Polymer products for pulp & paper

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derypol

"We make polymers, we care for the environment "

This means that at **Derypol** we work to establish the market needs, investigate and develop products and look after these needs under a strict quality control.

Our concern for the natural setting has been incorporated into our main objective; using processes and products that respect the environment. This is our way of contributing to the care of the ***environment.***

Our polymers used for the separation of ***pulp and paper*** are made in accordance with our objectives for innovation while using advanced technologies in the development of specialized and sophisticated products. All of our products are the fruit of extensive investigation and are made by following the strictest criteria to guarantee excellence in their quality.

As such, we are able to offer additives for he ***process of the fabrication and manipulation of paper*** that adapt themselves to the needs of each client, looking for the solutions to problems in each case, improving or making more profitable the Standard paper fabrication and manipulation process. As always we accomplish this implementing every security requirement and with the most respect for the environment.

Dr. Guillem Solé
General Manager

Products For pulp & Paper

INTRODUCTION

Derypol polymers for Pulp & Paper

RETENTION & DRAINAGE AGENTS

- **HIMOLOC SERIES**
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  - TG Series
  - KD Series
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  - ZW serie
- **HYDROSOL SERIES**
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- **HYFLOC SERIES**
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- **STRENGTHENING AGENT**
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- **CATIONIZAING AGENT**
  - C (Poliamine)
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- **ANIONIC AGENT**
  - HA 89

OTHERS AUXILIARS

- **C-1400 REHOLOGY MODIFIERS**
- **BF-43M**

INTRODUCTION

PAPER PROCESS

The areas where you can use Derypol polymers for paper industry are:

- White water treatment.
- Fibbers and pigments retention agents.
- Drainage agents.
- Waste water and final sludge treatment.
- Green and white liquor clarification.
- Dry Strength Agents
- Ply Bond agents
- Others

White Water Treatment

White water contains approximately the same components in the same proportion than the feeding blend, and so is recovered and recirculated. For this recirculation are used three kinds of processes:

1. **- Precipitation (conic recoverer).**
2. **- Flotation (Celloflot, krofta, etc).**
3. **- Filtration (Polydisc filter).**

The most appropriate products will be given as a function of manufacturing conditions (pH, pigments, and type of sizing) and therefore is difficult to recommend a specific type, because there are too many variants for determining the most adequate polyelectrolyte.

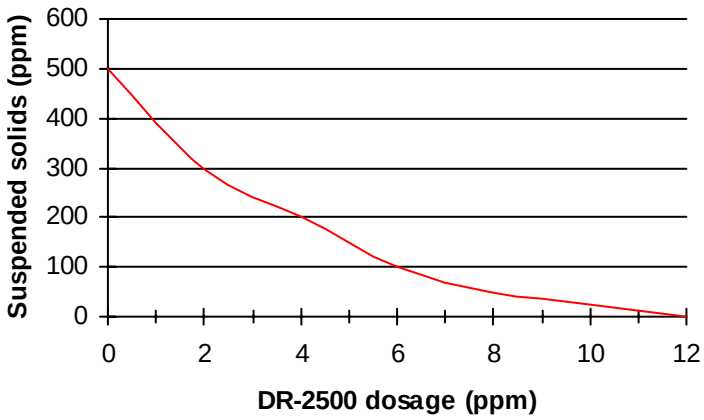
In each case, our technical department will help in determining the most suitable polymer for each treatment, although we can advance that the most used polymers in recovery are Derypol Himoloc Series.

For the white water treatment we recommend to use the corresponding polymer at a solution concentration of **0.5-2%,** feed behind the feeding pump.

Example:

Fibbers and pigment recovery in a Celloflot system:

Type of paper:	Writing paper
Pigment:	Calcium sulfate
Sizing:	Acid (Aluminum sulfate)
Suspended solids in drain water:	350 ppm
pH of drain water:	4.6



Retention Agents

Although a part of fibbers and pigments that make the white water are recovered, it is desirable a maximum retention of them on the paper sheet.

As in the case before, it is difficult to determine an adequate retention agent and, to find it; we recommend the help of our technical staff.

