



Operator's Manual

DWT8537-300V Thruster

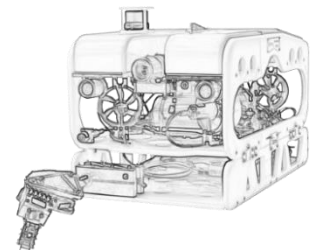
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Revision information

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1 Introduction








1.1 General

DWTEK releases new range of brushless DC thrusters with the outstanding characters of low-weight, powerful thrust and integral electronic components. The engineering capabilities of DWTEK in subsea application drive our passion to innovate high reliable design and components to our thrusters.

DWT8537 thruster is a heavy-duty electric underwater thruster. The design is in purpose of high efficiency and low noise stealth; meanwhile it is suitable the propulsion system of any underwater robots or high-end surface utility vehicles.

1.2 Precautions

Table 1 - Precautions

	<p>The “DANGER” symbol indicates a hazardous situation which, if not avoided, will result in death or serious injury. Carefully read the message that follows to prevent serious injury or death.</p>
	<p>The “WARNING” symbol indicates a hazardous situation which, if not avoided, could result in death or serious injury. Carefully read the message that follows to prevent serious injury or death.</p>
	<p>The “CAUTION” symbol indicates a hazardous situation which, if not avoided, could result in minor or moderate injury, or equipment damage. Carefully read the message that follows to prevent minor or moderate injury.</p>
	<p>The “NOTICE” symbol alerts to a situation that is not related to personal injury but may cause equipment damage</p>
	<p>Do not put hands near it when machine operating.</p>
	<p>Do not wear electrically conductive jewelry, clothing, or other items while working on the electrical system.</p>
	<p>An electric shock could be fatal. Ensure power to the Thruster is OFF” before opening electrical panels.</p>

2 Specifications

2.1 Thruster

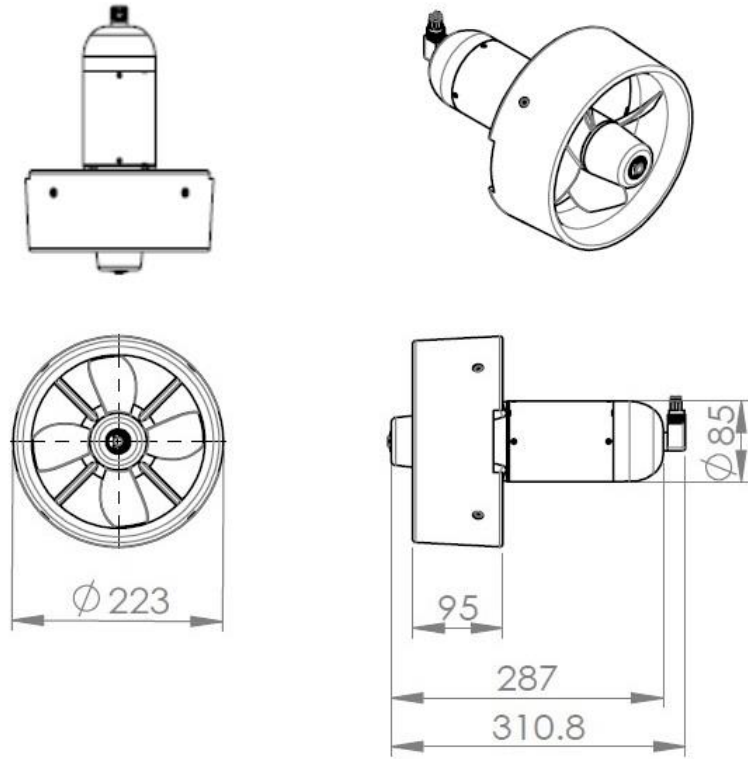
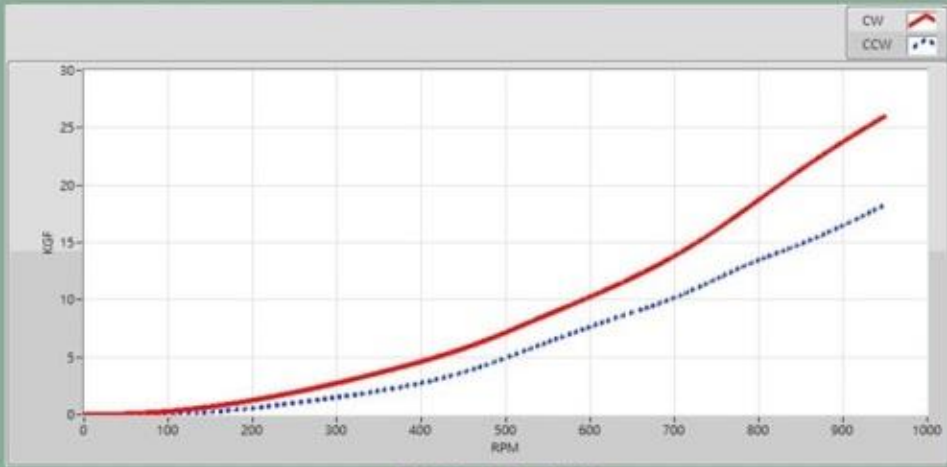


