• 100-200w rotary actuator develops 10 ft-lb (13.5 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 1.5rpm to 75rpm with 8 input voltages of 24vdc to 300vdc.
• Holding or backdrive torque is 25%-50% of rated torque and actuator can be fitted with an optional electro-magnetic brake.
• 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 1.5rpm to 45rpm with a torque rating of 10 ft-lb (13.5 Nm). 75rpm with a torque rating of 5 ft-lb (7 Nm).

Input
100-200 W at voltages of 24 - 300vdc, +/-5v analog speed control or full digital servo speed, torque or position control.

Weight
2-4 lbs (1-2 kg) in air, 1.2-2.4 lbs (.6 - 1.1 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 10 is the smallest of Tecnadyne’s highly efficient, lightweight DC brushless rotary actuators. Capable of continuous, variable speed rotation in either direction, the Model 10 is perfectly suited for many applications on AUV’s, ROV’s, manned submersibles and subsea tooling packages.

Performance Characteristics
As with all of Tecnadyne’s rotary actuators, the Model 10 has multiple gearing stages. The first stage is always a 7/1 ratio planetary gearset; for extremely low output speeds multiple planetary stages are used. The final, output stage is always harmonic drive and these are available in ratios from 30/1 to 100/1. Using different combinations of ratios, Tecnadyne is able to supply Model 10’s with 12 output speeds ranging from 1.5rpm to 75rpm. The maximum output torque of 10 ft-lbs (13.5 Nm) can be achieved at all speeds of operation, from 0rpm to the maximum rated speed (the 75rpm version is limited to 5 ft-lbs or 7 Nm).

DC Brushless Motor
Employing a 3-phase DC brushless motor that has been optimized for high efficiency and low noise, the Model 10 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 10 motors are manufactured in the U.S. to the ISO 9001:2008 quality standard.

Depth Rating Options
The standard Model 10 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). The thruster is oil filled and pressure balanced using electrical cabling of flexible Tygon tubing. The oil filled configuration is rated to full ocean depth. Alternately, for shallow water applications, the Model 10 can be supplied with 1-atmosphere housings and internal electronics. This configuration is rated to 150 fsw (50 msw).

Voltagess Supported
The Model 10 is available for operation at voltages of 24vdc, 48vdc, 70vdc, 85vdc, 100vdc, 150vdc, 200vdc, 250vdc and 300vdc. Alternate voltages are possible but will result in maximum output speeds not currently listed in this datasheet. 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 10 can be supplied 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 (AMCL & AMCH), that operate in current, velocity or position mode (when coupled with a suitable external position sensor). The 50m depth rated, 1-atmosphere version of the Model 10 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.
Download STP solid model of this rotary actuator here:
http://www.tecnadyne.com/rotary_actuators

W/ 2-STAGE GEARBOX OPTION
(Output Speeds of 2 - 11 rpm)
(Available with 1-Atmosphere & Oil Filled Options)

W/ INTERNAL BRAKE OPTION
(Available with 1-Atmosphere & Oil Filled Options)

1-ATMOSPHERE, 1-STAGE GEARBOX VERSION
(Rated to 150 ft [50 m] Depth)
(Available with Internal Brake or 2-Stage Gearbox Options)

W/ 1-STAGE GEARBOX
(Output Speeds of 14 - 79 rpm)

ACTUATOR MOUNTING
10-32 UNF - 2B Ø 0.38
4X on 1.75 [44.4] PCD

OIL FILLED, 1-STAGE GEARBOX VERSION
(Rated to Full Ocean Depth)
(Available with Internal Brake or 2-Stage Gearbox Options)

Download STP solid model of this rotary actuator here:
http://www.tecnadyne.com/rotary_actuators
REMOTE ELECTRONICS MODULE, HPFX CONFIG
USED IN THE HPFX CONFIGURATION & INSTALLED IN CUSTOMER FURNISHED PRESSURE VESSEL.

To Motor Phases
Black, Phase A
Red, Phase B
White, Phase C
(#16, 0.5m length)

Power Input
Red, + Power
Black, Return
(#16, 0.5m length)

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

REMOTE ELECTRONICS MODULE, HPRX CONFIG
USED IN THE HPRX CONFIGURATION & INSTALLED IN CUSTOMER FURNISHED PRESSURE VESSEL.

To Motor Phases
Black, Phase A
Red, Phase B
White, Phase C
(#16, 0.5m length)

Power Input
Red, + Power
Black, Return
(#16, 0.5m length)

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
REMOTE ELECTRONICS MODULE, AMCL CONFIG
ADVANCED MOTION CONTROLS DPRALTE-020B080E.

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

Download STP solid model of this electronics module here:
http://www.tecnadyne.com/rotary_actuators

REMOTE ELECTRONICS MODULE, AMCH CONFIG
ADVANCED MOTION CONTROLS DPRALTE-015B200E.

