



DEVICES	EXPLANATION
21, 21N	DISTANCE TIME-STEP PHASE AND GROUND DISTANCE RELAY
67, 67N	DIRECTIONAL PHASE AND GROUND OVERCURRENT RELAY
27,59	UNDER/OVER VOLTAGE RELAYS
25	SYNCHROCHECK RELAY
79	AUTOMATIC RECLOSING RELAY
50BF	BREAKER FAILURE RELAY
50	NON-DIRECTIONAL INSTANTANEOUS AND TIME PHASE OVERCURRENT RELAY
51	NON-DIRECTIONAL INSTANTANEOUS AND TIME GROUND OVERCURRENT RELAY
51GB	NON-DIRECTIONAL GROUND BACKUP OVERCURRENT RELAY
87T	TRANSFORMER DIFFERENTIAL RELAY
87REF	TRANSFORMER RESTRICTED EARTH FAULT RELAY THIS RELAY SHALL BE INCORPORATED IN THE TRANSFORMER DIFFERENTIAL RELAY (87T)
90	AUTOMATIC VOLTAGE REGULATOR
87B1, 87B2	BUS DIFFERENTIAL RELAYS - LOW IMPEDANCE TYPE
95B1, 95B2	BUS BAR SUPERVISION RELAY FOR BUSWIRE SUPERVISION FOR 87B1 AND 87B2
81	UNDER FREQUENCY RELAY
60	CAPACITOR CURRENT UNBALANCE SENSING RELAY
Q	POWER FACTOR CONTROLLER
DPM	DIGITAL POWER METER
DIM	DISTRIBUTED I/O MODULE (PROVIDED IN CSCS)
V METER	DIGITAL VOLTMETER
SS	SYNCHRONIZING SWITCH,3-POSITION,AUTO-OFF-MAN
L	SYNCHRONIZING LAMP
V	VOLTMETER
F	FREQUENCY METER
S	SYNCHROSCOPE
LL	LINE INDICATING LAMP
TS	CURRENT TEST SWITCH
TS	POTENTIAL TEST SWITCH
▲	LOCATED IN THE SWITCHYARD JUNCTION BOX
●	LOCATED IN THE CONTROL AND RELAY BOARD
▼	LOCATED IN THE 22 kV SWITCHGEAR JUNCTION BOX
◇	LOCATED IN 22 kV SWITCHGEAR CONTROL PROTECTIVE CIRCUITS
⏏	WYE CONNECTED CT OF SECONDARY WINDING
⏏	DELTA CONNECTED CT OF SECONDARY WINDING (IF ANY)
⏏	TRANSFORMER BUSHING CT OF SECONDARY WINDING, WYE CONNECTED FOR PHASE OR NEUTRAL
BCU	BAY CONTROL UNIT
— —	BUS GAS BUFFER MODULE (FOR DE-ENERGIZING ONLY ONE BUS DURING EXTENSION)

NOTES

- 115 kV. IVT RATIO $\frac{115,000}{\sqrt{3}} : \frac{115}{\sqrt{3}} / 115 // \frac{115}{\sqrt{3}} / 115 \text{ V}$
- 115 kV. CT RATIO $1800/1500/1200/900/600/300 : 1/1/1/1 \text{ A}$ - FOR LINE BAY
 $1800/1500/1200/900/600/300 : 1 \text{ A}$ - FOR TRANSFORMER BAY (CORE.1)
 $400/300/200 : 1/1/1 \text{ A}$ - FOR TRANSFORMER BAY (CORE.2-4)
 $1800/1500/1200/900/600/300 : 1/1/1 \text{ A}$ - FOR BUS COUPLER BAY
 $500/200/100 : 1 \text{ A}$ - FOR HIGH SIDE TRANSFORMER BUSHING CT
- 22 kV. VT. RATIO $\frac{22000}{\sqrt{3}} : \frac{110}{\sqrt{3}} / \frac{110}{\sqrt{3}} \text{ V}$
- 22 kV. CT. RATIO $1800/1500/900 : 1/1/1/1 \text{ A}$ - FOR INCOMING BREAKER
 $1800/1500/900 : 1/1 \text{ A}$ - FOR TIE BREAKER
 $1800/900 : 1/1 \text{ A}$ - FOR LOW SIDE TRANSFORMER BUSHING CT
 $1800/900 : 1/1 \text{ A}$ - FOR NEUTRAL TRANSFORMER BUSHING CT
 $600/300 : 1/1 \text{ A}$ - FOR OUTGOING 22 kV.
 $600/300 : 1/1 \text{ A}$ - FOR CAPACITOR BANK

50VA/0.5/1.5VF , 50VA/3P/1.5VF, SIMULTANEOUS BURDEN =100 VA.

