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Structural Report

U-Frame
50, 70 and 100

25483

for the system by

Global Truss GmbH
Im Stöckmädle 27

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compiled by:

responsible engineer:

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Aachen, 15.08.2025



This Structural Report includes pages

1 – 11 + Annexes

This static calculation is set up exclusively for the company Global Truss GmbH.
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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 4113	Aluminium Structures
DIN 4114	Stability
DIN 15920	Part 2: Stage and Studio structures
DIN 18800	Part 1: Steel Structures
DIN 2448	Steel tubes
DIN EN 12385	Steel cables

DGUV 215-313	Loads above persons
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1.2 Building Materials

EN AW-6082 T6	Aluminium of the Tubes U-Frame
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1.3 General description

Subject of this calculation is the verification of a frame structure and the fixation of this structure.

The structure consists of several stacked frames which are interconnected with fittings.

The frame structure can be connected to a ceiling structure by lifting eye bolts M12 or by swivel couplers (manufacturer: Globaltruss).

Optionally the distance between two frames can be extended by F31 spacers. In this case the allowable loading per frame has to be reduced by the weight of the spacers (see also chapter 1.4).

In this calculation only the indoor setup is taken into account

The frame components are verified in accordance with the principles of DGUV 215-313 as load lifting devices acc. EN 1999-1.

The top fixations (lifting eye bolts or by swivel couplers) are calculated acc. DGUV 215-313 as lifting tackles with doubled operation coefficient.

Three sizes of U-frames are taken into account:

U- Frame 50 with dimensions of 0,76 x 0,60m with tubes Ø50x3mm, material: Aluminium EN AW-6082 T6.

U- Frame 70 with dimensions of 1,05 x 0,80m with tubes Ø50x3mm, material: Aluminium EN AW-6082 T6.

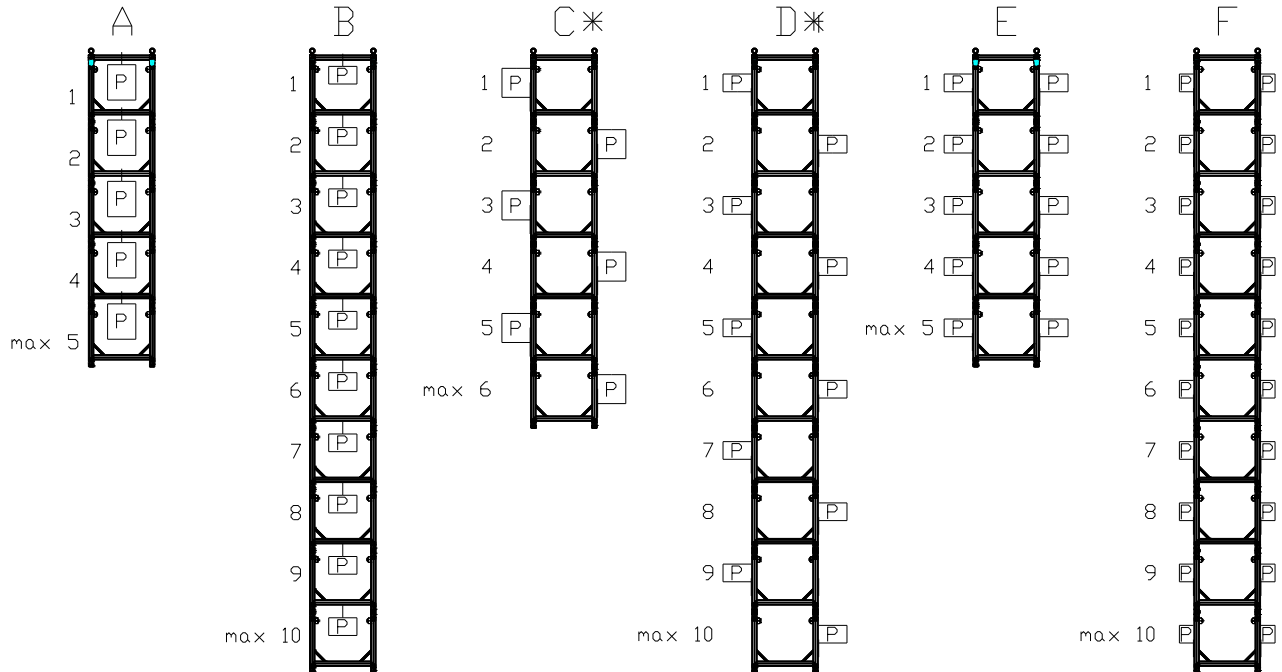
U- Frame 100 with dimensions of 1,10 x 1,25m with tubes Ø50x3mm, material: Aluminium EN AW-6082 T6.



1.4 Advice on setting up and operation

There are 6 different variants (A, B, C*, D*, E, F) of frame structures. Up to 10 U-frames can be mounted together.

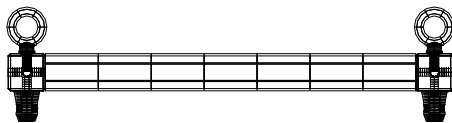
The suspended loadings are mounted centered at the horizontal tubes or at their vertical tubes:



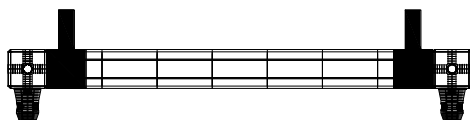
For the variants C* and D* the sum of loadings at the left and at the right side have to be equally. The number of frames has to be even.

There are 3 options for the fixation of the U-frames at the top:

- 1.) Lifting eye bolt M12 acc. DIN 580 (WLL 340kg)



- 2.) Globaltruss Swivel Coupler (WLL 250kg) (Artikelcode: 5025/5025-B)
The couplers have to be mounted at the ends of the upper horizontal tubes.



- 3.) Globaltruss Swivel Coupler (WLL 500kg) (Artikelcode: 8231/8231-B)
analogue fixation no. 2.



The allowable loadings P acc. DGUV 215-313 per U-frame of the different variants (A,B,C*,D*,E,F) and the different options for the fixations are shown in the following tables (see also chapter 3.2).

