by Fritz Ruoss

FED2+, FED3+: Compare spring material

As in FED1 +, you can now choose the optimal material for tension springs and torsion springs by comparing the materials from the database.

Select the material with a mouse click or the cursor keys, then the spring is recalculated and the results are displayed in the background graphic. In the table you can compare the materials based on the safety factors S k2 = tauz / tauk2 and S kh = tauhz / (tauk2-tauk1).
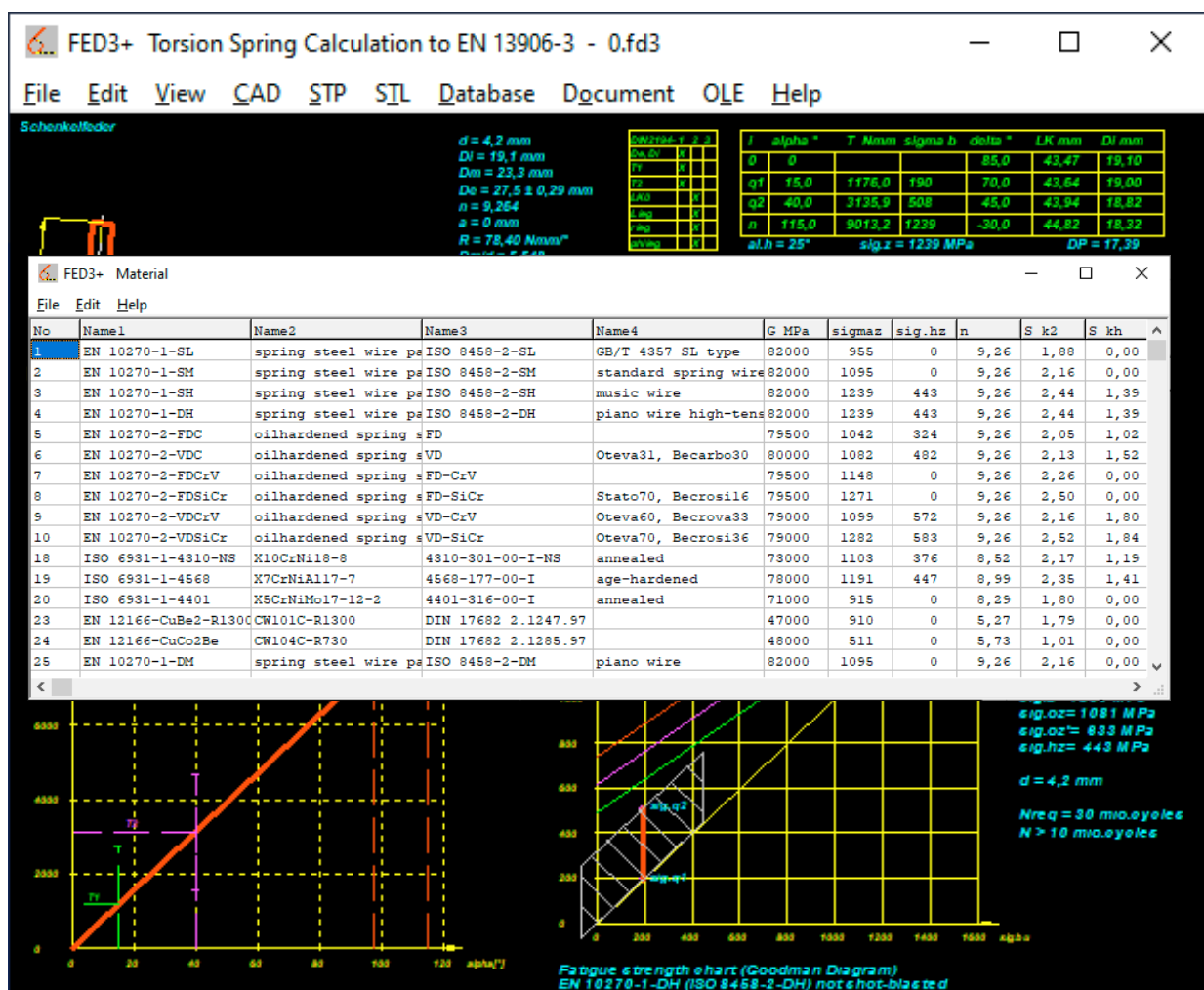
WL1 +: Calculation of shafts on three, four or five bearings

