



# COMBER

Drying and Filtration Technology

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# Pressofiltro®

## Pilot Nutsche Filters Pilot Filter Dryer



Pressofiltro® PF 10  
0.045 m<sup>2</sup> filtration area



Pressofiltro® PF 100  
0.20 m<sup>2</sup> filtration area



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## Pressofiltro® Pilot Units

Pressofiltro® pilot units, agitated nutsche filters or filterdryers, meet the demanding requirements for the manufacture of pharmaceutical ingredients and are designed to conform to stringent cGMP and FDA guidelines.



Small pilot units are skid mounted including all drives, the required instrumentation and the hydraulics.

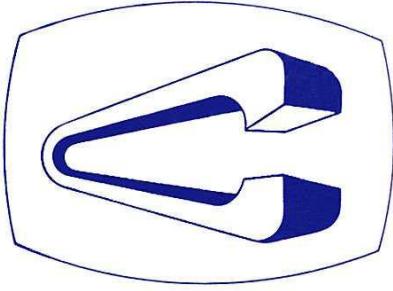
The vessel base is column mounted for lowering and displacement to the side to provide excellent access to the filter plate or dryer base for cleaning and inspection purposes. The vessel base is interchangeable for conversion to a conical bottom dryer or a Nutsche filter dryer respectively.

The agitator is supported from the top, shaft sealing is with a double mechanical seal and a convoluted bellows.

Simultaneous rotational and vertical agitator motions result in a very efficient and even mixing of the entire product mass for mixing and drying.

The product wetted surfaces are heated to obtain the largest possible heat exchange area for short drying times and a low attainable final humidity. Supplemental microwave heating is available to further reduce drying times.

Pressofiltro® PF 10 with 0.045 m<sup>2</sup> filtration area



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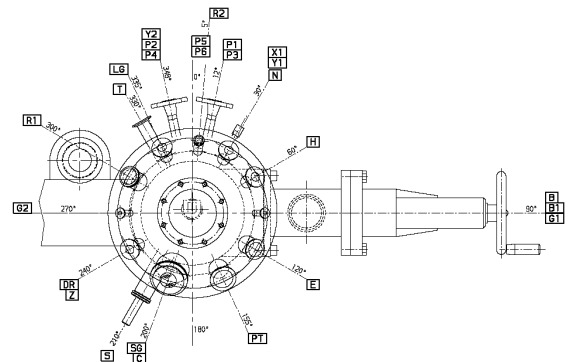
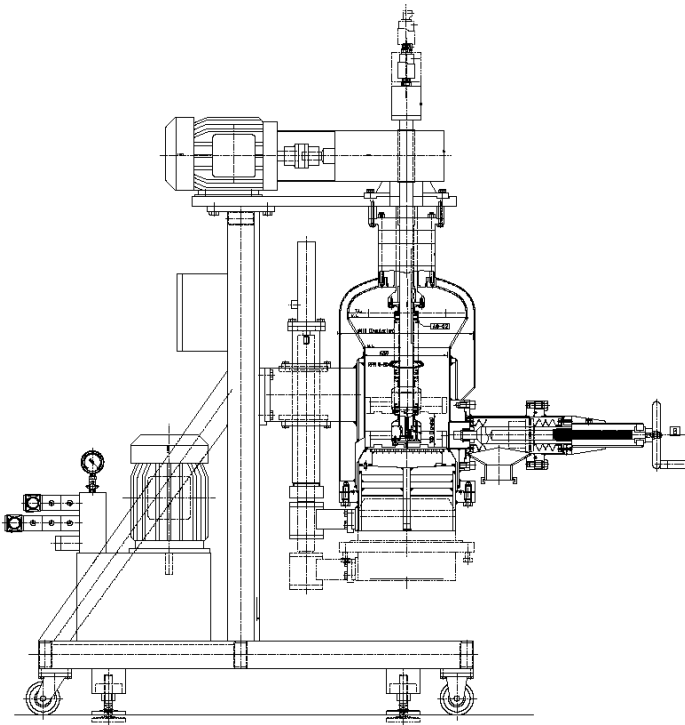
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## Pressofiltro® Pilot Units

Small filters have a widened upper vessel section to provide space for the required number of nozzles.



The product is discharged through a manually or hydraulically operated side discharge valve or through an active or passive isolator (glove box). The isolator permits contained sampling, product discharge and heel removal all in one system.



