

Supplement: Harmonized international/national voluntary consensus reports (Note that the bold and italic texts indicate projects under process)

	ASTM D22.04	CEN/TC 137	ISO/TC 146/SC 2
General – Air sampling strategies	<u>E1370-14</u> , Standard guide for air sampling strategies for worker and workplace protection status	<u>EN 689:1995</u> , Workplace atmospheres - Guidance for the assessment of exposure by inhalation to chemical agents for comparison with limit values and measurement strategy; <b><i>prEN 689 rev (WI=00137055), Workplace exposure - Measurement of exposure by inhalation to chemical agents - Strategy for testing compliance with occupational exposure limit values</i></b>	
General – Requirements for the performance of procedures		<u>EN 482:2012+A1:2015</u> , Workplace exposure - General requirements for the performance of procedures for the measurement of chemical agents	<b><i>ISO DIS 20581, Workplace air - General requirements for the performance of procedures for the measurement of chemical agents</i></b>
General – Choice of procedures for the measurement of chemical agents		<b><i>WI=00137065, Workplace exposure - Choice of procedures for the measurement of chemical agents complying with the requirements given in EN 482 and either one of EN 838, EN 1076, EN 13205, EN 13890 and EN 13936</i></b>	
General –Personal sampling pumps	<u>D5337-11</u> , Standard practice for flow rate for calibration of personal sampling pumps	<u>EN ISO 13137:2013</u> , Workplace atmospheres - Pumps for personal sampling of chemical and biological agents - Requirements and test methods (ISO 13137:2013)	<u>ISO 13137:2013</u> , Workplace atmospheres - Pumps for personal sampling of chemical and biological agents - Requirements and test methods
General - Terminology	<u>D1356-15b</u> , Standard terminology relating to sampling and analysis of atmospheres	<u>EN 1540:2011</u> , Workplace exposure - Terminology	<b><i>ISO 18158, Workplace air - Terminology</i></b>
Diffusive Samplers – Performance evaluation	<u>D6246-08(2013)e1</u> , Standard practice for evaluating the performance of diffusive samplers	<u>EN 838:2010</u> , Workplace exposure - Procedures for measuring gases and vapours using diffusive samplers - Requirements and test methods	<u>ISO 16107:2007</u> , Workplace atmospheres - Protocol for evaluating the performance of diffusive samplers
Detector tube – Requirements and test methods		<u>EN ISO 17621: 2015</u> , Workplace atmospheres - Short term detector tube measurement systems - Requirements and test methods (ISO 17621:2015)	<u>ISO 17621:2015</u> , Workplace atmospheres - Short term detector tube measurement systems - Requirements and test methods
Dermal – Measurement or strategy for the	<u>D7822-13</u> , Standard practice for dermal wipe sampling for the subsequent determination of metals and metalloids		

evaluation of dermal exposure		<p><u>CEN/TS 15279:2006</u>, Workplace exposure - Measurement of dermal exposure - Principles and methods</p> <p><u>CEN/TR 15278: 2006</u>, Workplace exposure - Strategy for the evaluation of dermal exposure</p> <p><b><u>WI=00137054</u>, <i>Workplace exposure - Guidance for the assessment of dermal exposure to nano-objects and their aggregates and agglomerates</i></b></p>	<p>TR 14294:2011, Workplace atmospheres - Measurement of dermal exposure - Principles and methods</p> <p>(1)</p>
Particles – Guidance for sampling of aerosol fractions	<u>D6062-07(2012)</u> , Standard guide for personal samplers of health-related aerosol fractions	<u>CEN/TR 15230:2005</u> , Workplace atmospheres - Guidance for sampling of inhalable, thoracic and respirable aerosol fractions	
Particles - Calculation of the health-related aerosol fraction concentration		<u>CEN/TR 15547:2007</u> , Workplace atmospheres - Calculation of the health-related aerosol fraction concentration from the concentration measured by a sampler with known performance characteristics	
Particles - Particle size fraction definitions		<u>EN 481:1993</u> , Workplace atmospheres - Size fraction definitions for measurement of airborne particles	<u>ISO 7708:1995</u> , Air quality-Particle size fraction definitions for health-related sampling; <b><u>PWI 7708 Revision</u></b>
Particles - Sampling conventions for airborne particle deposition		<u>EN ISO 13138:2012</u> , Air quality - Sampling conventions for airborne particle deposition in the human respiratory system (ISO 13138:2012)	<u>ISO 13138:2012</u> , Air quality - Sampling conventions for airborne particle deposition in the human respiratory system
Particles - Assessment of sampler performance for measuring airborne particle concentrations		<p><u>EN 13205-1:2014</u>, Workplace exposure - Assessment of sampler performance for measurement of airborne particle concentrations - Part 1: General requirements</p> <p><u>EN 13205-2:2014</u>, Workplace exposure - Assessment of sampler performance for measurement of airborne particle concentrations - Part 2: Laboratory performance test based on determination of sampling efficiency</p> <p><u>CEN/TR 13205-3:2014</u>, Workplace exposure - Assessment of sampler performance for measurement of airborne particle concentrations - Part 3: Analysis of sampling efficiency data</p>	

