CLEPA
European Association of Automotive Suppliers

Carbon – Ceramic Brake Discs UNECE R90:02

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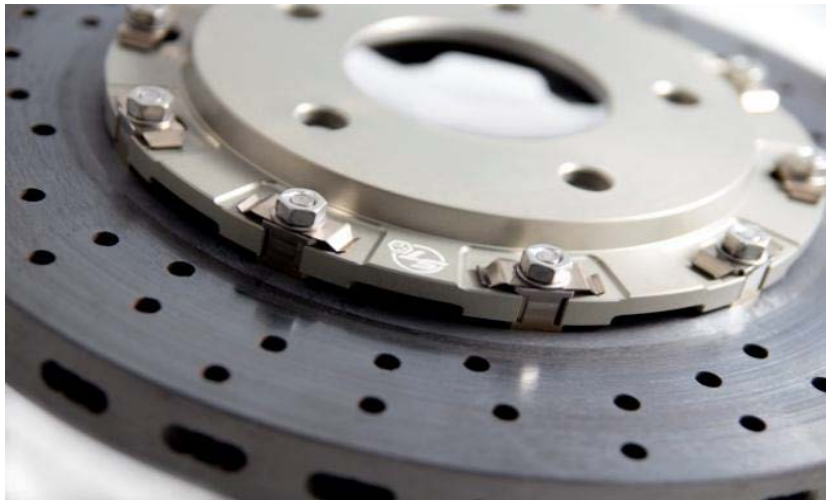
Carbon – Ceramic Brake Discs

Not to be confused with Carbon – Carbon brakes as used on FI cars,
Carbon – Ceramic (CSiC) brake discs are developed for road going cars and have “normal” friction levels & a user friendly operating temperature envelope

Construction

- ❑ Carbon – Ceramic (CSiC) braking ring
- ❑ Aluminium mounting hub



Benefits

- Weight savings of up to 70%
- High thermal competence
- Low wear
- Corrosion free

Requirements for proper function

- Special brake pads
- High temperature bedding (pre-use conditioning)

Carbon – Ceramic Brake Discs

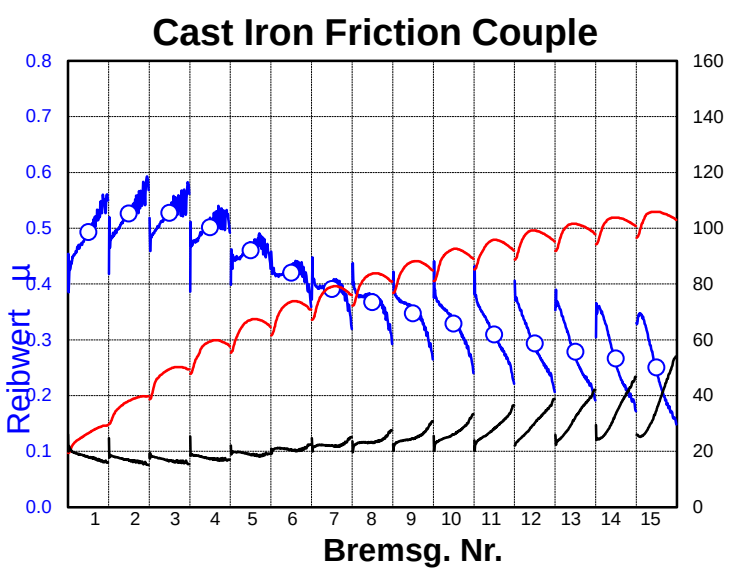
Cast Iron & Carbon – Ceramic : two different friction couples - the elements are not interchangeable

