

**MISSION
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POA MATERIALI AVANZATI PER L'ENERGIA**PROGETTO IEMAP - Piattaforma Italiana Accelerata per i Materiali per
l'Energia**

D3.5 - Stazione di prototipazione multifunzionale, con controllo ambientale e automatizzato

Alfonso Pozio

AGENZIA NAZIONALE PER LE NUOVE TECNOLOGIE,
L'ENERGIA E LO SVILUPPO ECONOMICO SOSTENIBILE

D3.5 - Prototipo: Stazione di prototipazione multifunzionale, con controllo ambientale e automatizzato

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Report MISSION INNOVATION

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Progetto: Piattaforma accelerata per i Materiali per l'Energia

Work package: Materiali per elettrolizzatori

Linea di attività: LA3.2, Sintesi e fabbricazione automatizzata di strutture composite per membrane anioniche, mediante tecniche di deposizione

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Sommario

Questo rapporto descrive le operazioni di Controllo Qualità, funzionalità e connettività eseguita sulla infrastruttura LE100 F048,

Nel particolare vengono descritti i metodi, gli strumenti e le procedure per ogni funzionalità e componente sottoposto al controllo di conformità all'ordine di acquisto e ai requisiti tecnici per le tecniche di electrospinning e spraying oggetto della creazione del modello statistico, nonché oggetto del training.

1 Scopo e metodologia

1.1 Scopo

Lo scopo del presente documento è di tenere traccia e comprovare che le prestazioni di produzione e di funzionamento delle apparecchiature siano conformi agli standard di Qualità Nanofaber e alle specifiche.

1.2 Metodologia

Le prove per eseguire la convalida delle apparecchiature sono definite in ciascuna sezione. Per ogni prova sono definiti lo scopo, la metodologia e i criteri di accettazione. Inoltre, per ogni prova sono incluse tabelle per la registrazione dei dati. I risultati devono essere registrati nella casella C/NC/NA durante l'esecuzione della prova, come spiegato di seguito:

- **C:** per CONFORME
- **NC:** per NON-CONFORMI
- **NA:** per NON APPLICABILE

Le deviazioni rilevate saranno riportate nella sezione "Deviazioni" dalla persona che le rileva e le catalogherà tra queste tre categorie:

- **CRITICA (Cr):** L'apparecchiatura non può essere convalidata con deviazioni importanti irrisolte.
- **MAGGIORE (Ma):** L'apparecchiatura può essere approvata con importanti deviazioni, ma è necessario risolvere le deviazioni entro un periodo di tempo stabilito che dovrebbe essere concordato con i tecnici.
- **MINORE (Mi):** L'apparecchiatura o il sistema può essere usato normalmente. La deviazione può essere parzialmente corretta (o non corretta) senza limitare l'approvazione dell'apparecchiatura

1.3 Strumenti di misura necessari

Per eseguire le prove specificate al punto 4, possono essere necessari gli strumenti elencati di seguito:

- Sonda ad alta tensione. (e.g., 72-3040; TENMA)
- Multimetro. (e.g., RS-14 RS)
- Cronometro. (e.g., 927.100 Lap VENTIX)
- Metro
- Flussimetro. (e.g., 4140, TSI) 1-3000 ml/min
- Tacometro. (e.g., Rotaro N0000.779C RS)
- Termoigrometro. (e.g., 313 A PCE)
- Anemometro. (e.g., 327-0640 RS)
- Vibrometro. (e.g., PCE-VT 1100 PCE)

2 Configurazione

Verificare che la configurazione corrisponda a quella del prodotto ordinato mediante confronto con l'PO.

REFERENCE	DESCRIPTION	QTY	CHECK
LE100.011.00.000	FLUIDNATEK® LE-100 basic platform, including: a) Stainless steel, aluminum and glass frame and enclosures b) Special safety-encapsulated diffuse LED lighting c) Control from Touch Screen d) Ethernet remote diagnostics e) One HV power supply (up to +30 kV) f) One syringe pump g) Single phase emitter h) Flat plate collector (to be removed at customer's request) i) Regulation of emitter-collector distance (0-30 cm) j) Temperature and humidity display k) Special castors l) CE compliance	1	C
FEEDING			
LE100.020.00.000	2nd syringe pump	1	C
COLLECTORS			
LE100.040.00.000	Universal rotating collector platform with brushless motor	1	C
LE100.060.00.000	Drum collector ø 200mm x300mm	1	C
LE100.090.00.000	R2R with flat collector (30cm wide)	1	C
AXIS			
LE100.100.00.000	X-axis automated scanning emitter motion	1	C
LE100.110.00.000	Y-axis automated scanning emitter motion	1	C
LE100.120.00.000	Z-axis automated regulation of spinning distance	1	C
HIGH VOLTAGE			
LE100.140.00.000	Additional Negative HV power supply -30kV	1	C
LE100.150.00.000	Additional positive HV supply +30kV	1	C
LE100.160.00.000	Upgrade to Bipolar power supply ±30kV	1	C
LE100.290.00.000	Dummy collector with independent HV power supply (-30kV)	1	C
OTHER			
LE100.220.00.000	Actively regulated exhaust system	1	C
SOFTWARE			

LE00.SOFT003	Multi-step recipe database + user level access	1	C
	Data logging and export function	1	C
EMITTERS			
LE50.010.11.000	Single-phase single Spinning head	1	C
LE50.020.22.000	Coaxial-phase single Spinning head	1	C
RAD105.060.00.000	Multi-emitter spinning head (20 emitters)	1	C
LE500.400.00.000	Slit injector (needle-less) - 100mm length (acople 20mm) + 5 juntas	1	C

SOFTWARE			
LE00.SOFT003	Multi-step recipe database + user level access	1	C
	Data logging and export function	1	C
EMITTERS			
LE50.010.11.000	Single-phase single Spinning head	1	C
LE50.020.22.000	Coaxial-phase single Spinning head	1	C
RAD105.060.00.000	Multi-emitter spinning head (20 emitters)	1	C
LE500.400.00.000	Slit injector (needle-less) - 100mm length (acople 20mm) + 5 juntas	1	C

GAS-HEATING			
LE100.280.00.000	Solvent gas jacket system	1	C
LE100.210.00.000	Gas assisted electrospinning system.	1	C

3 Requisiti generali

3.1 Aspetto generale (qualsiasi piccolo graffio, sporcizia o danni costituirà un NC)

SECTION	VERIFICATION	RESULT		#Note
3.1.1	Visual inspection looking for any damage, scratches, or unfinished parts:	Top View	C	
		Front View	C	
		Left Side	C	
		Right Side	C	
		Rear Side	C	
		Electrospinning chamber	C	
		High pressure pumps cabinet (if installed)	-	N/A
3.1.2	HMI	HMI hinges are properly tightened, and	C	

SECTION	VERIFICATION		RESULT	#Note
		rotation movement can be blocked		
3.1.3	Connectors	All sockets are properly tightened. (Rotating collector, HMI sockets, High Voltage, Facility panel sockets)	C	
3.1.4	Door opening/closing,	Lock keys are supplied and can lock/unlock the door. ITEM 1333	C	
		Door is aligned with the frame	C	
3.1.5	Emergency Button	The emergency button can be locked and unlocked with the safety key provided. SIEMENS SB30	C	
3.1.6	Safety Key	Safety key can only be removed in SAFE ON position.SIEMENS 455	C	

3.2 Etichettatura generale

SECTION	VERIFICATION		RESULT	#Note
3.2.1	Electrical cabinet	All components are labeled, and the electrical risk label is at the electrical cabinet door	C	
3.2.2	Facility panel All sockets/switches are correctly labeled and in accordance with format shown on ANNEX 1	PRESSURE SENSOR	C	
		COMPRESSED AIR	C	
		REMOTE	C	
		SAFETY ON-OFF	C	
		ECU	C	
3.2.3	Electrospinning chamber All elements inside the chamber are correctly labeled and in accordance with format shown on Annex 5	HV1 ☒ Positive (+) ☐ Negative (-) ☐ Bipolar (±)	C	Emitter
		HV2 ☐ Positive (+) ☒ Negative (-) ☐ Bipolar (±)	C	Auxiliary
		HV3 ☐ Positive (+) ☐ Negative (-) ☒ Bipolar (±)	C	Collector
		ROTATING COLLECTOR	C	
		LIQUID 1	C	
		LIQUID 2	C	
		GAS JACKET	C	
		GAS ASSISTED	C	
		R2R (Encoder)	C	
		R2R RIGHT/LEFT	C	
		Nameplate is in accordance with the	C	

SECTION	VERIFICATION		RESULT		#Note
		template shown in Annex 5			
		Voltage is according to destination country (110V/230V)	C		
		MAC address label is the same as the remote port of the VPN router. Write the MAC address:	C		
		<table border="1"><tr><td>MAC:</td><td>D4-F5-27-AB-1B-2F</td></tr></table>			
		MAC:	D4-F5-27-AB-1B-2F		
		Check air inlet and air outlet tags, ate the back side and at the upper side	C		
Warning labels are present accordingly to Annex 5	C				

3.3 Cablaggio generale

SECTION	VERIFICATION		RESULT		#Note
3.3.1	Electrospinning chamber	All components are labeled, and the electrical risk label is at the electrical cabinet door	C		
		Make sure all panel connectors are properly fixed and tight	C		
3.3.2	Electrical cabinet	All components inside the electrical cabinet are wired, fixed to the DIN rail and firmly tight, pull from the wires and check that there is nothing loose	C		
3.3.3		All the wires are labeled in accordance with the wiring diagrams	C		
3.3.4		Differential breaker is SI (super immunized) and doesn't trip when machine is ON when all the drivers are connected	C		

3.4 Elementi di sicurezza

SECTION	VERIFICATION		Ω	RESULT		#Note
3.4.1	Electrical earthing connection Resistance between the elements and machine ground power cable must be lower than 1 Ohms	MACHINE FRAME		C		
		ROT.COLLECTOR MOTOR		C		
		LIQUID 1		C		
		LIQUID 2		C		
		LIQUID 3		-	N/A	
		X AXIS 1		C		
		X AXIS 2		C		
		Y AXIS		C		
		Z AXIS		C		

