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Diligent
MICRO CONTROLS

DESIGN CONSULTANT & MANUFACTURER

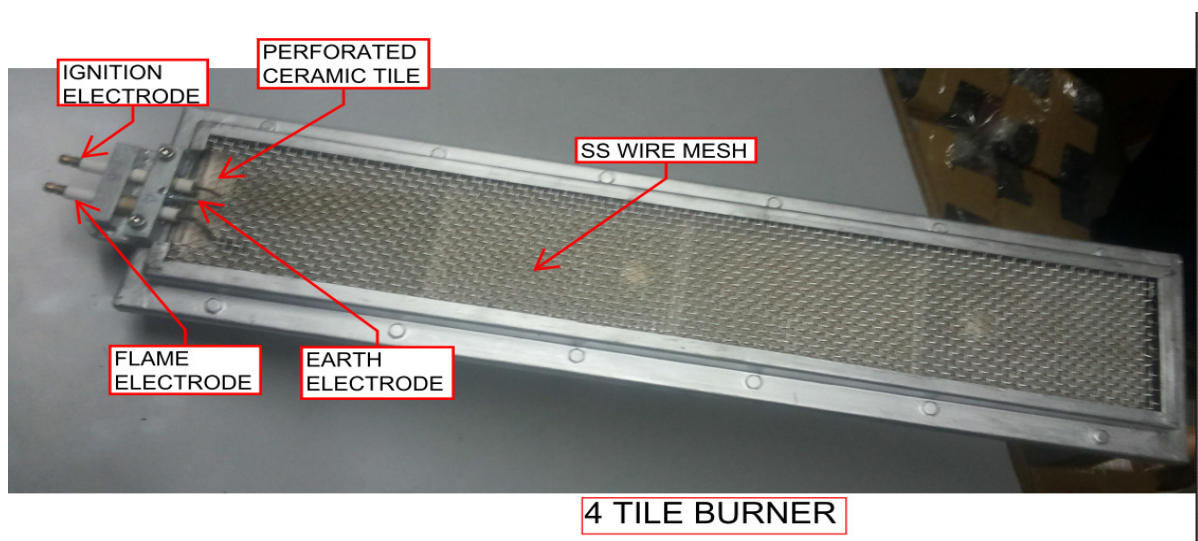
* ELECTRONIC CONTROL SYSTEMS
* IMPORT SUBSTITUTION

DUAL 4 TILE INFRARED GAS BURNER HEATING SYSTEM WITH AUTOMATIC BURNER CONTROL PANEL

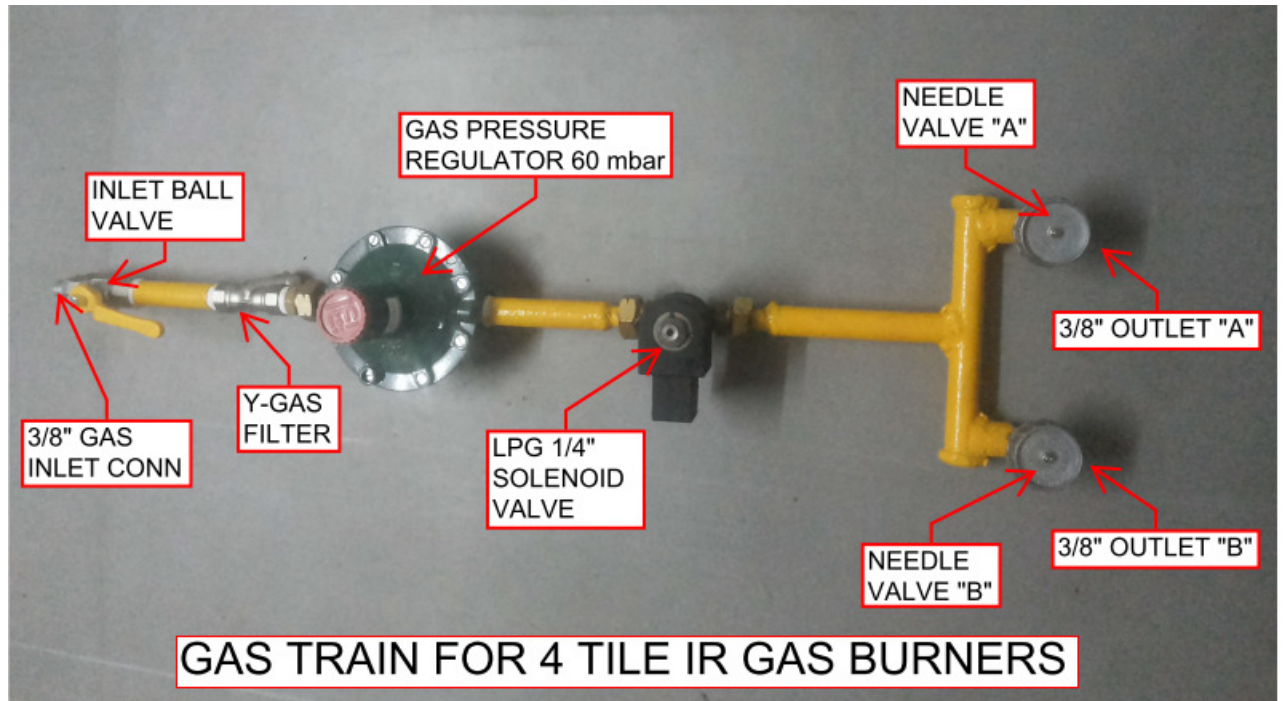
1. DESCRIPTION:

This System consists of two 4 Tile Burners with Flame Electrode suitably formed & mounted, Ignition Electrode suitably mounted, Two Ignition Transformer in m.s. enclosure with 1.5 meter long Ignition cable, LPG Gas Train & Gas Pipes and Control Panel with Digital Temperature Controller & Burner Controller duly wired. Heavy duty 16-PIN rack Connector Plug & Socket are provided for ease of field wiring.

4 Tile Gas Burner is built using standard size perforated Ceramic Tiles. These are mounted on m.s. enclosure specially designed to achieve proper distribution of Air Gas mix. Protection SS wire mesh is provided on the top of tiles, This Burner has Gas entry from **bottom side**. Ignition Electrode and Flame Electrode Assembly is mounted on one side length wise with Earth Electrode located at the center. LPG supply is connected to 3/8" BSP connector which has gas nozzle fixed on its other end. This Burner works on 35 mbar to 50 mbar LPG Supply obtained through Gas Train from LPG Industrial LPG Cylinder. Combustion Air is drawn from surrounding using venturi action created by jet of LPG gas coming out from the nozzle.



LPG GAS TRAIN is connected to the LPG Cylinder using suitable adaptor and 3' long high grade Gas Pipe with 3/8" Bullows Connector.. Gas Train has Ball Valve, Y-Gas Filter, Gas Pressure Regulator ,, 1/4" LPG Solenoid Valve and provides two 3/8" outlets with its respective Needle Valve. This Valve helps to control the heat output. Each outlet has 5' long high grade Gas Pipe with 3/8" Bullows Connector. These various items are interconnected using seamless Tata C class pipe sections and the whole assemble is tested for being leak proof.



IGNITION SYSTEM has Danfoss make Electronic Ignition Transformer of 1 Pole housed in powder coated m.s, enclosure. 1.5 meter long High Grade & High Voltage Ignition cable having multi strand copper conductors covered with Silicon Insulation, is provided with appropriate lugs at both ends. Its one end plugs in to Ignition Transformer pole and other end plugs on Ignition Electrode. Ignition Transformer is energized by pressing respective Push Button on Control Box which has one meter 3 core supply cable and 2 meters two cables for two ignition transformers.



CONTROL PANEL:

4 Tile Dual IR Burner System is designed for fully Automatic Operation to maintain the work temperature at the set value. This Control Panel has Digital Temperature Controller Selec DTC 503, Diligent Autocon N2211N011X-2, Auxiliary Relays, Burner Switch, Indicating Lamps, Audio-Visual Alarm and 16-pin Heavy Duty Rack Connector. Digital Temperature Controller is micro processor based digital unit and it is configured to work with Pt100 type Temperature sensor and shall have Hysteris of 3 deg C.



2. SET UP PROCEDURE:

a. Mounting Fixtures to hold the IR Burner shall be suitably fabricated by the Customer in such a way that **the clearance between Burner TOP and the object bottom shall not be less than 80 - 90 mm.**

Connect single strand (1.5 mm – 2 mm dia) copper wire to the EARTH Terminal provided on one of the “Burner Top fixing bolts”. There are 2 nuts, two plain washers and one spring washers provided for this purpose. **DO NOT UNSCREW THE BASE NUT THAT IS HOLDING THE BURNER TOP TO THE BODY OTHERWISE BURNER CAN MALFUNCTION.** The other end of this EARTH WIRE shall be directly connected to POWER EARTH without joints. Confirm that the Power Earthing is correctly done as per standard procedure and voltage between Power Neutral & Earth is minimal.

