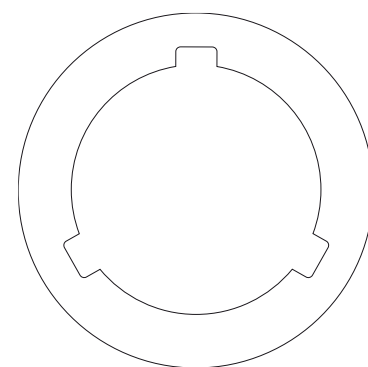


a perfect fit®

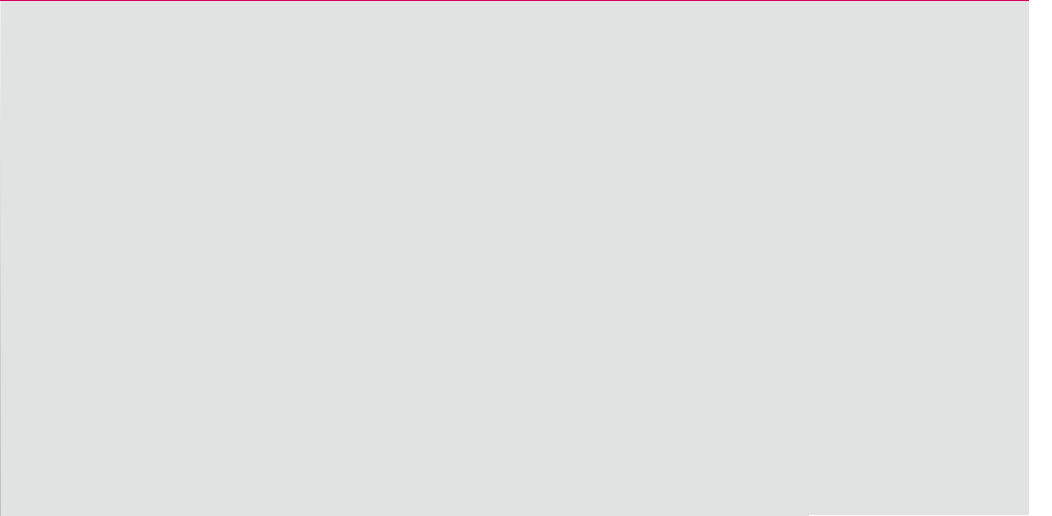


# CAMLOG® IMPLANT POSITION PLANNING

CAMLOG® Implant Lines  
Implant Indications  
Team and Treatment Concept  
Planning Process  
Instrument System



**camlog**



# TABLE OF CONTENTS

<b>GENERAL SYSTEM INFORMATION ABOUT THE CAMLOG® IMPLANT SYSTEM</b>	<b>4</b>
<b>CAMLOG® IMPLANT LINES</b>	<b>5</b>
GENERAL	5
SCREW-LINE IMPLANTS (K-SERIES)	5
ROOT-LINE IMPLANTS	7
SCREW-CYLINDER-LINE IMPLANTS	8
CYLINDER-LINE IMPLANTS	9
INDICATIONS FOR CAMLOG® IMPLANTS WITH 3.3 MM DIAMETER	9
<b>CAMLOG SURFACE STRUCTURES</b>	<b>10</b>
PROMOTE® SURFACE	10
TITANIUM PLASMA COATING TPS	10
<b>CAMLOG® TUBE-IN-TUBE™ IMPLANT ABUTMENT CONNECTION</b>	<b>11</b>
GENERAL	11
IMPLANT INNER THREAD AND OUTER GEOMETRY	11
PRODUCTION PRECISION	12
<b>TEAM CONCEPT</b>	<b>13</b>
THE TEAM	13
TEAM APPROACH	14
<b>TREATMENT CONCEPTS</b>	<b>15</b>
INTRODUCTION	15
LEVERAGE RELATIONS AT THE IMPLANT	15
ESTHETICS	16
PATIENT COMPLIANCE	16
PATIENT INFORMATION	16
FIXED RESTORATIONS	17
BIOLOGICAL WIDTH	18
SPLINTED CROWNS	19
IMPLANT-SUPPORTED BRIDGES	20
REMOVABLE RESTORATIONS	21
<b>PLANNING</b>	<b>23</b>
INTRODUCTION	23
ANAMNESIS	24
EXAMINATIONS	24
WAX-UP/SET-UP	27
PLANNING TEMPLATE	27
X-RAY TEMPLATE	28
PLANNING WITH ORTHOPANTOMOGRAPH/DENTAL FILM	29
ORTHOPANTOMOGRAPH	29
CT SCAN/DIGITAL VOLUME TOMOGRAPHY WITH/WITHOUT 3-D EVALUATION	30
<b>IMPLANT POSITION VERIFICATION</b>	<b>31</b>
FINAL PROSTHESIS DESIGN	31
INDIVIDUALIZATION OF THE PROSTHETIC DESIGN	31
PLANNING THE TREATMENT SEQUENCE	31
FABRICATING THE DRILLING TEMPLATE	31
<b>INSTRUMENT SYSTEM</b>	<b>32</b>
SURGERY SETS	32
DRILLING SPEED	34
COOLING	34
DRILL LIFE	34

# GENERAL SYSTEM INFORMATION ABOUT THE CAMLOG® IMPLANT SYSTEM

## THE CAMLOG® IMPLANT SYSTEM

The CAMLOG® Implant System is based on many years of clinical and laboratory experience and is a user-friendly, consistently prosthesis-oriented implant system.

All CAMLOG® products are continually updated to the latest technological standards. The CAMLOG® Implant System is being continuously developed and adapted by the CAMLOG research and development team in collaboration with clinics, universities and dental technicians and therefore stays abreast of the latest developments in technology.

The CAMLOG® Implant System is very well documented scientifically. Numerous studies addressing a number of parameters, e.g., implant surface, time of implantation and/or implant loading, primary stability, connection design or type of suprastructure, support this. The long-term results for the CAMLOG® Implant System are convincing.

## ATTENTION

The descriptions that follow are not adequate to permit immediate use of the CAMLOG® Implant System. Instruction by an experienced operator in the management of the CAMLOG® Implant System is strongly recommended. CAMLOG® dental implants and abutments should be used only by dentists, physicians, surgeons and dental technicians trained in the system. Appropriate courses and training sessions are regularly offered by CAMLOG. Methodological errors in treatment can result in loss of the implant and significant loss of peri-implant bone.



# CAMLOG® IMPLANT LINES

## GENERAL

CAMLOG® implants are endosseous implants, available in different lengths and configurations. They are placed surgically in the maxillary and/or mandibular bone and serve as anchors for functional and esthetic oral rehabilitations in partially or fully edentulous patients.

Prosthetic treatments include single crowns, bridges or full dentures attached to CAMLOG® implants by means of appropriate components. Generally, there are no preferred sites for the use of the different implant geometries. An independent selection of implants according to the surgical situation is possible because the diameter-specific prosthetic platform is identical for all implant configurations. Different implant types can be used in the same arch.

## SCREW-LINE IMPLANTS (K-SERIES)

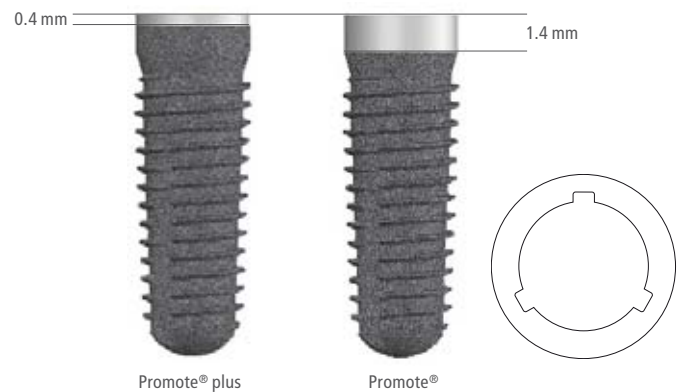
SCREW-LINE implants represent conical self-tapping screw implants in their geometry and are available with Promote® plus (0.4 mm machined implant neck part) and Promote® (new 1.4 mm machined implant neck part) surfaces.

### NEW INNER CONFIGURATION FOR PLATFORM SWITCHING

Both versions include the new inner configuration (K-Series) making the platform switching option available to the user. The geometry of the three grooves was changed from round to square and shortened. The implants are labeled new with K article numbers (K-Series). The new healing caps PS and abutments PS can only be used exclusively with the new SCREW-LINE implants. These components make the platform switching option with the CAMLOG® Implant System possible.

#### IMPORTANT NOTE

All prosthetic components PS for platform switching may only be used in conjunction with SCREW-LINE implants with K article numbers (K-Series)! If healing caps PS are used for healing, prosthetic components PS must be used for further prosthetic treatment including impression to avoid soft-tissue injury!



