



PLANNING SECTION





ENVIRONMENTAL CONDITIONS

Hygienic conditions

For food processing and other applications where hygiene is paramount we recommend the following materials, connectors and accessories:

- Stainless steel Shell,
- Stainless steel Shaft,
- Stainless steel End housing
TS8N/10N version
- IP66 Sealing with NBR or FPM with
stainless steel labyrinth drum motors
- Hot vulcanized Lagging, FDA
approved, white nitrile rubber NBR or in
polyurethane PU
- Oil, food-grade, synthetic
- Stainless steel Terminal box
- Straight or elbow connectors in stainless
steel
- Diamond patterned lagging is not suitable
for food processing as it can be difficult
to clean and leave traces of bacteria

Conveyor frame

According to EHEDG design rules, it is highly recommended to incorporate rust-free open conveyor frames to facilitate easy cleaning, wash down and disinfection of the conveyor, drum motor and belt.

The rubber material shall be USDA/FDA and EC1935/2004 compliant.

Wet and wash down applications

Wet and wash-down subject applications require rust-free or stainless steel materials for the drum motor shell and sealing system.

The following materials and accessories are available:

- Stainless steel or mild steel Shell with hot
vulcanised lagging
- Stainless steel Shaft,
- End housing for saltwater resistant
(80 LS- 138LS) powder coating
(165LS-320H) or with stainless steel shell
(80LS-320M)- TS8N/10N version
- End housings for LP-series, aluminium
with stainless steel cover
- IP66 seal, nitrile rubber NBR or FPM, with
stainless steel labyrinth
- Lagging, all types possible
- Diamond patterned lagging can be used
for non-food wet applications
- Cable connectors, all types possible
- Max. 50 bar at a distance of 0.3 m
- Max. 60°C water temperature for nitrile
rubber NBR regreasable sealing
- Max. 80°C water temperature for nitrile
rubber NBR or FPM sealing

ENVIRONMENTAL CONDITIONS

Dry and dusty applications

All Rulmeca drum motors regardless of specification or material, are sealed to IP66 protection rating. For applications in hazardous areas requiring intrinsically safe or explosion proof motors, please contact Rulmeca.

High temperature

With Rulmeca drum motors, the cooling is due to the contact of the shell with the conveyor belt. It is essential that every drum motor, has an adequate temperature difference between the internal motor and its ambient operating temperature.

All drum motors in the catalogue are designed and tested, without lagging and with a belt for use in a maximum ambient temperature of +40 °C.

- The maximum ambient temperature for standard Rulmeca drum motors is 40° C according to EN 60034
- Every execution is possible, stainless steel versions allow a lower heat dissipation
- Before installing, make sure that the type of oil, declared on the label of the drum motor, ensures a temperature range compatible with the temperature of the applications environment.
- The rubber coating for modular belts can cause overheating of the drum motor, therefore only use recommended specifications
- De-rated motors or standard motors with frequency converters, properly configured for reducing running temperatures (Reduced power and inrush current)
- The rubber lagging to increase the friction with the belts can cause overheating; comply with the limits allowed for the lagging and always connect the motors internal thermal protection.
- For drum motors with motors 6, 8, 12 poles and lagging thicker than 8 mm, use standard motors with frequency converters or de-rated drum motors
- For applications with ambient temperatures above +40 ° C, please contact Rulmeca

ENVIRONMENTAL CONDITIONS

Low temperature

When a drum motor is operated in low temperatures (less than +5 °C), the viscosity of the oil and temperature of the motor when it is not running should be considered. Consider also that condensation inside the drum motor and terminal box may occur with varying wide ranging temperatures.

We recommend the use of the following materials, cables and accessories:

- Mild steel with hot vulcanised lagging or stainless steel Shell
- Stainless steel Shaft,
- End housing in salt water resistant aluminium or solid stainless steel-TS version
- Sealing stainless steel with labyrinth
- Optional special oils for low temperatures
- Use special low temperature seals in temperatures below -25 °C
- System Activation of pre-heating, to prevent condensation
- Lagging, all types possible
- Very low temperatures reduce the effectiveness of the rubber to increase friction
- Cable connections: possible all kinds
- Use of anti rust materials

Anti Condensation heating

In ambient temperatures below +1 °C, consider heating the motor windings to keep the oil viscosity, seals and internal parts at a constant temperature.

If the motor current is switched off for some time and the ambient temperature is very low, then the motor oil becomes viscous. In these situations opt for the use of condensation heating systems, also in order to avoid the formation of ice crystals within the oil seals that would result in a premature damage.

Please refer to Rulmeca.

