

## VACUUM FILTERS



TÉCNICAS DE FILTRACIÓN S.A.

In the vacuum filters, the solid-liquid separation takes place thanks to the aspiration given by the vacuum pump under the filtration surface where the product is placed. This mentioned filtration surface gives name to the two existing vacuum filter methods available in the TEFSA production :

## ■ Vacuum Belt Filter :

The filtration process takes place on the horizontal filter cloth of the unit which travels on a rubber belt or on a trays assembly depending on the execution.

## ■ Vacuum Drum Filter :

The filtration process takes place on the rotating drum assembly. This is an older system that has been substituted by the vacuum belt filter, but still delivered in specific application.

With the use of new technologies based on PLC systems, an absolute control for the vacuum filters operation is achieved. Through the control panel the most adequate filtration operation process can be regulated based on the following parameter :

- Applied vacuum level.
- Operation speed.
- Load level.
- Filter cake washing quality.
- Filter cake drying time.



Both the Vacuum Belt Filter and the Vacuum Drum Filter are appropriate to operate in a huge diversity of applications, processes and industries. The given service characteristics are based on a continuous operation, in the optimum separated solids washing process, and in a broad particle size range application.

Different filter cloths can be installed according requirements and, in the case of the Vacuum Drum Filters, different discharge systems are available, always in order to adapt to the product conditions. All vacuum filters have an easy access, minimum mechanical wearing and diverse construction materials for each environment.

In the TEFSA laboratories we are able to define, through the corresponding testing processes and analysis, the correct calculations and dimensioning of the filtration units and requested auxiliaries. TEFSA also arranges pilot units for the application testing, process studies and further dimensioning of the equipment.



## ■ The Main Application Fields of the TEFSA Vacuum Filters are Broad and can be Briefly Defined in the Following List :

- Mining Industry :  
Flotation concentrates, fly ash, gypsum, silica, mineral salts, aluminum, aluminum hydroxide, gold precipitate, silver recovery, cement, coal slurries (flotation and fines), phosphates, red mud, etc.
- Chemical Industry :  
Silicates, zeolites, phosphates, fertilizers, fungicides, insecticides, pesticides, active carbon, sulphates, catalysts, phosphoric acid, pigments (organic and inorganic), silicon, flue gas desulphurization, resins, zinc salts, salts, etc.
- Food Industry :  
Organic acids, starch, vegetable oil, yeast calcium derivatives, fatty acid separation, sugars, proteins, etc.
- Pharmacy Industry :  
Antibiotics, vegetable extracts, fibrous materials, peniciline salts and derivatives, vitamins, laxatives, etc.
- Industrial residues and environmental technology.
- Others.

## ■ Main Operation Description of the Vacuum Belt Filters :

The filtration takes place on the horizontal belt supported by a rubber belt or by the tray assembly.  
The TEFSA vacuum belt filters present two main variations :

- Tray assembly execution.
- Rubber belt execution.

## ■ Main Characteristics :

- Complete continuous systems with no dead time in the operation.
- Adjustable belt movement speed according necessities.
- Engineered feeding system on the belt with full guarantee on a uniform product deposition on the flat surface.
- Clean filter cloth and always in optimum conditions for a proper filtration, and selected for each product to be treated.
- Excellent cake washing process in continuous or counter-current with reduced water consumption.
- Simple and reliable mechanical operation avoiding breakdowns and allowing an ideal maintenance and cleaning work.
- Limited operation costs.



The filtration operation in this case is as well fully continuous and on a horizontal filter cloth assembly, in this case supported on the individual trays assembly that can be made in stainless steel further synthetic material. The filtrate drainage takes place on replace able grids part of the trays which in addition allows a perfect cleaning of the filter. The tray assembly joins the filter cloth in a to-and-form motion regulated by the vacuum control valves of the filter; the trays are connected to the vacuum system by mean of flexible hoses.

Very relevant to this filter type is the perfect adaptability to the product to be treated and to the involved corrosive conditions, with at the same time assuring a minimum mechanical wearing of all elements in the filter.

