General Catalog 2018

Where
Innovative Technology
Begins

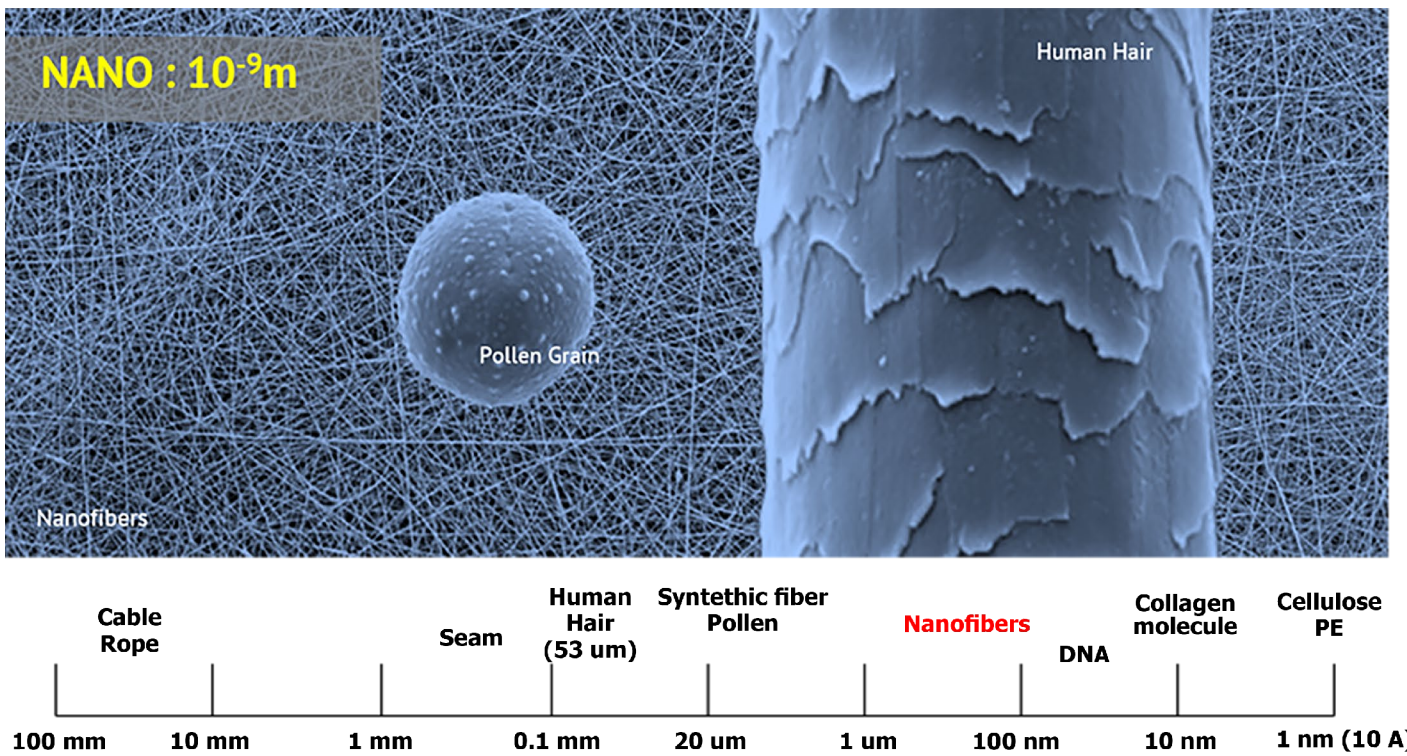
FNM co.

Electrospinning and
Nanofiber Company

Introduction to the Electrospinning Process

Electrospinning is a manufacturing technique involving electrostatic driven process used to create electrospun fibers. The diameter of these fibers typically ranges between tens of nanometers to a few micrometers. One of the main advantages of the electrospinning technique is its versatility of processing to create fibers with multiple arrangements and morphological structures. The popularity of the electrospinning technique has allowed multiple technologies such as new filters, tissue engineering, regenerative medicine, and encapsulation of bioactive molecules, to emerge and evolve over the past decade.

These days the electrospinning technique is not just for academic research, but one with real commercial applications. Currently, multiple industries around the world have adopted this technique in the development of new product innovations. Some of the applications where electrospinning is being currently used are tissue engineering, drug delivery, food encapsulation, insulating materials, energy conversion and storage, air and water filtration, among others.



Certificates & Awards

- ISO 9001; ISO 10002; ISO 14001; ISO 18001 and CE.
- VTT, DMT approved (air filtration tests)
- Nano scale certificates from INIC (Iran Nanotechnology Initiative Council)
- Ranked eighth in International Nanotechnology Festival-Tehran (2009).
- Award for research project at the Festival of Science to Practice (December 2010)
- Third laureate R&D 25th Khwarazmi international Award, 5th Feb 2012 Tehran, Iran.
- Academy of science award in developing countries (TWAS); UNESCO, 2012
- Second rank in Technology at 6th National Nano-Awards Festival, October, 2011, Tehran, Iran.
- First laureate nano products award at 11th National Nano-Awards Festival, October, 2016, Tehran, Iran.
- Award for high tech export at 12th National Nano-Awards Festival, October, 2017, Tehran, Iran.

About us

Fanavaran Nano-Meghyas (Fnm co. Ltd.;) was founded in 2004, is a knowledge based company and its goals are the development of nanofibers technology and its applications. FNM's products and services are design and production of electrospinning machines in lab, pilot and industrial scales as well as melt, force and blown electrospinning systems, with various accessories (High Voltage power supplies, Syringe Pumps and collectors), with focus on producing of respiratory face mask, power plant and automotive air and oil filters, window screen, vacuum cleaner bags, cosmetic face masks, wound dressing and etc. based on electrospun nanofibers.

