Technical Precautions for Design, Installation and Maintenance

The precautions below will enable conveyor engineers, system integrators, and end users to properly design, install, operate, and maintain conveyor systems using Rulmeca Motorized Pulleys.
Ignoring any of the precautions may result in Pulley damage *and will void the product warranty.*

Use these technical precautions with the Rulmeca Bulk catalogue entitled “Motorized Pulley – Bulk Handling Diameter 138 – 800,” version.

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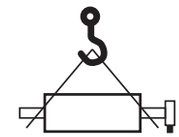
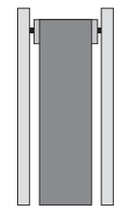
Technical Precautions for Design, Installation and Maintenance

a) **Transport/Handling:**



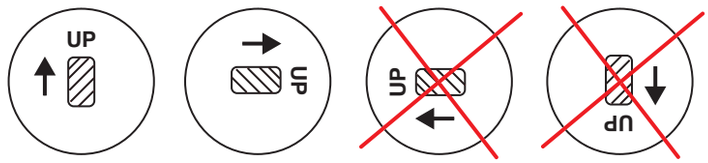
- For safety reasons during transport and assembly a lifting rope according to the max. weight of the Pulley has to be used. The weight of the Pulley is stamped on the data plate and /or given in the catalogue.
- The rope has to be fixed on the shaft ends.
- As to Motorized Pulley types 500H – 800H, a steel rope or chains should be fixed to the eyebolts, which are located on the mounting brackets.



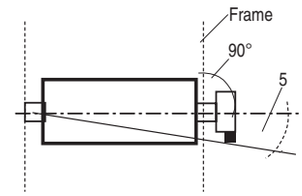
b) **Motorized Pulley Mounting Orientation:**

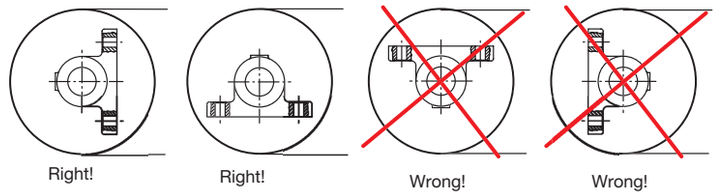
- Before installing the Motorized Pulley, please ensure that the data plate information is correct to your specification.
- At any time, Rulmeca Motorized Pulleys should always be mounted so that the Pulley shafts are
  1. Horizontal,
  2. Parallel to idler rollers, and
  3. Perpendicular to the conveyor belt **centreline**.

- As to Motorized Pulley types 138E to 500M "UP" is indicated with the word "UP" stamped on the Pulley shaft.
- All Motorized Pulleys except types 500H - 800H are to be mounted as shown on the sketch below.



- **This instruction does not apply to types 500H - 800H.**
- ***In case of a non-horizontal installation, of more than +/-5 degree, please consult Rulmeca.***
- **For Motorized Pulley types 500H - 800H please ensure that**
  Motorized Pulley's are positioned in such a way that the mounting brackets are located horizontal or vertical to the conveyor frame. The cable entry of the terminal box should be located downwards or in a 90° position.





- At any time all Rulmeca Motorized Pulleys shown in this catalogue must be fitted with a conveyor belt to prevent overheating.

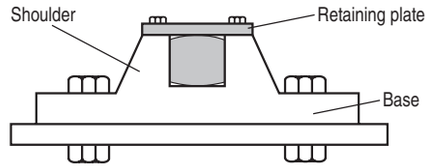
  Motorized Pulleys fitted without a belt must be referred to Rulmeca.
- **Installation and mounting of the Motorized Pulley in another position as described could cause severe product damage and *voids product warranty.***

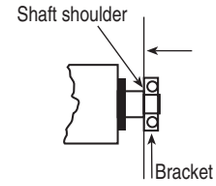
c) **Mounting Brackets:**

- As listed in the catalogue, use the **correct Rulmeca** mounting brackets matching the respective types of Motorized Pulleys.
- **Note that it is physically possible, but not permissible, to interchange mounting brackets between models. Mounting brackets designed for smaller diameters or lower-powered Pulleys may not be used for larger diameters or higher-powered Pulleys.**

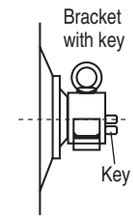
- Mounting brackets must be mounted to frame in such a way that belt pull is resisted by the shoulder or base of the mounting bracket. Motorized Pulleys types 138E to 500M have a top shaft retaining plate. This plate is **not** designed to resist belt pull.

