PERMA PURE

INSTRUCTION MANUAL

BALDWIN™ - Series

HEATED FILTER PROBES

GENERAL PURPOSE SERIES

Model 35C

Version 4.04

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TABLE OF CONTENTS

A: SPECIFICATIONS

General Specifications

Probe Stinger	18" Stinger probe, 0.5" dia x .065" wall, 316L SS tubing
Calibration	Integral calibration on both sides of filter element
Heater Jacket Temp Control	Circuit board regulated
Connections	1¼" male pipe nipple mount; ½" male pipe thread adapter
Connectors	¼" cal gas, ¼" sample line
Thermocouple	Type K
Blowback	Single direct; 2-way solenoid blowback / calibration valve
Blowback Tank	16 ga. SS, 4" x 8", leak checked, pressure tested
Heat-shrink Boot	7" length, 2.75" min expanded I.D. nose
O-rings	Viton®
Gaskets	Graphoil
Dimensions	14" x 12" x 8" HWD (w/o Stinger probe)
Weight	34 lbs

Operating Specifications

Calibration Gas Requirement	20 psig, 6-10 LPM
Probe Operating Temperature	383ºF (195ºC)
Input Voltage	110 (220 optional) VAC, 50/60 Hz
Blowback Duration	5 sec standard (30 sec maximum)
Blowback Frequency	Every 24 hours standard (range 10 minutes to 99 hours)
Blowback Valve	110 standard (220 optional) VAC, 50/60 Hz 24VDC (optional)
Blowback Flowrate	14 scfh
Instrument Air for Blowback	Min 50 psig, Max 90 psig

Material Specifications

Enclosure Material	NEMA 4
Probe Stinger	316L SS tubing (standard) Schedule 40 Schedule 80 Durinert® coated Hastelloy®
Heater Type	Heater bands, 350W (standard) Silicone rubber blanket w/ metal snap closures, 100W (optional)
Enclosure Insulation Material	⅛" thick silicone, medium density
Filter Chamber Material	316 stainless steel
Filter Element Types	10 micron sintered SS (standard) 5, 20 micron sintered SS 2 micron ceramic 2 micron SS screen mesh

B: LIMITED WARRANTY

Perma Pure LLC
WARRANTY and DISCLAIMERS

Perma Pure (Seller) warrants that product supplied hereunder shall, at the time of delivery to Buyer, conform to the published specifications of Seller and be free from defects in material and workmanship under normal use and service. Seller's sole obligation and liability under this warranty is limited to the repair or replacement at its factory, at Seller's option, of any such product which proves defective within one year after the date of original shipment from seller's factory (or for a normal usable lifetime if the product is a disposable or expendable item) and is found to be defective in material or workmanship by Seller's inspection.

Buyer agrees that (1) any technical advice, information, suggestions, or recommendations given to Buyer by Seller or any representative of Seller with respect to the product or the suitability or desirability of the product for an particular use or application are based solely on the general knowledge of Seller, are intended for information guidance only, and do not constitute any representation or warranty by Seller that the product shall in fact be suitable or desirable for any particular use or application; (2) Buyer takes sole responsibility for the use and applications to which the product is put and Buyer shall conduct all testing and analysis necessary to validate the use and application to which Buyer puts the product for which Buyer may recommend the use or application of the product by others; and (3) the characteristics, specifications, and/or properties of the product may be affected by the processing, treatment, handling, and/or manufacturing of the product by Buyer or others and Seller takes no responsibility for he nature or consequence of such operations or as to the suitability of the product for the purposes intended to be used by Buyer or others after being subjected to such operations.

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C: PRINCIPLE OF OPERATION

The Baldwin™-Series Model 35C Heated Filter Probe is designed to be mounted on a stack or duct for use in high particulate applications. Its primary function is to provide a heated environment to maintain sample gas temperatures above dewpoint and remove particulate material from the gas sample. Model 35C features a standard 10 micron sintered stainless steel filter element, a circuit board regulated heater jacket, an integral calibration gas port, a NEMA 4 steel enclosure, and a circuit board controlled blowback system to clean the filter element.