The calculation of shafts with three, four or five bearings now runs faster and the message "Final value C not reached" no longer appears because the accuracy was limited to a minimum of 0.0001mm. This mainly applies to shafts with zero deflection in either xy plane or xz plane.

LG1: Axial needle roller and cage assemblies and axial cylindrical roller bearings
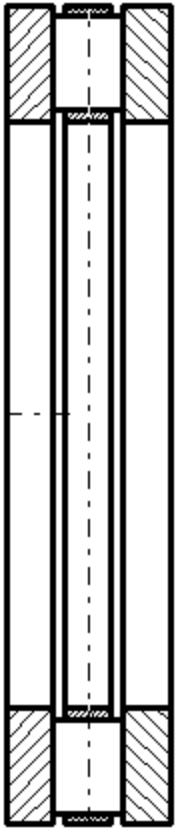
NAME	DC1	D1	DC	KD1	T	DW	B	AR	EB
K81110-TV	50	52	70	70	14	6	4	0,6	52
K81210-TV	50	52	78	78	22	9	6,5	1	53
K89310-TV	50	52	95	95	27	8	9,5	1,1	56
K81111-TV	55	57	78	78	16	6	5	0,6	57
K81211-TV	55	57	90	90	25	11	7	1	59
K89311-TV	55	57	105	105	30	9	10,5	1,1	61
K81112-TV	60	62	85	85	17	7,5	4,8	1	62
K81212-TV	60	62	95	95	26	11	7,5	1	64
K89312-TV	60	62	110	110	30	9	10,5	1,1	66
K89412-TV	60	62	130	130	42	14	14	1,5	65
K81113-TV	65	67	90	90	18	7,5	5,3	1	67
K81213-TV	65	67	100	100	27	11	8	1	69
K89313-TV	65	67	115	115	30	9	10,5	1,1	71
K89413-TV	65	68	140	140	45	15	15	2	70
K81114-TV	70	72	95	95	18	7,5	5,3	1	72
K81214-TV	70	72	105	105	27	11	8	1	74
K89314-TV	70	72	125	125	34	10	12	1,1	76

With LG1 you can now also calculate axial bearings: Axial needle roller and cage assemblies and axial cylindrical roller bearings have been added.

BEARING SPECS for Axial cyl.roller bearing K81110-TV			
Borehole diameter	d	mm	50,000
Outer diameter	D	mm	70,000
Bearing width	B	mm	14,000
Basic load rating dynamic	C	N	61000
Basic load rating static	C0	N	177000
Intrinsic fatigue resistance	Cu	N	17400
Diameter roller	DW	mm	6,000

| OPERATING DATA Axial cyl.roller bearing K81110-TV			
Rot. speed	n	1/min	250
Operat.temperature	theta	°C	50
Nominal viscosity at 40°C	nue n	mm²/s	70
Reference viscosity	nue 1	mm²/s	59
Operat.viscosity at 50°C	nue b	mm²/s	43
Life expectancy		%	90
Static equivalent strain	P0	N	50000
Dynamic equivalent strain	P	N	50000
Static safety margin	S0		3,54
Dynamic safety	S		1,22
Life expect. revolutions	L10	1e6	1,94
Life expect. hours	L10h	h	129,4
Lubricat. & material factor	a23		0,58
Life expectancy factor	a1		1,000
Modif. nominal rating life	L10a	1e6	1,12
Modif.nom.rat.life hours	L10ah	h	74,71

