

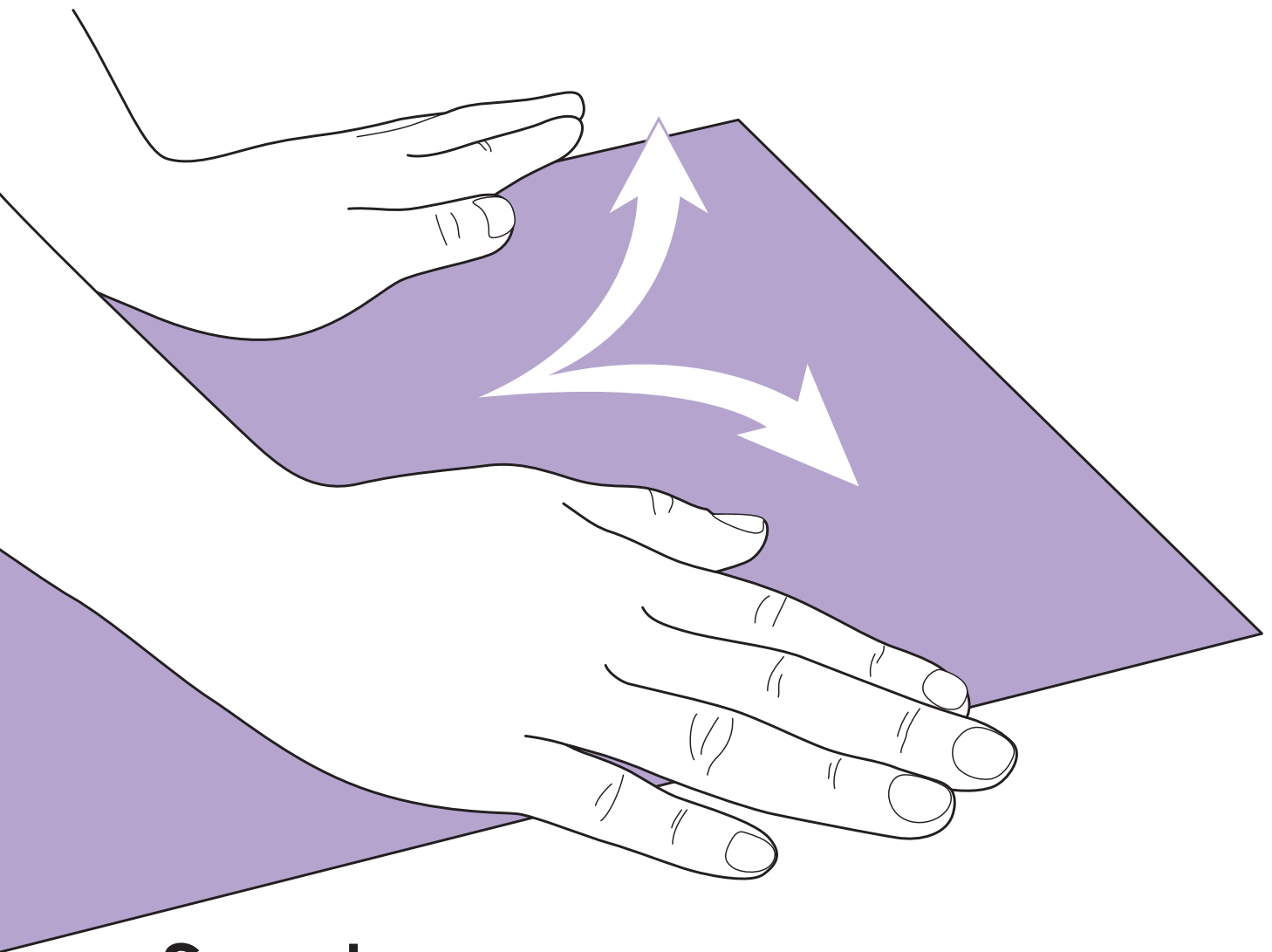
UE

WRINKLE REMOVING ROLL



FLAT EXPANDER ROLL (FE)

MIRAVO ROLL (MRV)



Spread

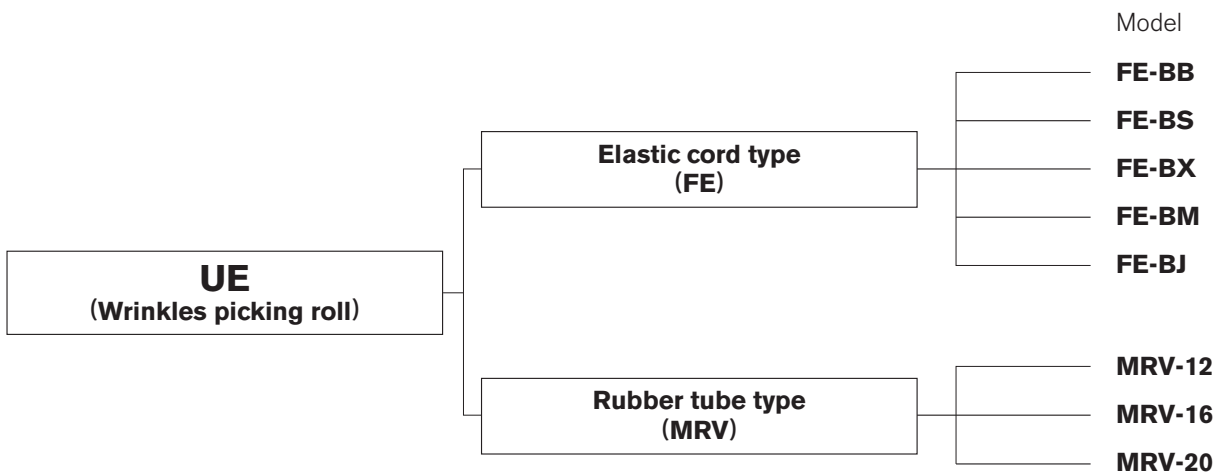
Gently removes wrinkles from web materials by natural movements.

