DEAS 751:2021

ICS: 13.040

DRAFT STANDARD

Air quality – Specification

Second Edition 2021

DEAS 751:2021

ICS 13.040

EAST AFRICAN COMMUNITY

Copyright notice

Foreword

Development of the East African Standards has been necessitated by the need for harmonizing requirements governing quality of products and services in the East African Community. It is envisaged that through harmonized standardization, trade barriers that are encountered when goods and services are exchanged within the Community will be removed.

In order to achieve this objective, the Community established an East African Standards Committee mandated to develop and issue East African Standards.

The Committee is composed of representatives of the National Standards Bodies in Partner States, together with the representatives from the private sectors and consumer organizations. Draft East African Standards are circulated to stakeholders through the National Standards Bodies in the Partner States. The comments received are discussed and incorporated before finalization of standards, in accordance with the procedures of the Community.

East African Standards are subject to review, to keep pace with technological advances. Users of the East African Standards are therefore expected to ensure that they always have the latest versions of the standards they are implementing.

This working document was prepared by Technical Committee EASC/TC082, Air quality

Air Quality- Specification

1 Scope

This draft Standard gives permissible limits of some common pollutants found in polluted air, namely sulfur dioxide (SO_2), carbon monoxide (CO), dust in terms of suspended particulate matter as TSP, PM_{10} and $PM_{2.5}$, oxides of nitrogen (NO, NO_2 and NO_X), hydrocarbons (HCs), Volatile Organic Compounds (VOCs), Ozone (O_3) and particulate lead (Pb). The standard covers both the ambient air and emission sources.

2 References

For the purpose of this draft Standard the following references shall apply:

TZS 3: 1979, *Atmospheric conditions for testing*

TZS 4: 2009, *Rounding off numerical values*

TZS 836 – 1: 2011, *Air quality – General considerations – Vocabulary*

TZS 836 – 2: 2011, *Air quality – General considerations – Particle size fraction definitions for health – related sampling*

TZS 837 – 1: 2011, *Air quality – Sampling and test methods – Guidelines for planning the sampling of atmospheric and location of monitoring stations*

TZS 837 – 2: 2011, *Air quality – Sampling and test methods – Sampling of gaseous pollutants*

TZS 837 – 3:2011, *Air quality – Sampling and test methods – Ambient air-determination of black smoke index*

TZS 837 – 3: 2011, *Air quality - Sampling and test methods – Stationary source emissions – Manual determination of mass concentration of particulate matter*

TZS 837 – 4: 2011, *Air quality – Sampling and test methods – Stationary source emissions – Determination of the mass concentration of sulphur dioxide – Hydrogen peroxide/barium perchlorate/Thorin method*

TZS 837 – 5: 2011, *Air quality – Sampling and test methods – Determination of the mass concentration of nitrogen oxides – Naphthyethediamine photometric method*

TZS 837 – 6: 2011, *Sampling and test methods – Determination of carbon monoxide carbon dioxide and oxygen – Performance characteristics and calibration of automated measuring systems*

TZS 837 – 7:2011, *Air quality – Sampling and test methods – Road vehicles – Measurement equipment for exhaust gas emissions during inspection or maintenance – Technical specifications*

TZS 837 – 8: 2011, *Air quality – Sampling and test methods – Determination of the particulate lead content of aerosol collected on filter – Atomic absorption Spectrophotometric method*

3 Terminology

For the purpose of this draft Standard, the following definitions shall apply:

3.1 ambient air

An outdoor air to which people, plants, animals or material are in normal circumstances exposed.

3.2 suspended particulate matter

All particulate material which persists in the atmosphere or in a flue gas stream for lengthy periods because the particles are too small in size i.e ≤10μm to have an appreciable falling velocity.

3.3 black smoke

Is the visible (black) aerosol usually resulting from combustion.

3.4 controlled area

A place or area where rules, regulations and behavioral norms are subject to strict enforcements and scrutiny.

3.5 immission

Is the transfer of pollutants from the atmosphere to a receptor.

3.6 immission limit

Is the highest permissible weight concentration of pollutants contained in the air.

3.7 emission

Discharge of substances into the atmosphere. The point or area from which the discharge takes place is called the “source”. The term is used to describe the discharge and the rate of discharge. The term can also be used for noise, heat, etc.

3.8 emission limit

Is the highest permissible quantity of pollutant released into the air from a pollution source, expressed as the concentration of pollutant in relation to one unit of production or to the degree of air pollution caused by these sources (e.g. dark colour of smoke).

NOTE:
1 All the emission limits are valid for concentration expressed for any dry gas under normal atmospheric conditions (see TZS 3: 1979 Atmospheric Conditions for Testing).

2 When emission limits are surpassed, other actions may be called in, e.g. proper land usage/relocation of factories, enforcement of by laws by local authorities (which may give more stringent specifications for emissions), revision of standards and types of fuels to be allowed.

