

# Plug to Mould Tooling Systems

A STEP BY STEP GUIDE



 **NORD  
COMPOSITES**

# KoverTek Tooling Range

PRODUCT	DESCRIPTION	APPLICATION
<b>Norester 879</b>	Plug Laminating Resin	Suitable for Polystyrene Plugs
<b>NCL 809 DO65</b>	Sprayable CNC Putty	Apply to min thickness of 8mm (2 layers) for machining
<b>NCL 815</b>	Extrudable CNC Putty	Apply to Final thickness of 12mm for machining (3 layers)
<b>Nord 230BV Primer</b>	Plug Primer (Sprayable)	Apply 450-600 Microns
<b>Nord GC 210</b>	Sprayable Plug Lacquer	Apply several thin layers to the primed plug
<b>Roar Extreme 900/ Extreme 910</b>	Polishing Compounds	For compounding from 800 grit sanding
<b>Tek-Kote Mould Cleaner</b>	Mould Cleaner Solvent	Wipe on Wipe Off
<b>Tek-Kote Mould Sealer</b>	Semi Permanent Mould Sealer	Wipe on Leave On or Wipe on Spread
<b>Tek-Kote Fast Release</b>	Semi Permanent Release Agent	Wipe on Leave On
<b>Norester GC 200 Gelcoat</b>	Iso Tooling Gelcoat (Brush Apply)	For low volume cycle moulds
<b>Norester GC 201 Gelcoat</b>	Iso Tooling Gelcoat (Spray Apply)	For low volume cycle moulds
<b>Norester GC 206 Gelcoat</b>	Vinyl Ester Tooling Gelcoat (Brush Apply)	For high cycle moulds & high temp resist
<b>Norester GC 207 Gelcoat</b>	Vinyl Ester Tooling Gelcoat (Spray Apply)	For high cycle moulds & high temp resist
<b>Norester 842 Vinyl Ester Resin</b>	Vinyl Ester Skin Coat (Clear)	For low shrink and high surface finish
<b>Norester 680 Vinyl Ester Resin</b>	Vinyl Ester Skin Coat (Clear)	For low shrink and high surface finish

PRODUCT	DESCRIPTION	APPLICATION
<b>Norester RM 1000/50</b>	Tooling Resin based on polyester resin, especially formulated for mould making. NORESTER® 1000/50 is filled and pre-accelerated.	A low cost system. 2.5 : 1 Resin to Glass. Ideal for low volume cycle moulds.
<b>Norester RM 2000/50</b>	Tooling Resin formulated from an unsaturated polyester resin. It is filled, promoted and pre-accelerated. Formulated for mould making.	Extensively used in the Marine industry. 4 : 1 Resin to glass. Apply min thickness of 8mm (2 layers) for machining.
<b>Norester RM 2550</b>	Tooling Resin based on polyester resin for the production of composite moulds with low shrinkage. It is a product ready to use, filled and pre accelerated	A rapid tooling resin with good surface appearance. Good curing. Good mouldability, and fast wet out, resin to glass ratio 2.5 : 1 Creates Lighter moulds with better mechanicals properties hence lower tooling resin costs. Superior mechanical properties due to a glass content approximately 28% higher than with conventional tooling resins.
<b>Norester RM 3000</b>	Vinyl Ester Tooling Resin especially formulated for producing composite moulds for applications where high thermal and chemical resistance are required	Designed to polymerize at room temperature following addition of normal MEKP catalysts. Resin pre-accelerated and promoted, permits a fast curing and a rapid manufacture of moulds. An easy to use product with low shrinkage hence high surface finish of the finished mould/parts. Fast build up of Barcol hardness. Improvement of the mould rigidity and low cost of mould production. Low exotherm curing system. Low viscosity.



