

# Solar systems from Schweizer



Data sheet PV mounting system

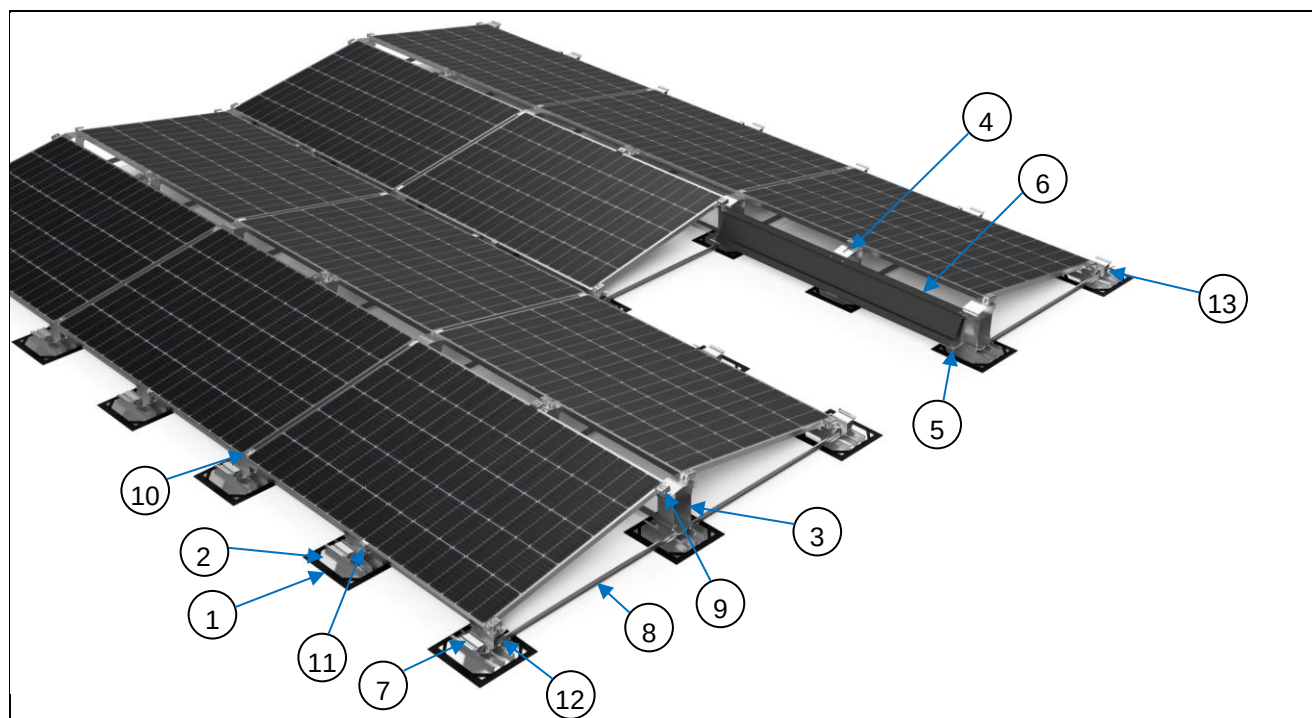
MSP flat roof east-west MSP-FR-EW

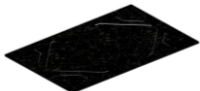
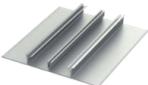
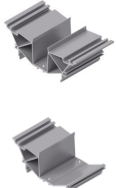


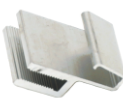
**Read carefully before use and store in a safe place.**



**MSP-FR-EW**



|   |                                                                                     |                                         |                                        |
|---|-------------------------------------------------------------------------------------|-----------------------------------------|----------------------------------------|
| 1 |   | MSP-FR-EW-PSF                           | Protective layer                       |
| 2 |  | MSP-FR-EW-BP                            | Base profile                           |
| 3 |  | MSP-FR-EW-SH90                          | Support high                           |
| 4 |  | MSP-FR-EW-SMH90                         | Support middle high                    |
| 5 |  | MSP-FR-EW-WDA-SH90                      | Wind deflector adapter                 |
| 6 |  | MSP-FR-S-WD                             | Wind deflector / Ballast tray          |
| 7 |  | MSP-FR-EW-SL8/SL10<br>MSP-FR-S-SL8/SL10 | Support (east-west)<br>Support (south) |
| 8 |  | MSP-FR-EW-Cxxxx                         | Connection channel                     |

|    |                                                                                                                                                                        |                                 |                                                                                 |
|----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|---------------------------------------------------------------------------------|
|    |                                                                                                                                                                        |                                 |                                                                                 |
| 9  |                                                                                       | MSP-PR-EC / -ECB / -ECG / -ECBG | End clamp                                                                       |
| 10 |                                                                                       | MSP-PR-MC / -MCB / -MCG / -MCBG | Middle clamp                                                                    |
| 11 |                                                                                       | MSP-FR-LC / -LCB                | Complementary clamp low                                                         |
| 12 | <br> | MSP-FR-S<br><br>MSP-FR-TS       | Screw M6 x 16<br><br>Screw 6,3 x 20 R<br>(lightning current capable connection) |
| 13 |                                                                                      | MSP-FR-GS                       | Screw<br>MSP-FR-GS 6 x 60                                                       |
|    |                                                                                     | MSP-FR-CHE                      | Cable holder with edge-clip                                                     |
|    |                                                                                     | MSP-FR-CH                       | Cable holder clip                                                               |
|    |                                                                                     | MSP-FR-C-CL                     | Connection channel clip                                                         |
|    |                                                                                     | MSP-FR-OC33                     | Optimizer clamp 33mm                                                            |

### 1 Roof requirements

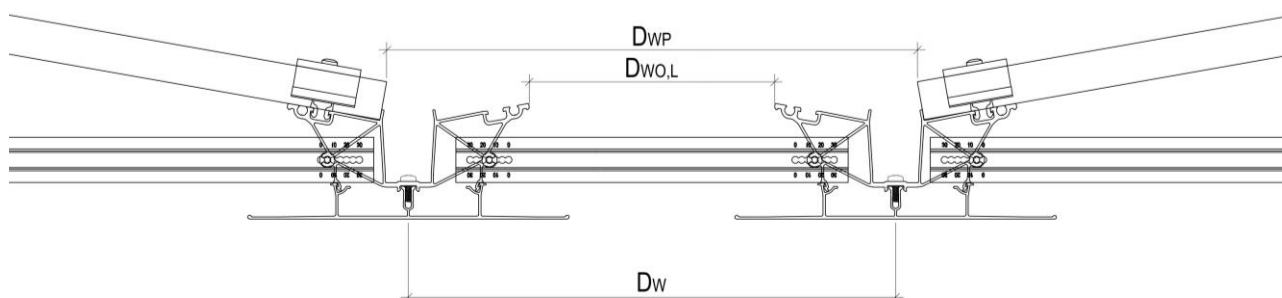
|                                       |                                                                                    |
|---------------------------------------|------------------------------------------------------------------------------------|
| <b>Slope</b>                          | ≤3.0° (optionally with on-site connection to the roof substructure up to 10°)      |
| <b>Unevenness</b>                     | ≤+2.5°, ≤-2.5°, ≤±1.25                                                             |
| <b>Sealing material</b>               | TPO/FPO, PVC, EVA, ASA, PVC-P, ECB, PIB, concrete, bitumen                         |
| <b>Coefficient of friction</b>        | Relevant for design, minimum requirement depending on wind load and field geometry |
| <b>Insulation material</b>            | EPS/XPS, mineral wool, PUR, PIR, foam glass                                        |
| <b>Permanent compressive strength</b> | ≥ approx. 10 kN/m <sup>2</sup> (depending on boundary conditions)                  |

