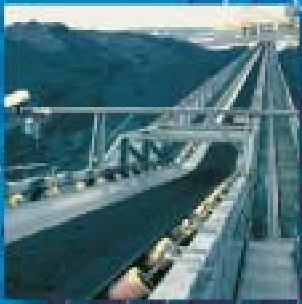
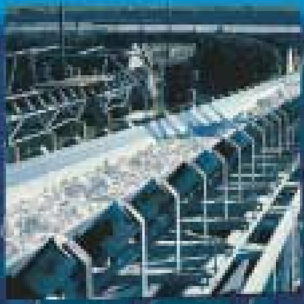
# RUBBER
# CONVEYOR BELTS





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**CONVEYOR BELTS** Conveyor belting for any purpose

## HOW TO CHOOSE CORRECT BELT TYPE:

SEE SYSTEM KEY

### WEAR RESISTANT RUBBER CONVEYOR BELTS

| | |
|---|---|
| **PROGRAMME 1:** | RO-PLY WEAR RESISTANT 2-PLY BELTS |
| **PROGRAMME 2:** | WEAR RESISTANT MULTIPLY BELTS, TYPE B, BW |
| **PROGRAMME 3:** | WEAR RESISTANT MULTIPLY BELTS, TYPE A, B, BW |

### HEAT RESISTANT RUBBER CONVEYOR BELTS

| | |
|---|---|
| **PROGRAMME 4:** | HEAT RESISTANT MULTIPLY BELTS, TYPE K, N |
| **PROGRAMME 5:** | HEAT RESISTANT MULTIPLY BELTS, TYPE TCC |
| **PROGRAMME 6:** | OIL & HEAT RESISTANT FLAMEPROOF 2-PLY BELTS, TYPE GWF |

### OIL RESISTANT RUBBER CONVEYOR BELTS

| | |
|---|---|
| **PROGRAMME 6:** | OIL & HEAT RESISTANT FLAMEPROOF 2-PLY BELTS, TYPE GWF |
| **PROGRAMME 6A:** | MEDIUM OIL RESISTANT 2-PLY BELTS, TYPE GWM |
| **PROGRAMME 7:** | OIL AND HEAT RESISTANT MULTIPLY BELTS, TYPE GW, GWF |
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### FOOD GRADE RUBBER CONVEYOR BELTS

| | |
|---|---|
| **PROGRAMME 8:** | ANTISTATIC 2-PLY BELTS FOR CONVEYING FOOD - TYPE IWE |

### RUBBER CONVEYOR BELTS WITH PATTERN

| | |
|---|---|
| **PROGRAMME 9:** | RO-PLY GRIP 4 2-PLY BELTS WITH PATTERN |
| **PROGRAMME 10:** | MULTIPLY BELTS WITH PATTERN |

### RUBBER CONVEYOR BELTS FOR INCLINED TRANSPORT

| | |
|---|---|
| **PROGRAMME 11:** | RIB BELTS (CHEVRON-BELTS) |
| **PROGRAMME 11A:** | SPECIAL PROGRAMME FOR THE WOOD INDUSTRY |

### CROSS-STABILISED RUBBER CONVEYOR BELTS FOR INCLINED TRANSPORT

| | |
|---|---|
| **PROGRAMME 12:** | MAXOFLEX SIDEWALL BELTS |
| | - SIDEWALLS |
| | - CLEATS |

### SPECIAL BELTING

| | |
|---|---|
| **PROGRAMME 13:** | TERPENE RESISTANT MULTIPLY BELTS, TYPE GT |
| **PROGRAMME 14:** | FLAME PROOF BELTS, TYPE SF, KF<br>STEELWIREMESH REINFORCED BELTS |
| **PROGRAMME 15:** | BUCKET ELEVATOR BELTS & BARE-BACKED (SLIDING) BELTS |

PROGRAMME 1

| BELT TYPE | COVER | MAX. WORKING TENSION (N/mm) | THICKNESS (mm) | WEIGHT per m² (Kg) | Belt width (mm) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 400 | 500 | 650 | 800 | 1000 | 1200 | 1300 | 1450 | 1500 |
| 200/2 | 2+1 | 20 | 5.2 | 6.8 | X | X | X | X | X | X | X | | X |
| 250/2 | 3+1 | 25 | 6.6 | 8.4 | X | X | X | X | X | X | X | X | X |
| 250/2 | 4+2 | 25 | 8.6 | 10.6 | | X | X | X | X | | X | | |
| 315/2 | 3+1 | 31.5 | 6.8 | 8.6 | X | X | X | X | X | X | X | | X |
| 315/2 | 4+2 | 31.5 | 8.8 | 10.8 | | X | X | X | X | | X | | |
| 400/2 | 3+1 | 40 | 7.3 | 9.1 | | X | X | X | X | X | X | | |
| 400/2 | 5+1.5 | 40 | 9.8 | 11.7 | | X | X | X | X | X | X | | X |
| 630/2 | 5+1.5 | 63 | 10.5 | 13.4 | | | X | X | X | X | X | | |



APPLICATION

RO-PLY has a wide field of application for the transport of moderately to very abrasive materials such as cement, coal, coke, earth, flint, grain, gravel, ore, phosphate, slag, stone materials and timber.

CONSTRUCTION AND PROPERTIES

RO-PLY is a 2-ply belt construction with cut edges and a carcass of synthetic EP fabric (polyester/polyamide). Between the fabric plies is an innerply of ROULUNDS patented STIFLEX - a rubber and textile fibre compound. The fibres are orientated lengthwise in the belt. This carcass combined with covers of standardized thicknesses and qualities adapted to the field of application provide the following good properties:

- High wear resistance
- Small elongation at highest working tension
- High impact resistance
- Excellent directional stability
- Good troughability
- Good weather resistance
- Not susceptible to humidity and microorganisms.

TECHNICAL DATA

Max. material temperature 100°C.
Ambient temperature max. 50°C, min. -30°C.
RO-PLY is antistatic according to ISO 284.
Maximum recommended trough angle for three-sectioned carrying idlers 45°.
Pulley diameters, see table 16 in belt selection basis (pdf-file).

| Cover | |
|---|---|
| Min. elongation (%)<br>Min. tensile strength (N/mm²)<br>Max. wear loss (mm³) | 400<br>20<br>120 |

AVAILABILITY

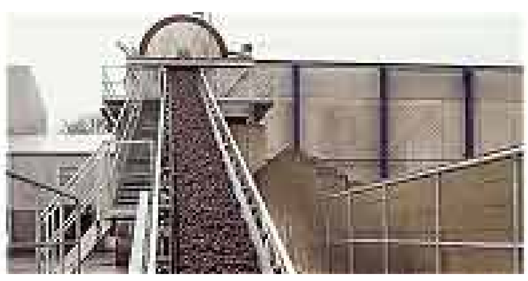
Open or endless lengths - Max. length unit 400 m/roll or according to agreement.
Max. belt width 1500 mm. - Ribs according to programme 11.

**For other wear resistant types see programmes 2 and 3.**

## STANDARD PROGRAMME   WEAR RESISTANT MULTIPLY BELTS - Type B, BW

PROGRAMME 2

| BELT TYPE | Cover | Max. working tension (N/mm) | Thick-ness (mm) | Weight per m² (Kg) | Belt width (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 400 | 500 | 600 | 650 | 800 | 1000 | 1200 | 1300 | 1450 | 1500 |
| EP200/2-B | 2+1 | 20 | 4.8 | 6.2 | X | X | X | X | X | X | X | X | X | X |
| EP250/2-B | 3+1 | 25 | 6.0 | 7.5 | X | X | X | X | X | X | X | X | X | X |
| EP315/3-B | 3+1 | 31.5 | 6.7 | 8.6 | | X | X | X | X | X | | X | X | |
| EP315/3-B, BW | 4+2 | 31.5 | 8.7 | 10.8 | X | X | X | X | X | X | X | X | | X |
| EP400/2-B | 3+1 | 40 | 7.0 | 9.1 | | X | X | X | X | X | X | X | | |
| EP400/3-B, BW | 4+2 | 40 | 9.0 | 11.3 | | X | X | X | X | X | X | X | X | X |
| EP500/3-B | 3+1 | 50 | 7.6 | 9.4 | | X | X | X | X | X | X | | X | |
| EP500/3-B, BW | 4+2 | 50 | 9.6 | 11.6 | | X | X | X | X | X | X | | X | |
| EP500/4-B, BW | 5+1.5 | 50 | 10.1 | 12.2 | | | | | X | X | X | | | |
| EP630/4-B, BW | 5+1.5 | 63 | 11.4 | 13.7 | | | | X | X | X | X | | X | |
| EP630/4-B, BW | 6+2 | 63 | 12.8 | 15.2 | | | | X | X | X | X | | X | X |
| EP800/4-B, BW | 6+2 | 80 | 13.2 | 16.4 | | | | X | X | X | X | | X | X |
| EP1000/4-B, BW | 6+2 | 100 | 13.6 | 16.9 | | | | | X | X | X | | X | X |


APPLICATION

This programme has a wide field of application for the transport of moderately to very abrasive materials such as crushed ice, cement, clay, coal, copper ore, crushed glass, eart, granite, gravel, iron ore, limestone, marl, mortar, potatoes, sacks, slags.
The programme includes belt constructions, which according to experience cover a considerable part of the most common transport applications.

CONSTRUCTION AND PROPERTIES

Belt with covered edges based upon carcass of synthetic EP fabric (polyester/polyamide) providing

- Small elongation at highest working tension
- High impact resistance
- Not susceptible to humidity and microorganisms.

Cover thickness and cover qualities are adapted to strength of carcass thus providing belts with good operational economy for the most common applications.

COVER TYPE B
Very wear resistant cover, suitable for transport of abrasive materials. Type B has a large field of application.
Fulfils DIN 22102 type Y.

COVER TYPE BW
Extremely wear resistant cover, for transport of highly abrasive materials.
Fulfils DIN 22102 type W.

TECHNICAL DATA

Max. material temperature
at lump size < 40 mm: 80°C
at lump size > 40 mm: 100°C
Ambient temperature max. 50°C, min. -30°C.
Antistatic according to ISO 284.
Maximum recommended trough angle for three-sectioned carrying idlers 45°.
Pulley diameters, see table 16 in belt selection basis (pdf-file).

| Cover | B | BW |
|---|---|---|
| Min. elongation (%) | 400 | 400 |
| Min. tensile strength (N/mm²) | 20 | 18 |
| Max. wear loss (mm³) | 120 | 90 |

AVAILABILITY

Open or endless lengths - Max. length unit 400 m/roll or according to agreement, however allowance must be made for practical handling possibilities (weight and roll diameter).
Regarding other belt widths, carcass strengths and cover combinations we refer to the programmes indicated below.
Ribs according to programme 11.

**For other wear resistant belt types see programmes 1 and 3.**

## SPECIAL PROGRAMME WEAR RESISTANT MULTIPLY BELTS - Type B, BW

PROGRAMME 3

| COVER TYPE | COVER COMBINATION (mm) | MAX. WORKING TENSION (N/mm) | CARCASS CONSTRUCTION | | | | |
|---|---|---|---|---|---|---|---|
| | | | 2 plies | 3 plies | 4 plies | 5 plies | 6 plies |
| B | 2 + 1, 3 + 1 | 20 | EP 200/2 | | | | |
| B, BW | 2 + 1, 3 + 1, 4 + 2 | 25 | EP 250/2 | | | | |
| B, BW | 3 + 1, 4 + 2 | 31.5 | | EP 315/3 | | | |
| B, BW | 3 + 1, 4 + 2 | 40 | | EP 400/3 | EP 400/4 | | |
| B, BW | 3 + 1, 4 + 2, 5 + 1.5 | 50 | | EP 500/3 | EP 500/4 | | |
| A, B, BW | 4 + 2, 5 + 1.5, 6 + 2 | 63 | | EP 630/3 | EP 630/4 | EP 630/5 | |
| A, B, BW | 5 + 1.5, 6 + 2, 8 + 2 | 80 | | | EP 800/4 | EP 800/5 | |
| A, B, BW | 6 + 2, 8 + 2, 10 + 3 | 100 | | | EP 1000/4 | EP 1000/5 | |
| A, B, BW | 6 + 2, 8 + 2, 10 + 3 | 125 | | | | EP 1250/5 | EP 1250/6 |
| A, B, BW | 6 + 2, 8 + 2, 10 + 3 | 160 | | | | EP 1600/5 | EP 1600/6 |
| A, B, BW | 6 + 2, 8 + 2, 10 + 3 | 200 | | | | EP 2000/5 | EP 2000/6 |
| A, B, BW | 6 + 2, 8 + 2, 10 + 3 | 250 | | | | | EP 2500/6 |

### APPLICATION

For transportation of all kinds of abrasive materials. Choice between 3 cover qualities depending on transport and running conditions. There are thus good possibilities of solving individual transport problems.

Programme 3 includes the belt types that are not included in the standard programmes 1 and 2 because of the requirements on strength, cover combinations and belt widths.

This programme also covers belts without cover for transportation of for instance cardboard boxes, letters, mail bags, parcels.

### CONSTRUCTION AND PROPERTIES

Belts with covered edges based upon carcass of synthetic EP fabric (polyester/polyamide).

The EP carcass provides

- Small elongation at highest working tension
- High impact resistance
- Not susceptible to humidity and microorganisms.

COVER TYPE A
Very wear resistant cover, suitable for transport of materials with sharp edges.
Fulfils DIN 22102 type X.

COVER TYPE B
Wear resistant cover for transport of abrasive materials. Type B has a large general field of application.
Fulfils DIN 22102 type Y.

COVER TYPE BW
Extremely wear resistant cover, for transport of highly abrasive materials.
Fulfils DIN 22102 type W.

### TECHNICAL DATA

Max. material temperature
at lump size < 40 mm: 80°C
at lump size > 40 mm: 100°C
Ambient temperature max. 50°C, min. -30°C.
Belts with cover are antistatic according to ISO 284.
For pulley diameters, belt weight and belt thickness as well as troughability we refer to the belt selection basis (pdf-file).

| Cover | A | B | BW |
|---|---|---|---|
| Min. elongation (%) | 450 | 400 | 400 |
| Min. tensile strength (N/mm$^2$) | 25 | 20 | 18 |
| Max. wear loss (mm$^3$) | 110 | 120 | 90 |

### AVAILABILITY

Cover combinations and cover qualities according to specification. Open or endless lengths.
Max. length unit 400 m/roll or according to agreement, however, allowance must be made for practical handling possibilities (weight and roll diameter).
Max. carcass strength 3150 N/mm.
Max. belt width 2200 mm.
Ribs according to programme 11, pattern according to programme 10.

**For other wear resistant types see programmes 1 and 2.**

## PROGRAMME 4

| BELT TYPE | COVER | MAX. WORKING TENSION (N/mm) Vulcanized joining | Mechanical joining | CARCASS CONSTRUCTION 2 plies | 3 plies | 4 plies | 5 plies |
|---|---|---|---|---|---|---|---|
| K, N | See table below | 20 | 16 | EP 200/2* | | | |
| K, N | | 25 | 20 | EP 250/2 | | | |
| K, N | | 31.5 | 25 | | EP 315/3* | | |
| K, N | | 40 | 31.5 | | EP 400/3 | EP 400/4* | |
| K, N | | 50 | 40 | | EP 500/3 | EP 500/4 | EP 500/5* |
| K, N | | 63 | 50 | | EP 630/3 | EP 630/4 | EP 630/5 |
| K, N | | 80 | 63 | | EP 800/3 | EP 800/4 | EP 800/5 |
| K, N | | 100 | 80 | | | EP 1000/4 | EP 1000/5 |

*) Are delivered in type K



### APPLICATION

For transportation of hot abrasive materials such as blast furnace clinker, coke, foundry sand, ore, slag etc. with max. material temperature of 170°C.

Materials with higher initial temperature can under certain conditions be transported if sprinkled with water at loading.

### CONSTRUCTION AND PROPERTIES

Belts with covered edges based upon carcass of synthetic EP fabric (polyester/polyamide).

The EP carcass provides

- Small elongation at highest working tension
- High impact resistance
- Not susceptible to humidity and microorganisms.

### COVERS

The belt types K and N are covering different temperature areas, see technical data.
Both types have good wear resistant properties.

### TECHNICAL DATA

The cover thickness is graduated according to lump size and temperature of material as follows:

| TYPE | LUMP SIZE | COVER THICKNESS (mm) 3 +1 | 4 + 1.5 | 5 + 1.5 | 6 + 1.5 |
|---|---|---|---|---|---|
| K | < 40 mm<br>>40 mm | 110°C<br>120°C | 120°C<br>130°C | 130°C<br>140°C | 130°C<br>140°C |
| N | < 40 mm<br>>40 mm | -<br>- | 130°C<br>150°C | 140°C<br>160°C | 150°C<br>170°C |

The above table is based on 50°C ambient temperature. Ambient temperature max. 50°C, min. -30°C.

Antistatic according to ISO 284.

For pulley diameters, belt weight and belt thickness as well as troughability we refer to the belt selection basis (pdf-file).

For powdered materials such as for instance cement, we recommend an upgrading of the cover type:
K to N
N to TCC (programme No. 5)

### AVAILABILITY

Cover combinations and cover qualities according to requirement and request.
Open or endless lengths.
Max. length unit 400 m/roll or according to agreement, however, allowance must be made for practical handling possibilities (weight and roll diameter).
Max. carcass strength 1600 N/mm.
Max. belt width 2200 mm.
Ribs according to programme 11.
Type K can be delivered with pattern according to programme 10.

**For other heat resistant types see programmes 5, 6 and 7.**

PROGRAMME 5

| BELT TYPE | COVER | MAX. WORKING TENSION (N/mm) Vulcanized joining | Mechanical joining | CARCASS CONSTRUCTION 2 plies | 3 plies | 4 plies | 5 plies |
|---|---|---|---|---|---|---|---|
| TCC | See table below | 20.0 | 16.0 | | | | |
| TCC | | 25.0 | 20.0 | EP 250/2 | | | |
| TCC | | 31.5 | 25.0 | | | | |
| TCC | | 40.0 | 31.5 | | EP 400/3 | | |
| TCC | | 50.0 | 40.0 | | EP 500/3 | EP 500/4 | |
| TCC | | 63.0 | 50.0 | | EP 630/3 | EP 630/4 | EP 630/5 |
| TCC | | 80.0 | 63.0 | | EP 800/3 | EP 800/4 | EP 800/5 |
| TCC | | 100.0 | 80.0 | | | EP 1000/4 | EP 1000/5 |
| TCC | | 125.0 | | | | | EP 1250/5 |



APPLICATION

Belt types TCC are used for transportation of hot, abrasive materials, which are chemically inactive, such as cement clinker, blast furnace clinker, coke, limestone, sinter, slags, foundry sand, etc. with max. material temperature of 210°C.

The TCC cover resists momentarily temperatures considerably higher than 210°C, and for isolated pieces peak temperatures of up to 400°C.

CONSTRUCTION AND PROPERTIES

Belt programme with cut edges based upon synthetic EP fabrics (polyester/polyamide).

The EP carcass provides

- Small elongation at highest working tension
- High impact resistance
- Not susceptible to humidity and microorganisms
- High resistance against stress on the edges

COVER

The type TCC is a wear and heat resistant cover, which resists a high constant material temperature. Further, it resists momentary peak temperatures of up to 400°C for isolated large pieces of material.

TECHNICAL DATA

The cover thickness is graduated according to lump size and temperature of material as follows:

| TYPE | LUMP SIZE | COVER THICKNESS (mm) 3 +1 | 4 + 1.5 | 5 + 1.5 | 6 + 2 |
|---|---|---|---|---|---|
| TCC | < 25 mm<br>>25 mm | 150°C<br>160°C | 170°C<br>180°C | 180°C<br>200°C | 190°C<br>210°C |

Ambient temperature max. 70°C, min. -30°C.
Antistatic according to ISO 284.
For pulley diameters, belt weight and belt thickness we refer to the belt selection basis (pdf-file).

AVAILABILITY

Cover combinations according to requirement and request.
Open or endless lengths.
Max. length unit 400 m/roll or according to agreement, however, allowance must be made for practical handling possibilities (weight and roll diameter).
Max. carcass strength 1600 N/mm.
Max. belt width 2200 mm.
Ribs according to programme 11.

**For other heat resistant types see programmes 4, 6 and 7.**

## STANDARD PROGRAMME  OIL AND HEAT RESISTANT FLAMEPROOF - TYPE GWF

PROGRAMME 6

| BELT TYPE | Cover | Max. working tension (N/mm) | Thick-ness (mm) | Weight per m$^2$ (Kg) | Belt width (mm) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 400 | 450 | 500 | 600 | 650 | 800 | 1000 | 1200 |
| 250/2 | 3+1 | 25 | 7.0 | 9.3 | X | X | X | X | X | X | X | |
| 400/2 | 3 + 1 | 40 | 7.5 | 10.0 | X | | X | X | X | X | X | X |



### APPLICATION

The belt type is used within industries manufacturing and handling grain, fertilizers, fodder mixtures, refuse, soyabean cakes, tinned goods, wood containing resin and cellulose and applications where oily and fatty materials are transported.

RO-PLY GWF is very resistant to Lila-mins that are used in the fertilizer industry.

RO-PLY GWF is oil and heat resistant and flameproof.

RO-PLY GWF has good anti-sticking properties.

### CONSTRUCTION AND PROPERTIES

2-ply construction with cut edges and carcass of synthetic EP fabric (polyester/polyamide). Between the fabric plies is an innerply of ROULUNDS patented STIFLEX - a rubber and textile fibre compound. The fibres are orientated lengthwise in the belt. This special carcass construction provides the following good properties:

- Small elongation at highest working tension
- High impact resistance
- Excellent directional stability
- Good troughability
- Not susceptible to humidity and microorganisms.

The special GWF cover provides the following advantages:

- Prevents damage caused by oil and fat
- Prevents the outbreak of fire caused by spark discharges from the belt (antistatic)
- Prevents the spreading of fires (self extinguishing cover)
- Good anti-sticking properties

### TECHNICAL DATA

Material temperature max. 125°C, min. -30°C.
Ambient temperature max. 50°C, min. -30°C.
Flameproof according to ISO R 433, basic quality K, testing according to ISO R 340.
Antistatic according to ISO 284.
Max. recommended trough angle for three-sectioned carrying idlers 45°.
For pulley diameters, see the belt selection basis (pdf-file).

### AVAILABILITY

Open or endless lengths.
Max. length unit 400 m/roll or according to agreement, however, allowance must be made for practical handling possibilities (weight and roll diameter).
Max. belt width 1300 mm.
Ribs according to programme 11.

**For other oil resistant belt types see programmes 6A, 7 ,7A and 8.**

# STANDARD PROGRAMME   MEDIUM OIL RESISTANT 2-PLY BELTS - TYPE GWM

PROGRAMME 6A

| BELT TYPE | Cover | Max. working tension (N/mm) | Thick-ness (mm) | Weight per m² (Kg) | Belt width (mm) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 400 | 450 | 500 | 600 | 650 | 800 | 1000 | 1200 |
| 250/2 | 3+1 | 25 | 6.8 | 8.6 | | | X | | X | X | | |



## APPLICATION

Type GWM is a supplement to RO-PLY type GWF suitable for handling materials with moderate oil content, such as grain, fodder mixtures, refuse, and other materials containing moderate amounts of oil and fat.

For other special requirements for heat resistant and flameproof conveyor belt types see programmes 6 and 7.

## CONSTRUCTION AND PROPERTIES

RO-PLY GWM is a 2-ply construction with cut edges. The carcass is made of synthetic EP fabrics (polyester/polyamide). Between the fabric plies is an innerply of ROULUNDS patented STIFLEX - a rubber and textile fibre compound. The fibres are orientated lengthwise in the belt and provide the following good properties:

- Small elongation at highest working tension
- Excellent directional stability
- Good troughability
- Not susceptible to humidity and microorganisms.

The special cover GWM provides the following advantages:

- Oil and fat resistant to moderate oily materials
- Antistatic

## TECHNICAL DATA

Material temperature max. +80°C, min. -30°C.
Ambient temperature max. +50°C, min. -30°C.
Antistatic according to ISO 284.
Max. recommended trough angle for three-sectioned carrying idlers 45°.
For pulley diameters we refer to the belt selection basis (pdf-file).

## AVAILABILITY

Open or endless lengths.
Max. production unit 400 m/roll or according to agreement. However allowance must be made for practical handling (weight and roll diameter).
Stock belting according to separate stock list.
Max. belt width 1300 mm.
Ribs according to programme 11.

**Other oil resistant belt types, see programme 6, 7 ,7A and 8.**

## OIL AND HEAT RESISTANT MULTIPLY BELTS - TYPE GW, GWF

PROGRAMME 7

| BELT TYPE | COVER COMBINATION (mm) | MAX. WORKING TENSION (N/mm) | | CARCASS CONSTRUCTION | | | |
|---|---|---|---|---|---|---|---|
| | | Vulcanized joining | Mechanical joining | 2 plies | 3 plies | 4 plies | 5 plies |
| GW, GWF | 3 + 1, | 20.0 | 16.0 | EP 200/2 | | | |
| GW, GWF | 3 + 1, 4 + 2 | 25.0 | 20.0 | EP 250/2 | | | |
| GW, GWF | 3 + 1, 4 + 2 | 31.5 | 25.0 | | EP 315/3 | | |
| GW, GWF | 3 + 1, 4 + 2 5 + 1.5 | 40.0 | 31.5 | | EP 400/3 | EP 400/4 | |
| GW, GWF | 3 + 1, 4 + 2 5 + 1.5 | 50.0 | 40.0 | | EP 500/3 | EP 500/4 | |
| GW, GWF | 4 + 2, 5 + 1.5 | 63.0 | 50.0 | | | EP 630/4 | EP 630/5 |
| GW, GWF | 4 + 2, 5 + 1.5 | 80.0 | 63.0 | | | EP 800/4 | EP 800/5 |



### APPLICATION

The two belt types are used for transportation of oily and comparatively hot materials such as clinkers, copra, fertilizers with Lila-min, fodder mixtures, meat and bone meal, refuse, slag etc.

Type GWF is particularly suitable for applications, which for safety reasons require a flameproof conveyor belt.

This programme is a supplement to the standardized stockprogramme RO-PLY GWF. It includes the belt types that fulfil special requirements on strength, cover combinations and belt widths, which are not fulfilled by the RO-PLY GWF standard programme

### CONSTRUCTION AND PROPERTIES

The types GW and GWF are with carcass of synthetic EP fabric (polyester/polyamide) providing

- Small elongation at highest working tension
- High impact resistance
- Not susceptible to humidity and microorganisms

The types GW and GWF have a good wear resistance, are oil and heat resistant and antistatic.
Apart from that type GWF is flameproof according to ISO R 433, basic quality K.

### TECHNICAL DATA

Max. material temperature GW: 100°C.
Max. material temperature GWF: 125°C.

Type GWF is flameproof according to ISO R 433, basic quality K, testing according to ISO R 340.
Antistatic according to ISO 284.
For pulley diameters, belt weight and belt thickness as wellas troughability we refer to the belt selection basis (pdf-file).

### AVAILABILITY

Cover combinations according to requirement and request (however, for type GW min. 4 mm totally).
Open or endless lengths.
Max. length unit 400 m/roll or according to agreement, however, allowance must be made for practical handling possibilities (weight and roll diameter).
Max. carcass strength 1600 N/mm for GW.
Max. carcass strength 1000 N/mm for GWF.
Max. belt width 2200 mm.
Ribs according to programme 11.

**For other oil resistant types see programmes 6, 6A, 7A and 8.**

## OIL RESISTANT MULTIPLY BELTS, STANDARD PROGRAMME - TYPE GWM, GWS

PROGRAMME 7A

| COVER COMBINATION (mm) | MAX. WORKING TENSION (N/mm) | | CARCASS CONSTRUCTION | | | |
|---|---|---|---|---|---|---|
| | Vulcanized joining | Mechanical joining | 2 plies | 3 plies | 4 plies | 5 plies |
| 3 + 1, | 20.0 | 16.0 | EP 200/2 | | | |
| 3 + 1, 4 + 2 | 25.0 | 20.0 | EP 250/2 | | | |
| 3 + 1, 4 + 2 | 31.5 | 25.0 | | EP 315/3 | | |
| 3 + 1, 4 + 2 5 + 1.5 | 40.0 | 31.5 | | EP 400/3 | EP 400/4 | |
| 3 + 1, 4 + 2 5 + 1.5 | 50.0 | 40.0 | | EP 500/3 | EP 500/4 | |
| 4 + 2, 5 + 1.5 | 63.0 | 50.0 | | | EP 630/4 | EP 630/5 |
| 4 + 2, 5 + 1.5 | 80.0 | 63.0 | | | EP 800/4 | EP 800/5 |



### APPLICATION

The two belt types are supplement to type GW and GWF and suitable for handling materials with moderate fat and oil contents, such as grain, fodder mixtures, refuse, wooden chips, fertilizer, etc.

Type GWM is used for the transportation of material containing moderate amounts of oil, whereas type GWS is resistant to oil amines and terpenes as well.

For other special requirements for maximum oil resistant properties incl. heat and/or flameproof types see programmes 6 and 7.

### CONSTRUCTION AND PROPERTIES

Type GWM and GWS are multiply constructgions with cut edges. The carcass is made of synthetic EP fabrics (polyester/polyamide) providing

- Small elongation at highest working tension
- Not susceptible to humidity and microorganisms

Type GWM is medium and type GWS medium to maximum oil resistant. Both types are antistatic.

### TECHNICAL DATA

Material temperature max. +80°C
Ambient temperature max. +50°C, min. -30°C.
Antistatic according to ISO 284.
For drum diameters, belt weight, belt thickness and troughability, see belt selection basis (pdf-file).

### AVAILABILITY

Cover combinations according to requirement.
Open or endless lengths.
Max. production unit 400 m/roll or according to agreement, however, allowance must be made for practical handling possibilities (weight and roll diameter).
Max. carcass strength 1000 N/mm.
Max. belt width 2200 mm.
Ribs according to programme 11. Conveyor belts for inclined transport, see programme no. 11A.

**Other oil resistant belt types, see programmes 6, 6A, and 7.**

PROGRAMME 8

| BELT TYPE | COVER | MAX. WORKING TENSION (N/mm) | THICKNESS (mm) | WEIGHT per m² (Kg) | BELT WIDTH (mm) | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 300 | 400 | 450 | 500 | 650 | 800 | 1000 |
| 250/2 | 2+1 | 25 | 4.6 | 5.9 | | | X | X | X | X | X |



APPLICATION

Type IWE is used for transportation of all sorts of foods, such as sugar, meat, fish, bread, poultry, etc. and has also a wide field of application within light material handling.

The belt is non-staining and therefore also suitable for transport of for instance packaging, parcels, etc.

The antistatic properties of type IWE prevent the outbreak of fires and explosions, and it is therefore suitable for transport of materials such as sugar, grain, flour, etc.

Type IWE is particularly suitable for applications, which for safety reasons require a flameproof conveyor belt.

CONSTRUCTION AND PROPERTIES

Type IWE is a 2-ply construction with cut edges. The carcass is made of synthetic EP fabrics.

The cover rubber quality is tasteless and odourless and resistant to animal and vegetable oil.

Type IWE is easy to wash, does not absorb moisture from humidity and is not influenced by microorganisms.

Type IWE fulfils the German BGA as well as the American FDA recommendations.

TECHNICAL DATA

Max. material temperature
at lump size < 40 mm: 100°C
at lump size > 40 mm: 120°C
Ambient temperature max. 50°C, min. -20°C.
Antistatic according to ISO 284.
Maximum recommended trough angle for three-roll carrying idlers 45°.
Pulley diameters, min. 200 mm.
Type IWE is non-inflammable according to ISO R 433, quality K, tested according to ISO R 340.

AVAILABILITY

Open or endless lengths.
Cut edges only.
Max. length unit 250 m/roll.
Stock belting according to separate stock list.

PROGRAMME 9

| BELT TYPE | COVER | MAX. WORKING TENSION (N/mm) | THICK-NESS (mm) | WEIGHT per $m^2$ (Kg) | BELT WIDTH (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 300 | 350 | 400 | 450 | 500 | 600 | 650 | 800 | 1000 | 1200 |
| 200/2 | 2.5+0 | 20 | 5.5 | 4.5 | X | X | X | X | X | X | X | X | X | X |



APPLICATION

The RO-PLY Grip 4 pattern belt is used for inclined transport of packaged goods such as boxes, luggage, parcels, sacks, etc.

The belt is non-staining and therefore also suitable for transport within for instance the wood and cardboard industries.

CONSTRUCTION AND PROPERTIES

RO-PLY Grip 4 is a 2-ply construction with cut edges and a carcass of synthetic EP fabric (polyester/polyamide).

Between the fabric plies is an innerply of ROULUNDS patented STIFLEX - a rubber and textile fibre compound. The fibres are orientated lengthwise in the belt, which gives the belt a good stability.

The carrying side has a tan coloured cover with a deep pattern providing maximum grip of the material.

The running side consists of impregnated EP fabric of high wear resistance and low friction. Therefore the belt is also suitable for conveyors with sliding plate

When choosing angles of inclination allowance must be made for the shape of the conveyor such as support with carrying idlers, plain support, belt speed as well as character of material and loading method.

It is recommended to place a short horizontal loading belt (booster) in front of steeply inclined conveyors.

TECHNICAL DATA

Max. material temperature 80°C.
Ambient temperature max. 50°C, min. -30°C.

Angles of inclination:

| | |
|---|---|
| Jute sacks | 38° |
| Paper sacks | 30° |
| Cartons and wooden boxes | 30° |
| Goods packed in paper | 32° |
| Goods packed in cellophane | 30° |
| Boxes of synthetic material | 25° |
| Goods packed in plastics | 22° |

The above angles of inclination are valid for indoor applications. For outdoor applications due consideration should be given the climatical influence on the surface friction.

Pulley diameters, see table 16 in belt selection basis (pdf-file).

AVAILABILITY

Open or endless lengths.
Max. length unit 250 m/roll or according to agreement.
Max. belt width 1300 mm.

**For other pattern belts see programme 10.**

## MULTIPLY BELTS WITH PATTERN - SPECIAL PROGRAMME

PROGRAMME 10

| | | |
|---|---|---|
| PATTERN TYPE | Pattern 4 | Fabric pattern |
| PROGRAMME | 3 | 3, 4, 7 |
| BELT TYPE | A, B | A, B, K, GW, GWF, GWS |
| MAX. WIDTH (mm) | 1300 | 1300 |



APPLICATION

Pattern belts for inclined transport of packaged goods such as boxes, parcels, sacks etc.

To be used where the angle of inclination is so high that belts without pattern cannot manage the transportation because of too low friction between materials and belt.

CONSTRUCTION AND PROPERTIES

PATTERN 4

The deep pattern is the most frequently used pattern type. The highest angle of inclination for pattern belts can normally be reached by using this type

FABRIC PATTERN

This pattern gives a light patterned surface structure and a slight increase of the friction between material and belt. Suitable in connection with scrapers for transportation of for instance powdered materials.

TECHNICAL DATA

Material and ambient temperature as for the belt type in question.

Angles of inclination:
- Pattern 4 ............... 35°
- Other types ............... 15-25°

The angles of inclination depend on shape of material, belt speed, distance between carrying idlers etc. Therefore, the values are only recommendations.

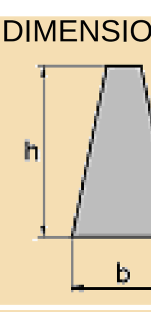
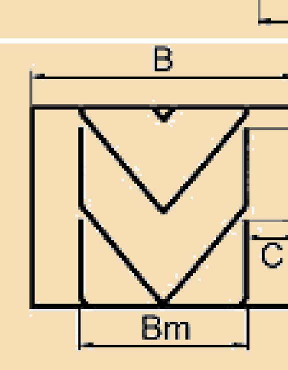
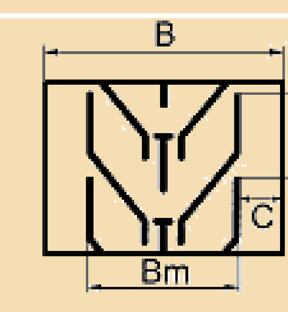
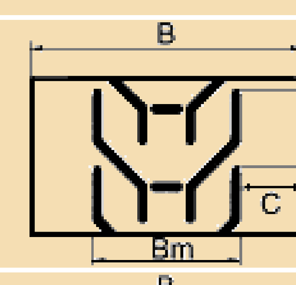
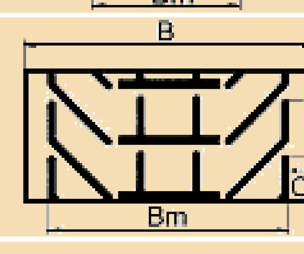
For pulley diameters and belt weight we refer to the belt selection basis for the belt type in question (pdf-file).

AVAILABILITY

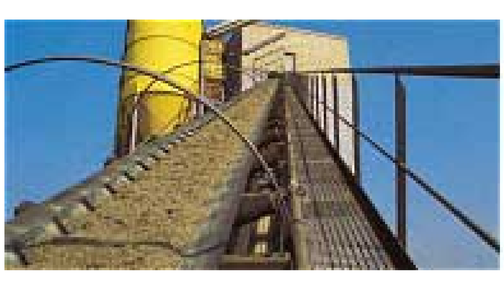
Open or endless lengths.
Max. length unit 250 m/roll or according to agreement.
Belt type and belt width as outlined above.
Belts with pattern 3 and 4 are with cut edges.

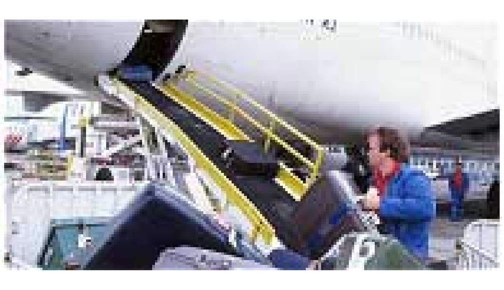
**For other pattern belts see programmes 8 and 9.**

PROGRAMME 11

| RIB TYPE | RIB DIMENSIONS (mm) Width Bm | Distance a | Height h | Thickness b | BELT WIDTH (mm) B | C | RIB PATTERN DIMENSIONS Tooth Dimension  | *Pulley diameter min. (mm) | Teoretical capacity m³/h v = 1 m/s trough angle 30º inclination 30º ß =10º | ß = 15º |
|---|---|---|---|---|---|---|---|---|---|---|
| 501 | 250 | 150 | 13 | 13 | 300<br>400 | 25<br>75 |  | 250 | 12-16<br>24 - 28 | 15-20<br>30 - 35 |
| 502 | 310 | 200 | 10 | 13 | 400<br>450<br>500 | 45<br>70<br>95 | | 250 | 24 - 28<br>32 - 36<br>40 - 44 | 30 - 35<br>40 - 45<br>50 - 55 |
| 503 | 380 | 250 | 13 | 13 | 450<br>500<br>600 | 35<br>60<br>110 | | 250 | 32 - 36<br>40 - 44<br>56 - 60 | 40 - 45<br>50 - 55<br>70 - 75 |
| 504 | 550 | 300 | 15 | 13 | 600<br>650<br>800 | 25<br>50<br>125 | | 250 | 56 - 60<br>64 - 68<br>104 - 112 | 70 - 75<br>80 - 85<br>130 - 140 |
| 511 | 420 | 275 | 20 | 15 | 450<br>500<br>600<br>650 | 15<br>40<br>90<br>115 |  | 315 | 36 - 40<br>48 - 52<br>64 - 68<br>72 - 76 | 45 - 50<br>60 - 65<br>80 - 85<br>90 - 95 |
| 512 | 550 | 300 | 25 | 20 | 600<br>650<br>800 | 25<br>50<br>125 | | 400 | 64 - 68<br>72 - 76<br>120 - 128 | 80 - 85<br>90 - 95<br>150 - 160 |
| 513 | 750 | 333 | 25 | 20 | 800<br>1000<br>1200 | 25<br>125<br>225 | | 400 | 120 - 128<br>190 - 200<br>240 - 264 | 150 - 160<br>230 - 250<br>300 - 330 |
| 521 | 450 | 300 | 35 | 30 | 500<br>600<br>650 | 25<br>75<br>100 |  | 315 | 60 - 68<br>76 - 80<br>80 - 84 | 75 - 80<br>95 - 100<br>100 - 105 |
| ** 525 | 1080 | 250 | 50 | 30 | 1200 | 60 |  | 630 | 272 - 288 | 340 - 360 |

*) concerns only the rib type.
**) on return part we recommend to place the return idlers in pairs 150 mm apart
For weight of ribs, see the belt selection basis.
Rib type 12 and 115, only for programme 1, 2 and 3.





APPLICATION

Rubber conveyor belts without ribs are used for inclined transportation of bulk goods up to approx. 22º dependent on the friction angle between material and belt.

If rib belts or belts with pattern are used the angle of inclination can be increased considerably, as in that case the max. angle of inclination depends on the internal friction of the material both in static and dynamic conditions. Guidance is given in table 17. Rib belts are ued for bulk goods with unit size of 0-150 mm and for transportation of sacks. Belt and rib qualities are chosen on the basis of the individual belt programmes 1-8 + 12, whereas rib dimensions are shown in the table above.

TECHNICAL DATA

V-ribs are hot-vulcanized and have been developed to secure a steady running on flat return idlers.
Width of rib Bm depends on shape of the hopper and placing of the skirting. Height and width of ribs (h x b) depend on lump size, capacity, and desired robustness. Recommended capacities can be seen from the above data. In order to secure the best capacity at a given angle of inclination it is important that the material is at rest on the belt. This is achieved by feeding uniformly in the travelling direction at a speed equal to that of the belt. Further we recommend to reduce the carrying idler distance compared to normal conveyors. The belt speed should not exceed 2 m/s and should be kept as low as possible.

HIGH TRANSVERSE RIBS

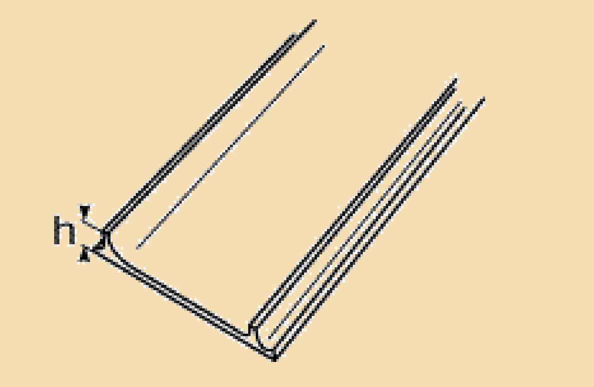
For inclined transportation of packaged goods, beets, coal, coke, potatoes etc.

| Type | Thickness b (mm) | Height h (mm) | Width Bm (mm) standard | Distance a (mm) | Pulley diameter min. (mm)* | Are delivered for programme 1, 2 3, 6, 6A, 7, 7A, 12 |
|---|---|---|---|---|---|---|
| 325 | 25 | 25 | 400<br>800 | As re-quested | 250 | X |
| 340 | 40 | 40 | | | 250 | X |
| 20 | 60 | 60 | | | 400 | X |
| 380 | 80 | 80 | | | 400 | X |
| 400 | 100 | 100 | | | 400 | X |

* concerns only the rib type.

SIDEWALLS

For transportation of powdered materials the use of flexible sidewalls can in some cases substitube rubber skirting on the conveyor.




The sidewalls can also be mounted on belts with straight transverse ribs and on belts with high transverse ribs.

| | Type | Height mm | Pulley diameter min. mm* | |
|---|---|---|---|---|
| | 10G4712 | 25 | 375 | |

*) concerns only the sidewalls.

The sidewalls are available for all belt programmes with the exception of the programmes 8, 9 and 10.

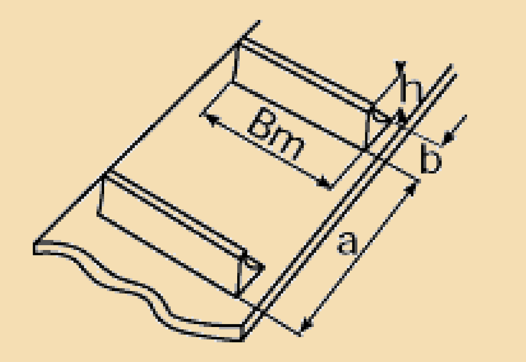
Max. belt width 1000 mm
Min. belt width 200 mm
Width interval 50 mm

Max. Angles of Inclination:

Angles of inclination are recommendations as they depend on kind of material and construction of conveyor:

| | |
|---|---|
| Sand | 30 - 35º |
| Sand, wet | 40 - 45º |
| Fertilizer | 35º |
| Coal < 100 mm | 30º |
| Potatoes | 30º |
| Beets | 30º |
| Sacks, jute | 35 - 40º |
| Sacks, paper | 30 - 35º |
| Grain, dry | 25º |
| Cement | 35º |
| Salt < 100 mm | 35º |

The ribs in this programme are primarily to be used for transportation of light materials. However, the rib base of type 20 is so strong that it can transport heavier materials.

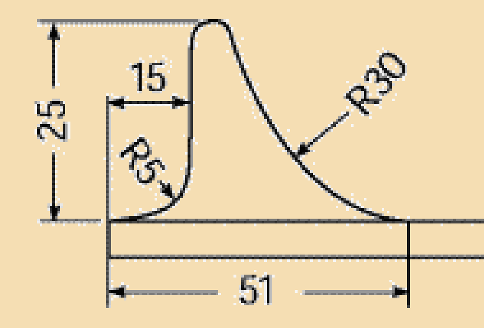



These ribs cannot be used for conveyors with normal return idlers, but require return idlers with supporting rings or free hanging return part.

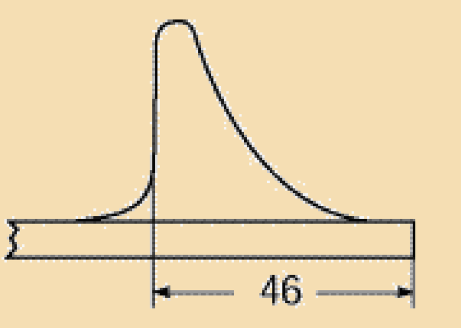
High transverse ribs are cold-vulcanized on the belt. They can be placed at distances which can be adapted to individual requirements.

Construction 1 is suitable where rubber skirting at the belt edge es required.

Construction 2 is normally used in connection with high transverse ribs.

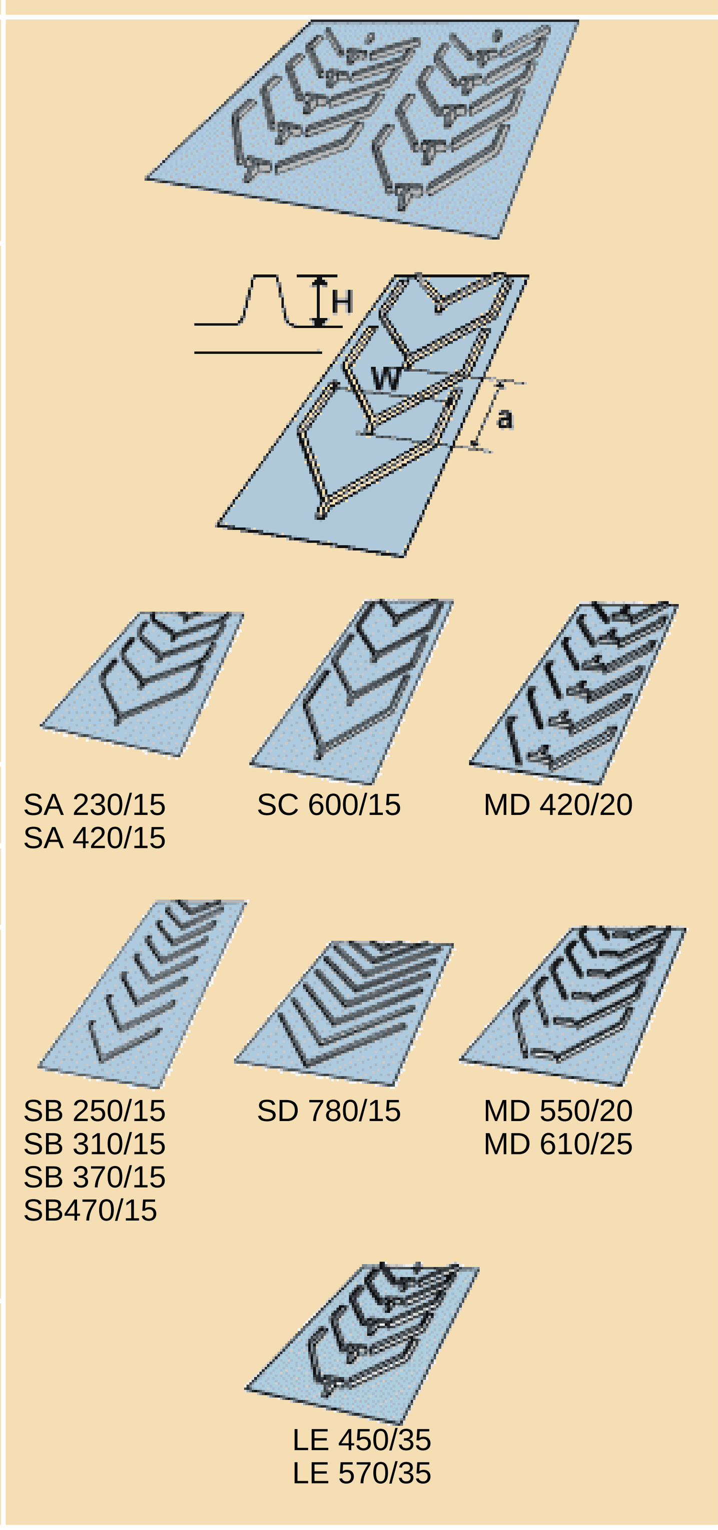



Construction 1




Construction 2

For fast delivery and high flexibility we offer conveyor belts with rib types in existing mould equipment.

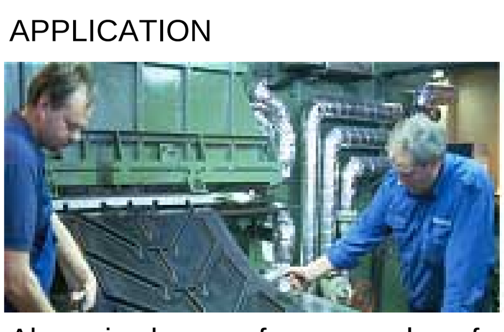
| Rib type | Rib dimensions (mm) Distance a | Height h | Min. Belt Width (mm) | Execution of rib | Pulley diameter Min. (mm) |
|---|---|---|---|---|---|
| SA 230/15 | 250 | 15 | 300 |  | 250 |
| SA 420/15 | 330 | 15 | 450 | | 250 |
| SB 250/15 | 150 | 15 | 300 | | 250 |
| SB 310/15 | 200 | 15 | 350 | | 250 |
| SB 370/15 | 250 | 15 | 400 | | 250 |
| SB 470/15 | 250 | 15 | 500 | | 250 |
| SC 600/15 | 333 | 15 | 650 | | 250 |
| SD 780/15 | 170 | 15 | 800 | | 250 |
| MD 420/20 | 200 | 20 | 450 | | 315 |
| MD 550/20 | 250 | 20 | 600 | | 315 |
| MD 610/25 | 250 | 25 | 650 | | 400 |
| LE 450/35 | 250 | 35 | 500 | | 400 |
| LE 570/35 | 300 | 35 | 600 | | 400 |



Theoretical capacity m³/h of rib belts at differnt belt widths, v = 1 m/s, trough angle 30º, inclination 30º.

| Rib type | Materials angle ß of inclination | Belt width in mm 300 | 400 | 450 | 500 | 600 | 650 | 700 | 800 | 1000 | 1200 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SA-SB | 10º | 12-15 | 24-28 | 24-35 | 40-45 | 55-60 | 65-70 | 95-100 | 105-110 | 150-160 | 190-210 |
| SC-SD | 15º | 15-20 | 30-35 | 30-44 | 50-55 | 70-75 | 80-85 | 115-125 | 130-140 | 170-180 | 230-260 |
| MD | 10º | | | | 45-50 | 60-65 | 70-75 | 90-95 | 120-125 | 170-180 | 220-250 |
| | 15º | | | | 60-65 | 80-85 | 90-95 | 115-125 | 150-160 | 190-200 | 270-300 |
| LE | 10º | | | | 55-60 | 70-75 | 85-90 | 105-115 | 140-150 | 185-195 | 250-270 |
| | 15º | | | | 70-75 | 95-100 | 105-110 | 135-145 | 180-190 | 200-220 | 300-340 |

APPLICATION



Above is shown a few examples of our unique programme of rib belts.
We can fulfil our customers requirements and deliver almost all lengths, qualities and types up to 2000 mm width.

## CONVEYOR BELTS FOR INCLINED TRANSPORT - WOOD INDUSTRY

PROGRAMME 11A

| Pattern type | RO-KNOP | | | | RIBS | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Programme | 3 - 7 - 12 | | | | 3 - 7 - 12 | | | | |
| Belt width (mm) | 800 | 1000 | 1200 | 1400 | 600 | 650 | 800 | 1000 | 1200 |
| Pattern width Bm (mm) | 650 | 800 | 1000 | 1200 | 500 | 500 | 650 | 800 | 1000 |
| Distance a (mm) | See sketch | | | | 600 or on request | | | | |



APPLICATION

Inclined transport of wooden chips requires a patterned surface, where icing up occurs.

The RO-KNOP pattern is used for angles of inclination of up to 18°, whereas ribs are used for angles up to 12°.

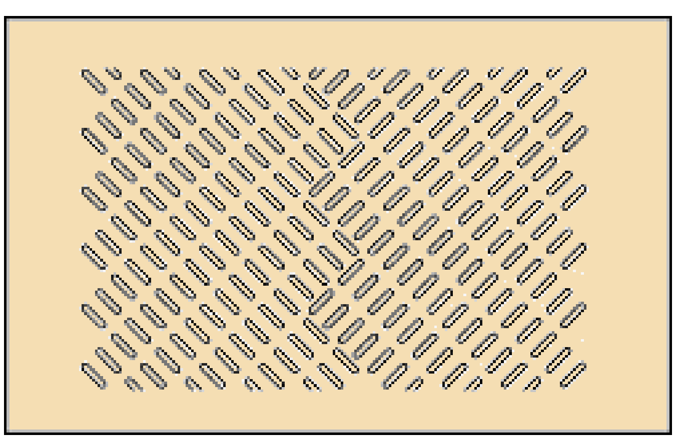
CONSTRUCTION AND PROPERTIES

The RO-KNOP pattern consists of 3 mm high knobs.
See pattern dimensions above.

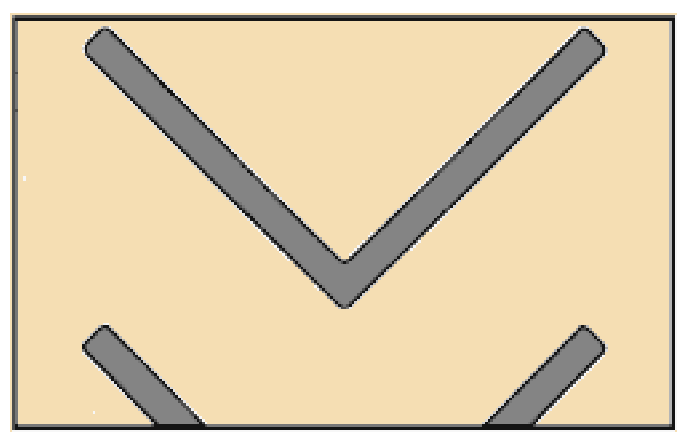
For efficient cleaning of the belt we recommend the use of rotating brushes.

The ribs are pressed into the cover in a thickness of 3 mm.
Pattern dimensions as outlined on the sketch below.

RO-KNOP



RIBS



TECHNICAL DATA

Material temperature and ambient temperature as for the belt type in question.

Angles of inclination:

RO-KNOP................................ 12 - 18°

RIBS ................................ 8 - 14°

The angles of inclination are dependant on material, loading conditions, distance between carrying idlers, belt speed etc. Therefore the values are only recommendations.

Pulley diameters, see table 16 in belt selection basis (pdf-file).

AVAILABILITY

Open or endless lengths

Max. production unit 400 m/roll or according to agreement. However allowance must be made for practical handling (weight and roll diameter).

Belt width and type according to the above table.
The belt types are with cut edges.

Min. cover thickness on material side = 3 mm.

**Other pattern and rib belt types, see programmes 10 and 11.**

PROGRAMME 12

| COVER | MAX. WORKING TENSION (N/mm) Vulcanized joining | Mechanical joining | Thick-ness (mm) | Weight per m² (Kg) | CARCASS CONSTRUCTION 1 ply | 2 plies | 3 plies | 4 plies |
|---|---|---|---|---|---|---|---|---|
| 2 + 2 | 25 | 20 | 8.5 | 9.6 | XE 250/1-2 | | | |
| 3 + 1.5 | 31.5 | 25 | 9.7 | 10.9 | | XE 315/2-2 | | |
| 3.5 + 1.5 | 40 | 31.5 | 10.8 | 12.3 | | | XE 400/3-2* | |
| 4 + 2 | 50 | 40 | 12.9 | 14.6 | | | XE 500/3-2 | |
| 4 + 2 | 63 | 50 | 13.8 | 15.6 | | | | XE 630/4-2 |
| 4 + 2 | 80 | 63 | 14.3 | 16.2 | | | | XE 800/4-2 |

*) IWE only deliverable as EE 400/3 2.5 + 1.5 (3 x cross stabile ply)



APPLICATION

These types of belts are used as base belts for specified purposes in the connection with MAXOFLEX® sidewalls and cleats.

The MAXOFLEX® is used for inclined conveying of loose material in all industries such as mining, agriculture and food industry.

The programme is also applicable for other purposes where cross stable belts are necessary, for example cover belts.

THE MAXOFLEX CONCEPT

MAXOFLEX® high-incline conveyor belts provide an efficient, safe way to transport all types of materials where accurate movement (filling and discharging) of the product is necessary.

The belts can be customized to specification e.g. three (3) sidewalls on one belt to form a double system with the same base belt. This provides the opportunity to convey two different products with the same belt.

The concept of using inclined and horizontal ('S' conveyor) transport with the same belt, eliminates the problems resulting from difficult transfer points.

The MAXOFLEX®-concept consists of a stabilized basebelt, with sidewalls and cleats attached to form a highincline or 'pocket' belt.

When an analysis is calculated based on the cost per meter lift, it is likely that the MAXOFLEX® belt will be more efficient costwise than using a custom made conventional incline belt.

Each MAXOFLEX® belt is designed and constructed for each individual application. Therefore, the combinations of differnt basebelts, sidewalls, and cleats provide for nuerous possibilities in problem solving.

More detailed information on the technical aspects of the MAXOFLEX® belt, can be found in our 'Maxoflex Handbook', which is available upon request.

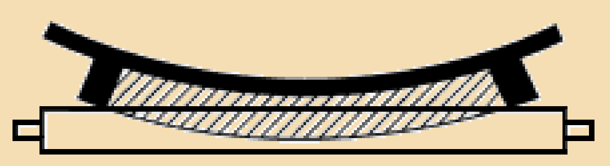
Advantages for MAXOFLEX® conveyor belts:

- ☑ Increases the transport capacity up to 4 times than that of a normal belt of the same width
- ☑ Saves space due to the possibility of inclining transport, up to 90 degrees.
- ☑ Protects the material from damage by providing better material handling control.
- ☑ Ability to change transportation direction with the same belt (the 'S' conveyor).

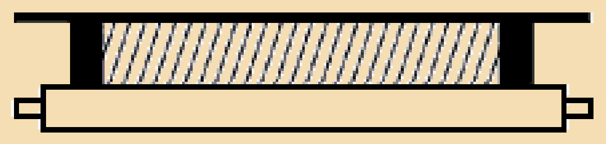
CONSTRUCTION AND PROPERTIES

XE is a multiply construction with cut edges based upon carcass of EP fabric (polyester/polyamide) and one monofilament ply on each side of the EP carcass integrated into the upper and lower cover providing:

- Saves on structural parts (conveyor)
- Saves place
- Excellent rigidity in the transverse direction



Cross section of a standard EP belt with sidewall



Cross section of a XE belt with sidewall

COVERS

Delivery according to specification in the qualities (B, GWF and IWE).

All covers are fulfiling DIN 22102.

TECHNICAL DATA

Max. material temperatures and ambient room temperature according to the satandard programs of the type B, GWF and IWE.

Antistatic according to ISO 284.

Pulley diameters, see belt selection basis.

AVAILABILITY

Cover combinations and cover qualities according to stpecifications.

Open or endless lengths.

Max. length unit 400 m/roll or according to agreement, however, MAXOFLEX® belts to be transported and storaged in special pallets.

Max. carcass strength 1600 N/mm²

Max. belt width 2000 mm.

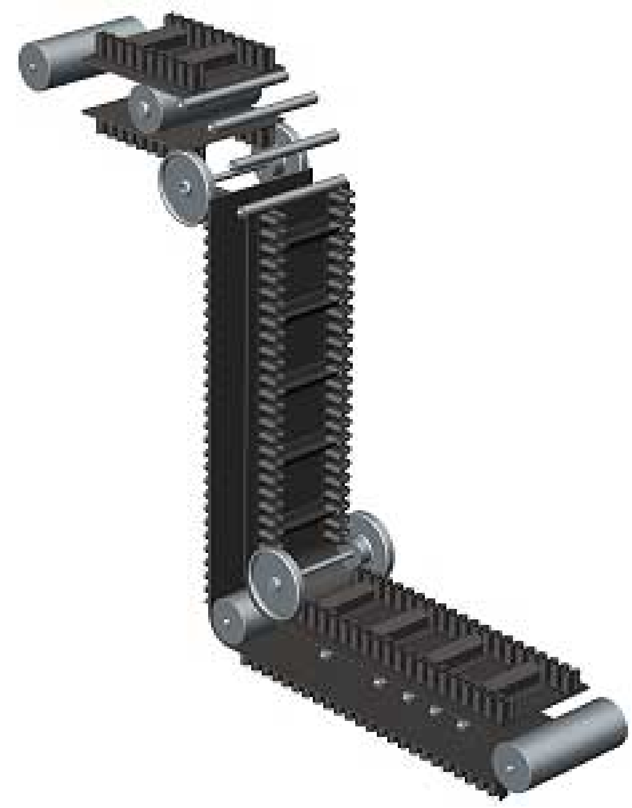
| Cover / Useful load / % | XE 250/1-2 2 + 2 | XE 315/2-2 3.5 + 1.5 | XE 400/3-2 3.5 + 1.5 | XE 500/3-2 4 + 2 | XE 630/4-2 4 + 2 | XE 800/4-2 4 + 2 |
|---|---|---|---|---|---|---|
| 60 - 100 | Ø 315 | Ø 315 | Ø 400 | Ø 500 | Ø 630 | Ø 800 |
| 30 - 60 | Ø 250 | Ø 250 | Ø 315 | Ø 400 | Ø 500 | Ø 630 |

PROGRAMME 12

MAXOFLEX® sidewalls are normally produced in black wear-resistant quality. However, upon request we can also offer product made from oil and fat resistant (OX), flame resistant (FL), and heat resistant (H100 & H130).

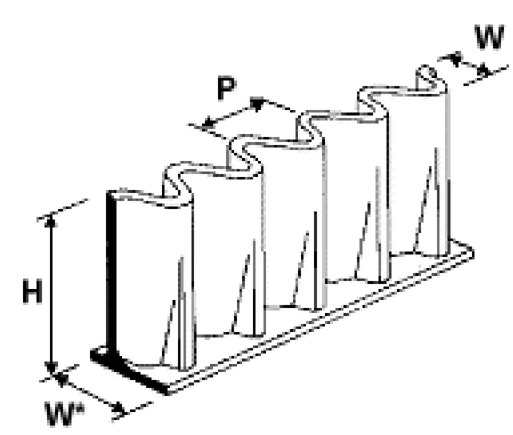
MAXOFLEX® sidewalls are produced in three categories: Light duty, non-fabric reinforced (M), Heavy duty, fabric reinforced (MWS) and Extra Heavy duty, fabric reinforced (MWSF). The fabric reinforcement in the MWS and the MWSF types, provide for greater strength and stability.

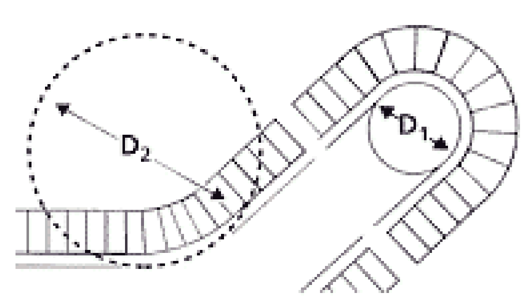
MAXOFLEX® sidewalls are characterized by being extremely stable in the transverse direction (from the side), but yet flexible in the running direction which allows for smaller pulleys. This also means that the sidewall is partially selfcleaning and therefore helps eliminate product 'carry-back':



MAXOFLEX® sidewall material can be delivered loose on a spool or attached to a basebelt.

| Type | H mm | W* mm | W mm | P mm | $D_1$ min mm | $D_2$ min mm |
|---|---|---|---|---|---|---|
| M 40 | 40 | 35 | 30 | 35 | Ø 120 | Ø 200 |
| M60 | 60 | 50 | 45 | 40 | Ø 150 | Ø 240 |
| M80 | 80 | 50 | 45 | 50 | Ø 200 | Ø 320 |
| M80S | 80 | 50 | 45 | 40 | Ø 200 | Ø 320 |
| M100 | 100 | 50 | 45 | 50 | Ø 250 | Ø 400 |
| M100S | 100 | 50 | 45 | 40 | Ø 250 | Ø 400 |
| M120 | 120 | 50 | 45 | 50 | Ø 300 | Ø 480 |
| M140 | 140 | 50 | 45 | 50 | Ø 350 | Ø 560 |
| MWS120 | 120 | 75 | 70 | 60 | Ø 300 | Ø 480 |
| MWS140 | 140 | 75 | 70 | 60 | Ø 350 | Ø 560 |
| MWS160 | 160 | 75 | 70 | 60 | Ø 400 | Ø 640 |
| MWS180 | 180 | 75 | 70 | 60 | Ø 450 | Ø 720 |
| MWS200 | 200 | 75 | 70 | 60 | Ø 500 | Ø 800 |
| MWS250 | 250 | 75 | 70 | 60 | Ø 625 | Ø 1000 |
| MWS300 | 300 | 75 | 70 | 60 | Ø 750 | Ø 1200 |
| MWSF250 | 250 | 110 | 100 | 80 | Ø 750 | Ø 1000 |
| MWSF300 | 300 | 110 | 100 | 80 | Ø 900 | Ø 1200 |
| MWSF350 | 350 | 110 | 100 | 80 | Ø 1050 | Ø 1400 |
| MWSF400 | 400 | 110 | 100 | 80 | Ø 1200 | Ø 1600 |




In order to achieve maximum belt life, the minimum diameters for D1 and D2 must be observed.

D1 min. =

| | |
|---|---|
| M | 2.5 x height of sidewall |
| MWS | 2.5 x height of sidewall |
| MWSF | 3.0 x height of sidewall |

Please note that the above figures are for normal quality. For other qualities we recommend D1 + 100.

D2 min. = 4.0 x height of sidewall

Diameters smaller than indicated in the table, will always result in a considerable decrease of belt life.

Standard Rubber Qualities:

N = Normal quality

OX = Fat- and oil resistant, heat resistant up to max. 100°C.

MWS(F) = Extra thick reinforced walls

On request we can supply following rubber qualities:

FL = Flame resistant quality

H = Heat resistant up to 130°C

Max. room temperature: -30°C to + 50°C

Types in bold writing are standard types.

# MAXOFLEX® CLEATS

PROGRAMME 12

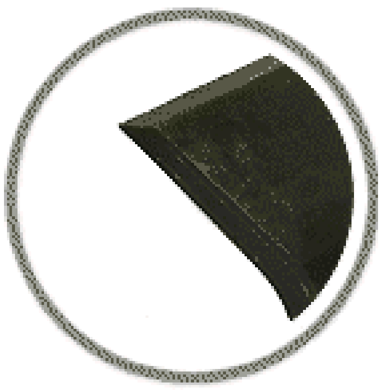
MAXOFLEX® cleats are produced in T, TC and TCW styles which can be combined with the sidewalls to provide numerous combinations.

The cleats are moulded in black wear resistant rubber, which guarantees optimal strenth and rigidity. Cleats can also be procuced as oil and fat resistant (OX), flame resistant (FL) and heat resistant (H100 & H130).

The TCW style is produced with fabric reinforcement, and is available in heights of 140 mm and higher. This provides greater stability and prevents 'back bending' of the cleats.

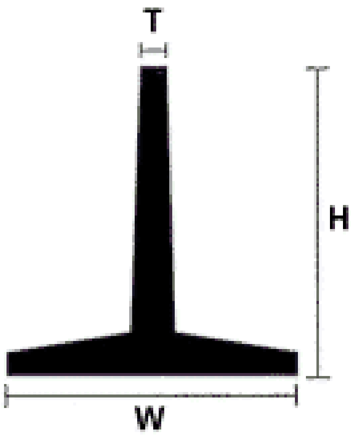
Cleats can also be used on belts without sidewalls.

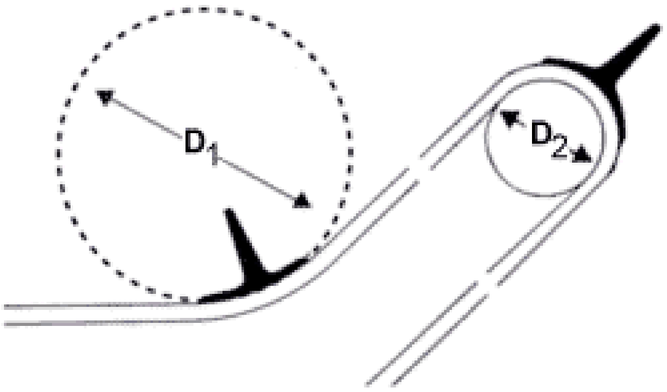
Stocked production length of cleat material is 2.8 m for cleat heights up to 230 mm. Over 230 mm, the production length is 2.4 meters.



Cleats that are 230 mm or higher are produced as a 'two part' cleat, which is made of a base (foot) in rubber that is attached to the belt, then a 'blade' made of rubber or polyurethane that is inserted and bolted into the foot.

| Type | H mm | W mm | T mm | $D_1$ min mm | $D_2$ min mm |
|---|---|---|---|---|---|
| T35 | 35 | 55 | 6 | Ø 160 | Ø 200 |
| T55 | 55 | 80 | 7 | Ø 160 | Ø 250 |
| T75 | 75 | 80 | 6 | Ø 200 | Ø 300 |
| T90 | 90 | 105 | 11 | Ø 275 | Ø 400 |
| T110 | 107 | 105 | 8 | Ø 275 | Ø 400 |
| T140 | 140 | 160 | 18 | Ø 400 | Ø 450 |
| T160 | 160 | 160 | 16 | Ø 400 | Ø 450 |
| T180 | 180 | 160 | 14 | Ø 400 | Ø 450 |
| C35 | 35 | 55 | 4 | Ø 160 | Ø 200 |
| C55 | 55 | 80 | 5 | Ø 160 | Ø 250 |
| C75 | 75 | 80 | 6 | Ø 200 | Ø 300 |
| C90 | 90 | 110 | 10 | Ø 275 | Ø 400 |
| C110 | 110 | 110 | 8 | Ø 275 | Ø 400 |
| TC75 | 75 | 80 | 7 | Ø 200 | Ø 300 |
| TC90 | 90 | 110 | 12 | Ø 275 | Ø 400 |
| TC110 | 105 | 110 | 11 | Ø 275 | Ø 400 |
| TC140 | 140 | 160 | 20 | Ø 400 | Ø 500 |
| TC160 | 160 | 160 | 20 | Ø 400 | Ø 500 |
| TC180 | 180 | 160 | 19 | Ø 400 | Ø 500 |
| TC230 | 230 | 180 | 30 | Ø 500 | Ø 600 |
| TCW280 | 280 | 230 | 30 | Ø 700 | Ø 900 |
| TCW330 | 330 | 320 | 30 | Ø 700 | Ø 900 |
| TCW360 | 360 | 230 | 30 | Ø 700 | Ø 900 |




Standard Rubber Qualities:

N = Normal quality
W = Qualities with reinforced fabric (example TCW 140).
OX= Fat- and oil resistant, heat resistant up to max. 100°C.

Types in bold writing are standard types.

Max. room temperature:
-30°C to +50°C

On request we can supply following rubber qualities:

FL= Flame resistant quality
H = Heat resistant up to 130°C

## TERPENE RESISTANT MULTIPLY BELT - TYPE GT

PROGRAMME 13

| BELT TYPE | COVER | MAX. WORKING TENSION (N/mm) | THICK-NESS (mm) | WEIGHT per m² (Kg) | BELT WIDTH (mm) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 400 | 450 | 500 | 600 | 650 | 800 | 1000 | 1200 | 1400 |
| 250/2 | 3 + 1 | 25 | 6.0 | 7.8 | X | X | X | X | X | X | | | |
| 315/3 | 3 + 1 | 31.5 | 6.4 | 9.2 | | X | X | X | X | X | X | X | |
| 400/3 | 3 + 1 | 40 | 7.0 | 9.4 | | | X | X | X | X | X | X | |
| 500/4 | 3 + 1 | 50 | 8.0 | 10.8 | | | | | X | X | X | X | X |
| 630/4 | 3 + 1 | 63 | 8.8 | 11.6 | | | | | | X | X | X | X |
| 800/5 | 3 + 1 | 80 | 10.0 | 13.0 | | | | | | X | X | X | X |



### APPLICATION

The belt type is used in sawmills and cellulose industries for the transportation of wooden chips, bark, and cellulose.

The belt type was developed in close cooperation with the Swedish timber and cellulose industry. It is resistant to terpene, antistatic, and resistant to temperatures down to - 30°C.

### CONSTRUCTION AND PROPERTIES

The carcass of this belt type is made of synthetic EP fabrics (polyester/polyamide) providing:

- Small elongation at highest working tension
- High tensile strength
- Not susceptible to humidity and microorganisms

The special GT cover provides the following advantages:

- Prevents damages caused by terpene
- A flexible cover that will keep flexibility and surface friction at low temperatures

### TECHNICAL DATA

Max. material temperature of chips and cellulose pulp +80°C.

Ambient temperature max. +50°C, min. -30°C.

Antistatic according to ISO 284.

Terpene resistant according to SSG 1471 and tested according to SIS 162208.

For drum diameters, belt weight, belt thickness and troughability, see the belt selection basis (pdf-file).

### AVAILABILITY

Cover combinations according to requirement.

Generally the belt is supplied with cut and thermofixed edges.

Open or endless lengths. Max. production unit 400 m/roll or according to agreement. However allowance must be made for practical handling (weight and roll diameter).

Max. carcass strength 800 N/mm. Max belt width 2200 mm.

Ribs according to programme 11.

PROGRAMME 14

APPLICATION

The belts, type SF and KF, are used at places where a fire must not spread using the belt as a media. Typical in mines, tunnels and various process industry.

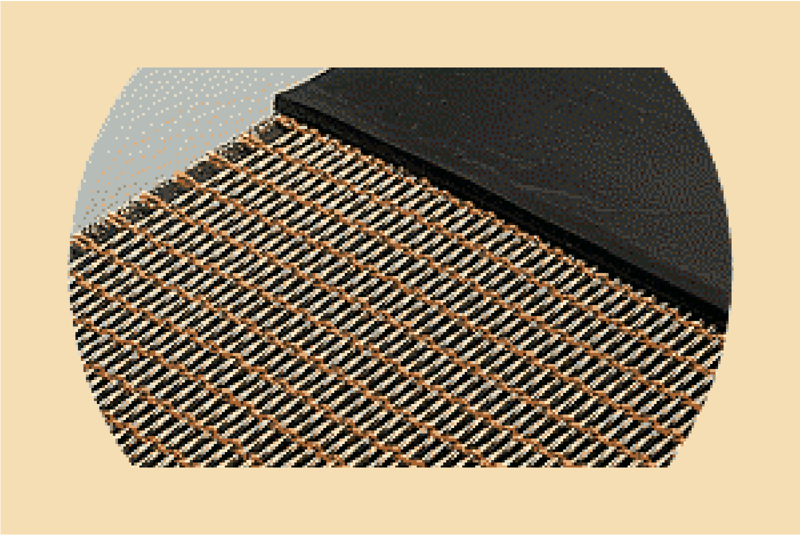
CONSTRUCTION AND PROPERTIES

The types SF and KF are with carcasses of synthetic EP fabric (polyester/polyamide) providing:

- Small elongation
- High impact resistant
- Not susceptible to humidity and micro organisms

The types SF and KF have a good wear resistance and are antistatic according to ISO 284 as well as type SF is flameproof according to ISO R433 grade S and KF is flameproof according to ISO R433 grade K.

REINFORCED STEELWIREMESH



The steel wire reinforced belts are normally based on an EP carcass with the wiremesh situated in the top rubber cover just above the carcass. The wiremesh then will protect the carcass from rips caused by sharp objects.

TECHNICAL DATA,TYPES SF AND KF

Max. material temperature 80°C.

Ambient temperature max 50°C min. -20°C.

Type SF is flameproof according to ISO R433 basic quality S, testing according to ISO R340.

Type KF is flameproof according to ISO R433 basic quality K, testing according to ISO R340.

Antistatic according to ISO 284

For pulley diameters, belt weight and belt thickness as well as troughability we refer to the belt selection basis (pdf-file).

TECHNICAL DATA AVAILABILITY STEELWIREMESH REINFORCEMENT

On request most of our black rubber based belts with min. 5 mm top cover can be steelwiremesh reinforced. The reinforcement claims that the drum diameters are one step higher than for the EP carcass only as well as the permissible through angle must be one step lower.

AVAILABILITY

Cover combinations according to requirement and request.

Open or endless lengths. Max. length unit 400 m/roll or according to agreement, however allowance must be made for practical handling possibilities (weight and roll diameter).

Max. carcass strength 2500 N/mm for SF.
Max. carcass strength 1600 N/mm for KF.

Max. belt width 2200 mm.

**For type KF the thickness of the cover rubber shall be min. 2 times the thickness of the carcass.**

## BUCKET ELEVATOR BELTS & BARE BACKED (SLIDING) BELTS

PROGRAMME 15

| BUCKET ELEVATOR BELTS | | |
|---|---|---|
| BELT TYPE | WEAR RESISTANT COVER mm | OIL RESISTANT COVER mm |
| EP 500/4 | 0.2 + 0.2 | 1 + 1 |
| EP 630/4 | 2 + 2 | 2 + 2 |
| EP 630/5 | 0.2 + 0.2 | 1 + 1 |
| EP 800/5 | 0.2 + 0.2 | 1 + 1 |
| EP 1000/6 | 0.2 + 0.2 | 1 + 1 |

| BARE-BACKED (SLIDING) BELTS | | |
|---|---|---|
| BELT TYPE | WEAR RESISTANT COVER mm | OIL RESISTANT COVER mm |
| EP 250/2 | | 2 + 0 |
| EP 400/3 | 0 + 0 | |
| EP 400/3 | 2 + 0 | |

### BUCKET ELEVATOR BELTS

APPLICATION

Basis vertical transportation of grain, flour, stone and gravel.

CONSTRUCTION

Complete delivery programme of all types of elevator buckets, both in welded and weldless design. Buckets available in steel, stainless steel and plastic.

Stocked Bucket Elevator Belts

Maximum 1500 mm wide material made of prestretched EP fabrics are normally kept in stock indicated in the table above.

### BARE-BACKED (SLIDING) BELTS

APPLICATION

Used where the belts run on steel, wood or some other low-friction surface (sliding bed), and for belts with low friction back and top cover. These belts allow easy scraping-off of parcels, sacks and other items.

Stocked Sliding Belts

Sliding belts are stocked in maximum 1300 mm widths based on prestretched EP fabrics indicated in the table above.

CUSTOM-MADE BELTS

Custom-made Elevator Cup Belts and Sliding Belts in our wear- and oil resistant qualities are produced on request.

| FIELD OF APPLICATION | MATERIAL EXAMPLES | Temperature area/ material °C | STANDARD PROGRAMMES | PROGRAMME | SPECIAL PROGRAMMES | PROGRAMME |
|---|---|---|---|---|---|---|
| Abrasive material | Beets, cement, coal, coke, earth, flint, grain, granite, gravel, limestone, ore, potatoes, slag, stone materials, timber. | -30/100<br>-30/80 | RO-PLY, 2 ply belts<br>Multiply belts type B and BW | 1<br>2 | Multiply belts type A, B and BW | 3 |
| Hot, abrasive materials | Blast furnace, cement clinker, slag | -30/170<br>-30/210 | | | Multiply belts type K and N<br>Type TCC | 4<br>5 |
| Hot materials containing oil | Fertilizer, fodder mixtures, refuse | GW -10/100<br>GWF -30/125 | RO-PLY GWF, 2-ply belts | 6 | Multiply belts typeGW and GWF | 7 |
| Materials containing moderate oil | Grain, fodder mixtures, refuse | -30/80 | RO-PLY GWM, 2-ply belts | 6A | Multiply belts type GWM and GWS | 7A |
| Food | Bread, chocolate, fish, meat | -30/110 | Type IWE | 8 | | |
| Packaged goods, inclined transport | Luggage, parcels, sacks | -30/80 | RO-PLY Grip 4, 2-ply belts | 9 | Multiply pattern belts | 10 |
| Packaged goods, goods in bulk, inclined transport | Beets, coal, coke, gravel, limestone, parcels, potatoes, sacks, stone | | | | Rib programme | 11 |
| Goods in bulk, wood industry | Woodchips | | | | Multiply pattern belts | 11A |
| Goods in bulk | Maxoflex® sidewall belts | -30/130 | | | Multiply belts type XE | 12 |
| Material containing terpene | Woodchips | -30/80 | | | Multiply belts type GT | 13 |
| Goods in bulk, tunnel & mine industry | Coal & stone | -20/80 | | | Multiply belts type SF, KF | 14 |
| Vertical transport, low fric. surfaces | Grain, flour stone, parcels , sacks | | | | Bucket elevator belts, sliding belts | 15 |

When choosing the belt type there will be several alternative possibilities of solving the transport application in question.

By means of ROULUNDS SYSTEM KEY including several belt programmes it will be rather simple to determine the belt type that gives the best operating economy.

ROULUNDS SYSTEM KEY contains:

STANDARD PROGRAMMES

2-ply and multiply belt types with cover combinations adapted to the individual transport applications.These programmes can be considered 'ready-made', and they are to a certain degree held in stock or can be delivered at a relatively short time of delivery. The standard programmes are composed on the basis of many years' experience in the conveyor belt field and cover a considerable part of this sector.

SPECIAL PROGRAMMES

Include multiply belt types that are 'tailored' to special, specific conditions in connection with a given transport. Thus these programmes make individual combinations of carcass strength, cover thickness, and cover quality possible.

ROULUNDS SYSTEM KEY starts with the material to be transported and continues to STANDARD PROGRAMMES or SPECIAL PROGRAMMES.

The application of the belt types, the technical data, and delivery possibilities are described in the programmes, and the right belt construction can thus be determined.

# CONVEYOR BELT CONSTRUCTIONS

A conveyor belt is constructed of two components – carcass and covers.

## CARCASS

The function of the carcass is to transmit and absorb the forces acting on the belt. It is primarily a question of tensile forces from the driving pulley. Secondly the carcass absorbs the impact that partly appears when the material is loaded onto the conveyor, and partly when the belt with material passes over the carrying idlers.

The carcass consists of one or more plies of textile fabric with rubber on each side to give adhesion and flexibility. The longitudinal direction is called warp and the cross direction is called weft, see fig. 1 and 2.

The conveyor belt fabrics can have the same or different material in warp and weft. One letter is designating each, for instance EP, in which E is Polyester in warp and P is Polyamide in weft.

In the following the most common carcass materials are described.

### Cotton (B)

A natural fibre used in both warp and weft. Cotton is still used in conveyor belt fabrics, but it is being displaced by synthetic materials.

### Polyester (E)

Synthetic fibres such as Terylene, Trevira, Diolen and Tetoron. Polyester fabrics are not influenced by moisture or micro-organisms. They are very flexible, have stability in length, and are acid resistant.

### Polyamide (P)

Synthetic fibres known as Nylon and Perlon. This fabric has more or less the same characteristics as Polyester, but not the length stability.

### Polyester-Polyamide (EP)

The EP fabrics have Polyester as the warp and Polyamide as the weft. This combination gives the best possible fabric characteristics with the following advantages:

– high strength in proportion to weight

– high resistance to impact

– negligible elongation

– great flexibility, excellent troughability

– not susceptible to humidity and micro-organisms

These technical advantages as well as many years' experience in the conveyor belt field is the reason why ROULUNDS prefer EP as carcass material in conveyor belts.

### Polyamide-Polyester (XE)

The XE fabrics have Polyester as the warp and Polyamid as the weft. The Polyester is, in general, made up of heavy monofile threads. These fabrics have the same advantages as EP fabrics chemically wise. Mechanically, 2 plies, in combination with an EP carcass, makes a traditional EP belt cross-stabilized. This type of carcass is used in the manufacturing of sidewall belting, cover belting etc.

### Steel net

Steel net, consisting of steel wires, is used as an extra ply in the carcass of the belt in order to protect the EP fabrics from longitudinal cuts while the ability for trough formation is kept.

Under speciel circumstances steel net can be used as carcass instead of EP.

## COVERS

The covers protect the carcass and give the necessary friction between belt and driving pulley and between belt and material.

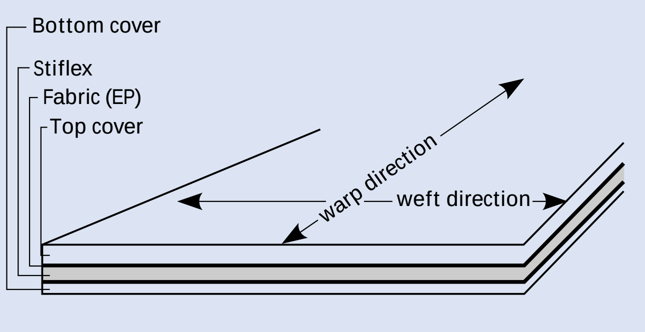
As the covers must resist influences from the transported material and the weather, cover types that are wear and live resistant, oil and/or heat resistant, antistatic or that combine two or more of these properties are required.

## BELT CONSTRUCTIONS

Belt construction means the combination of carcass and covers. The combination determines whether the belt construction is harmonious and works without problems.

In the harmonious belt construction the transmission of the necessary power, material type, lump size, height of fall, weight etc. are taken into consideration. Furthermore the carcass must give the belt stability, so that it is easy to guide on the conveyor. Increased carcass strength is normally followed by increased thickness and quality of the covers to ensure a balanced life between carcass and covers.

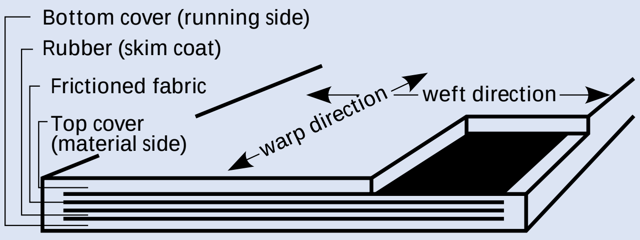
Fig. 1




### 2-ply belts

Such carcass constructions consist of 2 fabric plies and an innerply of rubber. In the 2-ply belt programme RO-PLY, ROULUNDS use an innerply – STIFLEX – consisting of rubber and textile fibres. The construction, which is patented, gives the belt excellent troughability and directional stability.

Fig. 2




**Multiply belts**
have three or more fabric plies in the carcass. The necessary strength and stability is secured by using sufficient number of fabric plies in the carcass.

To reach a harmonious combination of belt width, number of plies in carcass, and cover thickness, the following general lines can be used:

| **Belt Width (mm)** | **Number of Plies in Carcass** |
|---|---|
| - 800 | 3-4 |
| 800-1400 | 4-5 |
| 1400-2200 | 5-6 |

| **Tensile Strength of Carcass** Newton per mm belt width (N/mm) | **Cover Thickness (mm)** recommended minimum |
|---|---|
| - 200 | 2 + 1 |
| 250- 400 | 3 + 1 |
| 400- 630 | 5 + 1,5 |
| 630-1000 | 6 + 2 |
| 1000- | 8 + 3 |

It should be stressed that these lines are only **general,** and variations can easily be found depending on material, belt speed, loading conditions etc.

# CONVEYOR BELTS, ASSORTMENT

With the RO-PLY programme's combination of cover thichness and carcass strength we have created an assortment with a very wide field of applications.

RO-PLY is also supplied with ribs.

RO-PLY Grip 4 is with patterned surface.

The table indicates the RO-PLY programme.

In the system key and in each single programme more detailed information is given.

| APPLICATION | | | RO-PLY PROGRAMME | | |
|---|---|---|---|---|---|
| | Examples of material | Max. temp. | Type | Cover mm | Max. standard belt width*) mm |
| Abrasive materials | Slightly abrasive, small height of fall at loading. Grain, cement, loose earth, crushed coal. | 100°C | 200/2 | 2 + 1 | 800 |
| Abrasive materials | Moderately to very abrasive, normal height of fall . at loading Gravel, stone, coal, coke, crushed ore, wood. | 100°C | 250/2<br>315/2<br>400/2 | 3 + 1<br>3 + 1<br>3 + 1 | 1000<br>1200<br>1200 |
| Abrasive materials | Very and extra abrasive, great height of fall at loading. Flint, stone materials, coke, ore, slag, wooden logs. | 100°C | 400/2<br>630/2 | 5 + 1,5<br>5 + 1,5 | 1200<br>1200 |
| Hot materials containing oil | Refuse, fodder mixtures, wood containing resin, clinkers, copra, meat- and bone meal, slag, soya cakes, wooden chips.<br>Fertilizer with Lilamine.<br>Requirement for flameproof belt. | 125°C | 250/2 GWF<br>400/2 GWF | 3 + 1<br>3 + 1 | 1000<br>1200 |
| Moderate oily material | Refuse, grain | 80°C | 250/2 GWM | 3 + 1 | 800 |
| Inclined transport | Luggage, boxes, sacks, parcels, cellophane wrapped goods. | 80°C | 200/2<br>Grip 4<br>Other RO-PLY types with ribs | | 1200 |

*) Other belt widths can be delivered on request, however, max. 1500 mm.

ROULUNDS multiply conveyor belts are supplied with covers and carcass strength adapted to the individual requirements.

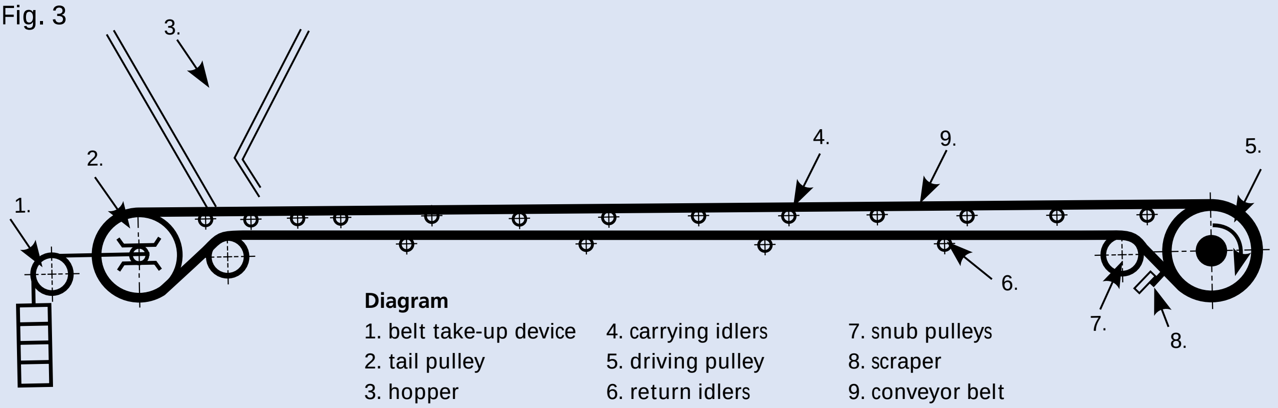
ROULUNDS conveyor belts are also supplied with ribs or patterned surface for inclined transport.

The table indicates ROULUNDS multiply conveyor belt programme.

In the system key and in each single programme more detailed information is given.

| APPLICATION | | | BELT PROGRAMME | | |
|---|---|---|---|---|---|
| | Examples of material | Max. temp. | Type | Carcass strength max. N/mm | Belt width max. mm |
| Abrasive materials | Very abrasive, sharp edges. Granite, iron, broken stone, slag, gravel, limestone, coke, ore, coal. | 80°C | A | 3150 | 2200 |
| Abrasive materials | Moderately to very abrasive. Ashes, cement, limestone, earth, coal, coke, lignite, potatoes, clay, marl, mortar, concrete. | 80°C | B | 3150 | 2200 |
| Abrasive materials | Highly abrasive material. Granite, iron, broken stone, slag. | 80°C | BW | 3150 | 2200 |
| Hot, abrasive materials | Abrasive, hot/wet. Ashes, coke, malt, slag, blast furnace clinker, cement clinker, foundry sand. | 140°C<br>170°C<br>210°C | K<br>N<br>TCC | 1600<br>1600<br>1600 | 2200<br>2200<br>2200 |
| Hot materials containing oil | Refuse, fodder mixtures, wood containing resin, clinkers, soya cakes, copra, meat- and bone meal, wooden chips , slag.<br>Fertilizer with Lilamine.<br>Requirement for flameproof belt. | 100°C<br>125°C | GW<br>GWF<br>GWF | 1600<br>1000 | 2200<br>2200 |
| Moderate oily material | Grain, fodder mixture, refuse, wodden chips,fertilizer. | 80°C | GWM<br>GWS | 1600 | 2200 |
| Food | Containing animal and/or vegetable oil and fat. Bread, chocolate, drops, fish, cheese, meat, margarine, butter. | 110°C | IWE | 250 | 1400 |
| Wood | Wood, chips, containing resin | 80°C | GT | 1400 | 2200 |

Fig. 3

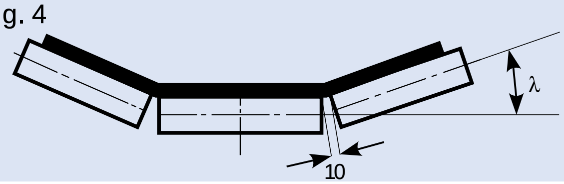



**CARRYING PART**
can be supported by

troughed idlers
flat idlers
sliding plate

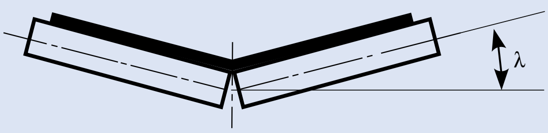
**Troughed idler set**
with 2-5 idlers is used for transportation of goods in bulk. Troughed idlers ensure high capacity, small risk of spillage of material and effective belt guiding.

Fig. 4




**The three-sectioned idlers**
are the most commonly used type. The optimum capacity is obtained at 45° trough angle (λ), and the idlers being of the same length. Distance between idlers is standardized at max. 10 mm.

Fig. 5

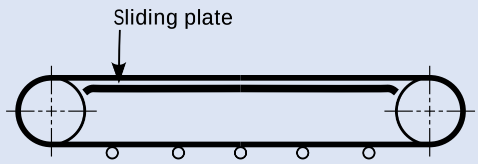



**The two-sectioned idlers**
are normally only used for belt widths under 650 mm. A trough angle (λ) larger than 25° is inexpedient because of the influences on the belt. Distance between idlers is standardized at max. 10 mm.

Fig. 6

**Flat idler set**
is mainly used for transportation of packaged goods, and in such cases when the material is loaded and unloaded from the side, and for belts with sidewalls.

Fig. 7

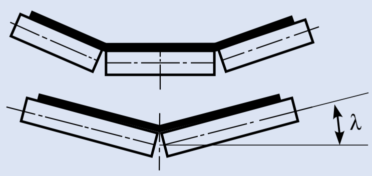



**Sliding plate**
can be used for transportation of packaged goods and goods in bulk. The sliding plate can be made of steel, plastics or hard wood.

Normally belts with low friction on the bottom side are used because of the friction forces between belt and sliding plate.

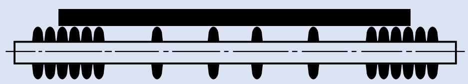
**RETURN PART**
is normally supported by flat idlers. However, on long conveyors it can be an advantage to use two-sectioned idlers, which makes the belt guiding easier. Trough angle 10-15° (λ).

Fig. 8




When transporting sticky materials return idlers with supporting rings or rubber lagging are used to reduce build-up of material on the idlers.

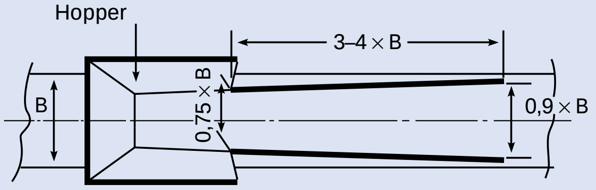
Fig. 9



Because of the guiding of the belts both carrying and return idlers must be adjustable in the travelling direction of the belt.

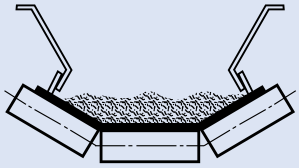
**LOADING OF GOODS IN BULK**
Feeding should take place in the travelling direction of the belt at a speed equal to the belt speed. Material should be distributed symmetrically across the middle of the belt, as unsymmetrical material stream is often the cause of oblique travel.
After a few metres' running the material stream will flatten out and assume the load stream cross section that is natural for the material. To avoid waste of material a hopper should therefore as a maximum cover 0,75 × belt width, see fig. 10.

Fig. 10




In connection with the hopper, rubber skirting is often mounted to avoid spillage of material. The skirting must be of rubber or some other material, the hardness of which is lower than that of the belt cover.
A hardness of approx. 45° Shore A will normally be suitable.
Scraps of belt should not be used as rubber skirting.
The distance between the rubber skirting being gradually increased from 0,75 to 0,9 x belt width, see fig. 10, a selfcleaning effect will occur, as the belt will pull out the material between skirting and belt.
The rubber skirting must be placed at right angles to the belt to avoid the material pressing it on to the belt with consequent wear of the cover, see fig. 11.

Fig. 11

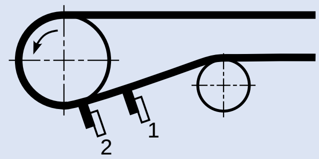


The height of fall of the material should be the smallest possible in order to reduce the impact effect on the belt. The consequences of the impact can be reduced by supporting the belt in an appropriate way by means of for instance closely placed rubberized carrying idlers, shock absorbing rubber mat, or other devices.

# MAINTENANCE OF BELT AND CONVEYOR

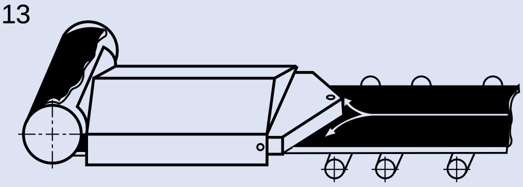
Build-up of the material on the belt, pulleys and idlers causes increased wear of covers and spillage of material at the return idlers as well as guiding difficulties.
The belt can be kept clean by means of scrapers, brushes or vibratory equipment, water jetting, or combinations of these. It will often be necessary to experiment to find the most effective solution.
Rubber scrapers as shown in fig. 12 can be made as single or double scrapers, which are kept in position by counterbalance or adjustable screw springs. The surface pressure between belt and scraper should be adapted to the transported material to avoid unnecessary wear of the cover.

Fig. 12




In connection with very sticky materials the scraper can be placed with the pulley as a counter-balance (2). In this way the scraper becomes more effective, but at the same time it must be able to rock to reduce the risk of damaging the belt in case of material between belt and pulley.
The pulley side of the belt is kept clean by means of diagonal or plough-shaped scrapers. An adjustment device should be made to prevent the rubber holder from getting into contact with the belt. Scraps of belt should not be used as scrapers.

Fig. 13



Build-up of materials on pulleys must be avoided. A possibility is scrapers on the pulleys.
Covering of the return part under the loading point can give an effective protection of the belt and can be recommended for transportation of goods in bulk.

## BELT TENSIONING SYSTEM

The purpose is to give the belt the pre-tension ensuring

– that the driving pulley drives the belt under all running conditions.

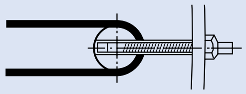
– that the belt sag between carrying and return idlers is limited. In this way waste of material and bending resistance at belt passage over the idlers is reduced.

Correct pre-tension is thus important to ensure troublefree operation of the conveyor.

Depending on the mode of operation the belt tensioning systems are divided into two main groups.

**Fixed belt tensioning system**
Screw take-up is often used for short, moderately loaded conveyors.

Fig. 14



The screw take-up cannot absorb all momentary elongations that may occur due to sudden variations of load and in the acceleration phase. Conveyors with centre distance of more than approx. 50 m should therefore have selfadjusting take-up.

**Self-adjusting belt tensioning system**
keeps the pre-tension constant and ensures at the same time that the permissible belt tension is not exceeded. The most common system is gravity take-up, and the best effect is normally obtained when the gravity take-up is placed close to the driving pulley.

Fig. 15

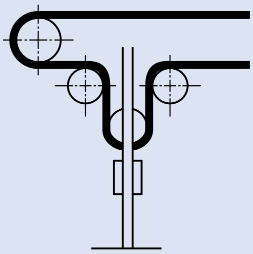
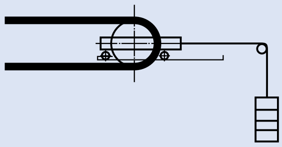


Fig. 16



In connection with large heavily loaded conveyors the gravity take-up will not be sufficient (it acts too slowly), and instead electrical, pneumatic or electro-hydraulic systems can be used.

The possibility of adjusting the belt tension should in general be 0,8-1,2% of the centre distance under normal running conditions.

A real calculation of the necessary adjustment of belt tension may be required, and ROULUNDS shall be at your disposal in this respect.

## SELECTION OF CONVEYOR BELTS

Selection of conveyor belts implies knowledge of
- existing conveyor data and running conditions

or of projecting data consisting of
- capacity of conveyor in t/h or $m^3$/h
- transport distance and belt travel
- type of material, weight per $m^3$, lump size, chemical activity, temperature and consistency
- loading conditions.

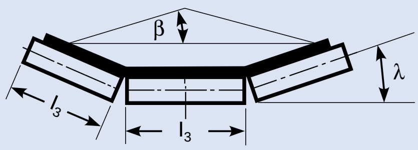
In the following the use of the **calculation formulas** and the procedure with both projecting and selection is described.

**Belt width B (mm)**
Minimum belt width is determined taking into consideration kind of material and lump size. Table 1 indicates guiding values for B min. (mm).

**Belt speed v (m/s)**
Max. belt speed is determined taking into consideration density of material, lump size, height of fall and belt width. Table 2 indicates guiding values for max. belt speed v max. (m/s).

**Capacity $Q_t$ ($m^3$/h)**
The theoretical capacity $Q_t$ ($m^3$/h) of the conveyor belt is calculated according to cross section of load stream and belt speed v (m/s). The basic angle $\beta$ is part of the cross section of load stream, and experience shows that for most materials a suitable safety margin is obtained by $\beta = 15°$. For dry, powdered material $\beta = 10°$ is recommended.

Fig. 17




The tables 4, 5 and 6 indicate theoretical capacity $Q'_t$ ($m^3$/h) at a belt speed of 1 m/s, horizontal transport and continuous operation with regular uniform feeding. Intermittant operation and dissimilar feeding must be taken into consideration when stipulating the required capacity.
Table 3 indicates correction factor for inclined or falling transport.
Regarding capacity for rib belts we refer to the programme for ribs on page 49.
With min. belt width B (mm) and $Q'_t$ ($m^3$/h) at 1 m/s as input values for table 4, 5, and 6 the theoretical capacity $Q_t$ ($m^3$/h) is determined.

$$Q'_t = \frac{Q_2}{v \times \gamma \times k} = \frac{Q_1}{v \times k} \qquad (m^3/h)$$

| | | |
|---|---|---|
| $Q'_t$ | = theoretical capacity at 1 m/s | ($m^3$/h) |
| $Q_1$ | = required capacity | ($m^3$/h) |
| $Q_2$ | = required capacity | (t/h) |
| $\gamma$ | = density of material, table 17 | (t/$m^3$) |
| v | = max. recommended belt speed, table 2 | (m/s) |
| k | = correction factor for inclined/falling transport, table 3 | ( - ) |

Generally the trough angle ($\lambda$) should be chosen in the upper area, the waste problems being thus minimized. The belt type being finally determined control that the empty belt can run in the chosen trough angle, see table 15, selection of conveyor belts.
Theoretical capacity $Q_t = Q'_t \times v \times k$ ($m^3$/h)

### Power requirement Nn (kW)
The theoretical power $N_n$ (kW) necessary for the transport is composed by

$N_1$ = power required to drive empty conveyor

$N_2$ = power required to convey material on the level

$N_3$ = power required to elevate or lower material

$N_4$ = additional power required from rubber skirting, scrapers, tripper etc.

$$N_n = N_1 + N_2 \pm N_3 + N_4 \qquad \text{(kW)}$$

Formulas for power, see calculations.

### Motor capacity

$$N_m = \frac{N_n}{\eta} \qquad \text{(kW)}$$

The transmission efficiency can, if not known, be put at $\eta$ = 0,85-0,95.

### Working tension p (N/mm)
When the theoretical necessary power $N_n$ (kW) is known, the effective tension P (N), max. belt tension $T_1$ (N) and working tension p (N/mm) of the belt are calculated.

The working tension p (N/mm) is used for determination of belt type, and the following points are taken into consideration:

Is the **starting torque** limited to **max. 1,4 × normal torque** the normal power $N_n$ (kW) can be used for calculating the working tension.

On larger conveyors, when large masses are to be started **allowance must be made for acceleration** and the acceleration forces belonging to it.

If further information about the calculation of acceleration forces as well as starting systems is required, please contact ROULUNDS.

Under normal **running conditions** the working tension p (N/mm) has the highest influence on the belt.

**The belt programmes** indicate max. permissible working tension p (N/mm), and belt type is chosen according to the calculated p (N/mm).

If the belt is exposed to extraordinary tension under loading or in transport these influences may result in local belt tensions exceeding the calculated working tension. In such cases a heavier belt construction should be chosen.

### Choice of belt type
The belt type can now be determined by means of:

- the system key, referring to belt programmes
- the calculated working tension p (N/mm)
- recommended cover dimensions, tables 12 and 13 in selection of conveyor belts.

### Control of »G« (kg/m) – weight of moving parts of conveyor
Belt type and conveyor data having been determined the real G value of the moving parts of the conveyor can be calculated and compared with the G value from table 7 used for the calculation.

If the comparison gives so great a difference that it will influence the working tension p (N/mm) considerably the calculation should be repeated with the real G value.

### Pre-tension gravity take-up $G_k$ (kg)
The pre-tension must be so that the belt can operate on the conveyor under all running conditions.

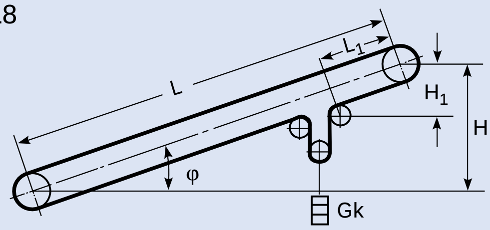
In connection with centre distance above 50 m automatic take-up is recommended.

The size of the pre-tension depends on the position of the take-up system on the conveyor.

The best function is achieved if the automatic take-up system is placed right after the driving pulley.

The following formula can generally be used for calculation of gravity take-up.

Fig. 18




$$G_k = \frac{2N_n\,(m-1)\,102}{v} + 2\left(L_1\left(G_b + \frac{G_{RU}}{S_2}\right) f - H_1 \times G_b\right) \text{(kg)}$$

Explanation of symbols:

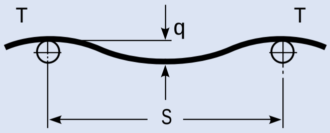
If $G_k$ becomes negative the max. belt tension $T_1$ can be calculated according to the real pre-tension:

$$T_1 = P + H_1 \times G_b \times g - L_1\left(G_b + \frac{G_{RU}}{S_2}\right) f \times g \text{ (N)}$$

### MAX. PERMISSIBLE BELT SAG
The belt sag between carrying idlers and return idlers is dependant on distance between carrying idlers, belt tension as well as weight of belt and material.

In practice a sag $(q/s)_{perm}$ = 0,005 to 0,02 is accepted.

Fig. 19




The belt tension $T_{min}$ (N), which is necessary in order to keep the limit for the belt sag $(q/s)_{perm}$, can be calculated according to the following formula:

Carrying part

$$T_{min} = \geq \frac{s_1\,(G_b + G_m)\,g}{8\,(q/s)_{perm}} \text{ (N)}$$

Return part

$$T_{min} = \geq \frac{s_2 \times G_b \times g}{8\,(q/s)_{perm}} \text{ (N)}$$

Explanation of symbols:

Values for belt tension lower than $T_{min}$ (N) should not be used in any point of the conveyor.

Are lower values reached, the distance between the carrying idlers should be reduced, or the pre-tension should be increased.

In both cases the working tension p (N/mm) should be checked to see that it does not exceed $p_{perm}$ (N/mm).

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# CALCULATION FORMULAS

| DETERMINATION OF | FORMULAS | REFERENCE |
|---|---|---|
| Min. belt width B (mm)<br>Max. belt speed v max. (m/s)<br>Required capacity $Q_1$ ($m^3/h$)<br>Required capacity $Q_2$ (t/h) | $Q_1 = \frac{Q_2}{\gamma}$<br>$Q_2 = Q_1 \times \gamma$ | Min. belt width, table 1<br>Max. speed, table 2<br>Is determined in consideration of intermittant operation<br>$\gamma$ according to table 17. |
| Theoretical capacity at 1 m/s $Q'_t$ ($m^3/h$)<br>Theoretical capacity $Q_t$ ($m^3/h$)<br>Theoretical capacity $Q_t$ (t/h) | $Q'_1 = \frac{Q_2}{v \times \gamma \times k} = \frac{Q_1}{v \times k}$<br>$Q_t = Q'_t \times v \times k$<br>$Q = Q_t \times \gamma$ | Correction factor k for inclined/falling transport, table 3.<br>Final belt width B (mm) and trough angle ($\lambda$) to be determined according to capacity tables 4, 5, and 6.<br>Table value $Q'_t$ ($m^3/h$) to be used when calculating $Q_t$ ($m^3/h$). |
| Power required to drive empty conveyor $N_1$ (kW)<br>Power required to convey material on the level $N_2$ (kW)<br>Power required to elevate or lower material $N_3$ (kW) | $N_1 = \frac{G\,(L + l)\,f \times v}{102}$<br>$N_2 = \frac{Q\,(L + l)\,f}{367}$<br>$N_3 = \frac{Q \times H}{367}$ | G – table 7<br>L – centre distance (m)<br>l – table 8<br>f – table 9<br>H = L sin $\varphi$ (m) is the vertical height to elevate or lower material.<br>H is positive for inclined and negative for falling transport. |
| Additional power requirement $N_4$ (kW) | | $N_4$ – table 10 |
| Theoretical necessary motor capacity $N_n$ (kW) | $N_n = N_1 + N_2 \pm N_3 + N_4$ | $N_3$ is positive for inclined and negative for falling transport. |
| Motor capacity $N_m$ (kW) | $N_m = \frac{N_m}{\eta}$ | If not known, the degree of efficiency of drive can be calculated at $\eta$ = 0,85-0,95. |
| Effective tension P (N)<br>Max. belt tension $T_1$ (N)<br>Drive factor m (-)<br>Pre-tension $T_2$ (N)<br>Working tension p (N/mm)<br>Choice of belt type | $P = \frac{N_n \times 1000}{v}$<br>$T_1 = P \times m$<br>$m = 1 + \frac{1}{e^{\mu\alpha} - 1}$<br>$T_2 = T_1 - P$<br>$p = \frac{T_1}{B}$ | m – table 11 or according to formula for drive factor.<br>According to directions see selection of conveyor belts.<br>SYSTEM KEY.<br>Cover dimensions table 12-13. |
| Control of G-value (kg/m) | $G = 2G_b + \frac{G_{RO}}{s_1} + \frac{G_{RU}}{s_2}$ | If the real G-value deviates considerably from the value used in table 7, $N_1$, $N_n$ and p should be corrected.<br>$G_b$ see table 14. |
| Pre-tension $G_k$ (kg)<br>Max. belt tension $T_1$ (N) | $G_k = \frac{2N_n\,(m - 1)\,102}{v} + 2\,(L_1(G_b + \frac{G_{RU}}{s_2})\,f - H_1 \times G_b)$<br>$T_1 = P + H_1 \times G_b \times g - L_1\,(G_b + \frac{G_{RU}}{s_2})\,f \times g$ | See drawing on previous page.<br>$G_{RU}$, $s_2$ and $G_b$ see tables 7 and 14.<br>If $G_k$ becomes negative $T_1$ is calculated according to the real pretension in the belt. |
| Belt sag<br>Max. permissible belt sag<br>Min belt tension on: carrying part $T_{min}$ (N)<br>return part $T_{min}$ (N)<br>Pulley diameters | $(q/s)_{perm} = 0{,}005\text{-}0{,}02$<br>$T_{min} \geq \frac{s_1\,(G_b + G_m)\,g}{8(q/s)_{perm}}$<br>$T_{min} \geq \frac{s_2 \times G_b \times g}{8(q/s)_{perm}}$ | Values for belt tension lower than $T_{min}$ should not be used in any point of the conveyor. If lower values are reached, the distance between carrying idlers should be reduced or the pretension increased. $T_1$ and p are adjusted and compared with $p_{perm}$ for chosen belt type.<br>See table 16. |
| | | |

## Table 1
**RECOMMENDED MIN. BELT WIDTH B (mm)**

| | Min. belt width (mm) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Material | 400 | 500 | 650 | 800 | 1000 | 1200 | 1400 | 1600 | 1800 | 2000 | 2200 |
| Sorted, length of largest edge (mm) | 50 | 75 | 125 | 175 | 250 | 350 | 400 | 450 | 550 | 600 | 600 |
| Unsorted, length of largest edge (mm) | 100 | 150 | 200 | 300 | 400 | 500 | 600 | 650 | 700 | 750 | 750 |

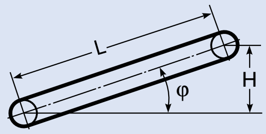
Min. belt width is determined according to kind and lump size of material. Coarsegrained material will reduce the capacity, especially in connection with narrow belt width. The widths indicated should be adhered to as far as possible. A few big lumps – till 10% of the total quantity – can, however, be allowed.

## Table 2
**RECOMMENDED MAX. BELT SPEED v max. (m/s)**

| | Belt width B (mm) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Material | 400 | 500 | 650 | 800 | 1000 | 1200 | 1400 | 1600 | 1800 | 2000 | 2200 |
| Light, fine-grained | 2,5 | 3,15 | 3,15 | 3,55 | 4,0 | 4,0 | 4,0 | 4,0 | 4,5 | 4,5 | 4,5 |
| Moderate, abrasive | 1,6 | 2,0 | 2,5 | 2,5 | 3,15 | 3,15 | 3,15 | 3,55 | 3,55 | 3,55 | 3,55 |
| Heavy, very abrasive | 1,25 | 1,6 | 1,8 | 1,8 | 2,24 | 2,24 | 2,24 | 2,5 | 2,5 | 2,5 | 2,5 |

Wear and cuttings of the cover will primarily take place while the material accelerates to belt speed. Thus a moderate belt speed should be chosen in connection with coarsegrained materials and big lump sizes.

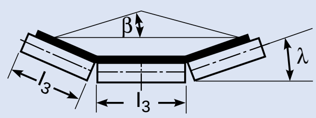
## Table 3
**CAPACITY FACTOR k (-)**




| φ (°) | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $\frac{H}{L}$ | 0,03 | 0,07 | 0,10 | 0,14 | 0,17 | 0,21 | 0,24 | 0,28 | 0,31 | 0,34 | 0,37 | 0,41 | 0,44 | 0,47 | 0,50 |
| k | 1 | 0,99 | 0,98 | 0,97 | 0,95 | 0,93 | 0,91 | 0,89 | 0,85 | 0,81 | 0,76 | 0,71 | 0,66 | 0,61 | 0,56 |

In connection with inclined or falling transport the effective load area is reduced by factor k. Are rib belts used, please see the capacity tables in programme 11.

## Table 4
**THEORETICAL CAPACITY Q'$_t$ (m$^3$/h) at v = 1 m/s**




THREE-SECTIONED CARRYING IDLERS

| B (mm) | $l_3$ (mm) | λ° | 20 | | 25 | | 30 | | 35 | | 40 | | 45 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | β° | 10 | 15 | 10 | 15 | 10 | 15 | 10 | 15 | 10 | 15 | 10 | 15 |
| 400 | 160 | | 36 | 43 | | | | | | | | | | |
| 500 | 200 | | 60 | 73 | 67 | 79 | | | | | | | | |
| 650 | 250 | | 110 | 132 | 123 | 145 | 134 | 155 | 145 | 164 | 153 | 171 | 160 | 176 |
| 800 | 315 | | 172 | 207 | 193 | 226 | 211 | 243 | 227 | 257 | 240 | 268 | 250 | 276 |
| 1000 | 380 | | 281 | 337 | 315 | 369 | 345 | 396 | 371 | 419 | 391 | 437 | 407 | 449 |
| 1200 | 465 | | 412 | 493 | 461 | 540 | 505 | 581 | 543 | 614 | 573 | 640 | 597 | 658 |
| 1400 | 530 | | 573 | 685 | 642 | 750 | 703 | 807 | 755 | 803 | 797 | 888 | 829 | 913 |
| 1600 | 600 | | 758 | 907 | 851 | 993 | 932 | 1068 | 1000 | 1128 | 1056 | 1075 | 1097 | 1208 |
| 1800 | 670 | | 970 | 1160 | 1088 | 1270 | 1196 | 1365 | 1279 | 1443 | 1350 | 1502 | 1402 | 1544 |
| 2000 | 750 | | 1204 | 1435 | 1351 | 1577 | 1479 | 1695 | 1588 | 1791 | 1676 | 1865 | 1742 | 1917 |
| 2200 | 800 | | 1476 | 1740 | 1656 | 1930 | 1813 | 2074 | 1946 | 2191 | 2052 | 2281 | 2131 | 2342 |

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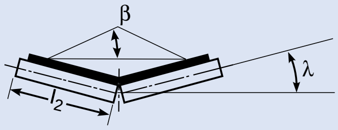
**Table 5**
**THEORETICAL CAPACITY Q'$_t$ (m$^3$/h) at v = 1 m/s**

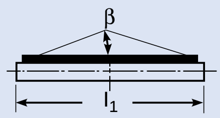
TWO-SECTIONED CARRYING IDLERS




| B (mm) | $l_2$ (mm) | λ° | 15° | | 20° | | 25° | |
|---|---|---|---|---|---|---|---|---|
| | | β° | 10° | 15° | 10° | 15° | 10° | 15° |
| 300 | 200 | | 18 | 21 | 21 | 24 | 23 | 26 |
| 400 | 250 | | 30 | 43 | 41 | 48 | 46 | 52 |
| 500 | 300 | | 60 | 72 | 69 | 80 | 76 | 87 |
| 650 | 375 | | 107 | 129 | 123 | 144 | 136 | 155 |
| 800 | 465 | | 168 | 202 | 193 | 225 | 213 | 244 |
| 1000 | 600 | | 270 | 325 | 310 | 363 | 344 | 392 |

**Table 6**
**THEORETICAL CAPACITY Q'$_t$ (m$^3$/h) at v = 1 m/s**

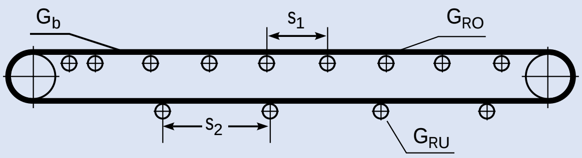
FLAT CARRYING IDLERS




| B (mm) | $l_1$ (mm) | β = 10° | β = 15° | B (mm) | $l_1$ (mm) | β = 10° | β = 15° |
|---|---|---|---|---|---|---|---|
| 300 | 400 | 8 | 12 | 1200 | 1400 | 168 | 256 |
| 400 | 500 | 15 | 23 | 1400 | 1600 | 232 | 353 |
| 500 | 600 | 25 | 39 | 1600 | 1800 | 307 | 466 |
| 650 | 750 | 45 | 69 | 1800 | 2000 | 391 | 594 |
| 800 | 950 | 71 | 108 | 2000 | 2200 | 406 | 739 |
| 1000 | 1150 | 115 | 174 | 2200 | 2400 | 591 | 898 |

**Table 7**
**WEIGHT OF MOVING PARTS OF CONVEYOR G (kg/m)**

$$G = 2Gb + \frac{G_{RO}}{s_1} + \frac{G_{RU}}{s_2} \text{ (kg/m)}$$




| $s_1$ (m) | $s_2$ (m) | Type of Conveyor | Belt width (mm) 300 | 400 | 500 | 650 | 800 | 1000 | 1200 | 1400 | 1600 | 1800 | 2000 | 2200 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1,0 | 2,0 | light $\gamma < 1,5$ | 9 | 11 | 13 | 17 | 28 | 37 | 52 | 69 | 82 | 108 | 128 | 145 |
| | | heavy $\gamma > 1,5$ | 12 | 15 | 20 | 28 | 43 | 57 | 77 | 100 | 120 | 143 | 164 | 186 |
| 1,25 | 2,5 | light $\gamma < 1,5$ | 8 | 10 | 12 | 15 | 25 | 33 | 48 | 62 | 75 | 96 | 115 | 131 |
| | | heavy $\gamma > 1,5$ | 11 | 14 | 18 | 25 | 39 | 52 | 71 | 90 | 109 | 131 | 148 | 169 |
| 1,5 | 3,0 | light $\gamma < 1,5$ | 8 | 10 | 11 | 14 | 23 | 31 | 45 | 58 | 70 | 89 | 107 | 121 |
| | | heavy $\gamma > 1,5$ | 10 | 13 | 17 | 23 | 36 | 48 | 67 | 84 | 102 | 122 | 138 | 156 |
| Trough Shape | | | | | | | | | | | | | | |
| Recommended diameters and weight of carrying idlers and return idlers | light conveyor | ∅ (mm) | 51 | 51 | 51 | 63 | 89 | 89 | 89 | 108 | 108 | 133 | 133 | 133 |
| | | $G_{RO} = G_{RU}$ (kg) | 2,5 | 3 | 3,5 | 5,5 | 11 | 13 | 15 | 22 | 25 | 39 | 43 | 47 |
| | heavy conveyor | ∅ (mm) | 63 | 63 | 63 | 89 | 108 | 108 | 108 | 133 | 133 | 159 | 159 | 159 |
| | | $G_{RO} = G_{RU}$ (kg) | 3,5 | 4 | 5,5 | 10 | 14 | 18 | 20 | 31 | 35 | 47 | 52 | 56 |

In the values for G the recommended values for $G_{RO}$ and $G_{RU}$ are used. Can one or more of these factors included in G be determined in the dimensioning phase they should be used when calculating the G-value.

**Table 8**
**ADDITION l (m) FOR CENTRE DISTANCE L (m)**

| L (m) | < 30 | < 80 | < 100 | > 100 |
|---|---|---|---|---|
| l (m) | 50 | 70 | 80 | 100 |

The centre distance L is increased by l to include the resistances caused by the bending of belt over pulleys, friction and inertia torque at loading and the scrapers.

**Table 9**
**COEFFICIENT OF FRICTION OF ROLLING PARTS f (-)**

| | |
|---|---|
| Good conveyors with easily running idlers and small internal friction in material | 0,017 |
| Standard value for conveyors in normal quality | 0,020 |
| For unfavourable running conditions, dusty operation, periodic overload | 0,023-0,030 |
| Descending transport requiring braking by means of brake motor (40% of f for driven belt) | 0,012 |

The standard value f = 0,020 is increased at the following conditions:

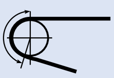
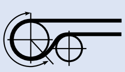
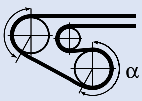
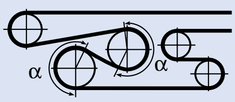
- high internal friction in material
- trough angles > 30°
- carrying idlers < 108 mm
- belt speed > 5 m/s
- temperature < 20°C
- lower belt tension
- flexible belts and high cover thicknesses

**Table 10**
**ADDITIONAL POWER REQUIREMENT $N_4$ (kW)**

| Addition per | Belt width B (mm) | at v = 1 m/s | $N_4$ (kW) |
|---|---|---|---|
| Discharge by tripper or scraper | ≤ 500<br>≤ 1000<br>> 1000 | 0,8 kW<br>1,5 kW<br>2,2 kW | 0,8 × v<br>1,5 × v<br>2,2 × v |
| Rubber skirting length in contact with belt | | 0,08 kW | 0,08 × v × length of skirting |

The values are recommendations and may be increased with extraordinary running conditions.

**Table 11**
**DRIVE FACTOR m (-)**

| $m = 1 + \frac{1}{e^{\mu\alpha} - 1}$ | | | Driving pulley arrangement | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | |  | | |  | | | |  | | |  | | |
| Driving pulley | | μ | Arc of contact α (°) | | | | | | | | | | | | |
| | | | 120 | 150 | 180 | 210 | 220 | 230 | 240 | 360 | 380 | 400 | 420 | 440 | 450 |
| Lagged | dry | 0,40 | 1,76 | 1,54 | 1,40 | 1,30 | 1,27 | 1,25 | 1,23 | 1,09 | 1,08 | 1,07 | 1,06 | 1,05 | 1,04 |
| | humid | 0,35 | 1,92 | 1,67 | 1,50 | 1,39 | 1,35 | 1,33 | 1,30 | 1,12 | 1,11 | 1,10 | 1,08 | 1,07 | 1,07 |
| Bare | dry | 0,35 | 1,92 | 1,67 | 1,50 | 1,39 | 1,35 | 1,33 | 1,30 | 1,12 | 1,11 | 1,10 | 1,08 | 1,07 | 1,07 |
| | humid | 0,20 | 2,92 | 2,45 | 2,14 | 1,93 | 1,87 | 1,81 | 1,76 | 1,40 | 1,36 | 1,33 | 1,30 | 1,27 | 1,20 |

The values m in the table are valid for automatic take-up (e.g. gravity take-up).
For screw take-up from α = 120° to α = 220° the values are multiplied by 1,20.

For belts with non-rubberized running side, see calculation of belts for conveyors with sliding plate.

**Table 12**
**RECOMMENDED VALUES FOR COVER THICKNESS, CARRYING SIDE, WEAR RESISTANT BELTS**

| $\frac{30 \times v}{L}$ v = m/s L = centre-distance m | Cover type | Slightly abrasive materials grain, cement, loose earth, crushed coal etc. | | Moderately abrasive materials: coal, limestone sand, superphosphate, crushed coke etc. | | | | Very abrasive materials: flint, gravel coke, crushed ore, etc. | | | | Extra abrasive materials: ore aggregate, slag etc. | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | grain size (mm) | | grain size (mm) | | | | grain size (mm) | | | | grain size (mm) | | | |
| | | to 10 | 10 to 50 | to 10 | 10 to 50 | 50 to 200 | 200 and over | to 10 | 10 to 50 | 50 to 200 | 200 and over | to 10 | 10 to 50 | 50 to 200 | 200 and over |
| 0,25 | A, B | 1,5 | 2,5 | 1,5 | 3,0 | 4,0 | 5,0 | 1,5 | 3,0 | 4,0 | 5,0 | 1,5 | 3,0 | 5,0 | 6,5 |
| | BW | 1,5 | 2,5 | 1,5 | 3,0 | 4,0 | 5,0 | 1,5 | 3,0 | 5,0 | 5,5 | 1,5 | 3,0 | 5,0 | 6,5 |
| 0,33 | A, B | 1,5 | 2,5 | 1,5 | 3,0 | 4,0 | 5,0 | 1,5 | 3,0 | 4,0 | 5,0 | 1,5 | 3,0 | 5,0 | 6,5 |
| | BW | 1,5 | 2,5 | 1,5 | 3,0 | 4,0 | 5,0 | 1,5 | 3,0 | 5,0 | 5,5 | 1,5 | 3,0 | 5,0 | 6,5 |
| 0,50 | A, B | 1,5 | 2,5 | 1,5 | 3,0 | 4,0 | 5,0 | 1,5 | 3,0 | 4,0 | 5,0 | 1,5 | 3,0 | 5,0 | 6,5 |
| | BW | 1,5 | 2,5 | 1,5 | 3,0 | 4,0 | 5,0 | 1,5 | 3,0 | 5,0 | 5,5 | 1,5 | 3,5 | 5,0 | 8,0 |
| 0,67 | A, B | 1,5 | 2,5 | 1,5 | 3,0 | 4,0 | 5,0 | 1,5 | 3,0 | 5,0 | 5,5 | 1,5 | 3,0 | 5,0 | 7,0 |
| | BW | 1,5 | 2,5 | 1,5 | 3,0 | 4,0 | 5,0 | 1,5 | 3,0 | 5,0 | 6,5 | 1,5 | 3,5 | 6,5 | 8,0 |
| 1,00 | A, B | 1,5 | 2,5 | 1,5 | 3,0 | 4,0 | 5,0 | 1,5 | 3,0 | 5,0 | 6,5 | 1,5 | 3,0 | 6,5 | 8,0 |
| | BW | 1,5 | 2,5 | 1,5 | 3,0 | 4,0 | 5,0 | 1,5 | 3,0 | 6,5 | 8,0 | 2,5 | 5,0 | 8,0 | |
| 1,25 | A, B | 1,5 | 2,5 | 1,5 | 3,0 | 4,0 | 5,0 | 1,5 | 3,0 | 5,5 | 8,0 | 2,5 | 4,0 | 7,0 | 8,0 |
| | BW | 1,5 | 2,5 | 1,5 | 3,0 | 5,0 | 7,0 | 1,5 | 4,0 | 8,0 | | 3,0 | 5,5 | 8,0 | |
| 1,67 | A, B | 1,5 | 2,5 | 1,5 | 3,0 | 5,0 | 6,5 | 2,5 | 4,0 | 6,5 | 8,0 | 3,0 | 5,5 | 8,0 | 8,0 |
| | BW | 1,5 | 2,5 | 1,5 | 3,0 | 6,5 | | 3,0 | 5,5 | 8,0 | | 5,0 | 8,0 | | |
| 2,50 | A, B | 1,5 | 2,5 | 1,5 | 3,0 | 6,5 | 8,0 | 3,0 | 6,5 | 8,0 | 8,0 | 4,0 | 8,0 | 8,0 | 8,0 |
| | BW | 1,5 | 2,5 | 2,5 | 5,0 | 8,0 | | 5,0 | 8,0 | | | 5,5 | | | |
| 5,00 | A, B | 1,5 | 3,0 | 3,0 | 6,5 | 8,0 | 8,0 | 5,5 | 7,0 | 8,0 | 8,0 | 8,0 | 8,0 | 8,0 | 8,0 |
| | BW | 2,5 | 5,0 | 5,0 | | | | 8,0 | | | | 8,0 | | | |

Type of material, lump size, height of fall and variation of speed between belt and material are influencing the wear of the cover decisively.

The table gives a guide for determination of cover thickness on carrying side for wear resistant belts. Although the cover thicknesses are sometimes identical, the same wear resistance cannot be expected for the types A, B and BW.

Cover thicknesses for special belts such as for instance heat resistant belts are determined according to the indications in each single belt programme.

**Table 13**
**RECOMMENDED VALUES FOR COVER THICKNESS, RUNNING SIDE**

| Material Properties | Cover Thickness, Running Side (mm) |
|---|---|
| Slightly abrasive materials | 1 |
| Moderately to very abrasive materials | 1-1,5 |
| Very abrasive and coarsegrained materials | 1,5-2 |

The cover thicknesses on the running side must be in harmony with the chosen thickness on the carrying side.

The belt programmes indicate recommended cover combinations.

**Table 14**
**BELT WEIGHT AND THICKNESS**

| MULTIPLY BELTS | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Fabric types | EP100 | EP125 | EP160 | EP200 | EP250 | EP315 | EP400 | EP500 | EP630 |
| Approx. weight/ply kg/m²) | 1,35 | 1,50 | 1,60 | 1,70 | 1,90 | 2,00 | 2,50 | 2,80 | 3,50 |
| Approx. thickness/ply (mm) | 0,9 | 1,0 | 1,2 | 1,3 | 1,4 | 1,6 | 1,8 | 2,2 | 2,6 |


| | A | B | BW | K | N | TCC | GW | GWF | GWM | GWS | GT | IWE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Approx. weight kg/m² pr. 1 mm | 1,11 | 1,14 | 1,14 | 1,14 | 1,14 | 1,11 | 1,11 | 1,23 | 1,16 | 1,18 | 1,18 | 1,38 |

Example:

EP 500/4, 6 + 2, type A
EP 500/4 = 4 EP125

| | | | | |
|---|---|---|---|---|
| Weight of carcass | = | 4 × 1,50 | = | 6,00 kg/m² |
| Weight of cover | = | 8 × 1,11 | = | 8,88 kg/m² |
| Belt weight | = | | approx. | 14,88 kg/m² |

| | | | | |
|---|---|---|---|---|
| Thickness of carcass | = | 4 × 1.0 | = | 4,0 mm |
| Thickness of cover | = | | | 8,0 mm |
| Belt thickness | = | | | approx. 12,0 mm |

2-PLY BELTS with STIFLEX

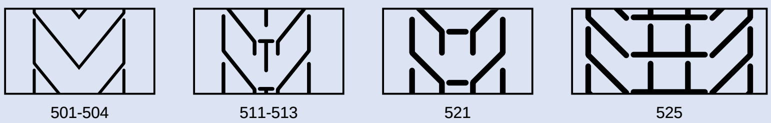

| | RO-PLY | | | | | | RO-PLY GWF | | GWM | RO-PLY |
|---|---|---|---|---|---|---|---|---|---|---|
| | 200/2 2 + 1 | 250/2 3 + 1 | 315/2 3 + 1 | 400/2 3 + 1 | 400/2 5 + 1,5 | 630/2 5 + 1,5 | 250/2 3 + 1 | 400/2 3 + 1 | 250/2 3 + 1 | Grip 4 |
| Approx. belt weight (kg/m²) | 6,8 | 8,4 | 8,6 | 9,1 | 11,7 | 13,4 | 9,3 | 10,0 | 8,6 | 4,5 |
| Approx. belt thickness (mm) | 5,2 | 6,6 | 6,8 | 7,3 | 9,8 | 10,5 | 7,0 | 7,5 | 6,8 | 5,5 |

Example:

RO-PLY 250/2, 3 + 1 – 650 mm
Ribs type 504

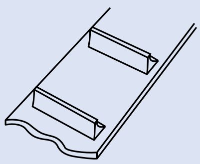
| | | | | |
|---|---|---|---|---|
| Belt weight | = | 0,65 × 8,4 | = | 5,46 kg/m |
| Ribs type 504 | | | = | 0,75 kg/m |
| Total weight | = | | approx. | 6,21 kg/m |

V-RIBS



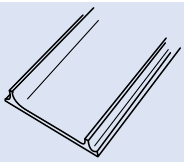

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Type | | | | | 501 | 502 | 503 | 504 | 511 | 512 | 513 | 521 | 525 |
| Approx. weight (kg/m) belt | | | | | 0,50 | 0,40 | 0,50 | 0,75 | 1,60 | 2,30 | 2,70 | 4,20 | 7,00 |
| Type | SA230 | SA420 | SB250 | SB310 | SB370 | SB470 | SC600 | SD780 | MD420 | MD550 | MD610 | LE450 | LE570 |
| Approx. weight (kg/m) belt | 0,76 | 0,90 | 1,145 | 0,65 | 0,525 | 0,88 | 1,10 | 1,60 | 1,20 | 1,60 | 2,40 | 3,15 | 3,40 |

HIGH TRANSVERSE RIBS



| | | | | | |
|---|---|---|---|---|---|
| Type | 325 | 340 | 20 | 380 | 400 |
| Approx. weight kg/pc. per 800 mm rib length | 0,22 | 0,43 | 1,64 | 1,65 | 1,92 |

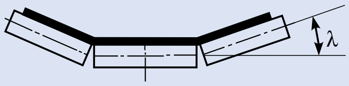
SIDEWALLS



| | |
|---|---|
| Approx. weight (kg/m) belt | 0,75 |

**Table 15**
**MAX. PERMISSIBLE TROUGH ANGLE λ (°)**

MULTIPLY BELTS




| Belt Type | Belt Width (mm) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | 300 | 400 | 500 | 650 | 800 | 1000 | 1200 | 1400 | 1600 |
| EP 200/2 | 45 | 45 | 45 | 45 | 45 | | | | |
| EP 250/2 | | 45 | 45 | 45 | 45 | 45 | | | |
| EP 315/3 | | 45 | 45 | 45 | 45 | 45 | 45 | | |
| EP 400/3 | | 45 | 45 | 45 | 45 | 45 | 45 | | |
| EP 400/4 | | 45 | 45 | 45 | 45 | 45 | 45 | | |
| EP 500/3 | | 30 | 45 | 45 | 45 | 45 | 45 | 45 | |
| EP 500/4 | | 30 | 45 | 45 | 45 | 45 | 45 | 45 | |
| EP 630/3 | | | 30 | 45 | 45 | 45 | 45 | 45 | |
| EP 630/4 | | | 30 | 45 | 45 | 45 | 45 | 45 | 45 |
| EP 630/5 | | | 30 | 45 | 45 | 45 | 45 | 45 | 45 |
| EP 800/3 | | | 30 | 45 | 45 | 45 | 45 | 45 | 45 |
| EP 800/4 | | | 30 | 45 | 45 | 45 | 45 | 45 | 45 |
| EP 800/5 | | | 30 | 45 | 45 | 45 | 45 | 45 | 45 |
| EP 1000/4 | | | | 30 | 45 | 45 | 45 | 45 | 45 |
| EP 1000/5 | | | | 30 | 45 | 45 | 45 | 45 | 45 |
| EP 1250/5 | | | | | 30 | 45 | 45 | 45 | 45 |
| EP 1250/6 | | | | | 30 | 45 | 45 | 45 | 45 |
| EP 1600/5 | | | | | 30 | 30 | 45 | 45 | 45 |
| EP 1600/6 | | | | | 30 | 30 | 45 | 45 | 45 |
| EP 2000/5 | | | | | | 30 | 30 | 45 | 45 |
| EP 2000/6 | | | | | | 30 | 30 | 45 | 45 |

The table is based on troughability according to ISO 703 and includes values for the most common width-strength relations. Regarding trough angles for widthstrength relations not indicated we recommend you to contact ROULUNDS. Troughability for 2-ply belts according to the belt programmes.

**Table 16**
**RECOMMENDED MIN. PULLEY DIAMETERS (mm)**
**2-PLY BELTS**

| Dependence of minimum pulley diameter on the degree of utilization of permissible working tension | | RO-PLY, PROGRAMMES 1, 6, 6A and 9 | | | | | | | TYPE IWE, PROGRAMME 8 |
|---|---|---|---|---|---|---|---|---|---|
| | | 200/2 2 + 1 | 250/2 3 + 1 | 315/2 3 + 1 | 400/2 3 + 1 | 400/2 5 + 1,5 | 630/2 5 + 1,5 | Grip 4 | EP 250/2 2 + 1 |
| 70-100% | driving pulley = $D_1$ mm | 200 | 250 | 315 | 400 | 400 | 500 | 200 | 200 |
| | tail pulley = $D_2$ mm | 160 | 200 | 250 | 315 | 315 | 400 | 160 | 160 |
| | snub pulley = $D_3$ mm | – | 160 | 200 | 250 | 250 | 315 | – | 160 |
| 50-70% | $D_1$ | 160 | 200 | 250 | 315 | 315 | 400 | 160 | 200 |
| | $D_2$ | 160 | 160 | 200 | 250 | 250 | 315 | 160 | 160 |
| | $D_3$ | – | 160 | 160 | 200 | 200 | 250 | – | 160 |
| < 50% | $D_1$ | 160 | 160 | 200 | 250 | 250 | 315 | 160 | 160 |
| | $D_2$ | 160 | 160 | 160 | 200 | 200 | 250 | 160 | 160 |
| | $D_3$ | – | 160 | 160 | 160 | 160 | 200 | – | 160 |

Example : Belt type RO-PLY 250/2,3 + 1, working tension 60% of max. permissible.
Driving, pulley $D_1$ = 200 mm,
tail pulley $D_2$ = 160 mm,
snub pulley $D_3$ = 160 mm.

MULTIPLY BELTS, see next page.

**RECOMMENDED MIN. PULLEY DIAMETERS (mm)**
**MULTIPLY BELTS**

| Utilization of max. permissible belt tension | Number of plies | Fabric types | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | EP 100 | | | EP 125 | | | EP 160 | | | EP 200 | | | EP 250 EP 315 | | | EP 400 EP 500 | | | EP 630 | | |
| | | $D_1$ | $D_2$ | $D_3$ | $D_1$ | $D_2$ | $D_3$ | $D_1$ | $D_2$ | $D_3$ | $D_1$ | $D_2$ | $D_3$ | $D_1$ | $D_2$ | $D_3$ | $D_1$ | $D_2$ | $D_3$ | $D_1$ | $D_2$ | $D_3$ |
| 65-100% | 2 | 160 | 160 | 125 | 200 | 160 | 160 | 250 | 200 | 160 | 315 | 250 | 200 | | | | | | | | | |
| | 3 | 200 | 200 | 160 | 315 | 250 | 200 | 400 | 315 | 250 | 500 | 400 | 315 | 630 | 500 | 400 | 800 | 630 | 500 | | | |
| | 4 | 315 | 250 | 200 | 400 | 315 | 250 | 500 | 400 | 315 | 630 | 500 | 400 | 800 | 630 | 500 | 1000 | 800 | 630 | 1250 | 1000 | 800 |
| | 5 | 400 | 315 | 250 | 500 | 400 | 315 | 630 | 500 | 400 | 800 | 630 | 500 | 1000 | 800 | 630 | 1250 | 1000 | 800 | 1600 | 1250 | 1000 |
| | 6 | | | | 630 | 500 | 400 | 800 | 630 | 500 | 1000 | 800 | 630 | 1250 | 1000 | 800 | 1600 | 1250 | 1000 | 2000 | 1600 | 1250 |
| 30-65% | 2 | 160 | 125 | 125 | 200 | 160 | 160 | 200 | 160 | 160 | 250 | 200 | 160 | | | | | | | | | |
| | 3 | 200 | 160 | 160 | 250 | 200 | 160 | 315 | 250 | 200 | 400 | 315 | 250 | 500 | 400 | 315 | 630 | 500 | 400 | | | |
| | 4 | 250 | 200 | 160 | 315 | 250 | 200 | 400 | 315 | 250 | 500 | 400 | 315 | 630 | 500 | 400 | 800 | 630 | 500 | 1000 | 800 | 630 |
| | 5 | 315 | 250 | 200 | 400 | 315 | 250 | 500 | 400 | 315 | 630 | 500 | 400 | 800 | 630 | 500 | 1000 | 800 | 630 | 1250 | 1000 | 800 |
| | 6 | | | | 500 | 400 | 315 | 630 | 500 | 400 | 800 | 630 | 500 | 1000 | 800 | 630 | 1250 | 1000 | 800 | 1600 | 1250 | 1000 |
| under 30% | 2 | 125 | 125 | 125 | 160 | 160 | 160 | 160 | 160 | 160 | 200 | 200 | 160 | | | | | | | | | |
| | 3 | 160 | 160 | 160 | 200 | 160 | 160 | 250 | 200 | 160 | 315 | 250 | 200 | 400 | 315 | 250 | 500 | 400 | 315 | | | |
| | 4 | 200 | 160 | 160 | 250 | 200 | 200 | 315 | 250 | 200 | 400 | 315 | 250 | 500 | 400 | 315 | 630 | 500 | 400 | 800 | 630 | 500 |
| | 5 | 250 | 200 | 200 | 315 | 250 | 250 | 400 | 315 | 250 | 500 | 400 | 315 | 630 | 500 | 400 | 800 | 630 | 500 | 1000 | 800 | 630 |
| | 6 | | | | 400 | 315 | 315 | 500 | 400 | 315 | 630 | 500 | 400 | 800 | 630 | 500 | 1000 | 800 | 630 | 1250 | 1000 | 800 |

$D_1$ = driving pulley.
$D_2$ = tail pulley – heavily loaded snub pulley.
$D_3$ = snub pulley – moderately loaded.

Example: belt type EP 500/4 = 4 EP 125.
Working tension: 50% of max. permissible working tension.
$D_1$ = 315 mm, $D_2$ = 250 mm, $D_3$ = 200 mm

**MATERIAL DATA**

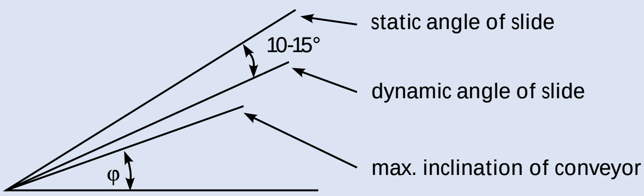
The list covers bulk density, static angle of slide as well as max. angle of inclination φ (°), under which the material can be transported on conveyor belts without ribs.

The angle of inclination is determined by the friction between material and belt, but decisive is the static and dynamic angle of slide of material, which depends on its internal friction.

The max. angle of inclination is lower than the dynamic angle of slide of material, which is rather difficult to determine exactly.

For most materials it can be said that the dynamic angle of slide is 10-15° lower than the static angle, which is formed horizontally by the material when it falls down shaping a free pile.

Fig. 20




Ribs can increase the angle of inclination in case the friction between belt and material is lower than the internal dynamic friction of the material, which determines the max. angle of inclination.

The bulk density, the angle of slide and max. angle of inclination being highly dependent on lump size, content of humidity etc., the values indicated in the table must be considered recommendations.

**Table 17**

| Material | bulk density γ (t/m³) | max. angle of inclination φ (°) | static angle of slide (°) |
|---|---|---|---|
| Agricultural lime | 1,1-1,2 | 20 | 30 |
| Alum lumps | 0,8-0,96 | 17 | 27 |
| powder | 0,72-0,8 | 23 | 30-45 |
| Aluminium oxide | 0,8-1,0 | | |
| hydrate | 0,3 | 25 | |
| sulphate | 0,86 | 17 | |
| Ammonia sulphate granulated | 0,7-0,9 | 10 | |
| Ammonium sulphate dry | 0,72-1,28 | 20 | 32 |
| moist | 1,3 | 33 | 45 |
| Ammonium chloride | 0,72-0,83 | 12 | |
| Ammonium nitrate | 0,72 | 15 | |
| Asbestos loose | 0,3-0,4 | 30 | 45 |
| pressed | 0,6-0,8 | | |
| Ashes dry from coal | 0,5-0,7 | 25 | 35-40 |
| moist from coal | 0,7-0,9 | 30 | 50 |
| Asphalt for road metal | 1,3-1,4 | 30 | |
| solid | 1,6 | | |
| Bakelite powder | 0,45-0,65 | 33 | 45 |
| Barley dry | 0,6-0,7 | 15 | 25-40 |
| Baryta coarse-grained | 2,4-2,9 | | |
| fine-grained | 1,9-2,3 | 18 | 30 |
| Bauxite from quarry | 1,3-1,44 | 17 | 31 |
| fine-grained, dry | 1,04-1,12 | 18 | 35 |
| Beet unwashed | 0,65-0,77 | 12-15 | 35-40 |
| washed | 0,5-0,6 | 10-12 | 30-45 |
| mass, wet | 0,4-0,7 | 18-20 | 31 |
| slices | | 20 | 35 |
| Bone meal | 0,9-0,96 | 20 | |
| Briquette lignite | 0,7-0,85 | 18 | |
| anthracite | 0,8-1,0 | 10 | |
| Broken stone, flint or granite | 1,3-1,6 | 18 | 40 |
| Cement portland | 1,2-1,36 | 20 | 39 |
| aereated | 0,8-1,2 | 6 | |
| clinker | 1,2-1,5 | 18 | 33 |
| slurry | 1,4-1,7 | 12 | |

| Material | bulk density γ (t/m³) | max. angle of inclina-tion φ (°) | static angle of slide (°) |
|---|---|---|---|
| Chile saltpetre | 1,0-1,3 | 25 | |
| Clay dry | 1,6-1,9 | 20-22 | 35 |
| dry in lumps, 75 mm | 1,0-1,2 | 18-20 | 35 |
| moist, 50 mm | 1,52-1,6 | 18 | 15-24 |
| Coal anthracite, coarse | 0,8-0,96 | 16 | 27 |
| bituminous, coarse | 0,7-0,9 | 18 | 38 |
| lignite | 0,72-0,88 | 22 | 38 |
| fine crushed | 0,7-0,8 | 22 | |
| Cocoa beans | 0,53-0,6 | 15 | 28 |
| Coffee beans, dried | 0,35-0,42 | 20 | 35 |
| beans, fresh | 0,51 | 10-15 | 25 |
| Coke and furnace coke | 0,4-0,55 | 20 | 45 |
| Concrete light-weight concrete | 0,3-1,5 | | |
| wet | 1,6-2,4 | 25 | 20-30 |
| dry | 2,1-2,4 | | |
| Copra lumps | 0,32-0,35 | 9 | 20 |
| Corn | 0,75 | 10 | 30 |
| Dolomite stone | 1,2-1,6 | 22 | 40 |
| Earth filling, moist with clay | 1,5-1,8 | 22 | 45 |
| filling, dry | 1,15-1,20 | 20 | 35 |
| Feldspar | 1,2-1,7 | 23 | 40 |
| Fish | 0,8-1,0 | | |
| Fishmeal | 0,55-0,65 | 20 | |
| Flour from grain | 0,55-0,65 | 21 | 45 |
| Flour-spar coarse | 1,7-1,9 | 30 | |
| fine-grained | 1,4-1,7 | 25 | |
| Foundry sand prepared | 1,3-1,45 | 24 | 32 |
| knocked out | 1,45-1,6 | 22 | 39 |
| core sand | 1,04 | 26 | 41 |
| Fullers earth, dry | 0,5-0,6 | 15 | 23 |
| oily | 0,96-1,04 | 20 | |
| Glass crushed | 1,3-1,6 | 20 | 35 |
| broken | 1,1 | 15 | 20-30 |
| Granite broken stones | 1,4-1,8 | 20 | 35 |
| pebble, 10 mm | 1,28-1,44 | 20 | 40 |
| Graphite crushed | 1,4 | | |
| flakes | 0,65 | 5 | |
| Gravel dry | 1,44-1,76 | 16 | 35 |
| moist | 1,84-2,1 | 20 | 32 |
| Gypsum powder | 0,95-1,4 | 20 | 40 |
| crushed. 3-10 mm | 1,12-1,28 | 21 | 40 |
| Ice crushed | 0,6-0,7 | 5 | 30 |
| Kaolin lumps | 1,0 | 20 | 35 |
| powder | 0,7-0,9 | 23 | 45 |
| Lead ore, fine | 3,2-4,3 | 15 | 30 |
| sulphate | 1,6 | 33 | 45 |
| oxide | 1,0-2,4 | 20 | |
| Lime lumps | 1,2-1,28 | 18 | 40-45 |
| burnt, 2 mm | 1,0 | 22 | |
| burnt, 2-20 mm | 0,96 | 15 | 5 |
| Limestone from quarry | 1,35-1,45 | 18 | 30-45 |
| Marble crushed | 1,3-1,6 | 10-15 | 20-30 |
| Marl | 1,3-1,5 | 20 | 35 |
| Millet, dry | 0,6-0,7 | 15 | 25 |
| Moler crushed, dry | 0,6-0,7 | | |
| Mortar, wet | 2,4 | 20-22 | |
| Oats, dry | 0,4-0,6 | 12 | 35-40 |
| Ore lead | 3,2-4,3 | 15 | 30 |
| iron | 1,6-3,2 | 18-20 | 35 |
| copper | 1,6-2,5 | 20 | |
| manganese | 2-2,3 | 20 | 39 |
| molybdenum | | 25 | |
| zinc, crushed | 2,4-2,6 | 22 | 38 |

| Material | bulk density γ (t/m³) | max. angle of inclina-tion φ (°) | static angle of slide (°) |
|---|---|---|---|
| Peanuts with shells | 0,25-0,3 | 8 | 20-30 |
| without shells | 0,55-0,7 | 8 | |
| Peas,dried | 0,7-0,8 | 8 | 30 |
| Phosphate fractional | 1,2-1,4 | 12-15 | 25-30 |
| pulverized | 0,96 | 13 | 26 |
| Potassium from quarry | 1,2-1,35 | 12-15 | |
| Potatoes | 0,7-0,8 | 12-15 | |
| Quartz coarse-grained, 30-75 mm | 1,35-1,52 | 18 | 35 |
| pulverized, 1-2 mm | 1,3-1,45 | 20 | 35 |
| Rice grain | 0,7-0,8 | 8 | 20 |
| Rye, dry | 0,67-0,73 | 8 | 23 |
| Salt refined, fine | 1,1-1,3 | 11 | 25 |
| refined, coarse | 0,65-0,9 | 18 | 30 |
| Saltpetre | 1,1 | | 30-45 |
| Sand fine, dry | 1,45-1,75 | 16-18 | 30-40 |
| fine, moist | 1,75-2,1 | 20-22 | 45 |
| Sandstone, crushed | 1,36-1,44 | 18 | 40 |
| Saw, dust | 0,15-0,21 | 22 | 36 |
| Slag coarse, blast furnace | 1,28-1,44 | 16 | 30 |
| crushed, dry | 0,96-1,04 | 16 | 30 |
| crushed, wet | 1,44-1,6 | 20-22 | 45 |
| Slate, crushed | 1,3-1,5 | 18 | |
| Soya bean whole | 0,7-0,8 | 12-16 | 21-28 |
| broken | 0,48-0,64 | 15-18 | 35 |
| cakes, 10 mm | 0,65-0,7 | 17 | 32 |
| Stone shingle | 1,4-1,5 | 20 | 35 |
| pebble gravel | 1,5 | 20-25 | 35 |
| crushed, 100/250 mm | 1,4-1,6 | 20 | 38 |
| pebble | 1,8 | 15 | |
| Sugar refined | 0,8-0,96 | 10-15 | 30 |
| unrefined | 0,88-1,04 | 23 | |
| Sulphur lumps | 1,2-1,4 | 18 | |
| powder | 0,8-1,0 | 21 | |
| Superphosphate, granulated | 0,8-0,9 | 15-17 | 33 |
| powder | | 18-20 | 30 |
| Wheat, dry | 0,5-0,7 | 12 | 40 |
| Wood-chips | 0,2-0,5 | 22-24 | 30 |

## EXAMPLE OF BELT SELECTION

The following projecting data are known:

| | |
|---|---|
| Material | Limestone |
| Bulk density | $\gamma$ = 1,40 t/m$^3$ |
| Capacity | $Q_2$ = 800 t/h, continuous operation |
| Lump size | 50-250 mm |
| Centre distance | L = 250 m |
| Angle of inclination | $\varphi$ = 6° |
| Height of fall at loading | 0,75 m |
| Material temperature | Ambient temperature –30/30°C |

### Belt Width and Belt Speed

| | |
|---|---|
| B min = 800 mm | table 1 (unsorted material) |
| v max = 2,5 m/s | table 2 (moderate, abrasive) |

### Capacity $Q_t$ (m³/h)

Required capacity $Q_2$ = 800 t/h, continuous operation

Theoretical capacity

$$Q'_t = \frac{Q_2}{v \times \gamma \times k} = \frac{800}{2,5 \times 1,40 \times 0,98} = 233\ m^3/h$$

With $Q'_t$ = 233 m³/h, B = 800 mm and basic angle $\beta$ = 15° as input values the job – ref. table 4 – can be solved by 3-sectioned idlers and trough angle $\lambda$ = 30°.

$Q_t = Q'_t \times v \times k = 243 \times 2,5 \times 0,98 = 595\ m^3/h$

$Q = Q_t \times \gamma = 595 \times 1,40 = 833\ t/h > Q_2$

Is a lower belt speed than v max. required, the trough angle or the belt width can be increased.

### Power Requirement

**Power required to drive empty conveyor $N_1$ (kW)**

$$N_1 = \frac{G\,(L + l)\,f \times v}{102} = \frac{25\,(250+100)\,0,020 \times 2,5}{102} = 4,29\ kW$$

| | | |
|---|---|---|
| G | = 25 kg/m | table 7 |
| $s_1$ | = 1,25 m | table 7 |
| $s_2$ | = 2,50 m | table 7 |
| l | = 100 m | table 8 |
| f | = 0,020 | table 9 |

**Power required to convey material on the level $N_2$ (kW)**

$$N_2 = \frac{Q\,(L + l)\,f}{367} = \frac{833\,(250 + 100)\,0,020}{367} = 15,88\ kW$$

**Power required to elevate material $N_3$ (kW)**

$$N_3 = \frac{Q \times H}{367} = \frac{833 \times 26,1}{367} = 59,24\ kW$$

$H = L \times \sin\varphi = 250 \times \sin 6° = 26,1\ m$

**Additional Power Requirement $N_4$ (kW), table 10**

$N_4 = 0,08 \times v \times$ length of skirt boards = $0,08 \times 2,5 \times 12 = 2,40$ kW

Length of skirt board 6 m each side

**Theoretical Necessary Motor Capacity $N_n$ (kW)**

$N_n = N_1 + N_2 \pm N_3 + N_4 = 4,29 + 15,88 + 59,24 + 2,40 \simeq 82,0$ kW

**Motor Capacity $N_m$ (kW)**

$$N_m = \frac{N_n}{\eta} = \frac{82}{0,85} = 96,47 \simeq 100\ kW$$

**Effective Tension P (N)**

$$P = \frac{N_n \times 1000}{v} = \frac{82 \times 1000}{2,5} = 32800\ N$$

**Max. Belt Tension $T_1$ (N)**

$T_1 = P \times m = 32800 \times 1,35 = 44280$ N

m is taken from table 11 according to the following:

- at a centre distance over 50 m gravity take-up is chosen
- arc of contact $\alpha$ is fixed at 220°
- driving pulley to be lagged with rubber
- running conditions estimated to be humid

m = 1,35 according to table 11.

**Working Tension p (N/mm)**

$$p = \frac{T_1}{B} = \frac{44280}{800} = 55\ N/mm$$

## CHOICE OF BELT TYPE

The procedure for the choice of belt type is indicated in selection of conveyor belts.

The initial torque is limited at max. 1,4 × normal torque of motor when choosing squirrel-cage motor and hydrodynamic clutch.

Recommended cover dimensions according to tables 12 and 13 in selection of conveyor belts.

### Material: Limestone

Carrying part

| $\frac{30 \times v}{L}$ | Cover types | Moderately abrasive, grain size 50-250 mm |
|---|---|---|
| $\frac{30 \times 2,5}{250} = 0,3$ | B, BW | 5 mm |

Return part

| | |
|---|---|
| Moderately to very abrasive | 1-1,5 mm |

**System key page 23**
Limestone that belongs to the group abrasive materials gives three programme possibilities.

The standard programmes 1 and 2 have p max. permissible working tension = 63 N/mm, vulcanized joint.

Programmes 1 = RO-PLY 630/2, 5 + 1,5

Programme 2 = EP 630/4, 5 + 1,5, type B, BW

Both belt types satisfy the demand on cover dimensions, and they are sufficiently robust to manage the loading conditions. As to technical use they are equally suitable, and the final choice will thus depend on wishes regarding standardization, delivery possibilities etc.

If the demands on cover dimensions, cover type, or working tension are outside the standard programmes 1 and 2, we refer to special programme 3.

**WE CHOOSE RO-PLY 630/2, 5 + 1,5 FROM PROGRAMME 1**

## CONTROL OF G-VALUE

If $G = 2G_b + \frac{G_{RO}}{s_1} + \frac{G_{RU}}{s_2}$ deviates considerably from the G-value used in table 7, $N_1$, $N_n$ and p should be corrected.

Belt weight $G_b = 13{,}4\ kg/m^2 \sim 10{,}7$ kg/m for 800 mm belt, table 14.

Carrying and return idlers, $G_{RO}$ and $G_{RU}$
Diameter is chosen at ∅ 89 mm: $G_{RO} = G_{RU} = 11$ kg, table 7

$$G = 2 \times 10{,}7 + \frac{11}{1{,}25} + \frac{11}{2{,}5} = 21{,}4 + 8{,}8 + 4{,}4 = 34{,}6 \text{ kg/m}$$

$$N_1 = \frac{34{,}6\ (250 + 100)\ 0{,}020 \times 2{,}5}{102} = 5{,}9 \text{ kW}$$

Original $N_1 = 4{,}29$ kW. The increased power requirement of empty conveyor is in this example without appreciable importance.

**The motor capacity $N_n$** is increased from 82 kW to 84 kW, but will not influence the chosen belt construction.

## PRE-TENSION $G_k$ (kg)

In the example $G_k$ is calculated with the gravity take-up placed at driving pulley and tail pulley.

Fig. 21

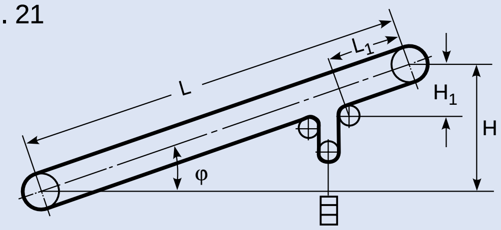
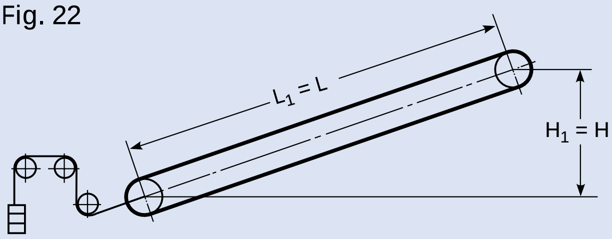



Fig. 22




**$G_k$ at driving pulley, fig. 21**

$$G_k = \frac{2 \times N_n\ (m\text{-}1)\ 102}{v} + \frac{2 \times 82\ (1{,}35\text{-}1)\ 102}{2{,}5} = 2342 \text{ kg}$$

**$G_k$ at tail pulley, fig. 22**

$$G_k = \frac{2 \times N_n\ (m\text{-}1)\ 102}{v} + 2\ (L_l\ (G_b + \frac{G_{RU}}{s_2})\ f - H_1 \times G_b)$$

$$G_k = \frac{2 \times 82\ (1{,}35\text{-}1)\ 102}{2{,}5} + 2\ (250\ (10{,}7 + \frac{11}{2{,}5})\ 0{,}02 - 26{,}1 \times 10{,}7)$$

$$G_k = 2342 + 2(76-279) = 1936 \text{ kg}$$

**Max. permissible belt sag (q/s)perm**
Max. belt sag q/s is fixed at 0,010

Requirement of min. belt tension $T_{min}$ (N) is calculated:
Carrying part

$$T_{min} = \frac{s_1\ (G_b + G_m)\ g}{8 \times (q/s)perm} = \frac{1{,}25\ (10{,}7 + 93)\ 10}{8 \times 0{,}01} = 16203 \text{ N}$$

$$G_m = \frac{Q}{v \times 3{,}6} = \frac{833}{2{,}5 \times 3{,}6} = 93 \text{ kg/m}$$

Belt tension at tail pulley, calculated

$$T = \frac{G_k \times g}{2} = \frac{1936 \times 10}{2} = 9680 \text{ N} < T_{min}$$

To keep the belt sag (q/s)perm = 0,01 the pre-tension must be increased by $T_{min}$-T = 16203-9680 = 6523 N

$$G_k \text{ tail pulley} = 1936 + 2 \times \frac{6523}{10} = 3241 \text{ kg}$$

$$G_k \text{ driving pulley} = 2342 + 2 \times \frac{6523}{10} = 3646 \text{ kg}$$

$T_1 = 45165 + 6523 = 51688$ N

$P = \frac{51688}{800} \simeq 64 \text{ N/m} \simeq p_{perm}$ for RO-PLY 630/2, 5 + 1,5

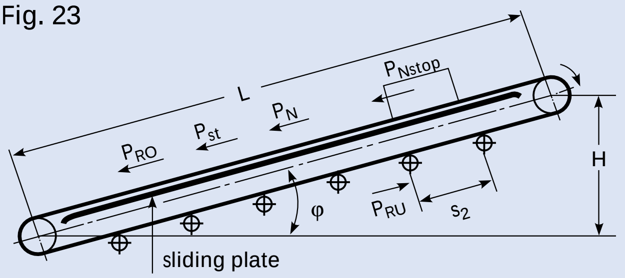
**Pulley diameters, table 16**
Driving pulley $D_1 = 500$ mm
Tail pulley $D_2 = 400$ mm
Pulleys at gravity take-up min. as $D_2$

# CALCULATION OF BELTS FOR CONVEYORS WITH SLIDING PLATE

Sliding belt conveyors are mainly used for light internal transport of packaged goods and goods in bulk. The advantages of sliding belts are quiet running without vibrations and belt sag.

On sliding belt conveyors the main forces are primarly produced by the frictional resistance between belt and sliding plate. Other forces are travelling friction on return part, lifting load and various secondary frictional resistances.

Fig. 23




## CALCULATION FORMULAS

| DETERMINATION OF | FORMULAS | REFERENCE |
|---|---|---|
| Belt width B (mm) | | Goods in bulk see table 1. Packaged goods max. specific pressure 3 kN/m$^2$ |
| Belt speed v (m/s) | | Normally 0,2-0,8 m/s |
| Weight of material $G_m$ (kg/m) | $G_m = \frac{Q}{v \times 3,6}$ | Capacity Q goods in bulk table 4, 5 and 6<br>For packaged goods convert to kg/m |
| FRICTIONAL RESISTANCES:<br>Carrying part $P_{RO}$ (N) | $PRO = g \times \mu \times L\ (G_b + G_m)$ | μ according to table 19<br>$G_b$ according to table 14 |
| Return part, idlers $P_{RU}$ (N) | $P_{RU} = g \times f \times L\ (G_b + \frac{G_{RU}}{s_2})$ | $G_{RU}$ according to table 7<br>f according to table 9 |
| Return part, sliding plate $P_{RU}$ (N) | $P_{RU} = g \times \mu \times L \times G_b$ | The most normal is return part with idlers |
| Lifting or lowering load $P_{st}$ (N) | $P_{st} = g \times H \times G_m$ | |
| Breaking $P_{Nstop}$ (N) | $P_{Nstop} = g\ (\mu \times G_m \times \cos\varphi - G_m \times \sin\mu)$ | Braking of material is often used in connection with transport of packaged goods |
| Effective tension P (N) | $P = C\ (P_{RO} + P_{RU}) \pm P_{st} + P_{Nstop}$ | C according to table 18 |
| Theoretical necessary motor capacity $N_n$ (kW) | $N_n = \frac{P \times v}{1000}$ | |
| Motor capacity $N_m$ (kW) | $N_m = \frac{Nn}{\eta}$ | If not known, the degree of efficiency of drive can be calculated at 0,85-0-95 |
| Max. belt tension $T_1$ (N) | $T_1 = P \times m$ | m according to table 20, or according to formula for drive factor m |
| Working tension p (N/mm) | $p = \frac{T_1}{B}$ | |
| Choice of belt type | | SYSTEM KEY<br>and particularly programme 3 and 9 |
| Pre-tension $G_k$ (kg) | $G_k \simeq 2\ (T_1 - P)\ \frac{1}{g}$ | |

**Table 18**
**FACTOR C (-)**

| Mean specific pressure belt and material (kN/m$^2$) | Centre distance L (m) | | | | | |
|---|---|---|---|---|---|---|
| | 2,5 | 5 | 10 | 25 | 50 | > 100 |
| ≤ 0,1 | 1,8 | 1,4 | 1,2 | 1,09 | 1,05 | 1 |
| < 3,0 | 1,04 | 1,02 | 1,01 | 1,0 | 1,0 | 1,0 |

1 kg/m$^2$ ≃ 10 N/m$^2$

**Table 19**
**COEFFICIENT OF FRICTION μ (-)**

| Bottom side of belt | Support – surface temperature | | | | | |
|---|---|---|---|---|---|---|
| | Bright steel plate | | | | Plastics + 18°C | Hard wood + 18°C |
| | -20°C | 0°C | + 18°C | + 40°C | | |
| EP non-rubberized | 0,30 | 0,30 | 0,30 | 0,25 | 0,28 | 0,28 |
| B60 non-rubberized | 0,75 | 0,70 | 0,45 | 0,35 | 0,40 | 0,35 |
| B60 rubberized | | | 0,70 | | 0,60 | 0,60 |
| Rubber cover | | | 0,90 | | | |

Friction between belt and slide bed at specific pressure p < 3 kN/m$^2$, belt speed v = 0,2-0,8 m/s

**Table 20**
**DRIVE FACTOR m (-)**

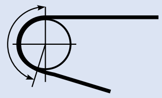
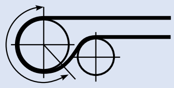
| $m = 1 + \frac{1}{e^{\mu\alpha}-1}$ | Driving pulley arrangement | | | α  | | | α  | | |
|---|---|---|---|---|---|---|---|---|---|
| Bottom side of belt | Driving pulley | | μ | Arc of contact α (°) | | | | | |
| | | | | 150 | 180 | 210 | 220 | 230 | 240 |
| Rubberized | lagged | dry | 0,30 | 1,84 | 1,64 | 1,50 | 1,46 | 1,43 | 1,40 |
| | | humid | 0,25 | 2,09 | 1,83 | 1,67 | 1,62 | 1,58 | 1,54 |
| | bare | dry | 0,22 | 2,08 | 2,00 | 1,81 | 1,75 | 1,71 | 1,66 |
| | | humid | 0,20 | 2,46 | 2,14 | 1,93 | 1,87 | 1,81 | 1,76 |
| Non-rubberized EP or cotton | lagged | dry | 0,25 | 2,09 | 1,83 | 1,67 | 1,62 | 1,58 | 1,54 |
| | | humid | 0,22 | 2,08 | 2,00 | 1,81 | 1,75 | 1,71 | 1,66 |
| | bare | dry | 0,15 | 3,08 | 2,66 | 2,36 | 2,30 | 2,22 | 2,13 |
| | | humid | 0,10 | 4,34 | 3,71 | 3,26 | 3,14 | 3,02 | 2,92 |

Table values are for screw take-up.

