LEGOR FASHION PLATING

TECHNICAL SHEET

EASYCOATPRO

RESIN FOR E-COATING

DESCRIPTION

- Easy to use and manage
- No “Orange peel” defects and excellent distension on large flat surface areas
- Stable versus metallic contamination
- Non-yellowing resin system
- Undetectable uniform film thickness
- 5-35 micron of thickness
- REACH & OSHA Compliant

EASYCOATPRO is the concentrate resin for the preparation of transparent e-coating lacquers specifically designed for industrial scale productions. The resin matrix has been specifically studied to remove the unwanted “orange peel” phenomenon, common when coating large flat surfaces, thanks to its good distension property. In production **EASYCOATPRO** is extremely simple, easy to use and drive as it is stable and more resistant versus metallic contaminations -like copper-, thus affording a non-yellowing self-emulsifying cathodically depositable system. Achievable thickness range of the coating layer covers from 5-35 micron while remaining completely transparent and undetectable.

DEPOSIT DATA	
Hardness	4H
Thickness (um)	5 - 35 micron
Appearance	Completely transparent and shiny

PRODUCT FORM	
Form	Resin
Material color	Yellow
Storage time	2 years after production
Packaging	5 kg

READY-TO-USE EMULSION (E-COATING LACQUER) PREPARATION

Being concentrate, the resin EASYCOATPRO can be used to prepare the ready-to-use emulsion by dispersing and diluting it with pure D.I. water.

Prepare the ready to use emulsion from EASYCOATPRO by following this proportion: **100 g of EASYCOATPRO are necessary per every liter of ready to use e-coating lacquer** so that with an entire 5 kg tank it is possible to prepare until 50 liters of ready-to-use emulsion.
EASYCOATPRO is self-emulsifying so that it is mostly efficiently converted into an aqueous emulsion pouring the concentrate resin gradually into moderately stirred D.I. water between 20°C and 25°C using mixing and transfer equipment constructed from clean non-corrodible materials e.g. stainless steel, PVC, PP, etc. Any valves or other accessories should be free from silicones or lubricants known to be incompatible with aqueous finishing process.
The addition of the whole D.I. water directly to the EASYCOATPRO resin concentrate does not form a stable emulsion.

With all those premised, the procedure to prepare the ready-to-use emulsion by the use of EASYCOATPRO is then reported stepwise here below:

1. Introduce half of the D.I. water necessary for the preparation of the ready-to-use solution in a perfectly cleaned working tank.
2. Then pour the resin under moderate stirring, taking care to mix it perfectly in the water already present.
3. Once a completely homogeneous dispersion is obtained, bring to final volume with further D.I. water.
4. When adding the remaining water, avoid the formation of foam as much as possible.
5. After complete emulsification the Refractometric Index or solid content should be checked and adjusted as necessary by the addition, in case, of extra D.I. water or resin.

LEGOR GROUP S.P.A. - Via del Lavoro, 1 - 36050 Bressanvido (VI) - Italy - Tel. +39 0444 467911 - info@legor.com - www.legorgroup.com

EASYCOATPRO

RESIN FOR E-COATING

Prior to start to work it is recommended that the final emulsion is filtered before or during dispensing. Suitable filtration medium is 5-10 micron nominally polypropylene bag type (“paint compatible, silicon-free materials and equipment throughout, see also next paragraph).

E-COATING LACQUER USAGE

	RANGE	OPTIMAL
Voltage (V)	30 - 120 V, maximum ripple 20%	
Current density (A/dm2)	Average 0.05 – 0.1 A/dm2	
Working temperature (°C)	23 - 27°C	25°C
Treatment time (sec)	10 - 120	
pH	3.5 - 4.5	
MEQ corrected	25 -45	
Conductivity and solido content	300 - 600 µS at 25°C and 6 -7% solid content.	
Refractometric Index (°Brixel)	9 – 11	9.5
Solvent (% w/w)	2.5 - 5.5%	
Anode/cathode ratio	Not higher than 2:1	
Anode type	Stainless steel AISI 316	
Circulation	Moderate, but Mandatory. In holidays or when not working for long periods transfer the solution to closed containers.	
Curing	120-160°C for reasonable 30-45 minutes.	