FNM's lab-scale electrospinning machines are excellent for research and development of several kinds of ceramic, polymer, composites nanofibers. These machines have reasonable and competitive price with high quality and FNM has exported this machines to some countries. FNM's large scale electrospinning machines can be used in coating of filters papers by a layer of polymeric nanofibers. A thin layer of nanofibers increase the filtration efficiency, filter life-time and dust holding capacity without significant increasing the pressure drop. The produced nanofilters by this large scale machine are useful in car filters, power plants filters, respiratory face masks, etc. The produced nanofilters passed required tests and standards and got needed certificates from some institute such as VTT (Finland) and DMT (Germany). Additionally, FNM is going to develop many kinds of technologies related to nanofibers including ceramic nanofibers, composite nanofibers, scaffold nanofibers and core-shell nanofibers. we are also producing capillary electrophoresis which has a lot of applications in separation and detections of protein, DNA and nanoparticles, etc.

Our company's R&D department is equipped with the following apparatus: Scanning Electron Microscope (SEM), All types of electrospinning machines in lab and pilot-scale, ultrasonic homogenizer, and some filter test equipment.

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High Voltage Power Supply

High voltage power supplies (HVPSs), manufactured by Fanavaran Nano-Meghyas Co. Ltd. (FNM Co.) offer small and lightweight packages, making them suitable for demanding laboratory and OEM applications such as capacitor testing, free-electron laser, ion implantation, physical vapor deposition, capillary electrophoresis, electrospinning, ion-beam assisted deposition, and ion sources. These supplies also feature a 1000:1 voltage monitor, scaled to match most common handheld voltmeters. The capacitors are fully embedded in solid resin for protection.

FNM HVPSs series

D-RC Series	OC Series	OV Series
HV35P D-RC	HV35P OC	HV35P OV
HV50P D-RC	HV50P OC	HV50P OV
HV35N D-RC	HV35N OC	HV35N OV
HV50N D-RC	HV50N OC	HV50N OV

HV35P OC: High Voltage 35kV, Positive, OC series

OV Series only have output voltage indicator (Accuracy = 0.1 kV).

OC series have output voltage indicator (Accuracy = 0.1 kV) and output current display (Accuracy = 1 micro-amp).

D-RC Series have a standard USB connector for digital remote control via windows Operating System with 10 bit resolution which means that 50kV (max) would be divided into 1024 segments. In this case, 50,000/1024 which is approximately 50V per bit.

Typical Applications

- Electrospinning
- Capillary electrophoresis
- Capacitor testing
- CRT display testing
- Free-electron lasers
- Photomultipliers
- Ion sources
- Biasing
- Dielectric Testing
- Piezoelectric Drivers
- Electrostatic Chucks
- Sealing Applications
- Inkjet Printers
- Photo Detectors

Features:

High Frequency Switch-Mode Circuit Design: HVPS design topologies are based upon switch mode power conversion technology, while operating at high frequencies. The "switcher" is the design of choice for many industrial and medical applications because of its desirable combination of high efficiency, small size, and low weight as well as increased safety for high voltages supplies.

Arc Sensing Circuitry (Optional): Proprietary arc sensing circuitry will suppress arcing conditions that can occur regularly in high voltage applications and provide maximum safety and protection for both the power supply and user.

Software: The DRC Series High Voltage Power Supply includes, control software and accessories, providing all the connectivity needed right out of the box. After the control software has been installed on a Windows compatible computer, the DRC HV unit is "plug and play". The user enters the desired output voltage and clicks the Start button. The power supply is activated and continuous read-back of the high voltage is displayed. The USB interface is accessed by a Windows USB driver through a standard communications port.

Specifications:

Weight: about 5 kg (35 and 50 kV) and 7 kg (more than 50 kV)
Output: Continuous, stable adjustment, from 0 to the desirable voltage by panel-mounted 10-turn potentiometer (OC and OV series) or by a digital volume (DRC Series).
Dimensions: OC and OV: 34×38×12 cm, D-RC: 34×43×12 cm

Input: 100-240 V AC, single-phase
Power: 35 Watt
Working Temperature: -5 to +45 °C
Voltage Monitoring: Accuracy: 0.1 kV
Current Monitoring (OC and DRC series): Accuracy: 1 µA
Arc detector: in DRC series
Polarity: Available either positive or negative
Warranty: 1 year for manufacturing defects

DRC Series

OV Series

OC Series

Syringe Pump

FNM syringe pumps are designed as a low-cost unit, capable of holding 2 or 10 syringes of any make from 10µl to 60ml. These syringe pumps are ideal for delivering accurate and precise amounts of fluids for a multitude of syringe pump applications including electrospinning, infusing calibration into a mass spectrometer or reaction chamber, long term drug infusion to animals and general infusion applications.

SP110 Series

SP102 Series

SP204 Series

Features:

- Bright Display and Easy-To-Use Interface
- Continuous flow of stream
- Injection capability in microliter (µl) scale
- Nonvolatile Memory
- Programmable (HPM and HSM series)
- Windows based Software (HSM series)
- Appropriate for high viscose substances (more than 5 bars: HSH series)
- Alarm as soon as the desired injection is completed (in HPM and HSM series)
- Dual pump is available (200 series)
- Autofill capability (HPM and HSM series); electric valve is optional
- Infuse/refuse capability (HPM and HSM series)

Software Description (windows platform)

The programming functions of HSM series provide powerful capabilities for advanced experiments. While in program mode, the pump could perform the following tasks at a predetermined time or when prompted by a signal from an external device:

- Start or stop pumping (injection)
- Change pumping (injection) direction (infuse-withdraw)
- Change flow rates
- Pump (Inject) a precise volume and stop
- Ramp up or down flow rates
- Inject in a desired formula

In the "Program" mode, the above-mentioned tasks could be linked together into powerful programs to simplify your automation projects. (commands are available)

