LDetek

LDP2000 SERIES

USER'S MANUAL

GAS PURIFIER FOR NOBLE GASES, NITROGEN & HYDROGEN

LDP2000

Gas Purifier

USER'S MANUAL
V1.0

Table of Content

1. FORWARNING

This manual is required to be read by any user that wants to use the LDP2000Gas Purifier. It contains important information to successfully operate the instrument. LDetek makes assumption that all operators have taken the time to read this information prior to install, operate and troubleshoot the purifier.

If any error is suspected by the reader, please contact an LDetek employee. LDetek has the right to reserve to make any changes to subsequent editions of this document without prior notice to holders of this edition.

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We would like to thank you for choosing LDetek as your gas purifier supplier.

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Goods and part(s) (excluding getter) manufactured by Seller are warranted to be free from defects in workmanship and material under normal use and service for a period of twelve (12) months after installation and start up and not exceeding 18 months from shipment date. Goods, part(s) proven by Seller to be defective in workmanship and/or material shall be replaced or repaired, free of charge, F.O.B. Seller's factory provided that the goods, part(s) are returned to Seller's designated factory, transportation charges prepaid, within the twelve (12) months after installation and start up and not exceeding 18 months from shipment date.

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Major force.Seller is not liable for failure to perform due to labor strikes or acts beyond Seller's direct control.

SERVICE POLICY

1.   If a product should fail during the warranty period, it will be repaired free of charge. For out of warranty repairs, the customer will be invoiced for repair charges at current standard labor and materials rates.

2.   Customers who return products for repairs, within the warranty period, and the product is found to be free of defect, may be liable for the minimum current repair charge.

3.   For parts replacement, the original part must be returned with serial and model numbers of the analyzer.

NO PART WILL BE SHIPPED IF THE ORIGINAL IS NOT SENT BACK TO LDETEKINC.

RETURNING A PRODUCT FOR REPAIR

Upon determining that repair services are required, the customer must:

1. Obtain an RMA (Return Material Authorization) number.

2. Supply a purchase order number or other acceptable information.

3. Include a list of problems encountered along with your name, address and telephone, and RMA number.

4. **Ship the parts in its original crating or equivalent. Failure to properly package the parts will automatically void the warranty.**

5. **Every gas connection must be capped with appropriate metal caps. Failure to do so will automatically void the warranty.**

6. Write RMA number on the outside of the box.

7. Use a LDetek approved carrier. Also, the delivery must be sent to the LDetek facility. LDetek will not accept airport to airport delivery.

8. LDetekdoes not cover transport fees.

Other conditions and limitations may apply to international shipments.

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Trademarks and product identification as LDetek are the property of LDetek Inc. and shall be used only in connection with LDetek's products. No third party could remove or deface any model number or marks.

3. DECLARATION OF CONFORMITY

To come soon

4. SPECIFICATIONS

Getter type: Combination of different alloy of Zr/V/Fe/Pd with 2 beds of purification

Gas Purified	Noble gases	Nitrogen	Hydrogen	Carbon Dioxide	Oxygen
Impurities removed at room temperature	H2O, O2, CO, CO2, H2			H2O, O2, THC	H2, H2O, CO, CO2, THC
Impurities removed when dual beds are heated	H2O, O2, CO, CO2, N2, H2, THC, VOC	H2O, O2, CO, CO2, THC, VOC, H2	H2O, O2, CO, CO2, N2, THC, VOC	n/a	n/a
Regeneration Mode available	n/a	n/a	n/a	Yes	Yes
Real Time monitoring trace N2-H2O with PED available	Yes	n/a	n/a	n/a	n/a

Impurity level at outlet: <1ppb

Flow: 2LPM nominal up to 20LPM maximum(when both getters are selected together)

Gas connections: 1/4'' VCR

Recommended operating inlet pressure range: 50psig-200psig (345kpag-1379kpag)

Electrical supply: 110/120VAC 50/60Hz or 220/240VAC 50/60Hz

Power consumption: At Start up: 300 Watts max, at Normal operation: 200 Watts max

Weight: 35LBS (15.9KGS)

Certification: CE & UKCA In compliance with EMC directive IEC 61000-6-2: 2016 (immunity) & IEC 61000-6-4: 2018 (emission) for equipment used in industrial environment

Serial Port :

Type	RS-232
Connector	Male DE-9 (DB-9)
Protocol supported	Modbus RTU
Baud rate supported	9600, 19200, 38400, 57600
Parity	None
Data bits	8
Stop bits	1

5. CAUTIONS AND INSTALLATION INFORMATION

5.1. Cautions

WARNING!