## ZAR5, ZAR7, ZAR8: Tooth gap drawing button at input of measuring circle
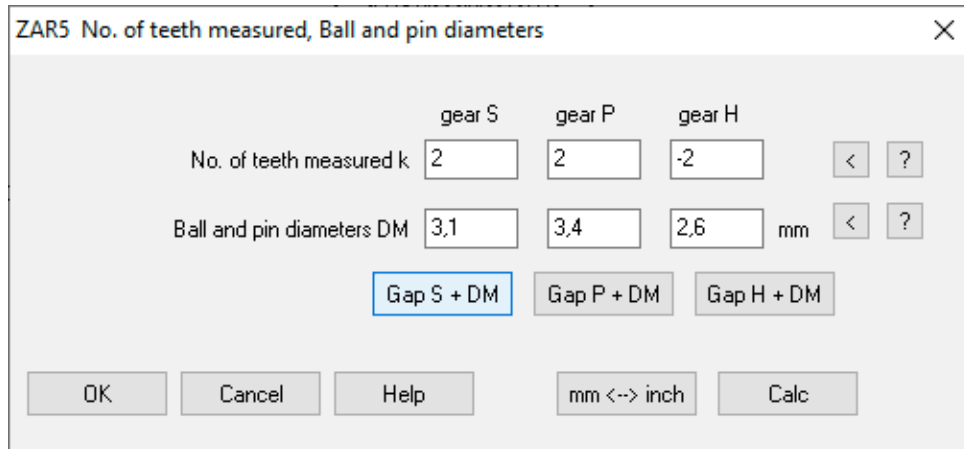
At "Edit Measurement" , a push of the new buttons "Gap" shows a drawing of the tooth gap with measuring circle in the background window for sun gear S, planet gear P, ring gear H.
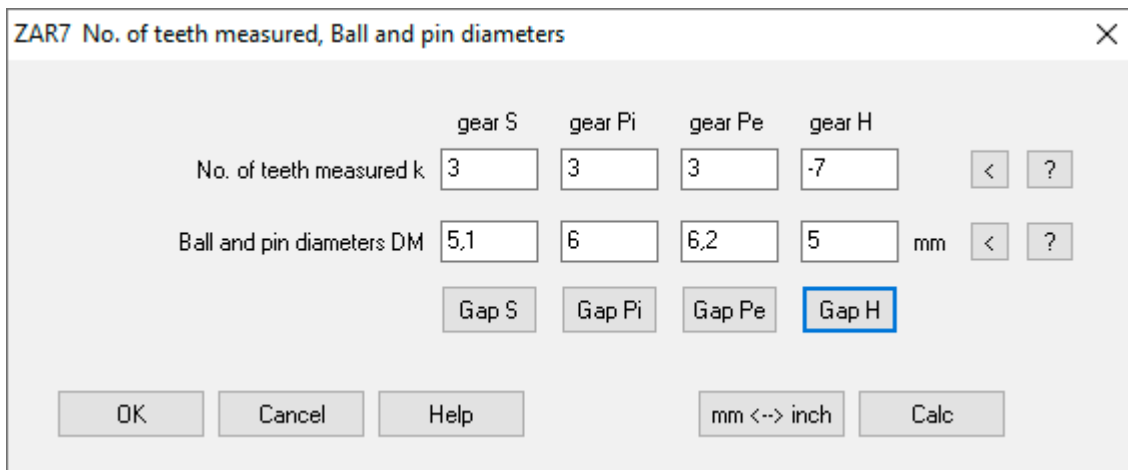
So you can quickly test different ball or pin diameters for suitability.
