Büro für Tragwerksplanung und Ingenieurbau
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Structural Report
Rev 01

Endplate-QLJZ15
Suspension point F34

23279-A

for the system by

Global Truss
Furong Industrial Area
Shajing Town

Baoan District Shenzen China

Compiled by:

Aachen, 15th April 2023

INGENIEURKAMMER-BAU NORDRHEIN-WESTFALEN
BERATENDER INGENIEUR
716397

This report includes pages: 1 – 6
Annex: Test Report 16 pages
Technical Drawing QLJZ15

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TABLE OF CONTENT

+Annex: Test Report 16 pages
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1 GENERAL REMARKS

1.1 Basics

The currently applicable regulations and standards, in particular:

DIN EN 1991-1	Loadings for buildings (Eurocode 1)
DIN EN 13814	Temporary structures
DIN EN 13782	Temporary structures - Tents
DIN EN 1993-1	Steel structures (Eurocode 3)
DIN EN 1995-1	Wooden structures (Eurocode 5)
DIN EN 1999-1	Aluminium Structures (Eurocode 9)
DIN EN 12385	Steel cable

Rev 01: The material of the suspension plate is changed from C45 to Q235.

1.2 Building materials

Q235 strength class of the used steel material

1.3 General description / advice on setting up and operation

Subject of this structural report is an attachment component for the F34 truss system.
The component can be connected to the four main chords of a F34 Truss (Fa. Globaltruss) with cone connectors.

The component is made of 10 mm thick steel plates and its dimensions are corresponding to the dimensions of the F34 truss. The component is designed to support a vertical payload of 1000 kg as shown in chapter 2.

The verifications on the basis of calculations are based on the safety concept of the European steel construction standard with increased safety for loads above persons (see chap. 1.4). These verifications are partly based on the yield strength and therefore do not provide a direct statement on the real breaking load.

So additional to this report breaking tests have been carried out, which shows that the real breaking load is at least 8000 kg. So the safety factor towards the breaking load can be attested to 1:8.

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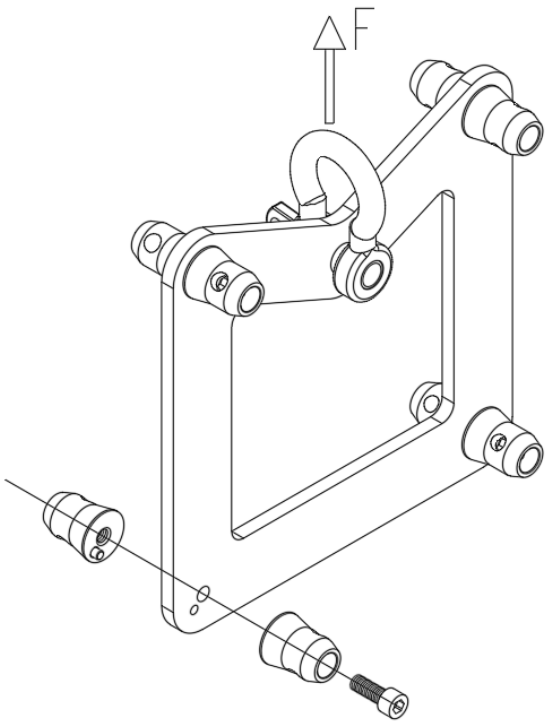
1.4 Loadings

Self-weight	The low self-weight can be neglected	
Payload	maximum vertical payload	F = 1000 kg = 10 kN
Safety factors	Safety factor on loading side y_F = 1,5 according to EN 1990	
	Additional safety factor y = 2,0 to cover the case: loads above person acc. to DGUV 17	



