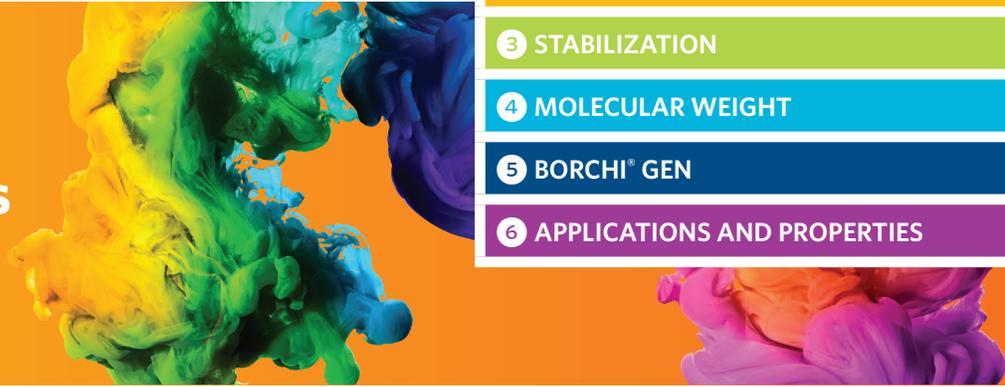


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Wetting and Dispersing Additives

BORCHI® GEN



INTRODUCTION

The importance of wetting and dispersing additives in the production of surface coatings is frequently underestimated - and wrongfully so! Dispersing pigments is not only the most time-consuming step, but also the most energy-consuming step in the entire production process.

An effective additive can help to significantly shorten the grinding time and thus **save time and money**. In addition, the performance of the wetting and dispersing additive can make a significant contribution to an optimal overall result. Apart from helping to develop gloss and color strength, the dispersing additive also plays a decisive role in stabilizing the paint.

The importance of wetting and dispersing additives is generally not recognized until it is too late. Many defects in the surface coating are attributable to inadequate pigment grinding and thus to the wrong choice of additive.

In addition to the poor development of color strength, the following typical defects can occur:

- Changes in shade
- Flocculation
- Flooding/Floating
- Bénard cells
- Rub-out
- Loss of gloss
- Settling



Lack of color strength



Flocculation



Rub-out



Bénard cells

Borchers has the ideal solution for preventing the occurrence of such defects: **the Borchí® Gen range of wetting and dispersion additives**. Borchí® Gen additives are suitable for all fields of application and exert a positive influence on the desired result throughout the dispersion process and beyond.

THE DISPERSION PROCESS

We can divide the dispersion process into three phases:

1. Wetting

The binder solution penetrates the cavities within the pigment agglomerates and expels the air out of them. In some cases, this may be as much as 75% of the pigment volume. During this process, a transformation takes place on the pigment surface from a solid/gaseous interface to a solid/liquid interface. The penetration of the binder breaks apart the first loose agglomerates.

2. Dispersing

In the second step, the pigment particles, consisting of loosely joined agglomerates and large-area aggregates firmly bound to one another, are broken up by the mechanical energy. Ideally, a fully deflocculated state will arise, in which all pigment particle agglomerates have been broken up into their primary particles.

Did you know that just a negligible amount of 0.1% of the energy needed will be expended to break up the strong adhesion between pigment particles? The far major part is mere loss of energy in terms of heat.

With an effective dispersing additive, the efficiency of the dispersing process can be significantly enhanced.

3. Stabilizing

Just as important as breaking up the pigment particles and distributing them homogeneously during the dispersing process is that this state be retained during the subsequent storage and application of the paint. Without the presence of a suitable dispersing additive, reflocculation of the primary particles will occur within a very short time, resulting in a significant drop in color intensity and a loss of gloss. Other undesirable side effects can be a change of color, specks or sedimentation.