Detail of the top head with the mechanical seal, nozzle with pressure transmitter installed plus all other nozzles required.

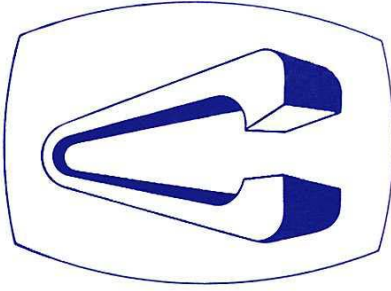
As to the specific requirements either liquid lubricated, non contacting gas barrier (lift-off) or contacting gas barrier mechanical seals may be installed.

On smaller pilot units nozzles with Tri-Clamp connections are typically installed, to permit quick installation or removal of the process connections.

If desired control units or human machine interfaces can be installed on the support skid.

All illustrations above show a Pressofiltro® PF 10 pilot unit with 0.045 m<sup>2</sup> filtration area

TI 0275 E - 03/09



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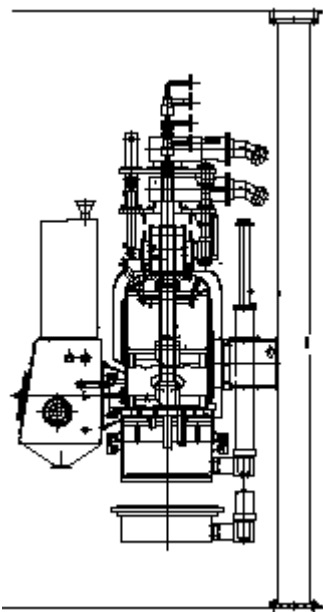
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## Pressofiltro® Pilot Units

Pressofiltro® pilot units are multipurpose tools for pilot plant or laboratory applications as well as for small scale production facilities. Versatile use of the equipment, cGMP compliant design, containment, efficient and complete cleanability, complete discharge-ability, highest drying efficiency, process safety and monitoring, simple validation and a compact design are important requirements for this type of equipment.



Most pilot units are used to process active pharmaceutical ingredients (API) and thus require varying degrees of containment for sampling, product discharge, product pack-off, heel removal and filter cloth disposal.

All the units pictured above are Pressofiltro® PF 100's with 0.20 m<sup>2</sup> filtration area. The unit on the left is equipped with a double chamber active isolator with continuous liner for all functions including product pack-off contained within the isolator. The unit in the center is equipped with a single chamber active isolator. The unit on the right is designed for the processing of sterile products and equipped with a conventional solids discharge valve.

Larger pilot units are typically mounted on a support column or post to facilitate access for operation, inspection and maintenance.

The vessel base is mounted on a separate column to lower the base and displace the base to the side. This arrangement provides excellent access to the filter plate or dryer base for cleaning and inspection purposes and is particularly useful for systems equipped with an isolator.

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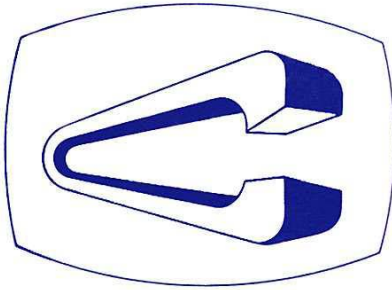
## Pressofiltro® Pilot Units

The vessel base typically is column mounted for lowering and displacement to the side. This permits excellent access to the filter plate for cleaning and inspection purposes as well as to install a new filter cloth on the filter base. A circumferential groove on the filter plate is designed to secure the filter cloth using PTFE rope. The PTFE rope is forced into the groove together with the cloth and permits a smooth installation of the cloth without wrinkles. Once secured, cloth outside of the PTFE rope is cut off. This arrangement also permits the contained disposal of a used filter cloth through the isolator.



A view through the discharge port opening shows the smooth transitions from the bellows to the agitator hub and from the agitator hub to the agitator arms, without any bolted connections. This design without dead areas allows for good cleanability using CIP systems and permits optimal inspection after the cleaning process. Dry product is discharged through a side discharge plug or discharge valve with the plug contoured to match the curvature of the vessel internal wall. Thus the vessel interior surface is smooth and cavity free.





