Description of

USED CHP PLANT - Power 5,7 MW

Gas Turbine TAURUS 60 T7901SA SoLoNOx and its auxiliaries

GENERAL INFORMATION OF THE COGENERATION PLANT

Characteristics Of Genset

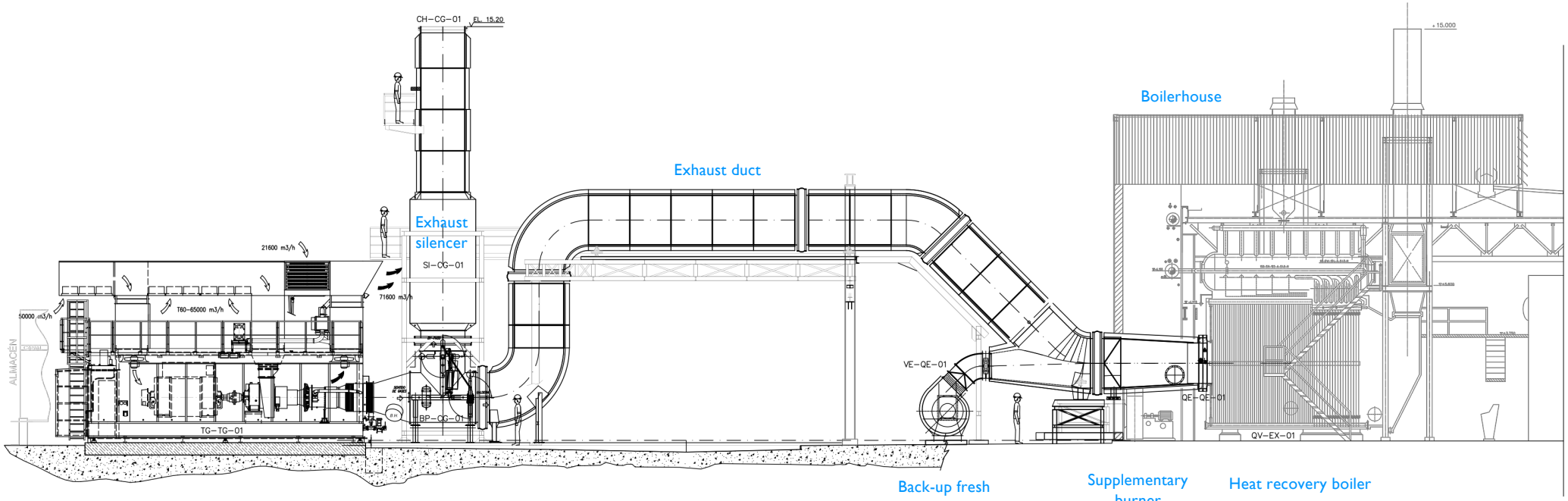
- ✓ Plant commissioned in year 2012.
- ✓ Gas turbine SOLAR Turbines | Model Taurus 60 - 7901SA | Power 5.670 kW | Reduced NOx emissions (SoLoNOx) | Fuel: Natural gas
- ✓ Generator Leroy Somer | Power 6750 kVA | 6,3 kV | 1.500 rpm | cos ϕ = 0,8 | 50 Hz. Last main revision of generator in June 2023
- ✓ Heat recovery boiler: Watertube type with supplementary firing and fresh air burner | Steam capacity @20 barg sat.: 25 t/h fired - 11,5 t/h unfired

Current Status Of Plant

- ✓ Unit always maintained by SOLAR under LTSA (long term service agreement) full guarantee.
- ✓ Last overhaul of core engine and gearbox performed June 2020 by substitution by SOLAR. Last service level B boroscope inspection 2024: successful
- ✓ Package definitely stopped in 1st April 2025 due to program of carbon footprint reduction. Since then the unit is started 30 min each month
- ✓ Fire hours of package: 101.278 h wehn stopped. **The turbine is serviceable and can be run for several hours as per Solar officials saying.**
- ✓ In 2023 Solar turbines performed disassembling of the unit, inspected Hot section and replaced 1st stage, 2nd stage, 3rd stage nozzle and stage 1, 2nd stage, 3rd stage blades, Housing Bearing #3 Assembly and bearing #3.
- ✓ Core engine fire hours: 37.349 h in the day it was stopped | Gearbox running hours: 36.244 h | Turbine starts: 184

GENERAL LAY OUT OF THE COGEN PLANT

- ✓ Engineering drawings are available, including constructive civil works drawings of foundations, racks etc.



