

DESIGN CALCULATION/APRĒĶINU ATSKAITE

TUBULAR POLE

Customer:

Site:

Report No. **0**

Column/bracket type: **PSP-10200-74_168-TO115-000-0.13m2-24ms-Tc2**

Column Height, h (m): **10.3**

Pole configuration:

Total shaft length	10460 mm	Bracket H	0.5 m	
Shaft length (ground level)	9800 mm	Outreach, w	3 m	
Top D	74 mm	Num. beams	1 pcs.	
Bot D	174 mm	Num. lamps	2 pcs.	Total:
Thickness	2 mm	Lamp mass	10.00 kg	20 kg
Conicity	10 mm/m	Lamp area	0.065 m2	0.13 m2
Door RF	YES	Top windage	0.34 m2 (incl. bracket)	
RF Type	4	Addit. Lamp	n/a m2 , @	n/a m
		Addit. Lamp2	n/a m2 , @	n/a m

Wind conditions:

Wind velocity, Vref,0 24 m/s
 Terrain category 2

Safety class:

B

Deflection class:

3

Flange Type n/a
 Flange size n/a mm
 Thickness n/a mm
 CC size n/a mm
 Bolt Dia. n/a mm

Conformity to EN 40-3:

Planting dept. 660 mm

EN 40-3-1:2013 Lighting columns-Part 3-1: Design and verification -Specification for characteristic loads

EN 40-3-3:2013 Lighting columns-Part 3-3: Design and verification -Verification by calculations

Revision Date Calculation tool
 0 19.09.2025 Tpole1.0

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- 5 WIND PRESSURE ON EACH SHAFT SECTION
- 6 RESISTANCE TO BENDING MOMENTS IN CRITICAL CROSS-SECTIONS
- 7 SLS. DEFLECTION AT THE TOP OF THE POLE

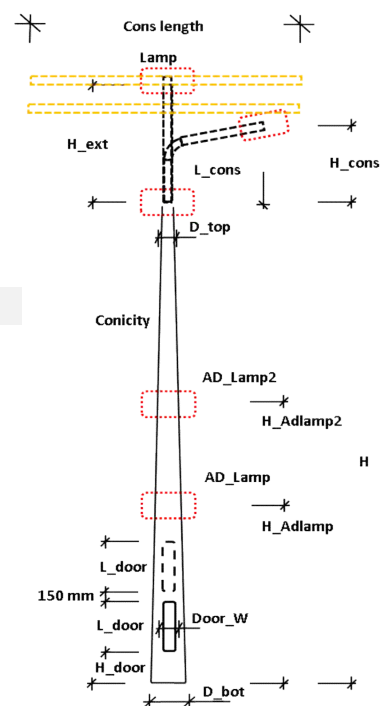
1. POLE GEOMETRY

Total height with bracket , h	10300 mm
Total shaft size	10460 mm
Shaft height from ground level	9800 mm
Top Diameter	74 mm
Base Diameter	174 mm
Conicity	10 mm/m
Pole type	Octagonal Pole

Door opening

Height to bottom, c	968 mm
Lenght of the door opening, a	440 mm
Width of door opening, b	80 mm
Additional door	n/a

Door reinforcement, dw	40.0 mm
Door reinforcement, tw	4.0 mm
Door reinforcement, L	640.0 mm



1.1 SHAFT GEOMETRY

Section	Top diameter (mm)	Base diameter (mm)	Lenght (mm)	Thickness mm
1	74	174	10460	2
2	0	0	0	0
3	0	0	0	0

2. STANDARDS AND TECHNICAL SPECIFICATIONS

EN 40-3-1:2013 Lighting columns-Part 3-1: Design and verification -Specification for characteristic loads

EN 40-3-3:2013 Lighting columns-Part 3-3: Design and verification -Verification by calculations

EN 1993-1-1:2005 Design of steel structures. General rules and rules for building

EN 1991-1-4:2005/NA:2011 National annex (Customer country)

3. DESIGN ACTIONS CONDITIONS AND PARTIAL FACTORS

Durability

Service life	25	years	EN 40-3-1 5.2.2
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Wind Loading

Map wind speed, $V_{b,0}$	24.0	m/s	EN 1991-1-4 AnnexA.
Terrain Category	2		EN 1991-1-4 AnnexA.
Site altitude	0	m	EN 1991-1-4 AnnexA.

