



## Test & Monitoring Services

Substations / Facilities



*In Test and Measurement energetic's field, we are offering the following services:*

- *Measurement*
- *Testing*
- *Monitoring*
- *Diagnostic*
- *Analysis*
- *Engineering*
- *Projecting*
- *Expert training*
- *Consultances*
- *Experts seminars*

*TECTRA has a longterm exoeriences in above topics. Our engineers passed the trainings at the world famous T&M equipment manufacturers. We have experts, knowledge and equipment to complete the most complex projects*

*Our service is always complete. If its about measurements, it includes observe the conditions, problem analysis, test and measurement, test results analysis and solution proposal (optional the complete solution execution)*

*TECTRA has colaboration with the most worldwide reputable organisations like: IEC, IEEE, CIGRE, SEV, CENELEC, PTB, METAS, MPL, NMI, VSL, DKD, TUV, NIST, UL, EPRI, ELECTROTEK*

*For each project we can, according to the needs and customer requirements, include each of above mentioned organisaions and their experts as well*



## **1 SUBSTATION**

### **1.1 COMMISSIONING**

#### **1.1.1 TESTING**

##### **ON-LINE**

##### **a) GENERAL INSPECTION**

Inspections of substation

Type of testing: visual, thermography, partial discharges

##### **b) INSPECTION OF PLANT ELEMENTS**

Inspection of substation's elements: transformers, cables, batteries, TC, CB, relays

Type of testing: visual, termography, partial discharges

##### **c) TEST OF REVENUE METER PLACES**

Test of accuracy of revenue meter places at LV/MV networks

Type of testing: Comparison of revenue meters with reference meters

##### **d) TEST OF LOADS, DEMANDS AND LOSSES**

Test of demand, loads and losses (*energy management*)

Type of testing: measurment of el.parameters at multiple sites

##### **e) TEST OF MV AND LV SWITCHGEARS**

Test of switchgears

Type of testing: visual, termovision, partial discharges

##### **f) TEST OF UPS AND BATTERIES**

Test, diagnostics and monitoring of UPS and batteries

Type of testing: test of UPS, battery cells and joints

##### **g) MEASUREMENT OF ELECTRIC ENERGY**

Periodic measurement of delivered/demanded electric energy (active and reactive)

Type of testing: measurement of electric energy with precise revenue meter

## **h) POWER QUALITY**

Periodic recording of power quality parameters on PCC according to standard EN 50160

Type of testing: measurement with portable PQ monitor Class A

## **OFF-LINE**

### **a) TEST OF TRANSFORMERS**

Test, diagnosis and monitoring of transformers  
For details pls have a look in separate document

### **b) TEST OF CABLES**

Test, diagnosis and monitoring of cables  
For details pls have a look in separate document

### **c) TEST OF UPS AND BATTERIES**

Test, diagnosis and monitoring of UPS and batteries  
Type of testing: test of UPS, battery cells and joints

## 1.2 PERIODIC MAINTENANCE

### 2.1.1 TESTING

#### ON-LINE

##### **a) GENERAL INSPECTION**

Inspections of substation

Type of testing: visual, thermography, partial discharges

##### **b) INSPECTION OF PLANT ELEMENTS**

Inspection of substation's elements: transformers, cables, batteries, TC, CB, relays

Type of testing: visual, termography, partial discharges

##### **c) TEST OF REVENUE METER PLACES**

Test of accuracy of revenue meter places at LV/MV networks

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Periodic measurement of delivered/demanded electric energy (active and reactive)

Type of testing: measurement of electric energy with precise revenue meter

##### **h) POWER QUALITY**

Periodic recording of power quality parameters on PCC according to standard EN 50160

Type of testing: measurement with portable PQ monitor Class A

### **i) POWER QUALITY MONITORING**

Permanent PQ monitoring at PCC

Type of testing: installation and measurement with PQ monitor Class

## **OFF-LINE**

### **a) TEST OF TRANSFORMERS**

Test, diagnostics and monitoring of transformers

For details pls have a look in separate document

### **b) TEST OF CABLES**

Test, diagnostics and monitoring of cables

For details pls have a look in separate document

### **c) TEST OF UPS AND BATTERIES**

Test, diagnostics and monitoring of UPS and batteries

Type of testing: test of UPS, battery cells and joints

## **1.3 MONITORING**

### **a) MONITORING OF POWER TRANSFORMERS**

Monitoring of power transformers

For details pls have a look in separate document

### **b) MONITORING OF POWER CABLES**

Monitoring of power cables

For details pls have a look in separate document

### **c) MONITORING OF UPS AND BATTERIES**

Monitoring of UPS and batteries

Type of monitoring: UPS, battery cells and joints

#### **d) MONITORING OF SWITCHGEARS**

Monitoring of switchgears

Type of monitoring: partial discharge

#### **e) MONITORING OF ELECTRIC ENERGY**

Monitoring of delivered/demanded electric energy (active and reactive)

Type of monitoring: installation of precise electric energy revenue meter

#### **f) POWER QUALITY MONITORING**

Permanent PQ monitoring at PCC

Type of monitoring: installation of PQ monitor Class A

## **2 INDUSTRIAL FACILITY CONNECTED TO POWER GRID**

### **2.1 COMMISSIONING**

#### **2.1.1 TESTING**

##### **ON-LINE**

##### **a) GENERAL INSPECTION**

Inspections of substation

Type of testing: visual, thermography, partial discharges

##### **b) INSPECTION OF PLANT ELEMENTS**

Inspection of substation's elements: transformers, cables, batteries, TC, CB, relays

