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Structural Report

F34-DNA

18468

for the system by

Global Truss
Furong Industrial Area
Shajing Town

Baoan District Shenzhen China

Compiled by:

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Aachen, 07th March 2019



This Structural Report includes pages

1 - 8 + annexes

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ANNEXES

Drawings F34-DNA	7 pages
Calculation of the characteristic stresses of the tubes (acc. chapter 4):	
With 1 m truss pieces	
Span 2 m	2 pages
Span 3 m	2 pages
Span 4 m	2 pages
Span 5 m	2 pages
Span 6 m	2 pages
Span 7 m	2 pages
Span 8 m	2 pages
Span 9 m	2 pages



1 PRELIMINARY NOTES

1.1 Basics

The currently applicable regulations and standards, in particular:

DIN EN 1991-1	Actions on structures (Eurocode 1)
DIN EN 13814	Fairground and amusement park machinery and structures
DIN EN 13782	Temporary Structures – Tents
DIN EN 1993-1	Design of steel structures
DIN EN 1999-1	Design of aluminium structures

1.2 Materials

Tubes	Aluminium EN AW-6082 T6
Bolts	Güte mid. 8.8 (grade min. 8.8)

1.3 General remarks

The truss system is part of a "modular construction system" with the different truss lengths

500mm, 1000mm, 1500mm, 2000mm, 2500 mm and 3000mm.

The Trusses consist of 4 main chords (round tubes 50 x 2mm), which are arranged in a spiral shape. Between the main chords welded diagonal bracings (round tubes 20 x 2mm) are arranged according chapter 2.

The distance between system lines of the mainchords is 24 cm in vertical- and 24 cm in horizontal direction.

The trusses are connected at the 4 mainchords with couplers consisting of female fittings, connectors and bolts.

The loads are applied acc. chapter 1.4. The allowable loads are listed in tables (see chapter 5).

The verification of the single parts is done according the safety concept of EN 1990 with a partial safety factor of the loading side of 1.50 for payloads.

For applications which can be calculated on the basis of other codes, the partial safety factors can be adjusted (for example temporary structures acc. EN 13814, $\gamma_F = 1.35$ for payloads).

To use the resulting allowable loads with British Standard (BS) and ANSI, the allowable loads listed in tables have to be multiplied by 0.85

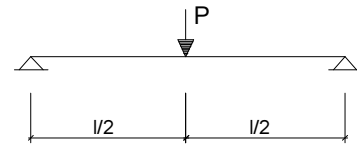


1.4 Geometry and loadings

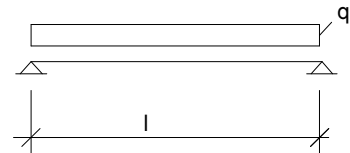
The selfweight of the truss is approx. 6 kg/m

For the payloads there are 2 loadcases taken into account:

LC 1) Center point load (CPL) in the middle of the span



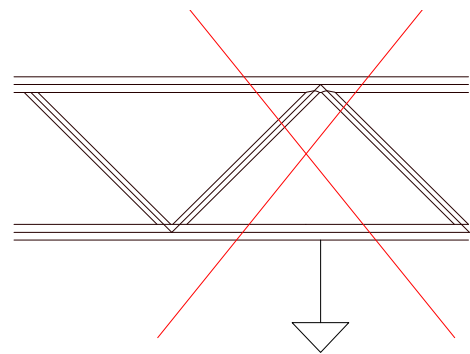
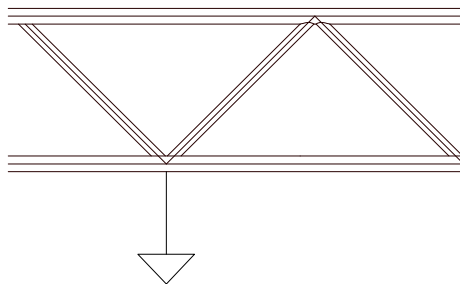
LC 2) Uniformly distributed load (UDL)



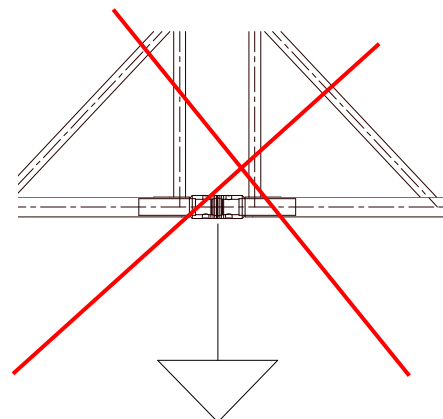
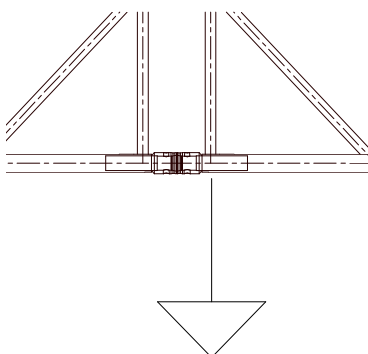
Distributed along the chord tubes $\varnothing 50 \times 2 \text{ mm}$.