### 2 System properties

|                                   |                                                                                                                                |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| <b>Block size max.</b>            | 15 m x 15 m                                                                                                                    |
| <b>Minimum block size</b>         | 6 modules                                                                                                                      |
| <b>System height</b>              | 303 – 323 mm                                                                                                                   |
| <b>Ground clearance MSP-FR-EW</b> | 80<br>A height increase of up to 200 mm is permitted on site and has no negative impact on aerodynamics (ballast requirement). |
| <b>Edge distance min.</b>         | 150 mm                                                                                                                         |
| <b>Module tilt angle</b>          | 8.6° – 12.4° (depending on module width)                                                                                       |
| <b>Module width</b>               | 926 mm – 1315 mm                                                                                                               |
| <b>Module length</b>              | 1555 mm – 2399 mm                                                                                                              |
| <b>Module height</b>              | 28 mm – 45 mm (up to 50 mm with prior loosening of the screw)                                                                  |
| <b>Ballast width</b>              | 100 mm                                                                                                                         |
| <b>Ballast length</b>             | 200 mm                                                                                                                         |
| <b>Ballast height</b>             | 40 mm – 80 mm                                                                                                                  |

#### 2.1 System geometry, dimensions in east-west direction

Pavement dimensions



| Item            | D <sub>w</sub> | D <sub>wo,L</sub> | D <sub>wp</sub> |
|-----------------|----------------|-------------------|-----------------|
| Without walkway | 0 mm           | 0 mm              | 44 mm           |
| MSP-FR-C0230    | 304 mm         | 115 mm            | 340 mm          |
| MSP-FR-C0400    | 474 mm         | 285 mm            | 510 mm          |
| MSP-FR-C0625    | 699 mm         | 510 mm            | 735 mm          |
| MSP-FR-C0725    | 799 mm         | 610 mm            | 835 mm          |
| MSP-FR-C0935    | 1009 mm        | 820 mm            | 1045 mm         |
| MSP-FR-C1131    | 1205 mm        | 1016 mm           | 1241 mm         |
| MSP-FR-C1639    | 1713 mm        | 1524 mm           | 1749 mm         |
| MSP-FR-C1964    | 2038 mm        | 1849 mm           | 2074 mm         |

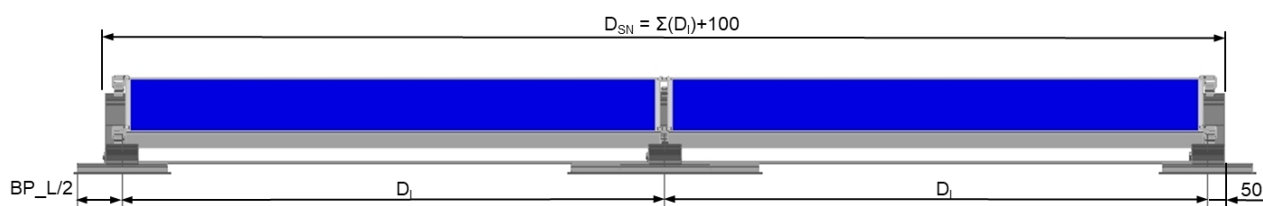
Grid dimensions, scale setting short connectionchannel



|       | Min.<br>Module<br>width | Max.<br>Module<br>width | Scale<br>Support<br>height | Scale<br>Support low | Inclination | D <sub>P</sub> | Angle of<br>attack<br>angle<br>nominal |
|-------|-------------------------|-------------------------|----------------------------|----------------------|-------------|----------------|----------------------------------------|
| C0935 | 926 mm                  | 930 mm                  | 0                          | 0                    | 12.4°       | 1952 mm        | 10°                                    |
|       | 931 mm                  | 935 mm                  | 0                          | 5                    | 12.3°       | 1962 mm        | 10°                                    |
|       | 936 mm                  | 940 mm                  | 5                          | 5                    | 12.3°       | 1972 mm        | 10°                                    |
|       | 941 mm                  | 945 mm                  | 5                          | 10                   | 12.2°       | 1982 mm        | 10°                                    |
|       | 946 mm                  | 950 mm                  | 10                         | 10                   | 12.1°       | 1992 mm        | 10°                                    |
|       | 951 mm                  | 955 mm                  | 10                         | 15                   | 12.1°       | 2002 mm        | 10°                                    |
|       | 956 mm                  | 960 mm                  | 15                         | 15                   | 12.0°       | 2012 mm        | 10°                                    |
|       | 961 mm                  | 965 mm                  | 15                         | 20                   | 11.9°       | 2022 mm        | 10°                                    |
|       | 966 mm                  | 970 mm                  | 20                         | 20                   | 11.8°       | 2032 mm        | 10°                                    |
|       | 971 mm                  | 975 mm                  | 20                         | 25                   | 11.8°       | 2042 mm        | 10°                                    |
|       | 976 mm                  | 980 mm                  | 25                         | 25                   | 11.7°       | 2052 mm        | 10°                                    |
| C1000 | 981 mm                  | 985 mm                  | 25                         | 30                   | 11.7°       | 2062 mm        | 10°                                    |
|       | 986 mm                  | 990 mm                  | 30                         | 30                   | 11.6°       | 2072 mm        | 10°                                    |
|       | 991 mm                  | 995 mm                  | 0                          | 0                    | 11.5°       | 2083 mm        | 10°                                    |
|       | 996 mm                  | 1000 mm                 | 0                          | 5                    | 11.5°       | 2093 mm        | 10°                                    |
|       | 1001 mm                 | 1005 mm                 | 5                          | 5                    | 11.4°       | 2103 mm        | 10°                                    |
|       | 1006 mm                 | 1010 mm                 | 5                          | 10                   | 11.3°       | 2113 mm        | 10°                                    |
|       | 1011 mm                 | 1015 mm                 | 10                         | 10                   | 11.3°       | 2123 mm        | 10°                                    |
|       | 1016 mm                 | 1020 mm                 | 10                         | 15                   | 11.2°       | 2133 mm        | 10°                                    |
|       | 1021 mm                 | 1025 mm                 | 15                         | 15                   | 11.2°       | 2143 mm        | 10°                                    |
|       | 1026 mm                 | 1030 mm                 | 15                         | 20                   | 11.1°       | 2153 mm        | 10°                                    |
|       | 1031 mm                 | 1035 mm                 | 20                         | 20                   | 11.0°       | 2163 mm        | 10°                                    |
| C1065 | 1036 mm                 | 1040 mm                 | 20                         | 25                   | 11.0°       | 2173 mm        | 10°                                    |
|       | 1041 mm                 | 1045 mm                 | 25                         | 25                   | 10.9°       | 2183 mm        | 10°                                    |
|       | 1046 mm                 | 1050 mm                 | 25                         | 30                   | 10.9°       | 2193 mm        | 10°                                    |
|       | 1051 mm                 | 1055 mm                 | 30                         | 30                   | 10.8°       | 2203 mm        | 10°                                    |
|       | 1056 mm                 | 1060 mm                 | 0                          | 0                    | 10.8°       | 2213 mm        | 10°                                    |
|       | 1061 mm                 | 1065 mm                 | 0                          | 5                    | 10.7°       | 2223 mm        | 10°                                    |
|       | 1066 mm                 | 1070 mm                 | 5                          | 5                    | 10.7°       | 2233 mm        | 10°                                    |
|       | 1071 mm                 | 1075 mm                 | 5                          | 10                   | 10.6°       | 2243 mm        | 10°                                    |
|       | 1076 mm                 | 1080 mm                 | 10                         | 10                   | 10.5°       | 2253 mm        | 10°                                    |
|       | 1081 mm                 | 1085 mm                 | 10                         | 15                   | 10.5°       | 2263 mm        | 10°                                    |
|       | 1086 mm                 | 1090 mm                 | 15                         | 15                   | 10.4°       | 2273 mm        | 10°                                    |
| C1131 | 1091 mm                 | 1095 mm                 | 15                         | 20                   | 10.4°       | 2283 mm        | 10°                                    |
|       | 1096 mm                 | 1100 mm                 | 20                         | 20                   | 10.3°       | 2293 mm        | 10°                                    |
|       | 1101 mm                 | 1105 mm                 | 20                         | 25                   | 10.3°       | 2303 mm        | 10°                                    |
|       | 1106 mm                 | 1110 mm                 | 25                         | 25                   | 10.2°       | 2313 mm        | 10°                                    |
|       | 1111 mm                 | 1115 mm                 | 25                         | 30                   | 10.2°       | 2323 mm        | 10°                                    |
|       | 1116 mm                 | 1120 mm                 | 30                         | 30                   | 10.1°       | 2333 mm        | 10°                                    |
|       | 1121 mm                 | 1125 mm                 | 0                          | 0                    | 10.1°       | 2345 mm        | 10°                                    |
|       | 1126 mm                 | 1130 mm                 | 0                          | 5                    | 10.0°       | 2355 mm        | 10°                                    |
|       | 1131 mm                 | 1135 mm                 | 5                          | 5                    | 10.0°       | 2365 mm        | 10°                                    |
|       | 1136 mm                 | 1140 mm                 | 5                          | 10                   | 9.9°        | 2375 mm        | 10°                                    |
|       | 1141 mm                 | 1145 mm                 | 10                         | 10                   | 9.9°        | 2385 mm        | 10°                                    |
| C1131 | 1146 mm                 | 1150 mm                 | 10                         | 15                   | 9.8°        | 2395 mm        | 10°                                    |
|       | 1151 mm                 | 1155 mm                 | 15                         | 15                   | 9.8°        | 2405 mm        | 10°                                    |
|       | 1156 mm                 | 1160 mm                 | 15                         | 20                   | 9.8°        | 2415 mm        | 10°                                    |
|       | 1161 mm                 | 1165 mm                 | 20                         | 20                   | 9.7°        | 2425 mm        | 10°                                    |
|       | 1166 mm                 | 1170 mm                 | 20                         | 25                   | 9.7°        | 2435 mm        | 10°                                    |
|       | 1171 mm                 | 1175 mm                 | 25                         | 25                   | 9.6°        | 2445 mm        | 10°                                    |
|       | 1176 mm                 | 1180 mm                 | 25                         | 30                   | 9.6°        | 2455 mm        | 10°                                    |
|       | 1181 mm                 | 1185 mm                 | 30                         | 30                   | 9.5°        | 2465 mm        | 10°                                    |

