

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. In order 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. In order to fulfill this obligation the shipper often turns to the packaging manufacturer for this training since the manufacturer has designed, produced and tested the packaging to meet UN performance standards. MAUSER is prepared to provide this training in addition to supplying closing instructions. It has been the practice of MAUSER to send closing instructions attached to the shipping documents with each shipment of drums. This document provides specific information on closing MAUSER packagings.

These closing instructions must be given to the individuals responsible for closing the packagings prior to shipment. Many companies use electronic copies as site specific work instructions and/or use laminated hard copies posted at the fill lines for reference by the fill line operators. 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 or IBC for shipment so that it is capable of meeting the performance standards indicated by the UN marking on the side or top of the packaging. **MAUSER recommends that only parts that have been tested and certified by MAUSER 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. In the case of Intermediate Bulk Containers, IBC's, the lid, gaskets, plugs, cages, pallets, valves and service equipment are supplied as tested.

Pictures of the plugs, lids and rings may be found on the website under products and services/accessories. If a specific closure is not listed on the website or your specific closure is not listed below, please contact MAUSER for assistance.

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. 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:

- 1. 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.**
- 2. 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. Adjustable wrenches available at hardware stores, auto parts stores, and through equipment catalog suppliers and drum parts suppliers.**

PLASTIC NON-REMOVABLE HEAD DRUMS

All non-removable head, UN 1H1, 1H1W Plastic Drums, 49 CFR § 178.509(a)(1), 15 gallon to 65 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 / Part Number (Plug number with gasket) ⁱ	Torque
A	2-inch buttress: L10 EPDM; L10B Buna; L10VT FPM ⁱⁱ	20-25 ft.-lbs.
B	2-inch NPS: L16 EPDM ⁱⁱ ; L16B Buna; L16VT FPM; L16RVCLG	20-25 ft.-lbs.
C	2-inch buttress: L10V Vented EPDM; L10V-B Buna; L10V-VT FPM	20-25 ft.-lbs.
D	2-inch NPS: L16 Vented EPDM; L16V Buna; L16VT FPM	20-25 ft.-lbs.
E	2-inch NPS: L16R with L12EP	20-25 ft.-lbs.
F	2-inch ACT buttress: SA10B with A72	30-40 ft.-lbs.
G	3/4-inch NPS: C34 or C39 (S) AD with C31 EPDM; C31 Silicone	6-9 ft.-lbs.
H	L10R-HD with L11F-HD; L16RHD; and Santoprene® gaskets	25-30 ft.-lbs.
I	Metric: 70x6 BCS LR10W with LR11EP; 70x6 BCS LR10W with LR11VT	35-40 ft.-lbs.
J	Metric: 56x4 BCS LR17 with LR12EP	20-25 ft.-lbs.
K	Polycon® II : 2-inch NPS L16-6RK/EPDM	37-42 ft.-lbs.
L	Polycon® II : 3/4-inch NPD C34-6RK/EPDM	8-10 ft.-lbs.

COMPOSITE DRUMS

All non-removable head, 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:

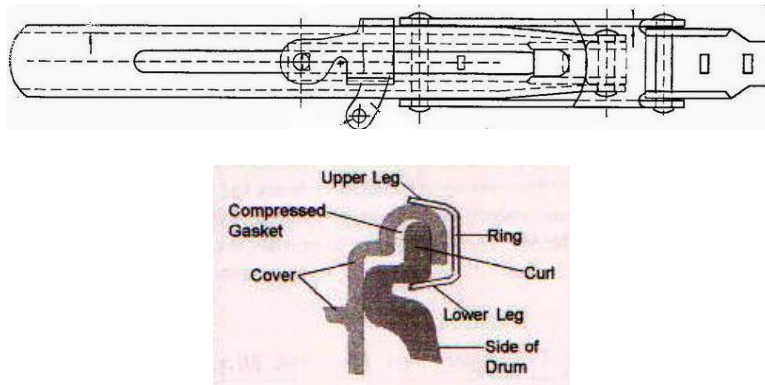
	Part Size / Part Number (Plug number with gasket)	Torque
A	HDPE Liner 6HA1/X1.8/350 and X1.8/300: 2 inch double buttress L-10xx with L11EP-xx	29-32 ft-lbs
B	Liner 5506: 2-inch NPS: L16-xx with L12-xx	14-18 ft.-lbs.
C	Liner 5506: ¾ inch NPS: C39-xx	4-6 ft.-lbs.
D	HDPE Liner 6HA1/Y1.8/100: 2-inch double buttress: L10-xx with L11EP-xx	21-25 ft.-lbs.
E	LDPE Liner 6HA1/Y1.8/100 and Y2.0/100: 2-inch combination plug: A16 EPG-TR	14-18 ft.-lbs.
F	LDPE Liner 6HA1/Y1.8/100 and Y2.0/100: ¾ inch NPS: C34TR with C31EP-TR gasket	4-6 ft.-lbs.
G	Liner 5510 :2-inch double buttress: L10-HD with L11-B4F	25-30 ft.-lbs.
H	Nylon/Polypropylene 2 inch with EPDM Gasket	12-15 ft.-lbs.

PLASTIC REMOVABLE HEAD DRUMS

	Part Size / Part Number (Plug number with gasket)	Plug Torque
A	Vanguard ® Lid with 2-inch Self-seal type NPS plug:	7-9 ft.-lbs.
B	Vanguard ® Lid with ¾ inch Self-seal type NPS plug:	5-7 ft.-lbs.

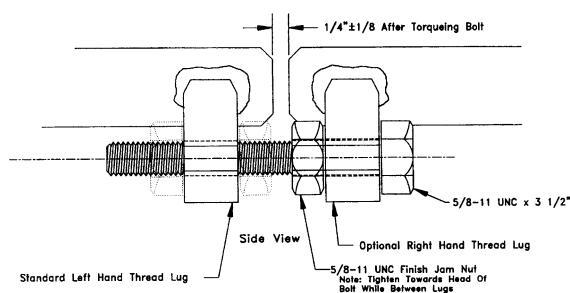
1. All removable head, UN 1H2, Plastic Drums, 49 CFR § 178.509(a)(2), of nominal capacity 15 to 60 U.S. gallons supplied with plastic lids, gaskets and associated clamp bands, or locking rings, or bolt rings, must be **closed for shipment using only the components supplied and specified** in the design qualification tests according to the following installation instructions:
 - Place drum lid with gasket and selected clamp band as supplied on the top opening of the drum body.
 - Firmly place lid onto top opening by applying downward pressure to lid above drum sidewall.
 - While pressing down on lid, engage locking mechanism of clamp band to secure the lid in place. Make sure the locking mechanism is completely latched. Insert locking tab into slots in lever lock handle.

Lever Lock Side View



2. Please note that the Vanguard 57 gallon HLR drum carries a liquid rating Y1.2/100 with a bolt ring or lever lock closure. This is valid when the lid is factory installed with a lid press. This drum should be filled through the 2-inch opening in the lid and closed as in subsections the steps listed above. If the lid is removed the liquid rating is no longer valid unless a new lid is installed with a lid press and a MAUSER bolt ring or lever lock is used for closure.
3. The MAUSER removable head plastic drum may be provided with a bolt ring closing device. This bolt ring is closed as follows:
 - Place lid with gasket in place, as supplied, on the curl at the top of the drum body.
 - Place bolt ring around the drum head and curl.
 - Using a head compressor, apply force to the top of the drum head assembly to compress head gasket.
 - Drive bolt into ring until the ends of the bolt ring are at a 3/8-inch or less ring gap.
 - 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 above requirements.
 - When ring has been tightened as required, the jam nut, if supplied, must be tightened against the left threaded eye.
 - In the case of the Vanguard V57 HLR drum supplied with a bolt ring for liquid service, the bolt has no jam nut but uses a shoulder type bolt. Follow steps 3 a through f tightening the bolt until the shoulder meets the threaded eye.

Bolt Ring Closure –Plastic Drums



STEEL NON-REMOVABLE HEAD DRUMS

1. All non-removable head, UN 1A1, Steel Drums, 49 CFR § 178.504(a)(1), that are supplied with plugs and gaskets must be **closed for shipment using only the plugs and gaskets supplied and specified** in the design qualification test for the drum, as indicated below:
 - a. Tri-Sure™ Plugs, 2-inch and 3/4-inch steel and plastic, installed in Tri-Sure™ steel flanges of corresponding size and tightened to the torque recommended by American Flange & Manufacturing Co., Inc. for the plug gasket used, as indicated below. *Materials classified as "POISONOUS BY INHALATION" must be sealed with Tri-Sure steel, gasketed Tab-Seal caps.*
 - b. Rieke® Corporation plugs 2-inch and 3/4-inch steel and plastic, installed in the appropriate Rieke steel or plastic flange of corresponding size and tightened to the torque recommended by Rieke, as indicated below.
 - c. For Technocraft brand plugs and flanges please follow the guidance under "TS Type" in the following table.

	Closing Torques in ft.-lbs. (by Type)	Gasket Type	3/4" Plug Torque	2" Plug Torque
A	Rieke ⁱ : VISE-GRIP II - Plastic Flange	Polyethylene	9 ft.-lbs.	20 ft.-lbs.
B	Rieke: VISE-GRIP II - Plastic Flange	Rubber	9 ft.-lbs.	20 ft.-lbs.
C	Rieke VISE-GRIP II- Steel Flange	Polyethylene	9 ft.-lbs.	20 ft.-lbs.
D	Rieke: VISE-GRIP II- Steel Flange	Rubber	9 ft.-lbs.	20 ft.-lbs.
E	Rieke: VISE-GRIP II Plug with built-in gasket - Plastic Flange		9 ft.-lbs.	20 ft.-lbs.
F	Rieke: VISE-GRIP II Plug with built-in gasket - Steel Flange		9 ft.-lbs.	20 ft.-lbs.
G	Rieke: Steel Plug - Steel Flange	Polyethylene	20 ft.-lbs.	40 ft.-lbs.
H	Rieke: Steel Plug - Steel Flange	Rubber	15 ft.-lbs.	30 ft.-lbs.
I	TS Type ⁱⁱ : Polypropylene and Nylon Plugs	Polyethylene	8 ft.-lbs.	15 ft.-lbs.
J	TS Type: Polypropylene and Nylon Plugs	Rubber	8 ft.-lbs.	15 ft.-lbs.
K	TS Type: Polyethylene Plugs (high-density)	Rubber	8 ft.-lbs.	15 ft.-lbs.
L	TS Type: Self-Gasketing, polyethylene plug		5 ft.-lbs.	12 ft.-lbs.
M	TS Type: Steel Plugs	Polyethylene, Teflon	20 ft.-lbs.	30 ft.-lbs.

ⁱ ISO 15750-3 Circular Serrated Closure Type B. ANSI MH2-2003 § 3.1.4

ⁱⁱ ISO 15750-3 Octagonal & Hexagonal Closures Type A. ANSI MH2-2003 §3.1.4

N	TS Type: Steel Plugs	Rubber	12 ft.-lbs.	20 ft.-lbs.
O	TS Type: Zinc Die-Cast Plugs	Polyethylene, Teflon	20 ft.-lbs.	30 ft.-lbs.
P	TS Type: Zinc Die-Cast Plugs	Rubber	12 ft.-lbs.	20 ft.-lbs.

STEEL REMOVABLE HEAD DRUMSⁱⁱⁱ

- All removable head, UN 1A2, Steel Drums, 49 CFR § 178.504(a)(2), that are supplied with clamp bands, bolts, gaskets and lids must be **closed for shipment using only the components supplied and specified** in the design qualification tests for the drum.
- Place lid with gasket in place, as supplied, on the curl at the top of the drum body.
- Place bolt ring around the drum head and curl.
- Using a head compressor, apply force to the top of the drum head assembly to compress head gasket.
- Drive bolt into lug until the ends of the bolt ring are as follows:
 - For steel drum thickness (marked on bottom of drum) 1.3/1.1/1.1 to 1.1/0.9/1.1: 1/2-inch or less ring gap.
 - For steel drum thickness (marked on bottom of drum) 1.1/0.8/1.1 or less: 3/8-inch or less ring gap.
 - NOTE:** If prescribed ring gap cannot be achieved, torque ring to 75 +/-5 ft.-lbs. The ends of the ring should not be touching, maintain a minimum gap of 1/16".
- 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 above requirements.
- When ring has been tightened as required, the jam nut must be tightened against the left lug.
- 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.

INTERMEDIATE BULK CONTAINERS

	IBC Type	Gasket Type	Torque
A	Bulkdrum ® II	EPDM/FKM	70 ft.-lbs.
B	MAUSER ® SM series 275/330 gallon	EPDM	70 ft.-lbs.
C	MAUSER ® SM series 275/330 gallon	FKM/FPM	70 ft.-lbs.
D	2" plug in Standard lid, vented and solid	EPDM/FKM	20-25 ft.-lbs.
E	56 mm plug in 150 mm lid vented and solid	EPDM/FKM	20-25 ft.-lbs.

All UN 31HA1 and 31 HG1 Composite IBC's 49CFR § 178.707 (a) (5) that are supplied with lids, cages, pallets and service equipment must be **closed for shipment using only the components supplied and specified in the design qualification tests for that IBC.**

- Place the lid with gasket in place on the top opening of the IBC.
- Screw the lid by hand until the gasket is in contact with the sealing surface.
- Using the lid adaptor and torque wrench tighten the lid to the recommended torque. Recommended torque is reached when the wrench releases or clicks.

ⁱⁱⁱ ANSI MH2-2003 §3.2 and 3.2.4

Preset torque wrenches or adjustable torque wrenches are suitable for this procedure. Please calibrate wrenches at least annually. Variable range adjustable machinist torque wrenches are available and most auto parts stores, catalog stores like Grainger and Mc Master Carr, Sears, Home Depot, Lowes, on-line drum parts suppliers, and many others. IBC Cap and valve adapters are available through MAUSER or many catalog houses that specialize in drum and IBC parts and components.

VALVES

The valves supplied with MAUSER IBCs are factory installed and are not meant to be installed by the filler. If an IBC valve must be replaced the following procedures must be followed. Only valves as specified in the original design qualification are suitable.

IBC valve replacement constitutes a "repair" and the person repairing must adhere to the requirements of 49 CFR Part 180 Subpart D §§ 180.350 -180.352 **Qualification and Maintenance of IBCs**. MAUSER assumes no responsibility for the performance of any packaging repaired by any person or company. This information is provided as an accommodation and MAUSER assumes no warranty or guarantee of any kind and the recipients use or non-use of this information is at the sole discretion and responsibility of the recipient.

1. Inspect new unused replacement valve for presence of defect free, clean gaskets.
2. Hand thread the valve until the threads begin to grip.
3. **MAUSER Butterfly and Cylinder Integrated Collar Valves** : Using a torque wrench with a valve adapter as above tighten the valve to a minimum of 70 ft-lbs, finishing the procedure with the valve in the proper vertical orientation. If the valve reaches 70 ft-lbs and will not orient properly, or if it can not reach 70 ft-lbs, it may be cross threaded or a bad thread. Discard and repeat with **a new** valve. The polyolefin gasket on the valve collar is not designed for repeated
4. **Banjo brand metal collar valves**: Holding the valve in the proper vertical orientation spin the metal collar until hand tight. Using a calibrated torque wrench with valve adapter tighten the collar to 50 ft-lbs.
5. **Leak proof test the empty IBC with ≥ 20 kPa air pressure per 49 CFR 178.813.**

TORQUE WRENCHES

The following are photographs of various torque wrenches MAUSER has found suitable to apply the required closing torque.



Dial Indicating and Adjustable Wrench



Husky Brand Indicating Wrench



Rieke Brand Preset Wrenches

ⁱ Note: MAUSER uses various buttress and NPS plugs under the generic part numbers L10 and L16 respectively. They are supplied with the drum with gasket-installed ready for final closing for shipment. The plug and gasket are specific to the drum as tested. The closures must be properly installed and tightened to the torque shown or specified on the particular closing instructions for the drum supplied. Closures must be tightened to recommended torque using pre-set or variable-range machinist torque wrenches calibrated to the indicated value. Variable range machinist torque wrenches are available and most auto parts stores, catalog stores like Grainger and Mc Master Carr, Sears, Home Depot, Lowes, on-line drum parts suppliers, and many others.

ⁱⁱ **MAUSER L-ring drums marked UN 1H1/Y1.9/150** must have a torque applied of 25-27 ft-lbs (34-37 N-m)**