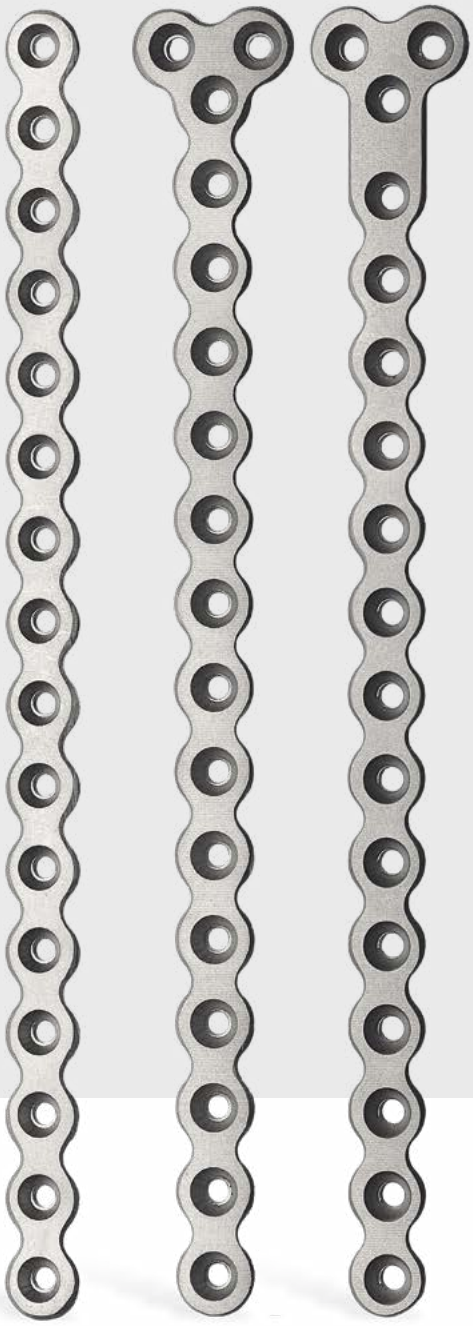
orthomed

# SOP™

# Low Profile Locking Plate System

User Guide



# SOP Low Profile
# Standard Operating Procedure

## Background

### Why develop the SOP Low Profile?

The standard SOP plate has been used in a wide variety of clinical settings and has been supported by a plethora of published data. However, it has a comparatively increased height profile compared to other plates.

Whilst in most settings this is of little clinical consequence, in smaller dogs and cats it can be less than ideal causing interference with the soft tissue envelope or periarticular tissue and can impede tension free wound closure.

By popular request, we have now designed a smaller, lower profile system to allow easier placement in particular on smaller patients.

The SOP Low Profile plate is available in 2.0mm which uses dedicated screws that are only available from Orthomed. A 1.5mm LP-SOP system is currently in development.

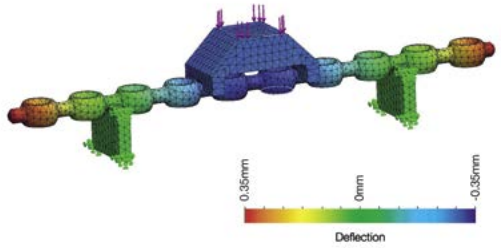
# Biomechanics

The SOP-LP plate and screws are made from Ti-Al6-4V. Titanium alloys have a high strength to weight ratio when compared to stainless steel which is useful in small patients and titanium alloy is highly biocompatible which again can be useful in minimising infection risk. Titanium alloys are less stiff and strong when compared to stainless steel but the 2.0mm SOP-LP has been designed to be stiffer than the standard 2.0mm SOP which has been confirmed by computer modelling.

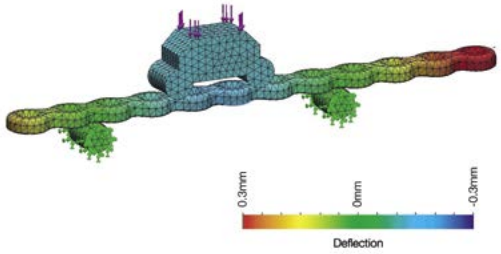
This is achieved by using a curved, rather than flat, cross-section profile with short relatively wide internodes and reduced hole spacing.