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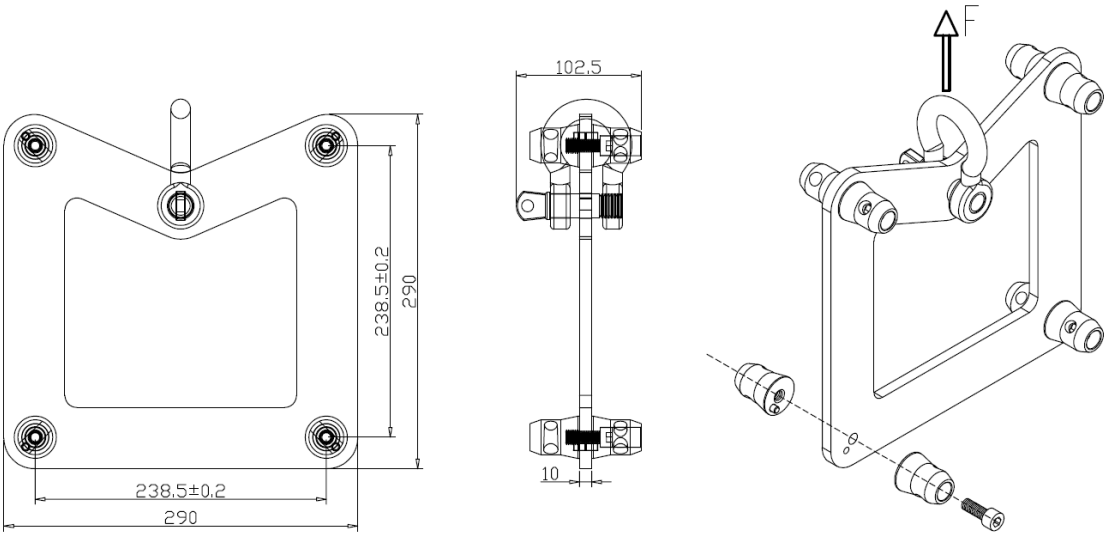
2 SYSTEM

Dimensions in [mm]

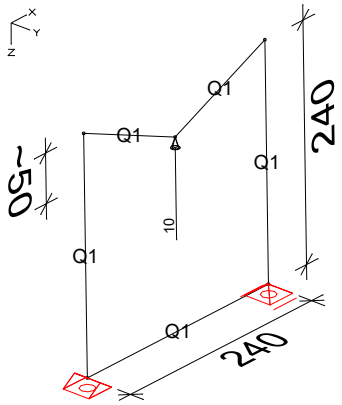


Steel Q235	t= 10 mm	yield strength	f_y = 235 N/mm²
		tensile strength	$f_u \geq$ 360 N/mm²
maximum Payload	F = 1000 kg = 10 kN		

The shackle is no part of this structural report.

3 VERIFICATION

System for the EDV-Calculation – Dimension in [mm]:



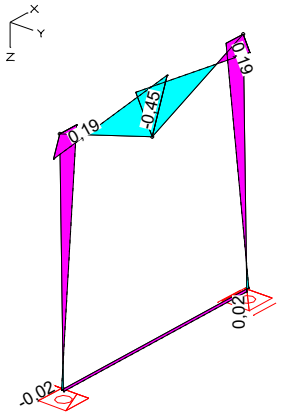
→ Loading without safety factor

with cross-section Q1 b x h = 10 x 50 mm
Q235 steel yield strength f_y = 235 N/mm² = 23,5 kN/cm²

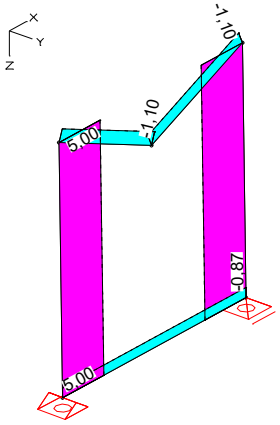
Verification of the Cross-section

Resulting internal Forces and stresses:

M_y [kNm]



N [kN]



Cross-section properties	W_{pl}	= t · h² / 4 = 1,0 · 5,0² / 4 = 6,25 cm³	
	A	= t · h =1,0 · 5,0 = 5,0 cm²	
resulting stress (without safety factors)	σ_x	= M_y / W_{pl} + N / A = 45 kNcm / 6,25 cm³ + 1,1 kN / 5,0 cm² = 7,42 kN/cm²	
with safety factors (see chapter 1.4)	**σ_{xd}**	= 1,5 · 2,0 · 7,42 kN/cm² **= 22,3 kN/cm²**	**< f_{yd} = 23,5 kN/cm²**

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Verification of the bearing capacity of the hole

Verification according to DIN EN 1993-1

Acting Payload $F_{sd} = 1{,}5 \cdot 2{,}0 \cdot 10{,}0 \text{ kN} = 30 \text{ kN}$

Bearing Capacity $F_{b,Rd} = k_1 \cdot \alpha_b \cdot f_u \cdot d \cdot t / y_{M2}$
$= 2{,}5 \cdot 0{,}44 \cdot 360 \text{ N/mm}^2 \cdot 20 \text{ mm} \cdot 10 \text{ mm} \cdot 10^{-3} / 1{,}25$
$= 63{,}36 \text{ kN}$

