

Fine Chemicals & Catalysts

Research • Development • Production

*Organic
Products*

*High Purity
Inorganics*



*Precious Metal
Compounds & Catalysts*

Alfa Aesar[®]

A Johnson Matthey Company

Fine Chemicals

Fine Chemicals and Catalysts

Part of the Johnson Matthey group of companies, Alfa Aesar is a leading manufacturer of fine chemicals and catalysts used for research and development in a wide span of applications.

Alfa Aesar is a trusted, service-oriented company. Product quality is of paramount importance, but production expertise is just the beginning. Factors such as product availability, packaging and delivery are just as crucial to meeting and exceeding your expectations. Our established quality process ensures a high level of service and a promise of continually striving for perfection.

Global Manufacturing

With plants situated all over the globe, Alfa Aesar can produce a wide variety of products to meet the requirements of customers in industries as varied as pharmaceuticals, semiconductors, structural materials and imaging.

Some of our key operations include our organic synthesis labs in Heysham, England, our high purity inorganics facility in Royston, England and our precious metal compounds and catalyst operations in various worldwide locations.

Our newest production facilities in China offer even further options for the production of quality fine chemicals in batches ranging from grams to hundreds of kilograms.



Global Inventory

The majority of our 30,000 products are available in semi-bulk or bulk quantities from stock. Some are in regular production and are available in bulk for next day shipment. We also supply most products from stock in research and development quantities. Our experience in manufacturing, sourcing and handling a wide range of chemicals enables us to respond quickly and efficiently to your needs. In addition, we offer hundreds of unique building blocks that are not available from any other manufacturer.



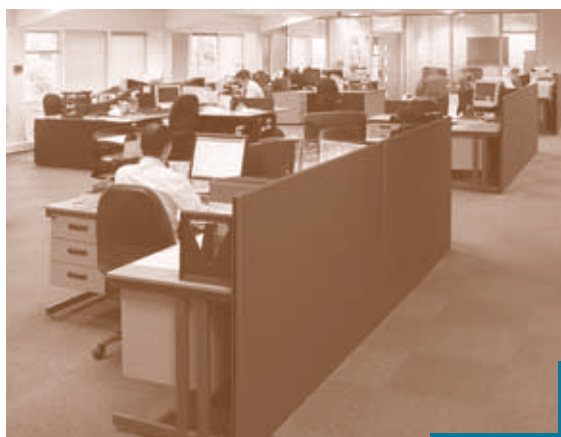
Custom Synthesis

We offer flexible custom manufacturing services to produce quality products with the assurance of full confidentiality. Our labs routinely output chemicals and materials to meet research, pilot-scale and full-scale production requirements.



Customer Service

Our dedicated scientific and commercial teams offer the full service package, from concept to production, packaging and delivery. For the sampling stage, our catalog distribution centers offer 30,000 distinct products, pre-packed in various sizes and ready for immediate shipment. On top of that, many thousands of products are stocked in semi-bulk or bulk quantities to meet the increasing demand for quick turn around of pilot- and production-scale units.



Quality Control

We employ advanced quality control for both in-process and final product testing phases. The high standard of our modern quality control and assurance facilities is matched by the expertise of our experienced staff.

Global Sourcing

Knowledgeable chemical industry experts on our global sourcing team know what manufacturers match best to your needs. All Alfa Aesar vendors are assessed for quality and service to remain on our approved vendor list. We practice rigorous in-house product testing to ensure quality standards.



E Catalysts

Organic Intermediates and Reagents

Our team of chemists can produce an extensive range of organic and organometallic compounds. Safe manufacturing routes to thousands of molecules have been developed in house.

Our involvement in a global research chemicals business means we have practical experience with almost every organic reaction. Our technology database makes us a leading global resource for effective problem solving in complex organic reactions.

We offer the majority of our range of 30,000 molecules in semi-bulk or bulk quantities from stock.



Some Reactions Commonly Employed by Alfa Aesar

Our production labs employ a variety of reactions, including:

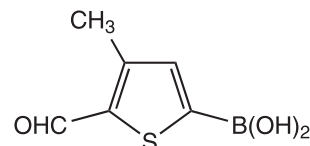
- Acylation
- Alkylation
- Amidation
- Amination
- Arbuzov Reaction
- Chlorosulfonylation
- Condensation
- Dehydration
- Diazonium Chemistry
- Diels-Alder Reaction
- Esterification
- Friedel-Crafts Reaction
- Grignard Chemistry
- Halogenation
- Heterocyclic Synthesis
- Lithiation
- Nitration
- Oxidation
- Quaternization
- Reduction
- Suzuki Coupling
- Vilsmeier Reaction
- Wadsworth-Emmons Reaction
- Wittig Reaction
- and more...