		<p><u>EN 13205-4:2014</u>, Workplace exposure - Assessment of sampler performance for measurement of airborne particle concentrations - Part 4: Laboratory performance test based on comparison of concentrations</p> <p><u>EN 13205-5:2014</u>, Workplace exposure - Assessment of sampler performance for measurement of airborne particle concentrations - Part 5: Aerosol sampler performance test and sampler comparison carried out at workplaces</p> <p><u>EN 13205-6:2014</u>, Workplace exposure - Assessment of sampler performance for measurement of airborne particle concentrations - Part 6: Transport and handling tests</p>	
Particles – Monitoring using direct reading Instruments		<p><u>CEN/TR 16013-1:2010</u>, Workplace exposure - Guide for the use of direct-reading instruments for aerosol monitoring - Part 1: Choice of monitor for specific applications</p> <p><u>CEN/TR 16013-2:2010</u>, Workplace exposure - Guide for the use of direct-reading instruments for aerosol monitoring - Part 2: Evaluation of airborne particle concentrations using Optical Particle Counters</p> <p><u>CEN/TR 16013-3:2012</u>, Workplace exposure - Guide for the use of direct-reading instruments for aerosol monitoring - Part 3: Evaluation of airborne particle concentrations using photometers</p>	
Particles – Weighing procedures for the collected aerosol	<u>D6552-06 (2011)</u> , Standard practice for controlling and characterizing errors in weighing collected aerosols		<u>ISO 15767:2009</u> , Workplace atmospheres - Controlling and characterizing uncertainty in weighing collected aerosols
Particles – Respirable Dust	<p><u>D4532-10(2015)</u>, Standard test method for respirable dust in workplace atmospheres using cyclone samplers</p> <p><u>D6061-01(2012)e1</u>, Standard practice for evaluating the performance of respirable aerosol samplers</p>		

