

HI-DEF

INSPECTION SYSTEMS



RVI + FOSAR

Remote Visual Inspection,
Foreign Object Search & Retrieval



Insight Into Your Assets

What you don't know about your critical plant assets and infrastructure can develop into significant risks. Sensor Networks, Inc. delivers the visual inspection tools you need to see inside and inspect process and pressure components for cleanliness and mechanical damage; helping you assess conditions and retrieve loose parts.



process



utilities



environmental

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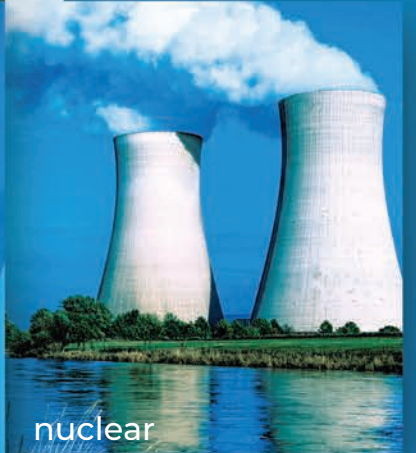
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oil & gas



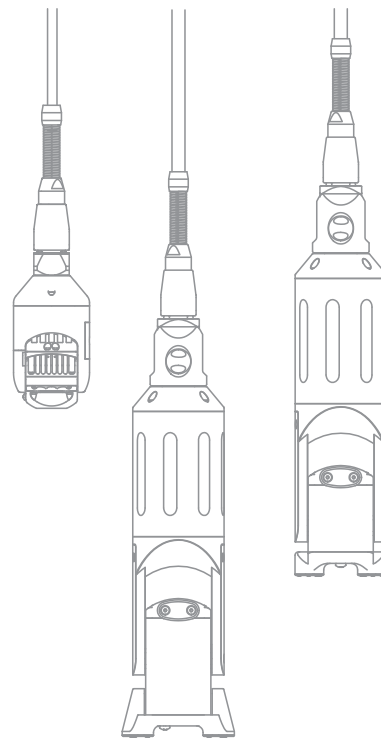
aerospace



nuclear

Innovation

At Sensor Networks, we combine new technologies with novel approaches for monitoring asset integrity, giving you advanced tools to keep your systems operating safely, productively, and efficiently.



Expertise

Drawing on more than 100 years of combined experience in visual inspection across a range of industrial sectors, our team takes the guesswork out of applications engineering. Trust us to bring the best technologies and techniques to bear on your inspection challenges.

Reliability

More than thirty Fortune 500 companies already rely on our technology and team to gain better insight on their critical infrastructure.



Hi-Def Systems



- Versatile solution for control room shelf
- Compact ergonomic design with intuitive rear panel connections
- All cable connections on rear panel
- Low-Voltage DC input, NRTL-approved AC adapter
- Magnetic swivel mount for display / recorder
- One power cord, no additional outlets needed

Modular System

Integrated System

- Portable one-hand carry solution
- High-strength composite construction for 20% less weight
- Compatible with all Hi-Def PTZx Cameras
- Spools 150 feet (45m) of integrated cable
- Swing-out built-in display / recorder
- One power cord, no additional outlets needed
- Low-Voltage DC input, NRTL-approved adapter



Understanding HD

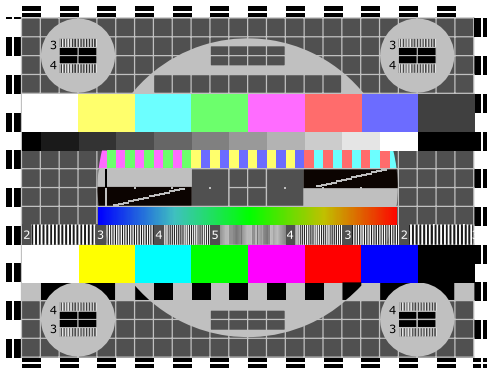
All Sensor Networks RVI tools are now Hi-Def

6:1 Pixel Improvement

345,600 pixels is typical of Standard Video vs. 2,073,600 for HDTV. That's a 6:1 ratio improvement just in pixel resolution not to mention HDTV's significantly improved color fidelity.

