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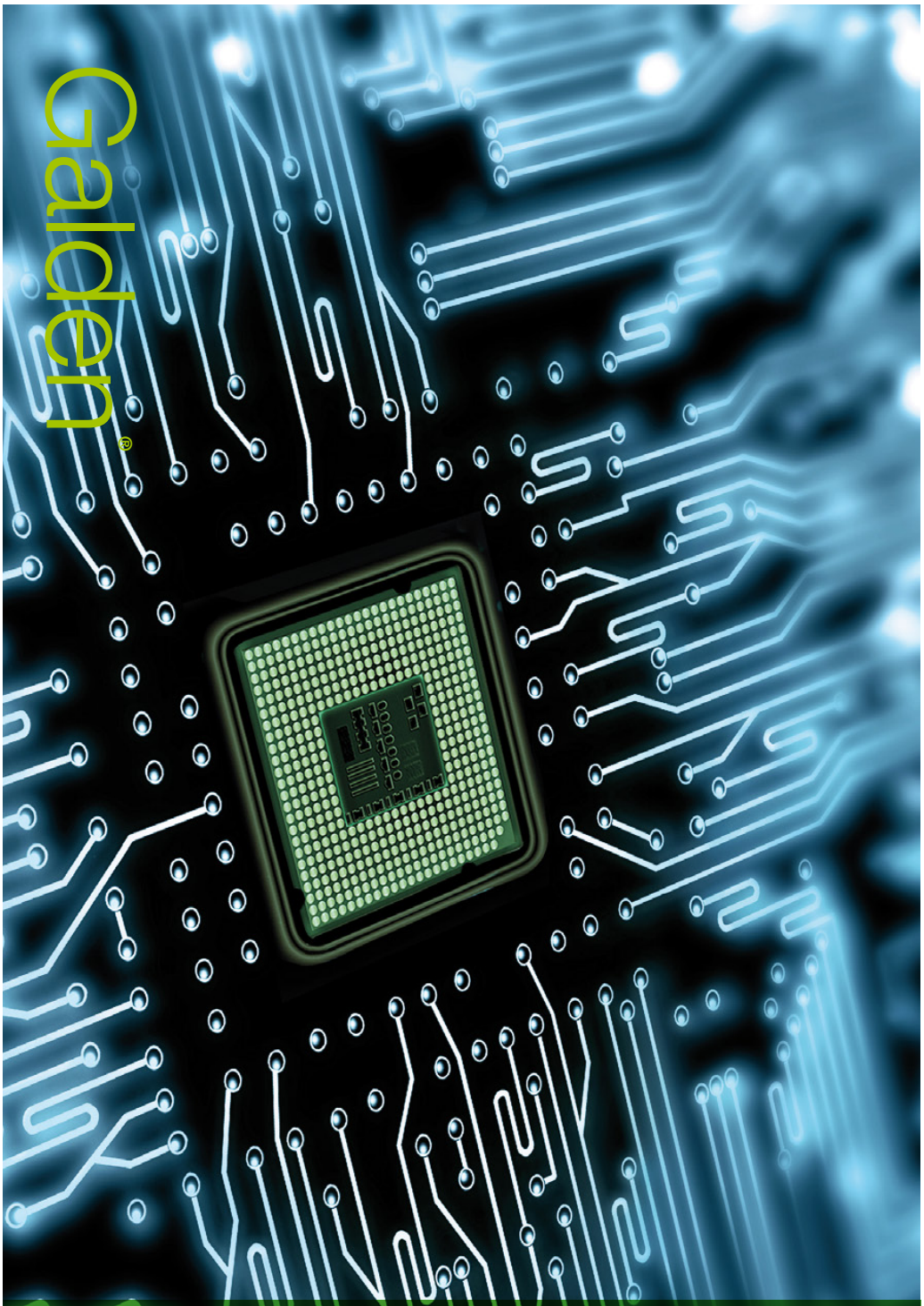

SOLVAY
asking more from chemistry®

Galden® PFPE Testing

Electronic Fluids

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SPECIALTY POLYMERS

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Galden® PFPE Testing
Electronic Fluids

Galden® PFPE electronic fluids is a line of dielectric fluids with boiling points ranging from 55 °C to 270 °C. Their excellent dielectric properties, high chemical and thermal stability combined with their capacity to operate at very low as well as elevated temperatures make them ideal for electronic quality testing.

Features	Benefits
High boiling point with low pour point and low viscosity Low evaporation rate Good heat transfer performance	Wide choice of grades to optimize performance Low consumption Low environmental load Better temperature control
High dielectric strength Excellent electrical resistivity (a billion times higher than DI-Water) No change in dielectric properties with use	No damage to sensitive electronics when immersed in the liquid No risk of short circuiting Better process control
Excellent thermal and chemical stability Good compatibility with materials	No corrosion or reaction with materials of construction No formation of decomposition residues
No flash or fire points No auto ignition point No explosion hazards	Enhanced safety Safe to use at high temperature

Fluids non-reactivity, excellent dielectric properties, non-toxicity, non flammability and non-solvent features make Galden® PFPE electronic fluids suitable for electronic reliability testing including thermal shock and hermetic seal testing.

