



Montgomery County Fire and Rescue

## **Battery Powered Hydraulic Rescue Tools**

April 2017

Manufacturer: Genesis Rescue Systems – [www.genesisrescue.com](http://www.genesisrescue.com)

### Overview and Background

- System operating pressure - 10,000 PSI
- System uses a mineral base hydraulic fluid. The battery powered hydraulic system is a closed system; the motor, fluid, and tool are all one system - there is nowhere for operators to access the fluid or motor. [MSDS](#)
- Regardless of the manufacturer, all battery powered tools have larger bodies and weigh slightly more than traditional hydraulic rescue tools. This is due to the brushless motor, fluid reservoir, and battery that are all self-contained.
- Benefits of Battery Powered Tools
  - Quieter operation
  - No hydraulic lines to create entanglement or trip hazards within the extrication area
  - Multiple tools can operate completely independent of each other with less setup time
  - Easier to deploy distant from the apparatus and not limited by hose length or power units
    - Over embankments
    - Industrial or indoor facilities
    - Construction areas
  - More versatility for interior of buildings - Rapid Intervention, industrial entrapments, collapse rescue
  - Integrated LED lights automatically illuminate the work area of the tool
- Limitations
  - Operations are limited to the life of the battery
    - Be prepared to stage additional batteries near the operation
  - Center of gravity is slightly different than traditional hydraulic tools
  - Overall length of the tools is longer than traditional hydraulic tools
  - Not recommended for submersion in water
    - If an underwater operation is necessary, the weakest link is the battery connection - make every attempt to keep the battery area above water
    - If the tool must be completely submerged to save a life, attempt to operate the tool underwater – other departments have been successful although it is not the recommended practice

## Battery Operated Hydraulic Tools

- New tool characteristics and features
  - Depress the power button to engage the motor
    - Pause to allow the motor to fully engage before attempting to cycle the tool
    - Motor automatically shuts off to conserve battery life after 30 seconds with no tool movement
    - Running motor reduces delay to operate the tool
  - Rocker lever control
    - Opens and closes the tool – motor must be running first
    - Deadman type controller – release the lever and the tool stops
    - Tool speed and power vary with the amount of lever actuation – maximum power is only achieved when the rocker is fully actuated
  - Anticipate swapping out batteries and charging batteries during extended or complex rescue operations – batteries have a charge status display to determine amount of charge left
    - When a battery reaches full discharge the tool will stop abruptly – there is no gradual slow down
  - Cutters, spreaders, and combination tools have some form of adjustable handle to suit various situations and tool positions
  - Similar to traditional hydraulic tools, the tool operation will slow down or stop as internal pressure builds to match the load and continue the cutting/spreading/pushing/pulling. Be sure to give the tool time to work.
  - “Dead-heading” the tool - when the tools, specifically the cutter and combi tool, are fully closed and the operator continues to press the rocker lever to close the tool the tool will make a loud audible alarm
    - If this occurs – release the rocker lever
    - If the alarm continues and the tool cannot be opened simply shut off the power and then turn the power back on - open the tool in the opposite direction to release the pressure
    - The alarm sounds as the tool is preventing damage to the tips, arms, or cutters



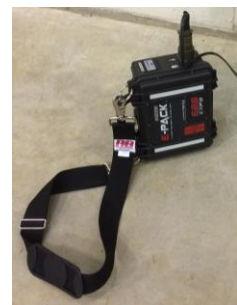
### Battery Characteristics and Power Options

- 28V lithium-ion batteries manufactured by Milwaukee
- There are enough batteries for each hydraulic tool to have three batteries assigned:
  - One 5 amp-hour battery
    - Provides approximately 20 minutes of continuous operation
  - Two 3 amp-hour batteries
    - Provide approximately 10 minutes of continuous operation each

- Battery life varies with the severity or intensity of the tool operation
  - Cutting sheet metal requires less pressure than cutting bar stock, so the battery will last longer when cutting sheet metal
- Battery charging
  - This generation of batteries does not develop a memory.
  - Good for approximately 500 cycles - a cycle is 1 full charge
  - Each battery has a charge level indicator
    - For accurate reading the battery must not be used for at least 1 minute prior to checking
  - Battery charges sense the amount of recharge needed and only provides the amount of charge required
    - If the battery level is at 50%, then recharging is half of a cycle
    - If the battery level is at 25%, then recharging is quarter of a cycle
    - One cycle may be the result of multiple partial charges
  - Batteries can be left out of the charger for prolonged periods with a very small loss of power, approximately 1-5% over a month
  - Batteries may be left in the charger for prolonged periods with no bad effects
    - Off and on shoreline or generator power to the charger does not reduce battery life
  - From a dead battery to full charge is 45 minutes to 1 hour
  - Recharging is slowest during the first 10% and the last 10%
    - Removing the battery prior to full recharge may offer enough power to complete your operation



- Batteries lock into place at the rear of the tool. Batteries slide into a channel and lock into the tool. The battery is released by depressing two buttons on the battery. The same system is in place on the chargers.
- Be careful not to side load the batteries as the mounting track for the battery may be damaged
- Sling pack – used when longer high intensity tool operation is desired or while batteries charge during a prolonged incident
  - One - Genesis E28 E-Pack
  - 13 amp-hour supply
  - 15' cable from Pelican case to battery insert
  - Weighs 10.9 lbs
  - Provides approximately 45 minutes of continuous operation
  - From dead to full charge is up to 6 hours








- 110V AC Adapter – provides continuous tool operation
  - Three – EFORCE 110V AC Adapters
  - Three-prong household plug to battery insert
  - Maximum draw is 8amps
  - Run from an apparatus generator, portable generator, or any suitable duplex outlet in a building