## ■ Main Advantages of the Vacuum Belt Filter with Tray System :

- Durable construction.
- Light filter cloth support system with absence of a rubber belt.
- Special unit for corrosive products and/or environment.
- Ideal for small units, implying light construction and excluding platforms.
- Small drive motors.
- No water and air requested for the belt sealing.
- Dry environment.
- Low energy consumption.



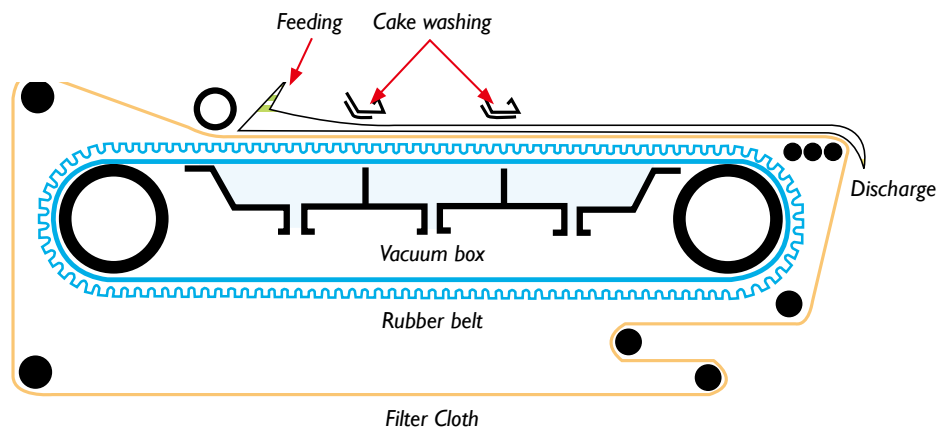
Flexible rubber hoses

The filtration operation in this case is as well fully continuous and on a horizontal rubber belt which acts as a support for the filter cloth. This rubber belt has a grooved design along the complete surface in order to allow the filtrate circulation towards the central drainage channel.

The vacuum box, located under the belt, receives the filtrate in order to send it to the separating filtrate tank. The mentioned vacuum box include the necessary protections to avoid eventual damages produced by the rubber belt friction and has been designed to easily attend eventual revision and maintenance works.

The filter cloth remains perfectly flat on the belt thanks to the special guiding systems operated by tension.

The vacuum belt filter assembly is completed with the feeding system, product distribution boxes and washing waters, the discharge scraper and the water cleaning systems.



## ■ Main Advantages of the Vacuum Rubber Belt Filter :

- Durable construction.
- Extreme robust unit.
- Special unit designed for mining applications.
- Ideal for big units, huge capacities and huge cake.
- Thickness up to 100 mm.
- Special unit for products with fast filtration.
- Belt speed with up to 30 m/min.
- Excellent cake washing process with minimum consumption.



