

Enduro Running & Setting Tools



The Enduro-ST with Enduro-RT tandem Setting and Running Tools are a premium liner running tool. Boasting innovative design features intended to put any liner into place, even in the most demanding hole conditions.

Features

- 48 square inches of setting area
- Simplest and most robust running/setting tool available, stab-in and automatic hydraulic release
- One tool sets and retrieves all Wellfirst hangers and seals
- Extremely high setting force capability; can set any Wellfirst hanger/seal with the rig pump
- Simple adapter kits accommodate different sizes of hanger and seals
- Simple operation and redress, field adjustable shear setting
- High torque through capabilities
- Emergency threaded and secondary emergency 1/6-turn shear release
- Depressurization of the work string/full circulation indicates full release
- Once unset, circulation is to the bottom of the hanger/seal or circulation string

Tool Operation

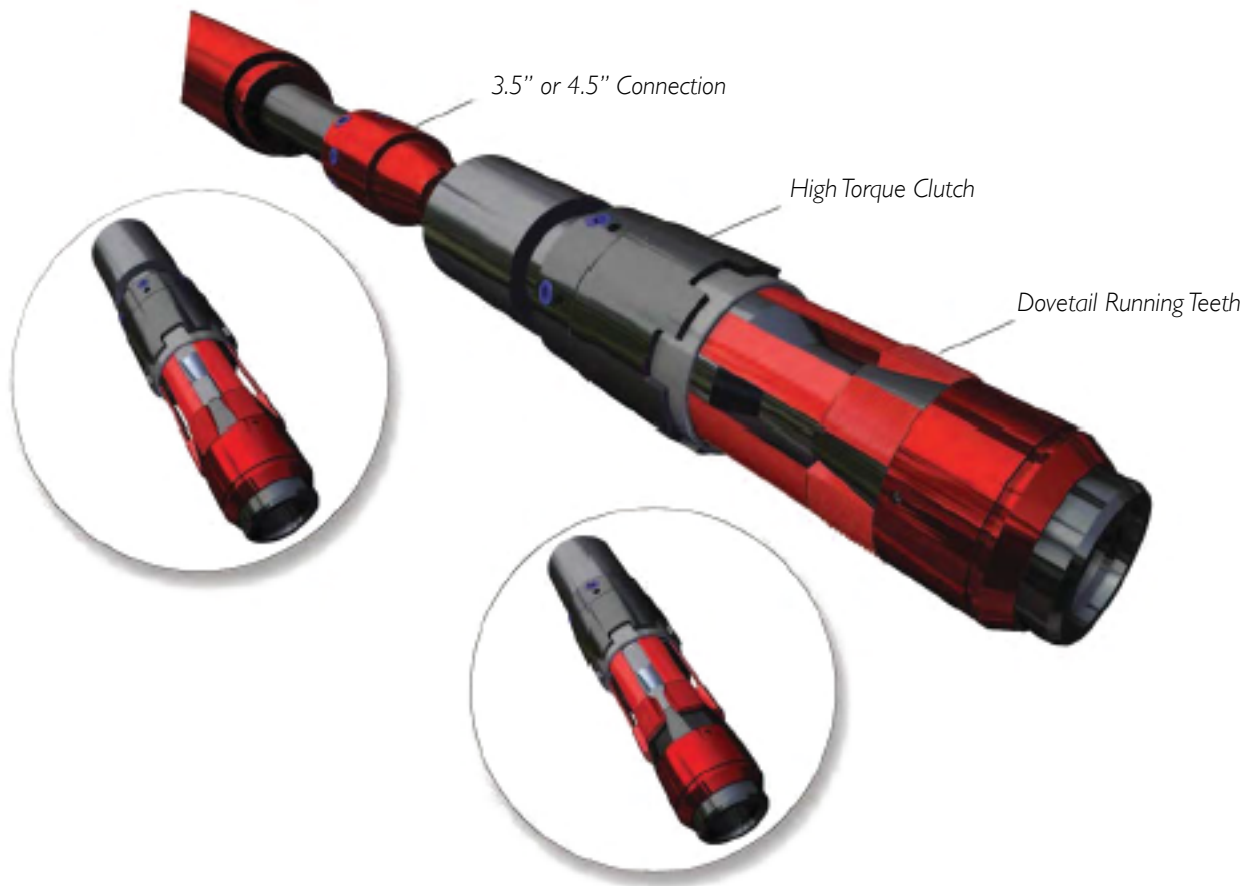
Enduro-ST is a double-piston, hydraulically actuated setting tool designed for vigorous tension, compression, drill-down, and drill-in-place operational situations. The tools will run and retrieve any Wellfirst liner hanger or liner top packer. With just the set down weight of the Enduro-RT, the running head, with sturdy snap-in running teeth, engages the running threads of the seal and/or liner hanger to be run. The Enduro-RT's high torque clutch, capable of up to 30,000 ft-lbs of torque, automatically engages the clutch of the seal and/or liner hanger with virtually no rotation.




