



Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of “Quality Parts,Customers Priority,Honest Operation,and Considerate Service”,our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!



Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

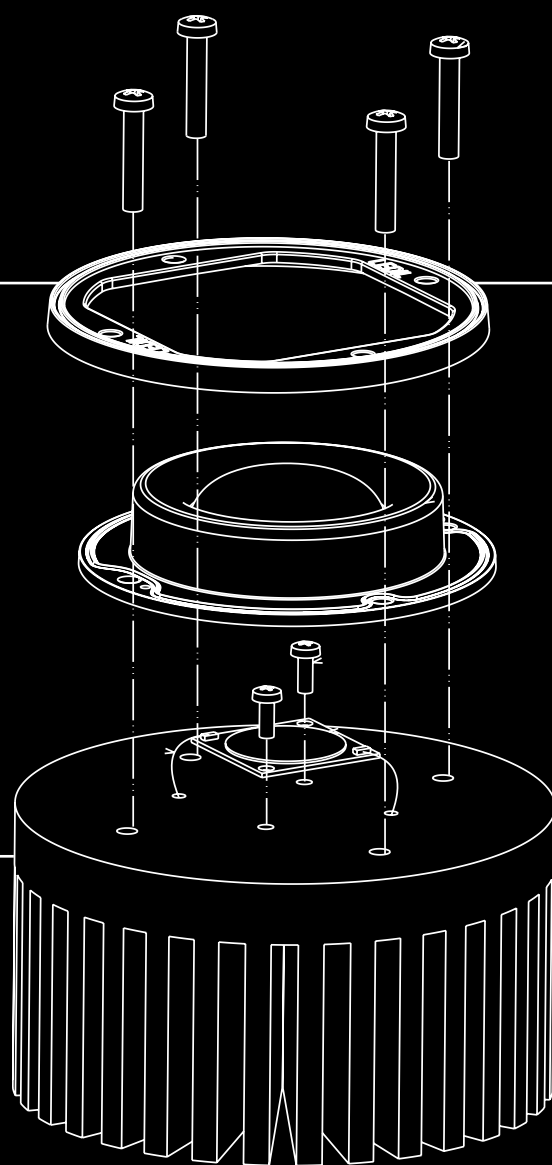
Email & Skype: info@chipsmall.com Web: www.chipsmall.com

Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China



LEDiL[®]

INSTALLATION GUIDE



GENERAL INFORMATION ABOUT ASSEMBLING LEDIL PRODUCTS

LEDiL®



READ THE FOLLOWING INSTRUCTIONS BEFORE USING LEDiL PRODUCTS TO ENSURE RELIABLE ASSEMBLY.

CONTENTS

MATERIALS	3	TOLERANCES	21
PMMA & PC	3	FASTENING	22
Silicone (as a lens material)	3	Tape	22
Heat durability of different materials	4	Screw	23
CHEMICALS	6	Glue	24
Glues / adhesives / potting / thread lock	6	Potting	24
Chemical resistance	7	Press-fit	24
Silicone	7	Holder	24
PMMA	7	Profiles	25
PC	8	PCB design	26
STRESS CRACKING	15	LED assembly	26
UV-RESISTANCE	16	LED chip positions	27
Plexiglas guarantee	16	Distance between lenses	27
Silicone	16	Sealing	28
PC	16	Ingress protection of LEDiL optics	28
FIRE RATING	17	THERMAL SOLUTIONS	29
Fire ratings	17	Heat sink machining	30
Hot Wire Ignition (HWI)	18	Thermal interface materials	30
High Amp Arc Ignition (HAI)	18	METAL COATING	31
Outdoor suitability	18	Vacuum Evaporation PVD	31
LEDiL materials fire rating	19	HMDS	31
TENSILE STRENGTH	20	USEFUL INFORMATION	32

LEDiL®

MATERIALS

PMMA & PC (TRANSPARENT PLASTIC POLYMERS IN OPTICS)

PMMA:

- Rigid and hard
- Average chemical resistance
- Good UV-resistance (naturally UV-stable technology)
- Good light transmission

PC:

- Very tough with excellent physical properties
- Good chemical resistance
- Good heat resistance
- Average UV-resistance (LEDiL uses UV-stabilized clear PC-grade)

In general, PMMA is harder and more fragile than PC, which has greater resistance to impact and heat. LEDiL uses many different types of PC in its products and the information given here is only valid for Makrolon 2407. Although other types of PC offer similar properties their performance should be verified separately.

Transparent polymers can reflect, absorb and refract visible light. Absorption causes the temperature to increase in a lens and this should be taken into consideration during heat simulations. In general, PMMA lenses have higher light transmission rates meaning less light is absorbed. PC on the other hand has better heat resistance, but thicker parts can absorb more light resulting in increased internal temperatures. LEDiL uses UV-stabilized clear PC for optics and all materials are f1-rated (UL746C-standard is suitable for outdoor applications and meets UV and water exposure demands).

SILICONE (AS A LENS MATERIAL)

Silicone has excellent optical properties, great impact strength, durability and high thermal stability. Silicone's elasticity allows complex optical and functional forms and low viscosity makes microstructural design possible. Silicone has high stability in ultraviolet light and ozone and can be used with UV LEDs where even UV stabilized plastics are unsuitable.

Silicone:

- Excellent optical properties with even better efficiency than glass
- Elasticity allows complex optical and functional forms
- High thermal and UV stability
- Great impact strength
- Lightweight design (lighter than glass)

As part of our continuous research and improvement processes LEDiL reserves the right of changing material grades without further notice to ensure best possible quality and availability of our products.

LEDiL®

HEAT DURABILITY OF DIFFERENT MATERIALS

LED lighting consumes much less power compared to other light sources such as bulbs, fluorescent or energy saving lamps. These tiny light sources are at the focal point of worldwide continuous improvement constantly pushing the edge of heat resistance and luminous output.

If in the early days of LED lighting the power consumption produced around 80°C or 90°C of heat, today the extremely large COBs can produce around 150°C. This direction has led to a situation where luminaire materials need to handle and dispose of more and more heat to ensure safe operation.

Sources of heat

As a general rule 1/3 of an LED's power consumption is turned into visible light and 2/3 into heat. There are three sources that produce heat in LED lighting: **conduction**, **convection** and **radiation**. All of these are extremely important when a new luminaire design is made but there are also other things to consider regarding heat generation.

Some materials **absorb** more light than others. This means that an optic's efficiency has a direct link to how hot the lens will get. All sorts of **dirt**, **dust** and **grease** on the optical surface block some of the light rays generating more heat inside the luminaire. During the product lifetime both of these effects tend to increase and therefore speed up the aging process. Every luminaire element and component that stops or reflects some of the light such as **protective glass** and **shades**, may also increase heat inside the luminaire and therefore speed up the aging process.

Careful consideration should be given to all of these areas when designing a luminaire to ensure a safe and long product lifetime. LEDiL products are designed and manufactured to meet high efficiency values to help extend the product lifetime.

