

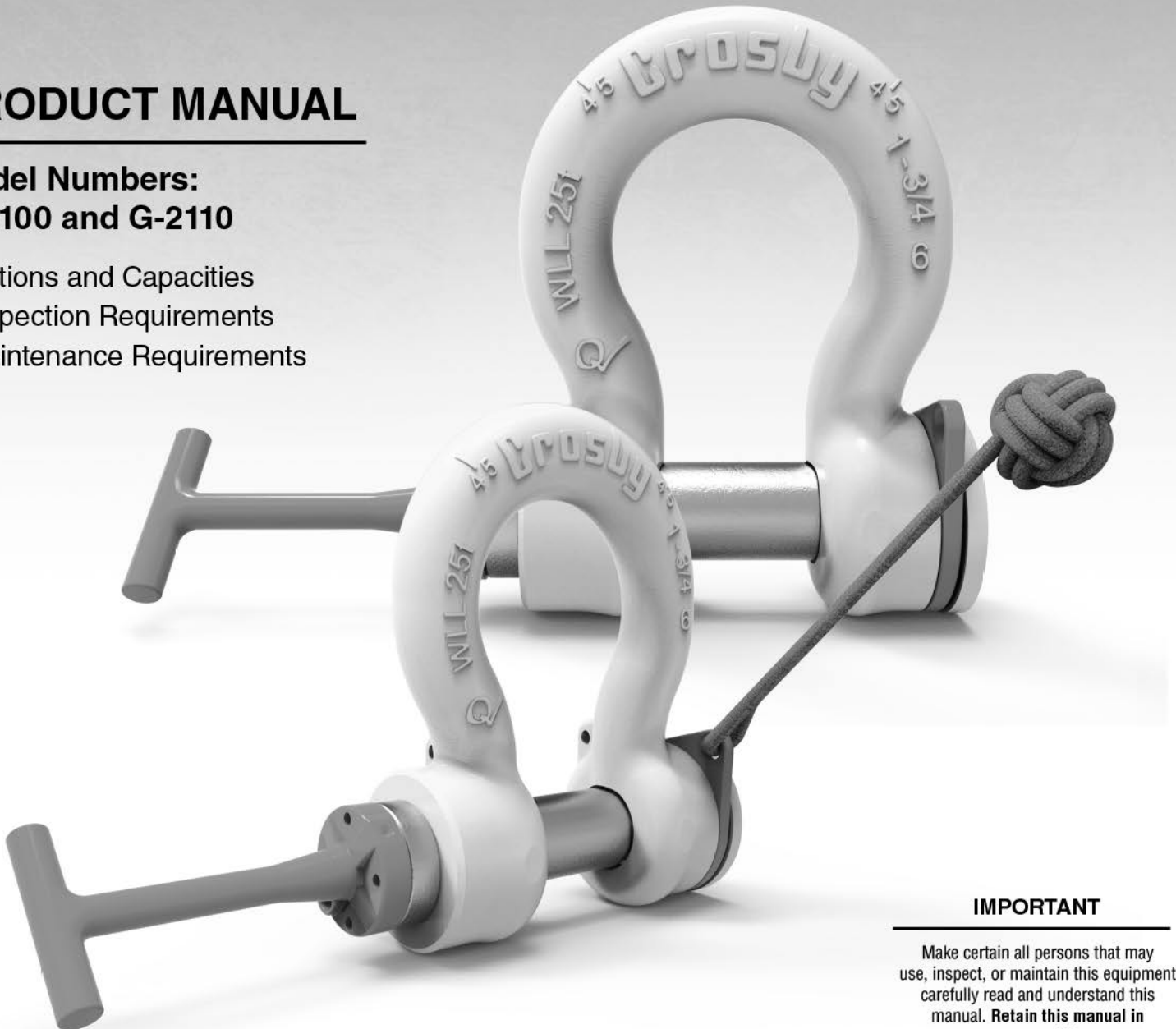
Crosby®

ROV RELEASE & RETRIEVE SHACKLES

PRODUCT MANUAL

**Model Numbers:
G-2100 and G-2110**

- Options and Capacities
- Inspection Requirements
- Maintenance Requirements



IMPORTANT

Make certain all persons that may use, inspect, or maintain this equipment carefully read and understand this manual. **Retain this manual in permanent file.**

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DEFINITIONS AND GLOSSARY

DEFINITIONS

STATIC LOAD - The load resulting from a constant applied force or load.

WORKING LOAD LIMIT - The maximum mass or force which the product is authorized to support in general service when the pull is applied in-line, unless noted otherwise, with respect to the centerline of the product. This term is used interchangeably with the following terms: WLL, Rated Load Value, Resultant Working Load.

WORKING LOAD - The maximum mass or force which the product is authorized to support in a particular service.

PROOF LOAD - The average force applied in the performance of a proof test; the average force to which a product may be subjected before deformation occurs.

PROOF TEST - A test applied to a product solely to determine injurious material or manufacturing defects.

ULTIMATE LOAD - The average load or force at which the product fails or no longer supports the load. Interchangeable with Ultimate Strength.

SHOCK LOAD - A force that results from the rapid application of a force (such as impacting or jerking) or rapid movement of a static load. A shock load significantly adds to the static load.

DESIGN FACTOR - An industry term denoting a product's theoretical reserve capability; usually computed by dividing the catalog ultimate load by the Working Load Limit. Generally expressed as a ratio, e.g., 5 to 1.

COMMERCIAL SURFACE QUALITY - The surface condition of the products shown in this catalog. The surface condition associated with the normal methods of production of raw material and machined surfaces. More refined surface qualities are considered as special.

ADJUSTED WORKING LOAD LIMIT - The reduced maximum mass or force which the product is authorized to support for specific non-standard loading applications.

Ton (T) - North American unit of measure, equals 2,000 pounds. Also referred to as a short ton. Abbreviated by capital T.

