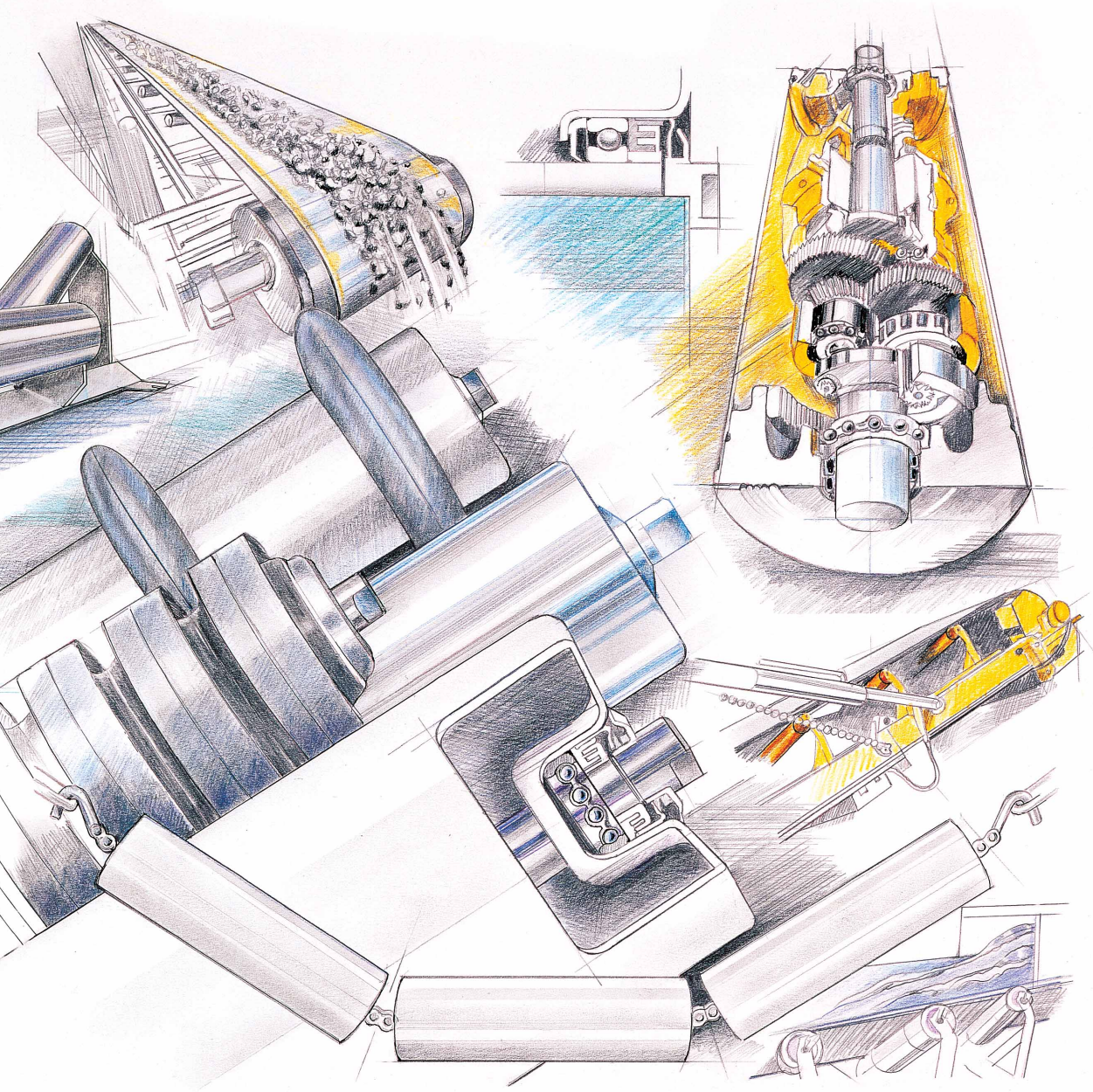


Rollers and components for bulk handling



BULK HANDLING

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RULLI RULMECA S.p.A.
4° Edition

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Rollers and components for bulk handling





TABLE OF CONTENTS

1	Technical information	page 9	2	Rollers	page 67
1.1	Introduction	11	2.1	Various industry uses	69
1.2	Technical symbols	12	2.2	Rollers, technical design and data	70
1.3	Technical characteristics of belt conveyors	14	2.3	Selection method	74
1.4	Component elements of a belt conveyor	16	2.3.1	Choice of diameter in relation to speed	75
1.5	Project criteria	18	2.3.2	Choice of type in relation to load	76
1.5.1	Conveyed Material	18	2.4	Ordering codes	80
1.5.2	Belt speed	23	2.5	Programme	89
1.5.3	Belt width	24	2.5.1	Rollers series PSV	91
1.5.4	Type of troughing set, pitch and transition distance	32		Rollers series PSV non standard	120
1.5.5	Tangential force, absorbed power, passive	36	2.5.2	Rollers series PL - PLF	121
1.5.6	Belt conveyor drive types and drum dimensions	44	2.5.3	Rollers series MPS - M	133
1.6	Rollers, function and critical data	48	2.5.4	Rollers series MPR	149
1.6.1	Choice of roller diameter in relation to speed	49	2.5.5	Rollers series RTL	155
1.6.2	Choice of type in relation to load	50	2.5.6	Guide rollers	161
1.7	Loading of belt and impact rollers	53	2.6	Rollers with rubber rings	164
1.7.1	Calculation of associated forces on impact rollers	54	2.6.1	Impact rollers	166
1.8	Accessories	58	2.6.2	Return rollers with spaced rubber rings	176
1.8.1	Belt cleaners	58	2.6.3	Return rollers with helical rubber rings	188
1.8.2	Belt inversion	59		for self cleaning	
1.8.3	Belt conveyor covers	59	2.6.4	Return rollers with helical steel cage	192
1.9	Project examples	60		for self cleaning	

3	Troughing sets	page 195
3.1	Introduction	197
3.2	Choice of troughing set	198
3.2.1	Choice of the transom in relation to load	200
3.3	Arrangements	202
3.3.1	Carrying troughing sets	202
3.3.2	Return sets	203
3.3.3	Order codes	204
3.3.4	Programme of transoms and bracketry	205
3.4	Self-centralising troughing sets	222
3.5	Cantilevered sets	234
3.6	Suspended sets	239
3.6.1	Characteristics	240
3.6.2	Applications and arrangements	241
3.6.3	Programme	243
3.6.4	Suspension designs	250

4	Pulleys	page 253
4.1	Introduction	255
4.2	Dimension of pulleys	256
4.2.1	Shaft importance	257
4.3	General construction data	258
4.3.1	Types and designs	259
4.4	Order codes	260
4.5	Programme	261
4.5.1	Serie USC drive with clampig units.....	262
4.5.2	Serie USF idler with clampig units.....	264
4.5.3	Serie CUF idler with incorporated bearings	266
4.5.4	Screw tension unit	267
4.5.5	Special pulleys	268

5	Belt cleaners	page 269
5.1	Introduction	271
5.2	Selection criteria	272
5.3	Programme	273
5.3.1	Belt cleaners type-P	274
5.3.2	Belt cleaners type-R	276
5.3.3	Belt cleaners type-H	278
5.3.4	Belt cleaners type-U	280
5.3.5	Belt cleaners simple and plough types.....	282

6	Covers	page 285
6.1	Introduction and methods of use	287
6.2	Styles and characteristics	287
6.3	Programme of plastic covers	289
6.3.1	Installation method	290
6.4	Programme of steel covers	293
6.4.1	Installation method and fixing accessories	294





Today's movement of goods and bulk materials demands state of the art methods.

In this field Rulli Rulmecca S.p.A. have the reputation to be one of the largest and most qualified producers in the world of rollers and equipment for all types of conveyors and automatic materials handling systems.

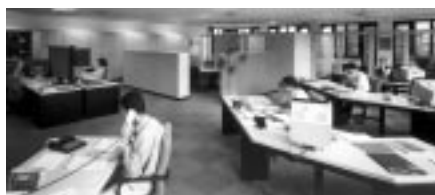
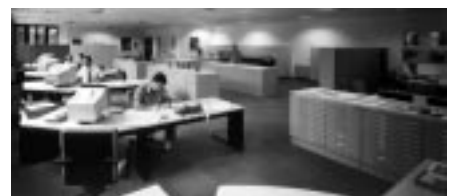
The development of the Company has reached impressive and significant levels.

Using advanced information technology and computer aided design the functions of the management, commercial, administration, project design, production and quality control blend together in an efficient, functional, and harmonious way.

The factory is technically advanced, having developed the principles of "open space"

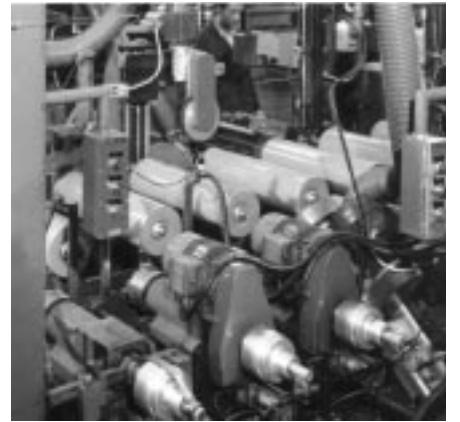
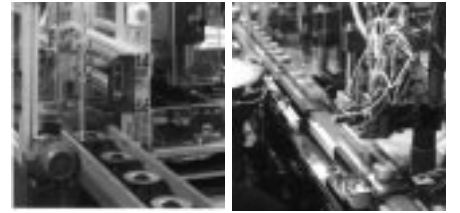
within the offices, control and machinery areas to provide the very best conditions of work for staff and operatives.

The company philosophy has always been and continues to be to satisfy the needs requests and problems of customers, providing not only products but a service based on specialised technical competence accumulated over 40 years of experience.





Experience



Automation

Modern Technology



Service





Fields of application:

- Coal
- Steel
- Energy
- Chemical
- Fertiliser
- Glass
- Cement
- Mineral extraction

You see below examples of the most important industries where Rulmeca has supplied rollers and components for the conveying of Bulk materials. In these fields belt conveyors distinguish themselves for their flexibility, practicality and economic application.





1 **Technical Information**

project and design criteria
for belt conveyors



1 Technical Information

project and design criteria for belt conveyors

Summary	1	Technical information	page	9
		1.1 Introduction		11
		1.2 Technical symbols		12
		1.3 Technical characteristics of belt conveyors		14
		1.4 Component elements of a belt conveyor		16
		1.5 Project criteria		18
		1.5.1 Conveyed Material		18
		1.5.2 Belt speed		23
		1.5.3 Belt width		24
		1.5.4 Type of troughing set, pitch and transition distance		32
		1.5.5 Tangential force, absorbed power, passive resistance, belt weight, tensions and checks		36
		1.5.6 Belt conveyor drive types and drum dimensions		44
		1.6 Rollers, function and critical data		48
		1.6.1 Choice of roller diameter in relation to speed		49
		1.6.2 Choice of type in relation to load		50
		1.7 Loading of belt and impact rollers		53
		1.7.1 Calculation of associated forces on impact rollers		54
		1.8 Accessories		58
		1.8.1 Belt cleaners		58
		1.8.2 Belt inversion		59
		1.8.3 Belt conveyor covers		59
		1.9 Project examples		60



1.1 Introduction

During the project design stage for the transport of raw materials or finished products, the choice of the method must favour the most cost effective solution for the volume of material moved ; the plant and its maintenance ; its flexibility for adaptation and its ability to carry a variety of loads and even be overloaded at times.

The belt conveyor, increasingly used in the last 10 years, is a method of conveying that satisfies the above selection criteria. Compared with other systems it is in fact the most economic, especially when one considers its adaptability to the most diverse and the most difficult conditions.

Today, we are not concerned only with horizontal or inclined conveyors but also with curves, conveyors in descent and with speeds of increasing magnitude.

However, the consideration in this section is not meant to be presented as the " bible" on project design for belt conveyors.

We wish to provide you with certain criteria to guide you in the choice of the most important components, and calculations to help with correct sizing.

The technical information contained in the following sections is intended to basically support the designer and be integrated into the technical fulfillment of the project.





1 Technical Information

project and design criteria for belt conveyors

1.2 Technical Symbols

a	pitch of troughing sets	m
A	length of roller spindle	mm
a _g	distance between the pulley flange and support	m
a _i	pitch of impact sets	m
a _o	pitch of carrying sets	m
a _t	pitch of transition sets	m
a _u	pitch of return sets	m
B	length of roller shell	mm
C	distance between roller supports	mm
Ca	static load on the carrying set	daN
ca	load on central roller of the carrying set	daN
Ca ₁	dynamic load on the carrying set	daN
cd	dynamic load on the bearing	daN
Cf	constant of elasticity of the frame/impact roller	Kg/m
ch	flats of roller shaft	mm
C _o	static load on bearing	daN
Cp	resulting load of associated forces on motorised drum shaft	daN
Cp _r	resulting load of associated forces on idler drum shaft	daN
Cq	coefficient of fixed resistance	—
Cr	static load on the return set	daN
c _r	load on the roller of return set	daN
Cr ₁	dynamic load on the return set	daN
Ct	coefficient of passive resistance given by temperature	—
Cw	wrap factor	—
d	diameter of spindle/shaft	mm
D	diameter of roller/pulley	mm
E	modules of elasticity of steel	daN/mm ²
e	logarithmic natural base	2,718
f	coefficient of internal friction of material and of rotating parts	—
f _a	coefficient of friction between the belt and drum given an angle of wrap	—
f _r	deflection of belt between two consecutive troughing sets	m
f _t	deflection of a symmetrical shaft	mm
Fa	tangential force to move the belt in the direction of movement	daN
Fd	factor of impact	—
Fm	environmental factor	—
Fp	contribution factor	—
Fp _r	contribution factor on the central roller of a troughing set	—
Fr	tangential force to move the belt in the return direction	daN
Fs	service factor	—
Fu	total tangential force	daN
Fv	speed factor	—
G	distance between support brackets	mm
G _m	weight of lump of material	Kg
H	height change of belt	m
Hc	corrected height of fall	m
Hf	height of fall of material belt-screen	m
Ht	height change between motorised drum and counterweight	m
Hv	height of fall of material screen - receiving belt	m
lc	distance from centre of motorised drum to the centre of the counterweight connection	m
l _M	load volume	m ³ /h
lv	belt load (material flow)	t/h

l_{VM}	load volume corrected to 1 m/s in relation to the inclination and irregularity of the feed	m^3/h
l_{VT}	load volume theoretic to 1 m/s	m^3/h
J	moment of inertia of section of material	mm^4
K	inclination factor	—
K_1	correction factor	—
σ_{amm}	admissible stress	daN/mm^2
L	load centres	m
L_b	dimensions of material lump	m
L_t	transition distance	m
M_f	bending moment	$daNm$
M_{if}	ideal bending moment	$daNm$
M_t	torsion moment	$daNm$
N	belt width	mm
n	revolutions per minute	rpm
P	absorbed power	kW
p_d	dynamic falling force	Kg
p_i	impact force of falling material	Kg
p_{ic}	force impact on central roller	Kg
P_{pri}	weight of lower rotating parts	Kg
P_{prs}	weight of upper rotating parts	Kg
q_b	weight of belt per linear metre	Kg/m
q_{bn}	weight of belt density	Kg/m^2
q_G	weight of material per linear metre	Kg/m
q_{RO}	weight of the upper rotating parts referred to the troughing set pitch	Kg/m
q_{RU}	weight of the lower rotating parts referred to the troughing set pitch	Kg/m
q_s	specific weight	t/m^3
q_T	weight of drum	daN
RL	length of motorised drum face	mm
S	section of belt material	m^2
T_0	minimum tension at end of load zone	daN
T_1	tension on input side	daN
T_2	tension on output side	daN
T_3	tension on idler drum	daN
T_g	tension on belt at the point of counterweight connection	daN
T_{max}	tension at point of highest belt stress	daN
T_{Umax}	unitary maximum tension of belt	daN/mm
T_x	tension of the belt at a considered point	daN
T_y	tension of the belt at a considered point	daN
v	belt speed	m/s
V	maximum rise of edge of belt	mm
W	module of resistance	mm^3
α	angle of wrap of belt on pulley	degreee
α_t	inclination of rotating symmetrical shaft	rad
β	angle of overload	degreee
γ	angle of screen inclination	degreee
δ	inclination of conveyor	degreee
λ	inclination of side roller of troughing set	degreee
λ_1	inclination of intermediate side roller	degreee
λ_2	inclination of external side roller	degreee
η	efficiency	—
y	angle deflection of bearing	degreee

The symbol for kilogram (kg) is intended as a unit of force.

1 Technical Information

project and design criteria for belt conveyors

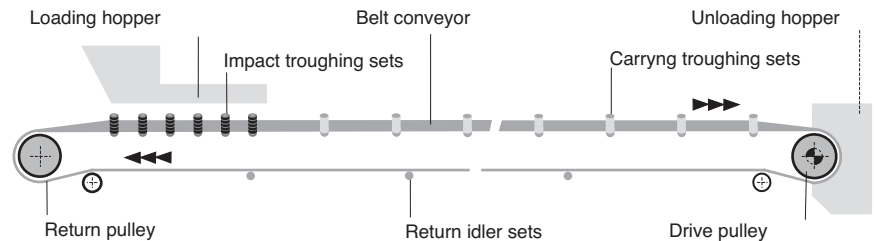


Fig.1 - Basic drawing of a belt conveyor

1.3 Technical characteristics of belt conveyors

The function of a belt conveyor is to continuously transport bulk materials of a mixed or homogeneous sort, a variable distance of some metres to tens of kilometres. One of the principal components of the conveyor is the elastomer belt which has a double function :

- to contain the conveyed material
- to transmit the force necessary to move the load.

The belt conveyor is designed to transport material in a continuous movement on the upper part of the belt.

The belt surfaces, upper on the carrying strand and lower on the return strand touch a series of rollers which are mounted from the conveyor structure itself in a group known as a troughing set. At either end of the conveyor the belt wraps around a pulley, one of which is coupled to a drive unit to transmit the motion.

The most competitive of other transport systems is certainly that of using lorries. With respect to the latter, the belt conveyor presents the following advantages :

- reduction in numbers of personnel
- reduction in energy consumption
- long periods between maintenance
- independence of the system to its surrounds
- reduced business costs

Based on the load large belt conveyors are able to show cost add savings of up to 40-60 % with respect to truck or lorry transport.

The electrical and mechanical components of the conveyor such as rollers, drums bearings, motors etc.... are produced according to the highest standards. The quality level reached by major manufacturers guarantees function and long life.

The principal components of the conveyor, rollers and belt, need very little maintenance providing the design and the installation has been correctly performed. The elastomer belt needs only occasional or superficial repair and as the rollers are sealed for life they need no lubrication. The high quality and advanced technology of Rulmecca may reduce even further, or substitute, the need for ordinary maintenance.

Drum lagging has a life of at least two years.

The utilisation of adequate accessories to clean the belt at the feed and discharge points yields corresponding improvements to increase the life of the installation with minor maintenance.



All these factors combine to limit operational costs, especially where excavation work occurs, or underpasses below hills, roads or other obstacles. A smooth belt conveyor may travel up slopes up to 18° and there is always the possibility to recover energy on down hill sections. Projects have therefore been realised where conveyor system lengths may be up to 100 km long with single sections of conveyor of 15 km.

Utilising the characteristics of flexibility, strength and economy of purpose the belt conveyor is the practical solution to conveying bulk and other materials. Continuous developments in this field add to these existing advantages.

The following drawings show typical belt conveyor arrangements.

Fig.2.1- Conveyor with horizontal belt.

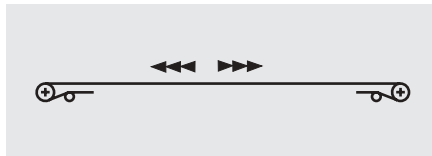


Fig.2.5- Conveyor belt with incline and horizontal where two belts are needed.

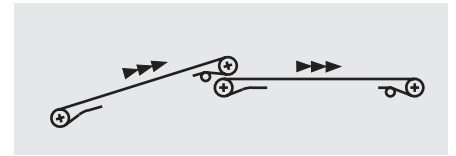


Fig.2.2 - Conveyor with horizontal belt with incline section, where the space permits a vertical curve and where the load requires the use of a single belt.



Fig.2.6 - Conveyor with horizontal and incline section where the space does not allow the vertical curve but the load may need the use of a single belt.

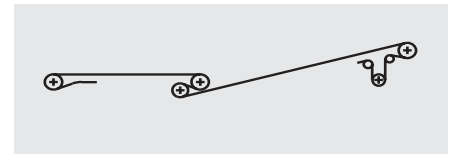


Fig.2.3 - Conveyor with incline belt and following horizontal section, when the load requires the use of a single belt and where space permits a vertical curve.



Fig.2.7 - Conveyor with a single belt comprising a horizontal section, an incline section and a decline section with vertical curves.

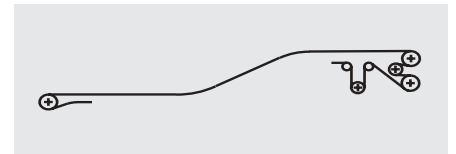


Fig.2.4 - Conveyor with horizontal and incline section where space does not allow a vertical curve and the load needs two belts to be employed.

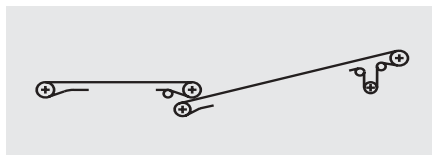
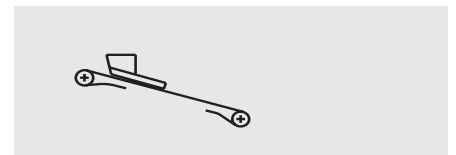


Fig.2.8 - Conveyor with belt loaded in decline or incline.



1 Technical Information

project and design criteria for belt conveyors



1.4 Components and their sizing

Fig. 3 illustrates the basic components of a typical belt conveyor. In practice, according to the variety of uses, it is possible to have many other diverse combinations of load and unload areas, elevations, and other accessories.

Drive head

May be of traditional design or with motorised drum unit.

- Traditional

Comprises a drive group consisting of : a drive drum of a diameter appropriately sized to the load on the belt, and an idler drum at the opposing end. The power is supplied by a direct coupled motor gearbox or by a direct or parallel shaft drive driving the drive drum through a suitably sized couple.

- Motorised Drum

In this arrangement the motor, gearbox and bearings form a complete designed unit inside and protected by the drum shell which directly powers the belt. This eliminates all the external complication of external drive, couples etc. as described above in the traditional design. Today motorised drums are produced in diameters up to 800mm with power in the order of 130 KW and with a drive efficiency which may reach 97 %.

Drive pulley

The shell face of the conventional drive pulley or the motorised drum may be left as normal finish or clad in rubber of a thickness calculated knowing the power to be transmitted.

The cladding may be grooved as herringbone design ; or horizontal grooves to the direction of travel ; or diamond grooves ; all designed to increase the coefficient of friction and to facilitate the release of water from the drum surface.

The drum diameter is dimensioned according to the class and type of belt and to the designed pressures on its surface.

Return pulleys

The shell face does not necessarily need to be clad except in certain cases, and the diameter is normally less than that designed for the drive pulley.

Deflection or snub pulleys

These are used to increase the angle of wrap of the belt and overall for all the necessary changes in belt direction in the areas of counterweight tensioner, mobile unloader etc..

Rollers

Support the belt and are guaranteed to rotate freely and easily under load. They are the most important components of the conveyor and represent a considerable value of the whole cost. The correct sizing of the roller is fundamental to the guarantee of the plant efficiency and economy in use.

Upper carrying troughing and return sets

The carrying rollers are in general positioned in brackets welded to a cross member or frame. The angle of the side roller varies from 20° to 45°. It is also possible to arrive at angles of up to 60° using the “garland” suspension design.

The return roller set may be designed incorporating one single width roller or two rollers operating in a “V” formation at angles of 10° .

Depending on various types of material being conveyed the upper carrying sets may be designed symmetrically or not, to suit.

Tension units

The force necessary to maintain the belt contact to the drive pulley is provided by a

tension unit which may be a screw type unit, a counterweight or a motorised winch unit.

The counterweight provides a constant tensional force to the belt independent of the conditions. Its weight designed according to the minimum limits necessary to guarantee the belt pull and to avoid unnecessary belt stretch.

The designed movement of the counterweight tension unit is derived from the elasticity of the belt during its various phases of operation as a conveyor.

The minimum movement of a tension unit must not be less than 2% of the distance between the centres of the conveyor using textile woven belts, or 0.5% of the conveyor using steel corded belts.

Hopper

The hopper is designed to allow easy loading and sliding of the material in a way to absorb the shocks of the load and avoids blockage and damage to the belt. It caters for instantaneous charging of load and its eventual accumulation.

The hopper slide should relate to the way the material falls and its trajectory and is designed according to the speed of the conveyor. Lump size and the specific gravity of the charge and its physical properties such as humidity, corrosiveness etc. are all very relevant to the design.

Cleaning devices

The system of cleaning the belt today must be considered with particular attention to reduce the need for frequent maintenance especially when the belt is conveying wet or sticky materials. Efficient cleaning allows the conveyor to obtain maximum productivity.

There are many types and designs of belt cleaners. The most straight forward simple design is that of a straight scraper blade mounted on rubber supports (chapter 5).

Conveyor covers

Covers over the conveyor are of fundamental importance when it is necessary to protect the conveyed material from the atmosphere and to guarantee efficient plant function (chapter 6).

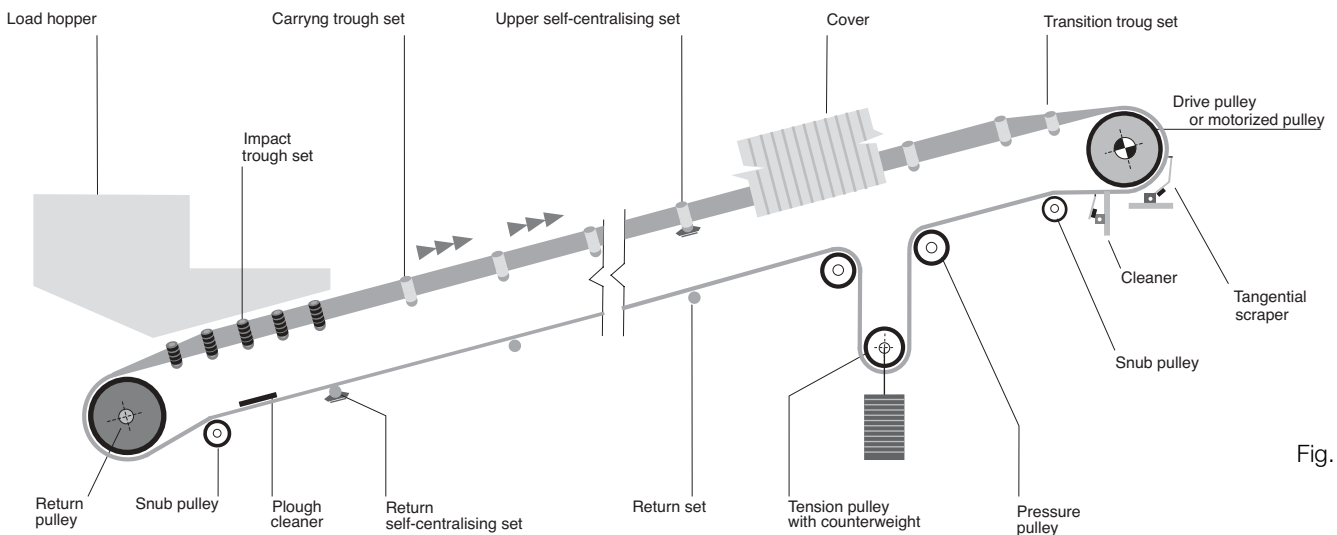


Fig. 3

1 Technical Information

project and design criteria for belt conveyors



1.5 - Project criteria

The choice of the optimum conveyor system and its project design and rationalisation depends on full knowledge of the construction characteristics and the forces involved that apply themselves to all the system components.

The principal factors that influence the sizing of a belt conveyor are : the required load volume, the type of transported material and its characteristics such as grain or lump size, and chemical / physical properties. The route and height profile of the conveyor is also relevant.

In the following illustrations you may follow the criteria used for the calculation of the belt speed and width, the type and arrangement of troughing sets, the type of rollers to be used and finally the determination of the drum sizes.

1.5.1 - Conveyed material

The correct project design of the belt conveyor must begin with an evaluation of the characteristics of the conveyed material and in particular the angle of repose and the angle of surcharge.

The angle of repose of a material, also known as the “angle of natural friction” is the angle at which the material, when heaped freely onto a horizontal surface takes up to the horizontal plane. Fig. 4.

The angle of surcharge is the angle measured with respect to the horizontal plane, of the surface of the material being conveyed by a moving belt. Fig. 5. This angle is normally between 5° and 15° (for a few materials up to 20°) and is much less than the angle of repose.

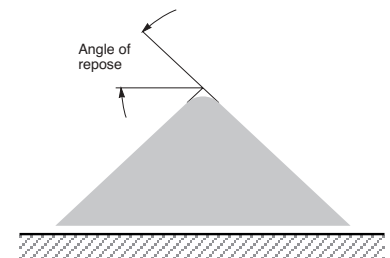


Fig.4

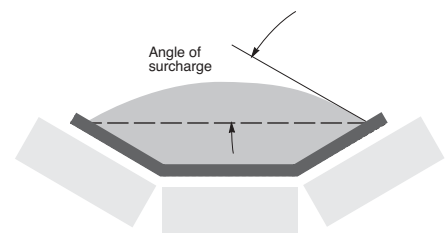


Fig.5

Tab.1 shows the correlation between the physical characteristics of materials and their relative angles of repose.

The conveyed material settles into a configuration as shown in sectional diagram Fig. 6.

The area of the section "S" may be calculated geometrically adding the area of a circle A1 to that of the trapezoid A2.

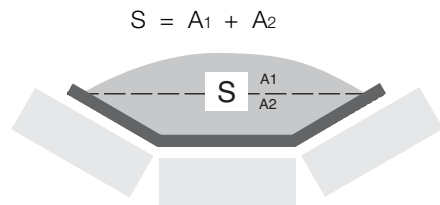


Fig.6

The value of the conveyed volume l_{VT} may be easily calculated using the formula :

$$S = \frac{l_{VT}}{3600} \text{ [m}^2\text{]}$$

where :

l_{VT} = conveyed volume at a conveyor speed of 1 m/s (see Tab.5a-b-c-d)



Tab. 1 - Angles of surcharge, repose, and material fluency

Fluency					Profile
very high	high	medium	low		on a flat belt
Angle of surcharge β					
5°	10°	20°	25°	30°	β

Angle of repose					
0-19°	20-29°	30-34°	35-39°	40° and more	Others

Characteristics of materials					
Uniform dimensions, round particles, very small size. Very humid or very dry such as dry sand, silica, cement and wet limestone dust etc.	Partly rounded particles, dry and smooth. Average weight as for example cereal, grain and beans.	Irregular material, granular particles of average weight as for example anthracite coal, clay etc.	General everyday material as for example bituminous coal and the majority of minerals.	Irregular viscous fibrous material which tends to get worse in handling, as for example wood shavings, sugar cane by product, foundry sand, etc.	Here may be included materials with a variety of characteristics as indicated in the following Tab.2.





1 Technical Information

project and design criteria for belt conveyors

Tab.2 - Physical properties of materials

Type	Average specific weight t/m ³	qs lbs. / Cu.Ft	Angle of repose	Abrasive - ness	Corrosive - ness
Alumina	0,80-1,04	50-65	22°	C	A
Aluminium chips	0,11-0,24	7-15	-	B	A
Aluminium oxide	1,12-1,92	70-120	-	C	A
Aluminium sulphate (granular)	0,864	54	32°	-	-
Ammonium nitrate	0,72	45	-	B	C
Ammonium sulphate	0,72-0,93	45-58	32°	B	C
Asbestos ore or rock	1,296	81	-	C	A
Ashes, coal, dry, up to 80 mm	0,56-0,64	35-40	40°	B	A
Ashes, coal, wet, up to 80 mm	0,72-0,80	45-50	50°	B	P
Asphalt, binder for paving	1,28-1,36	80-85	-	A	B
Asphalt, crushed up to 13 mm	0,72	45	-	A	A
Bakelite, fine	0,48-0,64	30-40	-	A	A
Barite	2,88	180	-	A	A
Barium carbonate	1,152	72	-	A	A
Bauxite, mine run	1,28-1,44	80-90	31°	C	A
Bauxite, ground, dried	1,09	68	35°	C	A
Bentonite, up to 100 mesh	0,80-0,96	50-60	-	B	A
Borax, lump	0,96-1,04	60-65	-	B	A
Brick, hard	2	125	-	C	A
Calcium carbide	1,12-1,28	70-80	-	B	B
Carbon black pellets	0,32-0,40	20-25	-	A	A
Carbon black powder	0,06-0,11	4-7	-	A	A
Carborundum, up to 80 mm	1,60	100	-	C	A
Cast iron chips	2,08-3,20	130-200	-	B	A
Cement, rock (see limestone)	1,60-1,76	100-110	-	B	A
Cement, Portland, aerated	0,96-1,20	60-75	39°	B	A
Charcoal	0,29-0,40	18-25	35°	A	A
Chrome ore (chromite)	2-2,24	125-140	-	C	A
Clay, dry, fine	1,60-1,92	100-120	35°	C	A
Clay, dry, lumpy	0,96-1,20	60-75	35°	C	A
Clinker	1,20-1,52	75-95	30-40°	C	A
Coal, anthracite	0,96	60	27°	B	A
Coal, bituminous, 50 mesh	0,80-0,86	50-54	45°	A	B
Coal, bituminous, run of mine	0,72-0,88	45-55	38°	A	B
Coal, lignite	0,64-0,72	40-45	38°	A	B
Coke breeze, 6 mm	0,40-0,5	25-35	30-45°	C	B
Coke, loose	0,37-0,56	23-35	-	C	B
Coke petroleum calcined	0,56-0,72	35-45	-	A	A
Concrete, in place, stone	2,08-2,40	130-150	-	C	A
Concrete, cinder	1,44-1,76	90-110	-	C	A
Copper, ore	1,92-2,40	120-150	-	-	-
Copper sulphate	1,20-1,36	75-85	31°	A	-
Cork	0,19-0,24	12-15	-	-	-
Cryolite	1,76	110	-	A	A
Cryolite, dust	1,20-1,44	75-90	-	A	A
Diocalcium phosphate	0,688	43	-	-	-
Disodium phosphate	0,40-0,50	25-31	-	-	-
Dolomite, lumpy	1,44-1,60	90-100	-	B	A

Table 2 states physical and chemical properties of materials that you have to take into consideration for the belt conveyor project.

Tab.2 - Physical properties of materials

Type	Average specific weight qs t/m ³	lbs. / Cu.Ft	Angle of repose	Abrasive - ness	Corrosive - ness
Earth, wet, containing clay	1,60-1,76	100-110	45°	B	A
Feldspar, 13 mm screenings	1,12-1,36	70-85	38°	C	A
Feldspar, 40 mm to 80 mm lumps	1,44-1,76	90-110	34°	C	A
Ferrous sulphate	0,80-1,20	50-75	-	B	-
Foundry refuse	1,12-1,60	70-100	-	C	A
Gypsum, 13 mm to 80 mm lumps	1,12-1,28	70-80	30°	A	A
Gypsum, dust	0,96-1,12	60-70	42°	A	A
Graphite, flake	0,64	40	-	A	A
Granite, 13 mm screening	1,28-1,44	80-90	-	C	A
Granite, 40 mm to 50 mm lumps	1,36-1,44	85-90	-	C	A
Gravel	1,44-1,60	90-100	40°	B	A
Gres	1,36-1,44	85-90	-	A	A
Guano, dry	1,12	70	-	B	-
Iron ore	1,60-3,20	100-200	35°	C	A
Iron ore, crushed	2,16-2,40	135-150	-	C	A
Kaolin clay, up to 80 mm	1,008	63	35°	A	A
Kaolin talc, 100 mesh	0,67-0,90	42-56	45°	A	A
Lead ores	3,20-4,32	200-270	30°	B	B
Lead oxides	0,96-2,04	60-150	-	A	-
Lime ground, up to 3 mm	0,96	60	43°	A	A
Lime hydrated, up to 3 mm	0,64	40	40°	A	A
Lime hydrated, pulverized	0,51-0,64	32-40	42°	A	A
Limestone, crushed	1,36-1,44	85-90	35°	B	A
Limestone, dust	1,28-1,36	80-85	-	B	A
Magnesite (fines)	1,04-1,20	65-75	35°	B	A
Magnesium chloride	0,528	33	-	B	-
Magnesium sulphates	1,12	70	--	-	-
Manganese ore	2,00-2,24	125-140	39°	B	A
Manganese sulphate	1,12	70	-	C	A
Marble, crushed, up to 13 mm	1,44-1,52	90-95	-	B	A
Nickel ore	2,40	150	-	C	B
Phosphate, acid, fertilizer	0,96	60	26°	B	B
Phosphate, florida	1,488	93	27°	B	A
Phosphate rock, pulverized	0,96	60	40°	B	A
Phosphate, super ground	0,816	51	45°	B	B
Pyrite-iron, 50 to 80 mm lumps	2,16-2,32	135-145	-	B	B
Pyrite, pellets	1,92-2,08	120-130	-	B	B
Polystyrene beads	0,64	40	-	-	-
Potash salts, sylvite, etc.	1,28	80	-	A	B
Potassium chloride, pellets	1,92-2,08	120-130	-	B	B
Potassium nitrate (saltpeter)	1,216	76	-	B	B
Potassium sulphate	0,67-0,77	42-48	-	B	-

- A non abrasive/non corrosive
- B mildly abrasive/ mildly corrosive
- C very abrasive/very corrosive

1 Technical Information

project and design criteria for belt conveyors

Tab.2 - Physical properties of materials

Type	Average specific weight qs		Angle of repose	Abrasive - ness	Corrosive - ness
	t/m ³	lbs. / Cu.Ft			
Quartz 40 mm to 80 mm lumps	1,36-1,52	85-95	-	C	A
Quartz, dust	1,12-1,28	70-80	-	C	A
Quartz, 13 mm screening	1,28-1,44	80-90	-	C	A
Rubber, pelletized	0,80-0,88	50-55	35°	A	A
Rubber, reclaim	0,40-0,48	25-30	32°	A	A
Salt, common dry, coarse	0,64-0,88	40-55	-	B	B
Salt, common dry, fine	1,12-1,28	70-80	25°	B	B
Sand, damp	1,76-2,08	110-130	45°	C	A
Sand, dry	1,44-1,76	90-110	35°	C	A
Sand, foundry, shakeout	1,44-1,60	90-100	39°	C	A
Slag, blast furnace, crushed	1,28-1,44	80-90	25°	C	A
Slate, 40 mm to 80 mm lumps	1,36-1,52	85-95	-	B	A
Slate, dust	1,12-1,28	70-80	35°	B	A
Soap powder	0,32-0,40	20-25	-	A	A
Soapstone, talc, fine	0,64-0,80	40-50	-	A	A
Soda heavy ashes	0,88-1,04	55-65	32°	B	C
Sodium bicarbonate	0,656	41	42°	A	A
Sodium nitrate	1,12-1,28	70-80	24°	A	-
Steel shavings	1,60-2,40	100-150	-	C	A
Sugar beet, pulp (dry)	0,19-0,24	12-15	-	-	-
Sugar beet, pulp (wet)	0,40-0,72	25-45	-	A	B
Sugar, cane, knifed	0,24-0,29	15-18	50°	B	A
Sugar, powdered	0,80-0,96	50-60	-	A	B
Sugar, raw, cane	0,88-1,04	55-65	30°	B	B
Sugar, wet, beet	0,88-1,04	55-65	30°	B	B
Sulphur, crushed under 13 mm	0,80-0,96	50-60	-	A	C
Sulphur, up to 80 mm	1,28-1,36	80-85	-	A	C
Talc, powdered	0,80-0,96	50-60	-	A	A
Talc, 40 mm to 80 mm lumps	1,36-1,52	85-95	-	A	A
Titanium dioxide	0,40	25	-	B	A
Wheat	0,64-0,67	40-42	25°	A	A
Wood chips	0,16-0,48	10-30	-	A	A
Zinc concentrates	1,20-1,28	75-80	-	B	A
Zinc ore, roasted	1,60	100	38°	-	-
Zinc oxide, heavy	0,48-0,56	30-35	-	A	A

A non abrasive/non corrosive
 B mildly abrasive/mildly corrosive
 C very abrasive/very corrosive



1.5.2 - Belt speed

The maximum speed of a belt conveyor in this field has reached limits not thought possible some years ago.

Very high speeds have meant a large increase in the volumes conveyed. Compared with the load in total there is a reduction in the weight of conveyed material per linear metre of conveyor and therefore there is a reduction in the costs of the structure in the troughing set frames and in the belt itself.

The physical characteristics of the conveyed material is the determining factor in calculating the belt speed.

Light material, that of cereal, or mineral dust or fines, allow high speeds to be employed. Screened or sifted material may allow belt speeds of over 8 m/s.

With the increase of material lump size, or its abrasiveness, or that of its specific weight, it is necessary to reduce the conveyor belt speed.

It may be necessary to reduce conveyor speeds to a range in the order of 1.5/3.5 m/s to handle unbroken and unscreened rock of large lump size.

The quantity of material per linear metre loaded on the conveyor is given by the formula :

$$q_G = \frac{l_v}{3.6 \times v} \text{ [Kg/m]}$$

where:

q_G = weight of material per linear metre

l_v = belt load t/h

v = belt speed m/s

q_G is used in determining the tangential force F_u .

With the increase of speed v it is possible to calculate the average belt load l_v with a narrower belt width, (and therefore it follows : a simpler conveyor structure) as well as a lower load per linear metre and therefore a reduction results in the design of rollers and troughing sets and in less belt tension.

Nevertheless larger belt widths, relative to the belt load, are used at high and low speeds where there is less danger of losing material, fewer breakdowns and less blockage in the hoppers.

From experimental data we show in *Tab. 3* the maximum belt speeds advised considering the physical characteristics and lump size of the conveyed material and the width of the belt in use.



Tab. 3 - Maximum speeds advised

Lumpsize max. dimensions		Belt min. width	max. speed			
uniform up to mm	mixed up to mm	mm	A	B	C	D
50	100	400	2.5	2.3	2	1.65
75	150	500				
125	200	650	3	2.75	2.38	2
170	300	800	3.5	3.2	2.75	2.35
250	400	1000	4	3.65	3.15	2.65
350	500	1200				
400	600	1400	4.5	4	3.5	3
450	650	1600				
500	700	1800	5	4.5	3.5	3
550	750	2000				
600	800	2200	6	5	4.5	4

A - Light sliding material non abrasive, specific weight from 0.5 ⇨ 1.0 t/m³

B - Material non abrasive, medium size, specific weight from 1.0 ⇨ 1.5 t/m³

C - Material moderately abrasive and heavy with specific weight from 1.5 ⇨ 2 t/m³

D - Abrasive material, heavy and sharp over 2 t/m³ specific weight

Considering the factors that limit the maximum conveyor speed we may conclude :

When one considers the inclination of the belt leaving the load point ; the greater the inclination, the increase in the amount of turbulence as the material rotates on the belt. This phenomena is a limiting factor in calculating the maximum belt speed in that its effect is to prematurely wear out the belt surface.

The repeated action of abrasion on the belt material, given by numerous loadings onto a particular section of the belt under the load hopper, is directly proportional to the belt speed and inversely proportional to its length.



1 Technical Information

project and design criteria for belt conveyors

1.5.3 - Belt width

Given, using *Tab.3*, the optimum belt speed, the determination of the belt width is largely a function of the quantity of conveyed material which is indicated by the project data.

In the following section, the conveyor capacity may be expressed as loaded volume lv_T [m³/h] per $v = 1$ m/sec.

The inclination of the side rollers of a transom (from 20° to 45°) defines the angle of the troughing set Fig.7.

Troughing sets at 40° / 45° are used in special cases, where because of this onerous position the belts must be able to adapt to such an accentuated trough.

In practice the choice and design of a troughing set is that which meets the required loaded volume, using a belt of minimum width and therefore the most economic.

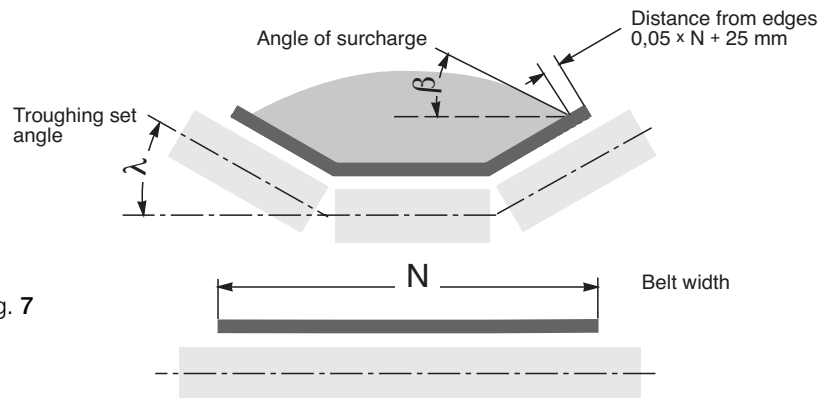


Fig. 7

All things being equal the width of the belt at the greatest angle corresponds to an increase in the loaded volume lv_T .

The design of the loaded troughing set is decided also as a function of the capacity of the belt acting as a trough.

In the past the inclination of the side rollers of a troughing set has been 20°. Today the improvements in the structure and materials in the manufacture of conveyor belts allows the use of troughing sets with side rollers inclined at 30° / 35°.

It may be observed however that the belt width must be sufficient to accept and contain the loading of material onto the belt whether it is of mixed large lump size or fine material.



In the calculation of belt dimensions one must take into account the minimum values of belt width as a function of the belt breaking load and the side roller inclination as shown in *Tab.4* .

Tab. 4 - Minimum belt width

in relation to belt breaking load and roller inclinations.

Breaking load N/mm	Belt width		
	$\lambda= 20/25^\circ$ mm	$\lambda= 30/35^\circ$	$\lambda= 45^\circ$
250	400		
315	400	400	450
400	400	400	450
500	450	450	500
630	500	500	600
800	500	600	650
1000	600	650	800
1250	600	800	1000
1600	600	800	1000

For belts with higher breaking loads than those indicated in the table, it is advisable to consult the actual belt manufacturer.



Loaded volume I_M

The volumetric load on the belt is given by the formula:

$$I_M = \frac{I_v}{q_s} \quad [m^3/h]$$

where:

I_v = load capacity of the belt [t/h]

q_s = specific weight of the material

Also defined as:

$$I_{vT} = \frac{I_M}{v} \quad [m^3/h]$$

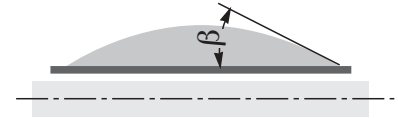
where the loaded volume is expressed relevant to the speed of 1 mtr/sec.

It may be determined from *Tab. 5a-b-c-d*, that the chosen belt width satisfies the required loaded volume I_M as calculated from the project data, in relation to the design of the troughing sets, the roller inclination, the angle of material surcharge and to belt speed.



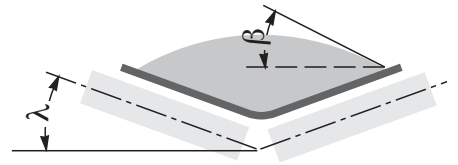
1 Technical Information

project and design criteria for belt conveyors



Tab. 5a - Loaded volume with flat roller sets $v = 1 \text{ m/s}$

Belt width mm	Angle of surcharge β	$lVT \text{ m}^3/\text{h}$ $\lambda = 0^\circ$	Belt width mm	Angle of surcharge β	$lVT \text{ m}^3/\text{h}$ $\lambda = 0^\circ$
300	5°	3.6	1600	5°	152.6
	10°	7.5		10°	305.6
	20°	15.4		20°	630.7
	25°	20.1		25°	807.1
	30°	25.2		30°	1008.7
400	5°	7.5	1800	5°	194.7
	10°	15.1		10°	389.8
	20°	31.3		20°	804.9
	25°	39.9		25°	1029.9
	30°	50.0		30°	1287.0
500	5°	12.6	2000	5°	241.9
	10°	25.2		10°	484.2
	20°	52.2		20°	1000.0
	25°	66.6		25°	1279.4
	30°	83.5		30°	1599.1
650	5°	22.3	2200	5°	295.5
	10°	45.0		10°	591.1
	20°	93.2		20°	1220.4
	25°	119.5		25°	1560.8
	30°	149.4		30°	1949.4
800	5°	35.2	2400	5°	353.1
	10°	70.9		10°	706.3
	20°	146.5		20°	1458.3
	25°	187.5		25°	1865.1
	30°	198.3		30°	2329.5
1000	5°	56.8	2600	5°	415.9
	10°	114.4		10°	831.9
	20°	235.8		20°	1717.9
	25°	301.6		25°	2197.1
	30°	377.2		30°	2744.1
1200	5°	83.8	2800	5°	484.0
	10°	167.7		10°	968.0
	20°	346.3		20°	1998.7
	25°	436.6		25°	2556.3
	30°	554.0		30°	3192.8
1400	5°	115.5	3000	5°	557.1
	10°	231.4		10°	1114.2
	20°	478.0		20°	2300.4
	25°	611.6		25°	2942.2
	30°	763.2		30°	3674.8



Tab. 5b - Loaded volume
with 2 roll troughing sets $v = 1 \text{ m/s}$

Belt width mm	Angle of surcharge β	$lvT \text{ m}^3/\text{h}$
		$\lambda = 20^\circ$
300	5°	17.6
	10°	20.5
	20°	28.8
	25°	32.0
	30°	36.3
400	5°	34.5
	10°	41.4
	20°	55.8
	25°	63.7
	30°	72.0
500	5°	57.6
	10°	68.7
	20°	92.8
	25°	105.8
	30°	119.8
650	5°	102.9
	10°	123.1
	20°	165.9
	25°	189.3
	30°	214.5
800	5°	175.6
	10°	192.9
	20°	260.2
	25°	296.6
	30°	336.2
1000	5°	317.1
	10°	310.6
	20°	418.6
	25°	477.3
	30°	541.0

To obtain the effective loaded volume l_M at the desired belt speed use:

$$l_M = lvT \times v \quad [\text{m}^3/\text{h}]$$



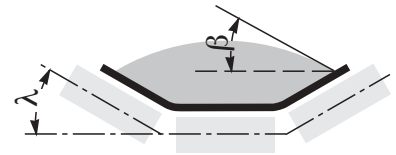


1 Technical Information

project and design criteria for belt conveyors

Tab. 5c - Loaded volume
with 3 roll troughing sets $v = 1 \text{ m/s}$

Belt width mm	Angle of surcharge β	lVT m ³ /h				
		$\lambda = 20^\circ$	$\lambda = 25^\circ$	$\lambda = 30^\circ$	$\lambda = 35^\circ$	$\lambda = 45^\circ$
300	5°	13.3	15.1	17.2	18.7	21.6
	10°	16.9	18.7	20.5	21.6	24.4
	20°	24.4	26.2	27.7	28.8	30.6
	25°	27.7	30.2	31.6	32.4	33.8
	30°	33.4	34.9	36.0	36.3	37.8
400	5°	28.0	32.4	36.6	39.6	45.7
	10°	35.2	29.2	43.2	45.3	51.4
	20°	50.4	54.3	57.2	59.4	66.3
	25°	56.8	62.2	65.1	66.6	69.8
	30°	67.7	70.9	73.4	74.5	77.0
500	5°	47.8	55.8	62.6	68.0	78.4
	10°	60.1	67.3	73.4	78.4	87.4
	20°	85.3	91.8	97.2	101.1	106.9
	25°	96.1	104.7	109.8	112.6	117.7
	30°	114.1	119.1	123.8	126.0	129.6
650	5°	87.8	101.8	114.4	124.9	143.2
	10°	109.4	122.4	134.2	142.9	159.1
	20°	154.4	166.3	176.4	183.6	193.6
	25°	174.2	189.7	198.7	204.4	212.4
	30°	205.5	215.2	223.5	227.8	233.6
800	5°	139.6	162.0	182.1	198.3	227.1
	10°	173.6	194.4	212.7	226.8	252.0
	20°	244.0	262.8	278.2	290.1	306.0
	25°	275.0	299.1	313.2	322.9	334.8
	30°	324.0	339.4	352.4	359.2	367.9
1000	5°	227.1	263.8	296.2	322.9	368.6
	10°	281.1	315.3	345.6	368.6	408.6
	20°	394.9	425.5	450.7	469.8	494.6
	25°	444.9	483.8	506.5	522.0	541.0
	30°	523.4	548.6	569.1	580.6	594.0
1200	5°	335.8	389.8	438.1	477.0	545.0
	10°	415.0	465.4	510.1	543.9	602.6
	20°	581.7	627.1	664.2	692.6	728.2
	25°	655.2	712.8	745.9	768.9	795.9
	30°	770.4	807.4	837.7	855.0	873.3
1400	5°	465.8	540.7	606.9	661.3	753.8
	10°	574.9	644.7	706.3	753.4	834.1
	20°	804.9	867.6	918.7	957.9	1006.9
	25°	906.4	985.3	1031.4	1063.4	1100.1
	30°	1064.8	1116.3	1157.7	1181.8	1206.3



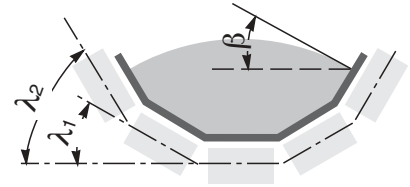
Belt width mm	Angle of surcharge β	lvT m ³ /h				
		$\lambda = 20^\circ$	$\lambda = 25^\circ$	$\lambda = 30^\circ$	$\lambda = 35^\circ$	$\lambda = 45^\circ$
1600	5°	616.6	716.0	803.8	875.5	997.5
	10°	760.6	853.2	934.5	997.2	1102.6
	20°	1063.8	1146.9	1214.2	1266.4	1330.2
	25°	1198.0	1302.1	1363.3	1405.4	1452.9
	30°	1432.8	1474.9	1529.6	1561.3	1593.0
1800	5°	788.7	915.4	1027.8	1119.6	1274.7
	10°	972.3	1090.8	1194.4	1274.4	1409.0
	20°	1353.2	1465.2	1551.2	1617.8	1698.8
	25°	1530.7	1663.2	1740.0	1794.9	1854.7
	30°	1796.4	1883.1	1953.0	1993.6	2032.9
2000	5°	981.7	1139.7	1279.8	1393.9	1586.5
	10°	1209.9	1357.2	1486.4	1586.1	1752.8
	20°	1690.0	1822.3	1929.2	2012.0	2112.1
	25°	1903.6	2068.2	2164.6	2231.6	2305.8
	30°	2233.4	2341.4	2427.8	2478.6	2526.8
2200	5°	1185.1	1371.5	1545.4	1691.3	1908.1
	10°	1461.1	1634.4	1796.0	1925.2	2109.2
	20°	2048.0	2199.9	2331.7	2433.2	2546.2
	25°	2316.2	2496.8	2613.6	2698.4	2777.9
	30°	2716.9	2826.3	2930.0	2995.2	3045.5
2400	5°	1403.7	1632.9	1832.9	2010.7	2275.5
	10°	1730.5	1945.8	2130.1	2288.8	2514.2
	20°	2431.0	2618.6	2776.3	2896.2	3041.2
	25°	2749.4	2972.1	3112.2	3211.8	3317.9
	30°	3225.0	3364.4	3488.7	3565.0	3636.4
2600	5°	1670.0	1936.7	2175.9	2382.4	2697.3
	10°	2058.8	2307.9	2528.6	2711.8	2981.5
	20°	2886.4	3099.6	3281.7	3425.0	3592.0
	25°	3264.5	3518.0	3678.7	3798.3	3918.8
	30°	3829.2	3982.3	4123.8	4216.1	4295.0
2800	5°	1930.8	2240.7	2517.8	2759.4	3119.7
	10°	2380.3	2670.1	2926.0	3141.0	3448.4
	20°	3342.6	3592.0	3805.5	3971.5	4168.4
	25°	3780.0	4076.9	4265.9	4404.3	4547.7
	30°	4433.9	4615.0	5185.6	4888.7	4984.2
3000	5°	2227.0	2585.8	2905.6	3184.8	3597.8
	10°	2745.7	3079.0	3376.8	3625.2	3976.9
	20°	3851.2	4140.3	4390.9	4579.5	4800.2
	25°	4355.7	4699.2	4922.1	5078.6	5237.0
	30°	5109.2	5319.4	5517.6	5637.2	5739.7

To obtain the effective loaded volume l_M at the desired belt speed use:

$$l_M = lvT \times v \quad [m^3/h]$$

1 Technical Information

project and design criteria for belt conveyors



Tab. 5_d - Loaded volume with 5 roll troughing sets $v = 1 \text{ m/s}$

Belt width mm	Angle of surcharge β	l _{VT} m ³ /h		Belt width mm	Angle of surcharge β	l _{VT} m ³ /h	
		$\lambda_1 30^\circ$	$\lambda_2 60^\circ$			$\lambda_1 30^\circ$	$\lambda_2 60^\circ$
800	5°	236.5		2000	5°	1679.7	
	10°	260.2			10°	1846.0	
	20°	313.9			20°	2185.2	
	25°	342.0			25°	2381.7	
	30°	372.9			30°	2595.9	
1000	5°	388.8		2200	5°	2049.1	
	10°	427.3			10°	2251.1	
	20°	510.4			20°	2661.8	
	25°	556.2			25°	2901.2	
	30°	606.2			30°	3162.2	
1200	5°	573.1		2400	5°	2459.8	
	10°	630.0			10°	2703.2	
	20°	751.3			20°	3185.2	
	25°	816.6			25°	3471.8	
	30°	892.4			30°	3784.3	
1400	5°	797.4		2600	5°	2899.4	
	10°	876.6			10°	3186.3	
	20°	1041.4			20°	3755.1	
	25°	1135.0			25°	4092.8	
	30°	1237.3			30°	4461.4	
1600	5°	1075.3		2800	5°	3379.3	
	10°	1181.8			10°	3713.7	
	20°	1371.9			20°	4372.2	
	25°	1495.0			25°	4765.6	
	30°	1629.7			30°	5194.4	
1800	5°	1343.1		3000	5°	3863.5	
	10°	1476.0			10°	4245.8	
	20°	1749.6			20°	5018.4	
	25°	1906.9			25°	5469.8	
	30°	2078.6			30°	5962.3	

To obtain the effective loaded volume l_M at desired belt speed use:

$$l_M = l_{VT} \times v \quad [m^3/h]$$

Corrects loaded volume in relation to the factors of inclination and feed

In the case of inclined belts, the values of loaded volume lv_T [m^3/h] are corrected according to the following:

$$lv_M = lv_T \times K \times K_1 \quad [m^3/h]$$

Where:

lv_M is the loaded volume corrected in relation to the inclination and the irregularity of feeding the conveyor in m^3/h with $v = 1 m/s$

lv_T is the theoretic load in volume for $v = 1 m/s$

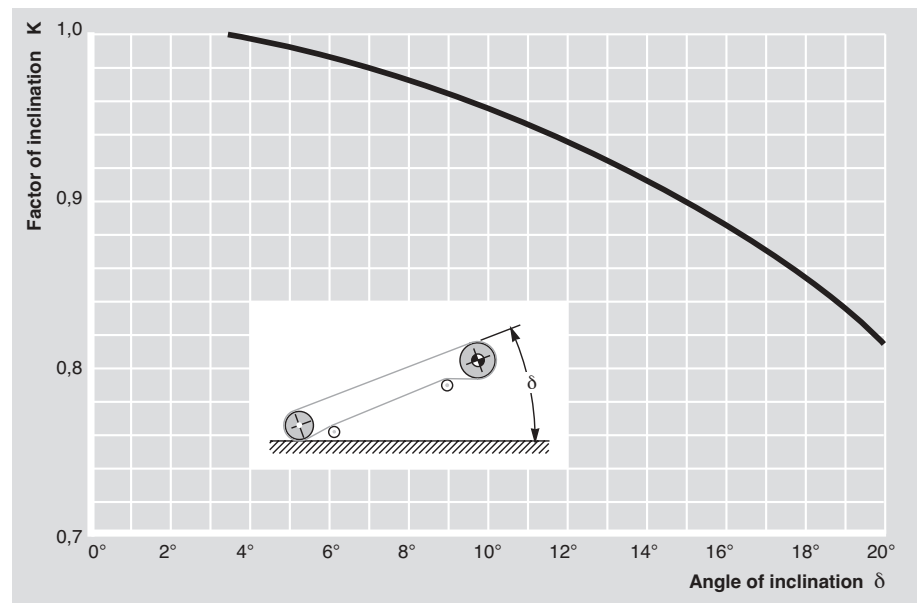
K is the factor of inclination

K_1 is the correction factor given by the feed irregularity

The inclination factor K calculated in the design, must take into account the reduction in section for the conveyed material when it is on the incline.

Diagram Fig.8 gives the factor K in function of the angle of conveyor inclination, but only for smooth belts that are flat with no profile.

Fig.8 - Factor of inclination K



In general it is necessary to take into account the nature of the feed to the conveyor, whether it is constant and regular, by introducing a correction factor K_1 its value being :

- $K_1 = 1$ regular feed
- $K_1 = 0.95$ irregular feed
- $K_1 = 0.90 \div 0.80$ most irregular feed.

If one considers that the load may be corrected by the above factors the effective loaded volume at the required speed is given by :

$$l_M = lv_M \times v \quad [m^3/h]$$

Given the belt width, one may verify the relationship between the belt width and the maximum lump size of material according to the following :

$$\text{belt width} \geq \text{max. lump size}$$



1 Technical Information

project and design criteria for belt conveyors

1.5.4 - Type of troughing set, pitch and transition distance

Type

For each troughing set there is a combination of rollers positioned into a suitable fixed support frame Fig. 9 ; the troughing sets may also be suspended as a "garland" Fig. 10.

There are 2 basic types of troughing set base frame : the upper set , which carries the loaded belt on the upper strand, and the lower set, which supports the empty belt on the return strand.

- The upper carrying troughing set is generally designed as the following arrangement :
 - one or two parallel rollers
 - two, three or more rollers in a trough.
- The return set can be with :
 - one or two flat rollers
 - a trough of two rollers.

The roller frame with fixed supports, with three rollers of equal length, support the belt well with a uniform distribution of forces and load sharing.

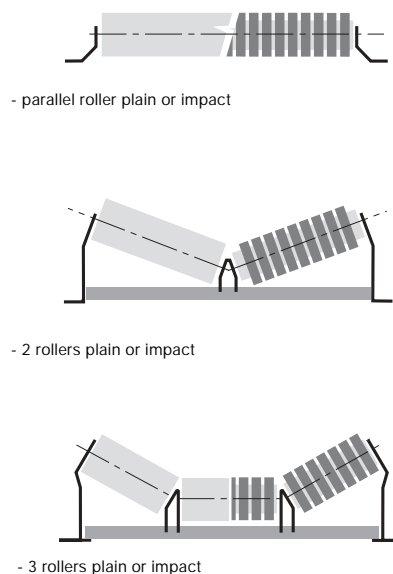
The inclination of the side roller varies from 20° up to 45° for belts of 400 mm width up to 2200mm and over.

The suspended sets of "garland" design are used incorporating impact rollers to accept the impact under the load hopper, and also in use along the conveyor upper and lower strands where large loads may be carried or on very high performance conveyors.

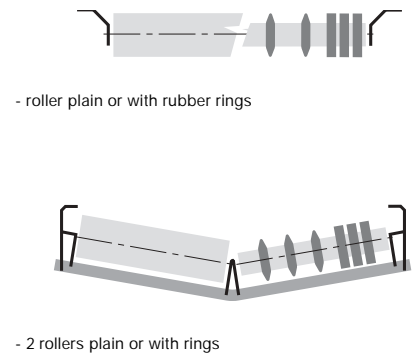
The troughing sets are generally designed and manufactured according to international unified standards.

The drawings illustrate the more common arrangements.

Fig. 9 - Troughing sets upper strand



Return sets





The choice of the most appropriate and correct troughing set installation (one needs to calculate the frictional force between the rollers and the belt itself) is the guarantee for the smooth belt start up and movement.

The troughing sets on the upper strand of a reversible belt may have the rollers in line with each other and at right angles to the belt as in Fig. 11; in the case of non-reversible belt the side rollers are inclined forward by 2° in the same sense of direction of the belt, as in Fig. 12.

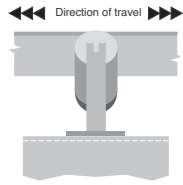
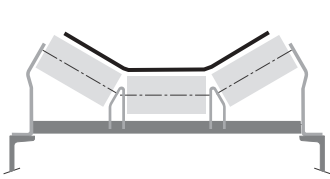
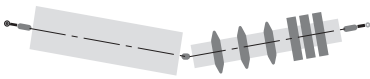


Fig. 11 - for reversible belts

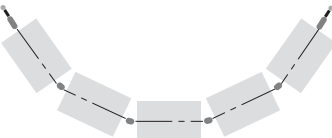
Fig. 10 - suspension sets "garland"



- 2 rollers plain or with rubber rings for return set



- 3 rollers plain for load carrying



- 5 rollers plain for load carrying

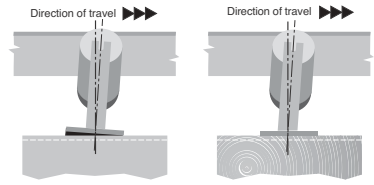
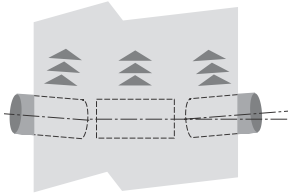
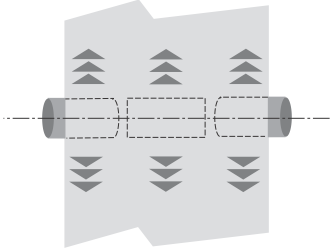


Fig. 12 - only for uni-directional belts

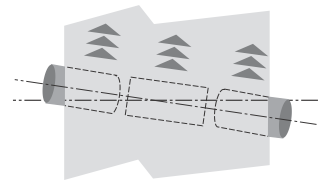


Fig.13 - misalignment of the troughing set may promote belt wandering.

1 Technical Information

project and design criteria for belt conveyors

Troughing set pitch

The trough set pitch a_o most commonly used for the upper strand of a belt conveyor is 1 metre, whilst for the return strand the sets are pitched normally at 3 metres (a_u).

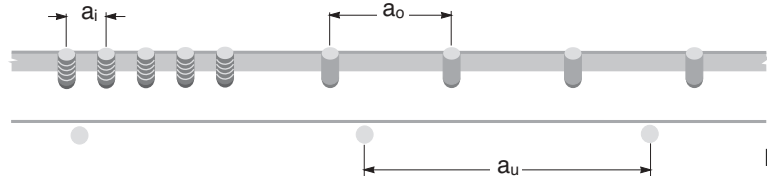


Fig.14

The deflection of the belt between 2 consecutive carrying troughing sets should not be more than 2 % of the pitch itself. A greater deflection causes the discharge of the material during the loading and promotes excessive frictional forces during the belt movement due to the manipulation of the material being conveyed. This not only increases the horse power and work, but also increases forces on the rollers, and overall a premature belt surface wear occurs.

to maintain a deflection of the belt within the indicated limits. Above all the pitch is also limited by the load capacity of the rollers themselves.

At the loading points the pitch is generally one half or less, that of the normal pitch of troughing sets so that any belt deflection is limited to the least possible ; and also to reduce the load forces on the rollers.

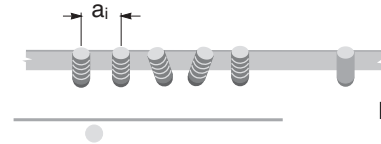


Fig.15

Tab.6 advises the maximum pitch for troughing sets in relation to belt width and the specific weight of the conveyed material,

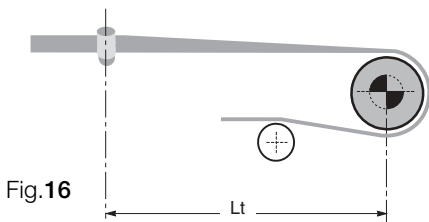
The calculation of the minimum pitch for suspension sets is calculated to avoid contact between adjoining “garlands” when the normal oscillation of the sets takes place during belt operation Fig.15.

Tab. 6 - Maximum advised pitch of troughing sets

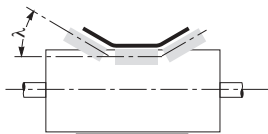
Belt width m	Pitch of sets upper specific weight of conveyed material t/m ³			lower m
	< 1.2 m	1.2 ÷ 2.0 m	> 2.0 m	
300	1.65	1.50	1.40	3.0
400				
500				
650				
800	1.50	1.35	1.25	3.0
1000	1.35	1.20	1.10	3.0
1200	1.20	1.00	0.80	3.0
1400				
1600				
1800				
2000	1.00	0.80	0.70	3.0
2200				

Transition distance Lt

The distance between the last troughing set adjacent to the head or tail pulley of a conveyor and the pulleys themselves is known as the transition distance Fig.16.



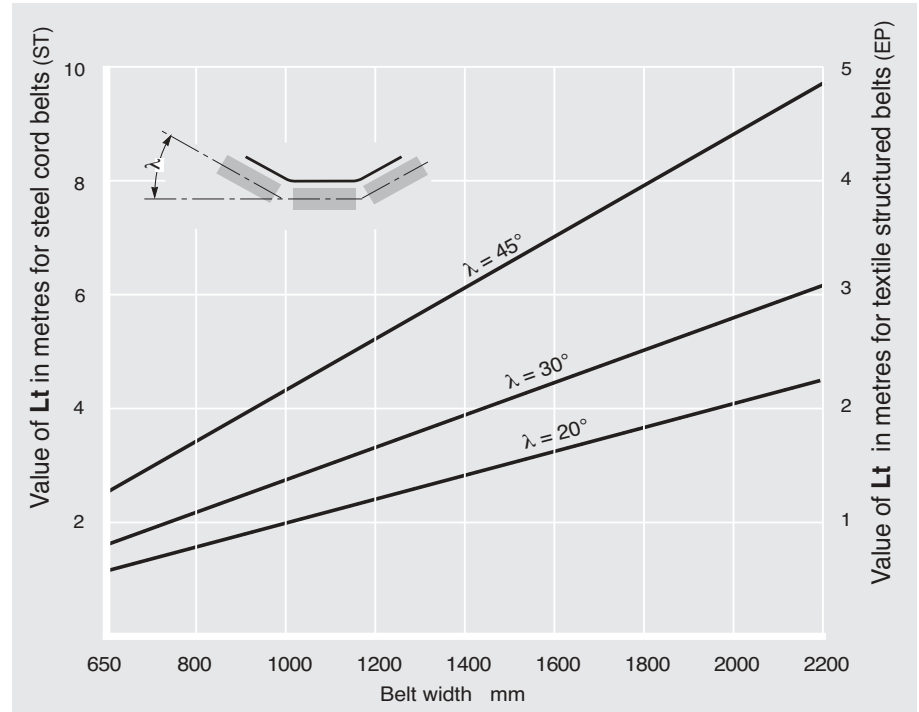
Along this section the belt changes from a trough configuration as determined by the inclination of the rollers of the carrying sets to a flat belt to match the flat pulley and vice versa.



The edges of the belt are in this area placed under an extra force which reacts on the side rollers, Generally the transition distance must not be less than the belt width to avoid excess pressures.



Fig.19 - Transition distance



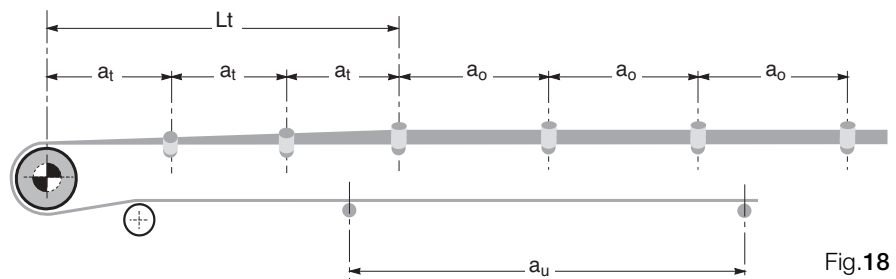
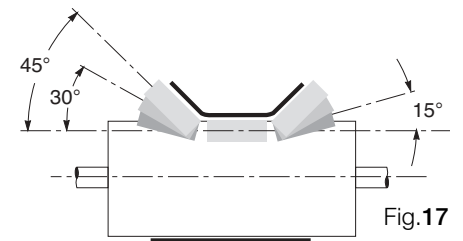
In the case where the transition distance Lt is larger than the pitch of the carrying troughing sets it is a good rule to introduce in this transition area troughing sets with inclined side rollers of gradual reduction in angle (known as transition troughing sets). In this way the belt may change gradually from trough to flat avoiding those damaging forces.

The graph Fig.19 allows the determination of the transition distance Lt (in relation to the belt width and to the inclination of the side rollers of the troughing sets), for belts with textile structure EP (polyester) and for steel corded belts (ST).

Example:

For a belt (EP) 1400mm width troughing sets at 45°, one may extract from the graph that the transition distance is about 3 metres.

It is advisable to position in this section Lt two troughing sets with respectively $\lambda = 15^\circ$ and 30° at a pitch of 1 metre.



1 Technical Information

project and design criteria for belt conveyors

1.5.5 - Tangential force, driving power, passive resistance, belt weight, tensions and checks

The forces which act on a running conveyor vary along its length. To dimension and calculate the absorbed power of the conveyor it is necessary to find the existing tensions in the section under the most force and in particular for conveyors with the following characteristics :

- incline of more than 5°
- length of decline
- variable height profile Fig.20

Tangential force

The first step is to calculate the total tangential force F_u at the periphery of the drive pulley. The total tangential force must overcome all the resistance that comes from motion and consists of the sum of the

following forces:

- force necessary to move the loaded belt: must overcome the belt frictional forces from the carrying troughing sets upper and lower, the pulleys, return and snub etc.;
- force necessary to overcome the resistance as applied to the horizontal movement of the material;
- force necessary to raise the material to the required height (in the case of a decline, the force generated by the mass changes the resultant power);
- force necessary to overcome the secondary resistances where accessories are present. (mobile unloaders, "Trippers", cleaners, scrapers, rubber skirts, reversing units etc.)

The total tangential force F_u at the drive pulley periphery is given by :



$$F_u = [L \times C_q \times C_t \times f (2 q_b + q_G + q_{RU} + q_{RO}) \pm (q_G \times H)] \times 0.981 \quad [\text{daN}]$$

For decline belts a negative sign (-) is used in the formula where:

- L = Centres of conveyor (m)
- C_q = Fixed coefficient of resistance (belt accessories), see *Tab 7*
- C_t = Passive coefficient of resistance see *Tab. 8*
- f = Coefficient of friction internal rotating parts (troughing sets), see *Tab. 9*
- q_b = Belt weight per linear metre in Kg/m, see *Tab. 10* (sum of cover and core weight)
- q_G = Weight of conveyed material per linear metre Kg/m
- q_{RU} = Weight of lower rotating parts in Kg/m see *Tab. 11*
- q_{RO} = Weight of upper rotating parts in Kg/m see *Tab. 11*
- H = Height change of belt.

When it is necessary to calculate the forces on a variable altitude belt conveyor it may be seen that the total tangential force is made up from forces F_a (tangential force to move the belt, upper strand) and the lesser force F_r (tangential force on return strand) all necessary to move a single uniform section of the belt that comprises the conveyor (Fig.20) thus we have:

$$F_U = (F_{a1} + F_{a2} + F_{a3} \dots) + (F_{r1} + F_{r2} + F_{r3} \dots)$$

Where:

F_a = tangential force to move a single section of the belt upper strand

F_r = tangential force to move a single section of the belt lower strand

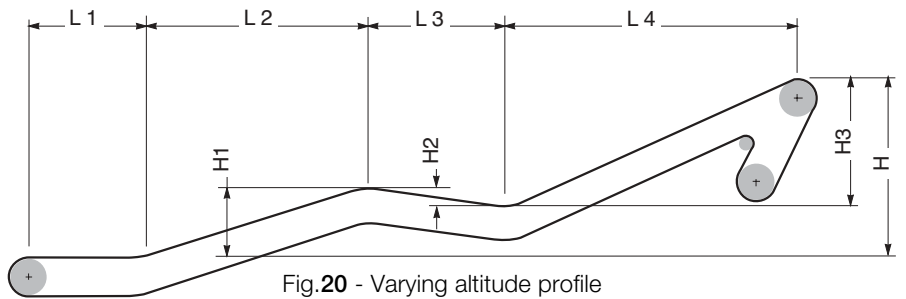


Therefore the tangential force F_a and F_r will be given by:

$$F_a = [L \times Cq \times Ct \times f (q_b + q_G + q_{RO}) \pm (q_G + q_b) \times H] \times 0.981 \quad [\text{daN}]$$

$$F_r = [L \times Cq \times Ct \times f (q_b + q_{RU}) \pm (q_b \times H)] \times 0.981 \quad [\text{daN}]$$

Using the indication (+) for belt sections that rise
 (-) for sections that fall



Driving power

Noting the total tangential force at the periphery of the drive pulley, the belt speed and the efficiency (η) of the reduction gear, the minimum necessary driving power is :

$$P = \frac{F_U \times v}{100 \times \eta} \quad [\text{kW}]$$

1 Technical Information

project and design criteria for belt conveyors

Passive resistance

The passive resistance is expressed by a coefficient which is dependant on the length of the belt conveyor, ambient temperature, speed, type of maintenance, cleanliness and fluidity of movement, internal friction of the conveyed material, and to the conveyor inclinations.



Tab. 7 - Coefficient of fixed resistance

Centres m	Cq
10	4.5
20	3.2
30	2.6
40	2.2
50	2.1
60	2.0
80	1.8
100	1.7
150	1.5
200	1.4
250	1.3
300	1.2
400	1.1
500	1.05
1000	1.03

Tab. 8 - Coefficient of passive resistance given by temperature

Temperature °C	+ 20°	+ 10°	0	- 10°	- 20°	- 30°
Factor Ct	1	1,01	1,04	1,10	1,16	1,27

Tab. 9 - Coefficient of internal friction **f** of materials and of the rotating parts

Horizontal belt conveyor rising and gently falling	speed m/s					
	1	2	3	4	5	6
Rotating parts and material with standard internal friction	0,0160	0,0165	0,0170	0,0180	0,0200	0,0220
Rotating parts and material with high internal friction in difficult working conditions	da 0,023 a 0,027					
Rotating parts of a conveyor in descent with a brake motor and/or generator	da 0,012 a 0,016					

Belt weight per linear metre qb

The total belt weight qb may be determined adding the belt core weight, to that of the belt covers upper and lower allowing about 1.15 Kg/m² for each mm of thickness of the covers themselves.



Tab.10 - Belt core weight qb_n

Breaking force of belt N/mm	Belt with textile inserts (EP) Kg/m ²	Belt with metal inserts Steel Cord (ST) Kg/m ²
200	2.0	-
250	2.4	-
315	3.0	-
400	3.4	-
500	4.6	5.5
630	5.4	6.0
800	6.6	8.5
1000	7.6	9.5
1250	9.3	10.4
1600	-	13.5
2000	-	14.8
2500	-	18.6
3150	-	23.4

The weights are indicative of the belt core with textile or metallic inserts in relation to the class of resistance.

In Tab. 11 the approximate weights of rotating parts of an upper transom troughing set and a lower flat return set are indicated.

The weight of the upper rotating parts q_{RO} and lower q_{RU} is given by :

$$q_{RO} = \frac{P_{prs}}{a_o} \quad [kg/m]$$

where :

P_{prs} = weight of upper rotating parts
a_o = upper troughing set pitch

$$q_{RU} = \frac{P_{pri}}{a_u} \quad [kg/m]$$

where :

P_{pri} = weight of lower rotating parts
a_u = return set roller pitch

Tab.11 - Weight of rotating parts of the rollers (upper/lower)

Belt width mm	Roller diameter mm									
	89		108		133		159		194	
	Pprs	Ppri	Pprs	Ppri	Pprs	Ppri	Pprs	Ppri	Pprs	Ppri
	Kg									
400	—	—	—	—	—	—	—	—	—	—
500	5.1	3.7	—	—	—	—	—	—	—	—
650	9.1	6.5	—	—	—	—	—	—	—	—
800	10.4	7.8	16.0	11.4	—	—	—	—	—	—
1000	11.7	9.1	17.8	13.3	23.5	17.5	—	—	—	—
1200	—	—	20.3	15.7	26.7	20.7	—	—	—	—
1400	—	—	—	—	29.2	23.2	—	—	—	—
1600	—	—	—	—	31.8	25.8	—	—	—	—
1800	—	—	—	—	—	—	47.2	38.7	70.5	55.5
2000	—	—	—	—	—	—	50.8	42.2	75.3	60.1
2200	—	—	—	—	—	—	—	—	—	—

1 Technical Information

project and design criteria for belt conveyors

Belt tension

It is necessary to consider the different tensions that must be verified in a conveyor with a powered belt system.

The sign (=) defines the limiting condition of belt adherence. If the ratio $T_1/T_2 > e^{f_a}$ the belt will slide on the drive pulley and the movement cannot be transmitted.

Tensions T_1 e T_2

The total tangential force F_u at the pulley circumference corresponds to the differences between tensions T_1 (tight side) and T_2 (output side). From these is derived the necessary torque to begin to move the belt and transmit power.

From the above formula we may obtain :

$$T_1 = F_u + T_2$$

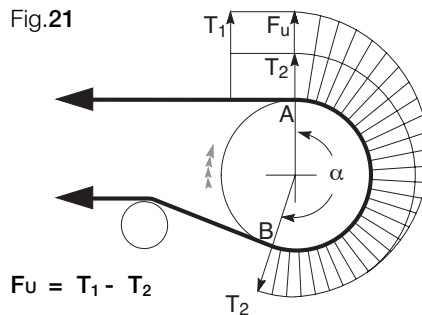
$$T_2 = F_u \frac{1}{e^{f_a} - 1} = F_u \times C_w$$

The value C_w , which defines the wrap factor, is a function of the angle of wrap of the belt on the drive pulley (may 420° when there are double pulleys) and the value of the coefficient of friction f_a between the belt and pulley.

Thus the calculation of the minimum belt tension values is able to be made to the limit of adherence of the belt on the pulley so that the position of a tensioner may be positioned downstream of the drive pulley.

A belt tensioning device may be used as necessary to increase the adherence of the belt to the drive pulley. This will be used to maintain an adequate tension in all working conditions.

On the following pages various types of belt tensioning devices commonly used are described.



Moving from point A to point B Fig. 21 the belt tension changes exponentially from value T_1 to value T_2 .

The relationship between T_1 and T_2 may be expressed :

$$\frac{T_1}{T_2} \leq e^{f_a}$$

where:

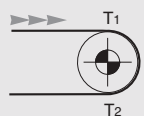
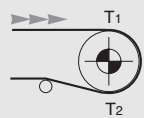
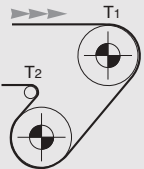
f_a = coefficient of friction between belt and drum, given by the angle of wrap

e = natural logarithmic base 2.718



Tab. 12 gives the value of the wrap factor C_w in relation to the angle of wrap, the system of tensioning and the use of the pulley in a lagged or unlagged condition.

Tab. 12 - Wrap factor C_w

drive arrangement	Angle of wrap α	tension unit or counterweight pulley		screw tension unit pulley	
		unlagged	lagged	unlagged	lagged
	180°	0.84	0.50	1.2	0.8
	200°	0.72	0.42	1.00	0.75
	210°	0.66	0.38	0.95	0.70
	220°	0.62	0.35	0.90	0.65
	240°	0.54	0.30	0.80	0.60
	380°	0.23	0.11	-	-
	420°	0.18	0.08	-	-

Given the values T_1 and T_2 , we may analyse the belt tensions in other areas that are critical to the conveyor. These are :

- Tension T_3 relative to the slack section of the return pulley;
- Tension T_0 minimum at tail end, in the material loading area;
- Tension T_g of the belt at the point of connection to the tension unit device;
- Tension T_{max} maximum belt tension.

Tension T_3

As already defined,

$$T_1 = Fu + T_2 \quad \text{and} \quad T_2 = Fu \times C_w$$

The tension T_3 that is generated at the belt slackside of the tail pulley (Fig. 22) is given from the algebraic sum of the tensions T_2 and the tangential forces Fr relative to a single return section of the belt.

Therefore the tension T_3 is given by :

$$T_3 = T_2 + (Fr_1 + Fr_2 + Fr_3 \dots) \text{ [daN]}$$



Fig. 22

1 Technical Information

project and design criteria for belt conveyors

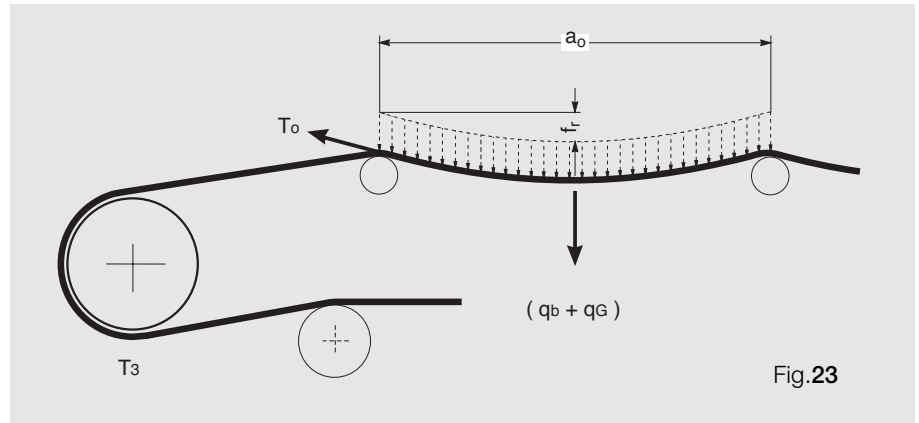


Fig.23

Tension T_0

The minimum necessary tension T_3 at the slack side of the return pulley, besides guaranteeing the belt adhesion to the driving pulley so as to transmit the movement must also guarantee a deflection not superseding 2% of the length of pitch between consecutive troughing sets.

Furthermore the tensions must avoid material spillage from the belt and excessive passive resistance caused by the dynamics of material as the belt travels over the troughing sets Fig. 23.

The minimum tension T_0 necessary to maintain a deflection of 2% is given by the following formula :

$$T_0 = 6.25 (q_b + q_G) \times a_0 \times 0,981 \quad [\text{daN}]$$

where:

- q_b = total belt weight per linear metre
- q_G = weight of conveyed material per linear metre
- a_0 = pitch of troughing sets on upper strand in m.

The formula derives from the application and essential simplification of theory, when considering "catenaries".

To alter as desired the deflection to a value less than 2 %, the figures 6.25 may be substituted by :

- for 1.5 % deflection = 8,4
- for 1.0 % deflection = 12,5

In order to have a tension able to guarantee the desired deflection, it will be necessary to apply a tensioning device, also effecting the tensions T_1 and T_2 to leave unchanged the circumferential force $F_u = T_1 - T_2$.

Tension T_g and tensioning devices

Tension devices used generally on belt conveyors are screw type or counterweight. The screw type tension unit is positioned at the tail end and is normally applied to conveyors where the centres are not more than 30 / 40 m.

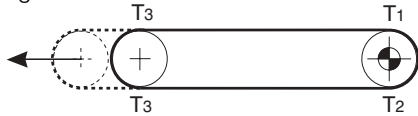
Where conveyors are of larger centres the counterweight tension unit is used or winch style unit where space is at a premium.

The tension unit minimum movement required is determined as a function of the type of belt installed, that is :

- the stretch of a belt with textile core needs a minimum 2 % of the conveyor centres;
- the stretch of a belt with metal or steel core needs a minimum of 0.3 + 0.5 % of the conveyor centres.

Typical tension device

Fig.24



In this arrangement the tension is regulated normally with the occasional periodic check of the tensioning screw.

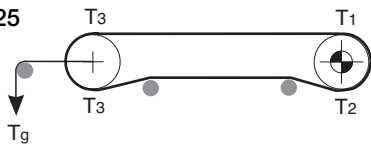


Maximum tension (T_{max})

This is the belt tension at the point where the conveyor is under the greatest stress.

Normally it is coincidental in value with tension T₁. Along the length of a conveyor with variable height change and in particular where conditions are variable and extreme, T_{max} may be found in different sections of the belt.

Fig.25

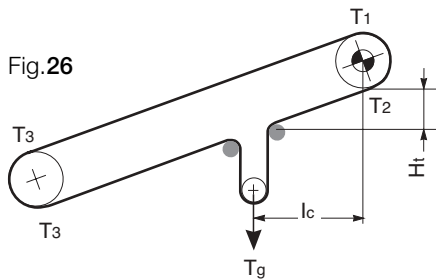


In this arrangement the conveyor is tensioned using a counterweight.

$$T_g = 2 (T_3) \quad [\text{daN}]$$



Fig.26



Also in this arrangement the conveyor is tensioned using a counterweight.

$$T_g = 2T_2 + 2 [(l_c \times C_q \times C_t \times f) (q_b + q_{Ru}) \pm (H_t \times q_b)] 0,981 \quad [\text{daN}]$$

In which:

- l_c = distance from centre of drive pulley to the counterweight attachment point
- H_t = belt height change from the point where the counterweight applies itself to the point where the belt exits from the slack side of the pulley, measured in metres.

Correct dimensioning verification

The belt will be adequately dimensioned when the essential tension T₀ (for the correct deflection of the belt) is less than the calculated tension T₃ the tension T₂ has always to be T₂ ≥ Fu x Cw and is calculated as T₂ = T₃ ± Fr (where T₃ ≥ T₀)

Working load and belt breaking strain

T_{max} is used to calculate the unitary maximum tension of the belt T_{Umax} given that:

$$T_{Umax} = \frac{T_{max} \times 10}{N} \quad [\text{N/mm}]$$

where:

N = belt width in mm;

T_{max} = tension at the highest stress point of the belt in daN.

As a security factor one may consider the maximum working load of the belt with textile core to correspond to 1/10 of the breaking load of the belt (1/8 for a belt with steel core).

1 Technical Information

project and design criteria for belt conveyors



1.5.6 - Belt conveyor drives and pulley dimensions

Type of drives

Conveyors requiring power up to 132 kW are traditionally driven at the head pulley with electric motor, gearbox, pulley, guards, transmission accessories etc., or, alternatively by motorised pulley. Fig.27.

In the drawings Fig.28 a comparison is made between the space needed for two drive systems.

Belt conveyors that need power over 132 kW utilise the conventional drive pulley arrangement but also with two or more motor gearboxes.

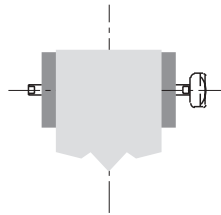


Fig.27

The motorised pulley is used today more and more as the drive for belt conveyors thanks to its characteristics and compactness. It occupies a minimal space, is easy to install, its motor is protected to IP67, all working parts are inside the pulley and therefore it needs very limited and occasional maintenance (oil change every 10,000 working hours).

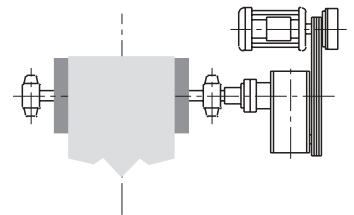
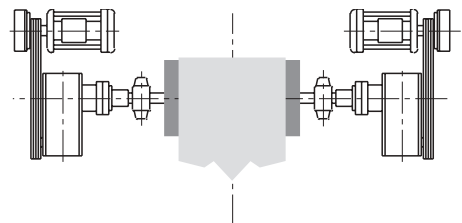


Fig.28



Pulley diameters

The dimensioning of the diameter of a head pulley is in strict relationship to the characteristics of the type of belt used.

In *Tab. 13* the minimum diameters recommended in relation to the type of belt used are indicated, avoiding damaging delayering of the belt layers or laceration of the reinforcing fabric.



Tab. 13 -Minimum pulley diameters recommended

belt breaking load N/mm	belt with textile core EP DIN 22102			belt with steel core ST DIN 22131		
	Ø motorised pulley mm	return pulley	direction change drum	Ø motorised pulley mm	return pulley	direction change pulley
200	200	160	125	-	-	-
250	250	200	160	-	-	-
315	315	250	200	-	-	-
400	400	315	250	-	-	-
500	500	400	315	-	-	-
630	630	500	400	-	-	-
800	800	630	500	630	500	315
1000	1000	800	630	630	500	315
1250	1250	1000	800	800	630	400
1600	1400	1250	1000	1000	800	500
2000	-	-	-	1000	800	500
2500	-	-	-	1250	1000	630
3150	-	-	-	1250	1000	630

Minimum diameters recommended for pulleys in mm up to 100% of the maximum working load as recommended RMBT ISO bis/3654

This table must not be applied to belt conveyors that convey material with a temperature over +110 °C or for conveyors installed where the ambient temperature is less than - 40 °C.

1 Technical Information

project and design criteria for belt conveyors

Sizing of the drive pulley

The shaft of the drive pulley is subject to alternating flexing and torsion, causing fatigue failure.

To calculate correct shaft diameter it is necessary to determine the bending moment M_f and the torsion moment M_t .

The bending moment of the shaft is generated as a result of the sum of the vector of tensions T_1 and T_2 and the weight of the pulley itself q_T Fig.29.

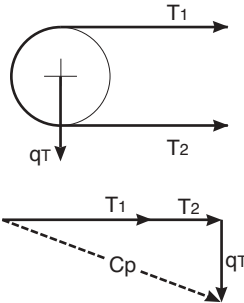


Fig.29

The dimensioning of the shaft diameter requires the determination of various values.

These are: the resultant of tensions C_p , the bending moment M_f , torsional moment M_t , the ideal bending moment M_{if} and the module of resistance W .

Proceeding in order we have:

$$C_p = \sqrt{(T_1 + T_2)^2 + q_T^2} \quad [\text{daN}]$$

$$M_f = \frac{C_p}{2} \times a_g \quad [\text{daNm}]$$

$$M_t = \frac{P}{n} \times 954,9 \quad [\text{daNm}]$$

where:

P = absorbed power in kW
 n = r.p.m. of the drive pulley



$$M_{if} = \sqrt{M_f^2 + 0,75 \times M_t^2} \quad [\text{daNm}]$$

$$W = \frac{M_{if} \times 1000}{\sigma_{amm.}} \quad [\text{mm}^3]$$

$$W = \frac{\pi}{32} \times d^3 \quad [\text{mm}^3]$$

from the combination of simultaneous equations we may discover the diameter of the shaft as follows :

$$d = \sqrt[3]{\frac{W \times 32}{\pi}} \quad [\text{mm}]$$

Tab.14 - Suggested value of σ

Steel type	daN/mm ²
38 NCD	12,2
C 40 Tempered	7,82
C 40 Normalised	5,8
Fe 37 Normalised	4,4

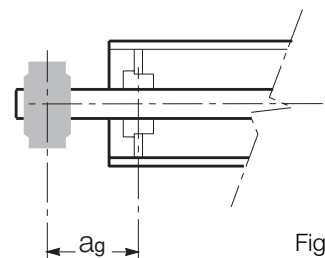


Fig.30



Sizing of the tail or return pulley shaft and change direction pulley.

In this case only shaft flexure must be considered, torsional loads are not a factor in fatigue failure.

The bending moment M_f must be determined as generated by the resultant of the sum of the vectors of belt tensions where the belt is before or after the pulley and the weight of the pulley itself.

In this case, treating the pulley as an idler one may consider $T_x = T_y$

In Fig.31 and 32 various arrangements for an idler return pulley are indicated.

The bending moment is given by:

$$M_f = \frac{C_{pr}}{2} \times a_g \quad [\text{daNm}]$$



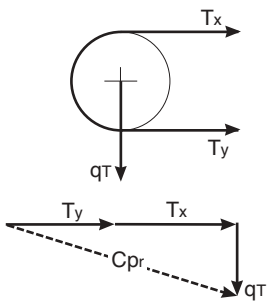
Limits of deflection and angle for drive and idler pulleys

After having sized the shafts of different pulleys, one is required to verify that the deflection and angle of the shaft does not exceed certain values.

In particular the deflection f_t and the angle α_t must respect the relationship:

$$f_{t \max} \leq \frac{C}{3000} \quad \alpha_t \leq \frac{1}{1000}$$

Fig.31 - Tail or return pulley



the module of resistance is found from :

$$W = \frac{M_f \times 1000}{\sigma_{amm.}} \quad [\text{mm}^3]$$

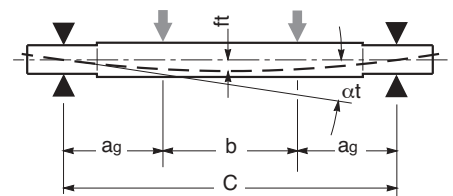
given the module of resistance:

$$W = \frac{\pi}{32} \times d^3 \quad [\text{mm}^3]$$

the diameter of the shaft is given by:

$$d = \sqrt[3]{\frac{W \times 32}{\pi}} \quad [\text{mm}]$$

Fig.33



$$f_t = \frac{(C_{pr}/2)a_g}{24E_xJ} [3(b+2a_g)^2 - 4a_g^2] \leq \frac{C}{3000}$$

$$\alpha_t = \frac{(C_{pr}/2)}{2xE_xJ} a_g (C - a_g) \leq \frac{1}{1000}$$

where:

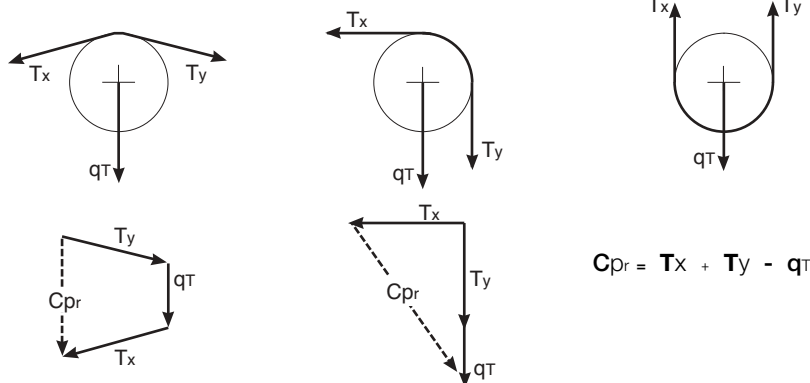
a_g = expressed in mm

E = module of elasticity of steel
(20600 [daN/mm²])

J = sectional moment of inertia of the shaft
(0,0491 D⁴ [mm⁴])

C_{pr} = load on shaft [daN]

Fig.32 -Change direction pulley



1 Technical Information

project and design criteria for belt conveyors



1.6 - Rollers, function and design criteria

In a conveyor, the elastomer belt represents the most perishable and costly item. The rollers that support the belt along its length are no less important, and therefore they should be designed, chosen and manufactured to optimise their working life and that of the belt itself.

The resistance to start up and rotation of rollers has a great influence on the belt and in consequence to the necessary power to move the belt and keep it moving.

The body of the roller and that of its end caps, the bearing position and its accompanying system of protection, are the principal elements which impact the life and torque characteristics of the roller.

Refer to chapter 2 where the construction criteria of rollers for belt conveyors are presented along with the factors which must be taken into account for a correct project design.



In the following sections we should examine other factors such as the :

- balance and start up resistance;
- tolerances;
- type of roller shell; characteristics of the tube and thickness
 - the fitting of the end caps;
- frictional resistance and impact resistance;

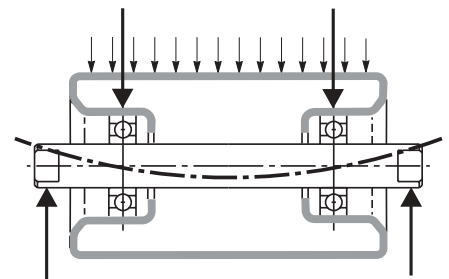


Fig. 34

- type of bearing
 - protection system
 - fit to the spindle and end caps
 - lubrication
 - alignment;
- spindle : characteristics and manufacturing tolerances.

1.6.1 - Choice of roller diameter in relation to speed

We have already stated that one of the important factors in the design of a conveyor is the speed of the belt movement in relation to the load conditions required.

From the belt speed and roller diameter we are able to determine the revolutions per minute of the roller using the formula :

$$n = \frac{v \times 1000 \times 60}{D \times \pi} \text{ [r.p.m]}$$

where:

D = roller diameter [mm]

v = belt speed [m/s]

Tab.15 gives the existing relationship between maximum belt speed, roller diameter and the relative r.p.m.

In choosing the roller it is interesting to note that even if a roller of larger diameter exhibits a higher inertia on start up, it actually yields, other conditions being equal, many advantages such as : less revolutions per minute, less wear of bearings and housing, less rolling friction and reduced wear between the roller and the belt.

Tab. 15 - Maximum speed and numbers of roller revolutions

Roller diameter mm	Belt speed m/s	r.p.m. 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 consideration the belt width. *Tab.16* shows the diameter of rollers in relation to belt width.

Tab.16 - Roller diameter advised

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 e oltre	194			194			194		

One may have indicated more diameters where the choice will be made in relation to the material lump size and the severity of working conditions.

1 Technical Information

project and design criteria for belt conveyors

1.6.2 - Choice in relation to load

The type and dimensions of rollers used in belt conveyors depends mainly on the width of the belt itself, the pitch of the troughing sets, and above all, the maximum load on the rollers most under pressure, not withstanding other correction factors.

The calculation of load forces is normally made by the project designer of the plant. Nevertheless, as a check or in the case of simple conveyors, we present the following concepts for determining the facts.

The first value to define is the load on the troughing sets. Following this, depending on the type of troughing set (carrying, return or impact), the number of rollers in a transom or frame, the angles of the side

roller, the material lump size and other relevant factors as listed below. One is able to calculate the roller load with the maximum force for each type of troughing set.

Furthermore there are some correction factors keeping count of the plant working hours per day (service factor), of the environmental conditions and of the speed for the different diameters of the rollers.


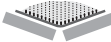
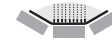



The load value obtained in this way may be compared with the load capacity of the rollers indicated in this catalogue valid for a project life of 30.000 hours. For a theoretically different life, the load capacity may be multiplied by a coefficient reported on *Tab.22* corresponding to life required.



Principal relevant factors:

lv	= belt load	t/h
v	= belt speed	m/s
a_o	= pitch of the troughing sets upper strand	m
a_u	= pitch of the return roller set	m
q_b	= weight of belt per linear metre	Kg/m
F_p	= participation factor of roller under greatest stress see <i>Tab.17</i> (depends on the angle of the roller in the transom)	
F_d	= impact factor see <i>Tab.20</i> (depends on the material lump size)	
F_s	= service factor see <i>Tab.18</i>	
F_m	= environment factor see <i>Tab.19</i>	
F_v	= speed factor see <i>Tab. 21</i>	

Tab. 17 - Participation factor F_p

0°	20°	20°	30°	35°	45°
					
1,00	0.50	0.60	0.65	0.67	0.72

Tab. 18 - Service factor

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 - Environment factor

Conditions	Fm
Clean and regular maintenance	0.9
Abrasive or corrosive material present	1.0
Very abrasive or corrosive material present	1.1

Tab. 20 - Impact factor Fd

Material 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 in 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	1.5
300 ÷ 450 mm	1.2	1.32	1.5	1.7	1.9	2.3	2.8

Tab. 21 - Speed factor 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	1.0

Tab. 22 - Coefficient of theoretical life of bearing

Theoretic project life of bearing	10'000	20'000	30'000	40'000	50'000	100'000
Coefficient with base 30'000 hours	1.440	1.145	1.000	0.909	0.843	0.670
Coefficient with base 10'000 hours	1	0.79	0.69	0.63	---	---



1 Technical Information

project and design criteria for belt conveyors



Load calculation

Having defined the roller diameter in relation to the speed and the number of revolutions one may then proceed to calculate the static load on the carrying set using the following formula :

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

Multiplying then by a working factor we have the dynamic load on the transom :

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

Multiplying then by the participation factor one may obtain the load on the roller carrying the most force (central roller in the case of a troughing set transom where all the rollers are of equal length) :

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

The static load on the return roller set, not having any material load present, is given by the following formula ;

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

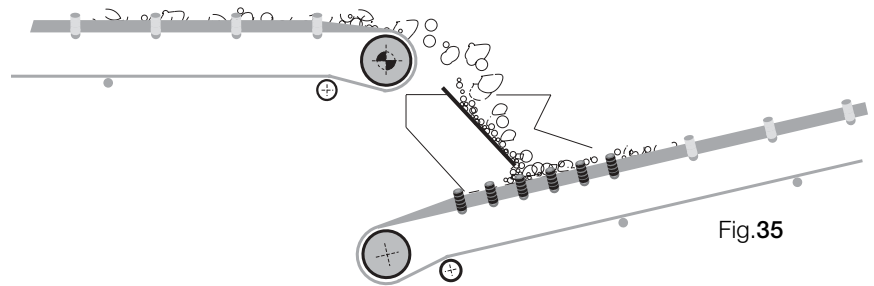
The dynamic load on the return roller set will be :

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

And the load on the rollers of the return roller set, single or double, will be :

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

Given the values of “ca” and “cr” one may look in the catalogue for rollers (first by diameter) that have a sufficient load capacity.



1.7 - Loading of belt and impact rollers

The feed system of material falling or dropping onto a belt conveyor must be constructed to minimise or eliminate impact damage to the belt material and surface. This is of particular importance when the material falls from a considerable height and consists of large lumps with sharp edges. The rollers supporting or carrying the belt in the loading zone are normally installed as impact design (with rubber rings), mounted onto troughing set frames set close to each other. In this way the belt is supported in a flexible manner.

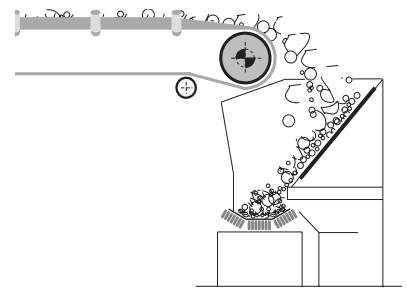


Fig.36

It is a widely held view that the use of suspension sets of the "garland" design-Fig.37-38, thanks to their intrinsic flexible characteristics absorb with great efficiency the impact of materials falling onto the belt and, what is more, the "garland" is able to adapt to conform to the shape of the charge (or load).

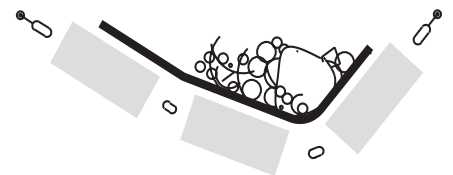


Fig.37

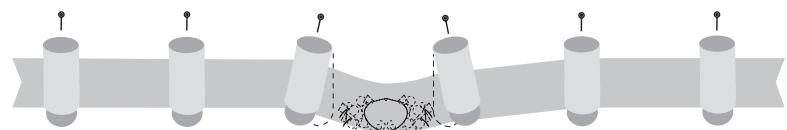


Fig.38

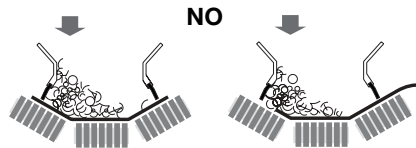
1 Technical Information

project and design criteria for belt conveyors

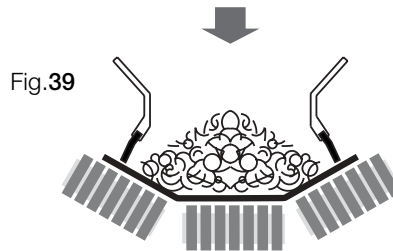
Particular attention must be paid at the project stage to the feed system and to the design of impact troughing sets.

The project designer of the conveyor system must take into account that :

- the impact of material onto the belt must take place in the conveyor direction and at a speed that approximates to the speed of the belt.



- the loading hopper is positioned so that material falling from it is deposited as near as possible to the centre of the belt.



Please refer to chapter 3 of this catalogue for greater detail regarding the programme of the design of impact rollers with rubber rings of high shock absorbing qualities and for the programme of suspension sets as “garland” design.

1.7.1 - Calculation of associated forces on impact rollers

The definition of the correct load fall height H_c may be given by the following formula :

$$H_c = H_f + H_v \times \text{sen}^2 \gamma$$

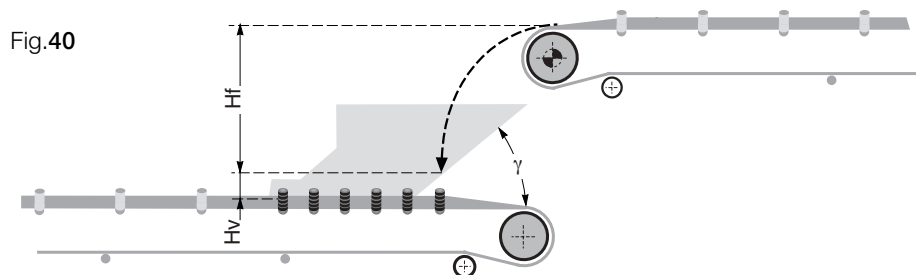
where:

- H_f = fall height from the upper face of the loading belt to the contact point of material contained in the hopper ;
- H_v = height from the contact point of material contained in the hopper to the belt face of the lower belt ;
- γ = hopper inclination angle.

In the choice of impact rollers we propose to follow two significant design aspects :

- the height that the material falls must be reduced to the minimum possible, compatible with the requirements of the plant design.

- constant loading with uniform fine material
- loading with material consisting of large lumps.



Constant loading with uniform fine material.

Impact rollers must be designed not only to carry the load of material arriving on the belt (as in a normal carrying troughing set) but also the impact load from falling material.

For loose, homogenous fine material the impact force p_i , given the corrected fall height, is calculated according to the following formula :

$$p_i \cong l_v \times \frac{\sqrt{H_c}}{8} \quad [\text{Kg}]$$

where:

l_v = flow of material in t/hr (the belt load capacity)

The force acting on the central roller p_{ic} , clearly the roller with the most stress, is obtained on consideration of the previously mentioned participation factor F_p . Various factors depend principally on the angle λ which is the side roller angle:

$$p_{ic} \cong F_p \times p_i = F_p \times l_v \times \frac{\sqrt{H_c}}{8} \quad [\text{Kg}]$$

One assumes as a rule:

$F_p = 0.65$ per $\lambda = 30^\circ$

$F_p = 0.67$ per $\lambda = 35^\circ$

$F_p = 0.72$ per $\lambda = 45^\circ$

Example:

Let us calculate the central roller load in a transom, given that the loading of the material onto the belt is: $l_v = 1800$ t/h, $H_c = 1.5$ m and $\lambda = 30^\circ$:

$$p_i = 1800 \times \frac{\sqrt{1.5}}{8} = 275 \text{ Kg}$$

On the central roller we have:

$$p_{ic} = F_p \times p_i = 0.65 \times 275 = 179 \text{ Kg}$$

Adding to this load value as considered on a horizontal belt we may obtain the total load on the troughing set central roller.

Refer to the paragraph "roller choice" for design characteristics of the most suitable roller.

Loading with material consisting of large lumps.

The force of dynamic load p_d on the central roller may be calculated using G_m which is the weight of large blocks of single lumps of material and takes into account the elasticity C_f of the transom and rollers.

$$p_d \cong G_m + \sqrt{(2 \times G_m \times H_c \times C_f)} \quad [\text{Kg}]$$

where:

G_m = weight of large lumps of material [Kg]

H_c = corrected fall height [m]

C_f = elasticity constant of the transom/ impact rollers.

The impact force is considered as distributed over the 2 bearings of the central load carrying roller.

The approximate weight of the lump may be extracted from the graph in Fig.41: one may note that as well as taking the length into account the weight depends on the form of the lump itself.

The graph of Fig.42 records the constant of elasticity for the most commonly used systems of support and shock absorbing (fixed troughing sets with steel rollers, fixed troughing sets with rollers with rubber rings, troughing sets with "garland" suspension design) and the impact forces resultant on the roller for varying drop energies of the falling load $G_m \times H_c$.

The graph shows above all the static load on the roller bearings derived from $G_m \times H_c$ but with a safety factor 2 and 1.5.



The coefficient of elasticity depends on various factors such as the type of rubber used in the rings, length and weight of the rollers, number and articulation of the suspension set as a "garland", and type and elasticity of the flexible parts used by the stock absorbing supports.

The calculation of the dynamic load force p_d must fore cast an accurate valuation of these factors.

Example :

A load of 100 Kg falls from a height H_c of 0.8 m onto a suspension "garland" style set, with rollers made from normal steel (coeff, C_f hypothetically 20,000 Kg/m = 200 Kg / cm).

Calculation of the drop energy :

$$G_m \times H_c = 100 \times 0.8 = 80 \text{ Kgm}$$

Calculating from the table the dynamic force of fall :

$$p_d = 1800 \text{ Kg.}$$

Assuming a safety factor of 2 we must have bearings that may withstand a static load of 1800 Kg; (2 bearings) that is rollers from series PSV7 (bearings 6308; $C_o = 2400$ Kg).



1 Technical Information

project and design criteria
for belt conveyors

Fig.41 - Weight of lump of material

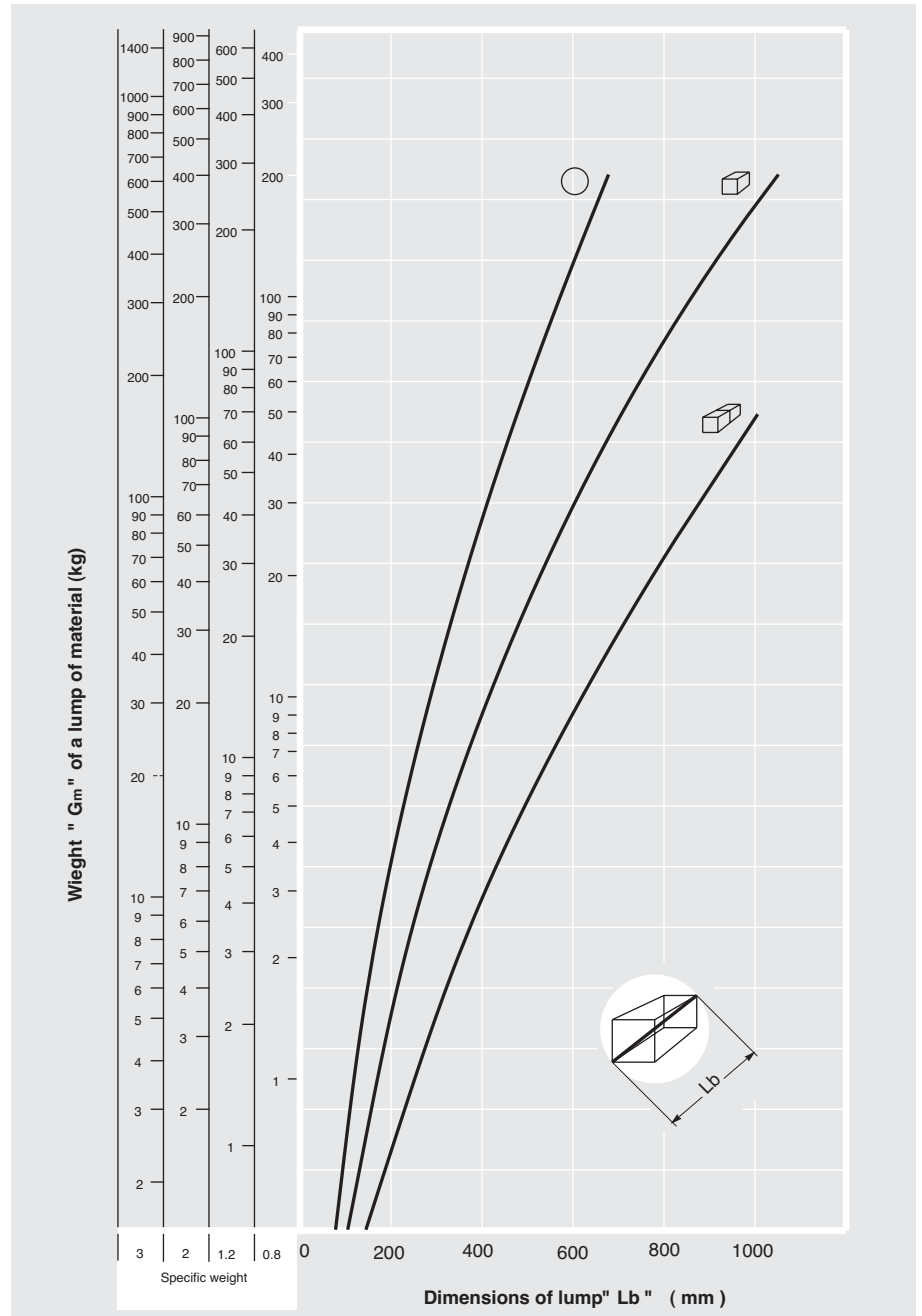
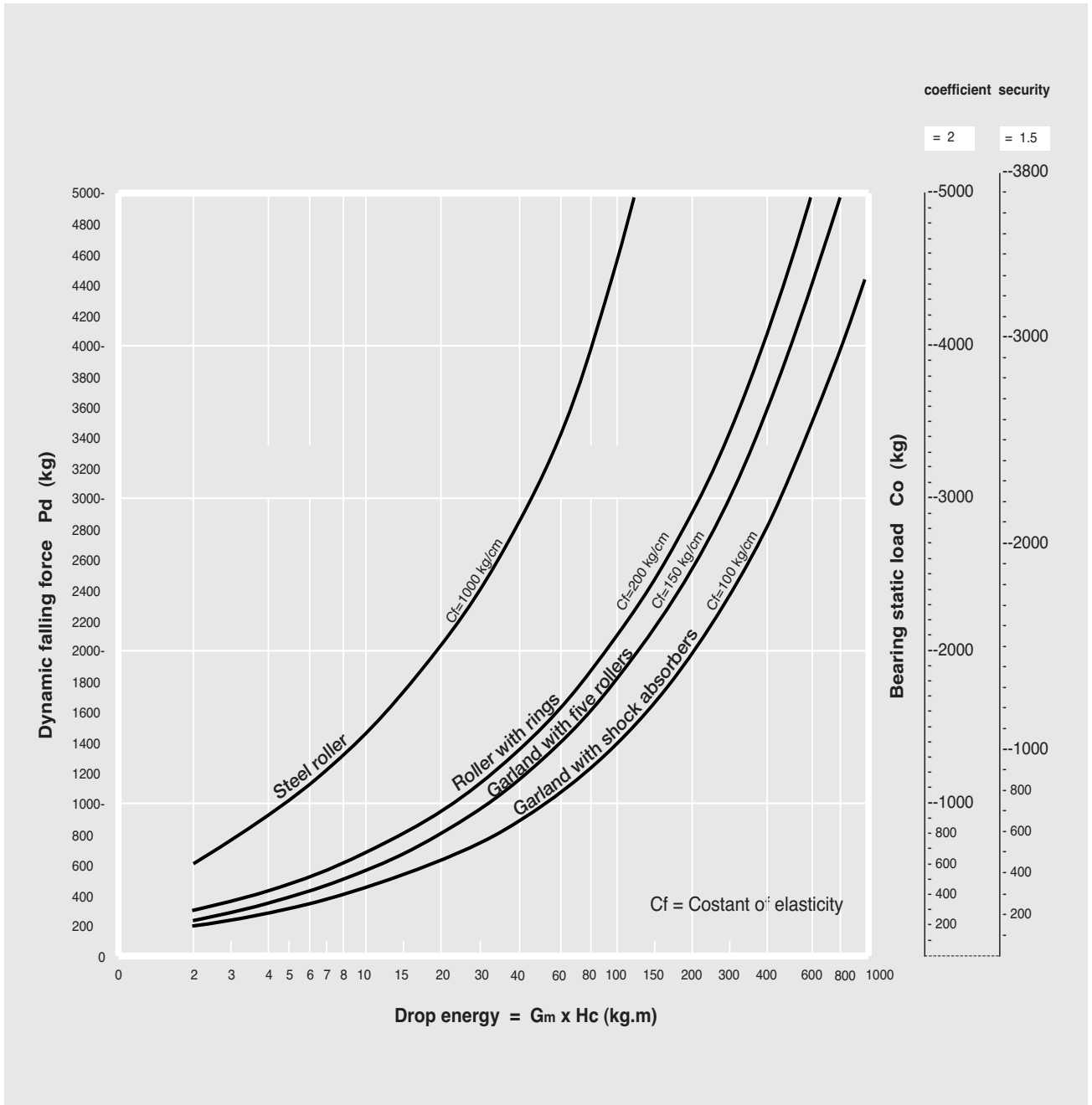


Fig.42 - Constant of elasticity Cf



1 Technical Information

project and design criteria for belt conveyors

1.8 - Other accessories

Amongst all of other conveyor components, the belt cleaning system and covers are regarded in certain situations, of fundamental importance and must be considered at an early stage in the project design of the conveyor itself.

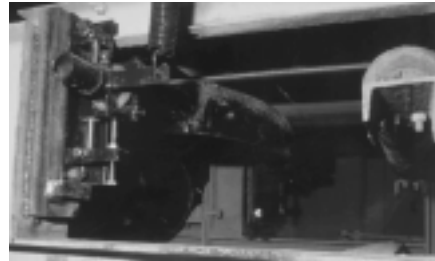
There are a variety of devices used for belt cleaning. The majority of these may be divided into two groups : static and dynamic.

1.8.1 - Belt cleaners

Savings in utilising efficient systems of belt cleaning may be amply demonstrated, in particular resulting from a reduction in belt maintenance time and increased production, proportional to the quantity of material recovered in the process and a large increase in the life of moving parts.



Fig.44



The static systems that are utilised the most are the most diverse as they may be applied along all positions on the dirty side of the belt. They are acting directly on the belt using a segmented blade. Fig. 44

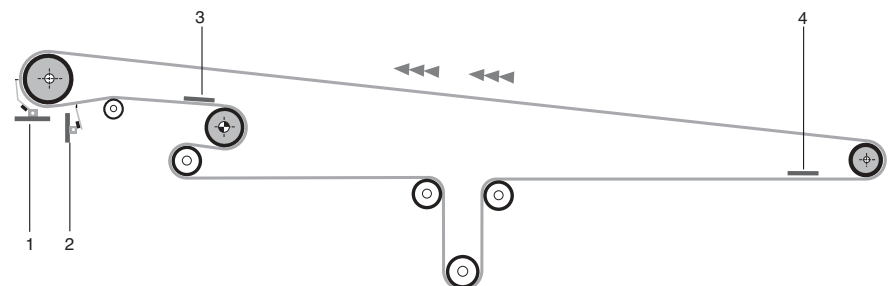


Fig.43 - Ideal positions for the installation of cleaning devices

1 on drive pulley

2 at about 200mm after the tangential point where belt leaves pulley

3 on internal side of belt on the return section and before the snub pulleys or directional change pulley.

4 on internal side of belt before the return pulley.

The dynamic systems where motors are used are of less variety and more costly in terms of capital cost, installation and commissioning.

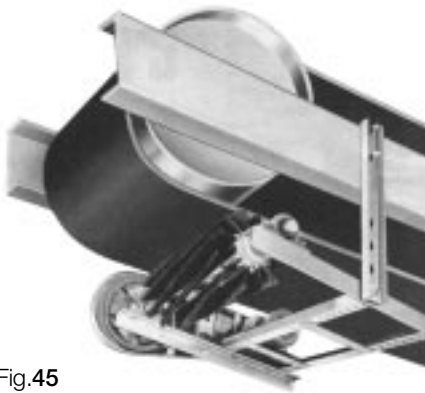


Fig.45

They consist of pulleys or motorised pulleys on which are assembled or fixed special brushes, that are then in direct contact with the belt. Fig.45

Other cleaners are those of plough or deviator design that are applied to the inside strand of the belt return section.



Fig.46

They are used to remove material deposited before the drive and return pulleys or certain other points where the material may become trapped between the pulley and belt, affecting the orderly tracking of the belt. Fig.46.



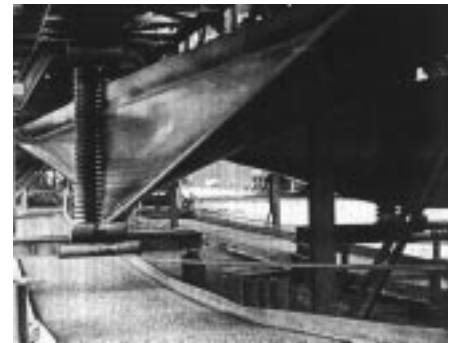
Fig.47

1.8.2 - Belt inversion

On return sections of the belt on very long conveyors, the belt is turned over 180° to reduce the phenomena of adhesion of material residue on the rollers and on the cross member of the troughing sets. The return strand of the belt may be turned over 180° after the drive drum and subsequently turned to its original position before the return drum.

Turning the belt over is generally effected by means of a series of rollers orientated as required. The minimum length to turn over a belt is generally about 14/22 times its width..

The rollers on the return set, thanks to this device, are no longer in contact with the carrying upper strand of the belt which is encrusted with material residue.



1.8.3 - Belt conveyor covers

After having defined the components of primary importance the project designer considers secondary accessories, such as covers.

The necessity to protect the belt conveyor is dictated by the climate, the characteristics of the conveyed material (dry, light, "volatile") and the type of plant.



1 Technical Information

project and design criteria for belt conveyors



1.9 - Project examples of a belt conveyor

To clarify our presentation of critical tensions in various sections of the belt conveyor here is a project example.

The relative data concerning the conveyed material and its physical / chemical characteristics are as follows :

Material:

- clinker of cement (Tab. 2 pag.20)
- specific weight: 1.2 t/m³
- lump size 80 to 150 mm
- abrasiveness: very abrasive
- angle of friction natural or at rest : ~ 30°

Required load:

$lv = 1000$ t/h corresponding to the volumetric load
 $l_M = 833$ m³/h

Plant characteristics :

- centres 150 m
- change of height $H = + 15$ m (rising)
- inclination = 6°~
- working conditions : standard
- utilisation : 12 hours per day

From the data supplied we are able to calculate :
 speed, belt width, design and type of conveyor troughing sets.

Furthermore we may define : the belt tensions in various critical areas and from these the absorbed power and the belt type.

Speed and belt width

From *Tab. 3* (pag.23) we are able to define that the said material may be grouped into B and given that the lump size is 80/150 mm the maximum advised speed results as 2,3 m/s.

From *Tab. 5* (pag.26-30) we may evaluate which type and design of carrying troughing sets are needed, given the speed just found, that satisfies the volumetric load l_M required as 833 m³/h.

To obtain the result one must calculate the volumetric load lv_T (for the speed $v = 1$ m/s) given the inclination of the conveyor $\delta = 6^\circ$.

$$lv_T = \frac{l_M}{v \times K \times K_1} \quad [m^3/h]$$

in which:

l_M = volumetric load

v = belt speed

K = correction coefficient to suit the inclination 6°: 0,98 (diagram Fig 8 pag.31).

K_1 = correction coefficient to suit the feed irregularity : 0,90 (pag.31)

Substituting we have:

$$l_{VT} = \frac{833}{2,3 \times 0,98 \times 0,90} = 410 \text{ m}^3/\text{h}$$

Given the angle of repose of the material in question is about 30° from *Tab. 1* pag.19 we may deduce that the angle of surcharge would be established in the order of 20°.

Having chosen a carrying troughing set with a transom side roller angle of $\lambda = 30^\circ$, the belt width that meets the load requirement l_{VT} of 410 m³/h at 1 m/s is 1000 mm.

Troughing set pitch

The pitch may be chosen as a function of the deflection of the belt between two consecutive troughing sets.

Tab. 6 pag.34 shows how to determine the maximum pitch of troughing sets, as a function of the belt width and the specific weight of the conveyed material.

We need to verify that the deflection does not supersede 2% of the pitch.

A greater deflection may give rise to material mass deformation during the belt movement, and consequently elevated friction.

Then we would be able to determine a major factor: that is major power absorption, giving rise to unusual stresses whether on the rollers or in the belt over and above the premature wear in the cover of the belt.

In our example, given that the belt width is 1000 mm with specific weight of material of 1.2 t/m³ the tables indicate that :

- for the carrying troughing sets the advised pitch is that of 1.2 m

- for the return sets the advised pitch is that of 3.0 m.

Roller choice

In *Tab. 16* pag.49 with a belt of 1000 mm and a speed of 2.3 m/s we may choose rollers with diameter 108 mm.

We may now proceed to determine the load falling on the roller in the carrying strand and those of the return strand.

Assuming we may use a belt with a resistance class equal to 315 N/mm, with cover thickness 4+2, and with a value q_b of 9,9 kg/m, we have:

- for carrying rollers the static load will be:

$$Ca = a_o \times (q_b + \frac{l_v}{3,6 \times v}) \times 0,981 \text{ [daN]}$$

$$Ca = 1,2(9,9 + \frac{1000}{3,6 \times 2,3}) \times 0,981 = 153,8$$

the dynamic load will be:

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

$$Ca_1 = 153,8 \times 1,03 \times 1,1 \times 1 = 174,2$$

where:

$$Fd = 1,03 \text{ from table 20, pag.51}$$

$$Fs = 1,10 \text{ from table 18, pag.51}$$

$$Fm = 1 \text{ from table 19, pag.51}$$

the load on the central roller of a carrying troughing set is given by :

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

$$ca = 174,2 \times 0,65 = 113,2$$

where from *Tab. 17* pag.50 the participation factor of a troughing set 30° $Fp = 0,65$

- for the return rollers the static load will be:

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

$$Cr = 3 \times 9,9 \times 0,981 = 29,2$$

the dynamic load will be:

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

$$Cr_1 = 29,2 \times 1,1 \times 1 \times 0,97 = 31,2$$

where:

$Fv = 0,97$ speed factor (it has been considered that relative to 2,5 m/s see *Tab. 21*, pag.51)

choosing the return troughing set with plain roller the load on the return roller will be :

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

$$cr = 31,2 \times 1 = 31,2$$

where from *Tab. 17* the participation factor with return plain roller set $Fp = 1$



We are able therefore to choose a belt 1000 mm, the rollers for carrying and return idlers both of loaded and return belt (see Chapter 2)

- rollers for carrying idlers type PSV/1, ϕ 108 mm, with bearings 6204 of length C = 388 mm with load capacity 148 Kg that satisfies the required loading of 113,2 Kg ,

- return roller type PSV/1, ϕ 108 mm , with bearings 6204, length C=1158 mm with load capacity 101 Kg that satisfies the required loading of 31,2 Kg.



1 Technical Information

project and design criteria for belt conveyors

Tangential force and absorbed power

We may now determine the total tangential force F_u at the drum periphery extracting the values q_{RO} , q_{RU} and q_G .

given:

- $D = 108$ roller diameter
- $f = 0,017$ friction coefficient inside material and of the rotating parts (*Tab. 9* pag.38)
- $C_q = 1,5$ fixed coefficient of resistance (*Tab. 7* pag.38)
- $q_b = 9,9$ Kg/m (utilising a belt resistance class 315 N/mm with a cover thickness 4+2 *Tab. 10* pag.39)
- $C_t = 1$ coefficient of passive resistance given by the temperature (per $q_{RO} - q_{RU}$ vedi *Tab.11* pag.39)

$$q_{RO} = \frac{\text{weight of rotating parts upper troughing set}}{\text{pitch of upper sets}} = \frac{17,8}{1,2} = 14,8 \text{ Kg/m}$$

$$q_{RU} = \frac{\text{weight of rotating parts lower troughing set}}{\text{pitch of upper sets}} = \frac{13,3}{3,0} = 4,4 \text{ Kg/m}$$

$$q_G = \frac{l_v}{3,6 \times v} = \frac{1000}{3,6 \times 2,3} = 120,8 \text{ Kg/m}$$

The total tangential force F_u is given by the algebraic sum of the tangential forces F_a and F_r relative to upper and lower sections of belt for which:

$$F_u = F_a + F_r \quad [\text{daN}]$$

$$F_a = [L \times C_q \times f \times C_t (q_b + q_G + q_{RO}) + H \times (q_G + q_b)] \times 0,981 \quad [\text{daN}]$$

$$F_a = [150 \times 1,5 \times 0,017 \times 1 (9,9 + 120,8 + 14,8) + 15 \times (120,8 + 9,9)] \times 0,981 = 2469$$

$$F_r = [L \times C_q \times f \times C_t (q_b + q_{RU}) - (H \times q_b)] \times 0,981 \quad [\text{daN}]$$

$$F_r = [150 \times 1,5 \times 0,025 \times 1 (9,9 + 4,4) - (15 \times 9,9)] \times 0,981 = -92$$

$$F_u = F_a + F_r = 2469 + (-92) = 2377$$

We consider an efficiency of the reduction gear and of possible transmissions as $\eta = 0,86$ will be :

$$P = \frac{F_u \times v}{100 \times \eta} \quad [\text{kW}] = \frac{2377 \times 2,3}{100 \times 0,86} \cong 64 \text{ kW}$$



Tensions T₁ - T₂ - T₃ - T₀ - T_g

Let us propose to design a conveyor driven by a single driving pulley, rubber covered and positioned at the head, given that the snub pulleys are positioned to give a wrap angle of 200°; a tension device with counterweight positioned at the tail.

From *Tab. 12* pag. 41 one may determine the wrap factor $C_w = 0,42$.

The tension downstream from the drive pulley is given by :

$$T_2 = F_u \times C_w \quad [\text{daN}]$$

$$T_2 = 2377 \times 0,42 = 998$$

The maximum tension upstream of the drive pulley will be :

$$T_1 = F_u + T_2 \quad [\text{daN}]$$

$$T_1 = 2377 + 998 = 3375$$

While the tension downstream of the return pulley is :

$$T_3 = T_2 + F_r \quad [\text{daN}]$$

$$T_3 = 998 - 92 = 906$$

To derive the maximum deflection between two consecutive carrying troughing sets equal to 2% we must apply the following formula :

$$T_0 = 6,25 (q_b + q_G) \times a_0 \times 0,981 \quad [\text{daN}]$$

$$T_0 = 6.25 \times (120,8 + 9,9) \times 1,2 \times 0,981 = 961$$

The tension T_3 is lower than the T_0 therefore we have to provide a counterweight dimensioned to obtain the tension T_0 .

We have therefore to assume $T_3 = T_0$ and we have to recalculate consequently the tensions T_2 and T_1 that result:

$$T_2 = 1053 \text{ daN}$$

$$T_3 = 3430 \text{ daN}$$

One may now determine the tension “ T_g ” in the belt at the tension unit connection point.

The plant project data has foreseen a counterweight tension unit positioned at the conveyor tail end.

The counterweight load T_g necessary to maintain the system in equilibrium is given by :

$$T_g = 2 \times T_3 \quad [\text{daN}]$$

$$T_g = 2 \times 961 = 1922$$

Belt choice

Given the maximum working tension of the conveyor: $T_1 = 3375 \text{ daN}$.

The unitary working tension of the belt for mm of width is given by:

$$T_{U \max} = \frac{T_{\max} \times 10}{N} \quad [\text{N/mm}]$$

$$T_{U \max} = \frac{3430 \times 10}{1000} = 34,3 \text{ N/mm}$$

The breaking load of the belt will correspond with the working load multiplied by a security factor “8” for belts with steel inserts and “10” for belts with textile inserts. In our case we may proceed to choose a belt with resistance equal to 400 N/mm.

Because this belt resistance is higher than the one selected in the starting data of this calculation, (315 N/mm), the belt weight is higher and we have to recalculate the T_1 and T_2 accordingly.

The resulted tensions are anyway lower than T_1 and T_2 above, therefore the following calculations will be made using

$$T_2 = 1053 \text{ daN}$$

$$T_3 = 3430 \text{ daN}$$

1 Technical Information

project and design criteria for belt conveyors

Diameter of drive pulley shaft

Let us utilise a motor gearbox to drive the conveyor in question.

Drive pulley data:

- D = 400 mm diameter (as Tab.13)
- $q_T = 220$ daN weight of pulley
- n = 110 rpm
- $a_g = 0,180$ m distance between the supports and pulley flange

Let us determine the resultant C_p of the tensions and the pulley weight (for simplicity let us suppose T and q_T perpendicular between them)

$$C_p = \sqrt{(T_1 + T_2)^2 + q_T^2} \text{ [daN]} = \sqrt{(3430 + 1053)^2 + 220^2} = 4488 \text{ daN}$$

The bending moment will be :

$$M_f = \frac{C_p}{2} \times a_g \text{ [daNm]} = \frac{4488}{2} \times 0,180 = 404 \text{ daNm}$$

The torsional moment will be :

$$M_t = \frac{P}{n} \times 954,9 \text{ [daNm]} = \frac{64}{110} \times 954,9 = 555,6 \text{ daNm}$$

One may now determine the ideal bending moment :

$$M_{if} = \sqrt{M_f^2 + 0,75 \times M_t^2} \text{ [daNm]} = \sqrt{404^2 + 0,75 \times 555,6^2} = 629 \text{ daNm}$$

Consequently we derive the value of the module of resistance W given that $\sigma_{amm} 7,82$ daN/mm² for heat treated steel C40

$$W = \frac{M_{if} \times 1000}{\sigma_{amm}} \text{ [mm}^3\text{]} = \frac{629 \times 1000}{7,82} = 80435 \text{ mm}^3$$

from which we may find the diameter of the pulley motor shaft :

$$d = \sqrt[3]{\frac{W \times 32}{\pi}} \text{ mm} = \sqrt[3]{\frac{80435 \times 32}{3,14}} \cong 93 \text{ mm}$$

The drum shaft diameter on the bearing seats, will be made according the above formula, or the nearer larger diameter available on the bearing.

The shaft diameter inside the hub and/or inside the drum (normally the raw shaft diameter) is determined with the formulas described in the paragraph " Limits of deflection and angle for motor and idler pulleys " at pag.47 and in this case the raw shaft diameter results 120 mm.

Diameter of return pulley shaft

Non-drive pulley data :

$$D = 315 \text{ mm diameter (as Tab.13)}$$

$$q_R = 170 \text{ daN pulley weight}$$

$$a_g = 0,180 \text{ m distance between the support and pulley flange}$$

Let us determine the resultant C_{pr} of the tensions and the pulley weight (for simplicity let us suppose T_3 and q_R is perpendicular between them)

$$C_{pr} = \sqrt{(2T_3)^2 + q_R^2} \text{ [daN]} = \sqrt{(2 \times 961)^2 + 170^2} = 1930 \text{ daN}$$

The bending moment will be :

$$M_f = \frac{C_{pr}}{2} \times a_g \text{ [daNm]} = \frac{1930}{2} \times 0,180 = 174 \text{ daNm}$$

Consequently we derive the value of the module of resistance W given that σ_{amm} 7,82 daN/mm² for heat treated steel C40

$$W = \frac{M_f \times 1000}{\sigma_{amm}} \text{ [mm}^3\text{]} = \frac{174 \times 1000}{7,82} = 22250 \text{ mm}^3$$

from which we may find the diameter of pulley motor shaft :

$$d = \sqrt[3]{\frac{W \times 32}{\pi}} \text{ mm} = \sqrt[3]{\frac{22250 \times 32}{3,14}} \cong 61 \text{ mm}$$

The drum shaft diameter on the bearing seats, will be made according the above formula, or the nearer larger diameter available on the bearing.

The shaft diameter inside the hub and/or inside the drum (normally the raw shaft diameter) is determined with the formulas described in the paragraph " Limits of deflection and angle for motor and idler pulleys " at pag.47 and in this case the raw shaft diameter results 95 mm.



1 Technical Information

project and design criteria for belt conveyors

Conclusions

Using successive steps we have obtained from the data of the relative characteristics of the belt conveyor components the following summary :

- the speed of the conveyed material is $v = 2,3 \text{ m/s}$
- carrying troughing sets with side rollers at $\lambda = 30^\circ$
- return sets with plain roller
- belt width 1000 mm with breaking load 400 N/mm
- carrying troughing set pitch 1,2 m
- lower return sets pitch 3 m
- load roller in carrying troughing set series PSV/1 $\varnothing 108 \text{ mm}$ $C=388 \text{ mm}$
- return rollers series PSV/1 $\varnothing 108 \text{ mm}$ $C=1158 \text{ mm}$
- power needed to move the belt conveyor 64 kW
- belt deflection between two adjacent troughing sets $< 2\%$

- drive pulley $D = 400 \text{ mm}$, $\varnothing \text{ shaft } 100 \text{ mm}$

- return pulley $D = 315 \text{ mm}$, $\varnothing \text{ shaft } 65 \text{ mm}$

One may consider the use of a traditional drive arrangement (drive pulley + gearbox + transmission gearing) or a motorised pulley.

In the later case, a pulley motor may be chosen using the relevant catalogue. The type TM801 of 75 kW with a shaft of 120 mm diameter meets the specification.



2 **Rollers**



2 Rollers

Summary	2	Rollers	page 67
2.1		Various industry uses.....	69
2.2		Rollers, technical design and data.....	70
2.3		Selection method.....	74
2.3.1		Choice of diameter in relation to speed	75
2.3.2		Choice of type in relation to load	76
2.4		Ordering codes.....	80
2.5		Programme.....	89
2.5.1		Rollers series PSV	91
		Rollers series PSV non standard	120
2.5.2		Rollers series PL - PLF	121
2.5.3		Rollers series MPS - M	133
2.5.4		Rollers series MPR	149
2.5.5		Rollers series RTL	155
2.5.6		Guide rollers	161
2.6		Rollers with rubber rings.....	164
2.6.1		Impact rollers	166
2.6.2		Return rollers with spaced rubber rings	176
2.6.3		Return rollers with helical rubber rings	188
		for self cleaning	
2.6.4		Return rollers with helical steel cage	192
		for self cleaning	

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.



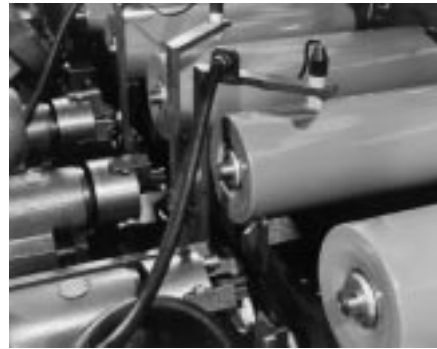
- Mineral industry
- Chemical and fertiliser industry
- Iron and steel industry
- Cement industry
- Glass industry
- Quarry industry
- Warehousing and storage of various materials.



2 Rollers

2.2 - Rollers, technical design and data

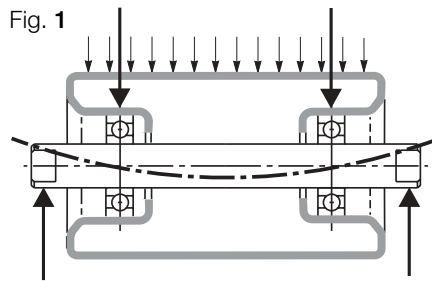
The principal characteristics that typify all the Rulmeca rollers are : long service life, quality of all components, high efficiency and economy of use.



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

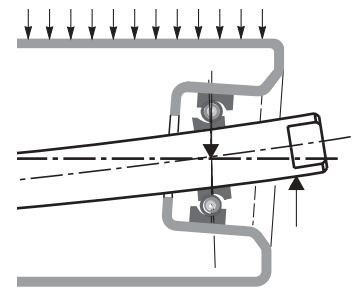


The design of the housings, of strong and rigid construction, has been developed using a computerised system that determines their thickness in relation to the maximum load required for various types of rollers.

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.

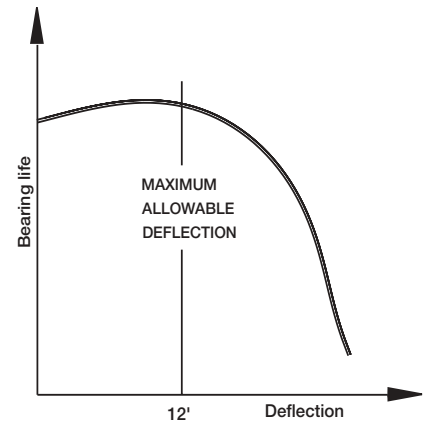


Fig. 3 - Deflection curve of bearings with C3 play.

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.

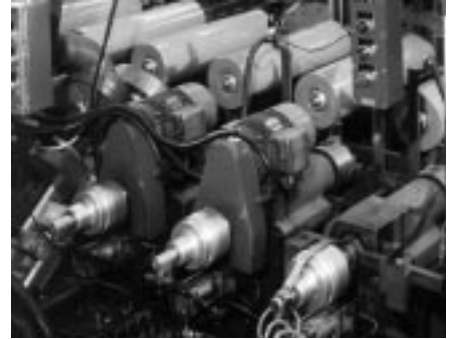
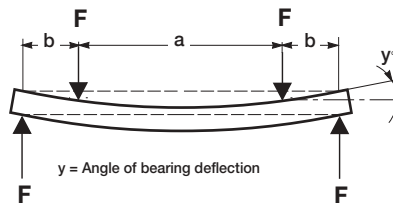


Fig. 4 - Deflection of spindle under load



Rulmecca 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 machine welding, the accuracy of assembly and the live testing, are all guarantees of the optimum balancing of Rulmecca 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 Rulmecca to develop a particular sealing that guarantees the optimum bearing performance.

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

All Rulmecca 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.

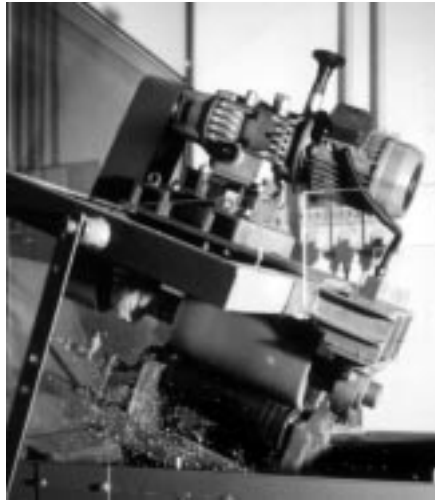
These machines allow the examination of the following characteristics for each roller type :

- 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 a + 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 e oltre	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 Rollers

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 <i>Tab.17</i> (depends on the side angle of the roller in transom)	
F_d	= shock factor see <i>Tab.20</i> (depends on lump size of material)	
F_s	= service factor see <i>Tab.18</i>	
F_m	= ambient factor see <i>Tab.19</i>	
F_v	= speed factor see <i>Tab. 21</i>	

Tab. 17 - Participation factor F_p

0°	20°	20°	30°	35°	45°
1,00	0.50	0.60	0.65	0.67	0.72

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	1.5	
300 ÷ 450 mm	1.2	1.32	1.5	1.7	1.9	2.3	2.8	

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	1.0	

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	---	---



2 Rollers



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:

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

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

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

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).

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

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 :

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

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

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

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:

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

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

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 PSV-2, with a sufficient load capacity: PSV-2, 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, 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, 20F14, 133NC, 708.

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

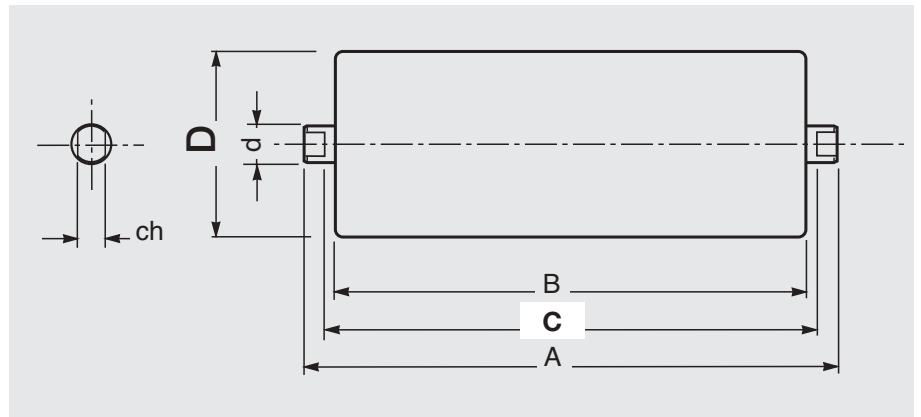


2 Rollers

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 S 235 JR (EN10027-1), ex Fe 360 (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: one coat antirust and sprayed colour dark red - thickness 40 micron	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).



2 Rollers

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

Basic design: spindle in steel S 235 JR (UNI Fe 360, DIN St 37)
 Supplementary design: **J** = spindle in steel S 235 JR (Fe 360) zinc plated
I = stainless steel spindle

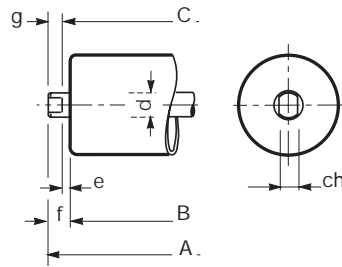
Spindle design

Basic abbreviation

F with flats

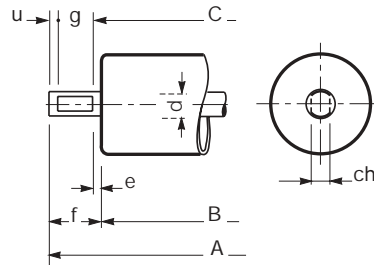
d	=	20	25	30	40
ch	=	14	18	22	32
e	=	4	4	4	4
g	=	9	12	12	12
f	=	13	16	16	16

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

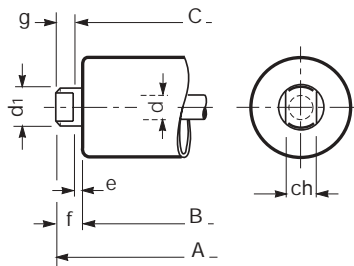


B with bush *

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

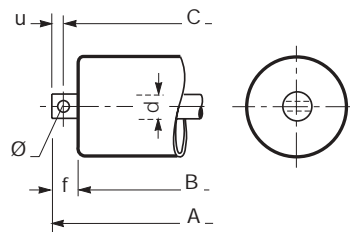
N

G & Q



K with hole

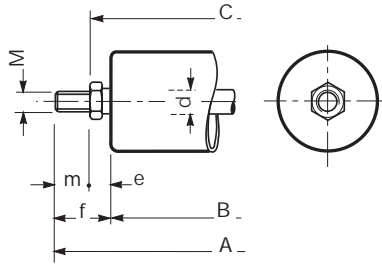
d	=	15	20	25	30	40
u	=	7	10	12	16	16
f	=	17	24	28	36	38
∅	=	6,3	8,3	10,3	14,5	16,5



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

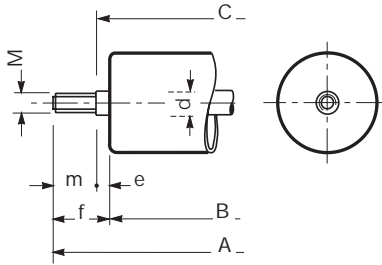
L threaded with nut

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



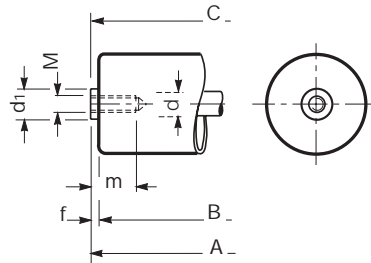
M projection threaded

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



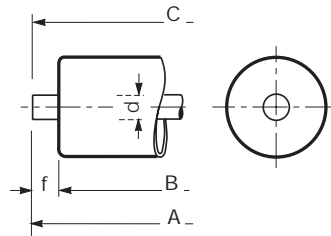
R with internal thread

d	=	15	20	25	30	40
d1	=	20	20	25	30	40
f	=	8	13	16	16	16
m	=	18	20	25	25	25
M	=	10	12	16	16	16



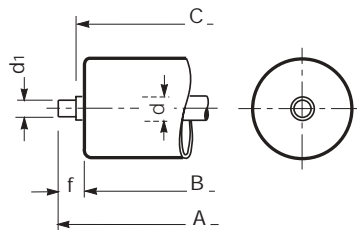
S plain

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



S1 with diameter reduction

d	=	15	20	25	30	40
d1	=	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 mm	Belt Width Arrangements		C 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	
89	300	400	168	179	157	142	132	124																			
		500	208	179	157	142	132	124			274	240	218	202	190						404	353	321	298	280		
	400	650	258	179	157	142	132	124			274	240	218	202	190					404	353	321	298	280			
		800	323	179	157	142	132	124			274	240	218	202	190					404	353	321	298	280			
	500	1000	388	179	157	142	132	124			274	240	218	202	190					404	353	321	298	280			
		1200	473	179	157	142	132	124			274	240	218	202	190					404	353	321	298	280			
	650	1400	538	179	157	142	132	124			274	240	218	202	190					404	353	321	298	280			
		1600	608	179	157	142	132	124			274	240	218	202	190					404	353	321	298	280			
	800	1800	708	173	157	142	132	124			274	240	218	202	190					404	353	321	298	280			
		2000	758	161	157	142	132	124			274	240	218	202	190					392	353	321	298	280			
	1000	2200	808	150	150	142	132	124			274	240	218	202	190					367	353	321	298	280			
		2400	908	133	133	133	132	124			274	240	218	202	190					327	327	321	298	280			
	1200	2600	958	126	126	126	126	124			274	240	218	202	190					310	310	310	298	280			
		2800	1158	104	104	104	104	104			267	240	218	202	190					259	259	259	259	259			
	1400	3000	1408	85	85	85	85	85			224	224	218	202	190					218	218	218	218	218			
		3200	1608	75	75	75	75	75			201	201	201	201						194	194	194	194	194			
1600	3400	1808								183	183	183	183						177	177	177	177	177				
	3600																										
108	300	400	168	191	167	152	141	133	126																		
		500	208	191	167	152	141	133	126												431	376	342	317	299	284	
	400	650	258	191	167	152	141	133	126												431	376	342	317	299	284	
		800	323	191	167	152	141	133	126												431	376	342	317	299	284	
	500	1000	388	191	167	152	141	133	126												431	376	342	317	299	284	
		1200	473	191	167	152	141	133	126												431	376	342	317	299	284	
	650	1400	538	191	167	152	141	133	126												431	376	342	317	299	284	
		1600	608	191	167	152	141	133	126												431	376	342	317	299	284	
	800	1800	708	170	167	152	141	133	126												404	376	342	317	299	284	
		2000	758	158	158	152	141	133	126												375	375	342	317	299	284	
	1000	2200	808	147	147	147	141	133	126												351	351	342	317	299	284	
		2400	908	130	130	130	130	130	126												310	310	310	310	299	284	
	1200	2600	958	123	123	123	123	123	123												294	294	294	294	294	284	
		2800	1158	101	101	101	101	101	101												242	242	242	242	242	242	
	1400	3000	1408	82	82	82	82	82	82												199	199	199	199	199	199	
		3200	1608	72	72	72	72	72	72												175	175	175	175	175	175	
1600	3400	1808																		157	157	157	157	157			
	3600																										
133	500	650	208	205	179	163	151	142	135	129																	
		800	258	205	179	163	151	142	135	129											462	403	366	340	320	305	291
	650	1000	323	205	179	163	151	142	135	129											462	403	366	340	320	305	291
		1200	388	205	179	163	151	142	135	129											462	403	366	340	320	305	291
	800	1400	473	205	179	163	151	142	135	129											462	403	366	340	320	305	291
		1600	538	205	179	163	151	142	135	129											462	403	366	340	320	305	291
	1000	1800	608	200	179	163	151	142	135	129											462	403	366	340	320	305	291
		2000	678																		416	403	366	340	320	305	291
	1200	2200	708	169	169	163	151	142	135	129											397	397	366	340	320	305	291
		2400	758	157	157	157	151	142	135	129											368	368	366	340	320	305	291
	1400	2600	808	146	146	146	146	142	135	129											343	343	343	340	320	305	291
		2800	908	129	129	129	129	129	129	129											303	303	303	303	303	305	291
	1600	3000	958	122	122	122	122	122	122	122											286	286	286	286	286	286	286
		3200	1008																		271	271	271	271	271	271	271
	1800	3400	1108																		245	245	245	245	245	245	245
		3600	1158	99	99	99	99	99	99	99											234	234	234	234	234	234	234
2000	3800	1408	81	81	81	81	81	81	81											192	192	192	192	192	192	192	
	4000	1608	71	71	71	71	71	71	71											167	167	167	167	167	167	167	
2200	4200	1808	63	63	63	63	63	63	63											149	149	149	149	149	149	149	
	4400	2008																		134	134	134	134	134			
2400	4600	2208																									
	4800																										
159	650	800	258																								
		1000	323																								
	800	1200	388																								
		1400	473																								
	1000	1600	538																								
		1800	608																								
	1200	2000	678																								
		2200	708																								
	1400	2400	758																								
		2600	808																								
	1600	2800	908																								
		3000	958																								
	1800	3200	1008																								
		3400	1108																								
	2000	3600	1158																								

(for a project life of bearings of 30.000 hours)

PSV 4								PSV 5						PSV 7						ROLLER									
belt speed m/s								belt speed m/s						belt speed m/s						Belt Width Arrangements									
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	c	Ø						
																				mm	mm								
																						168			400				
																						208		300	500				
																						258		400	650				
381	333	302	281	264				549	435	380												388	300	650	1000			800	800
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				
																						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				508							508	400						
406	355	323	299	282	268			585	465	406	369				538							538			1400				
406	355	323	299	282	268			585	465	406	369				608	500	1000	1600				608	500	1000	1600				108
406	355	323	299	282	268			585	465	406	369				708		1200					708		1200					
406	355	323	299	282	268			585	465	406	369				758	650						758	650						
406	355	323	299	282	268			585	465	406	369				808		1400					808		1400					
406	355	323	299	282	268			585	465	406	369				908		1600					908		1600					
406	355	323	299	282	268			585	465	406	369				958	800						958	800						
406	355	323	299	282	268			529	465	406	369				1158	1000						1158	1000						
406	355	323	299	282	268			442	442	406	369				1408	1200						1408	1200						
402	355	323	299	282	268			393	393	393	369				1608	1400						1608	1400						
366	355	323	299	282	268			356	356	356					1808	1600						1808	1600						
																						208			500				
																						258			650				
																						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		774	726	634	576	554	535		2008	1800							
270	270	270	270	270				270	270	270	270	270		575	575	575	575	554			2208	2000							
																						258			650				
																						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			18				



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

2 Rollers

ROLLER				PL 2 - PL 3 - PL 4								PLF 1 - PLF 5 - PLF 20																		
Ø mm	Belt Width Arrangements		roller C mm	belt speed m/s								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											
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	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											
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	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																					
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	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										
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	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																				
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	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									
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										</								



2 Rollers

2.5 - Programme

The experience of Rulmeca for 40 years producing belt conveyor rollers, has perfected and expanded the range of products we offer, so that the user will find the correct answer to the most diverse and difficult applications,

This catalogue presents the different series of rollers in production and their relative utilisation criteria :



1



2

- 1 - Rollers in steel series PSV
- 2 - Rollers in plastic series PL
- 3 - Rollers in steel series MPS
- 4 - Rollers in steel series MPR
- 5 - Rollers in steel series RTL



3



4

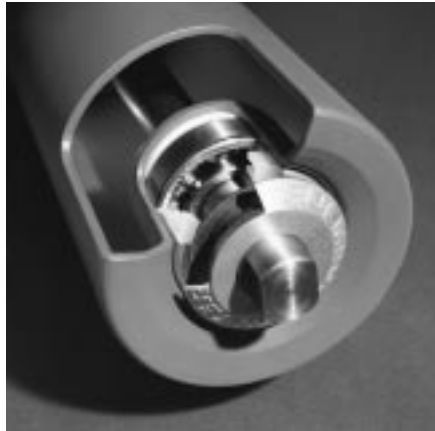


5



2 Rollers





2.5.1 - Rollers series PSV

Where used

Rollers PSV are particularly suited to conveyors that operate in very difficult conditions, where working loads are high, and large lump size material is conveyed ; and yet, despite these characteristics, they require minimal maintenance.

Typical types of application are : mines, caves, cement works, coal-fired electric utilities and dock installations,

The effectiveness of the PSV roller sealing system provides the solution to the environmental challenges of dust, dirt, water, low and high temperatures or applications where there is a large temperature imbalance between day and night.

The working temperature, with standard greased components is defined as between -20°C and $+100^{\circ}\text{C}$.

It is possible to reach temperatures outside of this range using special grease, bearings and seals.





2 Rollers

series PSV

Characteristics

The rollers series PSV offer the highest quality and the maximum load capacity of Rulmeca's production.

The unique design of our hermetic seal system not only protects the bearings but offers maximum effectiveness and long life, even in the presence of the most severe pollutants.

The control of all roller materials from incoming inspection, through manufacture and assembly in the automatic cycle, with on line function tests on 100% of production, allows us to state that the function and life of this roller is among the highest in the world.

Attention to detail, whether at the design stage or in the various manufacturing phases, observing close limits of starting resistance, of eccentricity and axial play, results in notable savings in energy and a reduction in maintenance over time.

These factors give rise to business economies, confidence and high productivity, objectives pursued by all users of belt conveyors.

The Quality System certified ISO 9001 got from Rulmeca attest to their continuous quality standards, and their stated performance.

Roller shell

It is the external diameter of the roller that is in contact with the conveyor belt. It consists of a steel tube produced according to Rulmeca standards, with particular reference to tight tolerances and specific particulars.

The tube is cut and machined using automatic numerically controlled machines, that guarantee and maintain the tolerances and the precision of the square cut.

Bearing housing

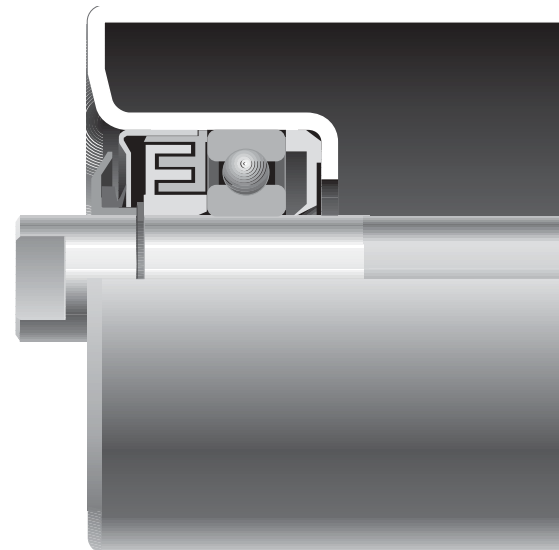
It is a steel monolithic structure, deep drawn and sized to a fine tolerance ISO M7 at the bearing position, This tolerance is necessary to guarantee the optimum assembly of the bearing by ensuring that it is square to the spindle of the roller.

The thickness of the housings is proportional to the spindle diameter and to the bearing type, with thicknesses that are up to 5 mm, to guarantee the maximum strength for each application, including the heaviest.

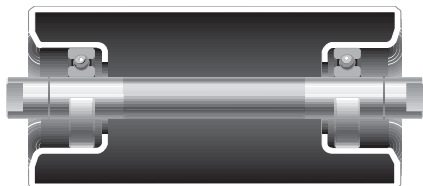
Monobloc

The bearing housings of the PSV rollers are welded to the tube body using autocentring automatic welding machines utilising a continuous wire feed : our patented system "UNIBLOC".

Tube and bearing housing form a monolithic structure of exceptional strength which itself reduces to the minimum any imbalance in the roller, This guarantees the alignment and concentricity with respect to the external diameter of the component parts of the sealing system.



The optimum balance and concentricity thus obtained allows these rollers to be used at the highest speeds, eliminating harmful vibration to the conveyor structure and the "hammer effect" on the bearings of the rollers.



Spindle

This is the component which sustains the roller when it is assembled into the troughing set supports. It is made from drawn steel, cut and machined by automatic numerically controlled machines.



The spindle is centreless ground to a tolerance ISO h6 at the extremities,

corresponding to where the bearings and seals are fitted, to guarantee a perfect match and optimum performance.

Bearings

These are the parts which give virtually frictionless rotation to the tube body with respect to the fixed spindle. Precision bearings only are used. They are the radial ball race type of the series : 6204, 6205, 6305, 6206, 6306, 6308 with internal play tolerance C3, ideal for applications of rollers used for belt conveyors.

Connecting spindle / bearing, bearing housing

PSV rollers require particular tolerances for the bearing housing, for the spindle and the bearing itself, that enables the roller to function optimally for a long life, whilst under pressure.

In fact the bearing housing has the very strict precision tolerance of M7, the spindle is precision ground to tolerance h6 and the bearing has internal play tolerance maximum C3.

These three tolerances functionally guarantees the autoalignment of the internal and outer bearing rings of the ball race resulting in a good performance even when

the spindle deflection is extreme due to overloading.

Sealing

The seals comprise the most important components in the design of the PSV rollers.

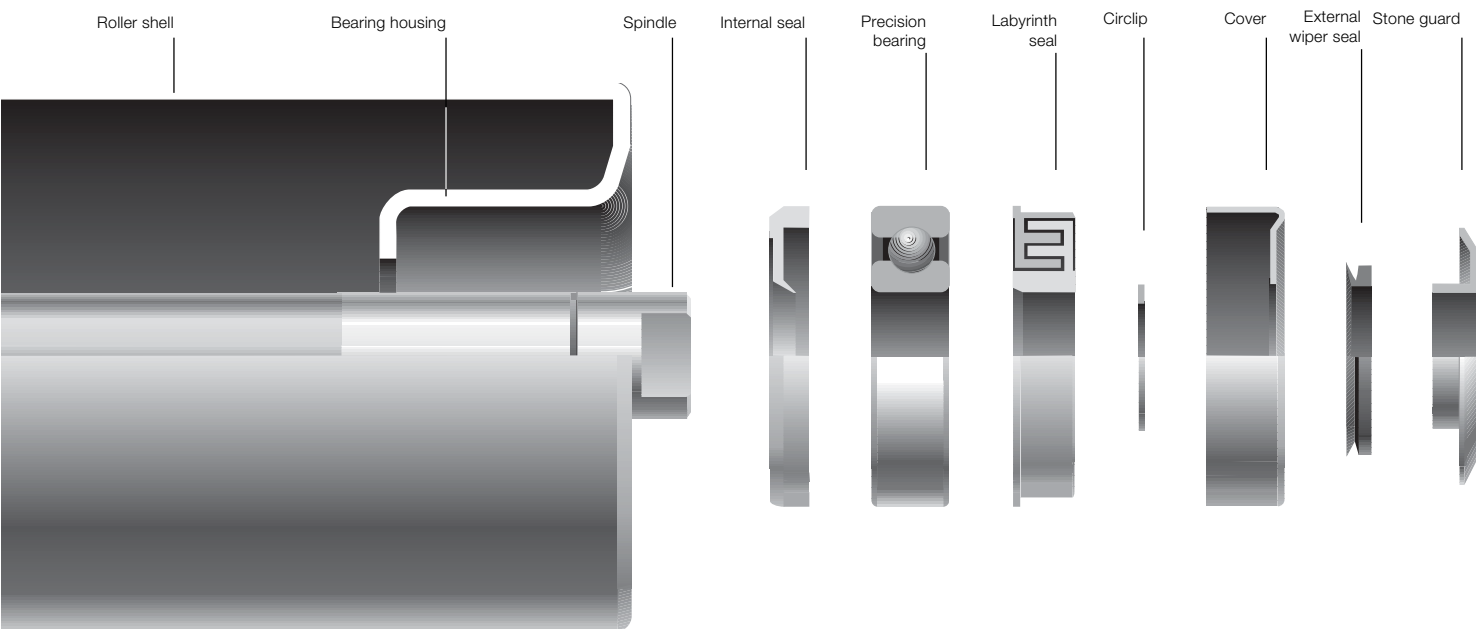
The principal task of the seals is to protect the bearing from harmful elements that may impinge from the outside or the inside of the roller.

The working conditions of these rollers is very often the most severe, with the presence of dust, abrasive sand, water, and various other pollutants.

On the inside of the roller there may be particles formed by the rusting of the internal tube body or condensation caused by the thermal changes that arise between day and night in particular climates.

The seal must also contain and retain a good quantity of grease for the bearing lubrication.

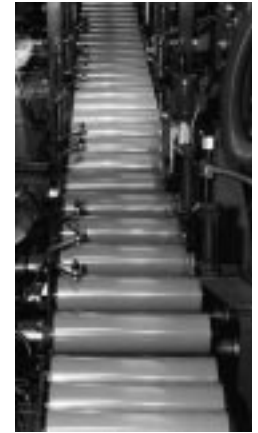
As a guarantee and to complete the PSV roller sealing system the final components are assembled at either end :
 - strong external stone guards formed as a





2 Rollers

series PSV



shield, in anti-corrosive material, to protect the seals from the fall of material onto the end cap of the roller.

- seal with two principal sections; one external and one internal.

- external section : self cleaning in that it centrifugally repels water and dust naturally towards the outside. Comprises a lip ring seal made from soft anti-abrasive rubber with a large contact surface that provides an effective hermetic seal of long working life.

The self cleaning effect is principally due to the particular design of the cover cap and the shape of the bearing housing which when rotating, tends to expel all pollutants, centrifugally.

- internal section : triple lip labyrinth in nylon PA6 greased to give further bearing protection.

Behind the bearing a sealing ring in nylon PA6 is positioned that provides an ample grease reservoir and also retains the grease near to the bearing even when there is a depression due to an abrupt change in temperature (pumping effect).

This ring acts also as a seal to counteract the eventual formation of condensation and oxidation which could take place inside the tube.

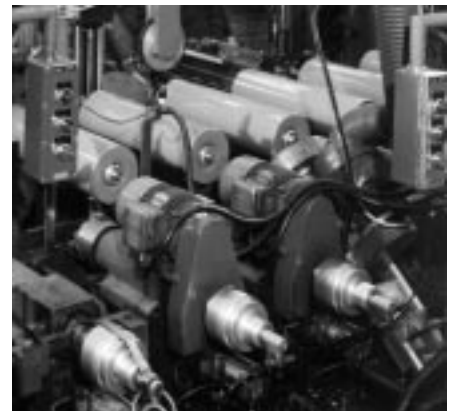
- locking system, provided by means of the correctly located circlips, which today is the best and the strongest system implemented in heavy rollers for belt conveyors.

Lubrication

PSV rollers are lubricated for life with an abundant quantity of lithium based water repellent grease, that guarantees the correct lubrication for the working life of the roller.

Final inspection

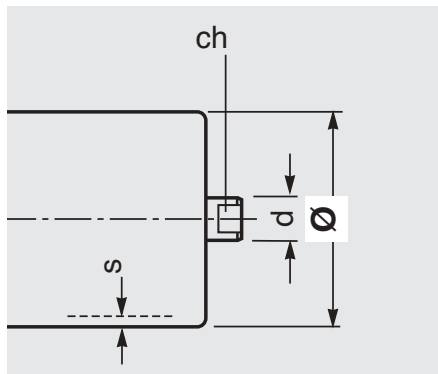
All PSV rollers are assembled on automatic assembly machines with live test stations that maintains roller rotation for a sufficient time to distribute the grease into the bearings and all the other internal components. 100% of the rollers are tested to verify their low-torque characteristics.



Programme of production series PSV

The table indicates the type and diameter of standard rollers in production according to European standards to DIN 15207-ISO 1537.

Upon request rollers may be supplied with varying dimensions, tube thickness end diameters according to standards CEMA, BS, JIS, AFNOR and FEM .

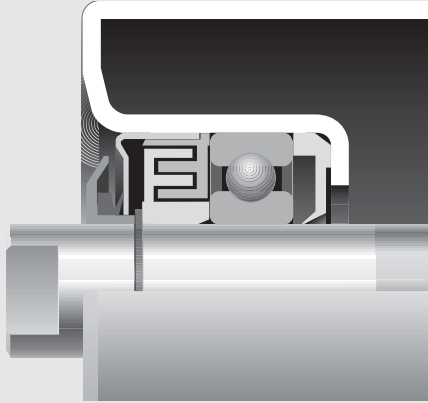


Roller type	Ø mm	basic design	s	spindle d	ch	bearing	note
PSV 1	63	N	3	20	14	6204	with tube and spindle in steel S 235 JR (EN 10027-1) ex Fe 360 (EN 10025) St 37 (DIN 17100)
	89	N	3				
	108	N	3,5				
	133	N	4				
PSV 2	89	N	3	25	18	6205	
	108	N	3,5				
	133	N	4				
	159	N	4,5				
PSV 3	89	N	3	25	18	6305	
	108	N	3,5				
	133	N	4				
	159	N	4,5				
PSV 4	89	N	3	30	22	6206	
	108	N	3,5				
	133	N	4				
	159	N	4,5				
PSV 5	89	N	3	30	22	6306	
	108	N	3,5				
	133	N	4				
	159	N	4,5				
PSV 7	108	N	3,5	40	32	6308	
	133	N	4				
	159	N	4,5				
	194	N	6,3				



2 Rollers

series PSV 1




Section through sealing

Ø 63 N

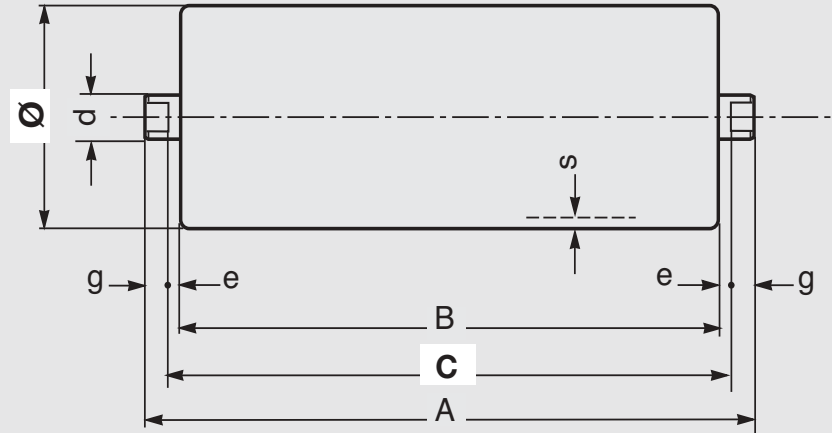
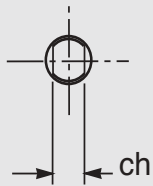
Bearing 6204
(20 X 47 X 14)

d = 20
ch = 14
s = 3
e = 4
g = 9

Belt width mm	roller						load capacity daN					
	dimensions mm			weight Kg		belt speed m/s						
arrangements 	B	C	A	rotating parts total		0.5	1	1.25	1.5	1.75	2	
400	160	168	186	1.3	1.8	201	160	148	140	133	127	
300 500	200	208	226	1.5	2.1	201	160	148	140	133	127	
400 650	250	258	276	1.7	2.4	201	160	148	140	133	127	
500 800	315	323	341	2.0	2.9	201	160	148	140	133	127	
300 650 1000	380	388	406	2.3	3.3	201	160	148	140	133	127	
800 1200	465	473	491	2.7	3.9	201	160	148	140	133	127	
400	500	508	526	2.9	4.1	201	160	148	140	133	127	
500 1000	600	608	626	3.3	4.8	201	160	148	140	133	127	
1200	700	708	726	3.8	5.5	184	160	148	140	133	127	
650	750	758	776	4.0	5.9	172	160	148	140	133	127	
800	950	958	976	4.9	7.3	138	138	138	138	133	127	
1000	1150	1158	1176	5.8	8.7	116	116	116	116	116	116	
1200	1400	1408	1426	6.9	10.4	99	99	99	99	99	99	

The indicated load capacity relates to a project working life of 30000 hours.

Example of ordering
standard design
PSV1,20F,63N,608
for special design
see pages 80-81



Ø 89 N

Bearing 6204
(20 X 47 X 14)

d = 20
ch = 14
s = 3
e = 4
g = 9

Belt	roller													
	width mm			dimensions mm			weight Kg		load capacity daN					
arrangements							rotating parts		belt speed m/s					
	B	C	A	parts	total	0.5	1	1.5	2	2.5	3			
	400	160	168	186	1.7	2.2	226	179	157	142	132	124		
	300	500	200	208	226	2.0	2.5	226	179	157	142	132	124	
	400	650	250	258	276	2.3	3.0	226	179	157	142	132	124	
	500	800	315	323	341	2.7	3.6	226	179	157	142	132	124	
	300	650	1000	380	388	406	3.1	4.1	226	179	157	142	132	124
	800	1200	465	473	491	3.7	4.9	226	179	157	142	132	124	
	400		500	508	526	3.9	5.2	226	179	157	142	132	124	
		1400	530	538	556	4.1	5.5	226	179	157	142	132	124	
	500	1000	600	608	626	4.6	6.1	204	179	157	142	132	124	
		1200	700	708	726	5.2	7.0	173	173	157	142	132	124	
	650		750	758	776	5.5	7.4	161	161	157	142	132	124	
		1400	800	808	826	5.8	7.9	150	150	150	142	132	124	
	800		950	958	976	6.8	9.2	126	126	126	126	126	124	
	1000		1150	1158	1176	8.1	11.0	104	104	104	104	104	104	
	1200		1400	1408	1426	9.7	13.2	85	85	85	85	85	85	
	1400		1600	1608	1626	11.0	15.0	75	75	75	75	75	75	

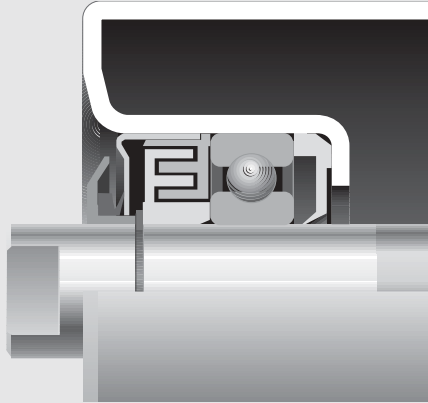
The indicated load capacity relates to a project working life of 30000 hours.

Example of ordering
standard design
PSV1,20F,89N,608
for special design
see pages 80-81



2 Rollers

series PSV 1




Section through sealing

Ø 108 N

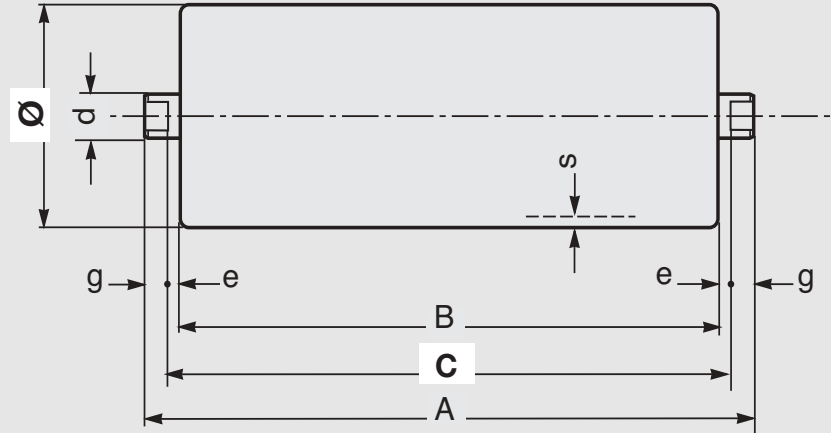
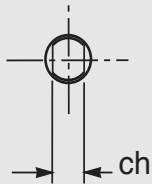
Bearing 6204
(20 X 47 X 14)

d = 20
ch = 14
s = 3,5
e = 4
g = 9

Belt	roller											
	width mm			dimensions mm		weight Kg		load capacity daN				
arrangements 	B	C	A	rotating parts		belt speed m/s						
				parts	total	1	1.5	2	2.5	3	3.5	
400	160	168	186	2.3	2.7	191	167	152	141	133	126	
300 500	200	208	226	2.6	3.2	191	167	152	141	133	126	
400 650	250	258	276	3.1	3.8	191	167	152	141	133	126	
500 800	315	323	341	3.7	4.5	191	167	152	141	133	126	
300 650 1000	380	388	406	4.3	5.3	191	167	152	141	133	126	
800 1200	465	473	491	5.0	6.2	191	167	152	141	133	126	
400	500	508	526	5.3	6.6	191	167	152	141	133	126	
1400	530	538	556	5.6	7.0	191	167	152	141	133	126	
500 1000	600	608	626	6.2	7.8	191	167	152	141	133	126	
1200	700	708	726	7.1	8.9	170	167	152	141	133	126	
650	750	758	776	7.6	9.5	158	158	152	141	133	126	
1400	800	808	826	8.1	10.1	147	147	147	141	133	126	
800	950	958	976	9.4	11.8	123	123	123	123	123	123	
1000	1150	1158	1176	11.2	14.1	101	101	101	101	101	101	
1200	1400	1408	1426	13.5	17.0	82	82	82	82	82	82	
1400	1600	1608	1626	15.3	19.3	72	72	72	72	72	72	

The indicated load capacity relates to a project working life of 30000 hours.


Example of ordering
standard design
PSV1.20F.108N.323
for special design
see pages 80-81



Ø 133 N

Bearing 6204
(20 X 47 X 14)

- d = 20
- ch = 14
- s = 4
- e = 4
- g = 9

Belt	roller			weight		load capacity						
	width mm	dimensions mm			Kg		daN					
arrangements 	B	C	A	rotating parts	total	belt speed m/s						
						1	1.5	2	2.5	3	4	
	500	200	208	226	3.6	4.1	205	179	163	151	142	129
	650	250	258	276	4.2	4.9	205	179	163	151	142	129
	500 800	315	323	341	5.0	5.9	205	179	163	151	142	129
	650 1000	380	388	406	5.9	6.9	205	179	163	151	142	129
	800 1200	465	473	491	6.9	8.1	205	179	163	151	142	129
	1400	530	538	556	7.8	9.1	205	179	163	151	142	129
	500 1000 1600	600	608	626	8.7	10.2	200	179	163	151	142	129
	1200	700	708	726	9.9	11.7	169	169	163	151	142	129
	650	750	758	776	10.6	12.5	157	157	157	151	142	129
	1400	800	808	826	11.2	13.2	146	146	146	146	142	129
	1600	900	908	926	12.5	14.8	129	129	129	129	129	129
	800	950	958	976	13.1	15.5	122	122	122	122	122	122
	1000	1150	1158	1176	15.7	18.6	99	99	99	99	99	99
	1200	1400	1408	1426	18.9	22.4	81	81	81	81	81	81
	1400	1600	1608	1626	21.4	25.4	71	71	71	71	71	71
	1600	1800	1808	1826	24.0	28.4	63	63	63	63	63	63

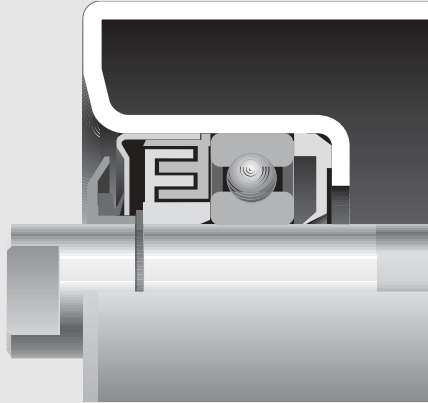
The indicated load capacity relates to a project working life of 30000 hours.

Example of ordering
standard design
PSV1,20F,133N,388
for special design
see pages 80-81



2 Rollers

series PSV 2




Section through sealing

Ø 89 N

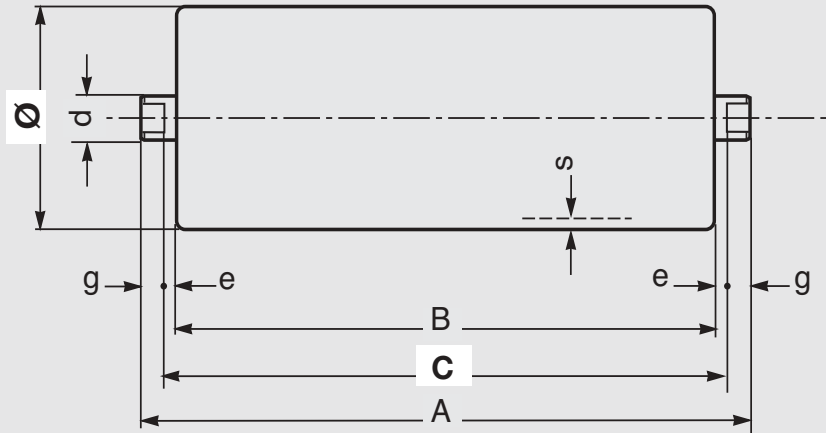
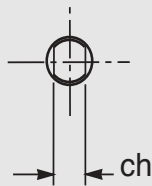
Bearing 6205
(25 X 52 X 15)

d = 25
ch = 18
s = 3
e = 4
g = 12

Belt	roller										
	width mm	dimensions mm			weight Kg		load capacity daN				
arrangements 	B	C	A	rotating parts	total	belt speed m/s					
						0.5	1	1.5	2	2.5	3
500	200	208	232	2.1	3.0	346	274	240	218	202	190
650	250	258	282	2.4	3.5	346	274	240	218	202	190
500 800	315	323	347	2.9	4.2	346	274	240	218	202	190
650 1000	380	388	412	3.3	4.9	346	274	240	218	202	190
800 1200	465	473	497	3.8	5.7	346	274	240	218	202	190
1400	530	538	562	4.2	6.4	346	274	240	218	202	190
500 1000 1600	600	608	632	4.7	7.1	346	274	240	218	202	190
1200	700	708	732	5.3	8.1	346	274	240	218	202	190
650	750	758	782	5.7	8.6	346	274	240	218	202	190
1400	800	808	832	6.0	9.2	346	274	240	218	202	190
1600	900	908	932	6.6	10.2	336	274	240	218	202	190
800	950	958	982	6.9	10.7	319	274	240	218	202	190
1000	1150	1158	1182	8.2	12.7	267	267	240	218	202	190
1200	1400	1408	1432	9.8	15.3	224	224	224	218	202	190
1400	1600	1608	1632	11.1	17.4	201	201	201	201	201	
1600	1800	1808	1832	12.4	19.4	183	183	183	183	183	

The indicated load capacity relates to a project working life of 30000 hours.

Example of ordering
standard design
PSV2,25F,89N,323
for special design
see pages 80-81



Ø 108 N

Bearing 6205
(25 X 52 X 15)

- d = 25
- ch = 18
- s = 3,5
- e = 4
- g = 12

Belt	roller			weight		load capacity						
	Width mm	dimensions mm			Kg		daN					
arrangements	B	C	A	rotating part total		belt speed m/s						
				1	1.5	2	2.5	3	3.5			
	500	200	208	232	2.7	3.6	293	256	232	216	203	193
	650	250	258	282	3.2	4.3	293	256	232	216	203	193
	500 800	315	323	347	3.8	5.1	293	256	232	216	203	193
	650 1000	380	388	412	4.4	6.0	293	256	232	216	203	193
	800 1200	465	473	497	5.1	7.0	293	256	232	216	203	193
	1400	530	538	562	5.7	7.9	293	256	232	216	203	193
	500 1000 1600	600	608	632	6.4	8.8	293	256	232	216	203	193
	1200	700	708	732	7.3	10.1	293	256	232	216	203	193
	650	750	758	782	7.7	10.7	293	256	232	216	203	193
	1400	800	808	832	8.2	11.4	293	256	232	216	203	193
	1600	900	908	932	9.1	12.6	293	256	232	216	203	193
	800	950	958	982	9.5	13.3	293	256	232	216	203	193
	1000	1150	1158	1182	11.3	15.9	249	249	232	216	203	193
	1200	1400	1408	1432	13.6	19.1	205	205	205	205	203	193
	1400	1600	1608	1632	15.4	21.7	180	180	180	180	180	180
	1600	1800	1808	1832	17.2	24.2	161	161	161	161	161	

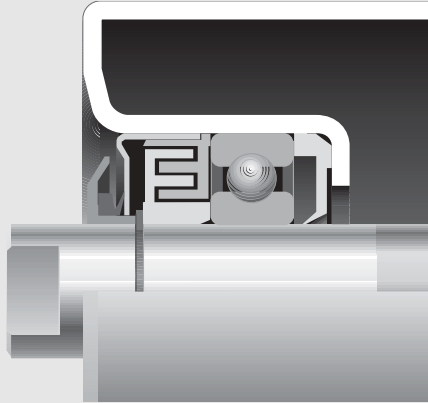
The indicated load capacity relates to a project working life of 30000 hours.

Example of ordering
standard design
PSV2,25F,108N,958
for special design
see pages 80-81



2 Rollers

series PSV 2




Section through sealing

Ø 133 N

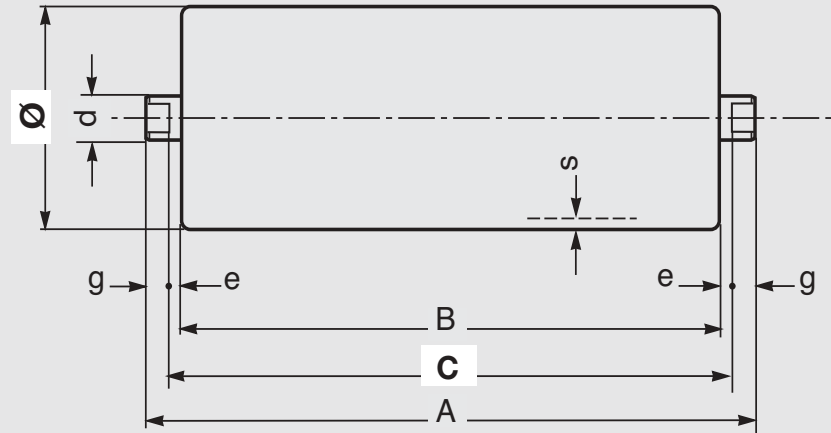
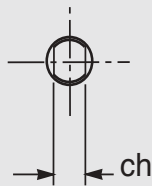
Bearing 6205
(25 X 52 X 15)

d = 25
ch = 18
s = 4
e = 4
g = 12

Example of ordering
standard design
PSV2.25F.133N.473
for special design
see pages 80-81

Belt	roller			weight		load capacity						
	width mm	dimensions mm			Kg		daN					
arrangements 	B	C	A	rotating parts total		belt speed m/s						
				1	2	1	1.5	2	2.5	3	4	
	650	250	258	282	4.5	5.5	314	274	249	231	217	198
	800	315	323	347	5.3	6.5	314	274	249	231	217	198
	650 1000	380	388	412	6.1	7.6	314	274	249	231	217	198
	800 1200	465	473	497	7.2	9.0	314	274	249	231	217	198
	1400	530	538	562	8.0	10.1	314	274	249	231	217	198
	1000 1600	600	608	632	8.9	11.3	314	274	249	231	217	198
	1800	670	678	702	9.8	12.4	314	274	249	231	217	198
	1200	700	708	732	10.2	12.9	314	274	249	231	217	198
650		750	758	782	10.9	13.8	314	274	249	231	217	198
	1400	800	808	832	11.5	14.6	314	274	249	231	217	198
	1600	900	908	932	12.8	16.2	310	274	249	231	217	198
800		950	958	982	13.4	17.1	293	274	249	231	217	198
	1800	1000	1008	1032	14.0	17.9	278	274	249	231	217	198
1000		1150	1158	1182	16.0	20.4	240	240	240	231	217	198
	1200	1400	1408	1432	19.1	24.5	197	197	197	197	197	197
	1400	1600	1608	1632	21.7	27.9	172	172	172	172	172	172
	1600	1800	1808	1832	24.2	31.2	153	153	153	153	153	153
	1800	2000	2008	2032	26.8	34.5	138	138	138	138	138	138


The indicated load capacity relates to a project working life of 30000 hours.



Ø 159 N

Bearing 6205
(25 X 52 X 15)

d = 25
ch = 18
s = 4,5
e = 4
g = 12

Belt	roller			weight		load capacity						
	width mm	dimensions mm			Kg	daN						
arrangements				rotating		belt speed m/s						
	B	C	A	parts	total	1	2	3	4	4.5	5	
	650	250	258	282	5.3	6.3	333	264	231	210	202	195
	800	315	323	347	6.3	7.6	333	264	231	210	202	195
	650 1000	380	388	412	7.3	8.8	333	264	231	210	202	195
	800 1200	465	473	497	8.6	10.5	333	264	231	210	202	195
	1400	530	538	562	9.6	11.7	333	264	231	210	202	195
	1000 1600	600	608	632	10.6	13.1	333	264	231	210	202	195
	1800	670	678	702	11.7	14.4	333	264	231	210	202	195
	1200	700	708	732	12.2	15.0	333	264	231	210	202	195
650		750	758	782	12.9	15.9	333	264	231	210	202	195
	1400	800	808	832	13.7	16.9	333	264	231	210	202	195
	1600	900	908	932	15.2	18.8	307	264	231	210	202	195
800		950	958	982	16.0	19.8	290	264	231	210	202	195
	1800	1000	1008	1032	16.8	20.7	275	264	231	210	202	195
1000		1150	1158	1182	19.1	23.6	237	237	231	210	202	195
1200		1400	1408	1432	22.9	28.4	193	193	193	193	193	193
1400		1600	1608	1632	26.0	32.2	169	169	169	169	169	169
1600		1800	1808	1832	29.0	36.0	150	150	150	150	150	150
1800		2000	2008	2032	32.1	39.9	134	134	134	134	134	134

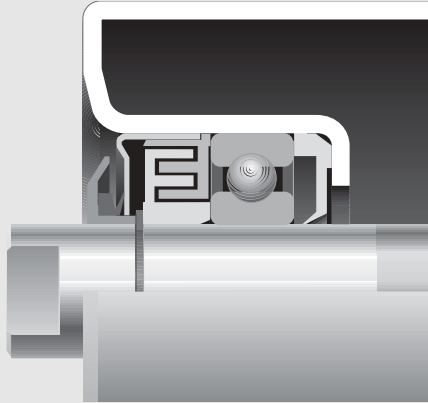
Example of ordering
standard design
PSV2,25F,159N,1158
for special design
see pages 80-81

The indicated load capacity relates to a project working life of 30000 hours.



2 Rollers

series PSV 3




Section through sealing

Ø 89 N

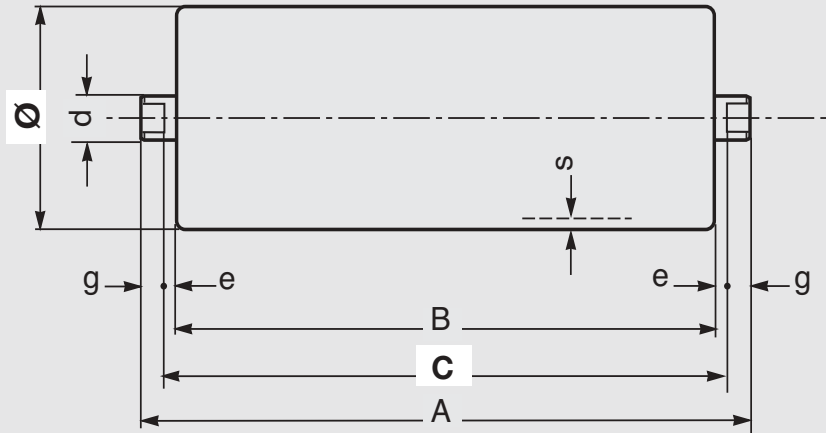
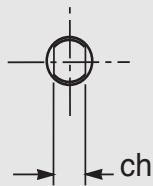
Bearing 6305
(25 X 62 X 17)

d = 25
ch = 18
s = 3
e = 4
g = 12

Belt	roller			weight		load capacity							
	width mm	dimensions mm			Kg		daN						
arrangements 	B	C	A	rotating parts total		belt speed m/s							
				0.5	1	1.5	2	2.5	3				
650	250	258	282	2.8	3.9	509	404	353	321	298	280		
800	315	323	347	3.2	4.5	509	404	353	321	298	280		
650 1000	380	388	412	3.6	5.2	509	404	353	321	298	280		
800 1200	465	473	497	4.2	6.1	509	404	353	321	298	280		
1400	530	538	562	4.6	6.7	509	404	353	321	298	280		
1000 1600	600	608	632	5.0	7.5	493	404	353	321	298	280		
1200	700	708	732	5.7	8.5	420	404	353	321	298	280		
650	750	758	782	6.0	9.0	392	392	353	321	298	280		
1400	800	808	832	6.3	9.5	367	367	353	321	298	280		
1600	900	908	932	7.0	10.5	327	327	327	321	298	280		
800	950	958	982	7.3	11.1	310	310	310	310	298	280		
1000	1150	1158	1182	8.6	13.1	259	259	259	259	259	259		
1200	1400	1408	1432	10.2	15.7	218	218	218	218	218	218		
1400	1600	1608	1632	11.5	17.7	194	194	194	194	194	194		
1600	1800	1808	1832	12.8	19.8	177	177	177	177	177	177		

The indicated load capacity relates to a project working life of 30000 hours.


Example of ordering
standard design
PSV3,25F,89N,323
for special design
see pages 80-81



Ø 108 N

Bearing 6305
(25 X 62 X 17)

- d = 25
- ch = 18
- s = 3,5
- e = 4
- g = 12

Belt	roller			weight		load capacity					
	width mm	dimensions mm			Kg		daN				
arrangements 	B	C	A	rotating parts	total	belt speed m/s					
						1	1.5	2	2.5	3	3.5
650	250	258	282	3.6	4.7	431	376	342	317	299	284
800	315	323	347	4.2	5.5	431	376	342	317	299	284
650 1000	380	388	412	4.8	6.4	431	376	342	317	299	284
800 1200	465	473	497	5.5	7.5	431	376	342	317	299	284
1400	530	538	562	6.1	8.3	431	376	342	317	299	284
1000 1600	600	608	632	6.8	9.2	431	376	342	317	299	284
1200	700	708	732	7.7	10.5	404	376	342	317	299	284
650	750	758	782	8.1	11.1	375	375	342	317	299	284
1400	800	808	832	8.6	11.8	351	351	342	317	299	284
1600	900	908	932	9.5	13.0	310	310	310	310	299	284
800	950	958	982	9.9	13.7	294	294	294	294	294	284
1000	1150	1158	1182	11.7	16.3	242	242	242	242	242	242
1200	1400	1408	1432	14.0	19.5	199	199	199	199	199	199
1400	1600	1608	1632	15.8	22.1	175	175	175	175	175	175
1600	1800	1808	1832	17.6	24.6	157	157	157	157	157	157

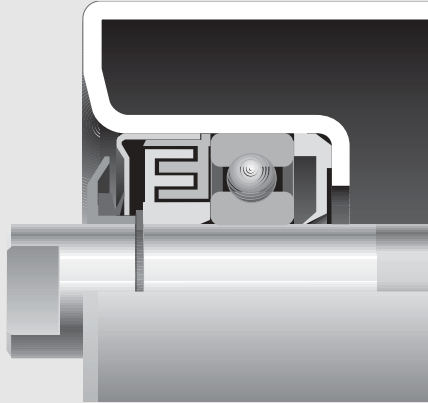
The indicated load capacity relates to a project working life of 30000 hours.

Example of ordering
standard design
PSV3,25F,108N,95B
for special design
see pages 80-81



2 Rollers

series PSV 3




Section through sealing

Ø 133 N

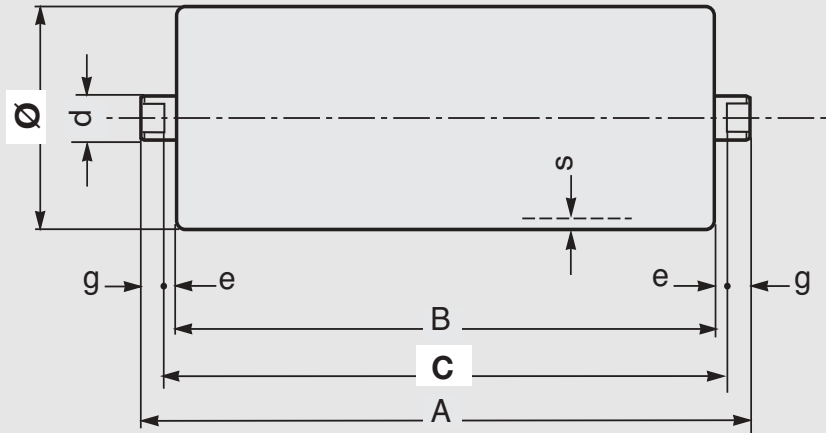
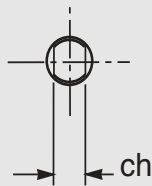
Bearing 6305
(25 X 62 X 17)

d = 25
ch = 18
s = 4
e = 4
g = 12

Example of ordering
standard design
PSV3,25F,133N,473
for special design
see pages 80-81

Belt	roller			weight		load capacity					
	width mm	dimensions mm			Kg		daN				
arrangements 	B	C	A	rotating		belt speed m/s					
				parts	total	1	1.5	2	2.5	3	4
800	315	323	347	5.7	7.0	462	403	366	340	320	291
1000	380	388	412	6.5	8.1	462	403	366	340	320	291
800 1200	465	473	497	7.6	9.5	462	403	366	340	320	291
1400	530	538	562	8.4	10.6	462	403	366	340	320	291
1000 1600	600	608	632	9.3	11.7	462	403	366	340	320	291
1800	670	678	702	10.2	12.9	416	403	366	340	320	291
1200	700	708	732	10.6	13.4	397	397	366	340	320	291
2000	750	758	782	11.2	14.2	368	368	366	340	320	291
1400	800	808	832	11.9	15.1	343	343	343	340	320	291
1600	900	908	932	13.1	16.7	303	303	303	303	303	291
800	950	958	982	13.8	17.5	286	286	286	286	286	286
1800	1000	1008	1032	14.4	18.4	271	271	271	271	271	271
2000	1100	1108	1132	15.7	20.0	245	245	245	245	245	245
1000	1150	1158	1182	16.3	20.9	234	234	234	234	234	234
1200	1400	1408	1432	19.5	25.0	192	192	192	192	192	192
1400	1600	1608	1632	22.1	28.3	167	167	167	167	167	167
1600	1800	1808	1832	24.6	31.6	149	149	149	149	149	149
1800	2000	2008	2032	27.2	35.0	134	134	134	134	134	134

The indicated load capacity relates to a project working life of 30000 hours.



Ø 159 N

Bearing 6305
(25 X 62 X 17)

- d = 25
- ch = 18
- s = 4,5
- e = 4
- g = 12

Belt	roller			rotating parts		load capacity daN						
	width mm	dimensions mm			parts	total	belt speed m/s					
arrangements	B	C	A			1	2	3	4	4.5	5	
	1000	380	388	412	7.8	9.4	490	389	340	309	297	287
	1200	465	473	497	9.1	11.0	490	389	340	309	297	287
	1400	530	538	562	10.1	12.3	490	389	340	309	297	287
	1000 1600	600	608	632	11.2	13.6	467	389	340	309	297	287
	1800	670	678	702	12.3	15.0	413	389	340	309	297	287
	1200	700	708	732	12.7	15.5	393	389	340	309	297	287
	2000	750	758	782	13.5	16.5	365	365	340	309	297	287
	1400	800	808	832	14.3	17.4	340	340	340	309	297	287
	1600	900	908	932	15.8	19.4	300	300	300	300	297	287
	1800	1000	1008	1032	17.3	21.3	268	268	268	268	268	268
	2000	1100	1108	1132	18.9	23.2	242	242	242	242	242	242
	1000	1150	1158	1182	19.6	24.1	231	231	231	231	231	231
	1200	1400	1408	1432	23.5	28.9	188	188	188	188	188	188
	1400	1600	1608	1632	26.5	32.8	164	164	164	164	164	164
	1600	1800	1808	1832	29.6	36.6	146	146	146	146	146	146
	1800	2000	2008	2032	32.6	40.4	131	131	131	131	131	131
	2000	2200	2208	2232	35.7	44.3	119	119	119	119	119	119

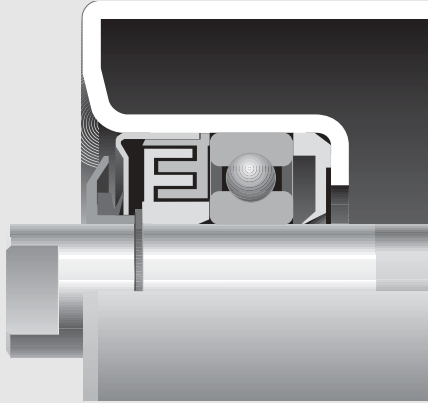
Example of ordering
standard design
PSV3.25F.159N.1158
for special design
see pages 80-81

The indicated load capacity relates to a project working life of 30000 hours.



2 Rollers

series PSV 4




Section through sealing

Ø 89 N

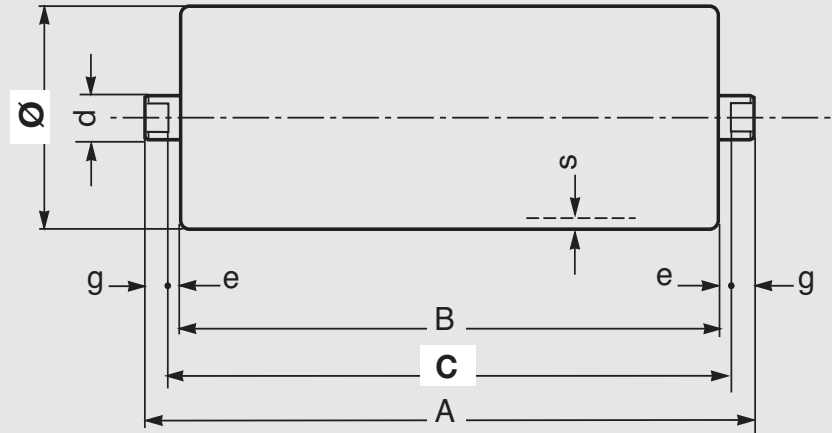
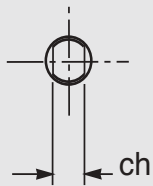
Cuscinetto 6206
(30 X 62 X 16)

d = 30
ch = 22
s = 3
e = 4
g = 12

Belt	roller			weight		load capacity					
	width mm	dimensions mm		Kg		daN					
arrangements 	B	C	A	rotating parts	total	bel speed m/s					
						0.5	1	1.5	2	2.5	3
800	315	323	347	3.4	5.3	480	381	333	302	281	264
1000	380	388	412	3.8	6.1	480	381	333	302	281	264
800 1200	465	473	497	4.3	7.1	480	381	333	302	281	264
1400	530	538	562	4.8	7.9	480	381	333	302	281	264
1000 1600	600	608	632	5.2	8.7	480	381	333	302	281	264
1200	700	708	732	5.9	9.9	480	381	333	302	281	264
1400	800	808	832	6.5	11.1	480	381	333	302	281	264
1600	900	908	932	7.1	12.3	480	381	333	302	281	264
800	950	958	982	7.5	12.9	480	381	333	302	281	264
1000	1150	1158	1182	8.7	15.3	480	381	333	302	281	264
1200	1400	1408	1432	10.4	18.3	480	381	333	302	281	264
1400	1600	1608	1632	11.6	20.6	337	337	333	302	281	264
1600	1800	1808	1832	12.9	23.0	233	233	233	233	233	233

The indicated load capacity relates to a project working life of 30000 hours.


Example of ordering
standard design
PSV4,30F,89N,323
for special design
see pages 80-81



Ø 108 N

Bearing 6206
(30 X 62 X 16)

- d = 30
- ch = 22
- s = 3,5
- e = 4
- g = 12

Belt	roller					weight		load capacity					
	width	dimensions			mm	Kg	daN						
arrangements					rotating		belt speed m/s						
	B	C	A		parts	total	1	1.5	2	2.5	3	3.5	
800	315	323	347		4.3	6.3	406	355	323	299	282	268	
1000	380	388	412		4.9	7.2	406	355	323	299	282	268	
800 1200	465	473	497		5.7	8.4	406	355	323	299	282	268	
1400	530	538	562		6.3	9.4	406	355	323	299	282	268	
1000 1600	600	608	632		6.9	10.4	406	355	323	299	282	268	
1200	700	708	732		7.8	11.9	406	355	323	299	282	268	
1400	800	808	832		8.7	13.3	406	355	323	299	282	268	
1600	900	908	932		9.6	14.8	406	355	323	299	282	268	
800	950	958	982		10.1	15.5	406	355	323	299	282	268	
1000	1150	1158	1182		11.9	18.4	406	355	323	299	282	268	
1200	1400	1408	1432		14.2	22.1	406	355	323	299	282	268	
1400	1600	1608	1632		16.0	25.0	402	355	323	299	282	268	
1600	1800	1808	1832		17.8	27.9	366	355	323	299	282	268	

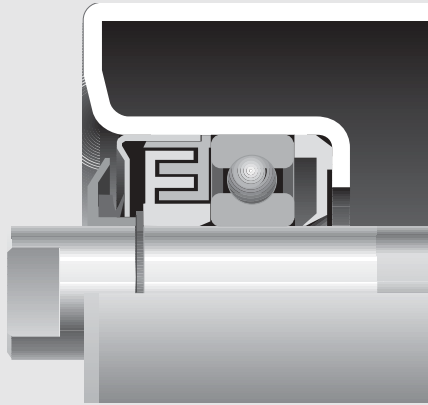
The indicated load capacity relates to a project working life of 30000 hours.

Example of ordering
standard design
PSV4,30F,108N,958
for special design
see pages 80-81



2 Rollers

series PSV 4




Section through sealing

Ø 133 N

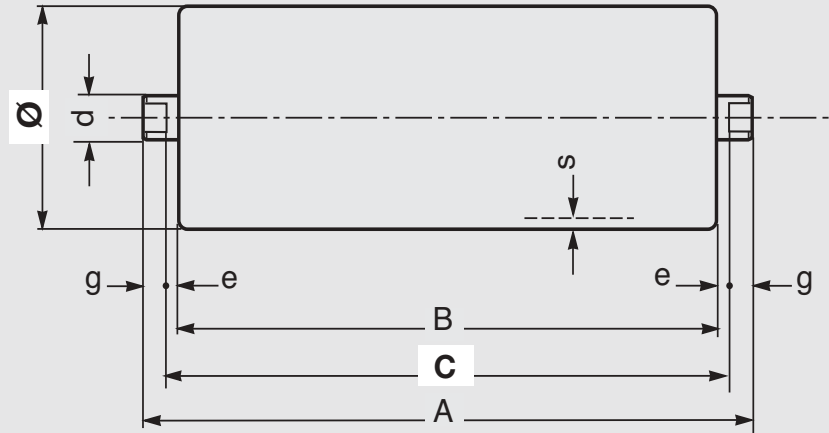
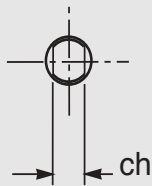
Bearing 6206
(30 X 62 X 16)

d = 30
ch = 22
s = 4
e = 4
g = 12

Example of ordering
standard design
PSV4,30F,133N,473
for special design
see pages 80-81

Belt	roller			weight		load capacity						
	width mm	dimensions mm			Kg		daN					
arrangements 	B	C	A	rotating		belt speed m/s						
				parts	total	1	1.5	2	2.5	3	4	
	800	315	323	347	5.8	7.8	436	381	346	321	302	274
	1000	380	388	412	6.7	8.9	436	381	346	321	302	274
	800 1200	465	473	497	7.8	10.5	436	381	346	321	302	274
	1400	530	538	562	8.6	11.7	436	381	346	321	302	274
	1000 1600	600	608	632	9.5	13.0	436	381	346	321	302	274
	1800	670	678	702	10.4	14.2	436	381	346	321	302	274
	1200	700	708	732	10.8	14.8	436	381	346	321	302	274
	2000	750	758	782	11.4	15.7	436	381	346	321	302	274
	1400	800	808	832	12.0	16.6	436	381	346	321	302	274
	1600	900	908	932	13.3	18.5	436	381	346	321	302	274
800		950	958	982	14.0	19.4	436	381	346	321	302	274
	1800	1000	1008	1032	14.6	20.3	436	381	346	321	302	274
	2000	1100	1108	1132	15.9	22.1	436	381	346	321	302	274
1000		1150	1158	1182	16.5	23.0	436	381	346	321	302	274
1200		1400	1408	1432	19.7	27.6	412	381	346	321	302	274
1400		1600	1608	1632	22.3	31.3	363	363	346	321	302	274
1600		1800	1808	1832	24.8	34.9	324	324	324	321	302	274
1800		2000	2008	2032	27.4	38.6	294	294	294	294	294	
2000		2200	2208	2232	29.9	42.2	270	270	270	270	270	


The indicated load capacity relates to a project working life of 30000 hours.



Ø 159 N

Bearing 6206
(30 X 62 X 16)

d = 30
ch = 22
s = 4,5
e = 4
g = 12

Belt	roller											
	width mm			dimensions mm			weight Kg		load capacity daN			
arrangements 	B	C	A	rotating parts		belt speed m/s						
				parts	total	1	2	3	4	4.5	5	
800	315	323	347	7.0	8.9	462	367	321	291	280	270	
1000	380	388	412	8.0	10.3	462	367	321	291	280	270	
800 1200	465	473	497	9.3	12.1	462	367	321	291	280	270	
1400	530	538	562	10.3	13.4	462	367	321	291	280	270	
1000 1600	600	608	632	11.4	14.9	462	367	321	291	280	270	
1800	670	678	702	12.5	16.3	462	367	321	291	280	270	
1200	700	708	732	12.9	17.0	462	367	321	291	280	270	
2000	750	758	782	13.7	18.0	462	367	321	291	280	270	
1400	800	808	832	14.5	19.1	462	367	321	291	280	270	
1600	900	908	932	16.0	21.1	462	367	321	291	280	270	
800	950	958	982	16.8	22.2	462	367	321	291	280	270	
1800	1000	1008	1032	17.5	23.2	462	367	321	291	280	270	
2000	1100	1108	1132	19.1	25.3	462	367	321	291	280	270	
1000	1150	1158	1182	19.8	26.4	462	367	321	291	280	270	
1200	1400	1408	1432	23.7	31.6	398	367	321	291	280	270	
1400	1600	1608	1632	26.7	35.7	348	348	321	291	280	270	
1600	1800	1808	1832	29.8	39.9	310	310	310	291	280	270	
1800	2000	2008	2032	32.9	44.1	279	279	279	279	279		
2000	2200	2208	2232	35.9	48.2	254	254	254	254	254		

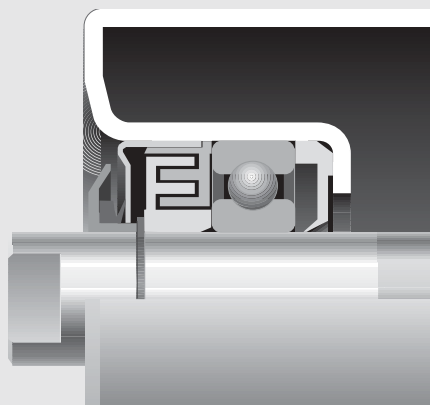
Example of ordering
standard design
PSV4,30F,159N,473
for special design
see pages 80-81

The indicated load capacity relates to a project working life of 30000 hours.



2 Rollers

series PSV 5



Section through sealing


Ø 89 N

Bearing 6306
(30 X 72 X 19)

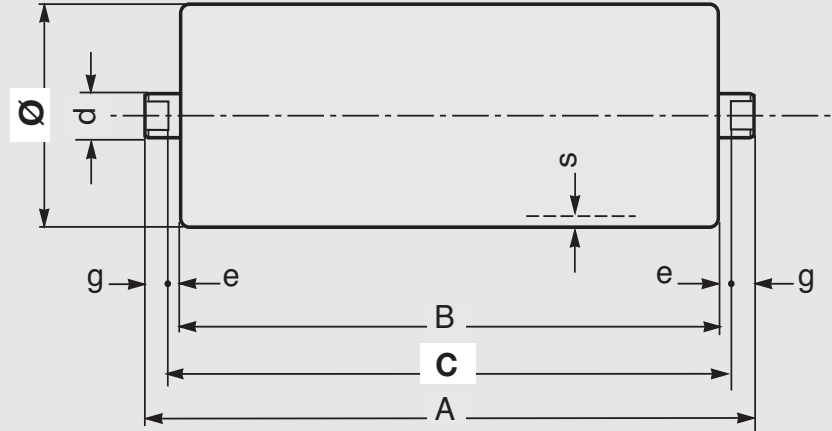
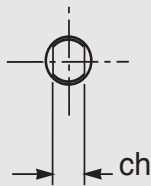
d = 30
ch = 22
s = 3 *
e = 4
g = 12

*s = 4 for basic
rollers with impact
rings

Example of ordering
standard design
PSV5,30F,89N,323
for special design
see pages 80-81

belt	roller										
	width mm	dimensions mm			weight Kg		load capacity daN				
arrangements 	B	C	A	rotating		belt speed m/s					
				parts	total	1	1.5	2	2.5	3	3,5
800	315	323	347	6.5	8.4	549	479	435	404	380	361
1000	380	388	412	7.3	9.6	549	479	435	404	380	361
800 1200	465	473	497	8.4	11.1	549	479	435	404	380	361
1400	530	538	562	9.2	12.3	549	479	435	404	380	361
1000 1600	600	608	632	10.1	13.6	549	479	435	404	380	361
1800	670	678	702	11.0	14.9	549	479	435	404	380	361
1200	700	708	732	11.4	15.5	549	479	435	404	380	361
2000	750	758	782	12.0	16.3	549	479	435	404	380	361
1400	800	808	832	12.7	17.2	549	479	435	404	380	361
1600	900	908	932	13.9	19.1	549	479	435	404	380	361
800	950	958	982	14.6	20.0	549	479	435	404	380	361
1800	1000	1008	1032	15.2	20.9	549	479	435	404	380	361
2000	1100	1108	1132	16.5	22.7	549	479	435	404	380	361
1000	1150	1158	1182	17.1	23.6	549	479	435	404	380	361
1200	1400	1408	1432	20.3	28.2	512	479	435	404	380	361
1400	1600	1608	1632	22.9	31.9	337	479	435	404	380	361
1600	1800	1808	1832	25.4	35.5	233	233	233	233	233	
1800	2000	2008	2032	28.0	39.2	168	168	168	168		
2000	2200	2208	2232	30.5	42.8	125	125	125			

The indicated load capacity relates to a project working life of 30000 hours.



Ø 108 N

Bearing 6306
(30 X 72 X 19)

d = 30
ch = 22
s = 3,5
e = 4
g = 12

belt	roller			weight		load capacity					
	width mm	dimensions mm			Kg		daN				
arrangements				rotating		belt speed m/s					
	B	C	A	parts	total	1	2	2,5	3	3,5	4
800	315	323	347	6.5	8.4	585	465	431	406	385	369
1000	380	388	412	7.3	9.6	585	465	431	406	385	369
800 1200	465	473	497	8.4	11.1	585	465	431	406	385	369
1400	530	538	562	9.2	12.3	585	465	431	406	385	369
1000 1600	600	608	632	10.1	13.6	585	465	431	406	385	369
1800	670	678	702	11.0	14.9	585	465	431	406	385	369
1200	700	708	732	11.4	15.4	585	465	431	406	385	369
2000	750	758	782	12.0	16.3	585	465	431	406	385	369
1400	800	808	832	12.7	17.2	585	465	431	406	385	369
1600	900	908	932	13.9	19.1	585	465	431	406	385	369
800	950	958	982	14.6	20.0	585	465	431	406	385	369
1800	1000	1008	1032	15.2	20.9	585	465	431	406	385	369
2000	1100	1108	1132	16.5	22.7	552	465	431	406	385	369
1000	1150	1158	1182	17.1	23.6	529	465	431	406	385	369
1200	1400	1408	1432	20.3	28.2	442	442	431	406	385	369
1400	1600	1608	1632	22.9	31.9	393	393	393	393	385	369
1600	1800	1808	1832	25.4	35.5	356	356	356	356	356	
1800	2000	2008	2032	28.0	39.2	327	327	327	327		
2000	2200	2208	2232	30.5	42.8	295	295	295			

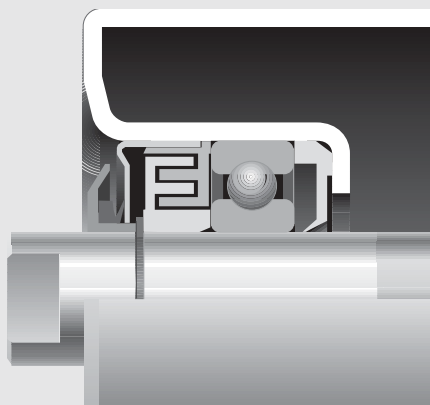
Example of ordering
standard design
PSV5,30F,108N,473
for special design
see pages 80-81

The indicated load capacity relates to a project working life of 30000 hours.



2 Rollers

series PSV 5




Section through sealing

Ø 133 N

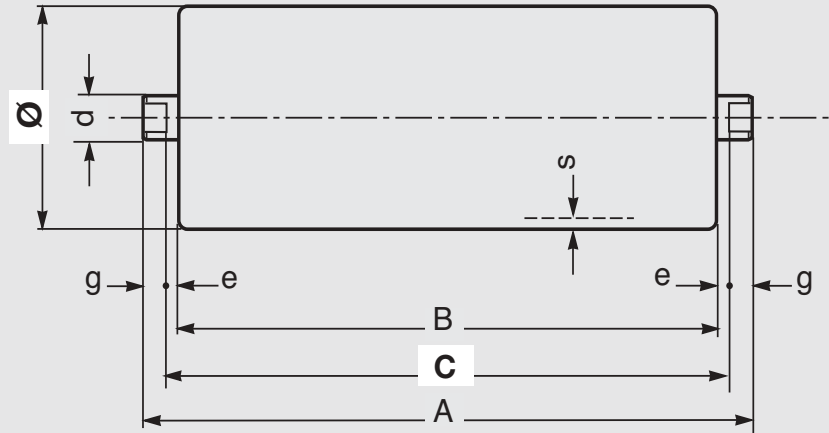
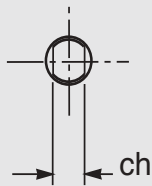
Bearing 6306
(30 X 72 X 19)

d = 30
ch = 22
s = 4
e = 4
g = 12

Example of ordering
standard design
PSV5,30F,133N,473
for special design
see pages 80-81

Belt	roller			weight		load capacity					
	width mm	dimensions mm			Kg	daN					
arrangements 	B	C	A	rotating parts	total	belt speed m/s					
						1	2	3	4	4.5	5
800	315	323	347	6.4	8.3	627	498	435	395	380	367
1000	380	388	412	7.2	9.5	627	498	435	395	380	367
800 1200	465	473	497	8.3	11.1	627	498	435	395	380	367
1400	530	538	562	9.2	12.3	627	498	435	395	380	367
1000 1600	600	608	632	10.1	13.5	627	498	435	395	380	367
1800	670	678	702	10.9	14.8	627	498	435	395	380	367
1200	700	708	732	11.3	15.4	627	498	435	395	380	367
2000	750	758	782	12.0	16.3	627	498	435	395	380	367
1400	800	808	832	12.6	17.2	627	498	435	395	380	367
1600	900	908	932	13.9	19.0	627	498	435	395	380	367
800	950	958	982	14.5	19.9	608	498	435	395	380	367
1800	1000	1008	1032	15.2	20.8	577	498	435	395	380	367
2000	1100	1108	1132	16.4	22.7	524	498	435	395	380	367
1000	1150	1158	1182	17.1	23.6	501	498	435	395	380	367
1200	1400	1408	1432	20.3	28.2	412	412	412	395	380	367
1400	1600	1608	1632	22.8	31.8	363	363	363	363	363	363
1600	1800	1808	1832	25.4	35.5	324	324	324	324	324	
1800	2000	2008	2032	27.9	39.1	294	294	294	294	294	
2000	2200	2208	2232	30.5	42.8	270	270	270	270	270	


The indicated load capacity relates to a project working life of 30000 hours.



Ø 159 N

Bearing 6306
(30 X 72 X 19)

d = 30
ch = 22
s = 4,5
e = 4
g = 12

Belt	roller			weight		load capacity					
	width mm	dimensions mm			Kg		daN				
arrangements				rotating parts total		belt speed m/s					
	B	C	A			1	2	3	4	5	6
1000	380	388	412	8.6	10.9	666	528	462	419	389	366
1200	465	473	497	9.9	12.6	666	528	462	419	389	366
1400	530	538	562	10.9	14.0	666	528	462	419	389	366
1000 1600	600	608	632	12.0	15.4	666	528	462	419	389	366
1800	670	678	702	13.0	16.9	666	528	462	419	389	366
1200	700	708	732	13.5	17.5	666	528	462	419	389	366
2000	750	758	782	14.3	18.6	666	528	462	419	389	366
1400 2200	800	808	832	15.0	19.6	666	528	462	419	389	366
1600	900	908	932	16.6	21.7	630	528	462	419	389	366
1800	1000	1008	1032	18.1	23.8	564	528	462	419	389	366
2000	1100	1108	1132	19.6	25.9	511	511	462	419	389	366
1000	1150	1158	1182	20.4	26.9	488	488	462	419	389	366
2200	1250	1258	1282	21.9	29.0	449	449	449	419	389	366
1200	1400	1408	1432	24.2	32.1	400	400	400	400	389	366
1400	1600	1608	1632	27.3	36.3	350	350	350	350	350	350
1600	1800	1808	1832	30.4	40.5	311	311	311	311	311	
1800	2000	2008	2032	33.4	44.6	281	281	281	281	281	
2000	2200	2208	2232	36.5	48.8	256	256	256	256		
2200	2500	2508	2532	41.1	55.1	227	227	227	227		

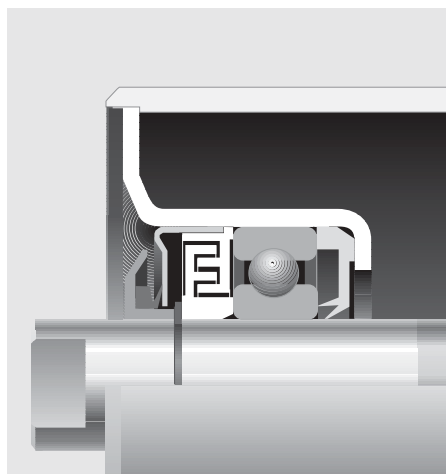
Example of ordering
standard design
PSV5,30F,159N,1158
for special design
see pages 80-81

The indicated load capacity relates to a project working life of 30000 hours.



2 Rollers

series PSV 7




Section through sealing

Ø 108 N

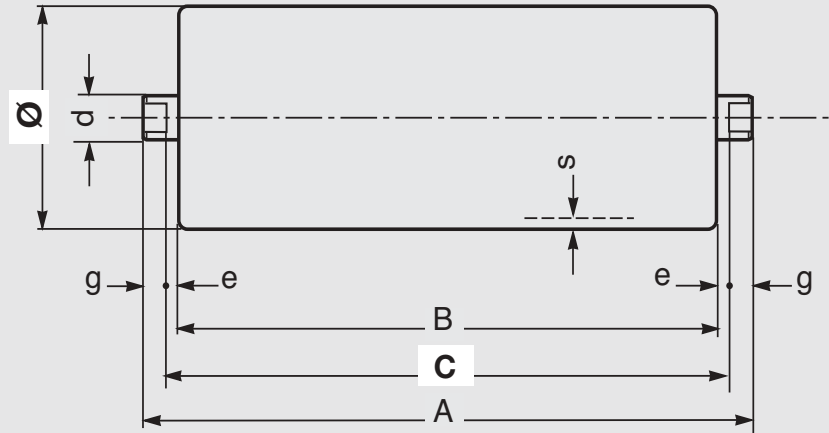
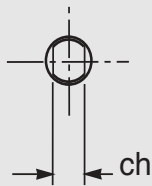
Bearing 6308
(40 X 90 X 23)

d = 40
ch = 32
s = 4
e = 4
g = 12

Example of ordering
standard design
PSV7,40F,133N,473
for special design
see pages 80-81

Belt	roller			weight		load capacity					
	width mm	dimensions mm			Kg		daN				
arrangements 	B	C	A	rotating parts	total	belt speed m/s					
						1	1,5	2	2,5	3	4
1000	380	388	412	7.6	11.6	853	746	677	629	592	538
1200	465	473	497	8.3	13.2	853	746	677	629	592	538
1400	530	538	562	8.9	14.5	853	746	677	629	592	538
1000 1600	600	608	632	9.6	15.8	853	746	677	629	592	538
1800	670	678	702	10.2	17.1	853	746	677	629	592	538
1200	700	708	732	10.5	17.6	853	746	677	629	592	538
2000	750	758	782	10.9	18.6	853	746	677	629	592	538
1400 2200	800	808	832	11.4	19.5	853	746	677	629	592	538
1600	900	908	932	12.3	21.4	853	746	677	629	592	538
1800	1000	1008	1032	13.4	23.4	853	746	677	629	592	538
2000	1100	1108	1132	14.1	25.1	853	746	677	629	592	538
1000	1150	1158	1182	14.5	26.1	853	746	677	629	592	538
2200	1250	1258	1282	15.4	28.0	853	746	677	629	592	538
1200	1400	1408	1432	16.7	30.8	853	746	677	629	592	538
1400	1600	1608	1632	18.5	34.5	727	727	677	629	592	538
1600	1800	1808	1832	20.3	38.3	501	501	501	501	501	501
1800	2000	2008	2032	22.1	42.0	360	360	360	360	360	360
2000	2200	2208	2232	23.9	45.8	267	267	267	267	267	267
2200	2500	2508	2532	26.6	51.4	180	180	180	180	180	180

The indicated load capacity relates to a project working life of 30000 hours.




Ø 133 N

Bearing 6308
(40 X 90 X 23)

d = 40
ch = 32
s = 4 *
e = 4
g = 12

*s = 6 for basic rollers with impact rings

Example of ordering
standard design
PSV7,40F,133N,473
for special design
see pages 80-81

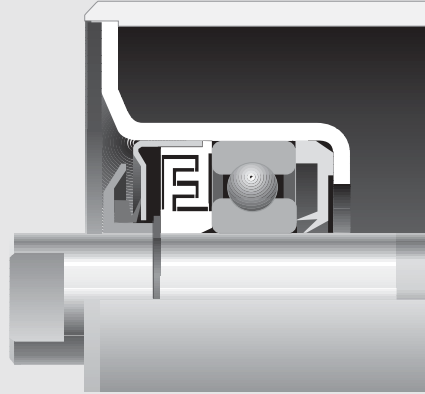
Belt	roller					weight		load capacity				
	width mm	dimensions mm			Kg	daN						
arrangements	B	C	A	rotating parts	total	belt speed m/s						
						1	2	3	4	4.5	5	
1000	380	388	412	9.3	13.3	915	726	634	576	554	535	
1200	465	473	497	10.4	15.2	915	726	634	576	554	535	
1400	530	538	562	11.2	16.7	915	726	634	576	554	535	
1000 1600	600	608	632	12.1	18.3	915	726	634	576	554	535	
1800	670	678	702	13.0	19.9	915	726	634	576	554	535	
1200	700	708	732	13.4	20.5	915	726	634	576	554	535	
2000	750	758	782	14.0	21.7	915	726	634	576	554	535	
1400 2200	800	808	832	14.6	22.8	915	726	634	576	554	535	
1600	900	908	932	15.9	25.1	915	726	634	576	554	535	
1800	1000	1008	1032	17.2	27.3	915	726	634	576	554	535	
2000	1100	1108	1132	18.5	29.6	915	726	634	576	554	535	
1000	1150	1158	1182	19.1	30.7	915	726	634	576	554	535	
2200	1250	1258	1282	20.4	33.0	915	726	634	576	554	535	
1200	1400	1408	1432	22.3	36.3	915	726	634	576	554	535	
1400	1600	1608	1632	24.9	40.9	915	726	634	576	554	535	
1600	1800	1808	1832	27.4	45.4	915	726	634	576	554	535	
1800	2000	2008	2032	30.0	49.9	774	726	634	576	554	535	
2000	2200	2208	2232	32.5	54.4	575	575	575	575	554		
2200	2500	2508	2532	36.4	61.2	386	386	386	386	386		

The indicated load capacity relates to a project working life of 30000 hours.



2 Rollers

series PSV 7




Section through sealing

Ø 159 N

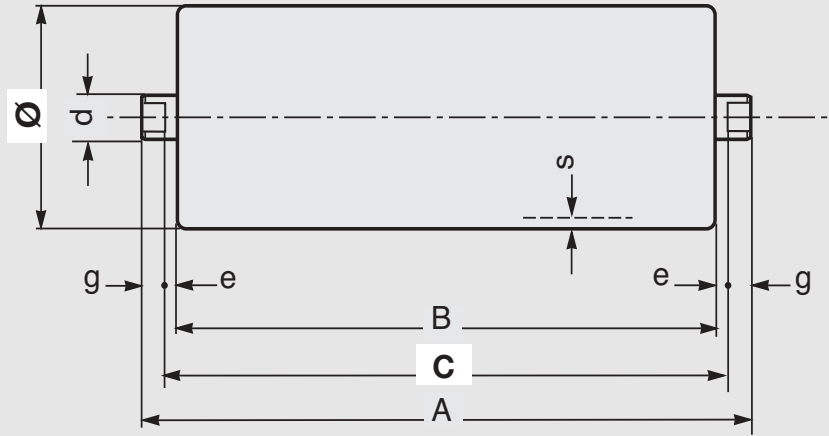
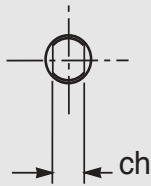
Bearing 6308
(40 X 90 X 23)

d = 40
ch = 32
s = 4,5
e = 4
g = 12

Example of ordering
standard design
PSV7,40F,159N,1158
for special design
see pages 80-81

Belt	roller			weight		load capacity						
	width mm	dimensions mm		Kg		daN						
arrangements 	B	C	A	rotating		belt speed m/s						
				parts	total	1	2	3	4	5	6	
	1000	380	388	412	10.6	14.7	971	771	673	612	568	534
	1200	465	473	497	11.9	16.8	971	771	673	612	568	534
	1400	530	538	562	12.9	18.4	971	771	673	612	568	534
	1000 1600	600	608	632	14.0	20.2	971	771	673	612	568	534
	1800	670	678	702	15.1	22.0	971	771	673	612	568	534
	1200	700	708	732	15.5	22.7	971	771	673	612	568	534
	2000	750	758	782	16.3	24.0	971	771	673	612	568	534
	1400 2200	800	808	832	17.1	25.2	971	771	673	612	568	534
	1600	900	908	932	18.6	27.7	971	771	673	612	568	534
	1800	1000	1008	1032	20.1	30.3	971	771	673	612	568	534
	2000	1100	1108	1132	21.7	32.8	971	771	673	612	568	534
1000		1150	1158	1182	22.4	34.0	971	771	673	612	568	534
	2200	1250	1258	1282	24.0	36.6	971	771	673	612	568	534
1200		1400	1408	1432	26.3	40.3	971	771	673	612	568	534
1400		1600	1608	1632	29.4	45.4	971	771	673	612	568	534
1600		1800	1808	1832	32.4	50.4	898	771	673	612	568	
1800		2000	2008	2032	35.5	55.4	819	771	673	612	568	
2000		2200	2208	2232	38.6	60.5	755	755	673	612		
2200		2500	2508	2532	43.2	68.0	670	670	670	612		

The indicated load capacity relates to a project working life of 30000 hours.




Ø 194 N

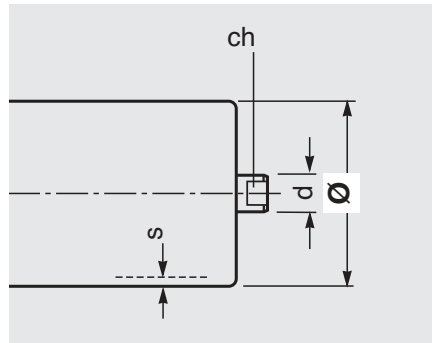
Bearing 6308
(40 X 90 X 23)

- d = 40
- ch = 32
- s = 6,3
- e = 4
- g = 12

Example of ordering
standard design
PSV7.40F.194N.758
for special design
see pages 80-81

Belt	roller			weight		load capacity						
	width mm	dimensions mm			Kg		daN					
arrangements 	B	C	A	rotating parts	total	belt speed m/s						
						2	3	4	5	6	7	
	1600	600	608	632	23.2	29.4	823	719	654	607	571	542
	1800	670	678	702	25.2	32.1	823	719	654	607	571	542
	2000	750	758	782	27.6	35.2	823	719	654	607	571	542
	2200	800	808	832	29.0	37.2	823	719	654	607	571	542
	1600 2400	900	908	932	31.9	41.1	823	719	654	607	571	542
	2600	950	958	982	33.4	43.0	823	719	654	607	571	542
	1800	1000	1008	1032	34.9	45.0	823	719	654	607	571	542
	2800	1050	1058	1082	36.3	46.9	823	719	654	607	571	542
	2000	1100	1108	1132	37.8	48.9	823	719	654	607	571	542
	3000	1120	1128	1152	38.4	49.6	823	719	654	607	571	542
	2200	1250	1258	1282	42.1	54.7	823	719	654	607	571	542
	2400	1400	1408	1432	46.5	60.6	823	719	654	607	571	542
	2800	1600	1608	1632	52.3	68.3	823	719	654	607	571	542
	3000	1700	1708	1732	55.3	72.2	823	719	654	607	571	542
1600	1800	1808	1832	58.2	76.1	817	719	654	607	571	542	
1800	2000	2008	2032	64.0	83.9	736	719	654	607	571	542	
2000	2200	2208	2232	69.8	91.7	671	671	654	607	571	542	
2200	2500	2508	2532	78.6	103.4	593	593	593	593	571	542	
2400	2800	2808	2832	87.3	115.1	532	532	532	532	571	542	
2600	3000	3008	3032	93.2	122.9	498	498	498	498	571	542	

The indicated load capacity relates to a project working life of 30000 hours.



The table indicates rollers with non standard diameters that we are already producing.

Upon request rollers may be supplied with varying dimensions, tube thickness end diameters according to standards CEMA, BS, JIS, AFNOR and ISO-FEM .

Production programme of non standard PSV

roller type	Ø mm	basic design	s	spindle d	ch	bearing	note
PSV 1	76	N	3	20	14	6204	with tube and spindle in steel S 235 JR (EN 10027-1) ex Fe 360 (EN 10025) St 37 (DIN 17100)
	102	N	3				
	114	N	3,5				
	127	N	4				
	140	N	4				
PSV 2	76	N	3	25	18	6205	
	102	N	3				
	114	N	3,5				
	127	N	4				
	140	N	4				
	152	N	4				
PSV 3	102	N	3	25	18	6305	
	127	N	4				
	152	N	4				
	168	N	4,5				
PSV 4	102	N	3	30	22	6206	
	127	N	4				
	152	N	4				
	168	N	4,5				



2.5.2 Series PL/PLF

Where used

In conveyors used to transport very corrosive materials ; and where difficult working conditions prevail : the extraction industries and in the mining of salt, chemical industries, fertiliser manufacture and in marine environments which require corrosion resistant rollers.

These rollers demonstrate particular resistance to the presence of high humidity and water, and also to corrosive elements present in the environment or in the conveyed material itself.

The design of the rollers utilises plastic materials for the most critical parts, which, excellently and economically, substitute for traditional materials such as stainless steel, bronze and aluminium.

Testing and actual plant trials have well demonstrated the efficiency and versatility of these rollers. The characteristics

designed into them provide a long working life even in the most severe environment, and when one considers their low purchasing and maintenance cost, PL/PLF rollers provide the ideal solution for severe applications.

The functioning temperatures recommended are:

- 10° to +50°C for rollers with PVC endcaps
- 10° to + 70° for rollers with steel endcaps.





2 Rollers

series PL-PLF



Characteristics

The PL roller has been designed with two important principles : to offer the maximum resistance to a corrosive environment, together with mechanical properties sufficient to sustain heavy loads on the belt conveyor or caused by the material being conveyed.

The first characteristic has been achieved utilising, for all the external parts of the roller, materials resistant to corrosion.

The second, is the design of the roller itself as a precision arrangement and generously dimensioned (whether it is the thickness of the load carrying parts or in the items in contact with the belt).

The result of this intelligent design has made possible a roller very resistant to the environment and to chemicals and aggressive materials, and at the same time of surprising lightness, optimum balance and quietness, that also reduces energy consumption thanks to the avoidance of any contact parts in the sealing system.

Roller shell

Comprises a precision high quality rigid PVC tube of a large thickness resistant to low and high temperatures.

In the PLF version the tube shell is in steel machined at either end, to allow the insertion of the bearing housings.

Bearing housings

They are produced by a high pressure moulding of polypropylene loaded with fibreglass.

This material gives high resistance to corrosion as well as an optimum mechanical resistance,

The endcap is forced with an interference fit into the counterbored section of the tube to present an united structure that is very robust, light, flexible and above all shock resistant.

Spindles

Diameter 20 mm in drawn steel and ground to guarantee at optimum fit to the bearing.

Bearings

Radial rigid precision bearings with a spherical ball race, series 6204 and internal play C3 fit.

Seals

Internally we find a labyrinth seal which brushes against the spindle to protect the bearing from eventual condensation or rusting from the interior of the tube where it is in steel.

The tube when in plastic does not rust and having a good thermic insulation limits the formation of condensation.

The patented external protection is made from anti-corrosive material : polypropylene loaded with glass fibre, similar to the end cap.

Resistance to chemical agents

Agents	Polypropylene (PP)	Polyvinyl chloride (PVC)
Grease, oil	○	○
Petrol	○	○
Strong alkalines	○	○
Weak alkalines	○	○
Strong acids	□	▲
Weak acids	▲	○
Hydrocarbons	□	▲
Organic acids	○	○
Alcohol	○	○
Ketone	□	●

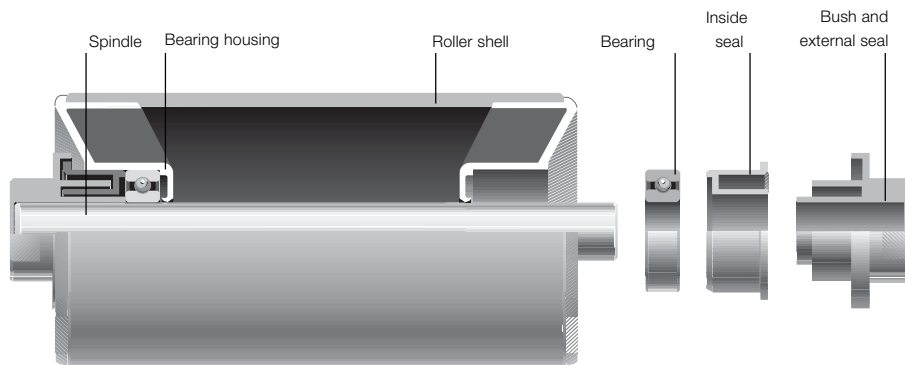
○ resistant ▲ in general sufficiently resistant
● non resistant □ resistant only in certain conditions

The seal presents a front cover shield, that prevents the ingress to the body of items larger than 0.5 mm.

The particular self cleaning geometry of the end cap facilitates the rejection of fine particles by the action of gravity, even when the roller is inclined, meanwhile the centrifugal action of the roller rotation aids the cleaning process when material arrives in the proximity of the end cap.

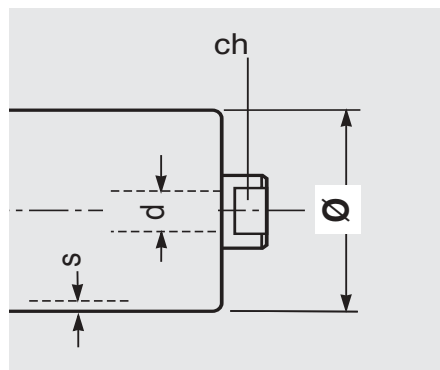
The labyrinth is very deep and divided into two zones separated by a large chamber, which lengthens the route for and protects the bearing from the ingress of foreign particles.

The wall of the labyrinth on the bearing side is formed in a manner that increases the grease chamber. The type of grease is lithium based water repellent and anti-rusting, providing lubrication for long roller life.



The table indicates the diameter of rollers in production. The diameters are those standards according to European unification to norm DIN (for steel body).

Upon request rollers may be supplied with lengths and spindle extensions according to norms CEMA, BS, JIS, AFNOR, ISO - FEM and UNI.



Programme of production series PL e PLF

roller type	Ø mm	basic design	s	spindle d	ch	bearings	note
PL 2	90	V	4,3	20	30	6204	with tube in rigid PVC, colour grey RAL 7030, spindle steel S 235 JR (Fe360, DIN St 37) bushes in polyamide loaded with glass fibre
	110	V	5,3				
	140	V	8,5				
PL 3	90	V	4,3	20	14	6204	with tube in rigid PVC, colour grey RAL 7030, spindle steel S 235 JR (Fe360, DIN St 37) bushes in polyamide loaded with glass fibre
	110	V	5,3				
	140	V	8,5				
PL 4	90	V	4,3	20	14	6204	with tube in rigid PVC, colour grey RAL 7030, spindle steel S 235 JR (Fe360, DIN St 37)
	110	V	5,3				
	140	V	8,5				
PLF 1	89	N	3	20	30	6204	with tube and spindle in steel S 235 JR (UNI Fe360, DIN St 37) bushes in polyamide loaded with glass fibre
	108	N	3,5				
	133	N	4				
PLF 5	89	N	3	20	14	6204	with tube and spindle in steel S 235 JR (UNI Fe360, DIN St 37) bushes in polyamide loaded with glass fibre
	108	N	3,5				
	133	N	4				
PLF 20	89	N	3	20	14	6204	with tube and spindle in steel S 235 JR (UNI Fe360, DIN St 37)
	108	N	3,5				
	133	N	4				



2 Rollers

series
PL 2
PL 3
PL 4

Ø 90 V

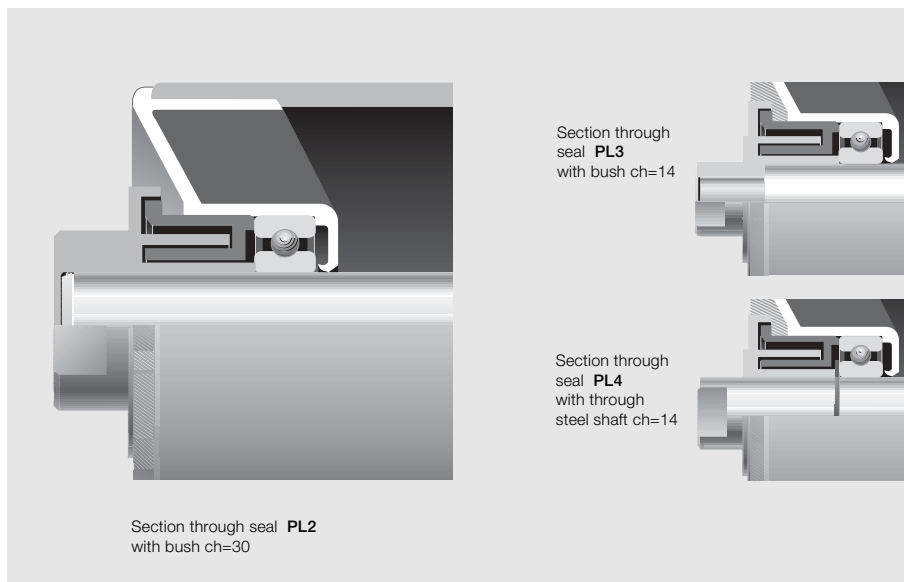
Bearing 6204
 (20 X 47 X 14)

PL 2
 d = 20
 d₁ = 35
 ch = 30
 s = 4,3
 e = 4
 g = 10

PL 4
 d = 20
 d₁ = 20
 ch = 14
 s = 4,3
 e = 4
 g = 10

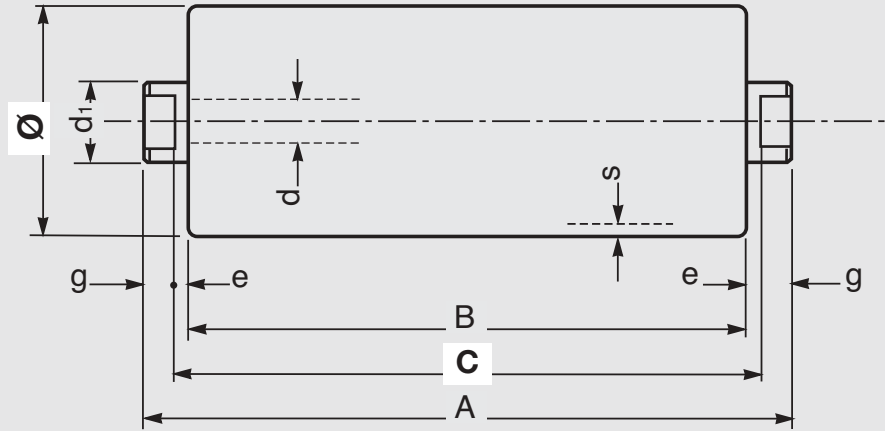
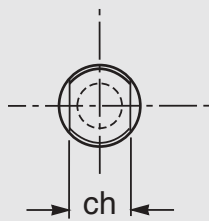
PL 3
 d = 20
 d₁ = 20
 ch = 14
 s = 4,3
 e = 4
 g = 10

Example of ordering
 standard design
 PL2,20N,90V,323
 for special design
 see pages 80-81



Belt	roller										
	width mm	dimensions mm			weight Kg		load capacity daN				
arrangements 	B	C	A	rotating parts total		belt speed m/s					
						1	1.25	1.5	1.75	2	2.5
400	160	168	188	0.7	1.2	97	88	80	75	70	63
500	200	208	228	0.8	1.3	97	88	80	75	70	63
400 650	250	258	278	0.8	1.5	97	88	80	75	70	63
500 800	315	323	343	1.0	1.8	97	88	80	75	70	63
650 1000	380	388	408	1.1	2.1	97	88	80	75	70	63
800 1200	465	473	493	1.2	2.4	97	88	80	75	70	63
400	500	508	528	1.3	2.6	97	88	80	75	70	63
500 1000	600	608	628	1.5	3.0	97	88	80	75	70	63
1200	700	708	728	1.6	3.4	97	88	80	75	70	63
650	750	758	778	1.7	3.6	97	88	80	75	70	63
800	950	958	978	2.1	4.5	50	50	50	50	50	50
1000	1150	1158	1178	2.4	5.3	28	28	28	28	28	28
1200	1400	1408	1428	2.8	6.3	16	16	16	16	16	16

The indicated load capacity relates to a project working life of 10.000 hours.



Ø 110 V

Bearing 6204
(20 x 47 x 14)

PL 2


d = 20
d₁ = 35
ch = 30
s = 5,3
e = 4
g = 10

PL 4

d = 20
d₁ = 20
ch = 14
s = 5,3
e = 4
g = 10

PL 3

d = 20
d₁ = 20
ch = 14
s = 5,3
e = 4
g = 10

Belt	roller			weight Kg		load capacity daN					
	width mm	dimensions mm				belt speed m/s					
arrangements 	B	C	A	rotating parts	total	1	1.25	1.5	2	2.5	3
400	160	168	188	1.2	1.6	107	96	88	77	69	64
500	200	208	228	1.3	1.8	107	96	88	77	69	64
400 650	250	258	278	1.4	2.1	107	96	88	77	69	64
500 800	315	323	343	1.5	2.4	107	96	88	77	69	64
650 1000	380	388	408	1.7	2.7	107	96	88	77	69	64
800 1200	465	473	493	1.9	3.1	107	96	88	77	69	64
400	500	508	528	2.0	3.3	107	96	88	77	69	64
500 1000	600	608	628	2.2	3.8	107	96	88	77	69	64
1200	700	708	728	2.5	4.3	107	96	88	77	69	64
650	750	758	778	2.6	4.5	107	96	88	77	69	64
800	950	958	978	3.1	5.5	107	96	88	77	69	64
1000	1150	1158	1178	3.6	6.5	62	62	62	62	62	62
1200	1400	1408	1428	4.2	7.7	35	35	35	35	35	35

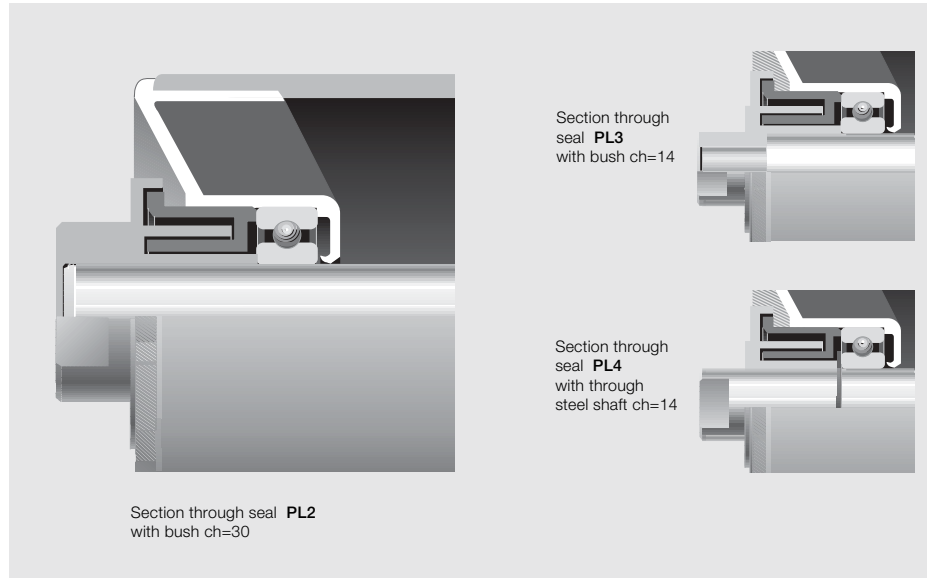
The indicated load capacity relates to a project working life of 10.000 hours.

Example of ordering
standard design
PL2,20N,110V,473
for special design
see pages 80-81



2 Rollers

series
PL 2
PL 3
PL 4



Ø140 V

Bearing 6204
 (20 X 47 X 14)

PL 2
 d = 20
 d₁ = 35
 ch = 30
 s = 8,5
 e = 4
 g = 10

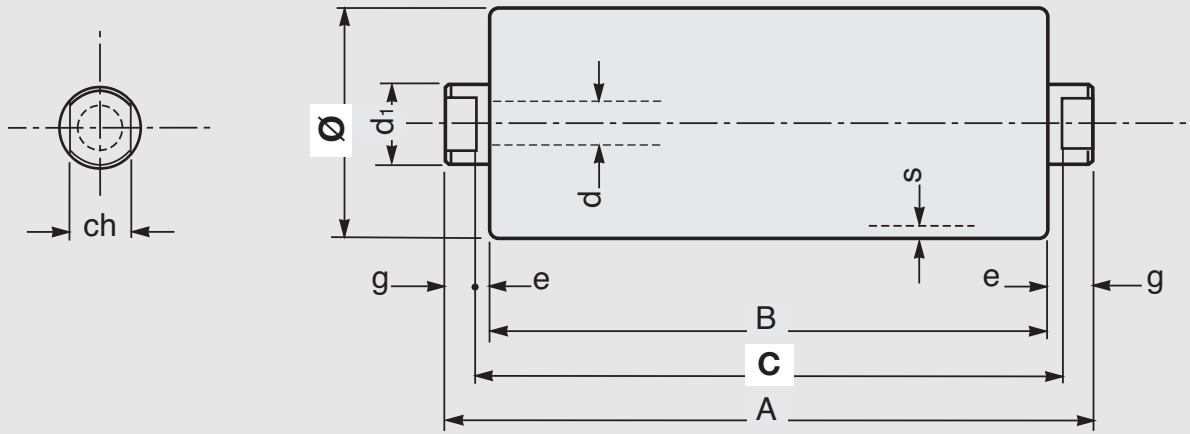
PL 4
 d = 20
 d₁ = 20
 ch = 14
 s = 8,5
 e = 4
 g = 10

PL 3
 d = 20
 d₁ = 20
 ch = 14
 s = 8,5
 e = 4
 g = 10

Belt	roller											
	width mm	dimensions mm			weight Kg		load capacity daN					
arrangements 	B	C	A	rotating parts		belt speed m/s						
				parts	total	1	1.5	2	2.5	3	4	
	400	160	168	188	2.3	2.8	120	99	78	76	71	62
	500	200	208	228	2.5	3.1	120	99	78	76	71	62
	400 650	250	258	278	2.8	3.4	120	99	78	76	71	62
	500 800	315	323	343	3.1	3.9	120	99	78	76	71	62
	650 1000	380	388	408	3.4	4.4	120	99	78	76	71	62
	800 1200	465	473	493	3.8	5.0	120	99	78	76	71	62
400		500	508	528	4.0	5.3	120	99	78	76	71	62
	1400	530	538	558	4.1	5.5	120	99	78	76	71	62
500 1000		600	608	628	4.5	6.0	120	99	78	76	71	62
	1200	700	708	728	5.0	6.8	120	99	78	76	71	62
650		750	758	778	5.2	7.1	120	99	78	76	71	62
	1400	800	808	828	5.5	7.5	120	99	78	76	71	62
800		950	958	978	6.2	8.6	120	99	78	76	71	62
1000		1150	1158	1178	7.2	10.1	120	99	78	76	71	62
1200		1400	1408	1428	8.4	11.9	107	99	78	76	71	62

The indicated load capacity relates to a project working life of 10.000 hours.

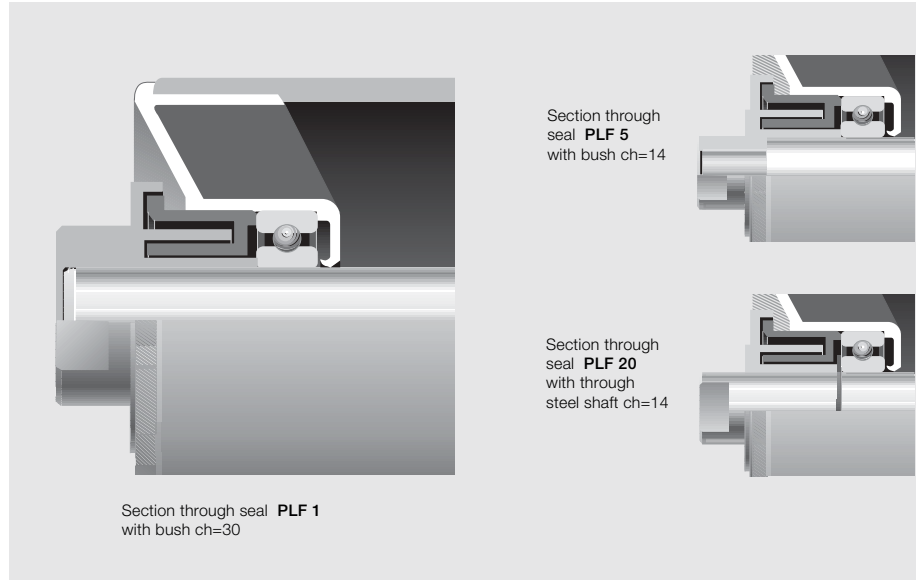
Example of ordering
 standard design
 PL2,20N,140V,473
 for special design
 see pages 80-81





2 Rollers

series
PLF 1
PLF 5
PLF 20



Ø 89 N

Bearing 6204
 (20 X 47 X 14)

PLF 1

d = 20
 d₁ = 35
 ch = 30
 s = 3
 e = 4
 g = 10

PLF 20

d = 20
 d₁ = 20
 ch = 14
 s = 3
 e = 4
 g = 10

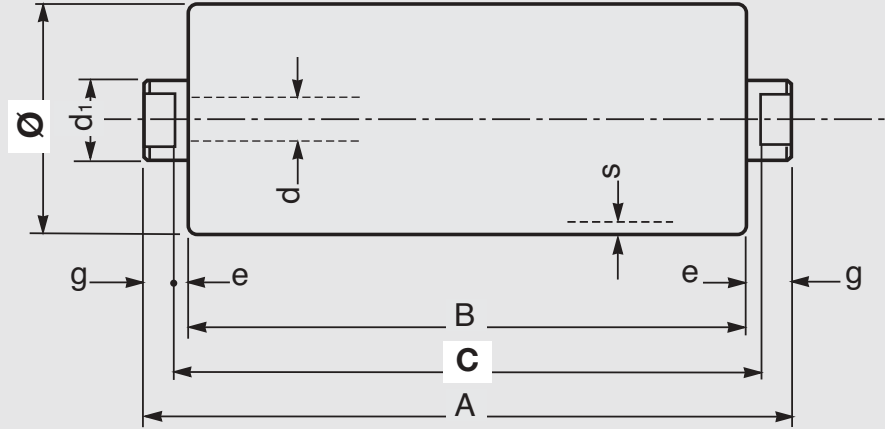
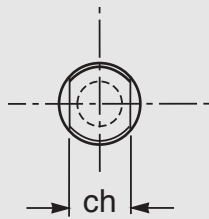
PLF 5

d = 20
 d₁ = 20
 ch = 14
 s = 3
 e = 4
 g = 10

Belt width mm	roller dimensions mm			weight Kg		load capacity daN					
	arrangements 			rotating parts total		belt speed m/s					
	B	C	A			1	1.25	1.5	1.75	2	2.5
400	160	168	188	2.3	2.8	129	116	107	99	93	84
500	200	208	228	2.5	3.1	129	116	107	99	93	84
400 650	250	258	278	2.8	3.4	129	116	107	99	93	84
500 800	315	323	343	3.1	3.9	129	116	107	99	93	84
650 1000	380	388	408	3.4	4.4	129	116	107	99	93	84
800 1200	465	473	493	3.8	5.0	129	116	107	99	93	84
400	500	508	528	4.0	5.3	129	116	107	99	93	84
1400	530	538	558	4.1	5.5	129	116	107	99	93	84
500 1000	600	608	628	4.5	6.0	129	116	107	99	93	84
1200	700	708	728	5.0	6.8	129	116	107	99	93	84
650	750	758	778	5.2	7.1	129	116	107	99	93	84
1400	800	808	828	5.5	7.5	129	116	107	99	93	84
800	950	958	978	6.2	8.6	129	116	107	99	93	84
1000	1150	1158	1178	7.2	10.1	117	116	107	99	93	84
1200	1400	1408	1428	8.4	11.9	96	96	96	96	93	84

The indicated load capacity relates to a project working life of 10.000 hours.

Example of ordering
 standard design
 PLF1,20N,89N,758
 for special design
 see pages 80-81



Ø 108 N

Bearing 6204
(20 x 47 x 14)

PLF 1


d = 20
d₁ = 35
ch = 30
s = 3,5
e = 4
g = 10

PLF 20

d = 20
d₁ = 20
ch = 14
s = 3,5
e = 4
g = 10

PLF 5

d = 20
d₁ = 20
ch = 14
s = 3,5
e = 4
g = 10

Belt	roller			weight		load capacity					
	width mm	dimensions mm			Kg		daN				
arrangements 	B	C	A	rotating parts	total	belt speed m/s					
						1	1.25	1.5	2	2.5	3
400	160	168	186	2.2	2.7	142	127	117	102	92	84
500	200	208	226	2.6	3.1	142	127	117	102	92	84
400 650	250	258	276	3.0	3.7	142	127	117	102	92	84
500 800	315	323	341	3.6	4.5	142	127	117	102	92	84
650 1000	380	388	406	4.2	5.2	142	127	117	102	92	84
800 1200	465	473	491	5.0	6.2	142	127	117	102	92	84
400	500	508	526	5.3	6.6	142	127	117	102	92	84
500 1000	600	608	626	6.2	7.7	142	127	117	102	92	84
1200	700	708	726	7.1	8.9	142	127	117	102	92	84
650	750	758	776	7.6	9.5	142	127	117	102	92	84
800	950	958	976	9.4	11.8	137	127	117	102	92	84
1000	1150	1158	1176	11.2	14.0	113	113	113	102	92	84
1200	1400	1408	1426	13.4	16.9	93	93	93	93	92	84

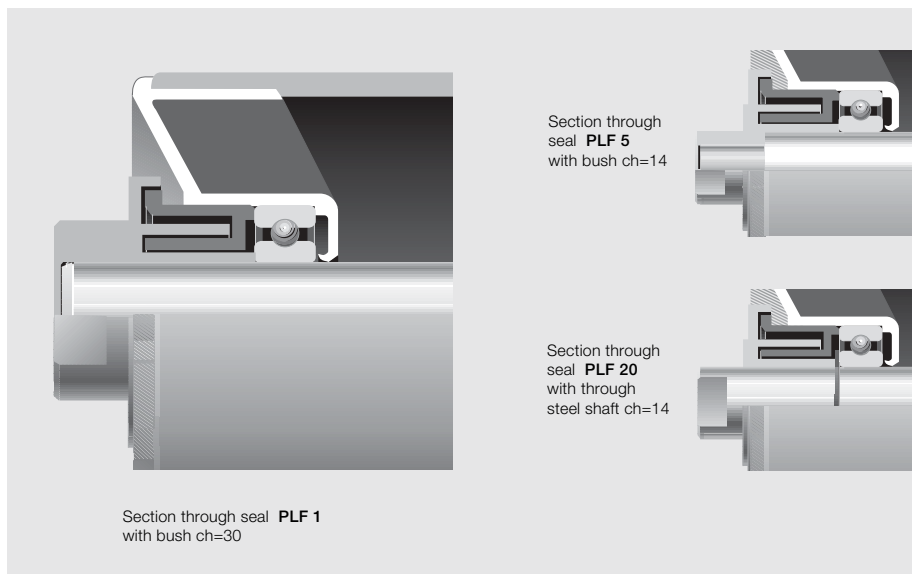
The indicated load capacity relates to a project working life of 10.000 hours.

Example of ordering
standard design
PLF1,20N,108N,958
for special design
see pages 80-81



2 Rollers

series
PLF 1
PLF 5
PLF 20



Ø 133 N

Bearing 6204
 (20 X 47 X 14)

PLF 1

d = 20
 d₁ = 35
 ch = 30
 s = 4
 e = 4
 g = 10

PLF 20

d = 20
 d₁ = 20
 ch = 14
 s = 4
 e = 4
 g = 10

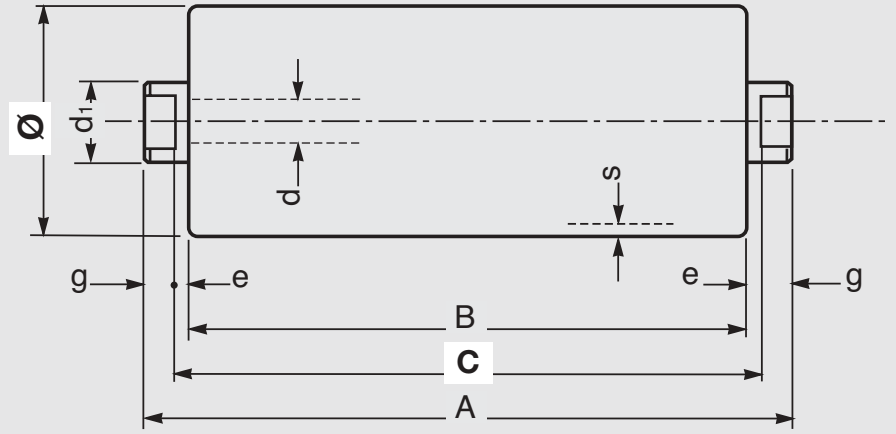
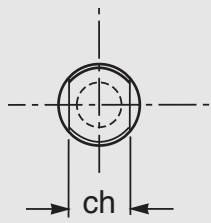
PLF 5

d = 20
 d₁ = 20
 ch = 14
 s = 4
 e = 4
 g = 10

Belt	roller											
	width mm	dimensions mm			weight Kg		load capacity daN					
arrangements 	B	C	A	rotating parts		belt speed m/s						
				total	1	1.5	2	2.5	3	4		
	400	160	168	186	3.6	4.0	156	129	112	101	93	81
	500	200	208	226	4.1	4.6	156	129	112	101	93	81
	400 650	250	258	276	4.7	5.4	156	129	112	101	93	81
	500 800	315	323	341	5.5	6.4	156	129	112	101	93	81
	650 1000	380	388	406	6.4	7.4	156	129	112	101	93	81
	800 1200	465	473	491	7.5	8.7	156	129	112	101	93	81
400		500	508	526	7.9	9.2	156	129	112	101	93	81
	1400	530	538	556	8.3	9.6	156	129	112	101	93	81
500 1000		600	608	626	9.2	10.7	156	129	112	101	93	81
	1200	700	708	726	10.5	12.2	156	129	112	101	93	81
650		750	758	776	11.1	13.0	156	129	112	101	93	81
	1400	800	808	826	11.7	13.8	156	129	112	101	93	81
800		950	958	976	13.6	16.0	136	129	112	101	93	81
1000		1150	1158	1176	16.2	19.1	111	111	111	101	93	81
1200		1400	1408	1426	19.4	22.9	91	91	91	91	91	81
1400		1600	1608	1626	21.9	25.9	79	79	79	79	79	79

The indicated load capacity relates to a project working life of 10.000 hours.

Example of ordering
 standard design
 PLF1,20N,133N,1158
 for special design
 see pages 80-81





2 Rollers



2.5.3 - Rollers series MPS - M

In recent years there has been a substantial increase in the use of belt conveyors due to their recognition as the most economic form of bulk transport.

The rollers comprise the principal components and are the focus of attention of the designer and the user who are always validating products both from a technical and economic point of view.



Accepting this premise, Rulmeca, with the intention to satisfy various requirements in the best way, has developed rollers series MPS and M, that complement the very heavy roller series PSV.



Where used

The use of these two roller series, is particularly advantageous in the economic sense where their difference is in the bearings employed : MPS uses rigid radial precision ball bearings, while M uses special cup and cone ball bearings.

Their use is in medium duty conveyors, but also at high speeds and even in dirty external environment.

The M roller type has a lower load and speed capacity than that of the MPS roller.





2 Rollers

series MPS - M



Characteristics

Rulmecca, in designing these rollers combines the requirements of high quality and hermetic sealing with low cost and where the loading does not require spindles of 20 Ø mm.

Roller shell

Consists of a selected steel tube, machined at either end to strict tolerances.

Bearing housing

Formed from strip steel deep pressed and calibrated to ISO M7: this tolerance allowing a perfect match between the bearing and the relevant parts of the sealing.

Unibloc

The roller shell and the two bearing housings are welded together in a way that forms a monolithic structure of exceptional strength.

This method guarantees the maximum precision and the minimum out of balance forces in the rollers.

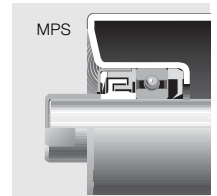
Spindle

The bright drawn precision spindle of Ø 15 provides an ideal fit to the bearing resulting in its perfect rotation.

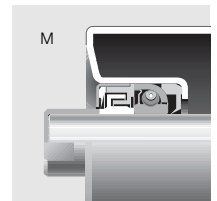
The standard design utilises closing bushes, pre-machined with spanner flats ch = 17 and 14.

Bearings

MPS series rollers use rigid radial 6202 series precision ball bearings from the very best market sources.



M series rollers use special cup and cone ball bearings manufactured in house to the strictest quality control and test criteria with precision dimensions.



Sealing

The external seal is a cover cap in zinc plated steel complete with a wiper seal.

Internally, the sealing comprises a nylon (PA6) labyrinth seal with optimum resistance to chemicals and to mechanical pressure, filled with grease that protects the bearing from unwelcome ingress of external particles.

A lip seal is positioned on the inside of the bearing that wipes the spindle and creates an ample space for grease. Its design is such as to contain lubrication even in the case of extreme changes in temperature and to protect the bearing from condensation and possible rusting from the inside of the roller tube.

Lubrication

The grease used is a special lithium based grease with high resistance to ageing and humidity.

The quantity introduced into the roller is sufficient to guarantee an optimum lubrication of the bearing for the working life of the roller.

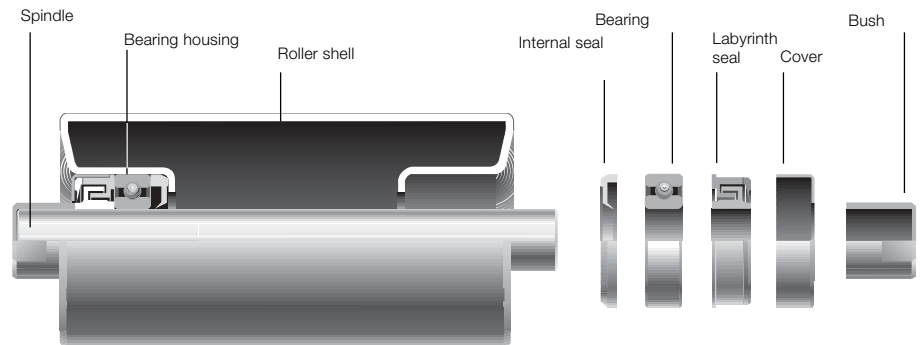
Balancing

The optimum roller balance is obtained thanks to the auto centring of the bearing housings to the tube (as in series PSV) during the automatic welding process.

This balance allows the MPS rollers to be used at high speeds eliminating dangerous vibrations and the subsequent “hammering” of the bearings.

Final Testing

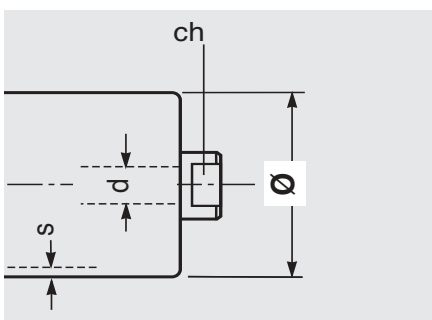
At the end of the automatic assembly line 100 % of the rollers are subjected to high speed rotation, that promotes the even distribution of grease in the seals, and verifies the rotation resistance. Any roller failing pre-set criteria is automatically eliminated from the production line.



Programme of production series MPS

roller type	Ø mm	basic design	s	spindle		bearing	note
				d	ch		
MPS 1	50	N	3	15	17	6202	with tube and spindle in steel S 235 JR (EN 10027-1) ex Fe 360 (EN 10025) St 37 (DIN 17100)
	60	N	3				
	76	N	3				
	89	N	3				
	102	N	3				
M 1	50	N	3	15	17	Cup and cone	
	60	N	3				
	76	N	3				
	89	N	3				
	102	N	3				

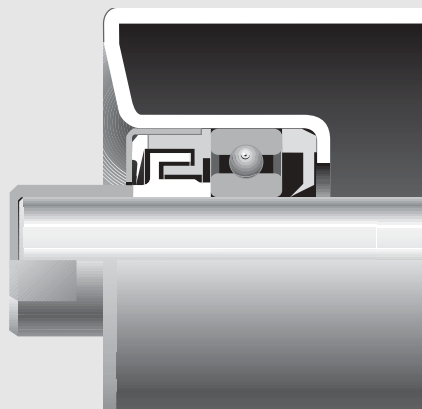
The table indicates the roller diameters in production. Upon request non standard dimensions may be supplied and with flats ch = 14 mm.





2 Rollers

series MPS 1




Section through seal

Ø 50 N

Bearing 6202
(15 X 35 X 11)

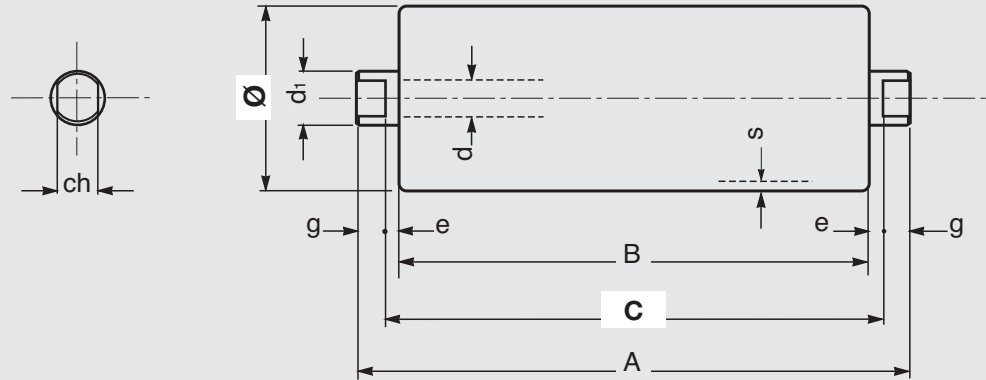
d = 15
d₁ = 20
ch = 17 *
s = 3
e = 4
g = 9

*ch = 14 upon
request

Belt		roller										
width mm		dimensions mm			weight Kg		load capacity daN					
arrangements 		B	C	A	rotating parts total		belt speed m/s					
							0.5	0.75	1	1.25	1.5	1.75
	400	160	168	186	0.8	1.1	138	121	110	102	96	91
	300 500	200	208	226	1.0	1.3	138	121	110	102	96	91
	400 650	250	258	276	1.1	1.5	138	121	110	102	96	91
	500 800	315	323	341	1.4	1.8	138	121	110	102	96	91
	300 650 1000	380	388	406	1.6	2.1	138	121	110	102	96	91
	800	465	473	491	1.9	2.6	117	117	110	102	96	91
	400	500	508	526	2.0	2.7	109	109	109	102	96	91
	500 1000	600	608	626	2.4	3.2	91	91	91	91	91	91
	650	750	758	776	2.9	3.9	73	73	73	73	73	73
	800	950	958	976	3.6	4.9	58	58	58	58	58	58
	1000	1150	1158	1176	4.3	5.9	49	49	49	49	49	49

The indicated load capacity relates to a project working of 10000 hours.

Example of ordering
standard design
MPS 1,15B,50N,208
for special designs
see pages 80-81



Ø 60 N

Bearing 6202
(15 x 35 x 11)

d = 15
d₁ = 20
ch = 17 *
s = 3
e = 4
g = 9

*ch = 14 upon
request

Belt	roller			weight		load capacity						
	width mm	dimensions mm			Kg		daN					
arrangements 	B	C	A	rotating parts total		belt speed m/s						
						0.75	1	1.25	1.5	1.75	2	
	400	160	168	186	1.0	1.2	128	117	108	102	97	93
	300 500	200	208	226	1.1	1.5	128	117	108	102	97	93
	400 650	250	258	276	1.4	1.7	128	117	108	102	97	93
	500 800	315	323	341	1.6	2.1	128	117	108	102	97	93
	300 650 1000	380	388	406	1.9	2.5	128	117	108	102	97	93
	800	465	473	491	2.3	2.9	114	114	108	102	97	93
	400	500	508	526	2.4	3.1	106	106	106	102	97	93
	500 1000	600	608	626	2.8	3.7	88	88	88	88	88	88
	650	750	758	776	3.5	4.5	70	70	70	70	70	70
	800	950	958	976	4.3	5.7	55	55	55	55	55	55
	1000	1150	1158	1176	5.2	6.8	46	46	46	46	46	46

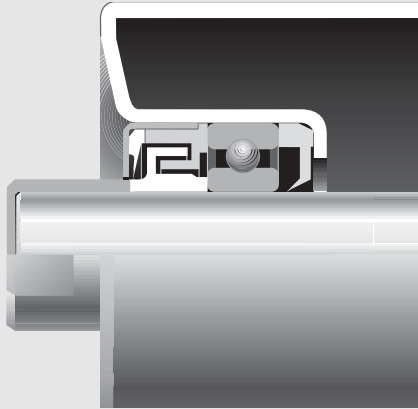
The indicated load capacity relates to a project working of 10000 hours.

Example of ordering
standard design
MPS 1,15B,60N,258
for special designs
see pages 80-81



2 Rollers

series MPS 1




Section through seal

Ø 76 N

Bearing 6202
(15 x 35 x 11)

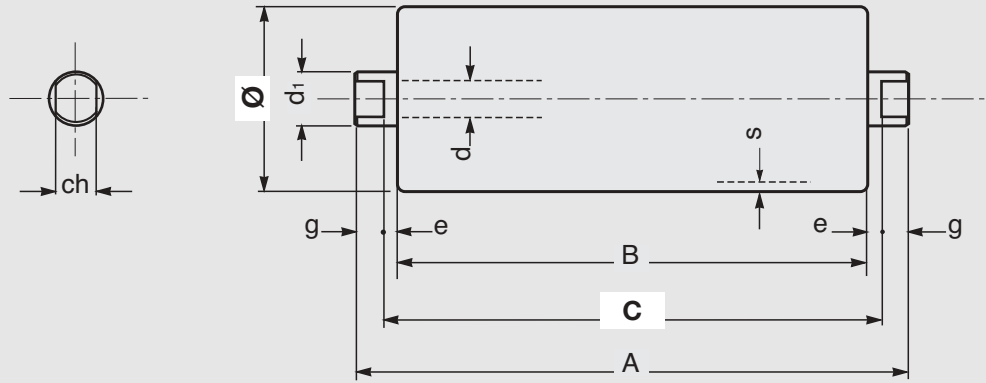
d = 15
d₁ = 20
ch = 17 *
s = 3
e = 4
g = 9

*ch = 14 upon
request

Belt width mm	roller dimensions mm			weight Kg		load capacity daN								
	arrangements 			B	C	A	rotating parts		belt speed m/s					
							total	1	1.25	1.5	1.75	2	2.5	
400				160	168	186	1.2	1.5	126	117	110	105	100	93
300	500			200	208	226	1.4	1.8	126	117	110	105	100	93
400	650			250	258	276	1.7	2.1	126	117	110	105	100	93
500	800			315	323	341	2.1	2.5	126	117	110	105	100	93
300	650	1000		380	388	406	2.4	3.0	126	117	110	105	100	93
800				465	473	491	2.9	3.6	113	113	110	105	100	93
400				500	508	526	3.1	3.8	104	104	104	104	100	93
500	1000			600	608	626	3.6	4.5	86	86	86	86	86	86
650				750	758	776	4.4	5.5	68	68	68	68	68	68
800				950	958	976	5.5	6.8	53	53	53	53	53	53
1000				1150	1158	1176	6.6	8.2	44	44	44	44	44	44

The indicated load capacity relates to a project working of 10000 hours.

Example of ordering
standard design
MPS 1,15B,76N,323
for special designs
see pages 80-81




Ø 89 N

Bearing 6202
(15 x 35 x 11)

d = 15
d₁ = 20
ch = 17 *
s = 3
e = 4
g = 9

*ch = 14 upon
request

Belt width mm	roller dimensions mm			weight Kg		load capacity daN						
	arrangements 	B	C	A	rotating parts	total	belt speed m/s					
							1	1.25	1.5	2	2.5	3
400		160	168	186	1.4	1.7	133	124	116	106	98	92
300	500	200	208	226	1.7	2.0	133	124	116	106	98	92
400	650	250	258	276	2.0	2.4	133	124	116	106	98	92
500	800	315	323	341	2.4	2.9	133	124	116	106	98	92
300	650 1000	380	388	406	2.9	3.4	133	124	116	106	98	92
	1200	465	473	491	3.4	4.1	112	112	112	106	98	92
400	800	500	508	526	3.6	4.3	103	103	103	103	98	92
500	1000	600	608	626	4.3	5.1	85	85	85	85	85	85
	1200	700	708	726	4.9	5.9	72	72	72	72	72	72
650		750	758	776	5.2	6.3	67	67	67	67	67	67
800		950	958	976	6.5	7.9	53	53	53	53	53	53
1000		1150	1158	1176	7.8	9.4	43	43	43	43	43	43
1200		1400	1408	1426	9.4	11.4	35	35	35	35	35	35

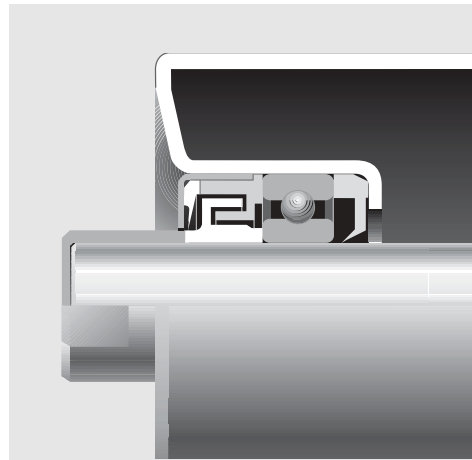
The indicated load capacity relates to a project working of 10000 hours.

Example of ordering
standard design
MPS 1,15B,89N,758
for special designs
see pages 80-81



2 Rollers

series MPS 1




Section through seal

Ø102 N

Bearing 6202
(15 x 35 x 11)

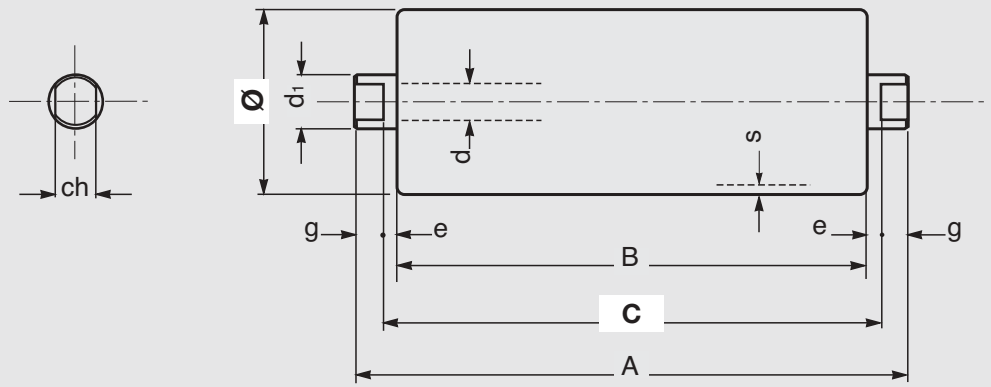
d = 15
d₁ = 20
ch = 17 *
s = 3
e = 4
g = 9

*ch = 14 upon
request

Belt width mm	roller dimensions mm			weight Kg		load capacity daN								
	arrangements 			B	C	A	rotating parts total		belt speed m/s					
									1	1.25	1.5	2	2,5	3
400				160	168	186	1.7	1.9	139	129	122	111	103	97
300	500			200	208	226	2.0	2.3	139	129	122	111	103	97
400	650			250	258	276	2.3	2.7	139	129	122	111	103	97
500	800			315	323	341	2.8	3.3	139	129	122	111	103	97
300	650	1000		380	388	406	3.3	3.9	139	129	122	111	103	97
800	1200			465	473	491	3.9	4.6	112	112	112	111	103	97
400				500	508	526	4.2	4.9	103	103	103	103	103	97
500	1000			600	608	626	4.9	5.8	85	85	85	85	85	85
	1200			700	708	726	5.6	6.6	72	72	72	72	72	72
650				750	758	776	6.0	7.1	67	67	67	67	67	67
800				950	958	976	7.5	8.8	52	52	52	52	52	52
1000				1150	1158	1176	8.9	10.6	43	43	43	43	43	43
1200				1400	1408	1426	10.8	12.7	35	35	35	35	35	35

The indicated load capacity relates to a project working of 10000 hours.

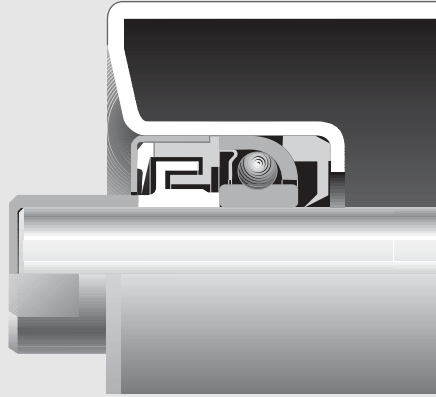
Example of ordering
standard design
MPS 1,15B,102N,388
for special designs
see pages 80-81





2 Rollers

series M 1



Section through seal

Ø 50 N

Cup and cone bearing

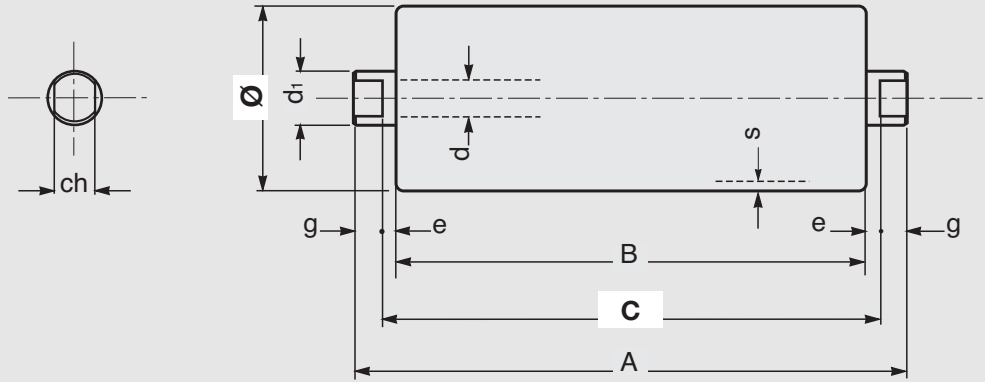
d = 15
d₁ = 20
ch = 17 *
s = 3
e = 4
g = 9

*ch = 14 upon request

Belt	roller												
	width mm			dimensions mm			weight Kg		load capacity daN				
arrangements	B C A			rotating parts total		belt speed m/s							
	B	C	A			0.2	0.4	0.6	0.8	1	1.25		
400	160	168	186	0.8	1.1	89	63	51	44	40	35		
300 500	200	208	226	1.0	1.3	89	63	51	44	40	35		
400 650	250	258	276	1.1	1.5	89	63	51	44	40	35		
500 800	315	323	341	1.4	1.8	89	63	51	44	40	35		
300 650 1000	380	388	406	1.6	2.1	89	63	51	44	40	35		
800	465	473	491	1.9	2.6	89	63	51	44	40	35		
400	500	508	526	2.0	2.7	89	63	51	44	40	35		
500 1000	600	608	626	2.4	3.2	89	63	51	44	40	35		
650	750	758	776	2.9	3.9	73	63	51	44	40	35		
800	950	958	976	3.6	4.9	58	58	51	44	40	35		
1000	1150	1158	1176	4.3	5.9	49	49	49	44	40	35		

The indicated load capacity relates to a project working of 10000 hours.

Example of ordering
standard design
M 1,15B,50N,208
for special designs
see pages 80-81



Ø 60 N

Cup and cone bearing

d = 15
d₁ = 20
ch = 17 *
s = 3
e = 4
g = 9

*ch = 14 upon request

Belt	roller			weight		load capacity					
	width mm	dimensions mm			Kg		daN				
arrangements				rotating parts		belt speed m/s					
	B	C	A	parts	total	0.4	0.6	0.8	1	1.25	1.5
400	160	168	186	1.0	1.2	69	56	49	43	39	35
300 500	200	208	226	1.1	1.5	69	56	49	43	39	35
400 650	250	258	276	1.4	1.7	69	56	49	43	39	35
500 800	315	323	341	1.6	2.1	69	56	49	43	39	35
300 650 1000	380	388	406	1.9	2.5	69	56	49	43	39	35
800	465	473	491	2.3	2.9	69	56	49	43	39	35
400	500	508	526	2.4	3.1	69	56	49	43	39	35
500 1000	600	608	626	2.8	3.7	69	56	49	43	39	35
650	750	758	776	3.5	4.5	69	56	49	43	39	35
800	950	958	976	4.3	5.7	55	55	49	43	39	35
1000	1150	1158	1176	5.2	6.8	46	46	46	43	39	35

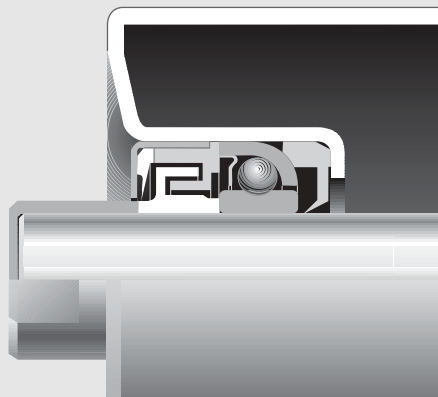
The indicated load capacity relates to a project working of 10000 hours.

Example of ordering
standard design
M1,15B,60N,258
for special designs
see pages 80-81



2 Rollers

series M 1



Section through seal

Ø 76 N

Cup and cone bearing

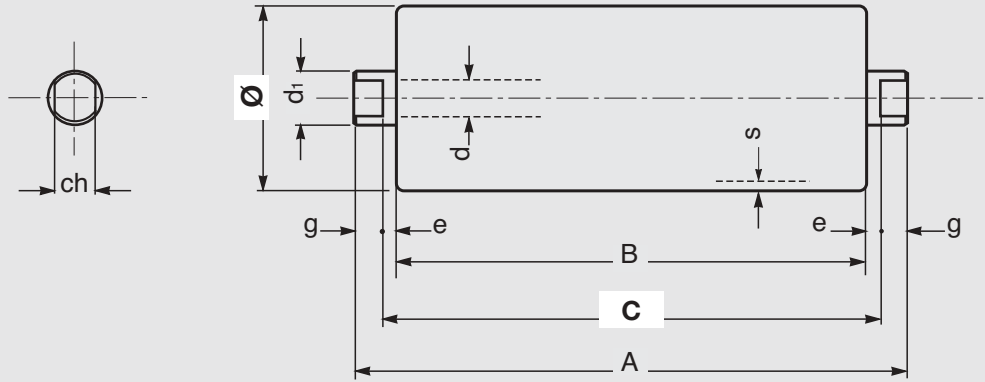
d = 15
d₁ = 20
ch = 17 *
s = 3
e = 4
g = 9

*ch = 14 upon request

Belt	roller												
	width mm			dimensions mm			weight Kg		load capacity daN				
arrangements	B C A			rotating parts total		belt speed m/s							
	B	C	A			0.5	0.75	1	1.25	1.5	1.75		
400	160	168	186	1.2	1.5	69	56	49	44	40	37		
300 500	200	208	226	1.4	1.8	69	56	49	44	40	37		
400 650	250	258	276	1.7	2.1	69	56	49	44	40	37		
500 800	315	323	341	2.1	2.5	69	56	49	44	40	37		
300 650 1000	380	388	406	2.4	3.0	69	56	49	44	40	37		
800	465	473	491	2.9	3.6	69	56	49	44	40	37		
400	500	508	526	3.1	3.8	69	56	49	44	40	37		
500 1000	600	608	626	3.6	4.5	69	56	49	44	40	37		
650	750	758	776	4.4	5.5	68	56	49	44	40	37		
800	950	958	976	5.5	6.8	53	53	49	44	40	37		
1000	1150	1158	1176	6.6	8.2	44	44	44	44	40	37		

The indicated load capacity relates to a project working of 10000 hours.

Example of ordering
standard design
M1,15B1,76N,323
for special designs
see pages 80-81



Ø 89 N

Cup and cone bearing

d = 15
 d₁ = 20
 ch = 17 *
 s = 3
 e = 4
 g = 9

*ch = 14 upon request

Belt	roller			weight		load capacity						
	width mm	dimensions mm			Kg		daN					
arrangements				rotating parts		belt speed m/s						
	B	C	A	parts	total	0.75	1	1.25	1.5	1.75	2	
400	160	168	186	1.4	1.7	61	53	47	43	40	37	
300 500	200	208	226	1.7	2.0	61	53	47	43	40	37	
400 650	250	258	276	2.0	2.4	61	53	47	43	40	37	
500 800	315	323	341	2.4	2.9	61	53	47	43	40	37	
300 650 1000	380	388	406	2.9	3.4	61	53	47	43	40	37	
800	465	473	491	3.4	4.1	61	53	47	43	40	37	
400	500	508	526	3.6	4.3	61	53	47	43	40	37	
500 1000	600	608	626	4.3	5.1	61	53	47	43	40	37	
650	750	758	776	5.2	6.3	61	53	47	43	40	37	
800	950	958	976	6.5	7.9	53	53	47	43	40	37	
1000	1150	1158	1176	7.8	9.4	43	43	43	43	40	37	

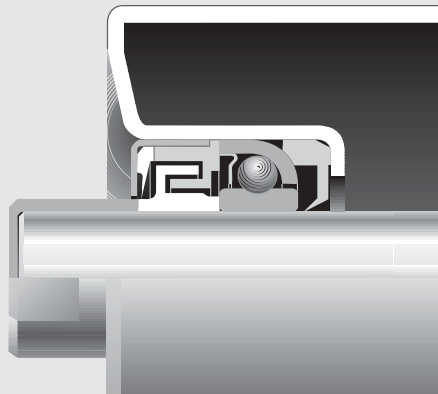
The indicated load capacity relates to a project working of 10000 hours.

Example of ordering
 standard design
 M1,15B,89N,758
 for special designs
 see pages 80-81



2 Rollers

series M 1



Section through seal

Ø 102 N

Cup and cone bearing

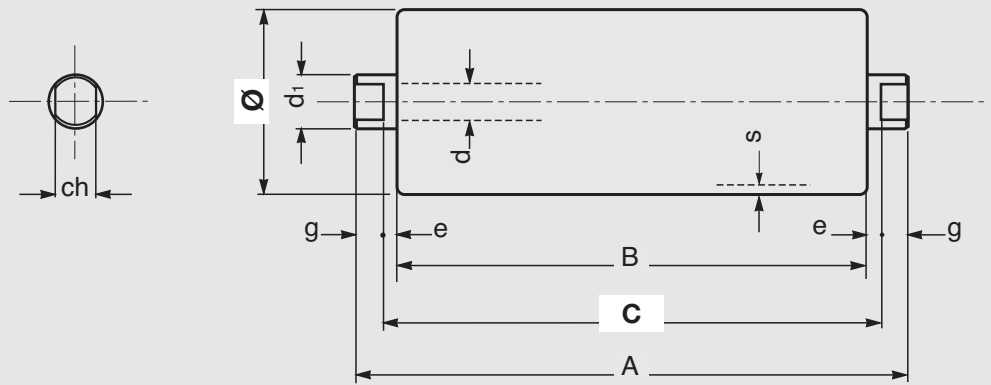
d = 15
d₁ = 20
ch = 17 *
s = 3
e = 4
g = 9

*ch = 14 upon request

Example of ordering
standard design
M1,15B,102N,388
for special designs
see pages 80-81

Belt	roller			weight		load capacity					
	width mm	dimensions mm			Kg		daN				
arrangements	B	C	A	rotating parts		belt speed m/s					
				total	1	1.25	1.5	1.75	2	2.5	
400	160	168	186	1.7	1.9	57	51	46	43	40	36
300 500	200	208	226	2.0	2.3	57	51	46	43	40	36
400 650	250	258	276	2.3	2.7	57	51	46	43	40	36
500 800	315	323	341	2.8	3.3	57	51	46	43	40	36
300 650 1000	380	388	406	3.3	3.9	57	51	46	43	40	36
800	465	473	491	3.9	4.6	57	51	46	43	40	36
400	500	508	526	4.2	4.9	57	51	46	43	40	36
500 1000	600	608	626	4.9	5.8	57	51	46	43	40	36
650	750	758	776	6.0	7.1	57	51	46	43	40	36
800	950	958	976	7.5	8.8	52	51	46	43	40	36
1000	1150	1158	1176	8.9	10.6	43	43	43	43	40	36

The indicated load capacity relates to a project working of 10000 hours.





2 Rollers



2.5.4 - Rollers series MPR

Application sectors

These rollers are used in medium duty conveyors with speeds in proportion to the available diameters : 60, 76, 89 mm. A long operating life is available due to the optimum bearing protection system.

Characteristics

The series MPR is designed using a steel tube swaged over at either end to join the steel end caps in mechanical harmony. The bearing housing is precision finished with a tolerance of ISO M7.

The bearings are of type 6202 rigid radial ball race of the best market supply, with ample grease chamber provided within the roller seal.

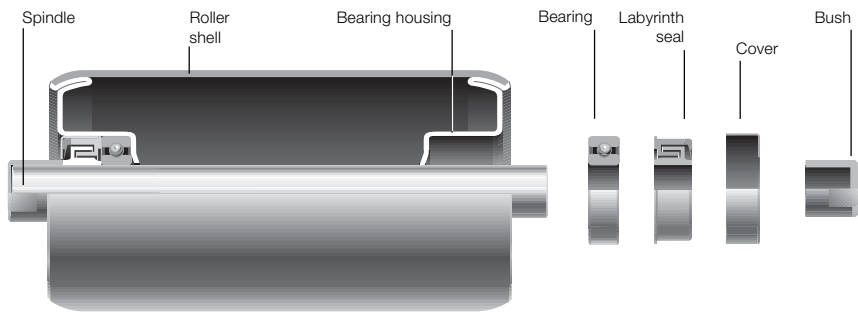
Lubricated for life with a lithium based grease that provides anti-ageing and water-repellent qualities.

The bearing protection is of a similar arrangement to that used in the MPS rollers and is known as MECA-BLOCK.

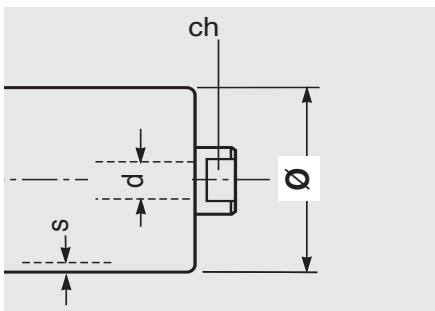
The steel spindle is \varnothing 15 mm, drawn and calibrated in the standard design, provided with a locking bush that has spanner flats (ch = 17) .The use is normally restricted within the temperature range from -20°C $+100^{\circ}\text{C}$.

Given that the method of joining the tube with the end caps is by swaging (not welding) it is advisable to use these rollers in medium severe environments where there is little presence of water.

Thanks to optimum balancing and strong construction these rollers may be employed at loads and speeds similar to those of series MPS. The roller series MPR offers a good cost effective solution.



The table indicates the roller diameters in production, On request they may be supplied with different dimensions to the standard and with ch=14 mm.



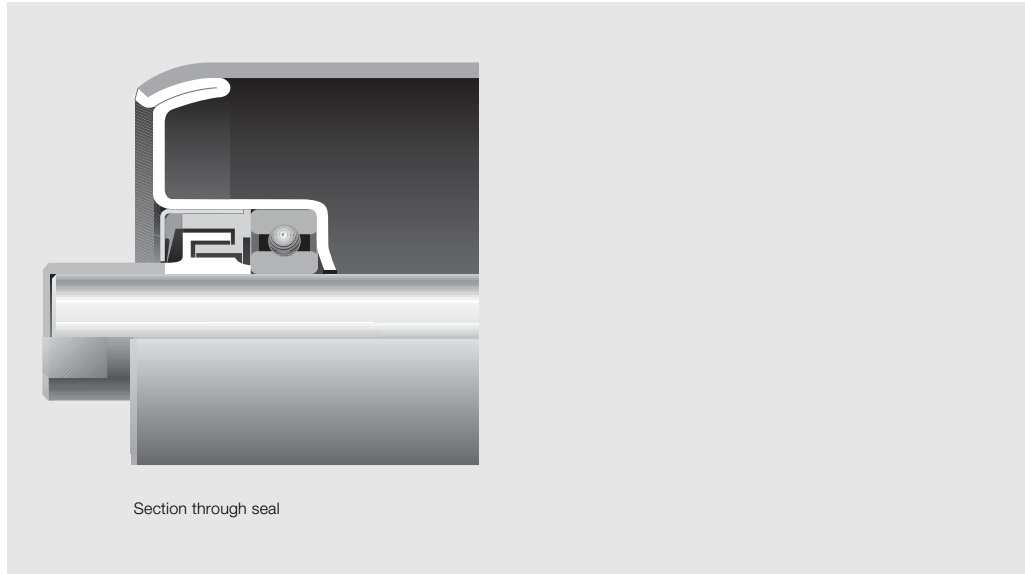
Programme of production series MPR

roller type	\varnothing mm	basic design	s	spindle d	ch	bearing	note
MPR 15	60	N	3	15	17	6202	with tube and spindle in steel S 235 JR (EN 10027-1) ex Fe 360 (EN 10025) St 37 (DIN 17100)
	76	N	3				
	89	N	3				



2 Rollers

series MPR 15




Ø 60 N

Bearing 6202
(15 X 35 X 11)

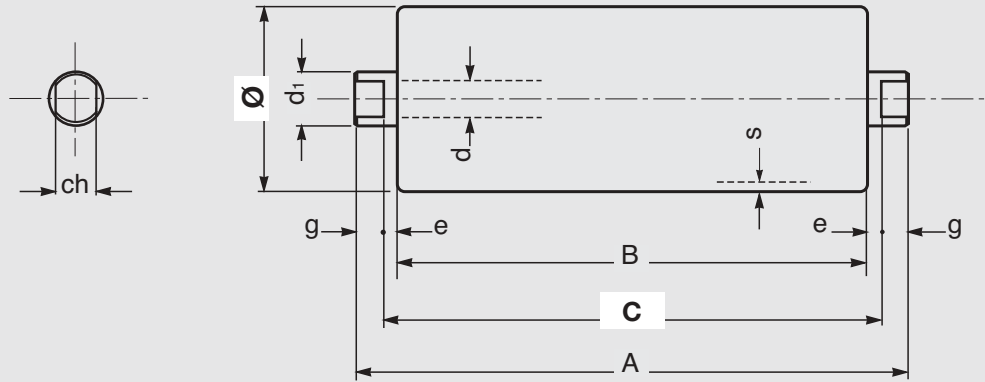
d = 15
d₁ = 20
ch = 17*
s = 3
e = 4
g = 9

*ch = 14 on request

Belt	roller			weight		load capacity					
	width mm	dimensions mm			Kg		daN				
arrangements 	B	C	A	rotating parts	total	belt speed m/s					
						0.5	0.75	1	1.25	1.5	1.75
400	160	168	186	0,9	1,2	147	128	117	108	102	97
300 500	200	208	226	1,1	1,4	147	128	117	108	102	97
400 650	250	258	276	1,3	1,7	147	128	117	108	102	97
500 800	315	323	341	1,6	2,1	147	128	117	108	102	97
300 650 1000	380	388	406	1,9	2,4	143	128	117	108	102	97
800	465	473	491	2,2	2,9	114	114	114	108	102	97
400	500	508	526	2,4	3,1	106	106	106	106	102	97
500 1000	600	608	626	2,8	3,7	88	88	88	88	88	88
650	750	758	776	3,4	4,5	70	70	70	70	70	70
800	950	958	976	4,3	5,6	55	55	55	55	55	55
1000	1150	1158	1176	5,1	6,7	46	46	46	46	46	46

The indicated load capacity relates to a project working life of 10.000 hours.

Example of ordering
standard design
MPR 15,60N,258
for special designs
see pages 80-81



Ø 76 N

Bearing 6202
(15 X 35 X1 1)

d = 15
 $d_1 = 20$
 ch = 17*
 s = 3
 e = 4
 g = 9

*ch = 14 on request

Belt	roller						load capacity						
	width mm			dimensions mm			weight Kg		daN				
arrangements	B C A			rotating parts total		belt speed m/s							
	B	C	A	parts	total	0.75	1	1.25	1.5	1.75	2		
400	160	168	186	1.2	1.5	139	126	117	110	105	100		
300 500	200	208	226	1.4	1.8	139	126	117	110	105	100		
400 650	250	258	276	1.7	2.1	139	126	117	110	105	100		
500 800	315	323	341	2.1	2.5	139	126	117	110	105	100		
300 650 1000	380	388	406	2.4	3.0	139	126	117	110	105	100		
800	465	473	491	2.9	3.6	113	113	113	110	105	100		
400	500	508	526	3.1	3.8	104	104	104	104	104	100		
500 1000	600	608	626	3.6	4.5	86	86	86	86	86	86		
650	750	758	776	4.4	5.5	68	68	68	68	68	68		
800	950	958	976	5.5	6.8	53	53	53	53	53	53		
1000	1150	1158	1176	6.6	8.2	44	44	44	44	44	44		

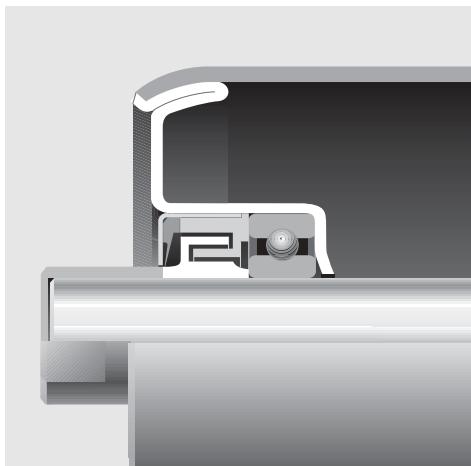
The indicated load capacity relates to a project working life of 10.000 hours.

Example of ordering
 standard design
 MPR 15,76N,323
 for special designs
 see pages 80-81



2 Rollers

series MPR 15




Section through seal

Ø 89 N

Bearing 6202
(15 X 35 X 11)

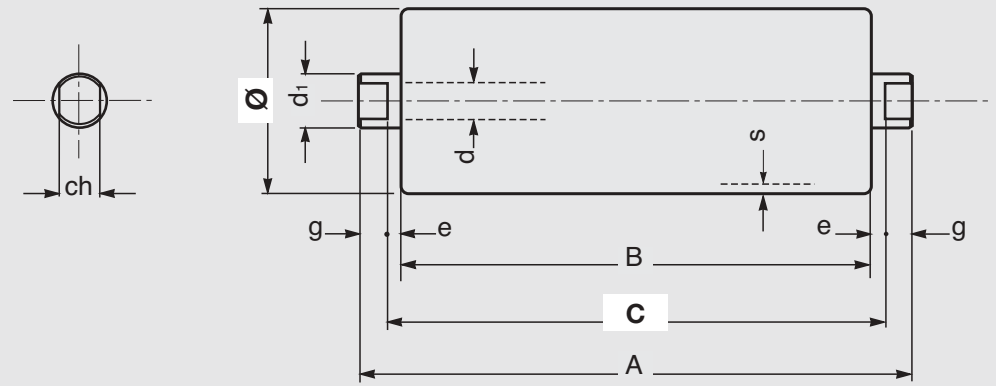
d = 15
d₁ = 20
ch = 17*
s = 3
e = 4
g = 9

*ch = 14 on request

Belt width mm	roller dimensions mm			weight Kg		load capacity daN						
	arrangements 	B	C	A	rotating parts	total	belt speed m/s					
							1	1.25	1.5	1.75	2	2.5
400		160	168	186	1.6	1.9	133	124	116	110	106	98
300 500		200	208	226	1.9	2.2	133	124	116	110	106	98
400 650		250	258	276	2.2	2.6	133	124	116	110	106	98
500 800		315	323	341	2.6	3.1	133	124	116	110	106	98
300 650 1000		380	388	406	3.0	3.6	133	124	116	110	106	98
800 1200		465	473	491	3.6	4.3	112	112	112	110	106	98
400		500	508	526	3.8	4.5	103	103	103	103	103	98
500 1000		600	608	626	4.5	5.3	85	85	85	85	85	85
1200		700	708	726	5.1	6.1	72	72	72	72	72	72
650		750	758	776	5.4	6.5	67	67	67	67	67	67
800		950	958	976	6.7	8.0	53	53	53	53	53	53
1000		1150	1158	1176	8.0	9.6	43	43	43	43	43	43
1200		1400	1408	1426	9.6	11.5	35	35	35	35	35	35

The indicated load capacity relates to a project working life of 10.000 hours.

Example of ordering
standard design
MPR 15,15B,89N,758
for special designs
see pages 80-81





2 Rollers

2.5.5 - Rollers series RTL

Where used

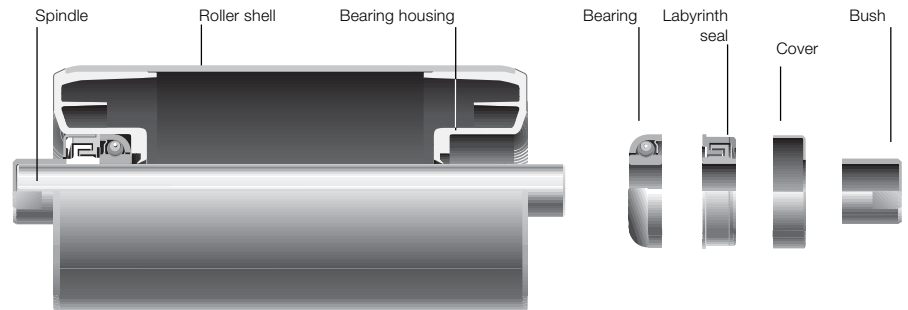
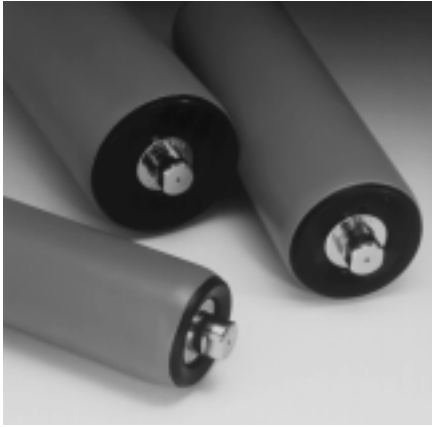
The roller series RTL has been designed to be used in the movement of small or light loads.

The roller consists of a special steel tube swaged over the bearing housings which are made from technopolymers which have high elastic properties, and resistance to mechanical forces and to corrosion.

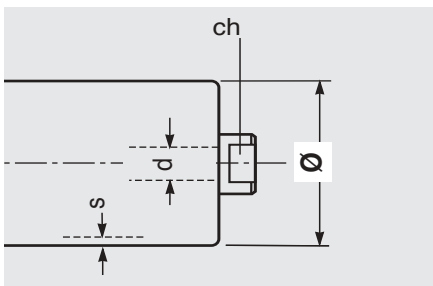
The standard design utilises the special cup and cone bearings, lubricated for life, a spindle of $\varnothing 15$ mm with locking bush with spanner flats $ch = 17$ mm.

A double radial labyrinth protects the bearing to allow use in medium severe environmental conditions.

In the following tables the diameters in production are indicated with their loads at varying recommended speeds.



The table indicates the roller diameters in production. On request they may be supplied with different dimensions to the standard and with $ch = 14$ mm.



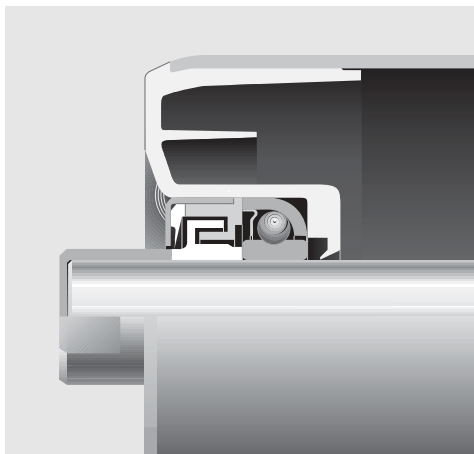
Programme of production series RTL

roller type	\varnothing	basic design	spindle d	spindle ch	bearing	note
RTL 1	60	N 2	15	17	Cup and cone	with tube and spindle in steel S 235 JR (EN 10027-1) ex Fe 360 (EN 10025) St 37 (DIN 17100)
	76	N 2				
	89	N 2				



2 Rollers

series RTL 1




Section through seal

Ø 60 N

Cup and cone bearing

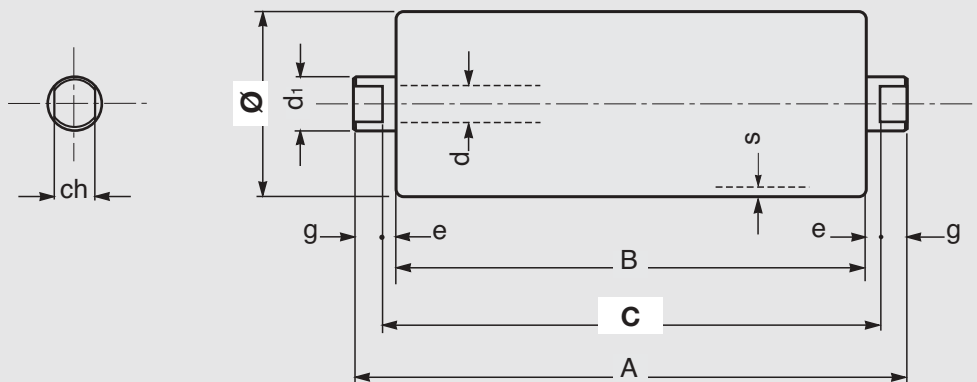
d = 15
d₁ = 20
ch = 17 *
s = 2
e = 4
g = 9

*ch = 14 on request

Belt	roller												
	width mm			dimensions mm			weight Kg		load capacity daN				
arrangements 	B	C	A	rotating parts		belt speed m/s							
				parts	total	0.4	0.6	0.8	1	1.25	1.5		
400	160	168	186	0.6	0.9	69	56	49	43	39	35		
300 500	200	208	226	0.8	1.1	69	56	49	43	39	35		
400 650	250	258	276	0.9	1.3	69	56	49	43	39	35		
500 800	315	323	341	1.1	1.6	69	56	49	43	39	35		
300 650 1000	380	388	406	1.3	1.8	69	56	49	43	39	35		
800	465	473	491	1.5	2.2	69	56	49	43	39	35		
400	500	508	526	1.6	2.3	69	56	49	43	39	35		
500 1000	600	608	626	1.9	2.8	69	56	49	43	39	35		
650	750	758	776	2.3	3.4	69	56	49	43	39	35		
800	950	958	976	2.9	4.3	55	55	49	43	39	35		
1000	1150	1158	1176	3.5	5.1	46	46	46	43	39	35		

The indicated load capacity relates to a project working life of 10.000 hours.

Example of ordering
standard design
RTL 1,15B,60N,258
for special designs
see pages 80-81




Ø 76 N

Cup and cone bearing

d = 15
d₁ = 20
ch = 17 *
s = 2
e = 4
g = 9

*ch = 14 on request

Belt width mm	roller dimensions mm			weight Kg		load capacity daN						
	arrangements 	B	C	A	rotating parts	total	belt speedm/s					
							0.5	0.75	1	1.25	1.5	1.75
400		160	168	186	0.8	1.1	69	56	49	44	40	37
300 500		200	208	226	1.0	1.3	69	56	49	44	40	37
400 650		250	258	276	1.1	1.5	69	56	49	44	40	37
500 800		315	323	341	1.4	1.8	69	56	49	44	40	37
300 650 1000		380	388	406	1.6	2.2	69	56	49	44	40	37
800		465	473	491	1.9	2.6	69	56	49	44	40	37
400		500	508	526	2.1	2.8	69	56	49	44	40	37
500 1000		600	608	626	2.4	3.3	69	56	49	44	40	37
650		750	758	776	3.0	4.0	68	56	49	44	40	37
800		950	958	976	3.7	5.0	53	53	49	44	40	37
1000		1150	1158	1176	4.4	6.1	44	44	44	44	40	37

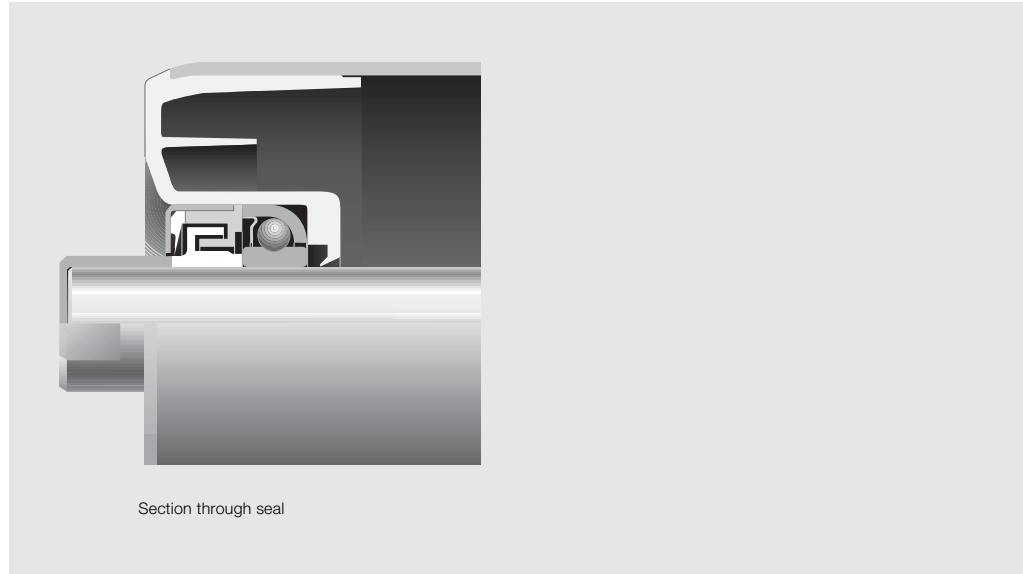
The indicated load capacity relates to a project working life of 10.000 hours.

Example of ordering
standard design
RTL 1,15B,76N,323
for special designs
see pages 80-81



2 Rollers

series RTL 1



Ø 89 N

Cup and cone bearing

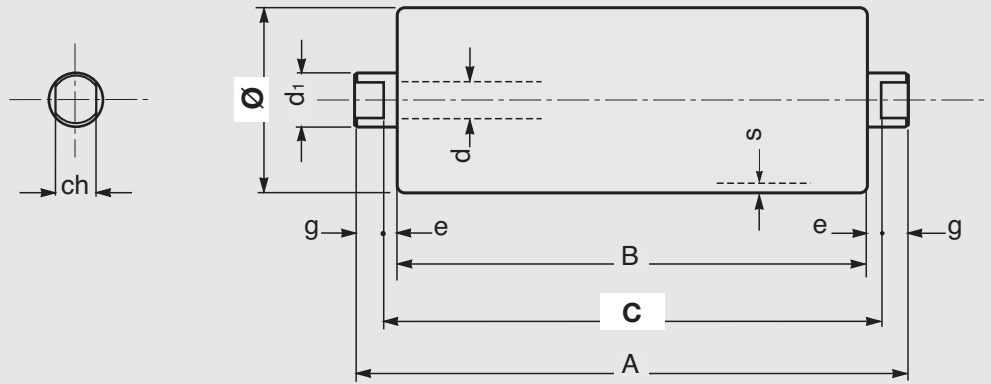
d = 15
d₁ = 20
ch = 17 *
s = 2
e = 4
g = 9

*ch = 14 on request

Belt width mm	roller dimensions mm			weight Kg		load capacity daN								
	arrangements 			B	C	A	rotating parts		belt speed m/s					
							total	0.75	1	1.25	1.5	1.75	2	
400				160	168	186	1.1	1.4	61	53	47	43	40	37
300	500			200	208	226	1.3	1.6	61	53	47	43	40	37
400	650			250	258	276	1.5	1.9	61	53	47	43	40	37
500	800			315	323	341	1.8	2.3	61	53	47	43	40	37
300	650	1000		380	388	406	2.1	2.6	61	53	47	43	40	37
	800			465	473	491	2.4	3.1	61	53	47	43	40	37
400				500	508	526	2.6	3.3	61	53	47	43	40	37
500	1000			600	608	626	3.0	3.9	61	53	47	43	40	37
650				750	758	776	3.7	4.7	61	53	47	43	40	37
800				950	958	976	4.5	5.9	53	53	47	43	40	37
1000				1150	1158	1176	5.4	7.0	43	43	43	43	40	37

The indicated load capacity relates to a project working life of 10.000 hours.

Example of ordering
standard design
RTL 1,15B,89N,758
for special designs
see pages 80-81





2 Rollers



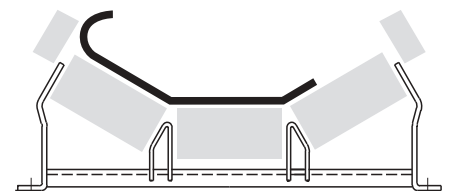
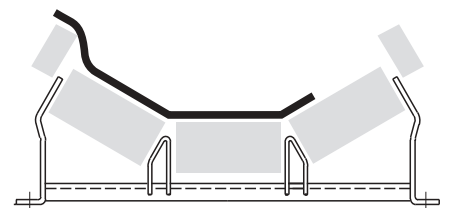
2.5.6 - Guide rollers

For various reasons, the conveyor belt may at times, tend to drift laterally. In these cases it is possible to utilise vertical rollers with cantilevered spindles. These are generally known as belt guide rollers.

It is necessary however to pay particular attention to the use to which these rollers are put, so that the forces on the guide roller by the belt do not damage the belt edge.

In other words, guiding does not eliminate the true reason for the belt tracking off. Consequently, the belt may ride over the guide roller or become distorted against it (see drawings).

For these reasons it is advisable to always use guide rollers on the most suitable transom, the self-centralising, transom which rotates automatically whenever the belt tracks off conveyor centre and self-corrects.





2 Rollers

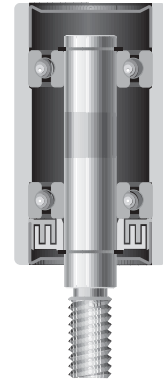
Guide rollers

Series PS

They are assembled using spherical ball bearings, protected by labyrinth seals, and constructed with similar characteristics to the series PSV.

In the following tables the various types are indicated with standard lengths and diameters.

On request non standard diameters, lengths and roller shell thicknesses may be supplied



guide roller										
type	D	s	d	B	f	m	e	*	bearing	weight Kg
PS/G7	60	8	20	100	43	35	8	M16	6204	1.4
PS/G7	60	8	20	100	43	35	8	Self centralising frames S18	6204	1.4

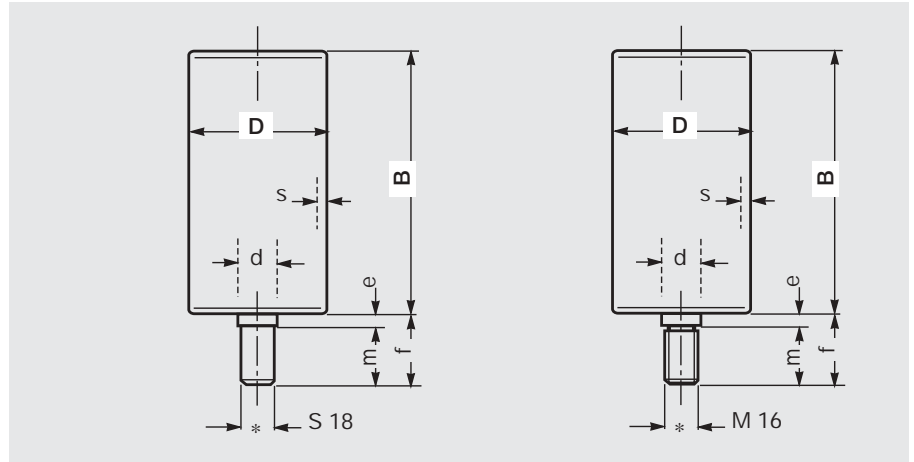
Serie MPS - M - RTL

These are the most cost effective series of guide rollers designed and produced with the identical characteristics to the load carrying roller itself ; of high quality and capacity.

guide roller										
type	D	s	d	B	f	m	e	M	bearing	weight Kg
MPS/G7	60	3	15	100	41	33	8	14	6202	0.9
M/G7	60	3	15	80	41	33	8	14	cup and cone	0.9
				100						0.9
RTL/G7	60	2	15	80	41	33	8	14	cup and cone	0.8
				100						0.8

Example of ordering

PS/G7, 20M16,60N,100
MPS/G7,15M14,60N,100
RTL/G7,15M14,60N,80



guide roller

type	D mm	s	d	B	f	m	e	M	bearing	weight Kg
PS/G1	63	3	20	130	43	35	8	16	6204	1.9
				150						2.1
PS/G1	89	3	20	130	43	35	8	16	6204	1.9
				150						2.2
PS/G2			25	130	43	35	8	20	6205	2.0
				150						2.1
PS/G3			30	130	48	40	8	24	6206	2.7
				150						3.1
PS/G1	108	3,5	20	130	43	35	8	16	6204	2.4
				150						2.7
PS/G2			25	130	43	35	8	20	6205	2.1
				150						2.6
PS/G3			30	130	48	40	8	24	6206	2.9
				150						3.4
PS/G1	133	4	20	130	43	35	8	16	6204	3.1
				150						3.5
PS/G2			25	130	43	35	8	20	6205	2.8
				150						3.4
PS/G3			30	130	48	40	8	24	6206	3.6
				150						4.1

Example of ordering

PS/G1, 20M16,89N,130
 PS/G2,25M20,108N,150
 PS/G3,30M24,133N,150



2 Rollers

2.6 - Rollers with rings

In the majority of belt conveyors, over and above the normal steel roller, it is necessary to position impact rollers, or return rollers with spaced rings and sometimes also self cleaning return rollers.



Impact rollers

The shock absorbing rollers, more often known as “impact rollers” consist of a base steel roller design, on which are fitted rings, designed to resist and absorb the pressures given by the impact of materials onto the belt.

These rollers are positioned in the carrying section of the belt, corresponding to the point of loading where the material falls onto it.



Return rollers with spaced rings

Rollers with spaced rings are used to sustain and support the belt during its return section, where the conveyed material tends to stick to the belt or wherever there is a wear problem or tracking problem of the belt itself.

The rubber rings may function in the temperature range between -20°C + 80°C .

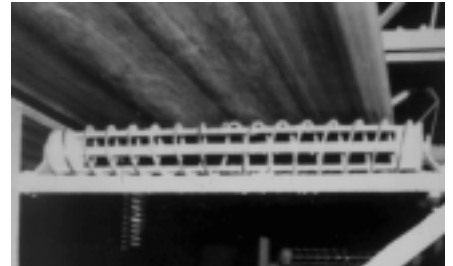
When a return roller with spaced rings is not sufficient to resolve the problem, it is recommended to mount self cleaning rollers, with rings in helical rubber form or with a spiral metal cage, taking into account in the roller positioning that the dislodged material should travel outwards to the belt edge and not towards its centre.



Cleaning return roller

Time after time, conveyed material adheres to the belt surface. If the material is abrasive, it may wear out the roller shell of the normal steel return rollers ; if it is viscous, it adheres to the roller itself, promoting dangerous build up of scale and causing vibration.

A large material deposit may also influence the tracking off of the belt in the return section.





2.6.1 - Impact rollers

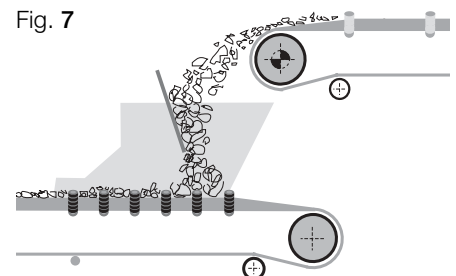
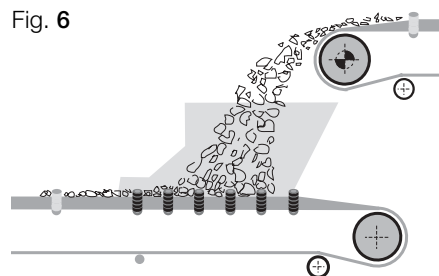
Impact rollers are used and positioned corresponding to the load points, where the lumps and the weight of material falling onto the belt could in fact cause damage to it.

For the correct dimensioning and the choice of impact rollers in relation to the load check the characteristics of the base roller.

To limit the impact effect of the material onto the rollers, the latter are covered with a series of rubber rings of adequate thickness and resistance.

Impact rollers are under stress not only from the load of the material, but also from the dynamic forces as the load falls onto the belt.

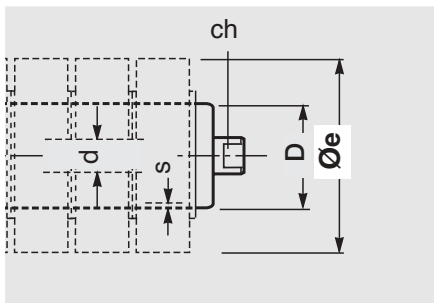
The impact onto the belt, arising from the free fall of material (Fig.6) will be naturally greater than in the case where the material is deflected onto the belt by an inclined plate (Fig.7).



Programme of production of impact rollers

basic roller type	D		$\varnothing e$		spindle		bearing
	mm	s	mm	design	d	ch	
MPS 1	60	3	89	NA	15	17	6202
	60	3	108	NA			
PSV 1	63	3	89	NA	20	14	6204
	63	3	108	NA			
	89	3	133	NA			
	89	3	159	NA			
PSV 2	89	3	133	NA	25	18	6205
	89	3	159	NA			
PSV 3	89	3	133	NA	25	18	6305
	89	3	159	NA			
PSV 4	89	3	133	NA	30	22	6206
	89	3	159	NA			
PSV 5	89	4	133	NA	30	22	6306
	89	4	159	NA			
	108	4	180	NA			
	133	4	194	NA			
	133	4	215	NA			
PSV 7	108	4	180	NA	40	32	6308
	133	6	194	NA			
	133	6	215	NA			

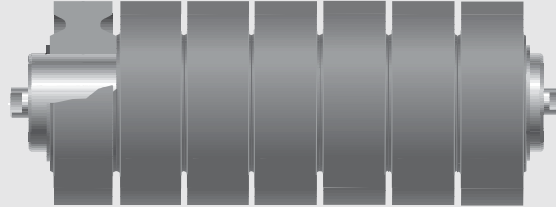
The table indicates the types and diameters of standard rings and dimensions according to European norms. On request special diameters and tube thicknesses may be supplied.





2 Rollers

series Impact



Øe 89 NA

Base roller:

MPS 1

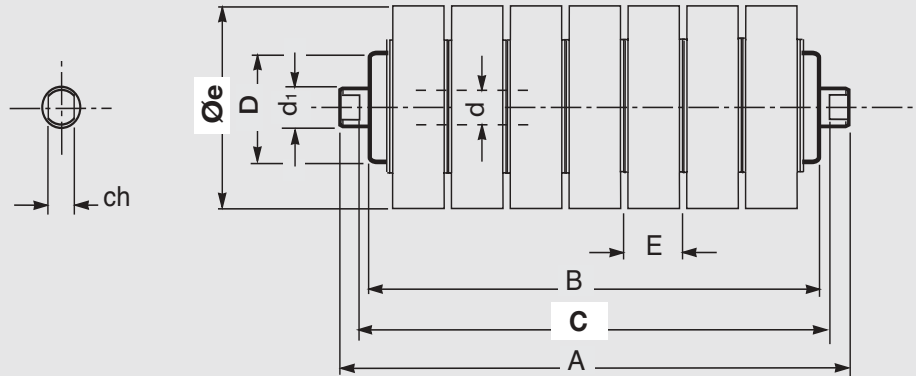
D = 60 ;
spindle 15 ; d₁ = 20
bearing 6202
ch = 17

PSV 1,

D = 63 ;
spindle 20 ; d₁ = 20
bearing 6204
ch = 14

belt	roller					
	width mm	dimensions mm			weight Kg	
arrangements 	B	C	A	MPS-1	PSV-1	E = 35
400	160	168	186	1.8	2.3	
300 500	200	208	226	2.1	2.7	
400 650	250	258	276	2.6	3.3	
500 800	315	323	341	3.3	4.1	
300 650 1000	380	388	406	3.9	4.8	
800 1200	465	473	491	4.6	5.6	
400	500	508	526	5.1	6.1	
1400	530	538	556		6.4	
500 1000	600	608	626	6.1	7.2	
1200	700	708	726	6.9	8.1	
650	750	758	776	7.4	8.8	
1400	800	808	826		9.2	
800	950	958	976	9.3	10.9	
1000	1150	1158	1176	11.1	12.9	
1200	1400	1408	1426	13.5	15.7	
1400	1600	1608	1626		17.9	

Example of ordering
standard design
MPS 1, 15B, 89NA, 323
for special designs
see pages 80-81



Øe 108 NA

Base roller:

MPS 1

D = 60 ;
spindle 15 ; d₁ = 20
bearing 6202
ch = 17

PSV 1,

D = 63 ;
spindle 20 ; d₁ = 20
bearing 6204
ch = 14

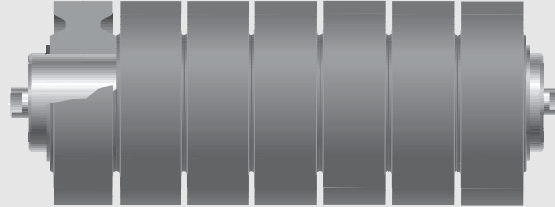
belt	roller				weight		rings width
	width mm	dimensions mm		Kg			
arrangements	B	C	A	MPS-1	PSV-1	E = 45	
	400	160	168	186	2.1	2.6	
	300 500	200	208	226	2.6	3.2	
	400 650	250	258	276	3.1	3.8	
	500 800	315	323	341	4.0	4.8	
	300 650 1000	380	388	406	4.6	5.5	
	800 1200	465	473	491	5.7	6.6	
	400	500	508	526	6.1	7.1	
	1400	530	538	556		7.3	
	500 1000	600	608	626	7.5	8.6	
	1200	700	708	726	8.6	9.9	
	650	750	758	776	9.2	10.5	
	1400	800	808	826		11.1	
	800	950	958	976	11.6	13.2	
	1000	1150	1158	1176	13.8	15.7	
	1200	1400	1408	1426	16.6	18.8	
	1400	1600	1608	1626		21.5	

Example of ordering
standard design
PSV 1,20F,108NA,323
for special designs
see pages 80-81



2 Rollers

series Impact



Øe 133 NA

Base roller:

PSV 1,
D = 89 ;
spindle 20 ; d₁ = 20
bearing 6204
ch = 14

PSV 4
D = 89 ;
spindle 30 ; d₁ = 30
bearing 6206
ch = 22


PSV 2
D = 89 ;
spindle 25 ; d₁ = 25
bearing 6205
ch = 18

PSV 5
D = 89 x 4* ;
spindle 30 ; d₁ = 30
bearing 6306
ch = 22

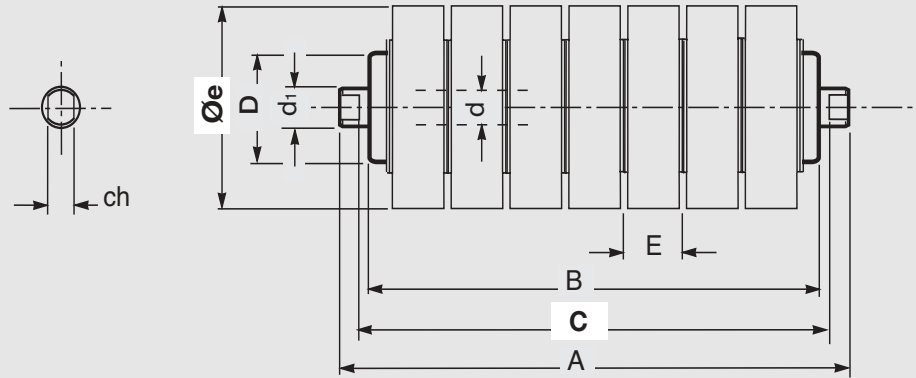
PSV 3
D = 89 ;
spindle 25 ; d₁ = 25
bearing 6305
ch = 18

* bigger tube thick-
ness than standard

Example of ordering
standard design
PSV 2,25F,133NA,388
for special designs
see pages 80-81

belt width mm	roller					rings width			
	dimensions mm			weight Kg					
arrangements 	B	C	A	PSV 1	PSV 2	PSV 3	PSV 4	PSV 5	E = 35
500	200	208	*	3.7					
650	250	258	*	4.5	5.1				
500 800	315	323	*	5.6	6.2	6.5	7.3	7.9	
650 1000	380	388	*	6.6	7.3	7.7	8.5	9.1	
800 1200	465	473	*	7.8	8.6	8.9	9.9	10.5	
1400	530	538	*	8.8	9.7	10.1	11.2	11.8	
500 1000 1600	600	608	*	10.1	11.1	11.4	12.7	13.3	
1800	670	678	*		12.2	12.6	13.9	14.5	
1200	700	708	*	11.4	12.6	12.9	14.3	14.9	
650 2000	750	758	*	12.3	13.5	13.9	15.3	15.9	
1400	800	808	*	12.9	14.2	14.6	16.2	16.4	
1600	900	908	*	14.5	15.9	16.3	18.0	18.6	
800	950	958	*	14.6	17.1	17.5	19.3	19.9	
1800	1000	1008	*		18.2	18.4	20.1	20.7	
200	1100	1108	*			19.8	21.7	22.3	
100	1150	1158	*	18.7	20.5	20.8	23.0	23.6	
1200	1400	1408	*	22.4	24.6	24.9	27.5	28.1	
1400	1600	1608	*	25.5	27.9	28.3	31.2	31.8	
1600	1800	1808	*	28.0	30.7	31.0	34.3	34.9	
1800	2000	2008	*		34.0	34.4	38.0	38.6	
2000	2200	2208	*			37.5	41.5	42.1	

* in relation to the choice of base roller



Øe 159 NA

Base roller:

PSV 1,
D = 89 ;
spindle 20 ; d₁ = 20
bearing 6204
ch = 14

PSV 4
D = 89 ;
spindle 30 ; d₁ = 30
bearing 6206
ch = 22

PSV 2
D = 89 ;
spindle 25 ; d₁ = 25
bearing 6205
ch = 18

PSV 5
D = 89 x 4* ;
spindle 30 ; d₁ = 30
bearing 6306
ch = 22

PSV 3
D = 89 ;
spindle 25 ; d₁ = 25
bearing 6305
ch = 18

* bigger tube thickness than standard

belt	roller									rings width
	width mm	dimensions mm			weight Kg					
arrangements	B	C	A	PSV-1	PSV-2	PSV-3	PSV-4	PSV-5	E = 50	
	800	315	323	*	7.3	7.9	8.2	9.0	9.0	
	1000	380	388	*	8.4	9.2	9.5	10.4	11.0	
	800 1200	465	473	*	10.4	11.3	11.6	12.6	12.2	
	1400	530	538	*	11.6	12.5	12.9	14.0	14.6	
	1000 1600	600	608	*	13.4	14.5	14.8	16.1	16.7	
	1800	670	678	*		15.8	16.2	17.5	18.1	
	1200	700	708	*	15.5	16.7	17.1	18.5	19.1	
	2000	750	758	*	16.6	17.8	18.2	19.7	20.3	
	1400	800	808	*	17.7	19.0	19.3	20.9	21.5	
	1600	900	908	*	19.8	21.2	21.6	23.3	23.9	
	800	950	958	*	20.6	22.3	22.7	24.5	25.1	
	1800	1000	1008	*		23.4	23.8	25.7	26.3	
	2000	1100	1108	*			26.0	28.1	28.7	
	1000	1150	1158	*	25.0	26.8	27.2	29.3	29.9	
	1200	1400	1408	*	30.3	32.4	32.8	35.4	36.0	
	1400	1600	1608	*	35.1	37.5	37.9	40.8	41.4	
	1600	1800	1808	*	39.3	42.0	42.4	45.6	46.2	
	1800	2000	2008	*		46.5	46.9	50.5	51.1	
	2000	2200	2208	*			51.3	55.3	59.9	

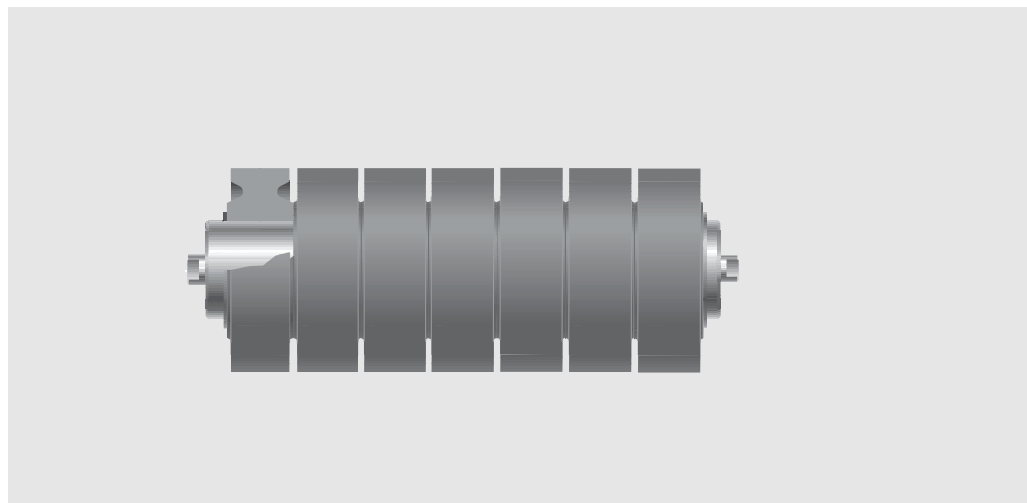
* in relation to the choice of base roller

Example of ordering
standard design
PSV 4,30F,159NA,473
for special designs
see pages 80-81



2 Rollers

series Impact



Øe 180 NA

Base roller:

PSV 5

D = 108 x 4* ;
spindle 30 ; d₁ = 30
bearing 6306
ch = 22

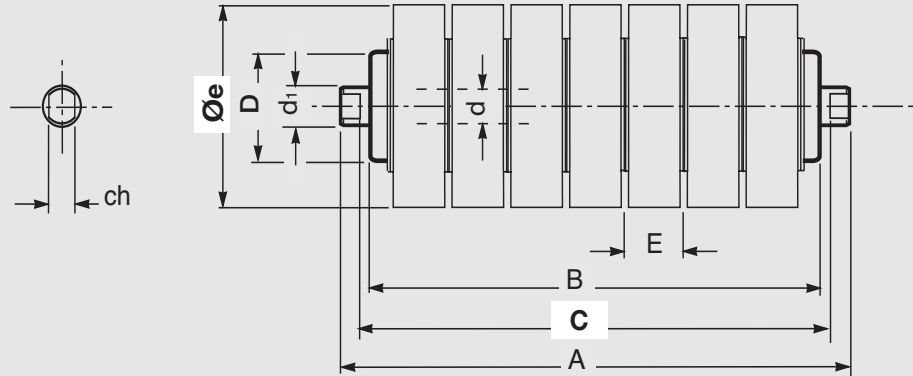
PSV 7

D = 108 x 4* ;
spindle 40 ; d₁ = 40
bearing 6308
ch = 32

* bigger tube thickness than standard

Example of ordering
standard design
PSV 5,30F,180NA,678
for special designs
see pages 80-81

belt width mm	roller dimensions mm				weight Kg		rings n° E = 40
	B	C	A	PSV-5	PSV-7		
	arrangements 						
1600	600	608	632	20.1	25.3		
1800	670	678	702	22,5	28.1		
2000	750	758	782	24.9	30.8		
2200	800	808	832	26.9	33.0		
1600	2400	900	908	932	29.7	36.2	
2600	950	958	982	31.7	38.4		
1800	1000	1008	1032	33.1	40.0		
2800	1050	1058	1082	34.4	41.6		
2000	1100	1108	1132	36.4	43.6		
3000	1120	1128	1152	36.7	44.2		
2200	1250	1258	1282	41.2	49.1		
2400	1400	1408	1432	45.9	54.5		
2600	1500	1508	1532	48.7	57.7		
2800	1600	1608	1632	52.1	61.4		
1600	1800	1808	1832	58.2	68.4		
1800	2000	2008	2032	64.9	76.0		
2000	2200	2208	2232	71.1	82.9		
2200	2500	2508	2532	80.6	93.6		
2400	2800	2808	2832	90.1	104.4		
2600	3000	3008	3032	96.2	111.3		
2800	3150	3158	3182	100.9	116.3		



Øe 194 NA

Base roller:

PSV 5


D = 133 ;
spindle 30 ; d₁ = 30
bearing 6306
ch = 22

PSV 7

D = 133 x 6* ;
spindle 40 ; d₁ = 40
bearing 6308
ch = 32

* bigger tube thick-
ness than standard

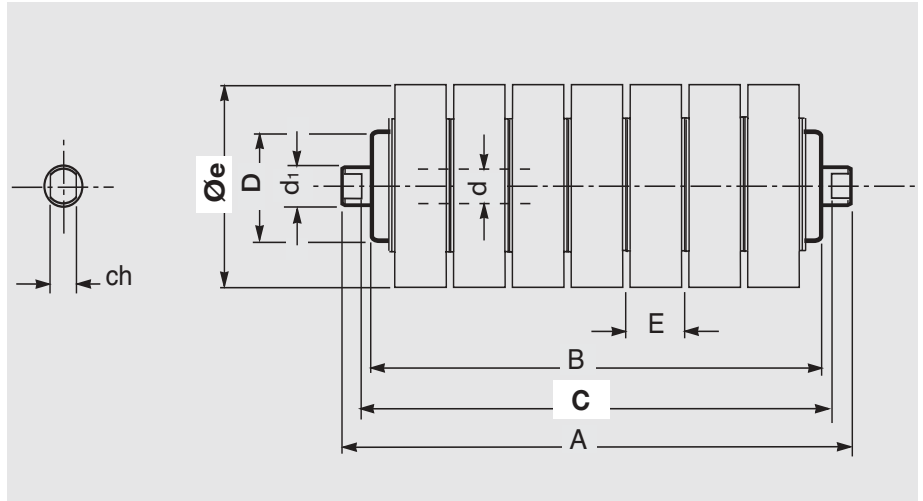
Example of ordering
standard design
PSV 5,30F,194NA,678
for special designs
see pages 80-81

belt width mm	roller			weight Kg		rings width	
	dimensions mm			PSV-5	PSV-7		
arrangements 	B	C	A			E = 50	
1600	600	608	632	23.4	28.1		
1800	170	678	702	25.5	30.5		
2000	750	758	782	28.6	34.0		
2200	800	808	832	30.3	35.9		
1600	2400	900	908	932	33.8	39.8	
2600	950	958	982	35.5	41.8		
1800	1000	1008	1032	37.2	43.7		
2800	1050	1058	1082	39.0	45.7		
2000	1100	1108	1132	40.7	47.6		
3000	1120	1128	1152	41.1	48.1		
2200	1250	1258	1282	45.9	53.5		
2400	1400	1408	1432	51.1	59.3		
2600	1500	1508	1532	54.6	63.2		
2800	1600	1608	1632	58.1	66.9		
1600	1800	1808	1832	65.0	74.9		
1800	2000	2008	2032	71.9	82.7		
2000	2200	2208	2232	78.9	90.5		
2200	2500	2508	2532	89.3	102.2		
2400	2800	2808	2832	99.7	113.9		
2600	3000	3008	3032	106.6	121.7		
2800	3150	3158	3182	111.8	127.5		



2 Rollers

series Impact



Øe 215 NA

Base roller:


PSV 5

D = 133 ;
spindle 30 ; d₁ = 30
bearing 6306
ch = 22

PSV 7

D = 133x 6* ;
spindle 40 ; d₁ = 40
bearing 6308
ch = 32

* bigger tube thickness than standard

belt	roller				weight		rings width
	width mm	dimensions mm			Kg		
arrangements 	B	C	A	PSV-5	PSV-7	E = 50	
		1800	670	678	702	27.6	32.6
	2000	750	758	782	31.0	36.4	
	2200	800	808	832	32.9	38.5	
	2400	900	908	932	36.7	42.7	
	2600	950	958	982	38,6	44.8	
	1800	1000	1008	1032	40.4	46.9	
	2800	1050	1058	1082	42.3	49.0	
	2000	1100	1108	1132	44.2	51.1	
	3000	1120	1128	1152	44.6	51.6	
	2200	1250	1258	1282	49.9	57.5	
	2400	1400	1408	1432	55.6	63.8	
	2600	1500	1508	1532	59.4	68.0	
	2800	1600	1608	1632	63.2	72.2	
	1800	2000	2008	2032	78.3	89.1	
	2000	2200	2208	2232	85.9	97.5	
	2200	2500	2508	2532	97.3	110.2	
	2400	2800	2808	2832	108.6	122.8	
	2600	3000	3008	3032	116.2	131.3	
	2800	3150	3158	3182	121.9	137.6	

Example of ordering
standard design
PSV 7,40F,215NA,758
for special designs
see pages 80-81



2.6.2 - Return rollers with rings

The straight tracking of the belt may be compromised by the type of conveyed material, specially when this material is sticky and thereby adheres easily to the belt surface.

In this case, material is also deposited on the return rollers that support the belt, adding an irregular addition of scale to the roller itself.

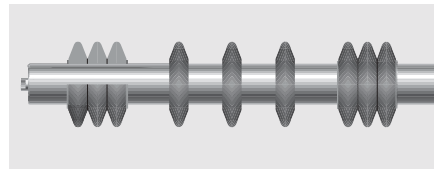
As a consequence, not only wear and tear of the belt occurs, but forces are brought into play to move the belt away from its correct track.

Return rollers with spaced rubber rings contribute largely to eliminating the build up of scale that forms in certain conditions on the belt surface.

The rings are pointed, assembled at intervals, in the central part of the roller, where they have the scope to break up the scale which normally is present at the belt centre; meanwhile flat rings mounted in groups at

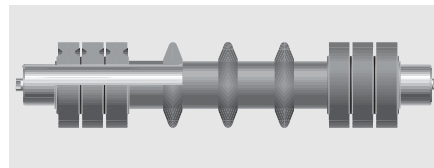
the extremities of the belt, support and protect the belt edges, also in cases of limited belt wandering.

Return rollers with rings should not be used as belt tensioning devices.



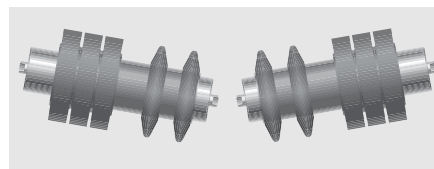
Arrangement G

Return rollers with pointed rings spaced in the central part and positioned in sets at the side. Used on belt conveyors of medium capacity.



Arrangement L

Return rollers used on belt conveyors in high duty plant. They are provided with sets of flat rings, positioned at the roller extremities, and with pointed rings spaced in the central part of the roller.



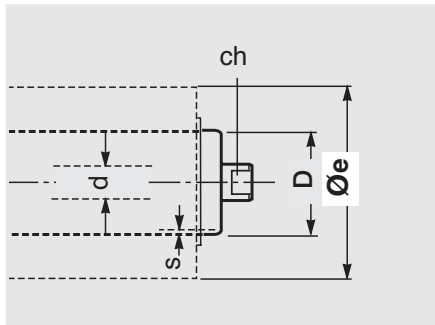
Arrangement C

Return rollers for return transom sets of "V" design format with base rollers from series PSV, with characteristic proportional dimensions to the requirements designed into large belt conveyors.

Programme of production of return rollers with rings

base roller D tipo	D		Øe		spindle		bearing
	mm	s	mm	design	mm	ch	
RTL 1	60	2.0	108	NG	15	17	cup and cone
	60	2.0	133	NG			
M/1	60	3.0	108	NG	15	17	cup and cone
	60	3.0	133	NG			
MPS 1	60	3.0	108	NG	15	17	6202
	60	3.0	133	NG			
PSV 1	63	3.0	108	NG	20	14	6204
	63	3.0	133	NG			
	63	3.0	108	NL, NC			
	89	3.0	133	NL, NC			
	89	3.0	159	NL, NC			
PSV 2	108	3.5	180	NL, NC	25	18	6205
	89	3.0	133	NL, NC			
	89	3.0	159	NL, NC			
	108	3.5	180	NL, NC			
PSV 4	89	3.0	133	NL, NC	30	22	6206
	89	3.0	159	NL, NC			
	108	3.5	180	NL, NC			
PSV 7	108	3.5	180	NL, NC	40	32	6308

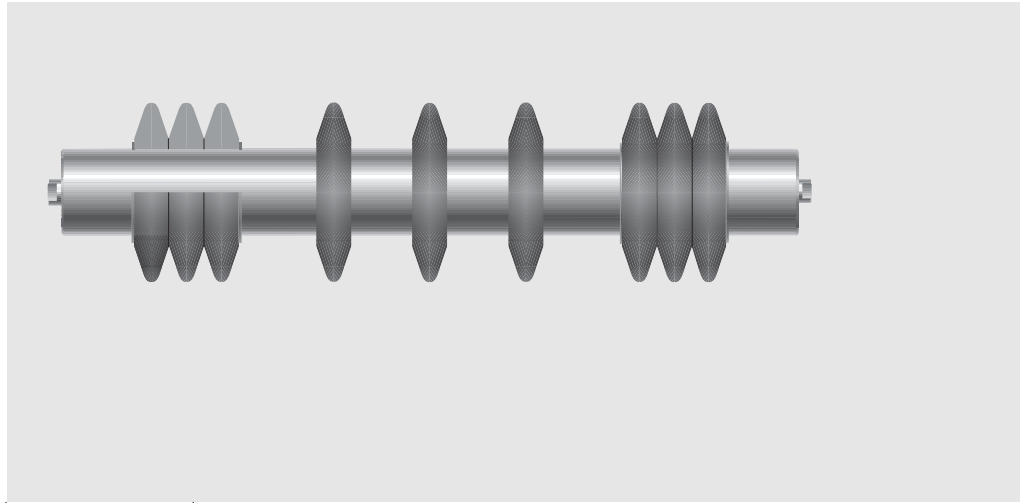
The table indicates the types and diameters of standard rings and dimensions according to European norms.
On request special diameters and tube thicknesses may be supplied.





2 Rollers

series with rings



Øe 108 NG

Base roller:

RTL 1

D = 60 ;
spindle 15 ; d₁ = 20
bearing cup and cone
ch = 17

M 1

D = 60 ;
spindle 15 ; d₁ = 20
bearing cup and cone
ch = 17

MPS 1

D = 60 ;
spindle 15 ; d₁ = 20
bearing 6202
ch = 17

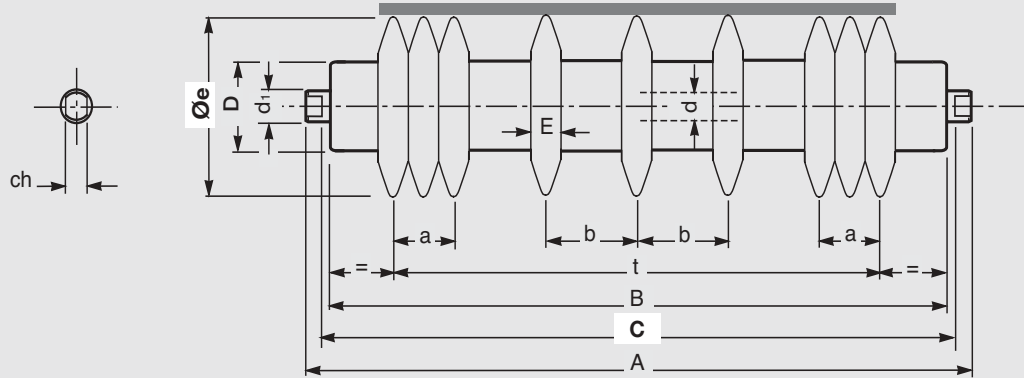
PSV 1,

D = 63 ;
spindle 20 ; d₁ = 20
bearing 6204
ch = 14

Example of ordering
standard design
MPS 1,,15B,108NG,508
for special designs
see pages 80-81

belt	roller							rings n°
	dimensions mm			weight Kg				
width mm	B	C	A	RTL-1	M -1	MPS-1	PSV-1	total
300	380	388	406	2,7	3,4	3,4		5
400	500	508	526	3,2	4,1	4,1		5
500	600	608	626	3,8	4,8	4,8	5,9	6
650	750	758	776	4,9	6,1	6,1	7,4	9
800	950	958	976	6,0	7,4	7,4	9,0	10
1000	1150	1158	1176	7,1	8,9	8,9	10,7	12
1200	1400	1408	1426			10,4	12,6	13
1400	1600	1608	1626				14,3	15

roller length C mm	rings				side central side n°		
	a mm	b	t	E			
388	25	85	220	25	2	1	2
508	25	135	320	25	2	1	2
608	25	130	440	25	2	2	2
758	50	125	600	25	3	3	3
958	50	124	720	25	3	4	3
1158	50	115	905	25	3	6	3
1408	50	125	1100	25	3	7	3
1608	50	120	1300	25	3	9	3



Øe 133 NG

Base roller:

RTL 1

D = 60 ;
spindle 15 ; d₁ = 20
bearing cup and cone
ch = 17

M 1


D = 60 ;
spindle 15 ; d₁ = 20
bearing cup and cone
ch = 17

MPS 1

D = 60 ;
spindle 15 ; d₁ = 20
bearing 6202
ch = 17

PSV 1,

D = 63 ;
spindle 20 ; d₁ = 20
bearing 6204
ch = 14

belt	roller								rings n°
	width mm	dimensions mm			weight Kg				
arrangements 	B	C	A	RTL-1	M-1	MPS-1	PSV-1	total	
300	380	388	406	3,8	4,4	4,4		5	
400	500	508	526	4,3	5,1	5,1		5	
500	600	608	626	5,1	6,0	6,0	7,1	6	
650	750	758	776	6,8	8,0	8,0	9,3	9	
800	950	958	976	8,1	9,5	9,5	11,1	10	
1000	1150	1158	1176	9,7	11,4	11,4	13,2	12	
1200	1400	1408	1426			13,2	15,4	13	
1400	1600	1608	1626				17,5	15	
1600	1800	1808	1826				19,7	17	

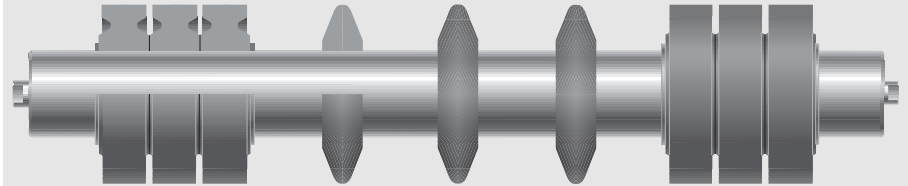
roller length C mm	rings				side centralside n°		
	a mm	b	t	E	side	central	side
388	30	100	260	30	2	1	2
508	30	120	300	30	2	1	2
608	30	115	405	30	2	2	2
758	60	120	600	30	3	3	3
958	60	120	720	30	3	4	3
1158	60	115	925	30	3	6	3
1408	60	125	1120	30	3	7	3
1608	60	120	1320	30	3	9	3
1808	60	115	1500	30	3	11	3

Example of ordering
standard design
PSV 1,20F,133NG,758
for special designs
see pages 80-81



2 Rollers

series with rings




The two sets of flat rings are held in position by steel rings welded to the tube

Øe 108 NL

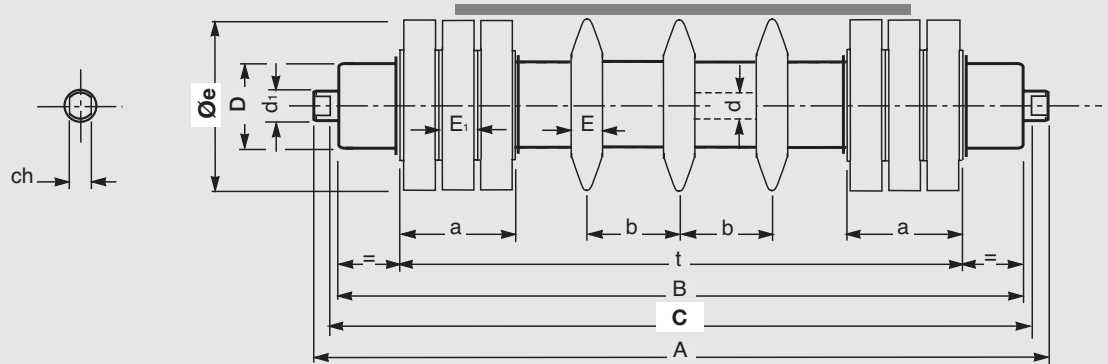
Base roller:

PSV 1,
D = 63 ;
spindle 20 ; d₁ = 20
bearing 6204
ch = 14

belt	roller			weight Kg	rings n°	
	width mm	dimensions mm				
arrangements 		B	C	A	PSV-1	total
300	380	388	406	4.6	5	
400	500	508	526	5.6	6	
500	600	608	626	6.4	7	
650	750	758	776	7.6	8	
800	950	958	976	9.6	10	
1000	1150	1158	1176	11.3	12	
1200	1400	1408	1426	13.2	13	
1400	1600	1608	1626	15.3	15	

roller length mm	rings					side centralside n°		
	a mm	b	t	E	E ₁			
388	90	50	360	25	45	2	1	2
508	95	75	465	25	45	2	2	2
608	95	80	560	25	45	2	3	2
758	90	110	730	25	45	2	4	2
958	135	125	895	25	45	3	4	3
1158	135	120	1110	25	45	3	6	3
1408	135	130	1310	25	45	3	7	3
1608	135	125	1520	25	45	3	9	3

Example of ordering
standard design
PSV 1,20F,108NL,1158
for special designs
see pages 80-81



Øe 133 NL

Base roller:

PSV 1,
D = 89 ;
spindle 20 ; d₁ = 20
bearing 6204
ch = 14

PSV 2
D = 89 ;
spindle 25 ; d₁ = 25
bearing 6205
ch = 18

PSV 4
D = 89 ;
spindle 30 ; d₁ = 30
bearing 6206
ch = 22

Example of ordering
standard design
PSV 2,25F,133NL,1608
for special designs
see pages 80-81

belt	roller						rings n°
	width mm	dimensions mm		weight Kg			
arrangement	B	C	A	PSV-1	PSV-2	PSV-4	total
	500	600 608	*	8.4			9
	650	750 758	*	10.0	11.6		10
	800	950 958	*	12.2	14.1	16.3	12
	1000	1150 1158	*	14.6	16.8	19.3	14
	1200	1400 1408	*	17.3	19.6	22.6	15
	1400	1600 1608	*	19.3	22.0	25.3	16
	1600	1800 1808	*	21.4	24.4	28.1	17
	1800	2000 2008	*		26.8	30.8	18
	2000	2200 2208	*			33.5	19

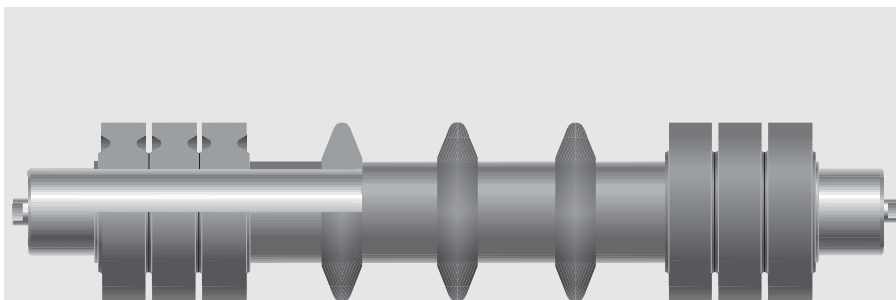
* in relation to the choice of base roller

roller length C mm	rings			E	E ₁	side n°	central n°	side n°
	a mm	b mm	t mm					
608	105	85	550	30	35	3	3	3
758	105	105	735	30	35	3	4	3
958	140	125	905	30	35	4	4	4
1158	140	120	1120	30	35	4	6	4
1408	140	130	1320	30	35	4	7	4
1608	140	135	1495	30	35	4	8	4
1808	140	140	1680	30	35	4	9	4
2008	140	145	1785	30	35	4	10	4
2208	140	150	2080	30	35	4	11	4



2 Rollers

series with rings



The pointed rings are held in position by PVC distance collars; the flat rings are held in position by external steel rings welded to the tube.

Øe 159 NL

Base roller:

PSV 1,
D = 89 ;
spindle 20 ; d₁ = 20
bearing 6204
ch = 14

PSV 2
D = 89 ;
spindle 25 ; d₁ = 25
bearing 6205
ch = 18

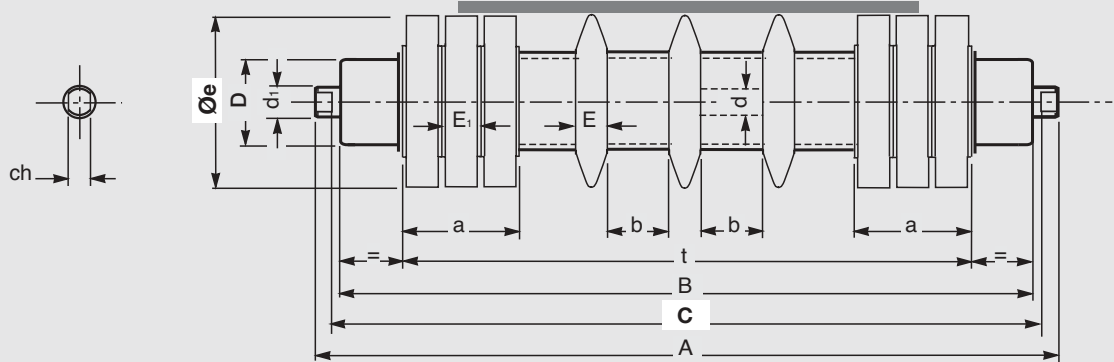
PSV 4
D = 89 ;
spindle 30 ; d₁ = 30
bearing 6206
ch = 22

Example of ordering
standard design
PSV 4,30F,159NL,1808
for special designs
see pages 80-81

belt	roller						rings n°
	dimensions mm			weight Kg			
width mm	B	C	A	PSV-1	PSV-2	PSV-4	total
arrangement 							
500	600	608	*	9.7			7
650	750	758	*	11.4	12.9		8
800	950	958	*	14.4	16.2	18.4	10
1000	1150	1158	*	16.9	19.0	21.5	12
1200	1400	1408	*	19.4	21.9	24.9	13
1400	1600	1608	*	21.6	24.3	27.6	14
1600	1800	1808	*	23.7	26.7	30.4	15
1800	2000	2008	*		29.2	33.2	16
2000	2200	2208	*			35.9	17

* in relation to the choice of base roller

roller length C mm	rings					side central side n°		
	a mm	b	t	E	E ₁			
608	100	75	584	30	50	2	3	2
758	100	80	712	30	50	2	4	2
958	150	95	887	30	50	3	4	3
1158	150	90	1098	30	50	3	6	3
1408	150	110	1376	30	50	3	7	3
1608	150	110	1514	30	50	3	8	3
1808	150	115	1702	30	50	3	9	3
2008	150	120	1900	30	50	3	10	3
2208	150	125	2108	30	50	3	11	3



Øe 180 NL

Base roller:

PSV 1 ,

D = 108 ;
spindle 20 ; d₁ = 20
bearing 6204
ch = 14

PSV 4


D = 108 ;
spindle 30 ; d₁ = 30
bearing 6206
ch = 22

PSV 2

D = 108 ;
spindle 25 ; d₁ = 25
bearing 6205
ch = 18

PSV 7

D = 108 ;
spindle 40 ; d₁ = 40
bearing 6308
ch = 32

belt	roller								rings n°
	width mm	dimensions mm		weight Kg					
arrangement 	B	C	A	PSV-1	PSV-2	PSV-4	PSV-7	total	
800	950	958	*	19.9	21.8	24.1	29.6	12	
1000	1150	1158	*	23.5	25.6	28.3	34.5	14	
1200	1400	1408	*	27.0	29.5	32.5	39.7	15	
1400	1600	1608	*	29.9	32.7	36.1	44.0	16	
1600	1800	1808	*	32.8	35.9	39.6	48.3	17	
1800	2000	2008	*		39.1	43.2	52.7	18	
2000	2200	2208	*			46.7	57.0	19	
2200	2400	2408	*			50.3	63.1	20	

* in relation to the choice of base roller

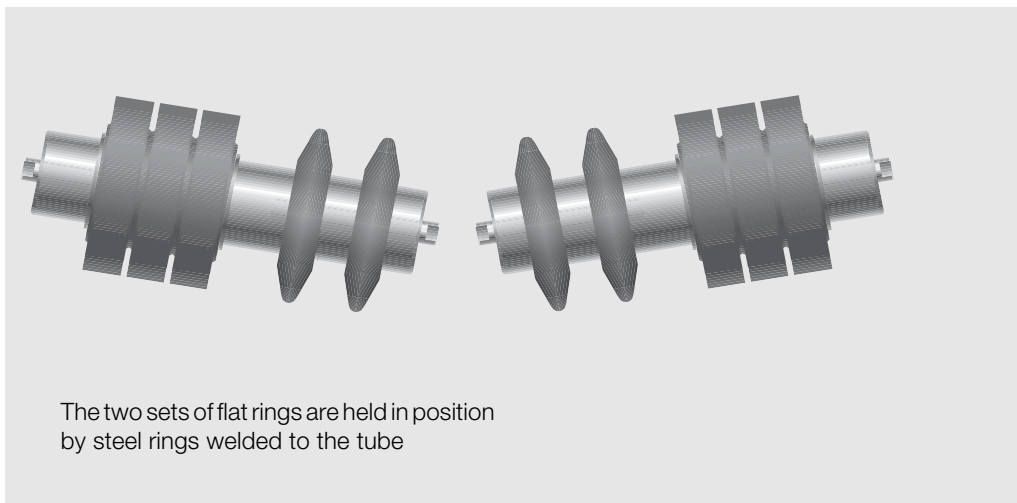
roller length C mm	anelli					side central side		
	a mm	b	t	E	E ₁	n°	n°	n°
958	160	85	897	40	40	4	4	4
1158	160	75	1073	40	40	4	6	4
1408	160	100	1386	40	40	4	7	4
1608	160	100	1524	40	40	4	8	4
1808	160	105	1712	40	40	4	9	4
2008	160	110	1910	40	40	4	10	4
2208	160	115	2118	40	40	4	11	4
2408	160	115	2271	40	40	4	12	4

Example of ordering
standard design
PSV 4,30F,180NL,1808
for special designs
see pages 80-81



2 Rollers


series with rings



Øe 108 NC

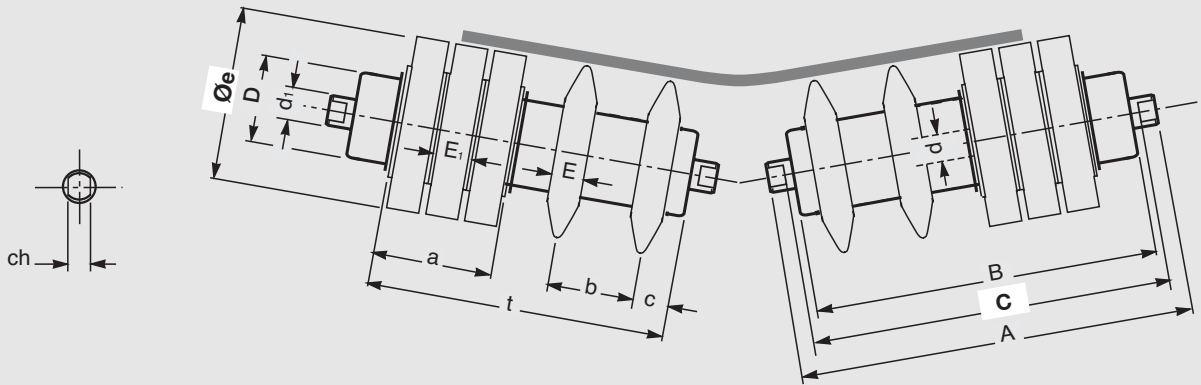
Base roller:

PSV 1,
D = 63 ;
spindle 20 ; d₁ = 20
bearing 6204
ch = 14

belt	roller			weight Kg	rings n°
	width mm	dimensions mm			
arrangement 	B	C	A	PSV-1	total
300	200	208	226	2.8	3
400	250	258	276	3.1	3
500	315	323	341	3.7	4
650	380	388	406	4.2	4
800	465	473	491	4.9	5
1000	600	608	626	6.1	6
1200	700	708	726	7.0	7
1400	800	808	826	7.9	8

roller length mm	rings						side central n°	
	a mm	b	c	t	E	E ₁		
208	90	60	25	175	25	45	2	1
258	90	80	25	195	25	45	2	1
323	90	70	25	255	25	45	2	2
388	90	90	30	300	25	45	2	2
473	90	95	30	405	25	45	2	3
608	135	110	40	505	25	45	3	3
708	135	105	40	595	25	45	3	4
808	180	120	40	700	25	45	4	4

Example of ordering
standard design
PSV 1,20F,108NC,608
for special designs
see pages 80-81



Øe 133 NC


Base roller:

PSV 1,
D = 89 ;
spindle 20 ; d₁ = 20
bearing 6204
ch = 14

PSV 2
D = 89 ;
spindle 25 ; d₁ = 25
bearing 6205
ch = 18

PSV 4
D = 89 ;
spindle 30 ; d₁ = 30
bearing 6206
ch = 22

Example of ordering
standard design
PSV 2,25F,133NC,808
for special designs
see pages 80-81

belt	roller							rings n°
	width mm	dimensions mm			weight Kg			
arrangement 	B	C	A	PSV-1	PSV-2	PSV-4	total	
500	315	323	*	4.8			5	
650	380	388	*	5.4	6.5		5	
800	465	473	*	6.5	7.7	9.1	6	
1000	600	608	*	7.9	9.3	10.9	7	
1200	700	708	*	9.1	10.6	12.4	8	
1400	800	808	*	10.0	11.7	13.6	8	
1600	900	908	*	11.2	13.0	15.1	9	
1800	1000	1008	*		14.0	16.3	10	
2000	1100	1108	*			17.8	11	

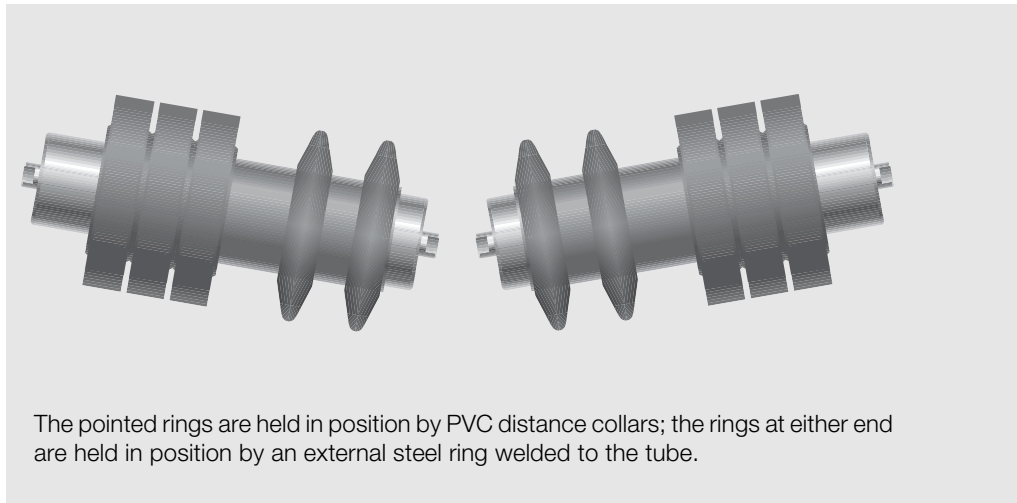
* in relation to the choice of base roller

roller length mm	rings						side n°	central n°
	a mm	b	c	t	E	E ₁		
323	105	70	30	275	30	35	3	2
388	105	85	30	305	30	35	3	2
473	105	90	30	405	30	35	3	3
608	140	105	40	495	30	35	4	3
708	140	105	40	600	30	35	4	4
808	140	130	40	700	30	35	4	4
908	140	125	40	805	30	35	4	5
1008	140	120	50	910	30	35	4	6
1108	140	120	50	1030	30	35	4	7



2 Rollers

series with rings



The pointed rings are held in position by PVC distance collars; the rings at either end are held in position by an external steel ring welded to the tube.

Øe 159 NC


Base roller:

PSV 1,
D = 89 ;
spindle 20 ; d₁ = 20
bearing 6204
ch = 14

PSV 2
D = 89 ;
spindle 25 ; d₁ = 25
bearing 6205
ch = 18

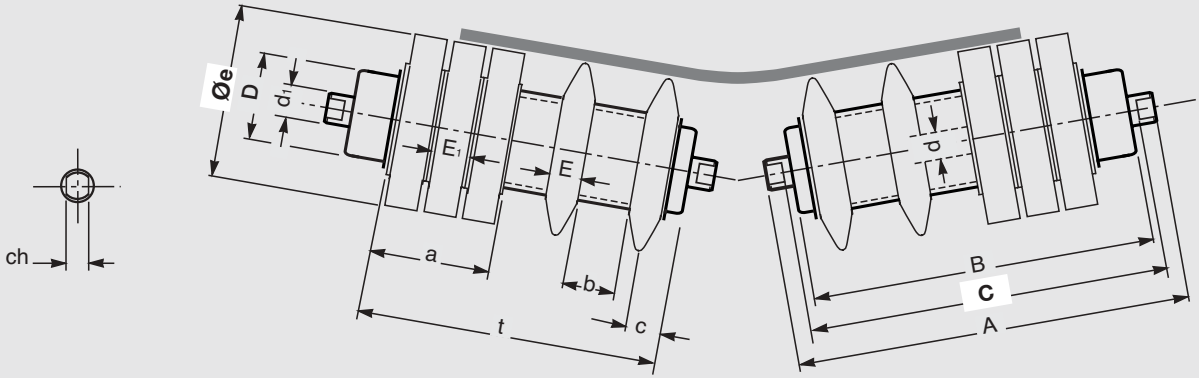
PSV 4
D = 89 ;
spindle 30 ; d₁ = 30
bearing 6206
ch = 22

Example of ordering
standard design
PSV 2,25F, 159NC,908
for special designs
see pages 80-81

belt width mm	roller dimensions mm			weight Kg			rings n° total	
	arrangement 	B	C	A	PSV-1	PSV-2		PSV-4
500		315	323	*	5.5			4
650		380	388	*	6.1	6.8		4
800		465	473	*	7.2	8.1	9.4	5
1000		600	608	*	9.0	10.1	11.6	6
1200		700	708	*	10.3	11.4	13.2	7
1400		800	808	*	11.2	12.5	14.4	7
1600		900	908	*	12.4	13.9	16.0	8
1800		1000	1008	*		15.3	17.5	9
2000		1100	1108	*			18.9	10

* in relation to the choice of base roller

roller length mm	rings						side central n°	
	a mm	b	c	t	E	E ₁		
323	100	40	30	253	30	50	2	2
388	100	65	30	303	30	50	2	2
473	100	65	30	396	30	50	2	3
608	150	85	40	516	30	50	3	3
708	150	85	40	629	30	50	3	4
808	150	110	40	729	30	50	3	4
908	150	100	40	817	30	50	3	5
1008	150	95	50	925	30	50	3	6
1108	150	95	50	1048	30	50	3	7



Øe 180 NC

Base roller:

PSV 1

D = 108 ;
spindle 20 ; d₁ = 20
bearing 6204
ch = 14

PSV 4


D = 108 ;
spindle 30 ; d₁ = 30
bearing 6206
ch = 22

PSV 2

D = 108 ;
spindle 25 ; d₁ = 25
bearing 6205
ch = 18

PSV 7

D = 108 ;
spindle 40 ; d₁ = 40
bearing 6308
ch = 32

belt width mm	roller dimensions mm			weight Kg					rings n°
	arrangement 	B	C		A	PSV-1	PSV-2	PSV-4	
800		465	473	*	10.2	11.0	12.4	16.8	6
1000		600	608	*	12.5	13.5	15.1	20.0	7
1200		700	708	*	14.2	15.4	17.2	22.4	8
1400		800	808	*	15.4	16.7	18.6	24.3	8
1600		900	908	*	17.2	18.6	20.7	26.7	9
1800		1000	1008	*		20.5	22.8	29.1	10
2000		1100	1108	*			24.9	31.6	11
2200		1250	1258	*			27.7	34.9	12

* in relation to the choice of base roller

roller length mm	rings						side central n°	
	a mm	b	c	t	E	E ₁		
473	120	60	45	435	40	40	3	3
608	160	70	45	515	40	40	4	3
708	160	75	45	645	40	40	4	4
808	160	100	45	745	40	40	4	4
908	160	90	45	835	40	40	4	5
1008	160	85	55	945	40	40	4	6
1108	160	85	55	1070	40	40	4	7
1258	160	85	55	1195	40	40	4	8

Example of ordering
standard design
PSV 2,25F,180NC,908
for special designs
see pages 80-81



2 Rollers

series Self cleaning



The rubber rings are held in position at either end by a steel ring welded to the tube.

2.6.3 - Return rollers with helical rubber rings for self cleaning

Used on the return transom to support the belt when the material being conveyed, even if only a little sticky, is very viscous.

The helical spiral form of the non-abrasive rings, assembled onto the base roller shell, performs a cleaning action and reduces the tendency of material to deposit itself and stick to the surface of the dirty side of the belt.

They may be employed on any part of the return belt section in the case of short conveyors.

On long sections it is satisfactory to employ these rollers only up to the point where the material does not adhere any more to the belt surface.

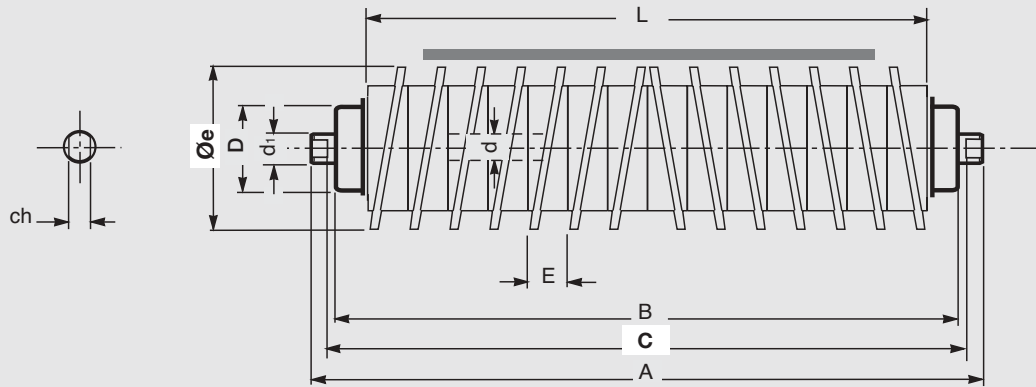
These rollers should not be employed as snub rollers adjacent to the drive or return drums.

The table indicates the types and diameters of standard rings with dimensions according to European norms.

On customer request different diameters and dimensions may be supplied.

Programme

base roller type	D mm	s	Øe mm	Standard design	spindle mm	ch	bearing
MPS 1	60	3	108	NM	15	17	6202
	89	3	133	NM			
PSV 1	63	3	108	NM	20	14	6204
	89	3	133	NM			
	89	3	180	NM			
PSV 2	89	3	133	NM	25	18	6205
	89	3	180	NM			
PSV 3	89	3	133	NM	25	18	6305
	89	3	180	NM			
PSV 4	89	3	133	NM	30	22	6206
	89	3	180	NM			



Øe 108 NM


Base roller:

MPS 1

D = 60 ;
spindle 15 ; d₁ = 20
bearing 6202
ch = 17

PSV 1,

D = 63 ;
spindle 20 ; d₁ = 20
bearing 6204
ch = 14

belt	roller			weight		rings width E = 38,5
	width mm	dimensions mm		MPS-1	PSV-1	
arrangement 	B	C	A			L
300	380	388	406	4.1	5.0	310
400	500	508	526	5.7	6.7	460
500	600	608	626	6.6	7.8	540
650	750	758	776	8.3	9.7	695
800	950	958	976	10.7	12.3	925
1000	1150	1158	1176	12.7	14.5	1080
1200	1400	1408	1426	15.3	17.5	1385

Example of ordering
standard design
PSV 1,20F,108NM,758
for special designs
see pages 80-81





2 Rollers

series Self cleaning



The rubber rings are held in position at either end by a steel ring welded to the tube.

Øe 133 NM

Base roller:

MPS 1

D = 89 ;
spindle 15 ; d₁ = 20
bearing 6202
ch = 17

PSV 3

D = 89 ;
spindle 25 ; d₁ = 25
bearing 6305
ch = 18

PSV 1

D = 89 ;
spindle 20 ; d₁ = 20
bearing 6204
ch = 14

PSV 4

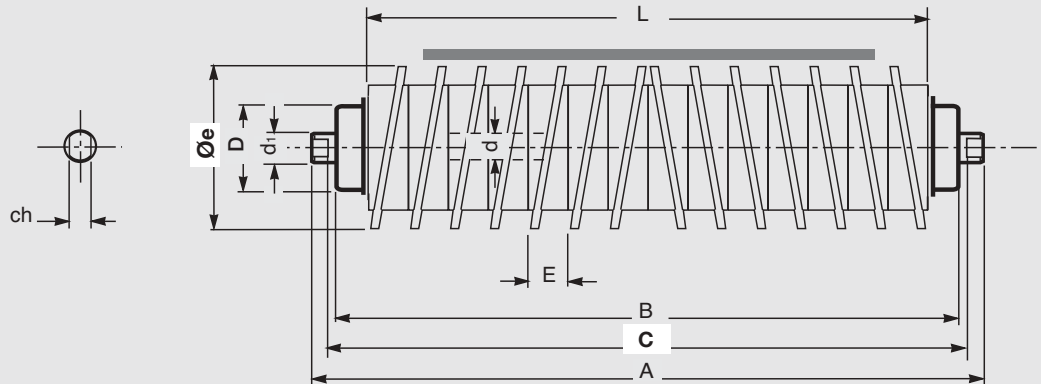
D = 89 ;
spindle 30 ; d₁ = 30
bearing 6206
ch = 22

PSV 2

D = 89 ;
spindle 25 ; d₁ = 25
bearing 6205
ch = 18

belt width mm	roller dimensions mm					weight Kg					rings width E=38,5
	B	C	A			MPS-1	PSV 1	PSV 2	PSV 3	PSV 4	
400	500	508	526	532		7.3	8.2				460
500	600	608	626	632		8.6	9.5				540
650	750	758	776	782		10.7	11.8	13.3			695
800	950	958	976	982		13.7	15.0	16.5			925
1000	1150	1158	1176	1182		16.2	17.7	19.5	19.9	22.0	1080
1200	1400	1408	1426	1432			21.4	23.5	23.9	26.5	1385
1400	1600	1608		1632				26.5	26.9	29.8	1540
1600	1800	1808		1832				29.5	29.8	33.0	1760

Example of ordering
standard design
PSV 1,20F,133NM,758
for special designs
see pages 80-81



Øe 180 NM

Base roller:

PSV 1

D = 89 ;
spindle 20 ; d₁ = 20
bearing 6204
ch = 14

PSV 4


D = 89 ;
spindle 30 ; d₁ = 30
bearing 6206
ch = 22

PSV 2

D = 89 ;
spindle 25 ; d₁ = 25
bearing 6205
ch = 18

PSV 3

D = 89 ;
spindle 25 ; d₁ = 25
bearing 6305
ch = 18

belt width mm	roller dimensions mm					weight Kg				rings width E = 38,5
	arrangement 	B	C	A		PSV 1	PSV 2	PSV 3	PSV 4	
500		600	608	626	632	15.7	16.7			540
650		750	758	776	782	19.7	20.9			695
800		950	958	976	982	25.6	27.0			925
1000		1150	1158	1176	1182	30.0	31.8	32.2	34.3	1080
1200		1400	1408	1426	1432	36.3	38.4	38.7	41.3	1385
1400		1600	1608		1632		43.3	43.7	46.6	1540
1600		1800	1808		1832		48.0	48.4	51.7	1770



Example of ordering
standard design
PSV 1,20F,180NM,1158
for special designs
see pages 80-81



2 Rollers

series Self cleaning



2.6.4 - Return rollers with helical steel cage for self cleaning

Used in the return section to support the belt when the conveyed material is very adhesive, as with for example clay.

They may be positioned on any part of the conveyor return section, when it is relatively short.

When these rollers are produced with a spiral steel cage, it is attached to the two end caps with similar characteristics to the PSV rollers series.

The spiral cage, in permanent contact with the dirty side of the belt, removes material from the belt using its natural rotary cleaning action.

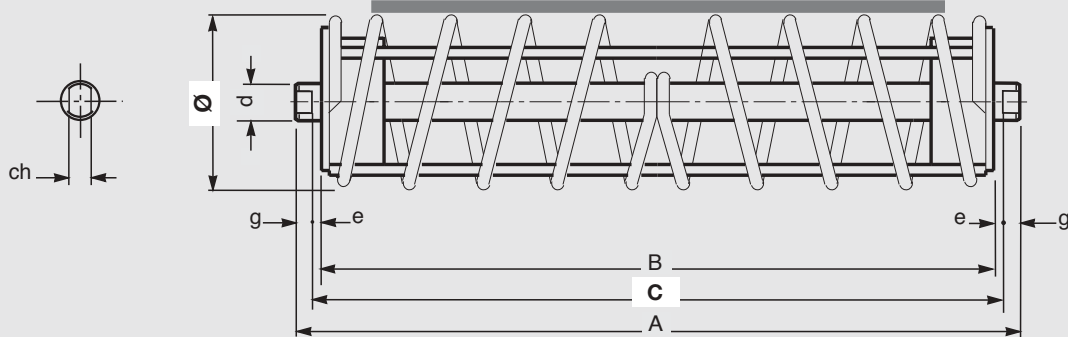
The rollers should be installed in a way that the spiral moves the material towards the edge of the belt.

These rollers must not be employed as belt snub rollers.

The tables indicate the standard types and diameters with their dimensions according to European norms. On customer request cleaning rollers may be supplied with spirals in steel, with non standard dimensions and characteristics (for example steel spiral in flattened format).

Program

base roller tipo	Ø mm	Standard design	spindle		bearing
			mm	ch	
PSV 91	108	S	20	14	6204
	133	S			
PSV 92	133	S	25	18	6205
PSV 94	133	S	30	22	6206
M 1, RTL 1	60	NS	15	17	cup and cone
	76	NS			
MPS 1, MPR 15	60	NS	15	17	6202
	76	NS			



Ø 108 S 133 S

Base roller:

PSV 91


D = 108, 133
spindle 20
bearing 6204
ch = 14
e = 4
g = 9

PSV 92

D = 133
spindle 25
bearing 6205
ch = 18
e = 4
g = 12

PSV 94

D = 133
spindle 30
bearing 6206
ch = 22
e = 4
g = 12

belt width mm	roller dimensions mm			weight Kg		
	arrangement 	B	C	A	Ø 108	Ø 133
300		380	388	406	6.0	9.8
400		500	508	526	6.8	10.5
500		600	608	626	7.5	11.3
650		750	758	776	8.5	12.5
800		950	958	976	9.9	14.1
1000		1150	1158	1176	11.3	15.7

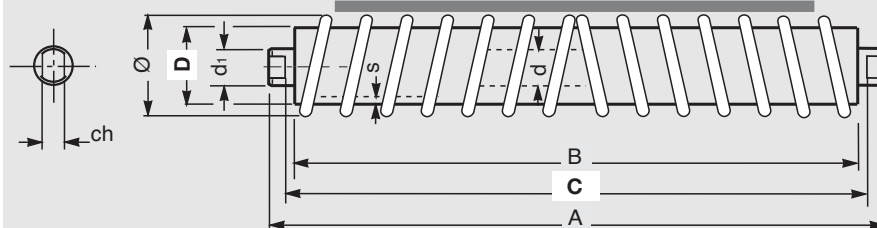


Example of ordering
standard design
PSV 91,20F,108S,758
for special designs
see pages 80-81



2 Rollers

series Self cleaning



60 NS 76 NS

Base roller:

MPS 1

s = 3 ;
spindle 15 ; d₁ = 20
bearing 6202
ch = 17

RTL 1

s = 2 ;
spindle 15 ; d₁ = 20
cup and cone bearing
ch = 17

M 1

s = 3 ;
spindle 15 ; d₁ = 20
cup and cone bearing
ch = 17

MPR 15

s = 3 ;
spindle 15 ; d₁ = 20
bearing 6202
ch = 17

Example of ordering
standard design
MPS 1,15B,60NS,758
for special designs
see pages 80-81

belt	roller D 60 ø 76			weight		
width mm	dimensions mm			Kg		
arrangement	B	C	A	RTL	MPR	MPS-M
300	380	388	406	2.5	3.1	3.2
400	500	508	526	3.3	4.1	4.1
500	600	608	626	3.9	4.8	4.8
650	750	758	776	4.8	5.9	5.9
800	950	958	976	6.0	7.3	7.4
1000	1150	1158	1176	7.2	8.8	8.9

belt	roller D 76 ø 92			weight		
width mm	dimensions mm			Kg		
arrangement	B	C	A	RTL	MPR	MPS-M
300	380	388	406	3.1	3.9	3.9
400	500	508	526	4.1	5.1	5.1
500	600	608	626	4.7	5.9	5.9
650	750	758	776	5.8	7.3	7.3
800	950	958	976	7.2	9.0	9.0
1000	1150	1158	1176	8.8	10.9	10.9

3 Troughing sets





3 Troughing sets

Summary	3	Troughing sets	page 195
3.1		Introduction	197
3.2		Choice of troughing set	198
3.2.1		Choice of the transom in relation to load	200
3.3		Arrangements	202
3.3.1		Carrying troughing sets	202
3.3.2		Return sets	203
3.3.3		Order codes	204
3.3.4		Programme of transoms and bracketry	205
3.4		Self-centralising troughing sets	222
3.5		Cantilevered sets	234
3.6		Suspended sets	239
3.6.1		Characteristics	240
3.6.2		Applications and arrangements	241
3.6.3		Programme	243
3.6.4		Suspension designs	250

3.1 - Introduction

In a belt conveyor one may identify two types of troughing sets : the upper carrying sets, that have the function to support the loaded sections of the belt and to move the material ; and the lower sets that support the unloaded belt on its return section.

The upper troughing sets may basically be in two arrangements : flat, with a single horizontal roller generally supported by two fixed brackets from the conveyer or structure ; troughed, generally with 3 rollers supported within a frame which is itself fixed to the conveyor structure.

There may be then, in the loaded sections, impact troughing sets with rollers with rubber rings or suspended "garland" sets with 3 or 5 rollers.

In the majority of belt conveyors, the upper troughing sets are used in a troughing arrangement, so that the carrying belt may transport a much greater amount of material than it could if the belt was flat, assuming an equal belt width and speed.

The rollers of an upper troughing set are undoubtedly the most important components to be considered during the project phase.



3 Troughing sets



3.2 - Choice of Troughing sets

When choosing the troughing sets and their arrangements during the project phase of the construction of a belt conveyor the following factors must be considered :

- total load capacity in tons / hour of conveyed material
- belt speed
- belt, uni-direction or reversible
- lump size of material and its angle of repose
- temperature and environmental challenge
- characteristics of load, humidity and material abrasiveness
- type, flexibility and weight of rubber belt

The development of detail concerning the above considerations is contained in chapter 1 - technical information.

Defining the belt width, in relation to the flow of conveyed material and establishing the speed, allows the choice to be made of the type of transom support and the correct roller series, matching the working conditions.

Above all when the rollers are subjected to a corrosive environment or materials (salt, chemical substances etc) very careful attention should be paid in their choice.

In the same way the transoms that carry the rollers must be protected with a suitable galvanised treatment.

The weight of the material determines the dynamic load which the troughing set has to sustain and also defines the pitch of the sets in the upper carrying sections of the belt.

In practice the type of troughing set is chosen that meets the criteria of load together with the use of the minimum rubber belt width to provide the most economic solution.

The choice of the return sets is also important, in that they take account of the belt centralising and cleaning conditions.

In fact on the return sets the rollers are in contact with the dirty side of the belt and thus face a variety of problems.

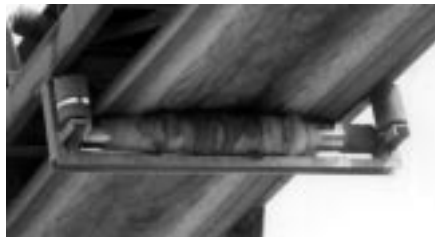


The residual material remains attached to the return section of the belt and may deposit onto the rollers in a non uniform way that promotes belt drifting and premature wear.

This material may act to abrade the roller shell in a serious way and place a critically high demand on the protection qualities of the sealing system of the roller bearings.

Therefore the solution must be to put in place the very best belt cleaning system, utilising the auto centralising system (self centralising troughing sets) and in the use of rollers with rubber rings that permits residual material to fall freely to the ground without build-up on the rollers.

The conveyed material deposits onto rollers and increases their diameter in an uneven way, usually less at the roller ends.



To choose the right troughing sets to suit the load see the chapter on rollers page 78 "Dynamic Load, on the carrying sets Ca_1 , on the return sets Cr_1 ".

The load on the troughing set is given by the material load added to the weight of rollers ; and using *Tab. 23* the transom may be chosen, that has a greater load capacity than the load thus calculated ; finally adding the weight of the transom itself, taking account the roller capacity and diameter that may be utilised in the frame and the following general considerations :

- the load capacity of the transom in *Tab. 23* is given by the admissible load on the base angle leaving aside the type of attachments and the characteristics of the side and central bracket supports.

- the transoms A2S, A3L, and A3M, belong to the light and medium series and are fixed to the structure by means of a single hole per side. Their side supports are relatively light, and are used therefore on conveyors with regular loads and small lump size of material and low speed so that damaging vibrations are avoided.

They are preferably not to be used at the loading points as impact sets especially when large lump size material exists and the loading heights are excessive.

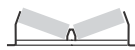


- the transoms A3P and A3S, form the heavy series for the iron and steel industry, and are fixed to the structure by plates with two holes in each plate, and have side brackets reinforced by shaping them as channels. They are therefore more adapted to be used in the transport of irregular loads, large material lump size, high speeds even if in the presence of vibrations.

They are most suitable for the positioning of the heaviest roller series up to the maximum capacities designed.

3 Troughing sets

3.2.1 - Choice of the transom in relation to load

Tab. 23 - Capacity of standard transom

belt width mm	type of transom and diameter of suitable rollers			
	 A2 S-20° Ø 60+110 Kg	 A3 L-30° Ø 76+110	 A3 M-30° Ø 89+110 Ø 110+140	
300	338			
400	286	286		
500	205	247	247	247
650	167	205	205	205
800	167	167	354	354
			289	289
1000			460	460
			244	244
1200			388	388
			204	204
1400			325	325
1600				
1800				
2000				
2200				

A3P-30°



Ø 89+108

Ø 108+133

Ø 133+159

A3 S-35°



Ø 133

Ø 159

Ø 194

R2 S-10°



Ø 89+180

R2 SP



Ø 133+194

							354	
	289	289	289	289	289		289	
	460	460	460	460	460			
	244	244	244	244				
	388	388	388	388	388		388	
		581	581	581	581			
	204	204	204	204				
	325	325	325	325	325		325	
		487	487	487	487			
				634	634			
		288	288	431	431		431	
		431	431	561	561		561	
		561	561	710	710			
		387	387	387	387		387	
		503	503	503	503	503	503	
				637	637	753		
			446	446	446	446	342	
			667	667	667	667	446	446
					604	604	604	604
					909	909		
					558	558		840
					840	840		

3 Troughing sets

3.3 - Arrangements

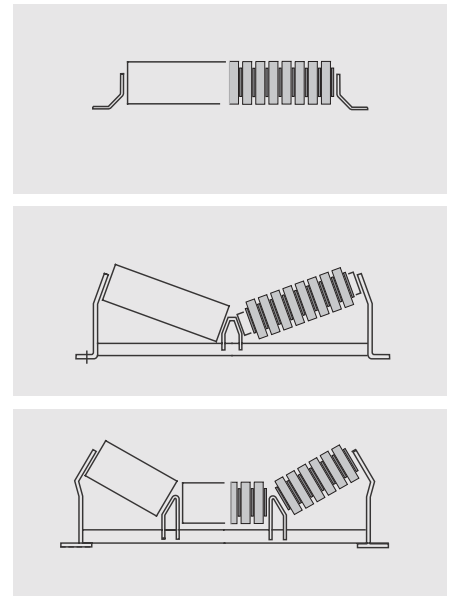
According to the requirements of the specific project, different arrangements of transoms have been designed. These may be separated into fixed and suspended transoms.

In belt conveyors there are two basic types of troughing sets : that of the carrying set, which supports the belt on the loaded section, known as the upper troughing set; and that of the return set, which supports the empty belt on its return section.

A particular category of troughing sets is that known as the impact set which is positioned to correspond to the section where the belt is loaded with material.



Fig. 1 - Fixed troughing sets



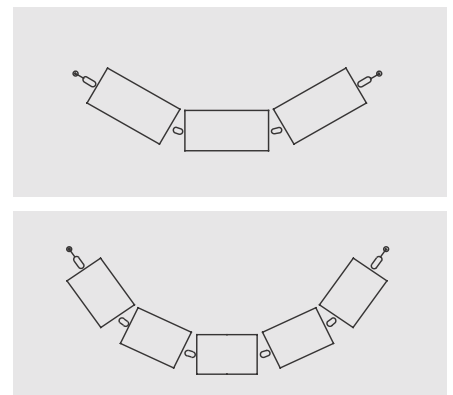
3.3.1 - Upper carrying troughing set

The drawings illustrate the arrangements of fixed carrying troughing sets with plain or impact rollers Fig. 1, and the suspended troughing set "garland" Fig. 2.

The carrying troughing sets of three rollers are designed as standard for unidirectional belts, and for this reason have a slight forward inclination of two degrees in the position of the side rollers.

This assists the belt tracking by an auto-centralising effect. For reversible belts the version R is required, which is without the above two degrees (see "order codes" para. 3.3.3)

Fig. 2 - "Garland" sets



3.3.2 - Return sets

The lower or return sets may also be chosen from varying arrangements according to the requirement : fixed sets with plain steel roller or with spacer rings Fig. 3 and suspended sets "garland" with plain rollers and with rings Fig. 4.

Fig. 3 - Fixed sets

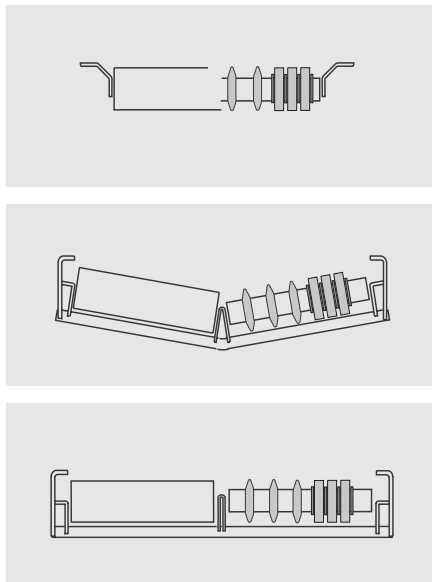
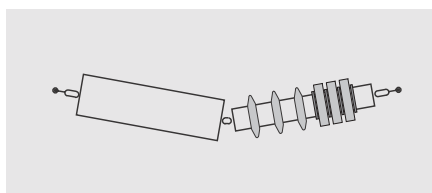


Fig. 4 - "Garland" sets

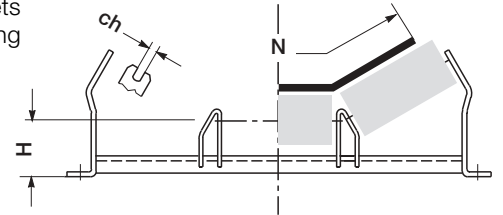




3 Troughing sets

3.3.3 Order codes

The transoms and the support brackets are identified according to the following characteristics :



A3M/26 - 800 F14 H160 - - - YA R

Example: Transom

Order code _____

Special design (T : with bracket) _____

Belt width _____

Dimension of flats "ch" _____

Height "H" (where existing from the order) _____

Diameter of rollers (only for the self-centering transom) _____

Type of finish (see table) _____

Reversible design R (without 2° inclination of side brackets) _____

Example: **Brackets**

SPT 1478 F17 YA

Support _____

Type _____

Dimension of flats "ch" _____


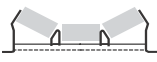




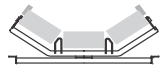

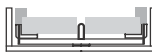
Type of finish (see table) _____

Type of finish of transom and brackets

Code	Description of treatment
YA	painted with anti rust
YB	sandblasted SA 2,5 + inorganic zinc 70 micron
YC	sandblasted SA 2,5 + inorganic zinc 70 micron + chlorinated rubber 30 micron
* Z	hot zinc min. 70 microns
J	electrolytic zinc min. 10 microns
YS	special paint
-	not specified: no finish

* Note: the type of finish "Z" for selfcentralising transoms is intended as zinc thermal spraying

3.3.4 - Programme of transoms and brackets

Series	Arrangements	Descriptions
A2 S 20°		upper transom for two rollers
A3 L 30° A3 M 30° A3 P 30° A3 S 35°		upper transom for three rollers
SPT 1657 SPT 070 SPT 1795		upper brackets for one roller
SPT 1478 SPT 243 SPT 1495		lower return brackets for plain roller
R2 S 10°		transom for two return rollers "V"
R2 SP		transom for two flat return rollers
P3 L,M,P,S - S P3 L,M,P,S - F P3 L,M,P,S - R		upper self-centralsing transom for three rollers
Q1 L Q1 P		lower self-centralsing return transom for one roller
Q2 L Q2 P		lower self-centralsing return transom for two rollers

The production programme of frames and supports indicated in the table is related to the standard production according to the Unified Standards DIN 22107.

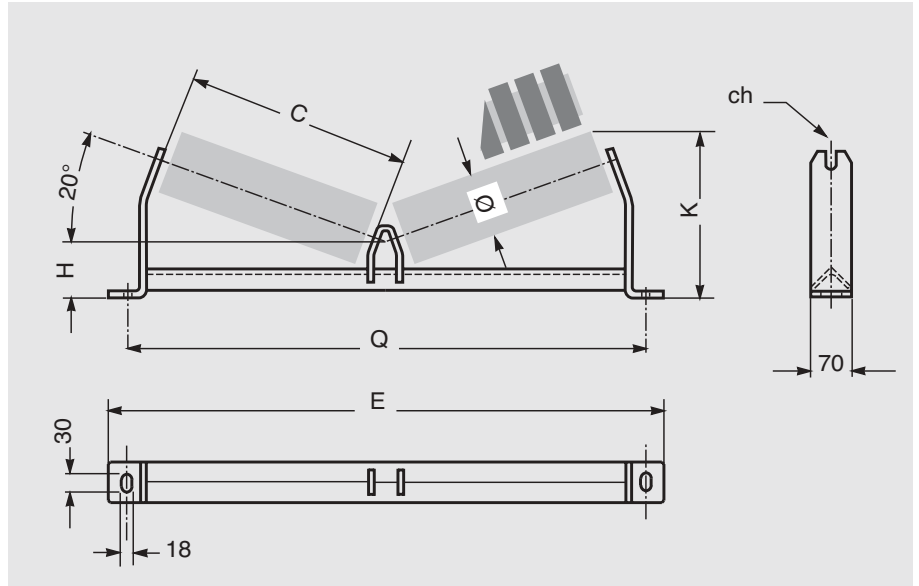
On request they can be supplied in different shapes and dimensions according to the standards CEMA, BS, JIS, AFNOR and ISO-FEM.



3 Troughing sets

transom A2 S-20°

For light upper troughing sets with two rollers, plain or with impact rings



for rollers series:

MPS
 ø 60, 76, 89, 102
 spindle 15
 bearing 6202
 ch = 17

PSV 1,
 ø 63, 89, 108
 spindle 20
 bearing 6204
 ch = 14

PL
 ø 90, 110
PLF
 ø 89, 108
 spindle 20
 bearing 6204
 ch = 30; 14

Order codes	belt		roller		ch	transom					Weight * without rollers Kg
	width mm		Ø mm	C		capacity Kg	H mm	K max	Q	E	
A2 S/49	300			208	14 - 17 - 30	338	95	213	540	600	3.9
A2 S/51	400			258		286	95	240	640	700	4.4
A2 S/53	500			323		247	95	262	740	800	4.9
A2 S/55	650			388		205	95	285	890	950	5.6
A2 S/57	800			473		167	95	314	1090	1150	6.6

On request transoms may be supplied with different dimensions, characteristics and angles.

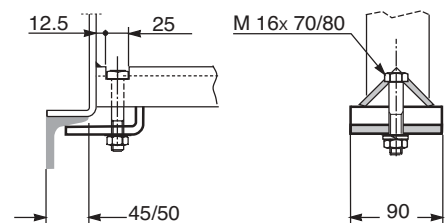


A2 S-20° Standard

A2 ST-20°

Special design with bracket

for fixing the transom without drilling the main frame



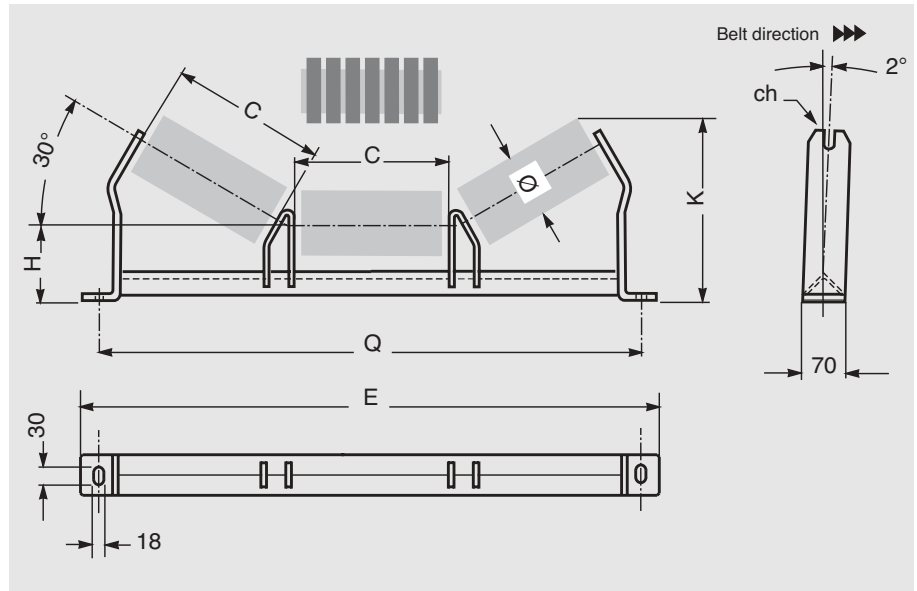
* Add 1.5 kg for the special design with bracket

Example of ordering
 A2S /51, 400, F17,

for special designs
 see page 204

transom A3 L-30°

For light upper troughing sets with three rollers, plain or with impact rings



for rollers series:

MPS

ø 76, 89, 102
spindle 15
bearing 6202
ch = 17

PL

ø 90, 110

PLF

ø 89, 108
spindle 20
bearing 6204
ch = 30; 14

Order codes	belt width mm	roller			transom					Weight ★ without rollers Kg
		Ø mm	C	ch	capacity Kg	H mm	K max	Q	E	
A3 L /1A	400	76 - 89 - 90 102 - 108 - 110	168	17 - 30	286	125	267	640	700	5.4
A3 L /01	500		208		247	125	287	740	800	5.9
A3 L /03	650		258		205	125	312	890	950	6.6
A3 L /05	800		323		167	125	344	1090	1150	7.5

On request transoms may be supplied with different dimensions, characteristics and angles.

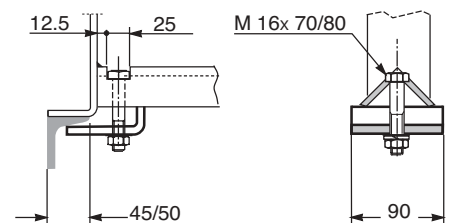


A3 L-30° Standard

A3 LT-30°

Special design with bracket

for fixing the transom without drilling the main frame



★ Add 1.5 kg for the special design with bracket

Example of ordering
A3L/03, 650, F17, YA

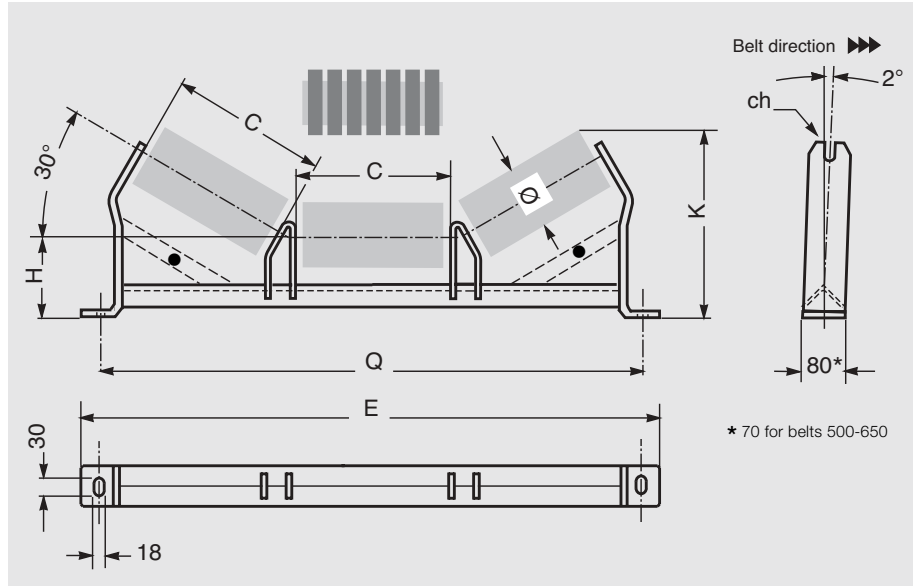
for special designs
see page 204



3 Troughing sets

transom A3 M-30°

For medium upper troughing sets with three rollers, plain or with impact rings



- Reinforcing only for frames with order code: A3 M /24 - A3 M /28 - A3 M /32
A3 M /26 - A3 M /30 - A3 M /34
for belt widths 800 - 1000 - 1200

for rollers series:

PSV 1,
ø 89, 108
spindle 20
bearing 6204
ch = 14

PL
ø 90, 110, 140

PLF
ø 89, 108, 133
spindle 20
bearing 6204
ch = 30, 14

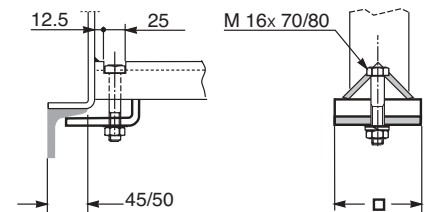


A3 M-30° Standard

A3 MT-30°

Special design with bracket

for fixing onto the transom without drilling a hole in the frame



□ Bracket width available: 90 - 100 - 110

Example of ordering
A3M /28,1000,F14, H140, Z

for special designs
see page 204

transom A3 M-30°

Order codes	belt width mm	roller		transom					Weight without rollers Kg
		∅ mm	C ch	capacity Kg	H mm	K _{max}	Q	E	
A3 M 1/3A	500	89 - 90 - 108 - 110	208	247	135	292	740	800	6.0
A3 M 1/3E	650		258	205	135	317	890	950	6.7
A3 M /22			354	135	317	890	950	8.1	
A3 M 1/3K	800		323	289	140	354	1090	1150	10.7
A3 M /24			460	140	354	1090	1150	13.3	
A3 M 1/3P	1000		388	244	140	387	1290	1350	12.2
A3 M /28			388	388	140	387	1290	1350	15.1
A3 M 1/3J	1200		473	204	140	429	1540	1600	14.0
A3 M /32			325	140	429	1540	1600	17.4	
A3 M 2/3C	500	133 - 140	208	247	155	325	740	800	6.5
A3 M 2/3G	650		258	205	155	350	890	950	7.2
A3 M 3/3I			354	155	350	890	950	8.6	
A3 M 2/3M	800		323	289	160	387	1090	1150	11.4
A3 M /26			460	160	387	1090	1150	13.9	
A3 M 2/3R	1000		388	244	160	420	1290	1350	12.7
A3 M /30			388	388	160	420	1290	1350	15.9
A3 M 2/3V	1200		473	204	160	462	1540	1600	14.5
A3 M /34			325	160	462	1540	1600	18.1	

On request transoms may be supplied with different dimensions, characteristics and angles.

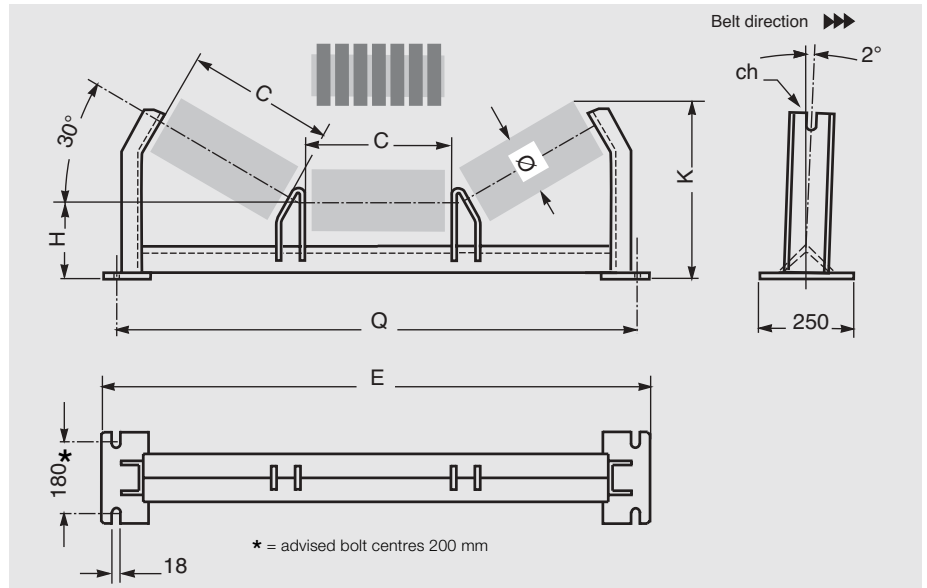




3 Troughing sets

transom A3 P-30°

For heavy upper troughing sets with three rollers, plain or with impact rings



for rollers series:

PSV 1,
 ø 89, 108, 133
 spindle 20
 bearing 6204
 ch = 14

PSV 2, 3
 ø 133, 159
 spindle 25
 bearing 6205, 6305
 ch = 18

PSV 4, 5
 ø 133, 159
 spindle 30
 bearing 6206, 6306
 ch = 22



A3 P-30° Standard

Example of ordering
 A3P/54,1200,4, F18, H168

for special designs
 see page 204

transom A3 P-30°

Order codes	belt width mm	roller			transom					Weight without rollers Kg
		∅ mm	C	ch	capacity Kg	H mm	K _{max}	Q	E	
A3 P 1/5A	800	89 - 108	323	14	289	133	347	1090	1150	11.5
A3 P 2/5B					460	140	355	1090	1150	13.6
A3 P 1/5E	1000				244	133	380	1290	1350	12.7
A3 P 2/5F					388	140	387	1290	1350	15.3
A3 P 1/5K	1200				204	133	422	1540	1600	14.4
A3 P 2/5L					325	140	429	1540	1600	17.3
A3 P 3/5C	800	133	323	14 - 18 - 22	289	153	380	1090	1150	12.9
A3 P /50					460	160	388	1090	1150	15.0
A3 P 3/5G	1000				244	153	413	1290	1350	15.5
A3 P 4/5H					388	160	420	1290	1350	18.1
A3 P /52					581	168	428	1290	1350	21.0
A3 P 3/5M	1200				204	153	455	1540	1600	17.3
A3 P 4/5N				325	160	462	1540	1600	20.3	
A3 P /54				487	168	470	1540	1600	23.7	
A3 P 1/5R	1400			288	160	496	1740	1800	22.1	
A3 P 2/5S				431	168	503	1740	1800	26.1	
A3 P /56				561	176	511	1740	1800	28.3	
A3 P 1/5V	1600			387	168	538	1940	2000	28.3	
A3 P /58		503	176	546	1940	2000	30.7			
A3 P 4/5D	800	159	323	18 - 22	284	173	413	1090	1150	13.8
A3 P /51					460	180	420	1090	1150	15.9
A3 P 5/5I	1000				244	173	445	1290	1350	16.6
A3 P 6/5J					388	180	452	1290	1350	19.1
A3 P /53					581	188	460	1290	1350	22.0
A3 P 5/5P	1200				204	173	475	1540	1600	18.3
A3 P 6/5Q				325	180	482	1540	1600	21.3	
A3 P /55				487	188	490	1540	1600	24.8	
A3 P 3/5T	1400			288	180	518	1740	1800	23.2	
A3 P 4/5U				431	188	525	1740	1800	27.1	
A3 P /57				561	196	533	1740	1800	29.3	
A3 P 2/5W	1600			387	188	580	1940	2000	29.4	
A3 P /59		503	196	588	1940	2000	31.8			
A3 P 1/5X	1800	446	196	615	2190	2250	34.9			
A3 P 2/5Y		667	203	623	2190	2250	43.9			

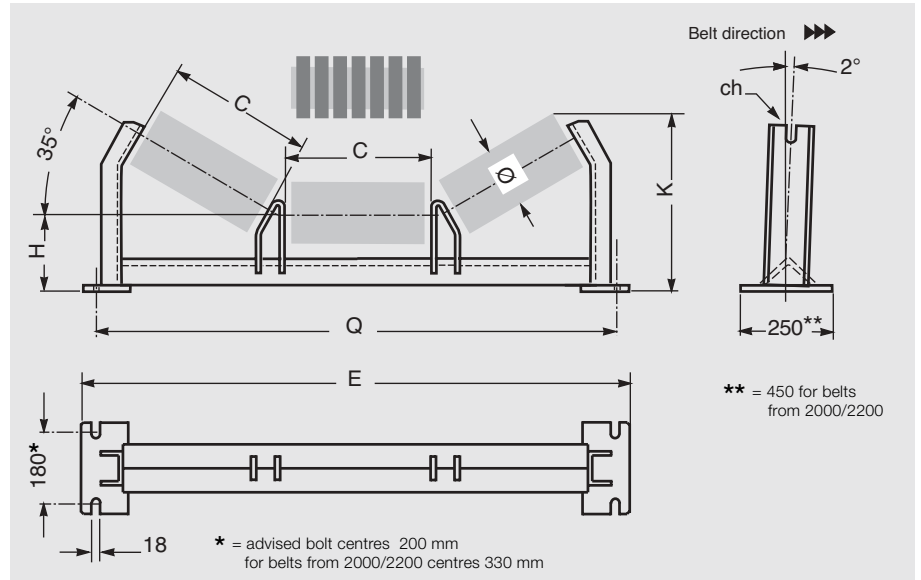
On request transoms may be supplied with different dimensions, characteristics and angles.



3 Troughing sets

transom A3 S-35°

For upper troughing sets, extra heavy with three rollers, plain or with impact rings



for rollers series:

PSV 2, 3

ø 133
spindle 25
bearing 6205; 6305
ch = 18

PSV 4, 5

ø 159
spindle 30
bearing 6206; 6306
ch = 22

PSV 7

ø 159, 194
spindle 40
bearing 6308;
ch = 32



A3 S-35° Standard

Example of ordering
A3 S/77, 1400, F22, H205

for special designs
see page 204

transom A3 S-35°

Order codes	belt width mm	roller			transom					Weight without rollers Kg
		∅ mm	C	ch	capacity Kg	H mm	K _{max}	Q	E	
A3 S 1/80	800	133	18 - 22	323	289	155	407	1090	1150	14.1
A3 S /70					460	163	415	1090	1150	16.2
A3 S 1/82	1000			388	244	155	444	1290	1350	15.6
A3 S 2/83					388	163	451	1290	1350	18.1
A3 S 3/84	1200			473	581	170	459	1290	1350	21.0
A3 S 1/87					204	155	493	1540	1600	17.5
A3 S 2/88					325	163	500	1540	1600	20.4
A3 S 3/89					487	170	508	1540	1600	24.0
A3 S /74	1400			538	634	178	516	1540	1600	25.9
A3 S 1/8C					431	170	546	1740	1800	26.2
A3 S 2/8D					561	178	553	1740	1800	28.4
A3 S /76					710	185	560	1740	1800	30.6
A3 S 1/8G	1600			608	387	170	586	1940	2000	28.6
A3 S 2/8H					503	178	593	1940	2000	31.0
A3 S /78					637	185	600	1940	2000	33.5
A3 S 1/8K					446	178	633	2190	2250	43.2
A3 S 2/8N	1800	678	667	185	640	2190	2250	48.7		
A3 S 2/8I			289	176	437	1090	1150	15.8		
A3 S /71	800	159	18 - 22	323	460	183	445	1090	1150	18.0
A3 S 4/85				388	183	475	1290	1350	19.7	
A3 S 5/86	581			190	490	1290	1350	22.6		
A3 S 4/8A	1200			473	325	183	532	1540	1600	21.7
A3 S 5/8B					487	190	539	1540	1600	25.5
A3 S /75					634	198	547	1540	1600	27.4
A3 S 3/8E	1400			538	431	190	576	1740	1800	27.8
A3 S 4/8F					561	198	583	1740	1800	30.0
A3 S /77					710	205	591	1740	1800	32.2
A3 S 3/8I	1600			608	387	190	616	1940	2000	30.1
A3 S 4/8J					503	198	588	1940	2000	32.6
A3 S /79					637	205	631	1940	2000	35.0
A3 S 3/8P	1800			678	446	198	663	2190	2250	41.0
A3 S 4/8Q					667	205	671	2190	2250	49.8
A3 S 1/8T	2000			758	604	210	717	2420	2520	62.0
A3 S 2/8U					909	225	732	2420	2520	70.0
A3 S 1/8X	2200	808	558	210	746	2620	2720	66.1		
A3 S 2/8Y			840	225	761	2620	2720	74.6		
A3 S 5/8L	1600	608	503	265	672	1940	2000	40.7		
A3 S 6/8M			753	273	680	1940	2000	48.7		
A3 S 5/8R	1800	678	446	265	712	2190	2250	43.5		
A3 S 6/8S			667	273	720	2190	2250	53.0		
A3 S 3/8V	2000	758	604	277	803	2420	2520	64.6		
A3 S 4/8W			909	290	816	2420	2520	72.3		
A3 S 3/8Z	2200	808	558	277	832	2620	2720	68.3		
A3 S 4/90			840	290	845	2620	2720	76.7		

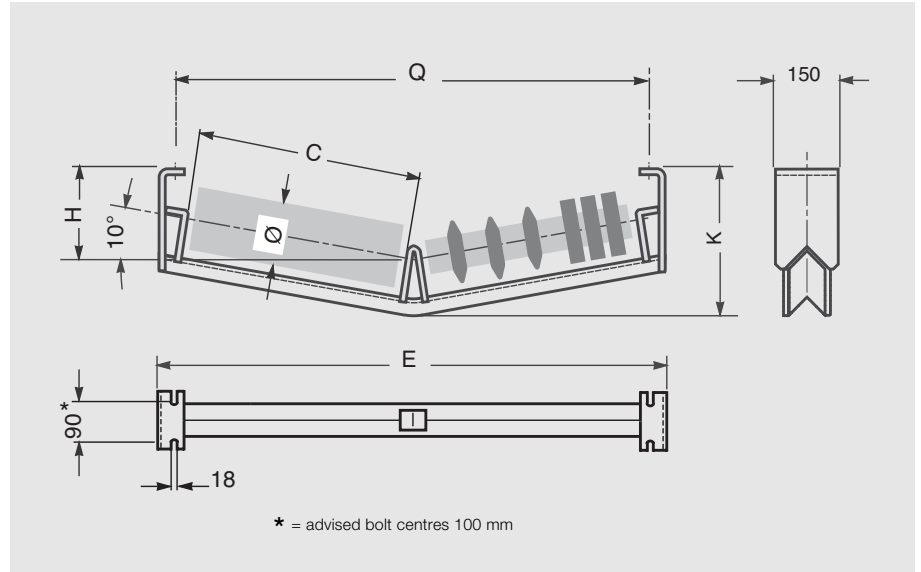
On request transoms may be supplied with different dimensions, characteristics and angles for belt widths up to 3000 mm.



3 Troughing sets

transom R2 S

For return sets "V", with two rollers, plain or with rings



for rollers series:

PSV 1,
 ø 89, 108, 133
 spindle 20
 bearing 6204
 ch = 14

PSV 2
 ø 133, 159, 180
 spindle 25
 bearing 6205
 ch = 18

PSV 4
 ø 159, 180
 spindle 30
 bearing 6206
 ch = 22

Order codes	belt		roller		transom					Weight without rollers Kg
	width mm		Ø mm	C ch	capacity Kg	H mm	K _{max}	Q	E	
R2 S /81	650		89 - 108 - 133 - 159 - 180	388	354	220	365	890	950	12.9
R2 S /82	800			473	289	238	384	1090	1150	14.4
R2 S /83	1000			608	388	256	408	1290	1350	18.1
R2 S /84	1200			708	325	279	430	1540	1600	20.1
R2 S 1/8A	1400			808	431	297	454	1740	1800	26.0
R2 S /85				908	561	297	462	1740	1800	28.3
R2 S 1/8B	1600			1008	387	314	474	1940	2000	28.1
R2 S /86					503	314	482	1940	2000	30.7
R2 S 1/8C	1800				342	338	503	2190	2250	30.0
R2 S 2/8D					446	338	511	2190	2250	32.8
R2 S 1/8E	2000				604	358	533	2420	2500	45.3
R2 S 1/8F	2200				560	375	560	2620	2700	50.4

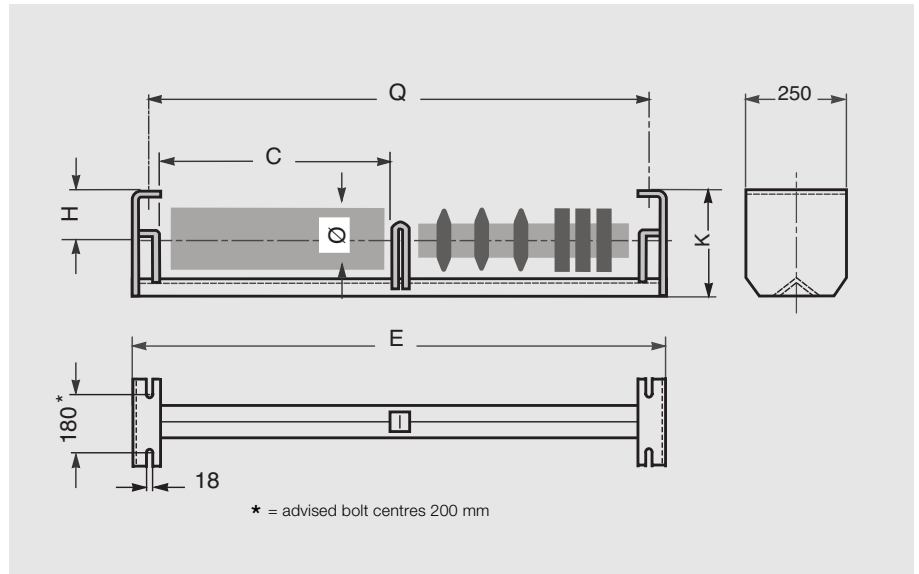
On request transoms may be supplied with different dimensions, characteristics and angles for belt widths up to 3000 mm.

Example of ordering
 R2S/85, 1400, F14, J

for special designs
 see page 204

transom R2 SP

For flat return sets with two rollers, plain or with rings



for rollers series:

PSV 4

∅ 159, 180
spindle 30
bearing 6206
ch = 22

PSV 7

∅ 133, 159, 194
spindle 40
bearing 6308
ch = 32

belt width mm	roller			transom					Weight without rollers Kg
	∅ mm	C	ch	capacity Kg	H mm	K _{max}	Q	E	
1800	133-159-194	1008	22 - 32	446	175	372	2190	2250	54.5
2000		1108		604	175	380	2420	2500	68.0
2200		1258		840	175	395	2620	2700	76.5

On request transoms may be supplied with different dimensions, characteristics and angles for belt widths up to 3000 mm.

Example of ordering
R2SP, 2000, F22, YC

for special designs
see page 204

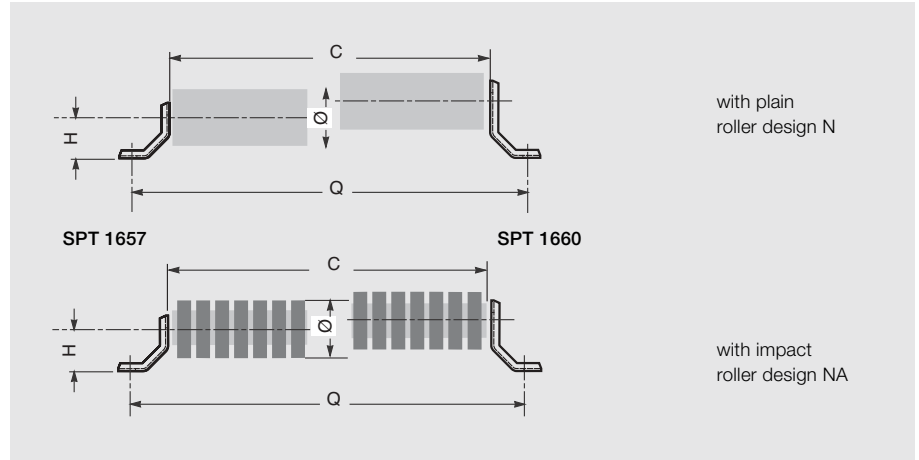


3 Troughing sets

support brackets

SPT 1657-1660

For light upper set flat roller, plain or with impact rings



SPT 1657 for rollers series:

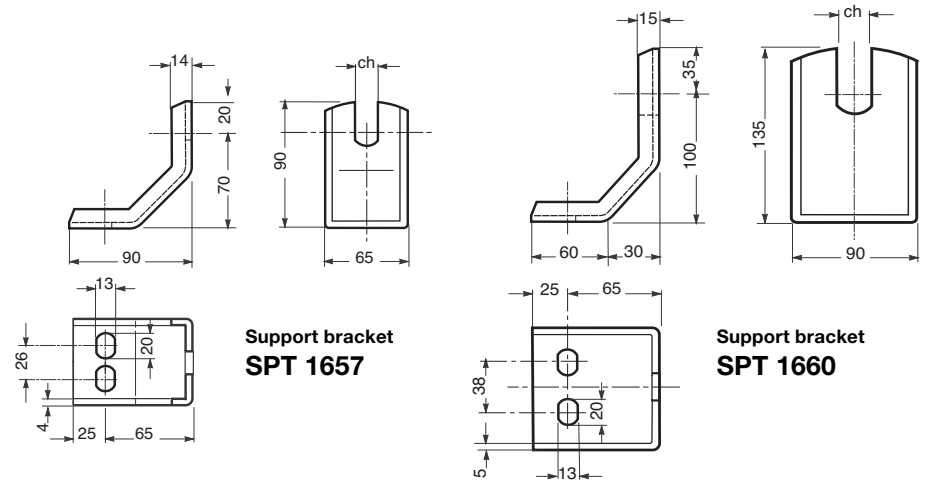
RTL
spindle 15
bearing cup and cone
ch = 17

MPS
spindle 15
bearing 6202
ch = 17

MPR
spindle 15
bearing 6204
ch = 17

PSV 1,
spindle 20
bearing 6204
ch = 14

M
spindle 15
bearing cup and cone
ch = 17



SPT 1660 for rollers series:

PSV 1
spindle 20
bearing 6204
ch = 14

PSV 4
spindle 30
bearing 6206
ch = 22

PSV 2
spindle 25
bearing 6205
ch = 18

PSV 5
spindle 30
bearing 6306
ch = 22

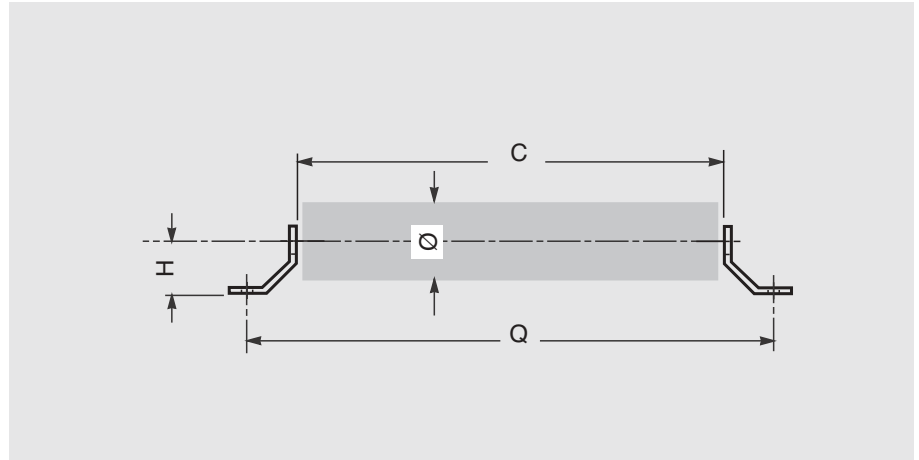
PSV 3
spindle 25
bearing 6305
ch = 18

belt width mm	roller		H mm	Q		Weight of two brackets without rollers Kg	
	Ø mm	ch		SPT 1657	SPT 1660	SPT 1657	SPT 1660
300		388	70	100	520	0.7	1.5
400		508	70	100	640	0.7	1.5
500	SPT 1657: 60 + 133 SPT 1660: 60 + 180	608	70	100	740	0.7	1.5
650		758	70	100	890	0.7	1.5
800		958	70	100	1090	0.7	1.5
1000		1158	70	100	1290	0.7	1.5
1200		1408	70	100	1540	0.7	1.5
1400		1608	70	100	1740	0.7	1.5

Example of ordering
support bracket SPT 1657, F17, YA

support brackets SPT 070

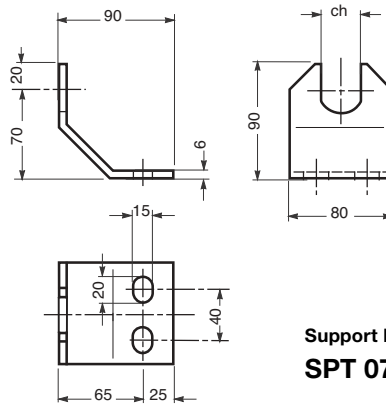
For upper set flat roller PL or PLF



for rollers series:

PL
 ø 90,110,140
 spindle 20
 bearing 6204
 ch = 30

PLF
 ø 89,108,133
 spindle 20
 bearing 6204
 ch = 30



Support bracket
SPT 070

belt width mm	roller		ch	H mm	Q	Weight of two brackets without rollers Kg
	Ø mm	C				
300	90-110-140	388	30	70	520	1.0
400		508		70	640	1.0
500		608		70	740	1.0
650		758		70	890	1.0
800		958		70	1090	1.0
1000		1158		70	1290	1.0
1200		1408		70	1540	1.0

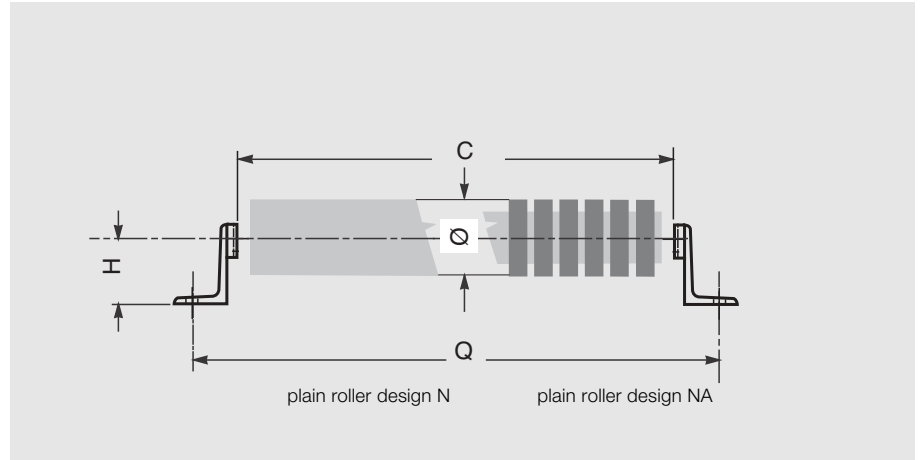
Example of ordering
 support bracket SPT 070,
 F30,YC



3 Troughing sets

support brackets SPT 1795

For upper set heavy flat roller, plain or with impact rings

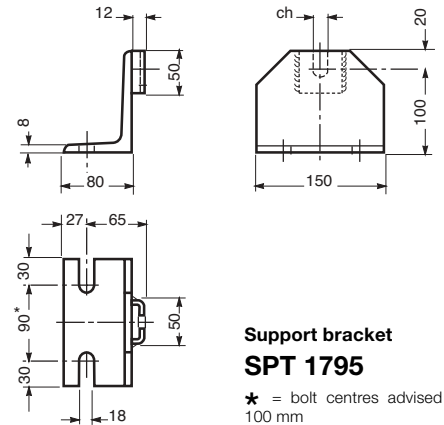


for rollers series:

PSV 1,
 ø 89,108,133
 spindle 20
 bearing 6204
 ch = 14

PSV 2
 ø 108,133,159
 spindle 25
 bearing 6205
 ch = 18

PSV 4
 ø 108,133,159
 spindle 30
 bearing 6206
 ch = 22



**Support bracket
SPT 1795**

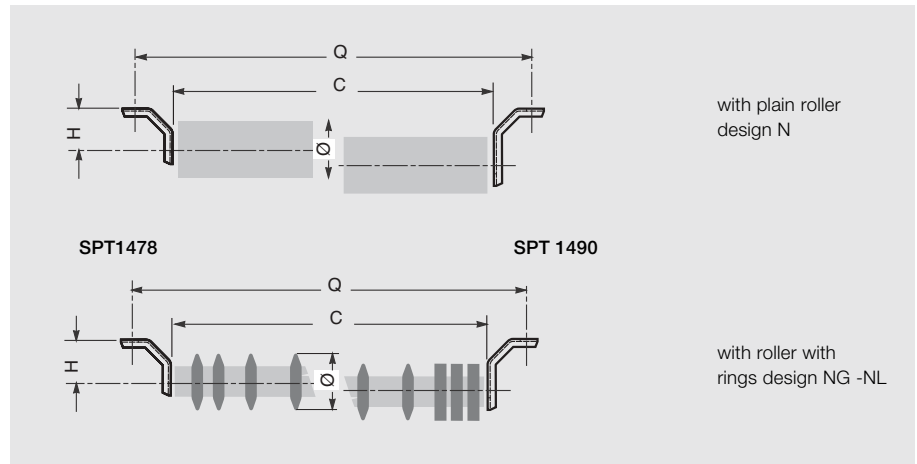
★ = bolt centres advised
100 mm

belt width mm	roller		ch	H mm	Q	Weight of two brackets without rollers Kg
	ø mm	C				
500	89-108-133-159	608	14-18-22	100	740	3.7
650		758		100	890	3.7
800		958		100	1090	3.7
1000		1158		100	1290	3.7
1200		1408		100	1540	3.7
1400		1608		100	1740	3.7
1600		1808		100	1940	3.7
1800		2008		100	2140	3.7
2000		2208		100	2340	3.7

Example of ordering
support bracket SPT 1795, F22.Z

support brackets SPT 1478 - 1490

For light flat return roller, plain or with rings



SPT 1478 for rollers series:

RTL

spindle 15
bearing cup and cone
ch = 17

MPS

spindle 15
bearing 6202
ch = 17

MPR

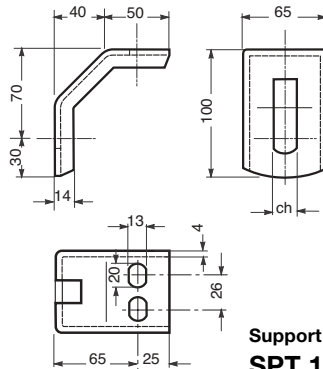
spindle 15
bearing 6202
ch = 17

PSV 1,

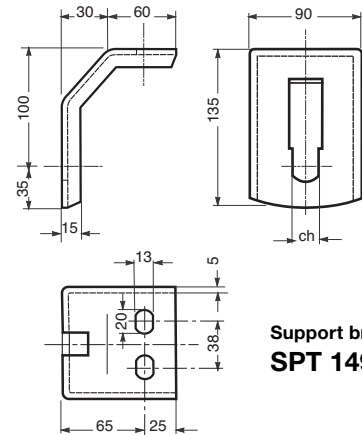
spindle 20
bearing 6204
ch = 14

M

spindle 15
bearing cup and cone
ch = 17



Support bracket
SPT 1478



Support bracket
SPT 1490

SPT 1490 for rollers series:

PSV 1

spindle 20
bearing 6204
ch = 14

PSV 4

spindle 30
bearing 6206
ch = 22

PSV 2

spindle 25
bearing 6205
ch = 18

PSV 5

spindle 30
bearing 6306
ch = 22

PSV 3

spindle 25
bearing 6305
ch = 18

belt width mm	roller		H mm	Q	Weight of two brackets without rollers SPT 1478 SPT 1490 Kg	
	Ø mm	C ch			SPT 1478	SPT 1490
300	SPT 1478: 60 ÷ 133 SPT 1490: 60 ÷ 180	388	70	100	520	0.7 1.5
400		508	70	100	640	0.7 1.5
500		608	70	100	740	0.7 1.5
650		758	70	100	890	0.7 1.5
800		958	70	100	1090	0.7 1.5
1000		1158	70	100	1290	0.7 1.5
1200		1408	70	100	1540	0.7 1.5
1400		1608	70	100	1740	0.7 1.5

Example of ordering

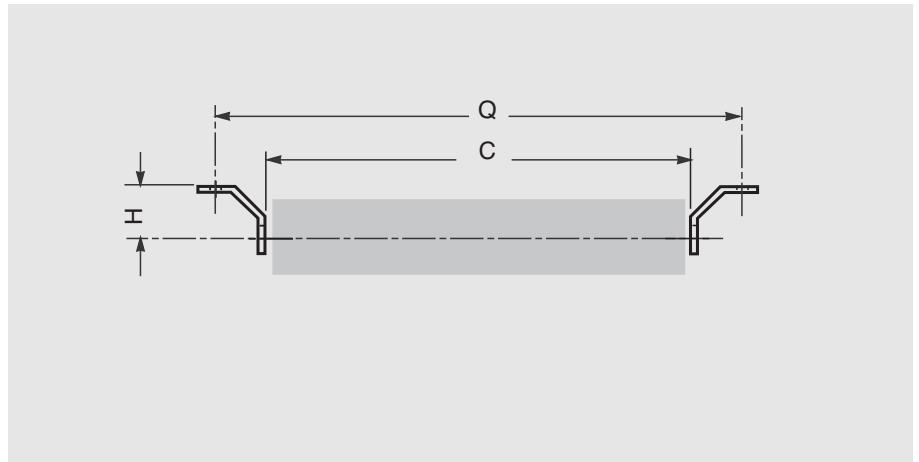
support bracket SPT 1478, F14,



3 Troughing sets

support brackets SPT 243

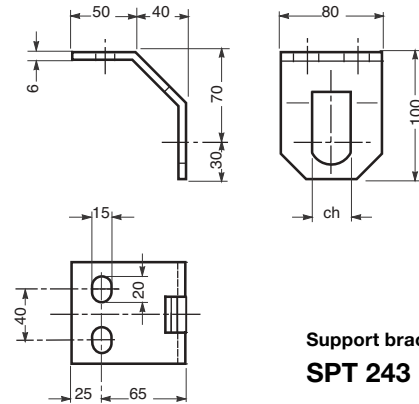
For flat return roller PL or PLF



for rollers series:

PL
 ø 90,110,140
 spindle 20
 bearing 6204
 ch = 30

PLF
 ø , 89,108,133
 spindle 20
 bearing 6204
 ch = 30



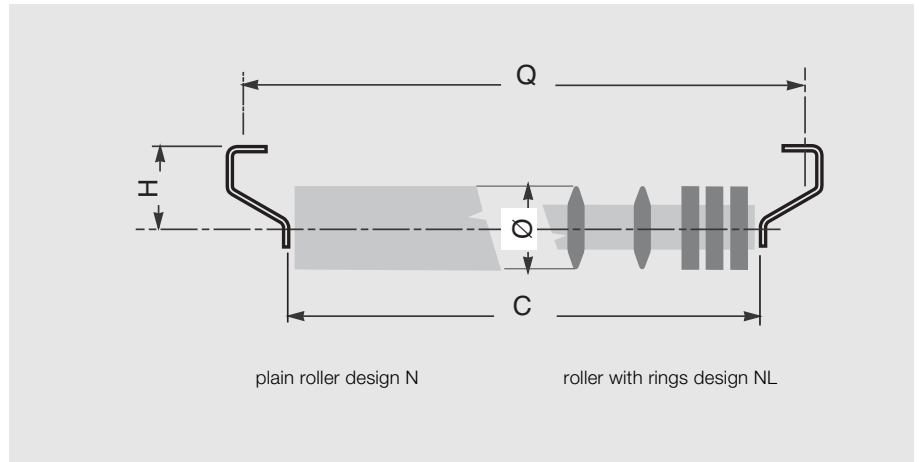
**Support bracket
SPT 243**

belt width mm	roller		ch	H mm	Q	Weight of two brackets without rollers Kg
	Ø mm	C				
300	90-110-140	388	30	70	520	1.0
400		508		70	640	1.0
500		608		70	740	1.0
650		758		70	890	1.0
800		958		70	1090	1.0
1000		1158		70	1290	1.0
1200		1408		70	1540	1.0

Example of ordering
 support bracket SPT 243,
 F30,Z

support brackets SPT 1495

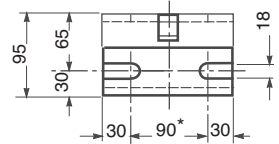
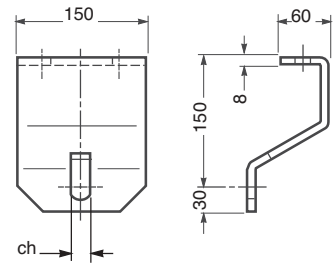
For heavy return set flat roller, plain or with rings



for rollers series:

PSV 2
 ø 108,133,159
 spindle 25
 bearing 6205
 ch = 18

PSV 4
 ø 108,133,159
 spindle 30
 bearing 6206
 ch = 22



**Support bracket
SPT 1495**
 ★ = bolt centres advised
 100 mm

belt width mm	roller		ch	H mm	Q	Weight of two brackets without rollers Kg
	Ø mm	C				
500	108-133-159-180	608	18-22	150	740	4.6
650		758		150	890	4.6
800		958		150	1090	4.6
1000		1158		150	1290	4.6
1200		1408		150	1540	4.6
1400		1608		150	1740	4.6
1600		1808		150	1940	4.6
1800		2008		150	2140	4.6
2000		2208		150	2340	4.6

Example of ordering
 support bracket SPT 1495,
 F18,YB

3 Troughing sets



3.4 - Self-centralising troughing sets

Sometimes the difficult working conditions of the plant results in a lateral movement of the belt. In this case a self-centralising troughing set is used which acts in a way that corrects the belt tracking and maintains it constantly in the central position.

The self-centralising troughing set is designed as a series of rollers arranged in a trough positioned onto the supporting transom which itself is fixed to a slewing ring Fig. 5 which permits rotation.

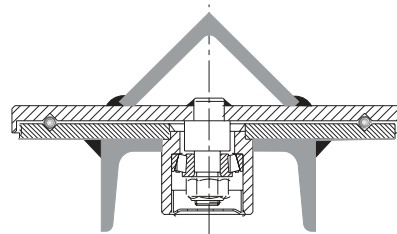


Fig. 5

The slewing ring (a large ball bearing) permits a rotation limited to 5-8 degrees and is sized in proportion to the vertical loading; a tapered roller bearing assembled to the shaft of the slewing ring, absorbs any side forces or overturning pressures.

The installation of the self-centralising troughing sets is advised to be positioned on the upper strand rather than the return section, and used only when the working conditions require.

Self - centralising troughing set for loaded strand of belt

The self-centralising troughing sets are designed and manufactured in a way that allows them to be entirely interchangeable with the normal transom.

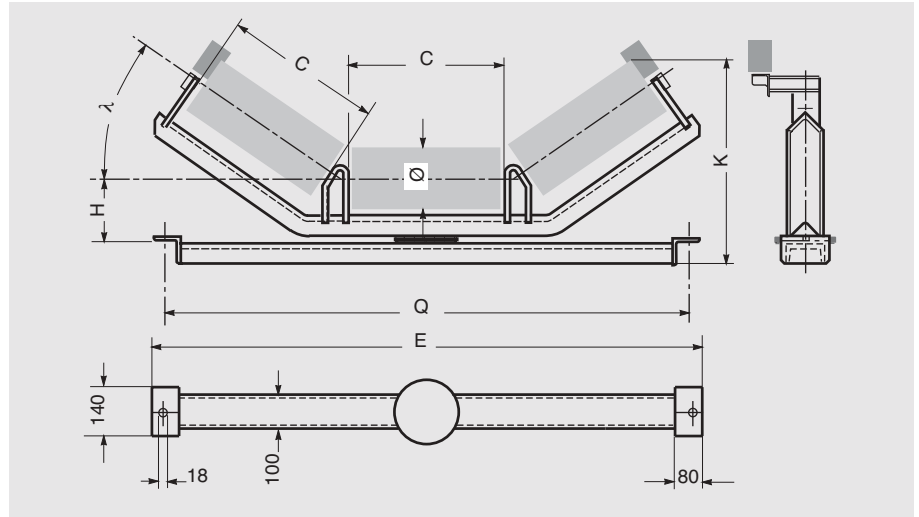
Normally it is a good standard to install them at an approximate distance of 15 metre from the pulley and at a pitch of about 30 m.

It is not advised to use self-centralising troughing sets on very short conveyors.

The self-centralising troughing sets are designed in 3 different versions : model S, with rigid arm; model F, with pivoting arm with brake; model R, with centralised pivoting arm with brake, for reversible belts.

self-centralising transom Model S

(without brake for unidirectional belt)

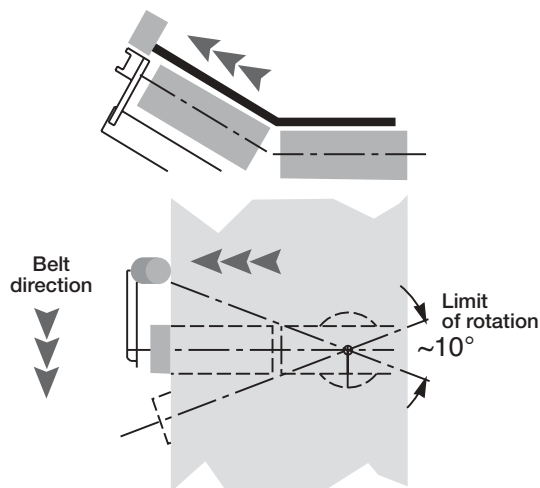


Characteristics and dimensions are similar to the corresponding fixed carrying transom

Series fixed transom	A3L	A3M	A3P	A3S
Series self-centralising transom	P3L-S	P3M-S	P3P-S	P3S-S



Carrying rollers and guide rollers type PS G7 20M16 60N 100 have to be ordered separately.



Method of operation Model S

The system is very simple comprising a rigid lever arm, on which is positioned a belt guide roller.

The pressure exerted by the edge of the belt when tracking off, acts against the offset guide roller which in turn rotates the

transom by an angle that encourages the belt to return centrally.

This model is used on small or medium unidirectional belts, where the tendency to track off is not excessive.

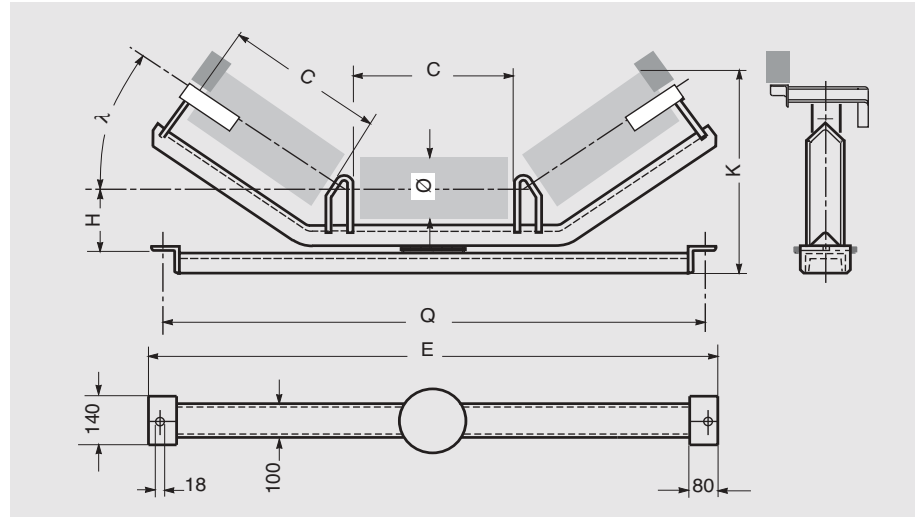


3 Troughing sets

self-centrising transom

Model F

(with brake for unidirectional belt)

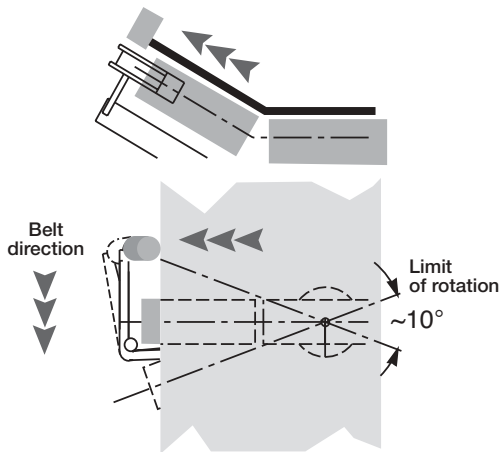


Characteristics and dimensions are similar to the corresponding fixed carrying transom

Series fixed transom	A3L	A3M	A3P	A3S
Series self-centrising transom	P3L-F	P3M-F	P3P-F	P3S-F



Carrying rollers and guide rollers type PS G7 20M16 60N 100 have to be ordered separately.



Method of operation Model F

In this design the lever arm pivots, transmitting a force produced by the belt onto the offset guide roller which in turn causes a brake to be applied to the side support roller.

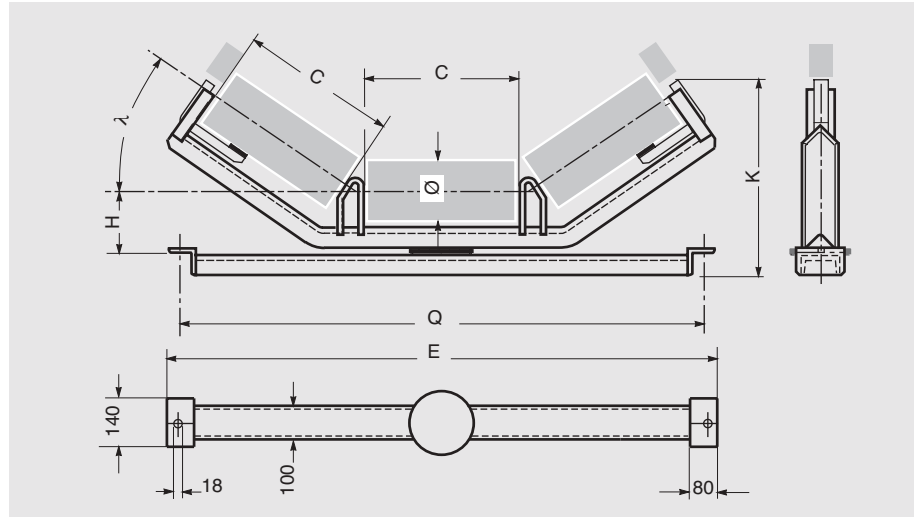
This braking action together with the side belt force itself on the lever arm (as with model S) generates a force that rotates the

transom and encourages the belt to return centrally.

Model F with brake, is normally used on very long uni-directional belts, where large material lumps and side or very irregular loading is experienced leading to a big centralising problem.

self-centrising transom Model R

(with brake for reversible belt)

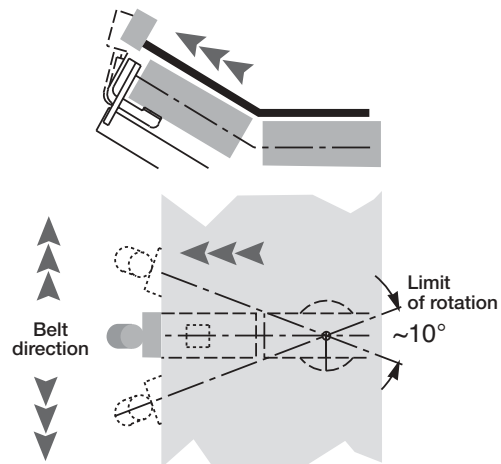


Characteristics and dimensions are similar to the corresponding fixed carrying transom

Series fixed transom	A3L	A3M	A3P	A3S
Series self-centrising transom	P3L-R	P3M-R	P3P-R	P3S-R



Carrying rollers and guide rollers type PS G7 20S18 60N 100 have to be ordered separately.



Method of operation Model R

In reversible conveyors a double action is needed to suit either belt direction. Model R acts on the same principle of braking as model F, but in this design the lever arm is on the same centre line as the rollers.

The action of the braking effect is to rotate the transom, encouraging the belt to the centre. Thanks to the centralised arrangement the system functions in either direction of belt movement.



3 Troughing sets

Series P3L *

codes	belt width mm	roller Ø mm	C mm	ch mm	transom					weight without rollers kg
					capacity Kg	H mm	K _{max} mm	Q mm	E mm	
P3L*/1A	400	76 - 89 - 90 102 - 108 - 110	168	17 - 30	286	125	334	640	700	20.7
P3L*/01	500		208		247	125	354	740	800	22.1
P3L*/02	650		258		205	125	379	890	950	24.3
P3L*/03	800		323		167	125	411	1090	1150	27.1

Series P3M *

codes	belt width mm	roller Ø mm	C mm	ch mm	transom					weight without rollers kg
					capacity Kg	H mm	K _{max} mm	Q mm	E mm	
P3M*/20	500	89 - 90 - 108 - 110	208	14 - 30	247	135	292	740	800	23.5
P3M*/21	650		258		354	135	317	890	950	25.9
P3M*/22	800		323		460	140	354	1090	1150	31.5
P3M*/24	1000		388		388	140	386	1290	1350	35.1
P3M*/26	1200		473		325	140	427	1540	1600	39.6
P3M*/2A	500	133 - 140	208	14 - 30	247	155	327	740	800	24.8
P3M*/2B	650		258		354	155	352	890	950	27.2
P3M*/23	800		323		460	160	390	1090	1150	32.7
P3M*/25	1000		388		388	160	422	1290	1350	36.3
P3M*/27	1200		473		325	160	465	1540	1600	40.8

*** = insert the transom model: S=with rigid arm, F=with pivoting arm with brake, R=reversible**

At order time please specify the height H, related to the corresponding upper transom selected.

Carrying rollers and guide rollers (PS G7 20M16 60N 100 for model F and S, PS G7 20S18 60N 100 for model R) have to be ordered separately.

Example of ordering:

P3LF/03, 800, F17, 76
 P3LS/02,650,F17,89,YA
 P3LR/01, 500,F30,110,YA
 P3MF/25, 1000, F30, H160, 140 YB
 P3MS/24,1000, F14, H140, 108, YB
 P3MR/21, 650, F14, H135, 89

Series P3P *

codes	belt width mm	roller Ø mm	C mm	ch mm	transom		K _{max} mm	Q mm	E mm	weight without rollers kg									
					capacity Kg	H mm													
P3P*/50	800	89 - 108- 133	323	14 - 18 - 22	460	133	460	1090	1150	33.9									
						140													
						153													
						160													
						160													
P3P*/52	1000		388	18 - 22	581	133	499	1290	1350	40.7									
						140													
						153													
P3P*/54	1200		473	18 - 22	487	160	573	1540	1600	45.8									
						168													
P3P*/56	1400	538	18 - 22	561	160	582	1740	1800	52.2										
					168														
P3P*/58	1600	608	18 - 22	503	176	597	1940	2000	56.7										
					176														
P3P*/51	800	159	323	18 - 22	460	173	491	1090	1150	34.4									
						180													
						P3P*/53					1000	388	18 - 22	581	173	530	1290	1350	41.2
															180				
						P3P*/55					1200	473	18 - 22	487	188	573	1540	1600	46.2
															180				
P3P*/57	1400	538	18 - 22	561	180	613	1740	1800	52.7										
					188														
P3P*/59	1600	608	18 - 22	503	196	628	1940	2000	57.2										
					188														
P3P*/5Y	1800	678	18 - 22	667	196	710	2190	2290	94.0										
					203														

* = insert the transom model: **S**=with rigid arm, **F**=with pivoting arm with brake, **R**=reversible

At order time please specify the height H, related to the corresponding upper transom selected.

Carrying rollers and guide rollers (PS G7 20M16 60N 100 for model F and S , PS G7 20S18 60N 100 for model R) have to be ordered separately.

Example of ordering:

P3PF/56,1400, F18, H168, 89, Z

P3PS/54, 1200, F18, H160, 133

P3PR/52,1000, F14, H140, 108, YB



Series P3S *

3 Troughing sets

codes	belt width mm	roller Ø mm	C mm	ch mm	transom					weight without rollers kg
					capacity Kg	H mm	K _{max} mm	Q mm	E mm	
P3S*/70	800	133	323	18 - 22	460	155 163	484	1090	1150	33.2
P3S*/72	1000		388		581	155 163 170	537	1290	1350	41.9
P3S*/74	1200		473		634	155 163 170 178	586	1540	1600	47.3
P3S*/76	1400		538		710	170 178	630	1740	1800	58.5
P3S*/78	1600		608		637	185	670	1940	2000	63.7
P3S*/71	800	159	323	18 - 22	460	176 183	517	1090	1150	34.8
P3S*/73	1000		388		581	183 190	570	1290	1350	43.5
P3S*/75	1200		473		634	183 190 198	619	1540	1600	48.9
P3S*/77	1400		538		710	190 198 205	663	1740	1800	60.0
P3S*/79	1600		159 194		608	637	190 198 205 265 273	703	1940	2000
P3S*/8S	1800	133 159 194	678	18 - 22 - 32	667	178 185 198 205 265 273	849	2190	2290	104.0
P3S*/8W	2000	159 - 194	758		909	210 225 277 290	912	2420	2520	126.6
P3S*/90	2200		808		840	210 225 277 290	641	2620	2720	133.1

* = insert the transom model: S=with rigid arm, F=with pivoting arm with brake, R=reversible.

At order time please specify the height H, related to the corresponding upper transom selected.

Carrying rollers and guide rollers (PS G7 20M16 60N 100 for model F and S , PS G7 20S18 60N 100 for model R) have to be ordered separately.

Example of ordering:

P3SF/79, 1600, F32, H190, 133, YC

P3SS/77, 1400, F22, H205, 159, Z

P3SR/75, 1200, F22, H198, 159,Z



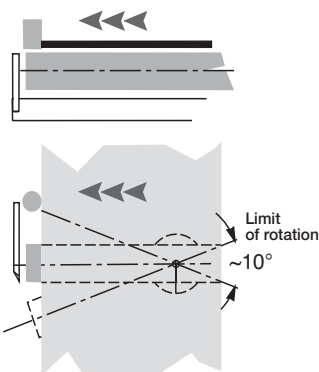
Self-centrizing troughing sets for return belt

Sometimes even on the return section it is necessary to correct the tracking of the movement of the belt.

As with the upper section, the return section self-centrizing troughing set exerts a corrective action on the belt.

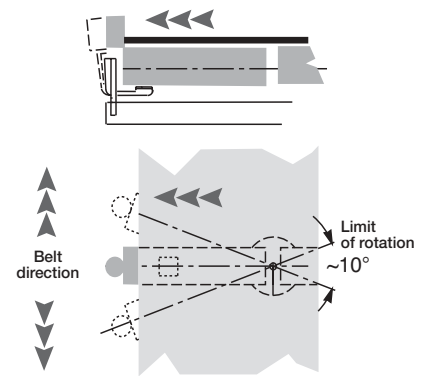
The method of function is similar to that of the upper self-centrizing troughing set.

Model S



Model S
 Standard version for uni-directional conveyor belt with single roller and fixed lever arm with offset guide roller.
 Guide rollers type PS G7 20M16 60N 100 to be ordered separately

Model R



Model R
 Special version used on reversible belt, using two rollers and pivoting lever arms with the brake and guide roller located in line. Guide rollers type PS G7 20S18 60N 100 to be ordered separately

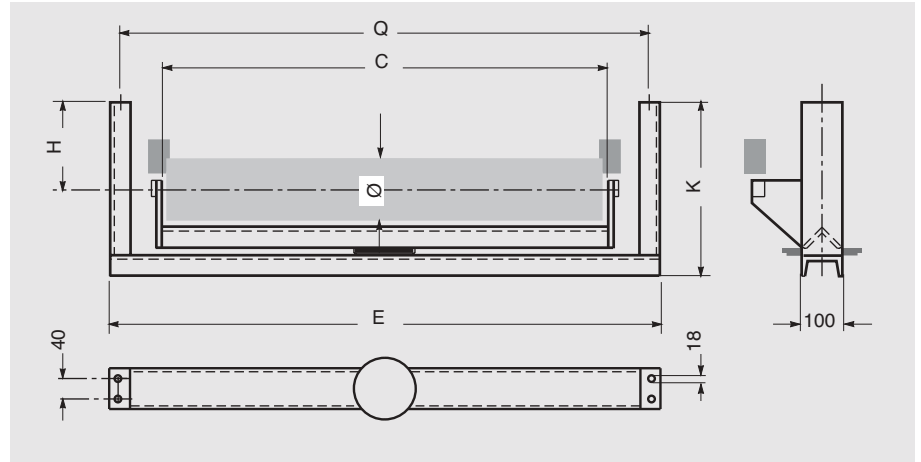


3 Troughing sets

transom self-centrising model S

Q1 L
Q1 P

return model with fixed lever-arm for uni-directional belts



Q1 L

for rollers series:

MPS

∅ 76, 89, 102
spindle 15
bearing 6202
ch = 17

PSV 1

∅ 89, 108, 133
spindle 20
bearing 6204
ch = 14

belt width mm	roller		self-centrising transom					Weight without rollers Kg	
	∅ mm	C	ch	capacity Kg	H mm	K _{max}	Q		E
400	76-89-102 108-133	508	14 - 17	175	70	259	640	700	20.8
500		608		143	70	259	740	800	22.2
650		758		197	70	267	890	950	25.9
800		958		158	70	267	1090	1150	29.1
1000		1158		209	70	275	1290	1350	34.7
1200		1408		167	70	275	1540	1600	39.2

Q1 P

for rollers series:

PSV 2

∅ 133
spindle 25
bearing 6205
ch = 18

PSV 4

∅ 159
spindle 30
bearing 6206
ch = 22

belt width mm	roller		self-centrising transom					Weight without rollers Kg	
	∅ mm	C	ch	capacity Kg	H mm	K _{max}	Q		E
800	133	958	18 - 22	158	150	367	1090	1150	32.9
1000		1158		209	150	375	1290	1350	38.6
1200		1408		167	150	375	1540	1600	43.1
1400		1608		227	150	389	1740	1800	50.5
1600		1808		202	150	389	1940	2000	54.6
800	159	958	18 - 22	158	150	387	1090	1150	34.2
1000		1158		209	150	395	1290	1350	39.9
1200		1408		167	150	395	1540	1600	44.4
1400		1608		227	150	409	1740	1800	52.0
1600		1808		202	150	409	1940	2000	55.9

Return roller and guide rollers type PS G7 20M16 60N 100 have to be ordered separately

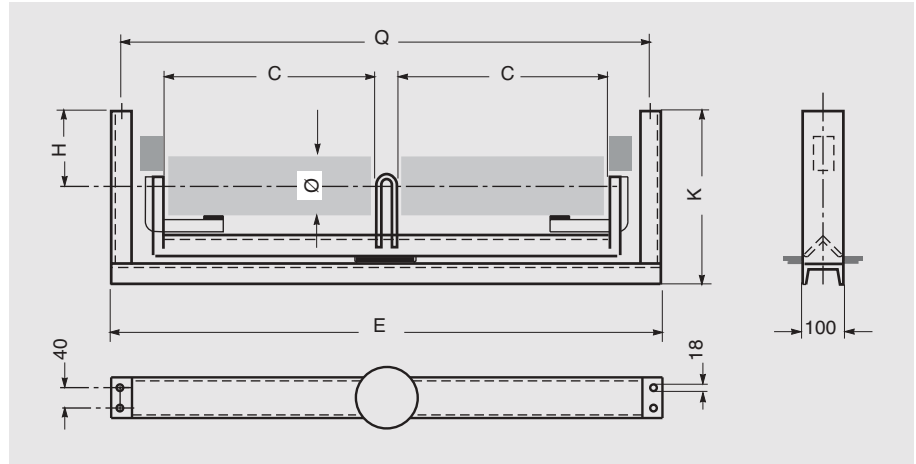
Example of ordering

Q1L, 800, F 14, 108
Q1P, 1000, F 18, 133, YA

transom
self-centralising model R

Q2 L
Q2 P

return model with fixed lever-arm and
brake for reversible belts.



Q2 L

for rollers series:

MPS

Ø 76, 89, 102
spindle 15
bearing 6202
ch = 17

PSV 1,

Ø 89, 108, 133
spindle 20
bearing 6204
ch = 14

belt width mm	roller		ch	self-centralising transom					Weight without rollers Kg
	Ø mm	C		capacity kg	H mm	K _{max}	Q	E	
400	76- 89-102 108-133	198	14 - 17	175	70	259	640	700	22.7
500		248		143	70	259	740	800	24.1
650		323		197	70	267	890	950	27.1
800		408		158	70	267	1090	1150	30.8
1000		508		209	70	275	1290	1350	36.4
1200		608		167	70	275	1540	1600	40.5

Q2 P

for rollers series:

PSV 2

Ø 133
spindle 25
bearing 6205
ch = 18

PSV 7

Ø 159, 194
asse 40
cuscinetto 6308
ch = 32

belt width mm	roller		ch	self-centralising transom					Weight without rollers Kg
	Ø mm	C		capacity kg	H mm	K _{max}	Q	E	
800	133	408	18 - 22	158	150	367	1090	1150	33.2
1000		508		209	150	375	1290	1350	38.8
1200		608		167	150	375	1540	1600	43.0
1400		708		296	150	389	1740	1800	52.3
1600		808		262	150	389	1940	2000	56.6

PSV 4

Ø 159
spindle 30
bearing 6206
ch = 22

800	159	408	18 - 22 - 32	158	150	387	1090	1150	34.3
1000		508		209	150	395	1290	1350	39.9
1200		608		167	150	395	1540	1600	44.1
1400		708		296	150	409	1740	1800	53.4
1600		808		262	150	409	1940	2000	57.7
1800	159-194	1008		351	175	473	2190	2290	87.5
2000		1108		318	175	473	2420	2520	94.2
2200		1258		440	175	490	2620	2720	117.1

Return roller and guide rollers type PS G7 20S18 60N 100 have to be ordered separately

Example of ordering

Q2L, 1000, F 14, 133, YA
Q2P, 1200, F 18, 159, YB



3 Troughing sets







3 Troughing sets



3.5 - Cantilevered sets

The development of this troughing set is the result of long practical experience in the field.

The two rollers that comprise the set are assembled onto a single shaft of 15 mm diameter, and their external end caps hermetically sealed. Together with the central support the unitary assembly is extremely strong.

Cantilevered sets are available with rollers from series RTL and MPS and their use is applicable to light or medium load capacity belt conveyors with small material piece size.

The support positions the two rollers in a manner that minimises the gap between them, without affecting their free rotation.

In this manner the belt is perfectly supported and no damage results even to a flexible belt due to the proximity of the two support rollers.

The cantilevered sets may be located by their support fixing with screws or onto an appropriate base plate part number SPT 1316.

The support brackets of the set have been designed with longitudinal “fixing” slots to allow for perfect belt alignment.



**cantilever
sets
GRS**



Type	roller		belt width mm	B mm	H	S	e	weight Kg
	series	Ø mm						
GRS 1	MPS	60N	300	195	152	370	48	3.1
2			400	245	171	464	48	3.9
3			450	275	182	520	53	4.0
4			500	305	193	576	58	4.4
5			600	355	211	668	58	5.0
GRS 1	MPS	76N	300	195	160	364	46	3.6
2			400	245	179	458	46	4.3
3			450	275	190	514	51	4.7
4			500	305	201	570	56	5.1
5			600	355	219	662	56	5.8

The table indicates the dimensions and the type of cantilever sets for various belt widths.
The maximum load capacity is calculated based on a life of 10,000 hours in relation to a belt speed of 1+2 m/s.

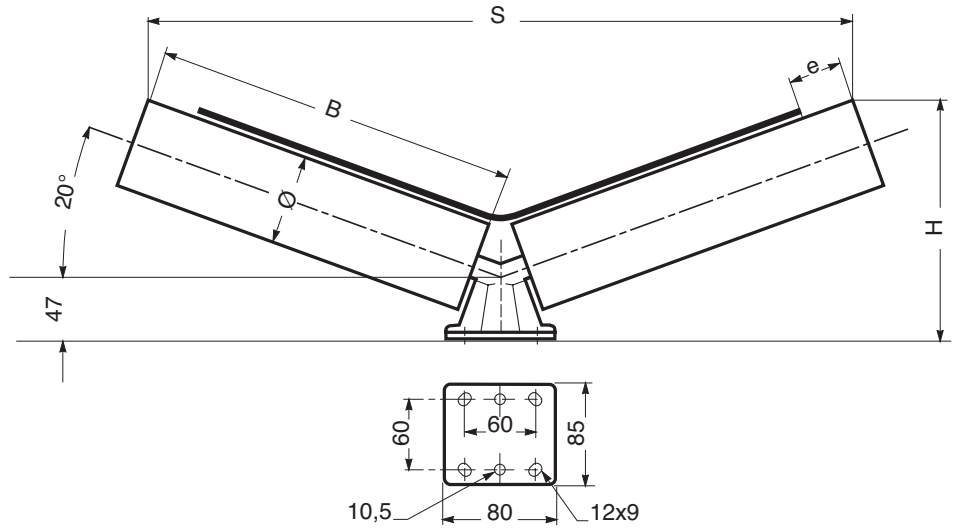
max load capacity with rollers series MPS 95 Kg



Example of ordering
GRS 4, 76N, 500
Base plate SPT 1316



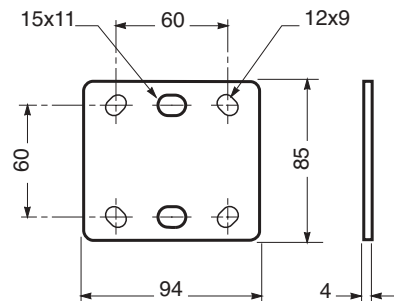
3 Troughing sets



Type	roller series	Ø mm	belt width mm					Weight Kg	
				B mm	H	S	e		
GRS 21	RTL	60N	300	195	152	370	48	2.8	
			22	400	245	171	464	48	3.8
			23	450	275	182	520	53	3.1
			24	500	305	193	576	58	3.2
			25	600	355	211	668	58	4.4
GRS 21	RTL	76N	300	195	160	364	46	3.1	
			22	400	245	179	458	46	3.4
			23	450	275	190	514	51	3.5
			24	500	305	201	570	56	3.7
			25	600	355	219	662	56	4.0

The table indicates the dimensions and the type of cantilever sets for various belt widths.
The maximum load capacity is calculated based on a life of 10,000 hours in relation to a belt speed of 1+2 m/s.

max load capacity with rollers series RTL 75 Kg



Base plate type SPT 1316
To be welded to structure to allow bolting the cantilever set to it.

Example of ordering
GRS 23, 76J, 450
Piastra base SPT 1316





3 Troughing sets



3.6 - Suspended sets

Increased activities of the bulk handling industry world wide necessitate conveying even greater quantities of bulk and large lump materials. This demand has accelerated the development of realistic solutions for belt conveyor that couple robust strength with working flexibility, resulting in even higher belt speeds.

In particular, research into solutions for the most critical area of the conveyor, that of the loading zone, has resulted in the RULMECA development of the suspended "garland" troughing sets.

These suspended sets are quickly and simply installed, and allow maintenance to be performed on them without shutting down the plant.

For these reasons, the "garland" suspended system has been the subject of substantial research and development, resulting in their increasing use in the most diverse applications.





3 Troughing sets

3.6.1 - Characteristics and advantages

The “garland” consists of a series of load carrying rollers, attached together by chain links.

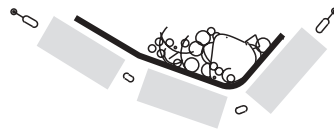
This arrangement gives to the troughing set the characteristics of mobility and flexibility resulting in a perfect central belt trough.

The “garland” is suspended from rigid supports or occasionally spring loaded which adds further flexibility to the structure.

The principal advantage obtained using these types of suspended sets, is their possibility to “flex”, in the direction of the conveyor or indeed in a transverse sense.

This movement helps to dissipate some of the kinetic energy derived from the friction contained in the conveyed material itself.

In this way forces and stresses are absorbed and limited with the consequent reduction in damage to the belt and to the rollers themselves.



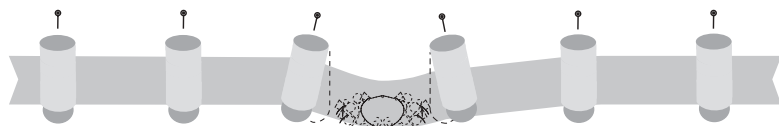
With respect to other lighter types of suspended sets (made from steel cable rotating in only two bearings), the RULMECA “garland” troughing set has spindles with two bearings in each roller (therefore up to

10 bearings for a set of 5 rollers) which combines to give constructive strength with the easiest fluency of rotation.



In comparison with the fixed troughing sets the “garland” systems have other notable superior features to recommend them :

- Improved absorption of dynamic stresses, above all, in the case of conveying large lump size material, which in turn results in a longer life for the rubber belt and the rollers.
- Improved belt centralising, in that any tracking off is absorbed by the articulation of the suspended set which realigns the belt.
- Improved load containment towards the centre of the belt.
- Improved load capacity, given the same belt width, due to the great increase in obtainable loading without material spillage.
- Maximum working speeds are higher
- Less maintenance down time
- Lower structural conveyor weight and installation costs.



3.6.2 - Applications and configurations

The suspended “garland” systems are particularly suitable for the high speed conveying of large lump size material or very sharp or angular material, and to absorb loading from excessive heights.

In these cases, the characteristic of flexibility of the suspended troughing set avoids over dimensioning that is necessary in the cases where a fixed troughing set of traditional design would be employed.

The Rulmeca suspended set utilises, as standard, rollers from the series PSV, PL and PLF, whose characteristics have previously been described in the respective chapters.

The “garland” may comprise 2, 3 or 5 plain rollers for the load carrying sets Fig. 6 ; a pair of plain rollers or with rings, for the return sets Fig. 7 ; and from 3,5 (or more as required) rollers with shock absorbing rings for the impact troughing sets Fig. 8.

In the latter case, if the average weight of material lump or the fall height is not excessive, it is possible to use plain rollers without shock absorbing rings.

“Garland” with 5 rollers in the loading zone
The major forces on the rollers and belt occur, as has been noted, in the loading zone.



It is here that the suspended system clearly exhibits its advantages over the fixed system. Studying the dynamic forces involved in this section one is able to demonstrate that, thanks to the ability to absorb impact, a system of 5 rollers as a “garland”

increases the load capacity 2 or 4 times with respect to traditional fixed troughing sets.

Other configurations as required may be taken into consideration on request.

Fig. 6 - Suspended set for carrying belt

Fig. 7 - Suspended set for return belt

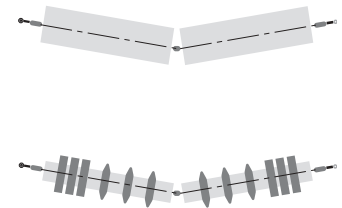
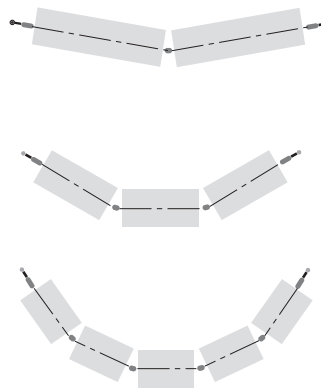


Fig. 8 - Suspended set for impact troughing set with three or five plain rollers or with shock absorbing rings








3 Troughing sets



3.6.3 - Programme

Garland type	Arrangements	description
GS 2		for upper and return set with two rollers
GS 3		for upper and impact set with three rollers
GS 5		for upper and impact set with five rollers
Suspension brackets and connections		for upper and return sets



3 Troughing sets "garland" series GS2



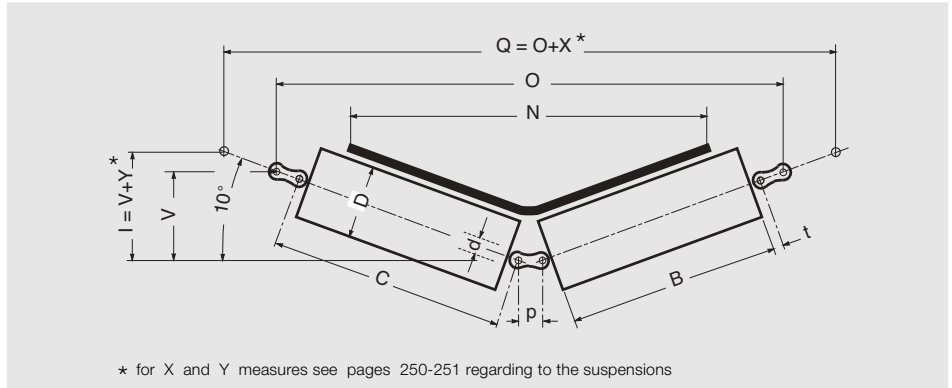
The diameters and types of rollers in the table are those advised for suspended sets with two rollers, for different widths of belt. The diameter of the roller is chosen from those possible for the type of roller considered (see chapter 2 rollers) and must be suitable for the speed and load capacity of the belt (see chapter 2 para. 2.3 selection method).

Rollers that may be utilised to comprise the "garland" GS2 must be from the series : PSV, PL, PLF, and where needed, with return rings (see chapter 2, rollers with rings).

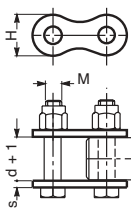
belt width mm	roller				bearing				spindle		form of suspensions
	D mm	B	C	A	type	V	O	d	p		
500	63-89 108-133	315	343	363	PSV 1	6204	64	751	20	25.40	A-C-F
		315	347	371	PSV 2	6205	66	778	25	31.75	A-C-F
		315	347	371	PSV 3	6305	66	778	25	31.75	A-C-F
650	63-89 108-133	380	408	428	PSV 1	6204	75	879	20	25.40	A-C-F
		380	412	436	PSV 2	6205	77	906	25	31.75	A-C-F
		380	412	436	PSV 3	6305	77	906	25	31.75	A-C-F
		380	420	452	PSV 4	6206	80	940	30	38.10	B-C-F
800	63-89-108 133-159	465	493	513	PSV 1	6204	90	1046	20	25.40	A-C-F
		465	497	521	PSV 2	6205	92	1073	25	31.75	A-C-F
		465	497	521	PSV 3	6305	92	1073	25	31.75	A-C-F
		465	505	537	PSV 4	6206	94	1108	30	38.10	B-C-F
1000	63-89-108 133-159	600	628	648	PSV 1	6204	113	1312	20	25.40	A-C-F
		600	632	656	PSV 2	6205	115	1339	25	31.75	A-C-F
		600	632	656	PSV 3	6305	115	1339	25	31.75	A-C-F
		600	640	672	PSV 4	6206	118	1374	30	38.10	B-C-F
1200	89-108 133-159	700	728	748	PSV 1	6204	131	1509	20	25.40	A-C-F
		700	732	756	PSV 2	6205	133	1536	25	31.75	A-C-F
		700	732	756	PSV 3	6305	133	1536	25	31.75	A-C-F
		700	740	772	PSV 4	6206	135	1571	30	38.10	B-C-F
		700	744	776	PSV 7	6308	137	1597	40	44.45	B-C-F
1400	89-108 133-159-194	800	828	848	PSV 1	6204	148	1706	20	25.40	A-C-F
		800	832	856	PSV 2	6205	150	1733	25	31.75	A-C-F
		800	832	856	PSV 3	6305	150	1733	25	31.75	A-C-F
		800	840	872	PSV 4	6206	152	1768	30	38.10	B-C-F
		800	844	876	PSV 7	6308	154	1794	40	44.45	B-C-F

Example of ordering
standard design
GS2, 1000/PSV 1, 20K, 89N, C=628

specify form and suspensions
see page 250-251 for available types)



belt width mm	roller		B	C	A	type	bearing	V	O	spindle		form of suspensions
	D mm									d	p	
1600	89-108 133-159-194		900	932	956	PSV 2	6205	167	1930	25	31.75	A-C-F
			900	932	956	PSV 3	6305	167	1930	25	31.75	A-C-F
			900	940	972	PSV 4	6206	170	1965	30	38.10	B-C-F
			900	944	976	PSV 7	6308	172	1991	40	44.45	B-C-F
1800	108-133 159-194		1000	1032	1056	PSV 2	6205	185	2127	25	31.75	A-C-F
			1000	1032	1056	PSV 3	6305	185	2127	25	31.75	A-C-F
			1000	1040	1072	PSV 4	6206	187	2162	30	38.10	B-C-F
			1000	1044	1076	PSV 7	6308	189	2188	40	44.45	B-C-F
2000	133 159-194		1100	1132	1156	PSV 2	6205	202	2324	25	31.75	A-C-F
			1100	1132	1156	PSV 3	6305	202	2324	25	31.75	A-C-F
			1100	1140	1172	PSV 4	6206	205	2359	30	38.10	B-C-F
			1100	1144	1176	PSV 7	6308	206	2385	40	44.45	B-C-F
2200	133 159-194		1250	1282	1306	PSV 3	6305	228	2619	25	31.75	A-C-F
			1250	1290	1322	PSV 5	6306	231	2654	30	38.10	B-C-F
			1250	1294	1326	PSV 7	6308	232	2681	40	44.45	B-C-F
2400	133 159-194		1400	1432	1456	PSV 3	6305	254	2915	25	31.75	A-C-F
			1400	1440	1472	PSV 5	6306	257	2949	30	38.10	B-C-F
			1400	1444	1476	PSV 7	6308	258	2976	40	44.45	B-C-F
2600	159 194		1500	1544	1576	PSV 7	6308	276	3173	40	44.45	B-C-F



d	20	25	30	40
s	3	4	5	6
H	21	24	30	36
M	8	10	14	16

Spindle design K

d	20	25	30	40
u	10	12	16	16
t	14	16	20	22
f	24	28	36	38
d ₂	8,3	10,3	14,5	16,5



3 Troughing sets "garland" series GS3



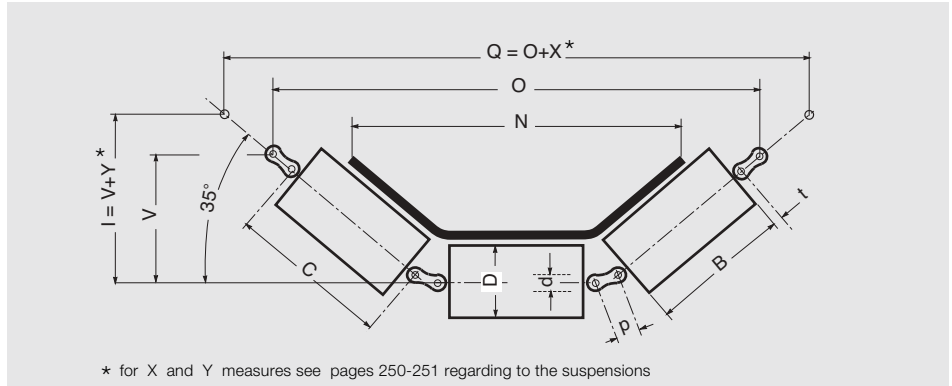
The diameters and types of rollers in the table are those advised for suspended sets with three rollers, for different widths of belt. The diameter of the roller is chosen from those possible for the type of roller considered (see chapter 2 rollers) and must be suitable for the speed and load capacity of the belt (see chapter 2 para. 2.3 selection method).

Rollers that may be utilised to comprise the "garland" GS3 must be from the series : PSV, PL, PLF, exceptionally, and only where absolutely necessary, with impact rings (see chapter 2, impact rollers).

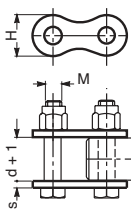
belt width mm	roller								spindle		form of suspensions
	D mm	B	C	A	type	bearing	V	O	d	p	
500	63-89 108-133	200	228	248	PSV 1	6204	153	692	20	25.40	A-C
		200	232	256	PSV 2	6205	161	725	25	31.75	A-C
		200	232	256	PSV 3	6305	161	725	25	31.75	A-C
		200	240	272	PSV 4	6206	171	768	30	38.10	B-C-E
650	63-89 108-133	250	278	298	PSV 1	6204	182	824	20	25.40	A-C
		250	282	306	PSV 2	6205	190	857	25	31.75	A-C
		250	282	306	PSV 3	6305	190	857	25	31.75	A-C
		250	290	322	PSV 4	6206	200	900	30	38.10	B-C-E
800	63-89 108-133-159	315	343	363	PSV 1	6204	219	995	20	25.40	A-C
		315	347	371	PSV 2	6205	227	1028	25	31.75	A-C
		315	347	371	PSV 3	6305	227	1028	25	31.75	A-C
		315	355	387	PSV 4	6206	237	1072	30	38.10	B-C-E
1000	63-89 108-133-159	380	408	428	PSV 1	6204	256	1166	20	25.40	A-C
		380	412	436	PSV 2	6205	264	1200	25	31.75	A-C
		380	412	436	PSV 3	6305	264	1200	25	31.75	A-C
		380	420	452	PSV 4	6206	274	1243	30	38.10	B-C-E
1200	89-108 133-159	465	493	513	PSV 1	6204	305	1391	20	25.40	A-C
		465	497	521	PSV 2	6205	313	1424	25	31.75	A-C
		465	497	521	PSV 3	6305	313	1424	25	31.75	A-C
		465	505	537	PSV 4	6206	323	1467	30	38.10	B-C-E
		465	509	541	PSV 7	6308	331	1501	40	44.45	B-C-E
1400	89-108 133-159-194	530	558	578	PSV 1	6204	342	1562	20	25.40	A-C
		530	562	586	PSV 2	6205	350	1595	25	31.75	A-C
		530	562	586	PSV 3	6305	350	1595	25	31.75	A-C
		530	570	602	PSV 4	6206	360	1639	30	38.10	B-C-E
		530	574	606	PSV 7	6308	368	1672	40	44.45	B-C-E

Example of ordering
standard design
GS3, 1200/PSV 4, 30K, 133N, C=505

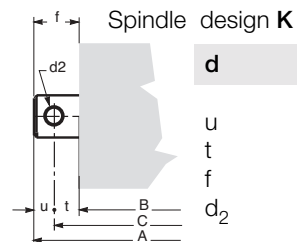
specify form and suspensions
(see page 250-251 for available types)



belt width mm	roller		B	C	A	type	bearing	V	O	spindle		form of suspensions
	D mm									d	p	
1600	89-108 133-159-194		600	632	656	PSV 2	6205	390	1780	25	31.75	A-C
			600	632	656	PSV 3	6305	390	1780	25	31.75	A-C
			600	640	672	PSV 4	6206	400	1824	30	38.10	B-C-E
			600	644	676	PSV 7	6308	408	1857	40	44.45	B-C-E
1800	108-133 159-194		670	702	726	PSV 2	6205	430	1965	25	31.75	A-C
			670	702	726	PSV 3	6305	430	1965	25	31.75	A-C
			670	710	742	PSV 4	6206	441	2008	30	38.10	B-C-E
			670	710	742	PSV 5	6306	441	2008	30	38.10	B-C-E
			670	714	746	PSV 7	6308	448	2041	40	44.45	B-C-E
2000	133 159-194		750	790	822	PSV 4	6206	486	2219	30	38.10	B-C-E
			750	790	822	PSV 5	6306	486	2219	30	38.10	B-C-E
			750	794	826	PSV 7	6308	494	2252	40	44.45	B-C-E
2200	133 159-194		800	840	872	PSV 4	6206	515	2351	30	38.10	B-C-E
			800	840	872	PSV 5	6306	515	2351	30	38.10	B-C-E
			800	844	876	PSV 7	6308	523	2384	40	44.45	B-C-E
2400	133 159-194		900	940	972	PSV 4	6206	572	2615	30	38.10	B-C-E
			900	940	972	PSV 5	6306	572	2615	30	38.10	B-C-E
			900	944	976	PSV 7	6308	580	2648	40	44.45	B-C-E
2600	159 194		950	994	1026	PSV 7	6308	609	2780	40	44.45	B-C-E



d	20	25	30	40
s	3	4	5	6
H	21	24	30	36
M	8	10	14	16



d	20	25	30	40
u	10	12	16	16
t	14	16	20	22
f	24	28	36	38
d ₂	8,3	10,3	14,5	16,5



3 Troughing sets "garland" series GS5



The diameters and types of rollers in the table are those advised for suspended sets with five rollers, for different widths of belt. The diameter of the roller is chosen from those possible for the type of roller considered (see chapter 2 rollers) and must be suitable for the speed and load capacity of the belt (see chapter 2 para. 2.3 selection method).

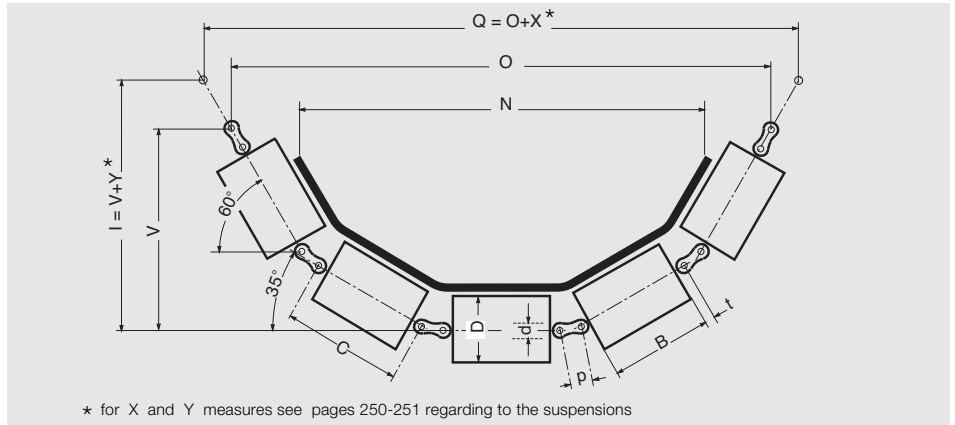
Rollers that may be utilised to comprise the "garland" GS5 must be from the series : PSV, PL, PLF, exceptionally, and only where absolutely necessary, with impact rings (see chapter 2, impact rollers).

belt width mm	roller				bearing				spindle		form of suspensions
	D mm	B	C	A	type	V	O	d	p		
800	89 108-133	165	193	213	PSV 1	6204	326	810	20	25.40	A-C
		165	197	221	PSV 2	6205	344	852	25	31.75	A-C
		165	197	221	PSV 3	6305	344	852	25	31.75	A-C
		165	205	237	PSV 4	6206	368	908	30	38.10	B-C-E
1000	89 108-133	205	233	253	PSV 1	6204	384	956	20	25.40	A-C
		205	237	261	PSV 2	6205	402	997	25	31.75	A-C
		205	237	261	PSV 3	6305	402	997	25	31.75	A-C
		205	245	277	PSV 4	6206	425	1054	30	38.10	B-C-E
1200	89-108 133-159	250	278	298	PSV 1	6204	449	1120	20	25.40	A-C
		250	282	306	PSV 2	6205	466	1161	25	31.75	A-C
		250	282	306	PSV 3	6305	466	1161	25	31.75	A-C
		250	290	322	PSV 4	6206	490	1217	30	38.10	B-C-E
		250	294	326	PSV 7	6308	508	1259	40	44.45	B-C-E
1400	89-108 133-159-194	290	318	338	PSV 1	6204	506	1265	20	25.40	A-C
		290	322	346	PSV 2	6205	524	1307	25	31.75	A-C
		290	322	346	PSV 3	6305	524	1307	25	31.75	A-C
		290	330	362	PSV 4	6206	548	1363	30	38.10	B-C-E
		290	334	366	PSV 7	6308	565	1404	40	44.45	B-C-E
1600	89-108 133-159-194	340	372	396	PSV 2	6205	596	1489	25	31.75	A-C
		340	372	396	PSV 3	6305	596	1489	25	31.75	A-C
		340	380	412	PSV 4	6206	620	1545	30	38.10	B-C-E
		340	384	416	PSV 7	6308	637	1586	40	44.45	B-C-E

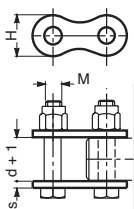
Example of ordering

standard design
GS5, 1600/PSV 7, 40K, 159N,C=384

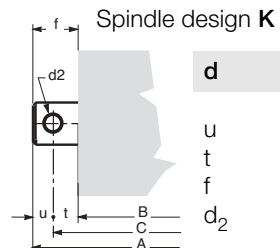
specify form and suspensions
(see page 250-251 for available types)



belt width mm	roller		B	C	A	type	bearing	V	O	spindle		form of suspensions
	D	mm								d	p	
1800	108-133	159-194	380	412	436	PSV 2	6205	654	1634	25	31.75	A-C
			380	412	436	PSV 3	6305	654	1634	25	31.75	A-C
			380	420	452	PSV 4	6206	677	1690	30	38.10	B-C-E
			380	420	452	PSV 5	6306	677	1690	30	38.10	B-C-E
			380	424	456	PSV 7	6308	695	1732	40	44.45	B-C-E
2000	133	159-194	420	460	492	PSV 4	6206	735	1836	30	38.10	B-C-E
			420	460	492	PSV 5	6306	735	1836	30	38.10	B-C-E
			420	464	496	PSV 7	6308	753	1877	40	44.45	B-C-E
2200	133	159-194	460	500	532	PSV 4	6206	792	1981	30	38.10	B-C-E
			460	500	532	PSV 5	6306	792	1981	30	38.10	B-C-E
			460	504	536	PSV 7	6308	810	2023	40	44.45	B-C-E
2400	133	159-194	500	540	572	PSV 4	6206	850	2127	30	38.10	B-C-E
			500	540	572	PSV 5	6306	850	2127	30	38.10	B-C-E
			500	544	576	PSV 7	6308	868	2169	40	44.45	B-C-E
2600	159	194	540	584	616	PSV 7	6308	925	2314	40	44.45	B-C-E



d	20	25	30	40
s	3	4	5	6
H	21	24	30	36
M	8	10	14	16



d	20	25	30	40
u	10	12	16	16
t	14	16	20	22
f	24	28	36	38
d ₂	8,3	10,3	14,5	16,5



3 Troughing sets suspensions for "garland"

3.6.4 - Suspensions

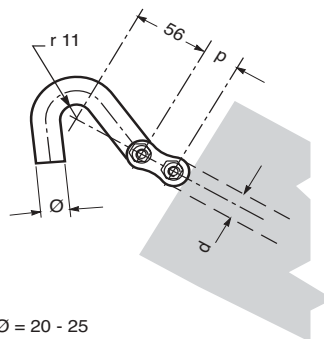
The connecting links and the suspensions are important components that assure ample movement possibilities and at the same time grant a rapid, straight forward installation and maintenance.

Different types of suspension satisfy different working conditions. The following indicate just some of the most common in use.



Form A

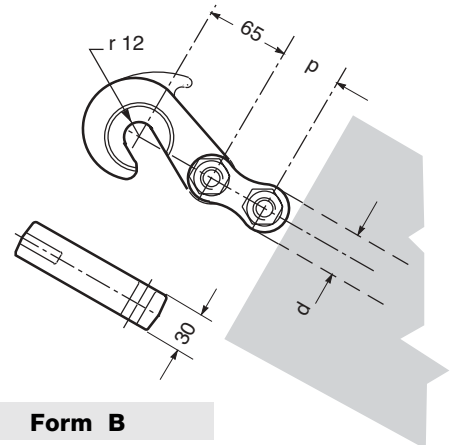
for upper and return sets with roller spindle $d = 20$ and 25 mm



$\text{Ø} = 20 - 25$

Form B

for upper and return impact sets with roller spindle $d = 30$ and 40 mm for heavy loads

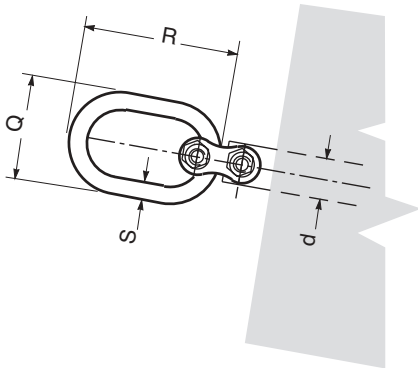


	Form A		Form B	
★	X	Y	X	Y
10°	105	19	122	22
35°	86	36	100	42
60°	56	48	65	56

★ The measures X and Y are used to determine the fixation distance Q - see GS2-GS3-GS5 garlands drawings at previous pages.

Form C

upper and return sets for light loads



d	Q	R	S
20	40	85	10
25/30	52	108	13
40	64	132	16

★	d	X	Y
10°	20	96	17
	25/30	122	22
	40	154	28
35°	20	78	33
	25/30	100	42
	40	126	53
60°	20	51	44
	25/30	65	56
	40	82	71

Important note : all types of supports that are designed to fit to the belt conveyor structure and those, in particular that hook up to the suspensions, must have an equal inclination to the side rollers angle and allow complete freedom of movement of the suspensions and of the rollers in both longitudinal and vertical senses.

Form E

This is a system for rapid "unhooking" of an upper troughing set. To be used when the conveyor cannot be stopped. This system allows sets to be removed from below the belt and allows substitution, during normal maintenance breaks.

Fig. 1 shows the application of a system using a retaining pin, in the case of an overloaded conveyor. Fig. 2 without pin.

d	S	p
30	20	38,10
40	20	44,45



★	X	Y
10°	346	63
35°	282	118
60°	184	159

★ The measures X and Y are used to determine the fixation distance Q - see GS2-GS3-GS5 garlands drawings at previous pages.

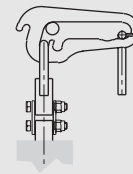


Fig. 1

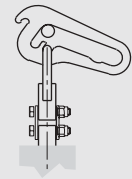
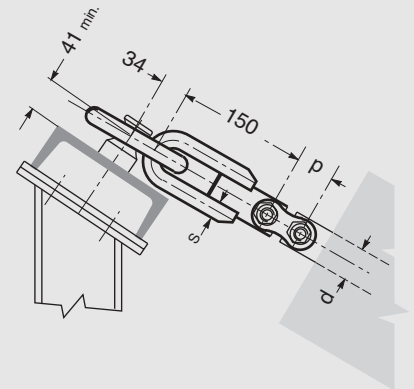
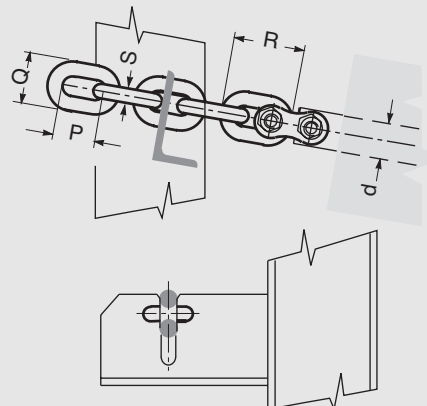


Fig. 2



Form F

To support the return belt and where it is necessary to change the angle of the rollers, the chain may be slotted into the fork as the links permit.



d	S	P	Q	R
20	10	35	34	55
25/30	13	45	44	71
40	16	56	54	88

★ Measures X and Y to be calculated according to the chain fixation point.



3 Troughing sets



4 Pulleys



4 Pulleys

Summary	4	Pulleys	page 253
4.1		Introduction	255
4.2		Dimension of pulleys	256
4.2.1		Shaft importance	257
4.3		General construction data	258
4.3.1		Types and designs	259
4.4		Order codes	260
4.5		Programme	261
4.5.1		Series USC drive with clampig units.....	262
4.5.2		Series USF idler with clampig units.....	264
4.5.3		Series CUF idler with incorporated bearings	266
4.5.4		Screw tension unit	267
4.5.5		Special pulleys	268



4.1 - Introduction

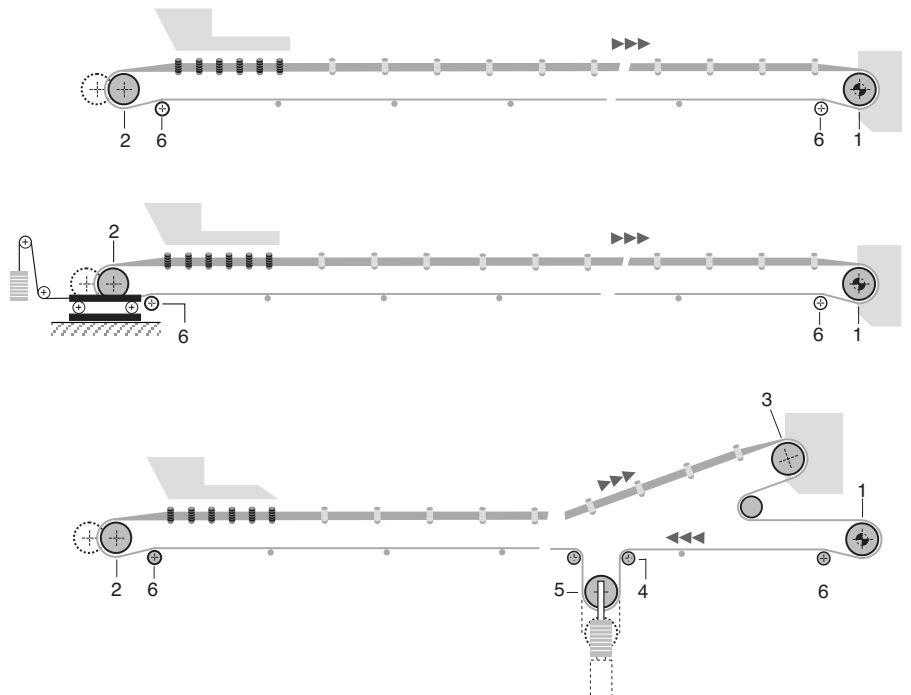
Pulleys are dimensioned according to the characteristics of each conveyor and may be designed to meet a great variety of construction methods.

For 40 years Rulmeca has designed and manufactured pulleys, using materials of the highest quality in a production process employing advanced technology. This together with the application of the Quality Assurance system certified to ISO 9001, contributes to the production of high

quality products offering dependable, long life performance in the field and appreciably reducing maintenance costs.

In the following drawings various arrangements of traditional belt conveyors are shown, with the pulleys numbered and described according to their function and position in the belt conveyor layout.

- | | |
|-------------------|-----------------------------|
| 1 - drive pulley | 4 - change direction pulley |
| 2 - return pulley | 5 - tension pulley |
| | 6 - snubbing pulley |



4 Pulleys



4.2 - Dimensioning pulleys

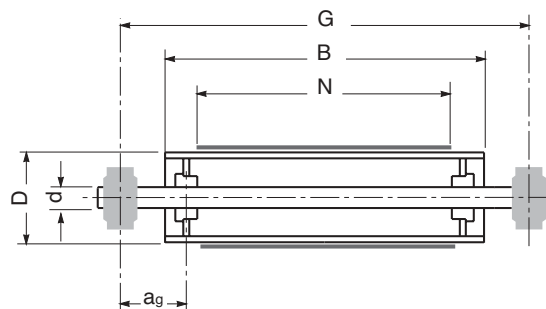
According to the position that they occupy in a belt conveyor, the pulleys must withstand the forces imposed by both belt tension and conveyed load.

To be as efficient as possible both for replacement and for new installation, proper selection of pulleys requires the following data that allows the determination of the construction characteristics and dimensions.

The principal data necessary to design a pulley comprises the following :

- belt width ;

- diameter of drum in relation to the belt type and characteristics ;
- locking arrangement of the shaft to the pulley (locking ring, key, welding);
- position of pulley (drive, return, snub etc...)
- wrap angle of belt on pulley " α ";
- belt tensions T1, T2 or T3 ;
- distance between the supports and flange of the pulley " a_g " ;
- type of lagging as required..





Limitation of deflection and rotation

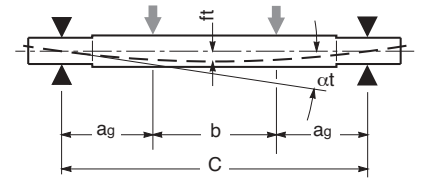
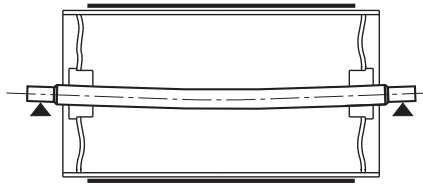
After having sized the diameter of the shaft for various pulleys, the next selection check is to verify that the deflection of the shaft does not exceed allowable values.

In particular the deflection "ft" and the angle of inclination "αt" must respect the relationship:

$$ft_{max} \leq \frac{C}{3000} \quad \alpha t \leq \frac{1}{1000}$$

4.2.1 - Shaft importance

Excessive deflection of the pulley shaft constitutes the major reason for failure of the drum structure.



$$ft = \frac{(Cpr/2)a_g}{24xExJ} [3(b+2a_g)^2 - 4a_g^2] \leq \frac{c}{3000}$$

$$\alpha t = \frac{(Cpr/2)}{2xExJ} a_g (c - a_g) \leq \frac{1}{1000}$$

The correct sizing of the shaft is therefore of the greatest importance and must take into account an extra high safety factor.

where:

ag = expressed in mm

E = modulus of elasticity of steel

(20600 [daN/mm²])

J = moment of inertia of shaft section

(0,0491 D⁴ [mm⁴])

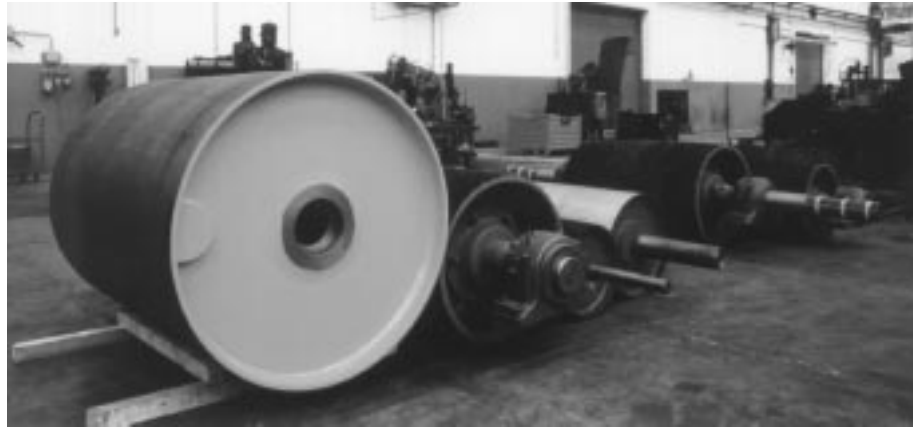
Cpr = load on shaft [daN]



Upon the request for pulleys with characteristics and dimensions different from those indicated in this catalogue it is advisable to supply a dimensioned drawing of the pulley with the required features.



4 Pulleys



4.3 -General construction data

Rulmecca pulleys have been developed using a high degree of security in the dimensioning of the flanges, in the sizing and penetration of the welding and in the assembly between the shell, flange and hub.

Pulleys may be cylindrical or machine crowned to aid belt tracking.

Shafts are normally manufactured from high strength steel bar.



All components have been normalised after machining or welding, to allow internal stresses to be eliminated and to facilitate assembly and in turn disassembly, and also to eliminate reasons for cracking or deforming under load.

Continuous wire feeds are employed during the welding process, utilising an inert gas atmosphere, which guarantees the maximum uniformity and resistance of weld.

Both the welding system and the welders themselves are certified by the Italian Institute of Welding, according to norms of ASME.



4.3.1 - Types and designs

In this catalogue numerous designs and types of pulleys are proposed, to meet the great variety of uses.

To meet the duties of the severest working conditions they may be supplied rubber lagged.

Lagging prevents belt slippage (in particular when water is present) and increases the drive traction of the pulley.



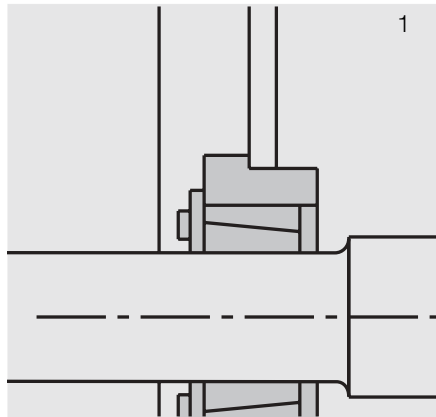
1. Series USC-USF with clamping units

Clamping units allow compression shaft locking, using a system of screws and tapered sleeves, eliminating play and eccentricity ensuring the power transmission through an adequately sized torque transmission at the hub of the pulley.

Pulleys using this method of shaft locking are the most utilised today for their strength, simplicity of construction, assembly and maintenance.

The central part of the shaft, located in the clamping units of the pulley, with its major diameter with respect to the drum equipped with a key, guarantees a major mechanical resistance and the reduction of deflection underload.

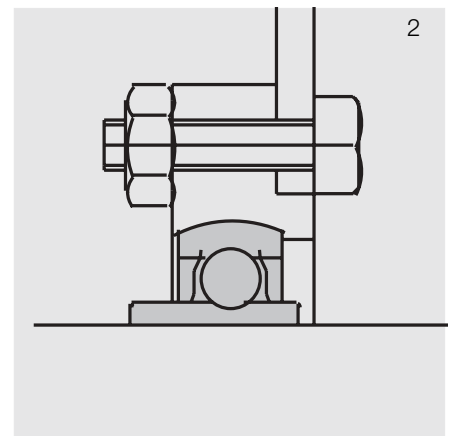
Above all disassembly by unscrewing, typical in such a bush, is always smooth and easy even in the case of dirt build-up or rusting.



2. Series CUF with incorporated bearings

Essentially a simplified construction, using radial ball bearings in a moveable housing designed into the pulley itself.

This system lends itself to be used together with the screw tensioning unit. Normally used as tail pulleys for small or medium loaded conveyors, and naturally only for idler type pulleys (not driven).

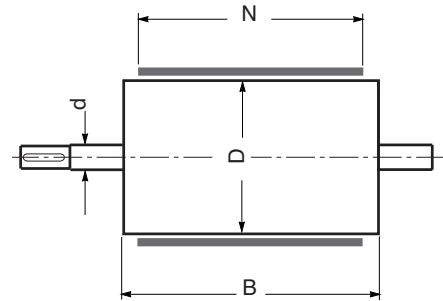


Other types of special pulleys or according to drawings can be supplied upon request as listed in page 268

4 Pulleys

4.4 - Order code

Pulleys are identified according to the following characteristics:



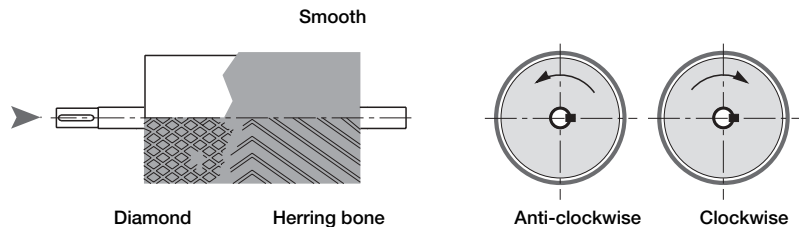
	USC	-630	-750	-40	YA	RA	12
Example:							
Pulley series							
Diameter of shell							
Length "B" of shell							
Diameter of shaft (corresponding to the bearings)							
System of end cap finish **							
Lagging *							
Thickness of lagging							

* - the lagging must be specified as : the form, the thickness and in the case of lagging cut as herringbone, the rotational sense of the pulley as seen from the drive side, as the following list :

- R - lagged in smooth rubber
- RR - lagged in rubber diamond pattern
- RA - lagged in rubber herringbone pattern, sense anti-clockwise
- RO - lagged in rubber herringbone pattern, sense clockwise

The type of standard rubber supplied for the lagging: hardness 60 or 70 Shore A, colour black, anti-abrasive.

On request it is possible to supply different hardnesses or types.



** System of pulley end cap finish

Symbol	Description of treatment
YA	painted with antirust enamel
YB	sandblasted SA 2,5 + inorganic zinc 70 micron
YC	sandblasted SA 2,5 + inorganic zinc 70 micron + chlorinated rubber 30 micron
YS	special paint finish as requested (specify)

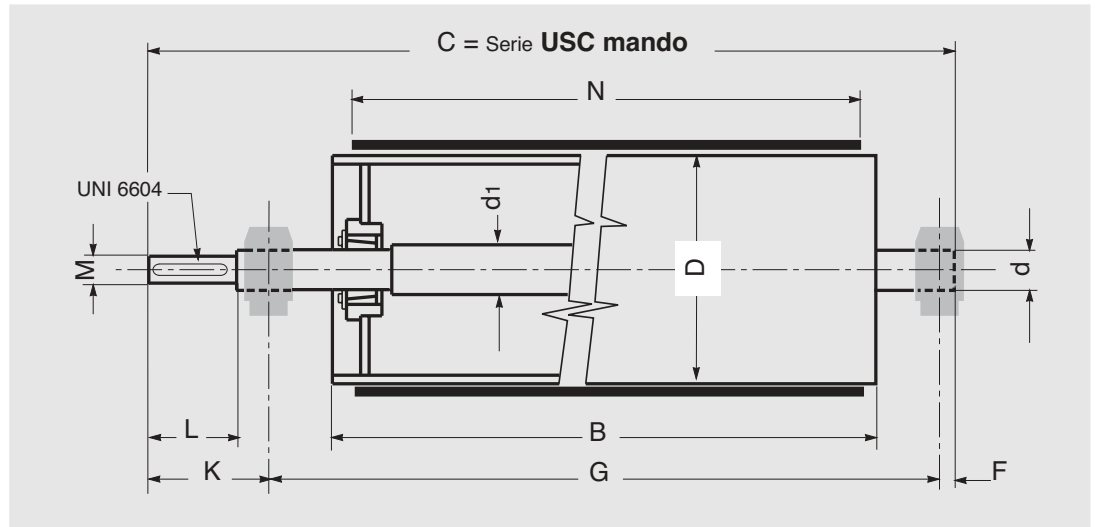
4.5 - Programme

Pulleys type	Series	Design
USC	drive pulley	with clamping units
USF	idler pulley	with clamping units
CUF	idler pulley	with incorporated bearings
TDV	screw tension unit	simple
Special PULLEY		



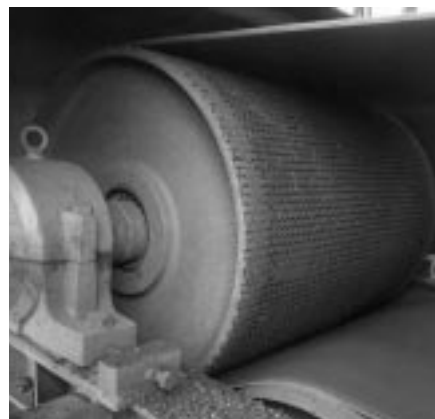
4 Pulleys

Serie USC drive with clamping units



4.5.1 - Drive pulleys with clamping units

On request pulleys may be supplied with characteristics and dimensions different from those indicated in the table or using the customer's drawing.



For the order code of execution and lagging see page 260

The weight stated on the list is referred to the complete pulley without supports which can be supplied upon request.

Pulley with dimensions according to standard NFH 95330

Example of ordering
standard design
USC, 800, 1150, 90, YB, RR,12



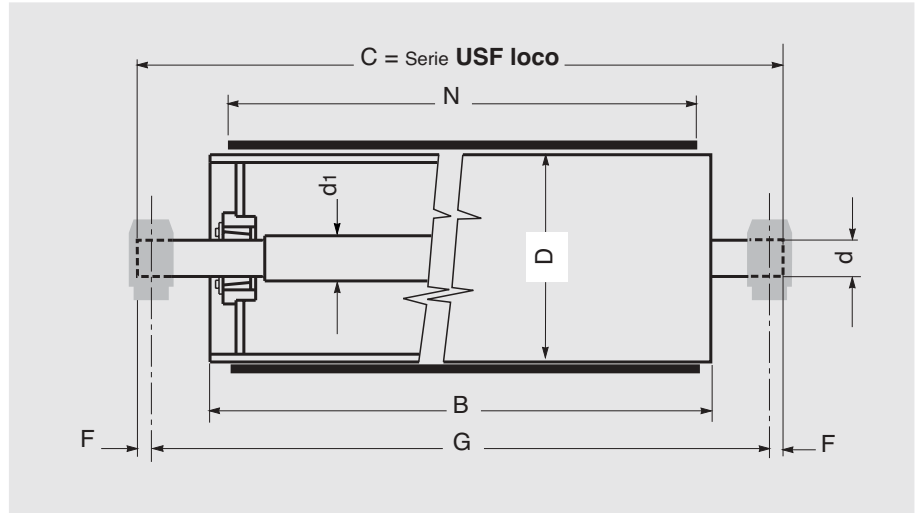
Serie USC drive pulleys with clamping units

Belt Width N mm	Pulley type	D mm	B	d	C	d1	M m6	L	K	F	G	Weight Kg
400	USC	190	500	40	830	45	38	80	145	25	660	34
		270	500	40	830	45	38	80	145	25	660	46
		320	500	40	830	45	38	80	145	25	660	52
500	USC	190	600	40	930	45	38	80	145	25	760	38
		270	600	40	930	45	38	80	145	25	760	52
		320	600	40	930	45	38	80	145	25	760	59
		400	600	50	990	55	48	110	180	30	780	94
		520	600	50	990	55	48	110	180	30	780	126
650	USC	270	750	40	1080	45	38	80	145	25	910	62
		320	750	50	1140	55	48	110	180	30	930	79
		400	750	50	1140	55	48	110	180	30	930	111
		520	750	65	1190	70	60	140	225	35	930	162
		620	750	65	1190	70	60	140	225	35	930	194
800	USC	320	950	50	1350	55	48	110	180	30	1140	95
		400	950	50	1350	55	48	110	180	30	1140	133
		520	950	65	1400	70	60	140	225	35	1140	191
		620	950	80	1450	85	70	140	235	45	1170	254
		800	950	80	1450	85	70	140	235	45	1170	417
1000	USC	400	1150	65	1600	70	60	140	225	35	1340	176
		520	1150	80	1650	85	70	140	235	45	1370	250
		620	1150	80	1650	85	70	140	235	45	1370	290
		800	1150	100	1725	105	90	170	280	55	1390	521
1200	USC	520	1400	80	1910	85	70	140	235	45	1630	307
		620	1400	80	1910	85	70	140	235	45	1630	361
		800	1400	100	1985	105	90	170	280	55	1650	659
1400	USC	620	1600	100	2185	105	90	170	280	55	1850	458
		800	1600	100	2185	105	90	170	280	55	1850	718



4 Pulleys

Serie **USF** idler with clamping units



4.5.2 - Idler pulleys with clamping units

On request pulleys may be supplied with characteristics and dimensions different from those indicated in the table or using the customer's drawing.



For the order code of execution and lagging see page 260

The weight stated on the list is referred to the complete pulley without supports which can be supplied upon request.

Pulley with dimensions according to standard NFH 95330

Example of ordering
standard design
USF, 500, 750, 70, YC, RO, 10

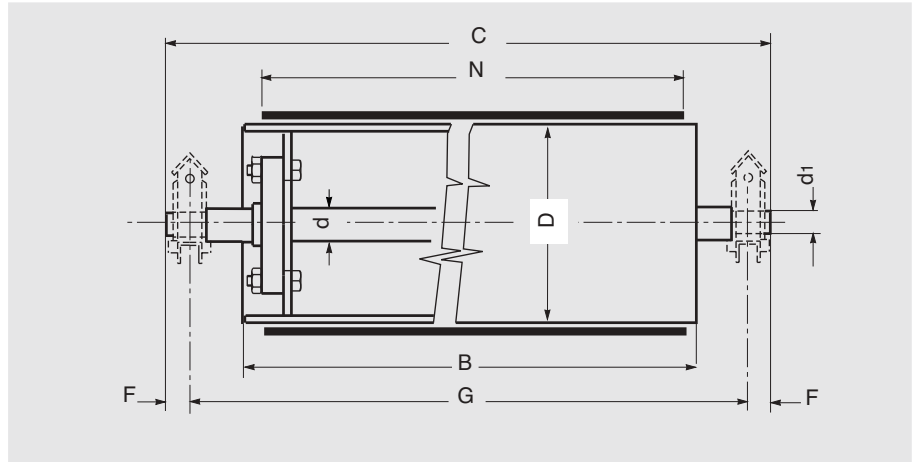


Serie USF Idler pulleys with clamping units

Belt Width N mm	Pulley type	D mm	B	d	C	d1	F	G	Weight Kg
400	USF	190	500	40	710	45	25	660	32
		270	500	40	710	45	25	660	45
		320	500	40	710	45	25	660	51
500	USF	190	600	40	810	45	25	760	37
		270	600	40	810	45	25	760	51
		320	600	40	810	45	25	760	58
		400	600	40	810	45	25	780	85
		520	600	50	840	55	30	780	124
650	USF	270	750	40	960	45	25	910	61
		320	750	40	960	45	25	910	69
		400	750	40	960	45	25	910	100
		520	750	50	990	55	30	930	144
		620	750	50	990	55	30	930	176
800	USF	320	950	40	1170	45	25	1120	83
		400	950	40	1170	45	25	1120	121
		520	950	50	1200	55	30	1140	170
		620	950	65	1210	70	35	1140	223
		800	950	65	1210	70	35	1140	387
1000	USF	400	1150	50	1400	55	30	1340	153
		520	1150	65	1410	70	35	1340	216
		620	1150	65	1410	70	35	1340	256
		800	1150	80	1460	85	45	1370	465
1200	USF	520	1400	65	1670	70	35	1600	270
		620	1400	65	1670	70	35	1600	324
		800	1400	80	1720	85	45	1630	599
1400	USF	620	1600	80	1920	85	45	1830	391
		800	1600	80	1920	85	45	1830	654

4 Pulleys

Serie CUF idler with incorporated bearings



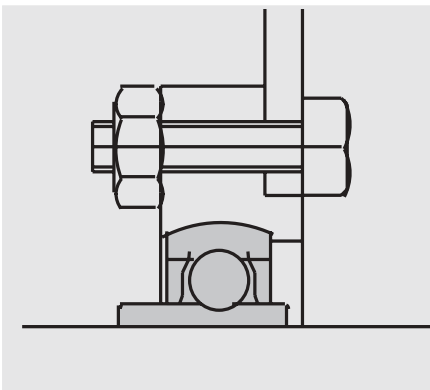
4.5.3 - idler pulleys with incorporated bearings

Essentially a simplified construction, using radial ball bearings in a moveable housing designed into the pulley itself.

This system lends itself to be used together with the screw tensioning unit. Normally used as tail pulleys for small or medium loaded conveyors, and naturally only for idler type pulleys (not driven).

This type of pulley and tension units TDV are suggested for use on belt conveyors length not up to 50 m.

2



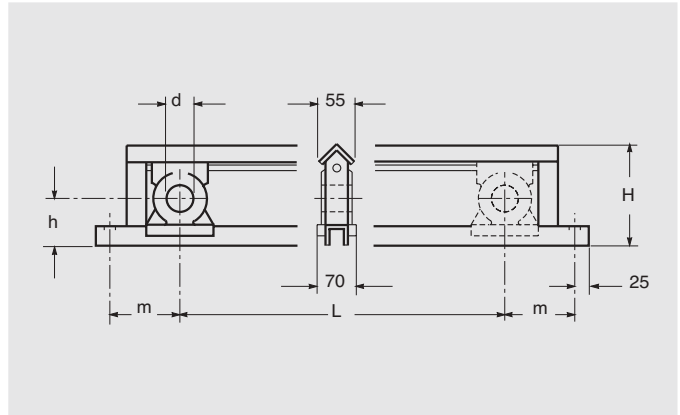
Belt width mm	Pulley type	D mm	B	d	d1	F	G	C	Weight Kg	
400	CUF	190	500	40	38	30	760	820	28	
		270							36	
		320							44	
500	CUF	190	600	40	38	30	860	920	47	
		270		40					57	
		320		40					79	
		400		50					48	130
650	CUF	270	750	40	38	30	1010	1070	50	
		320		40			38	1010	1070	61
		400		50			48	1050	1110	81
		520		60			58	1050	1110	136
800	CUF	320	950	40	38	30	1210	1270	75	
		400		50			48	1250	1310	105
		520		60			58	1250	1310	164
		620		70			68	1250	1310	197
1000	CUF	400	1150	50	48	30	1450	1510	123	
		520		60					58	176
		620		70					68	236

On request pulleys may be supplied with characteristics and dimensions different from those indicated in the table, or using the customer's drawing.

For the order code of execution and lagging see page 260

Example of ordering
standard design
CUF, 400, 600, 50, YA

tension units
TDV with screw



4.5.4 - Screw tension unit

Used only in combination with pulleys CUF with fixed shaft and internal bearings, in that a hole is positioned to accept a static shaft (the possibility of assembling external bearing supports has not been considered in these tension units)

The use is restricted only to the installation of the pulley at the tail of the belt conveyor of a length not more than 50 m, selecting the length of movement in relation to the presumed belt stretch.

Over the above length it is advisable to use other types of tension units.



Tension unit type	d mm	L	h	m	H	Weight Kg
TDV	38	300	75	110	165	9
		400				10
		500				11
		600				12
		700				13
		800				15
		900				16
		1000				17
		TDV				48
400	12					
500	13					
600	14					
700	15					
800	17					
900	18					
1000	19					
TDV	58		300	85	120	
		400	11.5			
		500	12.5			
		600	13.5			
		700	14.5			
		800	16.5			
		900	17.5			
		1000	18.5			

Example of ordering
 standard design
 TDV 38, YA, 300

4 Pulleys

4.5.5 - Special pulleys

Following specific requests and, if possible, a reference drawing provided by the customer, Rulmecca is able to manufacture different types of special pulleys such as:

Type 1 - pulleys with shaft-to-hub connection by means of key locking device (instead of clamping units).

These pulleys, of more traditional design, may have some limitation if compared to those pulleys having a shaft-to-hub connection by means of clamping units: lower shaft strength due to the reduced diameter in the centre and to the grooves for the keys.

Furthermore they have a lower centering precision between the shaft and the hubs and, in the frequent case of oxidation, the disassembly of the two parts can be very difficult if not impossible.

Type 2 - Pulleys with flanges directly welded to the shaft.

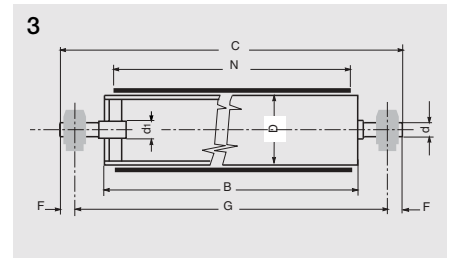
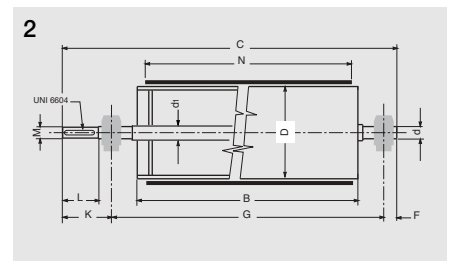
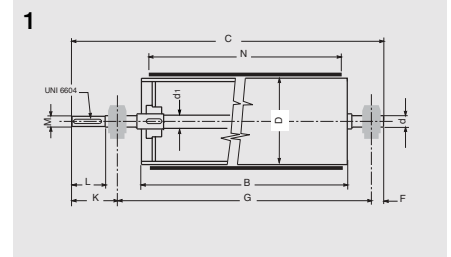
Type 3 - Pulleys without shaft, with flanges and stub axles.

These simplified types of pulleys are suitable only for light applications and should be used only for deviation, contrast or take up positions. Continuous service shaft substitution should not be foreseen for these pulleys.

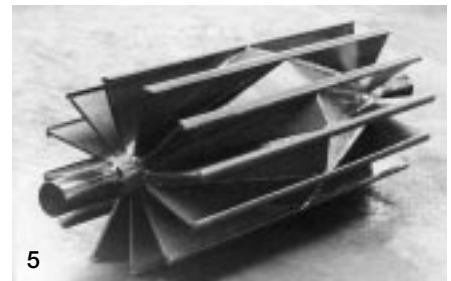
For particular applications, where very wet materials are conveyed and the belt inner surface gets very dirty, special pulleys can be supplied such as:

Type 4 - squirrel cage pulleys

Type 5 - wing pulleys



Pulleys according to other types and dimensions than those described in this catalogue can be quoted and manufactured if requested and provided that the customer submits a drawing.



5 Belt Cleaners



5 Belt cleaners

Summary	5	Belt cleaners	page 269
5.1		Introduction	271
5.2		Selection criteria	272
5.3		Programme	273
5.3.1		Belt cleaners type-P	274
5.3.2		Belt cleaners type-R	276
5.3.3		Belt cleaners type-H	278
5.3.4		Belt cleaners type-U	280
5.3.5		Belt cleaners simple and plough types.....	282



5.1 - Introduction

The problem of conveyed material adhering to the conveyor belt, occurs frequently with wet or sticky material, resulting in frequent downtime for maintenance, and clean up, with consequent loss of production.

The problems of belt cleaning have increased in parallel with the development of conveyors of ever increasing lengths, speed and belts widths, necessary to satisfy the need to maximise load capacities.

Therefore, the use of cleaning equipment has become an indispensable requirement to assure general plant efficiency and to reduce the periods of service needed for maintenance.

There has been a notable development of this equipment in recent time for differing reasons : prolonging the life of the conveyor ; limiting the deterioration of the belt, improving the energy efficiency of the installation, reducing loss of material thereby increasing the load capacity, eliminating a major cause of wear on the return rollers.



5 Belt cleaners



5.2 - Selection criteria

The choice of a belt cleaner depends on the efficiency that is desired to obtain from the conveyor ; the material itself ; and the environmental conditions prevailing.

However the adoption of a cleaning system should be considered early in the conveyor project design phase.

It may prove to be very difficult to achieve an average degree of efficiency by retrofitting cleaning system into an existing plant ; moreover, this operation may necessitate expensive modification to the plant structure.

Where high standard of cleaning is requested, and for particularly difficult applications, it is advisable to employ more than one cleaning system combining them in a way that increases the overall system efficiency.

It is however good practice that the user scrupulously observes the function and maintenance of the cleaners in use, to assure their maximum and continuous efficiency.

The belt cleaners proposed in this catalogue may be used for each type of application. They are well known for their efficiency, for ease of installation, for their project simplicity and economy of use.

There may be irregularities on the belt surface, such as metal clips, removed or lacerated sections of parts of the belt cover layers this may create abnormal wear in the components of the chosen scraper and lead to even further irregularities as mentioned above.

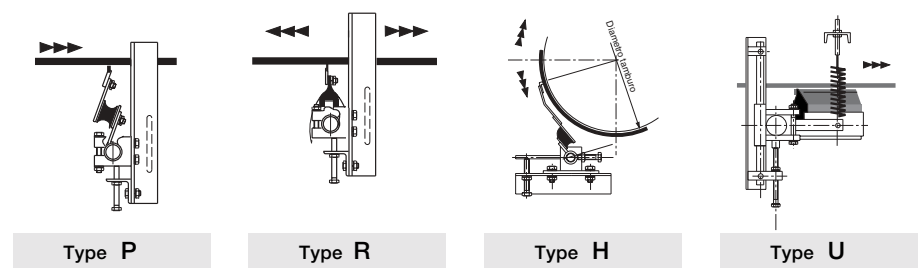
In this catalogue several different cleaners are proposed.

On request other types may be supplied other than the standard to facilitate installation and to extend the use for special applications.

5.3 - Programme

Cleaner type	For belt width mm	Characteristics
P	350 ÷ 2200	For uni-directional belts
R	350 ÷ 2200	For reversible belts
H	350 ÷ 2200	For reversible belts and tangential applications
U	350 ÷ 2200	For uni-directional belts

On request belt widths larger than those indicated or for special applications may be supplied.



5 Belt cleaners series P



5.3.1 - Belt cleaners series P for uni-directional belts

The proposed cleaner is a blade of multiple scrapers mounted on an intermediate flexible support which allows the blade an independent movement and assures a continuous and efficient cleaning of the belt.

They are principally applied to the removal of wet or sticky material in belts with a single movement direction.

Characteristics and indications of use:

The cleaners, series P, are characterised by scraper components (TIPS) attached to flexible and very resistant rubber components mounted onto a tubular frame.

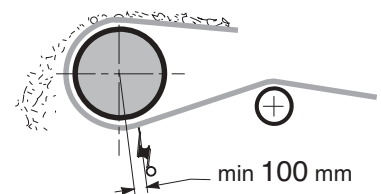
These supports, which act as anchors for the scrapers, give the correct balance between the frictional force and the necessary force needed to remove the residual scale on the belt surface.

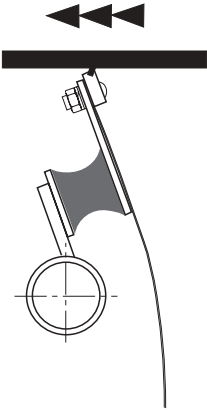
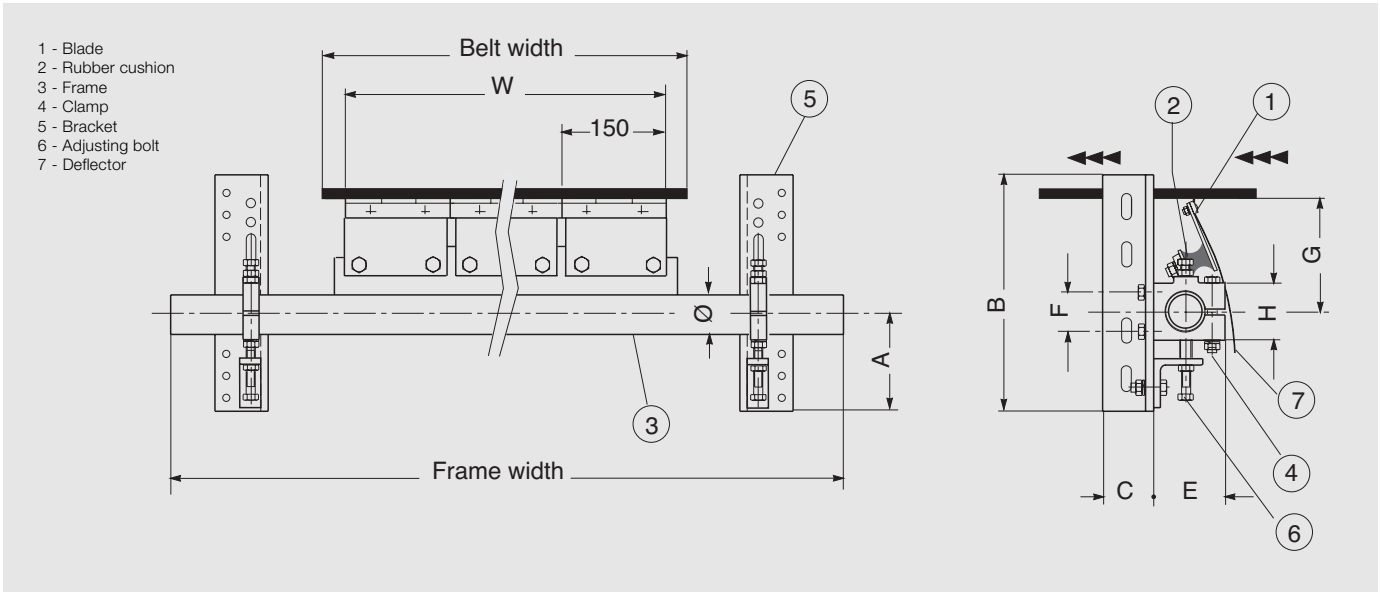
For its correct function the pressure of blade application is very low. It is however possible to control it by changing the position of an opposing screw from the moveable support onto the support frame.

These cleaners, especially because of their simplicity of construction, may be installed very easily with extremely controlled service and maintenance costs.

The excellent quality of the material used and the strength of the components, sized to meet overload conditions, lead to an assurance of prolonged and efficient life.

In addition to the standard types, special versions may be supplied for food or chemical environments.





Belt Cleaner type	Width belt mm	Tips n.	W mm	Width frame mm	A		B	C	Ø	E	F	G	H	Weight Kg
					min.	max.								
P	300/400	2	300	900										20
	450/500	3	450	1050										25
	600/650	4	600	1200										30
	750/800	5	750	1350										35
	900/1000	6	900	1550	120	200	320	70	54.0	98	56	154	80	40
	1050	7	1050	1700										44
	1200	8	1200	1900										48
	1400	9	1350	2100										54
	1500/1600	10	1500	2350										62
	1800	12	1800	2600										75
	2000	13	1950	2800	152	232	400	80	76.3	120	70	165	100	100
	2200	14	2100	3100										110

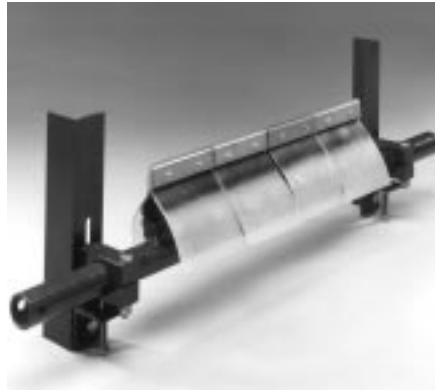
On request different dimensions to W as indicated may be supplied.

Example of ordering

Cleaner type P, 800



5 Belt cleaners series R



5.3.2 - Belts cleaners series R for reversible belts

This type of cleaner has been developed to function with reversible belts.

Its arrangement of multiple scraper blades of straight forward construction, is unique of its type, resulting in excellent efficiency.

Characteristics and indication of use

The characteristics of the cleaner series R is also that it uses a tubular member, with scraper blade components positioned on its structure and fixed between intermediate rubber supports as in the series P.

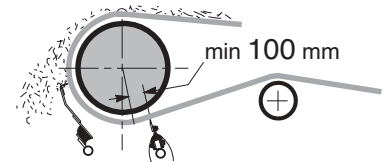
The rubber components are cleverly profiled and allow the application of the scraper blades on both senses of rotation Fig. A.

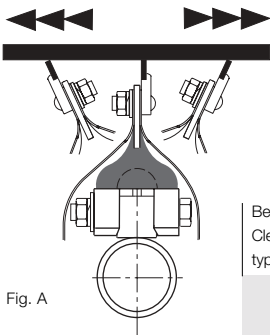
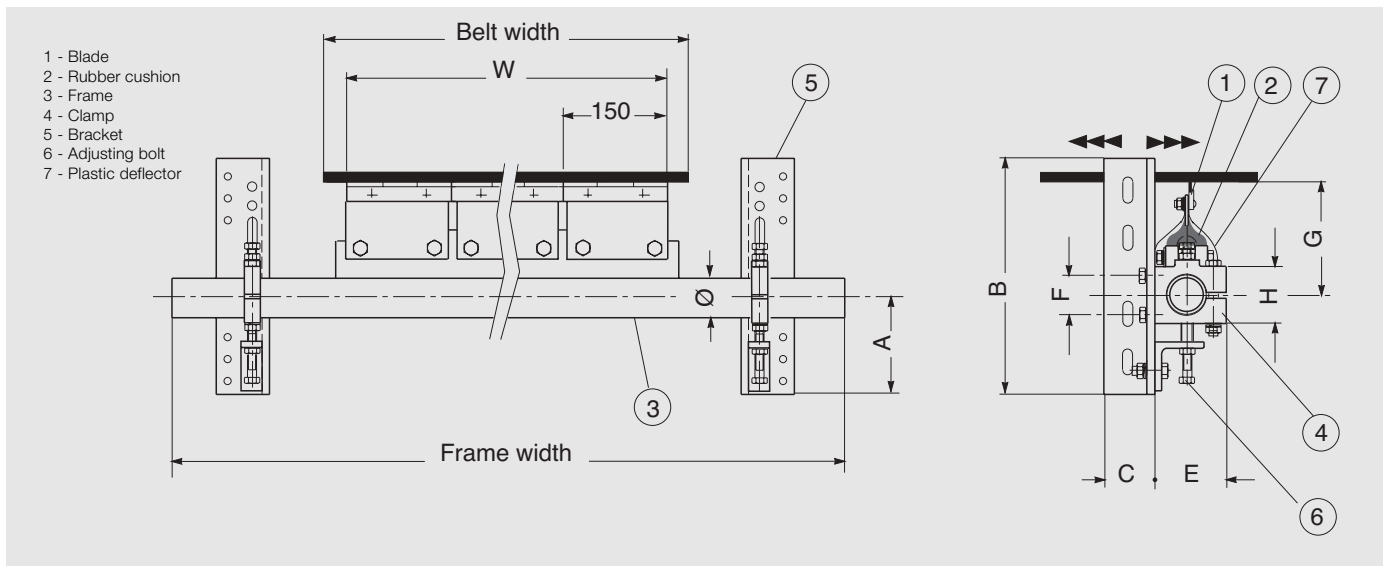
The blade may then flex in both directions without damaging or promoting damage to the belt in case of unforeseen pressures.

The scraper blade is positioned perpendicular to the belt which is different to that of the position of belt cleaner P.

The most important factors for the efficient system function are the correct installation and the precise regulation of the belt cleaner.

These instructions are described in a related booklet attached to the cleaner itself on delivery.





Belt Cleaner type	Width belt mm	Tips n.	W mm	Width frame mm	A		B	C	Ø	E	F	G	H	Weight Kg
					min.	max.								
R	300/400	2	300	900										20
	450/500	3	450	1050										25
	600/650	4	600	1200										30
	750/800	5	750	1350										35
	900/1000	6	900	1550	120	200	320	70	54.0	98	56	145	80	40
	1050	7	1050	1700										44
	1200	8	1200	1900										48
	1400	9	1350	2100										54
	1500/1600	10	1500	2350										62
	1800	12	1800	2600										75
	2000	13	1950	2800	152	232	400	80	76.3	120	70	156	100	100
	2200	14	2100	3100										110

On request different dimensions to W as indicated may be supplied.

Example of ordering

Cleaner type R, 1200

5 Belt cleaners series H



5.3.3 - Belt cleaners series H for reversible and uni-directional belts for tangential applications

This cleaning device has been developed principally as a scraper, capable of removing the majority of residual material from the belt surface.

The complete system of cleaning the belt may be made by utilising successive cleaners, chosen for example, from the range in series P or R.

May be installed where it is not always possible to install other types.

Characteristics and indications of use

The belt cleaner series H, has similar characteristics to the preceding series, in using a tubular member. The multiple scraper blades are positioned on this structure and themselves fixed by means of supporting arms proportional in size to the diameter of the drum and anchored finally in rubber supports.

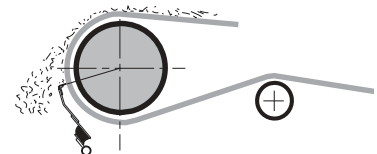
The construction characteristic of the system, allows in this case the use of extremely low functional pressure, precisely controlled by means of an appropriate regulating screw.

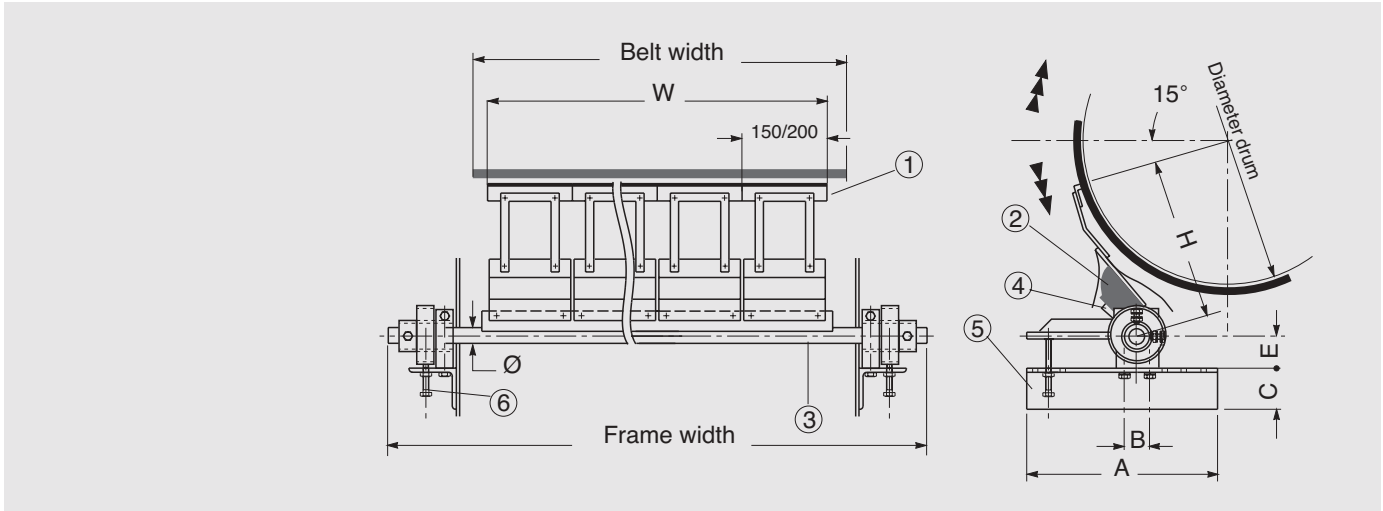
The belt cleaner employs a tangential action and is therefore applied to the external front part of the pulley.

It is then engaged in the task of cleaning the belt on the pulley using a perpendicular or square application.

The simplicity of design of this series assures excellent function over time and economies are found both in management costs and the consequent reduction of labour costs involved in maintenance.

May be easily installed on the belt conveyor structure, reversible, to suit extendible and other types of conveyors.

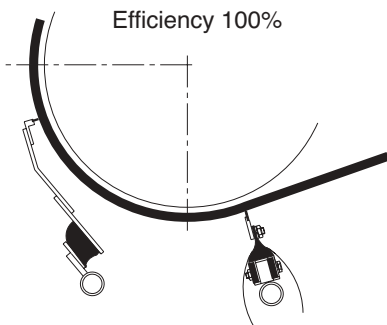




- 1 - Scraper tips
- 2 - Rubber cushion
- 3 - Frame
- 4 - Clamp
- 5 - Support
- 6 - Regulating screw

Cleaner type	Width belt mm	Tips mm	n.	W mm	Width frame mm	A	B	C	Ø	E	Weight Kg
H	300/400	150	2	300	1000	320	56	70	54.0	60	23
H	450/500	150	3	450	1000	320	56	70	54.0	60	25
H	600/750	200	3	600	1300	320	56	70	54.0	60	30
H	800/900	200	4	800	1500	320	56	70	54.0	60	35
H	1000/1050	200	5	1000	1650	320	56	70	54.0	60	45
H	1200	200	6	1200	1900	320	56	70	54.0	60	60
H	1400/1500	200	7	1400	2150	320	56	70	54.0	60	75
H	1600	200	8	1600	2300	320	56	70	54.0	60	90
H	1800	200	9	1800	2600	320	76	70	76.3	60	105
H	2000	200	10	2000	3000	320	76	70	76.3	60	120
H	2200	200	11	2200	3200	320	76	70	76.3	60	135

On request different dimensions to W as indicated may be supplied.



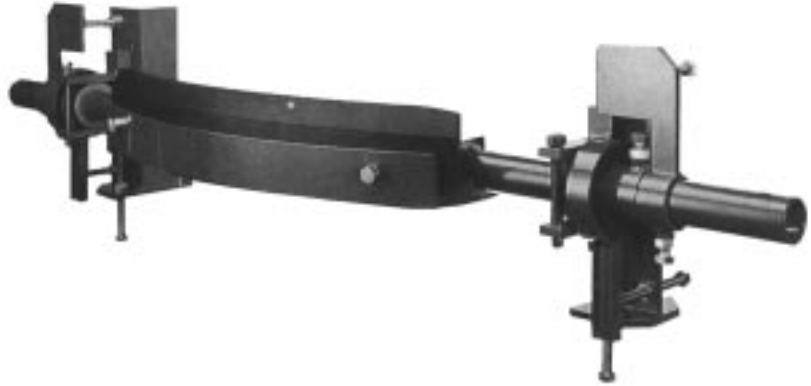
To order belt cleaner series H it is necessary to complete the type code with a model code which relates to the diameter of the pulley using the following table.

Cleaner type	Model	Pulley Ø mm	H mm ~
H	SS	less than 500	270
H	S	500 ÷ 800	330
H	M	700 ÷ 1100	390
H	L	1000 ÷ 1200	420
H	LL	greater than 1200	520

Example of ordering

Cleaner type HS, 1000

5 Belt cleaners series U



5.3.4 - Belt cleaners series U patented for uni-directional belts

Awareness of improved savings by utilising belt cleaning systems has resulted in requests for simplified equipment but with ever increasing efficiency.

The conception of this proposed cleaner is certainly revolutionary.

Characteristics and indications of use:

The cleaner type U is characteristic of a new patented technology.

It consists of a series of carbon steel blades, welded to a flexible rubber support. The assembly constitutes a unique scraper blade, inserted into a strong structural arc mounted on special bearings.

Although there is vertical regulation, the system is under spring pressure which acts to rotate the curved structure as a whole. The pressure of the blade is therefore stronger at the centre. The pressure is however controlled by a regulating screw.

The cleaning effect is therefore correspondingly higher in the central part, where there is normally the most residue of material to remove, and becomes less as it decreases towards the edge.

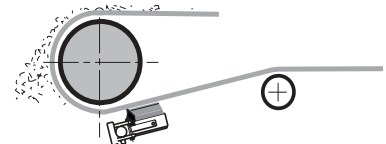
In this way the scraper is acting at its most efficient where the areas of high wear are normally encountered on the blade and the belt.

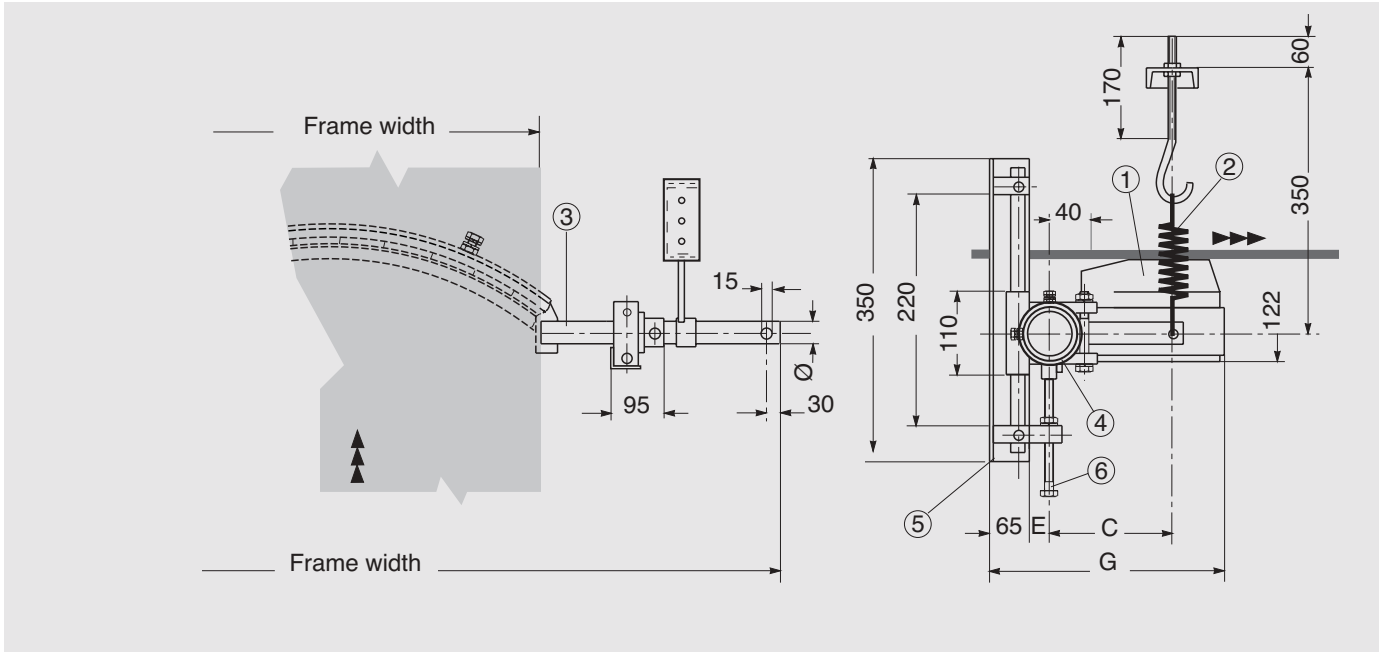
Thanks to the scraper and unique blade being formed into an arc the material that is removed has no tendency to build up or to block the cleaning action itself.

The scraper blade is the only replaceable component that will exhibit wear in time. It is easily and rapidly replaced without further disassembly of the scraper insitue.

This type of universal belt cleaner is particularly recommended to be used on high speed uni-directional conveyor belts, when the conveyed material is very wet and sticky.

Even greater belt cleaning performance may be obtained by using this cleaner linked with cleaner series H.





- 1 - Scraper blade
- 2 - Tension spring
- 3 - Frame
- 4 - Clamp
- 5 - Support
- 6 - Regulating screw



Cleaner type	Width belt mm	Width frame mm	C	Ø	E	F	G	Weight Kg
U	350	1000	130	42.7	30	134	229	25
U	450	1100	130	42.7	30	134	229	27
U	500	1200	130	42.7	30	134	229	28
U	600/650	1300	130	42.7	30	159	254	30
U	750/800	1500	130	48.6	30	184	279	32
U	900	1700	130	48.6	30	184	279	34
U	1000	1800	130	48.6	30	215	310	38
U	1050	1900	130	48.6	30	215	310	41
U	1200	2100	160	60.5	38	240	343	47
U	1400	2300	160	60.5	38	240	343	50
U	1500	2400	160	60.5	38	240	343	55
U	1600	2500	160	60.5	38	246	357	60
U	1800	2700	160	76.3	46	246	357	67
U	2000	3100	160	76.3	46	246	357	70
U	2200	3300	160	76.3	46	246	357	73

Example of ordering

Cleaner type U, 1400



**5 Belt
cleaners
series PLG
VLG - VLP**

5.3.5 - Simple plough cleaners

The most economic of cleaners with a scraper made of anti-abrasive rubber. The cleaners are applicable to light belts where the economies in the working conditions are of fundamental importance. Proposed therefore for belt widths from 400 up to 1200 mm.

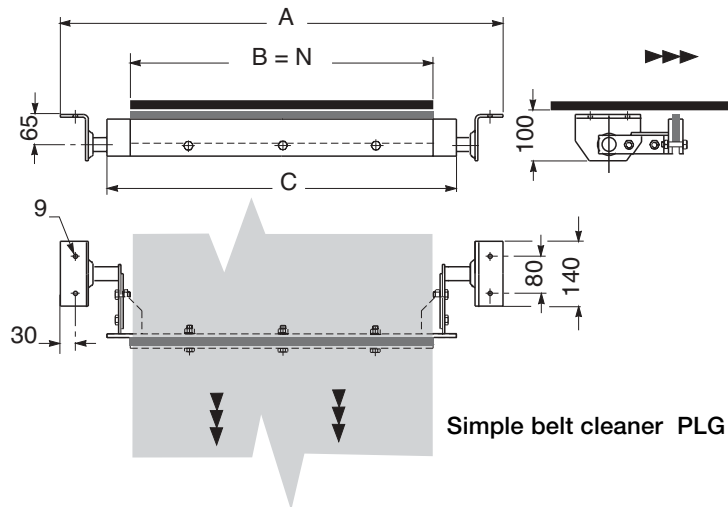
Simple belt cleaner type PLG

Comprises a steel structure in which is positioned a blade of anti-abrasive rubber (60 shore) of thickness 15 mm.

Considering the effect of pressure exercised on the belt, this cleaner should be supplied at the time of conveyor installation.

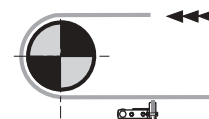


The cleaner PLG is for belt widths of 400, 500 and 650 mm. To be installed near to the drive drum.



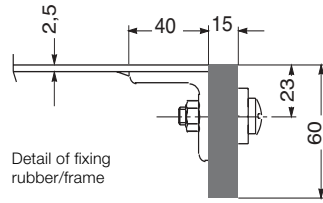
Simple belt cleaner PLG

Width belt mm	A	B	C
400	700	400	500
500	800	500	600
650	950	650	750

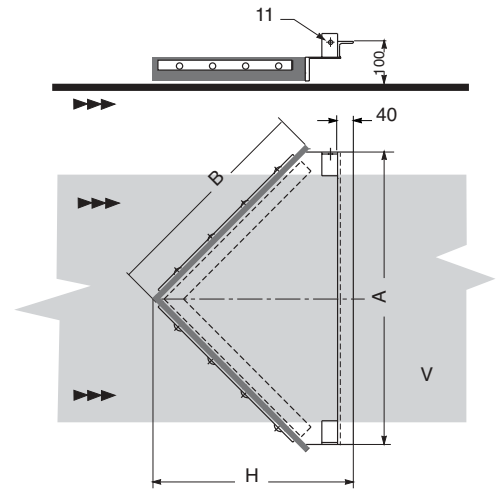
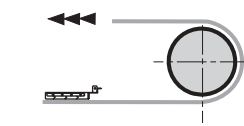


Example of ordering

Cleaner type PLG, 400



Detail of fixing rubber/frame



Width belt mm	A	B	H
400	500	350	360
500	600	420	410
650	740	525	480

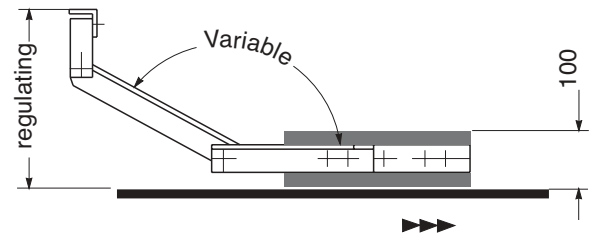
Belt plough cleaner type VLG - VLP

This is a system applied to the internal side of the return belt adjacent to the return drum.

Any residual material is deviated and removed by the effective action effect of the "V" design just before it reaches the belt terminal drum.

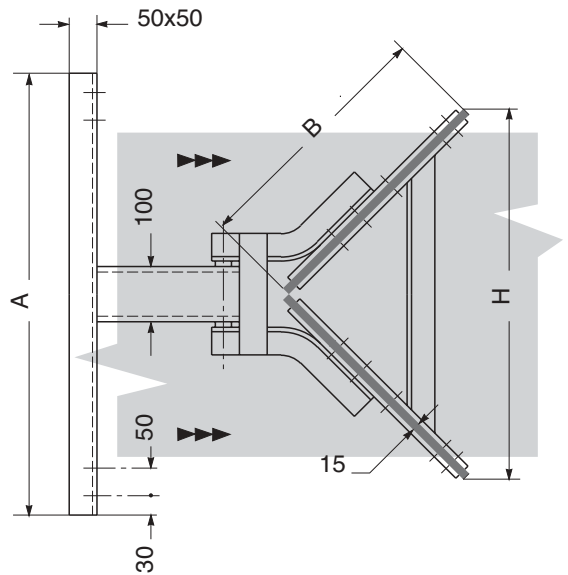
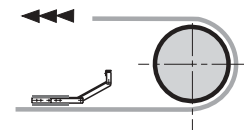
The plough, standard model type VLG, and the pressure regulating version type VLP for heavy applications meet direct customer needs for specific uses.

The belt plough cleaner must be installed at the terminal end to the belt near to the return drum, with the plough positioned in the opposite sense to the direction of movement of the belt.



Width belt mm	A	B	H
800	1100	600	850
1000	1300	750	1060
1200	1550	1030	1260
1400	1750	1030	1460
1600	1950	1170	1660

Plough cleaner type VLP



Example of ordering

Cleaner type VLG, 500
VLP, 650



6 **Covers**



6 Covers

Summary	6	Covers	page 285
6.1		Introduction and methods of use	287
6.2		Styles and characteristics	287
6.3		Programme of plastic covers	289
6.3.1		Installation method	290
6.4		Programme of steel covers	293
6.4.1		Installation method and fixing accessories	294



6.1 - Introduction and methods

In the project design of a belt conveyor, after having defined the components of primary importance, it is important to consider other accessories such as covers for the conveyor.

The necessity to protect belt conveyors may arise from the weather, from the volatile characteristics of the conveyed material, or from the type of works plant, and also from European norms that require the covering of the total length of a belt conveyor in the open.

For example rain may create a problem of belt slip on the drums causing a tracking problem.

Extreme temperatures may cause the plant to mal-function or stop, whilst very strong wind may move the conveyor belt off its

natural position causing serious problems to the business or loss of conveyed material.

6.2 - Styles and characteristics

Belt conveyors covers do not require maintenance and are very easy to install and move around.

The fixing system is designed in a way that allows quick and easy relocation of the covers to facilitate the inspection of the conveyor.

There are two styles of covers that are proposed : those in pre-formed PVC and those in corrugated galvanised sheet steel.



6 Covers

series CPT in PVC

Plastic covers, thanks to the characteristics of PVC, are light, of good transparency, anti-corrosive and with a smooth surface. Above all they are easy to adapt to any type of conveyor. Apart from their resistance to corrosion they are themselves classified "NON FLAMMABLE".

Notwithstanding this property of self-extinguishing, the limit to the use of PVC covers in hot areas should not exceed 65° C.

PVC covers are produced in sections by heat forming sheets into "greek style" corrugations with profile and dimensions available to suit the most common belt widths.



Greek module	Sketch of profile	Total length	Corrugations
70/18		mm 1090	n. 15 e 1/2

The mechanical properties of the belt covers are summarised in the following table.

Properties	Method	Unit (*)	Measurement
Specific weight	-	Kg/dm ²	1,4
Thickness of sheet	-	mm	~1,2
Max elastic tension	ISO R 527	N/mm ²	50
Breaking strain	ISO R 527	N/mm ²	50
Stretch to break	ISO R 527	%	125
Resilience to traction	DIN 53.448	J/cm ²	45 - 60
Resistance to falling weight	900 g x 2m at 23°C	% of breaking	< 5
Coeff. of linear expansion	-	mm/mm° C	7.10 ⁻⁵
Coeff. of thermal conduction	DIN 52.612	W/m° C	0,15
Profile deformation	1 h at 65°C	%	<3

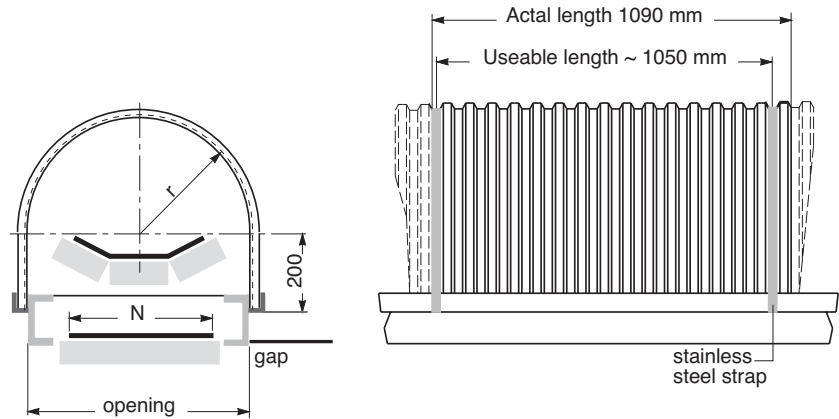
* the units of measurement are expressed in compliance with the advice from the European Community.

1 J/cm² = * 10 Kgf cm/cm²

1 N = * 0.1 Kgf

1 N/mm² = * 10 Kgf/cm²

1 W/m° C = 0.86 Kcal/m.h. °C



6.3 - Programme of plastic covers

Cover Type mm	Belt width mm	opening mm	radius r mm	Development straights mm	Weight Kg	Fixing accessories *
CPT 1	400	700	350	1500	3.6	CPT 1F 400
2	500	800	400	1660	4.0	2F 500
3	650	950	475	1890	4.5	3F 650
4	800	1150	575	2200	5.3	4F 800
CPT 5	1000	1350	675	2520	6.0	CPT 5F 1000
6	1200	1600	800	2910	7.0	6F 1200
7	1400	1800	900	3230	7.7	7F 1400

(*) To fixing accessories are supplied with each cover and vary according to the belt width according to the following specification :

type CPT -1-2-3

- 1 Stainless steel strap and spring with galvanised hook
- 1 Fixed galvanised hook
- 2 Bolts M8x20 cadmium plated
- 2 Washers cadmium plated

type CPT -4

- 2 Stainless steel strap and spring with galvanised hook
- 2 Fixed galvanised hooks
- 4 Bolts M8x20 cadmium plated
- 4 Washers cadmium plated

type CPT -5-6-7

- 2 Arch in profile 20 x 20 x 2
- 6 Screws M 6 x 35 cadmium plated
- 4 Nuts M6 cadmium plated
- 6 Washers cadmium plated
- 4 Locking ruts M6 cadmium plated
- 2 Fixing brackets 30 x 40 in zinc plated steel

The last section of each conveyor needs one supplementary set of accessories.

Example of ordering
CPT 5, 1000
plus fixing accessories
CPT 5F, 1000

6 Covers

series CPT in PVC



6.3.1 - Installation method

CPT covers for belts 400 ÷ 800 mm

The pre-formed PVC covers must be located into steel angle sections welded to the conveyor structure, to avoid any movements from their fixed position.

Each cover section must be fixed by a stainless steel strap of 20 mm width and 0.6 mm thickness.

The steel strap is positioned on top of the section in the lower corrugation.

For covers CPT 800 an additional central strap is positioned at the centre of each section.

As shown in Fig. A and in relation to the section length, the steel strap is positioned and fixed as follows :

- a) on one side by an angle section drilled to accept bolts and washers M 8 x 20 .
- b) on the other side and in the identical position with a zinc plated hook fixed to the angle section with a bolt, nut and washer M8 x 20.

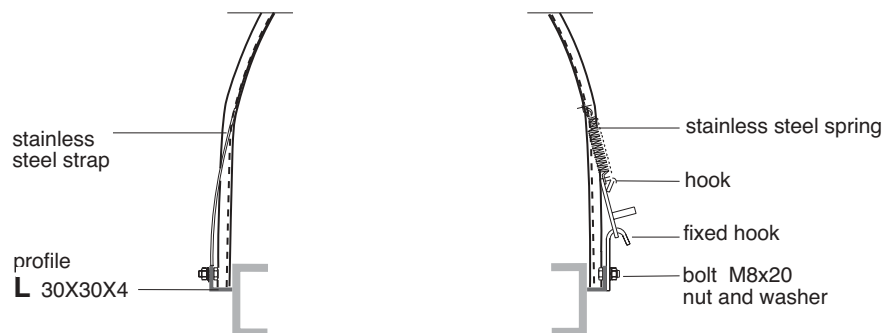
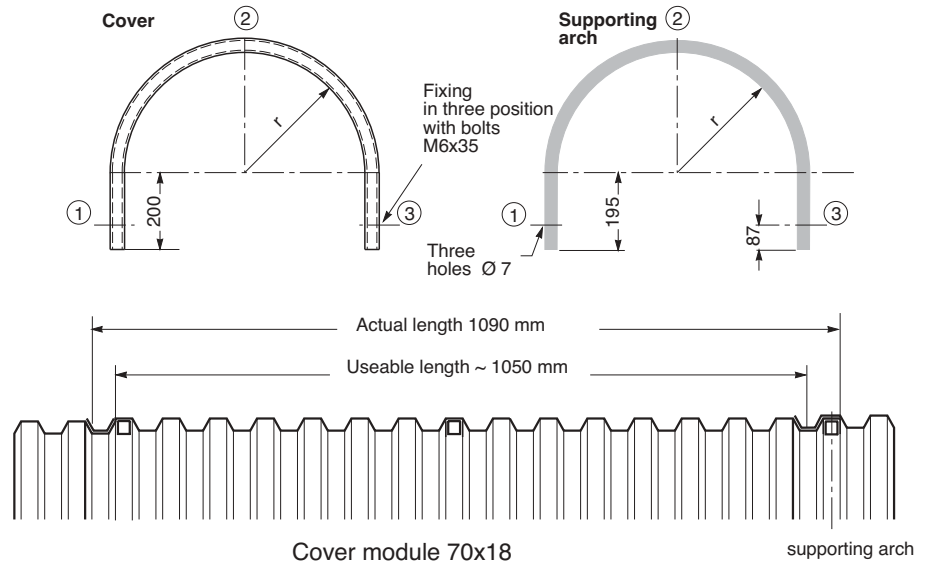


Fig. A

Fig. B



CPT covers for belts 1000+1400

Must be located into steel angle section which is welded to the belt conveyor structure Fig. C.

The arches must be fixed and positioned at the junction of two covers as indicated in Fig. B.

For these covers it is necessary to position two supporting arches made from galvanized steel tube, one at the overlap junction and the other at the centre of each section.

The pre-formed PVC cover and the steel arch are both positioned in the angle section with brackets and fixed and locked by bolts, washers and wing nuts.

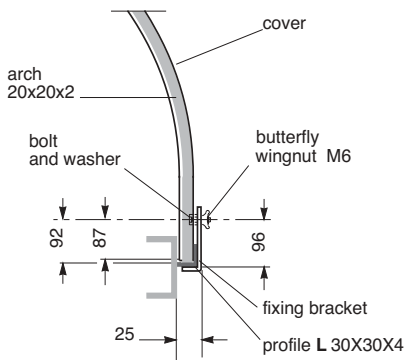


Fig. C

6 Covers

series CPTA in steel



Why covering belt conveyors ?

to protect the conveyed material,

to protect the environment:

- against dust
- against noise
- and for a better integration in the landscape

for the operators' safety,

for the protection of the belt:

- against the sun and bad weather
- and for a longer life

for the protection of the materials:

- with reduction of maintenance to the structures
- to avoid loss of materials and productivity due to the wind
- to avoid a deposit of the rain-water on the belt
- to assure the efficiency of the industrial constructions linked to the belt.

Advantages of the steel covers

Economy:

- less costs than the other systems or materials
- useable for any structure
- easy to install
- maintenance reduction.

Strength:

- can be built in (exceptional rigidity)
- resistance to bad weather (especially to high and low temperatures): they stand UV rays
- in compliance with the location (*)
- suited to the conveyed material (*)
- fire classification M.o.

Easy handling:

- lightness: 7,12 kg/m²
- handless (under request)
- easy fixing

(*) for extreme cases it is possible to supply covers in stainless steel or in aluminium.

Programme of installation

The steel covers are produced from galvanised corrugated sheet with 76/18 profile according to NFA 46.322 norm – December 1981.

Material:

- galvanised steel for construction according to Euronorm EN 10 147 of 1996
- class S 220 GD + Z 1.0241
- Other materials on request: aluzinc AZ 185 – aluminium-stainless steel.

Covering: Z 350 galvanisation on both sides 12.5 µm each side.

Covering options according to the environmental conditions and the conveyed materials:

Z=450 = 16.0 µ each side

Z=600 = 21.5 µ each side

Other types of covering:

- Painting – polyester 25 µm on galvanised steel Z 225
- PVDF 35 mm – polyvinyl thermoplastic resin
- Solifarm 25/35 µm – soft polyester resin
- Plastisol 100 µm – thermoplastic resin of polyvinyl chloride

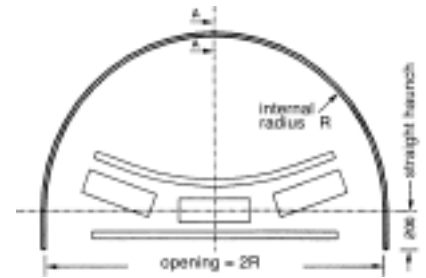


Characteristics

Produced from galvanised sheet steel corrugated section 18/76 for all belt conveyors but normally used for belt widths of 400 mm upwards.

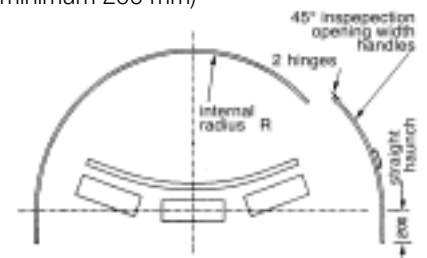
The steel covers for belt conveyors are produced from corrugated sheet to NFA 46322 norm and have the following advantages :

- self supporting
- non flammable
- resistant to breaking
- environmental
- supporting structures are not necessary
- maintenance free
- very strong
- easy to handle
- economic



Type 1, 180°

Other straight haunch lengths on request (minimum 200 mm)



Type 1, 135°

6.4 - Programme of steel covers

Cover Type	width belt mm	Radius r mm	standard Cover 180° Kg	open Cover 135° Kg	intermediate Cover 180° Kg	Thick. mm	complete Door 45° Kg	
CPTA 1	400	350	9.17	6.28	3.05	0.75	3.97	
	500	400	10.11	6.86	3.37	0.75	4.21	
	650	475	475	11.53	8.04	3.84	0.75	4.59
			550 *	12.94	9.10	4.32	0.75	4.95
	800	575	575	13.41	9.46	4.47	0.75	5.08
			650 *	14.82	10.52	6.59	1	5.45
	1000	675	675	15.30	10.87	6.80	1	5.57
			750 *	16.71	11.93	7.42	1	5.94
	1200	800	800	17.65	12.64	9.80	1.25	5.19
			875 *	19.07	13.70	10.59	1.25	6.55
	1400	900	19.54	14.05	10.85	1.25	6.68	
	1600	1025	21.89	15.82	14.60	1.50	7.29	
1800	1125	23.78	17.23	15.85	1.50	7.78		

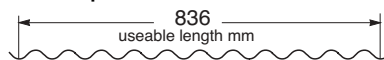
(*) Radius on request
Other types of covers on request

Ordering codes cover:

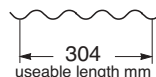


Example of ordering
Standard design:
CPTA 1, 650/475, 180°/836

Cover profile



Standard 11 waves



intermediate 4 waves

standard thickness 75/100

For intermediate covers thickness varies according to the radius.

6 Covers

6.4.1. Installation method and fixing accessories

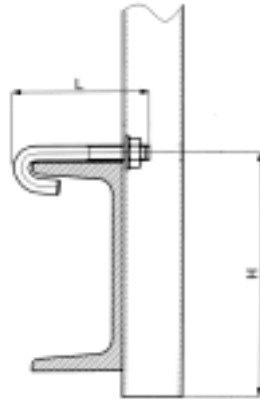
The fixing system is designed for a quick positioning and a simple removal of the covers to allow the inspection of the rollers sets and the conveyor belt.

Covers will be supplied:

- **with holes** for a fixing by bolts, hooks and brackets
- **without holes** for a fixing by stainless steel straps.



Fixing with galvanised hooks



The set is composed by:

- 1 hook M8
- 1 nut M8
- 1 washer

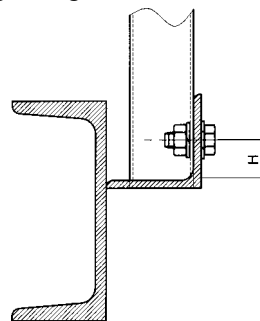
Quantity to be ordered: 4 for each cover

Ordering code: CPTA, LG, 60
CPTA, LG, 70
CPTA, LG, 80

The values 60, 70 and 80 represent the length "L" of the hook.

At the order time you should precise dimension "H" too.

Fixing with galvanised bolts



The set is composed by:

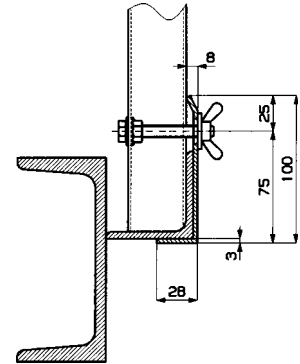
- 1 screw M8 x 20
- 1 nut M8
- 1 galvanised washer

Quantity to be ordered: 4 for each cover

Ordering code: CPTA, BU

At the order time you should precise dimension "H".

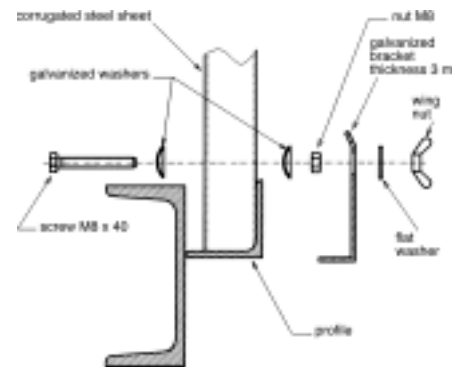
Fixing with bracket



This system allows a quick disassembling of the covers to inspect the belt and its structure.

No special tool is required for the operation and furthermore it is not necessary to unscrew the wing nut to remove the bracket.

Details of the components



The standard supply includes:

- 1 galvanised bracket thickness 3 mm.
- 1 screw M8 x 40
- 1 nut M8
- 1 wing nut
- 2 galvanised washers
- 1 flat washer

Quantity to be ordered:

- for belt width up to 800 = 2 for each cover
- for belt width up to 1000 and above = 4 for each cover

Ordering code: CPTA, ST

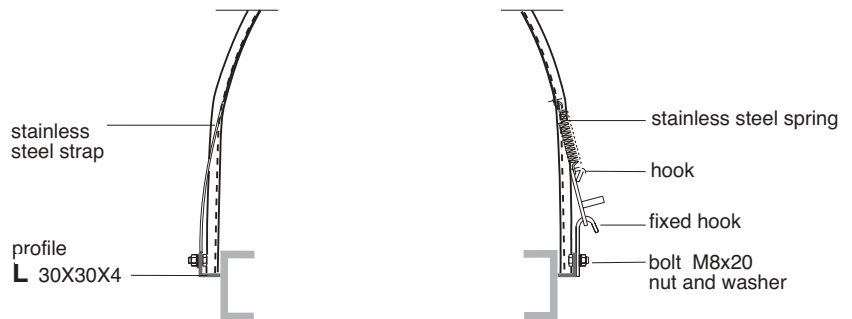
Fixing with stainless steel straps

Each cover must be fixed by a stainless steel strap of 20 mm width and 0.6 mm thickness.

The steel strap is positioned on top of the section in the lower corrugation.

As shown in Fig. A and in relation to the section length, the steel strap is positioned and fixed as follows :

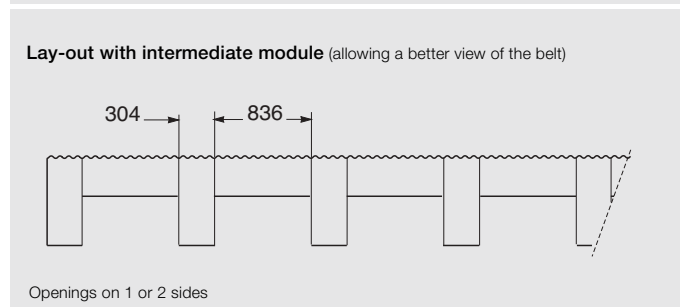
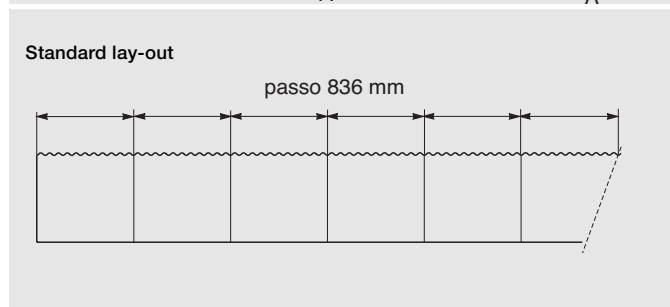
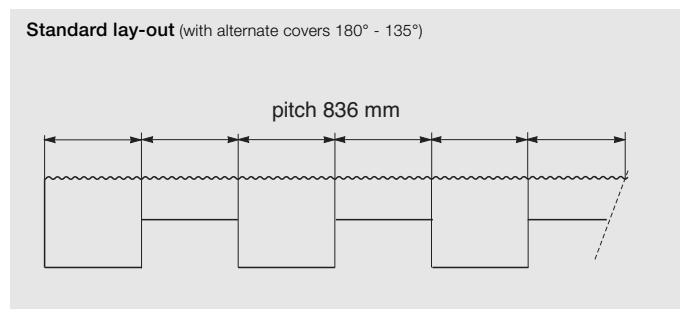
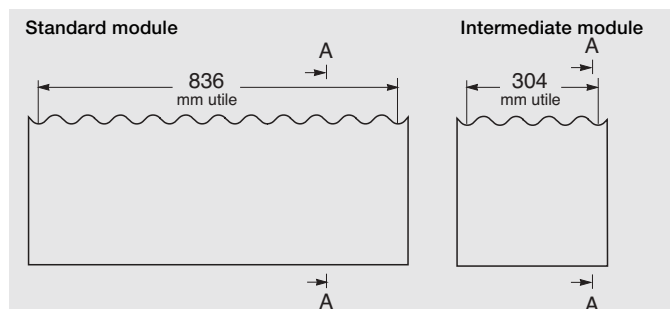
- a) on one side by an angle section drilled to accept bolts and washers M 8 x 20 .
- b) on the other side and in the identical position with a hook fixed to the angle section with a nut and washer M8 x 20.



- The standard supply includes:
- 1 strap with stainless steel spring and galvanised hook
 - 1 fixed galvanised hook
 - 2 bolts M8 x 20 cadmium plated
 - 2 washers cadmium plated

- Quantity to be ordered:
- for belt width up to 1000 = 1 for each cover
 - for belt width from 1200 upwards = 2 for each cover

Ordering code: CPT-1F





RULMECA GROUP

On the 3rd July 2003 Rulli Rulmeca S.p.A. finalised the acquisition of the "Bulk" Business Units of the Interroll Group. This was composed of four companies specialising in the production of equipment for belt conveyors in bulk handling applications.

The 4 companies will immediately take the name of Rulmeca as follows:

- **Rulmeca FAA GmbH.** With premises located in Aschersleben, Germany, they manufacture motorized pulleys in diameters from 216 to 800 mm, and fabricated pulleys and heavy duty rollers with shaft diameters up to 90 mm for the brown-coal industry.
- **Rulmeca España S.L.** A company located in Barbera del Vallès (Barcelona) and manufacturer of mainly Rulmeca PSV types of rollers for the Spanish market.
- **Rulmeca UK Ltd.** A company located in Corby, UK, and manufacturer of mainly Rulmeca PSV types of rollers for Great Britain.
- **Rulmeca Thailand Co. Ltd.** A company located in Bangkok, Thailand, who manufacture mainly Rulmeca PSV type of rollers for Thai markets and parts of South-East Asia.

Through this acquisition the Rulmeca Group strengthens its international presence (already represented thanks to the production units Precismeca-Rulmeca Group in France, Germany and Canada and Rulmeca de Portugal and Venezuela), especially in some traditionally important markets of belt conveyor engineering such as Spain and United Kingdom or for medium-term strategic locations such as the new Thailand Company.

With the acquisition of Rulmeca FAA and their specialised production of motorized pulleys, the Rulmeca Group adds, not only a new product to its portfolio, but also a new technology to its skills when looking ahead to developing the potential of future markets.

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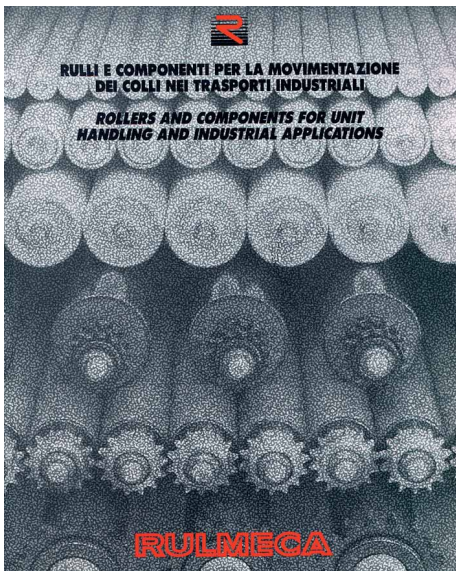
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All dimensions indicated in this catalogue are subject to working tolerances and, although the drawings are faithfully produced they are not necessarily binding.

Rulli Rulmecca SpA reserves the right to modify any product without notice.





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