Resolution

High definition television offers a much higher resolution than standard definition video. While a typical analog broadcast in the U.S. contains a maximum of 525 horizontal lines of resolution, an HDTV signal supports over 1000 HTVL (1920 Horizontal pixels).



Video test-pattern charts like this one are used to assess the camera system's ability to accurately translate color.

Aspect Ratio

While previous broadcasts used a 4:3 ratio (4 units wide for every 3 units tall), HDTV uses a ratio of 16:9. This wider aspect ratio more closely emulates how humans see the world, making the image appear more realistic.

Color Rendition

HDTV systems provide precise and vivid representation of color. This is important for certain industrial inspections where subtle color variations become meaningful to the examination.

Full HDTV - 1080p (1920 x 1080)

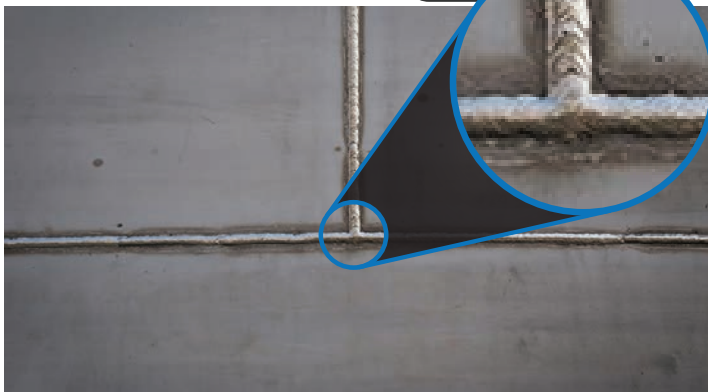
HDTV - 720p (1280 x 720)

Standard Definition (720 x 480)

This chart shows a simplified comparison of NTSC (Standard Video) in lower-left corner compared with medium resolution (720p) and high-res full HDTV (1080p).

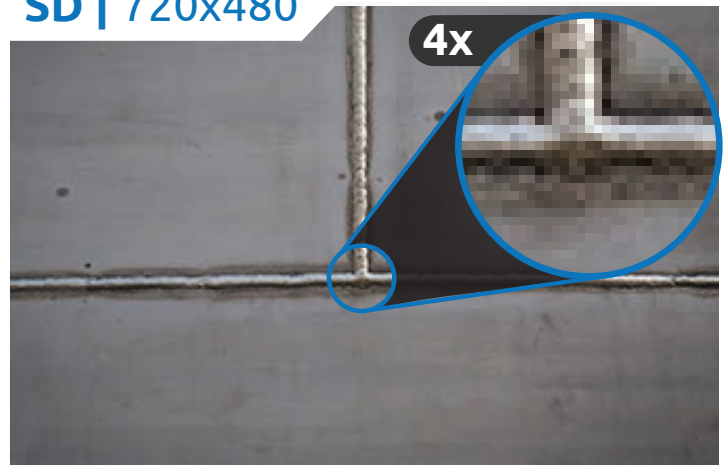
HD | 1920x1080

4x



SD | 720x480

4x



Hi-Def PTZ^X

PTZx includes everything you need to perform tank, vessel or large-area inspections of piping and facility infrastructure. Even with 100 feet of cable, cable reel, monitor and digital recorder, this system weighs under 30 lbs. (14 kg) and can be carried with one hand. The result of decades of RVI experience, PTZx is rugged, reliable, waterproof and easy-to-use.

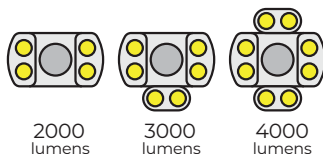


variable-speed pan with 360-degree continuous rotation

corrosion-resistant nickel-plated aluminum with stainless steel

submersible to 100 ft (30m)

