

Ballast Tank Switch UNIpro

for Piston Tanks type EA in 6V to 12V item no. 1584-UNIP

This control unit allows proportional control of a Piston Tank, e. g. the piston is driven to a position set by transmitter. The exact position is detected by a so-called Hall effect sensor connected to the UNIpro by a wire and switched through magnets mounted on to one of the Piston Tank's gear wheels. As control device on the transmitter a proportional or rotary slider can be used. The UNIpro is compatible to most customary R/C systems (accepted receiver signal 0.7 to 2.3 ms).

The UNIpro can be operated in two different modes. In the first mode, called 20/80, the first 20% on the slider of the transmitter control the first 70% of piston movement. The last 80% on the slider control the last 30% of piston movement. This mode allows precise trim of the boat and is preferable for most Piston Tank volumes. In the second, so-called linear mode the entire Piston Tank volume is controlled on the slider. This only makes sense for Piston Tank volumes with less than 300 ml, as resolution of the slider is otherwise too low to allow for exact adjustment.

The control current for the unit is fed in by the wire lead connecting to the receiver. Receiver current should be 4.8 to 6 V as common for most R/C components. The UNIpro can take currents up to 8.4 V. However, most servos and receivers cannot bear such high voltage. Operating current depends on Piston Tank (6 or 12 V) used and supplied by the main battery.

The Piston Tank used must feature end switches for safe termination of piston movement at its corresponding end positions (e. g. completely full or empty). All ENGEL Piston Tanks are equipped with such end switches.

With the optional Pressure Switch (DS) connected, maximum depth is limited to approx. 1.8 meters (5.9 ft). If the model dives below this level, the UNIpro will automatically switch to "bail" and empty the tank. The model will then resurface if the slider is also set to "bail". Otherwise, with the slider left in its initial position the model will emerge to a depth above 1.8 meters after which the tank will start filling again until the piston has reached the position according to the slider.

Furthermore, the Pressure Switch (DS) acts as a second security device. Should the overpressure which builds-up within the hull while submerging (by filling the tank) be lost due to a leakage, the "submerge" mode will be terminated. In this case, the red LED flashes steadily and the system does not allow the model to submerge again until this has been corrected. Furthermore, the UNIpro offers another fail safe device. If the transmitter signal is lost - due to increased depth or other circumstances - the UNIpro will switch to "blow" (empty) the Piston Tank.

The UNIpro also offers a so-called Battery Voltage Monitor. The voltage of the main battery is permanently verified. Should voltage fall below a specific threshold value for more than 5 seconds, the unit will switch to "bail". Threshold value is factory set to approx. 4.5 V for 6 V operation or about 9 V for 12 V operation (adjustable). Low battery mode is indicated by lighting of the red LED. It is highly recommend to always making sure all batteries are fully charged before your model commences its journey!

Connecting Piston Tank & Pressure Switch to UNIpro

Before installing Piston Tank (PT), Pressure Switch (DS) and UNIpro in the model run a "dry" test of the entire system. Make all of the connections and mark the leads accordingly after verifying the system is set up correctly.

The UNIpro offers a terminal with 4 sockets for connecting Piston Tank and power supply (battery) with wire leads (cable cross section min. 0.5 sqmm / AWG22) as per the following diagram (turn page over). A complete set of wire leads, hoses for Piston Tank and Pressure Switch as well as an outboard tubing connector is optionally available (item no. 1584-UNIP-99).

ENGEL Piston Tanks type EA (with AutoStop) are equipped with 2 micro (end) switches, illustrated as S1 and S2. Each micro switch has 3 contacts marked with 1, 2 and 4.

Micro switches S1 and S2 operate the PT's AutoStop device. All 3 contacts of S1 and S2 are employed in connection to the UNIpro and the PT motor.

Connect M1, M2, + and - to the socket block of the UNIpro as illustrated (turn page over). The cables should be soldered to the micro switches.

