



IPLOCA Novel Construction Spring Session 2025

- **AI Transformation**
- **Skills & Resources**
- **Standards & Compliance Regulatory**
- **Energy Transition & Net Zero Construction**

MICHELANGELO BLASI



April 16°, 2025 - NH Hotel, Palermo, Italy



MICROTUNNELING

TRENCHLESS TECHNOLOGY

LAURINI

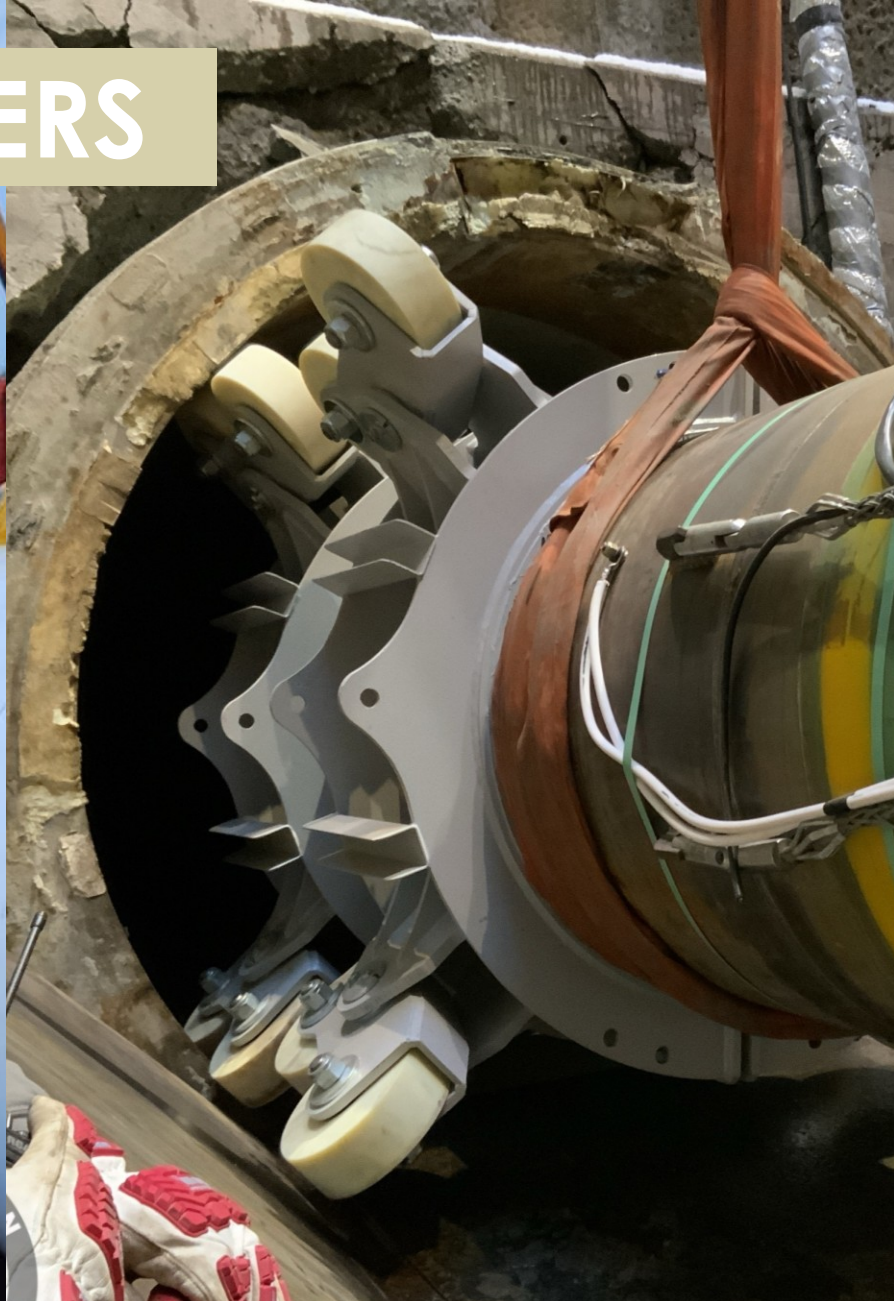
the Game Changer



IPLOCA

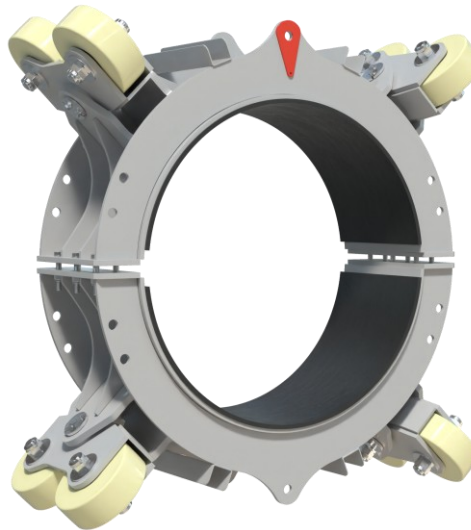
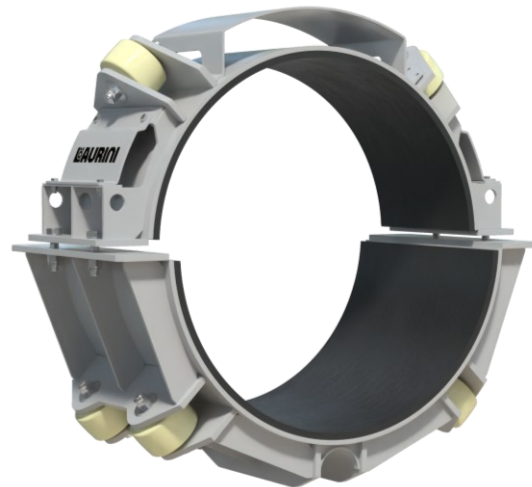
Novel Construction
Spring Session 2025