20VA/5P20,20VA/0.5F55,20VA/5P20,20VA/5P20
20VA/5P20
20VA/0.5F55,30VA/5P20, 30VA/5P20
20VA/5P20,20VA/5P20,20VA/5P20
20VA/5P20
***PARTICULAR REQUIREMENT FOR ALL 5P20 CLASS CT's
CURRENT RATIO ERROR AT 100% OF RATED CURRENT < 0.5%
50VA/0.5/1.9VF , 50VA/3P/1.9VF

20VA/5P20 , 20VA/0.5F55 , 20VA/5P20 , 20VA/5P20
20VA/0.5F55 , 20VA/5P20
20VA/5P20 , 20VA/0.5F55
20VA/5P20 , 20VA/5P20
20VA/0.5F55 , 20VA/5P20
20VA/0.5F55 , 20VA/5P20
20VA/0.5F55 , 20VA/5P20
***PARTICULAR REQUIREMENT FOR ALL 5P20 CLASS CT's
CURRENT RATIO ERROR AT 100% OF RATED CURRENT < 0.5%

- THE NEUTRAL GROUNDING RESISTORS (NGR) ARE INDICATED FOR FUTURE INSTALLATION.
- SYNCHRONIZING SCHEMATIC
6.1 0-Y-P-0 SHOWN THUS, REFER TO INCOMING IVT DESIGNATIONS.
6.2 0BYP-0 SHOWN THUS REFERS TO RUNNING BUS IVT
6.3 0B ONLY SHOWN THUS, REFERS TO THE SECONDARY WINDING OF IVT FOR PHASE"B" AND USING FULL TAP WINDING 115V FOR SYNCHRONIZING SYSTEM WITH ONE END OF THE WINDING CONNECTED WITH COMMON GROUND BUS.
- MANUAL SYNCHRONIZING BY SYNCHROSCOPE SHALL UTILIZE INCOMING AND RUNNING SECONDARY VOLTAGES OF METERING CORES FROM"PHASE B" FOR BOTH IVT'S.
- AUTOMATIC SYNCHRONISM VERIFICATION BY SYNCHRO CHECK RELAY (25) SHALL UTILIZE INCOMING AND RUNNING SECONDARY VOLTAGES OF RELAYING CORES FROM"PHASE B" FOR BOTH IVT'S.
- EACH DIGITAL POWER METER (DPM) SHALL BE COMMUNICATED WITH AUTOMATIC METER READING (AMR) APPLICATION SERVER VIA SWITCH NETWORK.
- AUXILIARY CURRENT TRANSFORMERS SHOWN THUS, SHALL BE AS PARTS OF THE BUS DIFFERENTIAL RELAYS.

- THE DEDICATED PROTECTION RELAY FOR 22 kV SWITCHGEAR SHALL BE STANDARDIZED WHICH CAN BE EITHER USED FOR INCOMING, OUTGOING FEEDERS, OR CAPACITOR BANK FEEDERS.
- FOR 115KV SYSTEM, RELAYS SHALL BE DOUBLE MAIN PROTECTION RELAY(MAIN1&2) AND DIFFERENT PRODUCT/MANUFACTURER.
- NETWORK TOPOLOGY OF SUBSTATION CONTROL AND PROTECTION SYSTEM IS TOPOLOGY 1

กองออกแบบสถานีไฟฟ้า
 ฝ่ายงานสถานีไฟฟ้า
 ผู้เขียน สุวิกรม
 ผู้สำรวจ
 วิศวกร สุวิกรม
 หัวหน้าแผนก วรวิทย์
 ผู้อำนวยการกอง
 ผู้อำนวยการฝ่าย (แนบ)
 รองผู้อำนวยการวิศวกรรม

การไฟฟ้าส่วนภูมิภาค
 ผู้ว่าการ (แนบ)
 สถานีไฟฟ้าเชียงใหม่ 9 จ.เชียงใหม่
 มิตรธรรมสกล โดยคณะกรรมการ
 CHIANG MAI 9 SUBSTATION
 METERING AND RELAYING DIAGRAM

ใช้แบบ
 ถูกแทน โดยแบบ
 เขียนเสร็จวันที่ 1 ก.ค. 63
 แก้แบบวันที่
 รับผิดชอบ
 มาตราส่วน
 แบบเลขที่ FA4-011/63047
 แผ่นที่ 1 ของจำนวน 1 แผ่น