For the application of the calculated allowable loadings the following rules have to be regarded:

Large loads have to be applied at the nodes or have to be distributed by appropriate constructions.

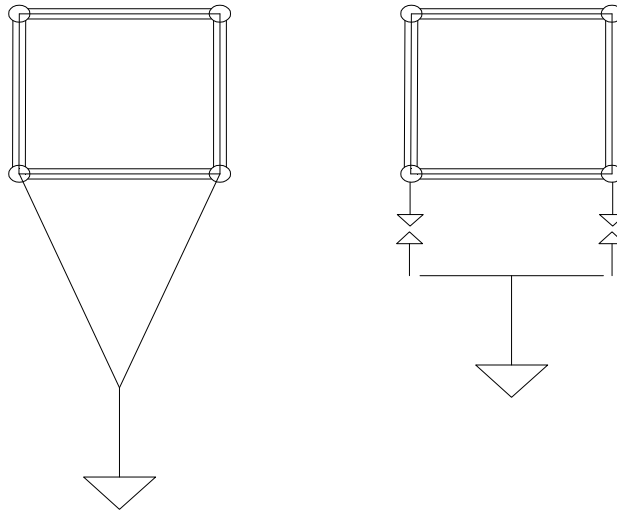


Loads at the middle of the couplers are not allowed.

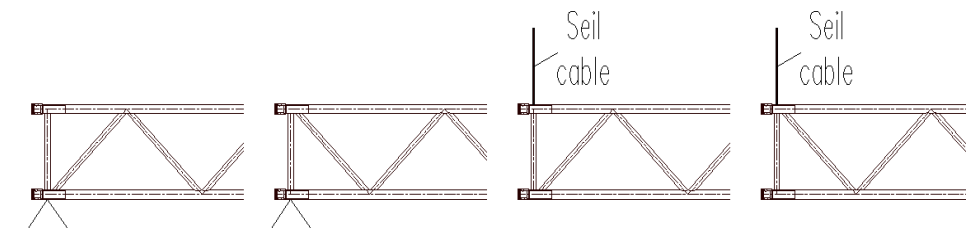




All loads have to be distributed equally to both chords.



For the support or suspension there are the following possibilities:





2 SYSTEM

Drawings F34-DNA

see annex

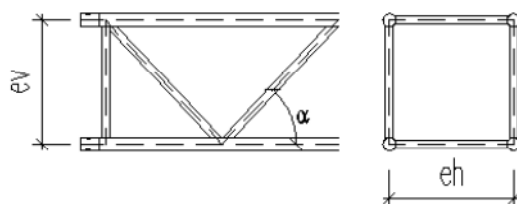


3 SECTION- AND MATERIAL PROPERTIES

Querschnittswerte Rohre / properties Tubes

	D	t	A	I	Wel	i
	[mm]	[mm]	[cm ²]	[cm ⁴]	[cm ³]	[cm]
Gurtrohre / main chords	50,0	2	3,02	8,70	3,48	1,70
vertikal Diagonalen / Bracing	20	2	1,13	0,46	0,46	0,64
horizontal Diagonalen / Bracing	20	2	1,13	0,46	0,46	0,64

Geometrie Traverse / truss geometry



Achsabstand Gurtrohre	vertikal	ev	24	[cm]
distance axes main chords	horizontal	eh	24	[cm]



Material properties

Gurtrohre + Diagonalen

EN AW 6082 T6 (AlMgSi1)

chords and bracing

zulässige Spannungen nach EN-1999-1-1 / allowable stress acc. to EN-1999-1-1

Teilsicherheitsbeiwerte Material / partial safety factors material

Y_{M1}= 1,10

Y_{M2}= 1,25

Beulklasse / BC= A

0,2%-Dehngrenze / 0,2%-Proof Strength

f₀ ≤5mm= 250 [N/mm²]

f₀ >5mm= 260 [N/mm²]

f_{0,haz}= 125 [N/mm²]