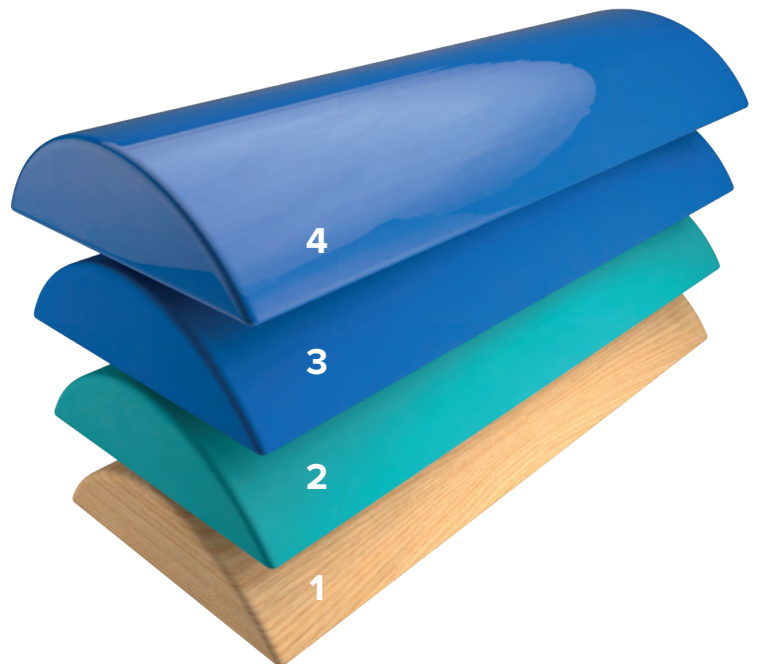
The first step in fibreglass mould making is to make a plug. The plug for a fibreglass or composite mould is usually an exact representation of the finished part, and can be an actual part or a mock up of a part. In planning for the mould certain factors must be taken into consideration; surface finish, draft angles, undercuts, and method of production. A composite mould that is going to be used for vacuum infusion or closed-moulding processes will require large flanges. Parts that are undercut or have negative draft will need to be done in two part moulds for them to be able to be extracted from the mould. Composite moulds that are designed to be used with carbon fibre parts often need to be made out of carbon fibre in order to match the coefficient of thermal expansion, especially if during the moulding process the part and mould will be heated to cure and then cooled to demould, i.e. prepreg parts.

If the mould is to see high temperatures and a post cure is necessary on the plug then your selection of materials will change. In this brochure we focus on making tools that are used extensively for producing Polyester Resin hand lay, spray lay up, closed mould or other RTM and resin infused parts. Plugs made from scratch can be done from a wide variety of materials using a wide variety of methods. There are many examples of making a plug from scratch and taking it all the way through making a mould. From a foam core, to plywood to make the flanges, and glassed over to provide a stable surface to fair over. You can use MDF to make plugs, high density foam, polystyrene, body filler, and other materials. For large parts often a framework is built and then layered with foam, fibreglass, and body filler before priming and finishing.

## Forming the Plug

- 1: Machine the chosen base (Polystyrene, Polyurethane, Timber etc).
- 2: Apply 2 layers of the Resin (**Norester 854**) using 300g powder bound mat. Laminate 10-15cm wider than the plug. Allow to cure for 24hrs before applying sprayable putty **NCL 809 D605** or extrudable putty **NCL 815**.  
Spray with a Graco type machine (pump ratio 20:1)  
Use several thin passes until you achieve 5-6mm.  
Final dimensions for CNC machining should be 8-12 mm.
- 3: After machining apply **Nord 230BV primer** (several fine passes 450-600 microns) Then sand to a smooth finish.
- 4: Spray several coats of **Nord Lacquer 210** to achieve a high gloss finish.

Then sand with a fine paper. Finally you can then compound the lacquer using **Roar 900** and **910** polishing compound with a machine polisher.



### GC210 PRIMER

Once the plug is prepared and de-greased using TEK-KOTE Mould Cleaner, Spray GC210 Primer to required thickness.



### POLISH FOR GLOSS FINISH

Wet and dry your plug to the required standard and gloss finish, polish with mop and Roar 900 and 910 cutting paste to level required for production needs.



# Treating The Plug With Tek-Kote Release System

Once you have completed the plug and it's been sanded lacquered and polished you are ready to form the tool.

First job is to clean & seal the plug using Tek-Kote Mould Cleaner and Sealer, before applying Tek-Kote Release agent such as Fast –Release.

**Application Type:** Tek-Kote Fast-Release is applied by a wipe and leave technique. The choice of cloth is important; as the Tek-Kote Fast-Release reacts with water, the cloth must be dry. A smooth, soft cloth with a high synthetic content, such as Kovertek Dry Wipes are advised.