### ADJUSTING THE IMPLANT NECK AREA OF THE SCREW-LINE IMPLANTS

The conical implant neck area of the SCREW-LINE implants has been drawn up higher toward the implant shoulder. The Promote® surface has been extended for the SCREW-LINE Implant Promote® and an increase in the vertical implant bone contact achieved. The cylindrical machined implant neck area is still only 1.4 mm with the Promote® surface.

### FINE ADJUSTMENT OF THE APICAL GEOMETRY

The fine adjustment of the apical geometry (rounding) makes inserting the SCREW-LINE implants into the bone gentler.

#### NOTE

- The adjustments described have only been carried out on the SCREW-LINE implants with K article numbers (K-Series).
- The existing surgical instruments of the SCREW-LINE can be used without limitation for the new SCREW-LINE implants with K article numbers.



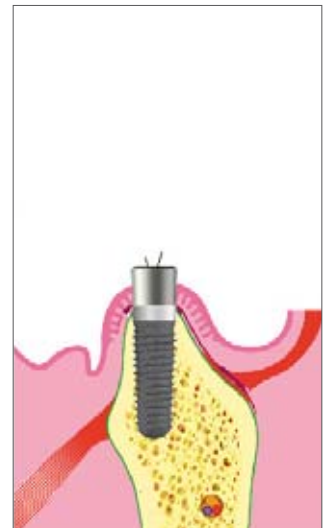
### RECOMMENDED INDICATIONS

- Endosseous use in the maxilla and mandible for functional esthetic rehabilitation in partial or fully edentulous patients
- Immediate and delayed implantation, as well as delayed immediate implantation
- Platform switching with SCREW-LINE implants Promote® plus with implant diameters 3.8/4.3/5.0/6.0 mm.

SCREW-LINE implants are mounted in the sterile packaging with an insertion post color-coded corresponding to their diameter.

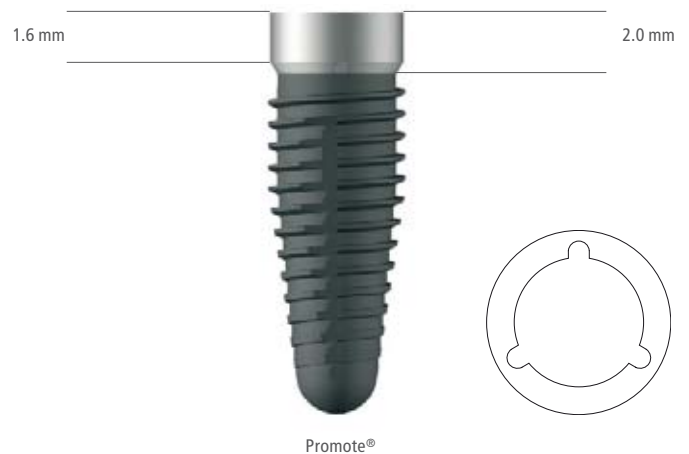
IMPLANT DIAMETERS:  
3.3/3.8/4.3/5.0/6.0 mm.

IMPLANT LENGTHS:  
9/11/13/16 mm  
(9 mm length not available for implant diameter 3.3 mm).



## ROOT-LINE IMPLANTS

ROOT-LINE implants represent root-shaped screw implants in their geometry with self-tapping thread and are available with the Promote® surface (2.0 mm machined implant neck part). The root-shaped design is particularly advantageous in the presence of root convergence from adjacent teeth. The Tube-in-Tube™ inner configuration has not been changed.



## RECOMMENDED INDICATIONS

- Endosseous use in the maxilla and mandible for functional esthetic rehabilitation in partial or fully edentulous patients
- Immediate and delayed implantation, as well as delayed immediate implantation.

ROOT-LINE implants are mounted in the sterile packaging with an insertion post color-coded corresponding to their diameter.

### IMPLANT DIAMETERS:

3.8/4.3/5.0/6.0 mm.

### IMPLANT LENGTHS:

9/11/13/16 mm.



## SCREW-CYLINDER-LINE IMPLANTS

SCREW-CYLINDER-LINE implants represent screw-cylinder implants in their geometry and are available with the Promote® surface (2.0 mm machined implant neck part). The cylindrical apical segment preserves the sinus mucosa during insertion of the implant (no thread edges) and provides superior adaptation to the particular bone augmentation material used. The Tube-in-Tube™ inner configuration has not been changed.



### RECOMMENDED INDICATIONS

- Endosseous use in the maxilla and mandible for functional esthetic rehabilitation in partial or fully edentulous patients
- Use in structurally weak sites in the posterior maxilla in conjunction with sinus floor elevation and augmentation, for use of the residual crestal bone height (> 5 mm) for implant stabilization by means of the tread section.

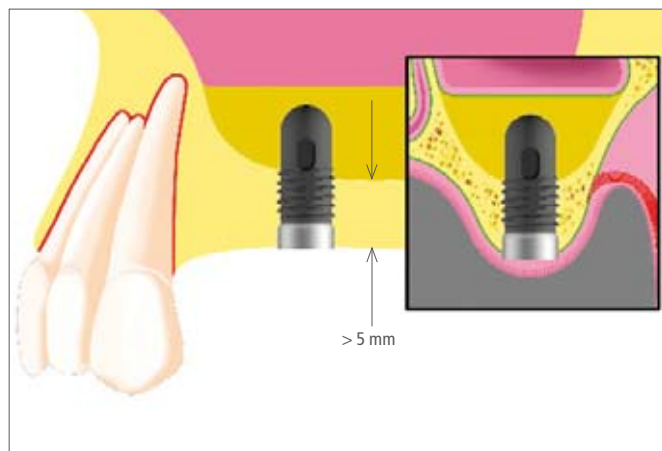
SCREW-CYLINDER-LINE implants are mounted in the sterile packaging with an insertion post color-coded corresponding to their diameter.

### IMPLANT DIAMETERS:

3.8/4.3/5.0/6.0 mm.

### IMPLANT LENGTHS:

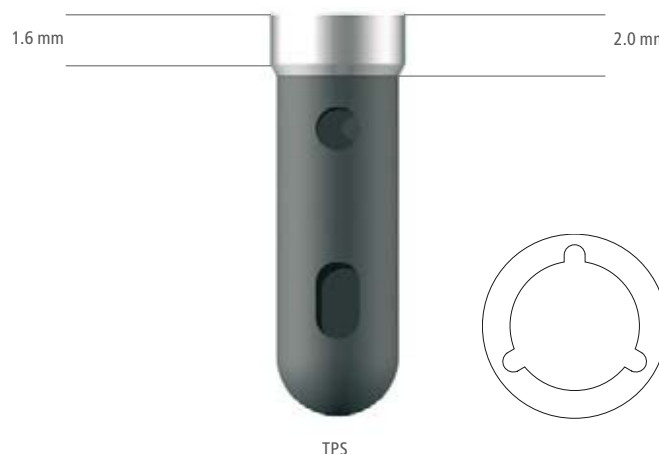
9/11/13/16 mm.





## CYLINDER-LINE IMPLANTS

CYLINDER-LINE implants represent cylinder implants in their geometry and have a titanium plasma coating (TPS), (2.0 mm machined implant neck part). A particular advantage of this implant type is its simple, time-saving application procedure. In conjunction with sinus floor elevation and augmentation, the press-fit from the cylindrical configuration of the implant allows it to be placed in a structurally weak site with a residual bone height  $< 5$  mm. The Tube-in-Tube™ inner configuration has not been changed.



### RECOMMENDED INDICATIONS

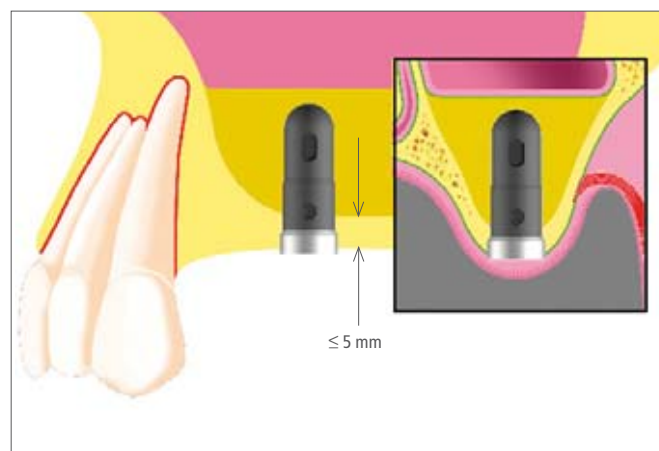
- Endosseous use in the maxilla and mandible for functional esthetic rehabilitation in partial or fully edentulous patients
- Use in structurally weak sites in the posterior maxilla in conjunction with sinus floor elevation and augmentation.

CYLINDER-LINE implants are mounted in the sterile packaging with an insertion post color-coded corresponding to their diameter.

