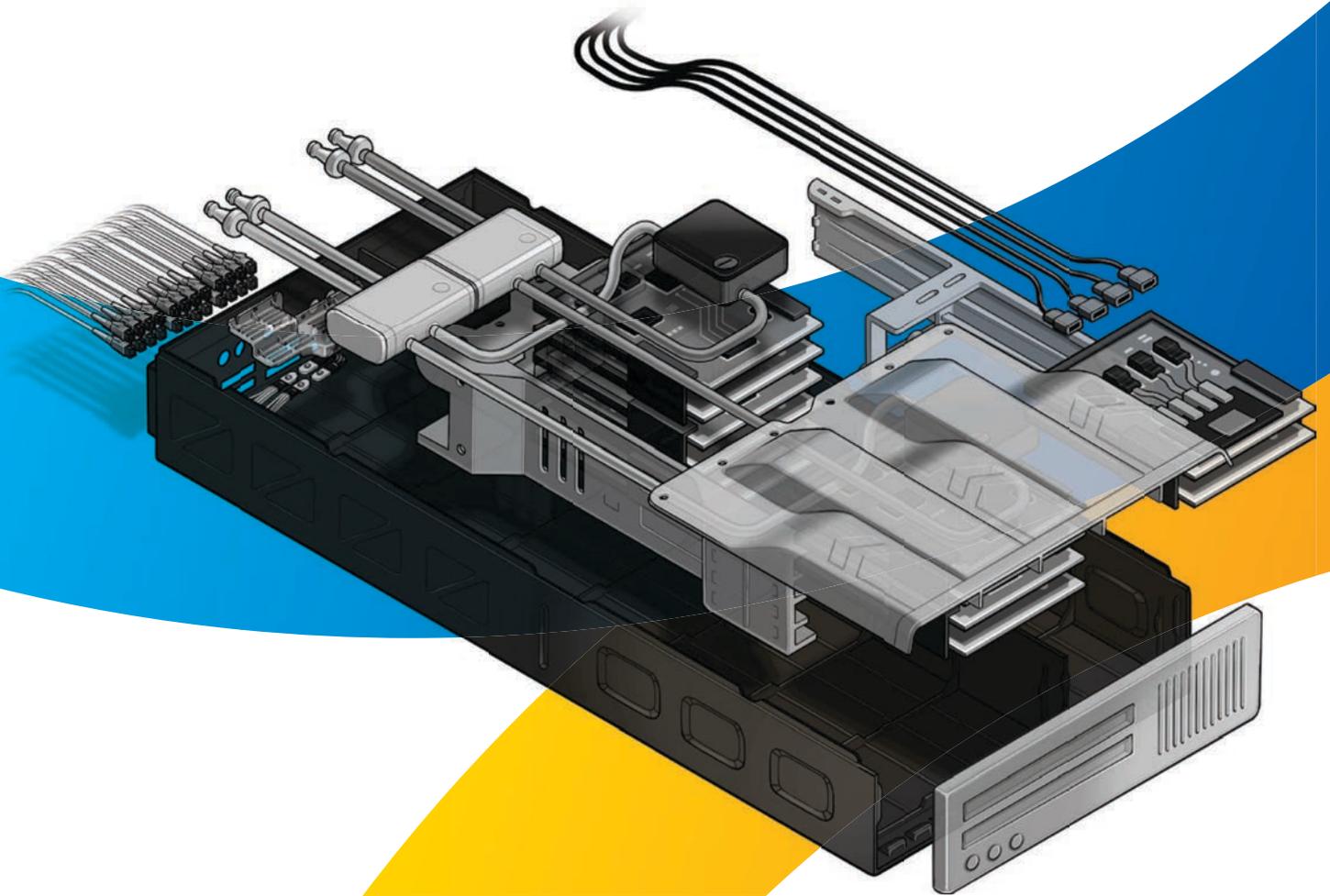


CHEMISTRY THAT MATTERS™



GET MORE FROM AI DATA CENTERS

MEET RELIABILITY, SUSTAINABILITY AND
FLAME RETARDANCY REQUIREMENTS



ABOUT SABIC SPECIALTIES

SABIC's Specialties business offers more than just materials. Our technical teams are constantly innovating to bring you advanced thermoplastic technologies that help address the rigorous requirements of AI data centers. For instance, we are expanding our NIA-PFAS and non-halogenated FR portfolio to offer grades containing more PCR or certified renewable bio-based content.

