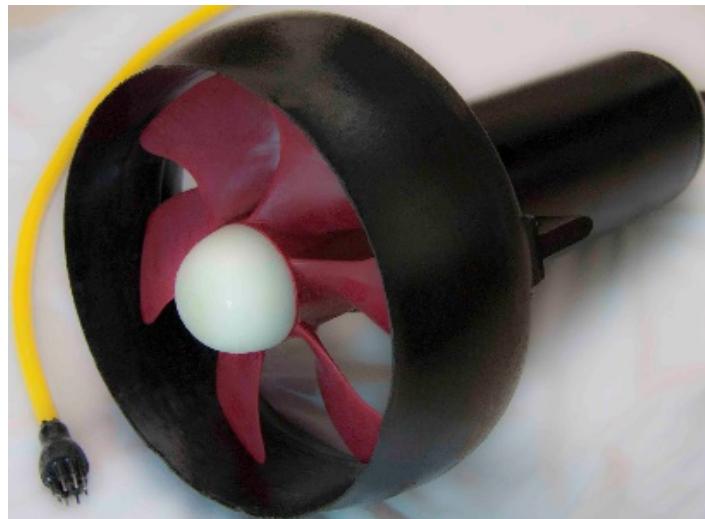


Underwater Thrusters



Lian Innovative has introduced the widest range of underwater thrusters which can be fitted to any type of applications. Many innovative features have been revealed in Lian Innovative underwater thrusters. The modular construction of the thruster let the customers select the best configuration for his/her application. Our products can be fitted for different application ranges from work class ROVs, inspection Class ROVs, AUVs, UUVs, Submarines and etc. Some models can be fitted with different propellers to exactly matches with user applications hydrodynamic load.

FEATURES

- High Reliability, Rugged, Low Maintenance Design
- Advanced triple redundant shaft seal option
- Continued Operation in the Event of Shaft Seal Failure
- Very long service life (10+)
- Direct Drive Reliability (no gearbox)
- Stealth operation (no gears)
- Highest Efficiency in the market (up to 63%)
- Forward / Reverse Thrust within 5-10% Band
- Widest choice of thruster configurations
- Various Connector Options
- Available with +/-5v analog, RS485 and CAN closed loop speed or **thrust control**
- Integral Redundant Drive available
- Proven PMSM (DC brushless motor) manufactured to the ISO 9001:2008 quality standard.
- Fouled propeller detector and reset circuitry
- Operates in all of the popular UAV/ROV voltage ranges from 24 to 420 volts
- Available with hard anodized 6061-T6 aluminum, Type 316 stainless steel housings.

High Efficiency, Low Noise Electric Underwater Thruster

Introduction

Electric underwater thrusters are used on Remotely Operated Vehicles (ROV's), AUV's, submarines and basically any underwater robots that needs electric propulsion to move underwater. Lian Innovative's first thruster designed for the growing Diver Propulsion Vehicle (DPV) market. Quickly it becomes well adapted to other market applications. Lian Innovative thrusters are designed for reliability and performance. With simplicity and versatility in mind, the range of electric thrusters includes numerous innovative features that make them stand out from similar thrusters for performance, reliability, and ease of maintenance.

Applications

- Small ROVs
- Work class ROVs
- AUVs
- Submarines
- Bow thrusters (tunnel mounted)

High Efficiency

All of our thrusters are very efficient in their class and are proven models that have a solid track record. All thruster body are streamlined and have a limited flow blockage. Being of superior design, using Torque PMSM motors together with SK propeller and Rice Nozzle keeps the efficiency as high as 42% at low speed heavy loads (T series) or for high speed, light loads using high speed Direct Drive PMSM motors combined with B-series propellers keeps efficiency up to 63% (E series). Employing a very advanced and compact planetary gearbox in T Series, changed it to C series, with the highest thrust to weight ratio in the market. The Efficiency has been calculated between input power (Dc voltage cross current) and output hydrodynamic power (Thruster force cross vehicle speed). This high level of efficiency rated our thrusters to be more attractive in the high-tech applications.

In ROV's using our thrusters led to using thinner umbilical which reduced the drag load and rises the system overall efficiency high. In AUV's and submarines using our thrusters led to reduces the battery size and cost.

Advanced System Design

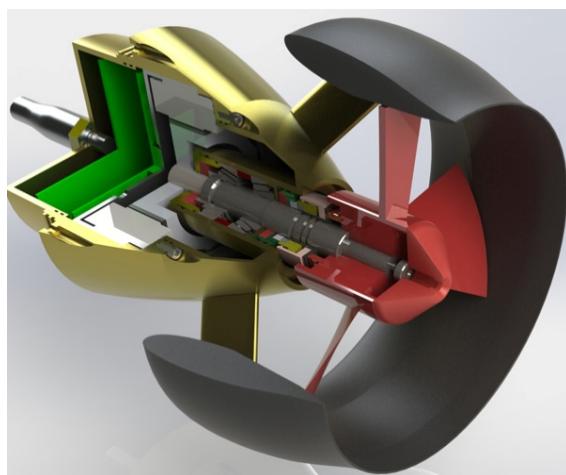
Lian Innovative thrusters provide the most reliable products currently in the marketplace. Long life PMSM Direct Drive brushless has been used to increase the reliability and efficiency. Two redundant advanced motor driver has been used as redundancy. All sections have been sealed with two O-Rings to maintain reliability. Electronics boards sealed independently from motor and shafting to avoid any injuries in case of water leakage in the motor section. The nozzle handles in the Standalone series have been designed as the thruster handle to save weight and reduces the water drag. Cancellation of gearbox not only increased the reliability and ease of maintenance but also decreases the noises, weight, and cost. Full system parameters monitor and control enable the user to qualify its thruster health condition. Controlling the thrust over than controlling the propeller rpm makes the control system enable to have a precise control on the underwater robot maneuvers.

Available Sizes, Types, and Variations

Today modern applications need thruster units to be exactly matched to the hydrodynamic load. Thanks to its advanced system design Lian Innovative have develops lots of hydrodynamic and electric variety in its products with minimum variation in its underwater thruster core. Its enables underwater robot development designer to modify the thruster with minimum effort and cost to reach the best answer. We have the widest range of product in the market within our competitor.

Quality control products

All of Lian Innovative Electric Underwater Thrusters independently tested for 12 hours under highest water pressure and variable load to ensure the finalized product quality. All of our products are guaranteed for one year. For individual specifications and data refer to the respective thruster data sheet.



Selection Procedure

Selecting of a thruster to be fitted to your applications needs lots of care. In this section, different options of Lian Innovative underwater thrusters have explained in detail to make the selection procedure as simple as possible.

1- Select the thruster series

The first step is to select the right thruster series. Lian Innovative have introduced three different series. C, T & E series. E series is suitable for robots with speeds more than 3 or 4 knots. This series is Direct Drive, Noiseless, high efficiency and best fitted for AUVs and submarines. C Series is suitable for robots with speeds less than 3 or 4 knots and lots of drag force. This series includes a reduction gearbox to produce the highest thrust to weight and volume ratio and best fitted for ROVs. And finally, T series is designed for special purpose low-speed high-efficiency applications that noise is of most importance. The mechanical connection of E series is different from C & T series. E Series designed to be integrated to the end of robot body directly to match the streamlined body and keep the efficiency as high as possible. C & T series can be attached to the underwater robot body by its handle. Details are explained in “Mechanical Integration Options” at page 9. Regarding of your application, you can select the right series and continue to the next selection step.

2- Select the thruster size

By selection of the thruster series, you can select the thruster size. You can select the initial choice by referring to “Quick selection charts” at page 10. In this chart, you may find a couple of choices to be suitable for your application. Each size has some propeller options that can be fitted for various hydrodynamic loads.

Consider the efficiency & physical size

The next step is to refer to the initially selected choices “Thrust & Power Vs. Propeller Speed Diagrams” at page 11 - 41 to carefully check the efficiency @ desired Thrust & Speed. In this step, you can find the best thruster size, based on the power level needed to develop the force. Also, the physical size of each thruster can be found in drawing paired by thrust diagrams.

3- Select the Reliability range

Underwater Thruster may have subjected to a harsh environment. Hitting of fishes to the high-speed

propeller, wrapping of fishing net to the thruster shaft, high shocks, and vibrations may happen during operations. Regards to the expected reliability and the hardworking level you may select the shafting and shell options. Lian Innovative has introduced two shafting options. Sleeve bearing shafting and Taper bearing shafting. Sleeve bearings are lighter, cheaper but are not suitable for long working periods or heavy loads and shocks. In harsh conditions, they may be the origin of leakages. Taper bearings can be subjected to very harsh shocks and vibrations. They are heavier and more expensive. But even in the harsh conditions and probable accidents they can keep the thruster continue working. Details can be found on “Shafting options” at page 6.

4- Select the depth rating and shaft sealing method

Lian Innovative underwater thrusters’ standard depth rating is 500 m. Oil filled full ocean depth also available as an option. Oil filled thrusters’ efficiency is lower than air filled one because lots of energy dissipate in the space between rotor and stator of the motor, or between gears dents. We strongly recommend using non-oil filled series because of their efficiency despite their highest sealing reliability.

For 500m and 750m depth rate, we have two options. Pressure balanced air filled option and triple redundant shaft sealing option. Refer to “Shaft Sealing” section at page 6 for more details. Pressure balanced air filled option is light, low cost and suitable for light duty applications. This option needs cyclic maintenance to keep the cylinder clean and the piston mechanism working. The triple redundant sealing option is heavier, more expensive and suitable for harsh environment and heavy duty applications. In this option, in the case of any leakage, the thruster continues its working and finishes the operation successfully.

5- Select the Supply voltage rating

Depends on your system power supply, you can select thruster voltage. As the thrusters got bigger and heavier its minimum operational voltage increases. Select the best choice based on your system design. Acceptable input voltage can be found on “Quick selection charts” at page 10.

6- Select the communication protocol

To control the thruster and have a feedback of its working factors you need to select a communication protocol. There is three option provided by Lian Innovative. CAN bus, RS485, and analog. CAN bus and RS485 are bidirectional and mostly used for

professional applications who care about noises and reliability. By this options, you can be able to have a close control on the thruster and continuously monitor vital factors of thruster health including motor temperature, motor RPM and rated current. Analogue option is one-way communication between thruster and controller. By a simple +/-5v, you can control the thruster. Analogue option cannot be as dynamic as CAN bus or RS485, because of the probable introducing of noise on the commands. Also, the thruster cannot send back any reports to the robot controller. Details can be found in "Electronics" section at page 8.

7- Select the casing material

The standard option for the casing is Aluminum alloy with a hard anodizing coating which has a good sea water corrosion resistant. It is light, cheap, wear resistance and suitable for most of the applications. The User may prefer to use SS alloy for a special purpose.

8- Select the connector

Lian Innovative offer a wide range of standard connector for its thrusters. Two of the most used one are the SEACON MSSL series (www.seaconworld.com). Depends on your application you may order your thruster with any standards model of connectors and penetrators or even bare cable ending.

9- Select the other options

Regarding of your applications, you may need to select different propellers, handles, and any other configurations. Please feel free to consult us to provide you best solution.

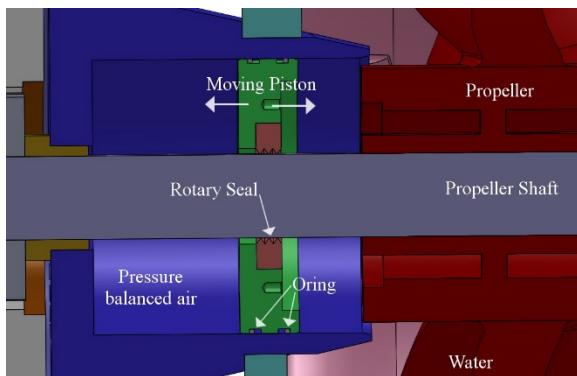


Shaft Sealing

Lian Innovative underwater thrusters have three different shaft sealing options. Shaft sealing options are totally independent of other section configurations. And this option can be selected independently. Reliability, Cost, Weight, Depth rating and hardworking level are different between these options.

Balanced, Air Filled Shaft Sealing

For economic applications with maximum 500m of operation depth, Balanced Air Filled series are the best option. In this sealing system, the thruster's internal volume fills with air, and shaft seals act as a piston to balances the internal and external pressure. This type of sealing is reliable, lighter than oil-filled and its efficiency is higher than oil-filled series. A cyclic maintenance needed to keep piston and cylinder clean and in working condition. This option is not suitable for heavy duty applications and none of the internal parts of this series are repairable (exclude electronics).

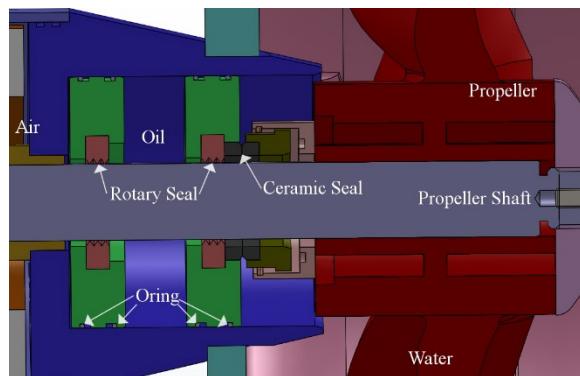


Oil-filled Shaft Sealing

For applications that needed to go down full ocean depth, Oil-filled series are the best option. In this sealing system, the thruster's internal volume fills with oil, and a soft diaphragm balances the internal and external pressure. This type of sealing is very reliable but oil weight makes the thruster heavier than Air filled version. Also, the viscosity of the oil reduces the efficiency of the thruster in contact with internal rotating parts.

Triple redundant Shaft Sealing

For heavy duty applications with maximum 750m of operation depth, triple redundant sealing series are the best option. In this series, the first seal is a high-quality Ceramic mechanical seal which is totally wear resistant. And two high quality rotary internal/external seals that are capable of sealing the motor on its own used as backup seals. This configuration offers a large safety margin to prevent water leaks into the motor. Redundant shaft sealing system allows the thruster to continue running in the event of a shaft main seal failure and subsequent leakage, without damage to the winding or electronic components.

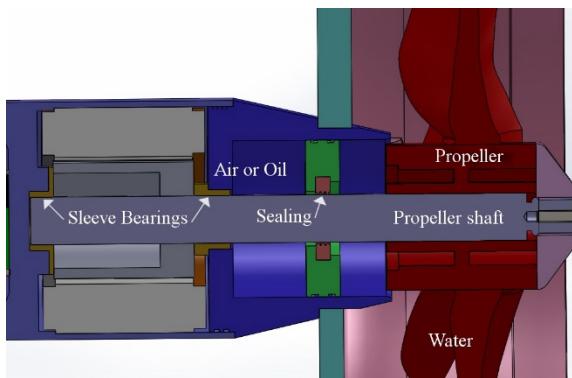


Shafting

Lian innovative underwater thruster shafting has two options, Sleeve bearing and Taper bearing shafting. These two options are totally independent from other section configurations. And this option can be selected independently. Reliability, Cost, Weight and to be Heavy Duty are different between two options.

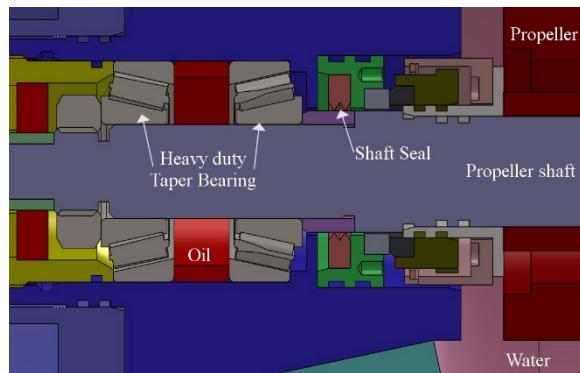
Sleeve Bearing Shafting

For standard light duty applications with light shocks and vibrations, the best option is Sleeve bearing. It is totally noiseless, light and cheap. But if this type of shafting uses in harsh environmental condition or subjected to heavy loads, or to be used in a long time, the bearing tolerances may become loose and the shaft radial play may become larger than the seal allowable radial play that leads to leakage. Also hitting of a fish or any external objects to this type of shafting may lead to water leakage. This type of shafting is suitable for one-time uses robots or for fun or hobby robots. We strongly do not recommend to use this type of shafting for heavy duty professional applications.



Taper Bearing Shafting

For heavy duty application with probable heavy shocks (up to 20g) and vibrations the best option is Taper bearing shafting. Back to Back Taber bearing configuration keeps the shaft tightly to avoid any displacement in case of hit or vibrations to guarantees shaft sealing mechanism. This option is suitable for application for very long running time or applications that fishing line may wrap around the propeller. This option is suitable for most of the professional long term operation robot that reliability is of most important. Hitting of a fish or any other external objects does not affect the shaft and seals. Back to Back Taper bearings bounds with two rotary seals to run with lubricant oil all the time. This advanced designed guarantees long time range operation of bearings and prevent any corrosion in the case of any seawater vapor leakages. This type of shafting is heavier than sleeve bearing and its price is higher.

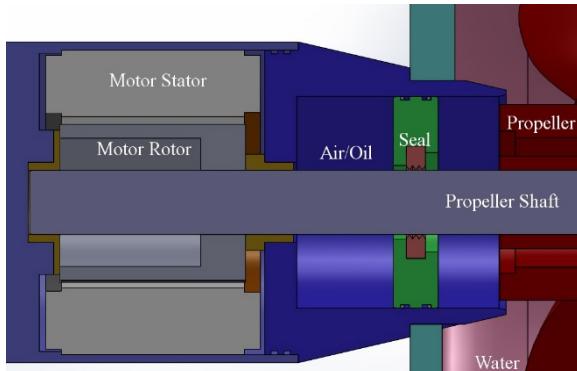


Motor Propeller Connection

Lian Innovative underwater thrusters have two type of connections between motor and propeller. Direct Drive connection and Gearbox integrated connection. Direct Drive is used in E & T series and Gearbox integrated connection is used in C series thrusters. This option affects the thrust/weight and noise level considerably. Depends on the application the first option that the user can select this option.

Direct Drive Connection

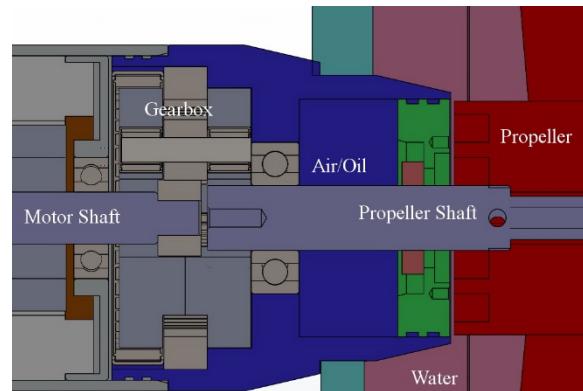
Direct Drive underwater thrusters are reliable, light, noiseless and its efficiency is high. Thanks to high torque of PMSM motor it's possible to rotate the propeller directly. Lian Innovative introduced this type of thrusters for high-tech applications especially for the one that efficiency and noise are of most importance. Fast response to commands is one of the abilities of this type of thrusters.



There is no mechanical discontinuity between propeller and rotor, then heavy shocks of the propeller (because of fish hitting or similar issues) directly transfer to the rotor without the probability of mechanical fraction. This type of connections is used in T and E series of thrusters and when users have weight or volume restrictions this is the best options.

Gearbox Integrated

For Applications which thrust/volume is of most importance, Lian Innovative Introduced Gearbox Integrated thrusters as C series. Lian Innovative designed and developed very compact, highly reliable gearbox which matches the torque of the propeller to the motor. This gearbox designed for 3000 hours of full load operation without any maintenance and repair needed. High-frequency noises of gears and bearings must be considered for users that noise level is important for them.



Electronics

Control PCBs is one of the most important sections of underwater thrusters. They are the origin of lots of operation failures. Users are not happy with them most of the time. Electric motors are the source of noises that may be the origin of disorder or confusion in other parts of the control system of robots. Lian Innovative has designed and developed a very advanced high-tech motor controller with lots of protections. Common and differential filters on the power and signal lines have been applied to confirm avoiding any type of disorder on other electronics parts of the robot.

The electronics is designed modularly in two separate boards, Control PCB and Power PCB. Control PCB receives data from the user or main controller of the robot and controls the Power PCB. Power PCB control the motor power. This advanced design minimizes the repair cost of electronics in case of any probable failure. Power PCB that runs the motor, can withstand the shocks that introduce to the propeller. If the propeller jams due to any external object wrapping the shaft, it will not fail. The motor will automatically stop and a signal will return to the users as feedback. The user can reset the circuit and by changing the revolution direction he/she may get rid of the issue.

The control PCB can accept speed or torque commands via RS485 or CAN bus. For most of the applications speed commands is enough. But for some special applications users need to have a close control on the

torque. The Control PCB is able to control both of control type and send back the feedback signal.

Voltages Supported

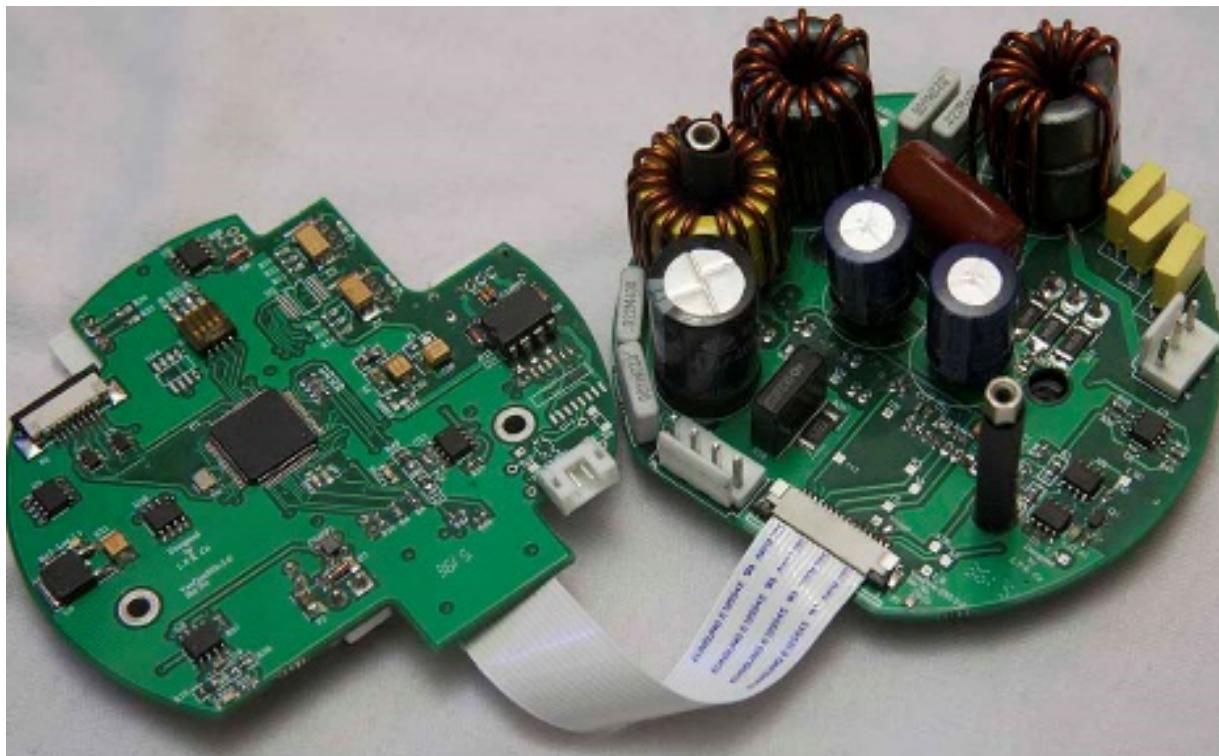
Different Lian Innovative thrusters are available for operation at voltages from 24 v DC up to 420 v Dc to keep ease of using by system designers. One of the most advanced features of our thrusters is that it can keep the thrust and performance within specified voltage range. This feature is very important for battery operated AUV's because the **thrust will be invariable during the session**.

RS485, CAN or Analog communication

Three communication options are available for our thrusters. For easy applications, +/-5v analog speed and direction control can be used. For professional applications such as advanced AUVs and ROVs, all thruster data including, motor temp, speed, water intrusion sensor, currents and many other parameters can be communicating with the thruster.

Redundant drive

For very special application where the thruster failures could be fatal, Lian Innovative can add the second set of PCB as redundancy. In the case of any failure, the user can switch to the second PCB and continues the operation. This advanced technique is now using in Lian Innovative Diver Propulsion Vehicles (DPV) to guarantees the returning of the diver in the operations.

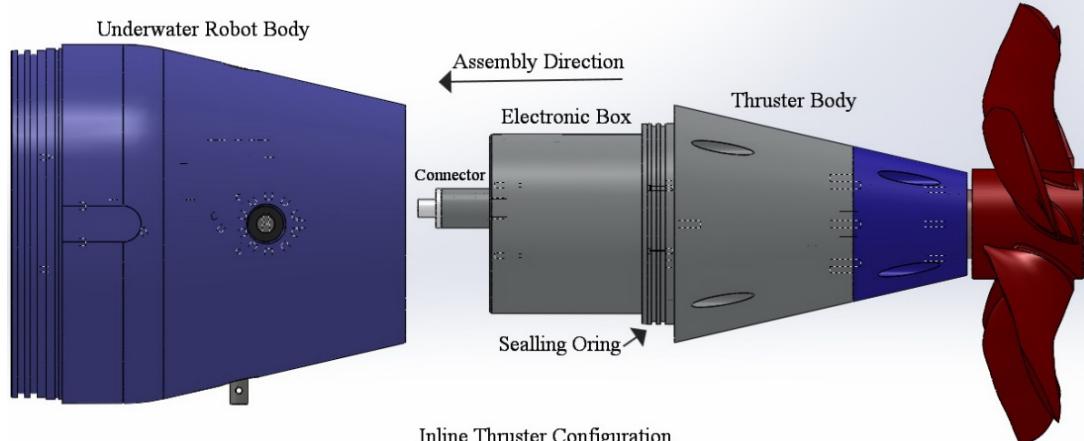
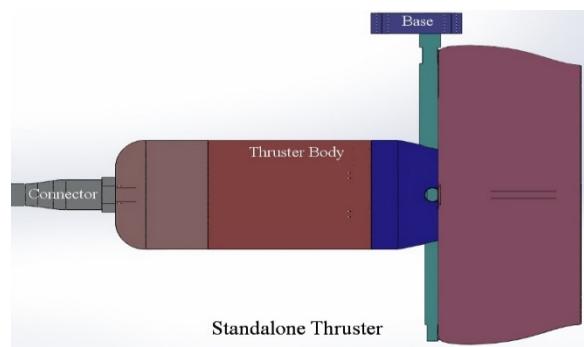


Mechanical Connection Options

Connecting an underwater thruster to the underwater robot body is an important parameter that lots of care must be considered to avoid subsequent issues. Propellers are the source of vibrations and probably shocks. Connecting of a thruster to the robot may block the propeller currents also. A well-designed connection not only must be able to withstand shocks and vibration but also must have least possible drag. Lian Innovative is the first company that introduced two type of connections. Inline connections and Standalone connection. The most advanced type of connection is Inline connections that connect thruster to the end of robot body directly. But for robots that this type of connections is impossible, Lian Innovative introduced Standalone configuration. Designing of a handle that its drag force is as low as possible, its weight is as light as possible and be able to withstand shocks and vibrations is a difficult job that Lian Innovative solve it with a lot of efforts by introducing Standalone connection. Now Lian Innovative underwater thrusters can be equipped with two types of mechanical integrations.