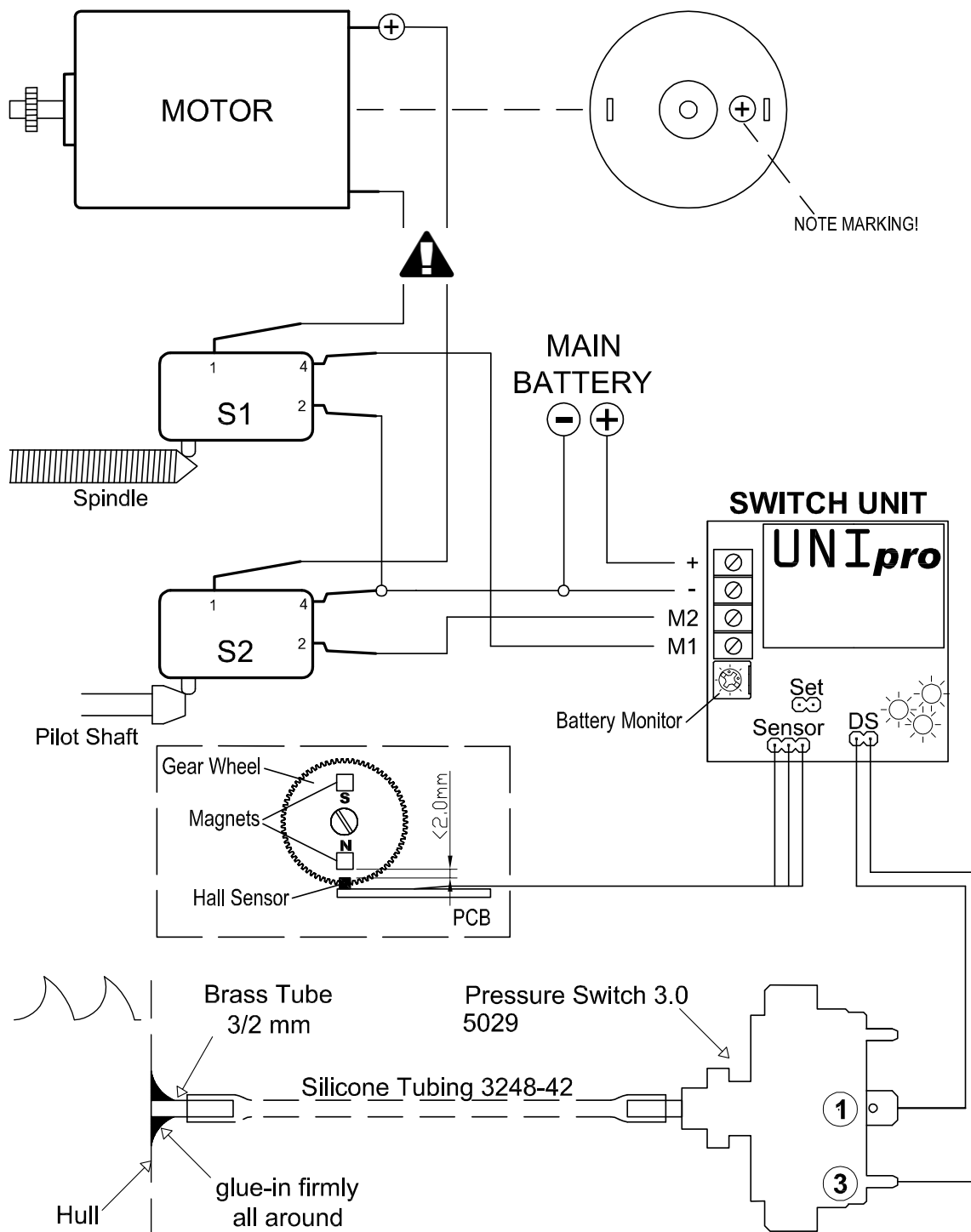
Connect Pressure Switch to the 2-pole pin row of the UNIpro marked "DS". BEC connector cable no. 9128 is ideal. On the Pressure Switch, only contacts 1 and 3 are employed. Polarity is not relevant here.