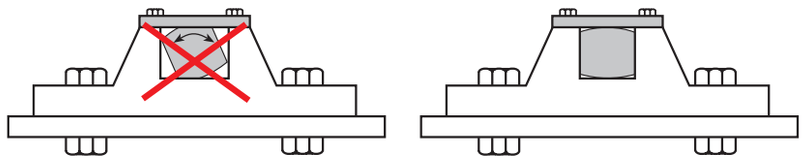
Technical Precautions for Design, Installation and Maintenance





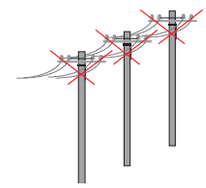
- The designer must select appropriate mounting bolts to resist belt forces and/or the weight of the Pulley depending on the mounting position of the Pulley.
- All types of mounting brackets must be fully supported by and fastened to the conveyor frame in such a way that the shafts ends **do not** deform. Shaft ends must always be fully supported by the brackets.
- Where solid mounting brackets type AL and ALO are used, the brackets have to be assembled close to the shoulder of the round shaft. This is to ensure that the drum motor has no axial clearance.
- The AL type of bracket is fitted with one or two keys depending on load.
- Keys must be securely fixed and checked regularly and locked if necessary.
- Mounting brackets should be fitted in such a way that they are in contact with the shoulder of each shaft. This will:
  1. Eliminate Motorized Pulley axial play between mounting brackets.
  2. Keep shaft deflection to a minimum.





- In noise-sensitive areas, the designer should use heavier gauge support structure and appropriate vibration isolating material, as necessary.
- **When Rulmeca Motorized Pulley mounting brackets are NOT used, it is essential that:**
  1. The mounting equipment supports at least 80% of the shaft flats.
  2. It has to be assembled without any clearance between the support and the shoulder of the shaft.
  3. The clearance between the shaft flats and the support should be less than 0.4 mm (torsion play).
- **A Motorized Pulley with frequent reversible operations or many start/stops should be mounted with NO axial clearance between the shaft flat and the brackets.**
- **Failing to follow these precautions could cause Pulley and/or mounting bracket damage and *voids product warranty.***

d) **Electrical Installation:**

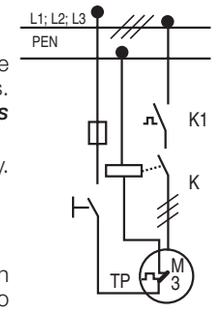


- **According to the European Council Directives related to machinery, the equipment manufacturer (OEM) has to secure that the Motorized Pulley is NOT put into operation before it is**
  – Correctly installed,
  – Correctly connected to the power supply,
  – Correctly protected against rotating parts.
- A specialist must perform the electrical connection of the Motorized Pulley in accordance with electrical regulations. If in doubt, contact Rulmeca.
- A wiring diagram is always supplied with the Motorized Pulley. Always refer to the connection instructions and ensure that the motor power and control circuits are properly connected.
- The wiring diagram is inserted in the accompanying booklet and into the terminal box.
- As standard, Rulmeca Motorized Pulleys are delivered with clockwise rotation when viewed from the terminal box end of the Motorized Pulley.
- Always refer to the connection instructions and ensure that the motor is connected as required to the correct mains supply.
- As a safety measure, please use the **earth screw** located in the terminal box.
- The protective conductor has to be connected to the earth screw.
- When using cable options the green/ yellow wire has to be connected to the protective conductor of the main supply.

Marking of the earth screw

Technical Precautions for Design, Installation and Maintenance

e) **Motor Current Overload and Over current Protection:**



- Motor control systems must include protection against operating Pulley motors in excess of Full Load Amperage (FLA.). The control system should also include protection against voltage spikes and excessive jogging of motors. Failing to provide adequate current overload and over current protection could stress the motor and ***voids product warranty***.
- FLA data is available for all motors upon request. FLA data is also supplied on motor label for each Motorized Pulley.
- Electrical power, control, and protection for Motorized Pulleys must adhere to all pertinent regulations.

