

BioRaCe requires:

- 1) any **speed** – between 300 and 600 rpm.
- 2) a **constant speed**
- 3) with a **low torque**. max.

They can be used on all combinations of motors + CA which can provide all 3 together.

Most rotary Niti present and active on the market in 2005 are used the same way – Profile, Protaper, Flexmaster, K3, Hero, etc.

Torque control motors.

Ex: Nouvag TC Endo, Maillefer-Dentsply Vision/ATR, Aseptico, SET, Analytic/SybronEndo, Morita Dentaport & Tri-Auto-ZX, NSK Endomate, etc.

They are generally supplied with a CA direct from the manufacturer – or one CA is suggested.

They may be useful but are no guarantee against instrument breakage – read Dr G Yared's article.

Automatic reverse (anticlockwise) rotation can be an advantage, but ... (see below).

Positive features : Preset speed ranges.

Negative features : Price
Give false illusion of security.
Awkward & cumbersome (and another tubing ...)

Motor on the unit. **Electric or Air + Reducing CA**
At MAXIMUM speed = CONSTANT.
At maximum speed : to make the most of maximum power.

40'000 rpm electric motors (generally set on 38'000 rpm at the factory)

+ 1:70 CA 38'000 : 70 = 542 rpm
+ 1:64 CA 38'000 : 64 = 593 rpm
+ 1:100 CA 38'000 : 100 = 380 rpm
(+ 1:128 CA 38'000 : 128 = 296 rpm)

20'000 rpm air motors – the max speed of which often reaches 10 to 20% rpm below.

+ 1:32 CA 18'000 : 32 = 562 rpm
+ 1:50 CA 18'000 : 50 = 360 rpm
(+ 1:64 CA 18'000 : 64 = 281 rpm)

Sironiti is a 1:115 reducing CA; therefore $38'000 : 115 = 330$ rpm, which is low for RaCe and even lower for S-Apex (originally made to run at 800 rpm).

With a torque control card for each rotary Niti instrument – I have no experience with it because I never found it in any country I travel to ...

Maximum speed of all motors tend to slow down with time – as the motor gets older. Rotary Niti effective speed will be slower on those older motors.

Reducing green band CA generally used in dental surgeries reduce by 6, 7, 10 depending on the brands: that reduction is NOT enough.

Positive features:	Economical No extra tubing in the operating field.
Negative features:	Longer Rotary Niti learning curve Reverse rotation is more difficult/awkward to master.

New units with digital reading for electric motors – brushless motors.

On the units: Sirona, Flex, Planmeca, etc.
As smaller separate kits: Bien-Air, WH, NSK etc.

Blue band 1:1 CA can be used, provided the selected speed is the rotating speed of the Niti instrument.

Implant units / motors.

They can be used as long as : Speed offered is in the **300 to 600 rpm** range.
It is **CONSTANT**.
Irrigation can be turned off (physiological solutions are no good in endo)

Important remarks

Torque. Torque needed in endo is low – less than 5 Ncm.

In endo, the dentist uses

- Instruments of a few 1/100th of a mm.
- In a canal that exists.

It is VERY DIFFERENT from the torque needed in surgery / implantology – 32 Ncm+ a

In surgery/implantology, the dentist uses

- Big diameter burs,
- To create holes that do not exist,
- In bone the cortex of which is very hard.

Reverse rotation.

Useful to *unscrew* an endodontic instrument that has been *threaded in and locked* in the canal. Therefore we hardly need the reverse rotation ... **But as BioRaCe do NOT thread in the canal, reverse mode become optionnal.**

To enlarge, **the instrument must get over the dentine resistance** as it penetrates the canal. Auto-reverse must therefore be set carefully:

- If setting is too low, rotation will revert too soon and the blade will not cut,
- If setting is too high, the risk of breakage will increase ...

It is a matter of feeling and experience.

Reverse rotation does exist on all standard motors on the units – either at the foot control (on older units) or on the digital board (of the more recent ones).

Contra-angles.

It is NOT ADVISABLE to use standard green or blue band CA. There is no chance of doing it on red band CA since the shank of endo instruments will not fit.

There are many types and brands. Most manufacturers now offer an endo CA with a higher reduction. Choosing one is a personal matter. But

1. The endo CA must reduce enough to rotate the file **within the 300 to 600 rpm range.** (500 rpm recommended)
2. It should have **a smaller head** – to save space and gain access in molars. And most rotary Niti instruments now come with a 12 mm shank (instead of 15).
3. **Push buttons are handy**, but not necessary.

Integrated spray is not important – root canals are generally irrigated/disinfected with NaOCl, lubricating and chelating agents. Water from the mains is not ideal (because of possible contamination), even though it does help to wash out debris.

Light – whoever is used to light on her/his handpieces and CA will find it difficult not to use it. But there are few endo CA with light AND with small heads at the same time. Furthermore the light is useful in endo only when the source is very close to the bur and the beam actually reaches inside the cavity and the canal ...

Endo CA are run at low speeds and will outlast standard CA. But they must be cleaned and oiled and sterilized after each patient, just as all the others (“universal precautions” ...).