Radio Frequency Equipment

Textile dryers

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Company Profile

Established in 1978, STALAM is the world leader in the development, design and manufacture of equipment where capacitive electromagnetic fields at I.S.M. metric frequencies (RF fields) are exploited for a variety of thermal processing and drying applications on raw materials, intermediate and finished industrial products.

As a member of AEI (Italian Electronic and Electrotechnical Association) and of ACIMIT (the Association of Italian Manufacturers of Machinery for the Textile Industry) STALAM cooperates actively with prestigious universities and research institutes for the development of the RF technology both as to generation techniques and to technological applications.

STALAM also co-operates with other leading machinery manufacturers for the development of innovative technologies and for the supply of "turn key" automated and integrated processing lines.

Presently, more than 2300 STALAM Radio Frequency machines are in operation in the world, with rated power values ranging from 3 to 450 kW; from the simple, manually operated machine, to the fully automated line complete with computerised control and supervision systems.

Exporting over 90% of its production to the five continents, STALAM provides professional and prompt commercial and technical assistance in all the relevant areas throughout the world.

2300+ machines in operation

STALAM



60+ countries global presence



RF Technology

How it works?

Radio Frequency dielectric heating is a drying and thermal processing technology based on the dissipation of electromagnetic energy within the product. Unlike conventional techniques, where heat is transferred to the product through its surface from an external heat source by conduction, convection or irradiation, a Radio Frequency field generates heat directly inside the entire product mass - that is why the related mechanism is called "endogenous" or "volumetric". The heat generation is instantaneous and allows a rapid, uniform and perfectly controlled process.

The RF heating mechanism, excluding the materials (like metals) which are good conductors of electric current, is related to the so called "dielectric losses". Dielectric losses are caused by the vibration and rotation of polar or polarised molecules and by the polarisation and translation movement of ionic particles inside the material, induced by the quick (several million times per second) polarity reversal of the RF field. This can be interpreted as if the electromagnetic field is absorbed and converted into thermal energy by the effect of the rapid movement of polar(ised) molecules and ions.

Water molecules are highly polar, more than all substrates in which water can normally be found, and many ionic species are usually dissolved in water.

materials containing water. In particular, Radio Frequency has the ability to evaporate water rapidly, efficiently and selectively from many substrates, which enables their users to obtain the maximum benefits in terms of product quality, reduced operating costs, high flexibility and reliability.







RF and **RFA** series dryers



Best for yarn packages and tops/bumps







With more than 2000 units in operation worldwide, the RF series dryers are STALAM's best sellers. They are multi-purpose dryers particularly suitable for yarn in packages and cakes as well as for worsted fibres (tops) in bobbin and bump form.

Almost all combinations of natural, artificial and synthetic fibres, pure or blended, in every count and form can be dried perfectly, down to the desired residual moisture level, with outstanding efficiency and quality results that cannot be achieved with any conventional drying system.

Hanks can also be perfectly dried, without any movement or passing air flow, thus avoiding yarn entanglement - which is a typical problem in hot air dryers - and making the winding operation more efficient. Tow slivers can be dried folded up on the conveyor belt of the RF dryer: a perfect residual moisture distribution is obtained within the sliver, resulting in an increased efficiency of the tow stretch-breaking or tops intersecting/re-combing operations. Moreover, the lamination effects, typical of drum dryers, are eliminated.

Loose stock can be loaded directly on the conveyor belt of the dryer or even inside permeable bags. The reduced losses of product, the uniformity of drying, the improved physical-mechanical characteristics of the fibres, and consequently the more efficient carding - combing - spinning operations, result in a higher yarn metric yield of up to 2%.

