1. **GENERAL DATA AND INFORMATION.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Feeder/Bay No |  |  | Rated Power | ≥ 16W |
| Bay Name |  | Aux: Supply | 125 VDC |
| Manufacturer |  | Serial No: |  |
| Model No | REF615 | Designation |  |
| CT ratio |  |  |  |
| VT ratio |  |  |  |  |

1. **MECHANICAL CHECKS AND VISUAL INSPECTION:**

|  |  |  |
| --- | --- | --- |
| **ITEM** | **DESCRIPTION** | **CHECKED** |
| 1 | Inspect for physical damage / defects. |  |
| 2 | Verify connections as per approved drawings. |  |
| 3 | Check tightness of all connections. |  |
| 4 | Check Ferrules. |  |
| 5 | Check apparatus lists. |  |

1. **ELECTRICAL TESTS:**
   1. **FUNCTION TEST**

|  |  |  |
| --- | --- | --- |
| **ITEM** | **DESCRIPTION** | **CHECKED** |
| 1 | Test switch / plug checked for correct function. |  |
| 2 | Indications checked. |  |
| 3 | Alarm contacts checked. |  |
| 4 | Trip contacts checked. |  |
| 5 | Self test checked. |  |
| 6 | All output contacts resistance measured |  |
| 7 | Rely Burden within limits |  |

1. **MEASUREMENTS**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Ph.** | **Applied Voltage** | **Injected Current** | **Measured Voltage Ph - Ph** | **Measured Current** | **Active Power (P)**  **MW** | **Reactive Power (Q)**  **MVAR** | **FREQ** | **P.F** |
| R-N |  |  |  |  |  |  |  |  |
| Y-N |  |  |  |  |  |
| B-N |  |  |  |  |  |
| R-N |  |  |  |  |  |  |  |  |
| Y-N |  |  |  |  |  |
| B-N |  |  |  |  |  |
| R-N |  |  |  |  |  |  |  |  |
| Y-N |  |  |  |  |  |
| B-N |  |  |  |  |  |
| R-N |  |  |  |  |  |  |  |  |
| Y-N |  |  |  |  |  |
| B-N |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Ph.** | **Applied Voltage** | **Injected Current** | **Measured Voltage Ph - Ph** | **Measured Current** | **Active Power (P)**  **MW** | **Reactive Power (Q)**  **MVAR** | **FREQ** | **P.F** |
| R-N |  |  |  |  |  |  |  |  |
| Y-N |  |  |  |  |  |
| B-N |  |  |  |  |  |
| R-N |  |  |  |  |  |  |  |  |
| Y-N |  |  |  |  |  |
| B-N |  |  |  |  |  |
| R-N |  |  |  |  |  |  |  |  |
| Y-N |  |  |  |  |  |
| B-N |  |  |  |  |  |
| R-N |  |  |  |  |  |  |  |  |
| Y-N |  |  |  |  |  |
| B-N |  |  |  |  |  |

**FREQ. MEASUREMENT:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| APPLIED |  |  |  |  |
| ACTUAL |  |  |  |  |

1. **TESTING AND COMMISSIONING:**
   1. **PICK UP AND DROP-OFF TEST:**

In=1.0A, I>> ∞ PHHPTOC1[3I>>(1)]= OFF, PHIPTOC1[3I>>>]=OFF, EFHPTOC1[Io>>]= OFF, EFIPTOC1[Io>>>]=OFF

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **CURRENT SETTING Amps I>** | **O/C [PHLTDOC1-3I>]** | | | | | | **CURRENT SETTING Amps** | **E/F DEFLPDEF1[Io>]** | |
| **R** | | **Y** | | **B** | |
| **P/U A** | **D/O A** | **P/U A** | **D/O A** | **P/U A** | **D/O A** | **P/U A** | **D/O A** |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |

* 1. **TIME MULTIPLIER TEST:**

In=1.0A, I>> PHHPTOC1[3I>>(1)]= OFF,

PHIPTOC1[3I>>>]=OFF, EFHPTOC1[Io>>]= OFF, EFIPTOC1[Io>>>]=OFF

I>=0.3 IN, I>>=∞

Normal Inverse, I>inj. = 5\*Is = 1.5A,

Io>=0.4 IN, Io>>=∞, Io>inj. = 5\*Is = 2.0A

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| TMS VALUE K | R-PHASE | | Y-PHASE | | B-PHASE | | E/F N | | RANGE SEC |
| CALC | ACTUAL | CALC | ACTUAL | CALC | ACTUAL | CALC | ACTUAL |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |

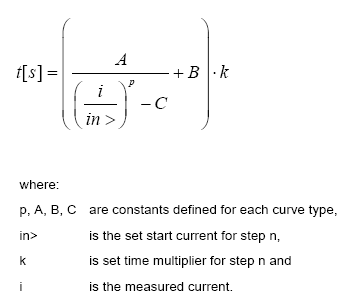
* 1. **RELAY OPERATING VALUE AS PER CURVE**

