

A close-up, diagonal view of a smartphone keyboard, showing the keys and the screen area. The background is a solid orange color.

Boltorn™

Advancing performance & comfort

Our dendritic polymers

- Secure exceptional firmness and comfort in flexible polyurethane foam
- Improve the Tg/flexibility ratio of cast polyurethane elastomer products
- Ensure rapid curing, excellent durability and low toxicity in UV curing applications
- Provide reduced VOC and improved performance in architectural coatings

The elements of success

You need a partner who can see the big picture when it comes to your products, your processes and your customers. Our experience and expertise in the special niches of organic chemistry, process technology and application development are at your service, providing you with a complete chain of solutions to enhance quality and profitability at every step.

Our versatile intermediates, an essential element of your winning formula, are specifically designed to add value and enhance end-product performance. Your solution to meeting the increasing demands for safer, lighter, more durable and environmentally friendly end-user products, begins here.

Innovation in everything we do

Innovation distinguishes every aspect of our business process. Developing smarter and safer solutions creates real value in new chemical applications. Focused innovation instills leadership and purpose in our business activities, improves internal processes and increases application and product competitiveness.

Delivering our promises globally

Our global presence provides you with reliable solutions and processes, consistent high quality, security of production and supply and delivery with precision. This commitment also means rapid response when product or application support is required and the very best in technical support.

Putting the care into chemicals

We take our responsibilities to heart and are committed to attentive, sustainable business practices. We minimize risks for our customers, our employees and the environment by working proactively to ensure safe products and processes.



Advancing performance & comfort

Sharpen your competitive edge by partnering with the global leader in bringing cost-effective dendritic polymers to the market. Dendritic polymers are characterized by a densely branched backbone and a large number of reactive groups. Their globular structures have excellent flow and processing properties at high molecular weight. The exceptional concentration of reactive groups facilitates customization of properties for a wide range of end uses.

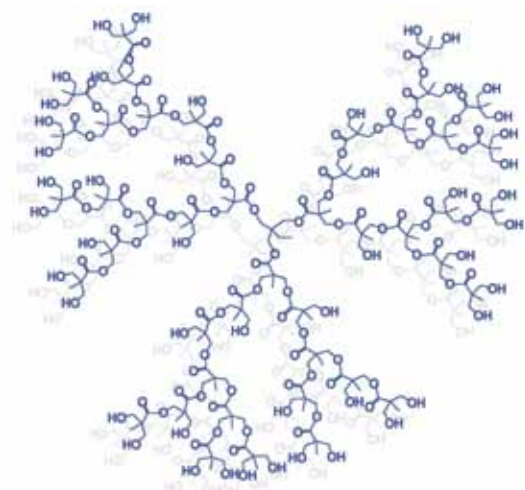
The main applications of Boltorn™ dendritic polymers:

- Performance additives for flexible polyurethane foam, such as in automotive seating applications
- Oligomer precursors for UV-curing applications for excellent scratch resistance, adhesion and flexibility in plastic coatings
- Water-dispersing additives for partial replacement of solvents with water in solvent-borne paints
- Reactive diluents for VOC control with maintained drying properties in high-solid alkyd paints

Boltorn™ technology

- Large number of primary hydroxyl groups
- Densely branched polymer backbone
- Extensive formulation possibilities

Boltorn™ dendritic polymer



The cutting edge of technology

Our Boltorn™ products are produced using polyalcohol cores, hydroxy acids and technology based on captive materials. The dendritic structures are formed by polymerization of the particular core and 2,2-dimethylol propionic acid (Bis-MPA). The base products obtained are hydroxyl-functional dendritic polyesters. Fully aliphatic and consisting only of tertiary ester bonds, they provide excellent thermal and chemical resistance. Extensive branching also improves reactivity, lowers viscosity and results in balanced mechanical properties.

Our dendritic polymer range:

Boltorn™ H20

16 terminal hydroxyl groups,
nominal molecular weight of 1,750 g/mol

Boltorn™ H2004

6 terminal hydroxyl groups,
nominal molecular weight of 3,100 g/mol

Boltorn™ H311

23 terminal hydroxyl groups,
nominal molecular weight of 5,300 g/mol

Boltorn™ P500

Formulated bimodal product with terminal hydroxyl groups,
nominal molecular weight 1,800 g/mol

Boltorn™ P1000

Formulated bimodal product with terminal hydroxyl groups,
nominal molecular weight 1,500 g/mol

Boltorn™ U3000

Modified with unsaturated fatty acid,
nominal molecular weight 6,500 g/mol

Boltorn™ W3000

Modified with non-ionic groups and unsaturated fatty acid,
nominal molecular weight 10,000 g/mol

We welcome your questions. More detailed information and specifications of each product are available on www.perstorp.com or through your Perstorp sales representative.

