

Start up and Shut down of Gas Turbines

Gas turbine start up procedure for gas turbine No 1 on Electrical generation (using Automatic start)

1. Screen MD201 (Lube oil system)

- Check level in lube oil storage tank is above 50%
- Open one supply filter (V20103 or V20104)
- Open one scavenge filter (V20105 or V20106)

2. Screen MD200 (Fuel supply system)

- Check both day tank levels are above 50%
- Open day tank suction (V20001)
- Open booster pump suction valve (V20002)
- Open booster pump delivery (V20003)
- Open fuel filter discharge valve (V20005)
- Open fuel main supply valve (V20006)
- Start booster pump (R20001)

3. Screen MD207

- Check that the speed controller output is zero
- Place the speed controller in AUTO

4. Screen MD820 (GT1 Local operating panel No 1)

- Place AECM in AUTO
- Switch Heater on
- Take brake off

5. Screen MD821 (GT1 Local operating panel No 2)

- Press the "Vibr Test" button to test the vibration alarms prior to starting
- Press "Seq. Reset" button (Automatic sequence reset)
- Press "PT O/S Reset button (Power Turbine Over-speed reset)
- Press "Start Perm." button. The blue "Ready to Start" light should illuminate
- Press "Start" button. (MD 202 will show the start sequence)

6. Once the Gas Turbine has started, the gas generator speed will exceed 4500 rev/min, and the starter valve will be closed, then using screen MD820

- Stop the heater
- Open the vent damper

8. On screen MD207

- Increase the power setting up to 37 in stages using the power control set point (X82033). Note this value can be changed at various screen, such as MD205 and MD820.
- Observe the operating parameters on MD300 as you increase the turbine power.

9. On screen MD205

- Ensure the generator magnetism is switched on and set to 50.
- Clutch in the Generator clutch, the generator speed should increase to 60Hz, and check that the generator terminal voltage is about 6600V.
- Check there is not breaker trip present, if so reset the breaker.
- Press CONN on the breaker control.

10. On screen MD207

1. Gradually increase the power control up to 75 achieve an active power output (E30001) from the generator of 15 - 15.5 MW. The maximum power control setting is 85.

Shut-down of the gas turbine from an electrical load

1. On Screen MD255

- Reduce power control from current operating value to 30, over 5 minutes to allow the gas turbine to cool.
- As the power control is reduced to 30, the breaker will be tested on Reverse Power trip.
- Reset breaker after it has tripped
- Switch off the magnetism
- Disengage the clutch
- Reduce the power control from 30 to zero over 1 minute

2. On screen MD921

- Press “Normal Stop”

3. On screen MD920

- Start “Post shutdown fan”

4. On Screen MD921

• Monitor shut-down sequence. The gas turbine will cool down for about three minutes before the fuel shut-off valves on MD253 will close to extinguish the combustion unit.

5. On Screen MD920

- Once the gas turbine has stopped, engage the brake.

***Gas turbine start up procedure for gas turbine No 2 on the Water Brake
(using Automatic start)***

1. Screen MD251 (Lube oil system)

- Check level in lube oil storage tank is above 50%
- Open one supply filter (V20123 or V20124)
- Open one scavenge filter (V20125 or V20126)

2. Screen MD200 (Fuel supply system)

- Check both day tank levels are above 50%
- Open day tank suction (V20021)
- Open booster pump suction valve (V20022)
- Open booster pump delivery (V20023)
- Open fuel filter discharge valve (V20025)
- Open fuel main supply valve (V20026)
- Start booster pump (R20021)

3. Screen MD257

- Check that the speed controller output is zero
- Place the speed controller in MANUAL

4. Screen MD920 (GT2 Local operating panel No 1)

- Place AECM in AUTO
- Switch Heater on
- Take brake off

5. Screen MD921 (GT2 Local operating panel No 2)

- Press the "Vibr Test" button to test the vibration alarms prior to starting
- Press "Seq. Reset" button (Automatic sequence reset)
- Press "PT O/S Reset button (Power Turbine Over-speed reset)
- Press "Start Perm." button. The blue "Ready to Start" light should illuminate
- Press "Start" button. (MD 252 will show the start sequence)

6. Once the Gas Turbine has started, the gas generator speed will exceed 4500 rev/min, and the starter valve will be closed, then using screen MD920

- Stop the heater
- Open the vent damper

8. To illustrate the differing load conditions, the procedure for the GT2 will use the water brake for a load, so that the gas turbine load is dependant on the torque and speed rather than constant speed operation. As the speed of the power turbine is no longer fixed by the electrical supply (which is held constant at 60 Hz), then a speed controller is necessary for stable gas turbine operation.

9. On MD257 (GT2 Speed controller).

- Input the following values into the speed controller
Tag and name Value

C25736 Speed controller gain 8.0
C25737 Speed controller I time 10.0
C25738 Speed controller D time 4.0
C25741 Speed controller FF1 gain 0.1
C25742 Speed controller FF1 TC 1 6.0
C25743 Speed controller FF1 TC 2 6.0
C25751 Speed controller FF2 gain 0.1
C25752 Speed controller FF2 TC 1 6.0
C25753 Speed controller FF2 TC 2 6.0

- Input the following tag names into the feedback and feed forward unit.

Tag number Tagname Function Graph lower

limit

Graph higher

limit

N25202 Power turbine speed Feedback (low = 0 high = 4000)

E30001 Gas turbine power Feed forward (low = 0 high = 30)

Q40001 Gas turbine torque Feed forward (low = 0 high = 50)

10. On MD255, clutch in the water brake

11. On MD257

- Set speed setting at 1000
- Switch the feedback and feed forward units on,
- Place the controller in AUTO and ON.
- Gradually increase the speed set point from 0 up to 2000

12. On MD257

- Increase the speed set point slowly from 2000 up to 3600 rev/min in stages over at least one minute

13. On MD257

- Input 10 to the Torque set point for the water brake (Q25511)
- Increase the torque set point up to 40 in stages noting the suggested loading programme rate shown below (Increasing up to full load should take about five minutes)