U-Frame 50

Variante	1A	Variante	1B	Variante	1C	Variante	1D	Variante	1E	Variante	1F
max n	5	max n	10	max n	6	max n	10	max n	5	max n	10
P [kg] ≤	63	P [kg] ≤	29	P [kg] ≤	52	P [kg] ≤	29	P [kg] ≤	31	P [kg] ≤	14

Variante	2A	Variante	2B	Variante	2C	Variante	2D	Variante	2E	Variante	2F
max n	5	max n	10	max n	6	max n	10	max n	5	max n	10
P [kg] ≤	45	P [kg] ≤	20	P [kg] ≤	37	P [kg] ≤	20	P [kg] ≤	22	P [kg] ≤	10

Variante	3A	Variante	3B	Variante	3C	Variante	3D	Variante	3E	Variante	3F
max n	5	max n	10	max n	6	max n	10	max n	5	max n	10
P [kg] ≤	95	P [kg] ≤	45	P [kg] ≤	78	P [kg] ≤	45	P [kg] ≤	47	P [kg] ≤	22

U-Frame 70

Variante	1A	Variante	1B	Variante	1C	Variante	1D	Variante	1E	Variante	1F
max n	5	max n	10	max n	6	max n	10	max n	5	max n	10
P [kg] ≤	62	P [kg] ≤	28	P [kg] ≤	51	P [kg] ≤	28	P [kg] ≤	31	P [kg] ≤	14

Variante	2A	Variante	2B	Variante	2C	Variante	2D	Variante	2E	Variante	2F
max n	5	max n	10	max n	6	max n	10	max n	5	max n	10
P [kg] ≤	44	P [kg] ≤	19	P [kg] ≤	36	P [kg] ≤	19	P [kg] ≤	22	P [kg] ≤	9

Variante	3A	Variante	3B	Variante	3C	Variante	3D	Variante	3E	Variante	3F
max n	5	max n	10	max n	6	max n	10	max n	5	max n	10
P [kg] ≤	94	P [kg] ≤	44	P [kg] ≤	77	P [kg] ≤	44	P [kg] ≤	47	P [kg] ≤	22

U-Frame 100

Variante	1A	Variante	1B	Variante	1C	Variante	1D	Variante	1E	Variante	1F
max n	5	max n	10	max n	6	max n	10	max n	5	max n	10
P [kg] ≤	61	P [kg] ≤	27	P [kg] ≤	50	P [kg] ≤	27	P [kg] ≤	30	P [kg] ≤	13

Variante	2A	Variante	2B	Variante	2C	Variante	2D	Variante	2E	Variante	2F
max n	5	max n	10	max n	6	max n	10	max n	5	max n	10
P [kg] ≤	43	P [kg] ≤	18	P [kg] ≤	35	P [kg] ≤	18	P [kg] ≤	21	P [kg] ≤	9

Variante	3A	Variante	3B	Variante	3C	Variante	3D	Variante	3E	Variante	3F
max n	5	max n	10	max n	6	max n	10	max n	5	max n	10
P [kg] ≤	93	P [kg] ≤	43	P [kg] ≤	76	P [kg] ≤	43	P [kg] ≤	46	P [kg] ≤	21

Extension between two frames => see following page



Extension between two frames

Optionally the distance between two frames can be extended by F31 spacers. In this case the allowable loading per frame has to be reduced by the weight of the spacers:

Example: Extension with a 1,0m tube
Weight of extension tube 1,4 kg per side
Total weight of extension 2,8 kg
=> allowable loading has to be reduced by 2,8 kg

For example variant 2 A - U-Frame50 :
now allowable P= 42,2 kg previoulsy 45 kg



1.5 Loadings

Selfweight U-Frame 50

U-Frame	approx. 3,70 kg
U-Top	approx. 1,50 kg
Verbinder	approx. 0,25 kg

Selfweight U-Frame 70

U-Frame	approx. 4,70 kg
U-Top	approx. 1,80 kg
Verbinder	approx. 0,25 kg

Selfweight U-Frame 100

U-Frame	approx. 5,70 kg
U-Top	approx. 2,10 kg
Verbinder	approx. 0,25 kg

Total wieght variants A – F

Variante	A in [kg]	B in [kg]	C in [kg]	D in [kg]	E in [kg]	F in [kg]
U-Frame 50	22,0	43,0	26,2	43,0	22,0	43,0
U-Frame 70	27,4	53,4	32,6	53,4	27,4	53,4
U-Frame 100	32,7	63,7	38,9	63,7	32,7	63,7

Pay loads P

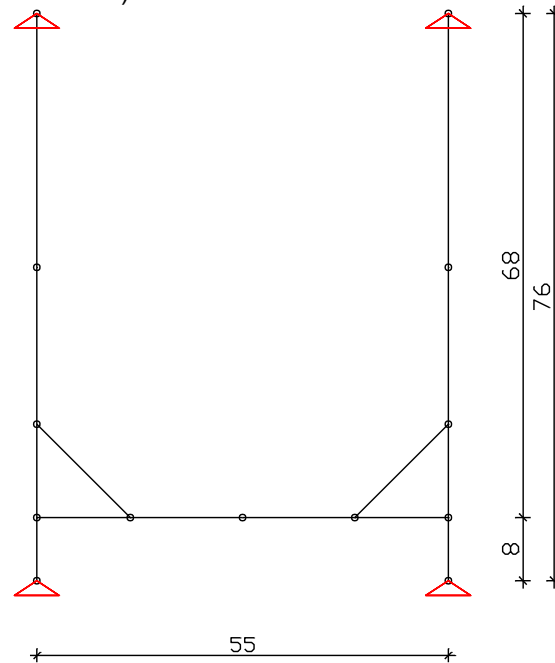
Depending on the variant see chapter 1.4



