

UV CURING FURNACE

PHOTOPOL VACUUM + GAS



USER AND MAINTENANCE MANUAL



PHOTOPOL

1. DESCRIPTION

1.1 PURPOSE OF USE

PHOTOPOL VACUUM + GAS has been expressly designed to carry out curing operations under the effect of ultraviolet rays, even without oxygen thanks to the vacuum treatment or inert gas protection.

The system has been developed to suit with the requirements of Dental Laboratories, Hearing Aids, Jewellery and Rapid Prototyping laboratories for the hardening (post-curing) process of objects manufactured with 3D DLP printers which use liquid resins and for the final stabilisation of photosensitive composites. The UV spectrum range achieved by this unit corresponds to the specific value of those resins (from 320 to 450nm) thus assuring to reach the complete result.

The curing process of **PHOTOPOL VACUUM + GAS** is achieved inside a completely transparent muffle, surrounded with the UV radiation sources and closed by a highly reflective lid to assure the most uniform distribution of the emitted rays.

All functions are controlled and run by an electronic microprocessor circuit. The operating software features a logical user interface providing ease of use and immediate understanding. All operating data are always clearly displayed and can be modified directly on the full-colour touch screen.

To assure a correct and practical operation the standard supply includes the following devices: LED circuits with incorporated reflectors magnifying the power, vacuum pump and bell-jar, connections and flow regulator for the inert gas.

The unit works under independent condition, it may not be supervised by the User himself therefore no defined working place is required.

1.2 IMPROPER USE

Do not use the UV radiation performed by this unit for any different purposes of use not herewith stated; the manufacturer will assume no liability further to improper use of the unit for any damage which could incur to persons, animals or things.

2. TECHNICAL SPECIFICATIONS

Width	400 mm (450 with the connections)
Depth at the base	430 mm
Height	245 mm
Net weight	14,6 kg
Gross weight	17,0 kg
Rated voltage	230VAC +/-10% – 50/60 Hz
Delayed effect fuses	2 Ø 5x20 - 3.15 Amp
Absorption	200 W – 0.9 Amp
Altitude	Up to 2000m slm
Operating temperature	from 10 to 40°C
Humidity (for storage, too)	from 20 to 80%
Storage temperature	from -10 to +70°C
Protection level	IP42
Acoustic pressure LAeq, Tp	<70 dB(A)
Pure UV LED (violet)	6 circuits à 8 LED each
Object max size	Ø 120 x 80h
Number of available programs	100
Max vacuum level	-0.8 / -1.0 bar
Max nitrogen pressure (N2)	3 BAR

3. TECHNICAL REFERENCE GUIDELINES AND TEST REGULATIONS

The light-curing furnace is mass-manufactured by DENTALFARM in compliance with technical and safety rules in force, as provided for by the 2006/42 EEC Community Directive on machinery and following amendments and integrations. PHOTOPOL VACUUM + GAS complies with the Directives EMC 2014/30/EU and LVD 2014/35/EU.

Careful inspection and full routine testing is carried out singularly on each machine which is furtherly tested by an automatic test installation (Chauvin Arnoux C.A 6155) carrying out in sequence several tests and it prints a report assuring compliance with the fixed limits.

Since the machine does not require a controlled operation it is not classified as a fixed working place, therefore the acoustic emission has been tested at a height of 1,60m and 1 meter away from the machine.

According to International Regulations, this unit has been classified as AEE (electric and electronic device, whose correct operation depends on electric currents and electromagnetic fields) and as a consequence, at the end of its lifetime, it cannot be treated as normal waste material but it must be disposed separately, complying with the Directive 2012/19/UE.



4. GENERAL PRECAUTIONS

- Read carefully the present manual before carrying out any starting, operating or maintenance operation on the machine
- The final User of the machine is an adult, skilled and well trained professional on the specific curing process and risks involved and not merely an occasional worker
- Safety of the User depends on the skillness, on the good sense and on the caution when using the machine; for this reason, it is of utmost importance to know in detail the allocation and the function of all the controls
- During the transport and the following storage do not turn the unit upside down and conform to the directions printed on the box
- In consideration of low weight of the unit, handling operations can be carried out by a single Operator
- Do not install and do not use the machine in potentially explosive areas
- The assembly components do not have any contraindication for persons with implantable active or passive devices, in any case we recommend to contact beforehand your Doctor
- Do not tamper the electrical wiring system of the machine
- The built-in safety mechanisms and the warning labels of the machine shall in no way be removed or modified
- Check regularly all the parts which tend to wear out easily due to their specific working conditions
- Check regularly that the feeding cable and most specifically the ground connections are intact and not damaged
- Do not allow unauthorized persons to try to repair the machine
- No modification to this unit is allowed unless previously authorised
- Should any inconvenience or malfunction occur, pls contact our Technical Servicing
- Residual risks: on the unit some warning or precaution symbols are affixed you will have to comply with according to their meaning as follows

