

Solar systems from Schweizer



Data sheet PV Mounting System

Flat roof south MSP-FR-S



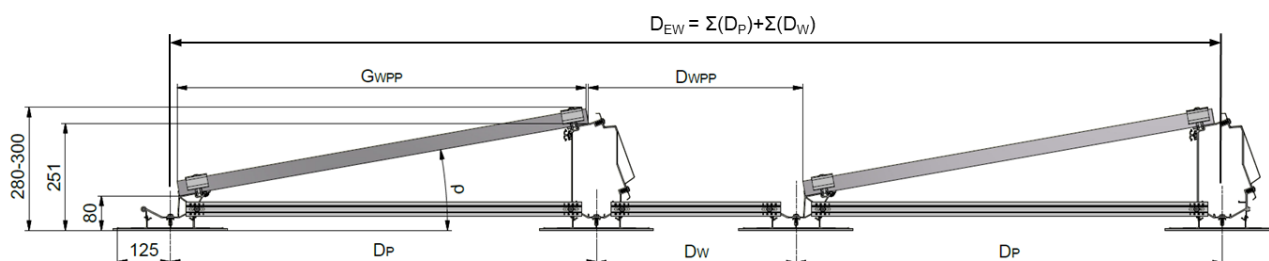
1 Requirements for the roof

Inclination	$\leq 3.0^\circ$
Unevenness	$\leq +2.5^\circ, \leq -2.5^\circ, \leq \pm 1.25^\circ$
Sealing material	TPO/FPO, PVC, EVA, ASA, PVC-P, ECB, PIB, concrete, bitumen
Friction coefficient	0,3 to 0,8 (Standard values in SPT, determine object-related for other material components)
Insulation material	EPS/XPS, mineral wool, PUR, PIR, foam glass
Resistance to continuous pressure	$\geq$ approx. 10 kN/m ² (depending on boundary conditions)

2 System properties

Block size max.	14,0 m x 14,0 m
Block size min.	No general restriction (depending on wind load)
System height	280 – 300 mm
Ground clearance	80 mm
Edge distance min.	1500 mm (standard), 500 mm with increased wind force coefficients
Inclination angle of the module	$8^\circ - 10^\circ$ (depending on module width)
Module width	950 mm – 1335 mm
Module length	1620 mm – 2399 mm
Module height	28 mm – 45 mm
Ballast width	100 mm
Ballast length	200 mm
Ballast height	40 mm – 80 mm

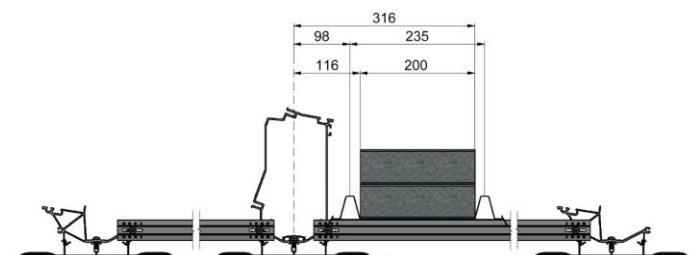
2.1 System geometry, dimensions in north-south direction



Footpath dimensions

Article	Scale	D _W	D _{WPP}	Shading angle	Scale
MSP-FR-C 300-360	15	301 mm	336 mm	26°	15
MSP-FR-C 470-530	15	471 mm	506 mm	18°	15
MSP-FR-C 950-1010	15	1006 mm	1041 mm	9°	15

Ballast tray holders dimensions



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Dimension gable, grid adjustment connection channel

