



- Rotary actuator with right angle drive for lower profile in space critical applications.
- 200-600w rotary actuator develops 60 ft-lb (81 Nm) of torque.
- Continuous 360° rotation, reversible, and continuously variable speed.
- Powerful, high speed DC brushless gear motor for reliability, efficiency and lightweight.
- 12 output speeds ranging from 0.25rpm to 25rpm with 8 input voltages of 24vdc to 300vdcv.
- Available with +/-5v analog speed control or RS232/RS485 position control.
- Rated to full ocean depth with an oil filled, pressure balanced motor / gear housing and remote electronics in a 1-atmosphere housing or to 50m with a 1-atmosphere housing and self-contained electronics.
- Available with hard anodized aluminum, Type 316 stainless steel or 6Al4V titanium housings.
- Available with motors for 24vdc, 48vdc, 70vdc, 85vdc, 100vdc, 150vdc, 200vdc, 250vdc and 300vdc. Other voltages optional.

**Output Speed**

12 output speeds from 0.25rpm to 25rpm with a torque rating of 60 ft-lb (81 Nm).

**Input**

200-600 W at voltages of 24 - 300vdc, +/-5v analog speed control or full digital servo speed, torque or position control.

**Weight**

6-12 lbs (2.7-5.4 kg) in air, 4.6-9.2 lbs (2.1 - 4.2 kg) in water, depending on configuration.

**Depth Rating**

Full ocean depth when oil filled with remote electronics, 150ft (50m) with 1 atm housings.

(specifications subject to change without notice)

### Introduction

The Model 60 is one of Tecnadyne's right angle drive rotary actuators. With continuous, variable speed CW and CCW rotation, the Model 60 is perfectly suited for applications on AUV's, ROV's, manned sub's and subsea tooling packages.

### Performance Characteristics

As with all of Tecnadyne's rotary actuators, the Model 60 has multiple gearing stages. The first stage is a 7/1 ratio planetary gearset and for the lowest speeds 2 planetary stages are used. The intermediate gearing stage is a 3/1 bevel gear. The final stage is a harmonic drive in ratios from 30/1 to 160/1. Using different combinations of ratios, Tecnadyne is able to supply Model 60's with 12 output speeds ranging from 0.25rpm to 25rpm. The maximum output torque of 60 ft-lbs (81 Nm) can be achieved at all speeds of operation.

### DC Brushless Motor

Employing a 3-phase DC brushless motor that has been optimized for high efficiency and low noise, the Model 60 delivers exceptional reliability and high power in an extremely compact, lightweight and easy to maintain package. As with all Tecnadyne thrusters and actuators, the Model 60 motors are manufactured in the U.S. to the ISO 9001:2008 quality standard.

### Position Feedback Option

The Model 60 can be fitted with an optional rotary position sensor, either a potentiometer or an optical encoder. This configuration is called a Model 61. One potentiometer option is offered and 12 encoder resolutions, from 100ppr to 2500ppr, are offered, in either line driver or open collector format.

### Depth Rating Options

The standard Model 60 configuration utilizes an oil filled housing for the DC brushless motor and gearing units, thus requiring that the electronics module be installed in a remote, 1-atmosphere housing (customer supplied). This configuration is rated to full ocean depth and is compensated using flexible

Tygon tubing for the cabling. Alternately, the Model 60 can have 1-atmosphere housings and internal electronics and is then rated to 150 fsw (50 msw).

### Voltages Supported

The Model 60 is available for voltages of 24vdc, 48vdc, 70vdc, 85vdc, 100vdc, 150vdc, 200vdc, 250vdc and 300vdc. Alternate voltages are possible. DC power must be supplied by a well filtered battery bank, rectified and filtered AC or a regulated DC power supply with less than 10% voltage ripple.

### Speed & Position Control

The oil filled configuration of the Model 60 is available with several remote controllers depending upon the customer's operating requirements and the available space in the customer's 1-atmosphere housing (or Tecnadyne can supply a suitable housing). The most compact remote electronics option (HPFX & HPRX) is an open loop speed mode controller which accepts a +/-5v analog speed control signal. Alternately, Tecnadyne can supply an Advanced Motion Controls servo drive in two voltage ranges (AMCR & AMCE), that operate in current, velocity or position mode. The 50m depth rated, 1-atmosphere version of the Model 60 can be supplied with an internal controller. This is an open loop speed mode controller accepting a +/-5v analog command signal.