We invite you to work with us in a personal and collaborative way. Our team is well equipped to support your product development organization with expertise in materials, design, application development, processing and testing.

Contact us today to learn more.

Email us at Specialties@sabic-hpp.com or scan the code.



Look for our
sustainability
icon

SPECIALTY THERMOPLASTICS HELP ENSURE RELIABLE PERFORMANCE OF AI DATA CENTERS

To achieve long-term efficiency and computing performance, hardware designers must look for materials that can retain critical properties and capabilities in the demanding data center environment.

Because data centers comprise massive amounts of advanced hardware in confined spaces, they will require new architectural, engineering and design changes. An example is incorporating advanced liquid cooling systems as air cooling reaches its limit. Heat, humidity, chemicals and electrical/electronic exposures are among the many challenges.

PERFORMANCE REQUIREMENTS FOR AI DATA CENTERS



CHEMICAL RESISTANCE

to cooling fluids, such as fluorinated dielectrics, mineral oil, synthetic oils, and propylene glycol and water mixtures, at high temperatures



FLAME RETARDANCY

to meet the UL94 V0 standard @ 1.5 mm with non-halogenated FR solutions and without intentionally added PFAS (NIA-PFAS)



OPTICAL TRANSPARENCY

for viewing bus bar connections and for clear dividers used to fill air gaps during server rack replacement or maintenance



SUSTAINABLE OPTIONS

through incorporation of post-consumer recycled (PCR) content or certified renewable bio-based feedstocks



ELECTRICAL PERFORMANCE

- Electromagnetic interference (EMI) shielding
- Anti-static performance
- Non-conductive, non-galling for Intel land module posts to reduce electrical shorting

MEETING SPECIFIC NEEDS WITH OPTIMIZED FORMULATIONS

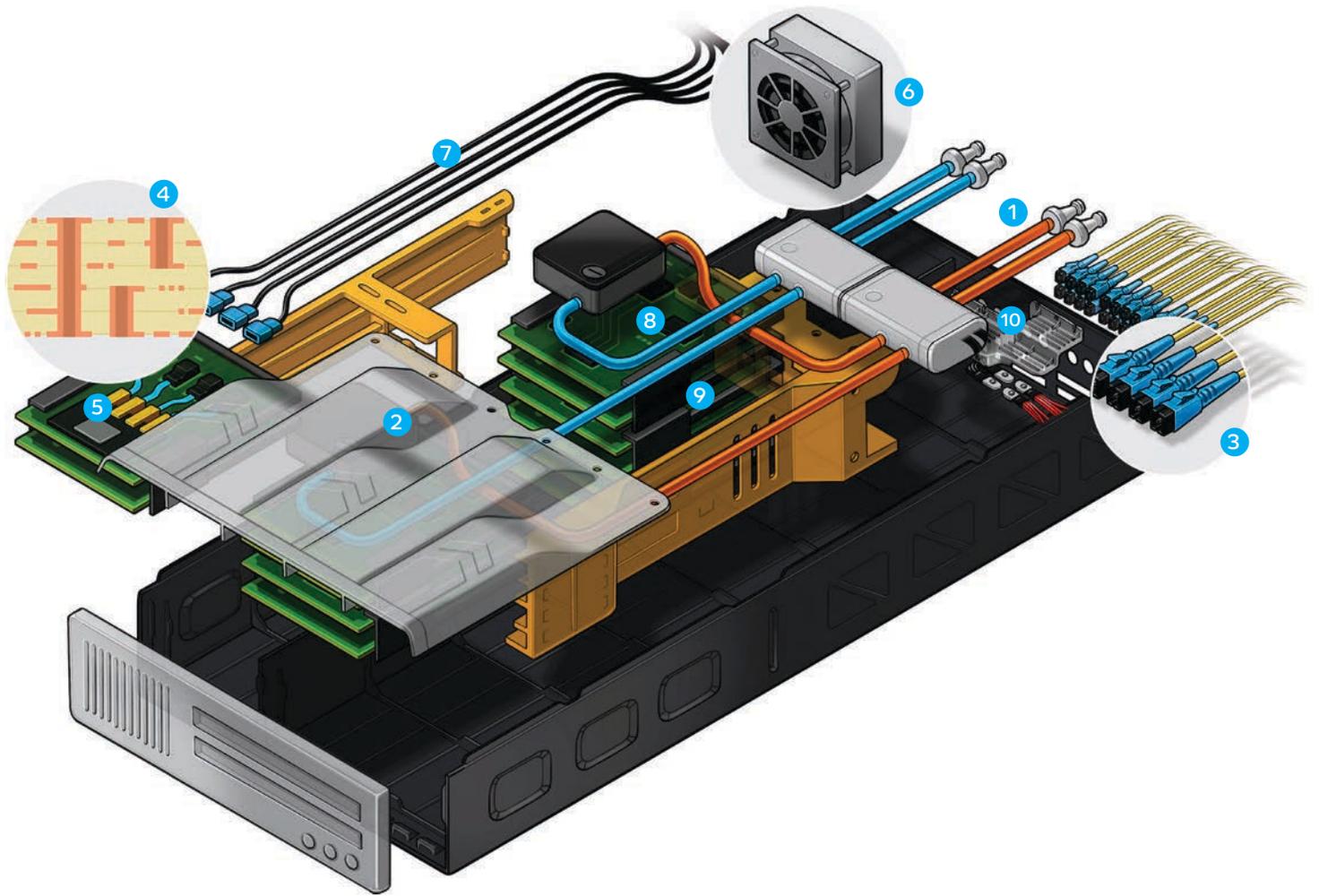
The unique properties of thermoplastics are valuable for advanced electronic systems in data centers: light weight and strength, inherently thermally and electrically nonconductive, transparent or opaque, and sustainable. Properties can be optimized through formulation of copolymers and blends and incorporation of additives and reinforcements.