Alfa Aesar Specialties & Reagents

The following listings outline just some of our organic chemistry expertise.

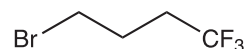
Boronic Acids and Esters

Alfa Aesar now offers a greater range than ever of these invaluable intermediates, applicable most significantly in the Suzuki cross-coupling reaction, one of the most widely used carbon-carbon bond forming reactions in current synthetic practice.



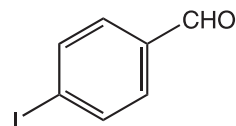
Fluorinated Intermediates

The inclusion of one or more fluorine atoms in a molecule can have profound effects on its properties. The large and continually growing number of Alfa Aesar fluoro-organics have applications either directly or as intermediates or reagents in a vast number of fields including polymers and materials, speciality solvents, performance fluids, medicinal agents and agrochemicals.



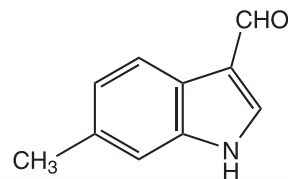
Iodoaromatics

The iodo substituent is often more susceptible to substitution than the other halogens. This is a useful feature, particularly in the widely used Heck, Stille and Suzuki cross-coupling reactions. A comprehensive range of iodo-substituted benzenoid and heteroaromatic molecules is available.



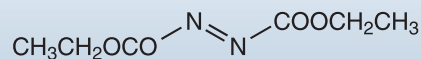
Indoles

This heterocyclic structure is also a component of many living and naturally derived systems. A wide choice of indoles is available, of interest in the synthesis of new biologically active molecules.



Azodicarboxylates

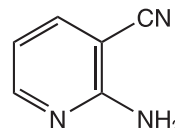
Alfa Aesar offers several esters of azodicarboxylic acid, including diethyl azodicarboxylate (DEAD), the reagent of choice for the Mitsunobu alkylation reaction with alcohols. Other applications of these molecules include: aza-dienophiles in Diels-Alder and other pericyclic reactions; dehydrogenating agents; NH_2^+ synthons for C-aminations.



Organic Intermediates and Reagents

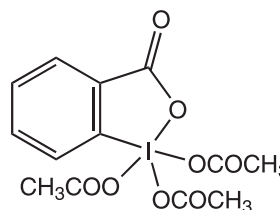
Pyridines

Many natural products and other biologically active molecules are derived from the pyridine nucleus. The Alfa Aesar product range includes an unparalleled variety of pyridine derivatives with great potential as synthetic intermediates.



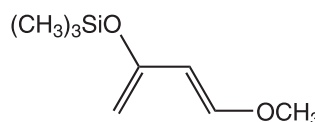
Hypervalent Iodine Reagents

Applications of molecules with more than one bond to an iodine atom include selective oxidations, carbon-carbon bond forming reactions and cleavage of protecting groups. Often they provide a convenient alternative to reagents containing toxic heavy metals. Many of the most useful hypervalent iodine reagents are available from Alfa Aesar, including iodonium salts, iodosobenzene derivatives and Dess-Martin periodinane, often the preferred reagent for highly selective oxidation of alcohols to carbonyl compounds.



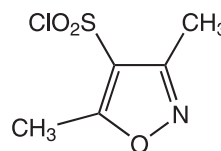
Silylating Agents and Silanes

A wide choice of reactive organosilane reagents is available for protection of hydroxyl and other functionalities in analytical and synthetic applications. Many silylated intermediates are also listed, offering modified reactivity and increased selectivity in comparison with the equivalent non-silylated molecules.



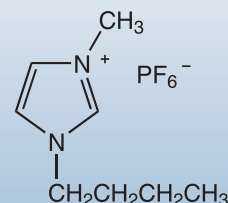
Sulfonyl Chlorides

A comprehensive range is offered, useful for the introduction of sulfonyl functionality with diverse substituents, particularly in the parallel synthesis of sulfonamides, sulfonates and related derivatives.