IMPLANT DIAMETERS:  
3.3/3.8/4.3/5.0/6.0 mm.

IMPLANT LENGTHS:  
9/11/13/16 mm

(9 mm length not available for implant diameter 3.3 mm)

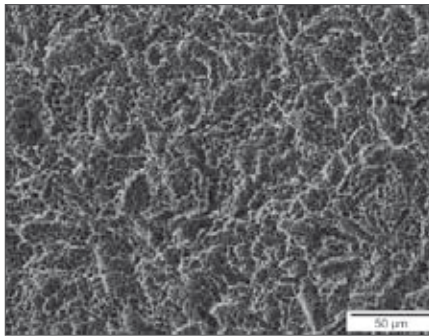


## INDICATIONS FOR CAMLOG® IMPLANTS WITH 3.3 MM DIAMETER

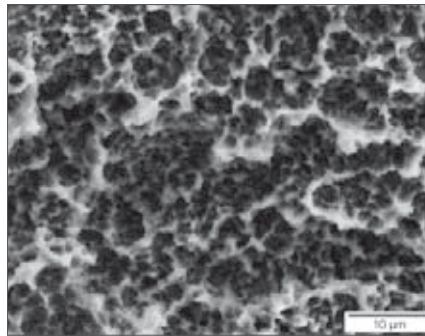
Implants with 3.3 mm diameter can only be used for the mandibular incisors and lateral maxillary incisors. Telescopic crown structures on implants with 3.3 mm diameter are not allowed. An edentulous arch can be restored with a prosthesis only if this is bar-splinted with four implants of 3.3 mm diameter without distal extensions. 3.3 mm implants are suitable for a partially edentulous arch when combined with implants of larger diameters for splinted superstructures. Avoid excessive mechanical stressing of the implants when using bar and ball abutments with 3.3 mm implants. The use of Locator® abutments for implant divergences of greater than  $10^\circ$  per implant is contra-indicated.

# CAMLOG SURFACE STRUCTURES

## PROMOTE® SURFACE



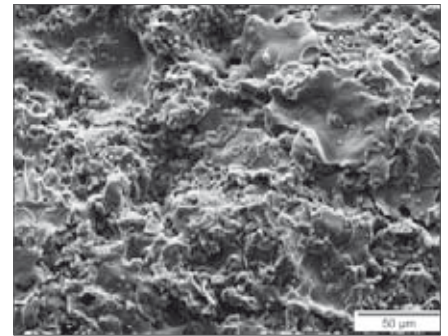
Scanning electron micrograph of the Promote® surface (1000x magnification)



Scanning electron micrograph of the Promote® surface (5000x magnification)

The SCREW-LINE, ROOT-LINE and SCREW-CYLINDER-LINE implants are available with the sandblasted, acid-etched Promote® surface. The microstructured, rough surface for SCREW-LINE implants with Promote® surface extends in the endosseous area apically up to 1.4 mm below the implant shoulder and for ROOT-LINE and SCREW-CYLINDER-LINE implants with Promote® surface up to 2.0 mm below the implant shoulder. For SCREW-LINE implants with Promote® plus surface, the rough/smooth boundary is up to 0.4 mm below the implant shoulder. Promote® has proven itself as the surface for anchoring CAMLOG® implants in the bone. Scientific studies show that implants with Promote® surface rapidly and efficiently integrate into the bone (Schwarz et al., 2008; Nelson et al., 2008; Semper et al., 2008).

## TITANIUM PLASMA COATING (TPS)



Scanning electron micrograph of the titanium plasma coated surface TPS (1000x magnification)

CYLINDER-LINE implants have a titanium plasma coating in the endosseous area up to 2.0 mm below the implant shoulder. The reliability of this surface is very well documented by years of successful use.

## REFERENCES

Schwarz F., Herten M., Bieling K., Becker J.

Crestal bone changes at nonsubmerged implants (Camlog) with different machined collar lengths: a histomorphometric pilot study in dogs. *Int J Oral Maxillofac Implants* 2008;23:335–342

Nelson K., Semper W., Hildebrand D., Özyuvaci H.

A retrospective analysis of sandblasted, acid-etched implants with reduced healing times with an observation period up to 5 years. *Int J Oral Maxillofac Implants* 2008;23:726–732

Semper W., Heberer S., Nelson K.

Early loading of root form and conical implants with a sandblasted large-grit acid-etched surface: a 6-year clinical follow-up. *Implants* 2008;2:14–19

# CAMLOG®

## TUBE-IN-TUBE™

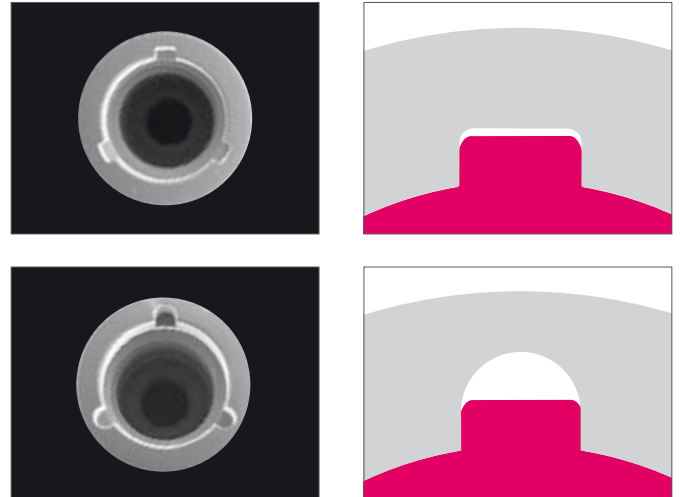
### IMPLANT ABUTMENT CONNECTION

#### GENERAL

All CAMLOG® implants are equipped with the proven Tube-in-Tube™ implant abutment connection and feature three symmetrically arranged grooves (width 0.5 respectively 0.7 mm, depth 1.2 mm).

**NEW:** SCREW-LINE implants have square grooves (new inner configuration of the K-Series) in the cylindrical implant neck area.

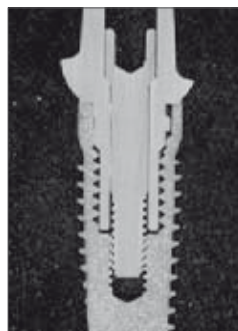
**EXISTING:** ROOT-LINE, SCREW-CYLINDER-LINE and CYLINDER-LINE implants feature the conventional grooves in the cylindrical implant neck area.



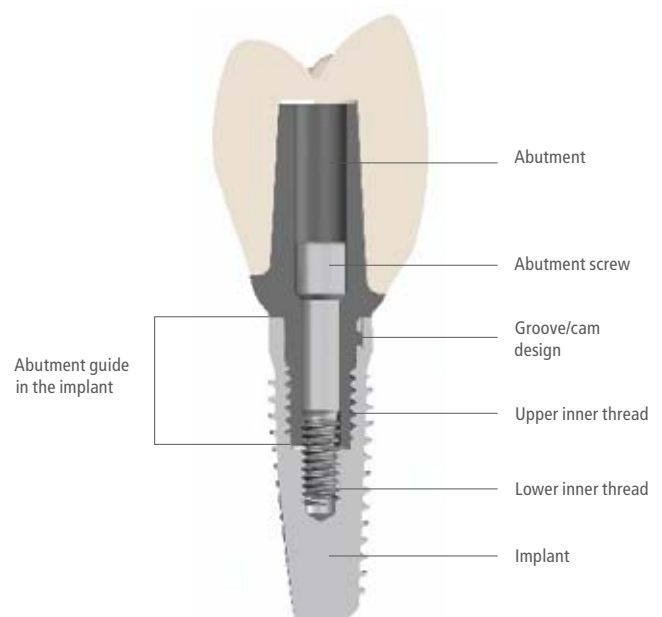
#### IMPLANT INNER THREAD AND OUTER GEOMETRY

Within the Tube-in-Tube™ connection, an upper inner thread attaches for all implant lines with 3.8/4.3/5.0/6.0 mm outer diameter, in which the thread of the gingiva former, the bar, ball and Locator® abutments engages (for 3.3 mm implants lower inner thread only). There is a second lower inner thread towards the apex M 1.6 or M 2.0 (to receive the abutment screw and fixing screw for impression posts).

For optimal positioning of the abutments in the implant, they should be aligned in the bone so that one of the three grooves points vestibularly. With the SCREW-LINE, ROOT-LINE and SCREW-CYLINDER-LINE implants, the drivers include markings that correspond to the three grooves of the implant inner configuration. To align the groove position in the bone, three points are milled into the endosseous part of the CYLINDER-LINE implants. These correspond to the three grooves of the implant inner configuration.



