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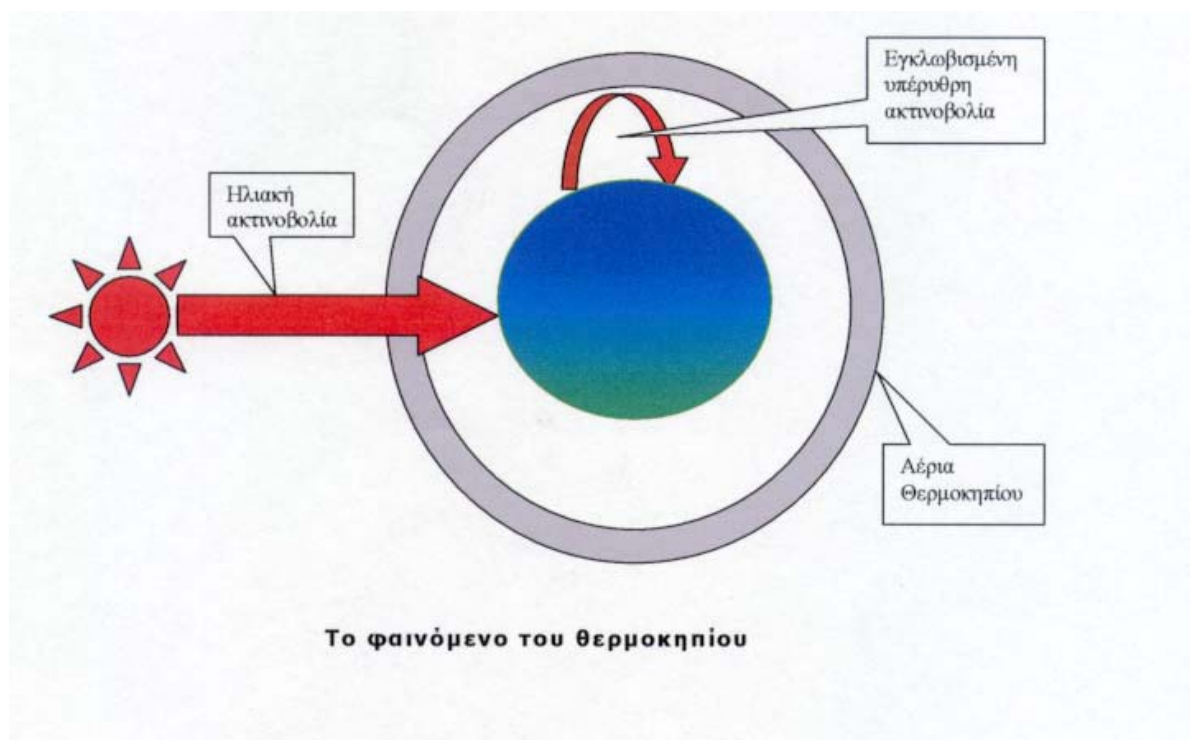
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παρόν – αυτονομία των συσσωρευτών (μπαταριών) και το μεγάλο βάρος των σύγχρονων ηλεκτρικών – υβριδικών αυτοκινήτων μειώνουν σημαντικά τη χρηστικότητά τους και έρχονται σε αντίθεση με τις επικρατούσες συνήθειες μετακίνησης. Η εξέλιξη των νέων μπαταριών (με μεγαλύτερη χωρητικότητα) αλλά και της τεχνολογίας που τις συνοδεύει (φορτιστές) είναι μια μεγάλη επένδυση, την οποία οι αυτοκινητοβιομηχανίες δε φαίνονται πρόθυμες να σηκώσουν από μόνες τους. Εκτός αυτού, η χρήση ηλεκτρικών αυτοκινήτων απαιτεί υποδομή που σήμερα δεν υπάρχει, όπως για παράδειγμα σημεία φόρτισης των μπαταριών, σταθμούς υποδοχής κ.τ.λ. Ας μην ξεχνάμε άλλωστε ότι η υποδομή των σύγχρονων αυτοκινήτων με κινητήρες εσωτερικής καύσης είναι αποτέλεσμα μιας εξέλιξης που διήρκεσε αρκετές δεκαετίες.

Προσπάθεια επίλυσης του προβλήματος στα πλαίσια της εργασίας

Στα πλαίσια της πτυχιακής αυτής εργασίας θα σχεδιαστεί και θα κατασκευαστεί ένα ηλεκτροκίνητο όχημα χαμηλού βάρους με σωληνωτό πλαίσιο το οποίο θα μπορεί να κουβαλήσει 2 επιβάτες και να έχει ένα υποτυπώδη χώρο αποσκευών. Θα κινείται από ένα κινητήρα διέγερσης σειράς και η κίνηση θα μεταδίδεται στο διαφορικό μέσω διβάθμιας αλυσοκίνησης. Ο κινητήρας τροφοδοτείται από 2 συσσωρευτές.

Το σύστημα διεύθυνσης αποτελείται από τηλεσκοπικό πιρούνι το οποίο παίρνει κίνηση από γωνιακό μειωτήρα μέσω διάταξης καρτανικών συνδέσμων από το τιμόνι.

Τέλος η ανάρτηση πίσω γίνεται μέσω ημιελλειπτικών ελατηρίων ενώ εμπρός με τηλεσκοπικό πιρούνι.

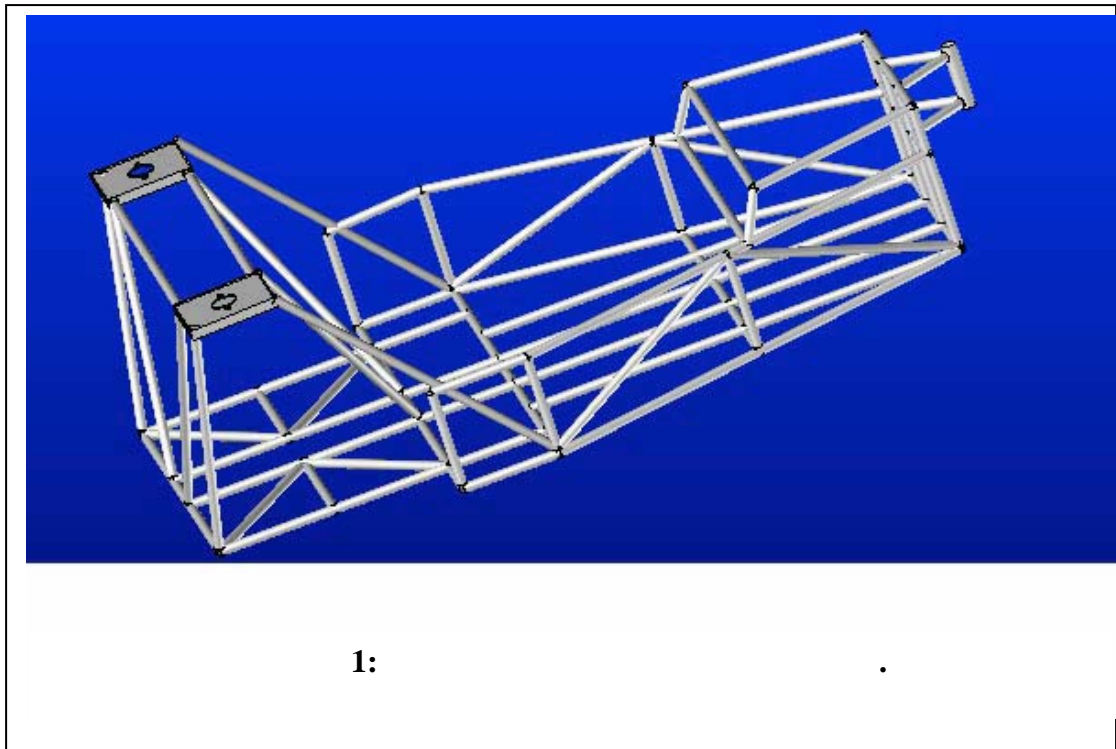
ΤΕΧΝΙΚΑ ΧΑΡΑΚΤΗΡΙΣΤΙΚΑ

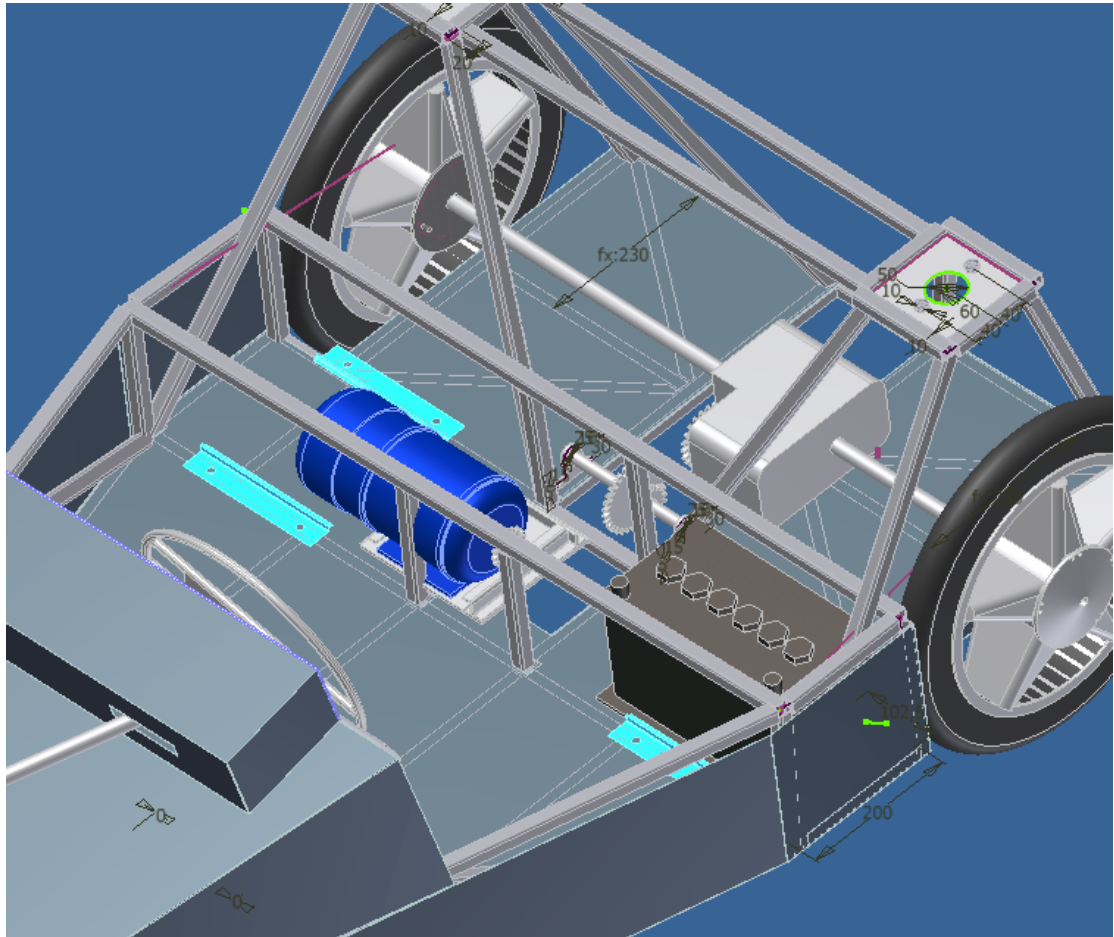
ΟΛΙΚΟ ΜΗΚΟΣ	1580 mm
ΟΛΙΚΟ ΠΛΑΤΟΣ	1100 mm
ΟΛΙΚΟ ΥΨΟΣ	800 mm
ΚΑΘΑΡΟ ΥΨΟΣ ΕΝΤΟΣ ΑΜΑΞΩΜΑΤΟΣ	-
ΤΥΠΟΣ ΟΧΗΜΑΤΟΣ	ΗΛΕΚΤΡΟΚΙΝΗΤΟ
ΚΙΝΗΤΗΡΑΣ	DC 24V
ΜΕΓΙΣΤΗ ΙΣΧΥΣ ΚΙΝΗΤΗΡΑ	800 W (1 PS)
ΣΥΣΤΗΜΑ ΔΙΕΥΘΥΝΣΕΩΣ	Τηλεσκοπικό Πιρούνι
ΚΙΒΩΤΙΟ ΤΑΧΥΤΗΤΩΝ	Διβάθμια αλυσοκίνηση συνολικής σχέσης μετάδοσης $i = 10$
ΗΛΕΚΤΡΙΚΟ ΣΥΣΤΗΜΑ	2 μπαταρίες 12 V - 120 Ah.
ΕΛΑΣΤΙΚΑ - ΖΑΝΤΕΣ	3 ελαστικά 1.95/2.85 R 16

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TOP SOLID , Inventor

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MIG.

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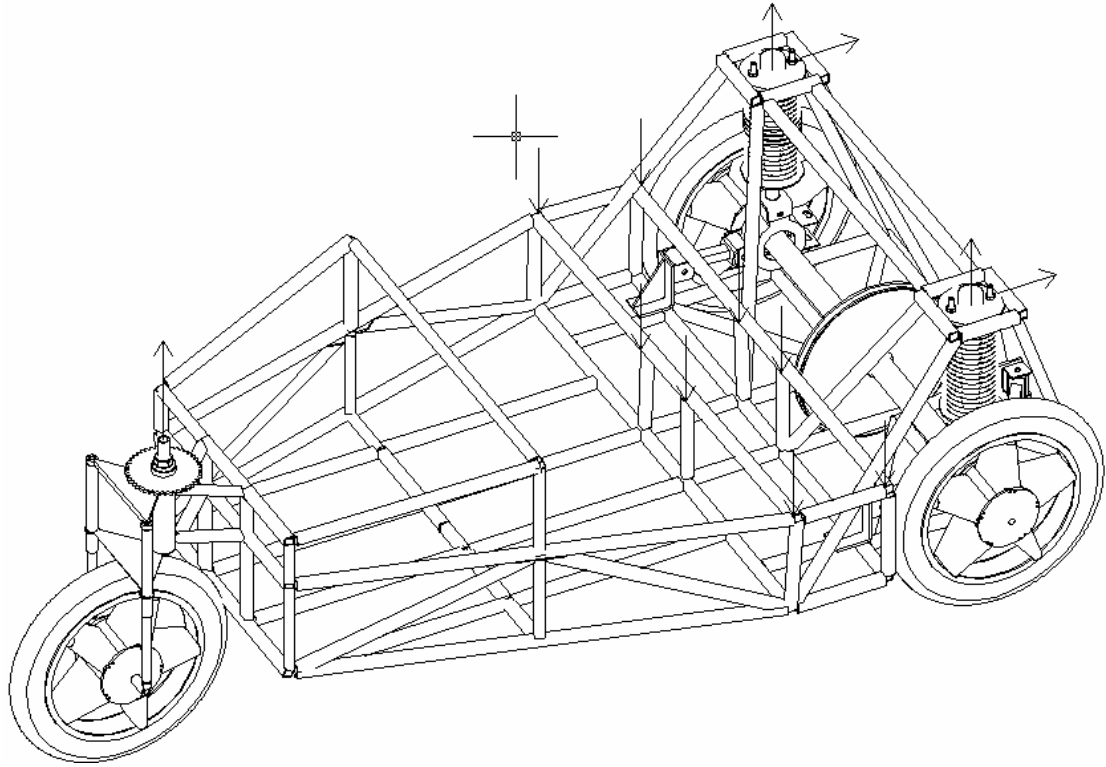
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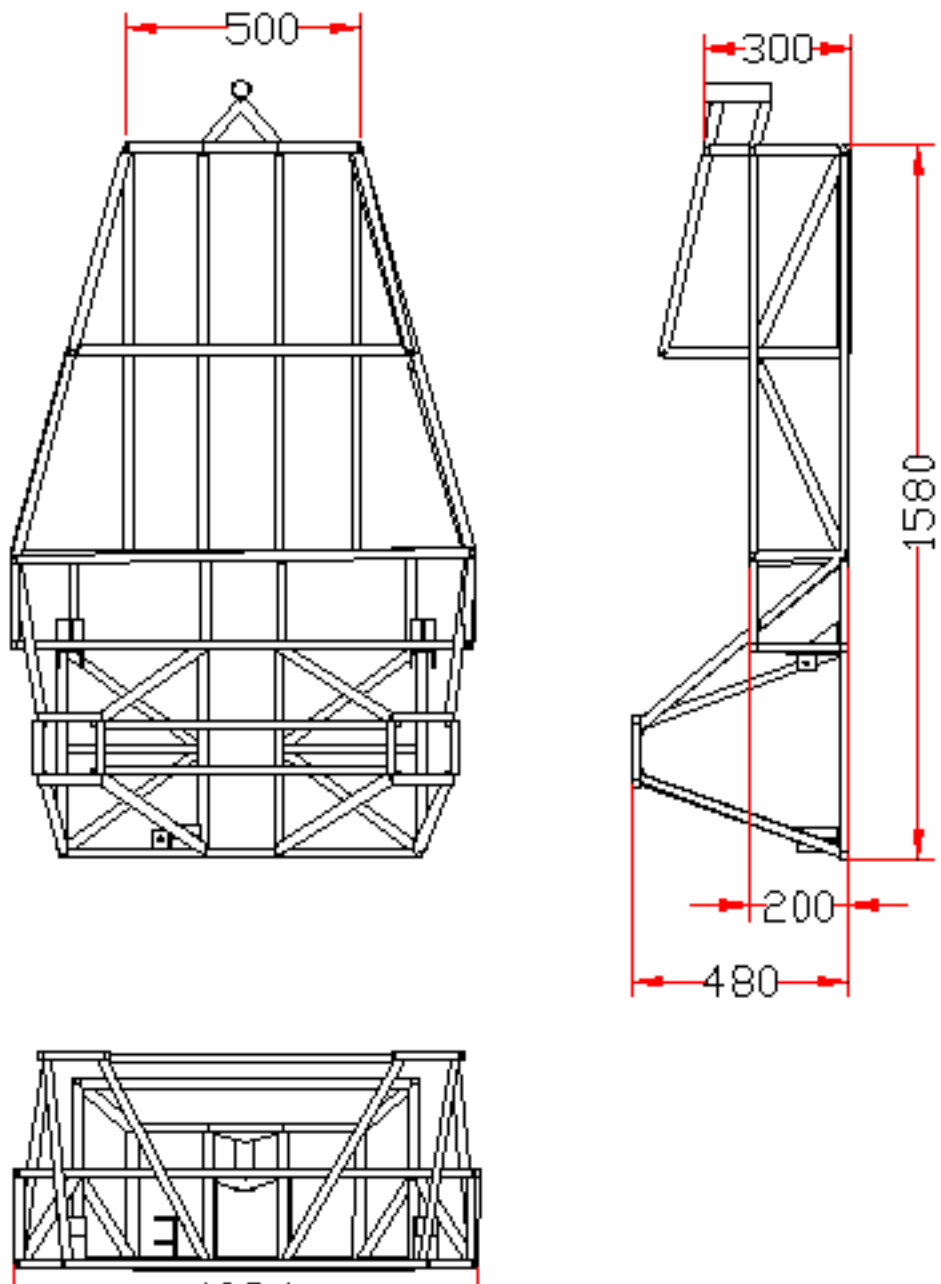


