

## Model 6

### Planetary gear



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Note on the history of technology: In 1780, James Pickard obtained a patent for the crank mechanism, which had already been known for at least 1500 years at that time, and attempted to blackmail James Watt (1736-1819), who was about to complete his first "steam engine." In response, Watt's congenial assistant William Murdoch (1754-1839) quickly invented a planetary gear consisting of two coupled gears, one of which revolves like a "planet" around the other (the "sun") in order to circumvent Pickard's patent. For this, Watt received his own patent in 1781 (Patent No. GB 1321) together with his expansion steam engine.

The students receive the construction instructions for the planetary gear with a fixed bridge.



## CONSTRUCTION TASK

The coaxial bevel gear causes a reversal of the direction of rotation.

The coaxial crown wheel gear causes a transmission ratio of 1:3.2 to slow down.

## THEMATIC TASK

The two gears are identical, as both the outer and inner gears have 30 teeth. In the planetary gear, the two planetary gears cause a reversal of direction (the direction of rotation remains the same for the inner gear). In the simple spur gear, the transition from Z10 to Z30 causes a reversal of direction.

The planetary gear with a fixed bridge and sun gear on the drive shaft thus results in a ratio of 1:3 in slow motion with a reversal of the direction of rotation.

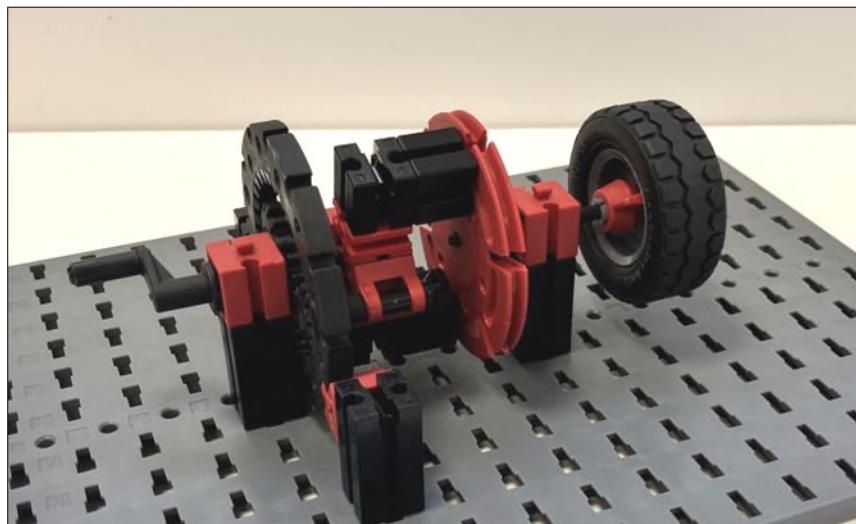
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## EXPERIMENT



1. The following two additional planetary gear systems are possible with the fischertechnik internal gear Z30:

a) Planetary gear with fixed ring gear.




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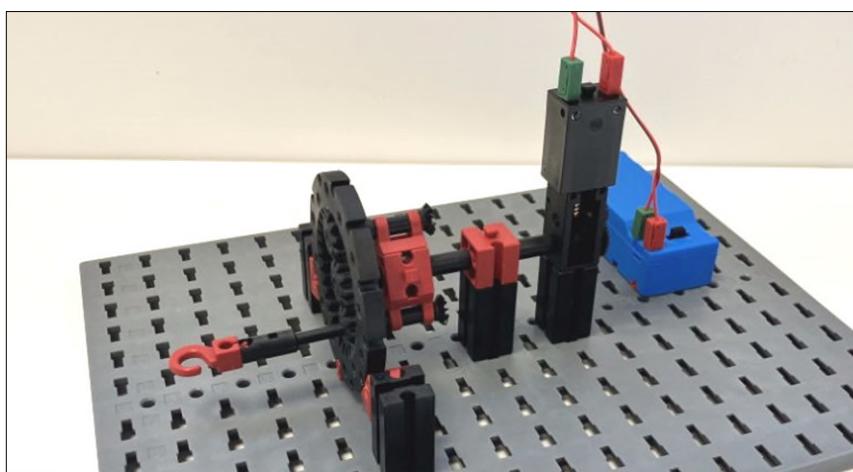
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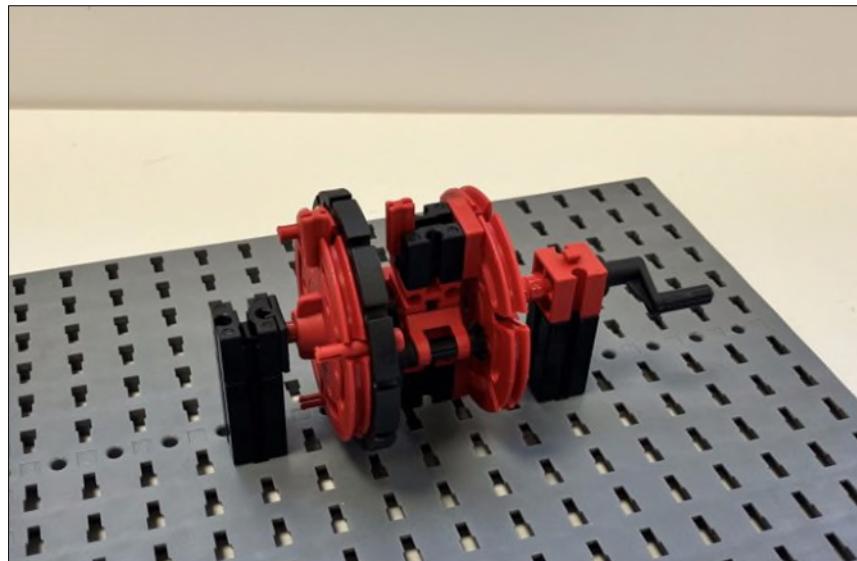
An interesting variation of this gear: The shaft of a planetary gear as the output delivers an agitator:



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b) Planetary gear with fixed sun gear:



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2. The following gear ratios can be achieved with these fischertechnik planetary gears:

Fixed	Drive	Output	Transmission ratio	Reversal of direction
Bridge	Sun gear	Pinion gear	-3	Yes
Bar	Pinion	Sun gear	-0.33	Yes
Ring gear	Sun gear	Web	4	No
Hollow wheel	Bridge	Sun gear	0.25	No
Sun wheel	Bridge	Hollow wheel	0.75	No
Sun gear	Pinion gear	Bridge	1.33	No

3. The highest possible gear ratio for slow speeds is achieved by coupling the first and third gears (in the table). This results in a gear ratio (with direction reversal) of -12.



## APPENDICES

Assembly instructions and templates for the gearboxes and models:

Model 6: Construction manual for planetary gear with fixed planet carrier (bridge), construction manual for planetary gear with fixed ring gear, construction manual for planetary gear agitator, construction manual for planetary gear with fixed sun gear.

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