Micrograph of the implant abutment connection

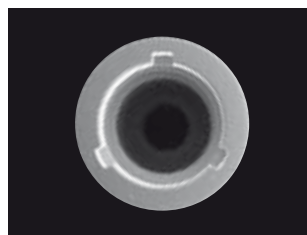


## PRODUCTION PRECISION

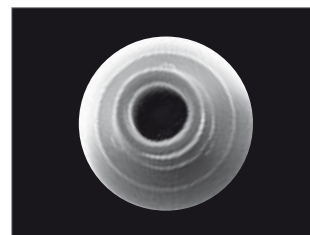
The inner and outer geometry of the implants and abutments are rotary machined for the most part. The production tolerances can therefore be very tightly maintained. The result is a precise and accurate fit of components without compromising the material structure. The patented Tube-in-Tube™ design of the implant abutment connection (Patent EP 851 744 and corresponding property rights) ensures a very precise, stable and rotation-securing connection to the prosthetic components.

### SHORT CAM GEOMETRY CONNECTION (K-SERIES)

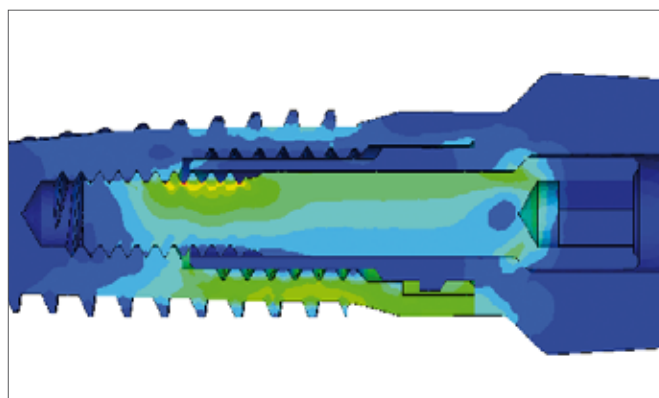
The implant abutment connection for the CAMLOG® Implant System is predominantly a form-fit connection. The connection with the short cam geometry has been optimized biomechanically by means of extensive finite element analyses. The figure to the right shows the distribution of the von Mises stress in the implant abutment connection at a load in accordance to ISO 14801 with 200 N.



SCREW-LINE Implant (K-Series)



Abutment (K-Series)



von Mises stress

## MATERIALS

All CAMLOG® implants are made from pure grade 4 titanium, the abutments and abutment screws from titanium alloy Ti6Al4V (ASTM F136).

# TEAM CONCEPT

## THE TEAM

### PATIENT

The patient must be fully informed about the options and limits of implant-supported rehabilitation in his or her particular case. The expectations and demands of the patient should be clearly formulated and documented.

### DENTIST

The restorative dentist providing prosthetic treatment is usually the team leader. His function is handling examinations, diagnostics, and treatment planning, and reaching a consensus for the treatment plan from the patient and possibly the surgeon and dental technician. He coordinates the prosthetic preparation, while the surgeon plans and manages the treatment stages: surgical intervention, wound healing, and exposure.

### SURGEON

The surgeon conducts a separate patient information session. He utilizes the diagnostic records, templates, medical/dental history, and radiographic information provided by the restorative dentist and dental technician. He performs the implantation procedures requested by the restorative dentist.

### DENTAL TECHNICIAN

The dental technician contributes his laboratory knowledge and experience to the pre-operative planning of the implant-supported restoration. He prepares a set-up/wax-up, evaluates esthetic and functional issues, and makes suggestions for the design of the final restoration and implant positioning. His tasks include fabrication of the provisional and final restorations as well as provision of radiographic and drilling templates and he selects the implant abutments.

### DENTAL HYGIENIST/NURSE/ASSISTANT

An important prerequisite for the long-term success of a dental implant is excellent oral hygiene. The dental hygienist/nurse/assistant explains correct oral hygiene to the patient and takes the preparatory steps to create an inflammation-free situation. She is also responsible for ensuring regular follow-up appointments.

### CAMLOG

CAMLOG supports all members of the implant treatment team by providing high product quality, information, service, continuing education, and continuous research and development of the CAMLOG® Implant System.

## TEAM APPROACH

Increasingly higher demands for quality and specialization require a multi-disciplinary team approach to combine the members' acquired knowledge and experience. Modern implant-supported restorations need a high level of attention to detail and clinical experience. This is true equally for the restorative dentist, the surgeon, the dental technician, and the dental office support staff such as the nurse, hygienist, and chair assistant.

The CAMLOG team concept takes all of these demands into consideration. The sequence of treatment procedures is structured, and specific procedures are clearly assigned to specific team members once the joint planning phase is complete.

Pre-implantation surgical interventions and the implantation itself are carried out by the surgeon, or a surgically qualified restorative dentist. The surgical instrumentation should be simply and thoughtfully organized. If a transgingival implantation (one-step) is to be performed, this eliminates a second intervention (implant exposure). In contrast, if a covered implantation is selected (two-step), a healing cap must be attached for soft-tissue conditioning for three weeks after the exposure and before taking the impression, depending on the indications. The dentist/surgeon takes the impression using the transfer system and an impression material of choice (silicone, polyether, etc.). In addition to the impression components, only a screwdriver is required. The implant-abutment selection is made after the

master cast has been fabricated in the laboratory. Because of the high precision of the implant components incl. the rotational stability of the implant-to-abutment connection, time-consuming intermediate try-ins can be skipped. Both dentist and dental technician can concentrate on esthetics and the hygienic adaptability of the restoration because the insertion of the abutment is simple and quick. Crown and bridge structures, as well as hybrid restorations can be fabricated to offer a perfect fit with CAMLOG® prosthetic components.

The CAMLOG® Implant System is therefore user-friendly and time-saving. The scope and value of pre-implantation diagnostics have changed. Today, pre-implantation diagnostics must be oriented to prosthetic needs (backward planning).

Since implant-supported treatment success is judged almost entirely in terms of esthetics and function, no prior compromises in these areas should ever be considered. The objective is to obtain a patient-oriented total rehabilitation.

## SEQUENCE OF TREATMENT PROCEDURES

• Planning	Team
• Pre-treatment	Dentist (surgeon, if needed), dental support staff, hygienist
• Implantation	Dentist (surgeon, if needed)
• Impression-taking	Dentist (surgeon, if needed)
• Model fabrication	Dental technician
• Plan review, abutment selection	Dentist, dental technician
• Fabrication of the restoration	Dental technician
• First bake (esthetics) try-in	Dentist, dental technician
• Finishing	Dental technician
• Insertion of the restoration	Dentist
• Maintenance/recall	Dentist, support staff

# TREATMENT CONCEPTS

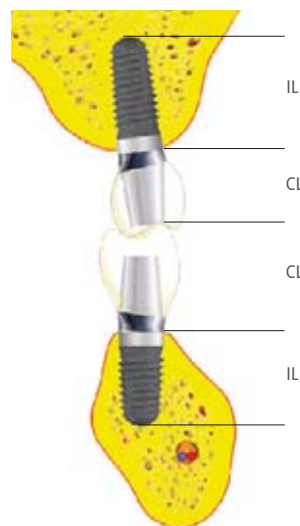
## INTRODUCTION

It is known from general physiology that both non-loading and underloading of the bone induce degradation just as much as overloading (inactivity atrophy, pressure atrophy). The area between these two extremes is called normal loading. This consists in a balance between growth and degradation. Working with bridge restorations in conventional prosthetics has led to identification of consistently high rates of bone degradation in non-loaded or underloaded teeth pillar (Misch/Frost 1990).

W. Schulte recognized this in 1982 and proposed early (= immediate, if possible) implantation to offset atrophy of the periodontal structures, which commences immediately after tooth loss. The implant supports the alveolar bone and prevents the bony areas from being either overloaded or subjected to inactivity atrophy (stress-shielding).

## LEVERAGE RELATIONS AT THE IMPLANT

Loading of the implant-bone interface is a result of the leverage relation generated by osseointegration-related resistance to the prosthesis load arm (equivalent to the supracrestal implant length plus the height of the crown above the implant shoulder). If IL is smaller than CL, then the load must be reduced (e.g., through prosthetic splinting).



### REFERENCES

Frost HM.

Bone „mass“ and the „mechanostat“:  
a proposal. Anat Rec  
1987; 219:1–9

Misch CE.

Contemporary implant dentistry.  
St Louis: Mosby Inc 1999  
Ch22:317–318

Schulte W.

Das Tübinger Implantat.  
Schweiz Mschr Zahnmed  
1985; 95:872–874

## ESTHETICS

The use of therapeutic methods from an esthetic perspective is very dependent upon the initial situation and the visibility of the esthetic impairment. In the “esthetic zone” (anterior maxillary area), the smile line determines the extent of work that may be necessary. If prominent transversal or vertical hard- or soft-tissue deficits are present that affect the extraoral soft tissue profile, then lip and cheek support will have to be provided through suitable augmentative methods such as implant positioning or prosthesis design. These can restore the patient’s physiognomy to a large extent.

