OPERATING MANUAL

IMR 5000

GAS ANALYSIS SYSTEM

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INTRODUCTION

Thank you for purchasing the
IMR Combustion-Gas Analyzer System 5000 with integrated gas-conditioning system.
Please read the following instructions before operating the unit for the first time.

The *IMR 5000* is a state of the art combustion-gas analysis system. Proper handling is necessary to make full use of the outstanding performance and features of the system.

IMPORTANT INFORMATION:
- Use the instrument just within the recommended temperature range.
- Never measure without the filter. The filter must be cleaned/replaced when dirty.
- The manufacturer or an authorized service facility should check and readjust the unit every three months.

SAFETY INSTRUCTIONS

Please make sure that you read this section carefully for use of your new combustion gas analyzer.

- Follow all warnings and instructions marked on the product or displayed on the screen.
- The AC inlet should only be connected to a socket with a protective earth contact.
- Any adjustment or maintenance of the analyzer under voltage should be avoided.
- The maintenance of the analyzer should be done by qualified personal and the instrument should be unplugged.
- Do not use this analyzer in water.
- Never spill water or any liquid on the analyzer.

SYSTEM DESCRIPTION - IMR 5000 GAS ANALYSIS SYSTEM

System features: Gas-sampling probe with 750mm tube and mounting flange
Heated hose 1.5m
IMR 400 Gas conditioning system
IMR 5000 O2, CO, HCl, NO, NO2, SO2 and CH4 with analog output

The analyzer is a complete combustion analysis system that can take readings from one sampling point. The gas-sampling probe has to be permanently mounted to the sampling point.

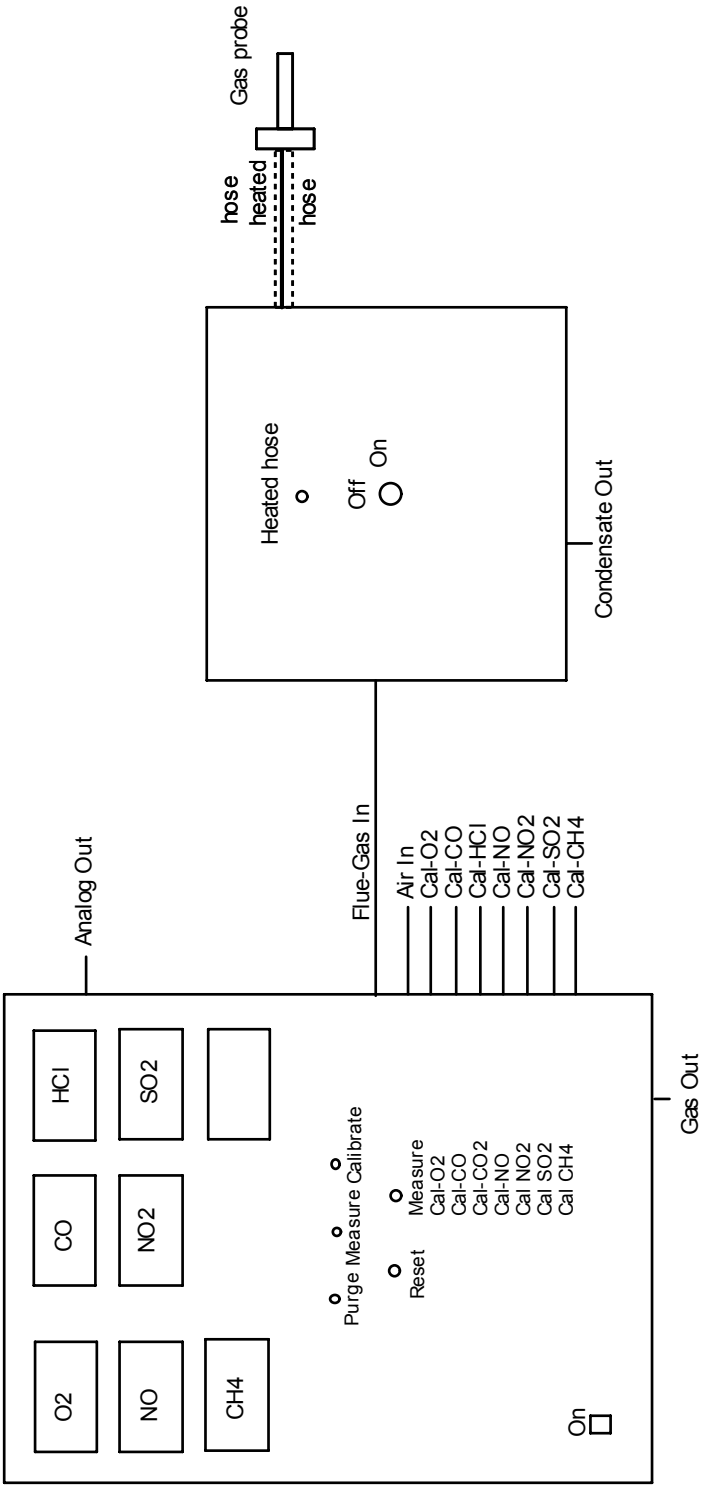
After the flue gas is extracted it flows through a heated hose to the IMR 400 gas conditioning system. The IMR 400 system dries, cleans and removes the moisture from the exhaust gas point.

The IMR 5000 then analyzes the clean and dry gas. The readings are shown on the display and each sensor has a programmable analog output (4..20mA or 0-10V).