Tonne (t) - Metric unit of measure, equals 1,000 kg. Abbreviated by lower case t.

LIMITED WARRANTY

Purchaser and Crosby expressly agree that Crosby's warranty with respect to sale of its products is LIMITED solely to Crosby's choice of repair, replacement or refund of the purchase price of any product or part thereof determined by Crosby to be defective within the first 12 months following the transfer of title of the product from Crosby to the purchaser. Purchaser and Crosby expressly agree that upon termination of the aforementioned 12 month period, the purchased product carries no warranty whatsoever. Purchaser and Crosby expressly agree that the remedies provided in this section are the purchaser's exclusive remedies in connection with the purchase or use of the product. Purchaser and Crosby expressly agree that in no event shall Crosby be liable for any incidental or consequential damages in connection with the purchase or use of the product.

ALL OTHER WARRANTIES, INCLUDING EXPRESS WARRANTIES AND THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. PURCHASER HEREBY WAIVES ALL OTHER WARRANTIES, RIGHTS AND REMEDIES ARISING BY LAW OR OTHERWISE INCLUDING, BUT NOT LIMITED TO, EXPRESS WARRANTIES, THE IMPLIED WARRANTY OF MERCHANTABILITY, ANY IMPLIED WARRANTIES ARISING FROM COURSE OF PERFORMANCE, COURSE OF DEALING OR USAGE OF TRADE, AND IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE. ADDITIONALLY, CROSBY HEREBY DISCLAIMS ANY OF ITS OBLIGATIONS OR LIABILITIES ARISING FROM STATUTE, WARRANTY, CONTRACT, TORT OR NEGLIGENCE.

Complete Agreement: This Warranty between purchaser and Crosby is complete. All prior or contemporaneous discussions, representations and/or understanding are merged into this Warranty. All prior or contemporaneous agreements between the parties are superseded by this Warranty. Choice of Law: Any dispute about the interpretation of this Warranty shall be governed by the laws of the State of Oklahoma. Resolution of Disputes: Purchaser and Crosby expressly agree that any dispute arising out of the purchase, use or operation of the purchased product shall, upon written notice to the other party, be resolved through binding arbitration. The arbitration shall be governed by the then existing rules of the American Arbitration Association. The location of any arbitration shall be Tulsa, Oklahoma. The substantive laws of the State of Oklahoma shall govern the arbitration to the extent they are not in conflict with the then existing rules of the American Arbitration Association. In no event shall Crosby be liable for incidental or consequential damages as part of the arbitration award. The award, decision, or filing rendered by the arbitration shall be final, and judgment may be entered upon it in accordance with the applicable law in any court having appropriate jurisdiction.

GENERAL INFORMATION

Crosby Release and Retrieve Shackles and accessories are manufactured to uncompromising quality standard. The G-2100 and G-2110 shackles and accessories are specifically designed to interface with remote operated vehicles in deep sea applications, yet also allow personnel to operate the shackle without tools.

The following features of Crosby's G-2100 and G-2110 line of Release and Retrieve shackles and accessories offer a number of advantages for ROV users. Both ROV shackles feature:

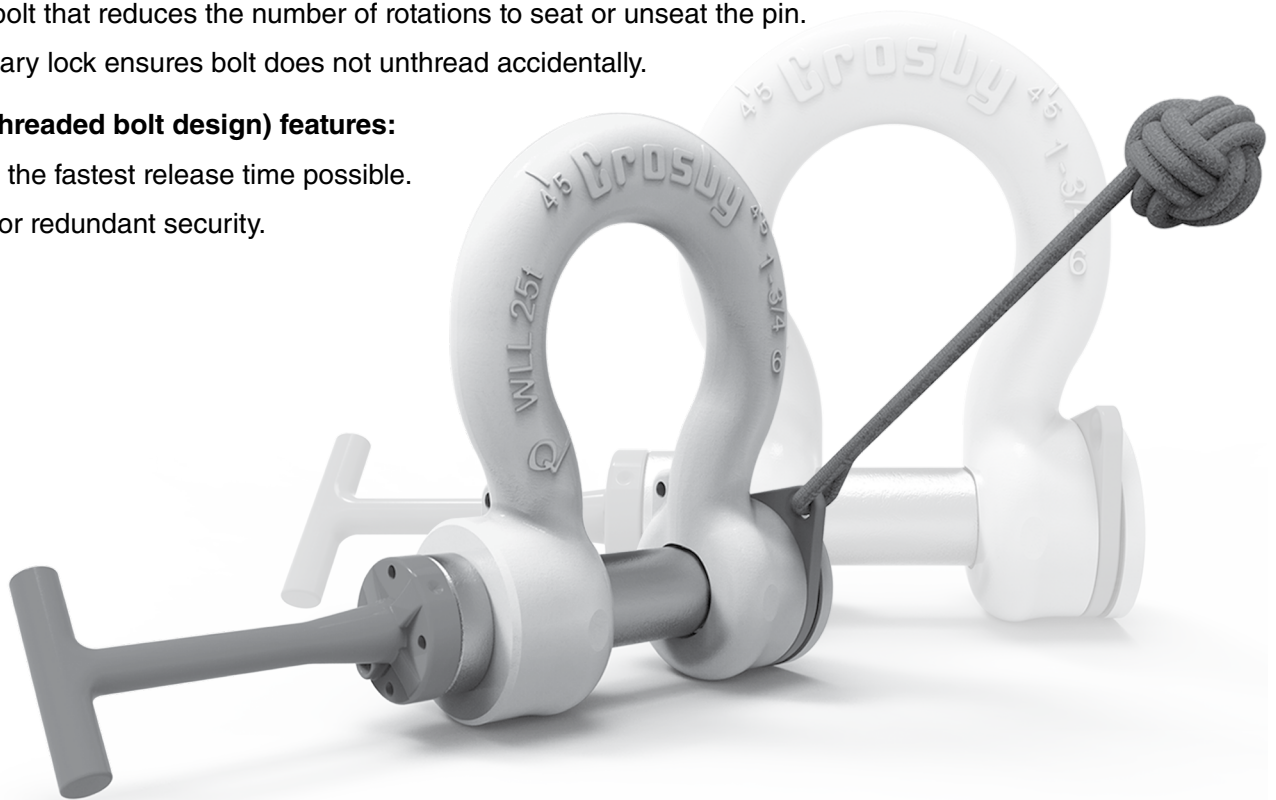
- Shackle assembly is self-contained. No small pins (bolts, nuts or cotters) or loose components to tether, drop, or lose.
- No tethers to get ROV manipulators tangled.
- Simple lock operation. Pull monkey's fist up to lock. Pull monkey's fist outward to unlock. End cap and lock plates are clearly labeled per API 17H for better visibility by operator.
- API 17H lock and unlock labeling "L" for lock clearly visible in the unlocked position and not visible in the locked position.
- Galvanized alloy bow and bolt for exceptional corrosion resistance in harsh environments.
- Integrated multi-use attachment points can be used in a variety of applications such as tethering extra tools or components.
- Choose from four styles of handle attachments to accommodate a variety of manipulators. Handles are threaded onto the bolt stud as well as bolted for added security and durability. (sold separately)
- Handles feature stainless steel construction and conform to API 17H.
- Shackle bows incorporate raised markings forged into the product with easy to use QUIC-CHECK[®] features.
- Shackle bolt stays in retracted position during placement operation.

