| F17-2014 | **Test Report**<br>**QuickFix Mechanism MMN pull-out force** | |
|---|---|---|
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| **project name:** | QuickFix | **Projekt Nr.:** | 4179-170701 |
|---|---|---|---|
| **responsible persons:** | Peter Witte (GF) / Arne Müller (QMB) | | |

| creator: | release: |
|---|---|
| 15.03.2021 | 15.03.2021 |

## 1. Introduction:

The Self-Retaining Screwdriver has been enhanced with a QuickFix locking system to increase user-friendliness. This simplifies the correct locking of the Screwdriver blade in the implant.

The QuickFix system consists of 2 parts (QuickFix = coulisse + clamping mechanism).

coulisse

clamping mechanism

Pressing the elastic tensioning mechanism over the slide creates a dynamic retaining connection. This connection is tested in an endurance test for stability and reproducibility of the clamping mechanism on a T25 Self-Retaining Screwdriver as follows.


**Example: Self-Retaining Screwdriver T25 with QuickFix Mechanism**

One sample was tested for tensile strength and its change due to the influence of sterilization temperature at 137°C and 10,000 mechanical applications (tensioning and relaxing) on the QuickFix system.

**Acceptance Criteria:**

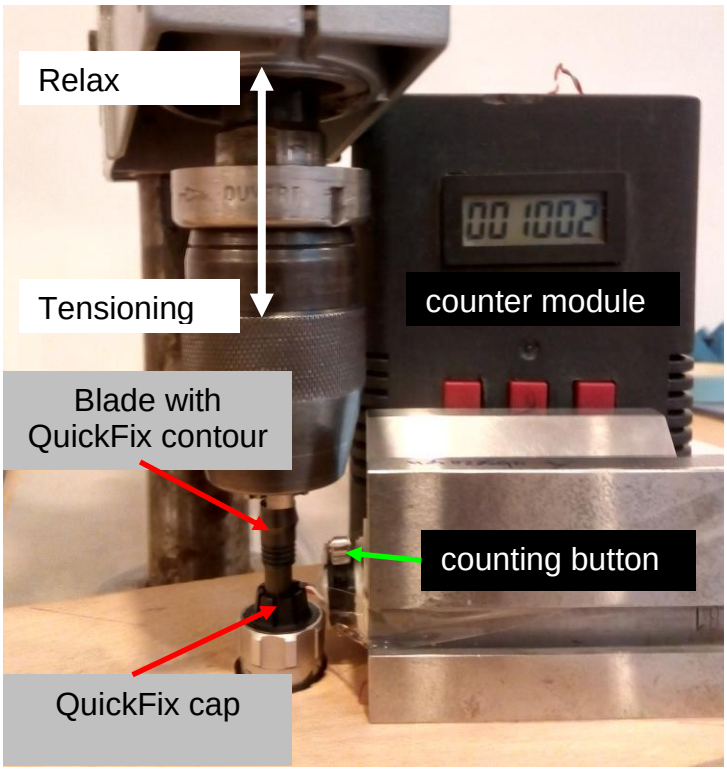
The QuickFix system must withstand 10,000 mechanical stresses (tensioning and releasing).

The QuickFix system must hold the sleeve securely on the blade even after repeated application of 137°C in a clamped state.

A possible increase in holding force due to thermal or mechanical stress is permissible. The pull-off force must be at least 90% of the pull-off force measured at the start of the test..

## 2. Experimental Setups

### Test setup 1: mechanical stress test using a lifting motion



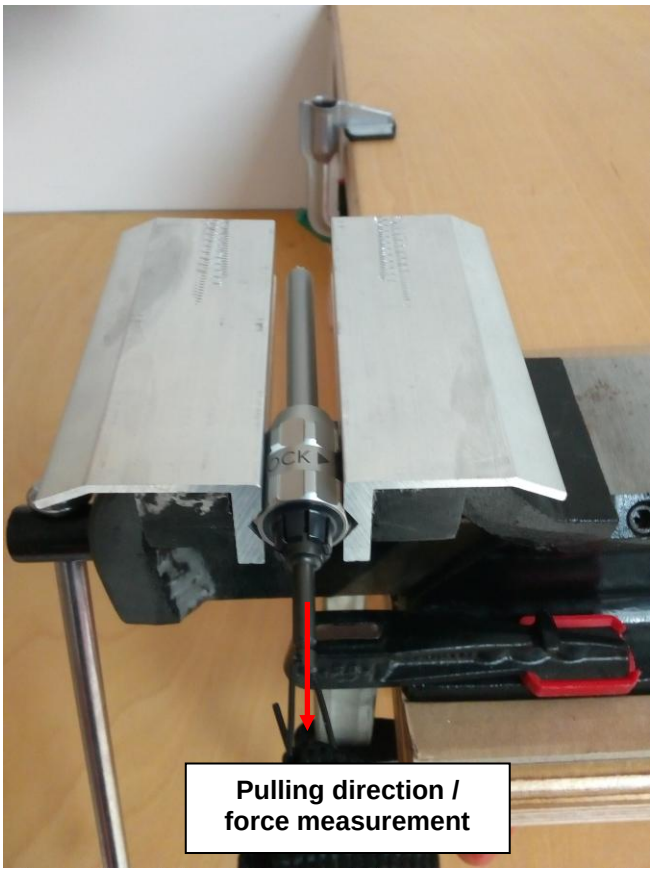

### Description:

A series sleeve with a Quick Fix cap is secured against vertical movement. The corresponding blade with a Quick Fix contour is secured in a 3-jaw chuck.

