DIN EN ISO 5167-3:2023-08 (E)

Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full - Part 3: Nozzles and Venturi nozzles (ISO 5167-3:2022)

Contents

Page

European foreword ... **4**

Foreword ... **5**

Introduction ... **6**

1 Scope ... **7**

2 Normative references ... **7**

3 Terms and definitions ... 8

4 Principles of the method of measurement and computation ... 8

5 Nozzles and Venturi nozzles ... 9

5.1 ISA 1932 nozzle ... 9

5.1.1 General shape ... 9

5.1.2 Nozzle profile ... 9

5.1.3 Downstream face ... 11

5.1.4 Material and manufacture ... 11

5.1.5 Pressure tappings ... 11

5.1.6 Coefficients of ISA 1932 nozzles ... 13

5.1.7 Uncertainties ... 14

5.1.8 Pressure loss, $\Delta\varpi$ ... 14

5.2 Long radius nozzles ... 15

5.2.1 General ... 15

5.2.2 Profile of high-ratio nozzle ... 15

5.2.3 Profile of low-ratio nozzle ... 17

5.2.4 Material and manufacture ... 18

5.2.5 Pressure tappings ... 18

5.2.6 Coefficients of long radius nozzles ... 18

5.2.7 Uncertainties ... 19

5.2.8 Pressure loss, $\Delta\varpi$ ... 19

5.3 Throat-tapped nozzles ... 19

5.3.1 General ... 19

5.3.2 Profile of throat-tapped nozzle ... 20

5.3.3 Material and manufacturing ... 21

5.3.4 Pressure tappings ... 21

5.3.5 Coefficients ... 22

5.3.6 Uncertainties ... 22

5.3.7 Calibration and extrapolation ... 23

5.3.8 Pressure Loss ... 23

5.4 Venturi nozzles ... 24

5.4.1 General shape ... 24

5.4.2 Material and manufacture ... 26

5.4.3 Pressure tappings ... 26

5.4.4 Coefficients ... 27

5.4.5 Uncertainties ... 28

5.4.6 Pressure loss ... 28

6 Installation requirements ... 29

6.1 General ... 29

6.2 Minimum upstream and downstream straight lengths for installation between various fittings and the primary device ... 29

6.3 Flow conditioners 35
6.4 Circularity and cylindricality of the pipe 35
6.5 Location of primary device and carrier rings 36
6.6 Method of fixing and gaskets 37

7 Flow calibration of nozzles 37
7.1 General 37
7.2 Test facility 38
7.3 Meter installation 38
7.4 Design of the test programme 38
7.5 Reporting the calibration results 38
7.6 Uncertainty analysis of the calibration 38
7.6.1 General 38
7.6.2 Uncertainty of the test facility 39
7.6.3 Uncertainty of the nozzle 39

Annex A (informative) **Tables of discharge coefficients and expansibility [expansion] factors 40**

Annex B (informative) **Akashi type (Mitsubishi type) flow conditioner 47**

Bibliography 48