

Restricted
Document no.: 0078-6490 V00
26 September 2018

Site specific performance specification

V120-2.0/2.2MW 50Hz

ISM 18-1298 - Tricarico, IT



Table of contents

1	General description	2
2	Power curve conditions.....	2
3	V120-2.0 MW, Performance	3
4	V120-2.2 MW, Performance	5

Recipient acknowledges that (i) this Specification is provided for recipient's information only, and, does not create or constitute a warranty, guarantee, promise, commitment, or other representation (Commitment) by Vestas Wind Systems or any of its affiliated or subsidiary companies (Vestas), all of which are disclaimed by Vestas and (ii) any and all Commitments by Vestas to recipient as to this general specification (or any of the contents herein) are to be contained exclusively in signed written contracts between recipient and Vestas, and not within this document.

See general reservations, notes, and disclaimers to this document is included in General Specification: 0063-8103

1 General description

The Vestas V120-2.0/2.2 MW wind turbines are pitch-regulated upwind turbines with active yaw, gearbox, and a three-blade rotor. Both turbines have a rotor diameter of 120 m with a generator rated at 2.0/2.2 MW. The turbines utilise a microprocessor pitch control system called OptiTip® and the OptiSpeed™ (variable speed) feature. With these features, the wind turbines are able to operate the rotor at variable speed (rpm), helping to maintain output at or near rated power.

General performance data for this turbine variant are available in the General specification document: 0063-8103

2 Power curve conditions

The power- and Ct curves are given with the conditions stated in the General specification 0063-8103 and in Table 1 below.

Conditions for power curve (at hub height)	
Wind shear	0.00-0.30 (10 minute average)
Turbulence intensity	6-12% (10 minute average)
Blades	Clean
Rain	No
Ice/snow on blades	No
Leading edge	No damage
Terrain	IEC 61400-12-1
Inflow angle (vertical)	0 ±2°

Table 1: Conditions for power curve

3 V120-2.0 MW, Performance

Power Curve														
Wind m/s	Air density kg/m ³													
	1.225	0.950	0.975	1.000	1.025	1.050	1.075	1.100	1.125	1.150	1.175	1.200	1.250	1.275
3.0	34	22	23	24	25	26	27	28	29	30	31	33	35	36
3.5	102	73	76	78	81	84	86	89	91	94	96	99	104	107
4.0	186	140	144	149	153	157	161	165	170	174	178	182	190	194
4.5	285	218	224	230	236	243	249	255	261	267	273	279	291	297
5.0	398	307	315	324	332	340	349	357	365	374	382	390	407	415
5.5	522	412	424	435	446	457	468	479	490	500	508	515	525	528
6.0	683	532	544	557	569	582	596	610	624	638	653	668	698	712
6.5	882	679	698	716	735	753	772	790	809	827	845	864	900	918
7.0	1108	859	882	905	928	951	973	996	1019	1041	1064	1086	1131	1153
7.5	1356	1061	1088	1116	1143	1170	1197	1224	1251	1278	1304	1330	1381	1406
8.0	1596	1277	1308	1338	1369	1399	1428	1456	1485	1514	1541	1568	1622	1648
8.5	1820	1498	1530	1562	1594	1626	1655	1684	1713	1742	1768	1794	1843	1866
9.0	1962	1717	1748	1779	1810	1841	1862	1883	1905	1926	1938	1950	1969	1976
9.5	1996	1898	1916	1934	1952	1970	1975	1980	1985	1990	1992	1994	1997	1998
10.0	2000	1984	1987	1990	1993	1996	1997	1998	1999	1999	1999	2000	2000	2000
10.5	2000	1998	1999	1999	1999	2000	2000	2000	2000	2000	2000	2000	2000	2000
11.0	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
11.5	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
12.0	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
12.5	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
13.0	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000
13.5	2000	1999	1999	1999	1999	1999	1999	1999	1999	1999	2000	2000	2000	2000
14.0	1995	1992	1993	1993	1993	1994	1994	1994	1994	1994	1995	1995	1996	1996
14.5	1984	1978	1979	1979	1980	1980	1981	1982	1982	1983	1983	1984	1985	1985
15.0	1967	1959	1960	1960	1961	1962	1962	1963	1964	1965	1966	1966	1968	1968
15.5	1945	1937	1938	1938	1939	1940	1941	1941	1942	1943	1944	1944	1946	1947
16.0	1926	1919	1920	1920	1921	1921	1922	1922	1923	1924	1924	1925	1926	1927
16.5	1911	1907	1907	1908	1908	1908	1909	1909	1910	1910	1910	1911	1912	1912
17.0	1904	1902	1902	1902	1902	1902	1902	1903	1903	1903	1903	1903	1904	1904
17.5	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
18.0	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900

