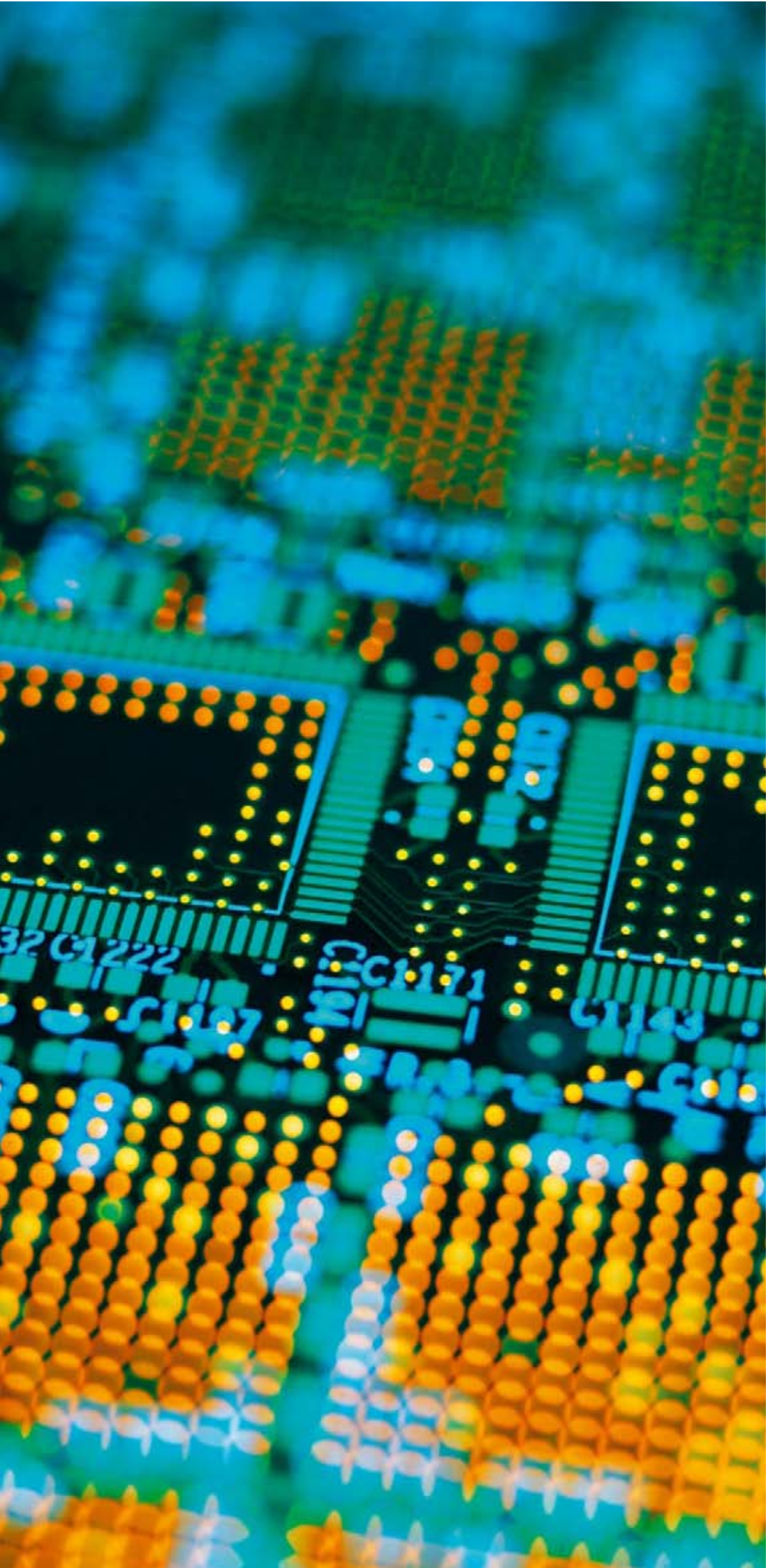


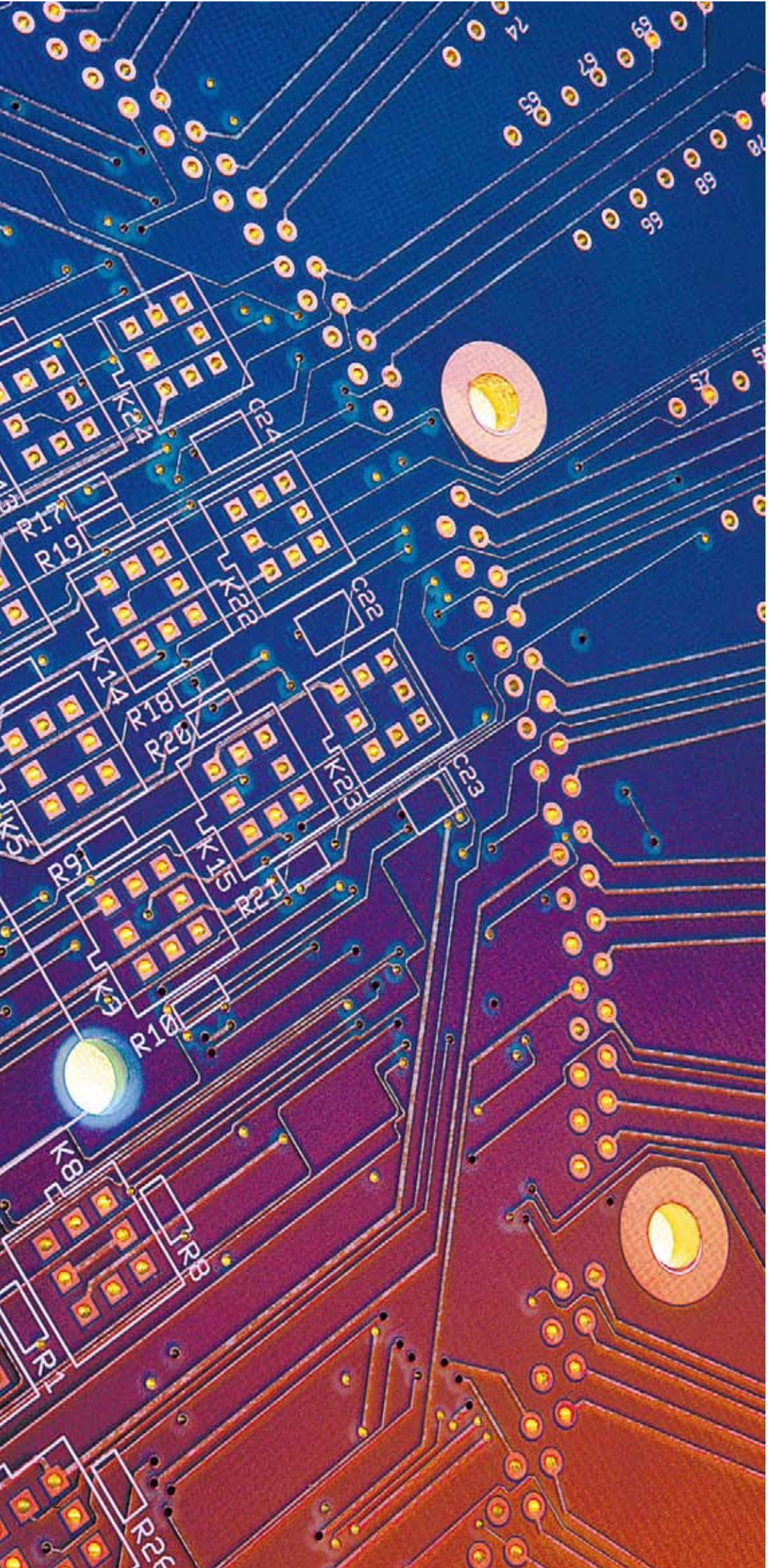
isola

B-DE 104 ML/4

DURAVER®-E-Cu quality 104 ML

Base materials

for multilayers


R17
R19
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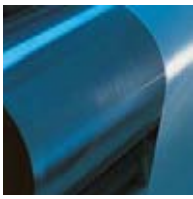
Quality and security to give you the edge



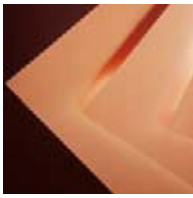
The demands imposed with regard to the performance of base materials are rising constantly, whether for communications or computer systems, automobile electronics or medical technology. Not only the electrical and thermal values, but also the dimensional stability and surface quality must be adapted to the particular application and meet today's requirements.

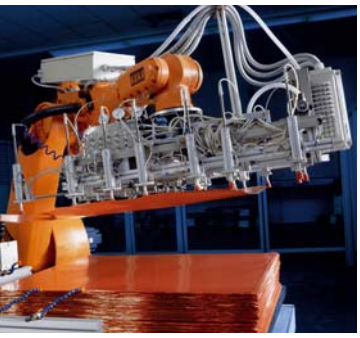
Isola is a pioneer in the manufacture of thin laminates and prepregs for multilayer systems.

Isola supplies a wide range of glass fabric reinforced thin laminates and prepregs for multilayer circuit boards, which are made from selected raw materials. In combination with a tried-and-tested production process and uncompromising quality concept, they are the best possible base for sophisticated and acknowledged products.