|       | Min.<br>Module<br>width | Max.<br>Module<br>width | Scale<br>Support<br>height | Scale<br>Support low | Inclination | D <sub>P</sub> | Angle of<br>attack<br>angle<br>nominal |
|-------|-------------------------|-------------------------|----------------------------|----------------------|-------------|----------------|----------------------------------------|
| C1197 | 1186 mm                 | 1190 mm                 | 0                          | 0                    | 9.5°        | 2477 mm        | 10°                                    |
|       | 1191 mm                 | 1195 mm                 | 0                          | 5                    | 9.4°        | 2487 mm        | 10°                                    |
|       | 1196 mm                 | 1200 mm                 | 5                          | 5                    | 9.4°        | 2497 mm        | 10°                                    |
|       | 1201 mm                 | 1205 mm                 | 5                          | 10                   | 9.4°        | 2507 mm        | 10°                                    |
|       | 1206 mm                 | 1210 mm                 | 10                         | 10                   | 9.3°        | 2517 mm        | 10°                                    |
|       | 1211 mm                 | 1215 mm                 | 10                         | 15                   | 9.3°        | 2527 mm        | 10°                                    |
|       | 1216 mm                 | 1220 mm                 | 15                         | 15                   | 9.2°        | 2537 mm        | 10°                                    |
|       | 1221 mm                 | 1225 mm                 | 15                         | 20                   | 9.2°        | 2547 mm        | 10°                                    |
|       | 1226 mm                 | 1230 mm                 | 20                         | 20                   | 9.2°        | 2557 mm        | 10°                                    |
|       | 1231 mm                 | 1235 mm                 | 20                         | 25                   | 9.1°        | 2567 mm        | 10°                                    |
|       | 1236 mm                 | 1240 mm                 | 25                         | 25                   | 9.1°        | 2577 mm        | 10°                                    |
|       | 1241 mm                 | 1245 mm                 | 25                         | 30                   | 9.0°        | 2587 mm        | 10°                                    |
| C1263 | 1246 mm                 | 1250 mm                 | 30                         | 30                   | 9.0°        | 2597 mm        | 10°                                    |
|       | 1251 mm                 | 1255 mm                 | 0                          | 0                    | 9.0°        | 2609 mm        | 10°                                    |
|       | 1256 mm                 | 1260 mm                 | 0                          | 5                    | 9.0°        | 2619 mm        | 10°                                    |
|       | 1261 mm                 | 1265 mm                 | 5                          | 5                    | 8.9°        | 2629 mm        | 8°                                     |
|       | 1266 mm                 | 1270 mm                 | 5                          | 10                   | 8.9°        | 2639 mm        | 8°                                     |
|       | 1271 mm                 | 1275 mm                 | 10                         | 10                   | 8.9°        | 2649 mm        | 8°                                     |
|       | 1276 mm                 | 1280 mm                 | 10                         | 15                   | 8.8°        | 2659 mm        | 8°                                     |
|       | 1281 mm                 | 1285 mm                 | 15                         | 15                   | 8.8°        | 2669 mm        | 8°                                     |
|       | 1286 mm                 | 1290 mm                 | 15                         | 20                   | 8.8°        | 2679 mm        | 8°                                     |
|       | 1291 mm                 | 1295 mm                 | 20                         | 20                   | 8.7°        | 2689 mm        | 8°                                     |
|       | 1296 mm                 | 1300 mm                 | 20                         | 25                   | 8.7°        | 2699 mm        | 8°                                     |
|       | 1301 mm                 | 1305 mm                 | 25                         | 25                   | 8.7°        | 2709 mm        | 8°                                     |
|       | 1306 mm                 | 1310 mm                 | 25                         | 30                   | 8.6°        | 2719 mm        | 8°                                     |
|       | 1311 mm                 | 1315 mm                 | 30                         | 30                   | 8.6°        | 2729 mm        | 8°                                     |

## 2.2 System geometry, dimensions in north-south direction



### Dimensions of base profiles

| Nominal length of<br>base profile | Protective layer | BP_L/2  | Area     |
|-----------------------------------|------------------|---------|----------|
| 150 mm                            | 195 mm           | 67.5 mm | 0.034 m² |
| 300 mm                            | 340 mm           | 140 mm  | 0.070 m² |
| 450 mm                            | 490 mm           | 215 mm  | 0.108 m² |
| 600 mm                            | 640 mm           | 290 mm  | 0.145 m² |
| 900 mm                            | 940 mm           | 440 mm  | 0.220 m² |
| 1200 mm                           | 1240 mm          | 590 mm  | 0.295 m² |