Inline Thrusters

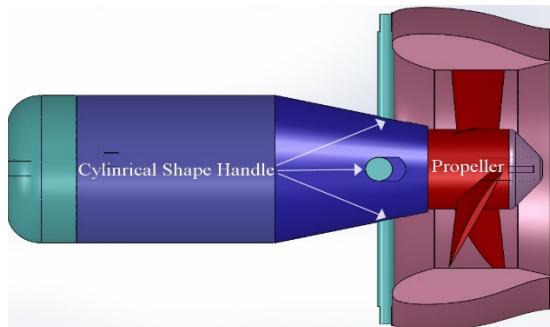
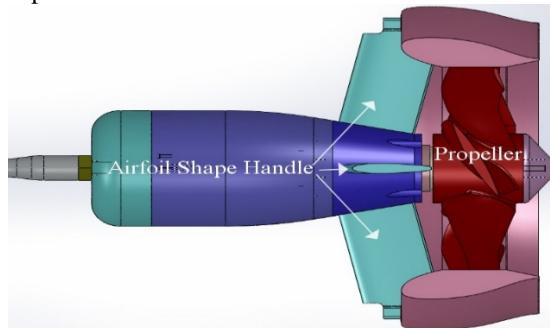
Inline underwater thrusters are the thrusters that integrated into the end of the underwater vehicle body. This thruster type usually uses on AUVs and Submarine to keep its hydrodynamic shape and streamline flow.



This type of integrations has the best behavior for shocks and vibrations and inserts lowest possible drag in fluid current. E series thrusters designed inline. The external geometry of inline thrusters can be modified by customer orders.

Standalone Thrusters

Standalone underwater thrusters are the most one you can see on the market. A Thruster with Hydrodynamic housing which can be connected to the device by its handle. This type of thruster is usually used in ROV and as Bow thruster. There are two types of standalone handle. Light duty handles and heavy duty one. The light duty handle is cylindrical shape, light and cheap. Heavy duty handle is airfoil shape, heavier, and more expensive. Airfoil shape handle can withstand heavy shocks especially in shaft directions, which cylindrical shape can not tolerate.



Quick selection charts:

High Thrust series						
Model	Propeller	Thrust Max N	Max Hydrodynamic Power W	Max Eff	Weight Wet Kg	Input Voltage
038T	105-080	50	65 @ 4 Knot	24% @ 4 Knot	1	24-350
049T	140-080	80	90 @ 4 Knot	28% @ 2 Knot	1.2	24-350
076T	176-080	160	190 @ 4 Knot	35% @ 2 Knot	1.8	48-350
092T	178-080	340	530 @ 4 Knot	38% @ 4 Knot	3.9	130-420
	245-080	250	280 @ 4 Knot	35% @ 2 Knot		
130T	245-080	700	1100 @ 4 Knot	40% @ 3 Knot	9.2	130-420
	300-080	570	800 @ 4 Knot	40% @ 4 Knot		
180T	300-080	1600	3800 @ 6 Knot	40% @ 5 Knot	12.4	200-420
	400-080	1200	1700 @ 6 Knot	38% @ 3 Knot		
240T	400-080	2600	11800 @ 4 Knot	42% @ 4 Knot	18.8	200-420
	500-080	2100	7500 @ 4 Knot	41% @ 3 Knot		

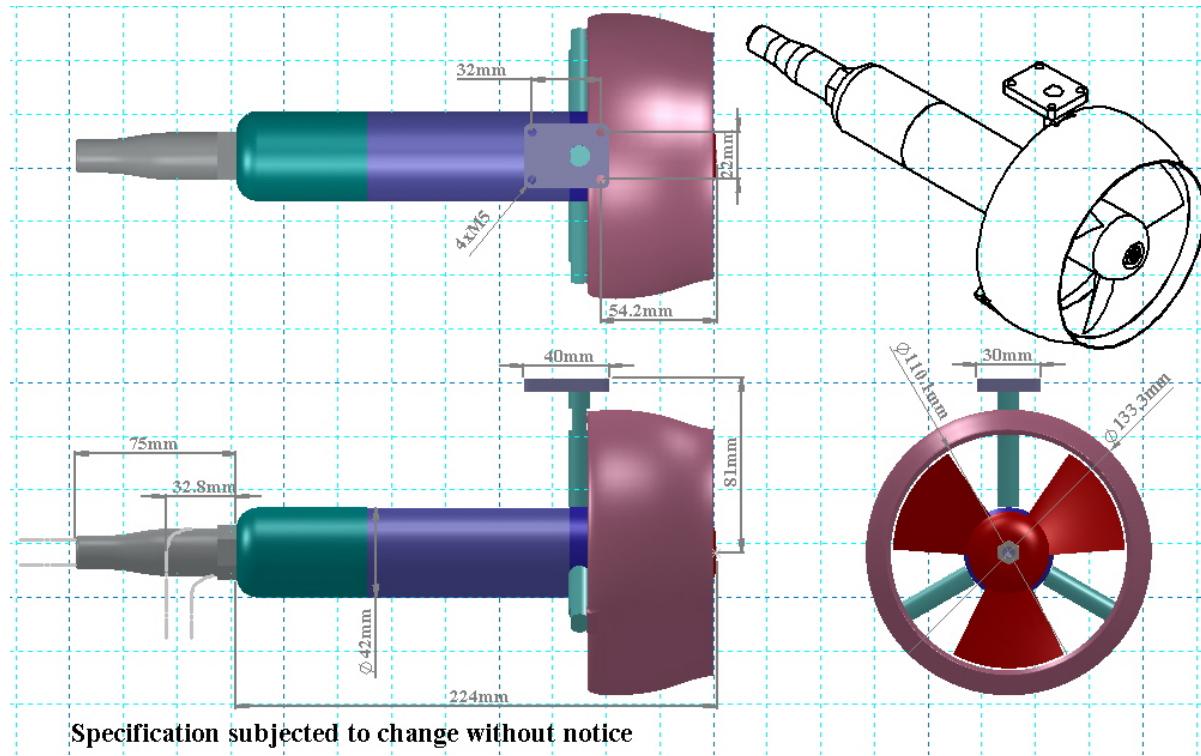
High-Efficiency series						
Model	Propeller	Thrust Max N	Max Hydrodynamic Power W	Max Eff	Weight Wet Kg	Input Voltage
038E	090-100	40 @ 0 Knot	105 @ 6 Knot	60% @ 4 Knot	1	24-350
	100-100	45 @ 6 Knot	140 @ 6 Knot	55% @ 6 Knot		
049E	110-100	70 @ 2 Knot	170 @ 6 Knot	63% @ 6 Knot	1.2	24-350
	120-100	60 @ 2 Knot	170 @ 6 Knot	63% @ 6 Knot		
076E	120-100	125 @ 0 Knot	170 @ 6 Knot	55% @ 6 Knot	1.8	48-350
	130-100	150 @ 2 Knot	270 @ 6 Knot	63% @ 6 Knot		
092E	184-055	360 @ 0 Knot	430 @ 4 Knot	51% @ 6 Knot	3.9	130-420
	184-080	290 @ 4 Knot	1000 @ 8 Knot	63% @ 8 Knot		
	185-114	220 @ 2 Knot	1400 @ 12 Knot	63% @ 12 Knot		
130E	235-086	680 @ 2 Knot	2500 @ 8 Knot	63% @ 8 Knot	9.2	130-420
	235-097	610 @ 2 Knot	3400 @ 12 Knot	63% @ 12 Knot		
	235-130	470 @ 2 Knot	3300 @ 16 Knot	63% @ 16 Knot		
180E	298-078	1450 @ 6 Knot	9900 @ 8 Knot	63% @ 8 Knot	12.4	200-420
	298-094	1350 @ 2 Knot	1050 @ 12 Knot	63% @ 12 Knot		
	298-104	1200 @ 4 Knot	11200 @ 6 Knot	63% @ 16 Knot		

Compact series						
Model	Propeller	Thrust Max N	Max Power W	Max Eff	Weight Wet Kg	Input Voltage
038C	105-080	190	970 @ 4 Knot	39% @ 4 Knot	1	48-350
049C	140-080	530	3400 @ 4 Knot	42% @ 4 Knot	1.2	200-350
076C	178-080	1400	10600 @ 4 Knot	43% @ 4 Knot	1.8	200-350
130C	245-080	3100	23000 @ 4 Knot	44% @ 4 Knot	9.2	200-420
	300-080	3900	27000 @ 4 Knot	43% @ 4 Knot		

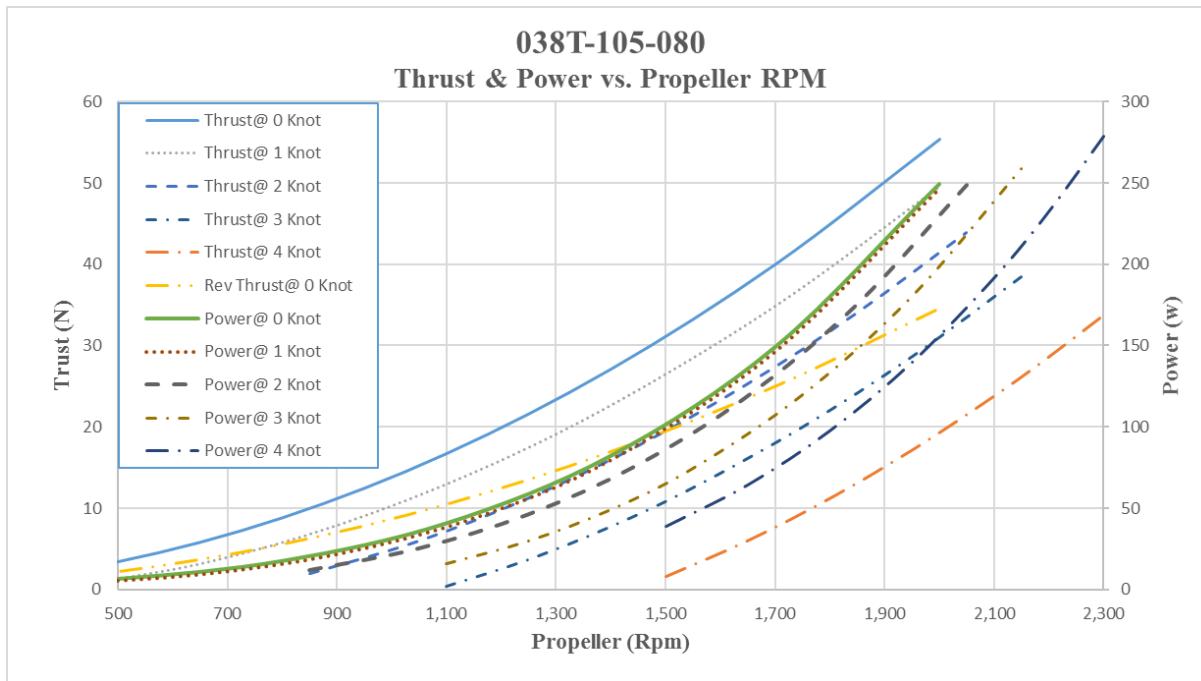
(specifications subject to change without notice)

Download STP solid model of this thruster here:
<http://www.lianinno.com/underwater-thrusters/>

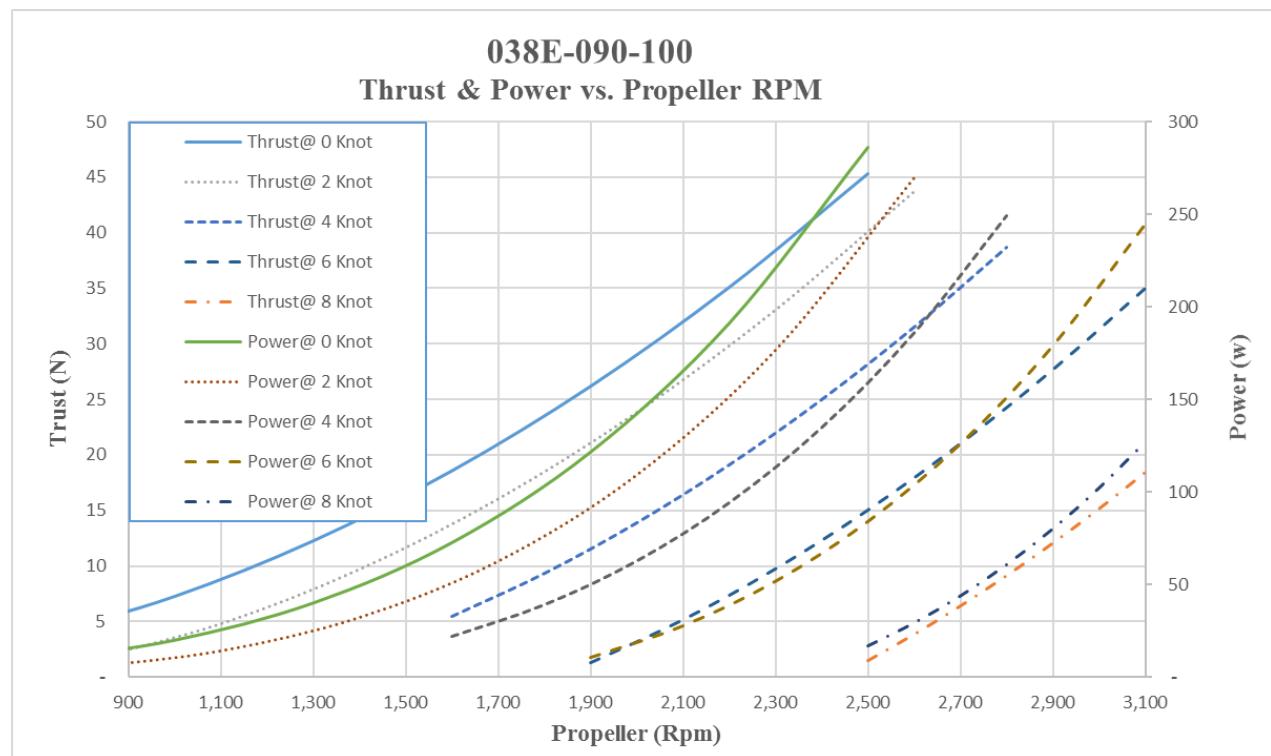
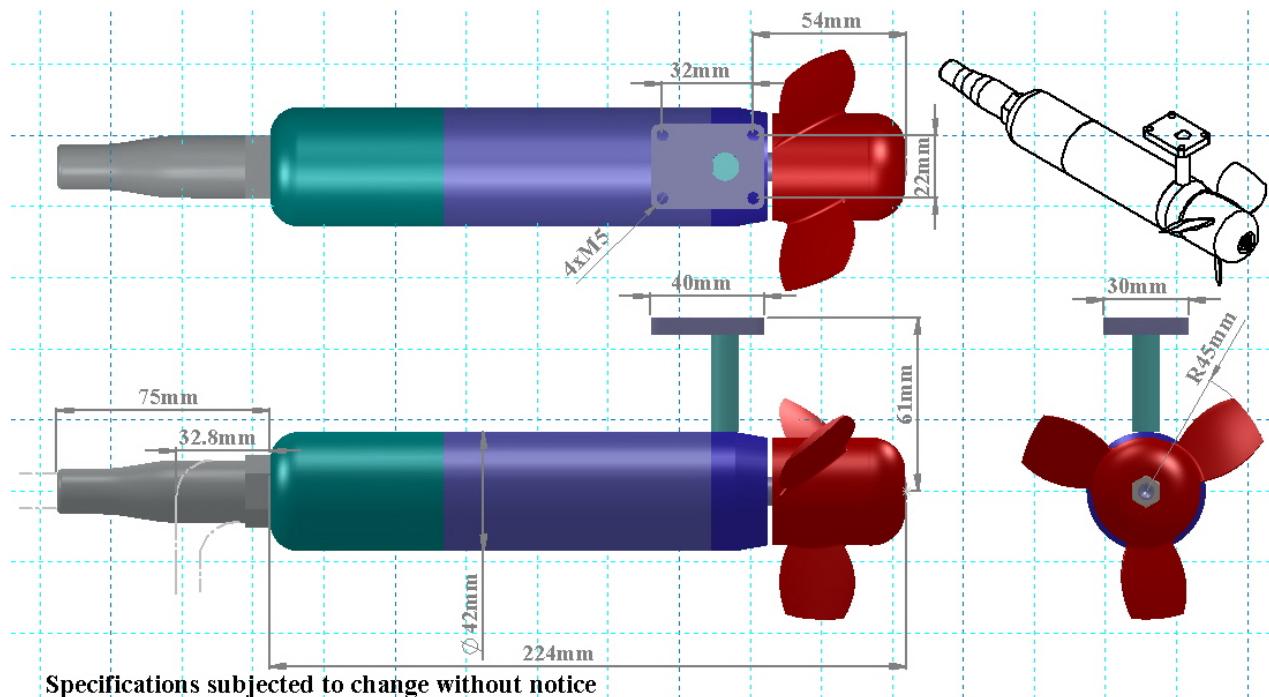
038TL-105-080 Drawing and charts



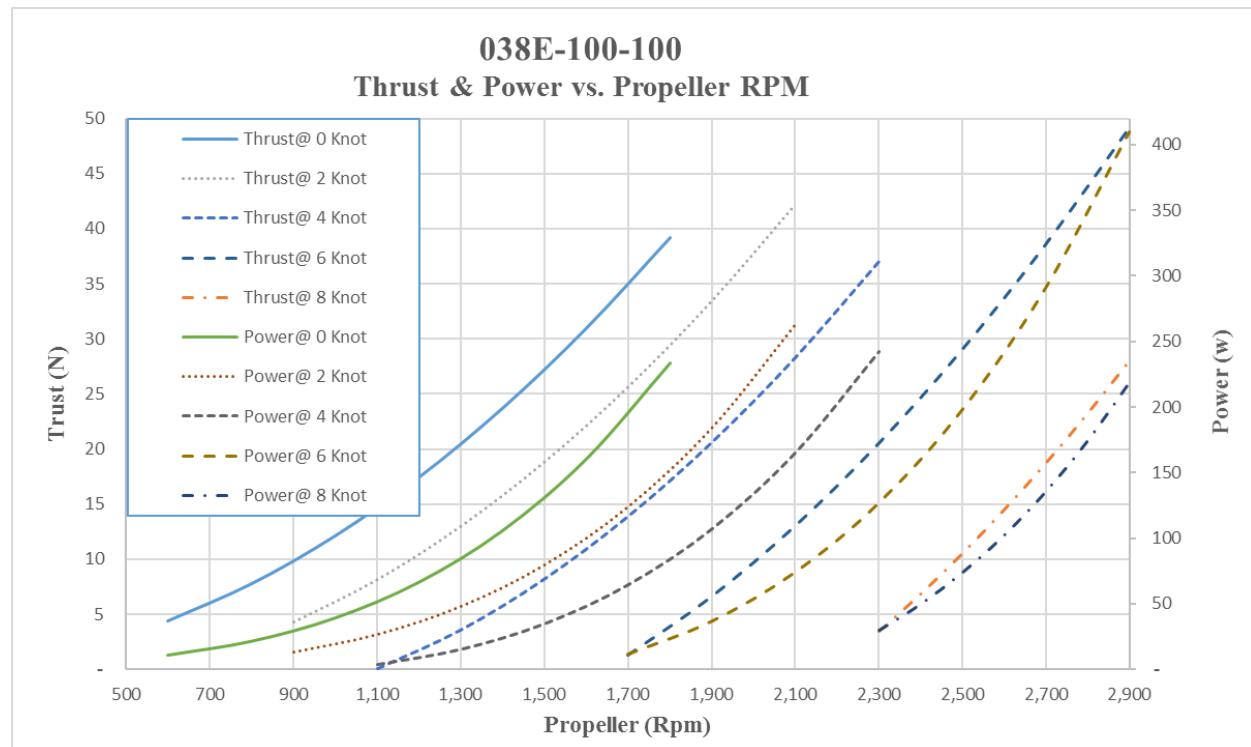
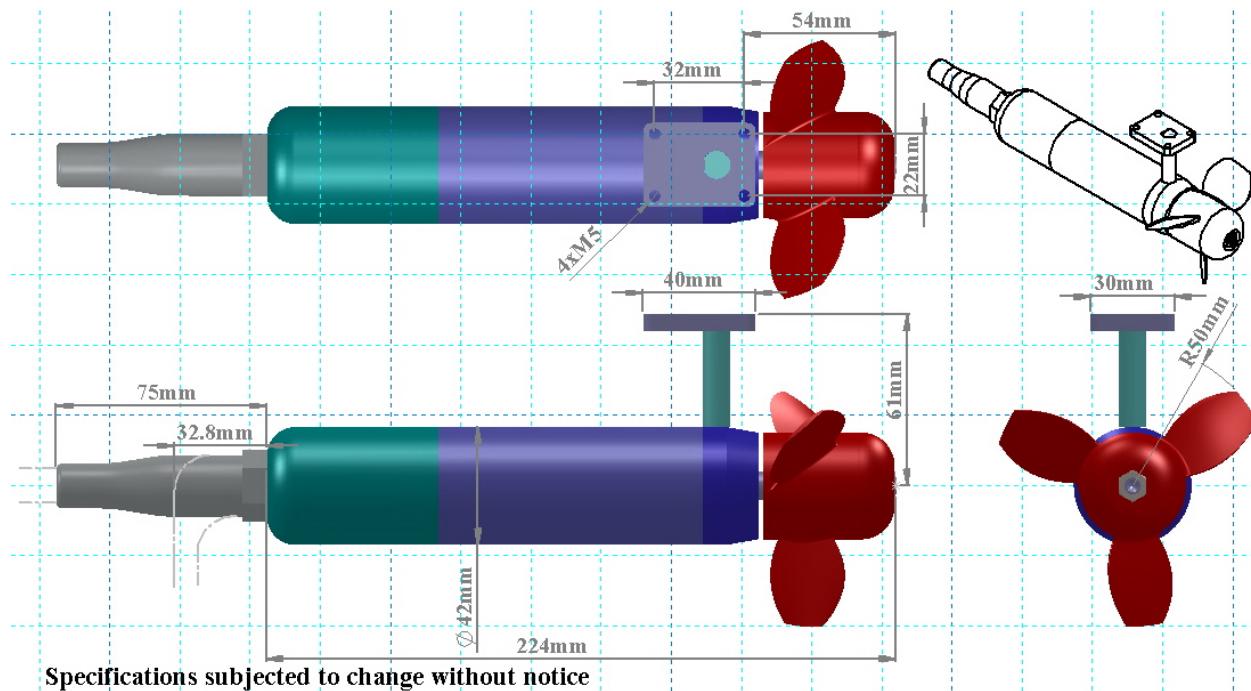
Drawing & Charts



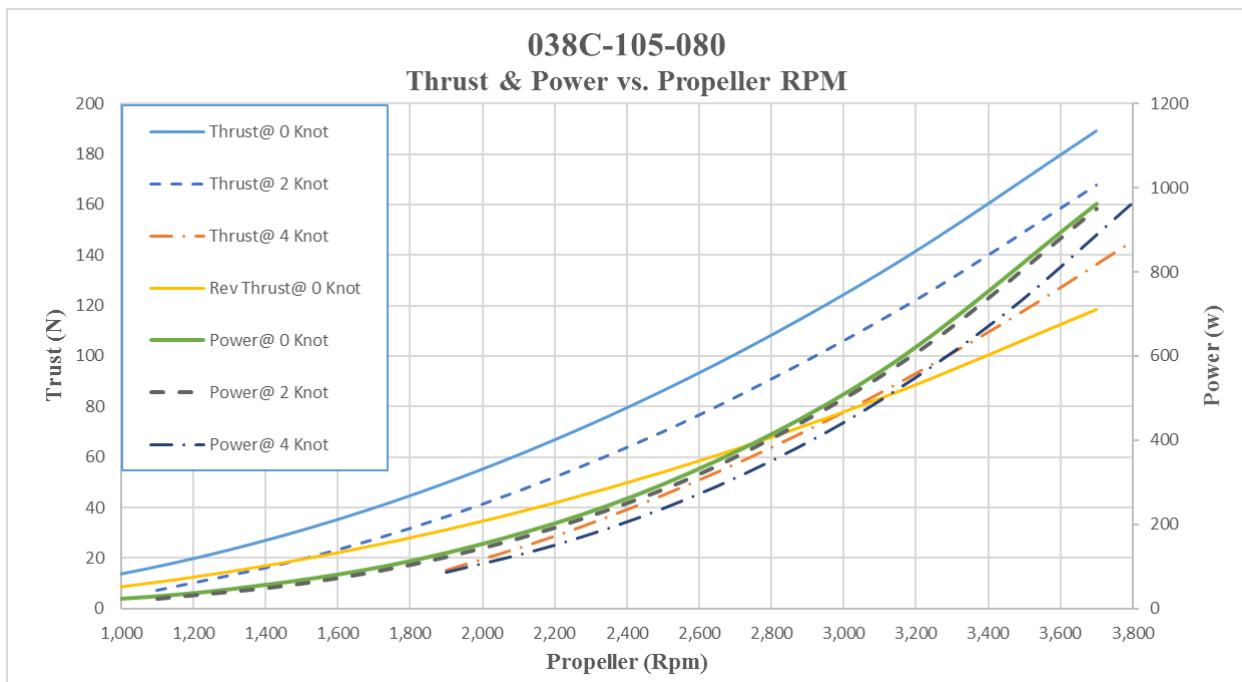
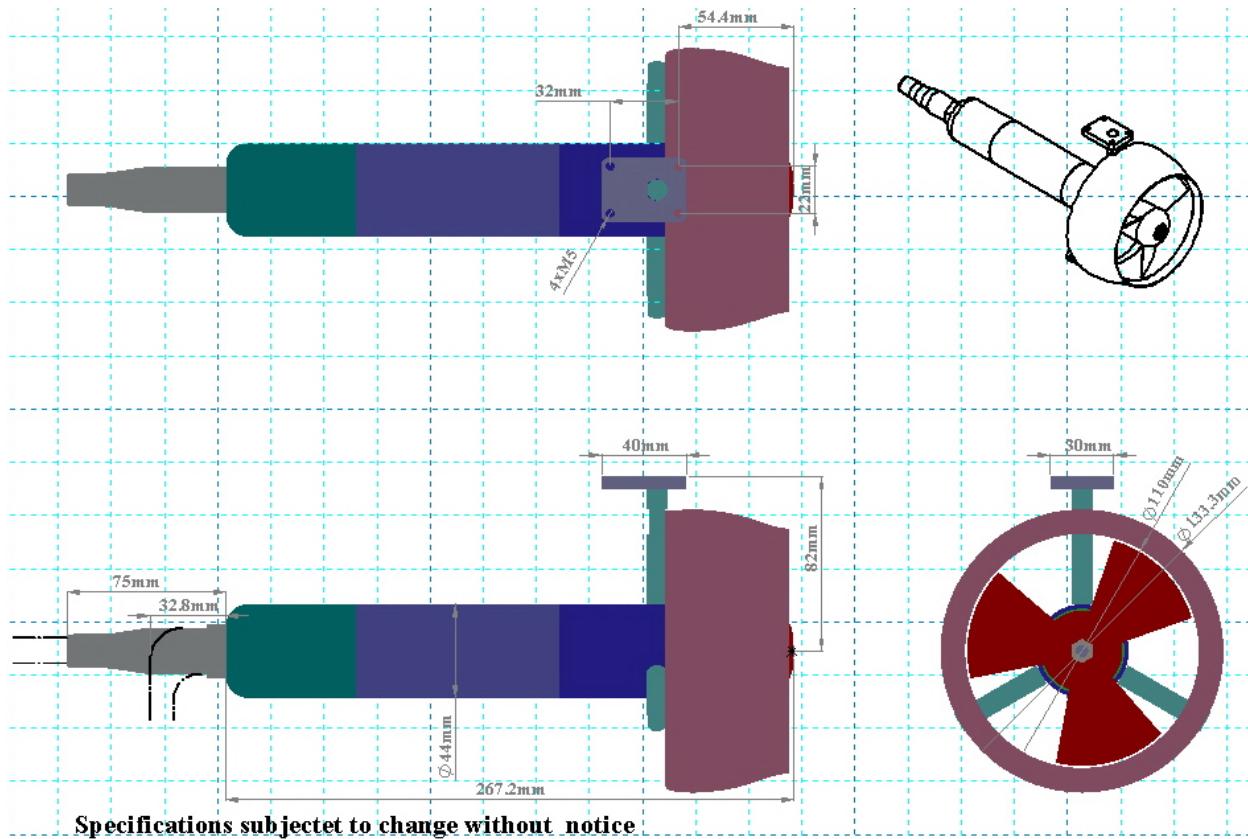
038ES-090-100 Drawing and charts



