

# Gas Industry Standard

GIS/DAT12:2019

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Specification for

## ALUMINIUM BASED LIGHT METALS AND PAINTS IN POTENTIALLY HAZARDOUS AREAS

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## Foreword

Gas Industry Standards (GIS) are revised, when necessary, by the issue of new editions. Users should ensure that they are in possession of the latest edition. Contractors and other users external to Gas Transporters should direct their requests for copies of a GIS to the department or group responsible for the initial issue of their contract documentation.

Comments and queries regarding the technical content of this document should be directed in the first instance to the contract department of the Gas Transporter responsible for the initial issue of their contract documentation.

This standard calls for the use of procedures that may be injurious to health if adequate precautions are not taken. It refers only to technical suitability and does not absolve the user from legal obligations relating to health and safety at any stage.

Compliance with this engineering document does not confer immunity from prosecution for breach of statutory or other legal obligations.

## Mandatory and non-mandatory requirements

For the purposes of a GIS the following auxiliary verbs have the meanings indicated:

**can** indicates a physical possibility;

**may** indicates an option that is not mandatory;

**shall** indicates a GIS requirement;

**should** indicates best practice and is the preferred option. If an alternative method is used then a suitable and sufficient risk assessment needs to be completed to show that the alternative method delivers the same, or better, level of protection.

## Disclaimer

This engineering document is provided for use by Gas Transporters and such of their contractors as are obliged by the terms of their contracts to comply with this engineering document. Where this engineering document is used by any other party, it is the responsibility of that party to ensure that the engineering document is correctly applied.

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## Brief history

First published as Data Sheet DAT12	April 1983
Withdrawn in GRM review	November 2004
Issued as SGN/SP/DAT/12	November 2011
Revised and re-issued	December 2016
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## 1. Introduction

The term 'light metal' refers to materials such as aluminium, magnesium, titanium and their alloys which have the ability when finely divided to react exothermically with atmospheric oxygen and, as a result, to ignite a flammable atmosphere. A 'light metal alloy' refers to an alloy containing at least 50%, by atomic proportions, of the light metal. This specification covers only aluminium based light metals and paints.

The impact of a light metal on a rusty (iron-oxide) surface can result in an incendive spark. In some instances the impact may not be of sufficient energy to cause a spark but great enough to leave a smear of light metal on the rusty surface. A subsequent impact may then result in sparking.

Light metal alloys having high magnesium content are potentially more dangerous than other Aluminium alloys. (It can be assumed that titanium will have a similar effect when alloyed with Aluminium).

The impact of steel on an alloy is not considered as significant as the impact of an alloy on a steel surface, because in the former case the impact energy would tend to be dissipated in distorting or breaking the alloy component rather than in causing a spark.

There is little evidence to suggest that impact of steel on aluminium paint leads to incendive sparking, unless the paint is heated to 150 °C or contains a cellulose nitrate base.

## 2. Scope

This Standard gives guidance on the use of aluminium based light metals and paints in potentially hazardous areas. This Standard is applicable to Gas Transporter installations that are zoned in accordance with the requirements of IGEM/SR/25 and BS EN 60079.

## 3. 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.

### 3.1 British and European standards

BS EN 1706, *Aluminium and aluminium alloys – Castings – Chemical Composition and mechanical properties.*

BS EN ISO 2409, *Paints and varnishes. Cross-cut test*

BS EN 60079, *Electrical apparatus for explosive gas atmospheres.*

*Part 1 Equipment protection by flameproof enclosures 'd'*

*Part 10-1 Classification of areas. Explosive gas atmospheres.*

BS EN IEC 60079-0, *Explosive atmospheres. Equipment. General requirements*

### 3.2 Institution of Gas Engineers and Managers Standards

IGEM/TD/13, *Pressure regulating installations for natural gas, liquefied petroleum gas and liquefied petroleum gas/air*

IGEM/SR/25, *Hazardous area classification of Natural Gas Installations*

IGEM/GM/7A, *Gas meter electrical connections*

IGEM/GM/7B, *Hazardous Area Classification for Gas Metering Equipment*

### 3.3 American Society for Testing and Materials

ASTM Book of Standards, Volume 02.02, Aluminium and Magnesium

## **NOTE**

Where no date is shown, the latest edition of each standard and specification shall apply.