Phase-Transfer Catalysts and Ionic Liquids

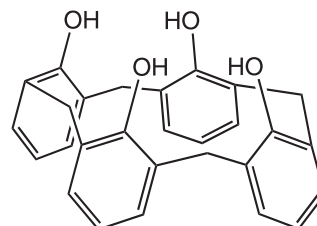
Phase-transfer catalysts are used in liquid-liquid or solid-liquid biphasic systems to enable faster reactions and simplified work-ups than conventional homogeneous conditions. Alfa Aesar offers a wide range of quaternary salts, crown ethers and analogous macrocycles, which can complex with a metal ion to liberate the anionic reactive species in the organic phase. Ionic liquids, organic salts which remain liquid at ambient temperatures, are becoming increasingly of interest as non-volatile alternatives to conventional volatile organic solvents (VOCs) in a growing number of applications.



Alfa Aesar Reagents

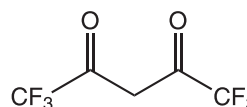
Calixarenes

These cyclic aromatic oligomers with a 3-dimensional basket-shaped cavity can hold molecules and ions selectively, depending on the dimensions of the cavity. Applications include enzyme mimetics, selective membranes and nanotechnology. There are Alfa Aesar calixarenes with different numbers of aromatic units in the ring and a variety of substituents, providing a range of cavity types.



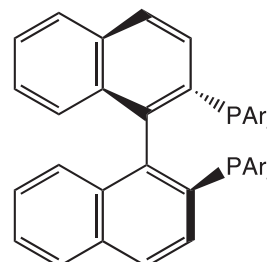
β -Dicarbonyls

These molecules can act as chelating ligands which form complexes with many different metal ions. The resulting chelates have applications in extraction and separation of metals, catalysis and Chemical Vapor Deposition (CVD) techniques. We offer a range of β -dicarbonyl ligands as well as many metal complexes derived from them.

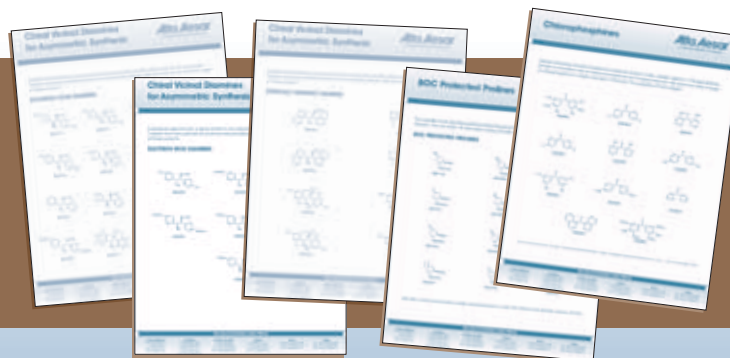


Binaphthyls

Many substituted 1,1'-binaphthyl derivatives are intrinsically chiral due to hindered rotation about the bond linking the naphthalene units. They are therefore widely used as components of chiral catalysts, with diarylphosphine substituted derivatives finding particular favor as ligands in asymmetric hydrogenations with platinum group metals and other enantioselective reactions.



Visit www.alfa.com or contact us to view literature outlining our products and expertise in these and other areas of organic synthesis.



Precious Metal Compounds and Catalysts

Precious Metal Compounds and Homogeneous Catalysts

Alfa Aesar offers a full range of precious metal salts and solutions manufactured to stringent specifications. Homogeneous catalysis provides an excellent choice where highly specific reactions are desired including chiral transformations. Our homogeneous catalysts can be used in a wide range of chemical transformations.

Catalyst and Ligand Kits

A few options are available for customers who wish to run trials with a series of catalysts and/or ligands. Contact our specialty sales department for the most up-to-date offerings.