Grid dimensions, scale setting long connection channel

|       | Module length<br>min. | Module length<br>max. | Scale<br>Support on left | Scale<br>Support on the<br>right | D <sub>i</sub> |
|-------|-----------------------|-----------------------|--------------------------|----------------------------------|----------------|
| C1574 | 1555 mm               | 1558 mm               | 0                        | 0                                | 1577 mm        |
|       | 1559 mm               | 1563 mm               | 0                        | 5                                | 1582 mm        |
|       | 1564 mm               | 1568 mm               | 5                        | 5                                | 1587 mm        |
|       | 1569 mm               | 1573 mm               | 5                        | 10                               | 1592 mm        |
|       | 1574 mm               | 1578 mm               | 10                       | 10                               | 1597 mm        |
|       | 1579 mm               | 1583 mm               | 10                       | 15                               | 1602 mm        |
|       | 1584 mm               | 1588 mm               | 15                       | 15                               | 1607 mm        |
|       | 1589 mm               | 1593 mm               | 15                       | 20                               | 1612 mm        |
|       | 1594 mm               | 1598 mm               | 20                       | 20                               | 1617 mm        |
|       | 1599 mm               | 1603 mm               | 20                       | 25                               | 1622 mm        |
|       | 1604 mm               | 1608 mm               | 25                       | 25                               | 1627 mm        |
|       | 1609 mm               | 1613 mm               | 25                       | 30                               | 1632 mm        |
| C1639 | 1614 mm               | 1619 mm               | 30                       | 30                               | 1637 mm        |
|       | 1620 mm               | 1623 mm               | 0                        | 0                                | 1642 mm        |
|       | 1624 mm               | 1628 mm               | 0                        | 5                                | 1647 mm        |
|       | 1629 mm               | 1633 mm               | 5                        | 5                                | 1652 mm        |
|       | 1634 mm               | 1638 mm               | 5                        | 10                               | 1657 mm        |
|       | 1639 mm               | 1643 mm               | 10                       | 10                               | 1662 mm        |
|       | 1644 mm               | 1648 mm               | 10                       | 15                               | 1667 mm        |
|       | 1649 mm               | 1653 mm               | 15                       | 15                               | 1672 mm        |
|       | 1654 mm               | 1658 mm               | 15                       | 20                               | 1677 mm        |
|       | 1659 mm               | 1663 mm               | 20                       | 20                               | 1682 mm        |
|       | 1664 mm               | 1668 mm               | 20                       | 25                               | 1687 mm        |
|       | 1669 mm               | 1673 mm               | 25                       | 25                               | 1692 mm        |
| C1704 | 1674 mm               | 1678 mm               | 25                       | 30                               | 1697 mm        |
|       | 1679 mm               | 1684 mm               | 30                       | 30                               | 1702 mm        |
|       | 1685 mm               | 1688 mm               | 0                        | 0                                | 1707 mm        |
|       | 1689 mm               | 1693 mm               | 0                        | 5                                | 1712 mm        |
|       | 1694 mm               | 1698 mm               | 5                        | 5                                | 1717 mm        |
|       | 1699 mm               | 1703 mm               | 5                        | 10                               | 1722 mm        |
|       | 1704 mm               | 1708 mm               | 10                       | 10                               | 1727 mm        |
|       | 1709 mm               | 1713 mm               | 10                       | 15                               | 1732 mm        |
|       | 1714 mm               | 1718 mm               | 15                       | 15                               | 1737 mm        |
|       | 1719 mm               | 1723 mm               | 15                       | 20                               | 1742 mm        |
|       | 1724 mm               | 1728 mm               | 20                       | 20                               | 1747 mm        |
|       | 1729 mm               | 1733 mm               | 20                       | 25                               | 1752 mm        |
| C1769 | 1734 mm               | 1738 mm               | 25                       | 25                               | 1757 mm        |
|       | 1739 mm               | 1743 mm               | 25                       | 30                               | 1762 mm        |
|       | 1744 mm               | 1749 mm               | 30                       | 30                               | 1767 mm        |
|       | 1750 mm               | 1753 mm               | 0                        | 0                                | 1772 mm        |
|       | 1754 mm               | 1758 mm               | 0                        | 5                                | 1777 mm        |
|       | 1759 mm               | 1763 mm               | 5                        | 5                                | 1782 mm        |
|       | 1764 mm               | 1768 mm               | 5                        | 10                               | 1787 mm        |
|       | 1769 mm               | 1773 mm               | 10                       | 10                               | 1792 mm        |
|       | 1774 mm               | 1778 mm               | 10                       | 15                               | 1797 mm        |
|       | 1779 mm               | 1783 mm               | 15                       | 15                               | 1802 mm        |
|       | 1784 mm               | 1788 mm               | 15                       | 20                               | 1807 mm        |
|       | 1789 mm               | 1793 mm               | 20                       | 20                               | 1812 mm        |
|       | 1794 mm               | 1798 mm               | 20                       | 25                               | 1817 mm        |
|       | 1799 mm               | 1803 mm               | 25                       | 25                               | 1822 mm        |
|       | 1804 mm               | 1808 mm               | 25                       | 30                               | 1827 mm        |
|       | 1809 mm               | 1814 mm               | 30                       | 30                               | 1832 mm        |

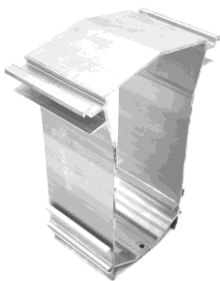
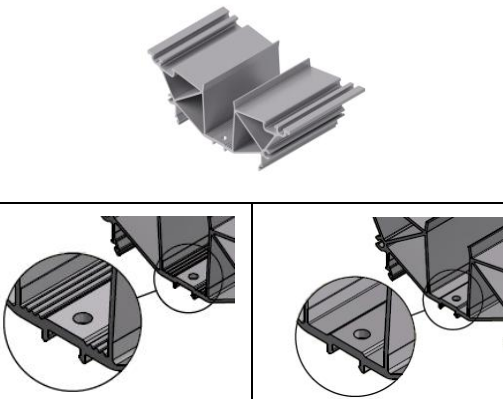


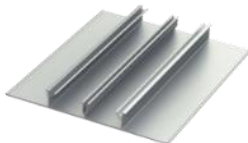
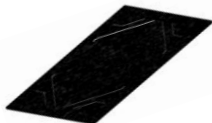
|       | Module length<br>min. | Module length<br>max. | Scale<br>Support on left | Scale<br>Support on the right | D <sub>i</sub> |
|-------|-----------------------|-----------------------|--------------------------|-------------------------------|----------------|
| C1834 | 1815 mm               | 1818 mm               | 0                        | 0                             | 1837 mm        |
|       | 1819 mm               | 1823 mm               | 0                        | 5                             | 1842 mm        |
|       | 1824 mm               | 1828 mm               | 5                        | 5                             | 1847 mm        |
|       | 1829 mm               | 1833 mm               | 5                        | 10                            | 1852 mm        |
|       | 1834 mm               | 1838 mm               | 10                       | 10                            | 1857 mm        |
|       | 1839 mm               | 1843 mm               | 10                       | 15                            | 1862 mm        |
|       | 1844 mm               | 1848 mm               | 15                       | 15                            | 1867 mm        |
|       | 1849 mm               | 1853 mm               | 15                       | 20                            | 1872 mm        |
|       | 1854 mm               | 1858 mm               | 20                       | 20                            | 1877 mm        |
|       | 1859 mm               | 1863 mm               | 20                       | 25                            | 1882 mm        |
|       | 1864 mm               | 1868 mm               | 25                       | 25                            | 1887 mm        |
|       | 1869 mm               | 1873 mm               | 25                       | 30                            | 1892 mm        |
|       | 1874 mm               | 1879 mm               | 30                       | 30                            | 1897 mm        |
| C1899 | 1880 mm               | 1883 mm               | 0                        | 0                             | 1902 mm        |
|       | 1884 mm               | 1888 mm               | 0                        | 5                             | 1907 mm        |
|       | 1889 mm               | 1893 mm               | 5                        | 5                             | 1912 mm        |
|       | 1894 mm               | 1898 mm               | 5                        | 10                            | 1917 mm        |
|       | 1899 mm               | 1903 mm               | 10                       | 10                            | 1922 mm        |
|       | 1904 mm               | 1908 mm               | 10                       | 15                            | 1927 mm        |
|       | 1909 mm               | 1913 mm               | 15                       | 15                            | 1932 mm        |
|       | 1914 mm               | 1918 mm               | 15                       | 20                            | 1937 mm        |
|       | 1919 mm               | 1923 mm               | 20                       | 20                            | 1942 mm        |
|       | 1924 mm               | 1928 mm               | 20                       | 25                            | 1947 mm        |
|       | 1929 mm               | 1933 mm               | 25                       | 25                            | 1952 mm        |
|       | 1934 mm               | 1938 mm               | 25                       | 30                            | 1957 mm        |
|       | 1939 mm               | 1944 mm               | 30                       | 30                            | 1962 mm        |
| C1964 | 1945 mm               | 1948 mm               | 0                        | 0                             | 1967 mm        |
|       | 1949 mm               | 1953 mm               | 0                        | 5                             | 1972 mm        |
|       | 1954 mm               | 1958 mm               | 5                        | 5                             | 1977 mm        |
|       | 1959 mm               | 1963 mm               | 5                        | 10                            | 1982 mm        |
|       | 1964 mm               | 1968 mm               | 10                       | 10                            | 1987 mm        |
|       | 1969 mm               | 1973 mm               | 10                       | 15                            | 1992 mm        |
|       | 1974 mm               | 1978 mm               | 15                       | 15                            | 1997 mm        |
|       | 1979 mm               | 1983 mm               | 15                       | 20                            | 2002 mm        |
|       | 1984 mm               | 1988 mm               | 20                       | 20                            | 2007 mm        |
|       | 1989 mm               | 1993 mm               | 20                       | 25                            | 2012 mm        |
|       | 1994 mm               | 1998 mm               | 25                       | 25                            | 2017 mm        |
|       | 1999 mm               | 2003 mm               | 25                       | 30                            | 2022 mm        |
|       | 2004 mm               | 2009 mm               | 30                       | 30                            | 2027 mm        |
| C2029 | 2010 mm               | 2013 mm               | 0                        | 0                             | 2032 mm        |
|       | 2014 mm               | 2018 mm               | 0                        | 5                             | 2037 mm        |
|       | 2019 mm               | 2023 mm               | 5                        | 5                             | 2042 mm        |
|       | 2024 mm               | 2028 mm               | 5                        | 10                            | 2047 mm        |
|       | 2029 mm               | 2033 mm               | 10                       | 10                            | 2052 mm        |
|       | 2034 mm               | 2038 mm               | 10                       | 15                            | 2057 mm        |
|       | 2039 mm               | 2043 mm               | 15                       | 15                            | 2062 mm        |
|       | 2044 mm               | 2048 mm               | 15                       | 20                            | 2067 mm        |
|       | 2049 mm               | 2053 mm               | 20                       | 20                            | 2072 mm        |
|       | 2054 mm               | 2058 mm               | 20                       | 25                            | 2077 mm        |
|       | 2059 mm               | 2063 mm               | 25                       | 25                            | 2082 mm        |
|       | 2064 mm               | 2068 mm               | 25                       | 30                            | 2087 mm        |
|       | 2069 mm               | 2074 mm               | 30                       | 30                            | 2092 mm        |