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PISTON TANK



Connecting and Fitting Hall Effect Sensor and Magnets

Position of the piston within the tank is detected by a Hall effect sensor pre-fitted on a separate board and connected to the UNIpro by a three-wire lead. Position and attachment of the sensor depends on the particular Piston Tank.

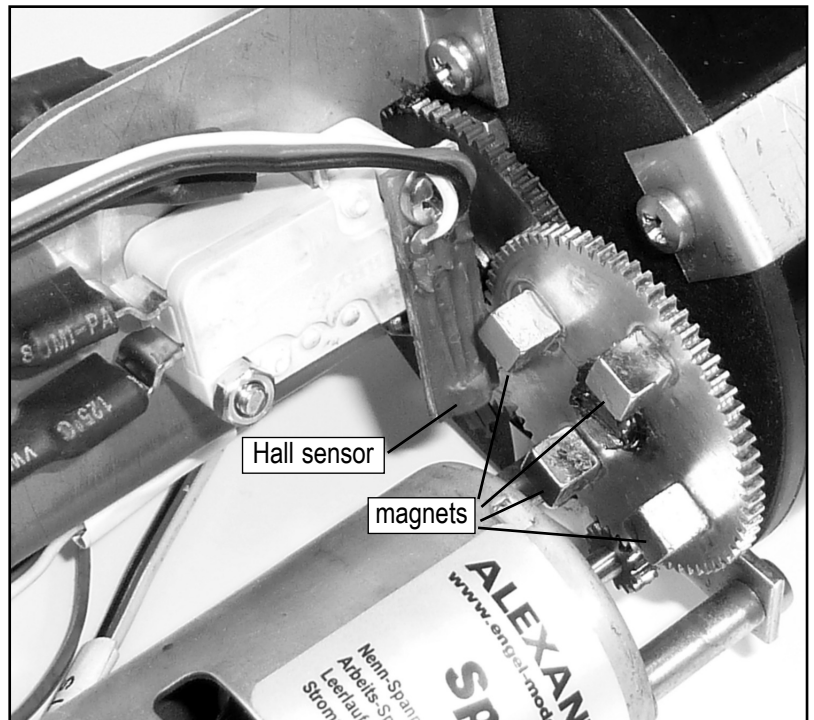
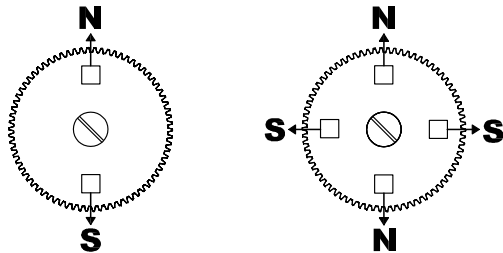
The Hall effect sensor is actuated by magnets. The UNIpro comes with two pairs of dice shaped magnets, two power (Neodymium, nickel-plated) and two ferrite (black) magnets. Additional magnets in various sizes and shapes are optionally available.

In theory, precision of adjustment increases with the amount of magnets used. This is only true to a certain extent. Neodymium magnets have very strong magnetic force. Therefore, when using such powerful magnets these should be positioned at a distance to one another. Otherwise their magnetic fields lead to mutual disturbances. This will result in less accuracy or even failure of the system.

A pair of magnets mounted to the main gear wheel (spindle) allows an accuracy of half a rotation. Mounted to the middle gear accuracy is already multiple. Using 2 pair of magnets will result in duplication of accuracy. For Piston Tanks in 6 V with 540 size motor as well as 12 V with 380 size motor the middle gear wheel is ideal for mounting up to 3 or 2 pair of magnets respectively. On a 6 V/540 tank drive the Hall sensor can be screwed directly to micro switch S1. On a 12 V/380 tank drive the middle gear is more distant to S1. To bridge this distance a bracket (i. e. bend from a piece of brass) can be used for reaching the necessary proximity of sensor to magnets.

