# **Differential-Crownwheel and Pinion**





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# INTRODUCTION

When a vehicle takes a curve, the external wheel must travel a greater distance than the internal wheel. The shaft is divided to enable the wheels of a same shaft have different speeds, guaranteeing the coupling of both parts with the differential.

It is difficult for many students to visualize the action of a differential when used to provide a drive from the gearbox to each shaft, allowing at the same time an independent motion between the shafts.

The Differential-Crownwheel and Pinion, "MDC", has been designed by EDIBON to demonstrate the action of the elements of a differential: the crown-wheel and the pinion.





Certificate of Approval of the Quality Management System









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## **GENERAL DESCRIPTION**

The Differential-Crownwheel and Pinion, "MDC", designed by EDIBON, simulates a differential mechanism. The function of the differential mechanism is to enable the drive wheels rotate at different speeds, regardless of whether they are the front or rear wheels.

When the vehicle is travelling in a straight line, the differential must behave as if it were rigid and make both wheels rotate at the same speed. It means that in this situation the sun gears do not spin around their own axis, in other words, they act as wedges to transmit the motion of the crown.

Therefore, the differential allows to provide the torque to either both wheels or only one wheel. When both wheels have the same load the differential supplies the same torque to both of them, but when one of them supports a greater load than the other, then motion is distributed uniformly.

This unit consists of:

Input pinion.

Crown-wheel.

Three gears, named sun gears.

Two gears coupled to the shafts of the wheels, named planetary gears.

Three pulleys with protractor.

The input pinion transfers the power to the crown. That motion of the crown drives the sun gears and they, rotating together with the crownwheel, transfer the power to the planetary gears. The planetary gears at the same time transfer the power to the output shafts, allowing them to rotate at the same or different speed.

# **SPECIFICATIONS**

Bench-top unit.

Anodized aluminum frame and panels made of painted steel.

Main metallic elements made of stainless steel.

Includes brackets that allow to hang the unit on a wall.

The "MDC" unit mainly consists of a differential group formed by:

Input pinion (Z = 21).

Crown-wheel (Z = 63).

Three sun gears (Z = 16).

Two planetary gears (Z = 32).



MDC detail

Gears are distributed on different shafts (input shaft, right output shaft and left output shaft), which are mounted on ball bearings that will allow low inertia and a decrease of the losses due to friction. Both the input shaft and the output shafts have pulleys equipped with protractors with the aim of enabling the student to determine and verify the torque and speed ratios. They are made of aluminum and their radius is 40 mm.

Manuals: This unit is supplied with the following manuals: Required services, Assembly and Installation, Starting-up, Security, Maintenance and Practices manual.

Required elements (Not included):

- SET B. Brass Hook and Mass Set 2 kg. (3 units)

Each "B type" set included:

6 weights of 200 g. (0.44 pounds)

6 weights of 100 g. (0.22 pounds)

2 weights of 50 g. (0.11 pounds)

2 weights of 20 g. (0.044 pounds)

2 weights of 10 g. (0.022 pounds)

1 support hook of 100 g. (0.22 pounds)

# EXERCISES AND PRACTICAL POSSIBILITIES

- 1.- Determination of the input and output speed ratio and the torque distribution.
- 2.- Study of the efficiency.

- 4.- Visualization and demonstration of the behaviour of a differential when used as a means to provide a drive.
- 5.- Verification of the gear ratio.
- 3.- Study of the use of a differential as a simple transmission system.

# **REQUIRED ELEMENTS (Not included)**

- SET B. Brass Hook and Mass Set 2 kg. (3 units)

# DIMENSIONS AND WEIGHTS

MDC:

- Dimensions: 450 x 350 x 700 mm approx.

(37 pounds approx.).

- (17.71 x 13.77 x 27.55 inches approx.). - Weight:
  - 17 Kg approx.

### Optional



MDC/ICAI. Interactive Computer Aided Instruction Software:

With no physical connection between unit and computer, this complete software package consists of an Instructor Software (EDIBON Classroom Manager -ECM-SOF) totally integrated with the Student Software (EDIBON Student Labsoft -ESL-SOF). Both are interconnected so that the teacher knows at any moment what is the theoretical and practical knowledge of the students.

Instructor Software

#### - ECM-SOF. EDIBON Classroom Manager (Instructor Software).

ECM-SOF is the application that allows the Instructor to register students, manage and assign tasks for workgroups, create own content to carry out Practical Exercises, choose one of the evaluation methods to check the Student knowledge and monitor the progression related to the planned tasks for individual students, workgroups, units, etc... so the teacher can know in real time the level of understanding of any student in the classroom.

Innovative features:

- User Data Base Management.
- Administration and assignment of Workgroup, Task and Training sessions.
- Creation and Integration of Practical Exercises and Multimedia Resources.
- Custom Design of Evaluation Methods.
- Creation and assignment of Formulas & Equations.
- Equation System Solver Engine.
- Updatable Contents.
- Report generation, User Progression Monitoring and Statistics.



ETTE. EDIBON Training Test & Exam Program Package - Main Screen with Numeric Result Question



ECM-SOF. EDIBON Classroom Manager (Instructor Software) Application Main Screen



ECAL. EDIBON Calculations Program Package - Formula Editor Screen



ERS. EDIBON Results & Statistics Program Package - Student Scores Histogram

#### Optional

#### Student Software

## - ESL-SOF. EDIBON Student Labsoft (Student Software).

ESL-SOF is the application addressed to the Students that helps them to understand theoretical concepts by means of practical exercises and to prove their knowledge and progression by performing tests and calculations in addition to Multimedia Resources. Default planned tasks and an Open workgroup are provided by EDIBON to allow the students start working from the first session. Reports and statistics are available to know their progression at any time, as well as explanations for every exercise to reinforce the theoretically acquired technical knowledge.

Innovative features:

- Student Log-In & Self-Registration.
- Existing Tasks checking & Monitoring.
- Default contents & scheduled tasks available to be used from the first session.
- Practical Exercises accomplishment by following the Manual provided by EDIBON.
- Evaluation Methods to prove your knowledge and progression.
- Test self-correction.
- Calculations computing and plotting.
- Equation System Solver Engine.
- User Monitoring Learning & Printable Reports.
- Multimedia-Supported auxiliary resources.

For more information see ICAI catalogue. Click on the following link: www.edibon.com/en/interactive-computer-aided-instruction-software



ERS. EDIBON Results & Statistics Program Package - Question Explanation



ESL-SOF. EDIBON Student LabSoft (Student Software) Application Main Screen



EPE. EDIBON Practical Exercise Program Package Main Screen

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ECAL. EDIBON Calculations Program Package Main Screen

\* Specifications subject to change without previous notice, due to the convenience of improvement of the product.



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