038ES-100-100 Drawing and charts

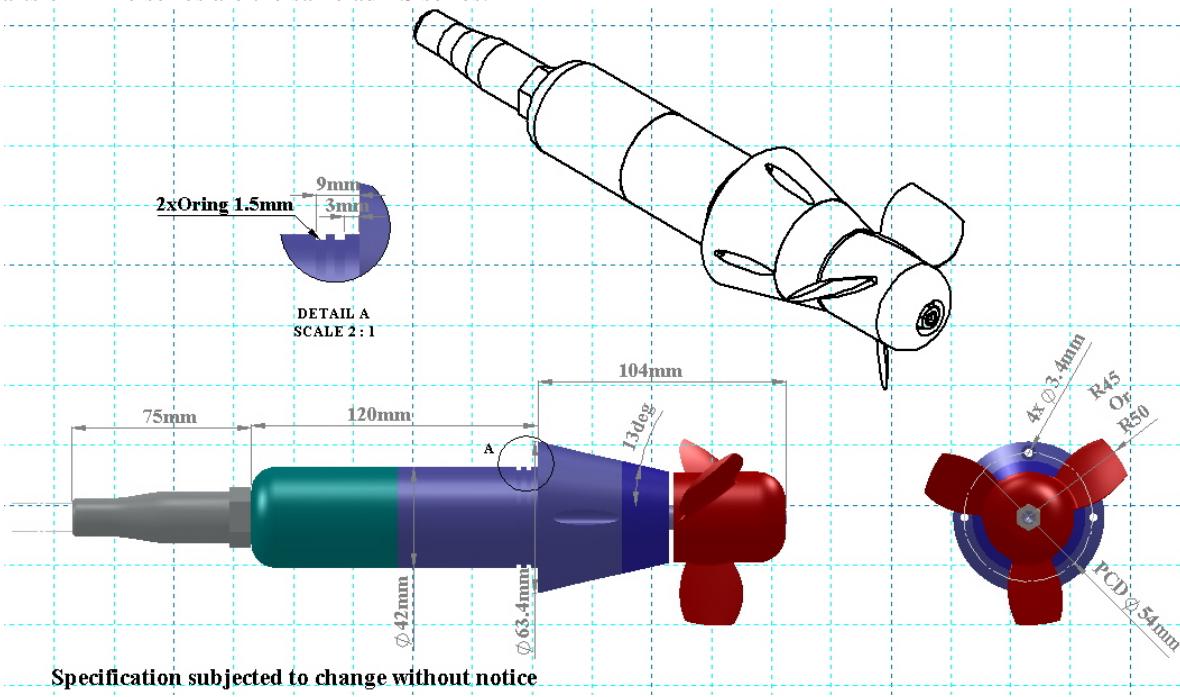


038CL-105-080 Drawing and charts



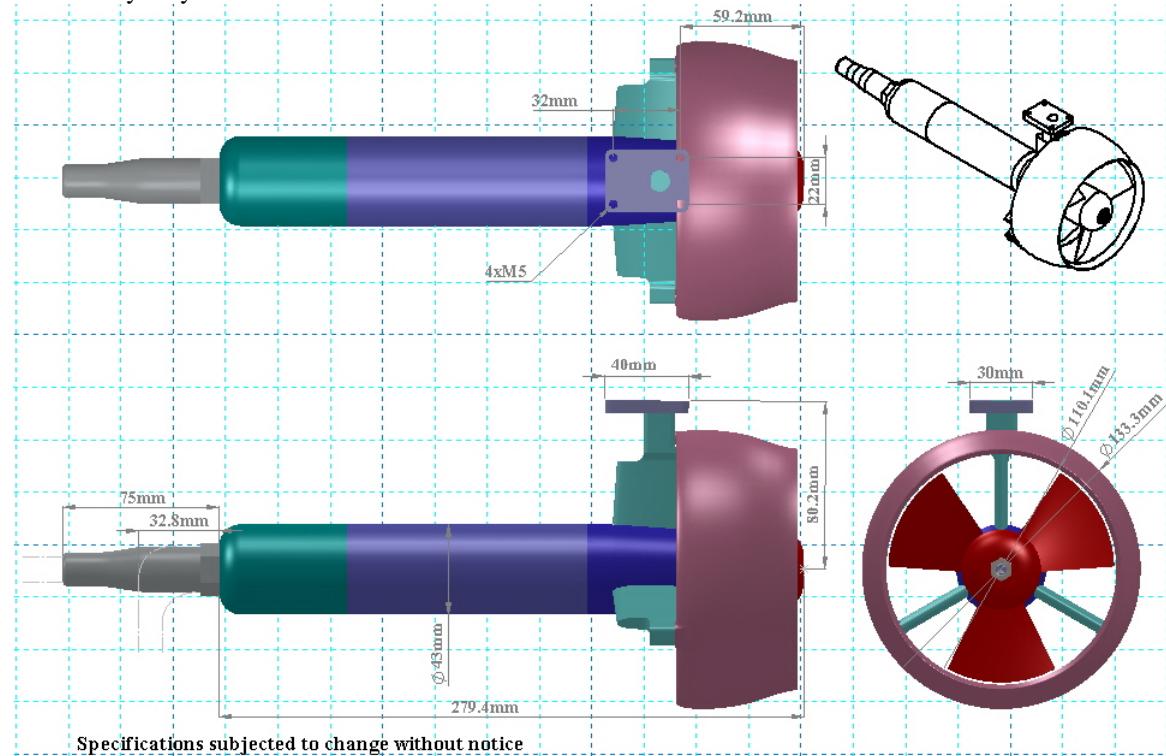
038EI-090 & 038EI-100 Drawing

Charts of Inline series are the same ad ES series.

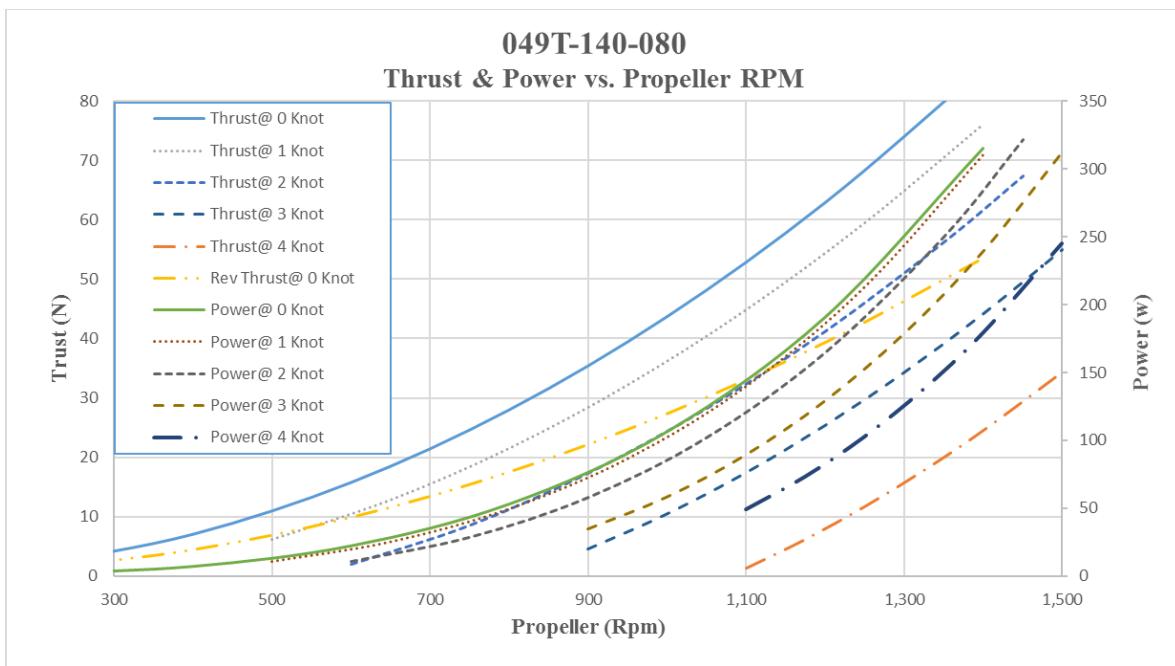
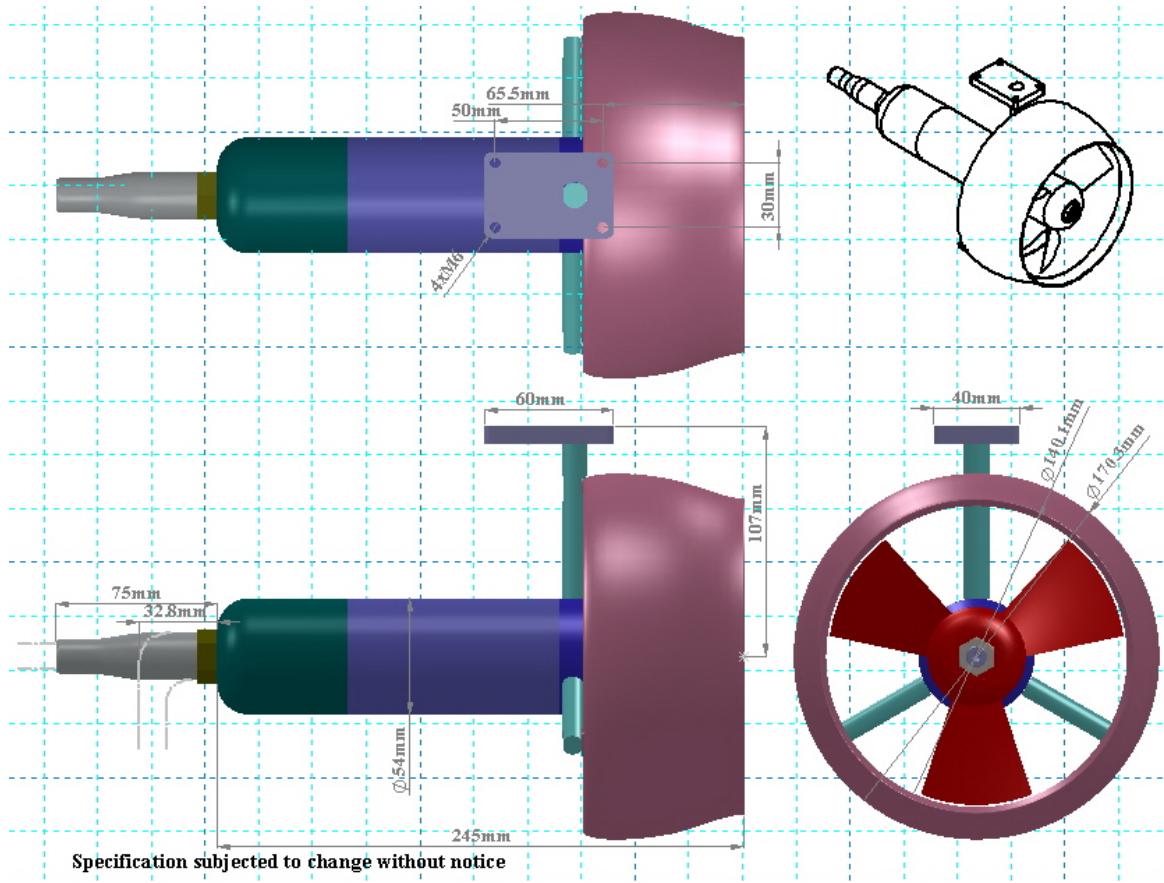


038TH-105-080 & 038CH-105-080 Drawing

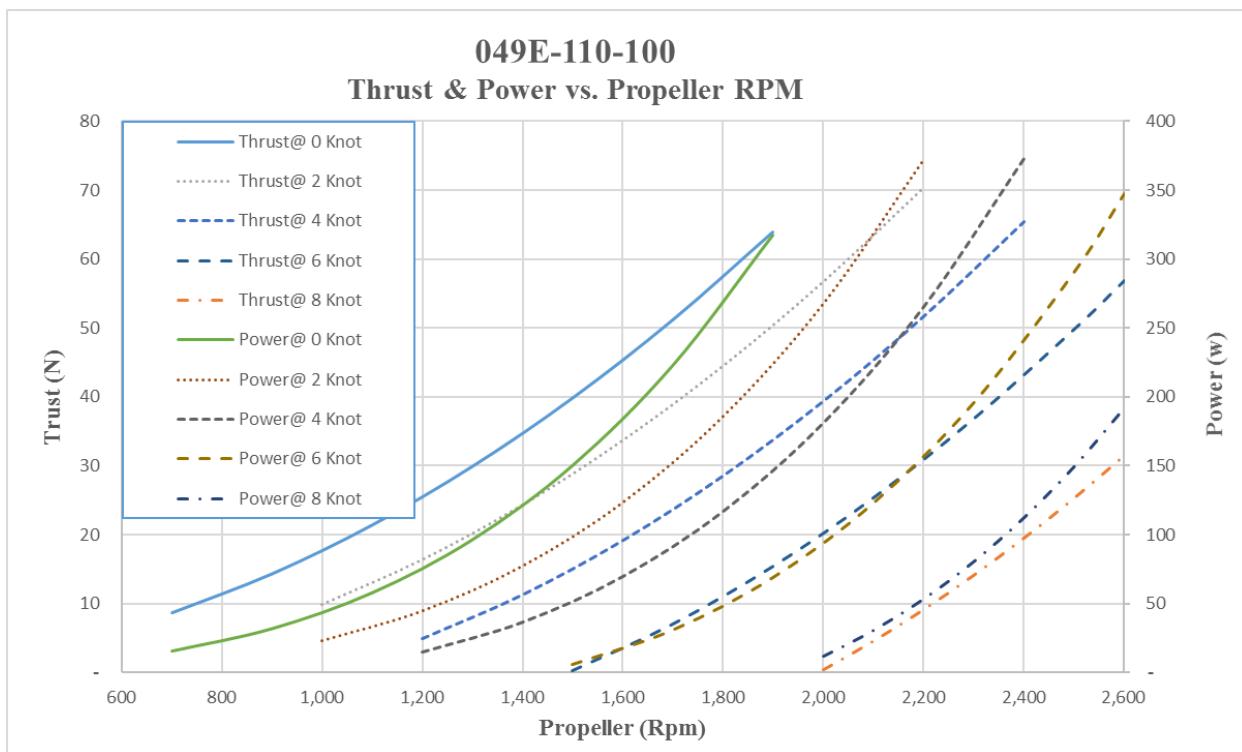
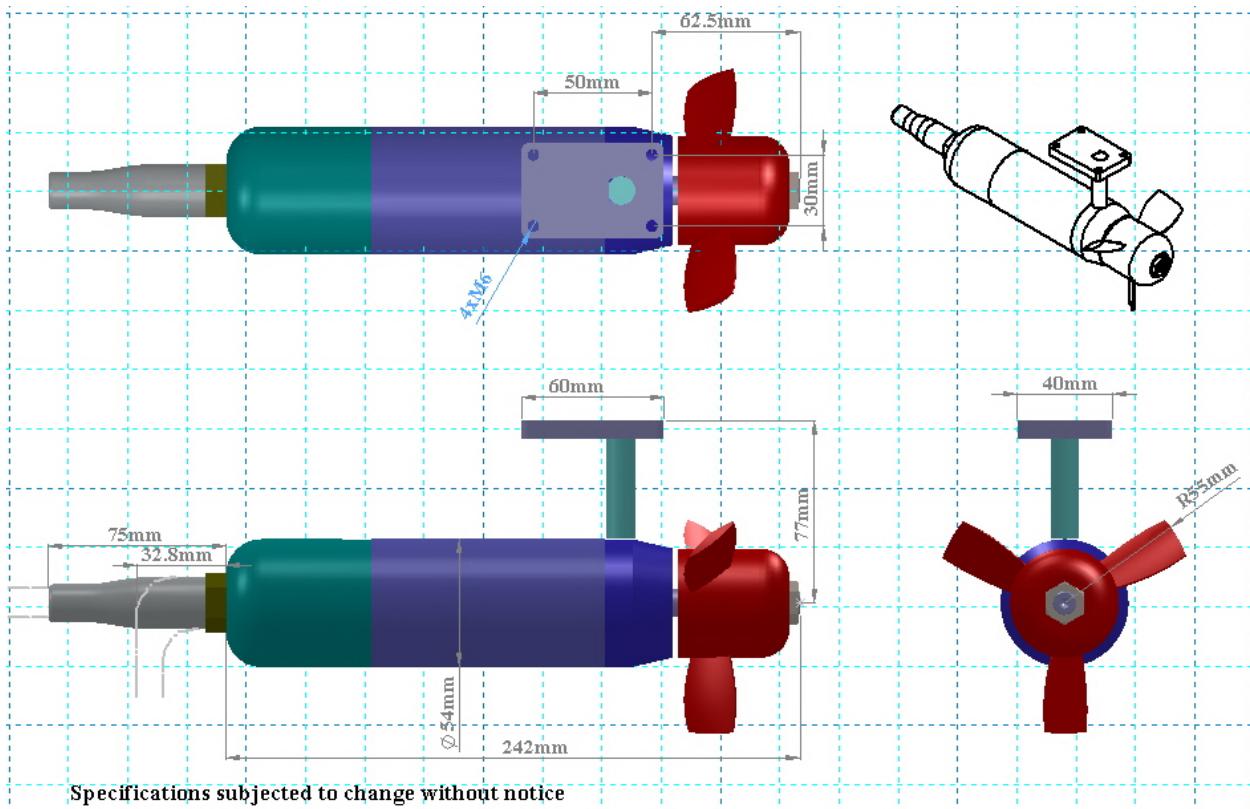
Charts of heavy duty series are the same as TL and CL series.



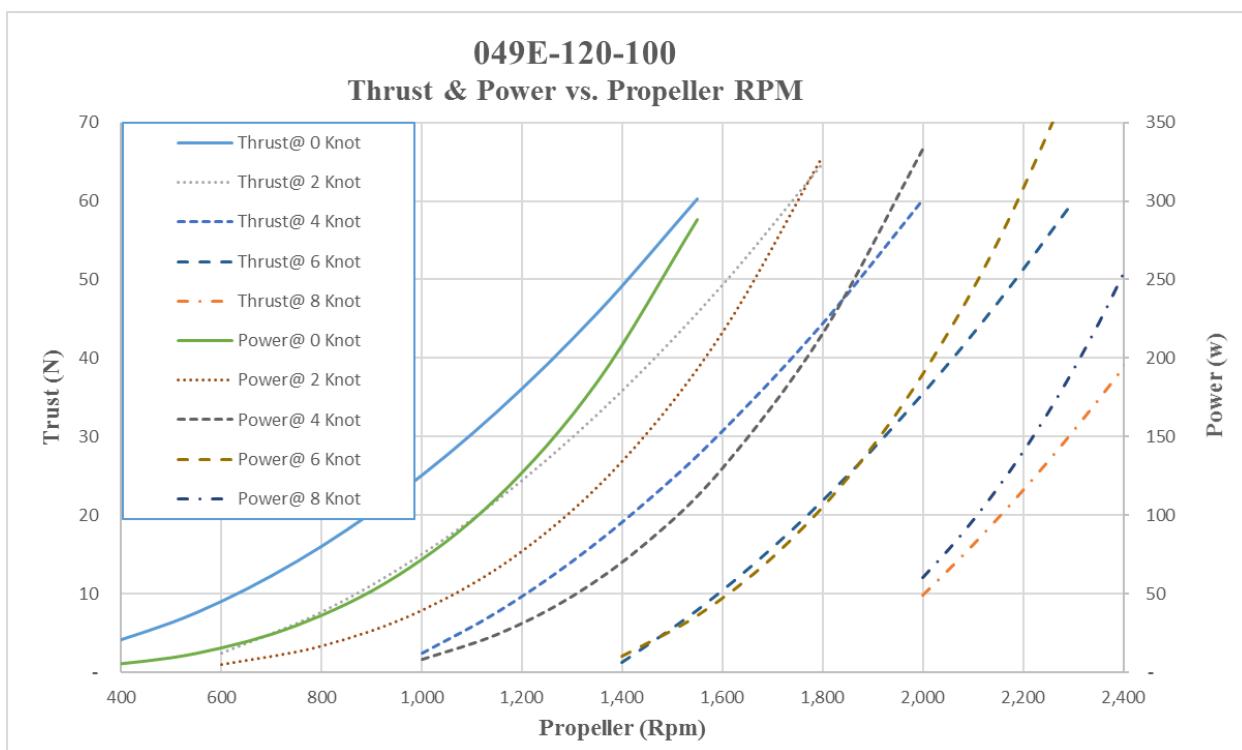
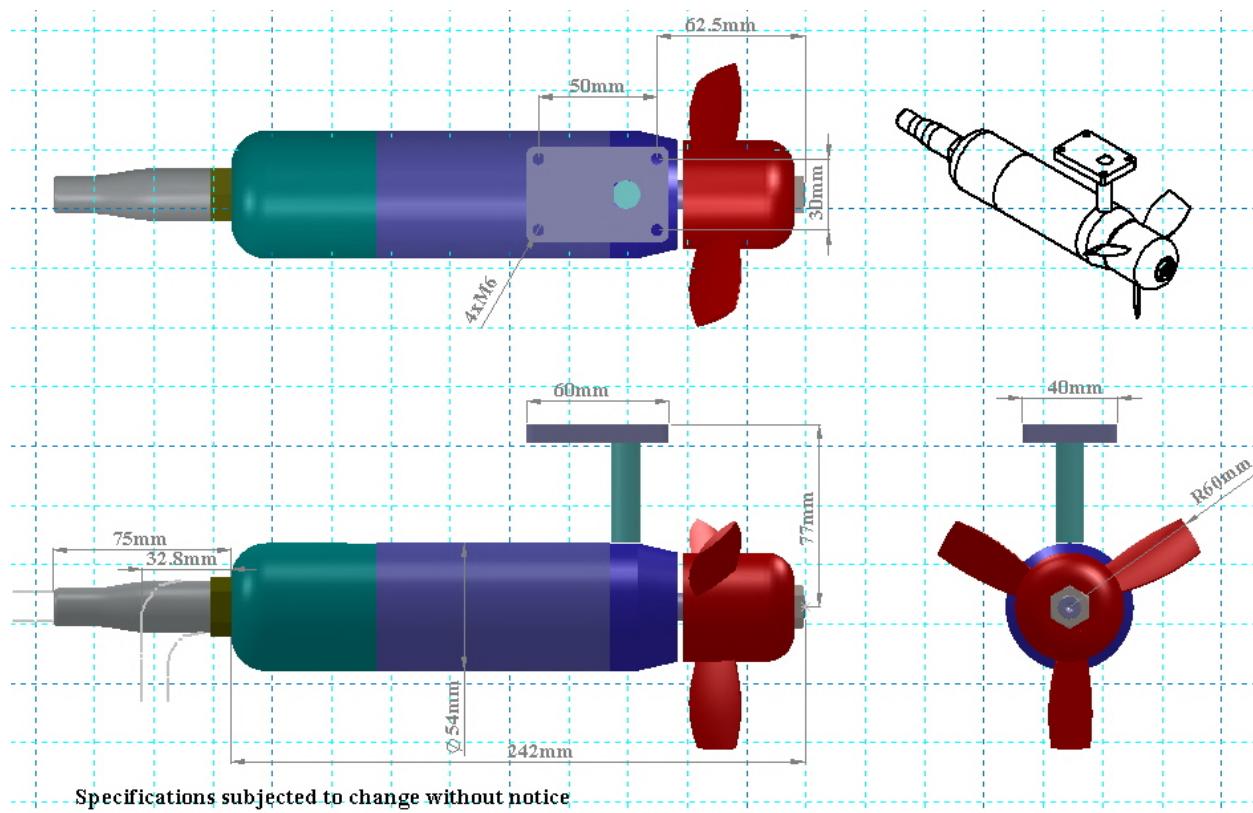
049TL-140-080 Drawing and charts



