

DOMININGHAUS

PLASTICS
FOR
ENGINEERS

TA
455
P5
D6413
1993
ENGI

IP Bridge Exhibit 2006

Hans Domininghaus

Plastics for Engineers

Materials, Properties,
Applications



Hanser Publishers, Munich Vienna New York Barcelona

05189251
ENGINEERING

The Author:
Dipl.-Ing. Hans Dominghaus
Dreieich-Buchsschlag, Germany

Translated and revised version of
"Die Kunststoffe und ihre Eigenschaften", 3rd Edition
© 1988 VDI-Verlag GmbH, Düsseldorf

Translated by *Dr. John Haim*, Bondway Publishing, Turners Hill, W. Sussex RH10 4YY
and *Dr. David Hyatt*, University of North London, London N2 6 HT

The use of general descriptive names, trademarks, etc. in this publication, even if the former are not especially identified, is not to be taken as a sign that such names, as understood by the Trade Marks and Merchandise Marks Act, may accordingly be used freely by anyone.

While the advice and information in this book are believed to be true and accurate at the date of going to press, neither the authors nor the editors nor the publisher can accept any legal responsibility for any errors or omissions that may be made. The publisher makes no warranty, express or implied, with respect to the material contained herein.

Die Deutsche Bibliothek – CIP-Einheitsaufnahme

Dominghaus, Hans:

Plastics for engineers : materials, properties, applications ;
[translated and revised version] / Hans Dominghaus.
[Transl. by John Haim and David Hyatt]. – Munich ; Vienna ; New York ;
Barcelona : Hanser , 1993

Einheitssacht.: Die Kunststoffe und ihre Eigenschaften <engl.>

ISBN 3-446-15723-9

All rights reserved. No part of this book may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying or by any information storage and retrieval system, without permission in writing from the publisher.

Copyright © Carl Hanser Verlag, Munich, Vienna, New York, Barcelona 1993
Printed in Germany

In vi
time
Carl

wou
toda
it de
form
Briti
of b
of su
nam
so-c

deve
the :