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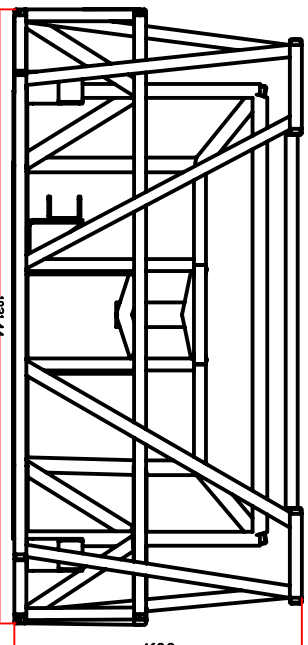
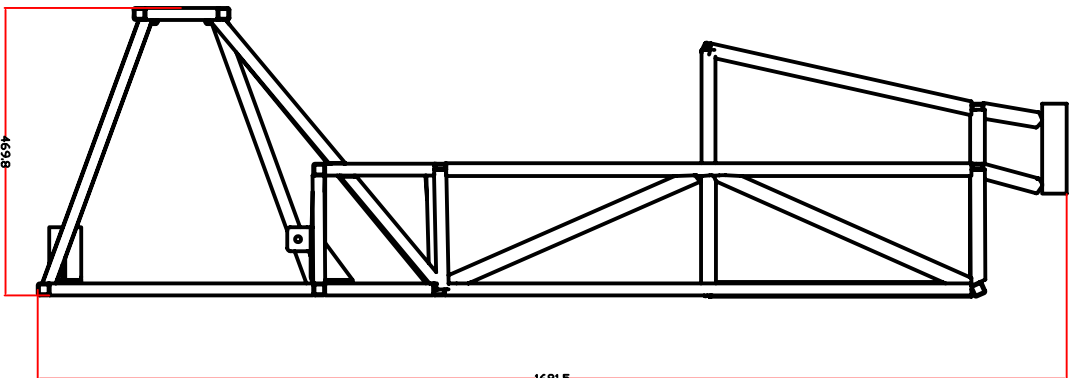
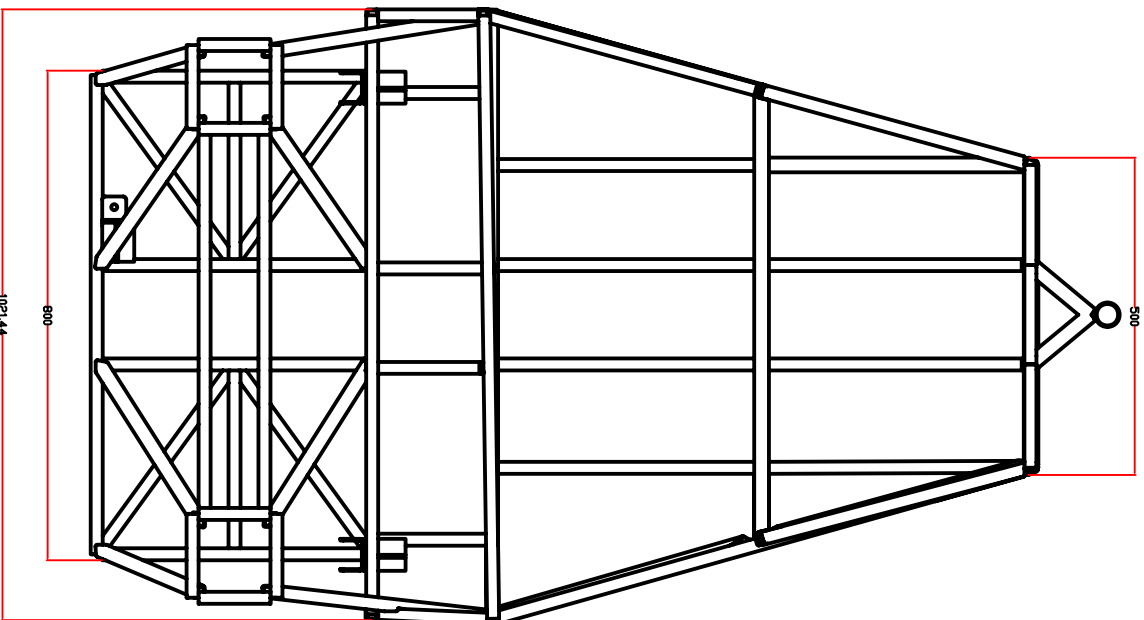
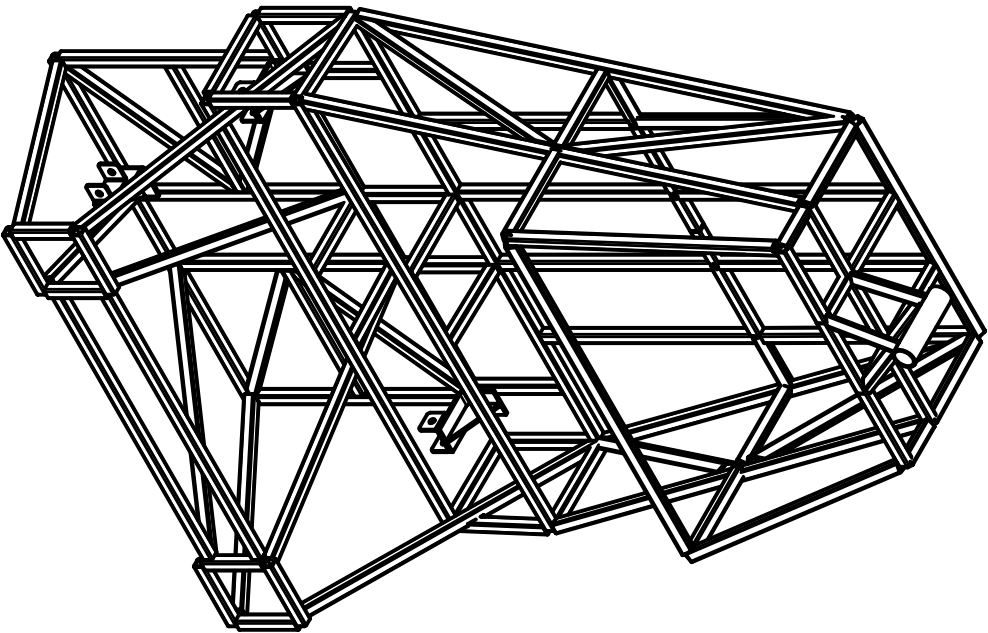
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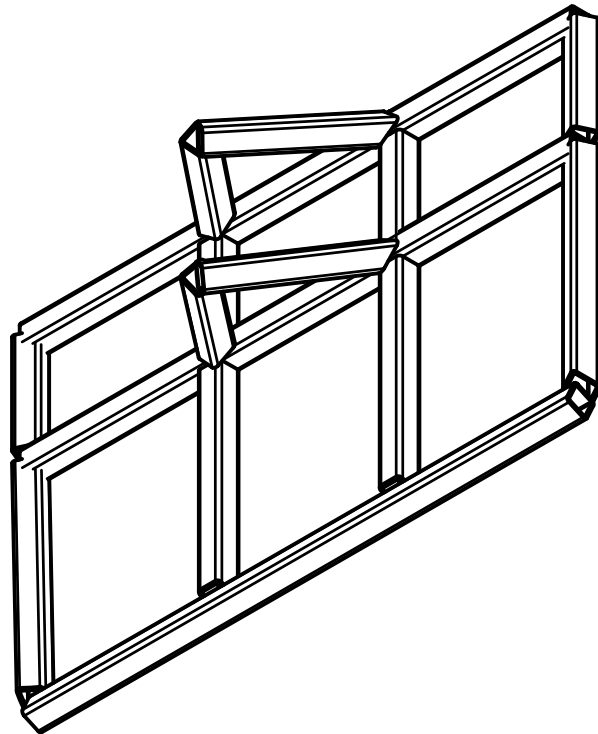
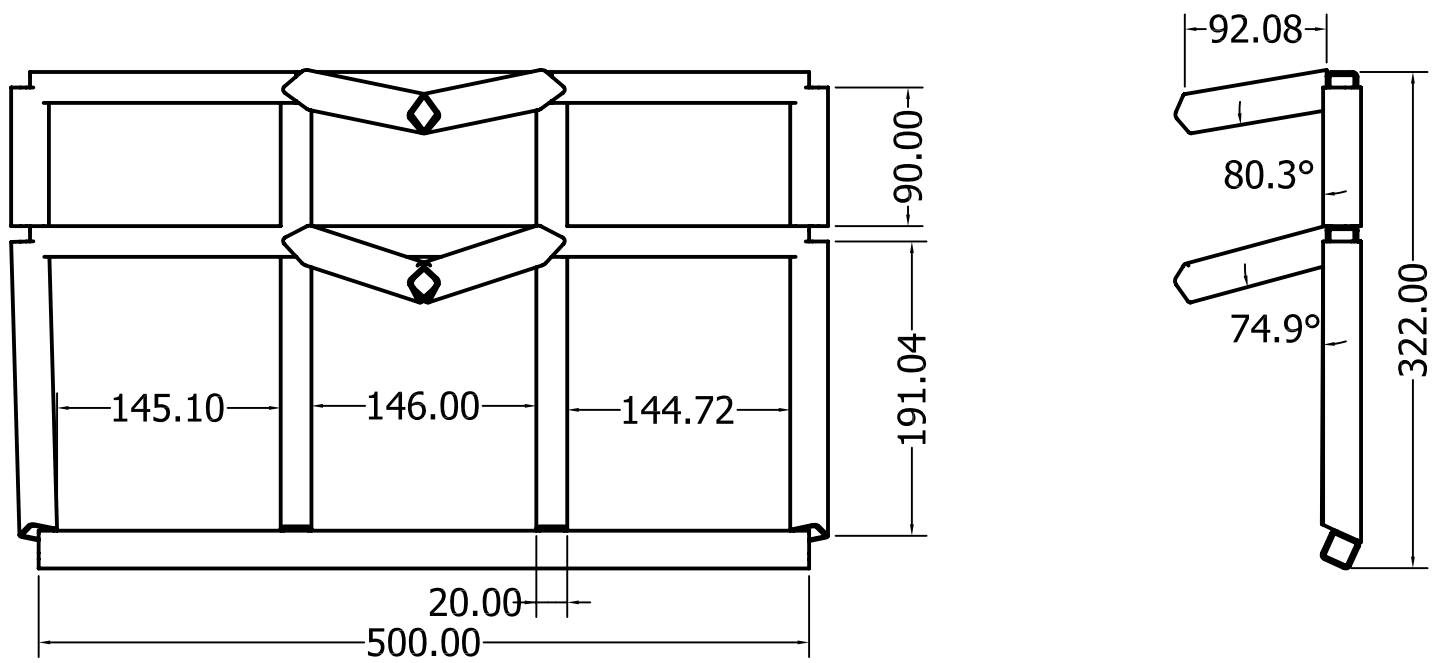


