2.1 - Various industry uses

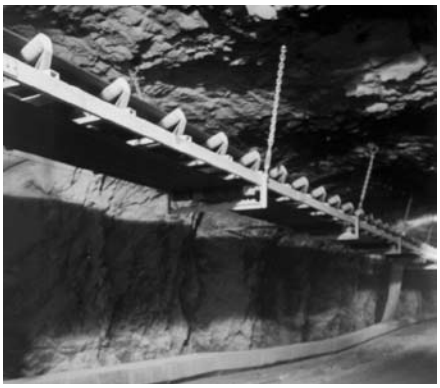
Rollers, very often, represent a high investment in the overall requirements of the project design of a belt conveyor installation. The choice of high quality rollers that guarantee an adequate working life with the result that equipment may function without the business of the plant being interrupted.

It has been well proven that considering the overall economies in todays modern conveyors, their life and efficiency depends to a great deal on the choice of quality rollers, accurately manufactured using highly selected materials.

Of particular importance in the search for efficiency is the sealing system that protects the roller bearings.

Rulmeca, keenly aware of this requirement, has subjected and examined their design of manufactured rollers to severe laboratory tests.
Numerous examples of plant and equipment used in material handling, all over the world, operating in the most severe environmental conditions, use for many years Rulmeca rollers of various types for many years.

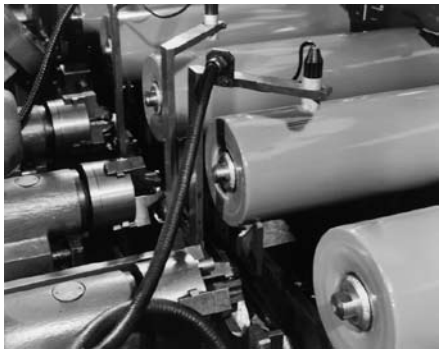
Rollers produced by Rulmeca are manufactured according to all known national and international standards: ISO, UNI, DIN, AFNOR, FEM, BS, JIS and CEMA.



- Mineral industry
- Chemical and fertiliser industry
- Iron and steel industry
- Cement industry
- Glass industry
- Quarry industry
- Warehousing and storage of various materials.

2.2 - Rollers, technical design and data

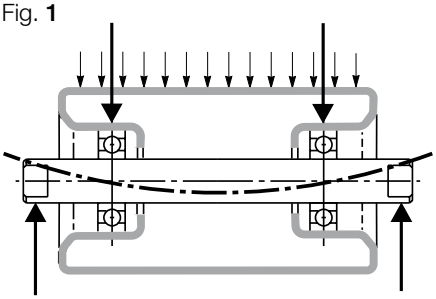
The principal characteristics that typify all the Rulmeca rollers are: long service life, quality of all components, high efficiency and economy of use.



Roller body

Consists of a steel tube of adequate thickness and diameter to match the required use, machined at either end to allow maximum precision in the assembly of the roller. Bearing housings are positioned at either end by welding or by deep swaging.

Fig. **1**

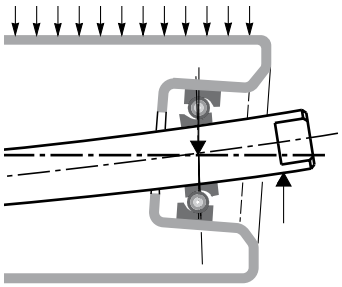


The design of the housings, of strong and rigid construction, has been developed using a computerised system that determines their thickness in relation to the maximum load required for various types of rollers.

The housing for the bearing has been studied and designed in a way that reduces the angle between the bearing and spindle caused by the deflection of the spindle under load. The positioning of the bearing in all the housings has been calibrated to the tolerance “M7” which is an optimum fit for the bearing in all working conditions.

The precision bearings of radial rigidity with a spherical ball race, have a maximum play of C3 fit, which is the most suitable class of fit to guarantee perfect function under serious load conditions or where the spindle is deflected a lot.

Fig. **2**



This type of bearing is today the most utilised in conveyor rollers, because it has a high tolerance to axial load and a low resistance to movement and rotation.
In all, together with lubrication, permanent and for life, a long working life results.

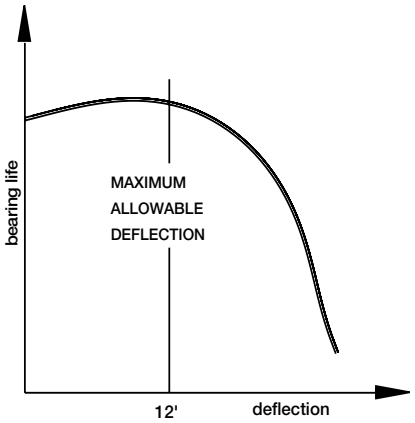
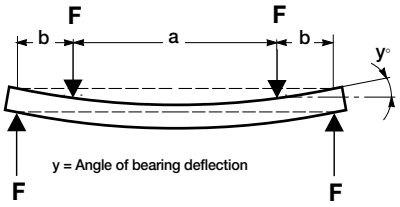


Fig. **3** - Deflection curve of bearings with C3 play.

Spindle
The spindle is the load carrying component of the roller and must be sized in relation to the load and the roller length.

It is important not to overload the roller due to the resultant excessive deflection of the spindle which in turn places irregular pressure on the bearing, and reduces, as a consequence, the roller life.

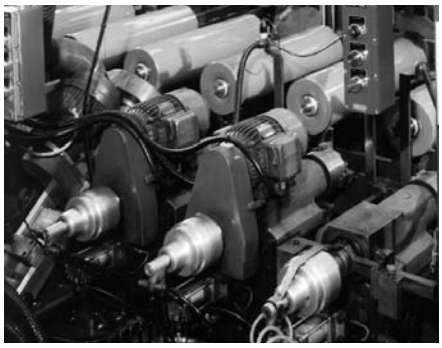
Fig. **4** - Deflection of spindle under load



Rulmeca rollers are designed to sustain (to the maximum load conditions as stated in the relevant tables) a dynamic load, calculated according to the roller type, of 30,000 or 10,000 hours of life (for greater life see the relevant tables), with a spindle that is designed to be underloaded and which does not deflect excessively, avoiding damaging the bearing.

Balance
At high conveyor speed, the balance of the roller is of particular importance, especially when we consider the requirements of todays conveyor equipment.

The out of balance force of a roller at low speed does not have a great effect, but when medium speeds (1,5/2 m/sec) are used, vibrations may be induced which may damage the bearings and which may some times make the roller jump out of its transom supports.



The high quality end machining of the roller and of the roller body, the numerically controlled welding machine, the accuracy of assembly and the live testing, are all guarantees of the optimum balancing of Rulmeca rollers.

Sealing and lubrication
A quality roller is characterised by its effective sealing system.

Scrupulous research and laboratory tests and above all the practical plant experience in the most variable environmental situations, has enabled Rulmeca to develop a particular sealing that guarantees the optimum bearing performance.

Rulmeca sealing combines the confirmed protection effectiveness with low resistance to movement and to rotation, important factors that directly influence the conveyor absorbed power.

All Rulmeca rollers are self-lubricated for life.

Adequate quantities of lithium grease per bearing, with its characteristics of high resistance to ageing, to corrosion and to water, are introduced into the spaces particularly designed into the sealing system.

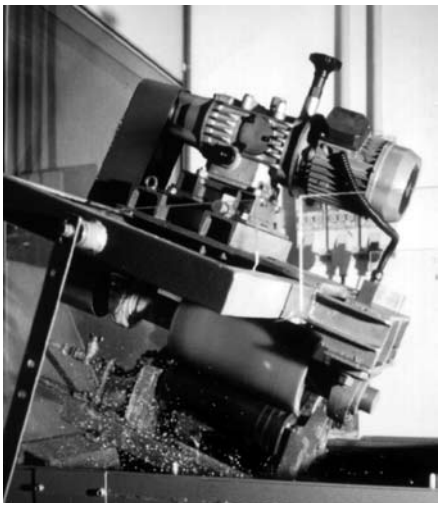
Rulmeca has prepared over many years a laboratory test room, with specially designed machines that permit testing to verify the designs and developments of rollers for belt conveyors.

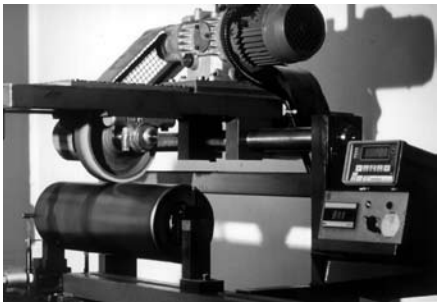
These machines allow the examination of the following characteristics for each roller type:

- load capacity and life;
- hermetic sealing of rollers: stationary and in rotation;
- hermetic sealing against dust;
- resistance to rotation and to start up;
- tests to withstand ambient temperatures -70°C to +200°C;
- inspection of the welding by tests using magnetoscope and penetrating liquids.

In the following photos we may show some of the more important machines and equipment that are situated in the test room.

- Computerised machines for load and life testing, in which load cells, digitised by signals from a personal computer, produce a typed report on the behaviour of the roller, and common to all the tests, to different speeds and imposed loads.





Machine for the dynamic hermetic test against water or dust ingress.

The seal is immersed in water or dust and the subsequent test with the roller inclined simulates the real situation of the working transom.

Machines that test the resistance to rotation. Here a load cell is utilised that feeds an electronic display where the resistance values are shown, at differing speeds or with different loads applied to the roller.

Tests are carried out periodically on all types of rollers bringing together all the gained experience of testing, that allow us to constantly control our production quality and to experiment with differing solutions relative to new projects.

2.3 - Selection method

The choice of roller type, most suitable for a certain application, will be dealt with in the following section but should also take into account other factors such as:

- the abrasive and corrosive characteristics of the conveyed material
- the environmental working conditions of the plant in which the rollers will be installed.

Abrasive materials (clay, granite, ferrous minerals) may influence the roller choice towards the heaviest series (PSV, MPS) and the choice of a large tube diameter as this results in only a minor contact of the roller surface with the conveyor belt itself.

The conveyor transport of corrosive materials (salt, chemicals etc....) requires the chosen rollers to be protected or manufactured from the appropriate materials that are time resistant to the corrosive substance.

The rollers may be in steel, covered with several layers of a particular specification of paint, or covered in rubber or in other anti corrosive materials.

Otherwise the rollers may be entirely manufactured from plastic materials that are resistant to corrosion (see PL rollers).

Environmental conditions where, in particular, dusty conditions prevail (cement, limestone, ash) rollers with the very best sealing systems that offer the highest possible protection are required (PSV).

2.3.1 - Choice of diameter in relation to speed

It has already been stated that one of the important factors to consider in the project design of a conveyor is the speed of the belt, in relation to the required conditions of transport.

From the speed of the belt and the roller diameter one is able to establish the number of revolutions of the roller from the formula:

$$n = \frac{v \times 1000 \times 60}{D \times \pi} \text{ [revs/min]}$$

where:

D = roller diameter [mm]
v = belt speed [m/s]

*Tab.***15** shows the relationship between the maximum belt speed, the roller diameter and its relative numbers of revolutions.

It is interesting, in the choice of the roller, to note that a roller of large diameter will also imply a major start up inertia but may still be the choice, because there are many other advantages to satisfy other conditions.

Tab. **15 - Maximum speed and roller revolutions**

Roller diameter mm	Belt speed m/s	rpm n
50	1.5	573
63	2.0	606
76	2.5	628
89	3.0	644
102	3.5	655
108	4.0	707
133	5.0	718
159	6.0	720
194	7.0	689

The correct choice of diameter must take into account the belt width. *Tab.***16** indicates our advice for roller diameters.

*Tab.***16 - Recommended roller diameter**

Belt width mm	For speed ≤ 2 m/s Ø roller mm			2 ÷ 4 m/s Ø roller mm			≥ 4 m/s Ø roller mm		
500	**89**			**89**					
650	**89**			**89**	**108**				
800	**89**	**108**		**89**	**108**	**133**	**133**		
1000	**108**	**133**		**108**	**133**		**133**	**159**	
1200	**108**	**133**		**108**	**133**	**159**	**133**	**159**	
1400	**133**	**159**		**133**	**159**		**133**	**159**	
1600	**133**	**159**		**133**	**159**	**194**	**133**	**159**	**194**
1800	**159**	**159**	**194**	**159**	**194**				
2000	**159**	**194**		**159**	**194**		**159**	**194**	
2200 and more	**194**			**194**			**194**		

Where more diameters of roller are indicated the choice will be made in relation to the lump size of material and to the severity of plant conditions.

2.3.2 - Choice of the type in relation to load

The type and size of rollers to use in a belt conveyor depends essentially on the belt width, the pitch of troughing sets, and above all the maximum load on the roller under the greatest forces, notwithstanding other corrective factors.

The calculation of this load is normally made by the plant project designer. Nevertheless, as a check or as in the case of straightforward conveyors, we would like to give you the following helpful fundamental concepts.

The first value to define is the load on the troughing set transom. Following this, according to the type of troughing set their angle, the lump size of material and various other operating factors which are listed below, one is able to determine the load that exists on the most stressed roller for each type of troughing set.
Besides this, we may provide various corrective coefficients that take into account the number of daily working hours of the equipment (service factors), the environment conditions and the speed for different roller diameters.
The load values obtained in this way may then be compared to the indicated roller load from the catalogue, valid for a project life of 30,000 hours.

For a theoretically different life, the load capacity may be multiplied by the determined coefficient from ***Tab.*22** that corresponds to the required life.

Principal operating factors:

Iv	=	belt load	t/h
v	=	belt speed	m/s
a_o	=	pitch of carrying trough set	m
a_u	=	pitch of return set	m
q_b	=	weight of belt per linear metre	Kg/m
Fp	=	participating factor of the highest stressed roller see ***Tab.*17** (depends on the side angle of the roller in transom)	
Fd	=	shock factor see ***Tab.*20** (depends on lump size of material)	
Fs	=	service factor see ***Tab.*18**	
Fm	=	ambient factor see ***Tab.*19**	
Fv	=	speed factor see ***Tab.*21**	

Tab. **17 - Participation factor Fp - loaded rate on the most loaded roller**

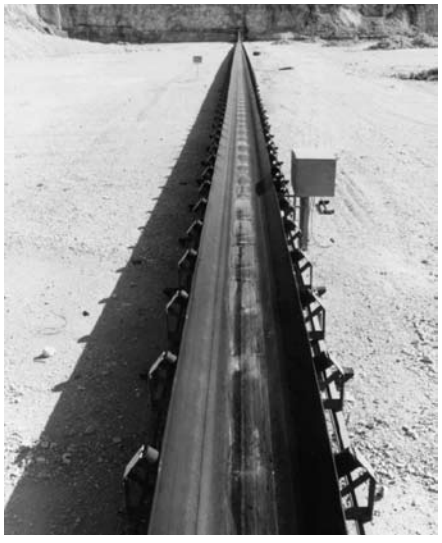
0°	20°	20°	30°	35°	40°	45°	30° - 45°	60°
1.00	0.50	0.60	0.65	0.67	0.70	0.72	~ 0.55 - 0.60 Shorter central roller	0.40

Tab. **18 - Service factors**

Working life	Fs
Less than 6 hours per day	0.8
From 6 to 9 hours per day	1.0
From 10 to 16 hours per day	1.1
Over 16 hours per day	1.2

Tab. **19 - Environmental factors**

Conditions	**Fm**
Clean and with regular maintenance	0.9
Presence of abrasive or corrosive materials	1.0
Presence of very abrasive or very corrosive materials	1.1



Tab. **20 - Shock factor Fd**

Lump size	Belt speed m/s						
	2	2.5	3	3.5	4	5	6
0 ÷ 100 mm	1	1	1	1	1	1	1
100 ÷ 150 mm	1.02	1.03	1.05	1.07	1.09	1.13	1.18
150 ÷ 300 mm with layers of fine material	1.04	1.06	1.09	1.12	1.16	1.24	1.33
150 ÷ 300 mm without layers of fine material	1.06	1.09	1.12	1.16	1.21	1.35	1.50
300 ÷ 450 mm	1.20	1.32	1.50	1.70	1.90	2.30	2.80

Tab. **21 - Speed factors Fv**

Belt speed	Roller diameter mm						
m/s	60	76	89-90	102	108-110	133-140	159
0.5	0.81	0.80	0.80	0.80	0.80	0.80	0.80
1.0	0.92	0.87	0.85	0.83	0.82	0.80	0.80
1.5	0.99	0.99	0.92	0.89	0.88	0.85	0.82
2.0	1.05	1.00	0.96	0.95	0.94	0.90	0.86
2.5			1.01	0.98	0.97	0.93	0.91
3.0			1.05	1.03	1.01	0.96	0.92
3.5					1.04	1.00	0.96
4.0					1.07	1.03	0.99
4.5					1.14	1.05	1.02
5.0					1.17	1.08	1.00

Tab. **22 - Coefficient of theoretical bearing life**

Project theoretical working life of bearings	10'000	20'000	30'000	40'000	50'000	100'000
Coefficient based on 30'000 hours	1.440	1.145	1.000	0.909	0.843	0.670
Coefficient based on 10'000 hours	1	0.79	0.69	0.63	---	---

Load determination

Having defined the diameter of the roller in relation to the speed and therefore the number of revolutions, one may now proceed to determine the static load Ca on the carrying troughing set, using the following formula:

$$Ca = a_o \times \left(q_b + \frac{l_V}{3.6 \times v} \right) 0{,}981 \quad [daN]$$

Multiplying them using the operating factors we have the dynamic load Ca_1 on the transom:

$$Ca_1 = Ca \times Fd \times Fs \times Fm \quad [daN]$$

Multiplying them by the participation factors one obtains the load ca on the highest stressed roller (central roller in the case of troughing set with rollers of equal length).

$$ca = Ca_1 \times Fp \quad [daN]$$

The static load on the return set, Cr (not needing to take account of the material weight) is determined from the following formula:

$$Cr = a_u \times q_b \times 0{,}981 \quad [daN]$$

The dynamic load on the return set will be:

$$Cr_1 = Cr \times Fs \times Fm \times Fv \quad [daN]$$

and the load on the single return roller or on a pair will be:

$$cr = Cr_1 \times Fp \quad [daN]$$

Having established the values of “ca” and “cr” one may find in the roller catalogue (the diameter being found first) the roller that provides a sufficient load capacity.

Example:
One wishes to select a troughing set and rollers for a belt conveyor to convey crushed limestone, with a load requirement Q = 2000 t/h at a speed v = 2 m/s and with the following additional data:

lump size	100-150 mm
working function	8 h for day
belt width	1200 mm
belt weight	16 Kg/m
carrying transom pitch	1 m
return set pitch	3 m
roller diameter	133 mm

Choosing a transom at 30° satisfies the load requirements on the 1200 mm belt.
The static load on the carrying trough set is given by:

$$Ca = a_o \times \left(q_b + \frac{l_V}{3.6 \times v} \right) 0{,}981 \quad [daN]$$

$$Ca = 1 \times \left(16 + \frac{2000}{3.6 \times 2}\right) 0{,}981 = 288 \quad daN$$

The dynamic load will be:

$$Ca_1 = Ca \times Fs \times Fd \times Fm \quad [daN]$$

$$Ca_1 = 288 \times 1 \times 1.02 \times 1 = 294$$

On the central roller of the troughing set we have a load:

$$ca = Ca_1 \times Fp \quad [daN]$$

$$ca = 294 \times 0.65 = 191 \text{ daN}$$

On the return set the static load is given by:

$$Cr = a_u \times q_b \times 0{,}981 \quad [daN]$$

$$Cr = 3 \times 16 \times 0{,}981 = 47 \text{ daN}$$

The dynamic load will be:

$$Cr_1 = Cr \times Fs \times Fm \times Fv \quad [daN]$$

$$Cr_1 = 47 \times 1 \times 1 \times 0.9 = 42{,}3 \text{ daN}$$

therefore the roller load will be:

$$cr = Cr_1 \times Fp \quad [daN]$$

$$cr = 42.3 \times 1 = 42.3$$

where:
Fp = 1 see *Tab.***16**

For each type of application, in an environment with the presence of dust and water, one should choose from the series PSV for which the load is equal to or immediately higher than the calculated value (for a carrying trough set).

Analysing the load tables of rollers ø 133, one may choose the type PSV2, with a sufficient load capacity:
PSV2, 25F18, 133N, 473 (Chapter 2).

To select the transom for these rollers, reference is made to the chapter in the catalogue on troughing sets, and tipe A3P is selected (Chapter 3.3.3)

For the return roller, we select it with rubber rings, so that the formation of scale on the belt or the roller itself is discouraged.

We therefore select the series PSV with rings that have sufficient load capacity.
The basic roller will be ø 89 with rings $ø_e$ 133 and the ordering code is PSV1, 20F14, 133NL, 1408 (see section 2.6.2).

As frames for these rollers we should utilise the type: R1P (see chapter 3.3.3).

In the case where the conveyor is very long (let us say over 300 m) we advise the choice of a double roller “V” return set that helps the belt to self-centralise. In this case we may select rollers type PSV1, 20F14, 133NC, 708.

The frames for these return rollers as a “V” will be type R2S (see chapter 3.3.4).

2.4 - Ordering codes

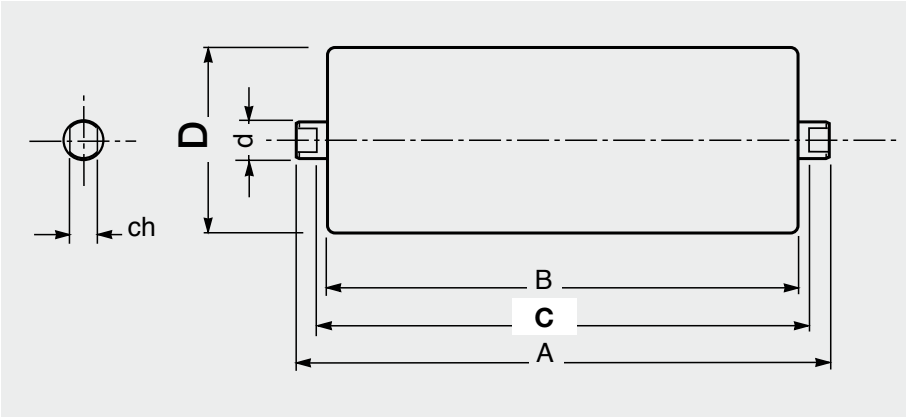
The rollers are identified to indicate:

- the series and type;

- the spindle: as standard design or according to the basic abbreviation which corresponds to the required design as indicated in the relative table;

- roller diameter and the abbreviation according to the basic design or to upplementary abbreviations as shown in the relative tables;

- roller length **C**.



Example: PSV 1 20 F * _ 108 N _ _ _ _323

Series
Type
Spindle diameter
Spindle design
Special spindle design
Roller diameter
Basic tube design
Special tube design
Length **C**

* Note: Specify the dimension of “ch” if it is non-standard.

In the first column of the table abbreviations are indicated according to the basic roller designs.
There are supplementary designs possible as indicated in the table, as long as the corresponding abbreviations are not represented in the same column.
In the indication of the ordering code abbreviations are listed according to the horizontal column order.

Tube designs

Basic Abbrev.	Supplementary	Description	Note
N		steel S235JR (EN10027-1), ex Fe360 (EN 10025), St37 (DIN 17100)	Standard
I		stainless steel AISI 304	Optional
V		rigid PVC - colour grey - RAL 7011	Standard
S		spiral metal cage	Standard
J		electrolytic zinc - colour grey - 10 micron thickness	Standard
	T	rilsan coated - colour grey - PA 11- thickness 100/150 micron	Optional
	Y	degreased - painted: electrostatic epoxy polyester powder coating - 40 - 70 microns	Optional
	A	flat rubber rings for impact rollers	Standard
	G	pointed rubber rings for flat return rollers	Standard
	L	mixed design rubber rings for flat return rollers	Standard
	C	mixed design rubber rings for "V" design return rollers	Standard
	M	helical form rubber rings	Standard
	P	rubber sheath in soft PVC - colour grey - hardness 68 Sh A	Optional
	R	rubber covered - anti ageing - anti ozone - colour black - black vulcanised - hardness 70/75 Sh A - turned - thickness as required	Optional

On request standard design N may be supplied with the application of Tectyl 100 (valvoline) waxing oil that protects for transport and the initial period of storage (about 6 months).

In the table basic designs of spindle are indicated in varying arrangements:

Basic design: spindle in steel S235JR (UNI Fe360, DIN St 37)
Supplementary design: **J** = spindle in steel S235JR (Fe360) zinc plated
I = stainless steel spindle

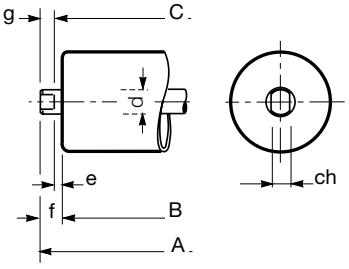
Spindle design

Basic abbreviation

Arrangements

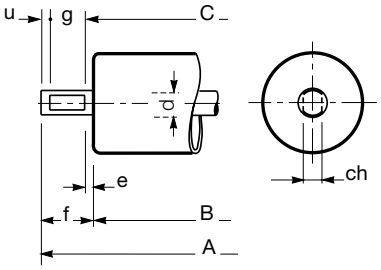
F **with flats**

d	=	20	25	30	40
ch	=	14	18	22	32
e	=	4	4	4	4
g	=	9	12	12	12
f	=	13	16	16	16



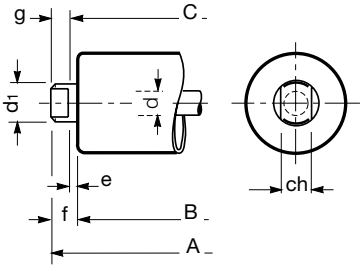
Y **with internal flats**

d	=	15	20	25	30	40
ch	=	11	14	18	22	32
e	=	4	4	4	4	4
g	=	5	8,5	11,5	11,5	11,5
u	=	4	4	4	4	4
f	=	13	16,5	19,5	19,5	19,5



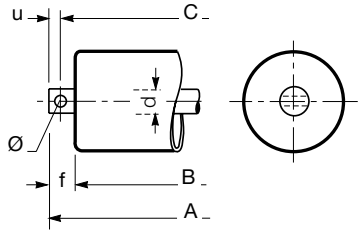
B **with bush *** | **N** | **G** & **Q**

d	=	15	15	20	20	15
ch	=	14	17	30	30	30
d_1	=	20	20	35	37	37
e	=	4	4	5	4	4
g	=	9	9	10	9	9
f	=	13	13	15	13	13



K **with hole**

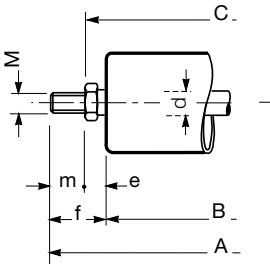
d	=	15	20	25	30	40
u	=	7	10	12	16	16
f	=	17	24	28	36	38
ø	=	6,3	8,3	10,3	14,5	16,5



* **B** = metal bush **N** = polycarbonate bush **G** = nylon bush **Q** = nylon bush

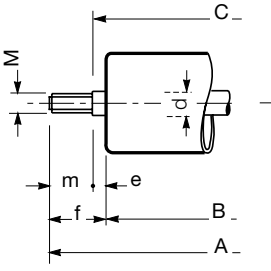
L **threaded with nut**

d	=	15	20	25	30
e	=	16	16	17	18
m	=	25	27	26	30
f	=	41	43	43	48
M	=	14	16	20	24



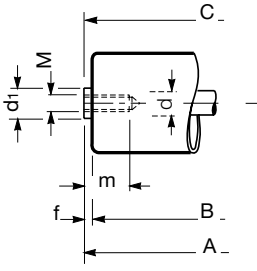
M **projection threaded**

d	=	15	20	25	30
e	=	8	8	8	8
m	=	33	35	35	40
f	=	41	43	43	48
M	=	14	16	20	24



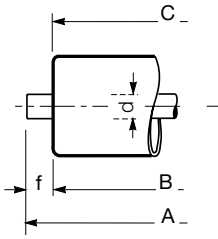
R **with internal thread**

d	=	15	20	25	30	40
d_1	=	20	20	25	30	40
f	=	8	13	16	16	16
m	=	18	20	25	25	25
M	=	10	12	16	16	16



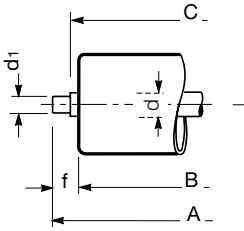
S **plain**

d	=	15	20	25	30	40
f	=	13	13	13	16	16



S_1 **with diameter reduction**

d	=	15	20	25	30	40
d_1	=	as required				
f	=	as required				



Spindle extensions that are not symmetrical, dimensions of flats “ch” that are different to the designs shown in the table, are all possible but should be specified clearly in the order with a sketch.

Choice of roller in relation to load capacity in daN, to diameter, to belt width and speed

ROLLER					PSV 1							PSV 2								PSV 3							
Ø	Belt Width Arrangements			length C																							
mm				mm	belt speed m/s							belt speed m/s								belt speed m/s							
					1	1.5	2	2.5	3	3.5	4	1	1.5	2	2.5	3	3.5	4	4.5	1	1.5	2	2.5	3	3.5	4	4.5
			400	168	179	157	142	132	124																		
		300	500	208	179	157	142	132	124			274	240	218	202	190											
		400	650	258	179	157	142	132	124			274	240	218	202	190				404	353	321	298	280			
		500	800	323	179	157	142	132	124			274	240	218	202	190				404	353	321	298	280			
	300	650	1000	388	179	157	142	132	124			274	240	218	202	190				404	353	321	298	280			
		800	1200	473	179	157	142	132	124			274	240	218	202	190				404	353	321	298	280			
	400			508	179	157	142	132	124			274	240	218	202	190				404	353	321	298	280			
			1400	538	179	157	142	132	124			274	240	218	202	190				404	353	321	298	280			
89	500	1000	1600	608	179	157	142	132	124			274	240	218	202	190				404	353	321	298	280			
		1200		708	173	157	142	132	124			274	240	218	202	190				404	353	321	298	280			
	650			758	161	157	142	132	124			274	240	218	202	190				392	353	321	298	280			
		1400		808	150	150	142	132	124			274	240	218	202	190				367	353	321	298	280			
		1600		908	133	133	133	132	124			274	240	218	202	190				327	327	321	298	280			
	800			958	126	126	126	126	124			274	240	218	202	190				310	310	310	298	280			
	1000			1158	104	104	104	104	104			267	240	218	202	190				259	259	259	259	259			
	1200			1408	85	85	85	85	85			224	224	218	202	190				218	218	218	218	218			
	1400			1608	75	75	75	75	75			201	201	201	201					194	194	194	194	194			
	1600			1808								183	183	183	183					177	177	177	177	177			
			400	168	191	167	152	141	133	126																	
		300	500	208	191	167	152	141	133	126		293	256	232	216	203	193										
		400	650	258	191	167	152	141	133	126		293	256	232	216	203	193			431	376	342	317	299	284		
		500	800	323	191	167	152	141	133	126		293	256	232	216	203	193			431	376	342	317	299	284		
	300	650	1000	388	191	167	152	141	133	126		293	256	232	216	203	193			431	376	342	317	299	284		
		800	1200	473	191	167	152	141	133	126		293	256	232	216	203	193			431	376	342	317	299	284		
	400			508	191	167	152	141	133	126		293	256	232	216	203	193			431	376	342	317	299	284		
			1400	538	191	167	152	141	133	126		293	256	232	216	203	193			431	376	342	317	299	284		
108	500	1000	1600	608	191	167	152	141	133	126		293	256	232	216	203	193			431	376	342	317	299	284		
		1200		708	170	167	152	141	133	126		293	256	232	216	203	193			404	376	342	317	299	284		
	650			758	158	158	152	141	133	126		293	256	232	216	203	193			375	375	342	317	299	284		
		1400		808	147	147	147	141	133	126		293	256	232	216	203	193			351	351	342	317	299	284		
		1600		908	130	130	130	130	130	126		293	256	232	216	203	193			310	310	310	310	299	284		
	800			958	123	123	123	123	123	123		293	256	232	216	203	193			294	294	294	294	294	284		
	1000			1158	101	101	101	101	101	101		249	249	232	216	203	193			242	242	242	242	242	242		
	1200			1408	82	82	82	82	82	82		205	205	205	205	203	193			199	199	199	199	199	199		
	1400			1608	72	72	72	72	72	72		180	180	180	180	180	180			175	175	175	175	175	175		
	1600			1808								161	161	161	161	161				157	157	157	157	157			
			500	208	205	179	163	151	142	135	129																
			650	258	205	179	163	151	142	135	129	314	274	249	231	217	207	198									
		500	800	323	205	179	163	151	142	135	129	314	274	249	231	217	207	198		462	403	366	340	320	305	291	
		650	1000	388	205	179	163	151	142	135	129	314	274	249	231	217	207	198		462	403	366	340	320	305	291	
		800	1200	473	205	179	163	151	142	135	129	314	274	249	231	217	207	198		462	403	366	340	320	305	291	
			1400	538	205	179	163	151	142	135	129	314	274	249	231	217	207	198		462	403	366	340	320	305	291	
	500	1000	1600	608	200	179	163	151	142	135	129	314	274	249	231	217	207	198		462	403	366	340	320	305	291	
			1800	678								314	274	249	231	217	207	198		416	403	366	340	320	305	291	
		1200		708	169	169	163	151	142	135	129	314	274	249	231	217	207	198		397	397	366	340	320	305	291	
	650		2000	758	157	157	157	151	142	135	129	314	274	249	231	217	207	198		368	368	366	340	320	305	291	
133		1400		808	146	146	146	146	142	135	129	314	274	249	231	217	207	198		343	343	343	340	320	305	291	
		1600		908	129	129	129	129	129	129	129	310	274	249	231	217	207	198		303	303	303	303	303	305	291	
	800			958	122	122	122	122	122	122	122	293	274	249	231	217	207	198		286	286	286	286	286	286	286	
		1800		1008								278	274	249	231	217	207	198		271	271	271	271	271	271	271	
		2000		1108								278	274	249	231	217	207	198		245	245	245	245	245	245	245	
	1000			1158	99	99	99	99	99	99	99	240	240	240	231	217	207	198		234	234	234	234	234	234	234	
	1200			1408	81	81	81	81	81	81	81	197	197	197	197	197	197	197		192	192	192	192	192	192	192	
	1400			1608	71	71	71	71	71	71	71	172	172	172	172	172	172	172		167	167	167	167	167	167	167	
	1600			1808	63	63	63	63	63	63	63	153	153	153	153	153	153			149	149	149	149	149	149	149	
	1800			2008								138	138	138	138	138				134	134	134	134	134			
	2000			2208																							
			650	258								333	291	264	245	231	220	210	202								
			800	323								333	291	264	245	231	220	210	202								
		650	1000	388								333	291	264	245	231	220	210	202	490	428	389	361	340	324	309	297
		800	1200	473								333	291	264	245	231	220	210	202	490	428	389	361	340	324	309	297
			1400	538								333	291	264	245	231	220	210	202	490	428	389	361	340	324	309	297
		1000	1600	608								333	291	264	245	231	220	210	202	467	428	389	361	340	324	309	297
			1800	678								333	291	264	245	231	220	210	202	413	419	389	361	340	324	309	297
		1200		708								333	291	264	245	231	220	210	202	393	393	389	361	340	324	309	297
	650		2000	758								333	291	264	245	231	220	210	202	365	365	365	361	340	324	309	297
		1400	2200	808								333	291	264	245	231	220	210	202	340	340	340	340	340	324	309	297
159		1600		908								307	291	264	245	231	220	210	202	300	300	300	300	300	300	300	297
	800			958								290	290	264	245	231	220	210	202	283	283	283	283	283	283	283	283
		1800		1008								275	275	264	245	231	220	210	202	268	268	268	268	268	268	268	268
		2000		1108								242	242	242	242	231	220	210	202	242	242	242	242	242	242	242	242
	1000			1158								237	237	237	237	231	220	210	202	231	231	231	231	231	231	231	231
		2200		1258								217	217	217	217	217	217	210	202	212	212	212	212	212	212	212	212
	1200			1408								193	193	193	193	193	193	193	193	188	188	188	188	188	188	188	188
	1400			1608								169	169	169	169	169	169	169	169	164	164	164	164	164	164	164	164
	1600			1808								150	150	150	150	150	150	150	150	146	146	146	146	146	146	146	146
	1800			2008								134	134	134	134	134	134	134	134	131	131	131	131	131	131	131	
	2000			2208																119	119	119	119	119	119	119	
			1600	608																							
			1800	678																							
			2000	758																							
			2200	808																							
		1600		908																							
		1800		1008																							
194		2000		1108																							
		2200		1258																							
	1600			1808																							
	1800			2008																							
	2000			2208																							
	2200			2508																							
	2400			2808																							

(for a project life of bearings of 30.000 hours)

PSV 4								PSV 5							serie PSV/7-FHD							ROLLER				
																						length	Belt Width Arrangements			
belt speed m/s								belt speed m/s							belt speed m/s							C				Ø
1	1.5	2	2.5	3	3.5	4	5	1	2	3	4	4.5	5	6	1	2	3	4	4.5	5	6	mm				mm
																						168			400	
																						208		300	500	
																						258		400	650	
381	333	302	281	264				549	435	380												323		500	800	
381	333	302	281	264				549	435	380												388	300	650	1000	
381	333	302	281	264				549	435	380												473		800	1200	
381	333	302	281	264				549	435	380												508	400			
381	333	302	281	264				549	435	380												538			1400	
381	333	302	281	264				549	435	380												608	500	1000	1600	89
381	333	302	281	264				549	435	380												708		1200		
381	333	302	281	264				549	435	380												758	650			
381	333	302	281	264				549	435	380												808		1400		
381	333	302	281	264				549	435	380												908		1600		
381	333	302	281	264				549	435	380												958	800			
381	333	302	281	264				549	435	380												1158	1000			
381	333	302	281	264				512	435	380												1408	1200			
337	333	302	281	264				337	377	377												1608	1400			
233	233	233	233	233				233	233	233												1808	1600			
																						168			400	
																						208		300	500	
																						258		400	650	
406	355	323	299	282	268			585	465	406	369											323		500	800	
406	355	323	299	282	268			585	465	406	369				853	677	592	538				388	300	650	1000	
406	355	323	299	282	268			585	465	406	369				853	677	592	538				473		800	1200	
406	355	323	299	282	268			585	465	406	369				853	677	592	538				508	400			
406	355	323	299	282	268			585	465	406	369				853	677	592	538				538			1400	
406	355	323	299	282	268			585	465	406	369				853	677	592	538				608	500	1000	1600	108
406	355	323	299	282	268			585	465	406	369				853	677	592	538				708		1200		
406	355	323	299	282	268			585	465	406	369				853	677	592	538				758	650			
406	355	323	299	282	268			585	465	406	369				853	677	592	538				808		1400		
406	355	323	299	282	268			585	465	406	369				853	677	592	538				908		1600		
406	355	323	299	282	268			585	465	406	369				853	677	592	538				958	800			
406	355	323	299	282	268			529	465	406	369				853	677	592	538				1158	1000			
406	355	323	299	282	268			442	442	406	369				853	677	592	538				1408	1200			
402	355	323	299	282	268			393	393	393	369				743	677	592	538				1608	1400			
366	355	323	299	282	268			356	356	356					587	587	587	538				1808	1600			
																						208			500	
																						258			650	
436	381	346	321	302	287	274		627	498	435	395	380	367									323		500	800	
436	381	346	321	302	287	274		627	498	435	395	380	367		915	726	634	576	554	535		388		650	1000	
436	381	346	321	302	287	274		627	498	435	395	380	367		915	726	634	576	554	535		473		800	1200	
436	381	346	321	302	287	274		627	498	435	395	380	367		915	726	634	576	554	535		538			1400	
436	381	346	321	302	287	274		627	498	435	395	380	367		915	726	634	576	554	535		608	500	1000	1600	
436	381	346	321	302	287	274		627	498	435	395	380	367		915	726	634	576	554	535		678			1800	
436	381	346	321	302	287	274		627	498	435	395	380	367		915	726	634	576	554	535		708		1200		
436	381	346	321	302	287	274		627	498	435	395	380	367		915	726	634	576	554	535		758	650		2000	
436	381	346	321	302	287	274		627	498	435	395	380	367		915	726	634	576	554	535		808		1400		133
436	381	346	321	302	287	274		627	498	435	395	380	367		915	726	634	576	554	535		908		1600		
436	381	346	321	302	287	274		608	498	435	395	380	367		915	726	634	576	554	535		958	800			
436	381	346	321	302	287	274		577	498	435	395	380	367		915	726	634	576	554	535		1008		1800		
436	381	346	321	302	287	274		524	498	435	395	380	367		915	726	634	576	554	535		1108		2000		
436	381	346	321	302	287	274		501	498	435	395	380	367		915	726	634	576	554	535		1158	1000			
412	381	346	321	302	287	274		412	412	412	395	380	367		915	726	634	576	554	535		1408	1200			
363	363	346	321	302	287	274		363	363	363	363	363	363		915	726	634	576	554	535		1608	1400			
324	324	324	321	302	287	274		324	324	324	324	324			915	726	634	576	554	535		1808	1600			
294	294	294	294	294	287			294	294	294	294	294			908	726	634	576	554	535		2008	1800			
270	270	270	270	270				270	270	270	270	270			750	726	634	576	554			2208	2000			
																						258			650	
462	404	367	341	321	305	291	270															323			800	
462	404	367	341	321	305	291	270	666	528	462	419	403	389	366	971	771	673	612	588	568	534	388		650	1000	
462	404	367	341	321	305	291	270	666	528	462	419	403	389	366	971	771	673	612	588	568	534	473		800	1200	
462	404	367	341	321	305	291	270	666	528	462	419	403	389	366	971	771	673	612	588	568	534	538			1400	
462	404	367	341	321	305	291	270	666	528	462	419	403	389	366	971	771	673	612	588	568	534	608		1000	1600	
462	404	367	341	321	305	291	270	666	528	462	419	403	389	366	971	771	673	612	588	568	534	678			1800	
462	404	367	341	321	305	291	270	666	528	462	419	403	389	366	971	771	673	612	588	568	534	708		1200		
462	404	367	341	321	305	291	270	666	528	462	419	403	389	366	971	771	673	612	588	568	534	758	650		2000	
462	404	367	341	321	305	291	270	666	528	462	419	403	389	366	971	771	673	612	588	568	534	808		1400	2200	
462	404	367	341	321	305	291	270	630	528	462	419	403	389	366	971	771	673	612	588	568	534	908		1600		159
462	404	367	341	321	305	291	270	564	528	462	419	403	389	366	971	771	673	612	588	568	534	958	800			
462	404	367	341	321	305	291	270	564	528	462	419	403	389	366	971	771	673	612	588	568	534	1008		1800		
462	404	367	341	321	305	291	270	511	511	462	419	403	389	366	971	771	673	612	588	568	534	1108		2000		
462	404	367	341	321	305	291	270	488	488	462	419	403	389	366	971	771	673	612	588	568	534	1158	1000			
417	404	367	341	321	305	291	270	449	449	449	419	403	389	366	971	771	673	612	588	568	534	1258		2200		
398	398	367	341	321	305	291	270	400	400	400	400	379	379	366	971	771	673	612	588	568	534	1408	1200			
348	348	348	341	321	305	291	270	350	350	350	350	350	350	350	971	771	673	612	588	568	534	1608	1400			
310	310	310	310	310	305	291	270	311	311	311	311	311	311		971	771	673	612	588	568	534	1808	1600			
279	279	279	279	279	279	279		281	281	281	281	281	281		922	771	673	612	588	568	534	2008	1800			
254	254	254	254	254	254	254		256	256	256	256	256			852	771	673	612	588	568	534	2208	2000			
																823	719	654	628	607	571	608			1600	
																823	719	654	628	607	571	678			1800	
																823	719	654	628	607	571	758			2000	
																823	719	654	628	607	571	808			2200	
																823	719	654	628	607	571	908		1600		
																823	719	654	628	607	571	1008		1800		
																823	719	654	628	607	571	1108		2000		194
																823	719	654	628	607	571	1258		2200		
																823	719	654	628	607	571	1808	1600			
																823	719	654	628	607	571	2008	1800			
																760	719	654	628	607	571	2208	2000			
																672	672	654	628	607	571	2508	2200			
																605	605	605	605	605	571	2808	2400			