Input Voltage Range
40vdc - 190vdc
Input Control Signals
+/10 analog, RS232 / RS485

Download STP solid model of this electronics module here:
http://www.tecnadyne.com/rotary_actuators
MODEL 10
CONFIGURATIONS & PART NUMBERING

10 - AAA - BB - CCCCC - XX - DD - EEEE - Y

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

<table>
<thead>
<tr>
<th>AAA</th>
<th>Voltage Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>24</td>
<td>24vdc</td>
</tr>
<tr>
<td>48</td>
<td>48vdc</td>
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<tr>
<td>70</td>
<td>70vdc</td>
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<td>85</td>
<td>85vdc</td>
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<tr>
<td>100</td>
<td>100vdc</td>
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<td>200</td>
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</tr>
<tr>
<td>250</td>
<td>250vdc</td>
</tr>
<tr>
<td>300</td>
<td>300vdc</td>
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</tbody>
</table>

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

<table>
<thead>
<tr>
<th>BB</th>
<th>Speed Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.5</td>
<td>1.5rpm, 100W, 2-stage</td>
</tr>
<tr>
<td>2</td>
<td>2rpm, 100W, 2-stage</td>
</tr>
<tr>
<td>3</td>
<td>3rpm, 100W, 2-stage</td>
</tr>
<tr>
<td>4</td>
<td>4rpm, 100W, 2-stage</td>
</tr>
<tr>
<td>6</td>
<td>6rpm, 100W, 2-stage</td>
</tr>
<tr>
<td>11</td>
<td>11rpm, 100W, 2-stage</td>
</tr>
<tr>
<td>14</td>
<td>14rpm, 120W</td>
</tr>
<tr>
<td>18</td>
<td>18rpm, 130W</td>
</tr>
<tr>
<td>24</td>
<td>24rpm, 150W</td>
</tr>
<tr>
<td>30</td>
<td>30rpm, 175W</td>
</tr>
<tr>
<td>45</td>
<td>45rpm, 200W</td>
</tr>
<tr>
<td>75</td>
<td>75rpm, 200W, 5 ft-lb</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>CCCCC</th>
<th>Connector Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCPBOF8M</td>
<td>Subconn MCPBOF8M, oil filled tubing, for oil filled, remote electronics only</td>
</tr>
<tr>
<td>MCPBOF10M</td>
<td>Subconn MCPBOF10M, oil filled tubing, for oil filled, remote electronics w/ brake</td>
</tr>
<tr>
<td>MHDG8CCP</td>
<td>Impulse MHDG-8-CCPOF, oil filled tubing, for oil filled, remote electronics only</td>
</tr>
<tr>
<td>MHDG10CCP</td>
<td>Impulse MHDG-10-CCPOF, oil filled tubing, for oil filled, remote electronics w/ brake</td>
</tr>
<tr>
<td>MCBH5M</td>
<td>SeaCon MCBH5M, bulkhead mount, no speed feedback signal, 50m 1-atmosphere only</td>
</tr>
<tr>
<td>MCBH6M</td>
<td>SeaCon MCBH6M, bulkhead mount, digital or analog speed signal, 50m 1-atm. only</td>
</tr>
<tr>
<td>MCIL5M</td>
<td>SeaCon MCIL5M, cable end, no speed feedback signal, 50m 1-atmosphere only</td>
</tr>
<tr>
<td>MCIL6M</td>
<td>SeaCon MCIL6M, cable end, digital or analog speed feedback signal, 50m 1-atm. only</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>DD</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>AL</td>
<td>6061-T6 Aluminum, Hard Anodized Black</td>
</tr>
<tr>
<td>SS</td>
<td>Type 316 Stainless Steel, Passivated</td>
</tr>
<tr>
<td>TI</td>
<td>6Al4V Titanium</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>EEEE</th>
<th>Option Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HPFX</td>
<td>Remote Electronics, Flat mount in customer 1-Atm. Housing, Oil filled full ocean depth actuator</td>
</tr>
<tr>
<td>HPRX</td>
<td>Remote Elec., Round mount in customer 1-Atm. Housing, Oil filled full ocean depth actuator</td>
</tr>
<tr>
<td>AMCL</td>
<td>Remote Elec., 20-80vdc, AMC DPRALTE in 1-Atm. Housing, Oil filled full ocean depth actuator</td>
</tr>
<tr>
<td>AMCH</td>
<td>Remote Elec., 40-190vdc, AMC DPRALTE in 1-Atm. Housing, Oil filled full ocean depth actuator</td>
</tr>
<tr>
<td>INTX</td>
<td>Internal Electronics, 1-Atmospher actuator, 150 fsw (50m) max. depth, +/-5v analog contol only</td>
</tr>
</tbody>
</table>

Y - Internal Brake Option

<table>
<thead>
<tr>
<th>Y</th>
<th>Option</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>Internal Brake Fitted</td>
</tr>
<tr>
<td>Y</td>
<td>No Internal Brake</td>
</tr>
</tbody>
</table>

or technical details on the referenced AMC controllers, please go to www.A-M-C.com
WHAT WERE YOU DOING 30 YEARS AGO?

In 1985 Tecnadyne 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, Tecnadyne’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. Tecnadyne is constantly developing and releasing new thruster models, with 4 new models released in 2010 and 4 models being released in 2013. It is Tecnadyne’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 Tecnadyne 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 Tecnadyne thrusters. You, your operators, your technicians and your customers will be glad you did – for the next 30 years.

QUALITY ASSURANCE
Tecnadyne 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 Tecnadyne 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 Tecnadyne are warranted to the original Purchaser for a period of one year from the date of shipment from the factory to conform to Tecnadyne’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 Tecnadyne’s instructions as listed in the Operations & Maintenance Manual accompanying the thrusters.

Except for the express warranty set forth herein, Tecnadyne 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.