EN 12186
GAS SUPPLY SYSTEMS — GAS PRESSURE
REGULATING STATIONS FOR
TRANSMISSION AND DISTRIBUTION —
FUNCTIONAL REQUIREMENTS
PRESSURE REGULATOR STANDARDS

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• EN 12279:2000 ‘Gas Supply Systems – Gas Pressure Regulating Installations on Service Lines – Functional Requirements’

• IGE/TD/13 – Pressure Regulating Installations for Transmission and Distribution Systems
PRESSURE REGULATOR STANDARDS

- IGE/TD/13 – Pressure Regulating Installations for Transmission and Distribution Systems
- ASME 31.8 – Gas Transmission and Distribution Piping Systems
HAZARDOUS AREA STANDARDS

- BS EN 60079-10-1 - Classification of areas - Explosive gas atmospheres

SCOPE - EN 12186

- Pressure limit 100 Bar

- If the inlet pipework of the station is a service line and the maximum upstream operating pressure does not exceed 16 bar and the design flowrate is equal to or less than 200 m³/h under normal conditions, EN 12279 applies.
SCOPE - EN 12186

- Pressure, design and testing
- Pressure control
- Continuity of supply
- Quality and management system
- Environmental impact
- Layout of the gas pressure regulating station
- Housings
SCOPE - EN 12186

Design of the station

- Continuity of supply
- Gas pre-heating
- Filters, separators, scrubbers
- Noise control
- Apertures and vent lines
- Hazardous areas
- Lightning and earthing
- Cathodic protection and electrical isolation
- Pressure control equipment and ancillaries
- Pipework
- Welding
- Instrumentation pipework
- Stress analysis
- Standard pressure equipment
- Isolating valves
Scope of EN 12186

Pressure Control

- Pressure regulating system
- Pressure safety system
- Safety shut-off devices
- Monitors
- Venting pressure safety devices
- Pressure alarm system
- Instrumentation
- Bypasses
SCOPE - EN 12186

- Pressure testing
- Commissioning
- Operation and maintenance
- Decommissioning and disposal
EN 12186 - TERMINOLOGY

Design pressure (DP)

- Pressure on which design calculations are based
EN 12186 - TERMINOLOGY

- **Design pressure (DP)**
  - Pressure on which design calculations are based

- **Operating pressure (OP)**
  - Pressure which occurs within a system under normal operating conditions
EN 12186 - TERMINOLOGY

- **Design pressure (DP)**
  - Pressure on which design calculations are based

- **Operating pressure (OP)**
  - Pressure which occurs within a system under normal operating conditions

- **Maximum operating pressure (MOP)**
  - Maximum pressure at which a system can be operated continuously under normal operating conditions
  - **NOTE** Normal operating conditions are: no fault in any device or stream.
Temporary operating pressure (TOP)

- Pressure at which a system can be operated temporarily under control of regulating devices
**Temporary operating pressure (TOP)**
- Pressure at which a system can be operated temporarily under control of regulating devices

**Maximum incidental pressure (MIP)**
- Maximum pressure which a system can experience during a short time, limited by the safety devices
EN 12186 – Pressure relationship

Table 1 — Relationships between MOP, peak level OP, TOP and MIP

<table>
<thead>
<tr>
<th>MOP(^1) bar</th>
<th>peak level OP ≤</th>
<th>TOP ≤</th>
<th>MIP ≤</th>
</tr>
</thead>
<tbody>
<tr>
<td>MOP &gt; 40</td>
<td>1,025 MOP</td>
<td>1,1 MOP</td>
<td>1,15 MOP</td>
</tr>
<tr>
<td>16 &lt; MOP ≤ 40</td>
<td>1,025 MOP</td>
<td>1,1 MOP</td>
<td>1,20 MOP</td>
</tr>
<tr>
<td>5 &lt; MOP ≤ 16</td>
<td>1,050 MOP</td>
<td>1,2 MOP</td>
<td>1,30 MOP</td>
</tr>
<tr>
<td>2 &lt; MOP ≤ 5</td>
<td>1,075 MOP</td>
<td>1,3 MOP</td>
<td>1,40 MOP</td>
</tr>
<tr>
<td>0,1 &lt; MOP ≤ 2</td>
<td>1,125 MOP</td>
<td>1,5 MOP</td>
<td>1,75 MOP</td>
</tr>
<tr>
<td>MOP ≤ 0,1</td>
<td>1,125 MOP</td>
<td>1,5 MOP</td>
<td>2,50 MOP(^2)</td>
</tr>
</tbody>
</table>

1) MOP is equal to or less than DP, but the relation factors are valid only when DP is equal to MOP.

