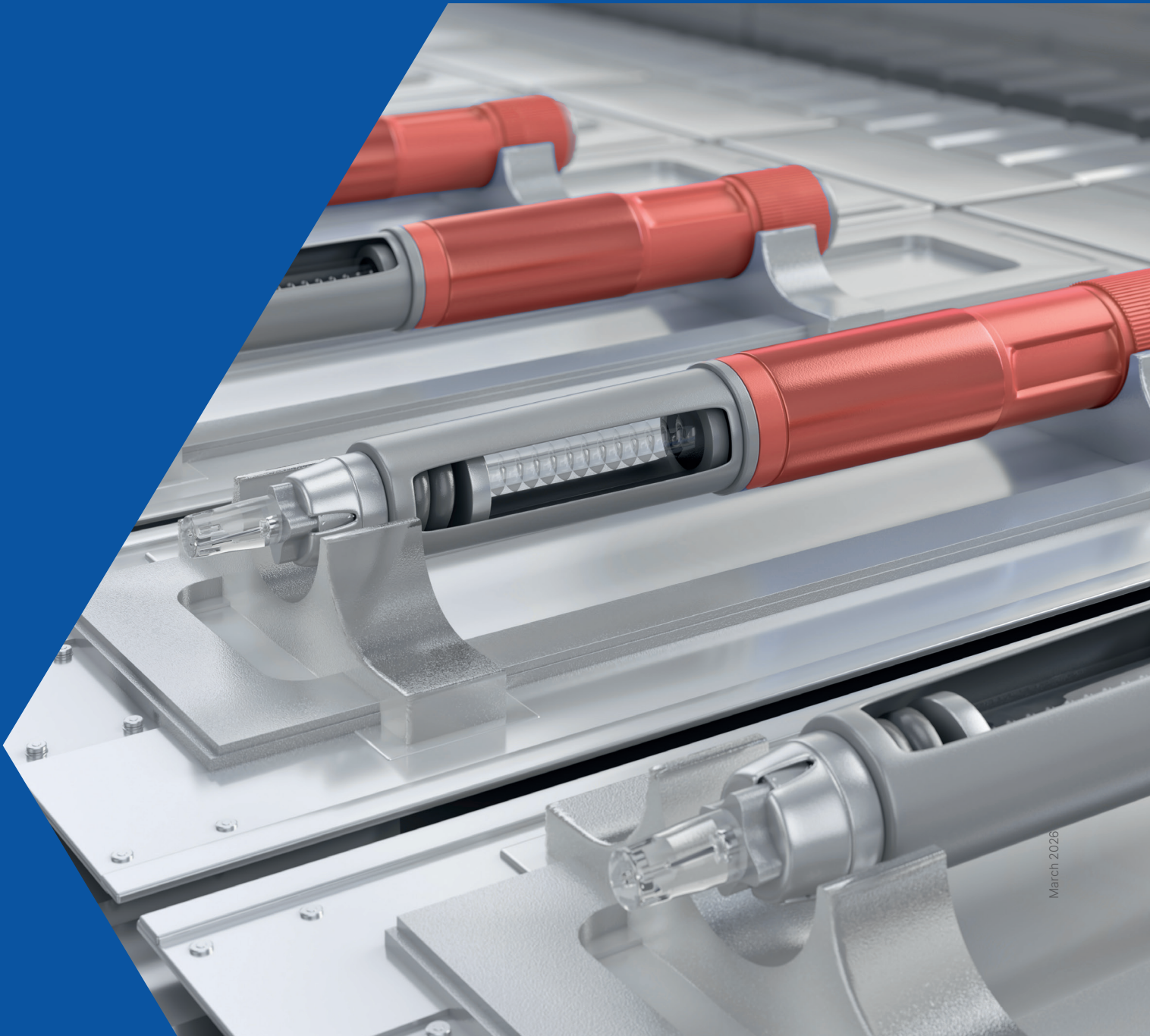


Drug Delivery Devices



Advanced Material Solutions for Drug Delivery Devices

Biesterfeld – Your Partner for Drug Delivery Devices: as critical medical devices, they require precision, safety, and regulatory compliance. At Biesterfeld, we offer a tailored portfolio of materials for the variety of Drug Delivery Devices including **injectable devices like auto-injectors, pulmonary devices like inhalers (MDP/DPI), pre-filled syringes and infusion sets.**

Why Biesterfeld?



