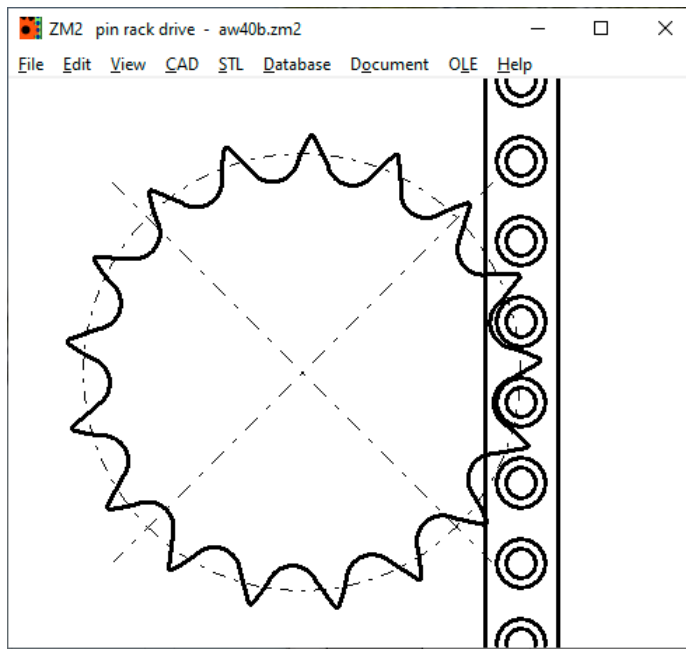


by Fritz Ruoss

ZM2 Software for pin rack drives



ZM2 is a new software for calculating pin rack gears. A pin rack is a simple rack with bolts welded in between two metal sheets (instead of involute teeth). The drive wheel is a sprocket according to ISO 606 or DIN 8187/8188. The dimensions can be selected from the database or you can define special dimensions yourself. The dimensions of the pin rack correspond to the dimensions of the corresponding chain. As an alternative to a pin rack, a chain can be clamped in linear fashion. The sprocket for the rack toothing must be a little thinner than for a chain drive. Because of this, and above all because there is usually only one tooth in mesh with the pin rack, the strength and hardness of the sprocket must be higher than when used as a chain sprocket. ZM2 calculates Hertzian pressure between the pin rack and the sprocket as well as the shear stress and pressure of the pin and the pin rack.

ZM2 pin rack drive - aw40b.zm2

File Edit View CAD STL Database Document OLE Help

sprocket 1 72B-1 - ISO 606 bff= 55,5			
no. of teeth	z		17
pitch	p	in.	4,500"
roller diameter	d1	in.	2,850"
face width	bff	mm	54,76 .. 55,5
pitch diameter	d	mm	622,042
root diameter	d1	mm	549,2 .. 549,7
pitch angle	tau	°	21,18
tip diameter	da	mm	674,7 .. 692,5
diameter groove	dg	mm	489,7 .. 500,7
roller root radius	ri	mm	36,56 .. 36,84
tooth flank radius	re	mm	165 .. 271,6
tooth chamfer radius	rx	mm	>=114,3
chamfer	ba	mm	14,29
tooth chamfer radius	ra	mm	0,5 .. 6
roller root angle	alpha	°	114,7 .. 134,7
flank angle	gamma	°	12,06 .. 22,06

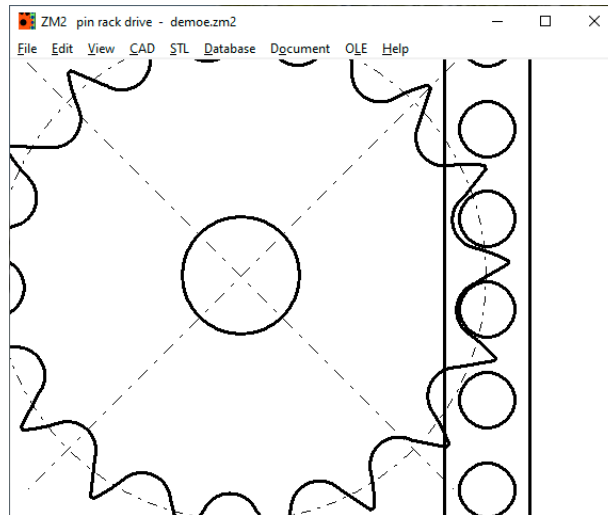
pin rack 2			
no. of teeth	z		17
pitch	p	mm	114,300
pin diameter	d1	mm	72,390
bolt diameter	d2	mm	44,480
face width	b1	mm	68,58
plate thickness	s	mm	16,00
pin rack height	h2	mm	103,60
pin rack length	lts	mm	1943,1
pin rack width	bts	mm	100,6