HELPING CUSTOMERS ACHIEVE SUSTAINABILITY GOALS

For circularity, plastic components of complex systems like data center servers should be easy to remove, separate, sort and recycle into new components. SABIC offers a wide range of sustainable materials that maintain the high quality, performance and manufacturability of fossil-based equivalents including feature upcycled, mechanically recycled and certified renewable bio-based feedstocks.



Download brochure:
bit.ly/Sustainable_Options



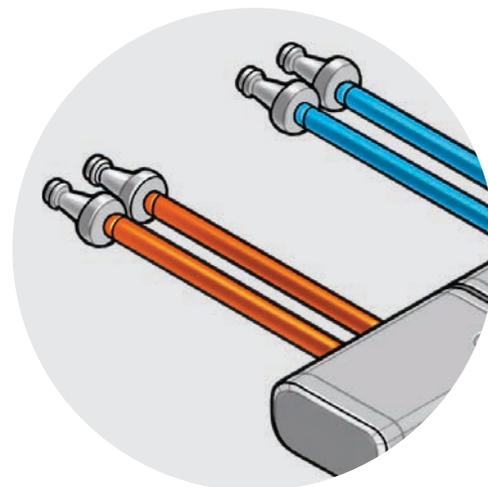
TYPICAL COMPONENTS IN AI DATA CENTERS

- | | |
|--|--|
| <p>1. LIQUID COOLING CONNECTIONS ULTEM™ resins</p> <p>2. INTERIOR AIR GUIDES, IBLANKS, CABLE GUIDES LNPTM ELCRIN™ copolymers NORYL™ resins</p> <p>3. SIGNAL CONNECTORS ULTEM™ resins</p> <p>4. DIELECTRIC SUBSTRATE MATERIALS NORYL™ PPE oligomers</p> <p>5. PLUG-IN, ONBOARD, CO-PACKAGED OPTICS ULTEM™ and EXTEM™ resins</p> | <p>6. SERVER COOLING FANS ULTEM™ resins LNPTM ELCRIN™ resins</p> <p>7. CABLE JACKETING SILTEM™ resins FLEX NORYL™ resins NORYL reactive polyols</p> <p>8. EMI SHIELDING LNPTM FARADEx™ compounds</p> <p>9. ANTI-STAT AND STATIC DISSIPATIVE IN PACKAGING/SLIDING PARTS LNPTM STAT-KONTM™ and STAT-LOYTM™ compounds</p> <p>10. BUS BAR COVER LNPTM ELCRESTM™ copolymers</p> |
|--|--|

