

**LUX | TSI**

**SIRIM LCA Seminar on Global Market Access  
(GMA) Testing Capabilities and Technical  
Services for E&E Equipment in SIRIM Penang**



January 2016

With the rapid changes to electrical and electronic products and with beginning of the **internet of things**, the traditional supply chain is being increasingly disrupted with many new suppliers and products lacking proven track records of reliability and performance.

Today we will explore the routes to compliance to the key regulatory requirements to take products from local markets into global markets.

# Lux Group of Companies



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**Delivering excellence in Testing, Consultancy and Certification world wide**



**LUX | TSI | Group**



**LUX | VAULT**

The VAULT  
Knowledge Base



**LUX | LCA**

**JV with ESC  
(Malaysia/A  
SEAN  
Region)  
Consultancy  
Services**



Global  
Consultancy  
Company –  
E&E,  
Medical and  
Machinery  
focus



**LUX | UK**

UK/Northern  
Europe  
Testing  
Laboratory  
Est 2010



**LUX | CEE**

Central &  
Eastern Europe  
Partnership  
(ex TUV GM)



**LUX | CSC**

Global  
Consultancy  
(Cyber Security  
Compliance &  
Certification)

# An Example of the Disruptive Changes going on in our world



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The global lighting industry is going through a period of disruptive change !



## **Traditional lighting...**

Glass and Gas  
Dominated by large established players  
Inefficient, Inflexible



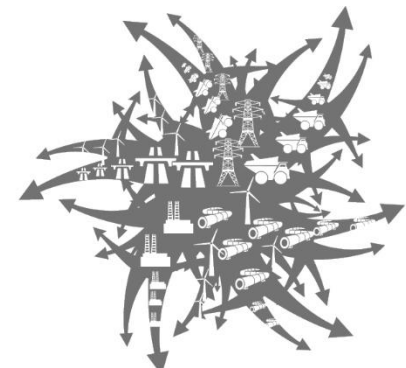
## **has gone digital...**

LED's are semiconductor electronics  
Huge variations in quality  
New players



## **growth is accelerating**

Philips forecasts the LED market to grow from 15% to 80% by 2020  
2015 growth has already exceeded forecasts



## **resulting in chaos !**

Confusing standards  
Changing regulations  
Complex supply chain  
Lack of trust in data



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Different rules  
Different players  
Different pricing  
Different qualities  
Huge variations in quality  
Confusing standards  
Changing regulations  
No single certification authority  
Suppliers  
Manufacturers  
Designers  
Retailers &  
Consumers  
are confused

**There is a large and growing  
need for  
honest,  
trustable advice,  
certification and  
validation of all this confusing  
data for the global  
marketplace**





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All this confusion exists without the new  
wave called the

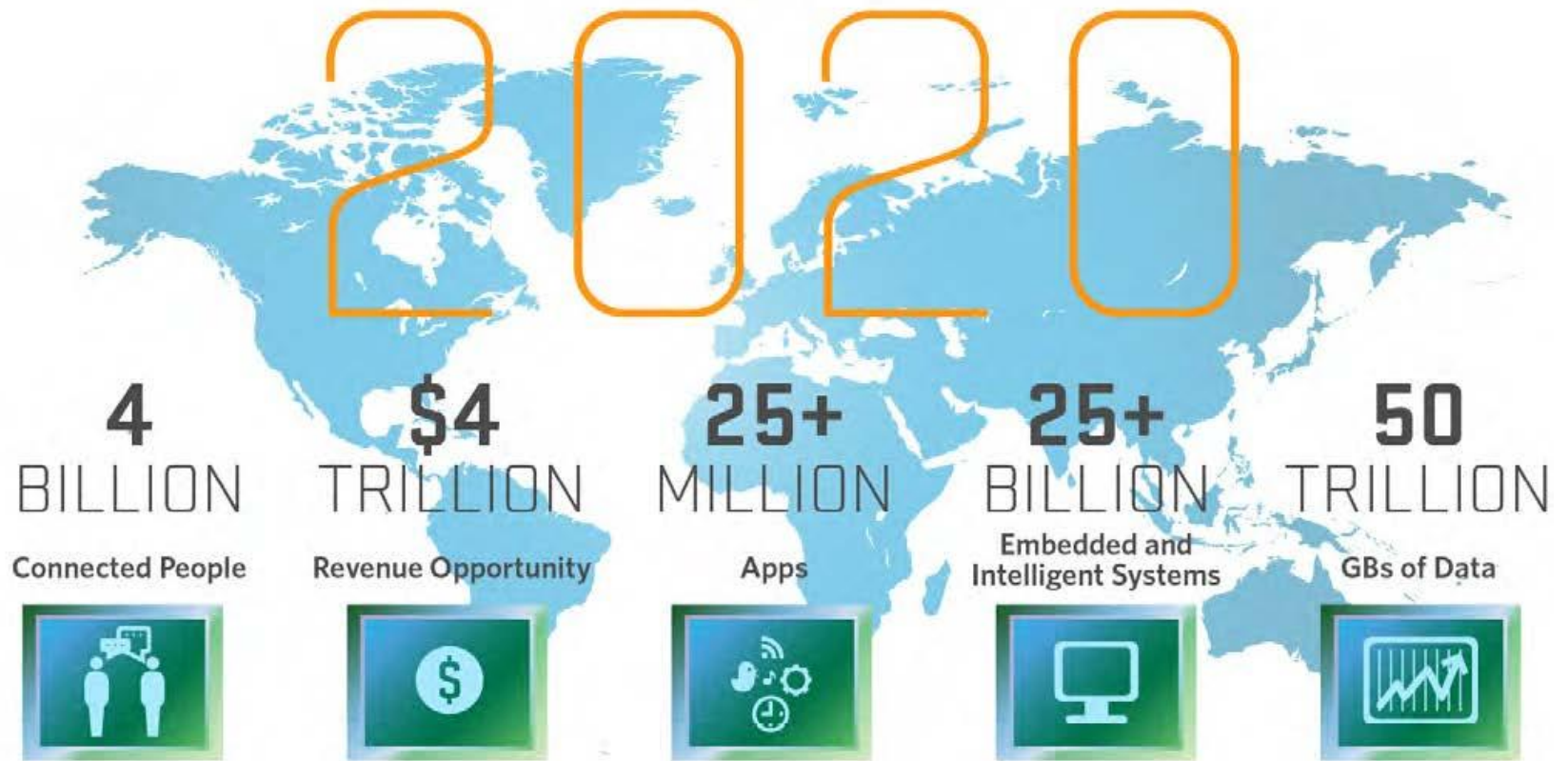
“ Internet of Things (IoT)”