Enduro Liner Hanger Running/Setting Tools

Enduro-RT Running Tool				
Torque Limits				
4140 Material	EXTrack Mandrel Clutch		4-1/2" IF Thread	
Torque	35,000 ft/lbs	47,454 Nm	31,000 ft/lbs	42,030 Nm
Tensile Limits				
4140 Material	EXTrack Release Dogs		4-1/2" IF Thread	
Tensile Limits	480,000 lbs	2135 kN	587,000	2611 kN
Maximum Pressure				
4140 Material	EXTrack Release Sleeve		3-1/2" EUE Tubing	
Burst	10,000 psi	68.95 Mpa	10,000 psi	68.95 Mpa
Releasing Pressure				
Maximum Hydraulic Releasing Pressure			3,000 psi	20.68 Mpa
Upper Connection		4-1/2" IF Box	114.3 mm IF Box	
Lower Connection		3-1/2" EUE Box	88.9 mm EUE Box	

Enduro-ST Setting Tool				
Torque Limits				
4140 Material	Torque Pins		4-1/2" IF Thread	
Torque	35,000 ft/lbs	47,454 Nm	31,000 ft/lbs	42,030 Nm
Tensile - Pressure Limits				
4140 Material (L-80)	Value			
Tensile Yield	460,000 lbs		2046 kN	
Pressure Limits	10,000 psi		68.95 Mpa	



ENDURO™ Liner Hanger Packer



The **ENDURO™** RLH features proprietary SureSet and SafeSlip technology providing the most reliable hanger in both setting and retrieving operations. Designed to exceed expectations over a wide range of completion operations including, fracturing, gravel-packing, sand control, and primary completions. The **ENDURO™** RLH is conveyed via tubing or drill pipe with the Enduro ST and Enduro RT running and setting tools, and are designed for extreme high torque operations, including rotating and drilling the liner into position.

The **ENDURO™** Liner Hanger Packer is a premium retrievable liner top packer that can be used in a wide variety of applications: as a production or isolation seal bore packer; vertical, deviated, and horizontal wells; gravel packing; fracturing; and hanging liners. The packer is designed for primary conditions - operable in high pressures and temperatures up to 7,500 psi (51.7 MPa) and 400°F (204°C). Due to the static nature of the mechanism, the sealing material is formed from a material rated at 400°F (204°C) in primary applications. The Solace Liner Packer can be configured with WELLFIRST proprietary Thermo Seal Packing Element Technology for use in static and dynamic applications up to 675°F (357°C) and 2,500 psi (17.2 MPa).

Features

- **High temperature and pressure applications**
- **SureSet™** — seal energized to replace seal efficiency over time
- **SafeSlip™** — unique dovetail slips energized to maintain maximum extension regardless of top or bottom pressure
- **Small footprint** — a thermal tie-back adapter kit and one-piece internal mandrel eliminates the need to seal into a long tie-back and also allows the hanger to be fished from the internal mandrel.
- **THERMONator™** thermal element refined over 20 years of thermal experience and testing.
- **Innovative pre-heating manufacturing process**, results in less than 1% minimum initial seal degradation
- **Soft and hard release options available**
- **High torque**
- **Design meets ISO 14310**
- **Fewer sealing points than competitive hangers**



THERMONator™ Sealing Technology

For high temperature applications, When the **ENDURO™** is configured with the proprietary **THERMONator** Seal which was tested at world renowned CFER Technologies test facility to 700°F and 2,500 psi. The **THERMONator's** seal material is chemically inert and is rated at 1,200°F and 3,000 psi. It is processed and heat treated to remove all filler materials to result in a seal that both seals better with solids impregnation in a dynamic state and also eliminates any risk of losing set force due to volume loss caused by material evaporation.