4 Limits

4.1 The following shall apply for the ambient air quality levels

Table 1 — Immission limits

	Pollutant	Time weighted Average	Designated Areas			Test methods
			Industrial area	Residential, Urban, Rural & Other area	Controlled areas***	
1.	Sulphur oxides (SO_X);	Annual Average*	80 μg/m^3	60 μg/m^3	15 μg/m^3	IS0 4221
		24 hours**	125 μg/m^3	80 μg/m^3	20 μg/m^3	
		One Hour Instant Peak	500 μg/m^3	500 μg/m^3	500 μg/m^3	
		Instant Peak (10 min)	500 μg/m^3	500 μg/m^3	500 μg/m^3	
2.	Oxides of Nitrogen (NO_X);	Annual Average*	80 μg/m^3	60 μg/m^3	15 μg/m^3	ISO7996
		24 hours**	150 μg/m^3	80 μg/m^3	30 μg/m^3	
		8 hours				
		Instant Peak	940 μg/m^3	500 μg/m^3		
3.	Nitrogen Dioxide	Annual Average	150 μg/m^3	95 μg/m^3		IS0 6768
		Month Average		150μg/m^3		
		24 Hours	100 μg/m^3	190μg/m^3		
		One Hour		380μg/m^3		
		Instant Peak		940μg/m^3		
4.	Suspended particulate matter (SPM)	Annual Average*	360 μg/m^3	140 μg/m^3	70 μg/m^3	ISO 9835
		24 hours**	500 μg/m^3	200 μg/m^3	100 μg/m^3	
		Annual Average****		100 μg/m^3		
		24 hours***	180 μg/m^3	180 μg/m^3		
5.	Respirable particulate matter(RPM) (<10μm)	Annual Average*	70 μg/m^3	20μg/m^3	20μg/m^3	ISO 9835:
		24 hours**	150 μg/m^3	50 μg/m^3	50g/m^3	
6.	Respirable particulate matter$PM_{2.5}$	Annual Average	35 μg/m^3	10μg/m^3	10μg/m^3	ISO 9835:
		24 hours	75 μg/m^3	25g/m^3	25μg/m^3	
7.	Particulate Lead (Pb)	Annual Average*	1.0 μg/m^3	0.75 μg/m^3	0.50 μg/m^3	ISO 9855:
		24 hours**	1.5 μg/m^3	1.00 μg/m^3	0.75 μg/m^3	
		Month Average		2.5 μg/m^3		
8.	Carbon monoxide (CO)	8 hours**	5.0 mg/m^3	2mg/m^3	1.0 mg/m^3	ISO 4224:
		1 hour	10.0 mg/m^3	4mg/m^3	2.0 mg/m^3	
		24 hours**				
9.	Non-methane hydrocarbons	instant Peak	800μg/m^3			ISO 12884
10.	Total VOC	8 hour**	6 mg/m^3	6 mg/m^3	6 mg/m^3	ISO16000-6
11.	Ozone	1-Hour	240 μg/m^3	240 μg/m^3	240 μg/m^3	ISO 13964
		8 hour (instant Peak)	100 μg/m^3	100 μg/m^3	100 μg/m^3	

Table 1. Continued

And any other parameter as may be prescribed by the Authority from time to time.

Legend

a) Values at Standard Temperature and Pressure (STP)

b) Conversion factors from ppm to mg/m^3 and mg/m^3 to ppm are stipulated under the annex A

c) * [Annual Arithmetic mean of minimum *104* measurements in a year taken twice a week 24 hourly at uniform interval.]

d) [** 24 hourly/8 hourly values should be met 98 % of the time in a year. However, 2 % of the time, it may exceed but not on two consecutive days.]

e) Whenever and wherever two consecutive values exceed the limit specified above for the respective category, it would be considered adequate reason to institute regular/continuous monitoring and further investigations.

f) ∗ the 24-hour limit may not be exceeded more than three times in one year;

g) ** 24-hour limit may not be exceeded more than three times in one year micrograms/m^3

h) *** Not to be exceeded more than once per year average concentration

i) Where measured components results from a combustion process, 10 % excess oxygen will be included. Excess air above 10 % will result in dilution of pollutants

j) The Regulatory Authority may, for purpose of compliance, correct the concentration for humidity (to account for location by location variation)

Table 2 — Ambient air quality at property boundary for general pollutants

	Pollutant	**Time weighted average**	**Property boundary**
1	Suspended Particulate matter (SPM)	Annual average*	50 μg/m^3
		24 hours**	70 μg/m^3
2.	Oxides of Nitrogen (NO_X);	Annual average*	80 μg/m^3
		24 hours**	150 μg/m^3
3.	Sulphur oxides (SO_X);	Annual average*	50 μg/m^3
		24 hours**	125 μg/m^3

NOTE

a) For residential premises in designated industrial areas, the above standards do not apply.

b) For industries in designated residential areas, standards for residential areas shall apply.

