TTT Standard-Equipment

Conditions and Quality

The latest microtap TTT Standard for measurements requires an adaption for TTT Tapping-Torque-Test compatibility (application / comparability / repeatibility).

All measurement equipment (testbar materials & measurement tools) are manufactured and delivered with consistent high precision and quality. Each single testbar is 100% quality assured (all 140 holes) and has a maximum of seven marked faulty holes. The equipment is suitable for customer specific laboratory conditions and meets the requirements for laboratory directives.

TTT Standard Testbars

Stainless Steel

X6CrNiMoTi17-12-2 / 1.4404 - 1.4571 / (V4A) / AISI 316Ti
Tensile strength Rm 725N/mm² / 225 HB / 112 PSIx1000
Elongation A5 (%) > 40 / Rm = 775N/mm²
Depth 20 mm M4F Forming 5 x D* / 20 mm M4C Cutting
V4A is the further development to "Test Melt 4 Austenite" with the alloy of at least two percent molybdenum.
These antiquated designations are replaced today as follows: -> V4A - **1.4404** originally 1.4571

Aluminium

AlZnMgCu01,5 / 3.4365 / 7075
Tensile strength Rm 420-450 N/mm² / Rp0,2 = 420 N/mm²
Elongation A5 > 5-7% / 140 HB / density 2.78 Kg/dm³
Aircraft – CarEngine standard/classic
Depth 20 mm M4F Forming 5 x D* / 20 mm M4C Cutting

TTT Standard Tools Specially Gauged Tools

Selected Forming Tools M4F (6HX 3.545 – 3.663***1** / DIN 13-20)
(e.g. gauged pitch diameter 3.642 mm)
TTT_M4F-NT Forming Standard, vaporised nitrated with gauged pitch diameter
TTT_M4F-TINT Forming TIN coated with gauged pitch diameter
TTT_M4C-T Cutting-Standard blank with gauged pitch diameter
TTT_M4C-TINT Cutting TIN coated with gauged pitch diameter

TTT Starter-Set

3 x Aluminium 3.4365: 2 x 3.4365 M4 Forming 20mm / 1 x M4 Cutting 12mm
4 x Stainless-Steel 1.4571,:3 x 1.4571 M4 Forming 20mm / 1 x M4 Cutting 12mm
18 x Gauged measurement tools: 10 x gauged M4F-NT / 3 x M4F-TINT (Forming) / 5 x M4C-T (Cutting) for approximate 980 laboratory measurements, costs 2.86 € each

Definition

When determining the coefficient of friction, the physical load parameters in a wear process are defined by:

- Normal Force **FN** ((Spindletorque) tool tolerance [*1] influence ΔT)
- Velocity **V** (Cutting Speed)
- „Fields of Load" / Time of Load **tB** (Depth of thread* & speed)
- Temperature T (Delta T[*2] / **ΔT**)

* Depth 20 mm = Mechanical fields of load tB (depending on depth & speed)

[*1] A possible tool tolerance of 0.118 mm influence torque & results up to ≈ 15%

[*2] Delta T (ΔT) is the temperature difference value, determined right before and right after process at the tip of the measurement tool.

Additional Steel Testbars

Stainless Steel

X6CrNiMoTi17-12-2 / 1.4404 - 1.4571 (V4A) / AISI 316Ti (Data see page 1)
Tensile strength Rm 725N/mm² / 225 HB / 112 PSIx1000
Elongation A5 (%) > 40 / Rm = 775N/mm²
Depth 20 mm M4F Forming 5 x D* / 12 mm M4C Cutting
V4A is the further development to "Test Melt 4 Austenite" with the alloy of at least two percent molybdenum.
These antiquated designations are replaced today as follows: -> V4A - **1.4404** originally 1.4571

Carbon Steel

C45 / 1.0503 (1.1730) / 1045 / JIS S45C
C45 Tensile strength Rm 600N/mm² / 175 HB / 85 PSIx1000
Elongation A5 (%) > 14 / Re>355N/mm²
Stress relief heat treated

C45E / 1.1191 / 1049 / JIS S48C
C45E Tensile strength Rm 600N/mm² / 175 HB / 85 PSIx1000
Elongation A5 (%) > 14 / Re>355N/mm²
Quenched and tempered steel with improved purity (less phosphorus and sulphur)

