CLOSING INSTRUCTIONS – STEEL DRUMS (UN 1A1, UN 1A2, UN 6HA1)

Mauser Packaging Solutions (MPS) provides these instructions to the filler of UN certified steel drums. A QR code link to this document is included on the Bill of Lading for all drum shipments from MPS. You can also access the document directly at: https://mauserpackaging.com/closing-instructions/

This document applies to drums produced at the following manufacturing locations.

M4453 -1229 Castle Drive, Mason, OH 45040
M4599 - 14 Convery Boulevard, Woodbridge, NJ 07095
M4601 - 4004 Homestead Road, Houston, TX 7702
M4921- 2000 S. Kilbourn Avenue, Chicago, IL 60623
M5369 - 12180 University City Boulevard, Harrisburg, NC 28075
M6066 - 304 Main Avenue, Warren, PA 16365
2-889 - 1121 Pioneer Rd, Burlington, ON L7M1K5
36-1846 - 5408 52 Avenue, Lloydminster, AB T9V1P8

United States Department of Transportation regulations state that packaging manufacturers are required to notify each person to whom the packaging is transferred of all requirements not met at the time of transfer. This requirement is given in Title 49, Code of Federal Regulations (49 CFR), Part 178 Specifications for Packagings, § 178.2 (c). In addition, this Paragraph requires the closing information to be provided to any person to whom this package is transferred who may need to close the packaging prior to re-shipment. Furthermore, it is the shipper's responsibility as set forth in §173.22(a)(4) to ensure that these closing instructions are carried out as described. To ensure the instructions are followed in a manner to result in safe transport of hazardous materials the shipper is obligated, as set forth in § 172.704(a)(4), namely - function specific training - to train his/her employees in the correct way to close the packaging for shipment. This document provides specific information on closing Mauser Packaging Solutions packaging.

These closing instructions must be given to the individuals responsible for closing the packagings prior to shipment. A hard copy (printed) must be maintained by the filler or offeror for shipment.

The following tables and text give examples of the parts and closing torque required to prepare the drum for shipment so that it can meet the performance standards indicated by the UN marking on the side or top of the packaging. Mauser Packaging Solutions recommends that only parts that have been tested and certified by MPS be used to close the packagings for shipment. Each closure is supplied with the proper gasket in accordance with the UN design type tests for the packaging supplied. In the case of removable head drums the lids, gaskets and locking rings are supplied as tested. Any modification of the drum components that changes the design of the drum from the design that was tested by or on behalf of Mauser Packaging Solutions, or any deviation from the above, voids said certification.

PRIOR TO CLOSING:

Inspect each closure to ensure that the closure has the proper gasket and that both closure and gasket are in good condition. Open head cover gasket performance can be affected by time (age), temperature, exposure. to chemicals and ozone. Inspect the sealing surface for damage and make sure the threads and sealing surfaces are dry. Replace any defective gaskets, plugs or lids with new, defect-free parts as sold with the original packaging.

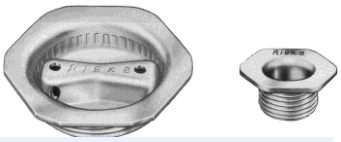
CLOSING PROCEDURES FOR PLUGS AND CAPS:

The plug or cap is inserted into the appropriate opening and screwed down hand tight until the gasket is in contact with the sealing surface. A torque wrench capable of applying the proper torque to the fitting as specified by the closing instructions following is then used to tighten the plug or cap until it reaches the pre- set torque as indicated by a release or click. These wrenches should be calibrated at least annually.

STEEL NON-REMOVABLE and REMOVABLE HEAD DRUMS

All non-removable head, UN 1A1, and removable head, UN 1A2, Steel Drums, 49 CFR § 178.504(a)(1), must be **closed for shipment using only the closures (plugs, gaskets, locking rings and bolts) supplied and specified** in the design qualification test for the drum, as indicated below:

HEXAGONAL HEAD PLUGS TORQUE (RIEKE VISE GRIP & VICE GRIP II STYLE)



Closing Torques in ft.-lbs. (by Type)	**Gasket Type**	**3/4" Plug Torque**	**1 ½" Plug Torque**	**2" Plug Torque**
Rieke[1]**:** VISE-GRIP II Plug - Plastic Flange	Polyethylene	8-10 ft.-lbs.	----	18-22 ft.-lbs.
Rieke: VISE-GRIP II Plug - Plastic Flange	Rubber	8-10 ft.-lbs.	----	18-22 ft.-lbs.
Rieke VISE-GRIP II Plug - Steel Flange	Polyethylene	8-10 ft.-lbs.	----	18-22 ft.-lbs.
Rieke: VISE-GRIP II Plug - Steel Flange	Rubber	8-10 ft.-lbs.	----	18-22 ft.-lbs.
Rieke: VISE-GRIP II Plug with built-in gasket - Plastic Flange		8-10 ft.-lbs.	----	18-22 ft.-lbs.
Rieke: VISE-GRIP II Plug with built-in gasket - Steel Flange		8-10 ft.-lbs.	----	18-22 ft.-lbs.
Rieke: Steel Plug - Steel Flange	Polyethylene, Teflon	18-22 ft.-lbs.	36-44 ft.-lbs.	36-44 ft.-lbs.
Rieke: Steel Plug - Steel Flange	Rubber	14-17ft.-lbs.	27-33 ft.-lbs.	27-33 ft.-lbs.

ROUND HEAD PLUGS TORQUE

TS Type (Tite Seal or Tri-Sure®)

Closing Torques in ft.-lbs. (by Type)	**Gasket Type**	**3/4" Plug Torque**	**2" Plug Torque**
TS Type[2]**:** Polypropylene and Nylon Plugs	Polyethylene	8-12 ft.-lbs.	18-25 ft.-lbs.
TS Type: Polypropylene and Nylon Plugs	Rubber	8-12 ft.-lbs.	18-25 ft.-lbs.
TS Type: Polyethylene Plugs	Rubber	8-12 ft.-lbs.	18-25 ft.-lbs.
TS Type: Self-Gasketing, polyethylene plug		5 ft.-lbs.	12 ft.-lbs.
TS Type: Steel Plugs	Polyethylene, Teflon	8-15 ft.-lbs.	15-25 ft.-lbs.
TS Type: Steel Plugs	Rubber	8-15 ft.-lbs.	15-25 ft.-lbs.
TS Type: Zinc Die-Cast Plugs	Polyethylene, Teflon	8-15 ft.-lbs.	15-25 ft.-lbs.
TS Type: Zinc Die-Cast Plugs	Rubber	8-15 ft.-lbs.	15-25 ft.-lbs.

STEEL REMOVABLE HEAD DRUMS[3]

If a head compressor is not available, start bolt into lug, alternating tapping of ring with a mallet and drive bolt with a wrench, until bolt ring ends meet the below requirements.

If using a 0.625" shoulder type bolt a jam nut is not required. These particular bolts claim easier ergonomics for the person closing the drums and less deformation of the ring in closing—hence better fit. Thread the bolt into the ring nut and tighten until the threaded portion is through the nut. The smooth unthreaded portion will not engage the threads and tightening stops at the prescribed gap.

[1] ISO 15750-3 Circular Serrated Closure Type B. ANSI MH2-2018 § 3.1.4
[2] ISO 15750-3 Octagonal & Hexagonal Closures Type A. ANSI MH2-2018 §3.1.4
[3] ANSI MH2-2018 §3.2 and 3.2.4

CLOSING RINGS BOLT LOCKING RINGS (Including Overlapping Style Ring)

1. Snap the closing ring over the cover and curl area of the drum, making sure that it is seated over the entire perimeter. For drums with 12-gauge forged lug rings, use of a mechanical head-compressing device is required to assure proper gasket compression. Ring bolts should be tightened while the cover/gasket is being compressed. Drums assembled without using a mechanical head compressing device may not perform to the certified level.

2. While a head compressing device is preferred for all rings, with lugs, it is acceptable to tighten the ring bolt while simultaneously tapping the outside of the closing ring around the entire perimeter, with a non-sparking mallet to compress the gasket uniformly. If a head-compressing device is used, make sure that the cover is centered on the drum curl. Check to see that the cover and the drum curl are pinched together and within the recess of the ring.

3. Torque the bolt and nut until the gap between the closing ring ends is 1/4" or less but with no bending of the lugs. Aim for 1/8" gap. For drums with poly liner "bags", the gap should be 1/2" or less while ensuring that the liner is seated uniformly over the curl of the drum and protruding out from under the cover. Generally, the closing ring ends must not touch when the ringbolt has been fully torqued (see paragraph "b" below).

   a. **On rings supplied with a jam nut between the lugs**, tighten the nut securely against the unthreaded lug. The closing ring ends should not touch when the ringbolt has been fully torqued.

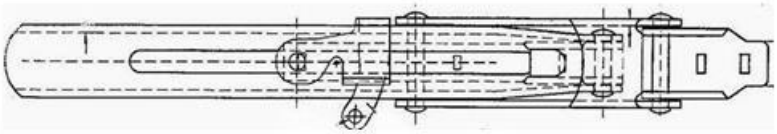
   b. **Rings supplied without a jam nut may look very similar to those supplied with a jam nut, however these are not interchangeable**. It is important that jam nuts not be used with rings for which they are not supplied. The closing ring ends may touch when these rings are fully torqued. See the Solid Seal ring closing instructions for specific torque values, etc. for these rings. **

4. Ring gap is critical. If it cannot be obtained, utilize the following torques:

Manufacturing plant	Drum/Ring Configuration	Application torque
All plants	55-gallon, 5/16" bolt 55-gallon, 3/8" bolt	7-9 ft-lbs. 12-16 ft.lbs
Warren/Harrisburg	55-gallon 12 ga Forged Lug ring w/ 5/8" bolt	60-65 ft-lbs.
Burlington/Chicago/Houston/Mason/Woodbridge	55-gallon 12 ga Forged Lug ring w/ 5/8" bolt	70-75 ft-lbs.
Mason/Warren	Intermediate drums, 12 ga. Forged Lug ring Intermediate drums, all other bolt rings	not less than 50 ft-lbs. not less than 8 ft-lbs.
Manufacturing location identification is marked in inkjet on drum. Burlington (2-889), Chicago (M4921), Harrisburg(M5369), Houston(M4601), Mason(M4453), Warren(M6066), Woodbridge (M4599)		

*** See the Solid Seal I & II closing instructions for specifics on Solid Seal Rings***

LEVER RINGS



1. Snap the closing ring over the cover and curl area of the drum, making sure that it is seated over the entire perimeter. In order to compress the gasket uniformly, tap around the entire perimeter of the ring. For some ring/gasket combinations, a mechanical head compressing device may be necessary to accomplish this while closing the lever assembly handle.

2. For side lever locking rings, the ring latch must be snapped securely in place. For top lever locking rings, the top lever must be fully locked in place under the securing bar.

3. Sealing the eyelets of lever rings is necessary not only for evidence tampering, but for the integrity of the closure.

CLOSING INSTRUCTIONS FOR 1A2 FULL OPEN HEAD DRUMS WITH SOLID SEAL ™ BOLT RING CLOSURE – TYPE II
(TYPE II HAS A 5/8" BOLT WITH A NYLON LOCKING PATCH, WHICH ELIMINATES THE NEED FOR A RETAINING NUT OR JAM NUT)

1.) Snap the closing ring over the cover and curl area of the drum, making sure that it is seated over the entire perimeter. Check to see that the cover and drum curl are fully contained and centered within the recess of the ring.

2.) The bolts for this application have a nylon-locking patch on the threads. Insert the 5/8" diameter nylon patched bolt through the unthreaded ring lug and tighten the bolt while compressing the gasket with a mechanical head press or while tapping the outside of the closing ring around the entire perimeter with a non-sparking mallet.

a) The bolt should be tightened until the two lugs meet and touch each other with no gap. A torque of at least 30 ft-lb should be applied. If a mechanical head compressor is not used, the torque required to bring the lugs together with no gap may be higher.

b) When the ring and bolt are assembled and tightened correctly the two lugs should meet and touch each other with no gap, regardless of the torque required. If the lugs do not meet, go back to step 1 and repeat steps 1 through 3.

c) For drums with poly liner bags, the gap should be 3/8" or less while ensuring that the liner is seated uniformly over the curl of the drum and protruding out from under the cover.

Note: Per IFI STD 124, a nylon patch bolt may be reused (re-torqued) a maximum of five times, after which it should be replaced.

CLOSING INSTRUCTIONS FOR 1A2 FULL OPEN HEAD DRUMS WITH SOLID SEAL ™ BOLT RING CLOSURE – TYPE I
(TYPE I HAS STANDARD 5/8" BOLT AND RETAINING NUT)

1) Snap the closing ring over the cover and curl area of the drum, making sure that it is seated over the entire perimeter. Check to see that the cover and drum curl are fully contained and centered within the recess of the ring.

2) Insert the 5/8" diameter bolt through the unthreaded ring lug and tighten the bolt while compressing the gasket with a mechanical head compressor or tapping the outside of the closing ring around the entire perimeter with a non-sparking mallet.

a) The bolt should be tightened until the two lugs meet and touch each other with no gap. A torque of at least 30 ft-lb should be applied. If a mechanical head compressor is not used, the torque required to bring the lugs together may be higher.

b) When the ring and bolt are assembled and tightened correctly the two lugs should meet and touch each other with no gap, regardless of the torque required. If the lugs do not meet, go back to step 1 and repeat steps 1 through 3.

PRESSURE RELIEF SCREWS

The pressure relief screw must be torqued to 3 ft-lbs.

COMPOSITE DRUMS

The UN 6HA1, Composite drums, 49 CFR § 178.522(a)(1), 55-gallon nominal capacity supplied with plug or screw cap closures with gaskets must be **closed for shipment using only the closures and gaskets supplied and specified** in the design qualification test for the drum as indicated below:

Part Size/Description	Closure Torque
HDPE Liner 6HA1/X1.8/350 and X1.8/300: 2-inch double buttress w/EPDM gasket	29-32 ft-lbs.
HDPE Liner with 2-inch double buttress: EPDM and FKM[4] gasket	20-25 ft-lbs.
HDPE Liner with 2-inch double buttress: Polyolefin gasket	25-30 ft-lbs.
HDPE Liner with 2-inch Nylon/Polypropylene: EPDM gasket	12-15 ft-lbs.
HDPE Liner with 56x4 mm plugs: BUNA gasket	20-25 ft-lbs.

[4] FKM, FPM and Viton are names for the same base material: fluoro rubber.

CAUTION

Per 49 CFR 172.22, it is the responsibility of the person offering a hazardous material for shipment to assure that the containers selected are appropriate to the product being shipped, and that the containers are properly assembled, as per the above closing Instructions. The correct installation and torquing of all closures, rings, plugs, etc. should be verified by the shipper prior to releasing a package for transportation.

Additionally, it is the responsibility of the Shipper to determine the suitability of any Mauser Packaging Solution packaging for transportation of hazardous materials by Air. For shipments by Air, the shipper must refer to all applicable provisions (including the Hazardous Materials Table and 172.321) in 49 CFR and take into account the characteristics of the material being shipped and the performance capabilities of the container sold to you.

Revision history:

Version	Description	Prepared by	Effective Date
MC/PAS-QA-101 REV.07	• Added MPS manufacturing locations • Updated to MPS format • Updated 6HA1 descriptions to reflect currently offered designs; added FKM gasket. • Updated reference to the current ANSI standard	T.Smoleeva	02/25/2021
MC/PAS-QA-101 REV.08	• Updated closing ring application torque for Chicago (M4453) & Mason (M4921)	T.Smoleeva	08/11/2021
MC/PAS-QA-101 REV.09	• Updated page 1 to include “Non removable head drums, 1A2.” • Editorial and formatting changes throughout document	T.Smoleeva	01/13/2023
MC/PAS-QA-101 REV.10	• Updated torque value for composite drums with 56x4 mm plugs	T.Smoleeva	02/06/2023
MC/PAS-QA-101 REV. 11	• Clarified torque requirements for 5/16” bolts, ring application/tightening, and added pressure relief screw requirements	D. Stanbro	07/31/2023
MC/PAS-QA-101 REV. 12	• Update for the end user how to access closing instructions.	T.Smoleeva	09/08/2025
MC/PAS-QA-101 REV. 13	• Updated manufacturing location	T.Smoleeva	09/15/2025
MC/PAS-QA-101 REV. 14	• Updated torque spec for TS 2” closures Content revisions to remove selected images	M.Acosta	06/19/2026