



# TCZ F200St

## System Description

Reference: TCZ / F200 / TECH / 2017 / 001

banedanmark





Nr	OCL System parameters	TCZ F200St	TSI interoperability reference
1.	<b>TYPE</b>	TCZ F200	
2.	<b>Design speed</b>		
3.	Maximum line speed	200 km/h	
4.	<b>Temperature Range</b>	-30°C to +60°C	
5.	<b>Life Span</b>	50 years <sup>ii</sup>	
6.	<b>Electrical Parameters</b>		
7.	Electrical voltage	25 kV	TSI ENE §4.2.3
8.	Frequency	50 Hz AC	
9.	Permissible continuous rating	880 A	
10.	Phase Separation	According to EN50367:2012 Annex A.1  Dynamic performance of the installed Short neutral section §A.1.3 shall be documented by the project/infrastructure manager.	TSI ENE §4.2.15
11.	Insulator minimum creepage distance	1000 mm	
12.	Booster transformer spacing	3000 m ± 300 m	
13.	Lightening Surge arrester	Installed at cable crimp connectors, feed points and at transition from one insulation level to another.	
14.	<b>Pantograph</b>		
15.	Number Operating	2 5 (Existing Operation)	TSI ENE §4.2.13 BN2-74



16.	Profile and Width	<p>DS/EN 50367:2012 Annex A.2 Profiles for interoperable pantograph head</p> <p>1600 mm: Figure A.6</p> <p>And/ or</p> <p>1950 mm<sup>i</sup>: Figure A.7</p> <p>The requirement for pantograph length will be defined by the project requirements.</p>	<p>TSI ENE §4.2.10 (2)</p> <p>TSI LOC&amp;PAS §4.2.8.2.9.1</p> <p>TSI LOC&amp;PAS §4.2.8.2.9.2</p>
17.	Contract Strip Material	<p>Specified in TSI LOC &amp; PAS 1302/2014 / EU clause 4.2.8.2.9.4.2. Other materials to be verified using verification module CV or by reference to the reference system in operation in Denmark.</p>	<p>TSI ENE §4.2.14</p> <p>TSI LOC&amp;PAS §4.2.8.2.9.4.2</p>
18.	Minimum Spacing	<p>9 m: <math>V \leq 80</math> km/h</p> <p>9 m: <math>80 &lt; V \leq 120</math> km/h</p> <p>31 m: <math>120 &lt; V \leq 200</math>km/h</p>	<p>TSI ENE Table 4.2.13</p>
19.	Structure gauge	<p>BN2-74-1</p> <p>GC</p>	<p>TSI INF §4.2.3.1</p>
20.	<b>Maximum allowed contact wire uplift</b>		<p>TSI ENE §4.2.12</p>
21.	At Support (physically limited)	<p>116 mm</p>	<p>TSI ENE §4.2.12 (2)</p>
22.	In span	<p>180 mm (uplift stop)</p> <p>240 mm (without stop)</p>	
23.	<b>Conductor Specification</b>		
24.	Contact wire	<p>RiS 120 mm<sup>2</sup> (CuAg 0,1 Ri 120)</p>	<p>TSI ENE §4.2.14 (3)</p> <p>EN 50149:2012</p>
25.	Catenary/Messenger wire	<p>70 mm<sup>2</sup> BZII DIN 48201-70/19-BZII</p>	



26.	Dropper	16 mm <sup>2</sup> BZII DIN 43138-16/49-BZII	
27.	Return conductor	327 mm <sup>2</sup> St Al DOVE CSA-C49.1, 1975	
28.	Fix point anchoring wire	70 mm <sup>2</sup> BZII DIN 43141-70/19-BZII	
29.	<b>Wind Effect</b>		
30.	Wind speed Existing Installations	General reference according to location; EN50125-2 Table 2	
	Future installations	Class W3; EN 50125-2 Table 2 EN 50119:2009, 6.2.4.3	
31.	Great Belt Bridge Only	42 m/s	
32.	Yearly probability of occurrence of wind speed	SLS: 10 years @ 6m ULS: 50 years @ 6m	
33.	Maximum deflection of contact wire in service (SLS) due to rotation of mast & foundation	40 mm	
34.	<b>Tensioning in wires</b>		
35.	Contact Wire	15 kN	
36.	Catenary/ Messenger wire	15 kN	
37.	Fixed point anchor wire	11,5 kN	
38.	<b>Maximum loss in tensioning force</b>	10%	
39.	<b>Separate tensioning wheels</b>	yes	
40.	<b>Tensioning device with gear function of 1:3</b>	2 x 5 kN	
41.	<b>Maximum tensioning length</b>		
42.	Half	750 m	
43.	Full	1500 m	