Its **cross portfolio offering** – spanning from medical thermoplastics, elastomers to thermosets, from polymers to bonding solutions- supports cutting edge applications in drug delivery, wearables, and surgical and interventional components, enabling customers to unlock synergies and increase design efficiency.

Biesterfeld **dedicated healthcare cross functional team** with technology, market, and regulatory specialists builds long term trust across suppliers, OEMs, CDMOs, CMOs, and design houses. By engaging early at specification stages and operating within the MedTech ecosystem, Biesterfeld helps customers accelerate innovation with confidence.



As the link between material suppliers and the device industry, Biesterfeld places a strong focus on **understanding key market needs.** These insights enable us to create comprehensive solution portfolios and provide customers with reliable, expert material guidance.



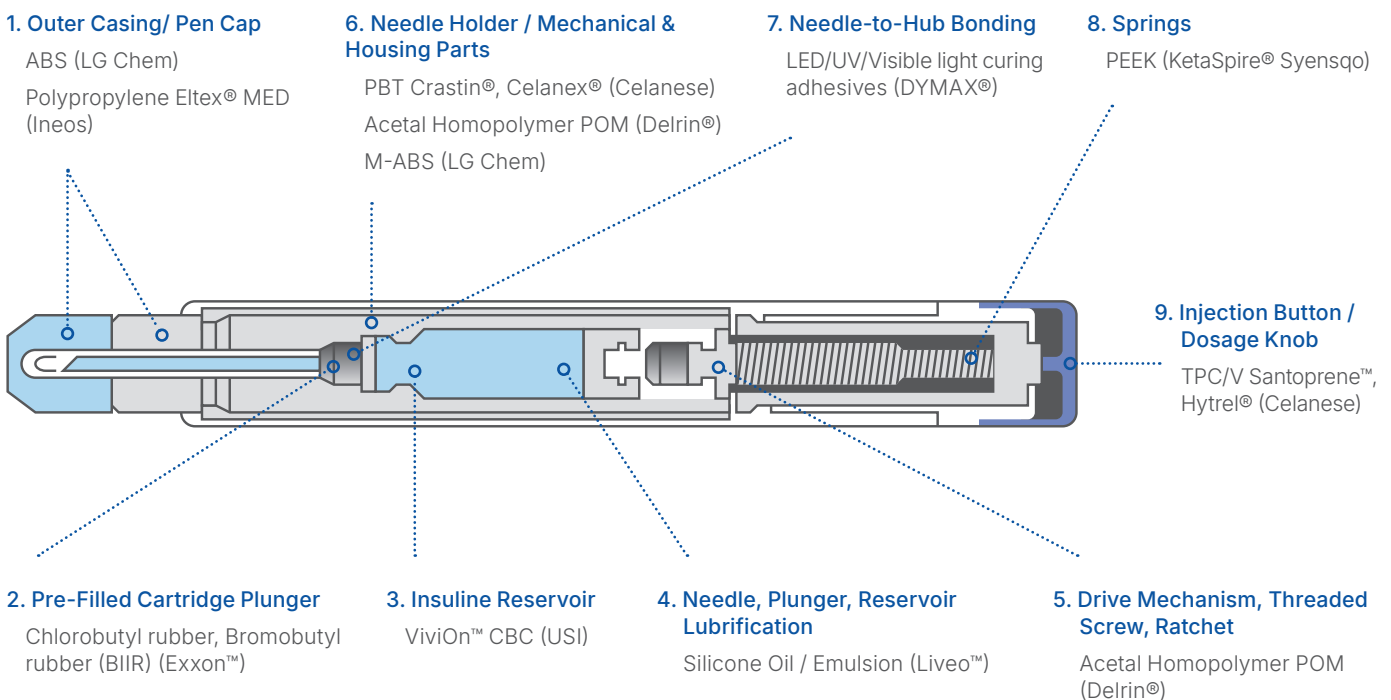
The Drug Delivery Market Trends

The Drug Delivery Devices market is evolving quickly as chronic diseases rise and injectable biologics gain traction. Growth in Internet of Medical Things and home care is driving demand for self administration and wearable systems, while therapies continue shifting from infusion to sub cutaneous delivery. Devices are becoming smaller and more ergonomic, supported by increasing interest in both single use and multi use designs with recyclable, PFAS free, metal free, and BPA free materials.