The locking system is similar to the standard SOP with threads in the base of the plate hole that accept the threads of the screw and an interference fit of the screw head and plate hole.

Standard 2.0mm SOP




Low Profile 2.0mm SOP




## Mechanical testing

The SOP-LP underwent a series of tests at University College Dublin. Testing was primarily comparative tests against the Synthes Unilock device. This is a 2mm thick plate used in similar applications. Both plates are made from Titanium alloy and are 2mm thick and use 2mm Titanium alloy locking screws.

### Four point bending test (ASTM-F382) results

| | Bending Stiffness (N/mm) | | Bending Strength (N-mm) | |
|---|---|---|---|---|
| | Mean | SD | Mean | SD |
| SOP-LP | 47.85 | 5.85 | 110 | 16 |
| Synthes Unilock 2.0mm | 23.08 | 0.52 | 75 | 2 |

### Compression testing results

During compression testing the SOP-LP plates did not fracture when the joint space was fully closed with an average peak load of 736N (SD 47N) which equates to around 75Kg.

### Cyclic loading test results

No damage to the plate and screws and no screw loosening was observed after 42,000 cycles at 63N (6.4Kg)

### Summary

In summary in bending tests the SOP-LP plate is 107% stiffer and 47% stronger than the equivalent 2.0mm Unilock plate. The SOP-LP plate also performed well in compression testing and cyclic loading.