SECCIÓN A–A'

THE TURBINE & GEARBOX

- ✓ Unit is in working condition. Boroscopy available.

PERFORMANCE

- Unit is in excellent state. Before stopping the genset we checked the performance of the gas turbine and power production was well adjusted to manufacturer curves. Production shown is 5.228 kW power at 19ºC ambient temperature and 20/220 mmwc inlet/exhaust presure lossses & 70 m.a.s.l.

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PREDICTED ENGINE PERFORMANCE

Customer: NESTLE	Model: TAURUS 60-7901S
Job ID:	Package Type: GSC
Run By: Albert Perez	Date Run: 15-Feb-19
Engine Performance Code: REV. 4.20.1.23.12	Engine Performance Data: REV. 2.1
	Match: STANDARD
	Fuel System: GAS
	Fuel Type: SD NATURAL GAS

DATA FOR MINIMUM PERFORMANCE

Elevation	metres	69
Inlet Loss	mm H2O	150.0
Exhaust Loss	mm H2O	250.0

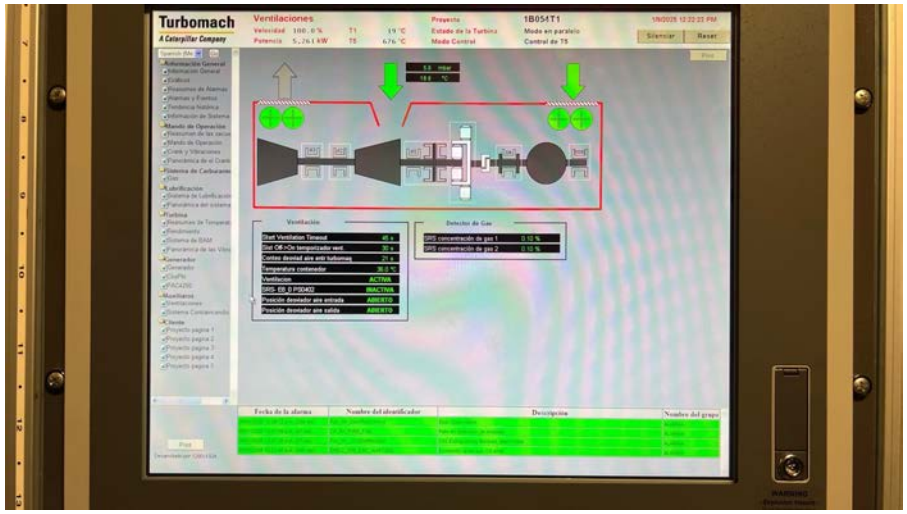
		1	2	3	4	5	6
Engine Inlet Temperature	deg C	15.0	-5.0	10.0	20.0	25.0	30.0
Relative Humidity	%	60.0	60.0	60.0	60.0	60.0	60.0
Gearbox Efficiency		0.9820	0.9820	0.9820	0.9820	0.9820	0.9820
Generator Efficiency		0.9740	0.9740	0.9740	0.9740	0.9740	0.9740
Based On 1.0 Power Factor							
Specified Load*	kW	FULL	FULL	FULL	FULL	FULL	FULL
Net Output Power*	kW	5233	5858	5392	5048	4843	4648
Fuel Flow	kcal/sec IT	4202.24	4577.10	4296.55	4097.83	3990.04	3893.13
Heat Rate*	kcal/kW-hr	2891	2813	2869	2922	2966	3015
Therm Eff*	%	29.746	30.568	29.973	29.425	28.988	28.516
Engine Exhaust Flow	kg/hr	76596	81125	77860	75020	73327	71797
PT Exit Temperature	deg C	517	507	514	521	525	530
Exhaust Temperature	deg C	517	507	514	521	525	530

