



Air Treatment Units (ATU) for the railway industry

Functional Overview

aerospace
climate control
electromechanical
filtration
fluid & gas handling
hydraulics
pneumatics
process control
sealing & shielding



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Functional Overview: Air Treatment Unit (ATU)

The Parker domnick hunter Air Treatment Units (ATU) are compressed air railway dryers fitted with associated filtration. Designed to remove bulk oil, oil aerosols, bulk water, dirt particles and water vapour from railway industry compressed air systems providing the highest quality compressed air to applications which depend upon clean dry air for their reliable operation. As the patented design is modular in construction, the ATU can be designed to meet the specific dewpoint requirements for the application at the specified worst case operating parameters.



A modern approach to high efficiency compressed air drying can remove water vapour to a dewpoint suppression. Vertical and horizontal solutions shown.



Benefits

- **Highest quality compressed air**
Meets international standards
- **Optimal performance guaranteed**
Continued protection in any climate
- **Compact and lightweight**
Can be installed almost anywhere onboard rolling stock
- **Modular design**
Simple to install
- **Low maintenance**
Easy to maintain
- **Compatible with all compressor oils**
Suitable for operation with all types of compressor
- **Cost effective**
Low operational costs
- **Energy efficient**
Purgy economy optimises performance

ATU orientation

The Parker domnick hunter ATU has the advantage of being used in horizontal and stacked orientations where the space envelope precludes the use of a vertical dryer.

The ATU is factory configured to the desired orientation to accommodate the moisture discharge from within the drying system.

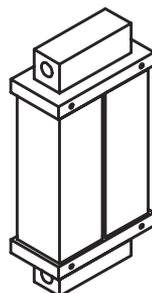
Orientation data is required at the time of specifying a dryer.

Features

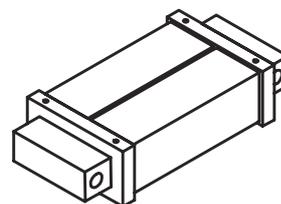
- **Fully corrosion protected**
Alocrom treatment and epoxy paint finish
- **Flexible installation**
Can be installed vertically or horizontally, internally or externally
- **Independently validated**
Independently tested for shock, vibration, EMC and flammability
- **Quiet operation**
Low operating noise level
- **Electrical supply**
Designed to customer specifications

Options

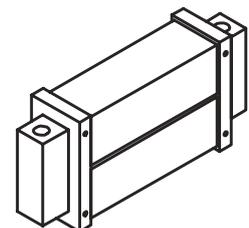
- **A range of dewpoint suppressions available**
- **OEM design and build**
- **Electronic condensate drains**
- **Pneumatic condensate drains**
- **Trace heating**