SP Series	HOM	HPM	HSM	HSH
Internal Programming	-	✓	✓	✓
Computer Control	-	-	✓	✓
Autofill	-	✓	✓	✓
High Pressure	-	-	-	✓

Model	SP102	SP110	SP204	SP301
No. of Mechanical mechanism	1	1	2	1
Max. Syringe No.	2	10	2 + 2	1
Big Cylinder	-	-	-	✓

FNM Syringe Pump nomenclature:

SPXYY ABC

X: 1: one Mechanical system, **2:** Two Mechanical system, **3:** one big mechanical system
YY: Max. Syringe lines.**(1, 2, 4 or 10)**
A: M: Medium precision **H:** High precision
B: O: not programmable; **P:** Internal programmable; **S:** Software and Internal programmable
C: M: Medium pressure **H:** High pressure

Example:

SP204 HSH ➔ Syringe Pump, 2 motors, maximum 4 syringes, High precision, Software, High pressure
SP110 HPM ➔ Syringe Pump, 1 motor, maximum 10 syringes, High precision, Programmable, Medium pressure
SP301 HSM ➔ Syringe Pump, 1 motor, maximum 1 big syringe, High precision, Software, Medium pressure

Specifications:

Input Power: 100-240V AC, 50-60 Hz.
Number of Syringe: Up to 2 (SP102 series) / Up to 10 (SP110 series)
Display: 4 lines, 20 character LCD display
Nonvolatile Memory: Stores syringe inner diameter, rate, target volume, programs and settings
Syringe Type: Plastic, metal or glass
Minimum Flow Rate: 1 µl/hr using a 10µl syringe (barrel diameter: 1 mm)
Maximum Flow Rate: 5968 ml/hr using a 60 ml syringe (barrel diameter: 29 mm)
Pedal resolution per step: 10 nm
Linear Force (Max): 17 kg (in M series); 25 kg (in H series); measured at the 120 ml/hr injection rate
Drive Motor: 1.8° Stepper Motor
Motor Drive Control: Microprocessor with 1/128 micro stepping
Number of Micro steps per one rev. of Lead Screw: 25600
Step Resolution: 0.049 µm/µstep
Pusher Travel Rate: Minimum: 0.25 µm/min; Maximum: 152 mm/min
Connectors: USB (S Series)
Operating Temperature: 0 – 45 °C
Storage Temperature: 0 – 45 °C
Method of Operation: Continuous
Dimension: SP102: 24 × 26 × 20 cm, SP110: 24× 34 × 20 cm, SP204: 30 × 30 ×22 cm
Weight: SP102: 4 kg, SP110: 5.8 kg, SP204: 9.2 kg
Warranty: 1 year

Typical Applications:

- Cell injection
- Controlled drug injection
- Electrospinning
- Controlled reactive injection into the reactor
- Lab on a chip

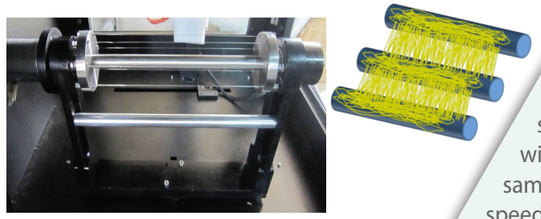
Electrospinning Accessories

Rotating Drum Collector

In electrospinning, rotating collector is used to produce a uniform nanofibrous mat. This collection module consists of the rotating drum with a rotation speed control and display unit. Using this type of collector, randomly/oriented nanofibers are deposited onto the surface of the drum.

Disk Collector

Using this collector, nanofibrous threads or highly aligned nanofibers could be formed. Furthermore, the effect of linear speed on the fiber formation could be studied.

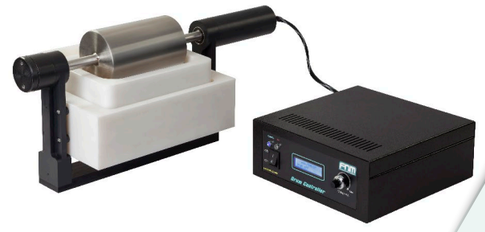


Rotating Wire Collector

The rotating wire collector is used to produce highly aligned nanofibers. It is composed of thin stainless-steel wires arranged at the same distance from the axis of the rotation. When the collector is rotating at very low speeds, fibers are also deposited between the conductive wires. The principle for the formation of aligned fibers is the same as in the case of the static patterned collector. At higher speeds, electrostatic and mechanical forces are combined, increasing the degree of alignment of the individual fibers. To achieve very good fiber alignment, the collector speeds could be much lower than those of the rotating drum collector.

Mandrel Collectors

Mandrel collector is a device to make tubular nanofibrous samples. The mandrel collector contains a stage, controller and a set of changeable mandrel collectors. The rotating mandrel collector could be used either as a stand-alone collector or could be integrated into lab-scale electrospinning machine. Six mandrels with the diameters of 2, 4, 6, 8 and 10 mm are included in this product.

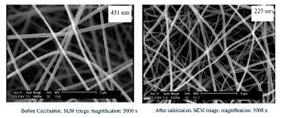


Wet Collector

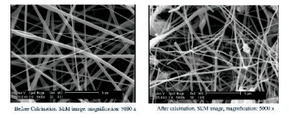
Wet collector is designed for electrospinning of polymers which could not be dissolved in normal solvents. A typical example of these types of collectors is cellulose. Common solvent for cellulose is liquid crystals which do not evaporate during jet traveling. So instead of evaporation, coagulation mechanism is used to produce nanofibers from the electrospinning jet. For this purpose, a solution bath is used with the rotating drum to solidify the jet and get the final fibers.

