NobelProcera™ Crown and Bridge Base Metal Alloy Cobalt Chromium

FACT SHEET VERSION 3

Overview

- Biocompatible.*
- High strength cement-retained solutions on teeth and abutments.
- Excellent retention of fit due to precise marginal contact surface design.
- Cost efficient.
- Excellent material homogeneity.
- Conventional or temporary cementation.
- Precision Milled Restoration manufacturing process employing 5-axis milling of a solid Base Metal Alloy Cobalt Chromium monobloc.

Material characteristics

Material type:	Dentaurum Remanium® Star Milling blank (Type 5 according to ISO 22674: 2006)
CTE (25–500° C):	$14.1*10^{-6}$ K^{-1}
Melting interval:	1320–1420° C
Composition [wt%]:	In compliance with ISO 22674: 2006 Cobalt 61±2%, Chromium 28±2%, Tungsten 9±1%, Silicon 1.5±1%. Iron, Manganese, Nitrogen, Niobium, each <1%
Yield strength ($R_{p0.2}$):	Min. 500 MPa, typical value 635 MPa
Elongation:	10%
Elastic modulus (E):	230 GPa

* According to the relevant tests of ISO 10993 (see also last page)

Veneering

– All commercially available veneering materials designed for use with cobalt chromium with a CTE of 14.1 are suitable.
– For long-term clinical success follow the recommendations and handling instructions of the veneering material manufacturer.

Our recommended partners for veneering of NobelProcera Base Metal Alloy Cobalt Chromium Crowns and Bridges are:

Ivoclar Vivadent

Composite:
– SR Adoro is certified for NobelProcera Base Metal Alloy Cobalt Chromium frameworks.
– SR Adoro is available in both A-D and Chromascop shades.
– Ivoclar Vivadent recommends an air abrasive process with 80–100 micron Al_2O_3 at 2–3 bar and the application of SR Link as a bonding agent before opaquer application.

Porcelain:
– IPS InLine, IPS InLine One and IPS InLine PoM are certified for NobelProcera Base Metal Alloy Cobalt Chromium frameworks.
– The IPS InLine metal-ceramic system permits the fabrication of restorations shaded according to A-D, Chromascop and Bleach shade guides. After the application of the opaquer, one can choose the product and the corresponding processing procedure according to personal preferences and the clinical situation:
  – IPS InLine is a conventional metal-ceramic for traditional, individualized layering.
  – IPS InLine One is an uncomplicated one-layer ceramic for quick and efficient layering.
  – IPS InLine PoM is a Press-on-Metal ceramic for accurately fitting, fully anatomical press-on procedures.
– Ivoclar Vivadent recommends to blast the surface with 100 micron Al_2O_3 at 2.5 bar pressure. Subsequently, clean with ultrasonic or steam.

Additional veneering material recommendations and supporting guidelines are available from Ivoclar Vivadent on www.ivoclarvivadent.com

VITA

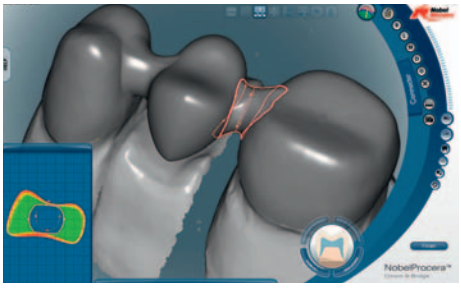
Composite:
– VITA VM LC is certified for NobelProcera Base Metal Alloy Cobalt Chromium frameworks.
– VITA VM LC is available in VITA SYSTEM 3D-Master and VITA classical A-D shades.
– VITA recommends sandblasting with 110–250 micrometer Al_2O_3 at 2.5–3.5 bar pressure and the application of VITA VM BOND as bonding system before opaquer application.

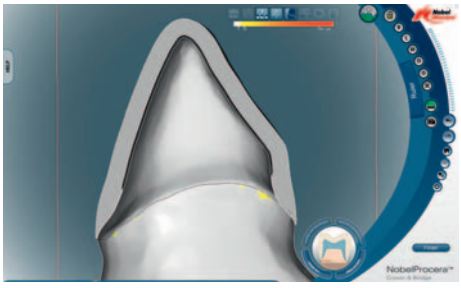
Porcelain:
– VITA VM13 and VITA VMK Master are certified for NobelProcera Base Metal Alloy Cobalt Chromium frameworks.
– VITA VM13 is available in VITA SYSTEM 3D-Master and VITA classical A1–D4 shades.
– VITA recommends sandblasting prior to veneering, with 130 micrometer Al_2O_3 at 3 bar pressure and slow cooling after firing.