Current product information can also be obtained from our website www.isola-group.com

Contents





Innovative solutions for individual applications

Thin laminates DURAVER®-E-Cu quality 104 ML

Thin laminates and prepregs have an operative influence on the effectiveness of multilayers. Due to permanent optimization of the material components and the accordingly production technology, the DURAVER®-E-Cu 104 ML became a versatilely applicable base material with a glass transition temperature of 135 °C.
The special resin formulation shows a high thermal resistance (time to delamination @ 260 °C > 60 min.) and is chemical resistant which reduces the risks of resin recession to a minimum.

An excessive etch back in the drill holes is prevented, whereby a high reliability of the trough-hole plating also under cyclic stress is implied.

All thin laminates DURAVER®E-Cu 104 ML corresponds to NEMA-Grade FR-4 and meets the requirements of the norm IPC-4104A, corresponding to data sheet 21.

DURAVER®-E-Cu quality 104 ML Standard Constructions

Nominal thickness (Substrate without Cu)		**Thickness tolerance**		**Construction**	**Mean resin content**
		IPC-4101A cl. B	IPC-4101A cl. C		
mm	inch	mm	mm		%
0.075	0.003	± 0.018	± 0.013	1 x 1080	64
0.100	0.004	± 0.018	± 0.013	1 x 2116	46
0.125	0.005	± 0.025	± 0.018	1 x 2165	49
0.150	0.006	± 0.025	± 0.018	1 x 2157	48
0.200	0.008	± 0.038	± 0.025	1 x 7628M	45
0.250	0.010	± 0.038	± 0.025	2 x 2165	49
0.300	0.012	± 0.050	± 0.038	2 x 2157	48
0.360	0.014	± 0.050	± 0.038	2 x 7628M	41
0.410	0.016	± 0.050	± 0.038	2 x 7628M	45
0.460	0.018	± 0.050	± 0.038	1 x 7628 + 1 x 2125 + 1 x 7628	44
0.510	0.020	± 0.064	± 0.050	3 x 7628	41
0.560	0.022	± 0.064	± 0.050	3 x 7628M	41
0.610	0.024	± 0.064	± 0.050	3 x 7628M	45
0.710	0.028	± 0.064	± 0.050	4 x 7628M	41
0.760	0.030	± 0.064	± 0.050	4 x 7628M	43
0.900	0.035	± 0.100	± 0.075	5 x 7628M	41
1.000	0.039	± 0.100	± 0.075	5 x 7628M	45
1.080	0.042	± 0.130	± 0.075	6 x 7628M	41
1.200	0.047	± 0.130	± 0.075	6 x 7628M	45

Other thicknesses on request.

Supply forms

One-sided and two-sided copper-clad laminates are available. Typical copper foil thicknesses (18, 35, 70 µm) correspond to IPC-4562, grade 3 (HTE-quality). For laminates with a substrate ≤ 0.1 mm VLP foils with HTE properties are used.

Sheets

The laminates are produced in the following sheet sizes:

1070 mm x 1165 mm warp
1225 mm x 1070 mm warp
1225 mm x 925 mm warp
1070 mm x 1285 mm warp

Tolerances: + 3.0 mm
- 0 mm

Panels

Panels are supplied cut to specifications, with a minimum thickness of 0.25 mm, on request also with mechanically profiled edges.

Various forms of identification are also available, such as laser marking, embossing or ink-jet printing (also as barcode).

On request the panels can be stacked on plastic mini pallets, which are suitable for a direct binding to the innerlayer production line. Thereby it is possible to reduce additional handling steps, which will have a positive impact on the copper surface quality.

Isola thin laminates are adjusted to absorb UV light. This property helps to reduce the pseudo-error rate in auto-optical inspections (AOI), particularly when using AOI laser scanners which operate with fluorescent methods. Undesired through-exposure (ghosting) on the opposite side is avoided when exposing the solder resist to UV light.

Important note for processing

The warp and weft of the laminates and prepregs must run in the same direction in the multilayers to be laminated. When ordering panels, it is therefore important to specify which value is to correspond to the warp direction.

Universal prepregs for greater flexibility

Prepregs
DURAVER®-E quality 104 ML
DURAVER®-E quality 104 KF ML

Flexibility and process optimization are factors of great importance in the circuit board industry.
Sophisticated production techniques and high-grade base materials are needed in order to meet customers' individual wishes – particularly when producing multilayers.

DURAVER®-E quality 104 ML Universal prepreg

In close cooperation with customers, Isola has developed a universal prepreg which can be processed without difficulty using every known modern bonding technology.

