ENERPAC

Operation and Maintenance Manual

Enerpac RRH10010C101
Double-acting, Hollow, 100-Ton, Hydraulic Cylinder

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⚠ To reduce the risk of injury, user must read and understand this document before use.

ABOUT US

Enerpac is a global market leader in high pressure hydraulic tools, controlled force products, portable machining, on-site services and solutions for precise positioning of heavy loads. As a leading innovator with a 110-year legacy, Enerpac has helped move and maintain some of the largest structures on earth. When safety and precision matters, elite professionals in industries such as aerospace, infrastructure, manufacturing, mining, oil & gas and power generation rely on Enerpac for quality tools, services and solutions. For additional information, visit www.enerpac.com.

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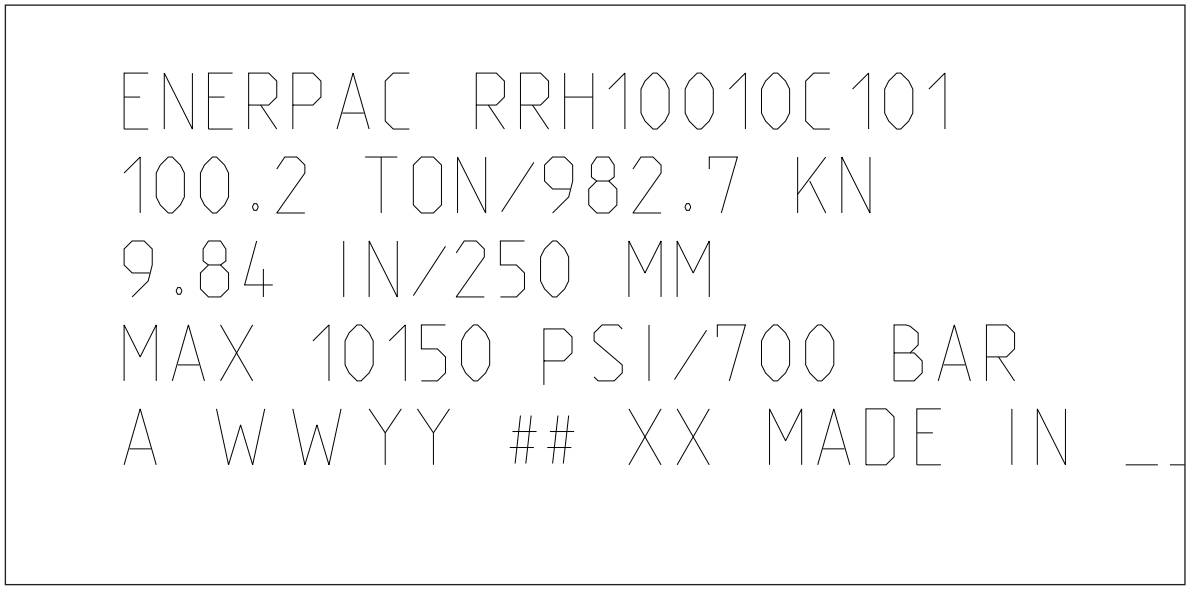
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WARRANTY

Refer to the Enerpac Global Warranty document for terms and conditions of the product warranty. Such warranty information can be found at www.enerpac.com.

NAMEPLATE



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1. Safety

Read all instructions carefully. Follow all recommended safety precautions to avoid personal injury as well as damage to the product and / or damage to other property. Enerpac cannot be responsible for any damage or injury from unsafe use, lack of maintenance, or incorrect operation. Do not remove warning labels, tags, or decals. In the event that any questions or concerns arise, contact Enerpac or a local Enerpac distributor for clarification.

Save these instructions for future use.

If you have never been trained on high-pressure hydraulic safety, consult your distributor or service center for information about Enerpac Hydraulic Safety Courses.

This manual follows a system of safety alert symbols, signals, words, and safety messages to warn the user of specific hazards. Failure to comply with these warnings could result in death or serious personal injury, as well as damage to the equipment or other property.



The Safety Alert Symbol appears throughout this manual. It is used to alert you to potential physical injury hazards. Pay close attention to Safety Alert Symbols and obey all safety messages that follow this symbol to avoid the possibility of death or serious injury.

Safety Alert Symbols are used in conjunction with certain Signal Words that call attention to safety messages or property damage messages and designate a degree or level of hazard seriousness. The Signal Words used in this manual are DANGER, WARNING, CAUTION, and NOTICE.