Zugfestigkeit / ultimate tensile strength

f_u ≤5mm= 290 [N/mm²]

f_u >5mm= 310 [N/mm²]

f_{u,haz}= 185 [N/mm²]

Festigkeit der Schweißnaht

Strength of welding seams

f_w= 190 [N/mm²]

Faktor für die WEZ-Werte beim WIG-Schweißen:

0,8

Factor for HAZ-values for TIG-welding:

Bolzen / Bolt

42 CrMo (8.8)

Verbinder / Connector

EN AW 2011 T6 (AlCuBiPb)

0,2%-Dehngrenze / 0,2%-Proof Strength

f₀> 230 [N/mm²]

Zugfestigkeit / ultimate tensile strength

f_u> 310 [N/mm²]

Hülse / Female fitting

EN AW 6082 T6

zulässige Spannungen nach EN-1999-1-1 / allowable stress acc. to EN-1999-1-1

Teilsicherheitsbeiwerte Material / partial safety factors material

Y_{M1}= 1,10

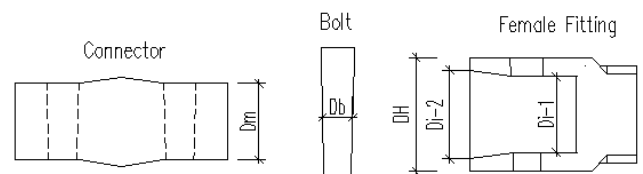
Y_{M2}= 1,25

0,2%-Dehngrenze / 0,2%-Proof Strength

f₀= 250 [N/mm²]

Zugfestigkeit / ultimate tensile strength

f_u= 290 [N/mm²]





4 ALLOWABLE LOADING

The allowable loading is determined by the maximum stress in the heat affected zone of the tubes.

The allowable characteristic stress σ_{Rk} is calculated as follows:

$$f_{u,haz} = 185 \text{ N/mm}^2$$

$$\text{reduction factor due to welding process} = 0,8$$

$$\text{partial safety coefficient material side } \gamma_M = 1,25$$

$$\text{partial safety coefficient loading side } \gamma_F = 1,50$$

$$\sigma_{Rk} = 185 \cdot 0,8 / 1,25 / 1,5 = \mathbf{78,93 \text{ N/mm}^2}$$

The loadcapacity of the truss strongly depends on the arrangement of the bracing tubes.

In comparative calculation it was determined that the 1m truss pieces have the most unfavorable bracing arrangements.

On account of this the determination of the allowable loadings is done for each span with the following truss arrangements:

<u>Span:</u>	<u>Truss pieces):</u>
2 m	2 x 1,0 m
3 m	3 x 1,0 m
4 m	4 x 1,0 m
5 m	5 x 1,0 m
6 m	6 x 1,0 m
7 m	7 x 1,0 m
8 m	8 x 1,0 m
9 m	9 x 1,0 m

The results of the calculation are shown in the annex!



5 ALLOWABLE LOADING SINGLE SPAN GIRDER

The values of the table below are only valid for single-span girder.

The truss-elements have to be braced with diagonals according chapter 2.

Large loads have to be applied at the nodes or have to be distributed by appropriate constructions.

Loads at the middle of the couplers are not allowed.

All loads have to be distributed equally to both chords.

The specified values include partial safety coefficients on the loadings side acc. EN 1990 of $\gamma_F = 1.50$ for payloads and $\gamma_G = 1.35$ for selfweight of the truss.