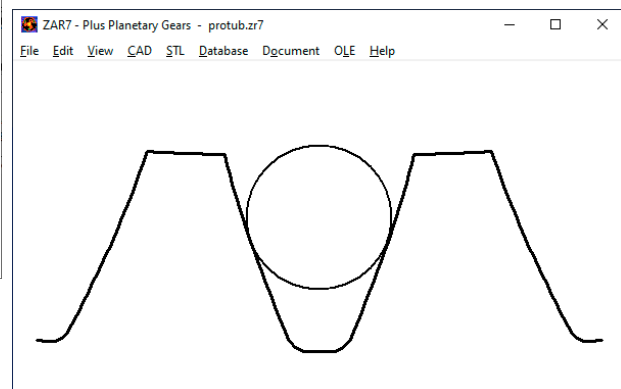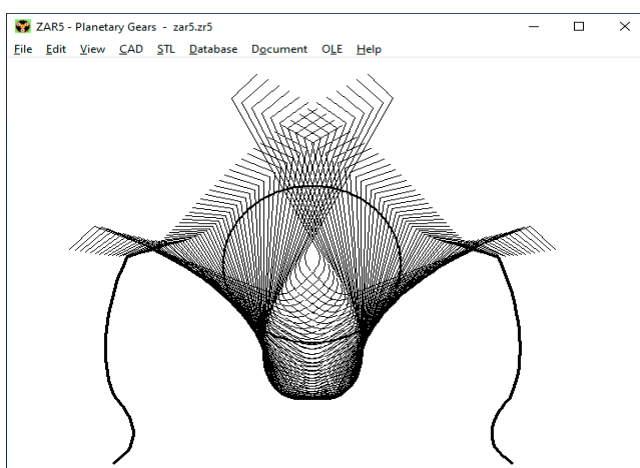
SR1/SR1+: Elastic resilience: consider multiple bore diameters and long holes
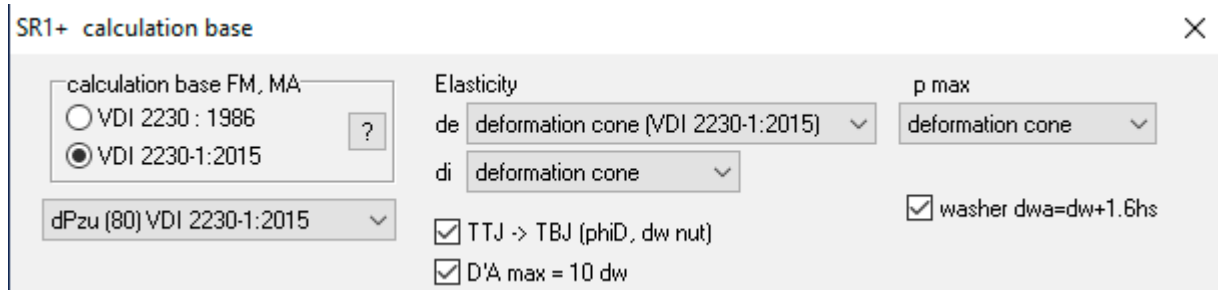
Under "Calculation method" you can now configure "di deformation cone" to calculate the hole in the clamping plates as a cone instead of a cylinder in the case of elastic resilience. If you use clamping plates with standard-compliant