**TDV
(Vertical)**



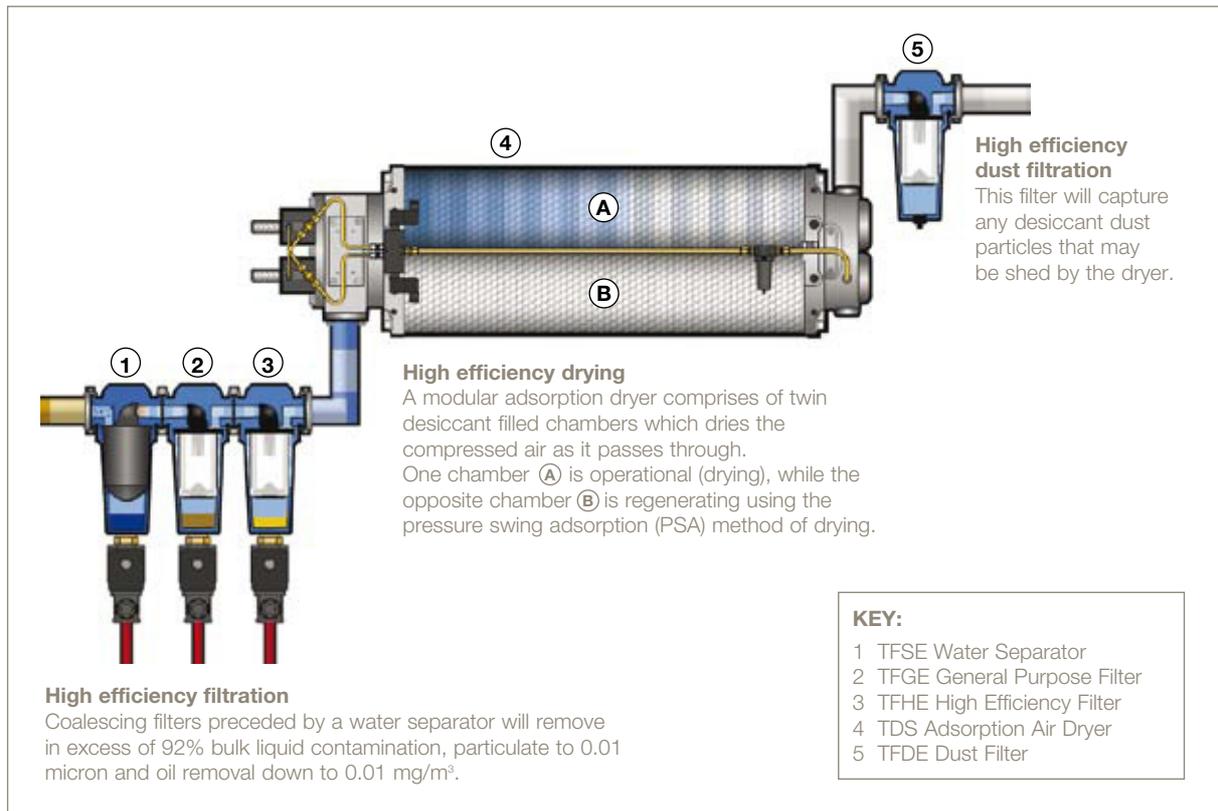
**TDH
(Horizontal)**



**TDS
(Stacked)**

The Parker domnick hunter ATU comprises of five separate compressed air treatment stages:

- 1 TFSE Water Separator
- 2 TFGE General Purpose Filter
- 3 TFHE High Efficiency Filter
- 4 TDS Adsorption Air Dryer
- 5 TFDE Dust Filter



Water separators

Water separators are used to protect coalescing filters in systems where excessive cooling takes place in air receivers and distribution piping.

Using mechanical separation techniques, water separators will remove in excess of 92% bulk liquid contamination.

Coalescing filters

Coalescing filters are probably the single most important purification equipment in a compressed air system. They are designed to not only remove aerosols (droplets) of oil and water using mechanical filtration techniques, but also to remove solid particulate to very low levels (as small as 0.01micron in size). Installed in pairs, the first filter is a 'general purpose filter' which protects the second 'high efficiency filter' from bulk contamination. The dual filter installation from Parker domnick hunter ensures a continuous supply of high quality compressed air with the additional benefits of low operational costs and minimal maintenance.

Adsorption dryers

Adsorption dryers are designed to remove water vapour only and not water in a liquid form, they require the use of coalescing filters to work efficiently.

Adsorption dryers remove moisture by passing air over a regenerative desiccant material which strips the moisture from the air. This type of dryer is extremely efficient and a typical pressure dewpoint for adsorption dryers is -40°C (-40°F). However, in rolling stock applications the dryness of the compressed air is stated as a dewpoint suppression.

Dust removal filters

Dust removal filters are used for the removal of dry particulates which may be carried over from the desiccant material in the dryer. They provide identical particulate removal performance to the equivalent coalescing filter and use the same mechanical filtration techniques to provide up to 99.9999% particle removal efficiency, often referred to as an insurance policy.

Stage 1. TFSE - Compressed Air Water Separator

The lightweight housing incorporates a module which creates a vortex that improves centrifugal and impingement separation. Over 92% of the bulk liquid present in the compressed air line is removed at this stage. Collected liquid condensate in the form of water and oil emulsification (mayonnaise) is automatically removed from the system by a solenoid operated / timed drain valve.