DANGER Indicates a hazardous situation that, if not avoided, will result in death or serious personal injury.

WARNING Indicates a hazardous situation that, if not avoided, could result in death or serious personal injury.

CAUTION Indicates a hazardous situation that, if not avoided, could result in minor or moderate personal injury.

NOTICE Indicates information considered important, but not hazard related (e.g. messages related to property damage). Please note that the Safety Alert Symbol will not be used with the signal word.

1.1 Safety Precautions

WARNING

Failure to observe and comply with the following precautions could result in death or serious personal injury. Property damage could also occur.

- Read and completely understand the safety precautions and instructions in this manual before operating the cylinder or preparing it for use. Always follow all safety precautions and instructions, including those that are contained within the procedures of this manual.
- Operating procedures will vary, depending on the system arrangement and the specific components being used. Always read, follow and completely understand all manufacturer's instructions when operating pumps, valves and all other devices used with the cylinders. Follow all safety precautions contained in the manufacturer's manuals.
- Always wear appropriate personal protective equipment (P.P.E.) when operating hydraulic equipment. Be sure to wear eye protection, work gloves and protective clothing. Use of additional P.P.E. safety items such as dust mask, non-skid safety shoes, hard hat, and hearing protection (used as appropriate for the conditions) will reduce the chance of personal injuries. The use of these items may also be required by local regulations or laws.
- Do not handle pressurized hoses. Escaping oil under pressure can penetrate the skin. If oil is injected under the skin, see a doctor immediately.
- Do not pressurize disconnected couplers.
- Use hydraulic cylinders only in a coupled system. It is acceptable to use a cylinder with a disconnected coupler only if the load is mechanically supported by the cylinder lock nut, and all hydraulic pressure is completely relieved.
- When holding loads, be certain that the lock nut is turned down firmly against the cylinder base so that the load is mechanically supported. Also be sure that all hydraulic pressure is completely relieved.
- Do not remove or disable the pump relief valve.
- Do not remove or disable the cylinder relief valve (if equipped).
- The system operating pressure must not exceed the pressure rating of the lowest rated component in the system.
- Install pressure gauge(s) in the system to monitor operating pressure. It is your window to see what is happening in the system.
- Never set a relief valve to a higher pressure than the maximum rated pressure of the pump and cylinder. If ratings are different, relief valve setting should not exceed the setting of the lowest rated component (pump or cylinder).
- RRH10010C101 cylinders are designed for a maximum working pressure of 10150 psi [700 bar]. Do not connect a pump with a higher pressure rating to these cylinders.

- Do not exceed equipment ratings. Never attempt to lift a load weighing more than the rated capacity of the cylinder. Overloading may cause equipment failure and possible personal injury.
- Be sure setup is stable before lifting load. Cylinders should be located on a firm and level surface capable of supporting the full load.
- Where applicable, use a cylinder base plate to provide added stability. If desired, the cylinder can be bolted to the base plate, using the bolt holes in the bottom of the cylinder base.
- Do not weld, drill or otherwise modify a cylinder to attach a base plate or other support unless approved in writing by Enerpac Engineering Department. Use only the provided bolt holes.
- Always perform a visual inspection of the cylinder before placing it into operation. If any problems are found, do not use the cylinder. Have the cylinder repaired and tested before it is returned to service.
- Never use a cylinder that is leaking oil. Do not use a cylinder that is damaged, altered or in need of repair.
- Always lift the cylinder using a hoist, crane or other suitable lifting device of sufficient rated capacity. Use only the supplied cylinder lifting eyes to attach the cylinder to the lifting device. Replace any missing or damaged lifting eyes.
- Allow only trained and experienced personnel to supervise and perform lifting and lowering procedures.
- Be certain that no persons are working on or near any cylinders before lifting or lowering of the load begins. Alert all personnel in advance that lifting or lowering is about to occur.
- Use suitable cribbing of rigid construction to hold loads.
- Never use a hydraulic cylinder as a shim or spacer in any lifting or pressing application.
- Be certain that the load is centered and covers the entire plunger saddle surface. Avoid situations where loads are not directly centered on the plunger saddle. The load may slip or fall, causing potential danger.
- Lift only dead weight loads. Avoid lifting live weight loads.
- Be especially careful when lifting loads such as partially filled storage tanks, in which the center of gravity could move or shift during lifting. Be aware that the distribution of some loads can change quickly and without warning.
- Do not use the cylinder to lift people. Do not allow people to be on top of the load during lifting or lowering.
- Keep all personnel clear of the work area while lifting or lowering is in progress. To avoid personal injury, keep hands and feet away from cylinder and load during operation.
- Maintain communication with the operator at all times during lifting or lowering to avoid accidents. Use hand signals, two-way radios or other appropriate forms of communication (as required by applicable laws and regulations) if the load is not visible to the operator.
- Operate pump and valve as required to ensure that the load is lifted and lowered evenly and at a controlled rate.
- Closely watch the load at all times during lifting and lowering. Stop lifting or lowering immediately if the load becomes unstable or appears to be lifting or lowering unevenly.
- Stay clear of loads supported only by hydraulics. As required, follow the lifted load with cribbing.
- Never allow persons to work under or near the load while the load is being supported hydraulically. After the load has been raised or lowered, it always must be blocked mechanically by the cylinder lock nut or via suitable cribbing.
- Always be certain that hydraulic pressure is fully relieved and that the load is fully removed from the cylinder(s) before disconnecting hydraulic hoses, loosening hydraulic fittings, or performing any cylinder disassembly or repair procedures.