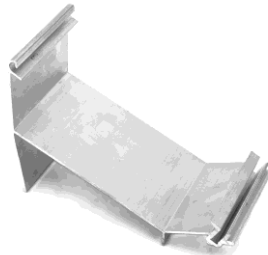
|       | Module length<br>min. | Module length<br>max. | Scale<br>Support on left | Scale<br>Support on the right | D <sub>i</sub> |
|-------|-----------------------|-----------------------|--------------------------|-------------------------------|----------------|
| C2094 | 2075 mm               | 2078 mm               | 0                        | 0                             | 2097 mm        |
|       | 2079 mm               | 2083 mm               | 0                        | 5                             | 2102 mm        |
|       | 2084 mm               | 2088 mm               | 5                        | 5                             | 2107 mm        |
|       | 2089 mm               | 2093 mm               | 5                        | 10                            | 2112 mm        |
|       | 2094 mm               | 2098 mm               | 10                       | 10                            | 2117 mm        |
|       | 2099 mm               | 2103 mm               | 10                       | 15                            | 2122 mm        |
|       | 2104 mm               | 2108 mm               | 15                       | 15                            | 2127 mm        |
|       | 2109 mm               | 2113 mm               | 15                       | 20                            | 2132 mm        |
|       | 2114 mm               | 2118 mm               | 20                       | 20                            | 2137 mm        |
|       | 2119 mm               | 2123 mm               | 20                       | 25                            | 2142 mm        |
|       | 2124 mm               | 2128 mm               | 25                       | 25                            | 2147 mm        |
|       | 2129 mm               | 2133 mm               | 25                       | 30                            | 2152 mm        |
|       | 2134 mm               | 2139 mm               | 30                       | 30                            | 2157 mm        |
| C2159 | 2140 mm               | 2143 mm               | 0                        | 0                             | 2162 mm        |
|       | 2144 mm               | 2148 mm               | 0                        | 5                             | 2167 mm        |
|       | 2149 mm               | 2153 mm               | 5                        | 5                             | 2172 mm        |
|       | 2154 mm               | 2158 mm               | 5                        | 10                            | 2177 mm        |
|       | 2159 mm               | 2163 mm               | 10                       | 10                            | 2182 mm        |
|       | 2164 mm               | 2168 mm               | 10                       | 15                            | 2187 mm        |
|       | 2169 mm               | 2173 mm               | 15                       | 15                            | 2192 mm        |
|       | 2174 mm               | 2178 mm               | 15                       | 20                            | 2197 mm        |
|       | 2179 mm               | 2183 mm               | 20                       | 20                            | 2202 mm        |
|       | 2184 mm               | 2188 mm               | 20                       | 25                            | 2207 mm        |
|       | 2189 mm               | 2193 mm               | 25                       | 25                            | 2212 mm        |
|       | 2194 mm               | 2198 mm               | 25                       | 30                            | 2217 mm        |
|       | 2199 mm               | 2204 mm               | 30                       | 30                            | 2222 mm        |
| C2224 | 2205 mm               | 2208 mm               | 0                        | 0                             | 2227 mm        |
|       | 2209 mm               | 2213 mm               | 0                        | 5                             | 2232 mm        |
|       | 2214 mm               | 2218 mm               | 5                        | 5                             | 2237 mm        |
|       | 2219 mm               | 2223 mm               | 5                        | 10                            | 2242 mm        |
|       | 2224 mm               | 2228 mm               | 10                       | 10                            | 2247 mm        |
|       | 2229 mm               | 2233 mm               | 10                       | 15                            | 2252 mm        |
|       | 2234 mm               | 2238 mm               | 15                       | 15                            | 2257 mm        |
|       | 2239 mm               | 2243 mm               | 15                       | 20                            | 2262 mm        |
|       | 2244 mm               | 2248 mm               | 20                       | 20                            | 2267 mm        |
|       | 2249 mm               | 2253 mm               | 20                       | 25                            | 2272 mm        |
|       | 2254 mm               | 2258 mm               | 25                       | 25                            | 2277 mm        |
|       | 2259 mm               | 2263 mm               | 25                       | 30                            | 2282 mm        |
|       | 2264 mm               | 2269 mm               | 30                       | 30                            | 2287 mm        |
| C2289 | 2270 mm               | 2273 mm               | 0                        | 0                             | 2292 mm        |
|       | 2274 mm               | 2278 mm               | 0                        | 5                             | 2297 mm        |
|       | 2279 mm               | 2283 mm               | 5                        | 5                             | 2302 mm        |
|       | 2284 mm               | 2288 mm               | 5                        | 10                            | 2307 mm        |
|       | 2289 mm               | 2293 mm               | 10                       | 10                            | 2312 mm        |
|       | 2294 mm               | 2298 mm               | 10                       | 15                            | 2317 mm        |
|       | 2299 mm               | 2303 mm               | 15                       | 15                            | 2322 mm        |
|       | 2304 mm               | 2308 mm               | 15                       | 20                            | 2327 mm        |
|       | 2309 mm               | 2313 mm               | 20                       | 20                            | 2332 mm        |
|       | 2314 mm               | 2318 mm               | 20                       | 25                            | 2337 mm        |
|       | 2319 mm               | 2323 mm               | 25                       | 25                            | 2342 mm        |
|       | 2324 mm               | 2328 mm               | 25                       | 30                            | 2347 mm        |
|       | 2329 mm               | 2334 mm               | 30                       | 30                            | 2352 mm        |
| C2354 | 2335 mm               | 2338 mm               | 0                        | 0                             | 2357 mm        |
|       | 2339 mm               | 2343 mm               | 0                        | 5                             | 2362 mm        |
|       | 2344 mm               | 2348 mm               | 5                        | 5                             | 2367 mm        |
|       | 2349 mm               | 2353 mm               | 5                        | 10                            | 2372 mm        |
|       | 2354 mm               | 2358 mm               | 10                       | 10                            | 2377 mm        |
|       | 2359 mm               | 2363 mm               | 10                       | 15                            | 2382 mm        |
|       | 2364 mm               | 2368 mm               | 15                       | 15                            | 2387 mm        |
|       | 2369 mm               | 2373 mm               | 15                       | 20                            | 2392 mm        |
|       | 2374 mm               | 2378 mm               | 20                       | 20                            | 2397 mm        |
|       | 2379 mm               | 2383 mm               | 20                       | 25                            | 2402 mm        |
|       | 2384 mm               | 2388 mm               | 25                       | 25                            | 2407 mm        |
|       | 2389 mm               | 2393 mm               | 25                       | 30                            | 2412 mm        |
|       | 2394 mm               | 2399 mm               | 30                       | 30                            | 2417 mm        |