Depth 20 mm M4F Forming 5 x D* / 12 mm M4C Cutting

High Grade Alloy Steel

42CrMo4V+QT / 1.7225 / 4140 / JIS 4105 (SCM440)
Tensile strength Rm 1000N/mm² / 300 HB / 145 PSIx1000
Elongation A5 (%)
QT = quenched and tempered
Depth ➔ only 12 mm Forming / Cutting (max. Depth 3 x D*)

Additional High Temperature (Superalloy) Testbars

Inconell-718

NiCr19NbMo / 2.4668 / T651 Inconell
Tensile strength Rm 350-450 / Rp0,2 1150 N/mm²
Elongation A5 15% / Hardness 350-450 HB
Depth ➔ only 10 mm / Diameter in mm 3.3, 3.7 and 3.72 (M4) available

Light Metal Testbars - M4F Forming (20 mm) and M4C Cutting (12 mm)

Aluminium

AlSi9Cu3 / 3.2163 / 1774 / 12844 (EN/ASTM/AiSi/SAE)
Tensile strength Rm 240-350 N/mm² / Rp0,2 140-220 N/mm²
Elongation A5 > 0-3 % / 80-115 HB / Rp0,2 min. 100 N/mm²

AlMgSi1 / 3.2315 / 6082
Tensile strength Rm 295 N/mm² / Rp0,2 240 N/mm²
Elongation A5 > 8% / 89 HB

G-AlSi12Cu / 3.2583 / GD-3-298 / SAE 413.1 / JIS ADC1)
Tensile strength Rm 150-290 N/mm² / Rp0,2 80-130 N/mm²
Elongation A5 (1-3,5%) / 50 HB / density 2,65 Kg/dm³

AlMg1SiCu / 3.3214 / 6061
Tensile strength Rm 290 N/mm² / Rp0,2 240 N/mm²
Elongation A5 (5-8%) / 88 HBS / density 2,7 Kg/dm³

AlZnMgCu0,5 / 3.4345 / 7022
Tensile strength Rm 420-450 N/mm² / Rp0,2 340-370 N/mm²
Elongation A5 > 5-7% / 140 HB / density 2.78 Kg/dm³
Machinery standard/classic

AlZnMgCu01,5 / 3.4365 / 7075
Tensile strength Rm 420-450 N/mm² / Rp0,2 = 420 N/mm²
Elongation A5 > 5-7% / 140 HB / density 2.78 Kg/dm³
Aircraft – CarEngine standard/classic

Depth of all testbars 20 mm M4F Forming 5 x D* / 12 mm M4C Cutting

Titan Grad 5 (No steel)

TiAl6V4 / 3.7164 / TiAl6V4 / 49-11-28-35-54-65-67
Hardness Rm 1150N/mm² / 340 HB / 163 PSIx1000 / 36 HRC
Elongation / Rem²´
Depth / Diameter ➔ only 10 mm / diameter in mm 3.3, 3.7 and 3.72 available

Additional Laboratory Measuring Tools

TTT_M4F-NT Forming Standard with gauged pitch diameter vaporised, nitrated
TTT_M4F-NS Forming with lubrication groove
TTT_M4F-TINT TIN coated with gauged pitch diameter
TTT_M4F-T for Titan applications

TTT_M4C-T Cutting-Standard blank / with gauged pitch diameter
TTT_M4C-TINT TIN coated / with gauged pitch diameter
TTT_M4C-NI Cutting for nickel-based alloys
TTT_M4C-TINT2 for Titan applications

TTT_G6 6 Tolerance proof gauges M4F & M4C (green / yellow / red)

For the TTT Method use tools with gauged pitch diameter [*1] only

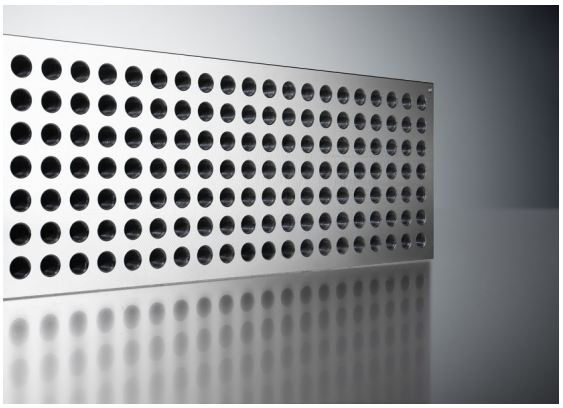
Conditions: Terms of delivery of microtap GmbH
Pricing: On request / ex work / excl. packaging
Payment: 14 days net / Foreign countries payment in advance
Delivery time: Approximately 1-2 weeks after order

