

CARBOLVE

Carbon Seal Material Selection Guide

Material Grades for Mechanical Seals, Bearings and Sliding Components

Resin Impregnated	Antimony Impregnated	Copper Impregnated
Babbitt / Bronze	Nickel Alloy	Electrographite / Fine-Grain

Version 1.0 | Development Target Values

carbolve.com

1. Material Grade Overview

CARBOLVE seal materials are organized by base carbon family, impregnation/treatment and performance level. Grade numbers identify the position within each family; they do not equal density, metal content, pressure rating or competitor equivalence.

Series	Material Family	CARBOLVE Grades	Typical Applications
CVM-CG-R	Resin Impregnated Carbon Graphite	R20 / R30 / HR40	General mechanical seals, pumps, water/oil service
CVM-CG-A	Antimony Impregnated Carbon Graphite	A20 / A30 / A40	Steam, hydrocarbons, high-load mechanical seals
CVM-CG-C	Copper Impregnated Carbon Graphite	C30 / C40	High-pressure and heat-dissipation service
CVM-CG-B / BR	Babbitt / Bronze Impregnated Carbon	B20 / B30 / BR30	Special bearings and heavy-duty sliding components
CVM-CG-NC	Nickel-Alloy Impregnated Carbon	NC40	Special severe-duty / high-temperature applications
CVM-EG / FG / RB	Electrographite / Fine-Grain / Resin-Bonded	EG-U20 / EG-R20 / FG-R30 / FG-A40 / RB-20	High-temp, precision and special seal applications

Grade Code Example

CVM-CG-A30 = CARBOLVE Material / Carbon Graphite / Antimony Impregnated / High Strength Grade.

20 = general purpose **30** = high strength / heavy duty **40** = severe duty / high temperature **50** = application engineered.

2. Core Carbon Seal Material Grades

The values below are provisional typical development targets for preliminary material selection.

Grade	Material	Density g/cm ³	Flexural MPa	Compressive MPa	CTE x10 ⁻⁶ /K	Thermal W/mK	Temp °C	Typical Application
CVM-CG-R20	Resin Carbon	1.76	62	210	4.6	10	200	General mechanical seals
CVM-CG-R30	Resin Carbon	1.82	78	260	4.7	9	200	Higher-load pump seals
CVM-CG-HR40	High-Temp Resin	1.82	80	270	4.7	9	240-260	Elevated-temperature seals
CVM-CG-A20	Antimony Carbon	2.25	78	250	4.5	12	300-350	General metal-impregnated seals
CVM-CG-A30	Antimony Carbon	2.28	90	320	4.5	11	350	Heavy-duty seals
CVM-CG-A40	Antimony Carbon	2.32	100	360	4.6	11	350	Severe-duty / high-load seals
CVM-CG-C30	Copper Carbon	2.38	85	290	4.7	20	300-350	High-pressure / thermal duty
CVM-CG-C40	Copper Carbon	2.52	95	340	4.9	24	300-350	Severe thermal/mechanical duty

Core positioning

R20 / R30: general-to-high-strength resin grades. **HR40**: elevated-temperature resin system. **A30 / A40**: high-duty antimony grades. **C30 / C40**: copper grades for higher thermal and current-conducting capability.

3. Extended Material Grades

Grade	Material / Treatment	Density g/cm³	Flexural MPa	Compressive MPa	Thermal W/mK	Temp °C	Typical Application
CVM-CG-B20	Lead-Free Babbitt	2.45	52	155	12	180-200	Special bearings / seals
CVM-CG-B30	Lead-Free Babbitt	2.45	68	195	12	180-200	Higher-load Babbitt service
CVM-CG-BR30	Bronze Impregnated	2.50	88	285	14	350	Heavy-duty sliding parts
CVM-CG-NC40	Nickel-Alloy Impregnated	2.42	102	350	13	350	Special severe-duty service
CVM-CG-U10	Unimpregnated Carbon	1.66	48	145	14	350	Segmented rings / porous service
CVM-CG-Y30	Carbon Redensified	1.75	72	230	15	350	Chemical-duty seals
CVM-CG-PT20	PTFE Impregnated	1.82	58	190	9	160-200	Special chemical service
CVM-EG-U20	Electrographite	1.73	42	110	60	450-500	High-temp / dry-running
CVM-EG-R20	Resin Electrographite	1.75	48	150	60	200-260	High-temp seals / bearings
CVM-FG-R30	Fine-Grain Resin Carbon	1.83	90	305	10	200-260	Precision seal faces
CVM-FG-A40	Fine-Grain Antimony Carbon	2.35	108	400	12	350	Precision severe-duty seals
CVM-RB-20	Resin-Bonded Graphite	1.73	62	150	5	160-180	Small molded seal components

4. Quick Material Selection Guide

Operating Need	First Choice	Alternative
General water / coolant / oil seal	CVM-CG-R20	CVM-CG-R30
Higher mechanical load, resin preferred	CVM-CG-R30	CVM-FG-R30
Elevated-temperature resin service	CVM-CG-HR40	CVM-FG-R30
Steam / light hydrocarbons / heavy duty	CVM-CG-A30	CVM-CG-A40
Severe mechanical load / high-speed seal	CVM-CG-A40	CVM-FG-A40
High pressure + heat-removal requirement	CVM-CG-C30	CVM-CG-C40
Bronze metallized carbon requested	CVM-CG-BR30	CVM-CG-C30
Nickel-alloy metallized carbon requested	CVM-CG-NC40	CVM-CG-A40
Aggressive chemistry; polymer/metal unsuitable	CVM-CG-Y30	CVM-EG-U20
High-temperature dry-running ring / bearing	CVM-EG-U20	CVM-EG-R20

Information Required for Final Grade Selection

Seal type - ring dimensions - mating face - operating pressure - shaft speed - fluid / gas - temperature - lubrication condition - dry or wet running - corrosion requirement - leakage requirement.

Engineering note: A carbon material grade alone does not define maximum seal pressure or service life. Seal geometry, shrink fit, mating material, PV condition, cooling and operating medium must also be evaluated.

5. Technical Notes

Development status

All material values in this guide are development targets intended for preliminary selection. They are not guaranteed specification limits.

Density and porosity

Bulk density and apparent porosity are useful indicators of impregnation quality, but they do not alone determine seal performance.

Mechanical strength

Flexural and compressive strength should be validated using fixed specimen geometry and a consistent test method.

Temperature limits

Temperature capability depends on atmosphere and impregnant. Oxidizing and inert/non-oxidizing temperature limits should be stated separately.

Gas tightness

A grade should only be described as gas-tight after a defined leak or permeability test.

Pressure rating

Do not publish one universal maximum pressure for a material grade without considering ring geometry, fit, mating face, speed and PV conditions.

Website publication

After CARBOLVE completes stable-batch testing, 'Development Target Values' can be changed to 'Typical Material Properties'.

CARBOLVE
Carbon Seal & Mechanical Carbon Manufacturer
carbolve.com

For material recommendations, provide your seal dimensions, mating face, operating medium, pressure, speed and temperature.