

**POWER GENERATION FACILITIES  
TURNKEY CONSTRUCTION CONTRACT**

**DATED 30.12.2003**

**Between**

**ELECTRABEL s.a.**

**and**

**ANSALDO ENERGIA S.p.A.**

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**ROSELECTRA PROJECT  
POWER GENERATION PLANT**

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## 4. Heat Balances and GT Ageing Curves

### 4.1 Heat Balances (Expected and Guaranteed)

The Performances for this Power Plant are:

|  |           |
|--|-----------|
| Gross Electrical Power output at generator terminals                       | 393700 kW |
| Auxiliaries consumption (*)  | 6000 kW   |
| Step-up & Unit transformers Losses   | 1970 kW   |
| Net Guaranteed Electrical Power at<br>Step-up 400/20 kV Transformer outlet | 385800 kW |
| Net Efficiency   | 56.40%    |

With new and clean Plant.

The attached performances have been calculated according to the design conditions of par. 1.1 and 1.2.

The performances are referred to a Turbine Inlet Temperature according to ISO2314 of  $1230^{\circ}\text{C} \pm 10^{\circ}\text{C}$  and with fully open IGVs. The GT setting at base load established during the performance test shall be maintained during GT operation.

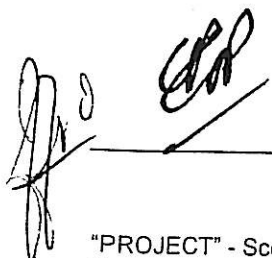
**For different fuel composition the performance will change accordingly.**

#### (\*) Auxiliaries considered:

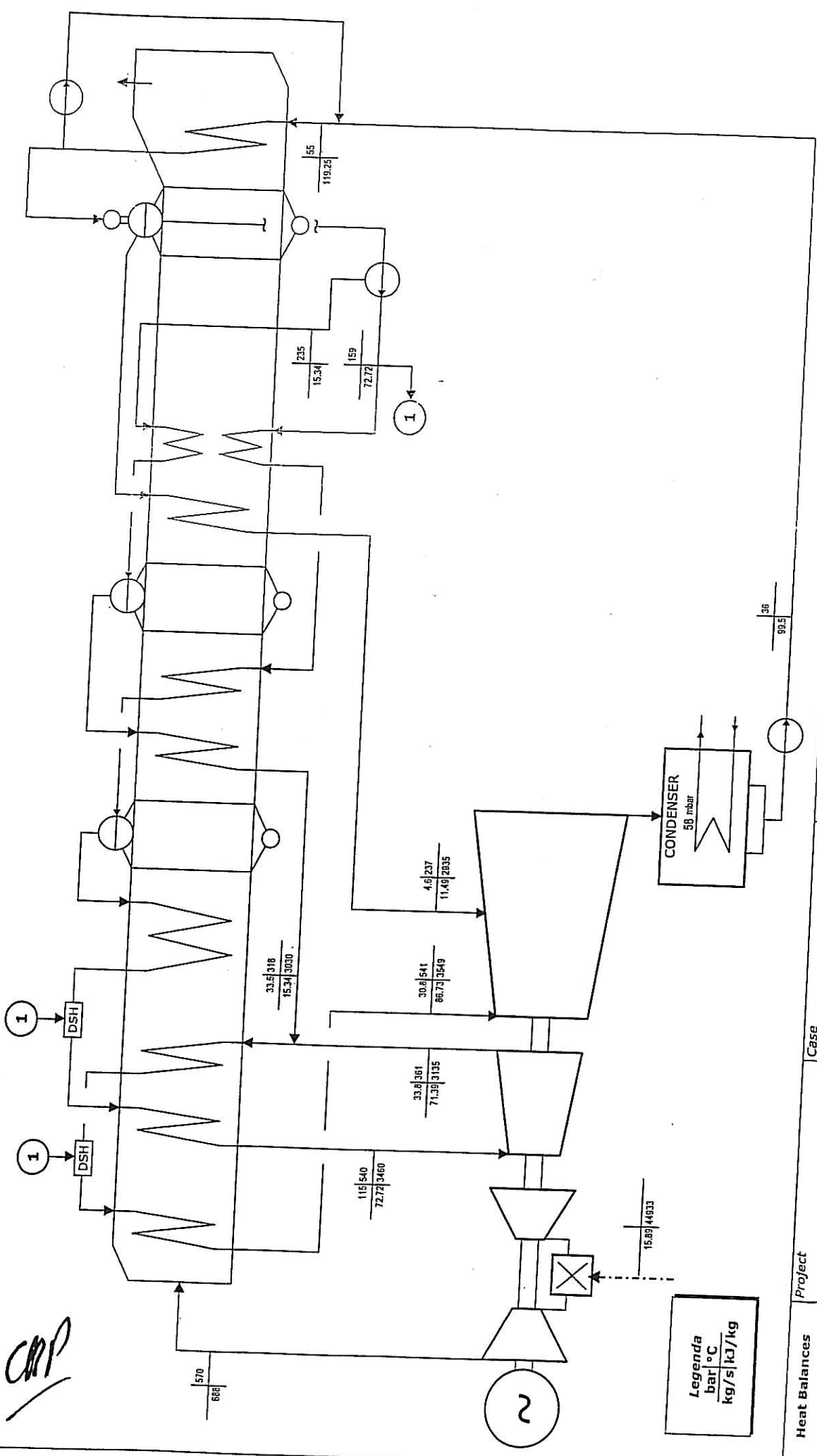
- Boiler Feedwater pumps
- Condensate extraction pumps
- HRSG recirculating pumps
- Condenser vacuum pumps
- Cooling tower make-up pump
- Circulating water pumps
- Cooling tower fans
- Closed cooling water pumps
- Turbogas auxiliaries
- Steam turbine auxiliaries
- HRG auxiliaries
- Chemical injection package
- Power Plant MV, LV and I&C Cables losses
- Power Plant auxiliary transformers losses

