“The TRV series has sufficient thrust to allow proven operations in currents up to 4 knots and down to depths of 3,300’ ...”

Wolfgang Burnside

TRV-005
Ultra High Thrust ROV
**Frame**
The TRV 005 Series has an open, angular frame made of T6061 marine grade aluminum which is designed to allow superior through flow for better hydrodynamics. The rugged frame is built to take abuse and allows secure mounting of any auxiliary equipment. Finally, the aluminum frame contributes significantly to the mass required for stability.

**Thrusters**
The thruster configuration on the TRV (Port, Starboard, Lateral and 2 x Verticals) allows for a 6 kt. Forward, 3 kt. Lateral and 4 kt. Aft capability. In addition, the TRV rotates 120º per second and provides the above performance figures at only 45% power. This is designed into the TRV whereby the desired performance is achieved without running the system at close to maximum power, thus providing greater reliability on all components.

**Modular Design**
In an attempt to minimize downtime, the TRV has a totally modular design. This allows minimum expertise to maintain the TRV, keeping the vehicle in a fully operational condition. Telemetry, Power and Capacitor bottles, HPU and Valve Pack are separate for easy change out. From convenient, easy to remove connectors, oil filled cables and simplicity in removing the foam block for complete access, the TRV was designed for the true offshore environment.

**Maneuverability**
TRV has the ultimate in vehicle maneuverability with ability to proceed Fore, Aft, Rotate, Lateral, Vertical (normal mode), Vertical (pitch mode).

**Independent Variable Gain on Thrusters**
To maximize pilot control, TRV has 0 to 100% Variable Thruster Gain on 2 circuits (Horizontals and Verticals).

**Pitch Mode**
Pitch and Roll Annotation in degrees, automatically displayed when selecting Pitch Mode.

**Cathodic Protection**
Ag/Ag/Chl Proximity Probe including CP Annotation with 1mvaccuracy

**Novatech Strobe**
Recovery strobe with pressure switch

**Sonar**
TRV 005 comes standard with an MS 1000 Sonar or comparable model as per client’s request.

**PA 500 Altimeter**
Altimeter standard on TRV

**Auto Altitude**
Accurate to ±1.2”

**Auto Heading**
Accurate to ± 2º

**Auto Depth**
Accurate to ± .5’

**Four-function HD Manipulator with Rope Cutter**
Hydro-Lek 4-function manipulator with 1” Rope Cutter.

**Cranes**
TRV comes standard with 4 Cameras: 1 x Color Camera with Zoom, Focus, Pan & Tilt, 1 x low-light Black & White with Pan & Tilt, 1 x 70º Colour manipulator camera and 1 x 50º Color camera with 360º rotate.

**Penetrators**
TRV comes standard with 3 spare penetrators to allow for additional functions as they become necessary.

**LED Lighting**
Five dual LED lights on 2 circuits with 0 - 100% variable gain.

**Tether**
TRV allows 1500’ excursions in live boat mode. Deeper options are available with side entry cage. TRV comes standard with a spare 1500’ terminated tether. Other tether lengths are available as per client’s request.

**Annotation**
Standard with 10 pages of user annotation including Heading, Depth, Altitude, Turns Counter, C.P., Pitch, Roll.

**Remote Joystick**
TRV comes standard with a remote joystick which is selected by the Pilot for launch and recovery assistance.
TRV - 005

ROV General Specifications:
Depth Rating .................................................. 3300 ft. (1000m) standard (deeper options)
Payload ................................................................. 30 lbs. (15 kg)
Height ................................................................. 18 in. (457 mm)
Length ................................................................. 60 in. (1524 mm)
Width (forward) ............................................... 36 in. (914 mm)
(aft) ................................................................. 48 in. (1219 mm)
Weight in Air .................................................... 550 lbs. (250 kg)

Maximum Static Thrust:
Forward ............................................................. 230 lbs.
Reverse .............................................................. 150 lbs.
Lateral ............................................................. 110 lbs.
Vertical .......................................................... 230 lbs.

