

DIMENSIONS AND TOLERANCES

TIMING BELTS IN optibelt OMEGA PROFILE



Timing belts with optibelt OMEGA profiles are produced in a wide range of lengths and widths. Many special lengths, widths and designs are available. Please contact our Application Engineering Department for further details. Timing belts with optibelt OMEGA profiles are produced to ground category G2 with a thickness tolerance of ± 0.25 mm as standard. If required, the belts can be ground to category G1 with a thickness tolerance of ± 0.13 mm.

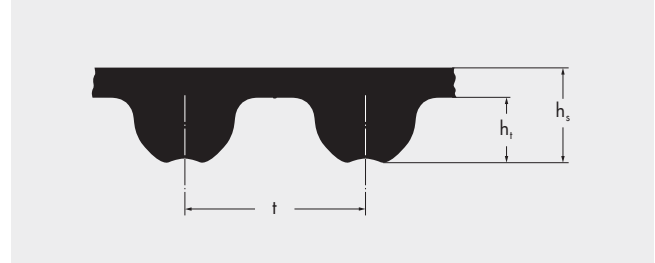


Table 37
Nominal dimensions and weights

Profile	2M	3M	5M	8M	D8M	14M
Tooth height h_t [mm]	0.70	1.10	1.90	3.20	3.20	5.60
Total belt thickness h_s [mm]	1.30	2.30	3.40	5.40	7.73	9.50
Tooth pitch t [mm]	2.00	3.00	5.00	8.00	8.00	14.00
Weight [kg/m] for 10 mm belt width	0.013	0.024	0.035	0.058	0.067	0.100

Length tolerances

Pitch length [mm]	≤ 250	> 250 ≤ 500	> 500 ≤ 750	> 750 ≤ 1000	> 1000 ≤ 1250	> 1250 ≤ 1500	> 1500 ≤ 1750	> 1750 ≤ 2000	> 2000 ≤ 2250	> 2250 ≤ 2500	> 2500 ≤ 2750	> 2750 ≤ 3000	> 3000
Length tolerances given as centre distance deviation	± 0.20	± 0.23	± 0.27	± 0.30	± 0.33	± 0.36	± 0.39	± 0.42	± 0.46	± 0.49	± 0.52	± 0.55	± 0.55 $\pm 0.03^*$