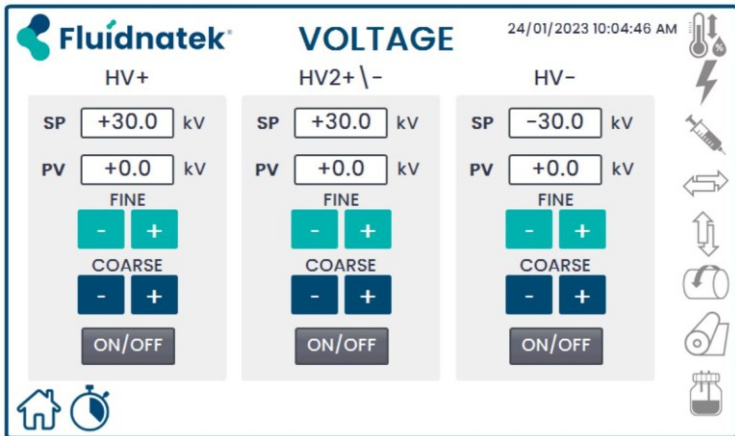
SECTION	VERIFICATION	Ω	RESULT		#Note
		R2R ENCODER	C		
		R2R MOTOR 1	C		
3.4.2	Emergency stop switch. All elements (Syringes Pumps, HV, Rotating Collector, Heater, Gas Jacket, Y-Z axes) must stop working if the emergency stop is pushed. (In both SAFE ON and OFF modes). Pumps must stop with flowrate function and with FF/RW function enabled, both modes must be tested	ROTATING COLLECTOR	C		
		LIQUID 1	C		
		LIQUID 2	C		
		LIQUID 3	-	N/A	
		VESSEL 1	C		
		GAS JACKET	C		
		GAS ASSISTED	C		
		AXIS X	C		
		AXIS Y	C		
		AXIS Z	C		
		R2R	C		
		HV1 ±	C		
		HV2 ±	C		
		HV3 ±	C		

SECTION	VERIFICATION		RESULT		#Note
3.4.1	Door switch All hazardous elements (HV, Rotating Collector, Heater, Gas Jacket, X-Y-Z axes) stop working if the door is opened (In both SAFE ON). Syringe pumps must not stop.	ROTATING COLLECTOR PLATFORM	C		
		VESSEL 1	C		
		GAS JACKET 1	C		
		GAS JACKET 2	C		
		X AXIS	C		
		Y AXIS	C		
		Z AXIS	C		
		R2R	C		
		HV1 ±	C		
		HV2 ±	C		
		HV3 ±	C		
		SYRINGE PUMPS (<u>do not stop</u>)	C		
3.4.2	Indoor negative pressure (See Annex 3)	Indoor pressure must be negative. If the extraction fan is at the 94% and there isn't negative pressure inside the chamber for 5 minutes, the machine stops working. (Safe	C		

SECTION	VERIFICATION		RESULT		#Note
		mode ON). An alarm will be shown on the HMI			
3.4.3	Exhaust	The exhaust speed raises to 94% when the door is open, or the emergency button is pressed	C		
3.4.4	Status led lightindicator	Machine OFF: <i>light OFF</i>	C		
		Safe mode ON + HV OFF: <i>continuous green light</i>	C		
		Safe mode ON + HV ON: <i>blinking green light</i>	C		
		Safe mode ON + DOOR OPEN: <i>light OFF</i>	C		
		Safe mode OFF + HV OFF: <i>continuous red light</i>	C		
		Safe mode OFF + HV ON: <i>blinking red light</i>	C		
3.4.5	Compressed Air Safety Valves The different systems driven by compressed air have a safety valve installed. Check that the valve is installed and works by blocking the exit of compressed air inside the electrospinning chamber once the pressure inside the circuit is above 1bar the valve should automatically start.	CFS	C		
		GAS JACKET	C		

4 Sorgenti di alto voltaggio (HV)

4.1 Software delle sorgenti di alto voltaggio

SECTION	VERIFICATION	RESULT	#Note
4.1.1	Machine screen appearance is like shown below: 	C	
4.1.2	SP Boxes are editable, with min. and max. of -30kV...30kV for all three HV supplies	C	
4.1.3	Coarse + and – buttons increase and decrease by 1 kV the SP	C	
4.1.4	Max and minimum values cannot be overcome by pressing ± or by manually introducing wrong values	C	
4.1.5	Fine + and – buttons increase and decrease by 0.1 kV the SP	C	
4.1.6	Max and minimum values cannot be overcome by pressing ± or by manually introducing wrong values	C	
4.1.7	PV Boxes are not editable	C	
4.1.8	ON/OFF button turns ON/OFF the respective HV power supply. The button is green while is ON and grey while is OFF	C	
4.1.9	Any HV supply that is not included or enabled, cannot be controlled and is not available	C	

4.2 Sorgente di alto voltaggio positivo (da 0 kV fino a 30kV) "HV+/HV1+"

Metodo di misurazione:

- Selezionare SAFE MODE OFF.
- Accendere il multimetro e selezionare la modalità di misurazione della tensione "V".
- Prendere la sonda HV, collegare il connettore "Rosso" alla porta "V" e il connettore "Nero" al connettore "COM".
- Fissare la piccola clip a un bullone o a una parte metallica della struttura della macchina e la sonda rossa al cavo di alimentazione HV che verrà misurato.
- Impostare i diversi valori indicati nella lista di controllo e confrontarli con quelli visualizzati sullo schermo del multimetro.

Acceptancecriteria

SP=1 kV; PV=1 kV, MV= 1 kV±0.1 kV

SP=15 kV; PV=15 kV, MV= 15 kV±0.2 kV

SP=30 kV; PV=30 kV, MV= 30 kV±0.2 kV

SP= -1 kV; PV= -1 kV, MV= -1 kV±0.1 kV

SP= -15 kV; PV= -15 kV, MV= -15 kV±0.2 kV

SP= -30 kV; PV= -30 kV, MV= -30 kV±0.2 kV

SECTION	VERIFICATION	RESULT	#Note
4.2.1	There is no sparking at maximum voltage. Check with nozzles at minimum height (Z = 300)	C	
4.2.2	Check at 1kV, 15kV and 30kV the SP, PV, and measured value MV. Note the values of calibration parameters.		

4.3 Sorgente di alto voltaggio negativo (0 kV fino a -30 kV) "HV -"

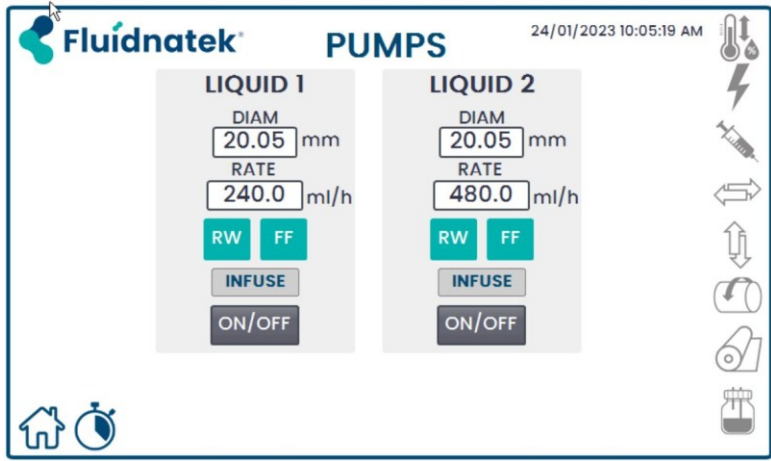
SECTION	VERIFICATION	RESULT	#Note
4.3.1	There is no sparking at maximum voltage. Check with nozzles at minimum height (Z = 300)	C	
4.3.2	Check at -1kV, -15kV and -30kV the SP, PV, and measured value MV. Note the values of calibration parameters.		

4.4 Sorgente di alto voltaggio bipolare (-30 kV fino a 30 kV) "HV3 ±"

SECTION	VERIFICATION	RESULT	#Note
4.4.1	There is no sparking at maximum voltage. Check with nozzles at minimum height (Z = 300)	C	
4.4.2	There is no sparking at maximum voltage. Check with nozzles at minimum height (Z = 300)	C	

5 Pompe di alimentazione per siringhe

5.1 Software del sistema di alimentazione per siringhe

SECTION	VERIFICATION	RESULT	#Note
5.1.1	Machine screen appearance is like shown below: 	C	
5.1.2	"DIAM" box is editable within the range 0...50.	C	
5.1.3	"RATE" box is editable and min/max values and units vary according DIAM value.	C	
5.1.4	"RW and FF" buttons move the syringe pumps fast rear and front direction respectively.	C	

SECTION	VERIFICATION	RESULT	#Note
5.1.5	"ON/OFF" button turns ON/OFF the respective syringe pump.	C	
5.1.6	If "Infuse" text is shown and the button is grey, pump moves forward, if text shown is "Withdr." and button is green, the pump moves back.	C	
5.1.7	If the pumps installed are High pressure pumps, the RATE units can be selected by the user, and are not linked to the DIAM value.	C	

5.2 Pompa di alimentazione per siringhe n°1

Metodo di misurazione

Syringe Pump

Fornire una siringa HSW* da 20 ml con acqua, impostare Diam a 20,05 mm e la portata specificata. Tirare lo stantuffo per raggiungere la linea di graduazione da 20 ml. Montare la siringa nella pompa. Misurare il tempo per raggiungere la linea di graduazione 0ml.

Acceptance Criteria

Test 1 Rate = 240ml/minil tempo dovrebbe attestarsi intorno a 4'55" – 5'05"

Test 2 Rate = 480 ml/minmin il tempo dovrebbe attestarsi intorno 2'25" – 2'35"

* Se si utilizza una diversa marca di siringa, il diametro utilizzato per il test deve essere misurato precisamente.

SECTION	VERIFICATION	RESULT	#Note
5.2.1	FF (fast forward) and RW (rewind), move forward and backwards the pump, respectively.	C	
5.2.2	Selecting "infuse" and "withdraw", the pump moves forward and backwards, respectively, when it is ON with a flow rate set.	C	
5.2.3	Test 1		
5.2.4	Diam = 20.5 F.Rate = 240 ml/min Time = 4.53 min	C	
5.2.5	Test 2		
5.2.6	Diam = 20.5 F.Rate = 480 ml/min Time = 2.27 min	C	

5.3 Pompa di alimentazione per siringhe n°2

SECTION	VERIFICATION	RESULT	#Note
5.3.1	FF (fast forward) and RW (rewind), move forward and backwards the pump, respectively.	C	
5.3.2	Selecting "infuse" and "withdraw", the pump moves forward and backwards, respectively, when it is ON with a flow rate set.	C	
	Test 1		
5.3.3	Diam = 20.5 F.Rate = 240 ml/min Time = 4.58 min	C	
	Test 2		
5.3.4	Diam = 20.5 F.Rate = 480 ml/min Time = 2.33 min	C	

6 Sistema di alimentazione a gas

Metodo di misurazione

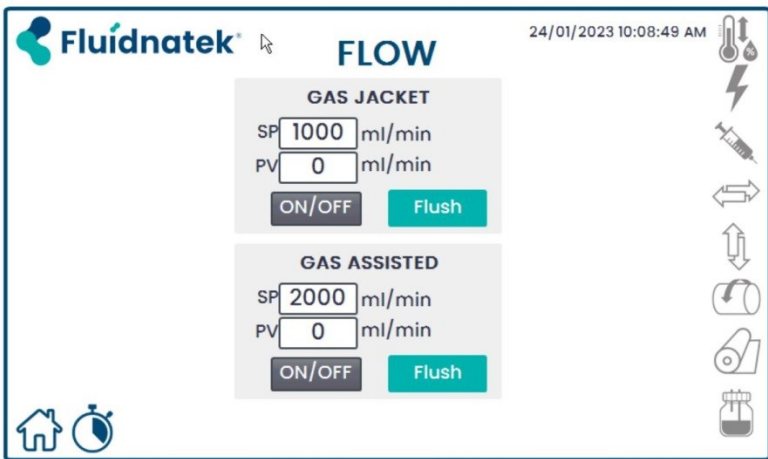
Gas Jacket/Gas Assisted

Controllare il valore del flusso reale con un flussimetro ai seguenti valori.

