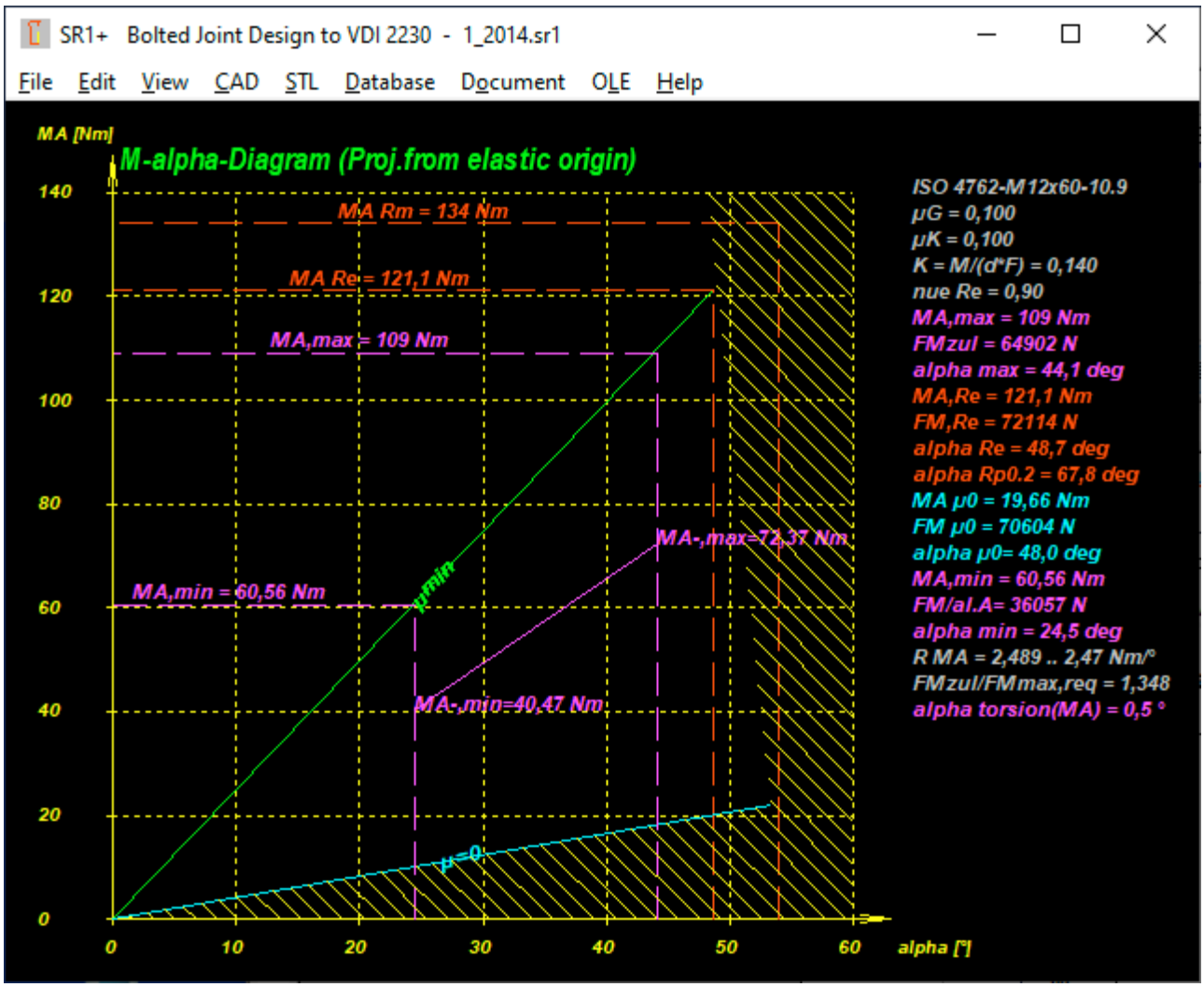
HEXAGON - Newsletter 193 May / June 2022

by Fritz Ruoss

SR1 / SR1+: M-alpha diagram incl. loosening torque



The tightening torque is MA= head friction MK + thread torque MG. The thread torque consists of a proportion of thread friction and thread pitch (MG=MGfriction+MPitch. When loosening the screw, MP (thread pitch) acts in the opposite direction,
The loosening torque is thus