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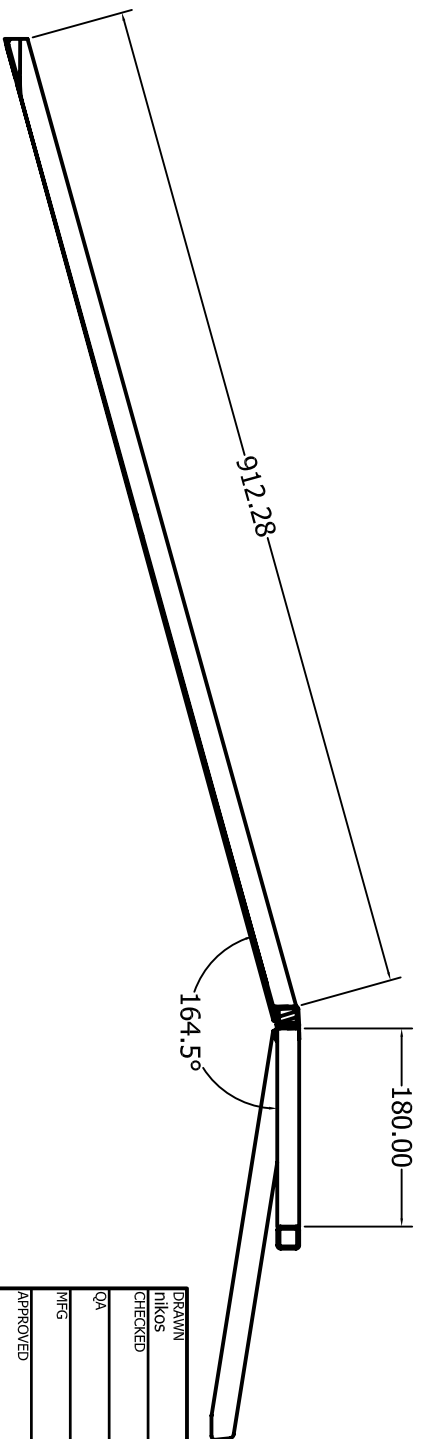
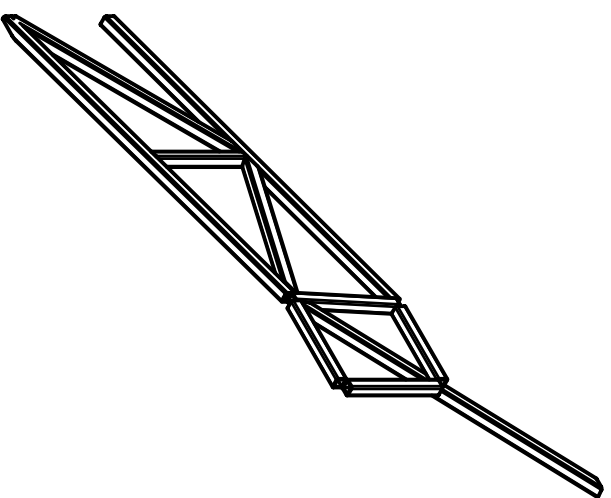
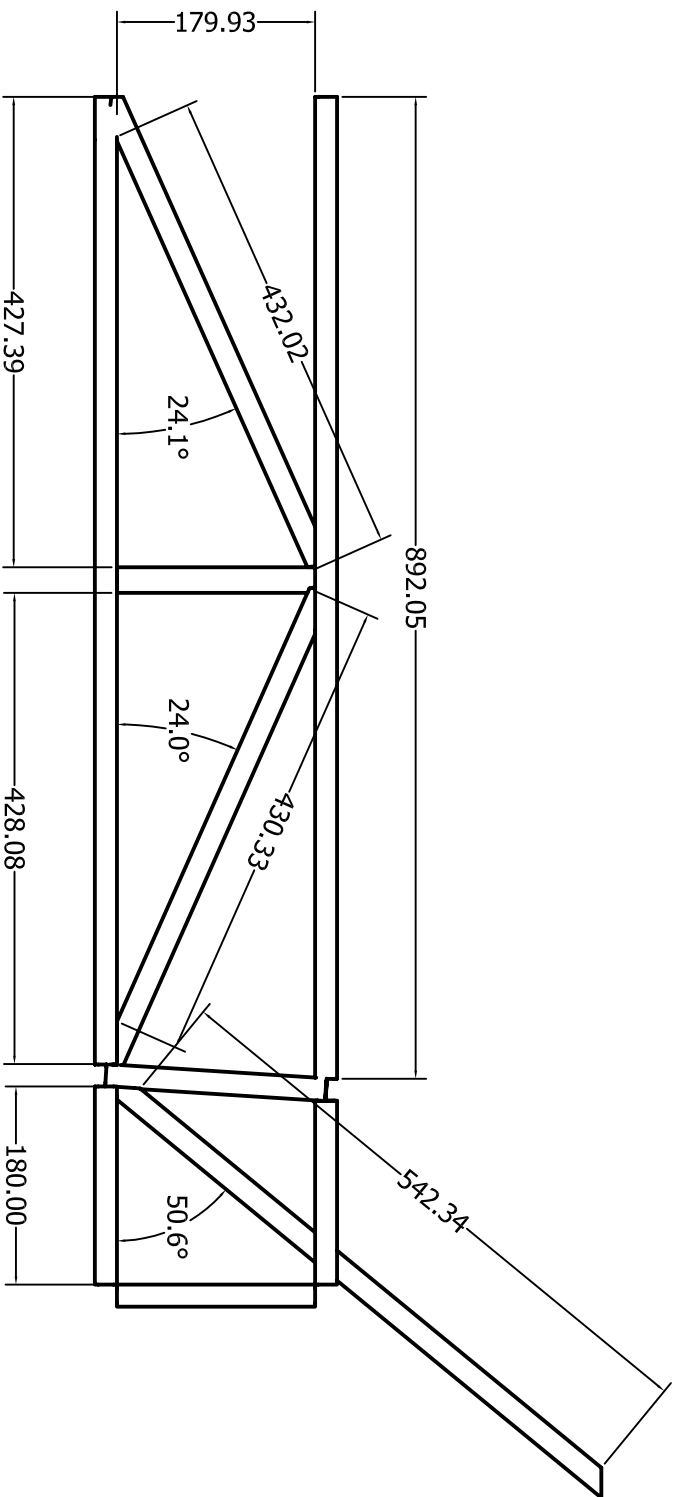
ΣΧΕΔΙΟ 1

DRAWN	11/11/2007	TITLE	
CHKOS			
CHECKED		ΟΨΕΙΣ ΣΑΖΙ	
QA			
MFG		SIZE	DWG NO
APPROVED		C	1
		SCALE	REV
		SHEET 1 OF 1	



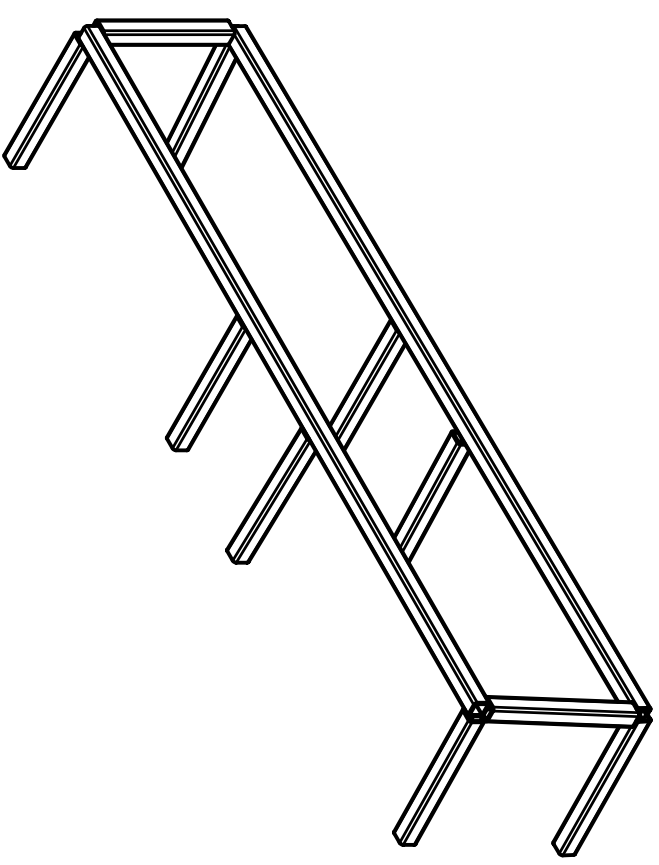
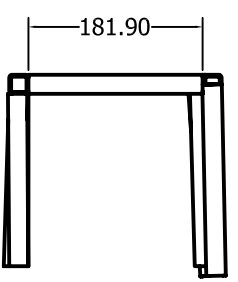
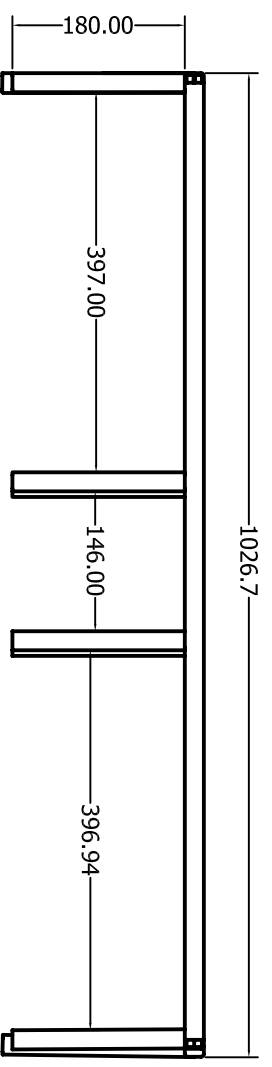
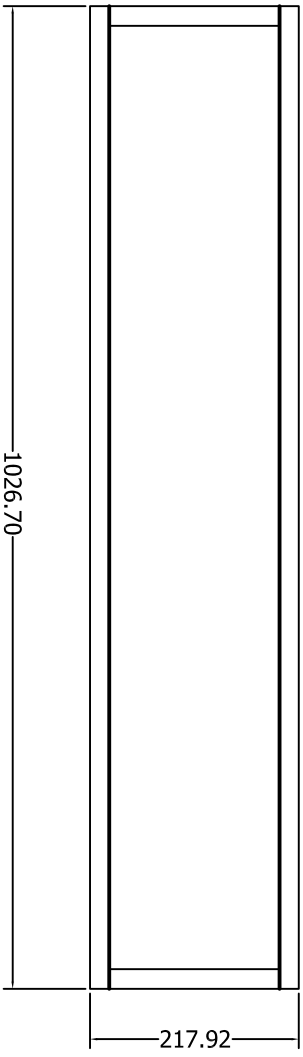
ΣΧΕΔΙΟ 3

DRAWN nikos	11/11/2007			
CHECKED		TITLE		
QA		ΜΕΤΩΠΗ		
MFG		SIZE	DWG NO	REV
APPROVED		C	3	
		SCALE	SHEET 1 OF 1	



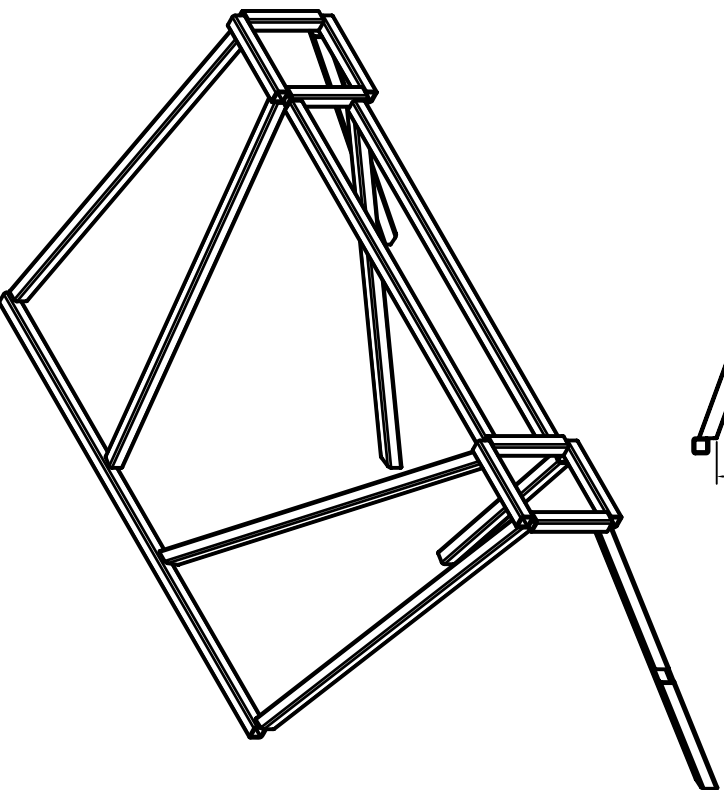
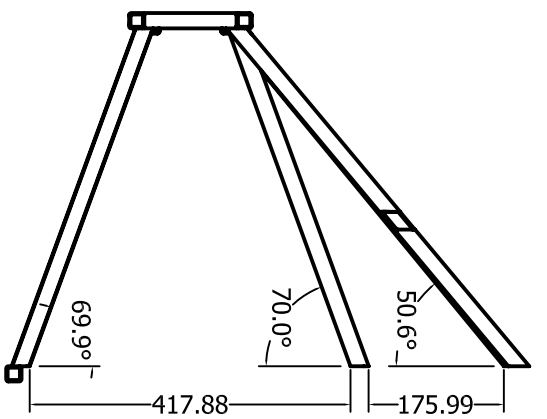
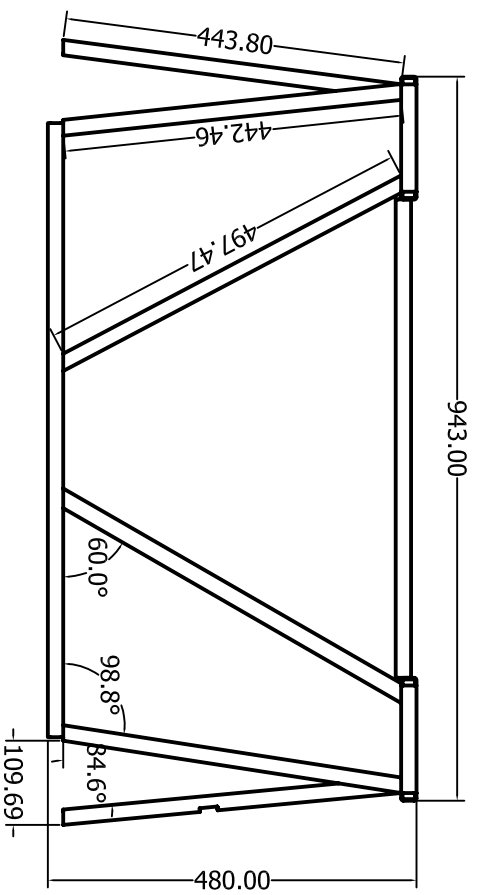
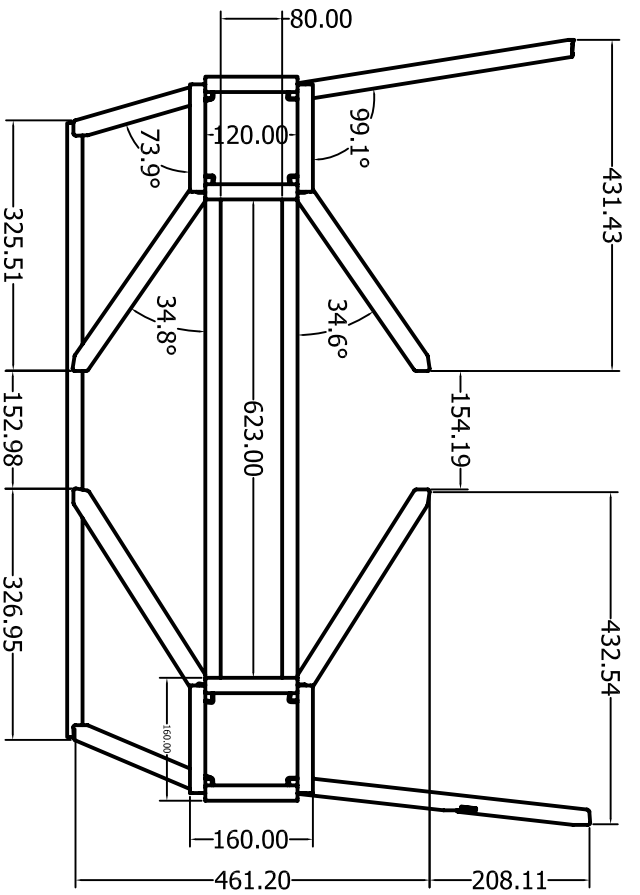
ΣΧΕΔΙΟ 4

DRAWN	11/11/2007	TITLE	
PIKOS		ΠΛΑΙΝΟ ΔΙΚΤΥΩΜΑ	
CHECKED		SIZE	DWG NO
QA		C	4
MFG		SCALE	REV
APPROVED			
		SHEET 1 OF 1	



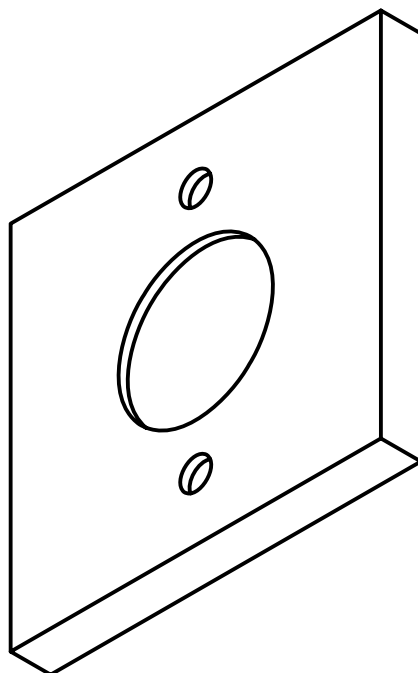
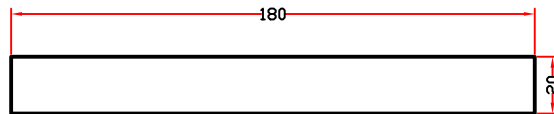
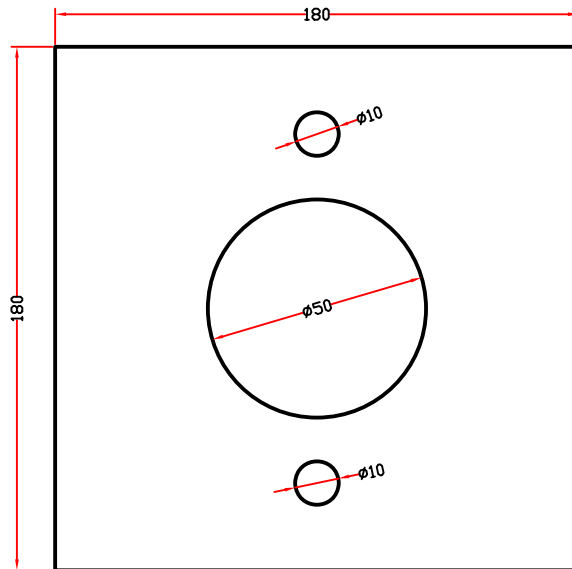
ΣΧΕΔΙΟ 5