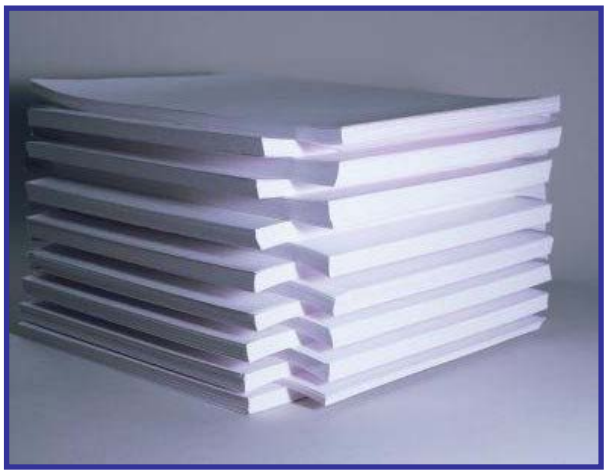
Generally the pulp has determined electric charge, as a result of its different components: fibbers, pigments, sizing agents, etc. This electric demand determines which type of polymer is the most adequate to get the best retention.

For selecting the retention polymer can be done a colloidal titration of the electrical demand of the pulp or, better still, a test of flocculation-drainage with the aid of a dynamic jar.

In order to calculate the demand we use a laboratory test by colloidal titration of which we could supply to you if you were interested in it.

Derypol recommend dosing polymers at machine head, just before or after the SP (centrifugal separator).

Our polymer must be feed at a concentration of 2% maximum and be filtered throw a 100-250 micron filter. Recommended dosage can vary between 0.5-3 kg/Tn of paper, always as a function of the desired results.

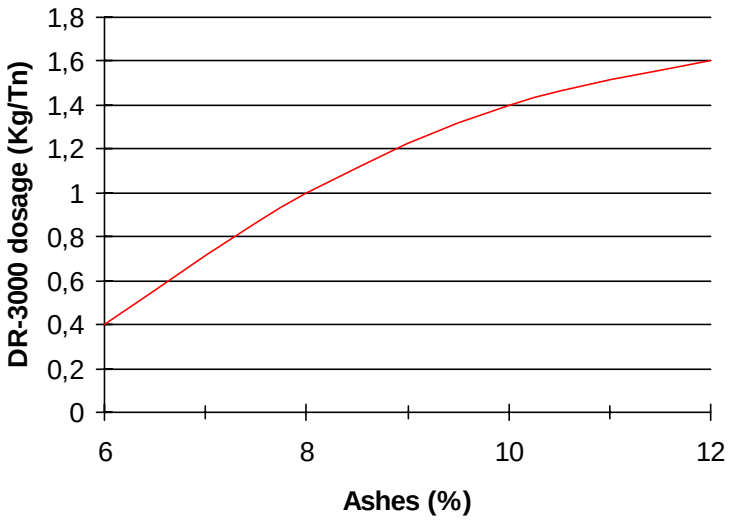


DERYPOL RETENTION AGENTS Advantages:

- √ 20-40% pigments savings.
- √ Improvement in short fibbers of the pulp retention.
- √ Solid content of white water reduces 30-50%.
- √ White water clarification undergoes an important improvement, originating product saving in waste water treatment.
- √ Improvement in sheet formation for instance increases its opaqueness degree and decreases finishing differences between both sides of paper.
- √ Due to drainage increase, machine velocity can be increased to a 10%
- √ Drainage increase makes the sheet less wet in the presses, and so we get drying energy savings.

Example:

Paper type:	Writing
Pigments:	China clay + talc (22% on pulp)
Sizing:	Acid with aluminum sulfate
pH:	4.6
Basis weight:	57 g/m^2
Feeding point HIMOLOC TG325:	Just after SP.



Drainage Agents

Derypol supply drainage agents for paper manufacturer, where is using paper waste as principal raw material.

Our **DRAINAGE AGENTS** increase the capillarity as the result of bridges between fibbers improving the drainage of water through these fibbers.

Derypol recommend to dose HYD or HIMOLOC KD series products at a concentration **not over 2%, even 5%**, before or after the SP. The amounts can vary from **0.5 to 4 kg/Tn**. Unlike the usual solvent based emulsion polymers, our products do not stain nor obstruct filters nor do clothes, being a water based emulsion completely water soluble in any proportion. Dual programs of combination with bentonite or silica can improve the performance of our polymers.

HYDROSOL and HIMOLOC Advantages

- √ Increase in solids content retained in the cloth, producing an increase in basis weight that means savings in pulp (raw material).
- √ Increase in drying speed.
- √ Increase in production.
- √ Increase of dry components after press.
- √ More clarified waste and recirculation water.
- √ Energy saving in drying.