bores, this is of no interest, the result always remains the same. The elastic resilience deltaP only changes if several clamping plates with changing inside diameters or elongated holes are used. Instead of the inner diameter of the clamping plate, a cone from the inner contact diameters of the adjacent clamping plates is then used.
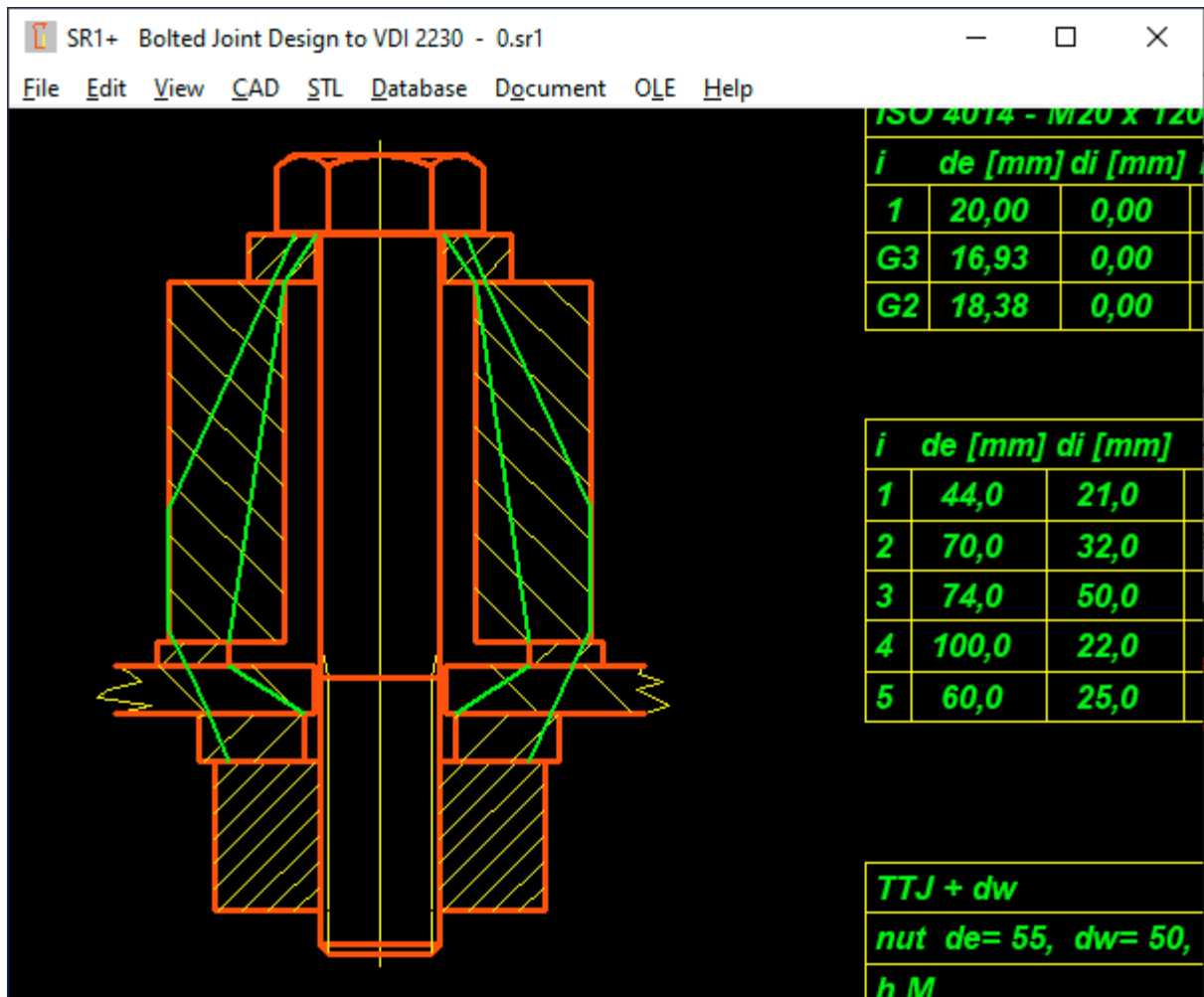
The elastic compliance is calculated as follows:

Cylinder: Delta = L / (E * A) = 4 * L / (E * pi * d²)

Truncated cone: Delta = 4 * L * (1 / dmin - 1 / dmax) / (pi * E * (dmax-dmin))

With L = length, d = diameter, E = modulus of elasticity

If this option is selected, the inner cones are drawn in the drawing of the bolted joint.

SR1 Tip: Tightening angle for combined torque-and-angle controlled tightening

SR1 calculates the tightening angle from the elastic origin to the specified yield strength factor. For example, torque-controlled tightening up to 30% yield point, then further up to 90% yield point under rotation angle control. How large is the angle of rotation from 30% yield point to 90% yield point? Quite simply, SR1 calculates the tightening angle of rotation alphaRe up to the yield point. Then the angle of further rotation is

deltaAlpha = alphaRe * (90% -30%) / 100% = 0.6 * alphaRe

The tightening torque for 30% Re can either be entered, or read off in the M-alpha diagram for alpha = 0.3 * alphaRe (with deviation due to friction tolerance).
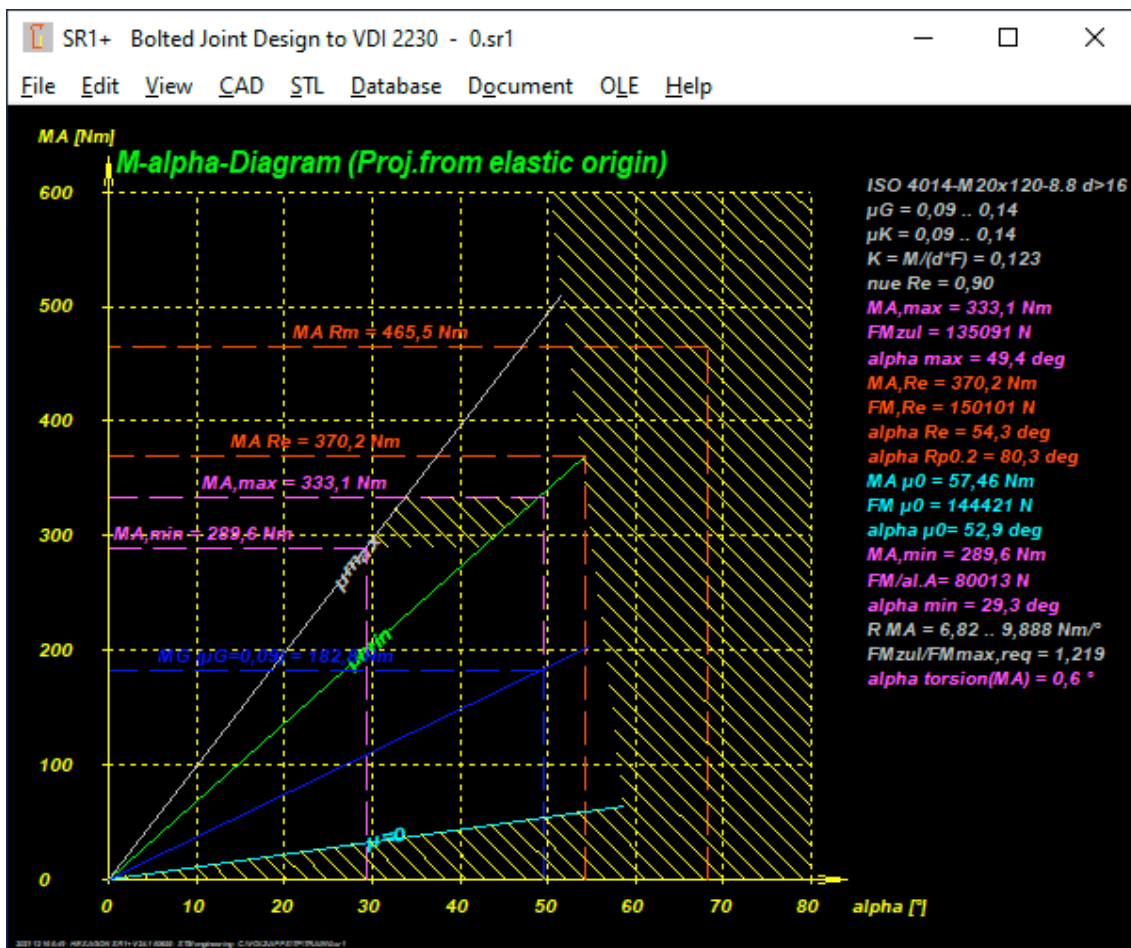
Tip: Bending angle and deflection of leaf springs, girders and shafts

The deflection of leaf springs firmly clamped on one side is calculated with:

$s = F * L^3 / (2 * E * I)$

the bending angle at the free end with

$\tan(alpha) = F * L^2 / (2 * E * I)$

So is

$\tan(alpha) = 3/2 * s / L$

Or the other way around

$s = 2/3 * \tan(alpha) * L$

Independent of the spring width, thickness, material.