⚠ CAUTION

Failure to observe and comply with the following precautions could result in minor or moderate personal injury. Property damage could also occur.

- Be careful to avoid damaging hydraulic hoses. Avoid sharp bends and kinks when routing hydraulic hoses. Do not exceed the minimum bend radius specified by the hose manufacturer. Using a bent or kinked hose will cause severe back-pressure. Sharp bends and kinks will internally damage the hose, leading to premature hose failure.
- Do not drop heavy objects on hoses. A sharp impact may cause internal damage to hose wire strands. Applying pressure to a damaged hose may cause it to rupture.
- Do not lift hydraulic equipment by the hoses or couplers. Use the cylinder lifting eyes and appropriately rated lifting equipment.
- Keep hydraulic equipment away from flames and heat. Excessive heat will soften packings and seals, resulting in fluid leaks. Heat also weakens hose materials and packings.
- For optimum performance, do not expose hydraulic equipment to temperatures of 150˚F [65˚C] or higher. Protect all hydraulic equipment from weld spatter.
- Immediately replace worn or damaged parts with genuine Enerpac parts. Enerpac parts are designed to fit properly and to withstand high loads. Non-Enerpac parts may break or cause the product to malfunction.

NOTICE

Failure to observe and comply with the following precautions could result in property damage and/or void the product warranty.

- Hydraulic equipment must only be serviced by a qualified hydraulic technician. For repair service, contact the Enerpac Authorized Service Center in your area.
- To help ensure proper operation and best performance, use of Enerpac oil is strongly recommended.

2. Compliance Statement(s)

2.1 Conformance to National and International Standards

• RRH10010C101

These tools conform with the requirements for CE and UKCA.

Enerpac declares that the product has been tested and conforms to applicable standards and the product is compatible to all EU and UK Requirements.

Copies of the EU Declaration as well as the UK Self-Declaration are enclosed with each shipment.