driving, load, safety		
P	kW	0,550
T	Nm	25010
n	1/min	0,21
a	mm	311,02
v	m/min	0,41
Ft	N	80413
KA		2
Fmax	N	160825
Fu chain	N	310777
tau d2	MPa	103
hole softt	MPa	113
p Hertz	MPa	1379
S B	Fu / Ft	3,86
S D	Fu / Fmax	1,93

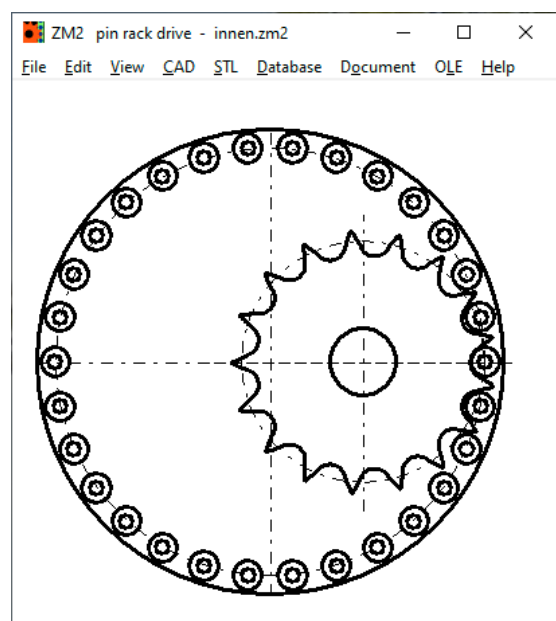
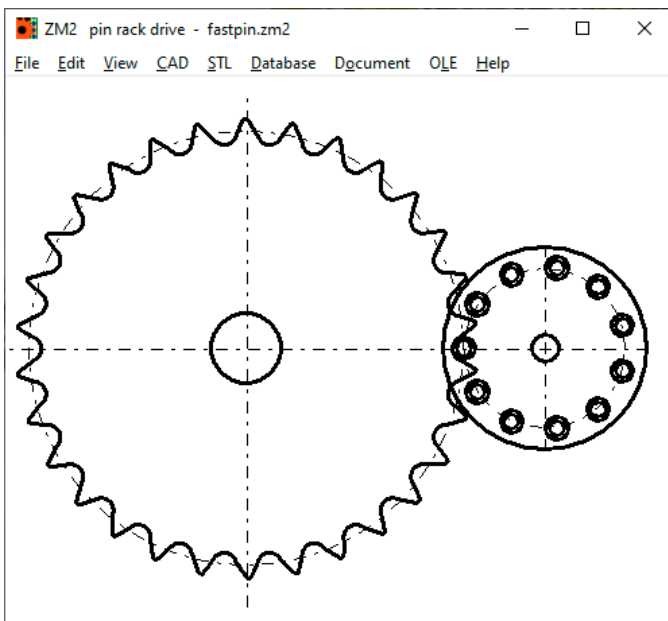
Error : SB < 7.1 (3,9)

Error : SD < 5.1 (1,9)

An animation can be used to simulate the rotation of the sprocket and the linear movement of the pin rack on the screen.



With ZM2 you can also calculate a gear with a pin wheel (pins on a bolt circle) instead of a pin rack.



The pin wheel can be an external gear wheel or an internal gear wheel. For the internal gear, the number of bolts is entered as negative (analogous to the negative number of teeth on a ring gear). ZM2 is now available for delivery at a price of 320 euros.

