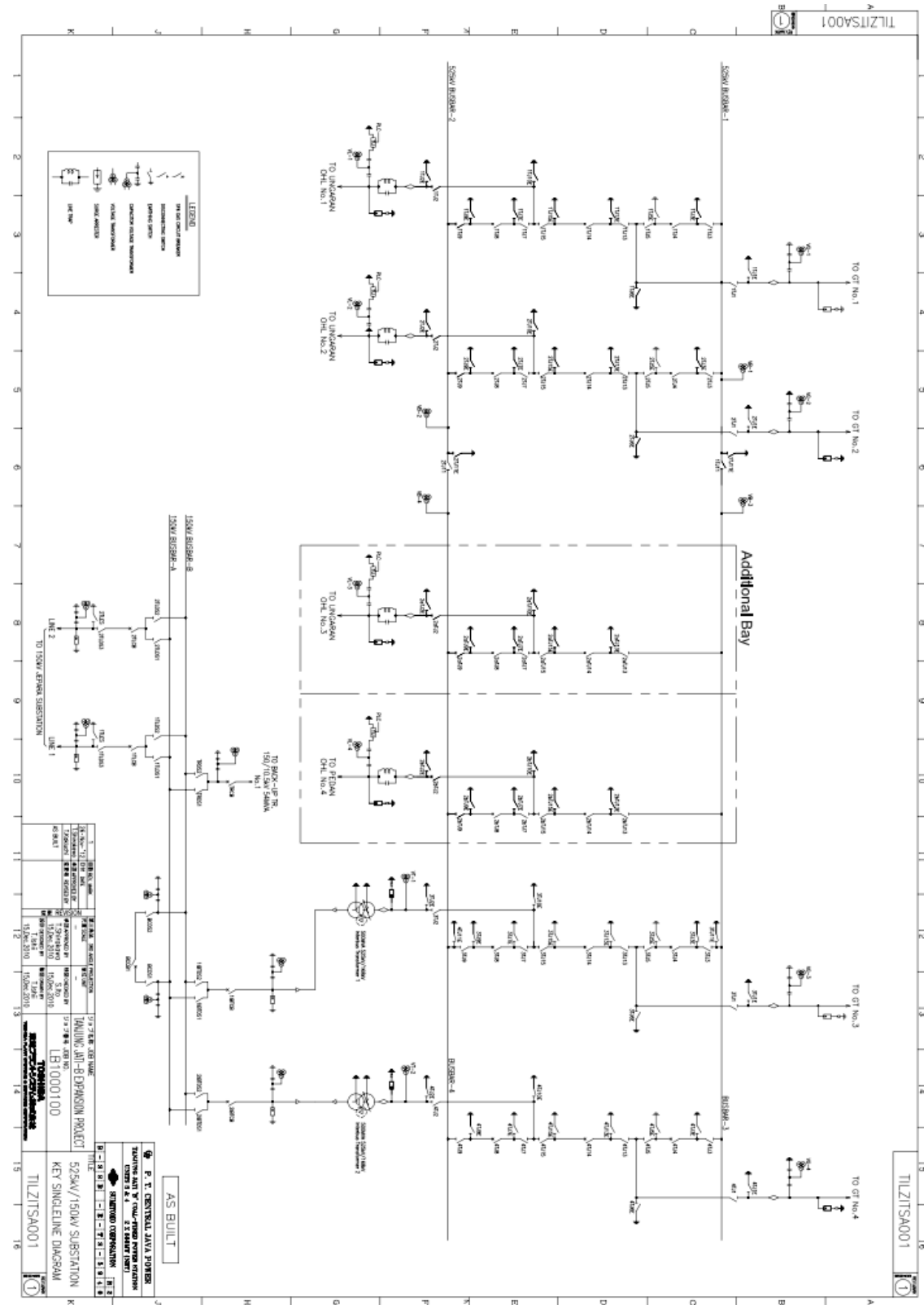


Lampiran

1. Single Line Diagram Generator 525 kV



2. Pemodelan Single Line diagram PLTU Tanjung Jati B



3. Nameplate Transformator PLTU Tanjung Jati

1-2204524

TOSHIBA

TRANSFORMER

MATERIAL STAINLESS STEEL
DIMENSIONS 1 2

RATED POWERS	<input type="text" value="786"/> MVA	STANDARD	<input type="text" value="IEC 60076"/>
HV	<input type="text" value="786"/> MVA	TYPE OF COOLING	<input type="text" value="ODAF"/>
LV	<input type="text" value="786"/> MVA	TEMPERATURE RISES	
RATED FREQUENCY	<input type="text" value="50"/> Hz	WINDINGS	<input type="text" value="63"/> K
NUMBER OF PHASES	<input type="text" value="3"/>	OIL	<input type="text" value="53"/> K
RATED VOLTAGES		SERIAL NO.	<input type="text" value="C2009126"/>
HV	<input type="text" value="525"/> kV	MANUFACTURED IN	<input type="text" value="2010 01"/>
LV	<input type="text" value="22.8"/> kV	INSTRUCTION NO.	<input type="text" value="E-2002208"/>
RATED CURRENTS		APPROXIMATE MASSES	