3. Features & Components

3.1 Feature Diagram

1. Cylinder Base.
2. Relief Valve.
3. Eyebolt (2).
4. Stop Ring.
5. Tilting Saddle.
6. Female Coupler (2).

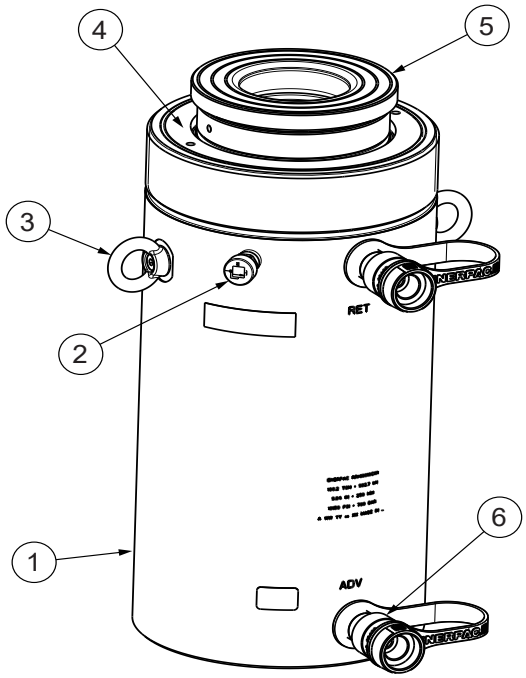


Figure 1: Features and Components

4. Technical Product Data

4.1 Dimensional Callout Art

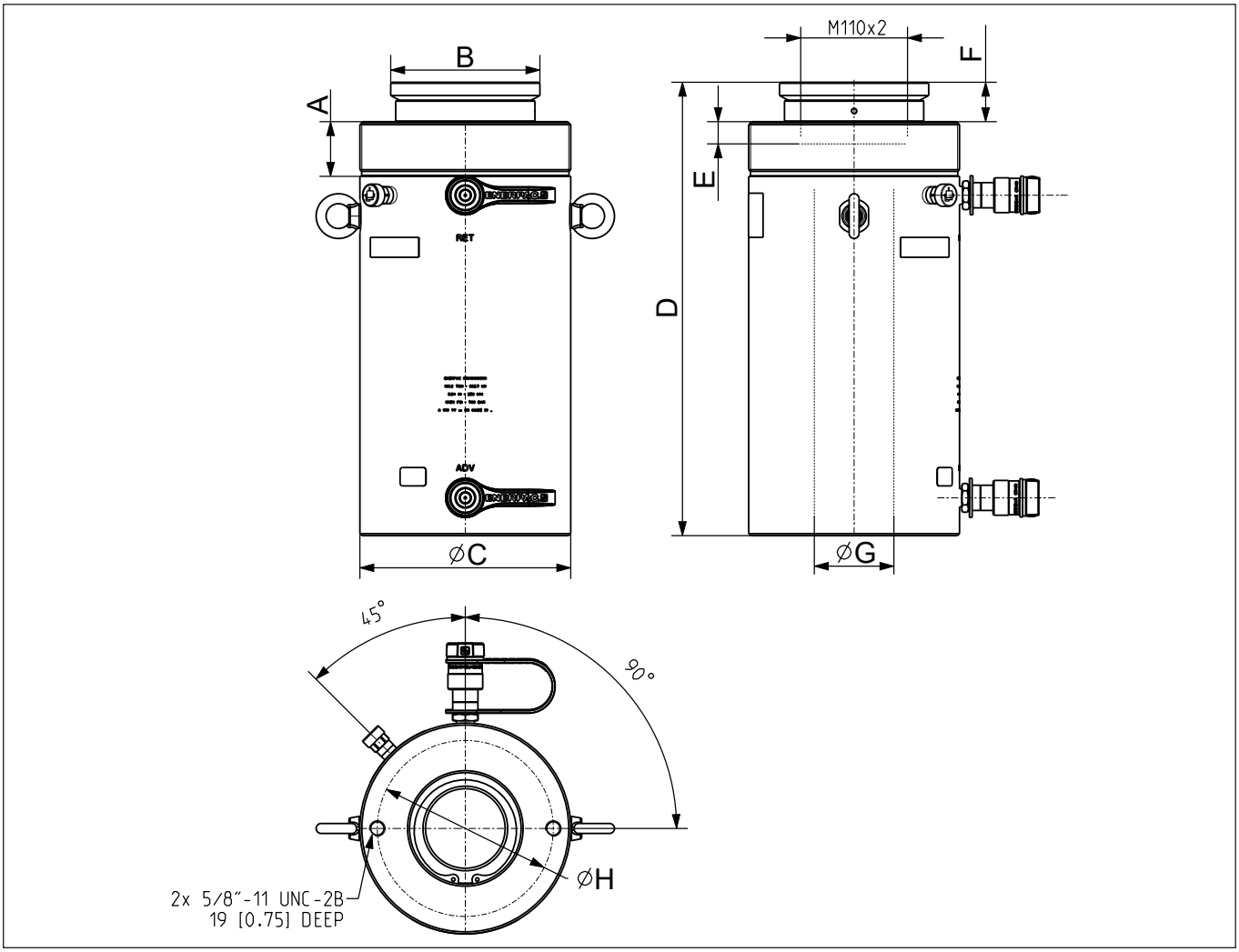


Figure 2: RRH10010C101 Dimensions

4.2 Dimensional Table

Measure	mm	in
A	55	2.17
B	150	5.91
C	212	8.35
D	456	17.95
E	22	0.88
F	40	1.56
G	80	3.15
H	177	6.97

4.3 Product Description

Enerpac RRH10010C101 hydraulic cylinders are an ideal solution for a wide variety of commercial and industrial applications.

RRH10010C101 is a double-acting hydraulic cylinder with hydraulic advance and return. The hydraulic return allows greater control during retraction and provides positive retraction of the plunger.

RRH10010C101 is designed for 10150 psi [700 bar] maximum working pressure. This cylinder has 250 mm stroke.