Supported Heterogeneous Catalysts

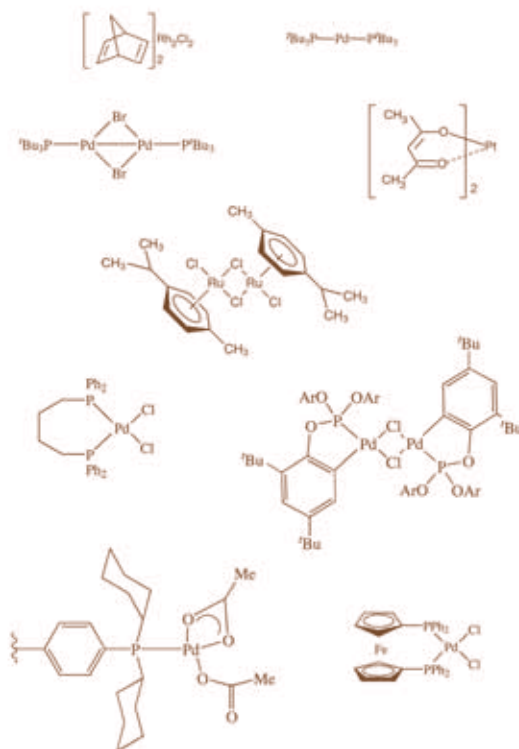
Supported (heterogeneous) precious metal catalysts are used in a variety of reactions including hydrogenation, oxidation, hydrogenolysis and isomerization. Our line of heterogeneous catalysts, are available in a variety of supports such as carbon, alumina, silica, calcium carbonate and barium sulfate.

Unsupported Heterogeneous Catalysts

The range of Johnson Matthey unsupported catalysts includes platinum oxides, the oxides of the other platinum group metals, and a number of metal "blacks."

FibreCat™ Anchored Homogeneous Catalysts

FibreCat catalysts are Johnson Matthey's line of anchored homogeneous catalysts, anchored to a series of functionalized fibers, enabling them to be optimized for a wide range of reaction types.



Fuel Cell Products

Johnson Matthey is a leading developer of catalysts and other products for fuel cell research and development.

HiSPEC™

The HiSPEC line of precious metal catalysts provides superior performance in proton exchange membrane (PEM) and direct methanol fuel cells, for fuel cell research.

HiFUEL™

HiFUEL fuel cell processing catalysts and gas treatment products are base metal catalysts for use in fuel cell and other distributed hydrogen processing applications.

Fuel Cell Components

Alfa Aesar offers a variety of fuel cell components, including Nafion® membranes, Toray™ carbon paper, cathodes, anodes and membrane electrode assembly (MEA) products.

Smopex® Scavenger Systems

The use of metal catalysts within the pharmaceutical industry allows the efficient transformation or combination of molecules that would otherwise be unfeasible. However, these metals can become an impurity in the final product. Smopex metal scavengers offer one of the most efficient options for removing these metal impurities.

Silver Products

Alfa Aesar is renowned as a leader in specialized high purity silver products. We have the capability of producing batch sizes up to 200 Kg. Many silver compounds are photosensitive. All our specialized silver compounds are packaged in lightproof containers.

Vertec™ Organo-Titanates

Vertec organo titanates are extremely effective and versatile catalysts for esterification reactions of all types. They range from relatively simple, highly reactive titanium species to more specialized and custom-made products.



Detailed product line catalogs are available online at www.alfa.com or by contacting us directly.

High Purity Inorganics

Known worldwide as a leading manufacturer of high purity inorganic compounds, Alfa Aesar produces thousands of distinct materials to exacting standards for research, development and production applications. Custom production and packaging services are part of our regular offering.

Our brands are recognized for purity and quality and are backed up by technical and sales teams dedicated to providing the best service.

Puratronic® High Purity Inorganics



The Puratronic line of base metal salts, solutions and pure elements is the leading choice of pharmaceutical and high technology companies needing the basic building blocks for many research and development processes. Each Puratronic compound has a minimum purity of 99.99% (metals basis) and each is backed by a lot-specific certificate of analysis. Our Puratronic production labs are in continuous operation and can produce lots from a few grams up to hundreds of kilograms.



Ultra Dry Anhydrous Materials

Your first choice for air and moisture sensitive applications is the Ultra Dry line of materials. Ultra Dry compounds are manufactured under exacting conditions to ensure that oxygen and water impurities are in the parts per million range. Only high purity starting materials are used in manufacturing, which produces results in overall purities of 99.9% to 99.999%. All ultra dry salts are ampouled under argon and most are available in -10 mesh beads and in powder form.

REacton® Rare Earth Products

REacton®

Rare Earth Metals
and Compounds

Recognized as a benchmark for high purity rare earths, the REacton brand line encompasses the entire lanthanide series (excluding promethium) along with scandium and yttrium. REacton brand rare earths feature extremely low impurity levels and a lot-specific certificate of analysis is issued with each shipment.