Check the state of Ignition Electrode for physical damage and distance between its tip from Earth

Electrode. It should be 3- 4 mm for good sparking. If this distance is disturbed, unscrew the 5 mm Allen bolt carefully, adjust the clearance and re-tighten it while electrode is firmly held by hand to prevent alteration of spacing while tightening. **DONOT OVER TIGHTEN OR ELSE CERAMIC PORTION OF ELECTRODE CAN BREAK.** It should be tight enough to prevent change of clearance during normal usage.

Check the state of Flame Electrode for physical damage and distance between its tip from surface of Ceramic Tile. It should be 2- 3 mm above the ceramic tile surface for correct sensing of combustion. If this distance is found to be disturbed, unscrew the 5 mm Allen bolt carefully, adjust the clearance and re-tighten it while electrode is firmly held by hand to prevent alteration of spacing while tightening. **DONOT OVER TIGHTEN OR ELSE CERAMIC PORTION OF ELECTRODE CAN BREAK.** It should be tight enough to prevent change of clearance during normal usage. **Take care not to press this electrode on Tile or else the tile can break.**

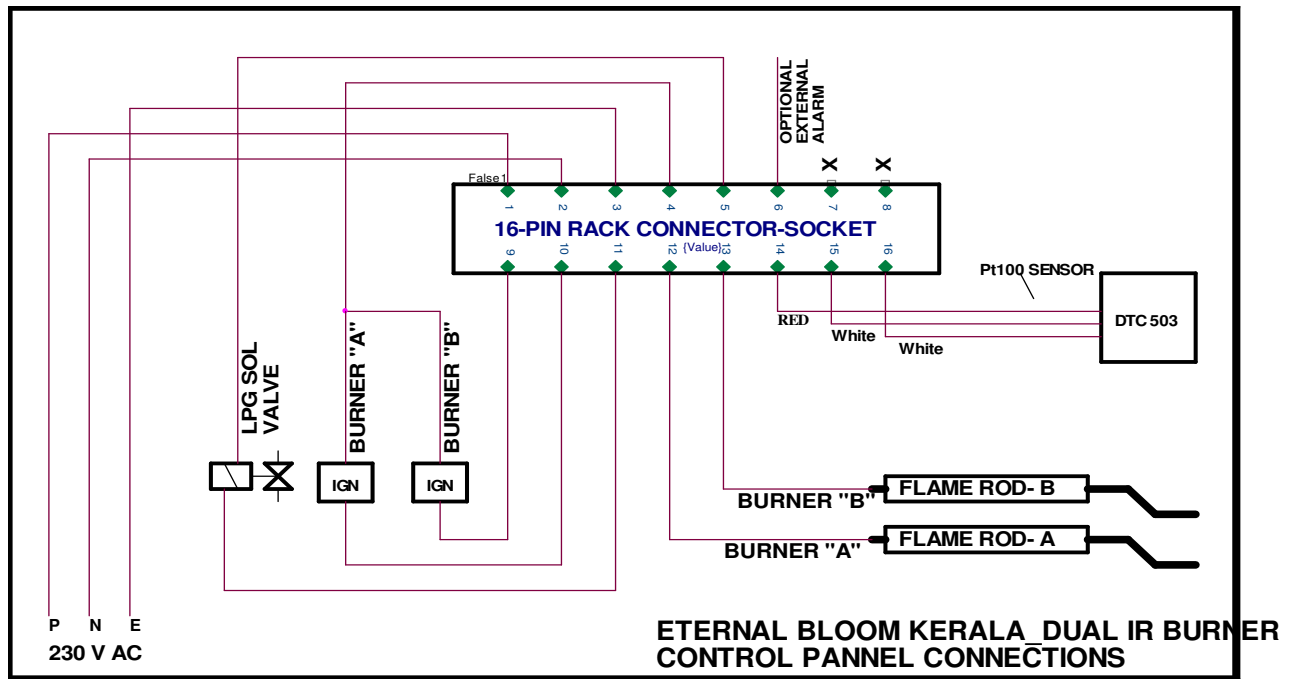
b. Gas Train shall be mounted on side wall or fabricated m.s. structure using two clamps provided with the system. It can be mounted in any direction, though, horizontal mounting be preferred. Connect “Industrial LPG Cylinder Adaptor” to 3’ Gas Pipe at Cylinder end. Connect other free end of 3’ long Gas Pipe to the Gas Inlet Ball Valve. Connect 5’ long Gas Pipe at each Outlet Needle Valve of Gas Train. Free end of 5’ Gas Pipe shall be firmly connected to respective IR Burner 3/8” Inlet. Connect Cylinder Adaptor to LPG Cylinder but **KEEP IT OFF. ALSO KEEP BOTH THE NEEDLE VALVES FULLY CLOSED.**

