

# DIN EN ISO 19296:2019-04 (E)

## Mining - Mobile machines working underground - Machine safety (ISO 19296:2018)

---

<b>Contents</b>		<b>Page</b>
European foreword .....		5
Annex ZA (informative) Relationship between this European Standard and the essential requirements of Directive 2006/42/EC aimed to be covered .....		6
Foreword .....		7
Introduction .....		8
<b>1</b>	<b>Scope .....</b>	<b>9</b>
<b>2</b>	<b>Normative references .....</b>	<b>9</b>
<b>3</b>	<b>Terms and definitions .....</b>	<b>12</b>
<b>4</b>	<b>Safety requirements and/or protective/risk reduction measures .....</b>	<b>17</b>
4.1	General requirements .....	17
4.1.1	General .....	17
4.1.2	Moving parts .....	17
4.1.3	Equipment carrier restraints .....	18
4.1.4	Starting system .....	18
4.1.5	Unintended movement .....	18
4.2	Lifting and transportation .....	18
4.3	Towing and retrieval .....	18
4.4	Fluid power systems .....	19
4.4.1	Hydraulic systems .....	19
4.4.2	Pneumatic systems .....	20
4.5	Electrical equipment .....	21
4.5.1	General .....	21
4.5.2	Electromagnetic compatibility (EMC) .....	21
4.5.3	Batteries .....	21
4.6	Machines powered by diesel engine .....	21
4.6.1	Fuel and exhaust .....	21
4.6.2	Exhaust pipes .....	21
4.6.3	Engine cooling system .....	22
4.7	Fuel systems .....	22
4.7.1	Fuel tanks .....	22
4.7.2	Fuel tank filler inlet .....	22
4.7.3	Fuel tank vent system .....	22
4.7.4	Fuel tank drainage device .....	22
4.7.5	Fuel shut-off system .....	22
4.7.6	Fuel lines .....	23
4.8	Light intensity and quantity .....	23
4.8.1	General .....	23
4.8.2	Head lights .....	23
4.8.3	Tail lights .....	23
4.8.4	Reversing lights .....	23
4.8.5	Stop lamps .....	23
4.8.6	Both direction lights .....	23
4.8.7	Protective systems .....	24
4.9	Warning devices and safety signs .....	24
4.10	Braking .....	24

4.10.1	General requirements .....	24
4.11	Control systems and devices .....	24
4.11.1	General .....	24
4.11.2	Control devices .....	24
4.11.3	Steering systems .....	25
4.11.4	Displays .....	25
4.12	Operator and passenger's position .....	26
4.12.1	Protection .....	26
4.12.2	Access systems .....	26
4.12.3	Visibility .....	26
4.12.4	Interior space, dimensions, and seats .....	27
4.13	Fire protection .....	27
4.14	Noise .....	28
4.14.1	Noise reduction at source at the design stage .....	28
4.14.2	Information on noise emission .....	28
4.15	Vibrations .....	29
4.16	Radiation health risks .....	29
4.17	Tyres and rims .....	29
4.18	Stability .....	30
4.19	Load haul dump capacity .....	30
4.20	Maintenance .....	30
4.20.1	General .....	30
4.20.2	Frequent maintenance .....	30
4.20.3	Support devices .....	30
4.20.4	Tiltable cab support device .....	31
4.21	Quick coupler systems .....	31
5	Verification of safety requirements and/or protective/risk reduction measures .....	31
6	Information for use .....	31
6.1	Operator's manual .....	31
6.1.1	General .....	31
6.1.2	Information on noise emission .....	32
6.1.3	Information concerning hand-arm and whole-body vibration emission .....	32
6.2	Marking .....	33
6.2.1	General .....	33
6.2.2	Attachment points .....	33
6.2.3	Section or sub-assemblies .....	33
6.3	Training manuals .....	34
Annex A (normative)	Brake requirements for rubber tyred underground mining machines .....	35
A.1	General .....	35
A.2	Normative references .....	35
A.3	Terms and definitions .....	35
A.4	General requirements .....	35
A.4.1	Required brake systems .....	35
A.4.2	Common components .....	35
A.4.3	Brake control system .....	35
A.4.4	Service brake systems .....	35
A.4.5	Secondary brake systems .....	36
A.4.6	Parking brake systems .....	37
A.4.7	Hydrostatic brake systems .....	37
A.4.8	Systems with combined brake and steer function .....	37
A.4.9	Performance and warning devices for stored energy sources .....	37
A.4.10	Brake systems with electronic MCS .....	38
A.4.11	Machines designed to tow trailers .....	38
A.4.12	Machine instructions and labels .....	38
A.4.13	Estimating brake slope capability .....	38
A.5	Test conditions .....	38
A.5.1	Overall test parameters .....	38
A.5.2	General test conditions .....	38

<b>A.5.3</b>	<b>Test course</b>	<b>38</b>
<b>A.5.4</b>	<b>Machine test configuration</b>	<b>38</b>
<b>A.6</b>	<b>Performance tests</b>	<b>39</b>
<b>A.6.1</b>	<b>General</b>	<b>39</b>
<b>A.6.2</b>	<b>Brake system controls</b>	<b>39</b>
<b>A.6.3</b>	<b>Stored energy sources</b>	<b>39</b>
<b>A.6.4</b>	<b>Holding performance</b>	<b>39</b>
<b>A.6.5</b>	<b>Stopping performance</b>	<b>39</b>
<b>A.6.6</b>	<b>General exceptions from ISO 3450:2011</b>	<b>40</b>
<b>A.7</b>	<b>Test report</b>	<b>40</b>
<b>Annex B (informative)</b>	<b>List of significant hazards, hazardous situations and hazardous events</b>	<b>41</b>
<b>Annex C (normative)</b>	<b>Verification table</b>	<b>45</b>
<b>Annex D (informative)</b>	<b>Examples of performance levels for safety-related functions</b>	<b>50</b>
<b>Bibliography</b>		<b>51</b>