Site-Specific Wind

Probability factor, C_s	0.96		EN 40-3-1 5.2.2
Column size factor, δ	0.897		EN 40-3-1 5.2.3
Reference wind pressure, $q(10)$	331.2	N/m ²	EN 40-3-1 5.2.2
Air density, ρ	1.25	kg/m ³	EN 1991-1-4 NA
Fundamental modal frequency	0.78	Hz	
Period of vibration, T	1.28	s	
Dynamic behaviour coefficient, β	1.59		EN 40-3-1 5.2.4

Deflection class	2	6 % (h + w)	EN 40-3-3 Tab 4.
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Partial factors for actions

Partial Load factors, γ_f	Safety class	B	EN 40-3-3 Tab 1.
	γ_w (wind)	1.2	
	Permanent actions	1.2	
Partial material factors, γ_M		1.05	EN 40-3-3 Tab 2.
Steel grade	Yield strenght, f_y	355	N/mm ²

4. POLE EQUIPMENT (FLOODLIGHTS, LADDERS, BRACKETS)

Equipment description	Height	Wind exposure area, m ²	Mass, kg	Shape coef. c
Top lamp, m	10.3	0.13	20.00	1.0
Additional lamp (on pole), m	n/a	n/a	n/a	1.0
Additional lamp 2 (on pole), m	n/a	n/a	n/a	1.0
Vertical Bracket length, m	0.5	0.03	2.83	1.2
Horizontal Bracket length, m	3	0.18	16.96	1.2
Access Ladders along the pole		n/a	n/a	n/a

5. WIND PRESSURE IN EACH SHAFT ELEVATION

Sect. Nr.	D(z) mm	h(z) mm	dh mm	A(z) m ²	Cr(z) -	Ce(z) -	q(z) N/m ²
1	165	484	968	0.160	0.83	1.80	848
2	159	1188	440	0.070	0.83	1.80	848
3	154	1704	592	0.091	0.83	1.80	848
4	146	2500	1000	0.146	0.83	1.80	848
5	136	3500	1000	0.136	0.83	1.80	848
6	127	4500	1000	0.127	0.85	1.87	880
7	117	5500	1000	0.117	0.89	1.99	935
8	108	6500	1000	0.108	0.92	2.09	982
9	98	7500	1000	0.098	0.95	2.17	1023
10	88	8500	1000	0.088	0.98	2.25	1060
11	79	9400	800	0.063	0.99	2.31	1090
Extension	60	10100	500	0.030	1.01	2.36	1110
Hor._bear	60	10300	3000	0.180	1.01	2.36	1110
Lamp	n/a	10300	n/a	0.130	1.01	2.37	1117

Sect. Nr.	D(z) mm	h(z) mm	dh mm	Ac(z) m2	V(z) m/s	Re(z) x10^5	C(z) -	Fc/Fb/FI N	M0 Nm
1	165	484	968	0.160	32.20	3.53	1.24	169	82
2	159	1188	440	0.070	32.20	3.38	1.25	74	88
3	154	1704	592	0.091	32.20	3.28	1.25	97	165
4	146	2500	1000	0.146	32.20	3.11	1.26	156	389
5	136	3500	1000	0.136	32.20	2.91	1.26	146	512
6	127	4500	1000	0.127	32.80	2.76	1.27	142	638
7	117	5500	1000	0.117	33.82	2.63	1.27	140	768
8	108	6500	1000	0.108	34.66	2.47	1.28	135	880
9	98	7500	1000	0.098	35.37	2.30	1.29	129	968
10	88	8500	1000	0.088	36.00	2.11	1.29	121	1030
11	79	9400	800	0.063	36.50	1.91	1.29	89	834
Extension	60	10100	500	0.030	36.83	1.46	1.20	40	403
Hor._bear	60	10300	3000	0.180	36.83	1.46	1.20	240	2469
Lamp	n/a	10300	n/a	0.130	36.96	n/a	1.00	385	3964