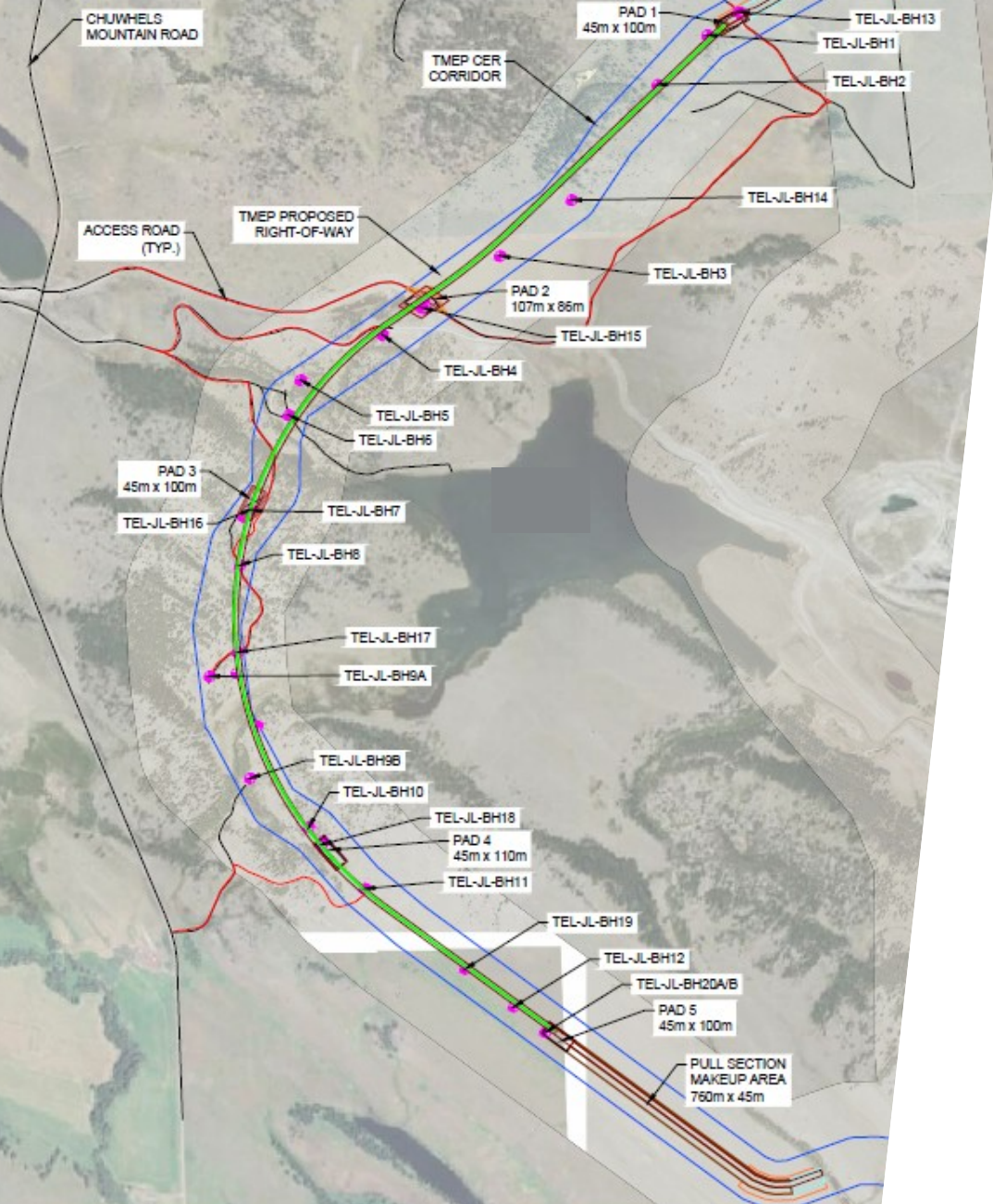
CASING ROLLERS



CASING ROLLERS

DESIGN	STRESS ANALYSIS	DESTRUCTIVE TESTS	CALCULATIONS REPORT	MANUFACTURING	COATING	QUALITY MANAGEMENT SYSTEM	PACKING & SHIPPING
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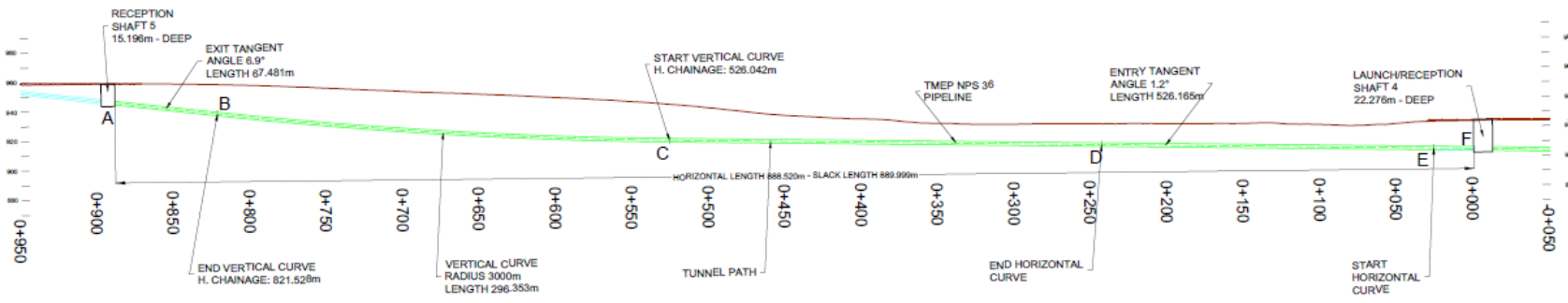


MICROTUNNELING PROJECT

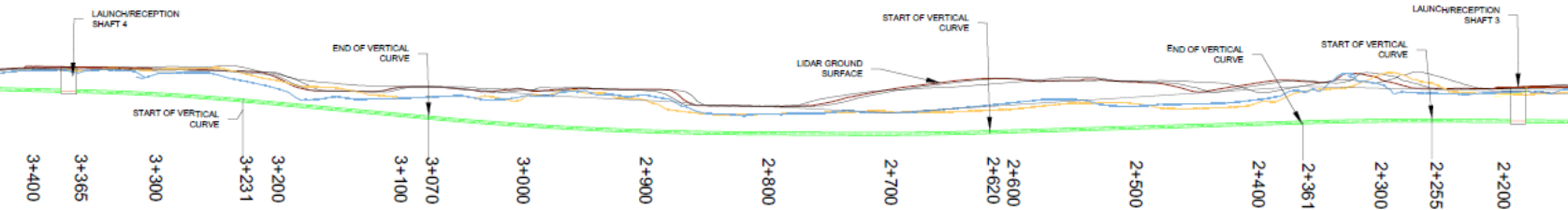
- **36'' STEEL PIPE**
- **CONCRETE TUNNEL: 4266 m / 2,0 m ID / 2,5 m OD**
- **N.5 SHAFTS:**

	ID	DEEP
SHAFT 1	12,5 m	13,15 m
SHAFT 2	12,5 m	15,83 m
SHAFT 3	12,5 m	30,19 m
SHAFT 4	12,5 m	22,27 m
SHAFT 5	9 m	15,19 m

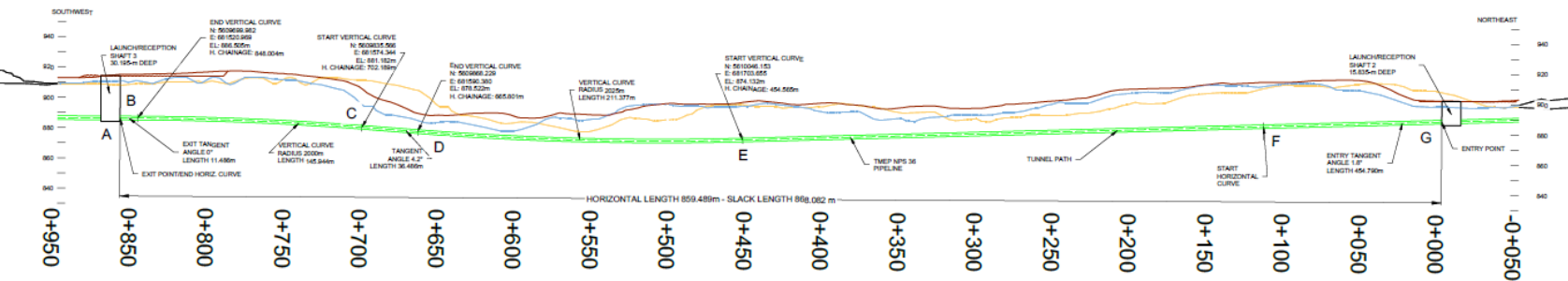
	TUNNEL LENGTH (m)
SHAFT 5 TO SHAFT 4	888,52
SHAFT 4 TO SHAFT 3	1170,15
SHAFT 3 TO SHAFT 2	859,48
SHAFT 2 TO SHAFT 1	1310,4



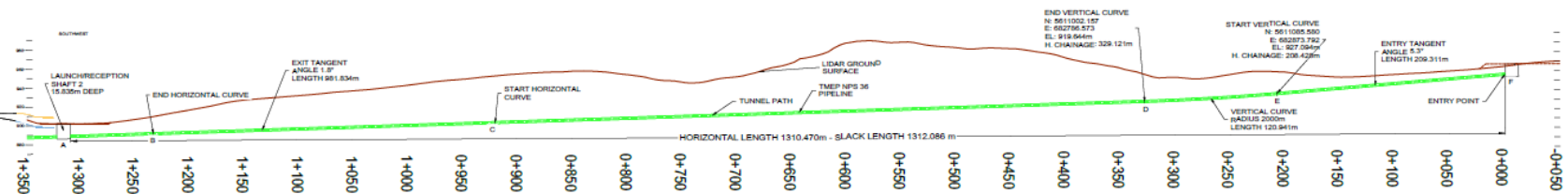
SHAFT 5 TO SHAFT 4
888,52 m



SHAFT 4 TO SHAFT 3
1170,15 m



SHAFT 3 TO SHAFT 2
859,48 m



SHAFT 3 TO SHAFT 2
1310,40 m

LINE PIPE PARAMETERS

DESCRIPTION	VALUE
Pipeline material specification	API5L X70
Specified minimum yield strength	483MPa
Outside diameter	914 mm
Wall thickness	14.7 mm

PIPE WEIGHTS

DESCRIPTION	VALUE
Coated pipeweight in-air – empty	326 kg/m
Coated pipeweight in-air – flooded with test water	940,61kg/m

TUNNEL RADIUS OF CURVATURE

DESCRIPTION	VALUE
Vertical radius of curvature	2000 m
Horizontal radius of curvature	1120 m
Combined Radius	977 m

ASSUMPTIONS

DESCRIPTION	VALUE
Steel density	7850 kg/m ³
Freshwater density	1000 kg/m ³
Elastic modulus for steel	207 GPa.
Distance between roller centres	10 m