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## Pressofiltro® Pilot Units

### Standard Features for Pilot Units:

- Calculation, design and manufacture in accordance with PED 97/23/EC or/and ASME pressure vessel code, Section VIII with U-Stamp as well as in compliance with cGMP and FDA guidelines.
- EC type examination certificate 03ATEX0246X per the 94/9/EC directive or with electrical components UL approved for operation in a Class 1, Division 1 or 2, Groups C & D environment.
- Double mechanical seals, externally interchangeable, dry running contacting or non contacting lift-off type seals as well as liquid lubricated seals.
- Vessel base column mounted for excellent access to the filter plate or dryer base.
- The vessel is skid mounted, complete with hydraulic unit or mounted on a support column.
- Sample valve.
- Hydraulic pre-piping to manifolds, pre-wiring to terminal boxes, all in Stainless Steel.
- CIP System.

### Options:

- Supplemental microwave heating to reduce time required for drying
- Aseptic versions, heel removal systems, contained discharge (Glove Box), DQ, IQ, OQ qualification
- PLC controls, autonomous or slaved to DCS, MCC

### Technical Data: (smaller pilot units)

	PF 5	PF 10	PF 25	PF 50	PF 100
Filter area:	0.03	0.045	0.07	0.13	0.20 m <sup>2</sup>
Vessel internal diameter:	200	250	300	400	500 mm
Vessel cylindrical height:	250	300	350	450	550 mm
Usable slurry volume:	8	15	25	55	100 l
Cake volume:	3	4.5	8	18	32 l
Bottom opening stroke:	120	150	200	250	300 mm
Heated area, wetted:	0.07	0.09	0.13	0.21	0.31 m <sup>2</sup>
Discharge valve ID:	60	60	80	100	150 mm
Agitator RPM:	10 - 100	8 - 80	7 - 70	6 - 55	5 - 50 RPM
Agitator drive:	0.75	1.1	1.5	2.2	4.0 kW
Agitator vertical stroke:	100	100	120	150	175 mm
Agitator up/down speed:	30	30	30	30	30 mm/min
Dust filter elements:	1	1	1	1	1 pcs.
Filter surface:	0.02	0.02	0.05	0.08	0.2 m <sup>2</sup>
Nitrogen vessel volume:					6 l

Design pressure: Vessel and jacket: Full vacuum / 4 barg  
 Design temperature: - 10 / + 151° C  
 Finish: Interior: mirror polish gr. 240 ( Ra 0.38 µm ) Exterior: satined gr. 180 ( Ra 0.76 µm )

Note: The technical data listed above are for the standard machine version. Machines with other pressure and temperature ratings and other specifications are available and can be quoted on request.

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## Pressofiltro® Pilot Units

### Standard Features for Pilot Units:

- Calculation, design and manufacture in accordance with PED 97/23/EC or/and ASME pressure vessel code, Section VIII with U-Stamp as well as in compliance with cGMP and FDA guidelines.
- EC type examination certificate 03ATEX0246X per the 94/9/EC directive or with electrical components UL approved for operation in a Class 1, Division 1 or 2, Groups C & D environment.
- Double mechanical seals, externally interchangeable, dry running contacting or non contacting lift-off type seals as well as liquid lubricated seals.
- Sample valve.
- Hydraulic pre-piping to manifolds, pre-wiring to terminal boxes, all in Stainless Steel.
- CIP System.

### Options:

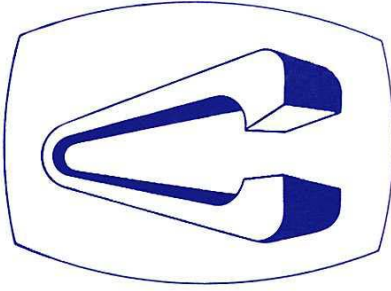
- Vessel base column mounted for excellent access to the filter plate or dryer base
- Skid mounted vessel or vessel mounted on a support column
- Supplemental microwave heating to reduce time required for drying
- Aseptic versions, heel removal systems, contained discharge (Glove Box), DQ, IQ, OQ qualification
- PLC controls, autonomous or slaved to DCS, MCC

