Diligent FTCS A/M-G1

FLAME TREATMENT CONTROL SYSTEM

OPERATION & MAINTENACE MANUAL

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Diligent
MICRO CONTROLS

DESIGN CONSULTANT & MANUFACTURER

* ELECTRONIC CONTROL SYSTEMS
* IMPORT SUBSTITUION

Diligent FTCS A/M-G1 is Flame Treatment Control System specially designed to provide two modes of operations; namely, Manual Mode for Burner Adjustment and Automatic mode to control the startup, operation and shutdown burner in response to the Start command from either PLC or proximity switch. Operation of Burner in Manual Mode is useful for burner setting during initial commissioning or maintenance of burner. It is housed in a strong m.s. enclosure and requires 230 V+/-10%, 50 Hz 1 phase ac auxiliary supply. This system uses standard and time-proven component to synthesize continuous and reliable operation for long period.

DESCRIPTION:

Diligent FTCS A/M-G1 is automatic controller which has been specifically designed to generate operating commands to start 'flame treatment burner' in specified sequence, monitor flame during operation and shutdown the burner when called for. Flame sensing is by detecting ions generated in the flame. Failure to light the flame or failure of flame during operation shall lead to lock out. Once locked out, all out going control commands are switched off and Alarm is energised from Terminal no. 7. This state prevails until controller is reset by pressing Reset Push Button on the front panel. This controller works on 230V ac auxiliary supply live control commands for air solenoid valve, gas solenoid valve and electronic hooter. **Diligent FTCS A/M-G1** provides 'Status & Fault' display, which indicates status of various components of FTCS and Flame Failure fault. This is very useful during commissioning in the initial period and fault diagnosis later during operation. Interconnection with system is through 10 ways Rack Plug-Socket.

Sparking for ignition is provided by Electronic HV transformer and ignition electrode.
Flame is sensed by collecting ions produced in the flame. Proper Earthing of burner body to power earth is extremely important to ensure good spark and also to prevent damage due to High Voltage energy entering in the flame circuit through flame electrode while flame is on & sparking continues.

Auxiliary Relay Board has plug-in relays appropriately wired to generate 230V ac control command from Autocon PCB for air solenoid valve, gas solenoid valve and electronic hooter. Relays used on this board are plug-in type. This makes maintenance quick and inexpensive.

Diligent FTCS A/M-G1 is housed in strong m.s. powder coated enclosure. Status & Fault LED display is provided in the front. Manual-OFF-Auto Mode selector switch is provided on the front panel to select the mode of operation. Momentary contact Push Button is placed next to Mode Selector switch. This Push Button is effective only in manual Mode and Starts burner for one minute when pressed momentarily.

OPERATION

Following settings are required to be carried out in the beginning and to be checked periodically during operation.

a. Distance between tip of electrode and burner body shall be between 4 - 7 mm for good ignition spark.
b. Tip of the electrode should be kept clean and should be approximately 5 – 10 mm inside the flame for correct sensing of flame..

There are two operating modes..

Manual Mode:

1. Complete the connection as per the drawing. Switch on the Air Supply but keep the Gas Stop Valve closed.
2. Keep the Mode Selector Switch in OFF position (Mid Position) and switch on the Mains Supply to **Diligent FTCS A/M-G1.** Mains LED on the Status & Fault Display will light.
3. Change Mode Selector Switch to Manual position. Press SET Push Button momentarily. Heat Demand, Air SV & Ignition LEDs will light on the panel and respective components shall be energised. i.e. Air Solenoid Valve will be switched on. This could be confirmed by the sound as well as air flowing out of burner. Observe Sparking at the tip of Ignition Electrode. Sparking should be strong.
4. After a delay of 1-2 sec delay Gas Solenoid Valve will be energised. A sound can be heard but gas will not flow as its Stop Valve is off. Its LED will light. Simultaneously Flame LED will also light but this is forcibly simulated flame signal for testing flame circuit and will go off when safety time ends.
5. The complete unit will go off after one minute and Manual operation ends. This time is sufficient to adjust the flame to correct size & structure.
6. Manual operation can be restarted by again pressing the SET PB momentarily.

Flame Setting:

1. Keep the Mode Selector switch in OFF state and switch on the power to **Diligent FTCS A/M-G1.**
2. Open Air Stop Valve & Gas Stop Valve. Ensure that AIR & GAS supplies are available at correct pressure required for the burner.
3. Change Mode Selector Switch in MANUAL Mode and press the SET PB momentarily.
4. Air Solenoid will open and ignition sparking will start. After 1-2 sec. delay, Gas Solenoid will open. Flame will try to light.
5. Ignition will switch of after 3.5 sec. Flame LED might go off and remain off till flame is correctly set.
6. Adjust Air & Gas flow to obtain correct flame for heat treatment. Further fine adjustment shall be required till FLAME LED lights.
7. Burner now is correctly set for Flame Treatment and Automatic Operation.

Auto Mode:

This operation in this mode must be after successful burner setting in manual mode.