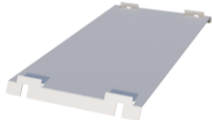
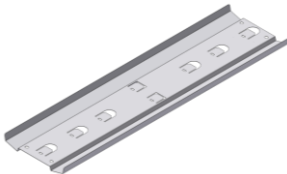
### 3 Components

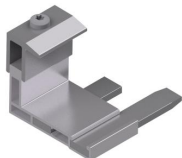
| Description  | Support high                                                                      | Support                                                                            | Support        | Support middle high                                                                 |
|--------------|-----------------------------------------------------------------------------------|------------------------------------------------------------------------------------|----------------|-------------------------------------------------------------------------------------|
| Designation  | MSP-FR-EW-SH90                                                                    | MSP-FR-EW-SL8                                                                      | MSP-FR-EW-SL10 | MSP-FR-EW-SMH90                                                                     |
| Illustration |  |  |                |  |
| Material     | EN AW-6063 T66<br>- EN 755-2                                                      | EN AW-6063 T66<br>- EN 755-2                                                       |                | EN AW-6063 T66<br>- EN 755-2                                                        |

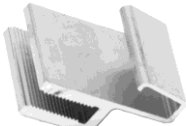
| Description  | Connection channel                                                                                                                                                                                                               |                                                                                                                                                                                                                                                     | Base profile                                                                                                          | Protective layer                                                                                          |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
| Designation  | MSP-FR-EW-C0230<br>MSP-FR-EW-C0400<br>MSP-FR-EW-C0566<br>MSP-FR-EW-C0666<br>MSP-FR-EW-C0625<br>MSP-FR-EW-C0725<br>MSP-FR-EW-C0935<br>MSP-FR-EW-C1000<br>MSP-FR-EW-C1065<br>MSP-FR-EW-C1131<br>MSP-FR-EW-C1197<br>MSP-FR-EW-C1262 | MSP-FR-EW-C1574<br>MSP-FR-EW-C1639<br>MSP-FR-EW-C1704<br>MSP-FR-EW-C1769<br>MSP-FR-EW-C1834<br>MSP-FR-EW-C1899<br>MSP-FR-EW-C1964<br>MSP-FR-EW-C2029<br>MSP-FR-EW-C2094<br>MSP-FR-EW-C2159<br>MSP-FR-EW-C2224<br>MSP-FR-EW-C2289<br>MSP-FR-EW-C2354 | MSP-FR-EW-BP 150<br>MSP-FR-EW-BP 300<br>MSP-FR-EW-BP 450<br>MSP-FR-EW-BP 600<br>MSP-FR-EW-BP 900<br>MSP-FR-EW-BP 1200 | MSP-FR-PSF 150<br>MSP-FR-PSF 300<br>MSP-FR-PSF 450<br>MSP-FR-PSF 600<br>MSP-FR-PSF 900<br>MSP-FR-PSF 1200 |
| Illustration |                                                                                                                                               |                                                                                                                                                                                                                                                     |                                   |                      |
| Material     | EN AW-6063 T66<br>- EN 755-2                                                                                                                                                                                                     |                                                                                                                                                                                                                                                     | EN AW-6063 T66<br>- EN 755-2                                                                                          | PES fleece 500 g/m <sup>2</sup><br>3-4 mm thick, slotted                                                  |

| Description  | Screw                                                                             | Screw                                                                             | Screw                                                                               |
|--------------|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Designation  | MSP-FR-S<br>M6 x 16                                                               | MSP-FR-TS<br>6.3 x 20 R (lightning current capable connection)                    | MSP-FR-GS<br>6 x 60                                                                 |
| Illustration |  |  |  |
| Material     | Carbon steel /<br>ZnNi-coated >10 µm                                              | Carbon steel /<br>ZnNi-coated >10 µm                                              | Carbon steel /<br>ZnNi-coated >10 µm                                                |

| Description  | Wind deflector / Ballast tray                                                                                                                                                                                                                                                                            | Wind deflector adapter                                                                |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Designation  | MSP-FR-S-WD 1620-1684<br>MSP-FR-S-WD 1685-1749<br>MSP-FR-S-WD 1750-1814<br>MSP-FR-S-WD 1815-1879<br>MSP-FR-S-WD 1880-1944<br>MSP-FR-S-WD 1945-2009<br>MSP-FR-S-WD 2010-2074<br>MSP-FR-S-WD 2010-2074<br>MSP-FR-S-WD 2140-2204<br>MSP-FR-S-WD 2205-2269<br>MSP-FR-S-WD 2270-2334<br>MSP-FR-S-WD 2335-2399 | MSP-FR-EW-WDA                                                                         |
| Illustration |                                                                                                                                                                                                                       |  |
| Material     | S320GD + ZM250                                                                                                                                                                                                                                                                                           | EN AW-6063 T66<br>- EN 755-2                                                          |

| Description  | Ballast tray holder                                                                                                                    | Ballast tray clamp                                                                  | Ballast tray start plate                                                             | Ballast fixation                                                                      |
|--------------|----------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Designation  | MSP-FR-BT 1620-1749<br>MSP-FR-BT 1750-1879<br>MSP-FR-BT 1880-2009<br>MSP-FR-BT 2010-2139<br>MSP-FR-BT 2140-2269<br>MSP-FR-BT 2270-2399 | MPS-FR-BC                                                                           | MSP-FR-EW-BS                                                                         | MSP-FR-BF                                                                             |
| Illustration |                                                     |  |  |  |
| Material     | S320GD + ZM250                                                                                                                         | Spring strip steel sheet<br>1.4404                                                  | S320GD + ZM250                                                                       | S320GD + ZM250                                                                        |

| Description         | End clamp                                                                                                                                                                                                    | Middle clamp                                                                                                                     | Complementary clamp low                                                                                            |
|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------|
| <b>Designation</b>  | MSP-PR-EC<br>MSP-PR-ECG<br>MSP-PR-ECB<br>MSP-PR-ECBG<br><br>DIBt approval:<br>abZ-14.4-926                                                                                                                   | MSP-PR-MC<br>MSP-PR-MCG<br>MSP-PR-MCB<br>MSP-PR-MCBG<br><br>DIBt approval:<br>abZ-14.4-926                                       | MSP-FR-LC<br>MSP-FR-LCB                                                                                            |
| <b>Illustration</b> |                                                                                                                             |                                                 |                                 |
| <b>Material</b>     | <u>Clamp</u><br>EN AW-6063<br>T66 - EN 755-2<br><br><u>Screw</u><br>A2-70 - ISO 3506-1<br><br><u>Lock washer</u><br>PE-HD or PVC<br><br><u>Nut</u><br>A4-70 - ISO 3506-2                                     | <u>Clamp</u><br>EN AW-6063<br>T66 - EN 755-2<br><br><u>Screw</u><br>A2-70 - ISO 3506-1<br><br><u>Lock washer</u><br>PE-HD or PVC | <u>Clamp</u><br>EN AW-6063<br>T66 - EN 755-2<br><br><u>Screw</u><br>A2-70 - ISO 3506-1<br><br><u>O-ring</u><br>NBR |
| <b>Note</b>         | For a centre support for modules with a height of more than 30 mm, use the MSP-FR-HC or MSP-FR-HCB complementary clamp high. The load capacity corresponds to that of the MSP-FR-LC complementary clamp low. |                                                                                                                                  |                                                                                                                    |

