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Power Transmission

Technical Manual

for Ribbed Belt Drives

Technical Manual
for
Ribbed Belt Drives

This manual incorporates all the important technical information and methods of calculation for drives and pulleys when using optibelt-RB Ribbed Belts. The Optibelt programme meets the requirements of DIN 7867, ISO 9982 and the USA Standard RMA/ MPTA IP-26.

Our engineers will be pleased to advise on the use of this type of belt and to assist with any drive design.

This service, which utilises the most modern equipment, including computer controlled drive simulation, is available to all our customers free of charge.

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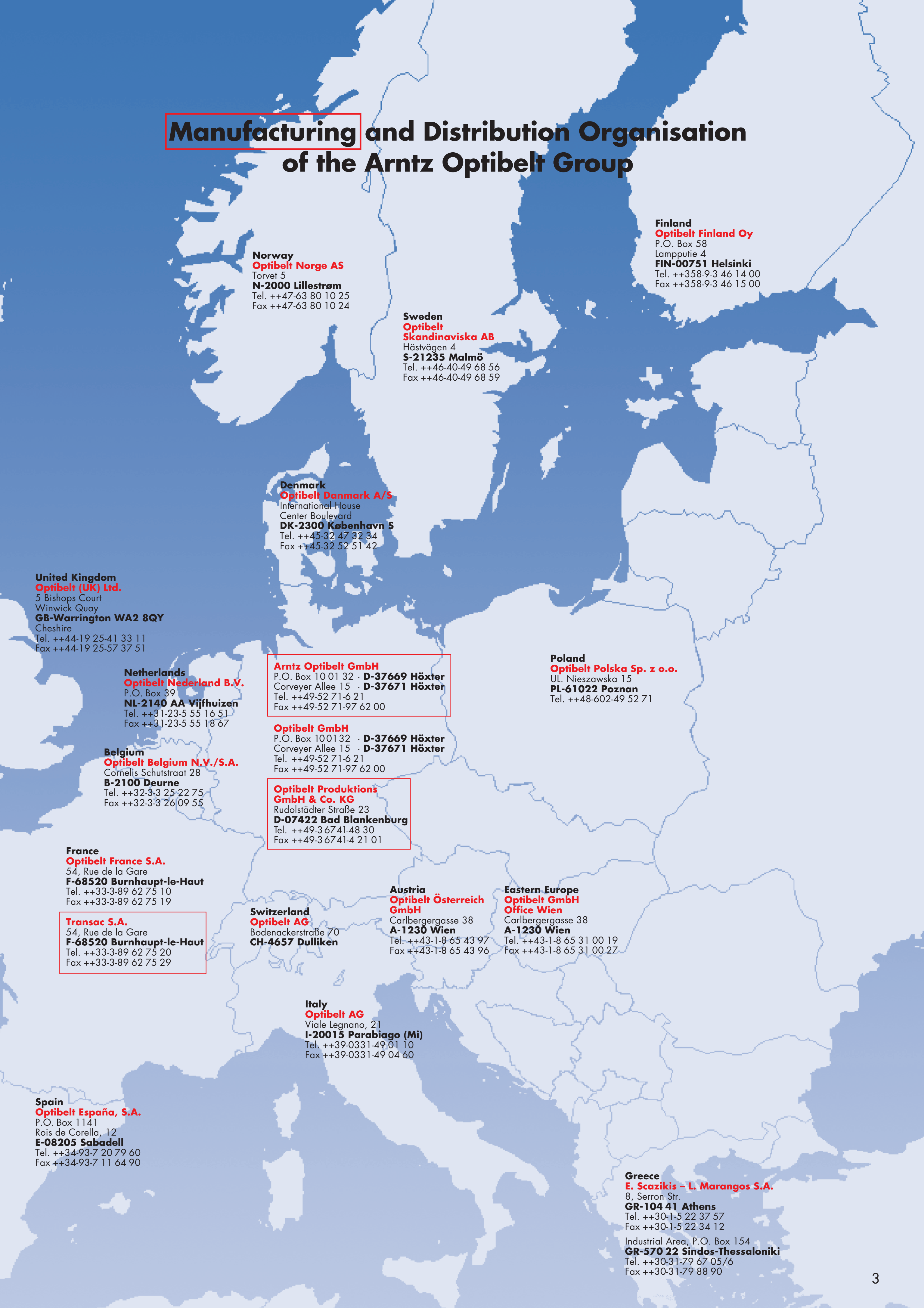

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Power Transmission

Contents

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Product Description

Dimensions - Construction - Characteristics - Applications

Construction

Optibelt-RB Ribbed Belts consist of

- Belt top surface
- Tension cord
- Base compound

Parallel V-shaped ribs of a wear resistant polychloroprene compound form the base of the belt. The polyester tension cord, of high quality and extremely low stretch, is embedded in a rubber compound and extends across the entire width of the belt. The belt top surface with fabric laminates, the tension cord and the base compound are bonded together by vulcanisation.

Characteristics

The Optibelt-RB Ribbed Belt combines the high flexibility of the flat belt with the high power transmission capability of the traditional V-belt. Further advantages of this type of belt are the small sectional thickness and especially good frictional power transmission with minimal slip. Small pulley diameters, low stretch and extremely large speed ratios are additional benefits.

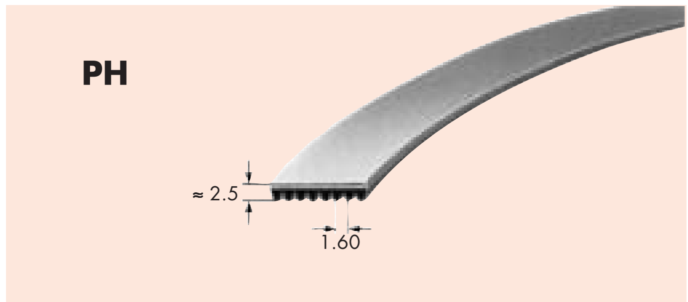
Since the ribs of the Optibelt-RB Ribbed Belt almost completely fill the pulley grooves, the resulting large contact area ensures a high degree of efficiency and a constant speed ratio. Belt turnover in the pulley is eliminated because of the single belt characteristic. Even at high speed the drive is quiet and vibration free. Due to the use of special materials, ribbed belts are resistant to most oils and will withstand high temperatures.

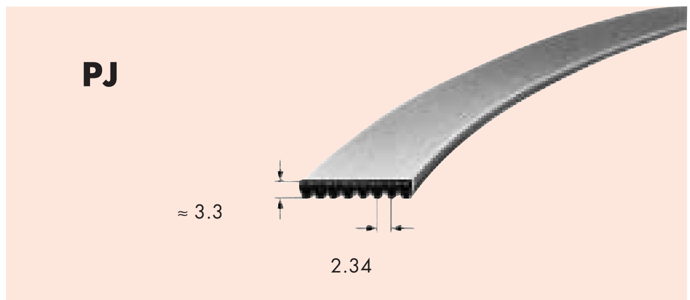
Only 5 sections are needed to cover a wide range of power transmission applications. The different sections are indicated by the letters PH, PJ, PK, PL and PM.

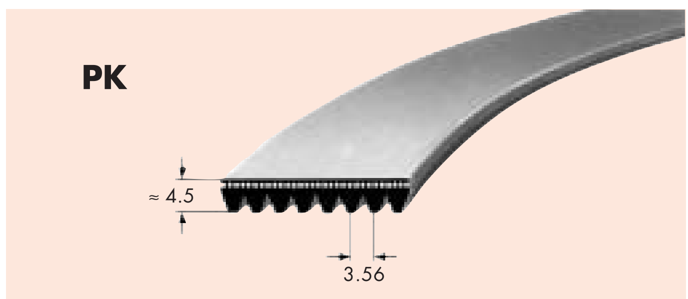
Applications

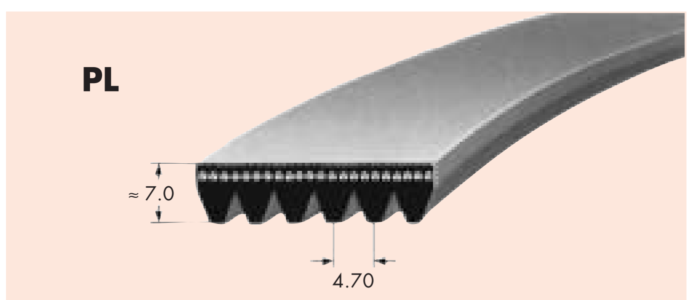
Whilst sections PJ, PL and PM are used on general purpose industrial machinery, section PH is preferred for domestic appliances. Section PK is mainly used in the automotive industry. Drives of this kind require special calculation methods and should be requested separately.

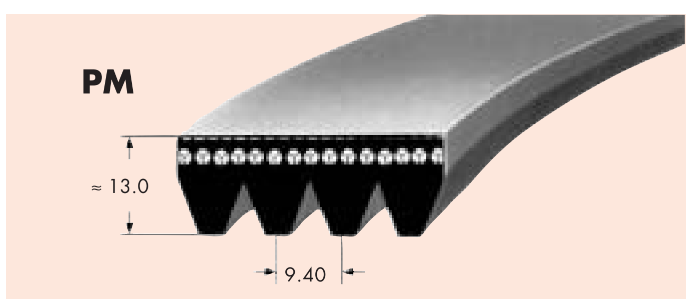
Standard Sections











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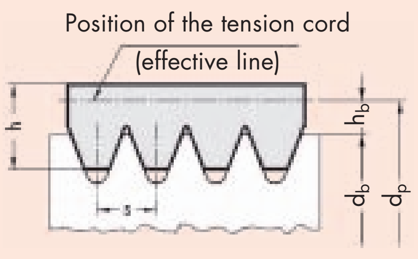
Power Transmission

Standard Range
Ribbed Belts



$d_p = d_b + 2\ h_b$

Section		PH	PJ	PK	PL	PM
Rib pitch	s (mm)	1.60	2.34	3.56	4.70	9.40
Belt thickness	≈ h (mm)	2.50	3.30	4.50	7.00	13.00
Belt speed	≈ v (m/s)	60	60	50	40	30
Min. pulley diameter	$d_{b\ min}$ (mm)	13	20	45	75	180
Effective line variation	h_b	0.80	1.25	1.60	3.50	5.00

Section PH

Effective length L_{es} (mm)	Effective length L_{es} (inch)	Effective length L_{es} (mm)	Effective length L_{es} (inch)
698	27.5	1333	52.5
735	28.9	1371	54.0
762	30.0	1397	55.0
813	32.0	1439	56.7
858	33.8	1475	58.1
864	34.0	1600	63.0
886	34.9	1854	73.0
914	36.0	1895	74.6
955	37.6	1915	75.4
965	38.0	1930	76.0
975	38.4	1956	77.0
990	39.0	1992	78.4
1016	40.0	2083	82.0
1080	42.5	2155	84.8
1092	43.0		
1096	43.1		
1168	46.0		
1194	47.0		
1200	47.2		
1222	48.1		
1230	48.4		
1244	49.0		
1262	49.7		
1270	50.0		
1285	50.6		
1290	50.8		
1301	51.2		
1309	51.5		
1316	51.8		
1321	52.0		

Section PJ

Effective length L_{es} (mm)	Effective length L_{es} (inch)	Effective length L_{es} (mm)	Effective length L_{es} (inch))	Effective length L_{es} (mm)	Effective length L_{es} (inch)
280	11.0	1150	45.3	1930	76.0
330	13.0	1168	46.0	1956	77.0
356	14.0	1194	47.0	1965	77.4
362	14.3	1200	47.3	1981	78.0
381	15.0	1222	48.1	1992	78.4
406	16.0	1244	49.0	2083	82.0
414	16.3	1262	49.7	2155	84.8
432	17.0	1270	50.0	2210	87.0
457	18.0	1285	50.6	2337	92.0
483	19.0	1301	51.2	2489	98.0
508	20.0	1309	51.5		
559	22.0	1316	51.8		
584	23.0	1321	52.0		
610	24.0	1333	52.5		
660	26.0	1355	53.4		
711	28.0	1371	54.0		
723	28.5	1397	55.0		
762	30.0	1428	56.2		
813	32.0	1439	56.7		
836	32.9	1475	58.1		
864	34.0	1549	61.0		
914	36.0	1600	63.0		
955	37.6	1651	65.0		
965	38.0	1663	65.5		
1016	40.0	1752	69.0		
1092	43.0	1780	70.0		
1105	43.5	1854	73.0		
1110	43.7	1895	74.6		
1123	44.2	1910	75.2		
1130	44.5	1915	75.4		

Non standard lengths on request. Maximum number of ribs: Please contact our Applications Engineering Department.

Section PH is made to order

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Power Transmission

Standard Range
Ribbed Belts

Section PK						Section PL		Section PM	
Effective length L_{es}		Effective length L_{es}		Effective length L_{es}		Effective length L_{es}		Effective length L_{es}	
(mm)	(inch)	(mm)	(inch)	(mm)	(inch)	(mm)	(inch)	(mm)	(inch)
625	24.6	985	38.8	1600	63.0	954	37.5	2286	90.0
630	24.8	990	39.0	1610	63.4	991	39.0	2388	94.0
648	25.5	995	39.2	1655	65.2	1075	42.3	2515	99.0
675	26.6	1000	39.4	1725*	67.9	1194	47.0	2693	106.0
698	27.5	1005	39.6	1755	69.1	1270	50.0	2832	111.5
725	28.5	1010	39.8	1854*	73.0	1333	52.5	2921	115.0
735	28.9	1015	40.0	1885	74.2	1371	54.0	3010	118.5
763	30.0	1020	40.2	1900*	74.8	1397	55.0	3124	123.0
775	30.5	1025	40.4	1915	75.4	1422	56.0	3327	131.0
780	30.7	1045	41.1	1935	76.2	1562	61.5	3531	139.0
790	31.1	1065	41.9	1980	78.0	1613	63.5	3734	147.0
795	31.3	1080	42.5	1992*	78.4	1664	65.5	4089	161.0
800	31.5	1090	43.0	2040*	80.3	1715	67.5	4191	165.0
805	31.7	1100	43.3	2050	80.7	1764	69.5	4470	176.0
812	32.0	1110	43.7	2080	82.0	1803	71.0	4648	183.0
815	32.1	1120	44.1	2100	82.7	1841	72.5	5029	198.0
825	32.5	1125	44.3	2120	83.5	1943	76.5	5410	213.0
830	32.7	1140	44.9	2145	84.4	1981	78.0	6121	241.0
835	32.9	1150	45.3	2155*	84.8	2020	79.5	6883	271.0
841	33.1	1160*	45.7	2170	85.4	2070	81.5	7646	301.0
845	33.3	1165	45.9	2230*	87.8	2096	82.5	8408	331.0
850	33.5	1180	46.5			2134	84.0	9169	361.0
858	33.8	1190	46.8			2197	86.5	9931	391.0
865	34.0	1215	47.8			2235	88.0	10693	421.0
870	34.2	1230	48.4			2324	91.5	12217	481.0
872	34.3	1260	49.6			2362	93.0	13741	541.0
875	34.5	1270*	50.0			2476	97.5	15266	601.0
880*	34.6	1285*	50.6			2515	99.0		
884	34.8	1290	50.8			2705	106.5		
886	34.9	1301*	51.2			2743	108.0		
890	35.0	1325	52.2			2845	112.0		
905	35.6	1330	52.4			2895	114.0		
913	36.0	1345	53.0			2921	115.0		
920	36.2	1371*	54.0			2997	118.0		
925	36.4	1397*	55.0			3086	121.5		
930	36.6	1415	55.7			3124	123.0		
935	36.8	1420*	55.9			3289	129.5		
940	37.0	1439*	56.7			3327	131.0		
945	37.2	1450	57.1			3492	137.5		
950	37.4	1460	57.5			3696	145.5		
954	37.6	1475*	58.1			4051	159.5		
962	37.8	1520	59.8			4191	165.0		
966	38.0	1540*	60.6			4470	176.0		
970	38.2	1550*	61.0			4622	182.0		
975	38.4	1560	61.4			5029	198.0		
						5385	212.0		
						6096	240.0		

Non standard lengths on request. Maximum number of ribs: Please contact our Applications Engineering Department.

*** non stock items**

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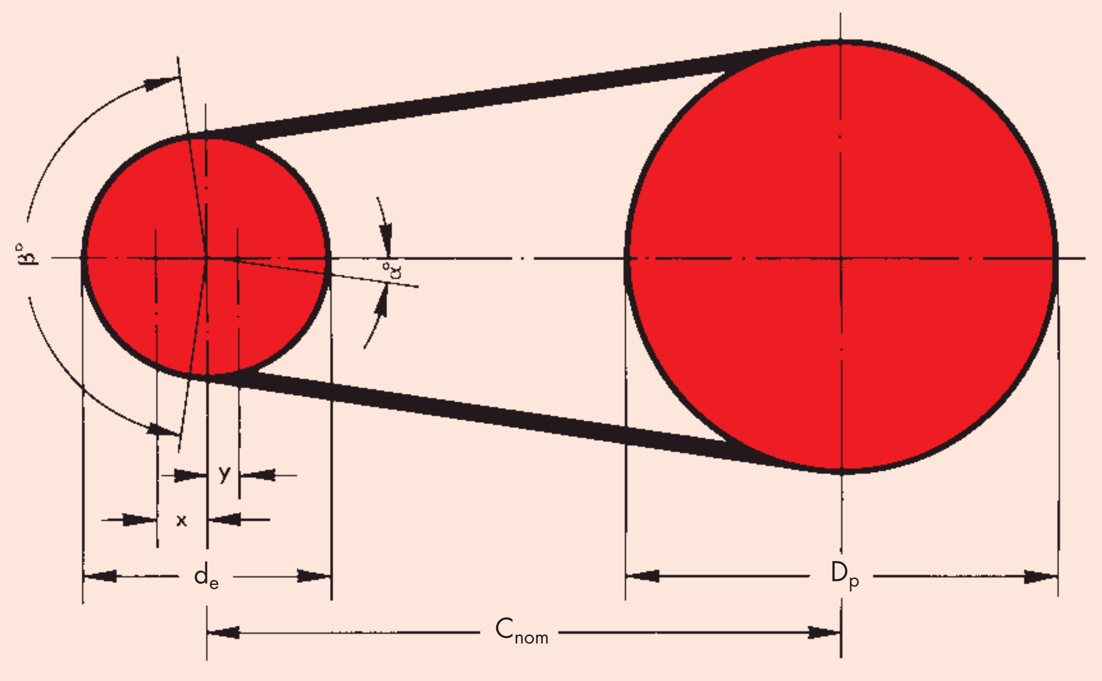
Drive Design

Abreviations used in Formulae

h_b	= Effective line difference	(mm)
C	= Drive centre distance provisional	(mm)
C_{nom}	= Drive centre distance actual	(mm)
2 c	= Difference between effective and pitch diameter	(mm)
c_1	= Arc of contact correction factor	
c_2	= Drive service factor	
c_3	= Belt length correction factor	
D_e	= Effective diameter of larger pulley	(mm)
d_e	= Effective diameter of smaller pulley	(mm)
de_1	= Effective diameter of driver pulley	(mm)
de_2	= Effective diameter of driven pulley	(mm)
D_p	= Pitch diameter of larger pulley	(mm)
d_p	= Pitch diameter of smaller pulley	(mm)
E	= Belt deflection per 100 mm span length	(mm)
E_a	= Belt deflection for a given span length	(mm)
f	= Load used to set belt tension per rib	(N)
k	= Constant for calculation of centrifugal force	
L_{es}	= Standard belt effective length	(mm)
L_{eth}	= Calculated belt effective length	(mm)
N	= Speed of larger pulley	(r.p.m.)
n	= Speed of smaller pulley	(r.p.m.)
n_1	= Speed of driver pulley	(r.p.m.)
n_2	= Speed of driven pulley	(r.p.m.)
P	= Motor or normal running power	(kW)
P_B	= Design power	(kW)
P_N	= Power rating per rib	(kW)
r	= Speed ratio	
S	= Drive span length	(mm)
S_a	= Static shaft loading	(N)
T	= Static belt tension per rib	(N)
v	= Belt speed	(m/s)
x	= Minimum allowance above drive centre distance C_{nom} for belt stretch and wear	(mm)
y	= Minimum allowance below drive centre distance C_{nom} for belt installation and tensioning	(mm)
z	= Number of ribs	
α	= Angle of belt run = $90^\circ - \frac{\beta}{2}$	(degrees)
β	= Arc of contact on smaller pulley	(degrees)



Drive Design

Optibelt Power Ratings P_N - Arc of Contact Correction Factor c_1

Optibelt power ratings P_N shown in tables 5 to 9 are based on internationally recognised formulae. These formulae contain material constants which must be used in accordance with the practices of the individual manufacturers. The P_N power rating formula is based on a specific tension ratio between the tight and slack sides of the belt. The power rating tables refer to the smallest loaded pulley in the drive. The belt power ratings from the tables are given for:

- the effective diameter of smaller pulley d_e
- the speed of smaller pulley n.
- the speed ratio r
- the arc of contact of the belt on smaller pulley ß =180°
- the ideal belt length for the particular belt section.

From the given drive data the power rating per rib P_N can be found which must then be modified by application of the arc of contact and belt length correction factors c_1 and c_3.

Intermediate values can be found by linear interpolation.

The arc of contact correction factor c_1 corrects the power rating P_N when the arc of contact of the belt around the smaller pulley d_e is smaller than ß =180o.

Table 1

$\frac{D_e - d_e}{C_{nom}}$	β ≈	c_1
0	180°	1.00
0.05	177°	1.00
0.10	174°	1.00
0.15	171°	0.99
0.20	168°	0.99
0.25	165°	0.99
0.30	162°	0.99
0.35	160°	0.99
0.40	156°	0.98
0.45	153°	0.98
0.50	150°	0.98
0.55	147°	0.97
0.60	144°	0.97
0.65	141°	0.97
0.70	139°	0.96
0.75	136°	0.96
0.80	133°	0.95
0.85	130°	0.95
0.90	126°	0.94
0.95	123°	0.94
1.00	119°	0.93
1.05	115°	0.92
1.10	112°	0.92
1.15	109°	0.91
1.20	106°	0.90
1.25	103°	0.89
1.30	100°	0.89
1.35	96°	0.87
1.40	92°	0.86
1.45	88°	0.85
1.50	84°	0.83
1.55	80°	0.82
1.60	77°	0.80

Intermediate values should be found by linear interpolation!

Power Transmission

Drive Design

Belt Length Correction Factor c_3

The belt length correction factor c_3 takes into account the bending stresses in the particular belt section in relationship to a standard effective length.

This results in the following relationships:

ribbed belt length used > standard effective length	$c_3 > 1.0$
ribbed belt length used = standard effective length	$c_3 = 1.0$
ribbed belt length used < standard effective length	$c_3 < 1.0$

$$c_3 = 1 + \left(\left(\frac{L_{es}}{L_{eff}} \right)^{0.09} - 1 \right) \cdot 2.4$$

L_{es} – ribbed belt length used

L_{eff} = standard effective length

Table 2

Section PH				Section PJ			
Effective length L_{es} (mm)	**c_3**	**Effective length L_{es} (mm)**	**c_3**	**Effective length L_{es} (mm)**	**c_3**	**Effective length L_{es} (mm)**	**c_3**
698	0.96	1956	1.19	280	0.74	1309	1.05
735	0.97	1992	1.20	330	0.76	1316	1.05
762	0.98	2083	1.21	356	0.78	1321	1.05
813	**1.00**	2155	1.22	362	0.78	1333	1.05
858	1.01			381	0.79	1355	1.06
864	1.01			406	0.80	1371	1.06
886	1.01			414	0.81	1397	1.06
914	1.02			432	0.82	1428	1.07
955	1.03			457	0.83	1439	1.07
965	1.03			483	0.84	1475	1.08
975	1.03			508	0.85	1549	1.09
990	1.03			559	0.87	1600	1.10
1016	1.04			584	0.88	1651	1.10
1080	1.06			610	0.89	1663	1.10
1092	1.06			660	0.90	1752	1.12
1096	1.06			711	0.92	1780	1.12
1168	1.07			723	0.92	1854	1.13
1194	1.08			762	0.93	1895	1.13
1200	1.08			813	0.95	1910	1.14
1222	1.08			836	0.95	1915	1.14
1230	1.09			864	0.96	1930	1.14
1244	1.09			914	0.97	1956	1.14
1262	1.09			955	0.98	1965	1.14
1270	1.09			965	0.98	1981	1.14
1285	1.10			**1016**	**1.00**	1992	1.14
1290	1.10			1092	1.01	2083	1.16
1301	1.10			1105	1.01	2155	1.17
1309	1.10			1110	1.01	2210	1.17
1316	1.10			1123	1.02	2337	1.18
1321	1.10			1130	1.02	2489	1.20
1333	1.10			1150	1.02		
1371	1.11			1168	1.03		
1397	1.11			1194	1.03		
1439	1.12			1200	1.03		
1475	1.13			1222	1.04		
1600	1.15			1244	1.04		
1854	1.18			1262	1.04		
1895	1.18			1270	1.04		
1915	1.19			1285	1.05		
1930	1.19			1301	1.05		

Non standard lengths on request.