phy
whc
in a
but

text
Mu
all t

Aut

Table 69 Guide values for the physical properties of polyarylether

| Properties | Units | | mod. Polyphenyleneether | | | | | | | |
|---|-------------------|--------------------|-------------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|
| | | | Noryl | | GFN 3 | | Lauranyl | | | |
| | SI | US | SI | US | SI | US | SI | US | | |
| Density | g/cm ³ | lb/in ³ | 1.06 | 0.038 | 1.27 | 0.0457 | 1.07 | 0.0387 | 1.26 | 0.0454 |
| Water absorption (23°C/78°F, 24h) | % | % | 0.07 | 0.07 | 0.06 | 0.07 | <0.1 | <0.1 | <0.1 | <0.1 |
| Mechanical | | | | | | | | | | |
| Yield stress | N/mm ² | psi | 55 | 7820 | - | - | 52 | 74000 | 100 | 14200 |
| Elongation at yield | % | % | 6-7 | 6-7 | - | - | 4 | 4 | 1.5 | 1.5 |
| Tensile strength | N/mm ² | psi | 50 | 7110 | 120 | 17100 | 45 | 6400 | 100 | 14200 |
| Elongation at break | % | % | 50 | 50 | 2-3 | 2-3 | 28 | 28 | 2 | 2 |
| Tensile modulus of elasticity | N/mm ² | psi | 2500 | 356000 | 9000 | 1280000 | 2500 | 356000 | 9000 | 1280000 |
| Impact strength (Izod) | J/m | J/m | - | - | - | - | - | - | - | - |
| Impact strength (Charpy) | kJ/m ² | J/m | - | - | - | - | - | - | - | - |
| Notched impact strength | J/m | J/m | 200 | 200 | 80 | 80 | no break | - | 12 | - |
| Notched impact strength | kJ/m ² | J/m | >15 | - | 8-10 | - | 11 | - | 5 | - |
| Ball indentation hardness (30 s) | N/mm ² | psi | 100 | 14000 | 137 | - | 100 | - | 180 | - |
| Rockwell hardness | scale | scale | M 78 | M 78 | M 93 | M 93 | - | - | - | - |
| Thermal | | | | | | | | | | |
| Service temperature in air without mechanical loading | °C | °F | 120 | 248 | 130 | 266 | 120 | 248 | 130 | 266 |
| short-term | °C | °F | 100 | 212 | 110 | 230 | 100 | 212 | 110 | 230 |
| long-term | °C | °F | 140 | 284 | 140 | 284 | - | - | - | - |
| Glass transition temperature | °C | °F | 135 | 275 | 150 | 302 | 115 | 239 | 145 | 293 |
| Heat deflection temperature | °C | °F | 130 | 266 | 144 | 291 | 90 | 194 | 137 | 279 |
| Vicat, Method B | °C | °F | - | - | - | - | 105 | 221 | 145 | 291 |
| ISO, Method A | °C | °F | 60 · 10 ⁻⁶ | 33 · 10 ⁻⁶ | 30 · 10 ⁻⁶ | 17 · 10 ⁻⁶ | 60 · 10 ⁻⁶ | 33 · 10 ⁻⁶ | 30 · 10 ⁻⁶ | 17 · 10 ⁻⁶ |
| Method B | K ⁻¹ | in/in/°F | - | - | - | - | - | - | - | - |
| Coefficient of linear expansion | W/mK | BTU/lb/°F | 0.22 | 1.5 | 0.28 | 1.9 | 0.18 | 1.2 | 0.22 | 1.5 |
| Specific heat capacity | Q/cm | Ω | >10 ¹⁵ | >10 ¹⁵ | >10 ¹⁵ | >10 ¹⁵ | 10 ¹⁵ | 10 ¹⁵ | 10 ¹⁵ | 10 ¹⁵ |
| Thermal conductivity | Q/cm | Ω | 10 ¹⁴ | 10 ¹⁴ | 10 ¹⁴ | 10 ¹⁴ | 10 ¹⁴ | 10 ¹⁴ | 10 ¹⁴ | 10 ¹⁴ |
| Electrical | | | | | | | | | | |
| Volume resistivity | Q cm | Ω | >10 ¹⁵ | >10 ¹⁵ | >10 ¹⁵ | >10 ¹⁵ | 10 ¹⁵ | 10 ¹⁵ | 10 ¹⁵ | 10 ¹⁵ |
| Surface resistance | Q | Ω | 10 ¹⁴ | 10 ¹⁴ | 10 ¹⁴ | 10 ¹⁴ | 10 ¹⁴ | 10 ¹⁴ | 10 ¹⁴ | 10 ¹⁴ |
| Dielectric constant 50 Hz | Q cm | Ω | 2.6 | 2.6 | 2.9 | 2.9 | 2.6 | 2.6 | 2.9 | 2.9 |
| 1 MHz | Q cm | Ω | 2.6 | 2.6 | 2.9 | 2.9 | 2.6 | 2.6 | 2.9 | 2.9 |
| Dissipation factor 50 Hz | Q cm | Ω | 0.0004 | 0.0004 | 0.0009 | 0.0009 | 0.001 | 0.001 | 0.001 | 0.001 |
| 1 MHz | Q cm | Ω | 0.0009 | 0.0009 | 0.0015 | 0.0015 | 0.001 | 0.001 | 0.001 | 0.001 |
| Dielectric strength | kV/mm | class C | 22 | 22 | 22 | 22 | 80 | 80 | 80 | 80 |
| Tracking resistance | class | class | HB | HB | HB | HB | HB | HB | HB | HB |
| Fire performance to UL 94 | class | class | HB | HB | HB | HB | HB | HB | HB | HB |

Mech
Short
proc
ure de
437.
tempe

20000-
psi

15000-

10000

5000

0

Trans
blenc
confi
glass

Creepl
glass
show
(in ai

Beha
even
fiber

Beha
load
Nory
are a

Har

Frict
at a
stain
0.26