The operation sequence to use properly the ready-to-use e-coating emulsion of EASYCOATPRO is:

- pre-treatment,
- application of READY TO USE EMULSION
- post-treatment
- curing

The pre-treatment is required to ensure absolute cleanliness and to obtain a surface free from any water breaks.
Articles which have been electroplated should pass a final cold water rinse before to enter in the e-coating treatment line. Mechanically polished or untreated articles should be cleaned using the appropriate treatments.
After the pre-treatment steps, the typical process sequence is:

- D.I. water rinse, 2 times
- pre-rinse in D.I. water added with 20 ml/l of READY TO USE emulsion
- E-COATING TREATMENT
- post-rinse in pure ultrafiltrate (permeate) or static D.I. water
- D.I. water rinse, 2 times subsequently
- Rinse with D.I. water added with a suitable *Rinse aid additive* that will lower the superficial tension of water (not mandatory in any case)
- air dry (**free from any dust and particles!)**
- curing

The purpose of the initial D.I. rinse is to prevent the lacquer solution from being contaminated.
The pre-dip in dilute lacquer is considered essential in order to prevent film defects caused by gassing.
The post-rinse is used to remove the excess of lacquer emulsion from the coated object.
Static rinses are suggested before and after the cataphoretic treatment.
The air dry stage is not critical, in fact some drain time is required to avoid excessive drag-out loss.
During the curing the deposited film will coalesce and cure.
A gradual heat-up to the recommended metal temperature – curing is preferred in order to limit as much as possible any shock thermic phenomenon.

LEGOR GROUP S.P.A. - Via del Lavoro, 1 - 36050 Bressanvido (VI) - Italy - Tel. +39 0444 467911 - info@legor.com - www.legorgroup.com

EASYCOATPRO

RESIN FOR E-COATING

PROCESS EQUIPMENT

A full range of specially developed equipment is available from Legor.

All tanks in contact with lacquer solution should be of suitable plastic construction or of steel covered with acid and solvent proof lining such as rubber or polypropylene ("paint compatible", silicone-free materials and equipment throughout).

It is advised to use plastic vessels (PP) or glass (Pyrex).for lab stuff. Do not use stainless steel or iron not covered. The equipment should offer the basic requirements as indicated in the following sequence/steps:

- Ultrasonic cleaning with detergent
- Recovery with normal water (2 recoveries are advised)
- Electrolytic degreasing
- Recovery with D.I. water
- Neutralization
- Rinse in circulating D.I. water
- Final rinse with D.I. water
- E-coating treatment, stabilized at a temperature of 23-27° C, provided with a 30 to 120 V rectifier
- Post rinse in pure ultrafiltrate (permeate) or D.I. water
- Recovery (2 subsequent recoveries with D.I. water)
- Final rinse in D.I. water by mist spray in D.I water
- Final Rinse Aid (recommended)
- Drying to air (min 5 to max 30 minutes)
- Drying in furnace (120-150° C for 30-45 minutes)

If the plant capacity for the e-coating tank is higher than 150-300 liters, an **Ultrafiltration/demineralization unit** for the e-coating and the first recovery vessel is strongly suggested.

In particular the EASYCOATPRO emulsion ready to use working tank should be fitted with:

- An overflow compartment.
- A circulating pump with a circulation capacity of 8 - 10 times tank volumes per hour.
- A filtration system through a 5 - 10 micron size polypropylene cartridges type filter is essential.
- A low energy (quartz) heater. Never use a heater that has a high heating power.
- Stainless steel AISI 316 anodes
- An ultrafiltration unit.

About the oven for the curing phase, re-circulatory hot air ovens or tunnel should be used.
An excellent system is a conveyor oven with temperature zoning in which the parts are heated slowly to the curing temperature.
NOTE: Box ovens require time to return to curing temperature when cold parts have been put in.

About plating racks: they must be made covered with normal PVC plastisol.

About rectifiers: use DC power rectifiers which are able to work in the range of 50 – 100 V provided of a function that permits to realize in case slow current ramps. For some specific work (like chains) some rectifiers able to reach up to 150 V are required provided with all the related safety devices.

Last but not least it is strongly **recommended to use adequate ventilation equipment** for the EASYCOATPRO emulsion ready to use tank and for the working area in general.

LEGOR GROUP S.P.A. - Via del Lavoro, 1 - 36050 Bressanvido (VI) - Italy - Tel. +39 0444 467911 - info@legor.com - www.legorgroup.com

LEGOR FASHION PLATING

TECHNICAL SHEET

EASYCOATPRO

RESIN FOR E-COATING

BATH MAINTENANCE

EASYCOATPRO ready-to-use emulsion

Emulsion level: restored regularly by adding cleaned D.I. water.
Water is lost by evaporation, the level in the overflow section should be looked by watching the solution level in the weir compartment, do not let the pump suck air because of too much low level.