Drive Design

Belt Length Correction Factor c_3

Table 2

Section PK						Section PL				Section PM	
Effective length L_{es} (mm)	c_3	Effective length L_{es} (mm)	c_3	Effective length L_{es} (mm)	c_3	Effective length L_{es} (mm)	c_3	Effective length L_{es} (mm)	c_3	Effective length L_{es} (mm)	c_3
605	0.80	975	0.89	1550	0.99	954	0.83	4051	1.14	2286	0.87
625	0.81	985	0.89	1560	0.99	991	0.84	4191	1.15	2388	0.88
630	0.81	990	0.89	1570	1.00	1075	0.86	4470	1.16	2515	0.89
648	0.81	995	0.90	**1600**	**1.00**	1194	0.88	4622	1.17	2693	0.91
675	0.82	1000	0.90	1610	1.00	1270	0.89	5029	1.19	2832	0.92
698	0.82	1005	0.90	1655	1.01	1333	0.90	5385	1.21	2921	0.92
725	0.83	1010	0.90	1690	1.01	1371	0.91	6096	1.24	3010	0.93
735	0.83	1015	0.90	1725	1.02	1397	0.91			3124	0.94
763	0.84	1020	0.90	1755	1.02	1422	0.91			3327	0.95
775	0.85	1025	0.90	1854	1.03	1562	0.93			3531	0.96
780	0.85	1045	0.91	1885	1.03	1613	0.94			3734	0.98
790	0.85	1065	0.91	1900	1.04	1664	0.95			**4089**	**1.00**
795	0.85	1080	0.91	1915	1.04	1715	0.95			4191	1.00
800	0.85	1090	0.91	1935	1.04	1764	0.96			4470	1.01
805	0.85	1100	0.92	1980	1.05	1803	0.96			4648	1.02
812	0.85	1110	0.92	1992	1.05	1841	0.97			5029	1.04
815	0.85	1120	0.93	2030	1.05	1943	0.98			5410	1.06
825	0.86	1125	0.93	2040	1.05	1981	0.98			6121	1.08
830	0.86	1140	0.93	2050	1.05	2020	0.99			6883	1.11
835	0.86	1150	0.93	2080	1.06	2070	0.99			7646	1.13
841	0.86	1160	0.93	2100	1.06	**2096**	**1.00**			8408	1.16
845	0.87	1165	0.93	2120	1.06	2134	1.00			9169	1.18
850	0.87	1180	0.94	2145	1.06	2197	1.01			9931	1.19
858	0.87	1190	0.94	2155	1.07	2235	1.01			10693	1.21
865	0.87	1215	0.94	2170	1.07	2324	1.02			12217	1.24
870	0.87	1230	0.94	2230	1.07	2362	1.02			13741	1.27
872	0.87	1245	0.95			2476	1.03			15266	1.30
875	0.87	1260	0.95			2515	1.03				
880	0.87	1270	0.95			2705	1.05				
884	0.87	1285	0.95			2743	1.05				
886	0.87	1290	0.95			2845	1.06				
890	0.88	1301	0.96			2895	1.07				
905	0.88	1325	0.96			2921	1.07				
913	0.88	1330	0.96			2997	1.07				
920	0.88	1345	0.96			3086	1.08				
925	0.88	1371	0.96			3124	1.08				
930	0.89	1397	0.97			3289	1.09				
935	0.89	1415	0.97			3327	1.10				
940	0.89	1420	0.98			3492	1.11				
945	0.89	1439	0.98			3696	1.12				
950	0.89	1450	0.98								
954	0.89	1460	0.98								
962	0.89	1475	0.98								
966	0.89	1520	0.99								
970	0.89	1540	0.99								

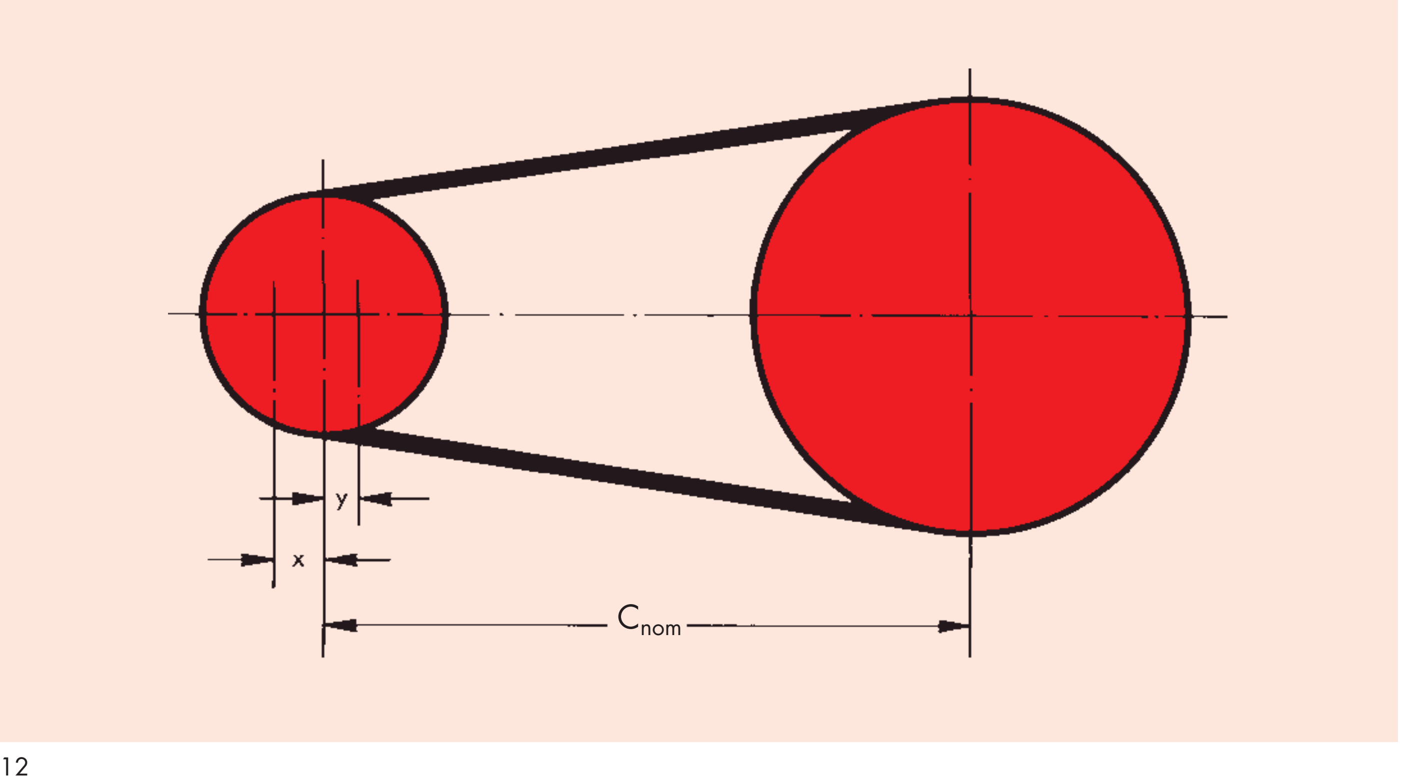
Non standard lengths on request.

Drive Design

Minimum Allowances x/y above and below Drive Centre Distance C_{nom}

Table 3

Effective length	Minimum allowance x (mm) for tensioning and retensioning	Minimum allowance y (mm) – for ease of fitting				
		Section PH	Section PJ	Section PK	Section PL	Section PM
≤ 500	10	10	10	—	—	—
> 500 ≤ 1000	15	15	15	20	25	—
> 1000 ≤ 1500	20	15	15	20	25	—
> 1500 ≤ 2000	25	15	15	20	25	—
> 2000 ≤ 2500	30	20	20	20	25	40
> 2500 ≤ 3000	35	20	20	25	30	40
> 3000 ≤ 4000	45	—	—	25	30	45
> 4000 ≤ 5000	55	—	—	30	35	45
> 5000 ≤ 6000	65	—	—	30	35	50
> 6000 ≤ 7500	85	—	—	—	—	55
> 7500 ≤ 9000	100	—	—	—	—	60
> 9000 ≤ 10 500	115	—	—	—	—	65
> 10 500 ≤ 12 000	130	—	—	—	—	75
> 12 000 ≤ 13 500	150	—	—	—	—	80
> 13 500 ≤ 15 266	165	—	—	—	—	90



Drive Design
Drive Service Factor c_2

The drive service factor c_2 takes into account the length of time the drive is operational in a 24 hour period and the type of driver and driven units. It applies exclusively to two pulley drives and cannot be applied for other working conditions, such as drives with idler and guide pulleys. Pages 26 and 27 give the design bases for drives with more than two pulleys. Adverse operating conditions such as high ambient temperatures, high humidity, the use of an idler pulley, etc., are **not** considered due to the obvious difficulties in creating factor tables to cater for every eventuality. The Table given below should thus be regarded as a **guideline.** In special cases e.g. high starting load (direct starting of fans), drives with high starting frequency, unusual shock loading, or the regular acceleration/ deceleration of mass, the load factor should be increased.

Typical value
Where the starting load is more than 1.8 times the standard running load, the minimum service factor c_2 should be determined by dividing the starting load factor by 1.5. Example: Starting load factor M_A =3.0; c_2 selected 2.0. Where the application is especially problematical please consult our engineers.

Table 4

		Types of Prime Mover					
		AC and three-phase motors with normal starting load (up to 1.8 times normal running load) e.g. synchronous and single-phase motors with auxiliary phase, three-phase motors with direct on-line start, star delta or commutator starter, DC shunt wound motors, internal combustion engines and turbines n> 600 min^{-1}.			AC and three-phase motors with high starting load (more than 1.8 times normal running load) e.g. single phase motors with high starting torque, DC motors series and compound wound, internal combustion engines and turbines n ≤ 600 min^{-1}.		
		Hours per day duty					
Types of Driven Machine		10 and under	over 10 to16	over 16	10 and under	over 10 to 16	over 16
Light duty	Agitators for liquids with uniform consistency, generators up to 0.05 kW, small conveyor belts for lightweight material, fans up to 0.05 kW, rotary pumps up to 0.05 kW	1.1	1.1	1.2	1.1	1.2	1.3
Light duty	Conveyor belts for lightweight material, fans from 0.06 to 0.1 kW, rotary pumps from 0.06 to 0.1 kW	1.1	1.2	1.3	1.2	1.3	1.4
Medium duty	Vibrating screens, mine fans, agitators for liquids with fluctuating consistency, compressors, screw presses, woodworking machinery, conveyor belts for heavy material, elevators, conveyor belts, fans above 0.8 kW, drills, milling machines, grinding machines, light lathes, bakery machinery, circular spinning frames, rotary pumps above 0.11 kW, laundry machinery	1.2	1.3	1.4	1.3	1.4	1.5
Heavy duty	Kneaders, mills, mixers, pumps, drying drums, general milling equipment, centrifuges, agitators for plastic materials with fluctuating consistency, bucket conveyors, centrifugal fans, parallel planing machines, weaving looms	1.3	1.4	1.5	1.4	1.5	1.6
Heavy duty	Paper making machinery, plate conveyors, slag mills, calenders, drilling rigs, heavy duty lathes, punches, shears, draw benches, piston pumps up to 2 cylinder	1.4	1.5	1.6	1.5	1.7	1.8
Extra heavy duty	Dredgers, heavy duty grinders, rolling mills, mixers, sawmills, calenders	1.6	1.7	1.8	1.6	1.8	2.0

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Power Transmission

Drive Design

A Guide to Selecting Ribbed Belt Sections

By using the following diagram and considering economy and size it is possible to determine the best Ribbed Belt section. Optimum utilisation of power and efficiency is achieved by the selection of the largest possible pulley diameter in relation to the section used. The limits to the permissible circumferential speeds must be observed.

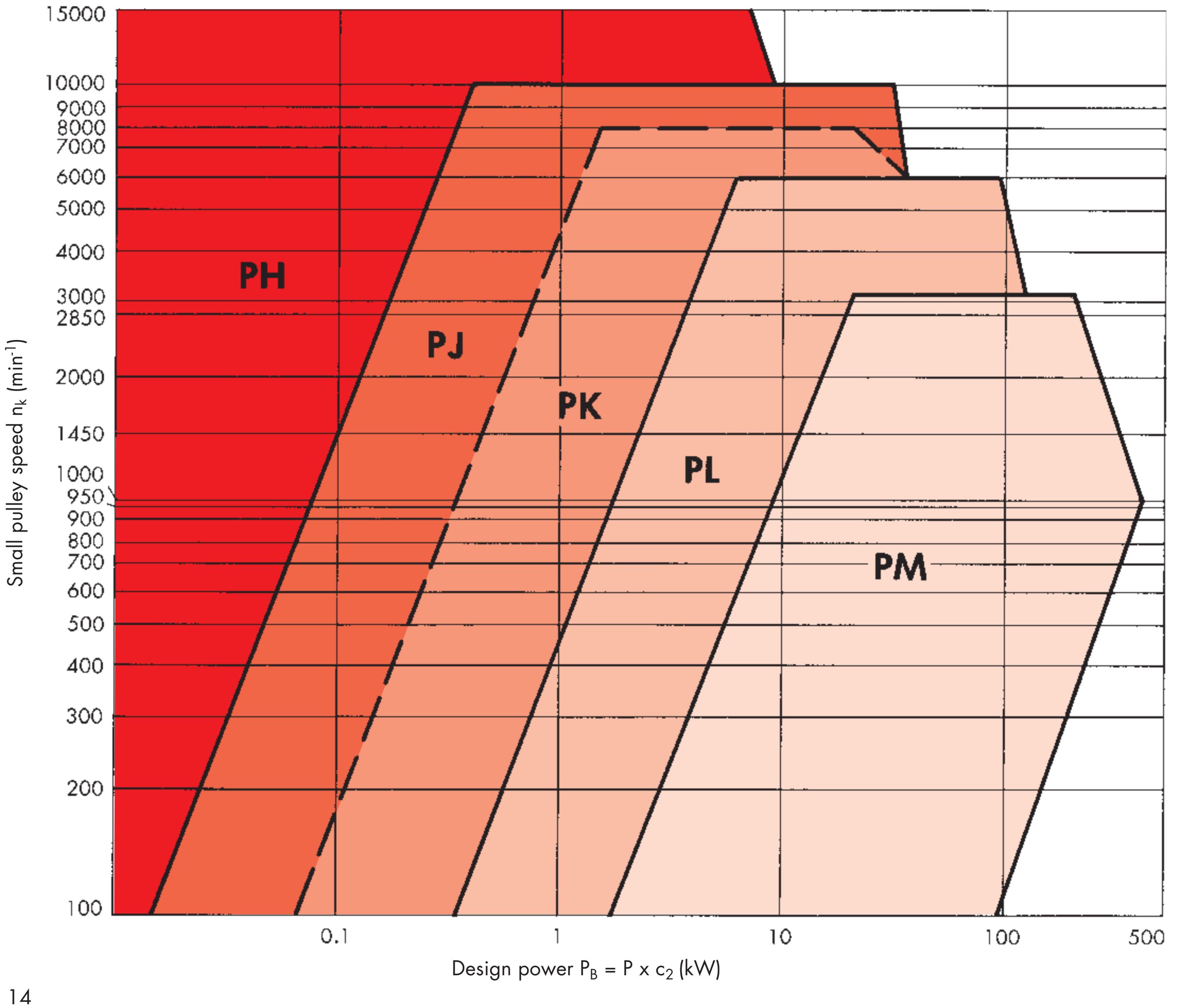
Section PH v_{max} = 60 m/s
Section PJ v_{max} = 60 m/s
Section PK v_{max} = 50 m/s
Section PL v_{max} = 40 m/s
Section PM v_{max} = 30 m/s

Experience has shown that minimum pulley diameters should be avoided. Such drives are not cheap and require large face widths.

In such borderline cases the use of the next smaller belt section on similar pulley diameters will often save both cost and space.

In these boundary areas, it is advisable to design the drive with both sections.

Diagram 1

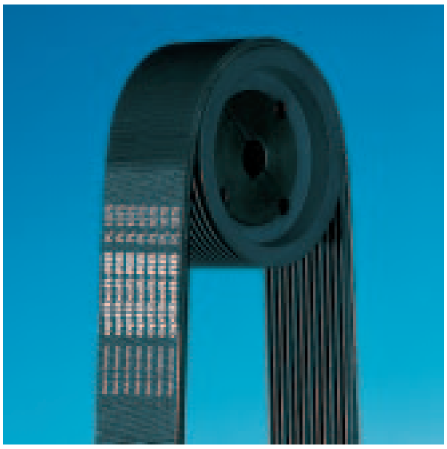


Power Transmission

Drive Design

Formulae and Drive Design Method

Prime Mover



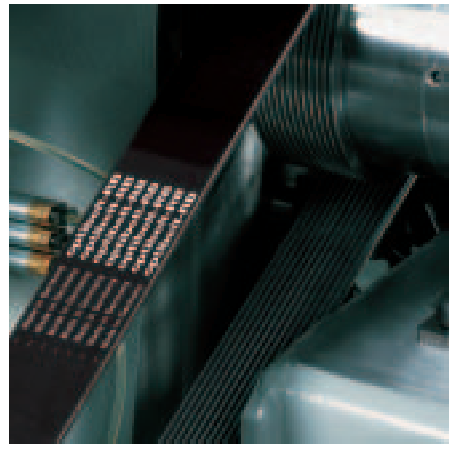
Electric motor
$P = 13$ kW
$n_1 = 2440$ min^{-1}
Start up: direct
Starting torque: $M_A = 2.7\ M_N$

Drive Conditions

Operational hours per day:
approx. 8 hours
Number of starts: approx. 20 per day
Normal ambient temperature, no exposure to oil and water

Drive centre distance: between 250 and 300 mm acceptable
Effective diameter of driver pulley:
$d_{e1} = 140$ mm

Driven Machine



Grinding spindle
$P = 13$ kW
$n_2 = 3100 \pm 100$ min^{-1}
Start up: from idling

Formulae	Calculation Example
Drive service factor c_2 from Table 4 page 13	c_2 = **1.8**
Design power $P_B = P \cdot c_2$	$P_B = 13 \cdot 1.8 =$ **23.40 kW**
Belt section selection from Diagram 1 page 14	**Profil PL**
Speed ratio $r = \frac{n_1}{n_2} = \frac{D_p}{d_p} = \frac{d_{e2} + 2\,b_e}{d_{e1} + 2\,b_e}$ h_b see page 24	$r = \frac{2440}{3173} =$ **0.769**
Effective diameters of ribbed belt pulleys d_{e1} Page 37 $d_{e2} = d_{e1} \cdot r + 2\,b_e\,(r - 1)$ when d_{e2} is known: $d_{e1} = \frac{d_{e2}}{r} + 2\,h_b\,\frac{1}{r} - 1$	d_{e1} = **123 mm** selected $d_{e2} = 123\text{ mm} \cdot 0.769 + 2 \cdot 3.5\,(0.769 - 1) = 92.97$ mm d_{e2} = **93 mm** see page 37

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Power Transmission

Drive Design

Formulae and Drive Design Method

Formulae

Calculation Example

Recalculation of speed of driven machine

$$r_{actual} = \frac{D_p}{d_p} = \frac{d_{e2} + 2\,b_e}{d_{e1} + 2\,b_e}$$

$$n_{2\,actual} = \frac{n_1}{r_{actual}}$$

Example:

$$r_{actual} = \frac{93 + 2 \cdot 3.5}{123 + 2 \cdot 3.5} = \mathbf{0.769}$$

$$n_{2\,actual} = \frac{2440}{0.769} = \mathbf{3173\ min^{-1}}$$

Required: 3100 ± 100 min^{-1} (Calculated speed meets requirement)

Drive centre distance (suggested)

Empfehlung: $c > 0.7\ (D_e + d_e)$

$c < 2\ \ (D_e + d_e)$

Example: c = **380 mm** suggested

Effective length of Ribbed Belt

$$L_{eth} \approx 2\,c + 1.57\,(D_e + d_e) + \frac{(D_e - d_e)^2}{4\,c}$$

Actual:

$$L_{eth} = 2\,c \cdot \sin\frac{\beta}{2} + \frac{\pi}{2}\,(D_e + d_e) + \frac{\alpha \times \pi}{180^\circ}\,(D_e + d_e)$$

Example:

$$L_{eth} \approx 2 \cdot 380 + 1.57 \cdot (123 + 93) + \frac{(123 - 93)^2}{4 \cdot 380} \approx 1099.7\ mm$$

Nearest standard length from page 7 selected

L_{es} = **1075 mm**

Drive centre distance

Calculated from L_{es} and L_{eth}

(when $L_{es} > L_{eth}$) $C_{nom} \approx C + \frac{L_{es} - L_{eth}}{2}$

(when $L_{es} < L_{eth}$) $C_{nom} \approx C - \frac{L_{es} - L_{eth}}{2}$

actual:

$$C_{nom} = \frac{L_{es} - \frac{\pi}{2}(D_e + d_e)}{4} + \sqrt{\left[\frac{L_{es} - \frac{\pi}{2}(D_e + d_e)}{4}\right]^2 - \frac{(D_e - d_e)^2}{8}}$$

Example:

$$C_{nom} \approx 380 - \frac{1099.7 - 1075}{2} \approx \mathbf{367.65\ mm}$$

Minimum allowances x/y above and belod drive centre distance C_{nom}

x/y from table 3 page 11

Example: $x \geq$ **20 mm** / $y \geq$ **25 mm**

Belt speed

$$v = \frac{d_{pk} \cdot n_k}{19100} = \frac{(d_{bk} + 2 \cdot h_b) \cdot n_k}{19100}$$

Example:

$$v = \frac{(93 + 2 \cdot 3.5) \cdot 3173}{19100} = \mathbf{16.61\ m/s}$$

Power Transmission

Drive Design

Formulae and Drive Design Method

Formulae / **Calculation Example**

Arc of contact and arc of contact correction factor

$$\frac{D_e - d_e}{C_{nom}}$$

Approximate $\beta°$ and c_1 from table 1 page 9

Actual: $\cos\frac{\beta}{2} = \frac{D_e - d_e}{2\,C_{nom}}$

Calculation example:

$$\frac{123 - 93}{368} = 0.082$$

$\beta \approx 175°$, c_1 = **1.0** } linearly interpolated

Belt length correction factor

c_3 from table 2 page 11

Calculation example:

c_3 = **0.86**

Power rating per rib

P_N for $d_e = 93$ mm, $n = 3173\ \text{min}^{-1}$, $r* = \frac{1}{0.769} = 1.3$ — Section PL from table 8 page 21

When a speed up drive is involved use the formula marked * to generate "r" for use with the power rating tables.

Calculation example:

$P_N = 2.28 + 0.2 =$ **2.48 kW**

Number of ribs

$$z = \frac{P \cdot c_2}{P_N \cdot c_1 \cdot c_3}$$

Calculation example:

$$z = \frac{13 \cdot 1.8}{2.48 \cdot 1.0 \cdot 0.86} = 10.97$$

Suggested:
1 Optibelt-RB Ribbed Belt 12 PL 1075

Static belt tension per rib

$$T \approx \frac{500 \cdot (2.03 - c_1) \cdot P_B}{c_1 \cdot z \cdot v} + k \cdot v^2$$

k from diagram 2 page 41

Calculation example:

$$T \approx \frac{500 \cdot (2.03 - 1.0) \cdot 23.4}{1.0 \cdot 12 \cdot 16.6} + 0.036 \cdot 16.6^2 \approx \textbf{70 N}$$

Minimum static shaft loading

$$S_a \approx 2\,T \cdot \sin\frac{\beta}{2} \cdot z$$

Calculation example:

$S_a \approx 2 \cdot 70 \cdot 0.9986 \cdot 12 \approx$ **1678 N**

Belt deflection for a given span length

$$E_a \approx \frac{E \cdot L}{100}$$

E from diagram 2 page 41

$L = C_{nom} \cdot \sin\frac{\beta}{2}$

For explanation see chapter on tensioning on page 40

Calculation example:

$$E_a \approx \frac{2.5 \cdot 367.0}{100} \approx \textbf{9 mm}$$

$E \approx 2.5$ mm

$L = 367.6 \cdot 0.9986 = 367.0$ mm

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Power Transmission

Section PH

Power Ratings P_N (kW) per Rib for β = 180° and L_{eff} = 813 mm

Table 5

v (m/s)	n (min⁻¹)	Effective diameter of the small pulley d_e (mm): 13	17	20	25	31.5	35.5	40	45	50	63	71	80	Additional power per rib for speed ratio r. 1.01 to 1.05	1.06 to 1.26	1.27 to 1.57	>1.57
	700	0.01	0.02	0.02	0.03	0.04	0.05	0.05	0.06	0.07	0.09	0.10	0.11				
	950	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.11	0.13	0.15				
	1450	0.02	0.03	0.04	0.06	0.08	0.09	0.10	0.11	0.13	0.17	0.19	0.21				
	2850	0.03	0.05	0.07	0.10	0.14	0.16	0.18	0.21	0.23	0.30	0.34	0.38			0.01	0.01
	100	0.00	0.00	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.02	0.02				
	300	0.01	0.01	0.01	0.01	0.02	0.02	0.02	0.03	0.03	0.04	0.05	0.05				
	500	0.01	0.01	0.02	0.02	0.03	0.03	0.04	0.04	0.05	0.06	0.07	0.08				
	700	0.01	0.02	0.02	0.03	0.04	0.05	0.05	0.06	0.07	0.09	0.10	0.11				
	900	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.08	0.11	0.12	0.14				
	1000	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.12	0.13	0.15				
	1100	0.02	0.02	0.03	0.04	0.06	0.07	0.08	0.09	0.10	0.13	0.15	0.17				
	1200	0.02	0.03	0.03	0.05	0.06	0.07	0.08	0.10	0.11	0.14	0.16	0.18				
	1300	0.02	0.03	0.04	0.05	0.07	0.08	0.09	0.10	0.12	0.15	0.17	0.19				
	1400	0.02	0.03	0.04	0.05	0.07	0.08	0.10	0.11	0.13	0.16	0.18	0.21				
	1500	0.02	0.03	0.04	0.06	0.08	0.09	0.10	0.12	0.13	0.17	0.19	0.22				
	1600	0.02	0.03	0.04	0.06	0.08	0.10	0.11	0.13	0.14	0.18	0.20	0.23				
	1700	0.02	0.04	0.05	0.06	0.09	0.10	0.12	0.13	0.15	0.19	0.22	0.24				
	1800	0.02	0.04	0.05	0.07	0.09	0.11	0.12	0.14	0.16	0.20	0.23	0.26				
	1900	0.02	0.04	0.05	0.07	0.10	0.11	0.13	0.15	0.16	0.21	0.24	0.27				
	2000	0.02	0.04	0.05	0.07	0.10	0.12	0.13	0.15	0.17	0.22	0.25	0.28				
	2100	0.02	0.04	0.06	0.08	0.10	0.12	0.14	0.16	0.18	0.23	0.26	0.29				
	2200	0.03	0.04	0.06	0.08	0.11	0.13	0.15	0.17	0.19	0.24	0.27	0.31				0.01
	2300	0.03	0.05	0.06	0.08	0.11	0.13	0.15	0.17	0.19	0.25	0.28	0.32				0.01
	2400	0.03	0.05	0.06	0.09	0.12	0.14	0.16	0.18	0.20	0.26	0.29	0.33				0.01
	2500	0.03	0.05	0.06	0.09	0.12	0.14	0.16	0.19	0.21	0.27	0.30	0.34				0.01
	2600	0.03	0.05	0.07	0.09	0.13	0.15	0.17	0.19	0.22	0.28	0.31	0.35				0.01
	2700	0.03	0.05	0.07	0.10	0.13	0.15	0.17	0.20	0.22	0.29	0.32	0.37				0.01
2	2800	0.03	0.05	0.07	0.10	0.13	0.16	0.18	0.21	0.23	0.30	0.33	0.38			0.01	0.01
	2900	0.03	0.06	0.07	0.10	0.14	0.16	0.18	0.21	0.24	0.30	0.34	0.39			0.01	0.01
	3000	0.03	0.06	0.08	0.10	0.14	0.17	0.19	0.22	0.24	0.31	0.35	0.40			0.01	0.01
	3100	0.03	0.06	0.08	0.11	0.15	0.17	0.20	0.22	0.25	0.32	0.37	0.41			0.01	0.01
	3200	0.03	0.06	0.08	0.11	0.15	0.17	0.20	0.23	0.26	0.33	0.38	0.42			0.01	0.01
	3300	0.03	0.06	0.08	0.11	0.15	0.18	0.21	0.24	0.27	0.34	0.39	0.43			0.01	0.01
	3400	0.04	0.06	0.08	0.12	0.16	0.18	0.21	0.24	0.27	0.35	0.39	0.44			0.01	0.01
	3500	0.04	0.06	0.09	0.12	0.16	0.19	0.22	0.25	0.28	0.36	0.40	0.46			0.01	0.01
	3600	0.04	0.07	0.09	0.12	0.17	0.19	0.22	0.26	0.29	0.37	0.41	0.47			0.01	0.01
	3700	0.04	0.07	0.09	0.13	0.17	0.20	0.23	0.26	0.29	0.38	0.42	0.48			0.01	0.01
	3800	0.04	0.07	0.09	0.13	0.17	0.20	0.23	0.27	0.30	0.38	0.43	0.49		0.01	0.01	0.01
	3900	0.04	0.07	0.09	0.13	0.18	0.21	0.24	0.27	0.31	0.39	0.44	0.50		0.01	0.01	0.01
	4000	0.04	0.07	0.10	0.13	0.18	0.21	0.24	0.28	0.31	0.40	0.45	0.51		0.01	0.01	0.01
	4100	0.04	0.07	0.10	0.14	0.19	0.22	0.25	0.29	0.32	0.41	0.46	0.52		0.01	0.01	0.01
	4200	0.04	0.08	0.10	0.14	0.19	0.22	0.25	0.29	0.33	0.42	0.47	0.53		0.01	0.01	0.01
	4400	0.04	0.08	0.10	0.15	0.20	0.23	0.26	0.30	0.34	0.43	0.49	0.55		0.01	0.01	0.01
	4600	0.04	0.08	0.11	0.15	0.21	0.24	0.27	0.31	0.35	0.45	0.51	0.57		0.01	0.01	0.01
	4800	0.05	0.08	0.11	0.16	0.21	0.25	0.28	0.33	0.37	0.47	0.52	0.59		0.01	0.01	0.01
	5000	0.05	0.09	0.12	0.16	0.22	0.26	0.29	0.34	0.38	0.48	0.54	0.60		0.01	0.01	0.01
	5200	0.05	0.09	0.12	0.17	0.23	0.26	0.30	0.35	0.39	0.50	0.56	0.62		0.01	0.01	0.01
	5400	0.05	0.09	0.12	0.17	0.24	0.27	0.31	0.36	0.40	0.51	0.57	0.64		0.01	0.01	0.01
	5600	0.05	0.09	0.13	0.18	0.24	0.28	0.32	0.37	0.42	0.53	0.59	0.66		0.01	0.01	0.01
	5800	0.05	0.10	0.13	0.18	0.25	0.29	0.33	0.38	0.43	0.54	0.61	0.67		0.01	0.01	0.01
	6000	0.05	0.10	0.13	0.19	0.26	0.30	0.34	0.39	0.44	0.56	0.62	0.69		0.01	0.01	0.01
	6200	0.06	0.10	0.14	0.19	0.26	0.31	0.35	0.40	0.45	0.57	0.64	0.70		0.01	0.01	0.01
	6400	0.06	0.11	0.14	0.20	0.27	0.31	0.36	0.41	0.46	0.58	0.65	0.72		0.01	0.01	0.01
	6600	0.06	0.11	0.14	0.20	0.28	0.32	0.37	0.42	0.47	0.60	0.66	0.73		0.01	0.01	0.02
	6800	0.06	0.11	0.15	0.21	0.29	0.33	0.38	0.43	0.49	0.61	0.68	0.75		0.01	0.01	0.02
	7000	0.06	0.11	0.15	0.21	0.29	0.34	0.39	0.44	0.50	0.62	0.69	0.76		0.01	0.01	0.02
	7200	0.06	0.12	0.15	0.22	0.30	0.35	0.40	0.45	0.51	0.63	0.70	0.77		0.01	0.01	0.02
5	7400	0.06	0.12	0.16	0.22	0.31	0.35	0.41	0.46	0.52	0.65	0.71	0.78		0.01	0.01	0.02
	7600	0.06	0.12	0.16	0.23	0.31	0.36	0.42	0.47	0.53	0.66	0.73	0.79		0.01	0.01	0.02
	7800	0.06	0.12	0.17	0.23	0.32	0.37	0.42	0.48	0.54	0.67	0.74	0.80		0.01	0.01	0.02
	8000	0.07	0.13	0.17	0.24	0.33	0.38	0.43	0.49	0.55	0.68	0.75	0.81		0.01	0.01	0.02
	8200	0.07	0.13	0.17	0.24	0.33	0.38	0.44	0.50	0.56	0.69	0.76	0.82		0.01	0.01	0.02
	8400	0.07	0.13	0.18	0.25	0.34	0.39	0.45	0.51	0.57	0.70	0.77	0.83		0.01	0.02	0.02
	8600	0.07	0.13	0.18	0.25	0.34	0.40	0.46	0.52	0.58	0.71	0.78	0.83		0.01	0.02	0.02
	8800	0.07	0.13	0.18	0.26	0.35	0.41	0.46	0.53	0.59	0.72	0.78	0.84		0.01	0.02	0.02
	9000	0.07	0.14	0.18	0.26	0.36	0.41	0.47	0.54	0.59	0.73	0.79	0.85		0.01	0.02	0.02
	9200	0.07	0.14	0.19	0.27	0.36	0.42	0.48	0.54	0.60	0.74	0.80	0.85		0.01	0.02	0.02
	9400	0.07	0.14	0.19	0.27	0.37	0.43	0.49	0.55	0.61	0.74	0.81	0.86		0.01	0.02	0.02
	9600	0.07	0.14	0.19	0.28	0.38	0.43	0.50	0.56	0.62	0.75	0.81	0.86		0.01	0.02	0.02
	9800	0.08	0.15	0.20	0.28	0.38	0.44	0.50	0.57	0.63	0.76	0.82	0.86		0.01	0.02	0.02
	10000	0.08	0.15	0.20	0.28	0.39	0.45	0.51	0.58	0.64	0.77	0.82	0.86		0.01	0.02	0.02
	10300	0.08	0.15	0.21	0.29	0.40	0.46	0.52	0.59	0.65	0.77	0.83	0.86		0.01	0.02	0.02
	10600	0.08	0.15	0.21	0.30	0.40	0.47	0.53	0.60	0.66	0.78	0.83	0.86		0.01	0.02	0.02
	10900	0.08	0.16	0.21	0.30	0.41	0.48	0.54	0.61	0.67	0.79	0.84	0.86		0.01	0.02	0.02
	11500	0.08	0.16	0.22	0.32	0.43	0.49	0.56	0.63	0.69	0.80	0.84	0.84		0.02	0.02	0.03
	12100	0.09	0.17	0.23	0.33	0.44	0.51	0.58	0.65	0.70	0.81	0.83	0.82		0.02	0.02	0.03
	12500	0.09	0.17	0.24	0.34	0.45	0.52	0.59	0.66	0.71	0.81	0.83	0.80		0.02	0.02	0.03
v (m/s)			10			20				30	40						

Where v >60 m/s, please consult our Applications Engineers

optibelt

Power Transmission

Section PJ

Power Ratings P_N (kW) per Rib for β = 180° and L_{eff} = 1016 mm

Table 6

v (m/s)	n (min⁻¹)	Effective diameter of the small pulley d_e (mm) 20	25	31.5	35.5	40	45	50	63	71	80	90	100	112	125	140	160	Additional power per rib for speed ratio r. 1.01 to 1.05	1.06 to 1.26	1.27 to 1.57	>1.57
	700	0.04	0.05	0.07	0.08	0.10	0.11	0.13	0.16	0.18	0.21	0.24	0.26	0.30	0.33	0.37	0.42				0.01
	950	0.05	0.07	0.09	0.11	0.13	0.14	0.16	0.21	0.24	0.28	0.31	0.35	0.39	0.44	0.49	0.56			0.01	0.01
	1450	0.06	0.09	0.13	0.15	0.18	0.21	0.24	0.31	0.35	0.40	0.45	0.51	0.57	0.63	0.71	0.81		0.01	0.01	0.01
	2850	0.11	0.16	0.23	0.28	0.32	0.38	0.43	0.56	0.64	0.72	0.82	0.91	1.02	1.14	1.27	1.43		0.01	0.02	0.02
	100	0.01	0.01	0.01	0.02	0.02	0.02	0.02	0.03	0.03	0.04	0.04	0.05	0.05	0.06	0.06	0.07				
	300	0.02	0.03	0.03	0.04	0.05	0.05	0.06	0.08	0.09	0.10	0.11	0.12	0.14	0.16	0.17	0.20				
	500	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.12	0.14	0.16	0.18	0.20	0.22	0.25	0.27	0.31				
	700	0.04	0.05	0.07	0.08	0.10	0.11	0.13	0.16	0.18	0.21	0.24	0.26	0.30	0.33	0.37	0.42				0.01
	900	0.04	0.06	0.09	0.10	0.12	0.14	0.16	0.20	0.23	0.26	0.30	0.33	0.37	0.42	0.46	0.53			0.01	0.01
	1100	0.05	0.07	0.10	0.12	0.14	0.16	0.19	0.24	0.28	0.31	0.36	0.40	0.44	0.50	0.56	0.63			0.01	0.01
	1200	0.05	0.08	0.11	0.13	0.15	0.18	0.20	0.26	0.30	0.34	0.38	0.43	0.48	0.54	0.60	0.68			0.01	0.01
	1300	0.06	0.09	0.12	0.14	0.16	0.19	0.22	0.28	0.32	0.36	0.41	0.46	0.52	0.58	0.64	0.73		0.01	0.01	0.01
	1400	0.06	0.09	0.13	0.15	0.18	0.20	0.23	0.30	0.34	0.39	0.44	0.49	0.55	0.62	0.69	0.78		0.01	0.01	0.01
	1500	0.07	0.10	0.14	0.16	0.19	0.22	0.24	0.32	0.36	0.41	0.47	0.52	0.59	0.65	0.73	0.83		0.01	0.01	0.01
	1600	0.07	0.10	0.14	0.17	0.20	0.23	0.26	0.34	0.38	0.44	0.49	0.55	0.62	0.69	0.77	0.88		0.01	0.01	0.01
	1700	0.07	0.11	0.15	0.18	0.21	0.24	0.27	0.36	0.41	0.46	0.52	0.58	0.65	0.73	0.82	0.93		0.01	0.01	0.01
	1800	0.08	0.11	0.16	0.19	0.22	0.25	0.29	0.37	0.43	0.48	0.55	0.61	0.69	0.77	0.86	0.98		0.01	0.01	0.01
(2)	1900	0.08	0.12	0.17	0.20	0.23	0.26	0.30	0.39	0.45	0.51	0.58	0.64	0.72	0.80	0.90	1.02		0.01	0.01	0.01
	2000	0.08	0.12	0.17	0.20	0.24	0.28	0.31	0.41	0.47	0.53	0.60	0.67	0.75	0.84	0.94	1.07		0.01	0.01	0.01
	2100	0.08	0.13	0.18	0.21	0.25	0.29	0.33	0.43	0.49	0.56	0.63	0.70	0.79	0.88	0.98	1.11		0.01	0.01	0.02
	2200	0.09	0.13	0.19	0.22	0.26	0.30	0.34	0.45	0.51	0.58	0.65	0.73	0.82	0.91	1.02	1.16		0.01	0.01	0.02
	2300	0.09	0.14	0.19	0.23	0.27	0.31	0.35	0.46	0.53	0.60	0.68	0.76	0.85	0.95	1.06	1.20		0.01	0.01	0.02
	2400	0.09	0.14	0.20	0.24	0.28	0.32	0.37	0.48	0.55	0.62	0.71	0.79	0.88	0.98	1.10	1.24		0.01	0.01	0.02
	2500	0.10	0.15	0.21	0.25	0.29	0.34	0.38	0.50	0.57	0.65	0.73	0.82	0.91	1.02	1.14	1.29		0.01	0.01	0.02
	2600	0.10	0.15	0.22	0.26	0.30	0.35	0.39	0.52	0.59	0.67	0.76	0.84	0.94	1.05	1.17	1.33		0.01	0.01	0.02
	2700	0.10	0.16	0.22	0.26	0.31	0.36	0.41	0.53	0.61	0.69	0.78	0.87	0.98	1.09	1.21	1.37		0.01	0.02	0.02
	2800	0.11	0.16	0.23	0.27	0.32	0.37	0.42	0.55	0.63	0.71	0.81	0.90	1.01	1.12	1.25	1.41		0.01	0.02	0.02
	2900	0.11	0.17	0.24	0.28	0.33	0.38	0.43	0.57	0.65	0.73	0.83	0.93	1.04	1.15	1.28	1.45		0.01	0.02	0.02
	3000	0.11	0.17	0.24	0.29	0.34	0.39	0.45	0.58	0.67	0.76	0.86	0.95	1.07	1.19	1.32	1.49		0.01	0.02	0.02
	3100	0.11	0.17	0.25	0.30	0.35	0.40	0.46	0.60	0.68	0.78	0.88	0.98	1.10	1.22	1.35	1.53		0.01	0.02	0.02
	3200	0.12	0.18	0.26	0.30	0.36	0.41	0.47	0.62	0.70	0.80	0.90	1.01	1.13	1.25	1.39	1.56		0.01	0.02	0.02
	3300	0.12	0.18	0.26	0.31	0.37	0.43	0.48	0.63	0.72	0.82	0.93	1.03	1.15	1.28	1.42	1.60		0.01	0.02	0.02
	3400	0.12	0.19	0.27	0.32	0.38	0.44	0.50	0.65	0.74	0.84	0.95	1.06	1.18	1.31	1.46	1.64		0.01	0.02	0.02
	3500	0.13	0.19	0.28	0.33	0.38	0.45	0.51	0.67	0.76	0.86	0.97	1.08	1.21	1.34	1.49	1.67		0.01	0.02	0.03
	3600	0.13	0.20	0.28	0.34	0.39	0.46	0.52	0.68	0.78	0.88	1.00	1.11	1.24	1.37	1.52	1.71		0.01	0.02	0.03
	3700	0.13	0.20	0.29	0.34	0.40	0.47	0.53	0.70	0.80	0.90	1.02	1.13	1.27	1.40	1.55	1.74		0.02	0.02	0.03
	3800	0.13	0.21	0.30	0.35	0.41	0.48	0.55	0.71	0.81	0.92	1.04	1.16	1.29	1.43	1.59	1.77		0.02	0.02	0.03
	3900	0.14	0.21	0.30	0.36	0.42	0.49	0.56	0.73	0.83	0.94	1.07	1.18	1.32	1.46	1.62	1.80		0.02	0.02	0.03
	4000	0.14	0.21	0.31	0.37	0.43	0.50	0.57	0.75	0.85	0.96	1.09	1.21	1.35	1.49	1.65	1.84		0.02	0.02	0.03
	4100	0.14	0.22	0.32	0.37	0.44	0.51	0.58	0.76	0.87	0.98	1.11	1.23	1.37	1.52	1.68	1.87		0.02	0.02	0.03
	4200	0.14	0.22	0.32	0.38	0.45	0.52	0.59	0.78	0.89	1.00	1.13	1.26	1.40	1.55	1.70	1.90		0.02	0.02	0.03
	4300	0.15	0.23	0.33	0.39	0.46	0.53	0.61	0.79	0.90	1.02	1.15	1.28	1.42	1.57	1.73	1.92		0.02	0.02	0.03
	4400	0.15	0.23	0.33	0.40	0.47	0.54	0.62	0.81	0.92	1.04	1.18	1.30	1.45	1.60	1.76	1.95		0.02	0.02	0.03
	4500	0.15	0.23	0.34	0.40	0.48	0.55	0.63	0.82	0.94	1.06	1.20	1.33	1.47	1.63	1.79	1.98		0.02	0.03	0.03
	4600	0.15	0.24	0.35	0.41	0.48	0.56	0.64	0.84	0.95	1.08	1.22	1.35	1.50	1.65	1.81	2.00		0.02	0.03	0.03
	4700	0.16	0.24	0.35	0.42	0.49	0.57	0.65	0.85	0.97	1.10	1.24	1.37	1.52	1.68	1.84	2.03		0.02	0.03	0.03
(5)	4800	0.16	0.25	0.36	0.43	0.50	0.58	0.66	0.87	0.99	1.12	1.26	1.39	1.55	1.70	1.86	2.05		0.02	0.03	0.03
	4900	0.16	0.25	0.37	0.43	0.51	0.59	0.68	0.88	1.01	1.14	1.28	1.42	1.57	1.72	1.89	2.07		0.02	0.03	0.04
	5000	0.16	0.26	0.37	0.44	0.52	0.60	0.69	0.90	1.02	1.16	1.30	1.44	1.59	1.75	1.91	2.09		0.02	0.03	0.04
	5100	0.17	0.26	0.38	0.45	0.53	0.61	0.70	0.91	1.04	1.17	1.32	1.46	1.62	1.77	1.93	2.12	0.01	0.02	0.03	0.04
	5200	0.17	0.26	0.38	0.46	0.54	0.62	0.71	0.93	1.05	1.19	1.34	1.48	1.64	1.79	1.95	2.13	0.01	0.02	0.03	0.04
	5300	0.17	0.27	0.39	0.46	0.55	0.63	0.72	0.94	1.07	1.21	1.36	1.50	1.66	1.82	1.98	2.15	0.01	0.02	0.03	0.04
	5400	0.17	0.27	0.40	0.47	0.55	0.64	0.73	0.96	1.09	1.23	1.38	1.52	1.68	1.84	2.00	2.17	0.01	0.02	0.03	0.04
	5500	0.18	0.28	0.40	0.48	0.56	0.65	0.74	0.97	1.10	1.25	1.40	1.54	1.70	1.86	2.02	2.19	0.01	0.02	0.03	0.04
	5600	0.18	0.28	0.41	0.48	0.57	0.66	0.76	0.98	1.12	1.26	1.42	1.56	1.72	1.88	2.03	2.20	0.01	0.02	0.03	0.04
	5700	0.18	0.28	0.41	0.49	0.58	0.67	0.77	1.00	1.13	1.28	1.44	1.58	1.74	1.90	2.05	2.22	0.01	0.02	0.03	0.04
	5800	0.18	0.29	0.42	0.50	0.59	0.68	0.78	1.01	1.15	1.30	1.45	1.60	1.76	1.92	2.07	2.23	0.01	0.02	0.03	0.04
	6000	0.19	0.29	0.43	0.51	0.60	0.70	0.80	1.04	1.18	1.33	1.49	1.64	1.80	1.95	2.10	2.25	0.01	0.02	0.03	0.04
	6200	0.19	0.30	0.44	0.53	0.62	0.72	0.82	1.07	1.21	1.36	1.52	1.67	1.83	1.99	2.13	2.27	0.01	0.03	0.04	0.04
	6400	0.20	0.31	0.45	0.54	0.64	0.74	0.84	1.09	1.24	1.40	1.56	1.71	1.87	2.02	2.16	2.28	0.01	0.03	0.04	0.05
	6600	0.20	0.32	0.47	0.55	0.65	0.76	0.86	1.12	1.27	1.43	1.59	1.74	1.90	2.05	2.18	2.28	0.01	0.03	0.04	0.05
	6800	0.20	0.32	0.48	0.57	0.67	0.78	0.88	1.15	1.30	1.46	1.62	1.77	1.93	2.07	2.20	2.29	0.01	0.03	0.04	0.05
	7000	0.21	0.33	0.49	0.58	0.68	0.79	0.90	1.17	1.32	1.49	1.65	1.80	1.96	2.10	2.21	2.28	0.01	0.03	0.04	0.05
	7200	0.21	0.34	0.50	0.59	0.70	0.81	0.92	1.20	1.35	1.52	1.68	1.83	1.98	2.12	2.22	2.27	0.01	0.03	0.04	0.05
	7400	0.22	0.35	0.51	0.61	0.71	0.83	0.94	1.22	1.38	1.54	1.71	1.86	2.01	2.13	2.23		0.01	0.03	0.04	0.05
	7600	0.22	0.35	0.52	0.62	0.73	0.85	0.96	1.24	1.40	1.57	1.74	1.88	2.03	2.15	2.23		0.01	0.03	0.04	0.05
	7800	0.22	0.36	0.53	0.63	0.74	0.86	0.98	1.27	1.43	1.60	1.76	1.91	2.05	2.16	2.23		0.01	0.03	0.04	0.06
	8000	0.23	0.37	0.54	0.64	0.76	0.88	1.00	1.29	1.45	1.62	1.79	1.93	2.07	2.17	2.22		0.01	0.03	0.05	0.06
	8200	0.23	0.37	0.55	0.66	0.77	0.90	1.02	1.31	1.48	1.65	1.81	1.95	2.08	2.17	2.21		0.01	0.03	0.05	0.06
	8400	0.24	0.38	0.56	0.67	0.79	0.91	1.04	1.33	1.50	1.67	1.83	1.97	2.09	2.18	2.20		0.01	0.03	0.05	0.06
	8600	0.24	0.39	0.57	0.68	0.80	0.93	1.06	1.36	1.52	1.69	1.85	1.99	2.10	2.18			0.01	0.04	0.05	0.06
	8800	0.24	0.39	0.58	0.69	0.82	0.95	1.07	1.38	1.54	1.71	1.87	2.00	2.11	2.17			0.01	0.04	0.05	0.06
	9000	0.25	0.40	0.59	0.71	0.83	0.96	1.09	1.40	1.56	1.73	1.89	2.01	2.12	2.16			0.01	0.04	0.05	0.06
	9200	0.25	0.41	0.60	0.72	0.84	0.98	1.11	1.42	1.59	1.75	1.91	2.03	2.12	2.15			0.01	0.04	0.05	0.07
(10)	9400	0.26	0.41	0.61	0.73	0.86	0.99	1.13	1.44	1.60	1.77	1.92	2.04	2.12	2.14			0.01	0.04	0.05	0.07
	9700	0.26	0.42	0.63	0.75	0.88	1.02	1.15	1.46	1.63	1.80	1.94	2.05	2.12				0.01	0.04	0.05	0.07
	9900	0.26	0.43	0.64	0.76	0.89	1.03	1.17	1.48	1.65	1.81	1.95	2.05	2.11				0.01	0.04	0.06	0.07
	10100	0.27	0.44	0.64	0.77	0.90	1.05	1.18	1.50	1.67	1.83	1.96	2.06	2.10				0.01	0.04	0.06	0.07
	10500	0.27	0.45	0.66	0.79	0.93	1.07	1.21	1.53	1.70	1.85	1.98	2.05	2.07				0.01	0.04	0.06	0.08