Drive roller

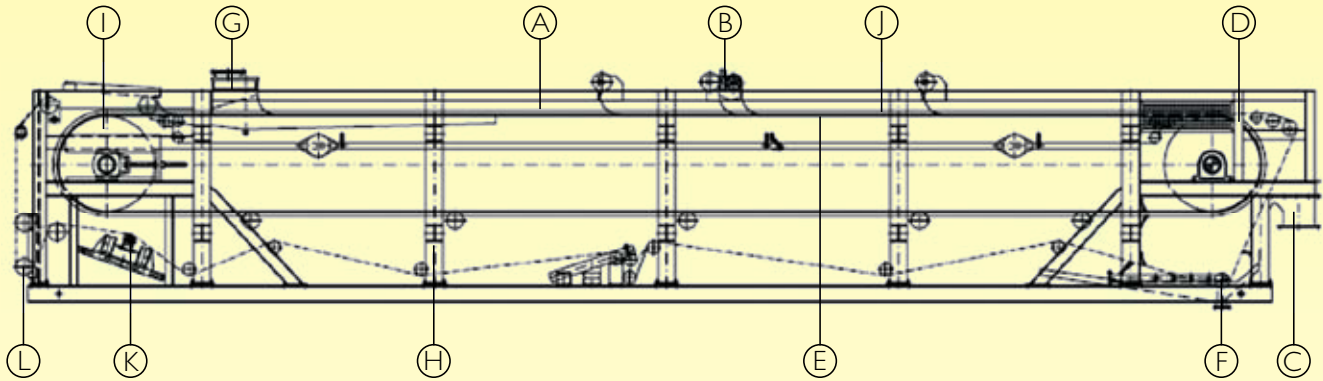
Rubber belt



Discharge

# Vacuum Belt Filters - Dimensions & Technical Data

Approximate TEFSA Vacuum Belt Filter sketch, main construction part sand normalized dimensions. The drive characteristics are not indicated, this is selected case to case and based on the requested needs and expectations. Eventual covers, drip trays, discharge chutes and other constructive details of the filter can modify the indicated general dimensions shown in the table.



- A- Filter cloth
- B- Cake washing box
- C- Discharge
- D- Rubber belt driving roller
- E- Vacuum box
- F- Filter cloth washing system
- G- Slurry feeding box
- H- Frame
- I- Rubber belt take up roller
- J- Rubber belt
- K- Filter cloth aligning system
- L- Filter cloth take up system

SERIES	FILTER AREA in m <sup>2</sup>	WIDTH in mm	LENGTH in m	HEIGHT in mm	WEIGHT in Ton
1	0.25-3.00	500	6.00	3,000	5-10
2	3.00-15.00	1,200	12.50	3,000	10-15
3	6.00-25.00	1,500	16.50	3,000	12-20
4	12.00-40.00	2,000	20.00	3,000	15-30
5	25.00-60.00	3,000	20.00	3,000	20-35
6	40.00-80.00	3,500	23.00	3,000	30-45
7	60.00-90.00	4,000	22.50	3,000	35-50

\*Vacuum belt filters with filter area 90 M<sup>2</sup> are available to be supplied upon requested.

# Vacuum Drum Filters - Main Description

The slurry is fed to the trough continuously. The filling level in the trough and the immersion depth of the filter drum is kept constant with an adjustable overflow weir or through a level regulation system.

A pendulum agitator prevents the solids from settling in the trough. The filter drum is divided into cells which are covered with the filter cloth, being the drum immersed such that approximately one third of the filter area is submerged into the solution. The rotation speed is duly adapted to the relevant filtration characteristics.

A vacuum pump is connected over the control head and the filter cells, producing a vacuum in these cells; therefore, the liquid phase is filtered through the filter cloth aid, at the same time, then solids form the cake.

The control head divides the circumference of the drum into sectors for filtration, washing, dewatering and cake discharge, each point of the drum circumference in the course of a revolution will run consecutively once more through each of these zones.

The filtrate flows from the filter cells through the filter pipes and the control head into the receiver. It is then pumped away. The filtered solids cake emerges with the rotation of the drum and, dependent on the strength, consistency and structure of the formed filter cake, different discharge methods can be selected.

Should the filtered cake be washed, wash liquors will be introduced with spray pipes or suspended wash belts. The wash liquor can be separated from the mother liquor.