They are produced on modern treaters which operate with radiant heat. This is the only way to guarantee that the prepreg values remain within close limits over the full width of the fabric web. The resin content is measured and adjusted on-line. This ensures an ideal process capability.

Properties

Universal prepregs of DURAVER®-E quality 104 ML are characterized by:

- Resin content
- Gel time
- Viscosity

Advantages of the universal prepreg

- Only one prepreg type for different bonding techniques
- Therefore simplified logistics and handling, no stock duplication
- Unchanging quality standards
- Short delivery times

Highly resinous prepregs DURAVER®-E quality 104 ML AT 99

For use in single ply multilayer constructions for prepregs, quality AT 99 has been developed. This quality has the distinction of a much higher resin content, compared with the standard prepregs AT 05. The residual gel time and viscosity of the AT 99 prepregs has been optimized according to the high resin content, so that a controlled resin flow can take place during the relamination process.

DURAVER®-E quality 104 KF ML

For the construction of multilayer with high tracking resistance special base material is needed. Isola offers a relamination prepreg with these superior properties in addition to tracking resistant rigid laminates. With these prepregs multilayer with tracking resistance CTI 400 can be realised.

Technical data and approvals

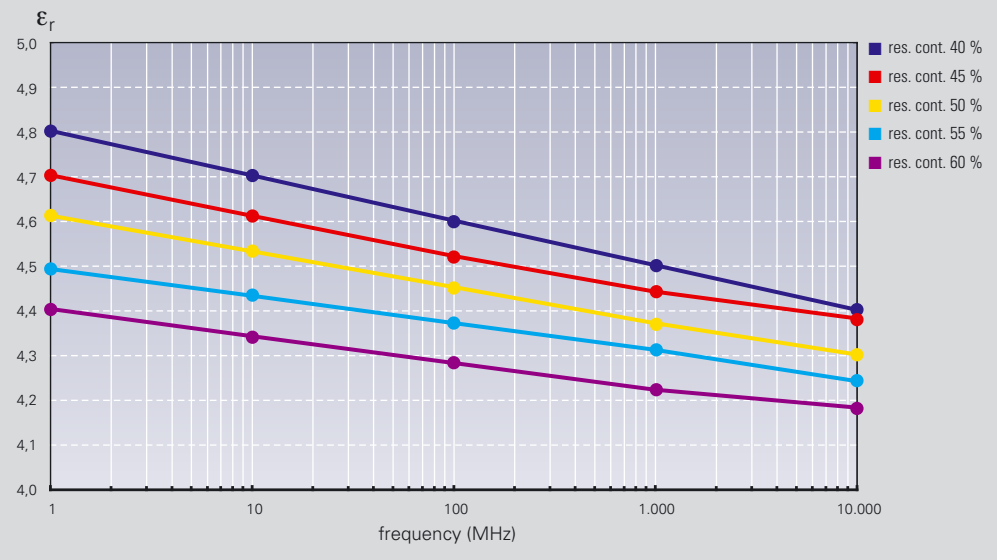
DURAVER®-E quality 104 ML/KF ML

Prepreg type	Nominal thickness		Resin content	Residual gel time	Viscosity	Scaled Flow	
	mm	inch	%	s	Pa · s	mil/Prepreg	mm/Prepreg
106 AT05	0.059	0.002	75 ± 3	50 ± 15	35 ± 10	1.8 ± 0.2	0.046 ± 0.005
1080 AT05	0.078	0.003	65 ± 3	50 ± 15	35 ± 10	2.5 ± 0.3	0.064 ± 0.008
2125 AT05	0.106	0.004	55 ± 3	50 ± 15	35 ± 10	3.7 ± 0.3	0.095 ± 0.008
2116 AT05	0.120	0.005	53 ± 3	50 ± 15	35 ± 10	4.0 ± 0.3	0.100 ± 0.008
7628 AT05	0.201	0.008	47 ± 3	50 ± 15	35 ± 10	6.8 ± 0.3	0.173 ± 0.008
1080 AT99	0.107	0.004	74 ± 3	45 ± 15	40 ± 10	3.0 ± 0.3	0.077 ± 0.008
2116 AT99	0.146	0.006	60 ± 3	45 ± 15	40 ± 10	4.7 ± 0.3	0.120 ± 0.008
7628 AT99	0.226	0.009	51 ± 3	45 ± 15	40 ± 10	7.1 ± 0.3	0.180 ± 0.008
7628 KF13	0.203	0.008	48 ± 3	125 ± 20	–	–	–

Other fabric types on request.