Mounting

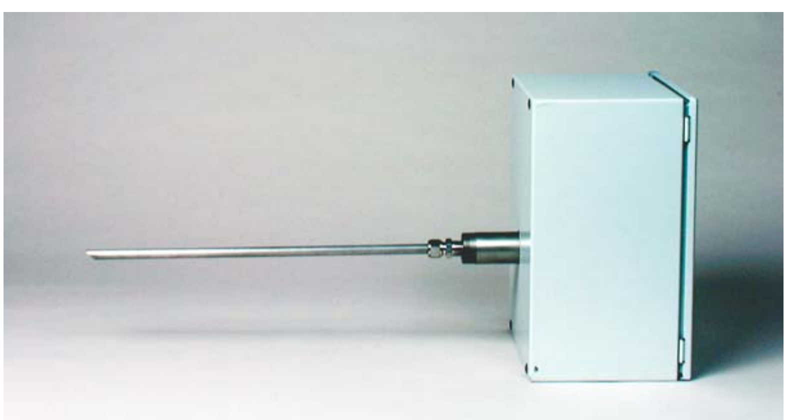
The Model 35C is designed to be mounted directly on a stack or duct with a 1¼" Schedule 40 male pipe nipple. This pipe nipple can be screwed into a standard ASA flange, either flat or raised face. The probe boot can be heat shrunk to the sample line to eliminate cold spots.

Blowback

The Model 35C comes with a blowback air accumulator tank and 2-way solenoid. To operate blowback, connect a 50-90 psig instrument airline to the blowback air accumulator tank. The electronic control board automatically controls blowback via an integral timer. The 2-way blowback solenoid is rated high temperature and 100 psig maximum pressure. The valve has a 1/8" orifice and the blowback instantaneous flowrate is 14scfh. See the Control Board section in this manual to change the timing of the blowback.

Calibration

To operate calibration gas to the probe, open the user supplied calibration gas control valve, adjust the cylinder pressure to >25 psig, and adjust the calibration gas flow rate to approximately 20% above the highest gas sample flow rate.



D: TEMP & BLOWBACK CONTROL BOARD

The probe temperature control/blowback timer board integrates a proportional temperature controller and a programmable blowback timer. The temperature controller incorporates an over and under temperature alarm along with a thermal couple failure alarm. Zero, span and the set temperature are all adjustable. Note that there is a 228°C thermal fuse on the heater jacket, and the set temperature should not exceed 204°C. Modes of operation:

a. *Programmable blowback timer:* Has three modes of operation.
b. *Automatic blowback mode:* Blowback will occur at preset intervals controlled by three digital rotary switches (10s of hours, hours, and 10s of minutes).
c. *Manual mode:* There are two manual modes; one has a preset dwell time, the other gives complete control to the operator.

Probe Board Terminal Block Description

Note: The terminal blocks are accessed by depressing the small levers with a small flat blade of a screwdriver.

TB1 TB1 is the thermocouple input terminal block. When replacing the thermocouple, be sure to install the yellow wire in the terminal marked YEL and the red wire in the terminal marked RED.

TB2 TB2 is the global alarm relay terminal block. This terminal block connects an SPDT (form C) dry contact relay to the appropriate computer sense. The global alarm relay will be energized when the control board senses an over or under temperature condition or a thermal couple failure.

TB3 TB3 is the AC power input terminal block. When connecting AC Power to the control board care should be taken to ensure the proper AC power connection.

If using USA standard wiring colors, the black wire is connected to the terminal marked L, the white wire is connected to the terminal marked N, and the green wire is connected to the terminal marked G.

If using Euro standard wiring colors, the brown wire is connected to the terminal marked L, the blue wire is connected to the terminal marked N, and the green wire is connected to the terminal marked G.

TB4 TB4 is the heater output terminal block. If replacement of the heater jacket is needed, connect the black and white wires to the terminal marked L, and the blue wire to the terminal marked N for a 120 VAC System.

Connect the black wire to the terminal marked L, the white wire to the terminal marked N, and insulate and secure the black wire for a 240 VAC System.

TB5 TB5 is the direct blowback solenoid valve output terminal block. A specific wiring procedure for the solenoid valves is not needed.