44.	<b>Absolute Span Length</b>		
45.	Maximum span length (For max design, minus 2 m)	60 m	
46.	Minimum span length	16 m	
47.	Span length bridge (Rebosio support)	max 9m Sh=0 mm max 12m Sh=93mm	
48.	Span length tunnel (tunnel support)	21 m	
49.	Limit for change in span length at constant contact wire height	15 m	
50.	Limit for change in span length in graded areas	8 m	
51.	Continuous spans <sup>ii</sup>	After 5 continuous spans (consecutive spans within 3m length of each other) the next span shall be at least 10m different to the previous.  Note: Bridge spans, overlaps and mid-point anchors reset the continuous span count to zero.  Exception: Existing infrastructure	
52.	<b>Installation/ maintenance tolerances</b>		
53.	Contact Wire Height	±25 mm Open Route ±10 mm Gradient	
54.	Stagger	±50 mm	
55.	<b>Stagger for in-running contact wire/catenary</b>		
56.	Tangent track (R ≥ 1800m)	±200 mm	
57.	Curved track (R < 1800m)	±250 mm	



58.	<b>Sweep<sup>ii</sup></b> (change of contact wire position)		
59.	Design	3mm to 12mm per m span	
60.	Maintenance	2,5mm to 20mm per m span	
61.	Restriction	Sweep may be reduced to zero for up to five consecutive spans where required by a constraint (e.g. station platform, canopy)	
62.	<b>Maximum actual horizontal deviation of contact wire 1950mm pantograph<sup>i</sup></b>		TSI ENE 4.2.9.2 (1)
63.	R > 400 m	443 <sup>1</sup> mm @ 6000 mm 490 <sup>1</sup> mm @ 5300 mm	Intermediate values of contact wire height may be interpolated
64.	400 m ≥ R ≥ 100	424 <sup>1</sup> mm @ 6000 mm 470 <sup>1</sup> mm @ 5300 mm	
65.	100 m > R ≥ 50 m	399 <sup>1</sup> mm @ 6000 mm 445 <sup>1</sup> mm @ 5300 mm	
66.	<b>Maximum actual horizontal deviation of contact wire 1600mm pantograph</b>		TSI ENE 4.2.9.2 (1)
67.	R > 400 m	268 <sup>1</sup> mm @ 6000 mm 310 <sup>1</sup> mm @ 5300 mm	Intermediate values of contact wire height may be interpolated
68.	400 m ≥ R ≥ 100	249 <sup>1</sup> mm @ 6000 mm 295 <sup>1</sup> mm @ 5300 mm	
69.	100 m > R ≥ 50 m	224 <sup>1</sup> mm @ 6000 mm 270 <sup>1</sup> mm @ 5300 mm	
70.	<b>Design Contact wire height:</b>		TSI ENE §4.2.9.1
71.	Maximum	6000 mm	According to EN50119:2009 5.10.7.
72.	Nominal	5300 mm	

<sup>1</sup> Additional allowance for stagger tolerance required for use in design.



73.	Minimum	According to EN50119:2009 5.10.7. Refer to System Technical Geometry Calculations, Section 3.9	
74.	<b>Contact wire gradients</b>		
75.	Maximum gradient	1:1000	
76.	Maximum change in gradient	1:2000	
77.	Gradient between reversal	Level	
78.	Requirement at bridges with supports	First span from last bridge support shall be level with bridge contact wire height	
79.	<b>Contact wire gradients side-track speed related</b>		
80.	Maximum change in gradient	EN50119:2009 Table 11	
81.	Maximum gradient	EN50119:2009 Table 11	
82.	<b>System height:</b>		
83.	Open route		
84.	maximum nominal minimum	1400 mm 1000 mm 380 mm	
85.	Tunnels minimum	380 mm	
86.	Overbridges minimum	0 mm	
87.	<b>Pre-sag on contact wire</b>		
88.	span length, $l > 28,5$ m	1/1000 span length	
89.	span length, $l \leq 28,5$ m	0	
90.	<b>Pre-sag on contact wire Great Belt Bridge Only</b>		