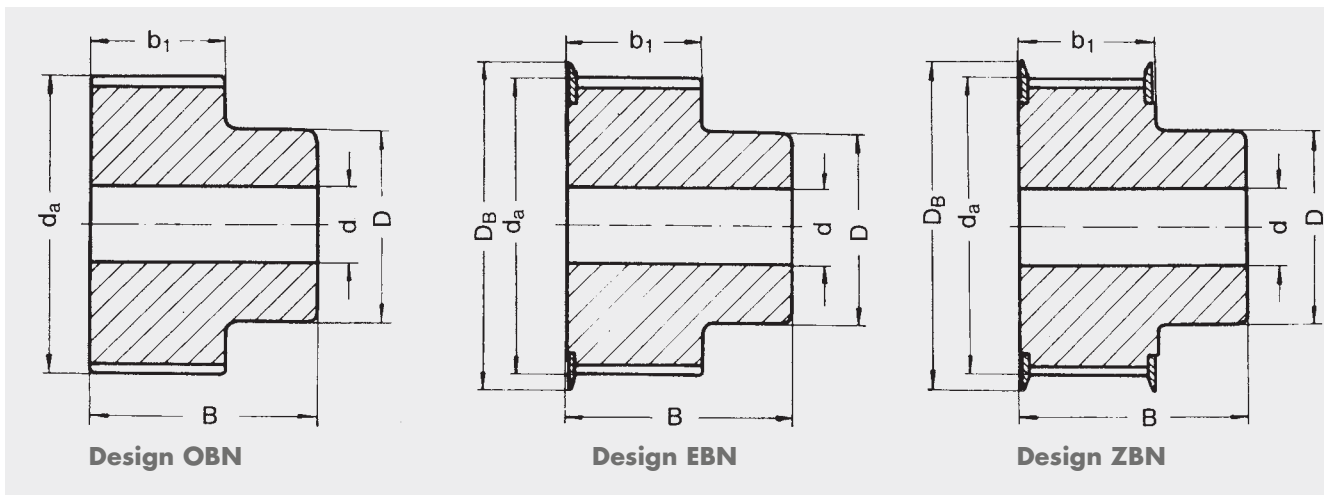
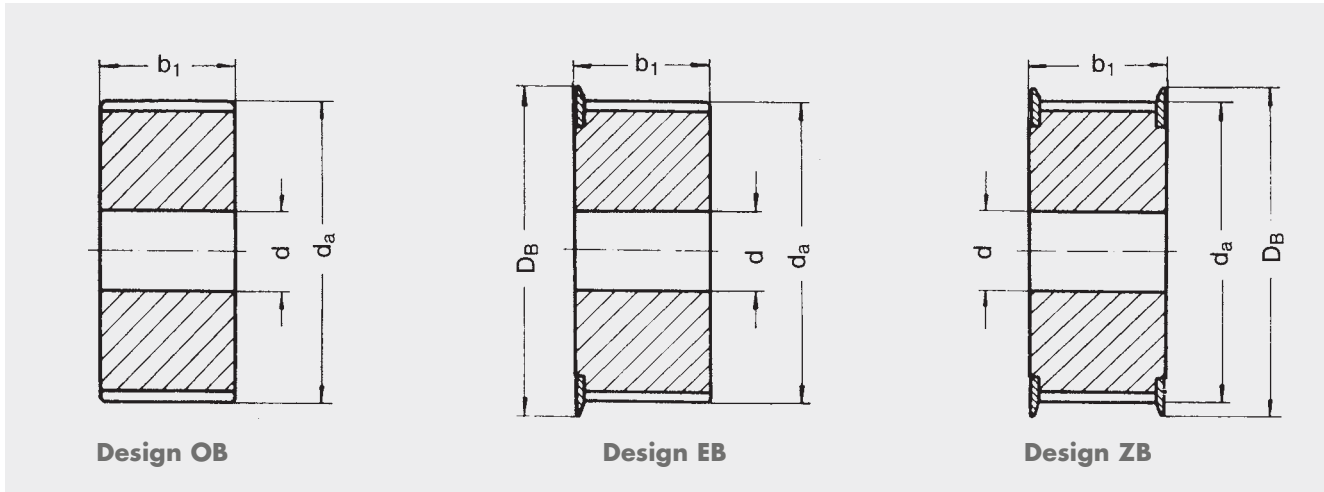
Width tolerance

Standard belt width	Allowed tolerance [mm] of the timing belt			
	Nominal width [mm]	Pitch length up to 838.2 mm	Pitch length 838.3 up to 1676.4 mm	Pitch length over 1676.4 mm
3.0 to 11.0		+ 0.4 - 0.8	+ 0.4 - 0.8	—
11.1 to 38.1		+ 0.8 - 0.8	+ 0.8 - 0.8	+ 0.8 - 1.2
38.2 to 50.8		+ 0.8 - 1.2	+ 1.2 - 1.2	+ 1.2 - 1.6
50.9 to 63.5		+ 1.2 - 1.2	+ 1.2 - 1.6	+ 1.6 - 1.6
63.6 to 76.2		+ 1.2 - 1.6	+ 1.6 - 1.6	+ 1.6 - 2.0
76.3 to 101.6		+ 1.6 - 1.6	+ 1.6 - 2.0	+ 2.0 - 2.0
101.7 to 177.8		+ 2.4 - 2.4	+ 1.6 - 2.0	+ 2.0 - 2.0
177.9 to max.		—	—	+ 4.8 - 6.4

* For greater lengths additional 0.03 mm should be added in length steps of 250 mm.

TIMING BELT PULLEYS

RECOMMENDED SPECIAL DESIGNS



Materials

Steel, grey cast iron, aluminium;
other materials available on request
Do NOT use cast iron for speeds > 30 m/s anymore!

Bores

All timing belt pulleys are pilot bored.
On request they can be finish bored according to DIN H7.

