



ARES

The Chinese QLZ87 Automatic Grenade Launcher

Timothy Yan

ARMS & MUNITIONS BRIEF No. 1



COPYRIGHT

Published in Australia by Armament Research Services (ARES).

© Armament Research Services Pty. Ltd.

Published in August 2014.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, without the prior permission in writing of Armament Research Services, or as expressly permitted by law, or under terms agreed with the appropriate reprographics rights organisation.

Enquiries concerning reproduction outside the scope of the above should be sent to the Publications Manager, Armament Research Services:
publications@armamentresearch.com

ISBN 978-0-9924624-2-0

CREDITS

Author: Timothy Yan

Editor: N.R. Jenzen-Jones (ARES)

Copy Editor: Anna Provost

Technical Reviewer: Jonathan Ferguson (ARES) & Martin Andrew

Layout/Design: Yianna Paris (Green Shell Media)

ABOUT **ARMAMENT RESEARCH SERVICES**

Armament Research Services (ARES) is a specialist consultancy which offers technical expertise and analysis to a range of government and non-government entities in the arms and munitions field. ARES fills a critical market gap, and offers unique technical support to other actors operating in the sector. Drawing on the extensive experience and broad-ranging skill sets of our staff and contractors, ARES delivers full-spectrum research and analysis, technical review, training, and project support services, often in support of national, regional, and international initiatives.

ARMAMENT RESEARCH SERVICES Pty. Ltd.

t + 61 8 6365 4401
e contact@armamentresearch.com
w www.armamentresearch.com

ABOUT THE AUTHOR

Timothy Yan

Timothy Yan is the Field and Equipment Editor for Guns & Ammo and Shotgun News, and a frequent contributor to The Firearm Blog. Mr. Yan also works with Point & Shoot Media Works, a producer of photography, video and web media for the firearms and shooting sports industry, and is a former US Marine Corps combat engineer.

ACKNOWLEDGEMENTS

The author would like to thank Eric Kincel of Bravo Company USA, David Fortier of Shotgun News, and Gloria Shytle of Guns & Ammo SIP for all of their encouragement and support.

ABBREVIATIONS AND ACRONYMS

AGL

Automatic grenade launcher

GPMG

General purpose machine gun (sometimes 'medium machine guns')

HE

High explosive

HEAT

High explosive anti-tank

HMG

Heavy machine gun

NORINCO

China North Industries Corporation (北方工业)

PLA

People's Liberation Army

SPLM-N

Sudan People's Liberation Movement-North

QLZ

Qing bing qi, Liu-dan Fa-she-qi, Zi-dong
(‘small arms, grenade launcher, automatic’)
[Mandarin]

SAA

Syrian Arab Army

SALW

Small arms and light weapons

TABLE OF CONTENTS

ABOUT ARMAMENT RESEARCH SERVICES	1
ABOUT THE AUTHORS	2
ACKNOWLEDGEMENTS	2
ABBREVIATIONS AND ACRONYMS	3
LIST OF PHOTOS	5
LIST OF DIAGRAMS	6
INTRODUCTION	7
DEVELOPMENT HISTORY	11
QLZ87 CHARACTERISTICS	13
Figure 1: QLZ87 AGL Technical Specifications	15
THE 35 x 32SR mm CARTRIDGE	16
NEWER CHINESE AUTOMATIC GRENADE LAUNCHERS	18
NOTES	21
REFERENCES	22

LIST OF PHOTOS

Cover African Union Mission in Somalia (Photo credit: UNPOS)