Resulting bending moments in critical sections (SLS)

Mp	10718.1	Nm	Ground level
Mx_bot	9036.5	Nm	1st Door_bot
Mx_top	8325.5	Nm	1st Door_top
Mx2_bot	0	Nm	2nd Door_bot
Mx2_top	0	Nm	2rd Door_top

Resulting torque moment(SLS)

Tp= 0 Nm

Resulting Shear force (SLS)

N0= 1821.5 N

Loads on foundation (at ground level) (ULS)

Moverturn	12862.0	Nm
Nvert	1278.5	N
Nshear	2185.8	N
Tmom	0.0	Nm

6. RESISTANCE TO BENDING MOMENTS IN CRITICAL CROSS-SECTIONS

Safety class *	B	Calcul. Value	Threshold value		Crossection resistance moments			
Safety reserve at Z0:		0.56	<1.0	PASSED	Mu, Nm	22992.9	Tu, Nm	12794.1
Safety reserve at Z1:		0.99	<1.0	PASSED	Mu1, Nm	8798.8	Tu1, Nm	5499.9
Safety reserve at Z2:		1	<1.0	PASSED	Mu2, Nm	8427.3	Tu2, Nm	5101.2
Safety reserve at Z3:		0	0	PASSED	Mu3, Nm	0	Tu3, Nm	0
Safety reserve at Z4:		0	0	PASSED	Mu4, Nm	0	Tu4, Nm	0

* Zero values should be ignored (values are not calculated for respective sections)

7. SLS. DEFLECTION AT THE TOP OF THE POLE

SLS checked by FEM

	Calcul. Value		Threshold value		
Vertical deflection (deadweight), m	n/a	n/a	n/a	m	PASSED

* n/a statement for vertical deflection in case of symmetric arrangement of top bracket/console

	Calcul. Value		Threshold value		
Horizontal deflection at top, m	0.693	<	1.03	m	NOT_PASSED

Design Verification by Calculation **NOT APPROVED**

Design comply with EN 40 standard

DESIGN CALCULATION/APRĒĶINU ATSKAITE

TUBULAR POLE

Customer:

Site:

Report No. **0**

Column/bracket type: **PSP-10600-74-L115-0.07m2-24ms-Tc2**

Column Height, h (m): **10.3**

Pole configuration:

Total shaft length	10460 mm	Bracket H	0.5 m	
Shaft length (ground level)	9800 mm	Outreach, w	1.5 m	
Top D	74 mm	Num. beams	1 pcs.	
Bot D	174 mm	Num. lamps	1 pcs.	Total:
Thickness	2 mm	Lamp mass	10.00 kg	10 kg
Conicity	10 mm/m	Lamp area	0.065 m2	0.065 m2
Door RF	No	Top windage	0.19 m2 (incl. bracket)	
RF Type	0	Addit. Lamp	n/a m2 , @	n/a m
		Addit. Lamp2	n/a m2 , @	n/a m

Wind conditions:

Wind velocity, Vref,0 24 m/s
 Terrain category 2

Safety class:

B

Deflection class:

2

Flange Type n/a
 Flange size n/a mm
 Thickness n/a mm
 CC size n/a mm
 Bolt Dia. n/a mm

Conformity to EN 40-3:

Planting dept. 660 mm

EN 40-3-1:2013 Lighting columns-Part 3-1: Design and verification -Specification for characteristic loads

EN 40-3-3:2013 Lighting columns-Part 3-3: Design and verification -Verification by calculations

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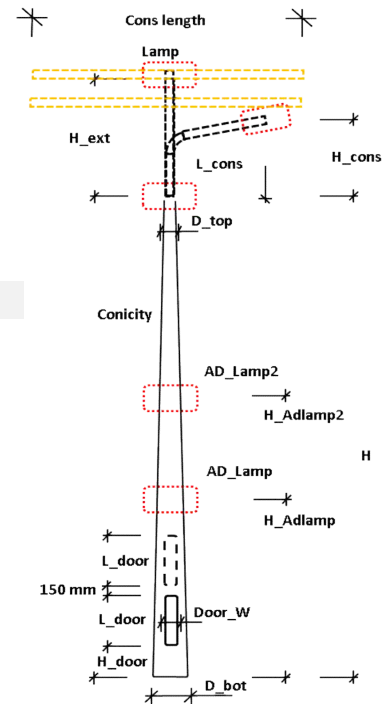
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1. POLE GEOMETRY

