

Most electrical products and equipment are required to be marked with specific safety-related information and meet permanency of marking requirements. These markings can include electrical ratings, use instructions, warnings regarding potential safety hazards, and cautionary markings. Compliance with permanency of marking requirements helps ensure that the labels will adhere to the application surface, and that the text will remain legible for the product's intended use.

This UL white paper discusses the specifics of marking and labeling requirements, and how to identify compliant marking and labeling systems for use by product and equipment manufacturers. Beginning with a definition of marking and labeling systems, the paper will then briefly review the testing and evaluation protocol required under current marking and labeling standards. The white paper then discusses the process for sourcing compliant marking and labeling systems, and concludes with recommendations for both end-product manufacturers and label converters and printers.

What Are Marking and Labeling Systems?

Labels (also referred to as nameplates or markers) convey a wide range of information regarding the safe installation or use of a given product. For example, information about a product's electrical rating can help confirm compatibility with an electrical system or other product, thereby preventing circuit overloads or product failures. Other information can warn users about the risk of electric shock under certain operating conditions such as proximity to water or sources of moisture. In other cases, labels can provide the user with information about appropriate use environments, e.g., "for indoor use only" or how to properly use the product.

Government regulations, codes such as the National Electric Code® and product safety standards, as well as many distributors and retailers, often stipulate that products need to meet applicable safety requirements. These product requirements usually prescribe requirements for the permanence of markings when a label is being used to convey safety-related information, including hazards, warnings, cautionary markings, installation instructions and electrical ratings. Even in cases where safety standards don't apply, original equipment manufacturers (OEMs) often specify marking performance requirements to their label suppliers. At UL, these types of labels are referred to as "marking and labeling systems."





Standards that Address the Permanence of Marking

Whether mandated by regulations, codes, retailers or manufactures themselves, specific permanence of marking performance requirements are often required for products such as appliances, consumer electronics, motors, lighting, medical equipment, and more. There are a number of permanence of marking standards for labels, but two of the most widely referenced are ANSI/UL 969, the Standard for Safety of Marking and Labeling Systems, and CSA C22.2 No. 0.15, Adhesive Labels.

- ***ANSI/UL 969, Marking and Labeling Systems***

UL 969 was first published in 1978 and is considered the de facto performance standard for durable safety label requirements around the world. UL 969 is referenced in over 450 UL and over 30 ULC end-product standards, and is mentioned in ASTM, NFPA, ANSI, and manufacturer specifications, making it the most widely referenced label standard in the supply chain.

UL 969 covers adhesive attached labels (pressure sensitive, heat activated or solvent activated) and in-mold labels for use as permanent nameplates or markers, that provide information, instructions or identification in the form of text or pictographs. The Standard outlines specific criteria regarding the permanence and legibility of the labels as well as the test procedures required to determine compliance. Under the Standard, labels are evaluated as complete “systems,” e.g., overlamination, ink and stock, on specific surface materials for use in dry indoor environments, indoor environments in which a label may be exposed to water or high humidity, or outdoor environments. Additional environmental conditions, such as exposure to oils, detergents or gasoline, can also be evaluated. Since most safety standards and manufacturers reference UL 969 requirements, labels found to meet the requirements of this Standard are considered suitable for use with a wide range of products, greatly reducing testing and supply chain complexity.

- ***CSA C22.2 No. 0.15, Adhesive Labels***

Canadian Standards Association (operating as “CSA Group”) standard C22.2 No. 0.15 was first published in 1990 and covers the performance requirements of labels used for products evaluated to CSA standards. It has a similar scope to UL 969 and also covers testing procedures and performance requirements of labels. However, the CSA and UL standards are not harmonized, and the test methods, conditions, and performance requirements presented in the standards differ.

- ***Label Requirements of Other Standards***

Some safety standards have chosen to utilize their own label performance requirements instead of a globally recognized standard like UL 969. Examples of these standards include ANSI portable ladder standards, UL 299 for dry chemical fire extinguishers and IEC-based standards. In other cases, safety standards may cover requirements for labels used as tags that are securement-strap attached, flag type, or wrapped around a cord or hose. In these specialized cases, the product safety standard has specific requirements that differ from typical products; therefore, labels used in these instances are required to be evaluated against the specialized performance requirements of the particular product standard.