This product is not for use with oxygen (except for the Oxygen getter model), either pure oxygen or gases with a significant proportion of oxygen. The purifier's gettering alloy is pyrophoric at operating or ambiant temperature. Use with significant amounts of oxygen can result in combustion of the material, potential damage to the surrounding area, and possible injury.

The installation process of this product must fully respect the installation procedure described in the user's manual. All steps of the procedure must be strictly followed in order to avoid any damage to the product or any accident caused by any bad manipulation of the product.

Special instructions for Hydrogen Purifier installation

To facilitate maintenance activities and emergency cases, isolation valves installation is required. Some isolation valves at the inlet and the outlet shall be installed at an accessible

location, so that the hydrogen flow can be shut off when necessary. A bypass valve is also appropriated to keep flow to the analytical instruments connected to the outlet of the purifier.

High impurity levels (air) in the gas stream could cause the high temperature alarm. In such event, purifier power must be turned off and isolation valves must be closed.

Over Pressure vent must be installed at the outlet of the purifier. In case of high level air contamination, a high pressure increased may occur in the purifier, a relief valve must open to reduce a system pressure.

In no event shall LDetek Inc. be liable for any direct, indirect, special, incidental, or consequential damage whether based on contract, tort, or any other legal theory and whether advised of the possibility of such damages.

5.2. Installation steps

1. After removing the purifier from the shipping container and protective wrapping, ensure that both end caps are tight, and that the unit is in good condition.
2. Make sure that the fittings in the gas line match those supplied with the purifier.
3. Start the flow of purge gas (minimum purity of 5N) through the gas line before the purifier inlet to purge the piping at approximately 0.5 LPM for a minimum of 20 minutes.
4. While holding the purifier in the gas stream, quickly remove inlet cap, and make a connection with the fitting on the gas line. Tighten as recommended by fitting manufacturer. Leak check the fitting connection.

   Note for high purity version:

   A new face seal must be installed each time to ensure a good sealing.

5. Remove the outlet end cap and quickly make a connection to the outlet gas line. Let it vent to atmosphere for 30 minutes at approximately 1LPM to eliminate air from the getter material. Connect the purifier on the electrical supply. Then, you must switch from 'None' to 'Getter #1' by referring to Getter Selection menu in the interface. This way the internal pneumatic valves will switch on getter one and start heating properly.

    __Caution! The getter should never be heated when air is present__

    __Caution! Be sure you connect the right operating voltage__

6. With the power on the purifier, let the gas vent to the atmosphere for 3 hours to allow complete purging of the unit. Once the Status led shows blinking green and Getter 1 led is solid green, it indicates the unit is ready for operation.

5.3. Installation Diagrams

The LDP2000 dual getters large gas purifier system is designed to feed the carrier gas of multiple analytical instruments. Having only one purification device to feed multiple instruments simplify the operations and the maintenance/installation costs.

With our mini plasma emission detector mounted at the outlet of the purifier to trace ppb N2 and H2O impurities in Helium or Argon mode, it offers the online monitoring of the real gas quality generated. If the purity level alarm is activated due to trace impurities measured, the device automatically switches to the spare getter to keep feeding the analytical instruments without interruption. The saturated getter is then cooled down and isolated to allow the replacement of it easily.

The device has a front LCD with keypad to navigate through its interface.