### Electro-magnetic Brake Option

The holding or backdrive torque of an unpowered actuator is 25%-50% of the rated torque, depending on gearing ratio. If higher holding torque is required, an optional electro-magnetic brake can be installed.

### Other Options

Optional configurations include: housings made from hard anodized aluminum (standard), Type 316 stainless steel or 6Al4V titanium; several bulkhead type or cable end subsea connectors.

Please note that these specifications are subject to change without notice.

Go to [www.tecnadyne.com](http://www.tecnadyne.com)



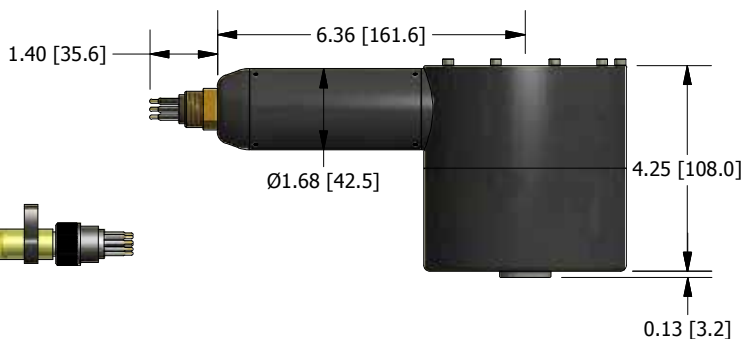
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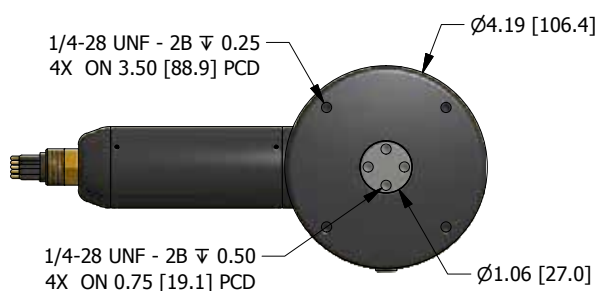
**MODEL 60**

**1-ATMOSPHERE, 1-STAGE GEARBOX VERSION**  
(Rated to 150 ft [50 m] Depth)

**OIL FILLED, 1-STAGE GEARBOX VERSION**  
(Rated to Full Ocean Depth)

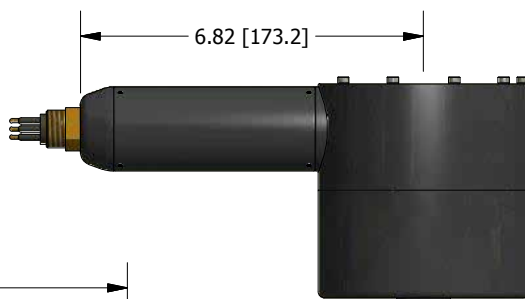


SCALE 1:4



Download STP solid model of this rotary actuator here:  
[http://www.tecnadyne.com/rotary\\_actuators](http://www.tecnadyne.com/rotary_actuators)