Tilt angle nominal 10°

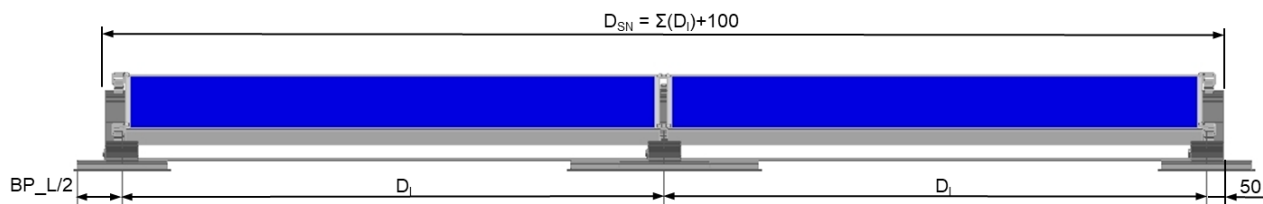
	Module width min.	Module width max.	Scale support high	Scale support low	Inclination	D _P
950 - 1010 mm	950 mm	951 mm	0	0	10.3°	976 mm
	952 mm	956 mm	0	5	10.3°	981 mm
	957 mm	961 mm	5	5	10.2°	986 mm
	962 mm	966 mm	5	10	10.1°	991 mm
	967 mm	971 mm	10	10	10.1°	996 mm
	972 mm	976 mm	10	15	10.0°	1001 mm
	977 mm	981 mm	15	15	10.0°	1006 mm
	982 mm	986 mm	15	20	9.9°	1011 mm
	987 mm	990 mm	20	20	9.9°	1016 mm
	991 mm	995 mm	20	25	9.8°	1021 mm
	996 mm	1000 mm	25	25	9.8°	1026 mm
1011 - 1075 mm	1001 mm	1005 mm	25	30	9.7°	1031 mm
	1006 mm	1010 mm	30	30	9.6°	1036 mm
	1011 mm	1015 mm	0	0	9.6°	1042 mm
	1016 mm	1020 mm	0	5	9.5°	1047 mm
	1021 mm	1025 mm	5	5	9.5°	1052 mm
	1026 mm	1030 mm	5	10	9.4°	1057 mm
	1031 mm	1035 mm	10	10	9.4°	1062 mm
	1036 mm	1040 mm	10	15	9.3°	1067 mm
	1041 mm	1045 mm	15	15	9.3°	1072 mm
	1046 mm	1050 mm	15	20	9.2°	1077 mm
	1051 mm	1055 mm	20	20	9.2°	1082 mm
	1056 mm	1060 mm	20	25	9.2°	1087 mm
	1061 mm	1065 mm	25	25	9.1°	1092 mm
	1066 mm	1070 mm	25	30	9.1°	1097 mm
	1071 mm	1075 mm	30	30	9.0°	1102 mm

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Tilt angle nominal 8°

	Module width min.	Module width max.	Scale support high	Scale support low	Inclination	D _p MSP-FR-S
1076 - 1140 mm	1076 mm	1080 mm	0	0	9.1°	1107 mm
	1081 mm	1085 mm	0	5	9.0°	1112 mm
	1086 mm	1090 mm	5	5	9.0°	1117 mm
	1091 mm	1095 mm	5	10	8.9°	1122 mm
	1096 mm	1100 mm	10	10	8.9°	1127 mm
	1101 mm	1105 mm	10	15	8.8°	1132 mm
	1106 mm	1110 mm	15	15	8.8°	1137 mm
	1111 mm	1115 mm	15	20	8.8°	1142 mm
	1116 mm	1120 mm	20	20	8.7°	1147 mm
	1121 mm	1125 mm	20	25	8.7°	1152 mm
	1126 mm	1130 mm	25	25	8.6°	1157 mm
	1131 mm	1135 mm	25	30	8.6°	1162 mm
1141 - 1205 mm	1136 mm	1140 mm	30	30	8.6°	1167 mm
	1141 mm	1145 mm	0	0	8.5°	1173 mm
	1146 mm	1150 mm	0	5	8.5°	1178 mm
	1151 mm	1155 mm	5	5	8.4°	1183 mm
	1156 mm	1160 mm	5	10	8.4°	1188 mm
	1161 mm	1165 mm	10	10	8.3°	1193 mm
	1166 mm	1170 mm	10	15	8.3°	1198 mm
	1171 mm	1175 mm	15	15	8.3°	1203 mm
	1176 mm	1180 mm	15	20	8.2°	1208 mm
	1181 mm	1185 mm	20	20	8.2°	1213 mm
	1186 mm	1190 mm	20	25	8.2°	1218 mm
	1191 mm	1195 mm	25	25	8.1°	1223 mm
1206 - 1270 mm	1196 mm	1200 mm	25	30	8.1°	1228 mm
	1201 mm	1205 mm	30	30	8.1°	1233 mm
	1206 mm	1210 mm	0	0	8.0°	1239 mm
	1211 mm	1215 mm	0	5	8.0°	1244 mm
	1216 mm	1220 mm	5	5	7.9°	1249 mm
	1221 mm	1225 mm	5	10	7.9°	1254 mm
	1226 mm	1230 mm	10	10	7.9°	1259 mm
	1231 mm	1235 mm	10	15	7.8°	1264 mm
	1236 mm	1240 mm	15	15	7.8°	1269 mm
	1241 mm	1245 mm	15	20	7.8°	1274 mm
	1246 mm	1250 mm	20	20	7.7°	1279 mm
	1251 mm	1255 mm	20	25	7.7°	1284 mm
1271 - 1335 mm	1256 mm	1260 mm	25	25	7.7°	1289 mm
	1261 mm	1265 mm	25	30	7.6°	1294 mm
	1266 mm	1270 mm	30	30	7.6°	1299 mm
	1271 mm	1275 mm	0	0	7.6°	1305 mm
	1276 mm	1280 mm	0	5	7.5°	1310 mm
	1281 mm	1285 mm	5	5	7.5°	1315 mm
	1286 mm	1290 mm	5	10	7.5°	1320 mm
	1291 mm	1295 mm	10	10	7.4°	1325 mm
	1296 mm	1300 mm	10	15	7.4°	1330 mm
	1301 mm	1305 mm	15	15	7.4°	1335 mm
	1306 mm	1310 mm	15	20	7.4°	1340 mm
	1311 mm	1315 mm	20	20	7.3°	1345 mm
	1316 mm	1320 mm	20	25	7.3°	1350 mm
	1321 mm	1325 mm	25	25	7.3°	1355 mm
	1326 mm	1330 mm	25	30	7.2°	1360 mm
	1331 mm	1335 mm	30	30	7.2°	1365 mm