Total height with bracket , h	10300 mm
Total shaft size	10460 mm
Shaft height from ground level	9800 mm
Top Diameter	74 mm
Base Diameter	174 mm
Conicity	10 mm/m
Pole type	Octagonal Pole

Door opening

Height to bottom, c	968 mm
Lenght of the door opening, a	440 mm
Width of door opening, b	80 mm
Additional door	n/a
Door reinforcement, dw	8.0 mm
Door reinforcement, tw	n/a mm
Door reinforcement, L	640.0 mm



1.1 SHAFT GEOMETRY

Section	Top diameter (mm)	Base diameter (mm)	Lenght (mm)	Thickness mm
1	74	174	10460	2
2	0	0	0	0
3	0	0	0	0

2. STANDARDS AND TECHNICAL SPECIFICATIONS

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EN 40-3-3:2013 Lighting columns-Part 3-3: Design and verification -Verification by calculations

EN 1993-1-1:2005 Design of steel structures. General rules and rules for building

EN 1991-1-4:2005/NA:2011 National annex (Customer country)

3. DESIGN ACTIONS CONDITIONS AND PARTIAL FACTORS

Durability

Service life	25	years	EN 40-3-1 5.2.2
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Wind Loading

Map wind speed, $V_{b,0}$	24.0	m/s	EN 1991-1-4 AnnexA.
Terrain Category	2		EN 1991-1-4 AnnexA.
Site altitude	0	m	EN 1991-1-4 AnnexA.

Site-Specific Wind

Probability factor, C_s	0.96		EN 40-3-1 5.2.2
Column size factor, δ	0.897		EN 40-3-1 5.2.3
Refference wind pressure, $q(10)$	331.2	N/m ²	EN 40-3-1 5.2.2
Air density, ρ	1.25	kg/m ³	EN 1991-1-4 NA
Fundamental modal frequency	0.99	Hz	
Period of vibration, T	1.01	s	
Dynamic behaviour coeficient, β	1.50		EN 40-3-1 5.2.4

Deflection class	2	6 % (h + w)	EN 40-3-3 Tab 4.
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Partial factors for actions

Partial Load factors, γ_f	Safety class	B	EN 40-3-3 Tab 1.
	γ_w (wind)	1.2	
	Permanent actions	1.2	
Partial material factors, γ_M		1.05	EN 40-3-3 Tab 2.
Steel grade	Yield strenght, f_y	355	N/mm ²

4. POLE EQUIPMENT (FLOODLIGHTS, LADDERS, BRACKETS)

Equipment description	Height	Wind exposure area, m ²	Mass, kg	Shape coef. c
Top lamp, m	10.3	0.07	10.00	1.0
Additional lamp (on pole), m	n/a	n/a	n/a	1.0
Additional lamp 2 (on pole), m	n/a	n/a	n/a	1.0
Vertical Bracket length, m	0.5	0.03	2.83	1.2
Horizontal Bracket length, m	1.5	0.09	8.48	1.2
Access Ladders along the pole		n/a	n/a	n/a

5. WIND PRESSURE IN EACH SHAFT ELEVATION

Sect. Nr.	D(z) mm	h(z) mm	dh mm	A(z) m ²	Cr(z) -	Ce(z) -	q(z) N/m ²
1	165	484	968	0.160	0.83	1.80	802
2	159	1188	440	0.070	0.83	1.80	802
3	154	1704	592	0.091	0.83	1.80	802
4	146	2500	1000	0.146	0.83	1.80	802
5	136	3500	1000	0.136	0.83	1.80	802
6	127	4500	1000	0.127	0.85	1.87	832
7	117	5500	1000	0.117	0.89	1.99	884
8	108	6500	1000	0.108	0.92	2.09	929
9	98	7500	1000	0.098	0.95	2.17	967
10	88	8500	1000	0.088	0.98	2.25	1002
11	79	9400	800	0.063	0.99	2.31	1030
Brack.low	60	10050	500	0.030	1.01	2.36	1049
Brack.upp	60	10315	1500	0.090	1.01	2.37	1056
Lamp	-	10381	-	0.065	1.01	2.37	1056

