

# JAPAN P&I NEWS

No.863-16/12/27

To the Members

Dear Sirs,

## **Singapore, Mandatory Adaption of Mass Flow Meter System for Bunker Barges**

In one of the biggest bunkering port, Singapore, it will become mandatory for all bunker barges to equip the MFM (Mass Flow Meter) system from 1<sup>st</sup> of January 2017.

MPA (Maritime and Port Authority of Singapore) announced this regulation by their Port Marine Circular (No.08 of 2014) not only to enhance transparency but also to improve operation efficiency and increase productivity of the bunker industry. From 1st of January 2017, the number provide by MFM will be treated as the delivery volume on the BDN (Bunker Delivery Note).

MPA provided three placards (Technical Reference, Dispute Management and Best Practice) and FAQ on MFM for vessel's reference. Together with them, Japan P&I Club would like to introduce its Loss Prevention Bulletin Vol.30 "Bunkers – Quantity and Quality Disputes."

We hope it will be of help to you with regard to the safe voyage.

Yours faithfully,

## **The Japan Ship Owners' Mutual Protection & Indemnity Association**

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Attachments / Links :

Mandatory adaption of mass flow metering system for marine fuel oil delivery in the port of Singapore  
Port Marine Circulars - No. 08 of 2014

<http://www.mpa.gov.sg/web/portal/home/port-of-singapore/circulars-and-notice/detail/pc14-08>

Frequently Asked Questions (MFM)

<http://www.mpa.gov.sg/web/portal/home/port-of-singapore/port-operations/bunkering/mass-flow-meter-for-bunkering/frequently-asked-questions-mfm>

MPA MFM Placard 01-03

01. Technical Reference for Bunker Mass Flow Metering (TR 48 : 2015)

<http://www.mpa.gov.sg/web/portal/home/port-of-singapore/port-operations/bunkering/bunkerin-g-101-placards/technical-reference-for-bunker-mass-flow-metering-tr-48-2015>

02. Mass Flow Meter Dispute Management

<http://www.mpa.gov.sg/web/portal/home/port-of-singapore/port-operations/bunkering/bunkerin-g-101-placards/mass-flow-meter-dispute-management>

03. Mass Flow Metering Best Practices

<http://www.mpa.gov.sg/web/portal/home/port-of-singapore/port-operations/bunkering/bunkerin-g-101-placards/mass-flow-metering-best-practices>

Japan P&I Club - Loss Prevention Bulletin Vol.30 / Bunkers – Quantity and Quality Disputes  
(not attached)

[https://www.piclub.or.jp/lossprevention/guide/?action=common\\_download\\_main&upload\\_id=3896](https://www.piclub.or.jp/lossprevention/guide/?action=common_download_main&upload_id=3896)



MARITIME AND PORT AUTHORITY OF SINGAPORE

PORT MARINE CIRCULAR

NO.08 of 2014

29 July 2014

Bunker Suppliers / Bunker Craft Owners and Operators  
Shipping Community  
Harbour Craft Community

**MANDATORY ADOPTION OF MASS FLOW METERING SYSTEM FOR MARINE FUEL OIL DELIVERY IN THE PORT OF SINGAPORE**

As the world's leading bunkering port, it is important for Singapore to provide quality bunkering services to vessels lifting bunkers in the port. The use of the Mass Flow Metering (MFM) system for bunkering in the Port of Singapore will not only enhance transparency in the bunkering process, but also improve operational efficiency and increase the productivity of the bunker industry.

2 As announced on 8 April 2014, MPA will be mandating the use of an MPA-approved MFM system for Marine Fuel Oil (MFO) delivery in the Port of Singapore from 1 January 2017.

**i. Existing bunker tankers**

All existing bunker tankers operating in port will be required to be fitted with an MPA-approved MFM for MFO delivery by 31 December 2016.

**ii. New bunker tankers**

All new bunker tankers applying for Harbour Craft (Bunker Tanker) licence from 31 December 2014 onwards will be required to be fitted with an MPA-approved MFM for MFO delivery.

3 As part of MPA's ongoing efforts to assist the maritime industry, MPA will be offering a lump sum incentive of S\$80,000 for each existing bunker tanker (as at 8 April 2014) delivering MFO in the Port of Singapore. The incentive will be given out upon MPA's approval of the fitted MFM system. All Bunker Craft Owners or Operators of bunker tankers eligible for the incentive will be notified by MPA on the application process for the incentives.

4 You may refer to the Frequently Asked Questions (FAQ) and Generic MFM procedure for Bunkering via the following links.

[http://www.mpa.gov.sg/sites/pdf/faq\\_mfm.pdf](http://www.mpa.gov.sg/sites/pdf/faq_mfm.pdf)

[http://www.mpa.gov.sg/sites/pdf/generic\\_mfm\\_delivery\\_procedure.pdf](http://www.mpa.gov.sg/sites/pdf/generic_mfm_delivery_procedure.pdf)

5 Please contact Mr Jackson Koh at tel. no. 6375 1953 or email to [Jackson\\_Koh@mpa.gov.sg](mailto:Jackson_Koh@mpa.gov.sg) for any clarification needed on this circular.

DR PARRY OEI  
DIRECTOR (PORT SERVICES) / CHIEF HYDROGRAPHER  
for CHIEF EXECUTIVE  
MARITIME AND PORT AUTHORITY OF SINGAPORE

## **FREQUENTLY ASKED QUESTIONS ON MASS FLOW METERING (MFM) FOR BUNKERING**

### **Q1: Are MFM a recent technology? Has it been tried and tested?**

**A:** The MFM is not a recent technology. The First Industrial Patent for the MFM dates back to the 1950s and the first meter was manufactured in 1970s. Today it's widely used in industries such as the Oil & Gas, Chemical, Life Sciences, F&B etc. American Petroleum Institute (API) has approved the use of MFM for custody transfer in 2002. (API MPMS 5.6 Coriolis flowmeters)

### **Q2: How does MFM measures mass directly?**

**A:** The MFM operates on the Coriolis principle which measures the oscillation frequency (ie: twisting) of the measuring tubes in the meter. The sensors, at the inlet and outlet ends, register the resultant phase shift in the tube's oscillation geometry and compute the rate of mass flow.

### **Q3: Why has it taken so long for bunker quantity measurements to adopt metering while automobile fuels retailers has adopted metering for some time?**

**A:** The use of MFM for bunkering is not a "plug & play" system. From our experience in the test bedding programme, we learnt that the piping configuration on each bunker tanker might vary. A proper set-up, including the piping configurations, is crucial to ensure the optimal performance of the entire MFM system.

In 2009, MPA and SPRING Singapore jointly initiated a MFM Working Group (WG) to develop and validate the use of MFM for bunkering. Since 2011, MPA and the WG had conducted extensive trials to ensure that the system is suitable for Singapore's bunkering environment. With the success of the trials, MPA had, in June 2012, approved the first MFM for official custody transfer in the Port of Singapore. The first MFM was an Emerson's meter. In Oct 2013, MPA approved an MFM produced by Endress & Hauser for use in the port of Singapore.

It is important to note that the approval for custody transfer is not a system-type approval. All individual MFM systems need to undergo and pass the physical acceptance test before approval is granted by MPA.

### **Q4: When will the delivery procedures by MFM be incorporated into SS600?**

**A:** The WG is currently developing a Technical Reference (TR) which will eventually be developed into a Singapore Standards (SS).

In the interim, the Singapore Standard Code of Practice for Bunkering (SS600) is being revised and will incorporate the use of MFM for bunker deliveries. The revised SS600 (SS600:2014) will be launched at SIBCON 2014. All MFM deliveries will have to adhere to the MPA- approved bunker tanker specific procedures. MPA has also published a Generic Mass Flow Metering (MFM) delivery procedure for the industry as a guide for the bunkering stakeholders

### **Q5: What are the 3rd party certifications or audits that MFM installations are subjected to?**

**A:** MFMs are calibrated in accordance to SPRING Singapore's requirement. The requirements are in line with both OIML R117 and ISO 17025 standards. All MFM systems onboard bunker tankers are to be evaluated and approved by MPA, before they are allowed to be used for custody transfer of bunkers.

### **Q6: How reliable is the MFM system and are there any contingency plans when the system breaks down?**

**A:** There are minimal moving parts in the system and MFMs have been reliably employed in other applications. MFM systems are also equipped with an uninterrupted power source (UPS) that is able to run the system in the event of a power failure.

In the unlikely event that the MFM stopped in the middle of a bunkering operation, pumping shall be stopped immediately and the meter's totalizer readings shall be recorded. Tank gauging, in accordance with SS 600, shall be used to determine the remaining quantity to be delivered and a separate BDN shall be issued. The final quantity delivered shall be the sum determined from the meter readings and the tank gauging recorded in the respective BDNs.

This procedure is covered under the Generic Generic Mass Flow Metering (MFM) delivery procedure that is available at [http://www.mpa.gov.sg/sites/pdf/generic\\_mfm\\_delivery\\_procedure.pdf](http://www.mpa.gov.sg/sites/pdf/generic_mfm_delivery_procedure.pdf)

**Q7: Incentive eligibility**

**A:** MPA has an incentive scheme to assist the industry in defraying a portion of the cost of MFM adoption. MPA will be making a lump sum payment of \$80,000 for all **existing bunker tankers** (holding a valid SB Harbour Craft (bunker tanker) licence) delivering MFO in the port, upon the final approval for MFM to be used for custody transfer for each bunker tanker.

**Q8: I have a new bunker tanker which is estimated to be delivered between now and 31 Dec 2014. Do I qualify for the incentive?**

**A:** New bunker tankers will not be eligible for the incentive. For new bunker tankers that are being registered between now till 31 Dec 2014, it is advisable to install the MFM system as soon as possible. The bunker tanker will be scheduled for the acceptance test to be conducted by MPA. The bunker tanker will not be allowed to deliver MFO after 1 Jan 2017.

**Q9: What is the approval process for MFM system and what is the downtime expected?**

**A:** The approval for MFM is an 8-step process (Annex A) covering from system procurement until the final approval for custody transfer. The entire process is estimated to take around 4 months. However, the downtime for the bunker tanker is approximately 1.5 weeks.  
(Installation: 1 week, acceptance test: 3 days)

MPA will be scheduling existing bunker tankers for the acceptance test. This will be done approximately 2 weeks after the deadline of the docking of the bunker tankers. With this arrangement, the downtime of the bunker tankers will be minimised.

**Q10: What happens when there is a difference between the reading of MFM and the terminal delivered figure during loading?**

**A:** All custody transfer meters used in terminals are required to follow the requirements as stipulated by SPRING Singapore. SPRING Singapore's requirement for the MFM is similar.

Our trial results showed that the variance between the MFM reading and the terminal delivered figure are within the industry acceptable standard of 0.5%. In addition, there is no change from the current arrangement and procedures when bunker tankers load from terminals. In the event of a bunker quantity dispute, the bunker tanker should raise a note of protest as per current practice. In such situation, the bunker tanker will be able to understand the loading operation in greater details through the recorded data.

**Q11: How often will calibration be done and how is it done?**

**A:** SPRING Singapore requires calibration procedures to comply with international standards OIML R117 and ISO 17025. The current requirement is for the meter to be calibrated every 3 years. Unlike traditional geared meters, MFM does not have mechanical parts or moving parts and therefore the need for re-calibration is relatively lower. The current approved meters were evaluated and are still performing in good condition.

Under the current practice, the MFM is required to be sent to a SPRING Singapore's Recognised Testing Laboratory (RTL) for re-verification/re-calibration. The bunker craft operator should time such operation to coincide with its docking schedule to reduce the downtime for the bunker tanker.

**Q12: Will my bunker tanker still be allowed to perform delivery via sounding (SS600) once the MFM system is approved for use by the bunker tanker??**

**A:** The mandatory use of MFM for MFO delivery is 1 Jan 2017. Once MPA approves the MFM system for custody transfer for the bunker tanker, the approved MFM system should be used as the default measuring equipment for bunker transfer/deliveries. In the event, there is a contractual agreement, between buyers and sellers, to use SS600 procedures (sounding) to measure the quantity of bunkers, MPA will not object to the arrangement. However, the MFM system shall be kept operational during all operations and the information recorded on the MFM system will be used in bunker dispute investigations.

**Q13: How will the cost of bunker be affected by the implementation of MFM?**

**A:** MPA calculated the monetary impact to bunker supplier and bunker craft operator using the cost of the MFM system as a base. The calculations did not consider the gain in efficiency enjoyed by the bunker craft operator with the expected bunker tanker's higher turnaround rate.

Items	Cost
Estimated cost of MFM inclusive of installation	\$220,000 (Estimated cost of \$300,000 - \$80,000*)
Estimated yearly maintenance cost inclusive of calibrations	\$20,000
Period of amortization	5 years
Average tanker capacity	4000
Average number of turns per month	8
Bunker delivered per month	32,000 mt
Unit cost for MFM	\$0.17/mt

\*MPA incentive of \$80,000 to existing bunker tankers delivering MFO

**Q14: How is the testing of MFM system conducted?**

**A:** Since 2011, MPA and the Working Group had conducted extensive trials on the MFM at varying operating conditions to ensure that the system is suitable for Singapore's bunkering environment. A total of 17 bunker tankers participated in the test-bedding programme.

All meters approved for custody transfer meets the recommendations set by the Organisation of Legal Metrology (OIML)'s R117:2007 standard - an international recommendation for measuring system for liquids other than water.

The meters are then sent to a SPRING Singapore's Recognised Testing Laboratory (RTL) for calibration before it is installed on the bunker tanker. Once fitted onboard and sealed, all MFM systems have to undergo 3 rounds of test. During the tests, the entire delivery system are put through the verification process to ensure all pass-by are blanked out and sealed. Sealings are to be done by an independent party to ensure the integrity of the system. The data collected during the test were sent to Singapore's National Metrology Centre for validation.

**Q15: How do I ensure the integrity of MFM system is not compromised?**

**A:** MPA requires the meter system set up to have no by-pass of flow after the meter. Any pass-by system on bunker tankers shall be blanked out and sealed.

Under the approved delivery procedure, opening and closing procedures for a bunker delivery differ slightly. All bunker tankers installed with the MPA-approved MFM are to maintain the latest seal verification report and metering system diagram indicating all the sealing points. The vessel representative and bunker surveyor, if engaged, are required to check and ensure all listed seals are intact. They shall sign on the Mass Flow Metering System Seal Checklist to indicate that the seals are intact. The same should be done for the closing procedure.

Other than the Mass Flow Metering System Seal Checklist, the Meter Reading Record Form and Bunker Metering Ticket generated by the system will provide an additional layer of security. All these requirements are stated in the Generic Mass Flow Metering (MFM) delivery procedure.

**Q16: How will transparency be enhanced when compared to tank sounding?**

**A:** There is continuous digital data captured during the delivery process, the data can be viewed in the form of a delivery profile. At any instance in time, and we are able to trace the amount of mass transferred. The MFM system is also able to detect changes in operating conditions e.g. when we change supply tank, or when we clear the lines at the end of the delivery.

The delivery profile data can be extracted from the system, if required.

**Q17: Is there still a need for bunker surveyors for deliveries done via the mass-flow meters?**

**A:** Yes. The role of bunker surveyor being an independent party to witness and ensure compliance to bunker delivery processes remains unchanged.

There is a change in the function of bunker surveyors for MFM deliveries. For example, the surveyor is required to cross check the seal verification report and the actual physical seals at various locations in the MFM system. This procedure is to ensure the integrity of the entire MFM before and after the delivery. The detailed actions required from bunker surveyors are covered under the Generic MFM delivery procedure.

MPA is also looking to expand the scope of work for surveyor and exploring the possibilities to train bunker surveyor to perform zero verification for approved MFM system.

**Q18: Will there be training provided to ensure bunker surveyors have the competency on MFM delivery?**

**A:** Yes. MPA is currently working with various organisations to conduct technical workshops, pre-conference symposium and bunker surveyor refresher courses to ensure bunker surveyors attain the competency to handle MFM delivery. We will be contacting accredited bunker surveying firms to share further details.

**Q19: If it's required by the owner/charterer to perform opening/closing using sounding method. Will MPA allow it?**

**A:** For a bunker delivery done via a MPA- approved MFM system, there is no need for sounding to be conducted. The BDN will reflect the delivered amount as registered on the MFM system. In the event there is a contractual agreement between the bunker buyer and bunker supplier to conduct a bunker delivery as per SS600 procedures, MPA will not object to such arrangement before 1 Jan 2017. However the appointed cargo officer and bunker surveyor shall ensure that the MFM system is kept operational during all operations.

Documents available on MPA website

Generic Mass Flow Metering (MFM) delivery procedure  
[http://www.mpa.gov.sg/sites/pdf/generic\\_mfm\\_delivery\\_procedure.pdf](http://www.mpa.gov.sg/sites/pdf/generic_mfm_delivery_procedure.pdf)



**Annex A**

Step	Certification stages	Details	Endorsing Party
1	Procurement of MFM system	<b>1. Sizing of MFM</b> (correct operating range) <b>2. Registration with MPA for incentive scheme, if eligible</b> (Submission of Purchase order)	MPA
2	Arrival of MFM system	<b>1. Complete water calibration</b> <b>2. Submission of all required documents to SPRING Singapore</b>	
3	SPRING Singapore's approval	<b>1. Level 1 &amp; 2 approval</b>	SPRING Singapore
4	Installation of MFM system	<b>1. Installation</b> <b>2. Development of sealing plan</b>	
5	MFM System Commissioning	<b>1. Submission of class endorsed revised piping diagram and proposed seals location for endorsement by MPA</b> <b>2. Submission of bunker tanker specific MFM delivery procedure</b> (to refer to generic MFM delivery procedure) <b>3. Submission of MFM vendor and BCO's attestation on system &amp; crew readiness for acceptance test</b> <b>4. Completion of sealing by SPRING Singapore &amp; Authorised Verifier/ authorised organisation(s)</b>	MPA
6	Official Acceptance test of MFM system	<b>1. 3 runs of test</b> (3 x loadings and 3 x deliveries with MPA chartered bunker tanker. Test date is scheduled by MPA (approximately 2 weeks after deadline of docking)	Data collection supervisor, test leader
7	Data Verification of test result by National Metrology Centre	<b>1. Submission of test data and test documents</b>	NMC, A*STAR
8	Submission of documents to MPA for approval	<b>1. Submission of all relevant documents*</b> <b>2. Lump sum incentive payment, if applicable</b>	MPA

\*list of documents required for application

1. Meter Certification
2. Water Calibration Certification
3. SPRING Singapore certification of verification
4. Water to Bunker conversion attestation
5. Mass Flow Metering system (Design, layout, configuration etc)
6. Endorsed Sealing plan and bunker tanker piping diagram
7. Latest Seal verification report
8. Zero verification procedure
9. All Zero verification reports
10. Endorsed MFM delivery procedure specific to the bunker tanker

# TECHNICAL REFERENCE FOR BUNKER MASS FLOW METERING (TR 48:2015)

LEGEND



Cargo Officer of Bunker Tanker

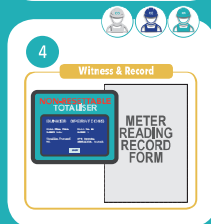
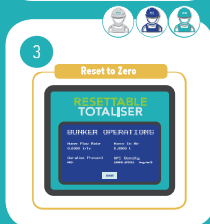
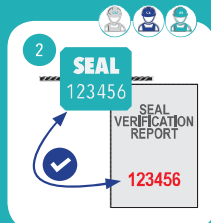
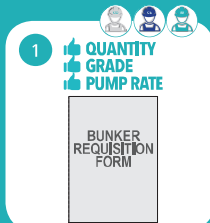


Chief Engineer of Receiving Tanker



Bunker Surveyor

## Pre-Delivery



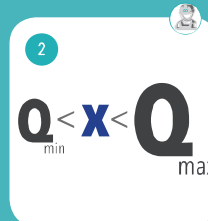
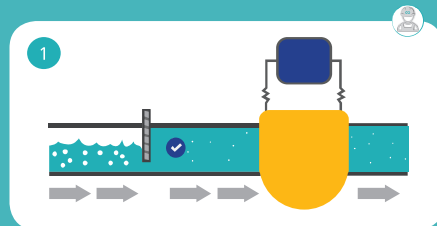
1. **Confirm** the quantity, grade of bunker and pumping rate (not lower than stated  $Q_{min}$  of the MFM system).
2. Seal numbers should **match** the latest seal verification report onboard. **Complete** the seal checklist.
3. Set resettable totaliser reading to **zero**.
4. **Witness** and **record** the opening meter readings.

**If any seal is missing, broken or if there is discrepancy, report to MPA immediately.**

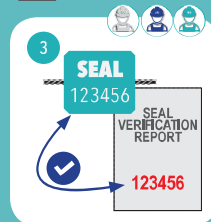
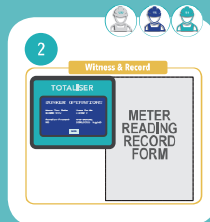
## During Delivery

1. **Fill** the cargo line as fast as practicable at the beginning of the bunkering operation.
2. Ensure that **agreed** pumping rate is adhered to.
3. **Record** all stoppages. Details for the stoppages must be **recorded**.

**Tank stripping and line clearing shall only be conducted at the end of the operation.**



## Post-Delivery



1. All parties shall **agree** on when the delivery is completed.
2. **Witness** and **record** the closing meter readings.
3. **Verify** that MFM system seals remain intact.

**No re-pumping of bunkers shall be allowed after the bunker metering ticket is printed.**

# MASS FLOW METER DISPUTE MANAGEMENT

LEGEND



Cargo Officer  
of Bunker Tanker



Chief Engineer of  
Receiving Vessel



Bunker Surveyor



## QUANTITY DISPUTES



### Cargo Officer (CO) shall do the following

1. Invite CE and BS to **re-witness** meter totaliser readings.
2. Provide assistance for CE & BS to check documentation, seals and piping system.
3. Raise a Note of Protest if dispute remains unresolved.

### Chief Engineer (CE) shall do the following

1. **Re-witness** meter totaliser readings.
2. **Re-check and verify** all seals in seal verification report are **intact**.
3. Confirm that no modification from piping diagram was made.
4. Obtain and examine relevant pages of bunker tanker meter totaliser log.
5. Obtain and examine certificates and documents listed in clause 10.7.6 of TR48.
6. Raise a Note of Protest if dispute remains unresolved.



### Bunker Surveyor (BS) shall do the following

1. **Assist CE** in the dispute management procedure as listed above.
2. Witness all procedures.
3. Record all relevant details, findings and observations in a statement of fact.

MPA HOTLINE FOR QUANTITY DISPUTES  
DURING BUNKERING OPERATIONS

**1800 - BUNKERS (1800-2865377)**

## QUALITY DISPUTES

- Lodge a complaint in writing to bunker supplier within 30 days after bunker delivery.
- Lodge a copy of the complaint and BDN with the "Executive Director, Singapore Shipping Association" AND "Bunker Services Department, Maritime and Port Authority of Singapore".



**QUANTITY DISPUTE:  
REPORT TO RELEVANT PARTY  
WITHIN 14 DAYS**



**QUALITY DISPUTE:  
REPORT TO RELEVANT PARTY  
WITHIN 30 DAYS**

# MASS FLOW METERING BEST PRACTICES

## BE FIRM

# F

**Flow Rate**  
( $Q_{min} < X < Q_{max}$ )

# I

**Inspect the seals before and after the bunker delivery.**

# R

**Reset the totaliser before the bunker operation and print out the Bunker Metering Ticket (BMT).**

# M

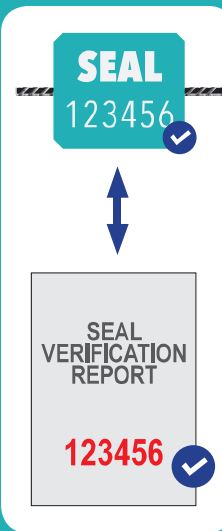
**Match the delivered quantity figure indicated on the BMT with the BDN.**

### Flow Rate



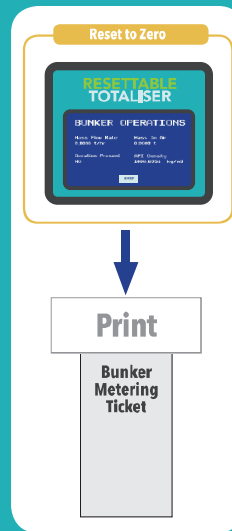
1. Flowrate for delivery shall be within the calibrated flow range of the MFM ( $Q_{min} < X < Q_{max}$ ).
2. Calibration range is indicated on the stamping plate of the meter. The meter calibration certificate is available onboard the bunker tanker upon request.

### Inspect Seals



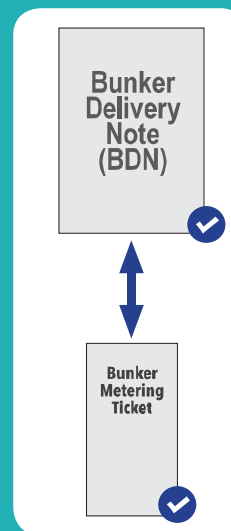
1. All seals have a **unique serial number** issued by Authorised Verifier.
2. **Match** the seal numbers with the seal verification report.
3. **Ensure** that the seals are **intact** and the blanks/flanges are **tamper-free before and after** the operation.

### Reset Totaliser



1. Always ensure that the resettable totaliser is **set to zero** prior to delivery.
2. **Record the readings** of the non-resettable totalisers before and after the operation.

### Match Records



1. Fill in **all** relevant and applicable fields of the BDN.
2. CO and CE to **endorse** and **stamp** all cancellation and amendments on BDN.