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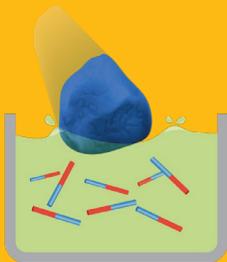
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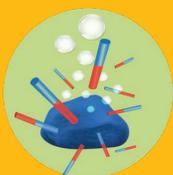
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1. Wetting

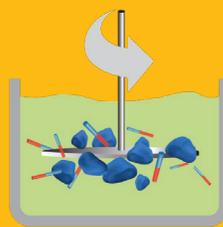


Wetting and dispersing agent is added before pigment. Stabilization types differ based on the agent used.



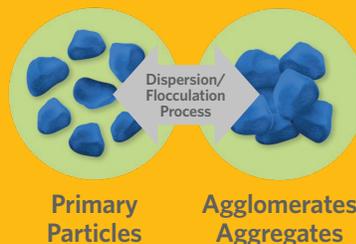
Wetting and dispersing agent is absorbed by the particle and drives air from the surface.

2. Dispersing



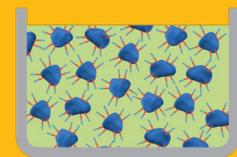
Stabilization

Flocculation



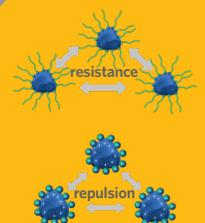
3. Stabilizing

Stabilizing and reagglomeration of primary particles.



Steric Stabilization

Electrostatic Stabilization





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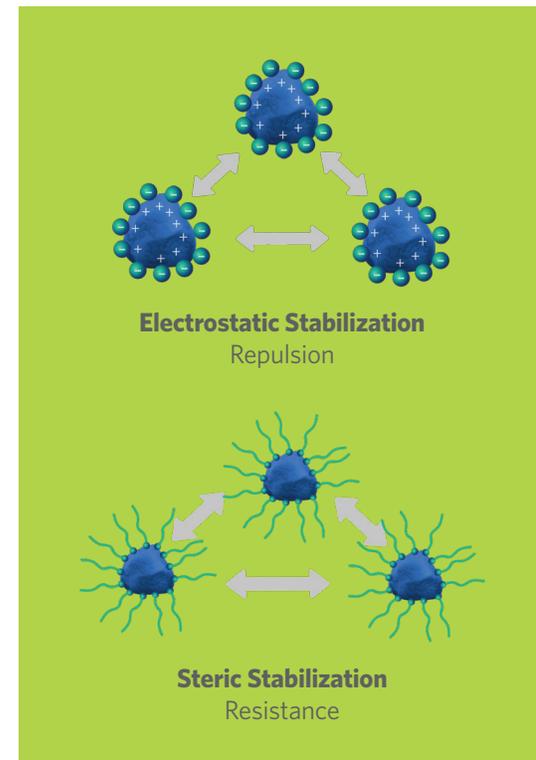
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STABILIZATION

Stabilization of the pigment particles within the binder matrix by the dispersing additives adsorbed on the pigment surface can typically be carried out in two different ways. In polar media, stabilization is usually achieved through the formation of electrical double layers, while the preferred method in non-polar environments is steric repulsion.

Electrostatic stabilization is based on the repelling of electrostatic charges brought about by the adsorption of an electrically charged dispersing additive on the pigment surface. An electrical double layer forms around the pigment, consisting of a solid layer in the direct vicinity of the surface, and adjacent to it, a diffuse layer. If two such coated pigment particles approach each other, their mutual electric repulsion prevents possible flocculation.

In non-polar media, pigment dispersions are generally converted to a stable condition with the aid of **steric stabilization**. This method requires polymer dispersing additives that are capable, via pigment affine groups, of adsorption on the pigment surface, and whose other chain end is freely mobile and projects into the surrounding binder or solvent matrix. This “polymer sheath” prevents the direct contact of two pigment particles, and thus hinders their flocculation. The denser the coverage of the pigment surface and the thicker the polymer layer, the more effective the steric stabilization.



