



Montgomery County Fire and Rescue
Battery Powered Hydraulic Tools
Updated November 2019

Genesis Rescue Tools

Overview

- Operating pressure - 10,000 PSI
- All battery powered tools, no matter the manufacturer, are longer and just a bit heavier than traditional hydraulic tools because of the internal brushless motor, fluid, and battery
- Benefits
 - Quieter operation
 - No hydraulic lines spread across extrication area
 - Faster to place multiple tools in service
 - Easier to deploy remote from the apparatus
 - Over embankments
 - Industrial settings
 - Not limited to operating within a specific distance from power units
 - Rapid Intervention operations
 - Integrated LED lights illuminate work area of the tool
- Limitations
 - You will have to have spare batteries on hand to switch out - part of the driver set-up
 - Center of gravity is slightly different than the current tools
 - Tools are a bit longer
 - Not recommended for submersion in water
 - In the event you are faced with needing to operate the tool underwater you should make every attempt to keep the battery area above water
 - If you are unable to keep the battery area above water and there is a life on the line then you should attempt to operate the tool underwater as there have been several successful uses of the battery tools in water but it is not the recommended practice, at this time
 - However:
https://www.wpxi.com/news/top-stories/shaler-car-in-creek-overtuned-car-pulled-from-pine-creek-in-shaler-after-crash/1003747714?utm_source=homestream&utm_medium=site_navigation&utm_campaign=homestream_click
- Learning curve
 - There will be some operational changes to using these tools

- Turning the tool on at the power button initially and after idling for 30 seconds - battery powered tools require depressing a power button to turn on the battery. Genesis tools shut down after 30 seconds of non use to save battery power.
- The deadman controller operation - the construction and thumb operation are different than what we have been using
- Swapping out batteries and having batteries charging during extended extrications
- The handle of the tool - the handle can swivel around the tool or be locked in place chosen by the user
- “Dead-heading” the tool - when the tools, specifically the cutter and combi tool are maxed out in their cut - the blades/arms are fully closed and the operator is still attempting to cut - the tool will make a loud audible alarm.
 - This alarm is a notification to the user that the tool is at a pressure that is above its operating capacity and cannot continue to build pressure
 - When this occurs the operator should stop operating the tool
 - If the alarm is still activated and the tool cannot be opened then shut off the power, next turn the power back on, then operate the tool in the opposite direction to release the built up pressure
 - When the tool reaches its maximum capacity it may also shut down. It does this because the hydraulics are a closed system and there is nowhere for the pressure to go to. Simply turn the tool back on and release the pressure and reposition.

Video of the Genesis battery tool operation; video is of a spreader but all tools have the same process to turn on, engage battery, operate, etc.

<https://www.youtube.com/watch?v=DvfDM3Go5t8>

Battery

- The battery slides into a channel on the rear of the tool and locks into the tool, the two buttons on the back of the battery should be depressed to release the battery from the channel - both on the tool and in the charger
- The batteries should not be side loaded at any point as it can damage the battery of the plastic track the battery sits in
- High volt lithium-ion batteries
- Each tool comes with three batteries
 - 1 - 5 amp hour battery (will last roughly 20 - 25 minutes with continuous operation)
 - 2 - 3 amp hour batteries (will last roughly 10 minutes with continuous operation)