Curved rolls, bow rolls or banana rolls usually come to mind when speaking about wrinkle removing rolls. However, the curved shape of the roll is responsible for its structural defect of overstretching center and slacking edges. This means that the central part of the web material is stretched more than its edges.

UE wrinkle removing rolls were developed to solve this problem. The rubber of the roll surface stretches greatly and gradually toward both sides from the center. This rubber stretch has the same effect as stretching the web by hand from the center to the edges to remove wrinkles. This effect allows to remove wrinkles by gently spreading the entire width of the web.

We offer two types of wrinkle removing rolls: an elastic cord type called "Flat Expander (FE)" and a rubber tube type called "Miravo (MRV)". We have dimensions to specifications of a film and the Web using, rubber materials. Each type can be produced with dimensions and rubber materials matching specifications of your web or film. We are working on further expansion of our line-up to meet the needs of our customers.

※ "UE" is the acronym for U. Engineering Co., Ltd. that has originally developed this product group. After receiving the wrinkle removing roll business in 2005, "UE" is used as a trade name.



1. Flat expander (FE)

1. Outline

- Flat expander (FE) is an elastic cord type straight wrinkle removing roll.
- It can remove wrinkles in cloth, nonwoven fabric, plastic film, paper and glass fiber.
- A large number of elastic cords are distributed evenly around the roll. Whenever the roll rotates, each elastic cord expands and contracts repeatedly. When the web is wound between expanding and contracting parts of the elastic cord, the stretching of the cord spreads the web. This action removes wrinkles from the web.
- The top-quality roll is manufactured from highly advanced parts. For example, a sliding resin piece with a very low friction coefficient is attached to the underside of the elastic cord. This allows the elastic cord to stretch gradually without obstacles.

2. Features

- **Linear roll removes wrinkles without stretching the web like curved rolls.**

Neither overstretching at the center nor slacking at the edges occurs like with curved rolls!

- **The installation direction**

Any direction of the web pass line is supported, from horizontal to vertical. The web wrap angle on the roll normally is in the range from 30 to 90 degrees.

- **Improved wrinkle removing effect**

The elastic cord extends smoothly outwards from the center of the roll. The web can be pulled outwards directly by surface friction in accordance with this extension. This action provides higher wrinkle removing effect compared to curved rolls.

- **Further service life increase**

Designed to reduce wear of rotating / sliding members, it can improve service life of the whole roll.

- **Ready for high-speed lines**

Various highly efficient high-speed mechanisms provide support for high-speed lines.

- **Simple adjustment of expansion even during web operation with adjustment bolts on both sides of the roll.**

The amount of expansion (stretching) of the elastic cord can be adjusted by changing tilt angle of the rings on both sides of the roll. The adjustment bolts on the rings can be moved even when the web is being transported, allowing simple adjustment of the optimal amount of expansion. The tilt angle of the ring can be checked with an angle scale.

- **Ready for use immediately after installation**

- **Consumable elastic cords can be easily replaced on site**

3. Spread wrinkles principle

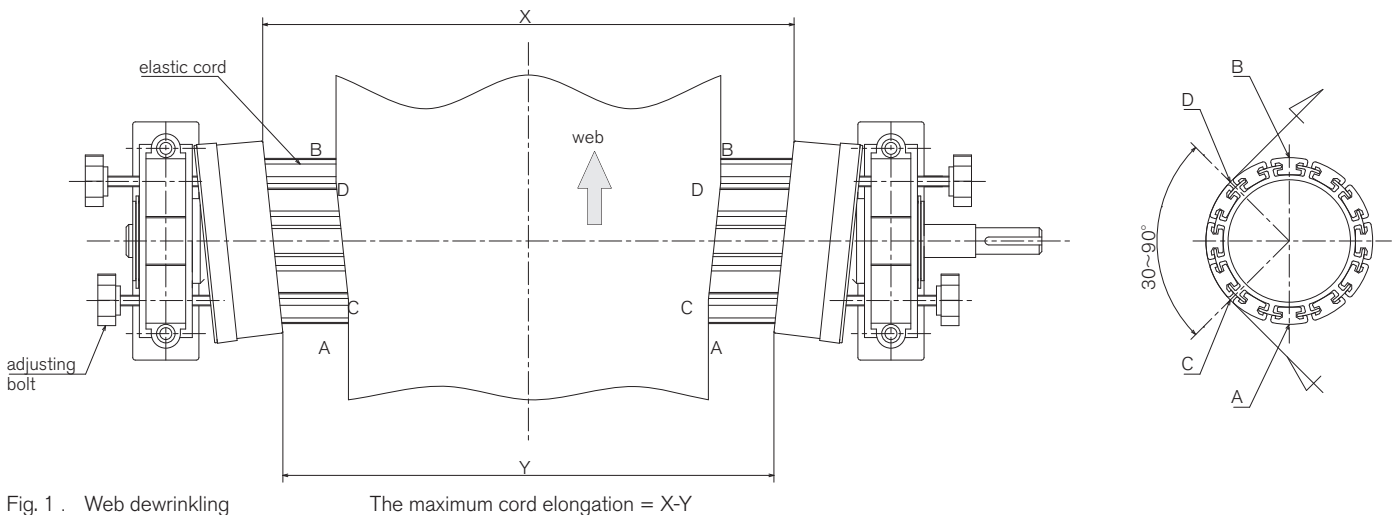
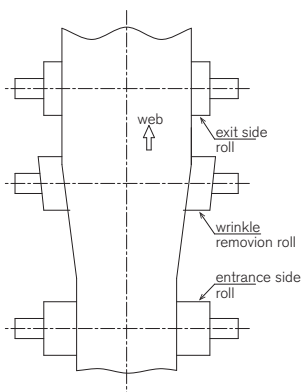


Fig. 1 . Web dewrinkling

The maximum cord elongation = X-Y



Push in the adjustment bolt on the web entrance side A, pull out the adjustment bolt on the exit side B, and tilt the left and right rings to make a symmetrical V shape as shown in the figure. When the roll rotates, the elastic cord contracts maximally at the point A and stretches maximally at the point B. As a result, when the web wound around the roll at the point C reaches the point D, only the part of the web between DD and CC line segments spreads. This spreading action removes wrinkles from the web.

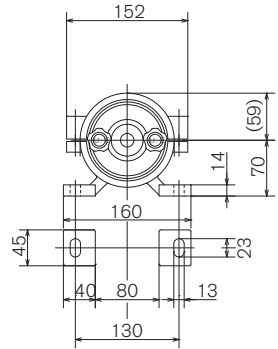
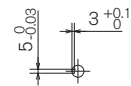
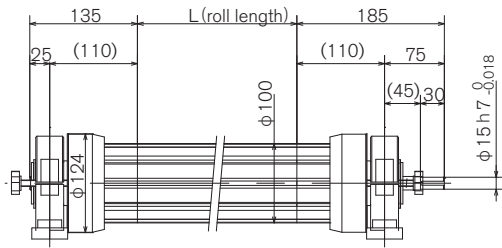
(Notes) It is the property of the wrinkle removing roll, that the web already begins to spread before touching the wrinkle removing roll. This means that the distance to the entrance side roll is important. The wrinkle removal effect varies with tension and Young's modulus of the web. Since metal foil and other highly rigid materials are difficult to stretch, it is necessary to ensure a large distance to the entrance side roll. On the other hand, wrinkles in soft and easily stretching webs can be removed even at a short distance. Install the wrinkle removing roll as close to the exit side roll as possible. The roll must be fixed with its center along the length aligned with the conveyor's axis.

4. Specification

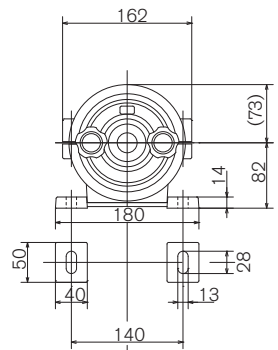
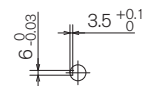
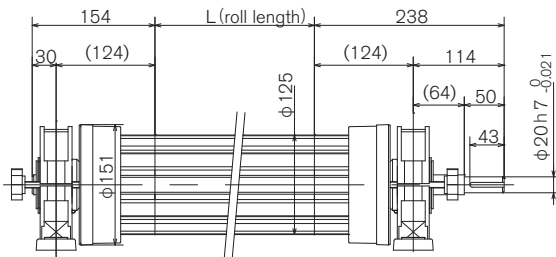
Flat expander (FE)



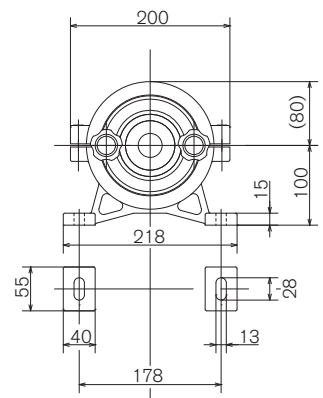
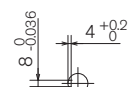
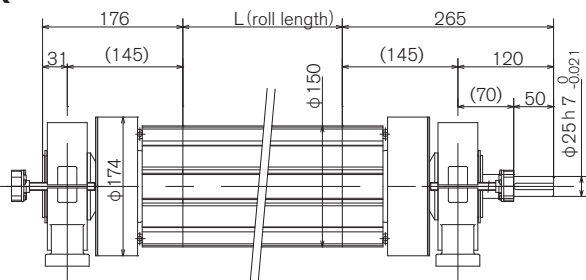
FE-BB



FE-BS



FE-BX



[Specification] ※ 1

| Model | Roll diameter (mm) | Roll length (mm) | Cord elongation (mm) ※ 2 | Starting torque (N·m) ※ 3 | Allowable tension (N) | Line speed (m/min) ※ 4 | Deflection (Less than [mm]) ※ 5 | Total mass (kg) ※ 6 |
|--------------|--------------------|------------------|--------------------------|---------------------------|-----------------------|------------------------|---------------------------------|---------------------|
| FE-BB | 100 | 150 ~ 1000 | 5.2 | 0.53 ~ 0.22 | 245 | 150 | 0.2 ~ 0.6 | 9 ~ 18 |
| FE-BS | 125 | 300 ~ 2000 | 6.5 | 0.73 ~ 0.59 | 294 | 250 | 0.1 ~ 0.2 | 17 ~ 32 |
| FE-BX | 150 | 1000 ~ 3000 | 7.8 | 0.66 ~ 0.73 | 588 | 400 | 0.1 ~ 0.5 | 37 ~ 61 |
| FE-BM | 200 | 2000 ~ 4500 | 10.4 | 1.12 ~ 1.22 | 784 | 450 | 0.2 ~ 0.6 | 94 ~ 138 |
| FE-BJ | 250 | 2000 ~ 6000 | 13.1 | 1.96 ~ 1.94 | 980 | 600 | 0.1 ~ 0.6 | 151 ~ 257 |

(※ 1) : These specifications are for the winding angle of 90 degrees and the ring inclination angle of 3 degrees. The ring inclination angle can be adjusted flexibly in the range between 0 to 6 position.

(※ 2) : The cord elongation is different from the dewrinkling width of the sheet.

(※ 3) : The starting torque is for the ring inclination angle of 3 degrees.

The above data are for reference only; actual values depend on roll length and elastic cord material.

(※ 4) : The line speed values in this table are not guaranteed values; actual line speed varies depending on operating conditions

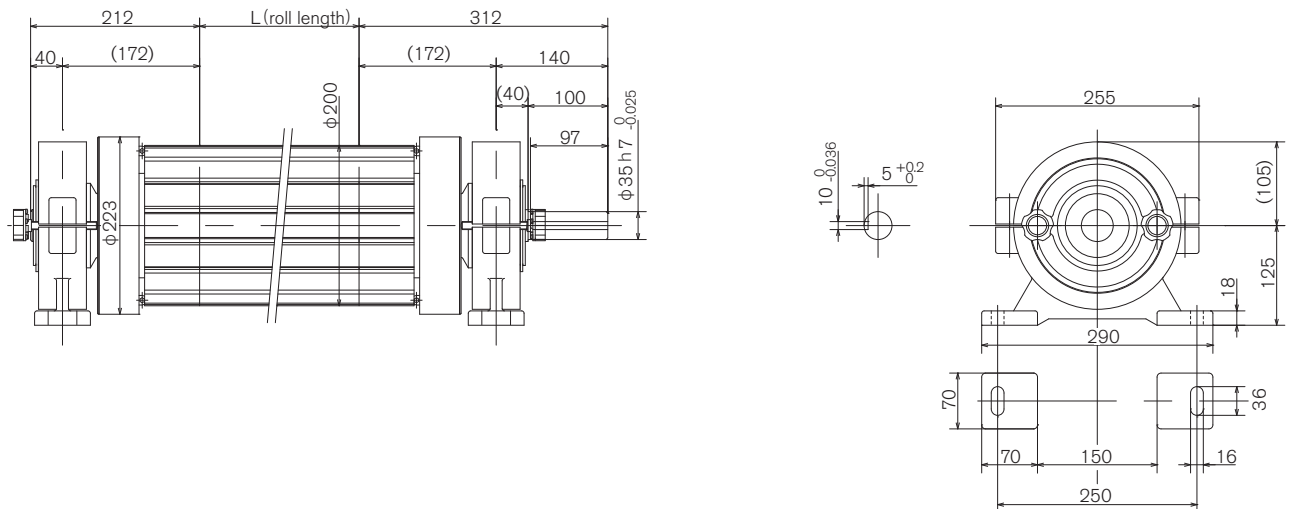
(※ 5) : The deflection amount at allowable tension. The actual deflection depends on tension and sheet winding angle.

(※ 6) : The total mass of the standard configuration (with a one-side driving shaft) with the representative roll length from specifications. Varies depending on the configuration.