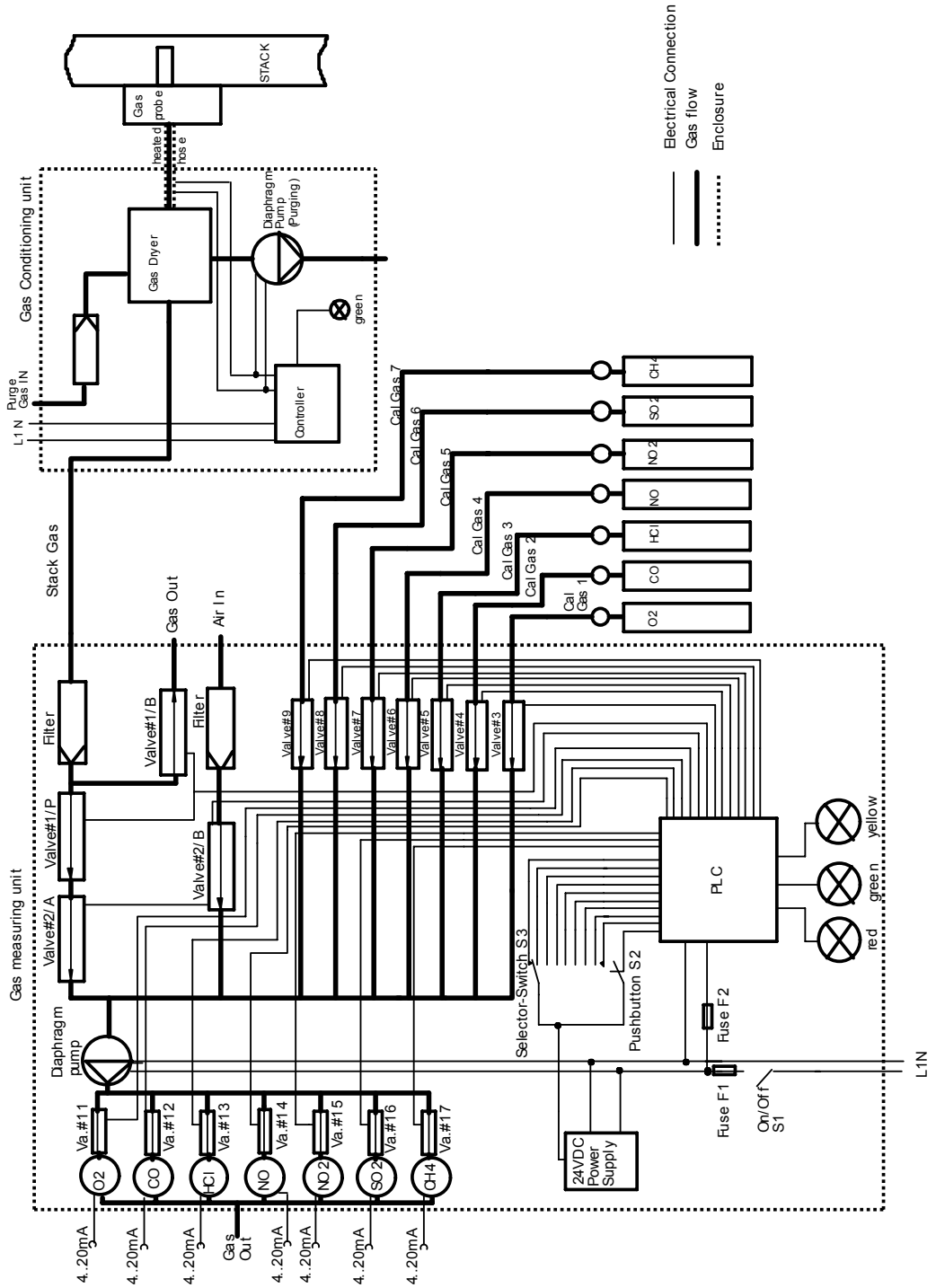
The gas analysis system consists of two wall-mounted enclosures that should be mounted close to each other.

1. IMR 400 Gas sampling and conditioning
2. IMR 5000 Gas analyzer

Function chart IMR 5000 - complete gas analysis system



Gas flow schematic



PREPARATIONS FOR USE

1) Installation - Gas sampling probe

Install the flange at the sampling point and then mount the gas-sampling probe to the flange.

Note: Connect the heated hose to the gas-sampling probe before mounting the probe to the flange.

Technical data:

Sampling tube length:	750 mm
Heated hose	1500mm

Note: Disconnect the AC power for any type of service.

3) Installation - Gas conditioning unit

Choose a place for the gas-conditioning unit and then mount it.
The best place for the gas-conditioning unit is within 1m of the gas-sampling probe.
Leave space around the housing.

Note: Do not extend the hose between the probe and the gas conditioning unit with any kind of tubing, because condensed water will cause a problem.

Connect the heated hose to the gas-conditioning unit and connect the plug of the heated hose with its socket on the enclosure.

The PVC hose (approx. 5m) has to be connected to the specific gas outlet of the gas conditioning unit and the gas inlet of the gas-controlling unit.

The "Air In" fitting supplies the analyzer with fresh air during the purge mode.
Do not block or connect this fitting.

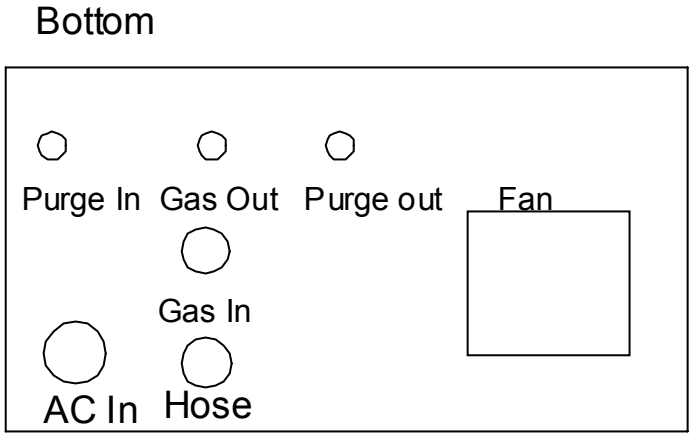
The On/Off-switch for the conditioning unit is on the outside of the enclosure.
The unit is heating the hose when the green LED is on.

The unit has a power cord already installed. Connect the power cord to AC when the installation is complete.

Technical data:

Power supply:	110V / 60Hz
Wall mounted housing:	350 x 300 x 200 mm
Ready for operation:	20 min
Ambient temperature:	5°C - 40°C
Storage temperature:	-25°C - +65°C
Fuse:	4A / 250VAC