- 1** Chinese People's Liberation Army (PLA) soldier training with a QLZ87 grenade launcher in 'light' configuration _____ 7
- 2** Chinese People's Liberation Army (PLA) soldiers armed with a QLZ87 grenade launcher in 'heavy' configuration _____ 7
- 3** Ugandan troops operating as part of the African Union Mission in Somalia (AMISOM) employ a QLZ87 grenade launcher with 15-round drum magazine mounted on a Mine-Resistant, Ambush Protected (MRAP) vehicle _____ 8
- 4** A Bolivian marine armed with a QLZ87 grenade launcher in 'light' configuration _____ 8
- 5** A Ugandan soldier with AMISOM armed with a QLZ87 grenade launcher in 'light' configuration _____ 8
- 6** A Pakistan Army soldier armed with a QLZ87 grenade launcher with 15-round drum magazine _____ 9
- 7** An anti-regime rebel combatant in Syria armed with a QLZ87 grenade launcher in 'light' configuration _____ 9
- 8** A QLZ87 grenade launcher in 'heavy' configuration captured from SPLM-N forces in South Kordofan _____ 10
- 9** Packaging for a QLZ87 grenade launcher, originating from the Yarmouk Industrial Complex, in Sudan _____ 10
- 10** W87 automatic grenade launcher with members of the design team _____ 11
- 11** American XM75 automatic grenade launcher, chambered for the 40 x 53SR mm cartridge _____ 11
- 12** Chinese copy of the Russian AGS-17 automatic grenade launcher, chambered for the 30 x 29B mm cartridge _____ 11
- 13** W87 automatic grenade launcher with 9-round box magazine and tripod _____ 12
- 14** 35 mm ammunition as designed for the W87 _____ 12
- 15** W87 automatic grenade launcher with 12-round drum magazine _____ 12
- 16** QLZ87 in 'heavy' configuration, with 15-round drum magazine, 3x optical sight, and tripod _____ 13
- 17** QLZ87 in 'light' configurations, with 6-round drum magazine and bipod deployed _____ 14
- 18** QLZ87 bolt carrier. Note Degtyarev-Shpagin type locking flaps and dual extractors _____ 14
- 19** 3x optical sight mounted on QLZ87, with detail of the sight reticule _____ 15
- 20** 3x optical sight mounted on QLZ87 in 'heavy' configuration _____ 15

21 & 22	DFJ87 HEDP and DFS87 HE 35 x 32SR mm cartridges_____	17
	15-round drum magazine for the QLZ87 grenade launcher, shown alongside internal spindle (above), and with rear cover open (below)_____	17
23 & 24		
25	PLA soldiers training on the QLZ04 belt-fed automatic grenade launcher_____	18
26	QLB-06 grenade launcher, a semi-automatic development of the QLZ87_____	19
27	LG3 belt-fed automatic grenade launcher chambered for the 40 x 53SR mm cartridge_____	19
28	LG5 grenade launcher, referred to by some Chinese sources as a 'sniper grenade launcher', and available in both 40 x 46SR mm and 35 x 32SR mm_____	20
29	LG6 grenade launcher with drum magazine, chambered for the 38 mm cartridge_____	20
30	LG4 revolver-type grenade launcher chambered for the 40 x 46SR mm cartridge_____	21

LIST OF DIAGRAMS

1 & 2	Diagrams of the DFJ87 HEDP and DFS87 HE 35 x 32SR mm cartridges, showing cutaway to internal components_____	16
------------------	--	----

INTRODUCTION

During the course of the ongoing Syrian civil war, a number of uncommon small arms and light weapons (SALW) have found their way into the hands of various anti-government rebel groups and the Syrian Arab Army. One such weapon is the rather unusual Chinese QLZ871¹ 35mm automatic grenade launcher (AGL).

The QLZ87 is a direct gas impingement operated, selective fire grenade launcher chambered for the Chinese 35 x 32SR mm cartridge. 'QLZ' is short for Qing bing qi, Liu-dan Fa-she-qi, Zi-dong (轻兵器 榴蛋发射器 自动) which translates to 'Small Arms, Grenade Launcher, Automatic'. As for the rest of the name, the '-87' portion refers to the year 1987, when the preliminary, working proof-of-concept model was developed.

Unlike the heavier, tripod-mounted American MK 19 and Russian AGS-17 grenade launchers, the Chinese QLZ87 features a size and weight comparable to many 7.62 x 51 mm or 7.62 x 54R mm calibre general-purpose machine guns (GPMG). It is able to be fired from the integral bipod, for shorter-range direct fire (light configuration), and a tripod for longer-range engagement and indirect fire (heavy configuration). In its light configuration the QLZ87 is intended for one soldier, and in the heavy configuration is operated by a team of three.

While the American and Russian armies choose to employ their automatic grenade launchers as a heavy, crew-served weapon at the infantry battalion level and as vehicle mounted weapons, the Chinese military have opted to deploy many of their AGLs at the company level as a light support weapon that can be carry by a single soldier.

PHOTO 1



Chinese People's Liberation Army (PLA) soldier training with a QLZ87 grenade launcher in 'light' configuration. Note laser training system.

Photo Credit: chinamil.com.cn, Garrison

The QLZ87 is occasionally also pintle-mounted on fast attack vehicles and jeeps². However, feedback from troops indicated that the drum magazine is awkward to reload, especially when the vehicle is driven off-road. The small magazine capacity necessitates frequent reloading.