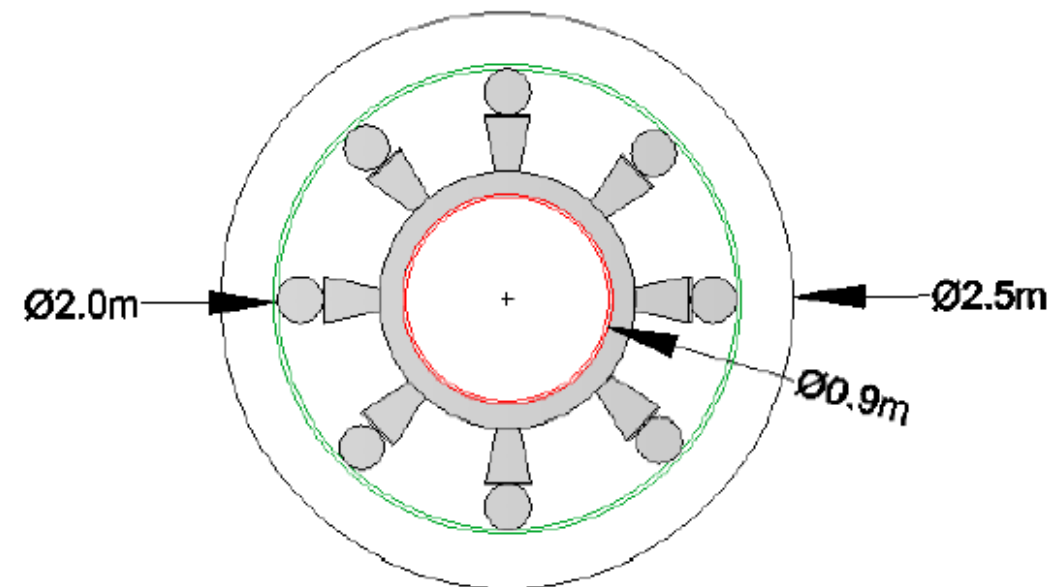


Figure 1 – Roller Sketch Proposal

LOADS ON CASING ROLLERS

- **WORST-CASE SCENARIO**

Both **vertical** and **horizontal radius** are acting at the same time.

The **bending** and **pipe weight** will act in the same direction.

- **ROLLERS WILL RUN ON TUNNEL WALLS**

There will not be any **concrete fill basement** or any **rail track**.

- **12 mm OFFSET**

Between tunnel segments on the curved sections

CASE	DESCRIPTION	VALUE
Rollers every 10 m	Maximum load per leg	25,4 tons

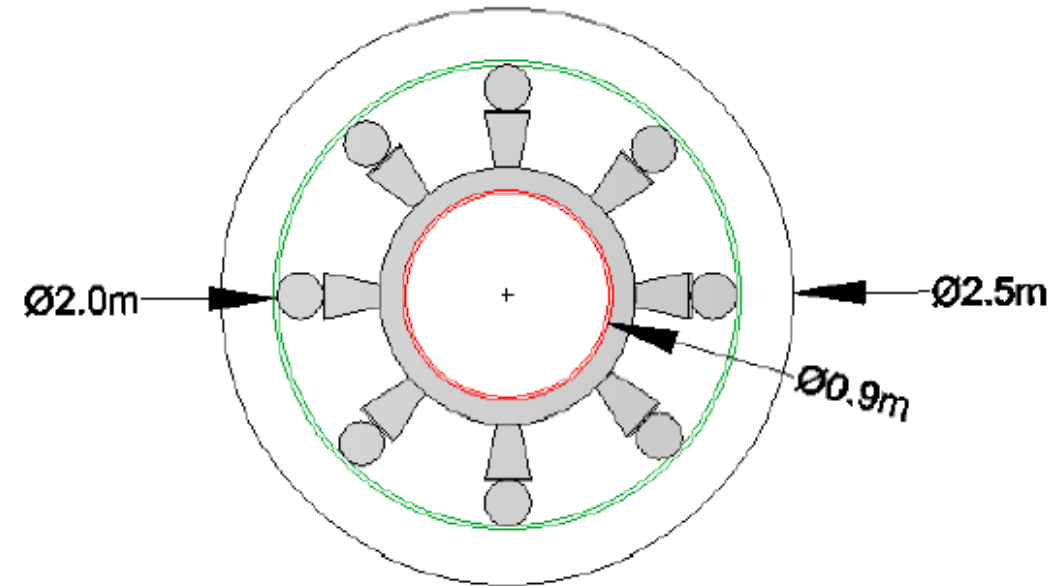
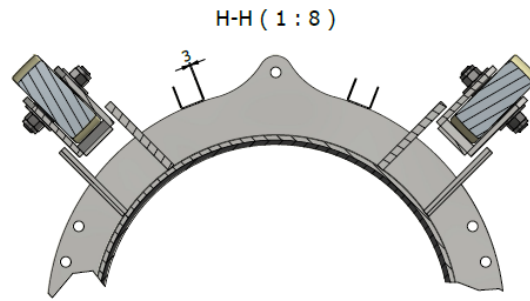
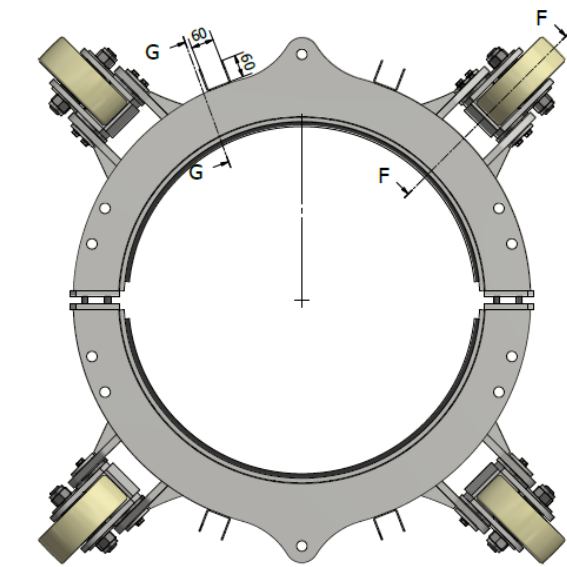
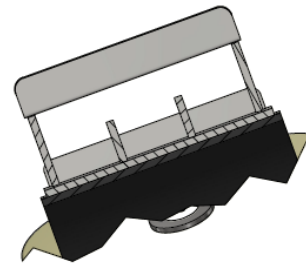


Figure 1 – Roller Sketch Proposal

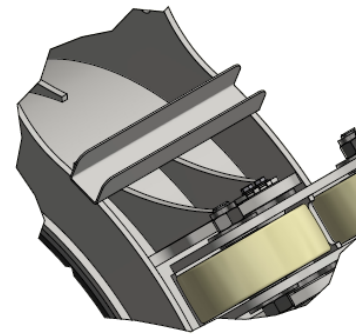
DESIGN



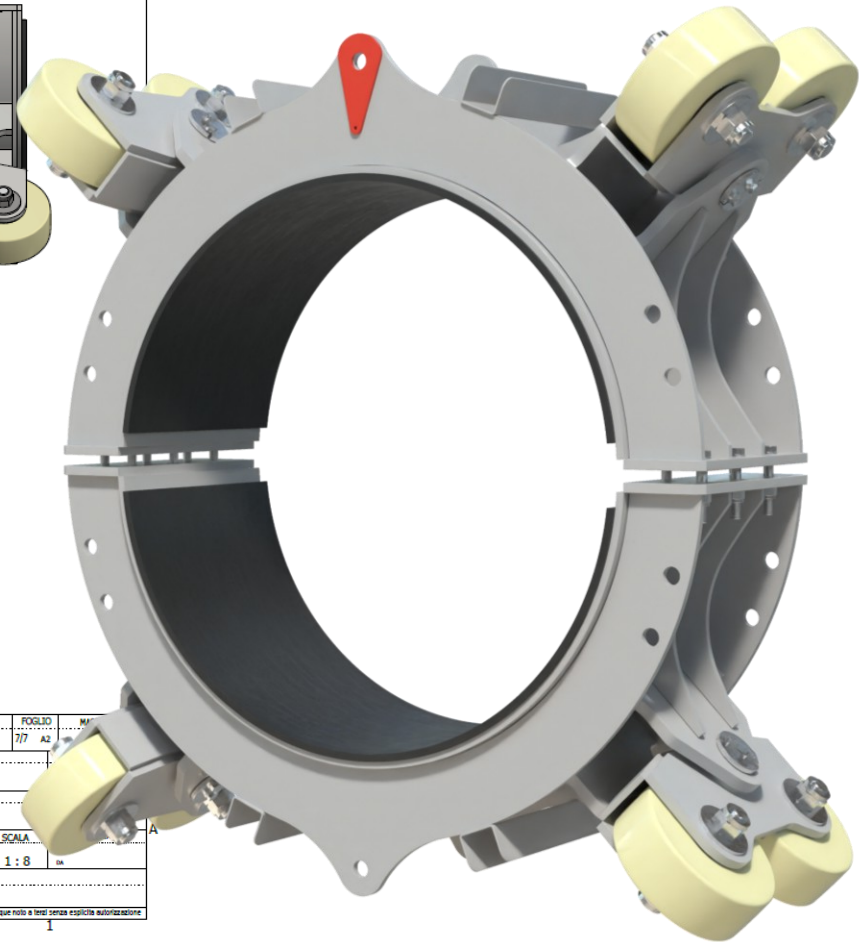
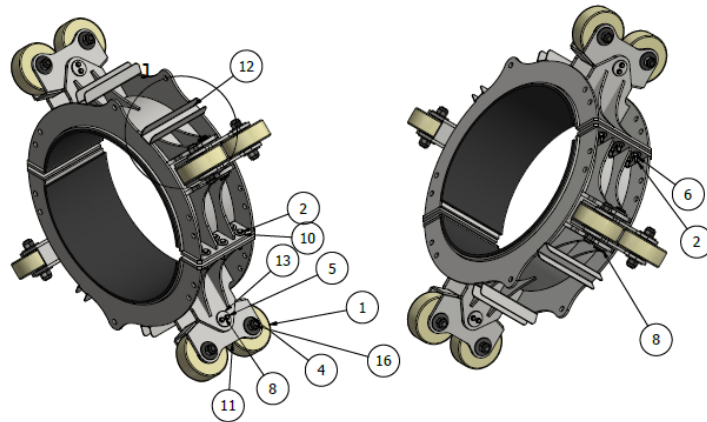
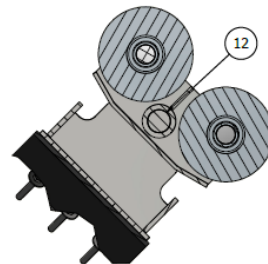
G-G (1:5)