G-2100 (threaded bolt design) features:

- Quick-thread bolt that reduces the number of rotations to seat or unseat the pin.
- Single secondary lock ensures bolt does not unthread accidentally.

G-2110 (non-threaded bolt design) features:

- No threads for the fastest release time possible.
- Double locks for redundant security.



GENERAL USAGE

- Capacities from 9 1/2t through 85t.
- Forged alloy bows with alloy pins, quenched & tempered.
- All ROV shackle bows are galvanized, then painted yellow.
- Handles are stainless steel and are available in “D”, “F”, “T” and “Eye” styles. (sold separately)
- Working Load Limit permanently shown on every shackle.
- **QUIC-CHECK**® deformation and angle indicators forged on the bow.
- Handles are painted orange.
- Handles are **RFID** ready.

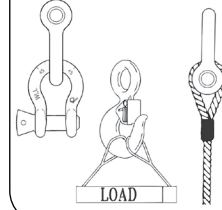
Load Rated



QUIC-CHECK®

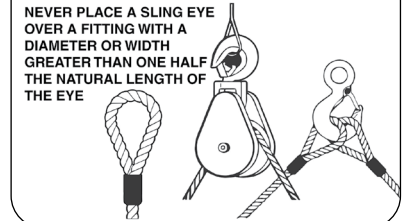


WIRE ROPE SLINGS AND CONNECTIONS TO FITTINGS



USE A THIMBLE TO PROTECT SLING AND TO INCREASE D/d
NEVER PLACE EYE OVER A FITTING SMALLER DIAMETER OR WIDTH THAN THE ROPE'S DIAMETER

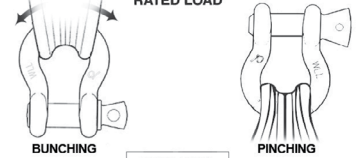
WIRE ROPE SLINGS AND CONNECTIONS TO FITTINGS



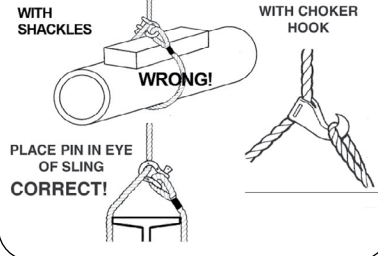
NEVER PLACE A SLING EYE OVER A FITTING WITH A DIAMETER OR WIDTH GREATER THAN ONE HALF THE NATURAL LENGTH OF THE EYE

SYNTHETIC SLINGS RATED LOAD

FOLDING, BUNCHING OR PINCHING OF SYNTHETIC SLINGS, WHICH OCCURS WHEN USED WITH SHACKLES, HOOKS OR OTHER APPLICATIONS, WILL REDUCE THE RATED LOAD



CHOKER HITCH FORMED



WITH SHACKLES

WITH CHOKER HOOK

WRONG!

PLACE PIN IN EYE OF SLING

CORRECT!

SIDE LOADED RATING REDUCTION TABLE FOR CROSBY SHACKLES LESS THAN 3"

Angularly loading must be applied in the plane of the bow.

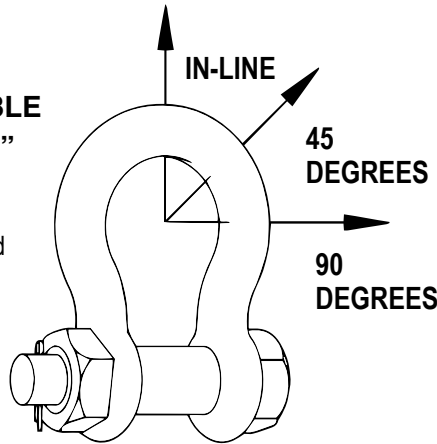


Table 1

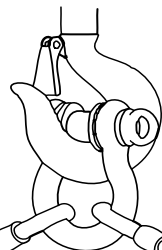
Side Loading Reduction Chart for Screw Pin and Bolt Type Shackles Only+

Angle of Side Load from Vertical In-Line of Shackle	Adjusted Working Load Limit
0° - 5° In-Line*	100% of Rated Working Load Limit
45° from In-Line*	70% of Rated Working Load Limit
90° from In-Line*	50% of Rated Working Load Limit

+ In-Line load is applied perpendicular to pin.