Altitude higher than 1000 m

The operation of a drum motor at an altitude above 1000 m above sea level may result in a loss of power and overheating due to low atmospheric pressure and the lower density of the air, which cools the motor. The altitude of the final application should be taken into consideration when calculating the required power. For more information please contact Rulmeca.

DIFFERENT POWER SUPPLY

Connecting 3-phase motors to a single phase supply

3-phase motors combined with a frequency converter can be connected to a single phase supply providing that the supply voltage is the same as that of the motor. 3-phase motors generally have a much higher efficiency than single phase motors.

INDUSTRIAL SOLUTIONS

Rulmeca offers a wide range of industrial solutions for different applications and market sectors.

This chapter will only give an overview of some the most important areas covered.

General logistics

Conveying in internal logistics, warehousing and storage handling covers a wide spectrum of applications, such as electronics, chemicals, food, automotive and general manufacturing.

All drum motors in this catalogue are suitable for general logistics applications.

Food application

Rulmeca drum motors are ultra-hygienic and easy to clean. All drum motors for food processing comply with EC 1935-2004 and FDA.

Airport logistics

Airport applications, such as check-in conveyors, X-Ray machines and scanning equipment, require low noise and frequent start / stops. Most applications use friction drive belts made of PU, PVC or rubber.

CERTIFICATIONS



COLLABORATIONS:



POWER CALCULATION AND SELECTION OF THE DRUM MOTOR FOR UNIT HANDLING

Calculation of the tangential force

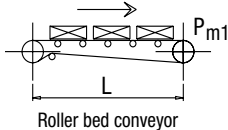
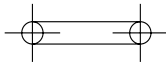
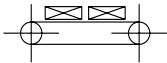
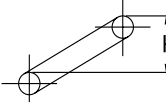
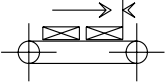
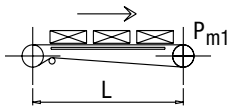
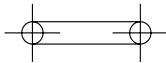
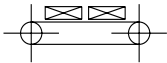
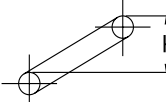
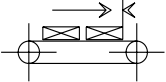
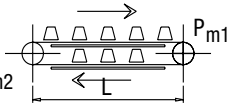
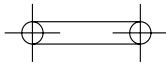
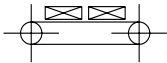
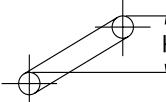
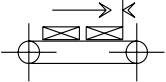
- F = Tangential Force [N], $F = F_0 + F_1 + F_2 + F_3$
 The tangential forces for drum motors are given in the tables of the range of standard products
- P_n = Belt weight per linear metre
 P_{pr} = Weight of rotating parts of the belt conveyor per metre length (carrying and return section)
- P_{m1} = Weight in Kg of the conveyed product on the load section, or each metre of length of the belt conveyor
 P_{m2} = Weight in Kg of the conveyed product on the return section, for each metre of length of the belt conveyor
- C_1 = Coefficient of friction between product and belt carrying side
 C_2 = Coefficient of friction between belt carrying side and slider bed
 C_3 = Coefficient of friction between return belt and product
 C_4 = Coefficient of friction between return belt side and slider bed
- L = Length of the conveyor in metres
 H = Height difference in conveyor
 F_0-F_3 = Force

Coefficient of friction

C_2 o C_4	Belt PE	Belt PP	Belt POM
Slide bed	0.30	0.15	0.10
Steel or stainless steel scroll plan slide bed	0.15	0.25	0.20

C_1 o C_3	Belt PE	Belt PP	Belt POM
Steel product	0.15	0.30	0.20
Glass product	0.15	0.15	0.15
Plastic product	0.10	0.15	0.15

Calculation of the tangential force

Conveying system	Force without load	Force to convey materials horizontally	Force to convey materials on incline	Accumulation
 Roller bed conveyor	 $F_0 = 0.4 \cdot L \cdot (2P_n + P_{pr})$	 $F_1 = 0.4 \cdot L \cdot P_{m1}$	 $F_2 = 10 \cdot H \cdot P_{m1}$	 $F_3 = 10 \cdot L \cdot P_{m1} \cdot C_1$
 Slide bed conveyor	 $F_0 = 11 \cdot L \cdot P_n \cdot C_2$	 $F_1 = 11 \cdot L \cdot P_{m1} \cdot C_2$	 $F_2 = 10 \cdot H \cdot P_{m1}$	 $F_3 = 10 \cdot L \cdot P_{m1} \cdot C_1$
 Double slide bed conveyor	 $F_0 = 10 \cdot L \cdot P_n \cdot (C_2 + C_4)$	 $F_1 = 10 \cdot L \cdot (P_{m1} \cdot C_2 + P_{m2} \cdot C_4)$	 $F_2 = 10 \cdot H \cdot (P_{m1} - P_{m2})$	 $F_3 = 10 \cdot L \cdot (P_{m1} \cdot C_1 + P_{m2} \cdot C_3)$

