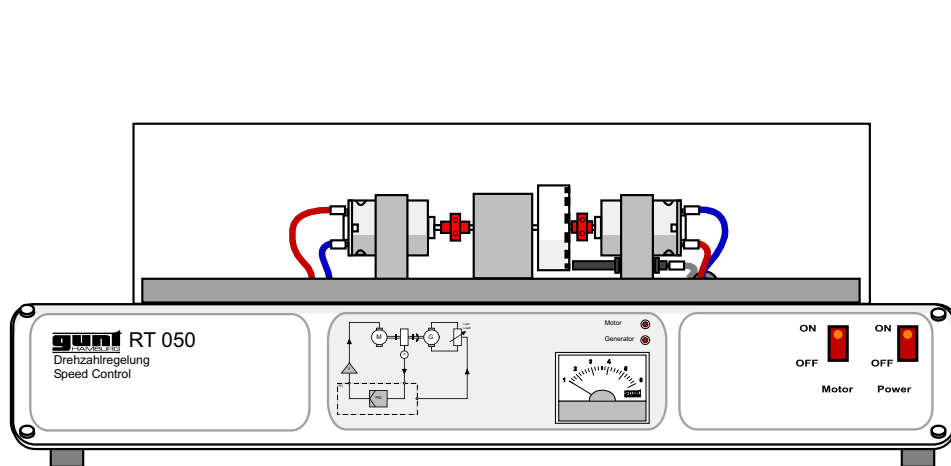# Instruction Manual

RT 050   Speed Control Unit

Instruction Manual

Please read and follow the safety regulations before the first installation!

Table of Contents

RT 050 — *SPEED CONTROL UNIT*

1 Introduction

The **RT 050 speed control model** represents a typical loop control system, as is standard and widespread in engineering.

The actual loop is an electric motor coupled to a mass flywheel. The speed of this arrangement is to be controlled. To simulate additional disturbances, a generator can optionally be connected to the shaft at three different load levels as a controllable mechanical resistor. Control achieved by influencing the motor current. The necessary speed signal is obtained directly on the mass flywheel using an inductive sensor and communicated as a pulse signal.

The model must be supplemented by a separate external controller to create a complete control loop. It communicates with the peripheral equipment (e.g. a PC) via a USB interface.

The most suitable control and regulation program is the associated software **RT 010 - RT 060 Principles of control engineering**.

In conjunction with the software, an extensive individual experimental program is available for the model, which includes the following application areas:

— Influence of controller design on control action and disturbance response

— Stability of control loop

— Controller optimisation

The clear real loop model is closely related to reality and thus aids understanding to a greater extent than pure computer simulation. The

processes taking place on the model can easily be observed through the transparent protective hood.

As a compact table-top model that does not require much space, it is particularly suitable for simultaneous experiments at multiple desks in the same room.
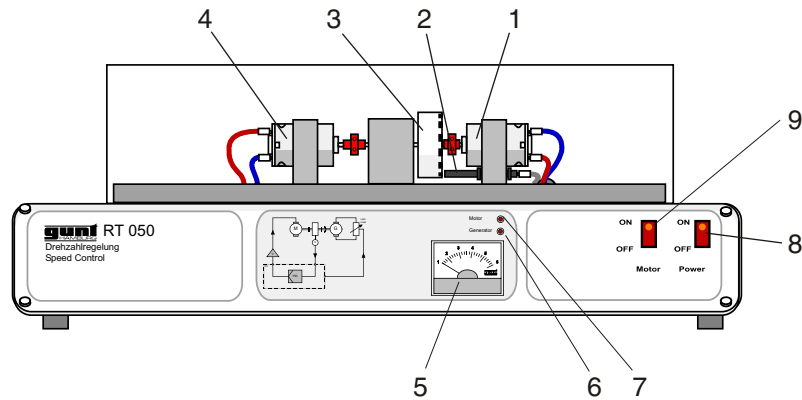
The software's networking capability also allows extensive systems to be set up.

The **RT 050 speed control model** is not designed for industrial use, but is intended exclusively for teaching and training purposes.