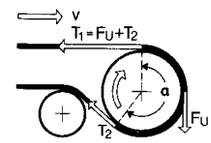
f) **Motor Thermal Protection:**

- **All Motorized Pulley motors are supplied with a built-in thermal protector in each phase**. Protection consists of heat-sensitive, bi-metallic switches built into each motor phase winding. The switches are designed to open if motor temperature elevates to an inappropriately high level meaning higher than the temperature rating of the insulation class of the winding. Whether insulation class "F" or "H", our standard bi-metallic switch
  – has a current of 2.5 Amps. and
  – a rated voltage of 230V.
- These switches must be connected to a normally closed control circuit (in series with a magnetic coil/relay device and contactor) in order ***to validate product warranty***.
- A motor control circuit should kill motor power if thermal switch opens. Thermal switches will automatically close as motor cools. Cooling times vary with Pulley model, power, and size. However, 30 to 60 minutes is common with most motors in an ambient temperature of 20°C.

g) **Belt Tension:**

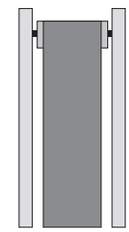
- The conveyor belt should never be over-tensioned. It should be installed with ***sufficient belt tension only*** to prevent belt slippage.
- To keep the radial load as low as possible to drive the belt without slipping anti-slip lagging should be used.
- Maximum allowable radial load of each Motorized Pulley (MP) is specified in this catalogue. Subjecting the Motorized Pulley to a higher than specified maximum radial load may damage internal components and shorten product lifetime and, therefore, ***voids product warranty***.
- To check Pulley radial load, do a vector summation of the loads on the Pulley.
- For example, as shown in the diagram,
  1. Radial load equals T1 + T2.
  2. T1, tight side tension, equals Belt Pull (Fu) plus T2.
  3. T2, slack side tension, is determined using CEMA standard calculations or DIN 22101 to provide enough friction between the Pulley and the belt to drive the belt.

  Belt type, belt thickness and the right diameter of the Pulley have to be selected according to Belt Supplier Requirements.



h) **Belt Alignment:**

- Motorized Pulleys must be installed with Pulley shaft perpendicular to belt centreline and parallel to all idler rollers.
- Belt centreline must be straight and parallel to side walls of slider bed (if any) and perpendicular to idler rollers and all Pulleys
- Belt and/or roller misalignment may cause high friction and overload the conveyor belt drive motor.
- Belt misalignment may cause premature wear of Pulley lagging.



i) **Start-up:**

- ***Prior to initial start-up of Motorized Pulley:***
  – Verify that Motorized Pulley nameplate data matches customer specification.
  – Ensure electrical connections are correct.
  – Check that Motorized Pulley is free to rotate.
  – Check that slack side belt tension is adequate to prevent belt slippage.
  – Check that belt is not over-tensioned.
  – Ensure the oil is present in the Motorized Pulley.

j) **Lagging:**

- Smooth and diamond pattern lagging is available in black synthetic rubber and white synthetic rubber. Approximate rubber hardness is 65 durometer (shore hardness A).

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- Standard lagging is cold-bonded to Pulley shell.
- Optional hot vulcanised lagging is available for high power/high torque/high temperature applications and for Motorized Pulleys with Class H motors.
- Oil & grease resistant synthetic rubber is also available for oily operating conditions and/or for certain types of belting material. Check with belting supplier if belt/lagging material compatibility could be a problem.
- Adequate Motorized Pulley heat dissipation is necessary.
  Lagging thickness and width greatly affect Pulley heat dissipation characteristics!
- Contact **Rulmeca** before applying any lagging to Pulley surface to obtain thickness and width specifications and maintain Motorized Pulley warranty coverage.
- Lagging material is a wear item and should be replaced when it wears out. Service life depends upon the application. Product warranty does not include lagging wear.

k) **Rubber lagging limitations:**

Motorized Pulley type /power	RL (mm)	Possible thickness (mm)
138E		
Up to 0.37 kW	-	No limitation!
0.55 kW	Up to RL599	Max. 3 mm
ditto	From RL600	Max. 5 mm
0.75 kW	Up to RL599	Max. 3 mm
	From RL600	Max. 5 mm
165E		
Up to 0.75 kW	-	No limitation!
1.1 & 1.5 kW	Up to RL599	Max. 5 mm
ditto	From RL600	Max. 8 mm
220M & 220H		
Up to 1.5 kW	-	No limitation!
2.2 & 3.0 kW	Up to RL799	Max. 6mm
ditto	From RL800	Max. 8 mm
4.0 kW + 5.5 kW	Up to RL699	Max. 6 mm hot Vulcan.
ditto	From RL700	Max. 6 mm
5.5 kW	Up to 849 mm	3 mm smooth
ditto	From 850 mm	6 mm
320L – 320H		
Up to 5.5 kW	-	No limitation!
7.5 kW	-	Max. 6 mm
400L	-	No limitation!
400M & 400H		
Up to 11.0 kW	-	Max. 8 mm
15.0 kW	-	Partial rubber lagging
500L & 500M	-	Max. 8 mm
500H		
Up to 15.0 kW ≥ 1.6 m/sec	-	Max. 10 mm
15.0 kW < 1.6 m/sec	Up to 1099	Partial rubber lagging
ditto	From RL 1100	Max. 10 mm
18.5 kW ≥ 1.6 m/sec	Up to RL 1399	Partial rubber lagging
ditto	From RL1400	Max. 10 mm
22.0 kW all speeds	All shell width	Partial rubber lagging
630M	-	Max. 10 mm
630H & 800M		
22.0 kW	-	Max. 10 mm
30.0 kW ≤ 1.6 m/sec	-	Partial rubber lagging
30.0 kW > 1.6 m/sec	-	Max. 10 mm
From 37.0 kW	-	Partial rubber lagging
800H	-	Partial rubber lagging