integral & optional auxiliary LED lamps



2000 lumens

3000 lumens

4000 lumens

30x or 10x optical zoom

high-res camera with sensitivity control for reflective surfaces

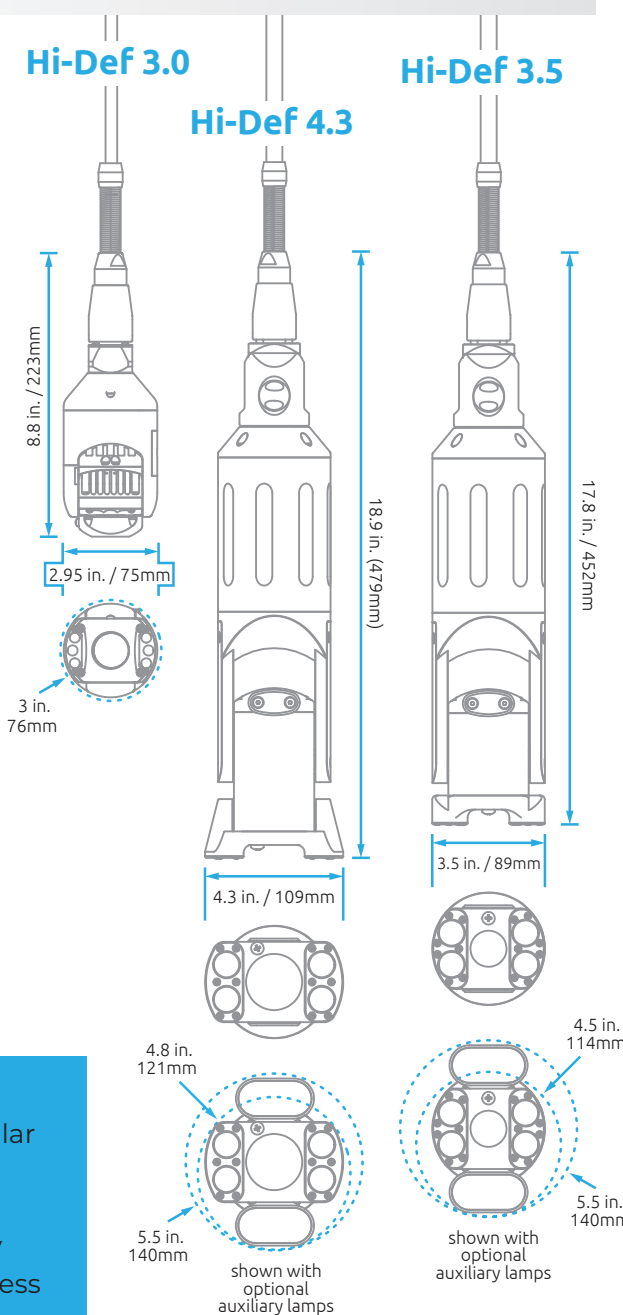
variable-speed 270 degree tilt (244 degree for Hi-Def PTZx35)

Three interchangeable camera heads

Hi-Def 3.0

Hi-Def 4.3

Hi-Def 3.5



digital video recorder & monitor

- 7 in (178mm) FHD display
- Records 1080p video in ProRes[®] or DNx format
- 64 GB SD card
- Microphone

control unit

- 150 ft (45m) reel or modular
- Adjustable zoom lens
- Auto/manual focus
- Adjustable light intensity
- Adjustable video brightness
- Camera position memory
- Image control