Specifications*					
Collector type	Drum Collector	Disk Collector	Wet Collector	Wire Collector	Mandrel Collector
Application	Producing uniform nanofibrous mat	Producing parallel (aligned) fibers/ fibrous threads	Wet electrospinning of polymers such as cellulose	Producing parallel (aligned) fibers	Producing nanofibrous tubular structures (artificial vessel, etc.)
Input power	100-240 VAC; 50-60 Hz				
Rotation speed	Up to 3000 rpm	Up to 3000 rpm	Up to 50 rpm	Up to 2500 rpm	Up to 2500 rpm
Length of collector	30 cm	N/A	16 cm	25 cm	20 cm
Collector diameter	8 cm	19.8 cm	10 cm	8 cm	2, 4, 6, 8 and 10 mm
Speed control	10-turn potentiometer				
Display	2 ×16 character LCD				

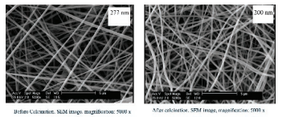
Inorganic and Organic Nanofibers



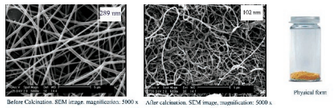
AL_2O_3 Nanofibers



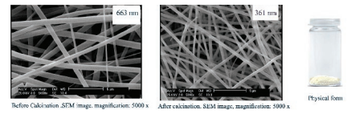
TiO_2 Nanofibers



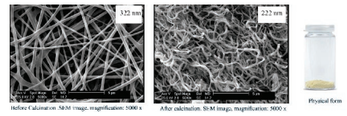
SiO_2 Nanofibers



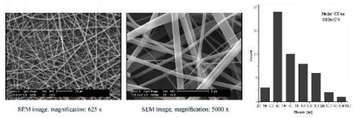
Fe_2O_3 Nanofibers



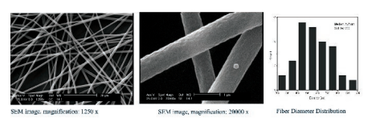
ZrO_2 Nanofibers



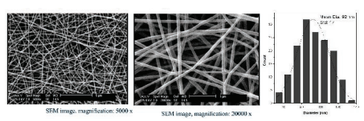
CeO_2 Nanofibers



Polyvinylpyrrolidone (PVP) Nanofibers



Poly (lactic acid) (PLA) Nanofibers



Poly (ε-caprolactone) (PCL) Nanofibers

Lab-Scale Electrospinning Machine (Electroris)

Electroris® is a lab-scale electrospinning machine to prepare polymeric/carbon/ceramic nanofibers with diameter range of 50 nm to a few microns. The machine mainly consists of metallic body, syringe pump, spinneret system, collector system and high voltage power supply.
Two different types of Electroris are available: Standard and dual pump model (Side by Side Electroris).
In side by side Electrospinning system, there are two syringe pumps on both sides of the rotating collector drum, making the system to consist of 2 syringe pumps, 2 scan systems, 2 distance adjusters and 2 high voltage power supplies. In these systems two different materials could be electrospun simultaneously. Furthermore, the system makes it possible to electrospin polymeric material from one side and additive materials, such as medications, from the opposite side, producing composite nanofibers containing desired components. Therefore, it is suitable for pharmaceutical, medicinal and biological. applications.
This machine employs a touch screen panel for controlling electrospinning parameters. Electroris® provides excellent safety schemes for the users with respect to the handling of high voltage power supply and chemical solvents.

Main Features

- Advanced safety features
- Reliable performance
- Modular design
- 4.3" touch screen HMI panel for controlling process parameters
- Emergency button to stop machine in any unexpected situation
- Easy use and maintenance
- Dual syringe pump model is available
- Core-Shell nonofibers can be produced by coaxial nozzle.

General

Chassis: Metallic body with 3 doors for easy access
Input power: 100-240 V AC/50-60 Hz
Ventilation: A programmable fan adjustable by HMI panel
Heating system: Adjustable from room temperature up to 45°C via HMI panel
Heater: 1000W, 4A
Safety: Voltage cut-off in case of door opening, grounding problem, or process disruption
Dimensions (L×W×H): Standard: 88 × 76 × 87 cm;
Dual pump: 131 × 80 × 96 cm
Weight: Standard: 100 kg; Dual pump: 140 kg

Spinneret

Number of syringes: Standard: 1 or 2; Dual pump: Up to 4 syringes
Configuration: Horizontal (No need for hose)
Scanning rate: 0-30 mm/s
Scanning range: 0-30 cm
Syringe pump injection rate: 10 µl/h to 500 ml/h
Usable syringe size: 1-25 mm (Inner Diameter)
Accessories (Optional): Co-axial nozzle with tube

Dual pump series:

- 2 syringe pumps (Up to 4 syringes can be used)
- 2 scan systems
- 2 distance adjuster

Collector

Type: Rotating drum (wire, cylinder, mandrel and disk collectors are optional)
Material: Stainless steel
Rotation speed: 300-3000 RPM
Spinning distance: 5-20 cm
Size:
Drum: 8(ø) cm × 30(L) cm
Plate: 25(L) cm × 20(W) cm
Wire (Optional): 8(ø) cm × 25(L) cm
Disk (Optional): Diameter: 19.8 cm
Mandrel (Optional): Length: 25 cm; Diameter: 2, 4, 6, 8 and 10 mm

Attachable to negative high voltage power supply up to -20 kV (Optional)

High voltage power supply

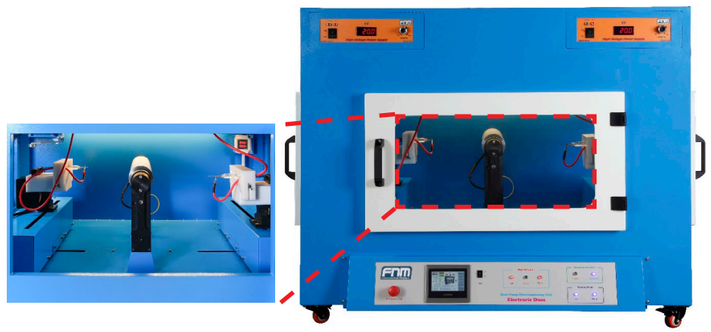
Model: HV35P OV
Max. output voltage: 35 kV
Power: 35 watt
Voltage monitoring: Digital, Accuracy: 0.1 kV
Body: Durable metal casing
Two high voltage power supplies are installed for dual pump series