2) When gas appliances, tightness tested at 150 mbar, are directly connected to an installation pipework, the MIP downstream of the final regulator shall be limited to 150 mbar.

When no safety device is required, TOP and MIP downstream of the regulator are not relevant for installation pipework supplied by systems with MOP upstream of the regulator up to and including 100 mbar.

NOTE   Where MOP is less than DP, the pressure relationships given in Table 1 can be related to DP.
EN 12186 – SAFETY SYSTEMS

- A pressure safety system is not needed if MOP is < 100 mbar
EN 12186 – SAFETY SYSTEMS

- A pressure safety system is not needed if MOP is < 100 mbar
- A single pressure safety system shall be installed if MOP is >100 mbar and < 16 Bar
A pressure safety system is not needed if MOP is < 100 mbar.

A single pressure safety system shall be installed if MOP is > 100 mbar and < 16 Bar.

A single pressure safety system plus a second device shall be installed if MOP is > 16 bar and.
RISK MITIGATION

• Fluctuation in downstream pressure potentially leads to metering measurement errors
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• Over pressure of the downstream pipework potentially leads to pipe failure, leakage, fire and/or explosion endangering life and/or property
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• Fluctuation in downstream pressure potentially leads to metering measurement errors.

• Over pressure of the downstream pipework potentially leads to pipe failure, leakage, fire and/or explosion endangering life and/or property.

• Interruption in gas supply potentially leads to unignited gas entering a building and when supplies are reinstated potentially causes fire and/or explosion endangering life and/or property.
UK IGE TD 13 STANDARD

• For upstream pressures less than 100 mbar no protection device is required
UK IGE TD 13 STANDARD

• For upstream pressures less than 100 mbar no protection device is required

• For upstream pressures greater than 100 mbar but less than 2 Bar then one safety device is recommended
UK IGE TD 13 STANDARD

- For upstream pressures less than 100 mbar no protection device is required

- For upstream pressures greater than 100 mbar but less than 2 Bar then one safety device is recommended

- For upstream pressures greater than 2 Bar then 2 safety devices are recommended unless a risk assessment determines that one device is acceptable
UK IGE TD 13 DESIGN
UK IGE TD 13 DESIGN

Diagram showing the following components:
- Heat Exchanger
- Monitor Pressure regulator
- Creep relief valve
- Meter
- Filter/Separator/Scruber
- Slam shut device
- Active Pressure regulator

The diagram illustrates a flow process involving these components.
UK IGE TD 13 DESIGN
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Diagram:
- Heat Exchanger
- Monitor Pressure regulator
- Creep relief valve
- Meter
- Filter/Separator/Scrubber
- Slam shut device
- Active Pressure regulator
UK - PRMS

- Show video
A structured decision-making process shall be used to identify the optimum maintenance requirements.

Optimum maintenance requirements are dependent on a number of factors, including the operating conditions and duty.
Maintenance utilizes any one or a combination of philosophies, such as:

- condition based maintenance;
- maintenance at regular intervals;
- breakdown maintenance.
MAINTENANCE REGIME UK
ROUTINE INSPECTION

- Routine Inspection
- Functional check
- Major Overhaul
# TYPICAL MAINTENANCE REGIME

<table>
<thead>
<tr>
<th>PRMS Type</th>
<th>Routine inspection frequency</th>
<th>Functional check frequency</th>
<th>Major overhaul frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Network, large commercial and industrial installations and residential</td>
<td>As determined by local risk assessment</td>
<td>12 months minimum</td>
<td>Determined by manufacturers recommendations but no less frequent</td>
</tr>
<tr>
<td>installations supplying more than 10 premises</td>
<td></td>
<td></td>
<td>than every 6 years</td>
</tr>
<tr>
<td>Small commercial and residential installations supplying less than 10</td>
<td>As determined by local risk assessment - every 5 years minimum</td>
<td>For installations inside an enclosure no less frequent than every 10 years and for all other installations no less frequent than every 6 years</td>
<td>Determined by manufacturers recommendations</td>
</tr>
<tr>
<td>premises</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
ROUTINE INSPECTION

