

# proceq

## CARBOTEQ<sup>®</sup> Made in Switzerland

HIGH PRECISION WEAR INDICATION OF CARBON CERAMIC BRAKE DISCS





## THE HISTORY AND UNIQUENESS OF CARBON CERAMIC BRAKE DISCS

Since its world premiere at the Frankfurt International Automobile Show (IAA 1999), the carbon ceramic brake disc has been gaining rapid recognition and usage within the premium class automobile community: Porsche, Pagani, Lexus, Mercedes-AMG, McLaren, Maserati, BMW and the list keeps growing.

The inspiration for the carbon ceramic brake disc derived from the continuous quest for performance perfection in racing and high performance road cars, high speed railway braking systems and in supersonic aircraft. The product as it is today delivers extraordinary advantages:

- » Weighing 50 % less than conventional cast iron brake discs results in subsequently reduced fuel consumption and CO<sub>2</sub> emissions.
- » Less rotation and a lower unsprung mass increase traction and steering control.
- » Its particular construction and extreme hardness ensure a substantially longer lifetime than cast iron brake discs.
- » A significant reduction in stopping distance (eg: 3 m braking from 100 to 0 km/h).
- » Low deformation at high temperatures, ie: constant braking force for high decelerations even after several stops.
- » 90 % less fine dust than cast iron brake discs.
- » Very good Noise Vibration Harshness behaviour and a constant brake pedal feeling.



Materials used for carbon ceramic brake discs: silicon carbide and carbon fibers

## THE CHALLENGE HOW TO ACCURATELY MEASURE BRAKE FADING

High performance carbon ceramic brake discs are subject to extreme forces – such as heat and friction. This leads inevitably to the reduction of the mechanical strength of the brake discs.

Although the discs are extremely durable under normal conditions, ambitious driving can dramatically shorten their lifetime. To ensure passenger safety, all brake components must be monitored regularly.

Until now, two methods of checking wear on carbon ceramic brake discs existed:

- » Dismantling and weighing of the disc
- » Visual inspections

These are both awkward and time-consuming tasks which deliver varying degrees of accuracy. There was a strong industry need for a better solution.



Automobile brakes must endure brutal braking forces

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## THE SOLUTION

### CARBOTEQ® – PATENTED TECHNOLOGY



Using our expertise and a close collaboration with BSCCB (Brembo SGL Carbon Ceramic Brakes), Proceq was able to design Carboteq – a unique and patented instrument to accurately measure brake disc wear.

Carboteq is based on pulse-induction technology using a specific arrangement of inductive coils and advanced signal analysis to compensate for influences of material characteristics and brake disc geometries.

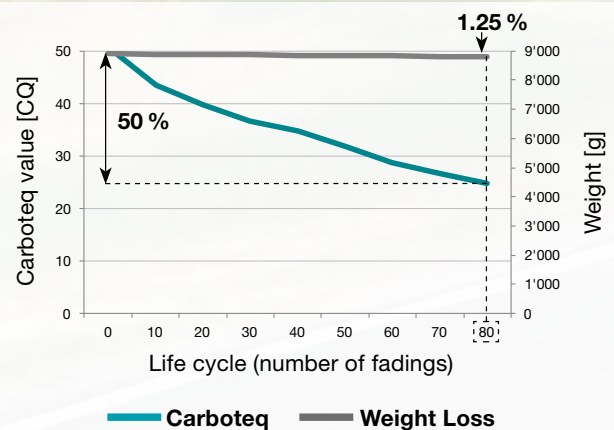
Early prototypes were extensively tested with selected automobile OEMs with astounding results. One such result is the undisputed superiority over the traditional weight loss method (see inset).

The latest Carboteq generation incorporates a specially designed line laser to further enhance positioning accuracy. This ensures the Carboteq instrument is always placed exactly at the right spot to read the pre-engraved Carboteq value on the brake discs.

The easy-to-read display and robust design of the housing make the instrument perfectly suitable for different working environments.

And to round it off, each Carboteq is extensively tested in Switzerland and certified by official certification bodies and is thereby conforming to highest quality and automobile standards (TüV, NRTL, GS, UL, CE).

## CARBOTEQ® VS. WEIGHT LOSS METHOD UP TO 40x MORE ACCURATE



While the weight of the brake disc decreases typically only about 1.25 % (ca. 100 g) during the whole life cycle of the brake disc (80 fadings in the test shown), the Carboteq value provides a difference of 50 % in the same test setup. This results in an accurate prediction of the remaining lifetime of a carbon ceramic brake disc.