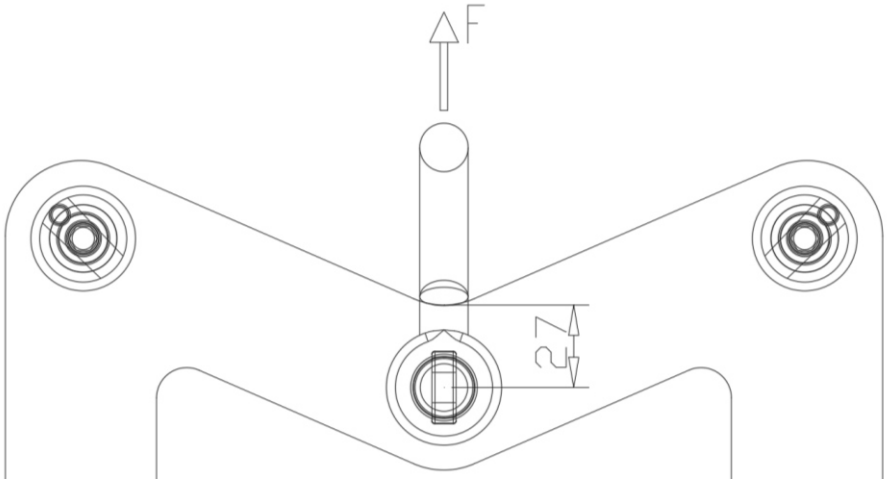
$F_{b,Rd}$ = 63,36 kN > F_{sd} = 30 kN

With:

$k_1 = \min\{2{,}8 \cdot e_2 / d_0 - 1{,}7 ; 1{,}4 \cdot p_2 / d_0 - 1{,}7 ; 2{,}5\}$
$= \min\{5{,}13 ; / ; 2{,}5\} = 2{,}5$

$\alpha_b = \min\{e_1 / (3 \cdot d_0) ; f_{ub} / f_u ; 1{,}0\}$
$= \min\{0{,}44 ; 1{,}11 ; 1{,}0\} = 0{,}44$

f_u = 360 N/mm²
f_{ub} = 400 N/mm² (assumption for bolt material 4.6)
d = 20 mm
d_0 = 20,5 mm
t = 10 mm
y_{M2} = 1,25
e_1 = 27 mm
p_2 = /
e_2 = 50 mm (set)



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Comparison with test-Load

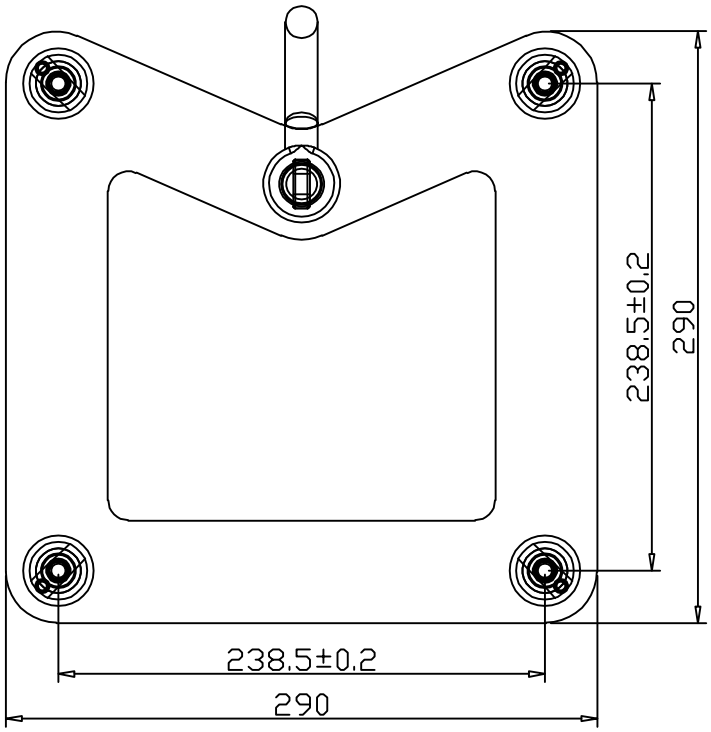
The preceding verifications are based on the safety concept of the European steel construction standard with increased safety for loads above persons. The verifications are partly based on the yield strength and therefore do not provide a direct statement on the actual breaking load.

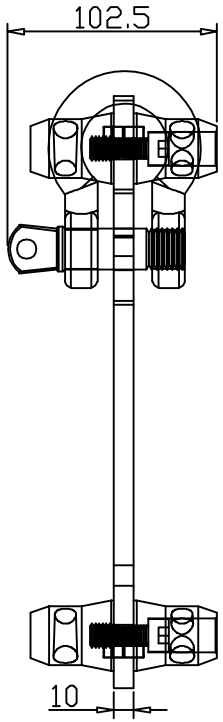
Therefore 5 additional load tests were carried out.

