

# DIN EN ISO 10524-3:2019-08 (E)

## Pressure regulators for use with medical gases - Part 3: Pressure regulators integrated with cylinder valves (VIPRs) (ISO 10524-3:2019)

---

| Contents   | Page |
|--|------|
| European foreword .....  | 5    |
| Foreword .....   | 6    |
| Introduction .....   | 8    |
| 1 *Scope .....   | 9    |
| 2 Normative references .....   | 9    |
| 3 Terms and definitions .....  | 10   |
| 4 Nomenclature .....   | 12   |
| 5 General requirements .....   | 13   |
| 5.1 Safety .....   | 13   |
| 5.2 Usability .....  | 13   |
| 5.3 Materials .....  | 13   |
| 5.4 Alternative construction .....                                     | 14   |
| 6 Design requirements .....  | 14   |
| 6.1 *General .....   | 14   |
| 6.2 Integrated electronic device .....                                 | 15   |
| 6.3 FILLING PORT .....   | 15   |
| 6.4 Connections .....  | 16   |
| 6.4.1 VALVE INLET CONNECTION .....                                     | 16   |
| 6.4.2 Outlet connectors .....  | 16   |
| 6.5 *Requirements for outlet pressure .....                            | 16   |
| 6.5.1 PRESSURE OUTLET .....  | 16   |
| 6.5.2 FLOW OUTLET .....  | 17   |
| 6.6 Cylinder pressure or cylinder CONTENT INDICATOR .....              | 17   |
| 6.6.1 PRESSURE GAUGES and cylinder CONTENT INDICATORS .....            | 17   |
| 6.7 FLOW SELECTOR .....  | 18   |
| 6.8 Filtration .....   | 18   |
| 6.9 MAIN SHUT-OFF .....  | 18   |
| 6.10 RESIDUAL PRESSURE DEVICE .....                                    | 18   |
| 6.11 *PRESSURE-RELIEF DEVICE .....                                     | 18   |
| 6.12 Leakage .....   | 19   |
| 6.13 Mechanical strength .....   | 19   |
| 6.13.1 Resistance of the high-pressure side .....                      | 19   |
| 6.13.2 Resistance of the low-pressure side to excessive pressure ..... | 20   |
| 6.13.3 Resistance of the low-pressure side to $P_1$ .....              | 20   |
| 6.13.4 Impact and drop tests .....                                     | 20   |
| 6.14 *Resistance to ignition .....                                     | 20   |
| 6.15 Requirements for VIPR fitted with fixed orifices .....            | 20   |
| 6.15.1 Stability and ACCURACY OF FLOW .....                            | 20   |
| 6.15.2 *Flow setting torque .....                                      | 21   |
| 6.15.3 Removal of a fixed orifice .....                                | 21   |
| 6.15.4 Legibility .....  | 21   |
| 6.16 Endurance .....   | 21   |
| 6.16.1 FLOW SELECTOR .....   | 21   |
| 6.16.2 NON-RETURN VALVE fitted to the filling port .....               | 21   |
| 6.16.3 PRESSURE REGULATOR .....  | 21   |