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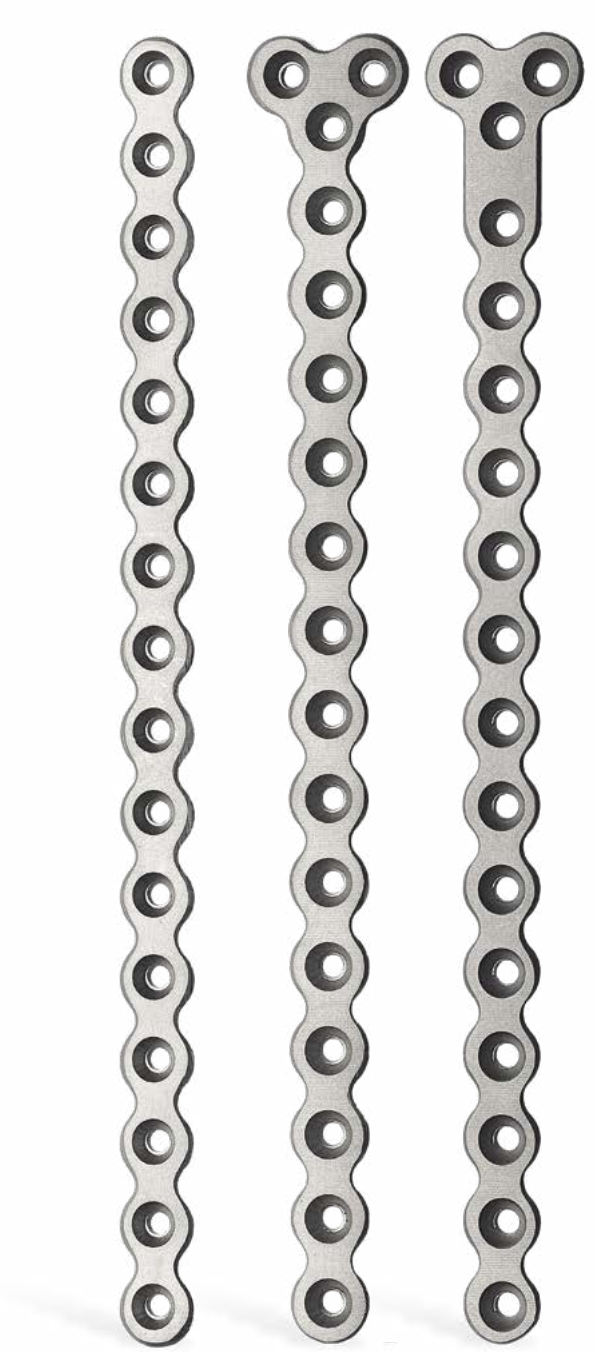
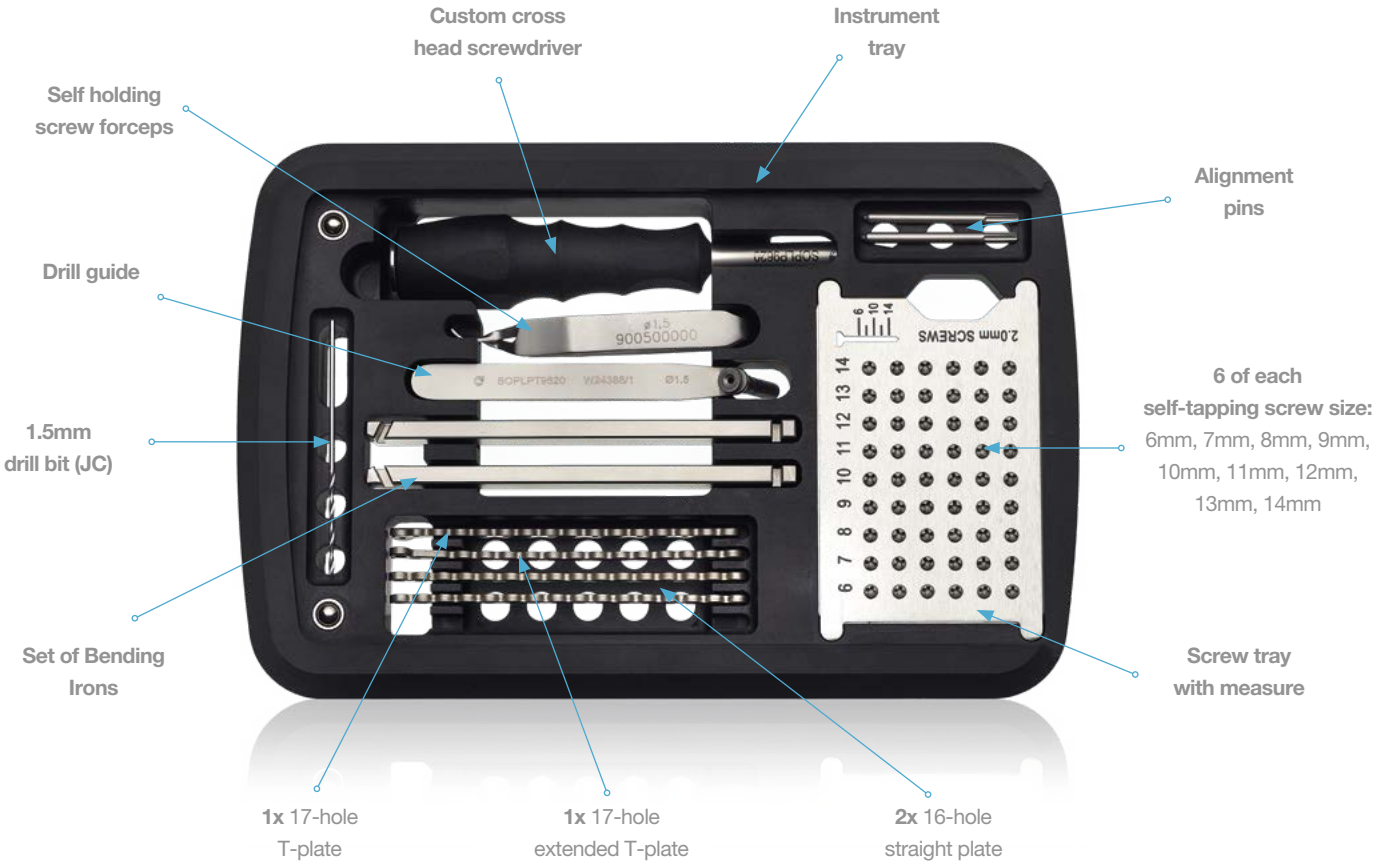
## Instruments & Implants

The SOP Low Profile plates are available in 2.0mm and there are three options of plate. A straight plate being 16 holes long, a 17 hole T-plate and a 17 hole extended T-plate.