Additional veneering material recommendations and supporting guidelines are available from VITA on www.vita-zahnfabrik.com/vm-working-instructions

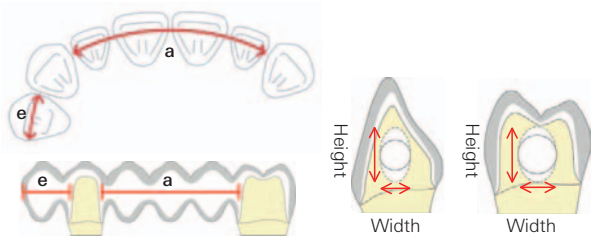
Indications & design features

– Crowns and bridges up to 6-units (on teeth and abutments).
– Minimum thickness 0.4 mm.
– Any position in the mouth.
– The connector dimension of a multi-unit framework depends on the distance between the supporting teeth (see table below). The design is supported by real-time feedback through warning function in the NobelProcera Software.
– A modifiable contact surface is available for bridges and short preparations.





Type – any position	**Maximum length** a=Arc length [mm] e=Extension length [mm]	**Minimum connector and cross section** height × width [mm] / area [mm²]
Free hanging arc	a ≤ 21.0	3.0 × 2.5 / 6.0
Free hanging arc	21.0 < a ≤ 35.0	4.0 × 3.0 / 9.4
Extension	e ≤ 10.0	4.0 × 3.0 / 9.4



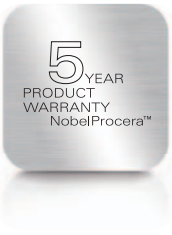
Maximum of one free hanging pontic

Contraindications & design limitations

– Cases with lengths that exceed the maximum limits.
– Bridges must be designed to fit into a cylindrical disc with a diameter of 98 mm and height of 15 mm.
– If the crown is not veneered, occlusal contact with other metal constructions/restorations.
– More than one cantilever.

NobelProcera™ – guaranteed and certified quality

NobelProcera Precision Milled Restorations on teeth and implants are guaranteed for five years; the NobelProcera Product Warranty covers the NobelProcera products and does not include any additional costs. NobelProcera also provides certificates of material authenticity.



Cobalt Chromium alloy CoCr: Biocompatibility

Introduction

The Cobalt Chromium alloys have a long history and clinical track record in the medical device industry. For removable dentures, the CoCr alloy was introduced in the dental field in the 1930's under the trade name "Vitallium®".[1] Later it was used in the orthopaedic industry as a bearing partner for total hip or knee replacements. It was, and still is, used because of its good mechanical performance in terms of elasticity and strength. Nevertheless – and rightfully – concerns were raised regarding the biocompatibility of the alloy in the human body. For example some of the CoCr based hip implants introduced in the 1960s were abandoned in the 1970s because the release of metal particles was high. This was partially related to the implant design and the production technologies used[2], and resulted in further improvements of the alloy processing including the powder metallurgical grades for orthopaedic implants. These advancements are also beneficial for the CAD/CAM milling blanks that are currently used by Nobel Biocare.

Biocompatibility: Definition and standards

There are several definitions of the very term "biocompatibility". One of the most often used versions states that it is "The ability of a material to perform with an appropriate host response in a specific application"[3]; often referred to as the Williams' definition.[1] The definition is rather unspecific, however, and therefore international standards have been developed to describe different aspects of a material's biocompatibility and how it can be tested. The ISO 10993 standard for the "Biological evaluation of medical devices" covers these aspects. The standard gives also guidelines what kind of tests should be taken into consideration for dental applications (crowns/ bridges/ copings): ISO 10993/3; ISO 10993/5 and ISO 10993/10.

- The ISO 10993/3 test indicates on the ability of a material to damage or change the genetic information of cells.
- The ISO 10993/5 test indicates whether a material has or releases substances with a cytotoxic potential – the ability to restrict or eliminate cell proliferation.
- The ISO 10993/10 test indicates on the potential to cause sensitization or irritation of tissues in contact with the material.

Biocompatibility of Nobel Biocares CoCr: Base material

The milling blanks that Nobel Biocare uses for CAD/CAM milling were tested according to ISO10993/5 and found that they did not invoke a cytotoxic response.

Biocompatibility of Nobel Biocares CoCr: Tests on a product level

For a final assessment of the biocompatibility it is relevant to do testing also on the final products, i.e. copings, crowns or frameworks, since this will reflect the material's biocompatibility performance after all the handling, processing and cleaning steps. Therefore the biocompatibility of CoCr products was evaluated after the relevant tests of ISO 10993 (ISO 10993-3, ISO 10993-5 and ISO 10993-10). These tests did not show genotoxic, cytotoxic or irritation potential of the material.

Biocompatibility of CoCr: Final remarks

Both the base material as well as the final products were tested according to the relevant ISO 10993 standards. No adverse reactions were reported on the CoCr material used for CAD/CAM milling. Furthermore it is important to mention that most of the CoCr copings and frameworks are veneered with a porcelain, i.e. most often there is no direct contact between the soft tissue (gums) and the CoCr material.

References

[1] Willams D. Concise Encyclopedia Medical and Dental Materials, edited by D. Williams, 1990 Pergamon Press.

[2] Pramanik S. et al., Chronology of Total Hip Joint Replacement and Materials Development, Trends Biomater. Artif. Organs, 19, 15, 2005.

[3] The definition was used in the European Society for Biomaterials Consensus Conference, but can also be found in reference 1.

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