The following heat balances have been attached:

- 1) Heat Balance Base Load-Gas Fuel at 0°C of Amb. Temp. at 60% RH (EXPECTED)
- 2) Heat Balance Base Load-Gas Fuel at 10°C of Amb. Temp. at 80% RH (EXPECTED)
- 3) Heat Balance Base Load-Gas Fuel at 15°C of Amb. Temp. at 60% RH (EXPECTEED)
- 4) Heat Balance Base Load-Gas Fuel at 15°C of Amb. Temp. at 60% RH (GUARANTEED)
- 5) Heat Balance Base Load-Gas Fuel at 30°C of Amb. Temp. at 50% RH (EXPECTED)

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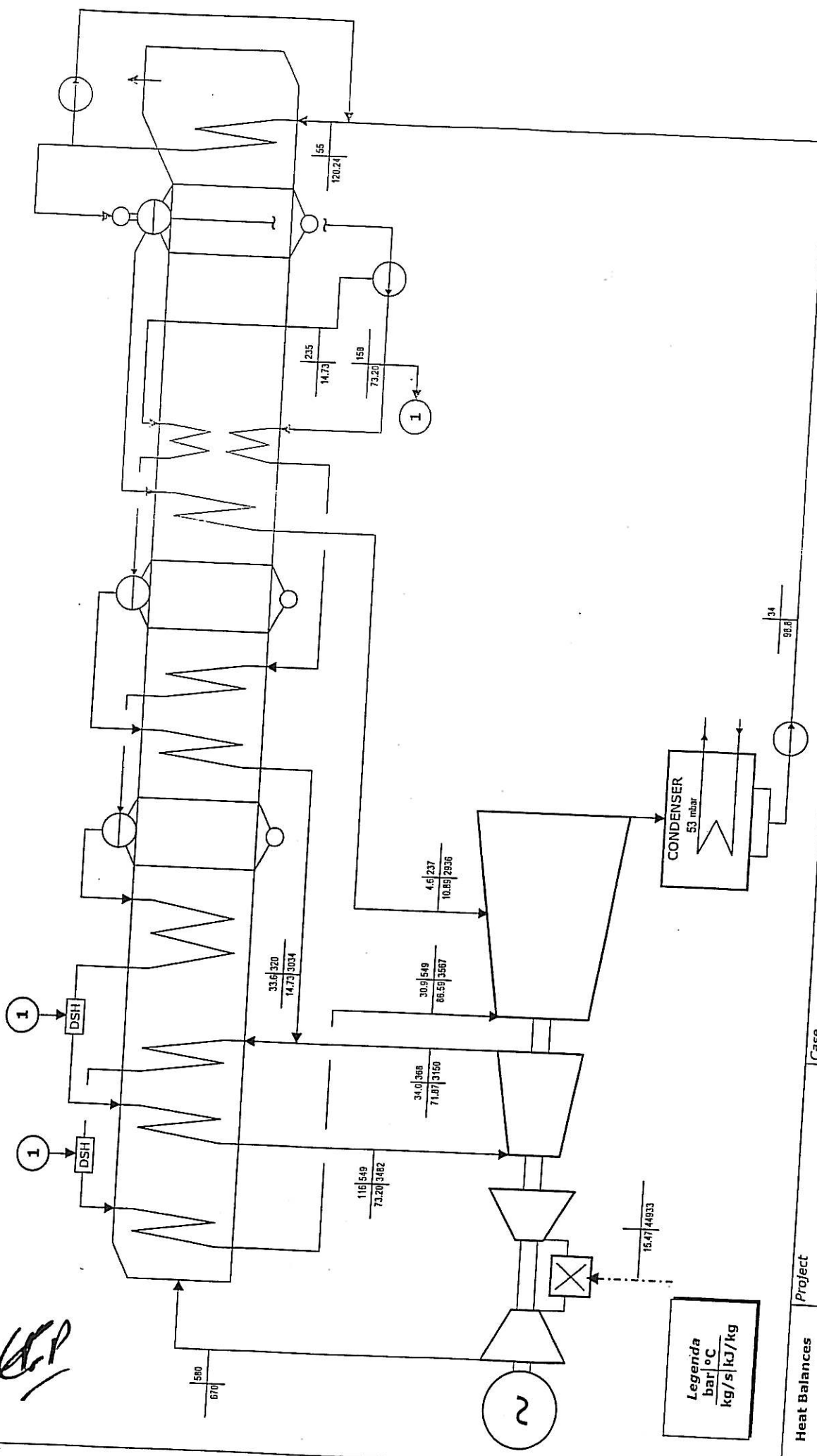