The schematic represents a typical gas chromatograph installation having multiple GCs. A switchover system (LDASS) with a pressure monitoring system (LDPMS) are used to secure the bottle pressure monitoring before the LDP2000 gas purifier. At the outlet of the LDP2000 gas purifier, our cryogenic purification system (LDCRYO) is mounted to remove the trace impurity Argon presents in Helium source. The combination of the 3 systems together is the best solution to feed high quality gas to any gas chromatography systems.
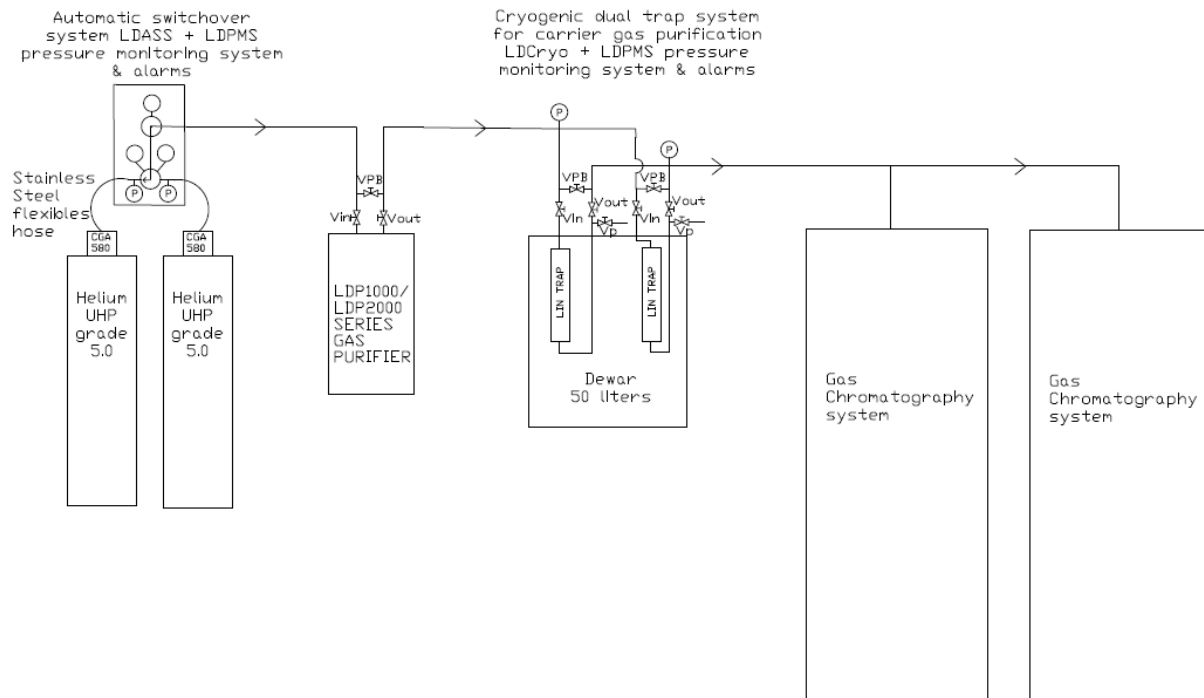
6. MENU

6.1 Getter Selection

Getter selection	
On the display GETTER SELECTION none	Description Press enter to change the getter selection. • None : No getter is selected, the bypass valve is activated. • #1 : Getter #1 is selected. • #2 : Getter #2 is selected. • Dual : Both getters are selected. When a getter is selected, the valves will be activated to let the flow through, and the getter will heat up to reach its operational temperature.

6.2 Getter Temperature

Getter temperature and setpoint	
On the display 250°C 72°C 150°C 48°C	Description The main page shows the current temperature of the getters. On the left you have the top and bottom temperature of the getter #1 and the getter #2 on the right. If you press Enter, you will see the setpoint for each part (top and bottom of getter #1 and getter #2) You can move up and down to select the setpoint to change. Press Enter to change a setpoint.

6.3 Impurities Display

Impurities reading and alarm level

On the display	Description
N2: 000.0 ppm H2O: 000.0 ppm	The main page shows the current impurities reading. If you press Enter, you can scroll up and down to see the alarm level of each impurity. If you press Enter again you will be able to change the alarm level.

6.4 Alarms

Active alarm

On the display	Description
ALARM MENU 00 active alarm(s)	The main page shows how many alarms we have. If we have at least one alarm and you press Enter you will be able to see the description of each active alarm. Use up and down to scroll among the active alarms. If you press Enter again, all alarm will be cleared. Of course, the alarms can come back the alarm conditions are still present.

6.4 Parameters

Parameters	
On the display	Description
PARAMETERS	You need to press Enter to see the parameters

Temperature unit	
On the display	Description
TEMPERATURE UNIT °C	Press Enter and select °C or °F using up and down button.

Concentration unit and number of decimals	
On the display	Description
CONCENTR. UNIT	Press Enter and select PPM or PPB using up and down button to select the concentration unit.
On the display	Description
CONCENTR. DEC.	Select 0, 1 , 2 or 3 using up and down button to select the number of decimal to display.

RS232 baud rate	
On the display	Description
RS232 BAUDRATE 57600	Press Enter and select the appropriate using up and down button. The default baud rate is 57600

Modbus slave ID	
On the display	Description
MODBUS SLAVE ID 001	Press Enter and enter the slave ID. The default slave ID is 1.

Inactivity delay	
On the display	Description
INACTIVITY DELAY 10 min	If you push any button during this delay, the display will fade out. Press any button and the display will be back normal. Press Enter and enter the inactivity delay.

