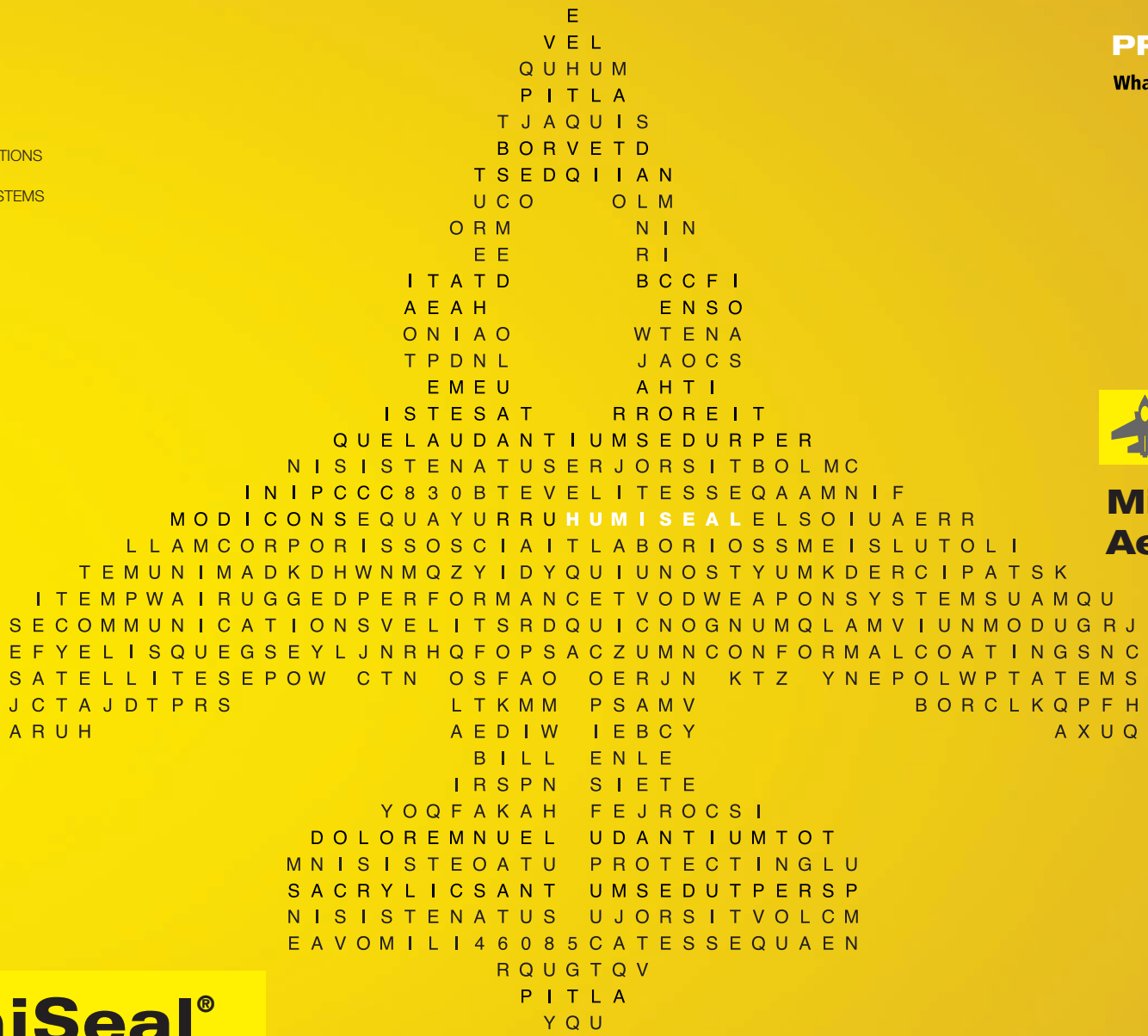
HUMISEAL
AVIONICS
RADAR
COMMUNICATIONS
SONAR
WEAPON SYSTEMS
UAV
SATELLITES



PRODUCT GUIDE

What's inside the machine?

Military & Aerospace

HumiSeal®

Military & Aerospace Electronics

HumiSeal®

Market Sectors

HumiSeal conformal coatings are being deployed in an increasing number of applications, across a wider range of market sectors.
This increased demand for conformal coatings is often coupled with elevated expectations in diverse areas such as performance, ease of application, sustainability, quality, functionality, and environmental properties. All of these expectations require special attention in order to ensure that our products meet expected standards. Each market sector has a distinct set of requirements in terms of standards, operating environments, as well as other factors.

With recent changes in OEM requirements related to CSR (Corporate Social Responsibility), ISO 14001 commitments and the need to drive down cost, both within their own factories and throughout their supply chains, and the continuous need to "do more with less", HumiSeal has a wide range of environmentally compliant low-outgassing, fast curing, high throughput, solvent-free materials, in addition to a wide range of traditional solvent-borne chemistries.

The Win3 Approach

Developing a conformal coating process involves a partnership between the end user, the equipment manufacturer and the coating supplier. We know from experience that the greater the interaction between the partners, the greater the chance of success of the project.