HV	<input type="text" value="864"/> A	TOTAL	<input type="text" value="460"/> t
LV	<input type="text" value="13900"/> A	TRANSPORTATION	<input type="text" value="360"/> t
CONNECTION SYMBOL	<input type="text" value="YNd11"/>	CORE AND COILS	<input type="text" value="295"/> t
IMPEDANCE VOLTAGES		COOLER	<input type="text" value="15"/> t
AT	<input type="text" value="22.8-525"/> kV	MAIN-TANK OIL	<input type="text" value="93"/> m ³
	<input type="text" value="786"/> MVA	TYPE OF INSULATING OIL	<input type="text" value="MINERAL"/>

NO-VOLTAGE
TAP-CHANGERS

INSULATION LEVEL (kV)			
TERMINALS	AC	LI	SI
1U 1V 1W	550	1500	1175
1N	38	95	—
2U 2V 2W	50	170	—

HV WINDING CONNECTIONS			
VOLTS (kV)	AMPS (A)	TAP POS	CONNECTIONS
551.3	823	1	3-4
538.1	843	2	2-4
525.0	864	3	2-5
511.8	886	4	1-5
498.6	910	5	1-6

PRIMARY AND SECONDARY CURRENT (A)	RATINGS AND ACCURACY CLASS	ACCURACY LIMIT FACTOR
1A	2000/1	15VA 3P 2S
1B	1000/1	15VA 3P 2S
1C	5000/1	20VA 3P 2S
1D	1000/1.5	FOR USE WITH VDD TEMP. INDICATOR