Figure 1 - DWT8537 Thruster

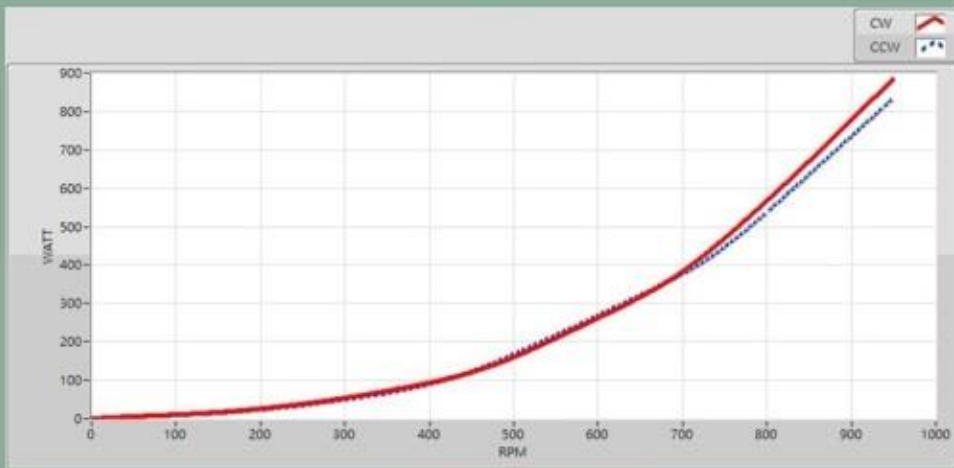
Table 2 - DWT8537 Specification

DWT8537	
MECHANICAL	
Weight in air	5.5kg
Weight in water	5kg
Standard Housing	AL 6061-T6
Propeller	Engineering Plastic
Nozzle	Nylon
ELECTRICAL	
Operation Voltage	300 VDC
Speed Control	0-100% PWM Signal
Drive	Gear Reducer
Watt	850W
Protection	Over-Temp / Over Current / Under Voltage / Abnormal Operation
PERFORMANCE	
Thrust	CW: 25 kgf / CCW: 18.5 kgf

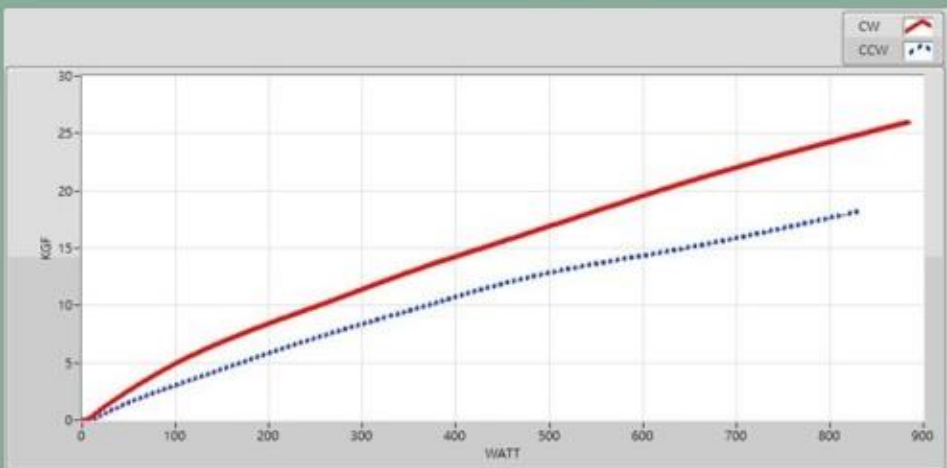
DWT8537 THRUST PERFORMANCE CURVES



RPM VS KGF



RPM VS WATT



WATT VS KGF

Figure 2 - DWT8537 Thruster performance curve

2.2 Connector

2.2.1 General

Part No.	2GW100708M-00001SS
Title	Mini Bulkhead Right Angle Connector
Service Check	Regularly

2.2.2 Indications for Replacement

Replace if connector is damaged, deformed or no longer watertight.

2.2.3 Installation Procedures

For greasing and mating above water

1. Connectors must be greased with Molykote 44 Medium before each mating.
2. A layer of grease corresponding to minimum 1/3 of socket depth should be applied to the female connector.
3. The inner edge of all sockets should be completely covered, and a thin transparent layer of grease should be left visible on the face of the connector.
4. After greasing, fully mate the male and female connector in order to secure optimal distribution of grease on pins and in sockets.
5. To confirm that grease has been sufficiently applied, de-mate and check for grease on each male pin, then re-mate the connector.