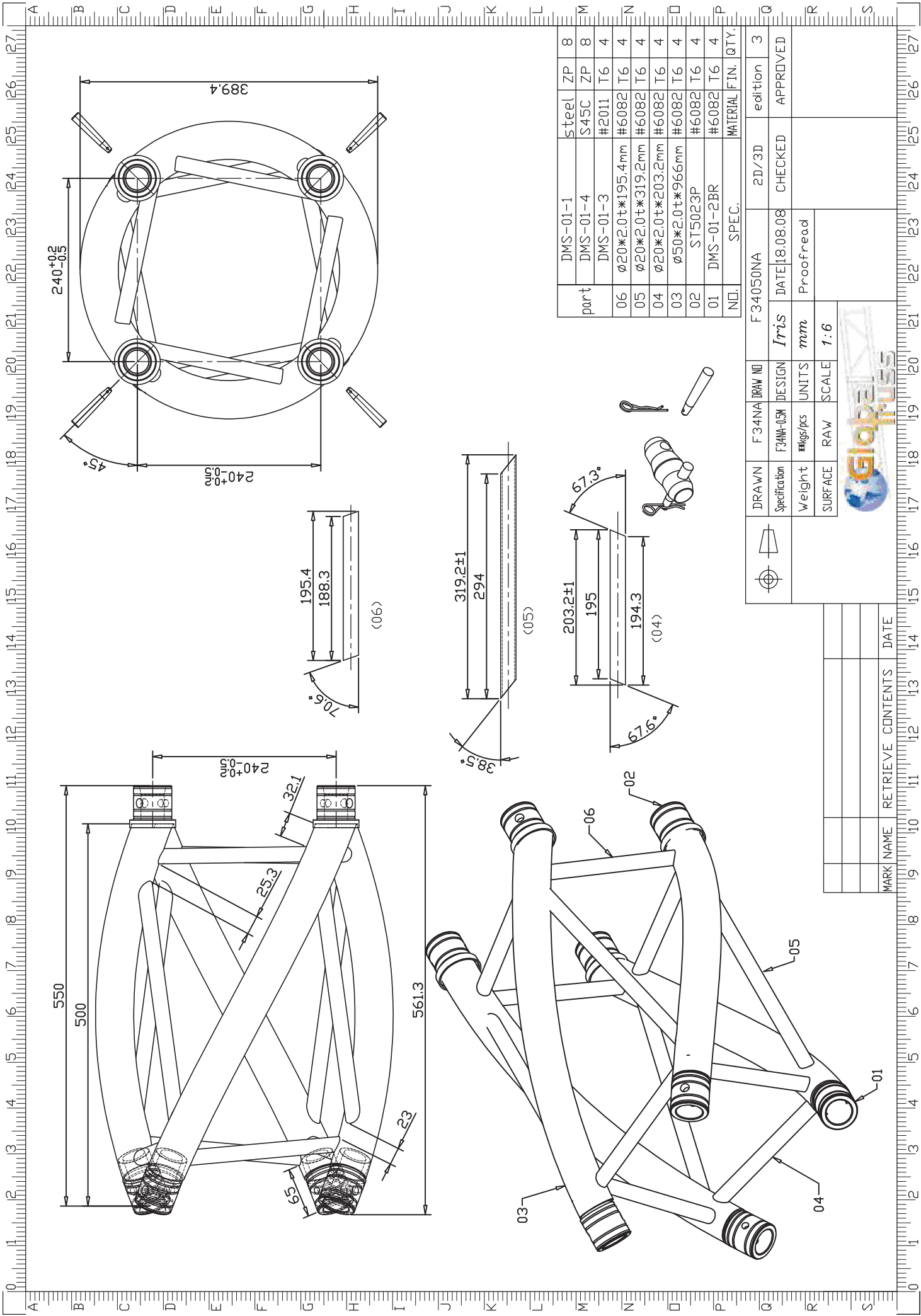
For applications which can be calculated on the basis of other codes, the partial safety factors can be adjusted (for example temporary structures acc. EN 13814, $\gamma_F = 1.35$ for payloads).

To use the resulting allowable loads with British Standard (BS) and ANSI, allowable loads listed in tables have to be multiplied by 0.85.

The values are calculated with no requirements for the location of the couplers.

span [m]	central point Load CPL		uniformly distr. Load UDL	
	[kg]	deflection [mm]	[kg/m]	deflection [mm]
2	328	4	228	4
3	198	8	104	8
4	138	12	54	12
5	102	17	34	19
6	78	23	21	26
7	61	32	14	35
8	48	42	10	46
9	36	53	6,5	57