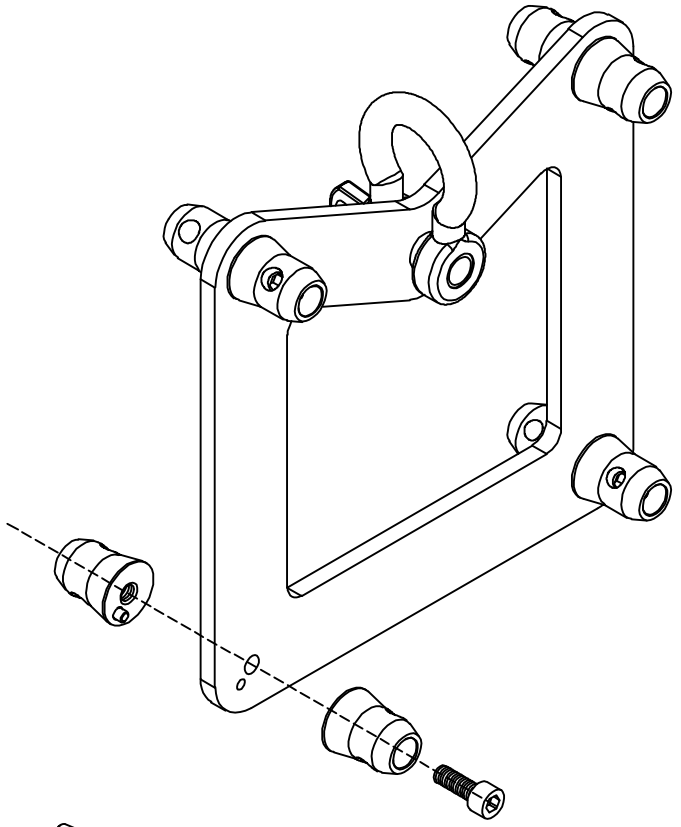
In all 5 Tests the component was loaded up to the maximum possible test load of 8000 kg of the testing machine. See documentation in Annex.

The tests show that plastic deformation occurs at a load of 8000 kg, but there is no failure of the system so far.

So a minimum breaking load of 8000 kg can be attested.







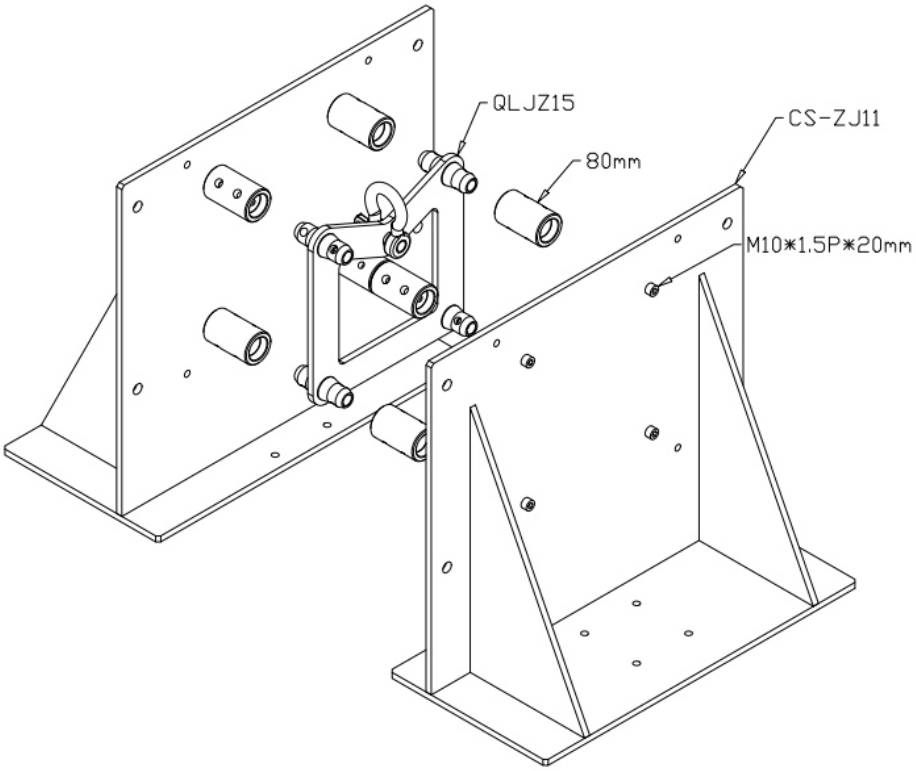
fitting	DMS-1-03	Steel	ZP	8
	DMS-1-04	S45C	ZP	8
05	M20*3.25Ton	S45C	ZP	1
04	M12*1.75P*25mm	10.9	Black	4
03	DMS-03-2N	S45C	ZP	4
02	ST5003A-2	S45C	ZP	4
01	PJ-TB115	Q235	ZP	1
NO.	SPEC.	MATERIAL	FIN.	QTY.