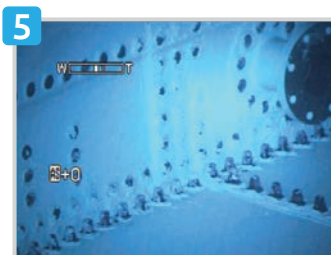
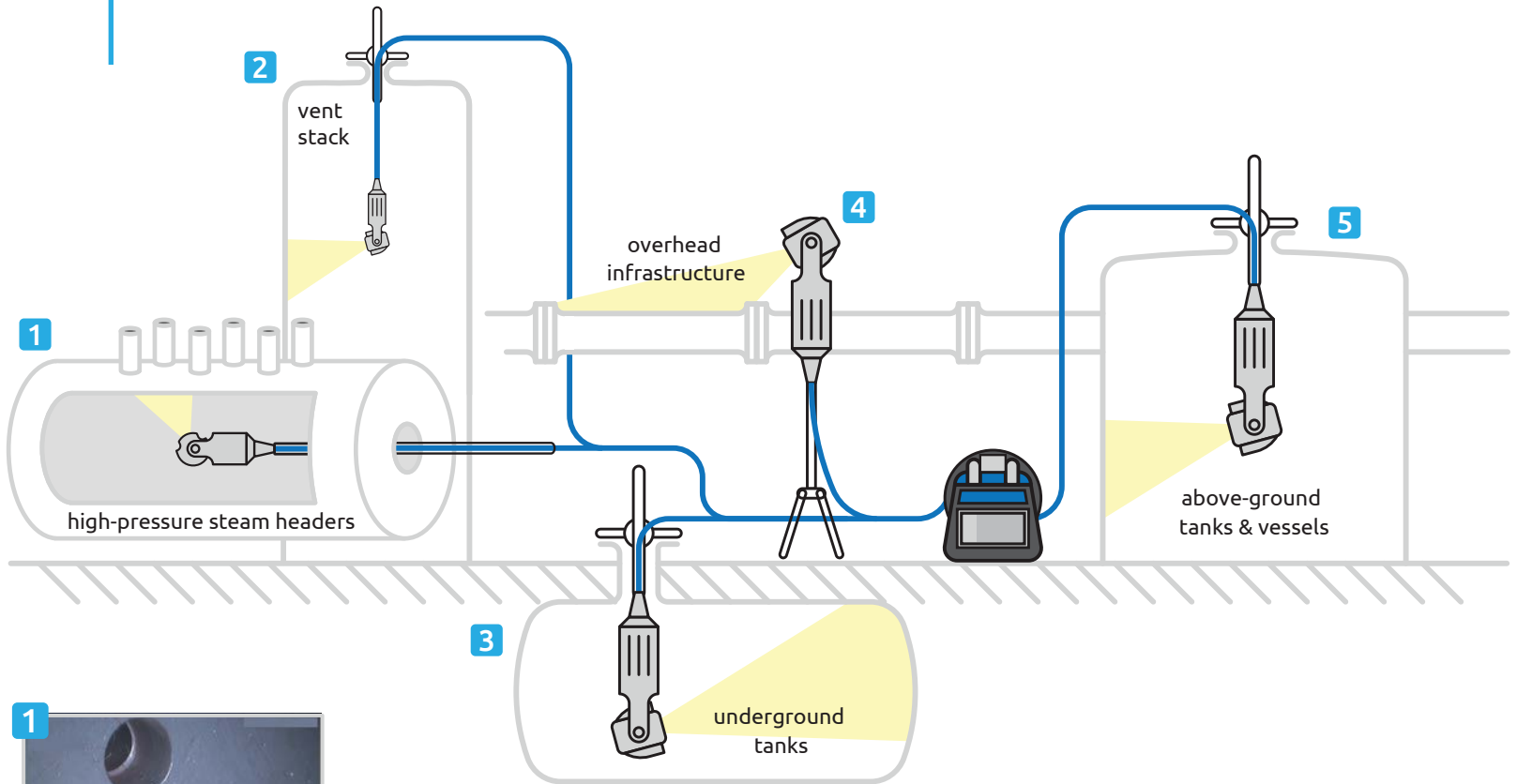
Three interchangeable camera heads

applications

Nuclear Power: Reactor pressure vessel and cooling pumps, steam generator channel head, nozzle welds, fuel pool, fuel assembly, spent fuel, IWE/IWL exams.

Fossil Power: FAC & MIC inspections, baffle plates, HP steam headers, tank and vessels.

Refining & Petrochemical: Tray-towers, refractory- and glass-lined vessels, tanks, pipe racks, heat exchanger internals, baffle plates.



lowering pole

- 6 ft (1.8m) length each
- connect two or more

tank flange mount

- mounts to flanged openings Ø 4-24 in.
- clamps pole to stabilize camera at any angle