REQUIRED DATA FOR POWER CALCULATION

SECTION A - ORDER DETAIL

Drum motor (TM)	Q.ty	Ø [mm]	Type	[kW]	Phase	Voltage [V]	[Hz]	[m/s]	RL [mm]	EL [mm]	AGL [mm]		
Idler Pulley (UT)	Q.ty	Ø [mm]	Type								RL [mm]	EL [mm]	AGL [mm]
TM	UT						New EDP code:					Additional comments:	
Note: please mark the required options with a cross													
		Terminal box stainless steel:				Terminal box aluminium:							
		Elbow connector stainless steel:				Elbow connector polyamide:							
		Straight connector stainless steel:				Straight connector brass:							
		Cable length [m]:				Cable type (screened/halogen free):							
		Insulation class:											
		Special certification:				CSA:		FDA:					
		Backstop:				Motor turning direction (at connection side):							
		Elektromagn. brake:				AC voltage to rectifier [V]:							
		Ø 80 - 220 RLmin + 50 mm				Fail safe unit:		Starts/Stops:					
		Special thermal controller:				(PTC):							
		Encoder option:		SKF:		RLS:		Special:					
		VFD-operation:				delivered with VFD:							
		Reversible operation:				Starts/Stops per hour:							
		Stainless steel option:											
		TS8N/TS10N:				TS7N/TS9N (with regreasable labyrinths):							
		Oil:		FDA:		Synthetic:							
		Special environmental condition - kind of aggressivity:											
		Temperature of material to be conveyed if higher than 70°C:											
		Ambient temperature if higher than 40°C or lower than - 25°C:											
		Special mounting vertical:				or with an angle of:		degrees					
		Cylindric shell:				Diameter (if special) [mm]:							
		Additional motor data plate required:											
		Special shell: (customer drawing has to be included)											
		Special shaft design: (customer drawing has to be included)				H [mm]:							
		F (key width) [mm]:		D [mm]:		K or C (flat length) [mm]:							
		Special end housings: (customer drawing has to be included)											
		Low noise requirements [dBA]:				dBA							
		Rubber lagging black/white/blue:				hot/cold vulcan.		Special:					
		Thickness of the lagging [mm]:											
		Special groove measurements: (customer drawing has to be included)											
		Groove type:		Groove dimens. [mm]:		Top:		Bottom:		Depth:			

SECTION B - NECESSARY DETAILS FOR POWER CALCULATION

Type of conveyor:	Slider bed:	Roller bed:	Special:	Inclining/Declining:
Conveyor length [m]:	Load [kg/m]:		Belt width [mm]:	Belt material:
Belt type:	Belt thickness [mm]:		Belt manufacturer:	
Additional comments:				
Environmental conditions:				
Accessories:				

TECHNICAL PRECAUTIONS FOR DESIGN, INSTALLATION AND MAINTENANCE

IMPORTANT INFORMATION

- After unpacking the drum motor, inspect carefully for any damage that may have occurred during transit. Check to be sure all supplied accessories are enclosed with the unit. If you have questions regarding safety or damaged or missing parts, please call one of your nearest RULMECA representative listed at the back of the manual.
- It is the responsibility of the contactor, installer, owner and user to install, maintain and operate the conveyor, components and conveyor assemblies in such a manner as to comply with:
 - The Williams-Steiger Occupational Safety and Health Act and with any and all state and local laws and ordinances as to the national and international standards as to:
 - ANSI – B20.1 Safety Code and Conveyor Equipment Manufacturers Association (CEMA) voluntary consensus standards which may prevail,
 - ANSI – Z535 Warning label Series
 - ISO 3864-2 Product Safety labels.

When existing equipment is being retrofitted, upgraded or even changed, it is in customer's best interest to bring the equipment up to today's standards. If there are any questions, please contact Rulmecca.

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- Electromagnetic Brake
- Mechanical Backstop
- Food Handling Applications
- Operation without belt/with narrow belt
- Variable Frequency Drive (VFD)
- Altitudes above 1000m
- Single Phase AC Motors
- Oil and Seal Maintenance

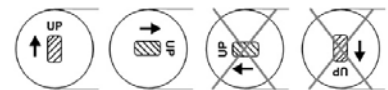
TRANSPORT/HANDLING

- For safety reasons during transport and assembly a lifting rope according to the max. weight of the drum motor has to be used. The weight is stamped on the data plate and /or given in the catalogue.
- The rope has to be fixed on the shaft ends.
- Handle with care. DO NOT lift the drum motor at the cable.