DRAWN	11/11/2007	TITLE	
PIKOS			
CHECKED		ΠΛΑΙΣΙΟ ΣΥΣΤΡΕΥΤΩΝ	
QA			
MFG		SIZE	DWG NO
APPROVED		C	5
		SCALE	REV



ΣΧΕΔΙΟ 6

DRAWN	11/11/2007	TITLE	
CHECKED		ΟΤΙΣΘΙΟ	
QA		ΔΙΚΤΥΩΜΑ	
MFG		SIZE	DWG NO
APPROVED		C	6
		SCALE	REV



ΣΧΕΔΙΟ 7

DRAWN nikos	11/11/2007			
CHECKED		TITLE		
QA		ΒΑΣΕΙΣ ΑΠΟΣΒΕΣΤΗΡΩΝ		
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APPROVED		SIZE C	DWG NO 7	REV
		SCALE	SHEET 1 OF 1	

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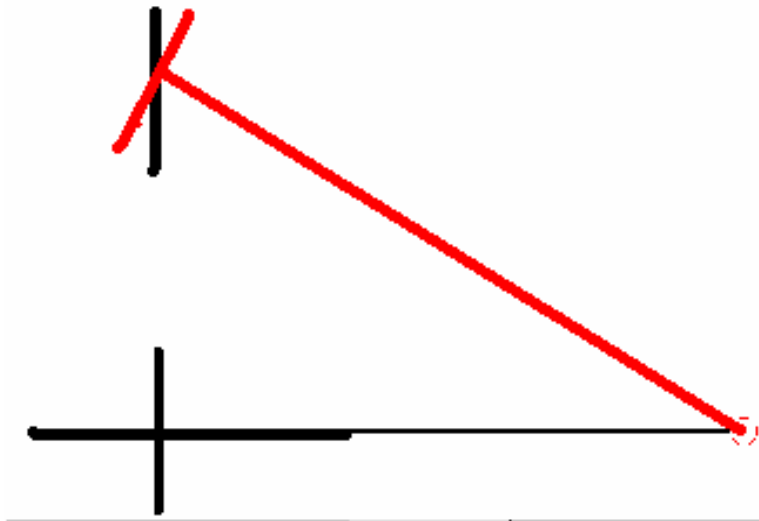
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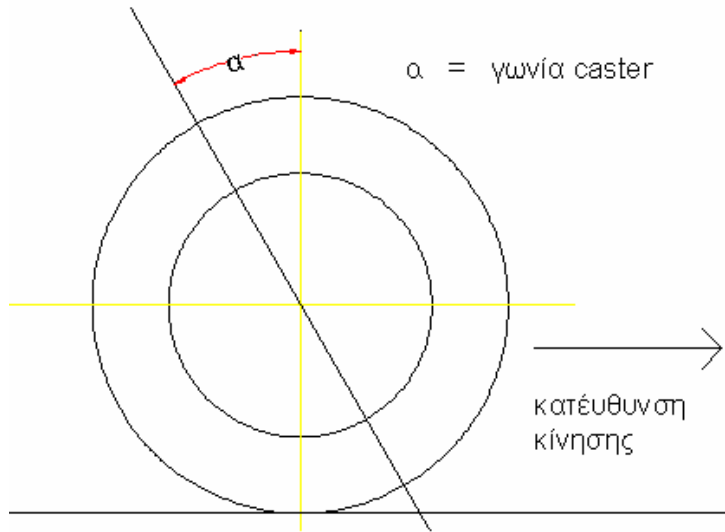
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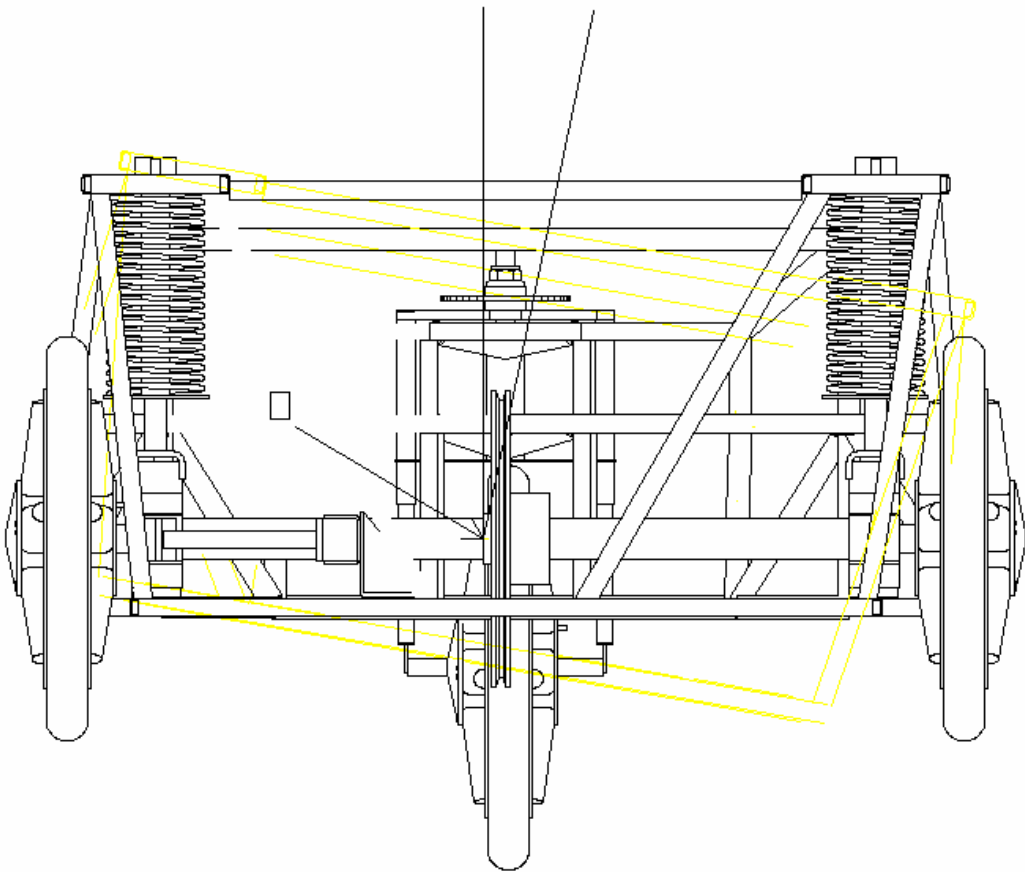
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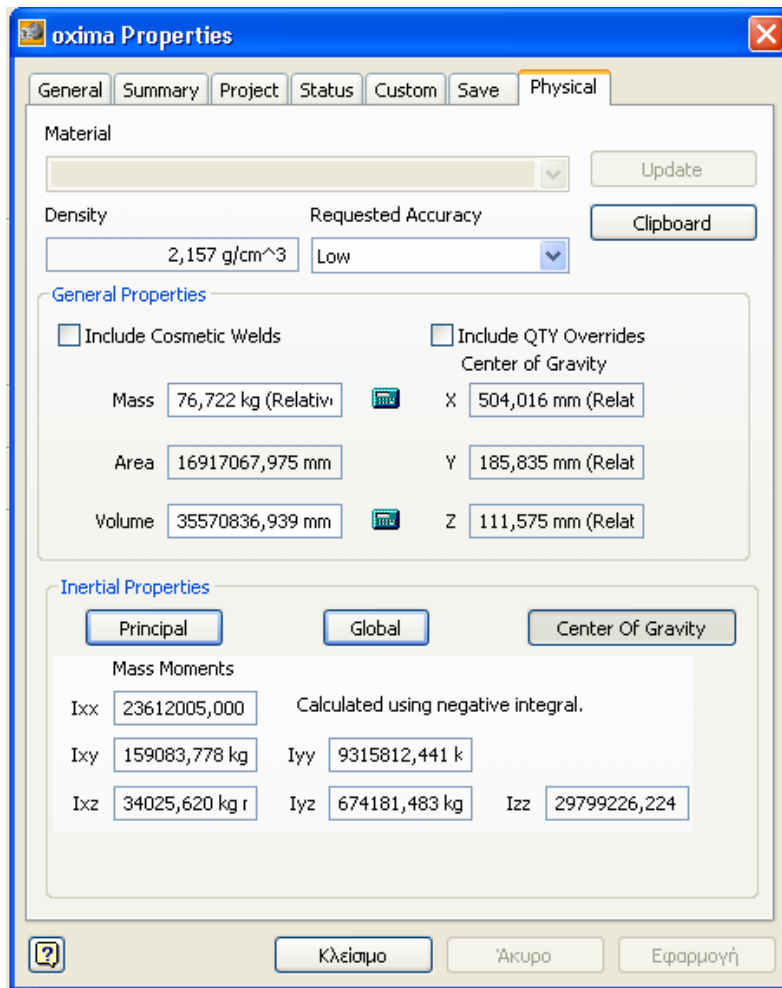
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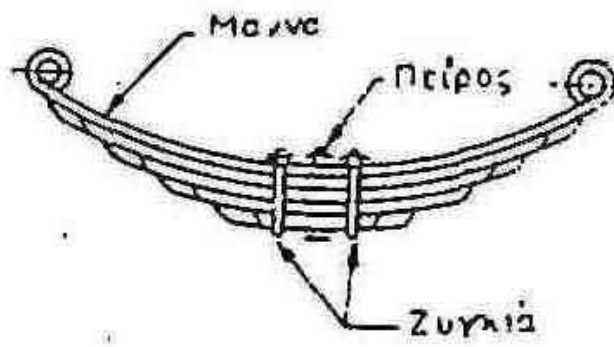
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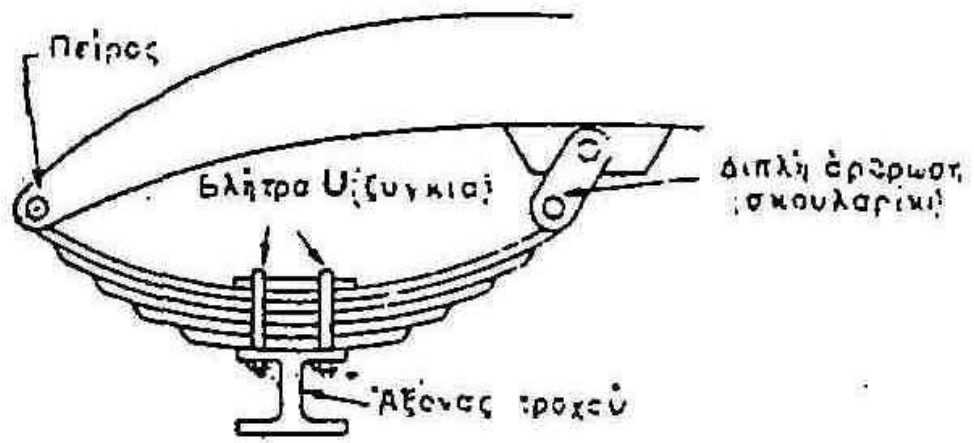