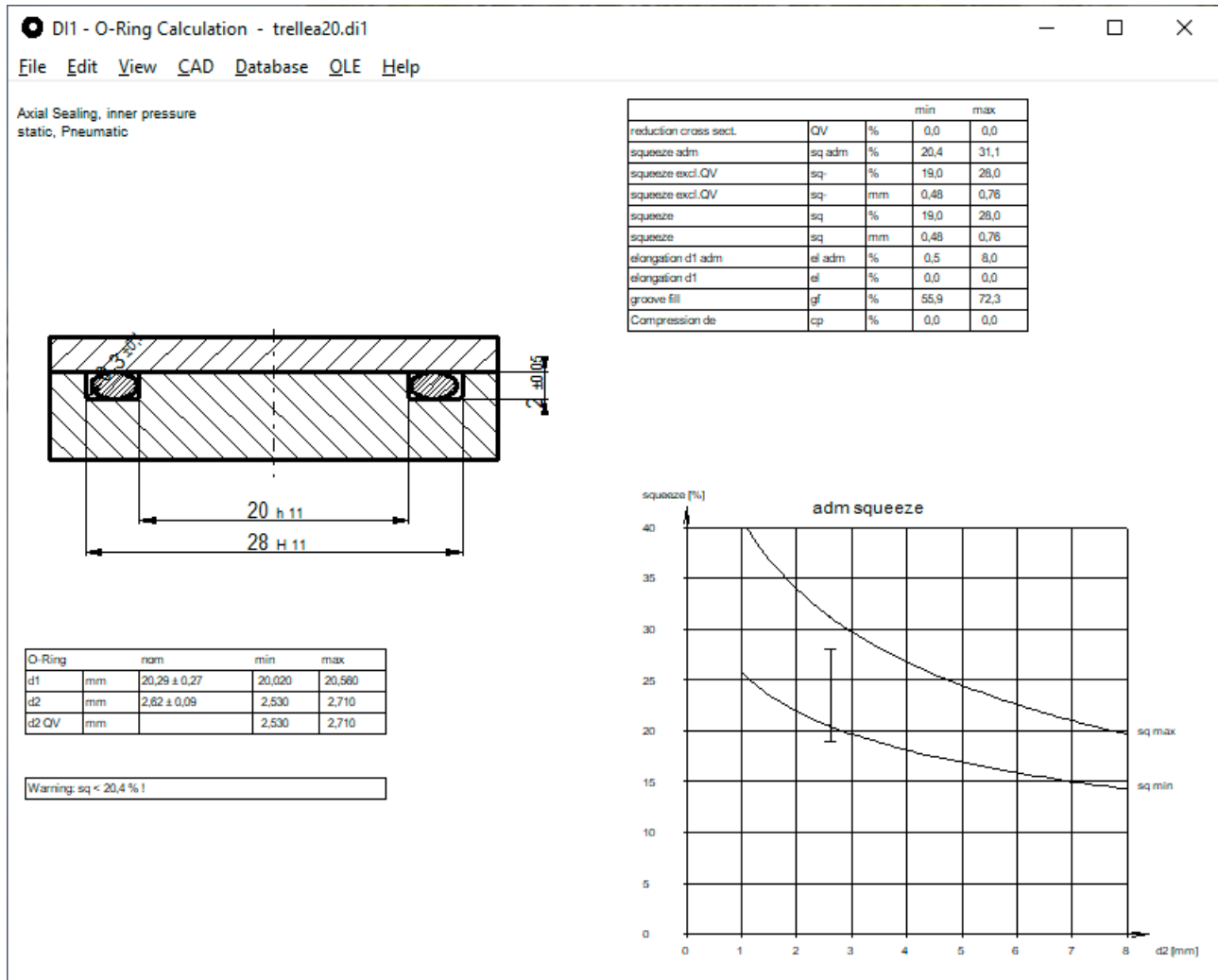
ZM1, ZM2: breaking force FB of chain

There are no material data for ZM1, the safety is calculated from the breaking force of the chain. If the shear stress of the pin of a chain link is calculated from this, the values are quite high: With $\tau_B = FB / (Ad_2)$, values of up to 750 MPa result. This must be taken into account when selecting the material for the bolts or journals for fuel gearing.

As a rule, no rollers are used for the headstock, with continuous bolts the bolt diameter d_2 can be set equal to the roller diameter. This roughly halves the maximum shear stress of the bolts to a tolerable value.

DI1: Quick3 View

In the Quick3 view, the stretched cord diameter has been added to the cross-section reduction by stretching as well as the squeeze if stretched or not in mm.