Dielectric constant depending on frequency and resin content

Loss factor from 1 MHz to 10 GHz = 0.0195 ± 0.005



Approval
Underwriters' Laboratories Inc.
File-No. E41625

Supply forms and storage

Prepregs are supplied in rolls or panels.

Supply forms

Rolls:

Standard widths (tolerance ± 5.0 mm) 1250 mm (location oriented); other roll widths available on request.
Standard lengths approx. 150 - 300 m, depending on the type of fabric

Panels:

Produced to customer's specifications (tolerance ± 1.0 mm)

Correct handling and storage of the prepregs are essential prerequisites for trouble-free processing. Isola prepregs are tested in accordance with delivery specifications immediately before being packaged. The test values obtained in such tests are stated on every package.

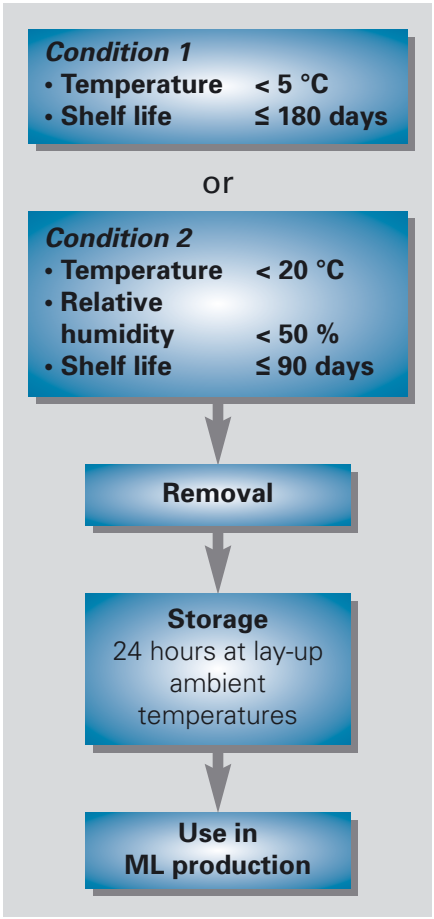
If required, the panels can also be tooled in accordance with specifications, i.e. provided with the reference system for pin-lam technology.

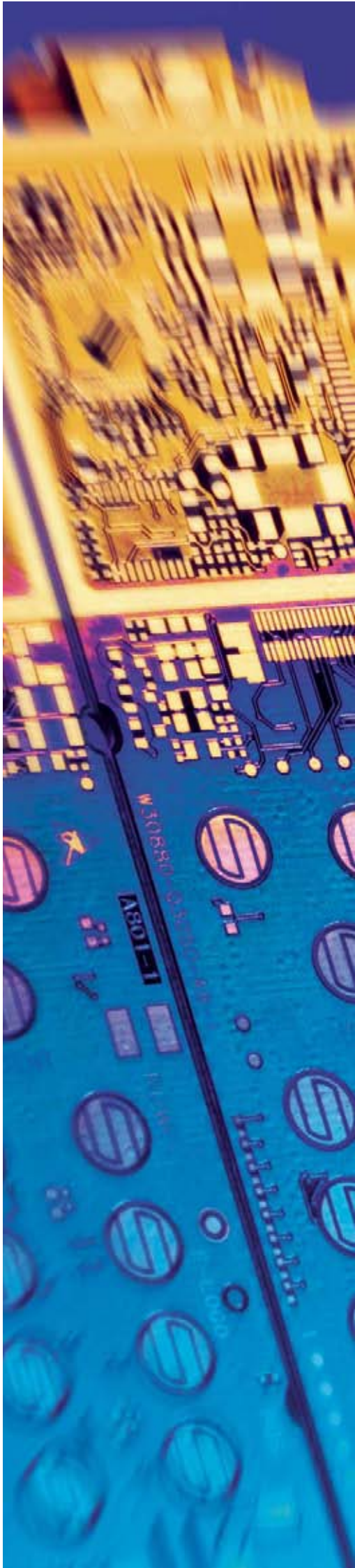
Various blanking tools are available.

Packing

To achieve a reduced handling on the one hand and thereby conditional low dust emerge by packing, we recommend to stack on plastic mini pallets, which can be used all the way to the multilayer lay up station. Thereby the cost for releasing the prepregs from stock will be minimized.