J (1:5)

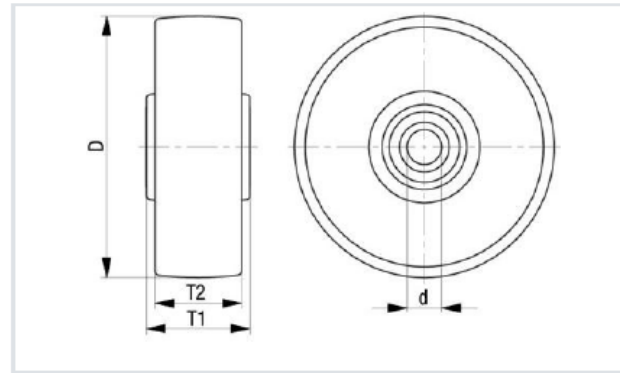


F-F (1:8)



LAURINI		TRATTAMENTO	FOLIO	M
		717	A2	
		FINITURA		
RUGOSITA' GENERALE		NUMERO DISEGNO		
12.5 6.3 3.2 1.6		PF002270003		
LAVORAZIONE		SCALA		
		1:8		
MATERIALE		DESCRIZIONE		
		Cravatta di scorrimento DN36*		
		Documento riservato e termini di legge con diritto di riproduzione e di rendere comunque noto e fare senza esplicita autorizzazione		

WHEELS CAPACITY



Tread and tyre hardness
 ■■■■■ 80 Shore D

Rolling resistance
 ■■■■■ excellent

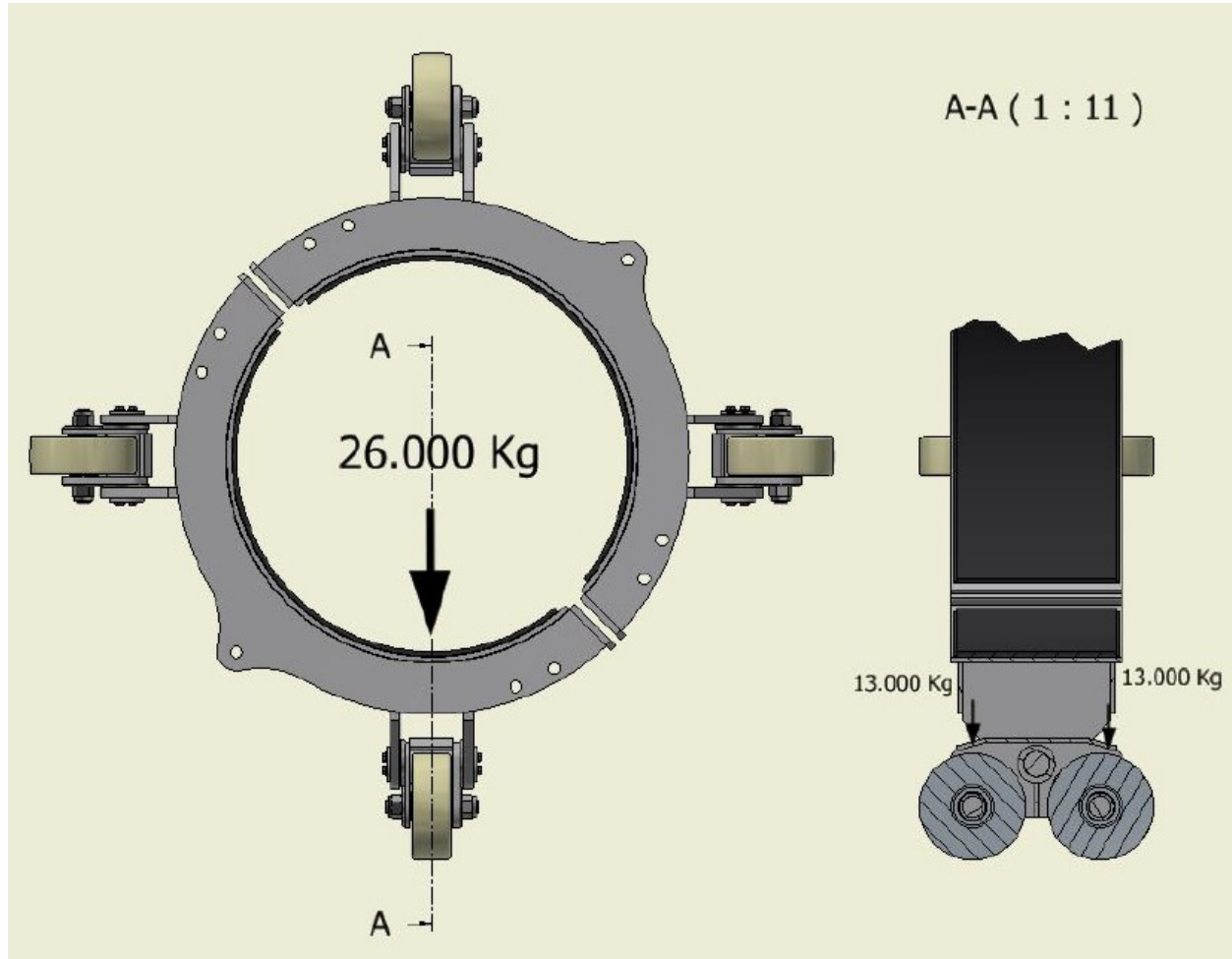
Wear resistance
 ■■■■□ very good

Operating noise / floor surface preservation
 ■■□□□ satisfactory

Technical data:

Wheel Ø (D)	⌀	250 mm
Wheel width	⌞	80 mm
Load capacity at 4 km/h	⬮	6,000 kg
Load capacity (static)	⬮	15,000 kg
Bearing type	⦿	ball bearing
Axle bore Ø (d)		50 mm
Hub keyway (T1)	⌘	90 mm
Temperature resistance min		-20 °C
Temperature resistance max		80 °C
Tread and tyre hardness		80 Shore D
Unit weight	⚖	6.313 kg
Non-marking		✓
Electrically conductive	⚡	×
Antistatic	⚡	×
Corrosion-resistant		×
Heat-resistant	🔥	×
Non-staining		✓
Tread hydrolysis-resistant		×
Suitable for autoclaves		×

WHEELS CAPACITY



Spinta teorica in funzione della pressione		Theoretical thrust in pressure function.	
bar	daN		
20	4000		
40	8000		
60	12000		
80	16100		
100	20100		
120	24100		
140	28150		
160	32100		
180	36200		
200	40200		
220	44200		
240	48250		
260	52250		
280	56300		
300	60300		
320	64300		
340	68350		
360	72350		
380	76400		
400	80400		
420	84400		
440	88450		
460	92450		
480	96500		
500	100500		



PRESSA IDRAULICA TIPO

HYDRAULIC PRESS TYPE

BP 100

N.