Testing and Evaluation

The evaluation for marking and labeling systems includes both a construction examination and testing for permanence. The test program involves evaluating the performance of each system on an actual or representative end-product surface after being subjected to environmental conditions that simulate the conditions that would be encountered in the label's intended use, e.g., indoor, outdoor, etc.

• **Construction Examination**

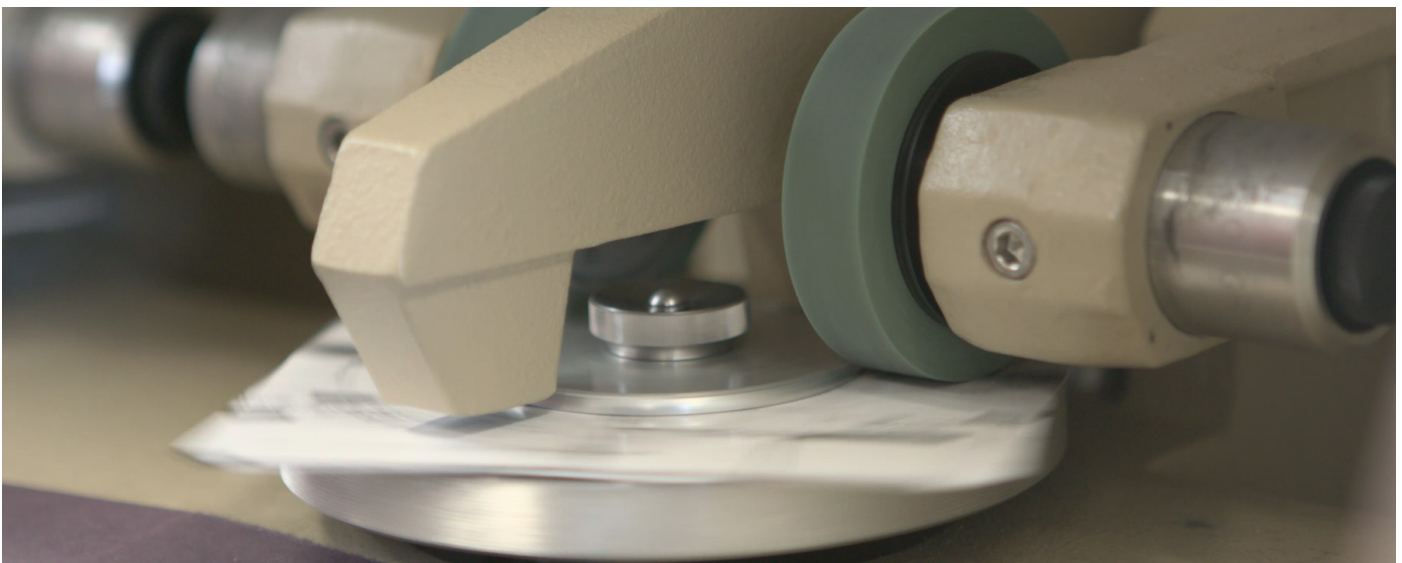
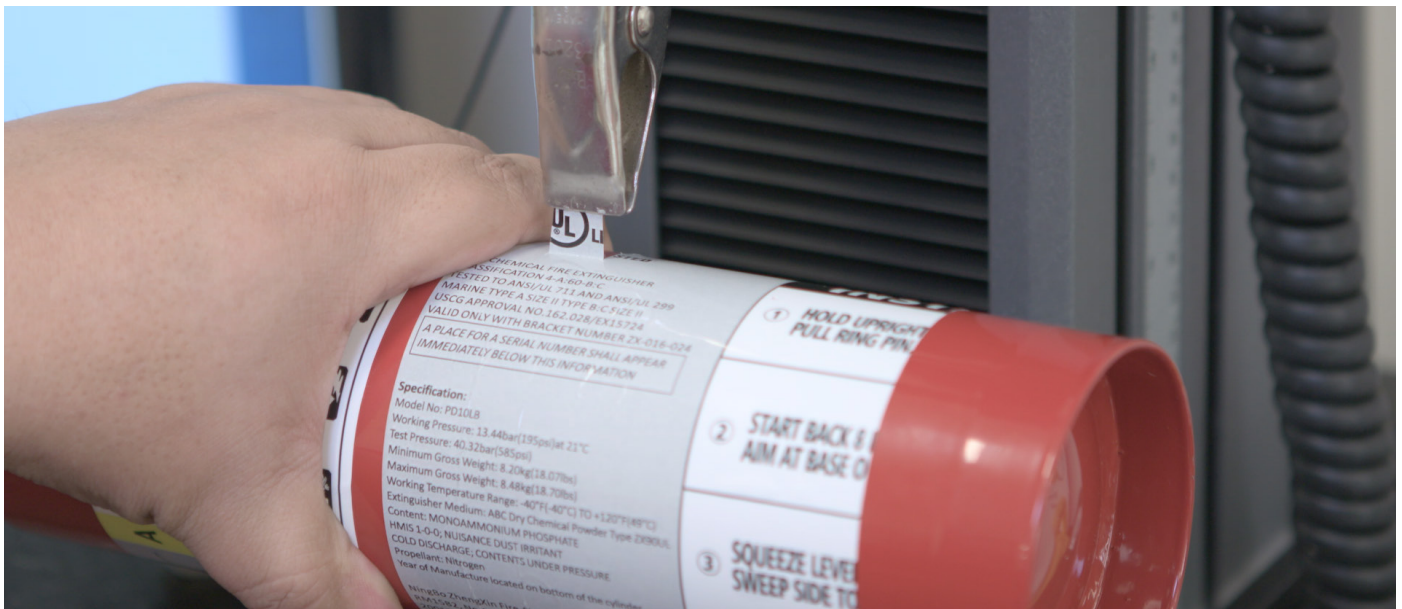
The construction examination is used to verify and document the construction of the label being evaluated. It involves identifying the different layers of the label and their thickness, and confirming whether the label incorporates an overlamination, varnish or support stock. The construction examination also identifies the layer or layers to which the ink is applied, i.e., top-surface or sub-surface, and confirms the generic type of label stock employed, e.g., paper or polymer-based. UL 969 and other marking and labeling standards typically specify only performance requirements and do not mandate the use of specific label materials.



