

ISO/PAS 24499:2024-05 (E)

Method of test for burning velocity measurement of A2L flammable gases

| Contents | | Page |
|--------------------|--|-------------|
| Foreword | | v |
| Introduction | | vi |
| 1 | Scope | 1 |
| 2 | Normative references | 1 |
| 3 | Terms and definitions | 1 |
| 4 | General test method | 2 |
| 4.1 | General | 2 |
| 4.2 | Principle of the test method | 2 |
| 5 | Measurement parameters | 4 |
| 5.1 | General | 4 |
| 5.2 | Flame propagation velocity | 4 |
| 5.3 | Flame front area | 5 |
| 5.4 | Cross-sectional area of the flame base | 5 |
| 6 | Test method | 5 |
| 6.1 | General | 5 |
| 6.2 | Gas handling and mixtures preparation | 6 |
| 6.3 | The test tube | 7 |
| 6.3.1 | General | 7 |
| 6.3.2 | Dimensions | 8 |
| 6.3.3 | Position | 9 |
| 6.3.4 | Tube ends | 9 |
| 6.3.5 | Interchangeable damping orifices | 9 |
| 6.3.6 | Flame quenching | 10 |
| 6.3.7 | Tube glass type | 10 |
| 6.3.8 | Tube purging with test mixture | 10 |
| 6.3.9 | Tube etching | 10 |
| 6.4 | Ignition | 11 |
| 6.4.1 | General | 11 |
| 6.4.2 | Ignition type | 11 |
| 6.4.3 | Positioning | 11 |
| 6.4.4 | Electrodes | 11 |
| 6.4.5 | Power supply | 11 |
| 6.4.6 | Ignition time | 11 |
| 6.5 | Flame front visualization | 12 |
| 6.5.1 | General | 12 |
| 6.5.2 | Luminous zone and direct photography | 12 |
| 6.5.3 | Flame emission spectra | 12 |
| 6.5.4 | Acquisition camera | 12 |
| 6.5.5 | Exposure Time | 13 |
| 6.5.6 | Positioning | 13 |
| 6.5.7 | Scaling and optical distortion | 13 |
| 6.5.8 | Resolution of the flame images | 14 |
| 6.6 | Purge, exhaust and gas treatment systems | 14 |
| 6.7 | Test temperature setting | 15 |
| 6.8 | Experimental protocol for mixtures prepared using partial pressure technique | 16 |

| | | |
|--------------|---|-----------|
| 7 | Evaluation and expression of results | 16 |
| 7.1 | General | 16 |
| 7.2 | Uncertainty | 17 |
| 7.2.1 | Uncertainty in the burning velocity | 17 |
| 7.2.2 | Uncertainty estimation of concentrations | 17 |
| 8 | Safety precautions | 17 |
| 9 | Overview on flame shape, propagation regimes and stability | 18 |
| 9.1 | Flame shape | 18 |
| 9.2 | Flame propagation regimes | 19 |
| 9.3 | Flame stability in tubes | 20 |
| 9.4 | Observations of flames in tubes | 21 |
| 9.5 | Flame quenching in circular tubes | 21 |
| 9.6 | Flame propagation velocity and tube diameter | 22 |
| 9.7 | Flame area calculation | 22 |
| | Bibliography | 24 |