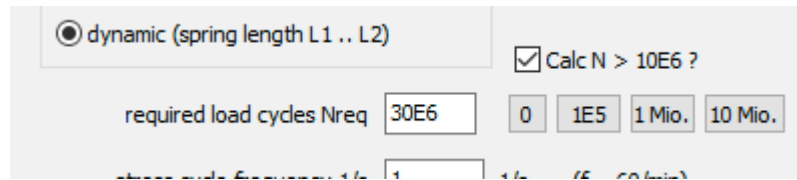


Groove volume min / max, O-ring volume min / max and O-ring weight have been added to the printout.

DI1: stretch and compression of O-ring, error in the axial sealing application

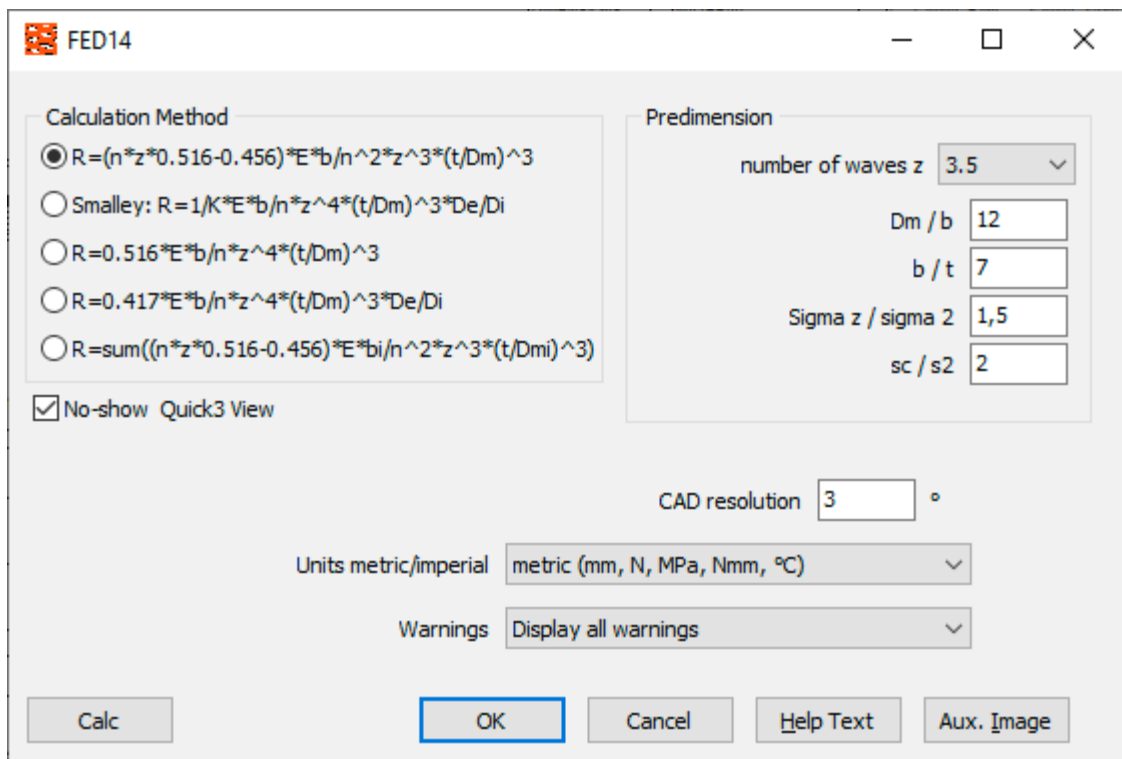
When an O-ring is pulled onto a piston or stretched in the groove, its cord diameter is reduced. When the O-ring is compressed, however, its cord diameter does not increase, instead it finds its place in the groove. In the case of axial sealing, DI1 incorrectly calculated increased cord diameter by negative stretching if the inside diameter of the groove was smaller than the inside diameter of the O-ring. This resulted in too high values for the squeeze. If the O-ring is compressed, it seeks its place in the groove. Therefore, the groove filling is no longer calculated from the O-ring cross-section and the groove cross-section, but from the O-ring volume and the groove volume. If this error occurs with your DI1 software, please report. You will immediately receive a free update to the latest version.