• **Testing for Permanency**

UL 969, CSA C22.2 No. 0.15, and most other marking and labeling standards utilize environmental conditioning of labels prior to their evaluation for label permanency. After applying label samples to the actual or representative test surfaces, the labels are conditioned in various exposures, such as water immersion, elevated and lowered temperatures, chemical immersions, and ultraviolet (UV) weathering. After environmental conditioning has been completed, label compliance is determined by visually examining the samples for evidence of curling, wrinkling, shrinkage or loss of adhesion around the perimeter. Compliance also typically includes an evaluation to assess legibility, resistance to defacement and minimum adhesion performance. Depending on the set of environmental conditions to which label samples have been subjected, labels are then deemed suitable for the application surface under those conditions.

IEC-based standards typically require compliance with a marking durability rub test. This test involves rubbing label samples with a cloth soaked with one or more liquids, such as water, petroleum spirit (hexane), methylated spirit (ethyl alcohol denatured with methanol), isopropyl alcohol solution or other liquids, and then visually examining the label samples for legibility and adhesion. The choice and sequence of the liquids to be applied and the duration of rubbing vary among IEC standards that include “Durability of Marking Requirements.” Compliance is determined by visually examining the label samples to confirm print legibility and that excessive curling/uplifting of the label edge has not occurred.