Very new ..... Very exciting.... Very  
concerning .....

Everything connected lacking proper  
standardisation and regulation

Software security will become very  
important in this new world





Source: Mario Morales, IDC



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## Summary of Key Activities of LCA for E&E/Medical Equipment

CE Marking guidance and management

Perform Technical File Reviews

Specialised Protocol Services

Gap Analysis when standards or regulations change - Standard update service

Support you obtain the approvals, permits, import certificates, export certificates and licenses that you need for your products so that you can reach new markets

Worldwide Authorised Representative Services (via LUX-IEC) via our network of AR providers – can also support local distribution requirements – particularly for medical products.

Factory Inspections/Audits

Pre Shipment Audits/Inspections

Technical Support in guiding through standards

Oversee third party compliance testing – liaising closely with the requested lab

CE/UL/IEC Seminars for international markets

Oversee technical issues consultation with manufacturers

Introduction and communication with Notified Bodies

[www.lux-iec.com](http://www.lux-iec.com) contains more information for medical devices





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# Standards



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# The World Standards and Certification Systems

Key International Standards and Certification Setting Bodies :

IEC	IEC safety and performance standards CISPR radio interference (EMC)	
CEN	European translation of IEC standards	
ICNIRP	Non-ionising radiation (i.e. light, UV, IR, Microwave, Radio)	
CIE	Photometry and Lighting	
IESNA	Lighting	
ANSI/UL	US Standards for Safety and Performance	
JES/JEDEC/MIL	Environmental/Reliability/Lifetest/Mechanical/	
CSA	Canadian Standards for Safety	
PSE	Japan	
FCC	Federal Communications Commission - radio, television, wire, satellite, and cable communications in USA	

Zhaga - proprietary groups

Wi-Fi

Zigbee

Bluetooth





## Key Safety Compliance Routes – 2 worlds

Europe and Rest of World	North America, Mexico	CA
<p data-bbox="150 304 591 344"><b>IEC Derived Standards</b></p> <p data-bbox="150 361 966 462">IECEE CB Scheme is most widely accepted EN useful for Europe – based on IEC</p> <p data-bbox="150 551 913 652">National and Regional Deviations Important (e.g. EN, SASO, AZ/NZS, PSE)</p> <p data-bbox="150 741 593 781">Technical File Essential</p> <p data-bbox="150 856 730 896">Critical Components Essential</p> <p data-bbox="150 989 933 1146">Higher End Markets demand Accredited Test Reports from Independent Third Party Labs</p>	<p data-bbox="1014 304 1603 344"><b>ANSI/UL Approved Standards</b></p> <p data-bbox="1014 551 1773 652">Must be approved by Authority Having Jurisdiction</p> <p data-bbox="1014 741 1456 781">Technical File Essential</p> <p data-bbox="1014 856 1574 896">Critical Component Essential</p> <p data-bbox="1014 989 1727 1146">National Recognised Testing Laboratory - NRTL (i.e. must be from Accredited Testing Laboratory)</p>	

## E&E Equipment classified by IECEE



- IT and office equipment
- Audio Visual
- Household and similar equipment
- Measurement, Control and Lab Equipment
- Medical Devices
- Lighting
- Toys
- Batteries
- Low voltage, high power switching equipment
- Safety Transformers
- Cables and Cords
- Industrial Automation
- Photovoltaics
- Electronics for entertainment