Table 2: V120-2.0 MW mode 0, power curve

Thrust coefficient														
Wind m/s	Air density kg/m ³													
	1.225	0.950	0.975	1.000	1.025	1.050	1.075	1.100	1.125	1.150	1.175	1.200	1.250	1.275
3.0	0.930	0.940	0.939	0.938	0.937	0.936	0.935	0.934	0.934	0.933	0.932	0.931	0.929	0.928
3.5	0.902	0.905	0.905	0.904	0.904	0.904	0.904	0.903	0.903	0.902	0.902	0.902	0.901	0.901
4.0	0.888	0.895	0.894	0.894	0.893	0.892	0.892	0.891	0.891	0.890	0.889	0.889	0.887	0.886
4.5	0.873	0.882	0.881	0.880	0.879	0.878	0.877	0.876	0.876	0.875	0.874	0.874	0.873	0.872
5.0	0.866	0.873	0.873	0.872	0.871	0.871	0.870	0.869	0.868	0.868	0.867	0.866	0.865	0.864
5.5	0.858	0.871	0.870	0.869	0.868	0.867	0.867	0.866	0.865	0.864	0.862	0.860	0.857	0.856
6.0	0.863	0.866	0.865	0.865	0.864	0.863	0.862	0.861	0.861	0.860	0.861	0.862	0.862	0.861
6.5	0.853	0.865	0.864	0.863	0.862	0.860	0.859	0.858	0.857	0.856	0.855	0.854	0.851	0.850
7.0	0.836	0.852	0.850	0.849	0.848	0.846	0.845	0.843	0.842	0.840	0.839	0.837	0.834	0.833
7.5	0.807	0.839	0.837	0.834	0.832	0.829	0.826	0.824	0.821	0.818	0.814	0.811	0.804	0.801
8.0	0.747	0.803	0.798	0.794	0.789	0.784	0.778	0.773	0.768	0.763	0.757	0.752	0.741	0.736
8.5	0.671	0.743	0.737	0.730	0.724	0.717	0.711	0.704	0.698	0.692	0.685	0.678	0.664	0.657
9.0	0.578	0.678	0.671	0.663	0.656	0.648	0.639	0.630	0.620	0.611	0.600	0.589	0.568	0.557
9.5	0.479	0.609	0.597	0.586	0.575	0.564	0.551	0.538	0.526	0.513	0.502	0.491	0.469	0.459
10.0	0.399	0.524	0.511	0.497	0.484	0.470	0.459	0.448	0.437	0.426	0.417	0.408	0.390	0.382
10.5	0.337	0.440	0.429	0.417	0.406	0.395	0.386	0.377	0.368	0.359	0.352	0.344	0.330	0.324
11.0	0.289	0.373	0.364	0.355	0.345	0.336	0.329	0.321	0.314	0.307	0.301	0.295	0.283	0.278
11.5	0.250	0.321	0.313	0.305	0.298	0.290	0.284	0.278	0.272	0.266	0.261	0.255	0.246	0.241
12.0	0.219	0.279	0.272	0.266	0.259	0.253	0.248	0.243	0.237	0.232	0.228	0.223	0.215	0.211
12.5	0.193	0.245	0.239	0.233	0.228	0.222	0.218	0.213	0.209	0.205	0.201	0.197	0.190	0.187
13.0	0.172	0.216	0.211	0.207	0.202	0.197	0.193	0.189	0.185	0.182	0.178	0.175	0.169	0.166
13.5	0.154	0.193	0.189	0.185	0.181	0.177	0.173	0.170	0.166	0.163	0.160	0.157	0.152	0.149
14.0	0.138	0.173	0.169	0.165	0.161	0.158	0.155	0.152	0.149	0.146	0.143	0.141	0.136	0.134
14.5	0.124	0.154	0.151	0.148	0.144	0.141	0.139	0.136	0.133	0.131	0.128	0.126	0.122	0.120
15.0	0.111	0.137	0.134	0.132	0.129	0.126	0.124	0.121	0.119	0.117	0.115	0.113	0.109	0.107
15.5	0.100	0.123	0.121	0.118	0.116	0.113	0.111	0.109	0.107	0.105	0.103	0.101	0.098	0.097
16.0	0.090	0.111	0.109	0.107	0.104	0.102	0.100	0.098	0.097	0.095	0.093	0.092	0.089	0.087
16.5	0.082	0.101	0.099	0.097	0.095	0.093	0.091	0.090	0.088	0.086	0.085	0.084	0.081	0.080
17.0	0.075	0.093	0.091	0.089	0.087	0.085	0.084	0.082	0.081	0.079	0.078	0.077	0.074	0.073
17.5	0.070	0.085	0.084	0.082	0.080	0.079	0.077	0.076	0.074	0.073	0.072	0.071	0.069	0.068
18.0	0.065	0.079	0.077	0.076	0.074	0.073	0.072	0.070	0.069	0.068	0.067	0.066	0.064	0.063