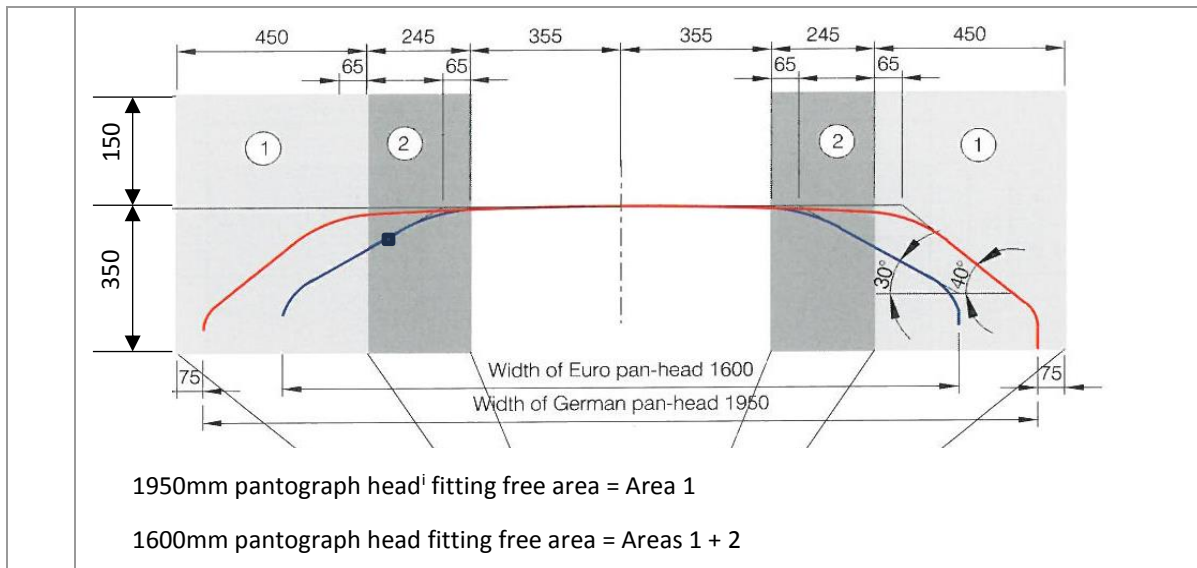


91.	span length, $l > 24$ m	1/1700 span length	
92.	span length, $l \leq 24$ m	5 mm	
93.	<b>Dropper</b>		
94.	Spacing	6 - 10 m	
95.	minimum standard span dropper length	318 mm	
96.	minimum bridge span dropper length	0 mm	
97.	<b>Construction overlap</b>		
98.	number of spans	3 and 5	
99.	length of overlapping span	max. 55 m	
100.	Horizontal distance between wires	min. 270 mm nom. 360 mm	
101.	Vertical distance between wires	min. 150 mm	
102.	<b>Insulated and booster transformer overlap</b>		
103.	number of spans	3 and 5 Dependent on insulator type	
104.	length of overlapping span	max. 55 m	
105.	Horizontal distance between wires	min. 270 mm nom. 360 mm	
106.	Vertical distance between wires	min. 150 mm	
107.	<b>Pole location at turn out</b>		





108.	Up to speed 160km/h (For trainset up to speed 180km/h)	Nominal placement is at point P which marks the position where the axes of both tracks are at the following distance from each other: <ul style="list-style-type: none"> <li>• 190 mm</li> <li>• 300 mm</li> <li>• 600 mm</li> </ul> Design with P = 600 and P differing from the above needs to be analysed.  Design with 300 mm < P < 600 mm is prohibited.	
109.	Above speed 160km/h <sup>ii</sup>	Soft wire exchange with floating cross	
110.	<b>Maintenance Requirements</b>		
111.	Documentation Ref	BN1-82	
112.	<b>Fitting Free Area</b>		
113.	<p>Fitting free area is defined to reduce the risk of collision between the pantograph contact strip and any inclined fittings due to the dynamic uplift. This is particularly appropriate to crossovers and other areas where wires cross or converge to a dynamic pantograph. The fitting free area is to the left and right of the track centre line, measured perpendicular from the top of rails and is to be kept clear of:</p> <ul style="list-style-type: none"> <li>- Feeder fittings, contact wire fittings, stitch wire fittings and insulators after taking into account deflections due to wind.</li> <li>- Wedge type dead-end fittings.</li> <li>- Butt connections or contact wire splices.</li> </ul> <p><i>NOTE: Installation of dropper clamps within the fitting free area is possible.</i></p>		



<sup>i</sup> Specification is only applicable for existing installations and non-TEN lines only

<sup>ii</sup> Requirement is applicable to new installations only