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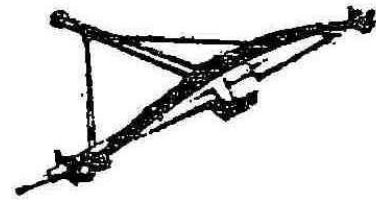
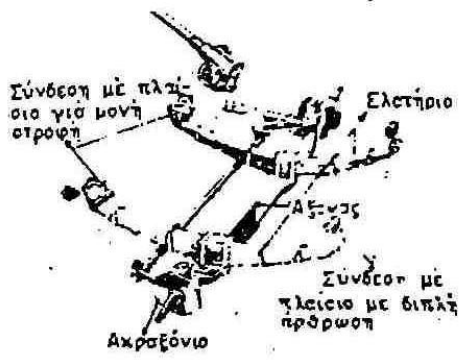
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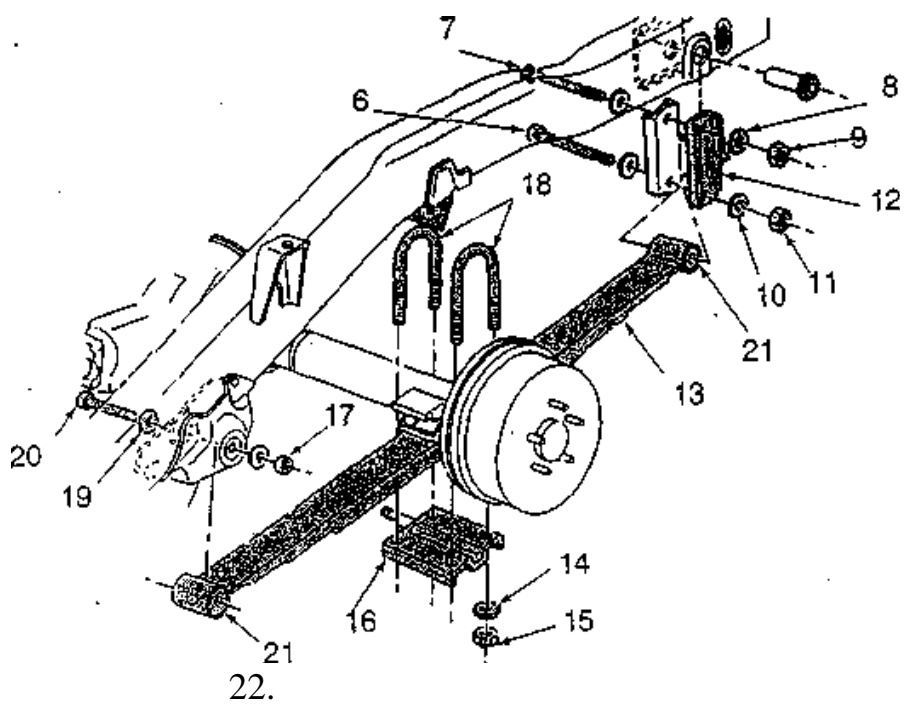
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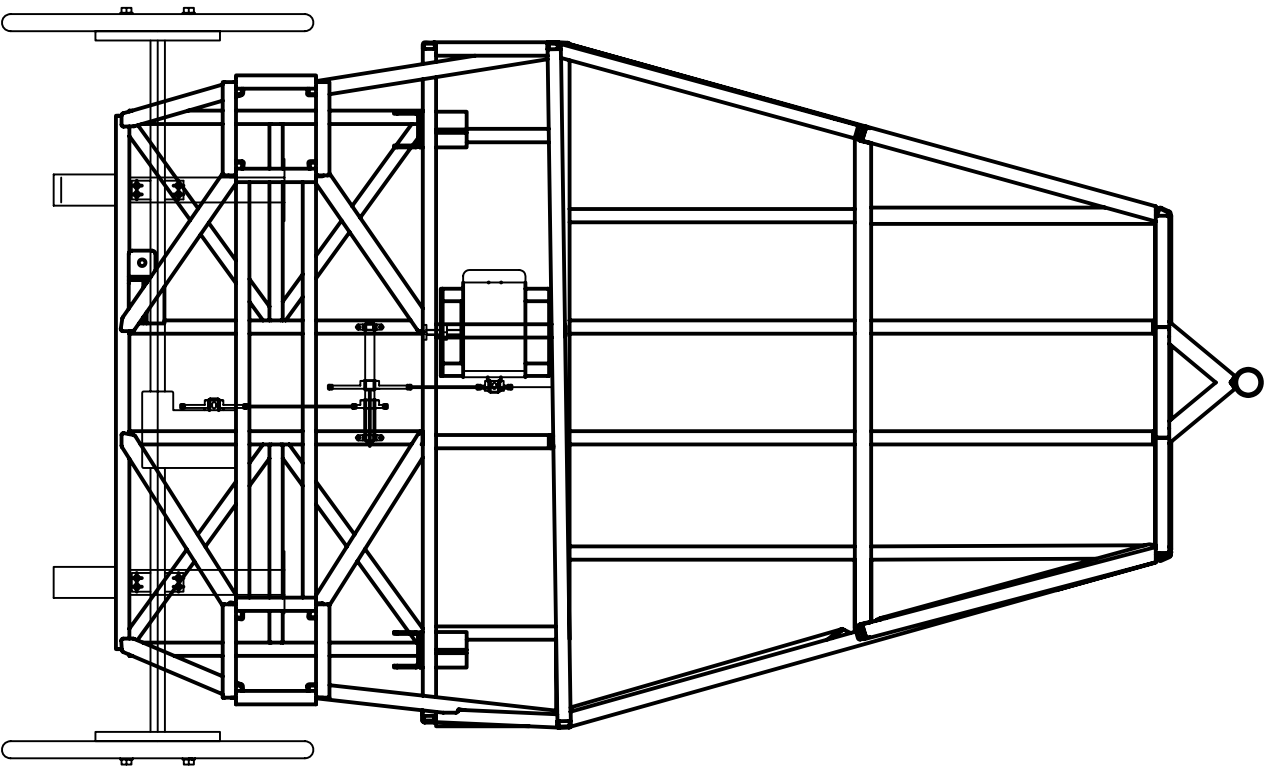
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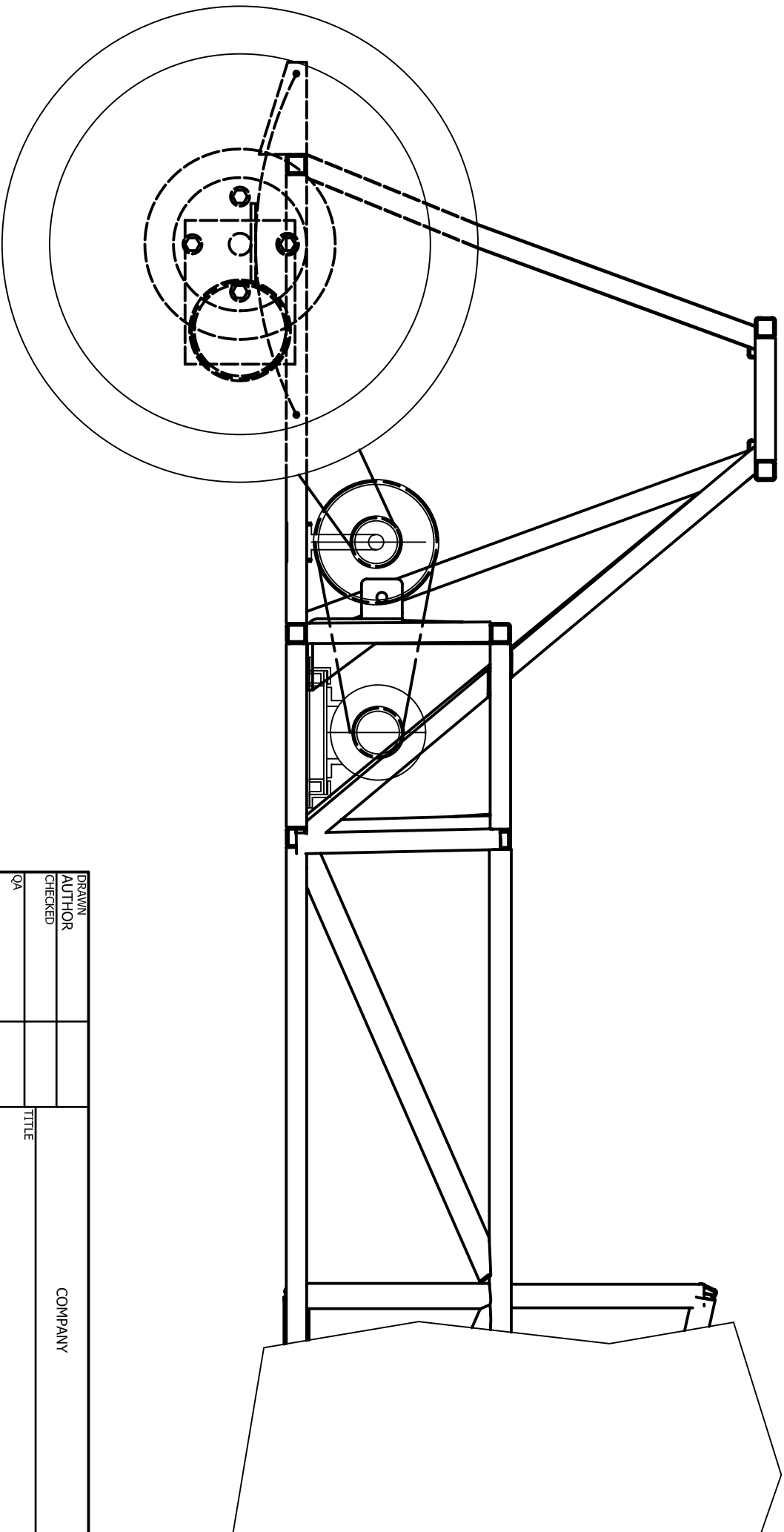
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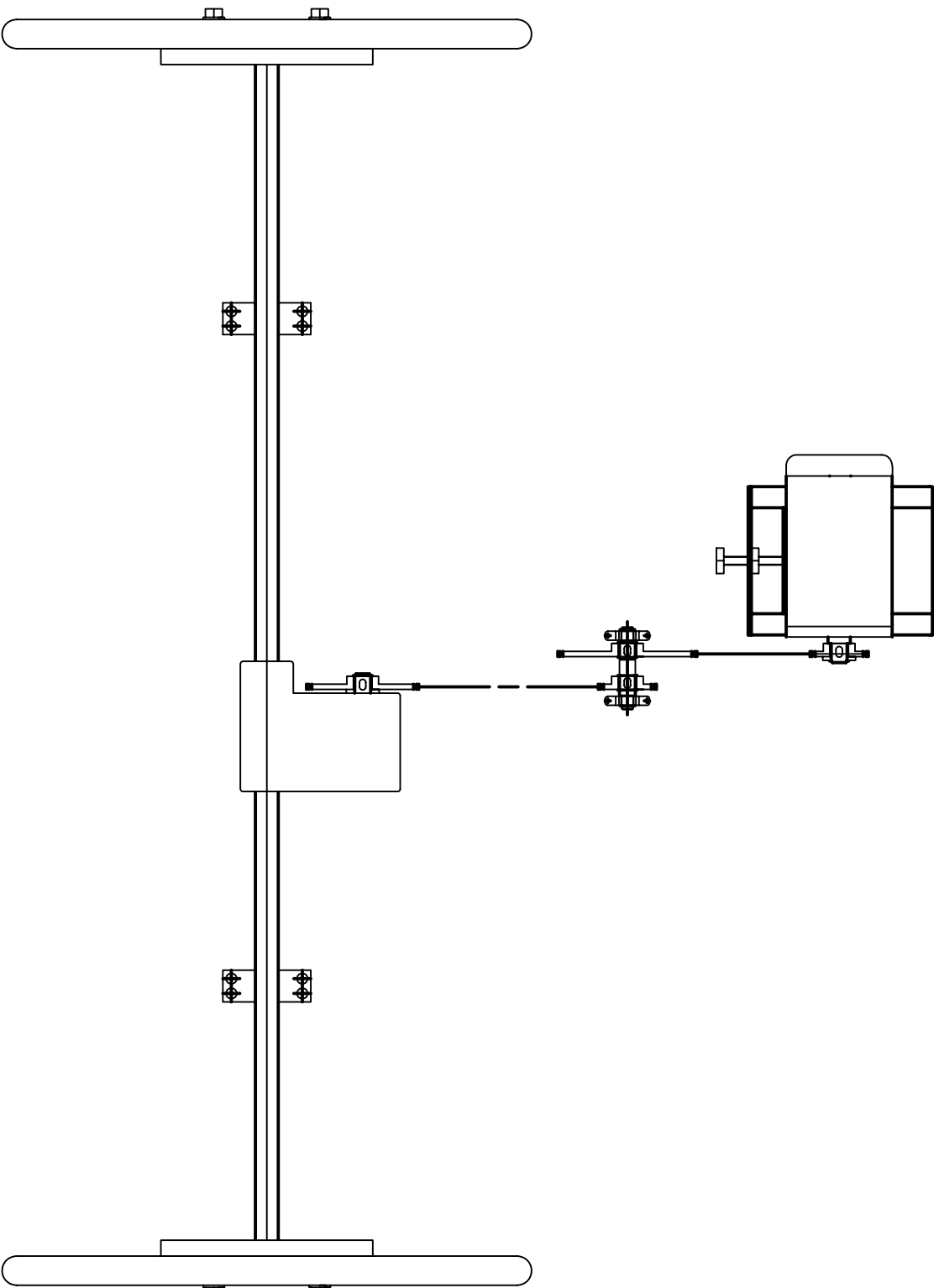
ΣΧΕΔΙΟ 8

DRAWN		COMPANY	
AUTHOR		ΣΥΝΟΛΤΙΚΟ_ΣΧΕΔΙΟ_ΑΙΣΘΟΚΙΝΗΣΗΣ	
CHECKED		TITLE	
QA		SIZE	
MFG		DWG NO	8
APPROVED		REV	
		SCALE	SHEET 1 OF 1



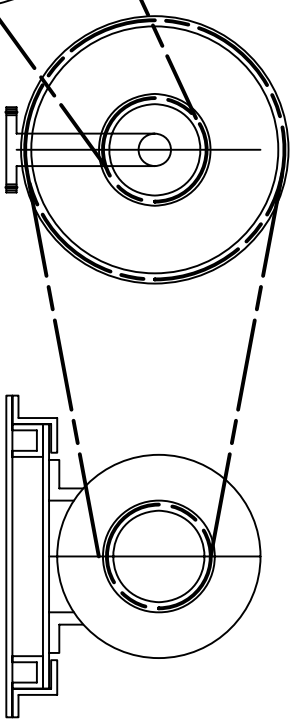
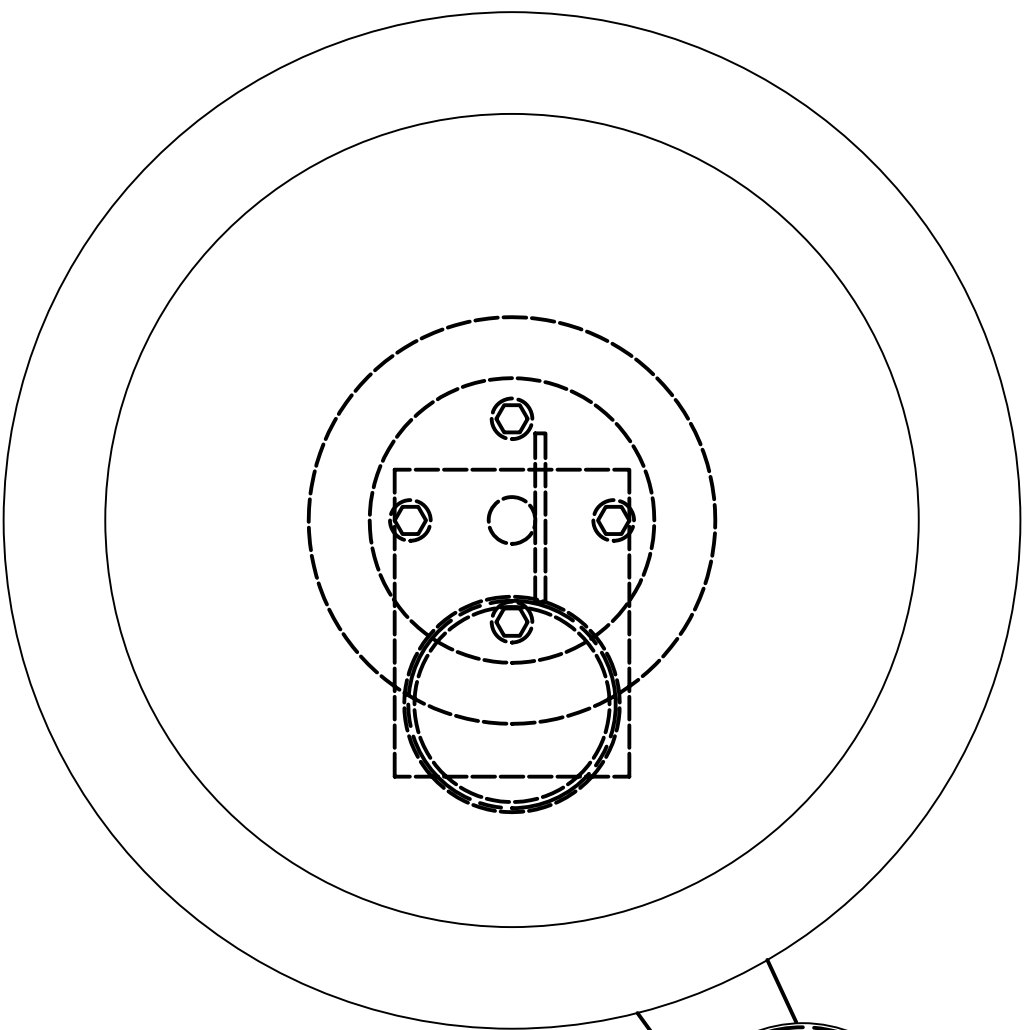
ΣΧΕΔΙΟ 9

DRAWN		COMPANY	
AUTHOR		ΤΡΑΓΙΑ_ΟΥΗ_ΑΜΙΣΟΚΙΝΗΣΗΣ	
CHECKED		TITLE	
QA		SIZE	DWG NO
MFG			9
APPROVED		SCALE	REV
			SHEET 1 OF 1



DRAWN		COMPANY		
AUTHOR		KΑΤΟΨΗ_ΑΝΙΣΟΚΙΝΗΣΗΣ		
CHECKED		TITLE		
QA		SIZE		
MFG		DWG NO	10	REV
APPROVED		SCALE		
		SHEET 1 OF 1		

ΣΧΕΔΙΟ 10



ΣΧΕΔΙΟ 11

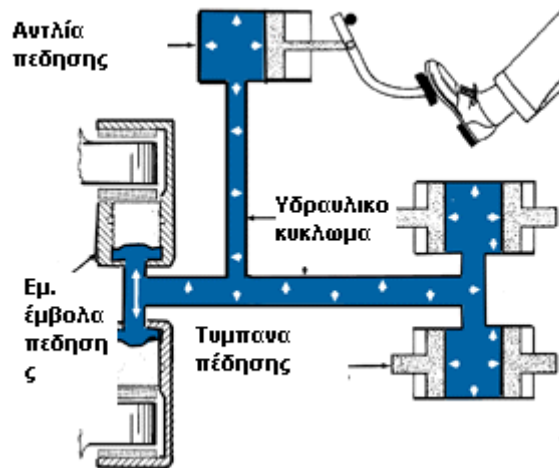
DRAWN		COMPANY	
AUTHOR		ΤΙΤΛΟΣ	
CHECKED		ΠΑΛΙΑ_ΟΥΗ_ΑΙΣΟΚΙΝΗΣΗΣ	
QA		SIZE	DWG NO
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		SHEET 1 OF 1	