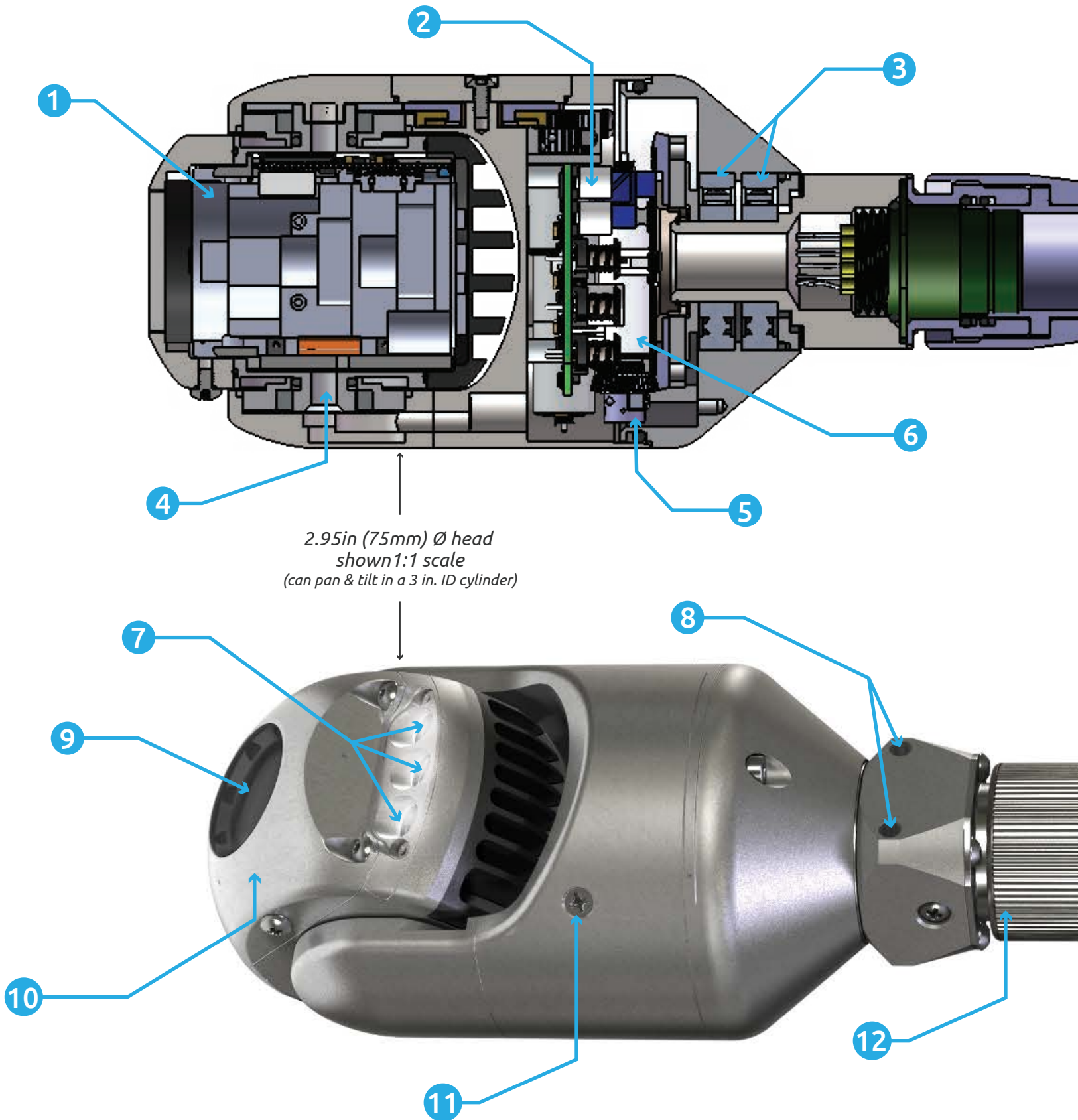
lifting hoist ring

- mounts to pole end
- attaches to safety lanyard



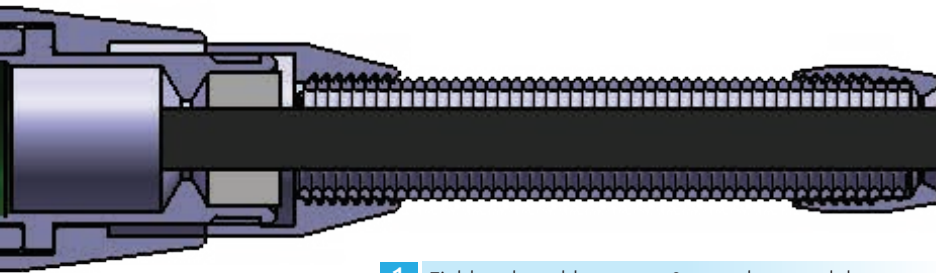
PTZ text overlay with data

Hi-Def PTZTMX



TECHNOLOGY EXPOSED

12 precision-engineered reasons to specify SNI's Hi-Def Pan-Tilt-Zoom product line



