

DRIVE DESIGN AND SELECTION GUIDE

CMW timing belt drives gives you high efficiency and long lifetime.

To achieve the best performance, a correct calculation must be made.

We detail the required data, equations and factors for calculation as well as the calculations steps you need to take.

Required data

- Machine type
- Drive motor type
- Motor power and/or required driving power
- Operating factor
- Rotational speed of the motor shaft
- Rotational speed of the driven shaft
- Center distance

TOTAL SERVICE FACTOR C_o

Factor c1

The total service factor C_0 is determined by adding factors C_2 , C_3 and C_4 :

$$C_o = C_2 + C_3 + C_4$$

GLOSSARY

Symbol	Unit	Definition
a	mm	Center distance
c0	-	Predefined total service factor
c0 err	-	Calculated total service factor
c1	-	Teeth in mesh factor
c2	-	Load factor
c3	-	Acceleration factor
c4	-	Fatigue factor
c5	-	Length factor
dw	mm	Pitch diameter of toothed pulley
dw1	mm	Pitch diameter of driving toothed pulley
dw2	mm	Pitch diameter of driven toothed pulley
dwg	mm	Pitch diameter of large toothed pulley
dwk	mm	Pitch diameter of small toothed pulley
Fstat	N	Static span tension
Fv	N	Axle load
Rt	-	Transmission ratio
k1	-	Initial load factor
k2	-	Initial service factor
Lw	mm	Pitch length of timing belt
n1	min ⁻¹	Speed of driving toothed pulley
n2	min ⁻¹	Speed of driven toothed pulley
P	kW	Power to be transmitted
P _R	kW	Power rating for selected width of belt
P _m	kW	Engine power
Ze	-	Number of meshed teeth
v	m/s	Belt speed
z1	-	No. of teeth of the driving toothed pulley
z2	-	No. of teeth of the driven toothed pulley
zk	-	No. of teeth of the small toothed pulley
β	°	Arc of contact around the small toothed pulley

The correct service factor is determined by:

- The extent and frequency of peak loads.
- The number of operating hours per year, broken down into average hours per day of continuous service.
- The proper service category (intermittent, normal or continuous).

Select the one that most closely approximates your application condition.

1) Intermittent service

- Light Duty – Not more than 5 hours per day.
- Never exceeding rated load.

2) Normal service

- Daily service 5 to 14 hours per day.
- Where occasional starting or peak load does not exceed 200% of the full load.

3) Continuous service

- Where starting or peak load is in excess of 200% of the full load or where starting or peak loads and overloads occur frequently.
- Continuous service 14 to 24 hours per day.

SELECTION PROCEDURE AND FORMULAE

Example:

Driver: 25 kW electric motor, 1 470 r/min with direct online start

Driven: Rotary compressor, 700 r/min

Service: 24 hours /day

Approximate distance between centres = 700 mm

Tensioning method: Belt Frequency Meter

1. Service factor (C2)

Service factors describe the severity of drive conditions Refer to tables 2 and 3 on page 359 and 360.

Example: Medium duty, heavy start C2 = 2,0

For speed increasing drives, use correction factors in table 1 on page 259.

2. Design power (Pd)

Multiply drive power and service factor C2 to get the design power

$$P_d = P_r C_2$$

Where:

Pd = design power [kW]

Pr = motor rated power or power absorbed by the load [kW]

C2 = service factor

Example:

$$P_d = 25 \times 2,0 = 50 \text{ kW}$$

3. Required speed ratio (Ir)

Divide speed of faster shaft with speed of slower shaft to get the required pulley speed ratio

$$I_r = \frac{r/\text{min}(\text{faster shaft})}{r/\text{min}(\text{slower shaft})}$$

Example:

$$I_r = \frac{1470}{700} = 2,1$$

4. Belt cross section

Refer to diagrams 1 and 2 for the appropriate belt cross section based on speed and design power

Example: The diagrams suggest section 8M or 14M for the given drive parameters

As the driven machine is classified heavy start, the selected section is 14M

5. A. If selected belt cross section is:

H tooth profile 5M, 8M, 14M

Refer to corresponding centre distance tables to get:

Belt pitch length (Lp)

Design centre distance (Cd)

Number of teeth of pulleys (Zs, Zl)

Example:

Speed ratio: 2,1

Belt length: 2 100 mm

CC distance 735,3 mm

Zs = 29

Zl = 60

d = 129,2 mm

D = 267,3 mm

Continue with step 10

5. B. If another type of timing belt is

selected, where centre distance tables are not available

Continue with step 6

6. Pulley diameter and number of teeth

(d, D, Zs, Zl)

- Try to use standard pulley diameters
- Calculate pulley diameters for small and large pulley

$$d = \frac{(Z_s \text{ Pitch})}{\pi}$$

$$D = \frac{(Z_l \text{ Pitch})}{\pi}$$

Where:

Pitch = belt pitch distance [mm]

d = pitch diameter of smaller pulley [mm]

D = pitch diameter of larger pulley [mm]

7. Nominal centre distance (Cn)

Determine nominal centre distance between pulleys from drive data sheet

8. Belt datum length (Ld)

Calculate theoretical belt length based on nominal centre distance

$$L_p = 2C_n + 1,57 (D + d) + \frac{(D - d)^2}{4 C_n}$$

Where:

Lp = belt datum length [mm]

D = large pulley diameter [mm]

d = small pulley diameter [mm]

Cn = nominal centre distance [mm]

Choose closest available belt pitch length from belt size range tables on pages xxx to xxx

9 Design centre distance (Cd)

Calculate actual centre distance based on selected belt pitch length Lp

$$C_d = \frac{a + \sqrt{a^2 - 8 (D - d)^2}}{8}$$

Where:

$$a = 2 L_p - \pi (D - d)$$

D = large pulley diameter [mm]

d = small pulley diameter [mm]

L_p = selected belt pitch length [mm]

10. Power correction factors (C1, C4)

- Refer to table 5 on page 360 for belt length correction factor C1. If C1 is not listed for a specific belt type, take C1 = 1
- Belt power tables consider only drives with 6 or more teeth in mesh. If less than 6 teeth in mesh, additional reduction of basic belt power rating due to excessive tooth loading is required

Calculate number of teeth in mesh by using the following formula:

$$TIM = \frac{0,5 - (D - d)}{6C_d} Z_s$$

Where:

TIM = number of teeth in mesh

D = large pulley diameter [mm]

d = small pulley diameter [mm]

C_d = design centre distance [mm]

Z_s = number of teeth on small pulley

- Refer to table 4 on page 360 for teeth in mesh correction factor C4

11. Corrected belt power rating and respective belt width (P_{corr}, W_b)

The corrected power rating is basic power rating given in power rating tables on pages 292 to 353 multiplied by power correction factors C1, C4 as defined in step 10

$$P_{corr} = P_b C_4 C_1$$

The corrected power rating must be equal or greater than the design power calculated in step 2

$$P_b C_4 C_1 \geq P_d$$

Minimum required basic power rating:

$$P_b = \frac{P_d}{C_4 C_1}$$

Refer to power rating tables on pages 292 to 353 to select the corresponding belt width W_b

This procedure may involve some degree of trial and error iterations from step 5 to 11 in order to reach the appropriate actual belt basic power rating

The following rules should be followed when selecting the belt width:

- Larger pulleys mean less belt width
- Larger pulleys will increase belt life and decrease bearing load
- Belt width should not exceed small pulley diameter

Example:

Required belt basic power rating is:

$$P_{50_b} = \frac{50}{1,0 \times 1,0} = 50 \text{ kW}$$

Selected belt width $W_b = 115 \text{ mm}$

Actual belt basic power for H tooth profile $115 = 54,9 \text{ kW} > 50 \text{ kW}$

12. Installation and take-up allowances

Installation allowance MIA is minimum distance needed to decrease the CC distance in order to be able to install the belt

Take-up allowance MTA is minimum distance needed to increase the CC distance in order to tension the belt

Refer to table 6 on page 360 for Values

Example:

For one flanged pulley:

MIA = 39 mm

MTA = 4 mm

CC min = 735,3 - 39 = 696,3 mm

CC max = 735,3 + 4 = 739,3 mm

13. Belt tension

Follow instructions in tensioning section to calculate Tension.

SERVICE FACTORS

TABLE 1 | SPEED INCREASE RATIO

For speed increasing drives of

Speed ratio 1,00–1,24 multiply service factor by 1,00

Speed ratio 1,25–1,74 multiply service factor by 1,05

Speed ratio 1,75–2,49 multiply service factor by 1,11

Speed ratio 2,50–3,49 multiply service factor by 1,18

Speed ratio 3,50 and over multiply service factor by 1,25

TABLE 2 | TYPES OF PRIME MOVER

Soft starts	Heavy starts
1) Electric motors:	1) Electric motors
AC – Star delta start	AC – Direct-on-line start
DC – Shunt wound	DC – Series and compound wound
2) Internal combustion engines with 4 or more cylinders:	2) Internal combustion engines with less than 4 cylinders:
Prime movers fitted with centrifugal clutches, dry or fluid couplings or electronic soft start devices	Prime movers not fitted with soft start devices

TABLE 3 | TYPES OF DRIVEN MACHINERY

Types of driven machinery	Soft starts			Heavy starts		
	Duty time h/day			Duty time h/day		
	8 and under	Over 8 to 14	Over 14	8 and under	Over 8 to 14	Over 14
"Light Duty: Blowers, exhausters and fans (up to 7,5 kW), 1,2 1,3 1,4 1,6 1,7 1,8 centrifugal compressors and pumps Belt conveyors (uniformly loaded)"	1,2	1,3	1,4	1,6	1,7	1,8
"Medium duty Agitators (uniform density), blowersexhausters and fans (over 7,5 kW) Rotary compressors and pumps (other than centrif- ugal) Belt conveyors (not uniformly loaded), gener- ators and excitors, laundry machinery, lineshafts, machine tools, printing machinery, sawmill and woodworking machinery, screens (rotary)"	1,3	1,4	1,5	1,7	1,8	1,9
"Heavy duty Agitators and mixers (variable density), brick ma- chinery, bucket elevators, compressors and pumps (reciprocating), conveyors (heavy duty) Hoists, mills (hammer), pulverisers, punches, presses, shears, quarry plant, rubber machinery, screens (vibrating), textile machinery"	1,6	1,7	1,8	1,9	2	2,1
"Extra heavy duty Crushers (gyratory-jaw roll), mills (ball-rod-tube)"	1,8	1,9	2	2,2	2,3	2,4

CORRECTION FACTORS

TABLE 4 | TEETH IN MESH (TIM) CORRECTION FACTOR C4

TIM	C4
6 and above	1
5	0,8
4	0,6
3	0,4
2	0,2

TABLE 5 | BELT LENGTH CORRECTION FACTOR C1

Belt length	Correction Factor			
	5M	8M	14M	XL, L, H, XH, T2.5, T5, T10, AT5, AT 10,
425	0,80			1,00
535	0,90			1,00
600	1,00			1,00
800	1,10			1,00
890	1,20			1,00
1050	1,30			1,00
1190		0,80		1,00
1200		0,90		1,00
1420		1,00		1,00
1610		1,10		1,00
1760		1,20		1,00
1890				1,00
2000			0,90	1,00
2450			0,95	1,00
2500			1,00	1,00
3150			1,05	1,00
3400			1,10	1,00

TABLE 6 | MINIMUM INSTALLATION AND TAKE-UP ALLOWANCES

Datum length	"Minimum takeup allowance for tensioning"	Minimum installation allowance – for fitting								
	mm	5M	8M	14M	XL	L	H	XH	XXH	
< 1 525	4	2,5	2,5	2,5	2,5	2,5	2,5	4,5	5,5	No flanged pulleys
1 525-3 050	7	5	5	5	5	5	5	7	8	
> 3 050	10	7,5	7,5	7,5	7,5	7,5	7,5	9,5	10,5	
< 1 525	4	14	22	37	14	14	22	38	54	One flanged pulleys
1 525-3 050	7	17	25	39	17	17	25	41	54	One unflanged pulleys

DIAGRAM 1

CMW H Type Timing Belts

Speed of faster pulley [r/min]

Speed of faster pulley [r/min]

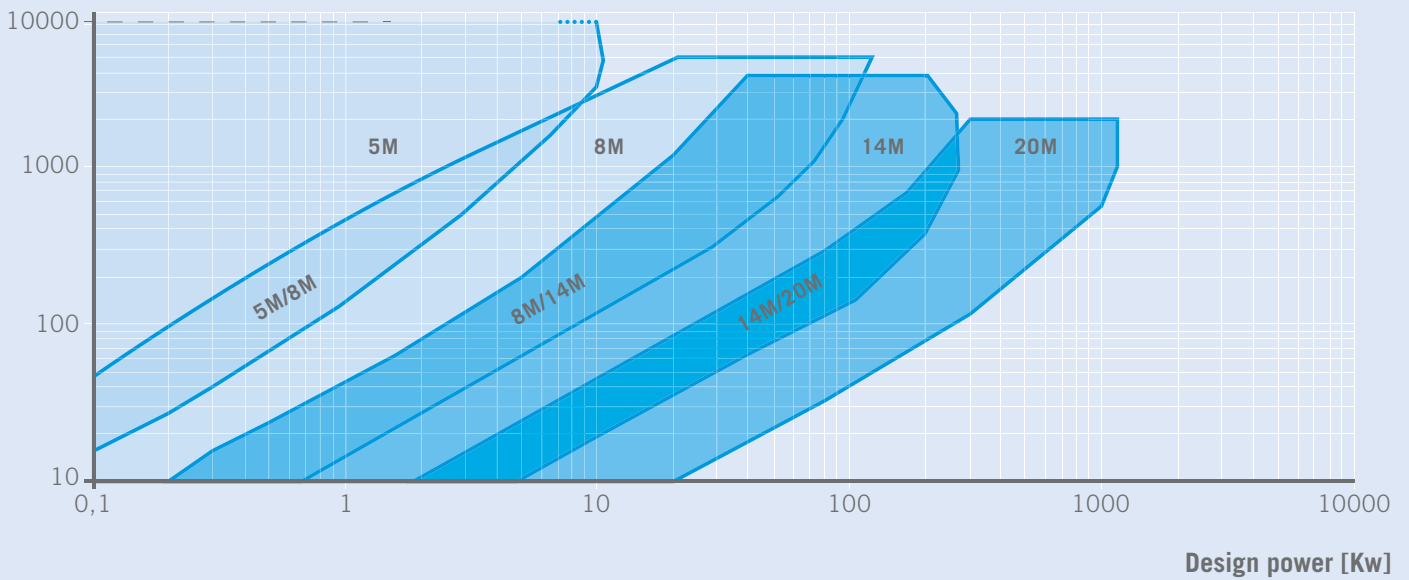
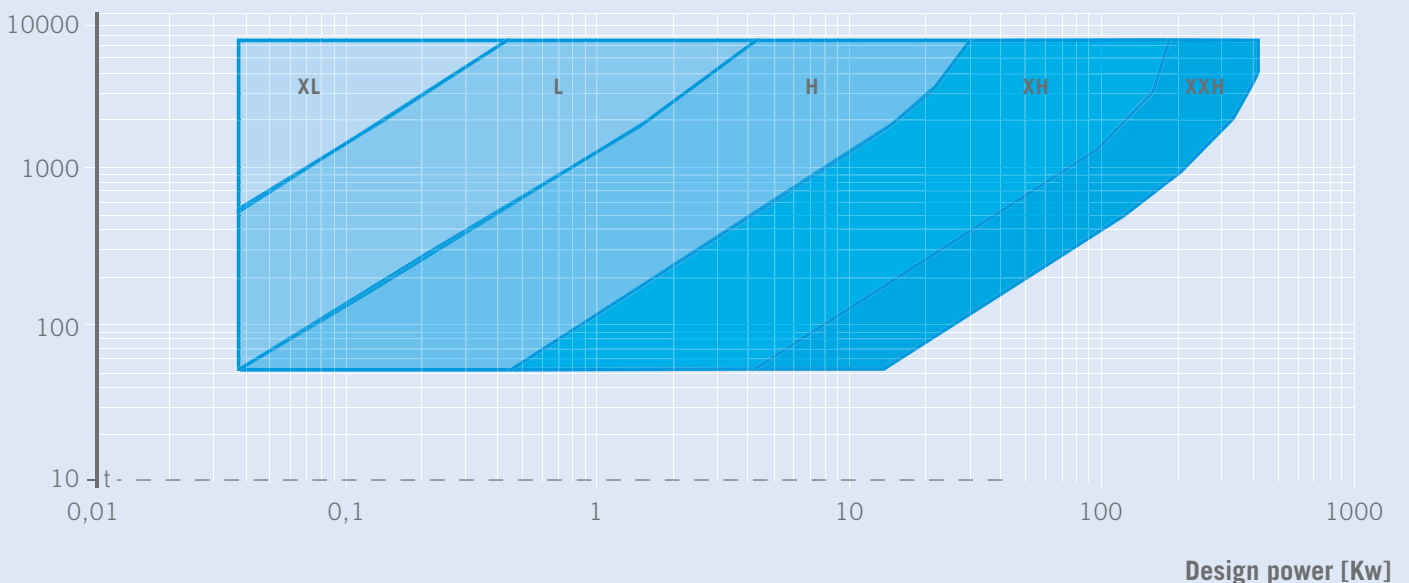


DIAGRAM 2

CMW Classical Trapezoidal Timing Belts

Speed of faster pulley [r/min]

Speed of faster pulley [r/min]



Speed ratio	Driver		Driven												
	Number of Pitch		Number of Pitch		350	375	400	425	450	475	500	535	565	600	635
	teeth	diameter	teeth	diameter											
-		mm	mm	mm											
1,60	40	63,66	64	101,86	-	-	-	-	-	105,80	118,50	136,20	151,30	168,90	186,50
1,61	56	89,13	90	143,24	-	-	-	-	-	-	-	-	-	-	132,20
1,63	32	50,93	52	82,76	-	80,90	93,60	106,30	118,90	131,50	144,10	161,70	176,80	194,30	211,90
1,64	44	70,03	72	114,59	-	-	-	-	-	-	-	120,40	135,70	153,40	171,00
1,65	68	108,23	112	178,25	-	-	-	-	-	-	-	-	-	-	-
1,65	34	54,11	56	89,13	-	-	85,70	98,40	111,10	123,80	136,40	154,00	169,10	186,70	204,20
1,67	48	76,39	80	127,32	-	-	-	-	-	-	-	-	-	119,80	137,60
1,67	36	57,3	60	95,49	-	-	-	90,50	103,20	115,90	128,60	146,30	161,40	179,00	196,60
1,68	38	60,48	64	101,86	-	-	-	-	95,20	108,00	120,70	138,50	153,60	171,20	188,90
1,70	40	63,66	68	108,23	-	-	-	-	-	100,00	112,80	130,60	145,80	163,50	181,10
1,73	52	82,76	90	143,24	-	-	-	-	-	-	-	-	-	-	136,60
1,75	64	101,86	112	178,25	-	-	-	-	-	-	-	-	-	-	-
1,75	32	50,93	56	89,13	-	-	87,90	100,70	113,40	126,10	138,70	156,30	171,40	189,00	206,60
1,76	34	54,11	60	95,49	-	-	-	92,70	105,50	118,20	130,90	148,60	163,70	181,30	198,90
1,78	36	57,30	64	101,86	-	-	-	-	97,40	110,20	123,00	140,70	155,90	173,60	191,20
1,79	38	60,48	68	108,23	-	-	-	-	-	102,20	115,00	132,80	148,10	165,80	183,40
1,80	40	63,66	72	114,59	-	-	-	-	-	-	107,00	124,90	140,20	157,90	175,70
1,82	44	70,03	80	127,32	-	-	-	-	-	-	-	108,70	124,20	142,10	159,90
1,87	60	95,49	112	178,25	-	-	-	-	-	-	-	-	-	-	-
1,88	48	76,39	90	143,24	-	-	-	-	-	-	-	-	-	122,90	141,00
1,88	34	54,11	64	101,86	-	-	-	-	99,60	112,50	125,20	143,00	158,20	175,90	193,50
1,88	32	50,93	60	95,49	-	-	-	94,90	107,70	120,40	133,10	150,90	166,00	183,60	201,30
1,89	38	60,48	72	114,59	-	-	-	-	-	-	109,10	127,10	142,40	160,20	177,90
1,89	36	57,30	68	108,23	-	-	-	-	-	104,40	117,20	135,10	150,30	168,10	185,80
2,00	56	89,13	112	178,25	-	-	-	-	-	-	-	-	-	-	-
2,00	40	63,66	80	127,32	-	-	-	-	-	-	-	113,00	128,50	146,50	164,40
2,00	36	57,30	72	114,59	-	-	-	-	-	98,30	111,30	129,30	144,70	162,50	180,20
2,00	34	54,11	68	108,23	-	-	-	-	93,60	106,50	119,40	137,30	152,60	170,30	188,10
2,00	32	50,93	64	101,86	-	-	-	88,80	101,80	114,70	127,40	145,30	160,50	178,20	195,80
2,05	44	70,03	90	143,24	-	-	-	-	-	-	-	-	-	127,20	145,00
2,11	38	60,48	80	127,32	-	-	-	-	-	-	-	115,10	130,70	148,70	166,60
2,12	34	54,11	72	114,59	-	-	-	-	-	100,40	113,40	131,50	146,90	164,70	182,50
2,13	32	50,93	68	108,23	-	-	-	-	95,70	108,70	121,60	139,50	154,80	172,60	190,30
2,15	52	82,76	112	178,25	-	-	-	-	-	-	-	-	-	-	-
2,22	36	57,30	80	127,32	-	-	-	-	-	-	-	117,20	132,90	150,90	168,90
2,25	40	63,66	90	143,24	-	-	-	-	-	-	-	-	112,90	131,40	149,70
2,25	32	50,93	72	114,59	-	-	-	-	-	102,50	115,60	133,70	149,10	167,00	184,80
2,33	48	76,39	112	178,25	-	-	-	-	-	-	-	-	-	-	-
2,35	34	54,11	80	127,32	-	-	-	-	-	-	100,80	119,30	135,00	153,10	171,10
2,37	38	60,48	90	143,24	-	-	-	-	-	-	-	-	115,00	133,50	151,80
2,50	36	57,30	90	143,24	-	-	-	-	-	-	-	-	117,00	135,60	154,00
2,50	32	50,93	80	127,32	-	-	-	-	-	-	102,80	121,40	137,10	155,30	173,30
2,55	44	70,03	112	178,25	-	-	-	-	-	-	-	-	-	-	-
2,65	34	54,11	90	143,24	-	-	-	-	-	-	-	-	119,10	137,10	156,10
2,80	40	63,66	112	178,25	-	-	-	-	-	-	-	-	-	-	-
2,81	32	50,93	90	143,24	-	-	-	-	-	-	-	-	121,10	139,80	158,20
2,95	38	60,48	112	178,25	-	-	-	-	-	-	-	-	-	-	-
3,11	36	57,30	112	178,25	-	-	-	-	-	-	-	-	-	-	-
3,29	34	54,11	112	178,25	-	-	-	-	-	-	-	-	-	-	-
3,50	32	50,95	112	178,25	-	-	-	-	-	-	-	-	-	-	-

CENTRE DISTANCE
SECTION 5M

Speed ratio	Driver		Driven												
	Number of Pitch		Number of Pitch												
	teeth	diameter	teeth	diameter	670	710	740	800	850	890	950	1 000	1 050	1 125	1 195
-	mm		mm		mm										
1,54	52	82,76	80	127,32	168,50	188,70	203,80	233,90	259,00	279,10	309,20	334,30	359,30	396,90	431,90
1,55	44	70,03	68	108,23	194,10	214,10	229,20	259,30	284,40	304,40	334,50	359,50	384,50	422,10	457,10
1,56	72	114,59	112	178,25	-	-	-	167,00	192,40	212,60	242,90	268,10	293,30	331,00	366,10
1,56	36	57,3	56	89,13	219,40	239,50	254,50	284,60	309,60	329,60	359,60	384,70	409,70	447,20	482,20
1,58	38	60,48	60	95,49	211,80	231,80	246,90	276,90	302,00	322,00	352,10	377,10	402,10	439,70	474,70
1,60	40	63,66	64	101,86	204,10	224,20	239,20	269,30	294,40	314,40	344,50	369,50	394,50	432,10	467,10
1,61	56	89,13	90	143,24	150,10	170,30	185,50	215,80	241,00	261,10	291,20	316,30	341,40	379,00	414,10
1,63	32	50,93	52	82,76	229,40	249,50	264,50	294,60	319,60	339,60	369,70	394,70	419,70	457,20	492,20
1,64	44	70,03	72	114,59	188,70	208,80	223,90	254,00	279,10	299,20	329,20	354,30	379,30	416,90	452,00
1,65	68	108,23	112	178,25	-	-	-	171,40	196,90	217,20	247,50	272,70	297,90	335,70	370,80
1,65	34	54,11	56	89,13	221,80	241,90	256,90	287,00	312,00	332,00	362,10	387,10	412,10	449,70	484,70
1,67	48	76,39	80	127,32	173,10	193,30	208,40	238,60	263,80	283,90	314,00	339,00	364,10	401,70	436,80
1,67	36	57,3	60	95,49	214,10	234,20	249,30	279,30	304,40	324,40	354,50	379,50	404,50	442,10	477,10
1,68	38	60,48	64	101,86	206,50	226,60	241,60	271,70	296,80	316,80	346,90	371,90	397,00	434,50	469,50
1,70	40	63,66	68	108,23	198,70	218,90	233,90	264,10	289,10	309,20	339,30	364,30	389,40	426,90	462,00
1,73	52	82,76	90	143,24	154,50	174,90	190,10	220,40	245,60	265,80	296,00	321,10	346,20	383,80	418,90
1,75	64	101,86	112	178,25	-	-	-	175,80	201,40	221,70	252,10	277,40	302,60	340,40	375,60
1,75	32	50,93	56	89,13	224,20	244,30	259,30	289,40	314,40	334,50	364,50	389,50	414,60	452,10	487,10
1,76	34	54,11	60	95,49	216,50	236,60	251,60	281,70	306,80	326,80	356,90	381,90	407,00	444,50	479,60
1,78	36	57,30	64	101,86	208,80	228,90	244,00	274,10	299,20	319,20	349,30	374,30	399,40	436,90	472,00
1,79	38	60,48	68	108,23	201,10	221,20	236,30	266,40	291,50	311,60	341,70	366,70	391,80	429,30	464,40
1,80	40	63,66	72	114,59	193,30	213,50	228,60	258,70	283,90	303,90	334,00	359,10	384,20	421,70	456,80
1,82	44	70,03	80	127,32	177,70	197,90	213,10	243,30	268,50	288,60	318,70	343,80	368,90	406,50	441,60
1,87	60	95,49	112	178,25	-	-	149,20	180,20	205,80	226,20	256,70	282,00	307,20	345,00	380,20
1,88	48	76,39	90	143,24	159,00	179,40	194,60	225,00	250,30	270,40	300,60	325,80	350,90	388,60	423,70
1,88	34	54,11	64	101,86	211,10	231,30	246,30	276,50	301,60	321,60	351,70	376,70	401,80	439,40	474,40
1,88	32	50,93	60	95,49	218,90	239,00	254,00	284,10	309,20	329,20	359,30	384,40	409,40	446,90	482,00
1,89	38	60,48	72	114,59	195,60	215,80	230,90	261,10	286,20	306,30	336,40	361,50	386,60	424,10	459,20
1,89	36	57,30	68	108,23	203,40	223,50	238,60	268,80	293,90	314,00	344,10	369,10	394,20	431,70	466,80
2,00	56	89,13	112	178,25	-	-	153,50	184,60	210,30	230,70	261,20	286,50	311,80	349,70	384,90
2,00	40	63,66	80	127,32	182,20	202,50	217,70	248,00	273,10	293,30	323,40	348,50	373,60	411,30	446,40
2,00	36	57,30	72	114,59	197,90	218,10	233,20	263,40	288,60	308,70	338,80	363,90	388,90	426,50	461,60
2,00	34	54,11	68	108,23	205,70	225,90	241,00	271,10	296,30	316,30	346,40	371,50	396,60	434,20	469,20
2,00	32	50,93	64	101,86	213,50	233,60	248,70	278,80	303,90	324,00	354,10	379,10	404,20	441,80	476,80
2,05	44	70,03	90	143,24	163,40	183,80	199,10	229,60	254,90	275,10	305,30	330,50	355,60	393,30	428,40
2,11	38	60,48	80	127,32	184,50	204,80	220,00	250,30	275,50	295,60	325,80	350,90	376,00	413,60	448,80
2,12	34	54,11	72	114,59	200,20	220,40	235,60	265,80	290,90	311,00	341,20	366,30	391,30	428,90	464,00
2,13	32	50,93	68	108,23	208,00	228,20	243,30	273,50	298,60	318,70	348,80	373,90	399,00	436,60	471,60
2,15	52	82,76	112	178,25	-	141,90	157,70	188,90	214,70	235,10	265,70	291,10	316,40	354,30	389,60
2,22	36	57,30	80	127,32	186,70	207,00	222,20	252,60	277,80	297,90	328,10	353,30	378,40	416,00	451,10
2,25	40	63,66	90	143,24	167,80	188,30	203,60	234,10	259,40	279,70	309,90	335,10	360,30	398,00	433,20
2,25	32	50,93	72	114,59	202,50	222,70	237,90	268,10	293,30	313,40	343,50	368,60	393,70	431,30	466,40
2,33	48	76,39	112	178,25	-	146,00	161,90	193,20	219,10	239,60	270,20	295,60	321,00	358,90	394,20
2,35	34	54,11	80	127,32	188,90	209,30	224,50	254,90	280,10	300,30	330,50	355,60	380,70	418,40	453,50
2,37	38	60,48	90	143,24	169,90	190,50	205,80	236,40	261,70	282,00	312,30	337,50	362,60	400,40	435,50
2,50	36	57,30	90	143,24	172,10	192,70	208,00	238,60	264,00	284,20	314,60	339,80	365,00	402,70	437,90
2,50	32	50,93	80	127,32	191,20	211,50	226,80	257,20	282,40	302,60	332,80	358,00	383,10	420,80	455,90
2,55	44	70,03	112	178,25	-	150,10	166,10	197,50	223,40	244,00	274,70	300,10	325,50	363,50	398,80
2,65	34	54,11	90	143,24	174,30	194,90	210,30	240,90	266,30	286,50	316,90	342,10	367,30	405,00	440,20
2,80	40	63,66	112	178,25	132,40	154,20	170,30	201,80	227,80	248,40	279,10	304,60	330,00	368,00	403,40
2,81	32	50,93	90	143,24	176,40	197,10	212,50	243,10	268,50	288,80	319,20	344,40	369,60	407,40	442,60
2,95	38	60,48	112	178,25	134,40	156,30	172,30	203,90	229,90	250,50	281,30	306,80	332,30	370,30	405,70
3,11	36	57,30	112	178,25	136,40	158,30	174,40	206,10	232,10	252,70	283,50	309,10	334,50	372,60	408,00
3,29	34	54,11	112	178,25	138,30	160,30	176,50	208,20	234,20	254,90	285,70	311,30	336,80	374,80	410,30
3,50	32	50,95	112	178,25	140,30	162,40	178,50	210,30	236,40	257,10	287,90	313,50	339,00	377,10	412,60

CENTRE DISTANCE SECTION 8M

Table with columns: Speed ratio, Driver (Number of Pitch, teeth, diameter), Driven (Number of Pitch, teeth, diameter), and gear diameters (480, 560, 600, 640, 720, 800, 880, 960, 1 040, 1 120, 1 200, 1 280). Rows list various speed ratios from 1.00 to 1.47.

CENTRE DISTANCE
SECTION 8M

Speed ratio	Driver		Driven															
	Number of Pitch		Number of Pitch															
	teeth	diameter	teeth	diameter	480	560	600	640	720	800	880	960	1 040	1 120	1 200	1 280		
-	mm		mm		mm													
3,08	26	66,21	80	203,72	-	-	-	-	-	174,3	217,0	258,8	300,1	341,0	381,8	422,4		
3,11	36	91,67	112	285,21	-	-	-	-	-	-	-	-	200,1	244,6	287,6	329,7		
3,21	28	71,3	90	229,18	-	-	-	-	-	-	187,1	230,3	272,5	314,0	355,2	396,1		
3,27	44	112,05	144	366,69	-	-	-	-	-	-	-	-	-	-	-	-		
3,27	22	56,02	72	183,35	-	-	-	-	159,1	201,9	243,6	284,9	325,8	366,5	407,0	447,5		
3,29	34	86,58	112	285,21	-	-	-	-	-	-	-	-	203,2	247,8	290,9	333,1		
3,33	24	61,12	80	203,72	-	-	-	-	-	177,5	220,4	262,2	303,6	344,6	385,4	426,0		
3,43	56	142,6	192	488,92	-	-	-	-	-	-	-	-	-	-	-	-		
3,46	26	66,21	90	229,18	-	-	-	-	-	-	190,3	233,6	275,9	317,5	358,7	399,7		
3,50	32	81,49	112	285,21	-	-	-	-	-	-	-	-	206,3	251,0	294,2	336,5		
3,60	40	101,86	144	366,69	-	-	-	-	-	-	-	-	-	-	-	-		
3,64	22	56,02	80	203,72	-	-	-	-	-	180,7	223,7	265,7	307,1	348,1	389,0	429,6		
3,73	30	76,39	112	285,21	-	-	-	-	-	-	-	-	209,4	254,2	297,5	339,8		
3,75	24	61,12	90	229,18	-	-	-	-	-	-	193,4	236,9	279,3	320,9	362,2	403,2		
3,79	38	96,77	144	366,69	-	-	-	-	-	-	-	-	-	-	-	236,3		
4,00	48	122,23	192	488,92	-	-	-	-	-	-	-	-	-	-	-	-		
4,00	36	91,67	144	366,69	-	-	-	-	-	-	-	-	-	-	-	239,3		
4,00	28	71,3	112	285,21	-	-	-	-	-	-	-	-	212,5	257,4	300,8	343,2		
4,09	22	56,02	90	229,18	-	-	-	-	-	150,3	196,6	240,2	282,6	324,4	365,7	406,8		
4,24	34	86,58	144	366,69	-	-	-	-	-	-	-	-	-	-	-	242,3		
4,31	26	66,21	112	285,21	-	-	-	-	-	-	-	-	215,5	260,6	304,1	346,6		
4,36	44	112,05	192	488,92	-	-	-	-	-	-	-	-	-	-	-	-		
4,50	32	81,49	144	366,69	-	-	-	-	-	-	-	-	-	-	-	245,2		
4,67	24	61,12	112	285,21	-	-	-	-	-	-	-	-	218,6	263,8	307,3	349,9		
4,80	40	101,86	192	488,92	-	-	-	-	-	-	-	-	-	-	-	-		
4,80	30	76,39	144	366,69	-	-	-	-	-	-	-	-	-	-	-	248,2		
5,05	38	96,77	192	488,92	-	-	-	-	-	-	-	-	-	-	-	-		
5,09	22	56,02	112	285,21	-	-	-	-	-	-	-	-	221,7	267,0	310,6	353,2		
5,14	28	71,30	144	366,69	-	-	-	-	-	-	-	-	-	-	-	251,2		
5,33	36	91,67	192	488,92	-	-	-	-	-	-	-	-	-	-	-	-		
5,34	26	66,21	144	366,69	-	-	-	-	-	-	-	-	-	-	-	254,1		
5,65	34	86,58	192	488,92	-	-	-	-	-	-	-	-	-	-	-	-		
6,00	32	81,49	192	488,92	-	-	-	-	-	-	-	-	-	-	-	-		
6,00	24	61,12	144	366,69	-	-	-	-	-	-	-	-	-	-	-	257,1		
6,40	30	76,39	192	488,92	-	-	-	-	-	-	-	-	-	-	-	-		
6,55	22	56,02	144	366,69	-	-	-	-	-	-	-	-	-	-	-	261,0		
6,86	28	71,30	192	488,92	-	-	-	-	-	-	-	-	-	-	-	-		
7,38	26	66,21	192	488,92	-	-	-	-	-	-	-	-	-	-	-	-		
8,00	24	61,12	192	488,92	-	-	-	-	-	-	-	-	-	-	-	-		
8,73	22	56,02	192	488,92	-	-	-	-	-	-	-	-	-	-	-	-		

CENTRE DISTANCE SECTION 8M

Table with columns: Speed ratio, Driver (Number of Pitch, teeth, diameter), Driven (Number of Pitch, teeth, diameter), and 16 numerical columns for different pitch diameters (1 440 to 4 400 mm).

Speed ratio	Driver		Driven													
	Number of Pitch		Number of Pitch		1 440	1 600	1 760	1 800	2 000	2 400	2 600	2 800	3 048	3 280	3 600	4 400
	teeth	diameter	teeth	diameter												
-		mm	mm	mm												
3,08	26	66,21	80	203,72	503,30	583,90	664,40	684,50	785,00	985,60	1085,80	1186,00	1310,20	1426,30	1586,50	1986,80
3,11	36	91,67	112	285,21	412,60	494,50	575,90	596,10	697,30	898,80	999,30	1099,70	1224,20	1340,50	1500,90	1901,50
3,21	28	71,3	90	229,18	477,50	558,40	639,10	659,30	759,90	960,80	1061,10	1161,30	1285,60	1401,80	1562,00	1962,40
3,27	44	112,05	144	366,69	318,20	403,80	487,30	508,00	610,70	814,00	915,10	1016,00	1140,90	1257,50	1418,30	1819,50
3,27	22	56,02	72	183,35	528,20	608,70	689,10	709,10	809,50	1 010,0	1 110,20	1 210,30	1 334,50	1 450,60	1 610,70	2 011,00
3,29	34	86,58	112	285,21	416,10	498,10	579,50	599,80	701,00	902,50	1 003,10	1 103,50	1 228,00	1 344,30	1 504,70	1 905,40
3,33	24	61,12	80	203,72	507,00	587,70	668,20	688,30	788,80	989,40	1 089,70	1 189,90	1 314,10	1 430,20	1 590,40	1 990,70
3,43	56	142,6	192	488,92	-	-	338,70	361,70	471,90	681,90	784,80	887,00	1 013,20	1 130,70	1 292,40	1 695,10
3,46	26	66,21	90	229,18	481,10	562,10	642,80	663,00	763,60	964,60	1 064,90	1 165,20	1 289,40	1 405,60	1 565,90	1 966,30
3,50	32	81,49	112	285,21	419,60	501,60	583,10	603,40	704,60	906,30	1 006,80	1 107,30	1 231,80	1 348,20	1 508,60	1 909,30
3,60	40	101,86	144	366,69	324,60	410,40	494,10	514,90	617,80	821,30	922,50	1 023,40	1 148,40	1 265,10	1 425,80	1 827,20
3,64	22	56,02	80	203,72	510,70	591,40	671,90	692,10	792,60	993,30	1 093,50	1 193,70	1 317,90	1 434,10	1 594,30	1 994,60
3,73	30	76,39	112	285,21	423,10	505,20	586,70	607,00	708,30	910,00	1 010,60	1 111,10	1 235,60	1 352,00	1 512,40	1 913,20
3,75	24	61,12	90	229,18	484,70	565,70	646,50	666,70	767,40	968,40	1 068,70	1 169,00	1 293,30	1 409,50	1 569,80	1 970,20
3,79	38	96,77	144	366,69	327,80	413,80	497,60	518,30	621,30	824,90	926,10	1 027,10	1 152,10	1 268,80	1 429,60	1 831,00
4,00	48	122,23	192	488,92	-	-	350,90	374,10	484,90	695,70	798,90	901,30	1 027,60	1 145,30	1 307,10	1 710,20
4,00	36	91,67	144	366,69	331,00	417,10	501,00	521,80	624,80	828,60	929,80	1 030,80	1 155,80	1 272,60	1 433,40	1 834,80
4,00	28	71,3	112	285,21	426,50	508,70	590,30	610,60	712,00	913,70	1 014,40	1 114,90	1 239,40	1 355,80	1 516,20	1 917,00
4,09	22	56,02	90	229,18	488,30	569,40	650,20	670,40	771,10	972,10	1 072,50	1 172,80	1 297,10	1 413,30	1 573,60	1 974,10
4,24	34	86,58	144	366,69	334,20	420,40	504,40	525,20	628,30	832,20	933,50	1 034,50	1 159,50	1 276,30	1 437,20	1 838,70
4,31	26	66,21	112	285,21	430,00	512,30	593,90	614,20	715,60	917,50	1 018,10	1 118,60	1 243,20	1 359,60	1 520,10	1 920,90
4,36	44	112,05	192	488,92	-	-	357,00	380,30	491,40	702,60	805,90	908,40	1 034,80	1 152,60	1 314,50	1 717,70
4,50	32	81,49	144	366,69	337,40	423,80	507,80	528,60	631,80	835,80	937,10	1 038,20	1 163,20	1 280,00	1 440,90	1 842,50
4,67	24	61,12	112	285,21	433,40	515,80	597,50	617,80	719,30	921,20	1 021,90	1 122,40	1 247,00	1 363,40	1 523,90	1 924,70
4,80	40	101,86	192	488,92	-	-	363,10	386,40	497,90	709,40	812,90	915,50	1 042,00	1 159,80	1 321,80	1 725,10
4,80	30	76,39	144	366,69	340,60	427,10	511,30	532,10	635,30	839,40	940,80	1 041,90	1 167,00	1 283,80	1 444,70	1 846,30
5,05	38	96,77	192	488,92	-	-	366,10	389,50	501,10	712,90	816,30	919,00	1 045,60	1 163,40	1 325,50	1 728,90
5,09	22	56,02	112	285,21	436,90	519,30	601,00	621,40	722,90	924,90	1 025,60	1 126,20	1 250,70	1 367,20	1 527,70	1 928,60
5,14	28	71,3	144	366,69	343,80	430,40	514,70	535,50	638,80	843,00	944,40	1 045,60	1 170,70	1 287,50	1 448,50	1 850,10
5,33	36	91,67	192	488,92	-	-	369,10	392,60	504,40	716,30	819,80	922,50	1 049,10	1 167,10	1 329,10	1 732,60
5,34	26	66,21	144	366,69	346,90	433,70	518,10	538,90	642,30	846,60	948,10	1 049,20	1 174,40	1 291,20	1 452,20	1 853,90
5,65	34	86,58	192	488,92	-	-	372,20	395,70	507,60	719,70	823,30	926,10	1 052,70	1 170,70	1 332,80	1 736,30
6,00	32	81,49	192	488,92	-	-	375,20	398,70	510,80	723,10	826,80	929,60	1 056,30	1 174,30	1 336,40	1 740,10
6,00	24	61,12	144	366,69	350,10	437,00	521,50	542,30	645,80	850,20	951,70	1 052,90	1 178,10	1 295,00	1 456,00	1 857,70
6,40	30	76,39	192	488,92	-	-	378,20	401,80	514,00	726,50	830,20	933,10	1 059,90	1 177,90	1 340,10	1 743,80
6,55	22	56,02	144	366,69	353,30	440,30	524,80	545,70	649,30	853,80	955,30	1 056,60	1 181,80	1 298,70	1 459,70	1 861,50
6,86	28	71,3	192	488,92	-	-	381,20	404,80	517,20	729,90	833,70	936,60	1 063,40	1 181,50	1 343,70	1 747,50
7,38	26	66,21	192	488,92	-	-	384,30	407,90	520,50	733,30	837,20	940,10	1 067,00	1 185,10	1 347,40	1 751,20
8,00	24	61,12	192	488,92	-	-	387,30	411,00	523,70	736,70	840,60	943,70	1 070,60	1 188,70	1 351,00	1 754,90
8,73	22	56,02	192	488,92	-	-	390,30	414,00	526,90	740,10	844,10	947,20	1 074,10	1 192,30	1 354,70	1 758,70

CENTRE DISTANCE SECTION 14M

Table with columns: Speed ratio, Driver (Number of Pitch, teeth, diameter), Driven (Number of Pitch, teeth, diameter, and values for ratios 966-2800). Rows include speed ratios from 1.00 to 1.36.

Speed ratio	Driver		Driven													
	Number of Pitch		Number of Pitch		966	1190	1400	1610	1778	1890	2100	2310	2450	2590	2 800	
	teeth	diameter	teeth	diameter												
-		mm		mm	mm											
5,60	30	133,69	168	748,66	-	-	-	-	-	-	-	-	-	505,10	630,40	
5,65	34	151,52	192	855,62	-	-	-	-	-	-	-	-	-	-	-	
5,68	38	169,34	216	962,57	-	-	-	-	-	-	-	-	-	-	-	
5,79	29	129,23	168	748,66	-	-	-	-	-	-	-	-	-	507,70	633,10	
6,00	36	160,43	216	962,57	-	-	-	-	-	-	-	-	-	-	-	
6,00	32	142,60	192	855,62	-	-	-	-	-	-	-	-	-	-	-	
6,00	28	124,78	168	748,66	-	-	-	-	-	-	-	-	-	510,30	635,80	
6,35	34	151,52	216	962,57	-	-	-	-	-	-	-	-	-	-	-	
6,40	30	133,69	192	855,62	-	-	-	-	-	-	-	-	-	-	-	
6,62	29	129,23	192	855,62	-	-	-	-	-	-	-	-	-	-	-	
6,75	32	142,60	216	962,57	-	-	-	-	-	-	-	-	-	-	-	
6,86	28	124,78	192	855,62	-	-	-	-	-	-	-	-	-	-	-	
7,20	30	133,69	216	962,57	-	-	-	-	-	-	-	-	-	-	-	
7,45	29	129,23	216	962,57	-	-	-	-	-	-	-	-	-	-	-	
7,71	28	124,78	216	962,57	-	-	-	-	-	-	-	-	-	-	-	

CENTRE DISTANCE SECTION 14M

Table with columns: Speed ratio, Driver (Number of Pitch, teeth, diameter), Driven (Number of Pitch, teeth, diameter), and various gear ratios (3 150 to 6 860).

CENTRE DISTANCE
SECTION 14M

Speed ratio	Driver		Driven												
	Number of Pitch		Number of Pitch												
	teeth	diameter	teeth	diameter	3 150	3 360	3 500	3 850	4 326	4 578	4 956	5 320	5 740	6 160	6 860
-		mm		mm	mm										
5,60	30	133,69	168	748,66	823,9	936,0	1 009,8	1 192,1	1 437,0	1 565,7	1 758,0	1 942,6	2 155,0	2 367,0	2 719,6
5,65	34	151,52	192	855,62	692,4	811,3	888,3	1 075,9	1 324,9	1 455,2	1 649,3	1 835,1	2 048,7	2 261,5	2 615,3
5,68	38	169,34	216	962,57	-	669,7	754,1	952,1	1 208,3	1 340,9	1 537,6	1 725,2	1 940,3	2 154,4	2 509,6
5,79	29	129,23	168	748,66	826,8	938,9	1 012,8	1 195,1	1 440,1	1 568,8	1 761,2	1 945,8	2 158,2	2 370,2	2 722,9
6,00	36	160,43	216	962,57	-	674,9	759,4	957,7	1 214,1	1 346,8	1 543,6	1 731,3	1 946,5	2 160,7	2 516,0
6,00	32	142,60	192	855,62	697,8	816,9	893,9	1 081,7	1 331,0	1 461,3	1 655,5	1 841,4	2 055,0	2 267,9	2 621,7
6,00	28	124,78	168	748,66	829,6	941,9	1 015,7	1 198,2	1 443,2	1 571,9	1 764,4	1 949,0	2 161,5	2 373,5	2 726,1
6,35	34	151,52	216	962,57	-	680,0	764,7	963,3	1 220,0	1 352,7	1 549,6	1 737,5	1 952,7	2 166,9	2 522,3
6,40	30	133,69	192	855,62	703,1	822,4	899,6	1 087,5	1 337,0	1 467,4	1 661,6	1 847,6	2 061,3	2 274,3	2 628,2
6,62	29	129,23	192	855,62	705,8	825,2	902,4	1 090,4	1 340,0	1 470,4	1 664,7	1 850,7	2 064,5	2 277,5	2 631,4
6,75	32	142,60	216	962,57	-	685,2	770,0	968,9	1 225,8	1 358,7	1 555,7	1 743,6	1 958,9	2 173,2	2 528,7
6,86	28	124,78	192	855,62	708,5	828,0	905,2	1 093,3	1 343,0	1 473,5	1 667,8	1 853,9	2 067,6	2 280,7	2 634,6
7,20	30	133,69	216	962,57	-	690,4	775,3	974,5	1 231,6	1 364,6	1 561,7	1 749,7	1 965,1	2 179,5	2 535,0
7,45	29	129,23	216	962,57	-	693,0	778,0	977,2	1 234,5	1 367,5	1 564,7	1 752,7	1 968,2	2 182,6	2 538,2
7,71	28	124,78	216	962,57	552,9	695,5	780,6	980,0	1 237,4	1 370,5	1 567,7	1 755,8	1 971,3	2 185,7	2 541,4