Models available

RF power (kW)	PF	PRODUCTION CAPACITY (KG/H)*				
	synthetics (acr, pes, ny, etc.)	wool and blends (wo/acr, cot/pes, pes/visc, etc.)	silk, cotton, linen, viscose	L(m) x W(m) x H(m)		
10	80 ÷ 110	35 ÷ 50	20 ÷ 25	6.0 x 1.7 x 2.8		
20	130 ÷ 220	70 ÷ 105	40 ÷ 55	7.5 x 1.8 x 3.3		
30	240 ÷ 330	105 ÷ 155	60 ÷ 80	7.5 x 1.8 x 3.3		
40	320 ÷ 440	140 ÷ 205	80 ÷ 105	7.5 x 1.8 x 3.3		
50	400 ÷ 550	170 ÷ 265	100 ÷ 135	9.0 x 2.4 x 3.3		
60	480 ÷ 660	205 ÷ 315	120 ÷ 160	9.0 x 2.4 x 3.3		
70/75	580 ÷ 790	250 ÷ 375	145 ÷ 195	9.0 x 2.4 x 3.3		
85	680 ÷ 920	290 ÷ 430	170 ÷ 225	9.0 x 2.4 x 3.3		
105	over 1000	360 ÷ 510	210 ÷ 280	9.5 x 2.4 x 3.5		

* Production capacity may vary depending on product type, loading density, actual moisture content etc. Contact us for specific information about your product.



In the RFA (Radio Frequency Assisted) series dryers, the RF treatment is combined with a conventional warm air circulation system.

The STALAM RF and RFA model dryers allow savings in operating costs up to 10-15% compared to other standard Radio Frequency dryers available in the world markets.

RF ECO+ series dryers



Best for yarn packages





STALAM's continuous investments aimed to improve the performance and sustainability of its products led to the development of the new RF ECO+ series dryers. These highly efficient machines are mostly dedicated to medium and large size dye-houses, to meet their high production capacity requirements with the most favourable productivity/foot-print and productivity/cost ratios.

Having rated power values ranging from 125 kW to 180 kW, the state-of-the-art *RFECO+* dryers ensure savings in operating costs up to 20% compared to the previous generation RF dryers still available in the market. Powerful, reliable and versatile, the *RF ECO+* series dryers are also Industry 4.0 ready.

Although the RF ECO+ dryers are designed to deliver high power values, the RF power distribution electrodes have been adequately sized to maintain the lowest possible power density on the product being dried.

Moreover, the innovative air circulation and evacuation systems assist the evaporation process maximizing the moisture removal efficiency while avoiding all dew condensation problems inside the drying tunnel.

The dryers' operation is supervised by CONTROL+, a highly sophisticated yet user-friendly software solution, that makes it simple but accurate and error-free to control all operational parameters like the RF power delivery, the electrodes position and voltage, the treatment time (or the conveyor belt speed), the tunnel temperature, etc. And while doing so, the CONTROL+ system will also make sure that all the machine components and circuitry are in good and safe working conditions, promptly warning the operator if otherwise and providing him with a detailed diagnosis and trouble-shooting advices in case of any issue.

Models available

RF power (kW)	PF	PRODUCTION CAPACITY (KG/H)*			
	synthetics (acr, pes, ny, etc.)	wool and blends (wo/acr, cot/pes, pes/visc, etc.)	silk, cotton, linen, viscose	L(m) x W(m) x H(m)	
125	over 1100	over 450	over 250	9.5 x 2.4 x 3.5	
150	over 1200	over 500	over 300	10.5 x 2.4 x 3.7	
180	over 1300	over 550	over 350	10.5 x 2.4 x 3.7	
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* Production capacity may vary depending on product type, loading density, actual moisture content etc. Contact us for specific information about your product.







Best for loose stock, tow/top slivers and yarns in hanks



The LTRF (Low Temperature Radio Frequency) series dryers are especially designed for the low temperature drying of all "loose" textile products.

These dryers derive directly from the RF series equipment. The innovation consists in the additional air suction and blowing compartments, placed just beneath the conveyor belt, which are fitted with medium-head centrifugal fans.

These compartments force a controlled amount of air - generally recovered from the triode cooling system - through the product being submitted to the RF field, so that the drying process takes place at temperatures which normally do not exceed 60-70°C.

The air passing through the product improves the energy efficiency as well, so that drying costs are reduced by 15-30% when compared to the standard RF technology.