**DO NOT ATTEMPT TO USE NORMAL COTTON CLOTHS AS THEY CONTAIN MOISTURE.**

## Wipe Application Technique:

1. Apply Tek-Kote Fast-Release to a clean “Dry Wipe”. Do not over-apply, the cloth must not be soaked or dripping.
2. Gently wipe a thin film over the mould surface covering an area of approximately 1m<sup>2</sup> at a time. Vigorous rubbing or polishing is not required. The film should stay wet for up to 2 minutes.  
Repeat steps 1 and 2 on the adjacent area. Ensure a good overlap with the previous area to provide complete coverage.
3. Frequently re-apply Tek-Kote Fast-Release to the wipe to ensure it stays wet.
4. Repeat until mould is completely coated.
5. When dry allow 15 minutes between coats for the film to partially cure. Repeat Steps 1-5 above for a further 3 coats (4 in total).

KoverTek

**TEK-KOTE**

## The Tek-Kote Range

A range of Semi Permanent, Silicone free Release Agents for mould preparation, release and care.

Available in 1Ltr and 5Ltr pack sizes.





KOVERTEK	DESCRIPTION	VE & PE RESINS		EPOXY RESINS	
TEK-KOTE		Gel Coat	Non-Gel Coat	RTM/Infusion	Prepreg
Tek-Kote Resi-Release	Wipe on Leave On or Spray On release agent		✓	✓	✓
Tek-Kote Fast-Release	High gloss wipe on only release agent suitable for most applications	✓		✓	
Tek-Kote Fast-Release-XPRES	High gloss wipe on only release agent. Choose this product if pre-release is an issue	✓			
Tek-Kote Spray-Release Gloss	High gloss fast dry sprayable release agent	✓		✓	
Tek-Kote Mould Cleaner	NOTE: All mould surfaces should be cleaned using Tek-Kote Mould Cleaner. New Moulds should be cleaned with Mould Cleaner and treated with 2 coats of Mould Sealer before adding 4 coats of the relevant sealer. Never use cotton rags, always use "Kovertek Dry Roll Wipes". When release agent has been opened, replace the lid straight away after use.				
Tek-Kote Mould Sealer					

RELEASE AGENT APPLICATION TIME COMPARISONS						
Product	Number of coats	Coverage (1) g/m <sup>2</sup>	Application (2) Time / 20m <sup>2</sup> (Hr)	Touch-up coat Total Time (3) Time (Hr)	Approx total time (Hr) Per week (1 part/day)	Total labour cost Assuming €20/hr rate
Paste Wax	g (4)	12	24	2.67	37.35	€747.00
Standard wipe applied SPMRA	7 (4,5)	20	11.5	1.5	13.0	€260.00
Fast-Release	5	25	2.0	1.0	3.0	€60.00
Spray-Release Gloss	5	25	1.5	0.75	2.25	€45.00

Coverage for total number of coats. Application times are quoted for 1 person. Total time includes final cure time which is invariably longer for SPMRAs than the cure time between coats. Manufacturers recommended application - 2 coats sealer, 5 coats topcoat

## Making a Mould from a Part

To make a fibreglass mould from an existing part, you would normally mount the part on a backing board. Generally speaking, we build all our moulds with flanges, assuming that at some point we will want to use them in a closed-moulding or vacuum infusion process. It is much easier to build flanges into the fibreglass mould from the start than to do it later. mould flanges should be a minimum of 150mm-200mm being preferable.