2.2 System geometry, dimensions in east-west direction



Dimension base profiles

Nominal length base profile	BP L/2	Surface area
150 mm	67,5 mm	0,034 m ²
300 mm	140 mm	0,070 m ²
450 mm	215 mm	0,108 m ²
600 mm	290 mm	0,145 m ²
900 mm	440 mm	0,220 m ²
1200 mm	590 mm	0,295 m ²

Grid dimension, scale setting Wind deflectors and connection channels if necessary

	Module length min.	Module length max.	Scale support left	Scale support right	D _i
1620 - 1684 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
1685 - 1749 mm	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
1750 - 1814 mm	1729 mm	1733 mm	20	25	1752 mm
	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
1815 - 1879 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

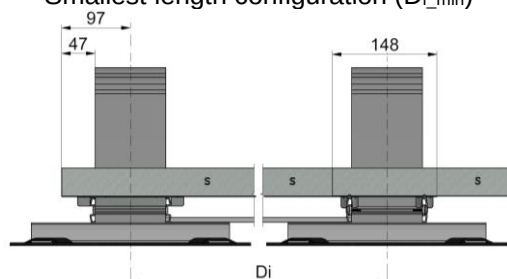
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	Module length min.	Module length max.	Scale support left	Scale support right	D _i
1815 - 1879 mm	1815 mm	1818 mm	0	0	1837 mm
	1819 mm	1823 mm	0	5	1842 mm
	1824 mm	1828 mm	5	5	1847 mm
	1829 mm	1833 mm	5	10	1852 mm
	1834 mm	1838 mm	10	10	1857 mm
	1839 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
1880 - 1944 mm	1874 mm	1879 mm	30	30	1897 mm
	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
1945 - 2009 mm	1934 mm	1938 mm	25	30	1957 mm
	1939 mm	1944 mm	30	30	1962 mm
	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
2010 - 2074 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
	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
2075 - 2139 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
	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

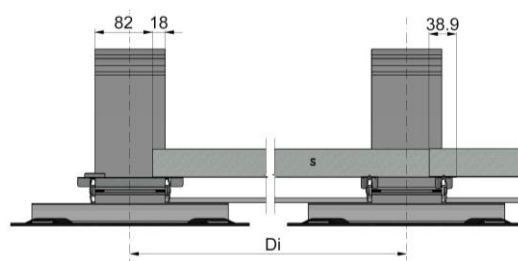
	Module length min.	Module length max.	Scale support left	Scale support right	D _i
2140 - 2204 mm	2140 mm	2143 mm	0	0	2162 mm
	2144 mm	2148 mm	0	5	2167 mm
	2149 mm	2153 mm	5	5	2172 mm
	2154 mm	2158 mm	5	10	2177 mm
	2159 mm	2163 mm	10	10	2182 mm
	2164 mm	2168 mm	10	15	2187 mm
	2169 mm	2173 mm	15	15	2192 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
2205 - 2269 mm	2199 mm	2204 mm	30	30	2222 mm
	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
2270 - 2334 mm	2259 mm	2263 mm	25	30	2282 mm
	2264 mm	2269 mm	30	30	2287 mm
	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
2335 - 2399 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
	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

Ballast tray holders dimensions

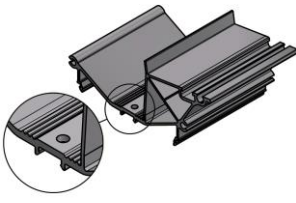
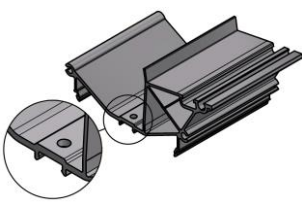
Smallest length configuration (D_{i_min})