1 LIQUID COOLING CONNECTIONS ULTEM™ RESINS

- Inherent FR (non-halogenated), chemical resistance, dimensional stability, burst pressure resistance
- Thin-wall FR: UL94 V0 down to 0.75 mm (0.03 in)
- Potential replacement for corrugated polytetrafluoroethylene (PTFE)
- Renewable, bio-based and PCR grades available

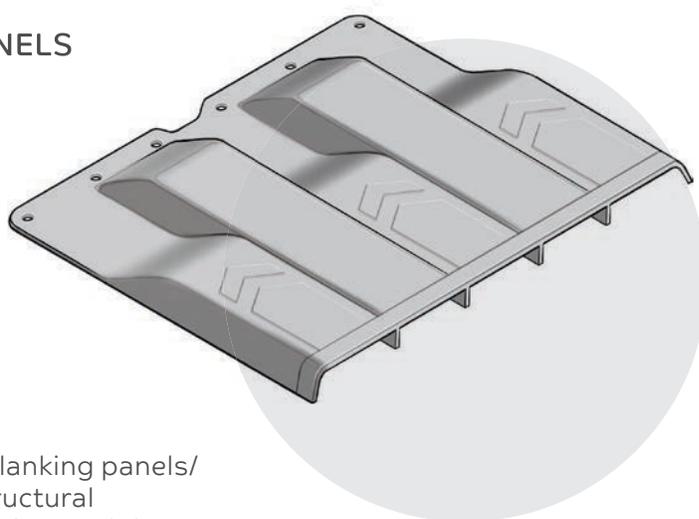
Immersion or direct-to-chip liquid cooling systems dissipate heat more efficiently than air cooling. In these cooling loops, thermoplastics are used in rigid connectors, rigid piping and connection points. ULTEM resins are inherently flame retardant with no additives that can detract from recyclability. These materials should demonstrate low weight loss when exposed to a variety of dielectric cooling fluids.



2 INTERIOR AIR GUIDES, BLANKING PANELS & CABLE GUIDES LNPT™ ELCRIN™ COPOLYMERS NORYL™ RESINS

- Metal replacement potential
- Design freedom due to impact resistance, high strength, thin-wall capability, high flow, HDT of more than 100°C
- Custom colors
- High PCR content options
- Flame retardancy without intentionally added halogens

Server elements such as interior air guides, blanking panels/sheets and cable guides may benefit from structural thermoplastics, which can replace metal to reduce weight, support more-intricate designs and offer custom colors. Requirements of structural materials include mechanical strength, sustainability and flame retardancy – ideally without halogens.



Download brochure:
bit.ly/ELCRIN_iQ



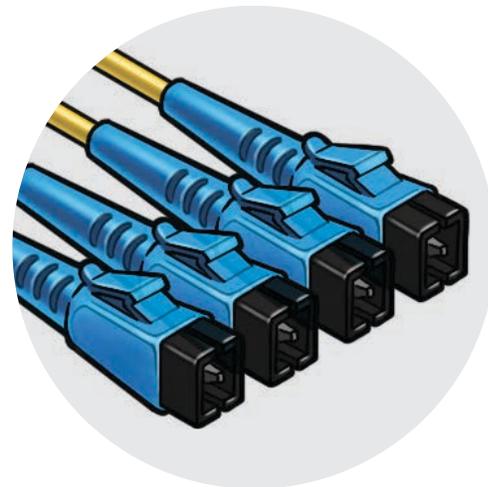
Download brochure:
bit.ly/NORYL_Structural_Parts

3 SIGNAL CONNECTORS (OPTICAL, ELECTRICAL & EXPANDED BEAM)

ULTEM™ RESINS

- Dimensional stability, high flow, colorability
- ISCC+ Certified renewable made with bio-based feedstocks and PCR grades

Compared to standard fiber optic systems for data transfer, AI data centers could require up to four times the number of connectors. Changes in data center architecture are expected to significantly impact connector design and material selection. Consolidation and densification using spine and leaf switching architecture will enable smaller footprints vs. 3-tier models. High-flow grades of ULTEM resins are available for molding complex connectors that are colorable and maintain the lowest CTE possible.