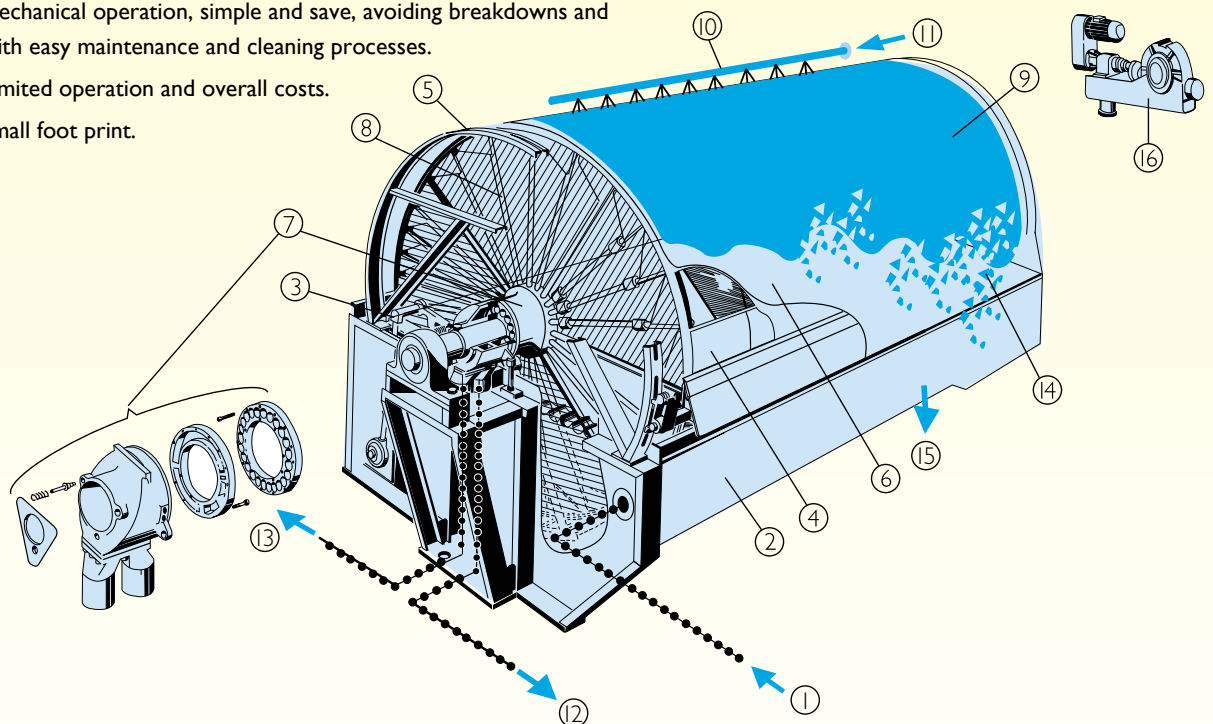
Pendulum agitator      Control head



Drum driver

## ■ Main Characteristics :

- ❑ Complete continuous filter system with no dead times during operation.
- ❑ Adjustable drum speed.
- ❑ Multiple cake discharge possibilities.
- ❑ Filter cloth continuous washing possibility.
- ❑ Filter cloth selection according each application and product.
- ❑ Possibility to have a continuous cake washing by aspersion.
- ❑ Mechanical operation, simple and save, avoiding breakdowns and with easy maintenance and cleaning processes.
- ❑ Limited operation and overall costs.
- ❑ Small foot print.



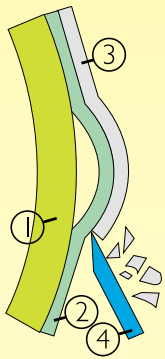
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|------------------------|---------------------|-----------------------|-------------------------------------|
| ■ 1. Suspension        | ■ 5. Drum           | ■ 9. Separated solids | ■ 13. Washing filtrate              |
| ■ 2. Filter trough     | ■ 6. Filter cloth   | ■ 10. Washing devices | ■ 14. Discharge devices or scrapers |
| ■ 3. Pendulum agitator | ■ 7. Control valve  | ■ 11. Washing liquid  | ■ 15. Solids discharge              |
| ■ 4. Filtration cells  | ■ 8. Filtrate pipes | ■ 12. Mother filtrate | ■ 16. Drum driver                   |



# Vacuum Drum Filters - Discharge Types

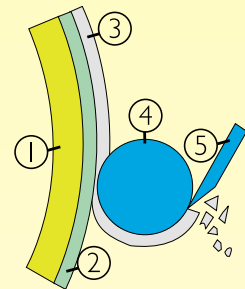
Different cake discharge systems are available based on the cake thickness, consistency and structure. With all systems the filter cloth will remain in best conditions as the washing system with pressurized water and mechanical brushes will be applied to each discharge system.

Discharge types for the TEFSA vacuum drum filters :



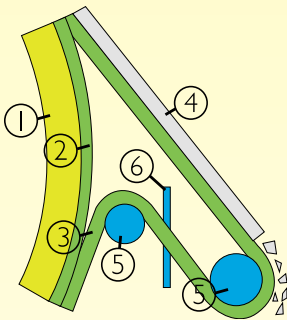
## Scraper Discharge :

Utilized for thicker and more solid filter cakes which release themselves easily from the filter cloth and tend to break off in pieces. The discharge is usually assisted by air blow-back in the discharge zone. (1-Drum, 2-Filter cloth, 3-Cake, 4-Scraper).