# SYMBOLS

B = belt width (mm)
C = factor for sliding belts, table 18 (-)
D = roll diameter of belt (m)
$D_1$ = driving pulley diameter, table 16 (mm)
$D_2$ = tail pulley diameter, table 16 (mm)
$D_3$ = diameter of snub pulley, table 16 (mm)
d = diameter of belt roller drum (m)
e = 2,7183, the base of natural logarithms
f = coefficient of friction of rolling parts, table 9 (-)
G = weight of moving parts of conveyor, table 7 (kg/m)
$G_b$ = weight of belt, table 14 (kg/m)
$G_k$ = gravity take-up (kg)
$G_m$ = weight of material, kg per m belt (kg/m)
$G_{RO}$ = weight of carrying idlers, table 7 (kg)
$G_{RU}$ = weight of return idlers, table 7 (kg)
g = acceleration due to gravity (m/s²)
H = lifting or falling height (m)
$H_1$ = height from driving pulley to gravity take-up (m)
k = correction factor, inclined transport, table 3 (-)
L = centre distance (m)
$L_1$ = distance from driving pulley to gravity take-up (m)
$l_1$ = length of idler, flat idlers (mm)
$l_2$ = length of idler, two-sectioned idlers (mm)
$l_3$ = length of idler, three-sectioned idlers (mm)
m = drive factor, table 11 – for sliding belts, table 20
$N_1$ = power required to drive empty conveyor (kW)
$N_2$ = power required to convey material on the level (kW)
$N_3$ = power required to elevate or lower material (kW)
$N_4$ = additional power requirement (kW)

$N_n$ = theoretical necessary power requirement (kW)
$N_m$ = motor capacity (kW)
p = working tension (N/mm)
P = effective tension (N)
$P_{RO}$ = frictional resistances, carrying part on sliding belts (N)
$P_{RU}$ = frictional resistances, return part on sliding belts (N)
$P_{st}$ = lifting or lowering load, sliding belts (N)
$P_{Nstop}$ = braking of material, sliding belts (N)
$Q_1$ = required capacity (m³/h)
$Q_2$ = required capacity (t/h)
$Q'_t$ = theoretical capacity at v = 1 m/s (m³/h)
Q = theoretical capacity (t/h)
q = belt sag between idlers (m)
$s_1$ = distance between carrying idlers (m)
$s_2$ = distance between return idlers (m)
T = belt tension (N)
$T_1$ = max. belt tension when approaching driving pulley (N)
$T_2$ = belt tension when leaving driving pulley (N)
$T_{min}$ = lowest permissible belt tension (N)
$t_d$ = thickness of cover (mm)
$t_b$ = thickness of belt (mm)
v = belt speed (m/s)
$v_{max}$ = max. belt speed, table 2 (m/s)
α = arc of contact on driving pulley (°)
ß = basic angle of load stream cross section (°)
γ = bulk density, table 17 (t/m³)
η = degree of efficiency of the transmission (-)
μ = coefficient of friction, table 11 – for sliding belts, table 19 and 20 (-)
λ = trough angle, carrying idlers, table 4 and 5 (°)
φ = angle of inclination of conveyor (°)

**SPECIFICATION OF CONVEYOR BELT TYPE**
The below mentioned examples indicate the data for unambiguous specification of conveyor belts.

BELT CHOICE FROM PROGRAMME 1

Conveyor Belt Type RO-PLY
Open 300 m × 800 mm × 400/2, 5 + 1,5

- Belt Length (open or endless)
- Belt Width
- Belt Strength (N/mm)
- Number of Plies
- Top Cover (mm)
- Bottom Cover (mm)
- Belt Type

BELT CHOICE FROM PROGRAMME 2
RIBS FROM PROGRAMME 11

Conveyor Belt Type B
Ribs Type 512
Endless 80,00 m × 650 mm × EP 400/3, 3 + 1

- Belt Length (open or endless)
- Belt Width
- Fabric Type
- Belt Strength (N/mm)
- Number of Plies
- Top Cover (mm)
- Bottom Cover (mm)
- Rib Type (programme 11)
- Belt Type

BELT CHOICE FROM PROGRAMME 12

Conveyor Belt Type XE
Open 200 m × 1000 mm × XE 630/3-2, 4 + 2

- Belt Length (open or endless)
- Belt Width
- Fabric Type
- Belt Strength (N/mm)
- Number of EP plies
- Number of monofilament plies
- Top Cover (mm)
- Bottom Cover (mm)
- Belt Type

## THE INTERNATIONAL SYSTEM OF UNITS (SI)

A system for technical measuring is being introduced. It is the SI (Système internationale d'unités) which is compiled by the International Committee of Measure and Weight.

The introduction of SI, which is based upon the basic units metre (m), kilo (kg), second (s) and ampere (A), will also influence those circles working with conveyor belts. Thus SI indicates power in kilowatt (kW), instead of the previously used horse power (HP).

In SI the tensile strength for conveyor belts will be indicated in Newton/millimetre (N/mm) against previously kilogrammeforce/centimetre (kp/cm).

The relations between the previously used units in the technical system and the SI-units are mentioned below. For the sake of clearness we have only mentioned the units that are most common for conveyor belts.

1N = 0,102 kp ~ 0,1 kp
1N/mm = 1 kp/cm
1 N/mm$^2$ = 10 kp/cm$^2$
1 kW = 1,36 HP


## CONVEYOR BELT STANDARDS

| | | ISO | DIN | BS | SMS | NF |
|---|---|---|---|---|---|---|
| Carcass | Adhesion fabric/fabric | 252 | 22102 | 490 | 2472 | M 81-671 |
| | Warp strength | 283 | 22102 | 490 | 2329 | M 81-671 |
| | Mechanical joining | 1120 | 22110 | | | M 81-671 |
| | Weft strength | 283 | 22102 | 490 | | M 81-671 |
| | Elongation | 283 | 22102 | 490 | | M 81-671 |
| Cover | Tensile strength | 10249 | 22102 | 490 | | M 81-671 |
| | Elongation at break | 10247 | 22102 | 490 | | M 81-671 |
| | Thickness | 583 | 22102 | 490 | 2329 | M 81-671 |
| | Wear loss | 10247 | 22102 | | | M 81-671 |
| Entire belt | Belt width | 251 | 22102 | 490 | 2329 | M 81-671 |
| | Straightness | | 22102 | | | M 81-671 |
| | Belt thickness | 583 | 22102 | 490 | 2329 | M 81-671 |
| | Adhesion fabric/fabric | 252 | 22102 | 490 | 2472 | M 81-671 |
| | Belt length | 251 | 22102 | 490 | 2329 | M 81-671 |
| | Adhesion cover/fabric | 252 | 22102 | 490 | 2472 | M 81-671 |
| | Troughability | 703 | | 490 | 2469 | M 81-671 |
| Belt properties | Antistatic | 284 | 22104 | 3289 | 2474 | M 81-671 |
| | Flameproof | 340 | 22103 | 3289 | | M 81-671 |

Conveyor belt data are standardized in a number of national and international standards. The following standards are indicated in the survey:

ISO – International Organization for Standardization
DIN – Deutsche Normen
BS – British Standard Institution
SMS – Sveriges Mekanförbunds Standardcentral
NF – Association Française de Normalisation

## Table 21. STANDARDS FOR CONVEYOR BELTS

| Cover | ISO 10247 | | | DIN 22102, 1991 | | | | BS 490 | |
|---|---|---|---|---|---|---|---|---|---|
| | H | D | L | W | X | Y | Z | M24 | N17 |
| Min. elongation at break (%) | 450 | 400 | 350 | 400 | 450 | 400 | 350 | 450 | 400 |
| Min. tensile strength (N/mm$^2$) | 24 | 18 | 15 | 18 | 25 | 20 | 15 | 24 | 17 |
| Max. wear loss (mm$^3$) | 120 | 100 | 200 | 90 | 120 | 150 | 250 | | |

The tables indicate the most commonly used data for conveyor belts.

## Table 22

| Adhesion | ISO 252 Natural fibres | ISO 252 Synthetic fibres | DIN 22102 | BS 490, Part 1, 1972 |
|---|---|---|---|---|
| Cover/fabric (N/mm) | 0,8 < $t_d$ < 1,5 mm: 2,4<br>$t_d$ > 1,5 mm: 3,0 | 0,8 < $t_d$ < 1,5 mm: 3,5<br>$t_d$ > 1,5 mm: 3,9 | 0,8 < $t_d$ < 1,5 mm: 3,5<br>$t_d$ > 1,5 mm: 4,5 | 0,8 < $t_d$ < 1,6 mm: 2,35<br>$t_d$ > 1,6 mm: 2,80 |
| Fabric/fabric (N/mm) | 3,5 | 5,0 | 5,0 | 3,15 |

## Table 23. THICKNESS TOLERANCE

| COVER THICKNESS | ISO 583 | DIN 22102 | BS 490 |
|---|---|---|---|
| $t_d \le 4$ mm | + none<br>– 0,2 mm | – 0,2 mm | + none<br>– 0,2 mm |
| $t_d > 4$ mm | + none<br>– 5% | – 5% | + none<br>– 5% |

## Table 24. VARIATION OF THICKNESS

| BELT THICKNESS | ISO 583 | DIN 22102 | BS 490 |
|---|---|---|---|
| $t_b \le 10$ mm | 1 mm | ± 1 mm | 1 mm |
| $t_b \le 10$ mm | 10% | ± 10% | 10% |

The max. difference between the values of the total thickness measured on two arbitrary points on the belt.

## Table 25. WIDTH TOLERANCE

| BELT WIDTH (mm) | ISO 251 | DIN 22102 | BS 490 |
|---|---|---|---|
| 300- 500 | ± 5 mm | ± 5 mm | ± 6,5 mm |
| 650-1600 | ± 1% | ± 1% | ± 1% |
| 1800-2200 | ± 1% | ± 1% | ± 1% |

## Table 26. LENGTH TOLERANCE

| BELT LENGTH (mm) | ISO | DIN 22102 | BS 490 |
|---|---|---|---|
| Endless belts:<br>up to 15,000<br>over 15,000 to 20,000<br>over 20,000 | ± 0.5% | ± 50 mm<br>± 75 mm<br>± 0.5% | ± 0.5% |
| Open belts:<br>One length | + 2%<br>– 0.5% | + 2,5%<br>– 0% | + 2%<br>– 0% |
| More than one length:<br>Each length<br>Sum of part lengths | + 2/– 0.5%<br>+ 2/– 0.5% | ± 5%<br>+ 2.5/0% | + 2/– 0%<br>+ 2/– 0% |
| Stock lengths | – | ± 5% | – |

*) Endless length is measured inside on a belt without tension.


## TRANSPORT AND STORAGE

It is important that conveyor belts are transported and stored correctly, as the opposite may result in damages even before the belts are mounted.

**Roll weight and roll diameter**

Because of the handling it is useful to know the weight and diameter of the belt roll.

**The roll weight** is calculated as follows:

Carcass weight (kg/ $m^2$ per ply) see table 14
\+ cover weight (kg/$m^2$ per 1 mm) see table 14
belt weight (kg/$m^2$)

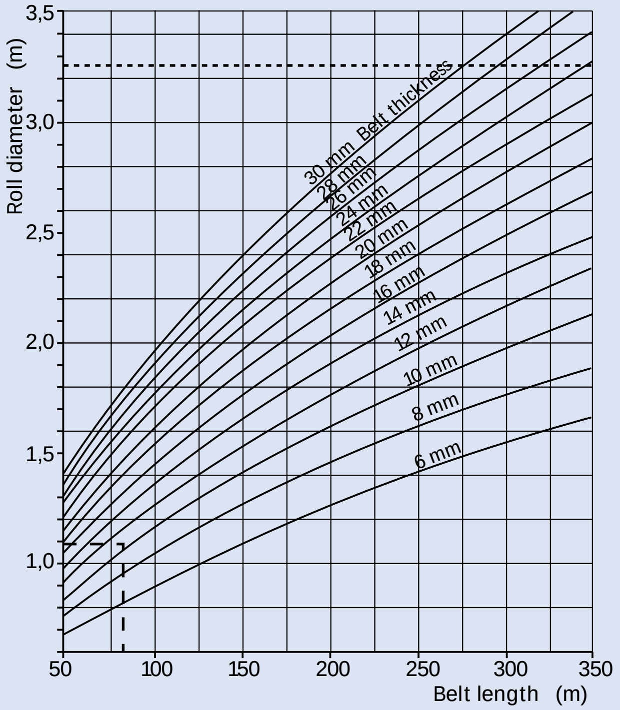
Roll weight = belt weight (kg/$m^2$) × belt width (m) × belt length (m)

Example:
Roll weight
85 m × 650 mm × EP 500/4, 5 + 1,5 GWF

| | | |
|---|---|---|
| Carcass weight | 1,50 × 4 | = 6,00 kg/$m^2$ |
| Cover weight | 1,23 × 6,5 | = 8,00 kg/$m^2$ |
| Belt weight = | | 14,00 kg/$m^2$ |
| Roll weight = | 14,00 × 0,65 × 85 ≅ 774 kg | |

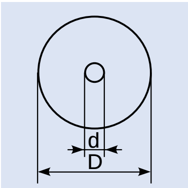
The roll diameter can be taken from the diagram fig. 24. For belt thickness between the values indicated, you can interpolate between the curves.

Fig. 24




The roll diameter can also be calculated according to the following formula:

$$D = \sqrt{\frac{4 \times t_b \times L}{\pi} + d^2}\ (m)$$




$t_b$ = belt thickness in metres
L = belt length in metres
d = diameter of roller drum in metres

Example:
85 m × 650 mm × EP 500/4, 5 + 1,5 GWF

| | | | |
|---|---|---|---|
| Carcass thickness | 1,0 × 4 | = | 4,0 mm, see table 14 |
| Cover thickness | | | 6,5 mm |
| Belt thickness | | | 10,5 mm |

In the diagram fig. 24 for belt thickness 10,5 mm and belt length 85 m the roll diameter is read at approx. 1,1 m.

**Packing**
If nothing else is specified the conveyor belts for European destinations are normally shipped unpacked.

For overseas destinations the conveyor belt rolls are normally wrapped in plastic foil. In connection with roll diameters of more than approx. 1,8 m a wooden cross is used.

If requested, the belts can be packed in wooden drums, see photo.

Narrow belts with large diameter are supplied with wooden cross to secure that the roll does not give way, see photo.

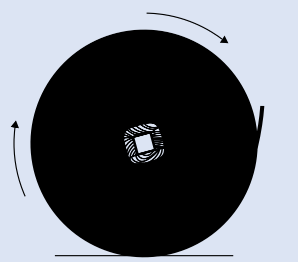
Long, endless belts as well as belts with ribs are also packed on wooden cross mounted on sledge, see photo.

The price for wooden packing and special packing is charged separately.

**Transport**
When conveyor belts are transported the following should be observed:

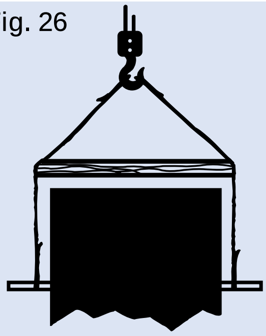
Belt rolls should never be thrown from the truck, waggon etc.

Fig. 25



Unprotected belts must as far as possible only be rolled over plane surfaces and only in the rolled up direction of the belt.

Fig. 26



When lifting by crane a traverse must always be used in order not to damage the belt carcass.

Unprotected belt rolls must not be tipped onto their side, and they must not be turned on the spot.

**Storage**
If the belts are to be stored for a long period the following should be observed:

The warehouse must:

- be dry and cool – 10 to 20°C – and be well airiated.
- have a relative humidity of approx. 65%.
- be screened from direct sunlight.
- not be used for storage of acids, lubricants, and dissolvents, the vapours of which may damage the rubber cover of the belts.

Position:

- belt rolls must never be placed direct on floor and never laid on their edges which may cause obliquities of belt.
- when storing for long periods the rolls should be fitted with a transverse shaft and be placed on a bearing frame. At intervals the rolls should be turned in order that the inner pressure does not continuously affect the same spot.

# MOUNTING OF BELT

**Preparation of conveyor**
Before monting a belt it must be checked that the conveyor is in order.

All carrying idlers and return idlers must have an easy and untroubled running, they must be at right angles to the travelling direction of the belt and level with each other. The same applies to driving and tail pulleys. All pulleys and idlers must be intact and without grease and build-up of material.

Scrapers, rubber skirting, and hoppers are dismounted, or their distance from the belt is increased so much that the belt can be mounted unhindered. Rubber on skirt boards, hoppers and scrapers are checked.

Screw take-up is adjusted at shortest centre distance. On conveyors with gravity take-up the suspension and the movable parts of the system are checked. After that the gravity take-up is locked in the uppermost position.

**Mounting of belt**
Unpacked belts must as far as possible only be rolled over plane surfaces and only in the rolled up direction. When lifting by crane traverse should always be used. The new belt is placed on trestles at the end of the conveyor.

The belt is pulled on to the conveyor by means of rope/tackle or it can be attached to the previous belt. It is normally appropriate first to pull the belt on to the return part, also with inclined conveyors.

Make sure that the belt is placed »the right way« round the snub idlers, and that the material side is away from the carrying idlers.

**Joining of belts**
With regard to joining of conveyor belts by hot and cold vulcanizing we refer to our instructions for the different belt types. The joining material indicated should be used.

When joining belts with ribs the ribs should be mounted over the joining by cold vulcanizing after the belt has been joined.

It must be pointed out that materials for cold vulcalnizing cannot be used for joining of heat resistant belts, if the temperature of the transported material exceeds 90°C. For warmer materials hot vulcanizing or mechanical joining is recommended.

With regard to mechanical joining we refer to instructions for the fastener type in question.

**Running-in**
For trouble free operation when the belt has been mounted ensure that it is run-in correctly:

- make sure that all tools etc. have been removed from both belt parts.
- give the belt a suitable initial tension. On installations with gravity take-up it may be an advantage to reduce the weight during initial start-up.
- the belt should be set in motion unloaded and fine adjusted.
- the load is gradually increased up to full load, and further adjustments should be made concurrently with increasing load. Necessary adjustment of initial tension is made.
- make sure that the driving pulley drives the belt under all conditions. On conveyors with gravity take-up ensure that the travel is sufficient. This must be checked regularly.

Concerning reversible conveyors great care should be taken with running-in. Corrections made to obtain straight running in one direction may have the opposite effect when the belt is reversed. Consequently you may be forced to accept a compromise.

# Maintenance

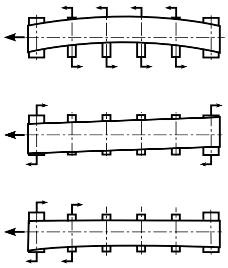
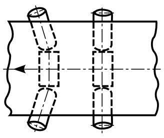
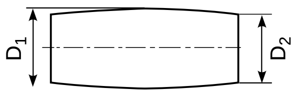
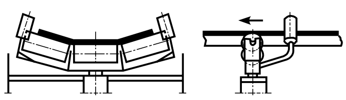
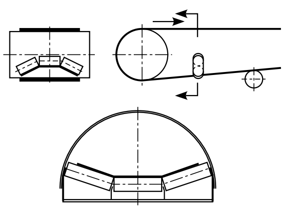
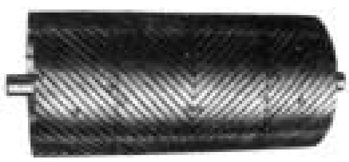
Belts in operation will provide the longest life-time if you tend to them regularly as follows:

- remove any built-up material from all rotating parts.
- remove any built-up material from underneath the conveyor.
- check that all idlers move easily.
- replace worn carrying idlers and return idlers.
- grease rotating parts and remove superfluous grease.
- check rubber skirtings and scrapers.
- check pulley lagging.
- adjust belt travel.
- check belt tension.
- repair damage in belt if any.

ROULUNDS

## TROUBLE TRACING

Oblique travel may cause a fast deterioration, although the quality of the belt is very high. In order to assist you we have compiled some of the reasons for oblique travel with appropriate corrective action.

| REASON FOR OBLIQUE TRAVEL | | REMEDIES |
|---|---|---|
| 1) Insufficient aligning of pulleys and idlers |  | a) align all pulleys, carrying idlers and return idlers at right angles to the travelling direction of the belt.<br>b) check that all pulleys and idlers are level to each other.<br>Adjustment is made as indicated on drawing by turning pulleys and carrying idlers in direction of arrow, until the belt is running straight and centered on the conveyor.<br>Also return idlers may cause oblique belt travel, and therefore they must be aligned at right angles to the travelling direction of the belt, and after that adjustment can be made. |
| 2) Malalignment of frame |  | c) oblique travel can be reduced by turning forward outer carrying idlers 1-3° in travelling direction of the belt.<br>d) align the frame. |
| 3) Material built-up on pulleys and idlers | | e) clean idlers and pulleys. Check belt cleaners and replace if necessary. Possibly change to more efficient type. |
| 4) Discharge of material, sidewards | <br>The crowing must be regular and symmetrical.<br>Max. permissible crowing:<br>$\frac{D_1-D_2}{2} < 0{,}005 \frac{D_1}{2}$ ~ $D_2 \geq 0{,}995\ D_1$ | See above point c).<br>f) head pulley is crowned. |
| 5) Oblique or sideways loading of material | | g) feeder must be changed so that the material falls in the middle and in the travelling direction of the belt. |
| 6) Wet patches on the pulley side of the belt due to rain or snow (causes friction variations between the belt and the pulleys) |  | See above points c) and f).<br>h) use self-adjusting carrying and return idlers.<br>Roofing the conveyor may be necessary. |
| 7) Side influences due to wind |  | See above points c), f) and h).<br>i) run belt correct on to tail pulley by mounting a »reverse trough frame« immediately before pulley. The frame must be adjustable in all directions.<br>j) strong winds may lift even comparatively heavy belts from uncovered conveyors. Arched wind screens can be mounted at a distance of 10-20 metres. |
| 8) Oblique joining of belt. Inspection almost always shows minor obliquities in the joint, but will seldom result in oblique travel.<br>In connection with an oblique joining of a belt the joint section of the belt is drawn to the same side during the whole length of the belt travel.<br>If there are obliquities of the conveyor, or if the carrying and/or return idlers are maladjusted the belt travel will only be oblique on the oblique section of the conveyor. |  | See above points c), f) and h).<br>k) lagged driving pulley can – due to the increase of friction – have a stabilizing effect on the belt travel.<br>l) the joining is opened and corrected. |

## SERVICE FACILITIES

As part of our service we can offer:

- technical support in connection with dimensioning and choice of conveyor belts
- education of your staff concerning application and maintenance of conveyor belts
- vulcanizing assistance and education af vulcanizers.

Apart from the above we can offer to help our customers to get a better transport economy by standardizing their belts. On the basis of technical data and/or drawings we limit the belt variants to a minimum of belt types. Such standardization provides evident advantages with regard to maintenance, spare belt stock and re-ordering.

Contact our importer/dealer or
A/S ROULUNDS FABRIKER.