1. **General Data and Specification**

|  |  |  |  |
| --- | --- | --- | --- |
| Circuit Ref. |  | Designation |  |
| Manufacturer | ALSTOM | Aux.Voltage | 110-250V DC |
| Type | P142 | Version |  |
| Serial No. |  | CT Ratio |  |

[..\WorkInstructions\61.pdf](file:///D%3A%5CRemovable%20Disk%5CDHRAN%20CENTRAL%5CWorkInstructions%5C61.pdf)

**For Mechanical Check/Visual Inspection and Electrical Tests Use C.L. of W.I.61**

1. **ELECTRICAL TESTS:**

###### Input Opto-Isolators CHECKS: (With Relay Energised), Check with Display & Software both.

|  |  |  |
| --- | --- | --- |
| **Opto Input No.** | **Test Method(Energize only one at a time with DC Voltage)** | **Result Display 0 to 1** |
| Opto 1 | Energize TB No. F1-F9 |   |
| Opto 2 | Energize TB No. F2-F9 |   |
| Opto 3 | Energize TB No. F3-F9 |   |
| Opto 4 | Energize TB No. F4-F9 |   |
| Opto 5 | Energize TB No. F5-F9 |   |
| Opto 6 | Energize TB No. F6-F9 |   |
| Opto 7 | Energize TB No. F7-F9 |   |
| Opto 8 | Energize TB No. F8-F9 |   |
| Opto 9 | Energize TB No. F11-F10 |   |
| Opto 10 | Energize TB No. F12-F10 |   |
| Opto 11 | Energize TB No. F13-F10 |   |
| Opto 12 | Energize TB No. F14-F10 |   |
| Opto 13 | Energize TB No. F15-F10 |   |
| Opto 14 | Energize TB No. F16-F10 |   |
| Opto 15 | Energize TB No. F17-F10 |   |
| Opto 16 | Energize TB No. F18-F10 |   |

###### Output Relays CHECKS: (With Relay Energised)

|  |  |  |
| --- | --- | --- |
| Output Relay No. | Operate Output – Force output from Software | Result Contact Checked |
| RL1 | Contact Operated | F21-F19-F20 |   |
| RL2 | Contact Operated | F24-F23-F22 |   |
| RL3 | Contact Operated | F25-F26 |   |
| RL4 | Contact Operated | F27-F28 |   |
| RL5 | Contact Operated | F29-F30 |   |
| RL6 | Contact Operated | F31-F32 |   |
| RL7 | Contact Operated | F33-F34 |   |
| RL8 | Contact Operated | F35-F36 |   |

**Device Watchdog Contact Check:**

|  |  |  |  |
| --- | --- | --- | --- |
| Auxiliary Supply Status | Relay Terminal | Contact Status | Remarks |
| Auxiliary Supply Off | H13-H14 | NO |  |
| H14-H15 | NC |  |
| Auxiliary Supply On | H13-H14 | NC |  |
| H14-H15 | NO |  |

**Operating DC Supply Current:**

 Power consumption Typical =25 VA, Maximum =45 VA

|  |  |  |
| --- | --- | --- |
| **Applied DC Voltage** | **DC Current**  | **Calculated Watts** |
| 125 V |  |  |

**A.SECONDARY INJECTION TEST:**

**Metering Check**

 Phase Current Accuracy Test – Supply Current in All Phase

±0.5% of the reading ± 10 mA from 0.05 to 10 A (for phases and ground) CT Ratio:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Applied Current | Expected Current | Reading (A) | Reading (B) | Reading (C) | Reading(N) |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
|  |  |  |  |  |  |

Voltage Measurement Accuracy Report

±1% reading ±0.1% Full Scale from 10 to 275 V PT Ratio :

|  |  |  |
| --- | --- | --- |
| Voltage Applied | Expected Voltage in KV | Actual Voltage in KV |
| Ph-Ph | Ph-N | AB | AN | BC | BN | CA | CN |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |

###### 1. 1 Non Directional Over Current Protection:

 ±0.5% of the reading ± 10 mA from 0.05 to 10 A,±1.5% of the reading for higher values.

