



QUADRA
Quadraflex™ ALE
ALIPHATIC POLYETHER



BIOMERICS

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TECHNICAL DATA & PROCESS GUIDE

PRODUCT

Quadraflex ALE

CHEMISTRY

Aliphatic Polyether TPU

APPLICATIONS

Extrusion, Injection Molding,
Solution

CHARACTERISTICS

Superior biocompatibility, chemical resistance, oxidative stability, non-yellowing, hemocompatible, body softening.



QUADRAFLEX

Quadraflex™ ALE is a family of aliphatic polyether-based medical grade thermoplastic urethanes. Quadraflex ALE exhibits excellent mechanical properties, elasticity, biocompatibility, and softening at body temperature. Quadraflex ALE is non-yellowing and is used across a range of medical markets including venous access, urology, cardiology, hemodialysis, respiratory, fluid management, balloons, and minimally invasive surgical devices. It is USP Class VI and ISO-10993 compliant.

CLEAR GRADES

Product & Properties	ASTM Test	ALE-70A	ALE-75A	ALE-80A	ALE-85A	ALE-91A	ALE-93A	ALE-95A	ALE-55D	ALE-60D	ALE-65D	ALE-72D
Durometer (Shore Hardness)	D2240	70A	75A	80A	85A	91A	93A	95A	55D	60D	65D	72D
Specific Gravity	D792	1.04	1.05	1.06	1.07	1.08	1.08	1.09	1.09	1.10	1.10	1.11
Flex Modulus (psi)	D790	1,000	1,100	2,400	3,300	4,000	7,000	11,000	13,500	38,000	47,000	93,000
Ultimate Tensile (psi)	D412	2,800	3,500	4,500	4,000	4,500	5,000	5,200	5,500	6,000	6,000	5,500
Ultimate Elongation (%)	D412	900	800	650	600	550	500	450	405	375	350	300
Tensile at 100% (psi)	D412	470	550	800	1,100	1,200	1,200	1,300	1,600	2,100	2,600	3,200
Tensile at 300% (psi)	D412	800	1,000	2,100	2,300	2,500	2,600	2,700	3,700	4,300	5,000	5,500
Mold Shrinkage (in/in)	D955	.006-.01	.006-.01	.006-.01	.006-.01	.006-.01	.006-.01	.006-.01	.006-.01	.006-.01	.006-.01	.006-.01

Biomerics Quadraflex can be compounded with radiopacifiers, colorants, or other additives. Customization of grades available.

B20 GRADES

Product & Properties	ASTM Test	ALE 70A-B20	ALE 75A-B20	ALE 80A-B20	ALE 85A-B20	ALE 91A-B20	ALE 93A-B20	ALE 95A-B20	ALE 55D-B20	ALE 60D-B20	ALE 65D-B20	ALE 72D-B20
Durometer (Shore Hardness)	D2240	70A	75A	80A	85A	91A	93A	95A	55D	60D	65D	72D
Specific Gravity	D792	1.2	1.23	1.25	1.27	1.29	1.30	1.31	1.31	1.31	1.31	1.31
Flex Modulus (psi)	D790	1,000	1,400	1,800	2,800	4,300	5,000	5,800	28,000	53,000	80,000	125,000
Ultimate Tensile (psi)	D412	2,500	3,300	4,000	4,700	5,100	5,300	5,700	5,700	6,000	6,500	7,000
Ultimate Elongation (%)	D412	705	600	580	550	520	510	500	450	400	475	350
Tensile at 100% (psi)	D412	500	700	900	1,100	1,400	1,600	1,800	1,900	2,000	2,350	3,200
Tensile at 300% (psi)	D412	1,000	1,200	1,900	2,000	2,200	2,500	3,000	3,500	5,000	6,000	7,000
Mold Shrinkage (in/in)	D955	.006-.01	.006-.01	.006-.01	.006-.01	.006-.01	.006-.01	.006-.01	.006-.01	.006-.01	.006-.01	.006-.01

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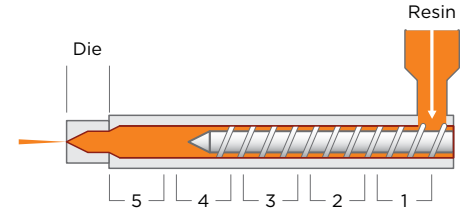
Extrusion, Injection Molding, Solution

CHARACTERISTICS

Superior biocompatibility, chemical resistance, oxidative stability, non-yellowing, hemocompatible, body softening.