Schematic: Connection



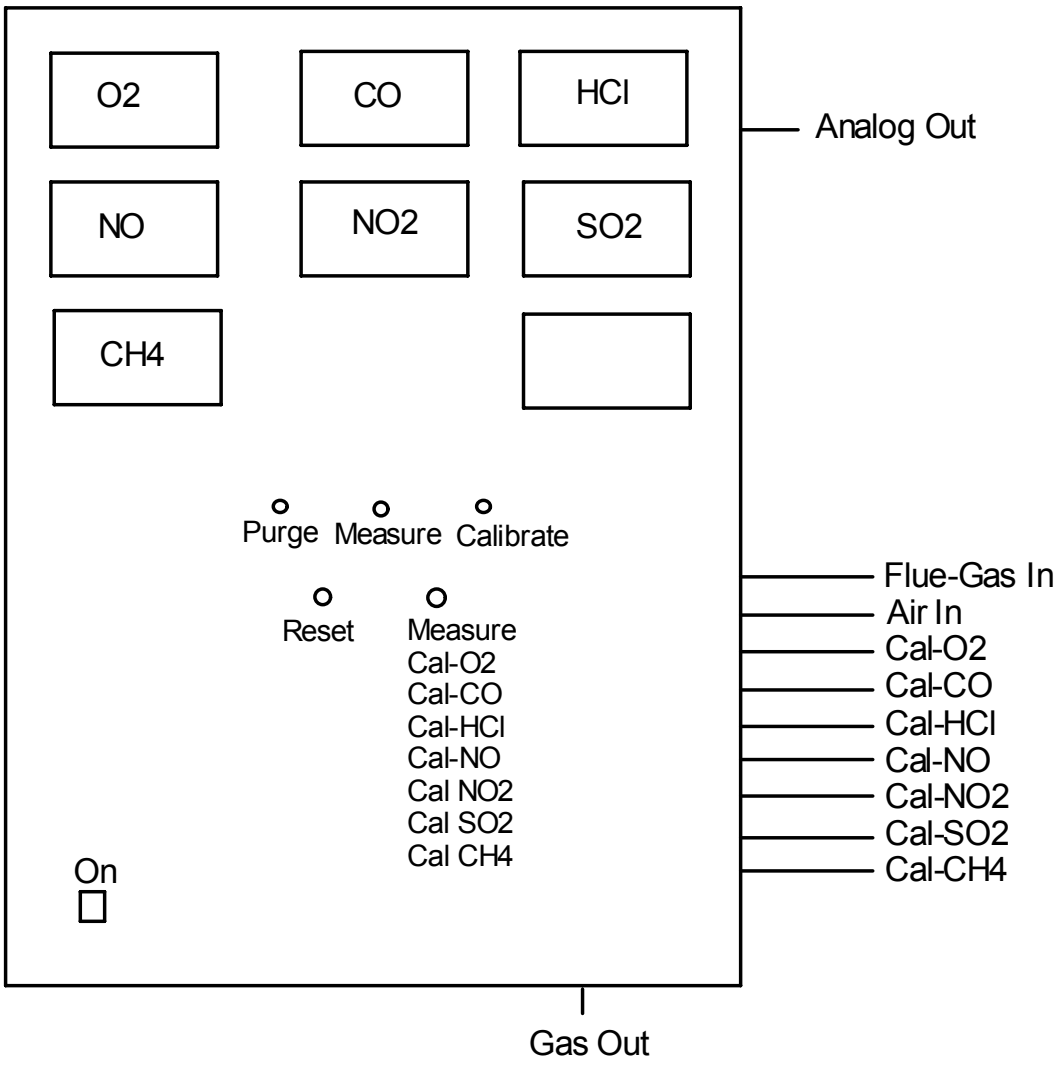
4) Installation - Gas controlling unit

Choose the best place to mount the gas analyzer and then mount it with the enclosed brackets to a wall.
The place should be close to the gas-conditioning unit.

Leave space around the housing for the different outlets and inlets.

Connect the PVC hose with the IMR 400.
A power cord is already installed. Connect the power cord to AC when the installation is complete.

Schematic: Connection

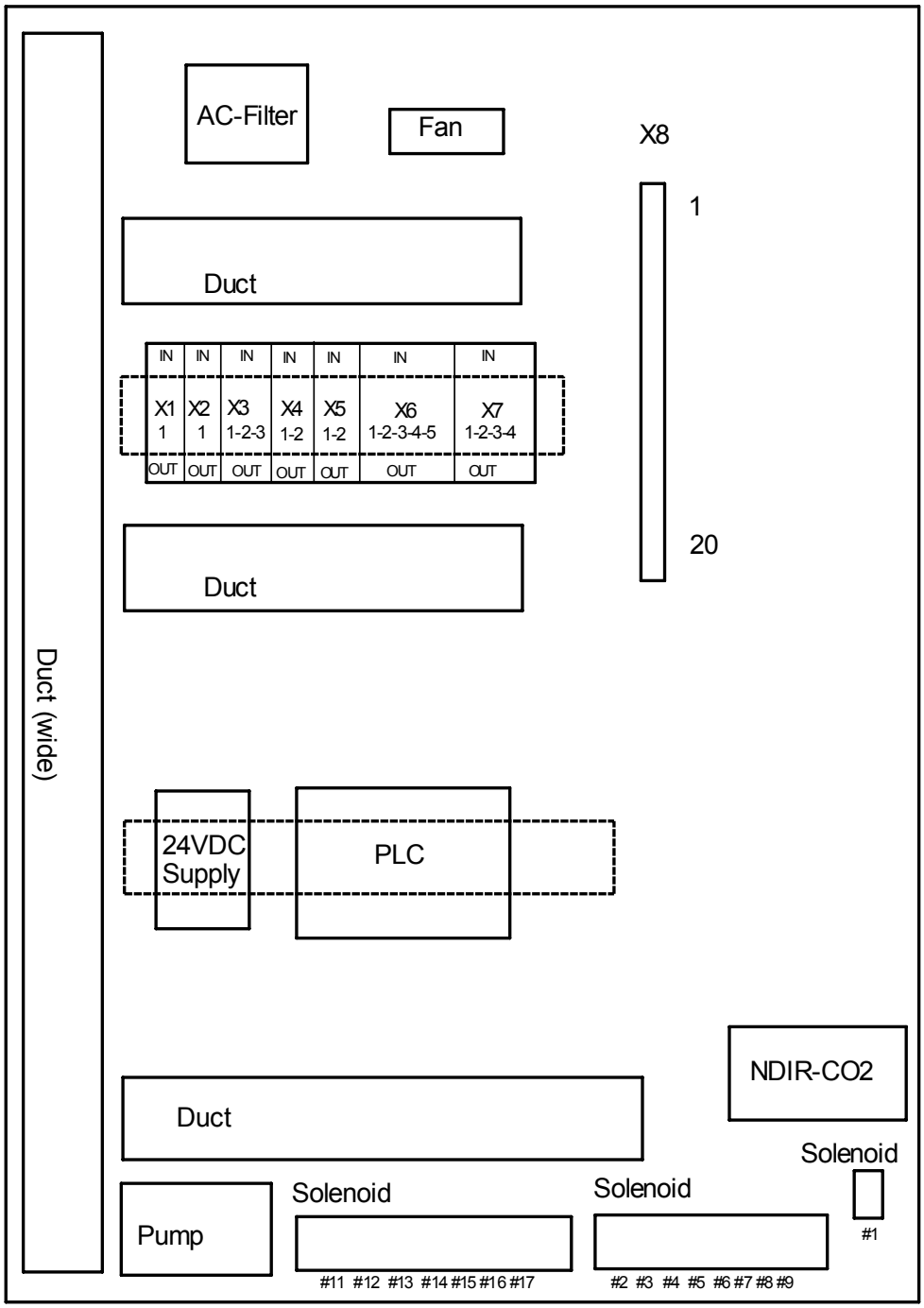


Technical data:

Parameter	Sensor Technology	Accuracy	Measuring range
Oxygen	Electrochemical	+/- 5%	0-21%
Carbon monoxide	Electrochemical	+/- 5%	0-2000ppm
Hydrogen Chloride	Electrochemical	+/- 5%	0-200ppm
Nitric Oxide	Electrochemical	+/- 5%	0-100ppm
Sulfur dioxide	Electrochemical	+/- 5%	0-2000ppm
Hydrocarbons HC-LEL	Electrochemical	+/- 5%	0-100%LEL
Nitric oxide	Electrochemical	+/- 5%	0-2000ppm

Power supply: 110V / 60Hz
Housing: wall mounted
700 x 500 x 250 mm
Display: 5 digit LCD, each sensor
Ready for operation: 40 min
Ambient temperature: 5°C - 40°C
Storage temperature: -25°C - +65°C
Fuse (Panelmount): 2A / 250VAC
Fuse (PLC-Terminalblock): 1A/250VAC

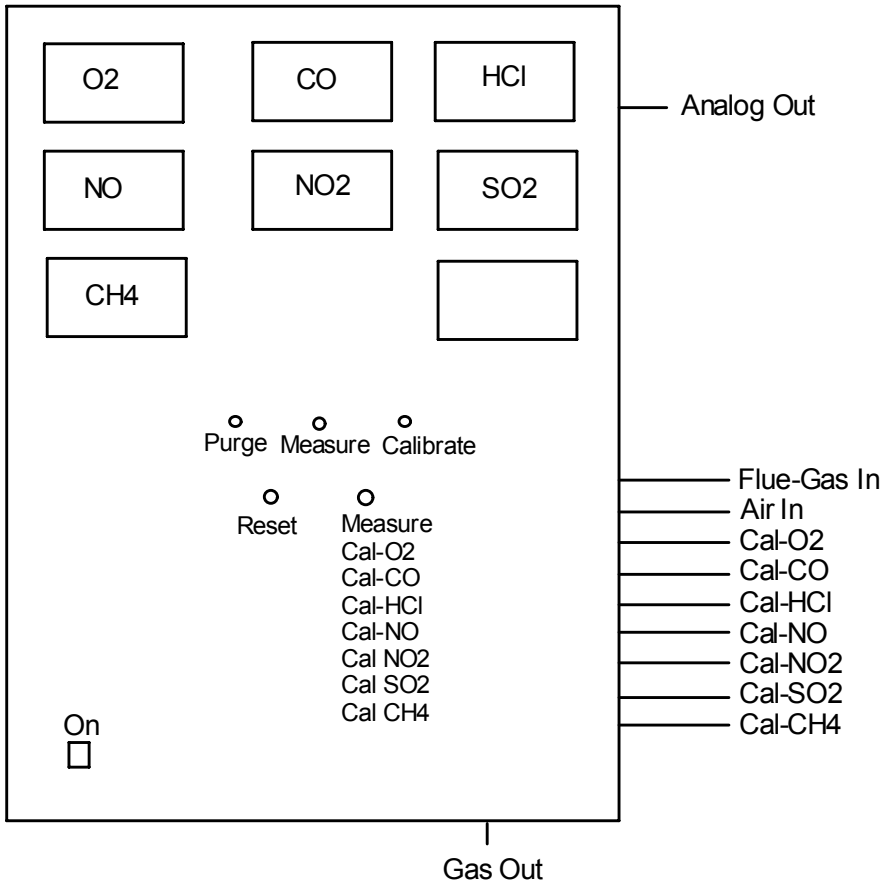
Internal panel IMR 5000



OPERATION

Note: Before the first use
The IMR 400 must be turned on for at least 30 minutes before the IMR 5000 can be turned on.

Front panel IMR 5000



O2	- Sensor in Vol.%
HC	- Sensor in LEL %
CO, HCl, NO, NO2, SO2	- Sensors in ppm
Yellow-LED	- Cal-mode
Red-LED	- Warm-up mode
Green-LED	- Measurement mode
Reset	- Pushbutton to reset the unit into purge/zero-adjustment mode
Cal-Gas	- Selector switch to calibrate
Calibration- switch	- Calibration for the different sensors
On/Off	- On/Off switch for the IMR 5000 (only measuring unit)

1) Description of the different controllers, buttons and LED's

Controller for the sensors
The gas sensor controllers show the actual value either in Vol.% or ppm.

Important:
This is only for your information!
Default configuration:

	General	*O2*	*CO*	*HCl*	*NO*	*NO2*	*SO2*	*HC*
Input	0-10VDC							
Display Resolution		0.00	0	0	0	0	0	0
Rounding Increment		0.01	1	1	1	1	1	0.01
Filter setting	1.0							
Band		0.10	10	10	10	10	10	0.10
Scaling points	2							
Scaling style	Apply							
Input 1		0.006	0.001	0.007	0.002	0.003	0.001	0.002
Display 1	0							
Input 2		0.364	0.088	0.958	0.120	0.100	0.530	0.303
Display 2		8.92	85	1010	120	51	520	3.00
Analog type	4-20							
Analog assignment	INP							
Low scale value		0.00	0	0	0	0	0	0.00
High scale value		20.00	2000	2000	2000	200	4000	5.00
Analog update time	0.0							

For more detailed information about these points check the specification of the controller in the appendix.

LEDS and Buttons

Green LED

Measurement mode	- on
Cal-mode	- off
Warm-up / Purge	- off

Red LED

Measurement mode	- off
Cal-mode	- off
Warm-up / Purge	- on

Yellow LED

Measurement mode	- off
Cal-mode	- on
Warm-up / Purge	- off

Pushbutton

The pushbutton is only activated during the measurement cycles.
If the pushbutton is pressed during the measurement cycles, then the internal timer is reset and the purge mode T2 starts over again.

Selector switch

The selector-switch is only activated during the measurement cycles.
Use the selector switch to calibrate the sensors with calibration gas. Now the analyzer is drawing the gas from the specific "cal-gas inlet" fitting on the right hand side and does not extract any combustion gas.
The 3-pos. switch selects the appropriate "cal-*** inlet" fitting.