Risk of misunderstanding	Risks deriving from the exposure to the UV rays and from materials handling		Electrical hazards	Mechanical hazards
				
Read through the User Manual for any information and to restrict any risk	Wear goggles as protection against UV radiation which may harm your eyes		Parts under tension, do not remove the protections	Risk of fingers pinching when closing the lid

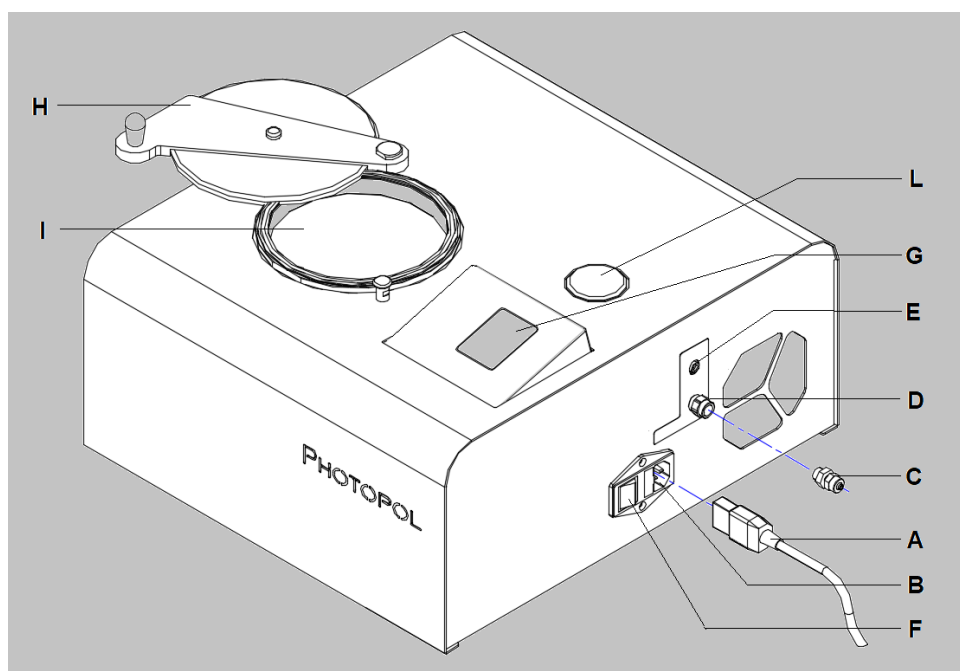
5. INSTALLATION INSTRUCTIONS

⚠ **ATTENTION**

Installation of this machine is quite easy but it must be carried out paying utmost attention in order to avoid any mistake which may originate problems during operation, inconvenience or even damages.

Store the original package of the unit for any further handling or shipment under extraordinary maintenance intervention. Remove the protective foils all around the metallic housing.

1. Place the machine on a suitable work bench, in a stable position appropriate to its weight, at least 10cm away from the wall to allow the necessary space for the connections. The intensity of the vibrations originated during operation of the vacuum pump do not represent a risk for the User or for any other people in the same working area, therefore no additional precaution during installation is required.
2. Check the plate data, referring to the electrical feeding and the absorption then feed the unit through a protected line by 10Amp magneto-thermic bipolar switch and circuit breaker with 30mA sensibility (devices not part of the supply)
3. Connect the feeding cable (A) to the socket (B) placed on the right side panel and plug the other end into an approved 230v AC - 50Hz socket with ground connections.
4. Check the outlet pressure from the nitrogen cylinder (N2) which must not exceed 3BAR, screw the pipe-fitting (C) for 6x4 pipe to the sleeve (D) and connect the feeding pipe of the inert gas (the flow shall be adjusted at the first cycle by mean of the reducer E – as soon as possible, launch the test cycle “00” for better understanding of the operating logic of vacuum + gas cycles)
5. Switch on the unit (F), the display (G) will light up.