6.5 Diagnostic

Diagnostic	
On the display DIAGNOSTIC	Description You need to press Enter to see the different diagnostic menu

Valve diagnostic	
On the display DIAG. VALVES	Description Press Enter and select the valve you want to see/test using up and down button. Press Enter again and you will be able to force ON or force OFF the valve using the up and down button. You can force ON and OFF more than one valve if you stay in the "diag. valves" menu. As soon as you get out of this menu, all valves return to their normal state.
ADC diagnostic	
On the display DIAG. ADC	Description Press Enter and select the ADC input you want to see using up and down button.
Getter diagnostic	
On the display DIAG. GETTER	Description Press Enter and select the Getter you want to see using up and down button. You can see the serial number of the getter and how many time left before its end of life.

6.6 Getter replacement

Getter replacement	
On the display GETTER REPLACEMENT	Description You need to press Enter to be able to select which getter your are replacing. Then you must enter the serial number of the new getter. Then you are ready to use this new getter.

7

Keypad Legend			
Up	⬆	↰	Back
Down	⬇	↵	Enter

. MENU OVERVIEW

...Rolls back to the last menu...

GETTER SELECTION
none

Allow to select getter #1, #2, dual (both) or none

(→250°C)(↓ 72°C)
(↑200°C)(55°C)

See the current temperature and adjust the setpoint

N2: 000.0 ppm
H2O: 000.0 ppm

See the current impurities reading and adjust their alarm level

ALARM MENU
00 active alarm(s)

See the active alarms and clear them

PARAMETERS

See and adjust all parameters

DIAGNOSTIC

Diagnostic for valve, ADC and getters

GETTER
REPLACEMENT

When you replace a getter

...Roll over to the first menu...

8. LIFETIME AND LED INDICATION

The LDP2000 getter has a lifetime of 3 years. The red light will indicate when the getter is not purifying the gas anymore. The cartridge getter can be replaced instead of the whole purifier. Some manipulation is required to change it. Please refer to maintenance section in this manual.

Here is the meaning of each LED on the side of the purifier:

The LDP2000 has three LEDs on the front.

Status	Blinking green	Everything is fine.
	Blinking red	There is at least one active alarm. Go in the *Operation* menu and *Alarms* to see which alarms are active.
	Blinking faster than 1s	It is because it receives data on the Modbus.
Getter 1	Off	The getter is not in use.
and	Solid green	The getter is in use.
Getter 2	Solid orange	The getter is in use and the life of the getter is close to the end.
	Solid red	The getter is in use and the life of the getter is done.
	Blinking green	The getter is in the regeneration process.
	Blinking orange	The getter is not in use and the life of the getter is close to the end.
	Blinking red	The getter is not in use and the life of the getter is done.

1. MODBUS MAPPING

You can exchange data by Modbus RTU with a LDP2000.
The only function you need is the function 3, to read multiple holding registers.
If you attempt to send any other functions, they will be ignored, and you will not get a response.

9.1 Device Info

The device information section is the place where the device is described.