FED1+ 2+ 3+ 5 6 7 8 17: Load cycles required for fatigue strength safety



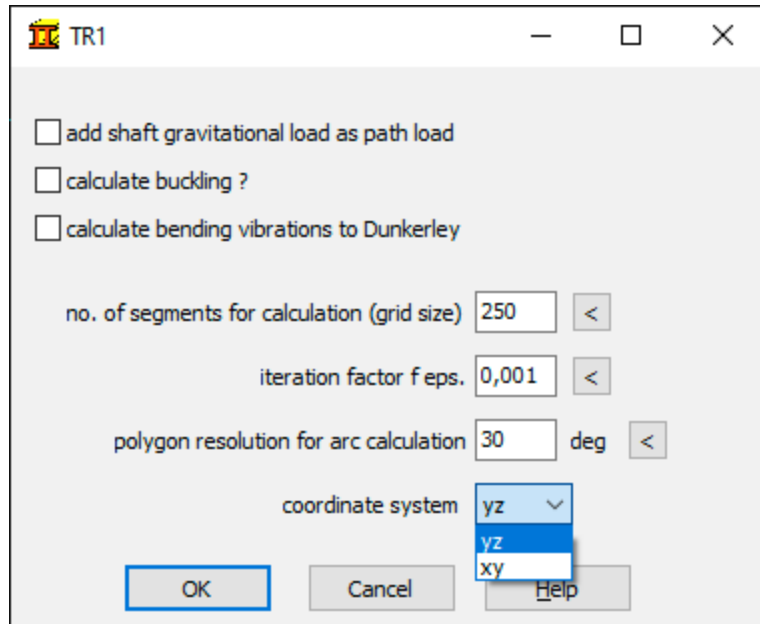
For some time now it has been possible to enter the required number of load cycles. The only purpose of this is to compare the calculated number of load cycles with the required number and to output an error message if it is exceeded. The spring is fatigue safe with 10 million load cycles. What happens now if you enter more than 10 million load cycles required? So far, a lower permissible stress variation has also been calculated from this, which provides additional safety. But if you assume that the spring, if it can withstand $1E7$ load cycles, can also withstand an infinite number of load cycles, then it does not matter whether you enter 10 million load cycles or 10 billion load cycles. In the new versions there is now an option “Calc Nreq > 10E6?”, Then a virtual number of load cycles is calculated beyond $1E7$, this is an additional safety compared with $1E7$ cycles. Otherwise it is assumed that the spring can withstand an infinite number of load cycles if it can withstand at least 10 million load cycles.

FED14: No-Show Calculation Formula



Because there is no binding standard for calculating helical wave springs, you can choose between different calculation methods: as a flat wave strip with different methods for taking the coil diameter into account, or with formulas and table values according to Smalley. The display of the calculation formula in the Quick3 view can now be switched off. Useful when forwarding the Quick3 printout, for example from the spring manufacturer to the customer, in order to avoid queries.

GEO1, TR1: Switching between yz and xy coordinate systems



When calculating the beam, the beam length is usually defined in the x direction and the cross section of the beam in yz coordinates. If you get confused when entering the cross-section coordinates y / z because you are used to x / y coordinates, you can now switch to the xy coordinate system.

The screenshot shows the TR1 dialog box with the coordinate system set to yz. The table below shows the beam data for 18 segments.

i	y [mm]	z [mm]	phi [°]
1	0	-21	0
2	1,039	-21	82,05
3	4,901	-17,64	0
4	6,627	-5,309	-82,05
5	10,49	-1,95	0
6	69,51	-1,95	-82,05
7	73,37	-5,309	0
8	75,10	-17,64	82,05
9	78,96	-21	0
10	80	-21	0
11	80	21	0
12	78,96	21	82,05
13	75,10	17,64	0
14	73,37	5,309	-82,05
15	69,51	1,95	0
16	10,49	1,95	-82,05
17	6,627	5,309	0
18	4,901	17,64	82,05

