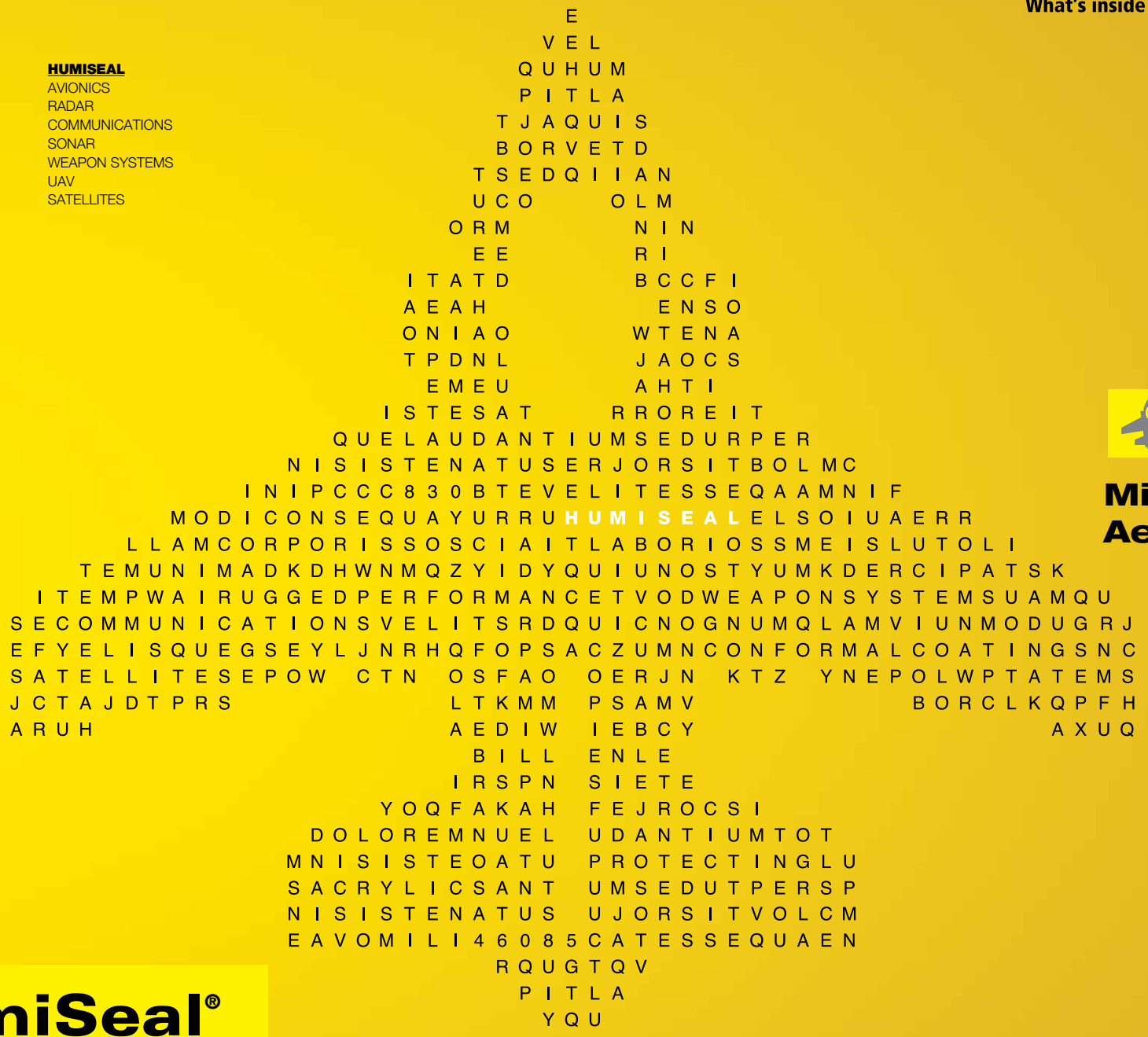
PRODUCT GUIDE
What's inside the machine?

HUMISEAL
AVIONICS
RADAR
COMMUNICATIONS
SONAR
WEAPON SYSTEMS
UAV
SATELLITES



Military & Aerospace

HumiSeal®

Military & Aerospace Electronics

With recent changes in OEM requirements related to CSR (Corporate Social Responsibility), ISO 140001 commitments and the need to drive out 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.

HumiSeal® is the only supplier specialized in conformal coating manufacture.

With a rich history of innovation for more than 50 years, our product offerings and technical support is second to none.

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.

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**

Whatever your requirements, HumiSeal has the solution.