deflection $> L / 200$

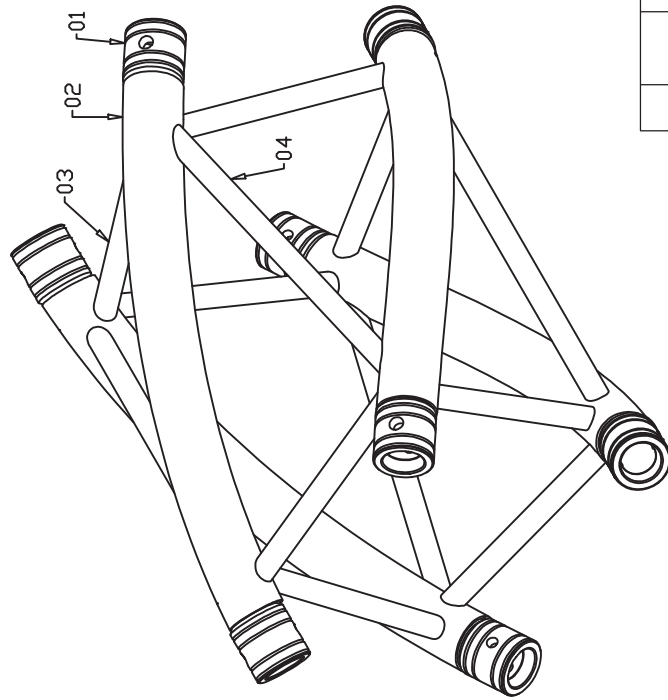
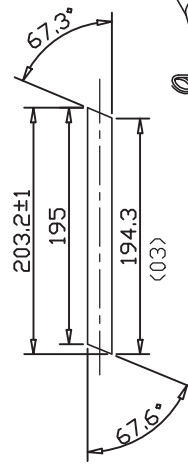
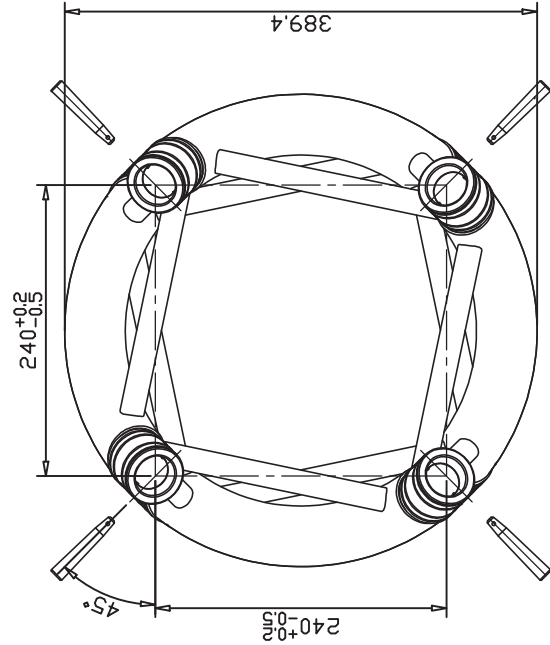


part	DMS-01-1	steel	ZP	8
	DMS-01-4	S45C	ZP	8
	DMS-01-3	#2011	T6	4
06	Ø20*2.0t*195.4mm	#6082	T6	4
05	Ø20*2.0t*319.2mm	#6082	T6	4
04	Ø20*2.0t*203.2mm	#6082	T6	4
03	Ø50*2.0t*966mm	#6082	T6	4
02	ST5023P	#6082	T6	4
01	DMS-01-2BR	#6082	T6	4
ND.	SPEC.	MATERIAL FIN.	QTY.	

DRAWN	F34NA	IRAW	NO	F34050NA	2D/3D	edition	3
Specification	F34NA-05M	DESIGN		DATE	18.08.08	CHECKED	APPROVED
Weight	##kgs/pcs	UNITS		Proofread			
SURFACE	RAW	SCALE		1:6			