TB6 TB6 is the sample solenoid valve output terminal block. This solenoid valve is activated at the same time the direct blowback solenoid valve is activated. It is used if there is a need to isolate the sampling system from the pressure of the blowback.

TB7 TB7 is the indirect blowback solenoid valve output terminal block. It is used if there has been a secondary blowback option installed. It has a 35 second delay after Blowback button is activated.

TB8 TB8 is the blowback sense relay terminal block. This terminal block connects an SPDT (form C) dry contact relay to the appropriate computer sense. The blowback sense relay will be energized when the control board activates the blowback option, whether from manual mode or automatically.

TB9 TB9 is the manual blowback trigger terminal block. When manual, the blowback function is enabled, an SPDT (form C) dry contact relay or switch is connected to the terminal block. The relay or switch may or may not be computer controlled. The common of the relay or switch is connected to the terminal marked C, normally open is connected to the terminal marked NO, and the normally closed is connected to the terminal marked NC.

Temperature Control Test and Adjustment

Tools Required: Thermocouple generator and 3 volt/ohmmeters.

A. Install a jumper on J1.

   Definition of Jumper: This jumper is used when the thermocouple has an isolated tip. If the thermocouple has a tip that is not isolated, that is if the tip is grounded, the jumper is removed.

B. Connect the thermocouple generator output wires to the thermocouple input terminal block (TB1), taking care to install the red wire in the terminal labeled red and the yellow wire in the terminal labeled yellow.

   Note: The heater jacket thermocouple is not installed at this time.

   1. Connect the red lead on the voltmeter to Test Point 1 (TP1), and the black lead to Pin 1 of P1.

      Note: TP1 is the thermocouple amplifier output pin and Pin 1 of P1 is the power supply return.

   2. Set the voltmeter to 2 VDC.

   3. Turn on the thermocouple generator and the voltmeter, then, apply power to the probe control board.

   4. Set the thermocouple generator to K type thermocouple to read in degrees Celsius, and the output to 0° Celsius.

   5. Adjust POT 1 so the voltmeter reads 0 VDC. The thermocouple amplifier is now zeroed.

6. Set the thermocouple generator to 200 degrees Celsius and the voltmeter to 20 VDC.

7. Adjust POT 2 so the voltmeter reads –2.0 VDC, The thermocouple amplifier is now spanned.

Note: This procedure may need to be repeated two or three times because one adjustment will slightly affect the other.

You should now be able to set the thermocouple generator to any temperature between 0°C and 250°C and read the corresponding voltage on the voltmeter. The voltmeter reading should be within 5% of the thermocouple generator setting where xxx degrees Celsius equals –x.xx VDC.

C. Set the thermocouple generator to 190°C.

1. Move the red voltmeter lead to Test Point 2 (TP2).

2. Set the voltmeter to 2 VDC.

3. Adjust the POT 3 so the voltmeter reads –1.75 VDC.

   This is the under temperature adjustment. If the temperature falls below 160°C, the global alarm relay will be activated.

D. Move the red voltmeter lead to Test Point 4 (TP4).

1. Set the voltmeter to 20 VDC.

2. Adjust POT 5 so the voltmeter reads –2.09 VDC. This is the over-temperature adjustment. If the temperature rises above 210° C, the global alarm relay will be activated.

Note: Maximum over temperature setting is 210°C. If the over temperature adjustment is set at a higher setting and temperature control is lost, permanent probe damage will occur.

E. Move the red voltmeter to Test Point 3 (TP3).

1. Set the voltmeter to 2 VDC.

2. Adjust POT 4 so the voltmeter reads 1.95 VDC. This is the operating temperature or set temperature adjustment. At this point, with the thermocouple generator set at 190° C, the red LED (TC ALARM) should be off and the green LED (HTR ON) should be blinking on and off.

F. Connect two ohmmeters to the global alarm terminal block (TB2).

1. Connect one ohmmeter between the common and the normally closed and the other ohmmeter between the common and the normally open. With the thermocouple generator set to 190°C, the first ohmmeter should be reading zero ohms and the second ohmmeter should be reading infinity or an open.