Possible manual movement direction:
1. Vertically upward (releasing the QuickFix))
2. vertically downward (tightening the QuickFix)

The vertical stroke cycles of the Quick Fix system are recorded via a counter button.

## Test setup 2: Measurement of extraction force





## Description:

A series sleeve with a QuickFix cap is fixed horizontally in the 2-jaw chuck. The corresponding blade with QuickFix contour is inserted into the cap with QuickFix against the direction of pull (clamped).

The blade is pulled out of the cap using a handle with integrated force measurement. The force required is displayed and logged.

**Test setup 3: Simulation of the sterilization process:**

Tempering Oven: Type Memmert



**Adjusting the tempering oven temperature:**

The oven temperature is set to 137°C on the thermostat..

The temperature is displayed digitally on the oven display..

**3. Experiment Implementation:**

Measurement and recording of the QuickFix extraction force at the start of the measurement series

**Cycle:**

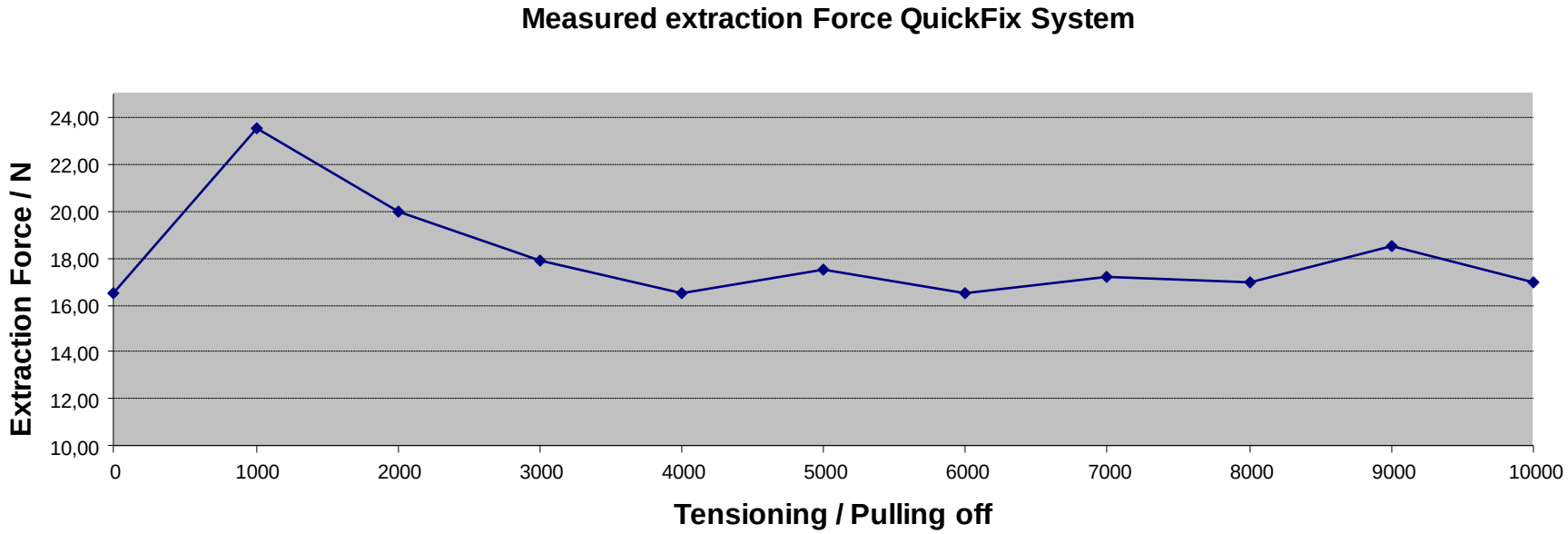
- The QuickFix is manually tightened and loosened 1,000 times..
  Repetition frequency 60 / minute. (test setup 1)
- Measurement and logging of extraction force QuickFix (test setup 2)
- The QuickFix clamped onto the blade is placed in the tempering oven. (test setup 3)
- The heating process is started.
  Once the required oven temperature of 137°C has been reached, it is maintained for 7 minutes (equivalent to the sterilization temperature and sterilization holding time).
- Simulation of the use of spray cooling in the standard sterilization process by switching off the oven, opening the oven door, and cooling the Quickfix with compressed air.
- After cooling the test specimen to room temperature, measure and record the pull-off force of the QuickFix.

This cycle is repeated 10 times.
Layover times and condition are recorded.