### PATIENT COMPLIANCE

The greater the patient’s desire for a functional – and especially for an esthetic – restoration and the more compromised the initial situation, the more extensively the patient must be educated.

Temporary limitation of function and esthetics may result from the surgery and the patient might be required to wear a long-term provisional. The extent of pre-treatment and the particulars of the case will affect the overall duration of treatment.

In selecting a prosthetic restoration, make sure to take into account, in addition to the functional and esthetic aspects of the case, any manual and visual impairments uncovered by the history that may affect the patient’s ability to manage oral hygiene and prosthesis care.

### PATIENT INFORMATION

When the process of ruling out contraindications, collecting clinical and radiographic information, and making a diagnosis is complete, an informational conference is held with the patient, using documents and models for demonstration. Risks of treatments and possible alternatives are fully discussed and documented.



**LOW SMILE LINE**  
The patient exhibits < 75% of the crown length.  
Application of all therapeutical means.



**HIGH SMILE LINE**  
The patient exhibits:  
– the entire crown length  
– adjacent gingiva  
  
Use of all therapeutic means:  
– All-ceramic restorations  
– Papillae  
– Hide scars  
– Soft tissues



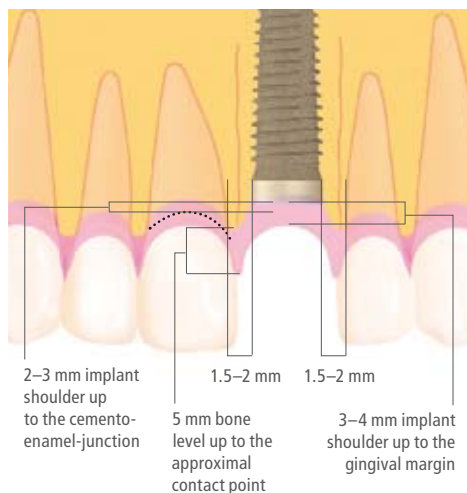
## FIXED RESTORATIONS

### SINGLE CROWNS

Single-crown treatment is a possible form of treatment under the aspect of a “Restitutio ad integrum”. It contains all the beneficial elements of periodontal prosthetic rehabilitation:

- Physiologically adequate biomechanical loading prevents further atrophy of the hard- and soft tissue
- Good preconditions for natural-looking esthetics are established
- Oral hygiene is simple
- Fabrication is technically straightforward
- Readily extendable/alterable.

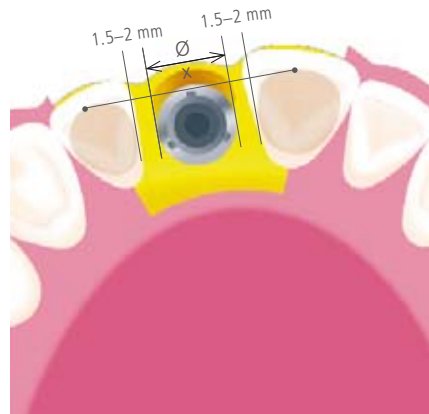
Vertical implant position



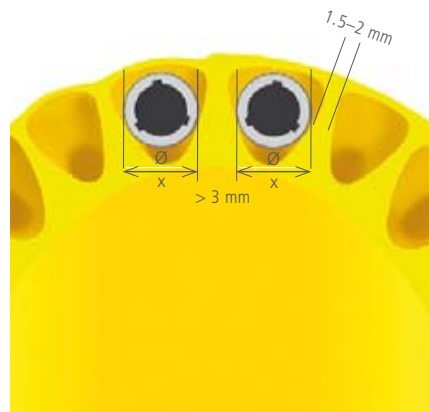
### ESTHETICALLY CHALLENGING AREAS

To achieve an esthetically successful restoration, a number of important elements are required: a harmonious gingival line, optimal implant positioning as well as vertical/orofacial and mesio-distal, a physiological crown shape, and the presence of interdental papillae. The indications for the hard-tissue configurations to be preserved and for soft-tissue management must be observed during planning.

Structure-preserving or structure-sparing procedures must be used during flap creation and implant placement. In addition, oral hygiene requirements must be kept in mind during planning.



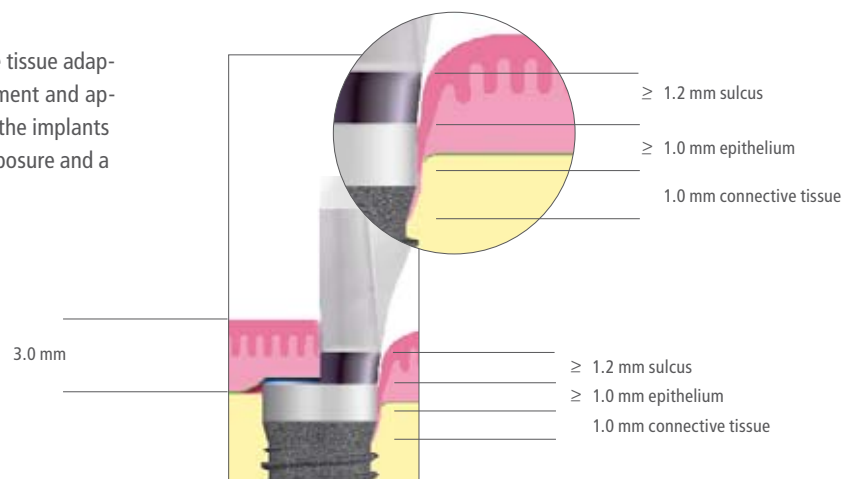
Mesio-distal implant position at bone level



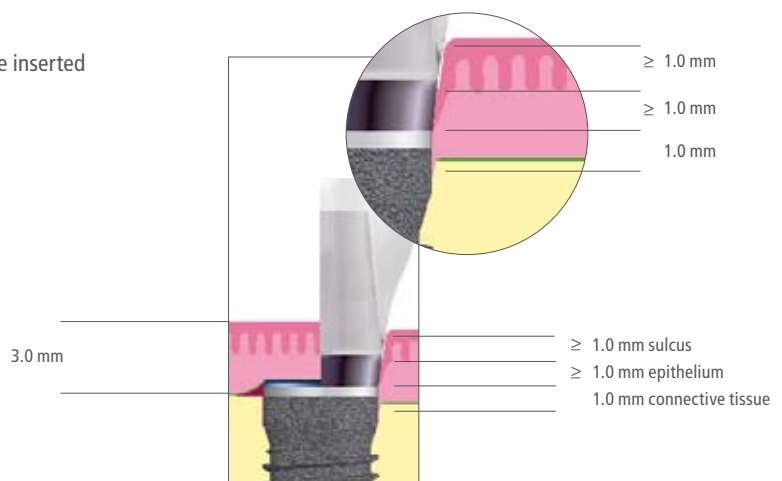
Distances at bone level

## BIOLOGICAL WIDTH

A biological width of approx. 3 mm remains (1 mm connective tissue adaptation, upon this an approx. 1 mm junction epithelial attachment and approx. 1 mm sulcus) following protocol-conformal insertion of the implants with the Promote® surface and TPS coating, and following exposure and a minor bone adaptation of approx. 1 mm apically.



SCREW-LINE Implants with Promote® plus surface are likewise inserted so as to leave a 0.4 mm projection above the bone level.



## SPLINTED CROWNS

In the event of unfavorable leverage relations around the implant, a choice must be made between a longer implant or, if this is anatomically impossible, splinting adjacent crowns. If splinting is required by reason of statics, then hygienic requirements must also be taken into account.

Development of a uniform insertion direction for the crown block must be part of the abutment preparation. The implant-to-abutment connection should not be altered.



Single-crown restoration



Crown splinting



## IMPLANT-SUPPORTED BRIDGES

Implant-supported bridges can be inserted wherever an implantation is impossible. Implant distribution should be structured in such a way that spanned segments are kept small.



Examples of bridge positioning

Development of a uniform insertion direction for the crown block should be part of the abutment preparation. The implant-to-abutment connection should not be altered.



Initial situation



Abutments in a lab analog



Prepared abutments



Cement-retained bridge

## REMOVABLE RESTORATIONS

### INTRODUCTION

A hybrid denture may be implant-retained mucosa-supported, or implant-supported. The tension-free seat of a secondary (telescopic crown) or primary (bar-) splinted structure on implants is called "passive fit".

In the case of telescopic crowns, this is obtained through intraoral bonding of the secondary crowns (preferably galvano crowns) onto the tertiary framework. In the case of bar structures, it involves the use of bar sleeves for a passive fit and intraoral bonding of the titanium bonding base.

The idea is to create a fit that is free from stress or to minimize stress on the implants.