Choice of roller in relation to the roller capacity in daN, to diameter, to belt

ROLLER Ø mm	Belt Width Arrangements			length C mm	PL 2 - PL 3 - PL 4 belt speed m/s								PLF 1 - PLF 5 - PLF 20 belt speed m/s							
					1	1.25	1.5	1.75	2	2.5	3.0	4	1	1.25	1.5	1.75	2	2.5	3.0	4
			400	168									129	116	107	99	93	84		
			500	208									129	116	107	99	93	84		
		400	650	258									129	116	107	99	93	84		
		500	800	323									129	116	107	99	93	84		
		650	1000	388									129	116	107	99	93	84		
		800	1200	473									129	116	107	99	93	84		
89	400			508									129	116	107	99	93	84		
	500	1000		608									129	116	107	99	93	84		
		1200		708									129	116	107	99	93	84		
	650			758									129	116	107	99	93	84		
	800			958									129	116	107	99	93	84		
	1000			1158									117	116	107	99	93	84		
	1200			1408									96	96	96	96	93	84		
			400	168	97	88	80	75	70	63										
			500	208	97	88	80	75	70	63										
		400	650	258	97	88	80	75	70	63										
		500	800	323	97	88	80	75	70	63										
		650	1000	388	97	88	80	75	70	63										
		800	1200	473	97	88	80	75	70	63										
90	400			508	97	88	80	75	70	63										
	500	1000		608	97	88	80	75	70	63										
		1200		708	97	88	80	75	70	63										
	650			758	97	88	80	75	70	63										
	800			958	50	50	50	50	50	50										
	1000			1158	28	28	28	28	28	28										
	1200			1408	16	16	16	16	16	16										
			400	168									142	127	117	109	102	92	84	
			500	208									142	127	117	109	102	92	84	
		400	650	258									142	127	117	109	102	92	84	
		500	800	323									142	127	117	109	102	92	84	
		650	1000	388									142	127	117	109	102	92	84	
		800	1200	473									142	127	117	109	102	92	84	
	400			508									142	127	117	109	102	92	84	
108	500	1000		608									142	127	117	109	102	92	84	
		1200		708									142	127	117	109	102	92	84	
	650			758									142	127	117	109	102	92	84	
	800			958									137	127	113	109	102	92	84	
	1000			1158									113	113	113	109	102	92	84	
	1200			1408									93	93	93	93	93	92	84	
	1400			1608									79	79	79	79	79	79	79	
			400	168	107	96	88	82	77	69	64									
			500	208	107	96	88	82	77	69	64									
		400	650	258	107	96	88	82	77	69	64									
		500	800	323	107	96	88	82	77	69	64									
		650	1000	388	107	96	88	82	77	69	64									
		800	1200	473	107	96	88	82	77	69	64									
110	400			508	107	96	88	82	77	69	64									
	500	1000		608	107	96	88	82	77	69	64									
		1200		708	107	96	88	82	77	69	64									
	650			758	107	96	88	82	77	69	64									
	800			958	107	96	88	82	77	69	64									
	1000			1158	62	62	62	62	62	62	62									
	1200			1408	35	35	35	35	35	35	35									
			400	168									156	142	129	120	112	101	93	81
			500	208									156	142	129	120	112	101	93	81
		400	650	258									156	142	129	120	112	101	93	81
		500	800	323									156	142	129	120	112	101	93	81
		650	1000	388									156	142	129	120	112	101	93	81
		800	1200	473									156	142	129	120	112	101	93	81
	400			508									156	142	129	120	112	101	93	81
133			1400	538									156	142	129	120	112	101	93	81
	500	1000		608									156	142	129	120	112	101	93	81
		1200		708									156	142	129	120	112	101	93	81
	650			758									156	142	129	120	112	101	93	81
		1400		808									156	142	129	120	112	101	93	81
	800			958									156	142	129	120	112	101	93	81
	1000			1158									111	111	111	111	111	101	93	81
	1200			1408									91	91	91	91	91	91	91	81
	1400			1608									79	79	79	79	79	79	79	79
			400	168	120	104	99	88	78	76	71	62								
			500	208	120	104	99	88	78	76	71	62								
		400	650	258	120	104	99	88	78	76	71	62								
		500	800	323	120	104	99	88	78	76	71	62								
		650	1000	388	120	104	99	88	78	76	71	62								
		800	1200	473	120	104	99	88	78	76	71	62								
140	400			508	120	104	99	88	78	76	71	62								
	500	1000		608	120	104	99	88	78	76	71	62								
		1200		708	120	104	99	88	78	76	71	62								
	650			758	120	104	99	88	78	76	71	62								
	800			958	120	104	99	88	78	76	71	62								
	1000			1158	120	104	99	88	78	76	71	62								
	1200			1408	107	104	99	88	78	76	71	62								

width and speed (for a project life of bearings of 10.000 hours)

ROLLER	Belt Width Arrangements			length	MPS						MPR						RTL					
Ø				C																		
mm				mm	belt speed m/s						belt speed m/s						belt speed m/s					
					0.75	1	1.5	2	2.5	3	0.75	1	1.5	1.75	2	2.5	0.5	0.75	1	1.50	1.75	2
			400	168	121	110	96															
		300	500	208	121	110	96															
		400	650	258	121	110	96															
		500	800	323	121	110	96															
	300	650	1000	388	121	110	96															
50		800		473	117	110	96															
	400			508	109	109	96															
	500	1000		608	91	91	91															
	650			758	73	73	73															
	800			958	58	58	58															
	1000			1158	49	49	49															
			400	168	128	117	102	93			128	117	102	97			56	49	43	35		
		300	500	208	128	117	102	93			128	117	102	97			56	49	43	35		
		400	650	258	128	117	102	93			128	117	102	97			56	49	43	35		
		500	800	323	128	117	102	93			128	117	102	97			56	49	43	35		
	300	650	1000	388	128	117	102	93			128	117	102	97			56	49	43	35		
60		800		473	114	114	102	93			114	114	102	97			56	49	43	35		
	400			508	106	106	102	93			106	106	102	97			56	49	43	35		
	500	1000		608	88	88	88	88			88	88	88	88			56	49	43	35		
	650			758	70	70	70	70			70	70	70	70			56	49	43	35		
	800			958	55	55	55	55			55	55	55	55			55	49	43	35		
	1000			1158	46	46	46	46			46	46	46	46			46	46	43	35		
			400	168		126	110	100	93		139	126	110	105	100		69	56	49	40	37	
		300	500	208		126	110	100	93		139	126	110	105	100		69	56	49	40	37	
		400	650	258		126	110	100	93		139	126	110	105	100		69	56	49	40	37	
		500	800	323		126	110	100	93		139	126	110	105	100		69	56	49	40	37	
	300	650	1000	388		126	110	100	93		139	126	110	105	100		69	56	49	40	37	
76		800		473		113	110	100	93		113	113	110	105	100		69	56	49	40	37	
	400			508		104	104	100	93		104	104	104	104	100		69	56	49	40	37	
	500	1000		608		86	86	86	86		86	86	86	86	86		69	56	49	40	37	
	650			758		68	68	68	68		68	68	68	68	68		68	56	49	40	37	
	800			958		53	53	53	53		53	53	53	53	53		53	53	49	40	37	
	1000			1158		44	44	44	44		44	44	44	44	44		44	44	44	40	37	
			400	168		133	116	106	98	92		133	116	110	106	98		61	53	43	40	37
			500	208		133	116	106	98	92		133	116	110	106	98		61	53	43	40	37
		400	650	258		133	116	106	98	92		133	116	110	106	98		61	53	43	40	37
		500	800	323		133	116	106	98	92		133	116	110	106	98		61	53	43	40	37
		650	1000	388		133	116	106	98	92		133	116	110	106	98		61	53	43	40	37
		800	1200	473		112	112	106	98	92		112	112	110	106	98		61	53	43	40	37
89	400			508		103	103	103	98	92		103	103	103	103	98		61	53	43	40	37
	500	1000		608		85	85	85	85	85		85	85	85	85	85		61	53	43	40	37
		1200		708		72	72	72	72	72		72	72	72	72	72						
	650			758		67	67	67	67	67		67	67	67	67	67		61	53	43	40	37
	800			958		53	53	53	53	53		53	53	53	53	53		53	53	43	40	37
	1000			1158		43	43	43	43	43		43	43	43	43	43		43	43	43	40	37
	1200			1408		35	35	35	35	35		35	35	35	35	35						
			400	168		139	129	122	103	97												
			500	208		139	129	122	103	97												
		400	650	258		139	129	122	103	97												
		500	800	323		139	129	122	103	97												
		650	1000	388		139	129	122	103	97												
		800	1200	473		112	112	112	103	97												
102	400			508		103	103	103	103	97												
	500	1000		608		85	85	85	85	85												
		1200		708		72	72	72	72	72												
	650			758		67	67	67	67	67												
	800			958		52	52	52	52	52												
	1000			1158		43	43	43	43	43												
	1200			1408		35	35	35	35	35												

Note: for the definitive load capacity, at different possible speeds, see the page relative to each series, type and diameter.