Acceptance Criteria

$SP = PV \pm 10\%$
 $SP=30 \text{ mL/min}$ $MV=30 \text{ mL/min} \pm 10 \text{ mL/min}$
 $SP=300 \text{ mL/min}$; $MV=300 \text{ mL/min} \pm 30 \text{ mL/min}$
 $SP=3000 \text{ mL/min}$; $MV=3000 \text{ mL/min} \pm 100 \text{ mL/min}$

6.1 Software del sistema Gas Jacket/Gas Assisted

SECTION	VERIFICATION	RESULT	#Note
6.1.1	Machine screen appearance is like shown below: 	C	
6.1.2	Gas Jacket "SP" boxes are editable within 10mL/min and 3000 ml/min.	C	
6.1.3	Gas Assisted "SP" boxes are editable within 2000 mL/min and 50000 ml/min.	C	
6.1.4	"PV" boxes are not editable and shows the current value of the pressure/flow provided when the system is ON	C	
6.1.5	"ON/OFF" button turns ON/OFF the respective vessel/gas jacket system.	C	
6.1.6	"FLUSH" buttons set the maximum flow of gas/air available on its respective system.	C	

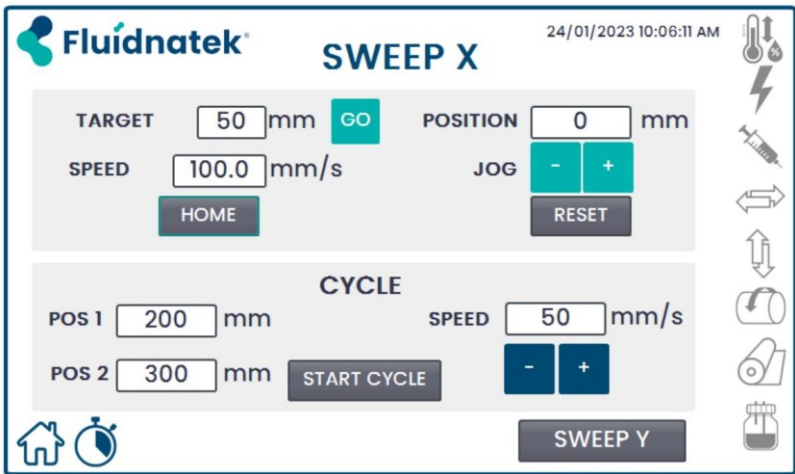
6.2 Gas Jacket

SECTION	VERIFICATION	RESULT	#Note
6.2.1	The general machine pressure regulator is limited to 0.2 MPa. The supply pressure must be higher than 0.6 MPa.	C	
6.2.2	Take off the glass cover (twist it to the left) of the regulator and move the green plastic indicators to 0.2MPa.	C	
6.2.3	The security valve is installed and is limited to 0.1MPa (1Bar)	C	

SECTION	VERIFICATION	RESULT	#Note
6.2.4	Check the absence of leaks applying pressure and blocking the exit. Mass flow meter must measure 0 mL/min and the PV value should drop to a value close to 0 mL/min.	C	

7 Movimento degli assi motorizzati

7.1 Software asse X

SECTION	VERIFICATION	RESULT	#Note
7.1.1	Machine screen appearance is like shown below: 	C	
7.1.2	"POSITION" box is not editable and shows the position of the X axis.	C	
7.1.3	"TARGET" box is editable within the range 0...300.	C	
7.1.4	Jog buttons - + move the axis in both directions.	C	
7.1.5	"GO" button moves the axis to the "Target" position.	C	
7.1.6	"POS1/POS2" boxes are editable within the range 0...300.	C	
7.1.7	"SPEED" check box is editable within the range 1...100,	C	
7.1.8	"SPEED" varies manually with - + buttons.	C	
7.1.9	"Start Cycle" button starts a cycle of the x axis, moving it from "POS 1" to "POS 2".	C	

7.2 Movimento asse X

SECTION	VERIFICATION	RESULT	#Note
7.2.1	The linear unit goes to home position with the home button without irregular noises.	C	
7.2.2	Measure the distance from "home" position to different set points, with a ruler. Acceptance criteria $\pm 10\%$ total distance or 1mm, whatever is smaller		
7.2.3	Measurements (mm)		

SECTION	VERIFICATION			RESULT		#Note
7.2.4	Target	Measured	Difference	C		
7.2.5	10	150	10			
7.2.6	150	150	150			
7.2.7	300	150	300			
7.2.8	With the help of a chronometer, measure the speed at different SPs. Acceptance criteria ±5% total time or 1s, whatever is higher. Distance=300 mm					
7.2.9	Measurements (sec.)					
7.2.10	Speed	Time expected	Time measured	C		
7.2.11	100 mm/s	2,5 -3,5s	3.30			
7.2.12	50 mm/s	5,5 - 6,5s	6.4			
7.2.13	20 mm/s	14,5 - 15,5s	15.4			

7.3 Software asse Y

SECTION	VERIFICATION	RESULT	#Note
7.3.1	Machine screen appearance is like shown below: 	C	
7.3.2	"POSITION" box is not editable and shows the position of the X axis.	C	
7.3.3	"TARGET" box is editable within the range 0...300.	C	
7.3.4	Jog buttons - + move the axis in both directions.	C	
7.3.5	"GO" button moves the axis to the "Target" position.	C	
7.3.6	"POS1/POS2" boxes are editable within the range 0...300.	C	
7.3.7	"SPEED" check box is editable within the range 1...100,	C	
7.3.8	"SPEED" varies manually with - + buttons.	C	
7.3.9	"Start Cycle" button starts a cycle of the x axis, moving it from "POS 1" to "POS 2".	C	

7.4 Movimento asse Y

SECTION	VERIFICATION	RESULT	#Note
7.4.1	The linear unit goes to home position with the home button without irregular noises.	C	
7.4.2	Measure the distance from "home" position to different set points, with a ruler. Acceptance criteria $\pm 10\%$ total distance or 1mm, whatever is smaller		

SECTION	VERIFICATION			RESULT	#Note
7.4.3	Measurements (mm)				
7.4.4	Target	Measured	Difference	C	
7.4.5	10	409	10		
7.4.6	150	409	150		
7.4.7	300	409	300		
7.4.8	With the help of a chronometer, measure the speed at different SPs. Acceptance criteria ±5% total time or 1s, whatever is higher. Distance= 300 mm				
7.4.9	Measurements (sec.)				
7.4.10	Speed	Time expected	Time measured	C	
7.4.11	100 mm/s	2,5 -3,5s	2.89		
7.4.12	50 mm/s	5,5 - 6,5s	5.55		
7.4.13	20 mm/s	14,5 - 15,5s	14.97		

7.5 Software asse Z

SECTION	VERIFICATION	RESULT	#Note
7.5.1	Machine screen appearance is like shown below: 	C	
7.5.2	"Position" box is not editable and shows the position of the X axis.	C	
7.5.3	"Target" box is editable within the range 0...200.	C	
7.5.4	-+ Jog buttons moves the axis manually in both directions.	C	
7.5.5	"GO" button moves the axis to the "Target" position.	C	
7.5.6	"Speed" check box is editable within the range 1...100 and varies manually with +- buttons.	C	

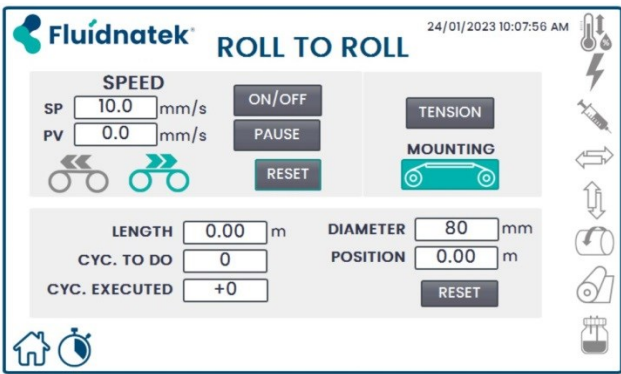
7.6 Movimento asse Z

SECTION	VERIFICATION	RESULT	#Note
7.6.1	The linear unit goes to home position with the home button without irregular noises.	C	
7.6.2	Measure the distance from "home" position to different set points, with a ruler. Acceptance criteria $\pm 10\%$ total distance or 1mm, whatever is smaller		
7.6.3	Measurements (mm)		
7.6.4	Target	Measured	Difference

SECTION	VERIFICATION			RESULT		#Note
7.6.5	10	105	10			
7.6.6	150	105	150			
7.6.7	300	105	300			

8 Collettore Roll to Roll

8.1 Roll to Roll software

SECTION	VERIFICATION	RESULT	#Note
8.1.1	Machine screen appearance is like shown below: 	C	
8.1.2	"ON/OFF" button starts/stops the R2R movement	C	
8.1.3	"RIGHT" and "LEFT" button changes the movement direction	C	
8.1.4	"TENSION LEFT" and "TENSION RIGHT" boxes are editable 0...99.	C	
8.1.5	"Clock" button access to "Chrono and timer" screen.	C	
8.1.6	"CYCLES TO DO" box is editable within 0 – 999.	C	
8.1.7	"CYCLE LENGTH" box is editable within 0 – 999.9m	C	
8.1.8	"SPEED PV", "CYCLES EXECUTED" and "POSITION" Boxes are not editable.	C	
8.1.9	"ROLL INITIAL DIAMETER" is editable within 0 - 200	C	
8.1.10	"SPEED SP" box is editable within 0.0 – 100.0 mm/s	C	
8.1.11	"INSIDE" and "OUTSIDE" buttons allow the user to select the substrate set-up direction	C	

8.2 Movimento del Roll to Roll

SECTION	VERIFICATION	RESULT	#Note
8.2.1	Both axes are parallel, and there is no visual deviation between them.	C	
8.2.2	The belts are firmly tight	C	
8.2.3	Connect the R2R to a LE-100 and measure the distance from "home" position to different set points, with a calibrated ruler. <i>Acceptance criteria $\pm 1\text{mm}$</i> <i>Both position 0 and target position should be marked on the substrate to have a reference from which verifying the measured distance can be possible.</i> Compare the measured distance with the Position box. This test should be		

