

CONTHERM SCIENTIFIC LTD

TECHNICAL MEMORANDUM

PRODUCT : PLCS4

No : 0049

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FROM : Contherm Scientific Ltd

DATE : 11/5/94

TO : All Agents

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=SUBJECT : Operation of CO2 solenoid in precision co2 Incubators

The operation of the CO2 solenoid in a Contherm Precision incubator (PLCS4) depends on a large number of factors. The final result is dependant on both the FIRMWARE (CPU Version) and the MECHANICAL (Gas pressures, sensors) settings on the incubator.

MECHANICAL:

In order for the sensing and response system to work correctly the incubator must be supplied with correct gas at correct pressures and the mechanical components of the gas injection system (solenoid(s), fitting, restrictors etc) must be correctly installed.

- A) Check that the CO2 bottle has gas (FOOD GRADE CO2) and that the bottle valve is open with the regulator set to the correct delivery pressure (5PSI or 25KPa).
- B) Check that there are no leaks between the outlet of the gas bottle and the inlet of the co2 solenoid. (Set the CO2 set point to 0.0, wind up the bottle regulator to a higher pressure, ie 75KPa, and then shut the main gas bottle valve OFF leaving the high pressure gas trapped in the hose between the bottle and the inlet of the CO2 solenoid). The pressure should hold for about 15-30 minutes.
- C) Check that the restrictor (on the OUTLET of the CO2 solenoid) is correctly installed and not blocked.
- D) Perform a CO2 solenoid test (using the cabinet DIAGNOSTICS) and check that the solenoid physically operates when turned on.

FIRMWARE:

The firmware of the PLCS4 incubator has a number of criteria which must be met before the CO2 solenoid will operate. There are **THREE** modes of operation,

- 1) OFF: The CO2 solenoid is DE-ENERGISED and NO gas will flow.
- 2) ON: The CO2 solenoid is ENERGISED and gas will flow through the solenoid into the cabinet at a rate determined by the GAS PRESSURE REGULATOR setting and

the SIZE of the restrictor hole.

- 3) MODULATED: The CO2 solenoid will change from ON to OFF for short periods of time to LIMIT the amount of gas flowing into the cabinet.

TEST	RESULT
MODE	
In USE? = NO OFF	CO2 solenoid turns off
CO2 Calibrated = NO OFF	CO2 solenoid turns off
Door OPEN? = YES OFF	CO2 solenoid turns off
Heater door Delay expired? = NO OFF	CO2 solenoid turns off
Co2 SET PT = 0.0? = YES OFF	CO2 solenoid turns off
Within +- 2.0oC? = NO OFF	CO2 solenoid turns off
Within 0.8% of CO2 SET PT? = YES MOD	CO2 solenoid modulates
within +- 0.3oC? = NO MOD	CO2 solenoid modulates
CO2% < CO2 SET PT? = YES	CO2 solenoid turns on ON

If the TEST result is not as indicated the next test is carried out.

NOTES: The 'IN USE' test is 'YES' if the cabinet has been set to run with BOTH a valid TEMPERATURE setting AND a valid time setting.

Whenever the outer door is opened and the 'DOOR AJAR' message is displayed, the HEATER is turned off and a HEATER DOOR DELAY started which will last for 1 minute AFTER the door is CLOSED.

CO2 'Calibrated' means that either an AUTO-CAL or MANUAL co2 calibration procedure has been performed.

If problems are experienced with either CO2 OVERSHOOT or CO2 undershoot, it usually indicated a problems with the gas bottle regulator settings or a leak in the co2 delivery system.

The restrictor is a small aluminium disc with either a **0.8mm** hole (180 size cabinet) or a **1.0mm** hole (190 size) drilled into the centre. A typical flow rate when the solenoid is energised is between **3-5** Litres/Minute of CO2 gas.