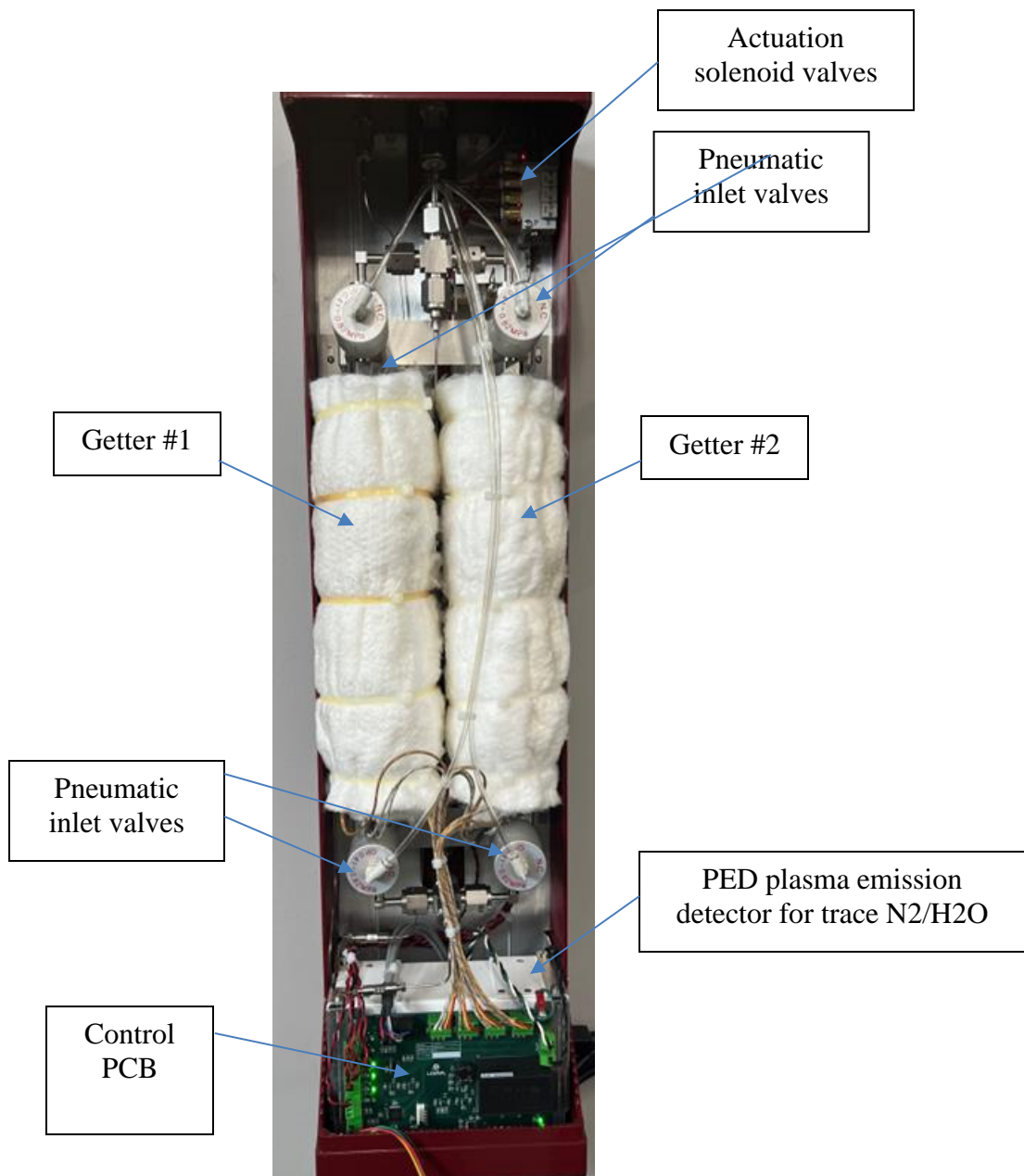| Register	R/W	Type	Description
41001	R	UINT16	LDetek Identification number, always 31307
41002	R	UINT16	Modbus version, start with 1000 and increment if future version makes important change in the mapping.
41003	R	ASCII[16]	Product name
41011	R	ASCII[16]	Model name
41019	R	ASCII[16]	Serial number
41027	R	ASCII[16]	Software version

9.2 Device Status

The device status section is the place to get actual information on the device.

