



Mainelec2

Roller conveyor for industrial maintenance and electrotechnics training



**Bac PRO PLP - MSPC
BTS MS - IUT
Universités - Ecoles d'ingénieurs**

System description

Functional description

- ✓ The Mainelec2 system consists of 3 main parts:
 - A roller conveyor
 - A gear motor
 - A control cabinet
- ✓ The equipment is designed to allow the student to work on the mechanical and electrical parts.

Sizes and volume

- ✓ L x W x H: 1840x520x1450mm
- ✓ Weight: 198 kg

Mechanical features

- ✓ The system is based on a mechanically welded support mounted on 4 free wheels including 2 with brake.
- ✓ It consists of:
 - An aluminium basis with 13 rollers;
 - Safety casing with safety electrical contacts;
 - Aluminium guides to secure the transport of the parts;
 - A drain pan

Electrical features

- ✓ The control cabinet ensures the control and protection of the equipment.
- ✓ It is connected to the 400V three-phase 50Hz sector, by a 5m cable and a P17 socket.
- ✓ The control boxes are mounted at the ends of the conveyor.
- ✓ Two adjustable photocells stop the moving part.
- ✓ Three types of cabinets are available:
 - A cabinet with an electromechanical controller (Ref. MA11);
 - A cabinet with a Digidrive SK speed drive, integrating the controller functions in LADER language (Ref. MA12);
 - An empty cabinet for wiring (without components, diagrams supplied) (Ref. MA13).
- ✓ Thanks to the Harting connection between the Control Part and the Operating Part, it is possible to replace the cabinet with another cabinet, to test different configurations and implement different wiring workstations.

Technical topic coverage

- ✓ Motors and reduction gears (asynchronous brake motor, spiral bevel reduction gear, parallel reduction gear, etc.)
- ✓ Electric energy (low-voltage switchgear, speed drive)
- ✓ Sensors (photoelectric)
- ✓ Automation (PLC function of the speed drive).

Training activities

- ✓ Preventive maintenance and TPM - Total Productive Maintenance (visual inspection, lubrication, adjustments, chain strain, component replacement, reduction gear draining, etc.);
- ✓ Control cabinet modification (cycle modification by means of sensors, adding a security component, inserting variation elements);
- ✓ Mechanical corrective maintenance (replacement of the motor, reduction gear, roller);
- ✓ Electrical corrective maintenance (electric lockout, troubleshooting with power up or down, algorithmic approach)

Key points

- ✓ Modular product (3 types of control cabinets, 2 types of reduction gears);
- ✓ Useful in both maintenance and electrotechnics training;
- ✓ Many maintenance tool cases and related activities.

References for Mainelec2:

- ✓ MA10: Framework for Mainelec 2 (without control cabinet or motor);
- ✓ MA11: Control cabinet with electromechanical controller;
- ✓ MA12: Control cabinet with Digidrive SK speed drive;
- ✓ MA13: Empty control cabinet (fitted with disconnector and circuit breaker) for wiring by the students;
- ✓ MA14: Control cabinet with Digidrive SK speed drive in kit (the following parts are supplied: box, electrical components, trunkings, rails-dins, labels – not supplied: wires, thimbles, benchmarks, collars and other supplies);
- ✓ MA15: OT gear motor with spiral bevel reduction gear and brake;
- ✓ MA16: CB31 gear motor with parallel gearing reduction gear and brake;
- ✓ MA19: Electrical and mechanical maintenance kit;

MA12: Coffret électrique avec
variateur de vitesse Digidrive SK
(Ancienne Réf LS: MN2VAR)





Electrical and mechanical maintenance kit (Ref MA19)

Main mechanical components included :

- ✓ 1 conveyor roller;
- ✓ 2 blocks;
- ✓ 1 triple gear fitted with 17 teeth;
- ✓ 1 hub for the triple gear;
- ✓ 1 chain fitted with 33 links;
- ✓ 1 double link;
- ✓ 2 rapid-attachment links.

Main electrical components included :

- ✓ 1 photoelectric detector;
- ✓ 1 button box and 2 pushbuttons;
- ✓ 1 emergency shutdown circuit breaker;
- ✓ 1 NO contact.

➤ *This kit allows to carry out corrective maintenance activities.*

Training activities

Preventive maintenance activities

✓ Using the guidance and operation documents of the maintenance teaching file, there are three levels of TPM (Total Productive Maintenance) that may be implemented:

- T.P.M. level 1:
 - visual checks;
 - lubrication;
 - level controls.
- T.P.M. level 2:
 - simple adjustments;
 - change of simple components;
 - strain of different chains.
- T.P.M. level 3:
 - replacement of complex components;
 - replacement sub-sets;
 - draining of the reduction gear.



Mechanical and electrical corrective maintenance activities

- ✓ Mechanical troubleshooting:
 - repairs of power kinematic chain elements;
 - motor replacement;
 - reduction gear replacement;
 - roller replacement (optional in the maintenance kit).
- ✓ Electrical troubleshooting:
 - equipment isolation;
 - troubleshooting in continuous mode;
 - troubleshooting under voltage;
 - algorithmic approach.