1. Keep the Mode Selector Switch in OFF position (Mid Position) and switch on the Mains Supply to **Diligent FTCS A/M-G1.** Mains LED on the Status & Fault Display will light.
2. Change Mode Selector Switch in Auto Mode.
3. No sooner Control Contact from PLC / Proxy closes across terminals 8 & 9, Heat Demand, Air SV & Ignition LEDs will light on the panel and respective components shall be energised. i.e. Air Solenoid Valve & Ignition Transformer will be energised. 1-2 sec later Gas Solenoid Valve shall be switched on. Flame will try to light. After 3.5 sec, Ignition transformer will be switched off. Status of Flame signal will be checked after this. If flame is properly detected, operation will continue. However, if flame fails to be sensed successfully, complete system shall lock out. All outgoing commands will be switched off and Audio Alarm shall be energised. To stop this alarm, change Mode Selecor switch to OFF position and Press Lock out RESET PB located below the Mode Selector Switch. Loss of flame during operation also leads to lock out. Lock out signal is also available at terminal no.7 of Rack Connector.

FAULT DIAGNOSIS & REMEDIES :

S No.	Type of Fault	Remedial Actions
1.	No ignition sparking	1. Check presence of 230 V ac at terminal no.5 of 10 way Rack connector. I it is absent, check if ignition relay in side is switching on when Ignition LED light on the Status & Fault Display. If it switching on as indicated by LED in the relay, check firmness of its terminal connection. If relay is defective, replace it. 2. Check spacing between ignition electrode tip and burner body. Restore it to correct spacing between 4 – 6 mm. 3. If spacing is correct, then check for possible sparking between HT connector & body. 4. Check if electrode tip is very close to or touching burner body. 5. Check for firmness of HT connections at both ends i.e. transformer & electrode ends. 6. Check for cracks in ceramic insulation of ignition electrode 7. Check ignition electrode tip for scaling. Clean by sand paper, if found scaled. 8. If Ignition LED of Status & Fault display fails to light, there is internal failure and unit be returned to the manufacturer for rectification.
2	Ignition sparking is good but flame does not light.	1. Check if Stop Valve in Gas Line is on. 2. Check if gas cylinder is not empty. Check that 230V ac signal appears at terminal no.6 when Gas SV LED lights. If this is absent, check auxiliary relay RL5 inside the box. Replace if not working. 3. Check if gas solenoid valve coil is failed. Replace, if defective. 4. Check if operating sound of solenoid valve is normal. Replace if solenoid valve is defective. 5. If Gas Sol Valve LED of Status & Fault display fails to light, there is internal failure and unit be returned to the manufacturer for rectification.
3	Flame lights but does not hold and system locks out.	1. Check if tip of flame electrode tip is touching burner body. Correct, if so. 2. Check that Earthing to burner is not interrupted or became loose. Correct as the case may be. 3. Check that Phase & Neutral connections are correctly made to terminal nos. 1 & 2, respectively. Correct, if found reversed. 4. Check for correct positioning of flame electrode tip with respect to the flame. Readjust the tip so that it is 5 mm inside the flame at all time. 5. Check if ceramic insulation of electrode is cracked and caused leakage to ground. 6. Check for continuity of flame signal cable through out the path between electrode & Terminal no.10 of Rack connector. 7. Check for scaling on flame electrode. If found, clean with sand paper. 8. Check for deposits of dust on ceramic insulator of flame electrode. Clean if found dirty. 9. Check if flame is properly anchored to the burner body and is not leaving it. If not proper, readjust Gas & Air till it is restored to normal state. 10. Check if flame is yellow and larger than normal size blue

		flame. Readjust air to burner till normal features of flame are restored. 11. If every thing above is correct, there is internal failure and unit be returned to the manufacturer for rectification.
4	Flame lights but is not normal blue but yellow and is much larger than normal size.	1. Check if Air Supply is available to burner. Restore, if it is closed. 2. Check if Air Solenoid coil is healthy. Replace coil if it is burnt. 3. Check that Air Solenoid Valve operating sound is normal. If not satisfactory, replace the valve. 4. Check if burner holes are blocked leading to disturbed flame. Clean, if necessary. 5. Check if Air Flow Adjusting setting is disturbed leading to yellow flame. Restore, if found changed. 6. Check presence of 230V ac signal at terminal no.4 of rack connector when AIR SV LED lights on Status & Fault Display lights. 7. Check presence of 230 V ac at terminal no.4 of 10 way Rack connector. I it is absent, check if ignition relay in side is switching on when AIR Sol Valve LED light on the Status & Fault Display. If it switching on as indicated by LED in the relay, check firmness of its terminal connection. If relay is defective, replace it. 8. If every thing above is correct, there is internal failure and unit be returned to the manufacturer for rectification.
5.	Flame Sensing is inconsistent & random.	1. Check for correct positioning of flame electrode tip with respect to the flame. Readjust the tip so that it is 5 mm inside the flame at all time. 2. Check if burner holes are blocked leading to disturbed flame. Clean, if necessary. 3. Check if flame is properly anchored to the burner body and is not leaving it. If not proper, readjust Gas & Air till it is restored to normal state. 4. Check for firm continuity of flame signal cable through out the path between electrode & Terminal no.10 of Rack connector. 5. Check that Earthing to burner is not interrupted or became loose. Correct as the case may be. 6. Check for corroded Earthing connection.
6	No Start even after receiving command from PLC or Proxy Switch.	1. Check if FLAME LED on Status & Fault Display is on. If so the burner will not start until this false flame signal is removed. 2. If Flame is actually present due to leaky solenoid valve, rectify/ replace the Gas Valve. 3. Check Mains On LED on Status & Fault Display. If it I off, there is internal failure and unit be returned to the manufacturer for rectification.

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