| Description         | Cable holder with edge-clip                                                         | Cable holder clip                                                                   | Connection channel clip                                                              | Optimizer clamp 33mm                                                                  |
|---------------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| <b>Designation</b>  | MSP-FR-CHE                                                                          | MSP-FR-CH                                                                           | MSP-FR-C-CL                                                                          | MSP-FR-OC33                                                                           |
| <b>Illustration</b> |  |  |  |  |
| <b>Material</b>     | PA6.6<br>UV resistant                                                               | PA6.6<br>UV resistant                                                               | EN AW-6060 T66<br>- EN 755-2                                                         | Stainless spring steel<br>1.4310                                                      |

### 4 Rated resistances of components and connections

In order to verify the resistance values of MSP-FR flat roof systems, the values of each component must be taken into account individually.

By the customer:

- Load-bearing capacity of the roof
- Compressive strength of the thermal insulation
- Static friction between the roof waterproofing and the protective layer
- Design value of the module according to the manufacturer's specifications

According to this data sheet:

- Support MSP-FR-EW-SL8/SL10
- Support high MSP-FR-EW-SH
- Support middle high MSP-FR-EW-SMH
- Connection channel MSP-FR-EW-C
- Ballast tray holder MSP-FR-BT
- End clamp MSP-PR-EC/-ECB/-ECG/-ECBG
- Middle clamp MSP-PR-MC/-MCG/-MCB/-MCBG
- Complementary clamp low MSP-FR-LC/-LCB

The component with the lowest resistance is relevant for dimensioning.

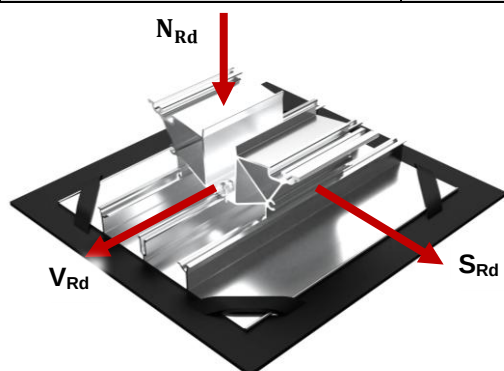
All resistances are calculated in accordance with the following standards and guidelines:

- DIN EN 1990 (EC1)
- DIN EN 1993-1-1 (EC3)
- DIN EN 1999-1-1 (EC9)
- VDI 2230 Sheet 1
- DIBt approval: German Institute for Building Technology ( ) abZ Z-14.4-926

The resistance values only apply if the complete MSP-FR-EW system from Schweizer is used and the installation is carried out in accordance with the MSP-FR-EW PV mounting system MSP flat roof east-west installation instructions.

#### 4.1 Resistance values for the MSP-FR-EW-SL8/SL10 support

|                        |                |                |
|------------------------|----------------|----------------|
| Compressive resistance | $N_{Rd}$ in kN | 3.75           |
| Tensile resistance     | $N_{Rd}$ in kN | -5.20          |
| Shear resistance       | $V_{Rd}$ in kN | $\pm 1.95$     |
| Shear resistance       | $S_{Rd}$ in kN | +1.95<br>-0.24 |



1 : Vectors of the resistances of MSP-FR-EW-SL8/SL10

#### 4.2 Resistances of the supports MSP-FR-EW-SH 90 and MSP-FR-EW-SMH90

|                      |                |       |
|----------------------|----------------|-------|
| Compressive strength | $N_{Rd}$ in kN | 6.79  |
| Tensile resistance   | $N_{Rd}$ in kN | -9.74 |
| Shear resistance     | $S_{Rd}$ in kN | 0.46  |

|                      |                |      |
|----------------------|----------------|------|
| Compressive strength | $N_{Rd}$ in kN | 6.39 |
| Tensile strength     | $N_{Rd}$ in kN | 5.42 |
| Shear resistance     | $S_{Rd}$ in kN | 0.22 |

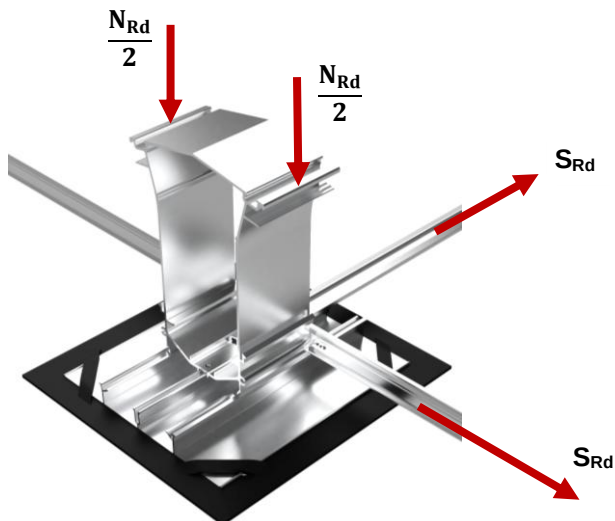


Fig.2 : Vectors of the resistances of MSP-FR-EW-SH90

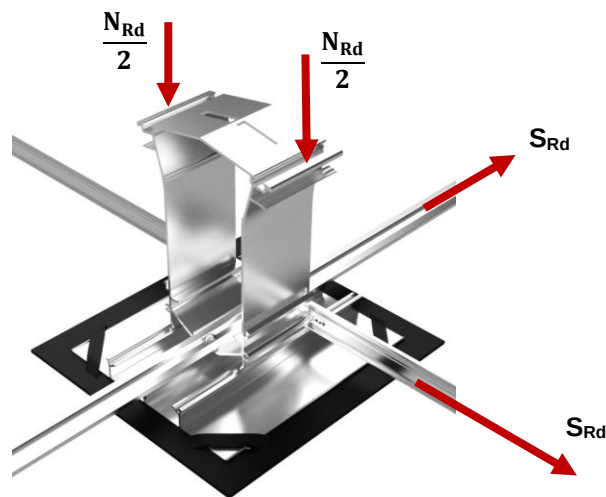


Fig.3 : Vectors of the resistances of MSP-FR-EW-SMH90

#### 4.3 Rated resistance of the MSP-FR-EW-C connection channel (triangular arrangement)

The following resistances apply to double connection channel MSP-FR-EW-C, even when using ballast fixation MSP-FR-BF.

| Module width range   | mm             | 950-1010 | 1011-1075 | 1076-1140 | 1141-1205 | 1206-1270 | 1271-1335 |
|----------------------|----------------|----------|-----------|-----------|-----------|-----------|-----------|
| Compressive strength | $N_{Rd}$ in kN | 0.77     | 0.67      | 0.59      | 0.53      | 0.47      | 0.4       |

