#### GENERAL DATA AND INFORMATION:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Bay No.** |  |  | **Designation** |   |
| **Bay Name** | ACDB |  | **Order No.** |  |
| **MAKER**  | Schneider  |  | **Serial No.** |  |
| **Dwg & Sh No.** |  |  | **Aux. Voltage** | 24 - 250 VDC |
| **Frequency**  | 60 Hz |  | **Rated Current in Service** | 5 A |
|  |  |  | **CT Ratio** | 1600 / 5 A |

#### 2. MECHANICAL CHECKS AND VISUAL INSPECTION:

|  |  |  |
| --- | --- | --- |
| ITEM | DESCRIPTION | CHECKED |
| 1 | Inspect for any physical damage or defects. |  |
| 2 | Check tightness of all bolted connections. |  |
| 3 | Check all grounding connections are securely fix |  |
| 4 | Verify connections as per approved drawing |  |
| 5 | Check apparatus lists |  |
| 6 | Check Ferrules |  |

#### 3. ELECTRICAL TESTS:

###### 3.1. FUNCTION TEST:

|  |  |  |
| --- | --- | --- |
| ITEM | DESCRIPTION | CHECKED |
| 1 | Test switch / plug checked for correct function |  |
| 2 | Indication checked |  |
| 3 | Alarm contacts checked |  |
| 4 | Trip contacts checked |  |
| 5 | Watchdog contacts checked |  |
| 6 | All output contacts resistance measured |  |
| 7 | All inputs checked |  |

###### 3.2. Operating DC Supply Current:

|  |  |  |  |
| --- | --- | --- | --- |
| **DC Volts (V)** | **DC Current W/O Fault (mA)** | **DC Current during Fault (mA)** | **Calculated Watt (W)** |
|  |  |  |  |

 Maximum burden of the aux. supply **11W** SEPAM manual PCRED301006EN

#### 4. TESTING AND COMMISSIONING:

###### 4.1. 1A: 50/51 & 50N/51N *PICK UP and DROP OFF* (I> & I0> Test)

 Ratio : 1600/5A

 In = 1600 A , I setting = I threshold (0.4 In to 24 In , 0.1 In0 to 15 In0)

 2A: 50/51 = OFF

 50N/51N = OFF

 3A: 50/51 = OFF

 50N/51N = OFF

 4A: 50/51 = OFF

 50N/51N = OFF

|  |  |  |  |
| --- | --- | --- | --- |
| **Current Setting** **I**Threshold**(50 / 51)****Amps**  | **Over Current Relay** | **Current** **Setting** **I**Threshold**(50N / 51N)****Amps** | **Earth Fault Relay (N)** |
| R | Y | B |
| P/UA | D/OA | P/UA | D/OA | P/UA | D/OA | P/UA | D/OA |
| 2.5 A |  |  |  |  |  |  | 1.0 A |  |  |
| 5.0 A |  |  |  |  |  |  | 1.5 A |  |  |
| 10.0 A |  |  |  |  |  |  | 4.0 A |  |  |

**For the phase over current Accuracy:** ±5% or ± 0.01 In

(AS MANUAL SEPAM PCRED301006EN page 3/28)

**For the earth fault Accuracy:** ±5% or ± 0.01 I­n0

(AS MANUAL SEPAM PCRED301006EN page 3/34)

**DROP-OFF/ PICK-UP Ratio:** 93.5% ± 5%

(AS MANUAL SEPAM PCRED301006EN page 3/28 & 3/34)

###### 4.2. 1A: 50/51 & 50N/51N *RELAY OPERATING VALUE AS PER CURVE* (I> & I0> Curve Test)

 Ratio : 1600/5A

 In = 1600 A

 50/51 Threshold = 320A

 I injected = 10 \* I threshold = 3200 A P (10 A S)

 50N/51N Threshold = 160A

 I0 injected = 10 \* I0 threshold = 1600A P (5.0 A S)

 2A: 50/51 = OFF

 50N/51N = OFF

 3A: 50/51 = OFF

 50N/51N = OFF

 4A: 50/51 = OFF

 50N/51N = OFF

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Function**  | **TMS****Setting** | **Operating Time (s)** | **Range (s)** | **Calculated Value (s)** |
| R | Y | B | N |
| IEC Very Inverse Time VIT/B | 1 |  |  |  |  | 1.425 – 1.575 | 1.5 |
| IEC Extremely Inverse Time EIT/C | 1 |  |  |  |  | 0.768 – 0.848 | 0.808 |
| IEC Standard Inverse Time SIT/A | 1 |  |  |  |  | 2.822 – 3.120 | 2.971 |
| IEC Long Inverse Time LTI/B | 0.937 |  |  |  |  | 11.868 – 13.118 | 12.493 |