DRUM MOTOR MOUNTING ORIENTATION

- Before installing the drum motor, please ensure that the values on the machine plate are corresponding to your requirements.
- At any time, RULMECA drum motors should always be mounted so that the drum shafts are
 1. horizontal,
 2. parallel to idler rollers,
 3. and perpendicular to the conveyor belt centreline.
- Drum motor types 80LS to 220H "UP" is indicated with the word "UP" stamped on the front shaft.

- All drum motors are to be mounted as shown on the sketch below.



Right! Right! Wrong! Wrong!

- In case of a non-horizontal installation, of more than +/-5 degree, please consult RULMECA.
- At any time all Rulmecca drum motors shown in this catalogue must be fitted with a conveyor belt to prevent overheating.
- Drum motors fitted without a belt must be referred to RULMECA.
- Installation and mounting of the drum motor in another position as described could cause severe product damage and voids product warranty.

MOUNTING BRACKET

- As listed in the catalogue, use the correct RULMECA mounting brackets matching the respective types of drum motors.
- Note that it is physically possible, but not permissible, to interchange mounting brackets between models. Mounting brackets designed for smaller diameters or lower-powered drums may not be used for larger diameters or higher-powered drums.
- 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. Drum motors types 80LS to 220H have a top shaft retaining plate. This plate is not designed to resist belt pull.
- The designer must select appropriate mounting bolts to resist belt forces and/or the weight of the drum depending on the mounting position of the drum.
- 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.

- Mounting brackets should be fitted in such a way that they are in contact with the shoulder of each shaft. This will:
 1. Eliminate drum motor 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 drum motor 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 0.4mm (torsion play).
- A drum motor with frequent reversible operations or many start/stops should be mounted with No axial clearance between the shaft flat and the brackets
- Not following these precautions could cause drum and/or mounting bracket damage and voids product warranty.

ELECTRICAL INSTALLATION

- Always use licensed electrician to install the unit. All electrical installation and wiring must be conform to the national code of the National Electrical Standards. Turn the electrical power off at the electrical panel board (circuit breaker or fuse box) and lock or tag the panel board door to prevent someone from turning on power while you are working on the unit, failure to do so could result in serious electrical shock, burns or possible death. According to the European Council Directives related to machinery, the equipment manufacturer (OEM) has to secure that the drum motor is NOT put into operation before it is
 - o Correctly installed,
 - o Correctly connected to the power supply,
 - o Correctly protected against rotating parts,

- A specialist must perform the electrical connection of the drum motor in accordance with electrical regulations. If in doubt, contact Rulmeca.
- A wiring diagram is always supplied with the drum motor. 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 drum motors are delivered with clockwise rotation when viewed from the terminal box end of the drum motor. 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.

All safety devices, including wiring of electrical safety devices itself will not result in a hazardous condition.

MOTOR CURRENT OVERLOAD AND OVER CURRENT PROTECTION

- Motor control systems must include protection against operating drum 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 drum motor.
- Electrical power, control, and protection for drum motors must adhere to all pertinent regulations.

MOTOR THERMAL PROTECTION

- All drum motor 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. 2.5 Amps are the permissible current of standard versions. The voltage is 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 drum model, power, and size. However, 30 to 60 minutes is common with most motors in an ambient temperature of 20°C.

BELT SPEED

- The belt speed shown in this catalogue is defined as the actual speed at full load measured at the standard outer diameter of the drum motors with a tolerance of +/- 10%.
- For single phase drum motors the tolerance range could be between +10% and -20%.
- Nominal speed is a design objective, providing consistent choice among all types.
- Actual belt speed is almost never exactly equal to nominal belt speed.
- The actual speed at full load is typically 5% lower than no load speed because of the rotor slip of an asynchronous motor.
- The slip rate is dependent on power and design of the motor. Low-powered motors have a lower slip rate than high-powered motors.
- With rubber lagging or bigger diameters the belt speed is increasing according to the formula below. Please recalculate the belt speed in one of the mentioned cases.

Example: A 0.75kW drum motors 138LS with an un-lagged drum diameter of 138mm has a nominal speed of 0.8m/sec.

TECHNICAL PRECAUTIONS FOR DESIGN, INSTALLATION AND MAINTENANCE

The actual belt speed is a function of

- The rotor speed (RPM),
- Gear ratio,
- Shell diameter,
- Load.