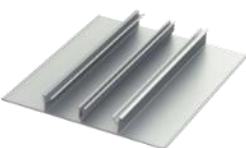


Largest length configuration (D_{i_max})

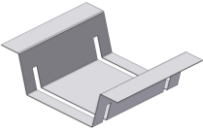


3 Components

Description	Support high	Support low	Support low
Designation	MSP-FR-S-SH	MSP-FR-S-SL8	MSP-FR-S-SL10
Illustration			
Material	EN AW-6063 T66 - EN 755-2	EN AW-6063 T66 - EN 755-2	EN AW-6063 T66 - EN 755-2

Description	Connection channel crosswise	Connection channel longitudinally	Base profile
Designation	MSP-FR-EW-C 300-360 MSP-FR-EW-C 470-530 MSP-FR-EW-C 950-1010 MSP-FR-EW-C 1011-1075 MSP-FR-EW-C 1076-1140 MSP-FR-EW-C 1141-1205 MSP-FR-EW-C 1206-1270 MSP-FR-EW-C 1271-1335	MSP-FR-EW-C 1555-1619 MSP-FR-EW-C 1620-1684 MSP-FR-EW-C 1685-1749 MSP-FR-EW-C 1750-1814 MSP-FR-EW-C 1815-1879 MSP-FR-EW-C 1880-1944 MSP-FR-EW-C 1945-2009 MSP-FR-EW-C 2010-2074 MSP-FR-EW-C 2075-2139 MSP-FR-EW-C 2140-2204 MSP-FR-EW-C 2205-2269 MSP-FR-EW-C 2270-2334 MSP-FR-EW-C 2335-2399	MSP-FR-EW-BP 150 MSP-FR-EW-BP 300 MSP-FR-EW-BP 450 MSP-FR-EW-BP 600 MSP-FR-EW-BP 900 MSP-FR-EW-BP 1200
Illustration			
Material	EN AW-6063 T66 - EN 755-2	EN AW-6063 T66 - EN 755-2	EN AW-6060 T66 - EN 755-2

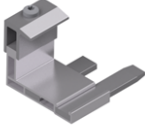
Data sheet PV-Mounting system Flat roof south MSP-FR-S

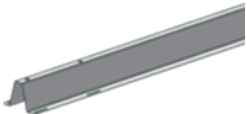
Description	Protective layer	Wind deflector / Ballast tray*	Ballast tray holder 
Designation	MSP-FR-PSF 150 MSP-FR-PSF 300 MSP-FR-PSF 450 MSP-FR-PSF 600 MSP-FR-PSF 900 MSP-FR-PSF 1200	MSP-FR-S-WD 1620-1684* MSP-FR-S-WD 1685-1749* MSP-FR-S-WD 1750-1814* MSP-FR-S-WD 1815-1879 MSP-FR-S-WD 1880-1944 MSP-FR-S-WD 1945-2009 MSP-FR-S-WD 2010-2074 MSP-FR-S-WD 2075-2139 MSP-FR-S-WD 2140-2204 MSP-FR-S-WD 2205-2269 MSP-FR-S-WD 2270-2334 MSP-FR-S-WD 2335-2399	MSP-FR-S-SB
Illustration			
Material	PES-fleece 450 g/m ² 3-4mm thick, slitted	Aluminium EN AW-5005 H14	Sheet steel SVZ/ZM coated

Description	Cable holder with edge-clip		
Designation	MSP-FR-CHE		
Illustration			
Material	PA66 UV-resistant		

Description	Screw	Screw	Screw
Designation	MSP-FR-S M6x16	MSP-FR-TS 6,3 x 22 (lightning current capable connection)	MSP-FR-GS earthing screw 6 x 60
Illustration			
Material	Coated steel ZnNi >10 µm	Stainless steel V2A >10 µm	Coated steel ZnNi >10 µm