## **4. Terms and Definitions**

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

### **4.1 Contractor**

The person, firm or company with whom a Gas Transporter enters into a contract to which this Standard applies, including the Contractor's personal representatives, successors and permitted assigns.

### **4.2 Zone 0**

An area in which an explosive gas atmosphere is present continuously or for long periods.

### **4.3 Zone 1**

An area in which an explosive gas atmosphere is likely to occur in normal operation.

### **4.4 Zone 2**

An area in which an explosive gas atmosphere is not likely to occur in normal operation and, if it occurs, will only exist for a short time.

## **5. Conformance**

### **5.1 Units of measurement**

In this standard, for data expressed in both SI and USC units, a dot (on the line) is used as the decimal separator, and no comma or space is used as the thousands separator, in order to be consistent with other Gas Transporter specifications.

## **6. Requirements**

**6.1** When aluminium based light metals and their alloys are to be used in potentially hazardous areas, requirements below should be followed.

- a) The incendiarity of aluminium based light alloys increases with magnesium content. Magnesium content should therefore be kept to a minimum.
- b) All light metals and their alloys should be excluded from Zone 0 hazardous areas.
- c) Cables with aluminium conductors having cross-sectional areas less than 16 mm<sup>2</sup> should not be used in Zone 1 or Zone 2 hazardous areas.
- d) Fixed apparatus and wall cladding, manufactured of aluminium based light metal, may be installed in Zone 1 hazardous areas provided that the magnesium content of the light alloy does not exceed 6% by weight (see also e).
- e) In Zone 1 hazardous areas where the impact risk is high the use of light metal enclosures should be avoided unless they are provided with a robust protective covering (see also h). Aluminium armoured or sheathed cables should be sheathed overall with PVC (polyvinyl chloride) or similar robust protective covering.
- f) Flameproof enclosures with plain flanges and having internal, current carrying, light alloy components should not be installed in Zone 1 hazardous areas. Cables with aluminium conductors should not terminate in flameproof enclosures with plain



flanges, but see c).

- g) The frictional sparking risk may be disregarded for fixed apparatus and aluminium armoured or sheathed cable in Zone 2 hazardous areas except in those particular cases where a heavy impact might also initiate the release of flammable material.
- h) Portable apparatus with light metal enclosures should not be taken into Zone 1 hazardous areas unless the enclosures are protected against frictional sparking by abrasion resistant materials or other means. Adhesion of abrasion resistant materials must comply with BS EN ISO 2409, Classification 0 unless otherwise agreed by the Gas Transporter.

## 7. Aluminium Alloys with high Magnesium Content

**7.1** The following aluminium alloys, to BS EN 1706, have percentages of magnesium approaching or greater than 6%:

Alloy Group	Numerical	Chemical symbols	% Mg by mass
AlMg	EN AC-51200	EN AC-Al Mg9	8,0 to 10,5
AlMg	EN AC-51300	EN AC-Al Mg5	4,5 to 6,5
AlMg	EN AC-51400	EN AC-Al Mg5(Si)	4,5 to 6,5

**7.2** The ASTM (American Society for Testing and Materials) Annual Book of Standards also lists alloys which have magnesium contents between 6% and 11%.

## 8. Related Publications

**8.1** The publications listed below are not referred to elsewhere in the text but are relevant to the subject of this specification.

Health & Safety Executive	-	The prevention and control of fire and explosion in mines.
Energy Institute Ref/ISBN: 9780852933701	-	Quantified risk assessment of the ignition of flammable vapour on petrol filling station forecourts during road tanker offloading due to thermite sparking