- A = electric cable
- B = feeding plug
- C = pipe-fitting for gas
- D = F 1/8" sleeve
- E = gas adjustment valve
- F = main switch
- G = touch display
- H = revolving lid
- I = glass flask
- L = vacuum gauge

6. CHECK OF THE CORRECT OPERATION - “00” TEST CYCLE

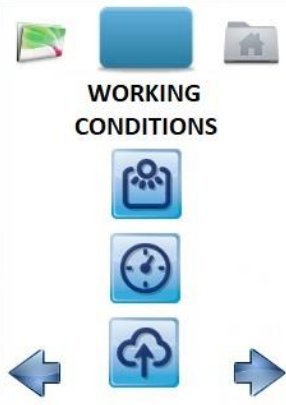
A specific program has been pre-installed allowing to check the correct operation of the internal devices. Once launched it will simulate in a very short time the curing cycle of the biomedical resins: the pump is activated to verify visually both the vacuum and the airtight seal, then the nitrogen flow is opened to check the transition to the inert environment (reduction of the vacuum level, then it starts up the UV radiation sources which develop a blue halo well visible all around the closed lid).

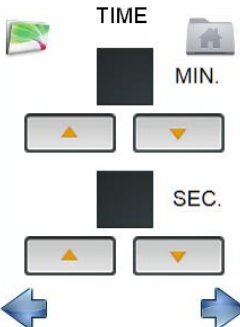
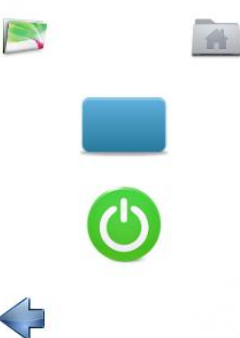
7. DESCRIPTION OF THE WORKING FUNCTIONS

All the functions of the machine can be selected, stored and operated by means of the touch display. The software will show some consecutive screenshots featuring all the necessary parameters to execute the most suitable working cycle and afterwards to launch and store the program.

	On startup the PHOTOPOL mark will appear, touch the screen to enter the main menu where the three icons are visible.
  	SETTINGS To set the software language PROGRAM STORAGE Where the cycles entered by the Customer are stored INFORMATION How to contact Dentalfarm
	SETTINGS Screenshot First of all check the preset language: touch on the language identification flag (the selected icon will light up). Available languages are: ITA – FRA – ENG – DEU – ESP HOME icon up on right back to the main menu
 DENTALFARM SRL VIA SUSA 9/A 10138 TORINO -I TEL. +39 0114346632 info@dentalfarm.it www.dentalfarm.it	INFORMATION screenshot Showing the data of the installed software and the references to contact Dentalfarm HOME icon up on right back to the main menu

8. SETTING THE WORKING CYCLE

	From the main menu select the central icon PROGRAM STORAGE
PROG  	Find a free number to be attributed to the program (at the beginning they are all free, once the cycle contains some stored data the V combined to the number will turn from green to red), START will appear allowing the immediate execution with no need to browse all parameters RIGHT ARROW to next page
When setting a working cycle some important parameters have to be selected: 1. Environmental condition (namely the quality of site where the curing will be carried out – highly important for resins in class IIa) 2. Applied voltage (speed and intensity rate the LEDs will be working at) 3. Working time (length of the irradiation step)	
	The preparation of a polymerization cycle starts with the choice of the WORKING CONDITIONS, the selected symbol will turn darker. Identifying a cycle under atmosphere (no special condition) Identifying a cycle under full vacuum execution (oxygen is evacuated by means of a vacuum pump) Identifying a cycle under protected atmosphere (once vacuum is achieved the flask will fill up with inert gas - nitrogen) RIGHT ARROW to next page
	Select POWER, the selected symbol will turn darker. Slow and progressive starting – highest power preventing the outer surface from hardening before the light can actually reach all parts at the inside. Slow and progressive starting – reduced power ideal for objects of much reduced thickness Immediate start – highest power ideal for dark elements RIGHT ARROW to next page