Where v >60 m/s, please consult our Applications Engineers

(20) (30) (40) (50) v (m/s)

optibelt

Power Transmission

Section PK

Power Ratings P_N (kW) per Rib for β = 180° and L_{eff} = 1600 mm

Table 7

v (m/s)	n (min⁻¹)	Effective diameter of the small pulley d_e (mm) 45	50	63	71	80	90	100	112	125	140	160	180	190	224	250	280	315	Additional power per rib for speed ratio r. 1.01 to 1.05	1.06 to 1.26	1.27 to 1.57	>1.57
	700	0.17	0.21	0.32	0.38	0.45	0.53	0.61	0.70	0.80	0.91	1.06	1.21	1.28	1.53	1.71	1.92	2.16		0.02	0.02	0.03
	950	0.21	0.27	0.41	0.49	0.59	0.69	0.79	0.92	1.05	1.20	1.39	1.58	1.68	2.00	2.23	2.50	2.81	0.01	0.02	0.03	0.04
	1450	0.29	0.37	0.58	0.70	0.84	0.99	1.14	1.32	1.51	1.73	2.01	2.28	2.42	2.86	3.19	3.56	3.97	0.01	0.04	0.05	0.06
	2850	0.48	0.63	1.00	1.23	1.48	1.75	2.01	2.32	2.65	3.01	3.47	3.90	4.11	4.75	5.16	5.56	5.91	0.02	0.07	0.10	0.12
	200	0.06	0.08	0.11	0.13	0.15	0.18	0.20	0.23	0.27	0.30	0.35	0.40	0.42	0.50	0.56	0.63	0.71			0.01	0.01
	400	0.11	0.13	0.20	0.24	0.28	0.33	0.37	0.43	0.49	0.56	0.65	0.74	0.78	0.93	1.04	1.17	1.32		0.01	0.01	0.02
	600	0.15	0.19	0.28	0.33	0.40	0.46	0.53	0.61	0.70	0.80	0.93	1.06	1.12	1.33	1.49	1.68	1.89		0.01	0.02	0.03
(2)	800	0.19	0.23	0.35	0.43	0.51	0.60	0.68	0.79	0.90	1.03	1.20	1.36	1.44	1.72	1.92	2.16	2.42		0.02	0.03	0.03
	1000	0.22	0.28	0.43	0.52	0.61	0.72	0.83	0.96	1.09	1.25	1.45	1.66	1.76	2.09	2.34	2.62	2.93	0.01	0.02	0.03	0.04
	1100	0.24	0.30	0.46	0.56	0.67	0.78	0.90	1.04	1.19	1.36	1.58	1.80	1.91	2.27	2.53	2.84	3.18	0.01	0.03	0.04	0.05
	1200	0.25	0.32	0.50	0.60	0.72	0.85	0.97	1.12	1.28	1.47	1.70	1.94	2.06	2.44	2.73	3.05	3.41	0.01	0.03	0.04	0.05
	1300	0.27	0.34	0.53	0.64	0.77	0.91	1.04	1.20	1.37	1.57	1.83	2.08	2.20	2.61	2.92	3.26	3.64	0.01	0.03	0.04	0.06
	1400	0.29	0.36	0.56	0.68	0.82	0.96	1.11	1.28	1.47	1.67	1.95	2.21	2.35	2.78	3.10	3.46	3.86	0.01	0.03	0.05	0.06
	1500	0.30	0.38	0.60	0.72	0.87	1.02	1.18	1.36	1.56	1.78	2.07	2.35	2.49	2.95	3.28	3.66	4.07	0.01	0.04	0.05	0.06
	1600	0.32	0.40	0.63	0.76	0.92	1.08	1.24	1.44	1.64	1.88	2.18	2.48	2.62	3.11	3.46	3.85	4.28	0.01	0.04	0.05	0.07
	1700	0.33	0.42	0.66	0.80	0.96	1.14	1.31	1.51	1.73	1.98	2.30	2.61	2.76	3.26	3.63	4.03	4.47	0.01	0.04	0.06	0.07
	1800	0.34	0.44	0.69	0.84	1.01	1.19	1.38	1.59	1.82	2.07	2.41	2.73	2.89	3.41	3.79	4.21	4.65	0.01	0.04	0.06	0.08
	1900	0.36	0.46	0.72	0.88	1.06	1.25	1.44	1.66	1.90	2.17	2.52	2.86	3.02	3.56	3.95	4.37	4.83	0.01	0.05	0.06	0.08
	2000	0.37	0.48	0.75	0.92	1.10	1.31	1.50	1.74	1.98	2.27	2.63	2.98	3.15	3.71	4.11	4.54	4.99	0.01	0.05	0.07	0.08
(5)	2100	0.39	0.50	0.79	0.96	1.15	1.36	1.57	1.81	2.07	2.36	2.74	3.10	3.27	3.85	4.25	4.69	5.15	0.01	0.05	0.07	0.09
	2200	0.40	0.52	0.82	1.00	1.20	1.41	1.63	1.88	2.15	2.45	2.84	3.21	3.40	3.98	4.40	4.83	5.29	0.01	0.05	0.07	0.09
	2300	0.41	0.53	0.84	1.03	1.24	1.47	1.69	1.95	2.23	2.54	2.94	3.33	3.51	4.11	4.53	4.97	5.42	0.01	0.06	0.08	0.10
	2400	0.42	0.55	0.87	1.07	1.28	1.52	1.75	2.02	2.31	2.63	3.04	3.44	3.63	4.24	4.66	5.10	5.54	0.01	0.06	0.08	0.10
	2500	0.44	0.57	0.90	1.10	1.33	1.57	1.81	2.09	2.39	2.72	3.14	3.55	3.74	4.36	4.79	5.22	5.64	0.01	0.06	0.08	0.11
	2600	0.45	0.59	0.93	1.14	1.37	1.62	1.87	2.16	2.46	2.80	3.24	3.65	3.85	4.48	4.90	5.33	5.74	0.02	0.06	0.09	0.11
	2700	0.46	0.60	0.96	1.18	1.41	1.67	1.93	2.22	2.54	2.89	3.33	3.76	3.96	4.59	5.01	5.43	5.82	0.02	0.07	0.09	0.11
	2800	0.47	0.62	0.99	1.21	1.46	1.72	1.98	2.29	2.61	2.97	3.43	3.86	4.06	4.69	5.11	5.52	5.88	0.02	0.07	0.09	0.12
	2900	0.49	0.64	1.02	1.25	1.50	1.77	2.04	2.36	2.69	3.05	3.52	3.95	4.16	4.79	5.21	5.60	5.94	0.02	0.07	0.10	0.12
	3000	0.50	0.65	1.04	1.28	1.54	1.82	2.10	2.42	2.76	3.13	3.61	4.05	4.25	4.89	5.30	5.67	5.97	0.02	0.07	0.10	0.13
	3100	0.51	0.67	1.07	1.31	1.58	1.87	2.15	2.48	2.83	3.21	3.69	4.14	4.35	4.98	5.38	5.73	6.00	0.02	0.08	0.10	0.13
	3200	0.52	0.68	1.10	1.35	1.62	1.92	2.21	2.54	2.90	3.29	3.77	4.22	4.43	5.06	5.45	5.78	6.01	0.02	0.08	0.11	0.14
	3300	0.53	0.70	1.12	1.38	1.66	1.97	2.26	2.61	2.97	3.36	3.86	4.31	4.52	5.14	5.51	5.82		0.02	0.08	0.11	0.14
	3400	0.54	0.71	1.15	1.41	1.70	2.01	2.31	2.67	3.03	3.43	3.93	4.39	4.60	5.21	5.57	5.85		0.02	0.08	0.11	0.14
	3500	0.55	0.73	1.18	1.44	1.74	2.06	2.37	2.73	3.10	3.51	4.01	4.47	4.67	5.28	5.62	5.86		0.02	0.09	0.12	0.15
	3600	0.56	0.74	1.20	1.48	1.78	2.10	2.42	2.78	3.16	3.58	4.08	4.54	4.75	5.34	5.65	5.87		0.02	0.09	0.12	0.15
	3700	0.57	0.76	1.23	1.51	1.82	2.15	2.47	2.84	3.23	3.64	4.15	4.61	4.82	5.39	5.68	5.86		0.02	0.09	0.12	0.16
	3800	0.58	0.77	1.25	1.54	1.85	2.19	2.52	2.90	3.29	3.71	4.22	4.68	4.88	5.43	5.70			0.02	0.09	0.13	0.16
	3900	0.59	0.79	1.28	1.57	1.89	2.24	2.57	2.95	3.35	3.77	4.29	4.74	4.94	5.47	5.71			0.02	0.10	0.13	0.17
	4000	0.60	0.80	1.30	1.60	1.93	2.28	2.62	3.01	3.41	3.83	4.35	4.80	4.99	5.50	5.72			0.02	0.10	0.13	0.17
	4100	0.61	0.82	1.33	1.63	1.96	2.32	2.66	3.06	3.46	3.89	4.41	4.85	5.04	5.53	5.71			0.02	0.10	0.14	0.17
	4200	0.62	0.83	1.35	1.66	2.00	2.36	2.71	3.11	3.52	3.95	4.47	4.91	5.09	5.54	5.69			0.02	0.10	0.14	0.18
(10)	4300	0.63	0.84	1.37	1.69	2.03	2.40	2.76	3.16	3.57	4.01	4.52	4.95	5.13	5.55				0.03	0.11	0.14	0.18
	4400	0.64	0.86	1.40	1.72	2.07	2.44	2.80	3.21	3.63	4.06	4.57	5.00	5.17	5.56				0.03	0.11	0.15	0.19
	4500	0.65	0.87	1.42	1.75	2.10	2.48	2.85	3.26	3.68	4.12	4.62	5.03	5.20	5.55				0.03	0.11	0.15	0.19
	4600	0.66	0.88	1.44	1.78	2.14	2.52	2.89	3.31	3.73	4.17	4.67	5.07	5.23	5.54				0.03	0.11	0.15	0.19
	4700	0.67	0.90	1.47	1.80	2.17	2.56	2.93	3.35	3.77	4.21	4.71	5.10	5.25	5.51				0.03	0.11	0.16	0.20
	4800	0.68	0.91	1.49	1.83	2.20	2.60	2.97	3.40	3.82	4.26	4.75	5.13	5.27	5.48				0.03	0.12	0.16	0.20
	4900	0.69	0.92	1.51	1.86	2.23	2.63	3.01	3.44	3.87	4.30	4.79	5.15	5.28					0.03	0.12	0.16	0.21
	5000	0.69	0.93	1.53	1.88	2.27	2.67	3.05	3.48	3.91	4.34	4.82	5.16	5.28					0.03	0.12	0.17	0.21
	5100	0.70	0.94	1.55	1.91	2.30	2.71	3.09	3.53	3.95	4.38	4.85	5.18	5.28					0.03	0.12	0.17	0.22
	5200	0.71	0.96	1.57	1.94	2.33	2.74	3.13	3.57	3.99	4.42	4.87	5.18	5.28					0.03	0.13	0.17	0.22
	5300	0.72	0.97	1.59	1.96	2.36	2.78	3.17	3.60	4.03	4.45	4.90	5.19	5.27					0.03	0.13	0.18	0.22
	5400	0.73	0.98	1.62	1.99	2.39	2.81	3.20	3.64	4.07	4.48	4.92	5.18	5.25					0.03	0.13	0.18	0.23
	5500	0.73	0.99	1.64	2.01	2.42	2.84	3.24	3.68	4.10	4.51	4.93	5.18						0.03	0.13	0.18	0.23
	5600	0.74	1.00	1.65	2.04	2.45	2.87	3.27	3.71	4.13	4.54	4.94	5.16						0.03	0.14	0.19	0.24
	5800	0.76	1.02	1.69	2.08	2.50	2.94	3.34	3.78	4.19	4.59	4.95	5.12						0.03	0.14	0.19	0.25
	6000	0.77	1.05	1.73	2.13	2.55	2.99	3.40	3.84	4.25	4.62	4.95							0.04	0.15	0.20	0.25
	6200	0.78	1.07	1.77	2.17	2.60	3.05	3.46	3.89	4.29	4.65	4.93							0.04	0.15	0.21	0.26
	6400	0.80	1.09	1.80	2.21	2.65	3.10	3.51	3.94	4.33	4.66	4.90							0.04	0.16	0.21	0.27
	6600	0.81	1.10	1.84	2.26	2.70	3.15	3.56	3.98	4.36	4.66	4.85							0.04	0.16	0.22	0.28
	6800	0.82	1.12	1.87	2.29	2.74	3.20	3.60	4.02	4.38	4.66								0.04	0.17	0.23	0.29
	7000	0.83	1.14	1.90	2.33	2.78	3.24	3.64	4.05	4.39	4.64								0.04	0.17	0.23	0.30
	7200	0.84	1.16	1.93	2.37	2.82	3.28	3.68	4.07	4.39	4.60								0.04	0.18	0.24	0.30
	7400	0.85	1.17	1.96	2.40	2.86	3.31	3.71	4.09	4.39	4.56								0.04	0.18	0.25	0.31
	7600	0.86	1.19	1.98	2.43	2.89	3.34	3.73	4.10	4.37									0.04	0.19	0.25	0.32
	7800	0.87	1.20	2.01	2.46	2.92	3.37	3.75	4.10	4.35									0.05	0.19	0.26	0.33
	8000	0.88	1.21	2.03	2.49	2.95	3.40	3.77	4.10	4.31									0.05	0.20	0.27	0.34
	8200	0.88	1.23	2.05	2.51	2.97	3.42	3.78	4.09	4.27									0.05	0.20	0.27	0.35
(20)	8400	0.89	1.24	2.08	2.54	3.00	3.43	3.78	4.07	4.21									0.05	0.21	0.28	0.36
	8600	0.90	1.25	2.10	2.56	3.02	3.44	3.78	4.05										0.05	0.21	0.29	0.36
	8800	0.90	1.26	2.11	2.58	3.03	3.45	3.77	4.01										0.05	0.22	0.29	0.37
	9000	0.91	1.27	2.13	2.59	3.05	3.46	3.76	3.97										0.05	0.22	0.30	0.38
	9200	0.91	1.28	2.14	2.61	3.06	3.46	3.74	3.92										0.05	0.23	0.31	0.39
	9400	0.91	1.28	2.16	2.62	3.06	3.45	3.72	3.87										0.06	0.23	0.31	0.40
	9600	0.91	1.29	2.17	2.63	3.07	3.44	3.69											0.06	0.23	0.32	0.41
	9800	0.92	1.30	2.18	2.64	3.07	3.43	3.65											0.06	0.24	0.33	0.41
	10000	0.92	1.30	2.19	2.64	3.07	3.41	3.61											0.06	0.24	0.33	0.42
	10200	0.92	1.31	2.19	2.65	3.06	3.39												0.06	0.25	0.34	0.43
	10400	0.92	1.31	2.20	2.65	3.05	3.36												0.06	0.25	0.35	0.44
				(30)		(40)		(50)												v (m/s)		

Where v >50 m/s, please consult our Applications Engineers

optibelt

Power Transmission

Section PL

Power Ratings P_N (kW) per Rib for β = 180° and L_{eff} = 2096 mm

Table 8

v (m/s)	n (min⁻¹)	76	80	90	100	112	125	140	160	180	200	224	250	280	315	355	400	1.01 to 1.05	1.06 to 1.26	1.27 to 1.57	>1.57
		Effective diameter of the small pulley d_e (mm)																Additional power per rib for speed ratio r.			
	700	0.49	0.53	0.64	0.74	0.87	1.00	1.15	1.34	1.54	1.73	1.96	2.20	2.48	2.80	3.16	3.55	0.01	0.03	0.04	0.06
	950	0.63	0.69	0.83	0.96	1.12	1.30	1.49	1.75	2.01	2.26	2.56	2.87	3.23	3.64	4.09	4.58	0.01	0.04	0.06	0.08
	1450	0.89	0.97	1.17	1.37	1.60	1.85	2.14	2.51	2.88	3.23	3.65	4.09	4.58	5.12	5.71	6.32	0.02	0.07	0.09	0.12
	2850	1.50	1.65	2.00	2.35	2.76	3.19	3.67	4.28	4.85	5.38	5.96	6.51	7.04	7.51	7.82	7.84	0.03	0.13	0.18	0.23
	100	0.10	0.10	0.12	0.14	0.16	0.18	0.21	0.24	0.28	0.31	0.35	0.39	0.44	0.50	0.56	0.63			0.01	0.01
	200	0.17	0.19	0.22	0.25	0.29	0.34	0.38	0.45	0.51	0.57	0.65	0.73	0.82	0.92	1.04	1.17		0.01	0.01	0.02
	300	0.24	0.26	0.31	0.36	0.42	0.48	0.55	0.64	0.73	0.82	0.93	1.04	1.17	1.32	1.50	1.69		0.01	0.02	0.02
	400	0.31	0.34	0.40	0.46	0.53	0.61	0.70	0.82	0.94	1.06	1.20	1.35	1.52	1.71	1.93	2.18		0.02	0.03	0.03
	500	0.37	0.40	0.48	0.56	0.65	0.75	0.86	1.00	1.15	1.29	1.46	1.64	1.85	2.09	2.35	2.65	0.01	0.02	0.03	0.04
	600	0.43	0.47	0.56	0.65	0.76	0.87	1.00	1.18	1.35	1.51	1.71	1.93	2.17	2.45	2.76	3.11	0.01	0.03	0.04	0.05
	700	0.49	0.53	0.64	0.74	0.87	1.00	1.15	1.34	1.54	1.73	1.96	2.20	2.48	2.80	3.16	3.55	0.01	0.03	0.04	0.06
	800	0.55	0.60	0.71	0.83	0.97	1.12	1.29	1.51	1.73	1.95	2.20	2.48	2.79	3.14	3.54	3.97	0.01	0.04	0.05	0.06
	900	0.61	0.66	0.79	0.92	1.07	1.24	1.42	1.67	1.92	2.16	2.44	2.74	3.08	3.47	3.91	4.38	0.01	0.04	0.06	0.07
	1000	0.66	0.72	0.86	1.00	1.17	1.35	1.56	1.83	2.10	2.36	2.67	3.00	3.37	3.80	4.27	4.78	0.01	0.05	0.06	0.08
	1100	0.71	0.78	0.93	1.09	1.27	1.47	1.69	1.99	2.28	2.56	2.90	3.25	3.65	4.11	4.61	5.15	0.01	0.05	0.07	0.09
	1200	0.76	0.83	1.00	1.17	1.37	1.58	1.82	2.14	2.45	2.76	3.12	3.50	3.93	4.41	4.94	5.51	0.01	0.06	0.08	0.10
5	1300	0.82	0.89	1.07	1.25	1.46	1.69	1.95	2.29	2.62	2.95	3.33	3.74	4.19	4.70	5.26	5.85	0.01	0.06	0.08	0.11
	1400	0.87	0.94	1.14	1.33	1.56	1.80	2.08	2.44	2.79	3.14	3.55	3.97	4.45	4.98	5.56	6.16	0.02	0.07	0.09	0.11
	1500	0.91	1.00	1.20	1.41	1.65	1.91	2.20	2.58	2.96	3.32	3.75	4.20	4.70	5.25	5.85	6.46	0.02	0.07	0.10	0.12
	1600	0.96	1.05	1.27	1.49	1.74	2.01	2.32	2.73	3.12	3.50	3.95	4.42	4.94	5.51	6.12	6.74	0.02	0.07	0.10	0.13
	1700	1.01	1.10	1.33	1.56	1.83	2.12	2.44	2.87	3.28	3.68	4.15	4.63	5.17	5.75	6.37	6.99	0.02	0.08	0.11	0.14
	1800	1.06	1.15	1.40	1.64	1.92	2.22	2.56	3.00	3.43	3.85	4.34	4.84	5.39	5.99	6.61	7.22	0.02	0.08	0.12	0.15
	1900	1.10	1.21	1.46	1.71	2.00	2.32	2.68	3.14	3.59	4.02	4.52	5.04	5.60	6.21	6.82	7.42	0.02	0.09	0.12	0.15
	2000	1.15	1.25	1.52	1.78	2.09	2.42	2.79	3.27	3.73	4.18	4.70	5.23	5.80	6.41	7.02	7.59	0.02	0.09	0.13	0.16
	2100	1.19	1.30	1.58	1.85	2.17	2.52	2.90	3.40	3.88	4.34	4.87	5.41	5.99	6.60	7.20	7.74	0.02	0.10	0.13	0.17
	2200	1.24	1.35	1.64	1.92	2.26	2.61	3.01	3.53	4.02	4.50	5.04	5.59	6.17	6.78	7.36	7.86	0.02	0.10	0.14	0.18
	2300	1.28	1.40	1.70	1.99	2.34	2.70	3.12	3.65	4.16	4.65	5.20	5.75	6.34	6.94	7.49	7.95	0.03	0.11	0.15	0.19
	2400	1.32	1.45	1.76	2.06	2.42	2.80	3.22	3.77	4.29	4.79	5.35	5.91	6.50	7.08	7.61	8.00	0.03	0.11	0.15	0.19
	2500	1.36	1.49	1.81	2.13	2.50	2.89	3.33	3.89	4.42	4.93	5.50	6.06	6.64	7.21	7.70	8.03	0.03	0.12	0.16	0.20
10	2600	1.40	1.54	1.87	2.19	2.57	2.98	3.43	4.00	4.55	5.06	5.64	6.20	6.77	7.32	7.76	8.02	0.03	0.12	0.17	0.21
	2700	1.44	1.58	1.92	2.26	2.65	3.06	3.52	4.11	4.67	5.19	5.77	6.33	6.89	7.41	7.81	7.98	0.03	0.13	0.17	0.22
	2800	1.48	1.63	1.98	2.32	2.72	3.15	3.62	4.22	4.79	5.32	5.90	6.45	7.00	7.48	7.82	7.90	0.03	0.13	0.18	0.23
	2900	1.52	1.67	2.03	2.38	2.80	3.23	3.72	4.33	4.90	5.43	6.01	6.56	7.09	7.54	7.81		0.03	0.14	0.19	0.23
	3000	1.56	1.71	2.08	2.45	2.87	3.31	3.81	4.43	5.01	5.55	6.13	6.67	7.17	7.57	7.77		0.03	0.14	0.19	0.24
	3100	1.60	1.75	2.13	2.51	2.94	3.39	3.90	4.53	5.12	5.65	6.23	6.76	7.23	7.59	7.71		0.03	0.14	0.20	0.25
	3200	1.63	1.79	2.18	2.56	3.01	3.47	3.98	4.62	5.22	5.75	6.32	6.83	7.28	7.58			0.04	0.15	0.20	0.26
	3300	1.67	1.83	2.23	2.62	3.08	3.55	4.07	4.72	5.31	5.85	6.41	6.90	7.31	7.56			0.04	0.15	0.21	0.27
	3400	1.71	1.87	2.28	2.68	3.14	3.62	4.15	4.81	5.40	5.94	6.49	6.96	7.33	7.51			0.04	0.16	0.22	0.28
	3500	1.74	1.91	2.33	2.74	3.21	3.69	4.23	4.89	5.49	6.02	6.56	7.00	7.33	7.44			0.04	0.16	0.22	0.28
	3600	1.78	1.95	2.38	2.79	3.27	3.77	4.31	4.97	5.57	6.09	6.62	7.04	7.32	7.34			0.04	0.17	0.23	0.29
	3700	1.81	1.99	2.42	2.84	3.33	3.83	4.38	5.05	5.65	6.16	6.67	7.06	7.29				0.04	0.17	0.24	0.30
	3800	1.84	2.02	2.47	2.90	3.39	3.90	4.45	5.13	5.72	6.23	6.71	7.07	7.24				0.04	0.18	0.24	0.31
	3900	1.87	2.06	2.51	2.95	3.45	3.96	4.52	5.20	5.78	6.28	6.74	7.06	7.17				0.04	0.18	0.25	0.32
	4000	1.91	2.09	2.55	3.00	3.51	4.03	4.59	5.26	5.85	6.33	6.76	7.04	7.09				0.05	0.19	0.26	0.32
	4100	1.94	2.13	2.60	3.05	3.56	4.09	4.65	5.32	5.90	6.37	6.78	7.01					0.05	0.19	0.26	0.33
	4200	1.97	2.16	2.64	3.09	3.61	4.15	4.71	5.38	5.95	6.40	6.78	6.97					0.05	0.20	0.27	0.34
	4300	2.00	2.19	2.68	3.14	3.67	4.20	4.77	5.44	5.99	6.43	6.77	6.91					0.05	0.20	0.28	0.35
	4400	2.03	2.23	2.72	3.18	3.72	4.25	4.82	5.49	6.03	6.45	6.75	6.83					0.05	0.21	0.28	0.36
	4500	2.05	2.26	2.75	3.23	3.76	4.31	4.88	5.53	6.06	6.46	6.73	6.74					0.05	0.21	0.29	0.36
	4600	2.08	2.29	2.79	3.27	3.81	4.36	4.92	5.58	6.09	6.46	6.68						0.05	0.22	0.29	0.37
	4700	2.11	2.32	2.83	3.31	3.86	4.40	4.97	5.61	6.11	6.45	6.63						0.05	0.22	0.30	0.38
	4800	2.13	2.35	2.86	3.35	3.90	4.45	5.01	5.64	6.13	6.44	6.57						0.05	0.22	0.31	0.39
	4900	2.16	2.37	2.89	3.39	3.94	4.49	5.05	5.67	6.13	6.42	6.50						0.06	0.23	0.31	0.40
20	5000	2.18	2.40	2.93	3.42	3.98	4.53	5.09	5.70	6.13	6.38	6.41						0.06	0.23	0.32	0.40
	5100	2.21	2.43	2.96	3.46	4.02	4.57	5.12	5.71	6.13	6.34							0.06	0.24	0.33	0.41
	5200	2.23	2.45	2.99	3.49	4.05	4.60	5.15	5.73	6.12	6.29							0.06	0.24	0.33	0.42
	5300	2.25	2.48	3.02	3.53	4.09	4.63	5.17	5.74	6.10	6.23							0.06	0.25	0.34	0.43
	5400	2.28	2.50	3.05	3.56	4.12	4.66	5.20	5.74	6.07	6.17							0.06	0.25	0.35	0.44
	5500	2.30	2.53	3.07	3.59	4.15	4.69	5.22	5.74	6.04	6.09							0.06	0.26	0.35	0.45
	5600	2.32	2.55	3.10	3.62	4.18	4.71	5.23	5.73	6.00								0.06	0.26	0.36	0.45
	5700	2.34	2.57	3.13	3.64	4.20	4.74	5.24	5.72	5.95								0.06	0.27	0.36	0.46
	5800	2.35	2.59	3.15	3.67	4.23	4.75	5.25	5.70									0.07	0.27	0.37	0.47
	5900	2.37	2.61	3.17	3.69	4.25	4.77	5.25	5.68									0.07	0.28	0.38	0.48
	6000	2.39	2.63	3.19	3.71	4.27	4.78	5.25										0.07	0.28	0.38	0.49
					30		35												v (m/s)		

