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M230LF Chain Gun® Development

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M230LF Chain Gun®
Development

• M230 History
• Features
• Why a Link Fed?
• Design Goals
• Configurations
• M230LF Features
M230 History

• Development begun in 1972 by HHI
  – Externally powered guns had high profile
  • 20mm and 7.62mm Gatling Guns

• Linked WECOM 30mm “DAT” gun
  – 1975, 250K round competitive test
  – Competition was Gatling gun w/ linked WECOM round

• MDHC won gun and YAH64 competition
M230 History

• 1976 DoD gave direction to HHI
  – Re-chamber XM230 to fire ADEN/DEFA rounds for NATO interoperability
  – Contractor given responsibility for development of a family of 30mm rounds
    • M788 (TP)
    • M789 (HEDP)
    • M799
AH-64A Apache Helicopter
M230 Chain Gun®
Ammunition
30mm x 113mm
M788, TP

- Target Practice
- Round Length (max): 199.75mm
- Case Length: 113mm
- Weight: 352.8g
- Muzzle Velocity (nominal): 805 m/s
- Chamber Pressure (typical): 415 MPa
- Penetration (typical): N/A

Information courtesy of ATK, Alliant Ammunition Systems Co.
Ammunition
30mm x 113mm
M789, HEDP

- High Explosive Dual Purpose
- Round Length (max): 199.75mm
- Case Length: 113mm
- Weight: 350.5g
- Muzzle Velocity (nominal): 805 m/s
- Chamber Pressure (typical): 415 MPa
- Trace (typical): Available
- Penetration (typical): 25mm RHA @ 50Á at 500m

Information courtesy of ATK, Alliant Ammunition Systems Co.
M230
Features

• 30mm x 113mm
  – M788, M789, ADEN, DEFA
  – Electric Primed
• Linear Linkless feed
• Electric Primed Ammo
• Externally powered
  – 115V, 400Hz, 3 Ø, 3 HP
• Chain drive
• 625 ± 25 shot per minute
• Rotating breech bolt
Hydraulic Recoil Dampers
  – 3000 lb peak load
  – 1.0 inch recoil
• Positive timing
M230
Features

• Weight 131.5 lbs (59.6 kg)

• Small
  • Length: 65.8 Inches (167.6 cm)
  • Width: 10.5 Inches (26.0 cm)
  • Height: 11.2 Inches (28.0 cm)
  • Frontal Area: 55.0 Inches² (354.8 cm²)

• Ease of Maintenance
  • Number of Component Items approx. 120
  • Dry cycle for one minute
  • Remove and replace: Less than 10 minutes
M230
Features

Characteristics

Barrel Life..................................................25,000 Rounds
Rate of Fire..................................................625 ± 25 spm
Dispersion..................................................<2.0 mil
Power required........................................3.0 hp, 115 Vac, 3 Ph, 400 Hz
Reliability..................................................15,000 MRBF
Safety..................................................Open Bolt
Ammunition Feed.....................................Linkless from right side
Case Eject..............................................Left side
Why Link Fed?

- Performance of 30mm x 113mm ammunition
- Increased interest from user community
- M230 single heritage application – Apache
- Installation flexibility
- Commonality with M230 Logistics support
Why Link Fed?

• Large Apache/M230 user base
  – Over 1,100 M230’s in service world wide

- Egypt
- Greece
- Israel
- Japan
- Netherlands
- Saudi Arabia
- Singapore
- UAE
- UK
- US Army
Design Goals

- Integral de-linking feeder
- Compatible with existing MK 12 ADEN link
- Maximize commonality with M230 cannon
- Hang fire protection for man-rated installations
- Rate of fire and recoil loads suitable for medium to light ground or naval applications
- 24 VDC operation
- Compact & simple
M230LF-1
Single Recoil Adapter
M230LF-1
Features

- 30mm x 113mm
  - M788, M789, ADEN, DEFA
  - Electric Primed
- Linked ammunition feed
- Electric Primed Ammo
- Externally powered
  - 24 VDC, 1 HP
- Hangfire Safety
- Chain drive
- 200 ± 25 shot per minute
- Rotating breech bolt
- Open bolt firing
- Single Recoil Damper
  - 6,500 lb peak load
  - 0.3 inch recoil
- Positive timing
M230LF-2 Standard Recoil
M230LF-2
Features

- 30mm x 113mm
  - M788, M789, ADEN, DEFA
  - Electric Primed
- Linked ammunition feed
- Electric Primed Ammo
- Externally powered
  - 24 VDC, 1 HP
- Hangfire Safety
- Chain drive
- 200 ± 25 shot per minute
- Rotating breech bolt
- Open bolt firing
- Hydraulic Recoil Dampers
  - 1,650 lb peak load
  - 1.4 inch recoil
- Positive timing
M230LF
Features

• Weight - 160 lbs (72.7 kg) w/ 60” barrel

• Small

  • Length: 84 Inches (213.4 cm)
  • Width: 10.5 Inches (26.7 cm)
  • Height: 11.4 Inches (29.0 cm)
  • Frontal Area: 55.0 Sq In. (354.8 Sq cm)

• Ease of Maintenance

  • Approximately 65% common with M230
M230LF
Features

Characteristics
Barrel Life........................................25,000 Rounds
Rate of Fire........................................200 ± 25 spm
Dispersion..........................................<2.0 mil
Power Required...............................1.0 hp, 24 Vdc
Reliability......................................15,000 MRBF
Safety..............................................Hang-fire Safety Mechanism
Ammunition Feed..............................Linked feed from right side
Case & Link Eject..............................Left side
# Barrel Comparison

<table>
<thead>
<tr>
<th>Model</th>
<th>Length</th>
<th>Muzzle Velocity</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>M230</td>
<td>42 in (106.7 cm)</td>
<td>2,624 ft/s (800 m/s)</td>
<td>32 lb (14.5 kg)</td>
</tr>
<tr>
<td>M230LF</td>
<td>60 in (152.4 cm)</td>
<td>2,750 ft/s (838 m/s)</td>
<td>45 lb (20.2 kg)</td>
</tr>
</tbody>
</table>
M230LF Anti-Hangfire Safety
M230LF Operating Group
Integral De-linking Feed
M230LF Feed Path

- LINK STRIPPER
- REAR FEED SPROCKET (FRONT SPROCKET OMITTED FOR CLARITY)
- LINK COVER
- FEED COVER
- FEED HOUSING
- ROUND GUIDE
- ROUND BASE PALTE
- LINK EJECT
- CASE EJECT

M230LF
VIEW OF FEED PATH (LOOKING AFT)
24 Vdc Motor Operation

Motor with clutch
Integral wire harness

Harness
Protective cover for Integral Wire Harness

Hang-fire Safety Mechanism

Cover
Summary
M230LF-1 & M230LF-2

• Proven Chain Gun® technology and reliability
• Compact Link feed design
• Positive Hang fire protection
• Potent 30mm x 113mm ammunition
• Suitable for medium to light applications
• 24 Vdc operation
• Commonality with existing M230 Chain Gun®
M230LF-1 Ground Vehicle Application
M230LF-2
Light Vehicle Application
M230LF-2 Boat Application
M230 & M230LF in Action