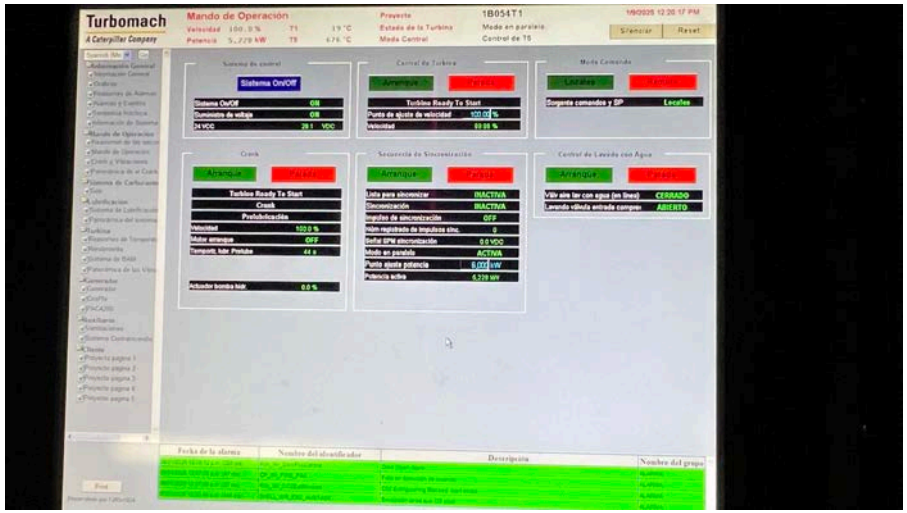
Fuel Gas Composition (Volume Percent)	
Methane (CH4)	92.79
Ethane (C2H6)	4.16
Propane (C3H8)	0.84
N-Butane (C4H10)	0.18
N-Pentane (C5H12)	0.04
Hexane (C6H14)	0.04
Carbon Dioxide (CO2)	0.44
Hydrogen Sulfide (H2S)	0.0001
Nitrogen (N2)	1.51

Fuel Gas Properties				
LHV (kcal/Nm3)	8827.1	Specific Gravity	0.5970	Wobbe Index at 60F 1215.6

*Electric power measured at the generator terminals.

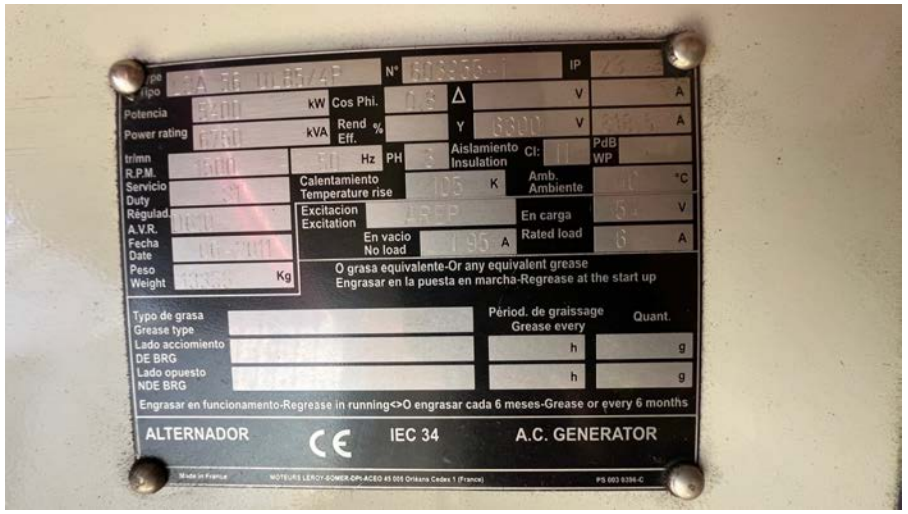
This performance was calculated with a basic inlet and exhaust system. Special equipment such as low noise silencers, special filters, heat recovery systems or cooling devices will affect engine performance. Performance shown is "Expected" performance at the pressure drops stated, not guaranteed.

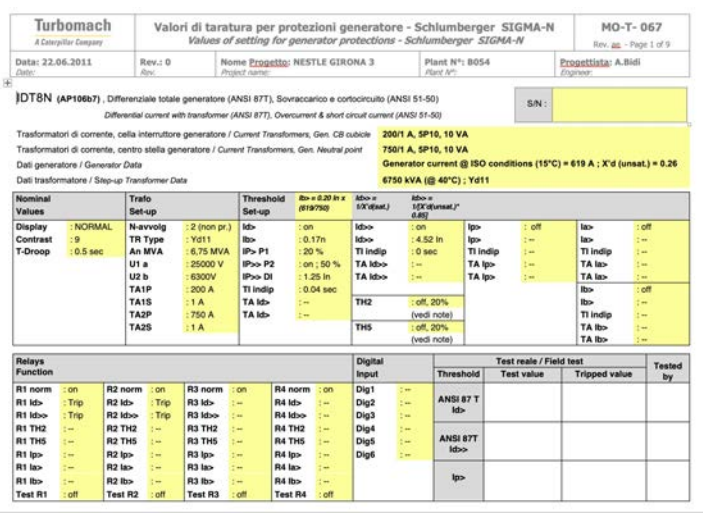




THE GENERATOR

- ✓ Generator Leroy Somer | Power 6750 kVA | 6,3 kV | 1.500 rpm | cos ϕ = 0,8 | 50 Hz
- ✓ Manual and all relays protection settings are available