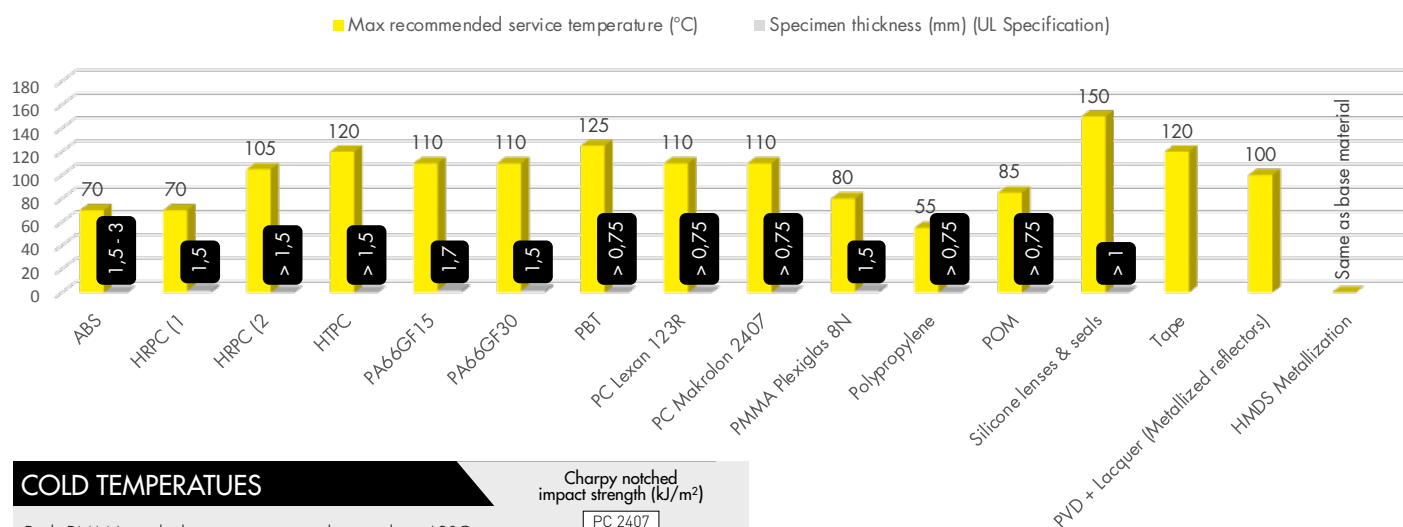
Choosing the right material

On the following page you can find a list of materials and recommended maximum service temperatures.

Please note that because of the complex nature and numerous variables involved in luminaire design and manufacturing that affect the final product heat control, LEDiL cannot take responsibility for third party solutions and designs we can't control. It is always the customer's responsibility to determine and verify there is sufficient cooling and maintenance in the final product and its components.

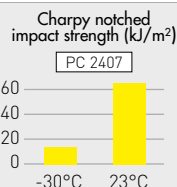
LEDiL®

MATERIAL	MAX RECOMMENDED SERVICE TEMPERATURE (°C)	SPECIMEN THICKNESS (MM) (UL SPECIFICATION)
ABS	70	1,5 - 3
HRPC ¹⁾ (LISA2, RITA-A, RITA-B, RITA-WAS, BRITNEY-XV, BOOM-MC-XV, LENINA-XV, LAURA-R-XV, LENA-XWAS, TINA2-R-CLIP16, LEILA-R-CLIP16 LEILA, MINNIE-XV, MINNIE-LT-XV, SAGA-FRAME, MIRELLAXV, MIRELLA-40-XV, MIRELLA-50-XV, MIRELLA-50-VVV-PF, REBECCA-RGB-HLD, BROOKE-XV, BARBARA-XV)	70	1,5
HRPC ²⁾ (ANGELA, ANGELINA, BARBARA, MIRELLA-G2)	105	> 1,5
HTPC (SPECIAL ORDERS ONLY)	120	> 1,5
PA66GF15	110	1,7
PA66GF30	110	1,5
PBT	125	> 0,75
PC LEXAN 123R	90 (LONG TERM) 110 (SHORT TERM)	> 0,75
PC MAKROLON 240Z	90 (LONG TERM) 110 (SHORT TERM)	> 0,75
PMMA PLEXIGLAS 8N	80	1,5
POLYPROPYLENE	55	> 0,75
POM	85	> 0,75
SILICONE LENSES & SEALS	150	> 1
TAPE	120	
METALLIZATION METHODS		PRODUCT FAMILIES
PVD + LACQUER (METALLIZED REFLECTORS)	100	ANGELETTE-WAS, BARBARA, BLONDIE, BOOM, BOOMERANG, BRIDGET, BRITNEY, BRITNEY-TE, BROOKE, LENA, LENINA, MINNIE, MIRELLA, REGINA, TYRA, TYRA3, VENIA
HMDS METALLIZATION	SAME AS BASE MATERIAL	ANGELA, ANGELETTE, ANGELINA, BARBARA-XX-PF, BROOKE-G2, MIRELLA-G2, BARBARA-G2



COLD TEMPERATURES

Both PMMA and silicone optics can be used in -40°C, but please note that while PC optics can also be used in cold temperatures its impact strength decreases gradually. E.g. in -30°C polycarbonate impact strength is equal to PMMA.



LEDiL®

CHEMICALS

GLUES / ADHESIVES / POTTING / THREAD LOCK

We strongly recommend that every customer fully tests and takes the necessary precautions to ensure there is complete chemical compatibility with each particular product, LEDs and other components. Testing and verifying adhesives, potting agents, coatings and their combinations are always the responsibility of the customer.

General instructions of use

All surfaces where adhesive is applied must be clean, dry and free from grease and dirt. If the PCB surfaces need to be cleaned, please follow the LED manufacturer cleaning instructions carefully – this is important as cleaning should, under no circumstances, damage LEDs or other electronic components on the PCB. Further note that **optical components should not be cleaned with any chemicals** – only micro fiber cloth should be used to remove fingerprints or other traces from handling. We recommend metallized reflectors should be cleaned with either gentle air pressure or using an air ionizer. When using adhesive, please follow the detailed instructions of the adhesive manufacturer. E.g. note that different humidity and/or temperature levels may slow down the curing process of the adhesive bond or shorten its lifetime

LEDiL Disclaimer:

LEDiL cannot take responsibility for the results obtained by third party methods we cannot control. It is always the customer's responsibility to determine the chemicals suitability for their product and to take precautions for protection of property and persons against any hazards that may be involved in the handling and use such of chemicals. LEDiL disclaims all warranties, including warranties of merchantability or suitability for a particular purpose, arising from use of any adhesive product. LEDiL disclaims any liability for consequential or incidental damages of any kind, including lost profits.



More information about bonding by DELO®
www.ledil.com/delo-adhesives



Tested materials and test procedure by CREE™
www.ledil.com/cree-chemical-compatibility

NOTE: These tests have been made only with LEDs and are not necessarily compatible with optical materials. Compatibility must be tested in advance by the customer.

CHEMICAL RESISTANCE

Silicone

LEDiL silicone lenses are made of VMQ, Vinyl Methyl group, general purpose silicone.