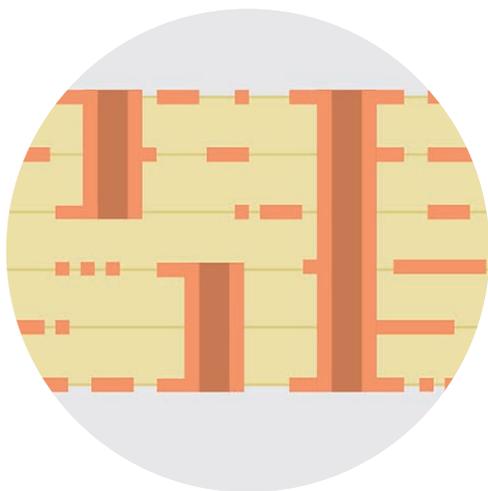


Download brochure:
bit.ly/FOC-ULTEM-resin

4 DIELECTRIC SUBSTRATE MATERIALS NORYL™ PPE OLIGOMERS

- Functional end groups
- Low Dk/Df, high Tg
- Resistance to water absorption

NORYL PPE oligomers enable construction of multi-layer, copper-clad laminates with low dielectric properties to reduce insertion loss. Key features include a high glass transition temperature of 150°C and low absorption. In formulation, NORYL oligomers enhance dielectric layer toughness to reduce cracks from drilling. They are inherently char forming, thereby reducing the loading of flame-retardant additives.



Download brochure:
bit.ly/Reactive_Additives

5 PLUG-IN, ONBOARD, CO-PACKAGED OPTICS ULTEM™ AND EXTEM™ RESINS

- Reflow soldering capability (Tg = 260°C)
- Near-IR transparency, dimensional stability

ULTEM resins have been used for decades to produce near-IR transparent lenses in fiber optic connectors, pluggable optical transceivers, and sensors.

Co-packaged optics are a next-generation technology that can help increase data center bandwidth and reduce power consumption and costs by bringing the optical connection much closer to the main switching ASIC. SABIC's Edison award-winning EXTEM RH resin addresses these needs as it allows optical engineers the design freedom of injection molding but also the assembly efficiency enabled by having multiple solder reflow capability.



Download brochure:
bit.ly/Photonics-SABIC



6 SERVER COOLING FANS ULTEM™ RESINS LNPT™ ELCRIN™ RESINS

- Dimensional stability, creep resistance, high temperature resistance
- PCR content options

AI data centers face tough server cooling challenges resulting from rapid transfer, handling and storage of huge data volumes. Server cooling fans, which can now reach over 20,000 rpm, require high-performance heat dissipation solutions to avoid blade distortion, noise or potential data center malfunctioning. ULTEM resins can help designers create cooling fans with improved precision and tolerancing for efficient airflow and heat dissipation, while featuring non-halogenated flame-retardant properties that meet UL94 V0 requirements at gauges down to 0.75mm.

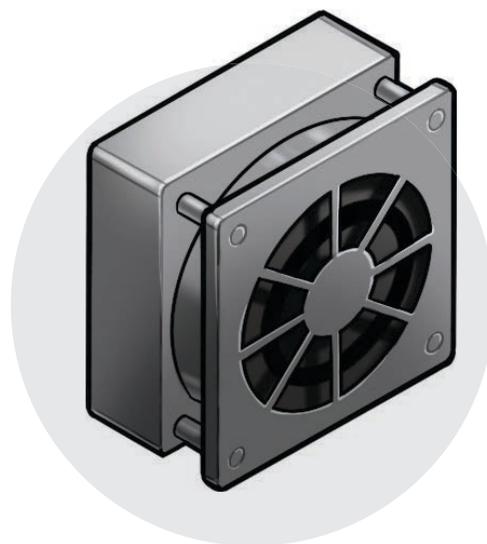
LNP ELCRIN compounds, which are based on PBT resin formulated using ELCRIN iQ upcycling technology, are available with different glass fiber reinforcement percentages, feature non-brominated/non-chlorinated FR, UL94 V0 and 5VA flame ratings, and excellent chemical resistance.