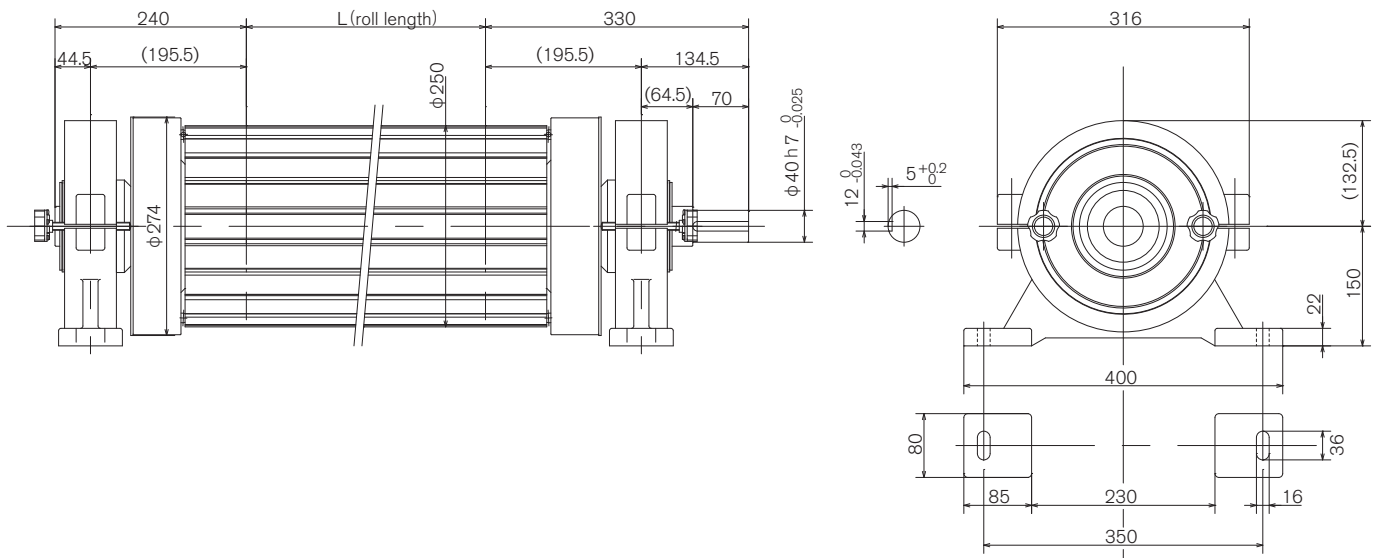
(※ 7) : Use in dry (45 to 85% RH, no condensation) environment with maximum temperature 80° C or lower.

(※ 8) : When the line speed for BX, BM and BJ types exceeds 100 m/min , take measures to prevent floating of the elastic cord.

FE-BM



FE-BJ



2. Miravo (MRV)

1. Outline

- Miravo roll (MRV) is a straight wrinkle removing roll covered with a rubber tube.
- It can remove wrinkles from nonwoven fabric, plastic film, paper, glass fiber, metallic foil, etc.
- The rubber tube covering the outer surface of the roll expands and contracts as the roll rotates due to a special internal structure. When the web is wound between expanding and contracting parts of the rubber tube, the expansions of the tube spreads the web. This action removes wrinkles from the web.

2. Features

- **Linear roll removes wrinkles without stretching the web like curved rolls.**
Neither overstretching at the center nor slacking at the edges occurs like with curved rolls!
- **The installation direction**
Any direction of the web pass line is supported, from horizontal to vertical. The web wrap angle on the roll normally is in the range from 30 to 90 degrees.
- **Applicable to a wide range of Web materials**
Removes wrinkles in a wide range of web materials, from ultra-thin (several microns) flexible films to highly rigid Cu, Al and other metallic foils.
- **Expansion of rubber tube**
Multiple rings are arranged inside the rubber tube. Left/right inclination angle of these rings increases symmetrically from the center to the edges. The rubber tube is gradually stretched due to the difference in inclination of adjacent rings. This structure provides more linear expansion increase and better wrinkle removal effect compared to FE roll with the elastic cord stretched by the left and right rings.
- **Ready for even faster lines**
Compared to elastic cord type (FE) wrinkle removing roll, the rubber tube type (MRV) wrinkle removing roll is designed to work with even faster lines. The line speed of the FE roll with an outer diameter from Ø125 to Ø200 is 250 to 450 m/min, but the MRV roll with a diameter from Ø120 to Ø200 can be used with up to 600 m/min ultra-high speed lines.
- **Pulley for synchronous rotation**
There is a structural rotational resistance
When used at low tension, use the pulley to rotate the MRV to synchronize line speed and roll peripheral speed.
- **Ready for use immediately after installation**

3. Spread wrinkles principle

As shown in Fig. 2, multiple rings are arranged inside the rubber tube along the longitudinal direction of the roll, with inclination changing symmetrically in the left/right direction outwards from the center of the tube. The inclination angles of these rings increase from the center of the roll to its edges ($\theta, 2\theta, 3\theta, 4\theta, \dots$). The equal difference of the inclination angles ($4\theta - 3\theta, 3\theta - 2\theta, 2\theta - \theta, \dots$) allows a uniform expansion over the entire roll length.

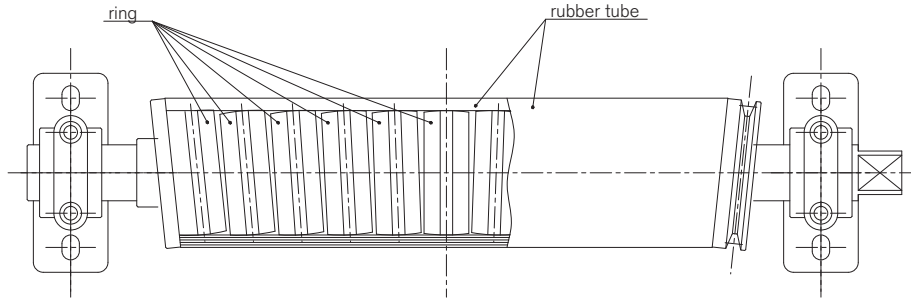


Fig. 2. MRV configuration

As shown in Fig. 3, when the roll rotates, the rubber tube contracts maximally at the point A and extends maximally at the point B. As a result, when the web wound around the roll at the point C reaches the point D, only the part of the web between DD and CC line segments is expanded and spread. This spreading action removes wrinkles from the web.