2. Set the thermocouple generator to 160° C.

   The first ohmmeter should now be reading infinity or an open and the second ohmmeter should be reading zero ohms.

3. Set the thermocouple generator back to 190°C. The ohmmeters should return to their original readings.

4. Set the thermocouple generator to 210°C. Again the first ohmmeter should now be reading infinity or an open and the second ohmmeter should be reading zero ohms.

5. Again set the thermocouple generator back to 190°C. The ohmmeters should return to their original readings again.

6. Disconnect the thermocouple generator output wires from the thermocouple input terminal block (TB1).

   Again the first ohmmeter should now be reading infinity or an open and the second ohmmeter should be reading zero ohms. The red LED (TC ALM) should also be on.

G. Remove the power from the probe control board.

H. Connect the probe heater thermocouple wires to the thermocouple input terminal block, again taking care to connect the wires correctly.

   Connect the probe heater power wires to the heater terminal block (TB4). The two white wires go to the neutral terminal and the black wire goes to the line terminal.

I. Apply the power to the probe control board. The green LED (HTR ON) should be on and the red LED (TC ALM) should be off. The heater is now on.

   1. Wait one to two hours. At that time the heater should be up to temperature and the green LED should be blinking on and off.

   2. Again, connect a voltmeter between Pin 1 of P1 (power supply return) and Test Point 1 (TP1). The voltmeter should read approximately –1.90 VDC. If the voltmeter reading is not, then the set temperature will need to be adjusted.

   3. Using another voltmeter connected between Pin 1 of P1 and Test Point 3 (TP3), note the difference between the two Voltmeters. Add or subtract

this difference (as appropriate) to or from the set temperature. Adjust the set temperature Pot (POT 4) to get the –1.90 VDC voltage reading at TP1.

Note: After each adjustment, you must wait to allow the heater to stabilize.

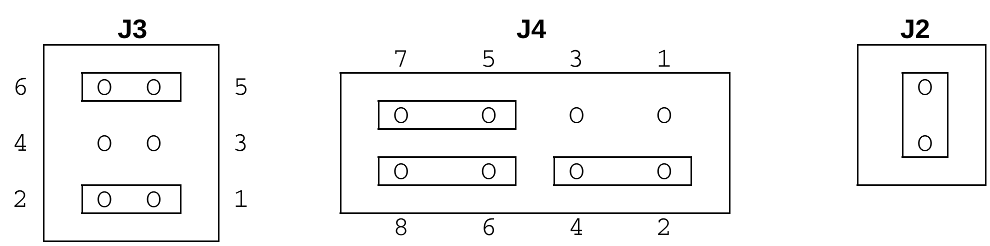
EXAMPLE: If the voltage reading at TP1 is –1.75 VDC and the voltage reading at TP3 is –1.90 VDC, then .15 VDC will be added to the set temperature. Therefore, POT 4 will be adjusted to read –2.05 VDC. Allow the temperature to stabilize and repeat the procedure again until the output at TP1 reads –1.90 VDC.

Blowback Timer Test and Adjustment

Tools Required: Frequency counter or oscilloscope, and volt/ohmmeters.

Note: POT 6, which is a 20k pot, is used to adjust the frequency of the 555 Timer IC. This adjustment determines the accuracy of the auto blowback time. This adjustment is made at the factory level and should not be changed in the field. But if it becomes absolutely necessary, the adjustment procedure follows below.

Using the three rotary switches (SW3, SW4, SW5) set the blowback timer for one hour.
Jump Pins 1& 2 and 5 & 6 on J3,
Jump Pins 2 & 4, 5 & 7, and 6 & 8 on J4, and Jump J2.



Apply power to the Probe Control Board.

a. Turn on the frequency counter or oscilloscope.

b. Connect the ground lead Pin 1 of P1 and the probe tip to Pin 3 of U10, the 555 Timer IC.

c. Adjust POT 6 to a frequency of 273.1Hz or a period of 3.662 ms. This sets the frequency for the blowback timer.

Note: Turning the 20K pot adjusting screw clockwise will increase the period.

Definition of Jumpers

Jumper J2: J2 is the initial enable/disable jumper for manual blowback.

Jump J2 when manual blowback is not used.