When planning a removable denture, the implants should be placed so that, if necessary, an extension to a fixed restoration is possible.

### BAR STRUCTURE

Bars are suitable for jaw relations in Angle Class II and for large horizontal deficits. It may be possible to fabricate a bar structure with either prefabricated or individualized components.



### BALL ABUTMENTS

The ball abutment is suitable for simple, implant-retained prosthetic restorations. It is simply a retainer, but if the alveolar process in the mandible is heavily atrophied, positional stability must be created through addition of an extension prosthesis.



### LOCATOR® ANCHORING SYSTEM

The Locator® anchoring system is intended for use in the implant-retained, tissue-borne prosthesis for resilient full dentures in the maxilla and mandible. The self-aligning design of the Locator® anchoring system supports the patient when inserting and seating the prosthesis.



### TELESCOPIC CROWNS

The production precision of the CAMLOG connection is particularly necessary with a telescopic crown restoration since the abutments can be fastened always in the same, exactly defined position on the implant. A precision fit for the removable superstructure is made simple and consistent in every case.

#### INDICATION:

The telescopic crown technique is suitable for jaw relations in Angle Classes I and III.



# PLANNING

## INTRODUCTION

Modern implant prosthetics is planned by working back from the desired therapy goal; this is referred to as “backward planning.” It applies particularly to pre-implantation augmentation procedures to restore sufficient bony structure to allow placement of implants in the optimal prosthetic position.

Esthetics, function, phonetics, and hygienic potential require prosthetically oriented implant positioning and dimensioning, which the dental technician defines on the basis of the wax-up. The prosthetic design and the required implant position(s) and axial alignment(s) are planned by the dentist and dental technician working closely together. This requires both to be fully informed of the treatment options.

If implant positions (implants approximating the former tooth positions) cannot be implemented for a fixed denture for whatever reason – functional (implant loading, crown length), esthetic (soft-tissue support) or hygienic – a removable denture must be planned.

## OVERVIEW

A planning project may be divided into the following modules:

### ACTUAL SITUATION/PROSTHETIC

#### INITIAL SITUATION

Find out and document the actual situation by taking a general and special (dental) history and performing intra- and extraoral clinical, functional and radiographic examinations. Together, these findings are the basis for a description of the initial situation of the oral-maxillofacial system.

### INDIVIDUAL TREATMENT GOAL

A full analysis is conducted with the patient, including a cost/benefit, work/benefit, and risk/benefit analysis. The final result will be a treatment goal customized to the desires and options of the patient.

### TREATMENT SEQUENCE

With the individualized treatment goal as guide, prosthetically oriented implant positioning is defined and verified clinically and radiographically. Then, a treatment sequence is set up. It includes the planning of accompanying measures, augmentation, and any required pre-treatment.

## ANAMNESIS

### INTRODUCTION

The medical history and diagnosis are not different from the evaluation procedures required for other dental surgery or restorative treatments. For this reason, only the specific points for perio-implant prosthetic treatments are described below.

The general, social and special (dental) medical history considers all general medical contraindications and diseases that could affect the microcirculation or the patient's suitability for the proposed implant-based restoration. Risk factors such as nicotine, alcohol and drug abuse are confidentially evaluated, discussed and documented. The patient's psychological and psychosocial situation gives an indication of the compliance that can be expected and influences the planning of the treatment and the future prosthetic design.

### GENERAL

The general medical history should include not only the disease history but also regular medication usage and the possibility of general medical problems that could adversely affect an implant-based prosthetic treatment.

### SPECIAL (DENTAL)

The special medical history must clarify the reasons for the current situation of the oral system. It may provide information on systemic diseases that may not have been detected, yet. If implants and/or grafts were previously placed, this may be important for assessment of the bone quality.

## EXAMINATIONS

### CLINICAL

In addition to all standard extraoral examinations, the soft-tissue profile and support of the soft tissues (especially in the maxilla) are a critical factor in designing the prosthesis. If a large discrepancy exists between the required labial tooth position and the proposed implant position, the use of a removable denture (bar-structure, telescopic crown, ball abutment, Locator®) may be necessary for loading reasons.

The results of the intraoral examinations determine which teeth can be saved. The standard of hygiene is evaluated and a check of the soft tissue for pathological conditions is performed for information on the patient's possible compliance during and after treatment.

The static and dynamic occlusion, interalveolar distance, and centric relations are checked. Temporomandibular joint disorders are addressed before the start of treatment.

All findings indicating elevated stress on the masticatory system (e.g., bruxism) must be investigated, documented, and considered in the prosthetic planning.

The status of the soft tissue in edentulous arch segments (width and thickness of the attached gingiva) must be checked and the extension of the alveolar ridge must be evaluated for its suitability as a possible implant site.

### RADIOGRAPHIC EVALUATION

#### DENTAL X-RAYS

Dental x-rays are sufficient for the initial assessment of bone supply with single tooth gaps or small interdental gaps. The periodontic situation of the remaining dentition must be closely examined, because the implant site may be colonized by pathogenic organisms from infected pockets.

#### ORTHOPANTOMOGRAPH

An orthopantomograph can also be a critical instrument for gathering basic information. Additional data required by the specific situation may be obtained through dental x-rays, remote x-ray side views, or computer-tomographic scans (CT).

#### REMOTE X-RAY SIDE VIEW

Use for large sagittal differences and planned bone removal in the chin region.

#### COMPUTER-TOMOGRAPHIC SCAN/DIGITAL VOLUME TOMOGRAPHY

The CT/DVT is used for extensive radiological diagnostics and for generating raw data for computer-based augmentation and implant planning. It enables a 3-D evaluation of the site from its anatomical structures and can provide information about the density of the existing bone (with DVT relative only or via calibration).

Indications must be strictly adhered to due to the increased radiation exposure compared to purely two-dimensional procedures.



## LABORATORY

### CAST ANALYSIS

It is essential to mount a diagnostic cast in an adjustable articulator to assess jaw relations. Specifically, a check should be made whether a change of the occlusal position is worthwhile or required. If at all possible, it should be done before the actual implant-supported prosthetic treatment gets under way. In any case, a change in occlusal height must be preceded by treatment with a long-term provisional.

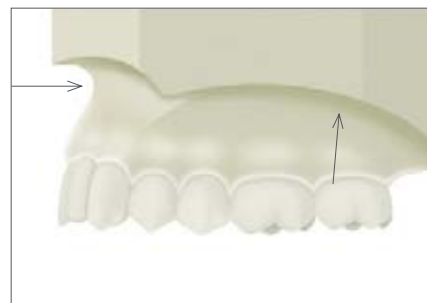
### DIAGNOSTIC CASTS

The diagnostic casts must clearly show not only the occlusal surfaces but also the vestibular fold and retromolar areas (see arrows).

The centric registration must be freely adjustable to enable the casts to be mounted in correct axial alignment and position.

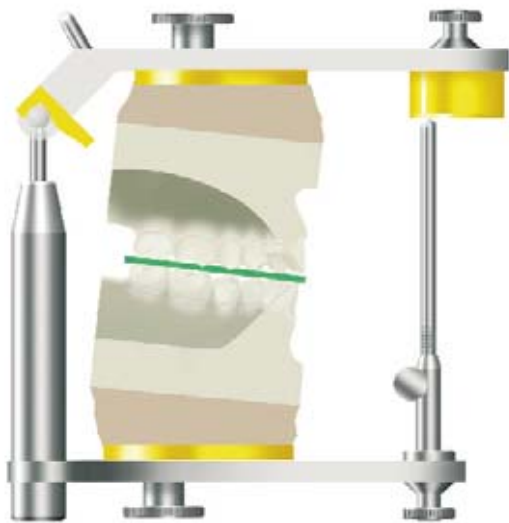
The impression should reproduce the soft-tissue situation and any hard- or soft-tissue deficits as far as the vestibular fold, since it is here we detect the first indications to incline the implant or the necessity for bone augmentation. Just as in perioprosthetics, the retromolar areas must be reproduced to allow specification of the dental arch and assessment of the vertical space available (see arrows).

Planning and implementation of periodontal implant-supported rehabilitation is much simpler when templates are used.



### ARTICULATOR SET-UP

Diagnostic casts for implant planning are made of super-hard dental stone, just as in perioprosthethics, and mounted on an adjustable articulator with an arbitrary face bow and centrics registration.



### OCCLUSAL HEIGHT

If an occlusal height requires correction, this must be done with a guard or long-term provisional before the implant-supported prosthetic restoration begins.

### ARCH RELATIONS (TRANSVERSAL)

The arch relations control the load direction and therefore the axial alignment of the implants. This is particularly important with cross-bite situations.

### ARCH RELATIONS (SAGITTAL)

Crowns cannot be placed precisely over the implants in the presence of Angle Class II dentition because the soft tissues must be supported and the space for the tongue must not be reduced. A removable denture is indicated in this situation.