Fine-tuning with polyols

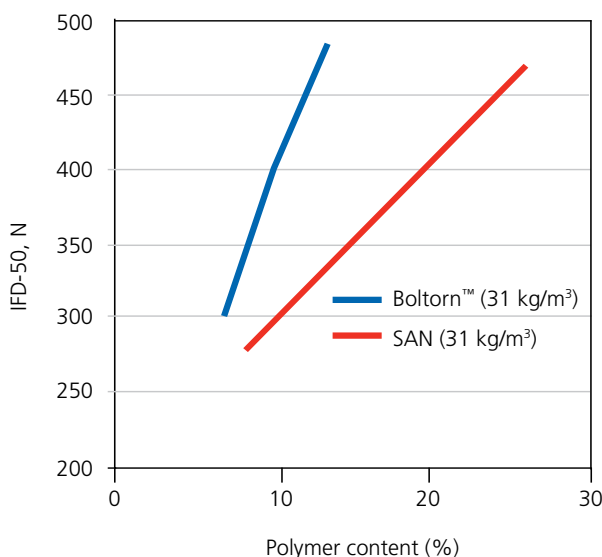
Boltorn™ for polyurethanes

Millions of car owners already enjoy superior seating comfort with the help of Boltorn™ technology. In partnership with a leading automotive foam supplier, we have developed a unique technology that improves the firmness of high-resilience foam articles with dendritic polymer polyols.

Boltorn™ H311 – for exceptional firmness & stability

This liquid polymer polyol provides exceptional compressive load-building characteristics in flexible foam at very low addition levels. It is used as an additive, partially replacing conventional cross-linkers or graft co-polymer polyols of SAN-type. Compared to conventional technology, Boltorn™ H311 offers considerable benefits:

- Two to three times the efficiency in providing compressive loads (IFD or CFD) at a given addition solids level, which allows lower average solids levels to be used
- Exceptional firmness, extending beyond current state-of-the-art technology
- Improved foam stability due to the cross-linking mechanism and reduced surface voids of finished parts



Compressive load as function of polymer content for Boltorn™ H311 vs. co-polymer polyols

Boltorn™ P500 – for high firmness at low compression set

Our dendritic polymer polyol for molded foam is a product that yields exceptionally low compression set at high firmness when used with graft co-polymer polyols. The low compression set allows you to operate at reduced foam density and still meet the comfort specifications of end users.

Formulation	60-5	60-15	50-11-4
Polyol (Hyperlite 1656), pph	87.95	63.85	63.51
Co-polymer polyol (Hyperlite 1650), pph	12.05	36.15	36.49
Boltorn™ P500, pph	0	0	4.19
DEOA-LF, pph	0.50	0.50	1.00
Glycerine, pph	0	0	0
H ₂ O, pph	1.76	1.75	2.21
DABCO 33-LV, pph	0.10	0.10	0.36
NIAX A-1, pph	0.08	0.08	0.08
PC77, pph	0.20	0.20	0.00
Y10184, pph	1.00	1.00	0.70
TDI 80, pph	23.61	23.12	33.72
Total wet weight, g	127.25	126.75	142.26
Total dry weight, g	119.60	119.10	130.75
SAN, %	5	15	11
Boltorn™ P500, %	0	0	4
Density, kg/m ³	60	60	50
IFD-25, N	147	239	192
IFD-65, N	390	633	558
Dry set, %	4	4	2.9