MOLECULAR WEIGHT

Wetting and dispersing additives can be subdivided into different categories according to various criteria. Apart from the mode of action just described, **the molecular weight of the additive is one of the most important distinguishing criteria.** As a rule, virtually all of the application-related characteristics are influenced or predetermined by the structure, for example, the suitability for certain types of pigments or the recommended dosage. A distinction is generally made between high-molecular weight and low-molecular weight wetting and dispersing additives.

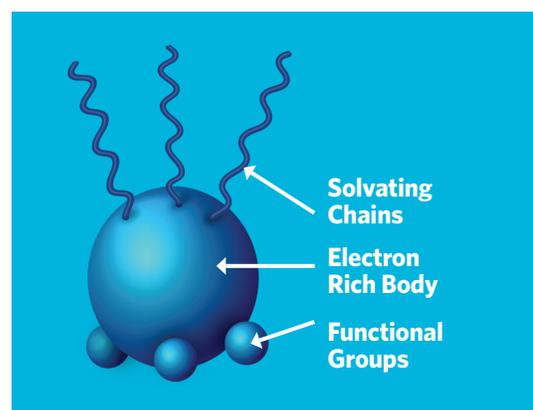
The conventional low-molecular weight types with a molecular weight normally between 1,000 and 2,000 g/mol, are, in turn, subdivided according to their chemical structure into anionic, cationic and non-ionic substances. They often have a linear surfactant-like structure made up of a polar hydrophilic and a non-polar hydrophobic chain-end, which become attached to the pigment surface according to their predominant polarities and are oriented towards the binder interface.

In most cases, however, they contain only one or two groups with affinity for pigment, which means that sufficiently strong and lasting adsorption is guaranteed only in the case of inorganic pigments, which have an ionic structure and thus a relatively high polarity on their surface. This plays a major role in terms of the effectiveness of the additive. The stabilization of organic pigments with the aid of conventional, low-molecular weight dispersing additives, on the other hand, is far more difficult because the comparatively low-polar pigment surface offers only weak interactions with the additive and is thus unable to form any sufficiently effective “protective layer” to prevent flocculation of the pigment particles.

This fact was the main reason for developing high-molecular weight wetting and dispersing additives with a mean molecular weight of between 5,000 and 30,000 g/mol. Unlike the low-molecular weight grades, they have far more groups with affinity to pigments. In addition, these groups are specifically geared to the characteristic structure and, as a result, the interactions prevailing on the surface of the organic pigments. They are thus able to produce a lasting and sufficiently thick adsorption layer. The adsorption forces are based for the most part on dipole-dipole and Van der Waals interactions. From a chemical point of view, a distinction can be made between two main groups: the modified polyurethanes and the large group of polyacrylics.