Our expertise in collaborative working means you'll get a product that delivers a perfect process within a short timeframe. You won't have to spend months optimising your process to suit our product, helping to minimise lead times and keep your project on schedule.

Military applications often push technologies to their limits. ISR (Intelligence, Surveillance, and Reconnaissance), electronic warfare (EW), radar, and communications have made many demands on RF/microwave technologies over the years.

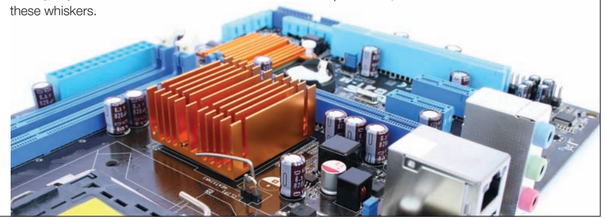
Levels of integration have increased with growing demands for greater packaging densities, reduced weight, increased reliability over a wider range of operational parameters such as wider temperature ranges, increased thermal rates of change, greater ranges of vibration and longer storage in field conditions at the point of deployment.

One of the challenges most unique to military and aerospace electronics is the high value of and length of service expected of these assemblies, often being 20-30 years. During the program life, the electronics are likely to be periodically repaired, refurbished and upgraded. Therefore, the degree of reworkability of the coating material needs to be thoroughly evaluated and the reliability of repair solutions thoroughly evaluated during the design process.

These electronic assemblies continue to become an increasingly sophisticated and important aspect of both the functionality and reliability of modern military and aerospace systems. The costs of failure, both in direct fiscal cost and especially the loss of highly trained personnel and civilian casualties are extremely high, and so it is extremely important that these systems function exactly as required, when required, for the entire duration of the program. Conformal coating is one of the main mitigation solutions, preventing degradation to the assembly from the external environment.

Although not presently subject to Pb-Free production, the reality is that many commercially available components are supplied with a pure tin finish (Lead-free compliant) to preserve solderability. There has recently been much concern about the potential for tin whisker growth, as a possible failure mechanism, due to the long service lifetimes and extreme operating environments encountered in military/aerospace electronics *(http://nepp.nasa.gov/whisker/background/)*. The use of the correct conformal coating has been shown to be an effective mitigation strategy against the formation of these whiskers.

SELECTION HumiSeal® offers the industry's widest range of high performance coatings, drawn from the widest range of chemistries and they can be applied by any of the common application methodologies. This will enable you to select the product that best meets your project needs, production throughput, floor space, and capital equipment requirements. Whether you are upgrading an existing product, transferring a production process from another facility, or are working on a new product introduction - Whatever your requirements, HumiSeal has the solution.



Whatever your requirements, HumiSeal has the solution.

In addition, with more than 50 years experience, and a wealth of clients that produce similar products, have similar end-use environments or have overcome similar challenges, HumiSeal is well placed to offer valuable advice that can help save time and reduce the effort to achieve an optimal solution.

TOTAL SOLUTION HumiSeal's central philosophy is that a conformal coating is not simply a material, it is part of a process, and all of HumiSeal's materials are backed by an unparalleled level of process knowledge and applications experience, to ensure that whatever your process requirements, a perfectly tailored total process solution is available thus ensuring the results that you demand.

TOTAL CONSISTENCY The overall consistency of your process is largely governed by the consistency of the process inputs, of which your conformal coating material is one. HumiSeal goes to very great lengths to ensure the consistency of batch-to-batch material characteristics. Take advantage of one of our pre-blended materials, to virtually eliminate any potential for on-site mixing or measuring mistakes and you can be assured of an industry beating level of consistent material inputs, taking you one step closer to your SPC or 6 Key Performance Indicators (KPIs).

TOTAL SUPPORT With even the best process solution, occasionally things change. Should this happen to your line, you can rest assured, wherever your factory is located, that HumiSeal's team of Global Application Experts are on call to ensure that you resolve the situation to your complete satisfaction in the shortest time-frame possible and get your process running at optimum efficiency once again.

HumiSeal®

HumiSeal®

Military & Aerospace Product Range

HumiSeal®, the world's leading formulator of conformal coatings, is proud to offer the most complete range of military and aerospace approved materials on the market.

We developed the world's first conformal coating over 50 years ago and continue to lead the market in terms of innovation and experience.

Our range embraces all major polymer types and multiple cure mechanisms. This guide aims to highlight the most popular products—other military approved coatings are featured in the low VOC product guide.

Acrylic Materials

Widely specified throughout the aerospace and defence industries, especially where humidity and condensation are main threats:

- Fast drying by solvent evaporation
- Ease of application all application methods
- Easiest coatings to rework
- Excellent resistance to moisture
- Superb flexibility over a wide temperature range

Urethane Materials

Widely specified in environments requiring solvent resistance:

- Easy to apply by all application methods
- Very good chemical and solvent resistance
- Repairable
- Fast drying and cross linking reactions
- Good flexibility over a wide temperature range

HumiSeal can supply materials pre-blended to your exact viscosity requirements, to eliminate on-site mixing and prevent batch-to-batch differences in material behaviour.