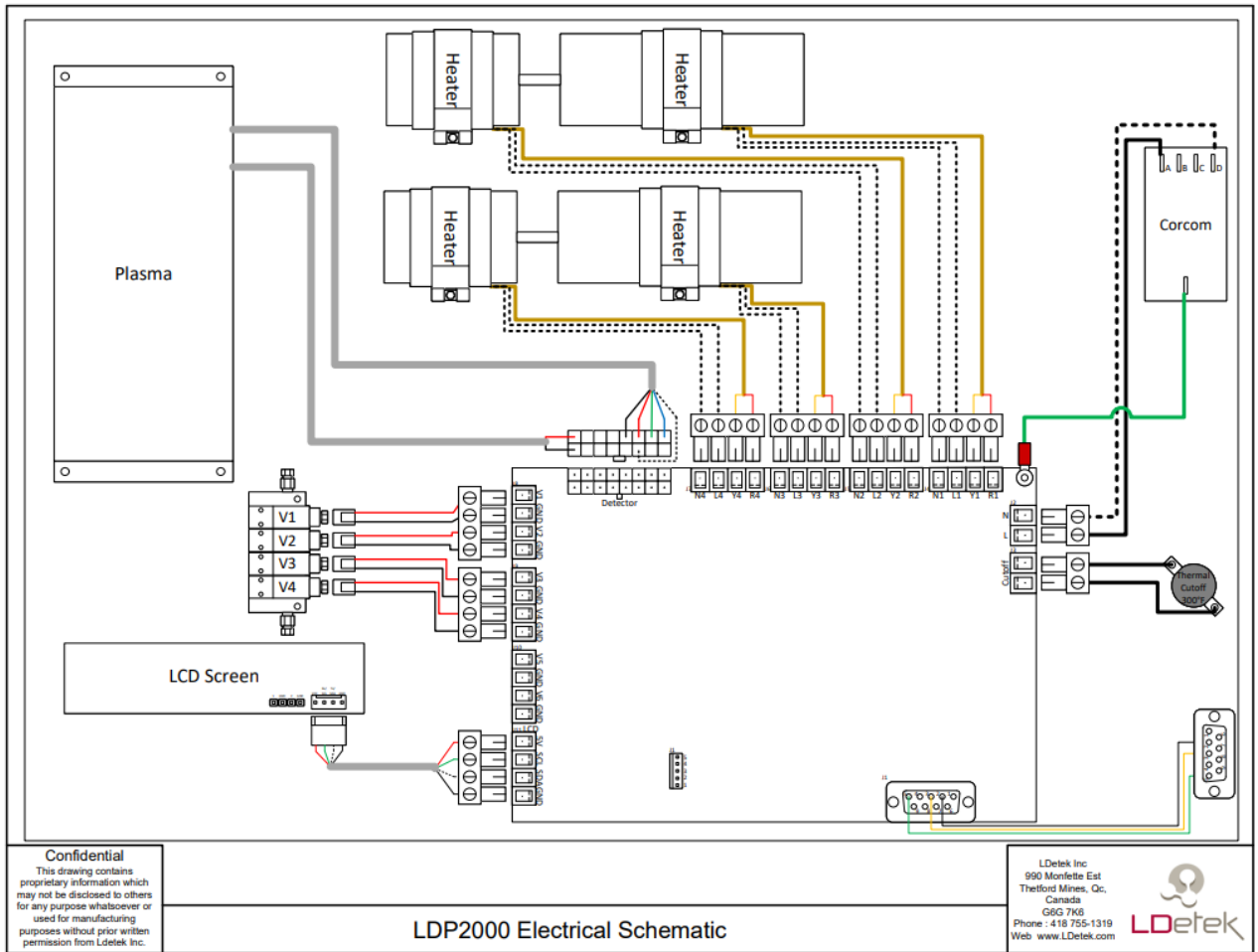| Register	R/W	Type	Description
42001	R	UINT16	Status word 1 • Bit00 : System is monitoring • Bit01 : Getter1 in use • Bit02 : Getter2 in use • Bit03 : Getter1 end of life warning • Bit04 : Getter2 end of life warning • Bit05 : Getter1 end of life • Bit06 : Getter2 end of life • Bit07 : Getter1 in regeneration • Bit08 : Getter2 in regeneration • Bit09 : Alarm : Noisy temperature • Bit10 : Alarm : Temperature not rising • Bit11 : Alarm : Getter Overheating • Bit12 : N2 alarm limit • Bit13 : H2O alarm limit
42002	R	UINT16	Temperature Top Left in Celsius
42003	R	UINT16	Temperature Bottom Left in Celsius
42004	R	UINT16	Temperature Top Right in Celsius
42005	R	UINT16	Temperature Bottom Right in Celsius
42006	R	UINT16	Setpoint Top Left in Celsius
42007	R	UINT16	Setpoint Bottom Left in Celsius
42008	R	UINT16	Setpoint Top Right in Celsius
42009	R	UINT16	Setpoint Bottom Right in Celsius
42010	R	UINT16	Intern Temperature in Celsius
42011	R	UINT16	N2 Concentration*
42012	R	UINT16	H2O Concentration*
42013	R	UINT16	N2 Alarm Level*
42014	R	UINT16	H2O Alarm Level*
			*The unit of those registers depend on the selection on the display (could be PPM or PPB) On the display you can also select how many digits you want between 0 and 3 included. You need to divide by 10 for each digit you have. For instance, if you select 3 digit and you have 1.234 PPM, the register will contain 1234. You need to divide by 1000 to get the real value. If the value gets bigger than 65535, you will read 65535.

