

High-Performance Bronze Bearings in the Oil & Gas Industry

A Material Selection Guide for CC493K, CC333G, and CC483K in Energy Applications

In the demanding world of Oil & Gas, equipment reliability is non-negotiable. From offshore drilling rigs to downstream refineries, components must withstand extreme pressures, corrosive environments, and heavy mechanical loads. Choosing the right bronze bearing material is critical to preventing downtime and ensuring operational safety.

CC493K (RG7) Leaded Tin Bronze: The Versatile Solution for Auxiliary Equipment

CC493K, often referred to as RG7, is a leaded tin bronze known for its excellent machinability and "emergency" dry-running properties. In the Oil & Gas industry, it serves as a reliable workhorse for auxiliary and general-purpose machinery.

Pump and Valve Components: Used for wear rings, valve stems, and gland nuts in freshwater cooling systems and low-pressure fluid transport.

General Industrial Gearboxes: Ideal for internal bushings in standard gear drives used in refinery conveyor systems.

Hydraulic Systems: Commonly found in hydraulic cylinder bushings for light-duty offshore lifting equipment where intermittent lubrication might occur.

Why Choose CC493K? Its lead content provides a low-friction surface that can tolerate temporary lubrication failures, making it a safe choice for equipment where maintenance access is limited.

KEY FEATURES	
★	Excellent dry-running performance
★	High wear resistance for extended service life
★	Reliable bearing material with stable mechanical properties
★	Outstanding machinability for precision components
★	Strong corrosion resistance in demanding environments

KEY MARKETS	
★	Power transmission systems
★	General industrial machinery
★	Marine applications
★	Oil and gas industry
★	Power generation equipment

MECHANICAL PROPERTIES	
Tensile Strength (N/mm ²)	260
Yield Strength (N/mm ²)	120
Elongation (%)	12
Hardness (HV)	70

CHEMICAL PROPERTIES		
	Min %	Max %
Copper (Cu)	81.0	85.0
Tin (Sn)	6.0	8.0
Lead (Pb)	5.0	8.0
Zinc (Zn)	2.0	5.0
Nickel (Ni)	—	2.0
Antimony (Sb)	—	0.3
Iron (Fe)	—	0.2
Phosphorous (P)	—	0.1
Sulphur (S)	—	0.05
Aluminium (Al)	—	0.01
Silicon (Si)	—	0.01

CC333G (AB2) Aluminium Bronze: Engineered for Offshore and Subsea Extremes

When it comes to offshore oil and gas environments, CC333G (AB2) is the gold standard. This nickel-aluminium bronze alloy is specifically engineered to resist the aggressive nature of seawater and high-stress mechanical loading.

Subsea Valve Actuators: Its exceptional resistance to cavitation and seawater corrosion makes it the primary choice for subsea valve components and actuator bushings.

Mooring and Winch Systems: Used in heavy-duty bushings for offshore mooring winches and crane pivot pins that face constant exposure to salt spray and high shock loads.

Non-Sparking Safety Tools: Critical for components in "Zone 0" explosive environments where steel-on-steel contact could cause catastrophic sparks.

Why Choose CC333G? It offers the highest tensile strength and the best corrosion resistance among the three, making it indispensable for structural and safety-critical offshore components.

KEY FEATURES

- ★ High strength and excellent toughness
- ★ Strong resistance to shock and impact loads
- ★ Excellent corrosion resistance in harsh environments
- ★ High wear resistance for long service life
- ★ Non-sparking properties for enhanced safety

KEY MARKETS

- ★ Marine applications
- ★ Oil and gas industry
- ★ Power generation equipment
- ★ General industrial machinery
- ★ Power transmission systems

MECHANICAL PROPERTIES

Tensile Strength (N/mm ²)	650
Yield Strength (N/mm ²)	280
Elongation (%)	13
Hardness (HV)	150

