

®

Graupner

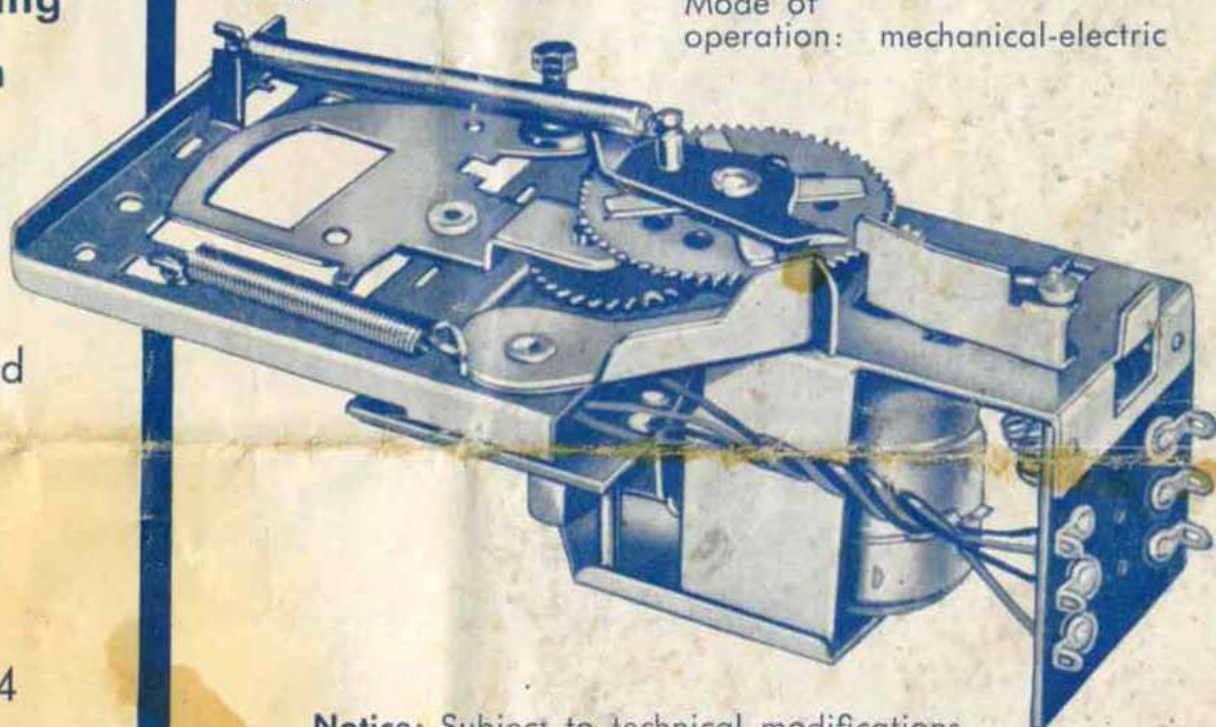
KINEMATIC

Dimensions and technical data

KC/E

Length: $4 \frac{11}{32}''$ Width: $2 \frac{19}{64}''$ Height: $2 \frac{3}{32}''$ Weight: approx. $5 \frac{1}{4}$ oz.
incl. counter weightPower: integral electric
motor 4—4,5 voltsMode of
operation: mechanical-electric

**Self neutralizing
multi function
rudder servo**
for
single channel
radio controlled
ship and
car models



Indent No. 3604

Notice: Subject to technical modifications

What KINEMATIC can do

In the course of the last few years KINEMATIC has become the most popular rudder servo for steering ship models with single or 2-channel R/C equipment. It permits to move the rudder to either right or left by transmitting long pulses, with the rudder automatically returning to neutral position as soon as these pulses stop.

In addition to, and independent of, these steering possibilities KINEMATIC can be used to control the electric main drive motor of the model by transmitting ultra short signals, which permit the following control sequence:

1. short pulse = motor on, forward
2. short pulse = motor off
3. short pulse = motor on, reverse
4. short pulse = motor off, etc.

With these control possibilities and a little practice – and that's just what you've got to acquire in any branch of this radio control business – a ship model can be made to manoeuvre very elegantly and without any restriction of its movements.

KINEMATIC can be operated in conjunction with any kind of receiver. Check page 6 for hook-up to GRUNDIG VARIOTON receiver.

The combination of KINEMATIC with a three channel gear is a most attractive proposition. In this case a multi channel rudder servo BELLAMATIC II is used to steer the rudder, using two channels (this ensures positive, precision directional control: left movement of the stick always results in left rudder, right movement always in right rudder). The third channel, using short pulses, permits reversing the polarity of the main drive motor. By transmitting long pulses the lever (which on single or 2-channel equipment operates the rudder) can be used for two optional, additional functions.

