

AIR-TEC

SYSTEM

OTPA



**Pressure vessels for
dense phase
pneumatic conveying
of bulk materials**





The **pressure vessels of the TPA line** are designed for handling a wide range of materials and blends of different products. They are also recommended for applications over long distances and with large rates; also able to ensure the integrity of the material and limit wear on the pipes.

Pressure vessel configuration

TPA vessels are standard machines and are configured from time to time on the basis to the required application. Initially, the volume of the tank must be defined as a function of the flow rate. Subsequently the pneumatic panel is chosen based on the type of operation and the estimated air consumption. Finally, the electrical panel in relation to the type of operation and in consideration of the number of destinations to feed.

Transport lines can be equipped with special boosters capable of fluidizing the passage of material inside the pipeline.

All TPA vessels are certified to PED standards and, on request, can be certified to ASME or other international standards.

They are available in the following versions:

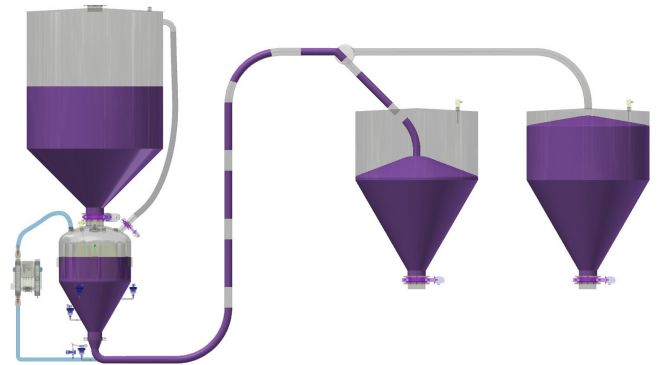
- carbon steel;
- AISI 304 stainless steel;
- AISI 316 stainless steel;
- with finishes for food application;
- for high temperatures;
- for ATEX zone.



Conveying phases

A total cleaning transport system is managed with the complete emptying of the line according to following steps:

1. Fill the conveying vessel.
2. Pressurization with consequent transport e emptying the line.
3. Re-filling and convey.



Description

Total cleaning or conventional pneumatic conveying is suitable for handling **various materials** and is indicated in cases where it is required a **complete cleaning of the line** after each cycle. It is widely used in multiple applications, for example unloading of weighing systems for the transfer of dosed products or at the mixer discharge where it is necessary to preserve the integrity of the mixture during transport.

The conventional methodology is not recommended for handling delicate materials or in the case of very long distances, as the product tends to accelerate with the increase in distance.

To correctly size a dense phase transport with the conventional system is the volume of the vessel must be comparable to the volume of the line.

Principle of operation

The pressure pot is loaded from above trough a butterfly valve until reached the maximum level indicator. Then the loading valve closes and opens air or other fluid supply valves. The tank, full of material, is put under pressure until it reaches the value useful for transport. The product then begins to flow in the pipeline, generating the **typical plug transport** proceeds until complete **emptying of the line**. When the line is empty the pressure switch detects the drop in pressure and indicates the end of transport. At this point, if necessary, the air cleaning phase is automatically activated which introduces into the pipe a continuous air flow of pre-settable duration.

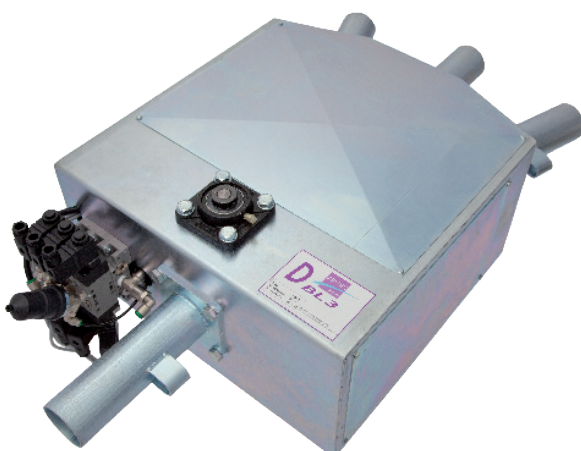
For the correct functioning of the total cleaning transport, it is necessary that the silos or hoppers at the destination are equipped with suitably sized filters so that they do not remain under pressure after each cycle.

Multi-destination transport

To ensure tightness at adequate pressures in the presence of multiple destinations and to allow complete emptying of the line, the use of two or three-way deviators, DEV model up to 5 bar, is recommended.

Application of boosters

The boosters are recommended in the case of heavy products, not free-flowing or with mixtures from different grain sizes.



TPA FULL PIPELINE

Conveying phases

Full pipeline transport is an innovative method in which pressure management is entrusted to a PLC with a specially designed control program to keep speeds constant during conveying.