Maximum Velocity: (100 ft. tether excursion)
Forward .......................................................... 3.08 m/s (6 kts)
Reverse ............................................................ 2.05 m/s (4 kts)
Lateral ............................................................... 1.54 m/s (3 kts)
Vertical ............................................................ Up to 3 m/s
Turning Rate ..................................................... 120° per second max.

Surface Control Unit:
Height ............................................................... 12.28 in. (312 mm)
Width ................................................................. 16.50 in. (419 mm)
Depth ............................................................... 22.25 in. (565 mm)
Weight ............................................................ 291 lbs. (132 kg)
SCU Power Requirements ................................. 220 VAC 30 25kw

Tether Dimensions:
Tether (standard length-live boat mode) ........... 3300 ft. (1000 m)
Diameter............................................................ 22.5 mm (.866 in.)
Weight in Air .................................................... 345 lb/kft (513 kg/km)
Weight in Seawater ......................................... 71 lb/kft (106 kg/km)
Breaking Load .................................................. 2500 lbf (11.2 kN)

Thruster Technology:
5 x Brushless DC motors with internal drive modules.

Chassis:
T6061 Aluminum

Buoyancy:
1000m Syntactic Foam (standard, deeper options available)

Hand Control Unit:
Height ............................................................... 3.25 in.
Width ............................................................... 8.5 in.
Length ............................................................. 12.0 in.
Weight ............................................................. 5.0 lbs. (2.27 kg)

Hand Control Functions:
Thruster Control: Fore, Aft, Lateral, Vertical (Normal), Vertical (Pitch), Rotate
0-100% Gain Control on Port, Stb. & Lateral
0-100% Gain Control on Verticals
0-100% Gain Control on Forward Bias
Auto Depth, Auto Heading, Auto Altitude
Thruster enable/disable
Normal/Pitch Mode Switch

Cameras: Pan, Tilt, Zoom & Focus on Colour Camera
Pan, Tilt Fixed Focus Colour Camera
Manipulator Colour Camera
Remote Control for aft 360° Colour Rotate Camera

Manipulators:
Swing Left/Right
Arm Up/Down
Jaw Rotate CW/CCW
Jaw Open/Closed

Lights: 2 x LED Light potentiometers 0-100% intensity

Remote Hand Control Unit:
Height .............................................................. 2.25 in.
Width ............................................................. 7.75 in.
Depth ............................................................ 4.75 in.
Weight ......................................................... 1.0 lbs.

Remote Hand Control Functions:
Thruster Control: Fore, Aft, Lateral, Vertical, Rotate, Thruster Enable/Disable Switch. Lights: On/Off (Full Intensity)

Sonar:
MS 1000 Sonar Head

Modular Components:
Telemetry Can, Power Can, Capacitor Bottle, HPU, 4-Function Valve Pack

Navigation:
Gyro/Fluxgate Combination w/pitch & roll.

Lighting:
5 x LED High Power Light Systems

Auto Functions:
Auto Depth, Heading & Altitude

Cameras: 4
Sony Color Zoom, Focus, Pan & Tilt
Low Light Colour, Pan & Tilt
Rotary Color 360° Viewing
Colour Manip Camera
Cameras on two Video CCT’s (any combination of two cameras can be viewed at any time)

Additional Vehicle Function:
Pilot-controlled vehicle pitch

Submersible Systems, Inc. P.O. Box 1843 / 333 Progresso Road, Patterson, LA 70392/ 985-395-0999/ www.ssirovs.com
**TRV-005: Frequently Asked Questions**

“Easy to fly, elegantly simple protocol to replace components to keep my project on schedule. A solid and reliable unit in its class.”  Peter Merullo, Semper Diving and Marine

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**TRV-005 Pitch Up and Pitch Down**