PHHPTOC1[3I>>(1)]= OFF, PHIPTOC1[3I>>>]=OFF,

EFHPTOC1[Io>>]= OFF, EFIPTOC1[Io>>>]=OFF

In=1A, Is (I>) =0.3 x In =0.3A, Io> = 0.3In

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| FUNCTION | INJECTED CURRENT Amps | EXPECTED TIME IN Sec | OPERATING TIME IN Sec K= | | | | RANGE SEC |
| R DPHLPDOC1 | Y DPHLPDOC1 | B DPHLPDOC1 | N DEFLPDEF1 |
| NORMAL INVERSE | 2 X Is |  |  |  |  |  |  |
| 5 X Is |  |  |  |  |  |  |
| 8 X Is |  |  |  |  |  |  |
| VERY INVERSE | 2 X Is |  |  |  |  |  |  |
| 5 X Is |  |  |  |  |  |  |
| 8 X Is |  |  |  |  |  |  |
| EXTREMELY INVERSE | 2 X Is |  |  |  |  |  |  |
| 5 X Is |  |  |  |  |  |  |
| 8 X Is |  |  |  |  |  |  |
| LONG INVERSE | 2 X Is |  |  |  |  |  |  |
| 5 X Is |  |  |  |  |  |  |
| 8 X Is |  |  |  |  |  |  |



**General formula for IDMT characteristics**

|  |  |  |  |
| --- | --- | --- | --- |
| CURVE | A | B | C |
| NORMAL INVERSE | 0.14 | 0 | 0.02 |
| VERY INVERSE | 13.5 | 0 | 1 |
| EXTREMELY INVERSE | 80 | 0 | 2 |
| LONG INVERSE | 120 | 0 | 1 |

* 1. **DEFINITE TIME CHARACTERISTICS:**

Is (I>, Io>) =0.3, In=1A DPHHPDOC1[3I>>(1)]= OFF,

PHIPTOC1[3I>>>]=OFF, DEFHPDEF1[Io>>]= OFF,

EFIPTOC1[Io>>>]=OFF

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **INJECTED CURRENT Amps** | **TIME SET - Sec** | **OPERATING TIME IN Sec DPHLPDOC1 3I>** | | | | **RANGE IN SEC** |
| **R** | **Y** | **B** | **N** |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

* 1. **HIGH STAGE ELEMENT**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **CURRENT SETTING Amps I>** | **O/C [DPHHPDOC1-3I>>]** | | | | | | **CURRENT SETTING Amps** | **E/F DEFHPDEF1[Io>>]** | |
| **R** | | **Y** | | **B** | |
| **P/U A** | **D/O A** | **P/U A** | **D/O A** | **P/U A** | **D/O A** | **P/U A** | **D/O A** |
|  |  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |

* 1. **INSTANTANEOUS SETTING ELEMENT**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Iset O/C& E/F Amps** | **R** | | **Y** | | **B** | | **N** | |
| **P/U A** | **D/O A** | **P/U A** | **D/O A** | **P/U A** | **D/O A** | **P/U A** | **D/O A** |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |

* 1. **INSTANTANEOUS TIMING TEST: In=1A**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **I set** | **I - Injected** | **SET TIME (m Sec)** | **OPERATING TIME IN mSec** | | | | **RANG IN mSEC** |
| **R** | **Y** | **B** | **N** |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

1. **CBF (CIRCUIT BREAKER FAIL) PROTECTION**

**INJECT** for Instantaneous Over Current for pickup time 50msec and adding CBF timer for CBF operate will be:

Time for I>>> + time for CBF timer = 50 + 200 = 250msec

**INJECT** for Inverse Time Over Current for pickup time 50msec and adding CBF timer for CBF operate will be:

Time for I>> + time for CBF timer = time for I>> + 200

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Phase | Current ( A ) | | | Stage 1 | | Stage 2 | |
| Set | Pickup | Drop-off | Set | OPTD (ms) | Set | OPTD (ms) |
| R |  |  |  |  |  |  |  |
| Y |  |  |  |  |
| B |  |  |  |  |
| R |  |  |  |  |  |  |  |
| Y |  |  |  |  |
| B |  |  |  |  |

When current drop-off (Less than 0.15In) before the timer for CBF complete time count the CBF operate not occur.

1. **Check of Binary input function ………………………... [ ]**
   1. **Check the IRF (Internal Relay Fail) output:**
   2. X2: 13-14 (OPEN in healthy condition/CLOSE in IRF) …………. [ ]

13-15 (CLOSE in healthy condition/OPEN in IRF) …………. [ ]

1. **RELAY FEATURES CHECK:**

|  |  |  |
| --- | --- | --- |
| Sr. | Relay Feature Description | Remarks |
| 1 | Display test at power up |  |
| 2 | Adjust the display contrast |  |
| 3 | Language has been set to English |  |
| 4 | Frequency has been set to 60Hz |  |
| 5 | Relay Model No. has been checked in the display |  |
| 6 | Resetting of alarms through HMI checked |  |
| 7 | Active setting group checked |  |
| 8 | Recorded Data has been checked |  |
| 9 | Setting has not been changed during DC supply fail |  |