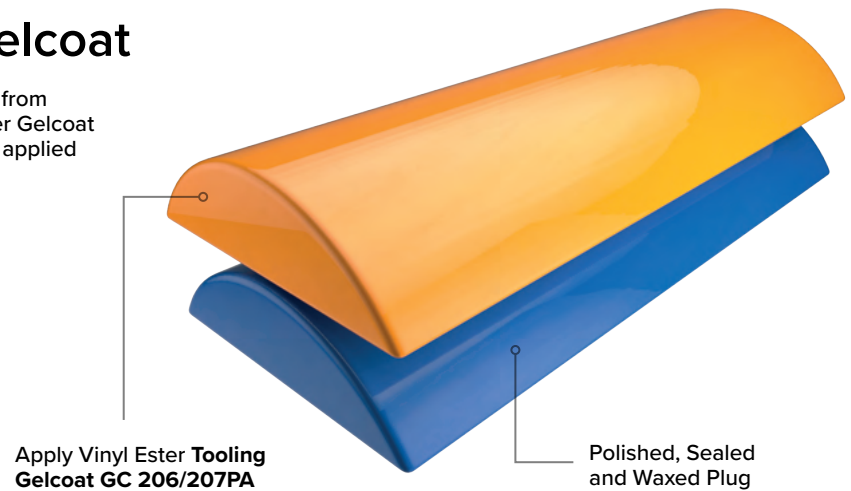
Mount the part to the backing board by whatever means available and necessary. Hot glue is one method as it sets up quickly and is usually removable, however, if you are dealing with elevated temperatures hot glue will not work.

Once the part is mounted on your backing board fill and fillet any gaps or transitions between the part and the backing board so that your plug becomes one unit. The surface quality of your plug and your backing board will be reflected in the gelcoat of the mould. It will not get any better, only worse. Before proceeding, bring the surface finish up to the level you desire in the finished composite part. With this type of plug we generally recommend using paste wax and PVA as the mould release. The PVA will make a physical barrier in between the plug and the gelcoat of the fibreglass mould. This provides a little extra protection to the finished part you are using as the plug.



## Applying the Tooling Gelcoat

You have many choices of Tooling Gelcoat available from KoverTek but in this scenario we are using Vinyl Ester Gelcoat for increased toughness and gloss. GC 206 is brush applied to the plug but if you spray then use GC 207.



## GC206 or Spray Version GC207 Tooling Gelcoat

- Once the plug is ready, mix the required amount of Gelcoat 206 or 207 for the mould (use Technical Data Sheet) .
- Check temperature before starting for catalyst requirements and apply thickness to Technical Data Sheet specifications.



## Applying the Tooling Gelcoat

GC206 FIRST LAYER TEMPERATURE



GC206 SECOND LAYER TEMPERATURE





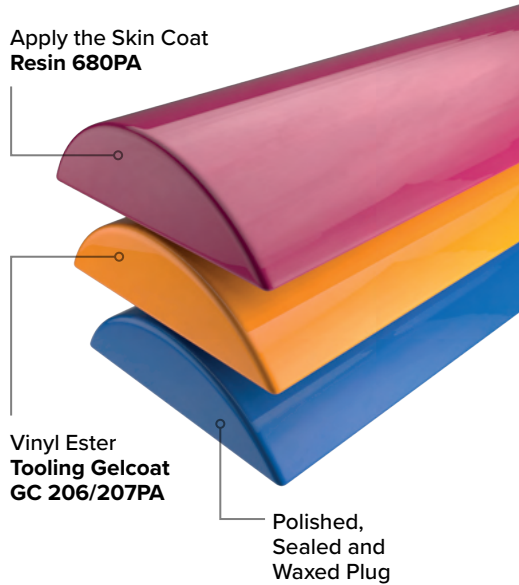
## Applying Skin Coat Resin 680PA

A skin coat gives benefits of improved surface aspect reduced print through of reinforcement and it can better resist the effects of fatigue which can cause cracking in hard-worked structures such as moulds. Vinyl ester can also withstand temperatures of up to around 200°C without distorting. Important if post curing!