Download brochure:
bit.ly/ULTEM_Cooling_Fans



Download brochure:
bit.ly/ELCRIN_iQ



7 CABLE JACKETING

SILTEM™ RESINS

FLEX NORYL™ RESINS

NORYL™ REACTIVE POLYOLS

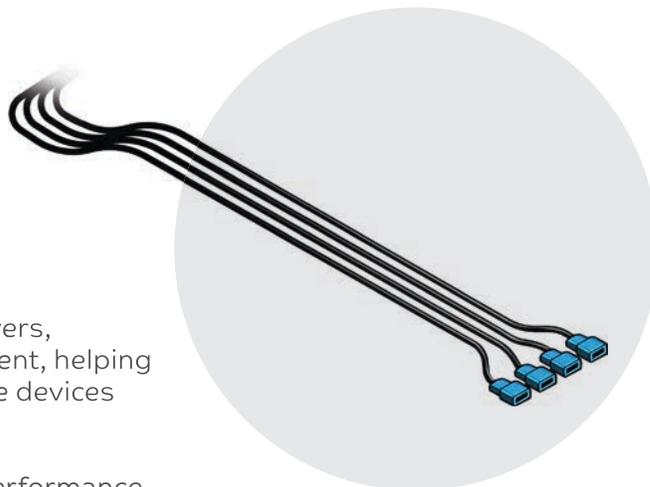
- Novel flexible, non-halogenated FR materials
- Colorable
- Heat stable

An AI data center's cabling system connects servers, switches and other essential networking equipment, helping to ensure the smooth flow of data across multiple devices with minimal latency and high speed.

SILTEM™ resins can be used in a range of high-performance wire & cable jacketing or tubing applications. It combines high-heat performance, non-halogenated FR, and flexibility. This extrusion material is also resistant to chemicals, UV degradation and radiation.

FLEX NORYL resins can be used in wire and cable insulation and jacketing. These grades provide low moisture absorption, creep resistance, heat stability, colorability and non-halogenated FR, and provide potential alternatives to polyvinyl chloride (PVC) materials.

NORYL reactive polyol is a low molecular weight, di-functional hydroxyl-terminated. Adding to a solid elastomer matrix may improve structural, wear and chemical resistance properties in polyurethane formulations. These properties may be maintained at elevated temperatures and humidity levels.



Download brochure:
bit.ly/Discover-SILTEM-resins

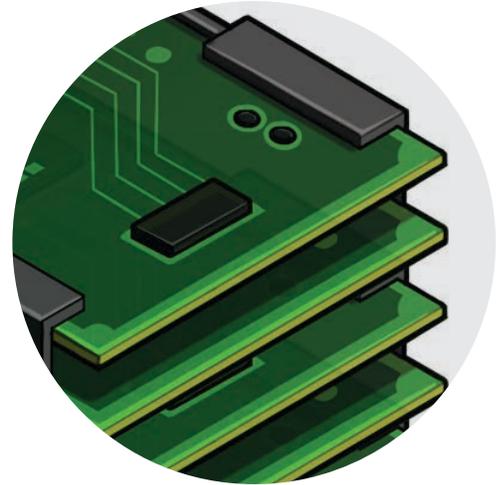


Download brochure:
bit.ly/NORYL_Wire_coating

8 EMI SHIELDING LNPT™ FARADDEX™ COMPOUNDS

- Flame-retardant options
- Range of base materials
- Lightweight, colorable

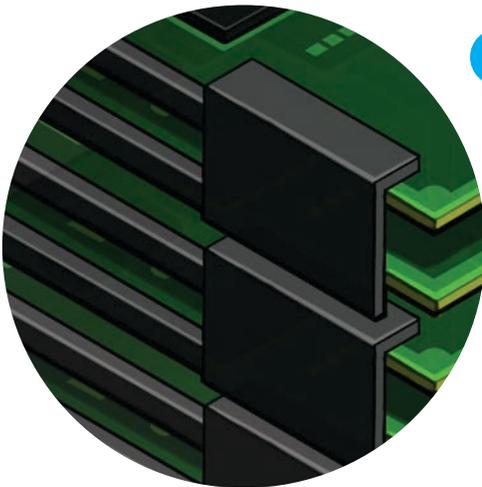
In AI data centers, common sources of low-frequency EMI are power equipment and electronic devices. EMI can harm IT equipment and communications cables, leading to operational issues ranging from hardware failures to data corruption and loss. Unprotected cables near EMI sources can experience damaging voltage surges. This high-voltage current also generates electrical noise, which interferes with data transfer.