2 SYSTEM

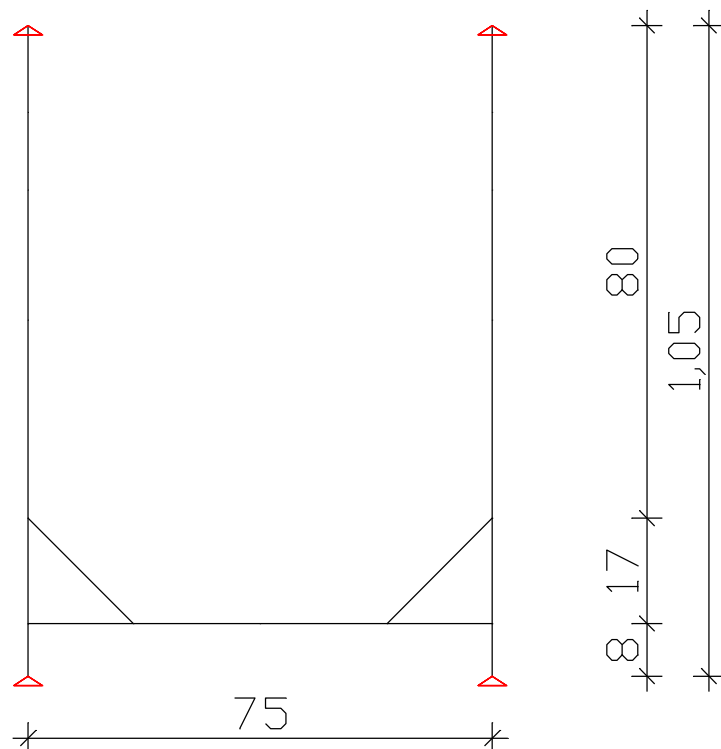
U-Frame 50 [cm]

(All dimensions refer to the axes of the tubes.)



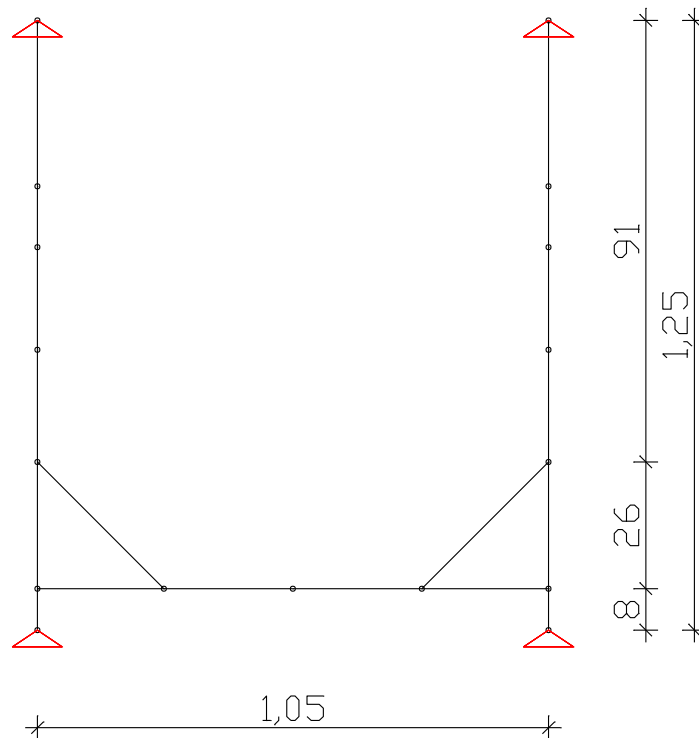
U-Frame 70 [m, cm]

(All dimensions refer to the axes of the tubes.)





U-Frame 100 [m, cm]
(All dimensions refer to the axes of the tubes.)





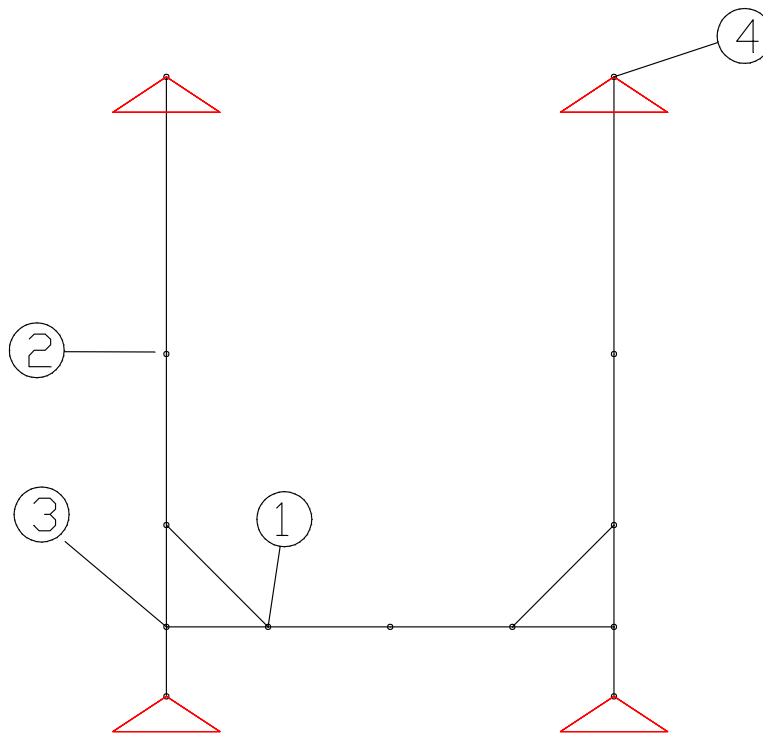
3 STRUCTURAL INTEGRITY

3.1 Verification of the chords of the U-Frame

Section- and material properties:

U-Frame	Chords	Material	f_o [N/mm ²]	f_u [N/mm ²]	$f_{o,haz}$ [N/mm ²]	$f_{u,haz}$ [N/mm ²]
50 / 100	50x3mm	6082 T6	250	290	125	185