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BORCHI® GEN

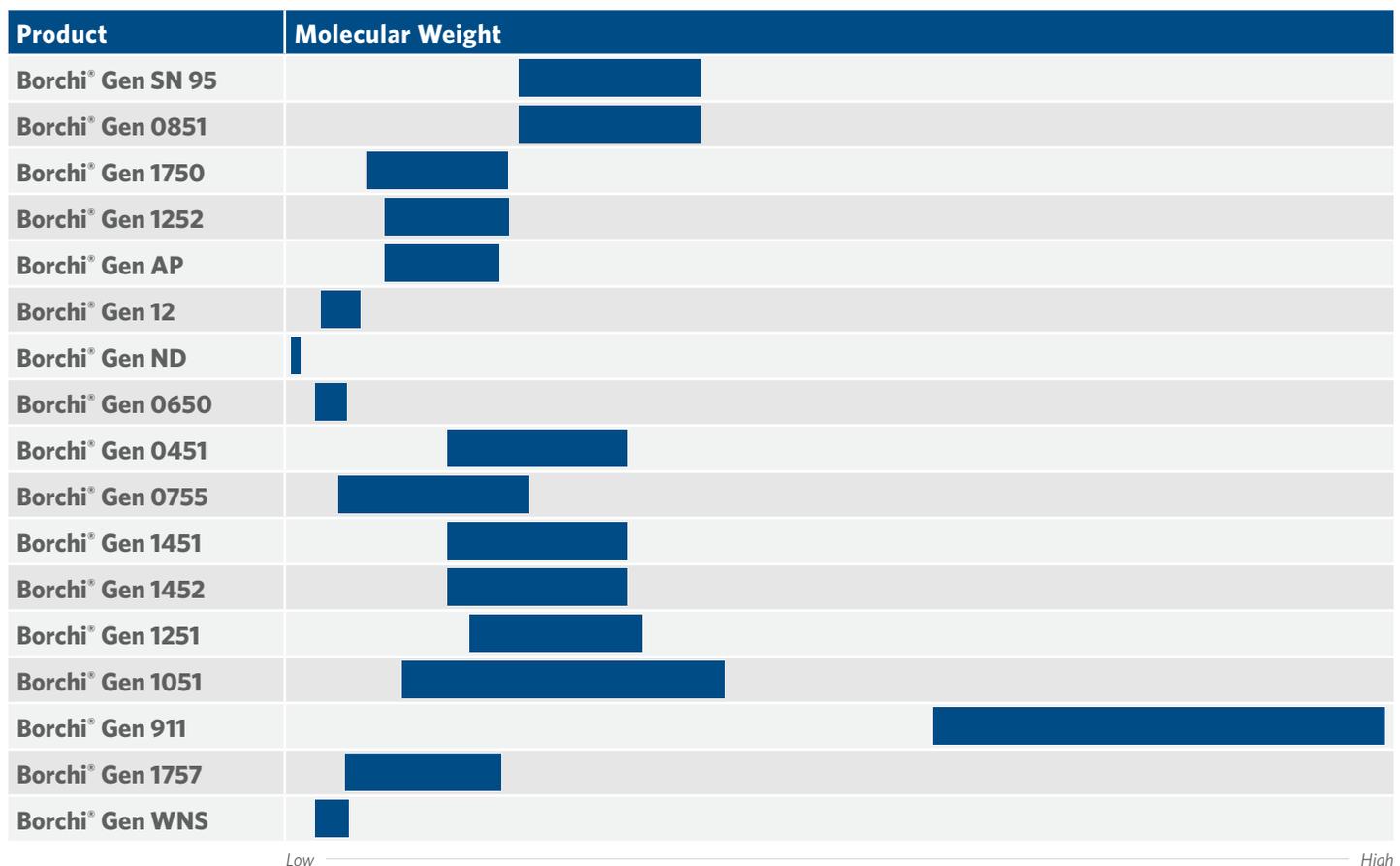
Although the high-molecular weight additives have been developed specifically for organic pigments, this concept also applies to inorganic pigments. However, there are also disadvantages to modern dispersing agents, for in some cases, the high molecular weight is associated with limited binder compatibility. Furthermore, the required dosages of high-molecular weight wetting and dispersing additives are usually considerably higher than with the low-molecular weight grades.

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Our range of **Borchi® Gen wetting and dispersing additives** includes both low-molecular weight and high-molecular weight products, providing optimal solutions for every field of application and every kind of pigment.

Our **Borchi® Gen** product group contains coordinated products for waterborne and solventborne systems.