Sect. Nr.	D(z) mm	h(z) mm	dh mm	Ac(z) m2	V(z) m/s	Re(z) x10 ⁵	C(z) -	Fc/Fb/FI N	M0 Nm
1	165	484	968	0.160	32.20	3.53	1.24	159	77
2	159	1188	440	0.070	32.20	3.38	1.25	70	83
3	154	1704	592	0.091	32.20	3.28	1.25	91	155
4	146	2500	1000	0.146	32.20	3.11	1.26	147	368
5	136	3500	1000	0.136	32.20	2.91	1.26	138	484
6	127	4500	1000	0.127	32.80	2.76	1.27	134	603
7	117	5500	1000	0.117	33.82	2.63	1.27	132	726
8	108	6500	1000	0.108	34.66	2.47	1.28	128	831
9	98	7500	1000	0.098	35.37	2.30	1.29	122	915
10	88	8500	1000	0.088	36.00	2.11	1.29	115	974
11	79	9400	800	0.063	36.50	1.91	1.29	84	788
Brack.low	60	10050	500	0.030	36.83	1.46	1.20	38	379
Brack.upp	60	10315	1500	0.090	36.96	1.47	1.20	114	1176
Lamp	-	10381	-	0.065	36.96	-	1.00	69	712

Resulting bending moments in critical sections (SLS)

Mp	8272.7	Nm	Ground level
Mx_bot	6858.5	Nm	1st Door_bot
Mx_top	6266.1	Nm	1st Door_top
Mx2_bot	0	Nm	2nd Door_bot
Mx2_top	0	Nm	2nd Door_top

Resulting torque moment(SLS)

Tp= 188.5 Nm

Resulting Shear force (SLS)

N0= 1540.6 N

Loads on foundation (at ground level) (ULS)

Moverturn	9927.0	Nm
Nvert	1048.3	N
Nshear	1848.8	N
Tmom	226.1	Nm

6. RESISTANCE TO BENDING MOMENTS IN CRITICAL CROSS-SECTIONS

Safety class *	B	Calcul. Value	Threshold value		Crossection resistance moments			
Safety reserve at Z0:		0.45	<1.0	PASSED	Mu, Nm	22992.9	Tu, Nm	12794.1
Safety reserve at Z1:		1	<1.0	PASSED	Mu1, Nm	8798.8	Tu1, Nm	2845.7
Safety reserve at Z2:		0.98	<1.0	PASSED	Mu2, Nm	8427.3	Tu2, Nm	2610.7
Safety reserve at Z3:		0	0	PASSED	Mu3, Nm	0	Tu3, Nm	0
Safety reserve at Z4:		0	0	PASSED	Mu4, Nm	0	Tu4, Nm	0

* Zero values should be ignored (values are not calculated for respective sections)

7. SLS. DEFLECTION AT THE TOP OF THE POLE

SLS checked by FEM

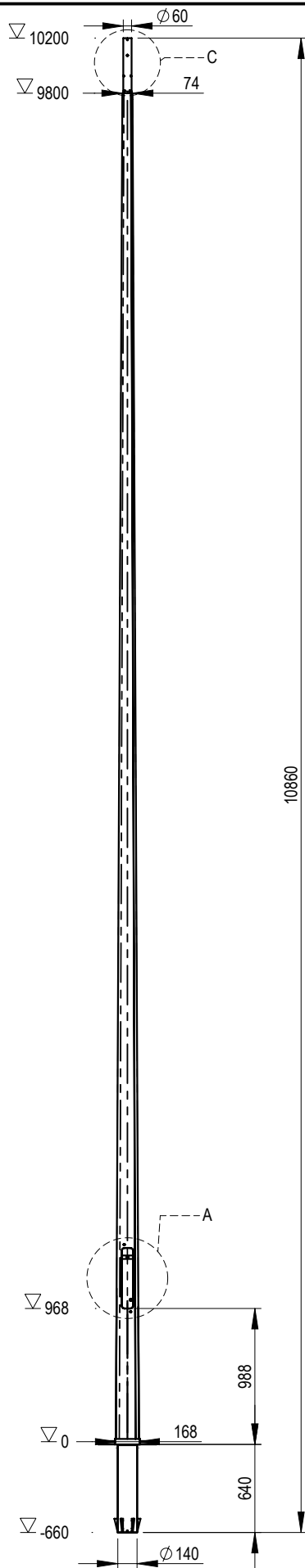
	Calcul. Value		Threshold value		
Vertical deflection (deadweight), m	0.021	<	0.038	m	PASSED