Where v >40 m/s, please consult our Applications Engineers

optibelt
Power Transmission

Section PM

Power Ratings P_N (kW) per Rib for β = 180° and L_{eff} = 4089 mm

Table 9

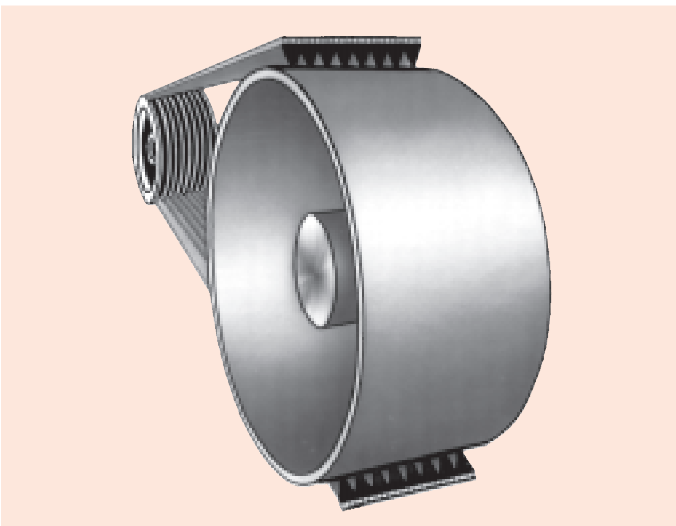
v (m/s)	n (min⁻¹)	180	190	200	224	250	280	315	355	400	450	500	560	630	710	800	1000	1.01 to 1.05	1.06 to 1.26	1.27 to 1.57	>1.57
		Effective diameter of the small pulley d_e (mm)																Additional power per rib for speed ratio r.			
	700	3.51	3.83	4.16	4.93	5.75	6.68	7.74	8.93	10.22	11.60	12.92	14.43	16.07	17.78	19.47	22.23	0.06	0.24	0.33	0.42
	950	4.46	4.88	5.30	6.29	7.34	8.52	9.85	11.31	12.86	14.48	15.97	17.58	19.20	20.65	21.74	21.79	0.08	0.33	0.45	0.56
	1450	6.06	6.65	7.22	8.57	9.96	11.47	13.11	14.80	16.43	17.90	18.97	19.66	19.57	18.16	14.71		0.12	0.50	0.68	0.86
	2850	8.24	8.97	9.64	11.01	12.10	12.77	12.69	11.34	8.03	1.86							0.24	0.98	1.34	1.69
	100	0.70	0.76	0.81	0.95	1.09	1.26	1.45	1.66	1.90	2.17	2.43	2.74	3.10	3.50	3.95	4.93	0.01	0.03	0.05	0.06
	200	1.25	1.36	1.46	1.72	1.99	2.30	2.66	3.06	3.51	4.00	4.49	5.07	5.73	6.48	7.31	9.10	0.02	0.07	0.09	0.12
	300	1.76	1.91	2.06	2.43	2.82	3.27	3.78	4.36	5.00	5.71	6.40	7.22	8.16	9.22	10.37	12.82	0.02	0.10	0.14	0.18
	400	2.23	2.43	2.62	3.10	3.60	4.18	4.84	5.59	6.42	7.32	8.20	9.24	10.42	11.73	13.15	16.08	0.03	0.14	0.19	0.24
5	500	2.67	2.92	3.16	3.73	4.35	5.05	5.86	6.76	7.75	8.83	9.89	11.12	12.50	14.01	15.62	18.79	0.04	0.17	0.23	0.30
	600	3.10	3.39	3.67	4.35	5.07	5.88	6.82	7.87	9.02	10.26	11.46	12.85	14.39	16.04	17.74	20.87	0.05	0.21	0.28	0.36
	700	3.51	3.83	4.16	4.93	5.75	6.68	7.74	8.93	10.22	11.60	12.92	14.43	16.07	17.78	19.47	22.23	0.06	0.24	0.33	0.42
	800	3.90	4.27	4.63	5.49	6.41	7.44	8.62	9.92	11.34	12.83	14.25	15.83	17.51	19.20	20.75	22.76	0.07	0.27	0.38	0.48
	900	4.27	4.68	5.08	6.03	7.04	8.17	9.45	10.86	12.38	13.96	15.43	17.05	18.70	20.26	21.55	22.37	0.07	0.31	0.42	0.53
10	1000	4.63	5.07	5.51	6.55	7.64	8.86	10.24	11.74	13.33	14.97	16.47	18.07	19.62	20.94	21.79		0.08	0.34	0.47	0.59
	1100	4.98	5.45	5.93	7.04	8.21	9.51	10.97	12.55	14.20	15.87	17.35	18.86	20.22	21.19	21.44		0.09	0.38	0.52	0.65
	1200	5.31	5.82	6.32	7.51	8.75	10.12	11.65	13.28	14.97	16.63	18.05	19.42	20.50	20.97			0.10	0.41	0.56	0.71
	1300	5.62	6.16	6.70	7.95	9.26	10.70	12.28	13.95	15.64	17.25	18.57	19.72	20.42	20.26			0.11	0.45	0.61	0.77
	1400	5.92	6.49	7.05	8.37	9.73	11.23	12.85	14.53	16.20	17.73	18.89	19.75	19.95				0.12	0.48	0.66	0.83
	1500	6.20	6.80	7.39	8.76	10.18	11.71	13.36	15.04	16.64	18.04	18.99	19.49					0.12	0.51	0.70	0.89
	1600	6.47	7.09	7.71	9.13	10.58	12.15	13.80	15.45	16.97	18.19	18.87	18.91					0.13	0.55	0.75	0.95
	1700	6.72	7.36	8.00	9.47	10.96	12.54	14.18	15.78	17.17	18.16	18.51						0.14	0.58	0.80	1.01
	1800	6.95	7.62	8.27	9.78	11.29	12.88	14.49	16.00	17.23	17.94	17.90						0.15	0.62	0.85	1.07
	1900	7.16	7.85	8.52	10.06	11.58	13.16	14.73	16.13	17.15	17.53							0.16	0.65	0.89	1.13
	2000	7.36	8.07	8.75	10.30	11.84	13.39	14.89	16.15	16.92	16.91							0.17	0.69	0.94	1.19
20	2100	7.54	8.26	8.96	10.52	12.05	13.56	14.97	16.06	16.54								0.17	0.72	0.99	1.25
	2200	7.70	8.43	9.13	10.71	12.21	13.67	14.97	15.85	16.00								0.18	0.76	1.03	1.31
	2300	7.84	8.58	9.29	10.86	12.33	13.72	14.88	15.52	15.29								0.19	0.79	1.08	1.37
	2400	7.96	8.70	9.41	10.97	12.41	13.71	14.70	15.07									0.20	0.82	1.13	1.43
	2500	8.06	8.81	9.51	11.05	12.43	13.62	14.43	14.48									0.21	0.86	1.17	1.48
	2600	8.14	8.88	9.59	11.09	12.40	13.47	14.06	13.76									0.22	0.89	1.22	1.54
	2700	8.20	8.94	9.63	11.09	12.32	13.25	13.59										0.22	0.93	1.27	1.60
	2800	8.23	8.96	9.64	11.05	12.19	12.95	13.02										0.23	0.96	1.32	1.66
	2900	8.24	8.96	9.63	10.97	12.00	12.57	12.34										0.24	1.00	1.36	1.72
	3000	8.23	8.93	9.58	10.85	11.75	12.12											0.25	1.03	1.41	1.78
	3100	8.19	8.88	9.50	10.68	11.44	11.58											0.26	1.06	1.46	1.84
	3200	8.13	8.79	9.38	10.46	11.07	10.96											0.26	1.10	1.50	1.90

Where v >30 m/s, please consult our Applications Engineers

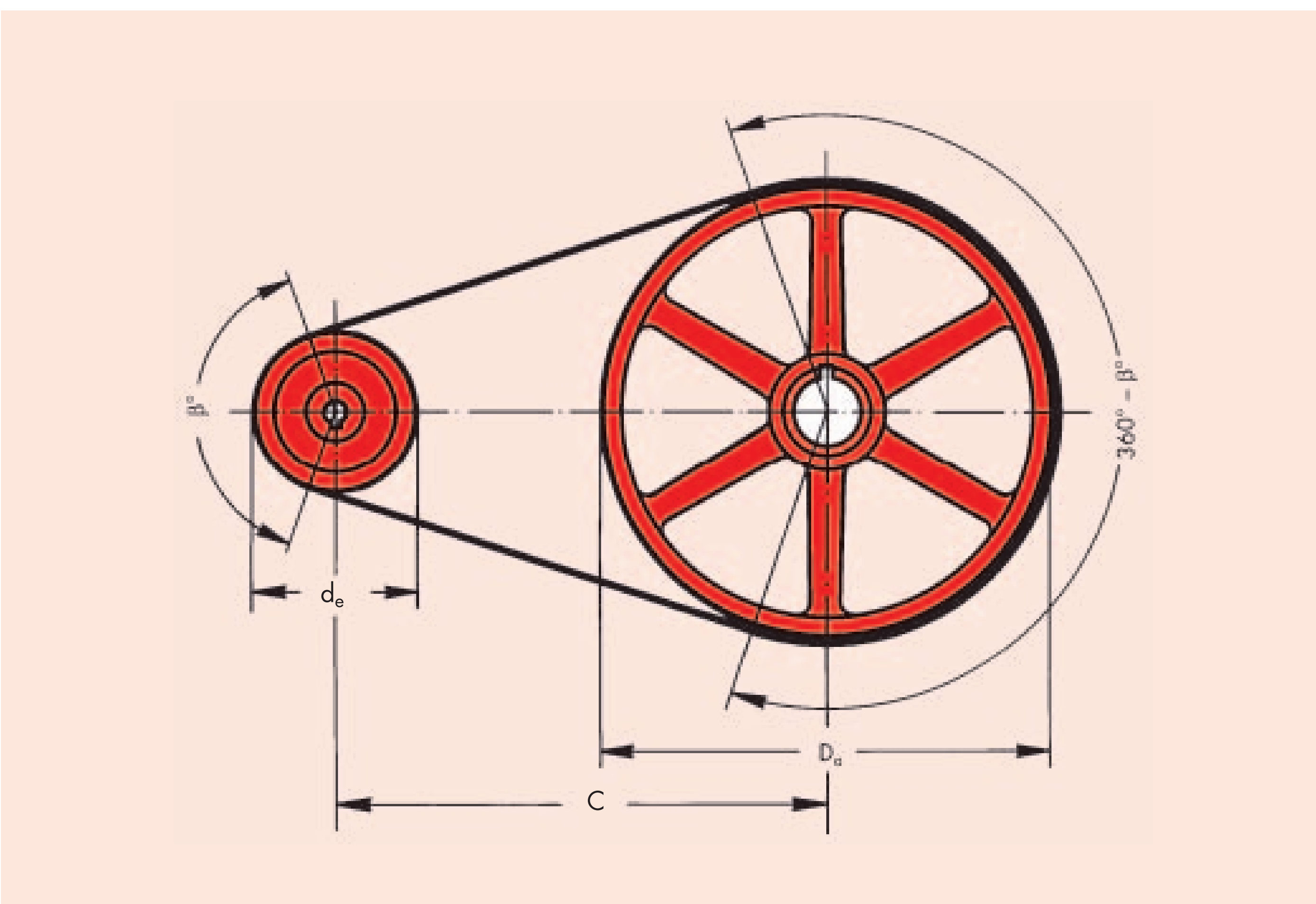
v (m/s)

Special Drives
V-Flat Drive

The V-Flat drive utilises a Ribbed Belt pulley and a flat faced pulley. Under certain conditions, this type of drive can be used for drives which are subject to shock loadings or have high moments of inertia. Because flywheels or flat pulleys are quite often already fitted, drive costs can be reduced. When converting a flat belt drive to a V-Flat drive, it is usually economical to continue to use the larger flat pulley.



C	=	Drive centre distance	(mm)
b	=	Flat pulley face width	(mm)
b_2	=	Ribbed Belt pulley face width	(mm)
D_a	=	Flat pulley outside diameter	(mm)
D_Z	=	Allowance for determining the theoretical diameter	(mm)
d_e	=	Effective diameter of Ribbed Belt pulley(mm)	
f	=	Allowance for determining the flat pulley face width	(mm)
h	=	Crown height per 100 mm of pulley face width	(mm)
r	=	Speed ratio	
L_{eth}	=	Calculated belt effective length	(mm)
K	=	K factor	



Special Drives
V-Flat Drive

Calculation of V-Flat Drives

The calculation for a V-Flat drive is undertaken in the same manner as shown on pages 15 to 17. The following important requirements must be checked so as to ensure a reliable and efficient V-Flat drive.

- The grooved pulley must always be the small pulley.
- The V-Flat drive is particularly economical when

$K = \frac{D_a - d_e}{a}$ lies between 0.5 and 1.15.

The ideal drive is achieved when K = 0.85. If the "K" factor falls outside the recommended range, it is then more economical to use a normal ribbed belt drive with grooved pulleys.

- The following recommendations are made based upon the above requirements:

Speed ratio	$i = \frac{D_a + D_Z}{d_e + 2\ b_e} \geq 3$
Drive centre distance	$c_{actual} \leq D_a$
	$c = \frac{D_a - d_e}{0.85}$
K-Factor	$K = \frac{D_a - d_e}{a}$
	K_{actual} 0.5 to 1.15

- When calculating the number of ribs and the belt tension, care must be taken to ensure that a **special arc of contact correction factor c_1** as detailed in the following table 10 is applied.

Table 10 Arc of contact correction factor c_1 (for V-Flat drives only)

$K = \frac{D_a - d_e}{c}$	$\beta \approx$	c_1
0	180°	0.75
0.07	176°	0.76
0.15	170°	0.77
0.22	167°	0.79
0.29	163°	0.79
0.35	160°	0.80
0.40	156°	0.81
0.45	153°	0.81
0.50	150°	0.82
0.57	146°	0.83
0.64	143°	0.84
0.70	140°	0.85
0.75	137°	0.85
0.80	134°	0.86
0.85	130°	0.86
0.92	125°	0.84
1.00	120°	0.82
1.07	115°	0.80
1.15	110°	0.78
1.21	106°	0.77
1.30	100°	0.73
1.36	96°	0.72
1.45	90°	0.70

The length calculation is for the effective length L_e. Therefore, in order to obtain the theoretical calculation diameter, an allowance D_z must be added to the flat pulley outside diameter.

Table 11: Effective Line Difference h_b

Section	PH	PJ	PK	PL	PM
h_b	0.80	1.25	1.60	3.50	5.00
D_Z	1.60	2.70	3.50	6.50	11.00

Calculation of the Effective Length

$$L_{eth} \approx 2\ c + 1.57\ (d_e + D_a + D_Z) + \frac{(D_a + D_Z - d_e)^2}{4\ c}$$

In addition to the drive design on page 15 to 17, the static belt tension for V-Flat Drives must be calculated with the adjoining formula.

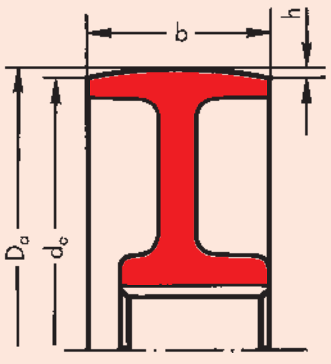
Formula:

Calculation of the static belt tension for V-Flat Drives

$$T = \frac{500 \cdot (2.25 - c_1) \cdot P_B}{c_1 \cdot z \cdot v} + k \cdot v^2$$

Special Drives
V-Flat Drive

- The flat pulley should have a flat faced outside diameter. If a crowned pulley is to be re-used then the crown height should be checked as follows.



The following condition is to be maintained:

Maximum Crown Height

h_{max} = 1 mm per 100 mm pulley face width

$$h = \frac{D_a - d_a}{2}$$

Additionally, the pulley face width must be calculated, or checked, as follows: Given/calculated

Grooved pulley 12 grooves
Section PJ
Drive centre distance C 380 mm

Solution:
$b = b_2 + f$
b = 62.0 + 10 = **72.0 mm**

b_2 from page 37
f taken from table 12
Choose standard flat pulley face width b = **72 mm**

Table 12: Allowance f for Determining the Flat Pulley Face Width

Sections PH, PJ, PK, PL, PM	
Drive centre distance C (mm)	f (mm)
≤ 500	10
> 500 ≤ 750	15
> 750 ≤ 1000	20
> 1000 ≤ 1250	25
> 1250 ≤ 1750	30
> 1750 ≤ 2250	40
> 2250	50

Special Drives
Tensioning / Guide Pulleys

Tensioning / guide pulleys are ribbed or flat faced and do not transmit power within a drive system. Because they create additional bending stresses within the belt their use should be restricted to the following applications if possible:

- with fixed drive centres to produce the required belt tension and to provide for maximum belt stretch and wear
- as damping and guide rollers with long span lengths
- as guide rollers on drives where the pulleys are not all positioned in one plane
- as movable tensioners, to achieve a constant belt tension. This results in reduced maintenance and longer service life. The tension force is normally generated by springs, pneumatics or hydraulics

If idler pulleys have to be used for the reasons mentioned above, the following criteria should be observed in drive design:

- position of the pulley in the belt span
- diameter
- shape
- the adjustment travel of the pulley, both for tensioning and retensioning the ribbed belts
- correction of the power rating per rib P_N

Idler Arrangement

Depending upon the drive conditions, idlers can be used externally or internally.

If the design conditions do not favour an external idler, an internal idler is then generally more advantageous. Internal idler diameters can be smaller than external idler diameters.

Flat pulleys, whether used internally or externally should be at least as wide as the other pulleys on the drive and should be placed as close as possible to the next pulley the belt will run onto.

Internal idlers can be grooved pulleys or flat pulleys, if in doubt, please contact our engineers.

Internal idler reduce the arc of contact on the loaded pulleys and hence also the arc of contact correction factor c_1. When calculating the number of ribs, the arc of contact correction factor is to selected at the point of the maximum belt extension (see table 14, page 27).

Ribbed belt pulleys are to be preferred as internal idlers on long spans as flat pulleys could permit the development of lateral vibration.

External idlers Because they run on the belt top surface, external idlers must basically be produced as flat pulleys. They increase the arc of contact. Care must be taken to ensure that maximum possible belt stretch can be taken up, and, in doing so, that contact is not made with the opposite belt span.

Idlers in the Tight / Slack Side

Both the theoretical power transmission formulae and actual practice have shown that wherever possible the idler should be placed in the slack side of the drive. This allows the idler tension force to be maintained at a considerably lower level. A spring loaded idler must not be used in a reversing drive because the tight and slack sides change continuously.

Our engineers will give advice concerning the special problems regarding spring loaded idlers.

Minimum diameter for internal idlers

Internal idler ≥ the smallest driven pulley in the system.

Minimum diameter for external idlers

External idler ≥ 1.2 times the smallest loaded pulley in the system.

Exceptions

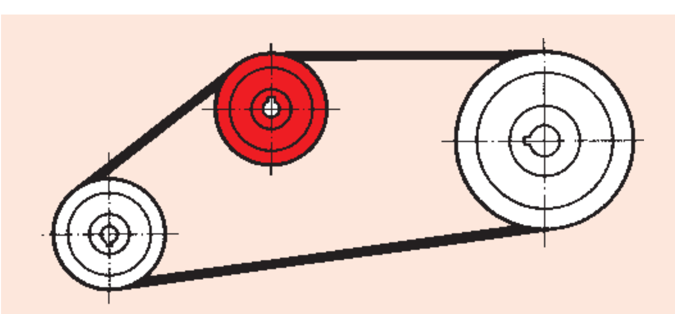
Section	Diameter of the smallest loaded pulley in the system (mm)	Minimum diameter of the external idler (mm)
PH	13 to 30	40
PJ	20 to 40	50
PK	45 to 50	60
PL	75 to 125	150
PM	180 to 250	300

Failure to observe the minimum recommended idler size will impair the service life of the ribbed belts

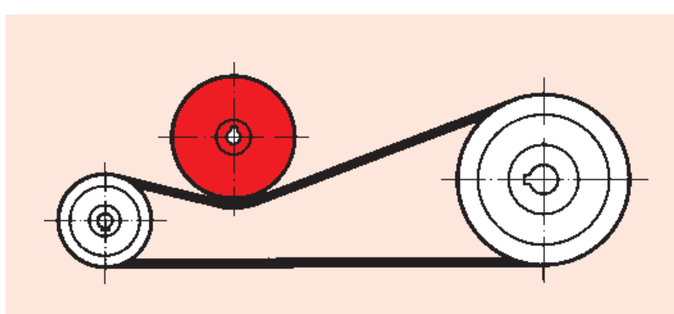
Idler design

Ribbed belt pulleys used as idlers should have standard groove dimensions. Flat pulleys should wherever possible be cylindrical, not crowned.

Internal idler



External idler



Special Drives
Tensioning / Guide Pulleys

Drive calculation

The length calculation and the determination of the number of ribs is undertaken as for two pulley drives. Certain details are, however, to be noted:

1. Calculate the Ribbed Belt length over two pulleys using the formula:

$$L_{eth} \approx 2\,c + 1.57\,(D_e + d_e) + \frac{(D_e - d_e)^2}{4\,c}$$

2. If the ribbed belt has to be fitted with a fixed drive centre distance, double the adjustment travel **y** from table 3 page 12 should be added to the belt length L_{eth}

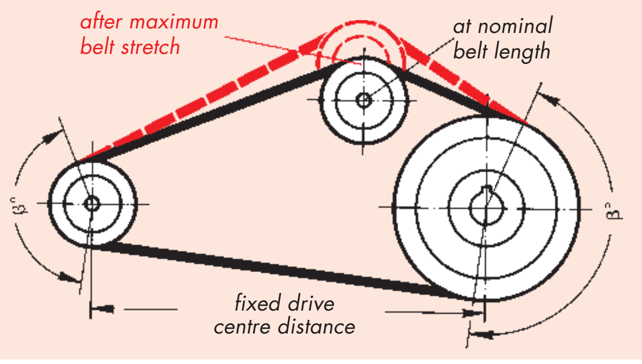
$$L_e = L_{eth} + 2\,y$$

3. The next longest standard length L_{es} should then be selected.

   A check should be made, usually by layout drawing, to determine whether the belt can be adequately tensioned with the idler in the outermost position. In this idler position, both the standard length L_{es} and double the adjustment for stretch and wear **x** must be taken up.

$$L_e \text{ for idler end position} = L_{es} + 2\,x$$

Position of the tension pulley



Number of idlers

The application of idlers increases the bending stress in the ribbed belts. To avoid a reduction in belt service life, the idler correction factor c_4 must also be included in the calculation. This correction factor takes the number of idlers into consideration with the minimum diameter being maintained.

Table 13

Number of idlers	c_4
0	1.00
1	0.91
2	0.86
3	0.81

The nominal power rating P_N per rib is as previously based on the smallest **loaded pulley.**

In determining the arc of contact correction factor c_1, the smallest contact angle of the loaded pulley which occurs at maximum belt extension must be used.

Table 14: Arc of Contact Correction Factor c_1

β ≈	c_1	β ≈	c_1
75°	0.78	175°	1.00
80°	0.82	180°	1.00
85°	0.84	185°	1.00
90°	0.85	190°	1.01
95°	0.87	195°	1.01
100°	0.89	200°	1.01
105°	0.90	205°	1.01
110°	0.91	210°	1.01
115°	0.92	215°	1.02
120°	0.93	220°	1.02
125°	0.94	225°	1.02
130°	0.95	230°	1.02
135°	0.96	240°	1.02
140°	0.97	250°	1.02
145°	0.97		
150°	0.98		
155°	0.98		
160°	0.99		
165°	0.99		
170°	0.99		

The following formula for the determination of the number of ribs is obtained using the idler correction factor c_4.

$$z = \frac{P \cdot c_2}{P_N \cdot c_1 \cdot c_3 \cdot c_4}$$

Ribbed Belt Pulleys

Measuring Pulleys - Length Measuring Conditions to DIN 7867 / ISO 9982

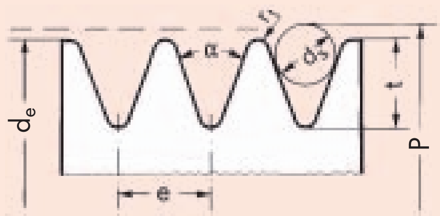


Table 15

Section	Pulley effective circumference U_e $= d_e \cdot \pi$ (mm)	Effective diameter d_e (mm)	Groove angle α ± 0.5°	Checking ball or rod diameter d_B ± 0.01 (mm)	Diameter over balls or rods P ± 0.1 (mm)	Groove Depth t_{min} (mm)	Transitional rip radius $r_{t\ min}$ (mm)	Measuring force per rib F (N)
PH*	100	31.8	40°	1.0	31.94	1.33	0.15	30
PH	300	95.5	40°	1.0	95.60	1.33	0.15	30
PJ*	100	31.8	40°	1.5	32.06	2.06	0.20	50
PJ	300	95.5	40°	1.5	95.72	2.06	0.20	50
PK	300	95.5	40°	2.5	96.48	3.45	0.25	100
PL	500	159.2	40°	3.5	161.51	4.92	0.40	200
PM	800	254.6	40°	7.0	259.17	10.03	0.75	450

* These values apply only for effective lengths under 457 mm.

The appropriate manufacturing tolerances for the dimensions of the grooves and measuring pulleys may be found in tables 15 and 16. Care must be taken to monitor wear or damage to the groove profiles.

Other diameters may be used for measuring pulleys providing the basic groove dimensions are used from the tables.

Measuring of Ribbed Belt Length

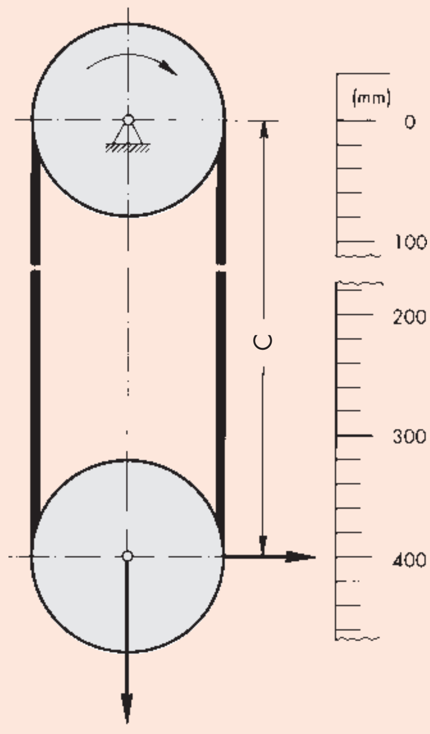
The belt is placed over two identical measuring pulleys as shown in the adjoining figure.

The appropriate measuring force F is applied to the moveable pulley. The Ribbed Belt should be rotated three revolutions at least before the drive centre distance C can be measured. Only then is the belt settled properly into the pulley grooves and exact measurement possible.