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Description	End clamp	Middle clamp	Complementary clamp high	Complementary clamp low
Designation	MSP-PR-EC 28-45 mm MSP-PR-ECB 28-45mm Approval by DIBt: abZ-14.4-92	MSP-PR-MC 28-45m MSP-PR-MCG 28-45mm MSP-PR-MCB 28-45mm MSP-PR-MCBG 28-45mm Approval by DIBt: abZ-14.4-92	MSP-FR-HC 28-40mm  MSP-FR-HCB 28-40mm 	MSP-FR-LC 28-40mm  MSP-FR-LCB28-40mm 
Illustration				
Material	<u>Clamp</u> EN AW-6063 T66 - EN 755-2 <u>Screw</u> A2-70 - ISO 3506-1 <u>Safety washer</u> PE-HD or PVC <u>Nut</u> A4-70 - ISO 3506-2	<u>Clamp</u> EN AW-6063 T66 - EN 755-2 <u>Screw</u> A2-70 - ISO 3506-1 <u>Safety washer</u> PE-HD or PVC	<u>Clamp</u> EN AW-6063 T66 - EN 755-2 <u>Screw</u> A2-70 - ISO 3506-1 <u>O-Ring</u> NBR	<u>Clamp</u> EN AW-6063 T66 - EN 755-2 <u>Screw</u> A2-70 - ISO 3506-1 <u>O-Ring</u> NBR

Description	Ballast tray holder	Ballast tray clamp	Ballast carrier start plate	
Designation	MSP-FR-BT 1620-1749  MSP-FR-BT 1750-1879  MSP-FR-BT 1880-2009  MSP-FR-BT 2010-2139  MSP-FR-BT 2140-2269  MSP-FR-BT 2270-2399 	MPS-FR-BC 	MSP-FR-EW-BS 	
Illustration				
Material	Galvanized sheet steel ZM	Spring stainless steel	Galvanized sheet steel ZM	

4 Rated resistance of the components (limit state of load-bearing capacity)

In order to verify the resistance values of flat roof systems of type MSP-FR, the values of each component must be considered individually:

– 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 manufacturer's specifications	– by the customer
– Support low MSP-FR-EW-SL8/SL10 – Support high MSP-FR-EW-SH – Connection channel MSP-FR-EW-C – Ballast tray and wind deflector MSP-FR-S-WD – Ballast tray holder MSP-FR-BT – Middle/ end clamp MSP-PR-MCG/MCB/EC/ECB – Complementary clamp MSP-FR-HC/-HCB/-LC/-LCB	– according to this data sheet

The component with the lowest resistance values is relevant for the design.

All resistances are calculated according to 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
- Approval by DIBt: abZ Z-14.4-926

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

4.1 Resistances of the support low MSP-FR-S-SL8/SL10

Pressure resistance	N_{Rd} in kN	3,75
Tension resistance	N_{Rd} in kN	-1,97
Shear resistance	V_{Rd} in kN	$\pm 1,95$
Shear resistance	S_{Rd} in kN	+1,95 -0,24

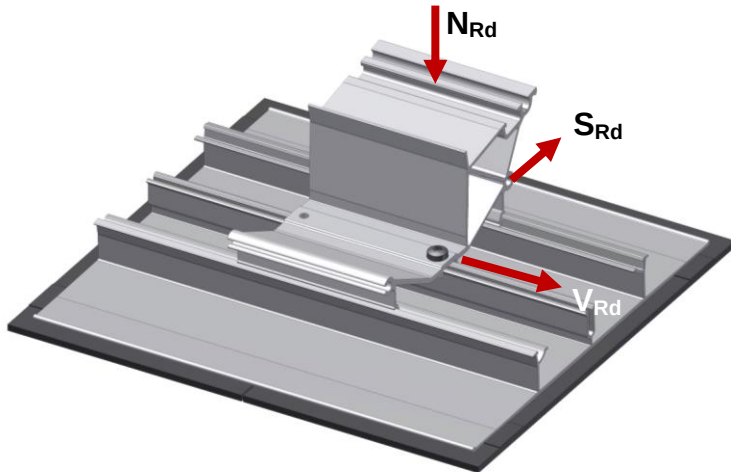


Fig. 1: Vectors of the rated resistances of MSP-FR-S-SL8/SL10

4.2 Resistances of the support high MSP-FR-S-SH

Pressure resistance	N_{Rd} in kN	3,75
Tension resistance	N_{Rd} in kN	-4,08
Shear resistance	V_{Rd} in kN	$\pm 1,95$
Shear resistance	S_{Rd} in kN	$\pm 1,95$