Control

Type: PLC
HMI: 4.3" touch screen
Control:

- Start and end position of the nozzle(s)
- Injection rate of syringe pump(s)
- Electrospinning distance(s)
- Electrospinning time
- ON/OFF timer for exhaust fan
- Drum ON/OFF switch (RPM controller) in standard series, and RPM control from HMI in dual pump series
- Temperature control
- Humidity indicator (dual pump series)
- Alarm after desirable volume of injection and after finishing the solution in syringe (after the operation of syringe pump switch)

Single pump electrospinning machine



Dual pump electrospinning machine

Industrial Electrospinning Machine

Pilot-scale Electrospinning Machine (Electroris-Pilot)

Pilot-scale Electrospinning Unit (Electroris-Pilot)

FNM Pilot-Electroris machine (NFL60R), which has 1 electrospinning unit, is a polymeric/ceramic nanofibers producer machine in pilot (semi-industrial) scale for various applications. In pilot-electroris, the electrospinning parameters and conditions such as spinneret and collector parameters, working distance, linear movement speed of the used substrate, working temperature, operation time, and the value of applied high voltages (positive and negative) could be controlled using an HMI control panel. The machine offers excellent safety for users with respect to the handling of high voltage power supplies and chemical solvents.
The pilot electrospinning machine has been designed and built to coat various substrates. Applying high voltage to the solution forms hundreds of polymer jets to the collector that is located on top of the spinneret. Finally, a layer of nanofibers forms on the collector.
Using this machine, nanofibers could be deposited on different substrates in pilot scale. Nanofiber coating rate on different substrates is about 1 - 100 m/h using this machine.

Pilot-Electroris with a winder roll (NFL60R)

Specification

Flexibility

- Various polymers and composites have the potential to be electrospun.
- Different product specifications such as porosity, morphology, diameter, and ability to load beads can be obtained.
- The process is easy and economical.
- Different polymer types such as synthetic, biodegradable and natural polymers and/or polymer/composite may be processed.

Easy operations and convenient functions:

- Electrospinning parameters could be fully controlled through a user-friendly HMI control panel.

Nanofiber diameters:

- 60 to 500 nm

Systems, control systems and panels:

- PLC system for controlling operating conditions
- Touch Screen interface (HMI)
- Using both positive and negative high voltage power supplies to obtain optimum electrospinning conditions
- Blown system:
  - Control the air pressure
- Scan system:
  - Control the scan speed
  - Control the start and end position of the spinnerets
- Control the temperature of the electrospinning Chamber

Indicating the humidity of the chamber (control is optional)

- Advanced high voltage control systems
- Emergency stop button
- easy-to-use

Input power

- 220 volts, single phase, 50-60 Hz

Power consumption:

- Heater System: maximum 3 kW
- Control and HVPS: maximum 0.7 kW

High voltage:

- Totally 80 kV DC
  - 0-40 kV DC, positive polarity, precisely adjustable
  - 0-40 kV DC, negative polarity, precisely adjustable
- Digital voltage monitoring and control (accuracy: 0.1 kV)
- HMI control system
- HV current limit to minimize the risks

Collector:

- Stainless steel plate (static collection of fibers) or rotating drum (coating a desired substrate)
- Working distance: 5 - 17 cm
- Rotating speed: 0 - 50 RPM (Synced by substrate speed)
- Diameter: 17 cm

Ventilation and heating

- Removing solvent from the chamber by a ventilation fan with a scheduled operation time
- Room temperature up to 45 °C

Substrate winder

- Servo motor control system
- Substrate speed: 1 to 100 m/h
- Maximum substrate width: 60 cm
- Analogue Tension control (Digital control is optional)

Case

- 7 doors for easy access to all parts of the system

Dimensions

- Length: 342 cm
- Width: 174 cm
- Height: 234 cm

Weight

- About 1000 kg

Pilot-Electroris with a winder roll (NFL60R)

Industrial Nanofiber Production Line (INFL)

FNM Industrial Nanofiber Production Line (INFL) is a polymeric/ceramic nanofibers producer machine in industrial scale for various applications. INFL uses 1 to 8 electrospinning units, based on the customer requirement.

In the industrial production line, the electrospinning parameters and conditions such as spinneret and collector parameters, working distance, linear movement speed of the used substrate, working temperature and operation time could be controlled using an integrated advanced control system. The machine offers excellent safety for users with respect to the handling of high voltage power supplies and chemical solvents.

Using this production line, nanofibers could be deposited on different substrates in industrial scale. INFL is widely used for producing nano-filters and nano-respiratory facemasks. Depending on the number of electrospinning units, nanofiber coating rate will be about 50-800 square meters per hour.

INFL8100

FNM INFL nomenclature:

INFLXYYY

X: Number of electrospinning units (1, 2, 4, 6 or 8)

YYY: Maximum electrospinning width (60 cm, 100 cm or 160 cm)

INFL4100: Industrial Nanofiber Production Line, 4 units, width: 100 cm

INFL6160: Industrial Nanofiber Production Line, 6 units, width: 160 cm

INFL160: Industrial Nanofiber Production Line, 1 unit, width: 60 cm

Specification

Flexibility

- Various polymers and composites have the potential to be electrospun.
- High output in compare with ordinary needle and needle-less electrospinning machines
- Different product specifications such as porosity, morphology, diameter, and ability to load beads can be obtained.
- The process is easy and economical.
- Different polymer types such as synthetic, biodegradable and natural polymers and/or polymer/composite may be processed.