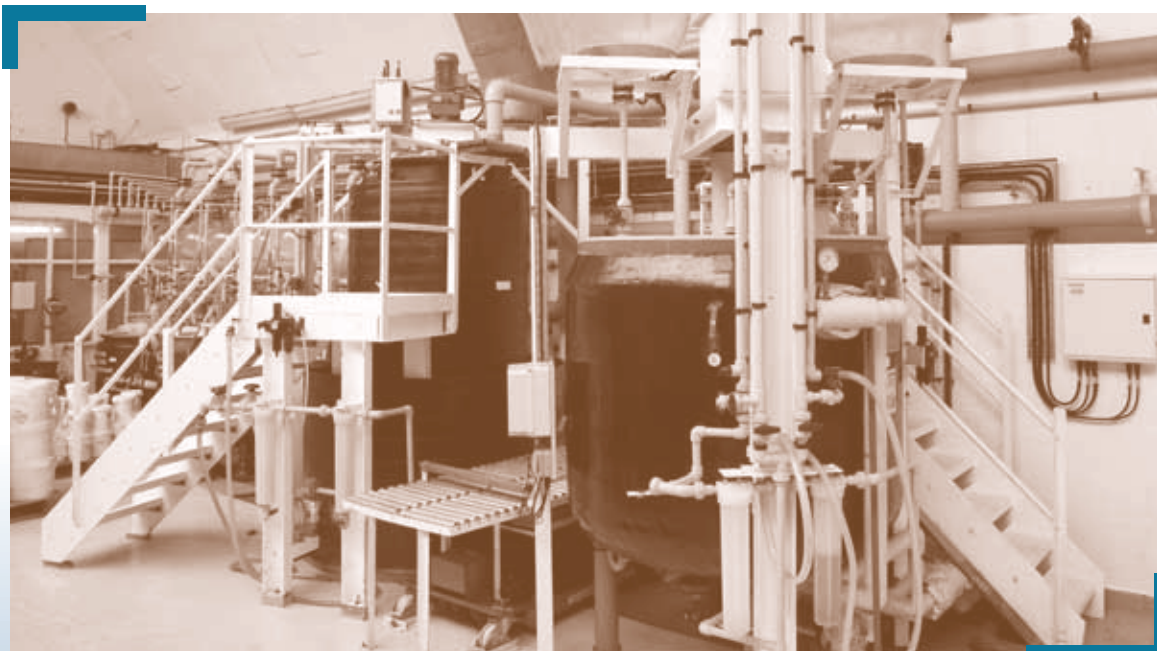
More detailed catalogs and brochures are available at www.alfa.com or by contacting your local sales office.

ACS Grade Chemicals

For our customers who need to specifically meet the American Chemical Society (ACS) certification guidelines for reagents, we are pleased to offer a complete line of ACS certified materials. Each chemical is rigorously tested to meet the specifications set forth in the Tenth Edition of *Reagent Chemicals*. Most materials are in stock in quantities from a few grams to hundreds of kilograms.

Nanopowders and Dispersions

Alfa Aesar offers a wide range of nanoparticle products ranging from pure elements to oxide powders and dispersions. As an exclusive distributor of Nanophase Technologies products, Alfa Aesar stocks an extensive range of raw nanoparticles as well as nanoparticle dispersions. The Nanophase production processes produce particles with the average sizes ranging from 8-80 nm from NanoArc® synthesis and from 7-60 nm from Physical Vapor Synthesis (PVS).



Inorganics

Resources

Alfa Aesar offers more than 30,000 products from its Research Chemicals, Metals and Materials Catalog. Keep the print version on your benchtop for quick reference or utilize the CD or online version for access to added features. Virtually all products in the catalog are in stock for immediate shipment from our distribution centers throughout the world. Each format offers unique benefits and ease of use.

Catalog

This 2800-page document is equal parts catalog and handbook. While the technical content of other chemical catalogs has been reduced, the Alfa Aesar catalog has been extensively augmented with thousands of new and updated literature references, application notes, synonym listings and other specification details. Molecular structure diagrams are included for most chemicals, and the catalog is extensively indexed by Chemical Abstract Service (CAS) number, stock number and molecular formula. The product listings for all hazardous substances are also enhanced with hazard pictograms and risk and safety phrases.

In addition to chemical compounds, the catalog includes special sections listing pure elements, alloys, analytical products, precious metal compounds and catalysts, labware and equipment.

A new 14-page introduction has been added to the Precious Metal Compounds and Catalysts section. Authored by recognized catalyst expert and Johnson Matthey Chief Scientist Martyn Twigg, the introduction briefly covers the history of precious metal catalysis, then proceeds with sections on general catalytic requirements for industrial applications, unsupported metal catalysts, supported catalysts, and homogeneous catalysts.