Filtration Grade:	GRADE SE
Filter Type:	Bulk Liquid Separator
Contaminants Removed:	Condensed Water Liquid Oil
Particle Removal (Inc water & oil aerosols):	N/A
Maximum Remaining Oil Aerosol Content:	N/A
Filtration Efficiency:	>92%
Test Methods Used:	ISO8573-9
ISO12500-1 Inlet Challenge Concentration:	33ml/ m ³ / hr
Initial Dry Differential Pressure:	N/A
Initial Saturated Differential Pressure:	N/A
Precede with Filtration Grade:	N/A
Change Internal Cartridge:	Every 3 years
Shock and Vibration:	BSEN61373:1999

Note:

All aluminium surfaces are corrosion protected using Alocrom, with external surfaces being further protected with a dry powder epoxy paint coating.

The filter housings and dryer extrusion are guaranteed for 10 years service life when maintained in accordance with the Planned Maintenance Schedule.



TFSE Water Separator

Benefits:

- Protects coalescing filters from bulk liquid contamination.
- Helps provide air quality in accordance with NF F11-100 and ISO8573-1:2010 the international standard for compressed air quality
- High liquid removal efficiencies at all flow conditions
- Suitable for all compressed air applications
- Reduced operational and maintenance costs
- Reduced set out for service costs
- Suitable for all compressor types
- The world's most energy efficient compressed air water separators
- Low pressure losses ensuring low operational costs
- All water separators are covered by a 10 year housing guarantee

Stage 2. TFGE - General Purpose Compressed Air Filter

This filter type utilises a coalescing element comprising of several layers of borosilicate glass micro-fibre, which captures dirt particles down to 1 micron in size. Coalesced liquid condensate collects in the base of the filter housing where it is automatically removed from the system by a solenoid operated / timed drain valve.

Filtration Grade:	GRADE GE
Filter Type:	General Purpose Coalescing Filter
Contaminants Removed:	Water Aerosols Oil Aerosols Atmospheric Dirt & Solid Particulates Micro-organisms Rust Pipe scale
Particle Removal (Inc water & oil aerosols):	Down to 1 micron
Maximum Remaining Oil Aerosol Content:	0.6 mg/m ³ at 21°C 0.5 ppm(w) at 70°F
Filtration Efficiency:	99.925%
Test Methods Used:	ISO12500-1 ISO8573-2 ISO8573-4
ISO12500-1 Inlet Challenge Concentration:	40mg/m ³
Initial Dry Differential Pressure:	<70 mbar (1.5 psi) at 7 bar g (100 psi g)
Initial Saturated Differential Pressure:	<140 mbar (2 psi) at 7 bar g (100 psi g)
Precede with Filtration Grade:	Grade SE (if bulk liquid is present)
Change Element:	Every 12 Months
Shock and Vibration:	BSEN61373:1999



TFGE / TFHE Compressed air filter

Benefits:

- Delivered air quality in accordance with NF F11-100 and ISO8573-1:2010, the international standard for compressed air quality
- Continuous protection of downstream equipment and applications
- Reduce unplanned maintenance and set out for service costs
- Filtration performance independently verified by Lloyds Register
- Coalescing filters tested in accordance with the test methods of the ISO8573 Series
- Suitable for all compressor types
- Pressure losses start low and stay low to save energy
- Low operational costs
- Filters are covered by one year compressed air quality guarantee which is automatically renewed with annual maintenance
- All filter housings are covered by a 10 year housing guarantee

Stage 3. TFHE - High Efficiency Compressed Air Filter

This filter type utilises a very high efficiency coalescing element comprising of several layers of very fine borosilicate glass micro-fibre which captures dirt particles down to 0.01 micron in size and removes oil aerosols down to 0.01 mg/m³ @ 20°C (68°F). Coalesced liquid condensate collects in the base of the filter housing where it is automatically removed from the system by a solenoid operated / timed drain valve.

Filtration Grade:	GRADE HE
Filter Type:	High Efficiency Coalescing Filter
Contaminants Removed:	Water Aerosols Oil Aerosols Atmospheric Dirt & Solid Particulates Micro-organisms Rust Pipe scale
Particle Removal (Inc water & oil aerosols):	Down to 0.01 micron
Maximum Remaining Oil Aerosol Content:	0.01 mg/m ³ at 21°C 0.01 ppm(w) at 70°F
Filtration Efficiency:	99.9999%
Test Methods Used:	ISO12500-1 ISO8573-2 ISO8573-4
ISO12500-1 Inlet Challenge Concentration:	10mg/m ³
Initial Dry Differential Pressure:	<140 mbar (2 psi) at 7 bar g (100 psi g)
Initial Saturated Differential Pressure:	<200 mbar (3 psi) at 7 bar g (100 psi g)
Precede with Filtration Grade:	Grade GE
Change Element:	Every 12 Months
Shock and Vibration:	BSEN61373:1999

Note:

All aluminium surfaces are corrosion protected using Alocrom, with external surfaces being further protected with a dry powder epoxy paint coating.