### INITIAL PROSTHETIC SITUATION

The initial prosthetic situation describes the dental status, arch relations, the anatomical status of the hard tissue, the intraoral and extraoral soft tissue, the presence of functional, phonetic and esthetic restrictions on the patient and the resulting influence on the patient's quality of life.

## WAX-UP/SET-UP

The wax-up or set-up is prepared on the diagnostic cast in the dental laboratory. This permits planning of optimal tooth positioning from both functional and esthetic perspectives. It also enables early recognition of the need for augmentation procedures if a discrepancy is detected between the atrophied crestal bone and the required position for a prosthetic crown.

The ideal articulation concept to aim at is a situation-adapted anterior-to-cuspid guidance with early disclusion of the posteriors ("freedom in centric" should be possible).

### PLANNING TEMPLATE

A planning template is fabricated to review the planned implant positions in the mouth. The template can be converted to a drilling template later.

The dental technician initially fabricates a complete wax-up/set-up with all missing teeth in their ideal prosthetic position for preliminary planning of

the prosthetic reconstruction. In accordance with the "backward planning" principle, any anatomical deficits are not considered at this stage. The treatment goal specifies the surgical and prosthetic procedure.

A silicone index is fabricated from this set-up. After hardening, the index is divided along the central occlusion to form a vestibular and an oral section.

An acrylic template can be fabricated with the aid of the silicone index. Alternatively, the work can be done with a rigid vacuum foil via a duplicate cast. Depending on the x-ray methods, radio-opaque markers (e.g., titanium, steel, barium sulfate coating) are integrated.



Initial situation



Wax-up/Set-up



Silicone index



Cast with planning template



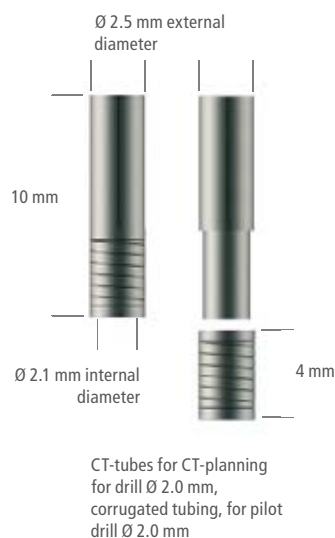
## X-RAY TEMPLATE

In the planning template or base produced from the wax-up/set-up, CT-tubes for planning or other radio-opaque markers are integrated at the ideal implantation position and are used as reference positions in the x-ray image.

The tubes consist of two parts: the titanium used leaves no scattering on CT scans. The lower part is polymerized in the template and the upper part inserts into this. The complete tube is used in radiologic diagnostics, and the upper part can be removed during surgery.

The lower part is used during surgery as guiding sleeve for the pilot drill.

Titanium CT-tubes for planning or other radio-opaque positioning components (steel, barium sulfate) are integrated, depending on the analysis software. If the tubes are placed directly on the mucous membrane, its thickness can be detected on the CT scan.



Drill for placement of CT-tubes, Ø 2.0 mm



Planning template with CT-tubes



Template without upper sections of tubes for use as a drilling template



X-ray template, outlined with tubes



X-ray template with radio-opaque teeth and installed tubes

## PLANNING WITH ORTHOPANTOMOGRAPH/ DENTAL FILM

### TARGET

The target is to specify the implant positions. Now, the final implant planning is performed depending on the selected concept. The x-ray images must show calibrated measurement points to enable measurement of the bone volume available for the implantation.

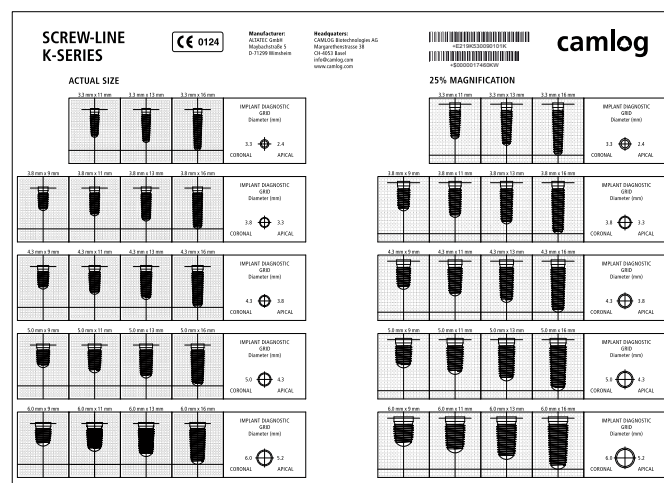
### CLINICAL

The wax-up or set-up must be checked at the patient. This allows esthetics to be included in the plan, such as the smile line, tooth shade, facial shape and general presentation of the patient.

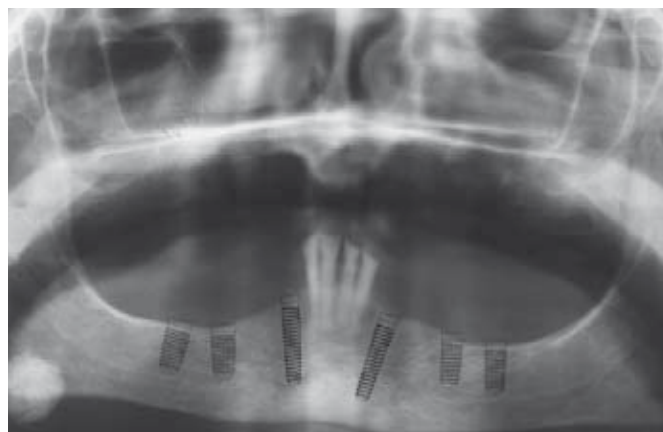
## ORTHOPANTOMOGRAPH

X-Ray planning foils are available in 1:1.25 and 1:1.4 scales for all implant types to check the dimensions on the orthopantomograph. The foil magnifications match the delay factors for most orthopantomographs. However, they should be considered only as approximations in implant dimensioning.

The self-adhesive implant planning films (X-Ray Transfer pictures, scale 1:1.25) for the specific implant type can be attached to the proposed implant positions on the orthopantomograph film.



X-Ray planning foil



X-Ray transfer pictures on the orthopantomograph

## COMPUTER-TOMOGRAPHIC SCAN/DIGITAL VOLUME TOMOGRAPHY WITH/WITHOUT 3-D EVALUATION

Precise three-dimensional evaluation of the bone dimensions and subsequent planning of the implant positions are only possible using the data from a CT scan or DVT and a computer-supported planning program. Special conditions such as septation or infections in planned sinus floor elevations and critical vertical relations in the mandible can be recognized. An x-ray or planning template that the patient wears while the image is taken provides information about the optimal prosthetic alignment of the implants. Depending on the program, the template must have radio-opaque position markers (e.g., titanium ball, titanium sleeve, barium sulfate-coated markers).

With the aid of a CT scan/DVT and a 3-D evaluation, the medical information derived can be used to determine the bone quantity and quality (with

DVT, definable only relatively or via calibration). Together with the prosthetic information from the geometry of the x-ray template, the number of implants, implant position, implant diameter and implant length are determined.

The final prosthetic design and the hard- and soft-tissue augmentation, if required, are discussed and coordinated in the team with the patient on the basis of this information.

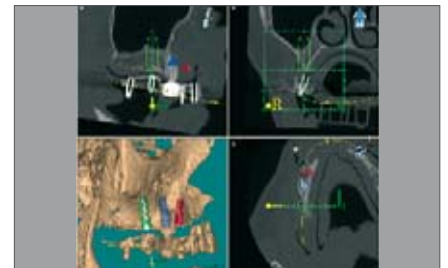
With the information derived, the planned implant positions are checked and adjusted if necessary.



View of the cast positioning



X-ray templates *in situ*



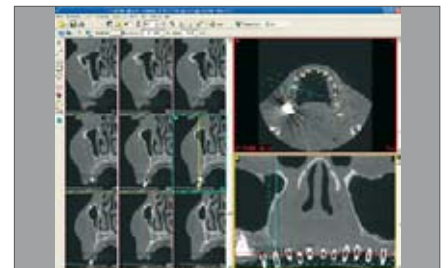
Computer-supported 3-D planning of implant positions



View of the cast positioning



X-ray templates *in situ*



Computer-supported 3-D planning of implant positions

# IMPLANT POSITION VERIFICATION

## FINAL PROSTHESIS DESIGN

The surgical feasibility of the treatment sequence is checked with reference to the clinical situation, the casts, the x-ray findings and the computer-supported planning. Depending on the clinical situation, periodontal or augmentation interventions are performed before implant surgery or at the time of the implant placement.