An original version of these dryers is the RFA/S series. Here, the principles of both the RFA and LTRF technologies are combined: the forced air flowing through the product and the accurate temperature control inside the drying tunnel allow us to set all parameters of the evaporation process. Both the product quality and the energy efficiency are improved, and savings in drying costs up to 35% in comparison with the standard RF technology are obtained.

Models available

RF power (kW)	PRODUCTION CAI			
	synthetics (acr, pes, ny, etc.)	wool and blend cot/pes, pes/		
30	300 ÷ 450	120 ÷ 1		
40	400 ÷ 600	160 ÷ 2		
50	500 ÷ 750	200 ÷ 3		
60	600 ÷ 900	240 ÷ 3		
70/75	700 ÷ 1050	280 ÷ 4		

* Production capacity may vary depending on product type, loading density, actual moisture content etc. Contact us for specific information about your product.





Several LTRF and RFA/S series dryers installed worldwide since the mid-nineties have proven their effectiveness with a wide range of products like: cotton, wool and cashmere loose stock, fine wool tops slivers, acrylic tow, silk hanks, cashmere, lambswool and other fine wool yarns in hank form, wool and nylon "jumbo" hanks for carpets, cotton, mercerised cotton and rayon yarns for knitting, sewing and embroidery, etc.

PACITY (KG/H)*

nds (wo/acr, silk, cotton, $L(m) \times W(m) \times H(m)$ linen, viscose /visc, etc.) 75 ÷ 110 9.0 x 2.1 x 3.3 180 9.0 x 2.1 x 3.3 240 100 ÷ 150 125 ÷ 180 9.0 x 2.5 x 3.3 300 360 150 ÷ 220 9.0 x 2.5 x 3.3 420 175 ÷ 250 9.0 x 2.5 x 3.3

DIMENSIONS



RFA/S COMBO Twin-Power series dryers



Best for loose stock, tow/top slivers and yarns in hanks



The RFA/S COMBO series dryers are the latest evolution of the RF and forced-air circulation combined drying equipment developed by STALAM in the early nineties.

In these dryers, independent forced-air drying sections are added to the standard configuration of the RFA/S machines, thus obtaining a truly "twin-power" drying system where it is possible to control and dose independently each form of energy (electromagnetic and conventional) for different products or process requirements, by modulating them through the PLC.



The unique modular design and the specific PLC software developed by STALAM for the RFA/S COMBO dryers will always allow the end-user to set the ideal combination of Radio Frequency and hot air (of which both the temperature and the flow can be controlled independently) to optimise the drying process for each substrate.

The *RFA/S COMBO* dryers can be successfully used with all the different textile substrates, but the best results can be achieved with the so called "low density products" such as loose fibres, unwound



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MODEL	PR	ODUCTION CAP
	synthetics (acr, pes, ny, etc.)	wool and blend cot/pes, pes/v
 40 kW + 1-2 HA	450 ÷ 600	200 ÷ 2
60 kW + 1-2 HA	650 ÷ 900	300 ÷ 3
 85 kW + 1-2 HA	900 ÷ 1200	400 ÷ 5

* Production capacity may vary depending on product type, loading density, actual moisture content etc Contact us for specific information about your product.

tow/top slivers, yarns in hanks, etc. where the conventional air circulation system can be more effective in evaporating water, bulking fibres, reducing the internal temperature and minimising the risk of overheating (scorching) especially in delicate and temperature-sensitive products.

The modular construction and the full flexibility in combining RF and air drying as desired, make it easy to size these dryers adequately for any production capacity requirement.

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ACITY (KG/H)*

ls (wo/acr. silk. cotton. /isc, etc.) linen, viscose 100 ÷ 150 250 375 150 ÷ 225 00 200 ÷ 300

STALAM Radio Frequency Equipment

DIMENSIONS

 $L(m) \times W(m) \times H(m)$

9.5-11.5 x 2.4 x 3.3

11.5-13.5 x 2.4 x 3.3

11.5-13.5 x 2.4 x 3.3

TCRF series dryers



Best for yarn packages and tops/bumps



The *TCRF* (Thermo-Controlled Radio Frequency) model dryers represent the outcome of the researches carried out by STALAM in co-operation with Messrs. Loris Bellini as to the drying of yarn packages and tops in bobbin or bump form by means of a combination of RF energy and forced air circulation. They can surely be considered as the most sophisticated batch-type textile dryers available worldwide.

