

Heating Jacket Cyclone™ Gas Cells



User Manual



2I-24302-13

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Cyclone™ Gas Cells

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1. Introduction

The Heating Jacket and 4000 Series Temperature Controller allows a long pathlength Cyclone™ gas cell to be used for applications where the gas to be analyzed needs to be maintained above ambient temperature and up to 200°C. Typical applications are for the study of the chemical reactions of gases at elevated temperatures and the study of combustion gases that can be directed into the Cyclone™ Cell.

There is an appropriate heating jacket and controller for each of the different pathlength Cyclone™ Cells. These are:

P/N GS24302: Heating Jacket and Controller for C2 Gas Cell

P/N GS24305: Heating Jacket and Controller for C5 Gas Cell

P/N GS24310: Heating Jacket and Controller for C10 Gas Cell

2. Construction

The Heating Jacket is constructed using two tubes. The heating element has been wound round the outside of the inner tube. Between the heating element and the outer tube there is a gap for air flow which allows the heat to be dissipated evenly and gradually by convection up the tube. The top of the heater has been designed to stop quick heat loss ensuring efficient heat distribution along the cell and good temperature stability. The thermocouple is located in the middle section of the Heating Jacket. The temperature along the whole length of the cell will show very little variation.

Power to heat the jacket is supplied by a dedicated 4000 Series Temperature Controller. A separate instruction manual is supplied for its usage.

3. Checklist

Please check on delivery that the following has been supplied:

1. Heating Jacket for appropriate C2, C5, or C10 Cyclone™ Gas Cell.
2. 4000 Series Temperature Controller and power cable.

The Heating Jacket and Controller are supplied as separate items. Carefully remove them from their packaging and proceed to install as per instructions.

4. Specification

Electrical Safety Class

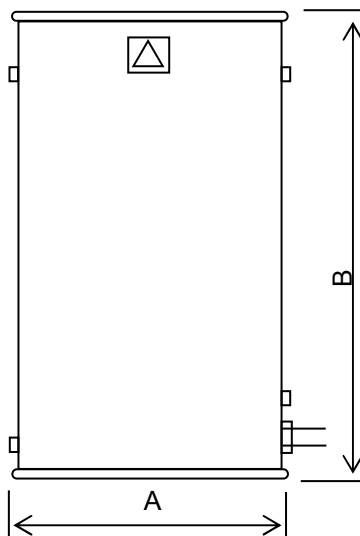
This apparatus has been designed and tested in accordance with Safety Class 1 requirements of IEC publication 348, Safety Requirements for Electronic Measuring Apparatus, and has been supplied in a safe condition. The present instruction manual contains some information and warning notes, which have to be followed by the user to ensure safe operation and retain the apparatus in a safe condition.

Operating Temperature range:	ambient to 200°C
Heating rate (Glass Body):	60 mins to 200°C
Heating rate (Metal Body):	90 mins to 200°C
Stability time:	30 mins after cell reaching 200°C
Control stability:	±1°C RMS
Cooling rate:	90 mins
Voltage:	low voltage (30 volts)
Storage - temperature:	5 to 40°C
- humidity:	20 to 80%

5. Installation

1. Install and align the gas cell in the spectrometer first. (See Cyclone™ Gas Cell instruction manual).
2. Carefully lift the Heating Jacket and slide it over its corresponding size gas cell. Ensure that the Heating Jacket sits firmly in the location step provided on the nickel plated bottom fitting of the gas cell. The outer tube of the jacket will come to rest approximately 11mm above the top plate of the transfer optics box for the C5 and C10 gas cells and 16mm above for the C2 cells.
3. After reading the instruction manual for the 4000 Series Temperature Controller, connect the plug from the Heating Jacket to the controller.

CELL	A	B
C2	124 mm	164 mm
C5	169 mm	339 mm
C10	197 mm	344 mm



6. Operating Parameters for Heating Jackets

The Cyclone™ Gas Cell Heating Jacket is provided with its own dedicated 4000 Series™ Temperature Controller. A separate manual is supplied for operation of the 4000 Series™ Temperature Controller.