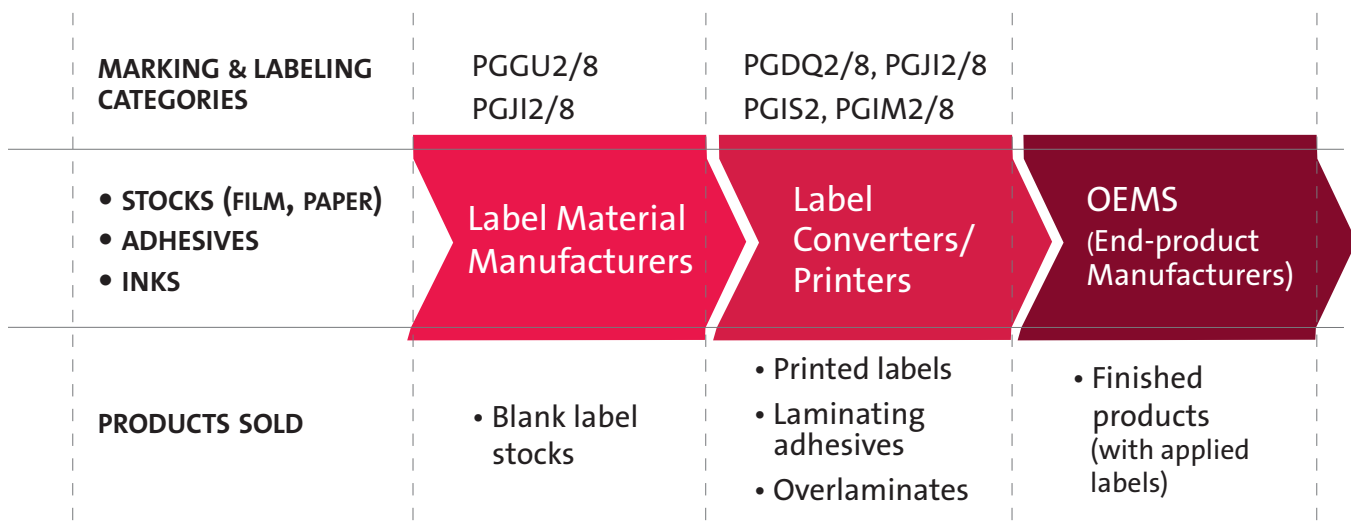




Sourcing Compliant Marking and Labeling Systems

UL maintains a comprehensive online database (<http://iq.ul.com/labels>) that allows manufacturers to search for UL Certified Component marking and labeling systems (often referred to as Recognized Components) that have been tested and evaluated by UL. The database lists over 1,400 companies offering more than 30,000 UL Recognized Component marking and labeling systems, and provides an easy and convenient way for OEMs to identify and acquire labels that meet the performance of marking requirements applicable to their products while helping to reduce the need for duplicative testing and surveillance of commercially available labels. The database also serves to strengthen supply chain integrity, since all Recognized marking and labeling systems fall under UL's Follow-Up Service (FUS) program, and are regularly verified for their continued compliance with UL's requirements through periodic factory inspections at the label manufacturer's facility and sample testing.

UL certifies marking and labeling systems under five different categories, PGDQ2/8, PGJ12/8, PGGU2/8, PGIS2 and PGIM2/8, based on the type of label product and the end-use application (see Table 1 for additional details on each category). Individual component listings in UL-maintained directories (also referred to as "yellow cards") provide detailed conditions of acceptability. In the case of marking and labeling systems, the conditions of acceptability include application surfaces and the associated minimum and maximum exposure temperatures, use conditions (indoor or outdoor), and any additional chemical agent exposures. Other relevant information may also be available, such as suitability for end-user printing at OEMs and the specific inks that may be used to produce such printing.





In addition to the UL database, UL also provides additional guidance on the proper use of marking and labeling systems through its online guide information. The guide information describes the intended use, conditions of acceptability and requirements applicable to each certification category as well as the appropriate certification mark to be used by the label supplier. As such, the “yellow card” and guide information provide invaluable information in determining the appropriateness of a given marking and labeling system for its application in a specific end product.