1U 1V 1W 2U 2V 2W

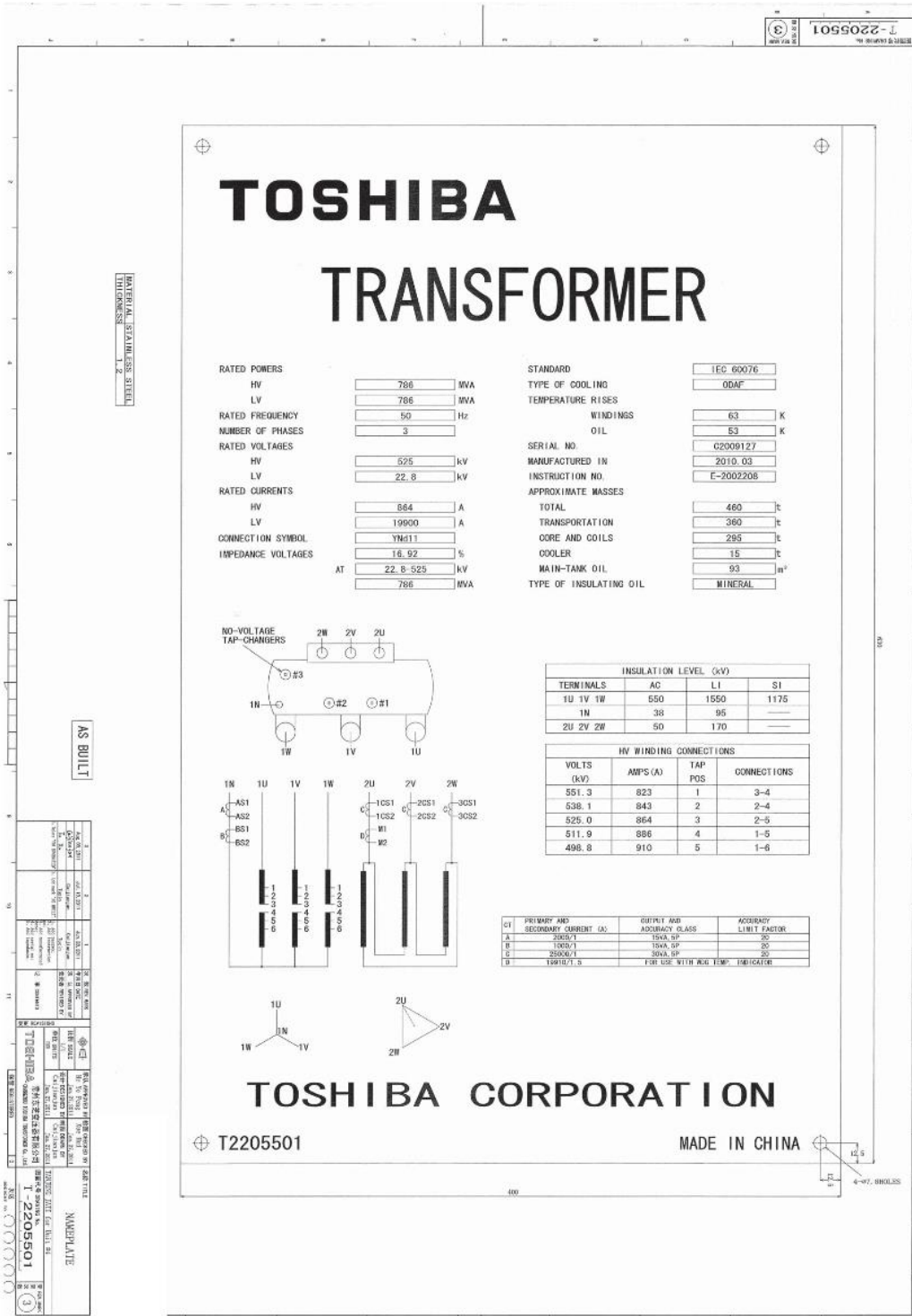
TOSHIBA CORPORATION

⊕ T2204524
MADE IN CHINA

AS BUILT

NO.	DATE	DESCRIPTION
1	2010.01.15	AS BUILT

TOSHIBA SHANGHAI 1-2204524	P.T. CENTRAL JAVA POWER TANJUNG JATI 3 RD COAL-FIRED POWER STATION UNIT 3 (GOVERNMENT) SURABAYA CORPORATION	NAMEPLATE No. 3
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4. Spesifikasi Generator PLTU Tanjung Jati B Jepara

TOSHIBA

SPC-GEH-XIT3-0013_Rev. 2

2. TECHNICAL DATA INFORMATION

2.1 Type	: Three phase, totally enclosed synchronous generator, direct coupled to turbine
2.2 Cooling Method	
(1) Stator Winding	: Direct water-cooled
(2) Stator Core	: Hydrogen-cooled
(3) Rotor Winding	: Direct hydrogen-cooled
2.3 Rated Characteristics	
(1) Active Power at rated H2 pressure	: 721.8 MW continuous
(2) Apparent Power at rated H2 pressure	: 802 MVA continuous
(3) Power Factor (Overexcited)	: 0.9 (lagging)
Power Factor (underexcited)	: 0.95 (leading)
(4) Rated Voltage	: 22.8 kV
(5) Rated Nominal Voltage Range	: 22.8 kV \pm 5% at rated apparent power, speed, and power factor
(6) Speed of Rotation	: 3000 rpm
(7) Frequency	: 50 Hz
(8) Number of Phases	: 3
(9) Coupling to turbine	: Direct
(10) Class of Insulation / temperature rise	
- Stator	: Class F / B
- Rotor	: Class F / B
(11) Rated Hydrogen Pressure	: 4.4 bar \cdot g
(12) Standard	: IEC 60034-1 (2004)
2.4 Excitation System	: Static excitation system with thyristor rectifier
(1) Excitation Voltage	: 550V DC
(2) Field Current	: 5110A DC

2.5 Operating Characteristics

(1) Short Circuit Ratio (at 802MVA base) : Not less than 0.50

(2) Resistances

- one stator phase at 95 degree C : 0.00184 ohm
 - rotor at 95 degree C : 0.0973 ohm