The cylinder stop ring is designed to withstand the full load. However, to reduce cylinder wear, use less than full stroke and pressure when possible.

A tilting saddle is also integrated on the cylinder body.

4.4 Technical Specifications

RRH10010C101 specifications are shown in the table below:

Cylinder Characteristics		
Max. Pushing Capacity	982.7 kN	100.2 Ton
Max. Pulling Capacity	511.3 kN	52.1 Ton
Stroke	250 mm	9.8 in
Effective Area (Pushing)	140.4 cm^2	21.76 in^2
Effective Area (Pulling)	73.0 cm^2	11.32 in^2
Oil Capacity (Pushing)	3509.7 cm^3	214.18 in^3
Oil Capacity (Pulling)	1826.1 cm^3	111.43 in^3
Max Working Pressure Push	700 bar	10150 psi
Weight	87.18 kg	192.20 lbs

5. Operation

5.1 Initial Setup

5.1.1 Lifting the Cylinder

RRH10010C101 cylinder is equipped with two pre-installed lifting eyes. Always use both lifting eyes when hoisting the cylinder.

Lifting straps or chains must be positioned at an angle where they will not interfere with the cylinder base. Use of a spreader bar is recommended. See Figure 3.

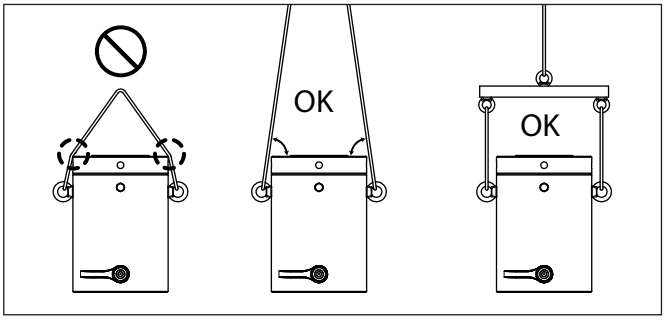


Figure 3: Lifting Arrangements (typical)

5.1.2 Hydraulic pump requirements

Hydraulic pumps are sold separately and are not included with the cylinders.

Whichever type of pump is used, be certain that the pump reservoir can hold enough amount of hydraulic oil to operate the cylinder (or set of cylinders) to full extension.

The pump must be equipped with a pressure release valve. This valve may be either manual or remote operated.

The pump must also be equipped with a secondary safety pressure relief valve that opens if the system working pressure exceeds 10,150 psi [700 bar]. Verify that the pump safety relief valve is adjusted to the proper setting before using the pump with the cylinder(s).

5.1.3 Hydraulic oil requirements

Use of Enerpac HF ISO 32 hydraulic oil is recommended. Enerpac HF oil is available at your local Enerpac Distributor or Authorized Service Center:

NOTICE

- Failure to use the correct oil type (high-quality ISO32 hydraulic oil) may result in damage to cylinderhydraulic components and will void the product warranty.
- Be sure that the oil is clean. The oil cleanliness should be maintained to a maximum level of 18/16/13 per the ISO4406 standard. If the oil develops a milky, cloudy or dark appearance, it should be changed immediately
- To avoid overfilling and possible equipment damage, add hydraulic fluid to the pump reservoir only after all cylinder plungers are completely retracted and system pressure is released.
- When using a hand pump to power the cylinder(s), it is permissible to use a high-quality brand of ISO 15 hydraulic oil. The lower oil viscosity will result in reduced pumping effort, especially in cold weather conditions.

5.1.4 Hydraulic connections

For double-acting cylinders, use a pump with a 4-way valve and two hoses.

Be certain that all couplers are fully connected, so that hydraulic flow is not blocked or restricted. All hoses, fittings and other hydraulic components in the circuit must be rated for at least 10150 psi [700 bar] operation.

Check for leaks in system and have repaired by qualified personnel.

NOTICE

RRH10010C101 is a double-acting cylinder. In both operational modes, return oil flow (from the non-pressurized side of the cylinder) must be directed back to the hydraulic reservoir. Check for proper flow before placing the equipment into operation.

NOTICE

To decompress port manually prior to connecting hose, move the manual valve several times in position advance and retract with the motor switched off (manual valves). For solenoid valves turn clockwise completely the valve handler in every valve and leave finally valves deactivated.