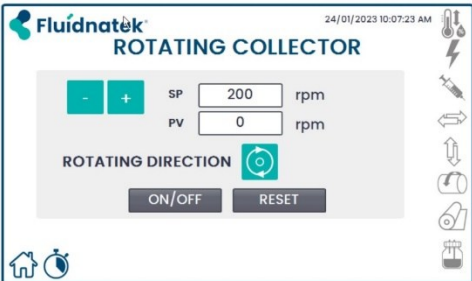
SECTION	VERIFICATION			RESULT	#Note
	done on both directions.				
8.2.4	LEFT DIRECTION MOVEMENT				
8.2.5	Measurements (mm)				
8.2.6	Target	Position	Distance	C	
8.2.7	100	0	100		
8.2.8	500	0	500		
8.2.9	1000	0	1000		
8.2.10	RIGHT DIRECTION MOVEMENT				
8.2.11	Measurements (mm)				
8.2.12	Target	Position	Distance	C	
8.2.13	100	0	100		
8.2.14	500	0	500		
8.2.15	1000	0	1000		
8.2.16	With the help of a chronometer, measure the speed at different SPs Acceptance criteria $\pm 5\%$ total time or 1s, whichever is higher. Distance= 1m				

9 Collettori

9.1 Collettore piatto

SECTION	VERIFICATION	RESULT	#Note
9.1.1	Check the absence of any damage/scratch on the platform.	C	
9.1.2	HV cable is included	C	
9.1.3	Mount it and check that fits in the LE100	C	

9.2 Software del collettore rotante

SECTION	VERIFICATION	RESULT		#Note
9.2.1	Machine screen appearance is like shown below: 	C		
9.2.2	"SP" box is editable within the range 200...2000.(20-2000 if servo)	C		
9.2.3	"PV" box is NOT editable and shows a value close to the one set in "SP", when the collector is "ON".	C		
9.2.4	+/- buttons vary SP values +/- 10rpm.	C		
9.2.5	Rotating Direction: If "LEFT" button is pressed, it turns green and collector rotates to the left, if "RIGHT" button is pressed, it turns green, and collector rotates to the right.	C		
9.2.6	"ON/OFF" button turns ON/OFF rotating collector motor. The button is highlighted green while is ON and grey while is OFF.	C		
9.2.7	With the rotating platform cable disconnected, and by pushing "Encoder alarm" is shown	C		

9.3 Piattaforma del collettore rotante

SECTION	VERIFICATION	RESULT		#Note
9.3.1	Check the absence of any damage/scratch on the platform.	C		
9.3.2	Check continuity between the cable connection and the axis.	C		
9.3.3	Remove the motor cover and check that the pulley, axle, and belt are not damaged or displaced.	C		
9.3.4	Check if the belt is tensed enough.	C		
9.3.5	Lithium grease has been applied to the bearings	C		
9.3.6	With the rotating platform cable disconnected, and by pushing "Encoder alarm" is shown	C		

9.4 Collettore rotante

SECTION	VERIFICATION	RESULT		#Note
9.4.1	Check the absence of any damage/scratch on the drum.			

10 Luci, videocamera e UV

10.1 Software delle luci, videocamera e UV

SECTION	VERIFICATION	RESULT	#Note
10.1.1	Machine screen appearance is like shown below: 	C	
10.1.2	"Menu" button access to manual menus screen.	C	
10.1.3	ON/OFF buttons activate/deactivate the light, camera, and UV, respectively.	C	
10.1.4	"Laptop" button access to "Data Storage" screen.	C	
10.1.5	"Clock" button access to "Chrono and timer" screen.	C	
10.1.6	With "SAFE MODE OFF", maintenance screen appears when Bionicia logo is pressed.	C	
10.1.7	With "SAFE MODE ON" maintenance Screen is not accessible	C	

10.2 Luci

SECTION	VERIFICATION	RESULT	#Note
10.2.1	Lights can be switched ON/OFF from the HMI.	C	
10.2.2	Lights are properly fixed to the machine.	C	
10.2.3	Light is steadily white.	C	

11 Supporti

11.1 Supporto per eiettore a fase singola

SECTION	VERIFICATION	RESULT	#Note
11.1.1	Check the absence of any damage/scratch on the holder	C	
11.1.2	Mount the holder and check that you can fix it in different positions and the HV can be connected to the emitter.	C	
11.1.3	Verify that all the pieces are included (see drawing pieces list).	C	

11.2 Supporto per connessione a pinza

SECTION	VERIFICATION	RESULT	#Note
11.2.1	Check the absence of any damage/scratch on the holder	C	
11.2.2	Mount the holder and check that you can fix it in different positions and the HV can be connected to the emitter.	C	
11.2.3	Verify that all the pieces are included (see drawing pieces list).	C	

12 Eiettori (fase singola, coassiale, multipli...)

12.1 Eietttore a fase singola

SECTION	VERIFICATION			RESULT	#Note
12.1.1	All the required parts are delivered with the emitter, check with the purchase order:				
12.1.2	Reference	Description	Qty		
12.1.3	LE50.010.30.001	Metal Body	1	C	
12.1.4	LE00.MEC0070	Luer female to 1/4-28 female	2	C	
12.1.5	LE00.MEC0071	Male Nut 1/8" Green (UCHP-305X)	3	C	
12.1.6	LE00.MEC0072	Flangeless Ferr 1/8 Yellow	3	C	
12.1.7	LE00.MEC0073	Tubo alimentación PTFE Ø3.25 1m	1	C	
12.1.8	LE00.MEC0074	Disposable needle 22"G-½" (blue)	5	C	
12.1.9	LE00.MEC0075	Luer Lock Male – ¼ - 28M	5	C	
12.1.10	The emitter can be assembled properly, and the thread is perfect			C	

12.2 Eietttore coassiale

SECTION	VERIFICATION			RESULT	#Note
12.2.1	All the required parts are delivered with the emitter, check with the purchase order:				
12.2.2	Reference	Description	Qty		
12.2.3	LE50.020.20.003	Metal body	1	C	
12.2.4	LE50.020.20.002	Metal tubing port	1	C	
12.2.5	LE00.MEC0039	Sealing ring	2	C	
12.2.6	LE00.MEC0070	Luer female to 1/4-28 female	3	C	
12.2.7	LE00.MEC0071	Male Nut 1/8" Green (UCHP-305X)	6	C	
12.2.8	LE00.MEC0072	Flangeless Ferr 1/8 Yellow	6	C	
12.2.9	LE00.MEC0025	Flngls Sys FlushNut 1/16	2	C	
12.2.10	LE00.MEC0040	Black Plug P-309	2	C	
12.2.11	LE00.MEC0027	Flangeless Ferr 1/16 Blue	2	C	

SECTION	VERIFICATION				RESULT	#Note
12.2.12	LE00.MEC0075		Luer lock male - 1/4-28M	5	C	
12.2.13	LE00.MEC0118		Disposable needle 16G-1/2" (black)	5	C	
12.2.14	LE00.MEC0117		Needle 60.5x0.9x0.6	5	C	
12.2.15	LE00.MEC0119		Spring 1.1-0.89 (1 Eppendorf included)	1	C	
12.2.16	LE00.MEC0073		Feeding tube PTFE Ø3.25 1m	1	C	
12.2.17	LE00.MEC0028		Needle adjusting tube 0.3m	1	C	
12.2.18			Coaxial Screwer	1	C	
12.2.19	The emitter can be assembled properly, and the thread is perfect				C	
12.2.20	Fill a syringe with demi water and, after assembling the emitter, checks that there are not water leakages and the water flows through the needles				C	

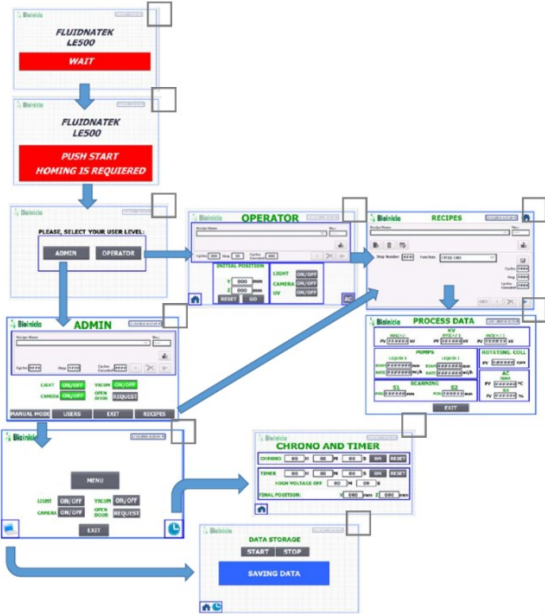
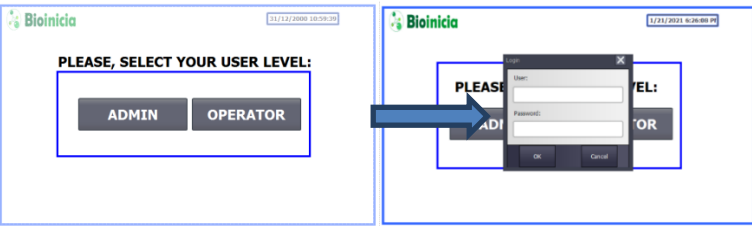
12.3 Eiettore a cortina 100 mm

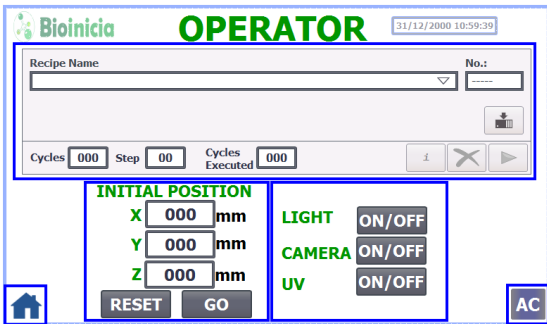
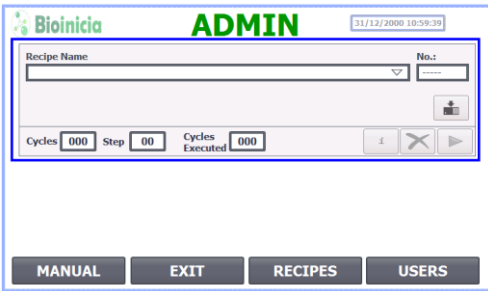
SECTION	VERIFICATION				RESULT	#Note
12.3.1	All the required parts are delivered with the emitter, check with the purchase order:					
12.3.2	Reference	Description	Qty			
12.3.3	LE100.D25.00.003	Air Chamber Slit Injector 100	2	C		
12.3.4	LE100.D25.00.004	Air Chamber Slit Injector cap 100	2	C		
12.3.5	LE100.D25.00.005	Axis fitting Slit Injector 20	1	C		
12.3.6	LE100.D25.00.001	Body Slit Injector 100	1	C		
12.3.7	DIN6325-Ø3x14	DIN6325-Ø3x14	2	C		
12.3.8	DIN7380-M4x6-A2-8.8	DIN7380-M4x6-A2-8.8	2	C		
12.3.9	DIN912-M4x16-A2-8.8	DIN912 M4x16-A2-8.8	8	C		
12.3.10	DIN912-M4x25-A2-8.8	DIN912-M4x25-A2-8.8	6	C		
12.3.11	LE00.MEC0158	PTFE tube DI 4mm, Øext 6mm	1.5	C		
12.3.12	LE100.D25.00.006	Film Slit Injector 100	5	C		
12.3.13	LE00.MEC0086	Mini clamp	1	C		
12.3.14	RACORD SMC_M-5H-6	Racord tubing SMC Inox	2	C		
12.3.15	LE00.MEC0513	Y Fitting for Ø4 ID tubing	2	C		
12.3.16	LE00.MEC0167	Theaded fitting 4mm (5/32")1/8-27 NPT	4	C		