For operation of the Cyclone™ Gas Cell Heating Jacket the parameters of the 4000 Series™ Temperature Controller have been factory set as shown on the following page. There are individual parameter listings for the three different sizes of Heating Jacket. Not all of the displayable parameters can be changed but have been listed for reference purposes. If you ever need to change a parameter or autotune the controller for a particular temperature range certain parameter settings will be altered. You can get back to original factory settings by reprogramming the controller with these original values.

Specifications

Accessory Type GS24302, GS24305, GS24310

Voltage	230V	110V	100V
Frequency	50HZ	60HZ	50/60HZ
Max Power	600W	600W	600W
Fuse Rating	5A	8A	8A
Fuse Type	T	T	T

Insulation rating of external circuits (appropriate for single fault condition) = basic insulation and protective (earth) bonding.

Humidity operation range – 20% to 90% relative humidity non-condensing.

**Displayable Parameters for Cyclone™ Gas Cell Heating Jacket
P/N GS24302 with WEST 6100+ (4000 Series™) Controller**

Parameter Display (In Green)	Parameter Name	Parameter Factory Set Value
FiLt	Input Filter Time Constant	3.0
OFFS	Process Variable Offset	0
PP _{LD}	Primary (Heat) Output Power	0
Pb_P	Primary Output Proportional Band	10.0
ArSt	Automatic Reset (Integral Time Constant)	0.32
rAtE	Rate (Derivative Time Constant)	0.08
biAS	Manual Reset (Bias)	25
SPuL	Setpoint Upper Limit	200
SPLl	Setpoint Lower Limit	0
OPuL	Primary (Heat) Output Upper Power Limit	100
Ct l	Output 1 Cycle Time	32
PhAl	Process High Alarm	200
AHy1	Alarm 1 Hysteresis	1
PLA2	Process Low Alarm	0
AHy2	Alarm 2 Hysteresis	1
APt	Auto Pre-Tune enable/disable	diSA
PoEn	Manual Control select enable/disable	diSA
SPr	Setpoint Ramping enable/disable	EnAb
rP	Setpoint Ramp Rate Value	600
SP	SP Value	10
SLoc	Set-up Lock Code	10

**Displayable Parameters for Cyclone™ Gas Cell Heating Jacket
P/N GS24305 with WEST 6100+ (4000 Series™) Controller**

Parameter Display (In Green)	Parameter Name	Parameter Factory Set Value
FiLt	Input Filter Time Constant	3.0
OFFS	Process Variable Offset	0
PPL□	Primary (Heat) Output Power	0
Pb_P	Primary Output Proportional Band	5.0
ArSt	Automatic Reset (Integral Time Constant)	3.10
rAtE	Rate (Derivative Time Constant)	0.29
biAS	Manual Reset (Bias)	25
SPuL	Setpoint Upper Limit	200
SPLL	Setpoint Lower Limit	0
OPuL	Primary (Heat) Output Upper Power Limit	100
Ct I	Output 1 Cycle Time	32
PhAl	Process High Alarm	200
AHy1	Alarm 1 Hysteresis	1
PLA2	Process Low Alarm	0
AHy2	Alarm 2 Hysteresis	1
APt	Auto Pre-Tune enable/disable	diSA
PoEn	Manual Control select enable/disable	diSA
SPr	Setpoint Ramping enable/disable	EnAb
rP	Setpoint Ramp Rate Value	600
SP	SP Value	10
SLoc	Set-up Lock Code	10