PRODUCT TYPE	PRODUCT DESCRIPTION	FABRICATED AS	REQUIREMENTS	CERTIFICATION CATEGORY	GUIDELINES WEBLINKS
Marking & Labeling Systems	Covers printed labels that are manufactured by a label printer/convertor. They are not intended to receive additional printing by end-use product manufacturers.	These products are sold as die-cut, finished printed labels.	UL 969	PGDQ2	Guide Information
			CSA C22.2 No. 0.15	PGDQ8	Guide Information
Marking & Labeling Systems – Printing Materials	Covers printed labels and unprinted stocks that have been evaluated to receive additional printing by end-use product manufacturers using simple printing equipment, including thermal transfer. Additional printing inks for which the labels have been found compatible are specified in the Recognition. Additional printing is considered an optional process for printed labels.	These products are sold by label material suppliers in bulk roll form or by label printer/converters as die-cut labels that are blank or preprinted with blank areas in which information is to be added.	UL 969	PGJ12	Guide Information
			CSA C22.2 No. 0.15	PGJ18	Guide Information
Marking & Labeling Systems – In-Mold	Covers printed in-mold labels that are manufactured by a label printer/convertor and are intended to embed into a molded plastic part during the molding process.	These products are sold as die-cut, finished printed in-mold labels.	UL 969	PGIM2	Guide Information
			CSA C22.2 No. 0.15	PGIM8	Guide Information
Marking & Labeling Systems – Materials	Covers materials that are used to make labels. Products in this category include blank label stocks, laminating adhesives and overlaminations . This category is intended for use by label printers/converters, not OEMs.	These products are typically produced in bulk sizes and sold to label printers/converters for the production of labels.	UL 969	PGGU2	Guide Information
			CSA C22.2 No. 0.15	PGGU8	Guide Information
Marking & Labeling Systems – Limited Use	Covers limited-use labels, cord tags (securement-strap attached, flag type, wrap-around) and placards that have been evaluated for compliance with requirements in specific end-product standards where performance requirements are either less stringent or different than those in UL 969. Label use is limited to the types of products covered by those end-product standards only.	These products are sold as die-cut, finished printed labels, cord tags and placards.	Varies	PGIS2	Guide Information
NOTES: Guidelines addressing the suitability of the label when used with an end product are included online and generally cover application surfaces, temperature ratings, and additional exposure conditions for which the label was found acceptable. Labels evaluated to UL 969 under PGDQ2, PGJ12, PGIM2 and PGGU2 may have additionally been evaluated for specific end-use applications – including IEC marking of durability requirements and fire extinguishers.					

Table 1: Marking and labeling systems summary table

Guidelines to Reading the “Yellow Card”

Published Certifications for marking and labeling systems follow a similar appearance across all the product categories starting with basic information about the supplier, product designation, and label type at the top, followed by detailed conditions of acceptability below. It is important to note that published Certifications for marking and labeling systems indicate suitability for use on generic application surface types, e.g., aluminum, polypropylene, etc., and not to specific grades or suppliers of these surface types. This approach affords OEMs great flexibility in selecting labels suitable for use on their product. In addition, it should be noted that the marking and labeling systems guide information specifies that the labels were not investigated to receive additional printing using hand implements, such as a pen or pencil, as that process is not considered suitable for presenting safety-related information.

Figure 1 illustrates a typical format for published Certification of a printed label under category PGDQ2, which covers finished printed labels evaluated to UL 969. In this example, the label was evaluated and found acceptable for use with five different generic application surfaces. Each application surface is considered to be smooth and flat, and labels can be used within the temperature ranges and conditions indicated for that surface.

Marking & Labeling Systems (guide info)					MH012345
Label Supplier					
333 Pfingsten Rd, Northbrook, IL 60062					
LS101					
Pressure-sensitive printed labels					
Application Surface	Max Temp (C)	Min Temp (C)	Indoor Use	Outdoor Use	Additional Conditions
Aluminum	150	-40	Yes	Yes	O
Alkyd paint	100	-40	Yes	No	RT(1)
Galvanized steel	100	-40	Yes	Yes	-
Stainless steel	100	-40	Yes	No	O, C
Acrylonitrile butadiene styrene	80	-40	Yes	No	RT(3)
C - Occasional exposure to Cooking Oil (room temp). O - Occasional exposure to Gasoline splashing. RT(1) - Complies with UL 514A, UL 60950-1, UL 60335-1, UL 60745-1, UL 60974-1, UL 61058-1 and IEC 60950-1 marking durability rub test requirements. RT(3) - Complies with UL 60601-1 and IEC 60601-1 marking durability rub test requirements.					
© 2016 UL LLC					