INCLUDED ANGLE - SHACKLES

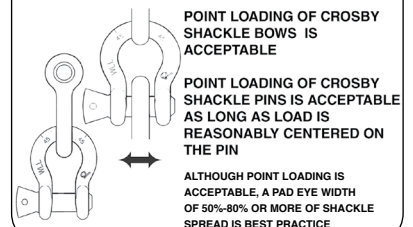
Never exceed 120° included angle. Use Bolt Type and Screw Pin Shackles ONLY.



Shackles symmetrically loaded with two leg slings having a maximum included angle of 120° can be utilized to full Working Load Limit.

120°
MAXIMUM
LOAD

CROSBY SHACKLES POINT LOADING

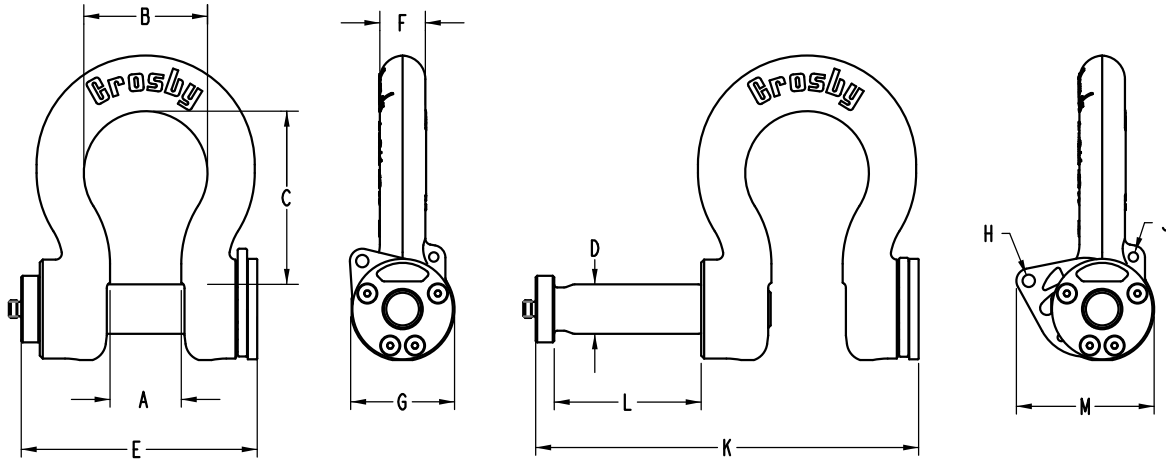


POINT LOADING OF CROSBY SHACKLE BOWS IS ACCEPTABLE

POINT LOADING OF CROSBY SHACKLE PINS IS ACCEPTABLE AS LONG AS LOAD IS REASONABLY CENTERED ON THE PIN

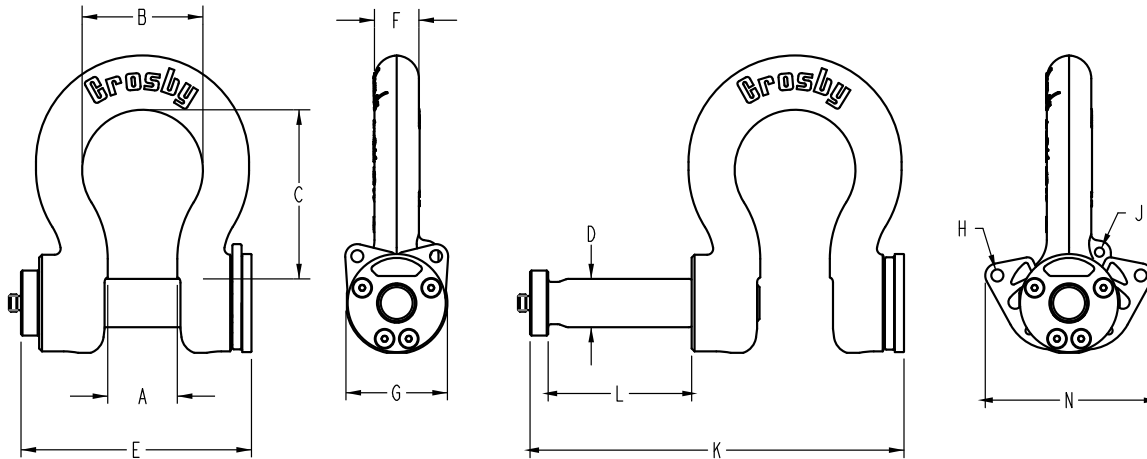
ALTHOUGH POINT LOADING IS ACCEPTABLE, A PAD EYE WIDTH OF 50%-80% OR MORE OF SHACKLE SPREAD IS BEST PRACTICE

OPTIONS AND CONFIGURATIONS



G-2100 ROV Shackle (threaded bolt design)

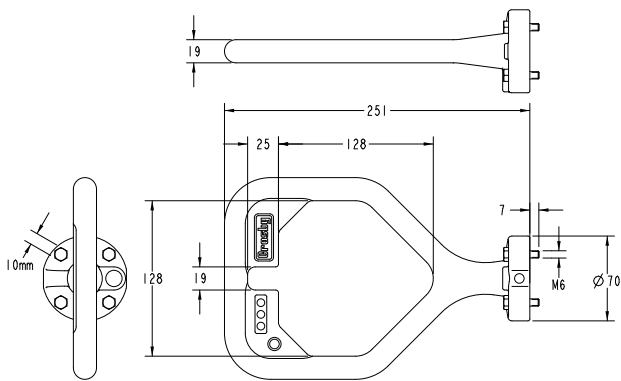
Working Load Limit (t)	Part Number	Weight Each (kg)	Dimensions (mm)											
			A	B	C	D	E	F	G	H	J	K	L	M
9.5	2038739	5.1	46.0	73.9	108	31.8	186	29.5	68.1	11.2	7.9	293	107	97.3
12	2038762	6.2	51.6	82.6	119	35.1	197	32.8	76.2	11.2	7.9	311	114	101
17	2038785	11	60.5	98.6	146	41.4	217	38.9	91.9	12.7	7.9	349	132	126
25	2038614	17	73.2	127	178	50.8	242	46.7	106.7	12.7	9.7	393	151	141
35	2038808	23	82.6	146	197	57.9	264	52.8	122.4	12.7	9.7	431	167	149
55	1028831	49	105	184	266	70.6	320	69.1	147.6	12.7	9.7	527	207	191
85	2038877	71	127	200	330	83.3	361	79.2	165.1	12.7	12.7	600	238	199