SureSet™ Technology Features

SureSet™ ensures the **THERMONator** sealing element is secured in the maximum extruded position and energized from both the top and bottom of the seal to provide maximum sealing efficiency over time. **SureSet's** energization mechanism is designed to maintain sealing efficiency by transferring stored energy to the seal over the life of the install. An integral ratchet mechanism secures the set seal to ensure, that regardless of top or bottom pressure, no energy is lost from the **ENDURO™** dovetail slips once set.

SafeSlip™ Technology

The **ENDURO™** unique **SafeSlip™** slips are neatly housed into the hanger during conveyance. The **SafeSlip™** mechanism ensures that the hangers slips are engaged into the casing wall with maximum extension regardless of pressure.

ENDURANCE™ Thermal Liner Hanger Packer

ENDURANCE™ Thermal Liner Hanger Packer											
Liner x Casing	Casing Size	Casing Weight	Liner Size	Liner Weight	Max. O.D.	Liner x Casing	Casing Size	Casing Weight	Liner Size	Liner Weight	Max O.D.
in	in	lb/ft	in	lb/ft	in	mm	mm	kg/m	m	kg/m	mm
4-1/2 x 6-5/8	6.63	28.00 – 32.00	4.50	9.50 – 15.10	5.38	114.3 x 177.8	168.4	41.67 – 47.62	114.3	14.14 – 22.47	136.60
	6.63	35.00	4.50	9.50 – 15.10	5.35		168.4	52.09	114.3	14.14 – 22.47	135.90
4-1/2 x 7	7.00	23.00 – 26.00	4.50	9.50 – 15.10	6.05	114.3 x 177.8	177.8	34.23 – 38.69	114.3	14.14 – 22.47	153.67
	7.00	26.00 – 29.00	4.50	9.50 – 15.10	5.95		177.8	38.69 – 43.16	114.3	14.14 – 22.47	151.13
	7.00	29.00 – 38.00	4.50	9.50 – 15.10	5.69		177.8	43.16 – 56.55	114.3	14.14 – 22.47	144.53
5 x 7	7.00	23.00 – 26.00	5.00	11.50 – 18.00	6.05	127.0 x 177.8	177.8	34.23 – 38.69	127.0	17.11 – 26.79	153.67
	7.00	26.00 – 29.00	5.00	11.50 – 18.00	5.95		177.8	38.69 – 43.16	127.0	17.11 – 26.79	151.13
	7.00	29.00 – 38.00	5.00	11.50 – 18.00	5.69		177.8	43.16 – 56.55	127.0	17.11 – 26.79	144.53
5 x 7-5/8	7.63	33.70 – 39.00	5.00	11.50 – 18.00	6.37	127.0 x 193.7	193.7	50.15 – 58.04	127.0	17.11 – 26.79	161.80
5-1/2 x 7-5/8	7.63	24.00 – 29.70	5.50	14.00 – 23.00	6.65	139.7 x 193.7	193.7	35.72 – 44.20	139.7	20.83 – 34.23	168.91
	7.63	29.70 – 33.70	5.50	14.00 – 23.00	6.56		193.7	44.20 – 50.15	139.7	20.83 – 34.23	166.62
	7.63	33.70 – 39.00	5.50	14.00 – 23.00	6.41		193.7	50.15 – 58.04	139.7	25.30 – 52.09	162.81
7 x 9-5/8	9.63	29.30 – 40.00	7.00	17.00 – 35.00	8.43	177.8 x 244.5	244.5	43.60 – 59.53	177.8	25.30 – 52.09	214.12
	9.63	40.00 – 53.50	7.00	17.00 – 35.00	8.25		244.5	59.53 – 79.62	177.8	25.30 – 52.09	209.50
	9.63	53.50 – 58.40	7.00	17.00 – 35.00	8.16		244.5	79.62 – 86.91	177.8	25.30 – 52.09	207.26
6-5/8 x 8-5/8	8.63	24.00 - 36.00	6.63	20.00 – 24.00	7.59	168.3 x 219.1	219.1	35.72 - 53.57	168.3	29.76 - 35.72	192.79
	8.63	40.00 - 49.00	6.63	28.00 – 32.00	7.31		219.1	59.52 - 72.92	168.3	41.67 – 47.62	185.67