Figure 1: A sample published Certification of a printed label under PGDQ2



Figure 2 illustrates a typical format for Published Certification of a printed label under categories PGJ12 and PGJ18. These categories cover finished printed and unprinted stocks evaluated to UL 969 and CSA C22.2 No. 0.15 that have been found suitable for additional end-user printing. This example follows the format illustrated in Figure 1 but also includes information on the printing process and ink type permitted for use with this label. The Canadian Certification is published in a separate section because CSA C22.2 No. 0.15 uses a separate nomenclature for identifying application surfaces and use conditions, and requires different exposure conditioning for the use condition ratings.

Printing Materials (guide info)

MH012345

Label Supplier
333 Pfingsten Rd, Northbrook, IL 60062

unprinted stock dsq: 102B
printed stock dsq: 102

PRESSURE-SENSITIVE SYSTEMS
Suitable for additional printing with one or more of the following inks (in the black color unless otherwise indicated):

Thermal transfer ribbon
Company 1: Type A, Type B
Company 2: Type C

Application Surface	Max Temp (C)	Min Temp (C)	Indoor Use	Outdoor Use	Additional Conditions
Acrylonitrile butadiene styrene	80	-40	Yes	Yes	-
Nylon - Polyamide	80	-40	Yes	Yes	-
Phenolic - Phenol Formaldehyde	80	-40	Yes	Yes	-
Polybutylene terephthalate	80	-40	Yes	Yes	-
Polycarbonate	80	-40	Yes	Yes	-

CANADIAN USES –
Suitable for additional printing with one or more of the following inks (in the black color unless otherwise indicated):

Thermal transfer ribbon
Company 2: Type C

Canadian Application Surface	Max Temp (C)	Indoor Use	Outdoor Use	Additional Conditions
Metals - bare, plated, painted or enameled steel or aluminum	80	Yes	Yes	-
Plastic Group III - polycarbonate, acetate, acrylic	80	Yes	Yes	-
Plastic Group IV - polyethylene, polypropylene, polybutylene	80	Yes	Yes	-
Plastic Group V - polyamide, polyimide	80	Yes	Yes	-

© 2016 UL LLC

UL

Figure 2: A sample published Certification of an unprinted stock and printed label under PGJ12 and PGJ18

Recommendations for OEM Compliance

The diversity of global safety requirements for end-products and the varying needs of OEMs can introduce many challenges in the effort to ensure the use of compliant marking and labeling systems. The following steps can help OEMs meet the challenge.

1 Identify requirement and uses – The marking and labeling requirements and uses are governed by end-product standards. OEMs should reference the marking and labeling requirements specified in the applicable safety standard, or seek guidance from a qualified source such as the UL engineer who handles the end-product investigation. In cases where more than one safety standard is used, such as UL, CSA and/or IEC standards, the label must meet the requirements of all standards. This process should result in the identification of the proper marking and labeling requirements that apply to a given product, based on its intended use.

2 Identify surface – Review the product design and the materials to which the label will be applied (typically, the product enclosure). In some cases, the bill of materials may make specific mention of a particular supplier and grade; therefore, research may be required to identify the generic equivalent (for example, LEXAN™ is a term often used for generic polycarbonate). In addition, special attention should be given to verify whether the surface to which a label will be applied is smooth or textured, and flat or curved. Completing this step will result in a full understanding of the generic application surface and its surface characteristics.

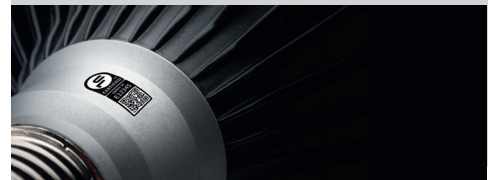
3 Identify additional printing – Review the manufacturing process to identify whether end-user printing is necessary to add information to the label, such as model and serial numbers, date codes, plant codes or voltage/amperage, and other rating information.