2) Switching on the IMR 5000 and IMR 400

Please make sure that all the electrical and tubing connections are made on the

- gas sampling probe
- gas conditioning units
- gas analyzer

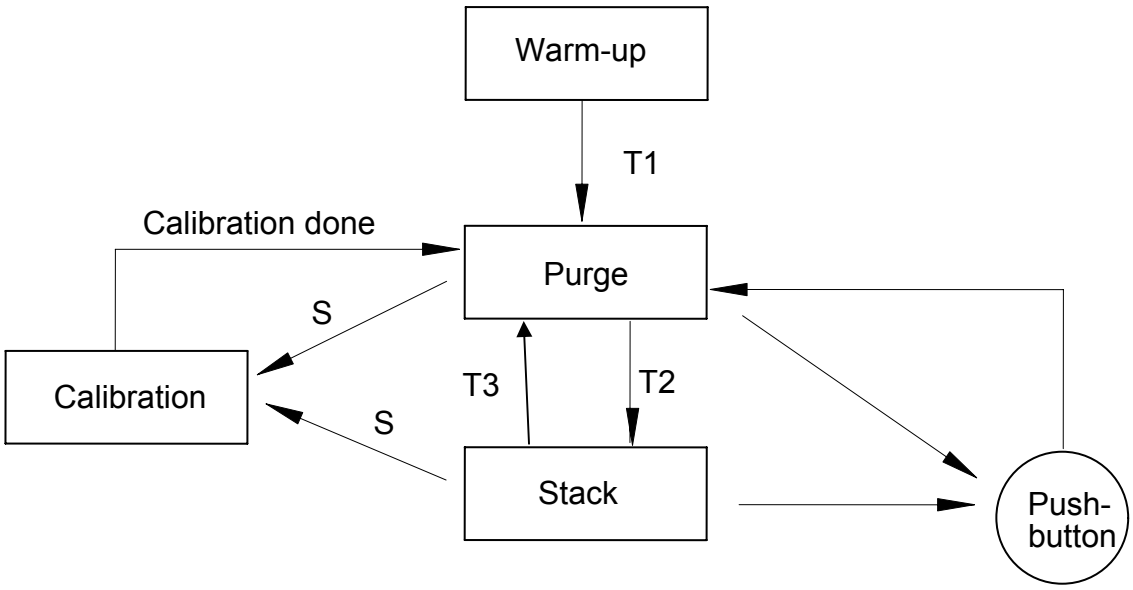
AC-connection - IMR 5000 / IMR 400

A power cord with a protective earth contact is supplied with all units.
If there is a need for a different power cord, then insert the new power cord through the cable gland at the bottom of the unit and then connect the power cord to the terminal block X1 (L1, N, PE).

Analog output - IMR 5000

A cable is needed to connect the analog output of the unit with a data recorder or similar. A cable gland is located on the right side of the housing. The analog output signals are on terminal block X8 (1-14).
The default setting of the analog output is 4..20mA. It also can be set to 0..20mA or 0-10V.

2.1 Operation cycles



T1 - Warm-Up Time 15min
T2 - Purge Time 5min
T3 – Measurement 30min
S - Selector-switch
P - Pushbutton

The different times are pre-set in different memory locations. These memory locations are called V-memory.

T1	⇒	V-memory location	V1200
T2	⇒	V-memory location	V1201
T3	⇒	V-memory location	V1202

The operator can change these times by entering new values in the PLC-controller.

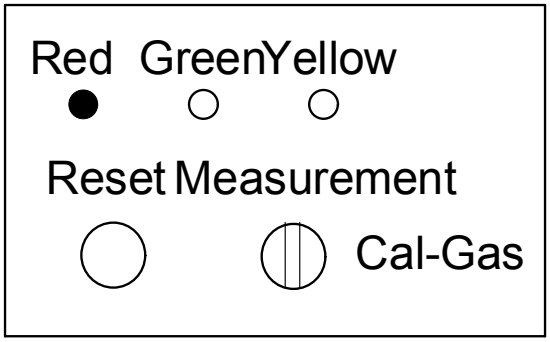
Min. time	5min	⇒	Input 50
Max. time	990min	⇒	Input 9900

The running mode of the PLC has to be stopped, before any changes can be made. Switch the toggle 'Mode Switch' on the PLC from 'Run' to 'Stop' (please see the appendix PLC-Controller).
Do not forget to return the toggle switch to 'Run' after the changes have been made. The IMR 5000 starts the measurement cycle with the purge mode again.

Please see the appendix on how to enter the menu for the V-memory location (Data monitor, Menu 3, V-memory values).

2.1.1 Warm-up cycle
The warm-up cycle starts immediately after the unit is turned on.
During this cycle the unit does a self-check and purges the sensors with fresh air. The warm-up cycle takes 20 minutes (this time can be changed by the operator) and cannot be interrupted by the reset-button or the selector switches.

Status of the different modules
- Sensors are doing a zero adjustment
- IMR 5000 will not extract any combustion gas in the first 20 minutes, the measurement will begin after the warm-up cycle ends
- Gas conditioning unit is working
- Red-LED must be on



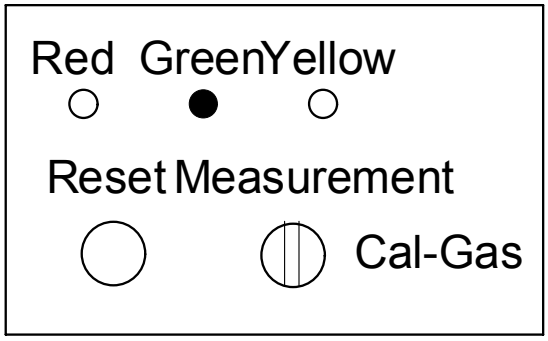
Zero-adjustment of the sensors
Please check the values of the sensors after 15 minutes.
The value must show
- All sensors 0.00% or 0ppm (only O2 = 20.9%)

If the controller is not showing the zero value, then the value needs to be adjusted manually.
Please see 2.1.4 for the zero point adjustment.

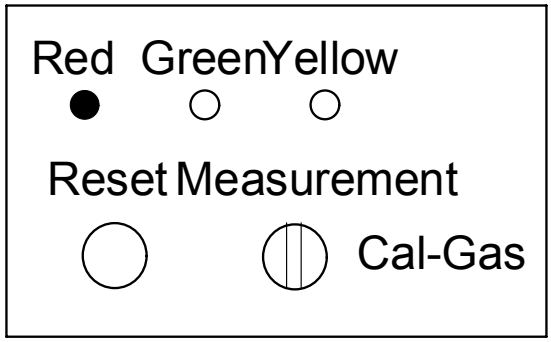
2.1.2 Measurement Cycle
The measurement cycle starts immediately after the warm-up cycle.