* n/a statement for vertical deflection in case of symmetric arrangement of top bracket/console

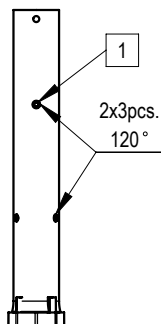
	Calcul. Value		Threshold value		
Horizontal deflection at top, m	0.542	<	0.708	m	PASSED

Design Verification by Calculation **APPROVED**

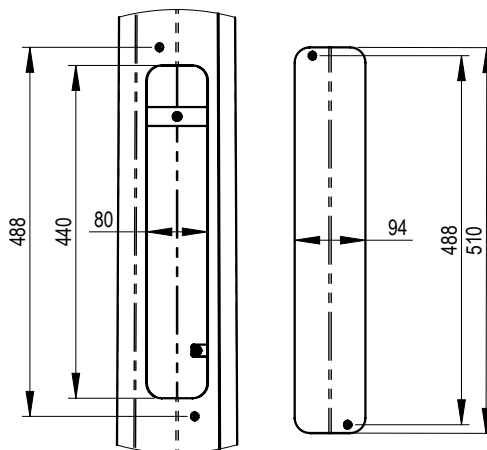
Design comply with EN 40 standard



DET. C
(1 : 10)



DET. A
(1 : 10)



