

2 **Rollers**



2 Rollers

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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 today's 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.

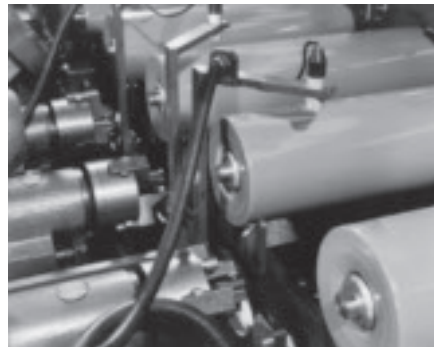


- Mineral industry
- Chemical and fertiliser industry
- Iron and steel industry
- Cement industry
- Glass industry
- Quarry industry
- Warehousing and storage of various materials.

2 Rollers

2.2 - Rollers, technical design and data

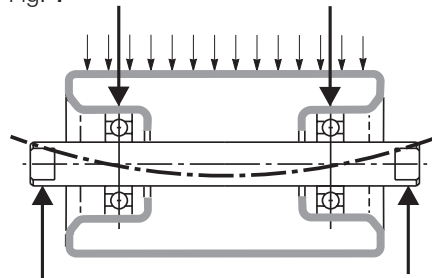
The principal characteristics that typify all the Rulmecca rollers are: long service life, quality of all components, high efficiency and economy of use.



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

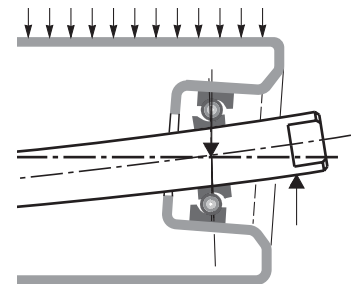


The design of the housings, of strong and rigid construction, has been developed using a computerised system that determines their thickness in relation to the maximum load required for various types of rollers.

The housing for the bearing has been studied and designed in a way that reduces the angle between the bearing and spindle 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.

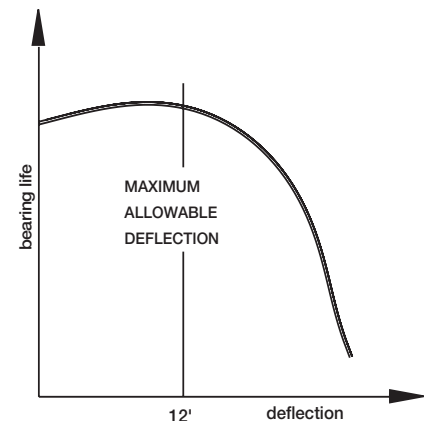


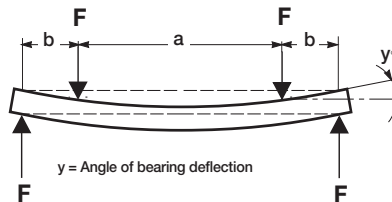
Fig. 3 - Deflection curve of bearings with C3 play.

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

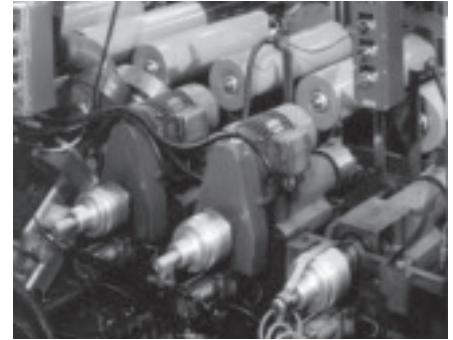


Rulmeca rollers are designed to sustain (to the maximum load conditions as stated in the relevant tables) a dynamic load, calculated according to the roller type, of 30,000 or 10,000 hours of life (for greater life see the relevant tables), with a spindle that is designed to be underloaded and which 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 today's 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.



2 Rollers



Rulmecca 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.

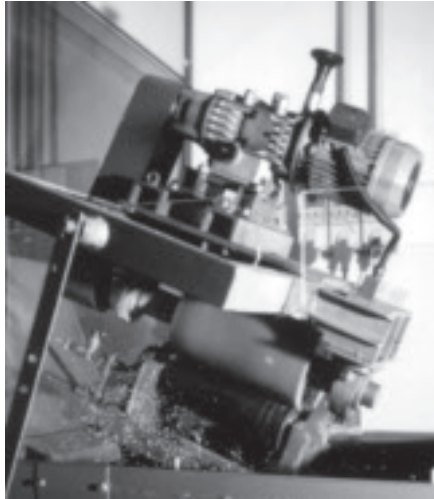
These machines allow the examination of the following characteristics for each roller type:

- 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 Rollers



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			2 ÷ 4 m/s			≥ 4 m/s		
	Ø roller mm			Ø roller mm			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.

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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.


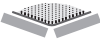
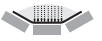
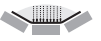
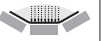
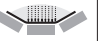


For a theoretically different life, the load capacity may be multiplied by the determined coefficient from **Tab.22** that corresponds to the required life.



Principal operating factors:

lv	= 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
F_p	= participating factor of the highest stressed roller see Tab.17 (depends on the side angle of the roller in transom)	
F_d	= shock factor see Tab.20 (depends on lump size of material)	
F_s	= service factor see Tab.18	
F_m	= ambient factor see Tab.19	
F_v	= speed factor see Tab.21	

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

0°	20°	20°	30°	35°	45°	$30^\circ-45^\circ$	60°
							
1.00	0.50	0.60	0.65	0.67	0.72	- 0.52 - 0.60	0.47
						Shorter central roller	5 rollers garland

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 m/s	Roller diameter mm						
	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	---	---



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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:

$$Ca = a_0 \times \left(q_b + \frac{lv}{3.6 \times v} \right) 0,981 \quad [\text{daN}]$$

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

$$Ca_1 = Ca \times F_d \times F_s \times F_m \quad [\text{daN}]$$

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).

$$ca = Ca_1 \times F_p \quad [\text{daN}]$$

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

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

The dynamic load on the return set will be:

$$Cr_1 = Cr \times F_s \times F_m \times F_v \quad [\text{daN}]$$

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

$$cr = Cr_1 \times F_p \quad [\text{daN}]$$

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:

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

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

The dynamic load will be:

$$Ca_1 = Ca \times Fs \times Fd \times Fm \text{ [daN]}$$

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

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

$$ca = Ca_1 \times Fp \text{ [daN]}$$

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

On the return set the static load is given by:

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

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

The dynamic load will be:

$$Cr_1 = Cr \times Fs \times Fm \times Fv \text{ [daN]}$$

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

therefore the roller load will be:

$$cr = Cr_1 \times Fp \text{ [daN]}$$

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

where:

$$Fp = 1 \text{ see Tab. 16}$$

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 $\varnothing 133$, one may choose the type PSV2, with a sufficient load capacity: PSV/2-FHD, 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 $\varnothing 89$ with rings $\varnothing_e 133$ and the ordering code is PSV/1-FHD, 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 PSV/1-FHD, 20F14, 133NC, 708.

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

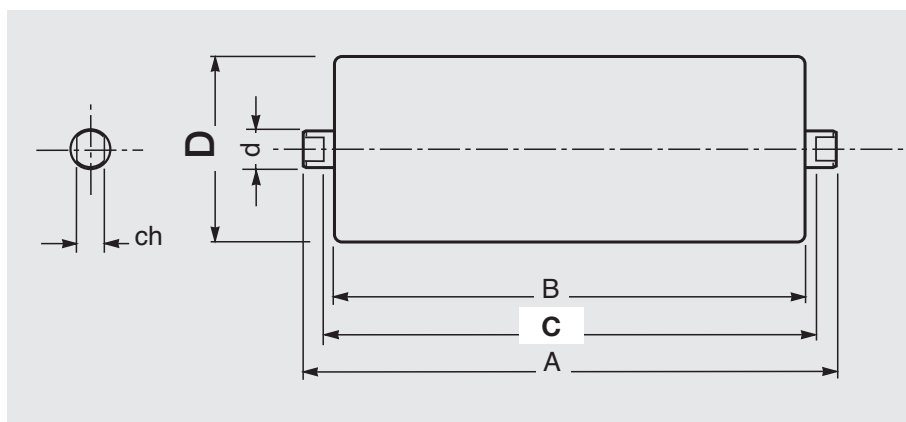


2 Rollers

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 supplementary 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
PE		HDPE high density polyethylene - black colour	Standard
V		rigid PVC - colour grey - RAL 7011	Standard
S		spiral metal cage	Standard
J		electrolytic zinc - colour grey - 10 micron thickness	Standard
T		rilisan 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
	PU	Polyurethane coating-orange colour-hardness 90 Sh. (different colour and hardness on request)	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).



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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

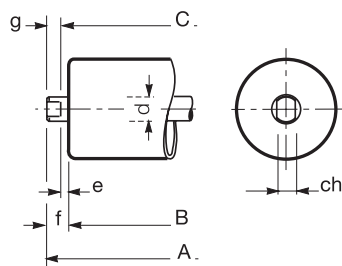
Spindle design

Basic abbreviation

F with flats

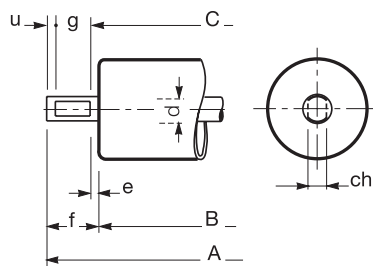
d	=	20	25	30	40
ch	=	14	18	22	32
e	=	4	4	4	4
g	=	9	12	12	12
f	=	13	16	16	16

Arrangements



Y with internal flats

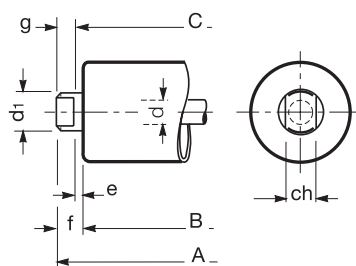
d	=	15	20	25	30	40
ch	=	11	14	18	22	32
e	=	4	4	4	4	4
g	=	5	8,5	11,5	11,5	11,5
u	=	4	4	4	4	4
f	=	13	16,5	19,5	19,5	19,5



B with bush *

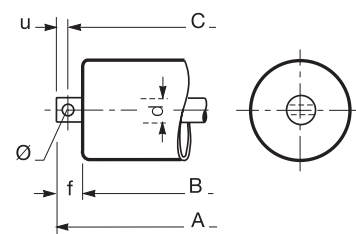
d	=	15	15	20	20	15
ch	=	14	17	30	30	30
d ₁	=	20	20	35	37	37
e	=	4	4	5	4	4
g	=	9	9	10	9	9
f	=	13	13	15	13	13

N **G & Q**



K orthogonal hole (for garlands)

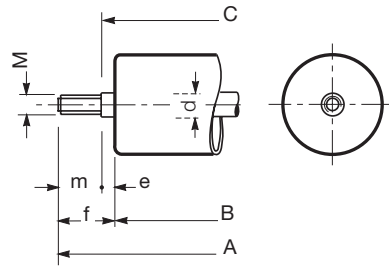
d	=	15	20	25	30	40
u	=	7	10	12	16	16
f	=	17	24	28	36	38
ø	=	6,3	8,3	10,3	14,5	16,5



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

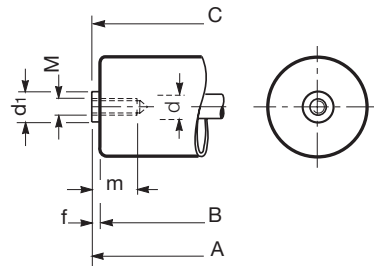
M male threaded

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



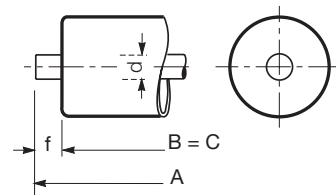
R female threaded

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



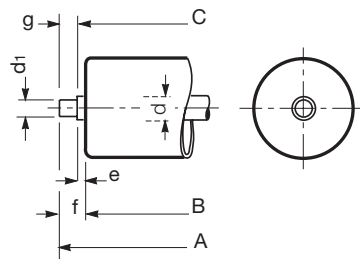
S plain

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






S1 with diameter reduction

d	=	15	20	25	30	40
d ₁	=	as required				
f	=	as required (g + e)				
g	=	as required (f - e)				
e	=	as required (f - g)				



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.

(for a project life of bearings of 30.000 hours)

PSV/4-FHD								PSV/5-FHD								serie PSV/7-FHD								ROLLER				
belt speed m/s								belt speed m/s								belt speed m/s								length	Belt Width			
																								C	Arrangements			Ø
																								mm				mm
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							
																						168			400			
																						208		300	500			
																						258		400	650			
																						323		500	800			
																						388	300	650	1000			
																						473		800	1200			
																						508	400					
																						538			1400			
																						608	500	1000	1600			
																						708		1200				
																						758	650					
																						808		1400				
																						908		1600				
																						958	800					
																						1158	1000					
																						1408	1200					
																						1608	1400					
																						1808	1600					

Choice of roller in relation to the roller capacity in daN, to diameter, to belt width and speed (for a project life of bearings of 30.000 hours)




2 Rollers

ROLLER				TOP C1-V1								TOP C2-V2							
Ø mm	Belt Width Arrangements		length C mm	belt speed m/s															
				0,5	1	1,5	2	2,5	3	3,5	4	0,5	1	1,5	2	2,5	3	3,5	4
89		300	400	168	179	179	179	179	179	179									
		400	500	208	179	179	179	179	179	179									
		500	800	323	179	179	179	179	179	179									
		650	1000	388	169	169	169	169	169	169									
		800	1200	473	132	132	132	132	132	132									
				508	122	122	122	122	122	122									
			1400	538	114	114	114	114	114	114									
		500	1000	608	96	96	96	96	96	96									
			1200	708*	81	81	81	81	81	81									
		650		758*	74	74	74	74	74	74									
			1400	808*	69	69	69	69	69	69									
		800		958*	56	56	56	56	56	56									
		1000		1158*	44	44	44	44	44	44									
		1200		1408*	33	33	33	33	33	33									
	1400		1608*	27	27	27	27	27	27										
102			400	168								287	287	287	269	249	235	223	
		300	500	208								287	287	287	268	249	234	223	
		400	650	258								287	287	287	268	249	234	223	
		500	800	323								287	287	287	268	249	234	222	
		650	1000	388								287	287	287	268	249	234	222	
		800	1200	473	250							250	250	250	249	234	222		
				508	232	232	232	232	232	232		232	232	232	232	232	222		
			1400	538	219	219	219	219	219	219		219	219	219	219	219	219	219	
		500	1000	608	157	157	157	157	157	157		157	157	157	157	157	157	157	
			1200	708*	200	200	200	200	200	200		200	200	200	200	200	200	200	
		650		758*	184	184	184	184	184	184		184	184	184	184	184	184	184	
			1400	808*	171	171	171	171	171	171		171	171	171	171	171	171	171	
		800		958*	141	141	141	141	141	141		141	141	141	141	141	141	141	
		1000		1158*	113	113	113	113	113	113		113	113	113	113	113	113	113	
	1200		1408*	89	89	89	89	89	89		89	89	89	89	89	89	89		
	1400		1608*	75	75	75	75	75	75		75	75	75	75	75	75	75		
108		300	400	168	191	191	191	191	191	191									
		400	500	208	191	191	191	191	191	191									
		500	800	323	191	191	191	191	191	191									
		650	1000	388	168	168	168	168	168	168									
		800	1200	473	132	132	132	132	132	132									
				508	121	121	121	121	121	121									
			1400	538	113	113	113	113	113	113									
		500	1000	608	98	98	98	98	98	98									
			1200	708*	80	80	80	80	80	80									
		650		758*	73	73	73	73	73	73									
			1400	808*	68	68	68	68	68	68									
		800		958*	55	55	55	55	55	55									
		1000		1158*	42	42	42	42	42	42									
		1200		1408*	32	32	32	32	32	32									
	1400		1608*	25	25	25	25	25	25										
127			400	168	309							309	309	309	289	268	252	241	229
		300	500	208	309	309	309	289	268	252	241	229							
		400	650	258	309	309	309	289	268	252	241	229							
		500	800	323	309	309	309	288	268	252	240	229							
		650	1000	388	309	309	309	288	267	251	240	228							
		800	1200	473	309	309	309	288	267	251	240	228							
				508	295	295	295	288	267	251	239	228							
			1400	538	276	276	276	267	251	239	228								
		500	1000	608	239	239	239	239	239	239	233	227							
			1200	708*	197	197	197	197	197	197	197	197							
		650		758*	182	182	182	182	182	182	182	182							
			1400	808*	169	169	169	169	169	169	169	169							
		800		958*	138	138	138	138	138	138	138	138							
		1000		1158*	109	109	109	109	109	109	109	109							
	1200		1408*	85	85	85	85	85	85	85	85								
	1400		1608*	70	70	70	70	70	70	70	70								
133			400	168	205	205	205	205	205	205	205	309	309	309	289	268	252	241	229
		300	500	208	205	205	205	205	205	205	205	309	309	309	289	268	252	241	229
		400	650	258	205	205	205	205	205	205	205	309	309	309	289	268	252	241	229
		500	800	323	205	205	205	205	205	205	205	309	309	309	288	268	252	241	229
		650	1000	388	168	168	168	168	168	168	168	309	309	309	288	267	251	240	228
		800	1200	473	131	131	131	131	131	131	131	309	309	309	288	267	251	240	228
				508	121	121	121	121	121	121	121	295	295	295	288	267	251	240	228
			1400	538	113	113	113	113	113	113	113	276	276	276	267	251	240	228	
		500	1000	608	97	97	97	97	97	97	97	239	239	239	239	239	239	233	227
			1200	708*	77	77	77	77	77	77	77	197	197	197	197	197	197	197	197
		650		758*	71	71	71	71	71	71	71	182	182	182	182	182	182	182	182
			1400	808*	65	65	65	65	65	65	65	169	169	169	169	169	169	169	169
		800		958*	51	51	51	51	51	51	51	138	138	138	138	138	138	138	138
		1000		1158*	38	38	38	38	38	38	38	109	109	109	109	109	109	109	109
	1200		1408*	27	27	27	27	27	27	27	85	85	85	85	85	85	85	85	
	1400		1608*	20	20	20	20	20	20	20	70	70	70	70	70	70	70	70	

* TOP rollers lengths with reinforcing internal steel tube

Choice of roller in relation to the roller capacity in daN, to diameter, to belt width and speed (for a project life of bearings of 10.000 hours)

ROLLER				PL 2 - PL 3 - PL 4								PLF 1 - PLF 5 - PLF 20										
Ø	Belt Width Arrangements		length C	belt speed m/s								belt speed m/s										
	mm			mm	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		
89			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				
		400			508								129	116	107	99	93	84				
		500			608								129	116	107	99	93	84				
			1000		708								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					
90			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											
		400			508	97	88	80	75	70	63											
		500			608	97	88	80	75	70	63											
			1000		708	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												
108			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			
		500			608								142	127	117	109	102	92	84			
			1000		708								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				
110			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										
		400			508	107	96	88	82	77	69	64										
		500			608	107	96	88	82	77	69	64										
			1000		708	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											
133			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		
		500			608								156	142	129	120	112	101	93	81		
			1000		708								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			
140			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									
		400			508	120	104	99	88	78	76	71	62									
		500			608	120	104	99	88	78	76	71	62									
			1000		708	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										

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

Choice of roller in relation to the roller capacity in daN, to diameter, to belt width and speed (for a project life of bearings of 10.000 hours)



2 Rollers

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