



# Networks Electronic Company

## CAD/PAD TEW

### Spot Charge Process Review

August 12, 2024

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- In November 2021, NEco became a subsidiary of PTI
- NEco's product heritage spans over 60 years in CAD/PAD
  - Igniters and Pressure Cartridges
  - Switches – SPST Mini and 2/4/6/8 Pole
  - Thermal Relays & Temperature Sensitive Fuses
  - Piston and Bellows Actuators and Piston Retractors
  - Cord, Cable & Tube Cutters
- NEco's product legacy strengthens PTI's product breadth and technological capabilities to further support the A&D Market.
- PTI manufactures filtration and fluid control subsystems
  - Complex Manifold Assemblies and Filter Elements – Hydraulics, Fuel, Lubrication, Thermal Management, Bleed Air, Environmental Air/Cabin Air, Water Systems
  - Valves – Pneumatic, Fuel
  - Aerial Refueling – Aerial Refueling Receptacles, Military Standard Probes & Nozzles
  - Fluid Control Components – Differential Pressure Indicators, Couplings, Custom Kitting

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- Topic Overview
- Example – MK 112 Squib Switch
- Comparison on NEI-29 Igniter
- Questions

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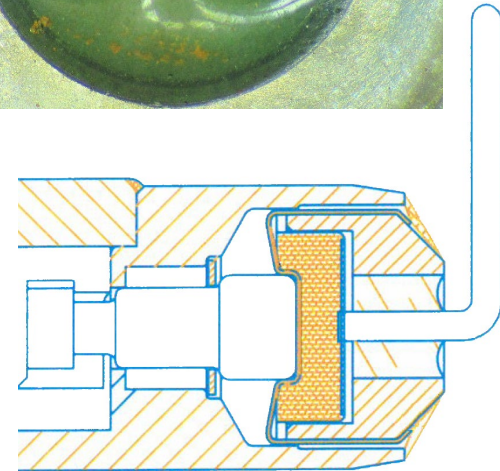
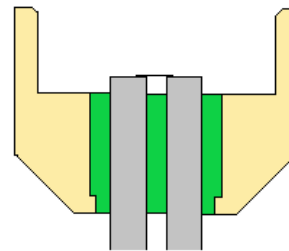
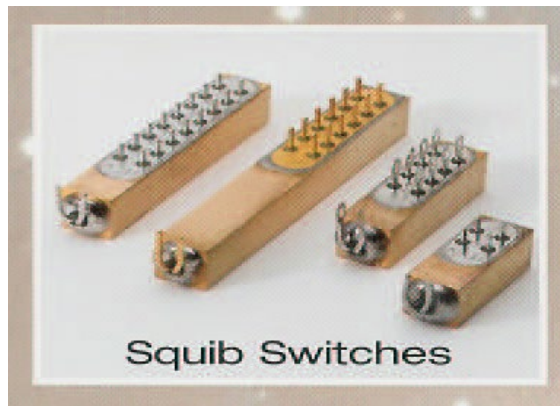
- Spot Charge – explosive powder/binder painted on a bridgewire
- Different kinds of powder may be used:
  - Pyrotechnics – ZPP
  - HD 1.1A explosive – LMNR, KDNBF
- Binder – generally NC lacquer
- Items of concern
  - Viscosity
  - Curing/drying rate
  - Coverage
  - Weight – multiple coats

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## MK 112 Squib Switch

- NEco manufactures various squib switches in 2, 4, 6 or 8 pole configurations.
- After activation, the switch state of the poles changes from open to close or close to open
  - Function time < 3 ms
  - Can incorporate time delay
  - Locking feature
  - Combustion confined within the squib



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# MK 112 Squib Switch

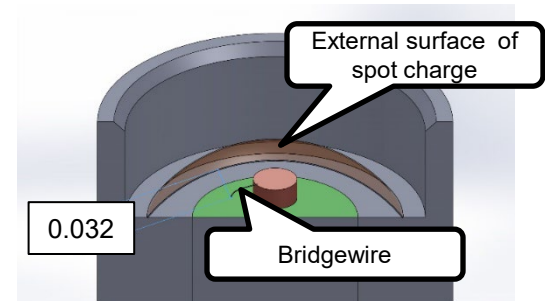
Test	Load Sizing Test	Less Viscous	New Supplier	Better Application of Spot Charge	DVT – Sh + Vib, 6 ft, no-fire and jumble	New spot charge Method	VTP – Sh + Vib and 6 ft	Output Consolidation with Filler (DE)	Qual – Sh + Vib, 6 ft, TS/H
$\bar{x}$ (ms)	9.9	14.8	7.4	3.9	4.4	0.9	3.8	1.9	1.6
$\sigma$ (ms)	4.6	3.4	4.6	1.7	4.2	0.2	2.9	0.2	0.3
Max (ms)	16.3	17.2	18.0	6.0	33.9	5.0	12.6	2.28	2.56
Notes			1 unit dud		2 units dud, mech tests	Spot Charge only	1 unit dud (Sh & Vib)		

- MK 112 (NEco PN 42735) (Qualified 10/2018)

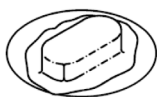
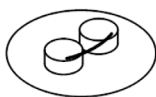
- LMNR
- Application
- Viscosity
- Post-application
  - Weight of spot charge is checked
  - Visual inspection
- Output Charge



LMNR Spot Charge burnt along path



	High $KClO_3$ (30%)	KDNBF	PN 40646
$\bar{x}$ (ms)	2.3	0.56	1.08
$\sigma$ (ms)	0.8	0.17	0.20
Max (ms)	4.08	0.8	1.52



First Coat

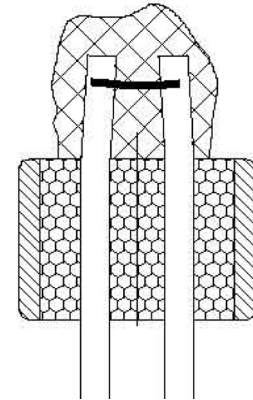


Final Coat

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- Legacy Igniter (part of NEI-1, 2 and 13 family)
  - Function time < 15 ms
  - Used in thermal batteries
  - Requirements
    - All-fire – 1.7 A, 50 ms
    - No-fire – 0.55 A, 16 s
- Comparison performed with KDNBF spot charge
  - Values at 0.99999 reliability at 95% CL
  - 50 ms pulse



Spot Charge	LMNR	KDNBF/DE	KDNBF
All-Fire (A)	0.932	0.875	0.742
No-Fire (A)	0.721	0.623	0.523

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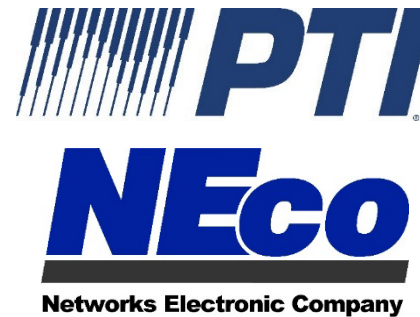
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