Technical Precautions for Design, Installation and Maintenance

l) **Actual Belt Speed vs. Nominal Belt Speed:**

- Two key specifications for each Motorized Pulley are Power (kW) and nominal belt speed (m/sec.), as given in the respective specifications in this catalogue.
- Nominal belt speed is a design target, providing consistent choices among all models and powers.
- Actual full load belt speed is almost never exactly equal to nominal belt speed.
- Actual belt speed is a function of the motor pole numbers, gear ratio and load. This catalogue displays the nominal belt speed at 50Hz.
- Note that **all** belt speeds shown in this catalogue refer to **un-lagged Pulleys** because:
  1. Belt speed for each model is a function of Pulley diameter,
  2. Pulleys are available with and without lagging,
  3. Lagging changes the Pulley diameter,
  4. Various lagging thickness are available.
- Note that each Rulmeca Motorized Pulley for a three-phase power supply uses an asynchronous squirrel cage induction motor with about 5% slip. In a no load condition, motor RPM is nearly equal to "synchronous speed" RPM. The slip rate is dependent on power and design of the motor. Low powered motors have a lower slip rate than high-powered motors. At full load, the motor RPM is about 5% less than synchronous.
- Pulley by Pulley the "nominal belt speed" displayed in this catalogue is based on un-lagged Pulleys running at full load, nominal voltage (e.g. 400V) and 50Hz.
- The nominal full load belt speed of a lagged Pulley running at
  1. Full load,
  2. Nominal voltage (e.g. 400 volts),
  3. 50 Hz

  – equals the nominal full load belt speed specified in this catalogue, times the ratio of the lagged/un-lagged Pulley diameters.

  Example: A 4.0kW Motorized Pulley 320M with an un-lagged Pulley diameter of 321mm has a nominal belt speed of 0.8 m/sec.

  The actual belt speed is a function of
  – The rotor speed (RPM),
  – Gear ratio,
  – Shell diameter and
  – Load.

  E.g. the above mentioned 320M with a nominal belt speed of 0.8m/sec. has
  1. A gear ratio of i = 28.6,
  2. A rotor speed of n = 1440 (1/min),
  3. A shell diameter of 0.321 m.

  The actual belt speed at full load is

  V(m/sec) = π x Ø d (mm) x RPM (1/min) / 60 x i

  π = Pie,
  d = Pulley diameter,
  RPM = revolutions per minute,
  i = gear ratio

  V = 3.14 x 0.321 m x 1440 (1/min) / 60 x 28.6 = 0.85 m/sec.

  If this Pulley is supplied with 10mm thick lagging, the belt speed of the lagged Pulley equals **0.85m/sec. x (0.341m/0.321m) = 0.90m/sec.** at full load, nominal voltage and 50Hz.

m) **Ambient Temperature:**

- Motorized Pulleys are normally cooled by dissipating heat through contact between the surface of the Pulley and the conveyor belt. It is essential that each Pulley have an adequate thermal gradient between the Pulley's motor stator and its ambient operating temperature.
- All Motorized Pulleys in this catalogue are designed and tested under full load without rubber lagging for a use in a max. ambient temperature of +40 °C. degree.
- **Rubber lagging and/or higher ambient temperatures than +40 °C as well as conveying hot material will reduce the heat transfer from the electrical motor through the Pulley body to the air and/or the conveyor belt. This will always switch off the motor winding protection switch (motor thermal protection) and could possibly end-up in a burned motor winding.**