### Technical Data: (larger pilot units)

	PF 200	PF 250	PF 350	PF 500S	PF 500
Filter area:	0.32	0.38	0.50	0.60	0.70 m <sup>2</sup>
Vessel internal diameter:	640	700	800	875	955 mm
Vessel cylindrical height:	720	750	800	850	900 mm
Usable slurry volume:	230	280	400	500	640 l
Cake volume:	80	115	150	180	210 l
Bottom opening stroke:	500	500	500	500	500 mm
Heated area, wetted:	0.57	0.74	0.85	0.94	1.04 m <sup>2</sup>
Discharge valve ID:	200	200	200	200	200 mm
Agitator RPM:	7 - 74	7 - 70	6 - 60	5 - 52	5 - 46 RPM
Agitator drive:	4.0	5.5	5.5	7.5	7.5 kW
Agitator vertical stroke:	250	300	300	300	300 mm
Agitator up/down speed:	30	30	30	30	30 mm/min
Dust filter elements:	1	1	1	1	1 pcs.
Filter surface:	0.2	0.3	0.4	0.4	0.4 m <sup>2</sup>
Nitrogen vessel volume:	6	6	6	6	6 l

Design pressure: Vessel and jacket: Full vacuum / 4 barg  
 Design temperature: - 10 / + 151° C  
 Finish: Interior: mirror polish gr. 240 ( Ra 0.38 µm ) Exterior: satined gr. 180 ( Ra 0.76 µm )

Note: The technical data listed above are for the standard machine version. Machines with other pressure and temperature ratings and other specifications are available and can be quoted on request.



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## Labo PF / TD Filter Dryer - Pan Dryer



Labo PF / TD 10



Labo PF / TD 50



Labo PF / TD 100

Labo filterdryers / pan dryers are economic units designed for less demanding laboratory applications, in particular for applications not requiring stringent containment. Labo units permit the operations inerting, slurry charging, vacuum or pressure filtration, cake smoothing, displacement or reslurry washing, heating, vacuum drying with agitation, cooling and manual discharge of the dry product.

The Labo filterdryers / pan dryers are installed on a wheeled trolley. Typically the units are equipped with welded insulation, Tri-Clamp process connections, stuffing box for shaft sealing and a dust filter with backcleaning. The instrumentation and the control system supplied permits operation in an ATEX group II 2 G / D (Zone 1 / 21) environment.



Left:

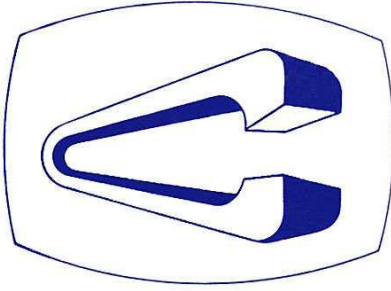
Vessel cover with agitator in the top position and turned to the side.

Centre:

Filter / dryer vessel turned over for emptying.

Right:

Filter / dryer vessel turned over with discharge funnel installed for product discharge



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## Labo PF / TD Filter Dryer - Pan Dryer

### Standard Features for Labo PF / TD Units:

- Calculation, design and manufacture in accordance with PED 97/23/EC or/and ASME pressure vessel code, Section VIII with U-Stamp as well as in compliance with cGMP and FDA guidelines.
- Suitable for operation in ATEX Group II 2 G / D (Zone 1 / 21) environments or with electrical components UL approved for operation in a Class 1, Division 1 or 2, Groups C & D environment.
- Suitable for use as a vacuum dryer, filter dryer or agitated nutsche filter.
- Shaft sealing with stuffing box.
- Unit mounted on wheeled trolley.
- Explosion proof control panel (EEx-d).

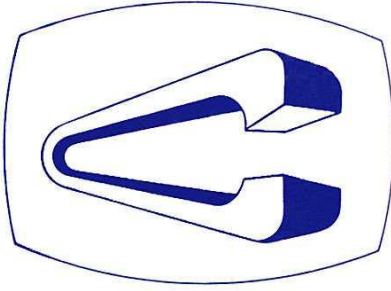
### Options:

- Multilayer filter elements.
- PLC based controls.

### Technical Data:

	PF/TD 5	PF/TD 10	PF/TD 20	PF/TD 50	PF/TD 100
Filter area:	0.03	0.045	0.055	0.12	0.2 m <sup>2</sup>
Vessel internal diameter:	200	250	270	400	500 mm
Vessel cylindrical height:	250	300	330	455	500 mm
Usable slurry volume:	0.6 - 6	1.2 - 12	1.5 - 15	5 - 46	8 - 80 litres
Usable cake volume:	0.2 - 1.5	0.5 - 3	1 - 5	2 - 15	4 - 25 litres
Agitator rotation speed:	15 - 150	15 - 150	12 - 120	8 - 80	7 - 70 RPM
Agitator drive:	1.1	1.5	1.5	2.2	4.0 kW
Agitator stroke:	200	200	250	300	300 mm
Agitator raise/lower speed:	25	25	25	25	25 mm/min.
Dust filter, surface area:	0.02	0.02	0.05	0.08	0.08 m <sup>2</sup>
Design pressure:	Vessel and jacket: Full vacuum / 2.0 barg				
Design Temperature:	-10 / +135 °C				
Finish:	interior: mirror polish gr. 240 (Ra 0.38µm) / exterior satined: gr. 180 (Ra 0.76µm)				
Weight:	160	200	250	400	980 kg