**Why have Pitch Control on the TRV-005?**

Pitch Control not only allows for safe / fast ascents to the surface whereby the Pilot can fly the vehicle directly to the Launch / Recovery site in a vertical plane avoiding the vessels propellers etc. Pitch also allows quick viewing of points of interest directly below or above the vehicle without tilting the Cameras. Descents in a vertical plane from the surface to the job site are also expedited due to the Sonar detecting the Target long before the vehicle reaches the seabed enabling the Pilot to fly directly to the Target rather than the 'norm' of operations where the Pilot would reach bottom and then attempt to acquire the Target, possibly stirring up the seabed in the process.

**Why do the TRV-005 Primary Camera's have fixed housings with internal Pan / Tilt?**

Having a dedicated Pan and Tilt mechanism with external Camera's installed will eventually lead to cable failure directly behind the Cameras. This is due to the constant flexing of the cables during Pan and Tilt operations, dedicated housings with internal Pan and Tilts eliminate these external cable problems as the cables are held in a fixed position. If a cable were to fail within the fixed Pan and Tilt housing this would be far easier and quicker to repair in the field.

**Why does the TRV-005 not use Fiber Optics for Data / Video?**

The main theory behind the TRV-005 design is 'Simplicity'; every component used on the TRV-005 has been carefully selected for reliability and ease of replacement in the field. Although Fiber Optics can be utilized in the TRV-005 system (as per Client spec), it is not an option that SSI would recommend due to the time, special equipment and experience required to repair in the field. The TRV-005 is designed to minimize down time should a component failure occur, having Fiber Optics in the system not only adds to the complexity but also increases the potential downtime.

**Why are there no Schematics of the Telemetry and Power Can in the Manual?**

Once again 'Simplicity' is the key, there are no field serviceable parts within the Telemetry or Power Cans. The TRV-005 system is provided with a complete Telemetry and Power Can as Spare which can replace the suspect unit onboard the vehicle while the suspected faulty unit is simply returned to SSI for repair / testing. Upon notification of a unit being returned to SSI for repair, an identical, fully tested and operational unit will be sent to the location immediately.

**Why does the TRV-005 have an Aluminum Chassis instead of the Polypropylene Frame which seems to be the Industry standard today?**

SSI believes in Stability for the Pilot, Video quality is primarily the end result of any Inspection / Survey vehicle, having Mass minimizes any undulations on the vehicle thereby providing a stable platform for excellent video images. As a side note: The Poly frames can also severely cut ROV personnel during Launch and Recovery handling due to the Poly frame being cut into by hard Marine growth etc creating sharp edges and protrusions which can lacerate individuals handling / working on the systems.
**General Specifications:**
- Depth Rating: 3300 ft. (1000m) standard (deeper options)
- Payload: 60 lbs. (27 kg)
- Height: 24 in. (610 mm)
- Length: 60 in. (1524 mm)
- Width: 48 in. (1219 mm)
- Weight in Air: 940 lbs. (426.37 kg)

**Maximum Static Thrust:**
- Forward: 230 lbs.
- Reverse: 150 lbs.
- Lateral: 110 lbs.
- Vertical: 230 lbs.

**Maximum Velocity: (100 ft. tether excursion)**
- Forward: 2.04 m/s (4 kts)
- Reverse: 1.53 m/s (3 kts)
- Lateral: 1.02 m/s (2 kts)
- Vertical: Up to 3 m/s
- Turning Rate: 120° per second max.