In the TCRF dryers a passing-through, invertercontrolled air flow makes it possible to control the product's internal temperature as desired while the RF energy is applied.

The air is recovered from the RF generator cooling system and can be additionally heated up by a steam-fed heat exchanger up to about 90°C. An automatic weighing system stops the drying cycle automatically when the desired final weight has been reached. All working parameters and dryer operations are set and automatically controlled through the PLC.

LIODE

Models available

MODEL	PRODUCTION CAPACITY (KG/H)*			DIMENSIONS		
	synthetics (acr, pes, ny, etc.)	wool and blends (wo/acr, cot/pes, pes/visc, etc.)	silk, cotton, linen, viscose	L(m) x W(m) x H(m)		
 TCRF 1C	350 ÷ 500	170 ÷ 250	100 ÷ 160	4.0 x 1.5 x 3.6		
TCRF 2C/RT	450 ÷ 700	220 ÷ 350	130 ÷ 210	4.0 x 1.8 x 3.6		
 TCRF 2C/R	600 ÷ 850	260 ÷ 440	160 ÷ 260	4.0 x 2.2 x 3.6		

* Production capacity may vary depending on product type, loading density, actual moisture content etc. Contact us for specific information about your product.





TCRF dryers with 1 or 2 trolleys specifically designed for yarn packages, and a dryer model with 2 trolleys suitable for both tops and packages, are available.

Thanks to the accurate drying temperature control, the TCRF dryers are particularly suitable for all products whose quality parameters are negatively affected by prolonged thermal treatments or by temperatures above a certain limit, such as bleached and pastel-shade wool or cotton/acrylic blends, direct-dyed cotton and viscose yarns, etc.

TCRF dryers allow a remarkable reduction of overall drying costs, with electricity savings up to 25% compared to the standard Radio Frequency technology and thanks to the ease of product loading and unloading operations, which contributes to minimise labour costs.

The TCRF dryers are also predisposed to be integrated into fully automated dyeing plants with robotised handling systems for dye-columns.

DUMENCIONS

RFA/HP dryer



Best for yarn packages





This revolutionary drying equipment, specifically designed for yarn packages, combines the RF technology with a forced air circulation system through the product in a conveyorised type dryer.

It is the first time worldwide that a passing-through air flow can be obtained in yarn packages in a continuous throughput drying equipment.



The air forced through the product is heated up to the desired temperature without using any external (additional) energy source by recovering the heat dissipated by the RF generator. Both the RF energy and the warm air forced through the product contribute to water evaporation. This combined process, other than being extremely efficient, enables a precise control of the product's internal temperature, thus optimising the drying quality results.

The operation of the dryer is fully automatic and managed through a PLC where all different "recipes" for various yarn package types can be stored and recalled.

This is an innovative, continuous type Radio Frequency dryer for yarn package dye-columns designed to simplify the logistics within the dyehouse and minimise product handling and related costs.

The dye-columns are carried in and out from the drying chamber of the RF/C machine in vertical position by a carousel system in stepped movements. The step pace is adjustable according to the drying requirements specific to the product such as: yarn type, package weight, moisture content, etc.

The product loading and unloading station is located at the front of the dryer. In this position the operator - or a robotized handling device - can load the wet package dye-columns directly from the hydroextractor and unload the dry ones to the finished product station.

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Models available					
RF power (kW)	PF	DIMENSIONS			
	synthetics (acr, pes, ny, etc.)	wool and blends (wo/acr, cot/pes, pes/visc, etc.)	silk, cotton, linen, viscose	L(m) x W(m) x H(m)	
90	800 ÷ 1200	400 ÷ 600	250 ÷ 350	8.5 x 2.4 x 2.9	

* Production capacity may vary depending on product type, loading density, actual moisture content etc. Contact us for specific information about your product.