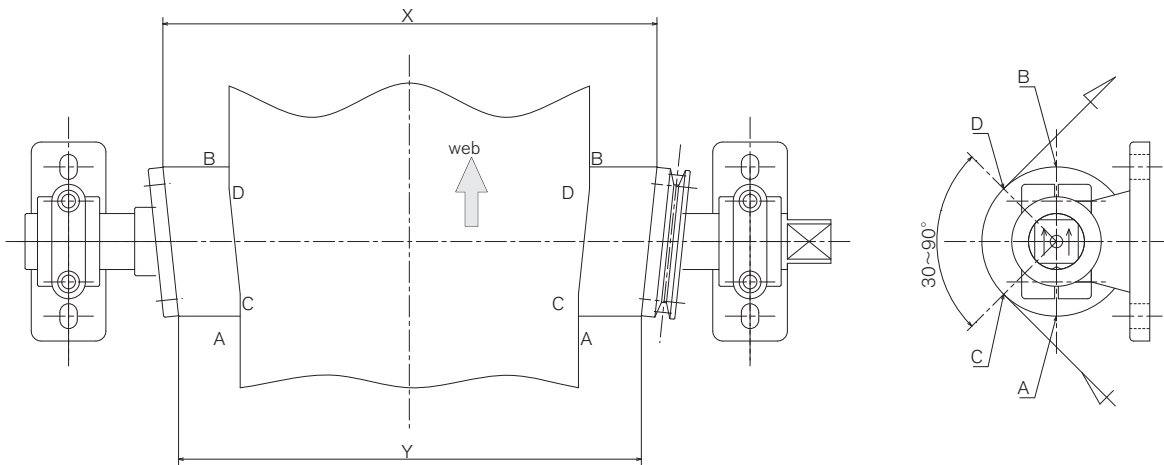
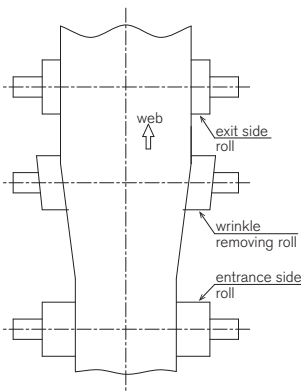


Fig. 3. Web dewrinkling The maximum rubber elongation = $X - Y$

(Note)

- ① It is the property of the wrinkle removing roll, that the web already begins to spread before touching the wrinkle removing roll. This means that the distance to the entrance side roll is important. The wrinkle removal effect varies with tension and Young's modulus of the web. Since metal foil and other highly rigid materials are difficult to stretch, it is necessary to ensure a large distance to the entrance side roll. On the other hand, wrinkles in soft and easily stretching webs can be removed even at a short distance. Install the wrinkle removing roll as close to the exit side roll as possible. The roll must be fixed with its center along the length aligned with the conveyor's axis.
- ② The rubber stretching depends on the difference of the inclination angles of the rings arranged inside the MRV roll. The maximum expansion depends on the number of the rings. For this reason, the difference of the inclination angles of the rings is determined at the time of order by the width and material of the web and the required amount of expansions.
- ③ The amount of expansion cannot be adjusted like in FE rolls.