1.Cycle	Purge mode	5min	(T2)
2.Cycle	Stack	20min	(T3)
3.Cycle	Purge mode	5min	(T2)
4.Cycle	Stack	20min	(T3)
5.Cycle	Back to Cycle#1 and start all over again		

Measurement cycle
Status of the different modules
- All sensors are showing the actual measurement value from the stack
- Gas-conditioning unit is cleaning and drying the combustion gas
- Green LED must be on

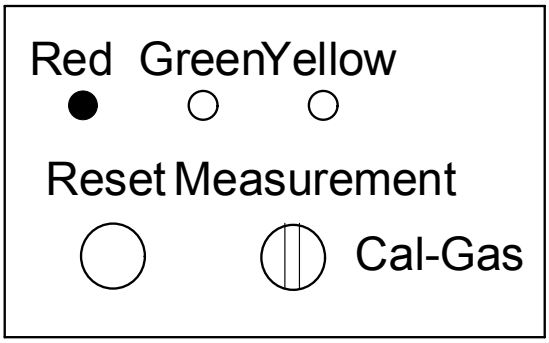


Purge cycle
Status of the different modules
- All sensors are being purged with fresh air
- Gas-conditioning unit is still working
- IMR 5000 draws fresh air through the air-in fitting
- Purge LED must be on



2.1.3 Reset mode
Pressing the pushbutton during the measurement cycles starts the purge mode again.

Status of the different modules
- All sensors are being purged with fresh air
- Gas-conditioning unit is still working
- IMR 5000 draws fresh air through the air-in fitting
- Purge LED must be on



2.1.4 Calibration with test-gas
Please see the schematic of the sensor and the instructions in the appendix!

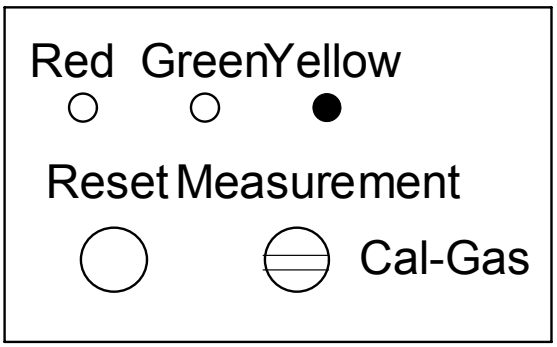
Certified calibration gas is needed to calibrate the sensors.
The calibration should be checked once a month to ensure the accuracy of the sensors.

1.) Press the reset button during the measurement cycle and the analyzer starts the purge cycle (selector switch on measurement)

2.) Waits for the purge time to be almost done and then adjust the zero point.

Each sensor should show its zero-point. If the sensor does not show its zero point, then the zero point has to be adjusted by using the "apply function" of the controller (see appendix "Signal input parameters").
Press the reset button again and if necessary adjust the zero point again.

3.) Switch the selector switch to 'calibration' and choose the requested sensor with the selector switch and apply the calibration gas to the analyzer.
The fittings for the calibration gases are located on the right side of the housing.



4.) Adjust the span:
The reading should be stabilized within three minutes.
Adjust the span by using the "apply function" of the controller (see appendix "Signal input parameters").
Take the calibration gas off.

5.) Wait for 5 minutes until the sensor reaches its zero point and then apply the calibration gas again.

6.) When all the sensors are calibrated, then switch the selector switch back to "measurement" and close the calibration gas bottles.

Information: If the sensor needs to be exchanged, then a new calibration point has to be set in the controller. Please see the section 'Reading/Configuration - Input/Reading' in the controllers manual.

MAINTENANCE

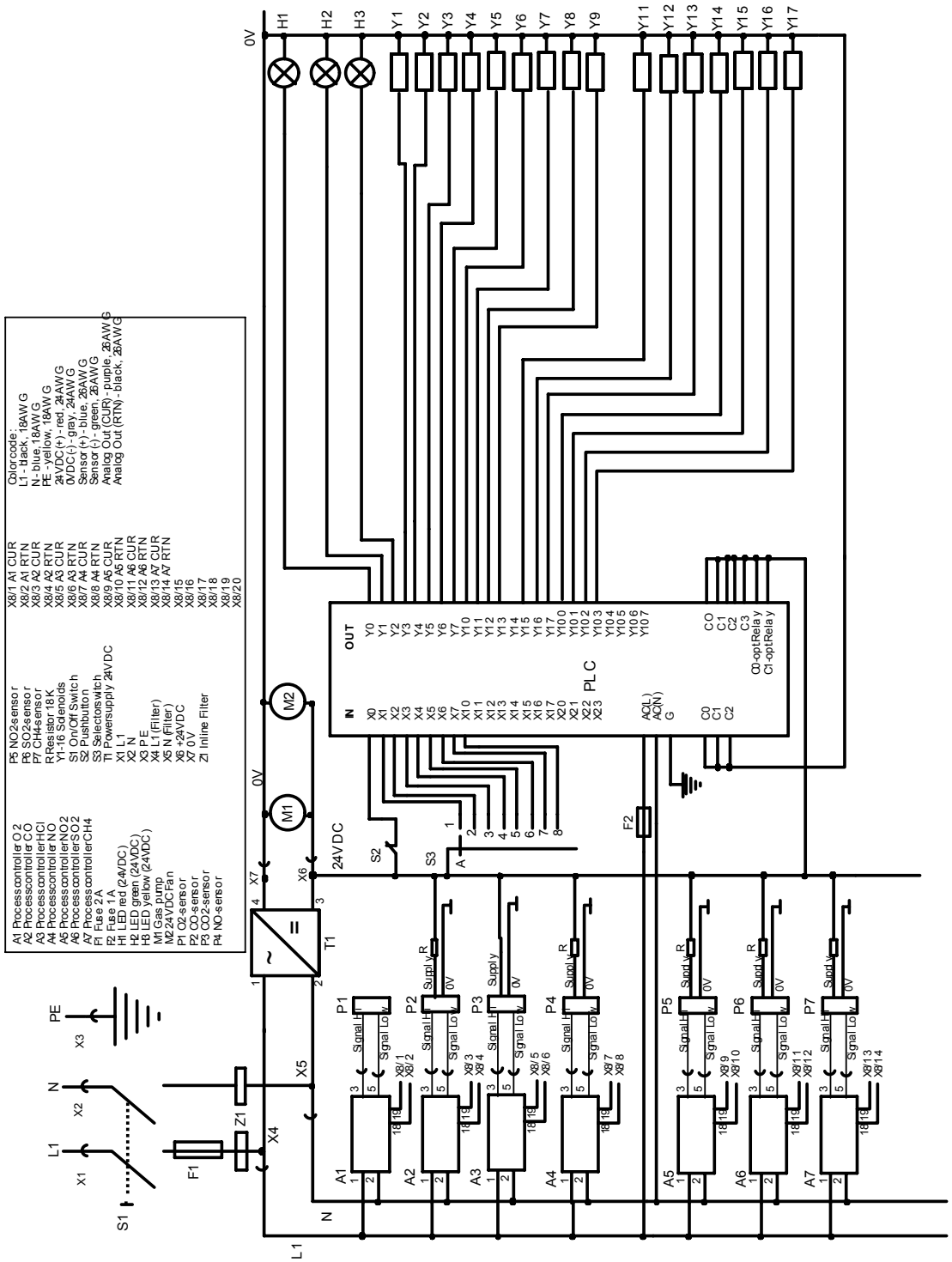
- Check the calibration once every month.
- Check the dust filter for dirt and replace if necessary.
- Check the gas outlets.
- Check the condensation outlet of the gas-conditioning unit.
- Check the filters of the gas-conditioning unit and replace if necessary.
- Check the filter element of the probe and replace if necessary.