For more information:

http://www.ledil.com/dowcorning_materials

PMMA

The chemical resistance of mouldings made from Plexiglas moulding powder (tables on pages 9-14)

- The behaviour in the tables on pages 9 to 14 relate to a test temperature of 23°C, a relative humidity of 50% and mouldings with few internal stresses.
- The behaviour of injection mouldings made from Plexiglas moulding powder depends in practice on the internal and external stresses, the orientation in the moulding and the change of temperature in the resistance to solvents and swelling.
- Plexiglas moulding powder resists all factors met in normal use such as water, perspiration, ink, lipstick, alkaline solutions and weak acids.
- As a result of the chemical structure, most organic solvents, e.g. aromatics, dissolve Plexiglas moulding powder which does, however, resist aliphatic hydrocarbons.
- Do not join Plexiglas moulding powder to plasticized thermoplastics and elastomers because some plasticisers migrate at high temperatures.
- Mouldings occasionally show residual stresses caused by processing or use, but this does not have a negative effect on their resistance to fracture. Inducing to solvents or swelling agents may however cause crazing.
- The material compatibility should be tested in advance in the actual application conditions.

LEDiL®

PC

General chemical behaviour

The chemical resistance of Makrolon® depends on the concentration of the substance, the temperature, contact time and internal tension level of the polycarbonate sheet depending on fabrication. The following types of damage can arise, sometimes more than one at the same time.

- **Dissolving / Swelling**

Low-molecular, aromatic, halogenated and polar components migrate into the plastic. The damage can range from a sticky surface to complete dissolving.

- **Stress cracking**

Some chemicals migrate to a minor extent and in very low quantity into the surface, and lead to relaxation of tensions in the material. This results in stress cracking, which can be optically disturbing. Because of increased notch occurrence, some mechanical properties are negatively influenced. Stress cracking is usually easy to see in transparent sheets.

- **Molecular reduction**

Some properties of materials are determined by the molecular weight. If a substance initiates a molecular reduction through a chemical reaction, the impact resistance and elastic properties of the material will be influenced. Electrical properties are usually not influenced, thermal properties are only slightly influenced by the molecular weight.

In the following tables (pages 9-14) you can find the resistance of Makrolon® to chemicals and several other substances. The test results have been obtained at samples with low internal tensions, which have been stored during 6 months in the substance at a temperature of 20°C, without any mechanical load.

Apart from the nature of the substances, the chemical resistance also depends on the concentration of the substance, the temperature during the contact, the contact time and the internal tension of the tested specimen. This means that our products can be resistant to a number of chemicals for short contacts, but are not resistant in the case of long exposure, such as performed in these tests. Therefore, it is always recommended to execute a test in the actual application conditions. The tested substances have been chosen according to their importance in several areas. In a lot of cases it is possible to assume similar results for other chemically comparable substances, even if these have not been tested.

Our UV-protected materials (Makrolon® UV) are slightly more sensitive to chemicals in comparison to unprotected materials, but in general the results shown in the table still comply.

LEDiL®

SUBSTANCE	PC	PMMA
Acetaldehyde	X	-
Acetic acid, up to 10% solution	R	-
Acetone	X	X
Acetylene	R	-
Acid-containing combustion gasses	R	-
Acrylate sealing compounds	-	X
Acrylic paints	-	○
Acrylonitril	X	-
Ajax®	R	R
Alcohol, concentrated	-	X
Alcohol, up to 30%	-	R
All purpose adhesive	-	○
All-purpose glue	○	-
Allyl alcohol	○	-
Alum	R	-
Aluminum chloride, saturated aqueous solution	R	-
Aluminum oxalate	R	-
Aluminum sulphate, saturated aqueous solution	R	-
Ammonia	X	R
Ammonia solution acids	-	R
Ammoniacal liquor	X	-
Ammonium chloride, saturated aqueous solution	R	-
Ammonium nitrate, saturated aqueous solution	R	-
Ammonium sulphate, saturated aqueous solution	R	-
Ammonium sulphide, saturated aqueous solution	X	-
Amylo acetate	X	-
Anfistatic plastics cleaner and preserving agent	-	R
Aniline	X	-
Antimony chloride, saturated aqueous solution	R	-
Antistatik C, 5%	X	-
Antistatikum 58	○	-
Antistatischer Kunststoff-Reiniger + Pfleger	-	R
Aqueous solutions of pesticides	-	○
Aral BG® 58	R	-
Arquad 18®, 50%	○	-
Arsenic acid, 20% solution	R	-
Baktol®, 5%	R	-
BAKTOLAN, conc.	-	X
BAKTOLAN, up to 5%	-	R
Ballpoint paste Diplomat	○	-
Ballpoint paste Othello	○	-
Ballpoint paste V77 (Linz)	R	-
Basilit® UAK, 20% in water (wood protection agent)	R	-
Battery acid	R	-

R = Resistant
○ = Limited resistance
X = No resistance

v = Vapour
c = Concentrate
g = Gas

SUBSTANCE	PC	PMMA
Baysilon® Silicone oil	R	-
Benzaldehyde	X	-
Benzene	X	-
Benzoic acid	X	-
Benzyl alcohol	X	-
BFK cleaner	-	R
Bitumen emulsion	-	X
Bleach	-	R
Bleaching agent	R	-
Blood	R	-
BOLIMENT	-	○
Borax, saturated aqueous solution	R	-
Boric acid	R	-
BOTTCHERIN	-	R
BP Energol EM 100®	R	-
BP Energol HL 100®	R	-
BP H LR 65®	R	-
Brake fluid (ATE)	X	-
Bromic benzene	X	-
Bromine	X	-
Bromine vapours, dry	-	○
BURMAT	-	R
BURNUS	-	R
Butane (liquid or gaseous)	R	-
Butanol	R	-
Butyl acetate	X	-
Butyl lactate	-	X
Butylene glycol	R	-
Butyric acid	X	-
Cable isolation oil IG 1402	R	-
Cable isolation oil KH 190	R	-
Calcium chloride, saturated aqueous solution,	R	-
Calcium hypochloride	R	-
Calcium nitrate, saturated aqueous solution	R	-
Calcium soap, fat/pure	R	-
Calcium soap fat	R	-
Calgonit® dishwashing	X	-
Calgonit® rinsing agent	R	-
Calgonit D®, DM, DA, R	X	-
CALGONIT D, DA, S	-	R
Calgonit S®, 1%	R	-
Camphor oil	X	-
Carbolic acid	X	-
Carbolic acid (sas)	-	X

m = Metallic
sas = Saturated aqueous solution
i.w. = In water

LEDiL®

SUBSTANCE	PC	PMMA
Carbon acid, wet	R	-
Carbon dioxide	-	R
Carbon disulphide	X	X
Carbon monoxide	R	R
Carbon tetrachloride	-	X
Castor oil	R	-
Cellux-sticking foils ®	R	-
Cement	R	R
CHINOSOL, up to 1%	-	R
Chlor. lime paste (sas)	-	R
CHLORAMIN, paste	-	X
CHLORAMIN, solution	-	R
Chlorine benzene	X	-
Chlorine gas, dry	O	-
Chlorine gas, wet	X	-
Chlorine lime slurry	R	-
Chlorine lime, 2% in water	R	-
Chlorine vapours, dry	-	O
Chloroamine	R	-
Chloroform	X	-
Chrom alum, saturated aqueous solution	R	-
Chromic acid, 20% in water	R	-
CILLIT-GRON	-	R
Citric acid	R	-
Citric acid, up to 20% (sas)	-	R
Cleaning gasoline	R	-
CLOPHEN T 55, A 60	-	R
Coal gas, natural gas	-	R
Cod-liver oil	R	-
Contact oil 61	R	-
Copper sulphate, saturated aqueous solution	R	-
Corrosive sublimate	-	R
Cresol	X	-
Cupric chloride, saturated aqueous solution	R	-
Cuprous chloride, saturated aqueous solution	R	-
Cyclo hexane	X	-
Cyclo hexanol	O	-
Cyclo hexanone	X	-
DDT	X	-
DEKALIN	-	O
Dekaline	R	-
Delegol ®, 5%	R	-
Delu-Antistatklösung ®	R	-
Diamyl phthalate	X	-

