

Model 5

Manual transmission

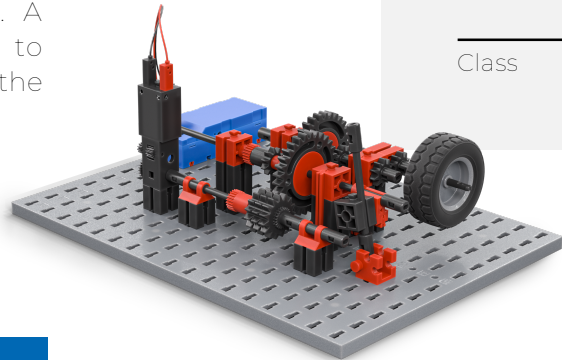
Transmissions with variable gear ratios are called manual transmissions. They are necessary in vehicles with combustion engines, as these engines only operate efficiently within a limited speed range. A manual transmission makes it possible to adjust the speed of the drive axle to the desired speed of the output axle.



Date

Name

Class



DESIGN TASK

Manual transmissions are usually constructed from gear drives. In the following, we distinguish the gears used based on their number of teeth: We call the gear with 30 teeth Z30, the one with ten teeth Z10, and so on.

In Fig. 1, you can see a drive train (with motor, front) and an output shaft (with wheel, rear right in the picture). Between them is an (empty) transmission axle that can be moved horizontally using a lever (right).

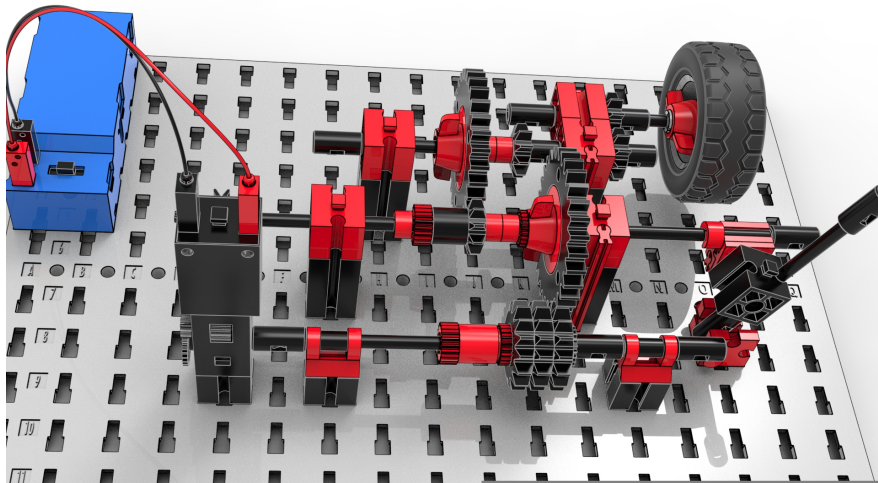
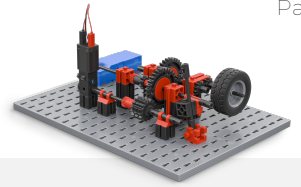


Fig. 1: Manual transmission – basic design

Task:

Expand this initial design into a manual transmission that allows two different gear ratios (also called "gears") to be selected.

THEMATIC TASK



1. What ratios does your gearbox achieve? How big is the difference in the rotational speeds of the output shaft (at the same speed of the drive shaft) in the two gears?

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1. Your manual transmission is one of several that can be constructed with the given gears (Z10, Z15, Z20, Z30, Z40). What other two-speed manual transmissions could you implement with these gears (and, if necessary, other distances between the transmission axles)?

EXPERIMENTAL TASK

1. Expand your two-speed manual transmission to a three-speed manual transmission. What gear ratios does your transmission achieve? Are other designs possible?

2. Add a reverse gear to your three-speed transmission.