# IEC Standards

Categories	Products	IEC Standards	ELVH	Electric Vehicles	60783, 60785, 61851, 62196, 62660, 60034, 60118, 60204, 60255, 60533, 60601, 60728, 60870, 60945, 60947, 60974, 61000, 61131, 61204, 61326, 61543, 61547, 61800, 61812, 62003, 62040, 62041, 62052, 62053, 62054, 62153, 62236, 62311, 62493, CISPR 11, CISPR 12, CISPR 13, CISPR 14, CISPR 15, CISPR 16, CISPR 20, CISPR 22, CISPR 24, CISPR 25, CISPR 32, CISPR 61000, CISPR/TR 16, 60204, 60311, 60312, 60335, 60342, 60350, 60436, 60456, 60530, 60580, 60661, 60704, 60705, 60967, 61011, 61121, 61591, 61770, 61817, 62233,
BATT	Batteries	<a href="#">60086</a> , <a href="#">60095</a> , <a href="#">60099</a> , <a href="#">60254</a> , <a href="#">60571</a> , <a href="#">60622</a> , <a href="#">60623</a> , <a href="#">60896</a> , <a href="#">60952</a> , <a href="#">61133</a> , <a href="#">61809</a> , <a href="#">61951</a> , <a href="#">61960</a> , <a href="#">61982</a> , <a href="#">62133</a> , <a href="#">62257</a> , <a href="#">62259</a> , <a href="#">62281</a> , <a href="#">62282</a> , <a href="#">62660</a> ,	EMC	Electromagnetic Compatability	
CABL	Cables and Cords	<a href="#">60227</a> , <a href="#">60245</a> , <a href="#">60502</a> , <a href="#">60702</a> , <a href="#">60800</a> , <a href="#">60840</a> , <a href="#">62067</a> , <a href="#">62275</a> , <a href="#">62821</a> ,			
CAP	Capacitors as components	<a href="#">60252</a> , <a href="#">60384</a> , <a href="#">60831</a> , <a href="#">60939</a> , <a href="#">61048</a> , <a href="#">61049</a> , <a href="#">61071</a> , <a href="#">61881</a> ,			
CONT	Switches for appliances and automatic controls for electrical household appliances	<a href="#">60255</a> , <a href="#">60691</a> , <a href="#">60730</a> , <a href="#">60934</a> , <a href="#">61095</a> , <a href="#">61508</a> , <a href="#">61810</a> ,	HOUS	Household and similar equipment	
		<a href="#">60034</a> , <a href="#">60299</a> , <a href="#">60311</a> , <a href="#">60312</a> , <a href="#">60350</a> , <a href="#">60379</a> , <a href="#">60436</a> , <a href="#">60442</a> , <a href="#">60456</a> , <a href="#">60496</a> , <a href="#">60508</a> , <a href="#">60530</a> , <a href="#">60535</a> , <a href="#">60619</a> , <a href="#">60661</a> , <a href="#">60665</a> , <a href="#">60675</a> , <a href="#">60705</a> , <a href="#">60879</a> , <a href="#">60969</a> , <a href="#">61121</a> , <a href="#">61254</a> , <a href="#">61309</a> , <a href="#">61591</a> , <a href="#">61592</a> , <a href="#">61683</a> , <a href="#">61817</a> , <a href="#">61855</a> , <a href="#">61923</a> , <a href="#">62018</a> , <a href="#">62040</a> , <a href="#">62075</a> , <a href="#">62087</a> , <a href="#">62301</a> , <a href="#">62473</a> , <a href="#">62552</a> , <a href="#">62587</a> , <a href="#">62611</a> , <a href="#">62612</a> , <a href="#">62617</a> , <a href="#">62623</a> , <a href="#">62717</a> ,	HSTS	Hazardous Substances Testing Service	<a href="#">62321</a> ,
E3	Energy Efficiency		INDA	Industrial Automation	<a href="#">60034</a> , <a href="#">60204</a> , <a href="#">60439</a> , <a href="#">60947</a> , <a href="#">61010</a> , <a href="#">60083</a> , <a href="#">60309</a> , <a href="#">60320</a> , <a href="#">60364</a> , <a href="#">60423A</a> , <a href="#">60423</a> , <a href="#">60614</a> , <a href="#">60669</a> , <a href="#">60670</a> , <a href="#">60684</a> , <a href="#">60799</a> , <a href="#">60807</a> , <a href="#">60884</a> , <a href="#">60974</a> , <a href="#">60998</a> , <a href="#">60999</a> , <a href="#">61058</a> , <a href="#">61076</a> , <a href="#">61084</a> , <a href="#">61210</a> , <a href="#">61238</a> , <a href="#">61242</a> , <a href="#">61316</a> , <a href="#">61386</a> , <a href="#">61534</a> , <a href="#">61535</a> , <a href="#">61537</a> , <a href="#">61800</a> , <a href="#">61950</a> , <a href="#">61984</a> , <a href="#">61995</a> , <a href="#">62080</a> , <a href="#">62094</a> , <a href="#">62103</a> , <a href="#">62106</a> , <a href="#">62208</a> ,
			INST	Installation accessories and connection devices	