SPARE PARTS

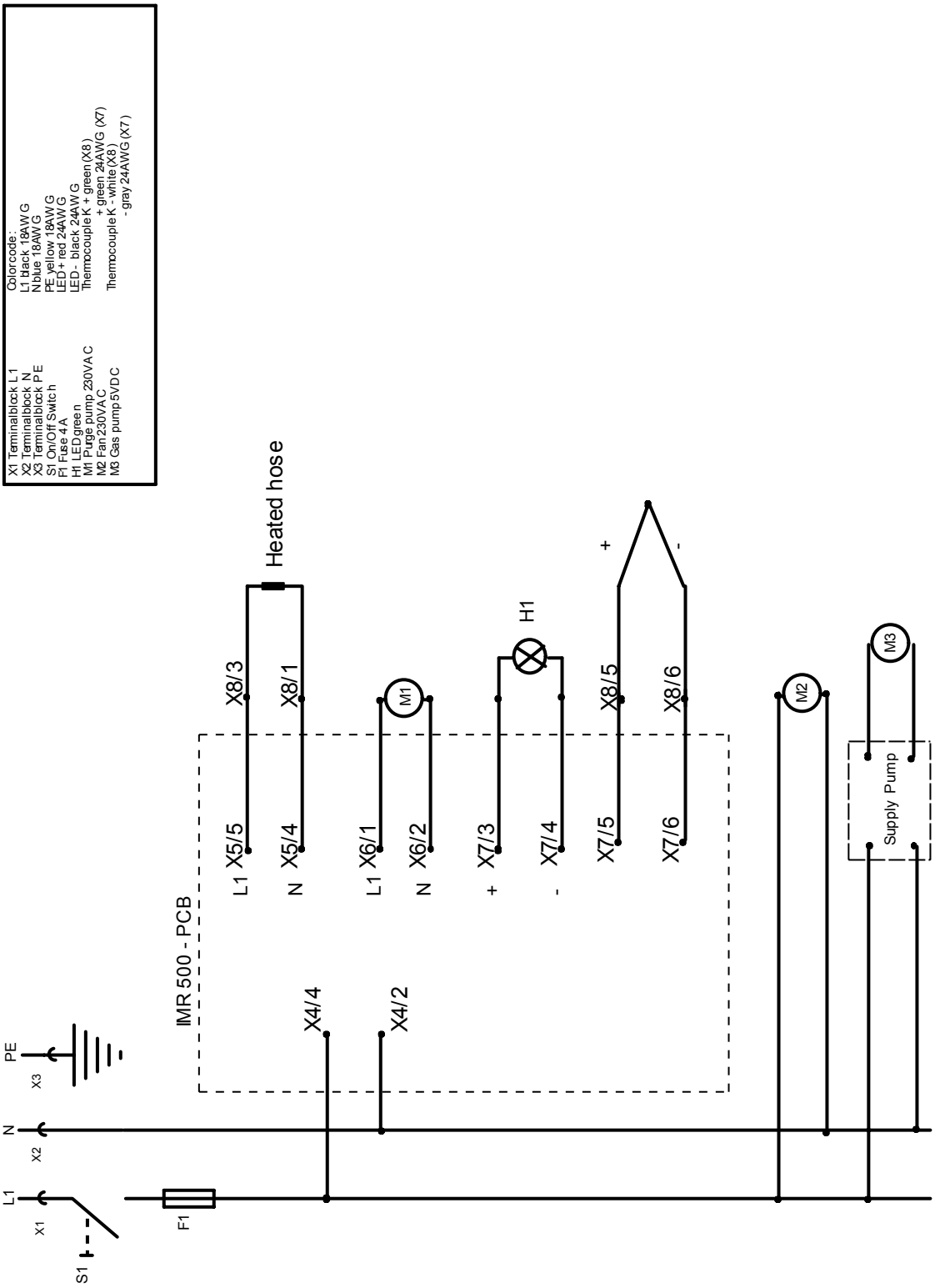
	Part No.
Pump	SP670
Dust filter	72200
Dust filter - probe	72560
Valves	VQD1151
Purge pump	400-1201
Permeation Dryer	MD-110-4

Please inform IMR about the serial no. and model of the analyzer by ordering spare parts.
Please specify the maximum range by ordering sensors.
Please ask for special items.