**MODEL 60**



**WITH INTERNAL BRAKE OPTION**  
(Available with 1-Atmosphere & Oil Filled Options)



**W/ 2-STAGE GEARBOX OPTION**  
(Output Speeds of 0.5 to 3 rpm)  
(Available with 1-Atmosphere & Oil Filled Options)

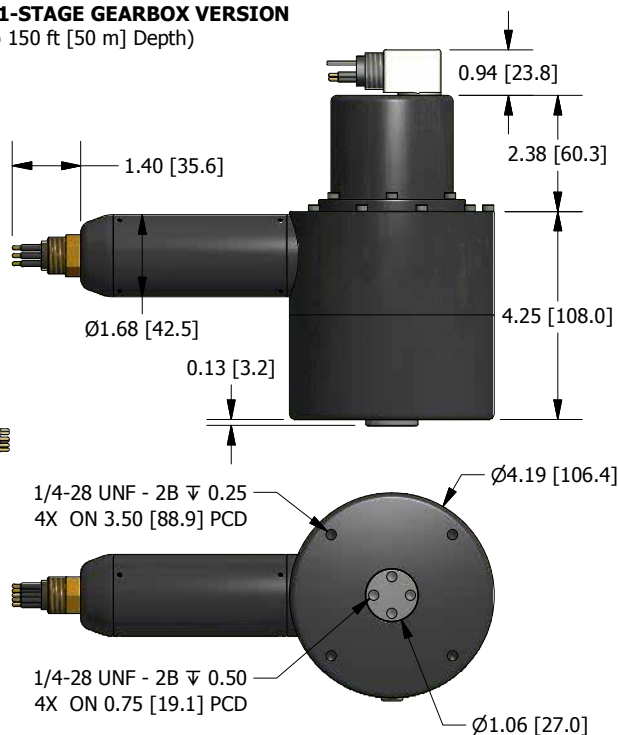
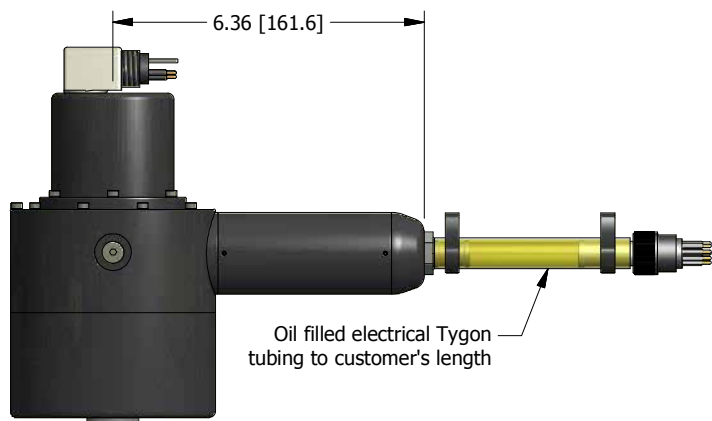
SCALE 1:4

Download STP solid model of this rotary actuator here:  
[http://www.tecnadyne.com/rotary\\_actuators](http://www.tecnadyne.com/rotary_actuators)

**MODEL 61**

**1-ATMOSPHERE, 1-STAGE GEARBOX VERSION**  
(Rated to 150 ft [50 m] Depth)

**OIL FILLED, 1-STAGE GEARBOX VERSION**  
(Rated to Full Ocean Depth)

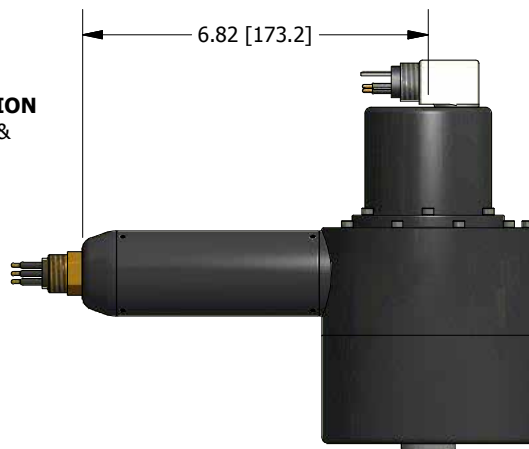
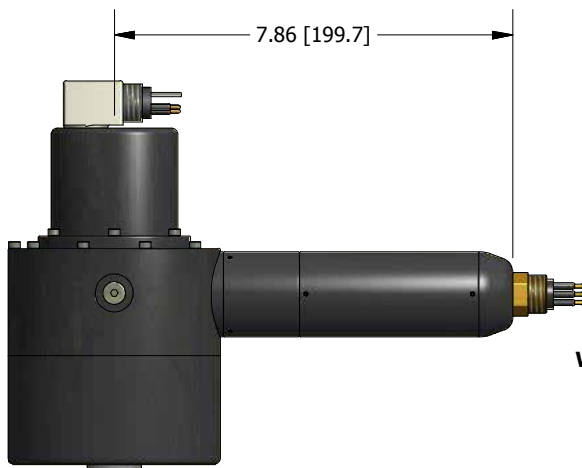


SCALE 1:4

Download STP solid model of this rotary actuator here:  
[http://www.tecnadyne.com/rotary\\_actuators](http://www.tecnadyne.com/rotary_actuators)