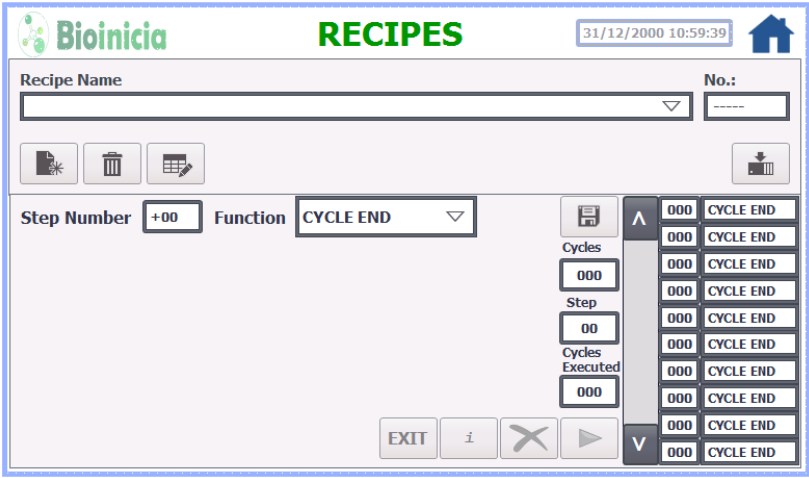
SECTION	VERIFICATION			RESULT	#Note
12.3.17	LE100.D25.00.002	Top cap Slit Injector 100	1	C	
12.3.18	LE500.D19.00.021	Top washer	1	C	

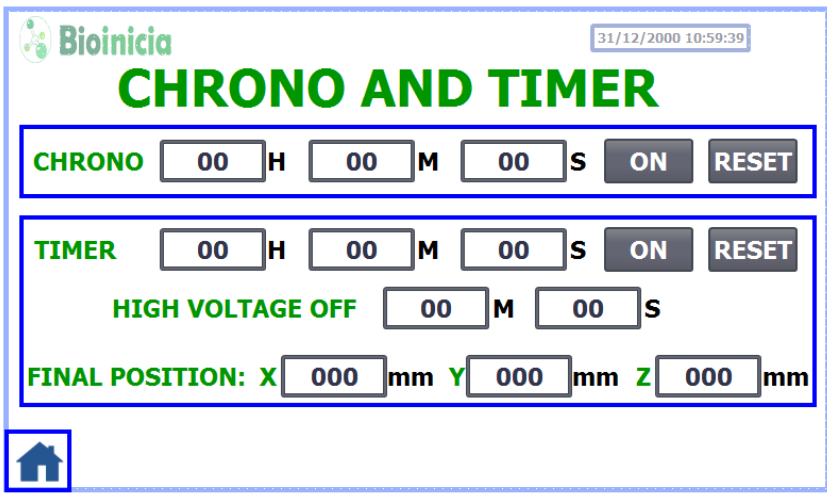
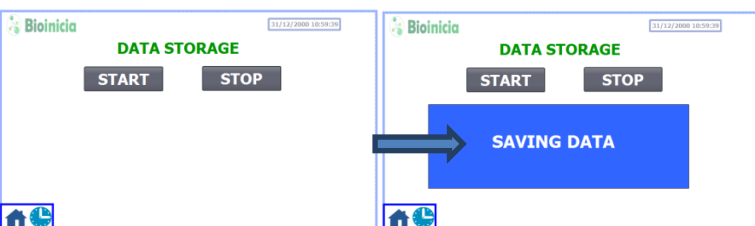
13 Funzionalità del software

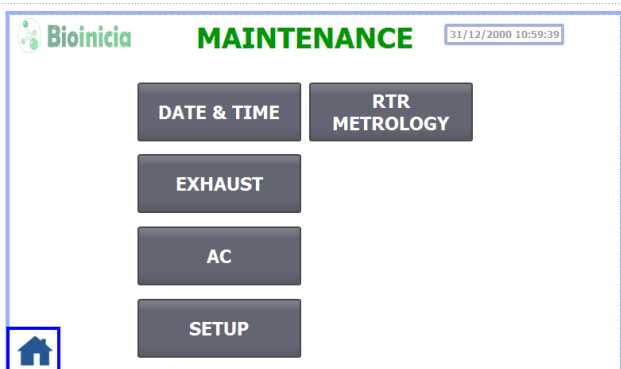
SECTION	VERIFICATION	RESULT	#Note
13.1.1	Data Logging-USB Download to a computer the data of a 5 minutes (at least) working cycle. Check that the date of the data log readings is up to date.	C	
13.1.2	Process variables (screens) Checks that every process variable keeps the value after a machine shutdown. (Set Points, Calibration screen)	C	
13.1.3	Time and date (screens) Time and date are editable and are set correctly.	C	
13.1.4	Exhaust Exhaust parameters are set to 50(min) and 52 (max)	C	
13.1.5	Chrono The time measured is the same with an external chronometer.	C	
13.1.6	Timer Start all the elements of the machine. Set timers, first timer stops all working elements except the HV and R2R/rotating collector. HV timer stops all elements that remain active at the set time. Y, X and Z final position moves the actuators to the pre-set position.	C	
13.1.7	Recipes Program and run 3 different recipes that use all the functions of the machine. Check that introducing wrong values is not possible.	C	
13.1.8	Password PLC program is password protected.	C	
13.1.9	Calibration Calibration values have been written in Annex 4.	C	
13.1.10	Screens* Perform the following screen checks and verifications. Check that the software follows the screen path shown below when interacting with the HMI (path identical for LE500 and LE100). Mark every screen if appearance is correct. <i><u>*Some screens may be modified upon manufacturing and SW needs.</u></i>	C	

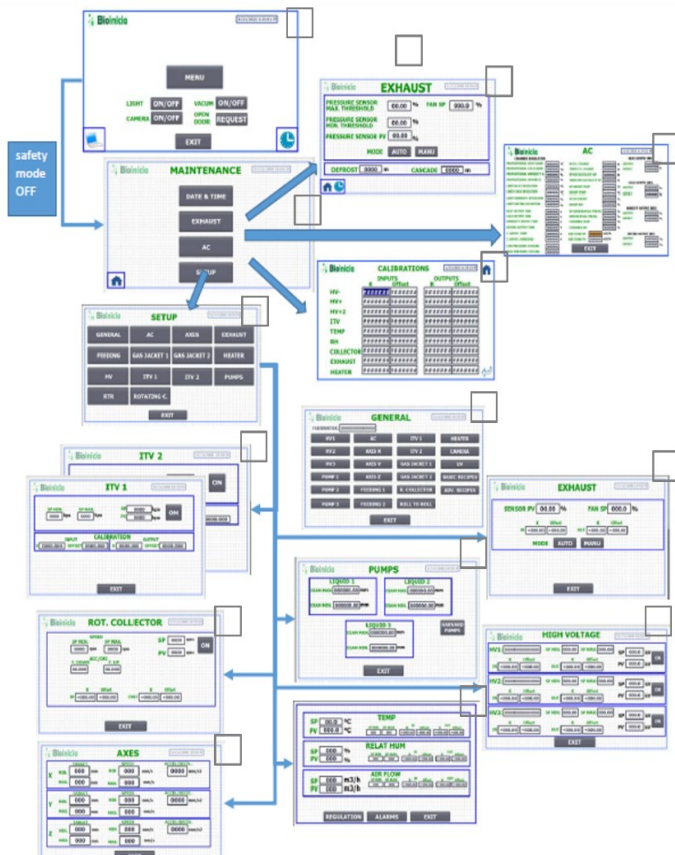
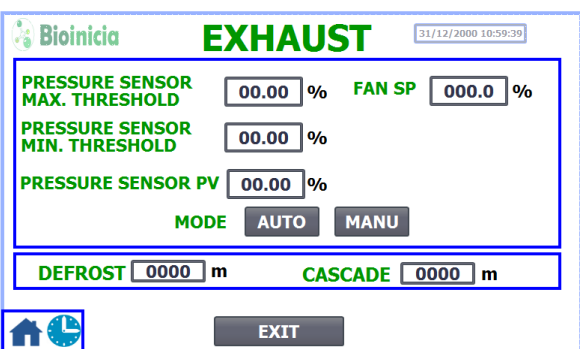
SECTION	VERIFICATION	RESULT	#Note
13.1.11			
13.1.12	Initial screens  Machine screen appearances are like the shown above.	C	
13.1.13	It is possible access to the principal screen pressing the hidden button located on the right-bottom corner	C	
13.1.14	Log in screen  Machine screen appearances are like the shown above	C	
13.1.15	ENTER button shows OPERATOR or ADMIN screen accordingly to the user/password introduced (admin/admin for administrator access or user/user for operator access). <i>Note: The password is case sensitive.</i>	C	
13.1.16	Operator Screen	C	

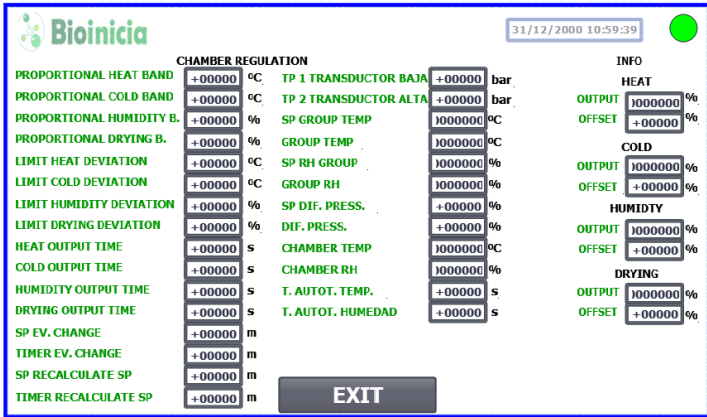
SECTION	VERIFICATION	RESULT	#Note
	 Machine screen appearance is like the shown above.		
13.1.17	"Cycles and Step" boxes are editable.	C	
13.1.18	"Recipe name" drop down menu shows different recipes stored.	C	
13.1.19	"i" button shows set values of each machine actuator.	C	
13.1.20	"Play" and "Cross" buttons starts and stops the recipes.	C	
13.1.21	"INITIAL POSITION" section, "X" box is editable within 0 - 300mm	C	
13.1.22	"INITIAL POSITION" section, "Y" box is editable within 0 - 300mm	C	
13.1.23	"INITIAL POSITION" section, "Z" box is editable within 0 - 300mm	C	
13.1.24	"INITIAL POSITION" section, "RESET" button sets the actuators ready	C	
13.1.25	CAMERA "ON/OFF" button enables or disables the Taylor visualization system	C	
13.1.26	LIGHT "ON/OFF" button enables or disables the e-spinning chamber LED lights.	C	
13.1.27	UV "ON/OFF" button enables/disables the germicidal UV-C lamps inside the chamber, and can only be turned ON with the door closed (on both safety modes)	C	
13.1.28	Admin Screen  Machine screen appearance is like the shown above	C	
13.1.29	"Recipe name" drop down menu shows different recipes stored.	C	
13.1.30	"i" button shows set values of each machine actuator.	C	
13.1.31	"Play" and "Cross" buttons starts and stops the recipes.	C	
13.1.32	"MANUAL" "EXIT" "RECIPES" and "USERS" buttons access to their corresponding screens.	C	
13.1.33	Programmable multi-step recipes screen	C	