<p>Particles – Ultrafine, nanoparticle and/or nano- structured aerosols<sup>(2)</sup></p>		<p><u>EN ISO 28439:2011</u>, Workplace atmospheres - Characterization of ultrafine aerosols/nanoaerosols - Determination of the size distribution and number concentration using differential electrical mobility analysing systems</p> <p><b><i>prEN 16897:2015(WI=00137052), Workplace exposure - Characterization of ultrafine aerosols/nanoserosols - Determination of number concentration using condensation particle counters</i></b></p> <p><b><i>prEN 16966:2016 (WI=00137056), Workplace exposure - Metrics to be used for the measurements of exposure to inhaled nanoparticles (nano-objects and nanostructured materials) such as mass concentration, number concentration and surface area concentration</i></b></p> <p><b><i>WI=00137053, Workplace exposure - Assessment of inhalation exposure to nano-objects and their agglomerates and aggregates</i></b></p>	<p><u>TR 27628:2007</u>, Workplace atmospheres - Ultrafine, nanoparticle and nano-structured aerosols- Inhalation exposure characterization and assessment</p> <p><u>ISO 28439:2011</u>, Workplace atmospheres - Characterization of ultrafine aerosols/nanoaerosols - Determination of the size distribution and number concentration using differential electrical mobility analysing systems</p>
<p>Particles – Diesel particulate matter</p>	<p><u>D6877-13e1</u>, Standard test method for monitoring diesel particulate exhaust in the workplace status</p>	<p><u>EN 14530:2004</u>, Workplace atmospheres - Determination of diesel particulate matter - General requirements</p>	
<p>Particles – Respirable crystalline silica</p>	<p><u>D7948-14</u>, Standard test method for measurement of respirable crystalline</p>		<p><u>ISO 16258-1:2015</u>, Workplace air - Analysis of respirable crystalline silica by X-ray diffraction - Part 1: Direct-on-filter method</p> <p><u>ISO 16258-2:2015</u>, Workplace air - Analysis of respirable crystalline silica by X-ray diffraction - Part 2: Method by indirect analysis</p> <p><u>ISO 24095:2009</u>, Workplace air - Guidance for the measurement of respirable crystalline silica; <b><i>NP 24095 Revision</i></b></p>

	silica in workplace air by infrared spectrometry		<b><i>ISO CD 19087, Workplace air - Measurement of respirable crystalline silica by infrared spectrometry</i></b>
Fiber - Asbestos	<p><u>D7200-12</u>, Standard practice for sampling and counting airborne fibers, including asbestos fibers, in mines and quarries, by phase contrast microscopy and transmission electron microscopy <b>(WK34196)</b></p> <p><u>D7201-06 (2011)</u>, Standard practice for sampling and counting airborne fibers, including asbestos fibers, in the workplace, by phase contrast microscopy (with an option of transmission electron microscopy)</p>		<p><u>ISO 8672:2014</u>, Air Quality - Determination of the number concentration of airborne inorganic fibres by phase contrast optical microscopy - Membrane filter method</p>
Fiber – Crystal ceramic	<p><u>D6056-96 (2011)</u>, Standard test method for determining concentration of airborne single-crystal ceramic whiskers in the workplace environment by transmission electron microscopy</p> <p><u>D6057-96 (2011)</u>, Standard test method for determining concentration of airborne single-crystal ceramic whiskers in the workplace environment by phase contrast microscopy</p> <p><u>D6058-96 (2011)</u>, Standard practice for determining concentration of airborne single-crystal ceramic whiskers in the workplace environment</p> <p><u>D6059-96 (2011)</u>, Standard test method for determining concentration of airborne single-crystal ceramic whiskers in the workplace environment by scanning electron microscopy</p>		
Metals – Requirements and test methods		<u>EN 13890:2009</u> , Workplace exposure - Procedures for measuring metals and	

		metalloids in airborne particles - Requirements and test methods	
Metals – Metals and/or Metalloids	<p><u>D4185-06 (2011)</u>, Standard practice for measurement of metals in workplace atmospheres by flame atomic absorption spectrophotometry</p> <p><u>D7035-10</u>, Standard test method for determination of metals and metalloids in airborne particulate matter by inductively coupled plasma atomic emission spectrometry (ICP-AES) <b>(WK50741)</b></p> <p><u>D7439-14</u>, Standard test method for determination of elements in airborne particulate matter by inductively coupled plasma-mass spectrometry</p>		<p><u>ISO 15202-1:2012</u>, Workplace air - Determination of metals and metalloids in airborne particulate matter by inductively coupled plasma atomic emission spectrometry - Part 1: Sampling</p> <p><u>ISO 15202-2:2012</u>, Workplace air - Determination of metals and metalloids in airborne particulate matter by inductively coupled plasma atomic emission spectrometry - Part 2: Sample preparation</p> <p><u>ISO 15202-3:2004</u>, Workplace air - Determination of metals and metalloids in airborne particulate matter by inductively coupled plasma atomic emission spectrometry - Part 3: Analysis</p> <p><u>ISO 30011:2010</u>, Workplace air - Determination of metals and metalloids in airborne particulate matter by inductively coupled plasma mass spectrometry</p>
Metals – Lead and/or lead compounds	<u>D6785-13</u> , Standard test method for determination of lead in workplace air using flame or graphite furnace atomic absorption spectrometry		<u>ISO 8518:2001</u> , Workplace air - Determination of particulate lead and lead compounds - Flame or electrothermal atomic absorption spectrometric method
Metals – Cadmium and cadmium compounds			<u>ISO 11174:1996</u> , Workplace air - Determination of particulate cadmium and cadmium compounds - Flame and electrothermal atomic absorption spectrometric method
Metals - Beryllium	<p><u>D7202-15</u>, Standard test method for determination of beryllium in the workplace by extraction and optical fluorescence detection</p> <p><u>D7441-08(2013)</u>, Standard practice for separation of beryllium from other</p>		