**MODEL 61**

**WITH INTERNAL BRAKE OPTION**  
(Available with 1-Atmosphere & Oil Filled Options)



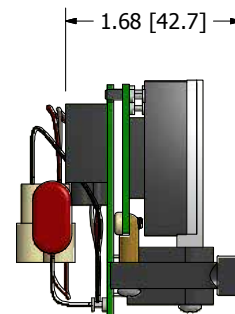
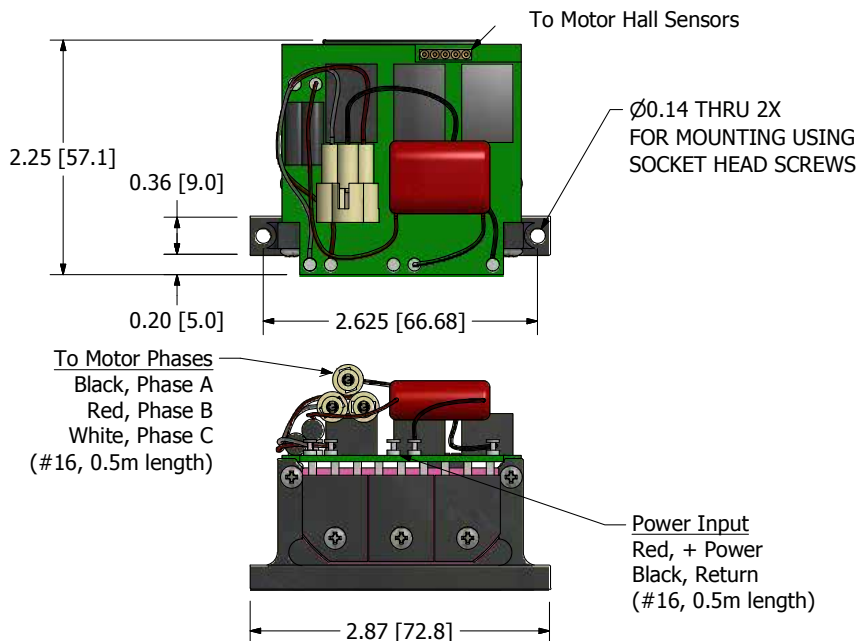
**W/ 2-STAGE GEARBOX OPTION**  
(Output Speeds of 0.5 to 3 rpm)  
(Available with 1-Atmosphere & Oil Filled Options)

SCALE 1:4

Download STP solid model of this rotary actuator here:  
[http://www.tecnadyne.com/rotary\\_actuators](http://www.tecnadyne.com/rotary_actuators)

**REMOTE ELECTRONICS MODULE, HPFX CONFIG**

USED IN THE **HPFX** CONFIGURATION & INSTALLED IN CUSTOMER FURNISHED PRESSURE VESSEL.



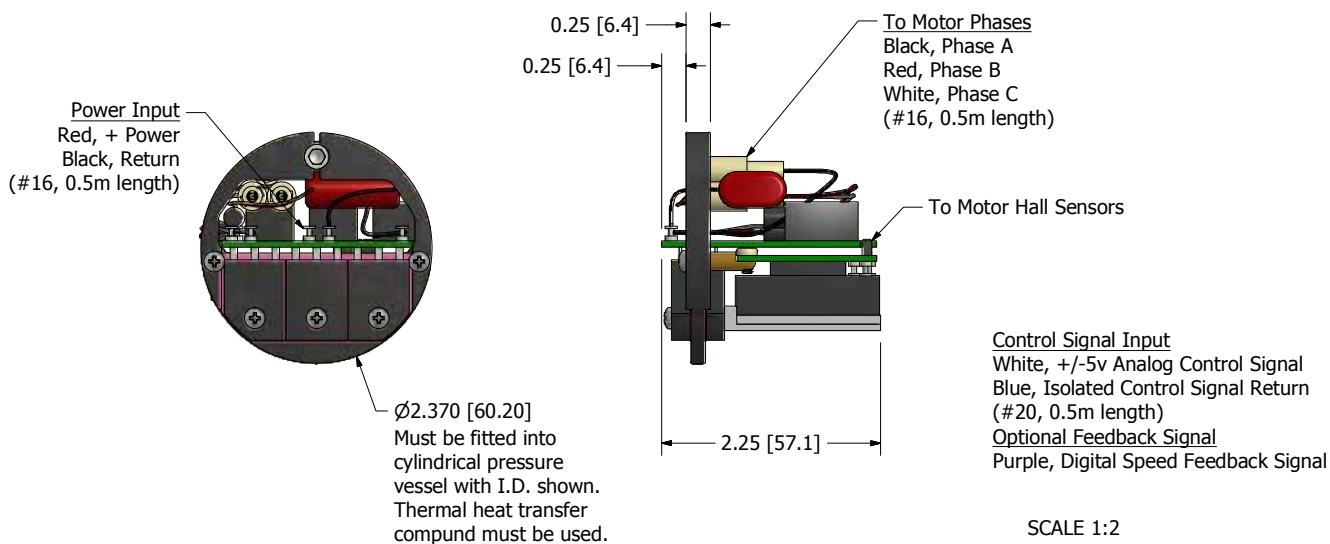
**Control Signal Input**  
White, +/-5v Analog Control Signal  
Blue, Isolated Control Signal Return (#20, 0.5m length)  
**Optional Feedback Signal**  
Purple, Digital Speed Feedback Signal