SECTION	VERIFICATION	RESULT	#Note
	 Machine screen appearance is like the shown above.		
13.1.34	"RECIPE NAME" drop down menu shows all previously stored recipes.	C	
13.1.35	 button creates a new recipe.	C	
13.1.36	 button deletes an existing recipe.	C	
13.1.37	 downloads the selected recipe to the PLC.	C	
13.1.38	 stores de selected recipe.	C	
13.1.39	Step number is editable within 0...100.	C	
13.1.40	"FUNCTION" drop-down menu shows all the machine menus.	C	
13.1.41	All functions are editable as at manual menu, with the same thresholds.	C	
13.1.42	"Exit" button returns to "Administrator" main screen.	C	
13.1.43	"i" button shows all process values.	C	
13.1.44	"Play" and "Cross" buttons starts and stops the recipes.	C	
13.1.45	Chrono and timer	C	

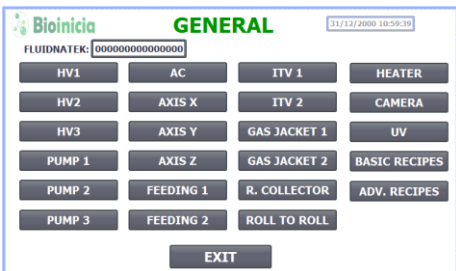
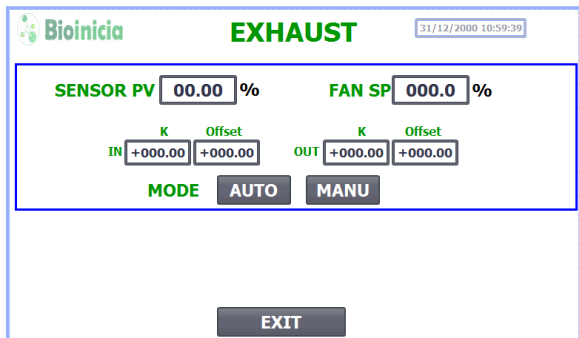
SECTION	VERIFICATION	RESULT	#Note
	 Machine screen appearance is like the shown above		
13.1.46	“Chrono ON” button starts the chronometer counting. And “Reset” button set “0” at “H,M,S”.	C	
13.1.47	Timer boxes are editable, with following ranges: H=0...99; M=0...59, S=0...59.	C	
13.1.48	“Timer ON” button start the countdown of the timer, from previously established “H,M,S” values.	C	
13.1.49	“Timer Reset” button resets the timer “H,M,S” values to the previously established.	C	
13.1.50	High Voltage Off boxes are editable within 0...99.	C	
13.1.51	Final Position boxes are editable within 0mm and 300mm (X,Y and Z)	C	
13.1.52	Data logging  Machine screen appearance is like the shown above.	C	
13.1.53	When “START” button is pushed, blue “SAVING DATA” advise is shown, a .csv file is created and each minute a new input to the .csv file is done.	C	
13.1.54	When “STOP” button is pushed, blue “SAVING DATA” disappears and stops updating .csv file.	C	
13.1.55	The created file has a structure like the shown below. TimeString column is up to date.	C	

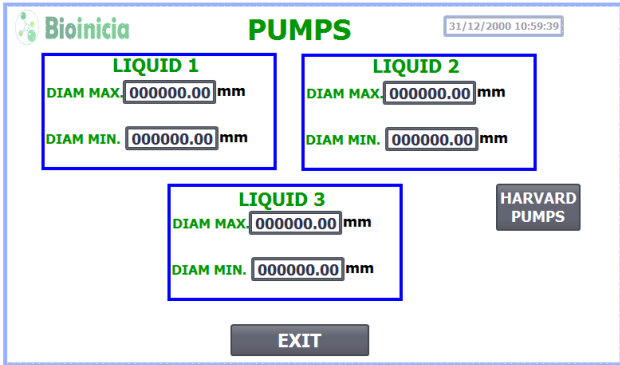
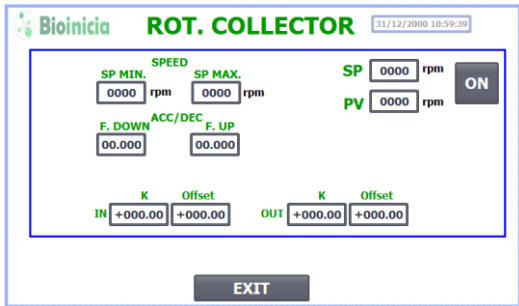
SECTION	VERIFICATION					RESULT	#Note																																																																																																																																																		
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13.1.56	Maintenance screen  Machine screen appearance is like the shown above.	C																																																																																																																																																							
13.1.57	The screen is shown when Bioinicia logo is pressed at manual screen if SAFE MODE is OFF.	C																																																																																																																																																							
13.1.58	The screen is not shown when Bioinicia logo is pressed at manual screen if SAFE MODE is ON.	C																																																																																																																																																							
13.1.59	“EXHAUST” button gives access to the exhaust configuration screen.	C																																																																																																																																																							
13.1.60	“DATE & TIME” grants access to the date and time configuration screen.	C																																																																																																																																																							
13.1.61	“AC” button gives access to the ECU regulation screen.	C																																																																																																																																																							
13.1.62	“SETUP” button gives access to the general configuration and calibration screens.	C																																																																																																																																																							
13.1.63	“SETUP” button is password protected.	C																																																																																																																																																							
13.1.64	Check that the software follows the screen path shown below when interacting with the HMI. Mark every screen if appearance is correct.	C																																																																																																																																																							

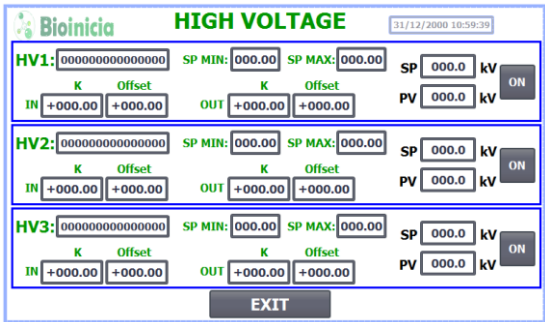
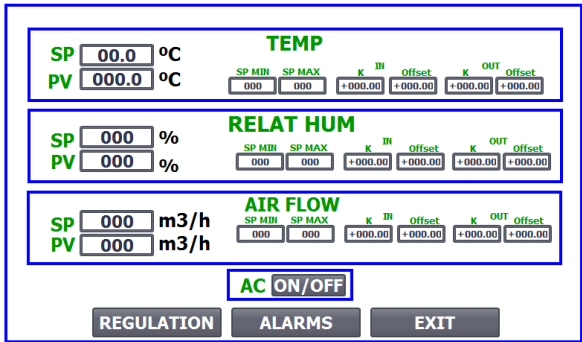
SECTION	VERIFICATION	RESULT	#Note
13.1.65			
13.1.66	.Exhaust screen  Machine screen appearance is like the shown above.	C	
13.1.67	Max and Min pressure sensor threshold boxes are editable within 50...120.	C	
13.1.68	"FAN SP" box is editable within 0...100.	C	
13.1.69	"DEFROST" box is editable within 0-999m	C	
13.1.70	"CASCADE" box is not editable.	C	
13.1.71	"MODE" and " AUTO" buttons switch the exhaust mode between automatic and manual and cannot be pressed at the same time.	C	

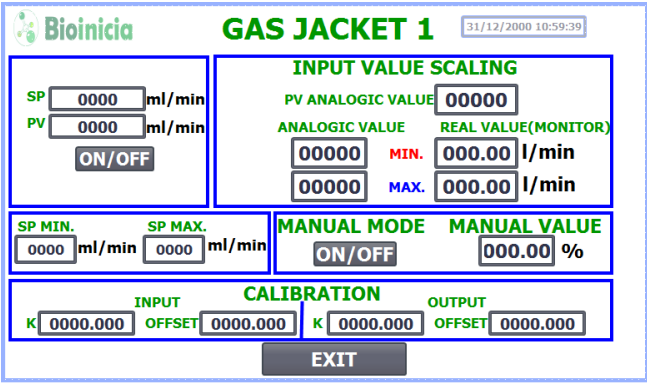
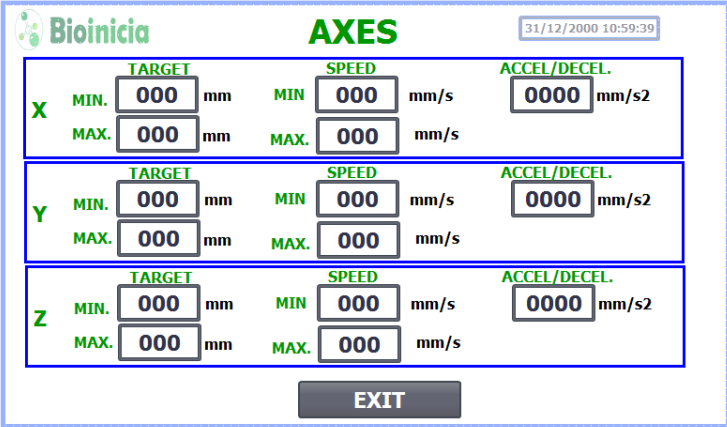
SECTION	VERIFICATION			RESULT	#Note
13.1.72	AC maintenance screen  Machine screen appearance is like the shown above			C	
13.1.73	ITEM	Editable	Value		
13.1.74	PROPORTIONAL HEAT BAND	Y	+150°C	C	
13.1.75	PROPORTIONAL COLD BAND	Y	+150°C	C	
13.1.76	PROPORTIONAL HUMIDITY BAND	Y	+500%	C	
13.1.77	PROPORTIONAL DRYING BAND	Y	+350%	C	
13.1.78	LIMIT HEAT DEVIATION	Y	+50°C	C	
13.1.79	LIMIT COLD DEVIATION	Y	+50°C	C	
13.1.80	LIMIT HUMIDITY DEVIATION"	Y	+1000%	C	
13.1.81	LIMIT DRYING DEVIATION	Y	1000%	C	
13.1.82	HEAT OUTPUT TIME	Y	30s	C	
13.1.83	COLD OUTPUT TIME	Y	30s	C	
13.1.84	HUMIDITY OUTPUT TIME	Y	6s	C	
13.1.85	DRYING OUTPUT TIME	Y	15s	C	
13.1.86	SP EV. CHANGE	0 – 500	480m at least.	C	
13.1.87	TIMER EV. CHANGE	NO	>SP EV. CHANGE	C	
13.1.88	SP RECALCULATE SP	Y	12min	C	
13.1.89	TIMER RECALCULATE SP	NO	<SP RECALCULATE SP	C	
13.1.90	SP GROUP TEMP/ SP RH GROUP	NO	ECU internal SP	C	
13.1.91	GROUP TEMP/RH GROUP	NO	ECU internal PV	C	
13.1.92	SP DIFFERENTIAL PRESS	NO	Usually set at 500	C	
13.1.93	DIFFERENTIAL PRESS	NO	fluctuates around 300	C	
13.1.94	CHAMBER TEMP/CHAMBER RH	NO	E-spinning	C	