CHEMICAL PROPERTIES

	Min %	Max %
Copper (Cu)	76.0	83.0
Aluminium (Al)	8.5	10.5
Nickel (Ni)	4.0	6.0
Iron (Fe)	4.0	5.5
Manganese (Mn)	—	3.0
Zinc (Zn)	—	0.5
Tin (Sn)	—	0.1
Silicon (Si)	—	0.1
Chromium (Cr)	—	0.05
Magnesium (Mg)	—	0.05
Lead (Pb)	—	0.03
Bismuth (Bi)	—	0.01

CC483K (PB2) Phosphor Bronze: Precision and Durability for High-Load Drilling

CC483K, or PB2, is a high-tin phosphor bronze that excels in high-load, high-speed applications. Its superior hardness and wear resistance make it the preferred material for the heavy-duty machinery found in upstream drilling operations.

Drilling Rig Drawworks: Used in the heavy-duty bushings of drawworks systems that manage the hoisting of the drill string.

Mud Pump Bearings: Its ability to withstand impact loading and abrasive environments makes it ideal for the internal bushings of high-pressure mud pumps.

Worm Gears and Transmission: Found in high-torque worm wheels for rotary tables and top drive systems where precision and durability are paramount.

Why Choose CC483K? It provides the best balance of fatigue strength and wear resistance, ensuring that high-precision drilling equipment maintains its integrity under constant vibration and heavy loads.

KEY FEATURES

- ★ High strength
- ★ Excellent machinability
- ★ High wear resistance
- ★ High load and impact ability
- ★ Good corrosion resistance

KEY MARKETS

- ★ Power Transmission
- ★ General Industrial
- ★ Marine
- ★ Oil and Gas
- ★ Power Generation

MECHANICAL PROPERTIES

	Continuous Cast	Centrifugal Cast
Tensile Strength (N/mm ²)	300	280
Yield strength (N/mm ²)	150	150
Elongation (%)	6	5
Hardness (HV)	90	90

CHEMICAL PROPERTIES

	Min %	Max %
Copper (Cu)	85.0	88.5
Tin (Sn)	11.0	13.0
Nickel (Ni)	—	2.0
Lead (Pb)	—	0.7
Phosphorous (P)	—	0.6
Zinc (Zn)	—	0.5
Iron (Fe)	—	0.2
Antimony (Sb)	—	0.15
Sulphur (S)	—	0.05
Aluminium (Al)	—	0.01
Silicon (Si)	—	0.01

Material Selection Summary for Oil & Gas Engineers

Feature	CC493K (Leaded)	CC333G (Aluminium)	CC483K (Phosphor)
Primary Environment	Onshore / Auxiliary	Offshore / Subsea	Upstream Drilling
Corrosion Resistance	Moderate	Extreme (Seawater)	High
Load Capacity	Medium	Very High	High
Special Property	Self-Lubricating	Non-Sparking	Fatigue Resistant

Copper Alloy Lead (Pb) Content Guide & Material Specifications

Relevant Products (Pb Content < 0.10%)

Products	Pb Content
AB1 / AB2 / AB3 / C63020 / C95700 / CC333G / CW403J / CW409J	Up to 0.03%
C101 / C102 / C103	Up to 0.01%
C106 / C61300 / C61400 / C96400 / CC101 / CC102 / CN102 / CN107	Up to 0.01%
C61900 / C63200 / C96900 / C96970 / CW305G / CW352H / CW354H	Up to 0.02%
CW452H / CW453H / PB102	Up to 0.02%
C64200 / C64210 / CA104 / CA107 / CC334G / CW307G / CW308G	Up to 0.05%
CW459K / CW501L / CW502L / CW503L / CW505L / CW507L / CMA1 / HTB1 / PB104	Up to 0.05%
C89320	Up to 0.09%

Relevant Products (Pb Content > 0.10%)