LITE	Luminaires	<a href="#">60064, 60081,</a>	PROT	Installation protective equipment	<a href="#">60099, 60127, 60257,</a>
		<a href="#">60155, 60238,</a>			<a href="#">60269, 60282, 60898,</a>
		<a href="#">60357, 60360,</a>			<a href="#">61008, 61009, 61540,</a>
		<a href="#">60400, 60432,</a>			<a href="#">61643, 62423, 62606,</a>
		<a href="#">60570, 60598,</a>			<a href="#">62640,</a>
		<a href="#">60838, 60901,</a>			
		<a href="#">60921, 60923,</a>			
		<a href="#">60925, 60927,</a>			
		<a href="#">60929, 60968,</a>			
		<a href="#">60969, 61047,</a>			
MEAS	Measurement, Control and Laboratory equipment	<a href="#">61048, 61049,</a>	PV	Photovoltaics	<a href="#">60891, 60904, 61194,</a>
		<a href="#">61050, 61184,</a>			<a href="#">61215, 61345, 61646,</a>
		<a href="#">61195, 61199,</a>			<a href="#">61683, 61702, 61721,</a>
		<a href="#">61228, 61347,</a>			<a href="#">61727, 61730, 61829,</a>
		<a href="#">61549, 62031,</a>			<a href="#">61853, 62093, 62108,</a>
		<a href="#">62035, 62257,</a>			<a href="#">62109, 62116, 62124,</a>
		<a href="#">62384, 62471,</a>			<a href="#">62257, 62446, PVRS 5A,</a>
		<a href="#">62532, 62560,</a>			<a href="#">PVRS 7A, PVRS11A,</a>
		<a href="#">62612, 62717,</a>			<a href="#">PVRS11, PVRS5, PVRS6A,</a>
		<a href="#">62722, 62776,</a>			<a href="#">PVRS6, PVRS7,</a>
MED	Electrical equipment for medical use	<a href="#">62778, 62868,</a>	SAFE	Safety transformers and similar equipment	<a href="#">60044, 60414,</a>
		<a href="#">60044, 60414,</a>			<a href="#">61010, 61131,</a>
		<a href="#">61010, 61131,</a>			<a href="#">61204, 61243,</a>
		<a href="#">61557,</a>			<a href="#">60044, 60076, 60704,</a>
		<a href="#">10079, 60601,</a>			<a href="#">60742, 61558, 61869,</a>
		<a href="#">60613, 60976,</a>			<a href="#">61980,</a>
		<a href="#">61223, 61676,</a>			
		<a href="#">62220, 62304,</a>			
		<a href="#">62353, 62366,</a>			
		<a href="#">62462, 62467,</a>			
OFF	IT and office equipment	<a href="#">62563, 80601,</a>	TOOL	Portable tools	<a href="#">60745, 61029, 61939,</a>
		<a href="#">60950, 61204,</a>			<a href="#">62841,</a>
		<a href="#">62040, 62310,</a>			
		<a href="#">62368,</a>			
		<a href="#">60158, 60265,</a>			
		<a href="#">60439, 60947,</a>			
		<a href="#">61439, 61851,</a>			
		<a href="#">62019, 62026,</a>			
		<a href="#">62271, 62314,</a>			
		<a href="#">62314,</a>			
POW	Low voltage, high power switching equipment	<a href="#">60158, 60265,</a>	TRON	Electronics, entertainment	<a href="#">60065, 60491, 61204,</a>
		<a href="#">60439, 60947,</a>			<a href="#">61965, 62368,</a>
		<a href="#">61439, 61851,</a>			
		<a href="#">62019, 62026,</a>			
		<a href="#">62271, 62314,</a>			
		<a href="#">62314,</a>			
		<a href="#">60158, 60265,</a>			
		<a href="#">60439, 60947,</a>			
		<a href="#">61439, 61851,</a>			
		<a href="#">62019, 62026,</a>			



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# Selling Products into Markets



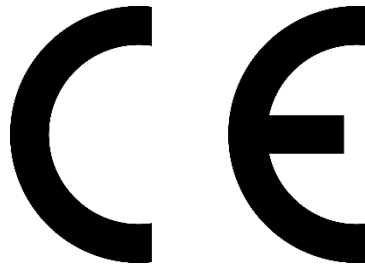


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## Key Questions

- Where do you want to sell your products ?
- What does your product do?
- How does it work? (begin to look at the hazards involved)
- Do you have a technical file with key information including data sheets?
- What is the intended use for your products?
- Will it be used indoor/outdoor – dry or wet use?
- It is portable or fixed?