When manual blowback is being used the jumper is removed. Also, to implement the manual blowback, a dry contact form C (SPDT) relay is used. The common, normally closed, and normally open contacts of the relay are connected to their corresponding terminals on TB9.

Jumper J3: J3 is used for enabling and disabling the clock and the auto trigger for the auto cycling blowback control.

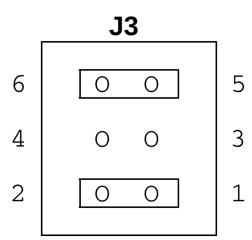
When Pins 1 & 2 and 5 & 6 of J3 are jumped, c and the auto trigger are connected and thereby enabling the auto cycling blowback control.

When Pins 4 & 6 and 1 & 3 of J3 are jumped, the clock and auto trigger are disconnected and thereby disabling the auto cycling blowback control.

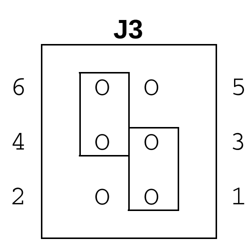
Jumper J4: J4 is used for enabling and disabling the blowback's auto cycling and the type of manual blowback.

When Pins 2 & 4, 6 & 8, and 5 & 7 of J4 are jumped, auto cycling of the blowback is enabled. Also, the manual blowback will have a preset, (30 seconds) dwell durations.

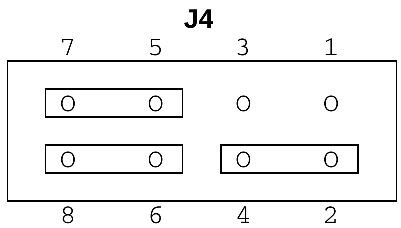
When absolute control of the blowback is required or when a sample/calibration gas plug valve is used, jumping Pins 3 & 4 and 5 & 6 of J4 will disable both the auto cycling and the preset dwell durations. This means, the manual blowback is the only blowback enabled and the blowback solenoid and/or the sample/calibration gas plug valve will remain activated as long as the blowback signal is applied.



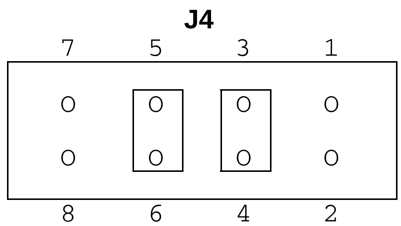
Auto Cycling Blowback Control Enable



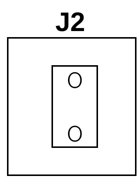
Auto Cycling Blowback Control Disable



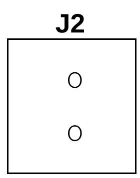
Auto Cycling Blowback Control Enable w/ Manual Blowback Preset Dwell of 30 Seconds



Absolute Blowback Control (Disables Auto Cycling & Preset Dwell)



Disable Manual Blowback



Enable Manual Blowback

Set two voltmeters to 200 VAC.

Connect one voltmeter to the direct blowback terminal (TB5) and the other voltmeter to the indirect blowback terminal block (TB7).

Connect an ohmmeter to the blowback sense terminal (TB8) between the common and the normally closed terminals.

Both voltmeters should read something less than 15 VAC and the ohmmeter should read zero ohms.

Press the reset button (SW1).

The voltmeter connected to the direct blowback terminal block (TB5) should now read 120 VAC and the voltmeter connected to the indirect blowback terminal block (TB7) should still read something less than 15 VAC. The ohmmeter should now read infinity or an open.

After approximately 5 seconds, both the voltmeters should again read something less than 15 VAC, and the ohmmeter should still read infinity or an open.

After 30 seconds, approximately, the voltmeter connected to the indirect blowback terminal block (TB7) should now read 120 VAC and the voltmeter connected to the direct blowback terminal block (TB5) should still read something less than 15 VAC. The ohmmeter should still read infinity or an open.

After another 30 seconds, approximately, both the voltmeters should again read something less than 15 VAC. At this time the ohmmeter should still read open or infinity.

This is the end of the blowback cycle.

Note: The blowback sense should switch back to zero ohms approximately 60 seconds after the indirect blowback turns off.