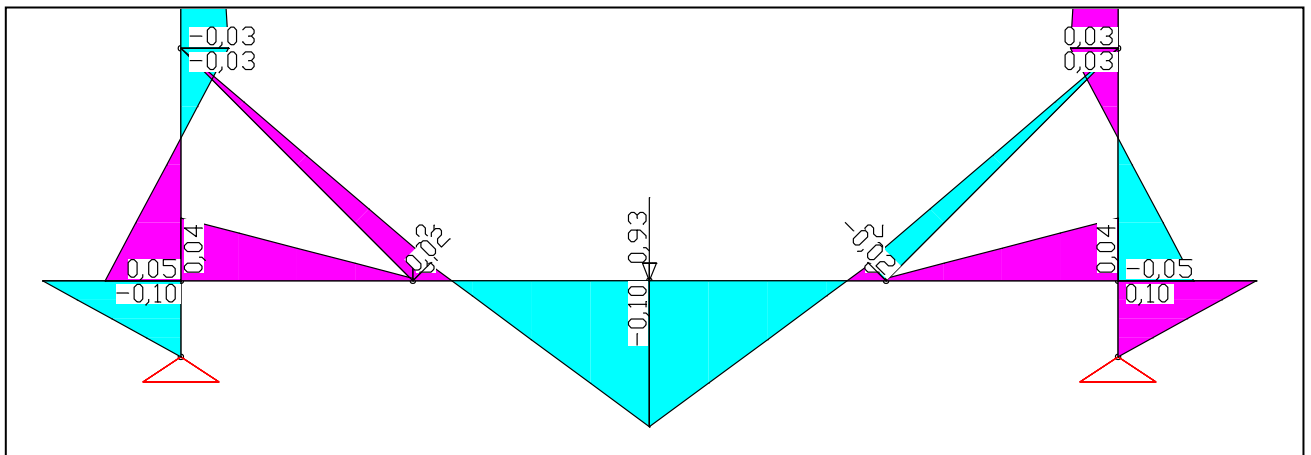
The verifications are done for the variant 3A, because this case includes the highest possible loadings of the U-frames



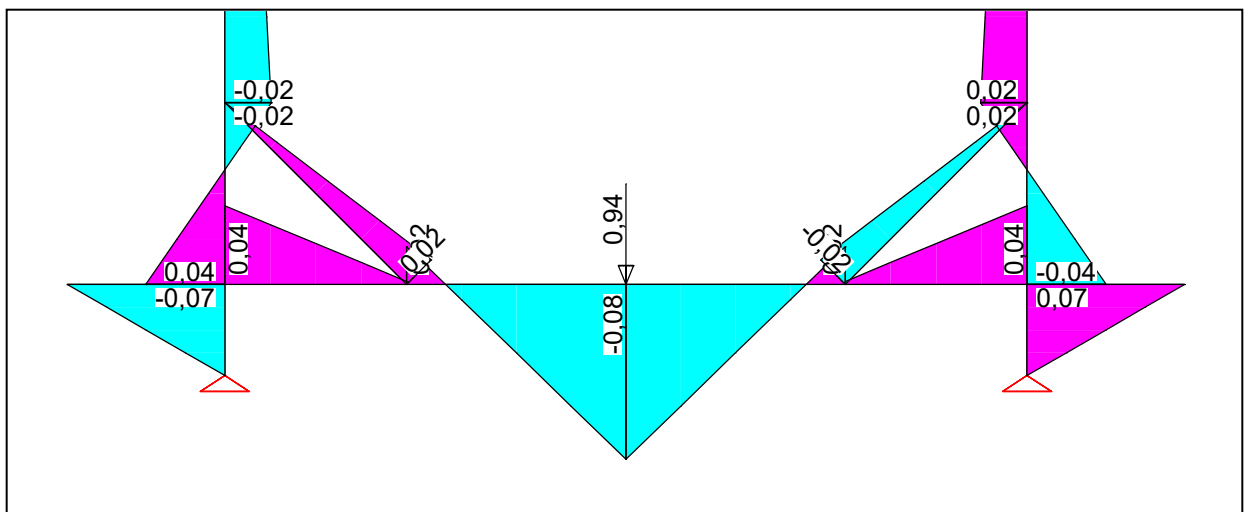
The worst point for the verification is point 3. On the safe side it is assumed that all of the section is in the heat affected zone (HAZ).



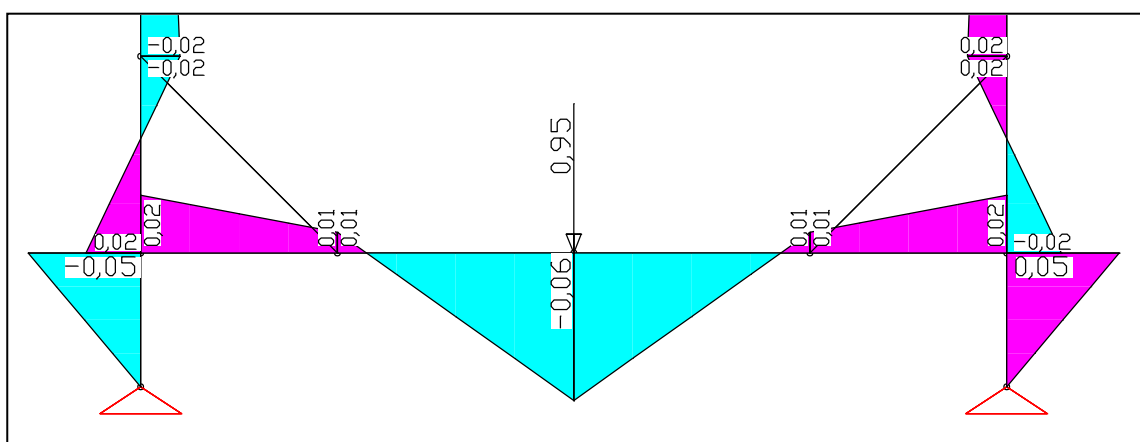
U-Frame 100: Diagram of bending moments at max. payload P of 93 kg (= 0,93 kN):



U-Frame 70: Diagram of bending moments at max. payload P of 94 kg (= 0,94 kN):



U-Frame 50: Diagram of bending moments at max. payload P of 95 kg (= 0,95 kN):





Verifications at point 3

Interaction of bending moment and normal force in the chord:

Maximum loading	$\max M_{Ed} = 10 \text{ kNcm}$ $\max N_{Ed} = 5,0 / 2 = 2,5 \text{ kN}$ (from max. load-capacity of the fixations, see chapter. 3.2)
Resistance	$\min f_{u,haz} = 18,5 \text{ kN/cm}^2 \text{ (EN AW 6082 T6)}$ $A = 4,43 \text{ cm}^2$ Reduction factor 0,8 acc. EN 1999-1 $NRd = 0,8 \cdot 18,5 / 1,25 \cdot 4,43 \text{ cm}^2 = 52,45 \text{ kN}$ $\rho_{u,haz} = 185 / 290 = 0,64$ $t_{eff} = 0,8 \cdot 0,64 \cdot 3 = 1,53 \text{ mm} \Rightarrow W_{net} = \pi \cdot 2,35^2 \cdot 0,153 = 2,65 \text{ cm}^3$ $\min f_u = 29 \text{ kN/cm}^2 \text{ (EN AW 6082 T6)}$ $MRd = 2,65 \cdot 29 / 1,25 = 61,48 \text{ kNcm}$
Verification:	Interaction acc. EN 1999-1: $(2,5 / 52,45)^{1,3} + 10 / 61,48 = 0,18 < 1,0$

3.2 Verification of fixations:

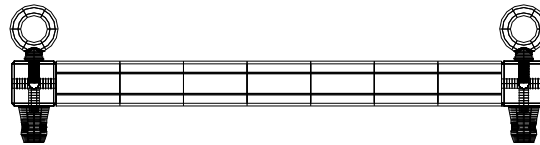
There are 3 options for the fixation of the U-frames at the top.

Acc. DGUV 215-313 only 50% of the load-capacity given by the manufacturer can be taken into account for loadings above persons.

1.) Fixation with lifting eye bolts M12 Variants 1A-1F

Lifting eye bolts M12 acc. DIN 580: WLL 340 kg

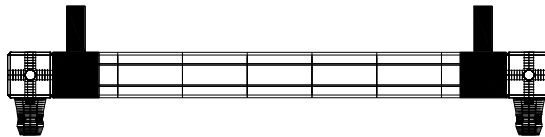
allowable $P_{\text{total}} = 2 \cdot 340 / 2 = 340 \text{ kg}$



2.) Fixation with Swivel Coupler (Globaltruss) Variants 2A-2F (Artikelcode: 5025/5025-B)

WLL 250 kg

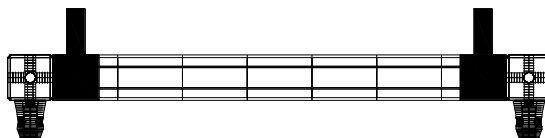
allowable $P_{\text{total}} = 2 \cdot 250 / 2 = 250 \text{ kg}$



3.) Fixation with Swivel Coupler (Globaltruss) Variants 2A-2F (Artikelcode: 8231/8231-B)

WLL 500 kg

allowable $P_{\text{total}} = 2 \cdot 500 / 2 = 500 \text{ kg}$



The calculation is done acc. the following principle:

$$P = (\text{all } P_{\text{total}} - G_{\text{ges}}) / k$$

The results are shown in the tables of chapter 1.

Example for variant 1F – U-Frame 50

Number of frames $n = 10$

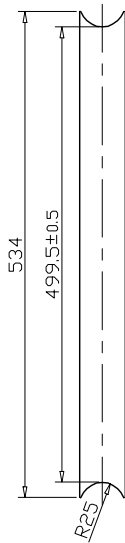
Number of mounted payloads $k = 20$

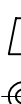
selfweight G :

$$\begin{aligned} G &= n \times 3,7 \text{ kg} + 1,5 \text{ kg} + (2n-2) \times 0,25 \\ &= 10 \times 3,7 + 1,5 + 18 \times 0,25 = 43 \text{ kg} \end{aligned}$$

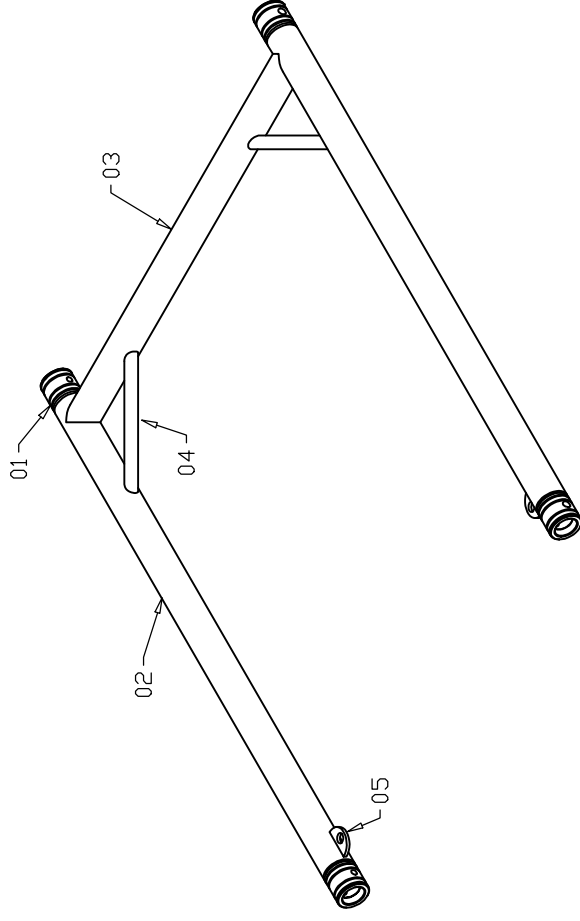
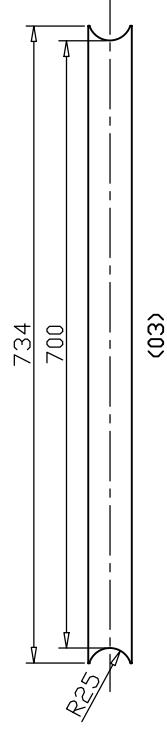
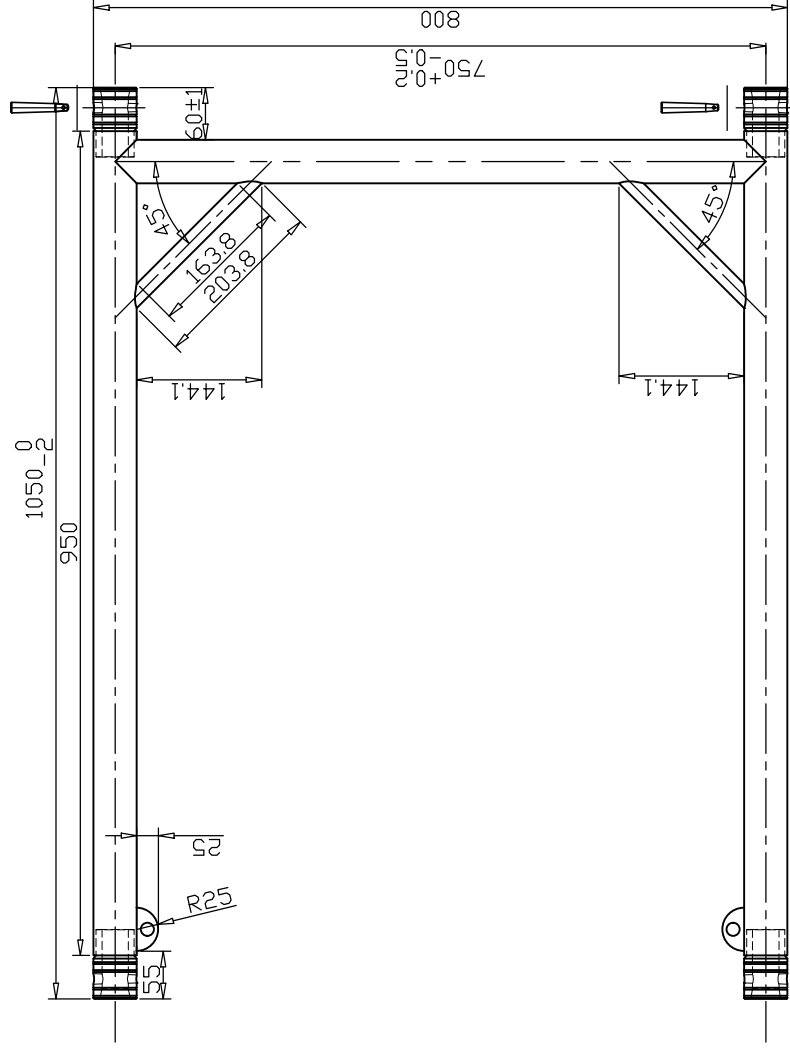
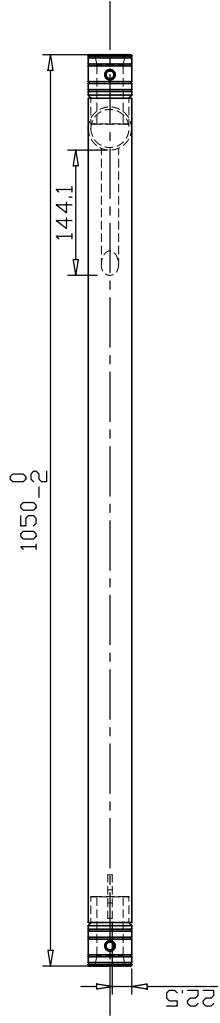
Allowable payloads P :

