ISO 15112:2018 (E)

Natural gas — Energy determination

Contents

Foreword

Introduction

- 1 Scope
- 2 Normative references
- 3 Terms and definitions
- 4 Symbols and units
- 5 General Principles
- 6 Gas measurement
 - 6.1 General
 - 6.2 Volume measurement
 - 6.3 Calorific value measurement
 - 6.3.1 Measurement techniques and sampling
 - 6.3.2 Direct measurement Calorimetry
 - 6.3.3 Inferential measurement
 - 6.3.4 Correlation techniques
 - 6.3.5 Pressure and temperature
 - 6.3.6 Gas quality tracking
 - 6.4 Volume conversion
 - 6.4.1 General
 - 6.4.2 Density
 - 6.4.3 Compression factor
 - 6.5 Calibration
 - 6.6 Data storage and transmission
- 7 Energy determination
 - 7.1 Interfaces
 - 7.2 Methods of energy determination
 - 7.2.1 Direct determination of energy
 - 7.2.2 Indirect determination of energy
 - 7.2.2.1 Measurement of volume or mass and calorific value at the same station
 - 7.2.2.2 Measurement of volume or mass and calorific value at different stations
- 8 Strategy and procedures
 - 8.1 General
 - 8.2 Strategies for energy determination
 - 8.2.1 Strategies for single interfaces
 - 8.2.1.1 General
 - 8.2.1.2 Interface 1
 - 8.2.1.3 Interface 2
 - 8.2.1.4 Interface 3
 - 8.2.1.5 Interface 4
 - 8.2.1.5.1 Gas grid separated from other gas qualities
 - 8.2.1.5.2 Gas grid not separated from other gas qualities
 - 8.2.1.6 Interface 5
 - 8.2.1.7 Interface 6
 - 8.3 Plausibility checks

- 9 Assignment methods
 - 9.1 Fixed assignment
 - 9.1.1 Fixed assignment of a measured calorific value
 - 9.1.2 Fixed assignment of a declared calorific value
 - 9.2 Variable assignment
 - 9.2.1 Input at two or more different stations with zero floating point
 - 9.2.2 Input at two or more different stations with comingled gas flows
 - 9.3 Determination of the representative calorific value
 - 9.3.1 Arithmetically averaged calorific value
 - 9.3.2 Quantity-weighted average calorific value
 - 9.3.3 Gas quality tracking
 - 9.3.3.1 Description
 - 9.3.3.2 Validation
 - 9.3.3.3 Master validation for commissioning
 - 9.3.3.4 Regular validation during operation
 - 9.3.3.5 Software and data processing
 - 9.3.3.6 Documentation
- 10 Calculation of energy quantities
 - 10.1 General formulae for energy
 - 10.2 Calculation of averaged values Calculation from average calorific values and cumulative volumes
 - 10.2.1 Arithmetic average of the calorific value
 - 10.2.2 Quantity-weighted average of the calorific value
 - 10.3 Volume and volume-to-mass conversions
 - 10.4 Energy determination on the basis of declared calorific values
- 11 Accuracy on calculated energy
 - 11.1 Accuracy
 - 11.2 Calculation of uncertainty
 - 11.3 Bias
- 12 Quality control and quality assurance
 - 12.1 General
 - 12.2 Check of the course of the measuring data
 - 12.3 Traceability
 - 12.4 Substitute values
- Annex A (informative) Main instruments and energy-determination techniques
- Annex B (informative) Different possible patterns in the change of the calorific value
- Annex C (informative) Volume conversion and volume-to-mass conversion
- Annex D (informative) Incremental energy determination
- Annex E (informative) Practical examples for volume conversion and energy quantity calculation
 - E.1 Calculations using ISO 12213-3
 - E.1.1 General formulae
 - E.1.2 Example calculation
 - E.2 Calculations using ISO 12213-2
 - E.2.1 General formulae
 - E.2.2 Example calculation
- Annex F (informative) Practical examples for averaging the calorific value due to different delivery situations
- Annex G (informative) Ways of determining substitute values
 - G.1 Redundant system
 - G.2 Non-redundant system
- Annex H (informative) Plausibility check graphical example

- Annex I (informative) Uncorrected data, bias correction and final result graphical example
- Annex J (informative) Single-reservoir calorific value determination

Annex K (informative)

- K.1 Input data for the gas quality tracking system
- K.2 Example for the application of standard load profiles
- K.3 Results of calculation
- K.4 Gas quality tracking uncertainty determination
- K.5 Example of software system with data inferfaces

Page count: 71