Density reduction at reduced compression set when using Boltorn™ P500

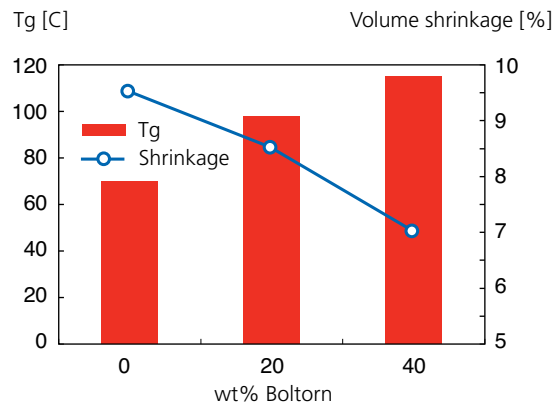
Boltorn™ for radiation curing

Oligomer precursors for superior performance

Boltorn™ products enhance radiation curing applications by providing oligomer precursors that significantly increase the average molecular weight of UV formulations at high acrylate concentration. Acrylates based on Boltorn™ technology are typically used to partially or fully replace urethane acrylates, other top-end oligomers or acrylates of high functionality. Using Boltorn™ dendritic polyols as starters for oligomer acrylates offers significant benefits:

- Excellent reactivity
- Improved scratch resistance and film hardness
- Low shrinkage and good adhesion
- Exceptional flow properties and good pigment wetting
- Improved labeling with low extractables
- Unique molecular weight/viscosity ratio

For coatings, the balance between flow and properties like reactivity, and chemical and scratch resistance, is crucial for meeting end-user demands. Environmental compliance is also a key competitive factor. Radiation curing systems, typically UV, have gained market share in the past decades since very rapid curing and excellent film properties are obtained with low or no VOC emissions.



The high molecular weight and functionality of acrylated Boltorn™ H20 improve hardness and Tg, yet reduce shrinkage and curl, when replacing polyether in polyether/PEOTA formulation



Acrylated polyol	Di-Penta (DPHA)	Acrylate of Boltorn™ P500
Viscosity, mPas, 100% solids, 23°C	14,000	700
Min. UV-dose, tack-free, mJ/cm²	200	200
Erichsen-flex., aluminum, mm	0.4	2.2
Pencil hardness, PC-Sheet, 250µm	3H/4H	2H/3H
Scratch resistance (200 rubs), gloss 60° ret., %	90	91
Tape adhesion on PC-sheet, 0-5,5 best	2	5
Adhesion, 180° bending test	No	OK

Properties of acrylated Di-Penta and acrylated Boltorn™ P500 – all coating formulations cured with 3% Irgacure 500 from Ciba at 12µm film thickness with a UV-dose of 500 mJ/cm² unless otherwise stated

Designed to enhance

Boltorn™ for architectural coatings

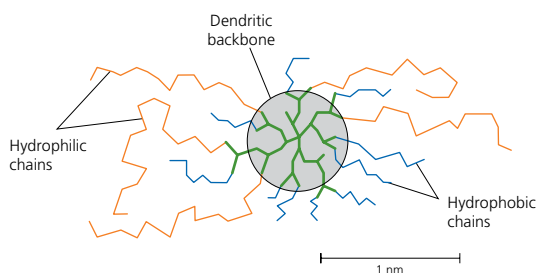
Our Boltorn™ performance additives for solvent-borne and water-borne architectural coatings help coating formulators comply with environmental demands without compromising coating performance. A number of patented technologies have been developed in which Boltorn™ additives improve the performance of architectural coatings. Achieve excellent properties including reduced VOC and improved drying in wood stain and reduced cost at lower VOC in water-extended solvent-borne paints.

Boltorn™ U3000 – unique flow properties

For high-solid alkyds, the branched structure of Boltorn™ U3000 provides unique flow properties, which allows wood-stains and alkyd paints for outdoor applications to comply with recent VOC demands while still securing rapid drying and durability.

Boltorn™ W3000 – add 1% and gain 10%

The unique properties of dendritic polymers offer extensive design possibilities. With Boltorn™ W3000, we have developed a water-dispersing additive that contains non-ionic as well as unsaturated fatty acid chains. This highly efficient product allows paint formulators to partially exchange solvent for water. By adding approx. 1% of Boltorn™ W3000 to a solvent-borne paint, 15% of the solvent can be replaced with water. The resulting paint will have a similar paint performance at a lower cost per liter and with reduced air emissions.