Dedicated self tapping screws are used, ranging in length from 6mm to 14 mm. The screws have a custom cross head drive and a custom cross head screwdriver must be used. This has a small diameter to limit torque.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## Technique

The SOP Low Profile plate can be cut to the desired length between holes using 2.0mm pin cutters to partially cut and then the bending irons are used to bend back and forth until the plate breaks.


## Contouring

Contouring irons have been designed to allow controlled contouring whilst preserving the integrity of the locking function. Small degrees of bending and twisting are possible but care must be taken to minimise contouring around the screw hole where a screw is planned to be placed. The locking mechanism can be easily disrupted.

## Bending

Bending is possible only in one plane with no ‘edge bending’ being possible. No bending tees are required.

The SOP-LP is loaded into the bending irons at adjacent plate holes. The offset slots in the bending irons means the irons are set apart when the SOP has been inserted. The irons are brought together to bend the plate between the holes.

## Twisting

At the opposite end of the bending irons are straight slots that allow a degree of twisting of the plate.

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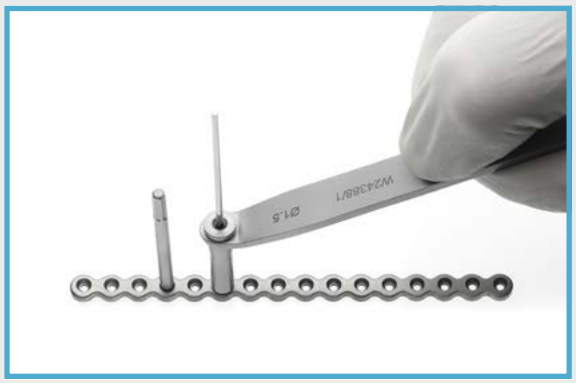
## Drilling/Tapping

As with the standard SOP the hole that is drilled for the screw must be perfectly central and perpendicular to the plate hole. The dedicated SOP-LP drill guide, which fits snugly into the plate, is used to drill and ensures the hole is correctly placed. Alignment pins are available which screw into the plate. These can be used to help the surgeon ensure the drill guide and therefore the drill bit is perpendicular to the plate.




When measuring the depth of the hole in the bone, the Orthomed 1.5/2.0mm depth gauge measures 4mm longer with the 2.0mm SOP-LP so you subtract 2mm from the measured depth when selecting the correct screw. This results in 2mm of screw protruding past the trans cortex ensuring the cutting flutes are not engaging the cortical bone.

*If using a different depth gauge you should be aware of how the measured depth compares to the actual depth for that individual guide.*

The dedicated screws are self tapping so no tapping is required.

The screw threads must 'seat' into the threads in the plate. This is achieved by offering the screw to the plate hole and first screwing counter-clockwise which seats the thread of the screw into the plate thread.

The screw is advanced through the plate to the drill hole in the bone and it is essential to ensure the screw is aligned to the hole. If the screw does not engage in the bone immediately then you will push the plate off the bone. To avoid this gentle axial pressure is applied and an alternating half turn forward, quarter turn back technique used until the screw engages the bone.

It can be helpful to place the first screw as a monocortical screw to fix the plate onto the bone. Thereafter screws can be placed as bicortical screws. It is possible then to change the first screw to a bicortical screw if desirable.

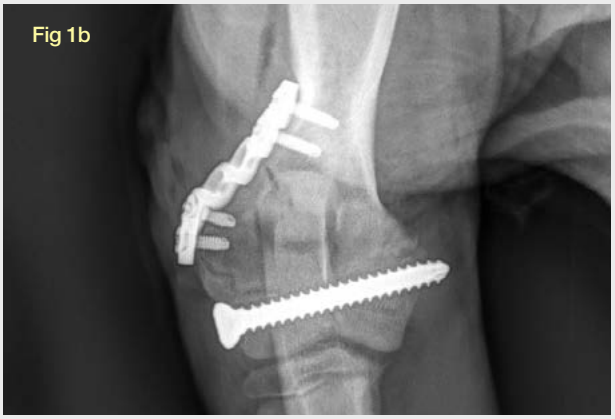
# Technical Applications

The SOP Low Profile plate is designed to be very versatile and it is indicated to be applied to any bone. The 2.0mm plate has been applied to a wide variety of fractures in canines and felines with single plate fixation in long bone fractures up to 7kg and double plate fixation in cases up to 10.5kg.