# European Marks



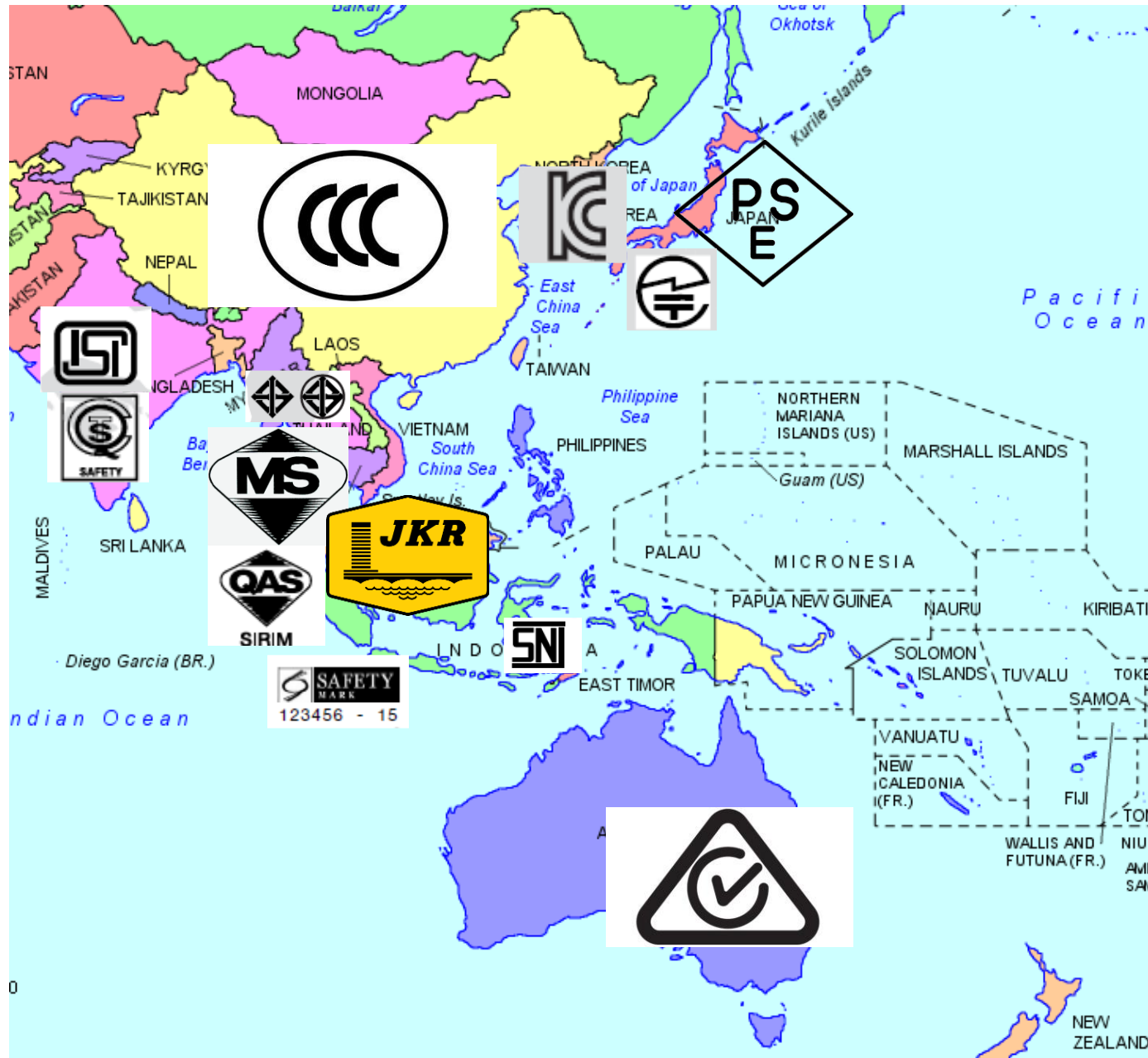
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## Asia-Pacific Markets







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## North America





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## Key Technical Compliance Parameters in all markets

### Safety

Mechanical

Thermal

Fire

Electrical

Optical  
(PhotoBio)

EMF

### EMC

Emissions

Immunity

Mains

### Wireless

Zigbee

Bluetooth

WIFI

### Environmental

RoHS

Recycling

WEEE

### Energy Efficiency & Performance

Photometric

Electrical

Thermal

Reliability

Lifetime

Environmental

Critical  
Components

Interoperability and  
Interchangeability



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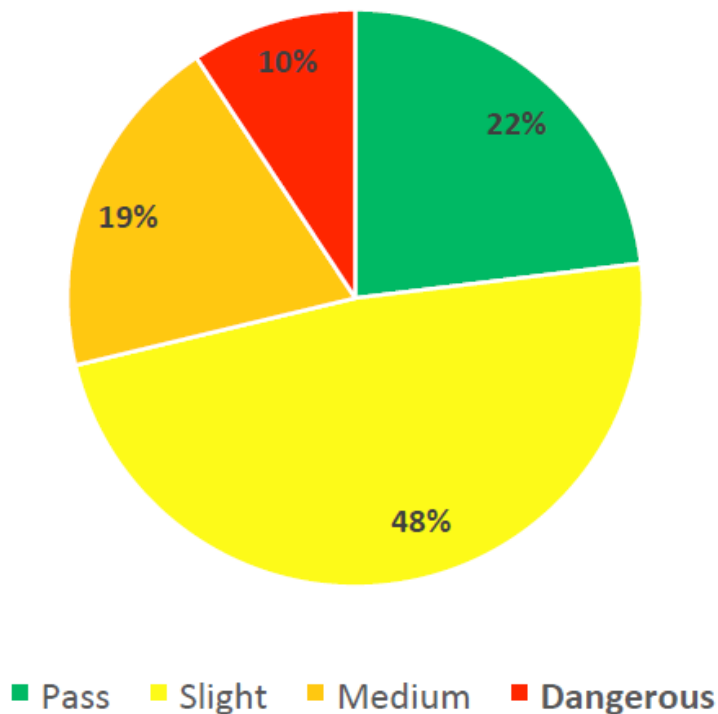
# Benefits of Accredited Testing



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International Federation of Inspection Agencies (IFIA) Study  
[http://www.ifia-federation.org/content/?dl\\_id=166](http://www.ifia-federation.org/content/?dl_id=166)