5.1.5 Air removal

Trapped air must be removed from the hydraulic cylinder and hoses before placing the system into operation. If multiple cylinders are to be used, it is recommended that air be removed from each cylinder individually. Refer to the following procedure:

1. Place the cylinder in the vertical position, with the base located on a flat and level surface. Be sure that there is no load on the plunger.
2. Position the hydraulic pump so it is located *higher* than the cylinder.
3. Fully advance and retract the plunger, being careful to avoid pressure build-up at full extension and full retraction. Repeat this process until plunger motion is smooth in both directions.
4. Fully retract the plunger after completing air removal procedures. Check oil level in pump hydraulic reservoir. Add oil if oil level is low.
5. Repeat steps 1 through 4 for all cylinders to be used in the hydraulic circuit.

NOTICE

Follow the pump manufacturer instructions when adding oil to the pump reservoir. To avoid overfilling, be certain that the cylinder plunger is fully retracted before adding any oil.

6. Fully advance and retract the plunger, being careful to avoid pressure build-up at full extension and full retraction. Repeat this process until plunger motion is smooth in both directions.
7. Fully retract the plunger after completing air removal procedures. Check oil level in pump hydraulic reservoir. Add oil if oil level is low.
8. Repeat steps 1 through 4 for all cylinders to be used in the hydraulic circuit.

5.1.6 Cylinder Base Support

Be certain to provide adequate support for the cylinder base. RRH10010C101 cylinders require a flat and stable lifting surface that is capable of supporting the load without settling.

⚠ CAUTION

Use of RRH10010C101 cylinder on surfaces such as sand, mud or dirt may result in loss of load and/or damage to cylinder.

5.2 Operating RRH10010C101

Operation procedures will vary, depending on hydraulic pump type, valve configuration and other factors. For detailed operating instructions and related information, refer to the instruction sheet included with your pump.

If using multiple RRH10010C101 cylinders: without load, verify that all plungers advance and retract in the same direction when the control valve is shifted. If necessary, relieve pressure and properly reconnect any reversed hydraulic hoses.

NOTICE

It is mandatory that the operator has a full understanding of all instructions, safety precautions and applicable safety regulations before operating any high force hydraulic equipment. If assistance is needed, contact your local Enerpac Distributor or Authorized Service Center.

⚠ WARNING

To prevent serious personal injury, keep hands, fingers and other body parts clear of working area during cylinder operation.

To advance: Operate pump and valve so that pressurized oil flow is directed in a controlled rate from the pump reservoir to the cylinder advance coupler.

To retract: Operate pump and valve so that pressurized oil flow is directed in a controlled rate from the pump reservoir to the cylinder retract coupler. Note that additional hydraulic components may be required to control the rate at wich the plunger retracts under load.

Retract Side Safety Relief Valve

RRH10010C101 cylinders include a retract side safety relief valve. It is located near the top of the cylinder base.

The valve is designed to relieve retract chamber pressure in the event that hydraulic flow is directed to the advance side of the cylinder while the retract side hose is disconnected. It is factory set at approximately 10150 psi [700 bar].

⚠ WARNING

Do not remove, alter or disable the retract side safety relief valve. Do not readjust the valve setting. Failure to observe this instruction may result in possible catastrophic failure of the cylinder. Serious personal injury could result.

6. Inspection, maintenance & storage

- Periodically check the hydraulic system looking for loose connections, leaks and other mishaps. Replace any damaged components.
- Monitor oil temperature during operation. Do not exceed temperatures above 150°F [65°C].
- Install dust cap(s) on the couplers after the hydraulic hoses are disconnected from the cylinder.
- Keep all hydraulic components clean.
- Change hydraulic oil at the recommended interval shown in the pump operation manual. Change the oil immediately if it shows signs of contamination.
- Store cylinders in a clean, dry and secure location. Keep stored cylinders and hoses away from heat and direct sunlight.
- If repairs are required, refer to the Enerpac website to find the repair parts sheet applicable to each cylinder model.

NOTICE

Hydraulic equipment must only be serviced by a qualified hydraulic technician. For repair service, contact the Enerpac Authorized Service Center in your area.

7. Relieving trapped pressure

Hydraulic pressure can sometimes become trapped within a hydraulic cylinder. This condition can occur in both single and double-acting cylinders but is most likely to happen in a double-acting cylinder that has been exposed to changing ambient temperatures.

A common indication of trapped pressure is when mating hose and cylinder couplers will not engage or are unusually difficult to engage.

If a trapped pressure condition is suspected, always use the Enerpac model CT-604 coupler bleed tool (available from your Enerpac distributor) to safely relieve any remaining pressure.