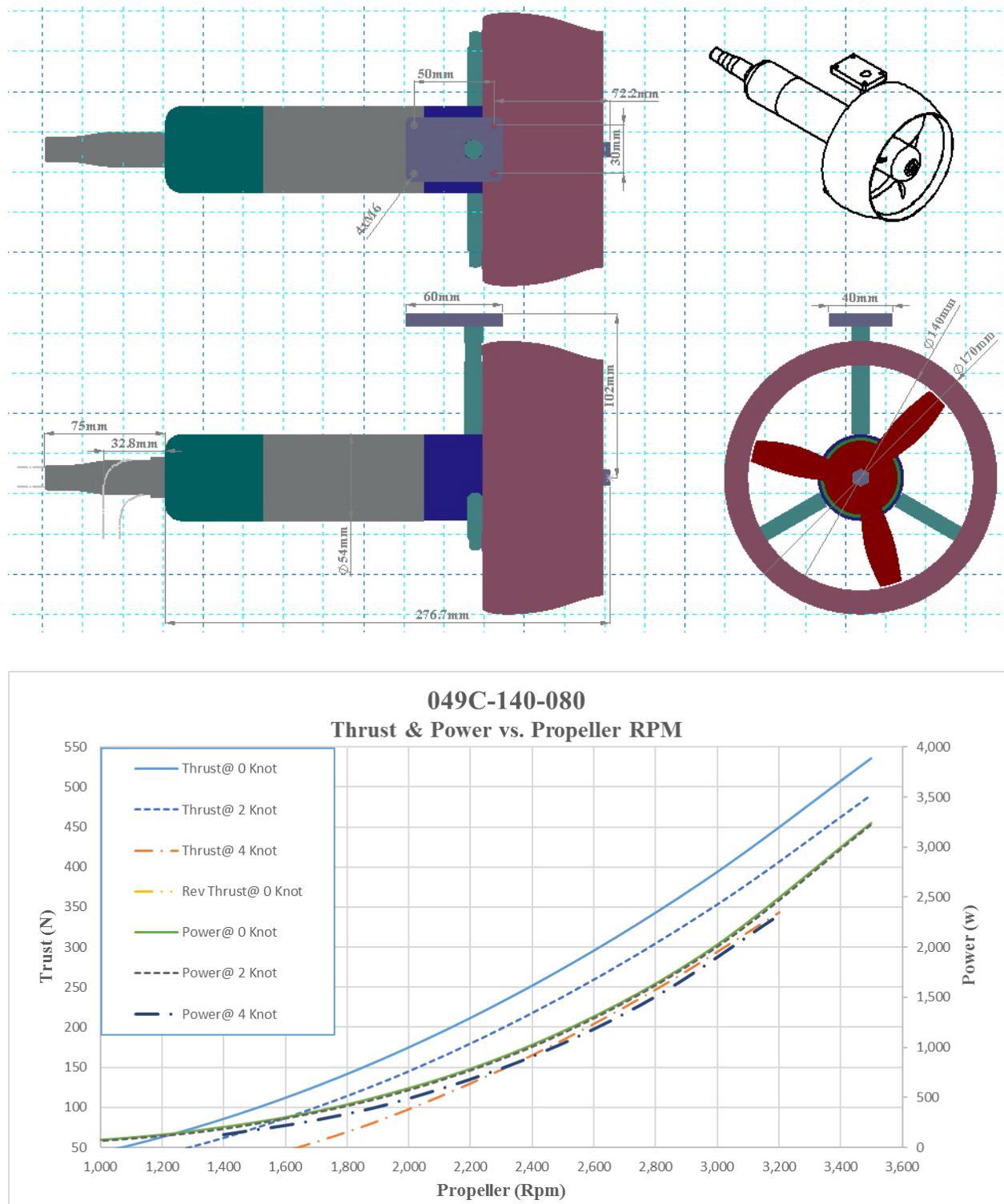
049ES-110-100 Drawing and charts



049ES-120-100 Drawing and charts

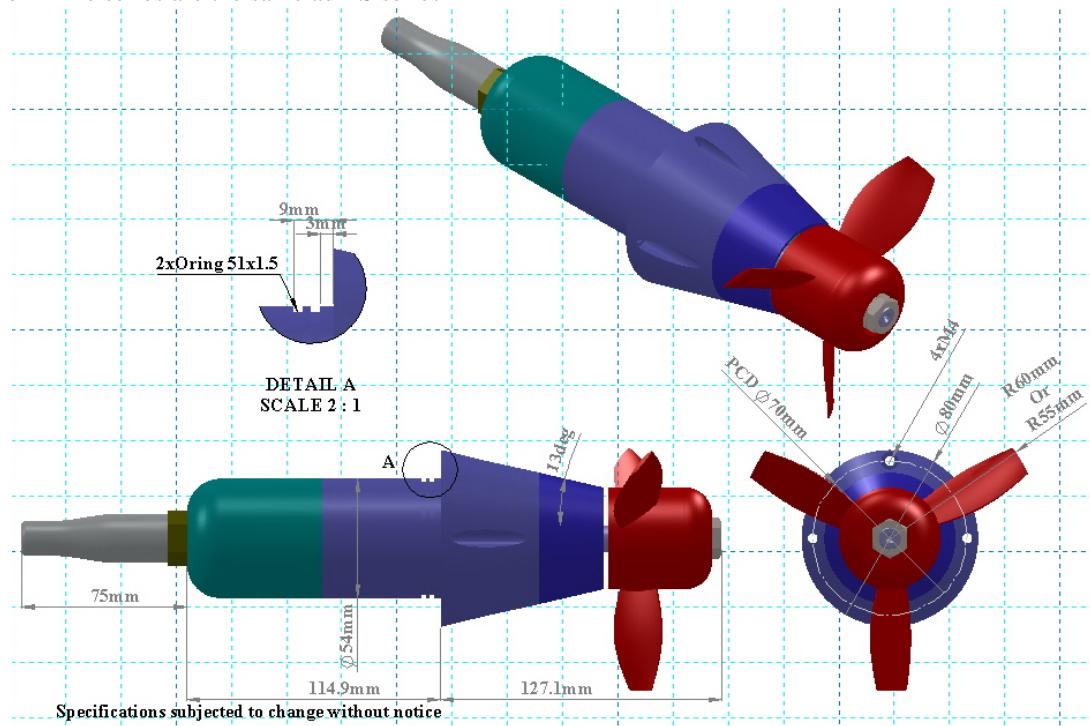


049CL-140-080 Drawing and charts



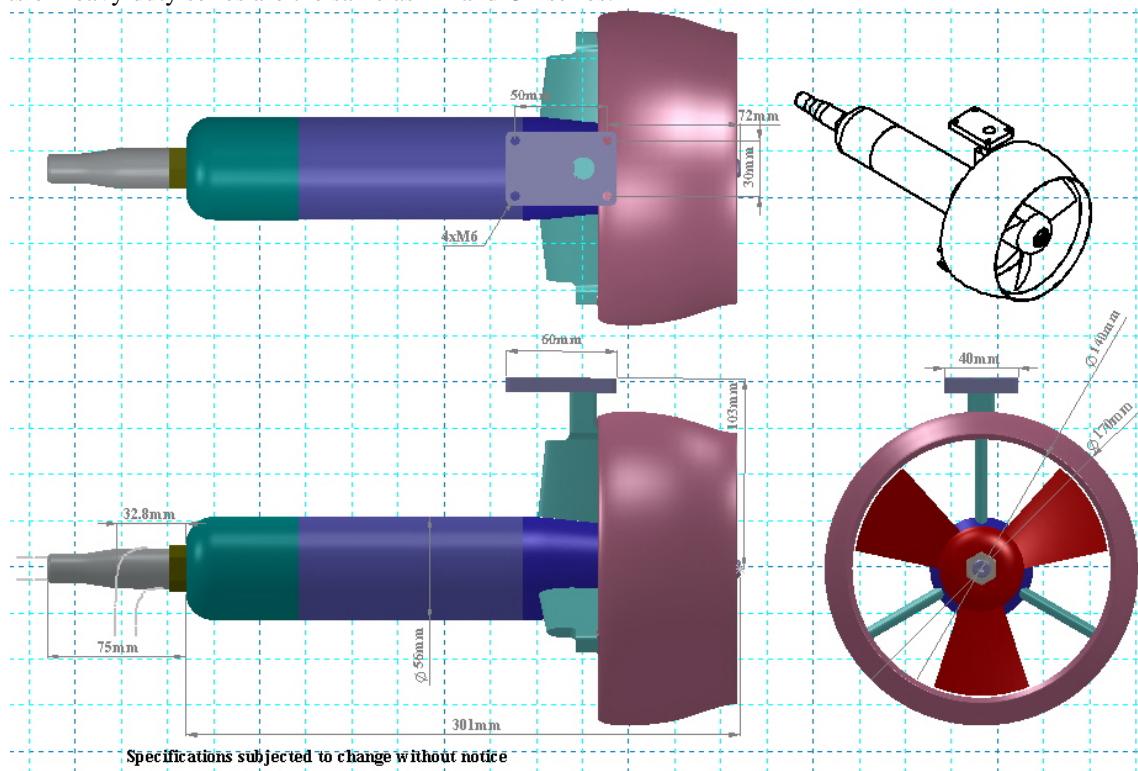
049EI-110 & 049EI-120 Drawing

Charts of Inline series are the same ad ES series

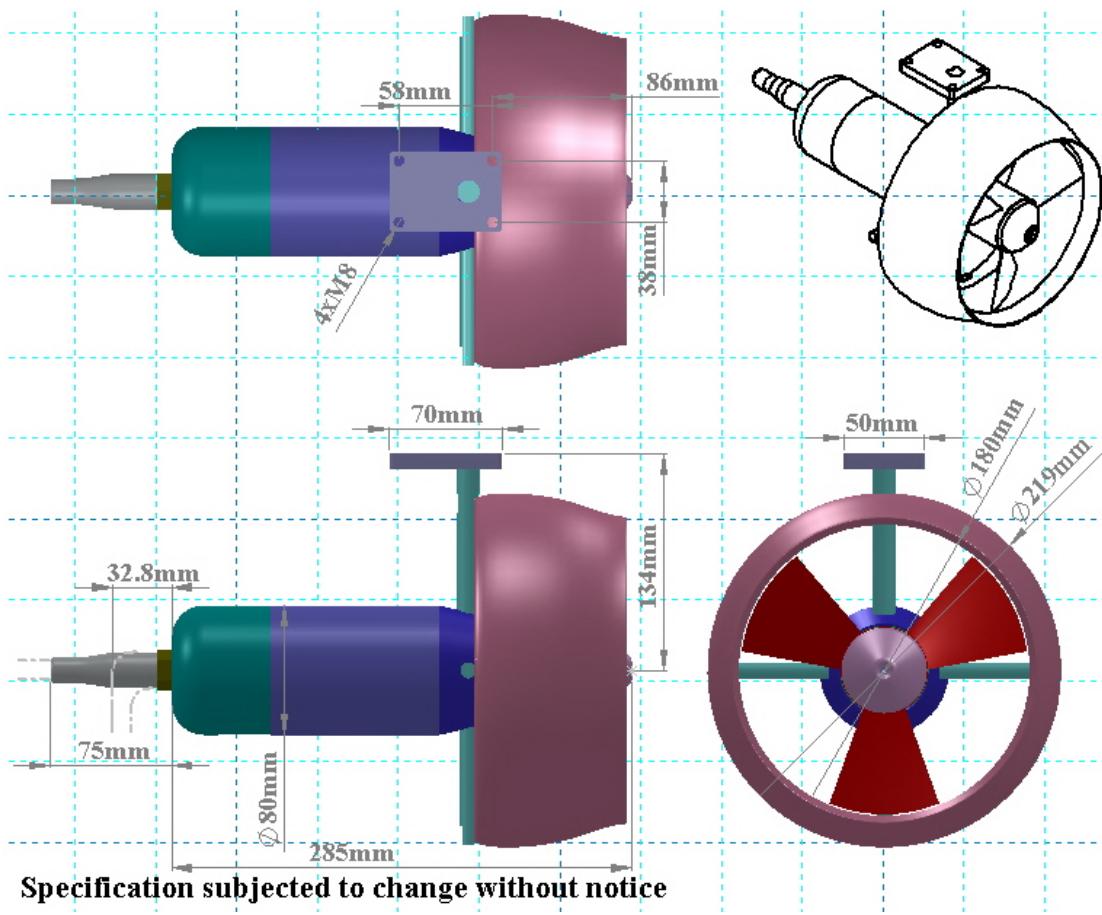


049TH-140-080 & 049CH-140-080 Drawing

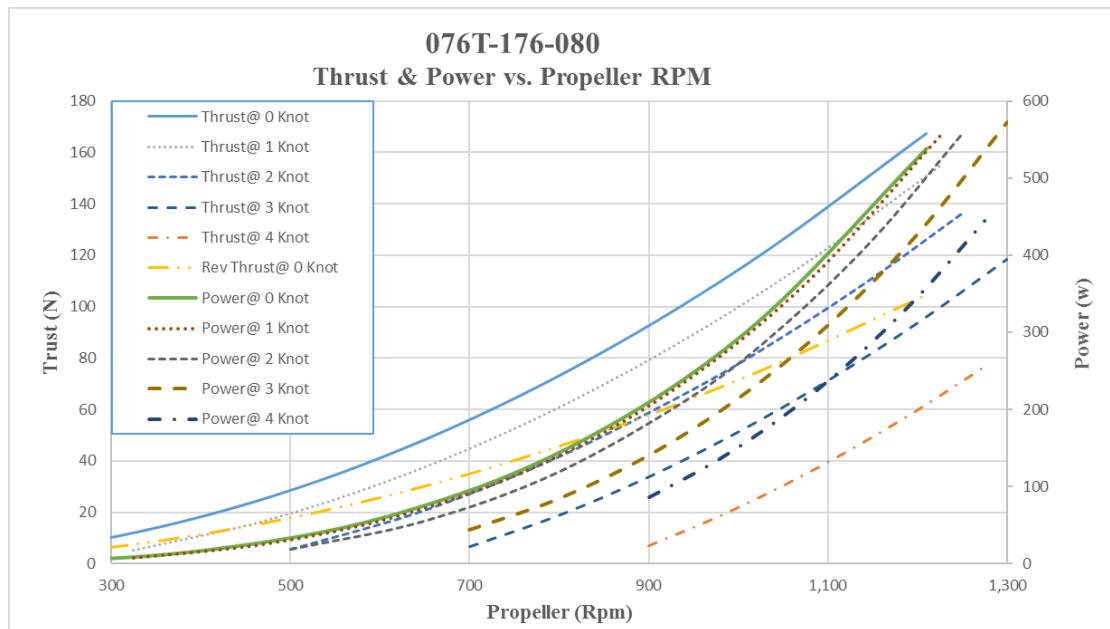
Charts of heavy duty series are the same as TL and CL series.



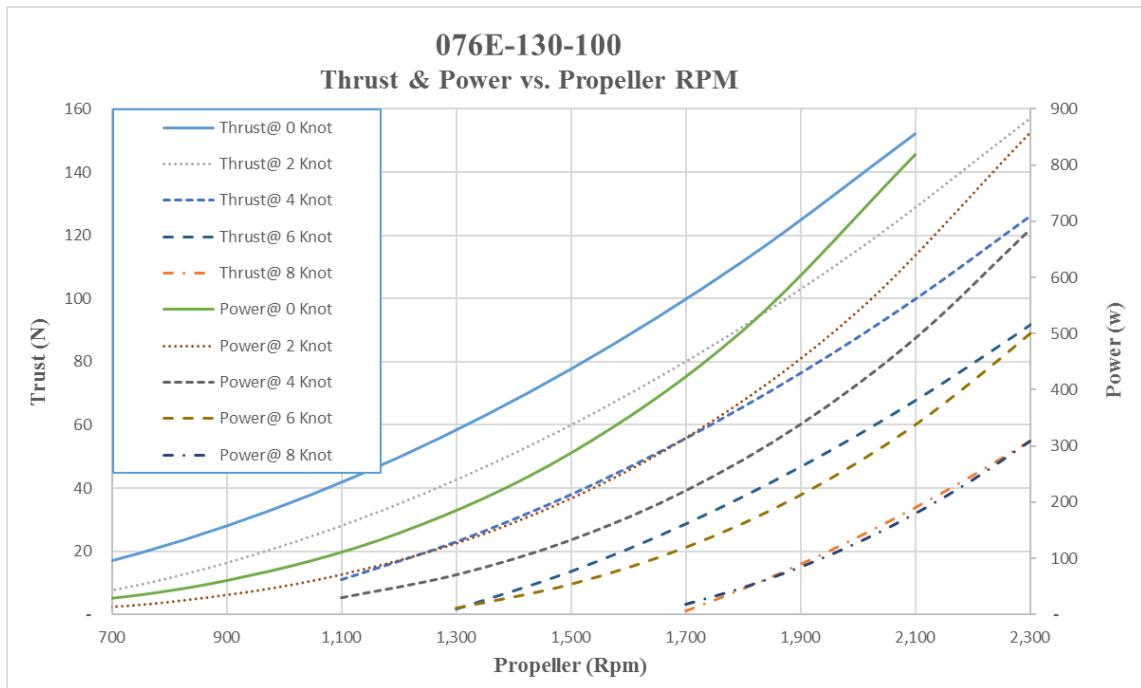
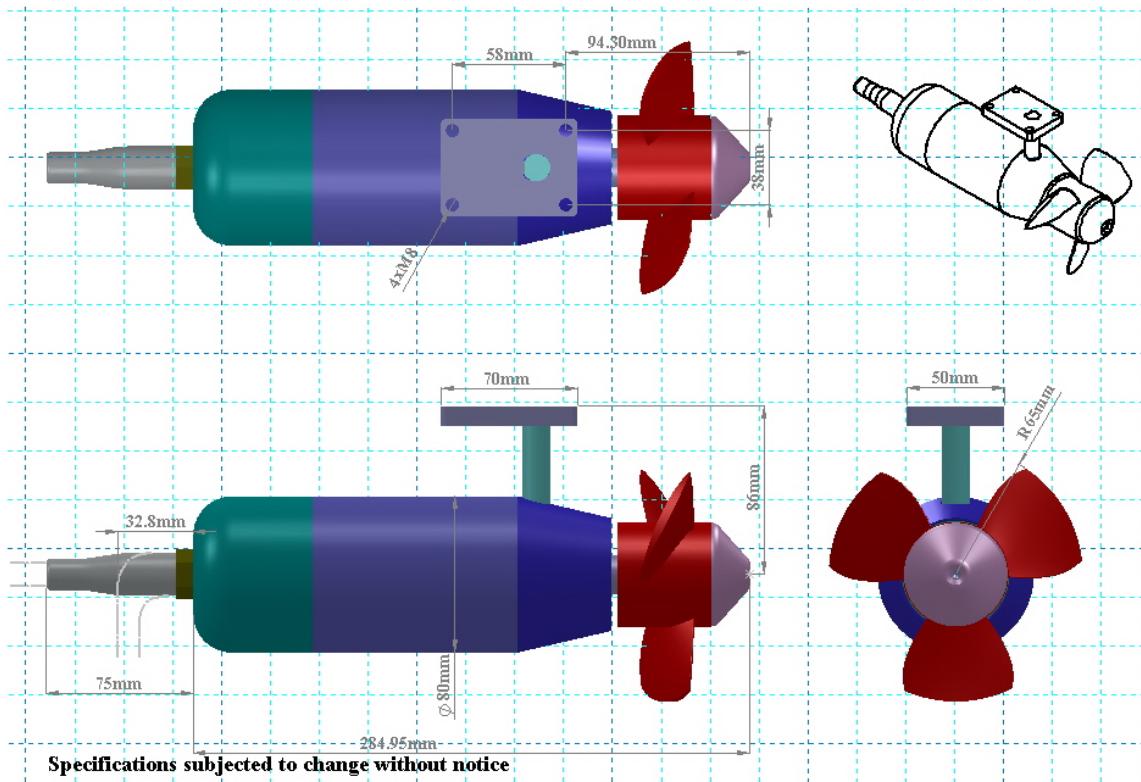
076TL-176-080 Drawing and charts



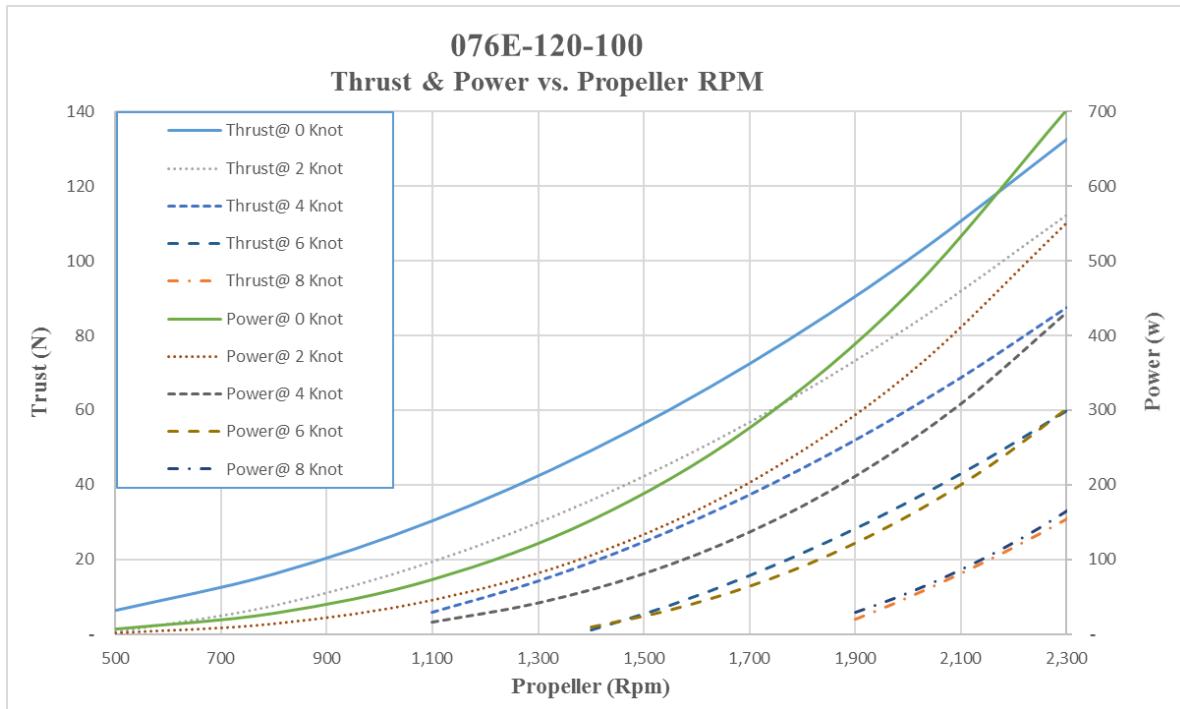
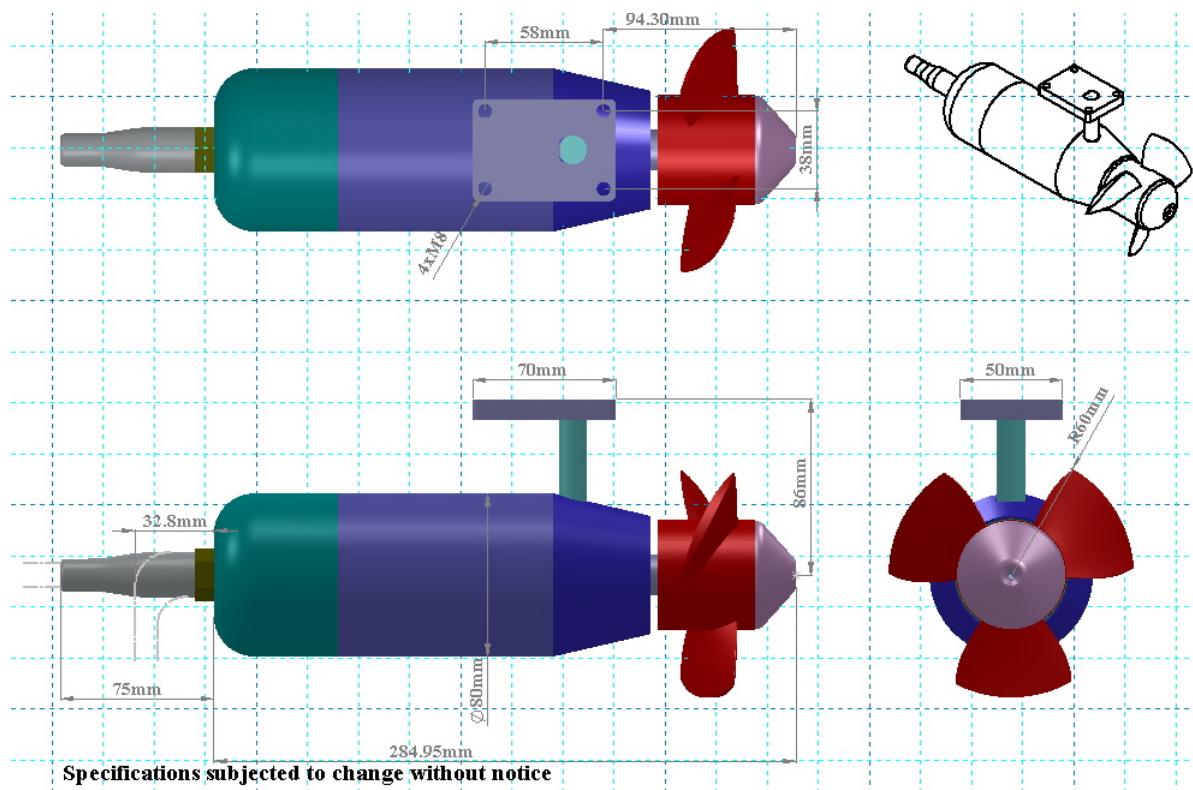
Drawing & Charts