Note: The technical data listed above are for the standard machine version. Machines with other pressure and temperature ratings and other specifications are available and can be quoted on request.



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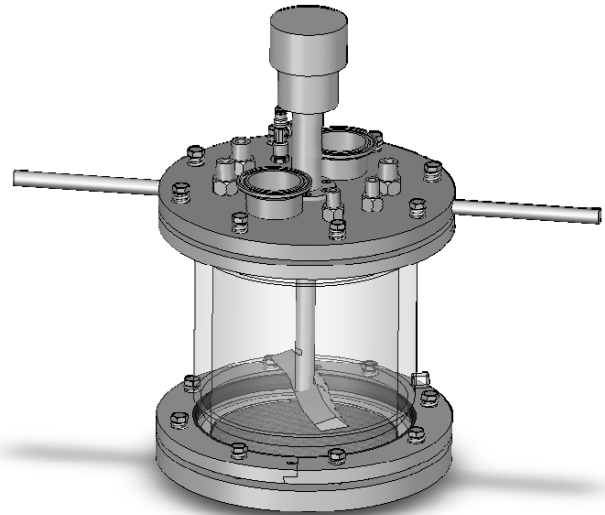
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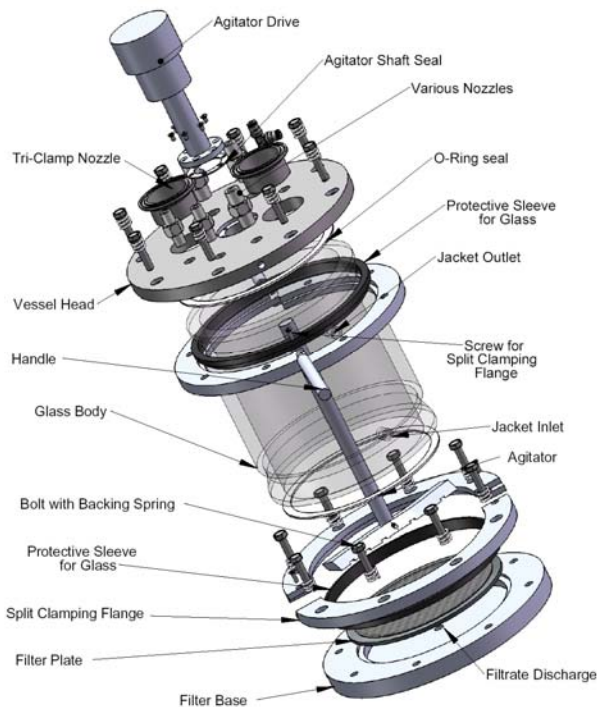
## LABO Nutsche Filter - Filter Dryer - Dryer

The LABO agitated nutsche filters / filter dryers / vacuum dryers with a volume of 2 liters and 5 liters have been developed for research, product development and small scale processing in laboratories. The units resemble as much as practicable plant nutsche filters or filter dryers and offer maximum visualization of the process.

LABO units permit the operations inerting, slurry charging, vacuum or pressure filtration, cake smoothing, displacement or reslurry washing, heating, vacuum drying with agitation, cooling and discharge of the dry product. The unit can be used as an agitated nutsche filter, filter dryer, pan dryer and also as a paddle dryer, mixer/blender and reactor. The cylindrical glass vessel body permits unobstructed observation of the processes.



The top head contains process nozzles as required as well as the agitator support and seal. The agitator permits clockwise and counterclockwise rotation for mixing, cake smoothing, reslurrying and drying operations, as well as up/down translation for mixing and for accommodating different cake heights. Agitator rotation is manual using the crank supplied with the unit or using a standard laboratory stirrer.