	DRAWN	LJZ	DRAW NO	QLJZ15		2D/3D	edition	1
	Specification	***	DESIGN	Bin Lee	DATE 18.03.21	CHECKED	APPROVED	
	Weight	**kgs/pcs	UNITS	mm	Proofread			
	SURFACE	RAW	SCALE					

MARK	NAME	RETRIEVE CONTENTS	DATE

TEST REPORT FOR F34 END PLATE-QLJZ15

Below picture for show the statement of the conditions of testing.

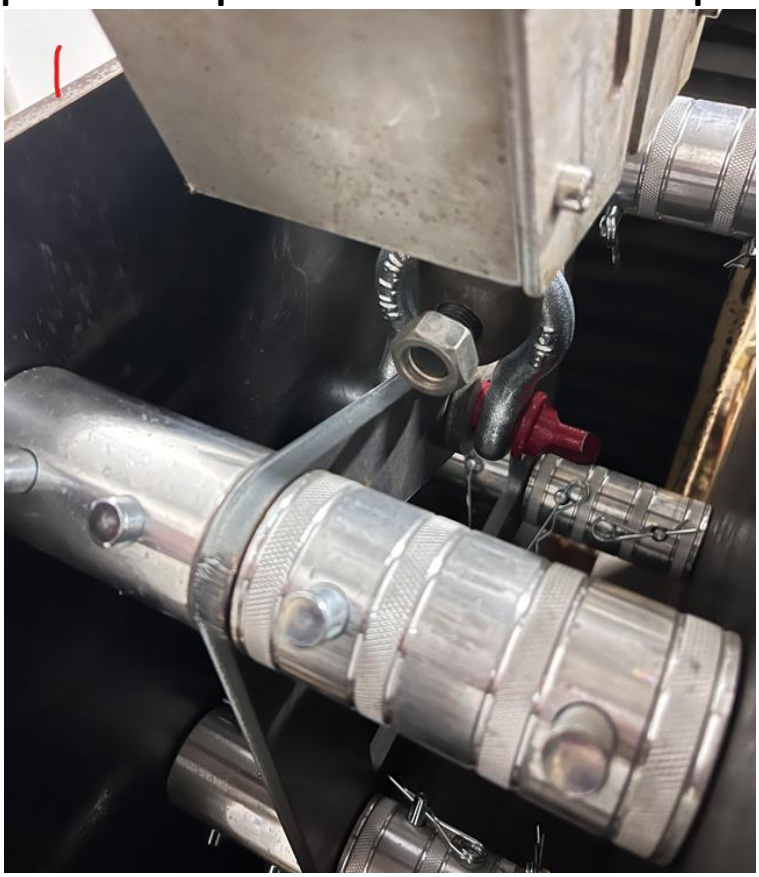


ST5019 length is 80mm

We tested 5 End plates

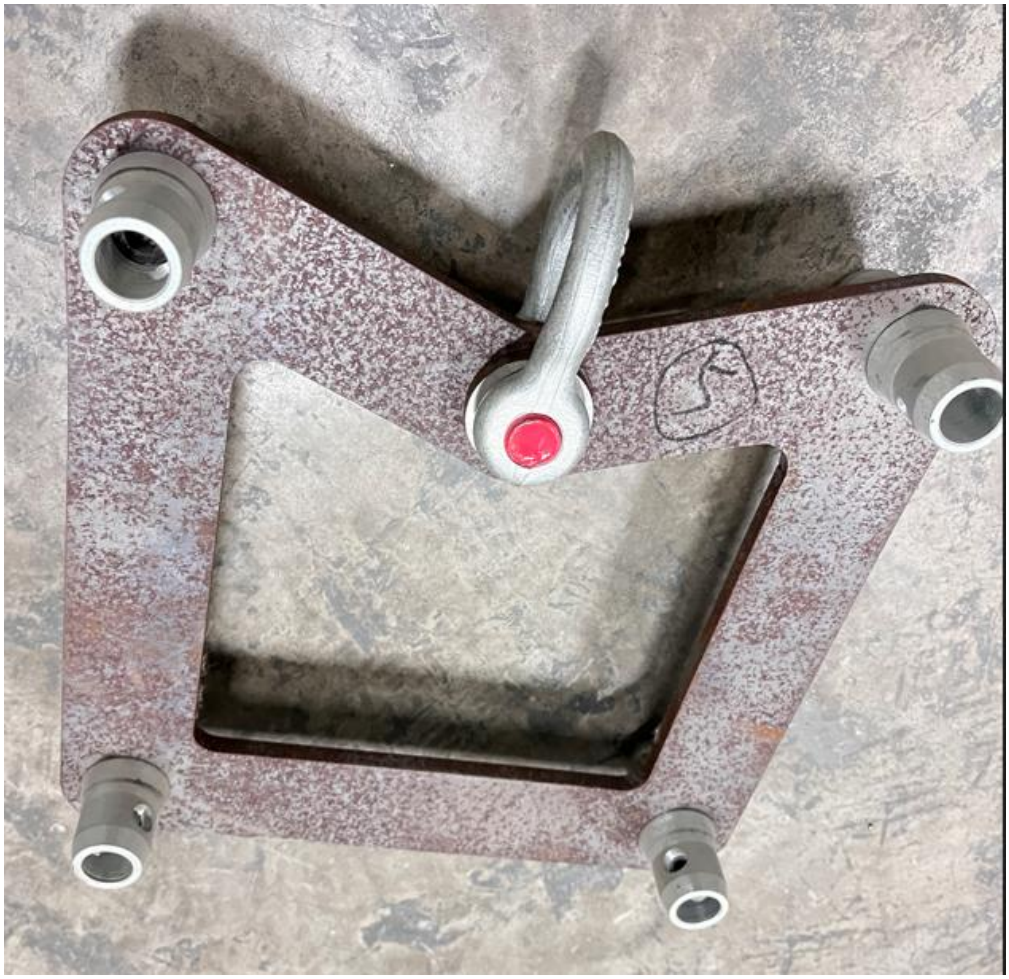
After loaded test

All part of the specimen showed as below photos




1


2



The Plate No obvious deformation


tested
New


2


3


4

D-shackle obvious deformation


2


3


4


5

The hole of the plate obvious deformation