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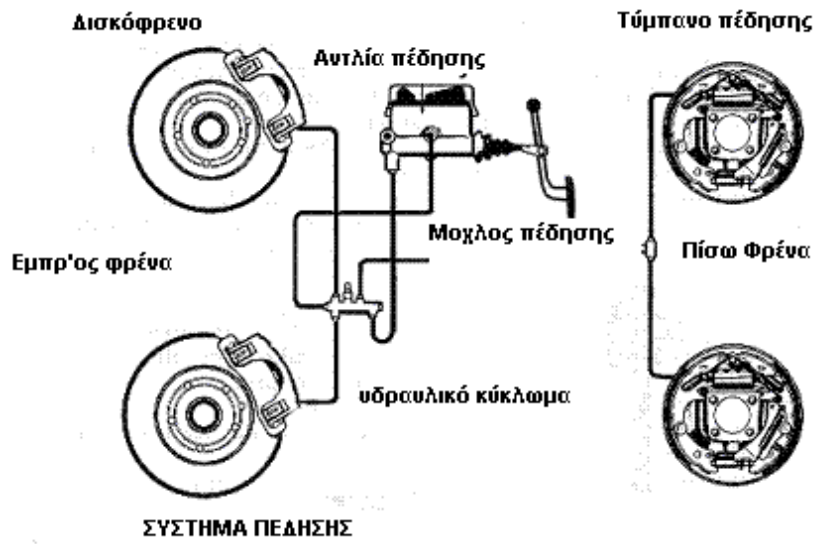
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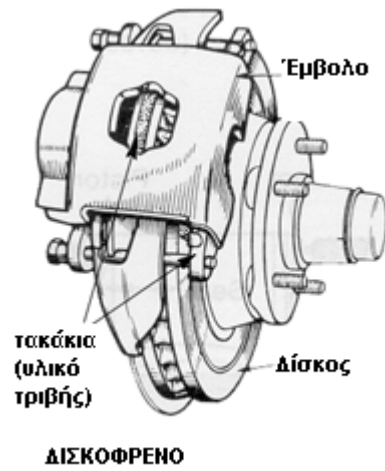
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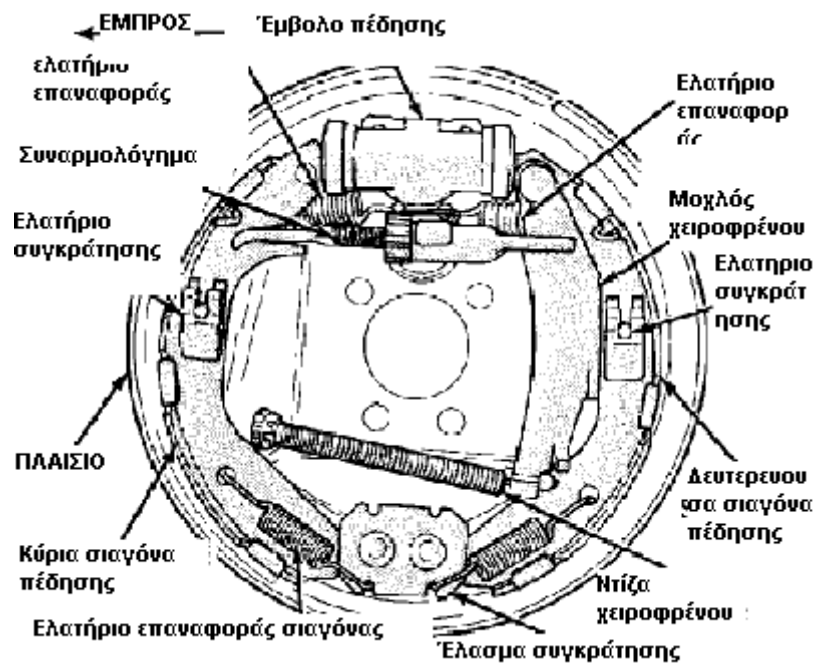


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300mm

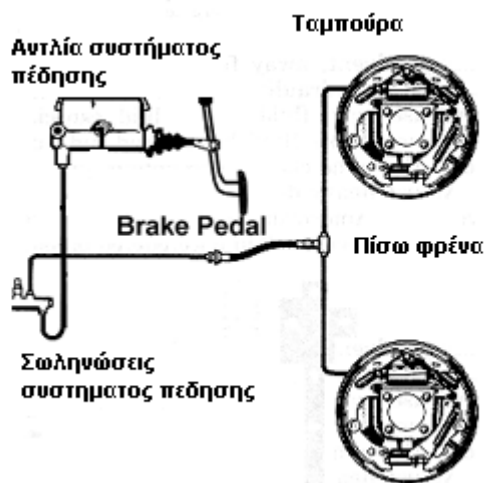
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$$\mathbf{E} \times \mathbf{I}$$

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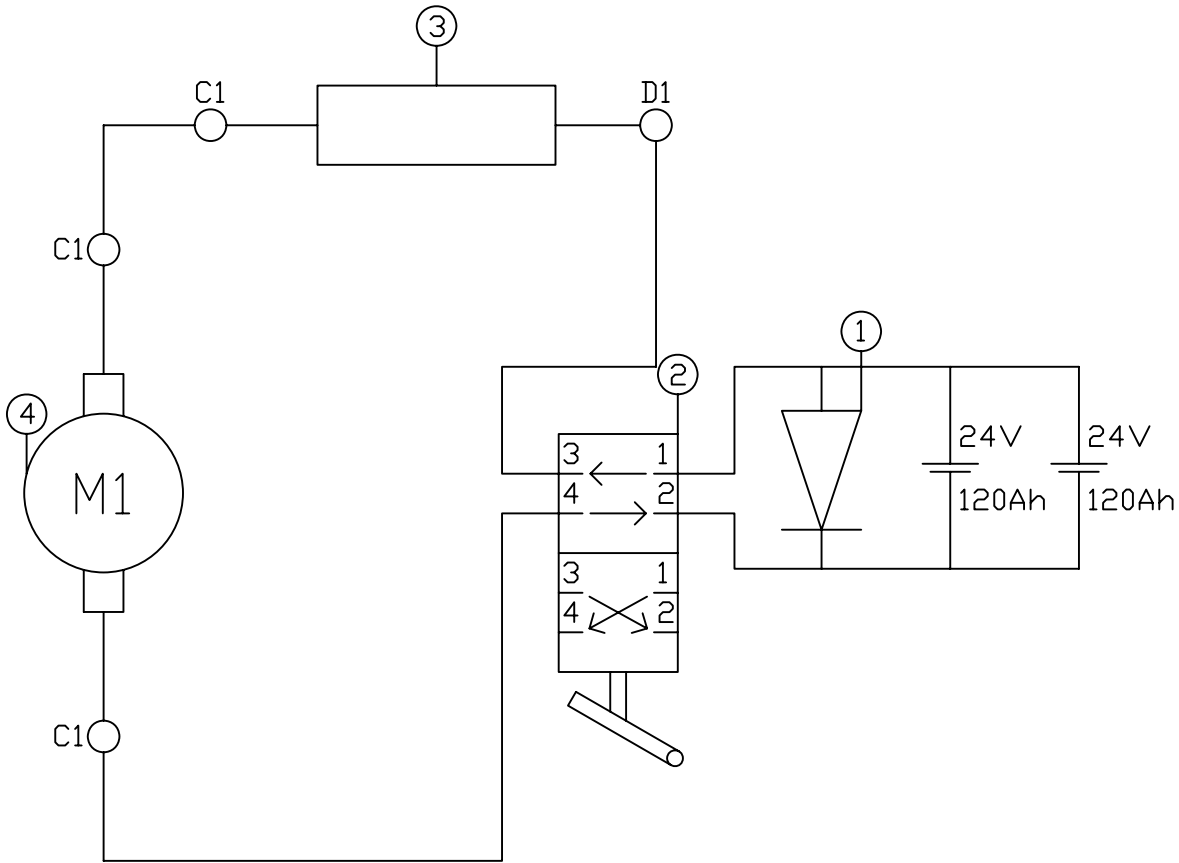
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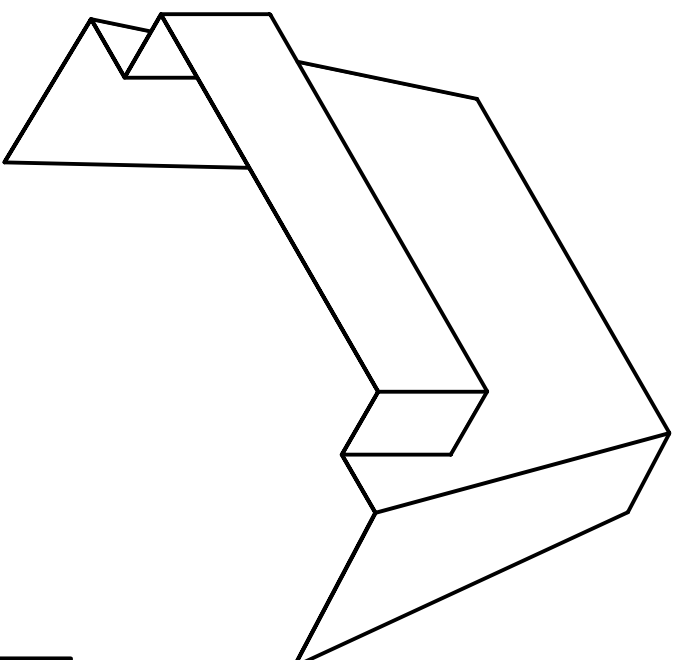
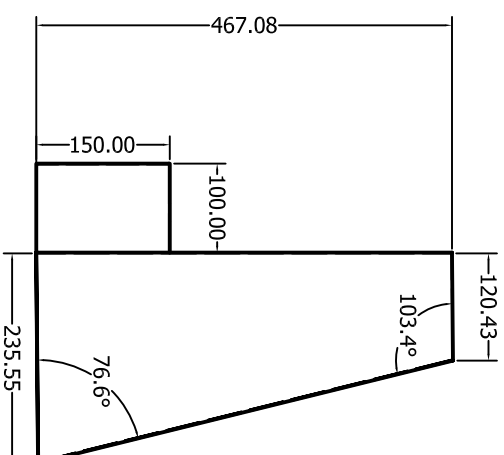
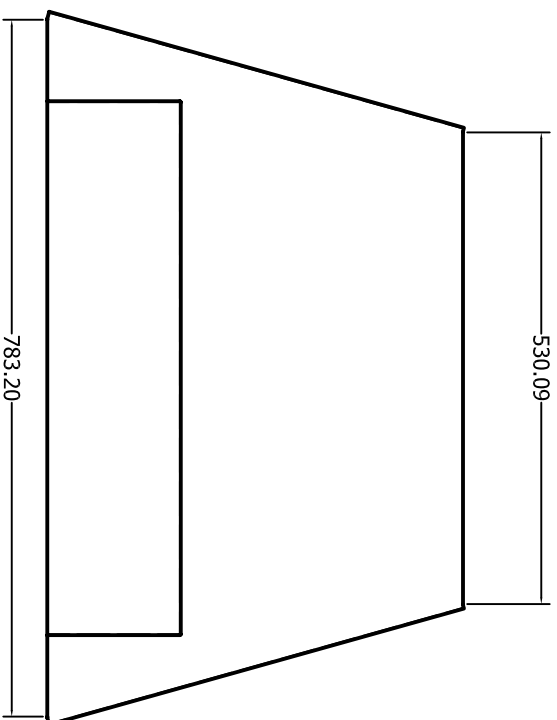
€

€

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1	1
2	2
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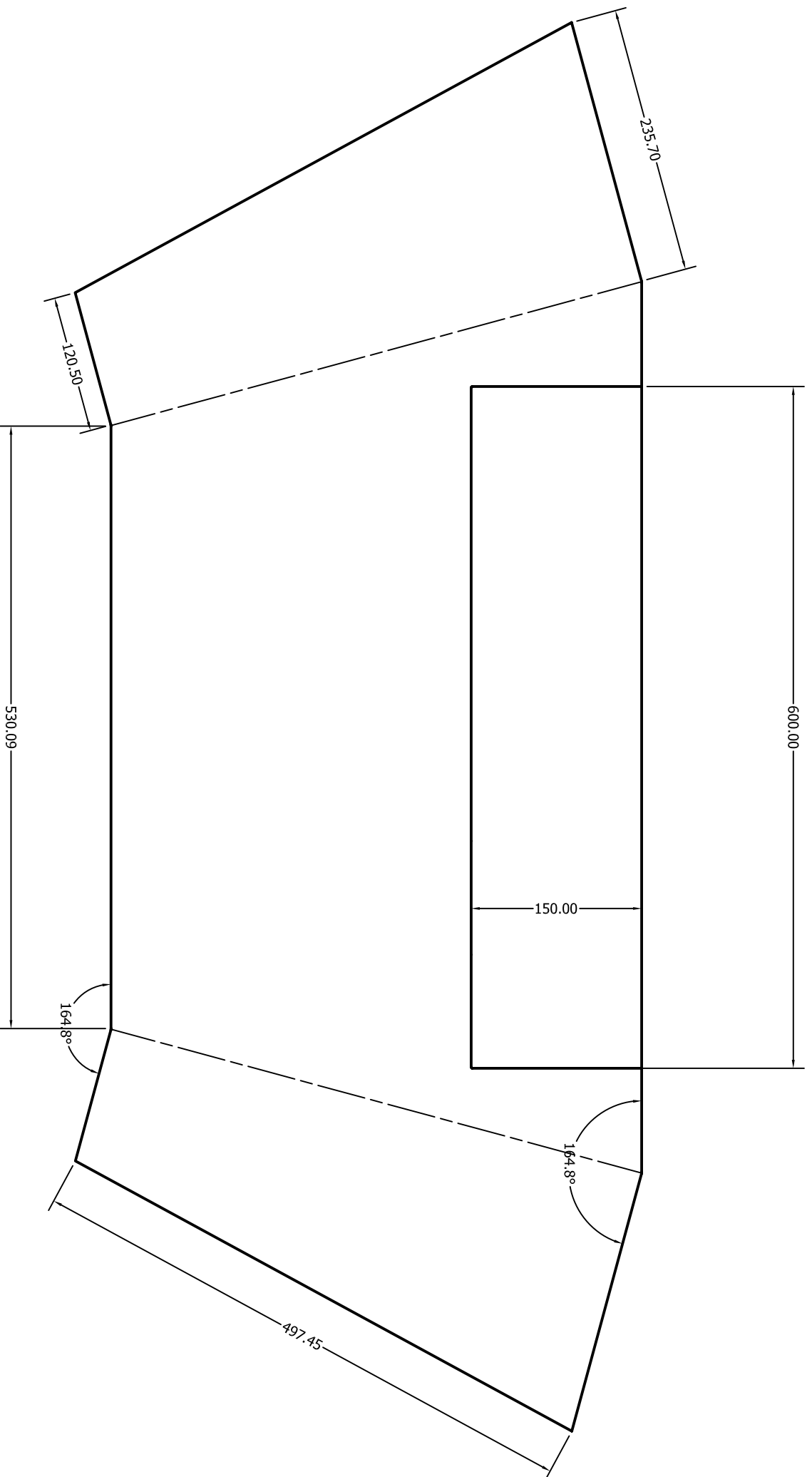


ΓΡΗΓΟΡΙΑΔΗΣ ΝΙΚΟΛΑΟΣ			
ΟΝΟΜΑ ΑΡΧΕΙΟΥ			ΣΧΕΔΙΑΣΤΗΚΕ ΑΠΟ
ΚΩΔΙΚΟΣ	ΠΕΡΙΓΡΑΦΗ		
	ΣΥΝΔΕΣΜΟΛΟΓΙΑ ΚΙΝΗΤΗΡΑ DC ΔΙΕΓΕΡΣΗΣ ΣΕΙΡΑΣ		
ΦΑΚΕΛΟΣ (PART)			ΥΛΙΚΟ
D:/SXEDIA			
ΑΝΑΘΕΩΡΗΣΗ	ΗΜΕΡΟΜΗΝΙΑ ΣΧΕΔΙΑΣΜΟΥ	ΗΜΕΡΟΜΗΝΙΑ ΑΝΑΘΕΩΡΗΣΗΣ	ΠΑΧΟΣ ΥΛΙΚΟΥ
	3 /07 /2007	18 /01 /2008	ΕΞΑΡΤΗΜΑΤΑ ΠΡΟΣ ΚΟΠΗ
			ΑΡ. ΣΕΛΙΔΑΣ
			1
ΦΑΚΕΛΟΣ (DRAWING)			