CAPACITA' MAX DI SPINTA

MAX CAPACITY OF THRUST

t

100

PRESSIONE MAX DI LAVORO

MAX WORKING PRESSURE

bar

500

BIGNOZZI

Via Comunale 65 - 44012 BONDENO - FERRARA
ITALY

WHEELS CAPACITY

150 bar

28150 daN

28705 kg



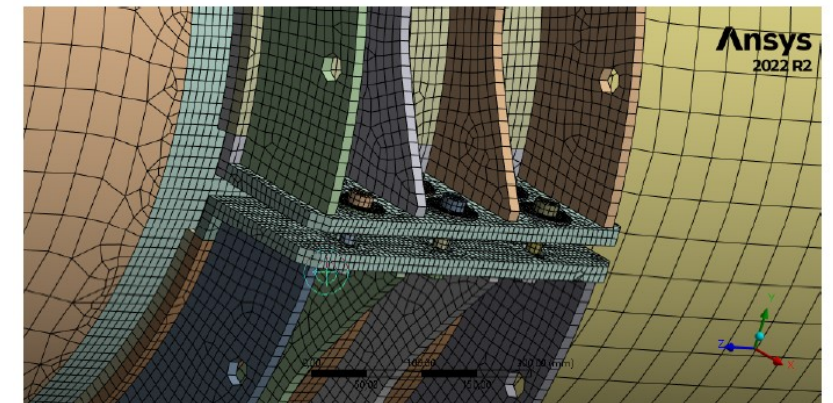
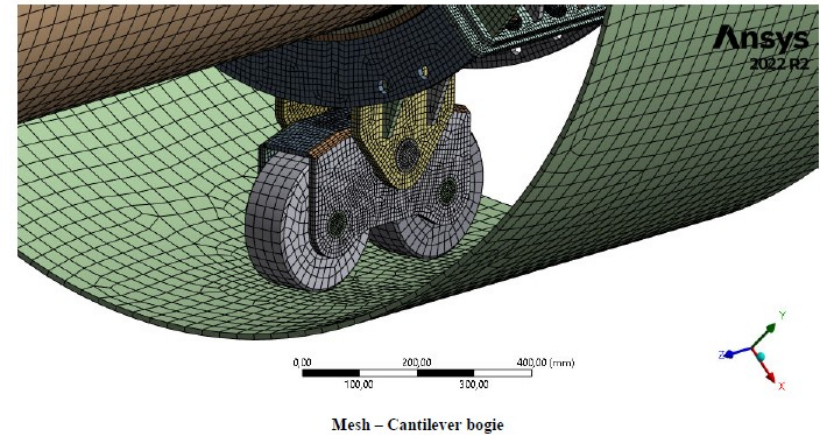
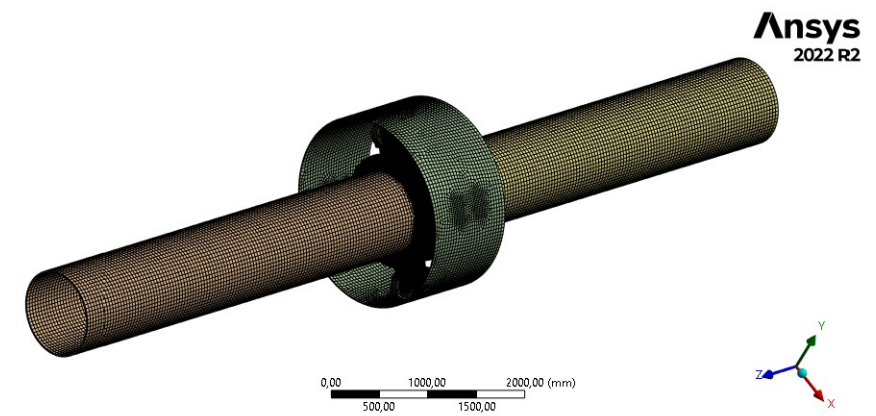
WHEELS CAPACITY

200 bar / 40200 daN / 40993 kg



CALCULATIONS REPORT

- LOADS ON **SLIDING SHOES**
- LOADS ON **CANTILEVER BOGIE AND WHEELS**
- **BOLT PRETENSION AND FRICTIONAL CONNECTION BETWEEN SLIDING SHOE AND DN36 STEEL PIPE**
- **FEA VERIFICATION OF SLIDING SHOE**
- **VERIFICATION OF DN36 STEEL PIPE SUBJECTED TO SLIDING SHOE LOADS**
- **VERIFICATION OF BOLT CONNECTIONS**
- **VERIFICATION OF PIN CONNECTIONS**



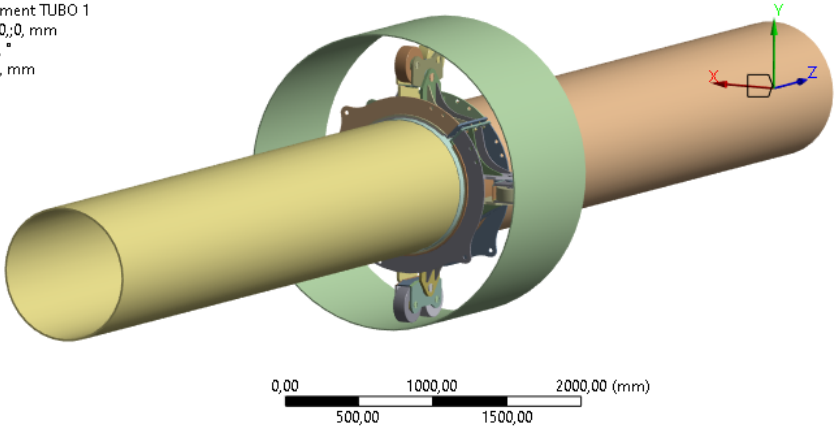
CALCULATIONS REPORT

VERTICAL LOAD

DESCRIPTION	VALUE
Maximum required vertical load by DN36 pipe	25400 kg
Maximum vertical load by DN36 pipe adopted	26000 kg
Maximum weight of sliding shoe	800 kg
Maximum vertical load on one sliding shoe	26800 kg ~ 263000 N
Maximum vertical load on one cantilever bogie	263000 N
Maximum vertical load on one wheel	131500 N

LOAD CONDITION 1 - 0°
Displacement TUBO 1
;

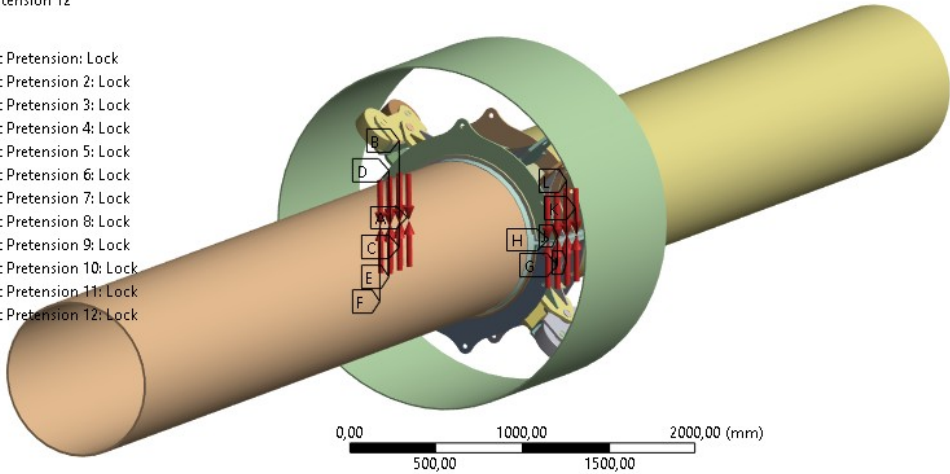
ote Displacement TUBO 1
omponents: 0,0,0 mm
osition: 0, 0, 0, "
ation: 0, 0, 0, mm



Support on DN36 pipe

R4 - LOAD CONDITION 1 - 0°
It Pretension 12
sp: 6

- Bolt Pretension: Lock
- Bolt Pretension 2: Lock
- Bolt Pretension 3: Lock
- Bolt Pretension 4: Lock
- Bolt Pretension 5: Lock
- Bolt Pretension 6: Lock
- Bolt Pretension 7: Lock
- Bolt Pretension 8: Lock
- Bolt Pretension 9: Lock
- Bolt Pretension 10: Lock
- Bolt Pretension 11: Lock
- Bolt Pretension 12: Lock



