



Piston Tank Type EA/TA/XP

Important Notes & Technical Specifications

First of all, we would like to thank you for purchasing an ENGEL Piston Tank! Piston Tanks are the most commonly used ballast systems for model submarines and have proven to be the most reliable and efficient system for static diving model submarines. To ensure perfect performance and full functionality of this unit please read the following instructions.

Operation of a single or two Piston Tanks requires a so called switch unit. The switch unit is not supplied with the Piston Tank and must be ordered separately. There are several alternatives depending on Piston Tank type and quantity used.

Each ENGEL Piston Tank is tagged with a label showing type, operational volume, voltage and its serial number.

Choosing the correct Switch Unit

For operation of a **single Piston Tank type EA** (with AutoStop) or **TA** (with AutoStop and AutoTrim) switch unit **UNI** is adequate.

For **two Piston Tanks type EA or TA** switch unit **TAE or TAES** is recommended. Switch unit TAES is based on the standard type TAE. In addition, the TAES incorporates a *Static Depth Controller* allowing the model to be held at approx. depth given via the transmitter.

For operating **Piston Tanks type XP** proportional control becomes necessary. For a **single** Piston Tank type XP switch unit **SBTS** is sufficient. Operation of **two** Piston Tanks type XP requires switch unit **Tmax**. This unit offers proportional and selective individual control of each tank.

Switch units UNI, SBTS and Tmax feature a battery monitor, which is preset to 4V (for 6V Piston Tanks) or 9V (for 12V Piston Tanks). Battery monitor voltage can be adjusted.

All switch units feature input sockets connecting to a pressure switch (item no. 5028) for increased safety. The pressure switch limits the operational depth to about 1.8 meters (71") and senses possible leaks through a pressure drop within the hull. This device is included in switch unit TAE, TAES and Tmax. For UNI and SBTS this device must be ordered separately as an option.

DO NOT use speed controllers for Piston Tank control! As electronic speed controllers (ESC) do not feature a brake for e.m.f. (electromotive force) the Piston Tank will not stop abruptly when reaching its respective end position (i.e. 100% full or empty). Therefore, when using an ESC the piston drive is not stopped at its actual end position but will be drawn further. This may result in serious damage of the tank's mechanism.

Operation of piston tank(s) without fully connected switch unit may cause malfunction of the tank mechanism or even total failure of the entire diving system! Only use switch units approved and licensed for operation with ENGEL Piston Tanks. Operation with speed controllers or other non-licensed/-approved switch units will result in the warranty to be null and void. Electric connection of a Piston Tank depends on the switch unit used. Please refer to the manual supplied with the corresponding switch unit for detailed description and operational safety.

If you are unable to identify the correct setup please do not hesitate to contact us.

Installation of Piston Tanks

Keep in mind that installation of the Piston Tank does not only require sufficient space for the unit itself but also for the spindle which is driven outwards when flooding the tank. The absolute length with respect to tank volume is shown on a separate diagram (turn page over).

The Piston Tank can be held in place with brackets (i.e. item no. 1589-418) adapted to a bolt of one of the stainless steel straps on the tank's front bearing plate. This should be an adequate fixture for most assemblies. Should it be necessary to place a bracket on the end cap a retaining bolt of the straps can also be used as fixture. In case that other fixtures are necessary it must be ensured that the bore in the end cap is not deeper than 6 mm.

The water inlet of the Piston Tank should lie at its top position (preferably at "12:00"). This will ensure that no air remains after bleeding the tank (by filling and emptying the cylinder several times before trimming the finished model). The tubing connecting the water inlet of the cylinder to the outboard connector of the model should have an inner diameter of 6 mm (preferably O.D 9, item no. 3247-6). Ensure that the tubing is not kinked. Otherwise dynamic pressure is increased resulting in a higher load on the motor. Filter or strainers should not be used as these are possible causes for malfunction of the system. Material sucked into the tank (such as mud or algae) will be discharged by simply emptying the tank.

The Piston Tank **should not be glued** (i.e. with Epoxy, Polyester or other 2-component adhesives) into an assembly. This might cause distortion of the cylinder and make the tank unusable.

Maintenance

Our Piston Tanks are superior to other designs also in terms of resilience to pollution. Even slush will not cause a malfunction of the tank as all material drawn into the tank will eventually be discharged.

Standard servicing of the Piston Tank only requires lubrication of the middle cog wheel's retaining bolt with white oil (as used for fire arms or sewing machines). BALLISTOL Oil (item no. 9720) is ideal for this. Just place a drop between the bolt head and the cog wheel. After several turns the lubricant will be sucked-in by itself.

