AluCalc OS

DETERMINISTIC ENGINEERING INTELLIGENCE PLATFORM

VDI 2230-1 SAMPLE CALCULATION REPORT

ILLUSTRATIVE BENCHMARK · VDI 2230 PART 1 / ISO 898-1

ORGANIZATION / LEGAL OWNER	PROJECT CODE	DOCUMENT NO / DRAWING REF	REVISION / STATUS
AluCalc OS Verification Benchmark	RRJ-VDI-2026-088	DOC-VDI2230-M12-SAMPLE	Rev 01 / SAMPLE RECORD

PREPARED BY (HESAPLAYAN)	CHECKED BY (KONTROL)	RELEASE DATE	SYSTEM / APP_VERSION
Automated Fastener Solver (Sample)	System-generated sample (Not reviewed)	2026-10-30 (Benchmark)	AluCalc OS v6.0.0

1. JOINT & FASTENER SPECIFICATION (GIRDI PARAMETRELERI)

ISO 898-1 / ISO 4017 / ISO 724

Bolt Designation	**M12 x 1.75 (Regular Hex Head ISO 4017)**	Standard coarse metric thread
Property Class	**Grade 8.8 (Quenched & Tempered)**	Sy = 640 MPa, Sp = 580 MPa, Rm = 800 MPa
Nominal & Core Diameters	**d = 12.00 mm, d2 = 10.863 mm, d3 = 9.853 mm**	ISO 724 / ISO 965-1 (D1 = 10.106 mm)
Tensile Stress Area As	**84.3 mm2**	As = 0.7854 * (d - 0.9382*P)^2
Thread Friction Coeff. muG	**0.140 (Standard lubricated state)**	ISO 16047 verification test
Underhead Friction Coeff. muK	**0.140 (Standard lubricated collar)**	dh = 13.5 mm, dw = 17.6 mm (DIN 933)
Tightening Factor alphaA	**1.20 (Standard torque control)**	VDI 2230 Table A8 (Torque wrench)
Target Utilization nu	**0.700 (70% Proof Stress utilization)**	FM = nu * As * Sp (Sp = 580 MPa)

2. STEP-BY-STEP CALCULATION TRACE (MADDE ATIFLI HESAP IZI)

VDI 2230 PART 1 (2015) / ISO 898-1

Step 1: Fastener Proof Strength Boundary `Fp = Sp * As = 580.0 MPa * 84.3 mm2`	[ISO 898-1:2013 Table 3]	**Fp = 48.89 kN (ISO 898-1 proof)**
Step 2: Assembly Preload Clamp Force FM `FM = nu * Sp * As = 0.700 * 580.0 * 84.3 * 10^-3`	[VDI 2230 Eq. R8/1]	**FM = 34.23 kN (Preload force)**
Step 3: Nut Torque Factors K1, K2, K3 `K1 = 0.0232 (lead), K2 = 0.0731 (thread), K3 = 0.0907 (collar)`	[VDI 2230 Clause 5.4]	**Total nut factor K = 0.1870**
Step 4: Calibrated Tightening Torque MA `MA = K * FM * d = 0.1870 * 34226 N * 12.0 mm * 10^-3`	[VDI 2230 Eq. 5.4/1]	**MA = 76.8 N.m (Tightening)**
Step 5: Axial Tensile Stress sigma_z `sigma_z = FM / As = 34226 N / 84.3 mm2`	[VDI 2230 Clause 5.5.1]	**sigma_z = 406.0 MPa (Axial)**
Step 6: Torsional Shear Stress tau `Wp = (pi * dS^3) / 16 = 218.2 mm3 (dS=10.358) | tau = (MG * 1000) / Wp`	[VDI 2230 Clause 5.5.2]	**tau = 181.1 MPa (MG=39.5 N.m)**
Step 7: von Mises Stress sigma_eq & Yield Reserve `sigma_eq = sqrt(sigma_z^2 + 3*tau^2) = sqrt(406^2 + 3*181.1^2) = 513.1 MPa <= 640 MPa`	[VDI 2230 / ISO 898-1]	**sigma_eq = 513.1 MPa (FoS = 1.25)**

SAMPLE BENCHMARK RECORD — VDI 2230-1 / ISO 898-1 (ILLUSTRATIVE)

TORQUE: MA = 76.8 N.m **PRELOAD: FM = 34.2 kN (FM,min = 28.5 kN, alphaA = 1.20)**

STRESS: sigma_eq = 513.1 MPa <= 640.0 MPa (FoS = 1.25 >= 1.05)

Illustrative sample benchmark generated by AluCalc OS VDI 2230 engine. Not independently certified.

CALCULATED & PREPARED BY (HESAPLAYAN)	CHECKED & VERIFIED BY (KONTROL)	SAMPLE BENCHMARK RECORD
AluCalc OS VDI 2230 Solver	**Not Independently Reviewed**	**AluCalc OS Standard Sample Report**
Automated Fastener Analysis Kernel	System-generated sample benchmark	Format: ISO 7200 Technical Title Block
Status: [SAMPLE BENCHMARK - UNREVIEWED]	**Status: [SAMPLE BENCHMARK - NOT CERTIFIED]**	**Model: VDI 2230-1 / ISO 898-1 Benchmark**
Date: 2026-10-30 | Model: M12 Gr 8.8 (nu=0.7)	Date: 2026-10-30 | Compliance: VDI 2230 Blatt 1	**Notice: Illustrative sample · Not certified**
		AluCalc OS Technical Report Engine