Technical notes for storage of prepregs





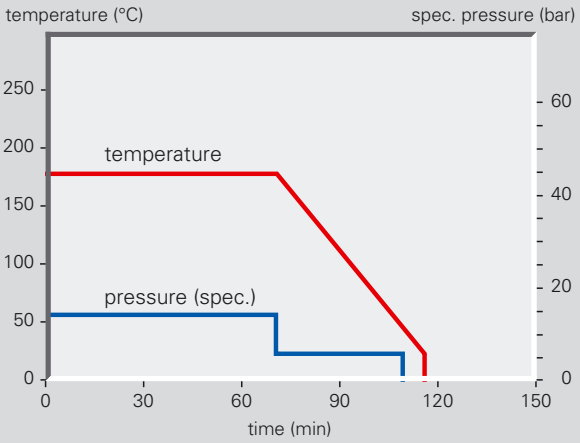
Multilayer press parameters

The flow properties (rheology) and polymerization of the prepregs used for multilayer production are decisively influenced by the following parameters:

- **Prepreg type**
- **Type of multilayer:**
  Format, Construction, Layout
- **Package:**
  Mould, Padding, Separating sheets, Package height
- **Press parameters:**
  Temperature profile, Pressure profile, Vacuum support

Recommended press parameters

Hydraulic press



Temperature profile

Load: 180 °C

180 °C → hold for 70 min

180 °C → Transfer to cooling press (cooling app. 45 min)

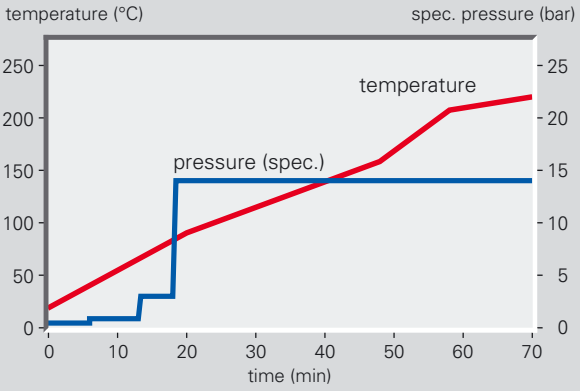
Pressure profile

Load: 15 bar

15 bar → hold for 70 min

15 bar → Transfer to cooling press (contact pressure)

ADARA press



Technical Values

DURAVER®-E-Cu quality 104 ML

Specification Sheet #:	IPC-4101A/21
Reinforcement:	woven E-glass
Resin system:	primary: difunctional epoxy • secondary: multifunctional epoxy
Flame Retardant Mechanism:	brominated epoxy resin • minimum UL 94 requirement: V-1
Fillers:	inorganic
ID Reference:	UL/ANSI: FR-4 • ANSI: FR-4/21
Glass Transition (T_g):	110 °C - 150 °C

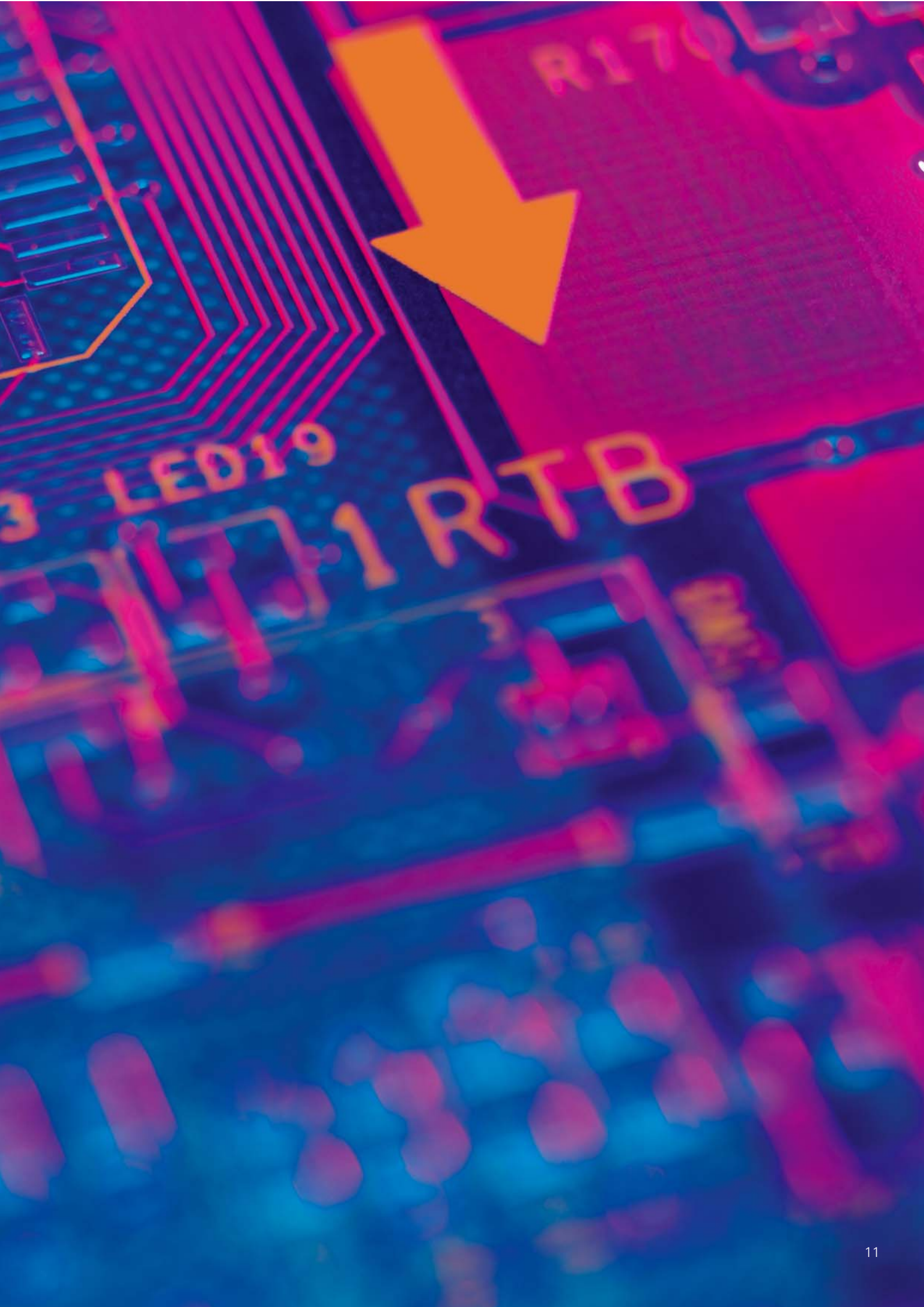
Explanations:
C = preconditioning in humidity chamber
E = preconditioning at temperature