	metals in digestion and extraction solutions from workplace dust samples		
Metalloid - Arsenic			<u>ISO 11041:1996</u> , Workplace air - Determination of particulate arsenic and arsenic compounds and arsenic trioxide vapour - Method by hydride generation and atomic absorption spectrometry
Metal working fluid aerosol	<u>D7049-04(2010)</u> , Standard test method for metal removal fluid aerosol in workplace atmospheres		
Bioaerosols	<sup>(3)</sup>	<u>EN 14583:2004</u> , Workplace atmospheres - Volumetric bioaerosol sampling devices - Requirements and test methods <u>EN 13098:2000</u> , Workplace atmosphere - Guidelines for measurement of airborne micro-organisms and endotoxin <u>EN 14031:2003</u> , Workplace atmospheres - Determination of airborne endotoxins	
Benzene	<u>D4600-95(2010)</u> , Standard test method for determination of benzene-soluble particulate matter in workplace atmospheres <u>D6494-99(2015)</u> , Standard test method for determination of asphalt fume particulate matter in workplace atmospheres as benzene soluble fraction		
Carbon monoxide			<u>ISO 8760:1990 and 8760:1990/Cor 1:2009</u> , Workplace air - Determination of mass concentration of carbon monoxide - Method using detector tubes for short-term sampling with direct indication
Ethylene oxide	<u>D5578-04(2015)</u> , Standard test method for determination of ethylene oxide in workplace atmospheres (HBr derivatization method) - Replaced D4413		
Fluorides	<u>D4765-13</u> , Standard test method for measurement of fluorides in workplace atmospheres by ion-selective electrodes		

Toxic gases or vapors	<u>D4490-96(2011)</u> , Standard practice for measuring the concentration of toxic gases or vapors using detector tubes <u>D4599-14</u> , Standard practice for measuring the concentration of toxic gases or vapors using length-of-stain dosimeters <u>D4597-10 (2015)</u> , Standard practice for sampling workplace atmospheres to collect gases or vapors with solids sorbent diffusive samplers		
Gases – Monitoring using direct reading instruments			<b><i>ISO CD 20435-1/IEC 62990-1, Workplace Atmospheres - Part 1: Gas detectors - Performance requirements of detectors for toxic gases<sup>(4)</sup></i></b>
Hexavalent chromium	<u>D6832-13e1</u> , Standard test method for the determination of hexavalent chromium in workplace air by ion chromatography and spectrophotometric measurement using 1,5-diphenylcarbazide		<u>ISO 16740:2005</u> , Workplace air - Determination of hexavalent chromium in airborne particulate matter - Method by ion chromatography and spectrophotometric measurement using diphenyl carbazide
Hydrofluoric acid and particulate fluorides	<b><i>WK38734 New Test Method for the determination of particulate fluorides and hydrofluoric acid using filter sampling and suppressed ion chromatography</i></b>		<u>ISO 21438-3:2010</u> , Workplace atmospheres - Determination of inorganic acids by ion chromatography - Part 3: Hydrofluoric acid and particulate fluorides
Hydrogen sulfide by direct reading, length of stain, visual chemical detectors	<u>D4913-00(2011)</u> , Standard practice for determining concentration of hydrogen sulfide by direct reading, length of stain, visual chemical detectors		
Isocyanates	<u>D5836-08 (2013)</u> , Standard test method for determination of 2,4-toluene diisocyanate (2,4-TDI) and 2,6-toluene diisocyanate (2,6-TDI) in workplace atmospheres (1-2 PP Method) <u>D5932-08(2013)e1</u> , Standard test method for determination of 2,4-toluene diisocyanate (2,4-TDI) and 2,6-toluene diisocyanate (2,6-TDI) in air (with 9-(N-methylaminomethyl) anthracene method) (MAMA) in the workplace		<u>ISO 14382:2012</u> , Workplace atmospheres - Determination of toluene diisocyanate vapours using 1-(2-pyridyl)piperazine-coated glass fibre filters and analysis by high performance liquid chromatography with ultraviolet and fluorescence detectors



