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INUKTUN SPECTRUM 45™ 150M DEEP WATER CAMERA

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About this Manual

This manual has been prepared to assist you in the operation and maintenance of your Eddyfi Technologies' Inuktun equipment. Correct and prudent operation rests with the operator who must thoroughly understand the operation, maintenance, service and job requirements. The specifications and information in this manual are current at the time of printing.

This product is continually being updated and improved. Therefore, this manual is meant to explain and define the functionality of the product. Furthermore, schematics or pictorials and detailed functionality may differ slightly from what is described in this manual.

Eddyfi Technologies reserves the right to change and/or amend these specifications at any time without notice. Customers will be notified of any changes to their equipment.

Information in this manual does not necessarily replace specific regulations, codes, standards, or requirements of others such as government regulations.

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Description

The Inuktun Spectrum 45™ (SP45) camera is an industrial video camera system for use in pipe inspection systems, harsh industrial environments and underwater. Standard features include focus, pan, tilt and a 150 m (500 ft) depth rating. The camera is usually made from anodized marine-grade aluminum, and stainless-steel versions are also available. Installation options include integration into a larger inspection system such as a Versatrax 100™ or used by itself as a drop camera or static system.

Typical applications include:

- Toxic environment inspection
- Underwater inspection
- Small diameter pipe inspection
- Foreign object search and assessment
- Dam and lock inspection
- Robotics and remote tooling
- ROV integration
- Caisson inspection
- Reactor vessel inspection
- Foreign object search and retrieval
- Corrosion evaluation
- Remote monitoring

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Specifications		
Operating Voltage		36 – 70 VDC
Operating Power		10 W Peak
Operating Current		280 mA Peak
Depth Rating		150 m (500 ft)
Speed	Pan	0 – 18 °/s
	Tilt	0 – 35 °/s
Range	Pan	360 ° Continuous
	Tilt	280 ° (-140 ° / +125 °)
Dimensions		45 x 163 mm (1.75 x 6.4 in)
Weight	Aluminum	0.7 kg (1.5 lb)
	Stainless Steel	1.2 kg (2.6 lb)
Imager	Sensor	1/4in CMOS (NTSC or PAL)
	Lens	f = 3.6mm
	Focus	Manual
	Horizontal Resolution	420 TVL
	Minimum Illumination	1.0 lux
	HFOV	47° (air)
	Depth of Field	10 mm (0.4in) to infinity
Lights		12 x High intensity LEDs
Maximum Tether Length		500 m (1,650 ft)
Operating Temperature		0 – 50 °C (32 – 122 °F)
Storage Temperature		-20° – 60 °C (-4 – 140 °F)

Certification

The product is built in accordance with:

Machinery Directive 2006/42/EC, and

Electromagnetic Compatibility Directive 2004/108/EC and Directive 2014/30/EU

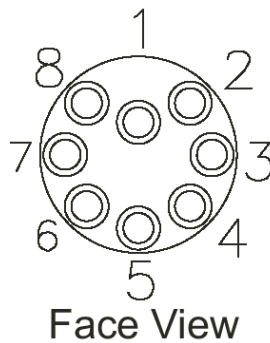


Connector Pin-Out

The Spectrum 45™ connects to power and communications through a Subconn MCBH8M connector on the back of the camera. Some versions have an Impulse connector – contact the factory if a pin-out is required.

Note: Pin-out is shown for the Bulkhead Connector on the camera.

Pin	Function
1	70 VDC GND (-)
2	70 VDC (+)
3	RS485A (+)
4	RS485B (-)
5	SpareA
6	SpareB
7	Video1 (+)
8	Video1 (-)



Safety

In order to be able to use this product properly and safely, every user must first read these operating instructions and observe the safety instructions contained therein. Take care of these operating instructions and keep them in a place where they can be accessed by everyone.



CAUTION: Failure to follow these safety instructions may result in injury or equipment damage.



WARNING: High Voltage 36-70 VDC. If the equipment is powered from a source other than an Eddyfi provided controller, the power supplied to the product must have reinforced isolation from the mains with no reference to earth ground.



CAUTION: Disconnecting the camera while the power is on can cause damage to the camera. Disconnect the power source before servicing the product.



WARNING: Spark Hazard - Under no circumstances should this equipment be used in a potentially explosive atmosphere.



WARNING: Intense Optical Radiation - The Spectrum 45™ camera lights are extremely bright. Never look directly at the lights. Use a welding filter (shade #8 or higher) if inspecting the LEDs.