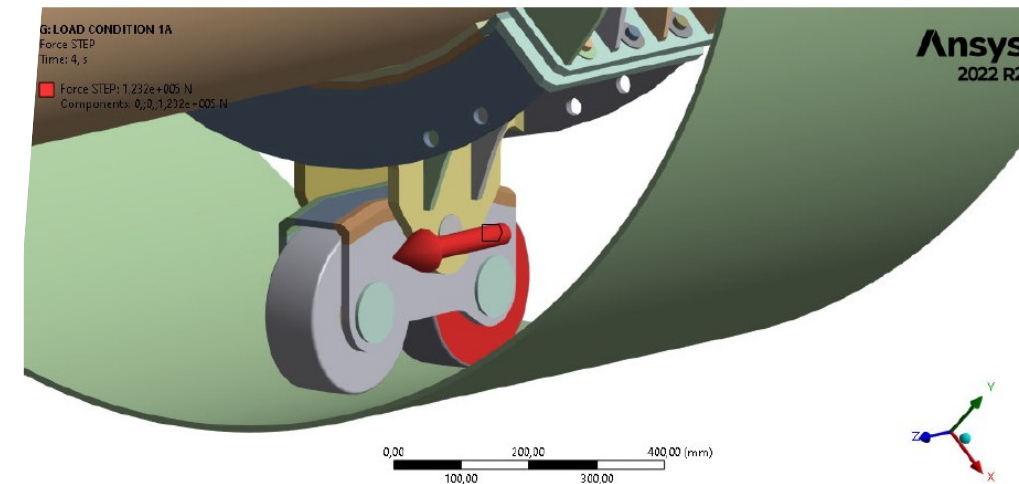
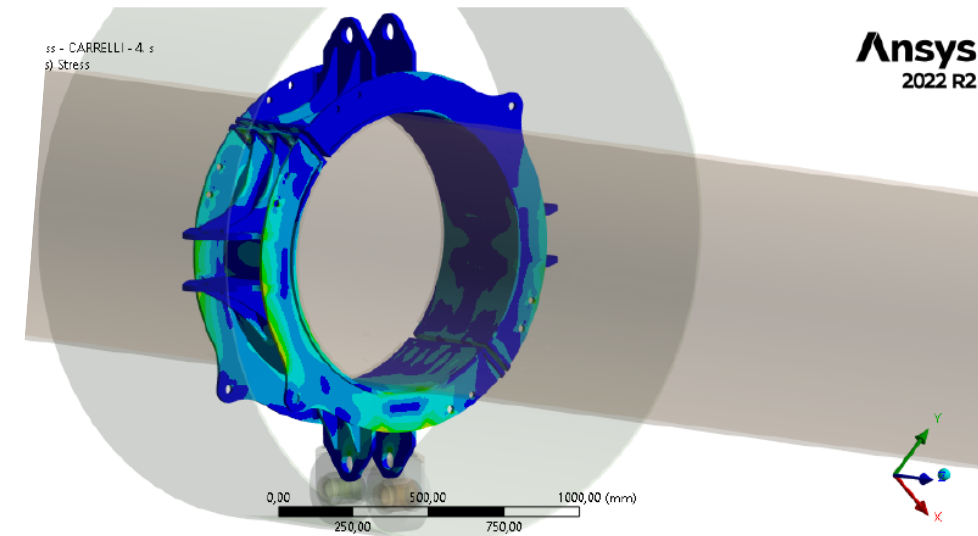
Load pretension of bolts

CALCULATIONS REPORT

- SLIDING SHOE FACING A STEP

LONGITUDINAL LOAD

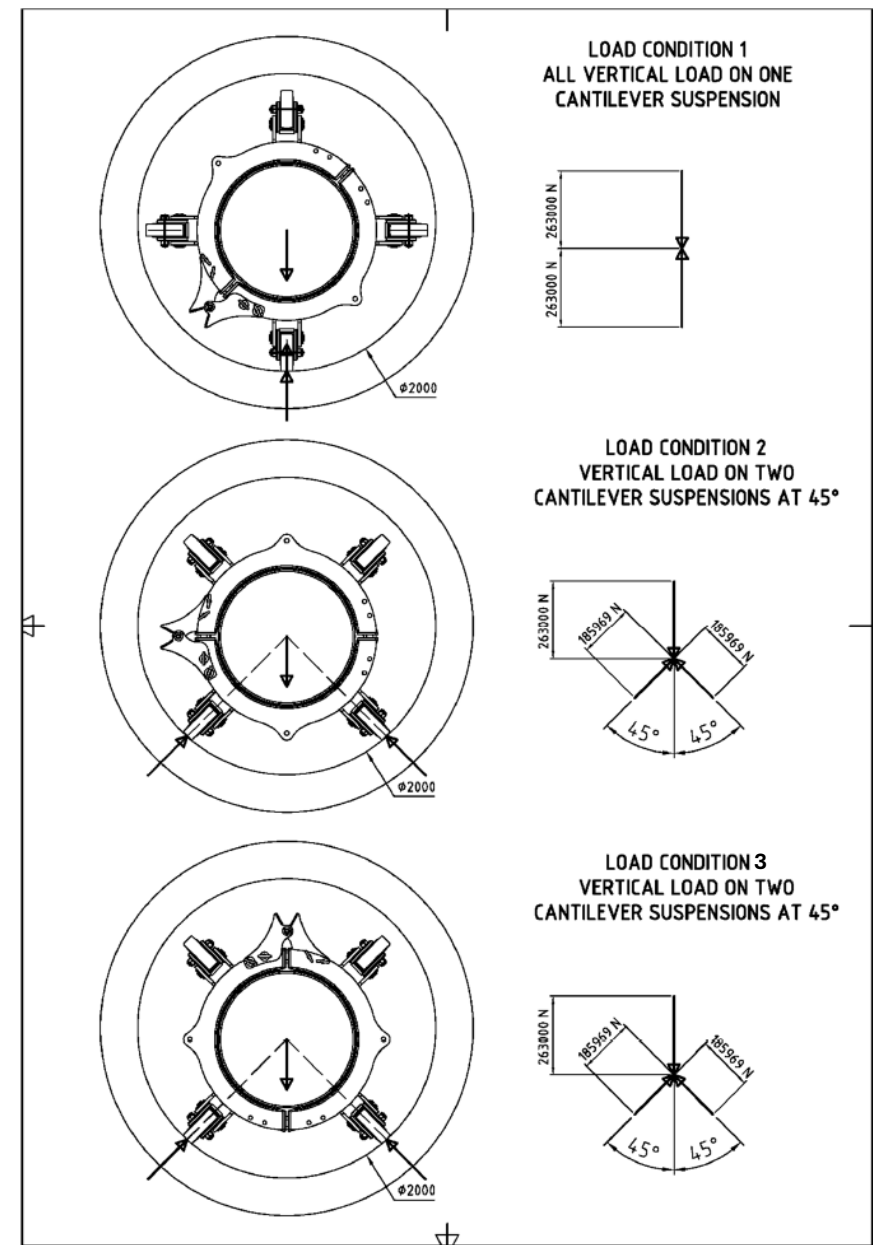
DESCRIPTION	VALUE
Maximum longitudinal load on cantilever bogie	73830 N
Maximum longitudinal load on sliding shoe	73830 N
Maximum total load on cantilever pin	273166 N
Maximum total load on wheel	172688 N



CALCULATIONS REPORT

- SLIDING SHOE FACING A STEP
- SLIDING SHOE SUBJECTED TO LATERAL LOAD

LOAD CONDITIONS	
DESCRIPTION	
LOAD CONDITION 1A	VERTICAL + LONGITUDINAL
LOAD CONDITION 1B	VERTICAL + TRANSVERSAL
LOAD CONDITION 2A	VERTICAL + LONGITUDINAL
LOAD CONDITION 2B	VERTICAL + TRANSVERSAL
LOAD CONDITION 3A	VERTICAL + LONGITUDINAL
LOAD CONDITION 3B	VERTICAL + TRANSVERSAL