PHOTO 2



Chinese People's Liberation Army (PLA) soldiers armed with a QLZ87 grenade launcher in 'heavy' configuration.

Photo Credit: PLA Hong Kong

PHOTO 3



Ugandan troops operating as part of the African Union Mission in Somalia (AMISOM) employ a QLZ87 grenade launcher with 15-round drum magazine mounted on a Mine-Resistant, Ambush Protected (MRAP) vehicle.

Photo Credit: AMISOM

PHOTO 4



A Bolivian marine armed with a QLZ87 grenade launcher in 'light' configuration.

Photo Credit: The Firearm Blog

PHOTO 5



A Ugandan soldier with AMISOM armed with a QLZ87 grenade launcher in 'light' configuration.

Photo Credit: AMISOM

The QLZ87 is also used by several countries other than China, including Bolivia, Ethiopia, Namibia, Pakistan (Pakistan Army, 2011), Somalia, Sudan, Tanzania, and Uganda (UNPOS, 2014). Given the opacity of Chinese arms transfers, there may be other states using the system which have not yet been documented. Additionally, the QLZ87 has been documented in limited service with a handful of non-state armed groups, including rebel forces in Syria (Syrian

Media Channel, n.d.), Khartoum-backed Chadian rebel groups, Al-Shabaab in Somalia (Al Jazeera English, 2011), and the Sudan People's Liberation Movement-North (SPLM-N), operating in Sudan and South Sudan (Leff & LeBrun, 2014). Photos 3 to 9 show the QLZ87 in service with various armed forces and non-state armed groups.

PHOTO 6



A Pakistan Army soldier armed with a QLZ87 grenade launcher with 15-round drum magazine.
Photo Credit: Pakistan Army

PHOTO 7



An anti-regime rebel combatant in Syria armed with a QLZ87 grenade launcher in 'light' configuration.
Photo Credit: Shaam News

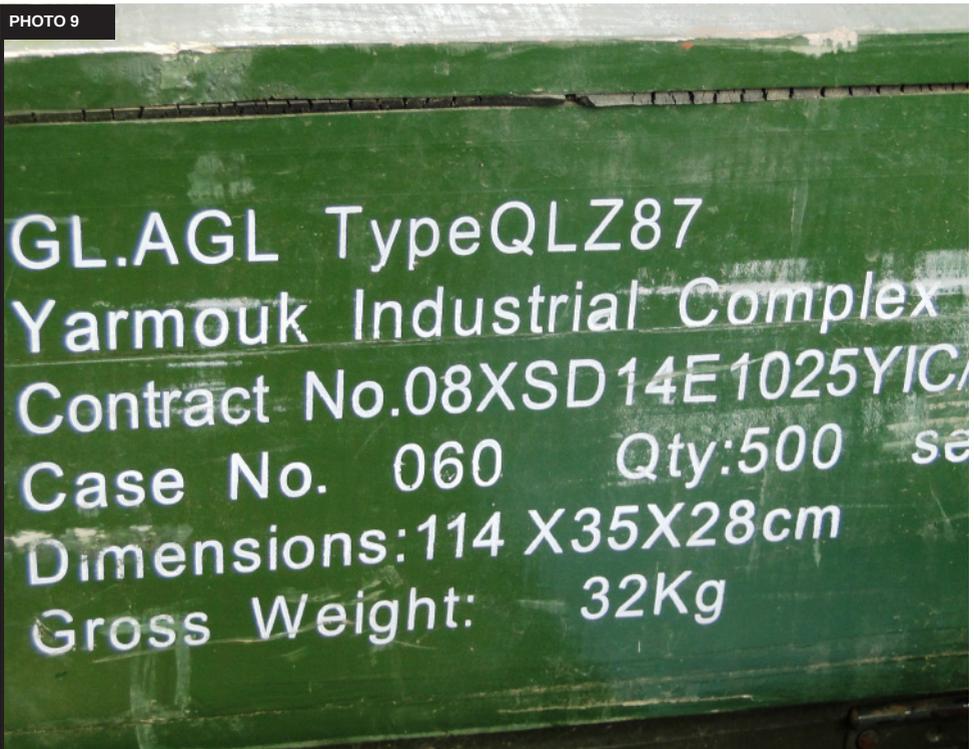
PHOTO 8



A QLZ87 grenade launcher in 'heavy' configuration captured from SPLM-N forces in South Kordofan. SPLM-N combatants claimed to have captured the weapon from the Sudanese Armed Forces (SAF). Note the English language firing tables marked on the top of the receiver (right).

Photo Credit: Lef & LeBrun/Small Arms Survey

PHOTO 9



Packaging for a QLZ87 grenade launcher, originating from the Yarmouk Industrial Complex, in Sudan. It is not clear whether the weapons are assembled in Sudan, or simply repackaged there.

Photo Credit: Claudio Gramizzi/Small Arms Survey

DEVELOPMENT HISTORY

The Chinese military commenced serious research into grenade launchers in the early 1980s. They examined samples of the American M79 and M203 low-pressure, single-shot 40 x 46SR mm grenade launchers captured during the Vietnam War. They were also familiar with the American 40 x 46SR mm MK 18 AGL, as well as the XM75 (see photo 11) and the then-new MK 19 AGLs in 40 x 53SR mm. Interestingly, the Chinese military also obtained samples of Russian AGS-17 30 x 29B mm grenade launchers captured by the Mujahideen during the Soviet war in Afghanistan. In fact, NORINCO rapidly manufactured a copy of the AGS-17 and offered it for export (see photo 12). However, the Chinese military concluded that both the MK 19 and the AGS-17 were too big and heavy to be man-portable and did not fit their deployment plans for AGL systems.



PHOTO 10

W87 automatic grenade launcher with members of the design team.

Photo Credit: 尖端科技, Defense Technology Monthly



PHOTO 11

American XM75 automatic grenade launcher, chambered for the 40 x 53SR mm cartridge.

Photo Credit: US Army Springfield Armory

The development of the first Chinese automatic grenade launcher was carried out by a state-controlled civilian organisation, the Hua Dong Industrial Academy's Mechanical Research Institute (华东工业机器研究院) in Nanjing, China. The development was separated into two component projects: one for the weapon itself, and the other for the ammunition. The launcher team was led by Professor Liu Jia Peng (陆家鹏) and the grenade ammunition team was led by Professor Yu Qi (于骥). Both teams had determined that using equivalent design decisions to the American 40 x 46 or 40 x 53SR mm calibres would result in a weapon that was too large and bulky to fit with the Chinese doctrinal vision for the employment of the AGL.

The ammunition team had also determined that the Russian 30 x 29B mm cartridge was slightly too small to contain an effective, high explosive anti-tank (HEAT) warhead. The compromise reached by these teams was a 35 mm semi-rimmed (SR) calibre cartridge. During the initial design, the launcher team found the American MK 19's advanced primer ignition

(API) operating principle to be less reliable than desired. However, the simpler, more reliable blowback operation of the Russian AGS-17 necessitated a long receiver and heavy bolt group, despite the smaller cartridge.

After five generations of prototypes, the team's working proof-of-concept weapon was designated the W87.



PHOTO 12

Chinese copy of the Russian AGS-17 automatic grenade launcher, chambered for the 30 x 29B mm cartridge.

Photo Source: Li et al., 2010

The W87 launcher featured a roller-delayed blowback operation that resembled the operating principle used in many Heckler & Koch rifles. The W87 was also designed to fire from a closed-bolt for improved accuracy and was provided with several ammunition feeding options: top-loading 6 and 9-round box magazines, or a 12-round drum magazine. A bipod was included for quick deployment and the W87 was also mountable on a tripod as required. The weight of the W87 was equivalent to the QZL87, with the weapon itself weighing approximately 12 kilograms, and the tripod an additional 8 kg. The 35 x 32SR mm grenade cartridge developed for the weapon featured a long aluminium case with a round-nose projectile.

In September 1988, the Chinese W87 AGL and its 35 mm ammunition were revealed in a presentation by the two team leaders at a small arms development conference hosted by the US Army's Aberdeen Proving Ground in Maryland, USA.



PHOTO 13

W87 automatic grenade launcher with 9-round box magazine and tripod.
Photo Credit: NORINCO

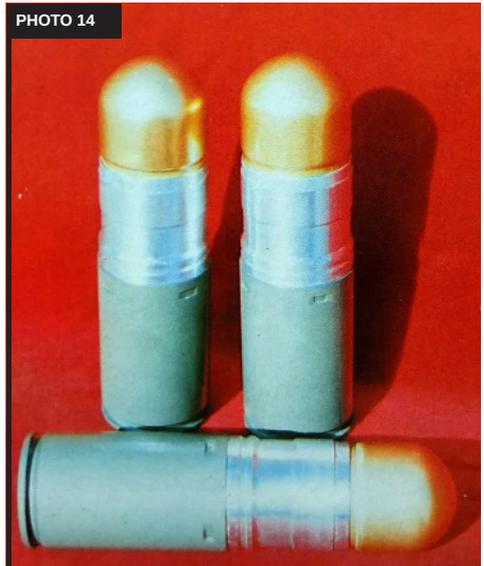


PHOTO 14

35 mm ammunition as designed for the W87.
Photo Credit: 尖端科技, Defense Technology Monthly



PHOTO 15

W87 automatic grenade launcher with 12-round drum magazine.
Photo Credit: 尖端科技, Defense Technology Monthly

QLZ87 CHARACTERISTICS

Precisely how the W87 evolved into the QLZ87 before it was accepted into service in the mid-1990s by the Chinese military is not known. The most likely scenario is that development of the W87 project was transferred over to the military's small arms research branch, possibly to the 208 Small Arms Research Institute just north of Beijing. Both the launcher and the 35 mm grenade were redesigned but many of the W87 and grenade's performance criteria were retained or replicated.

The QLZ87 is a tubular design, and now uses a direct gas impingement operating action, with two locking flaps derived from the Degtyarov-Shpagin system (most commonly seen in the DShK and DShKM heavy machine guns). The QLZ87 is magazine-fed from the bottom of the weapon. The magazines are drums in 6-round or 15-round capacity. The QLZ87 is, in fact, a derivative of the Type 85 12.7 x 108 mm heavy machine gun (HMG) with its similar tubular steel receiver, direct-gas operation and flap locks. The QLZ87 also features Czech-influenced right side mounted fire selector controls, also derived from the Type 85HMG and implemented in order to make room for ammunition to be fed from the bottom of the weapon.

The fire selector has one dot for 'safe', two dots for 'semi-automatic', and three dots for 'automatic'. The QLZ87 retained the bipod for quick deployment, however the new tripod has articulated legs and a crank elevation adjustment.

The carrying handle of QLZ87 also functions as the charging handle and forward assist. It is actually an external part of the bolt group, which is cycled by redirected propellant gas as per the weapon's direct impingement system of operation. Unlike the direct gas impingement system on the M16, the QLZ87 does not vent propellant gasses into the receiver.



PHOTO 16

QLZ87 in 'heavy' configuration, with 15-round drum magazine, 3x optical sight, and tripod.

Photo Credit: firearmsworld.net



PHOTO 17

QLZ87 in 'light' configurations, with 6-round drum magazine and bipod deployed.

Photo Credit: firearmsworld.net

Once the QLZ87's bolt group starts to recoil, remaining propellant gasses are immediately vented into the atmosphere. The gas system is adjustable with 3 settings. The bolt face has dual extractors and ejects the spent cases directly upwards after firing. A large, twin-port muzzle brake and a thick rubber pad help to reduce the recoil. On later production models, there is an internal buffer located to the rear of the bolt group.

Even with these design features, the recoil of firing the QLZ87 is reportedly harsh, and when firing from the bipod, only semi-automatic firing is viable if the user wishes to maintain accuracy.

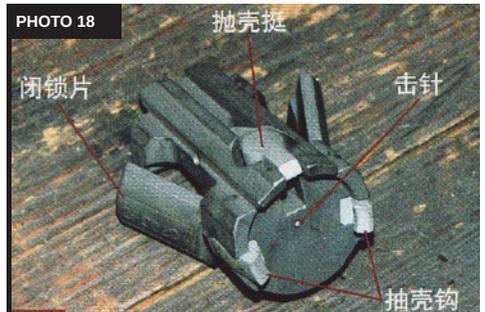


PHOTO 18

QLZ87 bolt carrier. Note Degtyarev-Shpagin type locking flaps and dual extractors.

Photo Credit: 轻兵器, QBQ Magazine

Figure 1: QLZ87 AGL Technical Specifications

Calibre	35 x 32SR mm
Weight	WEAPON: 12 kg; BIPOD: 8 kg; TOTAL CARRYING WEIGHT 20 kg
Length	1040 mm to 1300 mm
Operation	direct-gas impingement, flap lock, closed-bolt
Firing Mode	Selective fire (safe, semi-automatic, automatic)
Effective Range	800 m on bipod, 1750 m on tripod
Feed device	6-round or 15-round drum magazine
Sights	<ul style="list-style-type: none"> - Iron sights (w/ 600 m range markings) - 3x magnification optic (w/ 1200 m range markings and -10 degrees to +70 degrees elevation adjustment) - Optic mounting rail for night vision or thermal sight



THE 35 x 32SR mm CARTRIDGE

The 35 x 32SR cartridge was also completely redesigned. The new cartridge is shorter in length, with a tapered, flat nosed projectile that is housed in a short 32 mm semi-rimmed aluminum case. The cartridge produces typical muzzle velocities in the region of 190 metres per second in the QZL87: slightly faster than the earlier W87 cartridge design. The total cartridge weight is roughly the same as the original, at approximately 250 grams. At least five different projectile types are known to exist.

The two most common cartridges are the DFS87 high explosive (HE) and the DFJ87 high explosive, dual purpose (HEDP) varieties (see photos 21 and 22). The DFS87 projectile has a fragmentation warhead with a stated casualty radius of 10-11 metres, while the DFJ87 has a casualty radius of 5 meters, and a shaped charge warhead which can penetrate 80 mm of rolled homogeneous armour (RHA) or 35 mm of RHA at a 60 degree angle (Li et al., 2010). Projectile type is designated with markings in addition to a colour coded projectile nose; HE and HEDP projectiles are coloured silver and gold, respectively. The initial production of both the HE and HEDP projectiles featured a fragmentation liner, which consisted of small steel balls suspended in a polymer matrix (see diagrams 1 and 2).

More recent production examples of the DFS87 HE projectile feature a pre-fragmented wire coil jacket, while the DFJ87 HEDP projectile employs a steel upper casing to produce fragments. Both design changes are mostly intended to lower the manufacturing cost. The 35 x 32SR mm projectiles have an inertia-armed fuze in the nose which features a safe arming distance of 12-30 metres from the muzzle.

There are at least three other 35 x 32SR mm cartridges available: the DFR87 incendiary, DFN87 high explosive incendiary (HEI), and DFD87 smoke. The three new grenades are likely coloured as follows: incendiary in red or orange, HEI in red-silver or red-black, and smoke in blue.

DIAGRAM 1

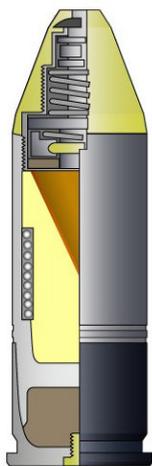
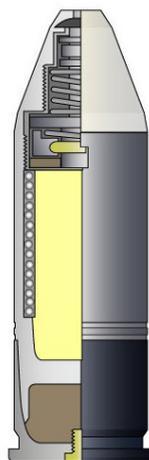


DIAGRAM 2



Diagrams of the DFJ87 HEDP (left) and DFS87 HE (right) 35 x 32SR mm cartridges, showing cutaway to internal components.

Diagram Credit: Timothy Yan



Each QLZ87 in Chinese service is issued with two 15-round drums and two 6-round drums. The drum magazines are loaded by opening the back cover, with cartridges being placed nose-first into the slots (see photo 24). The back cover of the magazine is then closed, and the spring is wound using either the bottom of the QLZ87 pistol grip, or a purpose built cranking tool. The drums can be stored loaded if the spring is unwound. A 6-round drum weighs 1.3 kg empty and 2.8 kg loaded. A 15-round drum weighs 2.3 kg empty and 6.0 kg loaded.

DFJ87 HEDP and DFS87 HE 35 x 32SR mm cartridges.

Photo Credit: Claudio Gramizzi/Small Arms Survey; Jonah Leff/Small Arms Survey

PHOTO 23

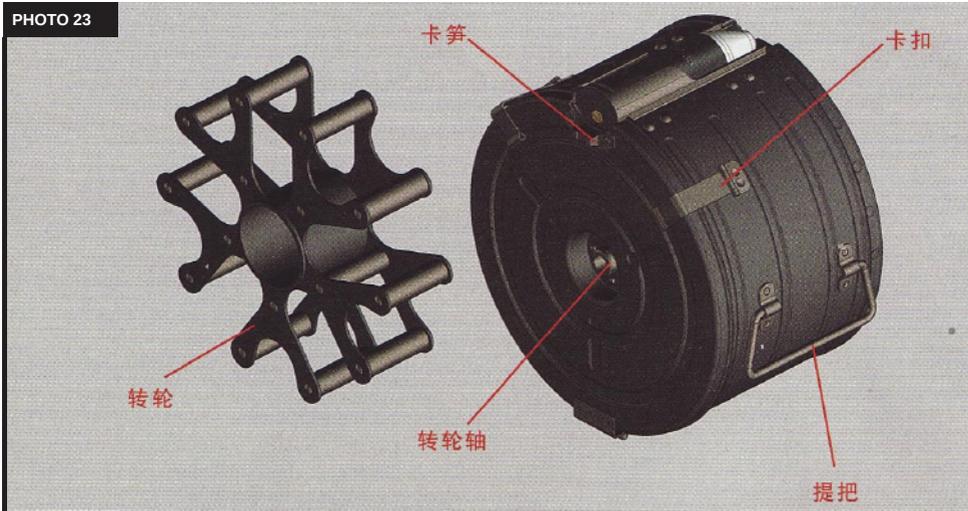


PHOTO 24



15-round drum magazine for the QLZ87 grenade launcher, shown alongside internal spindle (left), and with rear cover open (right).

Photo Credit: 轻兵器, QBQ Magazine

NEWER CHINESE AUTOMATIC GRENADE LAUNCHERS

The Chinese military have also started deploying the QLZ04 belt-fed 35 x 32SR mm automatic grenade launcher. The QLZ04 operates on a blowback principle and feeds from a 30-round non-disintegrating belt that can be fed from either side. It is not intended as a replacement for the QLZ87, but is designed to serve in the vehicle-mounted weapon and heavy crew-served weapon roles, or at the infantry battalion level in a similar fashion to the US deployment of their Mk 19.

PHOTO 25



PLA soldiers training on the QLZ04 belt-fed automatic grenade launcher.

Photo Credit: PLA Daily

A further development of the QLZ87, the QLB06³, has also been produced. However it has not yet been adopted by the Chinese military or exported. The QLB06 features a new aluminum receiver, redesigned action, new bipod, and a conventional pistol grip and fire control. The weapon weight has been reduced to 9.1 kg and a lightweight 4-round drum was also introduced. The tripod mount has been removed and the QLB06 is only capable of semi-automatic fire. It is unclear whether the weapon is still in production.

Recently, several further developments of Chinese grenade launchers have been publicly displayed: the LG3, LG4, LG5, and LG6. The LG3 appears to be a development of the belt-fed QLZ04, featuring a MK 19 style receiver and dual charging handles. It is noted that the trigger is located on the right hand charging handle in the similar 'Czech-style' configuration as the QLZ87.

Optional accessories include a fire control unit with laser range finder and ballistic computer, and an electronic fuse programming module which is attached to the muzzle brake. The LG4 is gas operated, with propellant gas redirected from the barrel in order to rotate the revolver style cylinder. No pre-indexing of the chamber is needed: it uses a double-action only trigger. The LG5 is based on an existing .50 calibre anti-material rifle design⁴. The whole receiver is a tubular buffer, which the barrel assembly recoils into. The LG5 appears to be long-recoil operated and semi-automatic firing only. A fire control unit with laser range finder, thermal imaging capability, and a ballistic computer is issued with each LG5 system. The new muzzle brake may incorporate an electronic fuze programming module. The LG6 is a weapon designed for law enforcement use, and chambered for the common 38 mm calibre often used as riot control munitions. It appears to be blowback operated.

PHOTO 26



QLB-06 grenade launcher, a semi-automatic development of the QLZ87.
Photo Credit: 轻兵器, QBQ Magazine

PHOTO 27



LG3 belt-fed automatic grenade launcher chambered for the 40 x 53SR mm cartridge.
Photo Credit: SINA Corporation

PHOTO 28



LG5 grenade launcher, referred to by some Chinese sources as a 'sniper grenade launcher', and available in both 40 x 53SR mm and 35 x 32SR mm.

Photo Credit: SINA Corporation

PHOTO 29



LG6 grenade launcher with drum magazine, chambered for the 38 mm cartridge.

Photo Credit: SINA Corporation

PHOTO 30



LG4 revolver-type grenade launcher chambered for the 40 x 46SR mm cartridge.

Photo Credit: SINA Corporation

NOTES

- ¹ Referred to as both the “QLZ87” and “QLZ-87” in official Chinese publications, and commonly in the West as the “QLZ-87”. Weapons are typically marked “QLZ87-35”.
- ² These include the M98 ‘fire power assault vehicle’, as operated by the 15th Airborne Corps.
- ³ The QLB06 has been referred to as the “QLZ-87B”.
- ⁴ The LR2, which is available in 12.7 x 108 mm and 12.7 x 99 mm (.50 BMG).

REFERENCES

- 何邓海 He Dan Hai. 'QLZ87式 35mm自动榴弹发射器' (The QLZ87 35mm automatic Grenade Launcher), Qing Bing Qi (轻兵器; QBQ Magazine; 'Small Arms Magazine'). January 2009 issue. Beijing: Qing bing qi bian ji bu Defense Industries Organization (DIO). No date. Online catalogue formerly hosted at: <www.diomil.ir>
- 畢雲皓 Bi Yun Hao, 孫靜 Sun Jing. 'Modern Ballista: The W87 35mm Grenade Launcher'. Jian Duan Ke Ji (尖端科技; 'Defense Technology Monthly'). Issue 55, March 1989. Taipei: Jian duan ke ji za zhi she chu ban
- Agence France-Presse. 2011. 'Avancée rebelle dans l'ouest ivoirien, une dizaine de morts samedi à Abidjan'. *l'Express*. Web edition: 13 March 2011. <http://www.lexpress.fr/actualites/1/actualite/avancee-rebelle-dans-l-ouest-ivoirien-une-dizaine-de-morts-samedi-a-abidjan_971658.html>
- Al Jazeera English. 2011. 'Al-Shabab mark Eid in Mogadishu'. YouTube video. 31 August 2011. <<http://www.youtube.com/watch?v=Y2r01XWNIWE>>
- HSBA. 2012. 'Further weapons seized from SAF in South Kordofan'. Human Security Baseline Assessment (HSBA) for Sudan and South Sudan. Geneva: Small Arms Survey. <<http://www.smallarmssurveysudan.org/fileadmin/docs/facts-figures/arms-ammunition-tracing-desk/HSBA-Tracing-Desk-SPLM-N-April-2013.pdf>>
- Bingqi Zhishi. 2008. 'Zhongguo M98 xing bubing huoli tuji', Bingqi Zhishi, 2008 Niandi, 3 Qi, Zhongdi 245.
- HSBA. 2013. 'Comparable SPLM-N arms and ammunition stocks in South Kordofan and Blue Nile, April 2013'. Human Security Baseline Assessment (HSBA) for Sudan and South Sudan. Geneva: Small Arms Survey. <<http://www.smallarmssurveysudan.org/fileadmin/docs/facts-figures/arms-ammunition-tracing-desk/HSBA-Tracing-Desk-SPLM-N-April-2013.pdf>>
- Leff, Jonah & Emile LeBrun. 2014. *Following the Thread: Arms and Ammunition Tracing in Sudan and South Sudan*. Geneva: Small Arms Survey.
- Li, Xinlong, Yi Ren, Junli Wang, Bin Yang & Juanjuan Yang. 2010. 'Grenade Launchers in China'. PowerPoint presentation. China R&D Academy of Machinery.
- Miller, Jonathan. 2012. 'Inside Syria's rebel Farouk brigade'. Channel 4 News. 10 September 2012. <<http://www.channel4.com/news/video-exclusive-inside-syrias-farouk-brigade>>
- Pakistan Army. 2011. 'Spending Eid ul-Fitr At The Front'. YouTube video. 31 August 2011. <<http://www.youtube.com/watch?v=WjcyLw9MHDY>>
- SINA Corporation. 2014. '国产多款军警用时髦榴弹发射器集中亮相北京' (Domestic police use a variety of stylish grenade launchers focus on appearance Beijing'). SINA Military News. <http://slide.mil.news.sina.com.cn//slide_8_32269_29558.html>
- Small Arms Training Manual (轻武器射击教材 (上、下册)). n.d. Official Chinese government publication.
- Syrian Media Channel. n.d. 'Strange Weapon used by FSA' (original title unknown). Liveleak video (original location unknown). 17 January 2013. <http://www.liveleak.com/view?i=38c_1358432363>
- UNPOS. 2014. 'AMISOM Troops in Baidoa'. Flickr album. 15 May 2014. United Nations Political Office for Somalia. <<http://www.flickr.com/photos/unpos/sets/72157629769036736#>>



ARMAMENT RESEARCH SERVICES Pty. Ltd.

+ 61 8 6365 4401

contact@armamentresearch.com

www.armamentresearch.com