(3) Percent Resistance and Reactance (on 802MVA base)

%Resistance (at 95 degree C):

Positive Sequence resistance, R1 : 4.6%
 Negative Sequence resistance, R2 : 8.2%
 Zero Sequence resistance, R0 : 0.96%

% Reactance:

(Non Saturated)

- Synchronous reactance, Xd : 223%
 - Direct-axis transient reactance, Xd' : 35.2%
 - Direct-axis subtransient reactance, Xd'' : 29.0%

(Saturated)

- Synchronous reactance, Xd : 200%
 - Direct-axis transient reactance, Xd' : 32.7%
 - Direct-axis subtransient reactance, Xd'' : 25.8%
 - Quadrature-axis reactance, Xq : 197%
 - Quadrature-axis transient reactance, Xq' : 51.6%
 - Quadrature-axis subtransient reactance, Xq'' : 25.8%

- Negative sequence reactance X2 : 25.8%
 - Zero sequence reactance Xo : 14.2%
 - Armature leakage reactance, X_l : 21.0%
 - Three Phase to ground capacitance of stator winding : 0.99μF

- (4) Time Constants
- Direct axis transient open-circuit time constant
Tdo' (sec) : 7.0
 - Direct axis transient short-circuit time constant
Td' (sec) : 1.1
 - Direct axis subtransient short-circuit time constant
Td'' (sec) : 0.023

 - Armature short circuit time constant
Ta (sec) : 0.30
 - Quadrature-axis transient short-circuit time constant
Tq' (sec) : 0.40
 - Quadrature-axis subtransient short-circuit time constant
Tq'' (sec) : 0.023
- (5) Three-Phase Short-Circuit Current at No-load Excitation Condition
- instantaneous symmetrical rms : 78717A
 - instantaneous asymmetrical ... peak : 222645A
 - continuous rms : 10155A

3. GENERATOR TECHNICAL DATA**3.1. Dielectric Strength**

One minute power frequency withstand voltage for stator and rotor

- Stator : 46.6 kV
- Rotor : 5.1 kV

3.2. Mechanical Strength

- Rotor overspeed test : 120% - 2 minutes
- Overspeed strength (for two minutes) at 3600 rpm : $\sigma_{mean} < 2/3$ yield stress
- Critical speed
 - 1st : 900 rpm
 - 2nd : 2,400 rpm

3.3 Efficiency

-Load	MW	100%	75%	50%	25%
- H2 pressure	bar. g	4.4	4.4	4.4	4.4
- Efficiency					
p.f. = 1.00	%	99.13	99.16	99.05	98.51
p.f. = 0.90	%	98.88	98.96	98.89	98.39

(See M210463b-4)

3.4. Temperature Rise Limit

- Stator : 72 deg. C
- Rotor : 62 deg. C
- Design Base Temperature (H2 gas temperature) : 48 deg. C measured at H2 cooler outlet

3.5. Cooling

Coolant	Flow	Inlet Temperature (degree C)	Outlet Temperature (degree C)	Number of Coolers
- deionized water (for direct cooling of stator winding)	1390 l/min	48	78	NA
- hydrogen	40 m ³ / sec	48	70	NA
- cooling water (for cooling of the deionized stator cooling water)	3500 l/min	38	50	2
- cooling water (hydrogen cooling)	8400 l/min	38	46.7	4

3.6. Shaft Voltage

- Shaft grounding brush : Turbine side
- Insulation resistance of bearing : More than 100 k-ohm

3.7. Rotor Shaft Vibration (absolute displacement)

- Alarm point : 125 μ m p-p
- Trip point : 175 μ m p-p

3.8. Hydrogen Gas

- Hydrogen purity for normal operation : 98%
- Hydrogen purity for emergency operation : alarm 92%
- Hydrogen water content : 50 ppm
- Hydrogen consumption under normal operating condition : 30 Nm³/day
- Maximum hydrogen consumption at 4.4 bar.g : 35 Nm³/day

3.9. Generator Capability When One Cooler Out-of-service

: 534 MVA

3.10. Short-time Thermal Capability of Armature Winding and Field Winding: see ES-GENLIMITS-3b
and ES-GENLIMITS-4b3.11. Excitation PerformanceVoltage response time : 100ms
Response ratio (measured over 0.5 sec) : 3.60
Ceiling voltage : 1022 V3.12. Number of Stator Terminal

