BULK HANDLING
ROLLERS AND COMPONENTS
FOR BULK HANDLING

RULMECA®

MOVING AHEAD

Rulmeca – Moving ahead.

Since its foundation in 1962, Rulmeca, headquartered in Bergamo (Almé), Italy, has grown to become one of the world's leading manufacturers of conveyor rollers/idlers, motorized pulleys, fabricated pulleys and other components for the bulk handling industry. 1,200 employees in seventeen production and sales companies around the globe serve clients in 85 countries.

Today, Rulmeca Group's global business incorporates the product brands Rulmeca, Precismeca and Melco. All three of them specialize in the supply of long-lasting premium belt conveyor components. Rulmeca Group products are developed and produced to meet the most demanding everyday challenges of all major bulk handling applications: coal and lignite mining, cement, steel, quarries, tunneling, power plant installations, ports, salt and fertilizers, sugar plants, recycling and demolition, crushing and screening.

The close partnership with our customers, OEMs, engineering companies and end users has made us one of the most trusted brands in the industry. As a family-owned business with a long-term perspective, our combination of traditional values and openness to innovation continues to be one of our key success factors. This is also seen in our consistent environmental and social responsibility throughout the value chain. We are committed to the continuous improvement of our range, often considered among the best in the market. Our research departments are equipped with state-of-the-art test facilities, where our products are thoroughly examined under extreme conditions.

Every day and on all continents, Rulmeca products improve the performance, safety and reliability of systems, equipment and machines within the bulk handling industry. Whatever your materials handling problem might be, talk to us. We have the expertise, the experience – and the products you need.
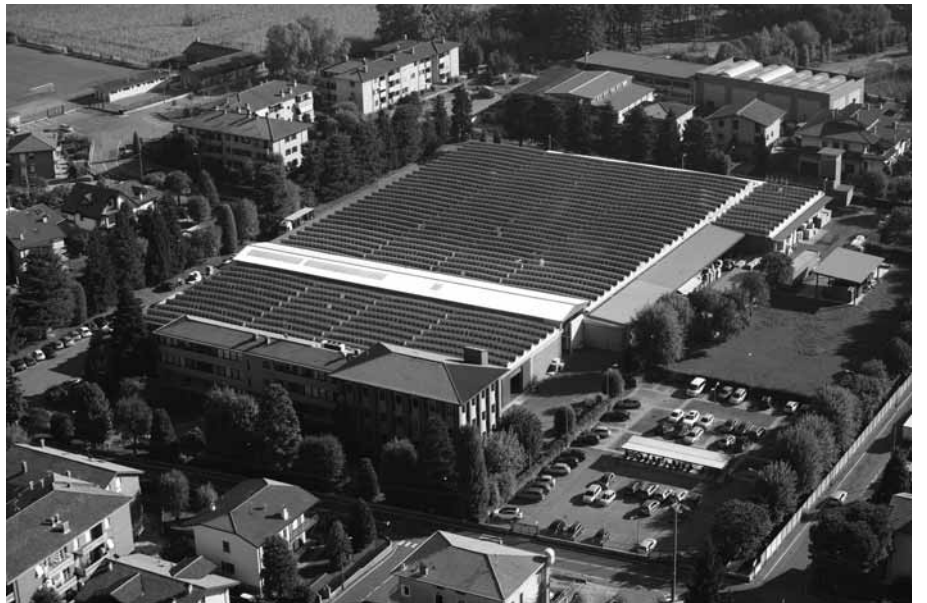
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Todays movement of goods and bulk materials demands state of the art methods.

In this field Rulmeca 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 60 years of experience.

Experience
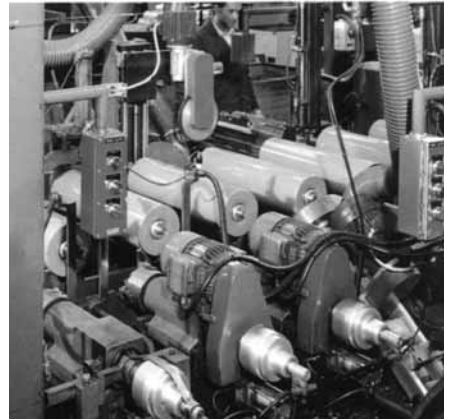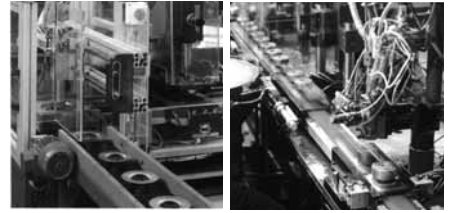
Modern, Flexible Technology

Automation

Service

Fields of application:

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

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**

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	mm
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
ft	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
Ic	distance from centre of motorised drum to the centre of the counterweight connection	m
I_M	load volume	m^3/h
Iv	belt load (material flow)	t/h

I_{vM}	load volume corrected to 1 m/s in relation to the inclination and irregularity of the feed	m³/h
I_{vT}	load volume theoretic to 1 m/s	m³/h
J	moment of inertia of section of material	mm⁴
K	inclination factor	—
K_1	correction factor	—
σ_{amm}	admissible stress	daN/mm²
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/m²
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/m³
q_T	weight of drum	daN
RL	length of motorised drum face	mm
S	section of belt material	m²
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	mm³
α	angle of wrap of belt on pulley	degree
α_t	inclination of rotating symmetrical shaft	rad
β	angle of overload	degree
γ	angle of screen inclination	degree
δ	inclination of conveyor	degree
λ	inclination of side roller of troughing set	degree
λ_1	inclination of intermediate side roller	degree
λ_2	inclination of external side roller	degree
η	efficiency	—
y	angle deflection of bearing	degree

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

**project and design criteria
for belt conveyors**
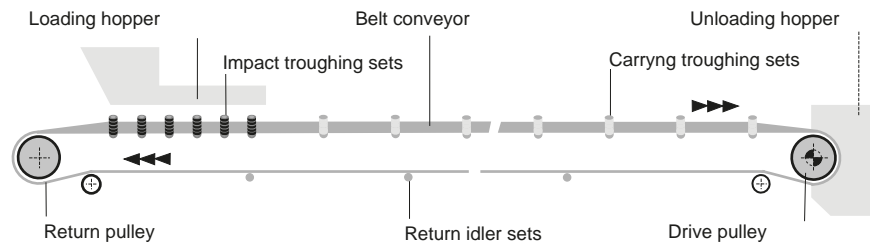
Fig.1 - Basic drawing of a belt conveyor

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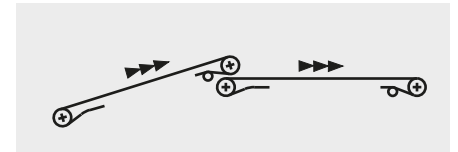
Fig.2.6 - Conveyor with horizontal and incline section where the space does not allow the vertical curve but the load may need the use of a single belt.

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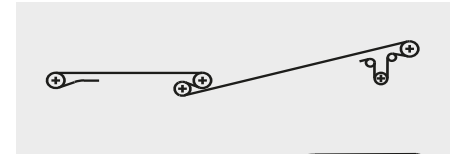
Fig.2.7 - Conveyor with a single belt comprising a horizontal section, an incline section and a decline section with vertical curves.

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.
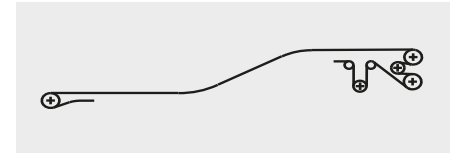
Fig.2.8 - Conveyor with belt loaded in decline or incline.
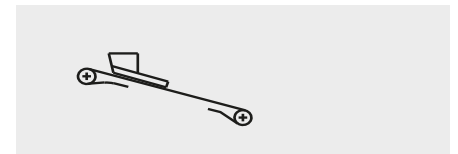
project and design criteria for belt conveyors

1.4 Rulmeca key components for belt conveyors

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 Pulleys
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 pulleys are produced in diameters up to 1000 mm with a maximum power of 250 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).
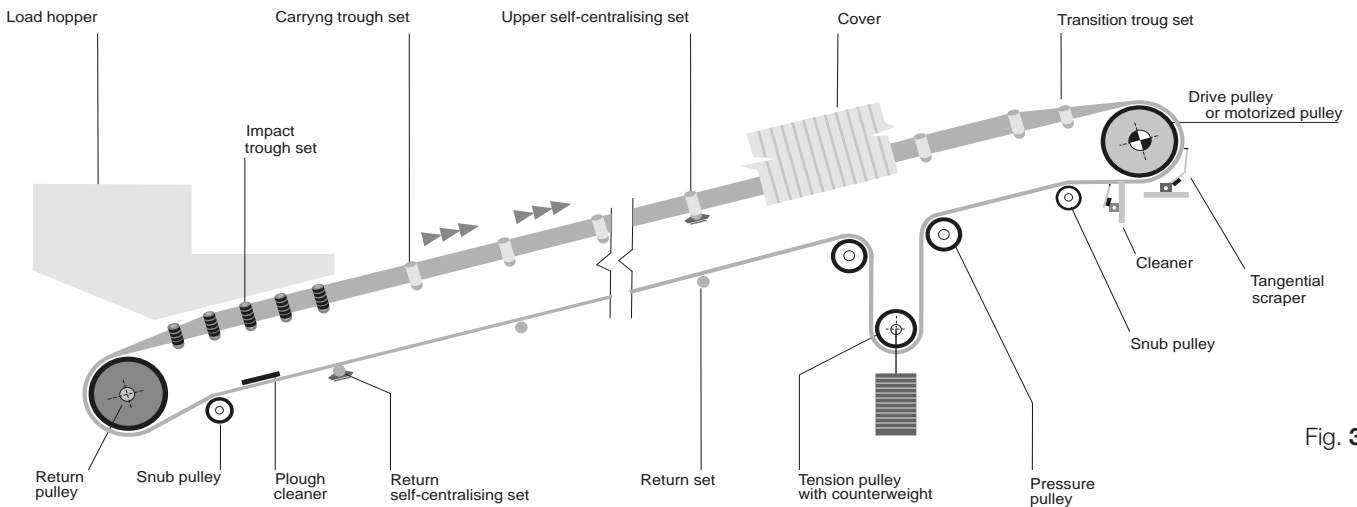
Fig. **3**

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.
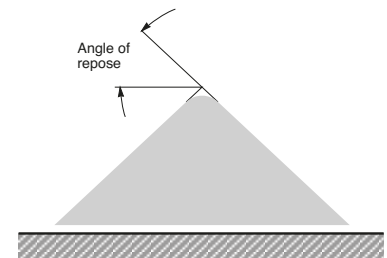
Fig.**4**
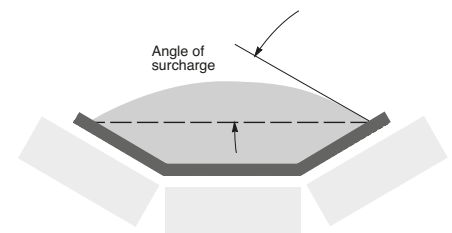
Fig.**5**

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 A_1 to that of the trapezoid A_2.

$$S = A_1 + A_2$$
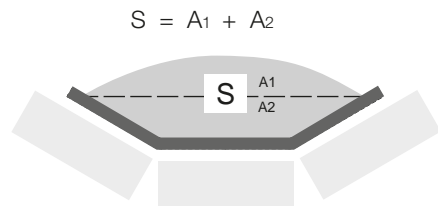
Fig.**6**

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

$$S = \frac{I_{VT}}{3600} \ [\,m^2\,]$$

where:

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

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°	ß

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.**

Technical Information

**project and design criteria
for belt conveyors**

Tab. 2 - Physical properties of materials

Type	Average specific weight qs t/m³	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	1,28-136	80-85	-	A	B
Asphalt, crushed up to13 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 (cromite)	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					
Diacalcium 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		Angle of repose	Abrasive - ness	Corrosive - ness
	t/m³	lbs. / Cu.Ft			
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 cloride, 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

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*Tab.***2 - Physical properties of materials**

Type	Average specific weight qs		Angle of repose	Abrasive-ness	Corrosive-ness
	t/m³	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 asmes	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:

$$q_G = \frac{Iv}{3.6 \times v} \quad [\,Kg/m\,]$$

where:

q_G = weight of material per linear metre

Iv = belt load t/h

v = belt speed m/s

q_G is used in determining the tangential force Fu.

With the increase of speed v it is possible to calculate the average belt load Iv 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**

Lump size 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	2.5	2.3	2	1.65
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	4	3.65	3.15	2.65
400	600	1400	4.5	4	3.5	3
450	650	1600	4.5	4	3.5	3
500	700	1800	5	4.5	3.5	3
550	750	2000	5	4.5	3.5	3
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.

1.5.3 - 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 I_{VT} [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.
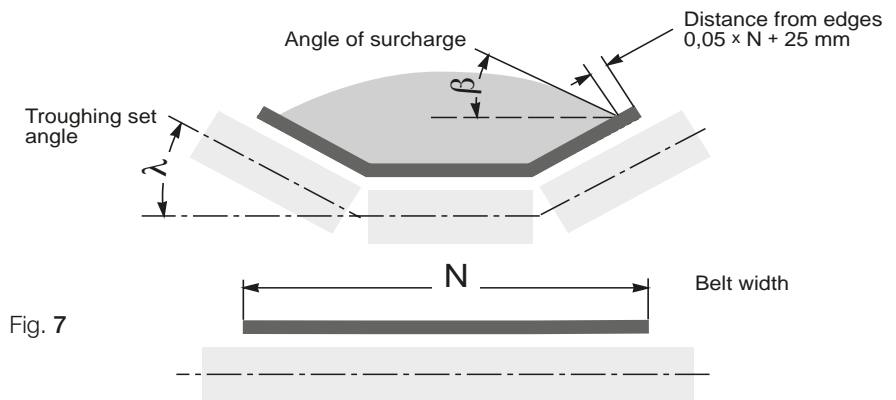
Fig. **7**

All things being equal the width of the belt at the greatest angle corresponds to an increase in the loaded volume I_{VT}.

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	Belt width		
N/mm	λ= 20/25° mm	λ= 30/35°	λ= 45°
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 m/s.

It may be determined from *Tab.* **5**a-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.

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Tab. **5**a **- Loaded volume
with flat roller sets v = 1 m/s**

Belt width mm	Angle of surcharge β	I_{VT} m³/h λ = 0°	Belt width mm	Angle of surcharge β	I_{VT} m³/h λ = 0°
300	5°	2.5	1600	5°	101.3
	10°	5.1		10°	203.2
	20°	10.3		20°	411.3
	25°	13.0		25°	519.0
	30°	15.8		30°	630.1
400	5°	5.0	1800	5°	129.2
	10°	10.1		10°	259.2
	20°	20.5		20°	524.8
	25°	25.8		25°	662.1
	30°	31.3		30°	803.8
500	5°	8.4	2000	5°	160.5
	10°	16.8		10°	322.0
	20°	34.1		20°	652.0
	25°	43.0		25°	822.7
	30°	52.2		30°	998.7
650	5°	15.0	2200	5°	199.3
	10°	30.1		10°	399.8
	20°	60.9		20°	809.6
	25°	76.9		25°	1021.5
	30°	93.3		30°	1240.0
800	5°	23.5	2400	5°	242.3
	10°	47.2		10°	486.0
	20°	95.6		20°	984.1
	25°	120.6		25°	1241.7
	30°	146.4		30°	1507.4
1000	5°	37.9	2600	5°	289.5
	10°	76.0		10°	580.7
	20°	153.8		20°	1175.8
	25°	194.1		25°	1483.5
	30°	235.6		30°	1800.9
1200	5°	55.6	2800	5°	340.8
	10°	111.6		10°	683.7
	20°	225.9		20°	1384.4
	25°	285.0		25°	1746.8
	30°	346.0		30°	2120.5
1400	5°	76.7	3000	5°	396.4
	10°	153.9		10°	795.2
	20°	311.7		20°	1610.1
	25°	393.3		25°	2031.5
	30°	477.5		30°	2466.2

Tab. **5b - Loaded volume**
with 2 roll troughing sets   v = 1 m/s

Belt width mm	Angle of surcharge β	IVT m³/h λ = 20°
300	5°	16,2
	10°	18,5
	20°	23,1
	25°	25,5
	30°	27,9
400	5°	32,2
	10°	36,7
	20°	45,9
	25°	50,6
	30°	55,5
500	5°	53,7
	10°	61,1
	20°	76,4
	25°	84,2
	30°	92,4
650	5°	96,0
	10°	109,4
	20°	136,6
	25°	150,7
	30°	165,2
800	5°	150,6
	10°	171,5
	20°	214,2
	25°	236,3
	30°	259,1
1000	5°	242,4
	10°	276,1
	20°	344,8
	25°	380,4
	30°	417,0
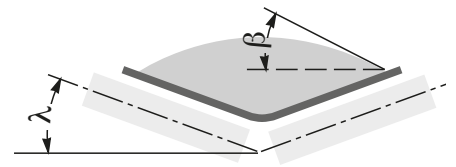
To obtain the effective loaded volume IM at the desired belt speed use:

$$I_M \;=\; I_{VT} \;\times\; V \qquad [\,m^3/h\,]$$

Tab. **5**c **- Loaded volume**
with 3 roll troughing sets   **v = 1 m/s**

Belt width mm	Angle of surcharge β	IVT m³/h				
		λ = 20°	λ = 25°	λ = 30°	λ = 35°	λ = 45°
300	5°	12.5	14.7	16.7	18.4	21.3
	10°	14.9	17	18.9	20.6	23.3
	20°	19.8	21.8	23.5	25	27.2
	25°	22.4	24.3	25.9	27.3	29.3
	30°	25	26.8	28.4	29.7	31.4
400	5°	25.3	29.7	33.8	37.4	43.2
	10°	30.1	34	38	41.7	47
	20°	39.9	43.8	47.4	50.4	54.8
	25°	44.9	48.7	52	54.9	58.8
	30°	50.2	53.8	56.9	59.5	62.9
500	5°	43.2	50.7	57.7	63.8	73.6
	10°	51.1	58.4	65	70.8	79.8
	20°	67.4	74	80.1	85.2	92.6
	25°	75.8	82.3	87.9	92.7	99.2
	30°	84.4	90.7	96	100	106
650	5°	80.3	94.4	107.2	118.6	136.3
	10°	94.4	108	125	131	147.1
	20°	123	136	147	156.3	169.3
	25°	138	150	160	169	180
	30°	153	165	175	182	192.7
800	5°	125.9	148.1	168.2	186	213.8
	10°	148.1	169.5	188.7	205.4	230.8
	20°	193.5	213.3	230	245.1	265.6
	25°	217	235.9	252.2	265.7	283.6
	30°	241.2	259.3	274.6	286.9	302.2
1000	5°	207.5	244.1	277.1	306.1	351
	10°	243.2	278.4	309.8	337.1	377.9
	20°	316	348.5	376.7	400.4	433
	25°	353.7	384.8	411.4	433.1	461.4
	30°	392.5	422.2	447	466.9	490.8
1200	5°	304	357.5	405.9	448	514.3
	10°	356.3	407.9	454	494	554
	20°	463.3	510.9	552.3	587	634.9
	25°	518.6	564.2	603.2	635	676.8
	30°	575.7	619.2	655.7	684	720
1400	5°	424.9	499.7	547.1	626.3	717.2
	10°	497	569	633.3	688.8	771.3
	20°	644.4	710.8	768.4	816.5	881.9
	25°	720.6	784.1	838.8	882.5	939.1
	30°	799.2	859.8	910.4	950.6	998.1
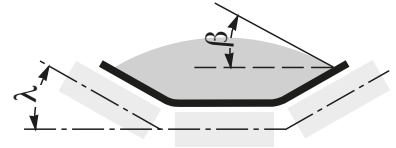
Belt width mm	Angle of surcharge β	I_{VT} m³/h				
		λ = 20°	λ = 25°	λ = 30°	λ = 35°	λ = 45°
1600	5°	564.1	663.4	752.8	831.2	951
	10°	659.2	754.8	839.9	913.4	1022.1
	20°	853.5	941.6	1017.9	1081.4	1167.3
	25°	954	1038.2	1110	1168.2	1242.4
	30°	1057.6	1137.9	1204.9	1257.9	1319.9
1800	5°	723	850.1	964.7	1064.9	1217.6
	10°	844.2	966.7	1075.6	1169.5	1307.9
	20°	1091.9	1204.7	1302.3	1383.3	1492.5
	25°	1220	1327.9	1419.6	1493.9	1587.9
	30°	1352.2	1454.9	1540.5	1608	1686.4
2000	5°	897.3	1055.2	1197.3	1321.7	1511.5
	10°	1047.9	1200	1335.2	1451.8	1623.8
	20°	1355.8	1495.8	1617	1717.6	1853.4
	25°	1515	1648.9	1762.7	1855.1	1972.1
	30°	1679.2	1806.7	1913	1996.9	2094.5
2200	5°	1130.8	1329.5	1508	1663.5	1898.1
	10°	1317.4	1508.7	1678.3	1823.8	2035.7
	20°	1698.7	1874.7	2026.2	2151.3	2317
	25°	1895.9	2064	2206.2	2320.7	2462.4
	30°	2099.3	2259.2	2391.8	2495.4	2612.4
2400	5°	1366.2	1606.4	1822.3	2010.9	2296.8
	10°	1599.2	1824.5	2029.8	2206.4	2465
	20°	2057.2	2270.1	2453.8	2605.9	2808.8
	25°	2297.2	2500.6	2673.1	2812.5	2986.6
	30°	2544.7	2738.3	2899.3	3029.5	3170
2600	5°	1650.6	1940.6	2200.6	2426.9	2767
	10°	1921.4	2200.4	2447.5	2659.1	2965.9
	20°	2474.7	2731.3	2951.9	3133.5	3372.4
	25°	2760.9	3005.8	3212.7	3378.9	3582.7
	30°	3056	3289	3481.8	3631.9	3799.5
2800	5°	1932.9	2272.7	2577.7	2843.6	3244.9
	10°	2252	2579	2868.9	3117.7	3480.3
	20°	2904.1	3205	3464.1	3678	3961.4
	25°	3241.4	3528.7	3771.9	3967.7	4210.3
	30°	3589.2	3862.6	4089.3	4266.6	4469.9
3000	5°	2256.1	2652.5	3008.1	3317.8	3783.9
	10°	2627	3008.4	3346.4	3636	4056.8
	20°	3384.9	3735.8	4037.6	4286.4	4614.5
	25°	3776.9	4111.9	4395.1	4627.7	4902.9
	30°	4181.3	4496.9	4763.8	4969.6	5200.3

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

$$I_M = I_{VT} \times V \quad [m^3/h]$$

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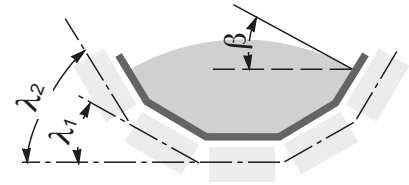
Tab. **5**d **- Loaded volume**
with 5 roll troughing sets **v = 1 m/s**

Belt width mm	Angle of surcharge β	IVT m³/h λ₁ 30° λ₂ 60°	Belt width mm	Angle of surcharge β	IVT m³/h λ₁ 30° λ₂ 60°
800	5° 10° 20° 25° 30°	236.4 252.4 284.6 301.4 318.7	2000	5° 10° 20° 25° 30°	1659 1762.6 1972.7 2081.3 2193.1
1000	5° 10° 20° 25° 30°	381.8 407.8 459 485.8 513.4	2200	5° 10° 20° 25° 30°	2058.2 2186.2 2447.7 2582.9 2722.4
1200	5° 10° 20° 25° 30°	566.8 603.3 678.1 716.7 756.6	2400	5° 10° 20° 25° 30°	2525.5 2678.1 2989.8 3151 3317.3
1400	5° 10° 20° 25° 30°	787.8 837.6 939.5 992.1 1046.4	2600	5° 10° 20° 25° 30°	3030.5 3210.5 3579.4 3770.2 3966.9
1600	5° 10° 20° 25° 30°	1038.8 1104.6 1239.2 1308.8 1380.6	2800	5° 10° 20° 25° 30°	3570.8 3782.9 4216.3 4440.5 4671.7
1800	5° 10° 20° 25° 30°	1324.4 1408.5 1580.4 1669.3 1761	3000	5° 10° 20° 25° 30°	4165.6 4410.5 4910.9 5169.6 5436.6

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

$$I_M = I_{VT} \times V \quad [\ m^3/h\ ]$$

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

In the case of inclined belts, the values of loaded volume I_{VT} [m³/h] are corrected according to the following:

$$I_{VM} = I_{VT} \times K \times K_1 \quad [m^3/h]$$

Where:

I_{VM} is the loaded volume corrected in relation to the inclination and the irregularity of feeding the conveyor in m³/h with v = 1 m/s

I_{VT} 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

Fig.8 - Factor of inclination K
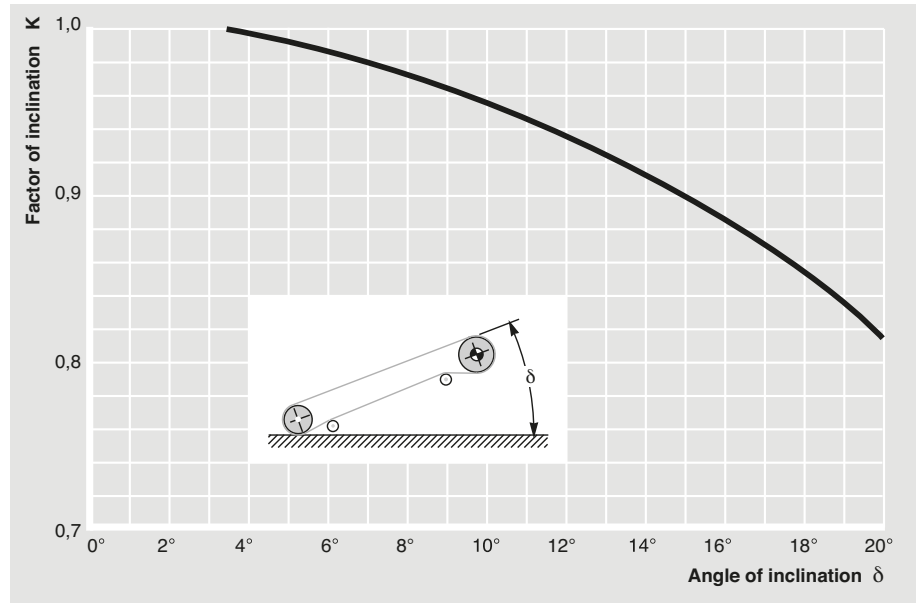
The inclination factor K calculated in the design, must take into account the reduction in section for the conveyed material when it is on the incline.

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.

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:

$$I_M = I_{VM} \times V \quad [m^3/h]$$

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

$$belt\ width \geq max.\ lump\ size$$

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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 2200 mm 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

- parallel roller plain or impact

- roller plain or with rubber rings

- 2 rollers plain or impact

- 2 rollers plain or with rings

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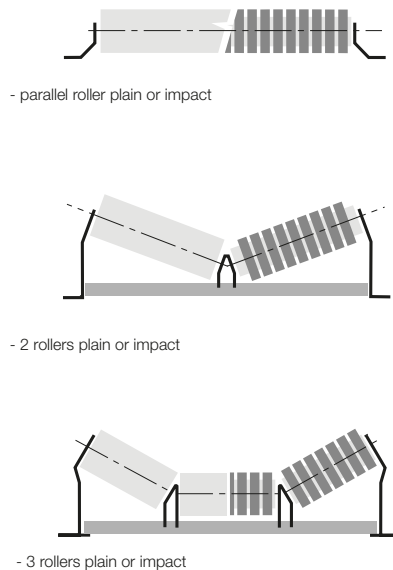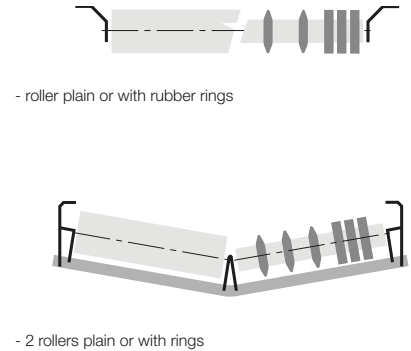
The choice of the most appropriate and correct troughing set installation (one needs to calculate the frictional force between the rollers and the belt itself) is the guarantee for the smooth belt start up and movement.

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**.
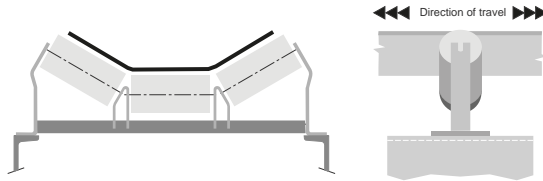
Fig. **11** - For reversible belts

Fig. **10** - Suspension sets "garland"
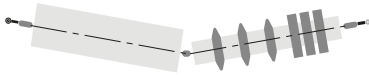
- 2 rollers plain or with rubber rings for return set

- 3 rollers plain for load carrying
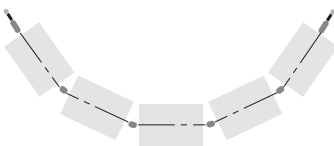
- 5 rollers plain for load carrying
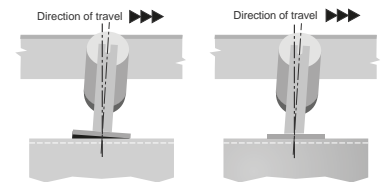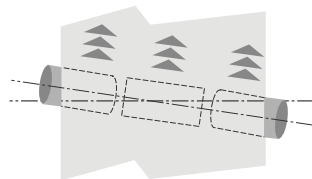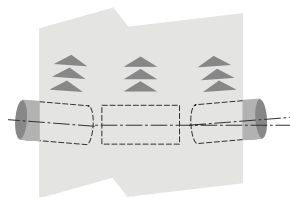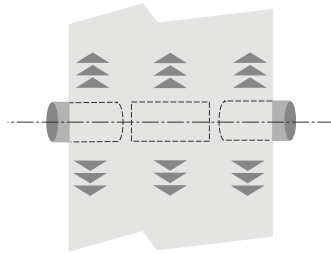
Fig. **12** - Only for single directional belts

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

**project and design criteria
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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).

indicated limits. Above all the pitch is also limited by the load capacity of the rollers themselves.
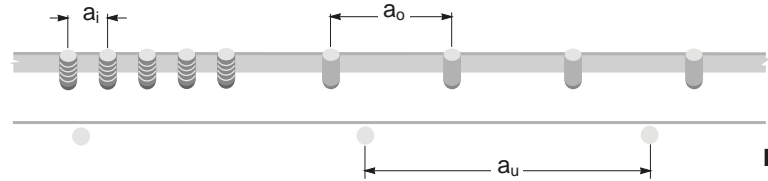
Fig.14

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 the increases the horse power and work, but also increases forces on the rollers, and overall a premature belt surface wear occurs.

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.
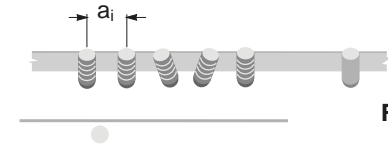
Fig.15

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

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	Pitch of sets			
	upper			**lower**
	specific weight of conveyed material t/m³			
	< 1.2	1.2 ÷ 2.0	> 2.0	
mm	m	m	m	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				

Fig.**19** - **Transition distance**

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**.

Fig.**16**
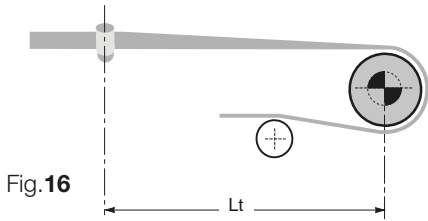
Along this section the belt changes from a trough configuration as determined by the inclination of the rollers of the carrying sets to a flat belt to match the flat pulley and vice versa.
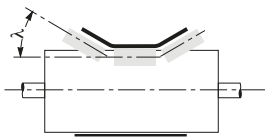
The edges of the belt are in this area placed under an extra force which reacts on the side rollers. Generally the transition distance must not be less than the belt width to avoid excess pressures.
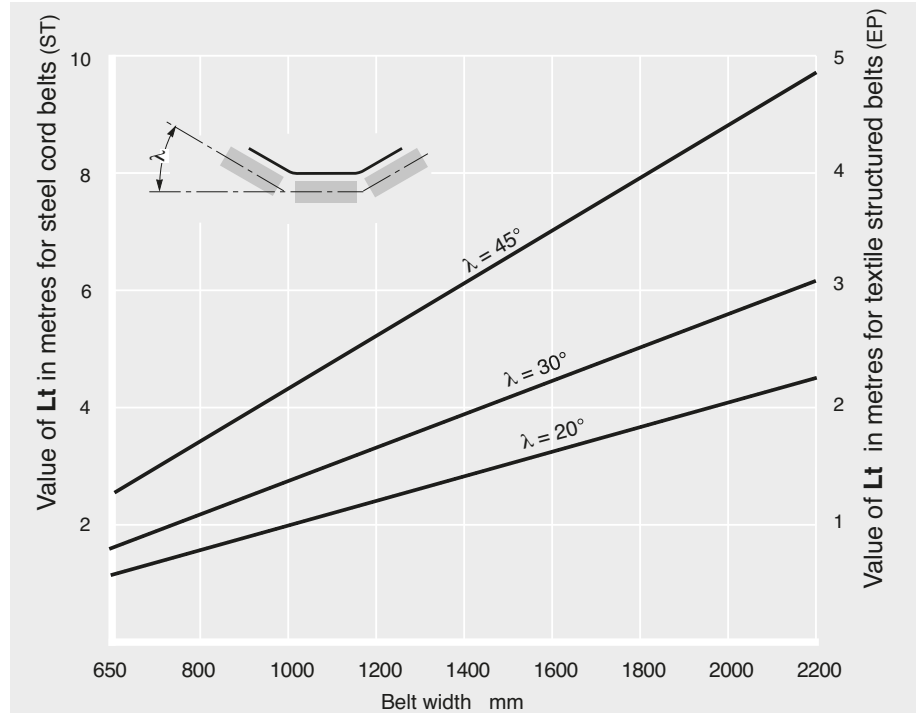
In the case where the transition distance Lt is larger than the pitch of the carrying troughing sets it is a good rule to introduce in this transition area troughing sets with inclined side rollers of gradual reduction in angle (known as transition troughing sets). In this way the belt may change gradually 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) 1400 mm 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 $\lambda=15°$ and 30° at a pitch of 1 metre.

Fig.**17**

Fig.**18**
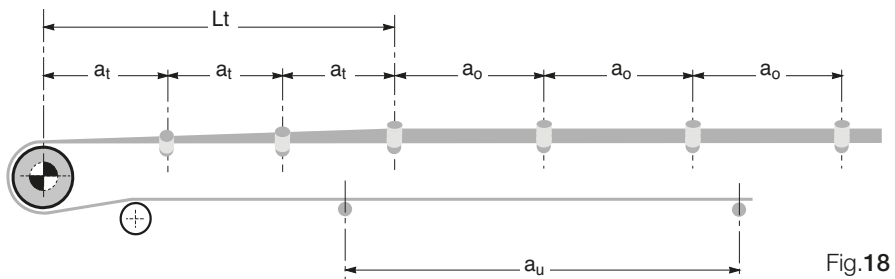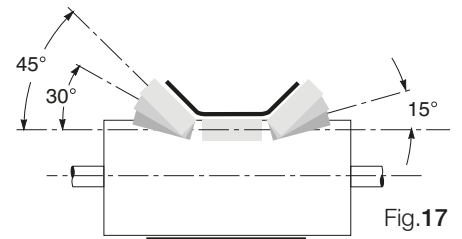
1 Technical
Information
**project and design criteria
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1.5.5 - Tangential force, driving power, passive resistance, belt weight, tensions and checks

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.).
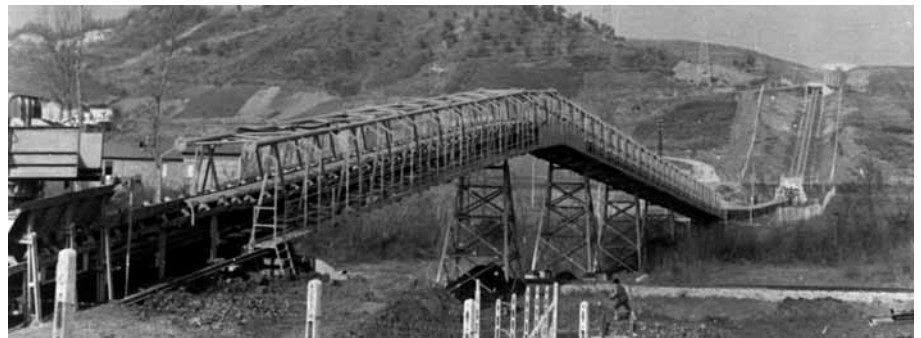
The total tangential force Fu at the drive pulley periphery is given by:

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

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 Fa (tangential force to move the belt, upper strand) and the lesser force Fr (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:

$$F_U = (Fa_1 + Fa_2 + Fa_3 ...) + (Fr_1 + Fr_2 + Fr_3 ...)$$

Where:

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

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

Therefore the tangential force Fa and Fr will be given by:

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

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

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

Fig.20 - Varying altitude profile
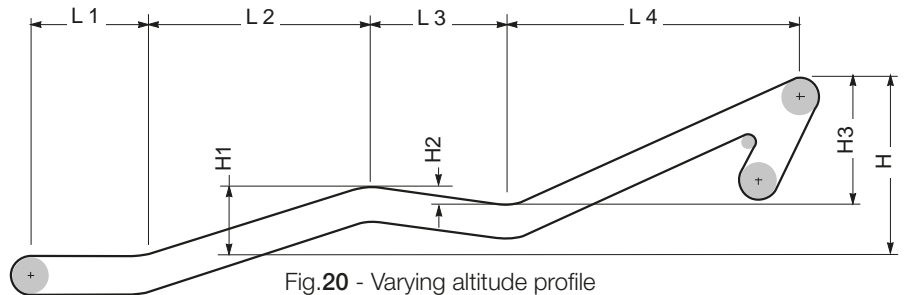
Driving power

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:

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

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°
Fattore C_t	**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	**from 0,023 to 0,027**					
Rotating parts of a conveyor in descent with a brake motor	**from 0,012 to 0,016**					

Belt weight per linear metre q_b

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** q_{bn}

Breaking force of belt N/mm	Belt with textile inserts (EP) Kg/m²	Belt with metal inserts Steel Cord (ST) Kg/m²
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 Kg	Ppri	Pprs	Ppri	Pprs	Ppri	Pprs	Ppri	Pprs	Ppri
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
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Belt tension

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

Tensions T_1 and 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.

Fig.**21**

$$F_U = T_1 - T_2$$

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:

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

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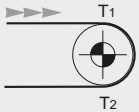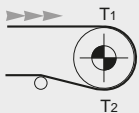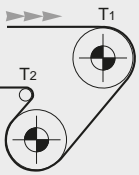
f_a = coefficient of friction between belt and drum, given by the angle of wrap

e = natural logarithmic base 2.718

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

From the above formula we may obtain:

$$T_1 = F_U + T_2$$

$$T_2 = F_U \, \frac{1}{e^{fa} - 1} = F_U \times C_W$$

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.

Tab. **12** gives the value of the wrap factor Cw 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 Cw**

Drive arrangement	Angle of wrap	tension unit or counterweight pulley		screw tension unit pulley	
		unlagged	lagged	unlagged	lagged
T_1 / T_2	180°	0.84	0.50	1.20	0.80
T_1 / T_2	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
T_1 / T_2	380°	0.23	0.11	-	-
	420°	0.18	0.08	-	-

Fig. **22**

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,

$$T_1 = F_u + T_2 \qquad \text{and} \qquad T_2 = F_U \times C_w$$

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:

$$T_3 = T_2 + (Fr_1 + Fr_2 + Fr_3 \ldots) \; [daN]$$
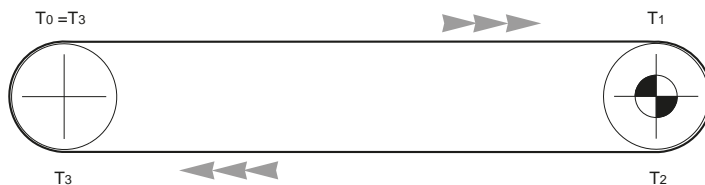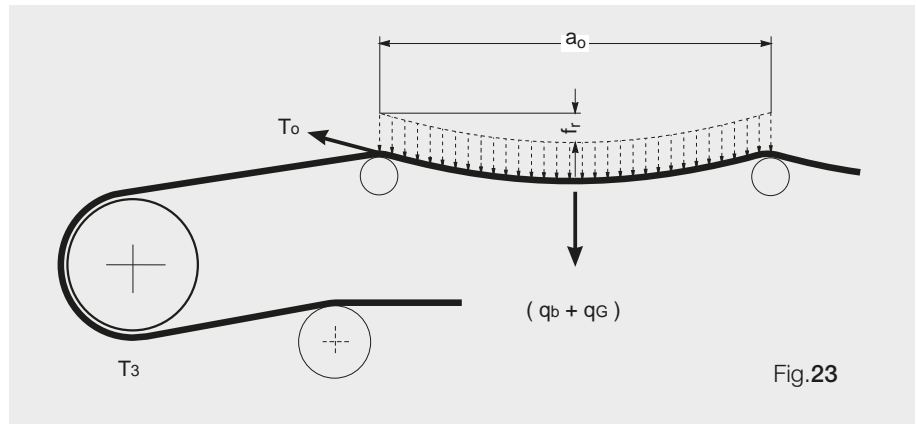
Fig.**23**

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 trasmit 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:

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

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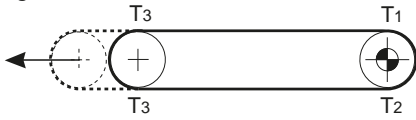
In this arrangement the tension is regulated normally with the occasional periodic check of the tensioning screw.

Fig.25
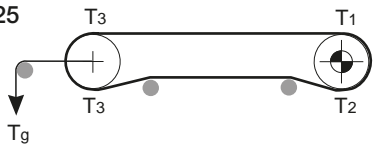
In this arrangement the conveyor is tensioned using a counterweight.

$$Tg \ = \ 2\,(\,T_3\,) \quad [daN]$$

Fig.26
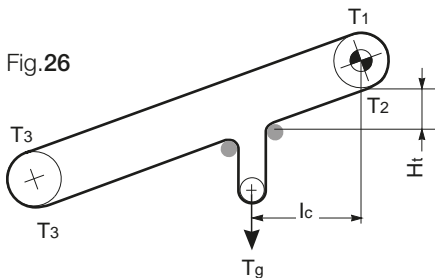
Also in this arrangement the conveyor is tensioned using a counterweight.

$$Tg \ = \ 2T_2 + 2\,[(\,I_C \times Cq \times Ct \times f\,)\,(\,q_b + q_{RU}\,) \pm (\,Ht \times q_b\,)]\,\,0,981 \quad [daN]$$

In which:

I$_C$ = distance from centre of drive pulley to the counterweight attachment point

Ht = 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 T_0 (for the correct deflection of the belt) is less than the calculated tension T_3 the tension T_2 has always to be $T_2 \geq Fu \times Cw$ and is calculated as $T_2 = T_3 \pm Fr$ (where $T_3 \geq T_0$).

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 T_1. 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.

Working load and belt breaking strain

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

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

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).

**project and design criteria
for belt conveyors**

1.5.6 - Belt conveyor drives and pulley dimensions

Type of drives
Conveyors requiring power up to 250 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 250 kW utilise the conventional drive pulley arrangement but also with two or more motor gearboxes.
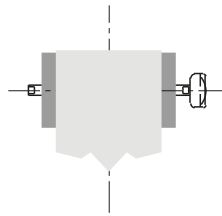
Fig.**27**

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 or 50.000 working hours with synthetic oil).
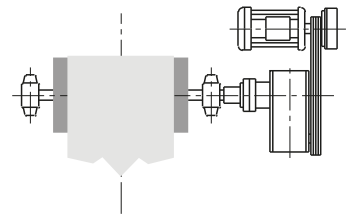
Fig.**28**
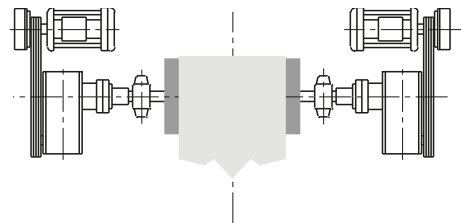
Pulley diameters

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 de-layering of the belt layers or laceration of the reinforcing fabric.
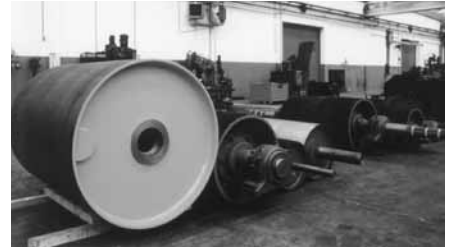
Tab. **13 - Minimum pulley diameters recommended**

Belt breaking load	Belt with textile core EP DIN 22102			Belt with steel core ST DIN 22131		
	Ø motorised pulley	return pulley	direction change	Ø motorised pulley	return pulley	direction change
N/mm	mm		drum	mm		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.

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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 Mf and the torsion moment Mt.

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**.
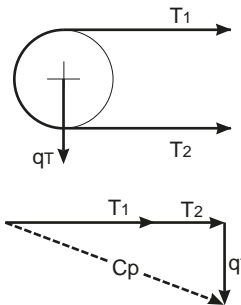
Fig. **29**

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

These are: the resultant of tensions Cp, the bending moment Mf, torsional moment Mt, the ideal bending moment Mif and the module of resistance W.

Proceeding in order we have:

$$Cp = \sqrt{(T_1 + T_2)^2 + q_t^2} \quad [daN]$$

$$Mf = \frac{Cp}{2} \times a_g \quad [daNm]$$

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

where:

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

$$Mif = \sqrt{Mf^2 + 0,75 \times Mt^2} \quad [daNm]$$

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

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

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

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

Tab. **14 -** **Suggested value of** σ

Steel type	daN/mm²
38 NCD	12,2
C 40 Tempered	7,82
C 40 Normalised	5,8
Fe 37 Normalised	4,4
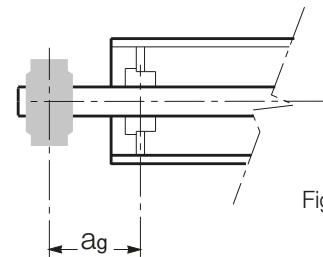
Fig.**30**

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 **Mf** 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:

$$Mf = \frac{Cp_r}{2} \times a_g \quad [daNm]$$

the module of resistance is found from:

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

given the module of resistance:

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

the diameter of the shaft is given by:

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

Fig.**31** - Tail or return pulley

Fig.**32** - Change direction pulley

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 **ft** and the angle αt must respect the relationship:

$$ft_{max} \leq \frac{C}{2000} \qquad \alpha t \leq \frac{1}{500}$$

Fig.**33**
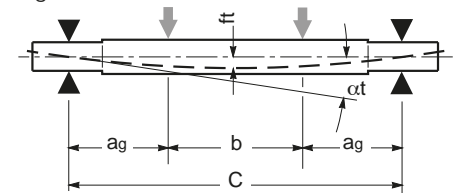
$$ft = \frac{(Cp_r/2)a_g}{24 \times E \times J} [3(b+2a_g)^2 - 4a_g^2] \leq \frac{C}{2000}$$

$$\alpha t = \frac{(Cp_r/2)}{2 \times E \times J} a_g (C - a_g) \leq \frac{1}{500}$$

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])
- Cp_r = load on shaft [daN]
- ft = shaft deflection [mm]
- αt = shaft angle at the pillow blocks [rad]
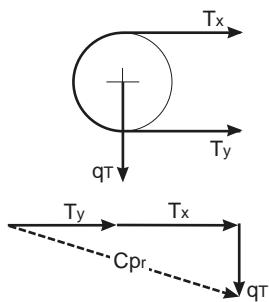
1.6 - Rollers, function and design criteria

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;
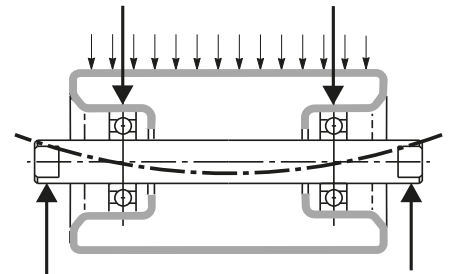
Fig.**34**

• 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:

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

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

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.

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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
Fp	= participation factor of roller under greatest stress see *Tab.* **17**	
	(depends on the angle of the roller in the transom)	
Fd	= impact factor see *Tab.* **20** (depends on the material lump size)	
Fs	= service factor see *Tab.* **18**	
Fm	= environment factor see *Tab.* **19**	
Fv	= speed factor see *Tab.* **21**	

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

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

Tab. **18 - Service 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	1.50
300 ÷ 450 mm	1.20	1.32	1.50	1.70	1.90	2.30	2.80

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	1.00

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	---	---

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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 troughing set using the following formula:

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

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

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

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):

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

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

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

The dynamic load on the return roller set will be:

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

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

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

Given the values of "ca" and "cr" one may look in the catalogue for rollers (first by diameter) that have a sufficient load capacity.
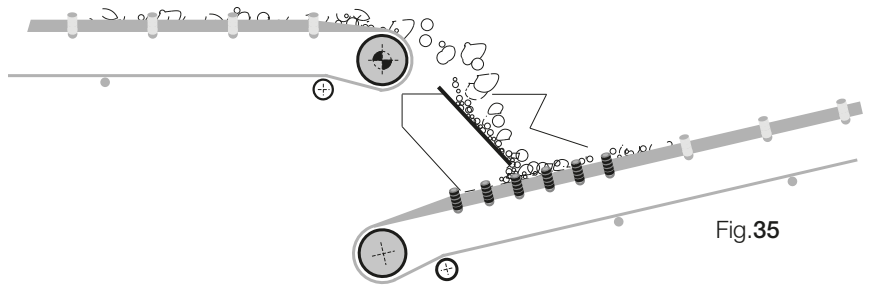
Fig.**35**

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.
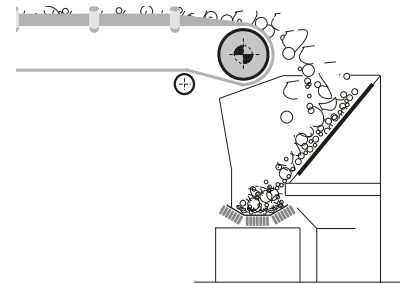
Fig.**36**

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).
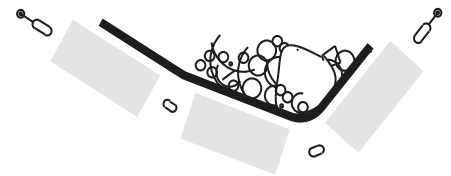
Fig.**37**
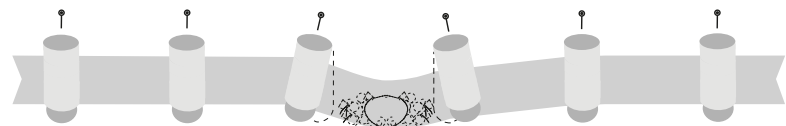
Fig.**38**

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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;

NO
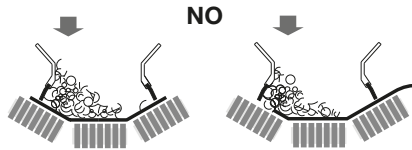
- the loading hopper is positioned so that material falling from it is deposited as near as possible to the centre of the belt;

Fig.**39**
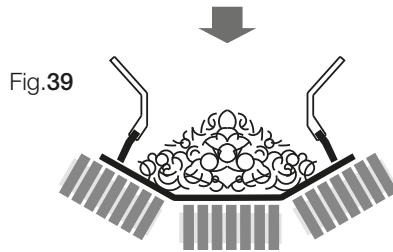
- the height that the material falls must be reduced to the minimum possible, compatible with the requirements of the plant design.
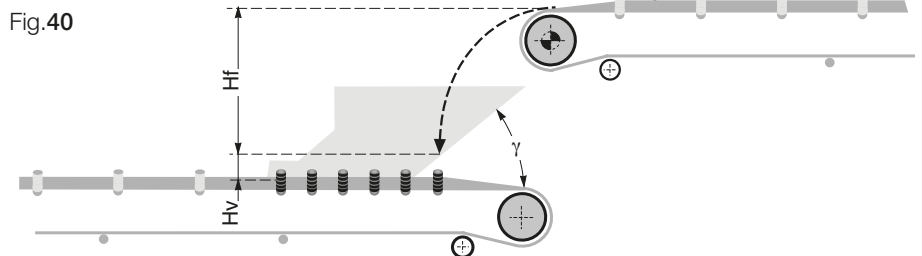
Please refer to chapter 3 of this catalogue for greater detail regarding the programme of the design of impact rollers with rubber rings of high shock absorbing qualities and for the programme of suspension sets as "garland" design.

1.7.1 - Calculation of associated forces on impact rollers

The definition of the correct load fall height Hc may be given by the folowing formula:

$$Hc = Hf + Hv \times sen^2\gamma$$

where:

- Hf = fall height from the upper face of the loading belt to the contact point of material contained in the hopper;
- Hv = 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:

- constant loading with uniform fine material;

- loading with material consisting of large lumps.

Fig.**40**

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 pi, given the corrected fall height, is calculated according to the following formula:

$$pi \cong lv \times \frac{\sqrt{Hc}}{8} \quad [Kg]$$

where:

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

The force acting on the central roller pic, clearly the roller with the most stress, is obtained on consideration of the previously mentioned participation factor Fp. Various factors depend principally on the angle λ wich is the side roller angle:

$$pic \cong Fp \times pi = Fp \times lv \times \frac{\sqrt{Hc}}{8} \quad [Kg]$$

One assumes as a rule:

Fp = 0.65 per λ = 30°
Fp = 0.67 per λ = 35°
Fp = 0.72 per λ = 45°

Example:

Let us calculate the central roller load in a transom, given that the loading of the material onto the belt is:
lv = 1800 t/h, Hc = 1.5m and λ = 30°:

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

On the central roller we have:
pic = $Fp \times pi$ = 0.65 × 275 = 179 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 pd on the central roller may be calculated using Gm which is the weight of large blocks of single lumps of material and takes into account the elasticity Cf of the transom and rollers.

$$pd \cong Gm + \sqrt{(2 \times Gm \times Hc \times Cf)} \quad [Kg]$$

where:

Gm = weight of large lumps of material [Kg]
Hc = corrected fall height [m]
Cf = 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 Gm x Hc.

The graph shows above all the static load on the roller bearings derived from Gm x Hc 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 rolers, 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 pd must fore cast an accurate valuation of these factors.

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

Calculation of the drop energy:
Gm x Hc = 100 × 0.8 = 80 Kgm

Calculating from the table the dynamic force of fall:
pd = 1800 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 PSV/7-FHD (bearings 6308; Co = 2400 Kg).

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Fig.**41 - Weight of lump of material**
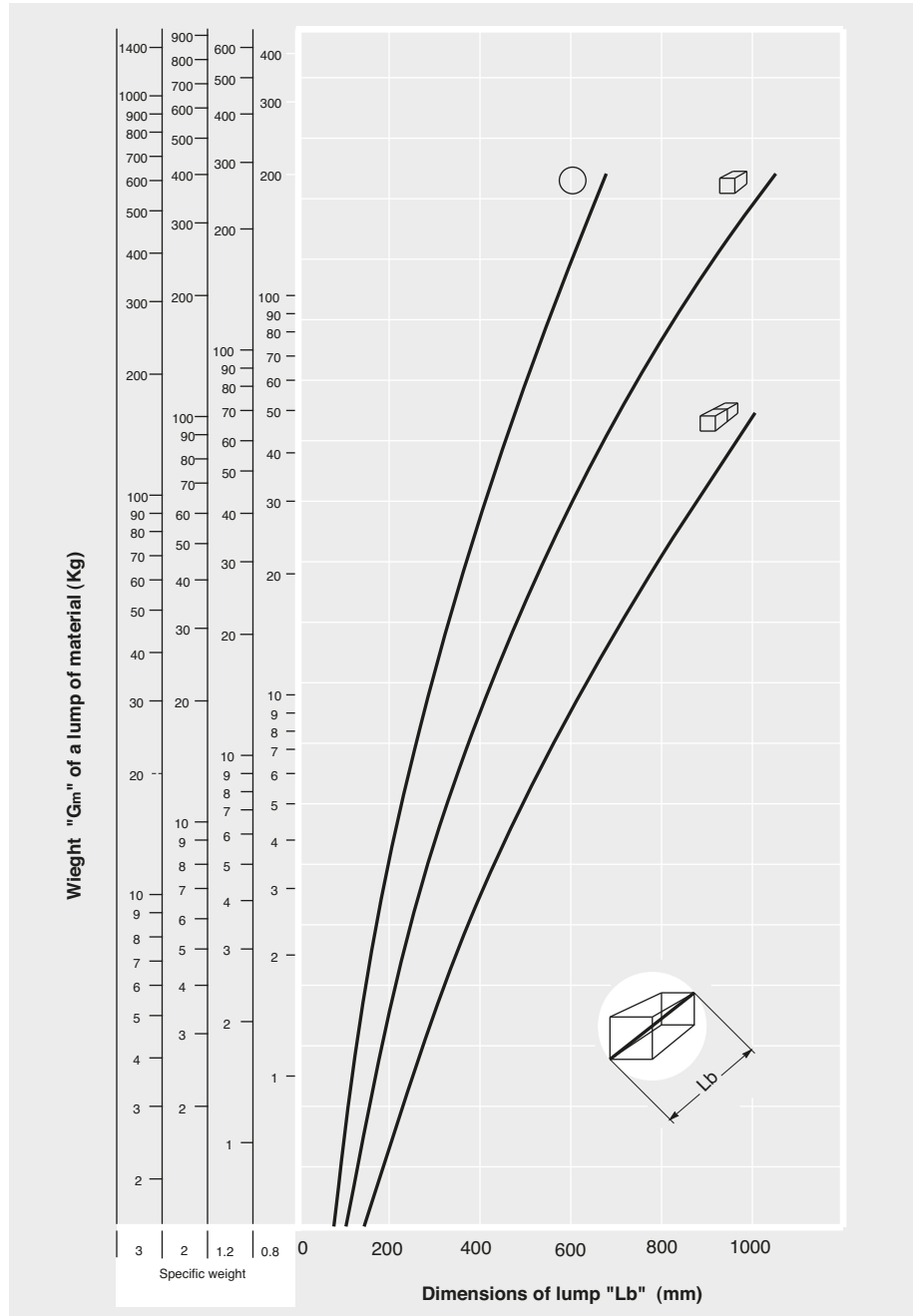
Fig.42 - Constant of elasticity   Cf
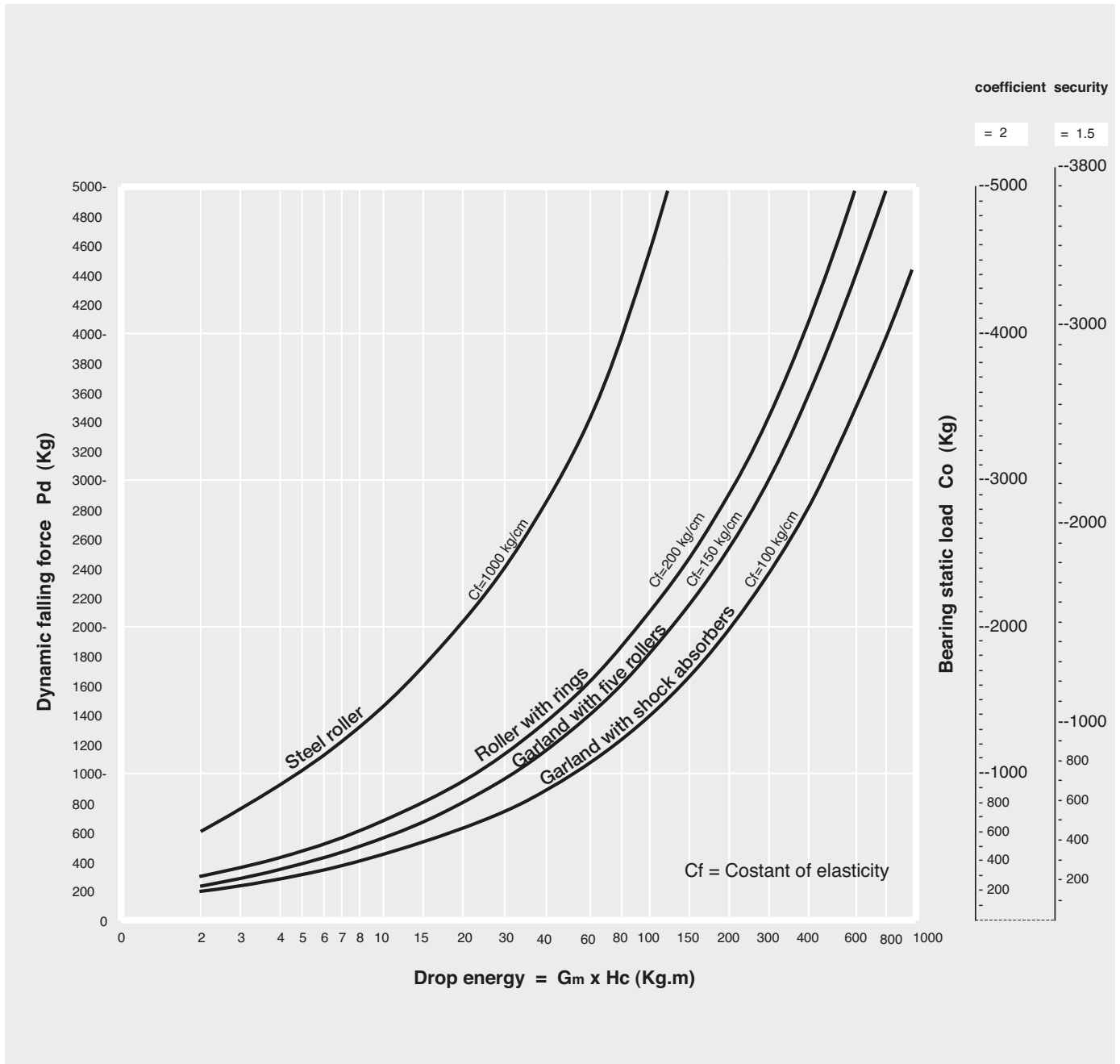
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1.8 - Other accessories

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.

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.

There are a variety of devices used for belt cleaning. The majority of these may be divided into two groups: static and dynamic.
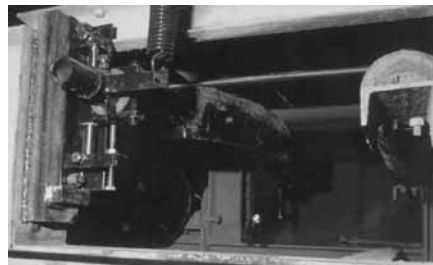
Fig.**44**

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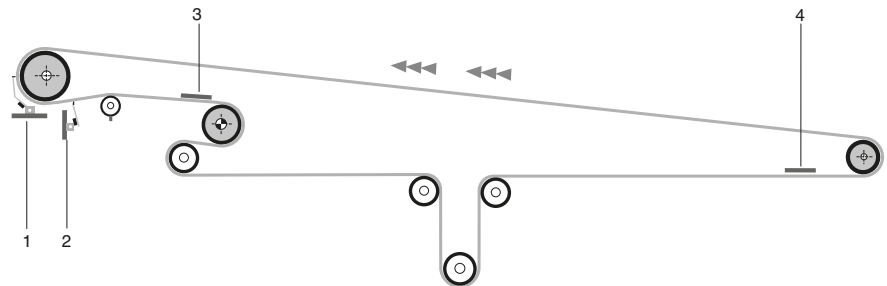
Fig.**43** - Ideal positions for the installation of cleaning devices

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.
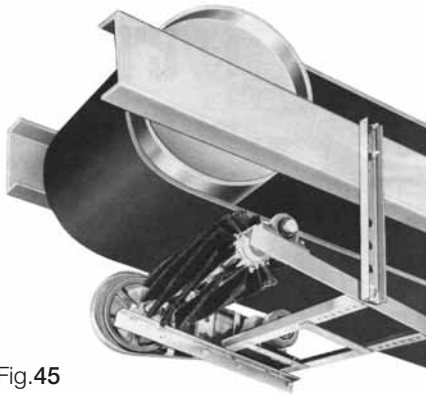
Fig.**45**

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.
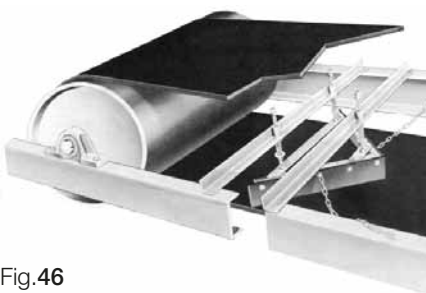
Fig.**46**

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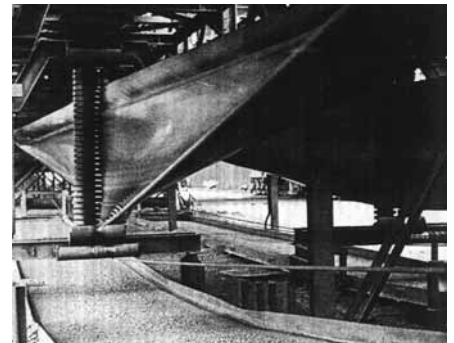
Turning the belt over is generally effected by means of a series of rollers orientated as required. The minimum length to turn over a belt is generally about 14/22 times its width.

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.

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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:
I_V = 1000 t/h corresponding to the volumetric load
I_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 I_M required as 833 m³/h.

To obtain the result one must calculate the volumetric load I_{VT} (for the speed v = 1m/s) given the inclination of the conveyor δ = 6°.

$$I_{VT} = \frac{I_M}{v \times K \times K_1} \quad [m^3/h]$$

in which:

I_M = volumetric load

v = belt speed

K = crrection 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:

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

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 $\lambda = 30°$, the belt width that meets the load requirement I_{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:

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

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

the dynamic load will be:

$$Ca^1 = Ca \times Fd \times Fs \times Fm \quad [daN]$$

$$Ca^1 = 153,8 \times 1,03 \times 1,1 \times 1 = 174,2$$

where:
Fd = 1,03 from table 20 pag.51
Fs = 1,1 from table 18 pag.51
Fm = 1 from table 19 pag.51

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

$$ca = Ca^1 \times Fp \quad [daN]$$

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

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:

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

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

the dynamic load will be:

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

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

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:

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

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

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 carring and return idlers both of loaded and return belt (see Chapter 2):

- rollers for carrying idlers type PSV/1-FHD, ø 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-FHD, ø 108 mm, with bearings 6204, length C = 1158 mm with load capacity 101 Kg that satisfies the required loading of 31,2 Kg.

**project and design criteria
for belt conveyors**

Tangential force and absorbed power

We may now determine the total tangential force Fu 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)

Cq = 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)

Ct = 1 coefficient of passive resistance given by the temperature
(for q_{RO} - q_{RU} see *Tab.11* pag.39)

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

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

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

The total tangential force Fu is given by the algebraic sum of the tangential forces Fa and Fr relative to upper and lower sections of belt for which:

$$Fu = Fa + Fr \quad [daN]$$

Fa = [L x Cq x f x Ct (q_b + q_G + q_{RO}) + H x (q_G + q_b)] x 0,981 [daN]
Fa = [150x1,5x 0,017x 1 (9,9+120,8+14,8)+15 x (120,8+9,9)]x 0,981 = 2469

Fr = [L x Cq x f x Ct (q_b + q_{RU}) - (H x q_b)] x 0,981 [daN]
Fr = [150 x 1,5 x 0,025 x 1 (9,9 + 4,4) - (15 x 9,9)] x 0,981 = - 92

Fu = Fa + Fr = 2469 + (- 92) = 2377

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

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

Tensions T1 - T2 - T3 - T0 -Tg

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:

$$T_2 = F_u \times C_w \quad [daN]$$

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

The maximum tension upstream of the drive pulley will be:

$$T_1 = F_u + T_2 \quad [daN]$$

$$T_1 = 2377 + 998 = 3375$$

While the tension downstream of the return pulley is:

$$T_3 = T_2 + F_r \quad [daN]$$

$$T_3 = 998 - 92 = 906$$

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

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

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

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:
$T_2 = 1053$ [daN]
$T_1 = 3430$ [daN]

One may now determine the tension "Tg" 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 Tg necessary to maintain the system in equilibrium is given by:

$$T_g = 2 \times T_3 \quad [daN]$$

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

Belt choice

Given the maximum working tension of the conveyor: $T_1 = 3375$ daN.

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

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

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

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

$$T_2 = 1053 \ daN$$
$$T_1 = 3430 \ daN$$

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 r.p.m.

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).

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

The bending moment will be:

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

The torsional moment will be:

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

One may now determine the ideal bending moment:

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

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

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

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

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

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 110 mm.

Diameter of return pulley shaft

Non-drive pulley data:

$$D = 315 \text{ mm} \quad \text{diameter (as } \textit{Tab.}\textbf{13)}$$
$$q_R = 170 \text{ daN} \quad \text{pulley weight}$$
$$a_g = 0{,}180 \text{ m} \quad \text{distance between the support and pulley flange}$$

Let us determine the resultant Cpr of the tensions and the pulley weight (for simplicity let us suppose T_3 and q_T is perpendicular between them).

$$\text{Cpr} = \sqrt{(2T_3)^2 + q_T^2} \quad [\text{daN}] \qquad = \sqrt{(2 \times 961)^2 + 170^2} = 1930 \text{ daN}$$

The bending moment will be:

$$\text{Mf} = \frac{\text{Cpr}}{2} \times a_g \quad [\text{daNm}] \qquad = \frac{1930}{2} \times 0{,}180 = 174 \text{ daNm}$$

Consequently we derive the value of the module of resistance W given that σ_{amm} 7,82 daN/mm^2 for heat treated steel C40

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

from which we may find the diameter of idler return pulley shaft:

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

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 page 47 and in this case the raw shaft diameter results 90 mm.

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 m/s

- carrying troughing sets with side rollers
  at λ = 30°

- 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-FHD, Ø 108 mm,
  C = 388 mm

- return rollers
  series PSV/1-FHD, Ø 108 mm,
  C = 1158 mm

- power needed to move the belt
  conveyor 64 kW

- belt deflection between two
  adjacent troughing sets < 2%

- drive pulley
  D = 400 mm,
  Ø shaft 100 mm (at the bearing seats and
  Ø 110 of the raw shaft in the middle)

- return pulley
  D = 315 mm,
  Ø shaft 65 mm (at the bearing seats and
  Ø 90 of the raw shaft in the middle)

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

2.1 - Various industry uses

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

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

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

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

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

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

2.2 - Rollers, technical design and data

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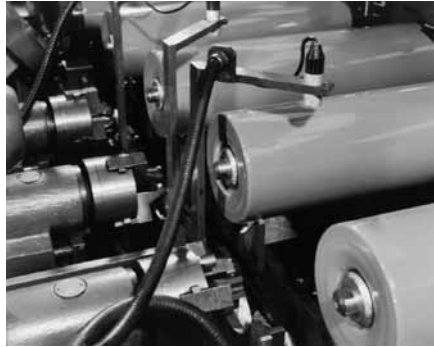
Roller body

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

Fig. **1**
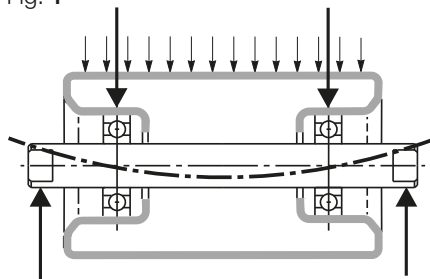
The design of the housings, of strong and rigid construction, has been developed using a computerised system that determines their thickness in relation to the maximum load required for various types of rollers.

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

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

Fig. **2**
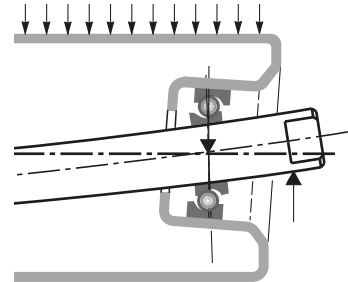
This type of bearing is today the most utilised in conveyor rollers, because it has a high tolerance to axial load and a low resistance to movement and rotation.
In all, together with lubrication, permanent and for life, a long working life results.
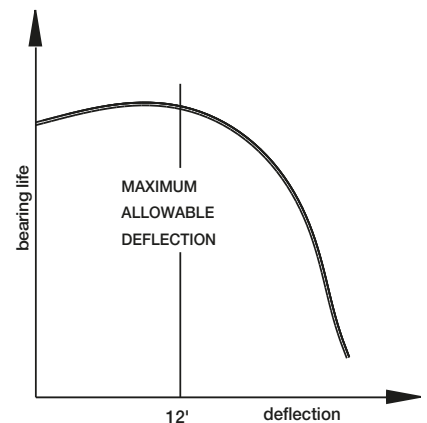
Fig. **3** - Deflection curve of bearings with C3 play.

Spindle

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

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

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

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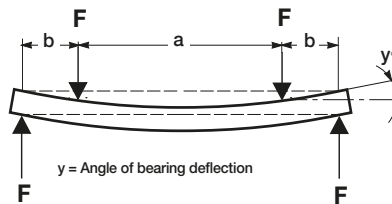
Rulmeca rollers are designed to sustain (to the maximum load conditions as stated in the relevant tables) a dynamic load, calculated according to the roller type, of 30,000 or 10,000 hours of life (for greater life see the relevant tables), with a spindle that is designed to be underloaded and which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

Balance

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

The out of balance force of a roller at low speed does not have a great effect, but when medium speeds (1,5/2 m/sec) are used, vibrations may be induced which may damage the bearings and which may some times make the roller jump out of its transom supports.
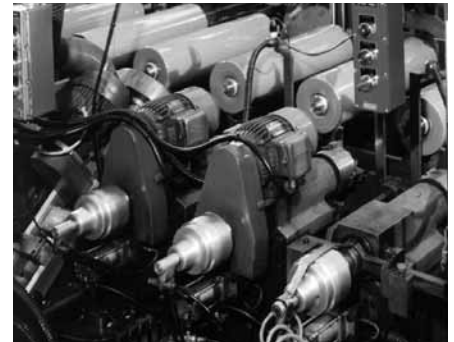
The high quality end machining of the roller and of the roller body, the numerically controlled welding machine, the accuracy of assembly and the live testing, are all guarantees of the optimum balancing of Rulmeca rollers.

Sealing and lubrication

A quality roller is characterised by its effective sealing system.

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

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

All Rulmeca rollers are self-lubricated for life.

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

2 Rollers

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

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

- load capacity and life;

- hermetic sealing of rollers: stationary and in rotation;

- hermetic sealing against dust;

- resistance to rotation and to start up;

- tests to withstand ambient temperatures -70°C to +200°C;

- inspection of the welding by tests using magnetoscope and penetrating liquids.

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

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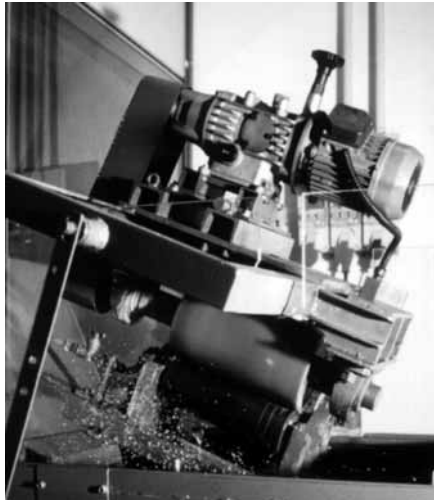
Machine for the dynamic hermetic test against water or dust ingress.

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

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

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

2 Rollers

2.3 - Selection method

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

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

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

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

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

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

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

2.3.1 - Choice of diameter in relation to speed

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

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

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

where:

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

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

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

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

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

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

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

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

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

2.3.2 - Choice of the type in relation to load

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

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

The first value to define is the load on the troughing set transom. Following this, according to the type of troughing set their angle, the lump size of material and various other operating factors which are listed below, one is able to determine the load that exists on the most stressed roller for each type of troughing set.

Besides this, we may provide various corrective coefficients that take into account the number of daily working hours of the equipment (service factors), the environment conditions and the speed for different roller diameters.

The load values obtained in this way may then be compared to the indicated roller load from the catalogue, valid for a project life of 30,000 hours.

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

Principal operating factors:

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
Fp	=	participating factor of the highest stressed roller see **Tab.17**	
		(depends on the side angle of the roller in transom)	
Fd	=	shock factor see **Tab.20** (depends on lump size of material)	
Fs	=	service factor see **Tab.18**	
Fm	=	ambient factor see **Tab.19**	
Fv	=	speed factor see **Tab.21**	

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

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

Tab. 18 - Service factors

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

Tab. 19 - Environmental factors

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

Tab. 20 - Shock factor Fd

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

Tab. 21 - Speed factors Fv

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

Tab. 22 - Coefficient of theoretical bearing life

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

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:

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

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

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

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

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

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

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

The dynamic load on the return set will be:

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

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

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

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

Example:

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

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

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

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

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

The dynamic load will be:

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

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

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

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

$$ca = 294 \times 0.65 = 191 \ daN$$

On the return set the static load is given by:

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

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

The dynamic load will be:

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

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

therefore the roller load will be:

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

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

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

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

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

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

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

We therefore select the series PSV with rings that have sufficient load capacity. The basic roller will be ø 89 with rings $ø_e$ 133 and the ordering code is PSV/1-FHD, 20F14, 133NL, 1408 (see section 2.6.2).

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

In the case where the conveyor is very long (let us say over 300 m) we advise the choice of a double roller "V" return set that helps the belt to self-centralise. In this case we may select rollers type PSV/1-FHD, 20F14, 133NC, 708.

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

2.4 - 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 upple-mentary abbreviations as shown in the relative tables;

- roller length **C**.
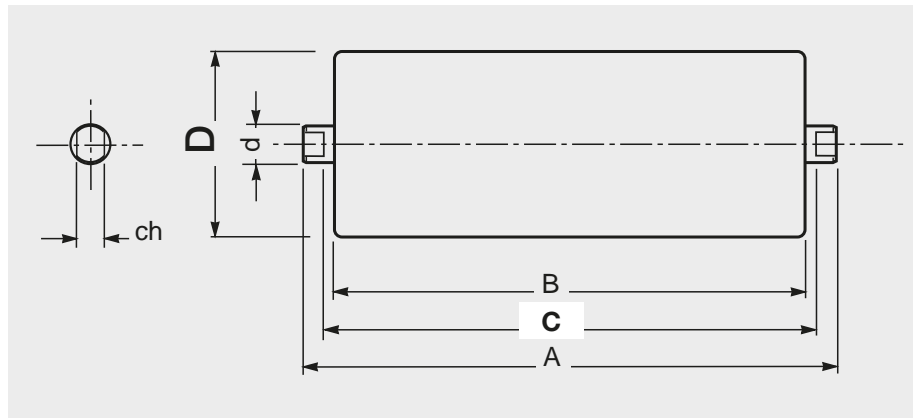
Example:				PSV	1	20	F *	_	108	N	_ _ _	_323
Series												
Type												
Spindle diameter												
Spindle design												
Special spindle design												
Roller diameter												
Basic tube design												
Special tube design												
Length **C**												

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

In the first column of the table abbreviations are indicated according to the basic roller designs.

There are supplementary designs possible as indicated in the table, as long as the corresponding abbreviations are not represented in the same column.

In the indication of the ordering code abbreviations are listed according to the horizontal column order.

Tube designs

Basic Abbrev.	Supplementary		Description	Note
N			steel S235JR (EN10027-1), ex Fe360 (EN 10025), St37 (DIN 17100)	Standard
I			stainless steel AISI 304	Optional
PE			HDPE high density polyethilene - black colour	Standard
V			rigid PVC - colour grey - RAL 7011	Standard
S			spiral metal cage	Standard
J			electrolytic zinc - colour grey - 10 micron thickness	Standard
	T		rilsan coated - colour grey - PA 11- thickness 100/150 micron	Optional
	Y		degreased - painted: electrostatic epoxy polyester powder coating - 40 - 70 microns	Optional
		A	flat rubber rings for impact rollers	Standard
		G	pointed rubber rings for flat return rollers	Standard
		L	mixed design rubber rings for flat return rollers	Standard
		C	mixed design rubber rings for "V" design return rollers	Standard
		M	helical form rubber rings	Standard
		PU	Polyurethane coating-orange colour-hardness 90 Sh. (different colour and hardness on request)	Optional
		R	rubber covered - anti ageing - anti ozone - colour black - black vulcanised - hardness 70/75 Sh A - turned - thickness as required	Optional

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

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

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

Spindle design

Basic abbreviation   Arrangements

F **with flats**

d	=	20	25	30	40
ch	=	14	18	22	32
e	=	4	4	4	4
g	=	9	12	12	12
f	=	13	16	16	16
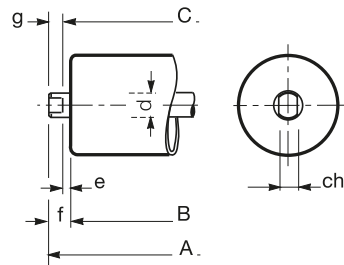
Y **with internal flats**

d	=	15	20	25	30	40
ch	=	11	14	18	22	32
e	=	4	4	4	4	4
g	=	5	8,5	11,5	11,5	11,5
u	=	4	4	4	4	4
f	=	13	16,5	19,5	19,5	19,5
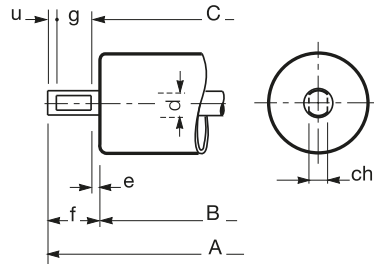
B **with bush ***   **N**   **G** & **Q**

				N	G & Q	
d	=	15	15	20	20	15
ch	=	14	17	30	30	30
d$_1$	=	20	20	35	37	37
e	=	4	4	5	4	4
g	=	9	9	10	9	9
f	=	13	13	15	13	13
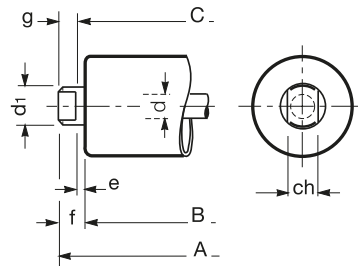
K **orthogonal hole (for garlands)**

d	=	15	20	25	30	40
u	=	7	10	12	16	16
f	=	17	24	28	36	38
ø	=	6,3	8,3	10,3	14,5	16,5
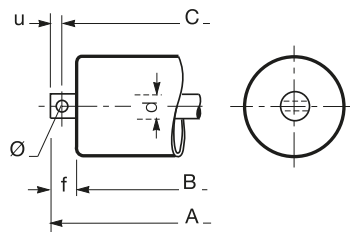
* B = metal bush   **N** = polycarbonate bush   **G** = nylon bush   **Q** = nylon bush

M male threaded

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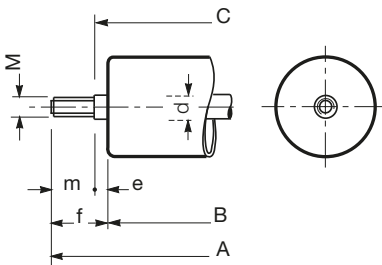
R female threaded

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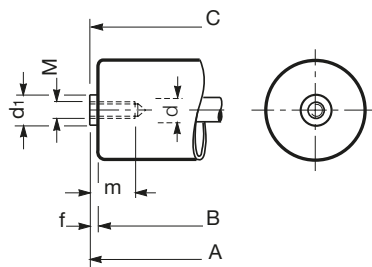
S plain

d	=	15	20	25	30	40
f	=	13	13	13	16	16
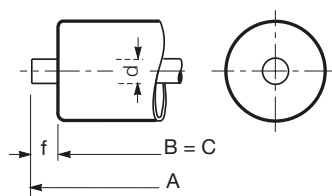
S_1 with diameter reduction

d	=	15	20	25	30	40
d_1	=	as required				
f	=	as required (g + e)				
g	=	as required (f - e)				
e	=	as required (f - g)				
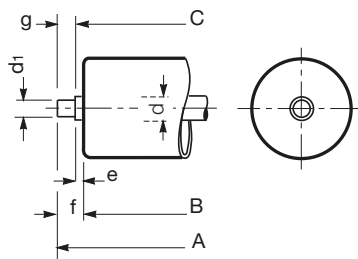
Spindle extensions that are not symmetrical, dimensions of flats "ch" that are different to the designs shown in the table, are all possible but should be specified clearly in the order with a sketch.

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

Belt speed m/s — PSV/1-FHD columns: 1, 1.5, 2, 2.5, 3, 3.5, 4 · PSV/2-FHD columns: 1, 1.5, 2, 2.5, 3, 3.5, 4, 4.5 · PSV/3-FHD columns: 1, 1.5, 2, 2.5, 3, 3.5, 4, 4.5

Ø mm	BW a	BW b	BW c	C mm	P1·1	P1·1.5	P1·2	P1·2.5	P1·3	P1·3.5	P1·4	P2·1	P2·1.5	P2·2	P2·2.5	P2·3	P2·3.5	P2·4	P2·4.5	P3·1	P3·1.5	P3·2	P3·2.5	P3·3	P3·3.5	P3·4	P3·4.5
89			400	168	179	157	142	132	124			274	240	218	202	190											
	300	500	650	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			
	500	800		323	179	157	142	132	124			274	240	218	202	190				404	353	321	298	280			
	300	650	1000	388	179	157	142	132	124			274	240	218	202	190				404	353	321	298	280			
		800	1200	473	179	157	142	132	124			274	240	218	202	190				404	353	321	298	280			
	400			508	179	157	142	132	124			274	240	218	202	190				404	353	321	298	280			
			1400	538	179	157	142	132	124			274	240	218	202	190				404	353	321	298	280			
	500	1000	1600	608	179	157	142	132	124			274	240	218	202	190				404	353	321	298	280			
		1200		708	173	157	142	132	124			274	240	218	202	190				404	353	321	298	280			
	650			758	161	157	142	132	124			274	240	218	202	190				392	353	321	298	280			
		1400		808	150	150	142	132	124			274	240	218	202	190				367	353	321	298	280			
		1600		908	133	133	133	132	124			274	240	218	202	190				327	327	321	298	280			
	800			958	126	126	126	126	124			274	240	218	202	190				310	310	310	298	280			
	1000			1158	104	104	104	104	104			267	240	218	202	190				259	259	259	259	259			
	1200			1408	85	85	85	85	85			224	224	218	202	190				218	218	218	218	218			
	1400			1608	75	75	75	75	75			201	201	201	201					194	194	194	194	194			
	1600			1808								183	183	183	183					177	177	177	177	177			
108			400	168	191	167	152	141	133	126		293	256	232	216	203	193										
	300	500	650	208	191	167	152	141	133	126		293	256	232	216	203	193			431	376	342	317	299	284		
	400	650		258	191	167	152	141	133	126		293	256	232	216	203	193			431	376	342	317	299	284		
	500	800		323	191	167	152	141	133	126		293	256	232	216	203	193			431	376	342	317	299	284		
	300	650	1000	388	191	167	152	141	133	126		293	256	232	216	203	193			431	376	342	317	299	284		
		800	1200	473	191	167	152	141	133	126		293	256	232	216	203	193			431	376	342	317	299	284		
	400			508	191	167	152	141	133	126		293	256	232	216	203	193			431	376	342	317	299	284		
			1400	538	191	167	152	141	133	126		293	256	232	216	203	193			431	376	342	317	299	284		
	500	1000	1600	608	191	167	152	141	133	126		293	256	232	216	203	193			431	376	342	317	299	284		
		1200		708	170	167	152	141	133	126		293	256	232	216	203	193			404	376	342	317	299	284		
	650			758	158	158	152	141	133	126		293	256	232	216	203	193			375	375	342	317	299	284		
		1400		808	147	147	147	141	133	126		293	256	232	216	203	193			351	351	342	317	299	284		
		1600		908	130	130	130	130	130	126		293	256	232	216	203	193			310	310	310	310	299	284		
	800			958	123	123	123	123	123	123		293	256	232	216	203	193			294	294	294	294	294	284		
	1000			1158	101	101	101	101	101	101		249	249	232	216	203	193			242	242	242	242	242	242		
	1200			1408	82	82	82	82	82	82		205	205	205	205	203	193			199	199	199	199	199	199		
	1400			1608	72	72	72	72	72	72		180	180	180	180	180	180			175	175	175	175	175	175		
	1600			1808								161	161	161	161	161				157	157	157	157	157			
133			500	208	205	179	163	151	142	135	129	314	274	249	231	217	207	198									
			650	258	205	179	163	151	142	135	129	314	274	249	231	217	207	198									
		500	800	323	205	179	163	151	142	135	129	314	274	249	231	217	207	198		462	403	366	340	320	305	291	
		650	1000	388	205	179	163	151	142	135	129	314	274	249	231	217	207	198		462	403	366	340	320	305	291	
		800	1200	473	205	179	163	151	142	135	129	314	274	249	231	217	207	198		462	403	366	340	320	305	291	
			1400	538	205	179	163	151	142	135	129	314	274	249	231	217	207	198		462	403	366	340	320	305	291	
	500	1000	1600	608	200	179	163	151	142	135	129	314	274	249	231	217	207	198		462	403	366	340	320	305	291	
			1800	678								314	274	249	231	217	207	198		416	403	366	340	320	305	291	
		1200		708	169	169	163	151	142	135	129	314	274	249	231	217	207	198		397	397	366	340	320	305	291	
	650		2000	758	157	157	157	151	142	135	129	314	274	249	231	217	207	198		368	368	366	340	320	305	291	
		1400		808	146	146	146	146	142	135	129	314	274	249	231	217	207	198		343	343	343	340	320	305	291	
		1600		908	129	129	129	129	129	129	129	310	274	249	231	217	207	198		303	303	303	303	303	305	291	
	800			958	122	122	122	122	122	122	122	293	274	249	231	217	207	198		286	286	286	286	286	286	286	
		1800		1008								278	274	249	231	217	207	198		271	271	271	271	271	271	271	
		2000		1108								278	274	249	231	217	207	198		245	245	245	245	245	245	245	
	1000			1158	99	99	99	99	99	99	99	240	240	240	231	217	207	198		234	234	234	234	234	234	234	
	1200			1408	81	81	81	81	81	81	81	197	197	197	197	197	197	197		192	192	192	192	192	192	192	
	1400			1608	71	71	71	71	71	71	71	172	172	172	172	172	172	172		167	167	167	167	167	167	167	
	1600			1808	63	63	63	63	63	63	63	153	153	153	153	153	153			149	149	149	149	149	149	149	
	1800			2008								138	138	138	138	138				134	134	134	134	134			
	2000			2208																							
159			650	258								333	291	264	245	231	220	210	202								
			800	323								333	291	264	245	231	220	210	202								
		650	1000	388								333	291	264	245	231	220	210	202	490	428	389	361	340	324	309	297
		800	1200	473								333	291	264	245	231	220	210	202	490	428	389	361	340	324	309	297
			1400	538								333	291	264	245	231	220	210	202	490	428	389	361	340	324	309	297
		1000	1600	608								333	291	264	245	231	220	210	202	467	428	389	361	340	324	309	297
			1800	678								333	291	264	245	231	220	210	202	413	419	389	361	340	324	309	297
		1200		708								333	291	264	245	231	220	210	202	393	393	389	361	340	324	309	297
	650	2000		758								333	291	264	245	231	220	210	202	365	365	365	361	340	324	309	297
	1400	2200		808								333	291	264	245	231	220	210	202	340	340	340	340	340	324	309	297
	1600			908								307	291	264	245	231	220	210	202	300	300	300	300	300	300	300	297
	800			958								290	290	264	245	231	220	210	202	283	283	283	283	283	283	283	283
		1800		1008								275	275	264	245	231	220	210	202	268	268	268	268	268	268	268	268
		2000		1108								242	242	242	242	231	220	210	202	242	242	242	242	242	242	242	242
	1000			1158								237	237	237	237	231	220	210	202	231	231	231	231	231	231	231	231
		2200		1258								217	217	217	217	217	217	210	202	212	212	212	212	212	212	212	212
	1200			1408								193	193	193	193	193	193	193	193	188	188	188	188	188	188	188	
	1400			1608								169	169	169	169	169	169	169	169	164	164	164	164	164	164	164	164
	1600			1808								150	150	150	150	150	150	150	150	146	146	146	146	146	146	146	
	1800			2008								134	134	134	134	134	134	134	134	131	131	131	131	131	131	131	
	2000			2208																119	119	119	119	119	119	119	
194		1600		608																							
		1800		678																							
		2000		758																							
		2200		808																							
	1600			908																							
	1800			1008																							
	2000			1108																							
	2200			1258																							
	1600			1808																							
	1800			2008																							
	2000			2208																							
	2200			2508																							
	2400			2808																							

(for a project life of bearings of 30.000 hours)

Column groups: **PSV/4-FHD** (belt speed m/s), **PSV/5-FHD** (belt speed m/s), **serie PSV/7-FHD** (belt speed m/s), **ROLLER** (length C mm | Belt Width Arrangements | Ø mm)

P4 1	P4 1.5	P4 2	P4 2.5	P4 3	P4 3.5	P4 4	P4 5	P5 1	P5 2	P5 3	P5 4	P5 4.5	P5 5	P5 6	P7 1	P7 2	P7 3	P7 4	P7 4.5	P7 5	P7 6	C mm	BW	BW	BW	Ø mm
																						168			400	
																						208		300	500	
381	333	302	281	264				549	435	380												258		400	650	
381	333	302	281	264				549	435	380												323		500	800	
381	333	302	281	264				549	435	380												388	300	650	1000	
381	333	302	281	264				549	435	380												473		800	1200	
381	333	302	281	264				549	435	380												508	400			
381	333	302	281	264				549	435	380												538			1400	
381	333	302	281	264				549	435	380												608	500	1000	1600	89
381	333	302	281	264				549	435	380												708		1200		
381	333	302	281	264				549	435	380												758	650			
381	333	302	281	264				549	435	380												808		1400		
381	333	302	281	264				549	435	380												908		1600		
381	333	302	281	264				549	435	380												958	800			
381	333	302	281	264				549	435	380												1158	1000			
381	333	302	281	264				512	435	380												1408	1200			
337	333	302	281	264				337	337	337												1608	1400			
233	233	233	233	233				233	233	233												1808	1600			
																						168			400	
																						208		300	500	
406	355	323	299	282	268			585	465	406	369											258		400	650	
406	355	323	299	282	268			585	465	406	369				853	677	592	538				323		500	800	
406	355	323	299	282	268			585	465	406	369				853	677	592	538				388	300	650	1000	
406	355	323	299	282	268			585	465	406	369				853	677	592	538				473		800	1200	
406	355	323	299	282	268			585	465	406	369				853	677	592	538				508	400			
406	355	323	299	282	268			585	465	406	369				853	677	592	538				538			1400	
406	355	323	299	282	268			585	465	406	369				853	677	592	538				608	500	1000	1600	108
406	355	323	299	282	268			585	465	406	369				853	677	592	538				708		1200		
406	355	323	299	282	268			585	465	406	369				853	677	592	538				758	650			
406	355	323	299	282	268			585	465	406	369				853	677	592	538				808		1400		
406	355	323	299	282	268			585	465	406	369				853	677	592	538				908		1600		
406	355	323	299	282	268			585	465	406	369				853	677	592	538				958	800			
406	355	323	299	282	268			529	465	406	369				853	677	592	538				1158	1000			
406	355	323	299	282	268			442	442	406	369				853	677	592	538				1408	1200			
402	355	323	299	282	268			393	393	393	369				743	677	592	538				1608	1400			
366	355	323	299	282	268			356	356	356					587	587	587	538				1808	1600			
																						208			500	
																						258			650	
436	381	346	321	302	287	274		627	498	435	395	380	367									323		500	800	
436	381	346	321	302	287	274		627	498	435	395	380	367		915	726	634	576	554	535		388		650	1000	
436	381	346	321	302	287	274		627	498	435	395	380	367		915	726	634	576	554	535		473		800	1200	
436	381	346	321	302	287	274		627	498	435	395	380	367		915	726	634	576	554	535		538			1400	
436	381	346	321	302	287	274		627	498	435	395	380	367		915	726	634	576	554	535		608	500	1000	1600	
436	381	346	321	302	287	274		627	498	435	395	380	367		915	726	634	576	554	535		678			1800	
436	381	346	321	302	287	274		627	498	435	395	380	367		915	726	634	576	554	535		708		1200		
436	381	346	321	302	287	274		627	498	435	395	380	367		915	726	634	576	554	535		758	650		2000	
436	381	346	321	302	287	274		627	498	435	395	380	367		915	726	634	576	554	535		808		1400		133
436	381	346	321	302	287	274		627	498	435	395	380	367		915	726	634	576	554	535		908		1600		
436	381	346	321	302	287	274		608	498	435	395	380	367		915	726	634	576	554	535		958	800			
436	381	346	321	302	287	274		577	498	435	395	380	367		915	726	634	576	554	535		1008		1800		
436	381	346	321	302	287	274		524	498	435	395	380	367		915	726	634	576	554	535		1108		2000		
436	381	346	321	302	287	274		501	498	435	395	380	367		915	726	634	576	554	535		1158	1000			
412	381	346	321	302	287	274		412	412	435	395	380	367		915	726	634	576	554	535		1408	1200			
363	363	346	321	302	287	274		363	363	363	363	363	363		915	726	634	576	554	535		1608	1400			
324	324	324	321	302	287	274		324	324	324	324	324			915	726	634	576	554	535		1808	1600			
294	294	294	294	294	287			294	294	294	294	294			908	726	634	576	554	535		2008	1800			
270	270	270	270	270				270	270	270	270	270			750	726	634	576	554			2208	2000			
																						258			650	
462	404	367	341	321	305	291	270															323			800	
462	404	367	341	321	305	291	270	666	528	462	419	403	389	366	971	771	673	612	588	568	534	388		650	1000	
462	404	367	341	321	305	291	270	666	528	462	419	403	389	366	971	771	673	612	588	568	534	473		800	1200	
462	404	367	341	321	305	291	270	666	528	462	419	403	389	366	971	771	673	612	588	568	534	538			1400	
462	404	367	341	321	305	291	270	666	528	462	419	403	389	366	971	771	673	612	588	568	534	608		1000	1600	
462	404	367	341	321	305	291	270	666	528	462	419	403	389	366	971	771	673	612	588	568	534	678			1800	
462	404	367	341	321	305	291	270	666	528	462	419	403	389	366	971	771	673	612	588	568	534	708		1200		
462	404	367	341	321	305	291	270	666	528	462	419	403	389	366	971	771	673	612	588	568	534	758	650		2000	
462	404	367	341	321	305	291	270	666	528	462	419	403	389	366	971	771	673	612	588	568	534	808		1400	2200	
462	404	367	341	321	305	291	270	630	528	462	419	403	389	366	971	771	673	612	588	568	534	908		1600		159
462	404	367	341	321	305	291	270	564	528	462	419	403	389	366	971	771	673	612	588	568	534	958	800			
462	404	367	341	321	305	291	270	564	528	462	419	403	389	366	971	771	673	612	588	568	534	1008		1800		
462	404	367	341	321	305	291	270	511	511	462	419	403	389	366	971	771	673	612	588	568	534	1108		2000		
462	404	367	341	321	305	291	270	488	488	462	419	403	389	366	971	771	673	612	588	568	534	1158	1000			
417	404	367	341	321	305	291	270	449	449	449	419	403	389	366	971	771	673	612	588	568	534	1258		2200		
398	398	367	341	321	305	291	270	400	400	400	400	379	379	366	971	771	673	612	588	568	534	1408	1200			
348	348	348	341	321	305	291	270	350	350	350	350	350	350	350	971	771	673	612	588	568	534	1608	1400			
310	310	310	310	310	305	291	270	311	311	311	311	311	311		971	771	673	612	588	568	534	1808	1600			
279	279	279	279	279	279	279		281	281	281	281	281	281		922	771	673	612	588	568	534	2008	1800			
254	254	254	254	254	254	254		256	256	256	256	256			852	771	673	612	588	568	534	2208	2000			
															823	719	654	628	607	571		608			1600	
															823	719	654	628	607	571		678			1800	
															823	719	654	628	607	571		758			2000	
															823	719	654	628	607	571		808			2200	
															823	719	654	628	607	571		908		1600		
															823	719	654	628	607	571		1008		1800		
															823	719	654	628	607	571		1108		2000		194
															823	719	654	628	607	571		1258		2200		
															823	719	654	628	607	571		1808	1600			
															823	719	654	628	607	571		2008	1800			
															760	719	654	628	607	571		2208	2000			
															672	672	654	628	607	571		2508	2200			
															605	605	605	605	605	571		2808	2400			

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

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

* TOP rollers lengths with reinforcing internal steel tube

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

ROLLER Ø mm	Belt Width Arrangements ▬	Belt Width Arrangements ◣◢	Belt Width Arrangements ◣◢◣	length C mm	PL 2 - PL 3 - PL 4 belt speed m/s 1	1.25	1.5	1.75	2	2.5	3.0	4
89			400	168								
			500	208								
		400	650	258								
		500	800	323								
		650	1000	388								
		800	1200	473								
	400			508								
	500	1000		608								
		1200		708								
	650			758								
	800			958								
	1000			1158								
	1200			1408								
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								
			500	208								
		400	650	258								
		500	800	323								
		650	1000	388								
		800	1200	473								
	400			508								
	500	1000		608								
		1200		708								
	650			758								
	800			958								
	1000			1158								
	1200			1408								
	1400			1608								
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								
			500	208								
		400	650	258								
		500	800	323								
		650	1000	388								
		800	1200	473								
	400			508								
		1400		538								
	500	1000		608								
		1200		708								
	650			758								
		1400		808								
	800			958								
	1000			1158								
	1200			1408								
	1400			1608								
140			400	168	120	104	99	88	78	76	71	62
			500	208	120	104	99	88	78	76	71	62
		400	650	258	120	104	99	88	78	76	71	62
		500	800	323	120	104	99	88	78	76	71	62
		650	1000	388	120	104	99	88	78	76	71	62
		800	1200	473	120	104	99	88	78	76	71	62
	400			508	120	104	99	88	78	76	71	62
	500	1000		608	120	104	99	88	78	76	71	62
		1200		708	120	104	99	88	78	76	71	62
	650			758	120	104	99	88	78	76	71	62
	800			958	120	104	99	88	78	76	71	62
	1000			1158	120	104	99	88	78	76	71	62
	1200			1408	107	104	99	88	78	76	71	62

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

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

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

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

2.5 - Programme

The experience of Rulmeca for over 60 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

1 - Rollers in steel series PSV
2 - Rollers in plastic series PL
3 - Rollers in steel series MPS
4 - Rollers in thermoplastic polymer series TOP
5 - Rollers in steel series RTL

3

2

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

2 Rollers

series
PSV
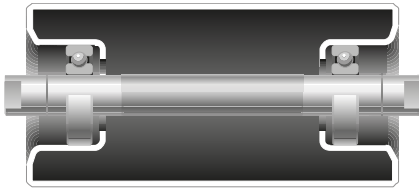
Monobloc

Spindle

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 9001:2008 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 welded tube produced according to Rulmeca standards, with reference to tight tolerances and particular specifications.
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 forced 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 autocentralising automatic welding machines utilising a continuous wire feed: our patented system "UNIBLOC".
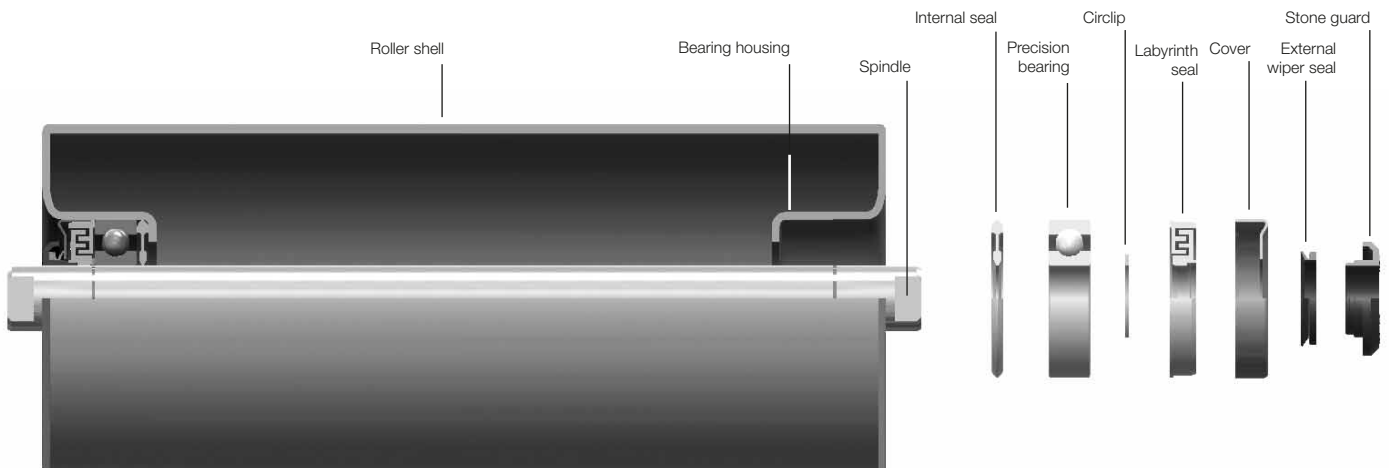
Section of PSV/1,2,3,4,5-FHD

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 ground for all its lenght or in the bearings and seals zones to a precision tolerance, to guarantee a perfect match of bearings, seals 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 clearance 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.

The above mentioned 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 shield, in anti-corrosive thermoplastic 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.

Roller shell   Bearing housing   Spindle   Internal seal   Precision bearing   Circlip   Labyrinth seal   Cover   External wiper seal   Stone guard
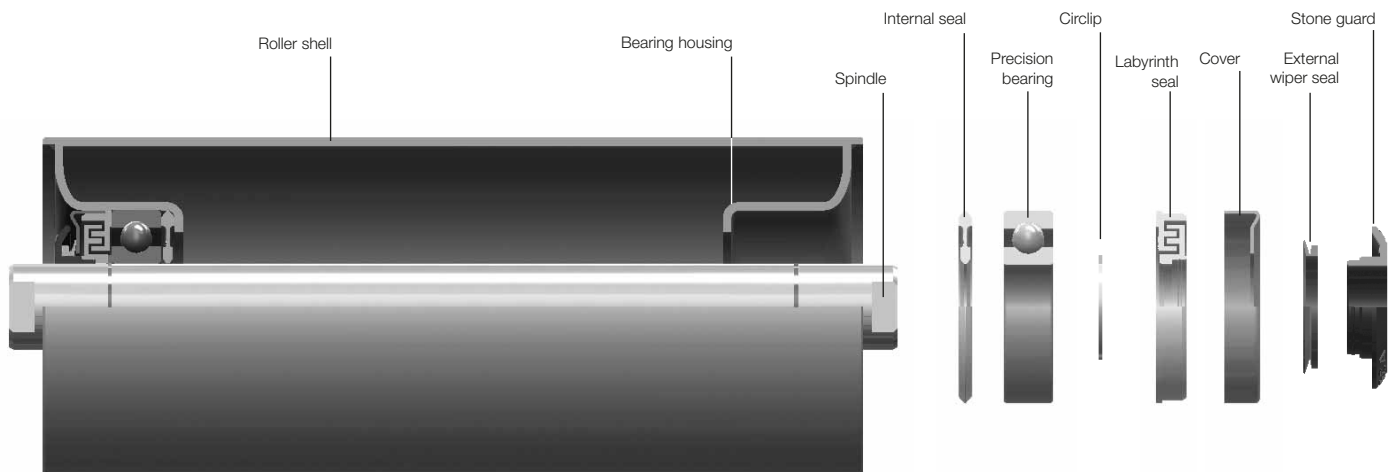
Section of PSV/7-FHD

serie
PSV

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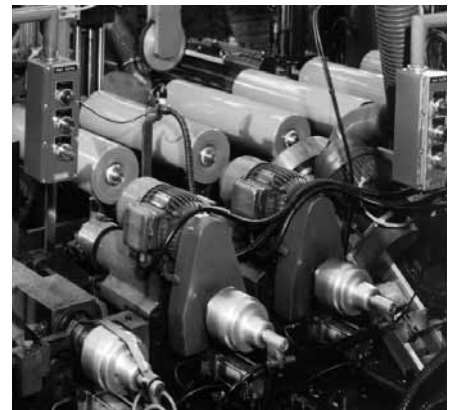
The table indicates the type and diameter of standard rollers in production according to European standards to DIN 15207- ISO 1537.

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

Rollers certified according to ATEX 94/9/EC norms, Explosion Group I category M2 for Mines, Explosion Group II category 2G for gas and 2D for dust, Explosion Group II category 3G for gas and 3D for dust (Zones 1, 2 for gas, Zones 21, 22 for dust).
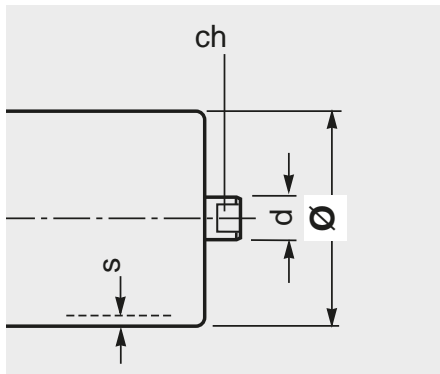
Programme of production series PSV

roller type	Ø mm	basic design	s	spindle d	ch	bearing	note
PSV/1-FHD	**63**	N	3	20	14	6204	
	89	N	3				
	108	N	3,5				
	133	N	4				
PSV/2-FHD	**89**	N	3	25	18	6205	
	108	N	3,5				
	133	N	4				
	159	N	4,5				
PSV/3-FHD	**89**	N	3	25	18	6305	
	108	N	3,5				with tube and spindle in steel S235JR (EN 10027-1) ex Fe360 (EN 10025), St37 (DIN 17100)
	133	N	4				
	159	N	4,5				
PSV/4-FHD	**89**	N	3	30	22	6206	
	108	N	3,5				
	133	N	4				
	159	N	4,5				
PSV/5-FHD	**89**	N	3	30	22	6306	
	108	N	3,5				
	133	N	4				
	159	N	4,5				
PSV/7-FHD	**108**	N	4	40	32	6308	
	133	N	4				
	159	N	4,5				
	194	N	6,3				
	219	N	6,3				

series

PSV/1-FHD

Ø 63 N

Bearing 6204
(20 X 47 X 14)

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

Section through sealing

belt			roller			weight Kg		load capacity daN					
width mm			dimensions mm										
arrangements						rotating		belt speed m/s					
			B	**C**	A	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 30,000 hours.
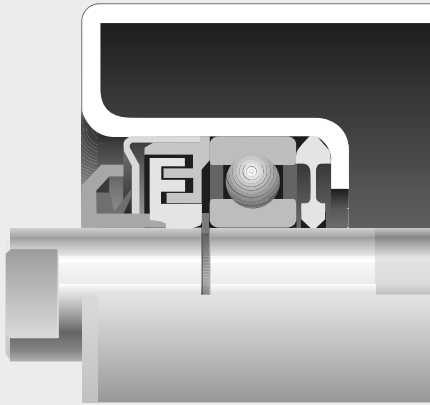
Example of ordering
standard design
PSV/1-FHD,20F,63N,608

for special design
see pages 80-81
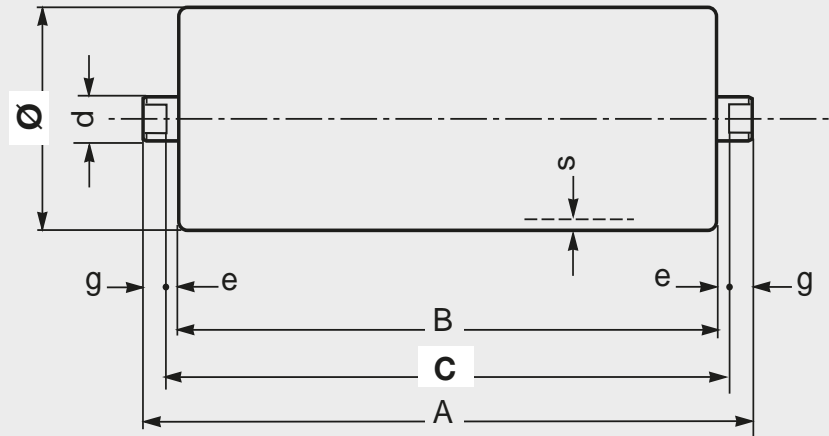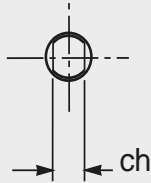
Ø 89 N

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			B	C	A	rotating parts	total	belt speed m/s					
								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 30,000 hours.

series
PSV/1-FHD

Ø 108 N

Bearing 6204
(20 X 47 X 14)

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

Section through sealing

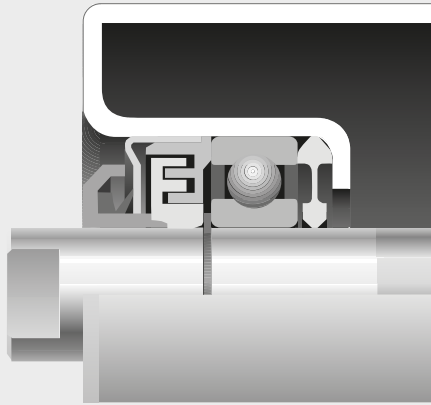| belt			roller										
width mm			dimensions mm			weight Kg		load capacity daN					
arrangements			B	**C**	A	rotating parts	total	belt speed m/s					
								1	1.5	2	2.5	3	3.5
		400	160	**168**	186	2.3	**2.7**	191	167	152	141	133	126
	300	500	200	**208**	226	2.6	**3.2**	191	167	152	141	133	126
	400	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 30,000 hours.

Example of ordering
standard design
PSV/1-FHD,20F,108N,323

for special design
see pages 80-81
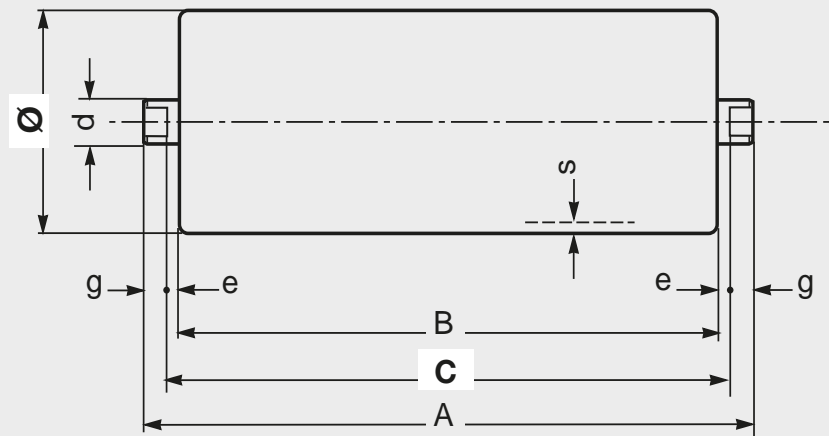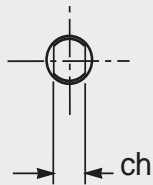
Ø 133 N

Bearing 6204
(20 X 47 X 14)

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

belt			roller			weight Kg		load capacity daN					
width mm			dimensions mm										
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 30,000 hours.

Example of ordering
standard design
PSV/1-FHD,20F,133N,388

for special design
see pages 80-81

series
PSV/2-FHD

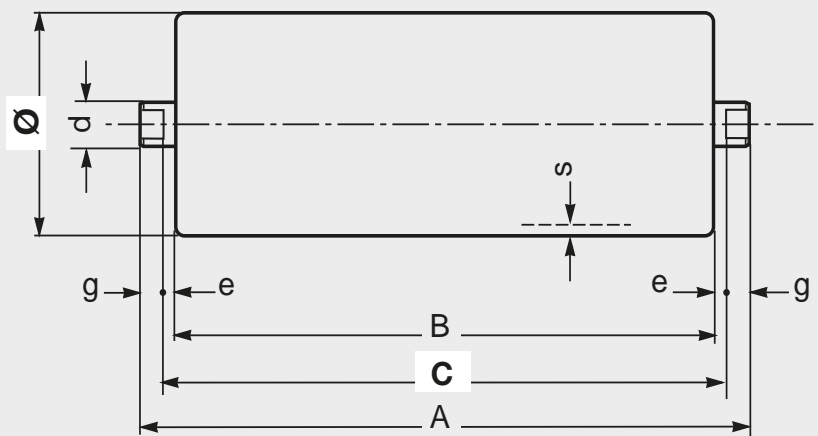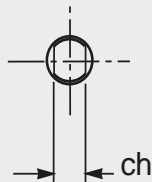Section through sealing

Ø 89 N

Bearing 6205
(25 X 52 X 15)

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

belt				roller			weight Kg		load capacity daN					
width mm				dimensions mm										
arrangements							rotating		belt speed m/s					
				B	C	A	parts	total	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 30,000 hours.

Example of ordering
standard design
PSV/2-FHD,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 Kg		load capacity daN					
width mm			dimensions mm										
arrangements			B	**C**	A	rotating parts	**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 30,000 hours.

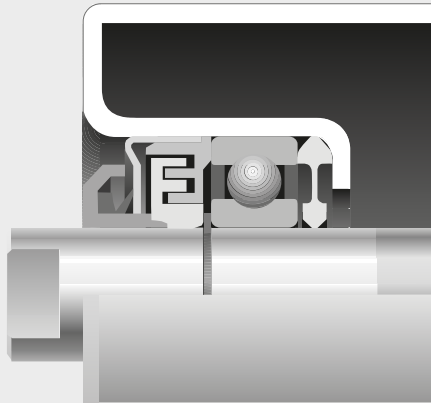**Example of ordering**
standard design
PSV/2-FHD,25F,108N,958

for special design
see pages 80-81

series
PSV/2-FHD

Ø 133 N

Bearing 6205
(25 X 52 X 15)

---

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

Section through sealing

belt		roller									
width mm		dimensions mm			weight Kg		load capacity daN				
arrangements					rotating		belt speed m/s				
		B	**C**	A	parts	**total**	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	
1800		2000	**2008**	2032	26.8	**34.5**	138	138	138	138	138	

The indicated load capacity relates to a project working life of 30,000 hours.

Ø 159 N

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

belt			roller					load capacity daN					
width mm			dimensions mm			weight Kg							
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	
1800			2000	2008	2032	32.1	39.9	134	134	134	134	134	

The indicated load capacity relates to a project working life of 30,000 hours.

series
PSV/3-FHD
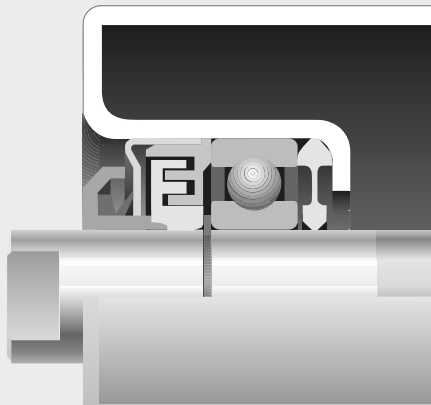
Section through sealing

Ø 89 N

Bearing 6305
(25 X 62 X 17)

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

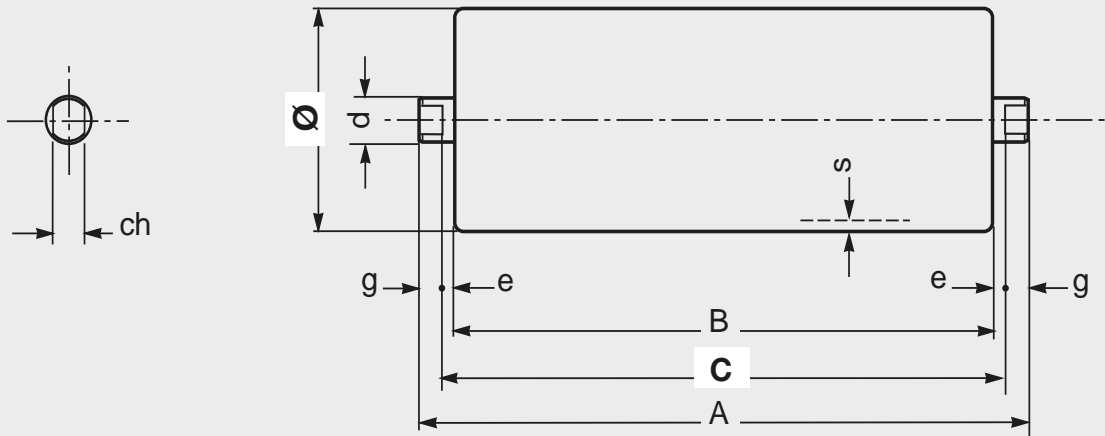| belt					roller										
width mm					dimensions mm			weight Kg		load capacity daN					
arrangements								rotating		belt speed m/s					
▬	◣◢	◣◢	◣◢		B	**C**	A	parts	**total**	0.5	1	1.5	2	2.5	3
			650		250	**258**	282	2.8	**3.9**	509	404	353	321	298	280
			800		315	**323**	347	3.2	**4.5**	509	404	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 30,000 hours.

Example of ordering
standard design
PSV/3-FHD,25F,89N,323

for special design
see pages 80-81
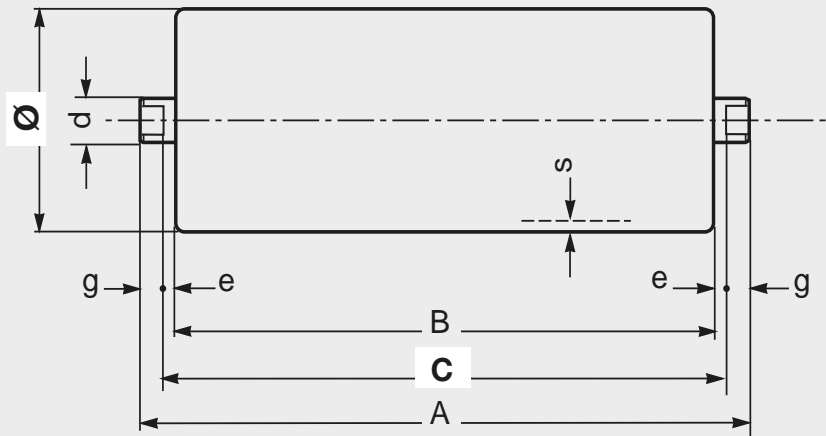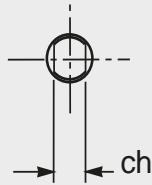
Ø 108 N

Bearing 6305
(25 X 62 X 17)

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

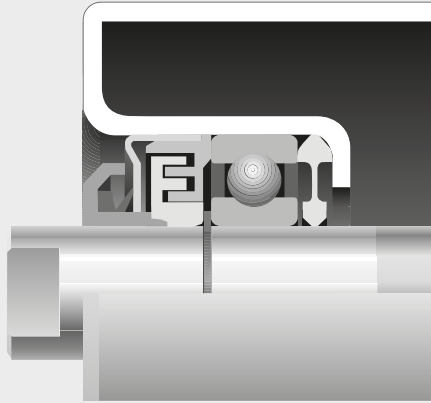| belt			roller			weight Kg		load capacity daN					
width mm			dimensions mm										
arrangements						rotating		belt speed m/s					
◤	◣	◢	B	C	A	parts	total	1	1.5	2	2.5	3	3.5
		650	250	**258**	282	3.6	**4.7**	431	376	342	317	299	284
		800	315	**323**	347	4.2	**5.5**	431	376	342	317	299	284
	650	1000	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	

The indicated load capacity relates to a project working life of 30,000 hours.

Example of ordering
standard design
PSV/3-FHD,25F,108N,958

for special design
see pages 80-81

series
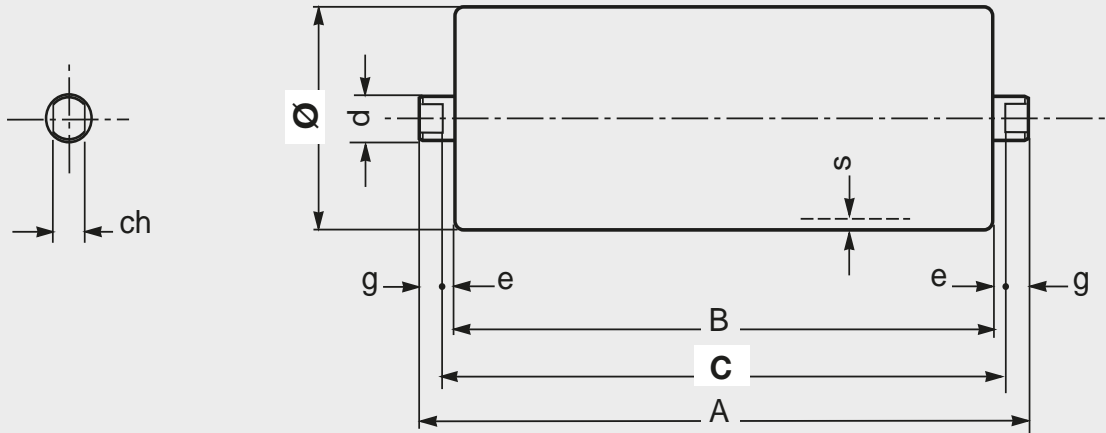# PSV/3-FHD

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
PSV/3-FHD,25F,133N,473

for special design
see pages 80-81

Section through sealing

belt			roller				weight Kg		load capacity daN					
width mm				dimensions mm										
arrangements				B	C	A	rotating parts	total	belt speed m/s					
									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	

The indicated load capacity relates to a project working life of 30,000 hours.
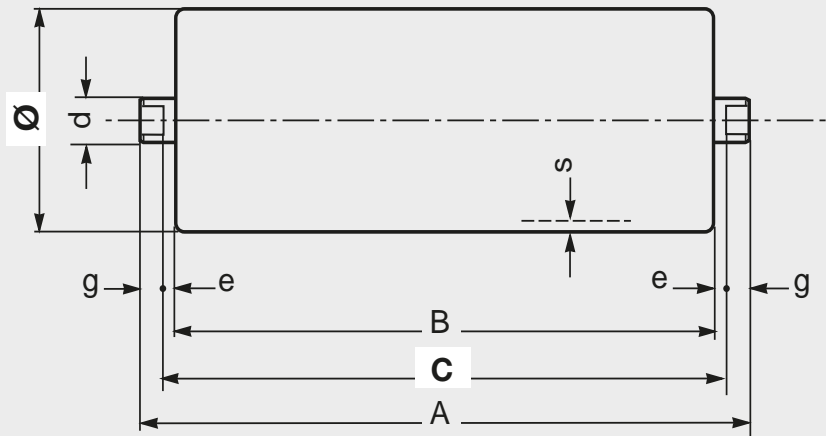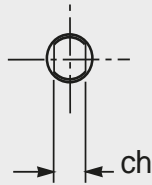
Ø 159 N

Bearing 6305
(25 X 62 X 17)

d = 25
ch = 18
s = 4,5
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 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	
2000	2200	**2208**	2232	35.7	**44.3**	119	119	119	119	119	

The indicated load capacity relates to a project working life of 30,000 hours.

series

PSV/4-FHD
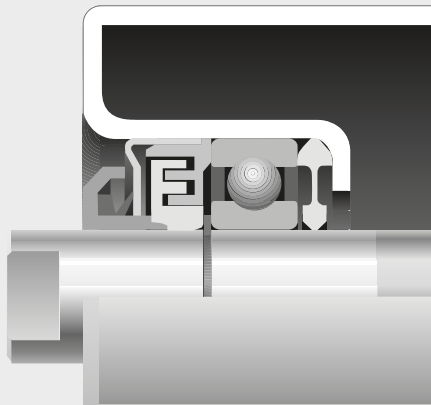
Ø 89 N

Bearing 6206
(30 X 62 X 16)

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

Section through sealing

belt		roller										
width mm		dimensions mm			weight Kg		load capacity daN					
arrangements					rotating		belt speed m/s					
		B	**C**	A	parts	**total**	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 30,000 hours.

Example of ordering
standard design
PSV/4-FHD,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 mm			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 30,000 hours.

Example of ordering
standard design
PSV/4-FHD,30F,108N,958

for special design
see pages 80-81

series

PSV/4-FHD

Section through sealing

Ø 133 N

Bearing 6206
(30 X 62 X 16)

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

belt			roller							load capacity daN					
width mm			dimensions mm				weight Kg			belt speed m/s					
arrangements			B	**C**	A		rotating 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 30,000 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	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	

The indicated load capacity relates to a project working life of 30,000 hours.

series
PSV/5-FHD
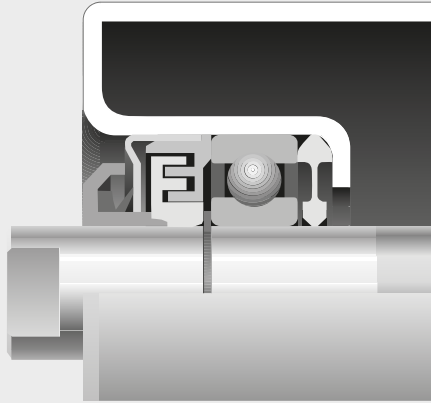
Section through sealing

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
PSV/5-FHD,30F,89N,323
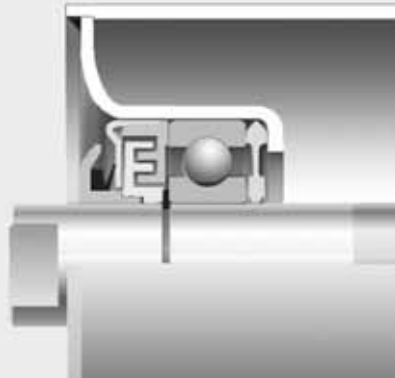
for special design
see pages 80-81

belt				roller											
width mm				dimensions mm			weight Kg		load capacity daN						
arrangements				B	**C**	A	rotating parts	total	belt speed m/s						
									1	1.5	2	2.5	3	3.5
			800	315	**323**	347	3.9	**5.8**	549	479	435	404	380	361
			1000	380	**388**	412	4.3	**6.6**	549	479	435	404	380	361
		800	1200	465	**473**	497	4.9	**7.6**	549	479	435	404	380	361
			1400	530	**538**	562	5.3	**8.4**	549	479	435	404	380	361
		1000	1600	600	**608**	632	5.8	**9.2**	549	479	435	404	380	361
			1800	670	**678**	702	6.2	**10.1**	549	479	435	404	380	361
	1200			700	**708**	732	6.4	**10.4**	549	479	435	404	380	361
			2000	750	**758**	782	6.7	**11.0**	549	479	435	404	380	361
	1400			800	**808**	832	7.0	**11.6**	549	479	435	404	380	361
	1600			900	**908**	932	7.7	**12.8**	549	479	435	404	380	361
800				950	**958**	982	8.0	**13.4**	549	479	435	404	380	361
	1800			1000	**1008**	1032	8.3	**14.0**	549	479	435	404	380	361
	2000			1100	**1108**	1132	9.0	**15.2**	549	479	435	404	380	361
1000				1150	**1158**	1182	9.3	**15.8**	549	479	435	404	380	361
1200				1400	**1408**	1432	10.9	**18.8**	512	479	435	404	380	361
1400				1600	**1608**	1632	12.2	**21.2**	337	337	337	337	337	337
1600				1800	**1808**	1832	13.5	**23.6**	233	233	233	233	233	
1800				2000	**2008**	2032	14.8	**26.0**	168	168	168	168		
2000				2200	**2208**	2232	16.1	**28.4**	125	125	125			

The indicated load capacity relates to a project working life of 30,000 hours.
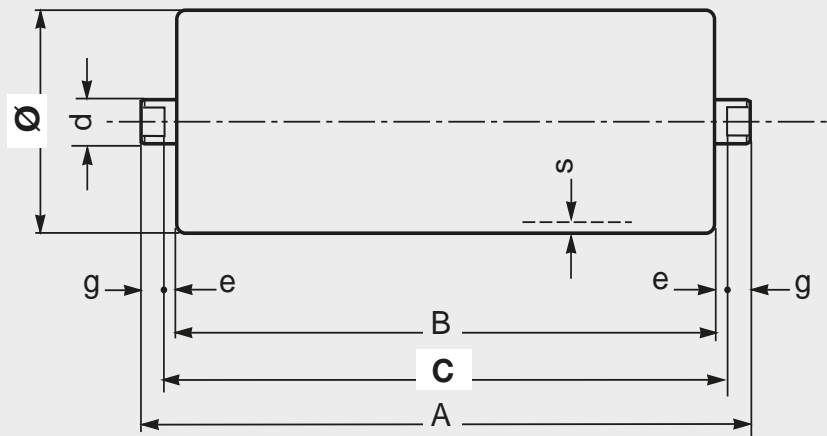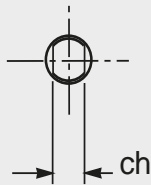
Ø 108 N

Bearing 6306
(30 X 72 X 19)

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

belt			roller				weight Kg		load capacity daN					
width mm			dimensions mm						belt speed m/s					
arrangements			B	**C**	A	rotating parts	**total**	1	2	2.5	3	3.5	4	
		800	315	**323**	347	4.9	**6.8**	585	465	431	406	385	369	
		1000	380	**388**	412	5.5	**7.8**	585	465	431	406	385	369	
	800	1200	465	**473**	497	6.3	**9.0**	585	465	431	406	385	369	
		1400	530	**538**	562	6.9	**10.0**	585	465	431	406	385	369	
	1000	1600	600	**608**	632	7.5	**11.0**	585	465	431	406	385	369	
		1800	670	**678**	702	8.1	**12.0**	585	465	431	406	385	369	
	1200		700	**708**	732	8.4	**12.5**	585	465	431	406	385	369	
		2000	750	**758**	782	8.9	**13.2**	585	465	431	406	385	369	
	1400		800	**808**	832	9.3	**13.9**	585	465	431	406	385	369	
	1600		900	**908**	932	10.2	**15.4**	585	465	431	406	385	369	
800			950	**958**	982	10.7	**16.1**	585	465	431	406	385	369	
	1800		1000	**1008**	1032	11.1	**16.8**	585	465	431	406	385	369	
	2000		1100	**1108**	1132	12.0	**18.3**	560	465	431	406	385	369	
1000			1150	**1158**	1182	12.5	**19.0**	537	465	431	406	385	369	
1200			1400	**1408**	1432	14.8	**22.7**	451	451	431	406	385	369	
1400			1600	**1608**	1632	16.6	**25.6**	402	402	402	402	385	369	
1600			1800	**1808**	1832	18.4	**28.5**	366	366	366	366	366		
1800			2000	**2008**	2032	20.2	**31.4**	337	337	337	337			
2000			2200	**2208**	2232	22.0	**34.3**	261	261	261				

The indicated load capacity relates to a project working life of 30,000 hours.

series
PSV/5-FHD
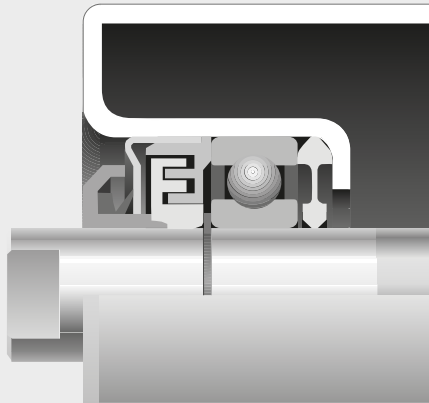
Section through sealing

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
PSV/5-FHD,30F,133N,473

for special design
see pages 80-81

belt			roller											
width mm			dimensions mm			weight Kg		load capacity daN						
arrangements						rotating		belt speed m/s						
			B	**C**	A	parts	total	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 30,000 hours.

Ø 159 N

Bearing 6306
(30 X 72 X 19)

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	total	belt speed m/s					
									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		

The indicated load capacity relates to a project working life of 30,000 hours.

series
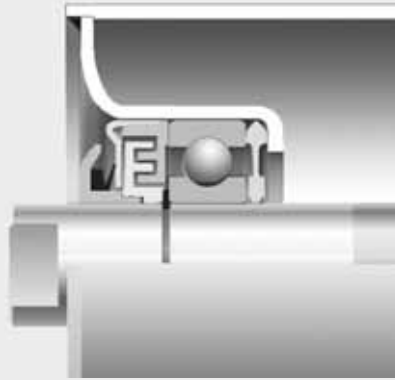
PSV/7-FHD

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
PSV/7-FHD,40F,108N, 473

for special design
see pages 80-81

belt			roller										
width mm			dimensions mm			weight Kg		load capacity daN					
arrangements						rotating		belt speed m/s					
▬	◣◢	◣◢	B	**C**	A	parts	total	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**	743	743	677	629	592	538
1600			1800	**1808**	1832	20.3	**38.3**	587	587	587	587	587	538
1800			2000	**2008**	2032	22.1	**42.0**	476	476	476	476	476	476
2000			2200	**2208**	2232	23.9	**45.8**	393	393	393	393	393	393
2200			2500	**2508**	2532	26.6	**51.4**	304	304	304	304	304	304

The indicated load capacity relates to a project working life of 30,000 hours.
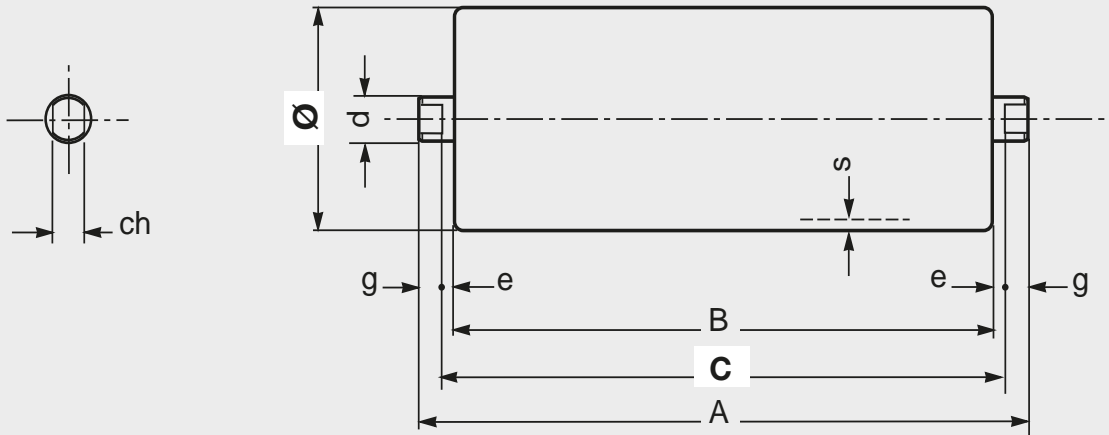
Ø 133 N

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
PSV/7-FHD,40F,133N,473

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	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**	908	726	634	576	554	535
2000		2200	**2208**	2232	32.5	**54.4**	750	726	634	576	554	535
2200		2500	**2508**	2532	36.4	**61.2**	581	581	581	576	554	

The indicated load capacity relates to a project working life of 30,000 hours.

series
PSV/7-FHD

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
PSV/7-FHD,40F,159N,1158

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	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**	971	771	673	612	568	534	
1800			2000	**2008**	2032	35.5	**55.4**	922	771	673	612	568	534	
2000			2200	**2208**	2232	38.6	**60.5**	852	771	673	612	568	534	
2200			2500	**2508**	2532	43.2	**68.0**	768	768	673	612	568		

The indicated load capacity relates to a project working life of 30,000 hours.
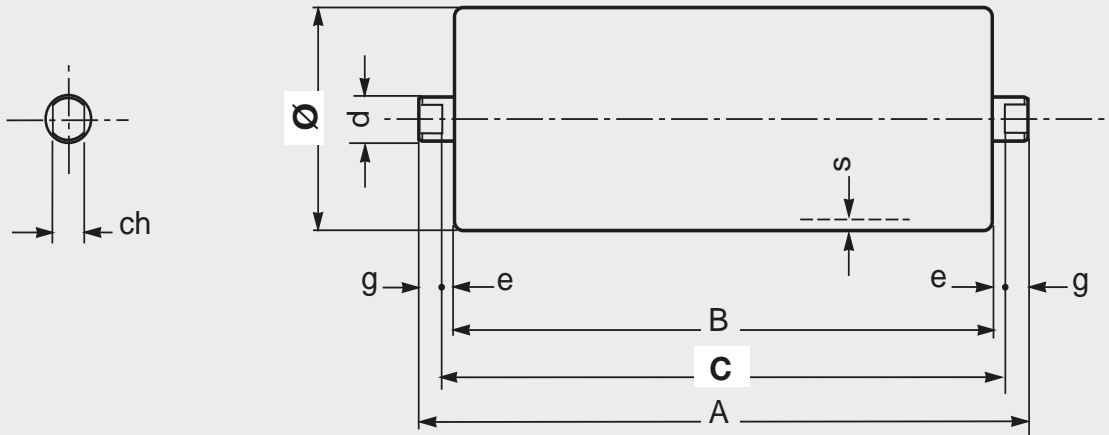
Ø 194 N

Bearing 6308
(40 X 90 X 23)

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

Example of ordering
standard design
PSV/7-FHD,40F,194N,758

for special design
see pages 80-81

belt			roller			weight Kg		load capacity daN					
width mm			dimensions mm										
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**	823	719	654	607	571	542
1800			2000	**2008**	2032	64.0	**83.9**	823	719	654	607	571	542
2000			2200	**2208**	2232	69.8	**91.7**	760	719	654	607	571	542
2200			2500	**2508**	2532	78.6	**103.4**	672	672	654	607	571	542
2400			2800	**2808**	2832	87.3	**115.1**	605	605	605	605	571	542
2600			3000	**3008**	3032	93.2	**122.9**	567	567	567	567	567	

The indicated load capacity relates to a project working life of 30,000 hours.

2 Rollers

serie
PSV/7-FHD
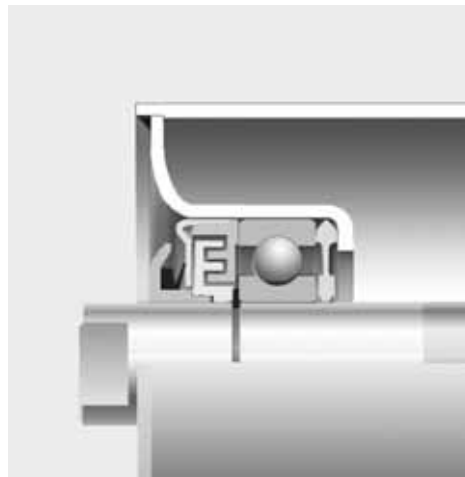
Ø 219 N

Bearing 6308
(40 X 90 X 23)

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

Example of ordering
standard design
PSV/7-FHD,40F,219N,1408

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					
								3	4	5	6	7	8
		1600	600	**608**	632	25.0	31.2	749	681	632	595	565	540
		1800	670	**678**	702	27.3	34.2	749	681	632	595	565	540
		2000	750	**758**	782	30.0	37.6	749	681	632	595	565	540
		2200	850	**858**	882	33.2	41.9	749	681	632	595	565	540
	1600	2400	900	**908**	932	34.9	44.0	749	681	632	595	565	540
		2600	950	**958**	982	36.5	46.2	749	681	632	595	565	540
	1800		1000	**1008**	1032	38.2	48.3	749	681	632	595	565	540
		2800	1050	**1058**	1082	39.8	50.4	749	681	632	595	565	540
	2000		1100	**1108**	1132	41.5	52.6	749	681	632	595	565	540
		3000	1120	**1128**	1152	42.1	53.4	749	681	632	595	565	540
	2200		1250	**1258**	1282	46.4	58.9	749	681	632	595	565	540
	2400		1400	**1408**	1432	51.3	65.3	749	681	632	595	565	540
	2600		1500	**1508**	1532	54.5	69.5	749	681	632	595	565	540
	2800		1600	**1608**	1632	57.9	73.9	749	681	632	595	565	540
	3000		1700	**1708**	1732	61.2	78.1	749	681	632	595	565	540
1600			1800	**1808**	1832	64.4	82.4	749	681	632	595	565	540
1800			2000	**2008**	2032	71.0	90.9	695	681	632	595	565	540
2000			2200	**2208**	2232	77.6	99.5	632	632	632	595	565	540
2200			2500	**2508**	2532	87.4	112.2	556	556	556	556	556	540
2400			2800	**2808**	2832	97.3	125.0	498	498	498	498	498	498
2600			3000	**3008**	3032	103.8	133.6	465	465	465	465	465	465
2800			3150	**3158**	3182	108.8	140.0	444	444	444	444	444	444
3000			3350	**3358**	3382	115.3	148.5	418	418	418	418	418	

The indicated load capacity relates to a project working life of 30,000 hours.

2 Rollers

ch

s

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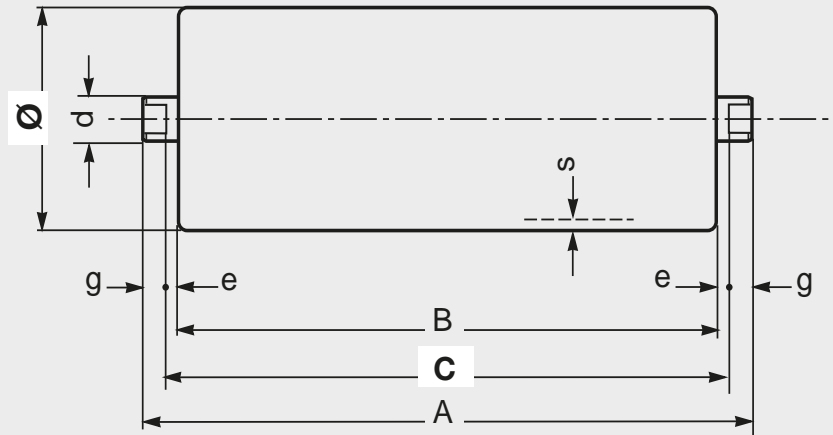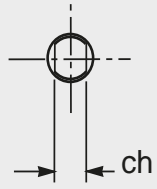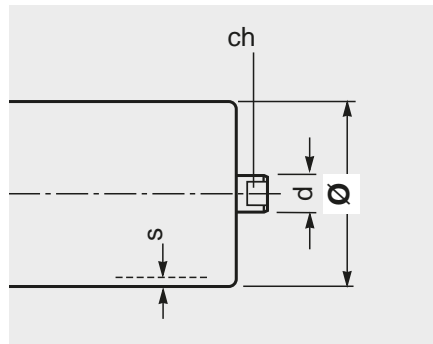
The table indicates rollers with non standard diameters that we are already producing.

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 on request

roller type	Ø mm	basic design	s	splinde d	ch	bearing	notes
PSV/1-FHD	**76**	N	3	20	14	6204	
	102	N	3				
	114	N	3,5				
	127	N	4				
	140	N	4				
PSV/2-FHD	**76**	N	3	25	18	6205	
	102	N	3				with tube and
	114	N	3,5				spindle in steel
	127	N	4				S235JR
	140	N	4				(EN 10027-1)
	152	N	4				ex Fe360
	168	N	4,5				(EN 10025)
PSV/3-FHD	**102**	N	3	25	18	6305	St37 (DIN 17100)
	127	N	4				
	140	N	4				
	152	N	4				
	168	N	4,5				
PSV/4-FHD	**102**	N	3	30	22	6206	
	127	N	4				
	140	N	4				
	152	N	4				
	168	N	4,5				
PSV/5-FHD	**140**	N	4	30	22	6306	
PSV/7-FHD	**127**	N	4	40	32	6308	
	152	N	4				
	178	N	6,3				

2.5.2 Series TOP

New thermoplastic polymer roller
New, very flexible roller series, suitable
in applications where a low weight is
requested, corrosive material or environ-
ment is present, high humidity, smooth
and low noise operation is necessary, or
where low resistances and low energy
consumption are researched.

TOP rollers are suitable for use in a wide
variety of applications and products such
as cement, coal, gravel, fertilisers, ports,
chemicals and many others.

Working temperature: -25 /+50 °C

2 Rollers

series
TOP

Characteristics

Shell
- Outer shell: High Density Polyethylene (HDPE) tube, black colour, anti-corrosion to the main chemical aggressive elements. Extra deep press fit between the tube and the bearing housing.
- Reinforcing steel tube fitted inside the HDPE shell, for rollers lengths B>600.

Bearing housings
Homopolymer Acetal Resin (POM), colour: yellow RAL 1018
High resistance techno-polymer moulded material, very robust, light, flexible, shock resistant and anti-corrosion to the main chemical aggressive elements.

Spindle
Diameters 20 & 25 in drawn steel, ground or fine calibrated to guarantee the best fit within bearings.

Bearings
Radial precision ball bearings series 6204 & 6205 increased internal clearance C3.

Sealing
Available in both hermetic (TOP/V) and contactless (TOP/C) executions, guaranteeing excellent performance in the presence of any kind of contaminant
- **TOP C1 & C2: Contactless execution** recommended where a very low resistance is preferable or requested, with outdoor normal environmental conditions.
  Stoneguard & Covercap in POM, Labyrinth & Inner seal in PA6.
- **TOP V1 & V2: Hermetic execution** (hermetic seals same as PSV series rollers) recommended in presence of rain, water, salt water, high humidity, powder, sand, dust or dirty applications in general.
  Stoneguard in POM, V-ring rubber sliding lip seal, Covercap in steel, Labyrinth & Inner seal in PA6.

Max lengths
Std. TOP roller max C=608 mm;
TOP rollers reinforced exec. max C=1608.

Lubrication
Life lubricated rollers assembled at the factory, with water repellent, anti rust, long life, high pressure, lithium grease NLGI grade 2 (or 3 on request). Special low temperature grease available on request for working temperatures below -20°C.

Load capacity
See following tables of the different diameters and shafts.

Caution:
Before assembly carry TOP rollers (up to B=600) into the conveyor, please store the rollers indoor or away from direct sun or heat sources, in order to avoid permanent deformation of the HDPE shell.

Features and benefits.

- lower weight with respect to a steel roller (about 50% for carry rollers). That means:
  - lower power consumption during start/stop operation of the belt conveyor and therefore reduction of power requirements on the plant;
  - easier mounting/maintenance operations, preventing back injuries of the operator and guaranteeing a safer intervention, especially in applications where roller mounting or replacement might be critical (suspended belt conveyor, difficult access, long conveyors etc.)
  - easier/cheaper transportation

- low level of abrasion and corrosion of the roller (wear resistant). That means:
  - longer life of the roller;
  - lower maintenance of the whole plant.

- belt friendly, since HDPE tube will not wear the belt

- high resistance to chemical agents.That means:
  - the roller will not rust
  - the roller is suitable for a wide variety of applications even very wet and aggressive

- low noise emission (due to polymers noise absorption)

- self-cleaning roller surface. That means:
  - prevention of build up of material, main cause of belt miss-tracking
  - less spillage from the belt

- low running resistance sealing system (contact-less execution).
  That means:
  - lower motor torque needed in conveyor starts
  - lower motor power size
  - reduction of energy consumption of the belt conveyor (added effect to that of the lower weight)
  - lower belt wear

Roller shell — Reinforcing tube only for B>600 — Bearing housing — Spindle — Internal seal — Precision bearing — Circlip — Labyrinth seal — Cover — Stone guard

TOP/C Contactless

Roller shell — Reinforcing tube only for B>600 — Bearing housing — Spindle — Internal seal — Precision bearing — Circlip — Labyrinth seal — Cover — External wiper seal — Stone guard
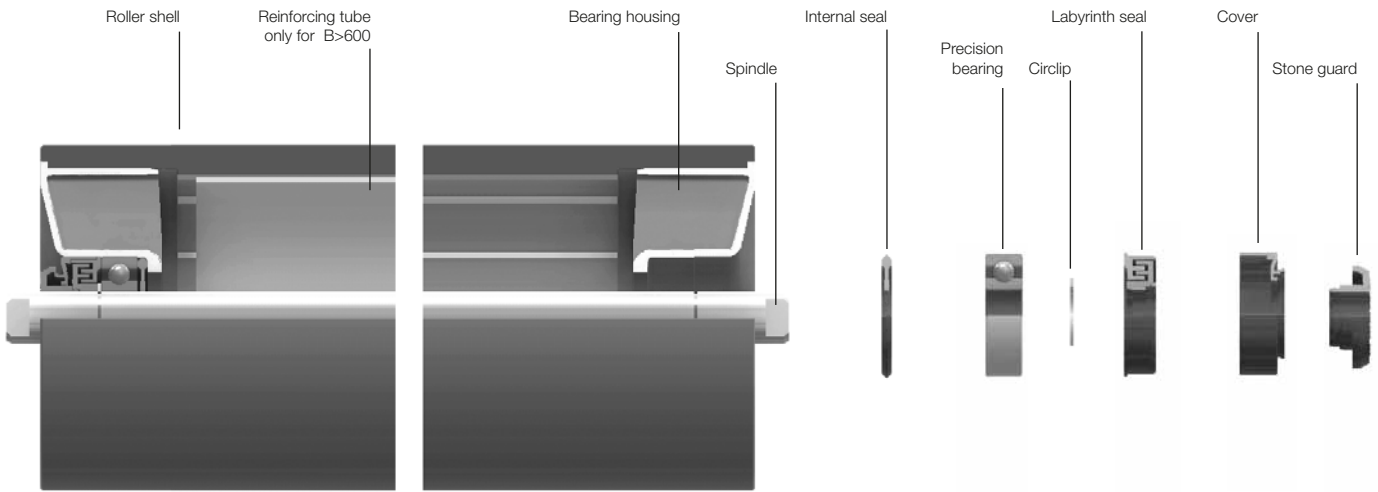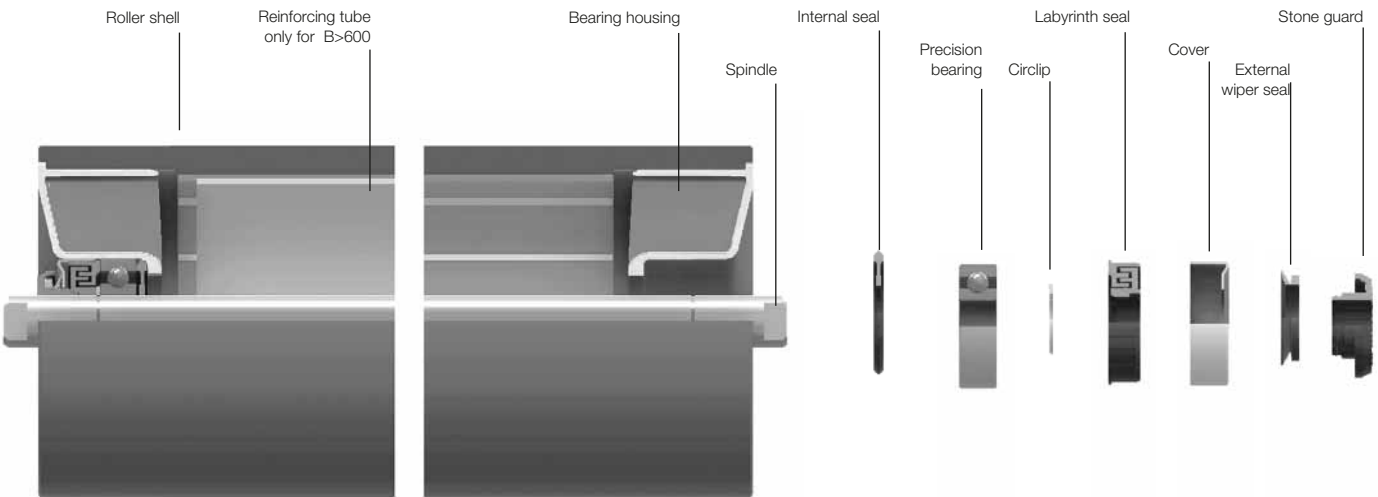
TOP/V Hermetic

2 Rollers

The table indicates the diameters of rollers in production.
Roller dimensions Ø89, 108, 133 acc. to DIN 15207 & ISO 1537
Roller diameters 102 (4"), 127 (5") acc. to CEMA C4 & C5.
Upon request rollers may be supplied with lengths and shaft extensions according to BS, JIS, AFNOR, FEM and other norms, or different shaft executions.
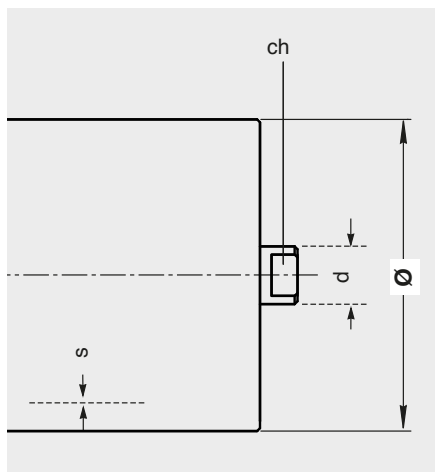
Programme of production series TOP/C & TOP/V

roller type	ø mm	shell type	HDPE tube s	Inner steel tube (B>600)	spindle d	ch	bearings	notes Std. features
TOP/C1 Contactless	**89**	**PE NPE**	9.0	Ø65x1.5	20	14	6204 C3	Tube HDPE black. POM brg. housings yellow RAL 1018 Spindle & inner steel tube (where present): steel S235JR (Fe360, St 37), open slots.
	108	**PE NPE**	9.5	Ø80x1.5				
TOP/V1 Hermetic	**133**	**PE NPE**	11.0	Ø108x2				
TOP/C2 Contactless	**102 (4")**	**PE NPE**	9.5	Ø80x1.5	25	18	6205 C3	
	127 (5")	**PE NPE**	10.5	Ø102x2				
TOP/V2 Hermetic Hermetic	**133**	**PE NPE**	11.0	Ø108x2				

Options on request:
- Stainless steel shaft in AISI 304 or 316
- Stainless steel covercaps in AISI 304 (only for the TOP/V Hermetic executions)
- Stainless steel bearings in AISI 440
- Alternative shaft executions: See page 82-83
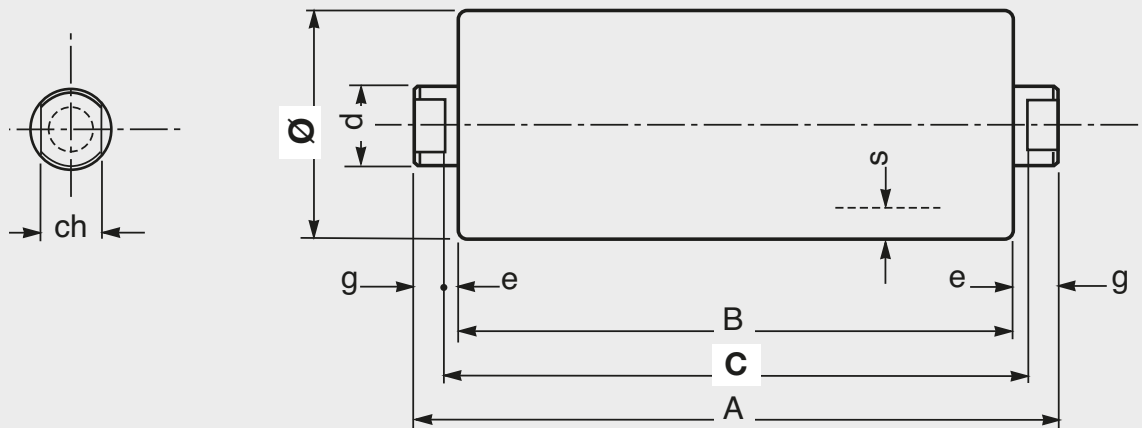
series
TOP C/1
TOP V/1

Ø 89PE
Ø 89NPE*

Bearing 6204
(20 x 47 x 14)

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

belt			roller			weight Kg		load capacity daN					
width mm			dimensions mm										
arrangements			B	C	A	rotating parts	total	belt speed m/s					
								0.5	1	1.5	2	2.5	3
		400	160	168	186	0,70	1,23	179	179	179	179	179	179
	300	500	200	208	226	0,79	1,42	179	179	179	179	179	179
	400	650	250	258	276	0,90	1,65	179	179	179	179	179	179
	500	800	315	323	341	1,04	1,95	179	179	179	179	179	179
300	650	1000	380	388	406	1,18	2,25	169	169	169	169	169	169
	800	1200	465	473	491	1,36	2,65	132	132	132	132	132	132
400			500	508	526	1,43	2,81	122	122	122	122	122	122
	1400		530	538	556	1,50	2,95	114	114	114	114	114	114
500	1000		600	608	626	1,65	3,27	96	96	96	96	96	96
	1200		700	708	726*	3,23	5,10	81	81	81	81	81	81
650			750	758	776*	3,46	5,45	74	74	74	74	74	74
	1400		800	808	826*	3,68	5,80	69	69	69	69	69	69
800			950	958	976*	4,36	6,85	56	56	56	56	56	56
1000			1150	1158	1176*	5,26	8,25	44	44	44	44	44	44
1200			1400	1408	1426*	6,39	9,99	33	33	33	33	33	33
1400			1600	1608	1626*	7,30	11,39	27	27	27	27	27	27

* TOP rollers lengths with reinforcing internal steel tube

Example of ordering
standard design
TOP/C1 20F 89PE 323
Contactless execution,
HDPE shell
TOP/V1 20F 89PE 473
Hermetic execution, HDPE
shell

TOP/C1 20F 89NPE 708
Contactless execution,
reinforced shell HDPE+steel
TOP/V1 20F 89NPE 708
Hermetic execution,
reinforced shell HDPE+steel

series
TOP C/1
TOP V/1

TOP C/1 Section through sealing

TOP V/1 Section through sealing
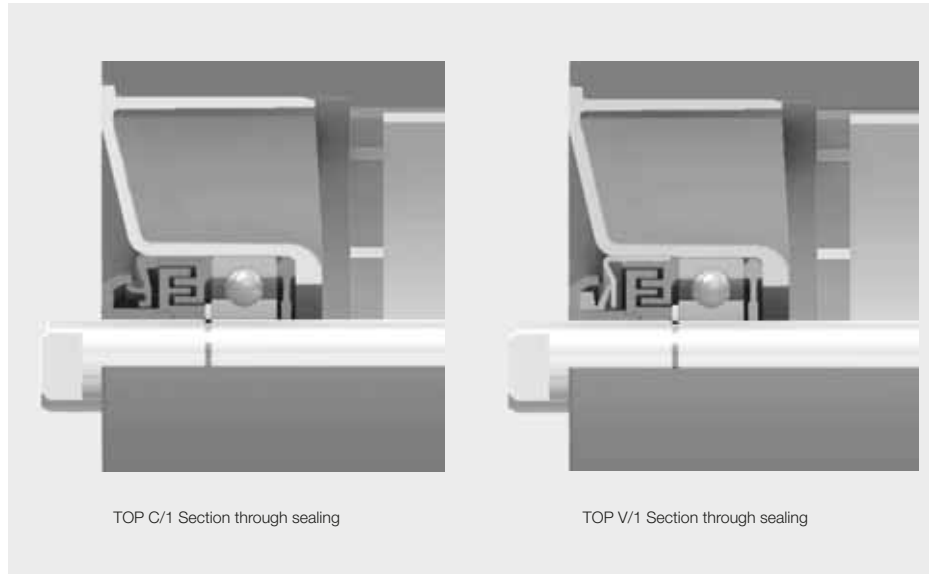
Ø 108PE
Ø 108NPE*

Bearing 6204
(20 X 47 X 14)

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

belt			roller										
width mm			dimensions mm			weight Kg		load capacity daN					
arrangements			B	**C**	A	rotating parts	total	belt speed m/s					
								1	1.5	2	2.5	3	3,5
		400	160	**168**	186	0,85	1,39	191	191	191	191	191	191
	300	500	200	**208**	226	0,97	1,60	191	191	191	191	191	191
	400	650	250	**258**	276	1,11	1,86	191	191	191	191	191	191
	500	800	315	**323**	341	1,29	2,21	191	191	191	191	191	191
300	650	1000	380	**388**	406	1,47	2,55	168	168	168	168	168	168
	800	1200	465	**473**	491	1,71	3,00	132	132	132	132	132	132
400			500	**508**	526	1,81	3,18	121	121	121	121	121	121
		1400	530	**538**	556	1,89	3,34	113	113	113	113	113	113
500	1000		600	**608**	626	2,09	3,71	98	98	98	98	98	98
	1200		700	**708**	726*	4,06	5,93	80	80	80	80	80	80
650			750	**758**	776*	4,34	6,34	73	73	73	73	73	73
	1400		800	**808**	826*	4,63	6,75	68	68	68	68	68	68
800			950	**958**	976*	5,49	7,98	55	55	55	55	55	55
1000			1150	**1158**	1176*	6,63	9,61	42	42	42	42	42	42
1200			1400	**1408**	1426*	8,06	11,66	32	32	32	32	32	32
1400			1600	**1608**	1626*	9,20	13,30	25	25	25	25	25	25

* TOP rollers lengths with reinforcing internal steel tube

Example of ordering
TOP/C1 20F 108PE 323
Contactless execution,
HDPE shell
TOP/V1 20F 108PE 473
Hermetic execution, HDPE
shell

TOP/C1 20F 108NPE 708
Contactless execution,
reinforced shell HDPE+steel
TOP/V1 20F 108NPE 708
Hermetic execution,
reinforced shell HDPE+steel

For special shaft executions
see pages 80-82-83
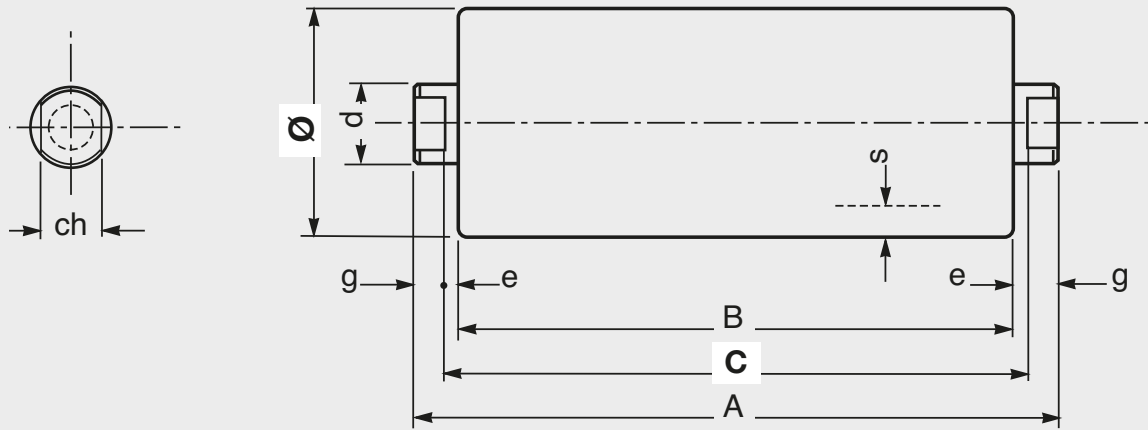
series

TOP C/1
TOP V/1

Ø 133PE
Ø 133NPE*

Bearing 6204
(20 x 47 x 14)

---

d = 20
ch = 14
 s = 11
 e = 4
 g = 9

belt			roller				weight Kg		load capacity daN					
width mm			dimensions mm						belt speed m/s					
arrangements			B	**C**	A	rotating parts	total	1	1.5	2	2.5	3	4
		400	160	**168**	186	1,09	1,62	205	205	205	205	205	205
	300	500	200	**208**	226	1,25	1,88	205	205	205	205	205	205
	400	650	250	258	276	1,45	2,21	205	205	205	205	205	205
	500	800	315	323	341	1,71	2,63	205	205	205	205	205	205
300	650	1000	380	388	406	1,97	3,05	168	168	168	168	168	168
	800	1200	465	473	491	2,32	3,60	131	131	131	131	131	131
400			500	508	526	2,46	3,83	121	121	121	121	121	121
		1400	530	538	556	2,58	4,03	113	113	113	113	113	113
500	1000		600	608	626	2,86	4,48	97	97	97	97	97	97
	1200		700	708	726*	6,30	8,17	77	77	77	77	77	77
650			750	758	776*	6,77	8,76	71	71	71	71	71	71
	1400		800	808	826*	7,23	9,35	65	65	65	65	65	65
800			950	958	976*	8,62	11,11	51	51	51	51	51	51
1000			1150	1158	1176*	10,47	13,45	38	38	38	38	38	38
1200			1400	1408	1426*	12,79	16,39	27	27	27	27	27	27
1400			1600	1608	1626*	14,64	18,74	20	20	20	20	20	20

* TOP rollers lengths with reinforcing internal steel tube

Example of ordering
standard design
TOP/C1 20F 133PE 323
Contactless execution,
HDPE shell
TOP/V1 20F 133PE 473
Hermetic execution, HDPE
shell

TOP/C1 20F 133NPE 708
Contactless execution,
reinforced shell HDPE+steel
TOP/V1 20F 133NPE 708
Hermetic execution,
reinforced shell HDPE+steel

series
TOP C/2
TOP V/2

TOP C/2 Section through sealing

TOP V/2 Section through sealing
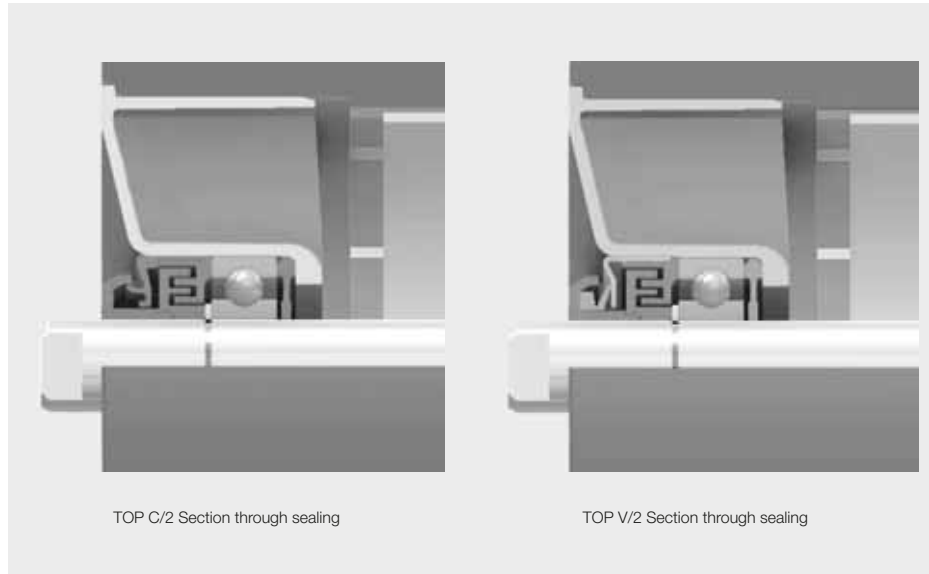
Ø 102PE
Ø 102NPE*

Bearing 6205
(25x52x15))

d = 25
ch = 18
 s = 9,5
 e =   4
 g = 12

belt			roller					weight Kg		load capacity daN					
width mm			dimensions mm												
arrangements						B	**C**	A	rotating parts	total	belt speed m/s					
											1	1.5	2	2.5	3	3,5
		400				160	**168**	192	0,87	1,70	287	287	269	249	235	223
	300	500				200	**208**	232	0,97	1,96	287	287	268	249	234	223
	400	650				250	**258**	282	1,10	2,28	287	287	268	249	234	223
	500	800				315	**323**	347	1,28	2,70	287	287	268	249	234	222
300	650	1000				380	**388**	412	1,45	3,13	287	287	268	249	234	222
	800	1200				465	**473**	497	1,67	3,68	250	250	250	249	234	222
400						500	**508**	532	1,76	3,91	232	232	232	232	232	222
		1400				530	**538**	562	1,84	4,10	219	219	219	219	219	219
500	1000					600	**608**	632	2,03	4,56	157	157	157	157	157	157
	1200					700	**708**	732*	3,98	6,90	200	200	200	200	200	200
650						750	**758**	782*	4,26	7,37	184	184	184	184	184	184
	1400					800	**808**	832*	4,53	7,84	171	171	171	171	171	171
800						950	**958**	982*	5,37	9,25	141	141	141	141	141	141
1000						1150	**1158**	1182*	6,48	11,13	113	113	113	113	113	113
1200						1400	**1408**	1432*	7,86	13,48	89	89	89	89	89	89
1400						1600	**1608**	1632*	8,97	15,37	75	75	75	75	75	75

* TOP rollers lengths with reinforcing internal steel tube

Example of ordering
standard design
TOP/C2 25F 102PE 323
Contactless execution,
HDPE shell
TOP/V2 25F 102PE 473
Hermetic execution, HDPE
shell

TOP/C2 25F 102NPE 708
Contactless execution,
reinforced shell HDPE+steel
TOP/V2 25F 102NPE 708
Hermetic execution,
reinforced shell HDPE+steel

For special shaft executions
see pages 80-82-83
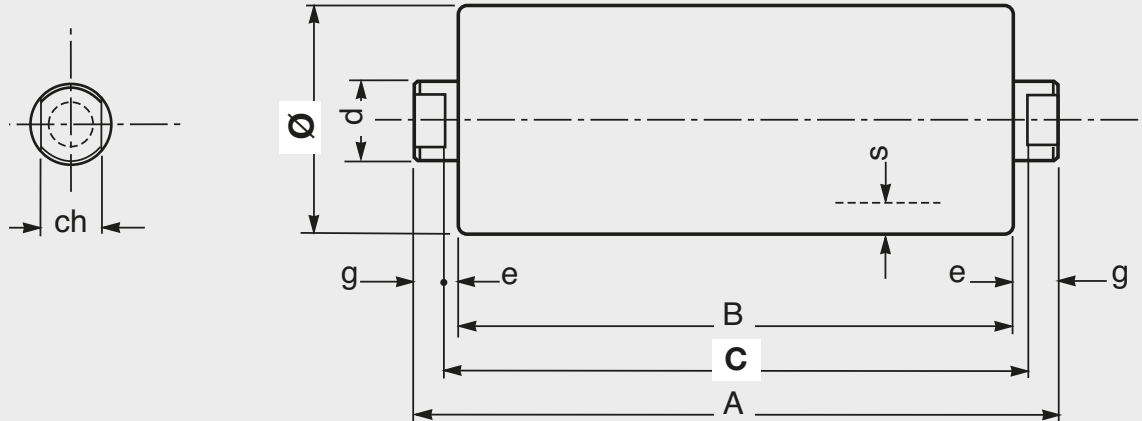
series
TOP C/2
TOP V/2

Ø 127PE
Ø 127NPE*

Bearing 6205
(25 x 52 x 15)

d = 25
ch = 18
s = 10,5
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					
								1	1,5	2	2,5	3	4
		400	160	**168**	192	1,08	1,91	309	309	289	268	252	229
	300	500	200	**208**	232	1,22	2,21	309	309	289	268	252	229
	400	650	250	**258**	282	1,41	2,58	309	309	289	268	252	229
	500	800	315	**323**	347	1,65	3,07	309	309	288	268	252	229
300	650	1000	380	388	412	1,88	3,56	309	309	288	267	251	228
	800	1200	465	473	497	2,20	4,20	309	309	288	267	251	228
400			500	508	532	2,32	4,47	295	295	288	267	251	228
		1400	530	538	562	2,43	4,69	276	276	276	267	251	228
500	1000		600	608	632	2,69	5,22	239	239	239	239	239	227
	1200		700	708	732*	5,93	8,84	197	197	197	197	197	197
650			750	758	782*	6,36	9,47	182	182	182	182	182	182
	1400		800	808	832*	6,79	10,09	169	169	169	169	169	169
800			950	958	982*	8,08	11,96	138	138	138	138	138	138
1000			1150	1158	1182*	9,80	14,46	109	109	109	109	109	109
1200			1400	1408	1432*	11,96	17,58	85	85	85	85	85	85
1400			1600	1608	1632*	13,68	20,07	70	70	70	70	70	70

* TOP rollers lengths with reinforcing internal steel tube

Example of ordering
standard design
TOP/C2 25F 127PE 323
Contactless execution, HDPE shell
TOP/V2 25F 127PE 473
Hermetic execution, HDPE shell

TOP/C2 25F 127NPE 708
Contactless execution, reinforced shell HDPE+steel
TOP/V2 25F 127NPE 708
Hermetic execution, reinforced shell HDPE+steel

For special shaft executions see pages 80-82-83

series
TOP C/2
TOP V/2

TOP C/2 Section through sealing

TOP V/2 Section through sealing
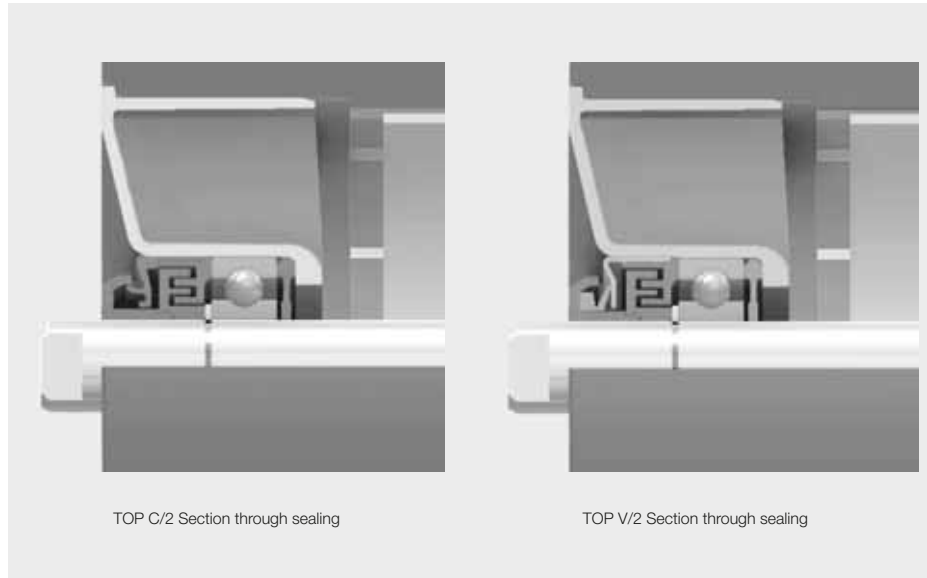
Ø 133PE
Ø 133NPE*

Bearing 6205
(25x52x15))

d = 25
ch = 18
 s = 11
 e = 4
 g = 12

belt			roller			weight Kg		load capacity daN					
width mm			dimensions mm										
arrangements			B	**C**	A	rotating parts	total	belt speed m/s					
								1	1.5	2	2.5	3	4
		400	160	168	192	1,15	1,98	309	309	289	268	252	229
	300	500	200	208	232	1,31	2,30	309	309	289	268	252	229
	400	650	250	258	282	1,51	2,69	309	309	289	268	252	229
	500	800	315	323	347	1,77	3,20	309	309	288	268	252	229
300	650	1000	380	388	412	2,04	3,71	309	309	288	267	251	228
	800	1200	465	473	497	2,38	4,39	309	309	288	267	251	228
400			500	508	532	2,52	4,66	295	295	288	267	251	228
		1400	530	538	562	2,64	4,90	276	276	276	267	251	228
500	1000		600	608	632	2,92	5,45	239	239	239	239	239	227
	1200		700	708	732*	6,36	9,28	197	197	197	197	197	197
650			750	758	782*	6,83	9,94	182	182	182	182	182	182
	1400		800	808	832*	7,29	10,59	169	169	169	169	169	169
800			950	958	982*	8,68	12,56	138	138	138	138	138	138
1000			1150	1158	1182*	10,53	15,19	109	109	109	109	109	109
1200			1400	1408	1432*	12,85	18,47	85	85	85	85	85	85
1400			1600	1608	1632*	14,70	21,10	70	70	70	70	70	70

* TOP rollers lengths with reinforcing internal steel tube

Example of ordering
TOP/C2 25F 133PE 323
Contactless execution,
HDPE shell
TOP/V2 25F 133PE 473
Hermetic execution, HDPE
shell

TOP/C2 25F 133NPE 708
Contactless execution,
reinforced shell HDPE+steel
TOP/V2 25F 133NPE 708
Hermetic execution,
reinforced shell HDPE+steel

For special shaft executions
see pages 80-82-83

2.5.3 Series PL

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 PL rollers

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.

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.

Spindle   Bearing housing   Roller shell   Bearing   Inside seal   Bush and external seal
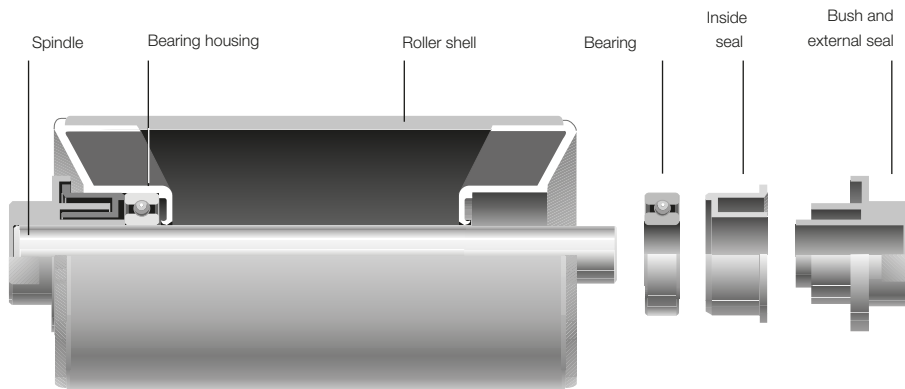
Programme of production series PL

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.

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 S235JR (Fe360, DIN St37) slotted bushes in polypropylene fiber glass charged
	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 S235JR (Fe360, DIN St37) slotted bushes in polypropylene fiber glass charged
	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 S235JR (Fe360, DIN St37) with flats ch14
	110	V	5,3				
	140	V	8,5				

ch

d

s

Ø
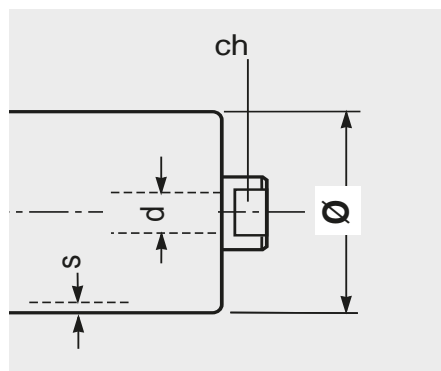
series
PL 2
PL 3
PL 4
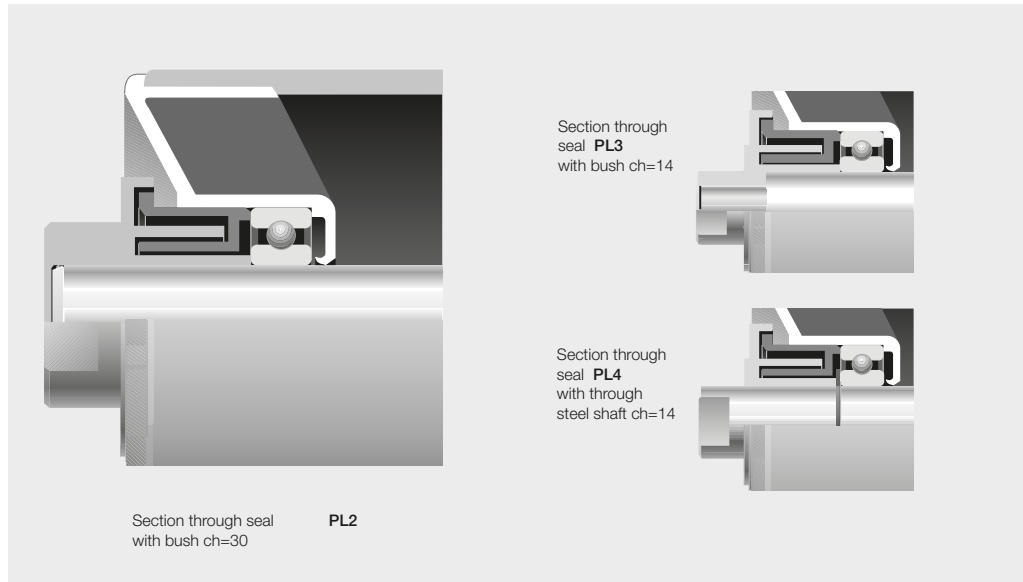
Ø 90 V

Bearing 6204
(20 X 47 X 14)

PL 2
d = 20
d_1 = 35
ch = 30
s = 4,3
e = 4
g = 10

PL 3
d = 20
d_1 = 20
ch = 14*
s = 4,3
e = 4
g = 10
* on request ch=18

PL 4
d = 20
d_1 = 20
ch = 14
s = 4,3
e = 4
g = 10

Section through seal **PL3** with bush ch=14

Section through seal **PL4** with through steel shaft ch=14

Section through seal **PL2** with bush ch=30

belt			roller				weight Kg		load capacity daN					
width mm			dimensions mm											
arrangements							rotating		belt speed m/s					
			B	**C**	A		parts	**total**	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.

Example of ordering
standard design
PL2,20N,90V,323
PL3,20N,90V,388
PL4,20F,90V,508

PL3,20N18,90V,538
PL4,20F15,90V,608

for special design
see pages 80-81
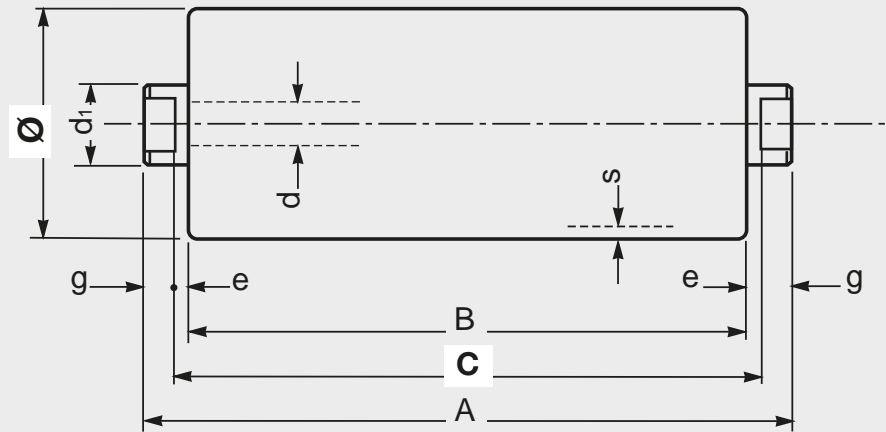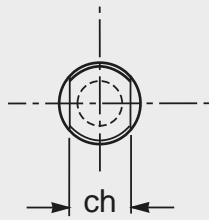
Ø 110 V

Bearing 6204
(20 x 47 x 14)

PL 2
d = 20
d₁ = 35
ch = 30
s = 5,3
e = 4
g = 10

PL 3
d = 20
d₁ = 20
ch = 14*
s = 5,3
e = 4
g = 10
* on request ch=18

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

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	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
PL3,20N,110V,388
PL4,20F,110V,508

PL3,20N18,110V,538
PL4,20F15,110V,608

for special design
see pages 80-81

2 Rollers

series
PL 2
PL 3
PL 4
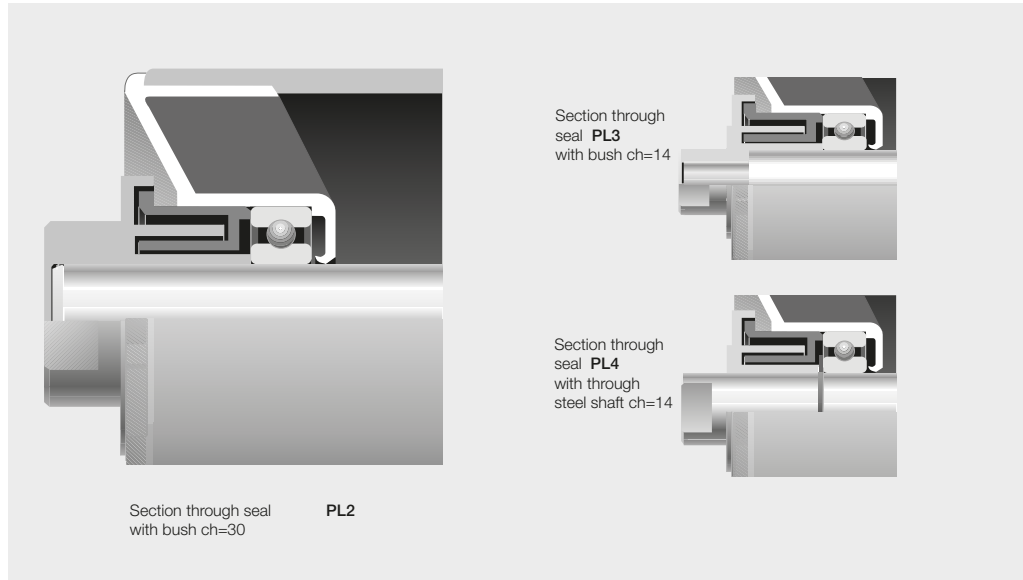
Ø140 V

Bearing 6204
(20 X 47 X 14)

PL 2
 d = 20
 d$_1$ = 35
 ch = 30
  s = 8,5
  e = 4
  g = 10

PL 3
 d = 20
 d$_1$ = 20
 ch = 14*
  s = 8,5
  e = 4
  g = 10
* on request ch=18

PL 4
 d = 20
 d$_1$ = 20
 ch = 14
  s = 8,5
  e = 4
  g = 10

Section through
seal **PL3**
with bush ch=14

Section through
seal **PL4**
with through
steel shaft ch=14

Section through seal   **PL2**
with bush ch=30

belt		roller											
width mm		dimensions mm			weight Kg		load capacity daN						
arrangements					rotating		belt speed m/s						
		B	**C**	A	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
PL3,20N,140V,388
PL4,20F,140V,508

PL3,20N18,140V,538
PL4,20F15,140V,608

for special design
see pages 80-81
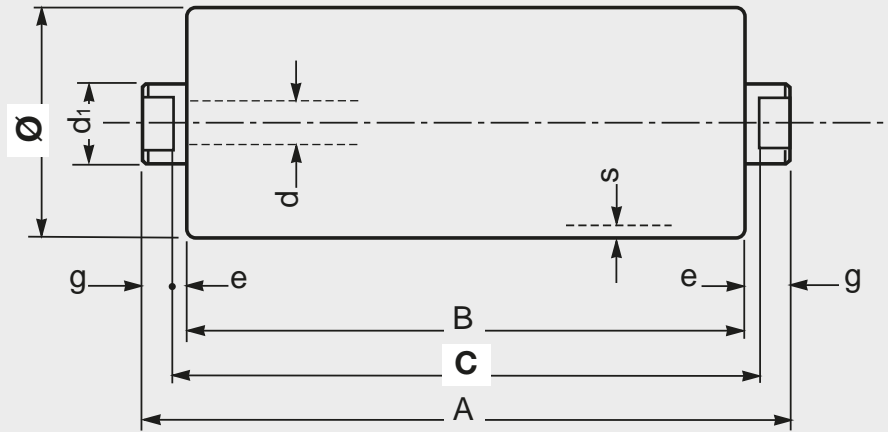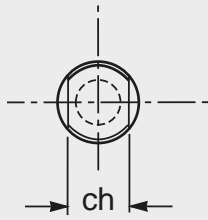
2 Rollers

2.5.4 - Rollers series MPS

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, that complement the very heavy roller series PSV.

Where used

The use of this roller series is particularly advantageous in the economic sense.
MPS uses rigid radial precision ball bearings.

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

The working temperature is defined as between -20°C and +100°C.

series
MPS

Characteristics
Rulmeca, 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 Ø 20 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.
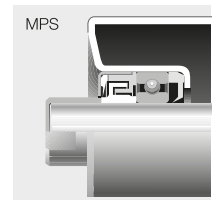
Sealing
The external seal is a cover cap in zinc plated steel complete with a wiper seal.

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 centralising 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.
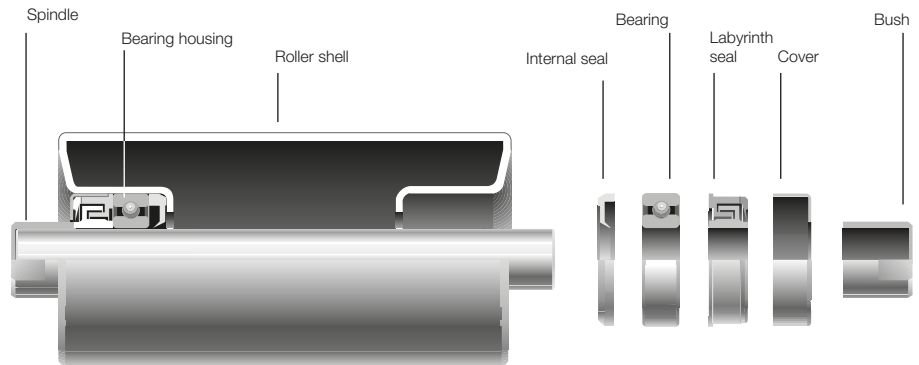
Rollers certified according to ATEX 94/9/EC norms,
Explosion Group I category M2 for Mines,
Explosion Group II category 2G for gas and 2D for dust,
Explosion Group II category 3G for gas and 3D for dust
(Zones 1, 2 for gas, Zones 21, 22 for dust).

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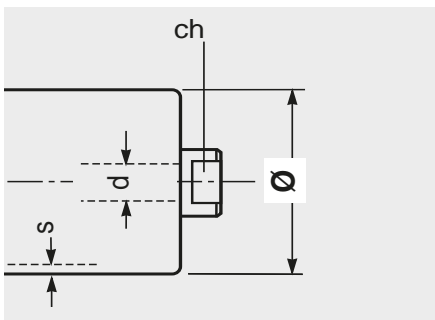
Programme of production series MPS

roller type	Ø mm	basic design	s	spindle d	ch	bearing	note
MPS 1	50	N	3	15	17	6202	
	60	N	3				with tube and spindle in steel S235JR (EN 10027-1) ex Fe360 (EN 10025) St37 (DIN 17100)
	76	N	3				
	89	N	3				
	102	N	3				

series
MPS 1

Ø 50 N

Bearing 6202
(15 x 35 x 11)

d = 15
d_1 = 20
ch = 17 *
s = 3
e = 4
g = 9

*ch = 14 upon
        request

Section through seal

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 10,000 hours.

Example of ordering
standard design
MPS1,15B,50N,208

for special design
see pages 80-81

Ø 60 N

Bearing 6202
(15 x 35 x 11)

d = 15
d_1 = 20
ch = 17 *
 s = 3
 e = 4
 g = 9

*ch = 14 upon
      request

belt			roller			weight Kg		load capacity daN					
width mm			dimensions mm										
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 10,000 hours.

Example of ordering
standard design
MPS1,15B,60N,258

for special design
see pages 80-81

series
MPS 1

Ø 76 N

Bearing 6202
(15 x 35 x 11)

d = 15
d_1 = 20
ch = 17 *
s = 3
e = 4
g = 9

*ch = 14 upon
request

Section through seal

belt			roller											
width mm			dimensions mm			weight Kg		load capacity daN						
arrangements			B	**C**	A	rotating		belt speed m/s						
						parts	**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 10,000 hours.

Example of ordering
standard design
MPS1,15B,76N,323

for special design
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			roller			weight Kg		load capacity daN					
width mm			dimensions mm										
arrangements						rotating		belt speed m/s					
			B	C	A	parts	total	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
	800	1200	465	**473**	491	3.4	**4.1**	112	112	112	106	98	92
400			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 10,000 hours.

Example of ordering
standard design
MPS1,15B,89N,758

for special design
see pages 80-81

series

MPS 1

Ø 102 N

Bearing 6202
(15 x 35 x 11)

d = 15
d$_1$ = 20
ch = 17 *
s = 3
e = 4
g = 9

*ch = 14 upon
request

Section through seal

belt		roller			weight Kg		load capacity daN					
width mm		dimensions mm										
arrangements					rotating		belt speed m/s					
		B	**C**	A	parts	**total**	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 10,000 hours.

Example of ordering
standard design
MPS1,15B,102N,388

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 rigid radial precision ball bearings, lubricated for life, a spindle of Ø 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 working temperature is definite as between -10° and +70°C

Spindle   Roller shell   Bearing housing   Bearing   Labyrinth seal   Cover   Bush
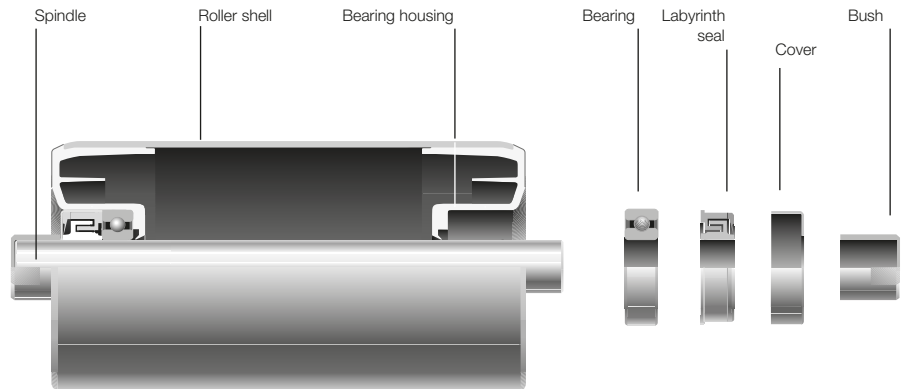
The table indicates the roller diameters in production. On request they may be supplied with different dimensions to the standard and with ch = 14 mm.
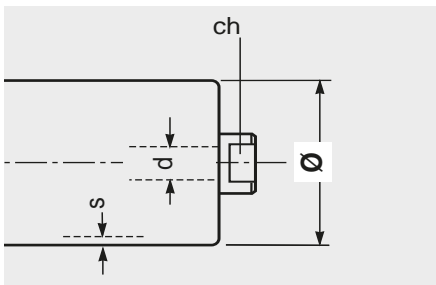
Programme of production series RTL

roller type	Ø mm	basic design	s	spindle d	ch	bearing	note
RTL 1	**60**	**N**	2	15	17	6202	with tube and spindle in steel S235JR (EN 10027-1) ex Fe360 (EN 10025) St37 (DIN 17100)
	76	**N**	2				
	89	**N**	2				

2 Rollers

series
RTL 1
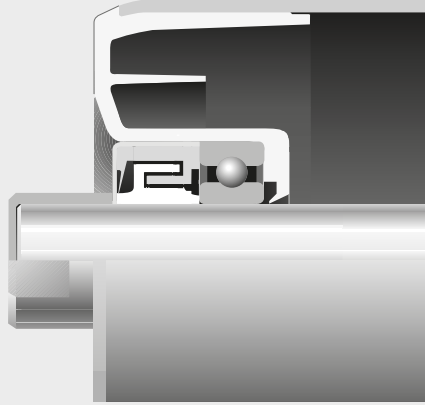
Section through seal

Ø 60 N

Bearing 6202
(15 x 35 x 11)

d = 15
d_1 = 20
ch = 17 *
s = 2
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						
								0.4	0.6	0.8	1	1.25	1.5
		400	160	**168**	186	0.6	**0.9**	113	99	90	83	77	73
	300	500	200	**208**	226	0.8	**1.1**	113	99	90	83	77	73
	400	650	250	**258**	276	0.9	**1.3**	113	99	90	83	77	73
	500	800	315	**323**	341	1.1	**1.6**	113	99	90	83	77	73
300	650	1000	380	**388**	406	1.3	**1.8**	113	99	90	83	77	73
	800		465	**473**	491	1.5	**2.2**	113	99	90	83	77	73
400			500	**508**	526	1.6	**2.3**	108	99	90	83	77	73
500	1000		600	**608**	626	1.9	**2.8**	89	89	89	83	77	73
650			750	**758**	776	2.3	**3.4**	71	71	71	71	71	71
800			950	**958**	976	2.9	**4.3**	57	57	57	51	51	51
1000			1150	**1158**	1176	3.5	**5.1**	48	48	48	48	48	48

The indicated load capacity relates to a project working of 10,000 hours.

Example of ordering
standard design
RTL1,15B,60N,258

for special designs
see pages 80-81

Ø 76 N

Bearing 6202
(15 x 35 x 11)

d = 15
d_1 = 20
ch = 17 *
s = 2
e = 4
g = 9

*ch = 14 upon
request

Example of ordering
standard design
RTL1,15B,76N,323

for special designs
see pages 80-81

belt			roller			weight		load capacity					
width			dimensions			weight		load capacity					
mm			mm			Kg		daN					
arrangements						rotating		belt speed m/s					
			B	C	A	parts	total	0.5	0.75	1	1.25	1.5	1.75
		400	160	**168**	186	0.8	**1.1**	114	99	90	84	79	75
	300	500	200	**208**	226	1.0	**1.3**	114	99	90	84	79	75
	400	650	250	**258**	276	1.1	**1.5**	114	99	90	84	79	75
	500	800	315	**323**	341	1.4	**1.8**	114	99	90	84	79	75
300	650	1000	380	**388**	406	1.6	**2.2**	114	99	90	84	79	75
	800		465	**473**	491	1.9	**2.6**	113	99	90	84	79	75
400			500	**508**	526	2.1	**2.8**	105	99	90	84	79	75
500	1000		600	**608**	626	2.4	**3.3**	86	86	86	86	86	86
650			750	**758**	776	3.0	**4.0**	69	69	69	69	69	69
800			950	**958**	976	3.7	**5.0**	54	54	54	54	54	54
1000			1150	**1158**	1176	4.4	**6.1**	45	45	45	45	45	45

The indicated load capacity relates to a project working of 10,000 hours.

series
RTL 1

Ø 89 N

Bearing 6202
(15 x 35 x 11)

d = 15
d_1 = 20
ch = 17 *
s = 2
e = 4
g = 9

*ch = 14 upon
        request

Section through seal

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	1.1	**1.4**	105	95	88	83	79	75
	300	500	200	**208**	226	1.3	**1.6**	105	95	88	83	79	75
	400	650	250	**258**	276	1.5	**1.9**	105	95	88	83	79	75
	500	800	315	**323**	341	1.8	**2.3**	105	95	88	83	79	75
300	650	1000	380	**388**	406	2.1	**2.6**	105	95	88	83	79	75
	800		465	**473**	491	2.4	**3.1**	105	95	88	83	79	75
400			500	**508**	526	2.6	**3.3**	104	95	88	83	79	75
500	1000		600	**608**	626	3.0	**3.9**	85	85	85	83	79	75
650			750	**758**	776	3.7	**4.7**	68	68	68	68	68	68
800			950	**958**	976	4.5	**5.9**	53	53	53	53	53	53
1000			1150	**1158**	1176	5.4	**7.0**	44	44	44	44	44	44

The indicated load capacity relates to a project working of 10,000 hours.

Example of ordering
standard design
RTL1,15B,89N,758
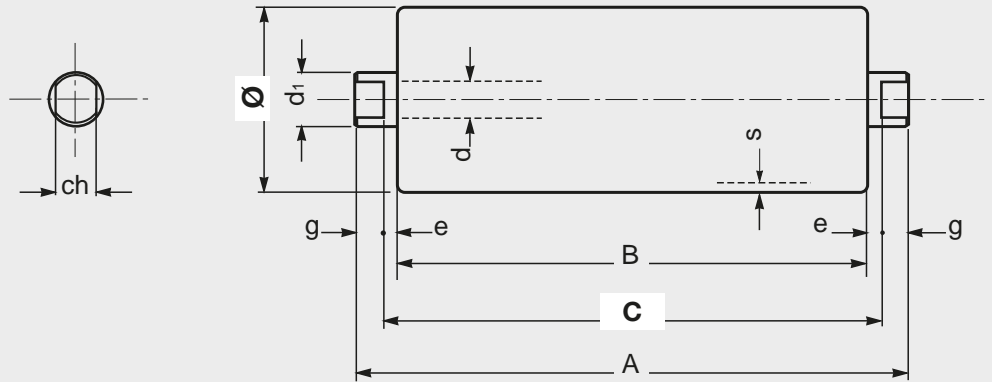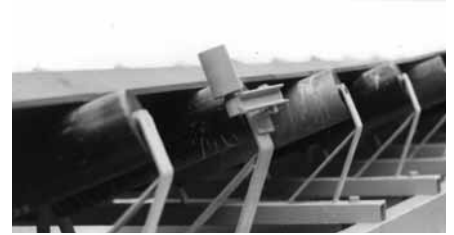
2 Rollers

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.
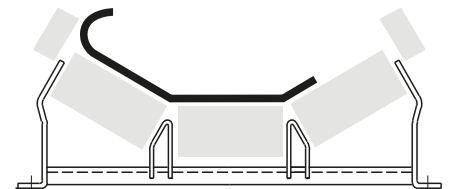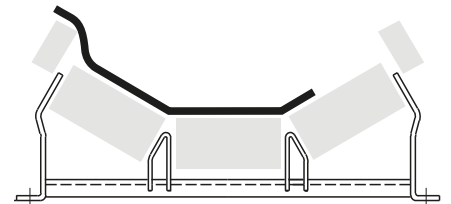
Series PS
They are assembled using spherical ball bearings, protected by labyrinth seals and constructed with similar characteristics to the series PSV.

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.

Series PSV/G7
These guide rollers get the shell made by thick tube ø 60x8, they are very robust and used as standard in the self-centralising transoms of all the belt widths.

PSV/G7-NCD-20M16-60N

guide roller										
type	**D** mm	s	d	**B**	**C**	m	e	*	bearing	weight Kg
PSV/G7-NCD	60	8	20	**100**	**108**	35	8	For self-centralising transoms type S, F M16	6204	1.4
PSV/G7-NCD	60	8	20	**100**	**108**	35	8	Only for self-centralising transoms type R S18	6204	1.4

Series MPS - 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** mm	s	d	**B**	**C**	m	e	M	bearing	weight Kg
MPS/G7	60	3	15	**80**	**88**	33	8	14	6202	0.9
				100	**108**					0.9
RTL/G7	60	2	15	**80**	**88**	33	8	14	6202	0.8
				100	**108**					0.8

Example of ordering
PSV/G7-NCD, 20M16, 60N, 108
MPS/G7, 15M14, 60N, 108
RTL/G7, 15M14, 60N, 88
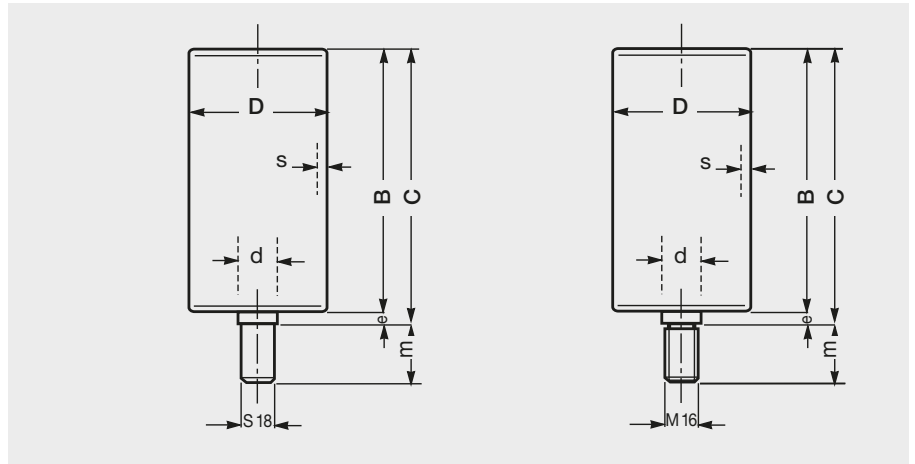
guide roller

type	D mm	s	d	B	C	m	e	M	bearing	weight Kg
PSV/G1-FCD	63	3	20	130	138	35	8	16	6204	1.9
				150	158					2.1
PSV/G1-FCD	89	3	20	130	138	35	8	16	6204	1.9
				150	158					2.2
PSV/G2-FCD			25	130	138	35	8	20	6205	2.0
				150	158					2.1
PSV/G3-FCD			30	130	138	40	8	24	6206	2.7
				150	158					3.1
PSV/G1-FCD	108	3,5	20	130	138	35	8	16	6204	2.4
				150	158					2.7
PSV/G2-FCD			25	130	138	35	8	20	6205	2.1
				150	158					2.6
PSV/G3-FCD			30	130	138	40	8	24	6206	2.9
				150	158					3.4
PSV/G1-FCD	133	4	20	130	138	35	8	16	6204	3.1
				150	158					3.5
PSV/G2-FCD			25	130	138	35	8	20	6205	2.8
				150	158					3.4
PSV/G3-FCD			30	130	138	40	8	24	6206	3.6
				150	158					4.1

Example of ordering
PSV/G1-FCD, 20M16, 89N, 138
PSV/G2-FCD, 25M20, 108N, 158
PSV/G3-FCD-FHD, 30M24, 133N, 158

2.6 - Rollers with rubber 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 and +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.

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).

For the correct dimensioning and the choice of impact rollers in relation to the load check the characteristics of the base roller.

Fig. **6**
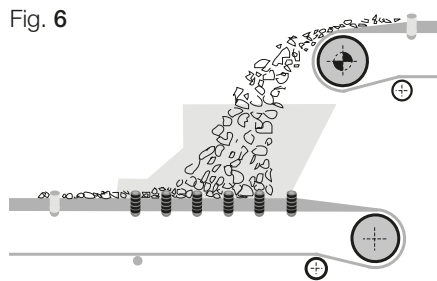
Fig. **7**
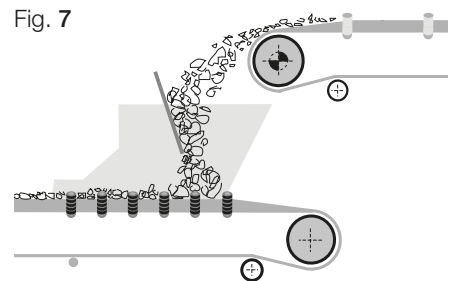
Programme of production of impact rollers
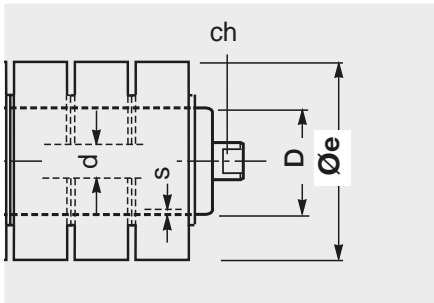
basic roller type	D mm	s	Øe mm	design	spindle d	ch	bearing
MPS/1	60	3	**89**	NA	15	17	6202
	60	3	**108**	NA			
PSV/1-FHD	63	3	**89**	NA	20	14	6204
	63	3	**108**	NA			
	89	3	**133**	NA			
	89	3	**159**	NA			
PSV/2-FHD	89	3	**133**	NA	25	18	6205
	89	3	**159**	NA			
PSV/3-FHD	89	3	**133**	NA	25	18	6305
	89	3	**159**	NA			
PSV/4-FHD	89	3	**133**	NA	30	22	6206
	89	3	**159**	NA			
PSV/5-FHD	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-FHD	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.

series
Impact

Øe 89 NA

Base roller:

MPS/1
D = 60;
spindle 15; $d_1 = 20$
bearing 6202
ch = 17

PSV/1-FHD
D = 63;
spindle 20; $d_1 = 20$
bearing 6204
ch = 14

belt			roller						rings
width mm			dimensions mm			weight Kg			rings width
arrangements			B	**C**	A	MPS/1-FHD	PSV/1-FHD		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; d_1 = 20
bearing 6202
ch = 17

PSV/1-FHD
D = 63;
spindle 20; d_1 = 20
bearing 6204
ch = 14

belt			roller						rings
width mm			dimensions mm			weight Kg			width
arrangements			B	**C**	A	MPS/1-FHD	PSV/1-FHD		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-FHD, 20F, 108NA, 323

for special designs
see pages 80-81

series
Impact
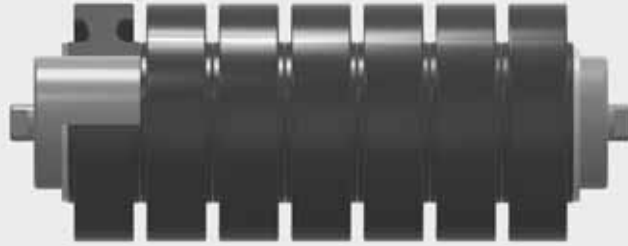
Øe 133 NA

Base roller:

PSV/1-FHD
D = 89;
spindle 20; $d_1 = 20$
bearing 6204
ch = 14

PSV/2-FHD
D = 89;
spindle 25; $d_1 = 25$
bearing 6205
ch = 18

PSV/3-FHD
D = 89;
spindle 25; $d_1 = 25$
bearing 6305
ch = 18

PSV/4-FHD
D = 89;
spindle 30; $d_1 = 30$
bearing 6206
ch = 22

PSV/5-FHD
D = 89 x 4*;
spindle 30; $d_1 = 30$
bearing 6306
ch = 22

*bigger tube thickness
than standard

Example of ordering
standard design
PSV/2-FHD,25F,133NA,388

for special designs
see pages 80-81

belt width mm			roller dimensions mm			weight Kg					rings width
arrangements			B	**C**	A	PSV/1-FHD	PSV/2-FHD	PSV/3-FHD	PSV/4-FHD	PSV/5-FHD	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	
	2000		1100	**1108**	*			19.8	21.7	22.3	
1000			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
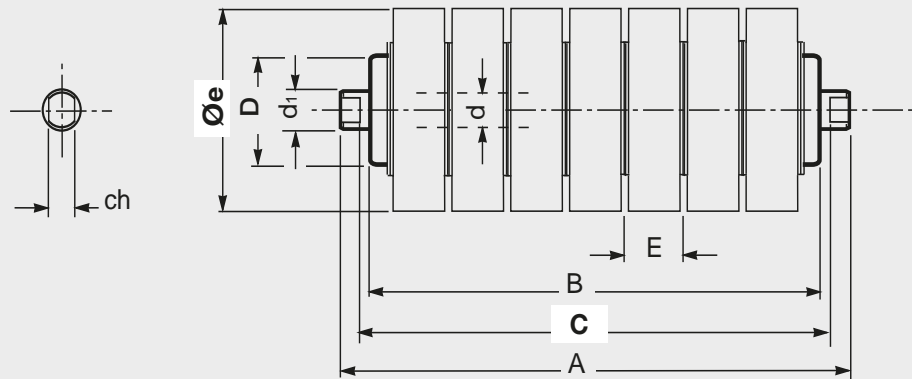
Øe 159 NA

Base roller:

PSV/1-FHD
D = 89;
spindle 20; d_1 = 20
bearing 6204
ch = 14

PSV/2-FHD
D = 89;
spindle 25; d_1 = 25
bearing 6205
ch = 18

PSV/3-FHD
D = 89;
spindle 25; d_1 = 25
bearing 6305
ch = 18

PSV/4-FHD
D = 89;
spindle 30; d_1 = 30
bearing 6206
ch = 22

PSV/5-FHD
D = 89 x 4*;
spindle 30; d_1 = 30
bearing 6306
ch = 22

*bigger tube thickness than standard

belt width mm (arrangements)	roller dimensions mm B	C	A	weight Kg PSV/1-FHD	PSV/2-FHD	PSV/3-FHD	PSV/4-FHD	PSV/5-FHD	rings width 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

2 Rollers

series
Impact
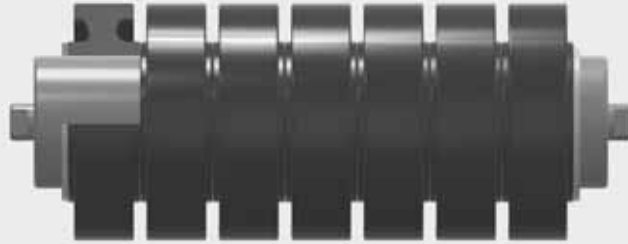
Øe 180 NA

Base roller:

PSV/5-FHD
D = 108 x 4*;
spindle 30; d_1 = 30
bearing 6306
ch = 22

PSV/7-FHD
D = 108 x 4*;
spindle 40; d_1 = 40
bearing 6308
ch = 32

* bigger tube
thickness than
standard

Example of ordering
standard design
PSV/5-FHD,30F,180NA,678

for special designs
see pages 80-81

belt			roller			weight		rings
width mm			dimensions mm			Kg		width
arrangements			B	**C**	A	PSV/5-FHD	PSV/7-FHD	E = 40
		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	
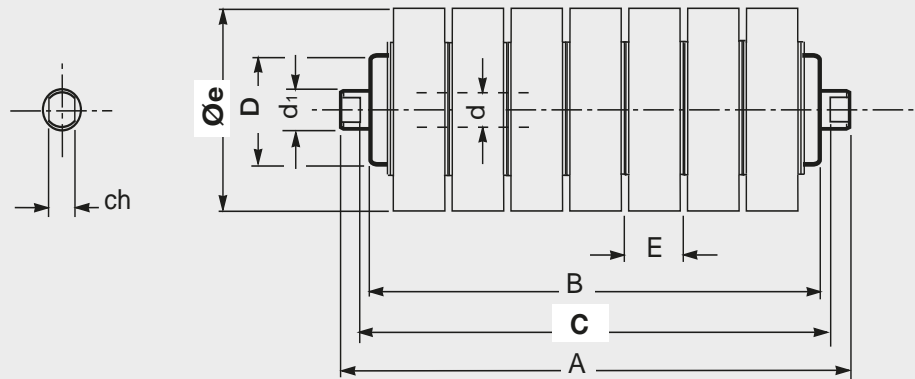
Øe 194 NA

Base roller:

PSV/5-FHD
D = 133;
spindle 30; d_1 = 30
bearing 6306
ch = 22

PSV/7-FHD
D = 133 x 6*;
spindle 40; d_1 = 4
bearing 6308
ch = 32

* bigger tube
thickness than
standard

---

belt			roller						rings
width mm			dimensions mm			weight Kg			rings width
arrangements			B	**C**	A	PSV/5-FHD	PSV/7-FHD		E = 50
		1600	600	**608**	632	23.4	28.1		
		1800	670	**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		

series
Impact
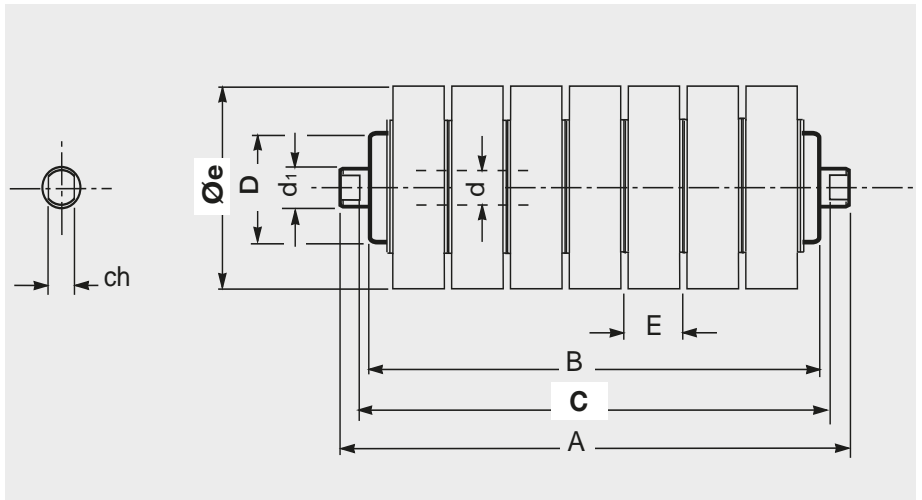
Øe 215 NA

Base roller:
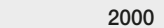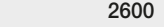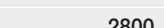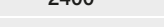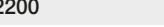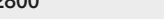
PSV/5-FHD
D = 133;
spindle 30; d_1 = 30
bearing 6306
ch = 22

PSV/7-FHD
D = 133x 6*;
spindle 40; d_1 = 40
bearing 6308
ch = 32

* bigger tube
thickness than
standard

belt			roller					rings
width mm			dimensions mm			weight Kg		rings width
arrangements			B	C	A	PSV/5-FHD	PSV/7-FHD	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-FHD,40F,215NA,758

2.6.2 - Return rollers with rubber 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.
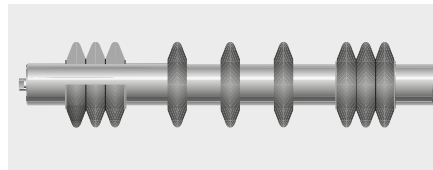
Arrangement G
Return rollers with pointed rings spaced in the central part and positioned in sets at the side. Used on belt conveyors of medium capacity.
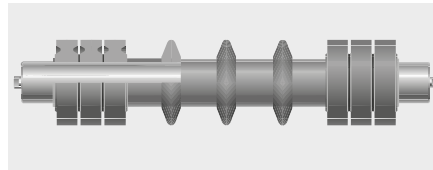
Arrangement L
Return rollers used on belt conveyors in high duty plant. They are provided with sets of flat rings, positioned at the roller extremities, and with pointed rings spaced in the central part of the roller.
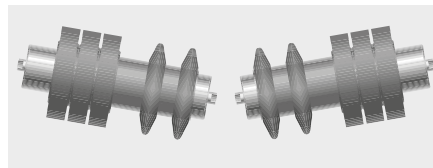
Arrangement C
Return rollers for return transom sets of "V" design format with base rolllers from series PSV, with characteristic proportional dimensions to the requirements designed into large belt conveyors.

Arrangement with special flat rubber ring type B for pulp and paper and other industries.

Programme of production of return rollers with rings

base roller type	D mm	s	Øe mm	design	spindle d	ch.	bearing
RTL/1	60	2.0	**108**	**NG**	15	17	6202
	60	2.0	**133**	**NG**			
MPS/1	60	3.0	**108**	**NG**	15	17	6202
	60	3.0	**133**	**NG**			
PSV/1-FHD	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**			
	108	3.5	**180**	**NL, NC**			
PSV/2-FHD	89	3.0	**133**	**NL, NC**	25	18	6205
	89	3.0	**159**	**NL, NC**			
	108	3.5	**180**	**NL, NC**			
PSV/4-FHD	89	3.0	**133**	**NL, NC**	30	22	6206
	89	3.0	**159**	**NL, NC**			
	108	3.5	**180**	**NL, NC**			
PSV/7-FHD	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.
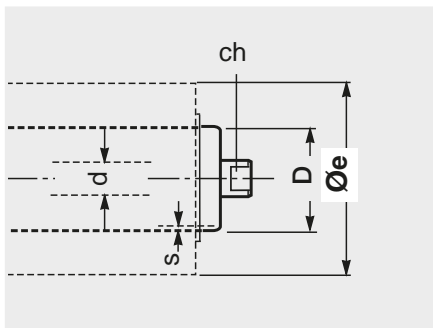
2 Rollers

series
with rings
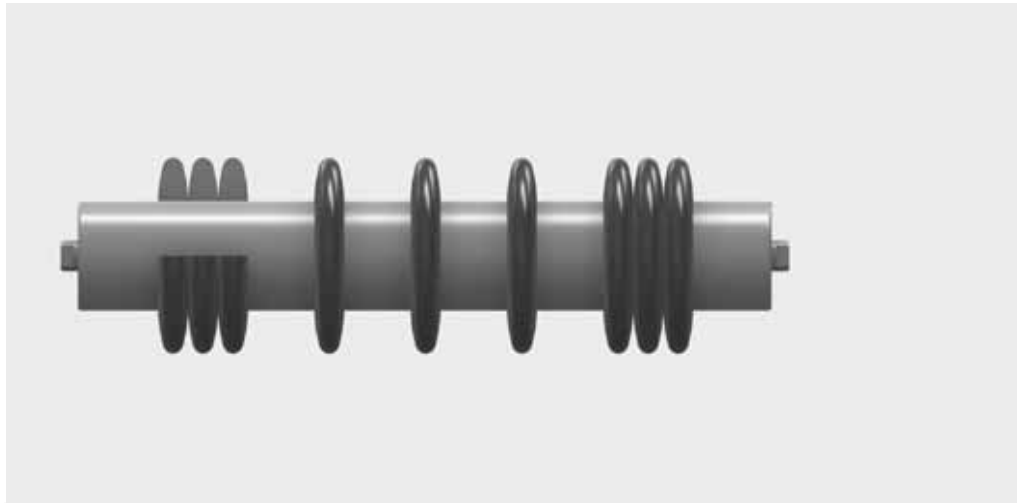
Øe 108 NG

Base roller:

RTL/1
D = 60;
spindle 15 ; d_1 = 20
bearing 6202
ch = 17

MPS/1
D = 60;
spindle 15; d_1 = 20
bearing 6202
ch = 17

PSV/1-FHD
D = 63;
spindle 20; d_1 = 20
bearing 6204
ch = 14

belt	roller							
width mm	dimensions mm			weight Kg				rings n°
arrangements ▬	B	**C**	A	RTL/1	MPS/1	PSV/1-FHD		total
300	380	**388**	406	2.7	3.4			5
400	500	**508**	526	3.2	4.1			5
500	600	**608**	626	3.8	4.8	5.9		6
650	750	**758**	776	4.9	6.1	7.4		9
800	950	**958**	976	6.0	7.4	9.0		10
1000	1150	**1158**	1176	7.1	8.9	10.7		12
1200	1400	**1408**	1426		10.4	12.6		13
1400	1600	**1608**	1626			14.3		15

roller	rings				side	central	side
length C mm	a mm	b	t	E	n°		
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

Example of ordering
standard design
MPS/1,15B,108NG,508

for special designs
see pages 80-81

Øe 133 NG

Base roller:

RTL/1
D = 60;
spindle 15; d_1 = 20
bearing 6202
ch = 17

PSV/1-FHD
D = 63;
spindle 20; d_1 = 20
bearing 6204
ch = 14

MPS/1
D = 60;
spindle 15; d_1 = 20
bearing 6202
ch = 17

Example of ordering
standard design
PSV/1-FHD,20F,133NG,758

for special designs
see pages 80-81

belt	roller						
width mm	dimensions mm			weight Kg			rings n°
arrangements							
▬	B	**C**	A	RTL/1	MPS/1	PSV/1-FHD	total
300	380	**388**	406	3.8	4.4		5
400	500	**508**	526	4.3	5.1		5
500	600	**608**	626	5.1	6.0	7.1	6
650	750	**758**	776	6.8	8.0	9.3	9
800	950	**958**	976	8.1	9.5	11.1	10
1000	1150	**1158**	1176	9.7	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	rings				side	central	side
length C mm	a mm	b	t	E	n°		
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

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-FHD
D = 63;
spindle 20; d_1 = 20
bearing 6204
ch = 14

belt	roller					rings
width mm	dimensions mm			weight Kg		rings n°
arrangements	B	**C**	A	PSV/1-FHD		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

Example of ordering
standard design
PSV/1-FHD,20F,108NL,1158

for special designs
see pages 80-81

belt	roller	rings								
width mm	lenght mm	a mm	b	t	E	E_1	side n°	central	side	
300	388	90	86	342	25	45	2	1	2	
400	508	90	90	442	25	45	2	2	2	
500	608	90	93	542	25	45	2	3	2	
650	758	90	104	690	25	45	2	4	2	
800	958	135	117	840	25	45	3	4	3	
1000	1158	135	112	1039	25	45	3	6	3	
1200	1408	133	123	1239	25	45	3	7	3	
1400	1608	135	118	1435	25	45	3	9	3	
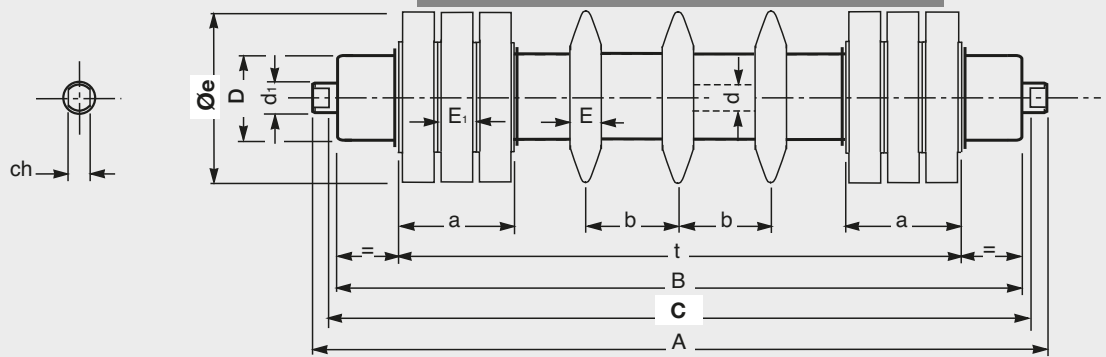
Øe 133 NL

Base roller:

PSV/1-FHD
D = 89;
spindle 20; d_1 = 20
bearing 6204
ch = 14

PSV/2-FHD
D = 89;
spindle 25; d_1 = 25
bearing 6205
ch = 18

PSV/4-FHD
D = 89;
spindle 30; d_1 = 30
bearing 6206
ch = 22

Example of ordering
standard design
PSV/2-FHD, 25F,133NL,1608

for special designs
see pages 80-81

belt	roller			weight Kg			rings n°
width mm	dimensions mm						
arrangement	B	**C**	A	PSV/1-FHD	PSV/2-FHD	PSV/4-FHD	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

belt	roller	rings					side n°	central	side
width mm	lenght mm	a mm	b	t	E	E_1			
500	608	105	84	531	30	35	3	3	3
650	758	105	98	685	30	35	3	4	3
800	958	140	115	835	30	35	4	4	4
1000	1158	140	110	1030	30	35	4	6	4
1200	1408	140	121	1228	30	35	4	7	4
1400	1608	140	130	1430	30	35	4	8	4
1600	1808	140	137	1630	30	35	4	9	4
1800	2008	140	143	1833	30	35	4	10	4
2000	2208	140	148	2036	30	35	4	11	4

series
with rings

Øe 159 NL

Base roller:

PSV/1-FHD
D = 89;
spindle 20; d_1 = 20
bearing 6204
ch = 14

PSV/2-FHD
D = 89;
spindle 25; d_1 = 25
bearing 6205
ch = 18

PSV/4-FHD
D = 89;
spindle 30; d_1 = 30
bearing 6206
ch = 22

Example of ordering
standard design
PSV/4-FHD,30F,159NL,1808
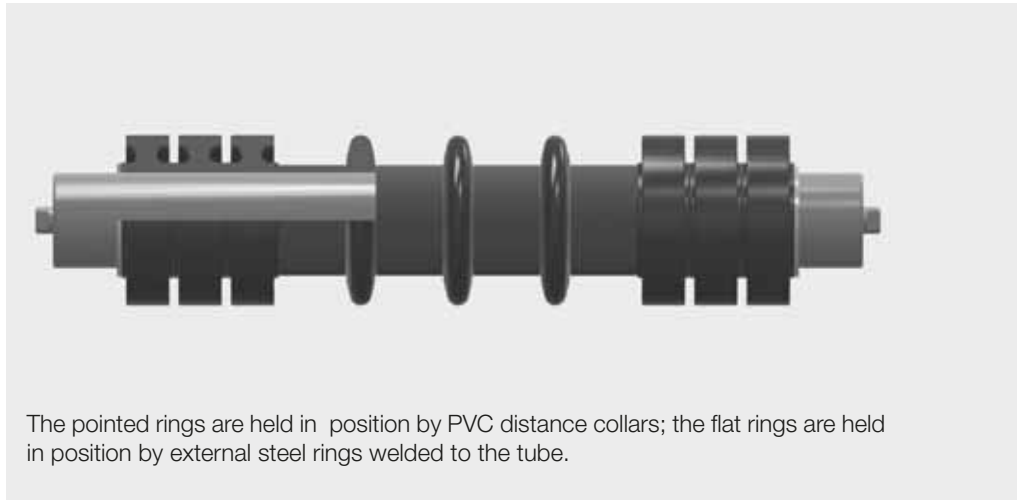
The pointed rings are held in position by PVC distance collars; the flat rings are held in position by external steel rings welded to the tube.

belt	roller							rings
width mm	dimensions mm				weight Kg			n°
arrangement		B	**C**	A	PSV/1-FHD	PSV/2-FHD	PSV/4-FHD	total
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

belt	roller	rings							
width mm	lenght mm	a mm	b	t	E	E_1	side n°	central	side
500	608	100	67	546	30	50	2	3	2
650	758	100	78	696	30	50	2	4	2
800	958	150	88	843	30	50	3	4	3
1000	1158	150	84	1047	30	50	3	6	3
1200	1408	150	96	1255	30	50	3	7	3
1400	1608	150	104	1451	30	50	3	8	3
1600	1808	150	110	1653	30	50	3	9	3
1800	2008	150	121	1847	30	50	3	10	3
2000	2208	150	116	2051	30	50	3	11	3

Øe 180 NL

Base roller:

PSV/1-FHD
D = 108;
spindle 20; d_1 = 20
bearing 6204
ch = 14

PSV/2-FHD
D = 108;
spindle 25; d_1 = 25
bearing 6205
ch = 18

PSV/4-FHD
D = 108;
spindle 30; d_1 = 30
bearing 6206
ch = 22

PSV/7-FHD
D = 108;
spindle 40; d_1 = 40
bearing 6308
ch = 32

Example of ordering
standard design
PSV/4-FHD,30F,180NL,1808

for special designs
see pages 80-81

belt	roller				weight Kg				rings n°
width mm	dimensions mm								
arrangement	B	**C**	A	PSV/1-FHD	PSV/2-FHD	PSV/4-FHD	PSV/7-FHD	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	2500	**2508**	*			52.0	63.1	20

* in relation to the choice of base roller

belt	roller	rings					side central side		
width mm	lenght mm	a	b	t	E	E_1	n°		
800	958	160	76	838	40	40	4	4	4
1000	1158	160	73	1041	40	40	4	6	4
1200	1408	160	84	1238	40	40	4	7	4
1400	1608	160	93	1439	40	40	4	8	4
1600	1808	160	100	1638	40	40	4	9	4
1800	2008	160	106	1840	40	40	4	10	4
2000	2208	160	111	2042	40	40	4	11	4
2200	2508	160	115	2241	40	40	4	12	4

series
with rings

The two sets of flat rings are held in position
by steel rings welded to the tube

Øe 108 NC

Base roller:

PSV/1-FHD
D = 63;
spindle 20; d_1 = 20
bearing 6204
ch = 14

belt	roller				
width mm	dimensions mm			weight Kg	rings n°
arrangement	B	**C**	A	PSV/1-FHD	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 C mm	rings a mm	b	c	t	E	E_1	side n°	central
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-FHD,20F,108NC,608

for special designs
see pages 80-81
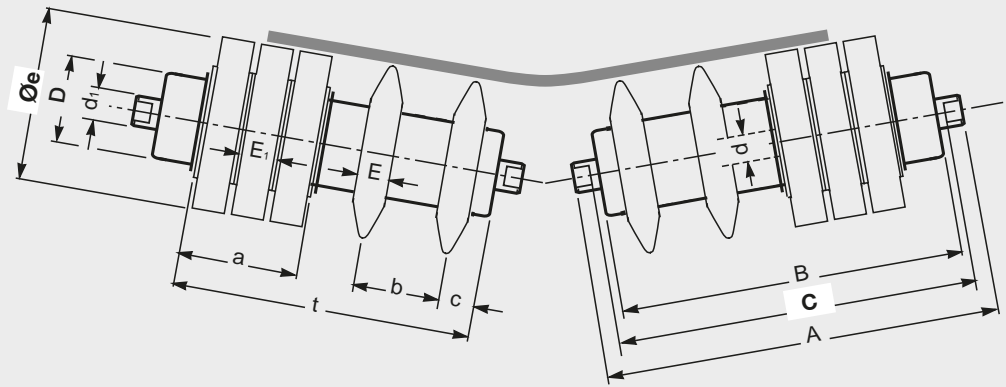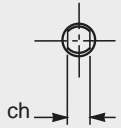
Øe 133 NC

Base roller:

PSV/1-FHD
D = 89;
spindle 20; d_1 = 20
bearing 6204
ch = 14

PSV/2-FHD
D = 89;
spindle 25; d_1 = 25
bearing 6205
ch = 18

PSV/4-FHD
D = 89;
spindle 30; d_1 = 30
bearing 6206
ch = 22

Example of ordering
standard design
PSV/2-FHD,25F,133NC,808

for special designs
see pages 80-81

belt	roller								rings
width mm	dimensions mm				weight Kg				rings n°
arrangement	B	**C**	A		PSV/1-FHD	PSV/2-FHD	PSV/4-FHD		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 C mm	rings a mm	b	c	t	E	E_1	side n°	central
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

NOTE: A different product configuration is available (see catalogue: "Return rollers with rubber rings VARIANT" available on rulmeca.com). Please get in touch with your Rulmeca contact person to check the availability of the product configuration in your country.

Øe 159 NC

Base roller:

PSV/1-FHD
D = 89;
spindle 20; d_1 = 20
bearing 6204
ch = 14

PSV/2-FHD
D = 89;
spindle 25; d_1 = 25
bearing 6205
ch = 18

PSV/4-FHD
D = 89;
spindle 30; d_1 = 30
bearing 6206
ch = 22

Example of ordering
standard design
PSV/2-FHD,25F,159NC,908

for special designs
see pages 80-81
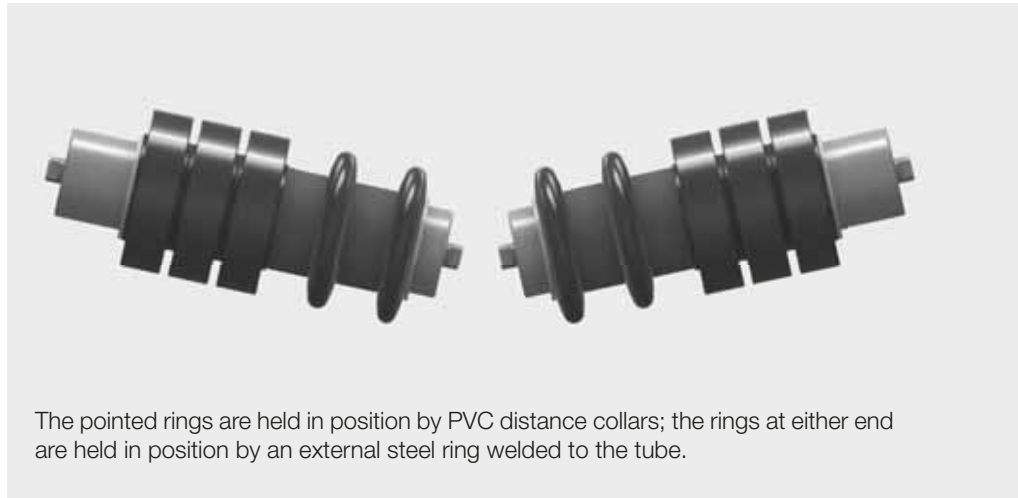
The pointed rings are held in position by PVC distance collars; the rings at either end are held in position by an external steel ring welded to the tube.

belt		roller						rings
width mm		dimensions mm			weight Kg			n°
arrangement		B	**C**	A	PSV/1-FHD	PSV/2-FHD	PSV/4-FHD	total
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	rings								
length C mm	a mm	b	c	t	E	E_1		side n°	central
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

NOTE: A different product configuration is available (see catalogue: "Return rollers with rubber rings VARIANT" available on rulmeca.com). Please get in touch with your Rulmeca contact person to check the availability of the product configuration in your country.
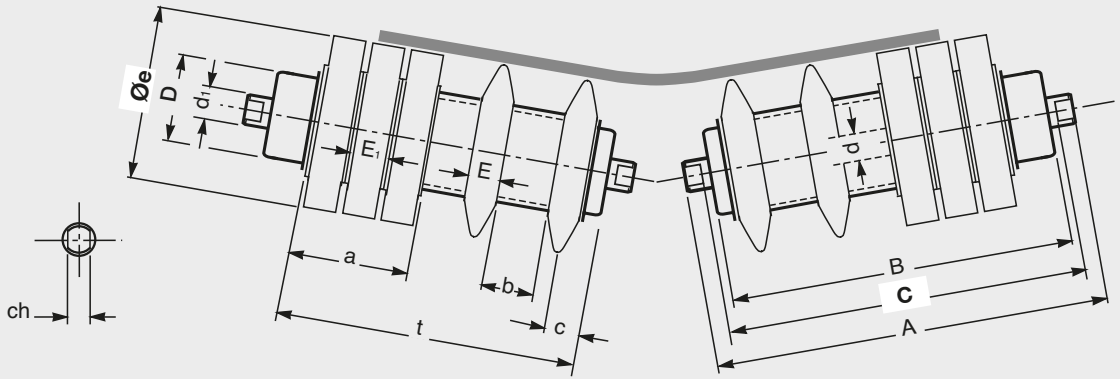
Øe 180 NC

Base roller:

PSV/1-FHD
D = 108;
spindle 20; d_1 = 20
bearing 6204
ch = 14

PSV/7-FHD
D = 108;
spindle 40; d_1 = 40
bearing 6308
ch = 32

PSV/2-FHD
D = 108;
spindle 25; d_1 = 25
bearing 6205
ch = 18

PSV/4-FHD
D = 108;
spindle 30; d_1 = 30
bearing 6206
ch = 22

Example of ordering
standard design
PSV/2-FHD,25F,180NC,908

for special designs
see pages 80-81

belt	roller								
width mm	dimensions mm			weight Kg					rings n°
arrangement	B	**C**	A	PSV/1-FHD	PSV/2-FHD	PSV/4-FHD	PSV/7-FHD		total
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 C mm	rings a mm	b	c	t	E	E_1	side n°	central
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

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 d	ch	bearing
MPS/1	60	3	108	NM	15	17	6202
	89	3	133	NM			
PSV/1-FHD	63	3	108	NM	20	14	6204
	89	3	133	NM			
	89	3	180	NM			
PSV/2-FHD	89	3	133	NM	25	18	6205
	89	3	180	NM			
PSV/3-FHD	89	3	133	NM	25	18	6305
	89	3	180	NM			
PSV/4-FHD	89	3	133	NM	30	22	6206
	89	3	180	NM			

Øe 108 NM

Base roller:

MPS/1
D = 60;
spindle 15; d_1 = 20
bearing 6202
ch = 17

PSV/1-FHD
D = 63;
spindle 20; d_1 = 20
bearing 6204
ch = 14

belt	roller						
width mm	dimensions mm			weight Kg			rings width E = 38,5
arrangement	B	**C**	A	MPS/1	PSV/1-FHD		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-FHD,20F,108NM,758

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; d_1 = 20
bearing 6202
ch = 17

PSV/1-FHD
D = 89;
spindle 20; d_1 = 20
bearing 6204
ch = 14

PSV/2-FHD
D = 89;
spindle 25; d_1 = 25
bearing 6205
ch = 18

PSV/3-FHD
D = 89;
spindle 25; d_1 = 25
bearing 6305
ch = 18

PSV/4-FHD
D = 89;
spindle 30; d_1 = 30
bearing 6206
ch = 22

belt	roller									
width mm	dimensions mm				weight Kg					rings width E = 38,5
arrangement	B	C	A (MPS/1 PSV/1-FHD)	A (PSV/2-FHD PSV/3-FHD PSV/4-FHD)	MPS/1	PSV/1-FHD	PSV/2-FHD	PSV/3-FHD	PSV/4-FHD	L
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-FHD,20F,133NM,758

for special designs
see pages 80-81
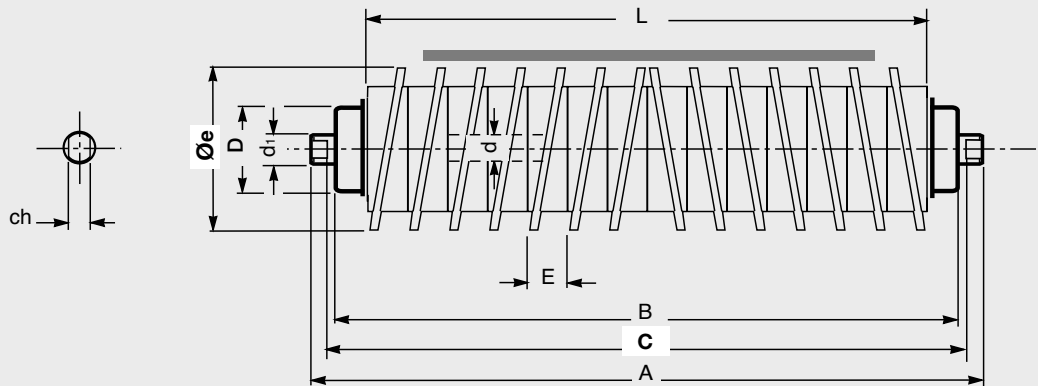
Øe 180 NM

Base roller:

PSV/1-FHD
D = 89;
spindle 20; d_1 = 20
bearing 6204
ch = 14

PSV/2-FHD
D = 89;
spindle 25; d_1 = 25
bearing 6205
ch = 18

PSV/3-FHD
D = 89;
spindle 25; d_1 = 25
bearing 6305
ch = 18

PSV/4-FHD
D = 89;
spindle 30; d_1 = 30
bearing 6206
ch = 22

belt	roller									rings width
width mm	dimensions mm					weight Kg				E = 38,5
arrangement	B	**C**	A			PSV/1-FHD	PSV/2-FHD	PSV/3-FHD	PSV/4-FHD	L
			PSV/1-FHD	PSV/2-FHD PSV/3-FHD PSV/4-FHD						
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-FHD,20F,180NM,1158

3   Troughing sets

3 Troughing sets

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 convey 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.

3.2 - 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, single directional 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 centering 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 "Dynamic Load, on the carrying sets Ca1, on the return sets Cr1".

The load on the troughing set is given by the material load added to the weight of rollers; and using 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 is given by the admissible load on the tubular leaving aside the type of attachments and the characteristics of the side and central bracket supports.
- the transoms T2L, T3M, T3P, 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 T3P, 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.

3.2.1 - Choice of the transom in relation to load

Belt width mm	T2L (upper troughing set with 2 rollers) 20°	T3M (light upper troughing set with 3 rollers) 20°-30°-35°-45°	
300	**338** (Ø60-Ø110)		
400	**286** (Ø60-Ø110)	**286** (Ø76-Ø110)	
500	**205** (Ø60-Ø110)	**247** (Ø76-Ø140)	
650	**167** (Ø60-Ø110)	**205** (Ø76-Ø140)	**354** (Ø89-Ø140)
800	**167** (Ø60-Ø110)	**167** (Ø76-Ø110)	**289** (Ø89-Ø159)
1000			
1200			
1400			
1600			
1800			
2000			
2200			

Load capacity daN

Belt width mm	T3P (medium upper troughing set with 3 rollers 800-1600 and heavy upper troughing set with 3 rollers 1800-2200) 20°-30°-35°-45°				R2T (return set "V") ((Ø89-(Ø194) 10°	
300						
400						
500						
650						354
800	460 (Ø89-Ø159)					289
1000	388 (Ø89-Ø159)		581 (Ø140-Ø159)			388
1200	325 (Ø89-Ø159)	487 (Ø140-Ø159)	634 (Ø140-Ø159)			325
1400	288 (Ø140-Ø159)	431 (Ø140-Ø159)	561 (Ø140-Ø159)	710 (Ø140-Ø159)	561	431
1600	387 (Ø140-Ø159)	503 (Ø140-Ø159)	637 (Ø140-Ø159)	753 (Ø194)	503	387
1800	446 (Ø140-Ø194)		667 (Ø140-Ø194)		446	342
2000	604 (Ø159-Ø194)		909 (Ø159-Ø194)			604
2200	558 (Ø159-Ø194)		840 (Ø159-Ø194)			560
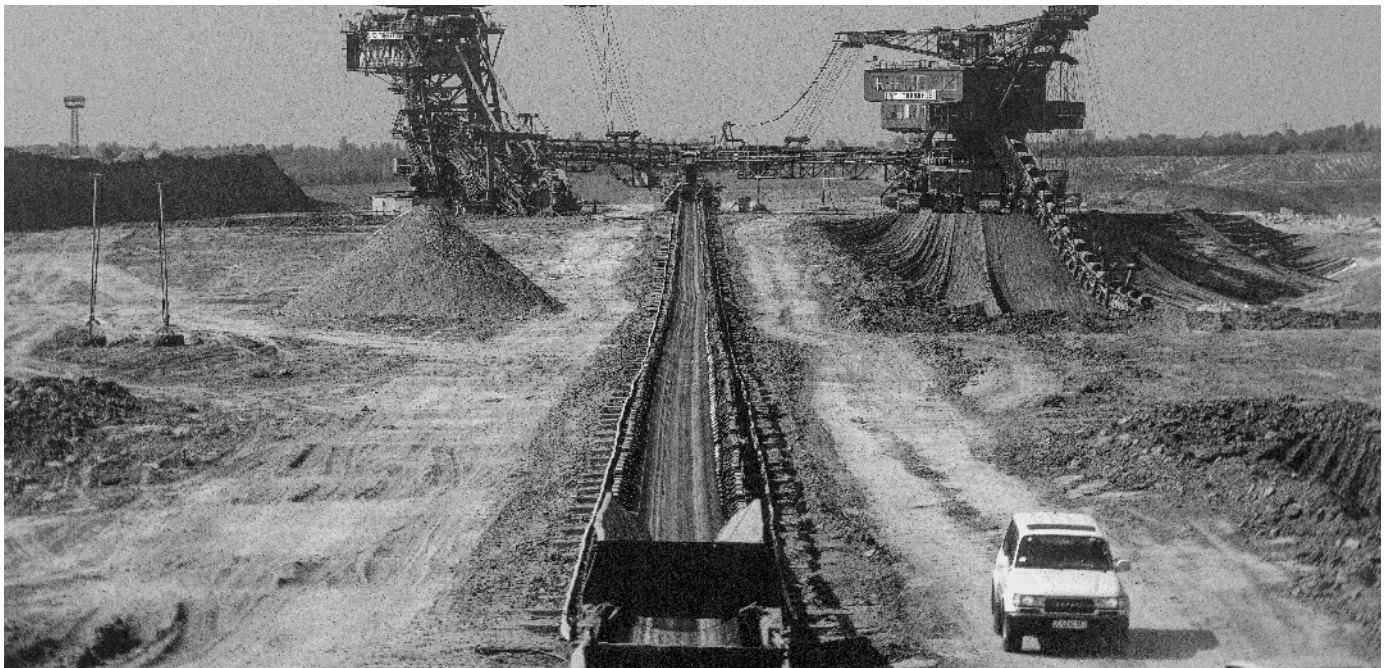
3.3 - Arrangements

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
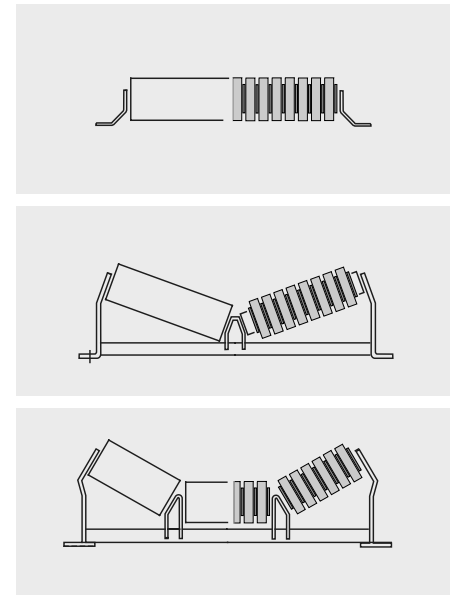
3.3.1 - Upper carrying troughing sets

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 single directional 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
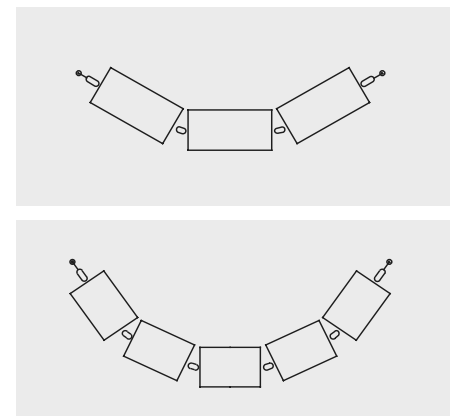
3.3.2 - Return sets

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
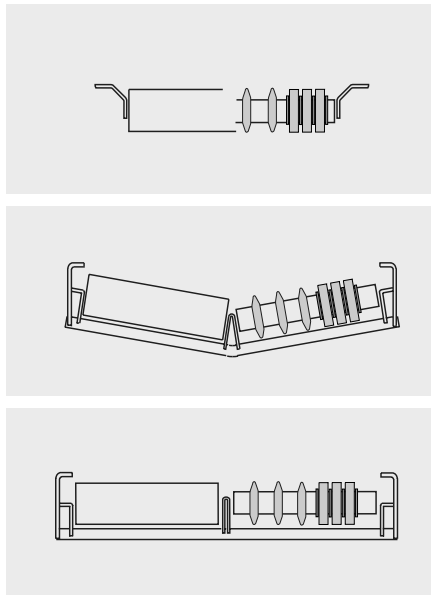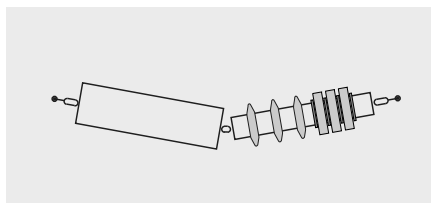
Fig. **4** - "Garland" sets

3.3.3 Order codes
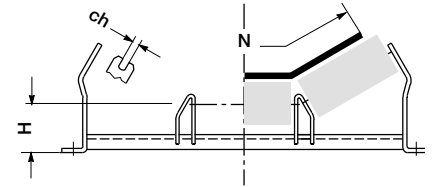
TRANSOMS ARTICLE CODE is composed by the following data:

Example:	Transom	T3P	1000	35°	SZ4	KE22	H186	YC	R

Series

Belt Width mm 300 ÷ 2200

Throughing angle deg. 20° 30° 35° 45°

Beam Size SZ 1-2-3-4-5-6-7

Across Flat Key KE mm refers to the roller's across flat width (ch. AF, SW...)

Height H mm of roller axis from ground

Type of finish (see table below)

Tilt angle

- with side rollerstilt angle, for one-way belt
R no tilt angle, for reversible belt (symmetrical)

BRACKETS ARTICLE CODE is composed by the following data:

Example:	Support	SPT	1490	KE18	H100	Z

Series

Type

Across Flat key KE mm refers to the roller's across flat width (ch. AF, SW...)

Height H mm of roller axis from ground

Type of finish (see table below)
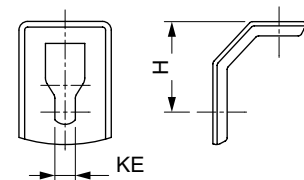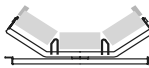
TYPE OF FINISH OF TRANSOM AND BRACKETS

Code	Description of treatment
-	WT without treatment, raw
YA	Painted: one hand antirust primer, zinc phosphate based 40 micron, colour grey (no RAL)
YB	Painted: sandblasted SA 2,5 + epoxy rich-zinc primer 70 micron (min. 80%), colour grey, (no RAL), over-paintable
YC	Painted: sandblasted SA 2,5 + epoxy rich-zinc primer 40 micron + epoxy enamel 60 micron, colour grey RAL 7035, over-paintable
YS	Special paint cycle (to be specified)
Z*	Hot dip zinc galvanized - min. 70 microns - EN ISO 1461
*	Z for self-centering t is made by hot dip zinc thermal spraying, acc. to European Norm EN ISO 2063

3.3.4 - Programme of transoms and brackets

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.

Series	Arrangements	Descriptions
T2L 20°		upper transom for two rollers
T3M BW 400-800 20° - 30° - 35° - 45° **T3P BW 800-1600** 20° - 30° - 35° - 45 **T3P BW 1800-2200** 20° - 30° - 35° - 45°		upper transom for three rollers
SPT 1657 - 1660 **SPT 070** **SPT 1795**		upper brackets for one roller
SPT 1478 - 1490 **SPT 243** **SPT 1495**		lower return brackets for plain roller
R2T 10°		transom for two return rollers "V"
CT3M **CT3P**		upper self-centering transom for three rollers
Q1 L **Q1 P**		lower self-centering return transom for one roller
Q2 L **Q2 P**		lower self-centering return transom for two rollers

T2L 20°

T2L 20° Standard.

For light upper troughing sets with two rollers, plain or with impact rings.
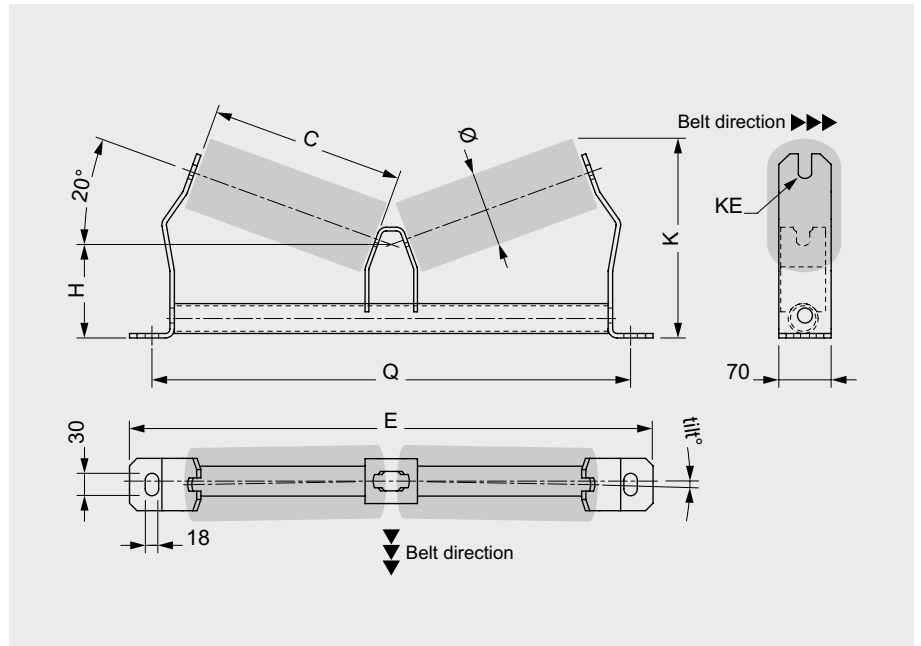
Belt direction ▶▶▶

for rollers series

RTL	**PL**
Ø 60, 76, 89	Ø 90, 110
spindle 15	spindle 20
bearing 6202	bearing 6204
KE = 17	KE = 14, 30

MPS	**PSV/1-FHD**
Ø 60, 76, 89, 102	Ø 63, 89, 108
spindle 15	spindle 20
bearing 6202	bearing 6204
KE = 17	KE = 14

Clamping kit available (for transom fixing without holes in the frame)
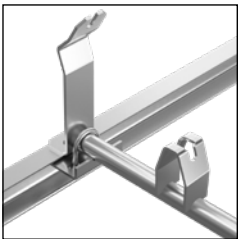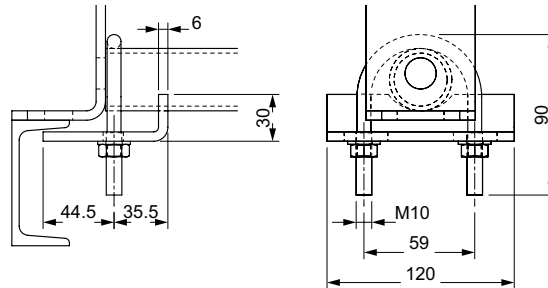
Clamps ordering codes: ask Rulmeca, reporting the selected transom type T2L beam size SZ 1 and finishing.

T2L 20°

| | Transom ordering code | | | | | | With tilt - reversible R | For rollers | Transom | | | | |
Series	Belt width mm	Troughing angle deg.°	Beam size SZ	Across Flat key KE mm	H mm	Finishing		Ø mm	Length C mm	Load capacity kg	Q mm	E mm	K mm	Weight without rollers kg
	300								208	338	540	600	253	3,6
	400							60 - 63 -76	258	286	640	700	270	4.0
T2L	500	20°	1	14 17 30	125	–, YA, YB, YC, YS, Z	-, R	89 - 90 102 - 108	323	205	740	800	292	4,4
	650							110	388	167	890	950	315	4,9
	800								473	167	1090	1150	344	5,7

3 Troughing sets

T3M 20°-30°-35°-45°

T3M α = 20°- 30°- 35°- 45° Standard

For light upper troughing sets with three rollers, plain or with impact rings.

Belt direction ▶▶▶

KE

70 with beam size = 1
80 with beam size = 2
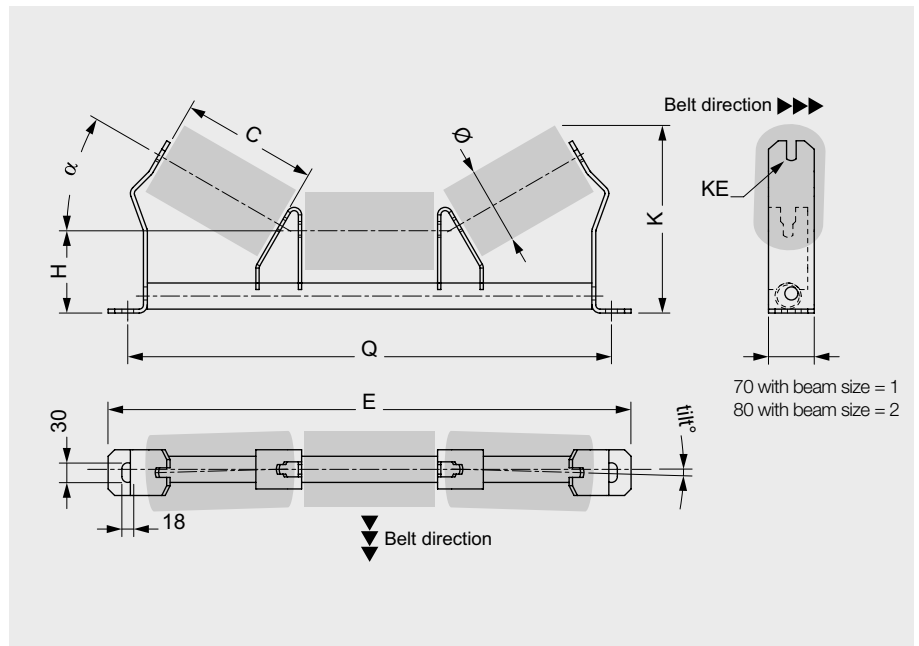
for rollers series

RTL
Ø 76, 89
spindle 15
bearing 6202
KE = 17

PSV/1-FHD
Ø 89, 108, 133
spindle 20
bearing 6204
KE = 14

MPS
Ø 76, 89, 102
spindle 15
bearing 6202
KE = 17

PSV/2, 3-FHD
Ø 89, 108, 133, 159
spindle 25
bearing 6205, 6305
KE = 18

PL
Ø 90, 110, 140
spindle 20
bearing 6204
KE = 14, 30

PSV/4, 5-FHD
Ø 108, 133, 159
spindle 30
bearing 6206, 6306
KE = 22

Clamping kit available (for transom fixing without holes in the frame)
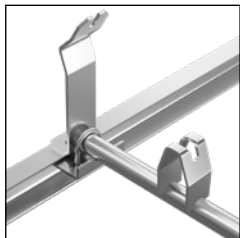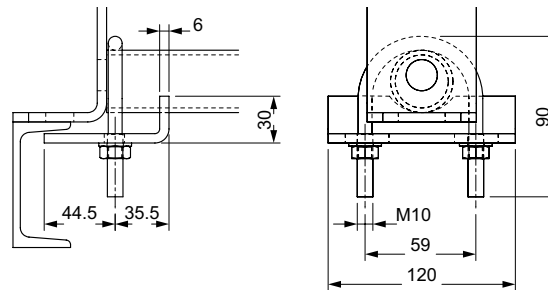
Clamps ordering codes: ask Rulmeca, reporting the selected transom type T3M beam size SZ 1 or 2 and finishing.

T3M 20°-30°-35°-45°

Transom ordering code								For rollers		Transom	K max						Weight without rollers			
Series	Belt width mm	Troughing angle deg.°	Beam size SZ	Across Flat key KE mm	H mm	Finishing	With tilt - reversible R	Ø mm	Length C mm	Load capacity kg	Q mm	E mm	20° mm	30° mm	35° mm	45° mm	20° kg	30° kg	35° kg	45° kg
T3M	400	20° - 30° 35° - 45°	1	14-17 18-22 30	121	–, YA, YB, YC, YS, Z	–, R	76	168	286	640	700	229	255	268	289	4,2	4,4	4,6	4,8
					126			89-90	168	286	640	700	229	256	268	290	4,3	4,6	4,7	5
					131			102	168	286	640	700	229	255	268	289	4,4	4,7	4,8	5,1
					136			108-110-114	168	286	640	700	250	275	287	308	4,5	4,8	4,9	5,2
	500		1		121			76	208	247	740	800	243	275	291	317	4,6	4,9	5	5,3
					126			89-90	208	247	740	800	243	275	291	318	4,7	5	5,2	5,5
					131			102	208	247	740	800	243	275	291	317	4,8	5,1	5,2	5,6
					136			108-110-114	208	247	740	800	263	295	309	337	4,9	5,2	5,3	5,7
					146			127-133-140	208	247	740	800	287	318	333	361	5,1	5,3	5,5	5,9
	650		1		121			76	258	205	890	950	260	300	320	353	5,1	5,4	5,7	6
					126			89-90	258	205	890	950	260	300	320	353	5,2	5,6	5,8	6,2
					131			102	258	205	890	950	260	300	320	353	5,3	5,7	5,9	6,3
					136			108-110-114	258	205	890	950	280	320	338	372	5,4	5,8	5,9	6,4
					146			127-133-140	258	205	890	950	304	343	362	396	5,6	5,9	6,2	6,6
			2		138			89-90	258	354	890	950	272	312	332	365	6,9	7,5	7,8	8,3
					148			108-110-114	258	354	890	950	292	332	350	384	7,2	7,7	8	8,6
					158			127-133-140	258	354	890	950	316	355	374	408	7,4	7,9	8,2	8,9
	800		1		121			76	323	167	1090	1150	292	332	357	399	5,8	6,2	6,5	7
					126			89-90	323	167	1090	1150	282	333	357	399	5,9	6,3	6,6	7,1
					131			102	323	167	1090	1150	292	332	357	399	6	6,4	6,7	7,2
					136			108-110-114	323	167	1090	1150	303	353	375	418	6,1	6,5	6,8	7,3
			2		138			89-90	323	289	1090	1150	294	345	369	411	7,8	8,5	8,9	9,6
					148			108-110-114	323	289	1090	1150	315	365	387	430	8,1	8,7	9,1	9,9
					158			127-133-140	323	289	1090	1150	339	388	411	454	8,3	8,9	9,4	10,2
					178			152-159	323	289	1090	1150	370	420	442	487	8,7	9,4	9,8	10,8

Example of ordering:
T3M 650 35°
SZ2 KE14 H148

T3P 20°-30°-35°-45°

BW 800-1600

T3P α = 20°- 30°- 35°- 45° Standard

For medium upper troughing sets with
three rollers, plain or with impact rings.
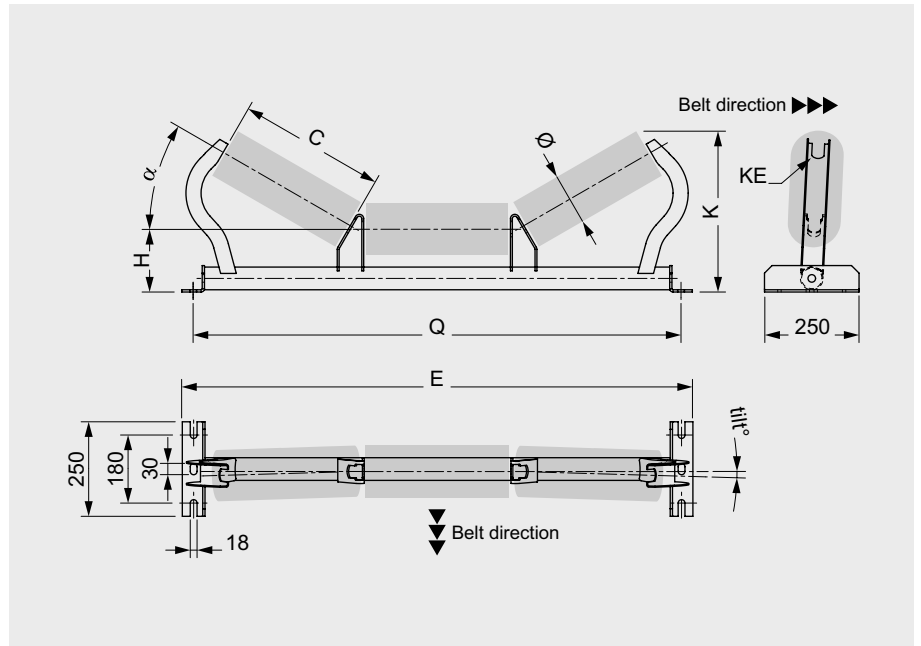
Belt direction ▶▶▶

for rollers series

PL
Ø 90, 110, 140
spindle 20
bearing 6204
KE = 14, 30

PSV/1-FHD
Ø 89, 108, 133
spindle 20
bearing 6204
KE = 14

PSV/2, 3-FHD
Ø 89, 108,
133, 159
spindle 25
bearing 6205,
6305
KE = 18

PSV/4, 5-FHD
Ø 108, 133, 159
spindle 30
bearing 6206,
6306
KE = 22

PSV/7-FHD
Ø 108, 133, 159,
194
spindle 40
bearing 6308
KE = 32

Clamping kit available (for transom fixing without holes in the frame)
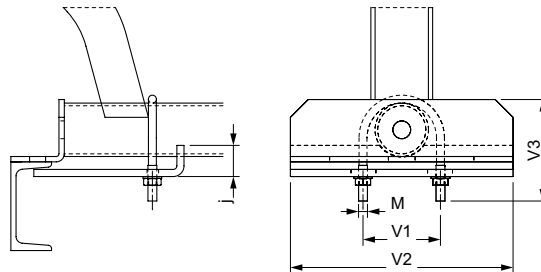
Size	J	V1	V2	V3	M
3-4	35	86	250	119	M10
5-6	50	100	250	150	M12

**Clamps ordering
codes:** ask Rulmeca,
reporting the selected
transom type T3P beam
size SZ 3, 4, 5, 6 and
finishing.

T3P 20°-30°-35°-45°
BW 800-1600

Transom ordering code								For rollers		Transom			K max				Weight without rollers			
Series	Belt width mm	Troughing angle deg.°	Beam size SZ	Across Flat key KE mm	H mm	Finishing	With tilt - reversible R	Ø mm	Length C mm	Load capacity kg	Q mm	E mm	20° mm	30° mm	35° mm	45° mm	20° kg	30° kg	35° kg	45° kg
T3P	800	20° - 30° 35° - 45°	3	14 - 18 22 - 30 32	146	-, YA, YB, YC, YS, Z	-, R	89-90	323	460	1090	1150	302	353	377	419	10,2	9,8	10,0	11,0
					156			108-110-114	323	460	1090	1150	323	373	395	438	10,3	10,0	10,2	11,2
					166			127-133 -140	323	460	1090	1150	347	396	419	462	10,4	10,1	10,3	11,5
					186			152-159	323	460	1090	1150	378	428	450	495	10,6	11,0	11,2	12,5
	1000		3		146			89-90	388	388	1290	1350	324	385	414	465	10,4	10,9	11,1	11,6
					156			108-110-114	388	388	1290	1350	345	405	433	484	10,8	11,0	11,2	11,8
					166			127-133-140	388	388	1290	1350	369	428	456	508	11,0	11,2	11,4	12,1
					186			152-159	388	388	1290	1350	400	460	487	541	11,6	12,0	12,3	13,6
			4		166			127-133-140	388	581	1290	1350	369	428	456	508	12,6	12,8	13,0	13,7
					186			152-159	388	581	1290	1350	369	428	456	508	13,2	13,7	13,9	15,4
	1200		3		146			89-90	473	325	1540	1600	354	428	463	525	11,7	12,2	12,4	13,1
					156			108-110-114	473	325	1540	1600	374	448	481	544	12,1	12,4	12,6	13,3
					166			127-133-140	473	325	1540	1600	398	471	505	568	12,2	12,5	12,8	13,5
					186			152-159	473	325	1540	1600	429	503	536	601	12,8	13,4	13,7	14,6
			4		166			127-133-140	473	487	1540	1600	398	471	505	568	15,4	14,5	14,7	14,2
					186			152-159	473	487	1540	1600	429	503	536	601	14,8	15,3	15,6	16,5
			5		184			127-133-140	473	634	1540	1600	416	489	523	586	18,2	16,2	16,4	16,9
					204			152-159	473	634	1540	1600	447	521	554	619	17,0	16,5	17,3	18,0
	1400		3		166			127-133-140	538	288	1740	1800	420	503	542	614	13,2	13,6	13,8	14,6
					186			152-159	538	288	1740	1800	451	535	573	647	13,8	14,4	14,7	15,7
			4		166			127-133-140	538	431	1740	1800	420	503	542	614	15,4	15,8	16,0	16,8
					186			152-159	538	431	1740	1800	451	535	573	647	16,0	16,6	16,9	17,9
			5		184			127-133-140	538	561	1740	1800	438	521	560	632	16,9	17,5	17,5	18,3
					204			152-159	538	561	1740	1800	469	553	591	665	17,7	18,3	18,6	19,4
			6		184			127-133-140	538	710	1740	1800	438	521	560	632	19,8	20,3	20,6	21,1
					204			152-159	538	710	1740	1800	469	553	591	665	20,5	21,1	21,5	22,2
	1600		4		166			127-133-140	608	387	1940	2000	444	538	582	664	16,7	17,1	17,4	18,2
					186			152-159	608	387	1940	2000	475	570	613	696	17,3	17,9	18,3	19,3
			5		184			127-133-140	608	503	1940	2000	462	556	600	682	18,2	18,8	19,1	19,7
					204			152-159	608	503	1940	2000	493	588	631	714	18,9	19,6	20,0	20,7
					234			165-168-178-180-194	608	503	1940	2000	540	633	678	758	19,6	20,3	20,7	21,4
			6		184			127-133-140	608	637	1940	2000	462	556	600	682	21,3	21,9	22,2	22,9
					204			152-159	608	637	1940	2000	493	588	631	714	22,1	22,8	23,1	21,9
					234			165-168-178-180-194	608	753	1940	2000	540	633	678	758	22,7	23,4	23,8	24,5

Example of ordering:
T3P 800 35°
SZ3 KE18 H186 Z
See page 198.

3 Troughing sets

T3P 20°-30°-35°-45°

BW 1800-2200

T3P α = 20°- 30°- 35°- 45° Standard

For upper troughing sets, extra heavy with three rollers, plain or with impact rings

Belt direction ▶▶▶

* 450 mm for BW 2000/2200

** advised bolts centre 200 mm
for BW 200/2200 bolts centre 330 mm

NOTE no clamping kits are for so heavy T3P 1800-2200 idler sets

for rollers series

PSV/2, 3-FHD
ø 133
spindle 25
bearing 6205, 6305
ch = 18

PSV/7-FHD
ø 159, 194
spindle 40
bearing 6308
ch = 32

PSV/4, 5-FHD
ø 159
spindle 30
bearing 6206, 6306
ch = 22

T3P 20°-30°-35°-45°

BW 1800-2200

Transom ordering code								For rollers		Transom			K max				Weight without rollers			
Series	Belt width mm	Troughing angle deg.°	Beam size SZ	Across Flat key KE mm	H mm	Finishing	With tilt - reversible R	Ø mm	Length C mm	Load capacity kg	Q mm	E mm	20° mm	30° mm	35° mm	45° mm	20° kg	30° kg	35° kg	45° kg
T3P	1800	20° - 30° 35° - 45°	5	18 - 22 32	186	–, YA, YB, YC, YS, Z	–, R	127-133-140	678	446	2190	2250	488	593	642	733	21,6	23,4	24,5	26,4
					206			152-159	678	446	2190	2250	519	625	674	765	22,7	24,7	25,7	27,8
					236			165-168-178 180-194	678	446	2190	2250	565	670	720	809	23,5	25,6	26,7	28,6
			6		186			127-133-140	678	667	2190	2250	488	593	642	733	25,2	27,0	28,1	30,0
					206			152-159	678	667	2190	2250	519	625	674	765	26,3	28,3	29,3	31,4
					236			165-168-178 180-194	678	667	2190	2250	565	670	720	809	27,2	29,2	30,4	32,4
	2000		6		206			152-159	758	604	2420	2500	546	665	719	822	32,5	34,8	35,6	38,1
					236			165-168-178 180-194	758	604	2420	2500	593	710	766	866	33,3	35,7	35,7	39,0
			7		219			152-159	758	909	2420	2500	559	678	732	835	46,3	48,7	49,3	51,7
					249			165-168-178 180-194	758	909	2420	2500	606	723	779	879	47,2	50,2	50,4	52,7
	2200		6		206			152-159	808	558	2620	2700	563	688	748	857	33,9	36,4	37,5	40,1
					236			165-168-178 180-194	808	558	2620	2700	610	735	795	901	34,7	37,3	38,6	41,1
			7		219			152-159	808	840	2620	2700	576	701	761	870	48,6	51,3	52,2	54,9
					249			165-168-178 180-194	808	840	2620	2700	623	748	808	914	49,5	52,2	53,4	55,9

Example of ordering:
T3P 1800 45° SZ5 KE22
H206 YB
See page 198.

3 Troughing sets

R2T 10°

R2T 10° Standard.

For return sets "V", with two rollers, plain or with rings.

Belt direction ◀◀◀

* advised bolts centre 100 mm
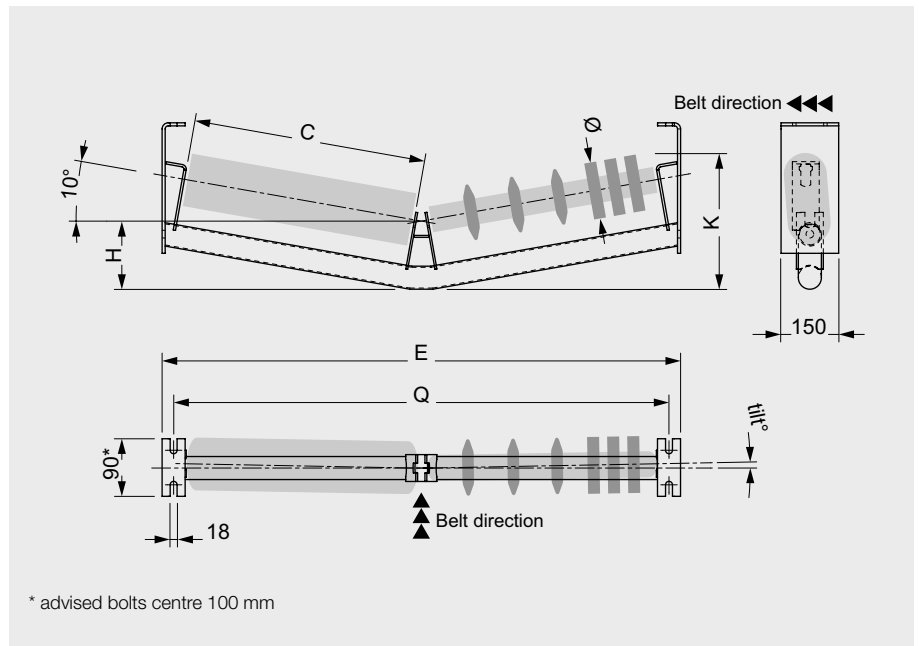
for rollers series

PSV/1-FHD
Ø 89, 108, 133 N
Ø 108, 133, 159 NC
spindle 20
bearing 6204
KE = 14

PSV/4 5-FHD
Ø 108, 133, 159 N
Ø 133, 159, 180 NC
spindle 30
bearing 6206, 6306
KE = 22

PSV/2, 3-FHD
Ø 89, 108, 133, 159 N
Ø 108, 159, 180 NC
spindle 25
bearing 6205, 6305
KE = 18

PSV/7-FHD
Ø 108, 133, 159, 194
Ø 159, 180, 194 NC
spindle 40
bearing 6308
KE = 32

R2T 10°

Transom ordering code							With tilt - reversible R	For rollers	Transom					
Series	Belt width mm	Troughing angle deg.°	Beam size SZ	Across Flat key KE mm	H mm	Finishing		Ø mm	Length C mm	Load capacity kg	Q mm	E mm	K mm	Weight without rollers kg
R2T	650	10°	2	14 - 18 - 22 - 32	220	–, YA, YB, YC, YS, Z	–, R	89 - 108 133 - 159 180 - 194	388	354	890	950	387	6,2
	800		2		238				473	289	1090	1150	405	7,0
	1000		3		256				608	388	1290	1350	433	8,6
	1200		3		279				708	325	1540	1600	456	9,8
	1400		4		297				808	431	1740	1800	474	13,1
			5		297				808	561	1740	1800	491	12,9
	1600		4		314				908	387	1940	2000	491	14,3
			5		314				908	503	1940	2000	508	14,0
	1800		4		338				1008	342	2190	2250	565	16,0
			5		338				1008	446	2190	2250	582	15,7
	2000		6		358				1108	604	2420	2500	552	21,5
	2200		6		375				1258	560	2620	2700	569	22,6

Example of ordering:
T3P 1800 45° SZ5 KE22
H206 YB
See page 198.

Troughing sets

Support brackets
SPT 1657-1660

For light upper set flat roller,
plain or with impact rings.

SPT 1657   SPT 1660

with plain
roller design N

with impact
roller design NA
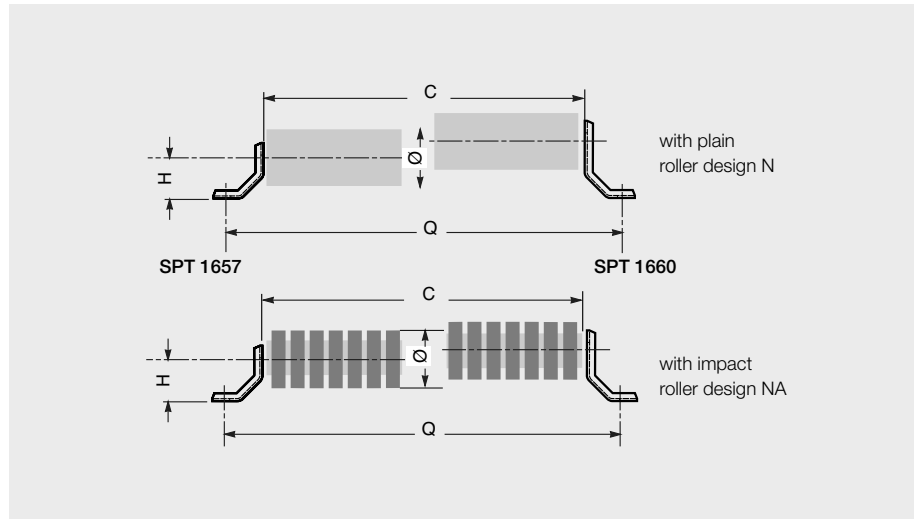
SPT 1657
for rollers series

RTL
spindle 15
bearing 6202
ch = 17

PSV/1-FHD
spindle 20
bearing 6204
ch = 14

MPS
spindle 15
bearing 6202
ch = 17

Belt width mm	Roller			H		Q mm	Weight of two brackets without rollers	
	Ø	C mm	ch	SPT 1657	SPT 1660 mm		SPT 1657	SPT 1660 mm
300		388		70	100	520	0.7	1.5
400		508		70	100	640	0.7	1.5
500	SPT 1657: 60 ÷ 133	608	SPT 1657: 14 - 17	70	100	740	0.7	1.5
650	SPT 1660: 60 ÷ 180	758	SPT 1660: 14 - 18 - 22	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

SPT 1660
for rollers series

PSV/1-FHD
spindle 20
bearing 6204
ch = 14

PSV/4-FHD
spindle 30
bearing 6206
ch = 22

PSV/2-FHD
spindle 25
bearing 6205
ch = 18

PSV/5-FHD
spindle 30
bearing 6306
ch = 22

PSV/3-FHD
spindle 25
bearing 6305
ch = 18

Support bracket SPT 1657
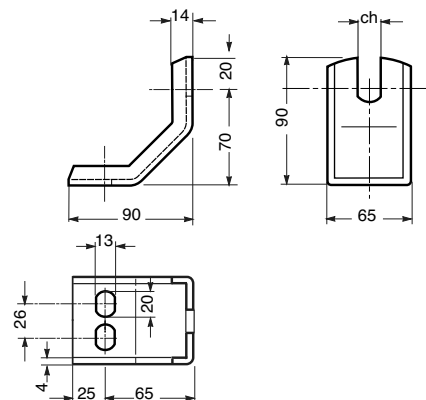
Support bracket SPT 1660
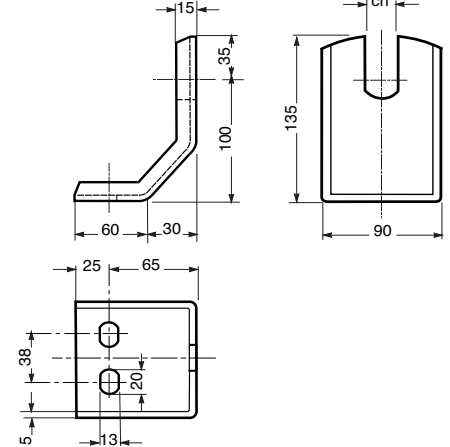
Example of ordering:
support bracket
SPT 1657, F17,YA
See page 198.

Support brackets
SPT 070

For upper set flat roller PL.

for rollers series

PL
ø 90,110,140
spindle 20
bearing 6204
ch = 30

Belt width mm	Roller Ø	C mm	ch	H mm	Q mm	Weight of two brackets without rollers mm
300		388		70	520	1.0
400		508		70	640	1.0
500	90-110-140	608		70	740	1.0
650		758	30	70	890	1.0
800		958		70	1090	1.0
1000		1158		70	1290	1.0
1200		1408		70	1540	1.0

Support bracket SPT 070

Support brackets
SPT 1795

For upper set heavy flat roller,
plain or withimpact rings.
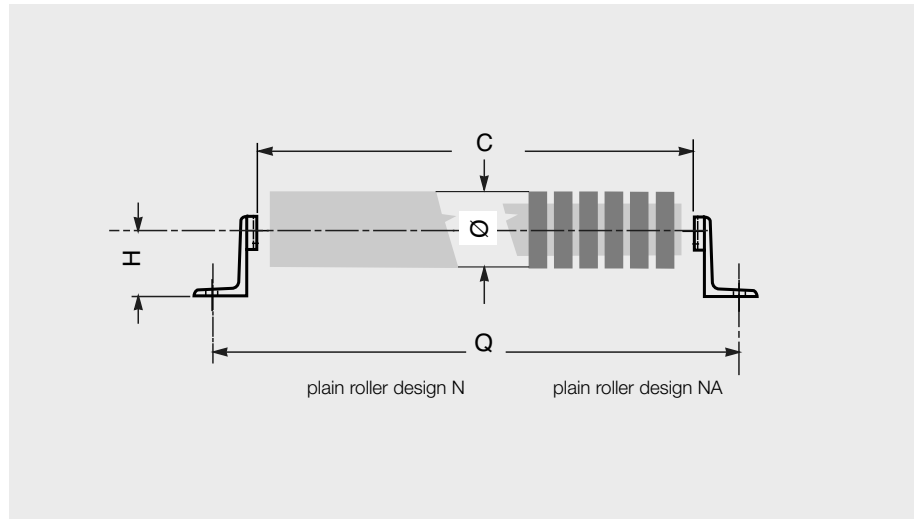
plain roller design N   plain roller design NA

for rollers series

PSV/1-FHD
ø 89,108,133
spindle 20
bearing 6204
ch = 14

PSV/2-FHD
ø 108,133,159
spindle 25
bearing 6205
ch = 18

PSV/4-FHD
ø 108,133,159
spindle 30
bearing 6206
ch = 22

Belt width mm	Roller Ø	C mm	ch	H mm	Q mm	Weight of two brackets without rollers mm
500		608		100	740	3.7
650		758		100	890	3.7
800		958		100	1090	3.7
1000	89-108-133-159	1158	14-18-22	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

Support bracket SPT 1795
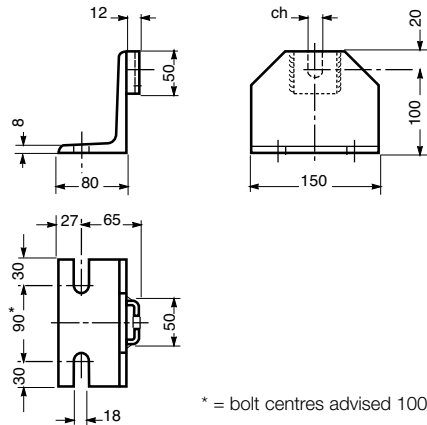
* = bolt centres advised 100 mm

**Example
of ordering:**
support bracket
SPT 1795, F22, Z
See page 198.

Support brackets
SPT 1478 - 1490

For light upper set flat roller,
plain or with impact rings.

SPT 1478   SPT 1490
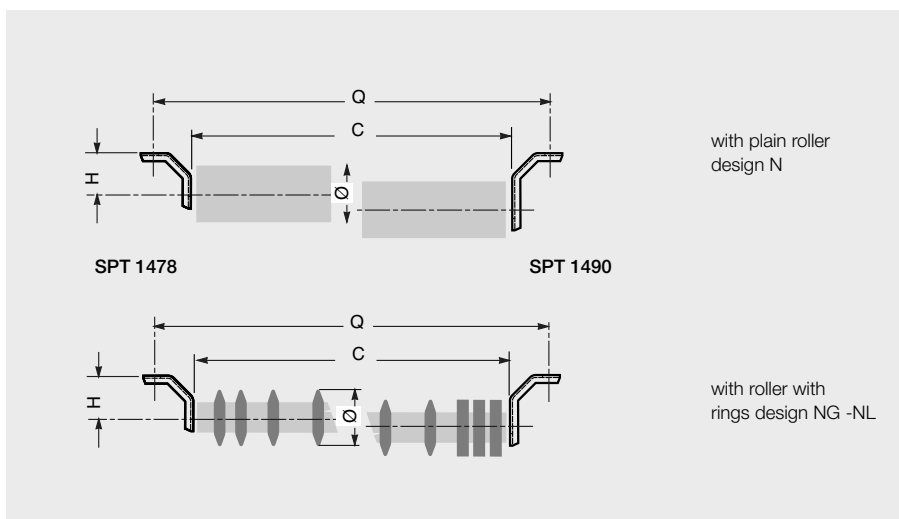
with plain roller
design N

with roller with
rings design NG -NL

SPT 1478
for rollers series

RTL
spindle 15
bearing 6202
ch = 17

PSV/1-FHD
spindle 20
bearing 6204
ch = 14

MPS
spindle 15
bearing 6202
ch = 17

Belt width mm	Roller Ø	C mm	ch	H SPT 1478 mm	H SPT 1490 mm	Q mm	Weight of two brackets without rollers SPT 1478 mm	Weight of two brackets without rollers SPT 1490 mm
300		388		70	100	520	0.7	1.5
400		508		70	100	640	0.7	1.5
500	SPT 1478 : 60 ÷ 133	608	SPT 1478: 14 -17	70	100	740	0.7	1.5
650	SPT 1490: 60 ÷ 180	758	SPT 1490; 14 - 18 - 22	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

SPT 1490
for rollers series

PSV/1-FHD
spindle 20
bearing 6204
ch = 14

PSV/4-FHD
spindle 30
bearing 6206
ch = 22

PSV/2-FHD
spindle 25
bearing 6205
ch = 18

PSV/5-FHD
spindle 30
bearing 6306
ch = 22

PSV/3-FHD
spindle 25
bearing 6305
ch = 18

Support bracket SPT 1478

Support bracket SPT 1490

Support brackets
SPT 243

For flat return roller PL.

for rollers series

PL
ø 90,110,140
spindle 20
bearing 6204
ch = 30

Belt width mm	Roller Ø	C mm	ch	H mm	Q mm	Weight of two brackets without rollers mm
300		388		70	520	1.0
400		508		70	640	1.0
500	90-110-140	608	30	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

Support bracket SPT 243

Support brackets
SPT 1495

For heavy return set flat roller, plain or with rings.
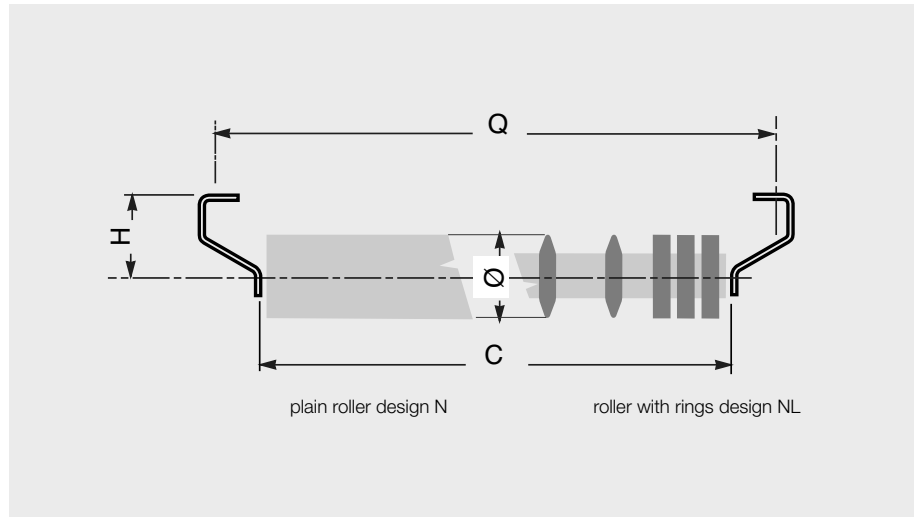
plain roller design N   roller with rings design NL

for rollers series

PSV/2-FHD
ø 108,133,159
spindle 25
bearing 6205
ch = 18

PSV/4-FHD
ø 108,133,159
spindle 30
bearing 6206
ch = 22

PSV/7-FHD
ø 133,159,194
spindle 40
bearing 6308
ch = 32

Belt width mm	Roller Ø	C mm	ch	H mm	Q mm	Weight of two brackets without rollers mm
500		608		150	740	4.6
650		758		150	890	4.6
800		958		150	1090	4.6
1000	108-133-159-180-194	1158	18-22-32	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

Support bracket SPT 1495
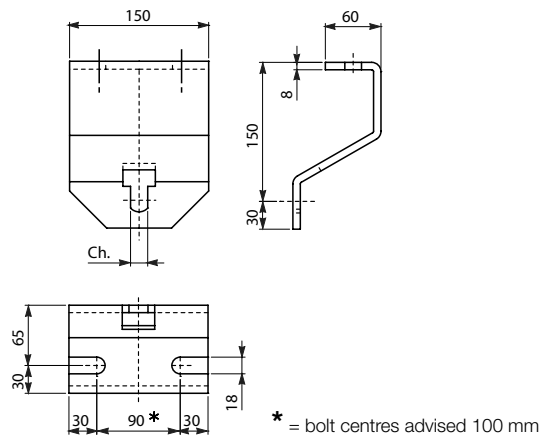
* = bolt centres advised 100 mm

3.4 - Self-centering troughing sets

Sometimes the difficult working conditions of the plant results in a lateral movement of the belt. In this case a self-centering troughing set is used which acts in a way that corrects the belt tracking and maintains it constantly in the central position.

The self-centering 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.

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-centering troughing sets is advised to be positioned on the upper strand rather than the return section, and used only when the working conditions require.

Warning:
the rollers supporting the belt in the self-centering sets must not have any rubber ring. In case of material high abrasion, on return self-centering sets, hot vulcanized rubber lagged rollers can be used.
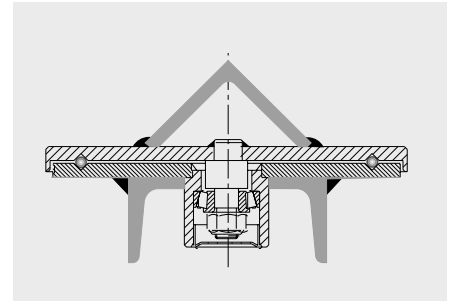
Fig. **5**

Self - centering troughing set for loaded strand of belt.
The self-centering 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 metres from the pulley and at a pitch of about 30 m.

It is not advised to use self-centering troughing sets on very short conveyors.

The self-centering 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-centering transom

Model S

without brake for single directional belt

Carrying rollers and guide rollers type PSV/G7-NCD 20M16 60N 100 have to be ordered separately.

* = advised bolt centres 200 mm
  for belts 2000/2200 centres 330 mm

** = 450 for belts from 2000/2200

Characteristics and dimensions are similar to the corresponding fixed carrying transom.

Belt direction

Limit of rotation ~10°
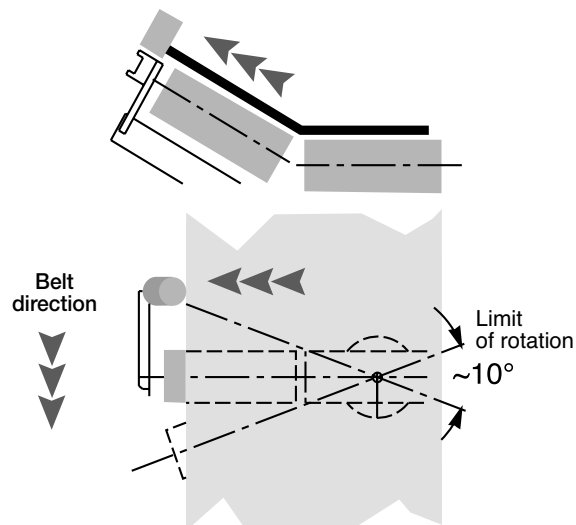
Method of operation Model S

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 single directional belts, where the tendency to track off is not excessive.

Example of ordering:
CT3PS 800 30°
SZ03 KE14 H166 WT

Self-centering transom

Model F

With brake for single directional belt

Carrying rollers and guide rollers type PSV/G7-NCD 20M16 60N 100 have to be ordered separately.

* = advised bolt centres 200 mm
for belts 2000/2200 centres 330 mm

** = 450 for belts from 2000/2200
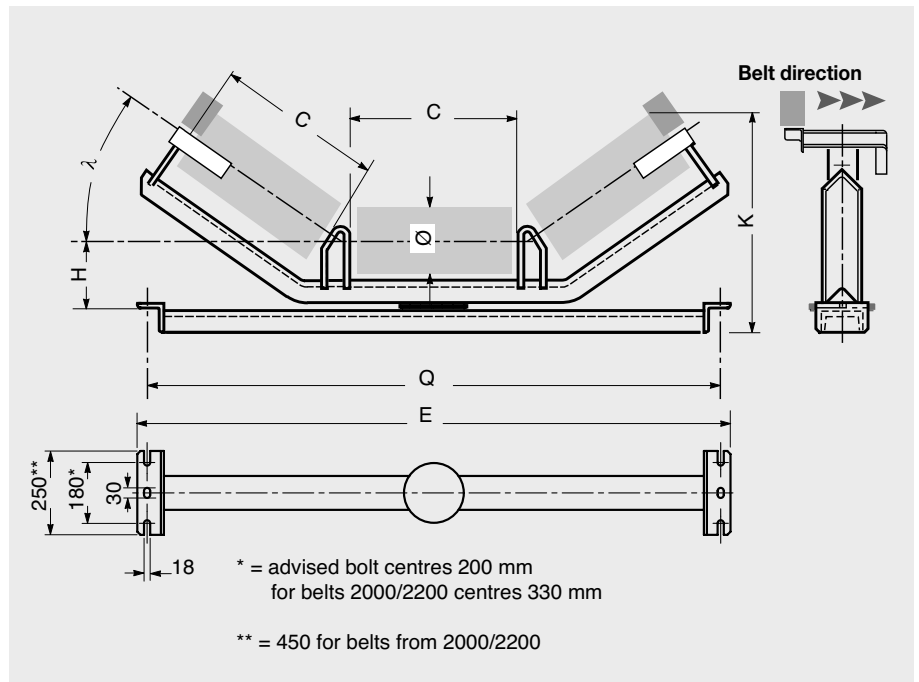
Characteristics and dimensions are similar to the corresponding fixed carrying transom.
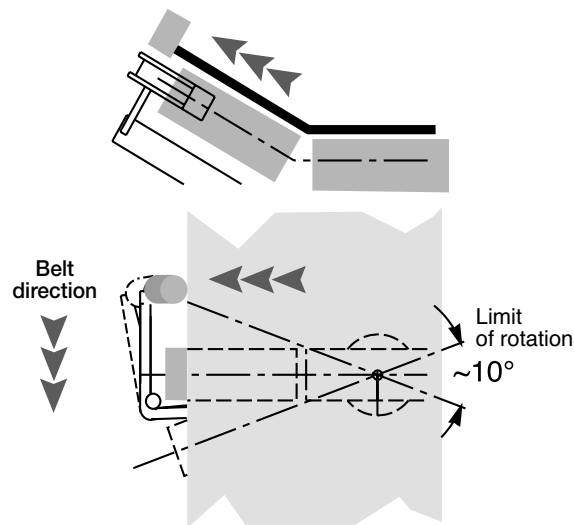
Method of operation Model F

In this design the lever arm pivots, transmitting a force produced by the belt on to 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 single directional belts, where large material lumps and side or very irregular loading is experienced leading to a big centralising problem.

Self-centering transom

Model R

With brake for reversible belt

Carrying rollers and guide rollers type PSV/G7-NCD 20S18 60N 100 have to be ordered separately.

* = advised bolt centres 200 mm
   for belts 2000/2200 centres 330 mm

** = 450 for belts from 2000/2200

Characteristics and dimensions are similar to the corresponding fixed carrying transom.

Belt direction

Limit of rotation

~10°
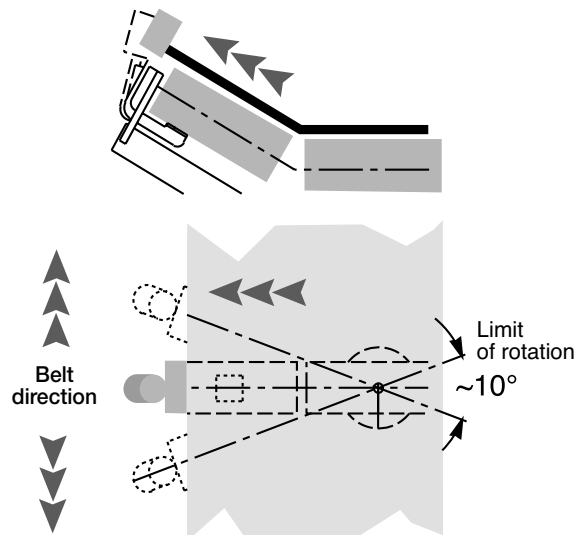
Method of operation Model R

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.

CT3M series

SELF CENTRALIZING TRANSOM - CT3M

Transom ordering code							For rollers		Transom			K max				Weight without rollers all troughing angles		
Series	Belt width mm	Troughing angle deg.°	Beam size SZ	Across Flat key KE mm	H mm	Finishing	Ø mm	Length C mm	Load capacity kg	Q mm	E mm	20° mm	30° mm	35° mm	45° mm	Type S kg	Type F kg	Type R kg
CT3M S, R, F	400	20° - 30° 35° - 45°	1	14 - 17 18 - 22 30	121	–, YA, YB, YC, YS, Z	76	168	286	640	700	229	255	268	289	14,2	14,7	16,9
					126		89-90	168	286	640	700	229	256	268	290	14,2	14,7	16,9
					131		102	168	286	640	700	229	255	268	289	14,6	14,7	17,5
					136		108-110-114	168	286	640	700	250	275	287	308	14,9	14,7	17,5
	500		1		121		76	208	247	740	800	243	275	291	317	15,6	16,1	18,3
					126		89-90	208	247	740	800	243	275	291	318	15,6	16,1	18,3
					131		102	208	247	740	800	243	275	291	317	16,0	16,1	18,9
					136		108-110-114	208	247	740	800	263	295	309	337	16,3	16,1	18,9
					146		127-133-140	208	247	740	800	287	318	333	361	16,4	16,2	19,0
	650		1		121		76	258	205	890	950	260	300	320	353	17,6	18,1	20,3
					126		89-90	258	205	890	950	260	300	320	353	17,6	18,1	20,3
					131		102	258	205	890	950	260	300	320	353	18,0	18,1	20,9
					136		108-110-114	258	205	890	950	280	320	338	372	18,3	18,1	20,9
					146		127-133-140	258	205	890	950	304	343	362	396	18,5	18,3	21,1
			2		138		89-90	258	354	890	950	272	312	332	365	19,5	20,0	22,2
					148		108-110-114	258	354	890	950	292	332	350	384	20,2	20,0	22,8
					158		127-133-140	258	354	890	950	316	355	374	408	20,3	20,1	22,9
	800		1		121		76	323	167	1090	1150	292	332	357	399	20,3	20,8	23,0
					126		89-90	323	167	1090	1150	282	333	357	399	20,3	20,8	23,0
					131		102	323	167	1090	1150	292	332	357	399	20,7	20,8	23,6
					136		108-110-114	323	167	1090	1150	303	353	375	418	21,0	20,8	23,6
			2		138		89-90	323	289	1090	1150	294	345	369	411	22,5	23,0	25,2
					148		108-110-114	323	289	1090	1150	315	365	387	430	23,2	23,0	25,8
					158		127-133-140	323	289	1090	1150	339	388	411	454	23,3	23,1	25,9
					178		152-159	323	289	1090	1150	370	420	442	487	23,7	23,7	26,3

* = 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 (PSV/G7-NCD 20M16 60N 100 for model F and S, PSV/G7-NCD 20S18 60N 100 for model R) have to be ordered separately.

CT3P series

SELF CENTRALIZING TRANSOM - CT3P   BW 800-1600

Series	Belt width mm	Troughing angle deg.°	Beam size SZ	Across Flat key KE mm	H mm	Finishing	Ø mm	Length C mm	Load capacity kg	Q mm	E mm	20° mm	30° mm	35° mm	45° mm	Type S kg	Type F kg	Type R kg
CT3P S, R, F	800	20° - 30° 35° - 45°	3	14 - 18 22 - 30 32	146	-, YA, YB, YC, YS, Z	89-90	323	460	1090	1150	302	353	377	419	25,1	27,8	27,8
					156		108-110-114	323	460	1090	1150	323	373	395	438	25,8	28,4	28,4
					166		127-133-140	323	460	1090	1150	347	396	419	462	25,9	28,5	28,5
					186		152-159	323	460	1090	1150	378	428	450	495	26,3	28,9	28,9
	1000		3		146		89-90	388	388	1290	1350	324	385	414	465	28,5	31,2	31,2
					156		108-110-114	388	388	1290	1350	345	405	433	484	29,2	31,8	31,8
					166		127-133-140	388	388	1290	1350	369	428	456	508	29,3	31,9	31,9
					186		152-159	388	388	1290	1350	400	460	487	541	29,7	32,3	32,3
			4		166		127-133-140	388	581	1290	1350	369	428	456	508	35,4	35,3	35,3
					186		152-159	388	581	1290	1350	369	428	456	508	35,8	35,8	35,8
	1200		3		146		89-90	473	325	1540	1600	354	428	463	525	32,8	35,5	35,5
					156		108-110-114	473	325	1540	1600	374	448	481	544	33,5	36,1	36,1
					166		127-133-140	473	325	1540	1600	398	471	505	568	33,6	36,2	36,2
					186		152-159	473	325	1540	1600	429	503	536	601	34,0	36,6	36,6
			4		166		127-133-140	473	487	1540	1600	398	471	505	568	40,8	40,3	40,3
					186		152-159	473	487	1540	1600	429	503	536	601	41,2	40,7	40,7
			5		184		127-133-140	473	634	1540	1600	416	489	523	586	48,9	45,5	45,5
					204		152-159	473	634	1540	1600	447	521	554	619	49,3	46,0	46,0
	1400		3		166		127-133-140	538	288	1740	1800	420	503	542	614	37,0	39,6	39,6
					186		152-159	538	288	1740	1800	451	535	573	647	37,4	40,0	40,0
			4		166		127-133-140	538	431	1740	1800	420	503	542	614	51,6	44,1	44,1
					186		152-159	538	431	1740	1800	451	535	573	647	52,0	44,5	44,5
			5		184		127-133-140	538	561	1740	1800	438	521	560	632	54,0	50,0	50,0
					204		152-159	538	561	1740	1800	469	553	591	665	54,4	50,5	50,5
			6		184		127-133-140	538	710	1740	1800	438	521	560	632	61,0	59,0	59,0
					204		152-159	538	710	1740	1800	469	553	591	665	61,4	59,4	59,4
	1600		4		166		127-133-140	608	387	1940	2000	444	538	582	664	56,5	48,1	48,1
					186		152-159	608	387	1940	2000	475	570	613	696	57,0	48,5	48,5
			5		184		127-133-140	608	503	1940	2000	462	556	600	682	59,2	54,7	54,7
					204		152-159	608	503	1940	2000	493	588	631	714	59,6	55,1	55,1
					234		165-168-178-180-194	608	503	1940	2000	540	633	678	758	60,2	56,2	56,2
			6		184		127-133-140	608	637	1940	2000	462	556	600	682	75,6	64,5	64,5
					204		152-159	608	637	1940	2000	493	588	631	714	76,1	64,9	64,9
					234		165-168-178-180-194	608	753	1940	2000	540	633	678	758	76,6	66,0	66,0

* = 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 (PSV/G7-NCD 20M16 60N 100 for model F and S, PSV/G7-NCD 20S18 60N 100 for model R) have to be ordered separately.

CT3P series

SELF CENTRALIZING TRANSOM - CT3P   BW 1800-2200

Transom ordering code							For rollers		Transom			K max				Weight without rollers all troughing angles		
Series	Belt width mm	Troughing angle deg.°	Beam size SZ	Across Flat key KE mm	H mm	Finishing	Ø mm	Length C mm	Load capacity kg	Q mm	E mm	20° mm	30° mm	35° mm	45° mm	Type S kg	Type F kg	Type R kg
CT3P S, R, F	1800	20° - 30° 35° - 45°	5	18 - 22 32	184	–, YA, YB, YC, YS, Z	127-133-140	678	446	2190	2250	488	593	642	733	70,7	57,1	59,9
					204		152-159	678	446	2190	2250	519	625	674	765	71,1	57,7	60,3
					234		165-168-178 180-194	678	446	2190	2250	565	670	720	809	71,7	58,3	61,5
			6		184		127-133-140	678	667	2190	2250	488	593	642	733	83,3	67,9	70,7
					204		152-159	678	667	2190	2250	519	625	674	765	83,7	68,5	71,1
					234		165-168-178 180-194	678	667	2190	2250	565	670	720	809	84,2	69,1	72,3
	2000		6		204		152-159	758	604	2420	2500	546	665	719	822	104,5	75,1	77,7
					234		165-168-178 180-194	758	604	2420	2500	593	710	766	866	105,0	75,7	78,9
			7		219		152-159	758	909	2420	2500	559	678	732	835	133,1	97,4	100,0
					249		165-168-178 180-194	758	909	2420	2500	606	723	779	879	133,6	97,9	101,1
	2200		6		204		152-159	808	558	2620	2700	563	688	748	857	111,1	79,9	82,5
					234		165-168-178 180-194	808	558	2620	2700	610	735	795	901	111,6	80,4	83,6
			7		219		152-159	808	840	2620	2700	576	701	761	870	141,3	103,5	106,1
					249		165-168-178 180-194	808	840	2620	2700	623	748	808	914	141,8	104,0	107,2

* = 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 (PSV/G7-NCD 20M16 60N 100 for model F and S, PSV/G7-NCD 20S18 60N 100 for model R) have to be ordered separately.

Self-centering 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-centering troughing set excercises a corrective action on the belt.

The method of function is similar to that of the upper self-centering troughing set. Normally it is a good standard to install them at an approximate distance of 25 metres from the pulley and at a pitch of about 50m.

Warning: the rollers supporting the belt in the self-centering sets, must not have any rubber ring. In case of material high abrasion, on return self-centering sets, hot vulcanized rubber lagged rollers can be used.

Model S (Q1)
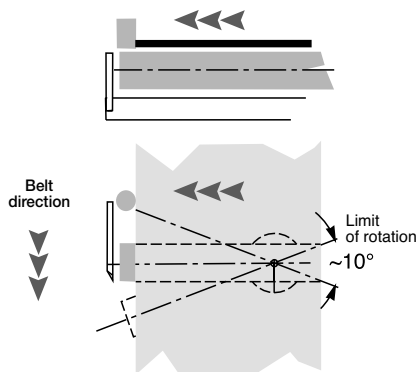
Model R (Q2)

Model S
Standard version for single directional conveyor belt with single roller and fixed lever arm with offset guide roller.
Guide rollers type PSV/G7-NCD 20M16 60N 100 to be ordered separately.
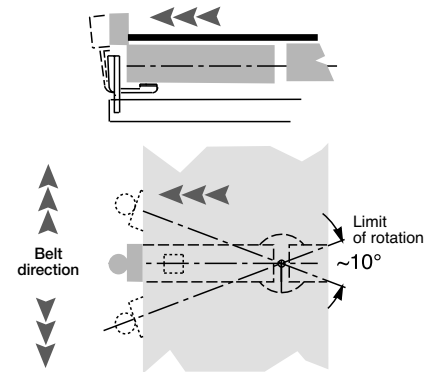
Model R
Special version used on reversible belt, using two rollers and pivoting lever arms with the brake and guide roller located in line.
Guide rollers type PSV/G7-NCD 20S18 60N 100 to be ordered separately.

Troughing sets

transom
self-centering model S

Q1 L
Q1 P

Return model with fixed lever-arm for single directional belts.
Guide rollers type PSV/G7-NCD 20M16 60N 100 have to be ordered separately.
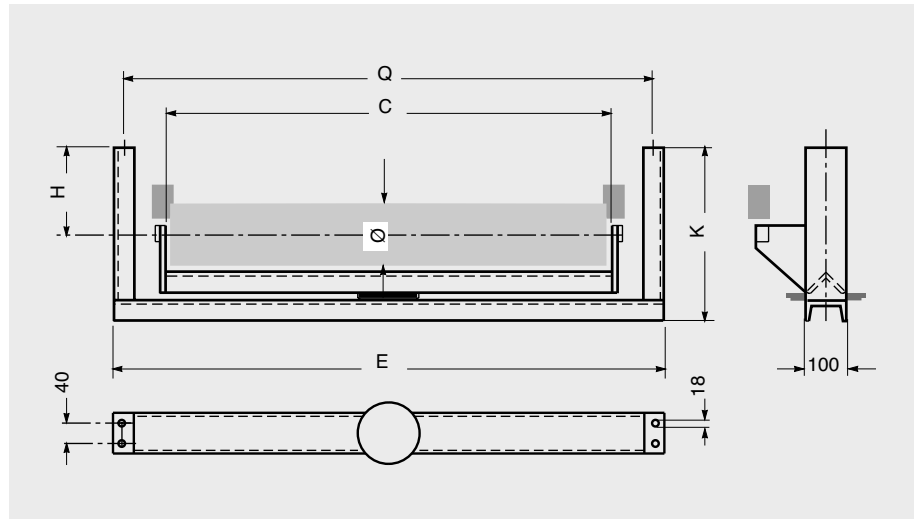
Q1 L
for rollers series

MPS
ø 76, 89, 102
spindle 15
bearing 6202
ch = 17

PSV/1-FHD
ø 89,108,133
spindle 20
bearing 6204
ch = 14

Q1 P
for rollers series

PSV/2-FHD
ø 133
spindle 25
bearing 6205
ch = 18

PSV/4-FHD
ø 159
spindle 30
bearing 6206
ch = 22

Return roller and guide rollers type PSV/G7-NCD 20M16 60N 100 have to be ordered separately
Example of ordering
Q1L, 800, F 14, 108
Q1P, 1000, F 18, 133, YA
See page 198.

Belt width mm	Roller Ø	C mm	ch	Self-centering transom Capacity kg	H mm	K mm	Q	E	Weight without rollers Kg
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

Belt width mm	Roller Ø	C mm	ch	Self-centering transom Capacity kg	H mm	K mm	Q	E	Weight without rollers Kg
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

transom
self-centralising model R

Q2 L
Q2 P

Return model with pivoting lever-arm and brake for reversible belts.
Guide rollers type PSV/G7-NCD 20S18 60N 100 have to be ordered separately.

Q2 L
for rollers series

MPS
ø 76, 89, 102
spindle 15
bearing 6202
ch = 17

PSV/1-FHD
ø 89,108,133
spindle 20
bearing 6204
ch = 14

Q2 P
for rollers series

PSV/2-FHD
ø 133
spindle 25
bearing 6205
ch = 18

PSV/4-FHD
ø 159
spindle 30
bearing 6206
ch = 22

PSV/7-FHD
ø 159, 194
spindle 40
bearing 6308
ch = 32

Return roller and guide rollers type PSV/G7-NCD 20S18 60N 100 have to be ordered separately.
Example of ordering
Q2L, 1000, F 14, 133, YA
Q2P, 1200, F 18, 159, YB
See page 198.

Belt width mm	Roller Ø	C mm	ch	Self-centering transom Capacity kg	H mm	K mm	Q	E	Weight without rollers Kg
400		198		175	70	259	640	700	22.7
500	76- 89-102 108-133	248	14 - 17	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

Belt width mm	Roller Ø	C mm	ch	Self-centering transom Capacity kg	H mm	K mm	Q	E	Weight without rollers Kg
800		408		158	150	367	1090	1150	33.2
1000		508		209	150	375	1290	1350	38.8
1200	133	608	18 - 22	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
800		408		158	150	387	1090	1150	34.3
1000		508		209	150	395	1290	1350	39.9
1200	159	608		167	150	395	1540	1600	44.1
1400		708	18 - 22 - 32	296	150	409	1740	1800	53.4
1600		808		262	150	409	1940	2000	57.7
1800		908		351	175	473	2190	2290	87.5
2000	159-194	1008		318	175	473	2420	2520	94.2
2200		1108		440	175	490	2620	2720	117.1

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 SPT1316.

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					weight
	series	Ø mm	width mm	B mm	H	S	e	Kg
GRS 1	MPS	60N	300	195	149	417	48	3.0
2			400	245	167	511	48	3.6
3			450	275	177	568	53	3.9
4			500	305	188	624	58	4.2
5			600	355	205	714	58	4.8
GRS 1	MPS	76N	300	195	157	423	46	3.5
2			400	245	174	517	46	4.1
3			450	275	185	573	51	4.5
4			500	305	195	629	56	4.9
5			600	355	213	723	56	5.6

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
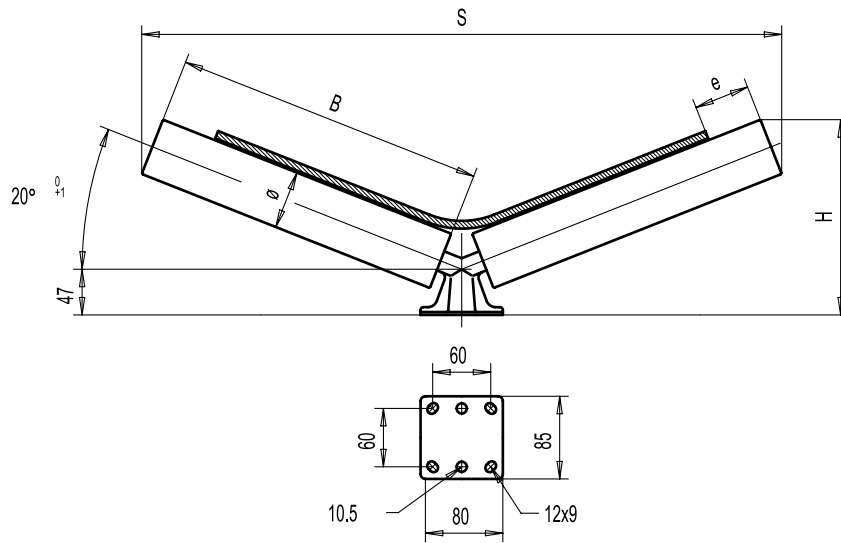
type	roller		belt					weight
	series	Ø mm	width mm	B mm	H	S	e	Kg
GRS 21	**RTL**	**60N**	**300**	**195**	**149**	**417**	**48**	**2.2**
22			**400**	**245**	**167**	**511**	**48**	**2.7**
23			**450**	**275**	**177**	**568**	**53**	**2.9**
24			**500**	**305**	**188**	**624**	**58**	**3.2**
25			**600**	**355**	**205**	**714**	**58**	**3.6**
GRS 21	**RTL**	**76N**	**300**	**195**	**157**	**423**	**46**	**2.6**
22			**400**	**245**	**174**	**517**	**46**	**3.1**
23			**450**	**275**	**185**	**573**	**51**	**3.5**
24			**500**	**305**	**195**	**629**	**56**	**3.7**
25			**600**	**355**	**213**	**723**	**56**	**4.2**

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
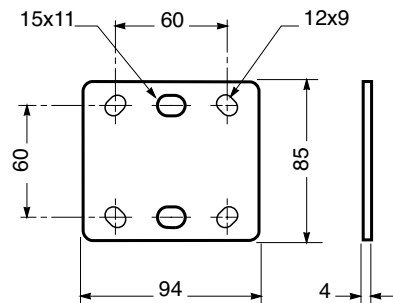
Base plate type SPT 1316
To be welded to structure to allow bolting the cantilever set to it.

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.
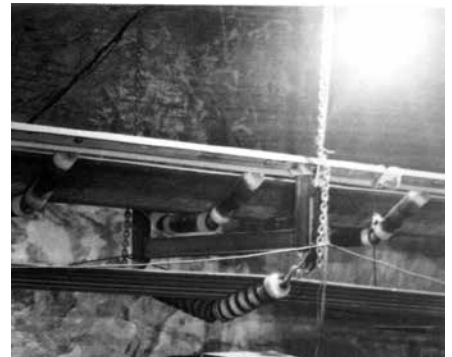
3 Troughing sets

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.
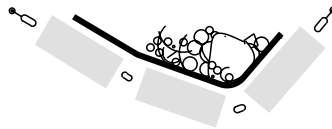
With respect to other lighter types of suspended sets (made from steel cable rotating in only two bearings), the RULMECA "garland" troughing set has spindles with two bearings in each roller (therefore up to 10 bearings for a set of 5 rollers) which combines to give constructive strength with the easiest fluency of rotation.
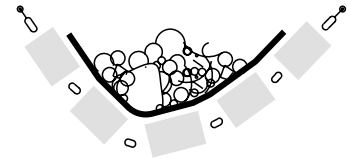
In comparison with the fixed troughing sets the "garland" systems have other notable superior features to recommend them:

- 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.
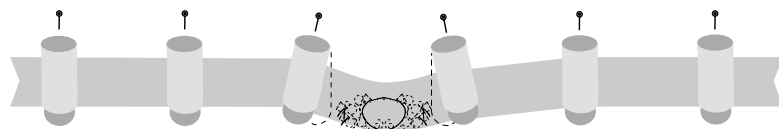
3.6.2 - Applications and configurations

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, TOP, 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
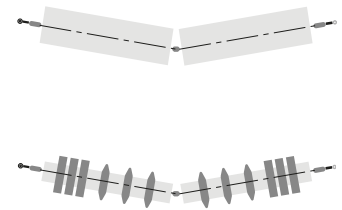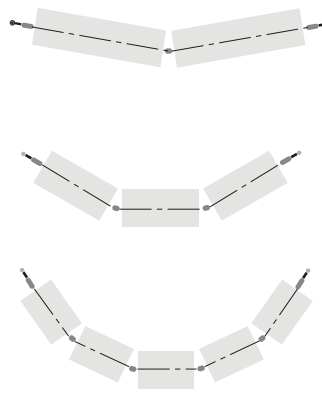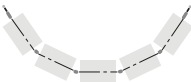
Fig. **8** - Suspended set for impact troughing set with three or five plain rollers or with shock absorbing rings

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
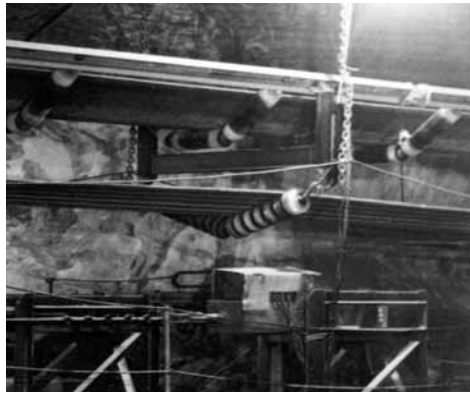
The diameters and types of rollers in the table are those advised for suspended sets with two rollers, for different widths of belt. The diameter of the roller is chosen from those possible for the type of roller considered (see chapter 2 rollers) and must be suitable for the speed and load capacity 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, TOP, PL, PLF, and where needed, with return rings (see chapter 2, rollers with rings).

| belt | roller | | | | | | | | spindle | | type of |
width mm	D mm	B	C	A	type	bearing	V	O	d	p	suspensions
500	63-89 108-133	315	**343**	363	PSV/1-FHD	6204	64	751	20	25.40	A-C-F
		315	**347**	371	PSV/2-FHD	6205	66	778	25	31.75	A-C-F
		315	**347**	371	PSV/3-FHD	6305	66	778	25	31.75	A-C-F
650	63-89 108-133	380	**408**	428	PSV/1-FHD	6204	75	879	20	25.40	A-C-F
		380	**412**	436	PSV/2-FHD	6205	77	906	25	31.75	A-C-F
		380	**412**	436	PSV/3-FHD	6305	77	906	25	31.75	A-C-F
		380	**420**	452	PSV/4-FHD	6206	80	940	30	38.10	B-C-F
800	63-89-108 133-159	465	**493**	513	PSV/1-FHD	6204	90	1046	20	25.40	A-C-F
		465	**497**	521	PSV/2-FHD	6205	92	1073	25	31.75	A-C-F
		465	**497**	521	PSV/3-FHD	6305	92	1073	25	31.75	A-C-F
		465	**505**	537	PSV/4-FHD	6206	94	1108	30	38.10	B-C-F
1000	63-89-108 133-159	600	**628**	648	PSV/1-FHD	6204	113	1312	20	25.40	A-C-F
		600	**632**	656	PSV/2-FHD	6205	115	1339	25	31.75	A-C-F
		600	**632**	656	PSV/3-FHD	6305	115	1339	25	31.75	A-C-F
		600	**640**	672	PSV/4-FHD	6206	118	1374	30	38.10	B-C-F
1200	89-108 133-159	700	**728**	748	PSV/1-FHD	6204	131	1509	20	25.40	A-C-F
		700	**732**	756	PSV/2-FHD	6205	133	1536	25	31.75	A-C-F
		700	**732**	756	PSV/3-FHD	6305	133	1536	25	31.75	A-C-F
		700	**740**	772	PSV/4-FHD	6206	135	1571	30	38.10	B-C-F
		700	**744**	776	PSV/7-FHD	6308	137	1597	40	44.45	B-C-F
1400	89-108 133-159-194	800	**828**	848	PSV/1-FHD	6204	148	1706	20	25.40	A-C-F
		800	**832**	856	PSV/2-FHD	6205	150	1733	25	31.75	A-C-F
		800	**832**	856	PSV/3-FHD	6305	150	1733	25	31.75	A-C-F
		800	**840**	872	PSV/4-FHD	6206	152	1768	30	38.10	B-C-F
		800	**844**	876	PSV/7-FHD	6308	154	1794	40	44.45	B-C-F

**Example of ordering**
standard design
GS2,1000/PSV/1-FHD,20K,89N,C=628

specify type of suspensions
(see pages 240-241 for available types)
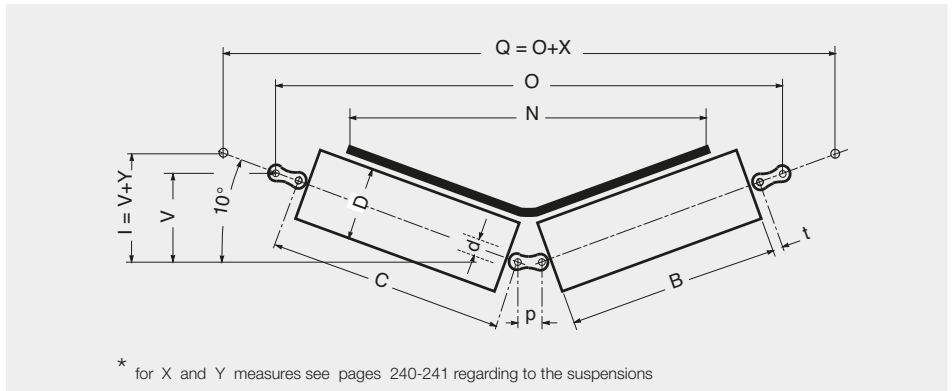
Q = O+X
O
N
10°
I = V+Y
V
D
d
C
p
t
B

* for X and Y measures see pages 240-241 regarding to the suspensions

belt width mm	roller D mm	B	C	A	type	bearing	V	O	spindle d	p	type of suspensions
1600	89-108 133-159-194	900	**932**	956	PSV/2-FHD	6205	167	1930	25	31.75	A-C-F
		900	**932**	956	PSV/3-FHD	6305	167	1930	25	31.75	A-C-F
		900	**940**	972	PSV/4-FHD	6206	170	1965	30	38.10	B-C-F
		900	**944**	976	PSV/7- FHD	6308	172	1991	40	44.45	B-C-F
1800	108-133 159-194	1000	**1032**	1056	PSV/2-FHD	6205	185	2127	25	31.75	A-C-F
		1000	**1032**	1056	PSV/3-FHD	6305	185	2127	25	31.75	A-C-F
		1000	**1040**	1072	PSV/4-FHD	6206	187	2162	30	38.10	B-C-F
		1000	**1044**	1076	PSV/7-FHD	6308	189	2188	40	44.45	B-C-F
2000	133 159-194	1100	**1132**	1156	PSV/2-FHD	6205	202	2324	25	31.75	A-C-F
		1100	**1132**	1156	PSV/3-FHD	6305	202	2324	25	31.75	A-C-F
		1100	**1140**	1172	PSV/4-FHD	6206	205	2359	30	38.10	B-C-F
		1100	**1144**	1176	PSV/7-FHD	6308	206	2385	40	44.45	B-C-F
2200	133 159-194	1250	**1282**	1306	PSV/3-FHD	6305	228	2619	25	31.75	A-C-F
		1250	**1290**	1322	PSV/5-FHD	6306	231	2654	30	38.10	B-C-F
		1250	**1294**	1326	PSV/7-FHD	6308	232	2681	40	44.45	B-C-F
2400	133 159-194	1400	**1432**	1456	PSV/3-FHD	6305	254	2915	25	31.75	A-C-F
		1400	**1440**	1472	PSV/5-FHD	6306	257	2949	30	38.10	B-C-F
		1400	**1444**	1476	PSV/7-FHD	6308	258	2976	40	44.45	B-C-F
2600	159 194	1500	**1544**	1576	PSV/7-FHD	6308	276	3173	40	44.45	B-C-F
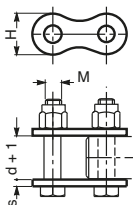
d	20	25	30	40
s	3	4	5	6
H	21	24	30	36
M	8	10	14	16
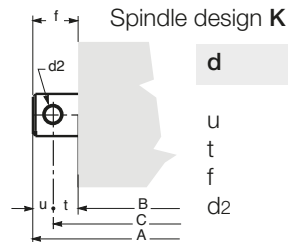
Spindle design **K**

d	20	25	30	40
u	10	12	16	16
t	14	16	20	22
f	24	28	36	38
d2	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, TOP, PL, PLF, exceptionally, and only where absolutely necessary, with impact rings (see chapter 2, impact rollers).

belt width mm	roller D mm	B	C	A	type	bearing	V	O	spindle d	p	type of suspensions
500	63-89 108-133	200	**228**	248	PSV/1-FHD	6204	153	692	20	25.40	A-C
		200	**232**	256	PSV/2-FHD	6205	161	725	25	31.75	A-C
		200	**232**	256	PSV/3-FHD	6305	161	725	25	31.75	A-C
		200	**240**	272	PSV/4-FHD	6206	171	768	30	38.10	B-C-E
650	63-89 108-133	250	**278**	298	PSV/1-FHD	6204	182	824	20	25.40	A-C
		250	**282**	306	PSV/2-FHD	6205	190	857	25	31.75	A-C
		250	**282**	306	PSV/3-FHD	6305	190	857	25	31.75	A-C
		250	**290**	322	PSV/4-FHD	6206	200	900	30	38.10	B-C-E
800	63-89 108-133-159	315	**343**	363	PSV/1-FHD	6204	219	995	20	25.40	A-C
		315	**347**	371	PSV/2-FHD	6205	227	1028	25	31.75	A-C
		315	**347**	371	PSV/3-FHD	6305	227	1028	25	31.75	A-C
		315	**355**	387	PSV/4-FHD	6206	237	1072	30	38.10	B-C-E
1000	63-89 108-133-159	380	**408**	428	PSV/1-FHD	6204	256	1166	20	25.40	A-C
		380	**412**	436	PSV/2-FHD	6205	264	1200	25	31.75	A-C
		380	**412**	436	PSV/3-FHD	6305	264	1200	25	31.75	A-C
		380	**420**	452	PSV/4-FHD	6206	274	1243	30	38.10	B-C-E
1200	89-108 133-159	465	**493**	513	PSV/1-FHD	6204	305	1391	20	25.40	A-C
		465	**497**	521	PSV/2-FHD	6205	313	1424	25	31.75	A-C
		465	**497**	521	PSV/3-FHD	6305	313	1424	25	31.75	A-C
		465	**505**	537	PSV/4-FHD	6206	323	1467	30	38.10	B-C-E
		465	**509**	541	PSV/7-FHD	6308	331	1501	40	44.45	B-C-E
1400	89-108 133-159-194	530	**558**	578	PSV/1-FHD	6204	342	1562	20	25.40	A-C
		530	**562**	586	PSV/2-FHD	6205	350	1595	25	31.75	A-C
		530	**562**	586	PSV/3-FHD	6305	350	1595	25	31.75	A-C
		530	**570**	602	PSV/4-FHD	6206	360	1639	30	38.10	B-C-E
		530	**574**	606	PSV/7-FHD	6308	368	1672	40	44.45	B-C-E

Example of ordering
standard design
GS3,1200/PSV/4-FHD,30K,133N,C=505

specify type of suspensions
(see pages 240-241 for available types)

* for X and Y measures see pages 240-241 regarding to the suspensions
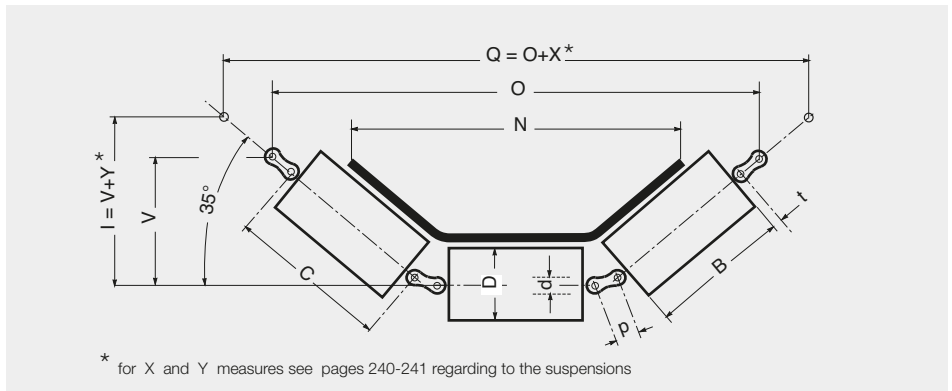
belt	roller								spindle		type of suspensions
width mm	D mm	B	C	A	type	bearing	V	O	d	p	
1600	89-108 133-159-194	600	632	656	PSV/2-FHD	6205	390	1780	25	31.75	A-C
		600	632	656	PSV/3-FHD	6305	390	1780	25	31.75	A-C
		600	640	672	PSV/4-FHD	6206	400	1824	30	38.10	B-C-E
		600	644	676	PSV/7-FHD	6308	408	1857	40	44.45	B-C-E
1800	108-133 159-194	670	702	726	PSV/2-FHD	6205	430	1965	25	31.75	A-C
		670	702	726	PSV/3-FHD	6305	430	1965	25	31.75	A-C
		670	710	742	PSV/4-FHD	6206	441	2008	30	38.10	B-C-E
		670	710	742	PSV/5-FHD	6306	441	2008	30	38.10	B-C-E
		670	714	746	PSV/7-FHD	6308	448	2041	40	44.45	B-C-E
2000	133 159-194	750	790	822	PSV/4-FHD	6206	486	2219	30	38.10	B-C-E
		750	790	822	PSV/5-FHD	6306	486	2219	30	38.10	B-C-E
		750	794	826	PSV/7-FHD	6308	494	2252	40	44.45	B-C-E
2200	133 159-194	800	840	872	PSV/4-FHD	6206	515	2351	30	38.10	B-C-E
		800	840	872	PSV/5-FHD	6306	515	2351	30	38.10	B-C-E
		800	844	876	PSV/7-FHD	6308	523	2384	40	44.45	B-C-E
2400	133 159-194	900	940	972	PSV/4-FHD	6206	572	2615	30	38.10	B-C-E
		900	940	972	PSV/5-FHD	6306	572	2615	30	38.10	B-C-E
		900	944	976	PSV/7-FHD	6308	580	2648	40	44.45	B-C-E
2600	159 194	950	944	1026	PSV/7-FHD	6308	609	2780	40	44.45	B-C-E
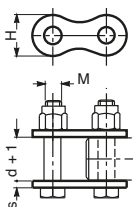
d	20	25	30	40
s	3	4	5	6
H	21	24	30	36
M	8	10	14	16
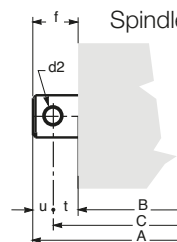
Spindle design **K**

d	20	25	30	40
u	10	12	16	16
t	14	16	20	22
f	24	28	36	38
d2	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, TOP, PL, PLF, exceptionally, and only where absolutely necessary, with impact rings (see chapter 2, impact rollers).

belt	roller								spindle		type of
width mm	D mm	B	C	A	type	bearing	V	O	d	p	suspensions
800	89 108-133	165	193	213	PSV/1-FHD	6204	326	810	20	25.40	A-C
		165	197	221	PSV/2-FHD	6205	344	852	25	31.75	A-C
		165	197	221	PSV/3-FHD	6305	344	852	25	31.75	A-C
		165	205	237	PSV/4-FHD	6206	368	908	30	38.10	B-C-E
1000	89 108-133	205	233	253	PSV/1-FHD	6204	384	956	20	25.40	A-C
		205	237	261	PSV/2-FHD	6205	402	997	25	31.75	A-C
		205	237	261	PSV/3-FHD	6305	402	997	25	31.75	A-C
		205	245	277	PSV/4-FHD	6206	425	1054	30	38.10	B-C-E
1200	89-108 133-159	250	278	298	PSV/1-FHD	6204	449	1120	20	25.40	A-C
		250	282	306	PSV/2-FHD	6205	466	1161	25	31.75	A-C
		250	282	306	PSV/3-FHD	6305	466	1161	25	31.75	A-C
		250	290	322	PSV/4-FHD	6206	490	1217	30	38.10	B-C-E
		250	294	326	PSV/7-FHD	6308	508	1259	40	44.45	B-C-E
1400	89-108 133-159-194	290	318	338	PSV/1-FHD	6204	506	1265	20	25.40	A-C
		290	322	346	PSV/2-FHD	6205	524	1307	25	31.75	A-C
		290	322	346	PSV/3-FHD	6305	524	1307	25	31.75	A-C
		290	330	362	PSV/4-FHD	6206	548	1363	30	38.10	B-C-E
		290	334	366	PSV/7-FHD	6308	565	1404	40	44.45	B-C-E
1600	89-108 133-159-194	340	372	396	PSV/2-FHD	6205	596	1489	25	31.75	A-C
		340	372	396	PSV/3-FHD	6305	596	1489	25	31.75	A-C
		340	380	412	PSV/4-FHD	6206	620	1545	30	38.10	B-C-E
		340	384	416	PSV/7-FHD	6308	637	1586	40	44.45	B-C-E

Example of ordering

standard design
GS5,1600/PSV/7-FHD,40K,159N,C=384

specify type of suspensions
(see pages 240-241 for available types)
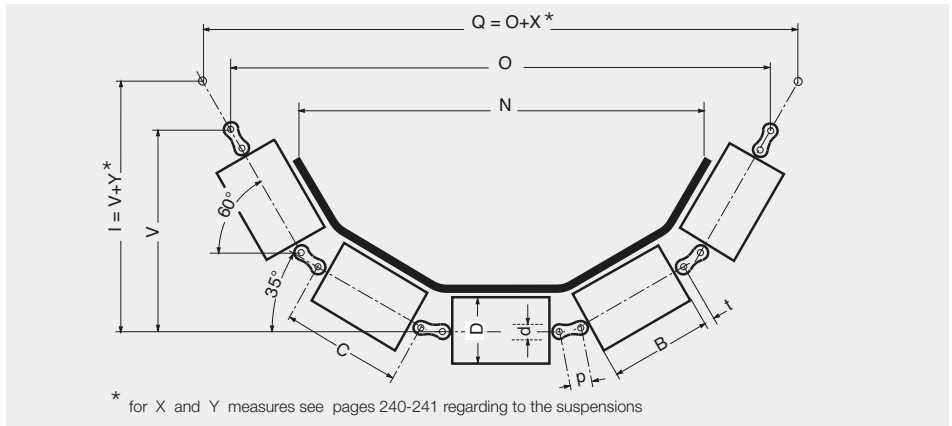
Q = O+X *
O
N
I = V+Y*
V
60°
35°
D
d
C
B
t
p

* for X and Y measures see pages 240-241 regarding to the suspensions

belt	roller								spindle		type of suspensions
width mm	D mm	B	C	A	type	bearing	V	O	d	p	
1800	108-133 159-194	380	412	436	PSV/2-FHD	6205	654	1634	25	31.75	A-C
		380	412	436	PSV/3-FHD	6305	654	1634	25	31.75	A-C
		380	420	452	PSV/4-FHD	6206	677	1690	30	38.10	B-C-E
		380	420	452	PSV/5-FHD	6306	677	1690	30	38.10	B-C-E
		380	424	456	PSV/7-FHD	6308	695	1732	40	44.45	B-C-E
2000	133 159-194	420	460	492	PSV/4-FHD	6206	735	1836	30	38.10	B-C-E
		420	460	492	PSV/5-FHD	6306	735	1836	30	38.10	B-C-E
		420	464	496	PSV/7-FHD	6308	753	1877	40	44.45	B-C-E
2200	133 159-194	460	500	532	PSV/4-FHD	6206	792	1981	30	38.10	B-C-E
		460	500	532	PSV/5-FHD	6306	792	1981	30	38.10	B-C-E
		460	504	536	PSV/7-FHD	6308	810	2023	40	44.45	B-C-E
2400	133 159-194	500	540	572	PSV/4-FHD	6206	850	2127	30	38.10	B-C-E
		500	540	572	PSV/5-FHD	6306	850	2127	30	38.10	B-C-E
		500	544	576	PSV/7-FHD	6308	868	2169	40	44.45	B-C-E
2600	159 194	540	584	616	PSV/7-FHD	6308	925	2314	40	44.45	B-C-E
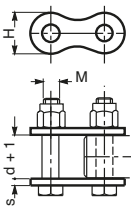
d	20	25	30	40
s	3	4	5	6
H	21	24	30	36
M	8	10	14	16
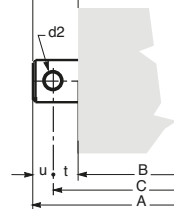
Spindle design **K**

d	20	25	30	40
u	10	12	16	16
t	14	16	20	22
f	24	28	36	38
d2	8,3	10,3	14,5	16,5

**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.

Hook type A
For upper and return sets with roller spindle d = 20 and 25 mm.
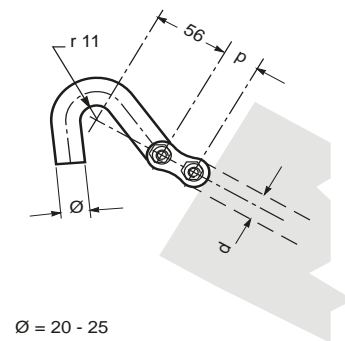
Hook type B
For upper and return impact sets with roller spindle d = 30 and 40 mm for heavy loads.

Ø = 20 - 25
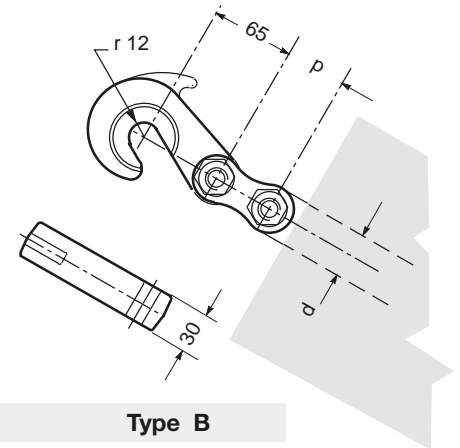
	Type A		Type B	
⋆	X	Y	X	Y
10°	105	19	122	22
35°	86	36	100	42
60°	56	48	65	56

⋆ The measures X and Y are used to determine the fixation distance Q - see GS2-GS3-GS5 garlands drawings at previous pages.

Hook type C
Upper and return sets for light loads.
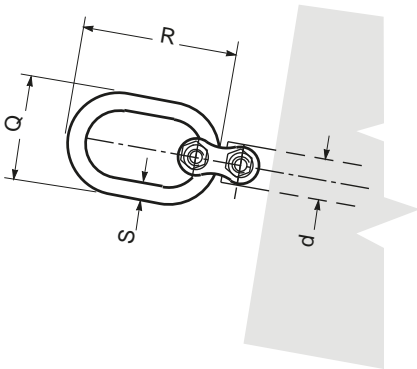
d	Q	R	S
20	40	85	10
25/30	52	108	13
40	64	132	16

✱	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.

Hook type 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.

Fig. 1   Fig. 2

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.
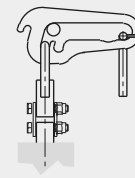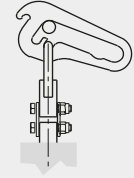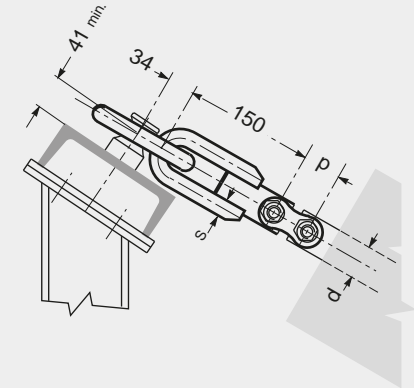
Hook type F
To support the return belt and where it is necessary to change the angle of the rollers, the chain may be slotted into the fork as the links permit.
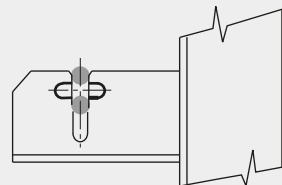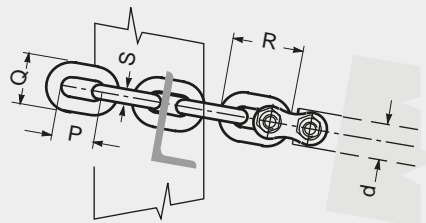
d	S	P	Q	R
20	10	35	34	55
25/30	13	45	44	71
40	16	56	54	88

✱   Measures X and Y to be calculated according to the chain fixation point.

3 Troughing sets

4   Pulleys

4 Pulleys

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 over 60 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 9001:2015, 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
2 - return pulley
3 - return pulley
4 - change direction pulley
5 - tension pulley
6 - snubbing pulley
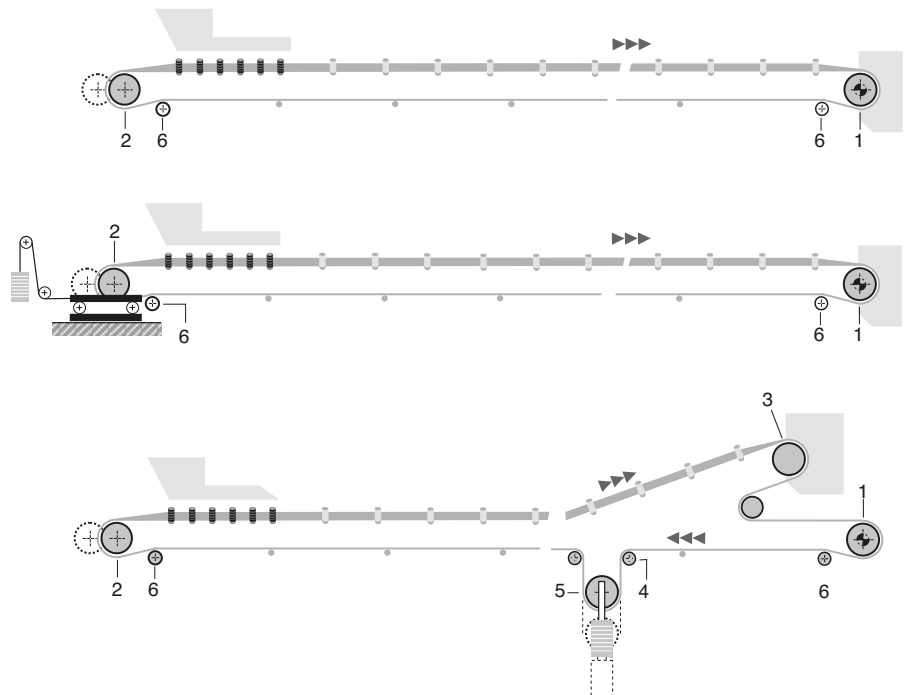
4 Pulleys

4.2 - Dimension of 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:

$$ft_{max} \leq \frac{C}{2000} \qquad \alpha t \leq \frac{1}{500}$$
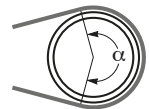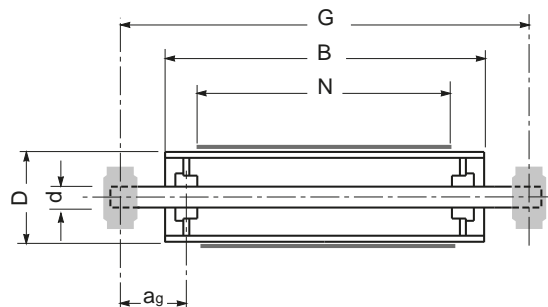
4.2.1 - Shaft importance

Excessive deflection of the pulley shaft constitutes the major reason for failure of the drum structure.

$$ft = \frac{(Cpr/2)a_g}{24 \times E \times J}\left[\,3(b+2a_g)^2 - 4a_g^2\,\right] \leq \frac{c}{2000}$$

$$\alpha t = \frac{(Cpr/2)}{2 \times E \times J}\,a_g\,(c - a_g) \leq \frac{1}{500}$$
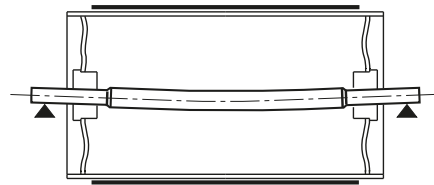
The correct sizing of the shaft is therefore of the greatest importance and must take into account an extra high safety factor.
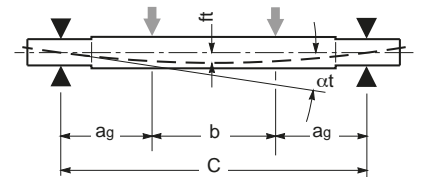
Upon the request for pulleys with characteristics and dimensions different from those indicated in this catalogue it is advisable to supply a dimensioned drawing of the pulley with the required features.
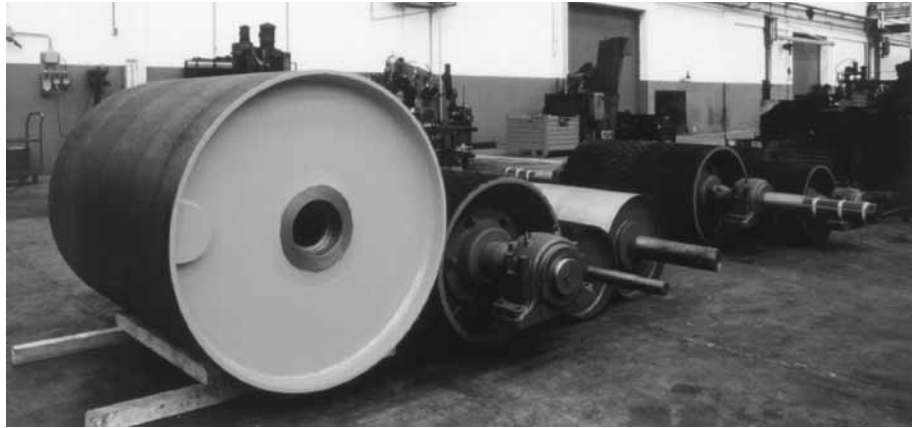
4.3 - Used Worldwide in important applications.

Rulmeca belt pulleys are the drive element for belt conveyors in bulk handling applications.

The Rulmeca belt pulleys have the shaft assembled by friction lock clamping units. Up to now this is the most used and reliable solution, granting strength, perfect centering, reliability and possibility of eventual future disassembly.

The pulleys are designed according to customer's requests.
The design and calculation is based on the current standards and can be verified by the FEM Finite Elements Modeling analysis.

Pulleys types
Drive pulleys, Idler Pulleys, Snub Pulleys, special pulleys etc.

Diameter
• Standard: 220 ÷ 1000
• Other dimensions on request.

Shell
• Shell width up to 4000 mm.
• Crowned or cylindrical shell

Shaft/Axles
• Fixed by self centering clamping units with tapered sleeves.
• Drive shafts: single or double drive shaft ends.

Bearings
• Pillow blocks or flange bearings of primary brands.
• Sealing system according to the application (e.g. double lip seals, labyrinth seals, taconite seals, shaft sealing rings etc.).

Rubber Lagging
• Hot vulcanized rubber lagging: smooth, diamond pattern or herringbone pattern.

Corrosion protection
• Different standard and special paint coats available, according to the application.
• Shaft ends temporary protected against corrosion by waxed oil.

General
• Stress relieve thermal treatment on all the pulleys welding.
• All pulleys are statically balanced.

Options (on request)
• Materials certification
• Magneto scope checks
• Ultrasounds checks
• Dynamic balancing
• Rubber lagging with ceramic inserts
• Plates or pins for speed sensors
• Shaft with holes for speed check devices
• High resistance, quenched and tempered steel shaft

4.4 - Order code

Pulleys are identified according to the following characteristics:
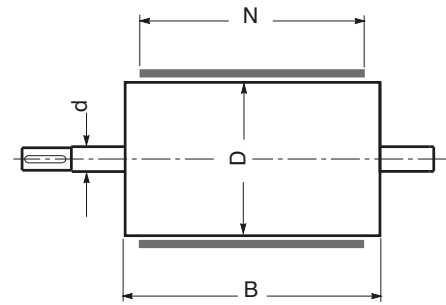
USC	-630	-750	-40	YA	RA	12

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.

Smooth

Diamond   Herring bone   Anti-clockwise   Clockwise
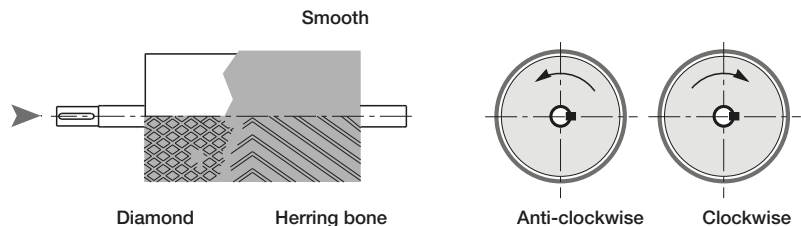
* * System of pulley end cap finish

Symbol	Description of treatment
YA	painted with antirust primer, zinc phosphate based 40 micron, colour grey
YB	sandblasted SA 2,5 + epoxy rich-zinc primer 70 micron, colour grey
YC	sandblasted SA 2,5 + epoxy rich-zinc 40 micron + epoxy enamel 60 micron, colour grey RAL 7035
YS	special paint finish as requested (specify)

4 Pulleys

4.5 - Programme

Pulleys type	Series	Design
USC	drive pulleys	with clamping units
USF	idler pulleys	with clamping units
CUF	idler pulleys	with incorporated bearings
TDV	screw tension units	simple
Special PULLEYS		
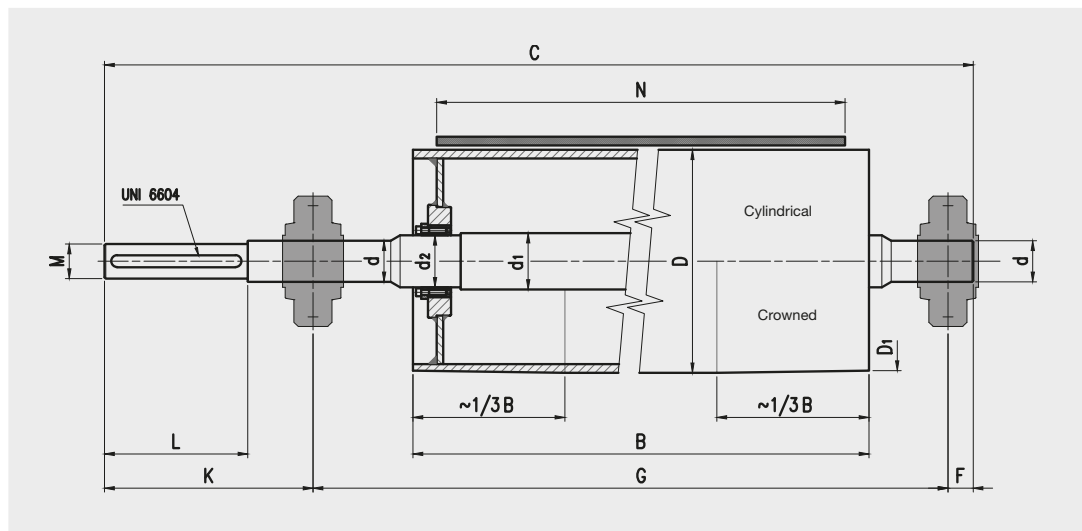
UNI 6604

C

N

Cylindrical

Crowned

~1/3B

~1/3B

B

L

K

G

F

M

d

d2

d1

D

D1

d

4.5.1 - Drive pulleys with clamping units

To require this type of pulleys, please fill in and send the form with the required data for the pulleys selection at page 253.
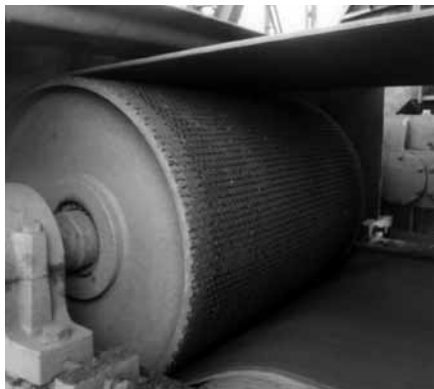
For the order code of execution and lagging see page 249.

Series

USF idler
with clamping units
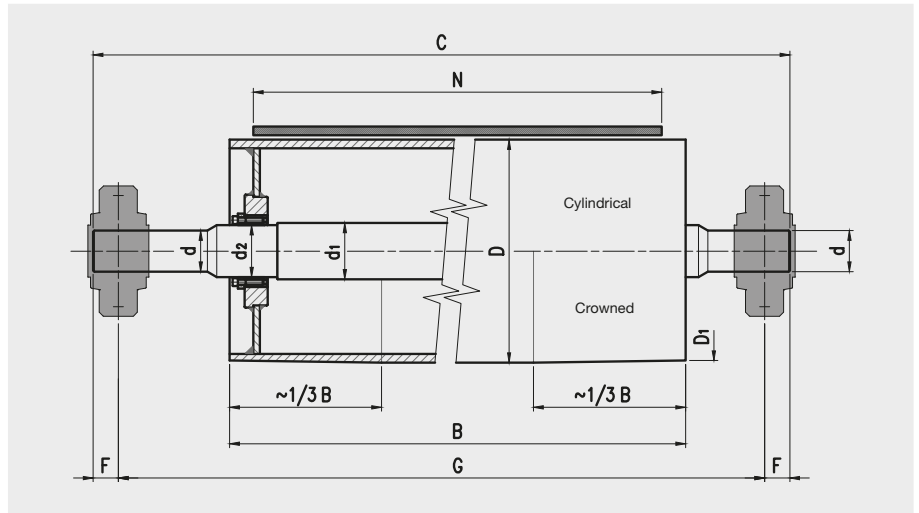
4.5.2 - Idler pulleys with clamping units

To require this type of pulleys, please fill in and send the form with the required data for the pulleys selection at page 253.

For the order code of execution and lagging see page 249.

Example of ordering
standard design
USF,620,750,50, YA,RO,10

4.5.3 Required data for the pulleys selection ☐ **USC** ☐ **USF**

Necessary data
- Pulley diameter   ø D   .... mm
- Shell width   B   .... mm
- Belt width   N   .... mm
- Lagging type   ....
- Bearings centre to centre distance   G   .... mm
- Max radial load   T1+T2 .... N
- Belt speed   v   .... m/s
- Shaft diameter at the bearings   ø d   .... mm
- Shaft diameter at the clamping units   ø d2   .... mm
- Length for the motor (only for use)   L   .... mm

Additional information
- Input torque   .... Nm
- Motor power   .... kW
- Shaft diameter to the gearbox   ø M   .... mm
- Belt wrap angle on drive pulleys USC   .... °degrees
- Requested bearing sealing system or for
  special operating condition   ....
- High friction lagging type   ....
- Shell design   ☐ crowned   ☐ cylindrical

Options (on request)
- Materials certification
- Magneto scope checks
- Ultrasounds checks
- Dynamic balancing
- Rubber lagging with ceramic inserts
- Plates or pins for speed sensors
- Shaft with holes for speed check devices
- High resistance, quenched and tempered steel shaft

4 Pulleys

Series
CUF idler

with incorporated bearings
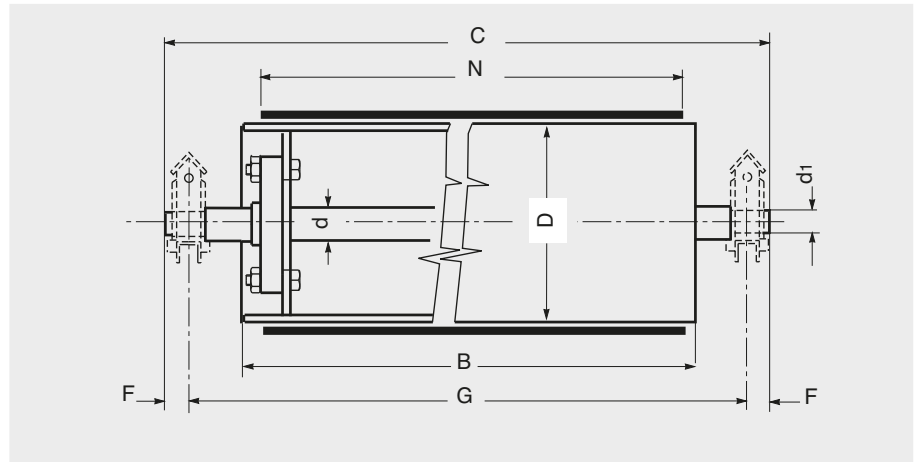
4.5.4 - Idler pulleys with incorporated bearings

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.
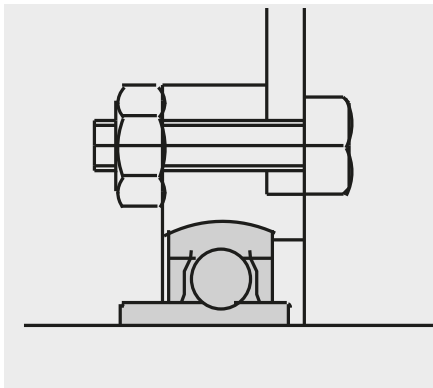
On request pulleys may be supplied with characteristics and dimensions different from those indicated in the table, or using the customer's drawing.

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	38				57
		320		40	38				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

For the order code of execution and lagging see page 249.

Example of ordering
standard design
CUF,400,600,50,YA

tension units

TDV with screw
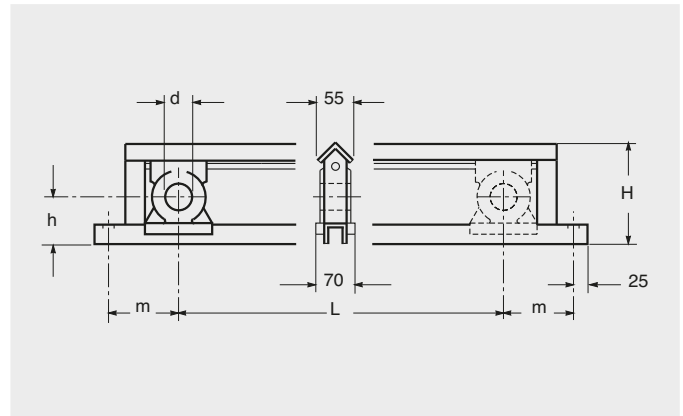
4.5.5 - Screw tension units

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	L	h	m	H	Weight
	mm					Kg
TDV 01	38	300	75	110	165	9
02		400				10
03		500				11
04		600				12
05		700				13
06		800				15
07		900				16
08		1000				17
TDV 21	48	300	85	120	185	11
22		400				12
23		500				13
24		600				14
25		700				15
26		800				17
27		900				18
28		1000				19
TDV 41	58	300	85	120	185	10.5
42		400				11.5
43		500				12.5
44		600				13.5
45		700				14.5
46		800				16.5
47		900				17.5
48		1000				18.5

Example of ordering
standard design
TDV38,YA,300

4.5.6 - Special pulleys

Following specific requests and, if possible, a reference drawing provided by the customer, Rulmeca 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 suit-able 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
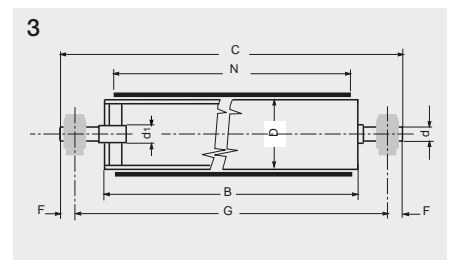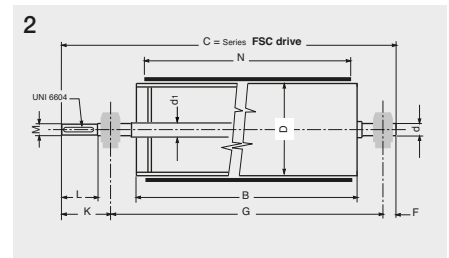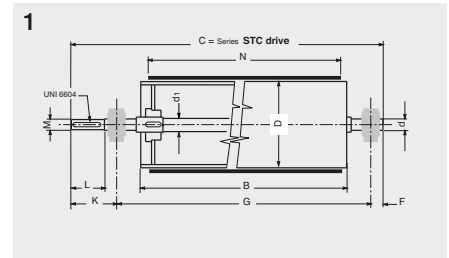
Pulleys according to other types and dimensions than those described in this catalogue can be quoted and manufactured if requested and provided that the customer submits a drawing.

5   Belt Cleaners

5 Belt cleaners

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.
Our standard product range is composed by:
- belt cleaners with blades made of tungsten-carbide;
- scrapers with Polyurethane blades.

