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Drying and Filtration Technology

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Turbodry®

Agitated Vacuum Pan Dryer



TI 0124 E - 02/06



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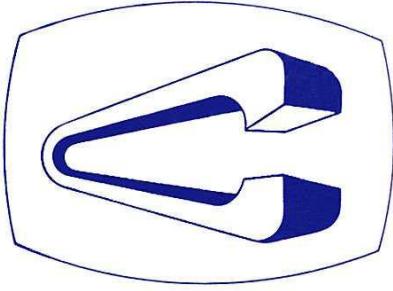
Turbodry® Agitated Vacuum Pan Dryers



Turbodry® agitated vacuum pan dryer, left conventional design, right single column design

- Shortest possible drying times, suitable for the drying of sensitive, pasty, sticky and other “difficult” products such as those turning highly viscous during the drying process.
- Simultaneous axial and radial agitator movements permit efficient and even mixing of the entire product mass, while preventing balling and the formation of lumps without requiring a chopper. The slowly rotating agitator minimizes the shear forces acting onto the product, thus limiting mechanical and thermal product degradation, maintaining the products original crystal structure.
- Conforming fully to **cGMP and FDA** guidelines:
 - Agitator supported on dished top only, without any seals in the product area.
 - Excellent cleanability using CIP Systems, simple validation process.
- Double mechanical seals, externally interchangeable, dry running contacting or non contacting lift-off type seals as well as liquid lubricated seals.
- Calculation, design and manufacture to **Pressure Equipment Directive 97/23/EC** and/or **ASME U-Stamp**.
- Large heating area resulting in an outstanding heat transfer rate by heating the vessel walls, the vessel bottom as well as the agitator blades. Optional supplemental heating with **microwaves**.
- Good emptying characteristics due to narrow agitator to wall/bottom clearances and a unique agitator blade design.

TI 0009 E - 04/05



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The double mechanical seal is installed on the dished top head, above the area wetted by the product and is well accessible for cleaning and maintenance purposes.

Dry or wet running mechanical seals may be installed.

The agitator shaft is sealed by a metal bellows over its entire length.

Simultaneous rotational and vertical agitator motions result in a very efficient and even mixing of the entire product mass, also preventing local overheating and the formation of lumps.

Sensitive products are protected by minimizing the shear forces acting onto the product.

Highly viscous products can be dried faster by lifting the product lump formed in the machine.

The agitator is designed to have a large surface for maximum possible heat transfer.

The cylindrical vessel, the flat base and the agitator are machined to assure the smallest possible tolerances between agitator and vessel wall and flat bottom respectively.

Smallest possible tolerances also permit good heat exchange and prevent product adherence to the vessel wall and flat bottom.

All internal surfaces are mirror polished, to improve the flow behavior of powdery products, the prevention of microdeposits as well as to facilitate cleaning.



TI 0042 E - 08/02



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Turbodry® Agitated Vacuum Pan Dryers

Standard Features:

- 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 03ATEX0245X 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:

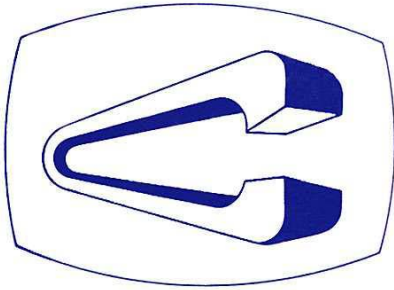
- Supplemental microwave heating to reduce time required for drying.
- Pressure proof versions, aseptic versions, contained discharge (Glove Box), DQ, IQ, OQ qualification.
- PLC controls, autonomous or slaved to DCS, MCC.

Technical Data: (small units)	TD 0.8/1.1	TD 1.5/2.3	TD 2.3/3.5	TD 3.8/5.6	TD 6.6/9.7	TD 8.0/12
Vessel internal diameter:	500	710	800	970	1140	1270 mm
Vessel cylindrical height:	650	750	920	920	1120	1130 mm
Total internal volume:	140	340	530	800	1330	1700 l
Usable volume:	100	235	350	560	970	1200 l
Agitated volume:	73	158	250	380	660	820 l
Bottom opening stroke:	500	500	500	500	800	800 mm
Heated area, wetted:	1.4	2.5	3.4	4.4	6.3	7.3 m ²
Discharge valve ID:	200	200	200	200	250	250 mm
Agitator RPM:	9 - 90	7 - 65	6 - 60	5 - 50	4 - 42	4 - 37 RPM
Agitator drive:	5.5	7.5	11.0	15.0	18.5	22.0 kW
Agitator vertical stroke:	300	300	400	400	500	500 mm
Agitator up/down speed:	50	50	50	40	40	40 mm/min
Dust filter elements:	1	1	1	1	2	2 pcs.
Filter surface:	0.2	0.3	0.4	0.4	0.8	0.8 m ²
Nitrogen vessel volume:	6	6	6	6	6	6 l