c. Ignition Assembly shall be mounted on either Side Wall or suitable m.s. Structure near Burner in such a way that 1.5 meter Ignition Cable from Ignition Transformer can be plugged to Ignition Electrode on respective Burner. Be careful to connect **PHASE, NEUTRAL & EARTH to correct Terminals.**

d. Control Panel shall be mounted on either Side Wall or suitable m.s. Structure close to Gas Train for ease of adjusting Gas Control Needle Valves while operating on the control panel. Complete the field wiring of 16-pin Rack Connector Socket as per the wiring diagram below-



3. WIRING DIAGRAM for 16-PIN RACK CONNECTOR-SOCKET:



a. Use 3 core 0.5 to 1 sq mm cable for connecting Power Supply to Two Ignition Assemblies and One Solenoid Valve. Please note the Neutral Return is given on Rack Connector Socket Terminal nos. 9, 10 & 11 and shall be appropriately used. Ensure correct connections to Phase, Neutral & Earth as it is important for correct functioning.

b. Connect Earth directly to each Burner and Control Panel from Power Earth. **Do not loop the earth wiring.**

c. Engage 16 Pin Rack Connector Plug & Socket and lock them together by the clamps.

4. OPERATION:

a. Prepare Soap Solution in water for Leak Testing.

b. After properly setting up the Burner & its components as above, turn on the Valve on Cylinder Adaptor and Open the Inlet Ball Valve on Gas Train. Apply soap water on various joints using brush. Should some spot has leakage, bubbles will be seen. Rectify the leak, if present. **Complete checking of Both Burners and close both the needle valves and Inlet Ball Valve.**

c. **Connect** 230V AC supply correctly i.e. Phase to Ter#1 and Neutral to Ter#2 to the Control Panel. Check if the 16 Pin Rack Connector Socket wiring has been done. Switch ON MCB on the right side of panel. Mains ON Lamp and Digital Temperature Controller DTC 503 will turn ON. DTC 503 should indicate temperature of Rtd 100 Sensor. Set the desired Process Temperature by pressing Square PB & either UP or DOWN PB on DTC 503. Turn ON the Burner switch. Autocon MAINS Lamp lights. If process temperature is less than the Set Process Temperature, then, Heat Demand Lamp and Ignition Lamp on AUTOCON will light. This will switch on both the Ignition Transformers and sparking will start between Ignition & Earth electrodes on both burners. Confirm that the Sparking is powerful and continuous. If spark is not present or if it is inconsistent check for loose connection of Ignition Cable at both ends, broken porcelain insulators and for proper earthing. Autocon will continue to proceed through Start up Sequence by switching ON Gas Solenoid Valve, switching OFF Ignition, Checking for Flame Status and cause Lockout as we had kept Inlet Ball Valve & Needle Valves Off. Audio cum Flashing Alarm will sound and all automatic operation suspended until Autocon is RESET.

Open the Inlet Gas Valve and open partially (50%) Needle Valve of Burner “A” only. Keep Needle Valve of Burner “B” closed. Autocon in Lockout condition can be reset manually either by momentarily switching OFF/ON Burner switch or by momentarily pressing Reset PB on Autocon. The Startup sequence will continue as above but this time the burner “A” will be fired as Inlet Ball Valve and its Needle valve are open. Confirm that this happens. However, Autocon will Lockout at the end of Safety Period as Burner “B” is off.

Close the Needle Valve of Burner “A” and open partially (50%) Needle Valve of Burner “B” only. Autocon in Lockout condition can be reset manually either by momentarily switching OFF/ON Burner switch or by momentarily pressing Reset PB on Autocon. The Startup sequence will continue as above but this time the burner “B” will be fired as Inlet Ball Valve and its Needle valve are open. Confirm that this happens. However, Autocon will Lockout at the end of Safety Period as Burner “A” is off.