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Valori di taratura per protezioni generatore - Schlumberger SIGMA-N
Values of setting for generator protections - Schlumberger SIGMA-N

MO-T- 067

Data: 22.06.2011 | Rev.: 0 | Nome Progetto: NESTLE GIRONA 3 | Plant N°: B054 | Progettista: A.Bidi

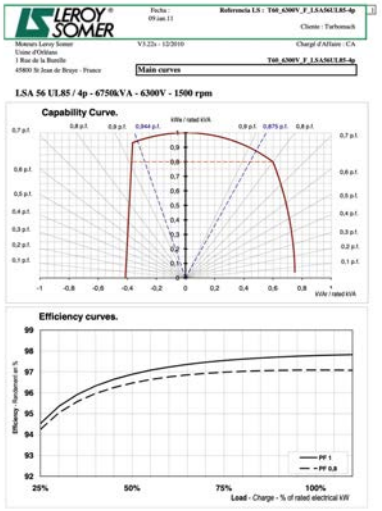
IDT8N (AP106b7) , Differenziale totale generatore (ANSI 87T), Sovraccarico e cortocircuito (ANSI 51-50)
Differential current with transformer (ANSI 87T), Overcurrent & short circuit current (ANSI 51-50)

S/N :

Trasformatori di corrente, cella interruttore generatore / Current Transformers, Gen. CB cubicle: 200/1 A, 5P10, 10 VA
Trasformatori di corrente, centro stella generatore / Current Transformers, Gen. Neutral point: 750/1 A, 5P10, 10 VA
Dati generatore / Generator Data: Generator current @ ISO conditions (15°C) = 619 A ; X'd (unsat.) = 0.26
Dati trasformatore / Step-up Transformer Data: 6750 kVA (@ 40°C) ; Yd11

Nominal Values		Trafo Set-up		Threshold Set-up	Id>> = 0.20 In x (619/750)	Id>> = 5'X'd(sat.)	Id>> = 1/[X'd(unsat.)* 0.85]				
Display	: NORMAL	N-avvolg	: 2 (non pr.)	Id>	: on	Id>>	: on	Ip>	: off	Ia>	: off
Contrast	: 9	TR Type	: Yd11	Ib>	: 0.17n	Id>>	: 4.52 In	Ip>	: --	Ia>	: --
T-Droop	: 0.5 sec	An MVA	: 6.75 MVA	IP> P1	: 20 %	TI indip	: 0 sec	TI indip	: --	TI indip	: --
		U1 a	: 25000 V	IP>> P2	: on ; 50 %	TA Id>>	: --	TA Ip>	: --	TA Ia>	: --
		U2 b	: 6300V	IP>> DI	: 1.25 In	TA Id>>	: --	TA Ip>	: --	TA Ia>	: --
		TA1P	: 200 A	TI indip	: 0.04 sec						
		TA1S	: 1 A	TA Id>	: --					Ib>	: off
		TA2P	: 750 A	TA Id>	: --	TH2	: off, 20% (vedi note)			TI indip	: --
		TA2S	: 1 A			TH5	: off, 20% (vedi note)			TA Ib>	: --
										TA Ib>	: --

Relays Function								Digital Input		Test reale / Field test			Tested by
										Threshold	Test value	Tripped value	
R1 norm	: on	R2 norm	: on	R3 norm	: on	R4 norm	: on	Dig1	: --				
R1 Id>	: Trip	R2 Id>	: Trip	R3 Id>	: --	R4 Id>	: --	Dig2	: --	ANSI 87 T Id>			
R1 Id>>	: Trip	R2 Id>>	: Trip	R3 Id>>	: --	R4 Id>>	: --	Dig3	: --				
R1 TH2	: --	R2 TH2	: --	R3 TH2	: --	R4 TH2	: --	Dig4	: --				
R1 TH5	: --	R2 TH5	: --	R3 TH5	: --	R4 TH5	: --	Dig5	: --	ANSI 87T Id>>			
R1 Ip>	: --	R2 Ip>	: --	R3 Ip>	: --	R4 Ip>	: --	Dig6	: --				
R1 Ia>	: --	R2 Ia>	: --	R3 Ia>	: --	R4 Ia>	: --			Ip>			
R1 Ib>	: --	R2 Ib>	: --	R3 Ib>	: --	R4 Ib>	: --						
Test R1	: off	Test R2	: off	Test R3	: off	Test R4	: off						