$$P = (340 \text{ kg} - 43,5 \text{ kg}) / 20 = 14,85 \text{ kg} = \text{ca. } 14 \text{ kg}$$



	Drawn	F 62E	Drawn No	F 62076E		2D/3D	edition	1
	Specification	F62E-076N	DESIGN	DATE	15.03.24	CHECKED	APPROVED	
	Weight	37kgs/pcs	UNITS	mm	Proofread			
	SURFACE	RAW	SCALE	1 : 8				

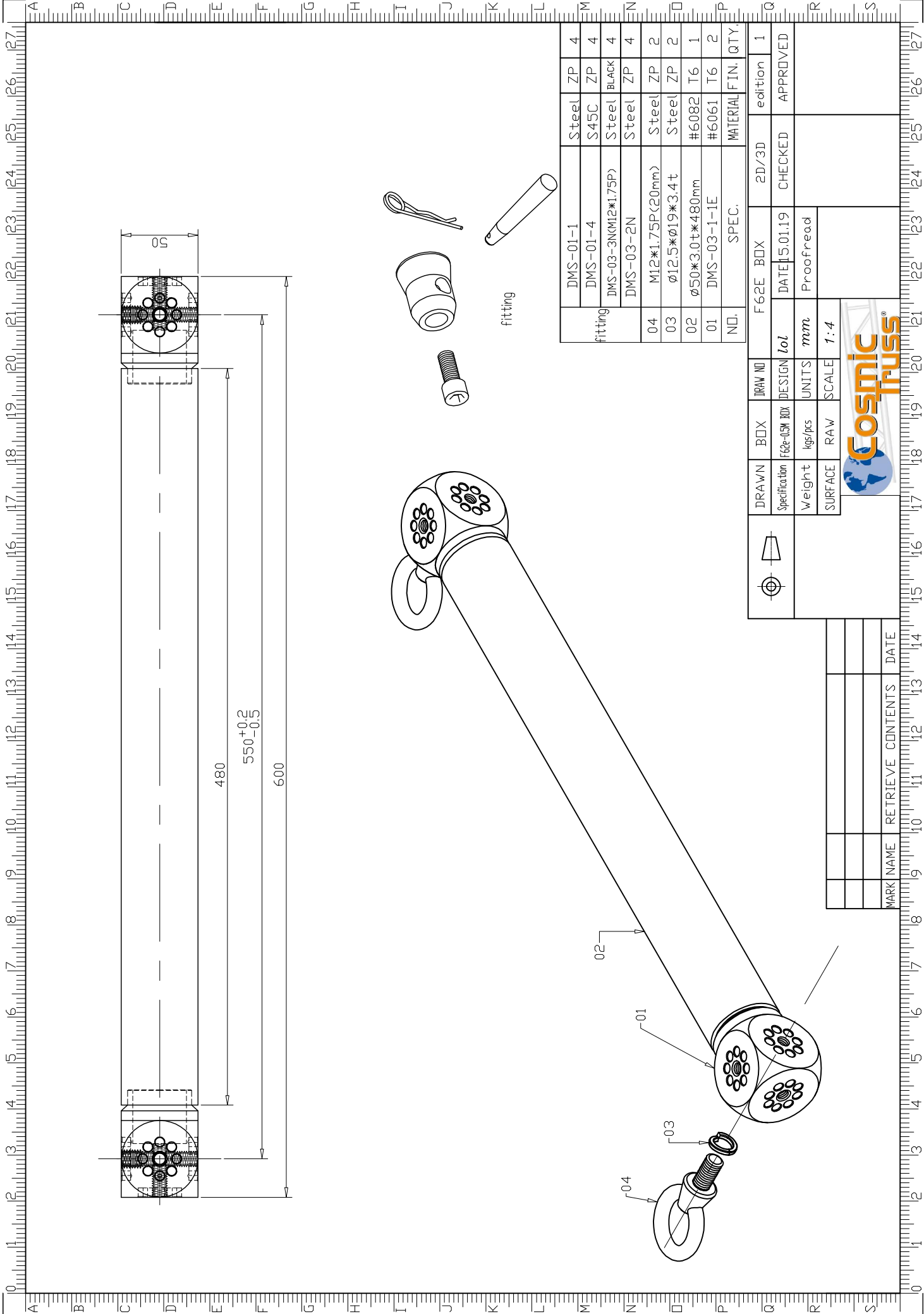
[illegible]



