

## Contents

<b>1</b>	<b>Safety measures</b>	<b>1</b>
1.1	Fuel tanks and fuel-carrying lines.	1
1.2	Air Conditioning	1
1.3	Electronic control units	2
1.4	Battery	2
1.5	High-voltage conducting components / electric vehicles	3
1.6	Safety instructions when performing repair work in bodysHELLS and liquefied petroleum gas systems (LPG)	3
1.7	Separation of aluminium and steel dust	4
1.8	Particulate matter	4
1.9	Safety instructions	5
1.10	Safety measures	5
1.11	Working on the alignment frame	5
1.12	Disassembly of parts	5
1.13	Welding work	5
1.14	Paintwork, glass, upholstery, trims	6
1.15	Airbag system	6
1.16	Safety instructions for belt tensioners	6
1.17	Warning signs	6
<b>2</b>	<b>Fundamentals of bodywork repairs</b>	<b>7</b>
2.1	Fundamentals of bodywork repair	7
2.2	Galvanised body parts	7
2.3	Removing residues	8
2.4	New parts	8
2.5	Foam moulds	9
2.6	Roof rack reinforcements	9
2.7	Original welding	12
2.8	Diagnosis of accident vehicles	12
2.9	Finishing work on the body	13
2.10	Repairing higher-strength body panels	13
2.11	High-strength/ultra-strength, warm-formed body panels	14
2.12	Body Work - Glued joints	15
2.13	Removing underbody protection and sealing seams	17
<b>3</b>	<b>Explanation of symbols</b>	<b>18</b>
3.1	Symbols, structure	18
3.2	Symbols, preparation	18
3.3	Symbols, welding	19
3.4	Symbols, riveting	20
3.5	Symbols, corrosion protection	21
<b>4</b>	<b>Design features of the vehicle body</b>	<b>23</b>
4.1	Multi-material mix	23
<b>5</b>	<b>Damage assessment</b>	<b>24</b>
5.1	General points	24
5.2	Check weld seams and body connections	24
5.3	Force reduction during impact	24
5.4	Measuring methods / damage diagnostics	27
5.5	Overview of the materials used	27
5.6	Passive safety	29
<b>6</b>	<b>Methods of thermal connection</b>	<b>30</b>
6.1	Methods of thermal connection	30
6.2	Spot welding (RP)	30
6.3	Hole seams - shielding gas	32
6.4	Seal with SG full seam (shielding gas) and quilting seam	33



6.5	MIG welding	33
6.6	Laser welding	34
6.7	Laser soldering	35
6.8	Replacement joining process in repair (steel)	35
6.9	Replacement joining process during repair (aluminium)	35
<b>7</b>	<b>Cold joining process</b>	<b>37</b>
7.1	Gluing	37
7.2	Establish adhesive connections for aluminium	37
7.3	Rivet	39
7.4	Overview - Pairing riveting tools	45
7.5	FDS screws (flow drill screws)	46
7.6	Pressing through	47
<b>8</b>	<b>Cutting techniques for body repairs; areas of application</b>	<b>48</b>
8.1	Bore	48
8.2	Cutting	48
8.3	Sanding	48
8.4	Milling	49
8.5	Remove adhesive bonds	49
<b>9</b>	<b>Repairing surfaces</b>	<b>50</b>
9.1	Bulking sheet steel techniques	50
9.2	Metal and aluminium mastic	51
9.3	Lead-free tin processing	52
9.4	Definition of "properly shaped surface" / Delivery to the paint shop	52
<b>10</b>	<b>Straightening the vehicle</b>	<b>53</b>
10.1	Alignment	53
10.2	Separation cuts	53
10.3	Bodyshell offcut sections and parts	53
<b>11</b>	<b>Corrosion prevention</b>	<b>54</b>
11.1	Long-term body protection	54
11.2	Body long-term protection if filling is needed	54
<b>12</b>	<b>Plastic repair</b>	<b>55</b>
12.1	Plastic repair	55
12.2	Repairing indentations	55
12.3	Repairing scratches	56
12.4	Repairing a crack (up to 100 mm length)	57
12.5	Repairing a hole (up to 30 mm diameter)	59
12.6	Plastic repair (GRP)	60
<b>13</b>	<b>Glass repair</b>	<b>64</b>
13.1	Front window repair	64
<b>14</b>	<b>Repairing thread</b>	<b>67</b>
14.1	Repairing thread	67
14.2	Repairing safety-relevant components	67
<b>15</b>	<b>Tools</b>	<b>68</b>
15.1	List of tools	68
<b>16</b>	<b>Decorative and protective foils</b>	<b>69</b>
16.1	Decorative and protective foils	69
16.2	Training videos	69