The full pipeline system always uses boosters and keeps the conveying pipeline full following these steps:

1. Fill the pressure vessel.
2. Pressurization and subsequent transport.
3. Depressurization of the empty tank and of the line full of product.
4. Refilling and new transport.

The full pipeline conveying is suitable for handling **all materials** in particular **fragile, delicate or abrasive**, it is suitable for long distances and is convenient for multiple destinations.

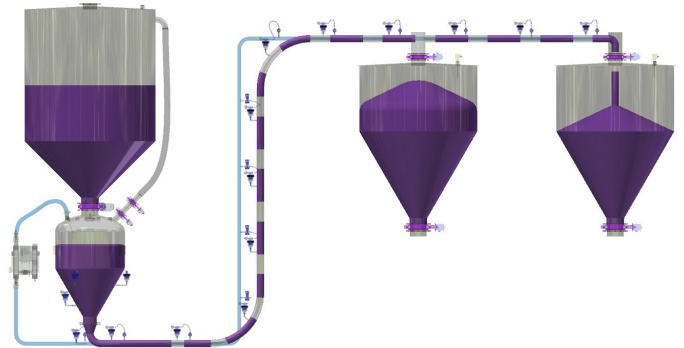
Principle of operation

The vessel is loaded by gravity through a dedicated butterfly valve. The filling ends when the product reaches the maximum level indicator. Then the filling valve and the vent valves close, while the air or other transport fluid supply valves open.

The tank, full of product, is put under pressure until it reaches the value useful for transport. The product then begins to flow in the pipeline, generating the **typical plug conveying** until the minimum level indicator remains uncovered. Once this condition is reached, air supply valves stop, **the material stops along the conveying line** and begins the depressurization.

The vent valve opens and through a calibrated orifice in the disc of the vent valve, the tank returns to atmospheric pressure.

The vessel is then ready for a new cycle; the loading valve and the two vent valves open.

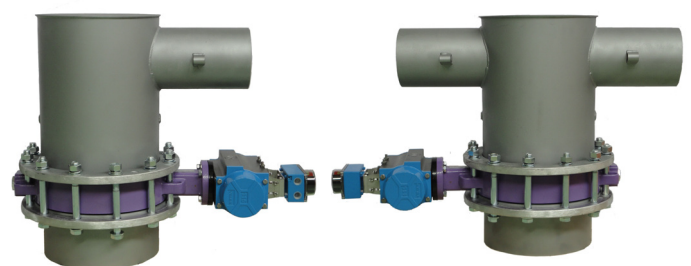


Use of boosters

Each time a new transport cycle begins the boosters appropriately calibrated and positioned at regular intervals along the line, allow the restart of the product. During the transport cycles following the first one, the air consumption is lower because a large part of the pipeline is still full of material.

Multi-destination transport

In cases where it is necessary to feed multiple destinations with a single product through the full pipeline system, just one pipe can be used. The material fills the line and then is downloaded to the destination desired thanks to the use of terminal receiving valves placed in series along the line.

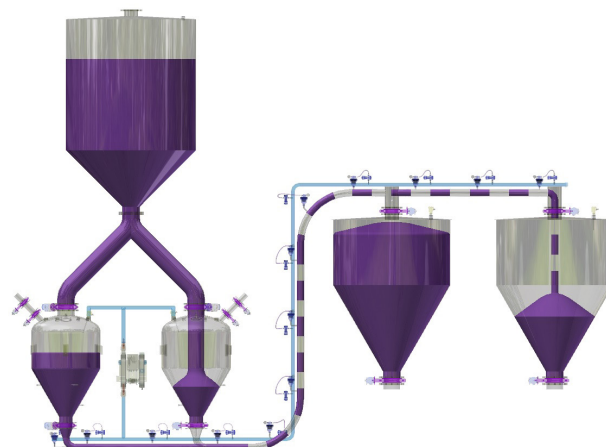


TPA FULL PIPELINE CONTINUOUS

Conveying phases

The full pipeline continuous system uses two TPA full pipeline vessels connected in parallel to allow a continuous passage of the material inside the pipeline.

The convey phases are the same as those of the full pipeline method with the difference that the pressure vessels are loaded alternately.



Full pipeline continuous is suitable for **long distances**: the use of two vessels with smaller dimensions and overall dimensions than the same cycle carried out with a single tank, allows optimal performance.

Conveying times are reduced by alternating the loading phase of the two vessels. This also ensures continuity of operation.

The continuous conveying mode allows to **increase the performance** of the system with a greater flow rate than the full pipeline technology.



The two engines are equipped with a single pneumatic panel and a single electronic control panel.

The use of boosters is necessary.