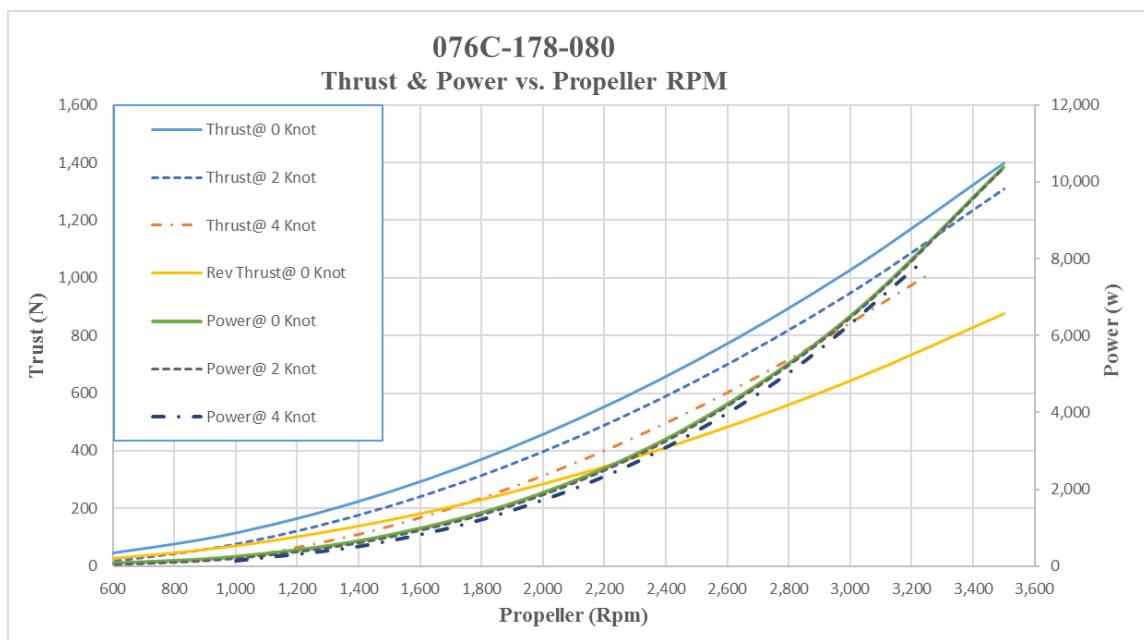
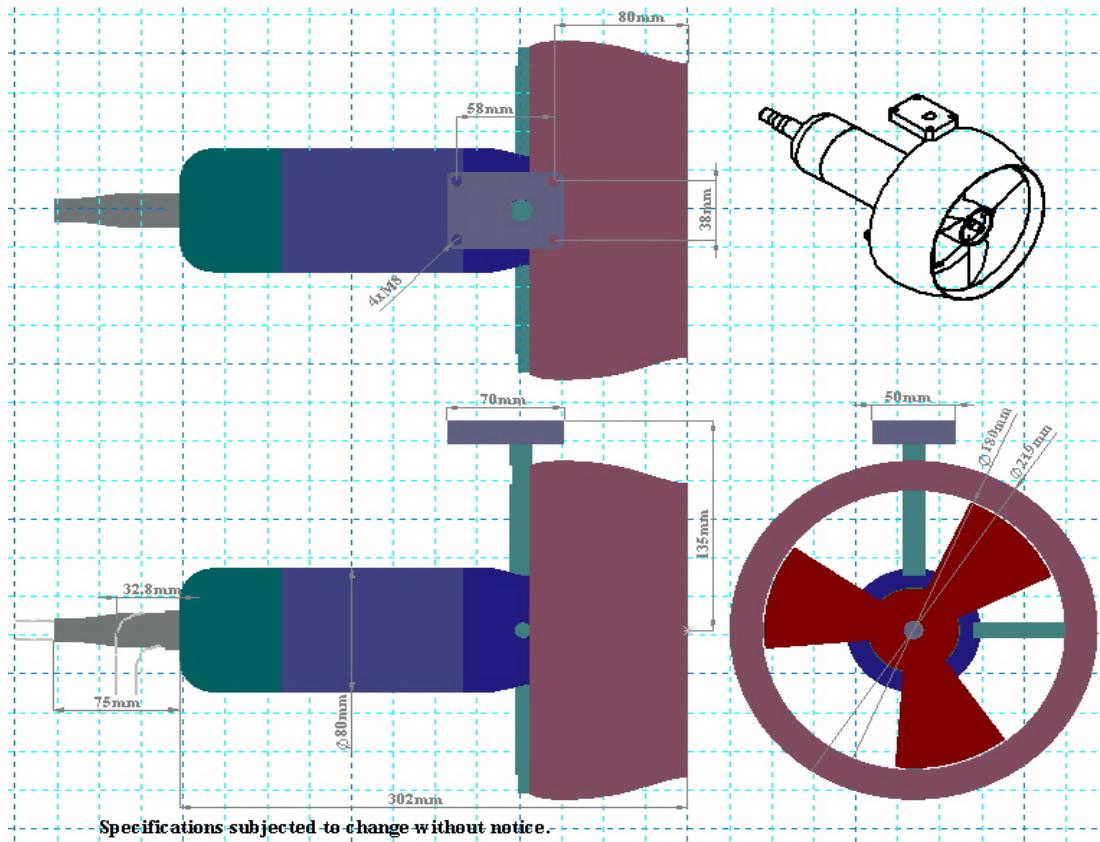
076ES-130-100 Drawing and charts



076ES-120-100 Drawing and charts

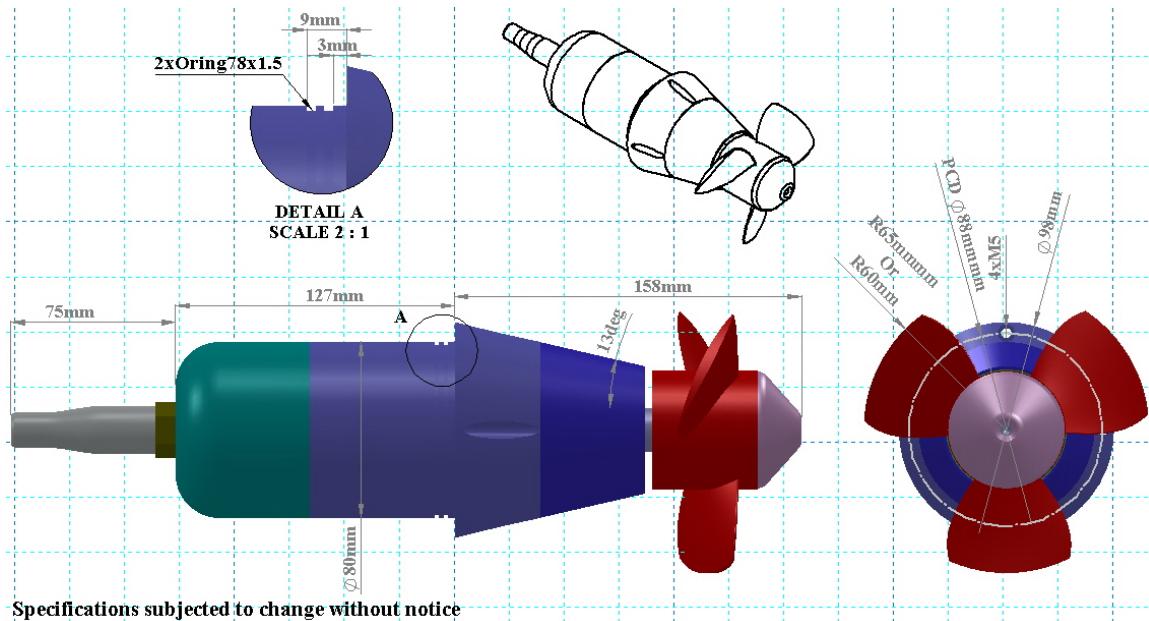


076CL-178-080 Drawing and charts



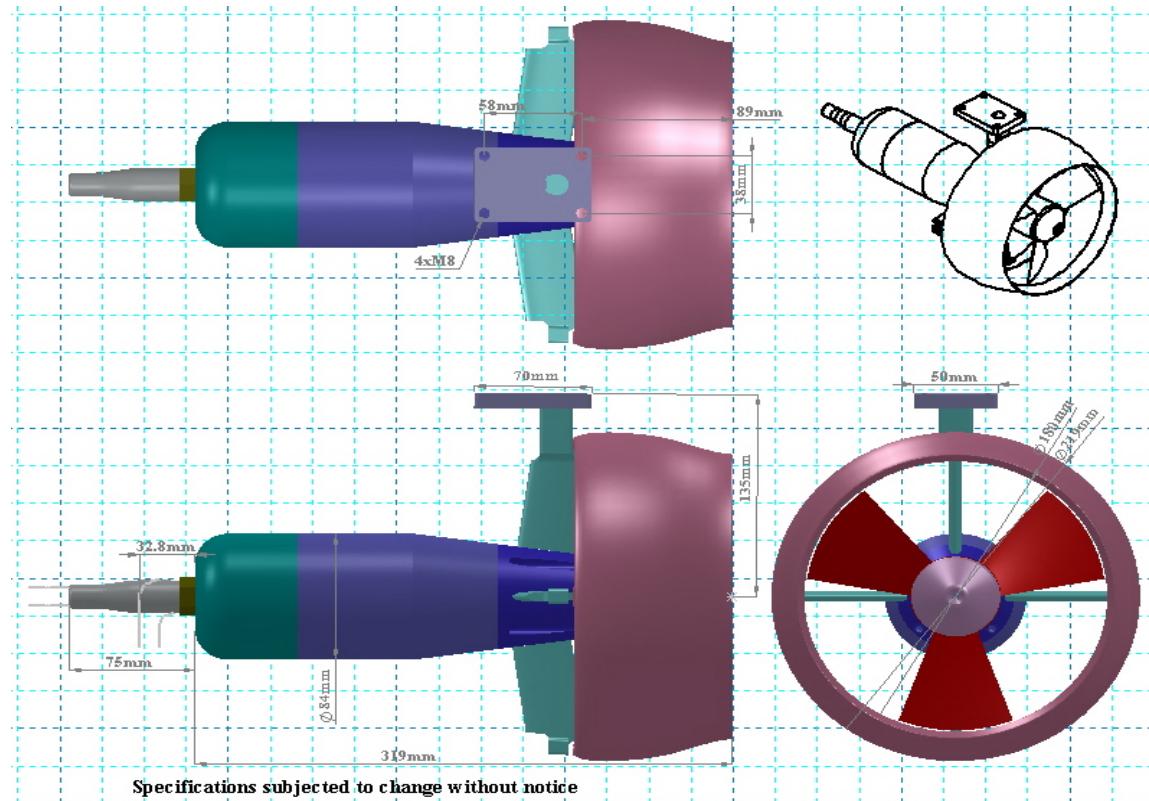
076EI-130 & 076EI-120 Drawing

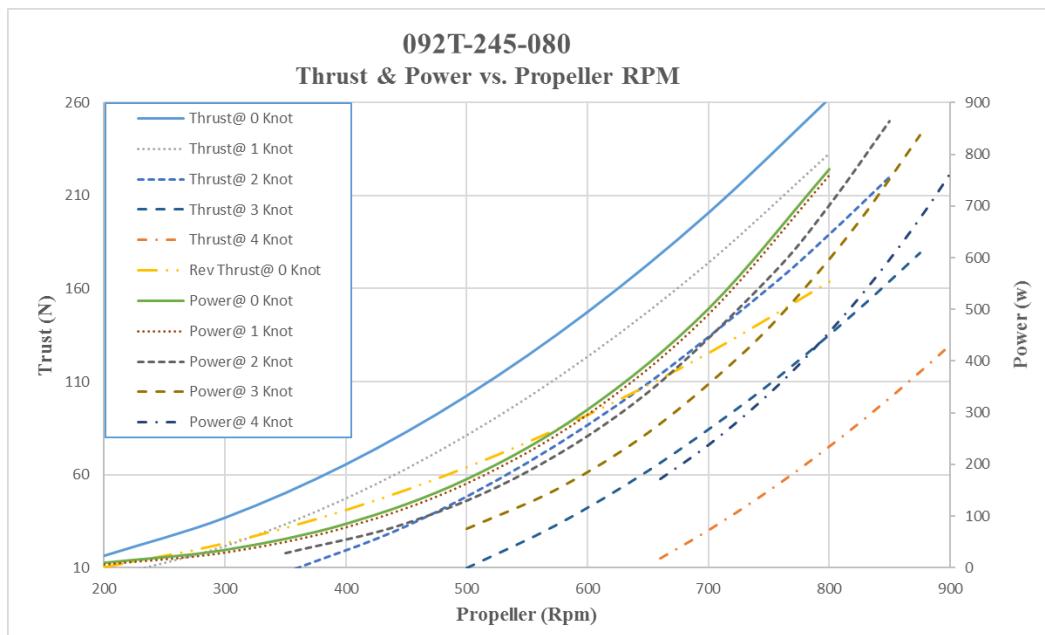
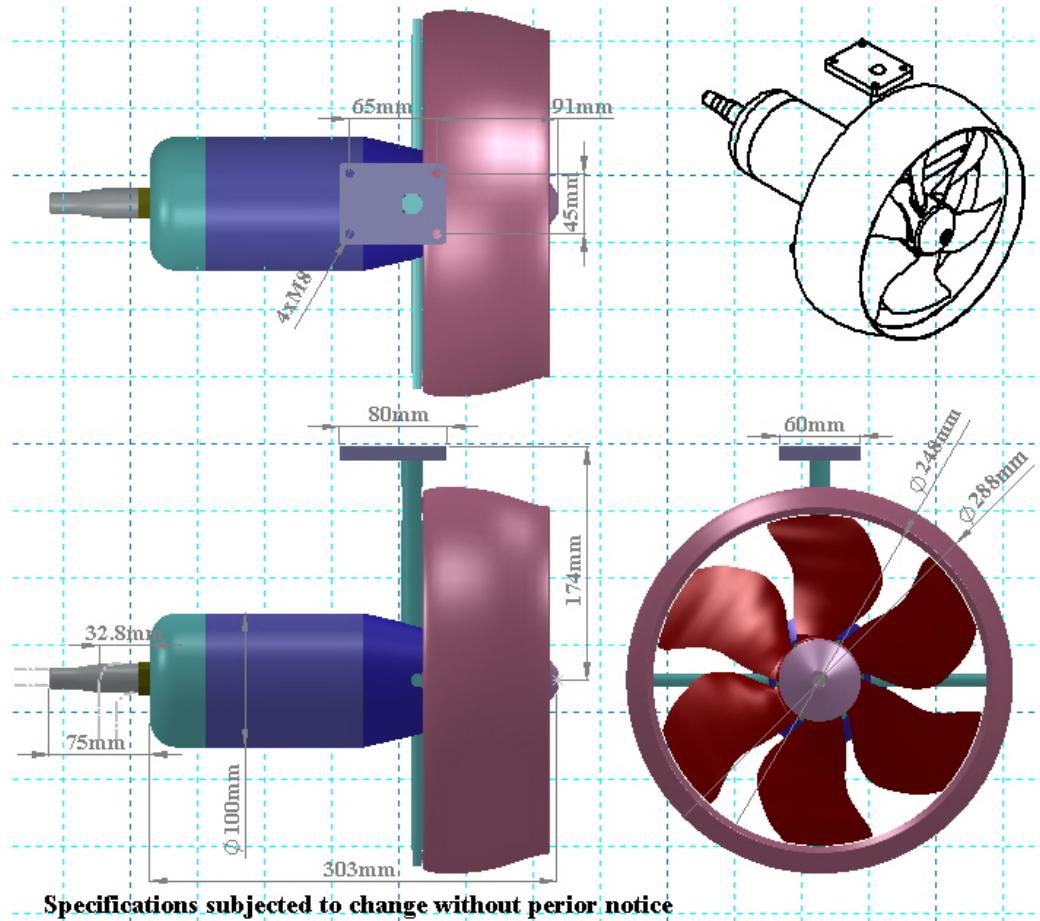
Charts of Inline series are the same ad ES series



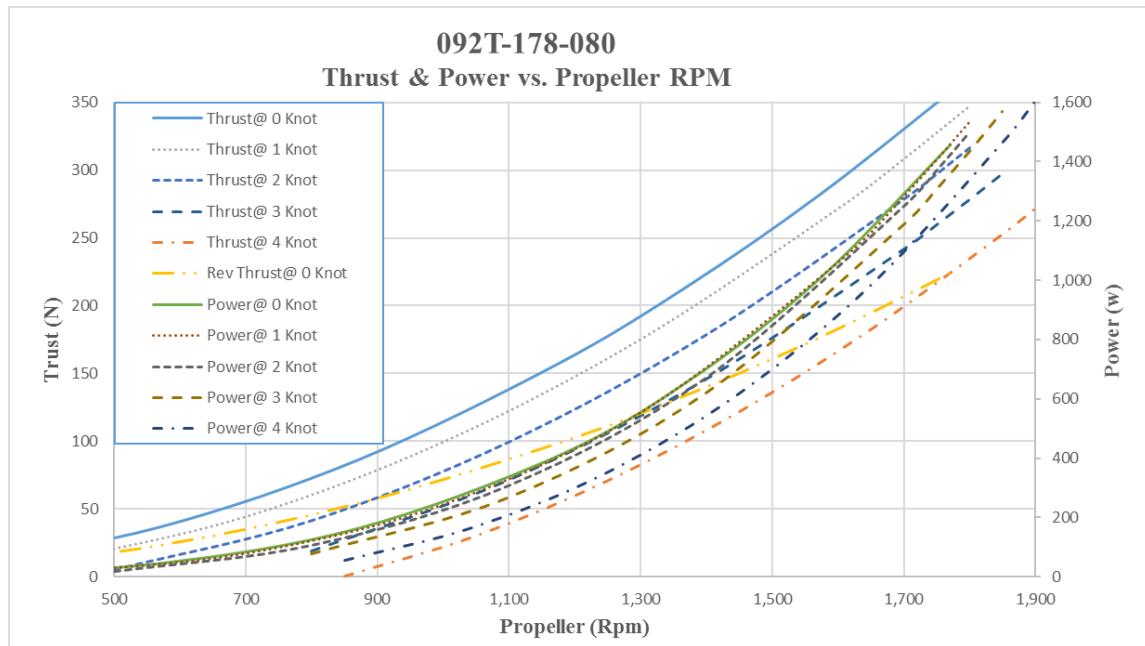
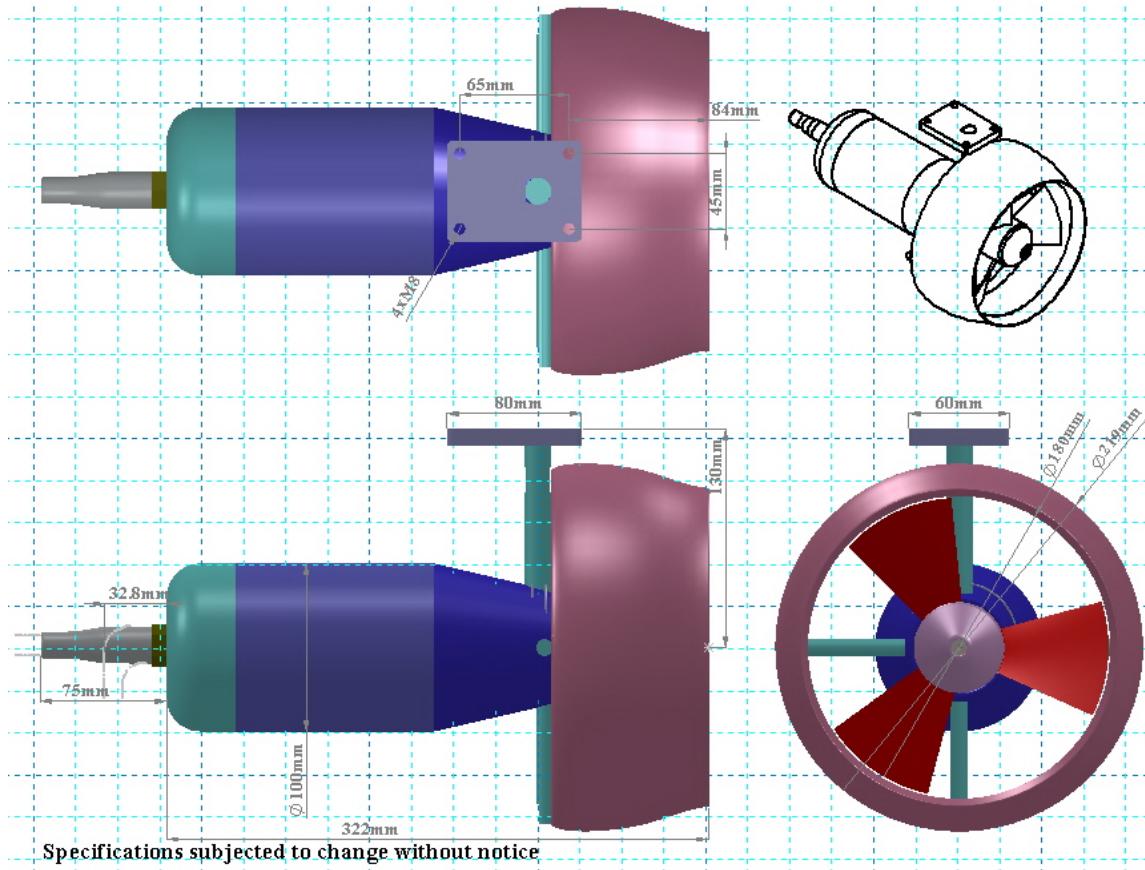
076TH-178-080 & 076CH-176-080 Drawing

Charts of heavy duty series are the same as TL and CL series.

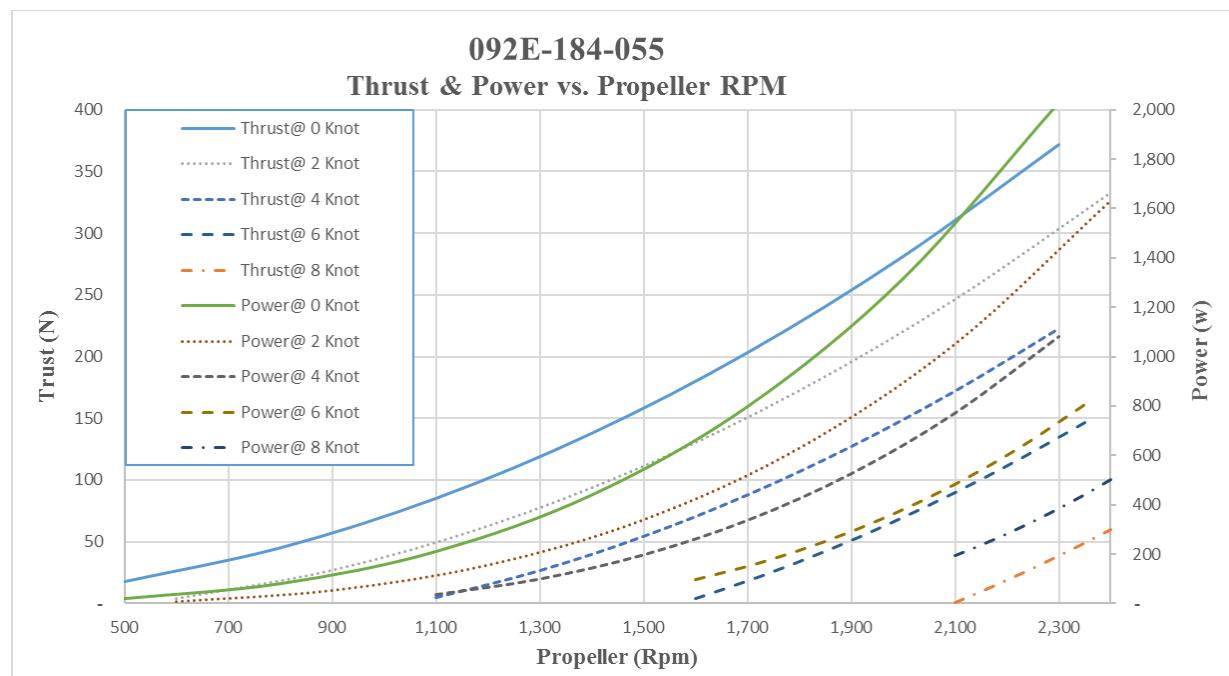
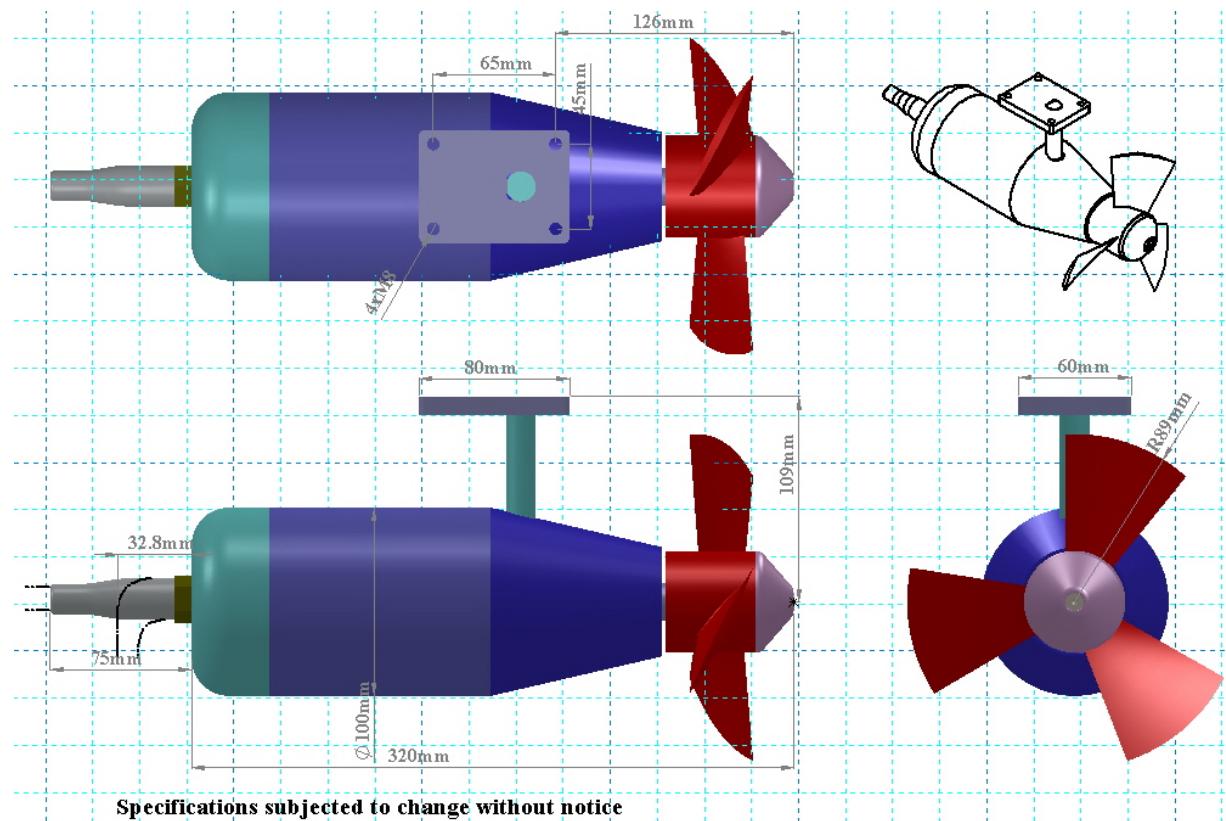