- The Spectrum™ 45 camera is an industrial product. All personnel operating or maintaining this equipment must be competently trained.
- There are no user serviceable parts inside. This product may be serviced only by qualified technicians or trained personnel.
- Eddyfi Technologies Inuktun equipment is used in many varied environments from hot/dry to confined spaces to deep underwater. Such diverse environment risks must be addressed by the operators who are trained to work in such surroundings. As such, the operator is responsible to determine safe site setup and appropriate procedures for operation and maintenance of the equipment.
- Do not use the product or any component exposed to pressures higher than the rated working pressure.
- Do not operate the camera with a damaged connector or cable. Inspect connectors and cables regularly for damage.
- Call the Eddyfi Technologies service department for assistance or service if needed.

System Setup

Unpacking Components

The Spectrum 45™ camera is shipped in a rugged case or is installed on an integrated system. Packaging is selected to protect the camera from damage during shipping or storage. Upon receiving your system, check the case and contents for any damage that may have occurred during transport. Should any of these components be missing or damaged, please notify your vendor. We suggest that when the system is re-shipped or stored for any length of time, it should be re-packaged in its original case or be put in a cardboard box encased in high-density foam. It is also strongly advised that the case be placed in a cardboard box again for shipping purposes. This measure greatly reduces rough handling and subsequent shipping damage.

Mounting the Camera

The Spectrum 45 camera may come installed on an Eddyfi robotic vehicle using 3x SS M3 SHCS. The camera may be mounted in any orientation.

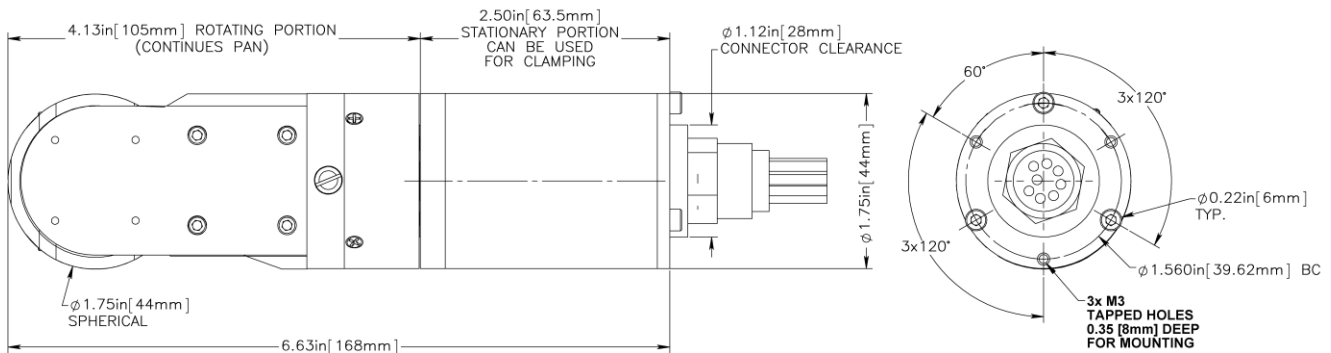
For custom mounting, the rear end cap has three clearance holes for M3 screws and the tube has three M3 tapped holes to be used for a custom-made mounting bracket – see figure below. Remember to provide minimum $\varnothing 28$ mm ($\varnothing 1.12$ in) clearance for the connector and locking collar. The camera may be mounted in any orientation.

Alternatively, the camera may be clamped around the stationary portion of the 44.5 mm (1.75 in) diameter housing. Take care that clamping arrangements do not scratch the anodizing.



CAUTION: Avoid forcing the TILT mechanisms by hand. It will wear the tilt clutch discs. It will wear the clutch discs and could cause premature failure.

The PAN mechanism is designed with a magnetic clutch and can be moved by hand indefinitely.