Example: If the incline of a 100 mm long leaf spring should not exceed 15 °, the deflection must be less than 17.8 mm.

Grüß Gott im Länd
The green state government of Baden-Württemberg wants to lure people into the state in a ridiculous, multi-million dollar advertising campaign "Welcome to the Länd" in the middle of Corona times. More travelers, more traffic, more CO_2, more pollutants, more traffic jams, more corona. No problem for the GründPä of the Länd. The main thing is that people are vaccinated. Unvaccinated people are not welcome, as accommodation is prohibited. And those who do not immediately disappear will be forcibly vaccinated.

Corona calculations: RKI weekly report from 2021-12-02:
(Table 3, breakthroughs in vaccination, mean 44-47, age 12-99 "cumulative")
Hospitalized COVID-19 cases: 11062, of which vaccinated: 4870, therefore unvaccinated: 6192
Covid-19 cases in intensive care unit: 1721, of which vaccinated: 592, therefore unvaccinated: 1129
Deceased COVID-19 cases: 1441, of which vaccinated: 665, therefore unvaccinated: 776
Calculations:
1129/1721 = 66% of the COVID-19 admissions to the intensive care unit were unvaccinated.
Of the 1129 unvaccinated people in the intensive care unit, 665/1129 = 59% died.
Of the 529 people vaccinated in the intensive care unit, all died (665> 592).

Corona extrapolation with 100% vaccination quota from RKI weekly report of 2021-12-02
With a vaccination rate of 100% there are no more unvaccinated people, but 30/70 = 43% more vaccinated people and correspondingly 43% more vaccination breakthroughs:
Hospitalized COVID-19 cases: 6964, all vaccinated (4870 + 43%)
COVID-19 cases in intensive care: 775, all vaccinated (592 + 43%)
Deceased COVID-19 cases: 951, all vaccinated (665 + 43%)
Calculations: With a vaccination rate of 100%, there is 37% less hospitalization, 55% fewer Covid intensive care patients, 34% fewer deaths.

Vaccination champion: compulsory vaccination does not protect against corona waves
The vaccination world champion Portugal (vaccination rate 98% for over 12-year-olds) had a new-infection incidence of 275 on December 14th, 2021, which is only 20% less than in Germany.
A vaccination does not protect against a fifth wave and certainly not against new mutations. After all, the omicron variant was spread all over the world by vaccinated air travelers.
Nevertheless, one can now advise vaccination: on the one hand, many millions of people have been vaccinated for many months without hearing too much about serious side effects and vaccination victims. On the other hand, with the high number of new infections, it is hardly possible to avoid contact with infected people. But compulsory vaccination? Sounds like Adolf H. Can't Olaf S. think of anything better? Suggestion: Unvaccinated people have to apply and pay for an additional corona risk health insurance. This pays if these people need intensive care with Covid. Otherwise they will be turned away at the hospital or taken to the palliative care unit. A compulsory vaccination, on the other hand, would be clumsy and unimaginative. It is embarrassing if not even enough vaccine is available for all those willing for the 3rd vaccination (booster) and 4th vaccination (Omikron).

Corona contamination theory
In India the 7-day incidence has dropped to 5, even though only 37% of the population are vaccinated. How come Corona in India was short and violent. Within a short time there were tons of corona infections and many deaths. Antibody tests in New Delhi have now shown that 97% of the population had formed antibodies against Covid, according to which almost everyone came into contact with the virus and survived an infection unnoticed.
Worldwide, new corona mutations are displacing the previously prevalent corona viruses if they are more contagious than those. More deadly mutations die with their host. So we hope for new corona mutations that are more contagious than the previous ones, but harmless in their course.
And until then: Vaccinated people can be boosted, those who have not been vaccinated can be vaccinated and / or avoid contact, eat healthily, exercise in the fresh air. Stay healthy!

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