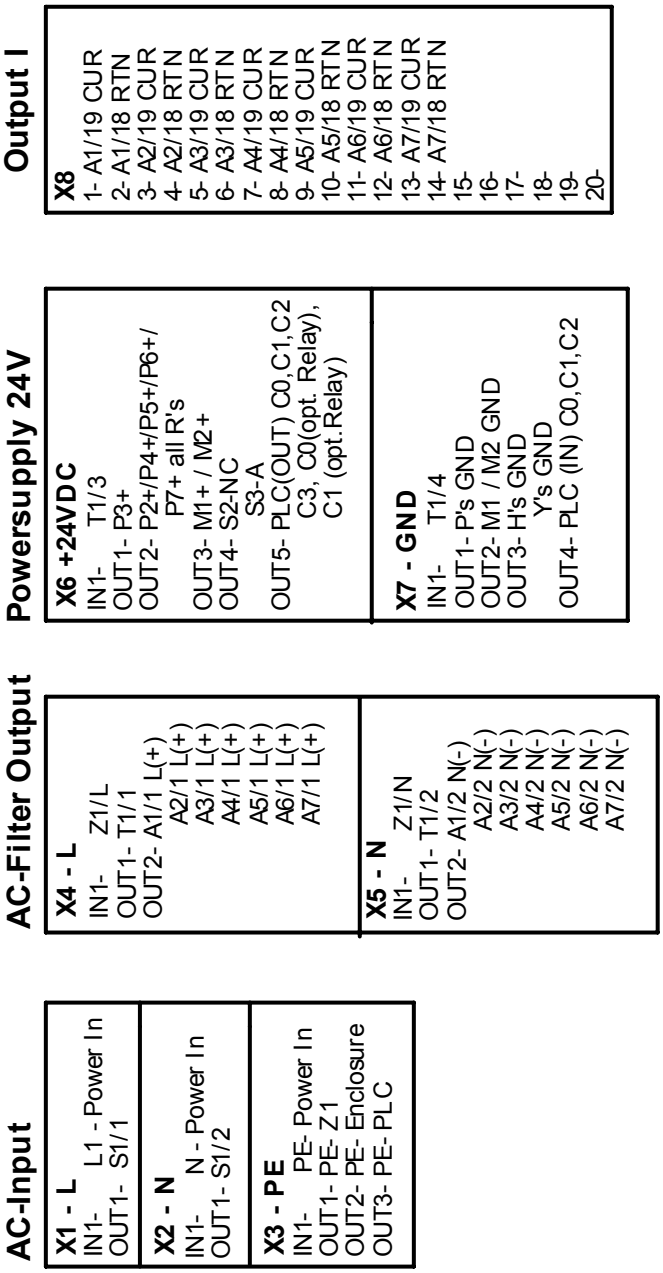
APPENDIX - CIRCUIT DIAGRAM- IMR 5000



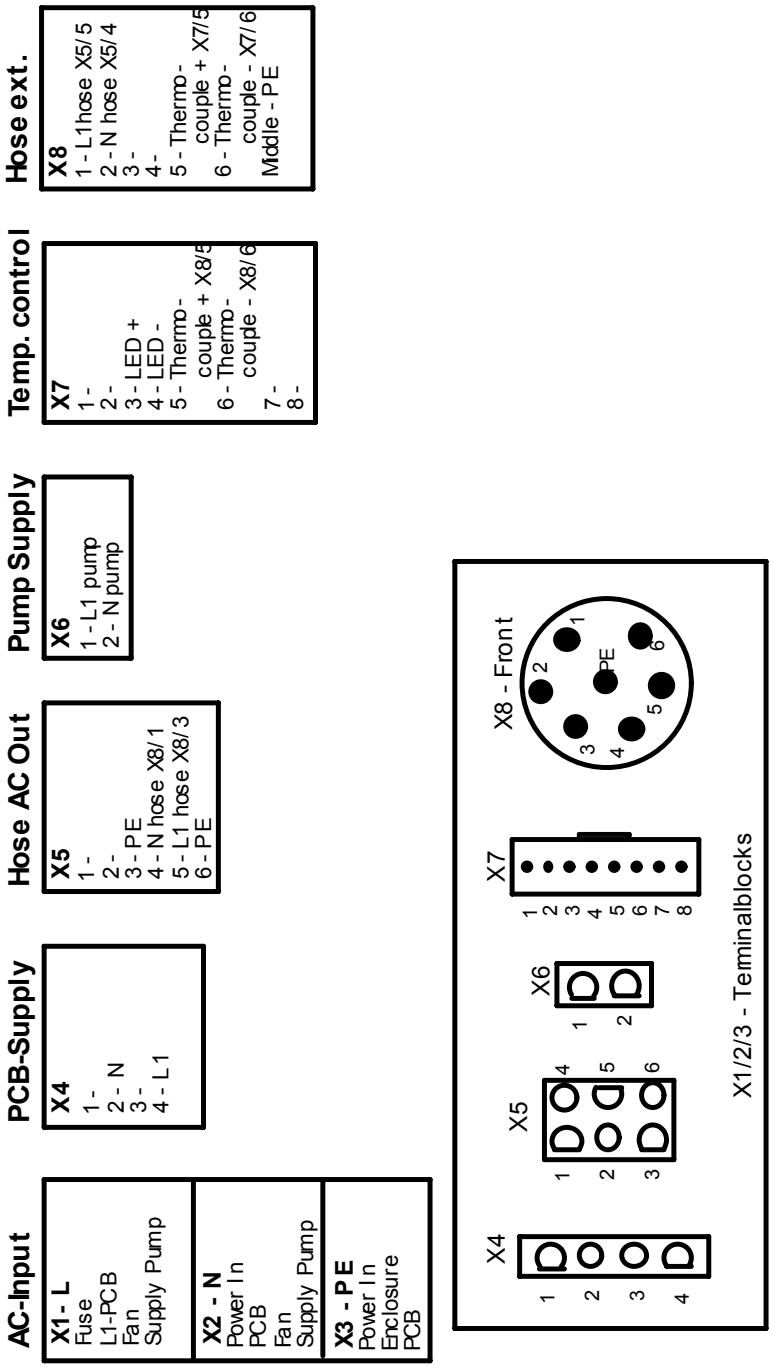
APPENDIX - CIRCUIT DIAGRAM- IMR 400



APPENDIX - TERMINAL BLOCKS - IMR 5000



APPENDIX - TERMINAL BLOCKS - IMR 400



WARRANTY

The company IMR Environmental Equipment International, Inc., 3634 Central Ave., St.Petersburg, Fl, 33711, USA states the following:

IMR, as manufacturer, hereby grants the following worldwide IMR guarantee for an IMR unit purchased from an authorized dealer.

1. The IMR guarantee shall entitle every IMR customer to demand a free replacement or repair of the defect parts of the IMR unit from any IMR dealer authorized for the respective IMR unit.

2. The IMR guarantee shall be granted on the factory new unit and shall commence on the date of the delivery of the original IMR unit to the customer. It shall last for a period of six months regardless of the type and the intensity of use and regardless of any change of owner, which may occur during this guarantee period.
   The IMR guarantee shall refer to absence of faults with respect to the state of the art nature of the sold unit in terms of material and finish. The guarantee for all parts fitted during the twelve month guarantee period shall end with the unit guarantee.

3. After the establishment of a material or production fault by IMR or the authorized IMR dealer, the faults will be eliminated by means of free repair or replacement.
   Replaced parts shall become the property of IMR.

4. No guarantee claims may be made for maintenance and setting work, cleaning or other utility materials required for the function of the unit and other wear parts unless they have a direct bearing on work performed under the guarantee.

5. The terms and conditions for the acknowledgement of this guarantee shall be the presentation of the fully completed guarantee card which must contain the confirmation from the authorized IMR dealer on its delivery and, if applicable, the prescribed maintenance work.

6. The IMR guarantee shall only be applicable if

   a. the IMR unit has been maintained in accordance with the instructions issued by the manufacturers and the operating instructions by an authorized IMR dealer;
   b. only original IMR spare parts have been used for any repairs;
   c. the unit has been used properly, the operating instructions observed and the unit has not been used for a purpose other than the one for which it has been designed;
   d. the IMR unit has been left in its original design and meets the original IMR specifications;
   e. the fault is not due to external influences or use for a purpose other than the one for which it has been designed;
   f. exclusively authorized IMR dealers have made repairs to the IMR unit;
   g. the IMR unit has been sent to an authorized IMR dealer immediately after the fault was discovered.

7. Electrochemical sensors are excluded from the guarantee.