## THE BENEFITS TO MANY DIFFERENT USERS

### Owners of Racing and High Performance Cars

Accurate tracking of the brake disc's lifespan allows greater ease of mind to decide when to replace brake discs (safety) and to optimize usage of expensive brake discs (cost).

### Manufacturers of Carbon Ceramic Brake Discs

Significant simplification of production processes resulting in enhanced manufacturing efficiencies and quality assurance levels. Full potential of the brake disc can now be exploited leading to higher demand for carbon ceramic brake discs.

### Automobile OEMs

Accelerated acceptance of "lighter" carbon ceramic brake discs for all types of vehicles resulting in reduced fuel consumption and CO2 emissions. Very little brake dust is generated contributing to further protection of the environment.

### Garages

Time saving maintenance since no dismantling of the wheel brake assembly is necessary. The user friendliness of Carboteq leads to even faster auto service times.

### Car Dealers

Quick and simple verification of carbon ceramic brake discs in used cars.

### Vehicle Inspection Stations

Reliable periodic inspections to ensure brake discs conform with regulations governing road safety.

## SOPHISTICATED TECHNOLOGY BUT SIMPLE MEASURING PROCESS

### 1 Getting Started



### 2 Functional Test



### 3 Measuring







*“Having an electronic precision instrument for wear indication of carbon ceramic brake discs makes the measuring process much easier!”*

**Alex Fach, owner of a motorsports company**

*“Carbotech is a huge step forward, for safety reasons but also in terms of cost optimization.”*

**Peter Hoberg, passionate driver and carbon ceramic brake user**



**Verband Schweizer Porsche Clubs**  
Fédération des Clubs Porsche Suisses  
Federazione Porsche Clubs Svizzeri



*Proceq is official partner of Verband Schweizer Porsche Clubs, organizer of the Porsche Sports Cup Suisse race series.*





# CARBOTEQ®

## TECHNICAL SPECIFICATION

Measuring Range	0.0 to 100.0 Carboteq [CQ]
Expanded	0 °C to 40 °C: U = 2.0 CQ (k = 2)
Uncertainty	-10 °C to 60 °C: U = 3.0 CQ (k = 2)
Display	26 x 62 mm, 3.5 digit LCD
Interface	USB
Laser	Class 2, < 1 mW, 650 nm
Battery	Lithium Polymer, 3.7 V / 380 mAh Rechargeable via USB (5 V DC/100 mA)
Battery Lifetime	> 10 h
Automatic	Laser after 30 seconds;
Power Down	Instrument after 10 minutes
Dimensions	170 x 75 x 40 mm
Weight	About 210 g
Operating	0 °C to 40 °C (charging);
Temperature	-10 °C to 60 °C (non-charging)
Storage	-10 °C to 60 °C
Temperature	
Humidity	< 95 %RH, non condensing
IP Classification	IP54

## ABOUT PROCEQ

Proceq SA of Switzerland, founded in 1954, develops and manufactures highest quality and precision measurement instruments.

Proceq introduced the world's first portable instruments for non-destructive testing of concrete strength (Original Schmidt Hammer) and metal hardness (Equotip).

This innovation tradition continues with the introduction of the Carboteq (patented) as the world's first instrument for high precision wear indication of carbon ceramic brake discs.

Other excellent products carried by Proceq are the SilverSchmidt, Pundit, Profometer, Profoscope, Resipod, DY-2 and many more in development.

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## equotip®

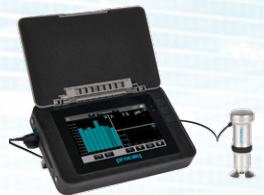
### METAL HARDNESS TESTER

The Equotip 550 Leeb is extensively used in the automotive industry for testing engine blocks, gears and shafts. Equotip also features automated serial production testing and full remote control of the instrument settings.



- » Ideal for heavy and large components
- » Quick on-site hardness monitoring
- » Possibility to test in restricted areas

The Equotip 550 Portable Rockwell is a state-of-the-art metal hardness tester suited for panels and cylindrical components such as axle arms and flat body parts. A variety of accessories and feet are available to suit specific applications.



- » Monitoring of thin parts, profiles and pipes
- » For very soft to very hard materials
- » Highly versatile

## ZONOTIP

### THICKNESS GAUGE

The Zonotip is suited for any metallic or non-metallic component. It is capable of obtaining pulse velocity providing accurate information on thickness as well as detecting flaws and cracks using the A-Scan capability.

- » Auto adaptation to the surface curvature and roughness
- » A-Scan visualization of the signal
- » Auto logging of max and min values



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