Type of testing: visual, termography, partial discharges

##### **c) TEST OF REVENUE METER PLACES**

Test of accuracy of revenue meter places at LV/MV networks

Type of testing: Comparison of revenue meters with reference meters

##### **d) TEST OF LOADS, DEMANDS AND LOSSES**

Test of demand, loads and losses (*energy management*)

Type of testing: measurment of el.parameters at multiple sites

##### **e) TEST OF MV AND LV SWITCHGEARS**

Test of switchgears

Type of testing: visual, termovision, partial discharges

##### **f) TEST OF UPS AND BATTERIES**

Test, diagnostics and monitoring of UPS and batteries

Type of testing: test of UPS, battery cells and joints



### **g) ELECTRIC ENERGY**

Periodic measurement of delivered/demanded electric energy (active and reactive)  
Type of testing: measurement of electric energy with precise revenue meter

### **h) POWER QUALITY**

Periodic recording of power quality parameters on PCC according to standard EN 50160  
Type of testing: measurement with portable PQ monitor Class A

## **OFF-LINE**

### **a) TEST OF TRANSFORMERS**

Test, diagnostics and monitoring of transformers  
For details pls have a look in separate document

### **b) TEST OF CABLES**

Test, diagnostics and monitoring of cables  
For details pls have a look in separate document

### **c) TEST OF UPS AND BATTERIES**

Test, diagnostics and monitoring of UPS and batteries  
Type of testing: test of UPS, battery cells and joints

## **2.2 PERIODIC MAINTENANCE**

### **2.2.1 TESTING**

## **ON-LINE**

### **a) GENERAL INSPECTION**

Inspections of substation  
Type of testing: visual, thermography, partial discharges

### **b) INSPECTION OF PLANT ELEMENTS**

Inspection of substation's elements: transformers, cables, batteries, TC, CB, relays  
Type of testing: visual, termography, partial discharges

### **c) TEST OF REVENUE METER PLACES**

Test of accuracy of revenue meter places at LV/MV networks

Type of testing: Comparison of revenue meters with reference meters

### **d) TEST OF LOADS, DEMANDS AND LOSSES**

Test of demand, loads and losses (*energy management*)

Type of testing: measurement of el.parameters at multiple sites

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Test of switchgears

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Type of testing: test of UPS, battery cells and joints

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### **h) POWER QUALITY**

Periodic recording of power quality parameters on PCC according to standard EN 50160

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## **OFF-LINE**

### **a) TEST OF POWER TRANSFORMERS**

Test, diagnostics and monitoring of transformers  
For details pls have a look in separate document

### **b) TEST OF POWER CABLES**

Test, diagnostics and monitoring of cables  
For details pls have a look in separate document

### **c) TEST OF UPS AND BATTERIES**

Test, diagnostics and monitoring of UPS and batteries  
Type of testing: test of UPS, battery cells and joints

## **2.3 MONITORING**

### **a) ELECTRIC ENERGY**

MONITORING of delivered/demanded electric energy (active and reactive)  
Type of monitoring: installation and measurement with precise revenue meter

### **b) POWER QUALITY**

Permanent PQ monitoring at PCC  
Type of monitoring: installation and measurement with PQ monitor Class A

### **c) UPS AND BATTERIES**

monitoring of UPS and batteries  
Type of monitoring: UPS, battery cells and joints

### **d) SWITCHGEARS**

Test of switchgears  
Type of monitoring: visual, termovision, partial discharges

## **3 BUSINESS AND RESIDENTIAL FACILITY CONNECTED TO POWER GRID**

### **3.1 COMMISSIONING**

#### **ON-LINE**

##### **a) GENERAL SITE INSPECTION**

Inspections of measuring site  
Type of testing: visual, thermography

##### **b) SEARCH FOR ILLEGAL ELECTRIC ENERGY USE**

Search for illegal electric energy use  
Type of testing: Measurement of electric energy with special energy loggers

##### **c) TEST OF REVENUE METER PLAC**

Test of accuracy of revenue meter places at LV/MV networks  
Type of testing: Comparison of revenue meters with reference meters

##### **d) TEST OF LOADS, DEMANDS AND LOSSES**

Test of demand, loads and losses (*energy management*)  
Type of testing: measurement of el.parameters at multiple sites

##### **e) POWER QUALITY**

Periodic recording of power quality parameters on PCC according to standard EN 50160  
Type of testing: measurement with portable PQ monitor Class A

## 3.2 PERIODIC MAINTENANCE

### 3.2.1 TESTING

#### ON-LINE

##### a) GENERAL INSPECTION

Inspections of measuring site  
Type of testing: visual, thermography

##### b) SEARCH FOR ILLEGAL ELECTRIC ENERGY USE

Search for illegal electric energy use  
Type of testing: Measurement of electric energy with special energy loggers

##### c) TEST OF REVENUE METER PLACES

Test of accuracy of revenue meter places at LV/MV networks  
Type of testing: Comparison of revenue meters with reference meters

##### d) TEST OF LOADS, DEMANDS AND LOSSES

Test of demand, loads and losses (*energy management*)  
Type of testing: measurement of el.parameters at multiple sites

##### e) POWER QUALITY

Periodic recording of power quality parameters on PCC according to standard EN 50160  
Type of testing: measurement with portable PQ monitor Class A