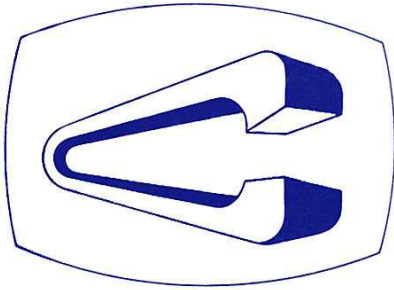


All commonly used filter materials such as synthetic or metal cloth, multilayer filter plates, glass frits etc. can be accommodated. Installing a solid bottom plate permits the operation as a pan dryer, with a different agitator type and in horizontal orientation it can be operated as a paddle dryer.

Dry product is discharged by turning the vessel through 90 degrees and discharging through one of the large top head nozzles or by removing the vessel head and agitator then turning the vessel through 90-180 degrees.

A range of supplementary equipment is available such as multilayer filter plates with different porosities, various ball and needle valves to control the process, pressure gauges and pressure sensors/transmitters, rupture disks for overpressure protection etc.

The unit is CE marked and thereby complies with all necessary regulations allowing CE compliance.



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## LABO Nutsche Filter - Filter Dryer - Dryer

### Standard Features for LABO Units:

- LABO units conform to the EC Machinery Directive 98/37/EC and are CE marked.
- Suitable for use as an agitated nutsche filter, filter dryer or vacuum dryer.
- Permits the use of all commonly used filter materials such as synthetic or metal cloth, multilayer filter plates, glass frits.
- Cylindrical vessel body in borosilicate glass 3.3 for unobstructed process observation, with jacket for heating/cooling.
- Vessel head with support arms in 316 L stainless steel.
- Vessel bottom with interchangeable filter plates, both in 316 L stainless steel.
- Agitator with crank for manual rotation, also suitable for rotation by standard laboratory stirrers.
- Adjustable slider for agitator up/down movement.
- Shaft sealing with packed gland.

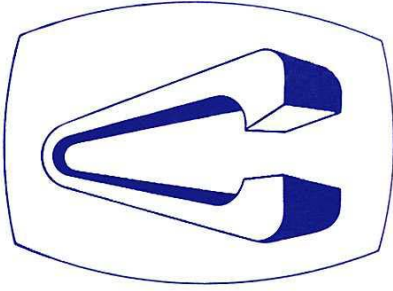
### Options:

- Vessel head, vessel bottom and agitator in Hastelloy C 22, Titanium, with ETFE coating (FDA approved) and other materials.
- Multilayer filter plates in various porosities.
- Rupture disk for overpressure protection.
- Pressure gauge, various process valves, various electronic instrumentation.
- Base plate for dryer only operation, agitator for use as paddle dryer with vessel in horizontal position.

### Technical Data:

	LABO 2	LABO 5
Filter area:	0.010 m <sup>2</sup>	0.020 m <sup>2</sup>
Vessel internal diameter:	116 mm	162 mm
Vessel cylindrical height:	190 mm	250 mm
Usable slurry volume:	0.2 - 1.6 litres	0.4 - 4.2 litres
Agitator rotation speed with stirrer:	1 - 200 RPM	1 - 150 RPM
Agitator stroke:	150 mm	200 mm
Top process nozzles:	2 x 1½" Tri-Clamp 4 x ½" NPT	2 x 2" Tri-Clamp 4 x ½" NPT
Jacket nozzles:	2 x 10 mm OD nipple	2 x 10 mm OD nipple
Bottom filtrate nozzle:	½" NPT	½" NPT
Design pressure vessel:	Full vacuum / 4.0 barg	
Design pressure jacket:	Full vacuum / 1.0 barg	
Design Temperature:	-10 / +135 °C	
Metal surface finish:	Mirror polished, interior gr. 240 (Ra 0.38µm) / exterior gr. 180 (Ra 0.76µm)	
Weight:	12 kg	25 kg

Note: The technical data listed above are for the standard filter device. Filters meeting other specifications are available and can be quoted on request.



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## Pressofiltro® Pilot Units



Pressofiltro® pilot nutsche filters and filter dryers designed to meet varied customer specifications. Customer specified options include single column support, support on a skid or conventional 3 leg design, hydraulically activated discharge valve or manually operated discharge port, active or passive isolators for sampling, discharge and heel removal, heel break-up system, microwave preparation, all electric versions, bayonet or C-clamp locking for filter bottom, etc.

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