## Indications

### Humeral fractures

unicondylar (Figs 1 a & b), bicondylar (Figs 2a & b), supracondylar and diaphyseal fractures.


Cross breed 6.5kg



French bulldog 10.5kg

## Radius and Ulna fractures

Single plating of the radius (Fig 3a & b) or double plating radius and ulna.



Domestic short haired cat 3.5kg

## Tibial fractures

Single medial plating, SOP-Rod or orthogonal plating.

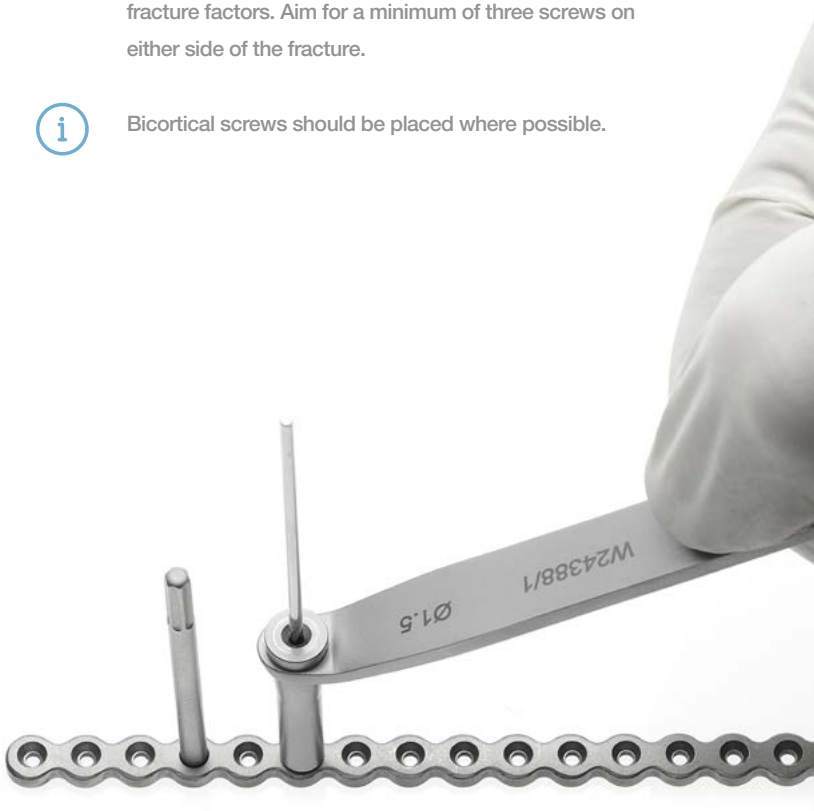
Cross breed 6.5kg

## Further Indications

- **Femoral fractures**
  diaphyseal fractures +/- IM pin.
  Supracondylar fractures will be more suited to standard SOPs due to the degree of contouring required.
- **Scapular fractures**
- **Metacarpal/tarsal fractures**
- **Mandibular fractures**
- **Maxillary fractures**
- **Adjunct fixation in arthrodesis**

# Hints & Tips

- Precise technique is critical.
- It is easy to drill a hole that is not perpendicular to the plate which will make screw insertion difficult. The alignment pins are an aid to help align the drill bit perpendicular to the plate.
- The screw threads must ‘seat’ into the threads in the plate. Remember to screw counter-clockwise first to seat the thread of the screw into the plate thread. This seating of the screw thread into plate thread is very subtle and easy to miss which may result in cross threading. Using the screw holding forceps eases screw insertion.
- If a screw is cross threaded or the drill hole is not perpendicular it can be very difficult to engage the trans cortex. The required torque to place the screw increases which can result in shearing of the screw heads. If this occurs, then that screw could be placed as a monocortical screw.
- The number of screws varies based on patient and fracture factors. Aim for a minimum of three screws on either side of the fracture.
- Bicortical screws should be placed where possible.



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