1	Field replaceable camera & zoom lens module	User can easily replace the camera module due to radiation failure
2	Digital control circuit board	Tested & improved radiation tolerance
3	O-ring, pan & tilt -axis seals	Reliable, time-tested, design allows for use at up to 100 ft. (30m) submerged in water
4	Rotary sensors on tilt and pan axis	Monitor, recorder, or frame grabber displays pan & tilt position
5	Miniature slip clutches	Clutch-protected drivetrain protects motors for manual positioning
6	High-energy, rare-earth magnet DC motors/gearboxes	Enables a small, compact and rugged pan & tilt gimbal
7	Broad-spectrum white LED lighting	Wide-angle and narrow-angle lighting for close and far viewing
8	M6-Threaded mounting points	Easily attach the PTZ head to tooling or robotic end-effectors
9	Field-replaceable window	Radiation-tolerant glass for lens and lighting
10	Aircraft-grade anodized aluminum construction	Provides for a light-weight & rugged camera head. Wide range of over-head and horizontal applications
11	Purge & pressure point	User can fill and monitor the camera with dry, inert gas with positive pressure
12	Rugged mil-standard connector with 500 lbs (2.2kN) strain relief	Two steel cables anchor camera body to cable



Decades of experience have gone into the design of SNI's cameras and inspection systems

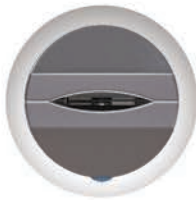
loose parts retrieval tooling

fits through
1.5 in. (38mm) Ø access
submersible up to
100 ft. (30.5m)
in water

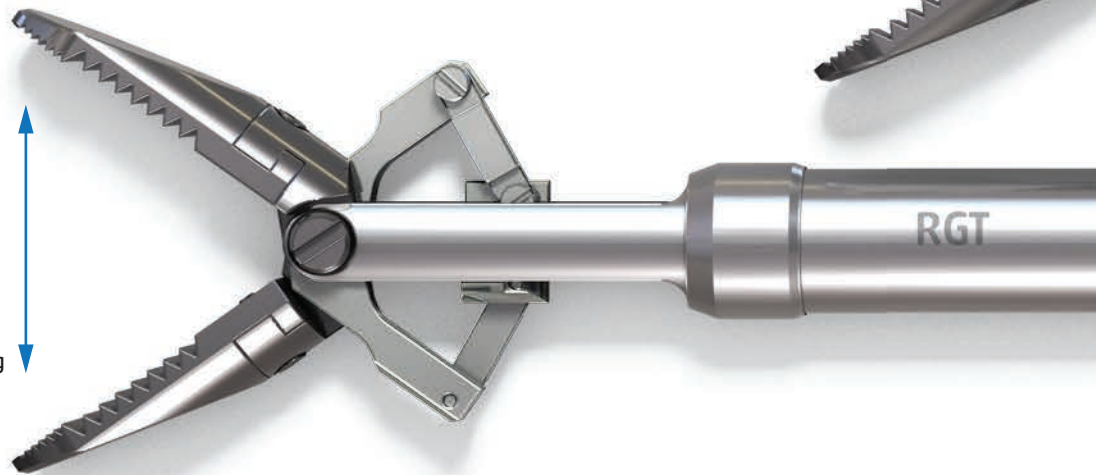


3.2 in. (81mm)
max. jaw opening

fits through
1.0 in. (25mm) Ø access



3.2 in. (81mm)
max. jaw opening



jaws

left to right: serrated jaws, long serrated jaws, curved serrated jaws, fork & tine, needle nose, magnet, snare, hook, sampling cups