RT 050   *SPEED CONTROL UNIT*

2   Description
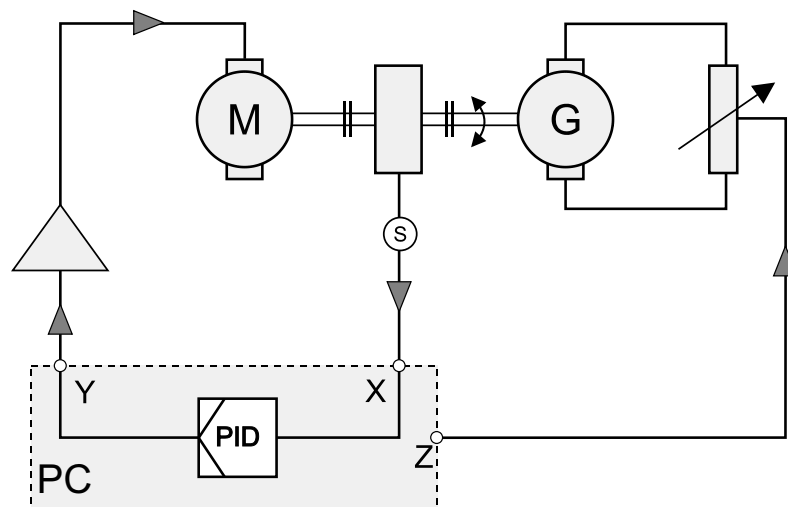
2.1   Equipment layout

1	Electric motor	5	Analogue speed display	9	Motor switch
2	Speed sensor	6	Generator signal lamp	>	USB plug-in connection (rear of unit)
3	Rotor	7	Motor signal lamp		
4	Generator	8	Master switch	>	Mains connection (rear of unit)

2.1   RT 050 Overall View

2.2   Process diagram

2.3   Function

The **RT 050 speed control model** is used as a simple loop for a controller. It does not include a controller itself; all control processes must be run externally. The **"RT 010 = RT 060 Principles of control engineering"** learning and exercise program is ideally suited for this purpose.

The model communicates with external devices via a USB interface, for which it has a plug-in connection on the rear.

A gearless electric DC motor (1) which directly drives a rotor (3) is used as an actuator. The speed is displayed on the analogue measuring instrument (5). A generator (4) at the other end of the shaft is used to provide an additional load on the motor. It can be externally actuated and connected at three different load levels. To do this, it is short-circuited with three burden resistors of different sizes. The generator signal lamp (6) indicates whether the generator is operational.

The motor can be separated from its actuation signal as required using the associated motor switch (9). The motor signal lamp (7) indicates whether the motor is actuated.

In order to be able to exercise control, a speed signal must be available. Grooves in the face of the rotor are scanned using an inductive sensor (2). The speed is therefore available in the form of a pulse signal, which is fed to an external counter (e.g. PC) via the USB connection.

NOTE: The electric motor has a **response threshold**. This means that it only starts to move when the control signal **y** is at least 18 - 20% of its full final value.

2.4   Commissioning

— Connect the model to the mains using the connecting socket on the rear.

— Using the USB port on the rear of the model, connect it to an external controller (e.g. PC).

— Switch on the model at the master switch (8)

— Switch on the motor switch (9)

The model is now ready for use.

Shutting down

To shut down, the model only needs to be switched off at the master switch.

The model should be disconnected from the mains if it will not be used for a long period of time.

The unit is maintenance free and does not require any additional servicing.

3   Safety

3.1   Health hazards

DANGER! Caution when making changes to the electrical components in the system! There is a risk of electric shock.

Do not open the housing of the unit. Disconnect the mains connector prior to any necessary work.

Only have work performed by suitably qualified personnel.

Protect the unit from moisture and dampness.

DANGER! Never operate the unit without a correctly installed earth wire. Non-compliance with this requirement means that the operator and the unit are no longer adequately protected.

CAUTION! Moving parts

There is a risk of serious injuries.

Do not touch the rotor during operation. Do not operate the unit without the protective hood.

3.2   Hazards for Equipment and Function

CAUTION! Do not obstruct or block the rotor. This can cause damage to the unit.

CAUTION! Risk of corrosion

Protect the unit from moisture and dampness.

RT 050   *SPEED CONTROL UNIT*

4   Appendix

4.1   Technical data

L x W x H: 600 x 410 x 310 mm

Weight: approx. 15 kg

Mains supply: 230 V , ~50 Hz

Optional alternatives, see rating plate

Electric motor

Type: DC motor, continuously excited

Mechanical power: ~ 9 W

Operating voltage: DC 6 ... 24 V

Nominal voltage: 12 V

Speed: max. 5700 rpm

Nominal speed: 5000 rpm

Torque: ~0,017 Nm

Response threshold: (y) = min. 18 %

                        (~ 2,0 V)

Speed sensor

Type: Inductive proximity switch

Output signal: Pulse

PC communication   USB

4.2   Items supplied

1   Complete model

1   USB cable

1   Mains cable

1   Operating instructions