R = Resistant
O = Limited resistance
X = No resistance

v = Vapour
c = Concentrate
g = Gas

SUBSTANCE	PC	PMMA
Dibutyl phthalate (plasticizer)	X	-
DIEGEL liquid film 23922	-	R
Diesel oil	O	-
Diethylene glykol	R	-
Diethylether	X	-
Diglycolic acid, saturated aqueous solution	R	-
Dimamin T, 5%	O	-
Dimethyl formamide	X	-
Dinonyl phthalate (plasticizer)	O	-
Diocetyl phthalate (plasticizer)	O	-
Dioxane	X	-
Diphyl 5,3	O	-
Dor ®	R	R
DOSYL	-	R
DOSYLAN	-	R
Drilling oil	X	-
E 605 ®, 0,5% (pesticide)	X	-
E 605 ®, conc.	X	-
Electroplating baths	-	R
ELMOCID GAMMA, up to 2%	-	R
Esso Estic 42-45 ®	R	-
Ether	X	-
Ethyl alcohol, 96% pure	R	-
Ethyl amine	X	-
Ethyl bromide	X	-
Ethylene chlorhydrine	X	-
Ethylene chloride	X	-
Ethylene glykol	R	-
FAKO polish	-	R
FAKO polishing paste	-	R
Ferritrichloride, saturated aqueous solution	R	-
Ferro bisulphate	R	-
Fewa ®	R	R
Final-photo developer (normal use concentration)	R	-
Fish oil	R	-
Foam plastics	-	R
Foam plastics, plasticise	-	X
Formaline, 10%ig	R	-
Formic acid, 30%	O	-
FRAPPIN	-	R
Freon ® TF (propellant)	R	-
Freon ® TWD 602 (propellant)	R	-
Frigen ® 113, R113 (propellant)	R	-
FRIGEN A 12 (CF2 Cl2)	-	O

m = Metallic
sas = Saturated aqueous solution
i.w. = In water

LEDiL®

SUBSTANCE	PC	PMMA
Fuel oil O	O	-
FULLBOX	-	R
GASOLIN, depending on the blend	-	O
Gasoline	R	-
Gasoline, normal	O	-
Gasoline, super	X	-
Geha stamping ink	R	-
GLYBAL A	-	X
Glycerine	O	-
Glycol	R	-
Green chrom oxide (polish paste)	R	-
Green soap	R	-
Gypsum	-	R
HB 155	-	R
Heptane	R	-
Hexane	R	-
Horolith M®	R	-
Hot bitumen	-	O
Household soap	R	-
Hydraulik oil Vac HLP 16	R	-
Hydrochloric acid (c)	-	R
Hydrochloric acid, 20%	R	-
Hydrochloric acid, conc.	X	-
Hydrofluoric acid, 5%	R	-
Hydrofluoric acid, conc.	X	-
Hydrofluorosilicic acid, 30%	R	-
Hydrogen peroxide	R	-
Hydrogen peroxide, 30%	R	-
Hydrogen peroxide, over 40% i.w.	-	O
Hydrogen peroxide, up to 40% i.w.	-	R
Hydrogen sulphide	R	R
Impact®, 0,2%	O	-
Indian ink S	X	-
Indian ink T	R	-
Industrial spirit	-	X
Insulating tape	-	R
Into-Fensterklar®	R	-
Iodine	X	-
Iodine tincture	O	-
Isoamyl alcohol	O	-
Isolation tape	R	-
Isolation tape	R	-
Isopropyl alcohol	R	X
Jet engine fuel JP 4 (Kp 97-209°C)	O	-

R = Resistant
O = Limited resistance
X = No resistance

v = Vapour
c = Concentrate
g = Gas

SUBSTANCE	PC	PMMA
Kaltron® 113 MDR (propellant)	R	-
Kerosene (Flugbenzin)	X	-
KOPPERSCHMIDT covering paste	-	R
Lactic acid, 10% in water	R	-
Lactic acid, up to 20% i.w.	-	O
LAVAPLEX	-	R
Lead tetraethylene, 10% in gasoline	O	-
Lighting gas	R	-
Ligroin (hydrocarbon compound)	R	-
Lime milk, 30% in water	O	-
Lubricant based on nafta	R	-
Lubricant based on paraffin	R	-
Lubricant R2 Darina®	R	-
Lugol solution	-	R
LYSOFORM	-	X
Lysoform, 2%	R	-
Magnesium chloride	-	R
Magnesium chloride, saturated aqueous solution	R	-
Magnesium sulphate	-	R
Magnesium sulphate, saturated aqueous solution	R	-
Maktol®	R	-
Manganous sulphate, saturated aqueous solution	R	-
Marlon®, 1% (moisturizing agent)	R	-
MEFAROL, up to 1%	-	R
MERCKOJOD, up to 1%	-	R
Mercurio chloride, saturated aqueous solution	R	-
Mercury	R	R
Merfen®, 2%	R	R
Metasystox®, 0,5% (pesticide)	X	-
Methacrylic acid-methyester (MMA)	X	-
Methane	R	R
Methanol	X	-
Methanol, concentrated	-	X
Methanol, up to 30%	-	O
Methyl amine	X	-
Methyl ethyl ketone (MEK)	X	X
Methylene chloride	X	-
Mobil DTE Oil-Light®	R	-
Mobil Special Oil 10 W 30®	R	-
Molikote® -Paste	R	-
Molikote® -Powder	R	-
Monobromonaphthalene	-	R
Mortar	-	R
Motor fuel blend contg. Benzene	-	X

m = Metallic
sas = Saturated aqueous solution
i.w. = In water

LEDiL®

SUBSTANCE	PC	PMMA
Motor fuel blend, free from benzene	-	R
Multi-Marker (Faber-Castell)	O	-
Nato-Turbine oil 0-250	R	-
Natril ®	R	-
Natural rubber	R	-
Nekal BX ®, 2% (moisturizing agent)	R	-
NEOMOSCAN M, M-powder	-	R
Neutol ® photo developer (normal use concentration)	R	-
NEXION stable spray	-	R
Nickel sulphate (sas)	-	R
Niroklar GR liquid	-	R
Niroklar GR powder	-	R
Nitric acid, 10%	R	-
Nitric acid, 10-20%	O	-
Nitric acid, 20 to 70% i.w.	-	O
Nitric acid, 20%	X	-
Nitric acid, over 70% i.w.	-	X
Nitric acid, up to 20% i.w.	-	O
Nitric Gas, dry	X	-
Nitrobenzene	X	-
Nitrocellulose lacquers	-	X
Nitrogen dioxide	-	R
Nitrogen monoxide	-	R
O Sprays (in the surroundings)	-	O
Oil paints, pure	-	R
Oktozon ®, 1%	R	-
Oleic acid, conc.	R	-
Omo ®	R	-
Orthozid ® 50, 0,5% (pesticide)	R	-
Oxalic acid (sas)	-	R
Oxalic acid, 10% in water	R	-
Oxygen	R	R
Ozone	R	R
P 3	-	R
P 3 basic cleaner	-	O
P3 Asepto ®	X	-
PALATINOL K	-	R
PALATINOL O, BB neu	-	O
Pantex ®, 2%	R	-
Paraffin oil	R	-
PATTEX special glue	-	O
Pelikan Royal Blue 4001	R	-
Pentane	R	-
PERBUNAN	-	R