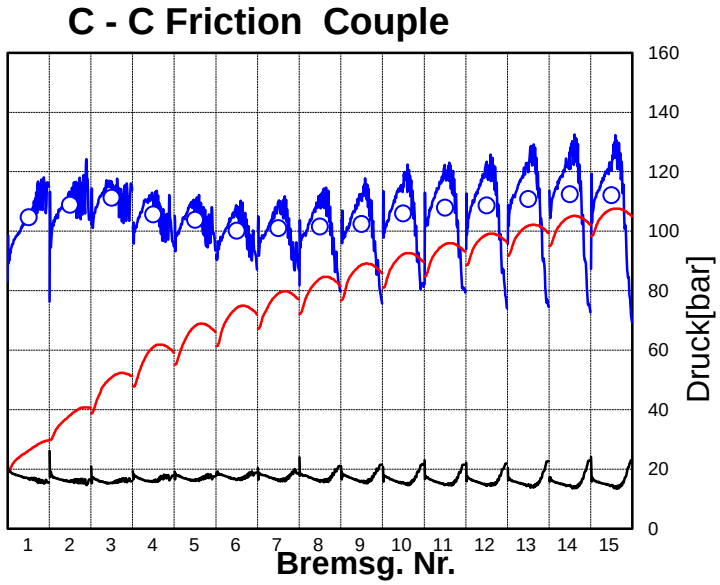
Brake Disc	Brake Pad	Result
Cast Iron	Conventional	OK
Carbon - Ceramic	C – C Compatible	OK
Cast Iron	C – C Compatible	NOK
Carbon - Ceramic	Conventional	NOK

Carbon – Ceramic Brake Discs

C - C friction couples fade less than cast iron friction couples

To offset the resulting higher surface temperatures slightly larger diameter discs are often employed when replacing a cast iron brake with a C- C brake





Carbon – Ceramic Brake Discs

Increasing market adoption

- Fitted as standard on “Supercars”
- Offered as customer option to conventional (cast iron) brakes on many high performance vehicles
- Available as replacement market “performance upgrade” for “enthusiasts” for track and road use

Fitment predicted to grow > 20 x during next decade

Carbon – Ceramic Brake Discs

With growing market adoption we need to consider replacement market

- By current definition they need to comply with R90

1.1.This Regulation applies to the basic braking function of the following replacement parts: Replacement brake drums and discs intended for use in friction brakes forming part of a braking system of vehicles of category M, N and O which have a type approval in accordance with Regulation No. 13 or Regulation No. 13-H

- But R90 written around conventional (cast iron) brakes and the way they function

Carbon – Ceramic Brake Discs

With appropriate bedding and axle loading C-C brake discs and compatible brake pads successfully meet UNECER90:02 criteria

UN ECER90:O2 Requirement (M1)	Carbon – Ceramic Friction Couple
Compliance with R13H	OK
Comparison with OE fitment (within 10%)	OK
Thermal Fatigue Test (≥ 150 cycles)	OK
High Load Test (≥ 500 applications)	OK

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Three cases to consider –

- 1) where C-C are fitted as original fitment
- 2) where C-C are offered as original fitment customer option
- 3) where companies wish to offer performance upgrades for road use

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OEM Production Vehicles

Type of Vehicle	Standard OEM Fitment		Replacement (AM) Fitment					Possible Action
	Brake Disc	Brake Pad	Brake Disc	Brake Pad	Approval Process		Issues/Problems	
					Brake Disc	Brake Pad		
Normal Car	Cast Iron	Conventional	Cast Iron	Conventional	R90	R90	None	
High Performance Car	Cast Iron	Conventional	Cast Iron	Conventional	R90	R90	None	
	Carbon - Ceramic	Carbon - Ceramic Compatible	Carbon - Ceramic	Carbon - Ceramic Compatible	R90 - "Interchangeable" category with OEM or R90 Approved Carbon – Ceramic brake pad	R90	Bedding process in R90 (A3/2.2.2.3) not suitable for CC couple. Inertia mass (A11/3.2.1.2) not relevant to vehicle type	Add specific C-C bedding regime. Modify A11/3.2.1.2)
Super Car	Carbon - Ceramic	Carbon - Ceramic Compatible	Carbon - Ceramic	Carbon - Ceramic Compatible	R90 - "Interchangeable" category with OEM or R90 Approved Carbon – Ceramic brake pad	R90	Bedding process in R90 (A3/2.2.2.3) not suitable for CC couple. Inertia mass (A11/3.2.1.2) not relevant to vehicle type	Add specific C-C bedding regime. Modify A11/3.2.1.2)
High Performance Car - Braking Performance Upgrade	Cast Iron	Conventional	Carbon - Ceramic	Carbon - Ceramic Compatible	?	?	Disc Size & design	Individual Vehicle Type Approval ?