RF power (kW) **PRODUCTION CAPACITY (KG/H)*** synthetics wool and blends (wo/acr, (acr, pes, ny, etc.) cot/pes, pes/visc, etc.) 600 ÷ 900

* Production capacity may vary depending on product type, loading density, actual moisture content etc. Contact us for specific information about your product.



All running parameters of the equipment (RF power, carousel speed, etc.) are set by a PLC via a touchscreen operator panel.



Models available

silk, cotton, $L(m) \times W(m) \times H(m)$ linen, viscose

DIMENSIONS

250 ÷ 400 160 ÷ 240 7.5 x 1.6 x 4.3



RF/T dryer





The *RF/T* series dryer can be considered the only industrial Radio Frequency drying equipment specifically designed for the tensionless drying partial or complete - of woven or knitted fabrics.

The *RF/T* series dryer can be used not only as a stand-alone drying unit, but also in combination with existing (old or new) equipment like conventional tensionless dryers, relaxation dryers, stenters, thermosetting equipment, and many other finishing machines, especially in the woollen industry (e.g. decatising, pressing and steaming machines): the RF/T will increase the efficiency and throughput of existing equipment, in addition to improving the quality of the finished product in terms of dimensional stability, formability and shear rigidity.

The drying process takes just a few seconds, even for very thick (heavy) fabrics, and occurs under low temperature conditions (40-60°C). The residual moisture content in the fabric is perfectly uniform and controlled by an in-line computerised system.

The equipment has the ability to transfer high Radio Frequency power values onto small surfaces, thus obtaining a correspondingly high productivity within a small space; moreover, the construction is modular, to fit any production requirement.

Models available				
RF power (kW)	DIMENSIONS			
	L(m) x W(m) x H(m)			
60	4.2 × 4.2 × 4.2			
85	4.2 x 4.2 x 4.2			



In comparison with traditional methods, the Radio Frequency drying of ladies stocking and tights after dyeing and hydroextraction, other than resulting in better product quality, offers various technical advantages, paving the way to innovative finishing procedures and, finally, leading to a corresponding increase in overall profitability.

Thanks to the ability of RF energy to penetrate thick and bulky products, stocking and tights, dyed and hydroextracted prior to - or after boarding and/ or ironing, can be dried efficiently and uniformly when laid on the conveyor belt of the dryer as loose dozens or directly inside the dye-bags. They remain stationary and completely relaxed until the drying process is completed. The product exits the dryer with the desired final moisture content (normally regain) and is cool enough to go immediately for packing. Being the RF heating phenomenon selective towards the wet areas, less evaporation is generated in the legs and more in the wetter, thicker areas (toes, welts, seams and waistcoat) resulting in a perfectly uniform drying of the whole product.

The ability to control accurately the water evaporation rate makes the use of RF drying beneficial not only for stocking and tights directly sent for packing and distribution, but also for products to be sent to boarding or ironing after dyeing. These operations can be carried out faster and more effectively when the product has an initial moisture content around 7-8%: such ideal moisture level can easily be achieved uniformly throughout the product by partial RF drying, starting from the usual 12-15% moisture content after centrifugal hydroextraction.





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RF power (kW)	PRODUCTION CAPACITY*	DIMENSIONS
	(doz/h)	L(m) x W(m) x H(m)
10	400	6.0 x 1.7 x 2.8
20	800	7.5 x 1.8 x 3.3
30	1200	7.5 x 1.8 x 3.3
40	1600	9.0 x 2.0 x 3.3
50	2000	9.0 x 2.4 x 3.3
60	2400	9.0 x 2.4 x 3.3

* Production capacity may vary depending on product type, loading density, actual moisture content etc. Contact us for specific information about your product.