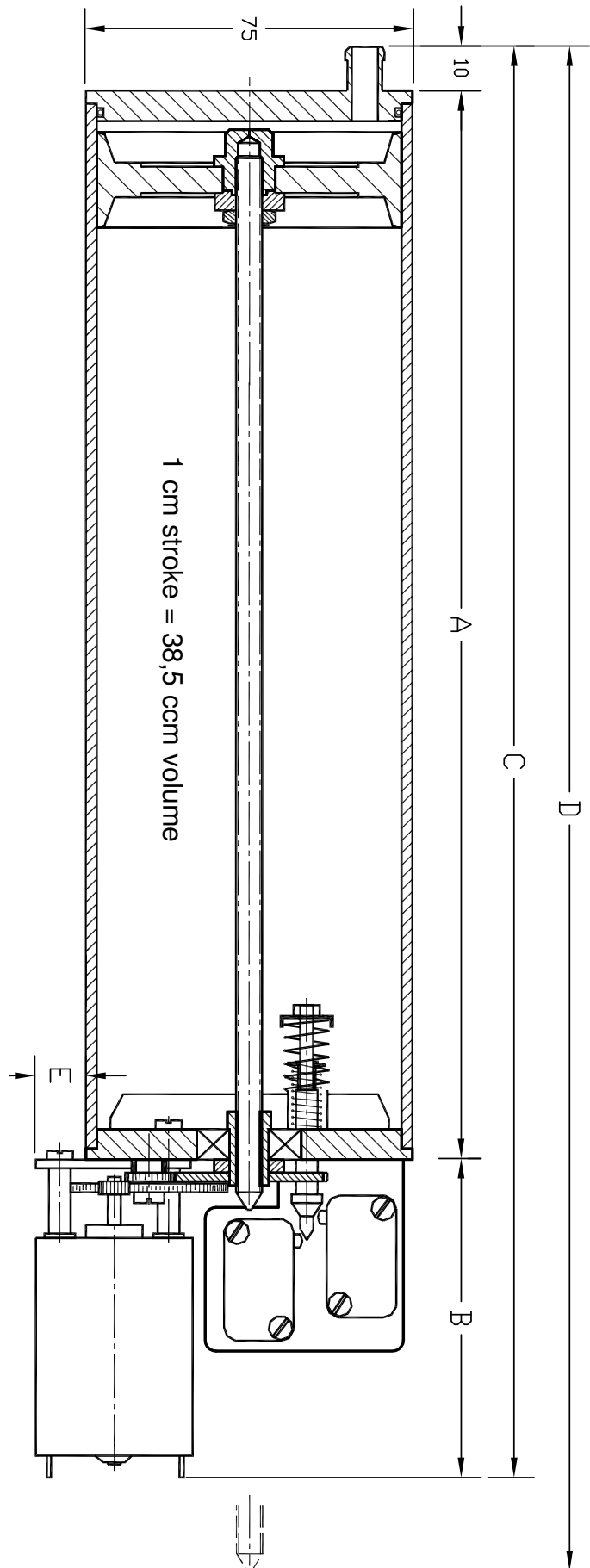
After operation in polluted waters (e. g. algae) the piston tanks should be rinsed with fresh water. Please note, that further lubrication of piston is only necessary, if a leakage of the Piston Tank itself is obvious. This might be the case if used in very sandy waters after a period of time. In this (very unlikely) circumstance, open the tank (unscrew at motor/gear cap), rinse the cylinder and lubricate piston and inner spindle with a high performance grease such as Q-Lube (recommended, item no. 9705) or a similar dedicated lubricant.

This item is designed for model hobby purposes only and not for commercial and/or industrial use. The application of this item is limited to ingesting and discharging water. Operation in or with other substances is prohibited. Please adhere to safety regulations of the country in which this device is operated.

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Kolbentank / Piston Tank		500-6	500-12	750-6	750-12	825-6	825-12
Typ / Type	EA / TA / XP	EA / TA / XP	EA / TA / XP	EA / TA / XP	EA / TA / XP	EA / TA / XP	EA / TA / XP
Nennvolumen / Nominal Volume	500 cm ³	500 cm ³	750 cm ³	750 cm ³	825 cm ³	825 cm ³	825 cm ³
Betriebsspannung / Operating Voltage	6V	12V	6V	12V	6V	12V	12V
A	176	176	246	246	266	266	266
B	75	60	75	75	75	75	75
C ¹⁾	261	246	331	331	351	351	351
D ²⁾	330	330	470	470	510	510	510
E	12	2.5	12	12	12	12	12
Zyl.-Außendurchmesser / Cylinder diameter outer	75	75	75	75	75	75	75
Kolbenhub / Piston Stroke	130	130	200	200	220	220	220
Getriebe-Untersetzung / Gear reduction	17.5 : 1	15 : 1	17.5 : 1	7.5 : 1	17.5 : 1	7.5 : 1	7.5 : 1
Motorumdrehungen / Motor Revolutions ³⁾	2275	1950	3500	1500	3850	1650	1650
Motordrehzahl Upm / Motor Rotation Speed RPM ⁴⁾	10500	11000	10500	5000	10500	5000	5000
Stromaufnahme / Current Consumption ⁴⁾	2.5 A	1.6 A	2.5 A	1.2 A	2.5 A	1.2 A	1.2 A
Verstellzeit / Adjustment Time ⁴⁾	13 s	11 s	20 s	18 s	22 s	20 s	20 s
Leistungsaufnahme / Power Input ⁴⁾⁵⁾	15 W	12 W	15 W	14 W	15 W	14 W	14 W
Zulässiger Betriebsdruck / Operating Pressure max.	1 bar	1 bar	1 bar	1 bar	1 bar	1 bar	1 bar
Prüfdruck / Test Pressure	2 bar	2 bar	2 bar	2 bar	2 bar	2 bar	2 bar
Gewicht ca. / Weight approx. ⁶⁾	770 g	680 g	820 g	820 g	850 g	850 g	850 g
Art.-Nr. / Item No. ⁷⁾	1581-__-6	1581-__-12	1583-__-6	1583-__-12	1587-__-6	1587-__-12	1587-__-12

¹⁾ Piston Rod retracted: TANK EMPTY

²⁾ Piston Rod extended: TANK FULL

³⁾ at full stroke

⁴⁾ at 2 metre water column in seconds

⁵⁾ testing pressure at 20 m water column = 2 bar: 40 W

⁶⁾ average weight, depending on type

⁷⁾ Item No.-TYPE-Voltage e.g. Piston Tank EA500-6 = Item No. 1581-EA-6