## EU products with CE Markings only (self-declaration)

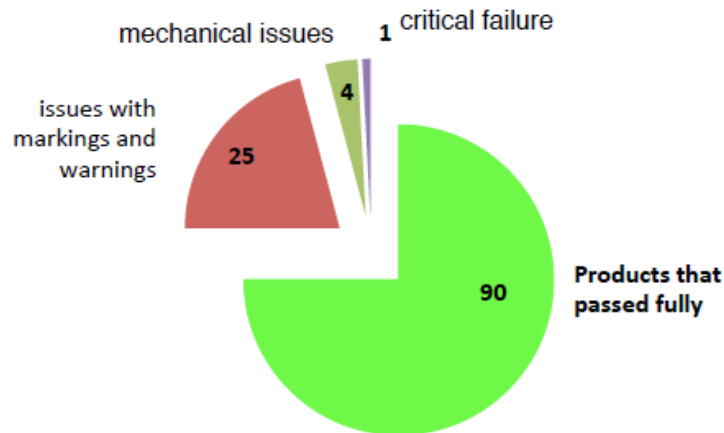


- Of the 247 samples submitted, **78%** were **NOT** in compliance with EU standards and regulations
- There were **38 instances of safety critical failures** which were reported to the local authorities
- Simpler requirements (marking labels and safety instructions) were not met by more than 50% of products evaluated





## EU products certified by accredited, independent third-party bodies



- Of the 120 samples submitted, there was only **1 instance** of a safety critical failure, which was reported to the certifier, and then to the manufacturer
- **25%** were not in full compliance with EU standards and regulations: marking labels and safety instructions accounted for the vast majority of the issues



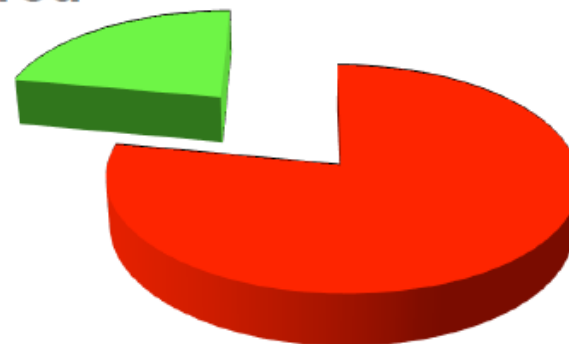
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International Federation of Inspection Agencies (IFIA) Study  
[http://www.ifia-federation.org/content/?dl\\_id=166](http://www.ifia-federation.org/content/?dl_id=166)

## Products where compliance is 'self-declared' (i.e. NOT reviewed by an independent third-party):

- **Non-compliant/faulty products 78%**

*Note: These products are on the market today,  
and can be purchased and used by any EU consumer*

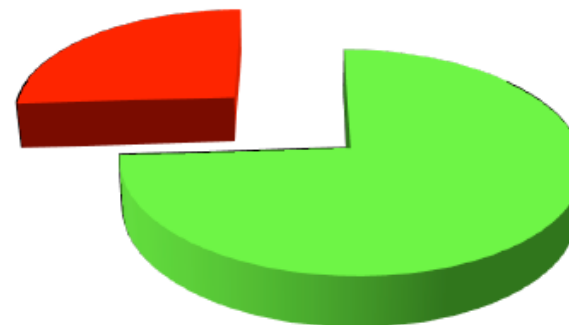


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## Products where compliance is assessed by an accredited, independent third-party:

- **Non-compliant/faulty products 26%**

*Note: the vast majority were issues  
related to warnings and labels*





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# ***Understanding & Pursuing European Conformity Marking (CE Marking)***

## CE Marking and Your Legal Obligations

- What is CE marking?
- What are EU Directives?
- What is Due diligence?
- Declaration of Conformity
- What is a Technical file?
- Placing products on the market
- CE conformity marking



Any product bearing the **CE** mark meets *all* the appropriate provisions of the *relevant* legislation implementing certain European Directives.

CE Marking allows *easy* access to the European Market without adaption or rechecking.



- The CE marking symbolises the conformity of the product with the applicable Community requirements imposed on the manufacturer.
- The CE marking affixed to products is a declaration by the person responsible that:
  - the product conforms to all applicable Community provisions, and
  - the appropriate conformity assessment procedures have been completed.
- CE marking does not indicate that a product was made in the EU, but merely states that the product is assessed before being placed on the market and thus satisfies the legislative requirements.
- It is the manufacturer's responsibility to carry out the conformity assessment, to set up the technical file, to issue the EC declaration of conformity and to affix CE marking on a product.