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| Heat Balances<br>For reference only | Project<br><b>TRACTEBEL<br/>ROSIGNANO</b> | Case<br><b>EXP2<br/>Load 100% Tamb=0°C</b> | Ambient conditions<br>Pressure 1.013 bar<br>Temp. 0 °C<br>Rel. Hum. 60 % | Net Output at Gen. Terminals<br>Power 402.1 MW<br>Heat Rate 6390 kJ/kWh<br>Efficiency 56.33 % | Model/Case<br>Date<br>ROS000<br>ROSE02<br>11/12/03 | <b>AnsaldoEnergia</b> |
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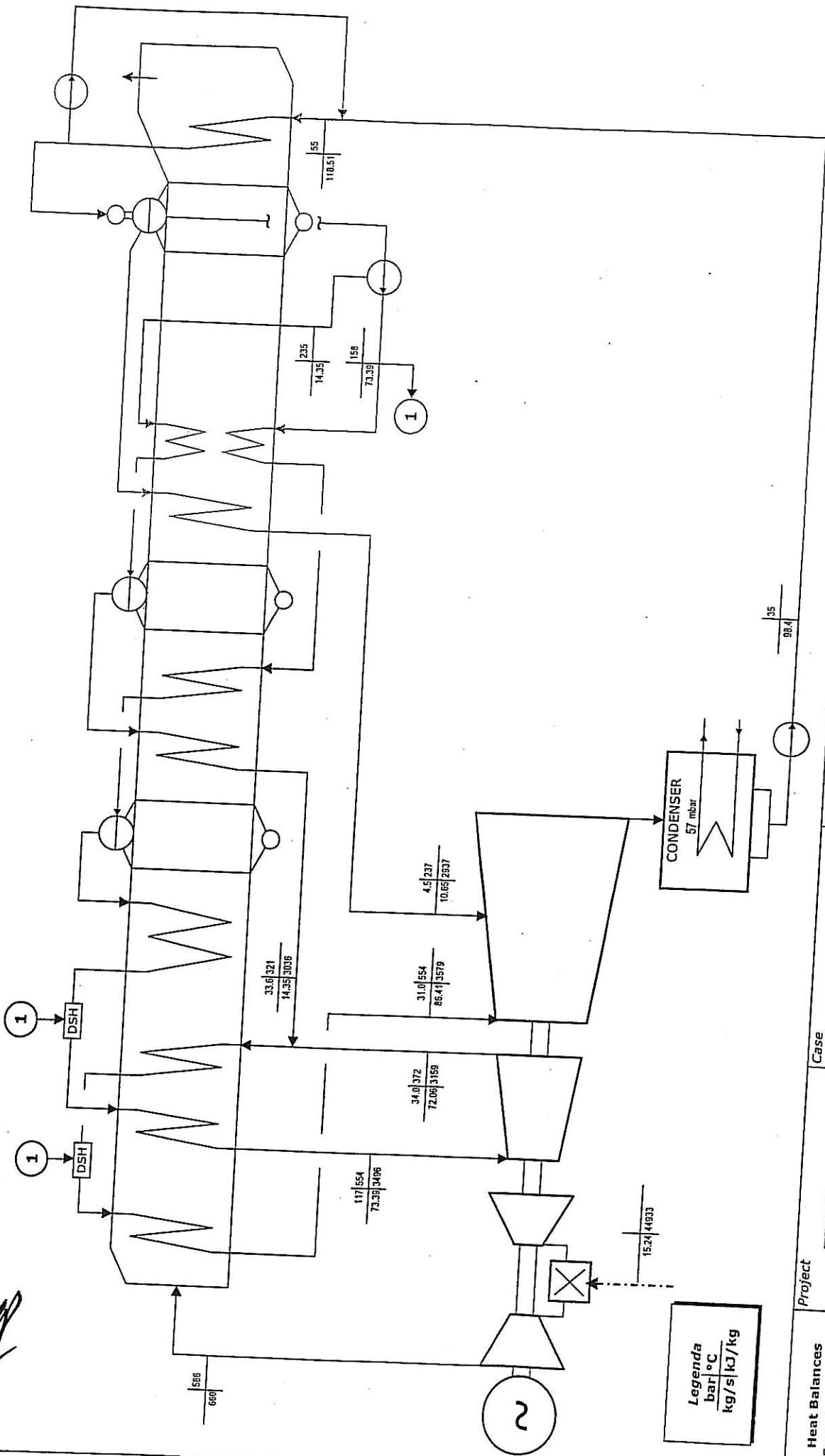