 (As Per Technical Specification – Page 35)

###### 1.1.1 Phase/Ground Time Over Current Protection STAGE – 1 (51P/51G)

|  |  |  |  |
| --- | --- | --- | --- |
| **Phase** | **Set Current(I›1)** | **Pickup (A)** | **Drop off (A)** |
| **R** |  |  |  |
| **Y** |  |  |  |
| **B** |  |  |  |
| **G** |  |  |  |

###### 1.1.2 Phase/Ground Instantaneous Over Current Protection (50P/50G)

|  |  |  |  |
| --- | --- | --- | --- |
| **Phase** | **Set Current(I›1)** | **Pickup (A)** | **Drop off (A)** |
| **R** |  |  |  |
| **Y** |  |  |  |
| **B** |  |  |  |
| **G** |  |  |  |

###### 1.1.3 Phase Time Over Current Operating Time MEASUREMENT: STAGE - 1 (51P) Is: 1.0 A

Operate at > 1.03 times the pickup ±3% of operate time or 50 ms. (whichever is greater)

(As Per Technical Specification – Page 35)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Curve Description** | **Cal. Time@**  | **TMS** | **Phase** | **Measured Time (Secs)** |
| **5 x Is=5A** |
| **STAGE - 1** | **STAGE - 1 (5xIs)** |
| **DMT** |  |  | **R** |  |
| **IEC Short Time Inverse** |  |  | **Y** |  |
| **IEC Long Time Inverse** |  |  | **B** |  |
| **IEEE Moderately Inverse** |  |  | **R** |  |
| **IEEE Extremely Inverse** |  |  | **Y** |  |
| **ANSI Normal Inverse** |  |  | **B** |  |
| **ANSI Extremely Inverse** |  |  | **R** |  |
| **IEC Curve-A** |  |  | **Y** |  |

Final Setting Curve to be implemented = IEC CURVE A, Enable TOC-1 & Hi-SET( IOC-1) Stage-1 with Phase & Ground Protection, All other stages to be disabled.

###### 1.1.4 Phase/Ground Instantaneous Over Current Time MEASUREMENT: STAGE – 2 (50P/50G)

Operate at > 1.03 times the pickup ±3% of operate time or 50 ms. (whichever is greater)

 (As Per Technical Specification – Page 35)

|  |  |  |  |
| --- | --- | --- | --- |
| **Phase** | **Settings** | **Measured Pick up** | **Measured Time** |
| **Amp** | **Time** |
| **R** |  | 0 |  |  |
| **Y** |  | 0 |  |  |
| **B** |  | 0 |  |  |
| **G** |  | 0 |  |  |

* + 1. **DIRECTIONAL OVER CURRENT PROTECTION (67P)**

±2º for I>0.1 A and V>5 Vac (As Per Technical Specification – Page-40)

**Directional Over current operation angle boundary limits (forward direction)**

Apply 3 Ph Rated Voltage & Respective Phase Current with following angle.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Phase | RCA setting | Voltage applied | Current setting | Limits | Phase angle pickup |
| Lead | Lag |
| R |  |  |  |  |  |  |
| Y |  |  |  |  |  |  |
| B |  |  |  |  |  |  |

**1.1.6 DIRECTIONAL EARTH FAULT PROTECTION (67G)**

±2º for I>0.1 A and V>5 Vac (As Per Technical Specification – Page-40)

**DEF operation angle boundary limits (forward direction)**

Apply 3 Ph Voltage with 1 Ph Polarized Voltage & Respective Phase Current with following angle.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| RCA setting | Voltage Setting | Current setting | Limit | Phase angle pickup |
| Lead |
| Lead | Lag |
|  |  |  |  |  |  |

**1.1.7 Under Voltage Protection (27P)**

Apply 3 Ph Voltage and Reduce Respective Phase Voltage.

±1% reading ±0.1% Full Scale from 10 to 275 V at nominal frequency, ±3.5% of operate time or 50 ms. (whichever is greater)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Phase | Voltage setting | Time Setting | Voltage | Measured Time |
| Pickup | Dropout |
| R |  |  |  |  |  |
| Y |  |  |  |  |  |
| B |  |  |  |  |  |

**1.1.8 Under Frequency Protection (81U)**

Apply 3 Ph Voltage and Reduce Frequency.

 ±0.01 Hz of the reading ±3.5% of operate time or 100 ms. (whichever is greater)

|  |  |  |  |
| --- | --- | --- | --- |
| U/F setting | Time Setting | Frequency | Measured Time |
| Pickup | Dropout |
|  |  |  |  |  |

**1.1.9 VT fuse failure supervision (VTFF)** Check Supervision Pickup V2/V1 Ratio>0.25

|  |  |
| --- | --- |
| Phase | Measured voltage – Lower Respective Phase Voltage & Note down V2/V1 Ratio. |
| Pickup Voltage | Ratio |
| R |  |  |
| Y |  |  |
| B |  |  |