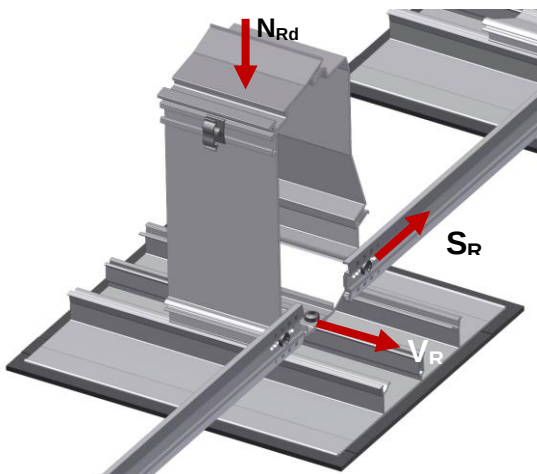


Fig. 2: Vectors of the rated resistances MSP-FR-S-SH

4.3 Resistance of the connection channel MSP-FR-EW-C (triangular arrangement)

The following resistances apply to the double channel

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

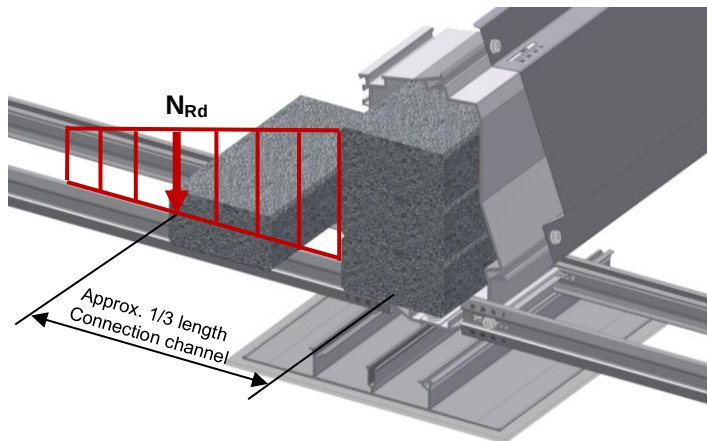


Fig. 3: Vectors of resistance of MSP-FR-EW-C

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

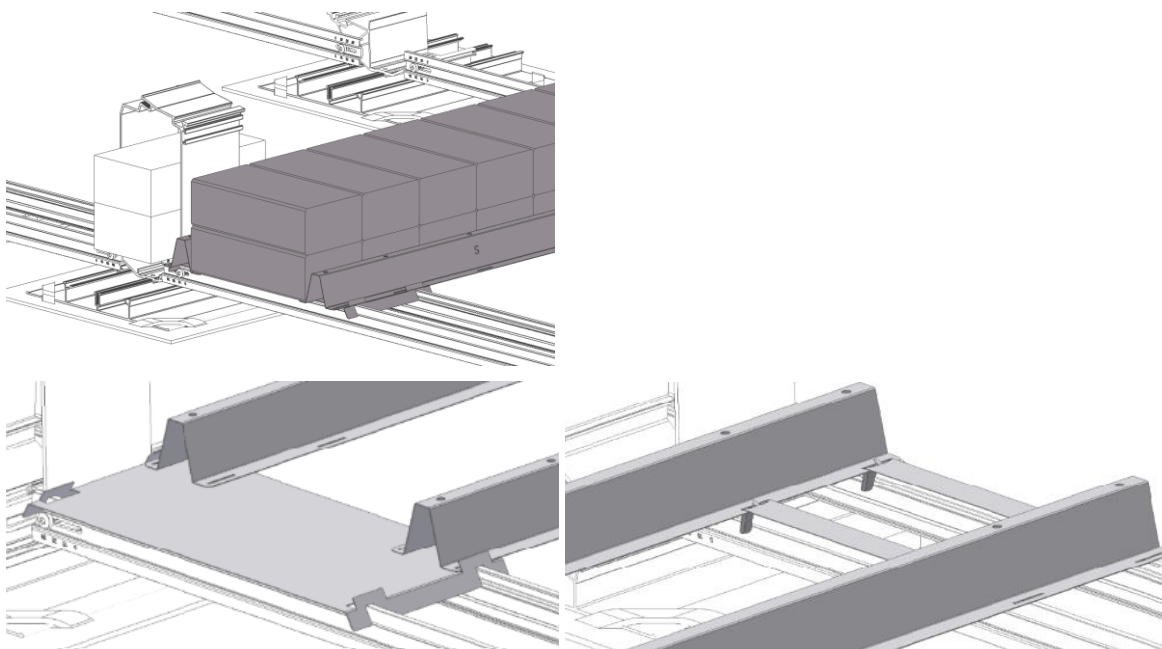


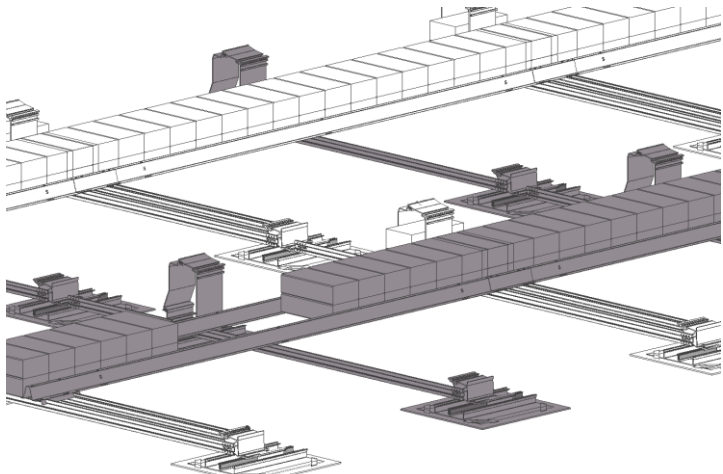
Fig. 4: Stiffening of the connection channels

4.4.1. Load capacity ballast tray holder pair without centre support

Module width range	mm	950-1010	1011-1075	1076-1140	1141-1205	1206-1270	1271-1335
Pressure resistance (two supports)	N_{Rd} in kN	1.12	1.04	0.96	0.90	0.86	0.82

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