The catalog includes seven appendices, each focusing on a separate area of chemistry: organophosphorous intermediates, phase-transfer reactions, isocyanates and isothiocyanates, silylation and silanes in organic synthesis, boronic acids, peptide reagents, and fluorinating agents in organic chemistry.

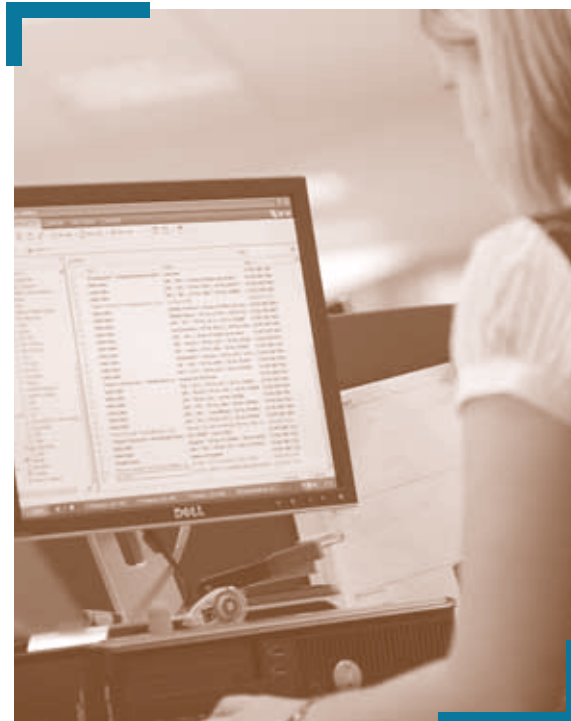
CD-ROM

The compact disc (CD) version of the catalog offers all the products in an electronic format with the added benefit of the MolSearch structure or substructure search tool.



Web site

The online catalog at **www.alfa.com** provides up to the minute accuracy and the latest new products, along with enhanced search tools and availability of documents such as Material Safety Data Sheets (MSDS) and Certificates of Analysis. The site provides many features for searching, ordering, and requesting quotes and technical information about our products.



Database Services

The Alfa Aesar product database is accessible in various file formats, which allows us to provide you with methods for locating the products or family of products to match your requirements.

Catalog Directories

Alfa Aesar products are listed in the Available Chemicals Directory, SciQuest, ChemFinder, Chemical Abstract Service and numerous other databases and buyers guides.

New Product Development

As a research chemicals business, we strive to bring you a constant stream of new screening compounds, building blocks, novel materials and other hard to find items. Our new product development team works hand in hand with our production chemists and key supply partners to identify and bring to market the most cutting edge items. Hundreds of new products per month are added to supplement the catalog.

Many of the recently added new products are novel fine organics, including hundreds of new boronic acids, silanes and silanols, chiral diamines, fluorochemicals and more. Other new products include nano-materials, base metal fuel cell catalysts, fuel cell components, pure metals, alloys, analytical standards and catalyst/ligand kits.



Sales & Distribution Network

The Alfa Aesar product line is backed up by our extensive global sales and distribution networks.



Technical Sales and Support

Sales

In each region, we employ experienced and knowledgeable sales representatives who are available to provide consultation and support to our customers. We work with our customers' scientific departments to fill needs and support the transition from the research to development and production stages, and with procurement departments to work out optimal commercial and supply arrangements.

Inside Sales and Customer Service

Our experienced customer service staff is well-equipped with systems enabling them to detail not only prices and availability, but also special handling and shipping factors that may effect your order. Product Specialists in our inside sales team are well-versed in our production capabilities and key supplier strengths, enabling them to give you competitive prices and make sure your order arrives on time.

Technical Support

Clarification about product specifications can often help with your application or make a purchasing decision. Our technical Product Specialists are on hand and ready to help with your technical questions and to help you with your application.

Distribution

Inventory

Meeting the demand of our customers requires that we carry inventory for nearly all of our 30,000 products in our distribution centers around the world. Many thousands of these products are available in semi-bulk and bulk quantities, which means we can often fill bulk and special orders from stock.

Packaging

Our distribution centers are all equipped with comprehensive repackaging operations and teams of experienced repackaging specialists. This capability allows us to offer customers a more complete service and to fill orders in a most timely manner. On a daily basis, we handle and repackage hundreds of products.



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