Guidance on electrostatic safety for handling flammable liquids

24 June 2026

1. Purpose

This guidance document outlines the main electrostatic hazards when handling flammable liquids, mainly in open vessels, at printing inks and coatings manufacturing sites. It also offers sources of information to assist with safe handling to prevent fires caused by electrostatic ignitions of flammable atmospheres.

2. Field of application

All flammable liquids, whether as raw materials, finished products, or otherwise, that are handled at printing inks and coatings manufacturing sites are covered by this guidance. This guidance applies to flammable, highly flammable, and extremely flammable liquids classified under the CLP Regulation, unless stated otherwise.

3. Definitions

3.1 Flammable, Highly Flammable and Extremely Flammable Liquids

According to EU legislation (see 5, Sources of information) flammable liquids are classified based on the following criteria:

3.1 a flammable liquids, that have a flash point between 23 and 60°C

3.1 b highly flammable liquids, that have a flash point below 23°C and an initial boiling point above 35°C

3.1 c extremely flammable liquids, that have a flash point below 23°C and an initial boiling point of 35°C or below.

3.2 Lower Explosion Limit (LEL)

The lower explosion limit is the lowest concentration of vapour in air at which the vapour/air mixture is flammable. Under this value organic vapour concentration is insufficient to sustain combustion.

3.3 Upper Explosion Limit (UEL)

The upper explosion limit is the highest concentration of vapour in air at which the vapour/air mixture is flammable. Over this value organic vapour concentration is too high and will impede combustion.

3.4 Flash Point

Flash point is the lowest temperature at which a liquid generates enough vapour to form a flammable mixture with air that will momentarily ignite when exposed to an ignition source such as a flame.

3.5 Fire Point

Fire point (or sustained combustion temperature) is the temperature at which the vapour ignites and continues to burn after the ignition source is removed.

4. Electrostatic Hazards and Control Methods

This section lists the main electrostatic hazards associated with flammable liquids handling (4.1) and the principal methods that may be used to control the risks that may arise in such cases (4.2). Guidance on the application of the control measures is given within the reference documents listed in section 5.

All users of flammable liquids should ensure that a risk assessment covering their specific operations has been made by a person(s) with an appropriate level of competence. This can be made by in-house trained personnel or external consultants. The risk assessment should meet the requirements of the ATEX User Directive 1999/92/EC (the ATEX '137' Directive), which aims to protect workers from hazards related to explosive atmospheres.

4.1 Electrostatic Hazards

Electrostatic hazards associated with handling of flammable liquids include but are not limited to:

- **Flammable atmospheres**
  Produced when flammable liquids are handled at temperatures above their flash point with vapour concentrations between the upper and lower explosion limits (as defined in section 3).

- **Electrostatic charge (direct liquid handling)**
  Static charge with sufficient energy to ignite a flammable atmosphere may be accumulated when directly handling flammable liquids via the following mechanisms:
  Pouring
  Pumping (includes discharging from tanks, vessels, road tankers, etc.)
  Spraying
  Splashing
  Mixing, stirring or agitating
  Filtering
  Transporting
  Cleaning activities in case cleaning products other than flammable liquids are not feasible/not effective

- **Low-conductivity liquids**
  Liquids with low conductivity are more susceptible to the generation of electrostatic charge during handling. Annex 1 provides a list of some commonly used low-conductivity liquids in the printing inks and coatings industry.

- **Electrostatic charge (peripheral activities)**
  Static charge with sufficient energy to ignite a flammable atmosphere may be generated and/or accumulated via the following peripheral activities when handling flammable liquids:

Movement of people, materials and equipment within the workplace
Loading of higher resistivity solids into a flammable liquid
Charge accumulation on isolated conductors (particularly hazardous as this can produce higher energy spark discharges at lower voltage potentials)
Charge accumulation on non-conductive materials (includes tools, packaging, clothing, containers, pipework etc.)

4.2 Control methods

Principal methods to control electrostatic risks when handling flammable liquids include but are not limited to:

- **Limiting or avoiding the presence of flammable atmospheres** – Use local exhaust ventilation (LEV) to remove flammable vapours. See references in section 5 for methods to completely avoid flammable atmospheres.
- **Earthing** – Connect all conductive items to earth (metal plant, equipment, containers, structures, etc). For metal items, the connection to a known / verified earth point should not exceed 10 Ω. A resistance above 10 Ω can indicate a compromised connection.

  For items that cannot be structurally earthed (e.g. portable containers), temporary connections, usually earthing clamps and cables, are usually required. Earthing clamps should have sharp, durable tips capable of penetrating insulators (coatings, product deposits, rust etc.) to achieve a ≤ 10 Ω connection.
- **Bonding** – Connect adjacent metal parts and items to each other to ensure that they are at the same electrical potential (sections of pipe, structures, floor plates, etc.). Again, bonding connections for metal items should not exceed 10 Ω (see 'Earthing').
- **Pumping flammable liquids at lower speeds**
  - Non-conductive liquids less than 50 pS/m, should not exceed 1 m/s See footnote i
  - Conductive liquids more than 50 pS/m as low as possible See footnote ii
- **Pouring solids at lower speeds and/or using alternative loading methods** – Preferably less than 1kg/s. See references in section 5 for alternative loading methods.
- **Avoiding use of insulating plastics in the workplace** – These may be a source of electrostatic charge generation and/or create a barrier to earthing of conductive items (e.g. tools, containers, equipment).
- **Check for the conductivity of the packaging used, as they can give rise to electrostatic discharges - especially for solid materials and non-flammable liquids.** See footnote **iii**
- **Provision of anti-static / dissipative clothing** - To ensure that a barrier to earth is not created by this clothing and that it is not a source of static charge (includes footwear, gloves and overalls) including regular checks of footwear. See footnote i
- **Provision of conductive or dissipative flooring** - To ensure that all personnel, equipment, containers, tools etc placed on or moved across the floor are connected to earth. See footnote **i**

- **Use of safer filling methods** – Avoid free fall of solvents, direct solvent flow to the sides of containers, avoid splashing and spraying. Ideally sub-surface filling via bottom inlet or dip-pipe should be applied.
- **Installing Intrinsically Safe Plant and Equipment that is suitable for the certification for the area(s) in question** – See references in section 5 for further information.
- **A suitable anti-static agent can be added to low-conductivity solvents to balance their conductivity - This is not an alternative to maintaining compliant flow speeds.**

  Note that the activity of anti-static agents can diminish over time> Therefore, it is recommended that checks are carried out to determine their continued effectiveness. See footnote [i]

- **Further general recommendations:**
  - Add conductive solvents first, then less conductive ones into a mixture
  - Flexible hoses conductivity must be ensured over the full length of the hose a couplings

Be aware of the fact that during liquid transfer all parts and joints must be conductive in order to have the correct conductive behaviour and avoid static charge accumulation!

5. Sources of information

Main reference:

- ESIG Best Practice Guideline, 'Flammability: A safety guide for users' Flammability-A-safety-guide_2022-FINAL-v2.pdf

Other references:

- Regulation (EC) No 1272/2008 on classification, labelling and packaging of substances and mixtures ('CLP')
  Classification and labelling (CLP/GHS) - Internal Market, Industry, Entrepreneurship and SMEs
- Directive 94/9/EC / Directive 2014/34/EU on equipment and protective systems intended for use in potentially explosive atmospheres ('ATEX'), and
  Directive 1999/92/EC on minimum requirements for improving the safety and health protection of workers potentially at risk from explosive atmospheres
  http://ec.europa.eu/growth/sectors/mechanical-engineering/atex/index_en.htm
- EuPIA Guidelines on loading high-resistivity powders into vessels containing flammable / explosive vapours
  (in CEPE Cloud Workplace folder 2020-11_ EuPIA Guidance on loading of high resistivity powders.pdf
- IEC/TS 60079-32-1 Explosive atmospheres – Electrostatic hazards, guidance
  https://webstore.iec.ch/publication/60166
- UK HSE Safe use and handling of flammable liquids HSG140
- UK HSE Storage of flammable liquids in containers HSG51

- UK HSE Storage of flammable liquids in tanks HSG176
- Solvent Industry Association Guidance Note 47 Flammable solvents and the hazard of static electricity

EuPIA OSRA, 24 June 2026
Replaces guidance of February 2019

ANNEX 1

Solvents conductivity

Solvent	Conductivity (S/m)
Citrosolv	$< 1 * 10^{-10}$
Hexane	$1 * 10^{-17}$ [2]
Isopar E	$3{,}0 * 10^{-12}$ [3]
n-Octane	$9* 10^{-12}$ [5]
iso-Octane	$1* 10^{-12}$ [5]
Heptane	$1 * 10^{-14}$ [2]
Xylene	$1 * 10^{-13}$ [2]
Solvesso 150	$1{,}0 * 10^{-9}$ [3]
Toluene	$8 * 10^{-14}$ [1]
Solvesso 100	$1{,}0 * 10^{-9}$ [3]
Solvesso 200	$2{,}0 * 10^{-9}$ [3]
Cyclohexane	$2{,}0 * 10^{-12}$ [2]
Pinewood oil	10^{-12} [1]
n-Butylacetate	$1{,}12 * 10^{-8}$ [2]
Ethyl acetate	$4{,}6 * 10^{-8}$ [2]
Isopropylacetate	$22 * 10^{-6}$ [4]

Sources:
[1] TRGS 727
[2] Britton
[3] BASF AG
[4] Monument Chemical
[5] Sovents Industry Association Guidance Note No. 47

Reason for adding esters to the table
Various esters have been added to the list based on industry experience with frequently observed ignition scenarios related to these solvents. There are several physico-chemical properties supporting easy ignition despite of higher conductance versus other solvents in the table.

Disclaimer

This guideline does not supersede any legislation in force.

This document is provided by EuPIA OSRA group solely to assist in promoting good practice in the industry and on the basis that it will be adapted and implemented by CEPE/EuPIA members for use in their organisations. EuPIA OSRA group gives no representation or warranty whatsoever in relation to anything written in the document or the compliance of any policy, recommendation or practice contained therein with applicable laws, regulations or best practice. EuPIA OSRA group shall have no liability whatsoever in relation to, or arising out of, the use of the document or the policies, practices or recommendations contained in it, or in any external links, by any third party. The document is provided on the strict understanding and on the basis that EuPIA OSRA group is not engaged in providing legal, managerial or other professional services in relation to its content.

---

[i] For more detailed information, see the ESIG guidance and IEC TS 60079-32-1:2013+A1:2017 Explosive atmospheres - Part 32-1: Electrostatic hazards - guidance
[ii] See also the note on Ethyl Acetate in Annex 1
[iii] See also the guidance not of the risk of explosion from static discharge