Enduro Liner Top Packer

Enduro RLP is a premium liner top seal that is designed for use in a wide variety of applications. The seal utilizes a proprietary blend of elastomer that is ideal for operation in primary conditions with high pressures and temperatures — up to 7,500 psi (51.7 MPa) and 400° F (204°C). When used in conjunction with the Enduro Running Tool and other liner circulation tools, the robust design is ideal for drilling in and circulating liners into position. A large beveled liner entry facilitates liner re-entry for workover or tractor operations.

Features

- Large bore liner top seal is suitable for drill-down operations
- Available in standard, thermal, and sour gas configurations
- Rated to 7,500 psi (51.7 MPa) and 400°F (204°C) primary and 2,500 psi (17.2 MPa) and 675°F (357°C) thermal

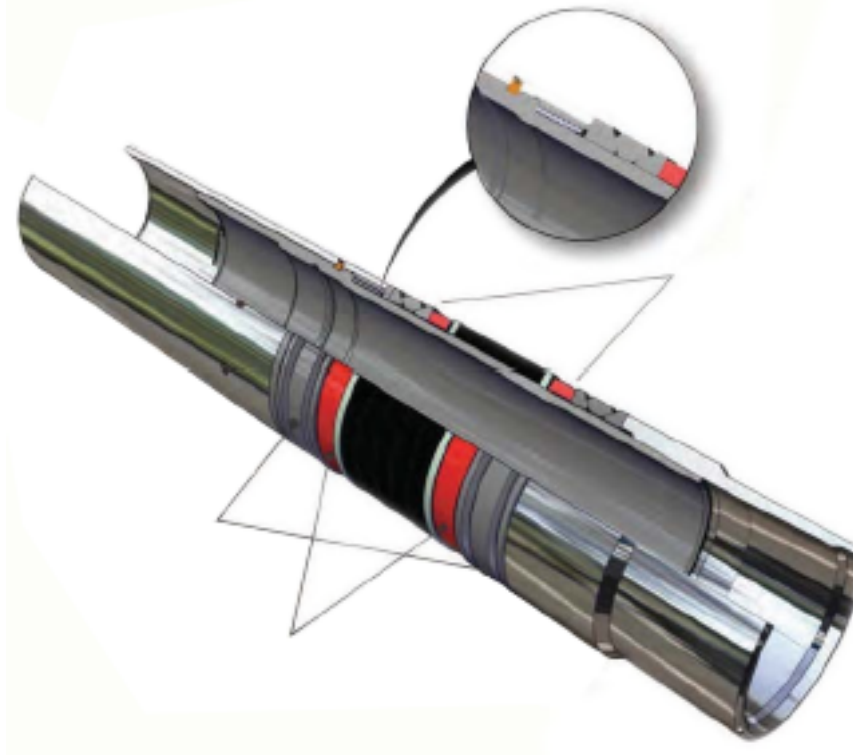
Thermo Seal Packing Element

For higher temperature static and dynamic applications — up to 675°F (357°C) and 2,500 psi (17.2 MPa) — the Thermal Sole Liner Top Seal Packer can be configured with our proprietary Thermoator Seal Packing Element. The chemically inert thermo seal material was tested to 675°F (357°C) and 2,500 psi (17.2 MPa). A unique internal mechanical locking mechanism charges the seal and maintains complete set force for the life of the installation.