R = Resistant
O = Limited resistance
X = No resistance

v = Vapour
c = Concentrate
g = Gas

SUBSTANCE	PC	PMMA
Perbunan C ®	R	-
Perchloric acid, 10% in water	R	-
Perchloric acid, concentrated	O	-
Perchloro ethylene	X	X
Perhydrol	R	R
Perhydrol, 30%	R	-
PERODIN	-	R
Persil ®	O	R
Persoftal ®, 2%	R	-
Perspex Polish 3 ®	R	-
Petrol ether	-	R
Petrol, contg. aromatic substances	-	X
Petrol, non-aromatic	-	R
Petrol, pure	-	R
Petroleum	O	O
Petroleum ether	O	-
Petroleum spirit	R	-
Phenol	X	-
Phenols	-	X
Phenyl ethyl alcohol	X	-
Phosphates	-	R
Phosphonic acid, up to 10% i.w.	-	R
Phosphor trichloride	X	-
Phosphoric acid, conc.	R	-
Phosphoric oxichloride	X	-
Phosphorus trichloride	-	X
Phosphorus, white	-	X
Photochemical baths	-	R
Picric acid, 1% i.w.	-	R
Plaster	R	-
Plasticiserfree glazing kit	R	-
Plexiklar ®	R	R
PLEXISOL adhesive	-	O
PLEXIT	-	O
PLEXTOL adhesive	-	R
PLK 4 (wood protection agent)	R	-
Polifac grinding paste ®	R	-
Polishing wax	R	-
Polyamide	R	R
Polyethylene	R	R
Polymer plasticizer O	O	-
Polyran ® MM 25 (lubricant)	R	-
Polyvinylchloride (plasticizer free)	R	-
Polyvinylchloride, (containing plasticizer)	O	-

m = Metallic
sas = Saturated aqueous solution
i.w. = In water

LEDiL®

SUBSTANCE	PC	PMMA
Potassium aluminum sulphate, (sas)	R	-
Potassium bichromate, (sas)	R	-
Potassium bromide, (sas)	R	-
Potassium carbonate, (sas)	R	-
Potassium chloride, (sas)	R	-
Potassium cyanide	X	-
Potassium hydroxide	X	-
Potassium metabisulphide, 4% in water	R	-
Potassium nitrate, saturated aqueous solution	R	-
Potassium perchlorate, 10% i.w.	R	-
Potassium permanganate, 10% i.w.	R	-
Potassium persulphate, 10% i.w.	R	-
Potassium rhodanide, (sas)	R	-
Potassium sulphate, (sas)	R	-
Pril ®	R	R
Propane gas	R	-
Propargyl alcohol	R	-
Propionic acid, 20%	R	-
Propionic acid, conc.	X	-
Propyl alcohol	R	-
Propylene	-	R
Putty	R	-
PVC	-	R
PVC, plasticised	-	X
Pyridine	X	X
RABOND stable spray	-	R
Rapdosept ®	O	-
Rape oil	R	-
Red lead	-	R
Register-ink DIA type U rot	R	-
Rei ®	R	R
Resorcin oil solution, 1%	R	-
Resorcinol solutions, 1%	R	-
Riseptin ®	R	-
Rubber	-	R
Rubber, plasticised	-	X
Sagrotan ®, 5%	O	O
SAGROTAN, up to 2%	-	R
SANGAJOL	-	R
Sea water	R	-
Sealing strips, (FAKO, TEROSTAT, PRESTIK)	-	R
SEIFIX	-	R
Sewing machine oil	R	-
Shell IP 4 (fuel)	X	-

R = Resistant
O = Limited resistance
X = No resistance

v = Vapour
c = Concentrate
g = Gas

SUBSTANCE	PC	PMMA
Shell Spirax 90 EP ®	R	-
Shell Tellus 11-33 ®	O	-
Shell Tellus 33 ®	O	-
Sidolin ®	R	X
Silicon tetrachloride	-	X
Silicone oil	R	-
Silicone rubber (acetic acid curing)	-	O
Silicone rubber (Camino curing)	-	R
Siliconoil emulsion	R	-
Silver nitrate (sas)	-	R
Skydrol 500 A ®	X	-
Soap solution	-	R
Soap suds	O	-
Sod. hydroxide soln.	-	R
Soda	R	R
Soda water	-	R
Sodium bicarbonate, (sas)	R	-
Sodium bisulphate, (sas)	R	-
Sodium bisulphide, (sas)	R	-
Sodium bisulphite	-	R
Sodium carbonate	-	R
Sodium carbonate, (sas)	R	-
Sodium chlorate (sas)	R	R
Sodium chloride (sas)	R	R
Sodium hydroxide	X	-
Sodium hypochloride, 5% in water	R	-
Sodium hypochlorite	-	R
Sodium soap fat	R	-
Sodium sulphate	-	R
Sodium sulphate, (sas)	R	-
Sodium sulphide	-	R
Sodium sulphide, (sas)	O	-
Somat W ® 731	O	-
SPECTROL	-	X
Spirit, pure	R	-
SPRAYLAT	-	O
SPULI	-	R
Stain remover Alkaline solutions	-	X
Stannous chloride	-	R
Starch	R	-
Statexan AN ®	R	-
Stearic acid	-	R
Styrene	X	-
Sublimate	R	-

m = Metallic
sas = Saturated aqueous solution
i.w. = In water

LEDiL®

SUBSTANCE	PC	PMMA
Sublimate, (sas)	R	-
Sulphur	R	-
Sulphur (c)	-	R
Sulphur dioxide	O	-
Sulphur dioxide (dry)	-	R
Sulphur dioxide, liquid	-	X
Sulphuric acid, 50%	R	-
Sulphuric acid, 70%	O	-
Sulphuric acid, conc.	X	-
Sulphuric acid, up to 30% i.w.	-	R
Sulphurous acid, 10%	X	-
Sulphurous acid, (c)	-	O
Sulphurous acid, up to 5%	-	R
Sulphuryl chloride	X	R
Suwa ®	R	-
Sweat, acid (pH 4,7)	R	-
sweat, alkaline (pH 9,5)	O	-
Tanigan ® CLS, 30%	O	-
Tanigan ® CV	O	-
Tannic acid	X	-
Tanning oil Brunofix ®	R	-
Tartaric acid, 10%	R	-
Tartaric acid, 50% i.w.	-	R
TB lysoform	X	-
TERAPIN	-	R
Terostat ®	R	-
Tesafilm ®	R	-
Tesamoll ®	R	-
Test fuel	X	-
Tetrachlorocarbon	X	-
Tetrachloroethane	X	-
Tetrahydrofurane	X	-
Tetralin	-	X
Tetraline	X	-
Texaco Regal Oil BRUO ®	R	-
Texaco Regal Oil CRUO ®	R	-
Thenocalor N	R	-
Thinners in general	-	X
Thiokol rubber (one- and two-component grades)	-	X
Thionyl chloride	-	X
Thiophene	X	-
Tincture of iodine, 5%	-	X
Toluene	X	X
Trichloro acetic acid, 10%	O	-

