

# Divergence compensation of abutments—A comparative study based on the mathematical calculation

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## \_Purpose

In literature and manufacturer's publications there are no exact data about the capacity and limits of individualization of the definite abutments for crowns, bridges and overdentures on Frialit®-2 and/or Xive® implants. Therefore the data for abutments have to be calculated by the use of a formula.

## \_Material and methods

First all abutments regarding the indications and construction were compared. The construction drawings and tables of dimensions made available by the manufacturer were consulted, in order to calculate thickness, height and given conicle angle. From this a formula was developed, in order to calculate the maximal possible conicle angle. The values for greatest possible divergence compensation of single crowns, bridges, both implant and tooth anchored suprastructures and multi-unit reconstructions were determined. The clinical consequences were described.

## \_Results

All abutments for the anchorage of fixed and removable implant retained dentures are computed and compared. With the abutment's different diameters, the individualizing capacity are rising when the diameter becomes larger. In comparison to ceramic abutments the titanium abutments could be more shortened and more reduced in wall thickness, so that they have the highest values for divergence compensation. The solid titanium Telescopic Abutment could be modified most: the maximum conicle angle for a single crown on D6.5 implant is 64.7°.

## \_Conclusions

Intensively inclined implants of both systems do not seem to be compatible with the unmodified prosthetical components. The capacity of divergence compensation has not been examined. Practical consequences and recommendations in literature or manufacturer's publications are not exact and usable. The limit values of the material-depending, abutment-specific and technically increased conicle angle for divergence compensation could be computed by a mathematical formula. This has not been published before for abutments of the systems Frialit-2 and Xive as well as for the entire implantology.

## \_Introduction

Natural teeth usually have an oral angulation between the longitudinal axes of root and crown, in particular for anterior teeth. That is the prosthetical or natural divergence. For implant-retained single crowns this divergence is in sagittal direction between implant and the prosthetical axis and must be adapted by the dentist and/or technician to the neighbour teeth for functional and esthetic requirements. If the longitudinal axes of implant and abutment are identical or less divergent than their conicle angles, straight and/or unchanged abutments can be used. If the divergence rises, straight or angled abutments can be used after appropriate individualization by preparation. This is the prosthetical compensation for divergence.

An implantological divergence develops by different longitudinal axes between implants, between implants and teeth in bridges or between multi-implant reconstructions. This applies both with fixed and with