Thermal Sole Liner Top Seal Packer

Thermal Sole Liner Top Seal Packer											
Liner x Casing	Casing Size	Casing Weight	Liner Size	Liner Weight	Max. O.D.	Liner x Casing	Casing Size	Casing Weight	Liner Size	Liner Weight	Max O.D.
in	in	lb/ft	in	lb/ft	in	mm	mm	kg/m	m	kg/m	mm
4-1/2 x 7	7.00	20.00 – 26.00	4.50	9.50 – 15.10	5.88	114.3 x 177.8	177.8	29.76 – 38.69	114.3	14.14-22.47	149.35
	7.00	26.00 – 29.00	4.50	9.50 – 15.10	5.75		177.8	38.69 – 43.16	114.3	14.14-22.47	146.06
5 x 7	7.00	17.00 – 23.00	5.00	11.50 – 18.00	6.00	127.0 x 177.8	177.8	25.30 – 34.23	127.0	17.11-26.79	152.40
	7.00	20.00 – 26.00	5.00	11.50 – 18.00	5.88		177.8	29.76 – 38.69	127.0	17.11-26.79	149.35
	7.00	26.00 – 29.00	5.00	11.50 – 18.00	5.75		177.8	38.69 – 43.16	127.0	17.11-26.79	146.05
	7.00	32.00 – 38.00	5.00	11.50 – 18.00	5.56		177.8	47.62 – 56.55	127.0	17.11-26.79	141.22
5-1/2 x 7	7.00	17.00 – 26.00	5.50	14.00 – 23.00	6.00	139.7 x 177.8	177.8	25.30 – 38.69	139.7	20.83-34.23	152.40
5 x 7-5/8	7.63	33.70 – 39.00	5.00	11.50 – 18.00	6.31	127.0 x 193.7	193.7	50.15 – 58.04	127.0	17.11-26.79	160.27
5-1/2 x 7-5/8	7.63	20.00 – 26.40	5.50	14.00 – 23.00	6.62	139.7 x 193.7	193.7	29.76 – 39.29	139.7	20.83-34.23	168.15
	7.63	26.40 – 33.70	5.50	14.00 – 23.00	6.41		193.7	39.29 – 50.15	139.7	20.83-34.23	162.81
7 x 9-5/8	9.63	29.30 – 40.00	7.00	17.00 – 35.00	8.43	177.8 x 244.5	244.5	43.60 – 59.53	177.8	25.30-52.09	214.12
	9.63	40.00 – 47.00	7.00	17.00 – 35.00	8.38		244.5	59.53 – 69.94	177.8	25.30-52.09	212.85
	9.63	43.50 – 53.50	7.00	17.00 – 35.00	8.20		244.5	64.74 – 79.62	177.8	25.30-52.09	208.28
	9.63	58.40	7.00	17.00 – 35.00	8.12		244.5	86.91	177.8	25.30-52.09	206.25
7-5/8 x 9-5/8	9.63	32.30 – 40.00	7.63	24.00 – 45.30	8.45	193.7 x 244.5	244.5	48.07 – 59.53	193.7	35.72-67.41	214.63
	9.63	40.00 – 47.00	7.63	24.00 – 45.30	8.25		244.5	59.53 – 69.94	193.7	35.72-67.41	209.55
9-5/8 x 13-3/8	13.38	54.50 – 68.00	9.63	32.30 – 58.40	12.00	244.5 x 339.7	339.7	81.10 – 101.19	244.5	48.07-86.91	304.80



PermaPak Liner Top Packer

Liner Hangers & Accessories

PermaPak Hydraulic Packer is a large seal bore packer. The hydraulic setting chamber is built into the packer, there is no need for additional setting tools in the string.

Features

- **Works in conjunction with 3J Seal Bore Receptacle**
- **Full Bore design**
- **No special setting tools required**

Operation

Pressure enters the setting chamber via holes in the internal mandrel of the packer. When the frac liner is positioned correctly in the proper location of the well a ball is dropped to start the setting activation process. The ball lands in the Flow Lock Sub, sealing off communication from tubing to annulus. Pressure is increased until the initial setting process beings (1,376 psi). The packer is completely set with 3,500 psi.

Packer Size	Weight	Recommended Hole Size	Tool OD	Seal Bore
in/mm	lbs/ft - kg/m	in/mm	in/mm	in/mm
4.0" x 7.0"	23 - 32	6.094 - 6.366	5.875	4.00
101.60x177.80	34.2 - 47.6	154.79 - 161.70	149.23	101.60

Packer Size	Setting Area	Setting Initiation	Minimum Setting Pressure	Maximum Setting Pressure
in/mm	in ² /cm ²	psi/mpa	psi/mpa	psi/mpa
4.0" x 7.0"	5.809	1,375	3,500	4,500
101.60x177.80	37.48	9.48	24.13	31.02



Model SS Hydraulic Liner Setting Tool

Liner Hangers & Accessories

The Model SS Hydraulic Liner Setting Tool is used primarily for running and setting the Model S series of conventional and thermal liner packers and liner hangers using conventional tubing or drill pipe.