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|  |  |  |  |  |                              |                              |
|--|--|--|--|--|------------------------------|------------------------------|
| <b>Heat Balances</b><br>For reference only | <b>Project</b><br>TRACTEBEL<br>ROSIGNANO | <b>Case</b><br>EXP3<br>Load 100% Tamb=10°C | <b>Ambient conditions</b><br>Pressure 1.013 bar<br>Temp. 10 °C<br>Rel. Hum. 80 % | <b>Net Output at Gen. Terminals</b><br>Power 393.6 MW<br>Heat Rate 6356 kJ/kWh<br>Efficiency 56.63 % | <b>Model</b><br>Case<br>Date | ROS000<br>ROSE03<br>11/12/03 |
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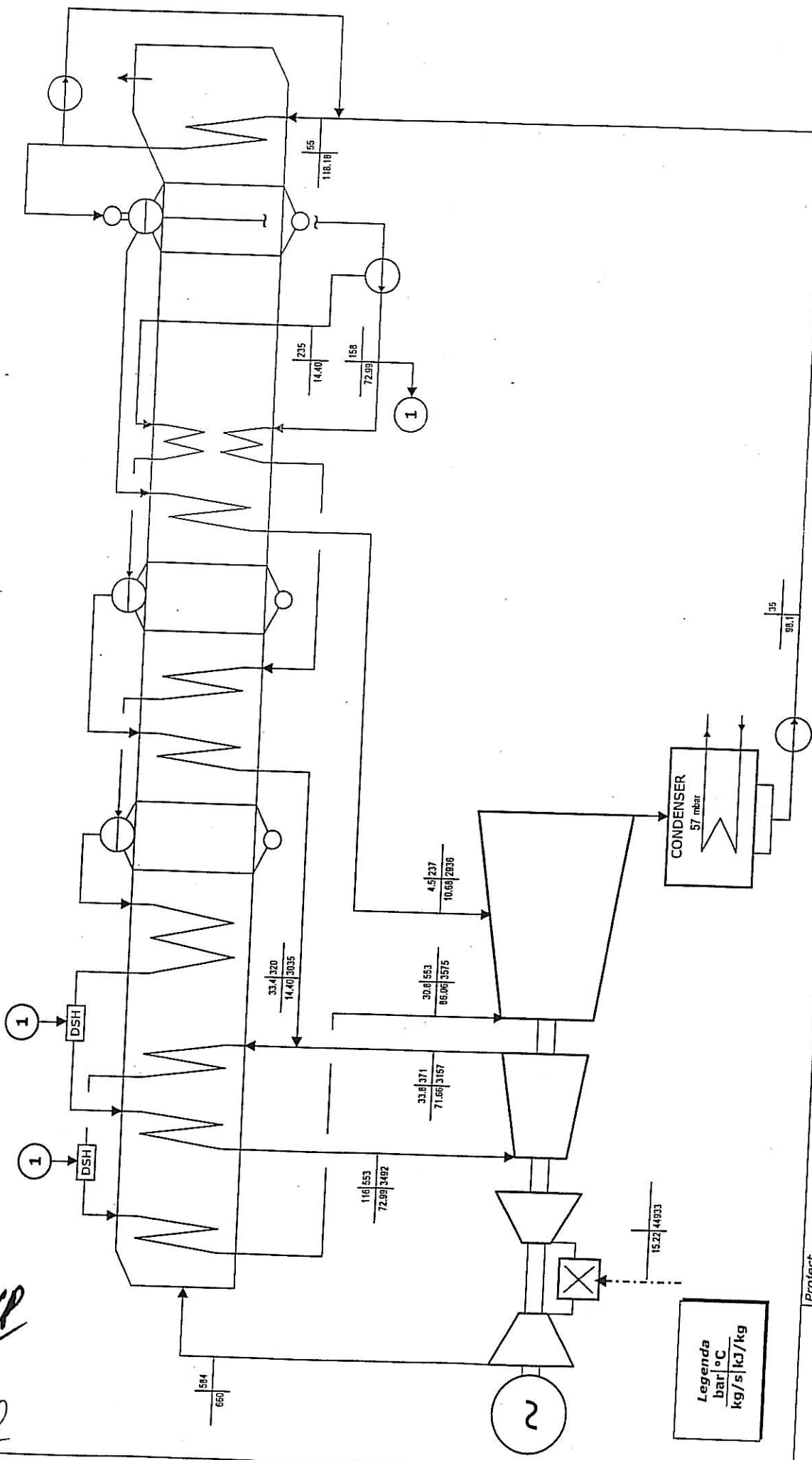


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| Heat Balances<br>For reference only | Project<br><b>TRACTEBEL -<br/>ROSIGNANO</b> | Case<br><b>EXP1<br/>Load 100% Tamb=15°C</b> | Ambient conditions<br>Pressure 1.013 bar<br>Temp. 15 °C<br>Rel. Hum. 60 % | Net Output at Gen. Terminals<br>Power 386.8 MW<br>Heat Rate 6374 kJ/kWh<br>Efficiency 56.48 % | Model<br>Case<br>Date<br>ROSD00<br>ROSE01<br>10/12/03 |
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| Heat Balances<br>For reference only | Project<br><b>TRACTEBEL<br/>ROSIGNANO</b> | Case<br>Load 100% Tamb=15°C | Ambient conditions    |                | Net Output at Gen. Terminals |                          | Model<br>Case<br>Date | ROS000<br>ROSG01<br>10/12/03 |
|                                     |   |                             | Pressure<br>1.013 bar | Temp.<br>15 °C | Power<br>385.8 MW            | Heat Rate<br>6383 kJ/kWh |                       |                              |

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