The middle gear wheel of a Piston Tank in 12 V and 540 size motor is rather small. For this type of tank the main gear wheel (with spindle bushing) is a better alternative. 3 pair of disc shaped Neodymium magnets 1.5 x 0.5 mm (item no. 5810-1510) will allow for accurate trim. The Hall sensor can be attached (i. e. glued) to micro switch S1.

Magnets are positioned so that north (N) and south (S) pole come by the sensor alternately. Magnets can be glued with Cyano ("Superglue"). Make sure to degrease surfaces to be glued thoroughly. Distance between magnet and sensor should be 2 mm or less.



Picture shows Hall sensor and 4 Neodymium magnets mounted to a Piston Tank with 540 size motor in 6V.

First Launch

1. UNIpro is fully connected, jumper "SET" is plugged in, transmitter is ON and slider is in position "bail" (resurface command).
2. Power up receiver. If not already completely "empty" Piston Tank will switch to "bail" (spindle drives inwards) and stops at its "empty" position. Actuation of sensor is indicated by blinking of the UNIpro's yellow LED. Implementation of multiple pair of magnets as well as fast rotating gear wheels might cause very fast blinking frequency or even constant lighting of the yellow LED.
3. Now the green LED will start to blink. The unit measures receiver signal "bail".
4. The green LED shows a double blink. Push slider to "fill". The unit now measures receiver signal "fill". Piston Tank remains idle.
5. The green LED shows triple blinking. This indicates that the unit is ready for setting of mode, either to linear or 20/80.
6. With slider remaining in "fill" position and pulling of jumper "SET" will switch the unit to linear mode. The yellow LED is OFF.
7. By pushing the slider to "bail" (yellow LED is ON) and pulling of jumper "SET" will switch the unit to 20/80 mode.
8. The Piston Tank now starts running with the UNIpro gauging the tank. The yellow LED indicates actuation of the Hall sensor. The piston is driven from its "empty" to its "full" position while the unit counts the switching operations required for that particular piston stroke.
9. Finally, the piston is driven very shortly to "bail" in order to account for a possible overrun whereby the piston is briefly stopped.

The piston then travels to the set position. Lighting of the green LED indicates that the system is now fully operational.

Lighting of the red LED indicates either low voltage or, if sufficient, that threshold voltage for battery monitor has been set too high.

This setup procedure can be repeated simply by starting anew. Just switch the unit OFF and ON and begin setup again at step 1.

Ensure correct direction of flow!



Connect the UNIpro to the main battery BUT leave the receiver switched OFF. The UNIpro must switch to "bail" (empty). If the PT runs in the opposite direction (i.e. Piston Rod extends outward), the tank must IMMEDIATELY be stopped by switching off main power. Reverse polarity on the motor (NOT the UNIpro). Otherwise the PT will not stop at its end position (micro switch) and stall.

The red LED indicates low battery voltage. If battery capacity has dropped below preset threshold value the red LED will light up. This consequently requires the main drive battery to be charged. If the LED is lit although battery voltage is sufficient threshold voltage might be set too high. This can be adjusted by turning the potentiometer on the UNIpro. Clockwise rotation of the potentiometer increases threshold value, meaning that low battery mode will set-in earlier (at a higher voltage). Anti-clockwise rotation will decrease this value; the battery monitor will activate resurfacing at lower battery voltage. For accurate adjustment a regulated mains unit is recommended. Alternatively, a battery with corresponding voltage can be used.