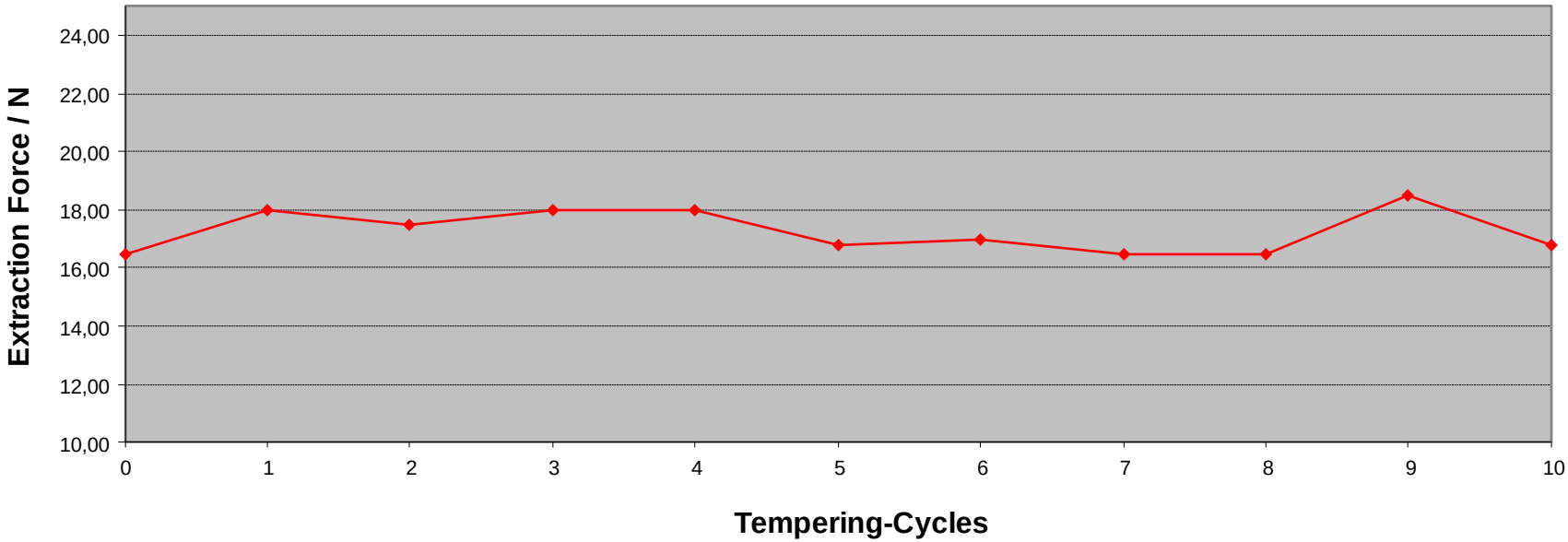
## 4. Measured Values

**System 3:** T25 pcs. with QuickFix contour (QuickFix – Closure cap glass bead blasted / 8-way slotted / Di = 8,041mm
Blade T25 with QuickFix contour, WCC coated)

| **Tempering cycles** | **0** | **0** | **1** | **1** | **2** | **2** | **3** | **3** | **4** | **4** | **5** | **5** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Tensioning / Pulling off | 0 | 1000 | 0 | 1000 | 0 | 1000 | 0 | 1000 | 0 | 1000 | 0 | 1000 |
| Pulling force/N | 16,50 | 23,50 | 18,00 | 20,00 | 17,50 | 17,90 | 18,00 | 16,50 | 18,00 | 17,50 | 16,80 | 16,50 |
| Date | 10.03.21 | 10.03.21 | 11.03.21 | 11.03.21 | 11.03.21 | 11.03.21 | 11.03.21 | 11.03.21 | 11.03.21 | 12.03.21 | 12.03.21 | 12.03.21 |
| Tempering cycles | **6** | **6** | **7** | **7** | **8** | **8** | **9** | **9** | **10** | **10** | | |
| Tensioning / Pulling off | 0 | 1000 | 0 | 1000 | 0 | 1000 | 0 | 1000 | 0 | 0 | | |
| Pulling force/N | 17,00 | 17,20 | 16,50 | 17,00 | 16,50 | 18,50 | 18,50 | 17,00 | 16,80 | 17,50 | | |
| Date | 12.03.21 | 12.03.21 | 12.03.21 | 12.03.21 | 12.03.21 | 12.03.21 | 12.03.21 | 12.03.21 | 12.03.21 | 15.03.21 | | |



## Measured Extraction Force QuickFix System



## 5. Evaluation of measured values

At the start of the experiment, the pull-off force was 16.50 N.
The measured pull-off forces during the entire test series ranged between 16,50 N and 23,50 N.

## 6. Evaluation

The measured values are within the range of the acceptance criteria.
At the beginning of the test series, the pull-off force increased slightly due to the mechanical stress.
During the test series, a slight difference in pull-off force was sporadically observed between the measurements after thermal stress and mechanical stress. The pull-off force increased slightly after mechanical stress, then decreased slightly after thermal stress.

## 7. Final Assessment

The tested samples demonstrated full functionality during 10,000 manual mechanical and thermal stresses.
The Self-Retaining Screwdriver with QuickFix thus fulfills the 10,000 mechanical application cycles of the Lyfecycle test, equivalent to the screwdriver version with double thread.