

**Gerhard Mallot**

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**From:** Wolfgang Weingarten

**Sent:** Wed 8/27/2003 3:21 PM

**To:** Gerhard Mallot

**Cc:** Jonathan Gulley; Emilie Freret; Wolf-Dieter Schlatter; Peter Schilly

**Subject:** Derogation request 23 July 2003

**Attachments:**

Dear Gerhard,

seen that the proposed material

(i) has better fire performance behaviour in terms of smoke and toxicity than PVC and ABS,

(ii) passes UL94-test (flame test) with result V1, and that

(iii) compensatory measures will be applied,

in accordance with the expert in TIS-GS, Jonathan Gulley,

I authorize the use of the material as mentioned in your derogation request dated 23 July 2003.

Wolfgang Weingarten.

## TIS-GS-GC

### Form for derogation request in use of non-metallic materials

**Material details:** Supplier General Electric Plastics B.V.  
Trade name NORYL, Modified PPO Resins ENV105 ;  
Base material Vicat B/120

**Reason for choice of material/application:** UL94-V1 and halogen free

**Research into alternative materials and why discounted:** PVC, ABS plastics etc,  
not halogen free.

**Reason for non-conformity (re: IS41) :**

Contains phosphorous

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**Amount (kg or m<sup>3</sup>):** 450 kg

**Fire Risk :**

Ignition sources (please specify): HV distribution system

Drips of material/containment:

**Compensatory measures :**

Encapsulated by metal (see drawings):

Smoke/fire detection

-  
-  
-

Documents attached

Material data sheet :

Oui

Non

Drawing showing location of  
material etc. :

Oui

Non

Additional information:

# Attachment to the form of derogation request.

15/07/2003

## 1 Rich Wall MiniDrift Tube (MDT) schematic view.

The MDT, shown in Fig. 1, consists of a thin-wall (0.4mm) aluminum profile with 8 rectangular cells of  $9.4 \times 9.4 \text{ mm}^2$  inner cross-sections, a stainless steel cover (0.15 mm thick), the envelope made of Noryl plastic and 50  $\mu\text{m}$  gold plated tungsten anode wires stretched in the middle of the cells with an individual signal output from each wire.

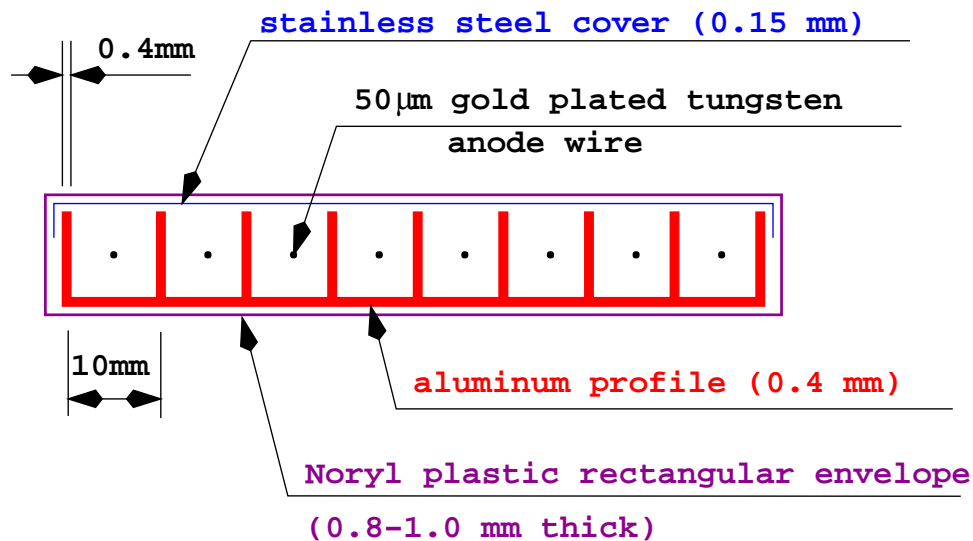


Figure 1: *Schematic section of RW MiniDrift Tube (MDT)*

A negative high voltage is applied to the cathode (aluminum profile and steel cover). The PT are filled with an Ar + CO<sub>2</sub> gas mixture (70% +30%).



### 3 The choice of the plastic for MDT's envelope.

In order to provide the MDT's gas tightness a special plastic envelope should be used as it is shown in Fig. 1. This envelope normally being produced using high temperature plastic extrusion machine. The hermeticity of the detector volume is achieved by welding of two endcaps on both open sides of the envelope. One of these two endcaps is equipped with gas and High Voltage connectors.