**Displayable Parameters For Cyclone™ Gas Cell Heating Jacket
P/N GS24310 with WEST 6100+ (4000 Series™) Controllers**

Parameter Display (In Green)	Parameter Name	Parameter Factory Set Value
FiLt	Input Filter Time Constant	3.0
OFFS	Process Variable Offset	0
PP _{LD}	Primary (Heat) Output Power	0
Pb_P	Primary Output Proportional Band	10.0
ArSt	Automatic Reset (Integral Time Constant)	5.00
rAtE	Rate (Derivative Time Constant)	1.15
biAS	Manual Reset (Bias)	25
SPuL	Setpoint Upper Limit	200
SPLL	Setpoint Lower Limit	0
OPuL	Primary (Heat) Output Upper Power Limit	100
Ct I	Output 1 Cycle Time	32
PhAl	Process High Alarm	200
AHy1	Alarm 1 Hysteresis	1
PLA2	Process Low Alarm	0
AHy2	Alarm 2 Hysteresis	1
APt	Auto Pre-Tune enable/disable	diSA
PoEn	Manual Control select enable/disable	diSA
SPr	Setpoint Ramping enable/disable	EnAb
rP	Setpoint Ramp Rate Value	600
SP	SP Value	10
SLoc	Set-up Lock Code	10

7. Important Notes of Safety and Operation

1. Avoid burns. Some parts of the Heating Jacket e.g. top disc plate with vent holes will be hot and should not be handled with bare hands when the Heating Jacket is hot. In normal operation at 200°C the top disc plate temperature would be about 50°C. The outside tube will be slightly cooler.
2. Do not remove the Heating Jacket from the Cyclone™ gas cell when hot. If it is absolutely necessary to do so, then make sure there is an air gap between a worktop bench and the Heating Jacket. Do not sit it directly on the bench. Failure to leave an air gap underneath to allow for air flow may result in over heating and damage the heater.
3. If the Heating Jacket is removed from the gas cell during the experiment for a period of more than 5 minutes, turn the controller power off.
4. Do not lie the Heating Jacket on its side on a work bench. The Jacket could roll and fall to the floor. This may result in heater or Jacket damage.
5. The Heating Jacket is fitted with a thermal fuse located between the inner and outer tubes. Should thermocouple failure occur or if the Jacket is misused, overheating will occur. As a safety precaution the thermal fuse will blow to stop overheating (thermal run-away) of the Jacket and Gas Cell when the temperature of the air gap between the two tubes exceeds 100°C.

Warning: *In the event of a blown thermal fuse, the Heating Jacket should be returned to Specac for repair.*

6. The full working temperature of 200°C can be achieved from vacuum to about standard atmospheric pressure (14.7psi). Pressurized gases have much higher thermal conductivity than non-pressurized gases. The full working temperature may therefore not be achieved under pressurized condition (check the

maximum pressure limit of your gas cell) depending on the thermal conductivity of the gas used. The higher the thermal conductivity of gas used the lower the temperature limit that can be attained. Thermal conductivity also increases with temperature and the rate of increase is important.

Guide for some Thermal Conductivity Values:

Gas	Thermal Conductivity Cal/(sec) (cm ²) (°C/cm) x 10 ⁻⁶	
	@ 26.7°C	@ 48.9°C
Nitrogen	62.40	65.71
Helium	360.36	376.07
Hydrogen	446.32	471.11
Oxygen	63.64	68.19
Air	62.20	66.04
Carbon Dioxide	39.07	43.81



EC Declaration of Conformity

This is to certify that the:

**CYCLONE GAS CELL HEATING JACKET & 4000 Series TEMP. CONTROLLER
24300 SERIES**

Manufactured by:
SPECAC LIMITED

Conforms with the protection requirements of Council directives 2004/108/EC , relating to the EMC DIRECTIVE,

by the application of:

- 1) Testing to the following standard:
EN-61326:2006/8 EMC (Emissions/Immunity) requirements for Electrical Equipment for measurement, control and laboratory use.
- 2) Supported by SPECAC Technical File No. **TF24300**


and also conforms to the general safety requirements of Council Directives 2006/95/EC , relating to the LOW VOLTAGE DIRECTIVE,

by the application of:

- 1) EN61010-1:2010, Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory use.
- 2) Supported by SPECAC Technical File No. **TF24300**

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Serial No:
Name:
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conforms to the above
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