2023.03.20

鑫源富金屬制品（深圳）有限公司
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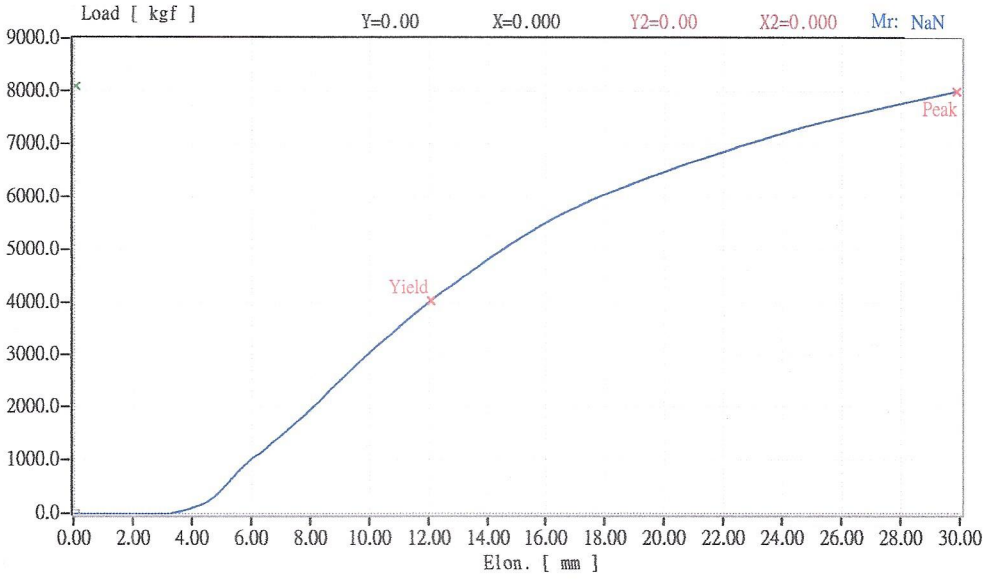
材料測試 試驗報告

1.Customer :
鑫源富金屬製品（深圳）有限公司
2.Operator :
3.Lot No. : 2023031701
4.Date : 2023年3月17日
5.Time : 下午 04:14:00
6.Temperature: 25C
7.Speed :20.00mm/min
8.Test Style : Tension Test
9.Standard :
10.Specimen : QLJZ15 T1
11.Spec.Length : 60.000mm
12.Spec.Style : Random
13.Spec.Area : 301.5929mm^2
14.Total Energy: 131564kgf · mm
15.Young's Modu. : 102.958kgf/mm^2
16.Notice :
17.Filename: E:\測試報告\2023031701

	Load(kgf)	Elon.(mm)	Stress(kgf/mm^2)	Strain(%)
Peak	8003.1	29.87	26.536	49.78
Break	8003.1	29.87	26.536	49.78
Yield	4026.0	12.10	13.349	20.17



