Annex 5:
Guidance for identifying sources

Table 41 lists the volatile organic compounds (VOCs) routinely examined in the MGU measuring programme for indoor measurements, plus the potential indoor sources. The list is not exhaustive and is merely intended to provide initial guidance.

Table 41:
Potential sources of the indoor air substances routinely examined in the MGU measuring programme for indoor measurements [1]

Substance/substance category	Potential sources and main uses	Perceived odour
Hydrocarbon mixtures, aliphatic (C_9 to C_{14}) [2]	Solvent in paints, varnishes and other coating products; dry cleaning products; car, shoe and floor care products; furniture polish; secondary component in water-based paints	Petrol-like, minor
Alkanes		
n-Heptane	Solvent for (fast-drying) varnishes and adhesives	Weak, petrol-like
n-Octane	Solvent (e.g. paint thinners); in acrylic products	Petrol-like
n-Nonane	Used in surfactant production; ingredient in petrol, fuel and lamp oil; solvent	Petrol-like
n-Decane	Solvent Contained in petrol	Petrol-like
n-Undecane	Contained in petrol	Petrol-like
n-Dodecane n-Tridecane n-Tetradecane	Contained in petrol Contained in petrol, oil fuel, paints, varnishes Contained in petroleum	Petrol-like
n-Pentadecane	Contained in petrol, oil fuel, paints, varnishes	Petrol-like
n-Hexadecane	Contained in petroleum jelly, petrol and petroleum	Petrol-like
Aromatic compounds		
Benzene	Solvent and cleaning agents; anti-knock additive in fuels; formerly used as solvent for rubber paints, waxes, resins and oils	Aromatic
Toluene [3]	Increased toluene concentration levels are generally likely in the vicinity of toluene-emitting facilities (printing works, petrol stations) and in rooms immediately adjacent to garages. In building materials that contain toluene; in freshly printed materials; solvent (as a benzene substitute) in paints, varnishes (e.g. including nail varnish), adhesives, furniture care products, rubber, greases	Flowery, pungent
Ethylbenzene	Solvent in paints and coatings; contained in polymer materials such as floor coverings and floor backings	Aromatic
o-Xylene m-Xylene p-Xylene	Most technical-grade xylene mixtures contain the three isomers o-xylene (20 to 24 vol.-%), m-xylene (42 to 48 vol.-%), p-xylene (16 to 20 vol.-%) plus ethylbenzene (10 to 11 vol.-%). Solvent in natural and synthetic resins, greases, waxes; contained in petrol; used in the production of varnishes, paints, printing inks, adhesives, building protection products, insecticides, etc.	Aromatic
1,2,3-Trimethylbenzene 1,2,4-Trimethylbenzene 1,3,5-Trimethylbenzene (mesitylene)	Used in the production of medicinal products and dyes; intermediate in the production of odorous substances	Aromatic
Styrene [4]	Numerous consumer products (e.g. household appliances, packaging, carpets) can contain monomer residues and thus cause styrene pollution in the indoor air. Solvent and reactant for unsaturated polyester resins; mounting media for anatomical specimens; used in the production of polystyrene (for packaging, insulating materials, components, etc.) and polystyrene copolymers with acrylonitrile, butadiene, maleic anhydride, etc. and thermoplasts	Sweet People become accustomed to the odour Strong-smelling

Substance/substance category	Potential sources and main uses	Perceived odour
Naphthalene [5]	In mothballs and insecticides; bitumen damp-proofing, powder-proofing (beneath packed beds) or joints in wooden floors glued using bitumen; occasionally rubber floor coverings; leaks in mineral oil tanks in basements; in some countries in and outside of Europe, naphthalene is used to preserve natural products (e.g. leather, natural bristles).	Like moth powder and bitumen Strong-smelling
Phenol [6]	In the past, phenol was widely used as a disinfectant, e.g. in laundries and in care products, but this practice was stopped over a decade ago. Solvent; used in the production of phenol resins, plasticisers, anti-oxidants, soaps, shampoos, adhesives, lubricants, dyes, etc.	Penetrating odour Strong-smelling
Alcohols		
n-Butanol	Solvent in varnishes, paints, resins, rubber; decomposition product resulting from plasticiser hydrolysis, therefore indicates damp damage or high levels of residual moisture in building structures (hydrolysis of dibutyl phthalate)	Ethanolic People become accustomed to the odour
2-Ethylhexanol	Solvent for greases, waxes, oils and resins; dispersing agents for pigments; plasticisers; decomposition product resulting from hydrolysis of the most common plasticiser, DEHP, therefore indicates damp damage or high levels of residual moisture in building structures	Alcoholic Strong-smelling
1-Hexanol [7]	Occurs in, for example, wallpaper, carpets, evaporation-type metres on radiators	Sweet
Ketones and esters		
Butanone	Solvent for vinyl resins and nitrocellulose varnishes; denaturants for ethanol	Acetone-like
4-Methyl-2-pentanone	Solvent; contained in coating substances that use cellulose nitrate as a binding agent, including natural resins, synthetic resins and epoxy resins; contained in printing inks as a solvent for dyes and binding agents	Pleasant People become accustomed to the odour
Esters	Solvent in varnishes and adhesives, perfumes and air fresheners	Pleasant, fruity odour
Ethyl acetate	Main ingredient in many special-purpose solvents; used in the production of nail varnish and nail varnish remover; used to flavour liqueurs, sweets, fizzy drinks and medicinal products; important solvent in the production of cellophane, celluloid, collodion wool, varnishes, synthetic resin, etc.	Fruity (typical “UHU” smell)
n-Butyl acetate	Solvent for varnishes; extraction agents; used in the production of essences, stain removers, glossy paper, nail care products; contained in paint removers, building chemicals	Fruity
Acrylates (Acrylic acid esters)	Predominantly used as methyl methacrylate in acrylic resins, adhesives or sealants	Pungent
Glycol ethers and esters		
2-Butoxyethanol	Solvent for printing inks; thinners; finishing agents; used in the production of varnishes	Weak ethereal odour
2-Butoxyethyl acetate	Contained in flexographic, gravure printing and silkscreen printing inks; used for leather and textile prints	Weak, ester-like odour
2-(2-Butoxyethoxy)ethanol	Contained in surface-cleaning products, drilling and cutting oils, firefighting foams; used in the production of plasticisers	Weak, fruity, almost odourless
2-(2-Butoxyethoxy)ethyl acetate	Contained in printing inks, ballpoint pen pastes, outdoor/indoor paints and synthetic resin plaster, wood stain, furniture polish and cleaning agents	Fruity

Substance/substance category	Potential sources and main uses	Perceived odour
Glycol ethers and esters		
2-Phenoxyethanol	Solvent in inks, ballpoint pen pastes, printing pastes and stamping inks; fixative for perfumes and soaps; used in the production of plasticisers, air fresheners	Weak aromatic odour
Terpenes		
α-Pinene [8]	Volatile component in conifer resin oil; main component in turpentine oil; used as a solvent in surface-treatment products and adhesives, in household products (e.g. shoe polish, floor cleaners); used as a fragrance additive in cosmetics; natural component of fruits and vegetables (e.g. oranges, lemons, carrots); contained in medicinal products	Pine-like
Limonene [9]	Contained in citrus oil but also in many other essential oils, e.g. fennel and caraway, and in many food crops; used as a solvent in the varnish industry and in do-it-yourself and household products, e.g. paint removers, brush cleaners, glaze, care products, polishes; used as a fragrance in cosmetics; used to flavour foods; in essential oils used as treatments for colds; increased values occur, for instance, when citrus fruits are peeled (circa 2 mg/m³); contained in alkyd resin varnishes (oil varnishes), shoe polishes, floor wax	Pleasant, citrus-like
3-Carene	Volatile component in conifer resin oil; used as a solvent in surface-treatment products and adhesives, in household products (e.g. shoe polish, floor cleaners); used as a fragrance additive in cosmetics; natural component of fruits and vegetables (e.g. oranges, lemons, carrots); contained in medicinal products	Pleasantly sweet
Aldehydes		
Aldehydes	Linoleum, alkyd resin varnishes, linseed oil varnish and other drying oils, PVC floor coverings, scented oils, perfumes, cooking and baking vapours	
Formaldehyde	Auxiliary agent in the textile, leather, fur, paper and wood-making industries; preservative and disinfectant in medicine and engineering; mostly used to make resins with urea (bonding agent with chipboard), phenols and melamine; anhydrous, pure formaldehyde is used in the production of thermoplastics	
Acetaldehyde	Flavouring that gives a fresh, fruity taste in such products as alcoholic beverages; by-product of alcoholic fermentation, e.g. during dough-making; product of the human metabolism; created by breakdown processes, e.g. protein breakdown in domestic dust	Pungent
Propionaldehyde	Used in the production of plastics, plasticisers, rubber auxiliary agents, vulcanisation accelerators, phenol resins, demulsifiers, flavourings and fragrances, agrochemicals, pest control products and medicinal products	Pungent
Butyraldehyde	Used in the production of synthetic resins, plasticisers, solvents, synthetic tanning and odorous substances, vulcanisation accelerators	Pungent
Glutaral (glutaraldehyde)	Preservative used for disinfection of equipment and instruments in the cosmetic industry and in medicine; hardener for gelatine; tanning agent for treating leather; water repellents for paper, wallpaper, etc.	Acrid, unpleasant smell

Substance/substance category	Potential sources and main uses	Perceived odour
Aldehydes		
Higher aldehydes such as pentanal, hexanal (capronaldehyde), heptanal, octanal, nonanal or decanal [10]	Contained in natural wood, thus also contained in, for example, wooden flooring or alkyd resin products Occurs as a result of secondary emission, due to fatty acid breakdown in resins and oils; therefore contained in linoleum, natural oil products (especially those based on linseed) and adhesives; Main aldehydic compound in many indoor rooms	Fatty, rancid or pungent, very strong smell (especially octanal, nonanal and decanal)
Siloxanes [11]	Contained in numerous consumer products, such as hair care and personal care products, cosmetics, washing and cleaning products, furniture polishes, in dummies for babies, baking moulds and electronic components; contained in joint sealants, paints, varnishes, paper materials and textiles; D5 is usually the siloxane with the highest concentration	Odour hardly perceptible

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