⚠ WARNING

Never attempt to relieve trapped hydraulic pressure within the cylinder by loosening a coupler on the cylinder base.

Trapped hydraulic pressure can cause a loosened coupler to dislodge unexpectedly with great force. Serious personal injury or death will result if the coupler becomes a projectile and strikes persons working in the area.

A sudden escape of pressurized hydraulic oil may also occur if a coupler is loosened while trapped hydraulic pressure is present. Serious personal injury or death could result if a high-pressure oil stream penetrates the skin.

Use only the Enerpac CT-604 coupler bleed tool to relieve trapped hydraulic pressure within the cylinder.

⚠ WARNING

Never use a hammer and punch (or other similar method) to unseat a coupler check ball that is under pressure. Serious personal injury or death could result due to the sudden and uncontrolled escape of high-pressure oil. Use only the Enerpac CT-604 coupler bleed tool to relieve trapped pressure within the cylinder.

8. Parts List

8.1 Exploded Views

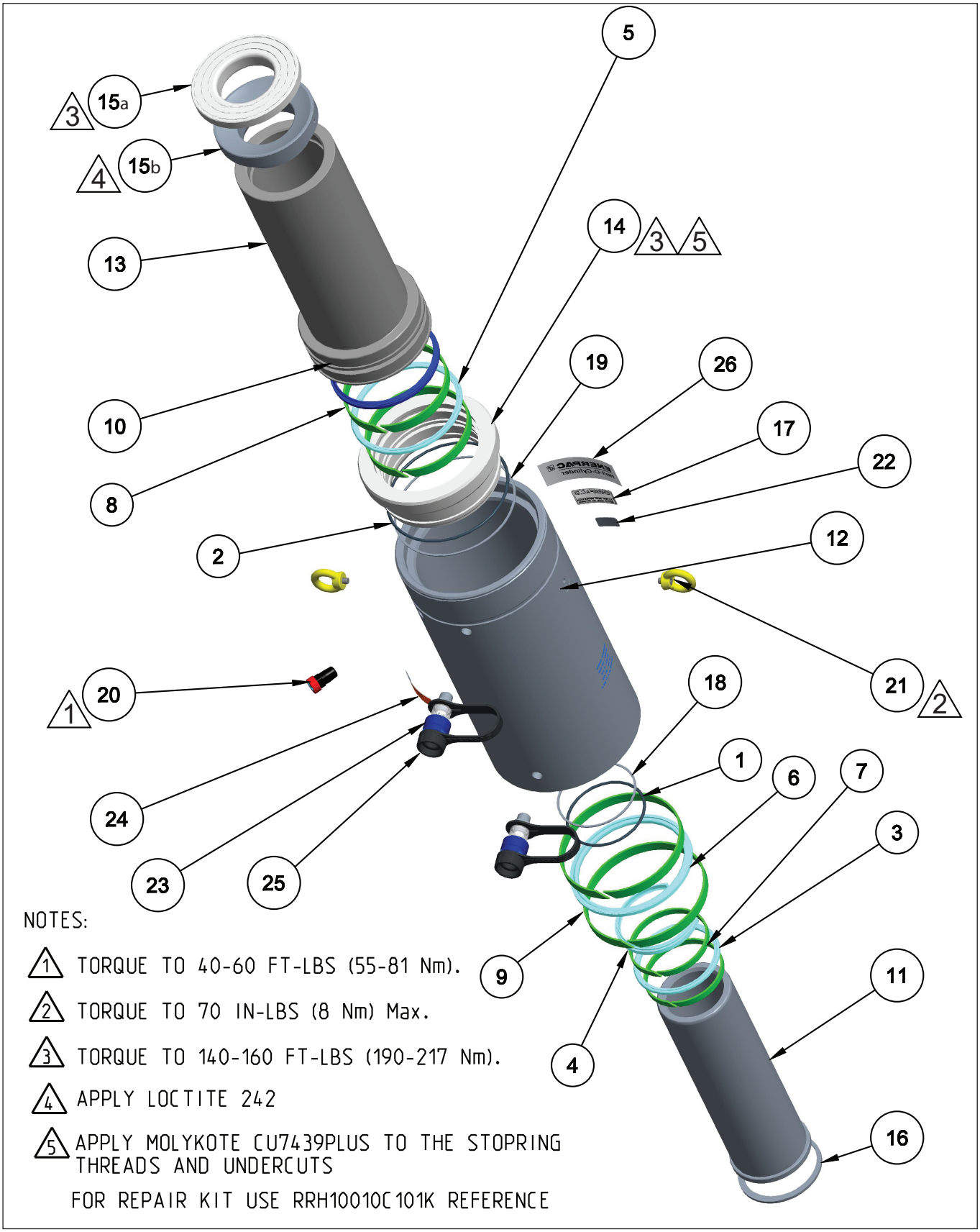


Figure 4: RRH10010C101 exploded view

Item Nº.	Description	Qty	Part Number
1	O-Ring	1	B1109503
2	O-Ring	1	B1126503
3	Rod Seal	1	BA0105514
4	Scraper	1	BA0105776
5	Rod Seal	1	BA0140514
6	Piston Seal	1	BA0170513
7	Rod Glide Ring	2	BAC0105141
8	Rod Glide Ring	2	BAD0140141
9	Piston Glide Ring	2	BBD0170141
10	Scraper	1	BC0140776
11	Internal Tube	1	C230150013
12	Cylinder Base	1	C230150030
13	Plunger	1	C230150040
14	Stop Ring	1	C230150044
15a	Upper Saddle	1	C230150045-1
15b	Under Saddle	1	C230150045-2
16	Retaining Ring	1	CCA1112044-1C
17	Model Number Decal	1	DA5255026
18	Back Up Ring	1	DB3117566
19	Back Up Ring	1	DB3118566
20	Relief Valve	1	DB8049900
21	Eyebolt	2	DB8050667
22	Enerpac UIN Warning Decal	1	DB9473026
23	Female Coupler	2	DC1389900
24	Warning Decal	1	DC6154026
25	Dust Cap	2	DD1782020
26	Enerpac Decal	1	G668026

9. Troubleshooting

Refer to the troubleshooting guide when diagnosing cylinder operational problems. Please note that the troubleshooting guide is not all-inclusive and should only be considered as an aid to help diagnose the most common possible problems. For repair service, contact your nearest Enerpac Authorized Service Center. As required, also refer to the troubleshooting information provided with your hydraulic pump or power unit.

Troubleshooting Guide		
Symptom	**Possible Cause**	**Solution**