The effective length is given by twice the centre distance plus the effective circumference of the measurement pulleys.

$$L_e = 2\,C + U_e$$

Method of Measuring Ribbed Belt Effective Length



Force F (N)

Ribbed Belt Pulleys
Pulley Dimensions to DIN 7867 / ISO 9982

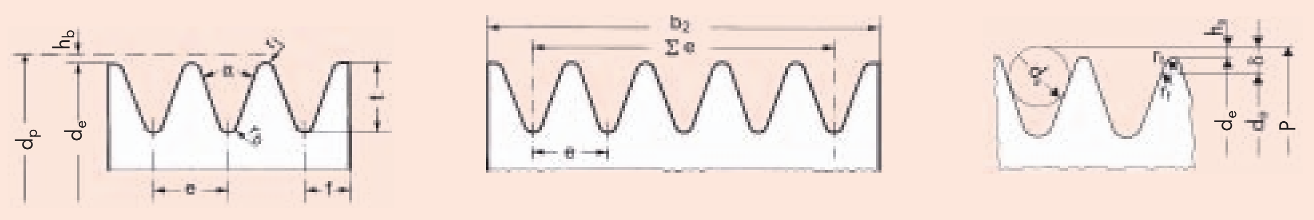


Table 16

Section	Effective Diameter $d_{e\ min}$ (mm)	Groove Angle α ± 0.5°	Groove pitch e (mm)	Σ e ± 0.3 (mm)	Groove Depth t_{min} (mm)	f_{min} (mm)	**Eff. Line Difference h_b (mm)**	**Trans. Tip Radius $r_{t\ min}$ (mm)**	**Gr. Bottom Radius $r_{b\ max}$ (mm)**	$2\ h_s$ (mm)	$2\ \delta_{max}$ (mm)
PH	13	40°	1.60 (± 0.03)	(z – 1) 1.60	1.33	1.3	0.80	0.15	0.30	0.11	0.69
PJ	20	40°	2.34 (± 0.03)	(z – 1) 2.34	2.06	1.8	1.25	0.20	0.40	0.23	0.81
PK	45	40°	3.56 (± 0.05)	(z – 1) 3.56	3.45	2.5	1.60	0.25	0.50	0.99	1.68
PL	75	40°	4.70 (± 0.05)	(z – 1) 4.70	4.92	3.3	3.50	0.40	0.40	2.36	3.50
PM	180	40°	9.40 (± 0.08)	(z – 1) 9.40	10.03	6.4	5.00	0.75	0.75	4.53	5.92

The diameter d_a may be reduced by the dimension 2δ - $2h_s$ depending upon the choice of manufacturer.
The arc with the radius r_t must have an angle of at least 30° and merge tangentially with the flank of the groove.

Pulley Face Width

$b_2 = e\ (z - 1) + 2\ f$

Maximum variation of diameter P

The difference between the diameters measured as distance P between the outer tangential plane of the checking ball or rod in all the grooves of a pulley must not exceed the value given in table 17.

Table 17: Groove to Groove Diameter P Variation

Effective Diameter (mm)	Total tolerance for number of grooves (mm) ≤ 6 Grooves	≤ 10 Grooves	Allowance for each extra groove (mm)
≤ 74	0.10	—	0.003
> 74 ≤ 500	—	0.15	0.005
> 500	—	0.25	0.010

Material

All conventional lasily machined material may be used, preferably steel, cast iron, aluminium alloy, brass or high strength plastics.

Surface Finish

Groove surface should have a maximum roughness R_t of 25 µm and must be free from defects.

Balancing

For velocities < 30 m/s static balancing is sufficient. Dynamic balancing is necessary for velocities of ≥ 30 m/s.

Manufacture

Pulleys for Optibelt-RB Ribbed Belts can be made to your specifications. Cutting tools for ribbed belt pulleys are available on special request.

Table 18: Run out tolerance

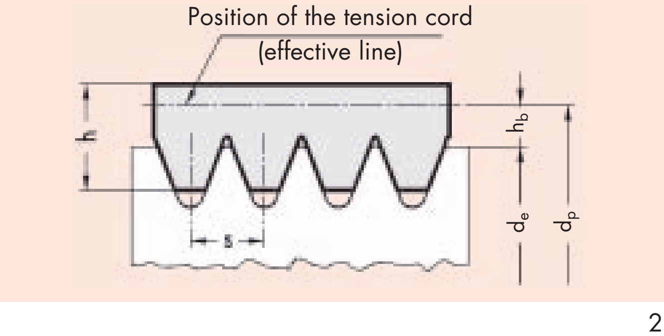
Effective diameter d_e (mm)	**Run-out tolerance t_R**
≤ 74	0.13
> 74 ≤ 250	0.25
> 250	0.25 + 0.0004 per mm effective diameter above 250

Side wobble tolerance

The side wobble tolerance t_p is 0.002 mm for each mm effective diameter.

Pitch diameter

The schematic illustration shows the seating of a ribbed belt in the pulley.



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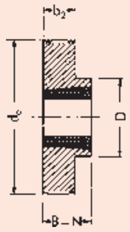
Power Transmission

Ribbed Belt Pulleys

bored for taper bushes, Section PJ



Type 1

Designation	No. of Grooves	Pulley Type	Material	d_e (mm)	b_2 (mm)	B (mm)	N (mm)	D (mm)	Taper-Bush
TB 4 PJ 47.5	4	1	GG	47.5	13	23	23	47.5	1008
TB 4 PJ 52.5	4	1	GG	52.5	13	23	23	47.5	1008
TB 4 PJ 57.5	4	1	GG	57.5	13	23	23	54.0	1108
TB 4 PJ 62.5	4	1	GG	62.5	13	23	23	54.0	1108
TB 4 PJ 67.5	4	1	GG	67.5	13	23	23	54.0	1108
TB 4 PJ 72.5	4	1	GG	72.5	13	23	23	54.0	1108
TB 4 PJ 77.5	4	1	GG	77.5	13	26	26	70.0	1210
TB 4 PJ 82.5	4	1	GG	82.5	13	26	26	78.0	1210
TB 4 PJ 87.5	4	1	GG	87.5	13	26	26	78.0	1210
TB 4 PJ 92.5	4	1	GG	92.5	13	26	26	78.0	1210
TB 4 PJ 97.5	4	1	GG	97.5	13	26	26	78.0	1210
TB 4 PJ 102.5	4	1	GG	102.5	13	26	26	85.0	1610
TB 4 PJ 107.5	4	1	GG	107.5	13	26	26	85.0	1610
TB 4 PJ 112.5	4	1	GG	112.5	13	26	26	85.0	1610
TB 4 PJ 117.5	4	1	GG	117.5	13	26	26	85.0	1610
TB 4 PJ 122.5	4	1	GG	122.5	13	26	26	85.0	1610
TB 4 PJ 127.5	4	1	GG	127.5	13	26	26	85.0	1610
TB 4 PJ 137.5	4	1	GG	137.5	13	26	26	85.0	1610
TB 4 PJ 152.5	4	1	GG	152.5	13	26	26	85.0	1610
TB 4 PJ 162.5	4	1	GG	162.5	13	26	26	85.0	1610
TB 4 PJ 172.5	4	1	GG	172.5	13	26	26	85.0	1610
TB 4 PJ 182.5	4	1	GG	182.5	13	26	26	85.0	1610
TB 4 PJ 192.5	4	1	GG	192.5	13	26	26	85.0	1610
TB 4 PJ 202.5	4	1	GG	202.5	13	33	33	100.0	2012
TB 4 PJ 222.5	4	1	GG	222.5	13	33	33	100.0	2012

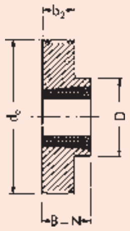
Taper bush	1008	1108	1210	1610	2012
Bore diameter d_2 (mm) from.. up to …	10-25	10-28	11-32	14-42	14-50

GG = Cast iron
Further sizes upon request
We reserve to alter specifications without notice

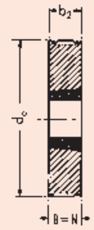
For standard bore diameters d_2 see page 52

Ribbed Belt Pulleys

bored for taper bushes, Section PJ



Type 1



Type 4

Designation	No. of Grooves	Pulley Type	Material	d_e (mm)	b_2 (mm)	B (mm)	N (mm)	D (mm)	Taper-Bush
TB 8 PJ 47.5	8	4	GG	47.5	23	23	23	—	1008
TB 8 PJ 52.5	8	4	GG	52.5	23	23	23	—	1008
TB 8 PJ 57.5	8	4	GG	57.5	23	23	23	—	1108
TB 8 PJ 62.5	8	4	GG	62.5	23	23	23	—	1108
TB 8 PJ 67.5	8	4	GG	67.5	23	23	23	—	1108
TB 8 PJ 72.5	8	4	GG	72.5	23	23	23	—	1108
TB 8 PJ 77.5	8	1	GG	77.5	23	26	26	70.0	1210
TB 8 PJ 82.5	8	1	GG	82.5	23	26	26	78.0	1210
TB 8 PJ 87.5	8	1	GG	87.5	23	26	26	78.0	1210
TB 8 PJ 92.5	8	1	GG	92.5	23	26	26	78.0	1210
TB 8 PJ 97.5	8	1	GG	97.5	23	26	26	78.0	1210
TB 8 PJ 102.5	8	1	GG	102.5	23	26	26	85.0	1610
TB 8 PJ 107.5	8	1	GG	107.5	23	26	26	85.0	1610
TB 8 PJ 112.5	8	1	GG	112.5	23	26	26	85.0	1610
TB 8 PJ 117.5	8	1	GG	117.5	23	26	26	85.0	1610
TB 8 PJ 122.5	8	1	GG	122.5	23	26	26	85.0	1610
TB 8 PJ 127.5	8	1	GG	127.5	23	26	26	85.0	1610
TB 8 PJ 137.5	8	1	GG	137.5	23	26	26	85.0	1610
TB 8 PJ 152.5	8	1	GG	152.5	23	26	26	85.0	1610
TB 8 PJ 162.5	8	1	GG	162.5	23	26	26	85.0	1610
TB 8 PJ 172.5	8	1	GG	172.5	23	26	26	85.0	1610
TB 8 PJ 182.5	8	1	GG	182.5	23	26	26	85.0	1610
TB 8 PJ 192.5	8	1	GG	192.5	23	26	26	85.0	1610
TB 8 PJ 202.5	8	1	GG	202.5	23	33	33	100.0	2012
TB 8 PJ 222.5	8	1	GG	222.5	23	33	33	100.0	2012

Taper bush	1008	1108	1210	1610	2012
Bore diameter d_2 (mm) from.. up to ...	10-25	10-28	11-32	14-42	14-50

GG = Cast iron
Further sizes upon request
We reserve to alter specifications without notice

For standard bore diameters d_2 see page 52

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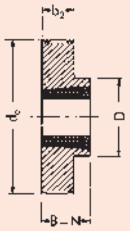
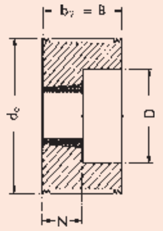
Power Transmission

Ribbed Belt Pulleys
bored for taper bushes, Section PJ



Type 1



Type 2

Designation	No. of Grooves	Pulley Type	Material	d_e (mm)	b_2 (mm)	B (mm)	N (mm)	D (mm)	Taper-Bush
TB 12 PJ 62.5	12	2	GG	62.5	32	32	23	50.0	1108
TB 12 PJ 67.5	12	2	GG	67.5	32	32	23	50.0	1108
TB 12 PJ 72.5	12	2	GG	72.5	32	32	23	50.0	1108
TB 12 PJ 77.5	12	2	GG	77.5	32	32	26	62.0	1210
TB 12 PJ 82.5	12	2	GG	82.5	32	32	26	62.0	1210
TB 12 PJ 87.5	12	2	GG	87.5	32	32	26	70.0	1610
TB 12 PJ 92.5	12	2	GG	92.5	32	32	26	70.0	1610
TB 12 PJ 97.5	12	2	GG	97.5	32	32	26	70.0	1610
TB 12 PJ 102.5	12	2	GG	102.5	32	32	26	70.0	1610
TB 12 PJ 107.5	12	2	GG	107.5	32	32	26	70.0	1610
TB 12 PJ 112.5	12	2	GG	112.5	32	32	26	70.0	1610
TB 12 PJ 117.5	12	2	GG	117.5	32	32	26	70.0	1610
TB 12 PJ 122.5	12	2	GG	122.5	32	32	26	70.0	1610
TB 12 PJ 127.5	12	1	GG	127.5	32	32	33	100.0	2012
TB 12 PJ 137.5	12	1	GG	137.5	32	32	33	100.0	2012
TB 12 PJ 152.5	12	1	GG	152.5	32	32	33	100.0	2012
TB 12 PJ 162.5	12	1	GG	162.5	32	32	33	100.0	2012
TB 12 PJ 172.5	12	1	GG	172.5	32	32	33	100.0	2012
TB 12 PJ 182.5	12	1	GG	182.5	32	46	46	110.0	2517
TB 12 PJ 192.5	12	1	GG	192.5	32	46	46	110.0	2517
TB 12 PJ 202.5	12	1	GG	202.5	32	46	46	110.0	2517
TB 12 PJ 222.5	12	1	GG	222.5	32	46	46	110.0	2517

Taper bush	1108	1210	1610	2012	2557
Bore diameter d_2 (mm) from.. up to ...	10-28	11-32	14-42	14-50	16-60

GG = Cast iron
Further sizes upon request
We reserve to alter specifications without notice

For standard bore diameters d_2 see page 52

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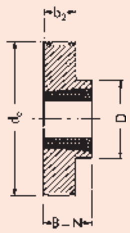
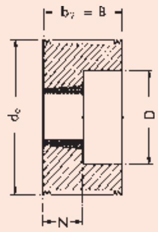
Power Transmission

Ribbed Belt Pulleys
bored for taper bushes, Section PJ



Type 1



Type 2

Designation	No. of Grooves	Pulley Type	Material	d_e (mm)	b_2 (mm)	B (mm)	N (mm)	D (mm)	Taper-Bush
TB 16 PJ 62.5	16	2	GG	62.5	41	41	23	50.0	1108
TB 16 PJ 67.5	16	2	GG	67.5	41	41	23	50.0	1108
TB 16 PJ 72.5	16	2	GG	72.5	41	41	26	62.0	1210
TB 16 PJ 77.5	16	2	GG	77.5	41	41	26	62.0	1210
TB 16 PJ 82.5	16	2	GG	82.5	41	41	26	62.0	1210
TB 16 PJ 87.5	16	2	GG	87.5	41	41	26	70.0	1610
TB 16 PJ 92.5	16	2	GG	92.5	41	41	26	70.0	1610
TB 16 PJ 97.5	16	2	GG	97.5	41	41	26	70.0	1610
TB 16 PJ 102.5	16	2	GG	102.5	41	41	26	70.0	1610
TB 16 PJ 107.5	16	2	GG	107.5	41	41	26	70.0	1610
TB 16 PJ 112.5	16	2	GG	112.5	41	41	33	85.0	2012
TB 16 PJ 117.5	16	2	GG	117.5	41	41	33	85.0	2012
TB 16 PJ 122.5	16	2	GG	122.5	41	41	33	85.0	2012
TB 16 PJ 127.5	16	2	GG	127.5	41	41	33	85.0	2012
TB 16 PJ 137.5	16	2	GG	137.5	41	41	33	85.0	2012
TB 16 PJ 152.5	16	2	GG	152.5	41	41	33	85.0	2012
TB 16 PJ 162.5	16	2	GG	162.5	41	41	33	85.0	2012
TB 16 PJ 172.5	16	2	GG	172.5	41	41	33	85.0	2012
TB 16 PJ 182.5	16	1	GG	182.5	41	46	46	110.0	2517
TB 16 PJ 192.5	16	1	GG	192.5	41	46	46	110.0	2517
TB 16 PJ 202.5	16	1	GG	202.5	41	46	46	110.0	2517
TB 16 PJ 222.5	16	1	GG	222.5	41	46	46	110.0	2517

Taper bush	1108	1210	1610	2012	2557
Bore diameter d_2 (mm) from.. up to ...	10-28	11-32	14-42	14-50	16-60

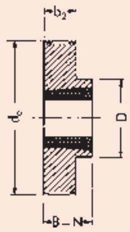
GG = Cast iron
Further sizes upon request
We reserve to alter specifications without notice

For standard bore diameters d_2 see page 52

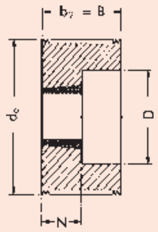
optibelt

Power Transmission

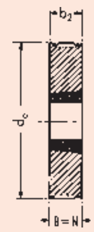
Ribbed Belt Pulleys
bored for taper bushes, Section PL



Type 1



Type 2



Type 4

Designation	No. of Grooves	Pulley Type	Material	d_e (mm)	b_2 (mm)	B (mm)	N (mm)	D (mm)	Taper-Bush
TB 6 PL 78	6	2	GG	78	33	33	26	62.0	1210
TB 6 PL 83	6	2	GG	83	33	33	26	62.0	1210
TB 6 PL 88	6	2	GG	88	33	33	26	70.0	1610
TB 6 PL 93	6	2	GG	93	33	33	26	70.0	1610
TB 6 PL 98	6	2	GG	98	33	33	26	70.0	1610
TB 6 PL 103	6	2	GG	103	33	33	26	70.0	1610
TB 6 PL 108	6	2	GG	108	33	33	26	70.0	1610
TB 6 PL 113	6	2	GG	113	33	33	26	70.0	1610
TB 6 PL 118	6	2	GG	118	33	33	26	70.0	1610
TB 6 PL 123	6	4	GG	123	33	33	33	—	2012
TB 6 PL 133	6	4	GG	133	33	33	33	—	2012
TB 6 PL 148	6	4	GG	148	33	33	33	—	2012
TB 6 PL 158	6	4	GG	158	33	33	33	—	2012
TB 6 PL 168	6	4	GG	168	33	33	33	—	2012
TB 6 PL 178	6	1	GG	178	33	46	46	110.0	2517
TB 6 PL 188	6	1	GG	188	33	46	46	110.0	2517
TB 6 PL 198	6	1	GG	198	33	46	46	110.0	2517
TB 6 PL 218	6	1	GG	218	33	46	46	110.0	2517
TB 6 PL 238	6	1	GG	238	33	46	46	110.0	2517
TB 6 PL 258	6	1	GG	258	33	46	46	110.0	2517
TB 6 PL 278	6	1	GG	278	33	46	46	110.0	2517
TB 6 PL 298	6	1	GG	298	33	46	46	110.0	2517
TB 6 PL 318	6	1	GG	318	33	46	46	110.0	2517
TB 6 PL 348	6	1	GG	348	33	46	46	110.0	2517
TB 6 PL 388	6	1	GG	388	33	46	46	110.0	2517

Taper bush	1210	1610	2012	2557
Bore diameter d_2 (mm) from.. up to …	11-32	14-42	14-50	16-60

GG = Cast iron
Further sizes upon request
We reserve to alter specifications without notice

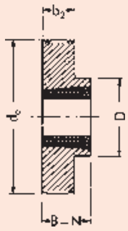
For standard bore diameters d_2 see page 52

optibelt

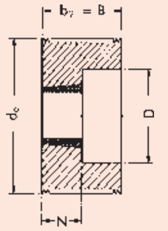
Power Transmission

Ribbed Belt Pulleys

bored for taper bushes, Section PL



Type 1



Type 2

Designation	No. of Grooves	Pulley Type	Material	d_e (mm)	b_2 (mm)	B (mm)	N (mm)	D (mm)	Taper-Bush
TB 8 PL 78	8	2	GG	78	42	42	26	62.0	1210
TB 8 PL 83	8	2	GG	83	42	42	26	62.0	1210
TB 8 PL 88	8	2	GG	88	42	42	26	70.0	1610
TB 8 PL 93	8	2	GG	93	42	42	26	70.0	1610
TB 8 PL 98	8	2	GG	98	42	42	26	70.0	1610
TB 8 PL 103	8	2	GG	103	42	42	33	85.0	2012
TB 8 PL 108	8	2	GG	108	42	42	33	85.0	2012
TB 8 PL 113	8	2	GG	113	42	42	33	85.0	2012
TB 8 PL 118	8	2	GG	118	42	42	33	85.0	2012
TB 8 PL 123	8	2	GG	123	42	42	33	85.0	2012
TB 8 PL 133	8	2	GG	133	42	42	33	85.0	2012
TB 8 PL 148	8	2	GG	148	42	42	33	85.0	2012
TB 8 PL 158	8	2	GG	158	42	42	33	85.0	2012
TB 8 PL 168	8	2	GG	168	42	42	33	85.0	2012
TB 8 PL 178	8	1	GG	178	42	46	46	110.0	2517
TB 8 PL 188	8	1	GG	188	42	46	46	110.0	2517
TB 8 PL 198	8	1	GG	198	42	46	46	110.0	2517
TB 8 PL 218	8	1	GG	218	42	46	46	110.0	2517
TB 8 PL 238	8	1	GG	238	42	46	46	110.0	2517
TB 8 PL 258	8	1	GG	258	42	46	46	110.0	2517
TB 8 PL 278	8	1	GG	278	42	46	46	110.0	2517
TB 8 PL 298	8	1	GG	298	42	46	46	110.0	2517
TB 8 PL 318	8	1	GG	318	42	46	46	110.0	2517
TB 8 PL 348	8	1	GG	348	42	46	46	110.0	2517
TB 8 PL 388	8	1	GG	388	42	46	46	110.0	2517

Taper bush	1210	1610	2012	2557
Bore diameter d_2 (mm) from.. up to ...	11-32	14-42	14-50	16-60

GG = Cast iron
Further sizes upon request
We reserve to alter specifications without notice

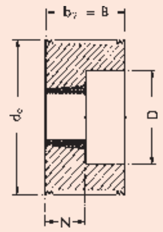
For standard bore diameters d_2 see page 52

optibelt

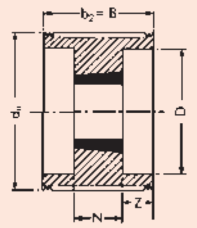
Power Transmission

Ribbed Belt Pulleys

bored for taper bushes, Section PL



Type 2



Type 3

Designation	No. of Grooves	Pulley Type	Material	d_e (mm)	b_2 (mm)	B (mm)	N (mm)	D (mm)	Taper-Bush
TB 10 PL 88	10	3	GG	88	53	53	26	70.0	1610
TB 10 PL 93	10	3	GG	93	53	53	26	70.0	1610
TB 10 PL 98	10	3	GG	98	53	53	26	70.0	1610
TB 10 PL 103	10	2	GG	103	53	53	33	85.0	2012
TB 10 PL 108	10	2	GG	108	53	53	33	85.0	2012
TB 10 PL 113	10	2	GG	113	53	53	33	85.0	2012
TB 10 PL 118	10	2	GG	118	53	53	33	85.0	2012
TB 10 PL 123	10	2	GG	123	53	53	33	85.0	2012
TB 10 PL 133	10	2	GG	133	53	53	33	85.0	2012
TB 10 PL 148	10	2	GG	148	53	53	33	85.0	2012
TB 10 PL 158	10	2	GG	158	53	53	33	85.0	2012
TB 10 PL 168	10	2	GG	168	53	53	33	85.0	2012
TB 10 PL 178	10	2	GG	178	53	53	46	105.0	2517
TB 10 PL 188	10	2	GG	188	53	53	46	105.0	2517
TB 10 PL 198	10	2	GG	198	53	53	46	105.0	2517
TB 10 PL 218	10	2	GG	218	53	53	46	105.0	2517
TB 10 PL 238	10	2	GG	238	53	53	46	105.0	2517
TB 10 PL 258	10	2	GG	258	53	53	46	105.0	2517
TB 10 PL 278	10	2	GG	278	53	53	46	105.0	2517
TB 10 PL 298	10	2	GG	298	53	53	46	105.0	2517
TB 10 PL 318	10	2	GG	318	53	53	46	105.0	2517
TB 10 PL 348	10	2	GG	348	53	53	46	105.0	2517
TB 10 PL 388	10	2	GG	388	53	53	46	105.0	2517

Taper bush	1610	2012	2557
Bore diameter d_2 (mm) from.. up to ...	14-42	14-50	16-60

GG = Cast iron
Further sizes upon request
We reserve to alter specifications without notice

For standard bore diameters d_2 see page 52

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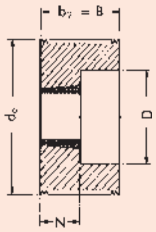
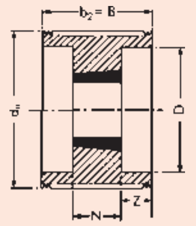
Power Transmission

Ribbed Belt Pulleys

bored for taper bushes, Section PL



Type 2



Type 3

Designation	No. of Grooves	Pulley Type	Material	d_e (mm)	b_2 (mm)	B (mm)	N (mm)	D (mm)	Taper-Bush
TB 12 PL 88	12	3	GG	88	62	62	26	70.0	1610
TB 12 PL 93	12	3	GG	93	62	62	26	70.0	1610
TB 12 PL 98	12	3	GG	98	62	62	26	70.0	1610
TB 12 PL 103	12	3	GG	103	62	62	33	85.0	2012
TB 12 PL 108	12	3	GG	108	62	62	33	85.0	2012
TB 12 PL 113	12	3	GG	113	62	62	33	85.0	2012
TB 12 PL 118	12	3	GG	118	62	62	33	85.0	2012
TB 12 PL 123	12	3	GG	123	62	62	33	85.0	2012
TB 12 PL 133	12	3	GG	133	62	62	33	85.0	2012
TB 12 PL 148	12	2	GG	148	62	62	46	105.0	2517
TB 12 PL 158	12	2	GG	158	62	62	46	105.0	2517
TB 12 PL 168	12	2	GG	168	62	62	46	105.0	2517
TB 12 PL 178	12	2	GG	178	62	62	46	105.0	2517
TB 12 PL 188	12	2	GG	188	62	62	46	105.0	2517
TB 12 PL 198	12	2	GG	198	62	62	46	105.0	2517
TB 12 PL 218	12	2	GG	218	62	62	46	105.0	2517
TB 12 PL 238	12	2	GG	238	62	62	52	130.0	3020
TB 12 PL 258	12	2	GG	258	62	62	52	130.0	3020
TB 12 PL 278	12	2	GG	278	62	62	52	130.0	3020
TB 12 PL 298	12	2	GG	298	62	62	52	130.0	3020
TB 12 PL 318	12	2	GG	318	62	62	52	130.0	3020
TB 12 PL 348	12	2	GG	348	62	62	52	130.0	3020
TB 12 PL 388	12	2	GG	388	62	62	52	130.0	3020

Taper bush	1610	2012	2557	3020
Bore diameter d_2 (mm) from.. up to ...	14-42	14-50	16-60	25-75