Similar effects have been obtained in manufacturing processes of kraft paper, cardboard, etc.

Even in manufacture of paper as delicate as tissue, there have been obtained excellent results without risk of breakings during the process nor deformations of the finished paper.

Waste water and final sludge treatment:

Most times the suspended solids that can be present in this water have been flocculated and separated in the recovery system.

Derypol recommend being our technical department who determine the flocculant or coagulant-flocculant combination more suitable for this water treatment.

For laboratory tests we have a wide range of flocculants, comprising polymers of different ionic charges, as well anionic as cationic, check the Water treatment brochure.

Sludge appears as a result from the flocculation-separation of suspended solids in waste water treatment. This sludge has a high water content (over 90%) that makes that for transport and disposal must be dewatered to contents around 30%. The most known equipments are centrifuges, belt filters tassters or other equipments designed for this use.

In any case is obtained a better dewatering by using a flocculant: greater dryness of the cake, less solid content in filtered water and to be able of treating a greater sludge flow.
Anyone of our flocculants can give good performance for this application although, in general, the best results have been obtained with our cationic types.

Example:

Tissue paper waste water inlet to the treatment plant (conical precipitator).

Non treated water:	SS = 535 ppm	T = 1300 NTU
Treatment:	200 ppm PAC + 2 ppm GO230 + sedimentation	
Result:	outlet: SS < 20 ppm	T < 25 NTU

Sludge without treatment:	4.25% dry matter	
Treatment:	1 kg/Tn DR-3000 dry sludge + centrifugation	
Result:	47.8 dry matter	SS filtered water < 100 ppm

Green and white liquor clarification

The high pH of both in paper pulp preparation makes that the most appropriate be using high anionic charge and high molecular weight anionic polyelectrolyte.

They are added at **0.01-0.05%** concentration, being the adequate doses between **0.1 to 2.5 ppm**.
We suggest the help of our technical staff to determine the most adequate type.

Dry Strengh Agents

ADG 1

Depending on the paper process a strength agent is required in order to improve the paper resistance. In this way Kraft paper is a common type of paper which requires both a dry and a temporally wet agent.

The low cationic polymeric system based on acrylamide becomes to a strength agent when that polymer is functionalized with sufficient -CHOHCHO subsistent.

Advantages:

- √ Improving in temporary wet strength.
- √ Improving in dry strength.
- √ Improving the bonding between fibbers.
- √ Better quality in the sheet formation.
- √ High speed machine.
- √ Due to its easy dissolution, it is possible the addition directly in the paper machine.
- √ Lower environmental problem produced by the starch.

Ply Bond Agents

HIMOLOC MJ 480

The MJ 480 have been developed to increase adherence between paper/board layers, by means of a spray as a starch substitute

A synergy with the mixture starch + MJ has been observed. Starch is supposed to increase viscosity at a certain temperature. That is what we call the "starch cooking or explosion". If we compare the starch itself with starch + MJ, we can see a decrease in the Temperature in this last case. That is to say, the starch+ MJ explodes at lower temperatures. That is an advantage of MJ versus the starch, since the earlier "explodes", the less it is absorbed.

In order to measure the strength between layers there some many parameters to consider, as the Scott Bond Tester, COD, Mullen ...

Advantages

- √ Economical advantages compared with starch
- √ Maintenance of paper characteristics
- √ Easy application/ handling
- √ Minimal risk for the trial

Cationizaing Agents

HYFLOC K / HYFLOC C SERIES

Synthetic coagulant formulated with strong cationic charge polymers in solution dosages as a cationizing agent in pulp, starch during paper process. Primary coagulant in recovery water and residual water treatments.
Applied as a decolourant or color fixer waste water treatment where a color is applied during paper process. In biological treatment with flocculant a Hyfloc K Series is applied for a fast praise system.

Anionic Coagulant

HA89 (Colloidal Silica)

In order to obtain an excellent retention and drainage a dual program anionic coagulant HA89 + flocculants is proposed. Indicated to neutralize positive charges anionic coagulant HA89 as a anionic coagulant helps to process for a good forming sheet.

Apart from that anionic coagulant HA89 is proposed to any treatment of waters or sludge in order to improve results.