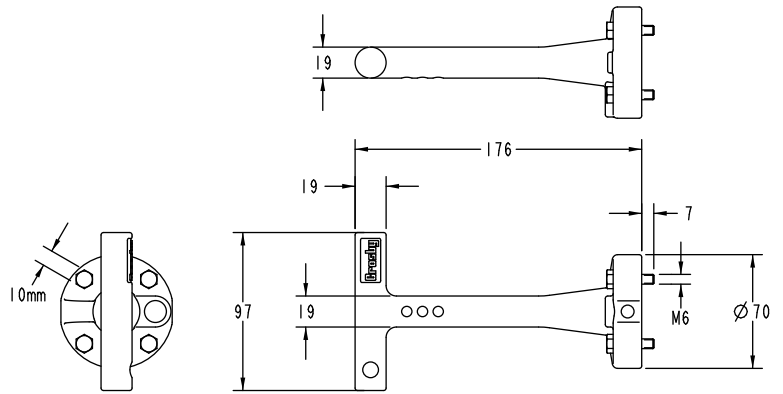
G-2100 ROV Shackle (non-threaded bolt design)

Working Load Limit (t)	Part Number	Weight Each (kg)	Dimensions (mm)											
			A	B	C	D	E	F	G	H	J	K	L	N
9.5	2038740	5.2	46.0	73.9	108	31.8	186	29.5	68.1	9.7	7.9	293	107	126
12	2038763	6.3	51.6	82.6	119	35.1	197	32.8	76.2	9.7	7.9	311	114	126
17	2038786	11	60.5	98.6	146	41.4	217	38.9	91.9	12.7	7.9	349	132	160
25	2038621	17	73.2	127	178	50.8	242	46.7	107	12.7	9.7	393	151	176
35	2038809	23	82.6	146	197	57.9	264	52.8	122	12.7	9.7	431	167	176
55	2038832	49	105	184	266	70.6	320	69.1	148	12.7	9.7	527	207	217
85	2038878	71	127	200	330	83.3	361	79.2	165	12.7	12.7	600	238	217