R = Resistant
O = Limited resistance
X = No resistance

v = Vapour
c = Concentrate
g = Gas

SUBSTANCE	PC	PMMA
Trichloroacetic acid	-	X
Trichloroethyl amine	X	-
Trichloroethyl phosphate (plasticizer)	O	-
Trichloroethylene	X	-
Tricresyl phosphate	-	R
Tricresyl phosphate (plasticizer)	X	-
Triethylamine	-	R
Trosilin F ® extra, 2%	R	-
Trosilin G extra ®, 1,5%	R	-
Tuba ® carpet shampoo, (c)	O	-
Turbo oil 29	R	-
Turpentine	-	O
Turpentine ersatz	R	-
Turpentine substitute	-	O
Urea, (sas)	R	-
VALVANOL, up to 2%	-	O
Valvoline WA 4-7	O	-
Varnish	O	-
Waste gases contg. hydrochloric acid	-	R
Waste gases contg. sulphuric acid	-	R
Water	R	-
WC-00	-	R
Whale fat	R	-
Visor-Pen 7 blau	R	-
WK 60 ® (Kron-Chemie)	R	-
X Sprays (applied directly)	-	X
Xylene	X	X
Zephirol ®	O	-
ZEPHIROL, up to 5%	-	R
Zinc chloride, (sas)	R	-
Zinc oxide	R	-
Zinc sulphate, aqueous	-	R
Zinc sulphate, (sas)	R	-
Zinc sulphate, solid	-	R
ÄTHROL, up to 5%	-	O

m = Metallic
sas = Saturated aqueous solution
i.w. = In water

LEDiL[®]

STRESS CRACKING

LEDiL products are designed and manufactured to avoid internal stress as much as possible, but this can't be totally avoided. Common optical grade thermoplastics are vulnerable to cracking from a combination of external or internal stress sources and chemicals.

Even relatively small concentrations of stress-cracking agent may be sufficient to cause the cracking, but in many cases it's caused by a combination of several factors.

Possible factors that cause cracking

- Manufacturing process
- Temperature changes
 - Thermal expansion and shrinking
- Chemical exposure
 - Detergents
 - Surface active chemicals
 - Lubricants
 - Oils
 - Ultra-pure water
 - Plating additives such as brighteners and wetting agents
- Screw type, torque and other fastening methods

**SEE OUR VIDEO
ABOUT CHEMICALS
IN LED LIGHTING**



LEDiL®

UV-RESISTANCE

Plastics degenerate differently when exposed to UV-light. Some plastics may show dramatic changes, turning yellow or losing some of their transmission properties over a long period of time. This must be considered when choosing materials for your application.

LEDiL has conducted extensive UV-testing over the years for various different materials and found that even materials that tend to have very heavy yellowing will not significantly suffer from efficiency loss. However yellowing may cause the colour temperature to change to warmer tones.

Plexiglas guarantee

PLEXIGLAS® guarantees their materials will not show yellowing and will retain a high level of light transmission for 30 years.



For more information:

http://www.ledil.com/plexiglas_guarantee

PMMA

High UV-resistance with no yellowing. For better impact resistance protective glass is needed.

SILICONE

Dow Corning® MS silicones have very high UV-resistance with no yellowing, and are highly transparent to radiation all the way down to IR-wavelengths.

PC

Good for applications that require higher impact resistance, but will show noticeable yellowing over time when exposed to UV-radiation. Therefore LEDiL does not recommend using products made of PC in applications where exposure to UV-radiation is high. To avoid yellowing special filtering glasses can be used to block out all the damaging UV from sunlight. After a very long period of time ultraviolet light may also cause some brittleness in the material and LEDiL recommends using plastic washers with fasteners to decrease mechanical stresses.

LEDiL[®]

FIRE RATING



Fire resistance testing is carried out as stated in the UL94 standard. The standard classifies plastics according to the burning rate in different positions and different-sized pieces. All LEDiL materials have UL94 standard fire rating. For metallized products UL-class confirmation tests were carried out by Tampere University of Technology.

Fire ratings

- **HB** Slow burning on a horizontal specimen; burning rate < 76mm/min for thickness < 3mm or burning stops before 100mm
- **V-2** Burning stops within 30 seconds on a vertical specimen; drips of flaming particles are allowed.
- **V-1** Burning stops within 30 seconds on a vertical specimen; drips of particles allowed as long as they are not inflamed.
- **V-0** Burning stops within 10 seconds on a vertical specimen; drips of particles allowed as long as they are not inflamed.
- **5VB** Burning stops within 60 seconds on a vertical specimen; no drips allowed; plaque specimens may develop a hole.
- **5VA** Burning stops within 60 seconds on a vertical specimen; no drips allowed; plaque specimens may not develop a hole



HOT WIRE IGNITION (HWI)

Test specimens are wrapped with resistance wire that dissipates a specified level of energy. HWI is the time it takes to either ignite or burn through a specimen. Performance Level Categories (PLC) were introduced to avoid excessive implied precision and bias.

HWI Mean Ignition Time (sec)

PLC0	120 and longer
PLC1	60 through 119
PLC2	30 through 59
PLC3	15 through 29
PLC4	7 through 14
PLC5	<7

HIGH AMP ARC IGNITION (HAI)

The number of arc rupture exposures necessary to ignite a material when they are applied at a standard rate on the surface of the material. Performance Level Categories (PLC) were introduced to avoid excessive implied precision and bias.

HAI Mean Number of Arcs

PLC0	120 and greater
PLC1	60 through 119
PLC2	30 through 59
PLC3	15 through 29
PLC4	<15

OUTDOOR SUITABILITY

Materials considered suitable for outdoor use have been subjected to ultraviolet (UV) light exposure and/or water immersion. UV exposure is performed by using either a twin-enclosed carbon weatherometer for 720 hours, or a xenon-arc weatherometer for 1000 hours. Water immersion testing is performed for 7 days at 70°C. Specimens are tested before and after exposure for flammability, mechanical impact and mechanical strength. Materials whose properties are not significantly degraded in any of these areas are considered to have passed and are suitable for outdoor use.