LEROY SOMER
Motores Leroy Somer
Usine d'Orléans
1 Rue de la Bastille
45800 St Jean de Braye - France

Fecha : 09 jan.11
Referencia LS : T60_6300V_F_LSA56UL85-4p
V3.22a - 12/2010
Cliente : Turbomach
Cliente d'Affaire : CA
T60_6300V_F_LSA56UL85-4p

Main curves

LSA 56 UL85 / 4p - 6750kVA - 6300V - 1500 rpm

Capability Curve.

Efficiency curves.


Proyecto : NESTLE GIRONA III
Related : R019a
No Rev. : 0
Fecha Rev : 16.08.2011

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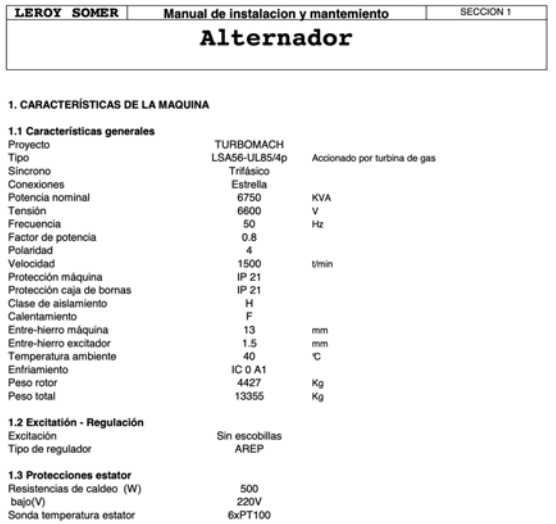
3.1.1.9 Vista del bastidor rotante del panel de control

(Esquema general, independiente del modelo)
Para esquemas referidos a modelos especiales, véanse diseños eléctricos.

Instrumentos de sincronización
PC HMI pantalla táctil
Transductor multifunción
Floppy disk, parada emergencia
Interruptor bomba lubrificación, botón apertura IG
Centralitas control vibraciones
Protecciones generador
Protección de red (si existen)
Regulador generador (AVR)


LEROY SOMER | Manual de instalacion y mantemiento | SECCION 1

Alternador

1. CARACTERÍSTICAS DE LA MAQUINA

1.1 Características generales

Proyecto	TURBOMACH	
Tipo	LSA56-UL85/4p	Accionado por turbina de gas
Sincrono	Trifásico	
Conexiones	Estrella	
Potencia nominal	6750	KVA
Tensión	6600	V
Frecuencia	50	Hz
Factor de potencia	0.8	
Polaridad	4	
Velocidad	1500	t/min
Protección máquina	IP 21	
Protección caja de bornas	IP 21	
Clase de aislamiento	H	
Calentamiento	F	
Entre-hierro máquina	13	mm
Entre-hierro excitador	1.5	mm
Temperatura ambiente	40	°C
Enfriamiento	IC 0 A1	
Peso rotor	4427	Kg
Peso total	13355	Kg