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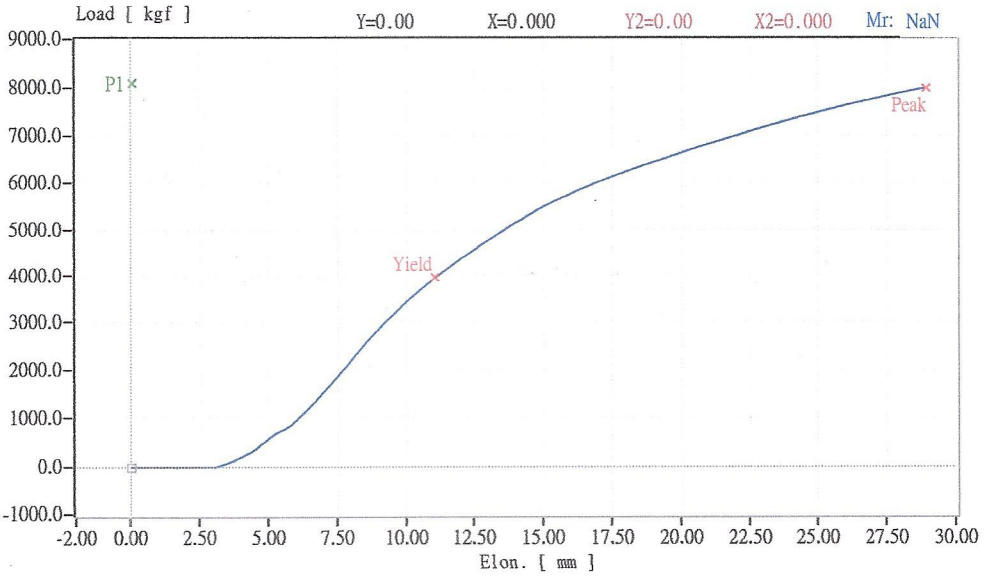
1.Customer :
鑫源富金屬製品（深圳）有限公司
2.Operator :
3.Lot No. : 2023031702
4.Date : 2023年3月17日
5.Time : 下午 04:42:50
6.Temperature: 25C
7.Speed :20.00mm/min
8.Test Style : Tension Test
9.Standard :
10.Specimen : QLJZ15 T2
11.Spec.Length : 60.000mm
12.Spec.Style : Random
13.Spec.Area : 301.5929mm^2
14.Total Energy: 129183kgf · mm
15.Young's Modu. : 114.187kgf/mm^2
16.Notice :
17.Filename: E:\測試報告\2023031702

	Load(kgf)	Elon.(mm)	Stress(kgf/mm^2)	Strain(%)
Peak	8004.5	28.94	26.541	48.23
Break	8004.5	28.94	26.541	48.23
Yield	3940.4	11.06	13.065	18.43



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1.Customer :
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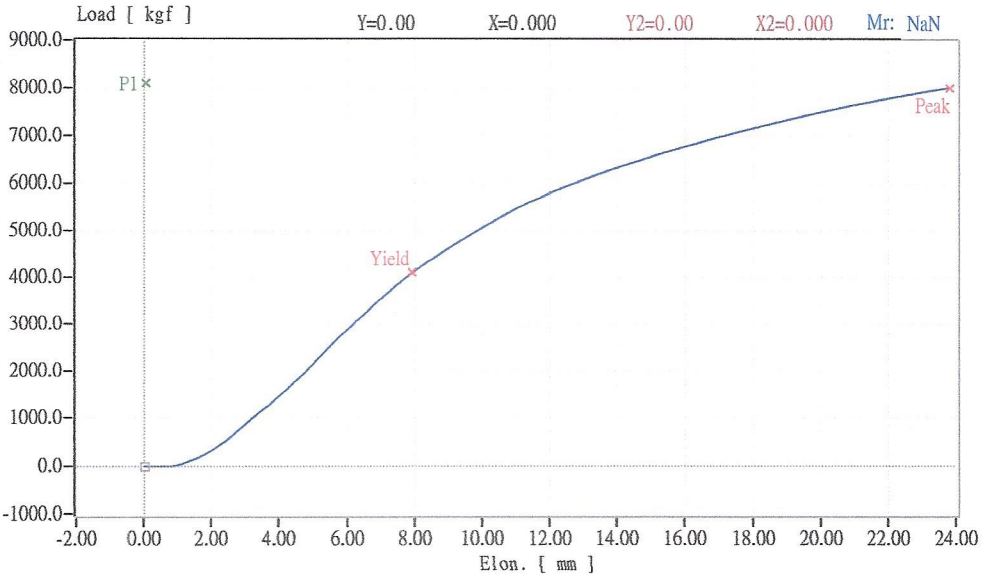
2.Operator :
3.Lot No. : 2023031703
4.Date : 2023年3月17日
5.Time : 下午 05:01:31
6.Temperature: 25C
7.Speed :20.00mm/min
8.Test Style : Tension Test
9.Standard :
10.Specimen : QLJZ15 T3
11.Spec.Length : 60.000mm
12.Spec.Style : Random
13.Spec.Area : 301.5929mm^2
14.Total Energy: 116657kgf · mm
15.Young's Modu. : 133.369kgf/mm^2
16.Notice :
17.Filename: E:\測試報告\2023031703