		ACRYLICS				URETHANES					UV CURE	SILICONES & EPOXY			
		1B31	1B31 LOC	1B73	1B73 LOC	1A20	1A20R	1A33	1A34	2A64	UV40	1C49	1C49LV	1C51 / 1C53	2A53
QUALIFICATIONS	MIL-I-46058C	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	IPC CC-830B	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	UL746E	No	No	Yes	Yes	Yes	No	Yes	No	No	Yes	Yes	Yes	Yes	No
	UL94	No	No	V0	V0	V0	No	V0	No	No	V0	V1	V1	V0	No
LIQUID PROPERTIES	Available as an Aerosol	Yes	No	Yes	No	No	No	Yes	No	No	No	No	No	Yes	No
	Solids Contents (%w/w)	35	25	29.5	26	50	50	44	39	55	95	95	90	98	54
	Viscosity (MAX)/cPs	215	475	270	475	130	130	200	200	180	800	10500	800	780	500
	Flash Point °C (°F)	-1 (30)	22 (72)	-1 (30)	6 (43)	28 (83)	28 (83)	-1 (30)	7 (45)	N/A	80 (176)	102 (215)	102 (215)	121 (250)	N/A
	VOC (grammes/litre)	592	91	661	92	511	511	531	576	501	35	0	0	0	455
	Drying Time Tack-free/mins	10	25	30	25	60	60	15	150	15	0.5	180	60	N/A	300
	Dry	24 hrs	24 hrs	24 hrs	24 hrs	24 hrs	24 hrs	20 hrs	24 hrs	3 hrs @ 76ºC	N/A	24 hrs	24 hrs	15 mins	2 hrs @ 93ºC
	Optimum Properties	1 week	1 week	1 week	1 week	1 week	1 week	1 month	1 week	1 week	72 hrs	1 week	1 week	15 mins	1 week
	Shelf Life at RT	24	24	24	24	6	12	24	6	12	12	12	12	12	12
	Coverage m^2/litre (25 microns thinkness)	14	14	12	12	20	20	18	16	34	40	40	40	40	32
PHYSICAL PROPERTIES	Continuous Use Operating Range °C	-65 to 125	-65 to 125	-65 to 125	-65 to 125	-65 to 125	-65 to 125	-65 to 125	-65 to 125	-65 to 125	-65 to 125	-65 to 200	-65 to 200	-65 to 200	-65 to 125
	Thermal Shock °C	-65 to 125	-65 to 125	-65 to 125	-65 to 125	-65 to 125	-65 to 125	-65 to 125	-65 to 125	-65 to 125	-65 to 125	-65 to 200	-65 to 200	-65 to 200	-65 to 125
	Glass Transition Temperature (Tg) °C	14	14	42	42	71	71	26	18	12	45	<-65	<-65	<-65	19
	CTE (x 10^6/ °C) Below Tg	170	170	138	193	193	193	119	85	82	85	0	N/A	0	N/A
	Above Tg	340	340	-	338	532	532	225	201	255	197	367	323	296	N/A
	Dielectric Constant (1MHz @ 25°C)	2.5	2.5	2.6	2.6	3.5	3.5	3.6	3.5	3.5	2.5	2.5	2.5	2.4	3
ELECTRICAL PROPERTIES	Dissipation Factor (1MHz @ 25°C)	0.01	0.01	0.01	0.01	0.03	0.03	0.03	0.03	0.03	0.01	0.01	0.01	0.01	0.03
	Dielectric Withstand Voltage V (1 minute)	>1500	>1500	>1500	>1500	>1500	>1500	>1500	>1500	>1500	>1500	>1500	>1500	>1500	>1500
	Insulation Resistance Per MIL-I-46058C (Ω)	8.0 x 1014	8.0 x 1014	5.5 x 1014	5.5 x 1014	3.0 x 1014	3.0 x 1014	2.0 x 1014	1.7 x 1014	4.5 x 1014	8.0 x 1014	5.0 x 1014	5.0 x 1014	5.0 x 1014	2.0 x 1014
	Moisture Insulation Resistance Per MIL-I-46058C (Ω)	6.0 x 1010	6.0 x 1010	7.0 x 1010	7.0 x 1010	4.8 x 1010	4.8 x 1010	1.6 x 1010	6.3 x 1010	4.8 x 1010	4.7 x 1010	1.0 x 1010	1.0 x 1010	1.0 x 1010	2.8 x 1010
	Resistance to chemicals and solvents	Poor	Poor	Poor	Poor	Excellent	Excellent	Very Good	Very Good	Excellent	Excellent	Moderate	Moderate	Moderate	Excellent
	Recommended Thinner (Dip & Brush/Spray)	503, 521 (EU)	701	521(EU)/73	701	521 (EU)	521 (EU)	503, 521, 521EU	521 (EU)	64	N/A	N/A	N/A	N/A	535
	Recommended Stripper	1080 (EU)	1080 (EU)	1080 (EU)	1080 (EU)	1072	1072	1063	1072	1072	1100*, Mech	1090, Mech	1090, Mech	1090, Mech	Mech

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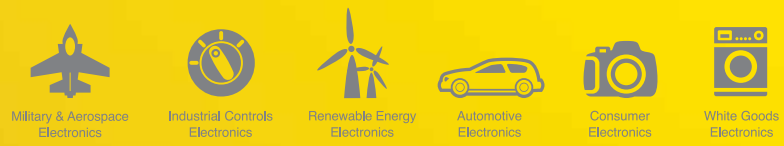
www.humiseal.com

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