1.2 Excitatión - Regulación

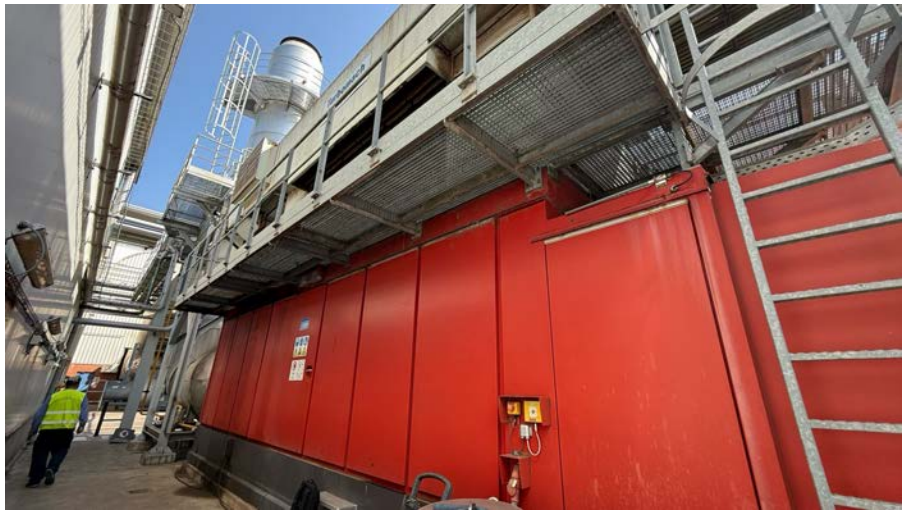
Excitación	Sin escobillas
Tipo de regulador	AREP