SCALE 1:2

Download STP solid model of this electronics module here:  
[http://www.tecnadyne.com/rotary\\_actuators](http://www.tecnadyne.com/rotary_actuators)

**REMOTE ELECTRONICS MODULE, HPRX CONFIG**

USED IN THE **HPRX** CONFIGURATION & INSTALLED IN CUSTOMER FURNISHED PRESSURE VESSEL.



**Control Signal Input**  
White, +/-5v Analog Control Signal  
Blue, Isolated Control Signal Return (#20, 0.5m length)  
**Optional Feedback Signal**  
Purple, Digital Speed Feedback Signal

SCALE 1:2

Download STP solid model of this electronics module here:  
[http://www.tecnadyne.com/rotary\\_actuators](http://www.tecnadyne.com/rotary_actuators)

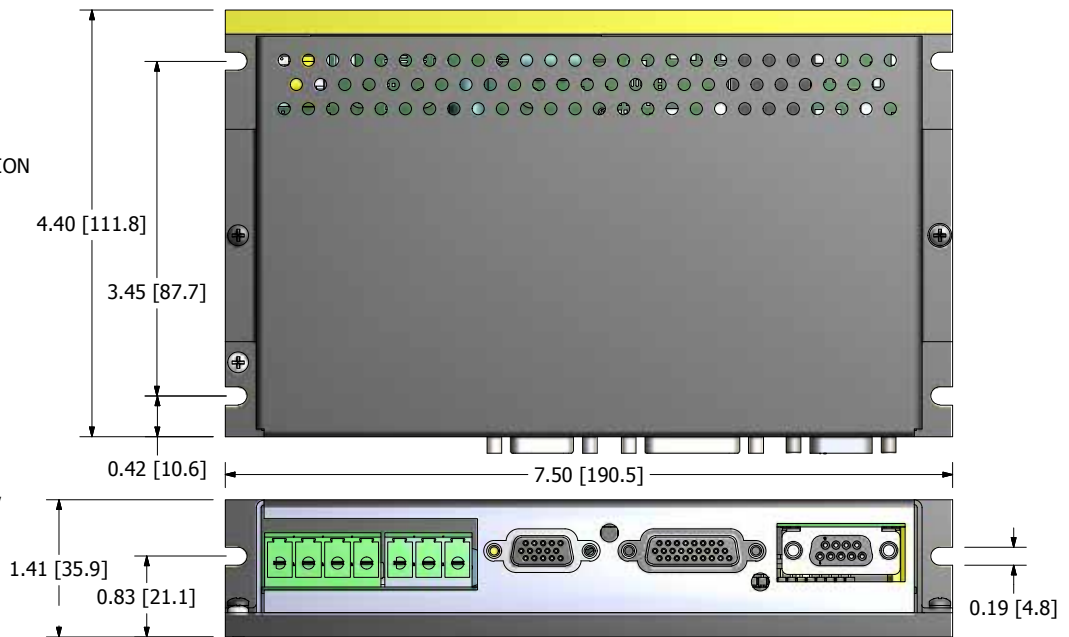
**REMOTE ELECTRONICS MODULE, AMCR CONFIG**

ADVANCED MOTION CONTROLS DPRALTE-060B080E.

REFER TO THE ADVANCED MOTION CONTROLS WEBSITE FOR ADDITIONAL TECHNICAL INFORMATION ABOUT THIS CONTROLLER -- [WWW.A-M-C.COM](http://WWW.A-M-C.COM)

Input Voltage Range  
20vdc - 80vdc  
Input Control Signals  
+/-10 analog, RS232 / RS485

SCALE 1:2



Download STP solid model of this electronics module here:  
[http://www.tecnadyne.com/rotary\\_actuators](http://www.tecnadyne.com/rotary_actuators)