E. g. the above mentioned 138LS with a nominal belt speed of 0.8m/sec. has

1. A gear ratio of $i = 25.2$,
2. A rotor speed of $n = 2845$ (1/min),
3. A shell diameter of 0.138m,

The actual speed at full load is

$$v \text{ (m/sec)} = \pi \times d \text{ (m)} \times \text{rpm (1/min)} / 60 \times i$$

$$\pi = \text{Pie (3.14),}$$

$$d = \text{drum diameter (m),}$$

$$\text{rpm} = \text{revolutions of the rotor per minute,}$$

$$i = \text{gear ratio}$$

$$v = 3.14 \times 0.138\text{m} \times 2845\text{min}^{-1} / (60 \times 25.2) = 0.815\text{m/sec.}$$

If this drum is supplied with 10mm thick lagging, the belt speed of the lagged drum equals 0.815m/sec. $\times (0.158\text{m}/0.138\text{m}) = 0.93\text{m/sec.}$ at full load, nominal voltage and 50Hz.

- For actual speeds at full load please refer to the power range charts in this catalogue
- To control an exact speed a Variable Frequency Drive can be used.

BELT PULL

- The catalogue specifies belt pull for each model, power and speed. Note that the specified actual belt pull comprises motor and gear box losses. I.e. the belt pull shown in the catalogue is the „utilisable belt pull“.
- Rulmecca recommends to select the drum motors 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 roller resistance or slider bed resistance,
6. F6 – force to frictional resistance of ploughs, etc.

- Furthermore, with special application additional power requirements can be needed (e.g. for belt operating under a hopper, squeezing of belt, accumulation, belt guiding, extreme stiff belts etc.).

BELT TENSION

- The conveyor belt shall be installed with sufficient belt tension to prevent belt slippage. Therefore the required tension at bottom side (T2 see picture) can be calculated after DIN 22101 or CEMA Standard. The belt must never be over-tensioned.
- Actual belt tension can be roughly defined after belt manufacturer’s specifications by measuring the belt elongation.
- The maximum allowable belt tension T1+T2 of each drum motors is specified in the power range charts of this catalogue. It can be reduced at higher speeds.
- **The belt type, belt thickness and the correct drum motors diameter have to be according to the belt manufacturer’s specifications.** Too small drum motors diameters could lead to a damage of the belt.
- Over tension of the belt may damage internal components of the drum motors and is shortening the product lifetime.
- There is no product warranty in case of damages due to over tension of the belt.

AMBIENT TEMPERATURE

- Drum motors are normally cooled by dissipating heat through contact between the surface of the drum and the conveyor belt. It is essential that each drum have an adequate thermal gradient between the drum’s motor stator and its ambient operating temperature.
- All drum motors in this catalogue are designed and tested under full load without rubber lagging and with a belt for

a use in a max. ambient temperature of +40°C.

- The drum motor specifications “maximum allowable temperature” refers to the temperature of the air or the bottom of the conveyor belt in contact with the drum motor.
- 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 drum motors to perform tasks for special applications – e.g. modular plastic belts and V-belts. Please contact RULMECA for such applications.
- Operating Rulmecca drum motors to drive standard conveyor belts outside of the allowable ambient temperature range voids product warranty.

LAGGING

- Smooth, diamond pattern and profiled lagging is available in different colours. Approximate rubber hardness is 65-70 durometer (shore hardness A).
 - Cold bonded or hot vulcanised lagging is available for high power/high torque/high temperature applications and for drum motors with Class H motors.
 - Oil & grease resistant synthetic rubber is also available for oily operating conditions and/or for certain types of belt material. Check with belting supplier if belt/lagging material compatibility could be a problem.
 - Adequate drum motor heat dissipation is necessary.
 - Lagging thickness and width greatly affect drum heat dissipation characteristics!
 - Contact RULMECA before applying any lagging to drum surface to obtain thickness and width specifications and maintain drum motor 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.
- Rubber lagging affects the heat dissipation characteristics of drum motors.

Please contact Rulmeca, when you are uncertain about the use of rubber lagged drum motors.

CYCLE / REVERSIBLE OPERATION

• Rulmeca drum motors are designed to operate either continuously in the LS drum motor range or intermittently in the LP & LS drum motor range.

3-phase types	Max. no. of Start/Stops per minute
80LP,113LP,138LP	15
80LS,113LS	15
138LS,	4
165LS,	3
220M/H	2

1-phase types	Max. no. of Start/Stops per minute
80LP,113LP	10
138LS	Please contact Rulmeca.

- For reversible operation the Drum motors should be installed in the centre of the conveyor. Therefore it is necessary to install additional idlers.
- Some drum motors can be specially prepared for reversible operation. Please specify reversible operation on the order.