Specification

Pos.	Type	DIN/ISO	Material	Pcs.
1	M10x10	916	A2	6



TECNO PALI
NORTH EUROPE

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Owner: **Tecnopali**

Drawn by: **R.Jaunslavietis**

Checked by: **D.Avisans**

Rev.: **0** Date: **23/03/2023**

Title: **SB_10200T_XP**

Item no.: **SB_10200T_XP**

Scale: **1:45**

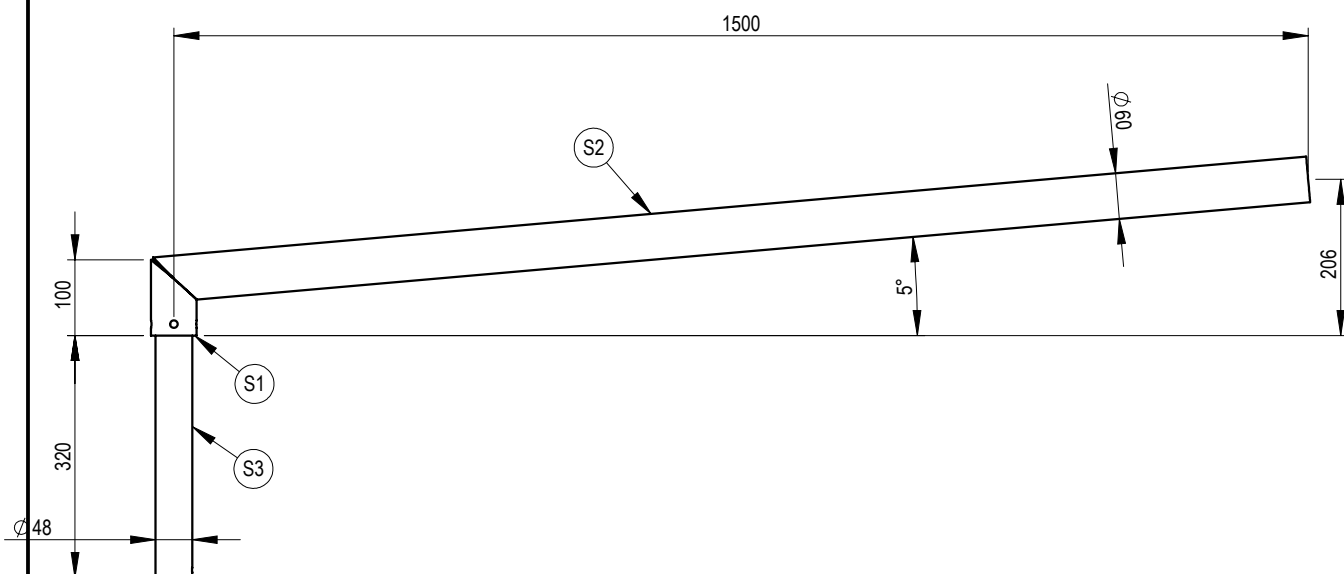
Weight: **84 kg**

Galvanized: **EN 1461**

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN MILLIMETERS
TOLERANCES EN40-2:H<10m ±25,
H>10m ±0,6%
LINEAR: Ø ±3%, Th ±0,2,
ANGULAR: +1°-0°
DO NOT SCALE DRAWING

Material: **S235JR**

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Section	Ø / □ / W	Material	Thickness	Pcs.	L / WxL
S1	60	S235	3	1	100
S2	60	S235	3	1	1531
S3	48	S235	3	1	350

TECNOPALI
NORTH EUROPE

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Phone +371 67148855
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Owner: **Tecnopali**
Drawn by: **M.Dombrovskis**
Checked by: **V.Ajučonoks**

Date: **30/01/2025**

Title: **L115-000_50**

Item no.:

Scale: **1:10**

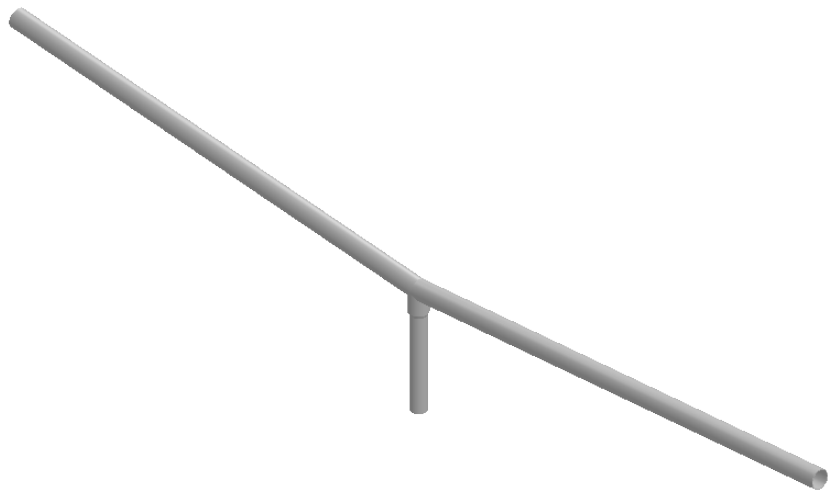
Weight: **8 kg**

Galvanized: **EN 1461**

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN MILLIMETERS
TOLERANCES EN40-2: H<10m ±25,
H>10m ±0,6%
LINEAR: Ø ±3%, Th ±0,2,
ANGULAR: +1° -0°
DO NOT SCALE DRAWING



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 "Vecratnieki" Daugmales pagasts, Ķekavas novads, LV-2124, Latvija Phone +371 67148855 E-mail sales@tecnopali.lv www.tecnopali.lv	Owner:	Tecnopali	Title: TO115-000-5o				UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN MILLIMETERS TOLERANCES EN40-2:H<10m ±2s, H>10m ±0,6% LINEAR: Ø ±3%, Th ±0,2, ANGULAR: +1° -0° DO NOT SCALE DRAWING			
	Drawn by:	Artūrs Rugājs								Item no.:
	Checked by:	V.Ajučonoks								
	Date:	20.09.2023	Scale:	1:20	Weight:	26 kg				Galvanized:
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