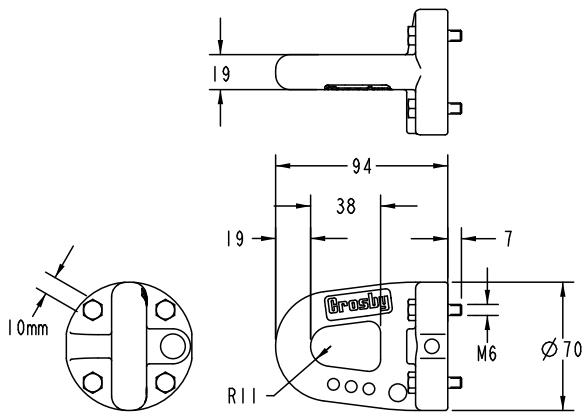
OPTIONS AND CONFIGURATIONS



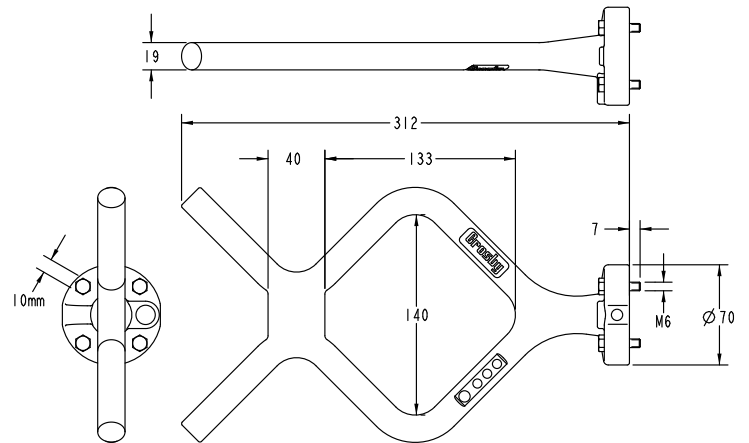
“D” Handle Kit - 1021324



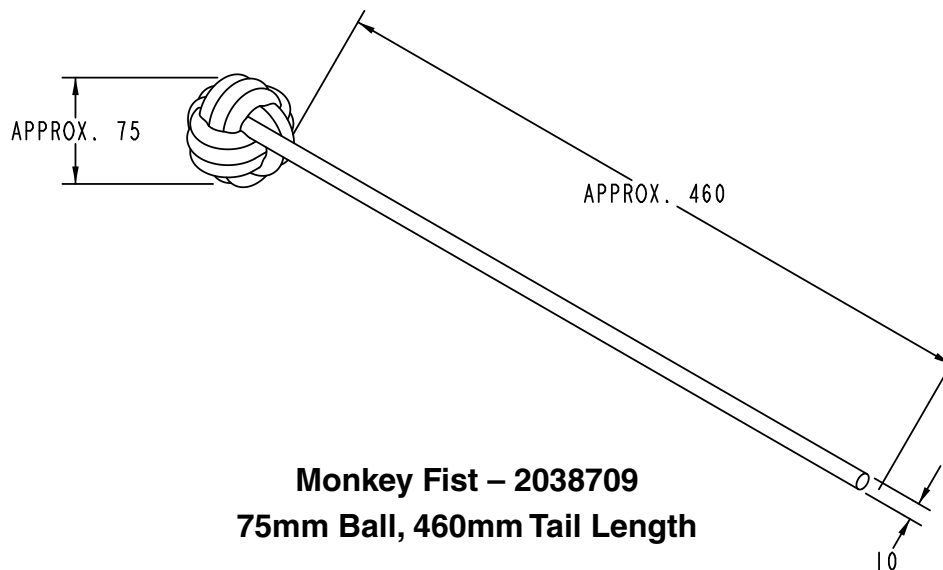
“T” Handle Kit - 1021306



“Eye” Handle Kit - 1021333



“F” Handle Kit - 1021315



Monkey Fist – 2038709
75mm Ball, 460mm Tail Length

HANDLE ASSEMBLY INSTRUCTIONS

Handle Kits – All Styles (sold separately)

1021324 “D” Handle Kit

1021315 “F” Handle Kit

1021324 “T” Handle Kit

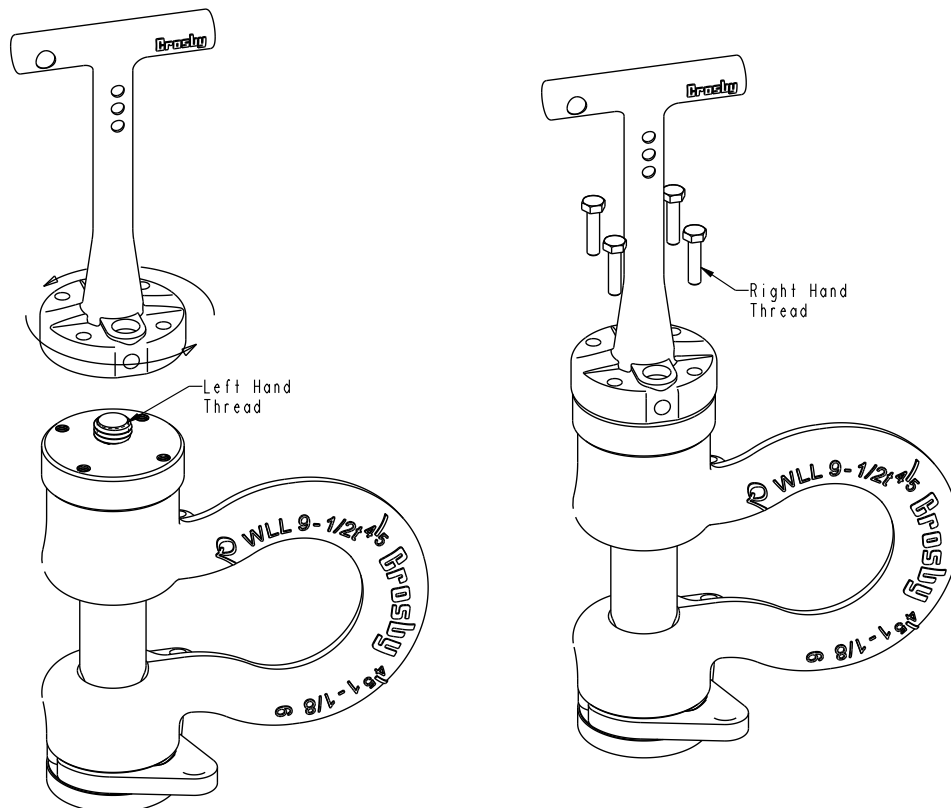
1021333 “Eye” Handle Kit

All ROV Release & Retrieve handle kits include the following components:

- (1) Handle
- (4) M6 screws
- (1) Tube of thread lock compound

Assembly Instructions:

1. Inspect the external thread and all threaded holes on the shackle bolt head. Verify the threads are free from corrosion and debris.
2. Screw the handle onto the stub thread and rotate handle counterclockwise until handle base is snug onto the bolt head.
3. Check for alignment of the (4) holes in the handle with the (4) holes in the shackle bolt. Rotate handle clockwise until the first set of holes align.
4. Apply thread lock compound to all (4) screw threads before inserting into the handle base holes.
5. Thread each of the (4) screws a few turns until all screws are started in the shackle bolt holes. Do not tighten screws until all screws are inserted.
6. Tighten all screws finger tight. Then torque all screws to 25 in-lbs in a crisscross pattern.
7. Allow 24 hours for the thread lock compound to cure before submerging shackle handle.



RETAINING RING REMOVAL INSTRUCTIONS

Frequently check the 2100/2110 shackles for proper pin retention, or disassemble and inspect pin retaining ring to evaluate wear and damage from usage. Replacement of the retaining ring is recommended if damage/wear is detected, or every six months of normal usage. The frequency of inspection is dependent upon frequency and periods of use, environmental condition, and the user's good judgment.

G-2100 ROV Release and Retrieve Shackle (threaded bolt)

1. Apply a strip of masking tape, duct tape, or other durable tape to a thin metal strip, offset with 1/4"-1/2" of tape exposed along the edge of the metal strip. For best results, apply tape to metal strip at a slight angle to the edge so that tape will overlap previous tape layer edge. (See Figure 1)
2. With the bolt retracted out of the lock ear and the collar accessible between the ears, wrap the thin metal strip tightly around the stop groove, collar, thread relief, and threads. (See Figure 2)
3. Press the tape to the bolt surface and metal strip surface securely. Remove all creases and wrinkles.
4. Pull the bolt pin handle until the bolt pin is extracted out of the shackle retaining ear. Remove the tape from metal strip. Do not discard metal strip.
5. Push the retaining ring to the side perpendicular to the ring slot and lift the exposed end out of the shackle ear.
6. Unthread the retaining ring out of the shackle ear.
7. Inspect retaining ring for tearing, gouging, or any missing or damaged areas.
8. Verify the retaining ring chamfer is undamaged.
9. Inspect the retaining ring slot and verify leg ends are parallel and aligned.
10. Inspect and clean groove for debris and corrosion.
11. If retaining ring is undamaged, reinstall into the shackle retaining ear. Otherwise, replace and install a replacement retaining ring.
12. See retaining ring installation instructions to install or reinstall the retaining ring and bolt.
13. Perform functional test. (See operating instructions, page 12)