The working principle

The working principle of the KINEMATIC is essentially very simple. The servo contains a small electric motor, which operates on a battery — the so-called working battery — of 4 to 4,5 volts and is actuated by the relay of the receiver when a signal is transmitted by the transmitter. The electric motor turns the large cog wheel on top of the machine via a pinion. The electric motor is mounted on a rocker arm in such a manner that it can turn on it. Thus on starting the motor and the rocker arm move a short distance counterclockwise and engage a pawl, which blocks the longer cam of the large cog wheel. This limits the movement of the latter to half a turn, i.e. till the cam hits the pawl. The steering lever, which actuates the pushrod linked to the rudder, is displaced from its neutral to the fore or aft position by another cog wheel. As long as the engine current is switched on, — i.e. the receiver relay is closed — the large cog wheel remains in its position, blocked by the pawl, and keeps the rudder in its position too. As soon as the transmitter signals stop, the motor current is switched off, the pawl unlocks and the large cog wheel returns to its neutral position under the influence of the large spiral spring.

The next transmitter signal induces the same procedure, but in the reverse direction of the steering lever movement. If the first signal causes right rudder, the next will move the rudder to the left.

If the same rudder is required once more, counter rudder must be skipped smartly. On account of the relatively low speed of ship models and the resulting slow response to rudder movements such a short-time application of counter rudder is visually almost unnoticeable.

Check proper function

of the KINEMATIC in the following manner: press a normal flashlamp battery of 4,5 volts with its contact strip to the two upper soldering lugs of the wiring panel: Plus terminal of the battery (short contact strip) to the white soldering lug, the Minus terminal of the battery to the black plug. As soon as the contact is established the steering lever moves and returns to neutral again when the current is interrupted.

Very short pulses prevent the large cog wheel to accomplish the normal half turn until blocked by the pawl. It then only travels for a quarter turn and is returned to neutral by the long spiral spring as soon as the current is interrupted.

A free wheeling device, which can be seen on the bottom side of the device, consists of a ratchet coupling, the movable part of which overrides the rigid part on clockwise movements of the large cog wheel. The coupling, however, engages when the cog wheels turns in the counter direction, and in so doing turns the contact wheel of insulating material and copper rails coupled with it, which in turn acts as engine switching device through these movements.

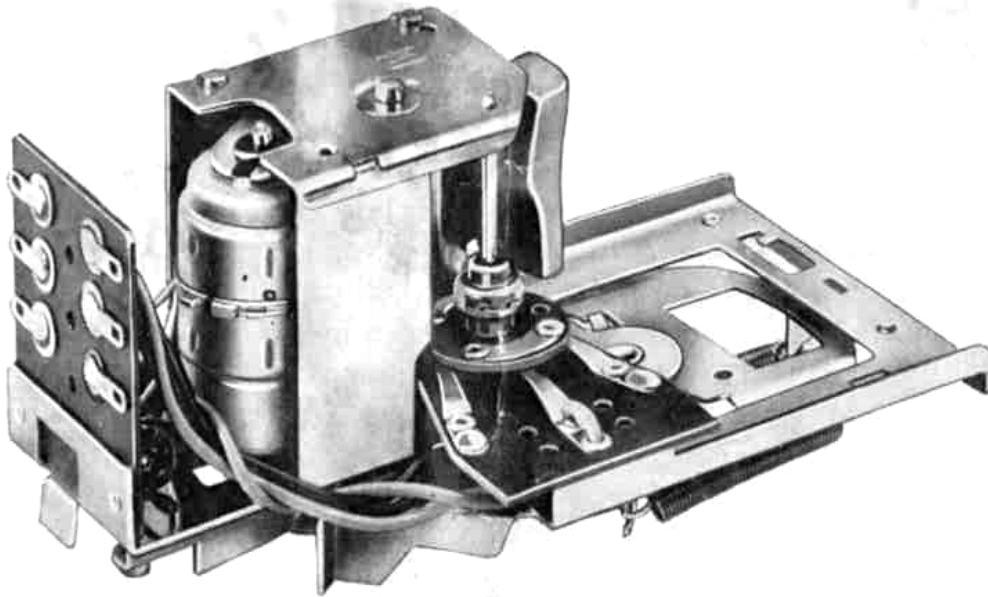


Illustration 1

Bottom view of the KINEMATIC. The wiring panel with its six soldering lugs is clearly shown, next to it the drive motor, then the polarity switching device with three rigid contacts, with the contact wheel and the ratched coupling atop it. The lead counterweight is on the rear right side.

When a short pulse is transmitted, the large cog wheel makes a quarter turn and is then returned to its neutral position again, this is exactly what happens: the drive motor is switched on, switched off and reversed in steps.

Each of these phases results in a very short rudder movement, which is not noticeable visually.

It is not absolutely necessary to know all these things if you are going to wire and use the KINEMATIC. It suffices to simply wire it according to the wiring diagrams shown here. On the other hand it does not do any harm to know exactly what such a device is doing and why, as it will give you a clear picture of its operational requirements.

On the bottom side of the machine you'll notice a small lead weight, for example, which is mounted on the rocker arm of the motor; its purpose is to dampen the movements of the lever. It is selfevident that the machine must be installed in such a manner that there is no chance of any of the movable parts rubbing or jamming against other parts.