4.4.2. Load capacity ballast tray holder pair MSP-FR-BT with centre support

Module width range	mm	950-1335	
Pressure resistance (two supports)	N_{Rd} in kN	1.16	

Support is divided between 3 to 4 connection channels. Maximum given by ballast trays.
Without middle clamp.

4.5 Permissible load on the wind deflector / ballast tray MSP-FR-S-WD

4.5.1. Fastening of all lengths

Tension resistance	N_{Rk} in kN	0,80
Shear resistance	V_{Rk} in kN	$\pm 0,80$

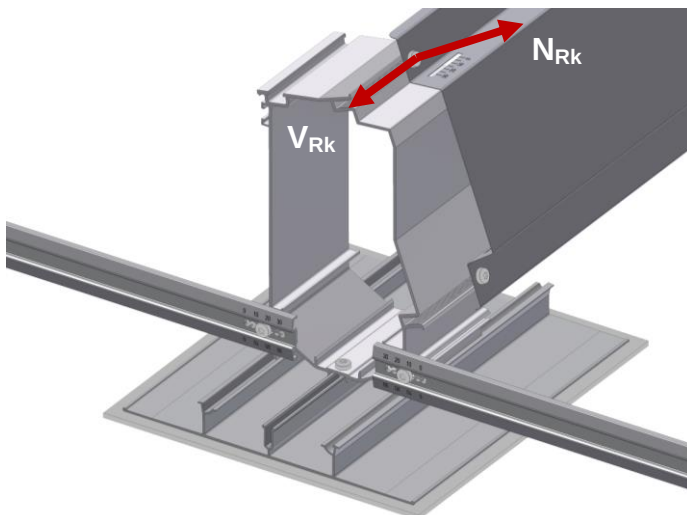


Fig. 1: Vectors of the rated resistances for the fastening of the wind deflector MSP-FR-S-WD

4.5.2. Use as a ballast tray up to module lengths of 1814 mm

Module length range		1620-1684	1695-1749	1750-1814
Pressure resistance	N_{Rd} in kN	0,49	0,49	0,39
Tension resistance	N_{Rd} in kN	-0,49	-0,49	-0,39

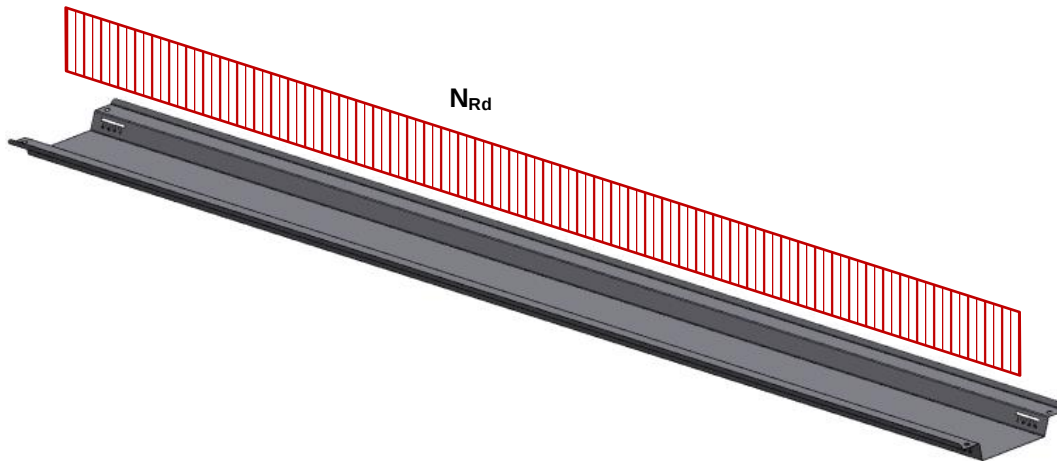
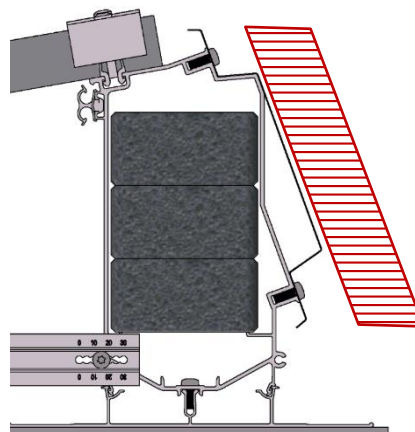


