

## FATIGUE STRENGTH

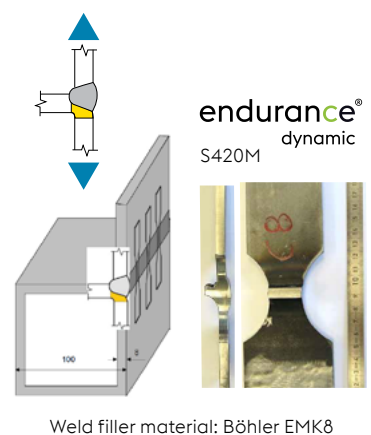
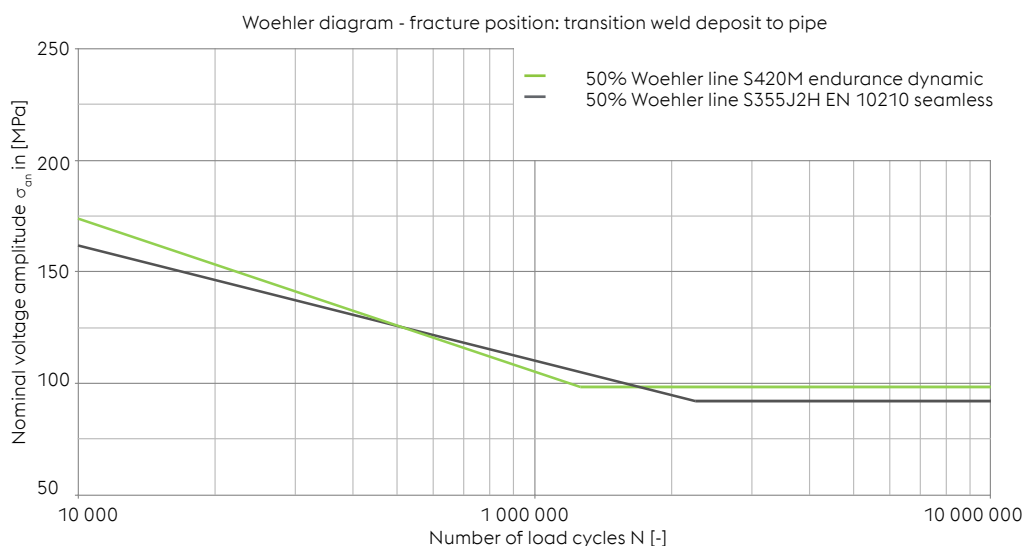
### IMPROVED FATIGUE STRENGTH

In many applications, rectangular and square tubes are welded to form a truss or framework, for example for agricultural equipment or crane booms.

Under cyclic loads, geometric and metallurgical notch effects are the main determinants of fatigue strength in most applications.

In the case of endurance dynamic, the geometric notch effect is reduced by a narrower C/T ratio and the metallurgical notch effect is lowered by the use of thermomechanically rolled steel.

To illustrate the product's good properties, welded sample assemblies were subjected to a dynamic load test. Regardless of the manufacturing route, the Woehler lines show **almost identical vibration resistance characteristics**, both in time and in the fatigue strength range..



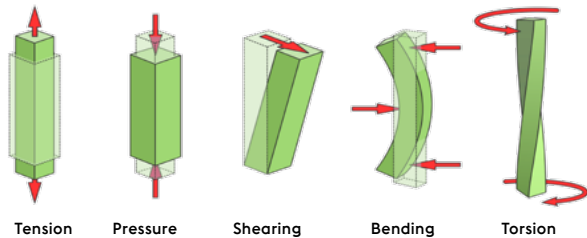
## DYNAMIC LOAD TESTS ON THE BASE TUBE

For independent and extended characterization of endurance dynamics, representative tests were developed with a university based on typical loads on the tube.