As to the return spring on top of the large cog wheel, this must have an exactly calibrated tension, permitting proper switching operation for rudder and change

Legend for ill. 2

1. A condenser of 5.000–50.000 pF is placed over the contacts of the KINEMATIC motor, which serves to suppress any collector sparks of the motor. This is necessary, since sparks cause high frequency radiations, i.e. radio waves of random frequencies, which may cause malfunction of the receiver.

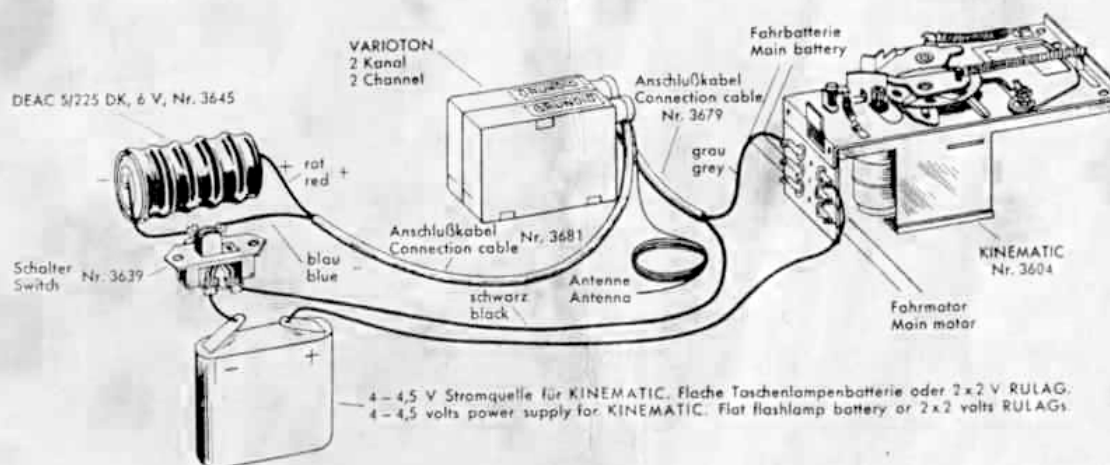
For the same reason an additional condenser of 5.000–50.000 pF should be placed over the contacts of the drive motor. The leads to the condensers should be kept as short as possible. The condensers are available at most local electric shops. It is not only possible, but in fact highly probable that a well designed tone modulated receiver will work properly without any provision for suppressing sparks in the KINEMATIC.

2. Either a normal flashlamp battery of 4,5 volts or two large RULAG accumulators wired in series form the power supply.
3. The front eye of the pushrod linked to the rudder should be bent in such a manner that it easily slips over the driving pin, but has no play. The push rod to the rudder should not be too long, if possible kept straight without kinks and bends, which might act as springs.
4. The rudder tiller should be attached to the rudder axle by means of a lock ring, so that the assembly can be adjusted to the proper neutral position after initial trial runs have been made. The rudder tiller of about 1 1/4" length has several holes, into which the push rod can be slipped, thus providing rudder travel of different magnitude.
5. The gear can be rigidly mounted on the mounting panel using two long bolts and suitable tubular spacers.
6. The bottom part of the motor bearing of the KINEMATIC must not contact the mounting panel.

For wiring purposes do not use solid wire, but soft and pliable stranded wire. Indent No. 3603, for example, is a good choice.

Notice: Ill. 2 shows a schematic hook-up for R/C equipment. If GRUNDIG R/C sets are used follow the wiring diagram on page 7. Experience has shown that the condenser mentioned above will not be required generally.

Wiring diagram VARIOTON-KINEMATIC



The 8-stranded cable, indent No. 3679, is used for wiring the KINEMATIC to the VARIOTON receiver.

The wiring diagram shows the proper hookup. Only the gray and black leads are required, the remaining ones are not occupied.

Hook-up to bus board of KINEMATIC

Colour of soldering lug	Connection to
black	grey litz wire of 8-stranded connection cable
white	+ 4,5 volts power supply
red	drive battery
red	
blue	drive motor
blue	

Operating hints

In order to get acquainted with the function of the equipment and its peculiarities a course of armchair piloting is highly recommended prior to practice runs on the water, once the equipment is mounted in the model.

You will have no difficulty to obtain the desired rudder throw by transmitting long pulses. The rudder will remain in its displaced position as long as the button is pressed. Skipping counter rudder (if, for example, right rudder is required twice and left rudder must be skipped) should not present any difficulties either.

Precision switching of the main drive motor requires a certain knack, however, as the pulses have got to be very short ones. If the pulse is too long this results in rudder throw instead of switching the motor. If it is too short the switching cam of the engine will not engage the next pawl and consequently there is no switching of the engine either.

Thus it is mandatory that you practice this engine switching a bit till you know exactly how long to press the button. A good method is to give the button a smart, elastic tap with the outstretched finger or to pass lightly over it on one side with the thumb.

The switching contacts of KINEMATIC are not meant to be used in conjunction with the larger kind of electric motor, for example the vacuum cleaner type and with 5 to 10 A current drain, but they do stand a permanent load of 2 A.

A final hint: If an especially large and fast boat is to be controlled the necessary rudder forces can be reduced by moving the rudder pivot back to nearly one third of the rudder chord.