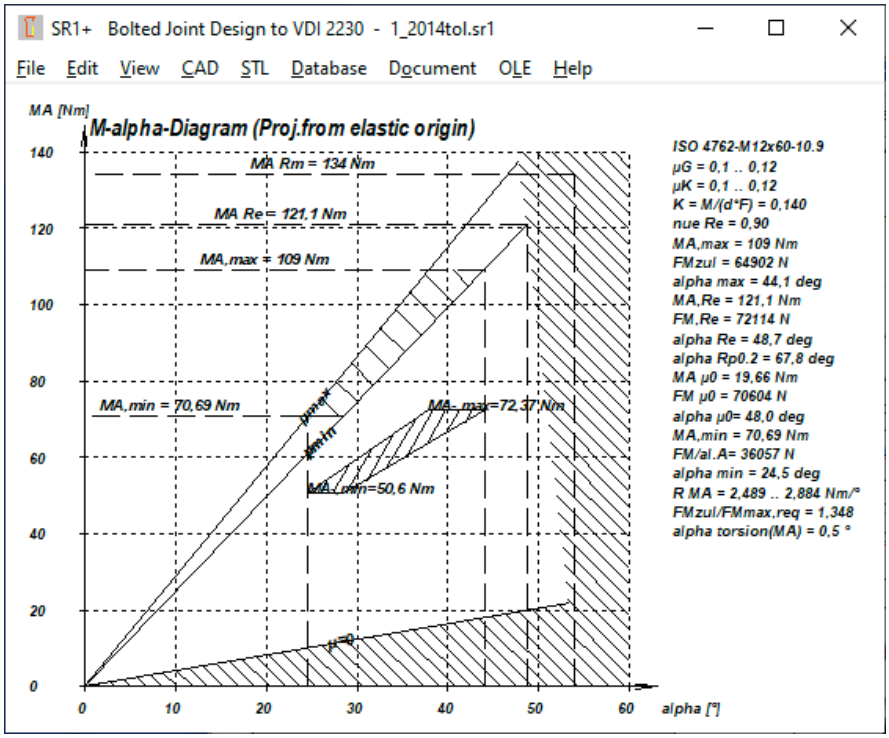
MA- = MK + MGfriction - MP

or

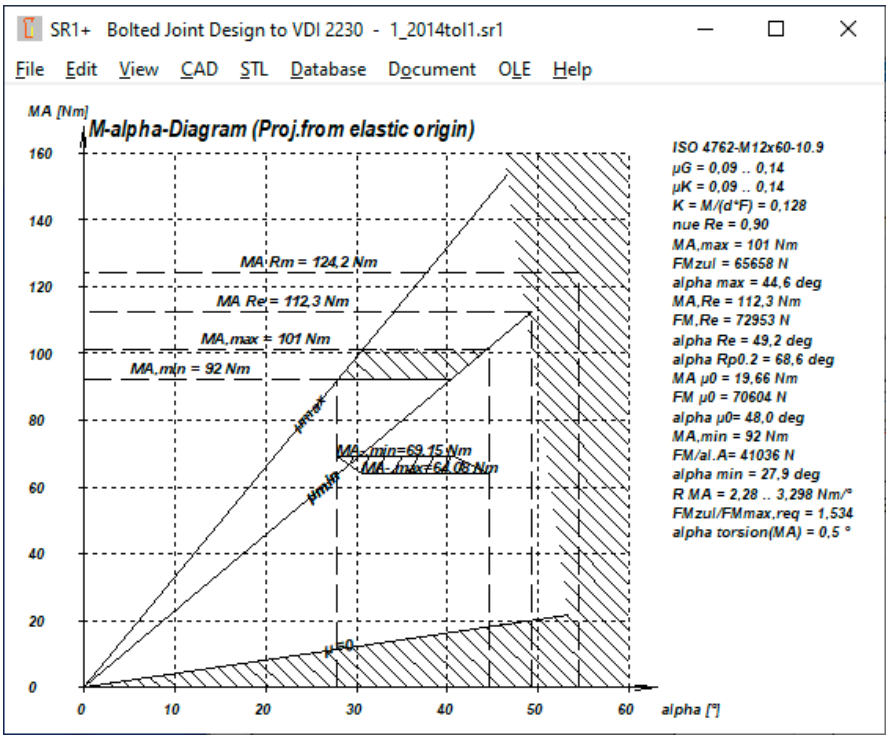
MA- = MA – 2 * MP.

(with MK + MGfriction = MA - MP)

MP(max) relates to the maximum clamping force FMzul at an alphamax angle of rotation. For alphamin, MPmin=MPmax/alphaA. The loosening torque is MA-,max = MA,max - 2*MPmax and MA-,min = MA,min - 2*MPmin.
If a tolerance is defined for the friction, there is a tolerance field for the tightening torque as well as for the loosening torque.