It is mandatory to apply GREASE before mating.

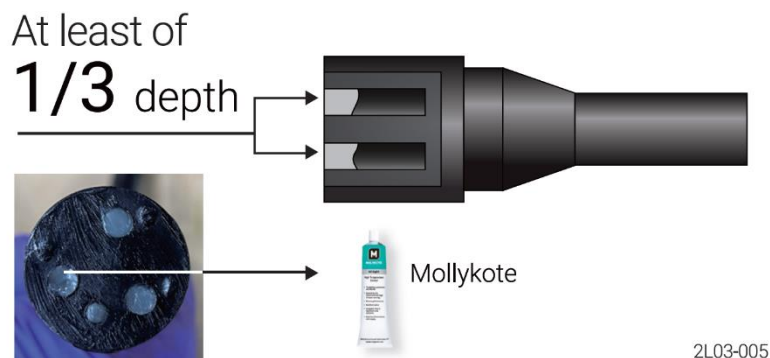


Figure 3 - Grease user guide

For Cleaning

1. General cleaning and removal of any accumulated sand or mud on a connector should be performed with spray based contact cleaner, Isopropyl Alcohol.
2. New grease must be applied again before mating.



Warning!!

Only the qualified specialist is allowed to proceed the connector replacement.

3 Installation

3.1 Installation Guide

Table 3 - DWT8537 Thruster Electrical

	Nominal	Max	Min
Input Voltage	300 VDC	315 VDC	285 VDC
Input Current	2.84 A	2.7 A	3 A
Instrument Power Voltage	15 V	16.5 V	13.5 V
Instrument Power Current	0.12 A	0.11 A	0.14 A

Table 4 - PWM Signal Control

	Min	Nominal	Max
PWM Voltage	4.9V	5V	5.1V
PWM Frequency	1KHz	2KHz	10KHz
PWM Adjustment	5%	48%-52%	95%

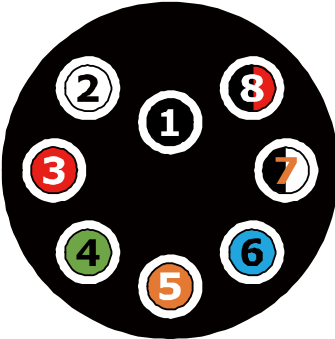

*The PWM adjustment is about $\pm 2\%$ tolerance.

Procedure of electronic Connection:

- Step1. Connect Pin3 to +300 VDC
- Step2. Connect Pin1 to HGnd
- Step3. Connect Pin5 to PWM Signal
- Step4. Connect Pin7 to PWM Signal GND
- Step5. Connect Pin4 to +15 VDC (instrument)
- Step6. Connect Pin1 to HGnd (instrument 15 VDC)

3.2 Pin Assignment

Table 5 - Pin Assignment

Female Inline Top View	Pin Assignment	Male Bulkhead Top View
	1 : HGnd 2 : PE 3 : +300 VDC 4 : +15 VDC 5 : PWM Signal 6 : N/A 7 : PWM Signal GND 8 : N/A	