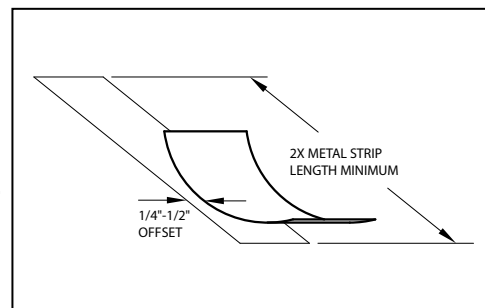


Figure 1

G-2110 ROV Release and Retrieve Shackle (non-threaded bolt)

1. Apply a strip of masking tape, duct tape, or other durable tape to a thin metal strip, offset with 1/4"-1/2" of tape exposed along the edge of the metal strip. For best results, apply tape to metal strip at a slight angle to the edge so that tape will overlap previous tape layer edge. (See Figure 1)
2. With the bolt retracted out of the lock ear and the collar accessible between the ears, wrap the thin metal strip tightly around the stop groove, and collar. (See Figure 2)
3. Press the tape to the bolt surface and metal strip surface securely. Remove all creases and wrinkles.
4. Pull the bolt pin handle until the bolt pin is extracted out of the shackle retaining ear. Remove the tape from metal strip. Do not discard metal strip.
5. Push the retaining ring to the side perpendicular to the ring slot and lift the exposed end out of the shackle ear.
6. Unthread the retaining ring out of the shackle ear.
7. Inspect retaining ring for tearing, gouging, any missing or damaged areas.
8. Verify the retaining ring chamfer is undamaged.
9. Inspect the retaining ring slot and verify leg ends are parallel and aligned.
10. Inspect and clean groove for debris and corrosion.
11. If retaining ring is undamaged, reinstall into the shackle retaining ear. Otherwise, replace and install a replacement retaining ring.
12. See retaining ring installation instructions to install or reinstall the retaining ring and bolt.
13. Perform functional test. (See operating instructions, page 12)

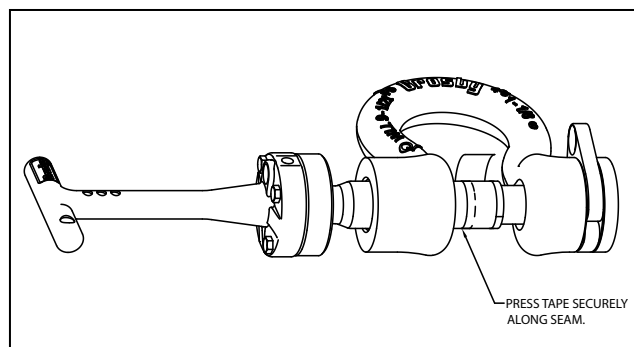


Figure 2

RETAINING RING INSTALLATION INSTRUCTIONS

Retaining Ring Replacement Kits	
Working Load Limit (t)*	Retaining Ring Replacement Kit Stock No.
9-1/2t	1020007
12t	1020016
17t	1020025
25t	1020034
35t	1020043
55t	1020052
85t	1020061

Installation Instructions:

1. Verify the shackle ear groove is free of debris, corrosion, and remnants of the old retaining ring.
2. Orientate the shackle so the shackle bow rests with the end cap on a sturdy work surface and the retaining ring groove is accessible from above.
3. Rest the new retaining ring on the shackle ear over the bolt hole. Verify the chamfer on the ID of the retaining ring is face up. Push up. Push one end of the retaining ring into the bolt hole and seat into the groove. (See Figure 3)
4. Thread the retaining ring until the retaining ring is fully seated in the groove. The retaining ring should rotate and move freely in the groove.

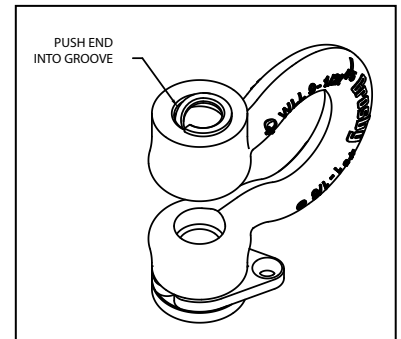


Figure 3

For G-2100 (threaded bolt) shackle version:

5. Apply a strip of masking tape, duct tape, or other durable tape to a thin metal strip, offset with 1/4"-1/2" of tape exposed along the edge of the metal strip. (See Figure 1)
6. Wrap the metal strip around the threads, thread relief, partially overlapping into the lock groove. For best results, angle the wrap so the metal strip forms a slight cone from the lock groove. (See Figure 4)
7. Push the bolt into the shackle hole and through the ear. The retaining ring should be seated over the bolt.
8. If the pin does not enter the retaining ring and easily push through, reposition the thin shim stock into a slight conical wrap deeper into the lock groove and apply tape securely.
9. Remove the tape and shim stock from the bolt threads once accessible from between ears.

For G-2110 (non-threaded bolt) shackle version:

1. Apply a strip of masking tape, duct tape, or other durable tape to a thin metal strip, offset with 1/4"-1/2" of tape exposed along the edge of the metal strip. (See Figure 1)
2. Wrap the metal strip around the collar and body pilot, but offset from the lock groove. For best results, angle the wrap so the metal strip forms a cone from the body pilot. (See Figure 4)
3. Push the bolt into the shackle hole and through the ear. The retaining ring should be seated over the bolt.
4. If the pin does not enter the retaining ring and easily push through, reposition the thin shim stock into a conical wrap and apply tape securely.
5. Remove the tape and shim stock from the bolt once accessible from between ears.

