



TCZ F160St

System Description

Reference: TCZ / F160 / TECH / 2016 / 001

banedanmark





Nr	OCL System parameters	TCZ F160St	TSI interoperability reference
1.	TYPE	TCZ F160	
2.	Design speed		
3.	Maximum line speed	200 km/h	
4.	Temperature Range	-30°C to +60°C	
5.	Life Span	50 years ⁱⁱ	
6.	Electrical Parameters		
7.	Electrical voltage	25 kV	TSI ENE §4.2.3
8.	Frequency	50 Hz AC	
9.	Permissible continuous rating	500 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.	Pantograph		
15.	Number Operating	2 5 (Existing Operation)	TSI ENE §4.2.13 BN2-74



Nr	OCL System parameters	TCZ F160St	TSI interoperability reference
16.	Profile and Width	DS/EN 50367:2012 Annex A.2 Profiles for interoperable pantograph head 1600 mm: Figure A.6 and/ or 1950 mm: Figure A.7 The requirement for pantograph length will be defined by the project requirements.	TSI ENE §4.2.10 (2) TSI LOC&PAS §4.2.8.2.9.1 TSI LOC&PAS §4.2.8.2.9.2
17.	Contract Strip Material	Specified in TSI LOC & 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.	TSI ENE §4.2.14 TSI LOC&PAS §4.2.8.2.9.4.2
18.	Minimum Spacing	9 m: $V \leq 80$ km/h 9 m: $80 < V \leq 120$ km/h 30 m: $120 < V \leq 200$ km/h	TSI ENE Table 4.2.13
19.	Structure gauge	BN2-74-1 GC	TSI INF §4.2.3.1
20.	Maximum allowed contact wire uplift		TSI ENE §4.2.12
21.	At Support (physically limited)	97mm	TSI ENE §4.2.12 (2)
22.	In span	180 mm (uplift stop) 240 mm (without stop)	
23.	Conductor Specification		



Nr	OCL System parameters	TCZ F160St	TSI interoperability reference
24.	Contact wire	RiS 100 mm ² (CuAg 0,1 Ri 100)	TSI ENE §4.2.14 (3) EN 50149:2012
25.	Catenary/Messenger wire	50 mm ² BZII DIN 48201-50/19-BZII	
26.	Dropper	10 mm ² BZII DIN 43138-16/49-BZII	
27.	Return conductor	327 mm ² St Al DOVE CSA-C49.1, 1975	
28.	Fix point anchoring wire	50 mm ² BZII DIN 43141-70/19-BZII	
29.	Wind Effect		
30.	Wind speed Existing Installations Future installations	General reference according to location; EN50125-2 Table 2 Class W3; EN 50125-2 Table 2 EN 50119:2009, 6.2.4.3	
31.	Yearly probability of occurrence of wind speed	SLS: 10 years @ 6m ULS: 50 years @ 6m	
32.	Maximum deflection of contact wire in service (SLS) due to rotation of mast & foundation	40 mm	
33.	Tensioning in wires		
34.	Contact Wire	12 kN	
35.	Catenary/Messenger wire	12 kN	
36.	Fixed point anchor wire	11,5 kN	
37.	Maximum loss in tensioning force	10%	
38.	Separate tensioning wheels	no	



Nr	OCL System parameters	TCZ F160St	TSI interoperability reference
39.	Tensioning device with gear function of 1:3	1x8 kN	
40.	Maximum tensioning length		
41.	Half	750 m	
42.	Full	1500 m	
43.	Span Length		
44.	Maximum span length (For max design, minus 2 m)	60 m	
45.	Minimum span length	16 m	
46.	Span length bridge (Rebosio support)	max 9m Sh=0 mm max 12m Sh=93mm	
47.	Span length tunnel (tunnel support)	21 m	
48.	Limit for change in span length at constant contact wire height	15 m	
49.	Limit for change in span length in graded areas	8 m	
50.	Continuous spans ⁱⁱ	<p>After 5 continuous spans (consecutive spans within 3m length of each other) the next span shall be at least 10m different to the previous.</p> <p>Note: Bridge spans, overlaps and mid-point anchors reset the continuous span count to zero.</p> <p>Exception: Existing infrastructure</p>	