	DMS-01-1	Steel	SP	4
Fitting	DMS-01-4	S45C	SP	4
	DMS-01-3	#2011	T6	2
05	PJ-BQP117	#6061	T6	2
04	Ø20*2.0t*203.8mm	#6082	T6	2
03	Ø50*3.0t*734mm	#6082	T6	1
02	Ø50*3.0t*952mm	#6082	T6	2
01	DMS-01-2CR	#6082	T6	4
NO.	SPEC.	MATERIAL	FIN. QTY	

	DRAWN	F 62S	DRAW NO	F 62105S		2D/3D	edition	1
	Specification	F62S-1.05M	DESIGN	<i>DJD</i>	DATE	25.04.21	CHECKED	APPROVED
	Weight	4.65kgs/pc	UNITS	<i>mm</i>	Proofread			
	SURFACE	RAW	SCALE	1 : 9				

MARK	NAME	RETRIEVE CONTENTS	DATE

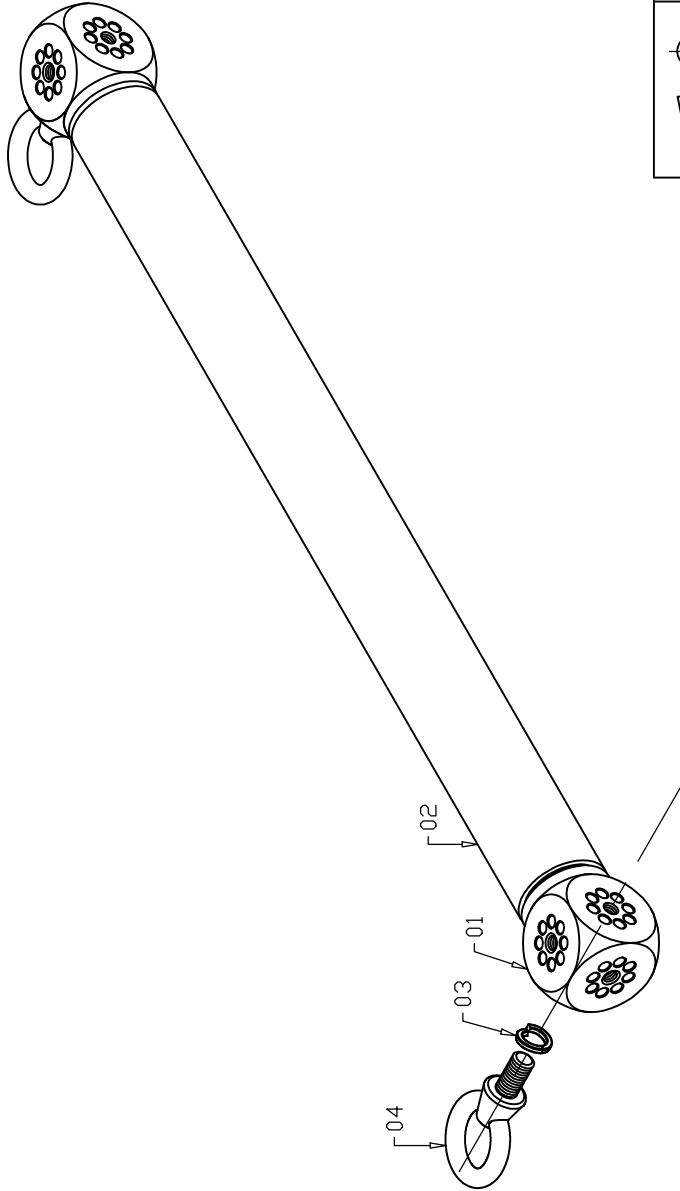
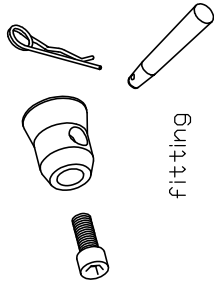
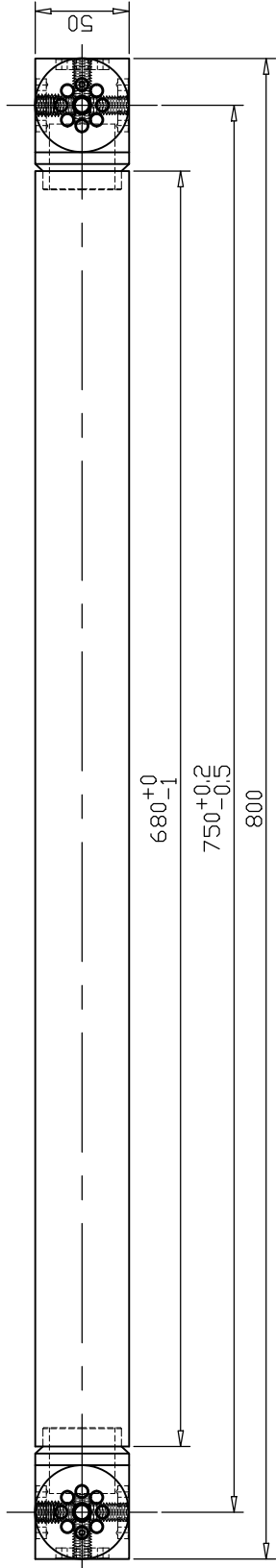


fitting	DMS-01-1	Steel	ZP	4
	DMS-01-4	S45C	ZP	4
	DMS-03-3N(M12*1.75P)	Steel	BLACK	4
	DMS-03-2N	Steel	ZP	4
04	M12*1.75P(<20mm)	Steel	ZP	2
03	ø12.5*ø19*3.4t	Steel	ZP	2
02	ø50*3.0t*480mm	#6082	T6	1
01	DMS-03-1-1E	#6061	T6	2
N.D.	SPEC.	MATERIAL FIN. QTY.		