Products	Pb Content
C113	0.16 - 0.25%
C83600 / C92800 / CC491K / LG1 / LG2	4.00 - 6.00%
C83800	5.00 - 7.00%
C84200	2.00 - 3.00%
C84400 / C93200 / SAE660	6.00 - 8.00%
C84800	5.50 - 7.00%
C85200 / C85400	1.50 - 3.80%
C85700 / CZ129	0.80 - 1.50%
C86200 / C86300 / C87300 / C91000 / CC762S / CW109C / CW111C / CW509L / CW510L / CW511L / CW512L / CZ110	Up to 0.20%
C86400 / C86700 / CZ114 / CZ115	0.50 - 1.50%
C86500	Up to 0.40%
C87400 / CC480K	Up to 1.00%
C87500 / C87600 / C90700 / CC760S / CC765S / CC766S / PB2 / SCB4 / SCB6	Up to 0.50%
C90300 / C90500 / CC330G / CC484K / CC764S / CT2	Up to 0.30%
C91300 / C95500 / CC481K / CT1 / DCB1 / PB1	Up to 0.25%
C92200 / CC498K	1.00 - 2.00%
C92300 / C94800	0.30 - 1.00%
C92500	1.00 - 1.50%
C92700 / C97800	1.00 - 2.50%
C92900	2.00 - 3.00%
C93400	7.00 - 9.00%
C93500 / CC494K / LB4	8.00 - 10.00%
C93600	11.00 - 13.00%
C93700 / C97300 / CC495K	8.00 - 11.00%
C93800	13.00 - 16.00%
C93900 / SAE67	14.00 - 18.00%
C94000	14.00 - 16.00%
C94100	18.00 - 22.00%
C94300	23.00 - 27.00%
C94700 / CC331G / CC332G / CC767S / CW508L / CW724R / CZ109	Up to 1.00%
C97600	2.00 - 3.00%
CC482K	0.70 - 2.50%
CC483K	Up to 0.70%
CC490K	3.00 - 6.00%
CC492K / LG4 / CZ121(Pb3) / CZ130	2.50 - 3.50%
CC493K	5.00 - 8.00%
CC496K / LB1	13.00 - 17.00%
CC497K / LB5	18.00 - 23.00%
CC499K / CZ136	Up to 3.00%

Relevant Products (Pb Content > 0.10%)

Products	Pb Content
CC750S / SCB3	1.00 - 3.00%
CC751S	0.80 - 2.20%
CC752S	1.50 - 2.20%
CC753S	1.80 - 2.50%
CC754S / DCB3 / PCB1	0.50 - 2.50%
CC755S	1.20 - 1.70%
CC761S / CW708R / CZ135	Up to 0.80%
CC763S / G1	Up to 1.50%
CW704R / CW710R	0.20 - 0.80%
CW712R	0.20 - 0.60%
CZ104	0.10 - 1.00%
CZ121(Pb4)	3.50 - 4.50%
CZ122 / CZ128 / CZ131	1.50 - 2.50%
CZ124	2.50 - 3.70%
CZ132	1.70 - 2.80%
CZ134	1.30 - 2.20%
CZ137	0.30 - 0.80%
G3	0.10 - 0.50%
LB2	8.50 - 11.00%
LPB1 / SCB1	2.00 - 5.00%
NS101	Up to 1.00%
PB4	Up to 0.75%

Selecting the right bronze alloy is a strategic decision that impacts the lifespan and safety of Oil & Gas infrastructure.

Whether you need the self-lubricating reliability of CC493K, the seawater immunity of CC333G, or the high-load precision of CC483K, understanding these material nuances is key to engineering excellence.

Looking for high-quality bronze bearings for your next Oil & Gas project? Contact our technical team for custom material specifications and precision-machined components.

For reference only

Please note that for many Copper Alloys there is no practical solution available to substitute lead. Lead enhances the machinability of the alloy and is present to improve other properties, especially sliding and dry-running properties. The material specifications provided herein are for reference only; please consult the supplier directly to confirm the specific manufacturing standards (e.g., ASTM, EN, JIS) applicable to your requirements.