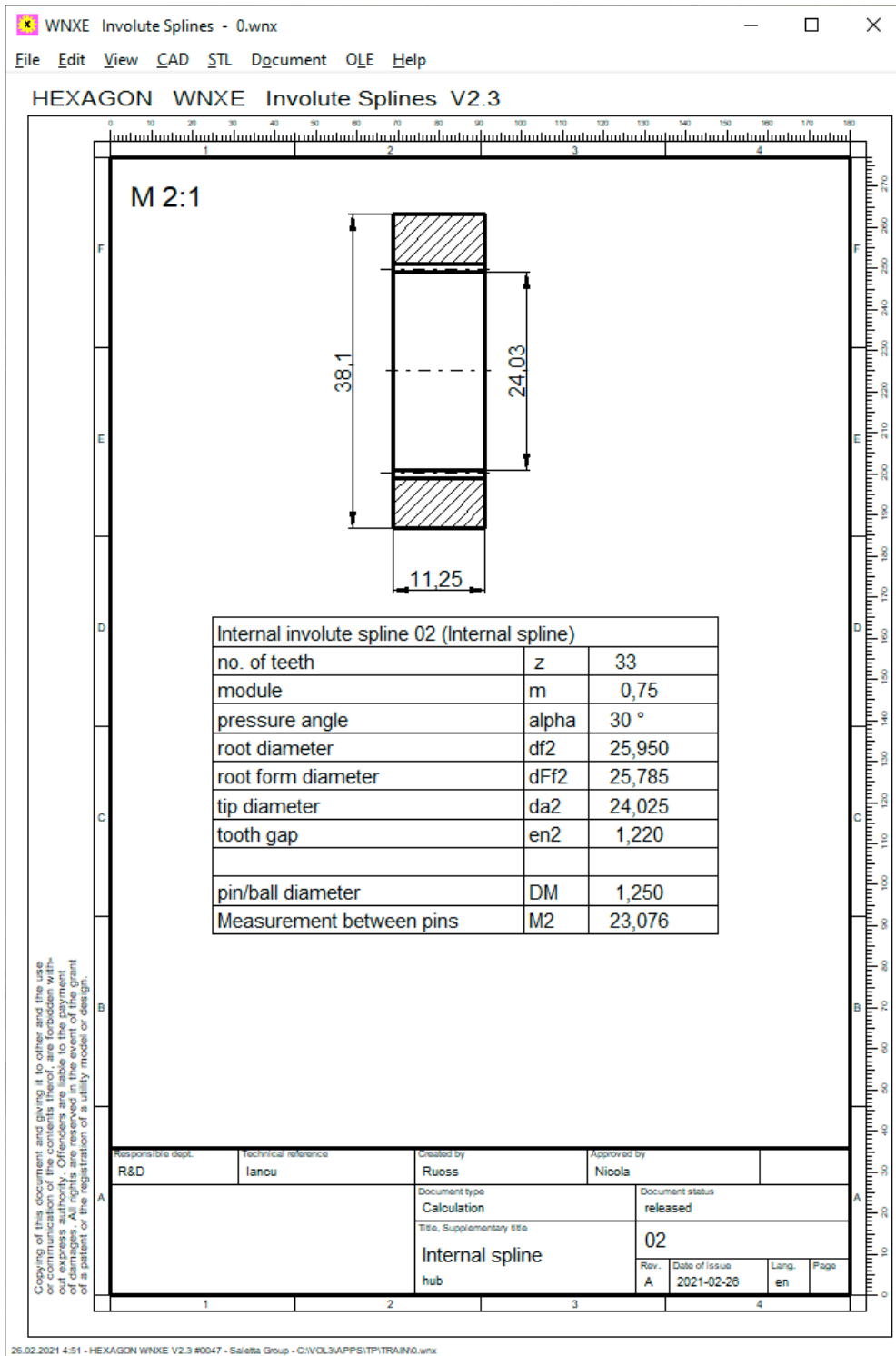
Buttons: OK, Cancel, Aux. Image, Help Text

The screenshot shows the TR1 dialog box with the coordinate system set to xy. The table below shows the beam data for 18 segments.

i	x [mm]	y [mm]	phi [°]
1	0	-21	0
2	1,039	-21	82,05
3	4,901	-17,64	0
4	6,627	-5,309	-82,05
5	10,49	-1,95	0
6	69,51	-1,95	-82,05
7	73,37	-5,309	0
8	75,10	-17,64	82,05
9	78,96	-21	0
10	80	-21	0
11	80	21	0
12	78,96	21	82,05
13	75,10	17,64	0
14	73,37	5,309	-82,05
15	69,51	1,95	0
16	10,49	1,95	-82,05
17	6,627	5,309	0
18	4,901	17,64	82,05

Buttons: OK, Cancel, Aux. Image, Help Text

WNXK, WNXE: inner diameter of the shaft and outer diameter of the hub If you have entered the inner diameter of the shaft and the outer diameter of the hub, these are now drawn in and dimensioned in the production drawing.