**Surface Control Unit:**
- Height: 12.28 in. (312 mm)
- Width: 16.50 in. (419 mm)
- Depth: 22.25 in. (565 mm)
- Weight: 291 lbs. (132 kg)
- SCU Power Requirements: 220 VAC 30 25kw

**Tether Dimensions:**
- Tether (standard length—live boat mode): 1500 ft. (500 m)
- Diameter: 22.5 mm (.886 in.)
- Weight in Air: 345 lb/kft (513 kg/km)
- Weight in Seawater: 71 lb/kft (106 kg/km)
- Breaking Load: 2500 lbf

**Thrust Technology:**
- 5 x Brushless DC motors with internal drive modules.

**Chassis:**
- T6061 Aluminum

**Buoyancy:**
- 1000m Syntactic Foam (standard, deeper options available)

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**Hand Control Unit:**
- Height: 3.25 in.
- Width: 8.5 in.
- Length: 12.0 in.
- Weight: 5.0 lbs. (2.27 kg)

**Hand Control Functions:**
- Thruster Control: Fore, Aft, Lateral, Vertical, Rotate
- 0-100% Gain Control on Port, Stb. & Lateral
- 0-100% Gain Control on Verticals
- 0-100% Gain Control on Forward Bias
- Auto Depth, Auto Heading, Auto Altitude
- Thruster enable/disable
- Normal/Pitch Mode Switch
- Auto Functions:
  - Thruster enable/disable
  - Normal/Pitch Mode Switch

**Remote Hand Control Unit:**
- Height: 2.25 in.
- Width: 7.75 in.
- Depth: 4.75 in.
- Weight: 1.0 lbs.

**Remote Hand Control Functions:**
- Thruster Control: Fore, Aft, Lateral, Vertical, Rotate, Thruster Enable/Disable Switch. Lights: On/Off (Full Intensity)
- Sonar: MS 1000 Sonar Head

**Modular Components:**
- Telemetry Can, Power Can, Capacitor Bottle, HPU, 2 x 4-Function Valve Pack

**Navigation:**
- Gyro/Fluxgate Combination w/pitch & roll.

**Lighting:**
- 5 x LED High Power Light Systems

**Auto Functions:**
- Auto Depth, Heading & Altitude

**Cameras:**
- 4
  - Sony Color Zoom, Focus, Pan & Tilt
  - Low Light Colour, Pan & Tilt
  - Rotary Color 360° Viewing
  - Colour Manip Camera
- Cameras on two Video CCT’s (any combination of two cameras can be viewed at any time)
**TRV - HD**

**Buoyancy:**
1000m Syntactic Foam (standard, deeper options available)

**Chassis:**
T6061 Aluminum

**Thruster:**
7 x Brushless DC motors with internal drive modules.

**Breaking Load:**
- Weight in Seawater: 71 lb/kft (106 kg/km)
- Diameter: 22.5 mm (.886 in.)

**Surface Control Unit:**
- SCU Power Requirements: 220 VAC 3kW

**Remote Hand Control Unit:**
- Hand Control Functions:
  - Thruster Control: Fore, Aft, Lateral, Vertical, Rotate
  - 0-100% Gain Control on Port, Stb. & Lateral
  - 0-100% Gain Control on Verticals
  - 0-100% Gain Control on Forward Bias
  - Auto Depth, Auto Heading, Auto Altitude
  - Thruster enable/disable

**Manipulator:**
- Cost: 1.0 lbs.

**Altimeter:**
- PA-500 (0-33 ft.)

**Hand Control Unit:**
- Height: 3.25 in.
- Width: 8.5 in.
- Length: 12.0 in.
- Weight: 5.0 lbs. (2.27 kg)

**Remote Hand Control Functions:**
- Thruster Control:
  - Fore, Aft, Lateral, Vertical, Rotate
  - 0-100% Gain Control on Port, Stb. & Lateral
  - 0-100% Gain Control on Verticals
  - 0-100% Gain Control on Forward Bias
  - Auto Depth, Auto Heading, Auto Altitude
  - Thruster enable/disable

**Cameras:**
- Pan, Tilt, Zoom & Focus on Colour Camera
- Pan, Tilt Fixed Focus Colour Camera
- Manipulator Colour Camera
- Remote Control for aft 360° Colour Rotate Camera