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Galvanic Corrosion Control

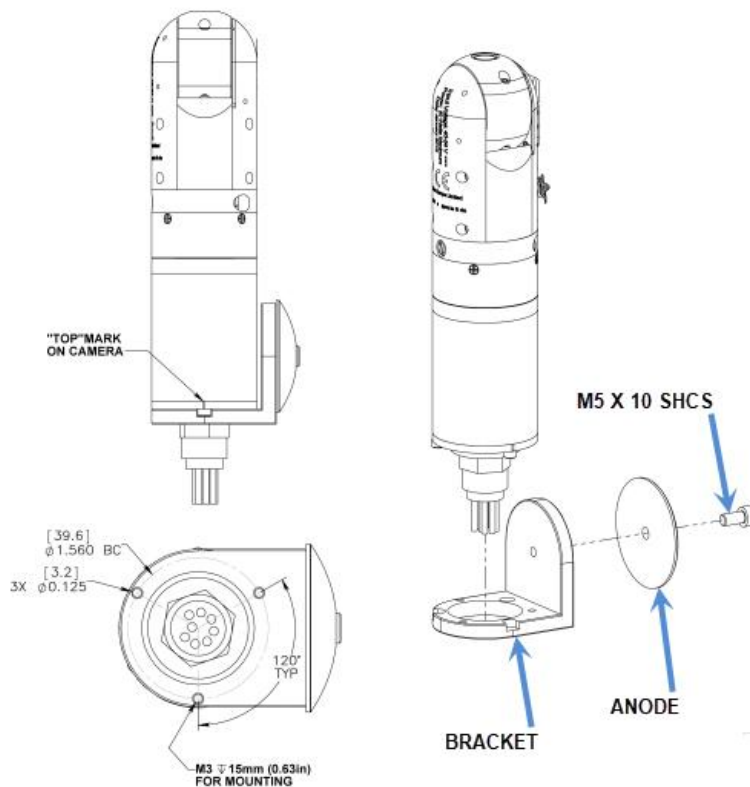
Eddyfi strongly recommends stainless steel cameras for salt water environments or other corrosive environments. The camera warranty is conditional when aluminum body cameras are deployed in these kinds of applications.

Cathodic protection is required whenever the camera is being deployed in a salt water environment – either submerged or in salt spray, regardless of camera material.

Eddyfi cameras use **aluminum** marine anodes for both stainless and aluminum cameras. Aluminum anodes are common in the marine industry and are replacing zinc anodes in many areas. For cameras systems that are often pulled in and out of the water, aluminum anodes are especially important, as zinc anodes tend to scale over when exposed to air and may not reactivate when submerged again. An aluminum anode will always reactivate.

It is required that the structure to which the camera is mounted also be protected by **aluminum** anodes. If the structure is of a dissimilar metal, the camera mount must be isolated from the structure. Do not mix anode types (zinc and aluminum) on the assembly. There must be only one anode type throughout the structure. Magnesium anodes must never be used with Spectrum™ camera installations.

Anodes are installed onto the camera as illustrated below. The anode is installed onto the mounting bracket using an M5 x 10mm 316 SS SHCS. Contact your sales representative for replacements.



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Connector Handling

Connectors are an essential part of system reliability. They should be properly maintained and cared for to ensure long life and reliability. It is recommended to follow these steps to help prevent damage and increase the life of connectors.

- Always put the cap back on the tether bulkhead when the tether is disconnected
- Always inspect the end of the connector prior to engaging
- Never plug in a dirty or damaged connector
- Visually align key-ways or locating pins prior to engaging the connector
- Always fully engage or tighten the connector
- Secure locking collars finger tight
- Install dummy plugs on unused connectors
- Disconnect by pulling straight, not on an angle
- Do not pull on the cable to disengage the connector



IMPORTANT: Never “Hot Plug” any connector, this will result in internal damage to the electronics. Power down the system prior to connecting the inspection system tether.

Note: Never use WD-40 or similar solvent-based fluids on connectors or crawlers. These will cause the rubber parts of the connector or crawler to soften and swell rendering them inoperable.

SubConn Connector: Lubrication and Cleaning

- Periodically apply Molykote 111 silicone grease or equivalent before mating connectors
- For dry mate connections, a layer of grease corresponding to 1/10 the socket depth should be applied to the female connector
- After greasing, fully mate the male and female connector and remove excess grease from the connector joint
- General cleaning and removal of sand or mud on a connector should be performed using a spray-based contact cleaner like isopropyl alcohol

Impulse Connector: Lubrication and Cleaning

- Lubricate mating surfaces regularly with 3M Silicone spray or equivalent, DO NOT GREASE
- Lubricate O-rings with Molykote 111 or equivalent
- Use dust caps to protect connectors wherever possible
- Clean connectors with soap and fresh water, rinse out with alcohol and allow connector to air dry before using.

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Operation

Pre-Operations Check

A Pre-Operations check should to be carried out prior to every camera mission.