delivery devices

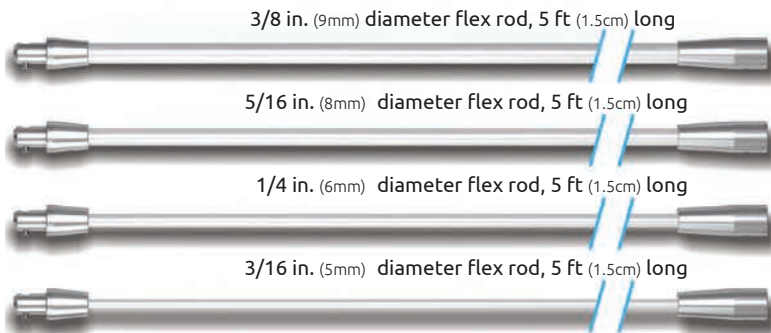


adjustable elbow

rubber flex joint

spring flex joint

6 in. (152mm) extension



3/8 in. (9mm) diameter flex rod, 5 ft (1.5cm) long

5/16 in. (8mm) diameter flex rod, 5 ft (1.5cm) long

1/4 in. (6mm) diameter flex rod, 5 ft (1.5cm) long

3/16 in. (5mm) diameter flex rod, 5 ft (1.5cm) long

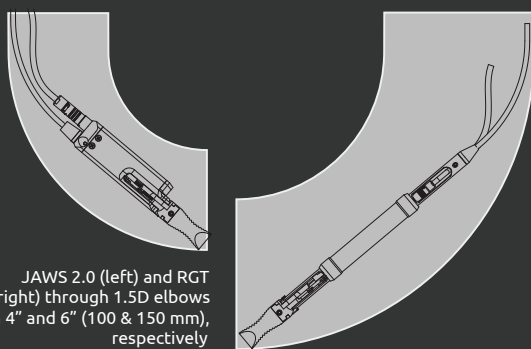
lowering ring



maneuvering ring



T-handle for rotational control



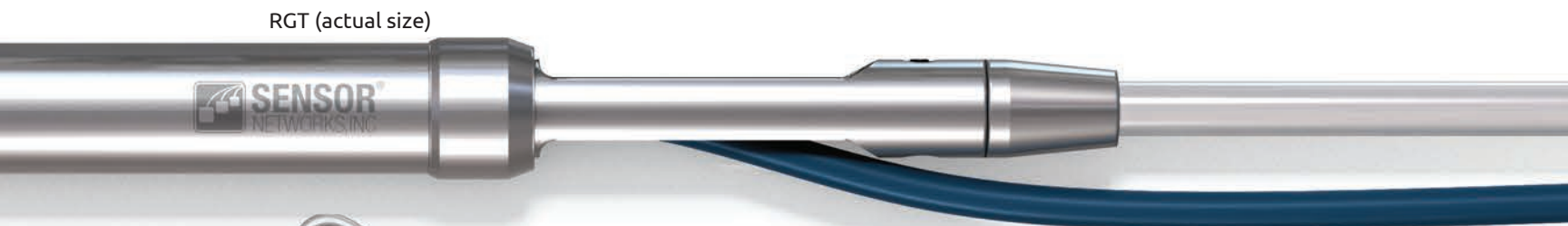
JAWS 2.0 (left) and RGT (right) through 1.5D elbows in 4" and 6" (100 & 150 mm), respectively



Large 1 in. drive impact socket retrieval with RGT



JAWS 2.0 with camera and illumination (actual size)



RGT (actual size)



RGT controls



JAWS 2.0 controls

JAWS 2.0 basic kit *blue items included*
14x22x8 in., 12 lb (5.5kg)



JAWS 2.0 ultimate kit *all contents*
15½x25x8½ in., 19 lb (8.6kg)



kits:

standard components: JAWS 2.0 HD grabber • JAWS 2.0 HD display/controller • AC adapter/charger • operator manual • 50 ft (15m) power/video cable • 50 ft (15m) power/video extension cable

Jaw Sets: short serrated jaws • fork and tine • flat serrated jaws • sampling cups • curved serrated jaws • tool adapter • needle-nose jaws

tools: snares: sm & lg • magnets: sm & lg (w/case) • hooks: sm, med, lg, xl (four) hooks: sm, med, lg, xl