Easy operations and convenient functions:

- Electrospinning parameters could be fully controlled through a user-friendly HMI panel.

Nanofiber diameters:

- 60 to 500 nm

Systems, control systems and panels:

- PLC system for controlling operating conditions
- Two 10˝ Human Machine Interfaces (HMI)
- Independent control of electrospinning parameters for each spinning unit
- Using both positive and negative high voltage power supplies to obtain optimum electrospinning condition
- Blown system:
  - Control the air pressure
- Scan system:
  - Control the scan speed
  - Control the start and end position of the spinnerets
- Control the temperature of the electrospining chamber
- Indicating the humidity of the chamber (control is optional)
- Advanced digital high voltage control systems
- Emergency stop button
- easy-to-use

Input power

- 380 volts, three phases, 50-60 Hz

Power consumption:

- Heater System: maximum 2.25 kW
- Dryer: maximum 2.25 kW
- Control and HVPS: maximum 3 kW

High voltage:

- 0-40 kV DC, positive polarity, precisely adjustable
- 0-40 kV DC, negative polarity, precisely adjustable
- Digital voltage monitoring and control (accuracy: 0.1 kV)
- Independent positive and negative voltage control of each unit
- HMI control system
- HV current limit to minimize the risks

Electrospinning Units

- 1 (INFL160), 4 (INFL 4100), 6 (INFL 6100) and 8 units (INFL 8100)

Collector:

- Stainless steel plate (static collection of fibers) or rotating drum (coating a desired substrate)
- Working distance: 5-17 cm
- Rotating speed: 0-50 RPM (Synced by substrate speed)
- Diameter: 17 cm

Heating system

- Room temperature up to 45 °C

Ventilation

- Removing solvent from the chamber by a ventilation fan with a scheduled operation time

Dryer system:

- Substrate dryer chamber with temperature control

Substrate winder

- Servo motor control system
- Substrate speed: 10 to 800 m/h
- Maximum substrate width: 60, 100 or 160 cm (depending on the model)
- Edge control system
  - Tension control system
  - Substrate cutting section (Optional)

Case

- 6 doors for easy access to all parts of the system

Dimension

- Length: 300 - 800 cm
- Height: 220 - 250 cm
- Width: 210 - 230 cm

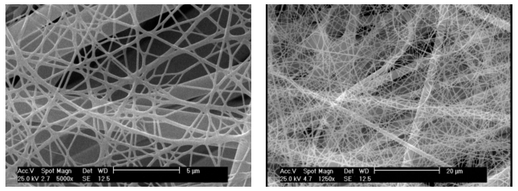
Weight

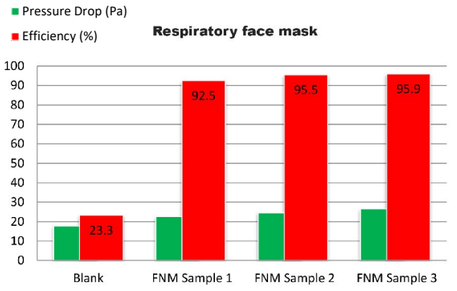
- Depends on the model and the number of electrospinning units (a machine with 6 electrospinning units: about 4500 kg)

INFL160

We design and produce in order to support you

Nanofibers coated on a substrate





Over 14 years of know how in design and production

High level technical consulting
Cross competences in several industrial sectors for an effective problem-solving

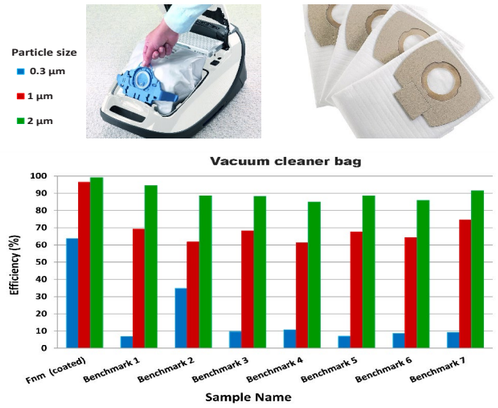
Values

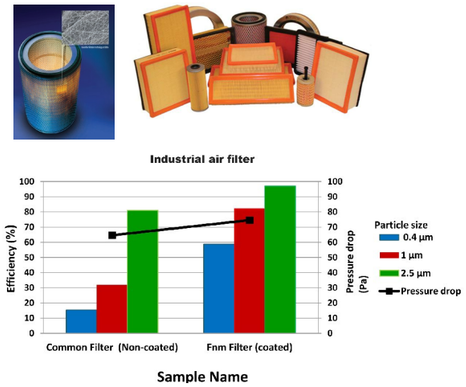
Collaboration

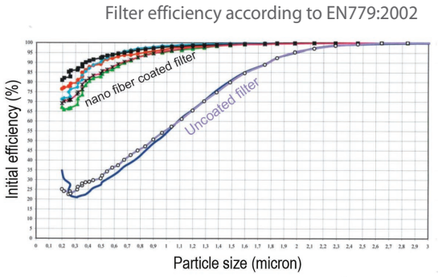
Solutions

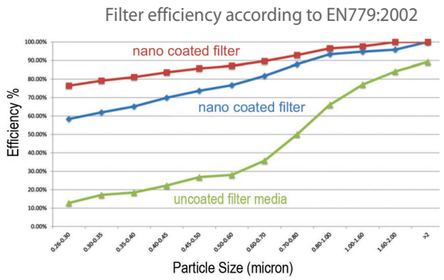
Applications

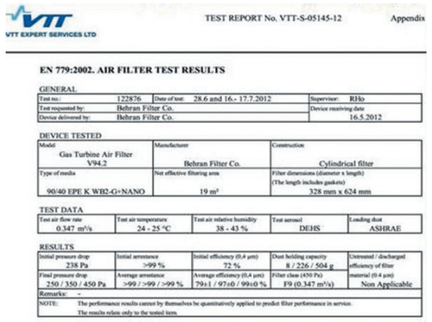
From a full range of standard products to fit-to-customer solution for best performance