1. Visually inspect the camera to ensure that there is nothing jamming the movement.
2. Check the camera cable for cuts, tears, etc.
3. Check that the camera connector is fully engaged and that the locking collar is finger tight.
4. Ensure that all other cables are properly connected including the monitor.
5. Clean the camera port (window).
6. Power up and test all camera functions. This includes adjustability of the lights and **full** pan and tilt movements.
7. Verify the functionality of your monitor and video recording equipment. At this time verify the functionality of the video overlay, zoom and manual focus settings.

Post-Operations Check

A Post-Ops inspection should be carried out after every camera mission.

1. The system should be visually inspected for mechanical damage.
2. If the system has been used in salt water, thoroughly rinse the camera and pole with fresh water right away. Accelerated corrosion will result if the camera is not rinsed properly. Pay close attention to rinsing and cleaning the spaces between moving parts.



CAUTION: Do not use a pressure washer to clean the camera. Very high-pressure water can push past seals and flood the camera resulting in electrical damage or personal injuries.

3. Clean off the camera and remove objects or debris from between its moving parts.
4. Visually check through the camera port to ensure that no water has entered the camera.
5. Inspect the camera cable for cuts, nicks or kinks. Store the camera in its rugged case with the connector sufficiently protected.

ICON™ & ICON™ RPT

Camera control and video recording are accomplished using ICON graphical interface controller software. Video playback and reporting are conducted through ICON RPT. **Manuals for these two software packages are included separately.** Controls for recording and snapshot functions are kept on-screen with the camera controls.

- ICON Manual – (Control Interface and Recording)
- ICON RPT Manual - (Reporting, Playback and Video Export)

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Troubleshooting

Camera Control Problems

1. Not all the auxiliary lights are on.
 - The ICON™ software allows the lights to be controlled independently. Ensure all lights are enabled. Refer to the ICON interface manual.
 - Inspect for blown LEDs.



CAUTION: High Intensity. Do not look directly into the lights. Use a welding filter (shade #8) to observe the light elements.

2. Camera tilt does not function in one or both directions.
 - Check that the camera is not jammed.
 - If you can hear a motor running but see no movement, there is a mechanical or clutch problem inside the camera. Contact us.
3. Camera is moving very slowly.
 - Check the tilt speed in the camera control window. Refer to the ICON user interface manual.

Video Problems

1. No video (black or blue background).
 - Interface box is not turned on.
 - Video cables are not hooked up between interface box and computer.
 - Camera connector on vehicle is loose (turn power off first before plugging in camera).
 - Check monitor input settings.
 - Vehicle power is not on.
 - Check for problems with other video components between the computer and monitor.
 - Try a different monitor. Whole days have been spent on field maintenance trips only to discover a faulty monitor.
2. Picture is very dark or very bright.
 - Check the light levels of both the camera and main lights.
3. Intermittent picture.
 - Check and replace the video cables.
 - Check the monitor is working properly.
 - Check that the camera harness whip is fully plugged in.
 - Check for intermittent breaks in the camera harness cable.
 - Check the tether connectors at both controller and vehicle.
 - Check for tether or slip ring damage by testing tether continuity.
4. Picture is blurry, will not focus, or has poor color.
 - This may be a dirty camera view port, or a narrow object lying in front of the view port.
 - Object may be too close to the camera.

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Maintenance

Tether Re-termination

Tether termination is a specialized service beyond the scope of this manual. Contact Eddyfi Technologies if the tether is damaged or requires re-termination.

Rinsing and Cleaning

After every mission check to see if the camera needs cleaning.

1. If the system has been used in salt water, thoroughly rinse the camera with fresh water prior to being stored away. Accelerated corrosion will result if the inspection system is not rinsed properly. Pay close attention to rinsing and cleaning the camera window, LED lights dome and the spaces between moving parts.
2. Use an open hose or tap at regular water line pressure for rinsing. Do not pressure wash the equipment – water will be forced into the camera at these high pressures.
3. Avoid scratching the camera port. Use glass cleaner and a soft cloth to clean the port.



CAUTION: Do not use a pressure washer to clean the camera. Very high-pressure water can push past seals and flood the components resulting in electrical damage or personal injuries.

Periodically:

1. Use a damp cloth or spray cleaner for the power supply / controller box. The box must never be sprayed down or immersed in water. Unplug the controller before cleaning.
2. For general cleaning of the camera, use a mild detergent.