Do not use the post-rinse solution for topping up.

SOLID CONTENT

A freshly prepared ready-to-use EASYCOATPRO emulsion contains 6 - 7% by weight solids.
In order to obtain stable performances, it is required to check the dry weight residue on regular basis. The dry weight should remain to 6 -7%.
It is recommended to run at least a refractometric analysis once a day, according to the use.
The more frequent is the use of the working emulsion, the more frequent the check could be necessary. If the dry residue should be below 6%, it is necessary to replenish the suspension with 15-17 g/l of concentrated resin EASYCOATPRO for every percent of dry weight below the reference value (6 - 7%). The concentrated replenisher consists of the pre-mixed concentrated resin, ceramic EASYCOATPRO.

The best method of addition is to premix the required amount of concentrate resin with the working solution in a separate container.
Preferably additions are done at the end of a production day.

SOLVENT CONTENT

Solvent is lost by evaporation and drag-out. Normally the solvent level is maintained by the addition of the EASYCOATPRO concentrate resin and the restoring of the solid content.
If solvent additions are necessary, following long idle periods for example, they should be made in increments of 0.5% through the weir.
It takes about one to two hours of solution circulation before the effect becomes apparent.

pH

pH of the bath should lie between 3.5 - 4.5.
It is good practice to check the pH once a day.
It is not advised to use pH paper for pH measurements but a suitable electrode-pHmeter probe.

LACTIC ACID CONTENT/ANOLYTE

It is determined by chemical analysis in lab.

IONIC CONTAMINATION

Avoid contamination of the EASYCOATPRO ready-to-use and working emulsion by soluble salts. They will decrease the efficiency leading to bad deposits.
Only with ultrafiltration the ionic contamination can be removed (slowly) by discarding the permeate. (Sometimes selective resins also work)

ADEQUATE CIRCULATION AND FILTRATION WILL KEEP THE LACQUER IN GOOD CONDITION.

Filter cartridge and/or bag will be clogged up with use. They should be cleaned or changed periodically.
The circulation pump should not suck air, any air getting into the circulation system will cause pitting.
It is recommended to carry out a batch filtration, followed by tank cleaning every one or two months.

DURING PROLONGED IDLE PERIODS TANK CIRCULATION CAN BE STOPPED, THE COVER OF THE TANK MUST BE CLOSED.

Alternatively the bath solution can be stored in closed containers.

LEGOR GROUP S.P.A. - Via del Lavoro, 1 - 36050 Bressanvido (VI) - Italy - Tel. +39 0444 467911 - info@legor.com - www.legorgroup.com

EASYCOATPRO

RESIN FOR E-COATING

RINSES (PRE- AND POST-) WITH D.I. WATER

The D.I. rinses before lacquering serve to minimize drag-in of hard water salts and pre-treatment chemicals into the ready-to-use emulsion and thereby prevent it from being contaminated.
After lacquering it can serve as a clean final rinse also.
The rinse should be dumped when the conductivity exceeds 10 µs/cm.
While doing the Post-rinse this solution gradually becomes contaminated by drag-in from the ready-to-use emulsion.
It should be replaced periodically or when the solids content reaches 1.5% by weight

ABOUT THE ULTRAFILTRATION

The use of an ultrafiltration unit has proven to be an integral part of successfully operating with this system
Every installation should have a single tube of Ultrafiltration unit especially for volumes bigger than 150 liters.
Its scope is that to minimize the effect of metallic contamination and to stabilize the pH of the solution as well as the solvent level.

ABOUT THE PROCESS WATER

Use pure D.I. water with conductivity close as much as possible to 0 µS/cm.
In any case D.I. water conductivity can not reach up to 5 µS/cm is s.

ANALYTICAL PROCEDURE

1. SOLID CONTENT DETERMIANTIOJN
   - Weigh a clean watch glass or aluminum foil
   - Add 10 ml of working ready-to-use emulsion
   - Heat it inside oven for 1 hours at 130°C
   - Cool down it and re-weigh.
   - Calculate the % solids content by weighing the difference.

   Now consider that to increase of 1% point of solid content, it is necessary to add 16 g of EASYCOATPRO concentrated resin per every liter of working solution

   Vice versa for the *"one spot"* solid content determination a pocket refractometer can be used:
   % solids (by weigh ratio) = 0.7 x Read °Brixel.

2. SOLVENT LEVEL DETERMINATION
   It has to be run in our Technical Assistance Laboratory.

3. pH measurement
   - Calibrate pHmeter
   - Rinse buffered electrodes carefully in D.I. water, dry and immerse in the ready-to-use and working emulsion.
   - After measuring, thoroughly rinse again electrodes in the same emulsion and finally rinse it in D.I. water again.