PROPERTIES FOR BORCHI® GEN ADDITIVES

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Borchers Additive	System*	Chemistry	% Active	Description
Borchi® Gen 0851	W	Polyurethane	50% in water	<ul style="list-style-type: none"> VOC- and APEO-free; specially designed for dispersing difficult organic pigments and carbon black in waterborne systems Provides low viscosity dispersions, high transparency with organic pigments, high jetness with carbon black and long-term dispersion stability
Borchi® Gen 1750	W	Polyurethane	40% in water	<ul style="list-style-type: none"> VOC-free; specially designed for transparent and opaque iron oxides, inorganic pigments and extenders in waterborne systems Small particle size dispersions produce high transparency, and low viscosity grinds allow up to 40% pigment loading with transparent oxide pigments and over 60% with opaque iron oxides
Borchi® Gen SN 95	W	Polyurethane	25% in water	<ul style="list-style-type: none"> Specially designed for dispersing difficult organic pigments and carbon black in waterborne systems Provides low viscosity dispersions, high transparency with organic pigments, high jetness with carbon black and long-term dispersion stability
Borchi® Gen WNS	W	Low-molecular weight polyether modified compounds	90% in water	<ul style="list-style-type: none"> VOC- and APEO-free; recommended for waterborne or glycol-based universal tinting pastes Provides strong color development with organic pigments and improved storage stability
Borchi® Gen SPE	W/S	Low-molecular weight polyether modified compounds	100%	<ul style="list-style-type: none"> VOC-free (according to the ASTM D2369 test method) and APEO-free; for use in a wide range of organic and carbon black pigments and base chemistries Improves particle size, viscosity, gloss and color
Borchi® Gen LMW	W/S	Low-molecular weight polyether modified compounds	100%	<ul style="list-style-type: none"> VOC-free (according to the ASTM D2369 test method) and APEO-free; for use in a wide range of organic and carbon black pigments and base chemistries Improves particle size, viscosity, gloss and color
Borchi® Gen 12	W/S	Low-molecular weight polyether modified compounds	100%	<ul style="list-style-type: none"> VOC- and APEO-free; recommended for systems based on CAB and nitrocellulose Improves pigment wetting and dispersion time and has OH functionality that can be covalently bonded in cross-linked or two-component waterborne and solventborne coatings systems
Borchi® Gen ND	W/S	Phosphate/amine compound	100%	<ul style="list-style-type: none"> Provides high gloss and strong color development, as well as good pigment wetting properties Acts as an anti-gelling agent when basic pigments and acidic binders are used
Borchi® Gen AP	W/S	Phosphoric acid ester polycondensate	100%	<ul style="list-style-type: none"> Improves pigment wetting of inorganic pigments and fillers
Borchi® Gen 1757	W/S	Copolymer with pigment affinic groups	100%	<ul style="list-style-type: none"> VOC-free; hybrid wetting and dispersing additive providing a combination of various principles of pigment stabilization Produces vibrant color and superior opacity with a wide range of bismuth vanadate pigments
Borchi® Gen 0755	W/S	Polyurethane	100%	<ul style="list-style-type: none"> VOC- and APEO-free; recommended for dispersing difficult organic pigments and carbon black in solventborne systems; broad compatibility; can be used in nitrocellulose Provides low viscosity dispersions, high transparency with organic pigments, high jetness with carbon black and long-term dispersion stability
Borchi® Gen 0650	W/S	Amine neutralized phosphoric acid ester	100%	<ul style="list-style-type: none"> VOC- and APEO-free; specially designed for stabilizing fillers and pigments with polar surfaces like titanium dioxide, iron oxides and hydrophilic organic pigments in waterborne and solventborne systems Provides low viscosity dispersions; may significantly improve the color of tinted white and clear alkyd-based coatings
Borchi® Gen 0451	W/S	Polyurethane	100%	<ul style="list-style-type: none"> VOC- and APEO-free; specially designed for dispersing difficult organic pigments and carbon black in waterborne and solventborne systems Provides low viscosity dispersions, high transparency with organic pigments and long-term dispersion stability
Borchi® Gen 1252	W/S	Acrylic ester copolymer	100%	<ul style="list-style-type: none"> VOC- and APEO-free; recommended for titanium dioxide, iron oxide and other inorganic pigments and fillers in waterborne and solventborne coating systems Provides high tint strength and contrast ratios, as well as stable dispersion with excellent color development for iron oxide pigments
Borchi® Gen 911	S	Modified polyester	70% in white spirits	<ul style="list-style-type: none"> Recommended for alkyd solventborne coatings, as well as nitrocellulose-based systems Provides improved pigment wetting, shorter dispersion time of organic and inorganic pigments and good storage stability of the finished paint
Borchi® Gen 1051	S	Polyurethane	45% in BAC/MPA	<ul style="list-style-type: none"> Specially designed for dispersing organic blue, green and red pigments in solventborne systems Provides low viscosity dispersions, high transparency and long-term dispersion stability
Borchi® Gen 1251	S	Polyurethane	85% in MPA	<ul style="list-style-type: none"> Provides excellent pigment wetting, color development and high gloss, as well as low viscosity dispersions and long-term dispersion stability Recommended for organic pigments and carbon black in solvent-based systems
Borchi® Gen 1451	S	Polyurethane	30% in EGDA	<ul style="list-style-type: none"> APEO-free; specially designed for dispersing difficult organic pigments and carbon black in solventborne systems Provides low viscosity dispersions, high transparency with organic pigments and long-term dispersion stability
Borchi® Gen 1452	S	Polyurethane	45% in EGDA	<ul style="list-style-type: none"> APEO-free; specially designed for dispersing difficult organic pigments and carbon black in solventborne systems Provides low viscosity dispersions, high transparency with organic pigments and long-term dispersion stability
Spurso®	S	Modified alkyd resin	70% in mineral spirits	<ul style="list-style-type: none"> Provides strong color development with organic pigments and improved storage stability Provides improved pigment stability and gloss, as well as reductions in dispersion times, discoloration in white enamels and pigment flooding and floating