LNP FARADDEX compounds with conductive fibers provide attenuation of EMI and radio frequency interference (RFI). They can also meet requirements for electrostatic discharge (ESD). These compounds deliver mechanical properties, part weight and design freedom similar to those of unfilled base resins. They also avoid secondary operations like metal plating to reduce system costs.



Download brochure:
bit.ly/FARADDEX_EMI_Shielding



9 ANTI-STATIC AND STATIC DISSIPATION IN PACKAGING, HARD DRIVE PARTS LNPT™ STAT-KON™ COMPOUNDS LNPT™ STAT-LOY™ COMPOUNDS

- Electrically conductive additives with varying surface resistivities
- Flame retardant options
- Unfilled or glass/mineral filled
- Multiple base resins

Electronic components such as server hard drives are typically shipped in electrostatic dissipative packaging to prevent charge buildup due to movement during transport. Once in the data center, these components – and the technicians who work with them – need to be protected against static buildup and discharge that can cause shocks and malfunctions.



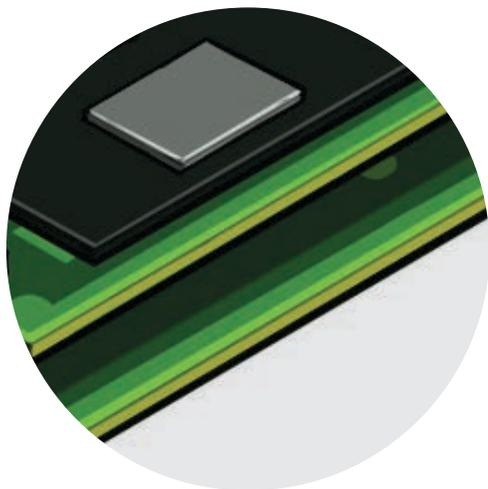
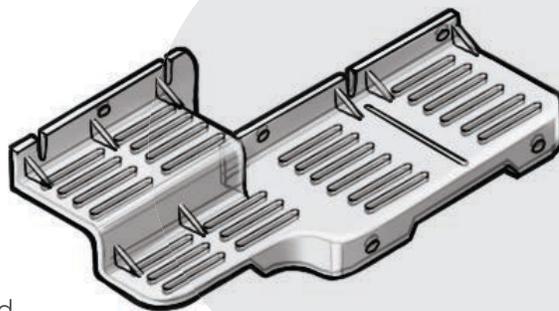
Learn more here:
bit.ly/STAT-KON_Compounds

10

BUS BAR COVER LNPT™ EXL COMPOUNDS (PC COPOLYMER SERIES)

- High voltage/electrically insulative
- Impact and scratch resistance
- Transparency (some grades)
- PCR and non-halogenated FR options available in some grades

LNP ELCRES EXL resins are polycarbonate (PC) siloxane copolymers featuring low temperature ductility, thin-wall, non-chlorinated/non-brominated FR and easy processing. These materials are available in a wide range of opaque colors.



11

INTEL LAND MODULE (ILM) POST ULTEM™ RESIN

- Excellent mechanical properties
- Gall and abrasion resistance
- PCR and PIR glass fiber options available
- Non-halogenated inherent FR

ILM posts connect the lid of the server rack to interior components. ULTEM resin can replace gall-resistant polyetheretherketone (PEEK) resin at a lower cost. ULTEM resin offers excellent wear properties. Unfilled and homopolymer grades are non-conductive. Selecting a grade containing recycled content (resin and/or glass fiber) can enhance the sustainability of this application.



Download brochure:
bit.ly/ULTEM_Portfolio

WE'RE ALWAYS HERE FOR YOU

Did you know that SABIC's Specialties Business can offer all these services and more?

- Material suggestions and samples
- Design and predictive engineering services
- COLORXPRESS™ color matching services
- Teardowns and prototyping
- Processing technical support
- Application testing guidance
- Industry-specific regulatory information

Reach out to us for one-on-one support to ensure you have all the information and insights you need to choose the best-fit materials for your applications.

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SABIC MATERIAL FINDER
Find the right Specialties material
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ULTEM, SILTEM, EXTEM
RESINS

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