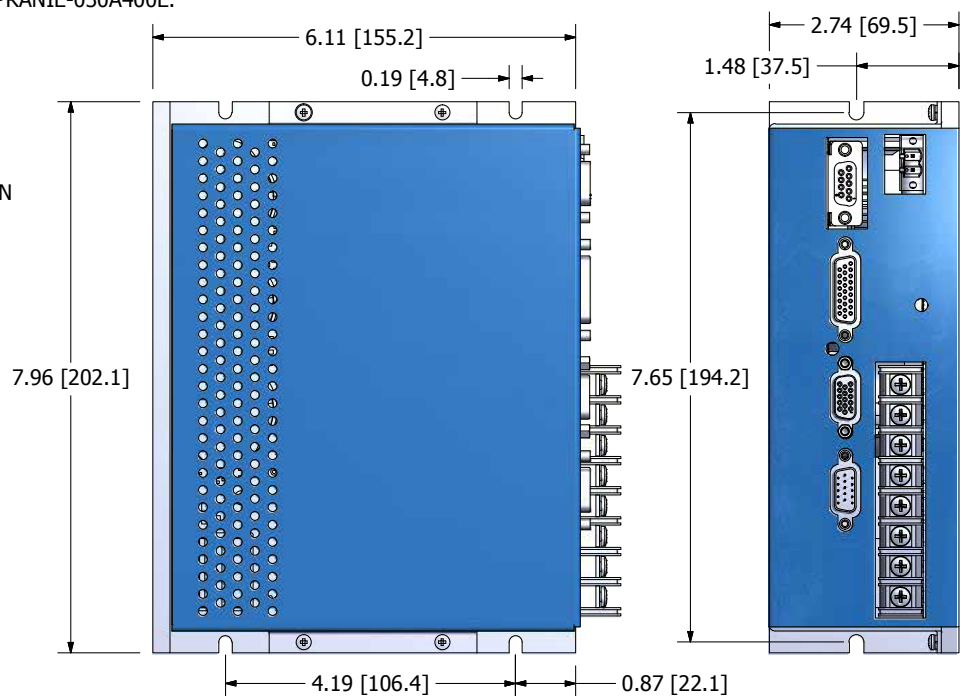
**REMOTE ELECTRONICS MODULE, AMCE CONFIG**

ADVANCED MOTION CONTROLS DPRANIE-030A400E.

REFER TO THE ADVANCED MOTION CONTROLS WEBSITE FOR ADDITIONAL TECHNICAL INFORMATION ABOUT THIS CONTROLLER -- [WWW.A-M-C.COM](http://WWW.A-M-C.COM)

Input Voltage Range  
127vdc - 373vdc  
Input Control Signals  
+/-10 analog, RS232 / RS485

SCALE 1:2



Download STP solid model of this electronics module here:  
[http://www.tecnadyne.com/rotary\\_actuators](http://www.tecnadyne.com/rotary_actuators)



### 60 - AAA - BB - CCCCC - XX - DD - EEEE - Y

**AAA** - Buss Voltage Option (Consult factory for other voltages)

<b>24</b> - 24vdc	<b>85</b> - 85vdc	<b>200</b> - 200vdc
<b>48</b> - 48vdc	<b>100</b> - 100vdc	<b>250</b> - 250vdc
<b>70</b> - 70vdc	<b>150</b> - 150vdc	<b>300</b> - 300vdc

**BB** - Output Speed Option (Consult factory for other speeds)

<b>0.25</b> - 0.25rpm, 200W, 2-stage	<b>3</b> - 3rpm, 250W	<b>8</b> - 8rpm, 275W
<b>0.5</b> - 0.5rpm, 200W, 2-stage	<b>4</b> - 4rpm, 275W	<b>10</b> - 10rpm, 350W
<b>1</b> - 1rpm, 200W, 2-stage	<b>5</b> - 5rpm, 300W	<b>15</b> - 15rpm, 400W
<b>2</b> - 2rpm, 225W, 2-stage	<b>6</b> - 6rpm, 325W	<b>25</b> - 25rpm, 600W

**CCCCC** - Motor Subsea Connector Option (Consult factory for other connectors)

- MCPBOF8M** - Subconn MCPBOF8M, oil filled tubing, for oil filled, remote electronics only
  - MHDG8CCP** - Impulse MHDG-8-CCPOF, oil filled tubing, for oil filled, remote electronics only
  - MCBH5M** - SeaCon MCBH5M, bulkhead mount, no speed feedback signal, 50m 1-atmosphere only
  - MCBH6M** - SeaCon MCBH6M, bulkhead mount, digital or analog speed signal, 50m 1-atm. only
  - MCIL5M** - SeaCon MCIL5M, cable end, no speed feedback signal, 50m 1-atmosphere only
  - MCIL6M** - SeaCon MCIL6M, cable end, digital or analog speed feedback signal, 50m 1-atm. only
- for technical details on the referenced connectors please go to [www.seaconworld.com](http://www.seaconworld.com), [www.subconn.com](http://www.subconn.com) & [www.impulse-ent.com](http://www.impulse-ent.com)