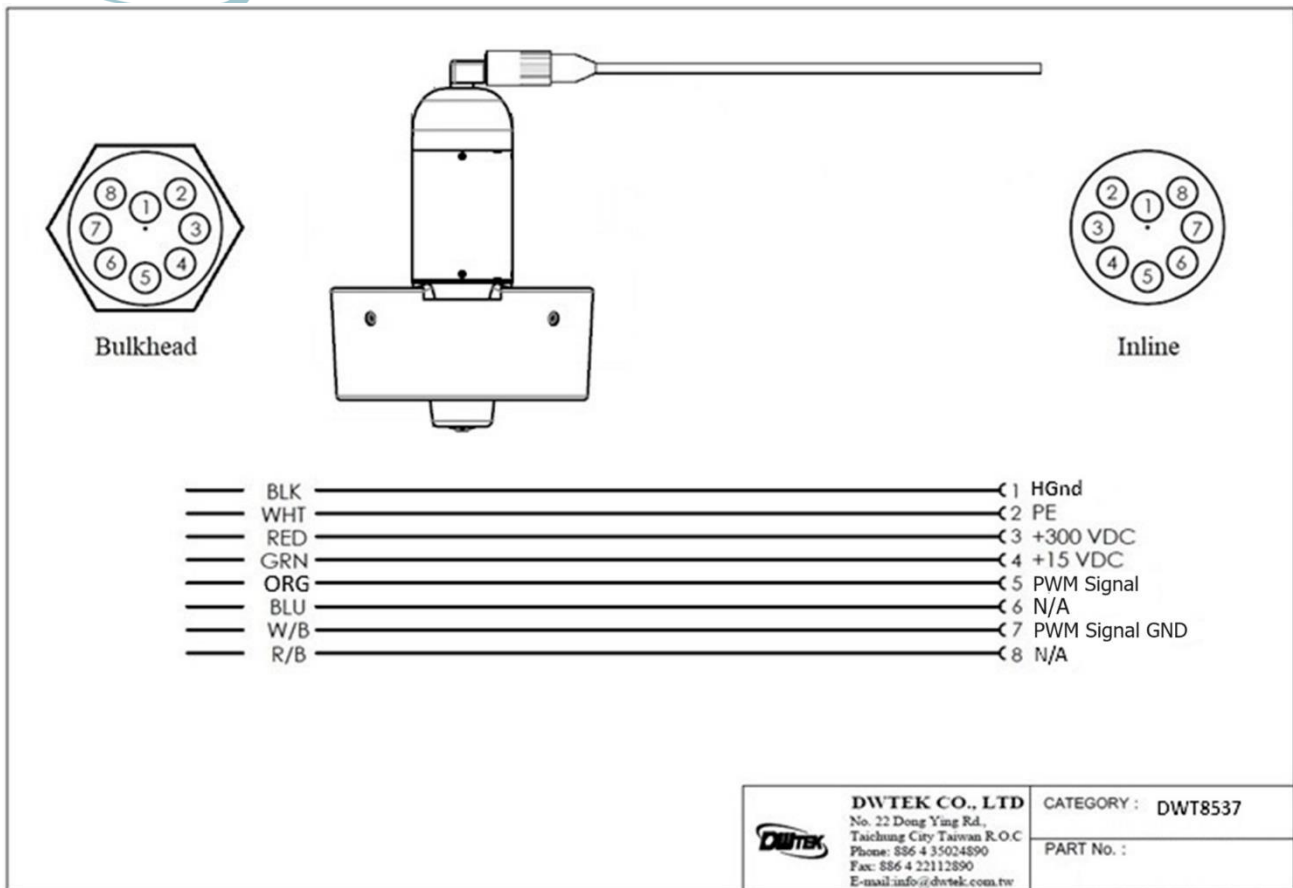


Figure 4 - DWT8537 Thruster Pin Assignment

Make sure all the connections are correct, and follow the instruction listed as below to power the thruster.

1. Connect Pin2 to the Protection Earth point
2. Deliver +15 VDC to Pin4 and Pin1
3. Deliver PWM control signal to Pin5 and Pin7
4. Make sure PWM control signal is set within 48%-52%
5. Deliver +300 VDC to Pin3 and Pin1
6. Adjust PWM control signal to Pin5 and Pin7
7. Thruster should turn CW and CCW according to the apply PWM signal

Note!!



1. Control signal is set as 0 RPM within PWM 48%-52%.
2. Always make sure to set the control signal within PWM 48%-52% before powering on +300Vdc to the thruster. Thruster will not be activated if control signal is out the range of PWM 48%-52% unless the control is set within PWM 48%-52%.
3. The CW maximum speed is set at 95% and the CCW maximum speed is set at 5%, to avoid the maximum speed caused by 0V or 5V when the wire is broken or shorted.
4. The WATT of DWT8537 at the maximum speed is about 850W±2%.
5. After the thruster powers on, DO NOT REMOVE the PWM control signal, otherwise the speed will be abnormal.



3.3 Maintenance and Removal

To remove the thruster, please follow below steps.

1. Disconnect the cable.
2. Install the protection dummy on the bulkhead connector

THRUSTER FIELD & DEPOT REPAIR PROCEDURES LISTED BELOW SHALL BE CARED.



Warning!!

Make sure to switch off thruster power and auto-functions once the system is on the surface.



Caution!!

It recommends considering the replacement of the O-rings and resealing DWT8537 thruster as annual maintenance. DWTEK offers comprehensive annual inspection and maintenance service to guarantee reliability and performance.



Caution!!

The thruster is designed as a simple maintenance unit. After each dive, please always wash with fresh water.

4 Trouble shooting

4.1 Thruster Trouble shooting

If thruster performed:

- I. RPM unsteady.
- II. Vibration.

please proceed the initial detection procedure which mainly caused by two type of cases as below:

- I. Power output.
- II. Consumption parts and determine the replacement.

4.2 Detection Procedure

1. Make sure the propeller is free of rotation and under safety and well protection.
2. Apply +15 VDC to Pin4 and HGnd to Pin1. It recommends using power supply with the current consumption indicator. The nominal current consumption is 0.12Amp +/- 0.02.
If current consumption is out of the above range without loading, the control PCB need to be examined and replaced.
3. Measure the analog input PWM signal with multimeter and make sure PWM signal is connected to Pin5 and Pin7 PWM Signal GND.
4. Apply input voltage +300 VDC to Pin3 and HGnd to Pin1.
5. Make sure PWM signal is within 48%-52% before delivering +300 VDC to thruster.
6. Use a current indicator to wire on the power supply in series before delivering +300 VDC.
7. Make sure current output is less than 0.1A when PWM control signal is 48%-52%.