LEDiL®

LEDiL materials fire rating

- HWI, HAI, RTI and physical

LEDiL materials fire rating		MATERIAL									
		PMMA	PC	PC	PC	PC	Silicone	Silicone	Silicone seal	Ultramid	
		MANUFACTURER									
		Evonik plexiglas 8N	Bayer Makrolon 2407	Sabic Lexan 123R	HRPC	HTPC	harder	softer	Silicone seal	BASF A3EG6	
Flammability	FLAME RATING	TEST METHOD	VALUE								
		0,75mm	UL 94		V-2	HB		HB			HB
	0,75mm	IEC 60695-11-10,20		V-2	HB40		HB75			HB75	
	1,00mm	UL 94					HB	HB			
	1,00mm	IEC 60695-11-10,20					HB75	HB75			
	1,50mm	UL 94	HB		HB	V-0	HB			HB	
	1,50mm	IEC 60695-11-10,20	HB75		HB75	V-0	HB75			HB75	
	1,50mm to 2,60mm	UL 94, IEC 60695-11-10,20		V-2							
	2,50mm	UL 94				V-0, 5VB					
	2,50mm	IEC 60695-11-10,20				V-0, 5VB					
	2,70mm	UL 94		HB							
	2,70mm	IEC 60695-11-10,20		HB75							
	3,00mm	UL 94		HB	HB	V-0, 5VA	HB	HB	HB	HB	
	3,00mm	IEC 60695-11-10,20		HB40	HB75	V-0, 5VA	HB40	HB40	HB40	HB40	
	4,00mm - 4,3mm	UL 94							V-0		
	4,00mm - 4,3mm	IEC 60695-11-10,20							V-0		
	6,00mm	UL 94		HB						HB	
	6,00mm	IEC 60695-11-10,20		HB40						HB40	
Electrical	Hot-wire ignition (HWI)										
	1,00mm	UL746					PLC4	PLC4		PLC4	
	1,50mm	UL746			PLC4						
	1,50-2,60mm	UL746		PLC3							
	2,70mm	UL746		PLC3							
	3,00mm	UL746		PLC2	PLC4		PLC2	PLC4		PLC1	
	6,00mm	UL746		PLC0						PLC0	
	High Amp Arc Ignition (HAI)										
	1,00mm	UL746					PLC1	PLC0		PLC0	
	1,50mm	UL746			PLC2						
	1,50-2,60mm	UL746		PLC0							
	2,70mm	UL746		PLC0							
	3,00mm	UL746		PLC0	PLC1		PLC0	PLC0		PLC0	
6,00mm	UL746		PLC0						PLC0		
Thermal	RTI Elec. (1,50mm)	UL 94	90°C	125°C	130°C	120°C	140°C	150°C	150°C	150°C (4,0-4,3mm)	120°C
	RTI Imp. (1,50mm)	UL 94	90°C	115°C	125°C	105°C	130°C	150°C	150°C	150°C (4,0-4,3mm)	120°C
	RTI Str. (1,50mm)	UL 94	90°C	125°C	125°C	120°C	140°C	150°C	150°C	150°C (4,0-4,3mm)	130°C
Physical	Outdoor suitability	UL 746C	f1	f1	f1			f1	f1		

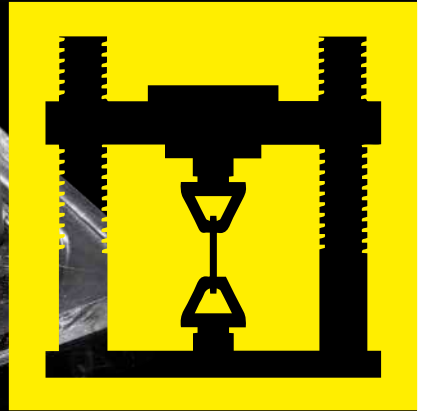
Rating Description

f1 The material has met both UV and water immersion requirements.

f2 The material has met either UV or water immersion requirements, or has only been partially tested.

LEDiL[®]

TENSILE STRENGTH



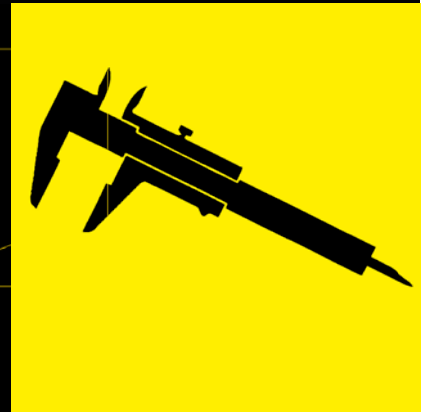
LEDiL tests its products to meet or exceed tensile strength requirements and standards; this includes tape fastening, third party adhesives and mechanical structures such as pins.

LEDiL Disclaimer:

LEDiL cannot take responsibility for the results obtained by third party methods we cannot control. It is always the customer's responsibility to determine and verify the sufficient tensile strength in the final product and its components.

LEDiL®

TOLERANCES



GENERAL TOLERANCES FOR LINEAR DIMENSIONS (DIN 16901-130)

Linear dimensions (mm)	(mm)
$a \leq 1$	$\pm 0,18$
$1 < a \leq 3$	$\pm 0,19$
$3 < a \leq 6$	$\pm 0,20$
$6 < a \leq 10$	$\pm 0,21$
$10 < a \leq 15$	$\pm 0,23$
$15 < a \leq 22$	$\pm 0,25$
$22 < a \leq 30$	$\pm 0,27$
$30 < a \leq 40$	$\pm 0,30$
$40 < a \leq 53$	$\pm 0,34$
$53 < a \leq 70$	$\pm 0,38$
$70 < a \leq 90$	$\pm 0,44$
$90 < a \leq 120$	$\pm 0,51$
$120 < a \leq 160$	$\pm 0,60$
$160 < a \leq 200$	$\pm 0,70$
$200 < a \leq 250$	$\pm 0,90$
$250 < a \leq 315$	$\pm 1,10$
$315 < a \leq 400$	$\pm 1,30$

GENERAL TOLERANCES FOR PRODUCTS MADE OUT FROM SILICONE (ISO 3302-1 CLASS M3)

Dimensions (mm)	(mm)
$a \leq 6,3$	$\pm 0,40$
$6,3 < a \leq 10$	$\pm 0,50$
$10 < a \leq 16$	$\pm 0,60$
$16 < a \leq 25$	$\pm 0,80$
$25 < a \leq 40$	$\pm 1,00$
$40 < a \leq 63$	$\pm 1,30$
$63 < a \leq 100$	$\pm 1,60$
$100 < a \leq 160$	$\pm 2,00$
> 160	$\pm 1,3\%$

DIN 16901-130

The tolerances in this standard

are applicable to the dimensions of plastic mouldings produced from thermoplastic and thermosetting moulding materials by compression moulding, transfer moulding, compression injection moulding or injection moulding;

are not applicable to extrusions, blow-moulded or foamed mouldings, deep drawn parts, sintered parts and parts produced by a chip removal machining process.

ISO 3302-1 Class M3

International Standard **ISO 3302-1** was prepared by Technical Committee ISO/TC 45, Rubber and rubber products, Subcommittee SC 4, Miscellaneous products.

The tolerances are primarily intended for use with vulcanized rubber but may also be suitable for products made of thermoplastic rubbers.

LEDiL[®]



FASTENING

We ask customers to check and fully test the suitability of the fastening and bonding integrity for their product. For example, mechanical stress, humidity, temperature fluctuation, vibration and holes on the surface of the circuit board can weaken the strength of the fastening and bonding. Final testing and verifying of fastening methods, adhesives and their combinations are always the customer's responsibility.

TAPE

Unless otherwise stated, all LEDiL products supplied with tape use the same double-sided foam (polyurethane), with an acrylic pressure-sensitive adhesive coating on both sides.