4 Verify marking and labeling system compliance – Working with a label supplier and reviewing the information on UL's Certification database, it is important to verify that the label selected addresses all of the requirements identified above, including application surfaces, uses and additional printing inks if they are used. Table 1 on page 7 provides guidance on the appropriate UL Certification category as well as a link to the additional guide information that should be reviewed. If a suitable label is not available, or if a Certified label does not meet all of the identified requirements, UL can evaluate the label during the end-product evaluation to confirm full compliance with the identified requirements.

5 Maintain appropriate traceability – OEMs are encouraged to maintain traceability records on Certified marking and labeling systems and additional printing inks (if applicable) to support the on-going integrity of the manufacturing process. Traceability records must be readily available for review by UL field representatives when inspecting and verifying that a marking and labeling system meets all applicable requirements that may be necessary during the end-product evaluation.

Authorized Label Suppliers

Many product manufacturers have the option to source UL Certification Marks from third-party label printers. If OEMs choose to have label printers supply the UL Certification Marks for use on their products, the label printer must be part of UL's Authorized Label Suppliers Program. UL's Authorized Label Suppliers program specifically addresses the printing format and distribution of the UL Certification Marks provided by label printers. Go to ul.com/labels and select Authorized Label Suppliers to learn more.



Recommendations for Label Converters and Printers

Label converters and printers are often called upon to assist OEMs in sourcing compliant labels, but may have limited information on specific end-product requirements. The following steps provide a roadmap that can help label converters and printers provide customers with compliant labels.

1 Confirm requirements and application surface of end-product –

It is the responsibility of the OEM to provide information regarding the label application surfaces and the intended exposure environment of the end-product. Specifically, this includes information on the generic surface type to which the label will be applied, the surface characteristics (smooth, flat, curved, textured, etc.), applicable standards, intended environmental exposure and temperature ratings.

2 Verify additional printing needs – Some OEMs prefer to add information to a label through the use of thermal transfer ribbons, laser toners or similar means. If the OEM is adding information, the label supplier needs information regarding the printing ink and process to be used.

3 Find a suitable marking and labeling system – Label converters/printers can review existing UL Certified labels under their UL file to determine if they meet the requirements of a given end-use application. Alternatively, a label converter or printer can submit a new label construction or request a revision to existing UL label construction for evaluation. If an OEM's label design bears a UL Certification Mark, the label supplier must also participate in UL's Authorized Label Supplier Program.



4 UL markings – It is the responsibility of the label converter or printer to manufacture labels in accordance with UL's procedures, and to mark the product packaging or roll core with the appropriate UL Markings when the labels are shipped to customers. Such markings are the only means of identifying their label products as Certified by UL. These markings play a critical role for OEMs, as it provides a clear method of traceability to identify Certified marking and labeling systems at the end-user manufacturing facility.

Label Adoption Process

It is common for label converters and printers who are submitting new label constructions to UL to use Recognized label materials, such as label stocks, laminating adhesives and overlaminations. Label converters who use these Recognized label materials can receive the benefit of that Recognition when establishing Recognition for printed labels made from those materials. This process is known as "label adoption."

However, printed labels made from Recognized label materials are not automatically considered Recognized printed labels. To establish Recognition for a printed label, the label converter or printer must submit the complete printed label system to UL for evaluation. Testing of representative samples is typically necessary and depends on several factors, including the required conditions of acceptability for label use and the label materials used. You can learn more about the Label Adoption Process at ul.com/labeladoption.



Summary and Conclusion

Labels are critical components that provide users with safety-related information of a wide variety of products. UL 969 is the most globally recognized and established label performance standard, but other standards such as CSA C22.2 No. 0.15 or IEC Durability of Marking Requirements are used either instead of, or in addition to, UL 969. OEMs need to be aware of the permanence of marking requirements for their products, and should incorporate best practices in their company to ensure that compliant labels are being sourced. The easiest way to accomplish this is to source Certified labels on UL's Online Certifications Directory that are appropriate for the intended end-use application.



For further information on marking and labeling systems, please contact PMSales@ul.com or visit ul.com/labels, and select **“Marking and Labeling Systems.”**