Caution!!

If the current goes higher with short circuit, the power PCB need to be examined and replaced, please do not hesitate to contact DWTEK Co., Ltd.



5 Maintenance

5.1 Nozzle

5.1.1 General

Part No.	2D004-00152
Title	Nozzle
Service Check	Replace if damaged
Tool	4mm Allen Key

The nozzle is designed to improve the performance in water. Without the nozzle, there would be a drastic thrust reduction and control failure. Thruster can be tested in air but it recommends contacting DWTEK if doing enforced dummy load in the shaft of thruster.

The nozzle consists of a cast Nylon material that is high impact-resistant.

5.1.2 Indications for Replacement

Please replace the nozzle if it damages to the point that it fouls the propeller.

5.1.3 Removal the Nozzle from Thruster`

Remove (4) Socket Head CAP Screw M5x80mm (P/N: 2P001-D122M5-08080) with 4mm Allen Key.

5.1.4 Installation Procedures

- 1.Put (4) Socket Head CAP Screw M5x80mm (P/N: 2P001-D122M5-08080) into the Nozzle screw hole.
- 2.Secure screws with 4mm Allen Key(4.2NM).



NOTE!!

If you have any further queries, please do not hesitate to contact DWTEK Co., Ltd.

5.2 Propeller Assembly

5.2.1 General

Part No. :	2C004-00058
Title :	Rotating Propeller
Service Check :	Before and after each dive
Tool	E-type removal circlip pliers

DWT8537 thruster uses Vectus propeller that has outstanding thrust performance in operation. The thrust differences between forward and reverse thruster are within 10%.

5.2.2 Indications for Replacement

Replace it if significant wear or damage is apparent on the blades of the propeller.

5.2.3 Removal Procedures

1. Remove 8mm E-ring (P/N: 2P001-AE228) with E-type removal circlip pliers and Stopper Washer (P/N: 2D004-00003) 、 Disc Spring (P/N: 2P006-JTEM-10).
2. Remove Rotating Propeller (P/N: 2C004-00058) from the shaft.

5.2.4 Install Procedures

1. Install Rotating Propeller (P/N: 2C004-00058) into the shaft.
2. Install E-ring (P/N: 2P001-AE228) and Stopper Washer (P/N: 2D004-00003) 、 Disc Spring (P/N: 2P006-JTEM-10) with E-type removal circlip pliers.



Warning!!

Operator is only allowed to remove propeller assembly under power off condition.



NOTE!!

If you have any further queries, please do not hesitate to contact DWTEK Co., Ltd.



5.3 Gear Shaft Seal Assy

5.3.1 General

Part No. : 2C004-00091
Title : Reducer Assembly
Service Check : Before and after each dive

Operator needs to check the sealing condition before and after each dive. If any damage or leaking are detected, please do not hesitate to contact DWTEK Co., Ltd



NOTE!!

If you have any further queries, please do not hesitate to contact DWTEK Co., Ltd

6 Appendix

6.1 Vacuum and Pressure Relief

All electronic components could generate heat and prohibit system operation with a vacuum condition. Pressure relief port can be used as a vacuum port for testing purpose.

Recommended vacuum test on the pod is -80kPa for a period of 30 to 60 minutes after disassemble and re-assembly. It should be released once the testing is complete. Filling in Nitrogen gas from the Nitrogen bottle with an adaptor would take out the moisture to prevent concentration.

Warning!!



- 1. Make sure that this process was carried out in a well-organized place.**
- 2. Check and clean the O-rings on pressure relief valve before installation. If they are damaged, please replace it with new one, and greased with Molykote 44 Medium.**



6.2 Spares and Tools

Table 6 - Spares list

Item No.	Part No.	Description	Qty
1	2D004-00158	Pressure relief valve	1pcs
2	2D004-00003	Stopper Washer	1pcs
3	2D004-00007	Support Bearing	1pcs
4	2P001-D4N0M5-0806	M5xP0.8x6 Socket Grub Screw	4pcs
5	2P001-AE228	E-ring	1pcs
6	2P002-SOR-AS149N70	AS-149 O-ring	1pcs
7	2P002-SOR-AS012N70	AS-012 O-ring	1pcs
8	2P006-JTEM-10	Disc Spring	1pcs