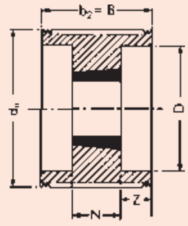
GG = Cast iron
Further sizes upon request
We reserve to alter specifications without notice

For standard bore diameters d_2 see page 52

optibelt

Power Transmission

Ribbed Belt Pulleys
bored for taper bushes, Section PL



Type 3

Designation	No. of Grooves	Pulley Type	Material	d_e (mm)	b_2 (mm)	B (mm)	N (mm)	D (mm)	Taper-Bush
TB 16 PL 103	16	3	GG	103	80	80	33	85.0	2012
TB 16 PL 108	16	3	GG	108	80	80	33	85.0	2012
TB 16 PL 113	16	3	GG	113	80	80	33	85.0	2012
TB 16 PL 118	16	3	GG	118	80	80	33	85.0	2012
TB 16 PL 123	16	3	GG	123	80	80	33	85.0	2012
TB 16 PL 133	16	3	GG	133	80	80	33	85.0	2012
TB 16 PL 148	16	3	GG	148	80	80	46	105.0	2517
TB 16 PL 158	16	3	GG	158	80	80	46	105.0	2517
TB 16 PL 168	16	3	GG	168	80	80	46	105.0	2517
TB 16 PL 178	16	3	GG	178	80	80	46	105.0	2517
TB 16 PL 188	16	3	GG	188	80	80	46	105.0	2517
TB 16 PL 198	16	3	GG	198	80	80	46	105.0	2517
TB 16 PL 218	16	3	GG	218	80	80	46	105.0	2517
TB 16 PL 238	16	3	GG	238	80	80	52	130.0	3020
TB 16 PL 258	16	3	GG	258	80	80	52	130.0	3020
TB 16 PL 278	16	3	GG	278	80	80	52	130.0	3020
TB 16 PL 298	16	3	GG	298	80	80	52	130.0	3020
TB 16 PL 318	16	3	GG	318	80	80	52	130.0	3020
TB 16 PL 348	16	3	GG	348	80	80	52	130.0	3020
TB 16 PL 388	16	3	GG	388	80	80	52	130.0	3020

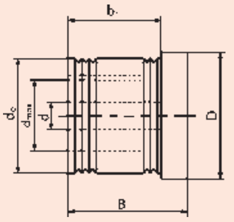
Taper bush	2012	2557	3020
Bore diameter d_2 (mm) from.. up to ...	14-50	16-60	25-75

GG = Cast iron
Further sizes upon request
We reserve to alter specifications without notice

For standard bore diameters d_2 see page 52

optibelt
Power Transmission

Ribbed Belt Pulleys
pilot bored, Section PJ



Type VB (pilot bored)

Designation	No. of Grooves	Pulley Type	Material	d_e (mm)	b_1 (mm)	B (mm)	D (mm)	Pilot Bore d (mm)	Finished Bore d_{max} (mm)	Weight (≈ kg)
4 PJ 22.5	4	VB	GG	22.5	13	20	25	8	12.0	0.045
4 PJ 27.5	4	VB	GG	27.5	13	20	30	8	14.0	0.070
4 PJ 32.5	4	VB	GG	32.5	13	20	35	8	18.0	0.100
4 PJ 37.5	4	VB	GG	37.5	13	20	40	8	20.0	0.135
4 PJ 42.5	4	VB	GG	42.5	13	20	45	8	22.0	0.180
8 PJ 22.5	8	VB	GG	22.5	23	30	25	8	12.0	0.063
8 PJ 27.5	8	VB	GG	27.5	23	30	30	8	14.0	0.100
8 PJ 32.5	8	VB	GG	32.5	23	30	35	8	18.0	0.150
8 PJ 37.5	8	VB	GG	37.5	23	30	40	8	20.0	0.200
8 PJ 42.5	8	VB	GG	42.5	23	30	45	8	22.0	0.265
12 PJ 22.5	12	VB	GG	22.5	32	40	25	8	12.0	0.086
12 PJ 27.5	12	VB	GG	27.5	32	40	30	8	14.0	0.140
12 PJ 32.5	12	VB	GG	32.5	32	40	35	8	18.0	0.200
12 PJ 37.5	12	VB	GG	37.5	32	40	40	8	20.0	0.280
12 PJ 42.5	12	VB	GG	42.5	32	40	45	8	22.0	0.360

GG = Cast iron
Further sizes upon request
We reserve to alter specifications without notice

Design Hints
Ribbed Belt Tension

The correct level of belt tension is of extreme importance for trouble free transmission of power, and for the achievement of acceptable belt service life. Often, tension which is either too high or too low results in early belt failure. A belt which is over tensioned sometimes causes bearing failure.

It has been shown that the more common tensioning instructions - e. g. using the "thumb pressure deflection method" - do not result in tension being obtained which would enable drives to be operated at optimum efficiency. It is therefore recommended that the required static belt tension "T" be calculated individually for every drive using the following Optibelt formulae. The best initial tension is the absolute minimum for a drive which permits the highest level of power transmission under consideration of the normal slip.

Once the ribbed belt has been fitted, the tension should be checked, using our tension gauge.

The belt should be observed regularly during the first few hours of service. Experience indicates that the first retensioning should be undertaken after approximately 0.5 to 4 hours full load running. The initial belt stretch is then taken up.

After approximately 24 hours running, especially if the belt has not run continuously under full load conditions, the drive should be checked and, if necessary, retensioned. The checking intervals can then be increased considerably to several hundred or thousand operating hours, and the tension adjusted when necessary. In addition, our basic fitting and service instructions should be observed.

Over or undertensioning of the drive will be avoided if the belt tension is calculated, set or checked by one of the following methods:

I. Checking the Belt Tension by Span Deflection

This method provides an indirect measurement of the calculated or actual static belt tension

E	=	Belt deflection per 100 mm span length	(mm)
E_a	=	Belt deflection for a given span length	(mm)
f	=	Load per rib used to set belt tension	(N)
k	=	Constant for calculation of centrifugal force	
L	=	Drive span length	(mm)
S_a	=	Static shaft loading	(N)
T	=	Static belt tension per rib	(N)

1. Calculate the static belt tension using the following formula:

$$T \approx \frac{500 \cdot (2.03 - c_1) \cdot P_B}{c_1 \cdot z \cdot v} + k \cdot v^2$$

The drive should initially be tensioned to a maximum of 1.3 x T (initial tensioning).

2. Determine E - the deflection per 100 mm length - from the belt tension deflection characteristics as given in diagram 2 page 41.

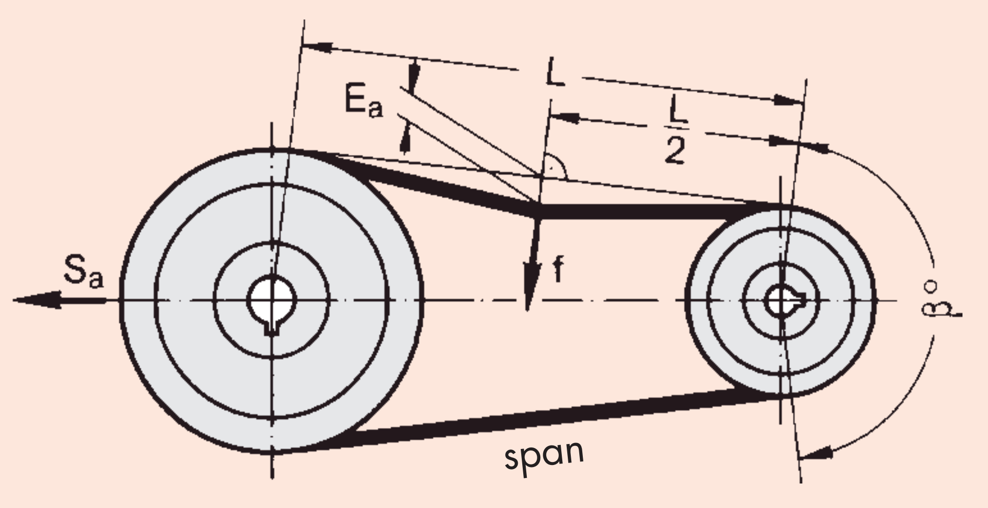
3. Calculate E_a-the deflection for a given span length- for the actual drive span length L.

$$E_a \approx \frac{E \cdot L}{100}$$

$$L = C_{nom} \cdot \sin \frac{\beta}{2}$$

Apply the load to set belt tension f*, using the value from Diagram 2 for the appropriate belt section, to the centre of, and at right angles to, the span, as shown in the figure below. Measure the deflection and if necessary adjust the centres until the correct belt tension is achieved.

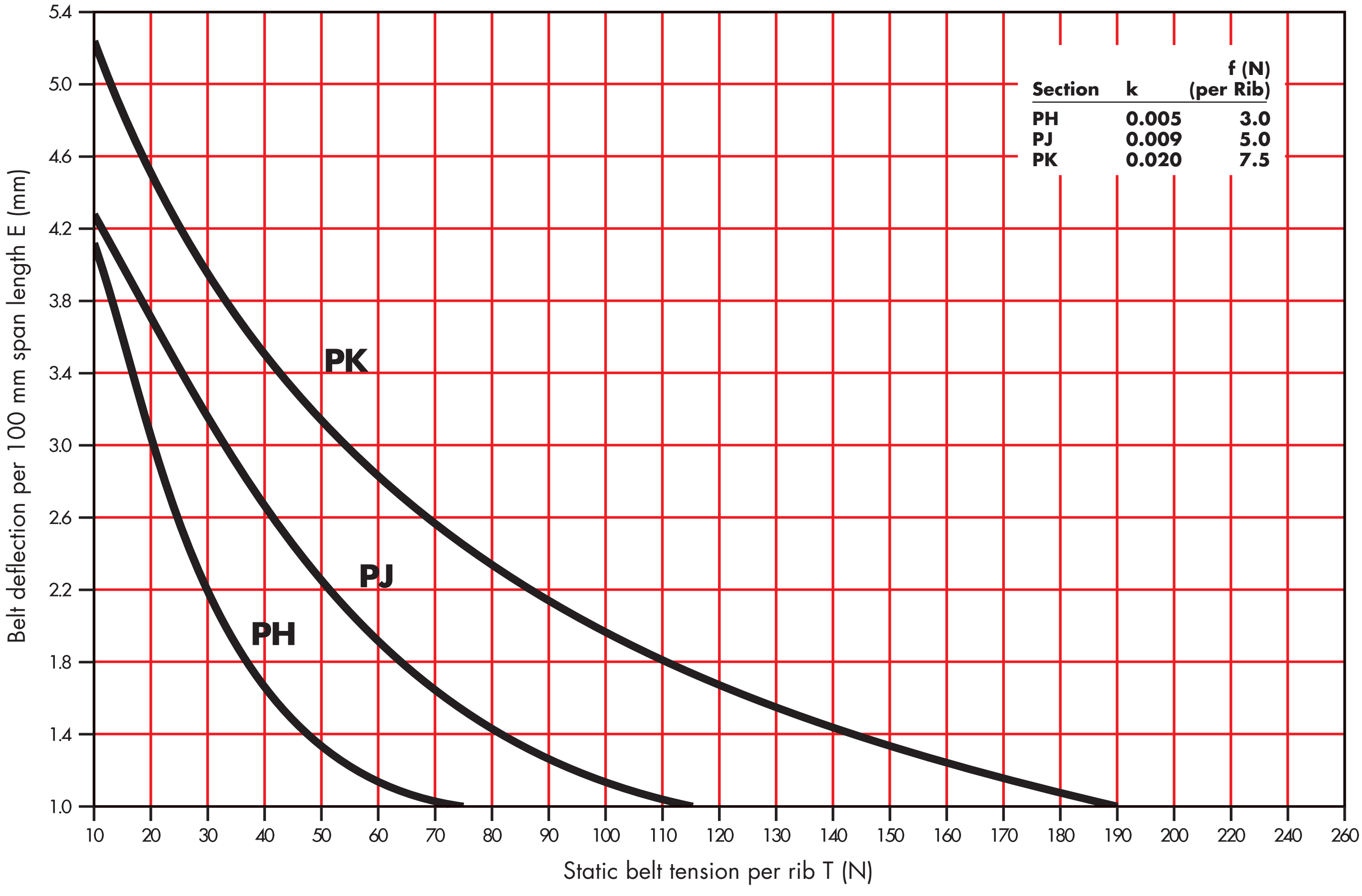
* When choosing the load to set belt tension the number of ribs must be taken into consideration.

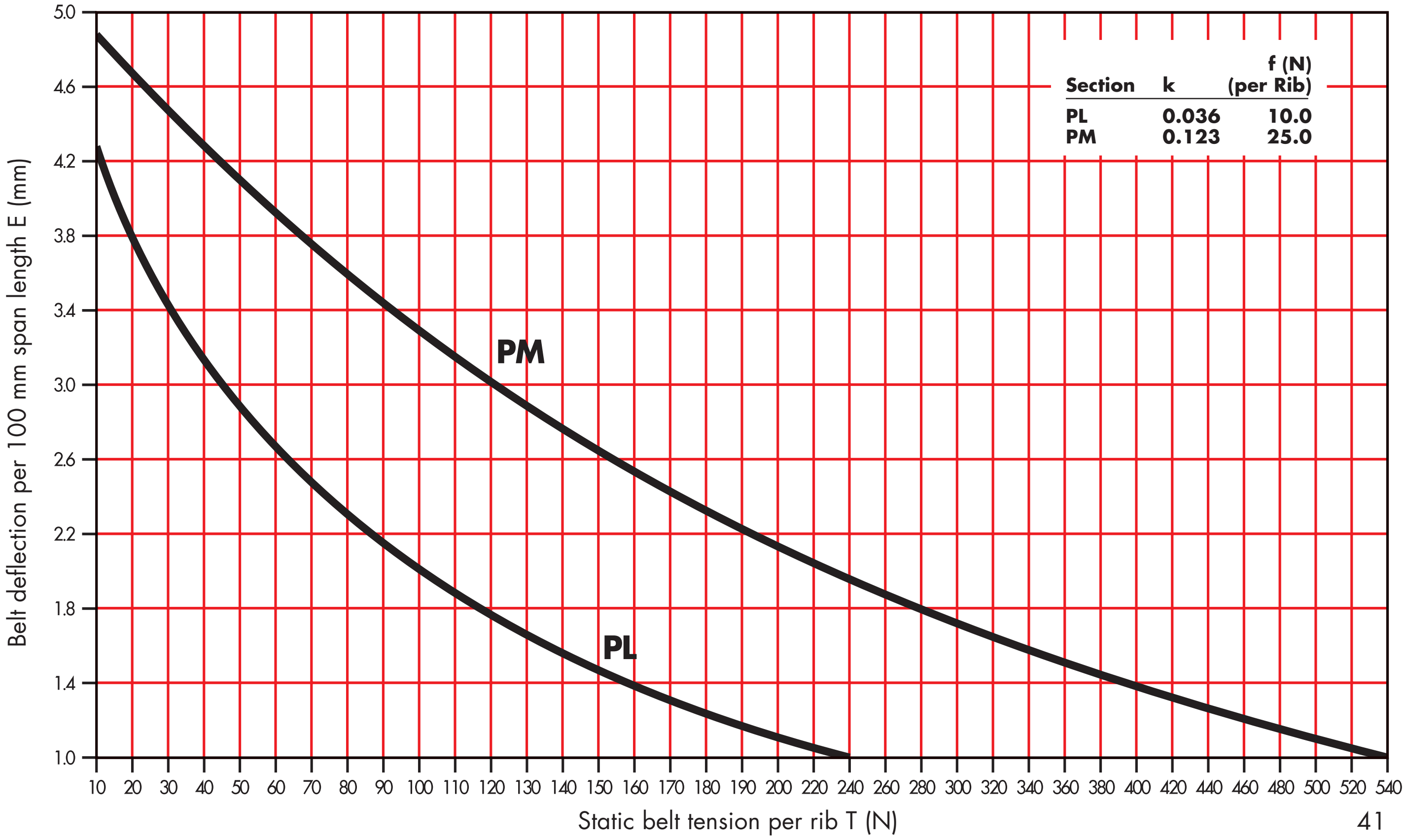


Design Hints

Ribbed Belt Tension

Diagram 2 Ribbed Belt Tension Graphs





Design Hints
Ribbed Belt Tension

II. Belt Tensioning using a "Length Additional Value"

It has become evident that span deflection methods are not always the ideal checking procedures for ribbed belts. The following very simple method for the determination of the belt tension is therefore recommended:

1. Calculate the static belt tension "T".

$$T \approx \frac{500 \cdot (2.03 - c_1) \cdot P_B}{c_1 \cdot z \cdot v} + k \cdot v^2$$

2. The outside length L_a of the Ribbed Belt should be measured on the top surface with the belt slack prior to fitting it to the drive. Measurement may also be taken on the drive itself, but **without tension.**

3. Calculate the length additional value "A" by using the formula:

$$A \approx L_{est} \cdot R$$

R = Stretch factor from table 19 page 43.

4. This length additional value A should then be added to the measured outside length (from step 2).

$$L_a^* \approx L_a + A$$

5. The ribbed belt should then be tensioned until the outside length L_a^* calculated in step 4 is obtained. The belt tension will then be correct.

6. If the drive is to be retensioned, the ribbed belt must first be slackened off so that it can be measured in a stress free condition. The procedure as detailed in steps 4. and 5. is then repeated.

Example::

P_B = 23.4 kW

c_1 = 1.0

v = 16.6 m/s

Drive specification with Optibelt-RB Ribbed Belt **12 PL 1075**

$$T \approx \frac{500 \cdot (2.03 - 1.0) \cdot 23.4}{1.0 \cdot 12 \cdot 16.6} + 0.036 \cdot 16.6^2 \approx \mathbf{70\ N}$$

When fitted for the first time, the tension should be multiplied by a factor of 1.3.

$T \approx 1{,}3 \cdot 70 \approx$ **91 N**

Length measured on the back of the belt whilst slack

$A \approx 1075 \cdot 0.00264 \approx$ **3 mm**

Tighten the belt until the length measured around the outside is 1103 mm. The belt is then correctly tensioned.

$L_a^* \approx 1100 + 3 =$ **1103 mm**

III. Checking the Ribbed Belt Tension by Measurement of the Static Shaft Loading

A very accurate method for the setting of the correct belt tension is by **direct measurement of the static shaft loading** using the formula:

$$S_a \approx 2\,T \cdot \sin\frac{\beta}{2} \cdot z$$

This checking method, however, does call for specialised measuring instruments.

IV. Checking the Belt Tension by Speed Measurement

In this method, the belt tension is checked using the theoretical slip. The speeds of the driver and driven pulleys are measured first in an unloaded and then in a loaded condition.

S	=	Slip	(%)
n_{1L}	=	Speed of driver pulley, unloaded (r.p.m.)	(min^{-1})
n_{2L}	=	Speed of driven pulley, unloaded (r.p.m.)	(min^{-1})
n_{1B}	=	Speed of driver pulley, under load (r.p.m.)	(min^{-1})
n_{2B}	=	Speed of driven pulley, under load (r.p.m.)	(min^{-1})

Formula for the calculation of slip:

$$S = \left(1 - \frac{n_{1L}/n_{2L}}{n_{1B}/n_{2B}}\right) \cdot 100$$

At the rated loading, the slip should not exceed 1%. The belt service is considerably shortened due to excessive flank wear with an unacceptably low initial tension or under extreme loading conditions, with slip in excess of 2%.

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Power Transmission

Design Hints
Ribbed Belt Tension

Table 19: Stretch Factor R for Optibelt-RB Ribbed Belts

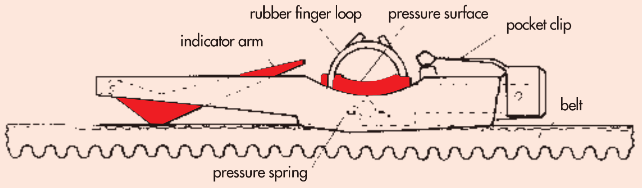
Section		PH	PJ	PK	PL	PM
Minimum static belt tension per rib T (N)	15	0.00155	0.00090			
	20	0.00207	0.00130			
	25	0.00263	0.00168			
	30	0.00331	0.00206	0.00065	0.00066	
	35	0.00407	0.00248	0.00077	0.00080	
	40	0.00500	0.00300	0.00093	0.00094	
	45	0.00600	0.00348	0.00114	0.00109	
	50	0.00700	0.00406	0.00136	0.00127	
	55	0.00831	0.00459	0.00160	0.00142	0.00062
	60	0.00958	0.00522	0.00192	0.00160	0.00072
	65	0.01085	0.00580	0.00223	0.00175	0.00079
	70	0.01229	0.00644	0.00254	0.00191	0.00087
	75	0.01356	0.00715	0.00280	0.00212	0.00098
	80	0.01500	0.00786	0.00312	0.00228	0.00101
	85	0.01636	0.00863	0.00346	0.00242	0.00111
	90	0.01780	0.00949	0.00377	0.00261	0.00120
	95	0.01924	0.01021	0.00411	0.00277	0.00124
	100	0.02070	0.01106	0.00445	0.00297	0.00135
	120	0.02644	0.01469	0.00572	0.00369	0.00159
	140		0.01849	0.00693	0.00437	0.00190
	160		0.02229	0.00820	0.00509	0.00219
	180			0.00949	0.00580	0.00249
	200			0.01095	0.00651	0.00279
	220				0.00735	0.00314
	240				0.00811	0.00340
	250				0.00849	0.00356
	260					0.00373
	280					0.00405
	300					0.00438
	350					0.00518
	400					0.00598
	440					0.00674
	460					0.00706
	480					0.00742
	500					0.00772
	520					0.00814
	540					0.00850
	560					0.00889
	580					0.00929
	600					0.00968
	620					0.01004
	640					0.01036
	660					0.01076
	680					0.01116
	700					0.01156
	720					0.01196

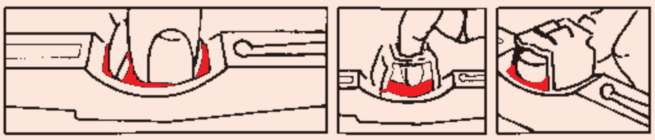
Intermediate values can be calculated by linear interpolation

Design Hints
Optikrik Tension Gauges 0, I, II, III

These tension gauges have been devised to simplify the maintenance of ribbed belt drives where the more essential technical data is unknown and the optimum tension cannot therefore be arrived at by calculation. With these simplified methods, all that is required is the pulley diameter.

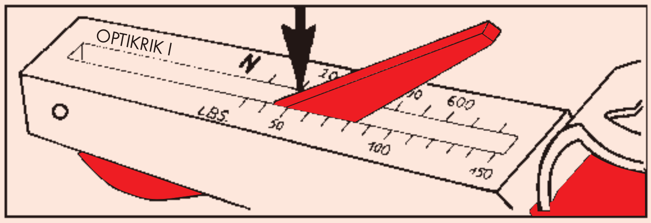
Optikrik tension gauges - operating instructions -





A B C

1. There are three ways of using the gauge (see illustration).
2. The gauge is placed on the centre of the belt surface between the two pulleys. (First press the indicator arm down flush with the scale.)
3. Place the gauge lightly on the belt and exert pressure slowly in the manner shown (A, B or C) using one finger only.



4. Avoid touching the gauge with more than one finger whilst measuring.
5. As soon as you hear or feel a click, immediately release the pressure and the indicator arm will remain in the measurement position.
6. Carefully lift the gauge off, taking care not to displace the indicator arm. The belt tension is indicated on the scale at the point where the upper edge of the indicator arm crosses the gauge body (see Fig.).
7. To ensure an accurate reading, you can mark the measured point on the scale with your thumb nail and then turn the gauge over to read it.
8. Raise or lower the belt tension until it is within the required tension range.

Belt Section	Diameter of the smallest pulley d_e (mm)	Static belt tension T_{max} (N)									
		Initial Installation	Retension	Initial Installation	Retension	Initial Installation	Retension	Initial Installation	Retension	Initial Installation	Retension
PH		4 PH		8 PH		12 PH		16 PH		20 PH	
	≤ 25	90	70	150	130	250	200	300	250	400	300
	> 25 ≤ 71	110	90	200	150	300	250	350	300	450	350
	> 71 *										
PJ		4 PJ		8 PJ		12 PJ		16 PJ		24 PJ	
	≤ 40	200	150	350	300	500	400	700	550	1000	800
	> 40 ≤ 80	200	150	400	350	600	500	800	650	1200	1000
	> 80 ≤ 132	250	200	450	350	700	550	900	700	1300	1000
	> 132 *										
PK		4 PK		8 PK		10 PK		12 PK		16 PK	
	≤ 63	300	250	600	450	700	600	900	700	1200	900
	> 63 ≤ 100	400	300	800	600	1000	700	1200	900	1500	1200
	> 100 ≤ 140	450	350	900	700	1100	800	1300	1000	1600	1300
	> 140 *										
PL		6 PL		8 PL		10 PL		12 PL		16 PL	
	≤ 90	800	600	1000	800	1300	1000	1500	1200	1900	1500
	> 90 ≤ 140	1000	700	1300	1000	1600	1300	1900	1500	2500	1900
	> 140 ≤ 200	1100	800	1400	1100	1900	1400	2100	1600	2800	2100
	> 200 *										

*Tension settings for these pulleys must be calculated.

Tension gauges

Optikrik 0	Measurement range:	70 – 150 N
Optikrik I	Measurement range:	150 – 600 N
Optikrik II	Measurement range:	500 – 1400 N
Optikrik III	Measurement range:	1300 – 3100 N

Method

1. Locate the section in the left hand column.
2. Select the smallest pulley diameter in the drive system.
3. The table shows the corresponding static belt tension.
4. Check the belt tension with the gauge as described.

Example

1. Optibelt-RB Ribbed Belt section	4 PJ
2. Smallest pulley diameter in drive system d_e	100 mm
3. Static belt tension - initial fitting	250 N
4. Static belt tension - retension	200 N

The tension figures (static belt tension) are for guidance only when sufficient drive data is not available. They are based on the maximum transmissible power (per ribbed belt).

Calculation basis

PH, PJ	Speed v = 5 bis 60 m/s.
PK	Speed v = 5 bis 50 m/s.
PL	Speed v = 5 bis 40 m/s.