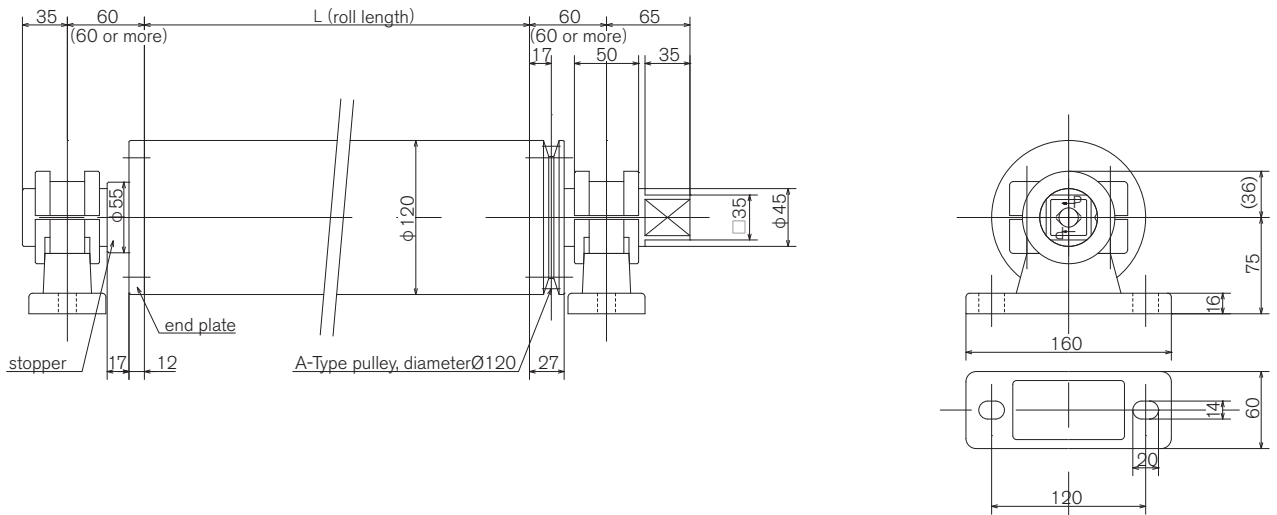


4. Specification

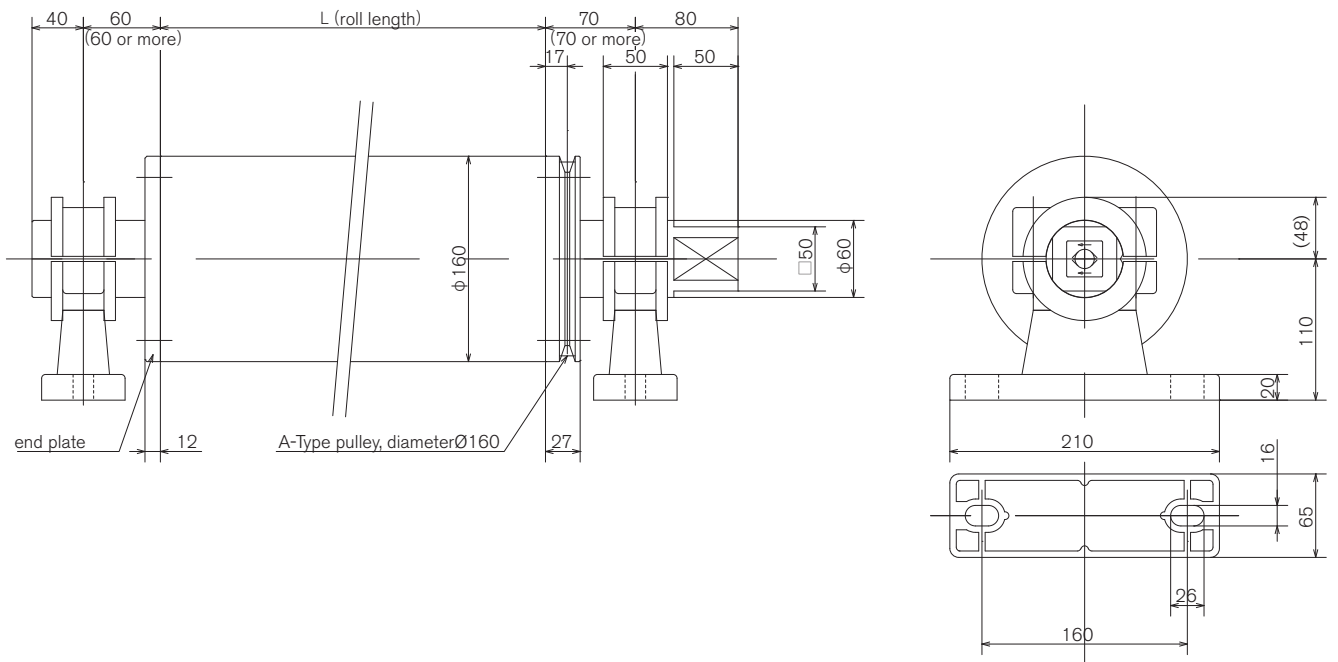
Miravo (MRV)