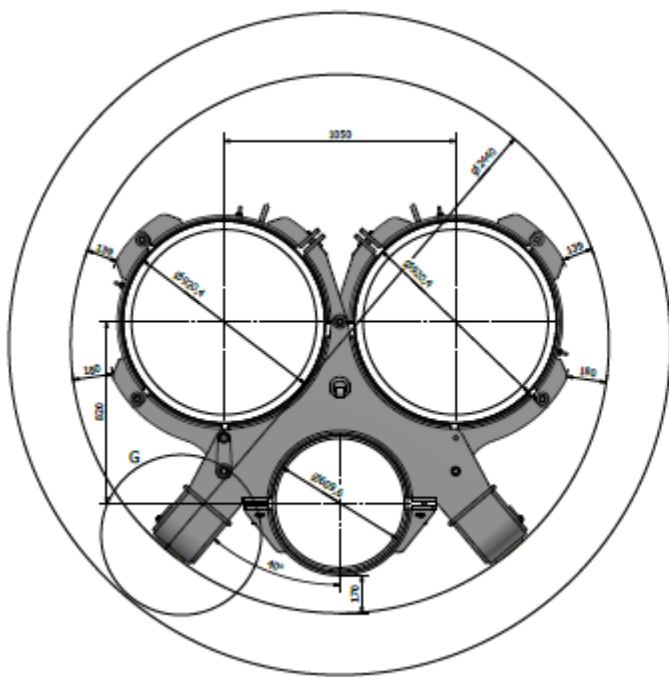




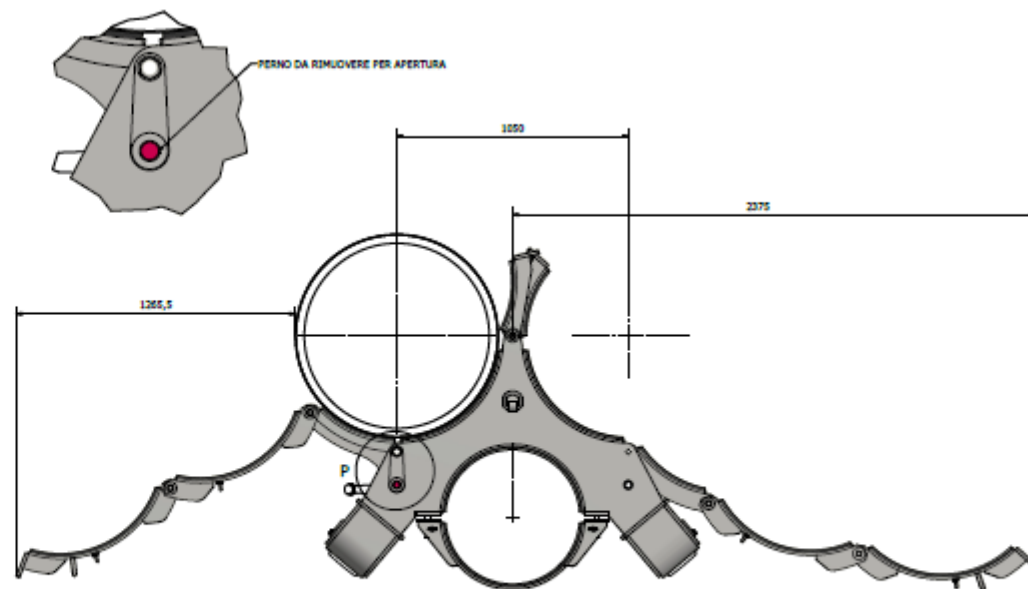
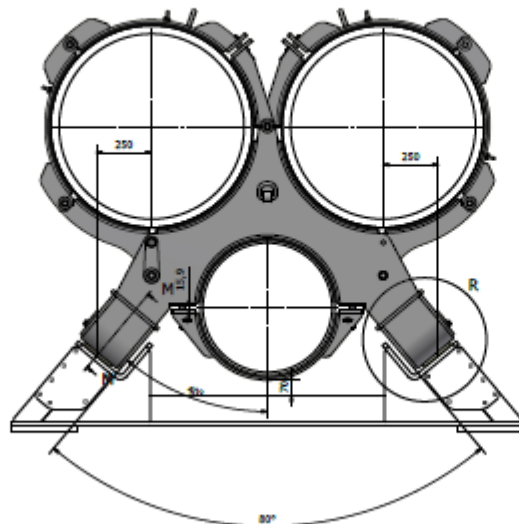
SOLUCIONES SIN ZANJA

Microtúnel conexión mar-tierra Coatzacoalcos

Microtúnel de 1700 metros
3 ductos dentro el microtúnel
Diámetro microtúnel de 3 metros
Plataforma de 130,000m²
Shaft de 10 m profundidad y 25 m de diámetro

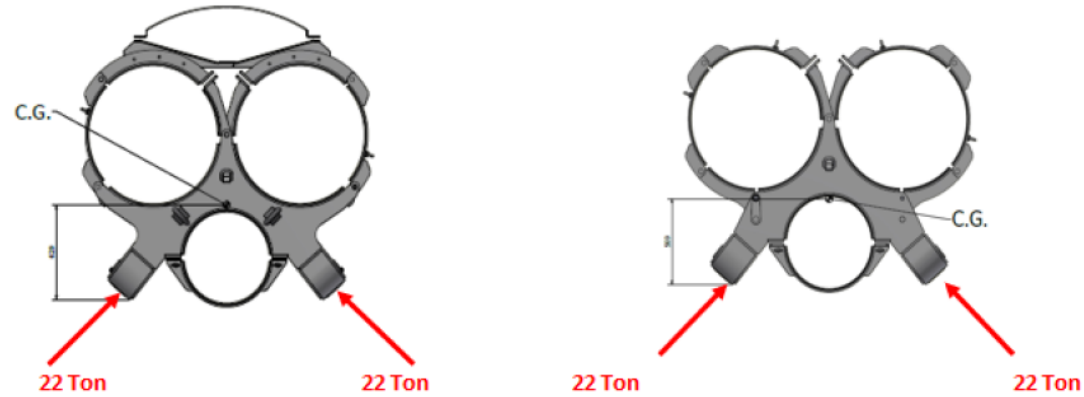


G (1:4)



FEM ANALYSIS

1- LOAD COMBINATION 1 ONSHORE AND OFFSHORE PIPE CLAMP:



3- LOAD COMBINATION 3 ONSHORE PIPE CLAMP

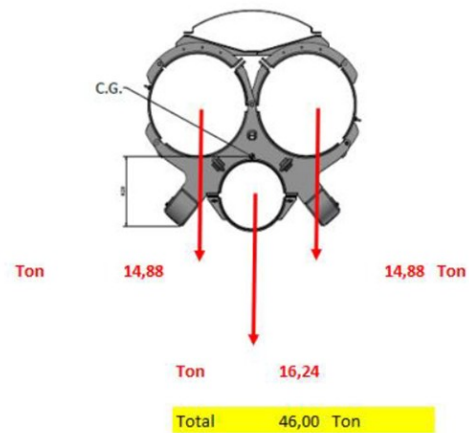


Figure 5: LC3 Loads

2- LOAD COMBINATION 2 OFFSHORE PIPE CLAMP

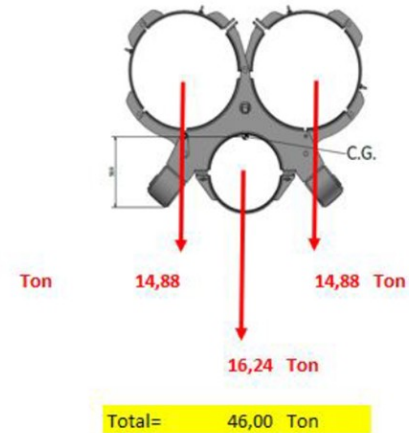


Figure 4: LC2 Loads

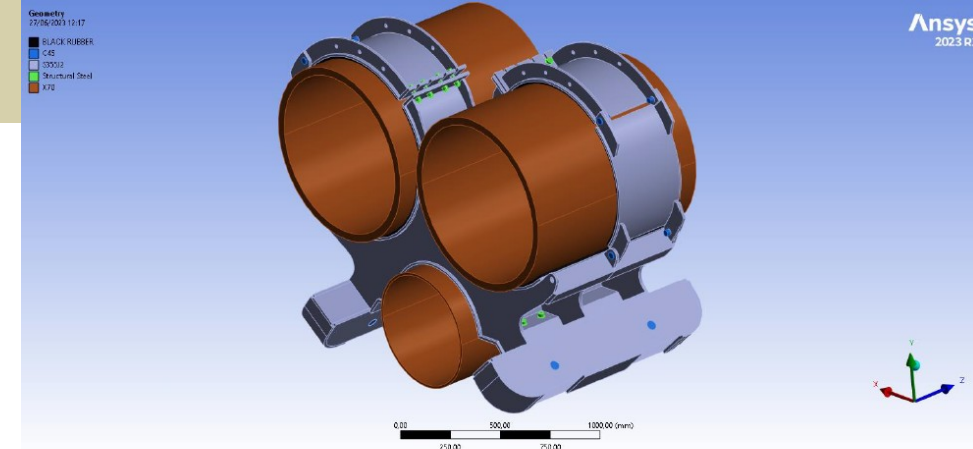
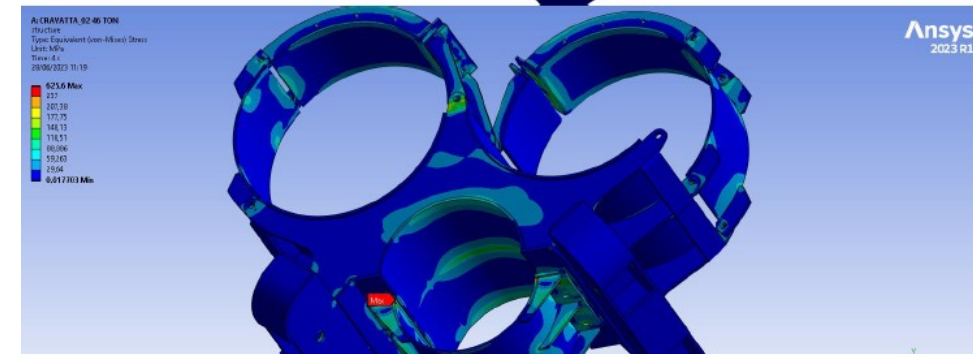
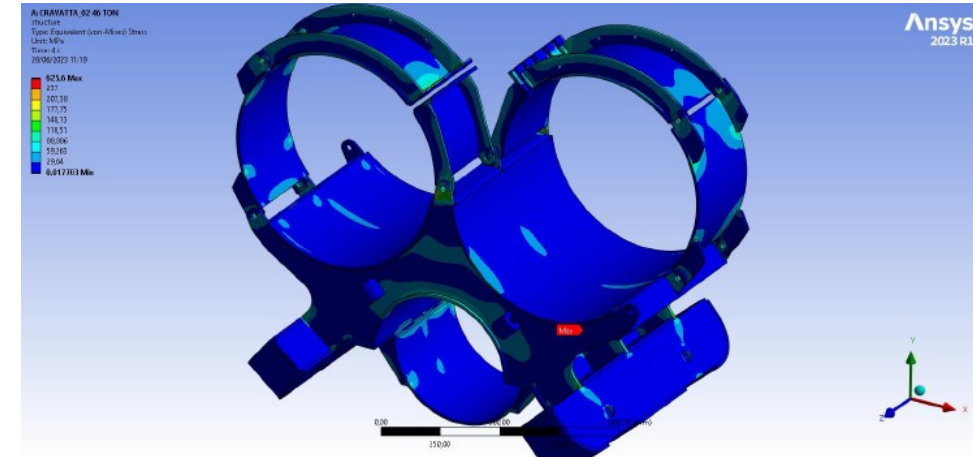