The filter housings and dryer extrusion are guaranteed for 10 years service life when maintained in accordance with the Planned Maintenance Schedule.



Typical contamination removed by a railway industry type TFGE / TFHE compressed air filter

Stage 4. TD(*) - Compressed Air Desiccant Dryer (* V = Vertical / H = Horizontal / S = Stacked options)

Water vapour is effectively removed from compressed air by a desiccant dryer using a process known as Pressure Swing Adsorption (PSA).

Modular construction

Consisting of high tensile aluminium inlet and outlet valve assemblies fitted to desiccant filled extruded aluminium columns, the valves are used to direct the airflow through the columns. By opening or closing the valves, the columns are alternately used for adsorption (drying) or desorption (regeneration). The inlet / outlet valves are controlled by an electronic timer unit which also operates the filter drain valves.

Drying (adsorption)

As the wet compressed air flows through the desiccant bed, water vapour is attracted and held by the desiccant material within its highly porous structure, enabling the now dried air to pass through the dryer outlet to system applications.

Compressed Air Treatment:

Dryer Type:

Contaminants Removed:

Particle Removal:

Maximum Remaining Oil Aerosol Content:

Filtration Efficiency (Typically):

Test Methods Used:

ISO12500-1 Inlet Challenge Concentration:

Initial Dry Differential Pressure:

Initial Saturated Differential Pressure:

Precede with Filtration Grades:

Change Desiccant:

Shock and Vibration:

Regeneration (desorption)

During regeneration, the column is vented to atmospheric pressure and the desiccant material releases any previously retained water vapour. A small percentage of the dried air is taken from the dryer outlet via a purge valve assembly and is used to drive out the water vapour from the desiccant and exits the dryer via the exhaust silencer.

Operational cycle

The electronic timer operates the dryer with a fixed cycle time to facilitate continuous drying and regeneration. A re-pressurisation step is included before the column undergoing regeneration is brought on-line to prevent pressure pulses on the desiccant and to provide a continuous flow of clean, dry compressed air.

Desiccant Dryer

Dewpoint Suppression

Water Vapour

N/A

N/A

40°C (72°F) pdp reduction on Inlet Temperature

ISO7183:2007 (Generally in accordance with)

N/A

<200 mbar (3 psi) at 7 bar g (100 psi g)

As above

Grade SE / GE & HE - Lubricated Compressor Grade SE & HE - Oil-Free Compressor

3 - 5 Years

Tested to BRB/LU Ltd./RIA Technical Specification No.20.



Typical Railway Dryer - stacked option

Benefits:

- Removes water vapour from compressed air
- Delivered air quality in accordance with NF F11-100 and ISO8573-1:2010, the international standard for compressed air quality
- Consistent dewpoint performance
- Compact and lightweight
- Easy to maintain
- Low noise level <75 dB(A)
- Approvals to International standards
- 10 year guarantee on pressure envelope

Stage 5. TFDE - Compressed Air Dust Filter

This filter type utilises a glass micro- fibre element installed after the dryer and is designed to remove small traces of desiccant dust, down to 1 micron in size, which may migrate from the dryer unit. A manual drain valve is fitted to this filter housing as it is installed after the dryer with no liquid present.

Filtration Grade:	GRADE DE
Filter Type:	General Purpose Dry Particulate Filter
Contaminants Removed:	Solid Particulates Micro-organisms Rust Pipe scale Down to 1 micron
Particle Removal:	Down to 1 micron
Maximum Remaining Oil Aerosol Content:	N/A
Filtration Efficiency:	99.925%
Test Methods Used:	ISO8573-4
ISO12500-1 Inlet Challenge Concentration:	N/A
Initial Dry Differential Pressure:	<70 mbar (1.5 psi) at 7 bar g (100 psi g)
Initial Saturated Differential Pressure:	N/A
Precede with Filtration Grade:	N/A
Change Element:	Every 12 Months
Shock and Vibration:	BSEN61373:1999

Note:

All aluminium surfaces are corrosion protected using Alocrom, with external surfaces being further protected with a dry powder epoxy paint coating.