: 6

3.13. Connection of Stator Coil

: STAR

3.14. Losses (at rated load, 0.9 pf lagging and rated hydrogen pressure)- Iron loss at no load (kW) : 700
- Stray loss (kW) : 1120
- Friction and windage loss (kW) : 1210
- Stator winding copper loss (kW) at 95 deg. C : 2280
- Rotor winding copper loss (kW) at 95 deg. C : 2670
- Excitation Loss (kW) : 130
- Total Loss (kW) : 81103.15. Unbalanced Load Capability- Continuous : $I_2 = 0.08$ p.u.
- Short time : $(I_2)^2 t = 8$
 I_2 : Negative phase sequence current (p.u.) : see ES-GENLIMITS-6 attached
t : Time (sec)

T. (sec)	10	60	120	continuous
I_2 (P.U.)	0.89	0.36	0.25	0.08

3.16. Stator Winding Over Temperature Detection

In the stator cooling water auxiliary system, detection of extremely hot water temperature or extremely low water pressure conditions will cause tripping of the generator.

1. Data Etap

Synchronous Generator Editor - Gen.3 ✕

PSS	Hamonic	Protection	Reliability	Fuel Cost	Remarks	Comment
Info	Rating	Capability	Imp/Model	Grounding	Inertia	Exciter Governor

22 kV 721.8 MW Swing

```

    graph LR
      PM[Prime Mover] --- CG[Coupling Gear]
      CG --- G[Generator]
  
```

Inertia Calculator

	PrimeMover	Coupling	Generator	Total
RPM	3000	3000	3000	3000
WR ²	680	0	3697147	3697827
H	0,002	0	9,584	9,586

Include Torsion Effect

Gen.3
OK
Cancel



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UNIVERSITAS ISLAM SULTAN AGUNG (UNISSULA)

Jl. Raya Kaligawe Km.4 Semarang 50112 Telp.(024) 6583584 (8 Sal) Fax.(024) 6582455
email: informasi@unissula.ac.id web : www.unissula.ac.id

Fakultas Teknologi Industri

Bismillah Membangun Generasi Khaira Ummah

LEMBAR REVISI dan TUGAS UJIAN SARJANA

Berdasarkan Rapat Tim Penguji Ujian Sarjana

Hari : Senin
Tanggal : 23 Maret 2020
Tempat : R. Sidang

Memutuskan bahwa mahasiswa :

Nama : Muhammad Nur Hidayat
NIM : 30601501734
Judul TA : Analisis Kestabilan Transien Menentukan Critical Clearing Time pada PLTU Tanjung Jati B Unit 3 dan 4 Generator 3 Menggunakan Software ETAP 12.6

wajib melakukan perbaikan dan membuat tugas seperti tercantum dibawah ini:

NO	REVISI	BATAS REVISI
1	Cek kembali kesesuaian Penunjukan nomor gambar dgn nomor gambar yang dirujuk.	
2	Absrak 1 span -> cetak miring	
3	latar belakang difokuskan kembali dgn judul.	

NO	TUGAS

Mengetahui,
Ketua Tim Penguji

Dedi Nugroho, ST, MT
NIDN. 0614117701

Semarang, 23 Maret 2020
Penguji, I

Dedi Nugroho, ST, MT
NIDN. 0614117701



YAYASAN BADAN WAKAF SULTAN AGUNG
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Fakultas Teknologi Industri

Bismillah Membangun Generasi Khaira Ummah

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Memutuskan bahwa mahasiswa :

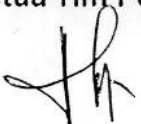
Nama : Muhammad Nur Hidayat
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wajib melakukan perbaikan dan membuat tugas seperti tercantum dibawah ini:

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2	Analisis tahanan kurang tajam	

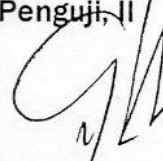
NO	TUGAS

Mengetahui,
Ketua Tim Penguji



Dedi Nugroho, ST, MT
NIDN. 0614117701

Semarang, 23 Maret 2020
Penguji, II



Gunawan, ST, MT
NIDN. 0618066301