Explanation of the abbreviations

- OB = without flanges
- EB = one flange
- ZB = two flanges
- OBN = without flanges, with hub
- EBN = one flange, with hub
- ZBN = two flanges, with hub

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Allowed deviation in tooth pitch

The allowed tolerances in the distance between two grooves and the sum of the deviations within a 90° arc on a pulley are given in the following table. These tolerances are the distance between the equivalent points on the right or the left side respectively of two adjacent grooves.

Outside diameter d_a [mm]	Allowed deviation in the tooth pitch [mm]	
	between two consecutive grooves	sum within a 90° arc
≤ 25	0.03	0.06
$> 25 \leq 50$	0.03	0.09
$> 50 \leq 100$	0.03	0.10
$> 100 \leq 175$	0.03	0.13
$> 175 \leq 300$	0.03	0.15
$> 300 \leq 500$	0.03	0.18
> 500	0.03	0.20

Allowed deviation of the outside diameter

Outside diameter d_a [mm]	Allowed deviation [mm]
≤ 25	+ 0.05 0
$> 25 \leq 50$	+ 0.07 0
$> 50 \leq 100$	+ 0.10 0
$> 100 \leq 175$	+ 0.13 0
$> 175 \leq 300$	+ 0.15 0
$> 300 \leq 500$	+ 0.18 0
> 500	+ 0.20 0

Pulley width

Profile	Pulley width designation [mm]	Pulley width [mm]	Smallest allowed pulley width	
			with flanges b_f^* [mm]	without flanges b [mm]
3 M	6	6	7	9
	9	9	10	12
	15	15	17	19
5 M	9	9	10	12
	15	15	17	19
	25	25	27	29
8 M	20	20	22	26
	30	30	34	38
	50	50	54	58
	85	85	90	94
14 M	40	40	47	54
	55	55	63	70
	85	85	95	102
	115	115	126	133
	170	170	180	187

* b_f = pulley width between the flanges

Note

The minimum width b for pulleys without flanges can be reduced, if there is no side wobble or run out; however, it may not fall below the minimum width b_f for pulleys with flanges.

Axial run-out tolerance

Outside diameter range [mm]	Maximum total fluctuation [mm]
≤ 100	0.10
$> 100 \leq 250$	0.01 mm per 10 mm outside diameter
> 250	0.25 mm + 0.0005 mm per mm outside diameter above 250.00 mm

Tolerance of eccentricity

Outside diameter [mm]	Maximum total fluctuation [mm]
≤ 200	0.10
> 200	0.0005 mm per 10 mm outside diameter, but not exceeding the tolerance for the outside diameter

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Balancing

Processed steel pulleys need no balancing if the rim speed is below 30 m/s. Grey cast iron pulleys for medium speeds should be statically balanced according to the following table:

Profile	Number of teeth	Static balancing [N]
3M	all	0.04
5M	all	0.08
8M	≤ 130 > 130	0.08 0.16
14M	≤ 72 > 72	0.08 0.16

Pulleys running at rim speeds exceeding of 30 m/s require dynamic balancing up to $1.8 \cdot 10^{-5}$ Nm.

Parallelism

The teeth should run parallel to the axis of the bore with a tolerance of not more than 0.001 mm per millimetre width.

Conicity

The conicity may not exceed 0.001 mm per millimetre of the width of the driving face and at the same time should not exceed the permitted outside diameter tolerances.

TIMING BELT PULLEYS

optibelt ZRS DIMENSIONS AND TOLERANCES



optibelt ZR standard timing belt pulleys

optibelt ZRS standard timing belt pulleys are manufactured according to the standards of ISO 5294 using a hobbing process. This ensures minimum tooth clearance and a precise tooth engagement. The following figures and tables show the dimensions and tolerances of the optibelt ZRS standard timing belt pulleys.