VTT EXPERT SERVICES LTD

TEST REPORT No. VTT-S-05145-12 Appendix

EN 779:2002. AIR FILTER TEST RESULTS

GENERAL

Test no.:	122876	Date of test:	28.6 and 16.- 17.7.2012	Supervisor:	RHo
Test requested by:	Behran Filter Co.			Device receiving date	
Device delivered by:	Behran Filter Co.			16.5.2012	

DEVICE TESTED

Model	Manufacturer	Construction
Gas Turbine Air Filter V94.2	Behran Filter Co.	Cylindrical filter
Type of media	Net effective filtering area	Filter dimensions (diameter x length) (The length includes gaskets)
90/40 EPE K WB2-G+NANO	19 m²	328 mm x 624 mm

TEST DATA

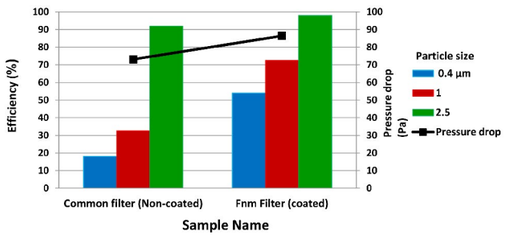
Test air flow rate	Test air temperature	Test air relative humidity	Test aerosol	Loading dust
0.347 m³/s	24 - 25 °C	38 - 43 %	DEHS	ASHRAE

RESULTS

Initial pressure drop	Initial arrestance	Initial efficiency (0.4 µm)	Dust holding capacity	Untreated / discharged efficiency of filter
238 Pa	>99 %	72 %	8 / 226 / 504 g	material (0.4 µm)
Final pressure drop	Average arrestance	Average efficiency (0.4 µm)	Filter class (450 Pa)	
250 / 350 / 450 Pa	>99 / >99 / >99 %	79±1 / 97±0 / 99±0 %	I9 (0.347 m³/s)	Non Applicable

Remarks: -

NOTE: The performance results cannot by themselves be quantitatively applied to predict filter performance in service. The results relate only to the tested item.



Capillary electrophoresis

Capillary electrophoresis (CE) is a separation and analytical method of which the differential migration rates of sample components is caused by an applied electrical field within a capillary, small-diameter polyimide coated fused silica capillary tube usually. “On-column” UV spectrometric or fluorescence analysis is usually used for detection of sample components through a “window” in the capillary. CE is a powerful technique having a wide range of applications including; analysis of proteins, peptides, chiral compounds, pharmaceuticals, inorganic ions, and specially sizing and characterization of nanomaterials.

Fnm’s Capillary electrophoresis (CE) is designed based on its minimal sample and solvent requirements, rapid analysis time and high efficiency and resolution useful in many laboratories. It covers a broad range of applications in a wide variety of industries. Some of its main application fields include: i) food analysis, ii) pharmaceutical analysis, iii) bioanalysis, iv) environmental pollutants analysis, and v) nanomaterial analysis.

Principle of operation

Capillary electrophoresis (CE) is a family of related separation techniques that use narrow-bore fused silica capillaries to separate a complex array of large and small molecules.

High voltages are used to separate molecules based on differences in charge, size and hydrophobicity.

Injection into the capillary is accomplished by immersing the end of the capillary into a sample vial and applying pressure, or voltage. Separated solutes are quantitatively detected at the capillary outlet by high sensitive optical system based on UV-Vis absorbance.

Features and Benefits

- High separation efficiency
- Short analysis time
- Low sample and electrolyte consumption
- Low waste generation
- User friendly Software: Complete control of the instrument from a PC

Powerful software package

- Increased flexibility in performing analyses of various complexity
- Any kind of complex runs are possible including those with pre-programming of changes in analysis conditions
- Customized report, data export to other programs

Extended instrumental options

- Spectra scanning facilitates peak identification
- Broad range of controlled pressure injection permits analysis of viscous samples

Analytical characteristics

Power voltage range

- Adjustable 1 to 20 kV high voltage power supply
- Operation under constant voltage
- Show current (µA)

Autosampler

- A 16-position carousel.
- All vials are randomly accessible from electrodes end of capillary.

Detectors

- CE 1000 is equipped with variable wavelength UV-detector
- Wavelength range 200 - 1100 nm.

Light source

- Halogen lamp (Visible and near IR)
- Deuterium lamp (UV light)

Vials

- Standard 1.5 ml
- Minimum sample volume 500 µl.

Injection modes

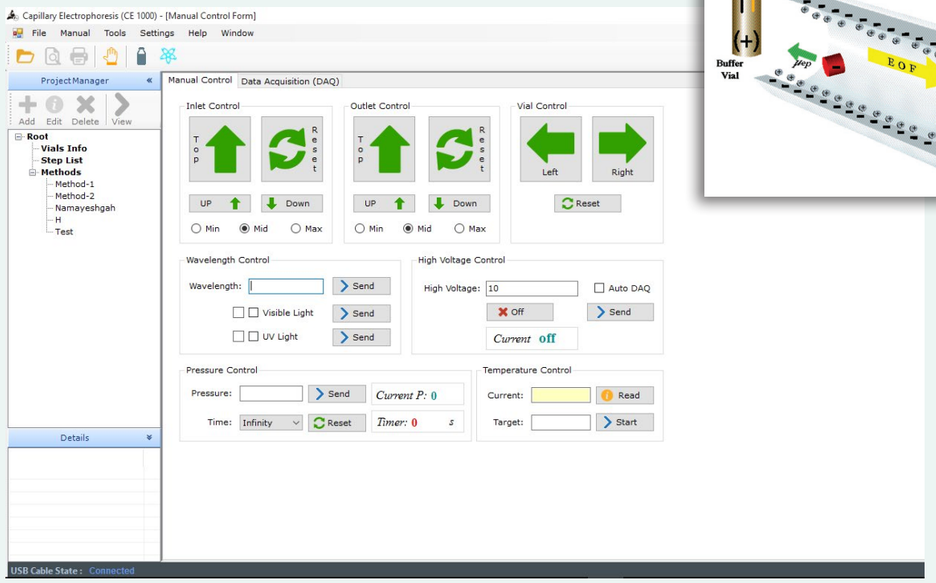
- Controlled pressure profile injection with variable peak pressure, programmable peak pressure range being 20 - 100 mbar
- Electrokinetic (1-5kV)
- Programmable injection time