092TL-245-080 Drawing and charts

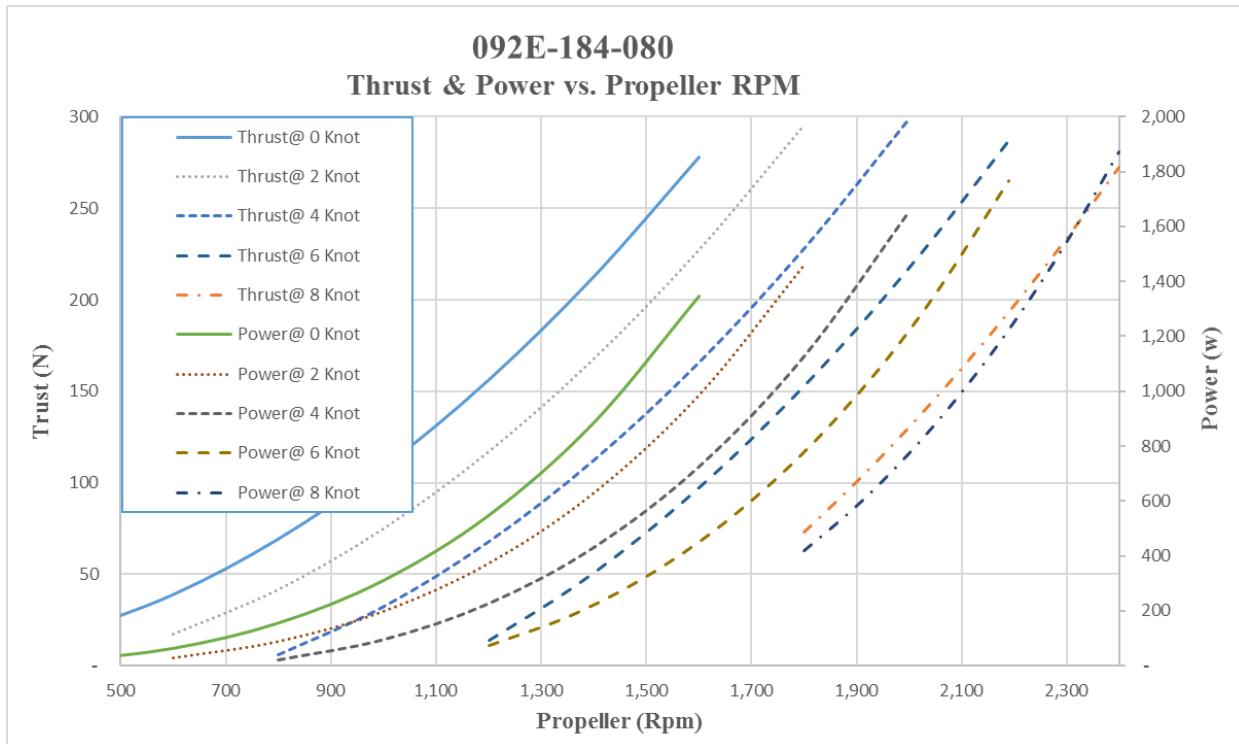
092TL-178-080 Drawing and charts



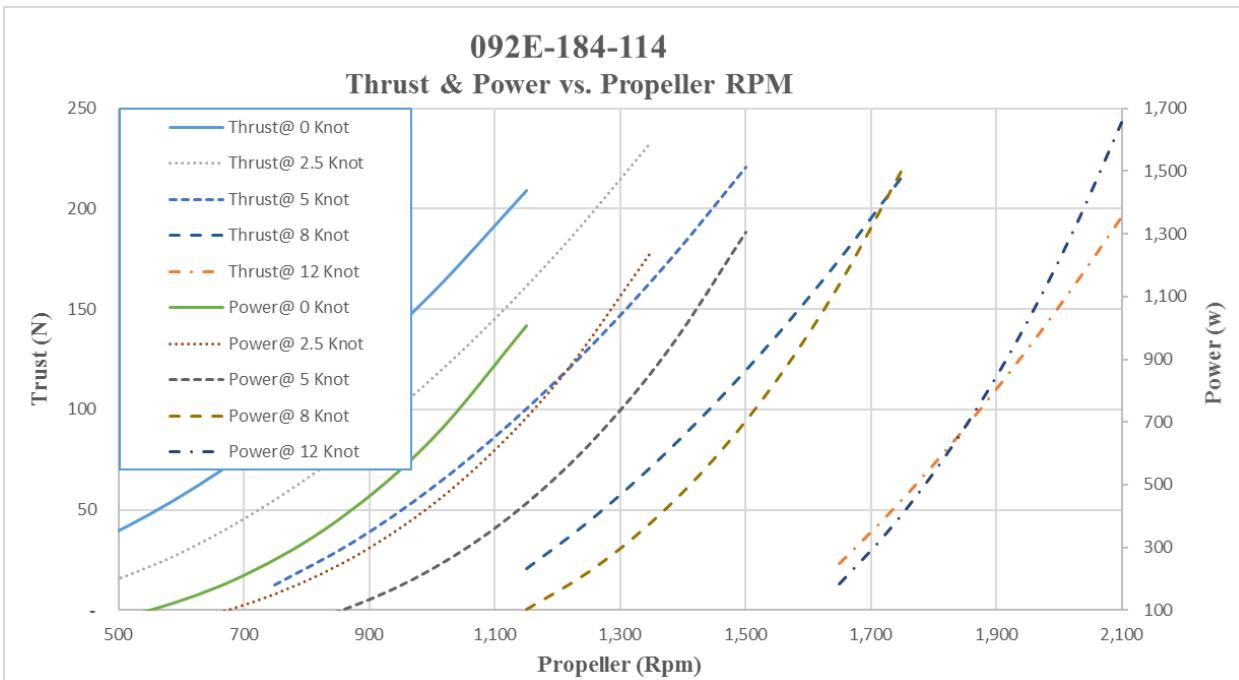
092ES-184-055 Drawing and charts



092ES-184-080 Drawing and charts

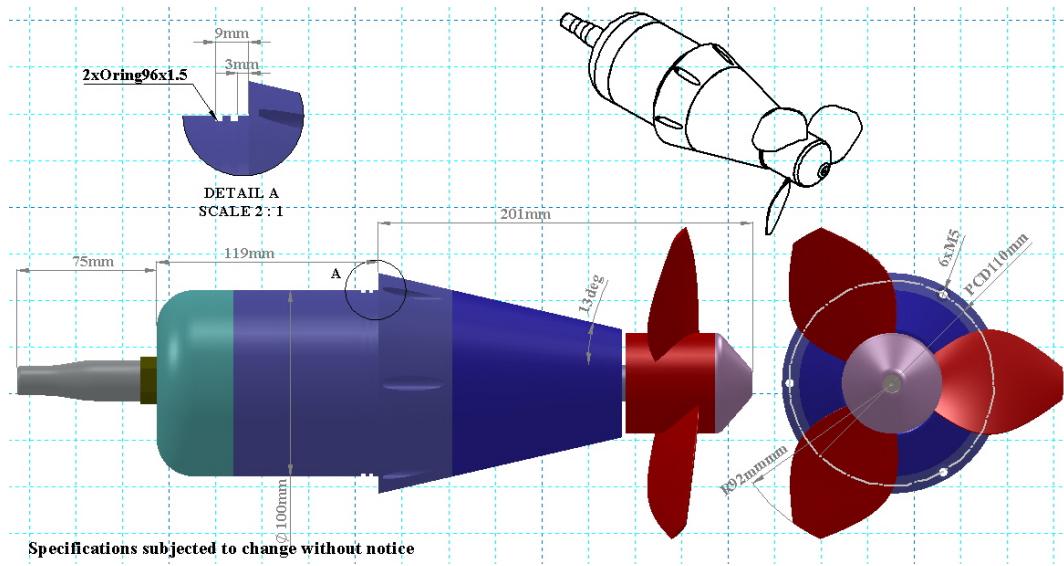


092ES-184-114 Drawing and charts



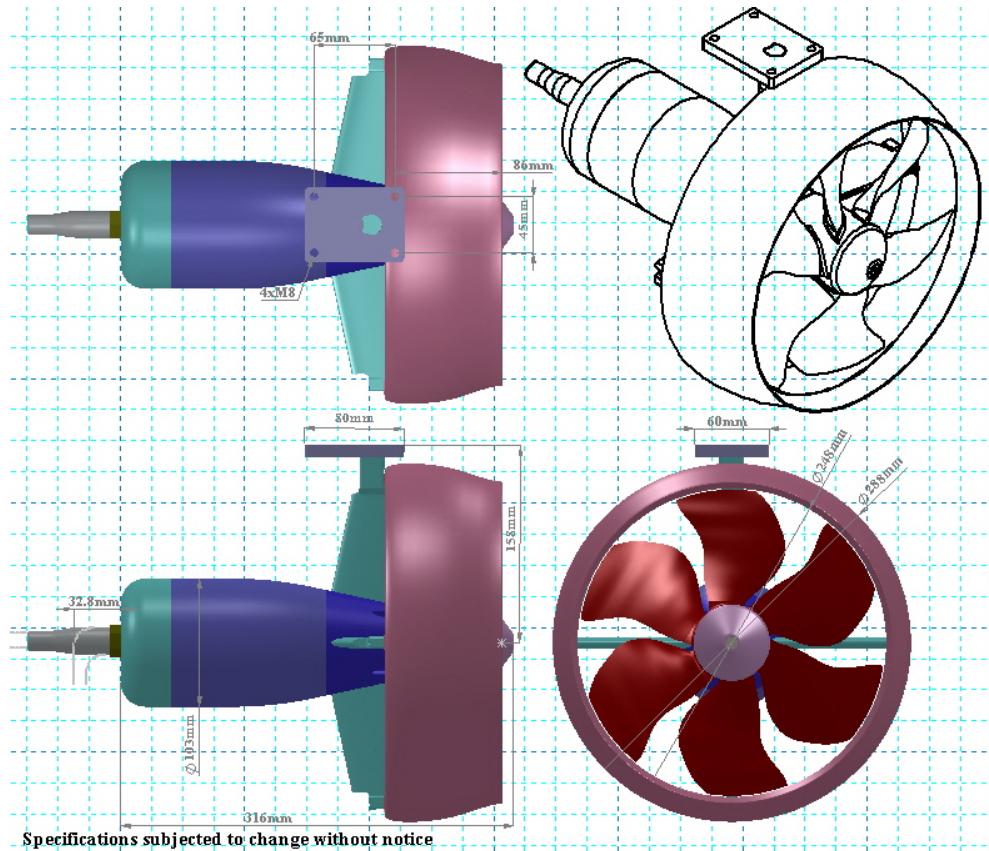
092EI-184 Drawing

Charts of Inline series are the same ad ES series

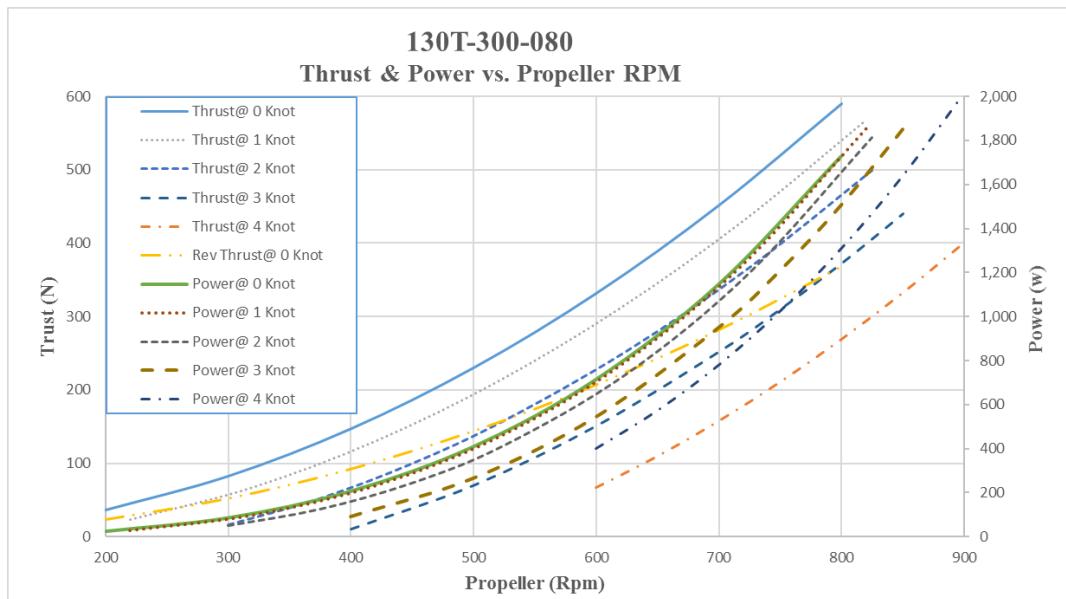
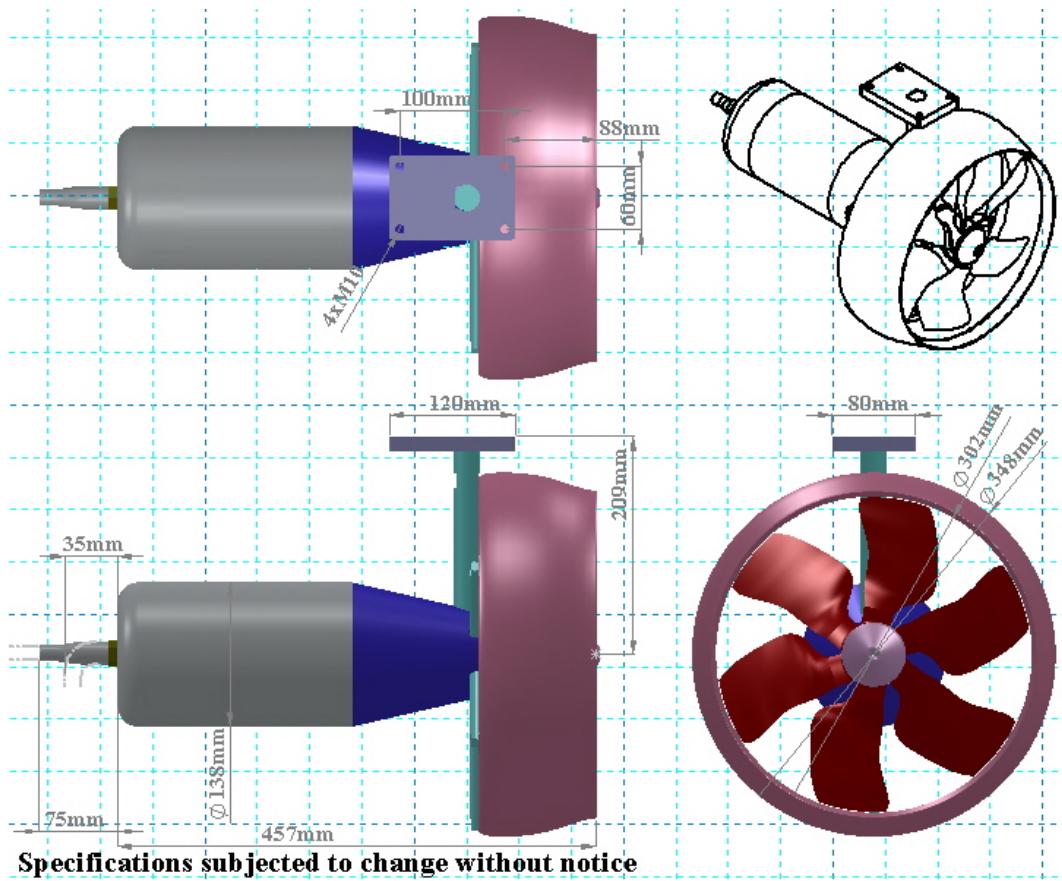


092TH-178-080 Drawing

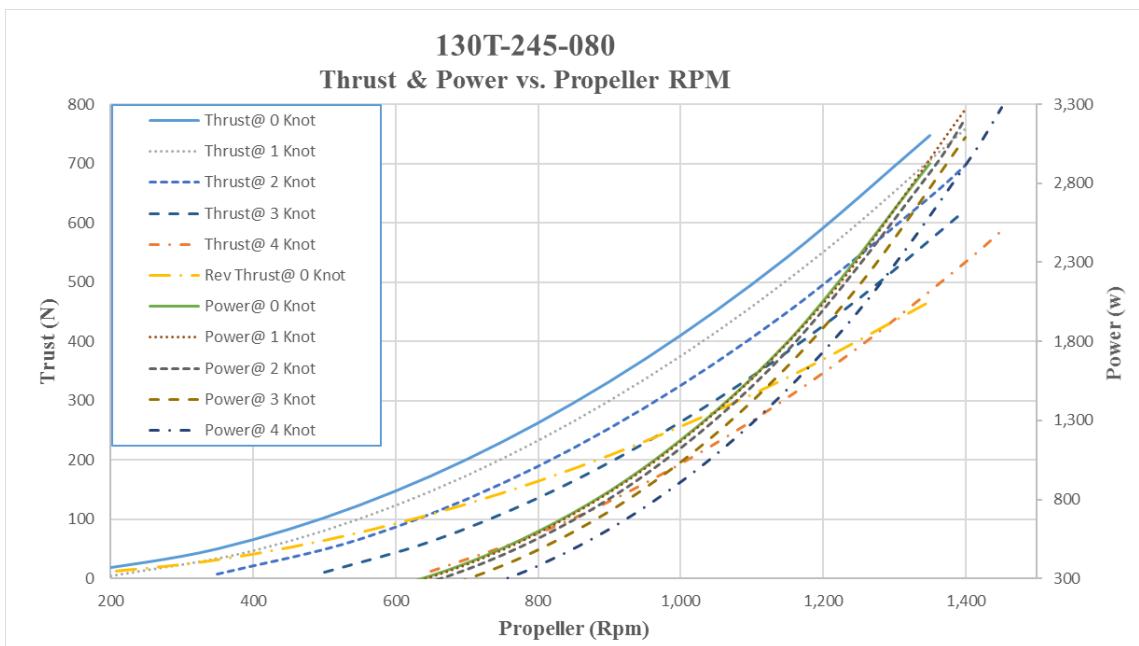
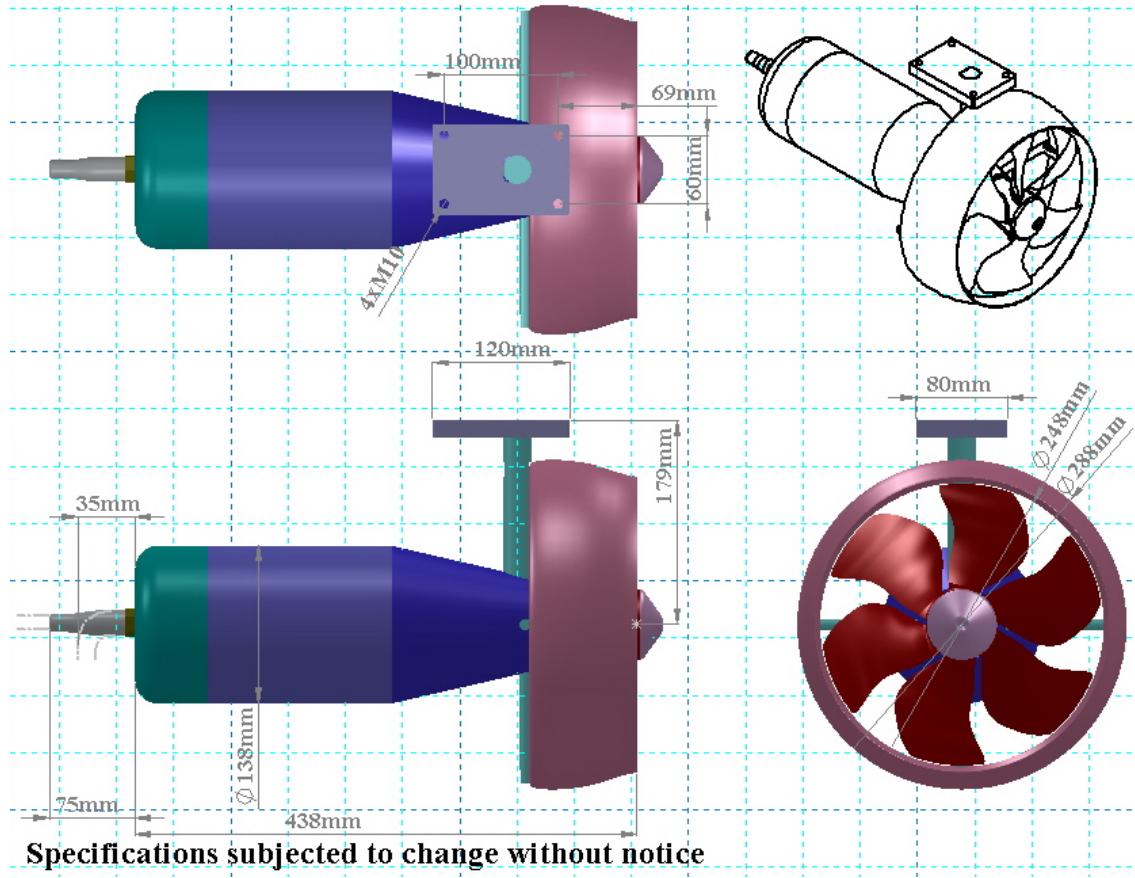
Charts of heavy duty series are the same as TL and CL series.