Nr	OCL System parameters	TCZ F160St	TSI interoperability reference
51.	Installation / maintenance tolerances		
52.	Contact Wire Height	±25 mm Open Route ±10 mm Gradient	
53.	Stagger	±50 mm	
54.	Stagger for in-running contact wire/catenary		
55.	Tangent track (R ≥ 1800m)	±200 mm	
56.	Curved track (R < 1800m)	±250 mm	
57.	Sweepⁱⁱ (change of contact wire position)		
58.	Design	3mm to 12mm per m span	
59.	Maintenance	2,5mm to 20 per m span	
60.	Restriction	Sweep may be reduced to zero for up to five consecutive spans where required by a constraint (e.g. station platform, canopy)	
61.	Maximum allowed horizontal deviation of contact wire 1950mm pantographⁱ		TSI ENE 4.2.9.2 (1)
62.	R > 400 m	443 ¹ mm @ 6000 mm 475 ¹ mm @ 5500 mm	Intermediate values of contact wire height may be interpolated
63.	400 m ≥ R ≥ 100	424 ¹ mm @ 6000 mm 455 ¹ mm @ 5500 mm	
64.	100 m > R ≥ 50 m	399 ¹ mm @ 6000 mm 430 ¹ mm @ 5500 mm	

¹ Additional allowance for stagger tolerance and crosswind required for use in design.



Nr	OCL System parameters	TCZ F160St	TSI interoperability reference
65.	Maximum allowed horizontal deviation of contact wire 1600mm pantograph		TSI ENE 4.2.9.2 (1)
66.	R > 400 m	268 ¹ mm @ 6000 mm 300 ¹ mm @ 5500 mm	Intermediate values of contact wire height may be interpolated
67.	400 m ≥ R ≥ 100	249 ¹ mm @ 6000 mm 280 ¹ mm @ 5500 mm	
68.	100 m > R ≥ 50 m	224 ¹ mm @ 6000 mm 255 ¹ mm @ 5500 mm	
69.	Design Contact wire height:		TSI ENE §4.2.9.1
70.	Maximum	6000 mm	
71.	Nominal	5500 mm	
72.	Minimum	According to EN50119:2009 5.10.7. Refer to System Technical Geometry Calculations, Section 3.9	
73.	Contact wire gradients main line		
74.	Maximum change in gradient	1:1200	
75.	Maximum gradient	1:600	
76.	Gradient between reversal	Level	
77.	Requirement at bridges with supports	First span from last bridge support shall be level with bridge contact wire height	
78.	Contact wire gradients side-track speed related		
79.	Maximum change in gradient	EN50119:2009 Table 11	



Nr	OCL System parameters	TCZ F160St	TSI interoperability reference
80.	Maximum gradient	EN50119:2009 Table 11	
81.	System height:		
82.	Open route		
83.	maximum nominal minimum	1400 mm 1000 mm 380 mm	
84.	Tunnels (minimum)	380 mm	
85.	Overbridges (minimum)	0 mm	
86.	Pre-sag on contact wire		
87.	span length, $l > 30$ m	1/1000 span length	
88.	span length, $l \leq 30$ m	0	
89.	Dropper		
90.	Spacing	4 - 12 m	
91.	minimum standard span dropper length	318 mm	
92.	minimum bridge span dropper length	0 mm	
93.	Construction overlap		
94.	number of spans	3	
95.	length of overlapping span	max. 52 m	
96.	Horizontal distance between wires	min. 270 mm nom. 360 mm	
97.	Vertical distance between wires	min. 150 mm	
98.	Insulated and booster transformer overlap		
99.	number of spans	3	
100.	length of overlapping span	max. 52 m	



Nr	OCL System parameters	TCZ F160St	TSI interoperability reference
101.	Horizontal distance between wires	min. 270 mm nom. 360 mm	
102.	Vertical distance between wires	min. 150 mm	
103.	Pole location at turnout		
104.	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"> • 190 mm • 300 mm • 600 mm Design with P = 600 and P differing from the above needs to be analysed. Design with 300 mm < P < 600 mm is prohibited.	
105.	Above speed 160km/h ⁱⁱ	Soft wire exchange with floating cross	
106.	Maintenance Requirements		
107.	Documentation Ref	BN1-82	

ⁱ Specification is only applicable for existing installations and non-TEN lines only

ⁱⁱ Requirement is applicable to new installations only