Key Market Requirements for Drug Delivery Devices

<p>Dimensional and Mechanical Requirements</p> <ul style="list-style-type: none"> > Performance and durability: tight tolerances, strong mechanical stability, and long term device reliability > Sophisticated design: thinner, more intricate geometries that reduce device size, and weight 	<p>Device Functionality and Usability</p> <ul style="list-style-type: none"> > Innovation and sustainability: advanced materials and eco design principles > Higher dosage capacity: larger fills or multiple dosage > Fewer dosing events: lowering injection frequency and time > Precise and intuitive delivery: dosing accuracy, actuation ease, and handling comfort 	<p>Drug Stability</p> <ul style="list-style-type: none"> > Optimized containment systems: integrity and compatibility with sensitive formulations > Controlled contact materials: minimize extractables and leachables
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Inside View of Injector Pens



Biesterfeld Material Recommendations for Injector Pens – Medical Polymers

	Components	Technical requirements	Materials
1.	Outer Casing/ Pen Cap	High impact resistance, good surface finish, chemical resistance, biocompatibility, clarity	ABS / ABS-PC blends (LG Chem): balance of impact strength, dimensional stability, and processing versatility Polypropylene Eltex® MED (Ineos): cost-effective, chemical resistant for lower stress parts
2.	Pre-Filled Syringe Plunger	High cleanliness, chemical resistance, gas barrier properties, drug compatibility	Chloro- & Bromobutyl Rubber (Exxon™): cleanliness, drug compatibility, low extractables and leachables and low permeability
3.	Insulin reservoir	Excellent barrier properties, good chemical resistance, drug compatibility	ViviOn™ CBC (USI) as an alternative to glass, COC or COP: superior moisture barrier, high purity, excellent optical properties, and compatibility with a wide range of APIs (including biologics)
5.	Drive Mechanism	High mechanical strength, low friction, consistent force delivery	Acetal Homopolymer POM (Delrin®): fatigue resistance, spring performance, dimensional stability (no creep)
6.	Needle Holder, Mechanical parts	Dimensional stability, reduced creep, sterilization compatibility	PBT Crastin®, Celanex® (Celanese): good dimensional stability, low creep at elevated temperature, good chemical resistance, gamma sterilisation compatibility Acetal Homopolymer POM (Delrin®): rigid, low friction supports, designed for medical use with high mechanical control and low friction
8.	Spring	High fatigue resistance, consistent force over time	Metal is typically used for autoinjectors. PEEK KetaSpire® (Syensqo, Lehmann&Voss): alternative for no auto-injectors
9.	Injection Button / Internal Gear	Tactile feedback durability, ergonomic design	TPC/V Hytrel® Santoprene® (Celanese): flexible detents or grips. Polyamide Zytel® PA66 Glass-filled (Celanese): high stiffness and strength for gears, supports

Biesterfeld Medical Polymer Brands for Drug Delivery Devices



Biesterfeld Material Recommendations for Injector Pens – Medical Specialties

	Components	Technical requirements	Materials
4.	Needle	Low friction, high adhesion to metal, biocompatibility	Medical Silicone Coatings (Liveo™ MDX4-4159): forms a hydrophobic layer to reduce insertion forces
	Reservoir	Low friction, good spreading, compatibility with most plastics and glass, biocompatibility	Medical Silicone Coatings (Liveo™ 360 Medical Fluid and Liveo 366 35% Dimethicone NF Emulsion): forms a hydrophobic film to prevent interactions of the API and the container and promotes drainage of solutions
	Plunger	Low friction, biocompatibility	Medical Silicone Coatings (Liveo™ 360 Medical Fluid): improved sealing and reduced friction between reservoir and plunger
7.	Needle-to-Hub Bonding	Bond strength, sterilization compatibility, biocompatibility	Dymax MD® 1xxx-series: light-curable, medical-grade adhesives formulated to bond difficult substrates as PP/COC/COP or PC and glass to stainless steel
	Housing		Dymax 2xxx-MW series: dedicated light-curable, medical-grade adhesive product line to address evolving customer requirements in terms of skin contact issues

Biesterfeld Medical Specialty Brands for Drug Delivery Devices



Interested to learn more about our medical solutions portfolio? Feel free to contact us at: medical@biesterfeld.com



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