The figures following the letter symbols indicate with the first digit the duration of the preconditioning in hours, with the second digit the preconditioning temperature in °C and with the third digit the relative humidity.

Properties	Units	Laminate thickness < 0.50 mm		Laminate thickness ≥ 0.50 mm	
		Specification	Isola-Value	Specification	Isola-Value
1. Peel Strength, minimum					
A. Low profile copper foil and very low profile profile copper foil – all copper weights >17 microns	N/mm	0.70	1.20	0.70	n/a*
B. Standard profile copper foil (35 microns)					
1. After thermal stress	N/mm	0.80	1.50	1.05	1.50
2. At 150 °C	N/mm	0.70	1.40	0.70	1.40
3. After process solutions	N/mm	0.55	1.50	0.80	1.50
C. All other foil composite	N/mm	n/a*	n/a*	n/a*	n/a*
2. Volume Resistivity, minimum					
A. C-96/35/90	MΩ · cm	$1.0 \cdot 10^6$	$6.0 \cdot 10^6$	n/a*	n/a*
B. After moisture resistance	MΩ · cm	n/a*	n/a*	$1.0 \cdot 10^6$	$8.0 \cdot 10^8$
C. At elevated temperature E-24/125	MΩ · cm	$1.0 \cdot 10^3$	$7.2 \cdot 10^6$	$1.0 \cdot 10^3$	n/a*
3. Surface Resistivity, minimum					
A. C-96/35/90	MΩ	$1.0 \cdot 10^4$	$1.3 \cdot 10^6$	n/a*	n/a*
B. After moisture resistance	MΩ	n/a*	n/a*	$1.0 \cdot 10^4$	$4.0 \cdot 10^6$
C. At elevated temperature E-24/125	MΩ	$1.0 \cdot 10^3$	$3.7 \cdot 10^7$	$1.0 \cdot 10^3$	$7.0 \cdot 10^4$
4. Moisture Absorption, maximum	%	n/a*	n/a*	0.80	0.16
5. Dielectric Breakdown, minimum	kV	n/a*	n/a*	40	45
6. Permittivity @ 1 MHz, maximum (Laminate or prepreg as laminated)		5.4	4.6 - 4.9	5.4	4.6 - 4.9
7. Loss Tangent @ 1MHz, maximum (Laminate or prepreg as laminated)		0.035	0.020	0.035	0.019
8. Flexural Strength, minimum					
A. Length direction	N/mm^2	n/a*	n/a*	415	600
B. Cross direction	N/mm^2	n/a*	n/a*	345	480
9. Flexural Strength @ Elevated Temperature, 150 °C length direction, minimum	N/mm^2	n/a*	n/a*	n/a*	n/a*
10. Thermal Stress at 288 °C, minimum					
A. Unetched	s	≥ 10	≥ 10	≥ 10	≥ 10
B. Etched	s	≥ 10	≥ 10	≥ 10	≥ 10
11. Electric Strength, minimum (Laminate or prepreg as laminated)	kV/mm	30	39	n/a*	n/a*
12. Flammability	class	V-1	V-0	V-1	V-0
13. Glass Transition Temperature (T_g) DSC	°C	110 - 150	135	110 - 150	135
14. Coefficient of Thermal Expansion (CTE) TMA					
Fill direction (below T_g/ above T_g)	ppm/K	–	–	–	17/12
Warp direction (below T_g/ above T_g)	ppm/K	–	–	–	12/7
Vertical (below T_g/ above T_g)	ppm/K	–	–	–	45/230