|          |   |           |
|----------|---|-----------|
| <b>7</b> | <b>Construction requirements.....</b>   | <b>22</b> |
| 7.1      | *Cleanliness .....  | 22        |
| 7.2      | Lubricants .....  | 22        |
| 7.3      | Loosening torques.....  | 22        |
| <b>8</b> | <b>Test methods for non-gas specific type tests.....</b>  | <b>23</b> |
| 8.1      | General conditions.....   | 23        |
| 8.1.1    | Ambient conditions.....   | 23        |
| 8.1.2    | Test gas.....   | 23        |
| 8.1.3    | Reference conditions.....   | 23        |
| 8.2      | Test schedule .....   | 23        |
| 8.3      | Test methods for OUTLET PRESSURE.....   | 25        |
| 8.3.1    | Purpose .....   | 25        |
| 8.3.2    | Test equipment.....   | 25        |
| 8.3.3    | Test methods for determining OUTLET PRESSURE limits for VIPRs fitted with a PRESSURE OUTLET ..... | 26        |
| 8.3.4    | Test method for determining OUTLET PRESSURE limits for a VIPR fitted with a FLOW OUTLET .....     | 27        |
| 8.4      | Test method for PRESSURE-RELIEF DEVICE .....  | 27        |
| 8.4.1    | Purpose .....   | 27        |
| 8.4.2    | Test procedure .....  | 27        |
| 8.5      | Test methods for leakage .....  | 28        |
| 8.5.1    | Purpose .....   | 28        |
| 8.5.2    | Test procedure .....  | 28        |
| 8.6      | Test method for mechanical strength.....  | 28        |
| 8.6.1    | Purpose .....   | 28        |
| 8.6.2    | Test procedure .....  | 28        |
| 8.7      | Test method for resistance to ignition .....  | 29        |
| 8.7.1    | Purpose .....   | 29        |
| 8.7.2    | General.....  | 29        |
| 8.7.3    | Test procedure .....  | 29        |
| 8.8      | Test methods for the stability and ACCURACY OF FLOW of VIPRs fitted with fixed orifices .....     | 31        |
| 8.8.1    | Purpose .....   | 31        |
| 8.8.2    | Test procedure .....  | 31        |
| 8.9      | Test method for flow setting and loosening torques.....   | 31        |
| 8.9.1    | Purpose .....   | 31        |
| 8.9.2    | Test procedure .....  | 32        |
| 8.10     | Test for integrity of the FILLING PORT NON-RETURN VALVE under high flow condition.....            | 32        |
| 8.10.1   | Purpose .....   | 32        |
| 8.10.2   | Test procedure .....  | 32        |
| 8.11     | Test method for durability of markings and colour coding .....                                    | 33        |
| 8.11.1   | Purpose .....   | 33        |
| 8.11.2   | Test procedure .....  | 33        |
| 8.12     | FLOW SELECTOR endurance test.....   | 34        |
| 8.12.1   | Purpose .....   | 34        |
| 8.12.2   | Test procedure .....  | 34        |
| 8.13     | FILLING PORT NON-RETURN VALVE endurance test.....   | 34        |
| 8.13.1   | Purpose .....   | 34        |
| 8.13.2   | Test procedure .....  | 34        |
| 8.14     | PRESSURE REGULATOR endurance test.....  | 35        |
| 8.14.1   | Purpose .....   | 35        |
| 8.14.2   | Test procedure .....  | 35        |

|   |   |           |
|---|---|-----------|
| <b>9</b>  | <b>*Gas-specific type tests .....</b>   | <b>36</b> |
| 9.1   | Purpose.....  | 36        |
| 9.2   | Apparatus .....   | 36        |
| 9.3   | General test conditions .....   | 37        |
| 9.3.1   | Test conditions.....  | 38        |
| 9.4   | Test procedure.....   | 38        |
| 9.4.1   | Test method for determining OUTLET PRESSURE limits for a VIPR fitted with a PRESSURE OUTLET ..... | 38        |
| 9.4.2   | Test method for stability and ACCURACY OF FLOW of a VIPR fitted with FIXED ORIFICES .....         | 38        |
| 9.4.3   | Test method for RESIDUAL PRESSURE DEVICE.....   | 39        |
| <b>10</b>   | <b>Marking, colour coding and packaging .....</b>   | <b>39</b> |
| 10.1  | Marking .....   | 39        |
| 10.2  | Colour coding .....   | 40        |
| 10.3  | Packaging.....  | 41        |
| <b>11</b>   | <b>*Information to be supplied by the manufacturer .....</b>                                      | <b>41</b> |
| <b>Annex A (informative) Example of VIPRs.....</b>  |   | <b>43</b> |
| <b>Annex B (informative) Rationale .....</b>  |   | <b>44</b> |
| <b>Annex C (informative) Reported regional and national deviations of colour coding and nomenclature for medical gases.....</b> |   | <b>47</b> |
| <b>Bibliography .....</b>   |   | <b>49</b> |