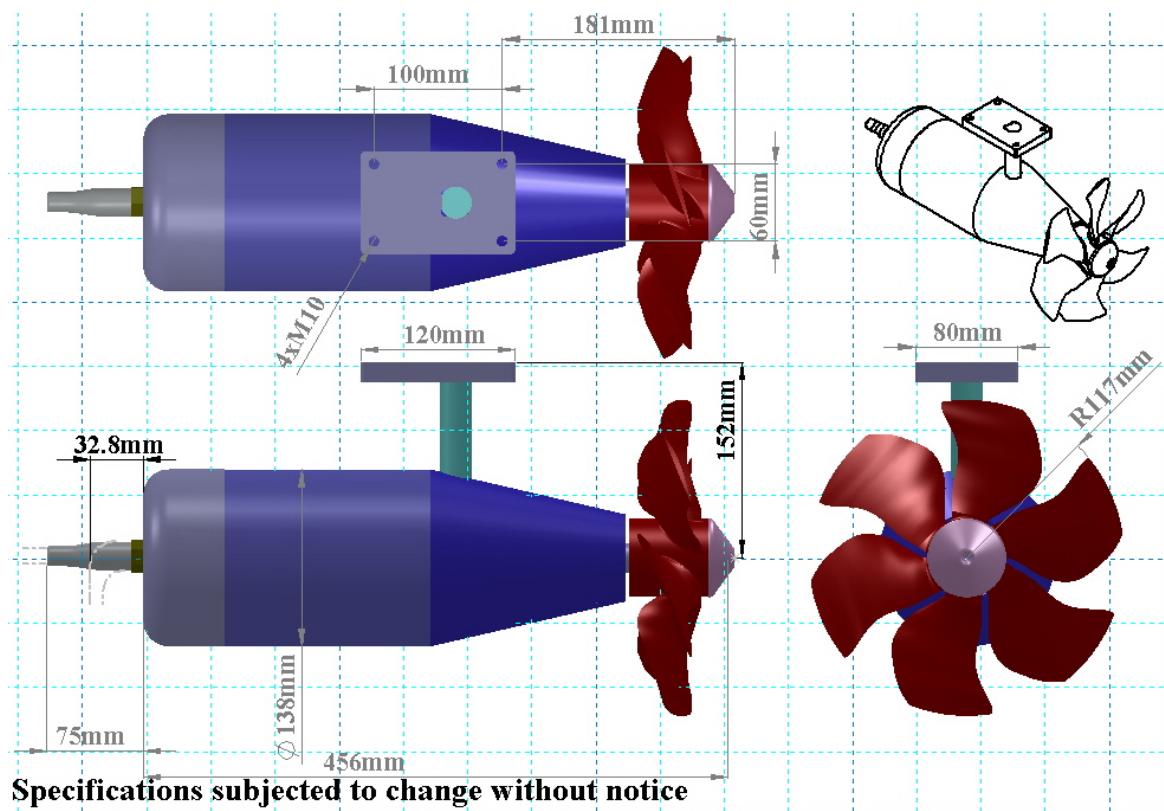
130TL-300-080 Drawing and charts



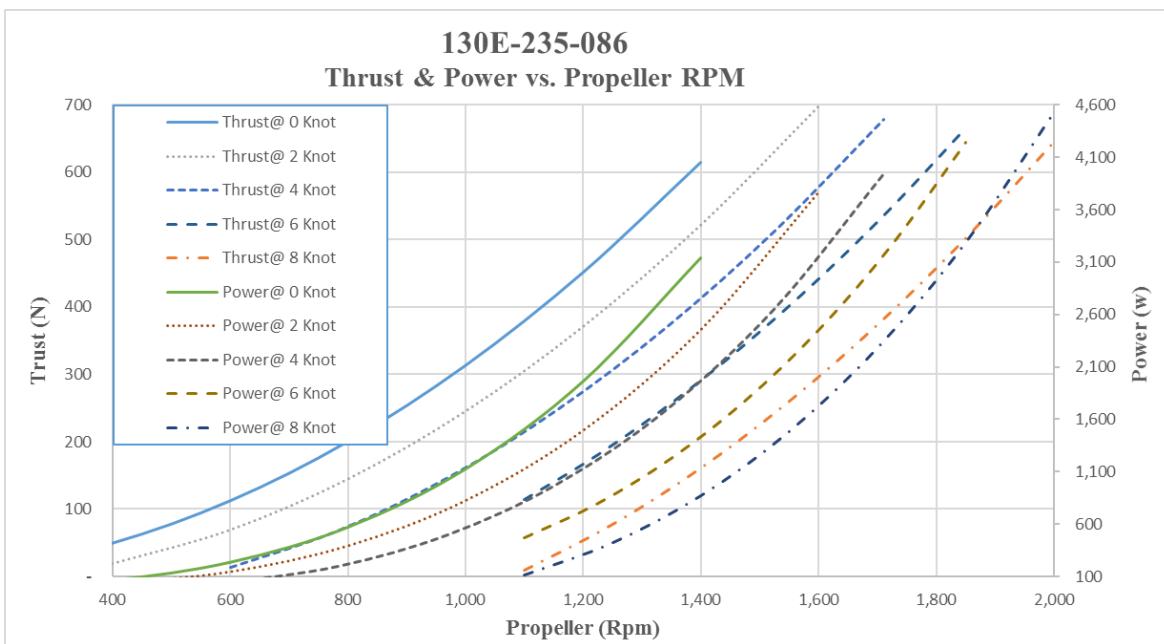
130TL-245-080 Drawing and charts



130ES-235-086 Drawing and charts

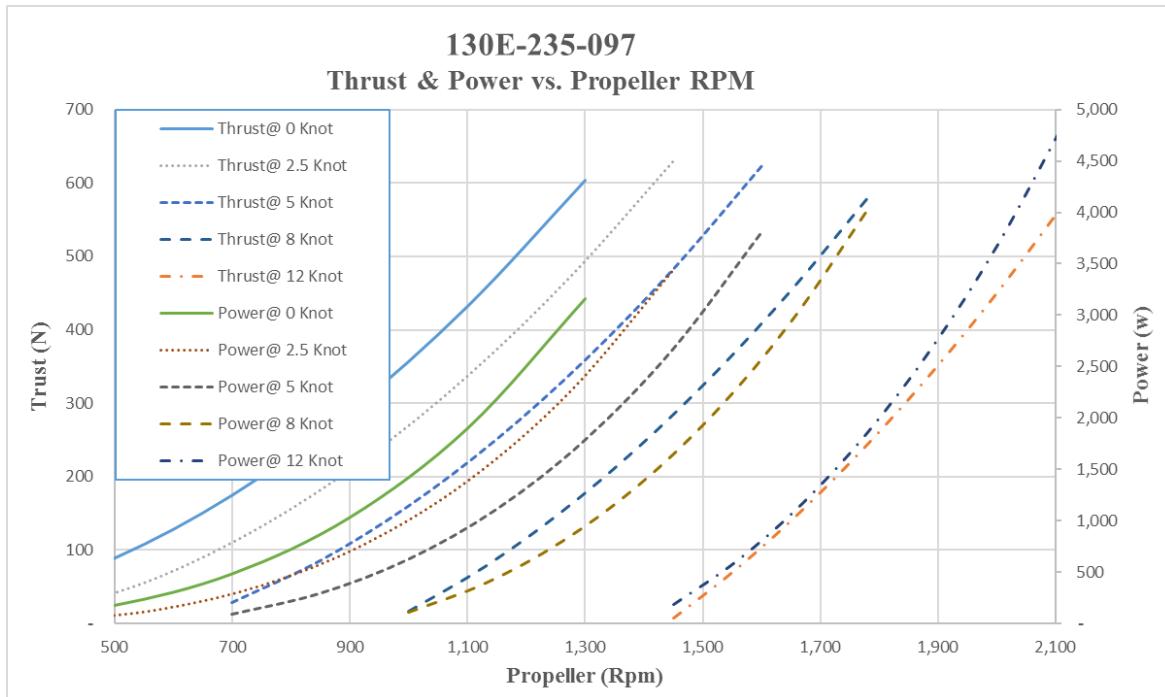


Drawing & Charts



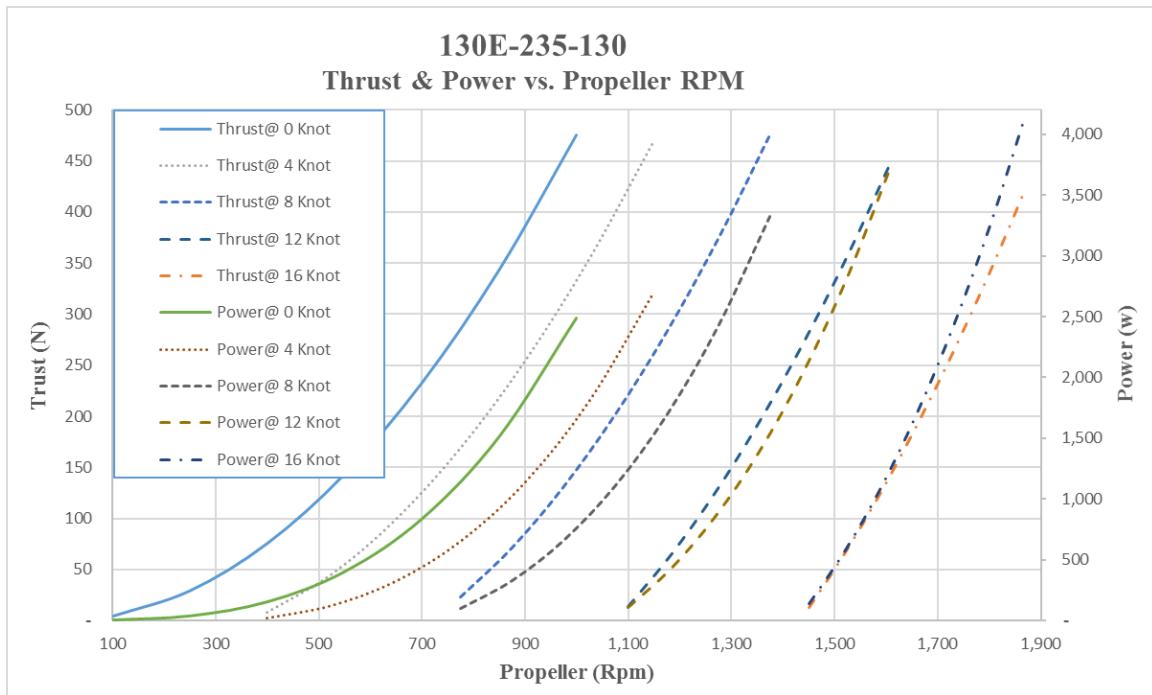
130ES-235-097 Drawing and charts

Drawing is the same as 130ES-235-086

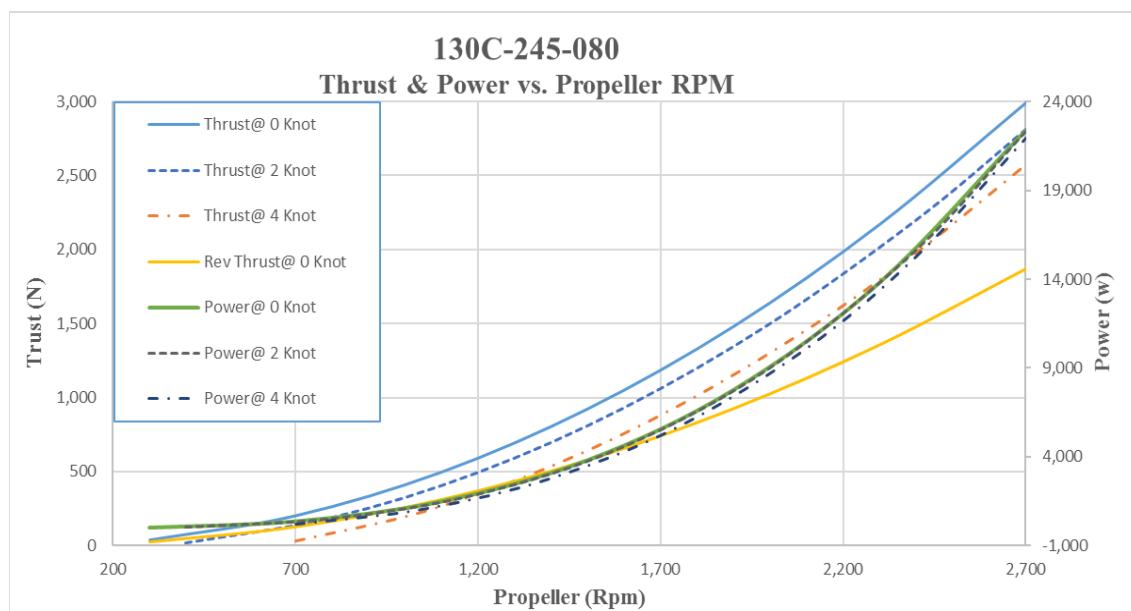
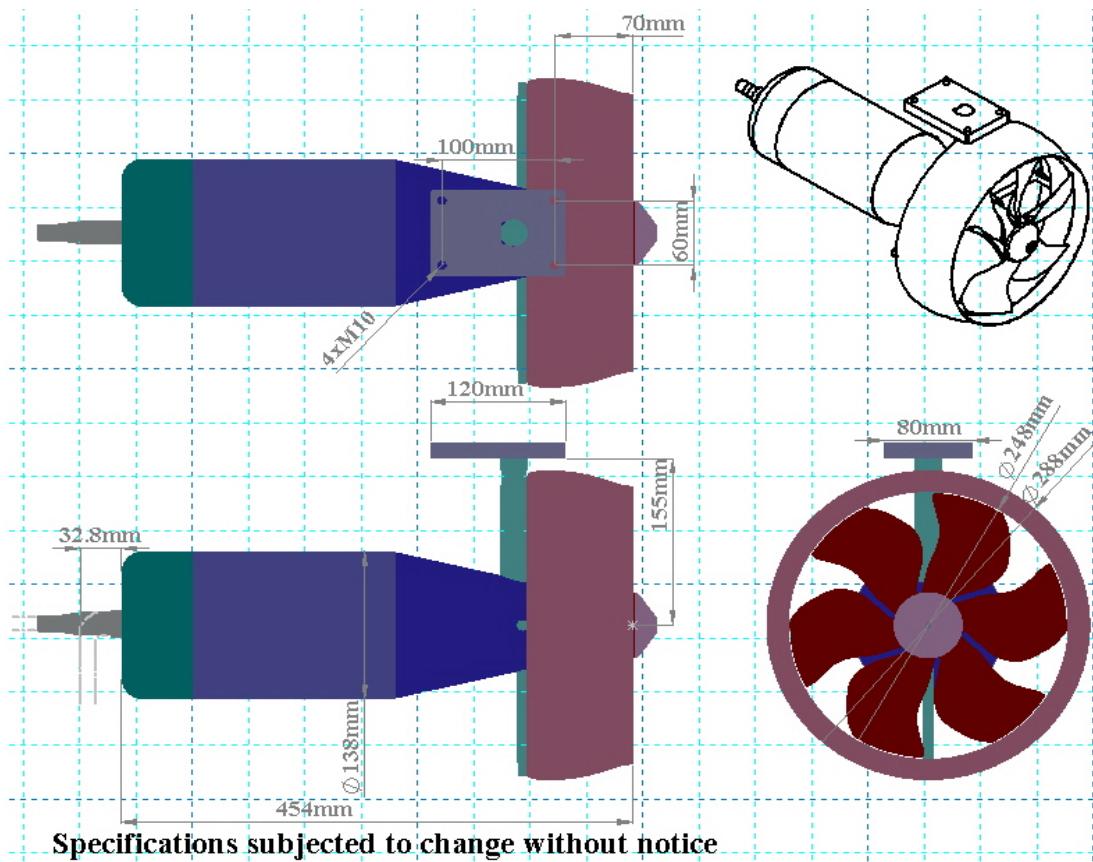


130ES-235-130 Drawing and charts

Drawing is the same as 130ES-235-086

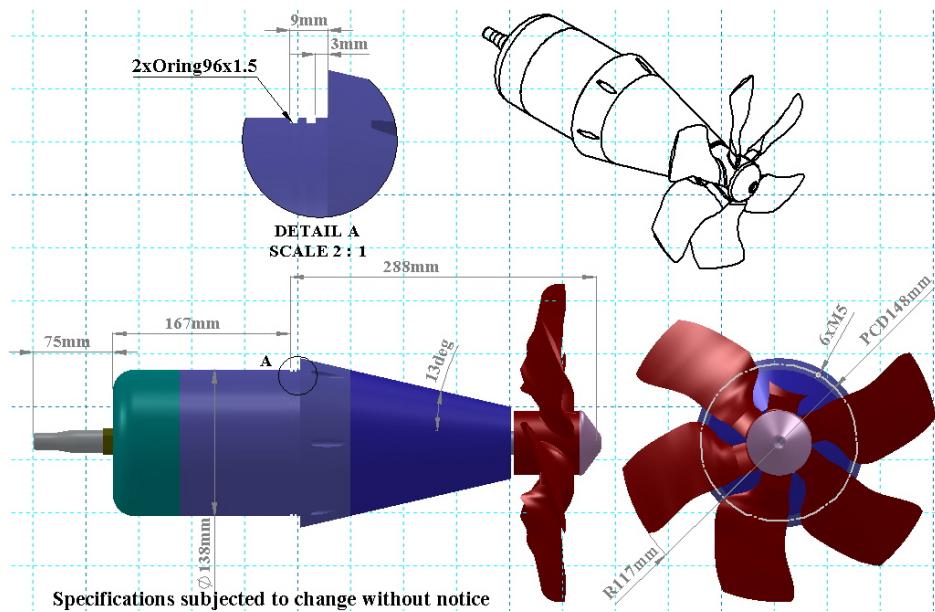


130CL-245-080 Drawing and charts



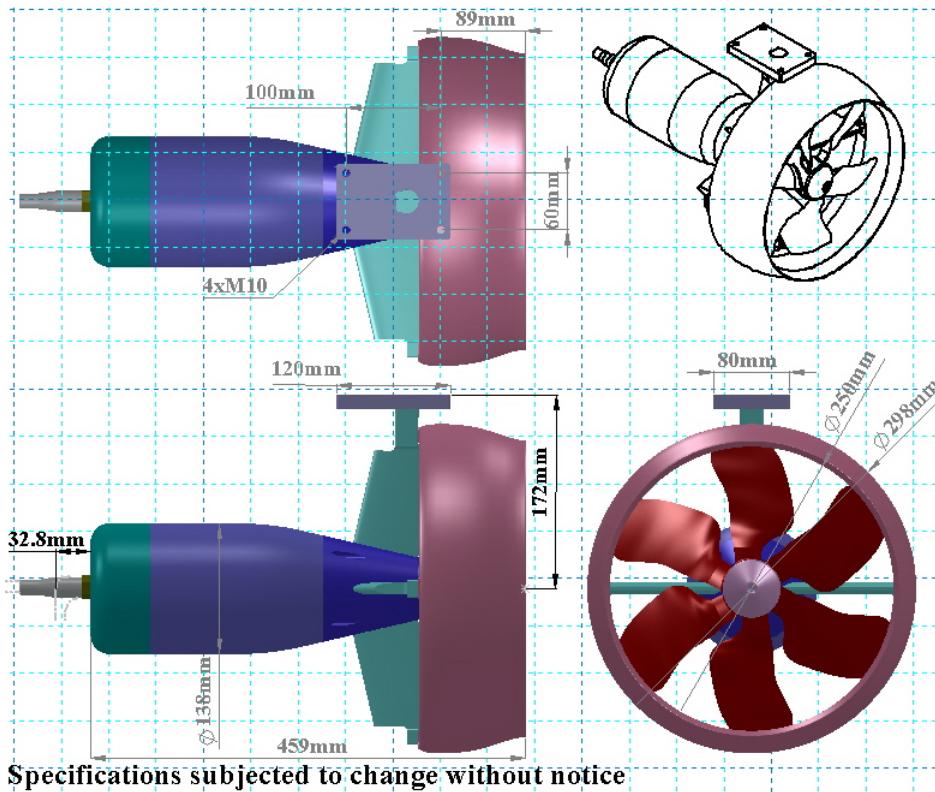
130EI-235 Drawing

Charts of Inline series are the same ad ES series

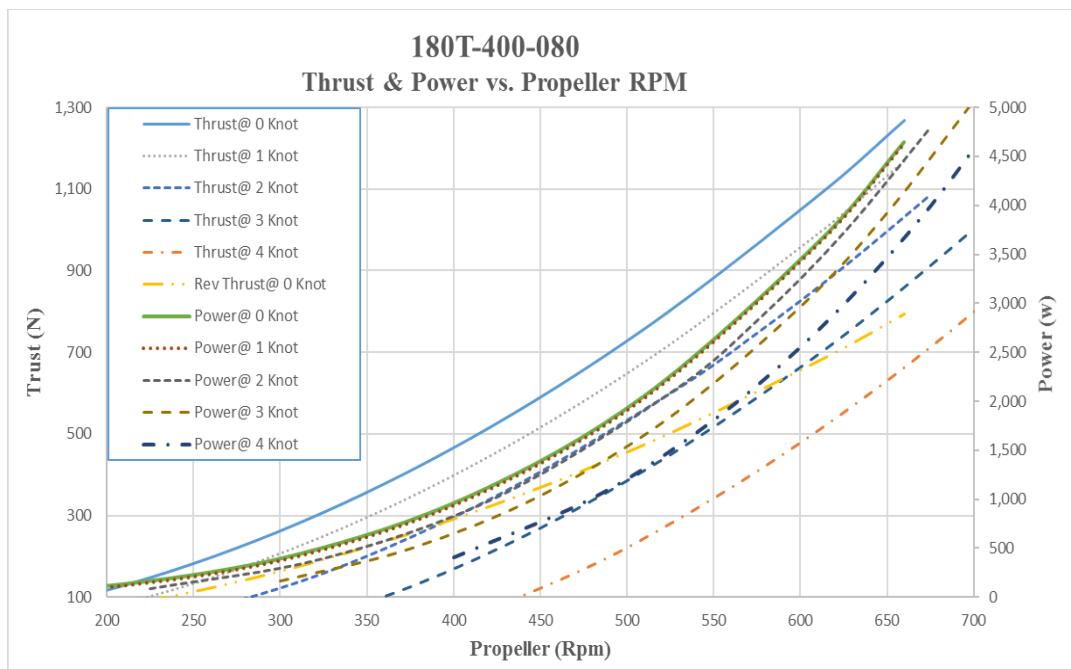
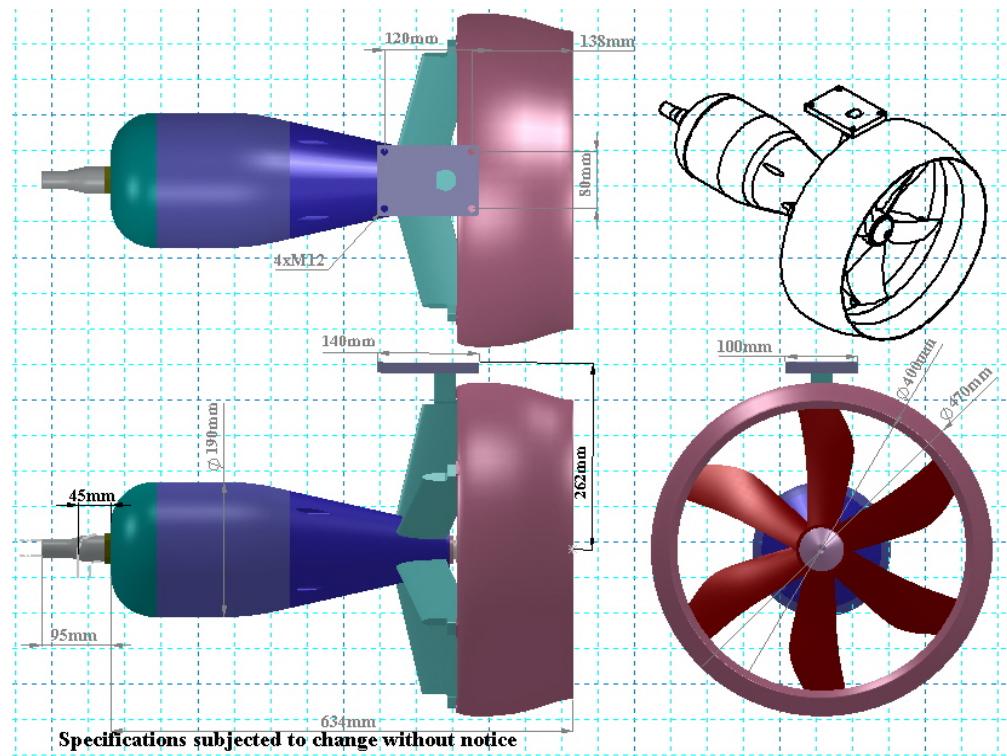


130TH-245-080 & 130CH-245-080 Drawing

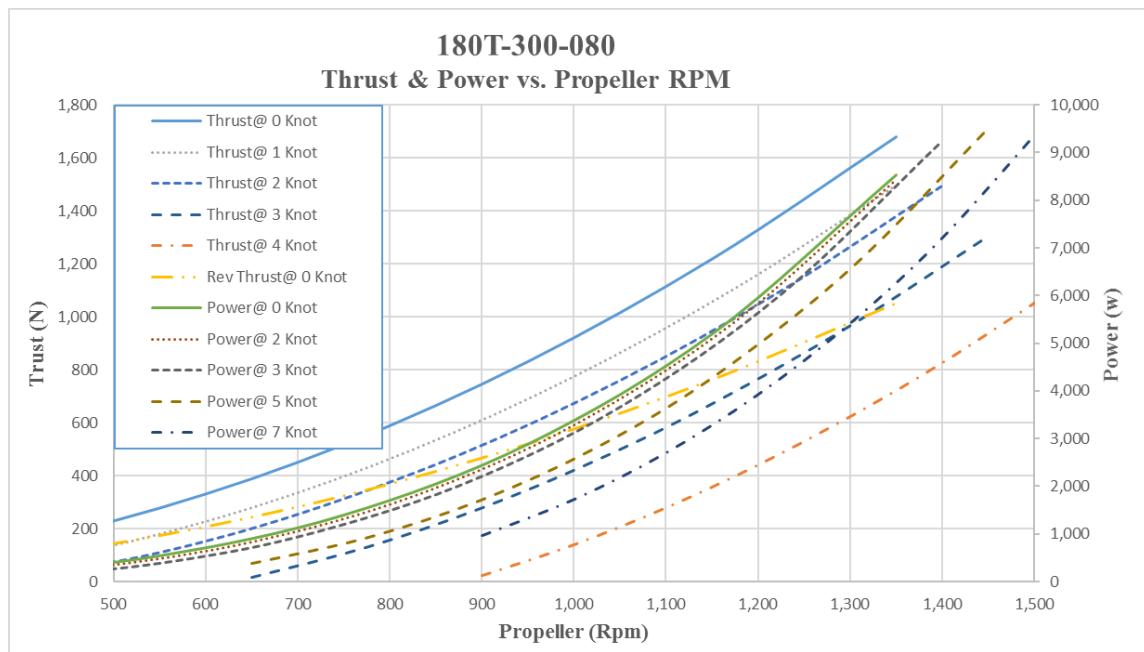
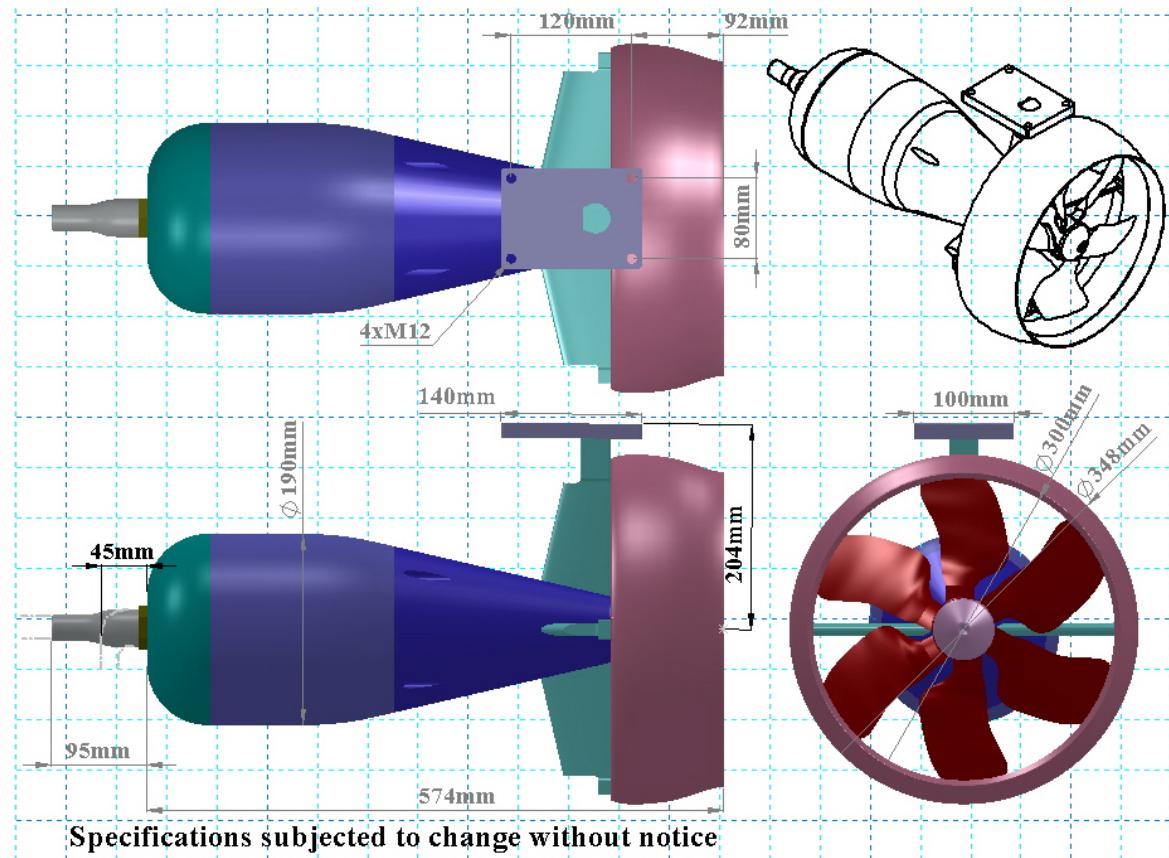
Charts of heavy duty series are the same as TL and CL series