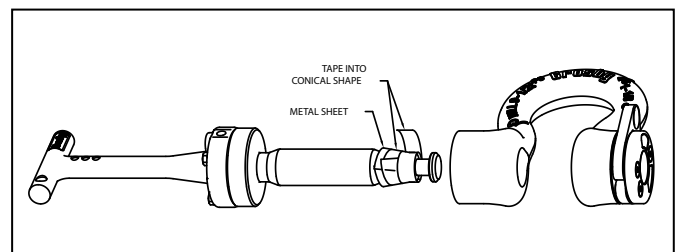


Figure 4

OPERATING INSTRUCTIONS

Operating the shackle is similar for both personnel and ROV devices. Even though the shackle is designed to interface with ROV devices, personnel can also operate the lock plates, the bolts and the handle.

G-2100 (threaded) ROV Release and Retrieve Shackle:

For Connection Operations (attaching the shackle to the load)

1. Unlock the lock plate by pulling on the monkey's fist in an outward direction.
2. Rotate the handle counterclockwise until bolt is released from the threaded shackle ear.
3. Retract the bolt by the handle until the bolt end clears the ear opening and stops against the retaining ring.
4. Place load connection between shackle ears.
5. Push the bolt inward until the threads contact in the shackle ear. The head will not be in contact with the shackle ear.
6. Rotate the handle clockwise until bolt head contacts the shackle ear.
7. Lock the lock plate by pulling on the monkey's fist in line with the plane of the shackle bow until the lock plate engages the bolt pin end groove.

For Release Operations (removing the shackle from the load)

1. Verify the load is positioned and the rigging is slack.
2. Unlock lock plate by pulling on the monkey's fist in an outward direction.
3. Rotate the handle counterclockwise until bolt is released from the threaded shackle ear.
4. Retract the bolt by the handle until the bolt end clears the ear opening and stops against the retaining ring.
5. Remove the shackle from the load connection.

G-2110 (non-threaded) ROV Release and Retrieve Shackle:

For Connection Operations (attaching the shackle to the load)

1. Unlock both lock plates by pulling on each monkey's fist in an outward direction.
2. Retract the bolt by the handle until the bolt end clears the ear opening and stops against the retaining ring.
3. Place load connection between shackle ears.
4. Push the bolt inward until the bolt head contacts the shackle ear. Lock the lock plates by pulling on each monkey's fist in line with the plane of the shackle bow until the lock plate engages the bolt end groove.
5. Pull on the handle to verify the lock plates are locked.

For Release Operations (removing the shackle from the load)

1. Verify the load is positioned and the rigging is slack.
2. Unlock each lock plate by pulling on the monkey's fists in an outward direction.
3. Retract the bolt by the handle until the bolt end clears the ear opening and stops against the retaining ring.
4. Remove the shackle from the load connection.

GENERAL INSPECTION

General inspection and maintenance for G-2100 and G-2110 ROV Release and Retrieve Shackles, all sizes and styles.

Inspect the shackle for:

- bent stems out of plane with the bolt.
- loose, damaged, or missing mounting screws.
- gap between the bolt pin head and handle base of 1/16" or greater.
- damage or broken handle parts.

With the lock plate(s) in the open/unlocked position and the bolt retracted out of the lock ear:

- inspect end cap for loose, damaged, or missing mounting screws.
- end cap spacer tubes for damage, corrosion, or mushrooming.
- the space between the end cap and shackle for debris or corrosion.
- the lock plate(s) through the end cap hole for damage such as gouges, indentions, and corrosion.
- shackle ears for thread damage and/or corrosion.

With the bolt collar visible between the shackle ears, inspect:

- bolt threads for damage and/or corrosion.
- collar damage such as indentions, gouges, sharp edges, bent tail, mushrooming, and missing areas.

Bolt Pin and Locking Device Functional Test:

G-2100 (threaded) ROV Release and Retrieve Shackle

1. With the bolt retracted out of the lock ear, operate the lock plate into the locked position and into the unlocked position. Initial resistance should be felt to rotate the lock plate from each position and should snap into the next position.
2. With the lock plate in the unlocked position, push the bolt into the lock ear until it bottoms out. The bolt head will not be in contact with the shackle ear. Rotate bolt clockwise until the thread is fully in the ear and the bolt head is in contact with the shackle ear.
3. Operate the lock plate into the locked position. Lock plate should freely engage the bolt groove without impacting the bolt pin tail. Lock plate should snap into the locked position.
4. Operate the lock plate into the unlocked position. Bolt should freely unthread from and retract out of the shackle lock ear and stop with the bolt tail inside the shackle retaining ear. The bolt should not pull completely out of the retaining ear.
5. Shackles that do not operate properly as outlined above are cause for removal from service.

G-2110 (non-threaded) ROV Release and Retrieve Shackle

1. With the bolt pin retracted out of the lock ear, operate each lock plate into the locked position and into the unlocked position. Initial resistance should be felt to rotate the lock plate from each position and should snap into the next position.
2. With both lock plates in the unlocked position, push the bolt pin into the lock ear until it bottoms out. An initial resistance should be felt as the bolt pin begins to move. The bolt pin head will contact the shackle ear when fully seated. Shackle pin should not freely retract out of position.
3. Operate both lock plates into the locked position. Lock plates should freely engage the bolt pin groove without impacting the bolt pin tail. Lock plates should snap into the locked position.
4. Operate the lock plates into the unlocked position. Bolt pin should retract out of the shackle lock ear after an initial resistance and stop with the tail inside the shackle retaining ear. The bolt pin should not pull completely out of the retaining ear.
5. Shackles that do not operate properly as outlined above are cause for removal from service.