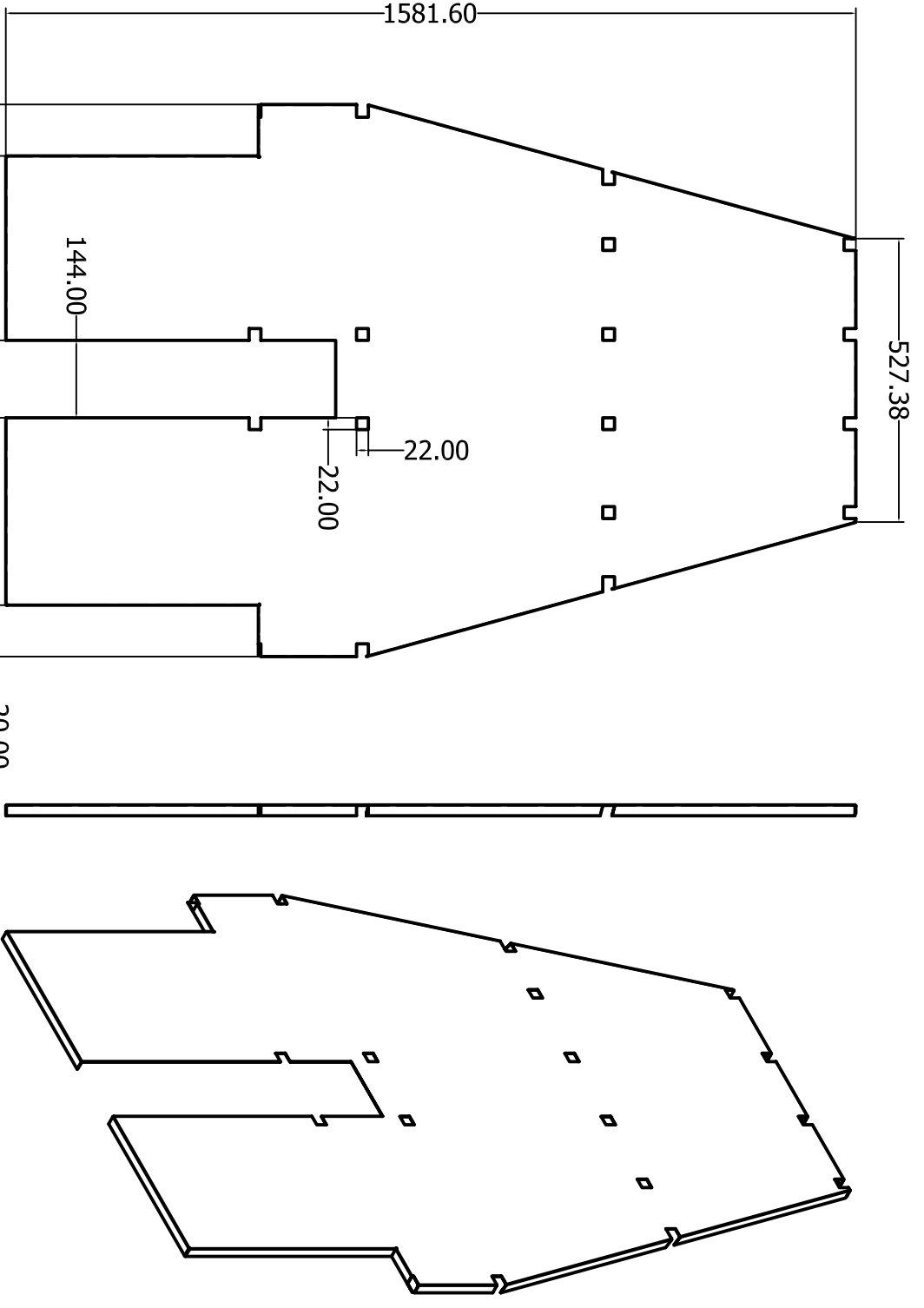
DRAWN	PIKOS	11/11/2007	TITLE	
CHECKED			EMΠΡΟΣΘΙΑ	
QA			ΕΠΕΝΔΥΣΗ	
MFG			SIZE	DWG NO
APPROVED			C	13
			SCALE	REV
			SHEET 1 OF 1	

ΣΧΕΔΙΟ 13



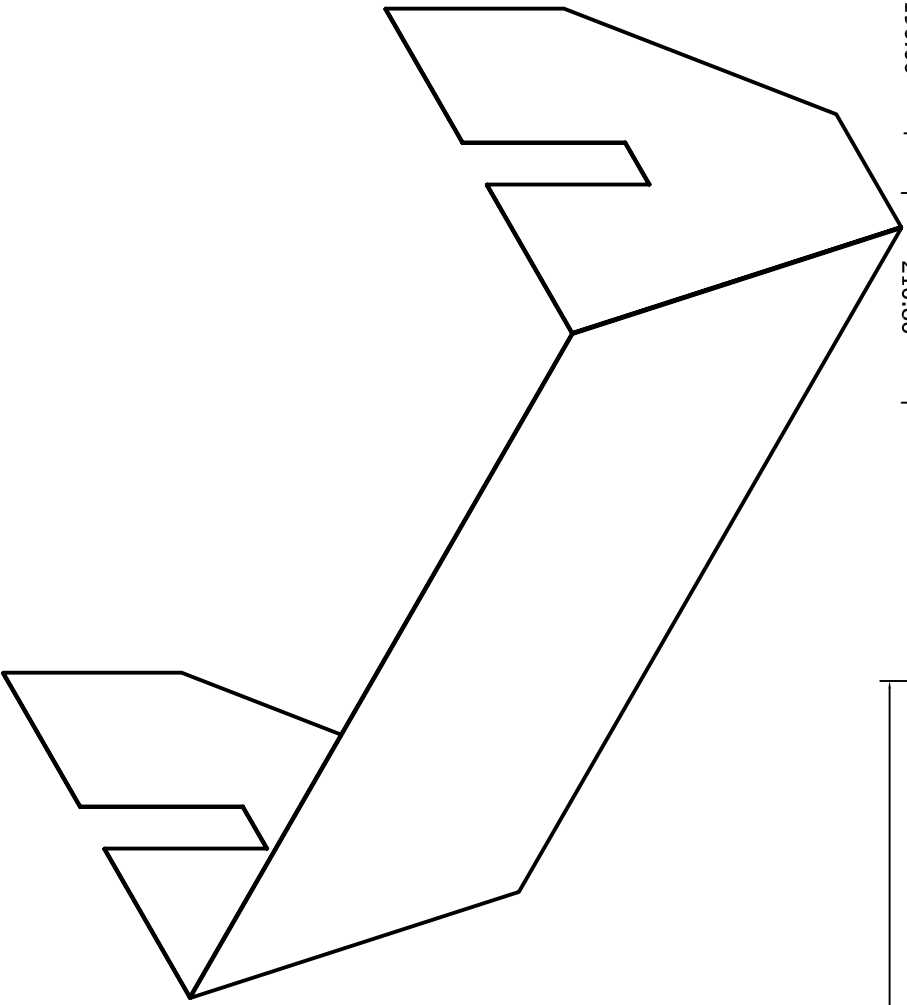
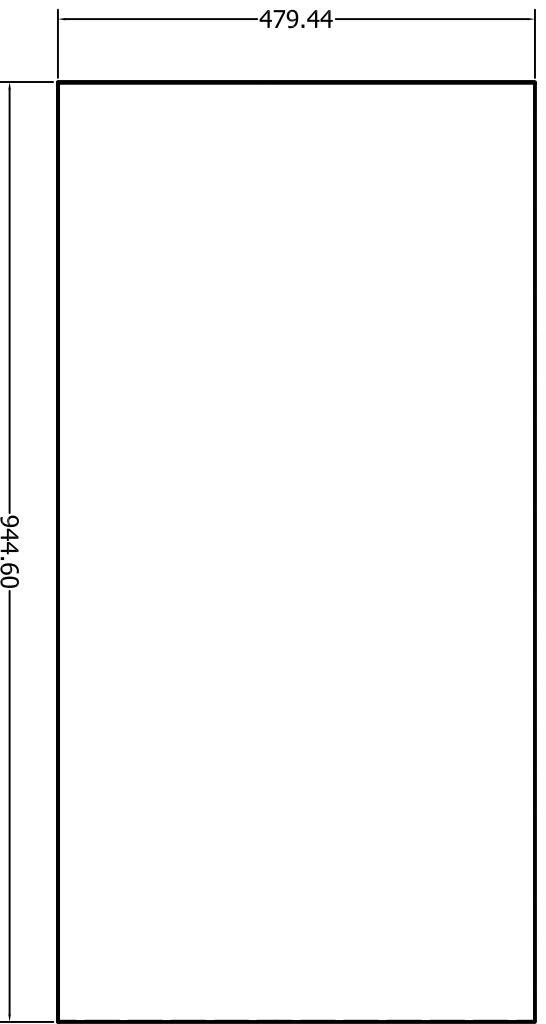
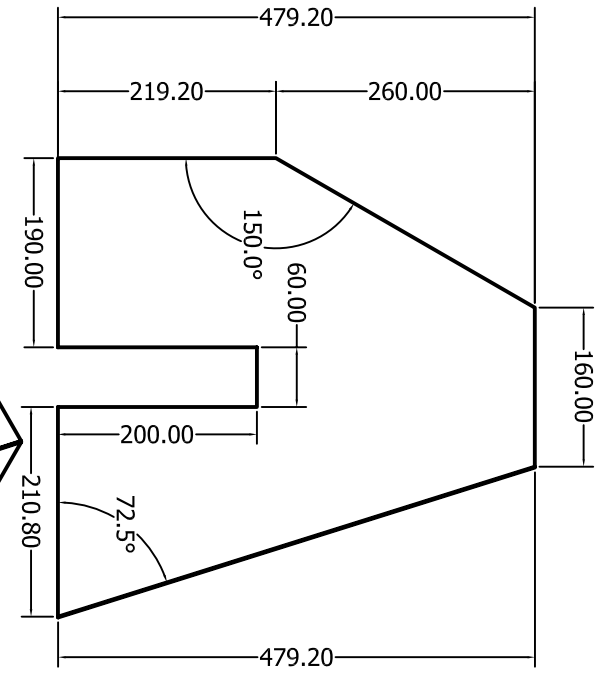
ΣΧΕΔΙΟ 14

DRAWN	11/11/2007	TITLE	
PIKOS			
CHECKED		ANAPTYΓMA EM. ΕΠΕΝΔΥΣΗΣ	
QA			
MFG		SIZE	DWG NO
APPROVED		C	14
		SCALE	REV



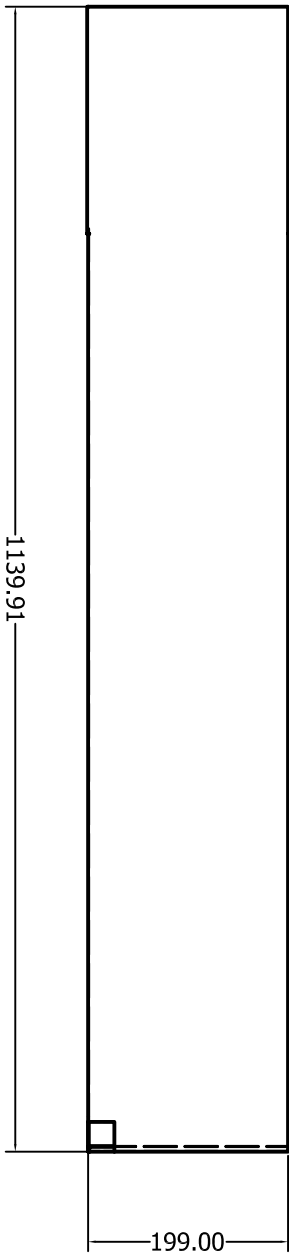
ΣΧΕΔΙΟ 14

DRAWN	PIKOS	11/11/2007	TITLE		
CHECKED			PLATFORMA		
QA			SIZE	DWG NO	REV
MFG			C	14	
APPROVED			SCALE		
					SHEET 1 OF 1

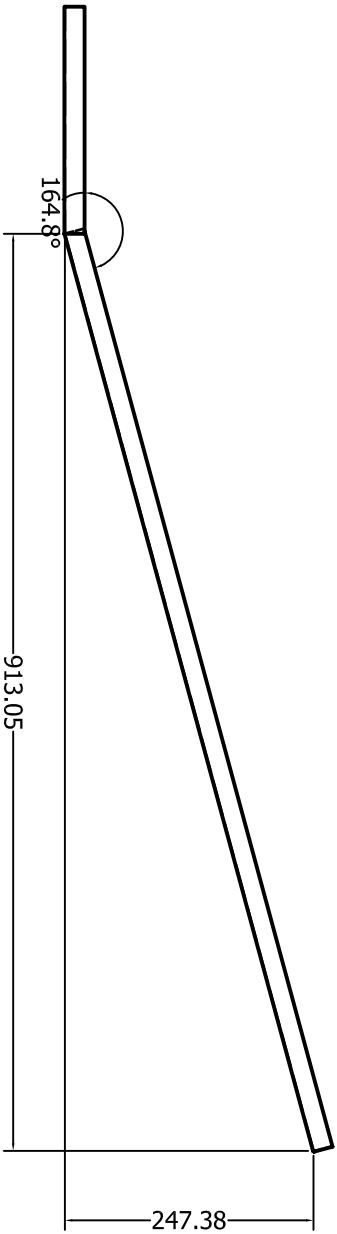
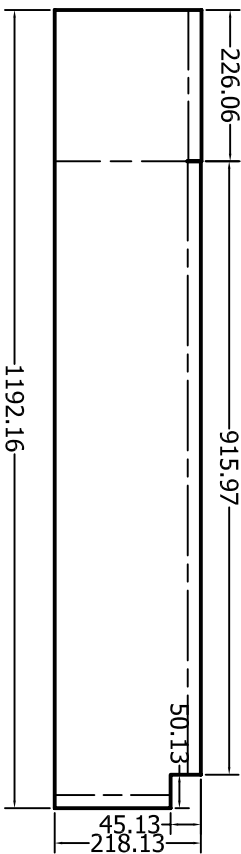
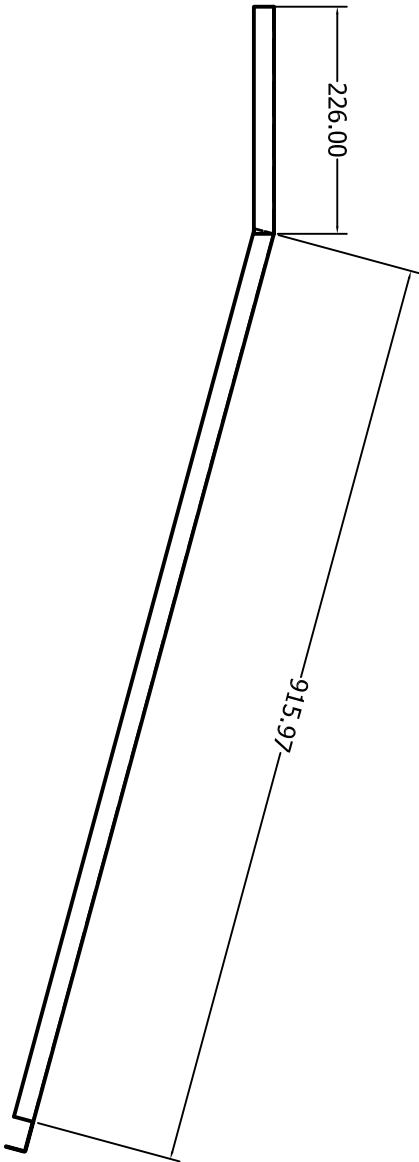