Apply the Skin Coat Resin 680PA

Vinyl Ester Tooling Gelcoat GC 206/207PA

Polished, Sealed and Waxed Plug



**SKINCOAT - Using R680 TPA**  
pre vinylester resin with tissue and 300CSM allow to cure for 23 hours.



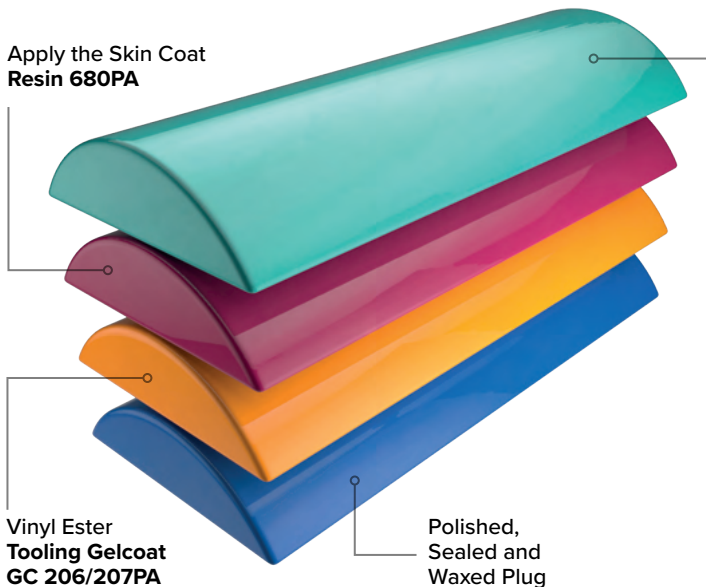
## Applying Tooling Resin Norester RM 2550 or RM 3000

Apply the Skin Coat Resin 680PA

Apply Tooling Resin Norester Resin RM 2550 or Resin RM 3000

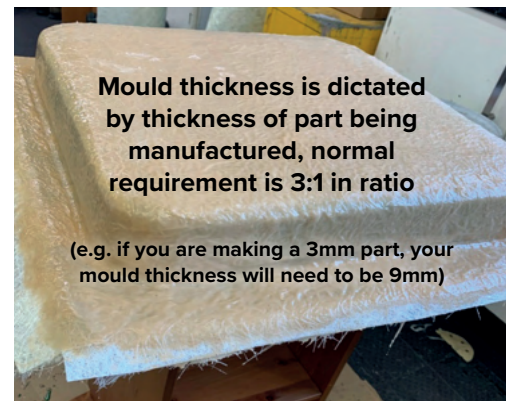
Vinyl Ester Tooling Gelcoat GC 206/207PA

Polished, Sealed and Waxed Plug



Mould thickness is dictated by thickness of part being manufactured, normal requirement is 3:1 in ratio

(e.g. if you are making a 3mm part, your mould thickness will need to be 9mm)



Follow TDS for amounts required for this process



### BULK LAYERS WITH NORD 2000/50 TOOLING RESIN

When using the resin system, it is extremely important to mix thoroughly before using and also get the temperature between the required specifications. (if used at temperatures too cold you will not achieve the required exothermic reaction).



Cured back face of mould



# Mould Release and Finishing



## Tooling System Ranges

### Small Mould Low Volume System \*

GC 200 Iso Tooling Gelcoat

R 568 LGT Iso Clear Skin Coat

RM 1000/50 Tooling Resin

\* RM 1000/50 was developed for low volume moulds.  
A lower cost system  
2.5 : 1 Resin to Glass Ratio

### High Stiffness System \*\*

GC 206/207 Vinyl Ester Tooling Gelcoat

R 842 Low shrink Vinyl Ester Clear Skin Coat

RM 680 TPA Vinyl Ester Clear Skin Coat

RM 2000/50 Tooling Resin

\*\* RM 2000/50 was the 1st MEKP cure system and is still  
extensively used in Marine Industry.  
4:1 resin to Glass Ratio

### High Glass Content System \*\*\*

GC 206/207 Vinyl Ester Tooling Gelcoat

R 842 Low shrink Vinyl Ester Clear Skin Coat

RM 680 TPA Vinyl Ester Clear Skin Coat

RM 2550 Tooling Resin

\*\*\* RM 2550 was developed to improve mechanical performance  
and a higher glass content gives a durable lighter weight mould.  
2.5:1 Resin to Glass Ratio

### Vinyl Ester System \*\*\*\*

GC 206/207 Vinyl Ester Tooling Gelcoat

R 842 Low shrink Vinyl Ester Clear Skin Coat

RM 680 TPA Vinyl Ester Clear Skin Coat

RM 3000 Vinyl Ester Tooling Resin

\*\*\*\* The full Vinyl Ester system is ideal for heat resistance moulds for  
post curing up to 120 degC. Used extensively for infusion and marine  
high durability moulds. RM 3000 can replace the need for a separate  
skin coat to reduce cost and waste.

## Get in touch:

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