Technical Precautions for Design, Installation and Maintenance

- **Example:** A conveyor is running in a facility with an ambient temperature of 45 °C. The temperature of the motor cannot be dissipated as it should be. The motor temperature will increase to a dangerous level.
- **Example:** A conveyor belt in an application with an ambient temperature of +24 °C, carrying processed material at a temperature of +70 °C, will have a Motorized Pulley "ambient temperature" that is significantly higher than +40 °C.
  In this case, the temperature of the material is higher than the max. allowed ambient temperature which is necessary for a proper heat dissipation. A situation is then created due to **heat accumulation (heat storage) between the bottom of the belt and the Motorized Pulley body.**
- **For ambient operating conditions lower or higher than allowable ambient temperature (-25 °C to 40 °C), contact Rulmeca.**
- **In many cases it is possible to use specially designed Motorized Pulleys to perform tasks for special applications – e.g. modular plastic belts and v-belts for Motorized Pulley types 138E & 165E. Please contact Rulmeca for such applications.**
- ***Operating Rulmeca Motorized Pulleys to drive standard conveyor belts outside of the allowable ambient temperature range voids product warranty.***

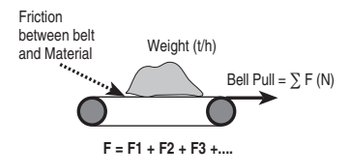
n) **Surface Coating:**

- The Motorized Pulley types 400L to 800H are supplied with a salt water resistant primary paint coat of 60µm. For aggressive environmental conditions the Motorized Pulley should be painted to a thickness of 120µm.
- In this case it is essential to ensure that no paint material enters the gap between the shaft and the end housing to prevent possible damage to the shaft sealing.
  Motorized Pulley types 138E to 320H are supplied with high resistant powder coated end housings. The shells and shafts are treated with anti-rust wax.

o) **Belt Pull:**

- The catalogue specifies "Actual Belt Pull" for each model, power, and speed of Pulley. Note that the specified actual belt pull allows for motor and gearbox efficiency losses (95 – 97%).
- Always select the Motorized Pulley power by comparing calculated "required belt pull (F)" with "Actual Belt Pull" and not simply on the basis of calculated Power (kW).
- Belt pull "F" is a summary of all of the existing forces to convey the material. E.g.
  1. F1 - force to move the belt,
  2. F2 - force to accelerate the material,
  3. F3 - force to lift or lower the conveyed material,
  4. F4 - force to clean the belt,
  5. F5 - force to overcome the skirt board friction or roller resistance,
  6. F6 - force to frictional resistance of ploughs, etc.

This includes all existing frictions.



p) **Mechanical Backstops:**

- Motorized Pulleys fitted with mechanical backstops are used on inclined conveyors to prevent run back of the loaded belt when power supply is off.
- The backstop is built into the Motorized Pulley and is mounted on the rotor shaft.
- If Pulley is supplied with optional mechanical backstop, direction of proper rotation of Pulley is indicated by an aluminium arrow or plastic sticker fastened to the end housing on the terminal box (or power cord) side of the Pulley. Clockwise or counter clockwise backstops are available.
- **Rotation direction is to be specified when placing the order.**
- Pulley rotation is specified from the point of view of a person looking at the Pulley from the terminal box (or power cord) side of the Pulley.
- It is essential that the identity of each of the three phases of the power supply be determined before attaching power supply wires to the Pulley to prevent motor from driving against the backstop. The identity of each of the three phases of the motor is clearly labelled on the terminal board, terminal strip, or wires (in power cord type).
- **Driving the motor against the mechanical backstop may damage motor and/or backstop and voids product warranty.**

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q) **Electromagnetic Brake:**

- The spring-loaded electromagnetic brake is intended for use as a conveyor belt holding brake and a positioning brake.
- The control circuit for the Motorized Pulley motor and brake must be designed to stop the Pulley motor before brake clamps are shut and start the Pulley motor after the brake is released.
- Spring-loaded electromagnetic brakes are designed to release when power is applied to the brake coil. This is a "fail safe" feature. The clamp shuts when brake power is removed (either during normal operation or during an emergency loss of overall system power.)
- ***Control circuits must be designed so that motor and brake NEVER work against each other. The brake should never be clamped shut when the motor is on except for "emergency stop" condition. The motor should never be powered on (including "jog" command) when the brake is clamped shut.***