Tool Specifications






- Cutters:
  - C236
    - Length = 38.7”
    - weight = 51.8 lbs
    - 7.9” opening
    - max cutting force of 236,000 lbf
    - NFPA Cut rating = A8, B9, C8, D9, E9 (see chart below)
  - C165
    - Length = 33.3”
    - Weight = 43 lbs
    - 5.9” opening
    - Max cutting force = 144,450 lbf
    - NFPA Cut rating = A8, B5, C6, D7, E9 (see chart below)
  - Old versus new
    - Battery tools are longer; 3” on the 165 and 8” on the 236
    - Battery tools have a higher ratings on the NFPA Cut Chart
    - Weight; the 165 is lighter by 4 lbs, the 236 is greater by 4 lbs
    - Cutter opening; 165 is less, the 236 is slightly greater



Material Category	A Round Bar	B Flat Bar	C Round Pipe	D Square Tube	E Angle Iron	
						
Material	A-36 Hot-Rolled	A-36	Schedule 40 A-53 Grade B	A-500 Grade	A-36	
Performance Level	Diameter (in.)	Thickness × Width (in. × in.)	Nominal size (in.)	OD × Wall Thickness (in. × in.)	Dimension × Wall Thickness (in. × in.)	Square Dimension × Thickness (in. × in.)
1	3/8	1/4 × 1/2	3/8	0.68 × 0.09	1/2 × 0.06	1/2 × 3/8
2	1/2	1/4 × 1	1/2	1.05 × 0.11	3/4 × 0.06	1 × 3/8
3	5/8	1/4 × 2	1	1.32 × 0.13	1 × 0.08	1 1/4 × 3/8
4	3/4	1/4 × 3	1 1/4	1.66 × 0.14	1 1/4 × 0.12	1 1/2 × 3/8
5	7/8	1/4 × 4	1 1/2	1.90 × 0.15	1 1/2 × 0.12	1 1/2 × 1/4
6	1	3/8 × 3	2	2.38 × 0.15	1 3/4 × 0.12	1 3/4 × 1/4
7	1 1/4	3/8 × 4	2 1/2	2.88 × 0.20	2 × 0.15	1 1/2 × 3/8
8	1 1/2	3/8 × 5	3	3.50 × 0.22	2 1/2 × 0.19	2 × 3/8
9	1 3/4	3/8 × 6	3 1/2	4.00 × 0.23	3 × 0.19	2 1/2 × 3/8

- Combi Tool
  - 17C
    - Length = 37"
    - Weight = 47.4 lbs
    - Spreads 16.5" @ max force of 160,055 LBF
    - Max cutting force of 115,965 LBF
    - NFPA Cut Rating = A7, B9, C7, D9, E9 (see chart below)
  - Old versus new
    - Battery tool is 3" longer
    - Battery tool weighs 6 lbs less
    - Same spreading distance
    - Battery tool has 102K LBF greater spreading force
    - Battery tool has 13K LBF greater cutting force
    - Battery tool has same NFPA rating for cutting



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- Spreader:
  - S53
    - Length: 39.1"
    - Weight: 52.9 lbs
    - Maximum spread: 31.5"
    - Maximum spreading force: 94,725 LBF
    - Maximum pulling force: 22,480 LBF
  - Old versus new
    - Battery tools are 6.5" longer
    - Battery spreader is 2.4 lbs heavier
    - Battery Spreader is .8" less
    - Battery Spreader spreads 72K lbs greater
    - Battery Spreader can pull 15K lbs greater



- Ram – new TDA carries two
  - 22-54 Telescopic Ram
    - Length Closed: 22”
    - Length at full extension: 53.5”
    - Stroke: 31.5”
    - Weight: 41.4 lbs
    - Max Pushing Force first stage: 24,279 LBF
    - Maximum pushing force second stage: 14,000 LBF
  - Old versus new
    - New ram is telescopic and there are only two
    - Capacities vary depending upon which ram is being compared
    - Battery ram has a longer total stroke (9”)



Maintenance

Daily:

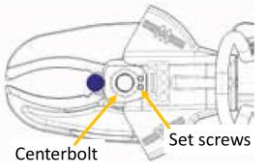
- Wipe down tool
- Ensure battery is charged
- Do not store tools fully opened or fully closed to avoid maintaining pressure on the system

Weekly:

- All daily requirements
- Operate tools under load
- Fully cycle the tool open and closed
- Lightly lubricate cutter blades with WD40 or dry graphite

Monthly:

- Daily and weekly maintenance
- Torque on the cutter centerbolt should be checked after the first 5 uses and after every 15 to 20 uses
  - C-165 = 100 ft lbs
  - C-236 = 140 ft lbs
  - 17-C = 100 ft lbs
  - Ensure the two set screws next to the center nut are tight
- The handle can be lubricated with any lubricant once cleaned of grease and debris



Annual:

- Preventive maintenance by service rep
  - Tear down of all tools except rams
  - Inspection of all parts
  - grease/lube and re-torque

After each rescue operation or practical training:

- Wipe down with damp rag
- Replace battery with fully charged battery, re-charge batteries that were used
- Blow out under the rubber boots of the tools with an air hose (no water spray)
- Coat the cutter and combi blades with dry graphite or WD40
- Store the tools opened or closed - but NOT fully either way
  - Recommended to not keep pressure on the piston when in storage (this occurs when left fully open or closed)
- Rotating handles can be lubed with any lubricant

Educational links:

<http://www.santiam.net/pdf/Use%20NFPA%20to%20Compare%20Performance.pdf>