



# FIRE SAFETY OF ELECTRICAL AND ELECTRONIC EQUIPMENT ICL-IP SOLUTIONS



**Brominated Flame Retardants**



**Phosphorus Flame Retardants**



**Magnesium Flame Retardants**



**Nitrogen Flame Retardants**



**ICL Industrial**  
P R O D U C T S

CARING FOR YOUR FUTURE TODAY

One major cause of the 4 to 5 million fires in Europe and the US that leave tens of thousands killed and hundreds of thousands injured is Electrical and Electronic (E&E) equipment. This is why fire safety is still an area of high concern in developed countries. The use of fire-retardant substances can prevent fatal electrical fire accidents and property or environmental damages caused by such fires.

ICL-IP develops flame retardants which not only reduce fire risk in high-performance E&E goods, but also meet or exceed the industry's most stringent environmental guidelines, including all risk assessment procedures according to Europe's strict REACH guidelines. As eco-friendly, effective and cost-effective products, they provide a comprehensive, sustainable solution to the market's real need for flame retardants.

ICL-IP is pleased to share its database with registered customers who are entitled to download a full and explicit set of Application Data Sheets by clicking on each product's name.

## FLAME RETARDANT SOLUTIONS BY APPLICATIONS

Application	Polymer Type	FR Tradename
Printed circuit board	Epoxy	<b>FR-1524</b>
	Phenolics	<b>FR-1410; F-2001; F-3014</b> <b>Fyrol® FR-2 &amp; PCF;</b> <b>Fyrolflex® RDP</b>
Housing, casing & internal parts	HIPS V-0/V-1	<b>FR-245; FR-1410; F-3014;</b> <b>Polyquel® 200 series</b>
	HIPS V-2	<b>FR-720; FR-245;</b> <b>FR-1410; FR-370</b>
	ABS	<b>FR-245; F-2016;</b> <b>F-2400; F-3020;</b> <b>F-3516;</b> <b>Polyquel® 200 series;</b> <b>Fyrolflex Sol-DP™ for V-2</b> <b>ABS</b>
	PC/ABS alloys	<b>Fyrolflex® RDP &amp; Sol-DP™;</b> <b>F-3100</b>
	Modified PPO	<b>Fyrolflex® RDP &amp; Sol-DP™</b>
Connectors & internal parts	Polyamide	<b>FR-803P; F-2400; F-3100;</b> <b>FR-1025;</b> <b>FR-1410;</b> <b>FR-20 210 S7;</b>
	PBT & PC/PBT alloys	<b>FR-1025; F-2100L;</b> <b>F-2400; F-3100;</b> <b>FR-803P; FR-1410; F-370</b>
Wire & cables	PP copolymers; EPR; SBR;	<b>FR-20 100 &amp; 120 S10 FR-1410;</b> <b>Polyquel® 100 series</b>
	Plasticized PVC	<b>Phosflex® 390 &amp; 418</b>



**Connectors**

(PP, PBT, Polyamides)

**Refrigerator interior panel**

(ABS, HIPS, PC/ABS)

**Control panel**

(ABS, PC/ABS, PC, Modified PPO)

**Printed Circuit boards**

(Epoxy, Phenolics)

**Heater covers**

(ABS, PC/ABS, PC, Modified PPO)

**Control panel**

(ABS, PC/ABS, PC, Modified PPO)

**Trim components**

(PP, ABS, PC/ABS, PC)

**Fan**

(PBT, ABS)

**Housing**

(ABS, HIPS, PC/ABS, Modified PPO)

**Connectors**

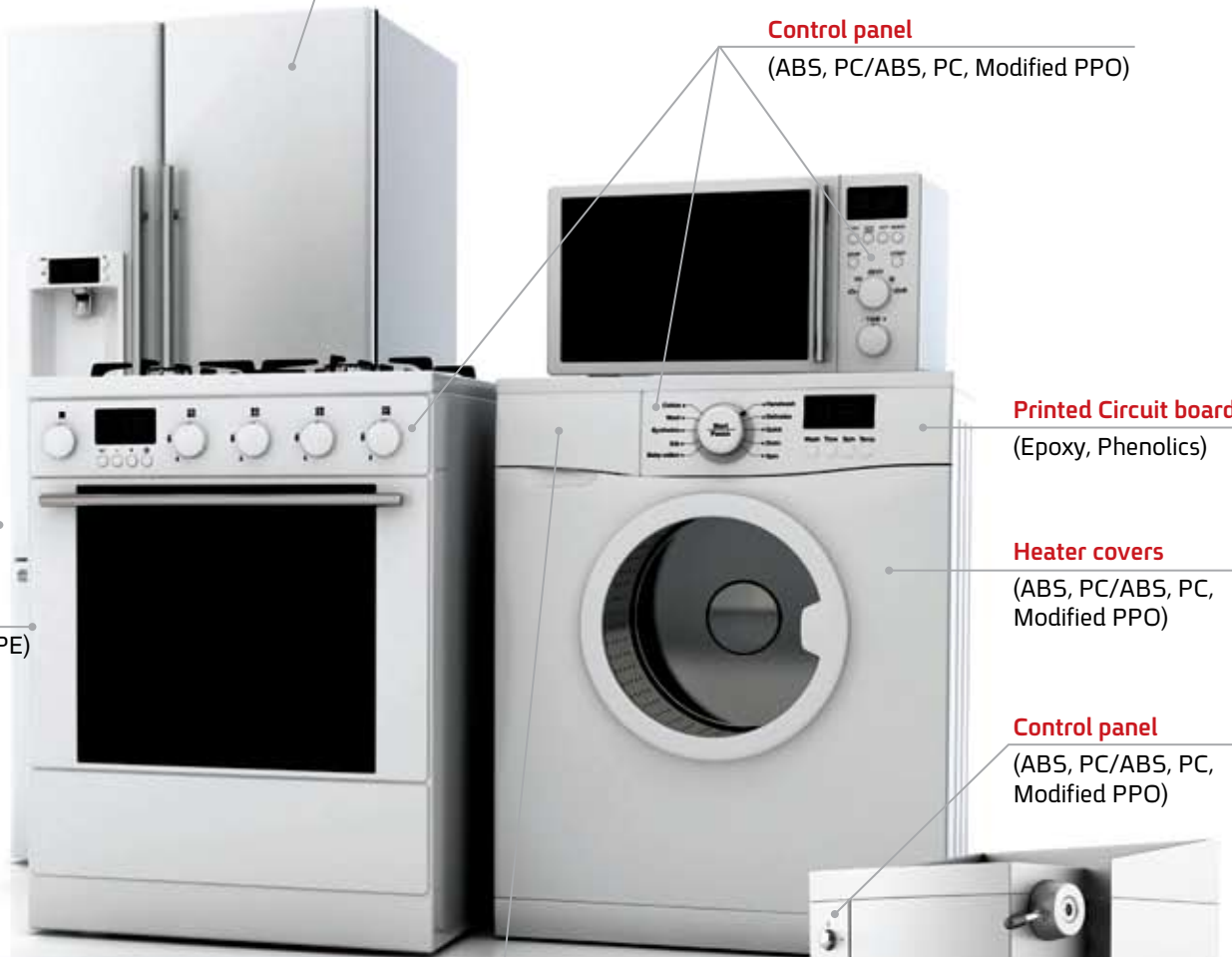
(PBT, Polyamides)