- **new cutters purchased in November 2019 for three rescue trucks and three rescue squads come 3 - 5 aH batteries
- When the power button is depressed the battery will run the tool for 30 seconds, motor is audible; after 30 seconds of idling the battery will shut down to conserve battery life. Simply depressing the power button will re engage the battery and the tool will be operable. Remember to wait 1 second after depressing the power button to operate the deadman control.
- Batteries will last longer when the tool is not pushed to capacity (heavy loads to cut, push, pull, or spread) and will have shorter life when high capacity operations are used - this is just something to be aware of when operating the tool and being aware of battery life, not something that should affect the user's decision making process on what or where to cut.
 - When cutting sheet metal there is less of a demand on the tool, the unit does not have to build up much pressure to cut through the material as it would when cutting reinforced steel posts
 - This is no different than us - if you sprint you will tire quicker, if you jog you will last longer
 - Similar to how the corded hydraulic tools would take some time to build up higher pressures - the tool would appear to slow down or stop as the pressure increased to a point that it was able to cut/spread/push/pull the necessary load
 - This is only to make the user aware of why a battery life may vary based upon the extrication; simply switch out the battery when necessary
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- These batteries do NOT have memories (unlike batteries in the past)
- Battery has a life of approximately 500 cycles
 - A cycle is 1 full charge
 - If the battery shows that it is half charged, then when it is plugged in it will only get a half charge (half cycle); if it only needs a quarter charge then it only gets a quarter cycle, therefore multiple charges may make only one cycle
 - Batteries can be left out of the charger for prolonged periods with a very small loss of power, approximately 1-5% over a month
 - If batteries are left in a charger they will not charge every time the charger is turned on (shore line plugged in or unit started) - the charger will read the battery and see that it is fully charge and will not charge, or will read that it needs charging and charge just the amount that is necessary
 - The battery takes the longest to charge if fully discharged and the last 10%
 - [Video](#) of how to determine the life of the battery

- From a dead battery to full charge is 45 minutes - 1 hour
 - The battery is slowest at recharging for the first 10% and the last 10%...you can take it out of the charger early and while you won't have a full battery, but it could be up to 90% charged

- Sling pack
 - E28 E-Pack
 - 15' cable from Pelican case (13Ah)
 - Weighs 10.9 lbs
 - Can be used to run tools from roughly 45 minutes
 - From dead to fully charged will take up to 6 hours

- 110 AC Adapter
 - Allows for tools to be run continuously via an adapter that plugs into a 110 outlet off the generator, or from a house plug inside a structure
 - Only plug directly into an outlet or to a cord of the same size

Capacities & weights

- Cutter:
 - All 9 Cutter
 - Length = 40"
 - Weight = 58 lbs
 - 7.1" opening
 - NFPA 1936 rating = A9, B9, C9, D9, E9

 - 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)

 - Difference between current tools and new battery tools
 - 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
- Spreader:
 - S53
 - Length = 39.1"
 - Weight = 52.9 lbs
 - Spreads 31.5" @ 94,725 LBF
 - Pulls 22,480 LBF
 - Difference between current tools and new battery tools:
 - 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
- Rams
 - 22-54 Telescopic Ram
 - Length Closed = 22"
 - Weight = 41.4 lbs
 - Fully extended = 53.5"
 - Stroke = 31.5"
 - Max Pushing Force = 24,279 LBF with the first stage and 14,000 lbs in the second stage
 - Difference between current tools and new battery tools
 - New ram is telescopic and there are only two
 - Capacities vary depending upon which ram is being compared
 - The battery ram has a longer total stroke (9") providing the user with a greater distance to push
- 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)
 - Difference between current tools and new battery tools
 - 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

Fluids: The type of hydraulic fluid is 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](#)

Maintenance

Daily:

- Wipe down tool
- Ensure battery is charged
- Do not store tools either fully opened or fully closed
 - When left fully opened or fully closed there is pressure on the system

Weekly:

- All daily requirements
- Operate tools under load
- Ensure tool operates fully by opening and closing
- WD40 or dry graphite on the blades

Monthly:

- Daily and weekly maintenance
- Toque on center nut is recommended to be checked after the first 5 uses and after every 15-20 cut jobs
 - 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:

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






After extrications/use:

- Wipe down with a damp rag
- Replace the battery with a 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 at all times 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>

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 × 1/8
2	1/2	1/4 × 1	3/4	1.05 × 0.11	1 3/4 × 0.06	1 × 1/8
3	5/8	1/4 × 2	1	1.32 × 0.13	1 × 0.08	1 1/4 × 3/16
4	3/4	1/4 × 3	1 1/4	1.66 × 0.14	1 1/4 × 0.12	1 1/2 × 3/16
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

For SI units 1 in. = 25.4 mm.