Galden® PFPE Thermal Shock Testing

Thermal Shock: The Test

Thermal shock testing is performed to check the resistance of electronic devices to extreme changes of temperature. The test is carried out by alternately dipping the devices in liquids maintained at two different temperatures.

For military applications thermal shock test has to be performed as specified in MIL STD 883 method 1011 or MIL STD 202 method 107.

Dual Fluid or Single Fluid?

Dual Fluid System

Traditionally two different fluids can be used in the hot and cold bath, but this practice presents the following disadvantages: high fluid loss from cold bath, cross contamination between cold and hot baths, equipment downtime and dual fluid inventory.

Single Fluid System

Galden® PFPE fluids with their single fluid system is an advantageous alternative to the dual fluid solution.

Galden® D02TS and D03 are the single fluids which can successfully replace the need for a dual fluid system.

Galden® D02TS is the proposal for all the military applications; it meets the MIL STD 883 and MIL STD 202 while for all non-military applications Galden® D03 can be used.

A single fluid for both baths allows for a dramatic decrease in operating costs by:

- Decreasing fluid consumption
- Reducing equipment downtime
- Eliminating cross contamination
- Reducing inventory to a single product

Galden® PFPE fluids for thermal shock testing
conforming to MIL STD 883

	Test Condition				
	B	C	D	E	F
Hot Step [°C]	125	150	200	150	200
Cold Step [°C]	−55	−65	−65	−195	−195
Hot Bath Fluid	D02 D02TS	D02 D02TS	D05	D02 D02TS	D05
Cold Bath Fluid	DET D02TS	DET D02TS	DET	Liquid N_2	Liquid N_2

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Galden® PFPE Hermetic Seal Testing

Hermetic Seal: The Test

Electronic devices must be completely sealed to avoid penetration by moisture and potential damage of the electrical response of the silicon chip.

To guarantee the hermeticity of devices, a leak test procedure has been defined and ruled by MIL STD 883, MIL STD 750 and MIL STD 202.

Galden® PFPE fluids being extremely inert and residue free are ideal and widely used as detector and indicator fluids in leak test procedures.

Galden® DET

Detector fluid specifically designed for high reliability measures.

Galden® DET, Type I and III detector fluid, offers higher reliability with respect to traditionally used fluids.

Galden® DET, thanks to its perfect balance between low and high boilers components, can easily detect large and small leaks:

- High boilers enter through large leaks and remain liquid until the test is performed
- Low boilers can easily penetrate into small leaks

Galden® D02 and D03

Low consumption indicator fluids.

Galden® D02 and D03 can be advantegeously used as Indicator fluids respectively in military and non-military applications.

- Higher boiling point
- Lower vapor pressure at test temperature

Will Result in...

- Reduced evaporative loss
- Lower consumption compared to other commercially available indicator fluids

Galden® PFPE fluids for gross leak test

conforming to MIL STD

Fluid Type	Type I Detector	Type II Indicator	Type III Detector
Test Condition	C1, C3	C1	E
Galden® Fluids	DET	D02	DET

Thermal shock testing

		Single Fluids		Dual Fluids	
Typical Properties	Units	D02TS	D03	D02	D05
Boiling point	°C	165	203	175	230
Pour point	°C	–97	–85	–97	–77
Density at 25 °C	g/cm^3	1.77	1.79	1.77	1.82
Density at –54 °C	g/cm^3	1.95	1.96	1.95	1.98
Kinematic viscosity at 25 °C	cSt	1.7	2.4	1.8	4.4
Kinematic viscosity at –54 °C	cSt	45	160	–	–
Specific heat at 25 °C	J/Kg·°C	973	973	973	973
Thermal conductivity at 25 °C	W/m·°C	0.07	0.07	0.07	0.07
Coefficient of expansion	cm^3/cm^3·°C	0.0011	0.0011	0.0011	0.0011
Surface tension	dyne/cm	16	16	16	17
Dielectric strength	kV (2.54 mm gap)	40	40	40	40
Dielectric constant	–	2.1	2.1	2.1	2.1
Volume resistivity	Ohm·cm	5·10^{15}	5·10^{15}	5·10^{15}	5·10^{15}
Average molecular weight	amu	750	870	760	1,020

Typical properties (Not for specification purpose)

Hermetic seal testing

		Detector Fluids	Indicator Fluids	
Typical Properties	**Units**	**DET**	**D02**	**D03**
Boiling point	°C	81	175	203
Pour point	°C	–110	–97	–85
Density at 25 °C	g/cm^3	1.70	1.77	1.79
Density at 125 °C	g/cm^3	–	1.54	1.58
Kinematic viscosity at 25 °C	cSt	0.60	1.80	2.40
Kinematic viscosity at 125 °C	cSt	–	0.46	0.55
Specific heat at 25 °C	J/Kg·°C	973	973	973
Thermal conductivity at 25 °C	W/m·°C	0.07	0.07	0.07
Coefficient of expansion	cm^3/cm^3·°C	0.0011	0.0011	0.0011
Surface tension	dyne/cm	16	16	16
Dielectric strength	kV (2.54 mm gap)	40	40	40
Dielectric constant		2.1	2.1	2.1
Volume resistivity	Ohm·cm	5·10^{15}	5·10^{15}	5·10^{15}
Average molecular weight	amu	430	760	870

Typical properties (Not for specification purpose)

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