• Check security of the site and note any abnormalities. Ensure that site labels, where used, are correctly displayed

• Note any defects in the structure of the housing and record on appropriate document(s)

• Check atmosphere around the installation for the presence of gas and report any leakage found

• Check installation for water ingress and pipework/regulator for corrosion. Report any significant deterioration
ROUTINE INSPECTION

• Check that the relief vents are correctly positioned and free from any visible obstructions

• Connect a pressure gauge to the test nipple on the outlet of the regulator/meter and record the outlet pressure. Report any deviation from set point

• Report any nearby works or buildings extensions which may have a detrimental effect on the operation of the installation, e.g. additional flues or electrical work
ROUTINE INSPECTION

• Lubricate locks and hinges where appropriate

• Check if the fire valve cover/box is still accessible and report as appropriate
FUNCTIONAL CHECK

• All those items for Routine Inspection
• If a bypass facility exists, connect a correctly sized regulator to maintain supply to the consumers
• If not, the supply to the consumer must be interrupted.
• Where it is necessary to interrupt customers’ supplies, the consumer installation should be tested before bringing back into service
• Check the lock-up of the regulator
FUNCTIONAL CHECK

• Isolate stream and check for leakage through isolation valve
• On stand-alone filter, check condition of element and clean/change as necessary
• Check the set point of the relief valve by gradually applying a controlled pressure to the outlet connection of the regulator. Note - If the slam shut trips before the relief valve lifts, record the trip pressure
FUNCTIONAL CHECK

• Check the slam-shut valve trip pressure (minimum of 3 trips) by applying a controlled pressure to the impulse line or to the outlet connection of the regulator.
• If any faults are found during testing they must be reported through a Fault Data Collection Scheme
• Before leaving site check all connections for leakage
• Ensure that the site is tidy and secure on leaving site
MAJOR OVERHAUL

• Refer to manufacturers recommendations
BS EN 60079-10-1:2009
EXPLOSIVE ATMOSPHERES —
PART 10-1: CLASSIFICATION OF AREAS —
EXPLOSIVE GAS ATMOSPHERES
This part of IEC 60079 is concerned with the classification of areas where flammable gas or vapour or mist hazards may arise and to be used for selection and installation of equipment for use in a hazardous area.
BS EN 60079-10-1:2009 - Definitions

- **Explosive gas atmosphere**
  - Mixture with air, under atmospheric conditions, of flammable substances in the form of gas or vapour, which, after ignition, permits self-sustaining flame propagation
BS EN 60079-10-1:2009 - Definitions

- **Explosive gas atmosphere**
  - Mixture with air, under atmospheric conditions, of flammable substances in the form of gas or vapour, which, after ignition, permits self-sustaining flame propagation

- **Hazardous area (on account of explosive gas atmospheres)**
  - An area in which an explosive gas atmosphere is or may be expected to be present, in quantities such as to require special precautions for the construction, installation and use of equipment
Zones

- Hazardous areas are classified into zones based upon the frequency of the occurrence and duration of an explosive gas atmosphere, as follows:
Zones

- Hazardous areas are classified into zones based upon the frequency of the occurrence and duration of an explosive gas atmosphere, as follows:

Zone 0

- An area in which an explosive gas atmosphere is present continuously or for long periods or frequently
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**Zone 0**
- An area in which an explosive gas atmosphere is present continuously or for long periods or frequently

**Zone 1**
- An area in which an explosive gas atmosphere is likely to occur in normal operation occasionally
Zones

- Hazardous areas are classified into zones based upon the frequency of the occurrence and duration of an explosive gas atmosphere, as follows:

Zone 0
- An area in which an explosive gas atmosphere is present continuously or for long periods or frequently

Zone 1
- An area in which an explosive gas atmosphere is likely to occur in normal operation occasionally