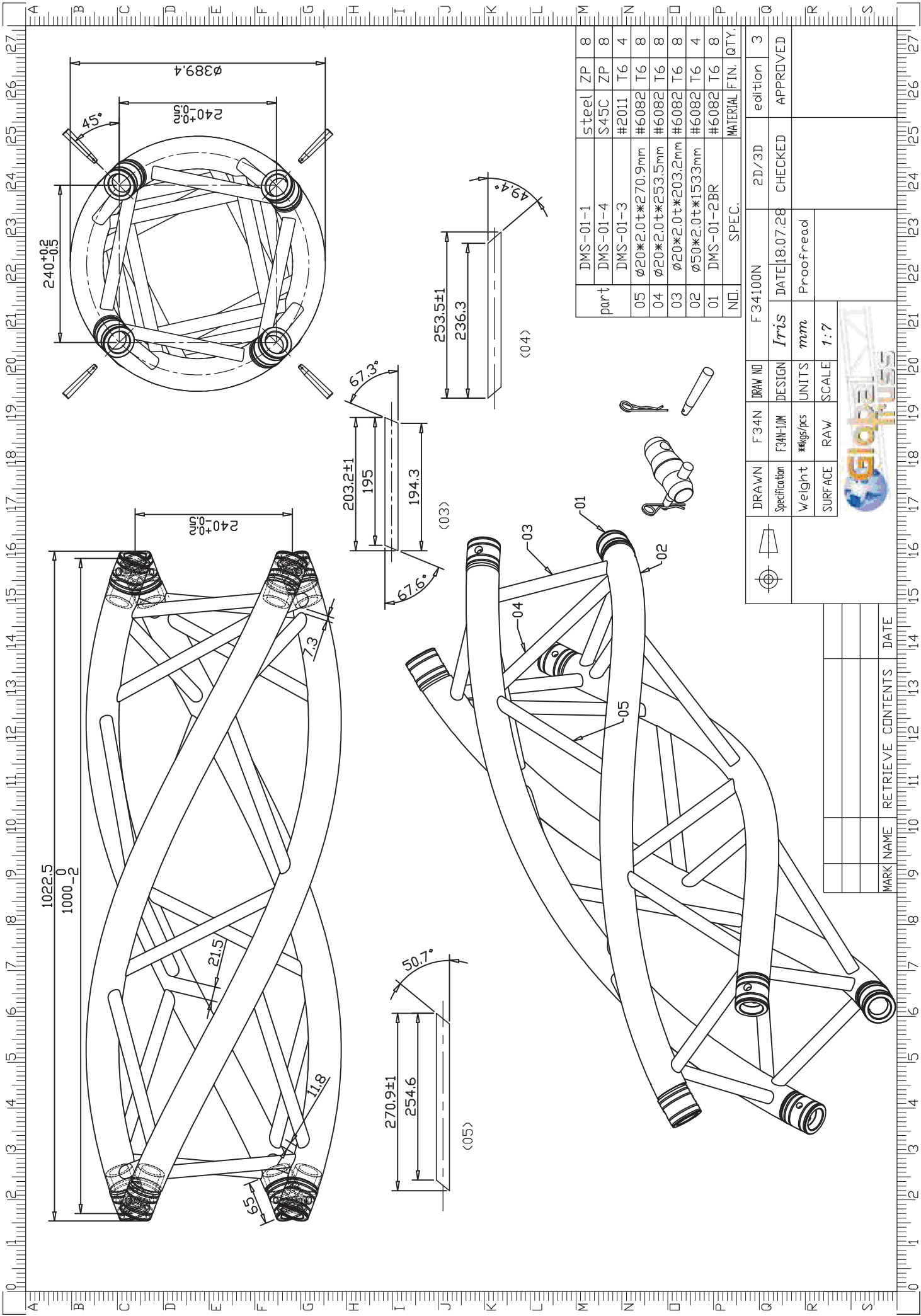
MARK	NAME	RETRIEVE	CONTENTS	DATE



part	DMS-01-1	steel	zp	8
	DMS-01-4	S45C	zp	8
05	DMS-01-3	#2011	T6	4
04	ø20*2.0t*319.2mm	#6082	T6	4
03	ø20*2.0t*203.2mm	#6082	T6	8
	ø20*2.0t*966mm	#6082	T6	4
01	DMS-01-2BR	#6082	T6	8
NO.	SPFC:	MATERIAL	FIN.	QTY.

	DRAWN	F 34 N	DRAW NO	F 34050N		2D/3D	edition	2
	Specification	F34N-05M	DESIGN	<i>Iris</i>	DATE	18.08.08	CHECKED	APPROVED
	Weight	##kgs/pcs	UNITS	<i>mm</i>	Proofread			
	SURFACE	RAW	SCALE	1:6				