	<p><u>D6561-06 (2011)</u>, Standard test method for determination of aerosol monomeric and oligomeric hexamethylene diisocyanate (HDI) in air with (methoxy-2-phenyl-1) piperazine (MOPIP) in the workplace</p> <p><u>D6562-12</u>, Standard test method for determination of gaseous hexamethylene diisocyanate (HDI) in Air with 9-(N-methylaminomethyl) anthracene method (MAMA) in the workplace</p>		<p><u>ISO 17734-1:2013</u>, Determination of organonitrogen compounds in air using liquid chromatography and mass spectrometry - Part 1: Isocyanates using dibutylamine derivatives</p> <p><u>ISO 17734-2: 2013</u>, Determination of organonitrogen compounds in air using liquid chromatography and mass spectrometry - Part 2: Amines and aminoisocyanates using dibutylamine and ethyl chloroformate derivatives</p> <p><u>ISO 17735:2009</u>, Workplace atmospheres - Determination of total isocyanate groups in air using 1-(9-anthracenylmethyl) piperazine (MAP) reagent and liquid chromatography</p> <p><u>ISO 17736:2010</u>, Workplace air quality - Determination of isocyanate in air using a double-filter sampling device and analysis by high pressure liquid chromatography</p> <p><u>ISO 16702:2007</u>, Workplace air quality - Determination of total organic isocyanate groups in air using 1-(2-methoxyphenyl) piperazine and liquid chromatography</p> <p><u>TR 17737:2012</u>, Workplace atmospheres - Guidelines for selecting analytical methods for sampling and analysing isocyanates in air</p>
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Lithium hydroxide, sodium hydroxide, potassium hydroxide and calcium dihydroxide			<u>ISO 17091:2013</u> , Workplace air - Determination of lithium hydroxide, sodium hydroxide, potassium hydroxide and calcium dihydroxide - Method by measurement of corresponding cations by suppressed ion chromatography
Mercury and inorganic mercury compounds			<u>ISO 17733:2015</u> , Workplace air - Determination of mercury and inorganic mercury compounds - Method by cold-vapour atomic absorption spectrometry or atomic fluorescence spectrometry
Mercury vapour			<u>ISO 20552:2007</u> , Workplace air - Determination of mercury vapour - Method using gold-amalgam collection and analysis by atomic absorption spectrometry or atomic fluorescence spectrometry
Mixture of airborne particles and vapour		<u>EN 13936:2014</u> , Workplace exposure - Procedures for measuring a chemical agent present as a mixture of airborne particles and vapour - Requirements and test methods	
Nitrogen dioxide			<u>ISO 8761:1989 and 8761:1989/Cor 1:2009</u> , Workplace air - Determination of mass concentration of nitrogen dioxide - Method using detector tubes for short-term sampling with direct indication
Organic vapors	<u>D3686-13</u> , Standard practice for sampling atmospheres to collect organic compound vapors (activated charcoal tube adsorption method) <u>D3687-07 (2012)</u> , Standard practice for analysis of organic compound vapors collected by the activated charcoal tube adsorption method	<u>EN 1076:2009</u> , Workplace exposure - Procedures for measuring gases and vapours using pumped samplers - Requirements and test methods	<u>ISO 9486:1991</u> , Workplace air - Determination of vaporous chlorinated hydrocarbons - Charcoal tube/solvent desorption/gas chromatographic method <u>ISO 16200-1:2001</u> , Workplace air quality - Sampling and analysis of volatile organic compounds by solvent desorption/gas chromatography - Part 1: Pumped sampling method <u>ISO 16200-2:2000</u> , Workplace air quality - Sampling and analysis of volatile organic compounds by solvent desorption/gas chromatography - Part 2: Diffusive sampling method <u>ISO 9487:1991</u> , Workplace air - Determination of vaporous aromatic

