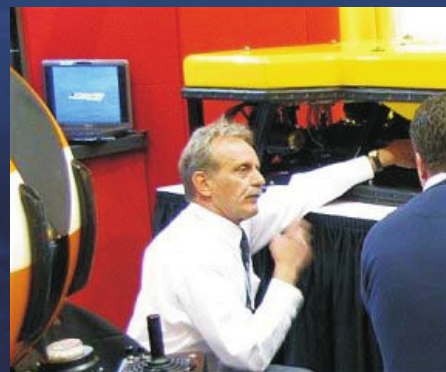
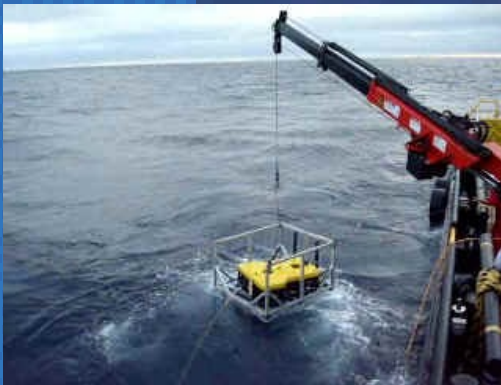




“The TRV series has sufficient thrust to allow proven operations in currents up to 4 knots and down to depths of 3,300’ ...”

Wolfgang Burnside



TRV-005
Ultra High Thrust ROV

TRV - 005 Series : Standard Features & Benefits



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 120° 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 1mv accuracy

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 $\pm 1.2''$

Auto Heading

Accurate to $\pm 2^\circ$

Auto Depth

Accurate to $\pm .5'$

Four-function HD Manipulator with Rope Cutter

Hydro-Lek 4-function manipulator with 1" Rope Cutter.

Cameras

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 70° Colour manipulator camera and 1 x 50° Color camera with 360° 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 3Ø 25kw

Tether Dimensions:

Tether (standard length—live boat mode)	3300 ft. (1000 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 (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/Close
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

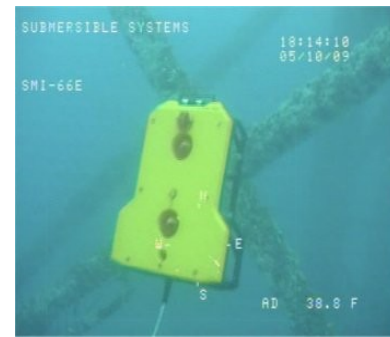
Sony Color Zoom, Focus, Pan & Tilt
Low Light Colour, Pan & Tilt
Rotary Color 360° Viewing
Colour Manip Camera
Cameras on two Video CCT's (any combination of two cameras can be viewed at any time)

Additional Vehicle Function:

Pilot-controlled vehicle pitch

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



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.

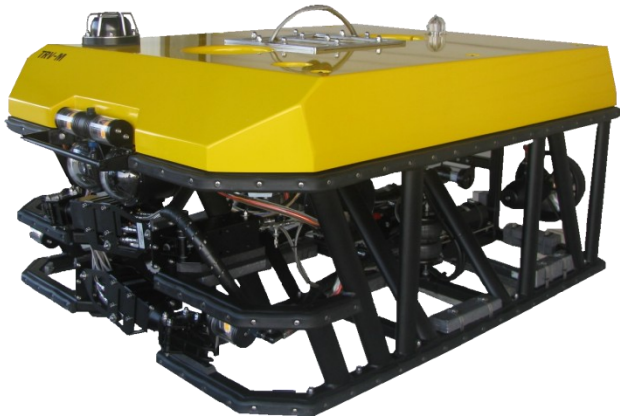
Why are there no Schematics of the Telemetry and Power Can in the Manual?

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.

TRV - M



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 3Ø 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

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, 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:	2 x 4 Function Swing Left/Right Arm Up/Down Jaw Rotate CW/CCW Jaw Open/Close
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, 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



ROV General Specifications:

Depth Rating 3300 ft. (1000m) standard
(deeper options)
Payload 300 lbs. (136 kg)
Height 36 in. (914 mm)
Length 67 in. (1700 mm)
Width (forward) 54.5 in. (1384 mm)
Weight in Air 1750 lbs. (795.45 kg)

Maximum Static Thrust:

Forward 460 lbs.
Reverse 300 lbs.
Lateral 110 lbs.
Vertical 230 lbs.

Maximum Velocity: (100 ft. tether excursion)

Forward 1.53 m/s (3 kts)
Reverse 1.02 m/s (2 kts)
Lateral75 m/s (1.5 kts)
Vertical Up to 2'/sec
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 3Ø 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 6500 lbf

Thruster Technology:

7 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, 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
Manipulators: 2 x RHD 5's
Swing Left/Right
Upper Arm Up/Down
Lower Arm Up/Down
Jaw Rotate CW/CCW
Jaw Open/Close
HPU Select Pump 1, Pump 2
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, 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.)

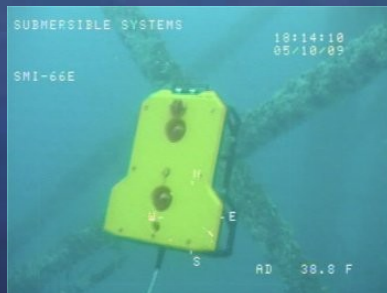
When comparing ROV Systems, it is the belief of Submersible Systems, Inc. That certain operational aspects must be investigated prior to investment.

Questions that should be asked:

<i>Approx. time taken to return System to fully operational status.</i>	TRV 005	System Comparison	
		System 1	System 2
1. Any possible Electronic/Telemetry Can Failure	45 min.		
2. Tether Failure	45 min.		
3. HPU Failure	20 min.		
4. Valve Pack Failure	45 min.		
5. Power Supply Failure	10 min.		
6. Thruster Replacement	45 min.		
7. Light Replacement	10 min.		
8. C.P. Proximity Probe Replacement	10 min.		
9. Sonar Replacement 10 min.	10 min.		
10. Camera Replacement	5-20 min.		
<i>Ease of Maintenance Scale : 1 (easy) - 10 (extremely difficult)</i>			
Debugging potential Electronic problems	1		
Debugging potential Electrical problems	1		
O-Ring inspection/replacement	1		
Complete wash down of system	1		
System access	1		
<i>Spares as part of Standard Package</i>			
Complete Telemetry Can	Qty. 1		
Complete Power Distribution Can	1		
Complete Thruster	1		
Complete Terminated 1500' Tether	1		

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

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