	Select TIME, data will be shown in the frame above: MINUTES are entered in the upper section SECONDS are entered in the lower section Once all the parameters have been entered the cycle is automatically stored (adjustable at any time) RIGHT ARROW to next page
	START CYCLE, press the green key to start the treatment LEFT ARROW back to menu
At this step the cycle has been automatically saved with the number selected at the beginning. Pressing the symbols on the top will lead back to the main menu and access to new programs. Press the green key to start the cycle, the display will show the operation screenshot.	
	Screenshot of the operating cycle Both the count-down and the residual time are steadily shown Should you decide to abort the cycle, press the red key
	Screenshot of end cycle As the program is definitively concluded, a sequence of sound signals will be emitted. It is possible to launch again the same program but only provided the lid has been opened and closed (the central key will turn again into green) or select the HOME icon at the bottom to go back to the main menu

9. INERT GAS REGULATION

Before activating the first working cycle it is necessary to calibrate the inert gas flow. To perform this operation use a cross-cut screwdriver.

- Adjust the outlet pressure from the gas cylinder at 1–2 BAR (MAX 3 BAR); if fitted, set the output flowmeter at a value not exceeding 5 liters per minute, open the gas cylinder cock.
- Make sure the lid is closed, upload the test cycle “00” and launch it: the pump activates the vacuum (in function for 30 seconds increasing the vacuum level between -0.9 and -0.8 BAR), afterwards the gas solenoid valve will open to fill in the volume previously emptied out. This valve will remain open for 10 seconds which is the required time to saturate the area. The input quantity of gas can be verified by glancing at the vacuum gauge needle. The correct data ranges between **-0.1 and 0.2 (it must never reach zero)**. Should the needle stop in different positions, use the screwdriver on the regulator **(I)**, the flow will decrease by turning rightwards and increase leftwards.
- At the end of the cycle open and close the lid to launch again the testing cycle and check data. If necessary the adjustment operation can be repeated until the required result is obtained.

10. INSTRUCTIONS FOR USE

A quick reference to the different performances according to the selected cycle:

- If a program under atmosphere has been selected (no vacuum and no protective gas), the software will immediately activate the UV irradiation sources and the actual duration of the cycle corresponds to the preset parameters
- In case of a program under vacuum, the pump only is initiated by the software (for 30 seconds, sufficient to empty out all the air inside the flask), afterwards the LEDs are activated according to the preset time and the pump keeps running during the whole cycle
- In case of a program under vacuum with gas protection, the software first ignites the pump (for 30 seconds to clear out the air), then it is switched off and gas is flowing in thus saturating the area (10 seconds) afterwards UV sources are activated.

Wear the personal safety protection devices (anti UV goggles and safety gloves)

1. Switch on the main switch, the display will light up and the unit is now ready to input the operating data, touch the display to access the main menu
2. Click the central icon **ARCHIVE**, select the desired working cycle or create a new one – **if the cycle had already been stored and data should not be modified, the start up procedure can be activated right away by pressing START at the top**
3. Let the lid slide sideways to access the inside of the muffle and position the objects to be treated, then close it completely (in case the lid is not fully closed the working cycle will not start)
4. Press the green start up key.



Should the vacuum gauge needle fail to raise in the immediate check if the lid has been accurately closed perfectly sticking all over the joint, slightly press to assist adhesion.

When the lid is opened the cycle will be immediately interrupted (if under vacuum no opening is allowed) and once closed it will restart from the step it had been cut off.

Once the cycle is definitively completed, the unit will emit a sequence of sound signals. When the lid is opened to pick up the object, parameters will be reset to zero and the furnace is ready for a new cycle.

In case of voltage drop during the cycle, it will cause it to stop permanently which can not be recovered, as a consequence it is recommended to protect the unit with an Uninterrupted Power Supply (UPS) to avoid wasting the objects as a result of an incomplete treatment (in any case a structural verification of the treated objects is always recommended).

Carry out periodically the test cycle “00” to check the correct performance of the main components of the unit (vacuum pump, vacuum seal and release valves, gas inlet valve and radiation sources).

11. CHECK OF LED CONSUMPTION

The partial or complete deterioration in performance of the UV LEDs will cause the failure or partial curing of the treated objects, the result is clearly visible (the object is not hardened or moist) or emerging in the following treatments (finishing). To help prevent this problem it is necessary to check always the efficiency (test cycle and visual inspection of the treated objects). In addition the software manages a control system on LED consumption



As the deterioration level is approaching, a warning symbol will appear on the display; operation is still allowed by slightly extending the working time. Spares replacement is promptly recommended.