Initially to produce such a MDT's envelopes the PVC plastic was used (as it was done by Dubna group for the D0 experiment in Fermilab, USA). That was not the case for the CERN because of the security rules, so ABS plastic was chosen for the similar MDT's construction for Muon Wall 1 detector of the Compass (NA58). Later also ABS plastic was forbidden because of the CERN security rules. So in an effort to abandon the ABS plastic envelopes (as non halogen free) the extrusion and welding of several plastic materials was studied. NORYL (environmental conditions 105) plastic was found to be the only workable alternative to PVC and ABS. It has been established that the production line can be modified to work with NORYL. In particular the welding of the NORYL endcaps and the extrusion of the NORYL rectangular envelopes was optimized, using this material we can really guarantee the detector gas tightness. These tests represents a major financial investments from Dubna and INFN-Torino in order to replace the PVC(ABS) from the original detector design.

Thus we see NORYL as the only viable alternative to PVC (ABS) within the Rich Wall project of the Compass.

As a compensatory measures, the detector stations will entirely be closed by aluminum sheets. Particular care will be taken in the distribution of the electrical power in order to guarantee that in case of a short circuit the available power is limited and immediately switched off by appropriate fuses.

# Product Information

COMMERCIAL

# NORYL®

Modified PPO® Resins

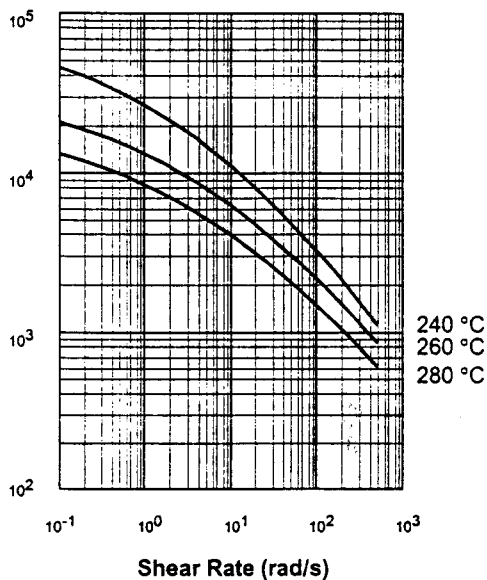
## ENV105

NORYL ENV105 is an impact modified extrusion grade with a Vicat B/120 of 115 °C according ISO 306.

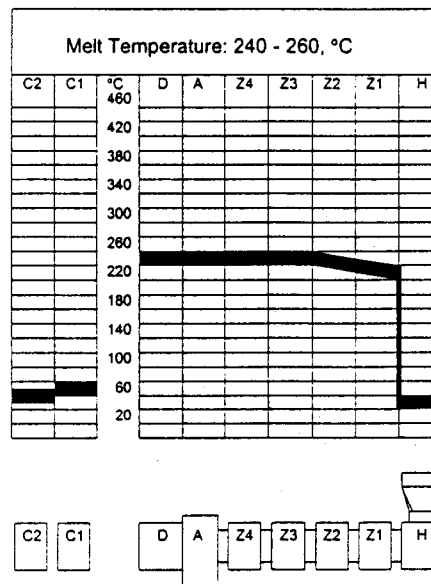
NORYL ENV105 is UL94-V1 and halogen free according VDE/DIN 472 part 815.

### RHEOLOGY

Melt Viscosity (Pa.s)



### PROCESSING CONDITIONS



Predrying temperature/time : 80 - 90°C / 2-3 hrs  
 Recommended melt temperature : 240 - 260 °C  
 Recommended calibration temperature: 50 - 70 °C

Note: Noryl ENV105 can be generally extruded on the standard available extruders. The die should have a landlength of 20 - 25 times the wall thickness and a 5-15% oversize, depending on profile dimensions.

| TYPICAL PROPERTIES <sup>1)</sup>        | TYPICAL VALUE | UNIT                    | STANDARD  |
|-----------------------------------------|---------------|-------------------------|-----------|
| <b>PHYSICAL</b>                         |               |                         |           |
| Density                                 | 1.10          | g/cm <sup>3</sup>       | ISO 1183  |
| Water Absorption (23 °C / sat.) 1L      | 0.15          | %                       | DIN 53495 |
| Moisture Absorption (23 °C / 50% RH) 1L | 0.06          | %                       | DIN 53495 |
| Mould Shrinkage on Tensile Bar, flow 2) | 0.5-0.7       | %                       | ASTM D955 |
| <b>RHEOLOGICAL</b>                      |               |                         |           |
| Melt Viscosity, MV 282 °C / 1500 s-1    | 270           | Pa.s                    | DIN 54811 |
| Melt Volume Rate, MVR 280 °C / 5 kg     | 7             | cm <sup>3</sup> /10min. | ISO 1133  |



**GE** *Plastics*

General Electric Plastics B.V.  
 Plasticslaan 1, PO Box 117, NL - 4600 AC Bergen op Zoom  
 The Netherlands  
 Tel. (+31) (1640) 32911 - Fax (+31) (1640) 32940

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