**XX** - Cable Length Option (Does not apply to MCBH style connectors)

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

**DD** - Material of All Wetted Metallic Surfaces Option

- AL** - 6061-T6 Aluminum, Hard Anodized Black
- SS** - Type 316 Stainless Steel, Passivated
- TI** - 6Al4V Titanium

**EEEE** - Remote Electronics Option (oil filled, full ocean depth) or Internal Electronics (50m depth)

- HPFX** - Remote Electronics, Flat mount in customer 1-Atm. Housing, Oil filled full ocean depth actuator
  - HPRX** - Remote Elec., Round mount in customer 1-Atm. Housing, Oil filled full ocean depth actuator
  - AMCR** - Remote Elec., 20-80vdc, AMC DPRALTE in 1-Atm. Housing, Oil filled full ocean depth actuator
  - AMCE** - Remote Elec., 127-373dc, AMC DPRANIE in 1-Atm. Housing, Oil filled full ocean depth actuator
  - INTX** - Internal Electronics, 1-Atmosphere actuator, 150 fsw (50m) max. depth, +/-5v analog control only
- for technical details on the referenced AMC controllers, please go to [www.A-M-C.com](http://www.A-M-C.com)

**Y** - Brake Option

- Y** - No brake
- B** - Electro-magnetic brake installed

**61 - AAA - BB - CCCCC - XX - DD - EEEE - Y - FFFFF - GG - ZZZZ**

**AAA** - Buss Voltage Option (Consult factory for other voltages)

<b>24</b> - 24vdc	<b>85</b> - 85vdc	<b>200</b> - 200vdc
<b>48</b> - 48vdc	<b>100</b> - 100vdc	<b>250</b> - 250vdc
<b>70</b> - 70vdc	<b>150</b> - 150vdc	<b>300</b> - 300vdc

**BB** - Output Speed Option (Consult factory for other speeds)

<b>0.25</b> - 0.25rpm, 200W, 2-stage	<b>3</b> - 3rpm, 250W	<b>8</b> - 8rpm, 275W
<b>0.5</b> - 0.5rpm, 200W, 2-stage	<b>4</b> - 4rpm, 275W	<b>10</b> - 10rpm, 350W
<b>1</b> - 1rpm, 200W, 2-stage	<b>5</b> - 5rpm, 300W	<b>15</b> - 15rpm, 400W
<b>2</b> - 2rpm, 225W, 2-stage	<b>6</b> - 6rpm, 325W	<b>25</b> - 25rpm, 600W

**CCCCC** - Motor Subsea Connector Option (Consult factory for other connectors)

- MCPBOF8M** - Subconn MCPBOF8M, oil filled tubing, for oil filled, remote electronics only
- MHDG8CCP** - Impulse MHDG-8-CCPOF, oil filled tubing, for oil filled, remote electronics only
- MCBH5M** - SeaCon MCBH5M, bulkhead mount, no speed feedback signal, 50m 1-atmosphere only
- MCBH6M** - SeaCon MCBH6M, bulkhead mount, digital or analog speed signal, 50m 1-atm. only
- MCIL5M** - SeaCon MCIL5M, cable end, no speed feedback signal, 50m 1-atmosphere only
- MCIL6M** - SeaCon MCIL6M, cable end, digital or analog speed feedback signal, 50m 1-atm. only

**XX** - Cable Length Option (Does not apply to MCBH style connectors)

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

**DD** - Material of All Wetted Metallic Surfaces Option

- AL** - 6061-T6 Aluminum, Hard Anodized Black
- TI** - 6Al4V Titanium
- SS** - Type 316 Stainless Steel, Passivated

**EEEE** - Remote Electronics Option (oil filled, full ocean depth) or Internal Electronics (50m depth)

- HPFX** - Remote Electronics, Flat mount in customer 1-Atm. Housing, Oil filled full ocean depth actuator
- HPRX** - Remote Elec., Round mount in customer 1-Atm. Housing, Oil filled full ocean depth actuator
- AMCR** - Remote Elec., 20-80vdc, AMC DPRALTE in 1-Atm. Housing, Oil filled full ocean depth actuator
- AMCE** - Remote Elec., 127-373vdc, AMC DPRANIE in 1-Atm. Housing, Oil filled full ocean depth actuator
- INTX** - Internal Electronics, 1-Atmosphere actuator, 150 fsw (50m) max. depth, +/-5v analog control only