After an additional short period, a ban symbol is shown locking the unit and forcing the technical intervention.

12. MAINTENANCE

<u>/!\ ATTENTION:</u>	Before carrying out any maintenance operation inside the machine, unplug the electric cable from the socket; in such a way the machine will be completely insulated from the electric wiring system. If you still have any doubts, difficulties or any possibility of mistake, contact our Technical Service to avoid any risks or damages. Any technical intervention involving to remove the protections and to manipulate the machine internal components can be carried out exclusively by skilled personnel or staff trained by the Manufacturer.
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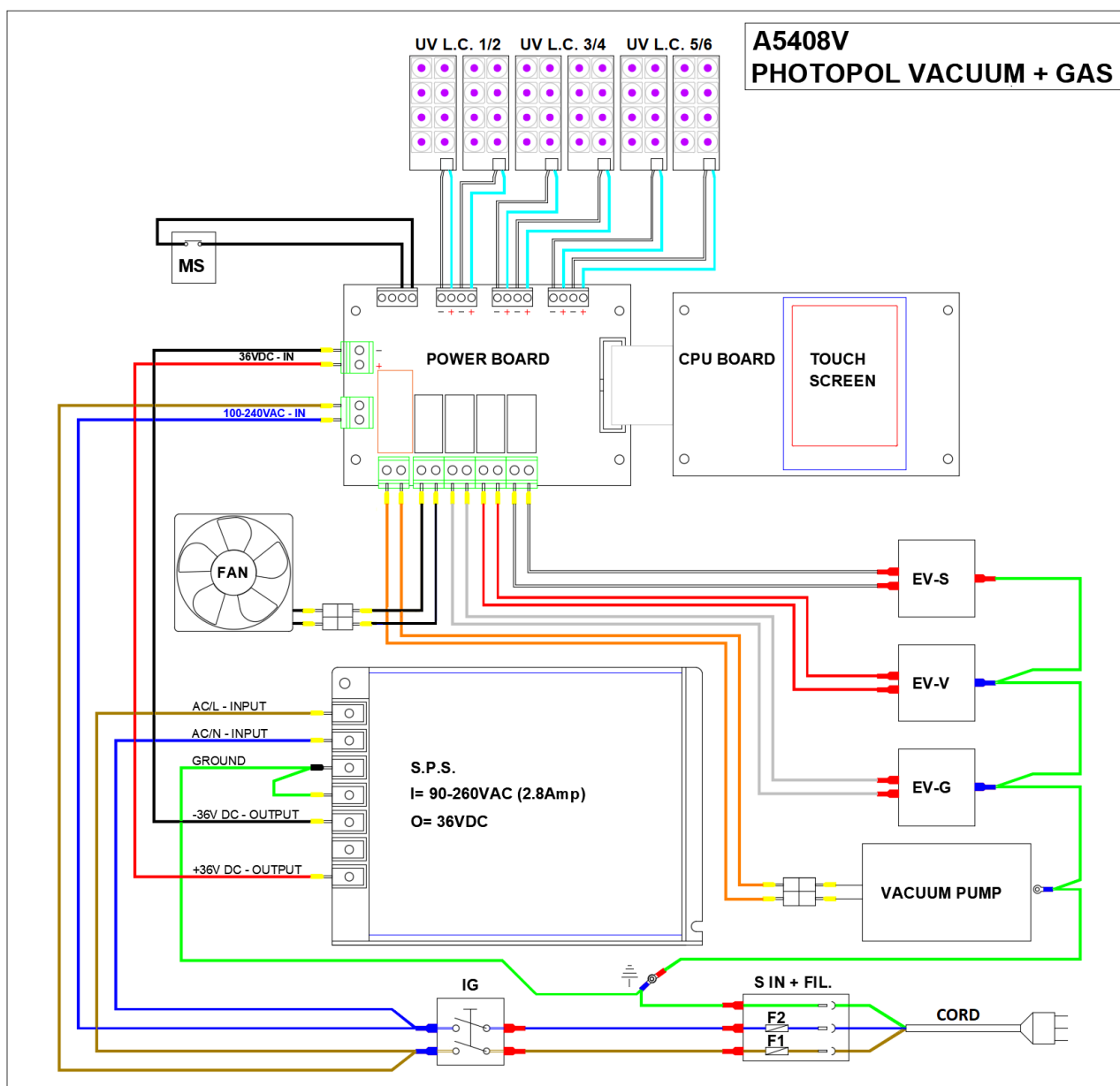
Cleaning of the working chamber consisting of a borosilicate glass bell

It is advisable to keep the internal surface of the bell-jar always clean to allow the correct refraction of the emitted rays; be careful to use exclusively non-aggressive liquid detergent specific for glass (absolutely with no abrasive components).