Others: AUXILIAR PRODUCTS

BF43/M dispersant

Slurry dispersant for inorganic pigments as titanium dioxide, caolin, iron oxides, zinc oxide, barita, calcium carbonate, etc.

Pigment dispersions are stable to increases of temperature, making dispersions more stable.

It can be dosed directly without previous dilution, or diluted in water for any proportion. This product can be used alone or as a component in blends for the applications mentioned in the previous section.

For its use as a dispersant, we recommend diluting the product previously in water before fillers and pigments are charged.

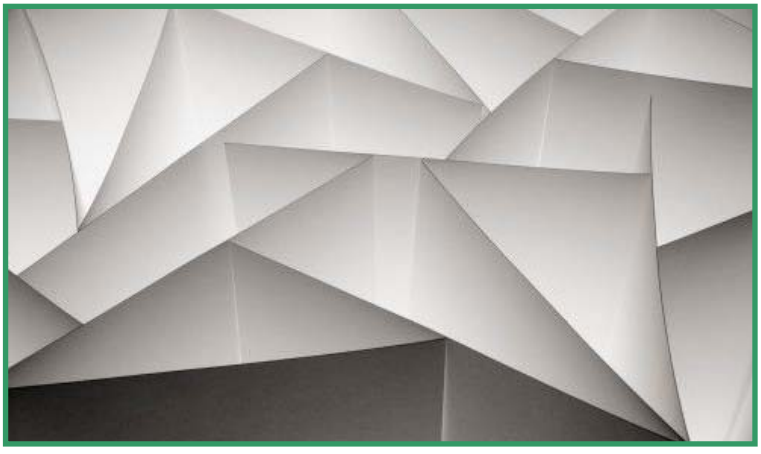
C-1400 thickening

Thickening agent for any kind of suspension or dispersion in pulp & paper process where a viscosity increase at neutral or basic pH is required. C-150 thickening is compatible with all kind of aqueous emulsion resins, and what is more, it is capable to keep pigments suspended.

After 24 hours a stable viscosity is reached. The product does not undergo sedimentation over time.

According to the studies it can be dosed directly without previous dilution, or diluted in water for any proportion.

It is recommended applying the product in an acid media, always before adjusting the pH, in the beginning of the formulation.



RETENTION AND DRAINAGE AGENTS

HIMOLOC SERIES

DR series

Specifications:

	DR1000	DR2200	DR3000	DR522
Appearance	White milky liquid	White milky liquid	White milky liquid	White milky liquid
Density	~1,2 g/cm^3	~1,2 g/cm^3	~1,2 g/cm^3	~1,2 g/cm^3
Viscosity	< 2000 cp	< 2000 cp	< 600 cp	<1500 cp
pH	3.0 – 5.0	3.0 – 4.5	3.0 – 4.1	3,0 - 4,1
Cationicity	Not ionic	Very low	Medium	Low
Molecular weigh	High	High	High	High

Applications:

- Fibber and filler retention agents.
- The recommended doses vary depending on the type of fibbers used.

TG series

Specifications:

	TG30	TG325	TG60
Appearance	White milky liquid	White milky liquid	White milky liquid
Density	~1,2 g/cm^3	~1,2 g/cm^3	~1,2 g/cm^3
Viscosity	< 1500 cp	< 3000 cp	< 1500 cp
pH	3.0 – 5.0	3.0 – 5.0	3.0 – 5.0
Cationicity	Medium	Weak	Very High
Molecular weigh	High	High	Very High

Applications:

- Fibber and filler retention agents. Free of oils and free of surfactants.
- Flocculant treatment for recovery water

KD series

Specifications:

	KD2025	KD7030	KDX700
Appearance	White milky liquid	White milky liquid	White milky liquid
Density	~1,2 g/cm^3	~1,2 g/cm^3	~1,2 g/cm^3
Viscosity	< 3000 cp	< 3000 cp	< 3000 cp
pH	3.0 – 5.0	3.0 – 5.0	3.0 – 5.0
Cationicity	Medium	Medium	Medium
Molecular weigh	Medium/Low	Médium/Low	Medium/Low

Applications:

- Fibber and filler retention agents.
- It improves sheet
- It increases mechanical properties of the paper (dry strength agent).
- It eliminates forming of pitch
- It precipitates and removes optical brightness

GO & GA series

Specifications:

	GO2030	GA 8713 WG
Appearance	White milky liquid	White milky liquid
Density	~1,20 g/cm^3	~1,20 g/cm^3
Viscosity	<3000 cp	<400 cp
pH	3,0 - 5,0	3,5 - 6,0
Anionicity	High	Medium
Molecular Weight	Very high	High

Applications:

- Retention agent.
- These products are especially effective when the ionic demand of the circuit is anionic, due to the addition of strong cationic products in the circuit.