	DRAWN	BOX	DRAW NO	F 62E BOX	2D/3D	edition	1
	Specification	F62e-05N BOX	DESIGN	DATE 15.01.19	CHECKED	APPROVED	
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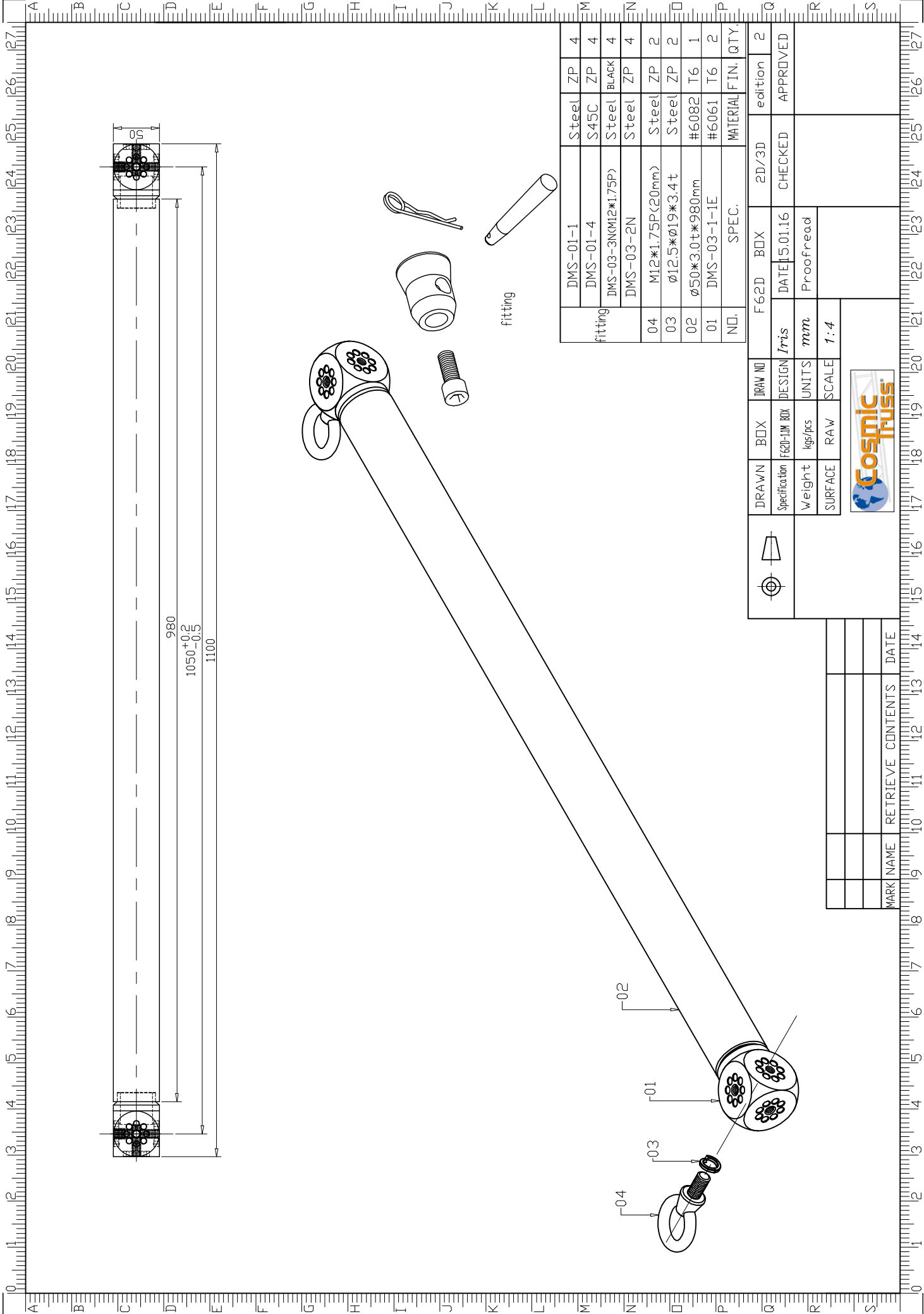


MARK	NAME	RETRIEVE	CONTENTS	DATE



fitting	DMS-01-1	Steel	ZP	2
	DMS-01-4	S45C	ZP	2
	DMS-03-3N(M12*1.75P)	Steel	BLACK	2
	DMS-03-2N	Steel	ZP	2
04	M12*1.75P(M20)	Steel	ZP	2
03	ø12.5*ø19*3.4t	Steel	ZP	2
02	ø50*3.0t*680mm	#6082	T6	1
01	DMS-03-1-1F	#6061	T6	2
NO.	SPEC.		MATERIAL FIN.	QTY.

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	Specification	F62S-08M BOX	DESIGN	DJD	DATE	CHECKED	APPROVED
	Weight	kgs/pcs	UNITS	mm	Proofread		
	SURFACE	RAW	SCALE	1 : 4			



fitting	DMS-01-1	Steel	ZP	4
	DMS-01-4	S45C	ZP	4
	DMS-03-3N(M12*1.75P)	Steel	BLACK	4
	DMS-03-2N	Steel	ZP	4
04	M12*1.75P(<20mm)	Steel	ZP	2
03	ø12.5*ø19*3.4t	Steel	ZP	2
02	ø50*3.0t*ø980mm	#6082	T6	1
01	DMS-03-1-1E	#6061	T6	2
N.D.	SPEC.	MATERIAL FIN. QTY.		

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	Weight	kg/pcs	UNITS	mm	Proofread			
	SURFACE	RAW	SCALE	1:4				

MARK	NAME	RETRIEVE	CONTENTS	DATE