10. DRAWINGS

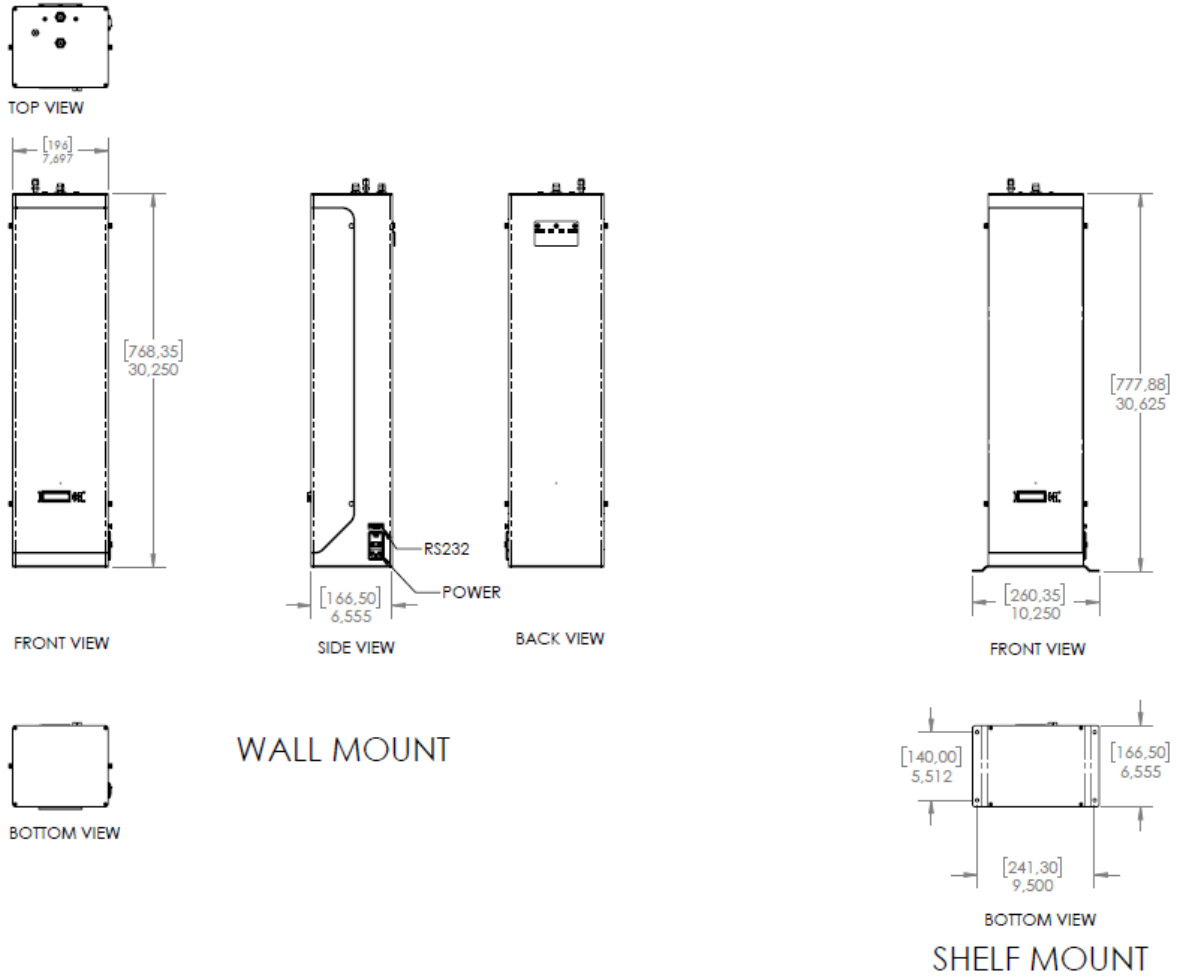### 10.1. Hardware identification

Actuation solenoid valves

Pneumatic inlet valves

Getter #1

Getter #2

Pneumatic inlet valves

PED plasma emission detector for trace N2/H2O
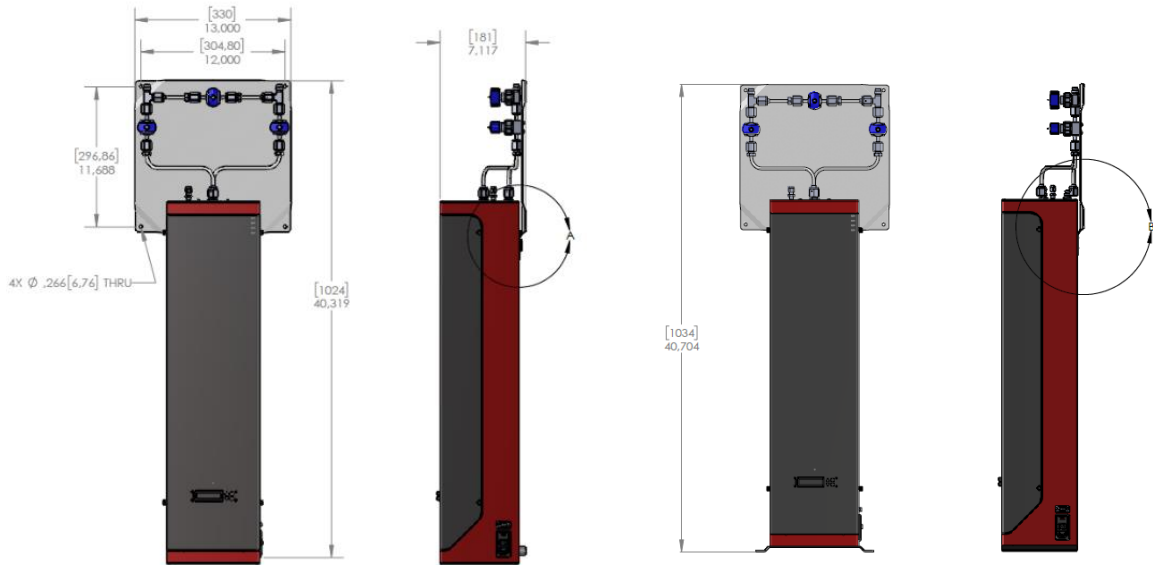
Control PCB