Schematic structure of Boltorn™ W3000

Formulation	Conventional woodstain	+40wt% Boltorn™ U3000
Type	oil/alkyd	oil/alkyd/dendritic alkyd
VOC, g/l	595	238
Viscosity, 23°C, mPas	28	72

Drying properties (45µm dry film)		
Film hardness-1 day, Ks	5	45
Film hardness-10 days, Ks	27	35
Film hardness-17 days, Ks	27	33
Film hardness-31 days, Ks	26	33

Effect on VOC and drying properties when adding Boltorn™ U3000 to a conventional woodstain available in Scandinavia

High-gloss paint for brush application	Water-extended paint with Boltorn™ W3000	Solvent-borne alkyd paint reference
Boltorn™ W3000, wt% in paint	1.34	-
Alkyd (OL65), wt% in paint	27.8	33.1
Water content, wt% in paint	15.1	-
PVC, wt%	18.7	18.7
VOC, g/l	340	420
Gloss, 60°, %	94	92
Drying*		
Dust dry, h	0.5	0.5
Tack-free, h	2.5	2.5
Through-dry, h	3.0	3.0
Hard, h	3.5	7.0

* Beck-Koller, glass panels at 23°C, 50% humidity, 25 µm DFT

The physical properties of a water-extended solvent-borne alkyd paint containing Boltorn™ W3000 compared to a solvent-borne counterpart



Product data summary

Product	Soluble in	Appearance	Functionality	OH-value mg KOH/g	Mw (GPC) g/mol	Tg (DMA) °C	Viscosity, Pas (°C)
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Polymer building blocks & CASE polyols

Boltorn™ H20	NMP, Diglyme, DMSO, Acetone, Glycols	Opaque pellets	16	490 – 520	2,100	30	7 (110)
Boltorn™ H2004	EtOH, Toluene, Xylene	Yellow liquid	6.4	105 – 125	3,200	-35	15 (23)

Product	Soluble in	Appearance	Water cont. wt%	OH-value mg KOH/g	Mw (GPC) g/mol	Tg (DMA) °C	Viscosity, Pas (°C)
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Molded flexible foam

Boltorn™ H311	Polyether/ polyester polyols	Yellow liquid	9.5 – 10.5	230 – 260	5,700	-5	40 (23)
Boltorn™ P500	Polyether polyols	Clear liquid	<0.5	560 – 630	1,800		15 (23)

Product	Soluble in	Appearance	Functionality	OH-value mg KOH/g	Mw (GPC) g/mol	Tg (DMA) °C	Viscosity, Pas (°C)
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Radiation curing

Boltorn™ H20	Acrylic acid + 15% toluene	Opaque pellets	16	490 – 520	2,100	30	7 (110)
Boltorn™ P500	Acrylic acid + toluene	Clear liquid	Mixed hydroxyl	560 – 630	1,800 (bimodal)	–	15 (23)
Boltorn™ P1000	Acrylic acid + toluene	Clear liquid	Mixed hydroxyl	430 – 490	1,500 (bimodal)	–	5 (23)

Product	Soluble in	Appearance	Functionality	Oil length % triglyc.	Mw (GPC) g/mol	Solids, %	Viscosity, Pas (°C)
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Architectural, waterborne coatings

Boltorn™ U3000	Oils, coalescents, EtOH, Xylene	Yellow liquid	Air-drying	75	6,500	99	1 (23)
Boltorn™ W3000	Emulsifying, soluble in alkyds, co-solvents, xylene	Yellow wax	Amphiphilic Air-drying	45 (fully aliphatic)	9,000	99	2 (35)



Precisely tailored
end-product properties





Your winning formula

The Perstorp Group, a trusted world leader in specialty chemicals, places focused innovation at your fingertips. Our culture of performance builds on over 125 years of experience and represents a complete chain of solutions in organic chemistry, process technology and application development.

Matched to your business needs, our versatile intermediates enhance the quality, performance and profitability of your products and processes. Present in the aerospace, marine, coatings, chemicals, plastics, engineering and construction industries, they can also be found in automotive, agricultural, food, packaging, textile, paper and electronics applications.

Our chemistry is backed by reliable business practices and a global commitment to responsiveness and flexibility. Capacity and delivery security are ensured through strategic production plants in Asia, Europe and North and South America, as well as sales offices in all major markets. Likewise, we combine product and application assistance with the very best in technical support.

As we look to the future, we strive for the development of safer products and sustainable processes that reduce environmental impact. This principle of innovation and responsibility applies not only to our own business, but also to our work with yours. In fulfilling it, we partner with you to create a winning formula that benefits your business – as well as the people it serves.

Discover your winning formula at www.perstorp.com