If there is a large friction tolerance and a small tightening torque tolerance, MA-,min can also be greater than MA-,max.



SR1+: Share of head friction, thread friction, thread pitch in the tightening torque
The share of head friction MK and thread torque MG in the tightening torque MA(max) have beeen added to the printout (MA=MK+MG).
The thread torque is made up of thread friction and thread pitch (MG=MP+MGfriction)

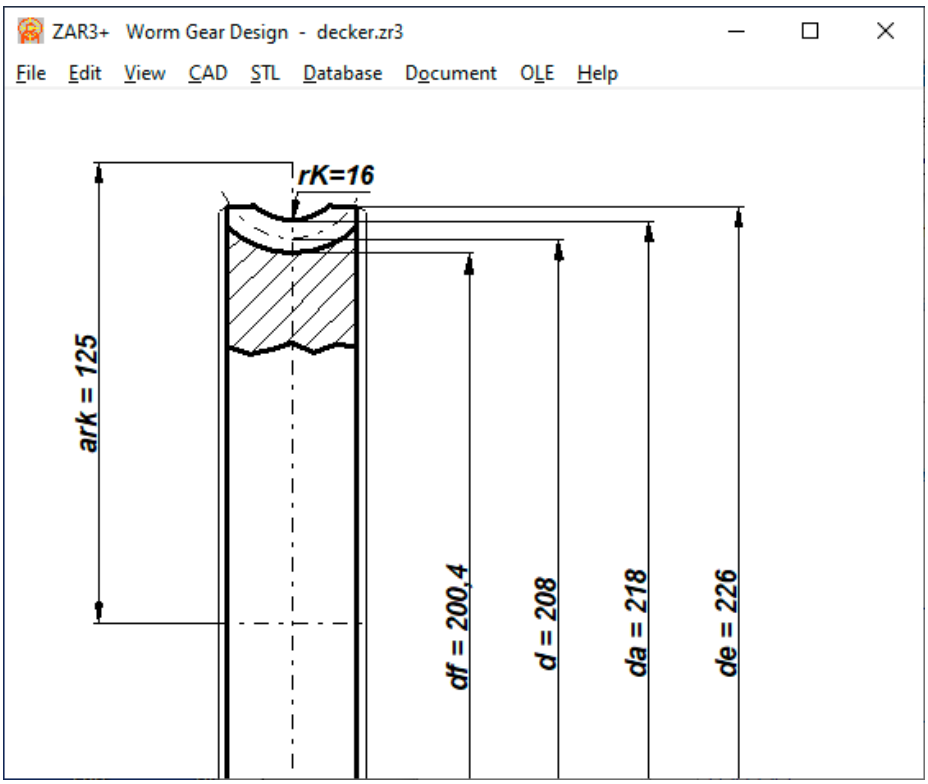
ASSEMBLY (tightening torque)			
Yield point tightening factor	nue Re		0,90
Tightening factor	alpha A		1,80
Dispersion of assembly load	Tol FM	%	28,6
tightening procedure: bolt driven			
Tightening torque MA	MA,max	Nm	109
Tightening torque	MA,min	Nm	60,56
Tightening torque	MA,nom	Nm	84,78
Tolerance tightening torque	Tol MA	%	28,6
Loosening torque (al.max)	***MA-,max***	***Nm***	***72,37***
Loosening torque (al.min)	***MA-,min***	***Nm***	***40,47***
Tightening torque f yield point	MA,Re	Nm	121,1
Tightening torque fracture	MA,Rm	Nm	134
Tightening angle	al.max	deg	44,1
Tightening angle	al.min	deg	24,5
Rate for tightening torque min	RMAmin	Nm/deg	2,489
Rate for tightening torque max	RMAmax	Nm/deg	2,47
Rate for prestressing load	R FM	N/deg	1471
Torsion bolt at MA,max	al.tors	deg	0,5
Head friction torque MK=46% MA	***MK***	***Nm***	***49,86***
Thread torque MG=54% MA	***MG***	***Nm***	***58,79***
Pitch torque MP=31% MG	***MP***	***Nm***	***18,08***
Thread friction torque MGf=69% MG	***MGf***	***Nm***	***40,72***
Mean friction diameter (B)	dkm	mm	15,37

Overview of spline standards (www.hexagon.de/splines.htm)
Since there is always a question as to which software is suitable for which standard, an overview has been created. If there is no special software for the standard you are looking for, you can at least calculate the tooth profile with WNXE for involute tooth flanks or WNXK for serrations with straight tooth flanks (or ZARXP for gears). With WNXE, WNXK and ZARXP, however, you first have to look up the most important dimensions in the standard, while with the other programs you simply select the size and tolerance zone.