Lubrication of the lid airtight seal

Before closing the lid to start a cycle, always check that no residues are left on the sealing joint which may affect the vacuum process. In addition we recommend to lubricate the sealing joint with some vaseline grease. This joint must be replaced every two years.

13. WIRING DIAGRAM



Symbol	Description
CORD	Separate electric cord (single-phase with protective conductor)
S-IN + FIL	Plug, mains filter and fuse-holder
F1 – F2	5x20 3.15Amp. delayed fuse
IG	Main switch
S.P.S.	100-260VAC – 36VDC switching power supply
POWER /CPU BOARD	Power board + display board
UV L.C.	LED circuits below 450nm
MS	Lid microswitch
VAC. PUMP	Vacuum piston pump
EV-V	Vacuum solenoid valve
EV-G	Inert gas vave
EV-S	Exhaust valve
FAN	Cooling fan

14. CE DECLARATION OF CONFORMITY



DICHIARAZIONE DI CONFORMITA' DECLARATION OF CONFORMITY

Noi sottoscritti,
We, the undersigned,

DENTALFARM S.r.l.

Via Susa, 9/A
10138 TORINO - I
tel. (+39) 011 4346588

dichiariamo sotto la nostra esclusiva responsabilità che il prodotto di ns. fabbricazione
declare under our own responsibility that the product of our exclusive manufacturing

Codice
Code

Tipo
Type

Modello
Model

Matricola
Serial Number

Lotto
Batch

A5408V

**Fotopolimerizzatore
Light-curing unit**

PHOTOPOL VACUUM +GAS

è conforme alle seguenti Direttive e Norme Tecniche:
complies with the following Directives and Technical Standards:

2006/42/CEE - DIRETTIVA MACCHINE - MACHINERY DIRECTIVE
2014/35/UE - DIRETTIVA BASSA TENSIONE - LOW VOLTAGE DIRECTIVE
2014/30/EU - DIRETTIVA COMPATIBILITÀ ELETTRONICA - EMC DIRECTIVE
2011/65/EU - DIRETTIVA RoHS II - RoHS II DIRECTIVE
2012/19/EU - DIRETTIVA SUI RIFIUTI DI APPARECCHIATURE ELETTRICHE ED ELETTRONICHE (RAEE)
DIRECTIVE ON WASTE ELECTRICAL AND ELECTRONIC EQUIPMENT (WEEE)
- EN 12100:2010
- EN 60204-1:2006 + A1:2009
- EN 60601-1 :2006
- EN 60601-1-2:2015

La persona incaricata di costituire il Fascicolo Tecnico è **Massimo Bertotti**
The person in charge of creating the technical file is Massimo Bertotti