ZW serie

Properties:

- The products ZW increase the dry strength in 14-18% respect the blank
- The products ZWand increase the temporary wet strength in 5-6% respect the blank

Specifications:

	ZW111	ZW322
Appearance	White opaque milky liquid	White opaque milky liquid
Density	~1,20 g/cm^3	~1,20 g/cm^3
Viscosity	< 2000 cp	< 2000 cp
pH	3,0 - 5,0	3,0 - 5,0
Cationicity	Low	Medium
Molecular Weight	High	High

Applications:

- These are amphoteric products with cationic and anionic charge in the same polymeric chain.
- They are used as a retention agent as they have a high molecular weight, with an added value because it is able to add simultaneously as flocculant and coagulants.

HYD Series

Specifications:

	HYD 151	HYD 252	HYD 755
Appearance	Whitish-yellowish viscous liquid	White viscous liquid	Whitish-yellowish viscous liquid
Viscosity	<12.000 cp	< 12.000 cp	< 15.000 cp
pH	2.5 - 5.5	2.0 - 4.0	2.0 - 4.0

Applications:

- Retention agent.
- It is used for medium/high grammages.
- The common doses are between 1-3 Kg/Tn.

Serie FIC

Specifications:

	FIC100	FIC300
Appearance	Whitish clear viscous liquid	Yellowish translucid liquid.
Density	~ 1,04 g/cm^3	~ 1,02 g/cm^3
Viscosity	300-1000 cp	300-1500 cp
Cationicity	Low	Medium
Molecular Weight	Very high	Very high

Applications:

Agents used for fibbers and charges retention. Because of having a very high molecular weight these products are suitable when high retention is the main priority.

Hyfloc XT Series

Hyfloc XT solid cationic flocculants series is especially recommended for sludge dewatering applications.
In centrifuges, these very high molecular weight flocculants provide a high dewatering yield:

	XT343	XT393
Appearance	White granular solid	White granular solid
Apparent Density	~ 0,80 g/cm³	~ 0,80 g/cm³
Viscosity at 0,3%	150-250 cp	300-450 cp
Cationicity	Very Low	Low
Molecular Weight	Very High	Very High

Hyfloc SS Series

Universal anionic solid flocculants are used for the elimination of the suspended materials, as well as in industries such as chemicals, textiles, paintings, curtición, food, metallurgical and hydrocarbon derivatives.

These products are especially recommended for the treatment of waste waters where the liquid-solid separation must be made by settling.

	SS200/H	SS120	SS140
Appearance	White granular solid	White granular solid	White granular solid
Apparent Density	~ 0,80 g/cm³	~ 0,80 g/cm³	~ 0,80 g/cm³
Viscosity at 0,3%	75-125 cp	100-150 cp	125-175 cp
Cationicity	Low	Medium	High
Molecular Weight	Very High	Very High	Very High

ADITIVES

PLY BOND AGENT

MJ 480

Properties:

MJ-480 was designed to partially replace (and combine with) starch, which is used as a ply bond agent. It produces a synergetic effect with starch, decreasing the hydration temperature of the blend.

The product is loaded in the same tank where starch suspension is prepared. Both products are completely compatible.

MJ-480 is insoluble in cold water, so it forms water suspensions as starch does.

The replacement ratios recommended are between 1:10 and 1:5 (MJ-480: Starch). This means an economic saving, and a significant reduction of COD in the resulting white waters.

Specifications:

	MJ 480
Appearance	White opaque milky liquid
pH	2.0 - 4.0
Viscosity	< 1.500 cp

ADG 1

Propierties:

Due to its reactivity, this low cationic charge polymer develops all its power as strengthening agent in the stage of paper drying. The mechanism of this process is by chemical reaction with the cellulose.

Although this product is thought as a dry strengthening agent, its special reactivity with cellulose also provides with some wet strengthening effect.