- Electromagnetic brakes are DC-powered. They are supplied with AC to DC rectifiers to be mounted in a remote panel (by others). Rectifiers must be fuse-protected.
- Motor control circuits must be designed to kill motor power in the event of loss of brake power. If this safety provision is not made, it is possible for Pulley motor to be "powered through" a clamped brake, burning brake and/or motor.
- A wiring diagram is supplied with every Motorized Pulley. Always ensure that motor and brake power and control circuits are connected according to instructions.
- For rectifier connection and protection instructions, refer to rectifier data sheet supplied with Motorized Pulley.
- **Neglecting these instructions could cause damage to the motor and/or brake and voids product warranty.**

r) **Reversing Conveyors:**

- All Motorized Pulleys for a three-phase power supply are reversible. Mechanical backstop option is not possible for reversible conveyor applications.
- The conveyor drive control system must be designed to bring the Motorized Pulley to a complete stop before reversing conveyor belt direction.
- **Reversing conveyor direction without stopping the drive motor will damage motor and gearbox and voids product warranty.**

s) **Oil and Oil Seal Maintenance:**

- Oil type and contents are given on the motor nameplate.
- Standard, synthetic, food grade, low viscosity (for low temperature applications,) and high viscosity (for noise-sensitive areas) are all available. For approved oil types and quantities, see pages 90-91.

- Motorized Pulleys require periodic oil changes and are supplied with two oil fill/drain plugs in end housing.
- The first oil change should be changed after 10,000 operational hours. This is due to normal wear of gears.
- All non-synthetic oils should be changed after each 10,000 operating hours.
- Synthetic oils may be changed after each 30,000 operating hours.
- Magnetic oil plug(s) should be cleaned during each oil change. A red dot plastic sticker indicates the position of the magnetic oil plug.

- Only approved non-conductive oil may be used in Motorized Pulleys.
- Note that oil seals, regardless of oil type used, should be changed after 30,000 operating hours. On Motorized Pulley types 320M to 800H oil seals may be changed **without** removing Motorized Pulley from conveyor. Motorized Pulley standard types 138E to TM320L require Pulley disassembly to change oil seals. Rulmeca service personal or authorized local service providers to perform this work.

  Take special precautions when changing brands of oil and types of oil because of potential oil incompatibility. Contact your local oil supplier for assistance.
- **For example**, when changing from standard to synthetic oil, it is necessary to:
  1. Completely drain old standard oil;
  2. Partially fill Pulley with "Clean-Flush-Lubricate" (CFL) fluid;
  3. Run Pulley for 20 minutes;
  4. Drain CFL fluid completely; then
  5. Fill Pulley with appropriate amount of new synthetic oil.
- Failing to observe these oil and oil seal precautions could shorten Pulley service life and ***voids product warranty.***

Technical Precautions for Design, Installation and Maintenance

- ***All the above instructions refer to Motorized Pulleys CONSTANTLY working under FULL LOAD. In case of Motorized Pulleys NOT working continuously under full load, the service life will increase considerably! When checking the oil, the cleanness of the oil is always the best guideline of***
  - ***– The wear and present position of the gears and bearings***
  - ***– Whether to change the oil immediately***
  - ***– Whether it is possible to delay the oil change.***

t) **Re-greasable labyrinth seals:**

- All Rulmeca Motorized Pulleys are hermetically sealed. Standard oil seals are designed to contain oil within the Motorized Pulley during normal operating conditions. They are capable of withstanding an internal pressure rise that occurs as the Pulley motor temperature increases.
- Optional re-greasable labyrinth seals are available to protect oil seals from harsh operating or maintenance conditions. Each labyrinth seal provides a barrier of steel and grease to prevent ingress of dust and fluid through the oil seal.
- In abrasive operating conditions labyrinth seals should be periodically grease-purged to flush abrasive dust away from the oil seal.
- In wet and or dirty conditions, where it is common to wash down equipment with high-pressure detergent spray, labyrinth seals should be refilled with grease after each wash-down. High-pressure sprays remove grease from the labyrinth seal, removing an important part of the barrier to fluid ingress.
- It has to be secured that grease is always seen at the labyrinth gap.
- If in some circumstances the re-grease frequency is too high a so-called **"Grease Man" is recommended.**
- Failing to perform necessary labyrinth seal maintenance could shorten service life and ***voids product warranty.***

u) **Pulley Diameter:**

- The type and size of conveyor belt will determine the minimum allowable Motorized Pulley diameter. Using a too small Pulley diameter, which does not match the belt, can cause belt de-lamination, belt splice damage and can shorten both belt and Pulley lagging life. Always contact your belting supplier before specifying a Pulley diameter.