For SIT/A : K = 0.14 , α = 0.02 (For SIT/A)

$$t\left(s\right)=\frac{TMS \*K}{(^{I inj}/\_{I set})^{α}-1} TMS=\frac{T}{β} ; β=2.97 (For SIT/A) $$

The accuracy for IDMT curves for phase over current or Earth fault

is class 5 or Calculation (-10 ms : +25 ms) at 10 Is or 10 Is0

 (AS MANUAL SEPAM PCRED301006EN )

###### 4.3. 1A: 50/51 & 50N/51N *TIME MULTIPLIER TESTS* (I> & I0> TMS Test)

 Ratio : 1600/5A , In = 1600 A ,

 50/51 Threshold = 320A , Curve: IEC Standard Inverse Time SIT/A

 I injected = 10 \* I threshold = 3200A P (10 A S)

 50N/51N Threshold = 160A , Curve: IEC Standard Inverse Time SIT/A

 I0 injected = 10 \* I0 threshold = 1600A P (5.0 A S)

 50/51 Threshold = 320A , Curve: IEC Standard Inverse Time SIT/A

 I injected = 2 \* I threshold = 640A P (2 A S)

 50N/51N Threshold = 160A , Curve: IEC Standard Inverse Time SIT/A

 I0 injected = 2 \* I0 threshold = 320A P (1.0 A S)

 2A: 50/51 = OFF

 50N/51N = OFF

 3A: 50/51 = OFF

 50N/51N = OFF

 4A: 50/51 = OFF

 50N/51N = OFF

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Delay** **=** **TMS** | **R – Phase (s)** | **Y – Phase (s)** | **B – Phase (s)** | **E / F N (s)** | **Range****(s)** |
| Calc. | Actual | Calc. | Actual | Calc. | Actual | Calc. | Actual |
| 0.2 | 0.598 |  | 0.598 |  | 0.598 |  | 0.598 |  | 0.564 – 0.620 |
| 0.4 | 1.188 |  | 1.188 |  | 1.188 |  | 1.188 |  | 1.129 – 1.247 |
| 0.5 | 1.485 |  | 1.485 |  | 1.485 |  | 1.485 |  | 1.411 – 1.56 |
| I injected = 2 \* I setting |
| 0.2 | 2.006 |  | 2.006 |  | 2.006 |  | 2.006 |  | 1.906 – 2.106 |
| 0.4 | 4.012 |  | 4.012 |  | 4.012 |  | 4.012 |  | 3.814 – 4.213 |
| 0.5 | 5.015 |  | 5.015 |  | 5.015 |  | 5.015 |  | 4.735 – 5.265 |

The accuracy for IDMT curves for phase over current or earth fault is

 class 5 or -10ms - +25ms at 10 Is or 10 Is0

 (AS MANUAL SEPAM PCRED301006EN page 3/28 & 3/34)

###### 4.4. 1A: 50/51 & 50N/51N *DEFINITE TIME CHARACRISTICS* (I> & I0> Definite Time Test)

 Ratio : 1600/5A

 In = 1600 A , I inj = 2 \* Is

 I threshold = 1600 A , Curve: Definite

 I0 threshold = 1600 A , Curve: Definite

 2A: 50/51 = OFF

 50N/51N = OFF

 3A: 50/51 = OFF

 50N/51N = OFF

 4A: 50/51 = OFF

 50N/51N = OFF

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Current Setting** **I**Threshold**(50 / 51)****Amps**  | **Delay****Set (s)** | **Operating Time (s)** | **Current** **Setting** **I**Threshold**(50N / 51N)****Amps** | **Delay****Set (s)** | **Operating Time (s)** |
| R | Y | B | **(N)** |
| 5 A | 10 |  |  |  | 5 A | 10 |  |
| 5 |  |  |  | 5 |  |
| 2 |  |  |  | 2 |  |

The accuracy for definite curves for phase over current or earth fault is

 Class ±2% or -10ms - +25ms at 10 Is or 10 Is0

 (AS MANUAL SEPAM PCRED301006EN page 3/28 & 3/34)