## Roller Discharger :

Designed for the discharge of pasty filter cakes which adhere to the surface of the discharge roller. (1-Drum, 2-Filter Cloth, 3-Cake, 4-Discharge roller, 5-Scraper).

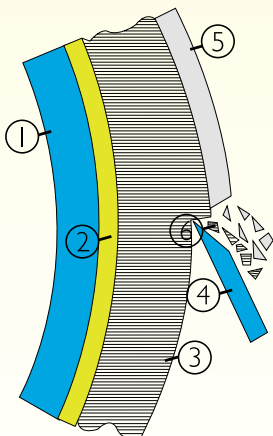
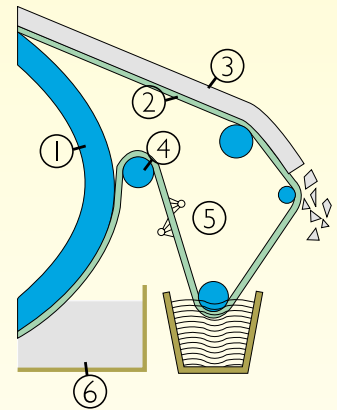


## Cords :

Parallel set of strings covering the drum surface and two return rollers, lifting the cake over one of these rollers. Also installed for thicker and solid cakes which tend to fleece formation (1-Drum, 2-Filter cloth, 3-Discharge strings, 4-Cake, 5-Return roller, 6-Rake).

## Belt Discharge :

Discharge method used for relatively thin, tough filter cakes which separate themselves easily from the filter cloth and are broken up by the return movement of the cloth. The filter cloth can be thoroughly washed before being reimmersed in the trough (1-Drum, 2-Filter cloth, 3-Cake, 4-Return roller/control roller, 5-Filter cloth washing system, 6-Trough).

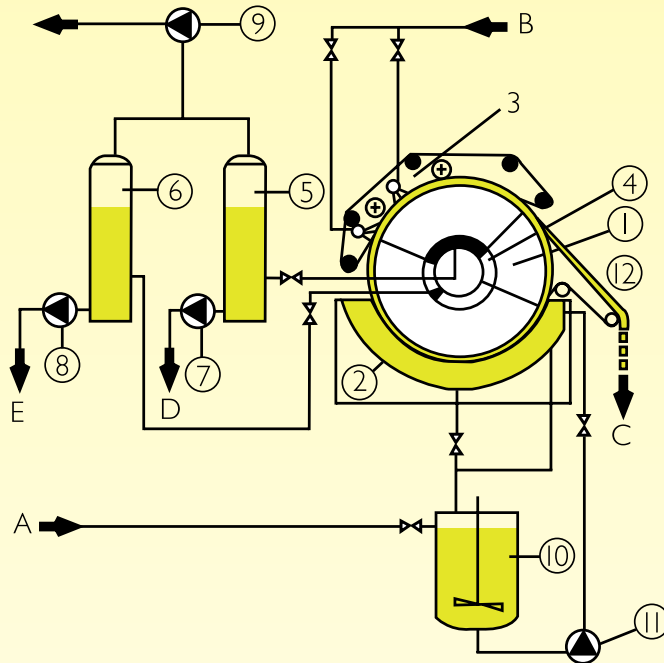


## Precoat Discharge :

Firstly a filter aid is dewatered over which the ensuing slurry is filtered. In order to keep the filter area, a thin layer of filter aid is scraped off together with the very thin filter cake. This discharge method is applied when extremely clean, solid free filtrates are required or when very fine particles would block the filter cloth (1-Drum, 2-Filter cloth, 3-Precoat layer, 4-Scraper, 5-Cake, 6-Scraped off precoat layer/cake).