v) **Terminal Box:**

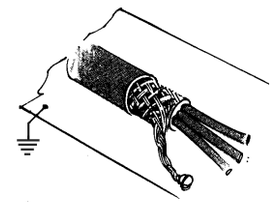
- **Rulmeca** Motorized Pulleys are available with terminal boxes or power cords to facilitate electrical installation. Motorized Pulleys with power cords are available up to 4kW.
- Two main types of terminal boxes are used:
  1. A **compact terminal box** equipped with clamp terminals "WAGO" used for Motorized Pulley types up to 4.0kW
  2. **Larger terminal boxes** with traditional threaded brass terminals.
- Switch off Motorized Pulley power supply and control circuit(s) before opening terminal box.
- Each terminal box has one or more conduit nipples and a cover plate. The cover plate should be removed to facilitate termination of power and control wires within the terminal box. After wire connections are made cover plate should be replaced.
- Terminal boxes should never be disassembled or removed from the end of the shaft to reorient conduit nipple location.
- Modifications to terminal boxes should only be made by an authorized **Rulmeca service centre** or after obtaining permission and instructions, in writing, from **Rulmeca**.
- A wiring diagram is placed inside the terminal box on the back of the terminal box cover.

  Dismantling and reassembling terminal boxes could cause short circuits within the internal wiring, which is factory set (and tested) and would *void product warranty.*

w) **Frequency Converter:**

- It is essential that each Frequency Converter be set within the motor's allowable operating spectrum. For Rulmeca Motorized Pulleys the allowable frequency spectrum is 15 Hz to 65 Hz. There will be no more than 5% torque loss within this range. This means that a Rulmeca Motorized Pulley is essentially a "constant torque" conveyor belt drive within the allowable frequency range.
- **If operators attempt to drive the motor outside of the allowable range, then torque loss becomes significant, motor current draw elevates, motor cooling can become problematic, and *product warranty is void*.**

Technical Precautions for Design, Installation and Maintenance



- Do not allow resonant frequencies in the power line to cause voltage spikes in the motor. It is possible for the Frequency Converter to set up resonant frequencies in the power line between the Frequency Converter and the motor if the power line isn't too long. Potential resonant frequencies may be eliminated in two ways. Either by limiting the distance between the Frequency Converter and the motor (some Frequency Converter manufacturers recommend cable lengths of 10m or less) or simply install a filter on the Frequency Converter output (available from Frequency Converter manufacturer.)
- To avoid any radio-interference the cable from Motor to the Frequency Converter has to be screened and properly fixed down according to the European Council Directive

"Electro-magnetic Compatibility"
- EMC-89/336/EEC –

- The power and current range of the Frequency Converter have to be selected according to the full-load amperage given on the Motorized Pulley data plate.
- Do not undersize the conveyor drive. Make certain the conveyor drive provides enough belt pull at each end of the desired belt speed range. Remember that power (kW) is linearly proportional to frequency (Hz).
- **Example**, a 2.2 kW Motorized Pulley type 320M, diameter 321 mm, which is designed to provide 6531N of belt pull at a nominal belt speed of 0.32 m/sec. at a three phase power supply of 400 volts and 50 Hz, will provide approximately 4180N of belt pull at 0.50 m/sec at 50 Hz.

Theory:

Torque:

$$M_{(Nm)} = 9550 \times \frac{\pi \times d_{(m)}}{60 \times v} \times \eta$$

Belt Pull:

$$F_{(N)} = \frac{1000 \times P_{(kW)}}{v_{(m/sec)}} \times \eta \qquad F_{(N)} = \frac{2 \times M_{(Nm)}}{d_{(m)}}$$

- By definition, 2.2kW at a speed of 0.32m/sec.equals to a belt pull of 6531N and at a speed of 0.50m/sec. it equals to 4180N.

$$F_{1\,(N)} = \frac{1000 \times P_{1\,(kW)}}{v_{1\,(m/sec)}} \times \eta = \frac{1000 \times 2.2_{\,(kW)}}{0.32_{\,(m/sec)}} \times 0.95 \textbf{ = 6531N}$$

$$F_{2\,(N)} = \frac{1000 \times P_{2\,(kW)}}{v_{2\,(m/sec)}} \times \eta = \frac{1000 \times 2.2_{\,(kW)}}{0.50_{\,(m/sec)}} \times 0.95 \textbf{ = 4180N}$$

- If it is necessary to have a belt pull of 6531N also at a speed of 0.50m/sec a higher-powered motor has to be selected.