###### 4.5. 1A: 50/51 = OFF

######  50N/51N = OFF

######  2A: 50/51 & 50N/51N *SETTING ELEMENT TEST* (I>> & I0>> Test)

 Ratio : 1600/5A

 In = 1600 A , I setting = I threshold

 3A: 50/51 = OFF

 50N/51N = OFF

 4A: 50/51 = OFF

 50N/51N = OFF

|  |  |  |  |
| --- | --- | --- | --- |
| **Current Setting** **I**Threshold**(50 / 51)****Amps**  | **Over Current Relay** | **Current** **Setting** **I**Threshold**(50N / 51N)****Amps** | **Earth Fault Relay (N)** |
| R | Y | B |
| P/UA | D/OA | P/UA | D/OA | P/UA | D/OA | P/UA | D/OA |
| 5.0 A |  |  |  |  |  |  | 2.5 A |  |  |
| 7.5 A |  |  |  |  |  |  | 3.75 A |  |  |
| 10.0 A |  |  |  |  |  |  | 5.0 A |  |  |

**For the phase over current Accuracy:** ± 5% or ± 0.01 In

(AS MANUAL SEPAM PCRED301006EN page 3/28)

**For the earth fault Accuracy:** ± 5% or ± 0.01 I­n0

(AS MANUAL SEPAM PCRED301006EN page 3/34)

**DROP-OFF/ PICK-UP Ratio:** 93.5% ± 5%

(AS MANUAL SEPAM PCRED301006EN page 3/28 & 3/34)

###### 4.6. 1A: 50/51 = OFF

 50N/51N = OFF

 2A: 50/51 & 50N/51N *TIMING TEST* (I>> & I0>> Timing Test)

 Ratio : 1600/5A

 In = 1600 A , I inj = 2 \* Is

 Curve: Definite

 3A: 50/51 = OFF

 50N/51N = OFF

 4A: 50/51 = OFF

 50N/51N = OFF

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Current Setting** **I**Threshold**(50 / 51)****Amps**  | **Injected Current****Amps** | **Set Delay****(m sec)** | **Operating Time (m sec)** | **Current** **Setting** **I**Threshold**(50N / 51N)****Amps** | **Operating Time (m sec)** |
| R | Y | B | **(N)** |
| 2.5 A | 5.0 A | 0 |  |  |  | 1.5 A |  |
| 3.75 A | 7.5 A | 400 |  |  |  | 2.5 A |  |
| 5.0 A | 10.0 A | 500 |  |  |  | 5.0 A |  |

**The accuracy for instantaneous phase over current or earth fault is**

< 50 ms at 2 Is or 2 Is0;Is>= 0.3In

<70 ms at 2 Is or 2 Is0; Is = 0.3In

 (AS MANUAL SEPAM PCRED301006EN page 3/28 & 3/34)

###### 4.7. 1A: 50/51 = OFF

######  50N/51N = OFF

 2A: 50/51 = OFF

 50N/51N = OFF

######  3A: 50/51 & 50N/51N *SETTING ELEMENT TEST* (I>>> & I0>>> Test)

 Ratio : 1600/5A

 In = 1600 A , I setting = I threshold

 4A: 50/51 = OFF

 50N/51N = OFF

|  |  |  |  |
| --- | --- | --- | --- |
| **Current Setting** **I**Threshold**(50 / 51)****Amps**  | **Over Current Relay** | **Current** **Setting** **I**Threshold**(50N / 51N)****Amps** | **Earth Fault Relay (N)** |
| R | Y | B |
| P/UA | D/OA | P/UA | D/OA | P/UA | D/OA | P/UA | D/OA |
| 5.0 A |  |  |  |  |  |  | 2.5 A |  |  |
| 7.5 A |  |  |  |  |  |  | 3.75 A |  |  |
| 10.0 A |  |  |  |  |  |  | 5.0 A |  |  |

**For the phase over current Accuracy:** ± 5% or ± 0.01 In

(AS MANUAL SEPAM PCRED301006EN page 3/28)

**For the earth fault Accuracy:** ± 5% or ± 0.01 I­n0

(AS MANUAL SEPAM PCRED301006EN page 3/34)

**DROP-OFF/ PICK-UP Ratio:** 93.5% ± 5%

(AS MANUAL SEPAM PCRED301006EN page 3/28 & 3/34)

###### 4.8. 1A: 50/51 = OFF

 50N/51N = OFF

 2A: 50/51 = OFF

 50N/51N = OFF

 3A: 50/51 & 50N/51N *TIMING TEST* (I>>> & I0>>> Timing Test)

 Ratio : 1600/5A

 In = 1600 A , I inj = 2 \* Is

 Curve: Definite

 4A: 50/51 = OFF

 50N/51N = OFF

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Current Setting** **I**Threshold**(50 / 51)****Amps**  | **Injected Current****Amps** | **Set Delay****(m sec)** | **Operating Time (m sec)** | **Current** **Setting** **I**Threshold**(50N / 51N)****Amps** | **Operating Time (m sec)** |
| R | Y | B | **(N)** |
| 2.5 A | 5.0 A | 50 |  |  |  | 2.5 A |  |
| 5.0 A | 10.0 A | 50 |  |  |  | 5.0 A |  |