Open both Needle Valves **partially** and Reset AUTOCON. The Startup sequence will start with Ignition at both Burners, switching on the Gas supply to both burners, Both burners firing simultaneously, switching off both ignitions and checking of Flame Status. Flame will be sensed at both burners and STARTUP cycle will end.

After some time the burner surface will start glowing red and flame will vanish. Opening Needle valve will turn orange red surface to bright red in colour. The heat output will increase. It is advisable to operate the Burner below bright red condition to minimize back firing.

IT IS NOT ADVISABLE TO OPERATE BURNER AT WHITISH RED as it is likely that the LPG can reach flash point inside its chamber below the ceramic tiles and could lead to irreversible damage if allowed to continue long enough to deform the structure. Operation at Orange of Just below bright red is advisable though it might increase process time marginally.

Heating will continue till the Set Temperature limit is crossed by the Process Temperature. The DTC 503 will withdraw Heat Demand by opening its contact wired to Autocon which in turn will switch off the Gas Solenoid Valve. Both the Burners will be switched off and system will wait for Process temperature to drop below set limit by 3⁰C. When the temperature fall below by 3⁰C, Heat Demand is raised and Autocon executes another Startup.

Should any one or both Burners loose combustion during operation, the Autocon will initiate fresh startup/ If burner fails to fire after this retrial, Autocon lockout the system, suspending all operations and give out Audio Visual Alarm. However if Burner firing is successful after retrial, operation continues.

5. CARE & PRECAUTIONS:

- a. This system is monitored by Autocon. Loss of Combustion in either or both burners switch off the system and gives out alarm. It is required to investigate the source of problem and rectify it.
- b. Preferably operate the Burner with **ceramic tile color below bright red**. Also ensure that the ventilation around Burner body is adequate to prevent rising of inside temperature above flash point leading to combustion inside the burner.
- c. These are Low Pressure Burners and therefore, ensure that **no gust of wind comes on the top of burner** otherwise the burner can malfunction and even get off.
- d. **Do not clean the Ceramic Tile with hard brush or tool or industrial Blower as the ceramic**

tile tends to become brittle with usage. Any crack or hole, render burner unusable.

e. Avoid mechanical impact, shocks, rough handling, etc once the burner has been subjected to heating.

f. Reversal of Phase & Neutral of Supply will render flame sensing inoperative. Ensure that Phase & Neutral get correctly connected.

6. TROUBLE SHOOTING:

S. No.	Type of Fault	Possible Cause	Remedial Action
1	No Sparking	a. Earthing Open. b. Ignition HV Cable open. c. Ignition Rod Insulator broken. d. Ignition Transformer failed. e. Ignition Electrode tip touching earthed portion. f. Too much distance of Ignition Tip from Earth Electrode is more. g. Auxiliary Relay failed. h. No output from Autocon ter#7	a. Check & correct b. Check & correct c. Check & replace d. Check & replace e. Check & correct f. Check & correct g. Check & replace h. Check & replace. Return defective Autocon to us.
2	No Firing	a. Gas Cylinder empty. b. Gas Valves closed, c. Gas Y-Filter choked. d. Gas Solenoid Valve failed. e. No Sparking. f. External Air gust on burner top.	a. Check & correct b. Check & open. c. Check, clean & replace d. Check & replace. e. Check & Correct. f. Check & correct
3	Burner Lights but goes to lockout at the end of safety Period	a. Phase & Neutral reversed. b. Flame Cable from electrode became loose. c. Flame electrode tip touching earthed part. d. Flame electrode insulator cracked. e. Flame electrode setting disturbed.	a. Check & correct. b. Check & correct. c. Check & correct d. Check & replace e. Check & correct
4	Burner Heating has reduced	a. Gas Y-Filter choked. b. Gas Cylinder emptied. c. Gas Pressure Regulator failed.	a. Check, clean & replace. b. Check and replace. c. Replace.
5	Burner continues to fire even when Solenoid Valve is switched off by Autocon	a. Solenoid valve not closing	a. Replace Solenoid Valve and return Valve to manufacturer.
6	Smell of raw gas even when solenoid valve is OFF	a. Solenoid valve not closing	a. Replace Solenoid Valve and return Valve to manufacturer.

7. CONTROL PANEL WIRING DIAGRAM:

