

GHS Chemical Labeling Compliance: Requirements & Solutions



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Introduction

Until recently, chemical labels were regulated by standards created by individual nations, usually with advice and commentary from related industry groups. We are now moving into an era of globalization, in which the manufacture, packaging, transport, sale, and use of chemicals and chemical products is accomplished by a globally interconnected supply chain. Driven by the recognition that chemicals must be classified and labeled under a universally understood communications system in order to avoid risks to human health and the environment, every nation in the world has agreed to harmonize chemical hazard communications under a system developed by the United Nations (UN) and the International Labor Organization (ILO). This Globally Harmonized System of Classification and Labelling of Chemicals, commonly known as GHS, was adopted by consensus in 2003 by the United Nations Economic and Social Council.

The following paper summarizes the new GHS regulations as they pertain to chemical product labeling and documentation.

Scope and Costs of GHS Label Changes

The transition to GHS communications standards is a significant task that will require chemical manufacturers to re-document and re-label all chemical products by the deadline date for implementation in their geographic region. Manufacturers will need to ensure that Material Safety Data Sheet (MSDS) documentation meets new GHS standards, and that all product labels, including labels for shipping cartons and secondary packages as well as primary product labels, comply with the new warning symbols, color codes, product identifiers, numbers, signal words, hazard statements, and precautionary statements of the Globally Harmonized System.

The task of reassessing each chemical under the new 16 classifications of Physical Hazards criteria is likely to require new laboratory testing and verification, and will be a time-consuming process that involves upstream and downstream supply chain partners as well as internal quality management systems. In recognition of the burden this places on manufacturers, the European Chemicals Agency has provided a limited grace period for adoption of GHS labeling and documentation standards on products manufactured before 1 December 2010 to allow them to continue to be sold in Europe until 1 December 2012 (see below “Deadlines for Compliance”).

Benefits of GHS Label Changes

While the industry will be required to bear the costs of re-assessing and re-packaging chemical products, it is important to note that manufacturers will also enjoy benefits from GHS. It will become simpler to export chemical products to foreign markets, and equally straightforward to import them, with no more hurdle of meeting country-specific documentation and testing standards, workplace safety standards, and environmental standards. The initial start-up costs of GHS implementation will be replaced by ongoing time savings and cost savings as manufacturing, labeling, and shipping activities commence under GHS.

Deadlines for Compliance

GHS labeling regulations are now legally required within the European Union and parts of Asia, and are in the process of legal adoption in the United States and Canada. Each region has taken a multi-phasic approach to adoption of GHS standards, with interim deadlines for compliance by chemical type. Currently, GHS compliant labels will be required for pure substance chemical products manufactured, imported, shipped, or advertised within Europe or to Europe from other regions as of 1 December 2010. Compliance dates for products shipped within the United States and Canada have not yet been determined.

European Union		
<i>Includes countries of: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Netherlands and the United Kingdom.</i>		
Chemical Substance/ Functional Area	Previous standard, replaced by GHS	Deadline Date for Adoption of GHS Label and GHS MSDS Format
Pure Chemical Substances (Explosives; Flammable gases; Flammable aerosols; Oxidizing gases; Gases Under pressure; Flammable liquids; Flammable solids; Self reactive substances and mixtures; Pyrophoric liquids; Pyrophoric solids; Self-heating substances and mixtures; Substances and mixtures which in contact with water will emit Oxidizing liquids, Oxidizing solids, Oxidizing peroxides, Corrosive to metals)	DSD/DPD, Country-specific standards	1 December 2010
Submit Notification to of Chemical Substances Placed on the Market as of 1 December 2011 to European Chemicals Agency	--	3 January 2011
Transition Period for Pure Substances which are Manufactured and "On-the- Shelf" Before 1 December 2010 (grace period, allows use of labels that do not meet GHS standards)	DSD/DPD, Country-specific standards	1 December 2012

Chemical Mixtures: Examples include adhesives, dyes, laboratory chemicals, paints, plastics, solvents, and chemicals used in cleaning products, cosmetics, and toiletries	DSD/DPD, Country-specific standards	1 June 2015
Transition Period for Chemical Mixtures which are Manufactured and “On-the-Shelf” before 1 June 2015 (grace period, allows use of labels that do not meet GHS standards)	DSD/DPD, Country-specific standards	1 June 2017
Pesticides	FAO, DSD/DPD, WHO	1 June 2015

Asia		
<i>Countries of: China, Japan, Korea, Indonesia, Malaysia, Philippines, Singapore, Taiwan, Thailand, Australia, New Zealand</i>		
Chemical Substance/ Functional Area	Previous standard, replaced by GHS	Deadline Date for Adoption
Pure Chemical Substances: <i>(Explosives; Flammable gases; Flammable aerosols; Oxidizing gases; Gases Under pressure; Flammable liquids; Flammable solids; Self reactive substances and mixtures; Pyrophoric liquids; Pyrophoric solids; Self-heating substances and mixtures; Substances and mixtures which in contact with water will emit Oxidizing liquids, Oxidizing solids, Oxidizing peroxides, Corrosive to metals)</i>	- Australia: NOHSC, SWA - Japan: CSCL, ISHL - Philippines: OSHS - Singapore: EPMA, WSHA	- Australia: 2012 - China : Implemented - Japan: Implemented - Korea : Implemented - Indonesia: date unknown - Malaysia : 2008 - New Zealand : Implemented - Philippines: date unknown - Singapore: Implemented - Taiwan: Implemented - Thailand: 2011
Chemical Mixtures: Examples include adhesives, dyes, laboratory chemicals, paints, plastics, solvents, and chemicals used in cleaning products, cosmetics, and toiletries	- Australia: NOHSC, SWA	- Australia: 2012 - Korea: June 30, 2013 - Malaysia: June 30, 2013 - Singapore: 2012 - Thailand: 2011
Pesticides	- Australia: AVCCA, NOHSC, SWA - Japan (PDSCL)	- Australia: 2012

Canada		
Chemical Substance/ Functional Area	Previous standard, replaced by GHS	Deadline Date for Adoption
Pure Chemical Substances: <i>(Explosives; Flammable gases; Flammable aerosols; Oxidizing gases; Gases Under pressure; Flammable liquids; Flammable solids; Self reactive substances and mixtures; Pyrophoric liquids; Pyrophoric solids; Self-heating substances and mixtures; Substances and mixtures which in contact with water will emit Oxidizing liquids, Oxidizing solids, Oxidizing peroxides, Corrosive to metals)</i>	WHMIS	Implemented
Pesticides	PMRA, CPSB, WHMIS	Not yet established
Hazardous Goods for Transport	Transport Canada, WHMIS	Not yet established
Chemical Mixtures: Examples include adhesives, dyes, laboratory chemicals, paints, plastics, solvents, and chemicals used in cleaning products, cosmetics, and toiletries	WHMIS, CPSB	Not yet established

United States		
Chemical Substance/ Functional Area	Previous standard, replaced by GHS	Deadline Date for Adoption
Pure Chemical Substances: <i>(Explosives; Flammable gases; Flammable aerosols; Oxidizing gases; Gases Under pressure; Flammable liquids; Flammable solids; Self reactive substances and mixtures; Pyrophoric liquids; Pyrophoric solids; Self-heating substances and mixtures; Substances and mixtures which in contact with water will emit Oxidizing liquids, Oxidizing solids, Oxidizing peroxides, Corrosive to metals)</i>	ANSI, EPA, OSHA	2015 (estimated)
Pesticides	ANSI, EPA, OSHA	Not yet established

Hazardous Goods for Transport	ANSI, DOT, OSHA	Not yet established
Chemical Mixtures: Examples include adhesives, dyes, laboratory chemicals, paints, plastics, solvents, and chemicals used in cleaning products, cosmetics, and toiletries	ANSI, OSHA, EPA	Not yet established

Required GHS Label Elements

Under GHS regulations, a Product Identifier, Pictogram, Signal Word, Hazard Statement, and Supplier Information must be stated on each chemical product label.

- **Product Identifier**

A Product Identifier is the ingredient name or number of the pure chemical substance or chemical mixture. The technical name(s) must be harmonized with IUPAC, CAS and with the technical name(s) listed on the MSDS sheet. It must also be harmonized with the UN Proper Shipping Name if the chemical is regulated under the United Nations Recommendations on the Transport of Dangerous Goods (UNRTDG). The Product Identifier is meant to prevent accidental or uninformed exposure. A worker, shipper, or supply chain partner must be able to accurately identify the chemical and recognize its potential hazard.

- **GHS Pictograms (Diamond-shaped symbols)**

Each red, black, and white diamond-shaped pictogram conveys information about particular hazardous risks associated with a chemical. In combination with the Signal Word “Danger” or “Warning,” the pictogram communicates the severity of the risk, and is meant to prevent accidental or uninformed exposure. More than one pictogram may be used on the same chemical label, if applicable. The size of the pictogram, and other label elements, should be proportionate to the physical dimensions of the label. (For more detailed information, see below “GHS Label Pictograms” and “GHS Label Size Requirements”)

- **Signal Words (1 and 2)**

These words are used to indicate the relative hazard severity and alert the reader to a potential hazard. The Signal Word “Warning” and the numeral “1” indicate a less-severe or non-lethal hazard. The Signal Word “Danger” and the number “2” indicate a severe or potentially lethal hazard.

- **Hazard Statements**

These phrases describe the nature and degree of the hazard posed by the chemical. All hazard statements should be included on the label for a substance/mixture possessing more than one hazard. An example of a hazard statement would be “Heating may cause an explosion.”

- **Precautionary Statements**

These statements must relate to the GHS pictogram, and further describe measures that should

be taken to minimize or prevent risks associated with the hazard. The number of precautionary statements should be kept to a maximum of six. An example of a precautionary statement would be: “Keep away from heat/sparks/open flames/hot surfaces – no smoking” in relation to a pictogram that shows Explosive Danger and a Hazard Statement such as “Heating may cause an explosion.”

- **Supplier Information**

Each chemical container, including secondary packaging such as crates and master cases, must include a GHS label printed with the Supplier Information. This must include the name, address, and telephone number of the manufacturer or supplier of the product.

- **Supplementary Information**

The Supplementary Information is additional product information volunteered by the manufacturer, supplier, or other responsible party. It is acceptable for the manufacturer to make a statement that is not harmonized with GHS standards. However, the statement must not conflict with GHS standards.

GHS Label Size Requirements

GHS Labeling regulations require different minimum label sizes, depending on the capacity of the container. The proper minimum label dimensions based on container size are depicted on the chart below:

Container Capacity	Required GHS Label Dimensions
≤ 3 liters (≤3 .17 quarts)	52mm x 74mm (2.04" x 2.91")
3 - 50 liters (3.17 13.2 gallons)	74mm x 105mm (2.91" x 4.133")
50 - 500 liters (13.2 – 132 gallons)	105mm x 148mm (4.133" x 5.82")
≥ 500 liters (≥ 132 gallons)	148mm x 210mm (5.82" x 8.26")

Printing GHS Labels In-House

The variety of GHS label formats and size configurations has made the prospect of printing labels in-house, tailored for each chemical product, attractive to many chemical manufacturers. There are typically three options for printing GHS labels as part of an in-house packaging process:

Option One: Printing Labels with a Barcode Printer

In this scenario, a barcode label printer is used to print pictograms, signal words, manufacturer address, and other text in one-color: black. The portion of the label that requires an additional color, usually red, is pre-printed onto a roll of labels. This pre-printed roll is inserted on a thermal transfer barcode printer, and the black-colored portion of the label, including the pictogram, signal words, hazard warning, and other text is printed with a black-colored thermal transfer ribbon. This solution requires a large inventory of pre-printed labels, and presents a logistical challenge in a production

setting, where packaging staff are required to identify and select the correct pre-printed label roll from among the many rolls on warehouse shelves for each batch.

Option Two: Printing Labels with a 2-Color Label Printer

A digital label printer capable of printing labels in two different colors, in one printing pass, provides manufacturers with the flexibility to make durable, color-fast labels with different GHS label content, in different label sizes, according to production demand. Manufacturers with a two-color digital label printer can adapt their in-house labeling system to print labels for different chemical substances and different container sizes, both of which may require changes to printed content, such as an increase or decrease in the size of pictograms, signal words, and warning statements. Digital printing allows manufacturers to change any label content at any time, producing labels with foreign language content and updating marketing content. When different label stock sizes are required because the physical dimensions of the container have changed, the two-color label printer can be re-loaded with a blank roll of labels in the desired size. This solution may suffice for label printers that offer adequate width to accommodate GHS label size requirements.

With a typically moderate price point and widely-accepted thermal transfer print technology, the two-color label printer can be a cost-effective and familiar solution for companies migrating from in-house barcode/monochrome label printing to in-house printing of red and black GHS labels and other dual-colored pictograms used on chemical labels covered by the UN Recommendations for the Transport of Dangerous Goods (UNRTDG).

Option Three: Printing Labels with a Full-Color Label Printer

A digital label printer with the capability of printing full-color, variable information labels provides maximum flexibility to comply with GHS labeling regulations. As manufacturers who formulate chemical mixtures prepare to meet the requirement for labeling chemical mixture products such as household and professional cleansers and other consumer chemicals under GHS labeling standards by the year 2015, they may find that a full-color label printer provides them with the additional in-house capacity to print labels that integrate GHS hazard warning label panels, required ingredients statements and usage instructions with graphic-rich primary display panels, all in the same label printing process. In essence, a four-color printer can satisfy both GHS and private or custom labeling requirements at the same time. In addition, full-color label printers typically offer a wider printable area, allowing manufacturers to print labels up to 210mm (8.3 inches) wide, the maximum label size required under GHS labeling regulations.

If the full-color label printer has the capacity to directly address an Enterprise Resource Planning (ERP) system or other company database, the manufacturer would also be able to centrally manage label production, printing color labels with product-specific and batch-specific label content, including both GHS color codes and pictograms as well as non-GHS color codes which may be utilized as part of an internal labeling system, in addition to brand logos, photos, illustrations, and other trade dress. This ensures that the correct label content is automatically printed on the label for each product, reducing labeling errors.

Use of Color-Coded Pictograms on GHS Labels

The GHS labeling standard requires visual, color-coded hazard warnings as part of its aim to make chemical hazard warnings universally understood. The purpose is to overcome the barriers created by the use of different languages, and by illiteracy, by visually conveying information about chemical hazards and safety measures. The use of the same standard symbols (pictograms) and color codes on chemical labels around the world ensures that workers who handle chemicals during production, transport, or at the point of use will share the same recognition and understanding of the GHS hazard warning system.







Most GHS labels will consist of a white background inside a red-colored diamond frame, with a black-colored symbol printed over the white area. Transport labels, which will continue to use additional colors and symbols developed by the UN Recommendations on the Transport of Dangerous Goods, Model Regulations, are an exception.




GHS Label Pictograms

Each pictogram must be combined with a signal word and number (1 or 2) to indicate hazard level, standardized hazard statements corresponding to health, physical, and environmental hazard class, precautionary statements, and the name, address, and the telephone number of the chemical manufacturer, importer, or other responsible party. More information about GHS pictograms is available at the UN Economic Commission website, [Annex I, Allocation of Label Elements](#).









Printable artwork for GHS pictograms can be downloaded from the UN website at:











<http://www.unece.org/trans/danger/publi/ghs/pictograms.html>.

 <p>Explosive; Heating may cause fire or explosion</p>	 <p>Oxidizer, may intensify fire; Oxidizing gas; Flammable gas; Flammable Aerosol; Flammable Liquid; Flammable Solid; Heating may cause a fire</p>	 <p>In contact with water, releases flammable gas; Self-reactive Substance or Mixture; Self-heating; Catches fire spontaneously if exposed to air</p>
 <p>Gas under pressure</p>	 <p>Corrosive to Metals; Causes Serious Eye Damage</p>	 <p>Acute Toxicity Oral; Acute Toxicity Skin; Causes Skin Irritation; Causes Serious Eye Irritation</p>

 <p>Germ Cell Mutagenicity, Carcinogenicity; Organ Damage; Birth Defects; Aspiration Hazard; Breathing Difficulties, Allergies, or Asthma if Inhaled</p>	 <p>Aquatic Environmental Toxicity Acute; Aquatic Environmental Toxicity, Chronic</p>	 <p>Harmful if Swallowed; Toxic if Inhaled; Harmful in Contact with Skin; May Cause an Allergic Skin Reaction; May Cause Respiratory Irritation</p>
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Transport Label Pictograms (valid under GHS)

 <p>Explosive, Division 1.1, Self-reactive</p>	 <p>Explosive, Division 1.2</p>	 <p>Explosive, Division 1.3</p>	 <p>Explosive, Division 1.4</p>
 <p>Explosive, Division 1.5</p>	 <p>Explosive, Division 1.6</p>	 <p>Flammable gas, Flammable aerosol</p>	 <p>Oxidizer, Oxidizing liquid, Oxidizing solid</p>

 <p>Gas under pressure</p>	 <p>Gas under pressure</p>	 <p>Flammable liquid and vapor</p>	 <p>Flammable Solid, Self-reactive Substance or Mixture</p>
 <p>Pyrophoric Liquid, Pyrophoric Solid, Self-Heating Substance or Mixture</p>	 <p>Substance Emits Flammable Gases</p>	 <p>Organic Peroxides</p>	 <p>Corrosive to Metals</p>
 <p>Acute Toxicity, Oral, Skin, Inhalation</p>	 <p>Skin Corrosion/Irritation</p>		

GHS Label Material Standards

GHS imposes packaging material requirements consistent with its safety measures aimed at containing chemical hazards. In Europe, the CLP (Classification, Labelling, and Packaging) Regulation administered by the European Chemical Agency under EC Regulation No 1272/2008 requires that GHS-compliant packaging must:

- Prevent the chemical from escaping

- Not be adversely affected by the chemical
- Be strong enough to withstand normal handling and repeated use

In order to satisfy GHS label standards for permanence and imperviousness, GHS label substrates must be chemical-resistant, abrasion-resistant, UV light resistant, weather-resistant, and must utilize a marine-grade label adhesive.

For the transport of dangerous goods by sea, GHS standards require that certain products must meet the International Maritime Dangerous Goods Code (IMDG) certification standard which seeks to prevent pollution resulting from the damage or loss of a chemical transport container at sea. In order to preserve the hazard warning label, IMDG and GHS standards require that labels meet British Standard BS 5609 under which printed label materials must survive three months of saltwater submersion without fading, while maintaining adhesion to the container.

MSDS Documentation Requirements under GHS

The new GHS hazard warning communications system applies to MSDS data sheets, which are intended to provide information to manage chemical safety in the workplace, as well as to product labels. The new MSDS sheet format, and new MSDS information requirements, have been established under EC No 1272/2008. The new MSDS format is similar to the previous ISO, EU, and ANSI safety data sheet format, but has 16 sections, including new sections on Ecological impact, Disposal Considerations, Transport Information, and Regulatory Information. Manufacturers must adopt the new GHS MSDS sheet format under the same deadlines for adoption of GHS label formats.

More information about GHS Labeling and Label Printing:

[European Questions & Answers on GHS Classification, Labelling, and Packaging \(CLP\) - European Chemicals Agency](#)

[USA Guide to GHS Labeling Implementation – US Department of Labor \(OSHA\)](#)

[Canadian GHS Labeling Implementation Schedule - Health Canada](#)

[QuickLabel Systems Digital Color Label Printer Models](#)

[QuickLabel Systems Label Substrates](#)

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QuickLabel.com



The Labels You Want When You Need Them®

USA WORLD HEADQUARTERS

600 East Greenwich Ave.
West Warwick, RI 02893 USA
Toll-Free: (877) 757-7978
Fax: (401) 822-2430
E-mail: info@QuickLabel.com

QuickLabel Systems Asheboro

5356 NC Highway 49 South, Asheboro, NC 27205
(336) 857-3115

QuickLabel Canada

Tel.: (800) 565-2216
QuickLabel.ca

QuickLabel Deutschland

Tel. +49 (0) 6106-28368-20
QuickLabel.de

QuickLabel France

Tel. : (+33) 1 34 82 09 00
QuickLabel.fr

QuickLabel United Kingdom

Tel.: +44 01628 668836
QuickLabel.co.uk