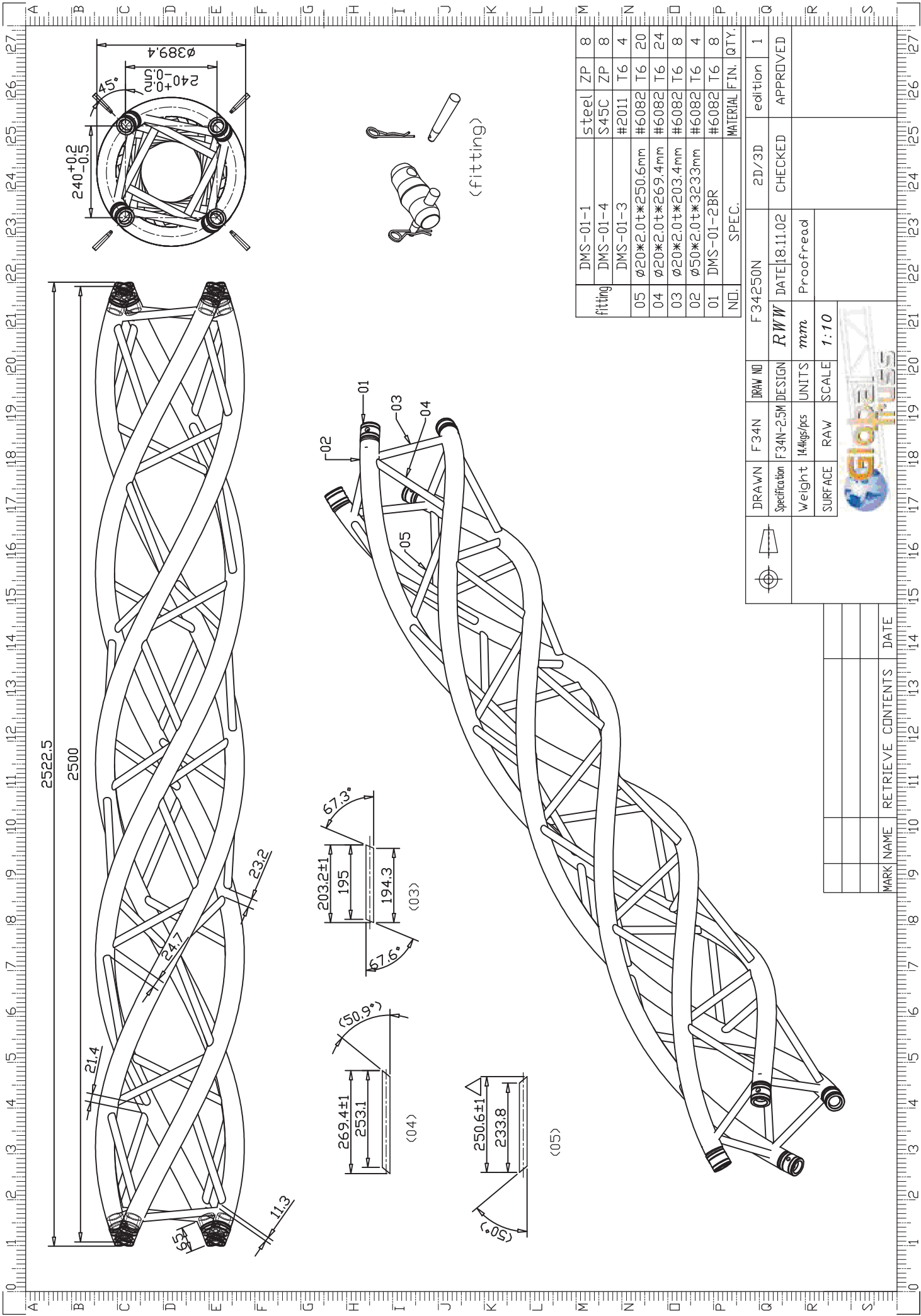


part	DMS-01-1	steel	ZP	8
	DMS-01-4	S45C	ZP	8
	DMS-01-3	#2011	T6	4
05	ø20*2.0t*270.9mm	#6082	T6	8
04	ø20*2.0t*253.5mm	#6082	T6	8
03	ø20*2.0t*203.2mm	#6082	T6	8
02	ø50*2.0t*1533mm	#6082	T6	4
01	DMS-01-2BR	#6082	T6	8
NO.	SPEC.	MATERIAL	FIN.	QTY.

DRAWN	F34N	IRAW NO	F34100N	2D/3D	edition	3
	Specification	DESIGN	DATE	CHECKED	APPROVED	
SURFACE	Weight	UNITS	mm	Proofread		
	RAW	SCALE	1:7			

MARK NAME	RETRIEVE	CONTENTS	DATE



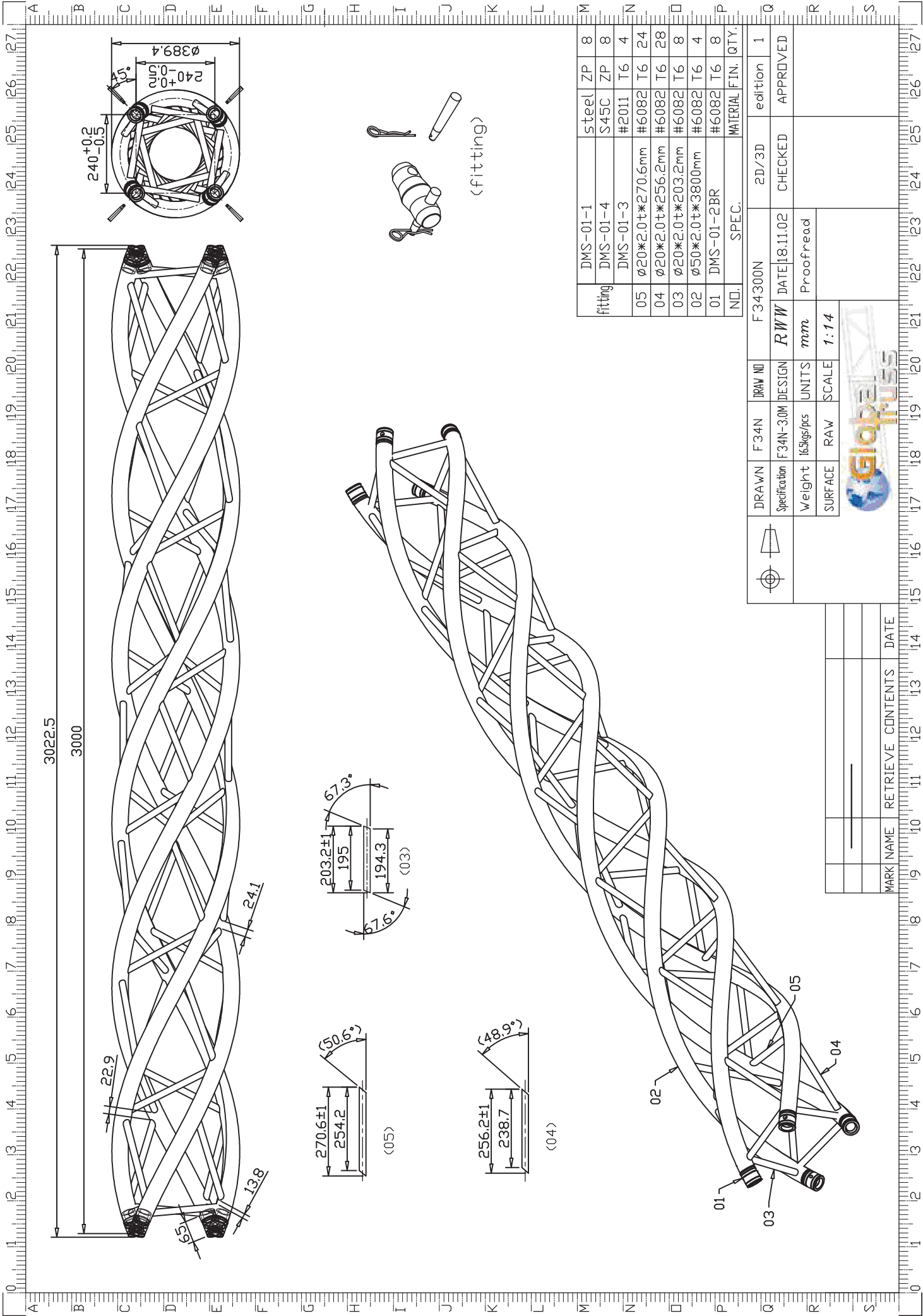


DMS-01-1	steel	ZP	8
DMS-01-4	S45C	ZP	8
DMS-01-3	#2011	T6	4
05	ø20*2.0t*250.6mm	#6082	T6
04	ø20*2.0t*269.4mm	#6082	T6
03	ø20*2.0t*203.4mm	#6082	T6
02	ø50*2.0t*323.3mm	#6082	T6
01	DMS-01-2BR	#6082	T6
ND.	SPEC.	MATERIAL FIN.	QTY.

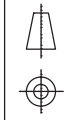
DRAWN	F 34N	IRAW NO	F 34250N	2D/3D	edition	1
Specification	F34N-2.5M	DESIGN	DATE	18.11.02	CHECKED	APPROVED
Weight	144kgs/pcs	UNITS	mm	Proofread		
SURFACE	RAW	SCALE	1:10			

MARK NAME	RETRIEVE	CONTENTS	DATE





MARK NAME	RETRIEVE	CONTENTS	DATE



DRAWN	F 34N	IRAW NO	DESIGN
Specification	F 34N-3.0M	DATE	18.11.02

Weight	16.5kgs/pcs	UNITS	mm
SURFACE	RAW	SCALE	1:14

PROOFREAD	DATE	18.11.02
CHECKED	DATE	18.11.02

edition	1
APPROVED	

2D/3D	CHECKED
DATE	18.11.02

PROOFREAD	DATE	18.11.02
CHECKED	DATE	18.11.02

edition	1
APPROVED	

2D/3D	CHECKED
DATE	18.11.02

PROOFREAD	DATE	18.11.02
CHECKED	DATE	18.11.02

edition	1
APPROVED	

2D/3D	CHECKED
DATE	18.11.02

PROOFREAD	DATE	18.11.02
CHECKED	DATE	18.11.02

edition	1
APPROVED	

2D/3D	CHECKED
DATE	18.11.02

PROOFREAD	DATE	18.11.02
CHECKED	DATE	18.11.02