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 of belt cleaners with blades made of tungsten-carbide

Cleaner type	For belt width mm	Characteristics
P	350 ÷ 2200	For single directional belts
R	350 ÷ 2200	For reversible belts
H	350 ÷ 2200	For reversible belts and tangential applications
D	350 ÷ 2200	For single directional belts

On request belt widths larger than those indicated or for special applications may be supplied.

| Type **P** | Type **R** | Type **H** | Type **D** |
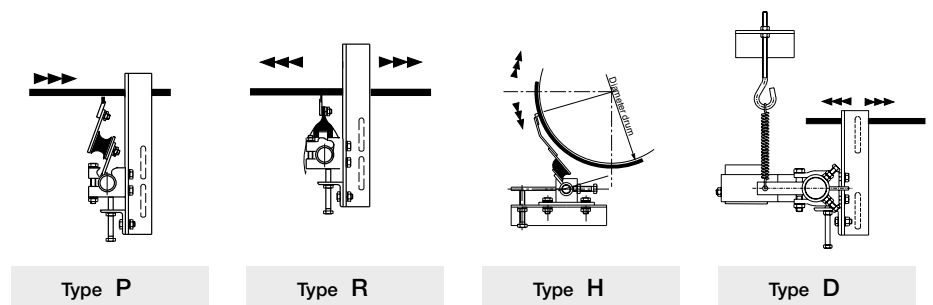
5 Belt cleaners

series P

5.3.1 - Belt cleaners series P for single 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.

min.100 mm
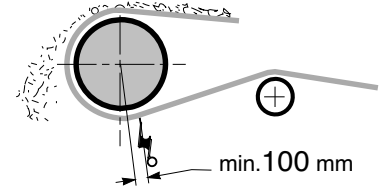
1 - Blade
2 - Rubber cushion
3 - Frame
4 - Clamp
5 - Bracket
6 - Adjusting bolt
7 - Deflector

Belt width

W

150

Frame width

Belt cleaner type	Belt width mm	Tips n.	W mm	Frame width mm	A min.	A max	B	C	Ø	E	F	G	H	Weight Kg
	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	85	56	154	80	40
P	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	115	70	165	105	100
	2200	14	2100	3100										110

On request different dimensions to W as indicated may be supplied.

Example of ordering
Cleaner type P, 800

263
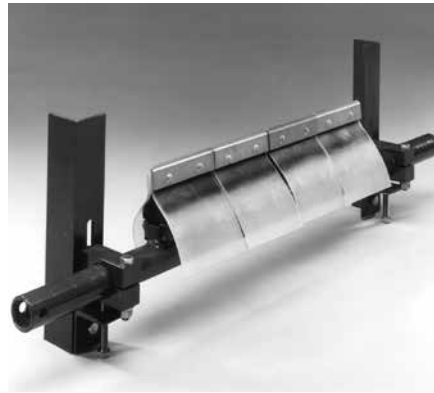
5.3.2 - Belts cleaners series R for reversible belts

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.

min.100 mm

1 - Blade
2 - Rubber cushion
3 - Frame
4 - Clamp
5 - Bracket
6 - Adjusting bolt
7 - Plastic deflector

Fig. A

Belt cleaner type	Belt width mm	Tips n.	W mm	Frame width mm	A min.	A max	B	C	Ø	E	F	G	H	Weight Kg
	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	85	56	145	80	40
R	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	115	70	156	105	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
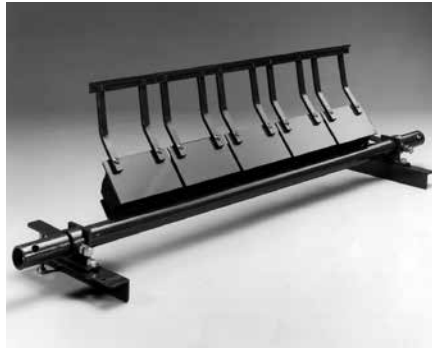
5.3.3 - Belt cleaners series H for reversible and single directional belts for tangential applications

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.

Belt width

W

150/200

15°

Drum diameter

H

Ø

Frame width

2

4

5

E

C

F

B
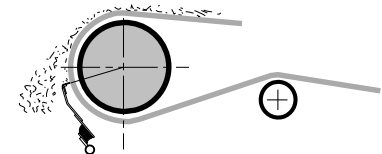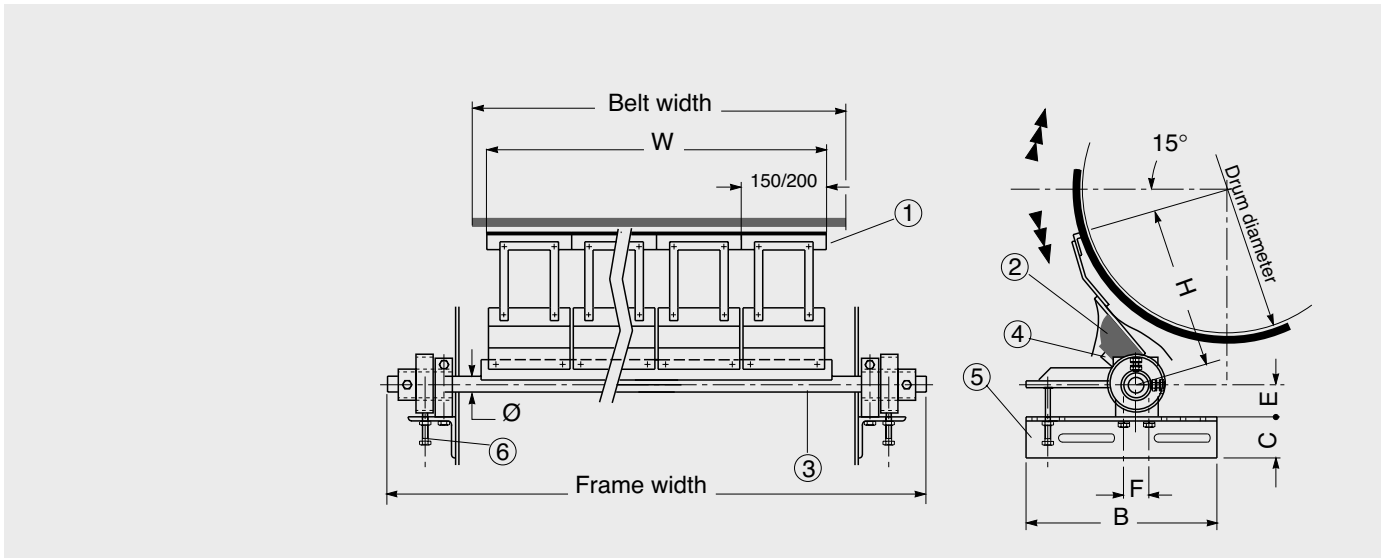
1 - Scraper tips
2 - Rubber cushion
3 - Frame
4 - Clamp
5 - Support
6 - Regulating screw

Efficiency 100%

Belt cleaner type	Belt width mm	Tips mm	n.	W mm	Frame width mm	B	F	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	400	70	80	76.3	70	105
H	2000	200	10	2000	3000	400	70	80	76.3	70	120
H	2200	200	11	2200	3200	400	70	80	76.3	70	135

On request different dimensions to W as indicated may be supplied.
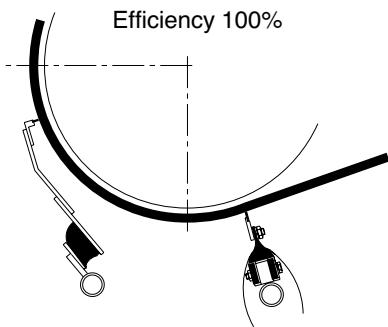
To order belt cleaner series H it is necessary to complete the type code with a model code which relates to the diameter of the pulley using the following table.

Cleaner type	model	Pulley Ø mm	H mm ~
H	SS	less than 500	276
H	S	500 ÷ 800	333
H	M	700 ÷ 1100	384
H	L	1000 ÷ 1200	416
H	LL	greater than 1200	527

Example of ordering
Cleaner type HS, 1000

5.3.4 - Belt cleaners series D patented for single 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 D is characteristic of a new technology.

It consists of a carbon steel blade, welded to a curved support. The assembly constitutes a unique scraper blade, inserted into a strong structural arc mounted on special bearings.

Although there is vertical adjusting, 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 in situ.

This type of universal belt cleaner is particularly recommended to be used on high speed single 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.

Legend:
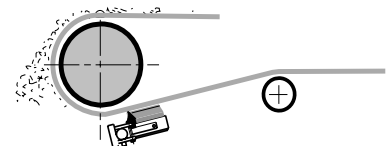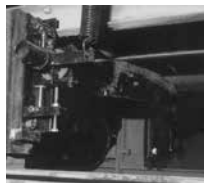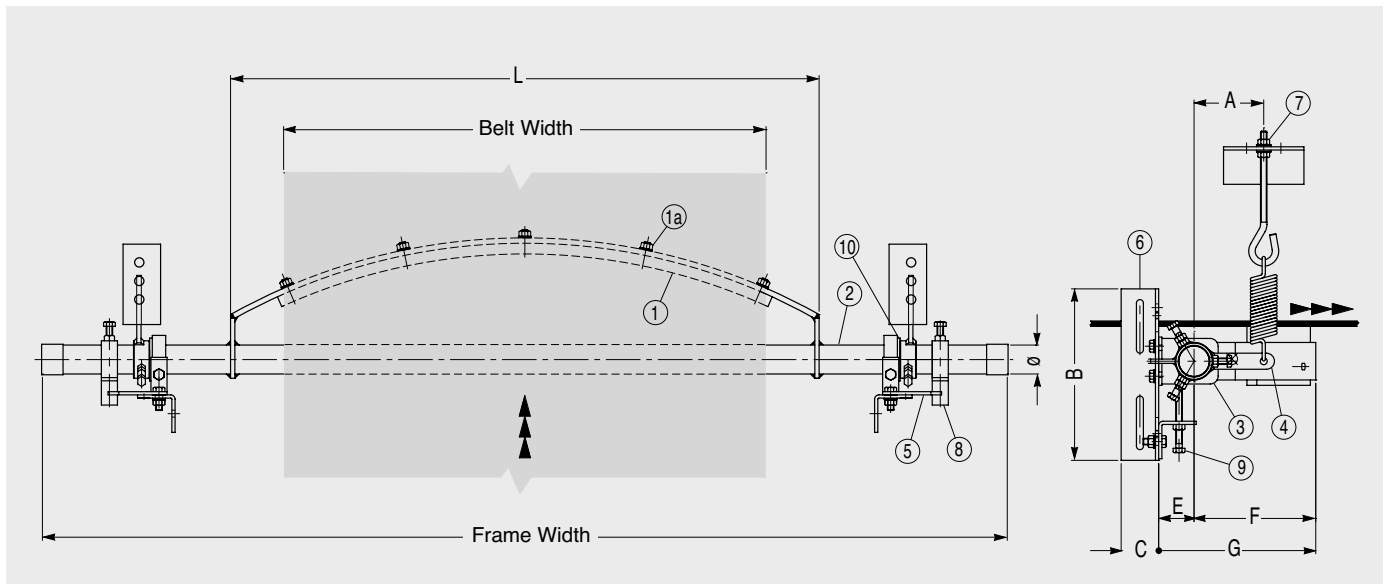
1 - Blade
1a - Blade fixing screws
2 - Frame
3 - Clamp
4 - Spring tensioning system
5 - Rotation stopper plate
6 - Bracket
7 - Pressure adjustement
8 - Rotation stopper
9 - Height adjustement screw
10 - Rotation bush

Example of ordering
Cleaner type D, 1400

Belt cleaner type	Belt width mm	Frame width mm	L	A	B	C	Ø	E	F	G	Peso Kg
	400	1000	490	130	320	70	54	66	141	207	20
	450	1100	540	130	320	70	54	66	146	212	25
	500	1200	590	130	320	70	54	66	152	218	30
	600	1300	690	130	320	70	54	66	164	230	40
	650	1350	740	130	320	70	54	66	179	245	42
	750	1500	840	130	320	70	54	66	182	248	45
	800	1550	890	130	320	70	54	66	194	260	50
D	900	1700	990	130	320	70	54	66	200	266	55
	1000	1800	1090	130	320	70	54	66	213	279	60
	1200	2100	1290	130	320	70	54	66	237	303	65
	1400	2300	1490	130	320	70	54	66	270	336	75
	1500	2400	1590	130	320	70	54	66	253	319	80
	1600	2500	1690	130	320	70	54	66	256	322	85
	1800	2700	1890	160	400	70	76	80	250	328	95
	2000	3100	2090	160	400	70	76	80	250	328	105
	2200	3300	2290	160	400	70	76	80	250	328	115

5.3.5 - Belt cleaners simple and plough types

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
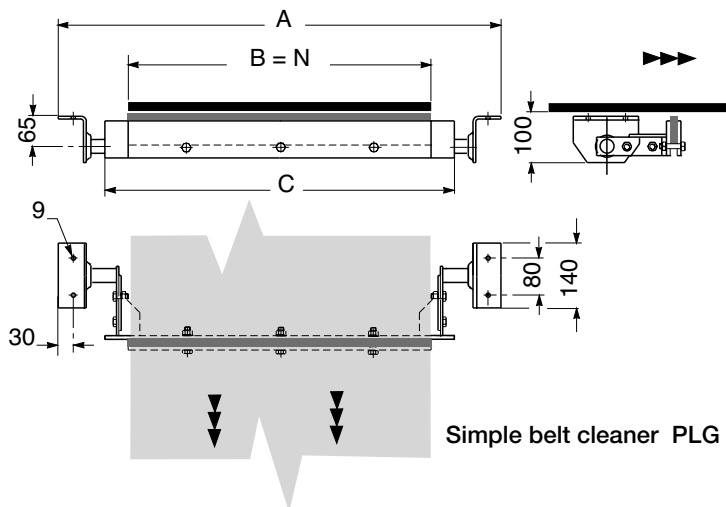
Belt width mm	A	B	C
400	700	400	500
500	800	500	600
650	950	650	750

Example of ordering
Cleaner type PLG, 400

Detail of fixing rubber/frame

2,5 · 40 · 15 · 23 · 60
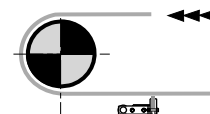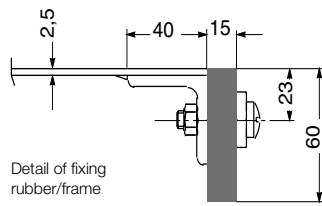
Plough cleaner type VLG
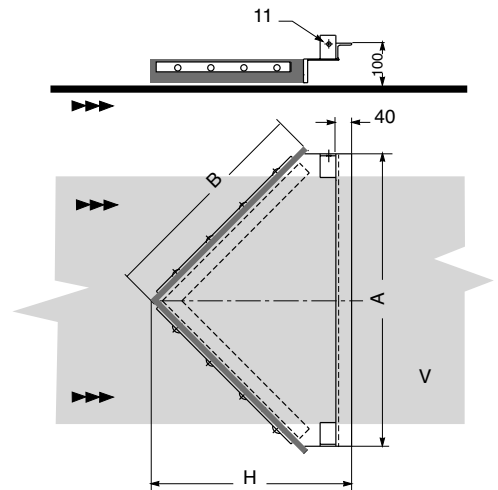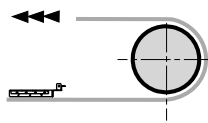
Belt width mm	A	B	H
400	500	350	360
500	600	420	410
650	740	525	480

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.
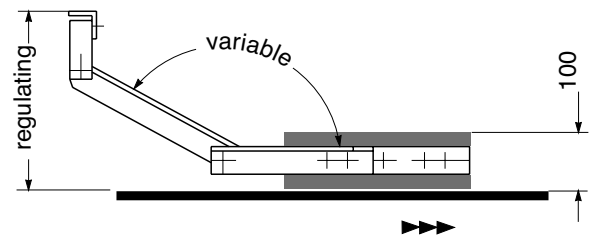
Belt width mm	A	B	H
800	1100	600	850
1000	1300	750	1060
1200	1550	890	1260
1400	1750	1030	1460
1600	1950	1170	1660

regulating — variable — 100

50x50

Plough cleaner type VLP
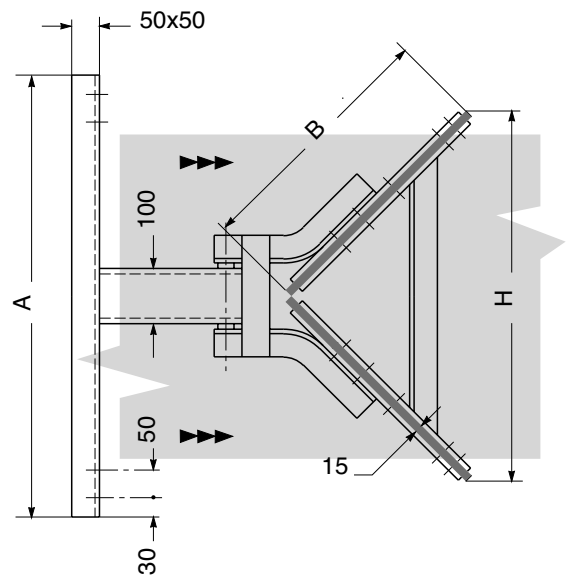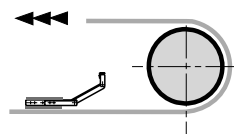
Example of ordering
Cleaner type VLG, 500
                    VLP, 650

5 Belt Scrapers

Scrapers with Polyurethane blades

Type PU-83   **Simple Pre-scraper with single polyurethane blade**
Position: Tangential for pulleys Ø 220-1000 mm
For BW 400-2000, max speed 3.5m/s, also reversible
For easy to medium cleaning
Typically a first scraper for an end user
Also used by many OEM as a standard scraper
Easy to replace the scraper blade without tools
The scraper must not be fitted to chevron belts or belts with mechanical joints
For materials: Sand, Gravel, Stone, Saw dust, garbage, soil

Type PU-89   **Heavy Pre- scraper single strong and thick polyurethane blade**
Position: Tangential for big pulleys Ø 400-1000 mm
For BW 650-1400, max speed 6 m/s, also reversible
For heavy cleaning
Easy to replace the scraper blade without tools
The scraper must not be fitted to chevron belts or belts with mechanical joints
For materials: Gravel, limestone, crushed stone, iron ore, cement

Type PU-91   **Pre- scraper with segment polyurethane blades**
Position: Tangential for pulleys Ø 200-630 mm
For BW 400-2000, max speed 3.5* m/s, also reversible
Medium to heavy cleaning
Accurate cleaning due to flexible multi sectored blades
Easy to service and maintain
The scraper must not be fitted to chevron belts or belts with mechanical joints
For materials: Sand, Gravel, crushed stone, wet and sticky material

Type PU-92   **Secondary scraper**
Single strong and thick polyurethane blade and pre-tensioning device
Position: under the return belt 30-100 mm away from the head pulley
For BW 400-2000, max speed 3.5** m/s, single direction belts
For medium industry with stringent cleaning requirements
Also in combination with a pre-scraper for a max cleaning effect
Easy to service and maintain
Can be fitted with tungsten-carbide blades
The scraper must not be fitted to chevron belts or belts with mechanical joints
For materials: Gravel, limestone, crushed stone, iron ore, cement and others

Type PU-88   **Plough scraper**
Self aligning steel frame and 2 exchangeable PU-scraper strips.
Position: on the return belt before the tail pulley
For BW 400-1800, max speed 4.5 m/s;
The purpose of the plough is to remove loose material from the return run of the belt

NOTES   **Working temperatures of PU Rulmeca scrapers:**
Max. temperature: + 50°C in wet environments
Max. temperature: + 85°C in dry environments
(ambient temperature + frictional heat)

Option for surface of steel parts:
Powder coat 60-80 μm
Coating with thermo plastic 120-800 μm
Stainless steel EN 1.4301 /AISI 304 / SS2333

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*PU 91 can be used at belt speeds up to 5 m/s with certain modifications. Contact your Rulmeca representative.

**PU 92 can be used at belt speeds up to 4.5 m/s with certain modifications. Contact your Rulmeca representative.

5.4.1 Scrapers with Polyurethane blades - Guide Table:

Scraper Code	Type	Blade	Position	BW mm	Max Speed m/s	Reversible Belt	Application	Shape
PU-83	Simple Pre-Scraper	PU Single	Tangential to pulley Ø220-1000	400-2000	3.5	✓	For easy to medium duty cleaning	
PU-89	Heavy Pre-Scraper	PU Single-Thick	Tangential to pulley Ø400-1000	650-1400	6	✓	For heavy duty cleaning	
PU-91	Pre-Scraper with segment PU blades	PU Segments	Tangential to pulley Ø220-630	400-2000	3.5*	✓	Medium to heavy duty cleaning. Accurate cleaning due to flexible multi sectored blades	
PU-92	Secondary Scraper	PU Single-Thick	Under the return belt (300-100 mm from head pulley)	400-2000	3.5**	No	For medium duty with stringent cleaning requirements. Also in combination of a pre-scraper for a max cleaning effect	
PU-88	Plough Scraper	2 PU Strips at V	Over the return run of the belt (near tail pulley)	400-1800	4.5		To remove loose material from the return upper run of the belt	

*PU 91 can be used at belt speeds up to 5 m/s with certain modifications. Contact your Rulmeca representative.
**PU 92 can be used at belt speeds up to 4.5 m/s with certain modifications. Contact your Rulmeca representative.

Simple Pre-Scraper

with single PU blade
series PU 83

5.4.2 Scraper PU 83

The PU 83 pre-scraper truly symbolizes our aim of making simple, effective scrapers.

Simplicity: the scraper strip is easy to remove from the beam (without tools) for replacement and cleaning. Simple holders guarantee easy fitting and functionality. A lever arm that is fixed to the frame using a chain produces the required scraper pressure.

Made for pulleys ø220-1000 mm

B-W 400-2000mm

min.15°

SCRAPING WIDTH

SCRAPING WIDTH +100 mm
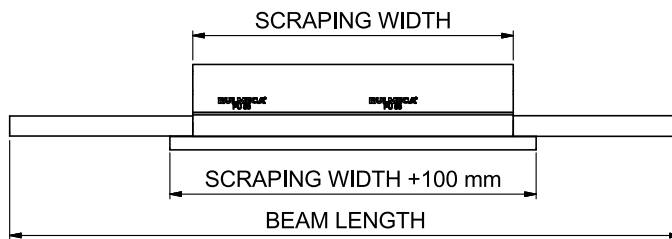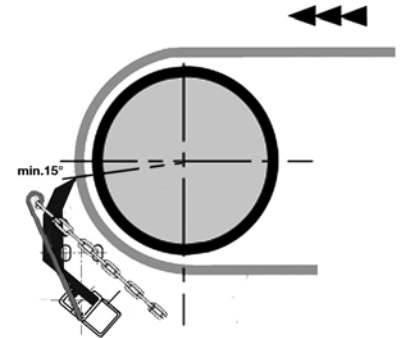
BEAM LENGTH

B-W	Scraping Width	Beam Length
400	350	1150
500	450	1250
650	550	1350
800	700	1500
1000	900	1700
1200	1050	1850
1400	1250	2050
1600	1450	2250
1800	1650	2450
2000	1850	2650

Robust Pre-Scraper

with single PU blade

series PU 89
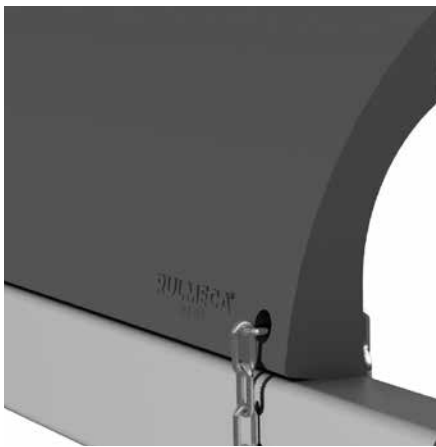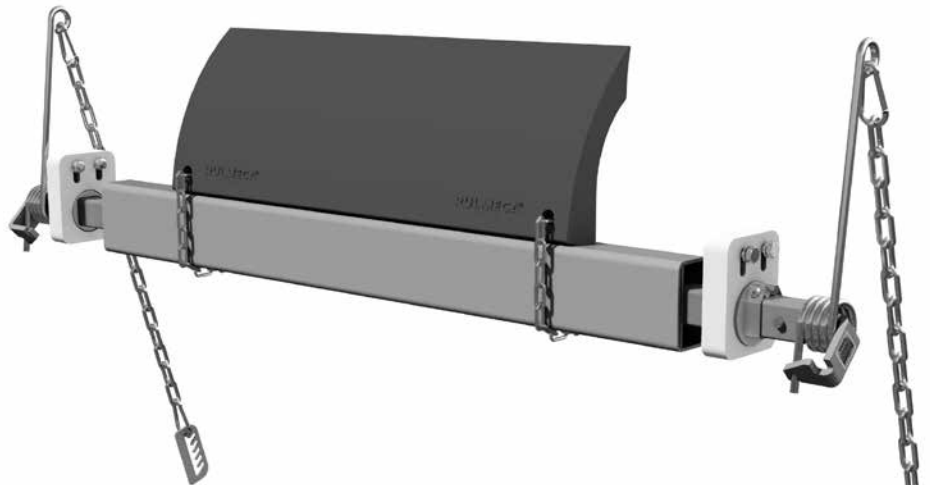
5.4.3 Scraper PU 89

PU 89 is a robust pre-scraper that effectively cleans the conveyor belt in tough operating environments.

Made for pulleys ø400 - 1000 mm.

The scraper blade is a solid polyurethane strip that adapts to the shape of the conveyor belt and pulley. Changing the blade is very easy and can be done without any tools. The scraper has been designed with a minimum of moving parts.

B-W 650-1400mm

SCRAPING WIDTH

54
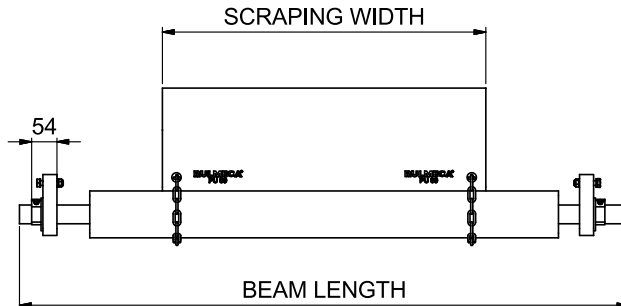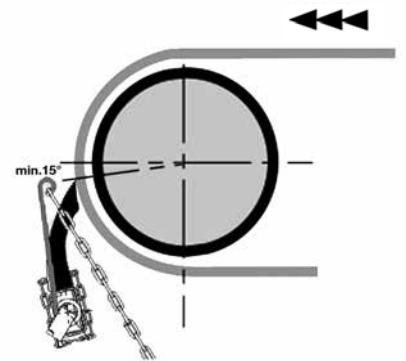
BEAM LENGTH

B-W	Scraping Width	Beam Length
650	545	850
800	695	1300
1000	895	1500
1200	1095	1700
1400	1295	1900

Pre-Scraper with
separated flexible PU blades
series **PU 91**
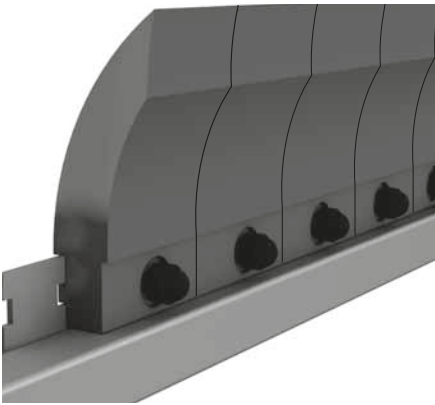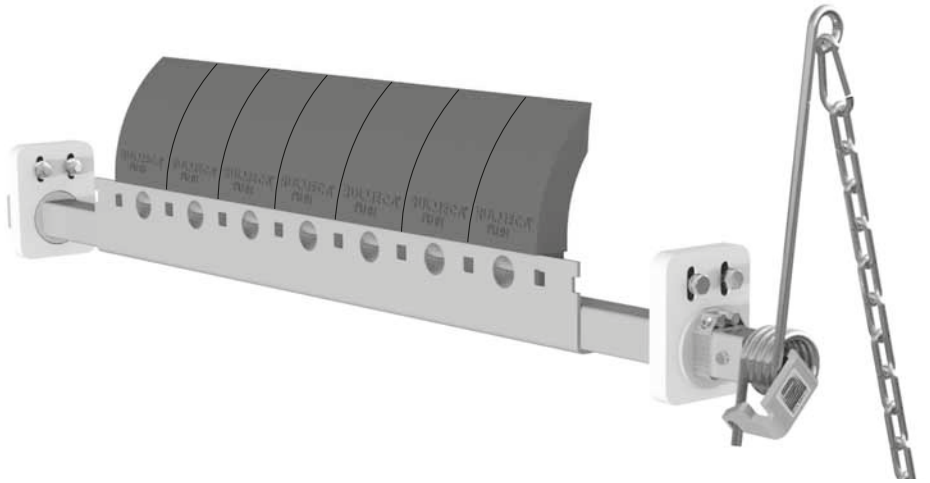
5.4.4 Scraper PU 91

The PU91 pre-scraper with scraper segments
that flex individually. It is fitted at the front of
the drive pulley, with the pu-blades just
below the horizontal centre line of the pulley,
at right angles to the conveyor belt.

Can be fitted with tungsten-carbide blades.

B-W 400-2000mm

min.15°

SCRAPING WIDTH
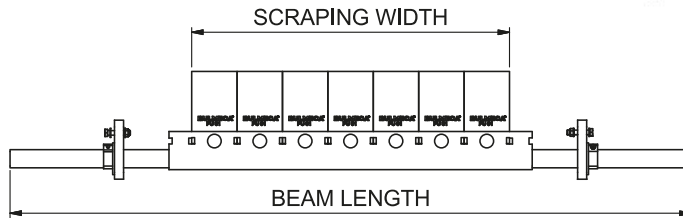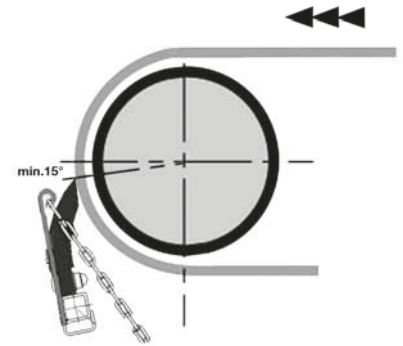
BEAM LENGTH

B-W	Segments	Scraping Width	Beam Length
400	4	400	1100
500	5	500	1200
650	6	600	1300
800	7	700	1500
1000	9	900	1700
1200	11	1100	1900
1400	13	1300	2100
1600	15	1500	2300
1800	17	1700	2500
2000	19	1900	2700

Secondary Scraper

with single PU blade
series PU 92
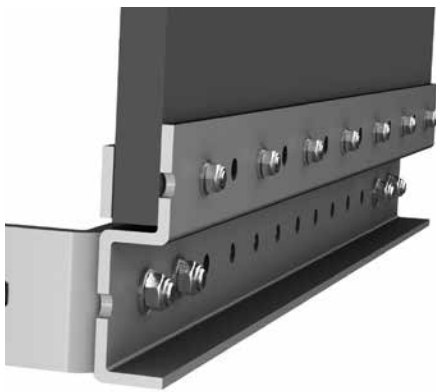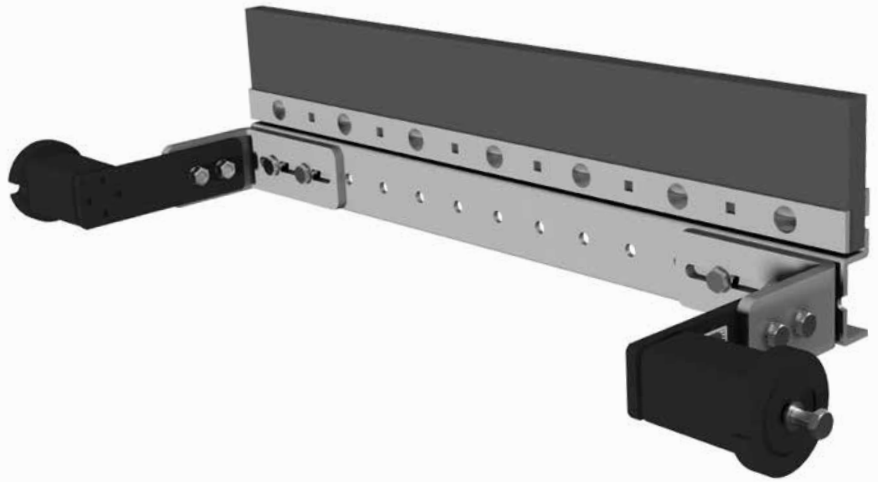
5.4.5 Secondary Scraper PU 92

PU 92 secondary scraper is placed below the drive pulley. The pressure of the PU strip against the belt is produced by two pre tensioned torsion springs. The installation dimensions of the scraper can be continuously adjusted. The scraper cannot be used on belts with reversible operations.

Can be fitted with tungsten-carbide blades.

BW 400-2000

MIN 30
MAX 100

FIXING BOLT

EXTERIOR DIMENSION L
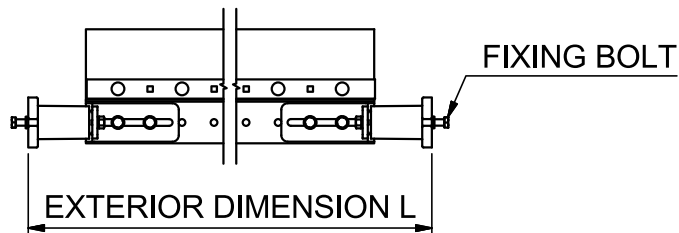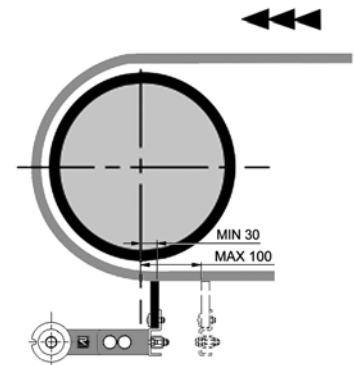
B-W	Scraping Width	L - Length
400	400	482 - 582
500	500	582 - 682
650	600	582 - 682
800	700	840 - 940
1000	900	1040 - 1140
1200	1100	1240 - 1340
1400	1200	1440 - 1540
1600	1400	1700 - 1800
1800	1600	1900 - 2000
2000	1800	2100 - 2200

Plough Scraper

with a couple of PU blades
series PU 88
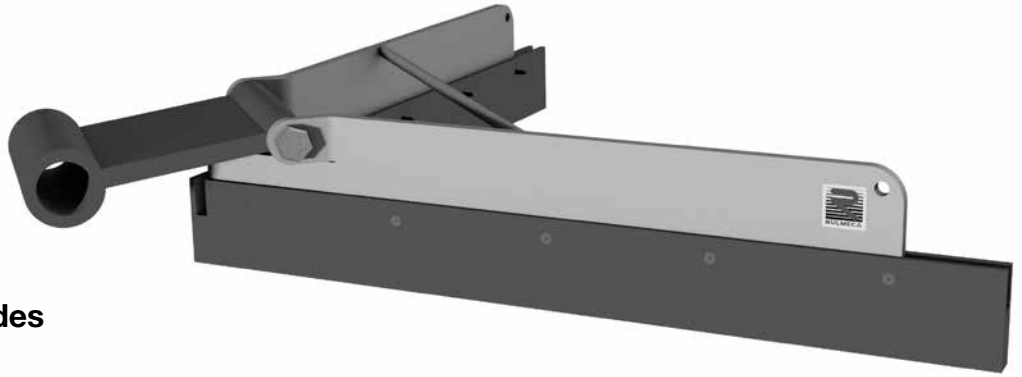
5.4.6 Plough Scraper PU 88

The PU 88 is a stable plough with steel frame and exchangeable pu-scraper strips. When fitting the plough, a tube of diameter 40 mm is inserted through the PU link. The tube is then fixed to the frame of the conveyor.

B-W 400-1800mm
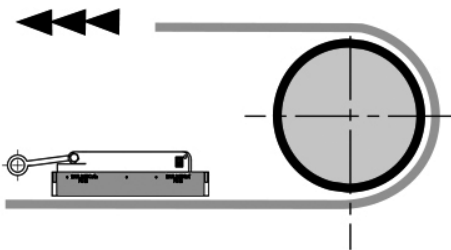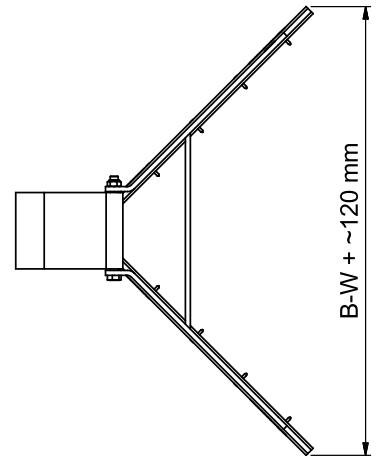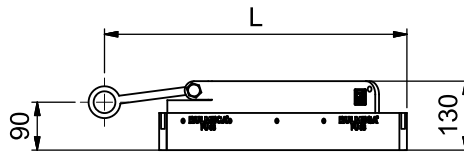
B-W	L
400	380
500	430
650	510
800	570
1000	680
1200	780
1400	880
1600	980
1800	1080

5.4.7 Codes

PU Series - Polyurethane Scrapers

Type PU-83
Simple Pre-scraper with single polyurethane blade

Article Code	Description
PU_83_400	Scraper PU-83 BW 400 SW = 350 single tensioning lever arm
PU_83_500	Scraper PU-83 BW 500 SW = 450 single tensioning lever arm
PU_83_650	Scraper PU-83 BW 650 SW = 550 single tensioning lever arm
PU_83_800	Scraper PU-83 BW 800 SW = 700 single tensioning lever arm
PU_83_1000	Scraper PU-83 BW 1000 SW = 900 double tensioning lever arm
PU_83_1200	Scraper PU-83 BW 1200 SW = 1050 double tensioning lever arm
PU_83_1400	Scraper PU-83 BW 1400 SW = 1250 double tensioning lever arm
PU_83_1600	Scraper PU-83 BW 1600 SW = 1450 double tensioning lever arm
PU_83_1800	Scraper PU-83 BW 1800 SW = 1650 double tensioning lever arm
PU_83_2000	Scraper PU-83 BW 2000 SW = 1850 double tensioning lever arm

Type PU-89
Heavy Pre- scraper with single polyurethane blade

Article Code	Description
PU_89_650	Scraper PU-89 BW 650 SW = 545
PU_89_800	Scraper PU-89 BW 800 SW = 695
PU_89_1000	Scraper PU-89 BW 1000 SW = 895
PU_89_1200	Scraper PU-89 BW 1200 SW = 1095
PU_89_1400	Scraper PU-89 BW 1400 SW = 1295

Type PU-91
Pre- scraper with segmented polyurethane blades

Article Code	Description
PU_91_400	Scraper PU-91 BW 400 SW = 400 single tensioning lever arm
PU_91_500	Scraper PU-91 BW 500 SW = 500 single tensioning lever arm
PU_91_650	Scraper PU-91 BW 650 SW = 600 single tensioning lever arm
PU_91_800	Scraper PU-91 BW 800 SW = 700 single tensioning lever arm
PU_91_1000	Scraper PU-91 BW 1000 SW = 900 double tensioning lever arm
PU_91_1200	Scraper PU-91 BW 1200 SW = 1100 double tensioning lever arm
PU_91_1400	Scraper PU-91 BW 1400 SW = 1300 double tensioning lever arm
PU_91_1600	Scraper PU-91 BW 1600 SW = 1500 double tensioning lever arm
PU_91_1800	Scraper PU-91 BW 1800 SW = 1700 double tensioning lever arm
PU_91_2000	Scraper PU-91 BW 2000 SW = 1900 double tensioning lever arm
PU_91_2200	Scraper PU-91 BW 2200 SW = 2100 double tensioning lever arm
PU_91_2400	Scraper PU-91 BW 2400 SW = 2300 double tensioning lever arm

Type PU-92
Secondary scraper with single polyurethane blade

Article Code	Description
PU_92_400	Secondary scraper PU-92 BW 400 SW = 400
PU_92_500	Secondary scraper PU-92 BW 500 SW = 500
PU_92_650	Secondary scraper PU-92 BW 650 SW = 600
PU_92_800	Secondary scraper PU-92 BW 800 SW = 700
PU_92_1000	Secondary scraper PU-92 BW 1000 SW = 900
PU_92_1200	Secondary scraper PU-92 BW 1200 SW = 1100
PU_92_1400	Secondary scraper PU-92 BW 1400 SW = 1300
PU_92_1600	Secondary scraper PU-92 BW 1600 SW = 1500

Type PU-88
Plough scraper - V form PU blades

Article Code	Description
PU_88_400	Plough scraper PU-88 BW 400
PU_88_500	Plough scraper PU-88 BW 500
PU_88_650	Plough scraper PU-88 BW 650
PU_88_800	Plough scraper PU-88 BW 800
PU_88_1000	Plough scraper PU-88 BW 1000
PU_88_1200	Plough scraper PU-88 BW 1200
PU_88_1400	Plough scraper PU-88 BW 1400
PU_88_1600	Plough scraper PU-88 BW 1600

5 Belt Scrapers

Ref. PU-83
Simple Pre-scraper with single polyurethane blade

5.4.8 Codes

SPU Spare Parts & Accessories - PU Series Scrapers

Article Code	Description
SPU_8324	Polyurethane blades SPU 8324 SW = 350 for scrapers PU 83 BW 400
SPU_8325	Polyurethane blades SPU 8325 SW = 450 for scrapers PU 83 BW 500
SPU_8326	Polyurethane blades SPU 8326 SW = 550 for scrapers PU 83 BW 650
SPU_8328	Polyurethane blades SPU 8328 SW = 700 for scrapers PU 83 BW 800
SPU_8330	Polyurethane blades SPU 8330 SW = 900 for scrapers PU 83 BW 1000
SPU_8332	Polyurethane blades SPU 8332 SW = 1050 for scrapers PU 83 BW 1200
SPU_8334	Polyurethane blades SPU 8334 SW = 1250 for scrapers PU 83 BW 1400
SPU_8336	Polyurethane blades SPU 8336 SW = 1450 for scrapers PU 83 BW 1600
SPU_8338	Polyurethane blades SPU 8338 SW = 1650 for scrapers PU 83 BW 1800
SPU_8340	Polyurethane blades SPU 8340 SW = 1850 for scrapers PU 83 BW 2000

Ref. PU-89
Heavy Pre- scraper with single polyurethane blade

Article Code	Description
SPU_8926	Polyurethane blades SPU 8926 SW = 545 for scrapers PU 89 BW 650
SPU_8928	Polyurethane blades SPU 8928 SW = 695 for scrapers PU 89 BW 800
SPU_8930	Polyurethane blades SPU 8930 SW = 895 for scrapers PU 89 BW 1000
SPU_8932	Polyurethane blades SPU 8932 SW = 1095 for scrapers PU 89 BW 1200
SPU_8934	Polyurethane blades SPU 8934 SW = 1295 for scrapers PU 89 BW 1400

Ref. PU-91
Pre- scraper with segmented polyurethane blades

Article Code	Description
SPU_9100	Blade segment in Polyurethane SPU 9100 for scrapers PU 91

Ref. PU-92
Secondary scraper with single polyurethane blade

| Article Code	Description
SPU_9224	Polyurethane blades SPU 9224 SW = 400 for scrapers PU 92 BW 400
SPU_9225	Polyurethane blades SPU 9225 SW = 500 for scrapers PU 92 BW 500
SPU_9226	Polyurethane blades SPU 9226 SW = 600 for scrapers PU 92 BW 650
SPU_9228	Polyurethane blades SPU 9228 SW = 700 for scrapers PU 92 BW 800
SPU_9230	Polyurethane blades SPU 9230 SW = 900 for scrapers PU 92 BW 1000
SPU_9232	Polyurethane blades SPU 9232 SW = 1100 for scrapers PU 92 BW 1200
SPU_9234	Polyurethane blades SPU 9234 SW = 1300 for scrapers PU 92 BW 1400
SPU_9236	Polyurethane blades SPU 9236 SW = 1500 for scrapers PU 92 BW 1600
SPU_9238	Polyurethane blades SPU 9238 SW = 1700 for scrapers PU 92 BW 1800
SPU_9240	Polyurethane blades SPU 9240 SW = 1900 for scrapers PU 92 BW 2000

Ref. PU-88
Plough scraper sets of PU V blades

Article Code	Description
SPU_8824	Set of Polyurethane blades SPU 8824 L1 = 350 L2 = 370 for plough scrapers PU 88 BW 400
SPU_8825	Set of Polyurethane blades SPU 8825 L1 = 420 L2 = 440 for plough scrapers PU 88 BW 500
SPU_8826	Set of Polyurethane blades SPU 8826 L1 = 540 L2 = 560 for plough scrapers PU 88 BW 650
SPU_8828	Set of Polyurethane blades SPU 8828 L1 = 630 L2 = 650 for plough scrapers PU 88 BW 800
SPU_8830	Set of Polyurethane blades SPU 8830 L1 = 780 L2 = 800 for plough scrapers PU 88 BW 1000
SPU_8832	Set of Polyurethane blades SPU 8832 L1 = 920 L2 = 940 for plough scrapers PU 88 BW 1200
SPU_8834	Set of Polyurethane blades SPU 8834 L1 = 1060 L2 = 1080 for plough scrapers PU 88 BW 1400
SPU_8836	Set of Polyurethane blades SPU 8836 L1 = 1230 L2 = 1250 for plough scrapers PU 88 BW 1600

6   Impact bars

6 Impact bars
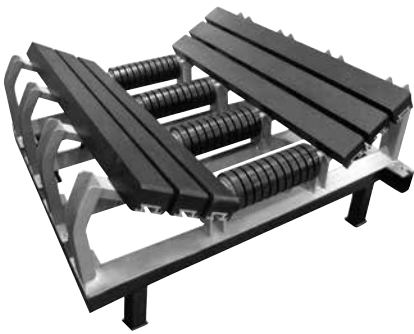
Rulmeca presents a new product to widen the range of components for belt conveyors: impact bars used at the loading point of the conveyor under the hopper. These impact bars utilise the important properties of two materials such as the low friction of polyethylene and a quality rubber to absorb shocks.

Benefits:
The impact bars, positioned under the loading points of the conveyor, prevent damage to the belt, keep the belt stable and avoid the spillage of the conveyed material.

Furthermore they ensure:
- less wear and risk of damage to the belt;
- limited extra power consumption as the belt runs on a polyethylene layer with a low friction coefficient;
- absorption of the shocks due to the impact of the material falling on the belt conveyor;
- more centralising effect and belt alignment;
- easy installation and reduction of maintenance time and costs;
- easy conversion from traditional impact systems;
- availability for any belt type and width and any inclination angle;
- the fixing bolts allow an easy and safe installation.

Note:
Impact rollers can be combined with bars, positioned within the central area, as they can further reduce friction.

Technical features:
Impact bars are produced and offered with the following technical features:
- polyethylene layer at high molecula density **HDPE 1000**;
- rubber cushion, hardness **45 Shore A**;
- aluminium profile AL 65;
- standard height **H = 75** (H = 50 on request);
- standard bar length **L =1220** with **4** bolts (other lengths on request);
- for use with belts from 650 to 1600 mm;
- standard surface colour: **red**;
- fixing bolts with self-blocking nuts **M16**.

Ordering code example:
Impact bars H75 x 100 L=1220 45Sh. 4M16
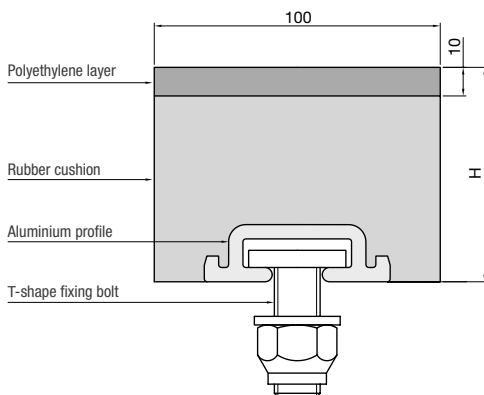
The supply of transoms to create an impact bar troughing effect in the loading points may be required.
They must comply with the dimensions of the carrying idlers on the belt conveyor, so, at the time of order please specify:
- shape and side inclination angle = 20°- 30°- 35° idlers;
- height to the top level of the central rollers;
- fixation or pitch distance of the idlers.

All dimensions are in mm.
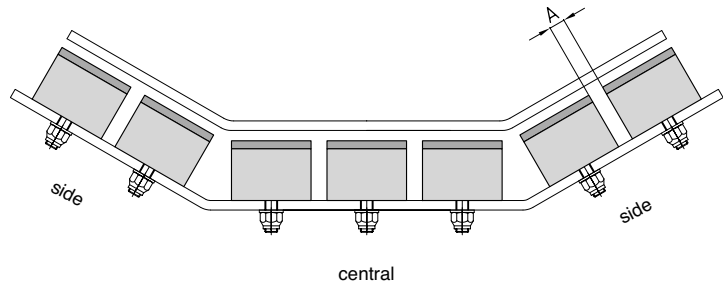
central

To be used for transoms with 20°- 30°- 35° inclination angle.

Suggested number of bars according to the belt width

Belt width mm.	Number of bars			Suggested distance 'A'	
	side	central	total	side	central
650	2+2	2	6	25	25
800	2+2	3	7	40	5
1000	3+3	3	9	25	25
1200	3+3	4	10	40	20
1400	4+4	5	13	20	5
1600	5+5	5	15	10	25

The distance "A" cannot be higher than 20 mm for rubber/steel cord belts and 40 mm for rubber/fabric belts.
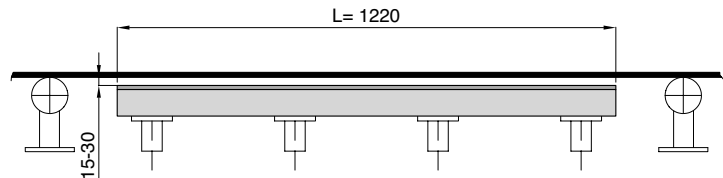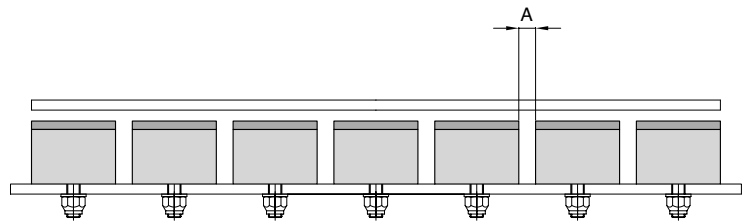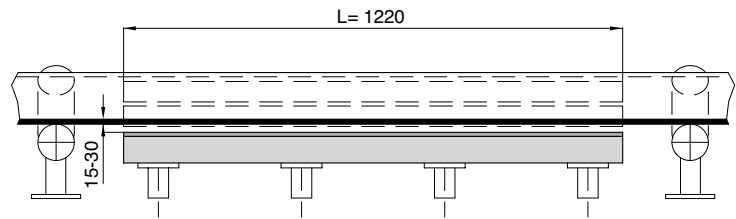

Impact bars must be installed to keep the clearance distance from the under-side of the belt to 15 mm for light applications and 30 mm for heavy applications.

THE RULMECA GROUP

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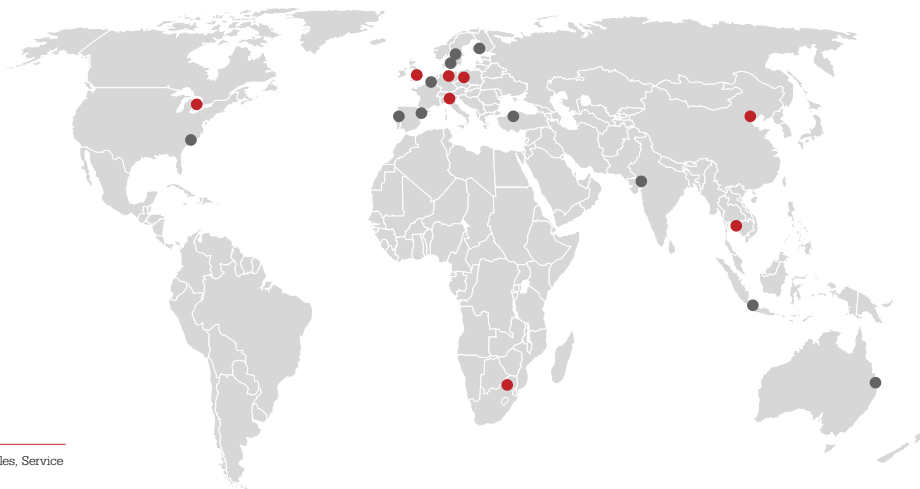
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