Specifications:

	ADG 1
Appearance	Colourless transparent to slightly Yellowish translucid liquid.
pH	2,0 - 3.0
Viscosity	</= 25 cp
Solids	7% ±1

CATIONIZING AGENT

HYFLOC C series (POYIAMINE)

Propierties:

We have a wide range of cationic products made to neutralize the cationic demand in water circuits. In additionally they reinforce the retention agent's performance.

Specifications:

	C 410	C 437
Appearance	Yellowish translucid liquid	Yellowish to redish liquid
Solids	50% ±1	36,0 - 39,0%
Viscosity	400 - 1.500 cp	< 600 cp
pH	2,5 - 6,0	2.5 - 5.0

HYFLOC K series (POLYDADMAC)

The synthetic or organic coagulants have the ability to replace partially or completely the classic coagulants of mineral origin (inorganic). They stay effective in a wide range of pH without modifying it, therefore reducing the required dose of alkaline reagents in the coagulation process (caustic lye, lime). For that reason they also reduce the sludge production, improve the later sludge dewatering and the effluent purification.

Likewise, its use is also standard in the secondary biological sludge coming from aerobic and anaerobic digestions, favouring the fast settling of sludge and respecting the bacterial flora.

Specifications:

	K10	K225	K240	K533	K833
Appearance	Colourless to yellowish translucent	Colourless translucent	Colourless translucent	White to yellowish opaque	Colourless to amber translucent
Density	~ 1,10 g/cm^3	~ 1,05 g/cm^3	~ 1,10 g/cm^3	~ 1,10 g/cm^3	~ 1,10 g/cm^3
Viscosity	~ 600 cp	~ 1400 cp	~ 10.000 cp	~ 12.000 cp	~ 12.000 cp
pH	3,5 - 5,5	4,5 - 6,5	3,5 - 5,5	3,0 - 5,0	4,0 - 6,0

ANIONIC AGENT

HA89

Coagulant with a high anionic charge and an exceptionally low particle size that interacts effectively with cationic and anionic flocculants.

Combined with cationic or amphoteric flocculants it generates a Dual System able to improve retention and drainage.

It can be dosed directly without previous dilution, or diluted in water for any proportion.

	HA89
Appearance	Colourless translucent liquid
pH	9,8 - 11,0
Viscosity	<20 cp
Solids	11,5-13,7%

OTHERS AUXILIARS

C 1400 REHOLOGY MODIFIER

Thickening agent for any kind of suspension or dispersion where a viscosity increase at neutral or basic pH is required.

It is compatible with all kind of aqueous emulsion resins.

It is capable to keep pigments suspended.

After 24 hours a stable viscosity is reached. The product does not undergo sedimentation over time.

Specifications:

	C 150
Appearance	White Milky liquid
Density	1,10g/cm^3
pH	2.0 – 5.0
Viscosity	< 100 cp
Solid Content	29% ±1

BF 43 M DISPERSANT AGENTS

Dispersant for inorganic pigments as titanium dioxide, caolin, iron oxides, zinc oxide, barite, calcium carbonate, etc.

Pigment dispersions are stable to increases of temperature.

	BF 43 M
Appearance	Yellowish liquid
Density	1,30g/cm^3
pH	6.8 – 8.5
Viscosity	< 1000 cp
Solid Content	42% ±1

LEGISLATION APROVALS

Derypol, S.A. reports that our products listed below have the following clearances for the regulations also mentioned:

Product	*DSL*	*TSCA*	*Paper and paperboard in contact with food, FDA - 21 CFR 176*	*BfR (Recommendation XXXVI: Paper and Board for food contact)*
TG 325	√	√	√	√
DR 2500	X	√	X	√
DR 2200	X	√	X	√
DR 3000	X	√	X	√
DR 522	X	√	X	√
DR 523	X	√	X	√
HYD 151	√	√	√	√
HYD 101	√	√	√	√
HYD 755	√	√	√	√
HYD 252	√	√	√	√
KD 2025	√	√	√	√
GO 2030	√	√	√	√
MJ 460	√	√	√	√
GA 8713	√	√	√	√
DW 217	√	√	√	√
DW 212	√	√	√	√
DW 211	√	√	√	√
DW 205	√	√	√	√

*The information provided has been compiled from our current regulatory database, and it is believed to be reliable. It is meant only as a guide, not intended to replace or supplement any regulations. It is the responsibility of the user to assess its product uses and applications and assure conformance to all applicable laws and regulations.

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