SECTION	VERIFICATION			RESULT	#Note
			chamber PVs		
13.1.95	T. AUTOT. TEMP/T AUTO HUMEDAD	Y	3s and 6s respectively	C	
13.1.96	OUTPUT INFO (heat, cold, humidity and drying)	NO		C	

SECTION	VERIFICATION			RESULT	#Note
13.1.97	"GENERAL" button gives access to the general configuration of the LE-100 features installed and enabled.			C	
13.1.98	Each button gives access to the general set up and calibration screen			C	
13.1.99	"EXIT" button gives access to the previous screen			C	
13.1.100	EXIT button gives access to the previous screen			C	
13.1.101	General configuration screen  Machine appearance is like the shown above.			C	
13.1.102	"FLUIDNATEK" shows the model of LE unit (LE-100) and can be edited.			C	
13.1.103	Components installed and enabled on the machine are highlighted in green.			C	
13.1.104	By enabling/disabling a component its manual control menu and control will not be accessible on manual mode and a "not available" mark will be shown if selected (on manual mode)			C	
13.1.105	EXIT button gives access to the previous screen			C	
13.1.106	Exhaust calibration screen  Machine appearance is like the shown above			C	

SECTION	VERIFICATION	RESULT	#Note
13.1.107	"FAN SP" box is editable.	C	
13.1.108	"SENSOR PV" box shows the pressure sensor present value.	C	
13.1.109	All "K" and "OFFSET" boxes are editable	C	
13.1.110	"EXIT" button gives access to the previous screen.	C	
13.1.111	Pumps set up screen  Machine appearance is like the shown above.	C	
13.1.112	DIAM MIN and DIAM MAX boxes, once modified, set the SP limits on the manual control screen of the corresponding system	C	
13.1.113	"HARVARD PUMPS" button enables/disables high pressure pumps control from the manual control screen. If Enabled, button is highlighted in green.	C	
13.1.114	EXIT button gives access to the previous screen.	C	
13.1.115	Rotary collector screen  Machine appearance is like the shown above	C	
13.1.116	SP MIN and SP MAX boxes, once modified, set the SP limits on the manual control screen of the corresponding system	C	
13.1.117	F. DOWN and F.UP boxes are editable, and upon modification increase/decrease the acceleration ramp of the rotating collector	C	
13.1.118	All K and OFFSET boxes are editable	C	
13.1.119	"EXIT" button gives access to the previous screen	C	
13.1.120	"ON" button enables/disables the Rotating platform rotational movement	C	

SECTION	VERIFICATION	RESULT	#Note
13.1.121	When the “ON” button is enabled, it is highlighted in green	C	
13.1.122	SP and PV boxes and ON button sets and shows the speed control values as the manual control screen	C	
13.1.123	High voltage screen  Machine appearance is like the shown above.	C	
13.1.124	SP MIN and SP MAX boxes, once modified, set the SP limits on the manual control screen of the corresponding system	C	
13.1.125	HV1,HV2 and HV3 boxes are editable, and set the title of each voltage supply on the manual control screen.	C	
13.1.126	All K and OFFSET boxes are editable.	C	
13.1.127	EXIT button gives access to the previous screen	C	
13.1.128	SP and PV boxes and ON button sets and shows the HV control values as the manual control screen.	C	
13.1.129	T/RH and airflow set up screen  Machine appearance is like the shown above.	C	
13.1.130	“SP MIN” and “SP MAX” boxes, once modified, set the SP limits on the manual control screen of the corresponding system	C	
13.1.131	All K and OFFSET boxes are editable.	C	
13.1.132	EXIT button gives access to the previous screen	C	
13.1.133	“SP” boxes are editable and set the requested value of temperature, relative humidity or airflow, with the same thresholds as on manual control.	C	
13.1.134	“PV” boxes are not editable and shows the “TEMP,” RELAT HUM” AND “AIRFLOW” present values as on the manual control	C	

SECTION	VERIFICATION	RESULT	#Note
	screen		
13.1.135	Gas jacket 1 set up screen  Machine screen appearance is like the shown above.	C	
13.1.136	“SP” box is editable and allows the user to set a value of gas flow in mL/min with the same ranges as on manual control menu.	C	
13.1.137	“PV” box is not editable and shows the present value of gas flow in mL/min	C	
13.1.138	“SP MIN” and “SP MAX” boxes are editable and allow the user to set the minimum and maximum values that can be set in the SP box (manual control menu).	C	
13.1.139	All “K” and “OFFSET” boxes are editable.	C	
13.1.140	MANUAL MODE “ON/OFF” button enables/disables the control for manual calibration of the gas jacket system.	C	
13.1.141	“PV ANALOGIC VALUE” box shows the present value of the analogic entry for this system.	C	
13.1.142	“ANALOGIC VALUE” boxes are editable	C	
13.1.143	REAL VALUE “MIN” and “MAX” boxes are editable.	C	
13.1.144	Axes set up screen  Machine screen appearance is like the shown above.	C	
13.1.145	TARGET and SPEED “MIN” and “MAX” boxes are editable, and once modified, set the SP limits on the manual control screen of	C	

SECTION	VERIFICATION	RESULT	#Note
	their corresponding feature.		
13.1.146	"ACCEL" and "DECEL" boxes are editable.	C	
13.1.147	"EXIT" button gives access to the previous screen	C	

14 Electrospinning

SECTION	VERIFICATION	RESULT	#Note
14.1.1	Fiber production with e-spinning solution The equipment has successfully electro-spun fibers with PVOH.	C	

15 Documentazione

SECTION	ITEM	RESULT	#Note
15.1.1	Send a copy Customer of this document once is finished as well as all the evidence requested on the different sections.	C	

16 Componenti inclusi nell'equipaggiamento

Item	Units	RESULT	#Note
Nozzles			
Single-Phase emitter spinning head	1	C	
Coaxial-phase Spinning head	1	C	
Multi-emitter spinning head (20x) LE100.180.10.000 + LE100.180.20.000	1	C	
Slit Injector	1	C	
Bionicia briefcase			
Briefcase with BI sticker	1	C	
Set of Allen keys	1	C	
Lithium Grease	1	C	
Plastic compartmented box with nozzles parts and consumables inside the Bioinicia briefcase.	1	C	
Eppendorf tubes.	1	C	
Bioinicia USB:	1	C	
Door, emergency button and safety mode switch keys.	1 pair each	C	
User guide hard copy included in the USB.	1	C	
Bioinicia Demo solution – PVOH (100ml)	1	C	

17 Training

Il training è stato fornito al personale ENEA (Dott. Alfonso Pozio) durante l'installazione e test, nei giorni 6-9 febbraio 2023. Sottolineiamo che:

- Su richiesta del cliente, Nanofaber ha accettato di produrre video tutorial per la LE100 in lingua italiana per la consultazione rapida da parte del cliente e la successiva formazione a più dipendenti ENEA, in ottica di continuità con il primo anno.
- Inoltre, Nanofaber rimane a disposizione per svolgere ulteriori training nei prossimi tre mesi, anche attraverso la videoconferenza.
- Un certificato di formazione è stato rilasciato per il Dr. Alfonso Pozio.

17.1 Video Guida

Vengono forniti i seguenti video tutorial in lingua italiana:

- LE100_Contrllro_della_Alimentazione
- LE100_Controllo_Collettori_Rotanti
- LE100_Controllo_degli_Assi
- LE100_Controllo_del_Sistema_Gas
- LE100_Controllo_del_Timer
- LE100_Controllo_del_Voltaggio
- LE100_Controllo_della_ECU

18 ANNESSO 1 – Procedure di misurazione

Alto Voltaggio

- Selezionare SAFE MODE OFF.
- Accendere il multimetro e selezionare la modalità di misurazione della tensione "V".
- Prendere la sonda HV, collegare il connettore "Rosso" alla porta "V" e il connettore "Nero" al connettore "COM".
- Fissare la piccola clip a un bullone o a una parte metallica della struttura della macchina e la sonda rossa al cavo di alimentazione HV che verrà misurato.
- Impostare i diversi valori indicati nella lista di controllo e confrontarli con quelli visualizzati sullo schermo del multimetro.

Pompe per siringhe

- Installare una siringa da 20 ml con un tubo e riempirla con acqua.
- Posizionare la siringa riempita nella pompa che verrà controllata.
- Nella schermata della pompa siringa, impostare i parametri come mostrato nella lista di controllo sopra (Diam 20mm, Rate 240ml/h), in modalità "INFUSE".
- Introdurre il tubo della siringa in un recipiente da 20 ml.
- Preparare un cronometro.

- Avviare la pompa della siringa, avviare il cronometro quando la prima goccia cade nel recipiente e arrestare il cronometro quando il marchio 20ml è stato raggiunto dall'acqua (mantenendo il recipiente in posizione verticale).

Gas Jacket

- Collegare il tubo del Gas Jacket al flussimetro.
- Lasciare aperto il condotto di uscita del flussimetro.
- Impostare la portata specificata nell'elenco di controllo sopra e confrontare il valore impostato con il valore mostrato nella schermata del flussimetro.

Asse X, Y e Z

Posizione

- Posizionare l'"asse X" in posizione home e misurare da una posizione fissa della macchina a un punto dell'asse "X". Questa misura sarà il riferimento.
- Impostare obiettivi diversi e misurare dalla posizione zero alla nuova posizione dell'"asse X".
- La distanza da confrontare con la posizione target del software è la differenza tra il riferimento e la posizione attuale, e deve essere uguale alla posizione target del software $\pm 1\text{mm}$

Velocità

- Impostare un ciclo di movimento, impostando due diverse posizioni e una velocità.
- Preparare un cronometro e misurare il tempo trascorso tra "Pos1" e "Pos2".

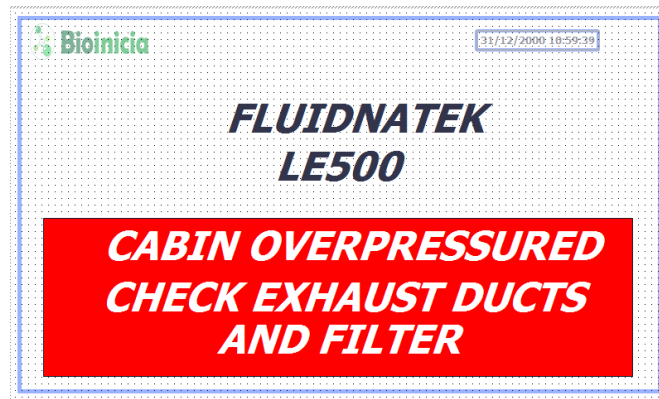
Collettore rotante

- Utilizzare un contagiri calibrato per misurare la velocità di rotazione del collettore.
- Posizionare un adesivo riflettente sul lato destro del collettore.
- Accendere il contagiri, impostarlo in modalità "rpm" e posizionarlo su una posizione stabile, puntando all'adesivo riflettente.
- Senza spostare il contagiri, impostare le velocità specificate nella lista di controllo sopra e confrontare i valori con quelli visualizzati sullo schermo del contagiri (attendere che il valore del tachimetro "rpm" sia stabilito intorno a $\pm 20\text{rpm}$).