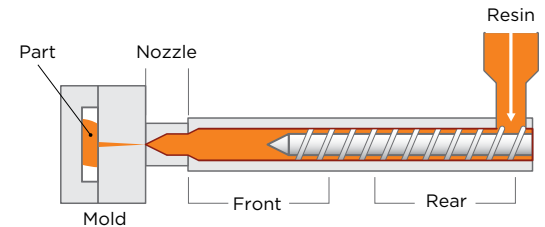


EXTRUSION TEMPERATURE PROFILE CLEAR AND B20 GRADES



	ALE-70A	ALE-75A	ALE-80A	ALE-85A	ALE-91A	ALE-93A	ALE-95D	ALE-55D	ALE-60D	ALE-65D	ALE-72D
	°F/°C	°F/°C	°F/°C	°F/°C	°F/°C	°F/°C	°F/°C	°F/°C	°F/°C	°F/°C	°F/°C
Zone 1	300/149	300/149	340/171	340/171	340/171	340/171	340/171	340/171	340/171	350/177	350/177
Zone 2	320/160	320/160	360/182	360/182	360/182	360/182	360/182	360/182	360/182	370/188	370/188
Zone 3	340/171	340/171	370/188	370/188	370/188	370/188	370/188	370/188	370/188	380/193	380/193
Zone 4	360/182	360/182	380/193	380/193	380/193	380/193	380/193	380/193	380/193	390/199	390/199
Adapter 5	360/182	360/182	380/193	380/193	380/193	380/193	380/193	380/193	380/193	390/199	390/199
Die	360-380 / 182-193	360-380 / 182-193	380-420 / 193-216	380-420 / 193-216	380-420 / 193-216	380-420 / 193-216	380-420 / 193-216	380-420 / 193-216	380-420 / 193-216	390-430 / 199-221	390-430 / 199-221

INJECTION MOLDING TEMPERATURE PROFILE CLEAR AND B20 GRADES



	ALE-70A	ALE-75A	ALE-80A	ALE-85A	ALE-91A	ALE-93A	ALE-95A	ALE-55D	ALE-60D	ALE-65D	ALE-72D
	°F/°C	°F/°C	°F/°C	°F/°C	°F/°C	°F/°C	°F/°C	°F/°C	°F/°C	°F/°C	°F/°C
Rear	350/177	350/177	350/177	350/177	360/182	370/188	380/193	390/199	390/199	400/204	400/204
Front	375/191	375/191	375/191	375/191	385/196	395/202	405/207	410/210	410/210	420/216	420/216
Nozzle	385/196	385/196	385/196	385/196	395/202	400/204	410/210	420/216	420/216	430/221	430/221
Melt	385/196	385/196	385/196	385/196	385/196	385/196	395/202	400/204	400/204	410/210	410/210
Mold	50-80 / 10-27	50-80 / 10-27	50-80 / 10-27	50-80 / 10-27	50-80 / 10-27	50-80 / 10-27	50-80 / 10-27	50-80 / 10-27	50-80 / 10-27	50-80 / 10-27	50-80 / 10-27

INJECTION SPEED: MEDIUM TO FAST



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HANDLING & DRYING

Quadraflex ALE is hygroscopic, meaning the material will absorb and react with moisture in the atmosphere, and requires proper drying prior to processing. Moisture in the material will adversely affect the process parameters and end product physical properties. Materials should be properly dried in a desiccant dehumidifying hopper dryer prior to processing. Airflow to the hopper should be at least 1 cubic foot pound per minute for every pound of resin per hour at a dew point -40 F or less. It is also recommended that a machine mounted hopper drier be used. Material should be dried until the moisture content is less than 0.03% by weight. Recommended drying temperatures at times are listed in the table below by material grade.

DRY FOR A MINIMUM OF 4 HOURS AT -40°F / -40°C DEW POINT

	ALE-70A	ALE-75A	ALE-80A	ALE-85A	ALE-91A	ALE-93A	ALE-95A	ALE-55D	ALE-60D	ALE-65D	ALE-72D
Recommended drying Temperature (°F)	135	135	140	140	150	150	160	160	170	180	180
Recommended drying Temperature (°C)	57	57	60	60	66	66	71	71	77	82	82

BIOCOMPATIBILITY

Standard	ISO-10993		USP Class VI								
	4	5	Acute Systemic Toxicity Test					Intracutaneous Test			Implantation
Test	MEM Elution	Hemolysis, Extract	Normal Saline	Cottonseed Oil	5% EtOH in Saline	Polyethylene	Normal Saline	Cottonseed Oil	5% EtOH in Saline	Polyethylene	Intermuscular
Result	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass	Pass

STERILIZATION

Sterilization Method	EtO	Peroxide	E-Beam	Gamma 25kGy	Gamma 50 kGy	Dry Heat	Autoclave
Guidance	Yes	Yes	Yes	Yes	Yes	Not Recommended	Not Recommended

NOTE

The information contained herein is believed to be accurate, but no representation or guarantees of any kind are made as to its accuracy. The information is based on lab results, are typical properties, and should not be construed as specifications. Fabrication conditions, part design, additives, process aids, finishing steps, and end use conditions all affect the performance and regulatory status of the end application. Due to variation in methods, conditions, and equipment, no warranties or guarantees are made as to the suitability or accuracy of this information for use in any end application. Users should confirm results via their own tests.

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