Table 3: V120-2.0 MW mode 0, Ct values

4 V120-2.2 MW, Performance

Power Curve														
Wind m/s	Air density kg/m ³													
	1.225	0.950	0.975	1.000	1.025	1.050	1.075	1.100	1.125	1.150	1.175	1.200	1.250	1.275
3.0	34	22	23	24	25	26	27	28	29	30	31	33	35	36
3.5	102	73	76	78	81	84	86	89	91	94	96	99	104	107
4.0	186	140	144	149	153	157	161	165	170	174	178	182	190	194
4.5	285	218	224	230	236	243	249	255	261	267	273	279	291	297
5.0	398	307	315	324	332	340	349	357	365	374	382	390	407	415
5.5	522	412	424	435	446	457	468	479	490	500	508	515	525	528
6.0	684	532	544	557	569	582	596	610	623	637	653	668	698	712
6.5	882	679	698	716	735	753	772	790	809	827	845	864	900	918
7.0	1109	859	882	905	928	951	973	996	1019	1041	1064	1086	1131	1153
7.5	1355	1061	1088	1116	1143	1171	1197	1224	1251	1278	1303	1329	1381	1406
8.0	1595	1277	1308	1338	1368	1399	1428	1456	1485	1514	1541	1568	1622	1648
8.5	1824	1498	1530	1562	1594	1625	1655	1684	1714	1743	1770	1797	1849	1874
9.0	2017	1718	1750	1782	1815	1847	1874	1902	1929	1956	1977	1997	2034	2051
9.5	2130	1916	1942	1969	1996	2022	2040	2058	2077	2095	2107	2118	2139	2147
10.0	2182	2067	2084	2100	2117	2134	2142	2150	2159	2167	2172	2177	2185	2188
10.5	2198	2153	2160	2167	2174	2181	2184	2188	2192	2195	2196	2197	2198	2198
11.0	2200	2190	2192	2194	2196	2198	2198	2199	2199	2200	2200	2200	2200	2200
11.5	2200	2199	2199	2199	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200
12.0	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200
12.5	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200
13.0	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200	2200
13.5	2200	2199	2199	2199	2199	2199	2199	2199	2199	2199	2199	2200	2200	2200
14.0	2195	2192	2192	2192	2192	2192	2193	2193	2194	2194	2194	2195	2195	2195
14.5	2183	2176	2177	2177	2178	2179	2179	2180	2180	2181	2182	2182	2183	2184
15.0	2164	2155	2155	2156	2157	2158	2159	2159	2160	2161	2162	2163	2164	2165
15.5	2140	2130	2131	2132	2133	2134	2134	2135	2136	2137	2138	2139	2140	2141
16.0	2117	2109	2110	2111	2111	2112	2113	2113	2114	2115	2116	2116	2118	2119
16.5	2101	2096	2096	2097	2097	2098	2098	2099	2099	2100	2100	2100	2102	2102
17.0	2092	2090	2090	2090	2090	2090	2091	2091	2091	2091	2092	2092	2093	2093
17.5	2087	2086	2086	2086	2086	2086	2087	2087	2087	2087	2087	2087	2087	2088
18.0	2086	2086	2086	2086	2086	2086	2086	2086	2086	2086	2086	2086	2086	2086