The filter housings and dryer extrusion are guaranteed for 10 years service life when maintained in accordance with the Planned Maintenance Schedule.



TFDE Compressed air filter

Benefits:

- Delivered Air quality in accordance with NF F11-100 and ISO8573-1:2010, the international standard for compressed air quality
- Continued protection of downstream equipment and applications
- Reduce unplanned maintenance and set out for service costs
- Filtration performance independently verified by Lloyds Register
- Dust removal filters tested in accordance with the test methods of the ISO8573 Series
- Suitable for all compressor types
- Pressure losses start low and stay low to save energy
- Low operational costs
- Filters are covered by one year compressed air quality guarantee which is automatically renewed with annual maintenance
- All filter housings are covered by a 10 year housing guarantee

ATU Control Systems

Electrical Power Supply

A range of power supply options is available depending on the required voltage, temperature, approvals and the choice is dependent upon the application requirements. All power supplies are capable of withstanding extremes of temperature, vibration and can tolerate the wide input voltage ranges that railway applications require.

The power supply is used to give a regulated, clean 24Vdc output for the controller.

Electronic Controller

The electronic controller operates from a 24Vdc supply and switches the outputs in a strict sequence. There are typically six outputs, four to control the dryer and two to control the filter solenoid drains.

All the valve outputs are monitored for open or short-circuit conditions during operation and should a failure occur, the timer is programmed to close all outputs.

Compressed Air Dryer Controls

Four 24Vdc electrically operated solenoid valves control the compressed air dryer. Two valves control the inlets and two valves control the exhausts.

Associated with the dryer are a number of filters; the inlet filters are fitted with valves, which allow the condensate to drain from the filter housings. The outlet particulate filter is fitted with a manual drain and prevents desiccant dust carryover down stream.

Purge Economy

Purge Economy is an “Energy saving” feature which will activate when the compressor receives a signal from the upstream Air Reservoir to “OFF LOAD”.

In this state, purge air is not consumed.

When the compressor receives a signal from the upstream Air Reservoir to “LOAD”, the Desiccant Air Dryer will also receive a signal to restart, returning the dryer safely to the precise point in its operating sequence from where it stopped.

At this point, purge air is consumed to dry the column which is undergoing regeneration.

Trace Heating

To avoid freezing condensate in the filter housings, the option of trace heating can be added to the dryer inlet head and to the inlet filter drain valves.

The heater elements are manufactured from a Positive Temperature Coefficient (PTC) material which has a low resistance at ambient temperatures, but with increasing temperature this resistance increases exponentially. Eventually, a critical temperature is reached, determined by the heater material beyond which the temperature will not increase. This means that the heaters are self-regulating and do not require active feedback.

There are heaters fitted to the drain valves of each compressed air inlet filter. These are rated at around 8W and are available in a range of voltages that can accommodate a wide operational voltage band.

Dependent upon compressed air dryer model, there is also one heater fitted to the inlet head of the dryer which is rated at 20W with two additional heaters fitted to the exhaust valves on dryer types 3 and 4 which are rated at 8W each.

ATU Input Data Sheet and Guidance Notes

To correctly size an ATU system for its application, two types of technical parameters **MUST** be known to ensure the correct selection of system to address the operating requirements of the Locomotive/Rolling Stock application.

Parameter 1: Variables to determine the physical ATU size.

Parameter 2: Variables to determine the design criteria of the compressed air system.

Parameter 1 - Inlet to ATU

- 1. Maximum Inlet Air Temperature**
Maximum air temperature expected to enter the dryer.
- 2. Minimum Inlet Air Pressure**
Minimum air pressure expected to enter the dryer.
- 3. Dewpoint Suppression on Inlet**
This is the difference between the dryness of the air entering and exiting the desiccant air dryer expressed in °C or °F.

Example:

For °C

At an inlet temperature of 55°C a 40°C dewpoint suppression will provide a moisture content at 15°C pdp.