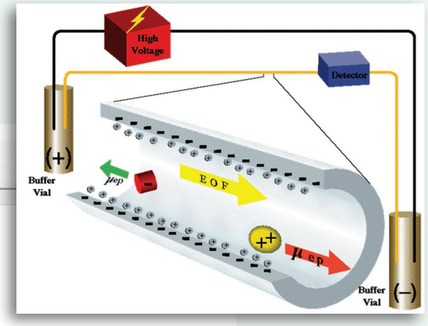
Pressure system

- Programmable with 20-100 mbar for injection, washing and flushing with maximum 1 bar.

Analysis

- Voltage range settable from 1 to 20 kV
- Current from 0 to 500 µA





Software features

- Real time electropherogram visualization
- electropherogram data processing
- Computation of electrophoresis system parameters
- Customized report output (hard copy and file), data exchanges with worksheets, databases and word processors
- Wave scan

Safety features

Disabling high voltage function:

- Over current limit
- Earth detection system
- Arc detection system
- Safety sensors at cover

Areas of application

- Food analysis
- Environmental pollutants analysis
- Chemical industry
- Pharmaceutical analysis
- Bioanalysis

Patents and Certificates

For more information, visit our website at

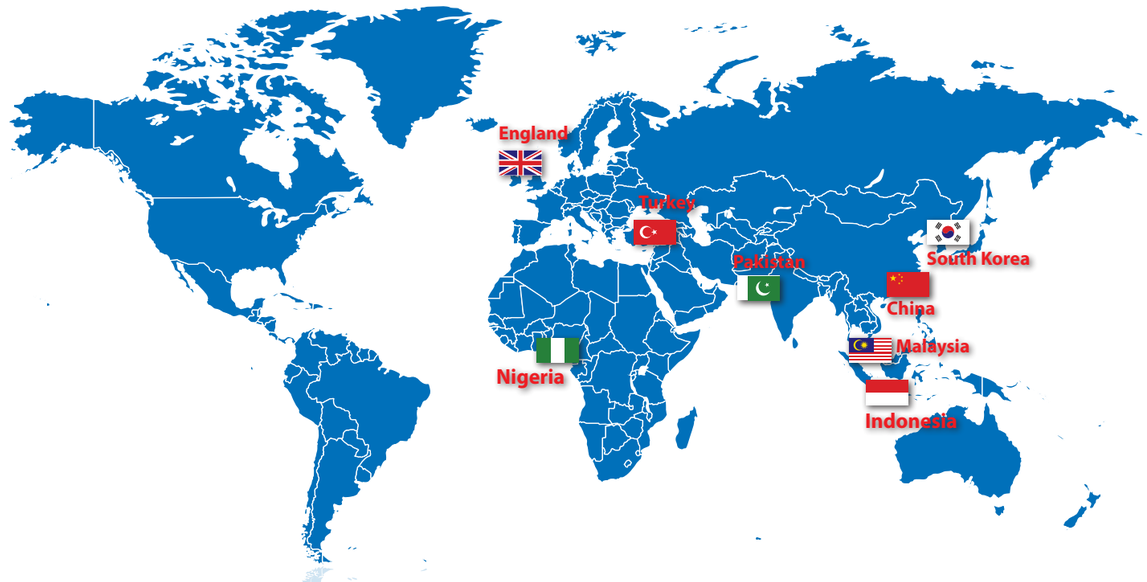
en.fnm.ir

Electroris.com

Linkedin.com/company/fnm-co

Overseas Offices

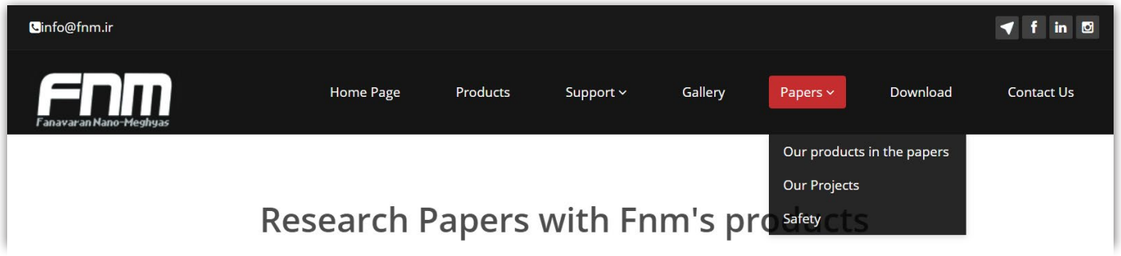
Today there are 8 overseas offices/sale representative, in Shanghai (China), Suzhou (China), Kuala-Lumpur (Malaysia), Jakarta (Indonesia), London (United Kingdom), Istanbul (Turkey), Seoul (S. Korea), and Islamabad (Pakistan).



Citations to our Products in Research Papers

More than 250 published research papers (updated 2018).

Citations are available on our website (http://electroris.com/papers/products-papers)



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