Table 4: V120-2.2 MW Power mode 4, power curve

Thrust coefficient														
Wind m/s	Air density kg/m ³													
	1.225	0.950	0.975	1.000	1.025	1.050	1.075	1.100	1.125	1.150	1.175	1.200	1.250	1.275
3.0	0.930	0.940	0.939	0.938	0.937	0.936	0.935	0.934	0.934	0.933	0.932	0.931	0.929	0.928
3.5	0.902	0.905	0.905	0.904	0.904	0.904	0.904	0.903	0.903	0.902	0.902	0.902	0.901	0.901
4.0	0.888	0.895	0.894	0.894	0.893	0.892	0.892	0.891	0.891	0.890	0.889	0.889	0.887	0.886
4.5	0.873	0.882	0.881	0.880	0.879	0.878	0.877	0.877	0.876	0.875	0.874	0.874	0.873	0.872
5.0	0.866	0.873	0.872	0.872	0.871	0.871	0.870	0.869	0.868	0.868	0.867	0.866	0.865	0.864
5.5	0.857	0.871	0.870	0.869	0.868	0.867	0.867	0.866	0.865	0.864	0.862	0.860	0.856	0.855
6.0	0.863	0.866	0.865	0.864	0.863	0.863	0.862	0.861	0.860	0.860	0.861	0.862	0.862	0.861
6.5	0.853	0.865	0.864	0.863	0.862	0.860	0.859	0.858	0.857	0.856	0.855	0.854	0.851	0.850
7.0	0.836	0.852	0.850	0.849	0.848	0.846	0.845	0.844	0.842	0.841	0.839	0.838	0.835	0.833
7.5	0.808	0.840	0.837	0.834	0.832	0.829	0.826	0.823	0.820	0.817	0.814	0.811	0.804	0.801
8.0	0.746	0.803	0.799	0.794	0.789	0.784	0.779	0.773	0.768	0.763	0.757	0.752	0.741	0.736
8.5	0.673	0.743	0.737	0.730	0.724	0.717	0.711	0.705	0.699	0.692	0.686	0.680	0.667	0.660
9.0	0.597	0.679	0.672	0.665	0.658	0.651	0.644	0.636	0.629	0.622	0.613	0.605	0.588	0.580
9.5	0.515	0.615	0.606	0.597	0.589	0.580	0.571	0.562	0.552	0.543	0.534	0.524	0.506	0.496
10.0	0.437	0.548	0.538	0.527	0.517	0.506	0.496	0.486	0.475	0.465	0.456	0.447	0.429	0.421
10.5	0.371	0.478	0.467	0.456	0.445	0.434	0.424	0.415	0.405	0.396	0.388	0.379	0.364	0.356
11.0	0.317	0.412	0.402	0.392	0.381	0.371	0.363	0.355	0.346	0.338	0.331	0.324	0.311	0.305
11.5	0.274	0.354	0.346	0.337	0.328	0.319	0.312	0.305	0.299	0.292	0.286	0.280	0.269	0.264
12.0	0.239	0.307	0.300	0.292	0.285	0.278	0.272	0.266	0.260	0.254	0.249	0.244	0.235	0.231
12.5	0.211	0.269	0.262	0.256	0.250	0.244	0.239	0.234	0.229	0.224	0.219	0.215	0.207	0.203
13.0	0.187	0.237	0.232	0.226	0.221	0.216	0.211	0.207	0.202	0.198	0.194	0.191	0.184	0.180
13.5	0.168	0.212	0.207	0.202	0.198	0.193	0.189	0.185	0.181	0.177	0.174	0.171	0.165	0.162
14.0	0.150	0.189	0.185	0.180	0.176	0.172	0.169	0.165	0.162	0.159	0.156	0.153	0.148	0.145
14.5	0.135	0.168	0.165	0.161	0.157	0.154	0.151	0.148	0.145	0.142	0.140	0.137	0.132	0.130
15.0	0.120	0.150	0.147	0.143	0.140	0.137	0.134	0.132	0.129	0.127	0.125	0.122	0.118	0.116
15.5	0.108	0.134	0.131	0.129	0.126	0.123	0.121	0.118	0.116	0.114	0.112	0.110	0.106	0.105
16.0	0.098	0.121	0.118	0.116	0.113	0.111	0.109	0.107	0.105	0.103	0.101	0.099	0.096	0.094
16.5	0.089	0.110	0.108	0.105	0.103	0.101	0.099	0.097	0.095	0.093	0.092	0.090	0.087	0.086
17.0	0.081	0.100	0.098	0.096	0.094	0.092	0.091	0.089	0.087	0.086	0.084	0.083	0.080	0.079
17.5	0.075	0.092	0.090	0.089	0.087	0.085	0.083	0.082	0.080	0.079	0.078	0.076	0.074	0.073
18.0	0.070	0.085	0.084	0.082	0.080	0.079	0.077	0.076	0.074	0.073	0.072	0.071	0.068	0.067

Table 5: V120-2.2 MW Power mode 4, Ct values

Sound Power Level at Hub Height	
Measurement standard:	IEC 61400-11 3 rd edition. 2012
Max. turbulence at 10 meter height:	16%
Inflow angle (vertical):	0 ±2°
Air density:	1.225 kg/m ³
Wind Shear	0.0-0.4 (10 minute average)
Wind Speed at Hub Height [m/s]	Maximum LwA [dB(A)] (with optional STE ¹)
3.0	98.2
4.0	97.9
5.0	99.4
6.0	102.8
7.0	104.9
8.0	107.0
9.0	107.7
10.0	107.7
11.0	107.7
12.0	107.7
13.0	107.7
14.0	107.7
15.0	107.7
16.0	107.7
17.0	107.7
18.0	107.7

Table 6 - Sound power level at hub height: V120-2.0/2.2 MW

¹ Serrated Trailing Edge is an optional aero add-on for V120 blades