

# Tanks for transport of dangerous goods — Sealed parcel delivery systems — Working principles and interface specifications

The European Standard EN 15208:2007 has the status of a British Standard

ICS 13.300; 23.020.20; 35.240.60

## National foreword

This British Standard was published by BSI. It is the UK implementation of EN 15208:2007.

The UK participation in its preparation was entrusted to Technical Committee AUE/18, Tanks for the transport of dangerous goods.

A list of organizations represented on this committee can be obtained on request to its secretary.

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This British Standard was published under the authority of the Standards Policy and Strategy Committee on 31 May 2007

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ISBN 978 0 580 50665 9

### Amendments issued since publication

| Amd. No. | Date | Comments |
|----------|------|----------|
|          |      |          |
|          |      |          |
|          |      |          |
|          |      |          |

English Version

## Tanks for transport of dangerous goods - Sealed parcel delivery systems - Working principles and interface specifications

Citernes destinées au transport de matières dangereuses -  
Systèmes de livraison par cargaisons scellées - Principes  
de fonctionnement et spécifications des interfaces

Tanks für die Beförderung gefährlicher Güter - Versiegelte  
Transportsysteme - Arbeitsgrundlagen und  
Schnittstellenfestlegungen

This European Standard was approved by CEN on 4 November 2006.

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## Foreword

This document (EN 15208:2007) has been prepared by Technical Committee CEN/TC 296 “Tanks for transport of dangerous goods”, the secretariat of which is held by AFNOR.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 2007, and conflicting national standards shall be withdrawn at the latest by October 2007.

This document forms part of a coherent standards programme comprising the following standards:

- EN 13616, *Overfill prevention devices for static tanks for liquid petroleum fuels.*
- EN 13922, *Tanks for transport of dangerous goods — Service equipment for tanks — Overfill prevention systems for liquid fuels.*
- EN 14116, *Tanks for transport of dangerous goods — Digital interface for the product recognition device.*
- EN 15207, *Tanks for transport of dangerous goods — Plug/socket connection and supply characteristics for service equipment in hazardous areas.*

This document is applicable for tanks according to ADR [1].

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

## Introduction

Sealed parcel delivery systems, the subject of this European Standard, provide information concerning the content and the status of each compartment, used to transfer liquid fuels from loading gantries to delivery points, and optionally, the delivered quantities.

SPDS may be suitable for other application, e.g. sealed transfer of products subject to duties.

Sealed parcel delivery systems may be classified according to:

- the combination of functions implemented by the system;
- the way the functions are implemented (“type of function”).

Sealed parcel delivery systems are not measuring instruments but they may be ancillary devices as defined in OIML R 117 [2].

## 1 Scope

This European Standard is applicable to sealed parcel delivery systems used with transport tanks and specifies the performance requirements, critical safety aspects, data transfer methods between loading gantries and transport tank, transport tank and delivery points, other optional communications and tests to provide functional and compatible systems.

Sealed parcel delivery systems covered by this European Standard is for bottom loaded transport tanks.

The systems specified by this European Standard are suitable for use with liquid petroleum products and other dangerous substances of Class 3 of ADR which have a vapour pressure not exceeding 110 kPa at 50 °C and petrol, and which have no sub-classification as toxic or corrosive.

## 2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 12266-1:2003, *Industrial valves — Testing of valves — Part 1: Pressure tests, test procedures and acceptance criteria — Mandatory requirements*

EN 12266-2, *Industrial valves — Testing of valves — Part 2: Tests, test procedures and acceptance criteria; Supplementary requirements*

EN 13082, *Tanks for transport of dangerous goods — Service equipment for tanks — Vapour transfer valve*

EN 13083, *Tanks for transport of dangerous goods — Service equipment for tanks — Adaptor for bottom loading and unloading*

EN 13094, *Tanks for the transport of dangerous goods — Metallic tanks with a working pressure not exceeding 0,5 bar — Design and construction*

EN 13308, *Tanks for transport of dangerous goods — Service equipment for tanks — Non pressure balanced foot valve*

EN 13314, *Tanks for transport of dangerous goods — Service equipment for tanks — Fill hole cover*

EN 13316, *Tanks for transport of dangerous goods — Service equipment for tanks — Pressure balanced foot valve*

EN 13317, *Tanks for transport of dangerous goods — Service equipment for tanks — Manhole cover assembly*

EN 13616:2004, *Overfill prevention devices for static tanks for liquid petroleum fuels*

EN 13922, *Tanks for transport of dangerous goods — Service equipment for tanks — Overfill prevention systems for liquid fuels*

EN 14025, *Tanks for the transport of dangerous goods — Metallic pressure tanks — Design and construction*

EN 14116, *Tanks for transport of dangerous goods — Digital interface for the product recognition device*

EN 14564, *Tanks for transport of dangerous goods — Terminology*

EN 14595, *Tanks for transport of dangerous goods — Service equipment for tanks — Pressure and Vacuum Breather Vent*

EN 14596, *Tanks for transport of dangerous goods — Service equipment for tanks — Emergency pressure relief valve*

EN ISO 3166-1, *Codes for the representation of names of countries and their subdivisions — Part 1: Country codes (ISO 3166-1:1997)*

ISO/IEC 7816-1, *Identification cards — Integrated circuit(s) cards with contacts — Part 1: Physical characteristics*

ISO/IEC 7816-2, *Identification cards — Integrated circuit cards — Part 2: Cards with contacts — Dimensions and location of the contacts*

ISO/IEC 7816-3:1995, *Information technology — Identification cards — Integrated circuit(s) cards with contacts — Part 3: Electronic signals and transmission protocols*

ISO/IEC 7816-4:1996, *Identification cards — Integrated circuit cards — Part 4: Organization, security and commands for interchange*

### **3 Terms and definitions**

For the purposes of this document, the following terms and definitions apply.

#### **3.1**

##### **access port**

port through which it is possible to access to cargo and/or to change the physical characteristics of the parcel

#### **3.2**

##### **bottom loading**

according to EN 14564

#### **3.3**

##### **cargo**

product contained within a parcel

#### **3.4**

##### **clingage**

quantity of product that remains adhering to the parcel's internal surfaces after a complete delivery

#### **3.5**

##### **compartment**

<tanks for transport of dangerous goods> vessel closed by a foot valve, vapour transfer valve and a manhole cover assembly

#### **3.6**

##### **delivery**

complete operation performed at a station to discharge products from one or more compartments into one or more tanks including a start and a finish phase

#### **3.7**

##### **depot**

terminal

site of the products to be loaded onto the tank vehicles and the location of the loading facilities

**3.8****depot session**

time period covering the complete loading of the tank vehicle, starting at the beginning of the loading procedure and ending with the final loading or transfer operation

**3.9****device for the transfer of measured quantities****DTMQ**

all the equipment contained within a system that permits the secure transfer of metrological data between the loading rack, the tank vehicle and the delivery or transfer station

**3.10****empty parcel**

parcel in which no product is present except clingage

**3.11****equipment port**

port through which only access to cargo is possible

**3.12****frustrated delivery**

delivery of a parcel which does not result in an empty parcel

**3.13****guaranteed cargo**

sum of measured quantities transferred into a sealed parcel under guaranteed routing where parcel emptiness has been previously automatically identified

**NOTE**

In this case, the actual cargo within a parcel is equal to the guaranteed cargo.

**3.14****guaranteed delivered volume**

volume of product passing a port of a parcel enabling the parcel to be empty (transferring point)

**3.15****guaranteed routing**

routing that is satisfactorily completed under routing control

**3.16****guaranteed transport**

transportation of a guaranteed cargo or a minimum guaranteed cargo or an automatically detected empty parcel

**3.17****maximum guaranteed volume**

fill capacity of a compartment which corresponds to 97 % of the compartment's total capacity

**3.18****maximum sealable quantity**

maximum volume of product which can be guaranteed by the parcel

**3.19****measured quantity routed**

product quantity as routed into a parcel which has been measured by an approved metering system

**3.20****measurement cycle**

time period between the connection and the disconnection of a loading arm onto a parcel

**3.21**

**measurement number**

non-repeating sequence number (incrementing from 1) assigned to each measurement cycle when a measured quantity routed is available

**3.22**

**metrological data**

data that includes product quantities and is used for metrological purposes

**3.23**

**minimum guaranteed cargo**

sum of measured quantities transferred into a sealed parcel under guaranteed routing

NOTE The actual cargo within a parcel may be greater than its minimum guaranteed cargo.

**3.24**

**monitored port**

port whose closed position is checked automatically

**3.25**

**non-guaranteed cargo**

condition of a guaranteed cargo or a minimum guaranteed cargo once the parcel has been unsealed

**3.26**

**operational port**

port which permits cargo transfer to or from the parcel in normal operation and through which it is not possible to change the physical characteristics of the parcel

**3.27**

**parcel**

compartment(s) and all associated pipes and equipment, including its ports

NOTE This here defined term "parcel" should not be confused with the term in the packaging practice.

**3.28**

**permanently closed port**

port which can only be opened by destroying it

**3.29**

**port**

<tanks for transport of dangerous goods> any inlet or outlet connection or hole in a parcel

**3.30**

**return facility**

facility dedicated to the handling of product returns

NOTE This facility may include means to measure the returned volume.

**3.31**

**returns**

undelivered product left in the parcel

**3.32**

**routing**

transfer of a measured product quantity into a parcel

**3.33**

**routing control**

control method used to ensure that the total measured quantity is transferred into the parcel

**3.34****sealed parcel**

one whose ports are monitored closed by either mechanical or electronic devices or are permanently closed

**3.35****sealed parcel delivery****SPD**

process where a measured quantity of product is loaded into a parcel which is then sealed, controlled during transportation and discharged without the need for further measurement

**3.36****sealed parcel delivery system****SPDS**

instrumentation system that controls the seal status of a parcel

**3.37****sealed port**

port which can not be opened without the destruction of its mechanical seal

**3.38****secured port**

port through which no product can be transferred even when it is open

**3.39****station**

<tanks for transport of dangerous goods> any discharge site, delivery point but particularly petrol filling stations

**3.40****tank vehicle**

according to EN 14564

**3.41****top-up loading**

adding of additional product to a parcel that, although containing product, is not full

**3.42****transaction**

<tanks for transport of dangerous goods> successful loading or delivery of a minimum guaranteed cargo or a guaranteed cargo

**3.43****transfer station**

set of measurement, pumping, and associated hoses and/or loading arms installed to enable the transfer of measured product between parcels of a tank vehicle(s)

**3.44****unknown cargo**

contents of a parcel which is not defined by either a minimum guaranteed cargo, a guaranteed cargo or a non-guaranteed cargo

NOTE This condition would be achieved following a cargo delivery using a tank vehicle not fitted with automatic empty detection.

**3.45****wet leg sensor**

liquid sensor(s) which detect the emptiness of the pipe(s)

**3.46**

**compartment's total capacity**

maximum volume capable of being loaded into the compartment without any product release or escape

## **4 Aims (functions) of SPDS**

### **4.1 Minimum aim for delivery**

- Check status of each parcel before loading;
- secure the transfer of product from the measuring set to each relevant parcel;
- acquire and transmit to receiver the product grades and quantities loaded per parcel;
- control the sealed status of each parcel during transport;
- confirm emptiness of each parcel after delivery or follow procedure of frustrated delivery.

### **4.2 Minimum aim for frustrated delivery**

The aim of 4.1 plus:

- secure the return of non-delivered product to return facility;
- acquire and transmit to receiver the quantities of non-delivered product per parcel, if required.

### **4.3 Minimum aim for unattended delivery (optional)**

The aim of 4.1 plus:

- give suitable insurance that the quantity is fairly delivered (e.g. location of petrol station or tank within the petrol station, product grade);
- minimise the risk of accidental or fraudulent withdrawal of liquid;
- allow the retrieval of measuring data until the settlement of the transaction.

### **4.4 Minimum aim for unattended frustrated delivery (optional)**

The aim of 4.2 and 4.3 plus:

- automatic recognition of the end of delivery.

## 5 Functionality

### 5.1 General

The functions of the systems shall be according to Table 1.

**Table 1 — Functions**

| <b>Functions</b>                | <b>Annex A<br/>DTMQ<br/>4.1 to 4.4 and<br/>Welmec [3]</b> | <b>Annex B<br/>PID/PRD<br/>4.1 to 4.4<br/>Welmec<br/>optional [3]</b> | <b>Annex C<br/>Paper<br/>4.1 and 4.2 no<br/>Welmec [3]</b> | <b>Annex D<br/>Radio stuff<br/>4.1 to 4.4<br/>Welmec<br/>optional [3]</b> |
|---------------------------------|-----------------------------------------------------------|-----------------------------------------------------------------------|------------------------------------------------------------|---------------------------------------------------------------------------|
| Measuring results indication    | yes                                                       | option                                                                | no                                                         | option                                                                    |
| Seal breakage                   | yes                                                       | yes                                                                   | yes                                                        | yes                                                                       |
| Loading arm identification      | yes                                                       | yes                                                                   | no                                                         | option                                                                    |
| Receiver tank identification    | option                                                    | yes                                                                   | no                                                         | option                                                                    |
| Location device                 | option                                                    | option                                                                | no                                                         | option                                                                    |
| Product grade at loading        | yes                                                       | yes                                                                   | no                                                         | option                                                                    |
| Product grade at discharge      | option                                                    | yes                                                                   | no                                                         | yes                                                                       |
| Guaranteed volume               | option                                                    | option                                                                | no                                                         | yes                                                                       |
| Receiver loading data           | yes                                                       | option                                                                | no                                                         | yes                                                                       |
| Data transfer receiver          | option                                                    | option                                                                | no                                                         | option                                                                    |
| Transaction recording           | yes                                                       | option                                                                | no                                                         | option                                                                    |
| Non transaction event recording | yes                                                       | yes                                                                   | yes                                                        | option                                                                    |
| Volume change detection         | option                                                    | option                                                                | no                                                         | option                                                                    |

This clause describes the requirements of the different functions that can be provided by a SPDS.

### 5.2 Data

#### 5.2.1 Recording

##### 5.2.1.1 Transaction recording

The SPDS shall be provided with a means of keeping track of all transactions. This recording shall be available until the settlement of the transaction has been completed, but for a minimum time period of 15 days.

As a minimum, the following transaction data per parcel shall be recorded:

- date and time of the transaction;
- product quantity;
- product grade;
- special conditions e.g. empty, not empty;
- guaranteed or non guaranteed cargo.

It is not required that the loaded quantity be recorded in the SPDS at the moment of sealing.

#### **5.2.1.2 Non transaction event recording**

Events, such as sealing, re-sealing, breaking of a seal or changing the status of a parcel, shall be recorded in an electronic memory.

The record shall include the time and date of the event.

These events may be recorded in a summary if the transaction has been completed.

If an automatic empty detection is available any change of the status shall be considered as an event.

#### **5.2.2 Display**

The secured status of each compartment shall be clearly visible and unambiguous.

- Measuring results indication

The volume and status of the cargo as presented to the receiver shall be displayed, printed or otherwise securely transferred to the interested parties.

- Guaranteed volume

The volume of the cargo delivered to a station shall be displayed, printed or otherwise securely transferred to the interested parties.

#### **5.2.3 Data transfer methods**

Data transfer methods to be used at the loading rack and on the station are described in the Annexes A, B, C or D.

#### **5.2.4 Integrity of the data**

The data transfer and recording shall be safe against interference and manipulation. Errors shall be detected.

#### **5.2.5 System identification**

Systems using data communication shall have permanently installed identification devices to determine the proper method of communication.

### **5.3 Loading**

#### **5.3.1 Empty status**

The status of the parcel shall be available prior to loading.

If the parcel is not empty the top-up procedures in the applicable annexes shall be followed.

### 5.3.2 Routing

Secured transfer of product shall be achieved by:

- ensuring that no product is diverted between the transfer point of the metering set and the routing port of the parcel;
- ensuring that no product is lost from the parcel during loading;
- the complete sealing of the loaded parcel shall be activated within a time scale that makes fraud or withdrawal of product impossible without detection.

The SPDS shall be able to detect or identify which loading arm either is or was connected to which parcel. Identification may be done directly or indirectly.

The SPDS shall be able to identify which product grade is about to be loaded or has been loaded into a parcel. Acquisition of product grade may be done directly or indirectly.

The SPDS shall be able to exchange data with the depot. Loading data shall contain at least volume and product grade. Data exchange may be done directly or indirectly.

## 5.4 Delivery

### 5.4.1 Attended delivery

The status of all parcels shall be presented to the receiver along with the allocated cargoes.

NOTE If the sealed status is not given an individual procedure should be defined.

All delivered parcels shall be presented empty after delivery. Otherwise see 5.5.

No product shall be diverted between the parcel and the receiving tank.

### 5.4.2 Unattended delivery

The minimum requirements are:

- automatic station identification;
- automatic empty detection;
- a method to transmit securely to the station product grade and volume.

Additional requirements may be:

- verification of volume which shall be delivered against the available ullage in the tank;
- automatic tank identification;
- confirmation that volume was delivered into the correct receivers tank.

## 5.5 Frustrated delivery

### 5.5.1 Station

The return of non-delivered product shall be secured by recording

- date and time of last resealing of the relevant parcels before transfer of return;
- date and time of end of last delivery at the station, either confirmed by the receiver signature or automatically generated.

The return discharge shall be carried out in accordance with 5.5.2.

### 5.5.2 Returns

#### 5.5.2.1 General

The safe transportation between the station and the return facility shall be controlled by comparing the time and date of the last resealing before the presentation at the return facility with the time and date of end of last delivery from the tank vehicle at the station.

Measuring of returned quantities may not be necessary if the returned product can be delivered in another place to the same receiver, e.g. where a cargo is split between delivery locations. The parcel shall be controlled to be empty at the final delivery location.

#### 5.5.2.2 Non-measured returns

The return shall be unloaded in the return facility (which may be a second station). It may not be necessary to control emptiness because no measurement has taken place.

#### 5.5.2.3 Measured returns

The unloaded volume shall be measured to conclude the frustrated delivery, volume delivered being the difference between guaranteed cargo and measured return. The parcel shall be controlled to be empty.

The bill of return product with the date and time of last resealing of the relevant parcels as well as their identification shall be issued. Reconciliation of loaded and returned product shall be performed and the results shall be transferred to the receiver of the frustrated delivery.

When the returned product is transferred into another parcel of the same tank, the requirements of 5.5.2.1 shall be fulfilled.

## 5.6 Integrity

Any unauthorised, accidental or fraudulent addition to or withdrawal of cargo from a parcel, shall be impossible or shall be detected, this shall also include equipment failure.

## 6 Design characteristics

### 6.1 Empty detection

If between two transactions the tanker runs with a guaranteed cargo, any change of state of the wet leg sensor shall initiate a seal break.

Types of empty detection according to Table 2.

Table 2 — Types of empty detection

| Type | Type code               |                           |                             |                 |                | Explanation/example                                  | Application limits                                                                                                                 |
|------|-------------------------|---------------------------|-----------------------------|-----------------|----------------|------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|
|      | Wet leg empty detection | Parcel internal detection | Compartment empty detection | Pitch detection | Roll detection |                                                      |                                                                                                                                    |
| 1    | M                       | M                         | O                           | O               | O              | Empty detection shall be controlled by the receiver. | Unsuitable for unattended delivery<br>Unsuitable for non-horizontal stations<br>Not suitable for unattended measurement of returns |
| 2    | M                       | A                         | O                           | O               | O              | Empty detection shall be controlled by the receiver. | Unsuitable for unattended delivery<br>Unsuitable for non-horizontal stations                                                       |
| 3    | M                       | M                         | O                           | M               | O              | Empty detection shall be controlled by the receiver. | Unsuitable for unattended delivery<br>Not suitable for unattended measurement of returns                                           |
| 4    | M                       | M                         | O                           | M               | M              | Empty detection shall be controlled by the receiver  | Unsuitable for unattended delivery<br>Not suitable for unattended measurement of returns                                           |
| 5    | A                       | A                         | O                           | O               | O              | Automatic empty detection by the system.             | Suitable for unattended delivery<br>Unsuitable for non-horizontal stations                                                         |
| 6    | A                       | O                         | A                           | O               | O              | Automatic empty detection by the system.             | Suitable for unattended delivery<br>May be suitable for non-horizontal stations                                                    |
| 7    | A                       | O                         | A                           | M               | O              | Automatic empty detection by the system.             | Suitable for unattended delivery<br>May be suitable for non-horizontal stations                                                    |
| 8    | A                       | A                         | O                           | M               | M              | Automatic empty detection by the system.             | Suitable for unattended delivery<br>May be suitable for non-horizontal stations                                                    |

Table 2 (concluded)

| Type                                                                          | Type code               |                           |                             |                 |                | Explanation/example                      | Application limits                                                              |
|-------------------------------------------------------------------------------|-------------------------|---------------------------|-----------------------------|-----------------|----------------|------------------------------------------|---------------------------------------------------------------------------------|
|                                                                               | Wet leg empty detection | Parcel internal detection | Compartment empty detection | Pitch detection | Roll detection |                                          |                                                                                 |
| 9                                                                             | A                       | O                         | A                           | M               | M              | Automatic empty detection by the system. | Suitable for unattended delivery<br>May be suitable for non-horizontal stations |
| 10                                                                            | A                       | A                         | A                           | A               | O              | Automatic empty detection by the system. | Suitable for unattended delivery<br>May be suitable for non-horizontal stations |
| 11                                                                            | A                       | A                         | O                           | A               | A              | Automatic empty detection by the system. | Suitable for unattended delivery<br>May be suitable for non-horizontal stations |
| 12                                                                            | A                       | A                         | A                           | A               | A              | Automatic empty detection by the system. | Suitable for unattended delivery<br>May be suitable for non-horizontal stations |
| M – manual (e.g. visual)<br>A – automatic (e.g. electronic)<br>O – not fitted |                         |                           |                             |                 |                |                                          |                                                                                 |

## 6.2 Types of ports

### 6.2.1 General

As defined, ports are those valves or openings which permit the cargo to enter or leave the parcel. They are not those devices which only enable cargo transfer within the parcel.

Valves or openings which, when opened during normal operation, connect between parcels or parcels to common collectors, shall also be classed as ports.

Ports immersed in product which could lead to product leakage shall be monitored.

### 6.2.2 Examples

As an example, for a bottom loaded tank with vapour recovery system, the following devices shall be classed as ports:

- API adaptor and discharge valve or manifold valve (operational port);
- fill hole cover (access port);
- manhole cover (access port);
- emergency pressure relief valve (equipment port);

- vapour transfer valve (equipment port);
- pressure vacuum breather vent (equipment port);
- overfill sensor (equipment port);
- dip tubes (equipment port).

Valve that is not to be classed as port is:

- foot valve.

### 6.3 Checking of ports

Ports shall be either monitored, sealed, secured or permanently closed. The level of security required shall be dependent upon the performance of the SPDS according to Table 3.

- Monitored port

Any attempt to open such a port shall be recorded. The port sensor shall be set such that any leakage of more than 10 l/h shall result in the initiation of seal break.

In the event of the monitoring system identifying the opening of an access or equipment port, the SPDS shall treat the parcel as unsecured until reset by an authorised person. In case of unsecured equipment port proper condition of equipment port shall be restored. In case of unsecured access port the proper condition of the whole parcel shall be verified.

- Sealed port

The completeness of any mechanical sealing device shall be easily verified. The tanker shall carry identification showing the location of all such devices. Examples of mechanical sealing devices include a lead seal.

- Secured port

If a guaranteed cargo is present in the parcel, a secured port shall not be immersed in product in normal operation. Secured ports may include barriers, e.g. flame arresters or filters.

- Permanently closed port

It is not necessary to check during normal operation the status of permanently closed ports. Examples of permanently closed ports include those which are kept closed by direct or indirect welding.

**Table 3 — Methods of checking of ports**

| Ports       | Monitored                         | Sealed                            | Secured | Permanently closed |
|-------------|-----------------------------------|-----------------------------------|---------|--------------------|
| operational | Yes, at least if cargo is present | Yes, at least if cargo is present | no      | no                 |
| equipment   | Yes, at least if cargo is present | Yes, at least if cargo is present | yes     | yes                |
| access      | Yes, continuously                 | Yes, continuously                 | yes     | yes                |

## 6.4 Quantity monitoring

### 6.4.1 General

Quantity monitoring based on level gauging, differential pressure measurement or other techniques may be integrated in an SPDS along with any combination of other monitoring methods.

Quantity measurements may be carried out at any time, but as a minimum after each loading and before each unloading.

Quantity monitoring systems shall be classified by the manufacturer according to their sensitivity threshold according to Table 4.

In addition, quantity monitoring systems are characterised by the measuring range, i.e. the minimum and maximum measurable product quantity.

The measuring range shall cover the maximum sealable cargo.

The minimum measurable product quantity shall be specified by the manufacturer.

### 6.4.2 Quantity monitoring above foot valve

#### 6.4.2.1 Long term quantity monitoring

Any quantity variation during the monitoring period which is greater than the value specified in Table 4 for the type of system shall initiate a seal break.

#### 6.4.2.2 Short term quantity monitoring

The quantity variation shall be checked continuously. A seal break shall be initiated as soon as the quantity variation exceeds the larger of:

- 0,05 of the value specified in Table 4 for the type of system, per hour;
- 0,1 of the value specified in Table 4 for the type of system.

### 6.4.3 Quantity monitoring below foot valve

Quantity variation before and after opening of the foot valves shall be checked immediately before unloading.

Any quantity change of more than 0,1 per hour of the value specified in Table 4 for the type of system shall be detected as a seal break.

Table 4 — Types of level monitoring

| Type                                                      | Min. detectable loss or gain of min.<br>transportable quantity<br><br>l | Min. detectable loss or gain of min.<br>transportable quantity<br><br>% |
|-----------------------------------------------------------|-------------------------------------------------------------------------|-------------------------------------------------------------------------|
| 1                                                         | < 500                                                                   | 5                                                                       |
| 2                                                         | < 250                                                                   | 2,5                                                                     |
| 3                                                         | < 100                                                                   | 1                                                                       |
| 4                                                         | < 50                                                                    | 0,5                                                                     |
| 5                                                         | < 25                                                                    | 0,25                                                                    |
| 6                                                         | < 10                                                                    | 0,1                                                                     |
| NOTE The values of this table do not include evaporation. |                                                                         |                                                                         |

## 6.5 Memory capacity and retention time

The memory capacity and the retention time shall be a minimum of 15 days. The use of removable storage devices to provide the memory capacity may be acceptable.

## 6.6 Data transfer methods

The data transfer methods shall be in accordance with at least one of the methods described in Annex A, Annex B, Annex C or Annex D.

## 6.7 Cross-over prevention at service station

Where cross-over prevention is provided, it shall comply with the requirements of EN 14116.

## 6.8 Overfill prevention at service station

Where overfill prevention is provided, it shall comply with the requirements of EN 13616.

## 6.9 Tank top equipment

### 6.9.1 General characteristics

If sealed ports are utilized on tank top equipment, then the tank vehicle shall be equipped with means (e.g. ladders, walkways, safety rails) allowing checking of the status of the seals by the receiver. Sealing points shall be clearly visible.

### 6.9.2 Manhole cover assembly

Manhole cover assemblies shall comply with EN 13317.

### 6.9.3 Fill hole cover

Fill hole covers shall comply with EN 13314.

#### **6.9.4 Overfill prevention sensor**

Overfill prevention sensors shall be in accordance with EN 13922.

#### **6.9.5 Pressure and vacuum breather vent**

Pressure and vacuum breather vent shall be in accordance with EN 14595.

#### **6.9.6 Emergency pressure relief valve**

Emergency pressure relief valves shall be in accordance with EN 14596.

#### **6.9.7 Vapour transfer system**

##### **— Common collector system**

Cargo shall be prevented from transferring from one parcel to another parcel through the common collector system.

##### **— Vapour transfer valve**

Vapour transfer valves shall be in accordance with EN 13082.

### **6.10 Product transfer equipment**

#### **6.10.1 Foot valve**

Foot valves shall be in accordance with EN 13308 or EN 13316.

#### **6.10.2 Manifold valve**

Manifold valves and their operating system shall be designed to prevent the transfer of cargo from one parcel to another parcel through the manifold.

#### **6.10.3 API Adaptor**

API adaptors shall be in accordance with EN 13083.

#### **6.10.4 Delivery valve**

If separate delivery valves used, these valves shall meet the requirements of EN 12266-1 and EN 12266-2.

### **6.11 Temperature range**

Unless otherwise specified, the system shall be designed for an operating temperature range of -20 °C to +50 °C and a product temperature range of -10 °C to +50 °C.

Where the SPDS is used in severe conditions, the operating temperature range shall be extended to -40 °C or +70 °C as applicable.

### **6.12 Power supply**

A power supply failure shall not cause a state where SPDS functions can be overridden or manipulated. If this is not possible, then the status of parcels shall be indicated as unsealed when the power supply returns.

If the integrity of the parcel is not guaranteed by the system in case of power failure the seal shall be broken. Under power supply failure conditions at truck/trailer either the system is fully functional or the integrity of the parcel shall be retained or any delivery in progress shall be stopped until the supply power returns.

The power supply shall be sized to provide sufficient power to satisfy the SPDS and maintain any seal, for a minimum period of 3 days.

## 7 Tests

### 7.1 General

Two classes of tests are required, type tests and production tests.

Test methods and procedures shall comply with the requirements of EN 12266-1 and EN 12266-2 except as specified or amended within this European Standard.

### 7.2 Equipment type tests

#### 7.2.1 General

A minimum of 2 production samples of each model type shall be type tested to demonstrate the performance and mechanical strength of the design.

NOTE 1 Devices having one design, size and set pressure are considered to be of one model type.

NOTE 2 Devices may mean complete SPDS.

These tests shall be performed at ambient temperature.

Type tests shall comprise:

- port leakage test;
- monitored routing port mechanical endurance test.

#### 7.2.2 Port leakage test

##### 7.2.2.1 Application

This test shall be applied to all port types, not only monitored, but also those defined as sealed, secured or permanently closed.

##### 7.2.2.2 Test procedure

Valve types shall be classified for the choice of the test method.

Gate/ball/plug valve according to Table A.3 of EN 12266-1:2003.

##### 7.2.2.3 Test pressures

- 12 kPa and
- 20 kPa.

#### **7.2.2.4 Test duration**

According to Table A.4 of EN 12266-1:2003.

#### **7.2.2.5 Acceptance criteria**

Leakage in either direction shall not exceed the permitted leakage rate according to Table A.5 of EN 12266-1:2003 at the test pressure.

### **7.2.3 Monitored Routing Port mechanical endurance test**

#### **7.2.3.1 Application**

This test is performed to demonstrate that a monitored routing port shall maintain permissible leakage rates over an extended operating time period of some 4 000 opening and closing operations, equivalent to 12 months operation.

This test shall be applied to all monitored ports that are used as routing ports.

#### **7.2.3.2 Test apparatus**

The test apparatus shall comprise a small vessel having a flanged opening onto which the port under test is mounted, a header tank to enable complete filling of the port, a sight glass to confirm the fill level, a device to open and close the port and the means to pressurise the complete assembly.

The port under test shall be fitted to the test apparatus in its normal operating attitude using the method used to attach the port to the parcel. All bolts and seals intended for parcel mounting shall be used and secured in accordance with the manufacturer's instructions.

A method of recording the number of opening/closing cycles and measuring the leakage rate shall also be provided.

The test fluid shall be water which may contain a corrosion inhibitor.

A typical example for an API adaptor is shown in Annex E.

#### **7.2.3.3 Test procedure**

- a) Mount the complete port, including any operating device, to the mounting flange of the test apparatus.
- b) Operate the port to demonstrate opening/closing function.
- c) Close the port, disconnect the operating device to ensure normal closure force is applied and fill the small vessel with the test medium, until the port is full.
- d) Wait for 60 s to stabilise.
- e) Wipe-off the sealing face(s) and check leakage rates (to be in accordance with the port leakage test criteria).
- f) Pressurise the vessel to apply at least 20 kPa hydrostatic pressure to the parcel side of the port during test.
- g) Wait for 60 s to stabilise.
- h) Wipe-off the sealing face(s) and check leakage rates (to be in accordance with the port leakage test criteria).

- i) Slowly crack-open the port and measure the leakage rate at the point when a seal break is initiated. This rate shall not exceed the permitted value.
- j) Turn-off the pressure source, fully open the port and drain off the test fluid.
- k) Reconnect the operating device.
- l) Subject the port to 4 000 opening and closing operations, ensuring that the port is closed on each closure.
- m) After completion of these cycles, and with the port closed and the operating device disconnected, refill the vessel with the test medium until full.
- n) Wait for 60 s to stabilise.
- o) Wipe-off the sealing face(s) and check leakage rates (to be in accordance with the port leakage test criteria).
- p) Pressurise the vessel to apply at least 20 kPa hydrostatic pressure to the parcel side of the port during test.
- q) Wait for 60 s to stabilise.
- r) Wipe-off the sealing face(s) and check leakage rates (to be in accordance with the port leakage test criteria).
- s) Slowly crack-open the port and measure the leakage rate at the point when a seal break is initiated. This rate shall not exceed the permitted value.
- t) Turn-off the pressure source, fully open the port and drain off the test fluid.

#### 7.2.3.4 Acceptance criteria

To be met before and after completion of the endurance cycling.

When closed, seat leakage shall be in accordance with 7.3.2.

When being opened, a seal break shall have been initiated before the port leakage rate exceeds the permitted value.

#### 7.2.4 Test results

Test results shall be recorded and maintained for a time period which shall not be less than the manufactured life of the product.

### 7.3 Production tests

#### 7.3.1 General

Production tests shall be carried out by the manufacturer of the tanker. These tests shall be performed at ambient temperature, and shall include as a minimum:

- parcel leakage test;
- SPDS functional test.

These tests may form part of other tests performed on the tank.

### **7.3.2 Parcel leakage test**

#### **7.3.2.1 General**

The complete parcel shall be subjected to a maximum sealable quantity leakage test considering the pressure and temperature conditions specified for the tanker.

The test fluid shall be selected by the manufacturer to suit the design and application of the tanker and shall have a viscosity not greater than water.

The maximum working pressure of the tanker as specified in EN 13094 or EN 14025 as appropriate shall not be exceeded during this test.

#### **7.3.2.2 Test procedure**

The test fluid shall be routed into the parcel through the normal routing port.

The parcel shall be filled, at a flow rate and pressure commensurate with normal operation, to the maximum sealable quantity to demonstrate that any valves or openings which connect between parcels or parcels to common collectors remain leak tight throughout this process.

Once filled, the filling mechanism shall be removed and the parcel left to stabilise for 15 min.

The parcel shall then be checked for leaks or any sign of fluid transfer, loss or gain.

The parcel shall then be emptied, to confirm the value of the residual product volume, and again checked for leaks or any sign of fluid transfer, loss or gain.

#### **7.3.2.3 Acceptance criteria**

Leakage rate (gain, loss or transfer) shall not exceed 50 ml/h for any parcel.

Residual product volume shall not exceed either 0,1 % of the parcel's nominal capacity or 5 l, whichever is the smaller quantity.

### **7.3.3 Tests for quantity monitoring**

#### **7.3.3.1 General**

In addition, the ability of the quantity monitoring system to detect small quantity variations shall be tested according to 7.3.3.2.

If the SPDS is capable of checking the pipework status by quantity monitoring, the tests according to 7.3.3.3 shall be performed in addition.

#### **7.3.3.2 Quantity above foot valve**

##### **7.3.3.2.1 Short term quantity variations**

A quantity of 0,1 of the value given in column 2 of Table 4 shall be removed with a constant flow within a minimum time period of 2 h.

If the SPDS comprises also monitored ports, the removal shall be carried out in such a way that the port monitoring is not triggered.