Zone 2
- Area in which an explosive gas atmosphere is not likely to occur in normal operation but, if it does occur, will persist for a short period only
Release rate

- Quantity of flammable gas, vapour or mist emitted per unit time from the source of release

Ventilation

- Movement of air and its replacement with fresh air due to the effects of wind, temperature gradients, or artificial means (for example, fans or extractors)
Lower explosive limit (LEL)

- Concentration of flammable gas, vapour or mist in air below which an explosive gas atmosphere will not be formed – 5% gas in air

Upper explosive limit (UEL)

- Concentration of flammable gas, vapour or mist in air, above which an explosive gas atmosphere will not be formed -15% gas in air
IGEM – SR 25 – Hazardous Area Classification of Natural Gas installations
**IGEM – SR 25 – Secondary Releases**

**Figure 1(d) - Valve glands**

**Colour Key:**
- Zone 0 – red
- Zone 1 – orange
- Zone 2 – green

The actual zone will depend upon the assessed frequency and duration of release.

*Note:* For values of X, see Table 1 for freely ventilated installations or Table 2 for congested or confined installations.

**FIGURE 1 - EXTENT OF THE HAZARDOUS AREA SURROUNDING FLANGES, SCREWED FITTINGS, JOINTS, VALVE GLANDS AND REGULATORS WITH THEIR COMPONENTS (SECONDARY GRADE RELEASES OUTDOORS) (Cont overleaf)**
IGEM – SR 25 – Secondary Releases

Determine the zoning distance from the centre of the fitting.

Figure 1(a) - Screwed fittings and joints up to 50 mm nominal size

Determine the zoning distance from the edges of the flange.

Figure 1(b) - Flanges

Determine the zoning distance from the centre for the opening of the valve. Where the valve is not capped or plugged, there will also be a Zone 1 area $X_v$ (see Table 5 and 18) associated with the valve seat. Where the valve is capped or plugged, the threads of these components are treated as in Figures 1(a) or 1(b). In both cases all other flanges or screwed connectors follow Figures 1(a) or 1(b).

Figure 1(c) - Valve connections
## IGEM – SR 25 – Secondary Releases

<table>
<thead>
<tr>
<th>OP (bar)</th>
<th>OUTDOOR FREELY VENTILATING</th>
<th>OUTDOOR CONGESTED CONFINED</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Zoning Distance (X) Under Normal Conditions (m)</td>
<td>Zoning Distance (X) Under Adverse Conditions (m)</td>
</tr>
<tr>
<td>&gt;75 ≤ 100</td>
<td>1.50</td>
<td>5.00</td>
</tr>
<tr>
<td>&gt;50 ≤ 75</td>
<td>1.50</td>
<td>4.00</td>
</tr>
<tr>
<td>&gt;30 ≤ 50</td>
<td>1.00</td>
<td>3.50</td>
</tr>
<tr>
<td>&gt;20 ≤ 30</td>
<td>1.00</td>
<td>2.50</td>
</tr>
<tr>
<td>&gt;10 ≤ 20</td>
<td>0.75</td>
<td>2.00</td>
</tr>
<tr>
<td>&gt;7 ≤ 10</td>
<td>NE</td>
<td>1.50</td>
</tr>
<tr>
<td>&gt;5 ≤ 7</td>
<td>NE</td>
<td>1.50</td>
</tr>
<tr>
<td>&gt;2 ≤ 5</td>
<td>NE</td>
<td>1.50</td>
</tr>
<tr>
<td>&gt;0.1 ≤ 2</td>
<td>NE</td>
<td>NE</td>
</tr>
<tr>
<td>≤ 0.1</td>
<td>NE</td>
<td>NE</td>
</tr>
</tbody>
</table>
IGEM – SR 25 – Primary Releases (Ideal)
IGEM – SR 25 – Calculation of release dispersion calculations

Information needed

• Vent diameter
• Ideal / no ideal
• Height of vent
• Length of vent
• Distance to nearest building
IGEM – SR 25 – Secondary release example

Secondary Release area
IGEM – SR 25 – Primary release example
IGEM – SR 25 – Calculation of release dispersion calculations

Demonstration of the model