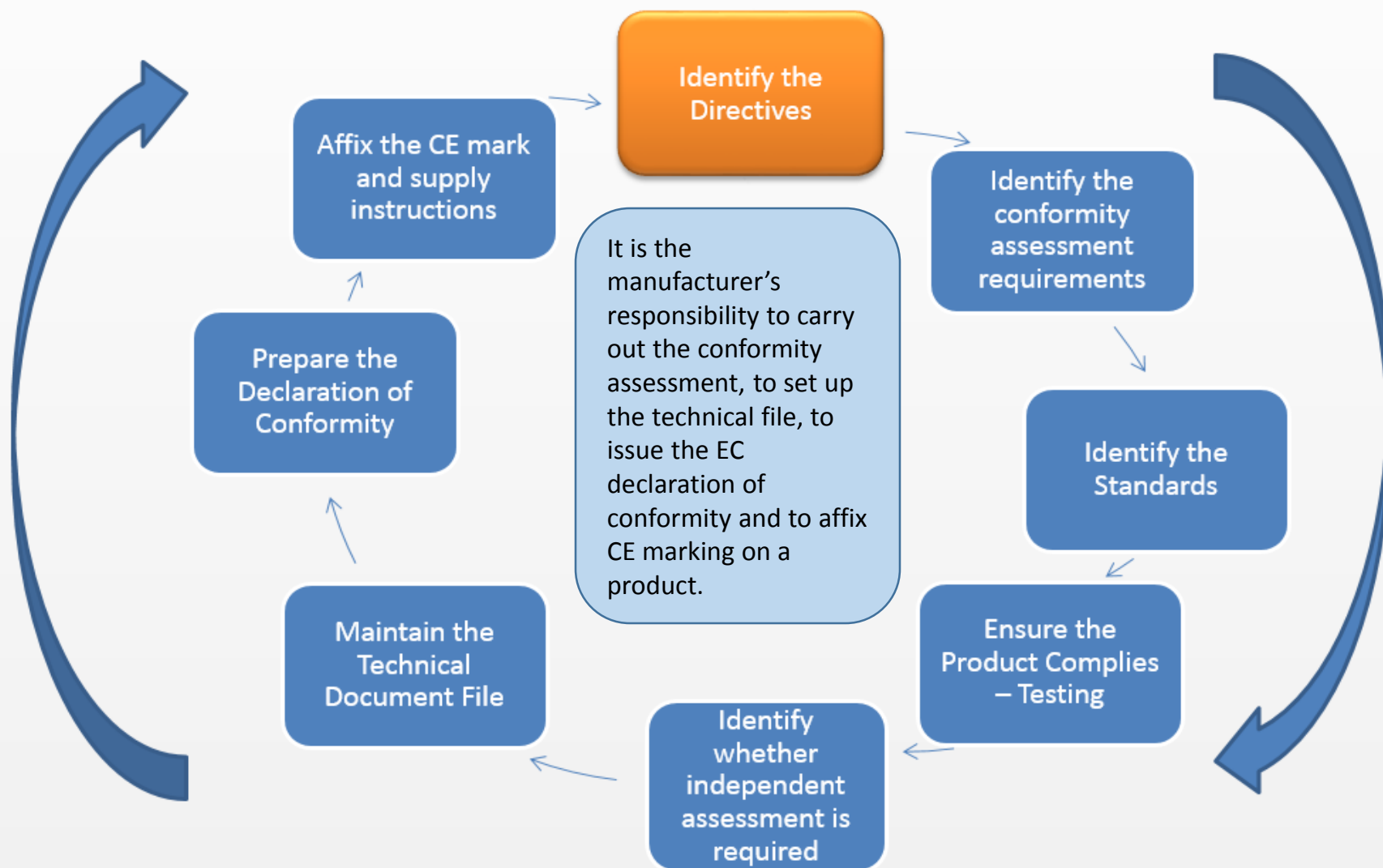


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# The Circle of CE





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# ***What are EU Directives?***



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# WHAT ARE EU DIRECTIVES?



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- ▶ "New Approach" Directives (Community Law) set out the **essential requirements**.
- ▶ Written in general terms and must be met before products may be sold in the EU.
- ▶ Directives explain how manufacturers are able to demonstrate conformity with the **essential requirements**.
- ▶ European harmonised (EN) standards provide guidance on the detailed technical information enabling manufacturers to meet the **essential requirements**
- ▶ **A directive is a legal document. Providing the detail the will of the EU. Very broad and not product specific.**
- ▶ **A standard is product specific and guides the manufacturer through the process and requirements.**
- ▶ **The New Legislative Framework (NLF) imparts new definitions with aim to improve market surveillance and boost the quality of conformity assessments. It also clarifies the use of CE marking and creates a toolbox of measures for use in product legislation.**

# WHAT ARE EU DIRECTIVES?



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There are 21 CE marking Directives

Directive	Amended by	Title of directive
2006/95/EC	2014/35/EU	Low Voltage
87/404/EEC 90/488/EEC 93/68/EEC	2014/29/EU	Simple Pressure Vessels
88/378/EE	93/68/EEC	Safety of toys
89/106/EEC	93/68/EEC	Construction products
2004/108/EC	2014/30/EU	Electromagnetic compatibility (EMC)
2006/42/EC		Machinery
89/686/EEC	93/68/EEC 93/95/EEC 96/58/EC	Personal protective equipment (PPE)
90/384/EEC 93/68/EEC	2014/31/EU	Non-automatic weighing instruments
90/385/EEC	93/42/EEC 93/68/EEC 2007/47/EC	Active implantable medical devices
90/396/EEC	93/68/EEC	Appliances burning gaseous fuels

# WHAT ARE EU DIRECTIVE



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Directive	Amended by	Title of directive
92/42/EEC	93/68/EEC 2004/8/EC 2005/32/EC	Efficiency requirements for new hot-water boilers fired with liquid or gaseous fuels
93/15/EEC	2014/28/eu	Explosives for civil uses
93/42/EEC	98/79/EC 2000/70/EC 2001/104/EC 2007/47/EC	Medical devices
94/9/EC	2014/34/EU	Equipment for explosive atmospheres (ATEX)
94/25/EC	2003/44/EC	Recreational craft
95/16/EC	2014/33EU	Lifts
97/23/EC		Pressure equipment
98/79/EC		In vitro diagnostic medical devices
1999/5/EC		Radio Equipment and Telecommunications Terminal Equipment
2000/9/EC		Cableway installations designed to carry persons
2004/22/EC	2014/32/EU	Measuring instruments

# WHAT ARE EU DIRECTIVE?



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The CE marking Directives listed below are the ones that would most typically be applicable to non medical E&E products.