Design Hints

Determining the Axial Force / Shaft Loading under Dynamic Conditions

In order to prevent premature bearing failure, shaft fracture or over engineered bearings and shafts, it is recommended that the dynamic axial force be calculated exactly. This is the only way to determine the stresses to which these components are exposed in the prime mover and driven machines.

In the case of two pulley drives, the driver and driven shafts or bearings are subject to the same dynamic axial force, but in opposite directions.

When tension or guide pulleys are incorporated, the magnitude and direction of the axial force are almost always different on each pulley. If the magnitude and direction of the dynamic axial force is to be determined, a graphical solution using the force parallelogram for the dynamic forces in the tight side S_1 and slack side S_2 is recommended.

If only the magnitude of the dynamic axial force is to be determined, this can be achieved using the formula for S_{adyn}. Both methods are illustrated by the following example:

Details of the calculation example given on pages 15 to 17.

P_B = 23.4 kW c_1 = 1.0

v = 16.6 m/s β = 175°

Dynamic tight side tension

$$S_1 \approx \frac{1030 \cdot P_B}{c_1 \cdot v}$$

$$S_1 \approx \frac{1030 \cdot 23.4}{1.0 \cdot 16.6} \approx \mathbf{1452\ N}$$

Dynamic slack side tension

$$S_2 \approx \frac{1000 \cdot (1.03 - c_1) \cdot P_B}{c_1 \cdot v}$$

$$S_2 \approx \frac{1000 \cdot (1.03 - 1.0) \cdot 23.4}{1.0 \cdot 16.6} \approx \mathbf{42\ N}$$

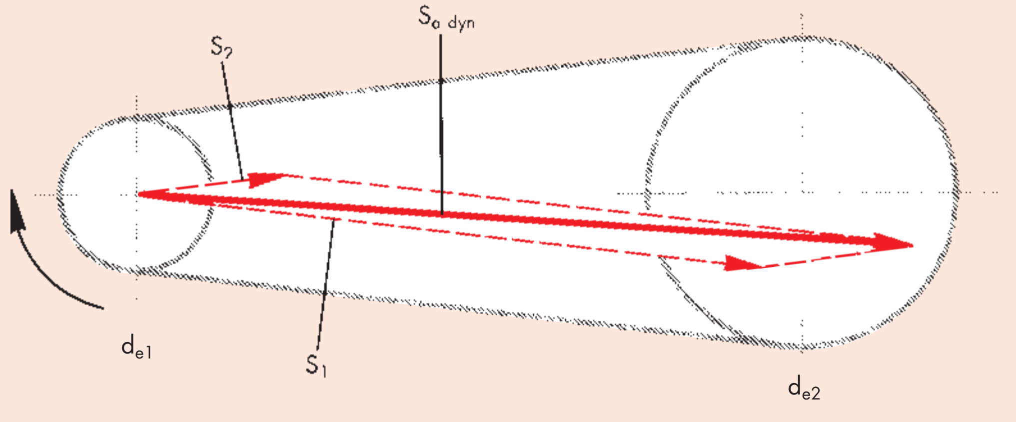
A) Solution using the Formula for S_{adyn}

Dynamic axial force

$$S_{a\,dyn} \approx \sqrt{S_1^2 + S_2^2 - 2\, S_1 \cdot S_2 \cdot \cos\beta}$$

$$S_{a\,dyn} \approx \sqrt{1452^2 + 42^2 - 2 \cdot 1452 \cdot 42 \cdot (-0.99619)} \approx \mathbf{1494\ N}$$

B) Graphical Solution



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Power Transmission

Design Hints

Length Tolerances - Installation and Maintenance

Table 20 Length Tolerances

Effective length L_e (mm)	Section PH Tolerance (mm)	Section PJ Tolerance (mm)	Section PK Tolerance (mm)	Section PL Tolerance (mm)	Section PM Tolerance (mm)
> 200 ≤ 500	+ 4 – 8	+ 4 – 8	+ 4 – 8		
> 500 ≤ 750	+ 5 – 10	+ 5 – 10	+ 5 – 10		
> 750 ≤ 1000	+ 6 – 12	+ 6 – 12	+ 6 – 12	+ 6 – 12	
> 1000 ≤ 1500	+ 8 – 16	+ 8 – 16	+ 8 – 16	+ 8 – 16	
> 1500 ≤ 2000	+ 10 – 20	+ 10 – 20	+ 10 – 20	+ 10 – 20	
> 2000 ≤ 3000	+ 12 – 24	+ 12 – 24	+ 12 – 24	+ 12 – 24	+ 12 – 24
> 3000 ≤ 4000				+ 15 – 30	+ 15 – 30
> 4000 ≤ 6000				+ 20 – 40	+ 20 – 40
> 6000 ≤ 8000				+ 30 – 60	+ 30 – 60
> 8000 ≤ 12500					+ 45 – 90
> 12500 ≤ 17000					+ 60 – 120

Installation and Maintenance

Correct design of drives using Optibelt-RB Ribbed Belts ensures long belt life and a high degree of operating safety.

Practice has shown that premature failure can often be traced to faulty installation or maintenance, thus the following recommendations are very important.

- **Safety**
  Before commencing any maintenance work, ensure that all machine components are safely positioned and cannot be altered whilst the work is in progress. It is also important that the manufacturer's safety instructions be carefully followed.

- **Pulleys**
  The grooves should be in good condition, free from scoring or sharp edges, and all dimensions should conform to the relevant standard.

- **Alignment**
  Shafts and pulleys should be correctly aligned prior to belt installation.
  We recommend a maximum tolerance of 0.5 ° in both planes.

- **Installation of Ribbed Belts**
  The centre distance should be reduced prior to the installation of ribbed belts so that they may be fitted without undue force. Forcing ribbed belts over the pulley flanges with a tyre lever, screwdriver or the like, must be avoided as the damage this causes to the ribs and low stretch tension members is often not visible.

- **Belt Tensionin**
  Once the calculated axial force has been applied, the tension of the ribbed belts should be checked, using our tension gauges and the methods described on pages 40 to 44. The tension should be monitored during the first few hours of operation. Experience has shown that the belt will need retensioning after between 30 minutes and 4 hours at full load, to compensate for the small initial belt stretch and "bedding" into the pulley grooves.

- **Idler Pulleys**
  Where possible, the use of idler pulleys should be avoided. If, for design reasons, such an arrangement is necessary, refer to the notes on pages 26 and 27 of this manual.

- **Maintenance**
  It is recommended that ribbed belt drives should be regularly inspected for loss of belt tension, unusual heat build up or wear. Suitable shielding must be provided to prevent the intrusion of foreign bodies such as stones, swarf or other material between pulley and belt.
  Optibelt-RB Ribbed Belts do not require any special maintenance measures. It is imperative belt dressing should not be used.

Design Hints
Ribbed Belt Widths

Table 21

Number of ribs z	Section PH (mm)	Section PJ (mm)	Section PK (mm)	Section PL (mm)	Section PM (mm)
2	3.20	4.68	7.12	9.40	18.80
3	4.80	7.02	10.68	14.10	28.20
4	6.40	9.36	14.24	18.80	37.60
5	8.00	11.70	17.80	23.50	47.00
6	9.60	14.04	21.36	28.20	56.40
7	11.20	16.38	24.92	32.90	65.80
8	12.80	18.72	28.48	37.60	75.20
9	14.40	21.06	32.04	42.30	84.60
10	16.00	23.40	35.60	47.00	94.00
11	17.60	25.74	39.16	51.70	103.40
12	19.20	28.08	42.72	56.40	112.80
13	20.80	30.42	46.28	61.10	122.20
14	22.40	32.76	49.84	65.80	131.60
15	24.00	35.10	53.40	70.50	141.00
16	25.60	37.44	56.96	75.20	150.40
17	27.20	39.78	60.52	79.90	159.80
18	28.80	42.12	64.08	84.60	169.20
19	30.40	44.46	67.64	89.30	178.60
20	32.00	46.80	71.20	94.00	188.00
21	33.60	49.14	74.76	98.70	197.40
22	35.20	51.48	78.32	103.40	206.80
23	36.80	53.82	81.88	108.10	216.20
24	38.40	56.16	85.44	112.80	225.60
25	40.00	58.50	89.00	117.50	235.00
26	41.60	60.84	92.56	122.20	244.40
27	43.20	63.18	96.12	126.90	253.80
28	44.80	65.52	99.68	131.60	263.20
29	46.40	67.86	103.24	136.30	272.60
30	48.00	70.20	106.80	141.00	282.00
31	49.60	72.54	110.36	145.70	291.40
32		74.88	113.92	150.40	300.80
33		77.22	117.48	155.10	310.20
34		79.56	121.04	159.90	319.60
35		81.90	124.60	164.50	329.00
36		84.24	128.16	169.20	338.46
37		86.58	131.72	173.90	347.80
38		88.92	135.28	178.60	357.20
39		91.26	138.84	183.30	366.60
40		93.60	142.40	188.00	376.00
41		95.94	145.96	192.70	385.40
42		98.28	149.52	197.40	394.80
43		100.62	153.08	202.10	404.20
44		102.96	156.64	206.80	413.60
45		105.30	160.20	211.50	423.00
46		107.54	163.76	216.20	
47		109.98	167.32	220.90	
48		112.32	170.88	225.60	
49		114.66	174.44	230.30	
50		117.00	178.00	235.00	
51				239.70	
52				244.40	
53				249.10	
54				253.80	
55				258.50	
56				263.20	
57				267.90	
58				272.60	
59				277.30	
60				282.00	

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Power Transmission

Design Hints
Problems - Causes - Remedies

Problems	Causes	Remedies
Ribbed Belt breaking after a short period of running	Forcing ribbed belt over pulley when fitting, damaging tension cord	Reduce drive centre distance to fit ribbed belt
	Ingress of foreign body during running	Fit an effective guard
	Overloaded drive, check number of ribs	Check drive details and fit correct number of ribs
	Drive stalled	Ascertain cause and put right
Cuts and splits in the ribs	Outside idler pulley in use whose position and size is not as recommended	Follow Optibelt recommendations e.g. increase pulley size; replace with inside idler pulley on the slack side of the drive
	Pulley diameter too small	Redesign using recommended minimum pulley diameters
	Ambient temperature too high	Ensure good ventilation and protect the belt from direct heat.
	Ambient temperature too low	Warm area around belt before start up
	Abnormal belt slip	Check drive design to ensure correct number of ribs, redesign if necessary. Check drive tension
	Contamination by chemical	Protect drive from contamination
Severe belt vibration	Overloaded drive	Check drive design and modify if necessary
	Drive centre distance significantly longer than recommended	Shorten centres. Use an inside idler in the drive slack side.
	High shock loading	Use an inside idler on the slack side
	Belt tension too low	Correct
	Unbalanced pulleys	Balance pulleys

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Power Transmission

Design Hints

Problems - Causes - Remedies

Problems	Causes	Remedies
Ribbed Belt cannot be retensioned	Insufficient allowance for drive centre adjustment	Modify drive to allow more take-up
	Excessive stretch caused by overloaded drive	Recalculate drive and modify
	Incorrect belt length	Use a shorter belt
Excessive wear of ribs	Starting torque too high	Check drive details and redesign if necessary
	Faulty pulleys	Renew or re-machine pulleys
	Excessive wear in pulley grooves	Renew pulleys
	Wrong section of belt for pulley	Section of belt or pulley must be Corrected
	Poor drive alignment	Realign
	Small pulley diameter below recommended minimum	Redesign using correct pulley diameters
	Belt tension too low	Check belt tension and correct
	Belt rubbing or catching on protruding parts	Remove protrusions or move drive away if necessary
Excessive noise	Poor drive alignment	Realign
	Incorrect belt tension, overloaded drive	Retension and check drive details and redesign if necessary
	High shock loading	Check drive design and modify if necessary
Ribbed Belt swelling or softening	Contamination by oil, grease or chemicals	Protect drive from contamination
		Clean pulley grooves with petrol or alcohol before fitting new ribbed belt

Further clarification of the various remedies shown above can be found elsewhere in this manual

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Power Transmission

Data Sheet
For Drive Calculation/Checking

Company ______
Address ______
Contact ______
Position ______ Date ______
______
Tel. ( ) ______ Fax: ______

For trials ☐
For pilot series ☐
For production series ☐

New drive ☐
Existing drive ☐
Requirement ______ belts/year

Fitted with:

Pieces	Effective length	Section	No. of ribs	Manufacturer

Prime Mover

Type (e.g. electric motor, diesel engine 3 cyl.) ______
Size of Starting Load (e.g. starting load = 1,8 mormal load) ______
Method of Starting (e.g. star delta) ______
Operation hours per day ______
Number of starts ______ per hour ☐ per day ☐
Rotational reverses ______ per minute ☐ per hour ☐
Power: P normal ______ kW
P maximum ______ kW
or max. torque ______ Nm at n_1 ______ rpm
Speed of driver pulley n_1 ______ rpm
Position of shafts: horizontal ☐ vertical ☐
angled ☐ ∡ ______ °
Maximum allowed static shaft loading $S_{a\ max}$ ______ N
Effective (or outside) diameter of driver pulley:
d_{e1} ______ mm
$d_{e1\ min}$ ______ mm
$d_{e1\ max}$ ______ mm
Pulley face width L_{max} ______ mm

Driven Machine

Type (e.g. fan, compressor) ______
Start: loaded ☐ unloaded ☐
Nature of load: constant ☐ pulsating ☐
Shock ☐
Load: P normal ______ kW
P maximum ______ kW
or max. torque ______ Nm at n_2 ______ rpm
Speed of driven pulley n_2 ______ rpm
$n_{2\ min}$ ______ rpm
$n_{2\ max}$ ______ rpm
Maximum allowable static shaft loading $S_{a\ max}$ ______ N
Effective (or outside) diameter of driven pulley:
d_{e2} ______ mm
$d_{e2\ min}$ ______ mm
$d_{e2\ max}$ ______ mm
Pulley face width L_{max} ______ mm

Speed ratio r ______ r_{min} ______ r_{max} ______
Drive centre distance C ______ mm c_{min} ______ mm c_{max} ______ mm
Tension/guide pulleys: inside ☐ in drive slack side ☐
outside ☐ in drive tight side ☐
d_e ______ mm Ribbed pulley ☐ moveable ☐ (e.g. spring loaded) ______
d_a ______ mm Flat pulley ☐ fixed ☐

Drive Conditions: Ambient temperature ______ °C/F min.
______ °C/F max.

Exposure to oil ☐ (e.g. oil mist, droplets) ______
water ☐ (e.g. spray) ______
acid ☐ (type, concentration, temperature) ______
dust ☐ (type) ______

Special conditions: Where the drive is subjected to unusual conditions (e.g. inside or outside idler pulleys, two or more driven pulleys) then a sketch or any other relevant information should accompany this completed sheet.

Power Transmission

Notes:

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Power Transmission

Standard Range
optibelt-TB Taper Bushes

Taper Bushes with metric bores and keyways to DIN 6885 part 1

Taper Bush No.	1008	1108	1210	1215	1310	1610	1615	2012	2517	3020	3030	3525	3535	4040	4545	5050
Bore diameter d_2 **(mm)**	10	10	11	11	14	14	14	14	16	25	35	35	35	40	55	70
	11	11	12	12	16	16	16	16	18	28	38	38	38	42	60	75
	12	12	14	14	18	18	18	18	19	30	40	40	40	45	65	80
	14	14	16	16	19	19	19	19	20	32	42	42	42	48	70	85
	16	16	18	18	20	20	20	20	22	35	45	45	45	50	75	90
	18	18	19	19	22	22	22	22	24	38	48	48	48	55	80	95
	19	19	20	20	24	24	24	24	25	40	50	50	50	60	85	100
	20	20	22	22	25	25	25	25	28	42	55	55	55	65	90	105
	22	22	24	24	28	28	28	28	30	45	60	60	60	70	95	110
	24*	24	25	25	30	30	30	30	32	48	65	65	65	75	100	115
	25*	25	28	28	32	32	32	32	35	50	70	70	70	80	105	120
		28*	30	30	35	35	35	35	38	55	75	75	75	85	110	125
			32	32		38	38	38	40	60		80	80	90		
						40	40	40	42	65		85	85	95		
						42*	42*	42	45	70		90	90	100		
								45	48	75						
								48	50							
								50	55							
									60							
Torque (Nm)	5.7	5.7	20	20	20	20	20	31	49	92	92	115	115	172	195	275
Bush length (mm)	22.3	22.3	25.4	38.1	25.4	25.4	38.1	31.8	44.5	50.8	76.2	63.5	88.9	101.6	114.3	127.0
Weight with $d_{2\,min}$ (≈ kg)	0.12	0.16	0.28	0.39	0.32	0.41	0.60	0.75	1.06	2.50	3.75	3.90	5.13	7.68	12.70	15.17

Material: cast iron 20

* This bore is provided with a shallow keyway

Shallow keys for taper bushes

Bore diameter d_2 (mm)	Keyway width b (mm)	Keyway depth t_2 (mm)	Bore diameter d_2 (mm)	Keyway width b (mm)	Keyway depth t_2 (mm)
24	8	2.0	28	8	2.0
25	8	1.3	42	12	2.2

Taper Bushes with inch bores and keyway to British Standard BS 46 part 1

Taper Bush No.	1008	1108	1210	1215	1310	1610	1615	2012	2517	3020	3030	3525	3535	4040	4545	5050
Bore diameter d_2 **(inch)**	3/8	3/8	1/2	5/8	1/2	1/2	1/2	5/8	3/4	1 1/4	1 1/4	1 1/2	1 1/2	1 3/4	2 1/4	3
	1/2	1/2	5/8	3/4	5/8	5/8	5/8	3/4	7/8	1 3/8	1 3/8	1 5/8	1 5/8	1 7/8	2 3/8	3 1/4
	5/8	5/8	3/4	7/8	3/4	3/4	3/4	7/8	1	1 1/2	1 1/2	1 3/4	1 3/4	2	2 1/2	3 1/2
	3/4	3/4	7/8	1	7/8	7/8	7/8	1	1 1/8	1 5/8	1 5/8	1 7/8	1 7/8	2 1/8	2 3/4	3 3/4
	7/8	7/8	1	1 1/8	1	1	1	1 1/8	1 1/4	1 3/4	1 3/4	2	2	2 1/4	2 7/8	4
	1✦	1	1 1/8	1 1/4✦	1 1/8	1 1/8	1 1/8	1 1/4	1 3/8	1 7/8	1 7/8	2 1/8	2 1/8	2 3/8	3	4 1/4
		1 1/8✦	1 1/4✦		1 1/4	1 1/4	1 1/4	1 3/8	1 1/2	2	2	2 1/4	2 1/4	2 1/2	3 1/4	4 1/2
					1 3/8✦	1 3/8	1 3/8	1 1/2	1 5/8	2 1/8	2 1/8	2 3/8	2 3/8	2 5/8	3 3/8	4 3/4
						1 1/2	1 1/2	1 5/8	1 3/4	2 1/4	2 1/4	2 1/2	2 1/2	2 3/4	3 1/2	5
						1 5/8✦	1 5/8✦	1 3/4	1 7/8	2 3/8	2 3/8	2 5/8	2 5/8	2 7/8	3 3/4	
								1 7/8	2	2 1/2	2 1/2	2 3/4	2 3/4	3	4	
								2	2 1/8	2 5/8	2 5/8	2 7/8	2 7/8	3 1/8	4 1/4	
									2 1/4	2 3/4	2 3/4	3	3	3 1/4	4 1/2	
									2 3/8	2 7/8	2 7/8	3 1/8	3 1/8	3 3/8		
									2 1/2	3	3	3 1/4	3 1/4	3 1/2		
												3 3/8	3 3/8	3 3/4		
												3 1/2	3 1/2	4		
Torque (Nm)	5.7	5.7	20	20	20	20	20	31	49	92	92	115	115	172	195	275
Bush length (mm)	22.3	22.3	25.4	38.1	25.4	25.4	38.1	31.8	44.5	50.8	76.2	63.5	88.9	101.6	114.3	127.0
Weight with $d_{2\,min}$ (≈ kg)	0.12	0.16	0.28	0.39	0.32	0.41	0.60	0.75	1.06	2.50	3.75	3.90	5.13	7.68	12.70	15.17

Material: cast iron 20

✦ Steel

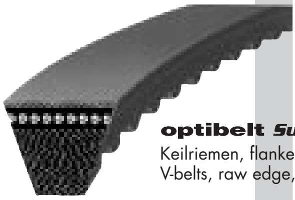
optibelt

optibelt Power Transmission

optibelt *VB*
Klassische Keilriemen
Classical V-belts

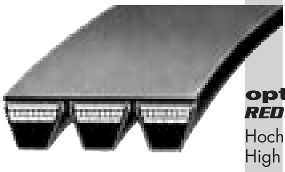
optibelt *SK*
Schmalkeilriemen
Wedge belts

optibelt *RED POWER II*
Hochleistungs-Schmalkeilriemen, wartungsfrei
High performance wedge belts, service-free

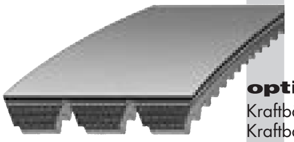


optibelt *Super X-POWER M=S*
Keilriemen, flankenoffen, formgezahnt
V-belts, raw edge, moulded cogged

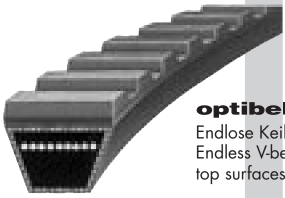
optibelt *KB*
Kraftbänder
Kraftbands



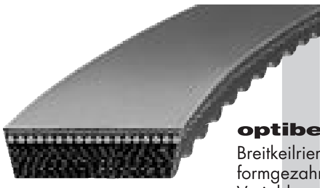
optibelt *KB RED POWER II*
Hochleistungs-Kraftbänder
High performance kraftbands



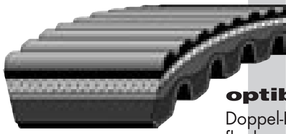
optibelt *KBX*
Kraftbänder, flankenoffen
Kraftbands, raw edge



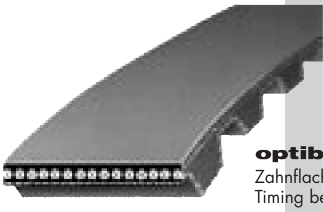
optibelt *PKR*
Endlose Keilriemen mit Auflage
Endless V-belts with special top surfaces



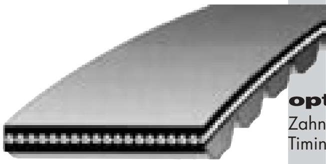
optibelt *SUPER VX*
Breitkeilriemen, flankenoffen, formgezahnt
Variable speed belts, raw edge, moulded cogged



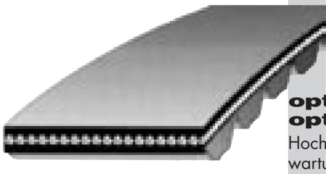
optibelt *SUPER DVX*
Doppel-Breitkeilriemen, flankenoffen, formgezahnt
Double section variable speed belts, raw edge, moulded cogged



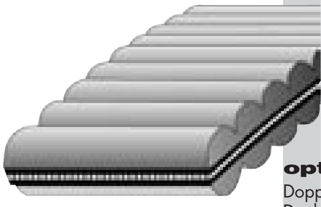
optibelt *ZR*
Zahnflachriemen
Timing belts



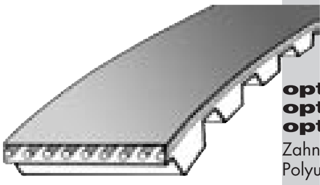
optibelt *OMEGA*
Zahnflachriemen, wartungsfrei
Timing belts, service-free



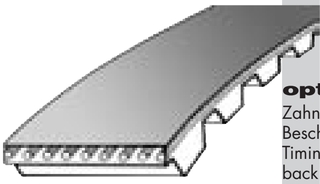
optibelt *OMEGA HL*
optibelt *OMEGA HP*
Hochleistungs-Zahnflachriemen, wartungsfrei
High performance timing belts, service-free



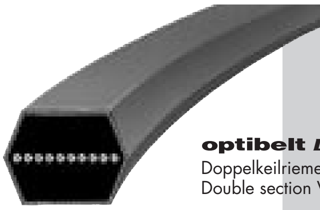
optibelt *HTD® D*
Doppel-Zahnflachriemen
Double section timing belts



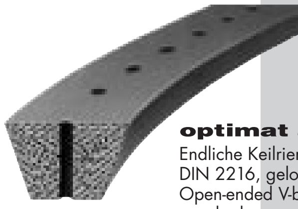
optibelt *ALPHA*
optibelt *ALPHA linear/V*
optibelt *ALPHAflex*
Zahnflachriemen aus Polyurethan
Polyurethane timing belts



optibelt *ALPHA Spezial*
Zahnflachriemen mit Nocken und Beschichtungen
Timing belts with cleats and back coverings

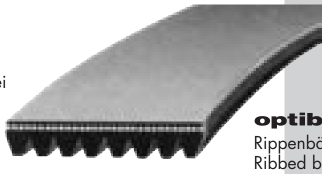


optibelt *DK*
Doppelkeilriemen
Double section V-belts



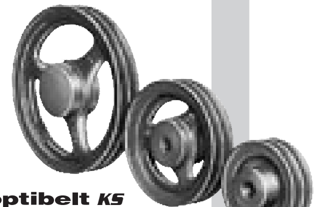
optimat *OE*
Endliche Keilriemen DIN 2216, gelocht
Open-ended V-belting, punched

optibelt *RR*
Kunststoffrundriemen
Plastic round section belting

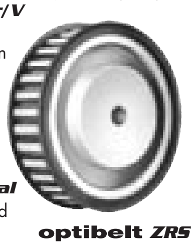


optibelt *RB*
Rippenbänder
Ribbed belts

optibelt *KK*
Kunststoffkeilriemen
Plastic V-belting



optibelt *KS*
Keilrillenscheiben
V-grooved pulleys



optibelt *ZRS*
Zahnriemenscheiben
Timing belt pulleys

optibelt *RBS*
Rippenbandscheiben
Ribbed belt pulleys

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