## INDIVIDUALIZATION OF THE PROSTHETIC DESIGN

The patient's wishes regarding the scope and cost of the implant-supported prosthetic restoration expressed in the patient interview are incorporated into the individual prosthesis design. The number of implants, the requirement for augmentation measures and required soft-tissue corrections are determined exclusively by local conditions and the prosthetic design. This interview must be documented in detail and the patient must sign a statement of consent before implementing the treatment process.

## PLANNING THE TREATMENT SEQUENCE

Now that the prosthetic goal has been defined, the required treatment steps are specified in a backward planning process. This process must consider the required healing time, particularly in connection with augmentation measures.

### DOCUMENTATION OF PATIENT INTERVIEW/EXPLANATION

The results of the planning process are discussed with the patient. Casts, x-ray images and the planning devices (wax-up/set-up) as well as the presentation of the completed computer-supported planning are helpful here.

The following criteria are considered:

- Initial situation
- Wishes and expectations regarding esthetics, function and comfort
- Effort/benefit ratio
- Costs
- Risk
- Duration of treatment
- Restrictions in comfort during treatment.

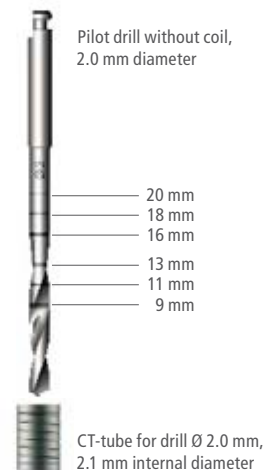
## FABRICATING THE DRILLING TEMPLATE

### A. WITH TUBES FOR CT PLANNING FOR DRILL Ø 2.0 MM

If a planning or x-ray template with tubes for CT planning was created, it can be converted into a drilling template after adjusting the tube positions based on the implant planning. If required, the template is reduced to an outline after preparation of the flap to ensure it stays in position during surgery (dental or gingival base outside the surgical area).

#### PILOT DRILLING WITH TUBE FOR CT PLANNING

The pilot drill without coil with 2.0 mm diameter is also available for use with the CT-tube for drill Ø 2.0 mm, with 2.1 mm internal diameter. There are ring markings the lower edges of which show drilling depths for 9, 11, 13, 16, 18 and 20 mm each in the working area of the drill. The width of the ring markings is 0.4 mm. The 18 and 20 mm markings are not filled in and are used for orientation when using the 4 mm long CT-tube with 2.1 mm internal diameter.



#### IMPORTANT NOTE

Only use CT-tubes for drill Ø 2.0 mm with 2.1 mm internal diameter in conjunction with the pilot drill.

### B. WITH THE CAMLOG® GUIDE SYSTEM

Together with suitable 3-D planning software and an associated tubing positioning system, the laboratory instruments of the CAMLOG® Guide System are used in the dental laboratory to convert an existing planning template into a drilling template. This drilling template is used to guide:

- The surgical instruments of the CAMLOG® Guide System during implant bed preparation
- SCREW-LINE implants CAMLOG® Guide, Promote®, during insertion.

# INSTRUMENT SYSTEM

## SURGERY SETS

A separate surgery set is available for the SCREW-LINE and ROOT-LINE implants. The instruments for SCREW-CYLINDER-LINE and CYLINDER-LINE are combined in one surgery set.

The surgery sets contain all surgical instruments required for implant bed preparation:

- Round burs
- Drill extension
- Pilot drills
- Pre-drills
- Depth stops
- Paralleling pins
- Form drills with mounted depth stops
- Form drills cortical bone (SCREW-LINE only)
- Taps
- Tap adapters
- Adapter, ISO shaft torque wrench
- Driver, ISO shaft for angled handpiece
- Screwdrivers
- Drivers
- Holding key for insertion post
- Torque wrench
- Seating instrument (CYLINDER-LINE only)
- Cleaning needle and cannula.

The drills are sorted based on the treatment sequence and according to the CAMLOG color-coding in the surgery set. The surgery sets are autoclavable with the instruments.

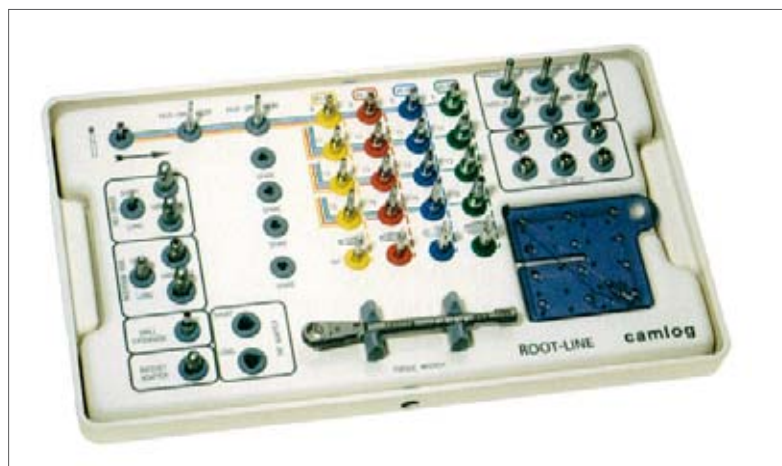
## COLOR-CODING OF THE SURGICAL AND PROSTHETIC CAMLOG® PRODUCTS

	Color	Diameter
	grey	3.3 mm
	yellow	3.8 mm
	red	4.3 mm
	blue	5.0 mm
	green	6.0 mm





Surgery set SCREW-LINE



Surgery set ROOT-LINE



Surgery set SCREW-CYLINDER/CYLINDER-LINE



## DRILLING SPEED

The drilling speed is diameter-dependent. The recommended speed is 300–800 rpm depending on the drill type (handpiece angle reduction ratio 16:1–20:1).

The recommended maximum drilling speed for thread tapping is 15 rpm (handpiece angle reduction ratio 70:1–100:1). The tap adapter for the torque wrench also permits manual tapping.

Article	Speed (rpm)
Round bur	800
Pilot drill Ø 2.0 mm with/without depth stop	800
Pre-drill Ø 1.7 / 2.8 mm	600
Form drill Ø 3.3 mm with/without depth stop	550
Cortical bone drill Ø 3.3 mm**	550
Tap Ø 3.3 mm*	max. 15
Form drill Ø 3.8 mm with/without depth stop	500
Cortical bone drill Ø 3.8 mm**	500
Tap Ø 3.8 mm*	max. 15
Form drill Ø 4.3 mm with/without depth stop	400
Cortical bone drill Ø 4.3 mm**	400
Tap Ø 4.3 mm*	max. 15
Form drill Ø 5.0 mm with/without depth stop	350
Cortical bone drill Ø 5.0 mm**	350
Tap Ø 5.0 mm*	max. 15
Form drill Ø 6.0 mm with/without depth stop	300
Cortical bone drill Ø 6.0 mm**	300
Tap Ø 6.0 mm*	max. 15

The lower edge of the depth mark is the reference for the preparation depth.

### CAUTION

The maximum apical extension length of the drill is 0.6 mm.

\* Use of a tap is recommended for SCREW-LINE, ROOT-LINE, and SCREW-CYLINDER-LINE Implants if the bone quality is D1 or D2.

\*\* The SCREW-LINE cortical bone drill reduces the torque for implant insertion into hard bone (D1).

## COOLING

The CAMLOG® drilling system for implant bed preparation consists mostly of internally cooled drills. The cooling liquid is sterile saline solution (pre-chilled to 5°C/41°F).

Optimum cooling consists of a combined internal/external cooling at the angled handpiece.

## DRILL LIFE

Drill longevity depends on bone quality and drilling technique. The pilot drills, pre-drills, and form drills are good for 10–20 drilling cycles. If excessive force has to be applied because of a dull drill, then change the drill immediately to prevent bone overheating.



**FURTHER DOCUMENTATION**

Information about preparing surgical and prosthetic instruments, as well as prosthetic components is available in "Preparation Instructions for the CAMLOG® Implant System", Art. No. J8000.0032.

Further information about CAMLOG® products is available in the current CAMLOG product catalog, in the working instructions and in the instruction manuals included with CAMLOG® products.

See also [www.camlog.com](http://www.camlog.com).

**TRADEMARKS AND COPYRIGHT**

Protected brand names (trademarks) are not specially indicated. The absence of such indication does not mean that it is not a trademarked name. This publication with all its parts is protected by copyright. Any exploitation beyond the narrow limits of the copyright Act is not permissible without the approval of CAMLOG Biotechnologies AG and is subject to legal sanctions.



## HEADQUARTERS

CAMLOG Biotechnologies AG | Margarethenstrasse 38 | CH-4053 Basel

Phone +41 61 565 41 00 | Fax +41 61 565 41 01 | [info@camlog.com](mailto:info@camlog.com) | [www.camlog.com](http://www.camlog.com)

Manufacturer of CAMLOG® products: ALTATEC GmbH, Maybachstraße 5, D-71299 Wimsheim

**camlog**