All surfaces where tape is applied must be straight, clean, dry and free from grease and dirt. The taped components should be firmly held for 1-5 seconds to ensure the best possible bond. The tape will reach its final strength in 72 hours, depending on the material and the ambient conditions.

Any chemical used during the installation process may damage both the LED or the lens. Please ensure that all harmful chemicals have been fully removed before applying these components. Optical components should not be cleaned with any chemicals – only a micro fibre cloth should be used for cleaning.

In extreme conditions (heavy or prolonged exposure to high ultraviolet radiation, moisture, temperature changes etc.) LEDiL recommends using glue or screws to ensure reliable operation. Tapes can also be used to absorb some of the vibrations.

Technical properties

- Installation pressure: 11N/cm²
- Maximum recommended weight load: 15g/cm²
- Assembly temperature range: +10°C ... +40°C
- Usage temperature range, when cured: -40°C ... +120°C
- Resistance to abrasion, corrosion, moisture, dilute acids and alkalis
- UV light resistance tested according to ASTM G53-84 by tape manufacturer
- 1 year expected shelf-life from purchase



For more information:

http://www.ledil.com/adhesive_tape

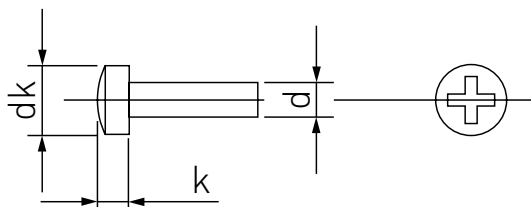
LEDiL[®]

SCREW

The following is only general information and for more details about tightening and exceptions please download the datasheet for each product.

For most of the products screws are of type M3. (DIN 7985, ISO 7045/ISO 14583 TX), with maximum tightening torque of 0,6 Nm. Countersunk screws are not allowed, and self-tapping screws are not recommended.

LEDiL recommends using M3 nylon washers (DIN 125 / ISO 7089) between the screws and the lens to minimize stresses induced by fastening torque.

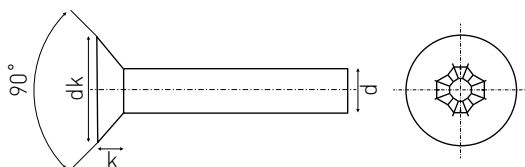


DIN 7985 / ISO 7045 / SFS 2976

Thread Size	M3
dk	6mm
d	3mm
k max	2,52mm
L	4-22mm

Please note:

Differing from other lenses, the **CS14145_STRADA-IP-2X6-DWC-90** module needs countersunk screws of type M3 (DIN 965) for fastening the PCB to the heatsink.



DIN 965 / ISO 7046 / SFS 2977

Thread Size	M3
dk	5,6 mm
d	3 mm
k max	1,65 mm
L	4 – 22 mm

If the design requires it, it is possible to use ultra-low head cap screws.



For more information:

<https://www.ledil.com/ultra-low-screw>

LEDiL®

GLUE

Contact your local bonding manufacturer such as DELO® or LOCTITE® for recommended adhesives for your product.



More information about bonding by DELO®
www.ledil.com/delo-adhesives

POTTING

Contact your local bonding manufacturer such as DELO® or LOCTITE® for recommended adhesives for your product.



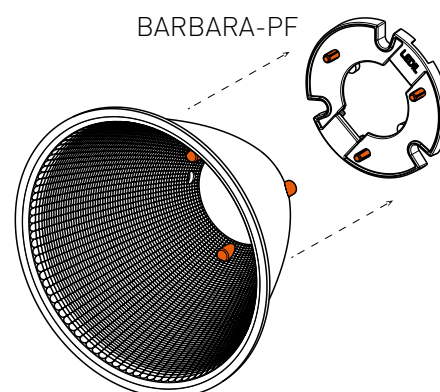
More information about bonding by DELO®
www.ledil.com/delo-adhesives

PRESS-FIT

Please note that LEDiL's press-fit products are designed to be assembled only once and pins won't withstand unfastening.

Align the pins in the socket with the holes in the reflector feet and press the reflector fully into the socket. Make sure you push the reflector evenly.

LEDiL's press-fit fasteners for the FLORENCE-3R product family are designed for electrical appliances that may, for security or safety reasons, require restricted access. They feature tamper-proof luminaire assembly and class 1 light fitting.



HOLDER

LEDiL's holders are generally very straightforward and easy to assemble. They can be fastened with either positioning pins, clips or screws. If there is a certain installation requirement, for example in some of the ROSE-lenses, it is mentioned in the corresponding datasheet or application note.

LEDiL Disclaimer:

Some holders may allow multiple installations after the optics are removed, but LEDiL does not guarantee this or accept liability in any circumstances where possible malfunctioning or damage to the product, component, individual or property is caused by such actions.

LEDiL[®]

PROFILES

Some LEDiL lenses are designed to fit existing aluminium profiles like GIZA from Klus for example. (<http://www.klusdesign.com/products/show/235>)

Currently supported product families:

- FLORENCE-1R
- FLORENTINA
- ZENIA

LEDiL Clips:

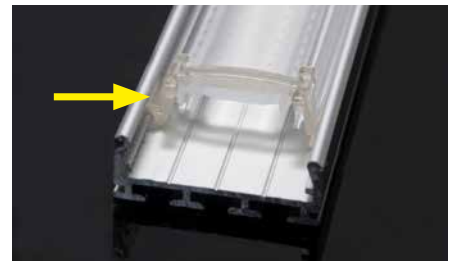
Achieve a sleek and uniform luminaire exterior by connecting lenses in continuous rows with LEDiL retaining clips.

Clip A and C for installation on a plate and Clip B for profile installation

- **C14353_FLORENCE-1R-CLIP-A** for 40 mm wide PCB's (like Philips Fortimo) and screw mount
- **C14409_FLORENCE-1R-CLIP-B** fits straight into aluminum profile, no screws needed.
- **C14751_FLORENCE-1R-CLIP-C** for 24 mm wide PCB's and screw mount



C14353_FLORENCE-1R-CLIP-A

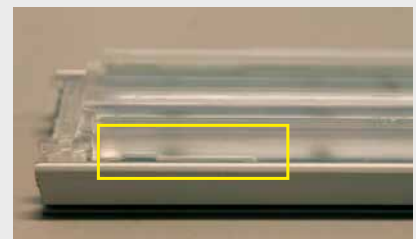
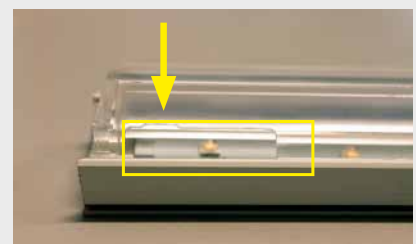


C14409_FLORENCE-1R-CLIP-B

FLORENCE-1R assembly

Place the lens in the aluminium profile and fasten it with the clips. Make sure the whole lens is evened out and that every hole reserved for connectors are hidden inside the profile.

The fastening clips will be installed on both sides of every lens. This allows lenses to be connected in a continuous row to achieve uniform appearance.



**SEE OUR VIDEO
ABOUT FLORENCE-1R
ASSEMBLY**

 YouTube

<https://youtu.be/ZP6QxR3hS6Q>