Table 7 - Tools list

Item No.	Part No.	Description	Qty
1	2P001-FLU5M4	M4 Allen Key	1pcs

6.3 Exploded View

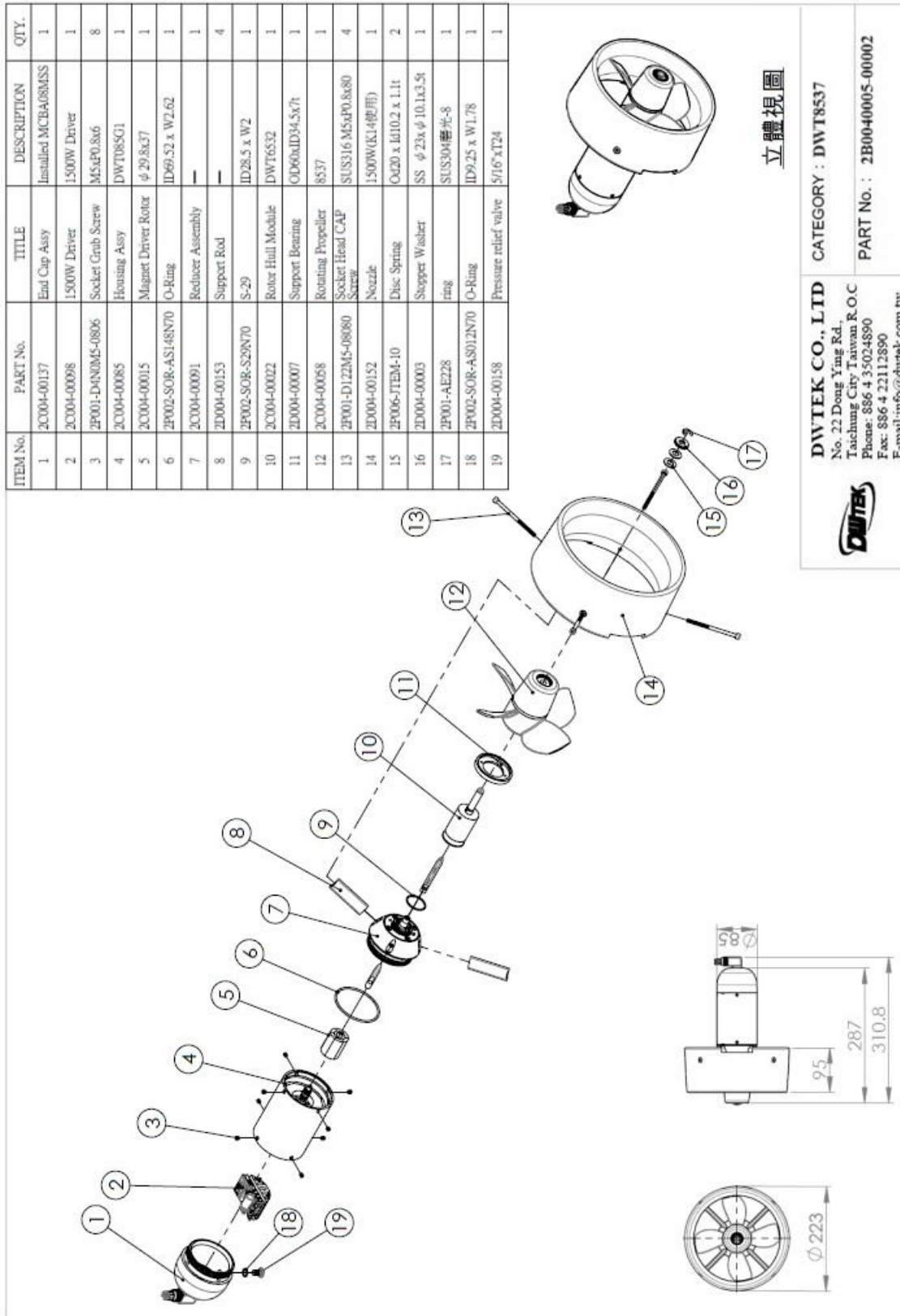
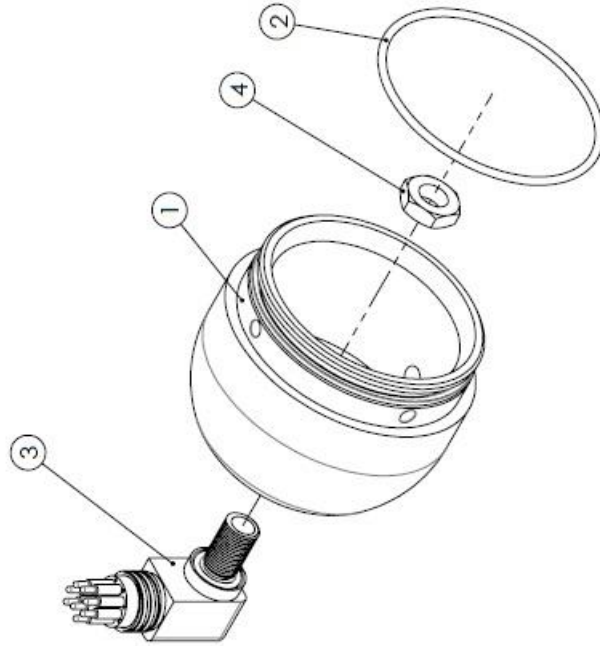