Blinking of the red LED indicates activation of Pressure Switch. The UNIpro will remain in the "bail" mode as long as Pressure Switch remains actuated. The green LED indicates good signal quality. If transmitter signal is too weak or lost the green LED will be off. A lost or faulty signal will cause the UNIpro to automatically switch to "bail". The UNIpro will only react to transmitter commands after signal has reached acceptable strength. Other than that the unit will remain in "resurface" mode.

During transport and storage main drive battery should be separated from the UNIpro as otherwise the battery will be discharged over time.

The fail safe system of the UNIpro might not function properly if your receiver already features such a device. Please read the manual of your R/C system or consult the manufacturer if in doubt.

Possible Failures and Probable Causes

During setup:

Green LED always blinks once (or twice) and setup does not progress.

- Signal received is either not continual (e. g. interference) or shows negative values which can be either too low, too high or too close to midpoint (1.3 - 1.7 ms).
- Differential between "fill" to "bail" signal is too small.

Yellow LED does not blink. Green LED blinks hectically.

- Check Hall effect sensor and magnets. Probably disturbance caused by other magnets (i. e. motor).
- Distance between sensor and magnets too large.
- Length of Piston Tank incompatible, e. g. more than 65,500 impulses.
- Override too large, larger or equal to 200 impulses.

During operation:

Green LED is off but unit is still functional.

- Receiver signal is weak or disturbed.

Green LED is off and Piston Tank switches to "bail".

- Magnet impulses false, probably disturbance caused by other magnets (i. e. motor).
- Receiver signal shows major disturbances or is totally lost.
- Piston Tank is mechanically blocked.
- Drop in voltage of receiver battery.

Other possible uses

The UNIpro can also be implemented for other applications in which a rotation can be detected by the Hall effect sensor.

Technical Specifications

Control voltage	4.0 to 8.4 V (receiver power)
Operational voltage	6 to 30 V (main battery)
Switching load	max. 10 A
Ascertainable impulses	65,500 (Hall effect sensor)
Dimensions (l x w x h)	switch unit 47 x 44 x 21 mm
	Hall sensor 28 x 8 x 3.5 mm
Weight	switch unit 35 g
	Hall sensor 7 g

Set includes

- 1 switch unit UNIpro
- 1 Hall effect sensor mounted to PCB with connection lead
- 1 pair of ferrite magnets 4 x 4 mm
- 1 pair of power magnets 3 x 3 mm
- 3 spacers 5 mm
- 3 screws A2 2.9 x 9.5 mm

Optionally available items

	item no.
Accessory pack for switch unit UNIpro	1584-UNIP-99
Pressure switch 3.0 mm	5029
Pressure switch 6.3 mm, adjustable	5026
Power magnet disc 1.5x0.5 mm, 10 pcs.	5810-1510
Power magnet disc 3x1 mm, 4 pcs.	5810-3104
Power magnet cube 3x3 mm, 2 pcs.	5811-3302



Trouble-free operation of the switch unit might only be possible in PPM modulation. In PCM modulation the unit may show dysfunctions (or not operate at all) due to non-standardized transmission signals in PCM. Ensure that your R/C system (transmitter and receiver) can be used in PPM. Please refer to the manual of your R/C for setting your system to PPM.

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Please read the following instructions and safety warnings carefully BEFORE you commence with the assembly of this unit and installation of the dive system. For further safety instructions please refer to the instructions supplied with Piston Tanks. During the charging period all batteries must be removed from the hull. NEVER charge batteries inside the hull as almost all battery types gas while being charged. Insufficient air circulation during the charging period may lead to a serious EXPLOSION! We are not liable for any personal injury or damage of any kind incurred during the assembly and/or use of our products as we are neither able to delegate nor verify the assembly and/or use of these items. Please adhere to your country's safety guidelines during construction and operation of this item. This product is not suitable for persons under 16 years of age. Technical specifications are subject to change without notice.



This symbol indicates that after the service life of this electrical device has ended it must be disposed separately from domestic refuse at your communal waste collection.