Spline Standards

Standard	Spline Type	Note	Software
ISO 4156	Involute Splines	2021	WN5
ISO 14	Straight Sided Splines	1986	WN9
ISO 500	Straight Sided Splines	DIN 9611	WN9
ANSI B92.1	Involute Splines	1996	WN4
ANSI B92.2M	Involute Splines	ISO 4156	WN5
DIN 5480	Involute Splines	2006	WN2
DIN 5481	Serration Splines	2019	WN8
DIN 5482	Involute Splines	1973, withdrawn	WN10
DIN 9611	Straight Sided Splines	ISO 500	WN9
SAE J498	Involute Splines	ANSI B92.1	WN4
BS 3550	Involute Splines	ANSI B92.1	WN4
BS 6186	Involute Splines	ISO 4156	WN5
E22-141	Involute Splines	155, 20 deg	WNXE
E22-144	Involute Splines	ISO 4156	WN5
E22-145	Involute Splines	ISO 4156	WN5
JIS B 1602	Involute Splines	1961, 45 deg	WNXE
JIS B 1603	Involute Splines	ISO 4156:1981, D2001	WNXE
JIS D 2001	Involute Splines	1959, withdrawn	WNXE

ZAR3: Center distance „a rk“
The distance between the center of the wheel and the fillet radius is now dimensioned in the production drawing.



HEXAGON PRICE LIST 2022-07-01

Base price for single licences (perpetual)	EUR
DI1 Version 2.2 O-Ring Seal Software	190.-
DXF-Manager Version 9.1	383.-
DXFPLOT V 3.2	123.-
FED1+ V31.4 Helical Compression Springs incl. spring database, animation, relax., 3D,..	695.-
FED2+ V22.1 Helical Extension Springs incl. Spring database, animation, relaxation, ...	675.-
FED3+ V21.6 Helical Torsion Springs incl. prod.drawing, animation, 3D, rectang.wire, ...	600.-
FED4 Version 8.0 Disk Springs	430.-
FED5 Version 17.0 Conical Compression Springs	741.-
FED6 Version 18.0 Nonlinear Cylindrical Compression Springs	634.-
FED7 Version 15.0 Nonlinear Compression Springs	660.-
FED8 Version 7.4 Torsion Bar	317.-
FED9+ Version 7.0 Spiral Spring incl. production drawing, animation, Quick input	490.-
FED10 Version 4.5 Leaf Spring	500.-
FED11 Version 3.6 Spring Lock and Bushing	210.-
FED12 Version 2.7 Elastomer Compression Spring	220.-
FED13 Version 4.3 Wave Spring Washers	228.-
FED14 Version 2.7 Helical Wave Spring	395.-
FED15 Version 1.7 Leaf Spring (simple)	180.-
FED16 Version 1.4 Constant Force Spring	225.-
FED17 Version 2.1 Magazine Spring	725.-
FED19 Version 1.0 Buffer Spring	620.-
GEO1+ V7.5 Cross Section Calculation incl. profile database	294.-
GEO2 V3.3 Rotation Bodies	194.-
GEO3 V4.0 Hertzian Pressure	205.-
GEO4 V5.3 Cam Software	265.-
GEO5 V1.0 Geneva Drive Mechanism Software	218.-
GEO6 V1.0 Pinch Roll Overrunning Clutch Software	232.-
GEO7 V1.0 Internal Geneva Drive Mechanism Software	219.-
GR1 V2.2 Gear construction kit software	185.-
GR2 V1.2 Eccentric Gear software	550,-
HPGL-Manager Version 9.1	383.-
LG1 V7.0 Roll-Contact Bearings	296.-
LG2 V3.1 Hydrodynamic Plain Journal Bearings	460.-
SR1 V24.4 Bolted Joint Design	640.-
SR1+ V24.4 Bolted Joint Design incl. Flange calculation	750.-
TOL1 V12.0 Tolerance Analysis	506.-
TOL2 Version 4.1 Tolerance Analysis	495.-
TOLPASS V4.1 Library for ISO tolerances	107.-
TR1 V6.4 Girder Calculation	757.-
WL1+ V21.8 Shaft Calculation incl. Roll-contact Bearings	945.-
WN1 V12.4 Cylindrical and Conical Press Fits	485.-
WN2 V11.2 Involute Splines to DIN 5480	250.-
WN2+ V11.2 Involute Splines to DIN 5480 and non-standard involute splines	380.-
WN3 V 6.0 Parallel Key Joints to DIN 6885, ANSI B17.1, DIN 6892	245.-
WN4 V 6.1 Involute Splines to ANSI B 92.1	276.-
WN5 V 6.1 Involute Splines to ISO 4156 and ANSI B 92.2 M	255.-
WN6 V 4.1 Polygon Profiles P3G to DIN 32711	180.-
WN7 V 4.1 Polygon Profiles P4C to DIN 32712	175.-
WN8 V 2.6 Serration to DIN 5481	195.-
WN9 V 2.4 Spline Shafts to DIN ISO 14	170.-
WN10 V 4.4 Involute Splines to DIN 5482	260.-
WN11 V 2.0 Woodruff Key Joints	240.-
WN12 V 1.2 Face Splines	256.-
WN13 V 1.0 Polygon Profiles PnG	238.-
WN14 V 1.0 Polygon Profiles PnC	236.-
WNXE V 2.3 Involute Splines – dimensions, graphic, measure	375.-
WNXK V 2.2 Serration Splines – dimensions, graphic, measure	230.-
WST1 V 10.2 Material Database	235.-
ZAR1+ V 26.7 Spur and Helical Gears	1115.-