Figure 5 - DWT8537 Thruster (2B0040005-00002)

ITEM No.	PART No.	TITLE	DESCRIPTION	QTY.
1	2D004-00177	End Cap	—	1
2	2P002-SOR-AS149N70	O-Ring	ID71.12 x W2.62	1
3	2GW100708M-00001SS	Mini Bulkhead Right Angle Connector	Male 8 Pin	1
4	2P001-N122U716A-T20	Hex Nut	SUS304 7/16"-T20	1



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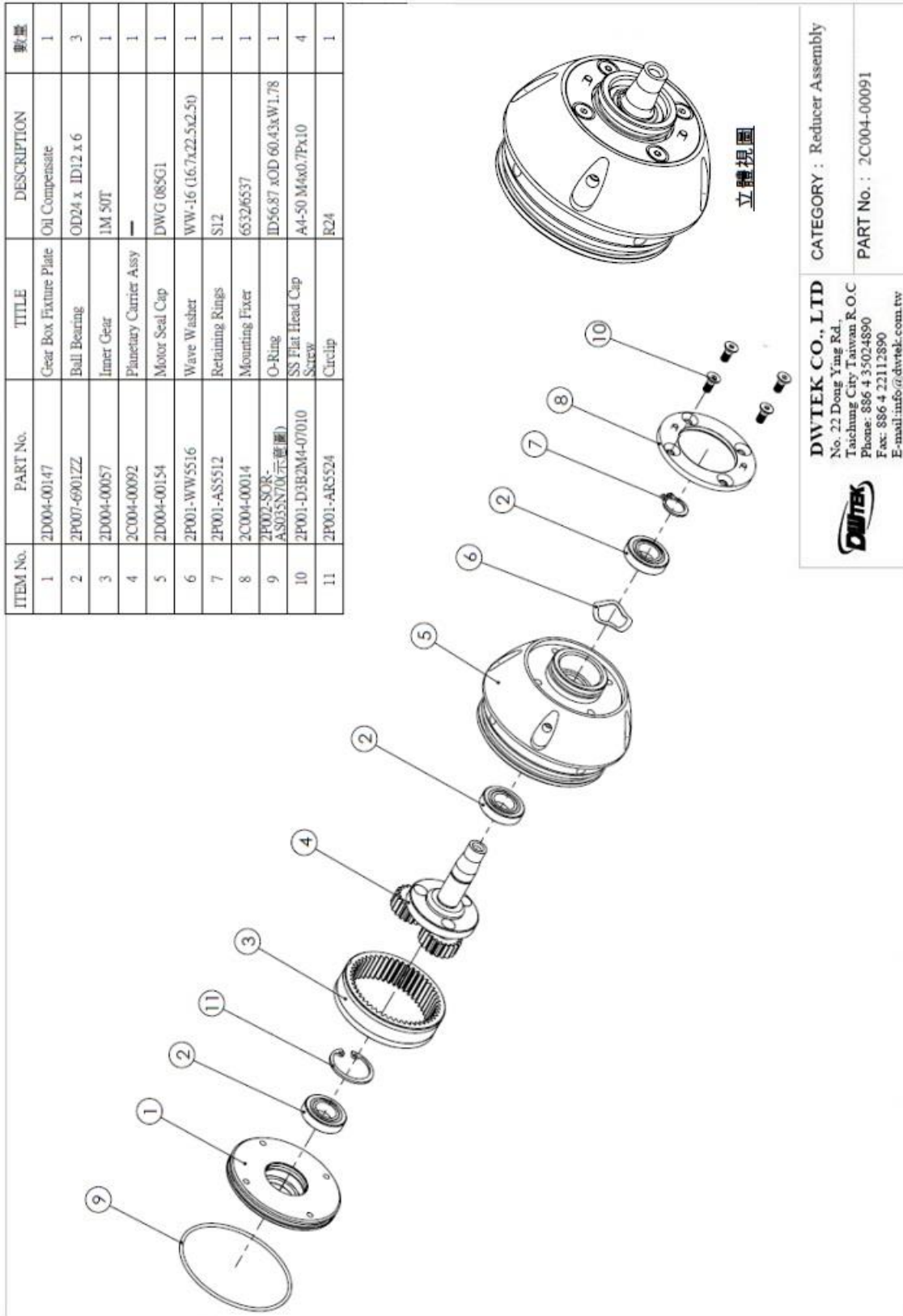


CATEGORY : End Cap Assy

PART No. : 2C004-00137

V1.0

Figure 6 - End Cap Assy (2C004-00137)



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DWTEK

CATEGORY : Reducer Assembly
 PART No. : 2C004-00091

Figure 7 - Reducer Assembly (2C004-00091)

6.4 PWM Signal Control

Table 8 - PWM specifications

	Min	Nominal	Max
Voltage	4.9V	5V	5.1V
Frequency	1KHz	2KHz	10KHz
Adjustment	5%	48%-52%	95%

*The PWM adjustment is about $\pm 2\%$ tolerance.