1.3 Protecciones estator

Resistencias de caldeo (W)	500
bajo(V)	220V
Sonda temperatura estator	6xPT100

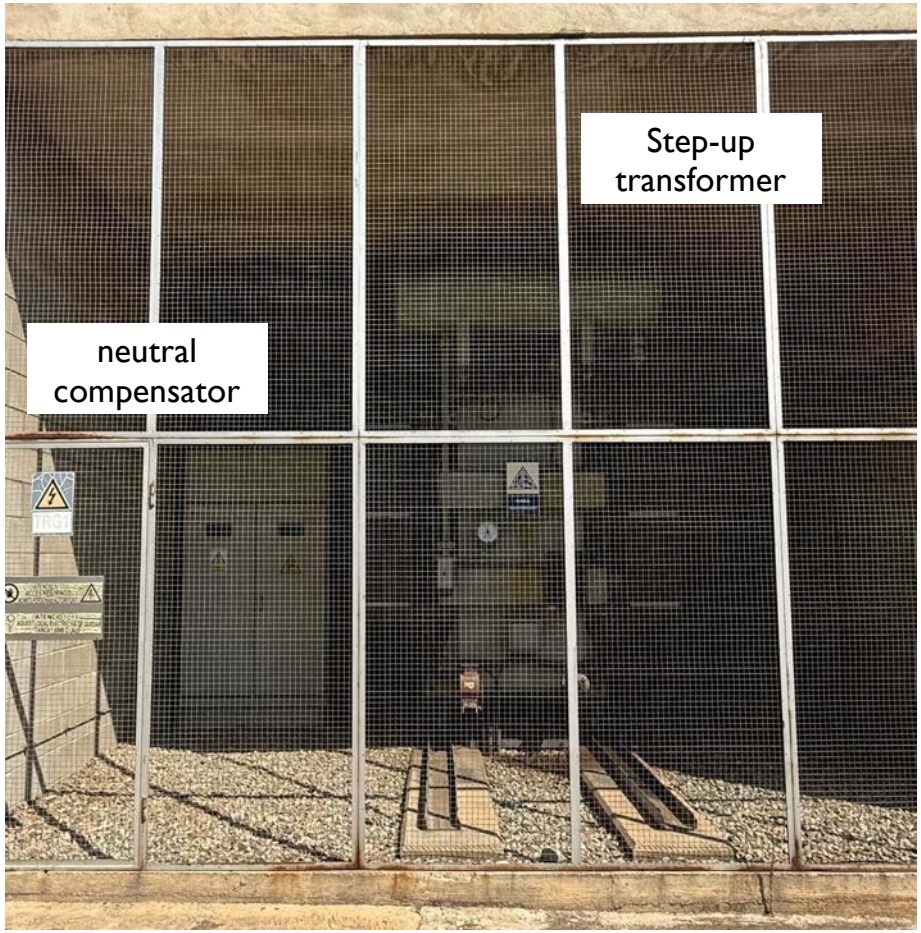
THE CONTROL SYSTEM

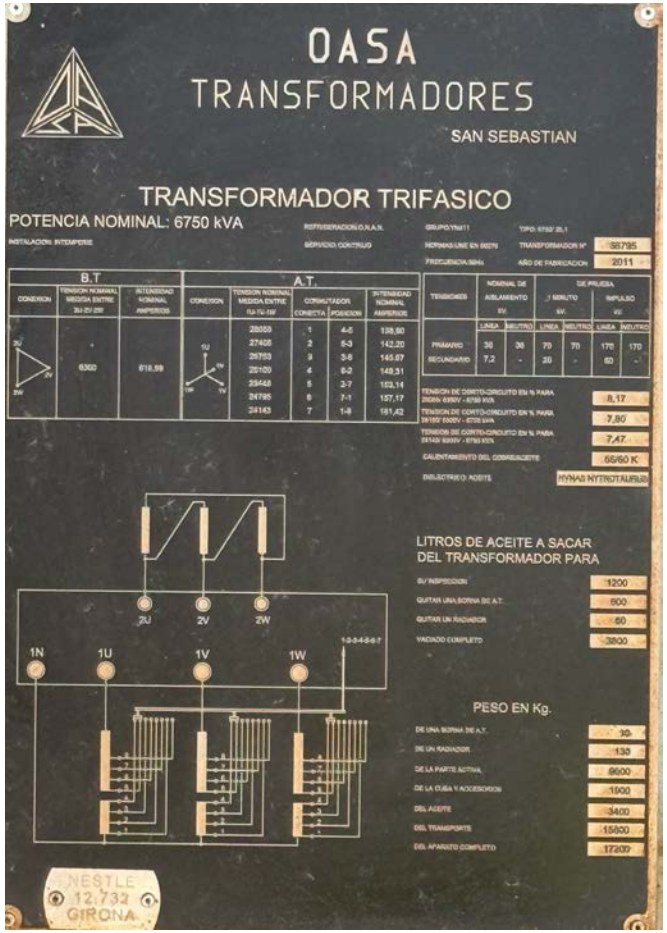
- ✓Control panels are integrated in the package.
- ✓Package is modular and compact.



STEP-UP TRANSFORMER

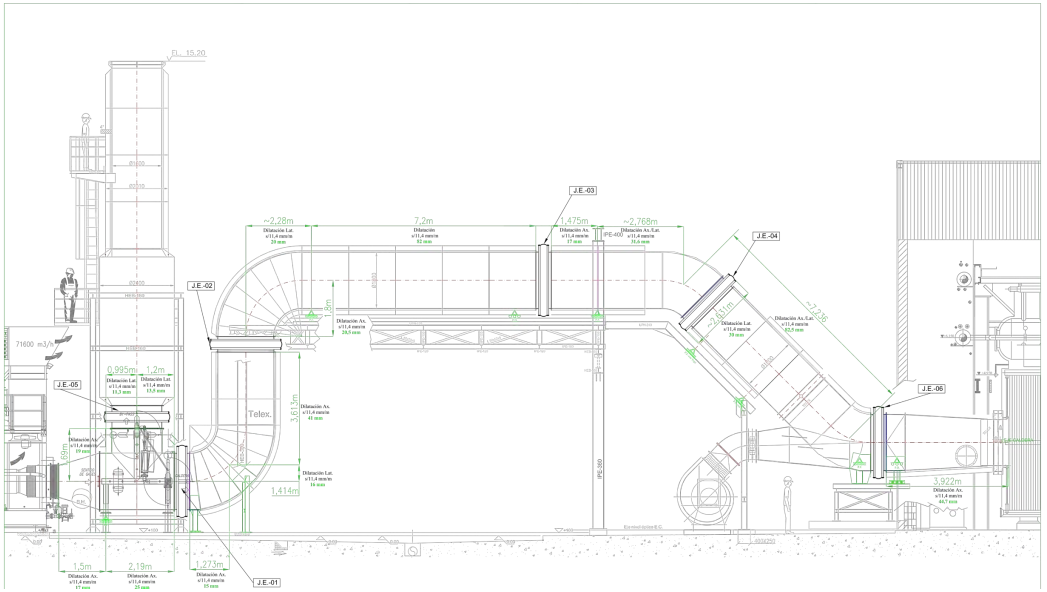
- ✓ Main step-up transformer YOM 2011 | 6.750 kVA | Voltage relation 6,3/25 kV
- ✓ Note1 : there is a second transformer available at site 6.500 kVA | Voltage relation 6,3/25 kV
- ✓ Note2 : Auxiliaries transformer not available
- ✓ Neutral three-phase compensator available for both transformers