**Y** - Brake Option

- Y** - No brake
- B** - Electro-magnetic brake installed

**FFFFF** - Position Sensor Subsea Connector Option (Consult factory for other connectors)

- MCBHRA3M** - Subconn MCBHRA3M, for use with potentiometer sensors only
- MCBHRA5M** - Subconn MCBHRA5M, for use with potentiometer and open collector encoder only
- MCBHRA8M** - Subconn MCBHRA8M, for use with line driver encoder
- FAWL-3P-BC-R/A** - SeaCon FAWL-3P-BC-R/A, for use with potentiometer sensors only
- FAWL-5P-BC-R/A** - SeaCon FAWL-5P-BC-R/A, for use with potentiometer & open collector encoder
- FAWM-8P-BC-R/A** - SeaCon FAWM-8P-BC-R/A, for use with line driver encoder

**GG** - Position Sensor Option

- POT** - Potentiometer
- OC** - Open Collector Encoder
- LD** - Line Driver Encoder

**ZZZZ** - Encoder Resolution Option (leave blank if encoder not fitted)

<b>100</b> - 100ppr	<b>360</b> - 360ppr	<b>600</b> - 600ppr	<b>1024</b> - 1024ppr
<b>200</b> - 200ppr	<b>400</b> - 400ppr	<b>800</b> - 800ppr	<b>2000</b> - 2000ppr
<b>300</b> - 300ppr	<b>500</b> - 500ppr	<b>1000</b> - 1000ppr	<b>2500</b> - 2500ppr



## WHAT WERE YOU DOING 30 YEARS AGO?

In 1985 Tecnadyme delivered its first thrusters, six Model 1020's that were installed on the original RTV-500 built by Mitsui Engineering & Shipbuilding (MES) of Tokyo. Since that time, we have manufactured and delivered over 6,000 thrusters, including more than 600 of the Model 1020. And even though the Model 1020 that we build today incorporates over 32 design revisions to improve reliability, efficiency and maintainability – that thruster is still 100% compatible with the Model 1020 that was installed on that first RTV-500 system more than 30 years ago. This means that, after 30+ years, MES (or any of our customers) can still purchase or repair a Model 1020 thruster to keep its fleet of ROV's working. And in those 30 years, the Model 1020 thruster has powered vehicles to the Titanic, that discovered JFK's PT-109 in the Pacific, that participated in record depth wellhead completions off the coast of West Africa, that discovered lost cities in the Black Sea, that have scoured the world's oceans for mines, and that have successfully completed thousands of routine subsea missions. And the Model 1020 thruster is still being installed on new ROV and AUV systems worldwide.

And, like the Model 1020, Tecnadyme's twenty-one other thruster models have also served the offshore community with reliability, high performance and cost effectiveness – but none for quite as long as the Model 1020's 30 years. Tecnadyme is constantly developing and releasing new thruster models, with 4 new models released in 2010 and 4 models being released in 2013.

It is Tecnadyme's commitment to its customers and to the subsea community that no vehicle system, be it an ROV, an AUV, a manned submersible or any other subsea system, will ever be made obsolete because the Tecnadyme thrusters installed on that system are no longer available for a reasonable and competitive price.

So, for your next ROV, AUV or manned submersible build or purchase, be sure to specify only genuine Tecnadyme thrusters. You, your operators, your technicians and your customers will be glad you did – for the next 30 years.

## QUALITY ASSURANCE

Tecnadyme operates under a Quality Plan that is fully ISO 9001:2008 compliant. All electrical soldering is performed by technicians certified to the IPC J-STD-009 & IPC-A-610 standards.

## FINAL TEST & INSPECTION

All Tecnadyme products undergo a rigorous set of final test procedures. Each thruster is operated at reduced power and full power in both directions for extended time periods. Each 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 Tecnadyme are warranted to the original Purchaser for a period of one year from the date of shipment from the factory to conform to Tecnadyme'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 Tecnadyme's instructions as listed in the Operations & Maintenance Manual accompanying the thrusters.

Except for the express warranty set forth herein, Tecnadyme 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.

**BUILT WITH PRIDE**



**IN THE U.S.A.**



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