Features

- The compact, high strength design securely locks the liner to the setting tool until the setting tool is activated and the setting procedure is complete.
- The setting tool allows rotation of the liner in order to facilitate running the liner assembly to the bottom in deviated wells or wells that are prone to sand fill.
- Circulation is possible through the setting tool and liner until the setting ball is inserted into the tubing string and lands on the ball seat. Once setting is complete, circulation between annulus and tubing through the setting tool is possible.
- The setting force at which the setting tool releases from the hanger is adjustable, in order to accommodate the use of both thermal and conventional packer elements. The setting force at which the tool begins to apply pressure to the liner packer/hanger is also adjustable in order to facilitate safe and secure running in all conditions.
- The unique design of the running dogs guards insures an easy and reliable release of the setting tool from the liner even in highly deviated wells.

Procedures

Once the Model SS Hydraulic Liner Setting Tool is made up onto the liner packer/hanger, the assembly is run into the well. Normally, the setting ball would not be run in place in order to allow circulation if necessary. The liner may be rotated to assist in getting the liner to bottom in deviated wells or to facilitate sand clean out. Once at depth, the setting ball is dropped and allowed to gravitate to the seat, or the ball may be circulated to the seat. Once the ball is seated, the tubing is pressured up against the ball. At a predetermined differential pressure, the setting tool is activated and the liner packer/hanger begins to set. The tubing pressure is generally increased in stages (important when thermal elements are used) to allow sufficient time for the element to set securely. The tubing pressure is then increased to the preset differential pressure at which the ball seat shifts downward, opening up circulation ports. At the same time, the dogs that lock the setting tool onto the liner are released and the setting tool is free to be retrieved and reused.

Model E Hydraulic Liner Setting Tool						
Liner		Casing				Product Number
Size		Size				
		O.D.		Weight Range		
in	mm	in	mm	lbs/ft	kg/m	
7	177.8	9-5/8	244.5	29.0 – 40.0	43.2 – 59.5	34-100-7095-00
				40.0 – 47.0	59.5 – 69.9	
				43.0 – 53.0	64.0 – 78.9	
		10-3/4	273.1	32.0 – 45.0	47.6 – 67.0	34-100-7017-00
45.0 – 55.0	67.0 – 81.8					
7-5/8	193.7	9-5/8	244.5	32.0 – 40.0	47.6 – 59.5	34-100-7595-00
				40.0 – 47.0	59.5 – 69.9	
				32.0 – 40.0	47.6 – 59.5	
		10-3/4	273.1	45.0 – 55.0	67.1 – 81.8	34-100-7517-00
55.0 – 65.0	91.8 – 96.7					
8-5/8	219.1	10-3/4	273.1	32.0 – 45.0	47.6 – 67.0	34-100-8517-00
10-3/4	273.1	13-3/8	339.7	48.0 – 61.0	71.4 – 90.8	34-100-1713-00
				61.0 – 68.0	90.8 – 101.2	



Single Trip Liner Tool

Liner Hangers & Accessories

The Single Trip Liner Tool integrates the functionality of a ball actuated isolation valve and retrievable bridge plug and is installed on the initial open hole liner run to provide wellbore isolation. This eliminates the need for a costly second trip bridge plug run. The tool is run below the liner hanger packer and allows full reciprocation, rotation, and circulation of the liner string during the run to setting depth. The isolation valve is actuated by ball drop during standard liner top installation procedures. Heavy duty lugs mechanically anchor the isolation valve to the liner string to resist movement due to differential pressure. A debris ring protects the anchor and seal system from sand and debris accumulation. The valve may be pressure tested after releasing the liner running tool.

The isolation valve is opened and retrieved with a standard On/Off stinger by straight tension shear. Equalization ports ensure wellbore pressure equalization occurs before the lugs are disengaged from the liner string. After retrieval, the full bore of the liner is unobstructed.

As an added feature, the Single Trip Liner Tool has second trip installation capability when the matching profile sub has been previously installed with the liner string. Simply run the tool to depth with the On/Off stinger until engaged with the profile sub and set the isolation valve by slacking off weight.