			hydrocarbons - Charcoal tube/solvent desorption/gas chromatographic method
Sulfuric acid and/or phosphoric acid	<u>D4856-11</u> , Standard test method for determination of sulfuric acid mist in workplace atmospheres collected on mixed cellulose ester filters (ion chromatographic analysis)		<u>ISO 21438-1:2007</u> , Workplace atmospheres - Determination of inorganic acids by ion chromatography - Part 1: Non-volatile acids (sulfuric acid and phosphoric acid)
Vinyl chloride	<u>D4766-98 (2014)</u> , Standard test method for vinyl chloride in workplace atmospheres (charcoal tube method)		
Volatile inorganic acids (HCl, HBr, and HNO <sub>3</sub> )	<u>D7773-12</u> , Standard test method for determination of volatile inorganic acids (HCl, HBr, and HNO <sub>3</sub> ) using filter sampling and suppressed ion chromatography		<u>ISO 21438-2:2009</u> , Workplace atmospheres - Determination of inorganic acids by ion chromatography - Part 2: Volatile acids, except hydrofluoric acid (hydrochloric acid, hydrobromic acid and nitric acid)
Surface sampling	<u>D6966-13</u> , Standard practice for collection of settled dust samples using wipe sampling methods for subsequent determination of metals <u>D7659-10 (2015)</u> , Standard guide for strategies for surface sampling of metals and metalloids for worker protection <u>D7144-05a(2011)</u> , Standard practice for collection of surface dust by micro-vacuum sampling for subsequent metals determination <u>D7296-12</u> , Standard practice for collection of settled dust samples using dry wipe sampling methods for subsequent determination of beryllium and compounds <u>D7707-11</u> , Standard specification for wipe sampling materials for beryllium in surface dust status <b><i><u>WK46215</u>, New practice for standard practice for surface sampling for detection of isocyanates using color change wipes</i></b>		
Measurement of the dustiness of bulk materials		<u>EN 15051-1: 2013</u> , Workplace exposure - Measurement of the dustiness of bulk materials	

		<p>- Part 1: Requirements and choice of test methods  <u>EN 15051-2: 2013</u>, Workplace exposure - Measurement of the dustiness of bulk materials  - Part 2: Rotating drum method <b><u>(WI=00137069)</u></b>  <u>EN 15051-3: 2013</u>, Workplace exposure - Measurement of the dustiness of bulk materials  - Part 3: Continuous drop method</p>	
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Abbreviation: CD = Committee Draft, Cor = Corrigendum, DIS = Draft International Standard, NP = New Work Item Proposal, prEN = Preliminary EN standard, PWI = Preliminary Work Item, TR = Technical Report, TS = Technical Specification, WK or WI = Work Item

<sup>(1)</sup>ISO/TC 146/SC 2 recently finished a ballot to develop a TS for assessment of dermal exposure to nano-objects and their aggregates and agglomerates with CEN/TC 137/WG 6 (WI=00137054) under Vienna Agreement (with CEN lead) and is waiting for a TS number from ISO Central Secretariat.

<sup>(2)</sup>Although separate TC/SC covering nano-related materials are present under three organizations (ASTM, CEN, and ISO), a few standards, TR and TS are developed or in development process under these particular TC or SC.

<sup>(3)</sup>Bioaerosols are covered under ASTM D22.08 on Sampling and Analysis of Mold

<sup>(4)</sup>This is a joint project by JWG developed between WG 3 and the International Electrochemical Commission.