**The accuracy for instantaneous phase over current or earth fault is**

< 50 ms at 2 Is or 2 Is0; Is>= 0.3 In

<70 ms at 2 Is or 2 Is0; Is = 0.3 In

 (AS MANUAL SEPAM PCRED301006EN page 3/28 & 3/34)

###### 4.9. 1A: 50/51 = OFF

######  50N/51N = OFF

 2A: 50/51 = OFF

 50N/51N = OFF

 3A: 50/51 = OFF

 50N/51N = OFF

######  4A: 50/51 & 50N/51N *SETTING ELEMENT TEST* (I>>>> & I0>>>> Test)

 Ratio : 1600/5A

 In = 1600 A , I setting = I threshold

|  |  |  |  |
| --- | --- | --- | --- |
| **Current Setting** **I**Threshold**(50 / 51)****Amps**  | **Over Current Relay** | **Current** **Setting** **I**Threshold**(50N / 51N)****Amps** | **Earth Fault Relay (N)** |
| R | Y | B |
| P/UA | D/OA | P/UA | D/OA | P/UA | D/OA | P/UA | D/OA |
| 5.0 A |  |  |  |  |  |  | 2.5 A |  |  |
| 7.5 A |  |  |  |  |  |  | 3.75 A |  |  |
| 10.0 A |  |  |  |  |  |  | 5.0 A |  |  |

**For the phase over current Accuracy:** ± 5% or ± 0.01 In

(AS MANUAL SEPAM PCRED301006EN page 3/28)

**For the earth fault Accuracy:** ± 5% or ± 0.01 I­n0

(AS MANUAL SEPAM PCRED301006EN page 3/34)

**DROP-OFF/ PICK-UP Ratio:** 93.5% ± 5%

(AS MANUAL SEPAM PCRED301006EN page 3/28 & 3/34)

###### 4.10.1A: 50/51 = OFF

 50N/51N = OFF

 2A: 50/51 = OFF

 50N/51N = OFF

 3A: 50/51 = OFF

 50N/51N = OFF

 4A: 50/51 & 50N/51N *TIMING TEST* (I>>>> & I0>>>> Timing Test)

 Ratio : 1600/5A

 In = 1600 A , I inj = 2 \* Is

 Curve: Definite

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Current Setting** **I**Threshold**(50 / 51)****Amps**  | **Injected Current****Amps** | **Set Delay****(m sec)** | **Operating Time (m sec)** | **Current** **Setting** **I**Threshold**(50N / 51N)****Amps** | **Operating Time (m sec)** |
| R | Y | B | **(N)** |
| 2.5 A | 5.0 A | 50 |  |  |  | 2.5 A |  |
| 5.0 A | 10.0 A | 50 |  |  |  | 5.0 A |  |

**The accuracy for instantaneous phase over current or earth fault is**

< 50 ms at 2 Is or 2 Is0; Is>= 0.3 In

<70 ms at 2 Is or 2 Is0; Is = 0.3 In

 (AS MANUAL SEPAM PCRED301006EN page 3/28 & 3/34)

**4.11.** Measurement Test:

In = 1600 A ;

Ratio : 1600 / 5 A

|  |  |
| --- | --- |
| **I injected/ph** | **Display Measurement Readings (A)** |
| I1 (A) | I2 (A) | I3 (A) | Io (A) |
| 2.5 |  |  |  |  |
| 5.0 |  |  |  |  |

**Accuracy for the phase current measurement is:**

± 0.5% and for the earth current measurement is ±1%

 SEPAM manual PCRED301006EN (sheet 2/3)

**4.12.** Relay Features Check:

|  |  |  |
| --- | --- | --- |
| **Sr.** | **Relay Features Description** | **Remarks** |
| 1 | Language has been set to English |  |
|
| 2 | Frequency has been set to 60 Hz |  |
| 3 | Relay Model No. has been checked in the display |  |
| 4 | Resetting of alarms through HMI checked |  |
| 5 | Active setting group checked Group-A |  |
| 6 | Setting has not been changed after DC fail |  |

**4.13.** Output Relay Contact Resistance Check:

|  |  |  |  |
| --- | --- | --- | --- |
| **Output Contact** | **01** | **03** | **04** |
| **Resistance (ohms)** |  |  |  |
|