10.2. Wiring diagram

LDP2000 Electrical Schematic

LDetek Inc
990 Monfette Est
Thetford Mines, Qc,
Canada
G6G 7K6
Phone : 418 755-1319
Web www.LDetek.com

10.3. LDP2000 dimensions

TOP VIEW

[196]
7,697

[768,35]
30,250

FRONT VIEW

RS232
POWER

[166,50]
6,555

SIDE VIEW

BACK VIEW

BOTTOM VIEW

WALL MOUNT

[777,88]
30,625

[260,35]
10,250

FRONT VIEW

[140,00]
5,512

[166,50]
6,555

[241,30]
9,500

BOTTOM VIEW

SHELF MOUNT

10.4. Supporting plate with isolation valves option (LDP2000 mounted)

WALL MOUNT   SHELF MOUNT

11. MAINTENANCE

In normal operation, the LDP2000 does not require any maintenance. Please refer to the lifetime and the LED indication section of this manual for detailed explanations of the alarms.

The LDP2000 cartridge can be easily changed on site. See following procedure that explains how to do it. Please contact LDetek at info@ldetek.com to get a replacement cartridge.

11.1. Cartridge replacement procedure

1. Be sure the device is OFF and power cable removed. (WAIT A MINIMUM OF 1 HOUR TO HAVE THE UNIT COOLING DOWN TO NOT BURN YOURSELF DURING OPERATIONS)

2. Take off the front cover and then the wool of the proper getter

3. Remove the getter by unscrew the VCR inlet & outlet fittings. (Be careful to hold the gasket)

4. Install the new getter and put in place new VCR gaskets **and well tight the VCR ends. Be sure to proceed as quick as possible to minimize the exposure to air.**

5. Be sure the wool is properly in place.

6. You can put back the front cover and restart the device.

7. Refer to the section 8.0 'Menu layout' to configure the device properly and select the right getter.

8. Few minutes are required to reach the proper operating temperature and then having the alarms gone away.

11.2. Regeneration mode (available for O2/CO2 model only)

To come soon

12. ORDERING INFORMATION

LDP2000	-xxx	-x	-x	-x	-xx	-xxxx
	Operating voltage : **120** :120VAC **240** :240VAC	Gas Type : **N** :Noble gas **N2** :Nitrogen **H2** :Hydrogen **O2** :Oxygen **CO2** :carbon dioxide	Gas Connection size : **4** : ¼''	Gas connection type : **C** :Compression **FS** :Face seal	Supporting plate : **WM** :Stainless Steel wall mount **SM** :Stainless Steel shelf mount	Supporting plate valves config **BP4C**:bypass valve only compression ¼'' **BPIO4C**:bypass & in & out valves compression ¼'' **BP4FS**:bypass valve only face seal ¼'' **BPIO4FS**:bypass & in & out valves Face Seal ¼''

12.1 Options

A fixing Stainless Steel mounting plate can be ordered with the LDP2000. This plate can come alone or with a selection of 3 valves. A bypass valve that allow maintenance of the unit or bypass flow of the unit. An inlet & outlet isolation valve to allow isolation of the purifier when none operating. The mounting of it is leak proof and tested by LDetek. All connections are welded. This ensures to have High Purity gas at the outlet of the Purifier and have easy manipulation of the unit.

Description	Part Number
Stainless Steel Mounting Plate	SSMP-LDP2000
Stainless Steel Mounting Plate with 3 mounted valves	SSMP-LDP2000-BPINOUT

12.2 Spare parts

Description	Part Number
Getter	Replacement getter (specify LDP2000 serial number when ordering) this is to ensure the right getter version is sent.
LDP2000FK	LDP2000 fuses kit
LDP2000GS	LDP2000 gasket kit (for VCR version only)

Notes :

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