Directive	Title of Directive
2006/95/EC	Low Voltage Directive (LVD)
2004/108/EC	Electromagnetic compatibility (EMC)
1999/5/EC	Radio Equipment and Telecommunications Terminal Equipment
2002/95/EC	Restriction of Hazardous Substances (RoHS)
2002/95/EC	Ecodesign

# WHAT ARE EU DIRECTIVE



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*“Just because a Directive does not call for CE marking does not mean the Directive is not applicable.”*

Other typically applicable directives:-

Directive	Title of Directive
2001/95/EC	General Product Safety Directive (GPSD)
2012/19/EU	Waste from Electrical and Electronic Equipment (WEEE)
2006/25/EC	Artificial Optical Radiation Directive (AORD)





## EU Directives

Sets Overall Objectives in line with macro measures, such as ecodesign or LVD

## EU Regulations (into National Law)

- Prescribes Targeted Levels of Performance for specific Products
- Specifies Labelling Requirements

## (Harmonised) Standards

- Details how to perform tests to determine performance or ensure safety
- EN standards are preferred



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# ***What is Due Diligence?***

- Knowing what is required
- Demonstrating compliance with applicable Directives through providing evidence – tests according to harmonised standards are the best way
- Declaring that you have met the relevant requirements
- Being properly prepared
  - being able to produce a technical file to back up your declaration
  - ready to defend yourself in court if necessary
  - being confident that your product meets the essential requirements and that is safe and fit for use
  - Key failure points – labelling and user instructions.



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# *Technical File*



**“Technical files are your documented evidence to show that products properly comply with the requirements of the markets in which you sell. Should contain all that is of importance from a regulatory aspect.”**

- ▶ Technical documentation must be such as to enable enforcement authorities to assess the conformity of the electrical equipment to the requirements of the Regulations
- ▶ It must cover the design, manufacture and operation of electrical equipment
- ▶ It can be the same document as your design file for the equipment
- ▶ Most importantly, it forms the basis of your safety case!



## Technical File Structure

### **CE Conformity**

Relevant Directives, Relevant Regulations, Relevant Standards  
Describe Other Markets

### **Technical Information**

Testing Result, Electrical Safety Testing  
EMC/EMF Testing, Mechanical Testing (IP, IK etc)

### **Overview**

Product Hierarchy Overview, Product List  
Nomenclature  
Product Datasheets

## Technical File Structure

### **Product Information**

Maintenance, Installation and User instructions  
Product Labels and Markings  
Records of any risk assessments and assessments to standards  
Warranty Terms and Conditions  
WEEE Directive Strategy  
Peripherals

### **Drawings and Documentation**

Parts List and Bill of Materials  
Drawings  
Critical Components and Specification  
RoHS Certification and Checklists  
Wiring and circuit diagrams





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# Declaration of Conformity



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## Declaration of Conformity for CE Mark

Each directive has slightly different requirements for the content of its Declaration but some features are common to all:

- Name/address of manufacturer (and of responsible person where applicable)
- Model and/or serial number of equipment
- List of relevant directives
- List of standards used, with dates + amendments
- Declaration statement
- Name and position of person signing
- Signature
- Date
- If a notified body is necessary then this should also be displayed.
- Certain directives have more specific requirements which need to be understood in order to provide compliant documents.

### EC Declaration of Conformity

In accordance with EN ISO 17050-1:2004

We  
of  
Acme Widget Ltd  
Unit 1, Wall Farm, Ind. Est., Walsall, W. Midlands, B1 23B

in accordance with the following Directive(s):

2006/95/EC	The Low Voltage Directive
2004/108/EC	The Electromagnetic Compatibility Directive
98/37/EC	The Machinery Directive

hereby declare that:

Equipment	Widget manufacturing machine
Model number	Super 77
Serial Number	001236

is in conformity with the applicable requirements of the following documents

Ref. No.	Title	Edition/date
BS EN 746-1	Industrial thermoprocessing equipment. Common safety requirements for industrial thermoprocessing equipment	1997
EN 60204-1	Safety of machinery. Electrical equipment of machines. General requirements	2006
BS EN 61000-6-1	Electromagnetic compatibility (EMC). Generic standards. Immunity for residential, commercial and light-industrial environments	2001
BS EN 61000-6-3	Electromagnetic compatibility (EMC). Generic standards. Emission standard for residential, commercial and light-industrial environments	2001

I hereby declare that the equipment named above has been designed to comply with the relevant sections of the above referenced specifications. The unit complies with all applicable Essential Requirements of the Directives.

Signed:

Name: Nigel Watkins  
Position: Technical Director  
Walsall  
On 1 April 2009



Document ref. No.  
1234/09D1234



LUX | LCA

**Thank you!**

## Contact

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CEO LUX TSI

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