ZAR2 V8.2 Spiral Bevel Gears to Klingelnberg	792.-
ZAR3+ V10.5 Cylindrical Worm Gears	620.-
ZAR4 V6.3 Non-circular Spur Gears	1610.-
ZAR5 V12.4 Planetary Gears	1355.-
ZAR6 V4.3 Straight/Helical/Spiral Bevel Gears	585.-
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ZAR8 V1.9 Ravigneaux Planetary Gears	1950.-
ZAR9 V1.0 Cross-Helical Screw Gears	650.-
ZARXP V2.6 Involute Profiles - dimensions, graphic, measure	275.-
ZAR1W V2.6 Gear Wheel Dimensions, tolerances, measure	450.-
ZM1.V3.0 Chain Gear Design	326.-
ZM2.V1.0 Pin Rack Drive Design	320.-
ZM3.V1.0 Synchronous Belt Drive Design	224.-

PACKAGES	**EUR**
HEXAGON Mechanical Engineering Package (TOL1, ZAR1+, ZAR2, ZAR3+, ZAR5, ZAR6, WL1+, WN1, WN2+, WN3, WST1, SR1+, FED1+, FED2+, FED3+, FED4, ZARXP, TOLPASS, LG1, DXFPLOT, GEO1+, TOL2, GEO2, GEO3, ZM1, ZM3, WN6, WN7, LG2, FED12, FED13, WN8, WN9, WN11, DI1, FED15, GR1)	8,500.-
HEXAGON Mechanical Engineering Base Package (ZAR1+, ZAR3+, ZAR5, ZAR6, WL1+, WN1, WST1, SR1+, FED1,+, FED2+, FED3+)	4,900.-
HEXAGON Spur Gear Package (ZAR1+ and ZAR5)	1,585.-
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HEXAGON Graphic Package (DXF-Manager, HPGL-Manager, DXFPLOT)	741.-
HEXAGON Helical Spring Package (FED1+, FED2+, FED3+, FED5, FED6, FED7)	2,550.-
HEXAGON Complete Spring Package (FED1+, FED2+, FED3+, FED4, FED5, FED6, FED7, FED8, FED9+, FED10, FED11, FED12, FED13, FED14,, FED15, FED16, FED17)	4,985.-
HEXAGON Tolerance Package (TOL1, TOL1CON, TOL2, TOLPASS)	945.-
HEXAGON Complete Package (All Programs)	14,950.-

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Discount %	25%	27.5%	30%	32.5%	35%	37.5%	40%	42.5%	45%

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- **Italiano**: FED1+, FED2+, FED3+, FED4, FED5, FED6, FED7, FED9+, FED13, FED14, FED17.
- **Swedish**: FED1+, FED2+, FED3+, FED5, FED6, FED7.
- **Portugues**: FED1+, FED17
- **Spanish**: FED1+, FED2+, FED3+, FED17

Updates:

Software Update (software Win32/64 + pdf manual)	40 EUR
Software Update (software 64-bit Win + pdf manual)	50 EUR

Update Mechanical Engineering Package: 800 EUR, Update Complete Package: 1200 EUR
Maintenance contract for free updates: annual fee: 150 EUR + 40 EUR per program

Hexagon Software Network Licenses

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Conditions of payment: bank transfer in advance with 2% discount, or PayPal (paypal.me/hexagoninfo) net.
After installation, software has to be released by key code. Key codes will be sent after receipt of payment.
Fee for additional key codes: 40 EUR

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