1. Plunger will not advance.	a. Pump release valve open.	Close pump release valve.
	b. Directional control valve not in proper position.	Shift directional control valve to proper position.
	c. Coupler not fully tightened.	Tighten coupler.
	d. Pump oil level is low.	Add oil to pump reservoir as required.
	e. Pump malfunctioning.	Repair or replace pump as required.
	f. Cylinder load rating too low for application.	Use a cylinder with a higher load rating.
	g. Cylinder seals leaking.	Repair or replace cylinder.
2. Plunger advances only part way.	a. Oil level in pump is low.	Add oil to pump reservoir as required.
	b. Coupler is not fully tightened.	Tighten coupler.
	c. Cylinder plunger binding.	Repair or replace cylinder.
3. Plunger advances erratically.	a. Air in hydraulic system.	Remove air from hydraulic system.
	b. Cylinder plunger binding.	Repair or replace cylinder.
4. Plunger advances more slowly than normal.	a. Leaking connection.	Repair leaking connection.
	b. Coupler not fully tightened.	Tighten coupler.
	c. Pump malfunctioning.	Repair or replace pump as required.
5. Plunger advances but will not hold.	a. Pump malfunctioning.	Repair or replace pump as required.
	b. Leaking connection.	Repair leaking connection.
	c. Incorrect system set-up.	Check hose connections at pump and cylinders.
	d. Cylinder seals leaking.	Repair or replace cylinder.
6. Cylinder leaks oil.	a. Worn or damaged cylinder seals.	Repair or replace cylinder.
	b. Internal cylinder damage.	Repair or replace cylinder.
	c. Loose connection.	Tighten or repair connection.
7. Plunger will not retract or retracts more slowly than normal.	a. Pump release valve closed.	Open pump release valve.
	b. Directional control valve not in proper position.	Shift directional control valve to proper position.
	c. Pump reservoir is overfilled.	Drain oil from pump reservoir as required.
	d. Improper hose connections.	Check hose connections.
	e. Narrow hose restricting oil flow.	Replace with larger diameter hose.
	f. Internal cylinder damage.	Repair or replace cylinder.
8. Oil leakage from external relief valve.	a. Coupler not fully tightened.	Tighten coupler.
	b. Restriction in return line.	Remove restriction from return line.
	c. Relief valve setting incorrect.	Check relief valve setting.
	d. Relief valve damaged or contaminated.	Repair or replace relief valve.

NOTES



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