The fatigue behavior of endurance dynamics compared with hot-finished tubes according to EN 10210 was the focal point

## FATIGUE STRENGTH BASE TUBE

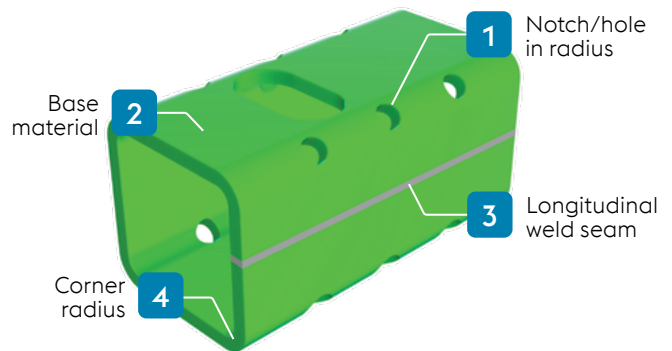
### LOAD TYPES



### DIAGRAMM LEGEND

- 50% Woehler line S420M endurance dynamic
- 50% Woehler line S355J2H EN 10210 welded
- 50% Woehler line S355J2H EN 10210 seamless

### LOCATION OF THE SAMPLES

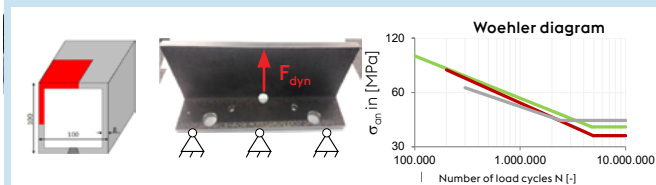


### NOTCH/HOLE IN THE RADIUS

1

#### Study objectives

- » Impact of notch effect in the radius / near the radius
- » Difference in manufacturing method COLD/HOT formed



#### Results

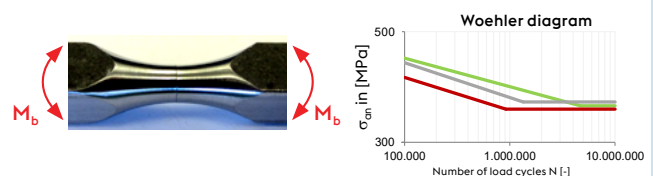
- » All three tube designs show almost identical behavior
- » endurance dynamic at least equivalent to tubes according to EN 10210

### BASE MATERIAL

2

#### Study objectives

- » Impact of base material (longitudinal & transverse)
- » Difference in manufacturing method COLD/HOT formed



#### Results

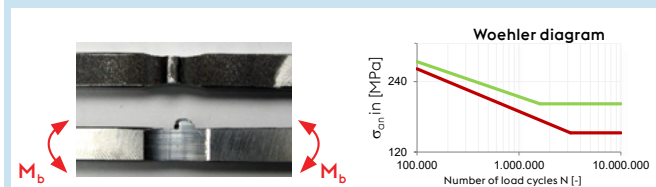
- » The Woehler line "EN 10210 welded" limits the scatter band downwards
- » The three base materials are viewed as equivalent, although S420M is slightly better

### LONGITUDINAL WELD SEAM

3

#### Study objectives

- » Impact of heat treatment on longitudinal weld seam
- » Difference in manufacturing method COLD/HOT formed



#### Results

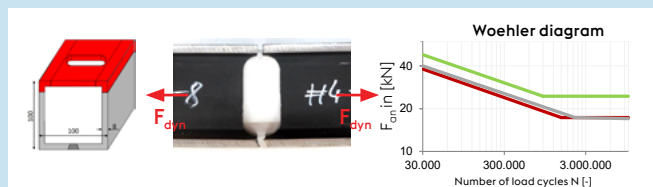
- » The Woehler line "EN 10210 welded" limits the scatter band downwards
- » endurance dynamic shows slightly better behavior in the transitional area

### CORNER RADIUS

4

#### Study objectives

- » Impact of strain hardening in the radius
- » Difference in manufacturing method COLD/HOT formed



#### Results

- » The Woehler lines run almost parallel
- » All three tubes show similar behavior
- » endurance dynamic slightly above