4.2 The following Emission limits shall apply for Large Combustion Plants

Table 3 — Emission limits for Large Combustion Plants

Pollutant	Guideline	Limit Level	Test Method
Sulphur oxides* SO_x	Large Combustion Plants (LCP) using solid fuel with thermal effect of: 50 to 100 MWth	Yearly average of: 850 mg/m^3	IS0 4221
	100 to 300 MWth	200 mg/m^3	
	> 300 MWth	200 mg/m^3	
	LCP using liquid fuel with thermal effect of: 50 to 100 MWth	850 mg/m^3	
	100 to 300 MWth	400 to 200 mg/m^3 (linear decrease)	
	> 300 MWth	200 mg/m^3	
	LCP using gaseous fuel	35 mg/m^3	
	LCP using low calorific gases from gasification of refinery residues, coke oven gas, blast-furnace gas	800 mg/m^3	
Carbon monoxide, CO	Liquid fuel combustion with heat output exceeding 5MW.	Not to exceed 175 mg/m^3	ISO 4224
	Solid fuel combustion with the heat output of 50MW and above	Not to exceed the level of 250 mg/m^3	
Hydrocarbon (as Total Organic Carbon)		Not to exceed 20 mg/m^3	ISO 12884
Dust	Inert dust	Not to exceed 250mg/m^3 (24h mean value)	ISO 12141
Nitrogen Oxides* NO_x	LCP using solid fuel with thermal effect of: 50 to 500 MWth	Yearly average of: 600 mg/m^3	ISO 7996
	>500 MWth	500 mg/m^3	
	LCP using liquid fuel with thermal effect of: 50 to 500 MWth	450 mg/m^3	
	>500 MWth	400 mg/m^3	
	LCP using liquid fuel with thermal effect of: 50 to 500 MWth	300 mg/m^3	

S_{Ox} to be reported as SO_2

* NOx to be reported as NO_2

Pollutant	Guideline	Limit Level	Test Method
	>500 MWth	200 mg/m^3	
Lead	Not to exceed 5 tonne/year of lead or lead compounds (measured as elemental lead) by a stationary source	0.15 µg/m^3	ISO 9855
Sulphur Oxides, SO_x*	Annual mean of 40 – 60 µg/m^3 (0.05-0.08 mg/kg) or 24 – hour average 100 µg/Nm^3 (0.129 mg/kg)	Daily average of hourly values shall not exceed 0.1 mg/kg 0.5 mg/m^3 for 10 minutes	ISO 4221 ISO 6767
Carbon monoxide, CO	Aims at preventing carboxyhaemoglobin levels exceeding 2.5-3% in non-smoking people.	1. A maximum permitted exposure of 100mg/m^3 for periods not exceeding 15 minutes. 2. Time-weighed exposures at the following levels: ▪ 100 mg/m^3 for 15 minutes ▪ 60 mg/m^3 for 30 minutes; ▪ 30 mg/m^3 for 60 minutes ▪ 10 mg/m^3 for 8 hours. or Daily average of hourly values shall not exceed 10mg/kg and average of hourly values in eight consecutive hours shall not exceed 20 mg/kg.	ISO 4224 ISO 8186
Black smoke	40 to 60 µg/m^3 (0.05-0.08 mg/kg)	Daily average of hourly values shall not exceed 0.10 µg/m^3 and hourly values shall not exceed 0.20 µg/m^3	ISO 9835
Suspended Particulate Matters (PM 10)	60 to 90 µg/m^3 (00.077 – 0.116 mg/kg)	Daily average of hourly values shall not exceed 0.10 µg/m^3 and hourly values shall not exceed 0.20 µg/m^3	ISO 9835
Nitrogen dioxide; NOx	Annual mean of 0.1 µg/m^3	150 µg/m^3 for 24-hours average value 120µg/m^3 for 8 hours	ISO 6768 and ISO 7996
Lead	Annual mean of 0.5 – 1.0 µg/m^3	1.5µg/m^3 for 24 – hours average value	ISO 9855
Ozone	Annual mean of 10 – 100 µg/m^3	120 µg/m^3 for 8 – hours average value	ISO 13964

* Sox to be reported as SO_2

Annex A
(Informative)

Guideline on conversion factors

A.1 ppm to mg/m^3 – air

The conversion between ppm and mg/m^3 is dependent on both the molecular weight of the substance and the temperature at which the conversion is made. The assumption is that the pollutant behaves as an ideal gas and as such, 1 mole of the substance occupies 22.4 litres at standard temperature (273K) and pressure (101.3 kPa). This is consistent with normalised concentrations, and it is therefore not normally necessary to take account of the temperature or pressure difference in the conversion. However, when converting ppm to mg/m^3 at actual discharge conditions, it is important to take account of the necessary factors.

To convert from ppm to mg/m^3, the following formula should be used:

$$\mathbf{mg/m^3 = ppm \times (MW/22.4) \times (273/T) \times (P/101.3)}$$

Where

MW is the molecular weight of the substance (in grams)
T is the temperature at which the conversion is to be made (degrees Kelvin)
P is the pressure at which the conversion is to be made (kPa)

A.2 mg/m^3 to ppm – air

To convert from mg/m^3 to ppm, the following formulae should be used:

$$\mathbf{ppm = mg/m^3 \times (22.4/MW) \times (T/273) \times (101.3/P)}$$

Annex B

List of Abbreviations.

kPa= Kilo Pascal

MW= Megawatt

Ppm= Parts per million

STP= Standard Temperature and Pressure

MW= Megawatt

MWth= Megawatt-thermal

WHO= World Health Organization