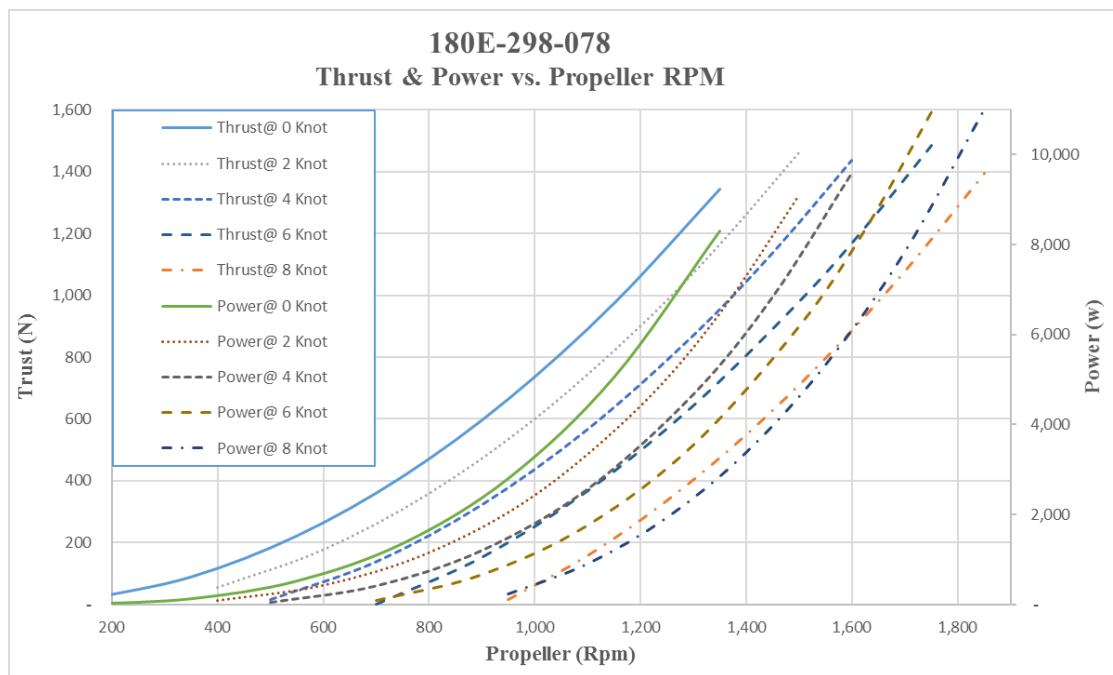
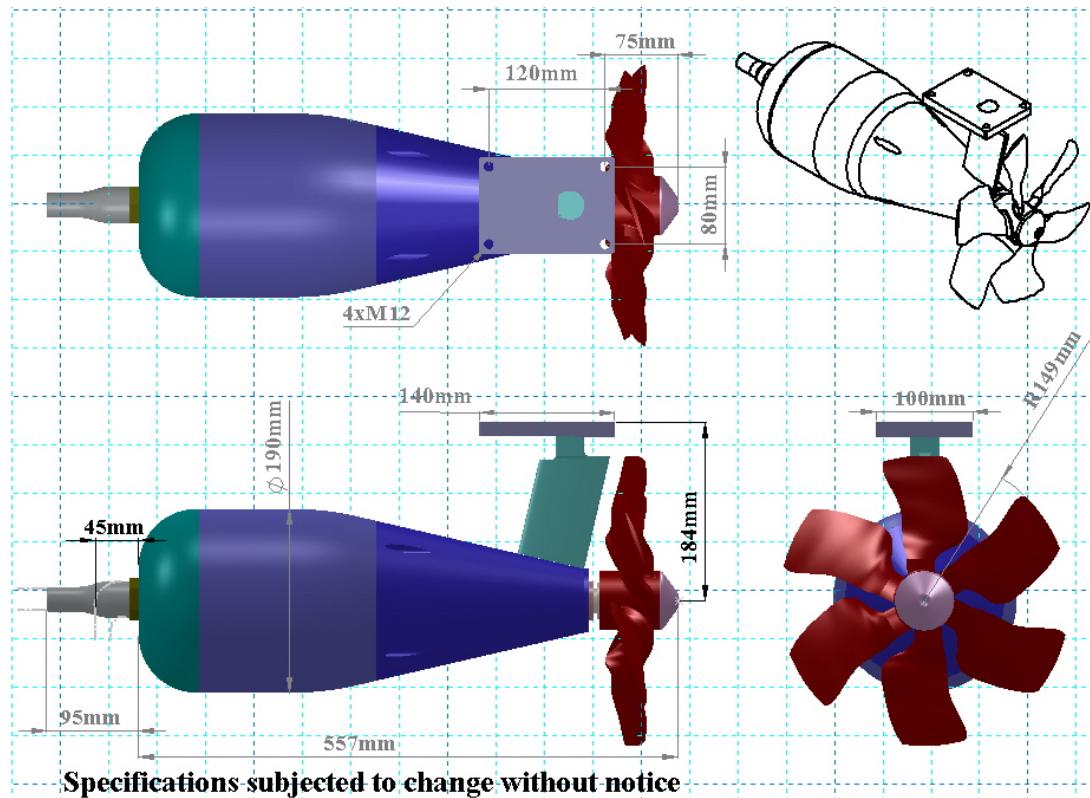
180TH-400-080 Drawing and charts



180TH-300-080 Drawing and charts

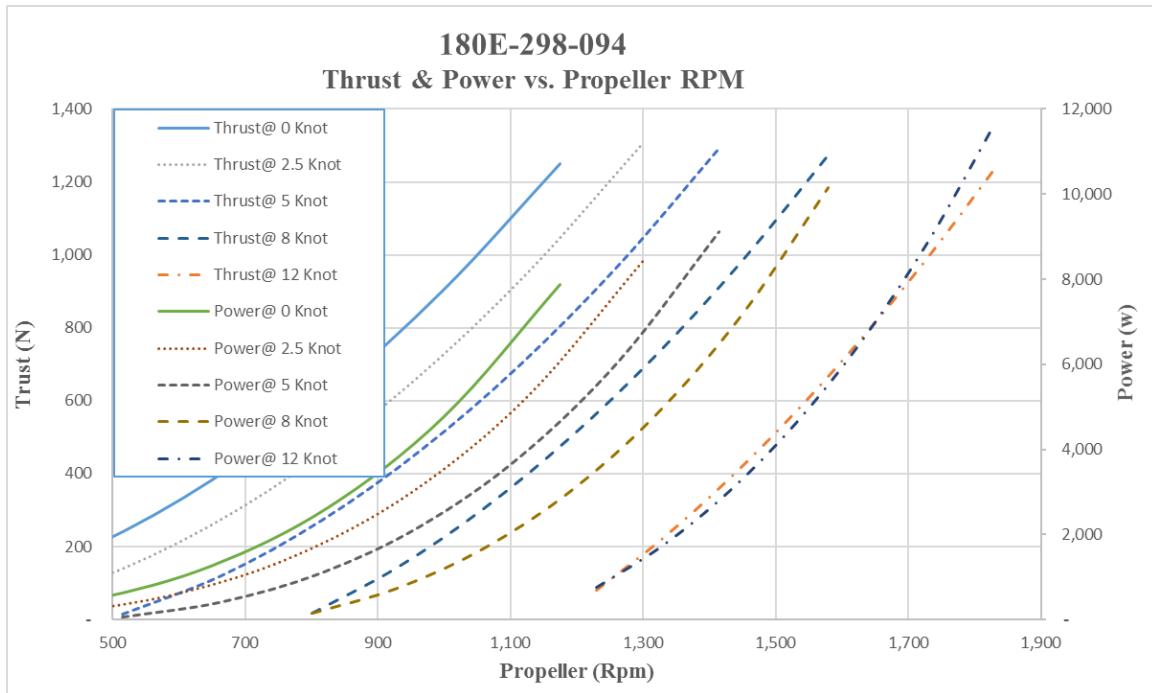


180ES-298-078 Drawing and charts



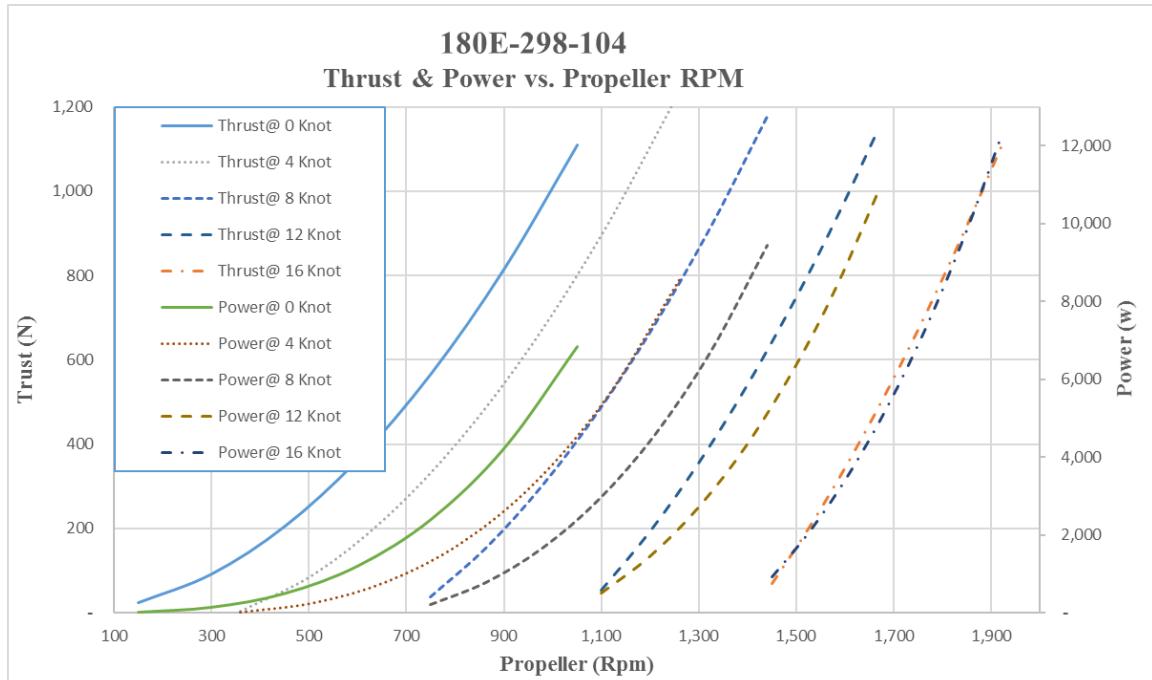
180ES-298-094 Drawing and charts

Drawing is the same as 180ES-298-078



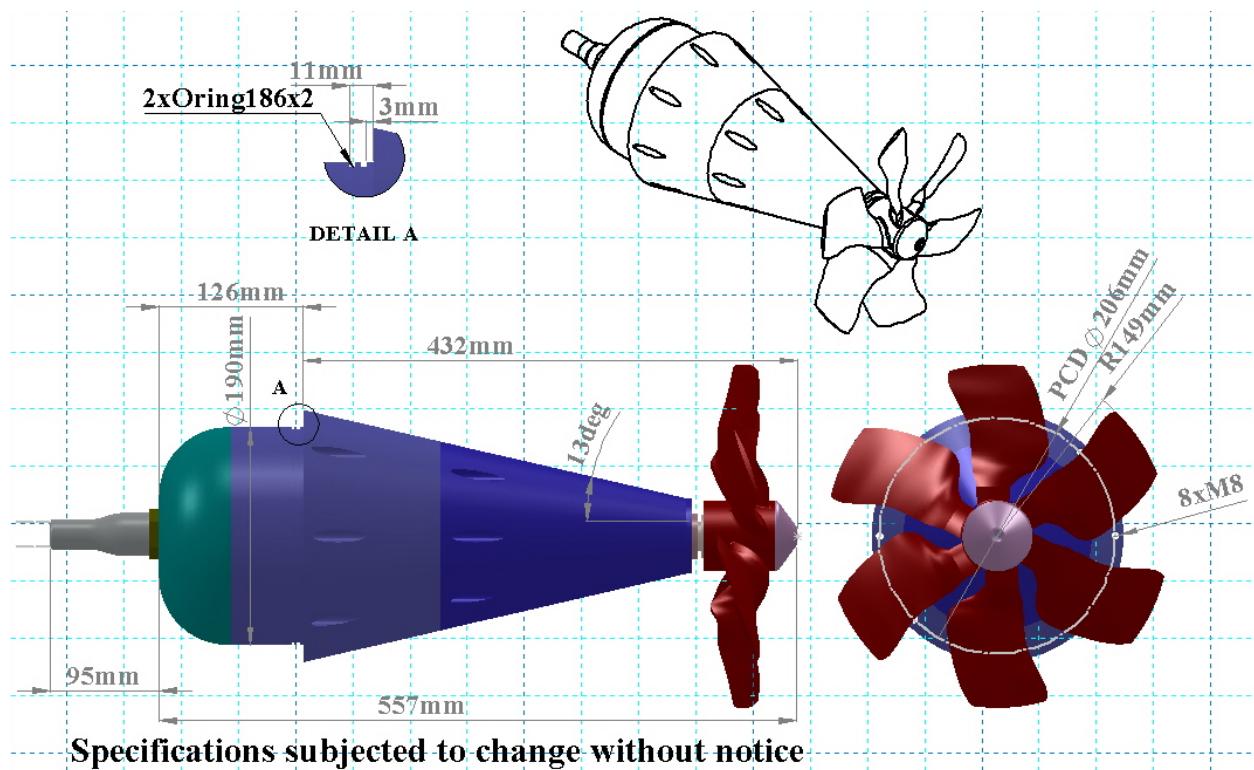
180ES-298-094 Drawing and charts

Drawing is the same as 180ES-298-078



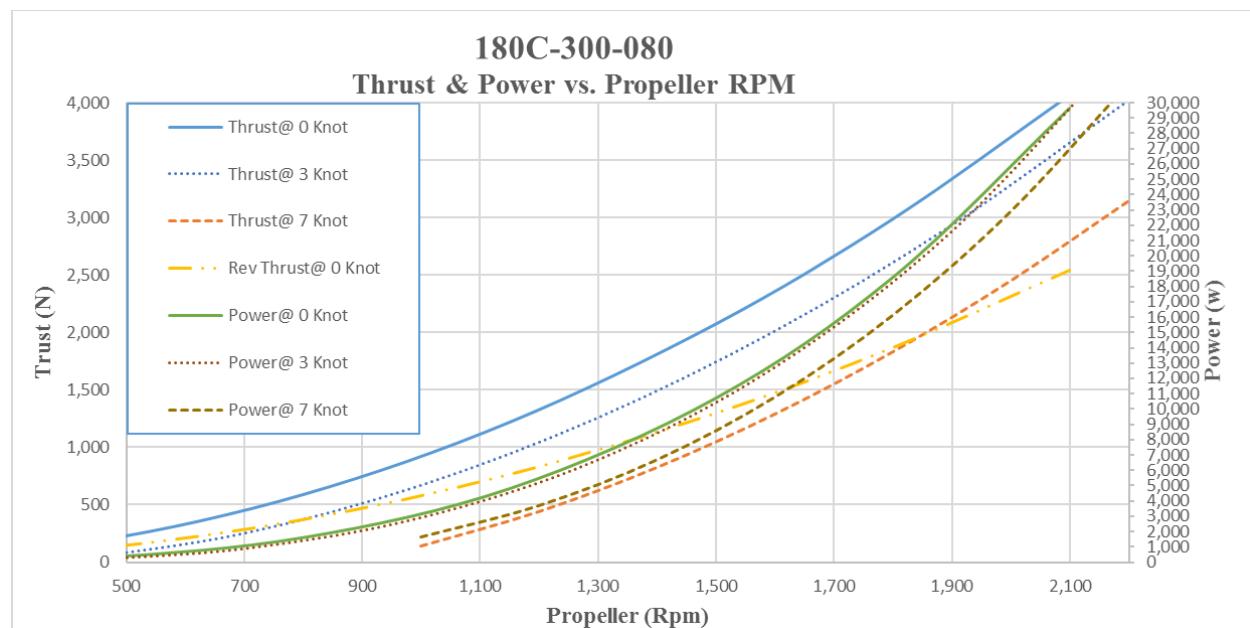
180EI-298 Drawing and charts

Charts of Inline series are the same ad ES series

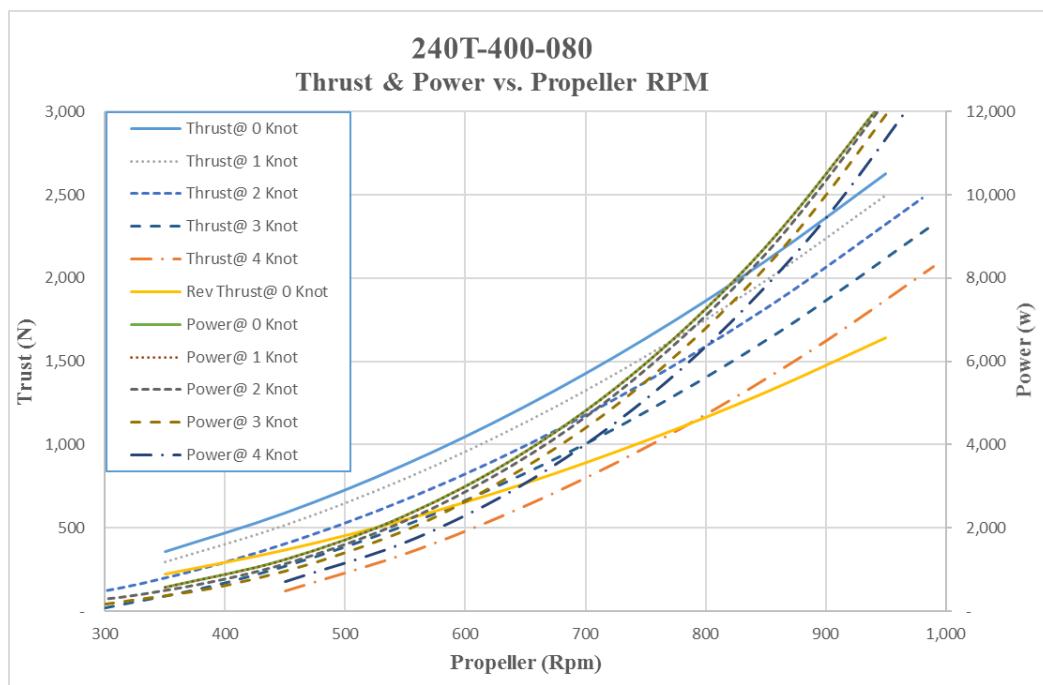
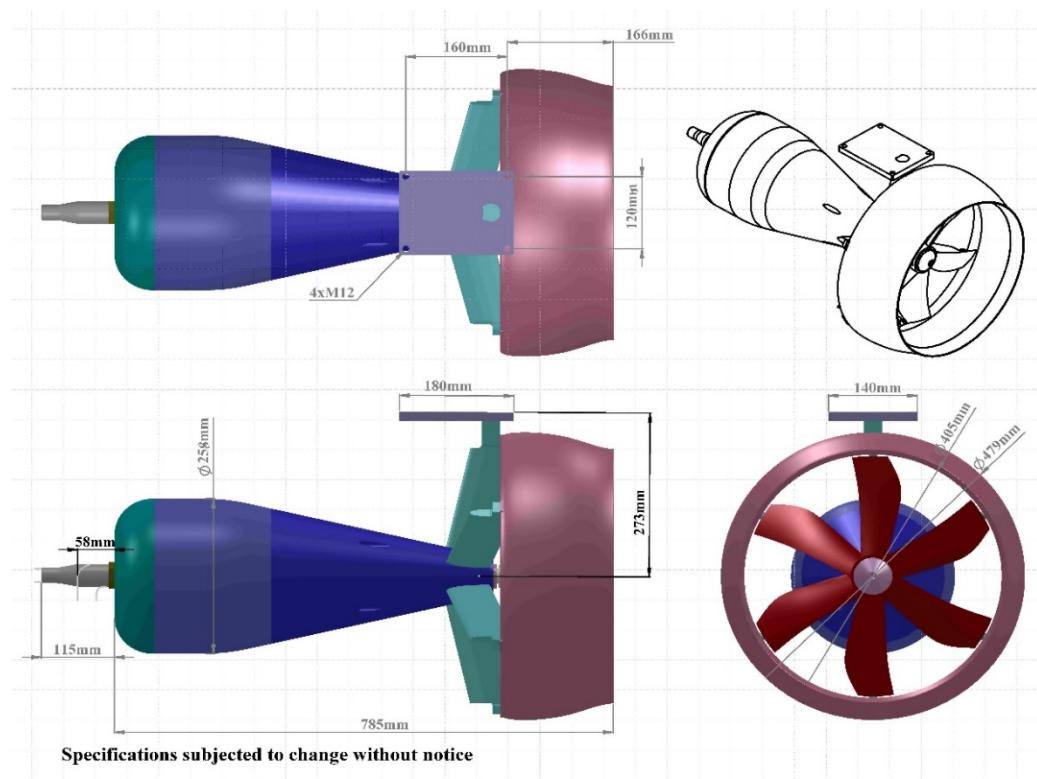


180CH-300-080 charts

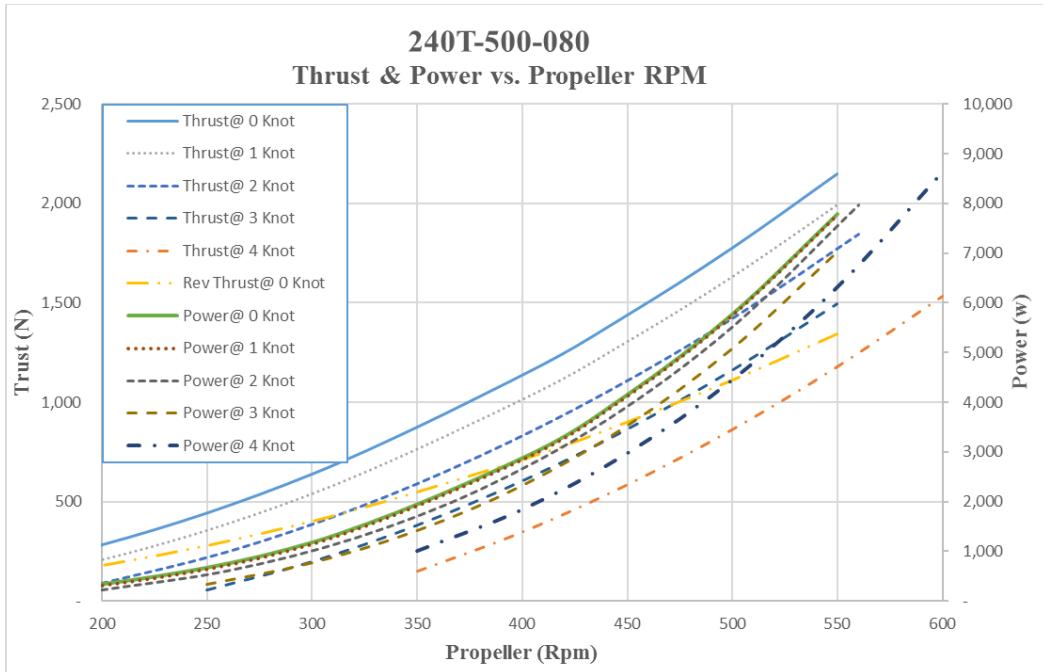
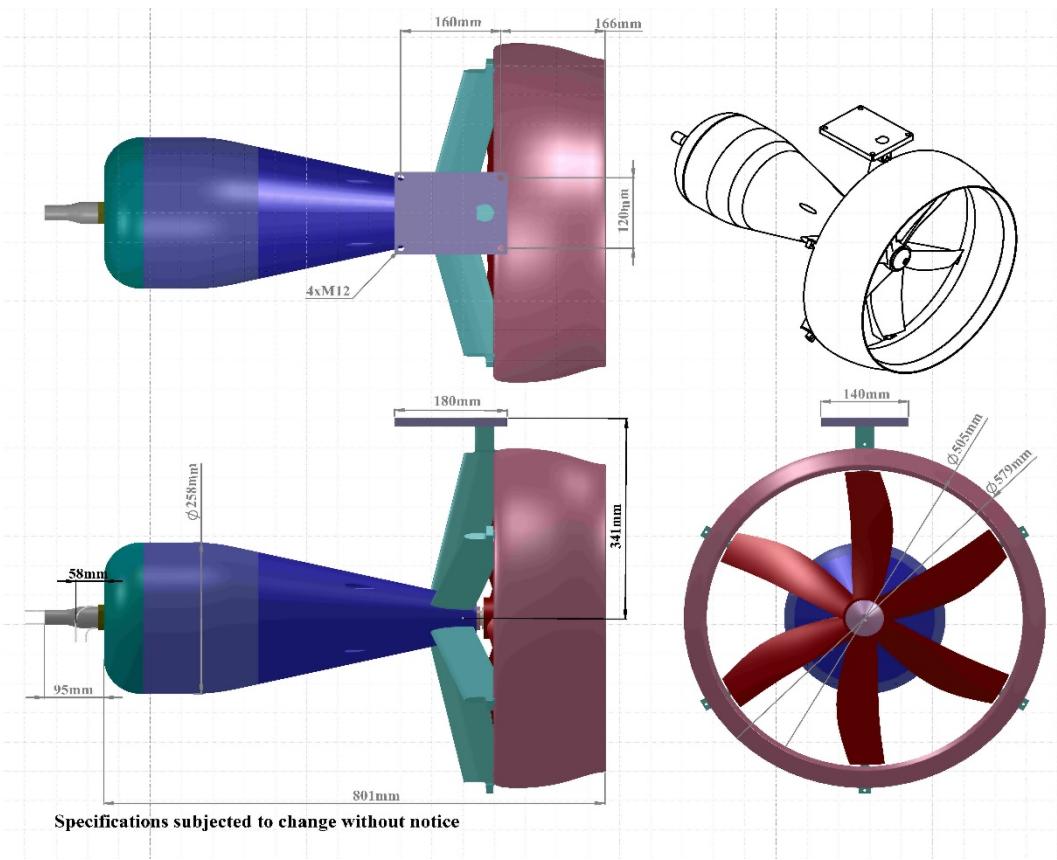
Drawing is the same as 180TH-300-080



240TH-400-080 Drawing and charts



240TH-500-080 Drawing and charts



Ordering Information:

AAA - B - C - DDD - EEE - FFF - GGGGGGGG - HH - II - J - K - L

AAA - Thruster Model

038, 49, 76, 92, 130, 180

B - Thruster Series

T - High Thrust Series

E - High-Efficiency Series

C - Compact series

C - Mechanical Connection

I - Inline

S - Standalone

(for E Series)

H - Heavy Duty

L - Normal Duty

(for T&C Series)

DDD - Propeller Diameter

090, 100, 105, 110, 120, 130, 178, 184, 245, 300, 400

EEE - Propeller pitch

055, 080, 086, 094, 100, 114

FFF - Bus Voltage Option (Consult factory for other voltages)

024 - (20v ...56v) 048 - (44v ...90v)

096 - (90v ...220v) 320 - (200v ...420v)

GGGGGGGG - Subsea Connector Option (Consult factory for other connectors)

MSSL18CCP - SeaCon MSSL-18-CCP, cable end, all voltages

MSSL18BCR - SeaCon MSSL-18-BCR, bulkhead mount, all voltages

Leave xx if no connector needed.

for technical details on the referenced connectors please go to www.seaconworld.com

HH - Cable Length Option (Does not apply to BCR style connectors)

Cable Length in X.X meters - leave as HH if no cable installed

II - Material of All Wetted Metallic Surfaces Option

AL - 6061-T6 Aluminum, Hard Anodized Black SS - Type 316 Stainless Steel

J - Control Signal Option

A - +/-5v Analog Control Signal R - RS485 Control Signal

C - CAN Control Signal

K - Sealing Option

A - Balanced air field

T - Triple redundant

O - Oil field

L - Bearing Option

T - Taper Bearing

S - Sleeve Bearing

QUALITY ASSURANCE

Lian Innovative operates under a Quality Plan that is fully ISO 9001:2008 compliant. All electrical Assembly has performed Automatically without the human interception and finally QC tested.

FINAL TEST & INSPECTION

All Lian Innovative products undergo a rigorous set of final test procedures. Each underwater thruster is operated at reduced power and full power in both directions for extended time periods. Each underwater thruster is pressure tested and then subjected to an insulation breakdown test to identify leaks or other problems. Prior to shipment to the customer, each thruster is certified to perform correctly and to factory specifications.

EXPRESS LIMITED WARRANTY

Subsea thruster motors manufactured by Lian Innovative are warranted to the original Purchaser for a period of one year from the date of shipment from the factory to conform to Lian Innovative's specifications at the time of purchase and to be free of mechanical, electrical and physical defects in material and workmanship if the products have been installed, electrically connected, operated and serviced in accordance with Lian Innovative's instructions as listed in the Operations & Maintenance Manual accompanying the thrusters.

Except for the express warranty set forth herein, Lian Innovative makes no other warranties or guarantees, express, oral, implied or statutory, regarding its subsea thruster products. All such warranties are expressly disclaimed to the extent allowable by law.

High-Quality product from China



Lian Innovative, A Red Dragon Company

info@lianinno.com

No103,area 8, shijichuncheng

minzhi, longhua town,

Baoan district, Shenzhen,

China

08/04/16