TRANSNET FREIGHT RAIL			
File Ref: TFR. (TM) 14/1/6 TD (BRK) 3/0001	AIR QUALITY SPECIFICATION FOR LOCOMOTIVES, SINGLE CAR TESTERS, YARD CHARGERS AND WAGON WORKSHOPS THAT SUPPLY AIR TO WAGON BRAKE SYSTEMS		**Document no:** RS-2007/122 **Document Rev no:** 04
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Table of Revisions

Rev	Clause	Description	Date
00	All	Original doc	30 July 2007
01	3.3	Correction of Class 1 to Class 2 air in sentence below table 3.	11 August 2010
02	3 & 3.2	Change Humidity specification from ISO to Transnet specification.	29 November 2013
03	- 3.2 2, 3 & 4 5	Add definitions Change Humidity specification Revise for clarity Improve referencing	23 March 2015
04	- 3.2 4	Clarified definition for Pressure dew point difference Added clarification of Transnet requirement as per ISO 8573-1 Revised for clarity	03 June 2019

Table of Definitions

AAR	Association of American Railroads
Ambient Temperature	Temperature within 1 meter of the compressor intake
Dew Point	Temperature at which water vapour begins to condense
Pressure Dew Point	Dew point at a specific air pressure (measured downstream after the air dryer)
Water Vapour	The gaseous phase of water
Critical Temperature	Temperature at which the saturated liquid and saturated vapour states are identical
|x|	Absolute value of x (Mathematical definition).
Pressure Dew Point Difference	The absolute value of the difference between the Pressure Dew Point at a specific pressure and the Ambient Temperature. (i.e. |Pressure Dew Point – Ambient Temperature|) e.g. Pressure Dew Point = -5°C, Ambient Temperature = 20°C Pressure Dew Point Difference = -5°C -20°C = |-25°C| = 25°C



Figure 1: Workshop Compressor

1 Scope

This specification qualifies the purity and dryness of compressed air generated in locomotives, single car testers, yard chargers and wagon workshops that supply air to wagon brake systems. The quality of the compressed air is identified as Compressed Air Purity Classes (see Clause 3) specified in this document.

Clean, dry air in the wagon brake system reduces the possibility of an undesired emergency brake application (UDE) [AAR Undesired Emergency Brake study complete – Railway Age, Dec, 1990]. Clean, dry air in wagon and locomotive brake valves ensures longer, fault free operation between overhauls and extended life cycles.

2 Introduction

Air is taken from the atmosphere to the inlet of the compressor at a pressure of ±1bar and delivered at a required higher pressure, however the air is found to have impurities that cause contamination in the brake system. There are three basic types of contaminants found in compressed air, namely:

- Solid particles
- Water vapour
- Oil content

The quality of air is determined by the air dryness and contamination level. Clean, oil free and dry air is essential for the reliable and consistent operation of brake valves, preventing premature system failures, increasing equipment life and reducing maintenance cost.

3 Compressed Air Purity Classes:

The compressed air specification for wagon and locomotive brake systems for Transnet is designated as:

ISO 8573-1 A B C, where:

A = Class 2 (see Clause 3.1 below),
B = Between Class 3 & 4 (see Clause 3.2 below),
C = Class 2 (see Clause 3.3 below),

3.1 Solid Particles

Maximum number of particles per m^3						
Class	**Particle size, d (µm)**				**Particle size**	**Concentration**
	d ≤ 0.10	**0.10 < d ≤ 0.5**	**0.5 < d ≤ 1.0**	**1.0 < d ≤ 5.0**	**(µm)**	**(mg/m^3)**
2	Not specified	100 000	1 000	10	N/A	N/A

Table 1 – Extract from Table 2 in ISO 8573-1

The properties of solid particles are important and characterized by density, shape, size and hardness. The acceptable solid particle size for Transnet is class 2 as shown in the table above.

3.2 Humidity and Liquid Water Classes

Atmospheric air always contains water vapour. When this air is compressed, the partial pressure of the water vapour increases, but, owing to the increase in temperature caused by the compression, no water precipitates. When the air is subsequently cooled (e.g. in an intercooler or after cooler) or during the expansion process in a reservoir, the excess water vapour condenses to droplets and the air remains 100% saturated with water vapour.

Reservoir drain valves remove the condensate from the reservoirs. Air dryers removed the water vapour from the air and are characterised with the pressure dew point difference and relative humidity.

Transnet requires a “Pressure dew point difference” of more than 30°C at specific pressures and flow rates (as in table 2 below), to be achieved by the air dryer. This is classified as between class 3 & 4 according to ISO 8573-1, Clause 7.2, table 3 and which is defined for different pressures and different ambient conditions in NF F 11-100 of April 1995, Clause 8.1, table 3.

ISO 8573-1 specifies only the “Pressure dew point” achieved at referenced conditions as stated in ISO8573-1, Clause 5. This accounts for only standard atmospheric conditions (20°C, 1 bar, etc.) which does not cater for the pressure and temperature variances during air dryer performance tests.

Therefore Transnet requires the "Pressure dew point difference" and "Relative Humidity" to be measured at operating conditions which differs from standard atmospheric conditions and still holds true to the ISO8573-1 specification in line with NF F 11-100 of April 1995.

Transnet requires the air dryer to reduce the ambient air temperature at the compressor intake to the pressure dew point temperature after the air dryer, by 30°C.

The table below specifies Transnet requirements at different operating environments:

Specification (Transnet)	Acceptable "Pressure Dew Point Difference"(°C)
Locomotives @ 900 kPa ± 100 kPa**	≥ |30|*
Single Car Testers @ 760 kPa ± 50 kPa +	
Yard Testers @ 600 kPa ± 50 kPa +	

Table 2 – Acceptable "Pressure Dew Point Difference"

*This value or less than 24% Relative Humidity (RH) to be obtained at a flow of 10 psid after 5 minutes to indicate acceptable air dryer performance. To be calculated as in definition of "Pressure Dew Point Difference" in Table of Definitions in this document.

**If no pressure quick-fit coupling is installed after the air dryer at the second reservoir, the plug on the second reservoir must be removed safely and an adapter with the quick-fit coupling must be installed to fit the humidity tester so that the tests can be done. After the tests are complete the locomotive must be returned to its original state.

+ The pressure dew point or relative humidity must be measured between the air dryer and the single car tester or yard tester, while the single car tester or yard tester is charging a wagon or rake of wagons.

3.3 Oil Content

Class	Concentration total oil (aerosol, liquid and vapour) (mg/m^3)
2	≤0.1

Table 3 – Extract from Table 5 in ISO 8573-1

The acceptable oil content for Transnet is class 2 as shown in the table above.

4 Compulsory Testing

Reliable production of clean and dry compressed air is a critical feature for wagon and locomotive brake systems.

The following must be tested annually for compliance to this specification (RS-2007/122), in accordance with the methods described in ISO 8573-1, ISO 8573-3 and all documents referenced in this document:

- Locomotives
- Work shop air points supplying air to single car testers and wagon brake systems
- Compressed air supply to yard testers

If the compressed air test results are inferior to the classes as specified in this specification, the air dryer and filter must be repaired or replaced and retested until the compressed air reaches the required purity classes.

5 References

ISO – Standard 8573-1

ISO – Standard 8756

Railway Age, Dec, 1990

French Standard NF F 11-100 April 1995