Diameter/Length	6 in. (15cm)	12 in. (30cm)	16 in. (40cm)	5ft (1.5m)
Ø3/16 in. (5mm)			1	10
Ø1/4 in. (6mm)			1	10
Ø5/16 in. (8mm)	1	1	1	10
Ø3/8 in. (9mm)			1	10

accessories: tee handle • adjustable elbow • rubber and spring flex joints • hoist lifting ring

misc.: hex keys • screws • quiver

Maneuvering ring not included in either kit

Hi-Def 3.0

Hi-Def 3.5

Hi-Def 4.3

video	optical / digital zoom	10x / 12x	10x / 12x	30x / 12x
	effective imager pixels	2.13 mega-pixels	2.13 mega-pixels	2.13 mega-pixels
	sensitivity	0.5 lux	0.5 lux	0.5 lux
	horizontal FOV (wide - tele)	W 54° / T 4.9°	W 54° / T 4.9°	W 59° / T 2.1°
	brightness adjustment	±7 step	±7 step	±7 step
	minimum focus distance	W 0.01m / T 1.0m	W 0.01m / T 1.0m	W 0.01m / T 1.2m
lighting	type	integral, long-life LED lamps		
	lumens (adjustable)	1500	2000	2000
	auxillary lighting	N/A	1,000 lumens x2	1,000 lumens x2
mechanical	minimum access hole	3.0 in. (76 mm)	3.6 in. (90 mm)	4.4 in. (110 mm)
	head weight	2.4 lbs. (1.1 kg)	6 lbs. (2.7 kg)	6 lbs. (2.7 kg)
	material	anodized aluminum	anodized & nickle-plated aluminum	
	temperature range (in degrees)	14 to 120°F (-10 to 49°C)		
	pressure rating	44 PSI (3 bar), 100 ft (30 M) of water		
	internal purge & pressurization	inert or dry air up to 10 psi (0.7 bar)		
	pan range (degrees)	±180	360 continuous	360 continuous
	tilt range (degrees)	±135	±135	±122
	radiation life expectancy	50,000 RAD average total dose†		
	system	integrated weight w/ 100' cable	23.7 lbs. (10.7 kg)	27.3 lbs. (12.4 kg)
modular weight w/ monitor		6.7 lbs. (3 kg)	6.7 lbs. (3 kg)	6.7 lbs. (3 kg)
# boxes		one with two handles		
cable length		50 ft - 550 ft (15 - 167 M)		
power requirement		110-240 VAC; 4 A; 50/60 Hz		
outputs		2 HDMI, 12 VDC accessory power		
other	text overlay with keyboard	time & date, pan & tilt, zoom, temperature, pressure, & humidity (internal), image title		
	single-button home position	saved pan, tilt, & zoom positions		

JAWS 2.0™

tool head	construction	aluminum, stainless steel
	diameter	1.4 in. (34 mm)
	access required	1.5 in. (38 mm)
	length	7.1 in. (180 mm)
	push point connector	10 mm quick-disconnect
	weight	0.7 lbs. (0.3 kg)
	jaw opening	3.2 in. (81 mm)
	jaw clamping force	25 lbs. at tip
	end-effectors	see chart*
	Radiation Life Expectancy	30,000 Rad Avg. Total Dose†
	submersible up to 100 ft. (30.5m) in water	

display/controller	type	12V NiMH
	size	9.0×5.5×2.4 in.
	weight	3.1 lbs. (1.4 kg)
camera	features	HD color 5 in. display, HDMI video output, battery gage, grip strength indicator
	camera	1/3 in. color CMOS (1920×1080 pixels)
	viewing angle	88° hor., 63° vert., 140° diag.
cable	lighting	2 long-life LEDs, total 150 lumens
	cable material	TPE
	cable dia.	1/4 in. (6 mm)
	cable length	50 ft (15 m) with extensions

RGT

tool head	construction	stainless steel
	diameter	0.82 in. (21 mm)
	access required	1.0 in. (25 mm)
	length	11.3 in. (287 mm)
	push point connector	10 mm quick-disconnect
	weight	0.7 lbs. (0.32 kg)
cable	jaw opening	3.2 in. (81 mm)
	jaw clamping force	25 lbs. at tip
	end effectors (3)	curved serrated, flat serrated, fork and tine
power supply	cable material	polyurethane
	cable dia.	3/16 in. (4.5 mm)
	cable length	50 ft (15 m) with extensions
power supply	type	Lithium-Ion rechargeable
	size	7.0×4.8×2.7 in.
	weight	1 lb. (0.5 kg)
	features	battery gage

* Basic kit comes standard with one serrated jaw. Options include a curved serrated, fork & tine, needle-nose pliers, sampling cups, hooks and manual tool adapter.
† Camera replacement module available

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JAWS 2.0 design is protected by U.S. patent #10,981,280 B2