Torino - Turin,

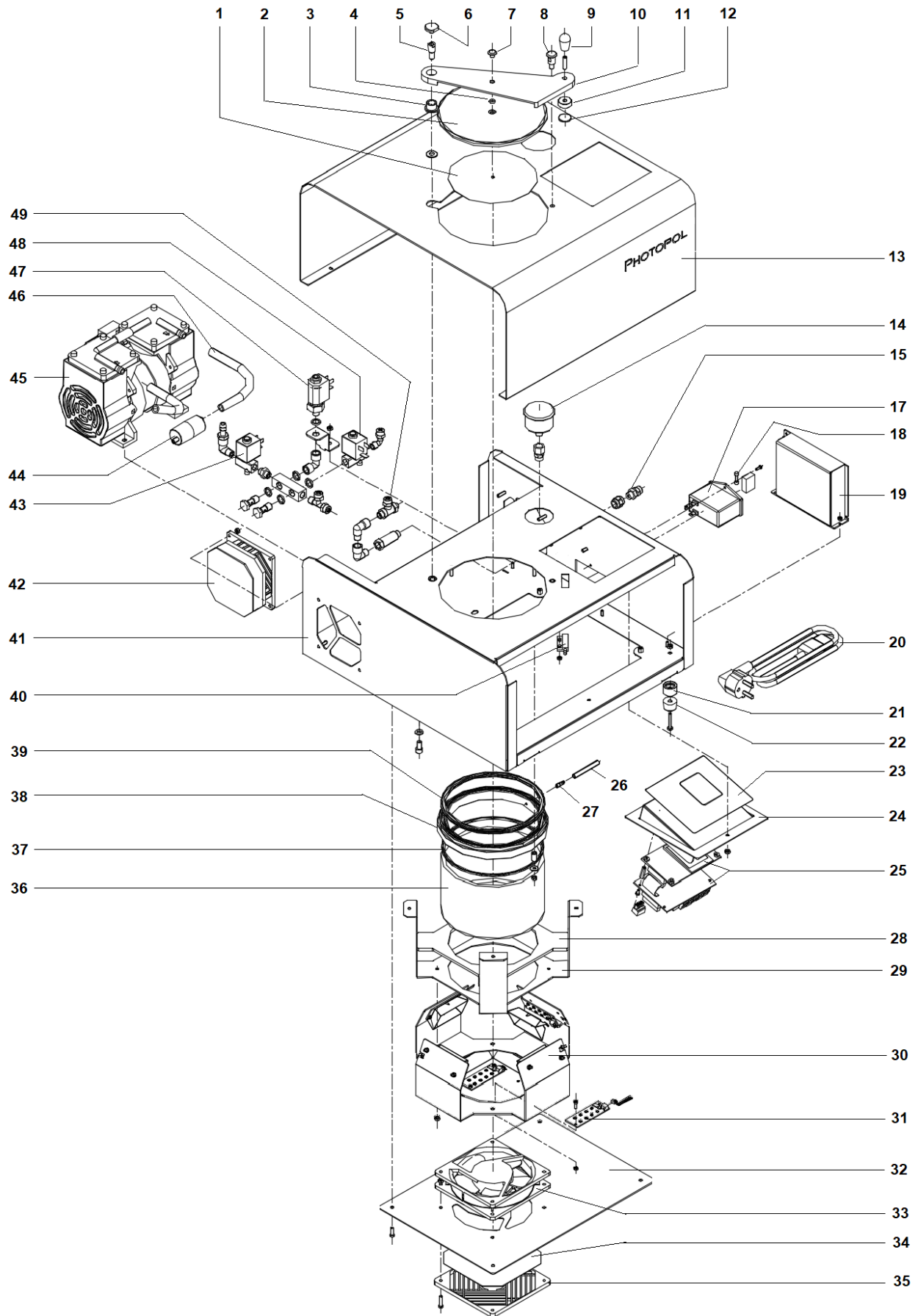
Amm. Delegato - *Managing Director*
Laura CATELLA

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15. EXPLODED VIEW AND SPARE-PARTS LIST PHOTOPOL VACUUM + GAS (A5408V)