## ■ Filtration Installation with Cake Washing and Filtrate Separation :

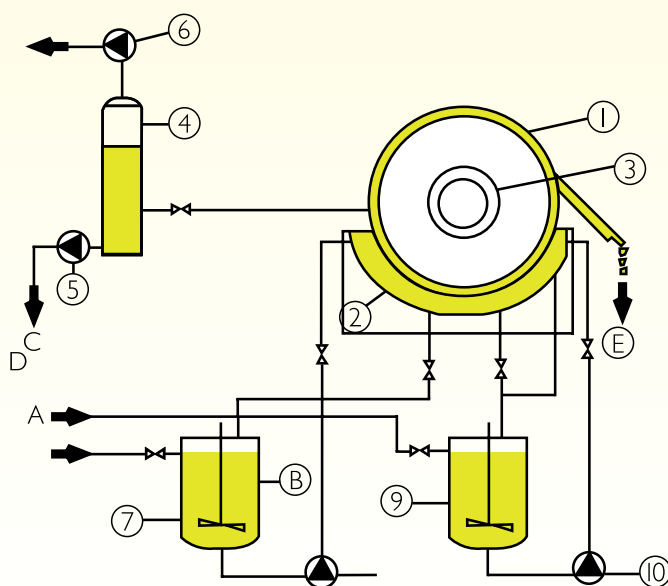
System with a vacuum drum filter equipped with two filtrate separators, pressure belt and cake washing process, as most complicated example. In case the washing is not necessary, or a separation between the mother liquor and the washing filtrate is not requested, the installation could be equipped with one filtrate separator only. The filtrate pump at the separator can be excluded if sufficient barometric height exists for the discharge process.



- A- Product
- B- Washing liquid
- C- Separated solid
- D- Washing filtrate
- E- Mother liquor
- 1- Drum
- 2- Trough
- 3- Washing system
- 4- Control head
- 5- Washing liquid separator
- 6- Mother liquor separator
- 7- Washing filtrate pump
- 8- Mother filtrate pump
- 9- Vacuum pump
- 10- Product tank
- 11- Feeding pump
- 12- Discharge device

## ■ Filtration Installation with Precoat System :

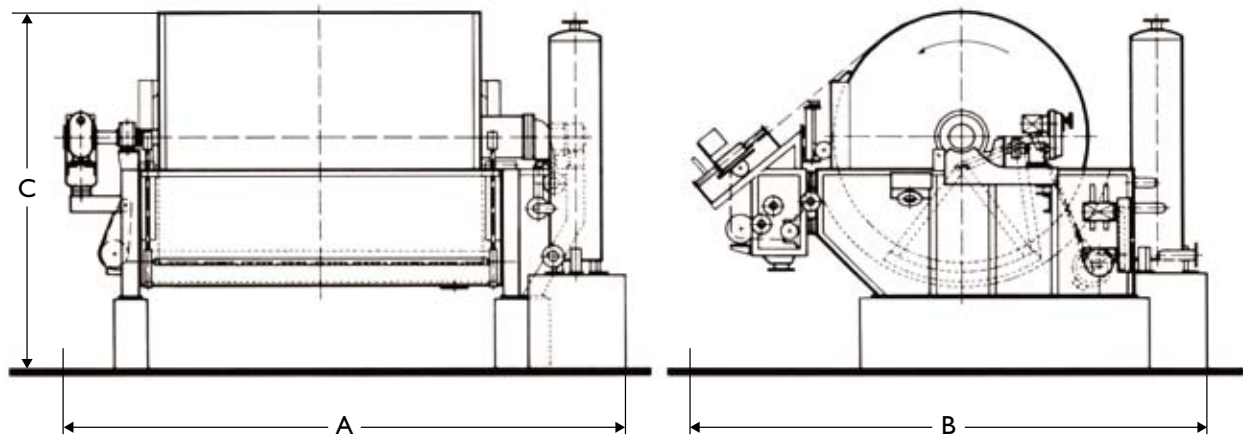
A precoat system filtration is used with diluted suspensions, with products with very fine solids, or with applications where an extreme clean filtrate is requested. The precoat is produced on the drum surface by filtering the suspended precoat material, followed by the product to be filtered as standard process and on the precoat layer. The cake will be discharged by means of a scraper together with a small part of the precoat layer in order to remain with a clean surface; when the minimum precoat layer is reached the filtration is interrupted in order to prepare a new precoat layer.