19 ANNESSO 2 – Procedura test del grado di vuoto

- Accedere al menu di manutenzione premendo il logo Bioinicia sulla schermata principale della modalità manuale con la modalità di sicurezza in posizione OFF.
- Nella schermata "Scarico" impostare i seguenti valori:
 - Sensore di pressione max. soglia= 85
 - Sensore di pressione min. soglia= 80
 - "Modalità automatica"
- Lo scarico aumenterà automaticamente la ventola SP, cercando di impostare il valore del sensore di pressione CV superiore alla soglia minima.

- Lasciare la macchina in questo stato per 5 minuti, dopodiché l'etichetta di avviso mostrata di seguito dovrebbe apparire sull'HMI. Questo allarme fermerà la macchina. Un riavvio manuale sarà necessario in seguito.
- Terminata la prova, impostare i valori come segue:
 - o Sensore di pressione max. soglia= 55
 - o Sensore di pressione min. soglia= 50
 - o Ventilatore SP=50%
 - o Modalità "Auto"



20 ANNESSO 3 – Costanti di calibrazione

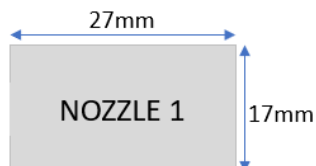
Se la seguente tabella non è riempita, una immagine (s) dei valori delle costanti di calibrazione devono essere prodotte e incluse in/ con questo documento.

ELEMENT	INPUTS		OUTPUTS	
	K	Offset	K	Offset
HV1	462	0.09	464	0.00
HV2	920.00	0.015	920.00	0.00
HV3	461.00	0.07	463.00	0.00
ROT. COLLECTOR	0.2	0.00	6.53	20.00
CFS1 Gas assisted	1000.000	0.000	1000.000	0.000
GAS JACKET	999.00	0.000	997.000	0.000
TEMP	100.00	40.00	0.00	0.00
RH	107.00	0.00	0.00	0.00
AIR FLOW	0.00	0.00	0.00	0.00
R2R	\	\	\	\
EXHAUST	100.00	0.00	100.00	0.00
HEATER	12.75	2.70	0.00	0.00

21 ANNESSO 4 – Etichettatura

Formato dell'etichettatura

Le etichette devono essere rettangolari, con una dimensione di 27mm x 17mm, in colore grigio con lettere nere.



Formato della targa

La targa della macchina deve contenere le seguenti informazioni:

Nome del produttore: Il nome del produttore sarà sempre Bioinicia, S.L.

Modello della macchina: modello della macchina (LE10,50,100, ecc.) e numero di serie della macchina,

Classificazione elettrica: Tensione, corrente, numero di fasi e frequenza dell'alimentazione elettrica.

(Fornito da Bioinicia)

Alimentazione pneumatica: Alimentazione pneumatica necessaria per la macchina, in termini di pressione e flusso d'aria. (Fornito da Bioinicia)

Custodia: grado di protezione NEMA dell'armadio elettrico.

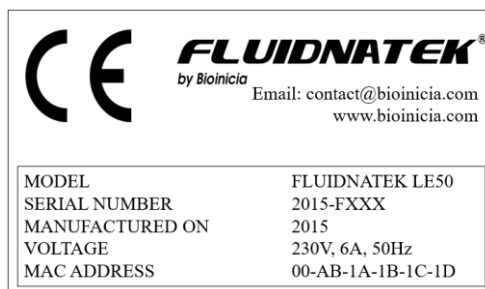
Prodotto il: Mese e anno di produzione: MM/YYYY es: 01/2019

Motore più grande FLA: Corrente consumata dal motore più grande a pieno carico.

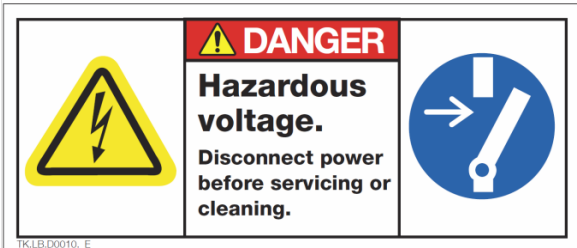
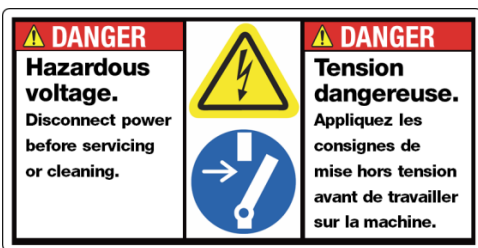
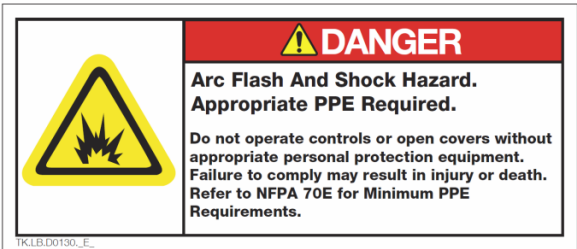
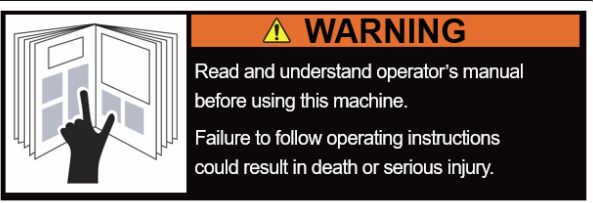
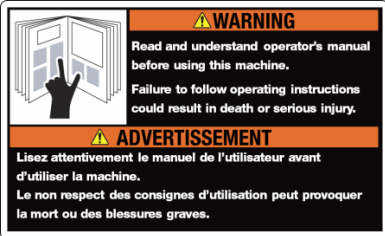
SCCR della macchina: "Short Circuit Current Rating" della macchina, è il livello massimo di cortocircuito che la macchina può sopportare.

SCCR del dispositivo di protezione: "Short Circuit Current Rating" del dispositivo di protezione, è il livello massimo di cortocircuito che il dispositivo di protezione principale può sopportare.

Indirizzo MAC: indirizzo MAC del router VPN.



Etichettatura di avvertenza

<u>Tensione pericolosa. Dovrebbe essere posizionato oltre all'interruttore di disconnessione del circuito principale.</u>	
USA/EU Size: Width 16,0 cm X Height 8 cm	CANADA Size: Width 16,0 cm X Height 9,86 cm
 TK.LB.D0010_E	
<u>Flash ad arco e pericolo di urti. Dovrebbe essere posizionato su entrambi i pannelli laterali della macchina.</u>	
USA/EU Size: Width 16,0 cm X Height 8 cm	CANADA Size: Width 16,0 cm X Height 9,86 cm
 TK.LB.D0130_E	
<u>Leggere il manuale dell'operatore. Deve essere posizionato nella parte anteriore della macchina, oltre ai pulsanti</u>	
USA/EU Size: Width 16,0 cm X Height 6 cm	CANADA Size: Width 16,0 cm X Height 9,86 cm
	
<u>Sovracorrente, cortocircuito e protezione da guasti di terra. Dovrebbe essere posizionato alla porta dell'armadio elettrico.</u>	
USA/EU Size: Width 18,43 cm X Height 10.5 cm	CANADA Size: Width 18,43 cm X Height 21 cm

Tensione pericolosa. Dovrebbe essere posizionato oltre all'interruttore di disconnessione del circuito principale.

⚠ WARNING

To maintain overcurrent, short-circuit, and ground-fault protection, the manufacturer's instructions for selection of overload and short circuit protection must be followed to reduce the risk of fire or electric shock.

If an overload or a fault current interruption occurs, circuits must be checked to determine the cause of the interruption.

If a fault condition exists, the current-carrying components should be examined and replaced if damaged, and the integral current sensors must be replaced to reduce the risk of fire or electric shock.

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⚠ ADVERTISSEMENT

Pour maintenir la protection de surintensité, de court-circuit et de défaut de la terre protection, les instructions du fabricant sur le choix de la protection de surcharge et de court-circuit devraient être suivies pour le risque du feu et de décharge électrique.

Si une surcharge ou une interruption de courant de défaut se produit, des circuits doivent être vérifiés pour déterminer la cause de l'interruption.

Si une condition de panne existe, les composants portant la courant de défaut devraient être examinés et remplacés si endommagés, et les dispositifs de mesure de courant intégrales doivent être remplacés pour réduire le risque du feu ou de décharge électrique.

22 ANNESSO 5 – Imballaggio

- LE100 deve essere pulita. Tutti i componenti all'interno/all'esterno della macchina devono essere puliti da polvere o residui di produzione.
- Tutti i componenti che non sono installati e fissati all'interno della camera di elettrofilatura devono essere smontati (se possibile) e conservati in scatole indipendenti e posizionati all'esterno della camera di elettrofilatura in modo che non si muovano causando danni ai pannelli o ad altri componenti o scatole nelle vicinanze.
- Collettore rotante: montato sulla piattaforma rotante del collettore, fissato su una posizione ed avvolto con film protettivo, tutti i terminali del cavo ed i collegamenti che non sono collegati dentro DEVONO essere protetti e riparati per evitare danni o graffi su tutto il collettore, vetro o pannello qui vicino.
- Porta-eiettori: imballato all'interno di una scatola indipendente, protetto da eventuali graffi o danni dovuti al trasporto.
- Valigetta Bioinicia: protetta da qualsiasi graffio o danno, posizionata all'esterno sul lato destro della macchina con le altre scatole.
- Recipienti: legati alla piattaforma dei supporti, se presente, per evitare movimenti. Se non è inclusa alcuna piattaforma, conservate in una scatola indipendente.
- HMI: Avvolto con il film protettivo con i cavi staccati, materiale protettivo fra HMI e la macchina, nessun contatto diretto fra i pannelli della macchina.
- Tutte le estremità dei cavi sono imballate e protette per evitare graffi su qualsiasi superficie.
- Tutti gli accessori gratuiti come flange ECU, collettori gratuiti (tamburo sottile, disco, fantasia, ecc.) devono essere avvolti con pellicola protettiva e conservati all'interno di una scatola, posizionati all'esterno della camera.
- Tutte le scatole devono essere etichettate con il logo Fluidnatek su un lato della scatola.
- Una volta che l'imballaggio è finito, le immagini dello stato dell'imballaggio devono essere prese.
- Tutte le cassette devono essere fissate all'esterno della camera per evitare movimenti durante il trasporto.