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 drum motor and brake must be designed to stop the drum motor before brake clamps are shut and start the drum 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 a drum motor to be "powered through" a clamped brake, burning brake and/or motor.
- A wiring diagram is supplied with every drum motor. 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 the drum motor.
- Neglecting these instructions could cause damage to the motor and/or brake and voids product warranty.
- The built in brake disc is a wear part and has a limited lifetime depending on the operation conditions. In case of premature wear off the operation conditions have to be checked and evaluated. Product warranty does not include wear parts of the brake.

MECHANICAL BACKSTOP

- Drum motors fitted with mechanical backstops must be used on inclined conveyors to prevent run back of the loaded belt which may result in minor or moderate injury when power supply is off.
- The backstop is built into the drum motor and is mounted on the rotor shaft.
- If the drum motor is supplied with optional mechanical backstop the sense of rotation is indicated by an aluminium arrow or plastic sticker fastened to the end housing on the terminal box (or power cord) side of the drum. Clockwise or counter-clockwise backstops are available.
- Rotation direction needs to be specified when placing order.
- The sense of rotation is specified from the point of view of a person looking at

the drum from the terminal box (or power cord) side of the drum.

- 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 drum to prevent the 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.

FOOD HANDLING APPLICATIONS

- The use of Rulmeca drum motors in food handling applications requires a totally stainless steel (TS8N) configuration of the outer material like shell, shafts and end housings.
- Rulmeca offers a variety of food approved (FDA) oil, rubber laggings and profiled rubber laggings for modular belting.

OPERATION WITHOUT BELT / WITH NARROW BELT

- A drum motor usually needs the belt for heat dissipation. To operate a drum motor without belt or with belts covering less than 2/3 of the roller length please refer to Rulmeca.
- Some lower powered and derated drum motors are usable as standard in continuous operation without belt. The selection of a suitable drum motor is always depending on the actual operation conditions. Rulmeca will assist you with the application design.
- If you are using standard drum motors in non-belt applications without confirmation from Rulmeca voids the product warranty.

VARIABLE FREQUENCY DRIVE (VFD)

- Do not run the Drum motors out of the frequency range or in another uncommon way. This could lead to overheating or

TECHNICAL PRECAUTIONS FOR DESIGN, INSTALLATION AND MAINTENANCE

overloading of internal components and voids product warranty.

- It is essential that the VFD be set within the motors allowable operating spectrum. For Rulmeca Drum motors the allowable frequency spectrum is 15Hz to 65Hz. There will not more than 5% torque loss within this range.
- VFDs are designed for a certain maximum length and cross section of the motor cable. This is specified by the VFD manufacturer and should be in general up to 10m. The heat development in the VFD increases with the length of the motor cable. The capacity reactance and herewith the losses in the cable are increasing and causing dangerous resonant frequencies. If the output current of the VFD is not reduced it will switch off the drum motor. Bigger cable cross sections or shorter cables may avoid this effect.
- To protect the motor from dangerous resonant frequencies with high voltage peaks it is recommended using a motor filter at the output of the VFD. This is available from the VFD manufacturer.
- To avoid electromagnetically influences to other electrical devices Rulmeca recommends to use always screened cables in connection with VFD operation.
- The cable screen has to be connected with a grounded part according to the electrical engineering rules.

ALTITUDES ABOVE 1000M

- Operation at altitudes above 1000 m is causing a height depending power loss of the motor. This has to be considered at the power calculation. If you need assistance please refer to Rulmeca.

SINGLE PHASE AC-MOTORS

- The use of different capacitors than the stated on the type label has influence to motor run, temperature performance and noise and leads in case of damages to deletion of the product warranty.

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 the oil type and content chart in this catalogue.
- Rulmeca recommends periodic oil changes and are supplied with two oil fill/drain plugs in end housing.
- The first oil change for all non-synthetic oils should be changed after 20.000 operational hours. This is due to normal wear of gears.
- Synthetic oils may be changed after each 50,000 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 drum motors.
- Note that oil seals, regardless of oil type used, should be changed after 30,000 operating hours. Drum motor standard types 80LS to 220H require a disassembly to change oil seals. RULMECA service personal or authorized local service providers to perform this work.

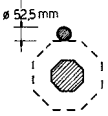
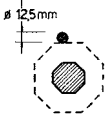
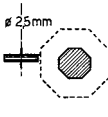
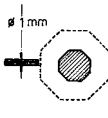
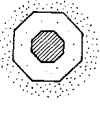
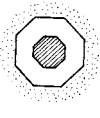
Take special precautions when changing brands of oil and types of oil because of potential oil incompatibility. Contact your local oil supplier for assistance.