Design pressure: Vessel: Full vacuum / 0.45 barg 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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Standard Features:

- 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 03ATEX0245X 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:

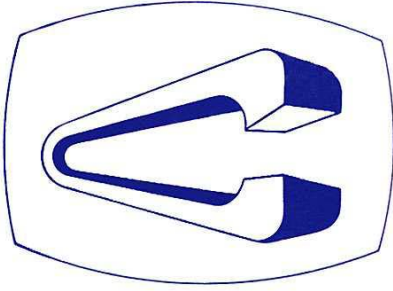
- Supplemental microwave heating to reduce time required for drying.
- Pressure proof versions, aseptic versions, contained discharge (Glove Box), DQ, IQ, OQ qualification.
- PLC controls, autonomous or slaved to DCS, MCC.

Technical Data: (larger units)	TD 12/17	TD 17/25	TD 21/32	TD 25/37	TD 32/50	TD 40/60
Vessel internal diameter:	1460	1650	1850	2000	2250	2500 mm
Vessel cylindrical height:	1290	1420	1420	1420	1465	1465 mm
Total internal volume:	2560	3620	4640	5500	7310	9240 l
Usable volume:	1750	2560	3220	3770	4890	6030 l
Agitated volume:	1250	1700	2150	2500	3200	3950 l
Bottom opening stroke:	800	800	800	800	800	800 mm
Heated area, wetted:	9.7	12.1	14.3	16.0	19.3	22.5 m ²
Discharge valve ID:	250	350	350	350	350	350 mm
Agitator RPM:	3 - 33	3 - 29	3 - 26	3 - 24	2 - 21	2 - 19 RPM
Agitator drive:	30	37	45	55	75	90 kW
Agitator vertical stroke:	600	600	600	600	600	600 mm
Agitator up/down speed:	30	30	20	20	20	20 mm/min
Dust filter elements:	3	4	4	4	5	6 pcs.
Filter surface:	1.2	1.6	1.6	1.6	2.0	2.4 m ²
Nitrogen vessel volume:	12	12	12	12	24	24 l

Design pressure: Vessel: Full vacuum / 0.45 barg 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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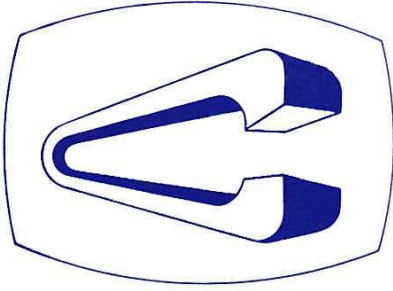
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Turbodry® TD 3.8/5.6 Vacuum Pan Dryer



TD 3.8 / 5.6 agitated vacuum pan dryer in pharmaceutical design, with bayonet locking system for dryer bottom, solids discharge valve actuated by electric motor, pre-wiring to junction box with cables contained within SS halfpipe, tubes and metal braided hoses.

TI 0083 E - 04/04



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Turbodry® TD17/25 Vacuum Pan Dryer



Left:

Turbodry® TD 17 / 25 agitated vacuum pan dryer in pharmaceutical design, wetted materials of construction in Hastelloy C 22 (2.4602). With bayonet locking system for dryer bottom, pre-wiring to junction box with cables contained within SS halfpipe, tubes and metal braided hoses.

Right:

Turbodry® TD 17 / 25 agitated vacuum pan dryer in pharmaceutical design, wetted materials of construction in Hastelloy C 22 (2.4602). With C-clamp locking system for dryer bottom, pre-wiring to junction box with cables contained within SS halfpipe, tubes and metal braided hoses.



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Turbodry® TD 21/32 Vacuum Pan Dryer



Type Turbodry® TD 21 / 32 agitated vacuum pan dryer in pharmaceutical design, wetted materials of construction in Hastelloy C 22 (2.4602). With bayonet locking system for dryer bottom, pre-wiring to junction boxes with cables contained within SS halfpipe, tubes and metal braided hoses.

TI 0087 E - 06/03