

ISO/TS 19016:2019-10 (E)

Gas cylinders - Cylinders and tubes of composite construction - Modal acoustic emission (MAE) testing for periodic inspection and testing

Contents		Page
Foreword		v
Introduction		vi
1	Scope	1
2	Normative references	1
3	Terms, definitions and symbols	1
3.1	Terms and definitions	1
3.2	Symbols	5
4	Modal acoustic emission (MAE) general operational principles	6
5	Personnel qualification	6
6	Test validity	6
7	Calibration	6
7.1	Absolute sensor calibration	6
7.2	Rolling ball impact calibration	7
7.2.1	General	7
7.2.2	Direct calibration	8
7.2.3	Linearity calibration	8
7.3	MAE wave recording system calibration	8
8	MAE testing equipment	9
9	MAE testing	9
9.1	General	9
9.2	MAE testing procedure	9
9.2.1	General	9
9.2.2	Sensor coupling	10
9.2.3	Sensor positioning	10
9.2.4	Attenuation measurement	11
9.2.5	System settings	11
9.2.6	System sampling rate	11
9.2.7	Sensor coupling checks	11
9.2.8	Pressurisation test methods	11
9.2.9	Repeating MAE testing	12
10	Interpretation	13
10.1	General	13
10.2	Noise filtering	13
10.2.1	General	13
10.2.2	Electromagnetic interference (EMI)	14
10.2.3	Mechanical rubbing	14
10.2.4	Flow noise	14
10.2.5	Leakage	14
10.2.6	Clean front end	14
10.3	Data analysis	14

11	Evaluation and rejection criteria	14
11.1	Evaluation	14
11.2	Analysis procedure	15
11.2.1	General	15
11.2.2	Rejection due to partial fibre bundle rupture criteria	15
11.2.3	Rejection due to single event energy	15
11.2.4	Rejection due to background energy (BE) and background energy oscillation (BEO)	15
12	Test report	16
13	Rejection and rendering cylinders unserviceable	16
Annex A (normative)	MAE testing equipments specification	17
Annex B (informative)	Overview of modal acoustic emission (MAE) test method	19
Bibliography		24