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


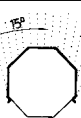
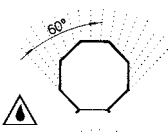
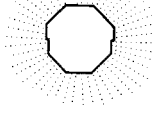


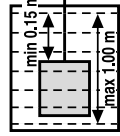
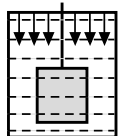

- All the above instructions refer to drum motors **CONSTANTLY** working under **FULL LOAD**. In case of drum motors **NOT** working continuously under full load, the service life will increase considerably! When checking the oil, the cleanness of the oil is always the best guideline of
 - The wear and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

INTERNATIONAL PROTECTION IP RATINGS

Protection against solid bodies

IP	Symbol	Test Definition
0		Not Protected
1		Protected against touch with the flat of the hand and large solid objects greater than 50mm
2		Protected against finger-touch and solid objects greater than 12mm.
3		Protected against solid objects greater than 2.5mm
4		Protected against solid objects greater than 1.0mm.
5		Dust-protected! Dust shall not penetrate in a quantity to interfere with the satisfactory operation of the apparatus.
6		Dust-tight

Protection of internal equipment against harmful ingress of water

IP	Symbol	Test Definition
0		Not Protected
1		Protected against dripping water.
2		Protected against dripping water when tilted up to 15°.
3		Protected against spraying water.
4		Protected against splashing water.
5		Protected against water jets (P1 nozzle 6.3mm, water delivery rate 12.5 l/min ± 5%)
6		Protected from projections of water similar to marine swells (P2 nozzle 12.5mm, water delivery rate 100 l/min ± 5%)
7		Ingress of water in quantities causing harmful effects shall not be possible when the enclosure is temporarily (30 min.) immersed 1 meter in water under standardized conditions of pressure and time
8		Ingress of water in quantities causing harmful effects shall not be possible when the enclosure is continuously immersed in water under conditions, which shall be agreed between manufacturer and the user, but are more severe than for no. 7
9		IP69 - Protected from water during high pressure/steam cleaning (not submersible)

OIL TYPES AND CONTENTS

Roller type	IEC34 Insulation Class	Ambient Temp.	ISO 3498 DIN51519	DIN 51517	Castrol	BP	ESSO Mobil	Shell	Texaco	Fuchs
80LS Standard mineral	F	-5°C +40°C	CC ISOVG 68	CLP ISOVG 68	ALPHA SP 68	ENERGOL GR-XP 68	MOBILGEAR 600 XP 68	OMALA 68	MEROPA 68	
80LS Synthetic option	F & H	-25°C +40°C	CC ISOVG 68	CLP ISOVG 68	ALPHA SYN T 68		SHC 626 68			
80LS Synthetic food grade	F & H	-40°C +40°C	CC ISOVG 68	CLP ISOVG 68						CASSIDA FLUID HFS 68
113LS Standard mineral	F	-5°C +40°C	CC ISOVG 150	CLP ISOVG 150	ALPHA SP 150	ENERGOL GR-XP 150	MOBILGEAR 600 XP 150	OMALA 150	MEROPA 150	
113LS Synthetic option	F & H	-25°C +40°C	CC ISOVG 150	CLP ISOVG 150	ALPHA SYN T 150		SHC 629 150			
113LS Synthetic food grade	F & H	-30°C +40°C	CC ISOVG 150	CLP ISOVG 150						CASSIDA GL150
138LS - 220H Standard mineral	F	-5°C +40°C	CC ISOVG 150	CLP ISOVG 150	ALPHA SP 150	ENERGOL GR-XP 150	MOBILGEAR 600 XP 150	OMALA 150	MEROPA 150	
138LS - 220H Synthetic option	F & H	-25°C +40°C	CC ISOVG 220	CLP ISOVG 220	ALPHA SYN T 220		SHC 630 220			
138LS - 220H Synthetic food grade	F & H	-30°C +40°C	CC ISOVG 220	CLP ISOVG 220						CASSIDA GL220

Note: Drum motors of the LP range contain lifetime oil filling.

Oil contents in litres for vertical mounting regardless of drum width		
	Litres	Special construction
Ø 80	0.2	} Electrical connection to be located at the top
Ø 113	0.6	
Ø 138	1,4	
Ø 165	3.0	
Ø 220	10	

Note: The given oil contents are valid for standard unlagged drum motors only.
For special options the oil quantity can deviate.
Therefore always use the given oil quantity shown on the data plate.