Hobbing Cutter for Pulleys with Involute Tooth Patterns according to ISO 5294

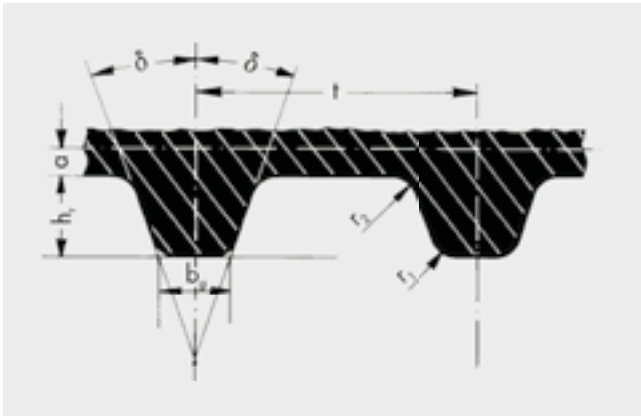


Table 38
Dimensions and permitted deviations of the hobbing cutter for pulleys with involute tooth patterns according to ISO 5294

Profile	Number of teeth	t [mm] ± 0.003	δ [°] ± 0.12	h_r [mm] $+ 0.05$ 0	b_g [mm] $+ 0.05$ 0	r_1 [mm] ± 0.03	r_2 [mm] ± 0.03	2α [mm]
MXL	≥ 10	2.032	20	0.66	0.84	0.25	0.13	0.508
XL	≥ 10	5.080	25	1.40	1.27	0.61	0.61	0.508
L	≥ 10	9.525	20	2.13	3.10	0.86	0.53	0.762
H	14-19	12.700	20	2.59	4.24	1.47	1.04	1.372
	>						1.42	
XH	≥ 18	22.225	20	6.88	7.59	2.01	1.93	2.794
XXH	≥ 18	31.750	20	10.29	11.61	2.69	2.82	3.048

Table 39
Tolerances for the outside diameter of the rough-machined blanks

Outside diameter d_a [mm]	Tolerances [mm]
≤ 100	+ 0.3 + 0.2
$> 100 \leq 200$	+ 0.4 + 0.3
$> 200 \leq 300$	+ 0.5 + 0.4
$> 300 \leq 500$	+ 0.7 + 0.5
> 500	+ 0.9 + 0.7

Allowed tolerances in tooth pitch

The allowed tolerances in the distance between two teeth and the sum of the deviations within a 90° arc on a pulley are given in the following table. These tolerances are the distance between the equivalent points on the right or the left side respectively of two adjacent teeth.

Table 40

Outside diameter d_a [mm]	Allowed deviation of the teeth distance [mm]	
	between two consecutive teeth [mm]	sum within a 90° arc [mm]
≤ 25.40	0.03	0.05
$> 25.40 \leq 50.80$	0.03	0.08
$> 50.80 \leq 101.60$	0.03	0.10
$> 101.60 \leq 177.80$	0.03	0.13
$> 177.80 \leq 304.80$	0.03	0.15
$> 304.80 \leq 508.00$	0.03	0.18
> 508.00	0.03	0.20

Table 41
Pulley widths according to ISO 5294

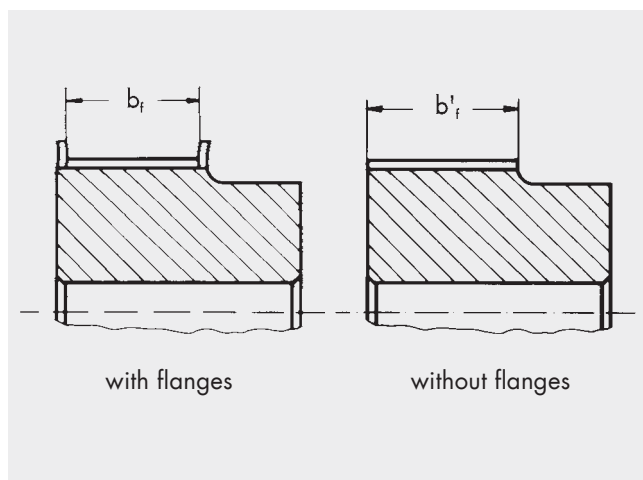
Profile	Pulley width designation [mm]	Nominal pulley width [mm]	Smallest pulley width	
			with flanges b_f [mm]	without flanges b'_f [mm]
MXL	012	3.2	3.8	5.6
	019	4.8	5.3	7.1
	025	6.4	7.1	8.9
XL	025	6.4	7.1	8.9
	031	7.9	8.6	10.4
	037	9.5	10.4	12.2
L	050	12.7	14.0	17.0
	075	19.1	20.3	23.3
	100	25.4	26.7	29.7
H	075	19.1	20.3	24.6
	100	25.4	26.7	31.2
	150	38.1	39.4	43.9
	200	50.8	52.8	57.3
	300	76.2	79.0	83.5
XH	200	50.8	56.6	62.6
	300	76.2	83.8	89.8
	400	101.6	110.7	116.7
XXH	200	50.8	56.6	64.1
	300	76.2	83.8	91.3
	400	101.6	110.7	118.2
	500	127.0	137.7	145.2