E: MAINTENANCE

The Model 35C does not require routine maintenance for the filter head or the temperature controller.

The filter element requires periodic replacement, depending upon application and dust loading. See the attached Spare Parts list for replacement elements.

If the Model 35C is used in conjunction with the Baldwin™-Series Flow Control Drawer, monitoring the sample vacuum will warn the operator when to change the filter element. The operator should log the beginning sample vacuum when the system is first started up.

Keeping a daily log of the sample vacuum will notify the operator what frequency of blowback is required and when increasing frequency of blowback is ineffective in reducing the sample vacuum. Once the sample vacuum will not reduce, the operator should replace the filter element with a new filter.

F: TROUBLESHOOTING

Symptom	*Check*	*Action*
115 VAC heater jacket is not heating with green led on	Check the resistance between the black and white wires (tied together) and the blue wire. A 200 watt heater @ 115 VAC will draw about 2 amps so the resistance is around 61 ohms.	If the measure is open for heater resistance the fusible links are melted and should be replaced.
230 VAC heater jacket is not heating with green LED on	Check the resistance between the black and white power wires using an ohmmeter. A 200 watt heater @ 230 VAC will draw about 1 amp so the resistance is around 245 ohms.	If the measure is open for heater resistance, the fusible links are melted and should be replaced.
Filter plug cannot be removed from filter housing	Check “O” rings for damage High particulate loading	Replace “O” rings Clean the “O” ring sealing surfaces with a clean towel prior to reassembly.
Red thermocouple LED is on and won’t turn off (no green LED and no heating)	Thermocouple wires are installed in correct positions J1 has a jumper on it	Correct wire positions and return to operation. Place a jumper on J1
Heater jacket fuses are good and green LED lit, but unit is not heating up	Check for a voltage of 110VAC at TB4.	Replace board.

For further service assistance, contact:
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Email: info@permapure.com
or your local representative

G: SPARE PARTS

Model 35C (Part Number 4P-35C)

Part No.	Description
3PCB-001	Circuit Board: Probe Heater Control
1PCG-002	Connector: Heated Line Entry Seal
3FES-015PK	Filter Element Seals: Silicone, Used w/ Screen Mesh 3FES-010 (10 pack)
3FES-010	Filter Element: 316L SS Screen Mesh, 2.0 Micron
3FES-004	Filter Element: 316L SS, 1.25” x 2.975”, 10 Micron
3FES-003	Filter Element: 316L SS, 1.25” x 2.975”, 20 Micron
3FES-005	Filter Element: 316L SS, 1.25” x 2.975”, 5 Micron
3FEC-002	Filter Element: Ceramic 2 Micron
3FEG-001	Filter Element: Glass, 0.1 Micron
3FEG-003	Filter Element: Glass/TFE Coated, 0.7 Micron
4P-FLANGE2	Flange: 2”, 150# with Gasket & Bolts
4P-FLANGE3	Flange: 3”, 150# with Gasket & Bolts
4P-FLANGE4	Flange: 4”, 150# with Gasket & Bolts
4P-FLANGE6	Flange: 6”, 150# with Gasket & Bolts
4P-GCS-212	Gas Cooling Spool Piece: w/ 2” Flanges & 12” Spool
4P-GCS-412	Gas Cooling Spool Piece: w/ 4” Flanges & 12” Spool
3PAM-006PK	Gasket: Graphoil 1.25” (10 pack)
3PHH-003	Heat Jacket, Wire-Wound w/ Thermostat & Thermal Fuse (“C” series only)
2HTR-007	Heater Band, 350W
3PAM-031PK	O-Ring: Pack, Viton, “C” series probes only, 5 ea 1⅞” OD, 2 ¼” OD
4P-STNG-STD	Stinger, Replacement: 18”, 316L SS, ½" x 0.065”w
2VRS-005	Valve: Check, 10 psig, ¼” Viton “O” Ring
2VS2-007	Valve: Solenoid, 2 Way, 120VAC/60Hz, 100 psig, Hi Temp
2VS2-006	Valve: Solenoid, 2 Way, 220VAC/50Hz, 100 psig, Hi Temp

APPENDIX: