



Specification 044

Fuel measurement





Specification 044

Fuel measurement

**AIRFIELDS AND BULK FUELS GROUP (ABFG)
DEFENCE ESTATE ORGANISATION
MINISTRY OF DEFENCE**

Foreword

This Specification was prepared under the patronage of the Defence Fuels and Lubricants Distribution Committee.

Fuel quantity control is of vital importance for operational, financial and environmental protection reasons.

This Specification provides a definition of MOD requirements for fuel measurement in compliance with:

STANAG 7011 Automated Fuel System Monitoring and Control Equipment, NATO
and supersedes:

- Standard Specification (M&E) No. 30 Bulk meters for Aviation Fuel, MPBW
- MEEG Volume 1 Section 1.15 Automatic Gauging and Level Control Systems for POL Tanks, PSA/DOE

The application of this Specification is fully defined in Section 1.1.

This document provides guidance to Works Services Managers (WSMs) and Project Managers on the types of measurement systems available, how they operate and details the most cost effective solutions for different sizes of storage tank.

This document is for the use of Top Level Budget Holders (TLBHs) for application by the Project Sponsors, Property Managers (PROMs), Establishment Works Consultants (EWCs), Works Services Managers and other parties involved in the specification and installation of fuel measurement systems for petroleum storage depots, oil fuel depots and aviation fuel installations on the MOD Estate.

The principal users of the document are expected to be Project Sponsors to influence the preparation of the Statement of Requirements; WSM specifiers, designers, installers and maintainers for works which fall within the property services remit; and Project Managers, designers and installers for projects.

Amendments to this Specification will be advised by Defence Estate Organisation (DEO) Technical Bulletin, issued to PROM and TLBH Works staff. It is the responsibility of the user to check with the PROM or Project Sponsor if amendments have been issued. There is a feedback sheet at Annex A, for suggested changes or developments to the document.

Technical advice and assistance can be obtained from the DEO. Approaches may be through local DEO offices or directly to the Focal Point:

Head of Bulk Petroleum Installations
Airfields and Bulk Fuels Group
Defence Estate Organisation
Blakemore Drive
SUTTON COLDFIELD
West Midlands
B75 7RL

Notwithstanding that this document sets out the specification for fuel measurement systems and is the MOD preferred solution, its use does not absolve a Project Manager or WSM from any responsibility for the design, neither does its existence constrain him from using alternatives, provided such alternatives can be demonstrated to provide a result of equal safety, quality and cost effectiveness.

This Specification has been devised for the use of the Crown and its Contractors in the execution of contracts for the Crown. The Crown hereby excludes all liability (other than liability for death or personal injury) whatsoever and howsoever arising (including, but without limitation, negligence on the part of the Crown, its servants or agents) for any loss or damage however caused where the Specification is used for any other purpose.

Compliance with a DEO Specification will not of itself confer immunity from legal obligations.

Abbreviations

BS	British Standard
BSPT	British Standard Pipe Thread
DEO	Defence Estate Organisation
EWC	Establishment Works Consultant
IP	Index of Protection
MOD	Ministry of Defence
PROM	Property Manager
RF	Raised Face
TLBH	Top Level Budget Holder
WSM	Works Services Manager

Contents

FOREWORD	iii
ABBREVIATIONS	v
CONTENTS	vii
1 INTRODUCTION	1
1.1 SCOPE	1
1.2 ARRANGEMENT	1
1.3 GENERAL REQUIREMENTS	1
2 BULKMETERS	3
2.1 APPLICATION	3
2.2 SCOPE OF SUPPLY	3
2.3 DOCUMENTATION REQUIREMENTS	3
2.4 BULKMETERS	4
2.5 COUNTERS	4
2.6 PRE-SET VALVES	4
2.7 TESTING	4
2.8 PAINTING	4
2.9 PRESERVATION	4
3 AUTOMATIC TANK GAUGING SYSTEMS	5
3.1 APPLICATION	5
3.2 SCOPE OF SUPPLY	5
3.3 DOCUMENTATION REQUIREMENTS	6
3.4 LEVEL AND VOLUME MEASUREMENT	6
3.5 TEMPERATURE MEASUREMENT	7
3.6 DENSITY MEASUREMENT	8
3.7 FUEL/WATER INTERFACE MEASUREMENT	8
3.8 LIGHTNING PROTECTION	8
3.9 LOCATION OF INSTRUMENT DISPLAYS	9
3.10 MONITORING SYSTEM	9
3.11 PROCESS CONTROL	10
3.12 MEASUREMENT AND MONITORING EQUIPMENT FOR TANKS LESS THAN 3.5 M IN HEIGHT (OR DIAMETER)	11
ANNEXES	
A CHANGE SUGGESTION FORM	13

1 Introduction

1.1 SCOPE

This document has been produced in order to detail the requirements for the design and installation of fuel measurement systems on the MOD Estate. It is equally applicable to both new projects and maintenance/refurbishment works.

This Specification is applicable to:

- Petroleum storage depots
- Oil fuel depots
- Aviation fuel installations
- Diesel storage depots.

It does not apply to:

- Mechanical transport fuelling installations for which reference should be made to DMG 14 Mechanical Transport Fuelling Installations, DEO
- Domestic heating tanks for which reference should be made to Spec 036 Heating, Hot and Cold Water, Steam and Gas Installations, DEO

1.2 ARRANGEMENT

Section 1 indicates the application of this Specification to the MOD Estate and the general requirements that all fuel measurement systems should meet.

Section 2 advises the requirements for bulkmeters which are installed at depot/installation dispense points to bulk fuel carrying vehicles.

Section 3 defines the requirements for automatic tank gauging systems in terms of scope of supply, type of equipment and information to be monitored and displayed. This Section provides an alternative equipment option for tanks containing fuel where the maximum fuel height cannot be greater than 3.5 m.

1.3 GENERAL REQUIREMENTS

1.3.1 Environmental conditions

All field mounted equipment shall be designed for outdoor installation. Items shall be unaffected by frost, tropical rain and high humidity and shall be suitable for ambient temperatures in the range -25°C to 50°C.

1.3.2 Design pedigree

Only standard designs in current production with a proven history of reliable operation in hydrocarbon service should be offered.

1.3.3 Materials of construction

Materials in contact with the fuel shall not be affected by the fuel, by water, or by water containing soluble fuel additives nor shall the materials have any effect upon the fuel. Metals and alloys that are fuel wetted shall be corrosion resistant or protected by a coating system in accordance with Spec 032 Internal Coating of Aviation Fuel Tanks, DEO. Dissimilar metals that will initiate and promote corrosion if in contact shall not be allowed. Copper, copper alloys, light metal alloys containing more than 4% copper, zinc or zinc alloys, cadmium, lead and lead alloys shall not be used in components exposed to the fuel.

1.3.4 Special tools and spare parts

The equipment manufacturer shall provide one set of commissioning spares and special tools together with a list of recommended operating spares for a two year period.

2 Bulkometers

2.1 APPLICATION

Bulkometers are installed at depot/installation dispense points to bulk fuel carrying vehicles. Their purpose is to deliver a pre-set volume of fuel from the facility to the vehicle. When the pre-set volume of fuel is reached the bulkmeter activates a shut-off valve to stop the fuel transfer.

2.2 SCOPE OF SUPPLY

The bulkmeter manufacturer's scope of supply shall include, but not be limited to, the following for each bulkmeter:

- positive displacement bulkmeter
- pipework reducers (required when the bulkmeter flanges do not match the dispense pipework)
- integral pre-set counter
- pre-set valve
- calibration certification
- painting and preservation
- documentation
- special tools and spare parts.

The following items are excluded from the bulkmeter manufacturer's scope of supply:

- site installation and testing
- bulkmeter and pre-set valve supports
- installation bolting.

2.3 DOCUMENTATION REQUIREMENTS

Proposal requirements:

- general arrangement drawing showing overall dimensions, weights, location, type and size of all termination points.

'As-installed' requirements:

- general arrangement drawing showing overall dimensions, weights, location, type and size of all termination points revised as required to indicate a true record of the equipment supplied
- cross-sectional drawings of the bulkmeter and pre-set valve
- lubrication schedule
- painting procedures
- hydrostatic test certification

- calibration certification
- installation and commissioning procedures
- operation and maintenance manual.

2.4 BULKMETERS

Bulk meters shall be of the horizontal positive displacement type. Bulk meters shall be selected to ensure compatibility with the anticipated range of flow rates and the maximum pressure that can be generated in the pipework.

Bulk meter (or reducer) flanges shall be selected to match the dispense pipework and comply with FS 05 Specialist Works on Petroleum Installations - Mechanical, DWS.

The bulk meter manufacturer is to confirm acceptability of the intended maximum pressure drop at maximum flow rate.

The accuracy of the bulk meter shall be $\pm 0.1\%$.

2.5 COUNTERS

Bulk meters shall be fitted with an eight digit continuously recording counter (totaliser) together with a five digit resettable counter indicating volume dispensed in litres. The resettable counter shall be provided with a mechanical device to operate the pre-set valve.

2.6 PRE-SET VALVES

A pre-set valve shall be supplied and installed on the bulk meter outlet operated by the counter. The valve shall be of a two stage slow closing type to avoid shock waves being initiated in the pipework.

The accuracy of the valve shall be ± 1 litre.

2.7 TESTING

All pressure containing parts shall be hydrostatically tested at 150% of the maximum allowable working pressure. The test shall be considered satisfactory when no leaks are observed for a minimum of 30 minutes.

All bulk meters are to be calibrated at the bulk meter manufacturer's works over a range of flow rates using the intended fuel and a calibration certificate issued.

2.8 PAINTING

The bulk meter manufacturer shall paint all external carbon steel surfaces to his standard paint system suitable for an exposed saline environment. The paint system shall also be resistant to all of the pumped fluids.

2.9 PRESERVATION

Each bulk meter shall be prepared for despatch to site by closing all openings to atmosphere by means of flanges or plugs securely bolted or screwed in place.

Any special requirements for the removal of any preservative shall be clearly indicated on the bulk meter and repeated in the commissioning instructions.

3 Automatic tank gauging systems

3.1 APPLICATION

Automatic tank gauging systems are installed at oil fuel depots, petroleum storage depots and aviation bulk fuel installations. They comprise field and control room equipment to monitor fluid parameters to ensure that an accurate method of stock control can be achieved for accounting purposes and to give an early indication of loss of fluid through leakage.

Automatic tank gauging systems can be used for above ground vertical and horizontal tanks, semi-buried (mounded) tanks and below ground tanks.

The method of data transfer eg hard wired or radio transmission between field and control room equipment shall be defined in the Statement of Requirement.

It should be noted that tanks which are less than 3.5 m in height (or diameter) should be fitted with different instruments and monitoring systems than tanks with greater dimensions, for these applications Section 3.12 has been written. When Section 3.12 equipment is used it is not possible to expand the system for process control nor is it possible to measure density or obtain local instrument displays: it does however, offer significant capital cost savings. The maximum permissible height (or diameter) is dictated by the length of the level and temperature probes.

3.2 SCOPE OF SUPPLY

The equipment manufacturer's scope of supply shall include, but not be limited to, the following:

- tank mounted instruments to monitor level, temperature, density and volume
- field junction boxes and interface units as required by the manufacturer's design
- control room mounted monitoring system and printer
- all interface cabling between tanks, field equipment and the control room
- site installation of equipment
- commissioning
- equipment calibration certification to the prescribed accuracy
- documentation
- special tools and spare parts
- operator training.

The following shall be excluded from the scope of supply:

- cable trays, ducting and trunking
- site installation of cabling.

3.3 DOCUMENTATION REQUIREMENTS

Proposal requirements:

- general arrangement drawing showing overall dimensions and weights of all field and control room equipment
- schematic diagram indicating the full scope of supply of field and control room equipment
- cabling requirements between all items of equipment
- power supply requirements for all items of equipment

'As-installed' requirements:

- all documentation submitted under the proposal requirements revised to indicate 'as-installed' status
- calibration certification
- installation and commissioning procedures
- operation and maintenance manual.

3.4 LEVEL AND VOLUME MEASUREMENT

3.4.1 Servo gauges

The servo gauge operates by the movement of a displacer positioned at the surface of a liquid. The displacer is connected by a cable to a force transducer which operates a servo motor to maintain the displacer at the liquid surface. The gauge can detect whether any change in displacer buoyancy is due to surface turbulence or to a permanent change in the liquid level.

The servo gauge shall be mounted on the tank roof and requires a 150# RF flange in the range 2" to 6" depending on the selected manufacturer.

Dependent on the manufacturer selected, the servo gauge will either require mains voltage electricity or 24V dc (the latter shall be produced via manufacturer supplied equipment).

The servo gauge and cable gland shall be certified for a Zone 1 hazardous area in accordance with the relevant Parts of BS 5345 Code of Practice for the Selection, Installation and Maintenance of Electrical Apparatus for use in Potentially Explosive Atmospheres. The degree of environmental protection shall be IP 65 or better in accordance with BS EN 60529 Specification for the Degrees of Protection afforded by Enclosures (IP Code).

The manufacturer shall advise whether the displacer should be installed using guide wires or a stilling tube.

The measured fuel level accuracy shall be ± 1 mm.

3.4.2 Radar gauges

The radar gauge operates by sending radar waves from an antenna mounted on the tank roof to the fuel surface which reflects the wave back to the antenna, the fuel level is calculated from the difference in wave frequency. The antenna is connected to a control unit which is normally mounted at the tank base, the control unit acts as a marshalling point for other measured parameters such as temperature, pressure and the fuel/water interface level.

The radar gauge shall be mounted on the tank roof and requires an 8" 150# RF flange (to be confirmed by manufacturer).

The radar gauge will require a mains voltage power supply.

The radar gauge, control unit and cable glands shall be certified for a Zone 1 hazardous area in accordance with the relevant Parts of BS 5345 Code of Practice for the Selection, Installation and Maintenance of Electrical Apparatus for use in Potentially Explosive Atmospheres. The degree of environmental protection shall be IP 65 or better in accordance with BS EN 60529 Specification for the Degrees of Protection afforded by Enclosures (IP Code).

The measured fuel level accuracy shall be +/-1 mm.

3.4.3 Volume measurement

The fuel volume shall be calculated from the fuel levels and from the tank calibration tables. Initial tank calibration shall be undertaken in accordance with the following Institute of Petroleum publications:

- vertical above ground tanks: Petroleum Measurement Manual Part II Tank Calibration Section 1 Vertical Cylindrical Tanks. Method 1 - Calibration of Vertical Cylinders by Strapping
- semi-buried (mounded) tanks: Petroleum Measurement Manual Part II Tank Calibration Section 1 Vertical Cylindrical Tanks. Method 2 - Calibration of Vertical Cylinders by Internal Measurement
- horizontal tanks: Petroleum Measurement Manual Part II Tank Calibration Section 2 Horizontal and Inclined Cylindrical Tanks. Method 3 - Calibration of Horizontal and Inclined Cylinders by Internal Measurement.

The measured volume of the fuel shall be corrected to 15°C. Tolerance levels are not specified for volume as they will be compounded from level, temperature and tank calibration errors.

3.5 TEMPERATURE MEASUREMENT

The fuel temperature shall be measured by a temperature element string which shall comprise a minimum of 10 elements equally spaced from the tank bottom to the maximum possible fuel level. The temperature shall be the average of the readings taken from the elements immersed in the fuel.

The temperature element data unit shall be mounted on the tank roof and requires a 2" 150# RF flange.

The temperature elements and cable gland shall be certified for a Zone 0 hazardous area in accordance with the relevant Parts of BS 5345 Code of Practice for the Selection, Installation and Maintenance of Electrical Apparatus for use in Potentially Explosive Atmospheres. The degree of environmental protection shall be IP 65 or better in accordance with BS EN 60529 Specification for the Degrees of Protection afforded by Enclosures (IP Code).

The temperature elements shall be encased in a protective sheath. The manufacturer shall advise whether the sheath should be anchored to the tank bottom or installed within a thermowell.

The measured fuel temperature accuracy shall be $\pm 0.5^{\circ}\text{C}$.

3.6 DENSITY MEASUREMENT

If the Statement of Requirement requires the fuel density to be measured and the displacer type servo gauge has been selected (refer to Section 3.4.1) no additional equipment is required as the servo gauge calculates fuel density by comparing displacement in fuel with displacement in air.

If a radar gauge has been selected (refer to Section 3.4.2) then an externally mounted pressure transmitter is required to be located close to the bottom of the tank. The pressure transmitter can then interface with the radar gauge which measures fuel height to calculate the fuel density.

As an external mounting is required it is not possible to measure fuel density in underground or semi-buried (mounded) tanks when a radar gauge is installed.

The pressure transmitter shall be mounted on the tank using a 2" 150# RF flange and an interposing isolation valve complying with FS 05 Specialist Works on Petroleum Installations - Mechanical. DWS.

The pressure transmitter and cable gland shall be certified for a Zone 1 hazardous area in accordance with the relevant Parts of BS 5345 Code of Practice for the Selection, Installation and Maintenance of Electrical Apparatus for use in Potentially Explosive Atmospheres. The degree of environmental protection shall be IP 65 or better in accordance with BS EN 60529 Specification for the Degrees of Protection afforded by Enclosures (IP Code).

The measured density of the fuel shall be corrected to 15°C and be accurate to within $\pm 5 \text{ kg/m}^3$.

3.7 FUEL/WATER INTERFACE MEASUREMENT

The fuel/water interface shall be measured. If the displacer type servo gauge has been selected (refer to Section 3.4.1) no additional equipment is required as the servo gauge compares displacement between the two liquids to determine the interface point.

If a radar gauge has been selected (refer to Section 3.4.2) then a water interface sensor is required to be installed and either attached to the bottom of the tank or suspended from the tank roof in which case a 2" 150# RF flange is required.

The sensor and cable glands shall be certified for a Zone 0 hazardous area in accordance with the relevant Parts of BS 5345 Code of Practice for the Selection, Installation and Maintenance of Electrical Apparatus for use in Potentially Explosive Atmospheres.

The measured interface level shall be accurate to within $\pm 2 \text{ mm}$.

3.8 LIGHTNING PROTECTION

Lightning protection shall be afforded to automatic tank gauging systems through the use of galvanic isolation on all input/output circuits for servo and radar gauges. Electrical supplies shall be protected by suitable rated fuses as selected by the equipment manufacturer.

3.9 LOCATION OF INSTRUMENT DISPLAYS

All alarms, parameters and monitoring functions shall be displayed on the monitoring system located in the control room (refer to Section 3.10).

Displays at each individual tank shall be in accordance with the following:

- servo gauges: level (mm) and temperature ($^{\circ}\text{C}$) shall be displayed on the gauge at the tank roof. If required by the Statement of Requirement a slave indicator shall be located at ground level repeating the parameters. The slave indicator and cable gland shall be certified for a Zone 1 hazardous area in accordance with the relevant Parts of BS 5345 Code of Practice for the Selection, Installation and Maintenance of Electrical Apparatus for use in Potentially Explosive Atmospheres. The degree of environmental protection shall be IP 65 or better in accordance with BS EN 60529 Specification for the Degrees of Protection afforded by Enclosures (IP Code)
- radar gauges: level (mm) and temperature ($^{\circ}\text{C}$) shall be displayed on the control unit at ground level.

3.10 MONITORING SYSTEM

The monitoring system shall be located in the control room (deemed to be unclassified as regards hazardous area requirements) where it shall be capable of monitoring a minimum of 25 tanks. The system shall be provided with a colour monitor (minimum 17" screen) and a colour printer. The system shall operate on a personal computer based Windows environment, the computer processor and memory requirement shall be specified by the automatic tank gauging manufacturer.

The system shall be provided with a self-diagnostic checking facility for level, temperature and (when specified) density. The system shall be capable of printing any displayed page.

Pre-programmed alarms shall be incorporated for high high, high, low and low low levels. The system shall monitor all tanks in the quiescent state and alarm on falling fluid levels. Alarms shall be audible and visual and shall only be acknowledged/cleared following entry to a password protected supervisory level. An audible and visual common alarm shall be provided to a 24 hour manned location eg Guardroom.

The automatic tank gauging manufacturers' standard display formats shall be utilised providing the following requirements can be displayed:

3.10.1 Individual tank display

Mimic view of the tank indicating:

- tank identifier
- fuel stored
- alarm status
- temperature ($^{\circ}\text{C}$)
- corrected density (kg/m^3) (when specified)
- fuel level (mm)
- water level (mm)
- maximum working fuel level (mm)
- corrected volume (m^3)
- maximum working volume (m^3)
- ullage volume (m^3).

3.10.2 Product display

Mimic view of all tanks containing the same fuel indicating:

- tank identifier
- fuel stored
- alarm status
- temperature (°C)
- corrected density (kg/m³) (when specified)
- fuel level (mm)
- corrected volume (m³)
- ullage volume (m³)
- total corrected volume stored (m³)
- total ullage volume (m³).

3.10.3 Overall depot/installation display

Mimic view of all tanks in the depot/installation indicating:

- tank identifier
- fuel stored
- alarm status
- temperature (°C)
- corrected density (kg/m³) (when specified)
- fuel level (mm)
- corrected volume (m³).

3.10.4 Alarm/event display

The alarm/event display shall be in tabular format detailing:

- date and time initiated
- tank identifier
- description of alarm/event
- date and time cleared.

3.10.5 Trend display

The trend display shall indicate, for any selected tank, level and corrected volume against time.

3.10.6 Manual data input

The facility shall be provided to enable manual input of fuel level and temperature and to modify alarm set points. Manual input may be required in circumstances where not all tanks are fitted with an automatic tank gauging system or in case of equipment failure. Following manual input the monitoring system shall calculate and display all required parameters. This facility shall be at a password protected supervisory level.

3.11 PROCESS CONTROL

An automatic tank gauging system may be expanded to provide control and status functions for process equipment such as pumps, actuated valves and pipeline flow reconciliation. If there is a need for process control the prospective automatic tank gauging manufacturers should be contacted at the initiation stage to ensure compatibility of interface signals.

Common applications for process control are:

- transfer pump shutdown when the receipt tank reaches high high level
- dispense pump shutdown when the suction tank reaches low low level
- receipt tank inlet valve closure when the receipt tank reaches high high level.

3.12 MEASUREMENT AND MONITORING EQUIPMENT FOR TANKS LESS THAN 3.5 m IN HEIGHT (OR DIAMETER)

The measurement and monitoring features stated in this section are not as comprehensive as those listed in Sections 3.4 - 3.11. In particular it is not possible to expand the system for process control nor is it possible to measure density or obtain local instrument displays: it is however considered to be advantageous where for operational reasons a reduced level of monitoring is permissible and capital costs need to be kept to a minimum.

It should be noted that the maximum permissible height (or diameter) is dictated by the length of the level and temperature probes.

3.12.1 Level and temperature measurement

A capacitance or magnetostrictive level gauge combined with an average temperature gauge shall be mounted on the tank roof and requires either a 2" 150# RF flange or a 2" BSPT tapping depending on the selected manufacturer.

The combined gauge and cable gland shall be certified for a Zone 0 hazardous area in accordance with the relevant Parts of BS 5345 Code of Practice for the Selection, Installation and Maintenance of Electrical Apparatus for use in Potentially Explosive Atmospheres. The degree of environmental protection shall be IP 65 or better in accordance with BS EN 60529 Specification for the Degrees of Protection afforded by Enclosures (IP Code).

The measured fuel level accuracy shall be ± 0.1 mm.

The measured fuel/water interface level shall be accurate to within ± 2 mm.

The average temperature shall be $\pm 0.1^{\circ}\text{C}$.

3.12.2 Volume measurement

The requirements of Section 3.4.3 apply.

3.12.3 Lightning protection

The manufacturer's standard method of lightning protection shall be provided.

3.12.4 Location of instrument displays

All alarms, parameters and monitoring functions shall be displayed on the monitoring system located in the control room (refer to Section 3.12.5).

3.12.5 Monitoring system

The monitoring system shall be located in the control room (deemed to be unclassified as regards hazardous area requirements) where it shall be capable of monitoring a minimum of 6 tanks.

The system shall be provided with a self-diagnostic checking facility for level and temperature.

Pre-programmed alarms shall be incorporated for high and low fuel levels and high water level. The system shall monitor all tanks in the quiescent state and alarm on falling fluid levels. Alarms shall be audible and visual and shall only be acknowledged/cleared following entry to a password protected supervisory level. An audible and visual common alarm shall be provided to a 24 hour manned location eg. Guardroom.

The method of indication shall be defined in the Statement of Requirement and shall either be by a combined proprietary monitoring, indication and printer unit or shall be by a Windows based PC system with colour monitor and separate printer.

Irrespective of the method of indication specified the following shall be displayed:

Individual tank

- tank identifier
- fuel stored
- alarm status
- temperature (°C)
- fuel level (mm)
- water level (mm)
- corrected volume (m³)
- ullage volume (m³).

Overall depot/installation

- tank identifier
- fuel stored
- alarm status
- temperature (°C)
- fuel level (mm)
- corrected volume (m³).

Annex A Change suggestion form

15