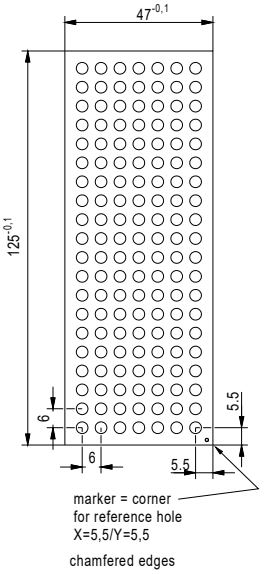
Material Conditions & Tolerances

for TTT measurement tools M4 forming & cutting

Measuring TTT test-bars with 10 up to 20 mm thread depth

Test bar sizes: 125 x 47 x 18 / 25 mm (D), 140 drilled array at 6 mm for TTT tools – M4F and M4C





Every test-bar is manually gauged with tolerence 0,01 mm hole diameter. We deliver our test-bars with max. 6 bad holes, wich are red signed and identified.
For your controll, we deliver and offer our gauged TTT_G6 6 Tolerance proof gauges M4F & M4C (green / yellow / red) each Price on demand. For the TTT Method and for precise and repeatable results use tools with gauged pitch diameter*1 only.

New TTT Standard & Methode

20 mm ➔ Mechanical load time tB* - depending on depth & speed
➔ M4F Thread with 5 x Diameter = 20 mm thread depth !
Test bars size 125 x 47 x 25 mm / 140 holes – M4

Thread forming and cutting

Tap hole forming: A = 3.70 mm + 0.01 mm (20 mm thread depth)
Counterbore: B = 0.2 mm
Thread Depth: C = 20 mm / 23 mm - with counter sinking

Tap hole cutting: A = 3.30 mm + 0.01 mm (12 mm thread depth)
Counterbore: B = 0.4 mm
Thread Depth: C = 12 mm / 15 mm - with counter sinking

Legend

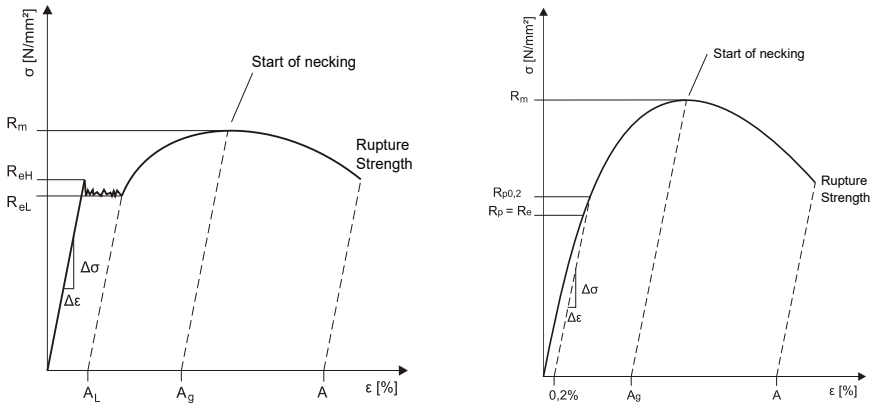
Rm Ultimate strength - Indicates the tension at the peak of the stress-strain chart

Elongation A5 - Indicates the tension prevailing in material immediately before stretching

Rp0,2 0,2% Yield point - Indicates the tension at which tension test displays a yield point of 0,2 % of plastic deformation after release. Rp0,2 value is only used with materials lacking a yield strength

Stress-Strain-Chart

Suppose that a metal specimen be placed in tension-compression-testing machine. As the axial load is gradually increased in increments, the total elongation over the gauge length is measured at each increment of the load and this is continued until failure of the specimen takes place. Knowing the original cross-sectional area and length of the specimen, the normal stress σ and the strain ε can be obtained. The graph of these quantities with the stress σ along the y-axis and the strain ε along the x-axis is called the stress-strain diagram. The stress-strain diagram differs in form for various materials. The left figure is an example for most steels whereas the right figure applys to alumium.



R_{eH} - Upper yield strength **R_{eL}** - Lower yield strength

E - Flexibility module **A_g** - Symmetry distension / start of necking

ε - Distension [%] **σ** - Tension [N/mm²]

A – Fracture / Rupture Strength

* Depth 20 mm = Mechanical fields of load tB (depending on depth & speed)

*1 A possible tool tolerance of 0.118 mm influence torque & results up to ≈ 15%

*2 Delta T (ΔT) is the temperature difference value, determined right before and right after process at the tip of the measurement tool.