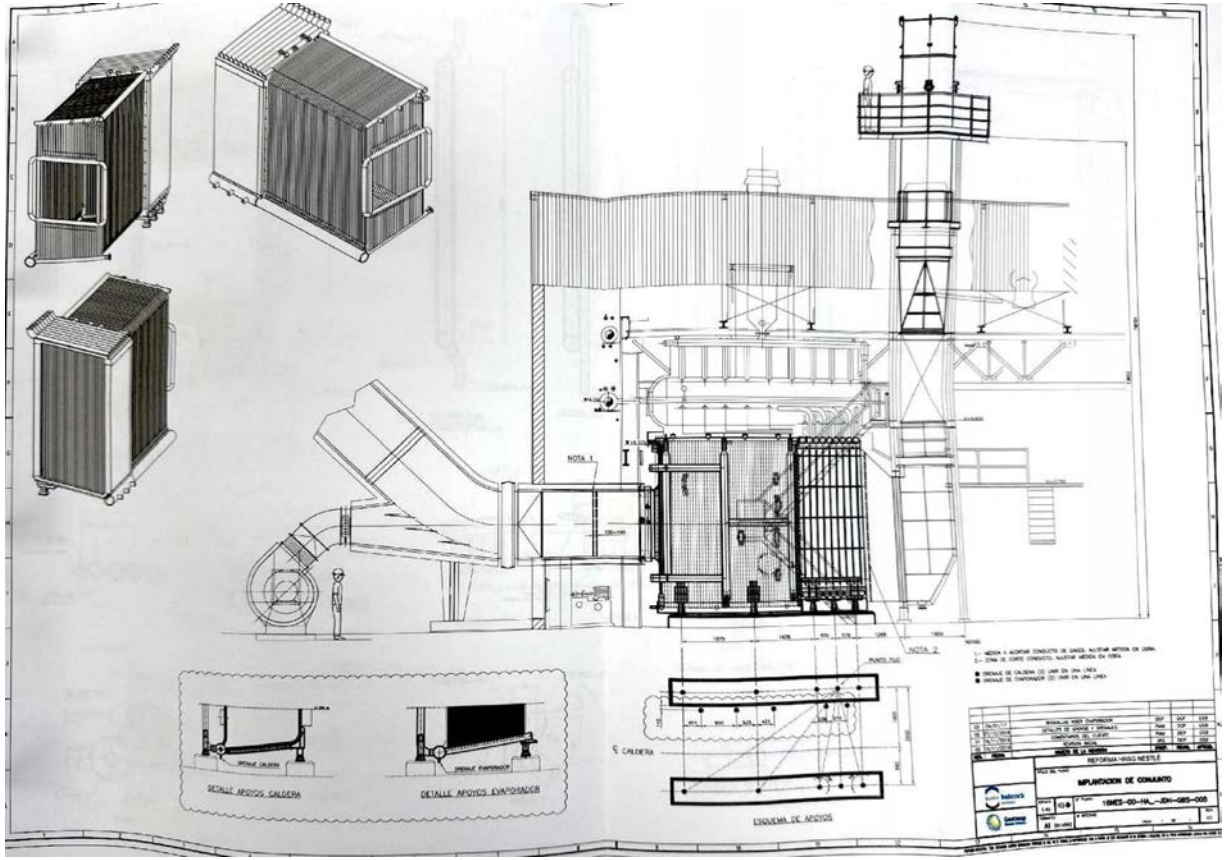
EXHAUST DUCTS AND BY-PASS DAMPER

- ✓ Exhaust damper bypass STEJASA make
- ✓ By-pass stack ND1600 height 15,20 m
- ✓ Exhaust duct to boiler DN 1800 including expansion joints, insulation



HEAT RECOVERY BOILER

- ✓ Manufacturer Babcock Montajes YOM 1996. All heat recovery bundles completely renewed in 2012
- ✓ New supplementary burner in 2012 manufacturer PILLARD | thermal power 9 MW | turn-down ratio 1:20
- ✓ Production of steam UNFIRED (only gas turbine exhaust): 11,5 t/h @ 20 barg sat.
- ✓ Production of steam FULLY FIRED (gas turbine exhaust + burner 100%): 25 t/h @ 20 barg sat.
- ✓ Production of steam FRESH AIR FIRED (gas turbine stopped + burner 100%): 11,5 t/h @ 20 barg sat.



HEAT RECOVERY BOILER PERFORMANCE

- ✓ Production of steam UNFIRED (only gas turbine exhaust) on day 9th January 2025: 11,44 t/h @ 20 barg sat.