**Thruster Control:**
- 0-100% Gain Control on Port, Stb. & Lateral
- 0-100% Gain Control on Verticals
- 0-100% Gain Control on Forward Bias
- Auto Depth, Auto Heading, Auto Altitude
- Thruster enable/disable

**Depth Rating:**
- 3300 ft. (1000m) standard
- ... on two Video CCT's (any combination of two cameras can be viewed at any time)

**Altimeter:**
- PA-500 (0-33 ft.)

**Sonar:**
- MS 1000 Sonar Head

**Modular Components:**
- Telemetry Can, Power Can, Capacitor Bottle, 2 x HPU's, 2 x 7 Function Valve Packs

**Navigation:**
- Gyro/Fluxgate Combination w/pitch & roll

**Lighting:**
- 5 x LED High Power Light Systems

**Auto Functions:**
- Auto Depth, Heading & Altitude

**Cameras:**
- 4
  - Sony Color Zoom, Focus, Pan & Tilt
  - Low Light Colour, Pan & Tilt
  - Rotary Color 360° Viewing
  - Colour Manip Camera
  - Cameras on two Video CCT’s (any combination of two cameras can be viewed at any time)

**Altimeter:**
- PA-500 (0-33 ft.)
When comparing ROV Systems, it is the belief of Submersible Systems, Inc. That certain operational aspects must be investigated prior to investment. 

Questions that should be asked:

<table>
<thead>
<tr>
<th>Approx. time taken to return System to fully operational status</th>
<th>TRV 005</th>
<th>System 1</th>
<th>System 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Any possible Electronic/Telemetry Can Failure</td>
<td>45 min.</td>
<td></td>
<td></td>
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<tr>
<td>2. Tether Failure</td>
<td>45 min.</td>
<td></td>
<td></td>
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<tr>
<td>3. HPU Failure</td>
<td>20 min.</td>
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<tr>
<td>4. Valve Pack Failure</td>
<td>45 min.</td>
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<tr>
<td>5. Power Supply Failure</td>
<td>10 min.</td>
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<tr>
<td>6. Thruster Replacement</td>
<td>45 min.</td>
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<tr>
<td>7. Light Replacement</td>
<td>10 min.</td>
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<tr>
<td>8. C.P. Proximity Probe Replacement</td>
<td>10 min.</td>
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<td></td>
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<tr>
<td>9. Sonar Replacement 10 min.</td>
<td>10 min.</td>
<td></td>
<td></td>
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<tr>
<td>10. Camera Replacement</td>
<td>5-20 min.</td>
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</tbody>
</table>

Ease of Maintenance Scale: 1 (easy) - 10 (extremely difficult)

<table>
<thead>
<tr>
<th>Ease of Maintenance</th>
<th>System Comparison</th>
</tr>
</thead>
<tbody>
<tr>
<td>Debugging potential Electronic problems</td>
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</tr>
<tr>
<td>Debugging potential Electrical problems</td>
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</tr>
<tr>
<td>O-Ring inspection/replacement</td>
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<tr>
<td>Complete wash down of system</td>
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</tr>
<tr>
<td>System access</td>
<td>1</td>
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</table>

Spares as part of Standard Package

<table>
<thead>
<tr>
<th>Spares as part of Standard Package</th>
<th>Qty.</th>
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</thead>
<tbody>
<tr>
<td>Complete Telemetry Can</td>
<td>1</td>
</tr>
<tr>
<td>Complete Power Distribution Can</td>
<td>1</td>
</tr>
<tr>
<td>Complete Thruster</td>
<td>1</td>
</tr>
<tr>
<td>Complete Terminated 1500’ Tether</td>
<td>1</td>
</tr>
</tbody>
</table>

1 Year Warranty Standard with further Enhanced Service Plan options.
“Since 1989, we have been providing ROV Inspection services to Offshore Oil & Gas Telecom, Civil Engineering and the Marine Construction Sectors”

Sales Offices: USA, Singapore, and Scotland