Figure 1: "Cravatta" Assembly



WHEELS CAPACITY



UNIVERSITÀ
DI TRENTO



CENTRO SERVIZI TECNICI ALLE IMPRESE

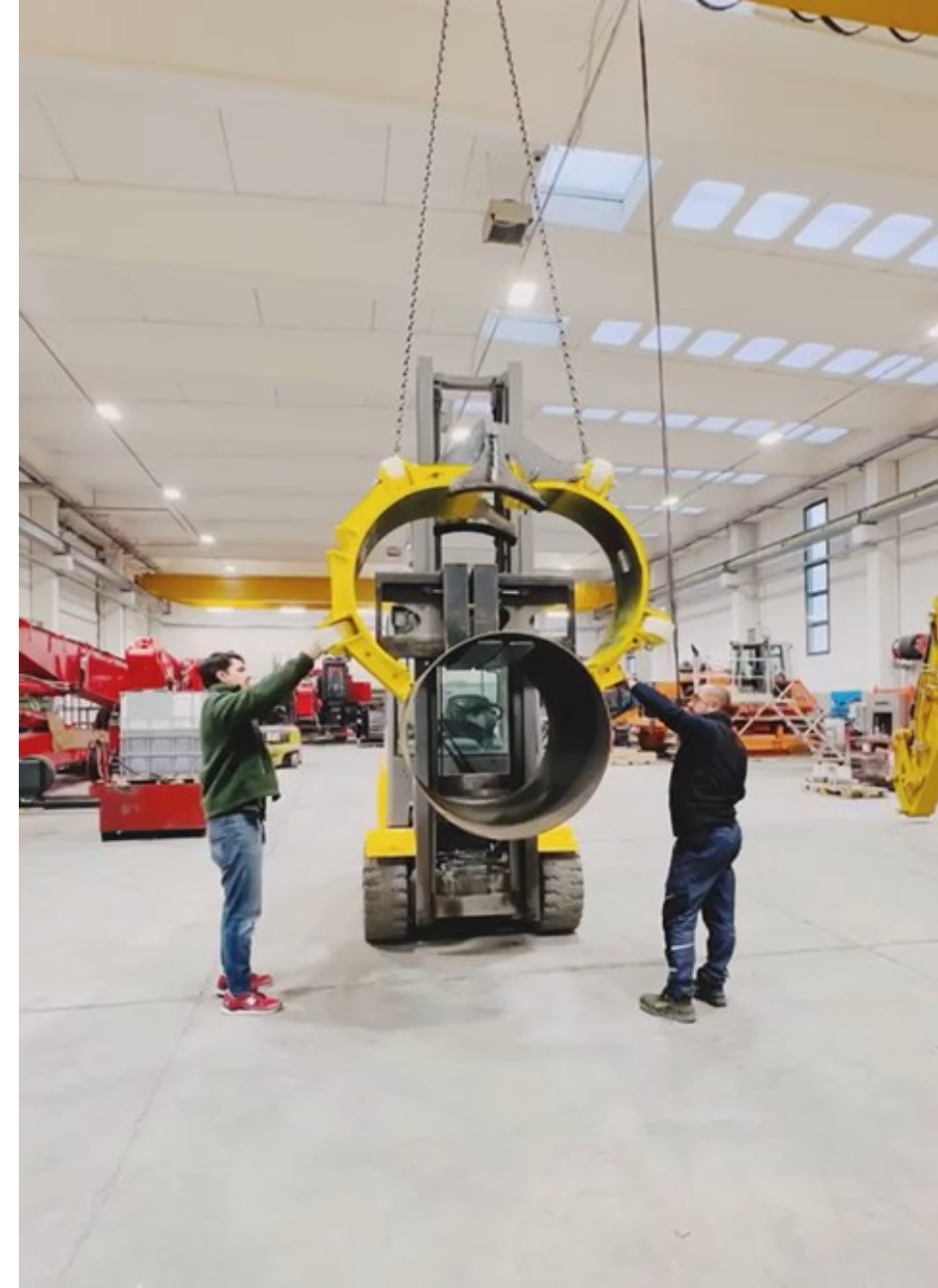
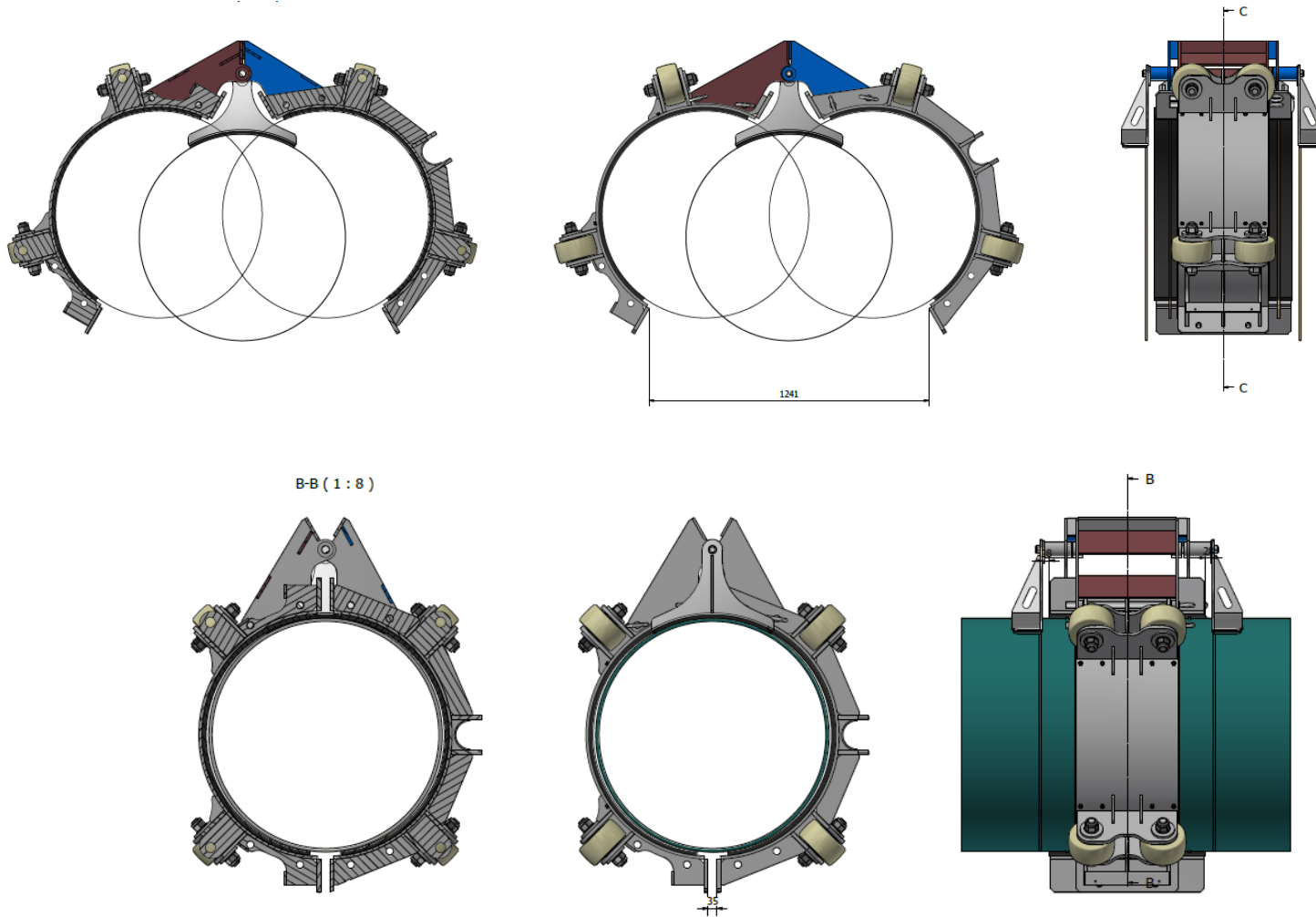






LIFTING BEAM

INSTALLATION TOOL





WINCHES

cause **together**, we can do **anything...**

THANK YOU!



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