Note: The belt pull of 4180N is lower than required! Therefore the next power of the range has to be selected – 3.0kW.

$$F_{2\,(N)} = \frac{1000 \times P_{2\,(kW)}}{v_{2\,(m/sec)}} \times \eta = \frac{1000 \times 3.0_{\,(kW)}}{0.50_{\,(m/sec)}} \times 0.95 \textbf{ = 5700N!!!}$$

Note: The belt pull of 5700N is still lower than required! Therefore the next power of the range has to be selected – 4.0kW.

$$F_{2\,(N)} = \frac{1000 \times P_{2\,(kW)}}{v_{2\,(m/sec)}} \times \eta = \frac{1000 \times 2.2_{\,(kW)}}{0.50_{\,(m/sec)}} \times 0.95 \textbf{ = 4180N}$$

Calculation based on power:

$$P_{(kW)} = \frac{F_{1(N)} \times v_{2\,(m/sec)}}{1000} = \frac{6531N \times 0.50\ m/sec}{1000} \textbf{ = 3265 kW}$$

or

$$P_{2(kW)} = P_1 \times \frac{v_{2\,(m/sec)}}{v_{1\,(m/sec)}} = \frac{0.50\ m/sec}{0.32\ m/sec} \times 0.95 = \textbf{3265 kW}$$

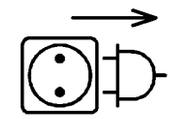
Required power for a speed of 0.50m/sec:

$$P_{3(kW)} \times \frac{P_{2\,(kW)}}{\eta} = \textbf{4, 4375 kW kW}$$

Technical Precautions for Design, Installation and Maintenance

x) **Capacitors (For Single Phase Motors):**

- Each single phase Motorized Pulley requires an appropriate capacitor. For models 138E and 165E RUN capacitors are supplied with the Pulley. Detailed information available on request. Using other than the specified RUN capacitors may damage the motor and voids product warranty.
- The RUN capacitors must be permanently connected to the motor, as shown on the connection diagrams.
- RULMECA single-phase motors are “permanent split phase motors”. Each motor is supplied with two windings. They are designed so that an appropriately sized capacitor connected to one of the windings will start the motor rotating.
- Starting torque is limited to 70% of full running torque.
- It is possible to increase starting torque to 100% by adding a second appropriately sized capacitor (START capacitor) to the circuit. Note that this circuit must be designed to drop the starting capacitor out of the circuit after the motor has reached its nominal speed. Contact RULMECA for more information on how to run single-phase motors using START and RUN capacitors.



y) **Maintenance:**

- Normally Motorized Pulleys are maintenance free and require no specific attention during their operation. They are ready for operation immediately after connection to the power supply.
- **If repair or maintenance is required, the Motorized Pulley has to be disconnected form the supply before the terminal box can be opened.**
- During a test run, the shaft ends must be correctly fixed to the support frame, and suitable guarding must be provided around the rotating parts, for the protection of all personnel.

z) **After Sales Service**

- Always contact your local authorized Rulmeca service centre or distributor for aftermarket service or please refer to nearest Rulmeca distributor listed on the back of our catalogue.
  Alternatively please refer to **www.rulmeca.com**.

aa) **Wiring Diagrams**

- **Please refer to pages 92-96.**

bb) **Non-Belt, Partial Belt, Modular Belt**

- Special Motorized Pulley designs are available for “non-belt, V-belt, partial belt, and modular belt” applications. See “ambient temperature section” above.
- It is essential that each special application is designed to adequately dissipate heat from the Pulley surface.
- Using a standard Motorized Pulley in one of these special applications could result in motor heat damage and ***voids product warranty.***
- Contact RULMECA for assistance with these applications.

cc) **Storage of Motorized Pulleys**

During storage RULMECA Motorized Pulleys

– should be stored in a house or as a minimum covered by an awning.
– have to be protected against direct influence of the sun to secure that the sealing system does not dry out!
– have to be turned 180° every _ year to make sure that all internal parts are being lubricated.

If Motorized Pulleys have stored longer than 1year, they have to be tested before being put into operation. Such a test should include that

– The motor winding is checked with an insulation tester
– The winding resistance is checked
– The thermal protector is checked with continuity tester
– The Pulley is connected to the power supply and runs for a minimum of 30 minutes to check that there is NO oil leaks – make sure that the Pulley body temperature DOES NOT exceed 70°C degree.

For safety reasons make sure that the Pulley is proper fixed to the test frame during test.