Fig. 6: Illustration of the load effect on the ballast tray MSP-FR-S-WD

4.5.3. Characteristic pressure resistance for module lengths from 1815mm to 2399mm

Note: Test based determination at 15 mm deflection for use without central support (no rattling on module).

Module length range	Pressure resistance q_p in kPa
1815-1879	2
1880-1944	1.8
1945-2009	1.6
2010-2074	1.4
2075-2139	1.2
2140-2204	1.05
2205-2269	0.9
2270-2334	0.75
2335-2399	0.6



4.6 Rated resistances of the middle clamp MSP-PR-MC/G & MSP-PR-MCB/G

Rated value of the load-bearing capacity of the middle clamp
MSP-PR-MC/G & MSP-PR-MCB/G according to abZ Z-14.4-926

Rated resistance	F_{tension} in kN	-6.14
Rated resistance	$V_{\text{crosswise}}$ in kN	2.20
Rated resistance	$V_{\text{longitudinally}}$ in kN	2.04

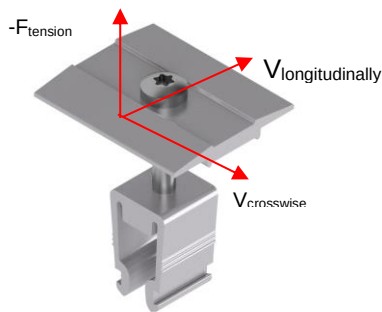


Fig. 6: Vectors of resistance of the middle clamp MSP-PR-MC/G & MSP-PR-MCB/G

4.7 Rated resistances of the end clamp MSP-PR-EC/B

Rated value of the load-bearing capacity of the end clamp
MSP-PR-EC/B according to abZ Z-14.4-926

Rated resistance	F_{tension} in kN	-3.76
Rated resistance	$V_{\text{crosswise}}$ in kN	1.33
Rated resistance	$V_{\text{longitudinally}}$ in kN	1.93

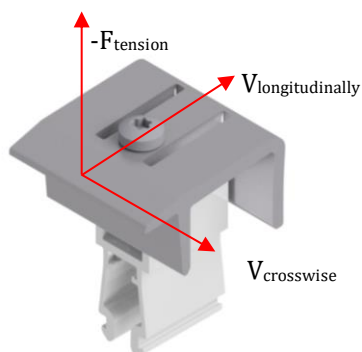


Fig. 8: Vectors of resistance of the end clamp MSP-PR-EC/B

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

Rated value of the load-bearing capacity of the complementary clamp low MSP-FR-LC/B

Rated resistance	F_{tension} in kN	1.89
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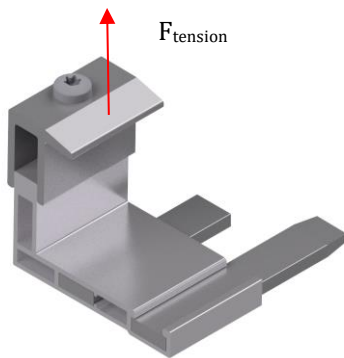


Fig. 8: Vectors of resistance of the complementary clamp low MSP-FR-LC/B

4.9 Rated resistances of the complementary clamp high MSP-FR-HC/B

Rated value of the load-bearing capacity of the complementary clamp high MSP-FR-HC/B

Rated resistance	F_{tension} in kN	1.89
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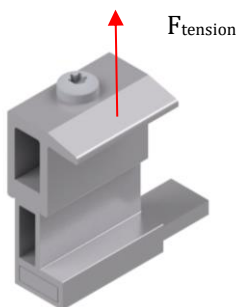


Fig. 10: Vectors of resistance of the complementary clamp high MSP-FR-HC/B