Table 42
Permitted tolerances for the outside diameter to ISO 5294

Outside diameter d_o [mm]	Allowed tolerances [mm]
≤ 25.40	+ 0.05 0
$> 25.40 \leq 50.80$	+ 0.08 0
$> 50.80 \leq 101.60$	+ 0.10 0
$> 101.60 \leq 177.80$	+ 0.13 0
$> 177.80 \leq 304.80$	+ 0.15 0
$> 304.80 \leq 508.00$	+ 0.18 0
> 508.00	+ 0.20 0

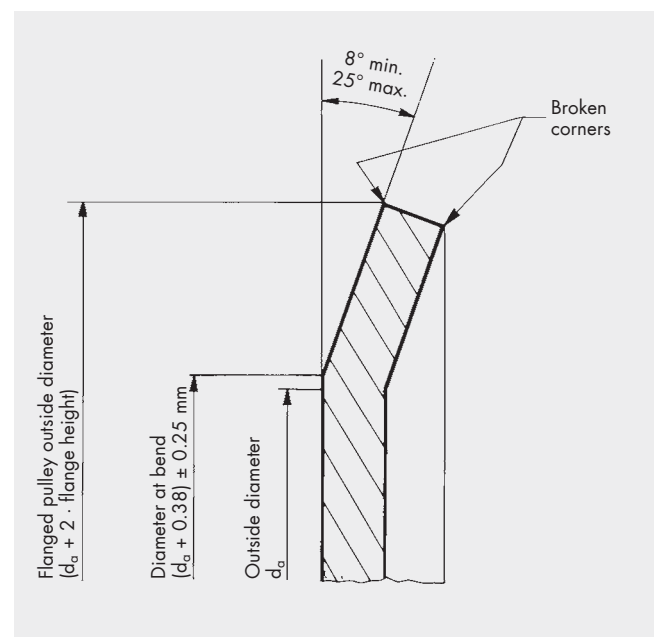
Table 43
Minimum flange height according to ISO 5294

Profile	Minimum flange height [mm]
MXL	0.5
XL	1.0
L	1.5
H	2.0
XH	4.8
XXH	6.1



Note
The minimum width for pulleys without flanges b'_f can be reduced if the drive alignment can be guaranteed; however it may not be less than the value b_f given for pulleys with flanges.

Flange dimensions according to ISO 5294



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Table 44
Axial circular run-out according to ISO 5294

Outside diameter d_o [mm]	Maximum total fluctuation [mm]
≤ 101.60	0.10
$> 101.60 \leq 254.00$	0.01 mm per 10 mm outside diameter
> 254.00	0.25 mm + 0.0005 mm per mm outside diameter above 254.00 mm

Please also consult software:
optibelt CAP drive calculation
and data
optibelt CAD 2D/3D
online at: www.optibelt.com

Table 45
Radial circular run-out according to ISO 5294

Outside diameter d_o [mm]	Maximum total fluctuation [mm]
≤ 203.20	0.13
> 203.20	0.13 mm + 0.0005 mm per outside diameter above 203.20 mm

Pulleys running at rim speeds exceeding 30 m/s require dynamic balancing up to $1.8 \cdot 10^{-5}$ Nm.

Parallelism

The teeth should run parallel to the axis of the bore with a tolerance of less than 0.001 mm per millimetre width.

Conicity

The conicity may not exceed 0.001 mm per millimetre of the width of the driving face and at the same time should not exceed the permitted outside diameter tolerances given in table 44.