Multi-destination transport

In cases where it is necessary to feed multiple destinations with a single product through the full pipeline continuous system, as well as in the full pipeline system, it is possible to use only one pipe. The material fills the line and is then unloaded to the desired destination thanks to the use of crossing or terminal valves placed in series along the line.



PNEUMATIC PANEL

Pneumatic panels are devices dedicated to the control of pressure and air volumes used in dense phase conveying.

In most cases are applied for air regulation, but they can be also used with other inert gases such as nitrogen.

For the proper functioning of the systems Air-Tec System, it is necessary to supply air dry or nitrogen at a pressure of 7.5 bar.

The pneumatic panels are connected directly to the air storage tank located downstream of the compressor and have the scope of controlling the power supply of both the pressure vessel and the bypass line dedicated to boosters.

In the case of handling poorly flowing products, the pneumatic panels of the TPA line can be equipped with special valves called Pulse Jet. These devices have the scope of generating a sequence of high pressure air pulses inside the cone to facilitate its complete emptying.

For applications in unfavourable setting, such as the marine environment or in areas subject to the aggression of atmospheric agents, the pneumatic panel can be housed inside a stainless steel box while the air collectors can be painted according to customer specifications.

The TPA line uses ACP type panels with **manual or electronic control** according to the type of transport:

- total cleaning TPA vessels have an ACP / M pneumatic control panel with manual control;
- full pipeline TPA vessels have a ACP / E pneumatic panel with electronic control;
- the TPA full pipeline continuous have an ACP FLC panel with electronic control.

The pneumatic panel is designed according to the total flow required by the system.



Available configurations

- Single calibration (/M): set the pressure to manual valve, which controls one or more pilot-operated regulators.
- Multi pressure calibration (/E): a proportional valve converts the analog signal from the electronic control panel into a pneumatic signal for the pilot-operated regulator(s).



The standard electronic control panels for the TPA line are complete with Siemens S7 1200 series PLC and color touch screen operator panel. Available models:

- CV 3000
- U 3000 FL
- U 3000 FLC

All standard panels have a terminal block with clean contacts for the main I / O signals and, on request, can be programmed for data exchange with Modbus TCP / IP protocol. They are equipped with quick connection systems that allow, thanks to the use of a multipolar wire, can be easily connected to the junction box. In the case of systems installed in Atex zones 22 or 21, the electronic panels must be positioned in a safe area.

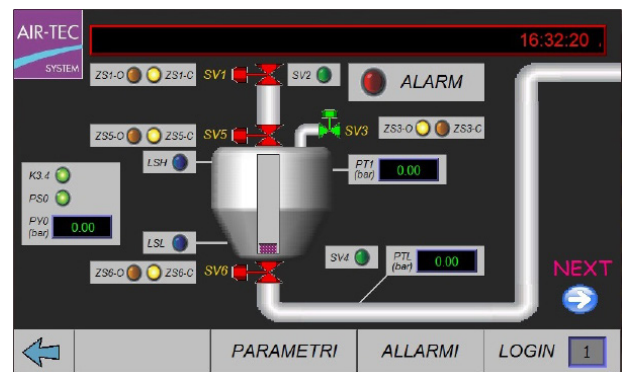
In the PLC and operator panel are installed software and interfacing process, which allow complete control of the lines, with parameterization, alarms, test and debug, and distinct operating modes:

- automatic: process management complete, from loading of the material, storage and transport to the requested destination;
- semi-automatic: with the possibility of choosing, starting and stopping the single process phase, in total safety and without the possibility of mistakes;
- manual: offers the possibility of interacting with each individual user, inputs and outputs, for the purpose of verification or control.

In the case of supplies that do not include automation by Air-Tec System™, the

vessels can be equipped with junction boxes for the management of process inputs and outputs remotely, which can be connected to the customer's central units (CPU PLC) through specific fieldbus, in particular Profinet for Siemens or Ethernet-IP for Allen Bradley systems.

The panels of the TPA line are designed to accommodate the remote assistance device. The software option of the Modbus TCP / IP communication module is provided, with the purpose of data integration and the possibility of control, by the customer, by their own supervision systems.



The models of the electrical panels are chosen according to the type of transport:

- **CV 3000 electronic panels**
designed for the conventional TPA line

- **U 3000 FL electronic panels**
designed for the full pipeline TPA line

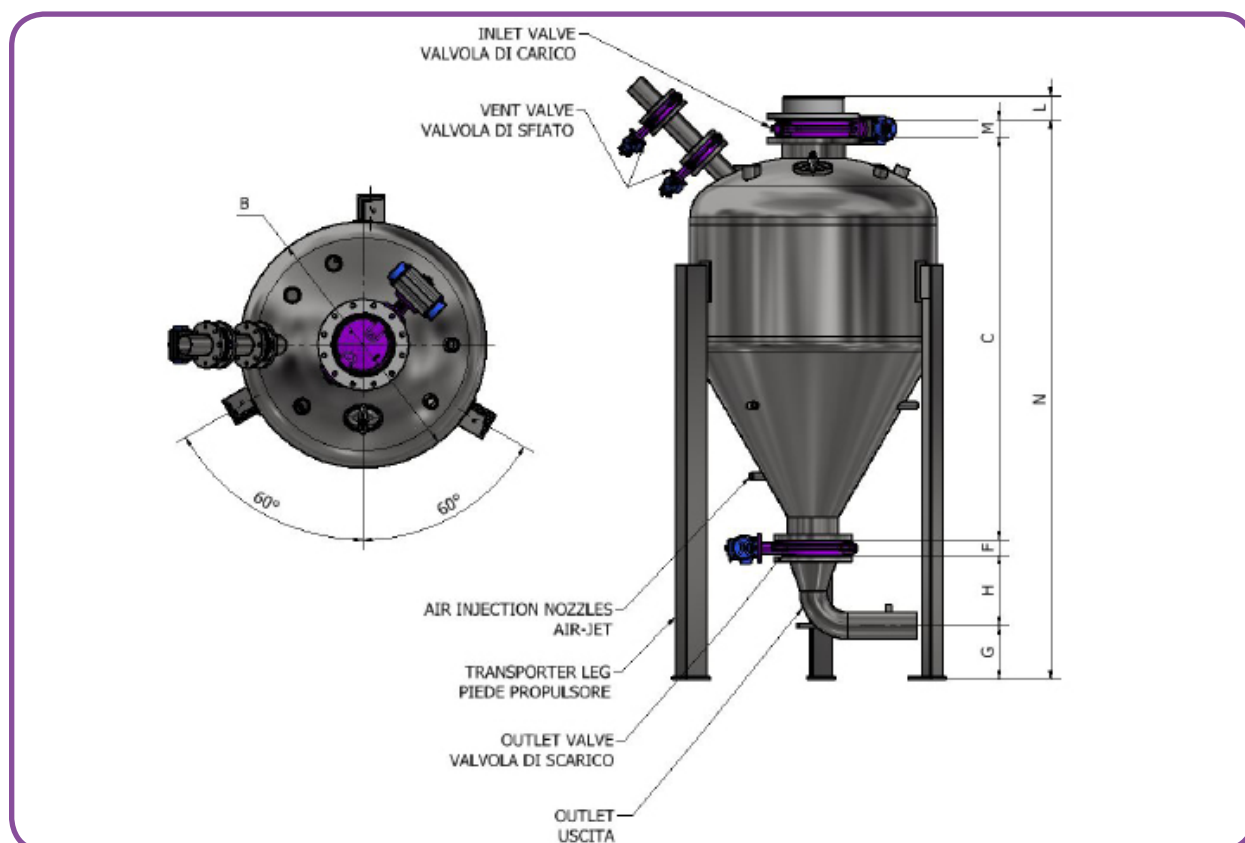
U 3000 FL panels designed for multi-destination transport with receiving valves, can manage 3 destinations in the standard version.

- **U 3000 FLC electronic panels**
designed for the TPA full pipeline continuous line

The U 3000 FLC panels have the same functional characteristics as the U 3000 FL model and are able to manage two pressure vessels simultaneously.



DIMENSIONS



Type	Capacity (liters)	B (mm)	C (mm)	Vent valve ø	Inlet valve ø	Outlet valve ø	F (mm)	G	H	L (mm)	M (mm)	N (mm)	Weight (kg)
8 TPA 30 S	85	762	1009	80	200	100	51	CONTACT AIR-TEC SYSTEM TECHNICAL DEPT.		100	64	1463	124
8 TPA 50 S	142	762	1158	80	200	100	51			100	64	1612	145
8 TPA 100	283	762	1263	80	200	150	54			100	64	1802	196
10 TPA 200	566	1067	1496	80	250	150	54			100	64	2084	351
10 TPA 300	850	1067	1804	80	250	200	64			100	64	2468	417
12 TPA 400	1133	1219	1988	80	300	200	64			150	76	2664	515
12 TPA 500	1416	1219	2210	80	300	250	64			152	76	2858	560
12 TPA 600	1699	1219	2413	80	300	250	64			152	76	3137	602
12 TPA 700	1982	1219	2642	100	300	250	64			152	76	3366	646
12 TPA 800	2265	1219	2896	100	300	250	64			152	76	3620	694
12 TPA 900	2549	1219	3124	100	300	250	64			152	76	3848	738
16 TPA 1000	2832	1219	3353	100	400	300	76			152	102	4229	876
16 TPA 1500	4248	1524	3505	100	400	300	76			152	102	4382	1247



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