Activities for the modification of the control part

- ✓ Intervention and modification of the machine cycle features:
 - cycle (sensors) modification;
 - addition of a security component (optional in the maintenance kit);
 - insertion of variation elements: either speed or angle sequence.





Maintenance tool cases

Orthogonal gear motor maintenance case with specific tooling – Maintenance of bearings and of an orthogonal reduction gear



➤ Case content:

- ♦ Complete orthogonal gear motor
- ♦ Specific mounting/dismounting tools

➤ Training activities:

- ♦ Shaft line extraction and **bearing replacement**
- ♦ Mounting, **adjustment and blocking** of the conical housing
 - ♦ Mounting of the intermediate line
- ♦ Measurement of conical housing and case **dimensions**
- ♦ Conical and intermediate axes **assembly** in the case
- ♦ Checking for **backlash in the toothing** of the conical housing and **torque loss measurement**
- ♦ **Complete mounting** of the reduction gear and **motor coupling**
 - ♦ Testing of the running gear motor

➤ **Key point:** Gear motor used in the Mainelec2 system (technical file **provided**)

➤ **Reference:** **MM13:** Orthogonal gear motor maintenance case with specific tooling – **MM14:** Wear part kit of the OT32 orthogonal reduction gear – **OT32I:** Standalone reduction gear

Orthogonal reduction gear bearing mounting case – Mounting/dismounting of bearings and constraint adjustment



➤ Case content:

- ♦ 1 identical sets of OT 3233 reduction gear parts (bearings, spiral bevel gear axes, intermediate axes)
- ♦ 1 sets of specific tools

➤ Training activities:

- ♦ Mounting of the **conical housing** (parts: conical gear, bearings, key, spacer, rings)
- ♦ **Adjustment and blocking** of the conical housing
- ♦ **Mounting of the intermediate line** (parts: gear, bearings, key, bevel gear, rings)

➤ **Key point:** Several students can work simultaneously (6 sets of parts and 2 sets of tools)

➤ **Reference:** **MM11:** Orthogonal reduction gear bearing mounting case – **MM14:** Wear part kit of the OT32 orthogonal reduction gear

Orthogonal reduction gear mounting and blocking case – Mounting/dismounting and blocking of a reduction gear



➤ Case content:

- ♦ Case and pre-mounted reduction gear assemblies
- ♦ Set of specific tools

➤ Training activities:

- ♦ Measurement of conical housing and case dimensions
- ♦ Conical and intermediate axes assembly in the case
- ♦ Checking for backlash in the toothing of the conical housing and torque loss measurement

➤ **Key point:** Gear motor used in the Mainelec2 system (technical file provided)

➤ **Reference:** **MM12:** Orthogonal reduction gear mounting and blocking case – **MM14:** Wear part kit of the OT32 orthogonal reduction gear

Constraint-free orthogonal reduction gear case – Mechanical study and constraint-free mounting/dismounting of an orthogonal reduction gear



➤ Case content:

- ♦ **Set of orthogonal reduction gear parts** adjusted for dismounting/mounting without tools

➤ Training activities:

- ♦ Complete constraint-free mounting of the reduction gear
- ♦ Mechanical study of the reduction gear

➤ **Key point:** Gear motor used in the Mainelec2 system (technical file provided)



Maintenance tool cases

Constraint-free orthogonal reduction gear case – Mechanical study and constraint-free mounting/dismounting of an orthogonal reduction gear



➤ Case content:

- ♦ Complete parallel reduction gear
- ♦ Specific mounting/dismounting tools

➤ Training activities:

- ♦ Mounting of bearings and wheels on axes
- ♦ Mounting of the reduction gear (**Axes assembly in the case**)
- ♦ Output shaft **extraction** and **key and bearing replacement**
- ♦ Intermediate shaft extraction and key and bearing replacement
- ♦ Input shaft extraction and bearing replacement

➤ Key point: Gear motor used in the Mainelec2 system (technical file provided)

➤ Reference: **MM16:** Parallel reduction gear maintenance case with specific tooling

Constraint-free parallel reduction gear case – Mechanical study and constraint-free mounting/dismounting of a parallel reduction gear



➤ Case content:

- ♦ Set of parallel reduction gear parts adjusted for dismounting/mounting without tools

➤ Training activities:

- ♦ Complete constraint-free mounting of the reduction gear
- ♦ Mechanical study of the reduction gear

➤ Key point: Gear motor used in the Mainelec2 system (technical file provided)

➤ Reference: **MM15:** Constraint-free parallel reduction gear case

Brake motor case – Mechanical study and maintenance of a brake motor



➤ Case content:

- ♦ Brake motor, as separate parts and mounted sub-assemblies
 - ♦ Two additional lining carrier fans
 - ♦ Innerspring unit and additional keys
- ♦ Tools needed for mounting and torque measurement

➤ Training activities:

- ♦ Study and maintenance of a brake motor
- ♦ Study, calculations and measurements on an electric motor brake

➤ Key point: Gear motor used in the Mainelec2 system (technical file provided)

➤ Reference: **MM17:** Brake motor case