POS.	CODE	DESCRIZIONE	DESCRIPTION
1	5408042	DISCO RIFLETTENTE INTERNO SPORTELO	LID INTERIOR REFLECTING DISC
2	5408039	SPORTELO MUFFOLA (PIATTELLO)	FLASK COVER (PLATE)
3	5408029	BRONZINA	BUSH
4	NPOR2021	GUARNIZIONE OR 2021	OR 2021 JOINT
5	5408028A	PERNO ROTAZIONE SPORTELO	LID ROTATION PIN
6	5408028B	TAPPO SU PERNO ROTAZIONE SPORTELO	TAP ON LID ROTATION PIN
7	5408044	VITE ASSEMBLAGGIO SPORTELO	LID ASSEMBLY SCREW
8	5408030	PERNO ARRESTO ROTAZIONE	ROTATION STOP PIN
9	NVT152	POMELLO FEMMINA M6	M6 FEMALE KNOB
10	5408039	SPORTELO MUFFOLA (TRAVE)	FLASK LID
11	5408031	ISOLANTE PER MAGNETE	MAGNET GUIDE
12	NEC043	UNITA' MAGNETICA CILINDRICA	MAGNETIC UNIT
13	5408038	COPERCHIO ESTERNO ALLUMINIO SATINATO	SATIN FINISHED ALUMINUM COVER
14	NPS048	VUOTOMETRO DA PANN. 1/8"	VACUUM GAUGE 1/8" CASE D.=40
15	NPR111	RACC. DIRITTO MASCHIO 6x4 1/8	6x4 1/8 STRAIGHT MALE PIPE-FITTING
17	NEC131I	GRUPPO SPINA, FILTRO, PORTAFUSIBILI E INTER.	SET OF PLUG, FILTER, FUSE HOLDER AND SWITCH
18	NEA070	FUSIBILE D.=5x20 – 3.15 A	FUSE D.=5x20 – 3.15 A
19	NES100	ALIMENTATORE SWITCHING GENERALE	MAIN SWITCHING POWER SUPPLY
20	NEV013	CAVO ELETTRICO 3x1 SPINA/PRESA	ELECTRIC CABLE 3x1 PLUG/SOCKET
21	5408066	DISTANZIALE PER PIEDINO	FOOT SUPPORT
22	NVG048	PIEDINO GOMMA H=12	RUBBER FOOT
23	5408040	ETICHETTA QUADRO COMANDI	CONTROL PANEL LABEL
24	5408035	SUPPORTO COMANDI	CONTROL SUPPORT
25	5408100	SCHEDA CONTROLLO DISPLAY TOUCH	CONTROL BOARD WITH TOUCH DISPLAY
26	NPV042	TUBO POLIURETANO EXTRAFLEX 6x4	6X4 SOFT POLYURETHANE PIPE
27	1049019	RACCORDO PORTAGOMMA	PIPE FITTING
28	5408027	GUARNIZIONE BASE CAMPANA D.=150	BELL GASKET D. = 150
29	5408032	TELAIO SUPPORTO MUFFOLA	FLASK SUPPORT FRAME
30	5408033	TELAIO SUPPORTO CIRCUITI LED UV	UV LED CIRCUITS SUPPORT FRAME
31	5408101	CIRCUITO 8 LED UV 350-430nm	8 UV LEDs 350-430nm CIRCUIT
32	5408036	CHIUSURA INFERIORE	LOWER CLOSURE
33	NES047	VENTOLA DI RAFFREDDAMENTO	COOLING FAN
34	NVT255	FILTRO METALLICO SU VENTOLA	METALLIC FILTER ON FAN
35	NVT256	PROTEZIONE IN PLASTICA SU VENTOLA	PLASTIC PROTECTION ON FAN
36	5408016	CAMPANA VETRO BOROSILICATO D.=150	BOROSILICATE GLASS BELL-JAR
37	NPOR4562	GUARNIZIONE OR 4562	OR 4562 JOINT
38	5408026	ANELLO TENUTA CAMPANA D.=150	BELL HOLDING RING D. = 150
39	5408048	GUARNIZIONE TENUTA SPORTELO	LID SEALING JOINT
40	NEC044	SENSORE MAGNETICO PIATTO	FLAT MAGNETIC SENSOR
41	5408034	CORPO	METAL BODY
42	NVT251	KIT COPERTURA e FILTRO per VENTOLA	COVER SET AND FAN FILTER
43	NES029	ELETTROVALVOLA 2 VIE N.C. /VUOTO)	N.C. SOLENOID VALVE (VACUUM)
44	NVT260	SILENZIATORE PER SCARICO POMPA VUOTO	SILENCER FOR VACUUM PUMP RELEASE
45	NES059	POMPA VUOTO A SECCO 745mmHg	DRY VACUUM PUMP 745mmHg
46	NVG011	TUBO RESINA TRASP. 8x12	TRANSPARENT RESIN PIPE 8x12
47	NES018	ELETTROVALVOLA 3 VIE N.C. (SCARICO)	N.C. SOLENOID VALVE (QUICK DISCHARGE)
48	NES029	ELETTROVALVOLA 2 VIE N.C. (GAS INERTE)	N.C. SOLENOID VALVE (INERT GAS)
49	NPS034	RIDUTTORE DI FLUSSO GAS INERTE	INERT GAS FLOW REGULATOR
--	5408512	GRUPPO IRRAGGIAMENTO COMPLETO	UV RADIATION GROUP COMPLETE



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