	Load(kgf)	Elon.(mm)	Stress(kgf/mm^2)	Strain(%)
Peak	8001.1	23.79	26.529	39.65
Break	8000.4	23.79	26.527	39.65
Yield	4079.9	7.93	13.528	13.22



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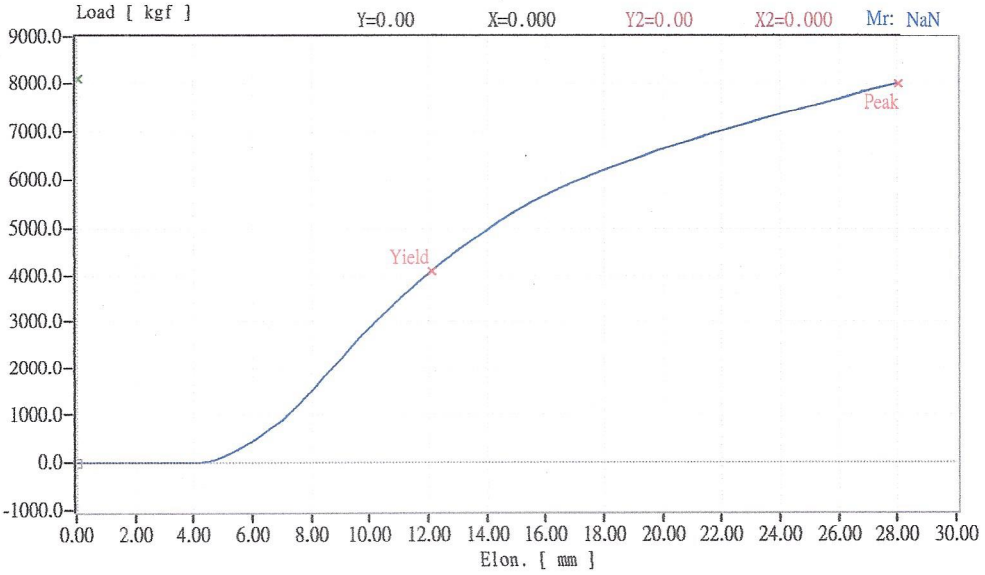
材料測試 試驗報告

1.Customer :
鑫源富金屬製品（深圳）有限公司
2.Operator :
3.Lot No. : 2023031704
4.Date : 2023年3月17日
5.Time : 下午 05:20:37
6.Temperature: 25C
7.Speed :20.00mm/min
8.Test Style : Tension Test
9.Standard :
10.Specimen : QLJZ15 T4
11.Spec.Length : 60.000mm
12.Spec.Style : Random
13.Spec.Area : 301.5929mm^2
14.Total Energy: 116964kgf · mm
15.Young's Modu. : 122.730kgf/mm^2
16.Notice :
17.Filename: E:\測試報告\2023031704

	Load(kgf)	Elon.(mm)	Stress(kgf/mm^2)	Strain(%)
Peak	8002.4	28.01	26.534	46.68
Break	8002.4	28.01	26.534	46.68
Yield	4090.9	12.10	13.564	20.17



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1.Customer :
鑫源富金屬製品（深圳）有限公司
2.Operator :
3.Lot No. : 20230302001
4.Date : 2023年3月20日
5.Time : 上午 08:56:11
6.Temperature: 25C
7.Speed :20.00mm/min
8.Test Style : Tension Test
9.Standard :
10.Specimen : QLJZ15 T5
11.Spec.Length : 60.000mm
12.Spec.Style : Random
13.Spec.Area : 301.5929mm^2
14.Total Energy: 114378kgf · mm
15.Young's Modu. : 98.636kgf/mm^2
16.Notice :
17.Filename: E:\測試報告\20230302001

	Load(kgf)	Elon.(mm)	Stress(kgf/mm^2)	Strain(%)
Peak	8002.8	27.94	26.535	46.57
Break	8002.8	27.94	26.535	46.57
Yield	4876.1	14.53	16.168	24.22