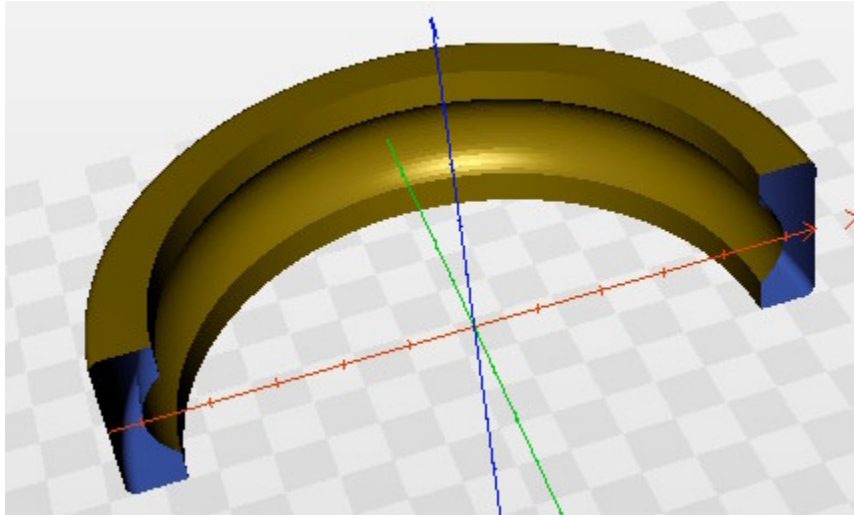


SR1: Database material plates / nuts: Brass and bronze added

CuZn39Pb3F50, G-CuSn12Pb and CuSn6 R980 have been added at the pressing.dbf material database for clamping plates and nuts.

GEO2: STL half-section

A 3D model of the calculated rotationally symmetrical body can be printed out in half-section. Helpful for the quick production of cutaway models with a 3D printer.



Corona currently in January / February 2021

When authorities buy ...

.. then it usually becomes more expensive and takes longer. Although the EU was the first to order large-scale orders from Biontech, it is the last to be delivered. After 2 months, less than 1% of the ordered quantity has been delivered. There is criticism from all sides that too little was ordered. This criticism is completely unjustified, rather too much and hastily ordered. The delivery date is the problem. But the EU is actually still doing what the smart Biontech boss recommends: order more. Another 300,000,000 vaccination doses for > 3,000,000,000 euros. The EU president proudly announces that the EU can now make 80% of all residents happy with a Biontech corona vaccination. And another 300 million doses have been ordered from Curevac. And from Moderna. And from AstraZeneca. And from Sogefi. And from Johnson & Johnson. AstraZeneca tried the same trick, but instead of reordering, they were criticized. Others ordered fewer and later and received their goods earlier. But: It was of no use to the State of Israel to snatch the first vaccines produced from other countries. When vaccination started in December 2020, the number of new infections in Israel rose exponentially. The 7-day incidence has only declined since the airports were closed. But still over 200 (270 on February 22nd, 2021), the same as when the vaccination started on December 27th, 2020.

Contergan - aftermath

Every drug has side effects. Many are not discovered until much later, for example cancer or damage to the genetic make-up. The harmless sedative “Contergan” was considered to be particularly safe in terms of side effects. Only after 9 months did the side effects come to day light. It took another 3 years until thalidomide was identified as the cause of the malformations in newborns.

When authorities hand out gifts ...

..then give a voucher to pick up a gift for a nominal fee.

In Corona times, everyone buys online to avoid contact. Only the German federal government is sending millions of citizens at risk of corona to the pharmacies to pick up 6 protective masks and to put 2 euros on the table. It would have been smarter to put the 6 paper masks in the envelope instead of a forgery-proof voucher.

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