**Printed Circuit boards**

(Epoxy, Phenolics)

**Wire & Cables**

(PVC, PP, XLDPPE)



## FLAME RETARDANT MAIN ADVANTAGES

### Brominated flame retardant reactive

**FR-1524** High purity, high reactivity, low color, high clarity, good solubility and FR efficiency for epoxy printed circuit board application

### Brominated flame retardant additives

**FR-245** Thermal and UV stability, imparts good flow and impact strength, non-blooming FR, option for low antimony trioxide or antimony trioxide-free solutions and good recycling properties

**FR-720** High FR efficiency and thermal stability

**FR-1410** High FR efficiency and thermal stability, multi-purpose

**FR-370** Synergism between phosphorus & bromine, outstanding UV stability, non-blooming, good melt-flow and impact.

### Brominated polymeric flame retardant additives

**FR-803P** Very high thermal stability, non-blooming, good electrical properties

**FR-1025** Excellent thermal aging stability, processing aid, high FR efficiency, high impact properties, non-blooming, compatibility with fiber reinforcement and good recycling

**F-2000 series** High thermal and UV stability, high FR efficiency, melt blendable, non-blooming, and good recycling properties

**F-3000 series** High thermal and good UV stability, low metal adhesion, non-blooming and very good recycling properties

**Polyquel® series** Non-dust, non-blooming, high thermal and UV stability, FR efficiency

### Phosphorus based flame retardant additives

**Fyrol® FR-2 & PCF** Excellent thermal and hydrolytic stability and low viscosity

**Fyrolflex® RDP** Halogen-free, high FR efficiency and thermal stability

**Fyrolflex Sol-DP™** Halogen-free, easy to handle free-flowing powder, good hydrolytic and thermal stability

**Phosflex® 390** Good performance at low temperature, low smoke

**Phosflex® 418** Excellent plasticizing efficiency at low temperature, low smoke & low volatility

### Mineral flame retardant additive

**FR-20 series** High purity grades of magnesium hydroxide with option of surface treatment, high abrasion resistance, smoke suppressant, high thermal stability, good electrical properties and acid scavenger

## MAIN FIRE SAFETY STANDARDS

In the following table, you will find a summary of the fire safety standards by categories of applications. More information about fire safety standards can be found in the Plastics Flammability Handbook of Jürgen Troitzsch, 3rd edition published by Hanser.

CATEGORIES	FIRE SAFETY STANDARD
Consumer equipment, TVs and household appliances	IEC 60335-1 (International); IEC 60065 (International); EN 60065 (Europe); UL 1410 (USA)
Wire & cables	IEC 60332-1 to 3 (International); ASTM D2863 (US ; LOI)
Fire Hazard Tests for Electrotechnical Equipment	IEC 60695-1-1 (General guidance); IEC 60695-2-10 to 13 (Glow Wire test); (International); IEC 60695-2-2 (Needle test) (International)
Evaluation of Materials for Electrical End Products	UL 746A, B & C (US); UL 1694 (US); CTI (Comparative Tracking Index) according to ASTM D 3638-85 (US) or IEC 112 (International)
Heat and Smoke release	UL 2043 (Cone calorimeter; US)
Corrosion Damages	IEC 60695-5 (International)
Toxicity of fire effluents	IEC 60695-7-2, 3 & 4 (International); ASTM E 1687-97 (US)
General for E&E equipment	UL 94; ASTM D2863 (LOI)

ICL-IP invites you to make use of the “Flame Retardants brochure” and benefit from its long experience in order to optimize your choice of flame retardant solutions. Moreover our Technical Support Network – TECNET is a team of highly professional technical experts always available all over the globe to advise and help you.



**Toner cartridge**  
(HIPS)



**Printed circuit board**  
(Epoxy, Phenolics)



**Connectors**  
(PBT, Polyamides)

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## GLOBAL PRESENCE



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