Dryers for other applications





Considering that most non-electrically conductive (ie. dielectric) substrates containing water can be dried quickly, uniformly, efficiently and with optimal quality results by means Radio Frequency, over the years STALAM has developed and supplied specific drying equipment suitable to process a wide range of textile, technical-textile and related products. Some existing applications of STALAM Radio Frequency dryers include:



- the drying of bleached hydrophilic cotton fibres for medical, sanitary and cosmetic use;
- the drying of raw or processed/dyed hemp, flax, ramie, coir, jute and sisal fibres;
- the drying of wet-spun linen yarns on spools, either off-line on suitable pin trays or in-line with the spinning frame;
- the low temperature drying of raw silk hanks after the wetting/oiling process, before twisting;
- the drying of silk cocoons and silk wastes after carbonising;
- the drying of dyed elastic bands, narrow fabrics, lace, strings, cords, etc.;
- the drying of dyed garments, sweaters, sport socks, leather items, etc. specifically when the tumbling effect is not desired;
- the drying of woollen felts for clothing or industrial use, after impregnation, in the form of sheets and disks:
- the drying of washed and hydroextracted thread waste and rags;
- the drying and pre-heating of defective or waste synthetic fibres (mainly PA, PES, PP) after washing, to be recycled in pellet form, off-line or in-line with the extrusion equipment;
- the drying of short-cut, high-porosity reinforcement fibres (cellulose, aramide, glass, etc.).

Work frequency of RF generators Cooling system of RF generators Evaporation capacity of dryers

Main optional devices

- Prolonged inlet and outlet tables;
- indicators of "empty" inlet and outlet tables;
- metaldetector on the inlet table;
- lateral protection teflon guards;

Technical data

Technical specifications

(I.S.M.) 27.12 MHz +/-0.6% Single-unit RF dryers: water or air RF, RFA. RF ECO+, LTRF, RFA/S, RFA/S COMBO modular dryers: water or air TCRF batch dryers: air *RFA/HP, RF/C, RF/T* dryers: air *RF, RFA, RF ECO+, RF/C, RF/T*: 1.2 ÷ 1.4 kg(H2O)/kW(RF)h TCRF, RFA/HP: 1.4 ÷ 1.8 kg(H2O)/kW(RF)h

LTRF: 1.4 ÷ 1.7 kg(H2O)/kW(RF)h RFA/S: 1.5 ÷ 1.9 kg(H2O)/kW(RF)h RFA/S COMBO: 1.6 ÷ 2.2 kg (H2O)/kW(RF)h

internal air blowers;

- suction cooling device in the outlet;
- automatic multi-position upper electrode;
- manual or automatic fire extinguishing system
- (UV or smoke-detector).



After-sale services

Supplying and successfully installing a Radio Frequency equipment is, at the same time, the result and the starting point of several pre- and after-sale activities. STALAM strives to establish strong, trustworthy, mutually rewarding and long-term business relationships with its prospect and existing customers by providing them the best possible technical assistance, aimed first to prove the outstanding benefits of the RF technology and then to make sure that the equipment provided will maintain its performance and profitability in the years to come.

Spare parts available on stock

Availability in stock of at least 80% of standard mechanical and electrical components of the RF equipment manufactured in the last 20 years.

Fast shipping

Shipment of spare parts available in stock at the latest within 24 hours from the order (generally, orders confirmed before h. 12:00 noon time are dispatched through selected courier services on the same day before h. 16:00). Spare parts not available in stock are manufactured in-house or procured in the shortest possible time.



Test & Demo facilities

The STALAM testing lab is an integral part of our R&D and engineering departments. Through testing and analysis of the results, our experts can study in details the characteristics and behaviour of a product submitted to the Radio Frequency field, thus assessing the technical and economic feasibility of drying and thermal processes on specific substrates, based on customers' requirements. In the same way, our engineers can identify the best process parameters and the technical specifications of the most suitable RF equipment to perform such processes.

STALAM's R&D lab is equipped with a wide range of pilot machines available for product testing and demos. Such tests and demos can be performed in our company or at our customers' facilities as appropriate. Some of these machines are also available for rental for product and process development purposes or systematic testing sessions. Our highly qualified technical team will assist customers to develop better, more profitable and innovative process solutions.



Via dell'Olmo, 7 36055 Nove (Vicenza) Italy



Tel. +39 0424 597400



stalam@stalam.com



www.stalam.com

Contacts