*not applicable

Tests are carried out in accordance with IPC-650 test methods.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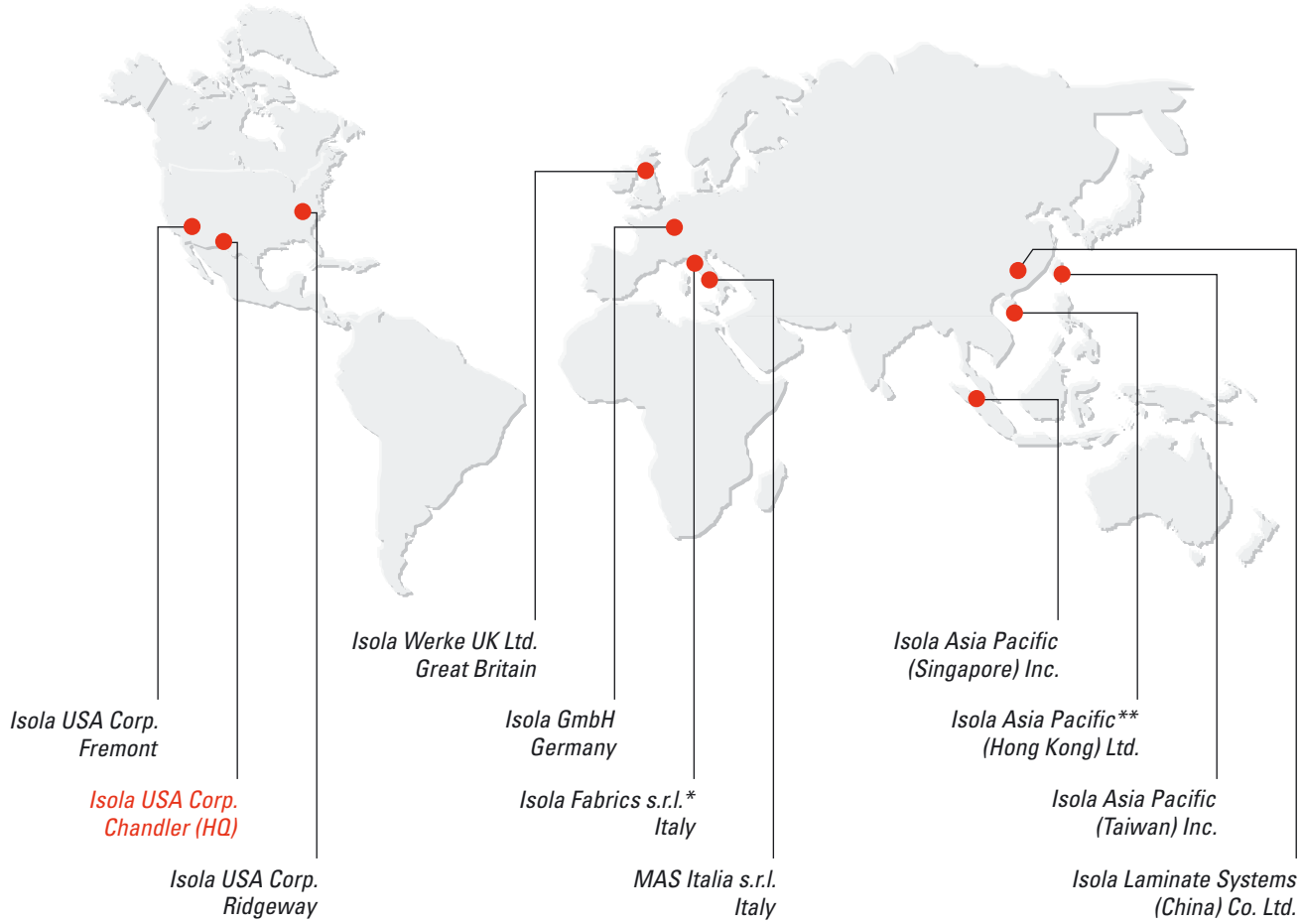

* Glass fabrics ** Sales office only

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