W = Waterborne, S = Solventborne

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RECOMMENDED APPLICATIONS FOR BORCHI® GEN ADDITIVES

The following table will help you select the optimal Borchi® Gen wetting and dispersing additive for your application:

Product	Solvent			Binder						Pigment Preparations			Pigment			
	Waterborne	Solvent free	Solvent borne	PU	Acrylic	EP	Alkyd	UV	NC	Binder free	With binder	Universal	Titanium dioxide	Inorganic	Organic	Carbon black
Borchi® Gen 1252	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	(S)
Borchi® Gen WNS	✓			✓	✓	✓	✓	✓		✓	✓	✓	(S)		✓	(S)
Borchi® Gen SN 95	✓			✓	✓	✓		✓		✓	✓		(S)		✓	✓
Borchi® Gen 0851	✓			✓	✓	✓		✓		✓	✓		(S)		✓	✓
Borchi® Gen 1750	✓			✓	✓	(S)	✓	✓		✓	✓		✓	✓	✓	✓
Borchi® Gen AP	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓		
Borchi® Gen 12	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	(S)	
Borchi® Gen ND	✓	✓	✓				✓	✓		(S)	✓	(S)	✓	✓	(S)	
Borchi® Gen 0650	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	
Borchi® Gen 0451	✓	✓	✓	✓	✓	✓	✓	✓	(S)	✓	✓	✓	✓	(S)	✓	✓
Borchi® Gen 0755	✓	✓	✓	✓	(S)	(S)	✓	(S)	✓	✓	✓	✓	(S)	(S)	✓	✓
Borchi® Gen 1451			✓	✓	(S)	✓	(S)	✓	(S)	✓	✓		(S)	(S)	✓	✓
Borchi® Gen 1452			✓	✓	(S)	✓	(S)	✓	(S)	✓	✓		(S)	(S)	✓	✓
Borchi® Gen 1251			✓	✓	✓	✓	✓		(S)	✓	✓	✓	✓	(S)	✓	✓
Borchi® Gen 1051			✓	✓	✓	✓	(S)		✓	(S)	✓		(S)		✓	✓
Borchi® Gen 911			✓	(S)	(S)	(S)	✓		✓	(S)	✓		✓	✓	✓	(S)
Borchi® Gen 1757	✓		✓	✓	✓		✓			✓	✓		(S)	✓		

✓ Highly recommended application (S) Suitable application



For more information, please reach us at [borchers.com/contact](https://www.borchers.com/contact)

PLEASE NOTE: As each customer's use of our product may be different, information we provide, including without limitation, recommendations, test results, samples, care/labeling/processing instructions or marketing advice, is provided in good faith but without warranty and without accepting any responsibility/liability. Each customer must test and be responsible for its own specific use, further processing, labeling, marketing, etc. All sales are exclusively subject to our standard terms of sale posted at www.milliken.com/terms (all additional/different terms are rejected) unless explicitly agreed otherwise in a signed writing. Borchi is a trademark of Borchers Americas.

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