Factory Maintenance

The Spectrum 45™ camera is equipped with a number of rotary surface seals that have to operate with close tolerances to achieve the 150 m (500 ft) depth rating. It is of the utmost importance that the sealing surfaces are protected from scratches during maintenance work. When seals are removed or replaced the sealing surfaces and seals must be clean and sufficiently lubricated before installation.

To re-certify a camera's depth rating we recommend the camera be serviced at Eddyfi Technologies in-house service centre.

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Parts and Repairs**Ordering Parts/Customer Service**

Spare and/or replacement parts are available for your product and can be ordered directly from your local office.

When ordering parts, always make sure to quote the sales order acknowledgement (SOA) number and (or) the serial number of the system component in question.

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Warranty Repairs

Warranty conditions are specified in the Warranty section. Should any conditions of the manufacturer's warranty be breached, the warranty may be considered void. All returned items must be sent prepaid to Eddyfi Technologies at the above address.

Factory Returns to Canada

Some sub-assemblies of your Eddyfi Technologies product are not field-serviceable and may need to return to the factory for repair. Warranty claims must return to the factory for evaluation.

To return an item for evaluation or repair, first contact Eddyfi Technologies at our toll-free number or e-mail address. Eddyfi Technologies will supply a Return Merchandise Authorization (RMA) number with detailed shipping and customs instructions. Items shipped without an RMA number will be held at Eddyfi Technologies until the correct paperwork is completed. If cross-border shipments are not labelled as per the instructions, the items may be held by customs and issued additional fees.

All returned items must be sent prepaid unless other specific arrangements have been made.

When the product or system is being shipped anywhere by courier or shipping company, it must be packaged in the original packaging it was received in. This measure greatly reduces the consequences of rough handling and subsequent shipping damage.

Eddyfi Technologies cannot be held responsible for damages due to improper packaging. Shipping damage may have significant impact on repair turnaround times.

Product/System Drawing Package Availability

Mechanical assembly and electrical wiring diagram drawing packages for your equipment are available in PDF format upon request. Printed copies may also be purchased from Eddyfi Technologies. Contact your local sales contact for more information.

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Limited Warranty Policy

Eddyfi Technologies will repair or replace, at its expense and at its option, any system or component, subject to the limitations and / or exclusions specified herein, which in normal use has proven to be defective in workmanship or material provided that, within one (1) year of the purchase date, the original purchaser returns the product prepaid, accompanied by proof of purchase, from a sales agent authorized by Eddyfi Technologies, and provides Eddyfi Technologies with reasonable opportunity to verify the alleged defect by inspection.

Warranty Limitations and/or Exclusions:

1. This warranty does not apply to light bulbs.
2. Batteries, fuses, transistors, integrated circuit modules (IC's), voltage regulating devices and electrical plugs and / or connectors are warranted to be free from defects in material and workmanship for a period of ninety (90) days from the date of shipment to the original purchaser.
3. Any article purchased from, but not manufactured by, Eddyfi Technologies is sold with only such warranties as are made by the manufacturer therein. Eddyfi Technologies only warrants that it has title thereto, free of all liens or encumbrances.
4. This warranty does not apply to units which are damaged by connection to improperly wired AC receptacles.
5. Track belts, tethers, view ports and other components subject to wear through abrasion are warranted to be free from defects in material and workmanship for a period of ninety (90) days from the date of shipment to the original purchaser.
6. Any damage caused by failure to observe proper packing or to observe instructions for operation and maintenance as contained in the Instruction Manual furnished with the equipment, by accident in transit or elsewhere, will not be covered by the warranty.
7. Repairs are warranted for 90 days.

Eddyfi Technologies may require that certain components may be returned, prepaid, to a manufacturer's authorized station for inspection and repair or replacement.

Eddyfi Technologies will not be responsible for any asserted defect which has resulted from Acts of God, normal wear, misuse, abuse, improper configuration, repair, or alteration made, or specifically authorized by, anyone other than a representative of Eddyfi Technologies authorized to do so. The giving of, or failure to give, any advice or recommendation by Eddyfi Technologies shall not constitute any warranty by, or impose any liability on, Eddyfi Technologies.

The foregoing constitutes the sole and exclusive remedy of the purchaser and the exclusive liability of Eddyfi Technologies and is in lieu of any and all other warranties, express, implied or statutory as to merchantability, fitness for purpose sold, description, quality productiveness, or any other matter. Under no circumstances shall Eddyfi Technologies be liable for special, incidental or consequential damages, or for delay in performance of this warranty.

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