For °F

At an inlet temperature of 131°F a 72°F dewpoint suppression will provide a moisture content at 59°F pdp.

- 4. Maximum Inlet Flow Rate**
Maximum air flow rate expected to enter the dryer.

Parameter 2 – Compressed air system variables

- 1. Compressor Type**
Type of compressor utilised in the application. eg. LUBRICATED or OIL FREE.
- 2. Maximum System Working Pressure**
Maximum pressure rating of the compressor.
- 3. Minimum Ambient Temperature**
Minimum ambient temperature the ATU is expected to operate at.
- 4. Maximum Ambient Temperature**
Maximum ambient temperature the ATU is expected to operate at.
- 5. Supply Voltage**
The rolling stock supply voltage to be utilised by the ATU.
- 6. Supply Tolerance**
Tolerance on the supply voltage to the ATU.
eg. 74Vdc+/-30%
- 7. Preferred Dryer Orientation**
Orientation of the dryer when finally assembled into the customers system. eg. Vertical / Horizontal or Stacked. (see page 3)
- 8. Purge Economy**
Is the Energy Saving feature required.
- 9. Filter drain valve configuration**
Are the drain valves required to be configured Normally Open (N/O) or Normally Closed (N/C).
Typically, installations are supplied configured Normally Closed to prevent the loss of air in the event of a power failure.
- 10. Preferred Pipe Thread**
Filter Pipe threads can be supplied either BSPT or NPT.
- 11. Operating Alarm requirements**
Is an Alarm contact required in the event of a power/dryer valve failure.
- 12. Location of the Main Air Reservoir in relation to the ATU**
Is the Main Reservoir on the rolling stock fitted Upstream or Downstream of the proposed position of the ATU? To activate the Purge Economy feature it is essential that the Main Reservoir be fitted Downstream of the ATU.
- 13. Essential Approval Requirements**
Please specify any specific Approvals/Standards which may be required for the project.

Notes

Originator:	Customer:	Date:
Project name:	Dryer Sizing: Office use only	Project Reference & Revision: Office use only

To correctly size an ATU system for its application, two types of parameters **MUST** be known.

Parameter 1: Variables to determine the **physical size** of the ATU.

Parameter 2: Variables to determine the **design criteria** of the compressed air system.

Parameter 1 - ATU Inlet Conditions

No:	Description	Customer Requirements
1	Maximum inlet air temperature	_____ °C / _____ (°F)
2	Minimum inlet air pressure	_____ barg / _____ (psi g)
3	Dewpoint suppression on inlet	_____ °C / _____ (°F)
4	Maximum inlet flow rate	_____ L/min / _____ (cfm)

Reference conditions 20°C (68°F) @ 1 bar a (14.5 psi a)

Parameter 2 - Compressed Air System Variables

No:	Description	Customer Requirements (please tick appropriate box)
1	Compressor type	<input type="checkbox"/> Lubricated <input type="checkbox"/> Oil Free
2	Maximum system working pressure	_____ barg / _____ (psi g)
3	Minimum ambient temperature	_____ °C / _____ (°F)
4	Maximum ambient temperature	_____ °C / _____ (°F)
5	Supply voltage	<input type="checkbox"/> V dc <input type="checkbox"/> Alternative
6	Supply tolerance	+ / - _____ %
7	Required ATU orientation	<input type="checkbox"/> Vertical (V) <input type="checkbox"/> Horizontal (H) <input type="checkbox"/> Stacked (S)
8	Purge economy required	<input type="checkbox"/> Yes <input type="checkbox"/> No
9	Filter drain valve configuration	<input type="checkbox"/> Normally Open (N/O) <input type="checkbox"/> Normally Closed (N/C)
10	Preferred pipe thread	<input type="checkbox"/> BSP <input type="checkbox"/> NPT
11	Operating alarm requirements	<input type="checkbox"/> Yes <input type="checkbox"/> No
12	Location of main reservoirs in relation to the ATU	<input type="checkbox"/> Upstream <input type="checkbox"/> Downstream
13	Essential approvals requirements	

Projected Customer Volume _____ (No. off.) Delivery time period requirements _____

Additional Requirements

Please return completed form by fax (or scan and email) to your local Parker Sales Company