- A- Product
- B- Precoat suspension
- C- Product filtrate
- D- Precoat filtrate
- E- Separated solid
- 1- Drum
- 2- Trough
- 3- Control head
- 4- Filtrate separator
- 5- Filtrate pump
- 6- Vacuum pump
- 7- Precoat tank
- 8- Precoat tank
- 9- Product tank
- 10- Feeding pump

# Vacuum Drum Filters - Dimensions & Technical Data

Approximate TEFSA Vacuum Drum Filter sketch, main construction parts and normalized dimensions. The drive characteristics are not indicated, this is selected case to case and based on the requested needs and expectations. Eventual covers, drip trays, discharge chutes and other constructive details of the filter can modify the indicated general dimensions shown in the table.



Filter Model	Filter Area	Drum Diameter	Drum Width	Number of Cells	A	B	C	Service Weight	Power
TSF	m <sup>2</sup>	mm	mm		mm	mm	mm	Ton	kW
5.0/1.55 5.2/1.55	0.25	520	155	16	1,900	850	1,000	0.5	0.5
9.2/2.5 9.2/5.0 9.2/7.5 9.2/10 9.2/15 9.2/20	0.72 1.45 2.15 2.90 4.3 5.8	920	250 500 750 1,000 1,500 2,000	14	2,050 2,300 2,550 2,800 3,300 3,800	2,050	1,700	2.0 2.3 2.6 2.9 3.5 4.1	1.5
13.1/10 13.1/15 13.1/20 13.1/25 13.1/30	4 6 8 10 12	1,310	1,000 1,500 2,000 2,500 3,000	14	2,900 3,400 3,900 4,300 4,700	2,300	2,000	3.5 4.5 5.5 6.5 7.5	3.0
20.9/15 20.9/20 20.9/20 20.9/30	10 13 16 19	2,090	1,500 2,000 2,500 3,000	16	3,500 4,000 4,500 5,000	3,700	2,800	9.5 10.5 12.5 13.5	4.4
26.2/25 20.9/30 26.2/35 26.2/40	20 25 29 33	2,620	2,500 3,000 3,500 4,000	20	4,900 5,400 5,900 6,400	4,100	3,500	17 19 21 23	6.0
31.4/30 31.4/35 31.4/40 31.4/45 31.4/50 31.4/55 31.4/60	30 35 40 45 50 55 60	3,140	3,000 3,500 4,000 4,500 5,000 5,500 6,000	24	5,400 5,900 6,400 6,900 7,400 7,900 8,400	4,700	4,000	24 27 30 33 36 39 42	8.0
36.6/60 36.6/65	69 75	3,660	6,000 7,500	28	8,250 9,250	5,700	4,200	56 59	8.0
41.8/75	100	4,180	7,500	32	9,850	6,000	5,300	68	11.0



## VACUUM FILTERS



TÉCNICAS DE FILTRACIÓN S.A.

- FILTER PRESSES
- BELT FILTER PRESSES
- VACUUM BELT AND VACUUM DRUM FILTERS
- PRESSURE LEAF AND PRESSURE CANDLE FILTERS
- THERMAL SLUDGE DRYING



COMERCIAL LASMERT, S.A.

- THICKENERS / DECANTERS
- SLUDGE CONDITIONERS
- PNEUMATIC AND DOSING PUMPS
- HEAT EXCHANGERS



MEDIOS FILTRANTES, S.A.

- FILTER PRESS FILTER CLOTHS
- BELT PRESS BELTS
- SELF CLEANING FILTERS
- BAG FILTERS
- CARTRIDGE FILTERS
- PAPER FILTERS
- BASKET FILTERS
- PLATES



ECOTEC

ecologiatecnica s.a.

- GAS WASHING AND ASPIRATION SCRUBBERS
- ODOR REMOVAL SYSTEMS
- NON CORROSIVE VENTILATION
- PLASTIC WORKS (PVC, PP, GRF AND MIXED)
- LAMELLAR DECANTERS / DIFFUSERS
- BIOLOGICAL FILLINGS
- SCRAPERS / GRATINGS / RAILINGS

- POLYELECTROLYTES
- POLYMER PREPARATION UNITS

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