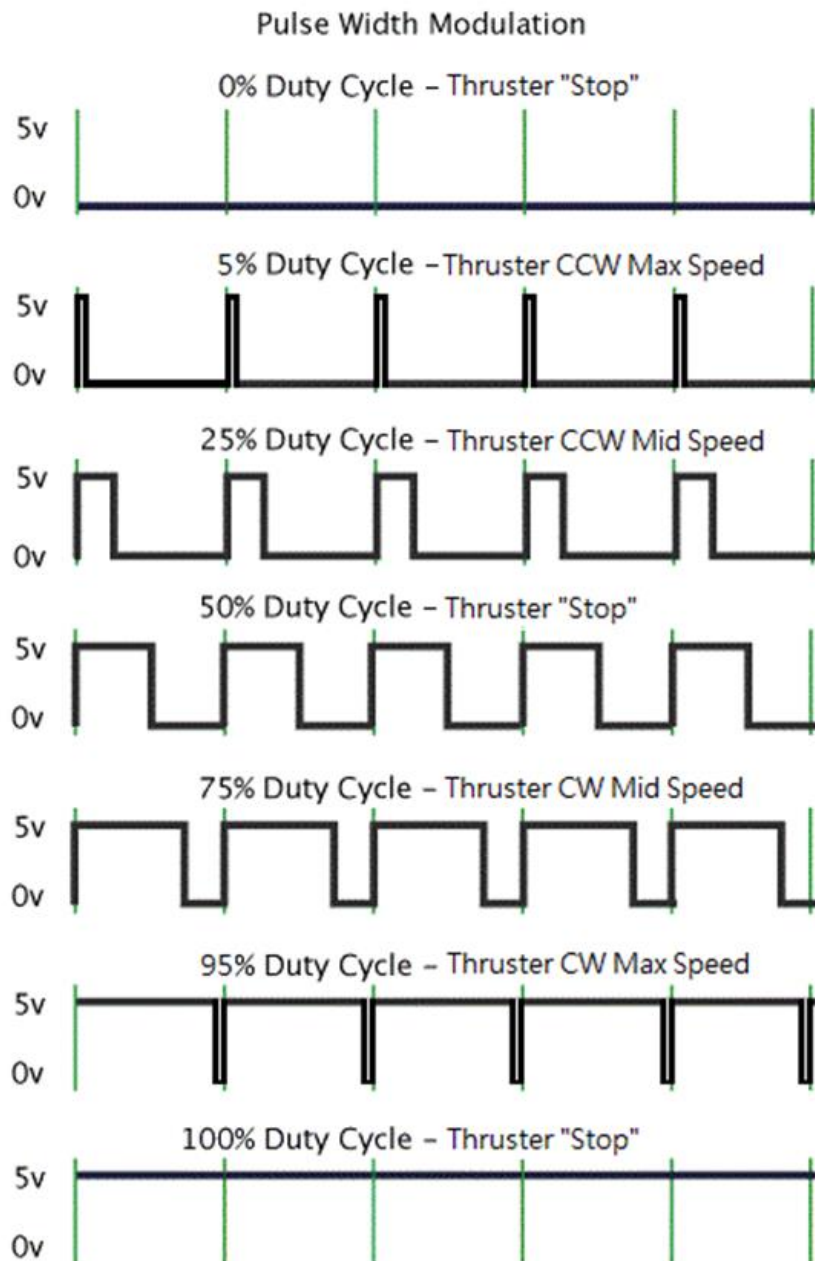


Figure 8 - The schematic diagram of the thruster PWM control

1. Thrusters are Clockwise from 53%-95%.
 - 53% are min speed Clockwise (CW)
 - 95% are max speed Clockwise (CW)
2. Thruster is stopped at 48%-52%, 0%-5%, 95%-100%.
3. Thrusters are Counter-Clockwise from 5%-47%.
 - 47% are min speed Counter-Clockwise (CCW)
 - 5% are max speed Counter-Clockwise (CCW)

*The PWM adjustment is about $\pm 2\%$ tolerance.

Note!!



1. **Control signal is set as 0 RPM within PWM 48%-52%.**
2. **Always make sure to set the control signal within PWM 48%-52% before powering on +300Vdc to the thruster. Thruster will not be activated if control signal is out the range of PWM 48%-52% unless the control is set within PWM 48%-52%.**
3. **The CW maximum speed is set at 95% and the CCW maximum speed is set at 5%, to avoid the maximum speed caused by 0V or 5V when the wire is broken or shorted.**
4. **The WATT of DWT8537 at the maximum speed is about $850W \pm 2\%$.**
5. **After the thruster powers on, DO NOT REMOVE the PWM control signal, otherwise the speed will be abnormal.**



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