MRV-12



MRV-16

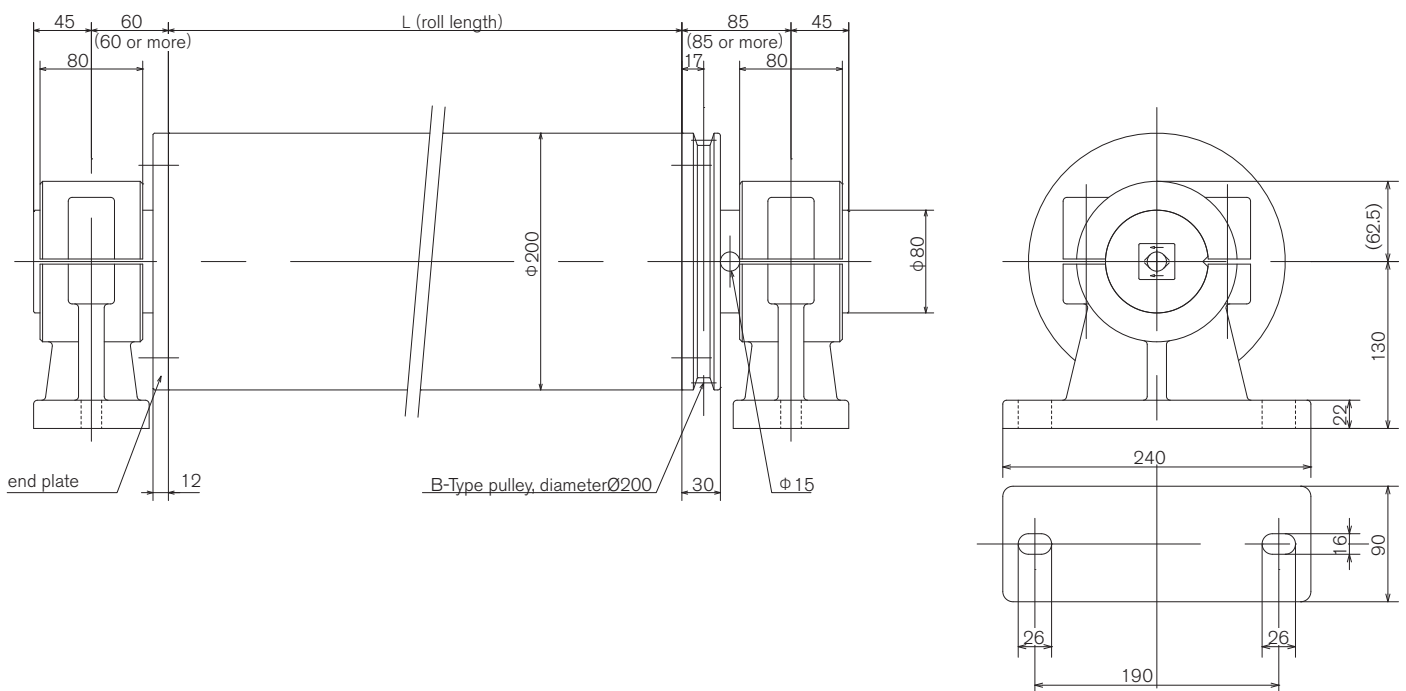


[Specification] ※ 1

| Model | Roll diameter (mm) | Roll length (mm) ※ 2 | Rubber elongation (mm) ※ 3,4 | Starting torque (N·m) ※ 5 | Allowable tension (N) | Line speed (m/min) ※ 6 | Deflection (Less than [mm]) ※ 7 | Total mass (kg) ※ 8 |
|---------------|--------------------|----------------------------|------------------------------|---------------------------|-----------------------|------------------------|---------------------------------|---------------------|
| MRV-12 | 120 | 240 ~ 2040 ※ 40pitches | 0.2 ~ 2.5 | 0.17 ~ 2.89 | 800 | 400 ~ 300 | 0.1 ~ 1.5 | 16 ~ 74 |
| MRV-16 | 160 | 300 ~ 2600 ※ 50pitches | 0.2 ~ 2.9 | 0.21 ~ 3.59 | 1200 | 500 ~ 400 | 0.1 ~ 1.7 | 30 ~ 157 |
| MRV-20 | 200 | 1050 ~ 3450 ※ 75pitches | 0.7 ~ 2.5 | 4.39 ~ 6.55 | 2000 | 600 ~ 450 | 0.1 ~ 2.2 | 111 ~ 310 |

- (※ 1) : These specifications are for the winding angle of 90 degrees and standard ring angles.
- (※ 2) : The effective roll length is obtained by subtracting one segment on each side from the roll length.
Removal of wrinkles from the sheet hanging over the effective roll length may be impossible.
MRV-12 : Roll length - 80mm
MRV-16 : Roll length - 100mm
MRV-20 : Roll length - 150mm
- (※ 3) : The rubber elongation is different from the dewrinkling width of the sheet.
- (※ 4) : Standard tolerance of ring angles used to expand the rubber tube (angle difference between adjacent rings)
Standard angles: MRV-12 (3 minutes), MRV-16 (2.5 minutes), MRV-20 (2 minutes)
Rings with non-standard ring angles are also available. Please consult us about the required rubber expansion.
- (※ 5) : The above data are for reference only. Actual values may vary depending on roll length, rubber material and individual differences during assembly.
- (※ 6) : The line speed at allowable tension. The line speed values in this table are not guaranteed values; actual line speed varies depending on operating conditions.
- (※ 7) : The deflection amount at allowable tension. The actual deflection depends on tension and sheet winding angle.
- (※ 8) : The total mass of our standard configuration (end plate, V belt pulley, with a bearing bracket).
- (※ 9) : Use in dry (45 to 85% RH, no-condensation) environment with maximum temperature 80° C or lower.

MRV-20



3. Rubber characteristic

Materials used in our wrinkle removing rolls and their characteristics are listed below.
You can choose according to your operating conditions.

| | EPT white / black ※ 1 | NBR white / black | Silicon | Urethane |
|-------------------|-----------------------------|----------------------|---------|----------|
| FE | ○ | × | ○ | ○ |
| MRV ※ 2 | ○ | ○ | ○ | × |

(※ 1) : Ethylene propylene terpolymer : Also called EPDM.

(※ 2) : MRV rolls can also be manufactured from rubber with special specifications or rubber specified by customer. Please consult us.

(※ 3) : Although in the process of rubber tube manufacturing spots or stains may be made on the roll surface,
the mechanical performance of rubber is not affected and there are no problems with quality or performance.

| | EPT white / black | NBR white / black | Silicon | Urethane |
|--------------------------|----------------------|----------------------|---------|----------|
| permanent set resistance | ○ | ○ | ◎ | ◎ |
| abrasion resistance | ○/◎ | ○ | △ | ◎ |
| tensile strength | ○/◎ | ○ | △ | ◎ |
| conductivity | ×/◎ | ×/◎ | × | × |
| oil resistance | × | ◎ | △ | ◎ |
| water resistance | ◎ | ◎ | ◎ | × |
| alkali resistance | ◎ | ◎ | ◎ | × |
| acid resistance | ◎ | ○ | × | × |
| ozone resistance | ◎ | △ | ◎ | △ |

4. Application machine

- Nonwoven fabric manufacturing : Winding machine, Slitter, Coater machine
- Film manufacturing : Winding machine, Slitter, Printing machine, Coater machine,
Vacuum vapor deposition machine
- Glass fiber manufacturing : Loom, Winding machine,
- Paper manufacturing : Winding machine, Slitter, Coater machine
- Metallic foil manufacturing : Copper and aluminum foil manufacturing plant



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In order to improve our products, specifications may change without notice