TABLE OF THE CORRELATED PRODUCTS TO EASYCOATPRO	
3019001	Lactic Acid 90% solution, 1 liter bottle
3019002	Solvent, 1 liter bottle
3009010	Stripper for e-coating, 10 kg tank
3009018	"ECO" Stripper for e-coating, 5 liters tank
3009011	Rinse aid solution

LEGOR GROUP S.P.A. - Via del Lavoro, 1 - 36050 Bressanvido (VI) - Italy - Tel. +39 0444 467911 - info@legor.com - www.legorgroup.com

LEGOR FASHION PLATING | TECHNICAL SHEET

EASYCOATPRO

RESIN FOR E-COATING

SUPPLEMENTARY INFORMATION

Below important supplementary information to know in order to drive this process with success.

WORKING ENVIRONMENT

It is particularly important the quality of the air and the cleanliness of the working environment. Since the e-coating is sticky before the heat treatment, any air-borne particle may adhere on of the pieces causing surface defects. This problem may become particularly evident on large and flat surfaces (e.g.: medals, trays, etc.). If treated pieces are items with small surfaces (e.g.: chains) the risk for defects from airborne particles is less evident. In order to obtain the highest surface quality, it is recommended to place the equipment ina cleanroom.

OPERATING CONDITIONS - GENERAL RECOMMENDATIONS

An optimal voltage for e-coating application should be around 30 – 50 Volts. Current density is low and decreases rapidly after the first seconds of treatment, due to the insulating properties of the deposit itself. Optimal treatment time is around 15-30 seconds. In order to keep in good efficiency the e-coating liquid suspension, it is extremely important to avoid any contamination of the working suspension from the previous steps. Slight increase of salinity may negatively impair the e-coating performances, leading to clots formation.

BATH TURNOVER RATE

In order to maintain the optimum properties, the feed replenishment rate should be consistent with one bath turnover within three months.

CIRCULATION

Continuous pumped circulation from a skim weir and return via submerged pipe. Circulation turnover rate is 8-10 bath volumes per hour.

ABOUT WATER DISPOSAL AND SAFETY INFORMATION

Being acidic, prior to dispose the working emulsion, increase its pH to 7-8 with alkaline solutions. The solid will precipitate out in settlement tank. Recover the supernatant liquid which will contain around 4% on volume basis of lactic acid. This liquid should be further diluted before discharge in according with the local legislation.
The anolyte contains lactic acid which, after proper neutralization with alkaline solution, can be disposed.

EASYCOATPRO resin should be stored between 0° and 30°C. **Never store in an area where the temperature can go above 35°C.**
Smoking should be prohibited in the vicinity of the concentrate resin EASYCOATPRO as well as close to the working tank emulsion..

While EASYCOATPRO is flammable resin, the ready to use emulsion will not support combustion.

The ready-to-use emulsion is irritating to eyes and skin. In case of contact with eyes rinse immediately with plenty of D.I. water and seek medical advice if symptoms persist. After contact with skin, wash immediately with plenty of soap and water.
The solvent level normally lies around 3% in the ready-to-use emulsion.

It is strongly recommended to ensure adequate ventilation of the workroom in order to provide a healthy working atmosphere.
The anolyte is acidic; protect eyes and wear protective clothing when handling, or when handling pure lactic acid. Flush exposed areas immediately with cold water.

In any case classification and designation are noted in the Material Safety Data Sheet (according to the European legislation). The safety instructions and the instructions for the environmental protection have to be followed in order to avoid hazards for people and environment. Please consider the explicit details in our Material Safety Data Sheets.

LEGOR GROUP S.P.A. - Via del Lavoro, 1 - 36050 Bressanvido (VI) - Italy - Tel. +39 0444 467911 - info@legor.com - www.legorgroup.com

TECHNICAL SHEET

EASYCOATPRO

RESIN FOR E-COATING

DISCLAIMER

All recommendations and suggestions in this bulletin concerning the use of our products are based upon tests and data believed to be reliable. Since the actual use by others is beyond our control, no guarantee expressed or implied, is made by Legor Group, its subsidiaries of distributors, as to the effects of such use or results to be obtained, nor is any information to be construed as a recommendation to infringe any patent.

LEGOR GROUP S.P.A. - Via del Lavoro, 1 - 36050 Bressanvido (VI) - Italy - Tel. +39 0444 467911 - info@legor.com - www.legorgroup.com