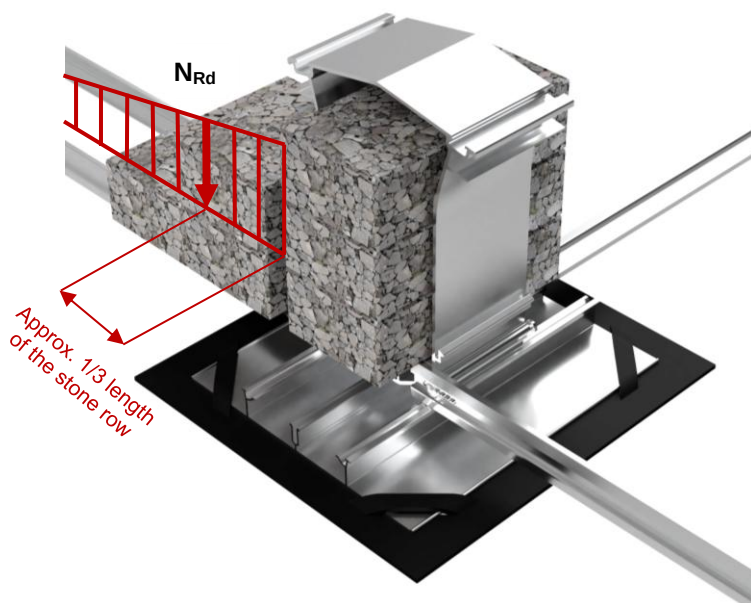


Fig.4 : Resistance vectors of MSP-FR-EW-C and MSP-FR-BF



#### 4.4 Design resistance of the ballast tray holder pair MSP-FR-BT (stiffened connection channels)

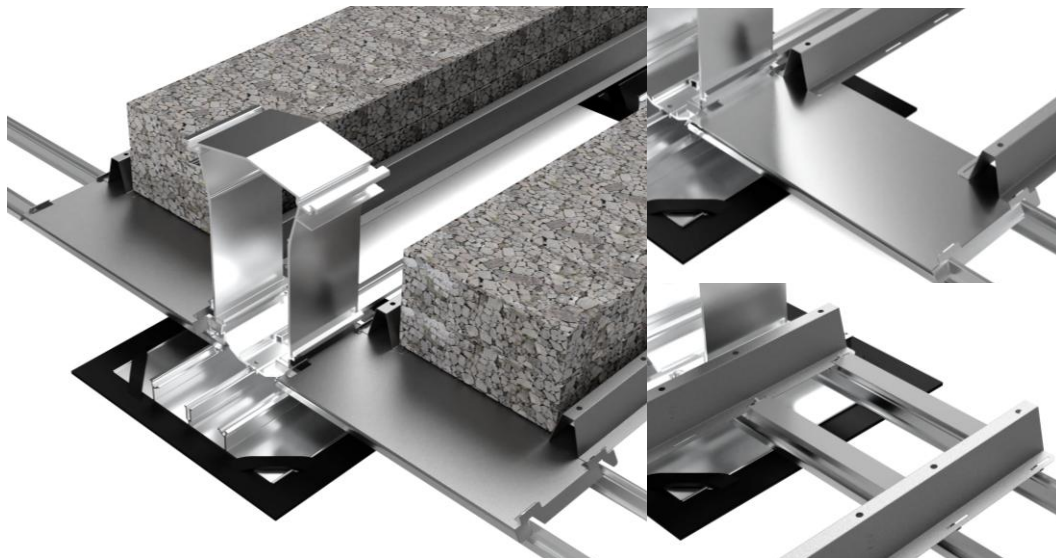


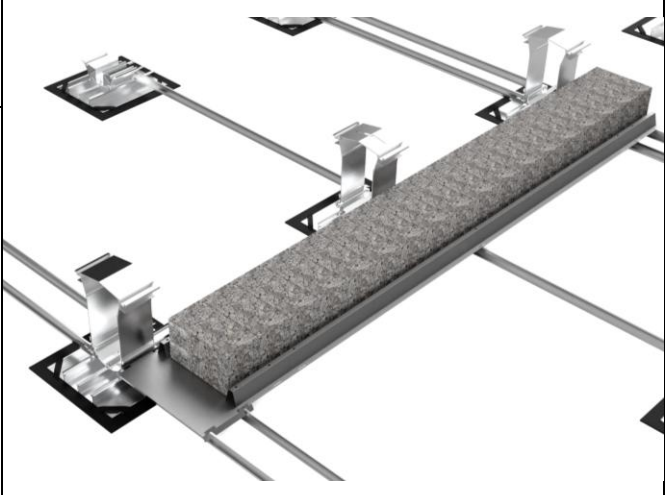
Fig.5 : Reinforcement of the connection channels

#### 4.5 Load capacity Pair of ballast tray holder MSP-FR-BT without middle support

| Module width range                    | mm             | 950-1010 | 1011-1075 | 1076-1140 | 1141-1205 | 1206-1270 | 1271-1335 |
|---------------------------------------|----------------|----------|-----------|-----------|-----------|-----------|-----------|
| Pressure resistance<br>(two supports) | $N_{Rd}$ in kN | 1.12     | 1.04      | 0.96      | 0.9       | 0.86      | 0.82      |

*The load capacities are limited by the load-bearing capacity of the connection channels.*

#### 4.6 Load capacity of ballast support pair MSP-FR-BT with middle support

|                                          |                |          |                                                                                      |
|------------------------------------------|----------------|----------|--------------------------------------------------------------------------------------|
| Module width range                       | mm             | 950-1335 |  |
| Compressive strength<br>(three supports) | $N_{Rd}$ in kN | 1.16     |                                                                                      |

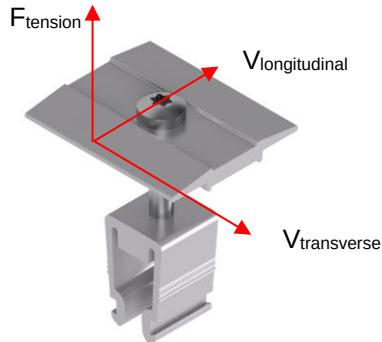
*The load capacity is limited by the load-bearing capacity of the ballast tray holder.*



#### 4.7 Rated resistance of the MSP-PR-MC/G & MSP-PR-MCB/G middle clamps

Rated load capacity of the middle clamp in accordance with abZ Z-14.4-926.

|                               |                                 |      |
|-------------------------------|---------------------------------|------|
| Rated resistance to tension   | $F_{\text{tension}}$ in kN      | 6.14 |
| Rated resistance transverse   | $V_{\text{transverse}}$ in kN   | 2.2  |
| Rated resistance longitudinal | $V_{\text{longitudinal}}$ in kN | 2.04 |



6 : Resistance vectors of the middle clamp

#### 4.8 Rated resistances of the MSP-PR-EC/G & MSP-PR-ECB/G end clamps

Rated load capacity of the end clamp in accordance with abZ Z-14.4-926.

|                               |                                 |      |
|-------------------------------|---------------------------------|------|
| Rated resistance to tension   | $F_{\text{tension}}$ in kN      | 3.76 |
| Rated resistance transverse   | $V_{\text{transverse}}$ in kN   | 1.3  |
| Rated resistance longitudinal | $V_{\text{longitudinal}}$ in kN | 1.93 |

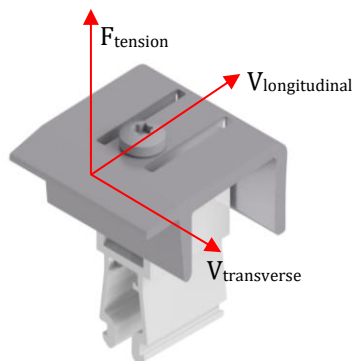
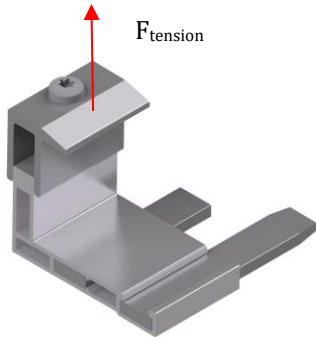


Fig.7 : Vectors of the resistance of the end clamp

#### 4.9 Rated resistances of the complementary clamp low MSP-FR-LC/B

Rated value of the load capacity of the complementary clamp low.

|                             |                            |      |
|-----------------------------|----------------------------|------|
| Rated resistance to tension | $F_{\text{tension}}$ in kN | 1.89 |
|-----------------------------|----------------------------|------|



8 : Vectors of the resistance of the complementary clamp low