			ACRYLICS				URETHANES			UV CURE	SILICONE	
			1B31	1B31LOC	1B73	1B73LOC	1A20	1A33	1A34	UV40	1C49	1C51
QUALIFICATIONS	MIL-I-46058C		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	IPC CC-830B		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	UL746E		No	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes
	UL94		No	No	V0	V0	V0	V0	No	V0	V-1	V-0
LIQUID PROPERTIES	Available as an Aerosol		Yes	Yes	Yes	Yes	No	Yes	No	No	No	No
	Solids Contents (%w/w)		35	35	29.5	29.5	50	44	39	100	100	100
	Viscosity (MAX)/cPs		215	215	270	270	100	200	200	800	10500	690
	Flash Point °C (°F)		1 (33)	1 (33)	1 (33)	1 (33)	28 (82)	1 (33)	7 (44)	85 (185)	102 (215)	121 (249)
	VOC (grammes/litre)		592	592	654	654	511	521	576	0	0	0
	Drying Time	Tack-free/mins	10	10	30	30	60	15	140	0.5	180	15 mins @ 110°C
		Dry	24 Hrs	24 Hrs	24 Hrs	24 Hrs	24 Hrs	24 Hrs	24 Hrs	N/A	24	15 mins @ 110°C
		Optimum Properties	1 Week	1 Week	1 Week	1 Week	1 Week	1 Month	1 Week	72 Hrs	1 Week	15 mins @ 110°C
	Pot Life at Room Temperature (RT)		12 Months	12 Months	12 Months	12 Months	N/A	12 Months	N/A	N/A	N/A	1 Month
	Shelf Life at RT		24 Months	24 Months	24 Months	24 Months	6 Months	24 Months	6 Months	12 Months	6 Months	12 Months
	Coverage m^2/litre (25 microns thickness)		14	14	12	12	20	18	16	40	40	40
PHYSICAL PROPERTIES	Continuous Use Operating Range °C (°F)		-65 (-85) + 125 (+257)	-65 (-85) + 125 (+257)	-65 (-85) + 125 (+257)	-65 (-85) + 125 (+257)	-65 (-85) + 125 (+257)	-65 (-85) + 125 (+257)	-65 (-85) + 125 (+257)	-65 (-85) + 150 (+302)	-65 (-85) + 200 (+392)	-65 (-85) + 200 (+392)
	Thermal Shock °C (°F)		-65 (-85) + 125 (+257)	-65 (-85) + 125 (+257)	-65 (-85) + 125 (+257)	-65 (-85) + 125 (+257)	-65 (-85) + 125 (+257)	-65 (-85) + 125 (+257)	-65 (-85) + 125 (+257)	-65 (-85) + 150 (+302)	-65 (-85) + 200 (+392)	-65 (-85) + 200 (+392)
	Glass Transition Temperature (Tg) °C		14	14	42	42	71	26	18	45	<-65°C	<-65°C
	CTE (x 10^{-6} / °C)	Below Tg	170	170	193	193	70	119	85	85	N/A	N/A
		Above Tg	340	340	338	338	183	225	201	197	367	340
ELECTRICAL PROPERTIES	Dielectric Constant (1MHz @ 25°C)		2.5	2.5	2.6	2.6	3.5	3.6	3.5	2.5	2.5	2.7
	Dissipation Factor (1MHz @ 25°C)		0.01	0.01	0.01	0.01	0.03	0.03	0.03	0.01	0.01	0.01
	Dielectric Withstand Voltage V (1 minute)		>1500	>1500	>1500	>1500	>1500	>1500	>1500	>7500	>1500	>1500
	Insulation Resistance Per MIL-I-46058C (ohms)		8.0 x 10^{14}	8.0 x 10^{14}	5.5 x 10^{14}	5.5 x 10^{14}	3.0 x 10^{14}	2.0 x 10^{14}	1.7 x 10^{14}	8.0 x 10^{14}	5.0 x 10^{14}	5.0 x 10^{14}
	Moisture Insulation Resistance Per MIL-I-46058C (ohms)		6.0 x 10^{10}	6.0 x 10^{10}	7.0 x 10^{10}	7.0 x 10^{10}	4.8 x 10^{10}	1.6 x 10^{10}	6.3 x 10^{10}	4.7 x 10^{10}	1.0 x 10^{10}	1.0 x 10^{10}
	Resistance to chemicals and solvents		Poor	Poor	Poor	Poor	Very Good	Very Good	Very Good	Excellent	Moderate	Moderate
	Recommended Thinner (Dip & Brush/Spray)		503/521	701	73	701	503/521	503/521	503/521	N/A	N/A	N/A
	Recommended Stripper		1080/1080A	1080/1080A	1080/1080A	1080/1080A	1063, 1072	1063, 1072	1063, 1072	Thermal/Mechanical	1090/Mechanical	1090/Mechanical

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www.humiseal.com

What's inside the machine?

HUMISEAL®, THE WORLD'S LEADING FORMULATOR OF
PROTECTIVE COATINGS FOR ELECTRONIC CIRCUITS

CHASE Electronic Coatings
We make a material difference