OIL TYPES AND CONTENTS IN LITERS

Drum motors in horizontal applications

RL	80LS	113LS	138LS	165LS	220M 0.37-0.55 kW 1.1-1.5 kW	220H 0.75 kW 2.2-5.5 kW
200	0.10					
250	0.14	0.32				
300	0.18	0.43	0.7			
350	0.22	0.54	0.9	1.2		
400	0.26	0.65	1.1	1.4	3.0	
450	0.30	0.76	1.3	1.6	3.5	4.0
500	0.34	0.87	1.5	1.8	4.0	5.0
550	0.38	0.98	1.8	2.0	4.3	5.3
600	0.42	1.09	2.0	2.3	4.5	5.5
650	0.46	1.20	2.2	2.5	4.8	5.8
700	0.50	1.31	2.4	2.7	5.0	6.0
750	0.54	1.42	2.6	2.9	5.3	6.3
800	0.58	1.53	2.8	3.1	5.5	6.5
850	0.62	1.64	3.0	3.3	5.8	6.8
900	0.66	1.75	3.2	3.5	6.0	7.0
950	0.70	1.86	3.4	3.7	6.3	7.3
1000	0.74	1.97	3.7	3.9	6.5	7.5
1050		2.08	3.8	4.1	6.8	7.8
1100		2.19	4.0	4.4	7.0	8.0
1150		2.30	4.2	4.6	7.3	8.3
1200		2.41	4.4	4.8	7.5	8.5
1250			4.6	5.0	7.8	8.8
1300			4.8	5.2	8.0	9.0
1350			5.0	5.4	8.3	9.3
1400			5.1	5.6	8.5	9.5
1450			5.3	5.8	8.8	9.8
1500			4.8	6.0	9.0	10.0
1550			5.0	5.8	9.3	10.3
1600			5.1	6.0	9.5	10.5
1650			5.3	6.2	10.0	11.0
1700			5.5	6.4	11.5	11.5
1750			5.6	6.6	12.0	12.0
1800			5.8	6.8	13.0	13.0
1850					13.5	13.5
1900					14.0	14.0
1950					15.5	14.5
2000					15.0	15.0

Note: The given oil contents are valid for STANDARD drum motors only. For special options the oil contents might deviate slightly. Therefore, always use the given oil quantity stated on the data plate.

CABLES

The overview shows the available cables for elbow or straight exits.
For an operation via frequency inverter Rulmeca recommends the usage of screened cables.

Drum motor series	80LS / 113LS	80LS / 113LS	80LS / 113LS	80LS / 113LS	80LS / 113LS	113LS / 138LS	113LS / 138LS	113LS / 138LS	113LS / 138LS	113LS / 138LS / 165LS <=1.5kW
Quantity main core	7	7	7	7	4	9	7	7	9	9
Cross section [mm]	0.50	0.50	0.50	0.50	0.75	0.75	0.75	0.75	0.75	0.75
Numeric or colour code	Numeric	Numeric	Numeric	Numeric	Numeric	Numeric	Numeric	Numeric	Numeric	Numeric
Insulation conductors main core	PVC	special-mixture HFFR	PVC	TPE	TPE	special-mixture HFFR	special-mixture HFFR	PVC	PVC	PVC
Halogen-free	X	✓	X	X	X	✓	✓	X	X	X
Quantity data core	-	-	-	2	2	-	-	-	-	-
Cross section [mm]	-	-	-	0.34	0.34	-	-	-	-	-
Numeric or colour code	-	-	-	colour code	colour code	-	-	-	-	-
Insulation outer sheath	PVC	special-mixture HFFR	PVC	PVC	PVC	special-mixture HFFR	special-mixture HFFR	PVC	PVC	PVC
Halogen-free	X	✓	X	X	X	✓	✓	X	X	X
Colour outer sheath	grey RAL7001	grey RAL7001	grey RAL7001	orange RAL 2003	orange RAL 2004	grey RAL7001	grey RAL7001	grey RAL7001	grey RAL7001	orange RAL 2003
Screen material	-	-	copper	copper	copper	-	copper	copper	-	copper
Outer diameter [mm]	6.7	6.9	7.5	7.9	7.5	9.6	8.5	10.5	10.5	10.5
Operating voltage [V]	300/500	300/500	300/500	300/500	300/500	300/500	300/500	300/500	300/500	300/500
Operating voltage [V] acc. UL		600		600	600	600		600	600	600
Temperature range	-15°C -70°C	-30°C -70°C	-5°C -70°C	-5°C-70°C UL -5°C -90°C	-5°C-70°C UL -5°C -90°C	-30°C -70°C	-25°C -70°C	-5°C-70°C UL -5°C -90°C	-5°C-70°C UL -5°C -90°C	-5°C-70°C UL -5°C -90°C
Approval				CSA/UL	CSA/UL			CSA/UL	CSA/UL	UL



LIGHT INDUSTRIAL
DRUM MOTOR RANGE

INDUSTRIAL
DRUM MOTOR RANGE

OPTIONS

ACCESSORIES

PLANNING SECTION