ΣΧΕΔΙΟ 15

DRAWN	11/11/2007	TITLE	
CHKOS		ΕΠΕΝΔΥΣΗ ΠΙΣΩ	
CHECKED		ΜΕΡΟΣ	
QA		SIZE	DWG NO
MFG		C	15
APPROVED		SCALE	REV

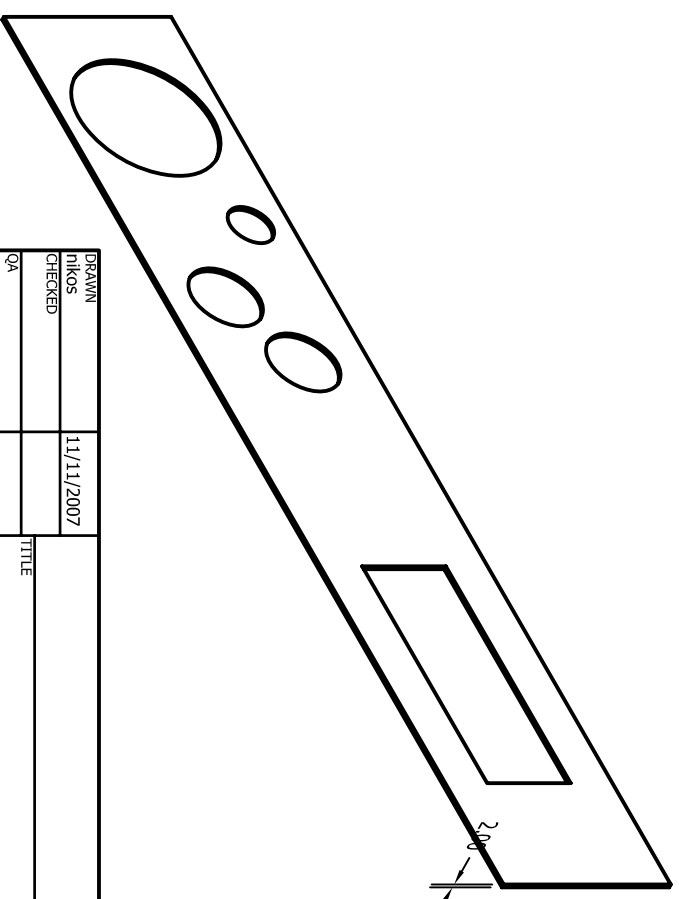
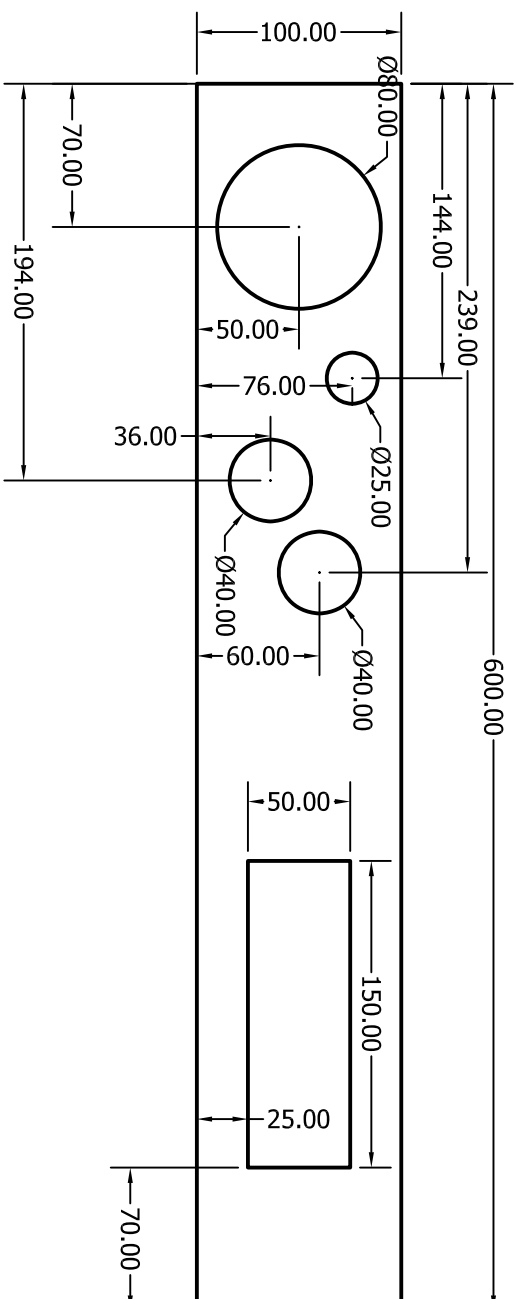


FLAT PATTERN

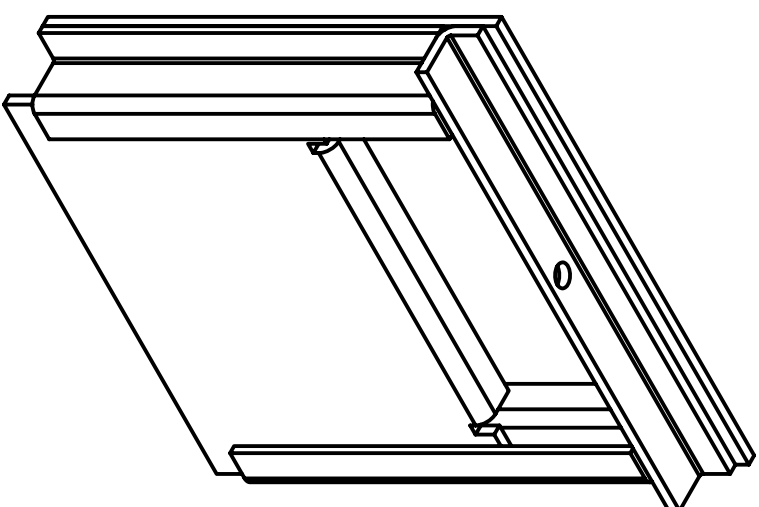
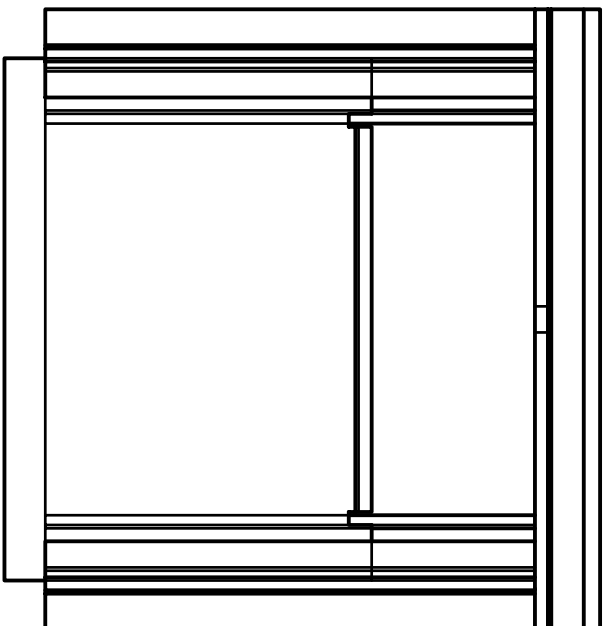


ΣΧΕΔΙΟ 16

DRAWN	11/11/2007	TITLE	
PIKOS			
CHECKED		ΠΑΙΝΗ Η ΕΠΕΝΑΥΣΗ Η	
QA			
MFG		SIZE	DWG NO
APPROVED		C	16
		SCALE	REV

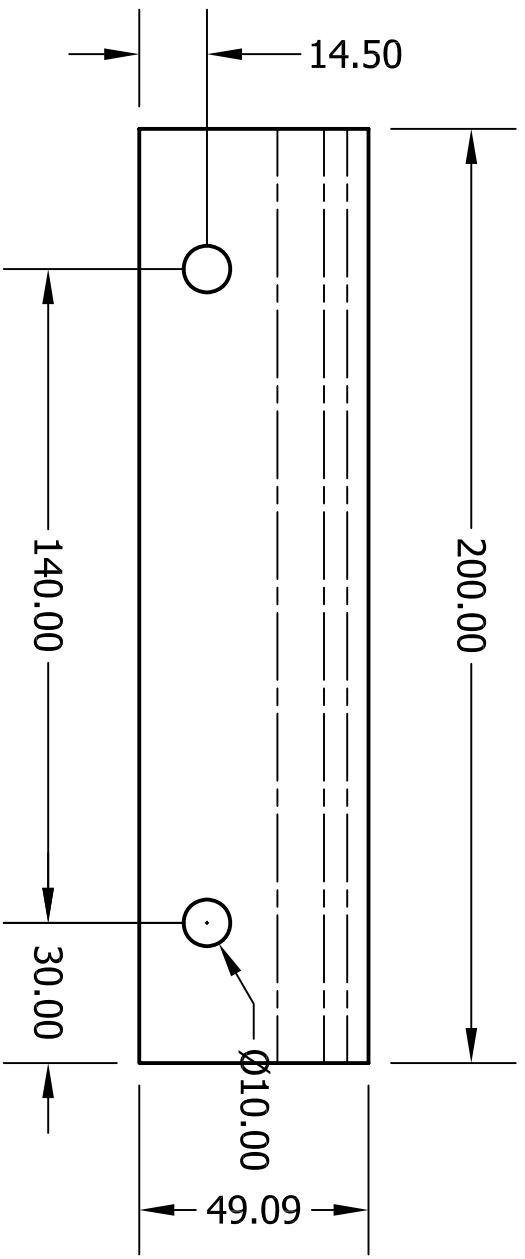
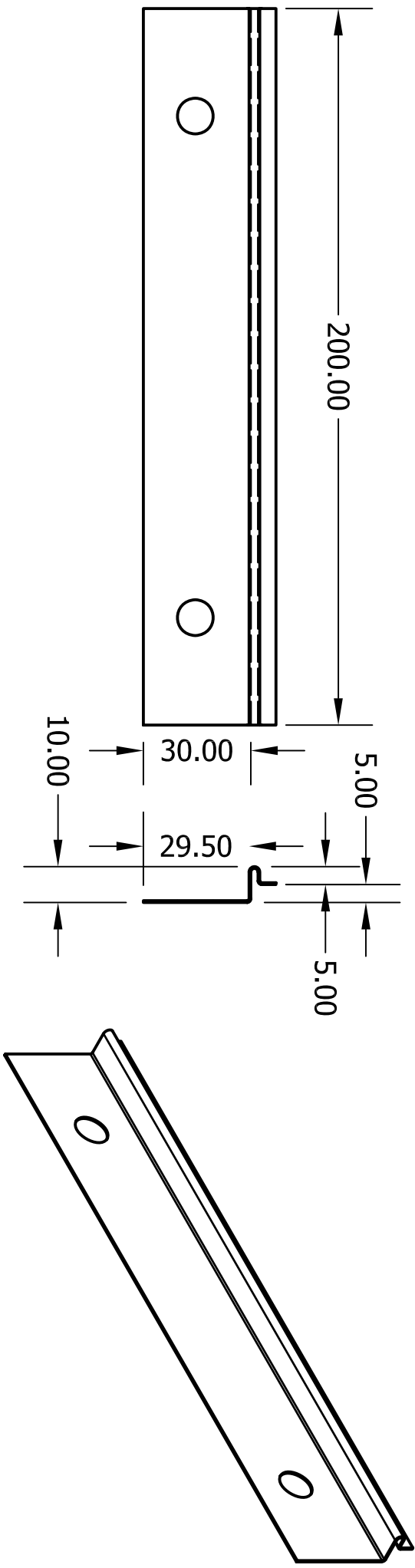


DRAWN	PIKOS	11/11/2007	TITLE		
CHECKED			ΠΙΝΑΚΑΣ ΟΡΓΑΝΩΝ		
QA			SIZE	DWG NO	REV
MFG			C	17	
APPROVED			SCALE		



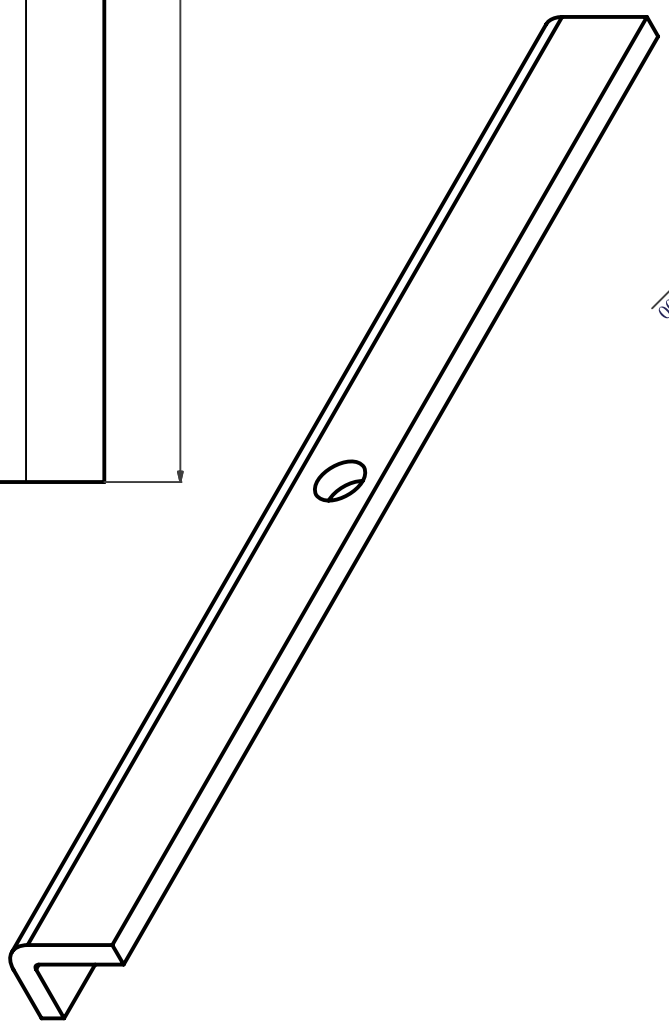
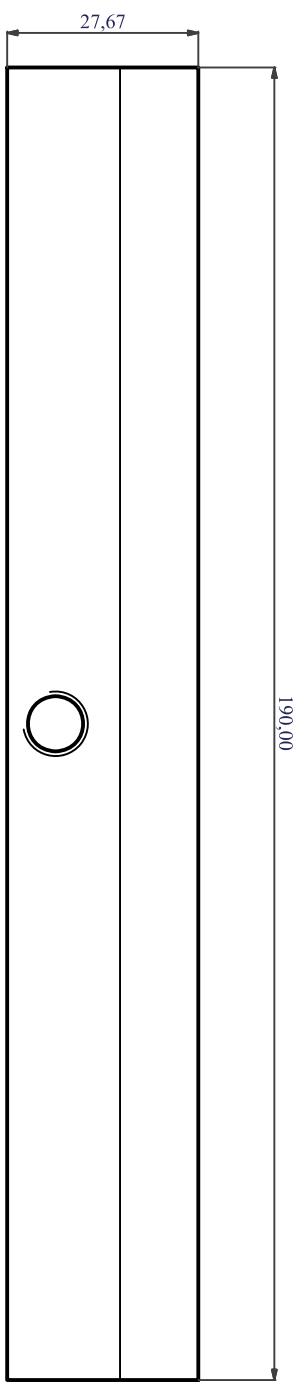
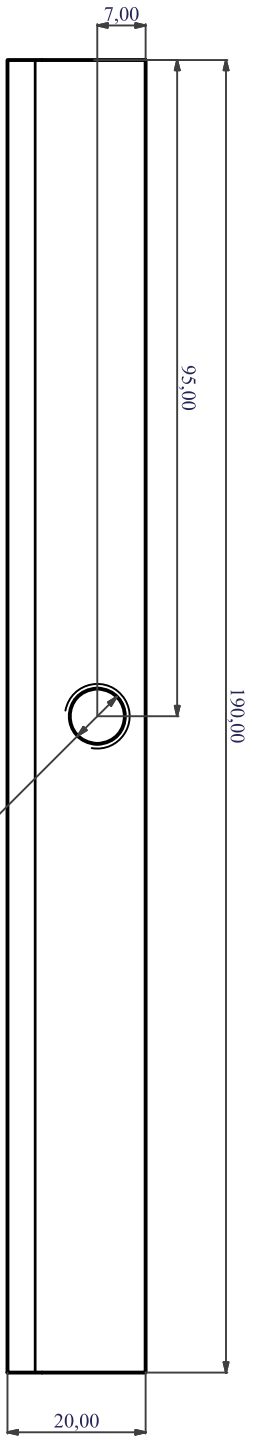
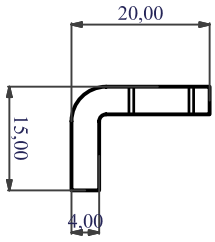
ΣΧΕΔΙΟ 18

DRAWN		COMPANY	
AUTHOR			
CHECKED			
QA			
MFG			
APPROVED			
TITLE		ΣΥΝΟΛΤΙΚΟ ΣΧΕΔΙΟ ΒΑΣΗΣ ΚΙΝΗΤΗΡΑ	
SIZE	DWG NO	REV	
	18		
SCALE	SHEET 1 OF 1		



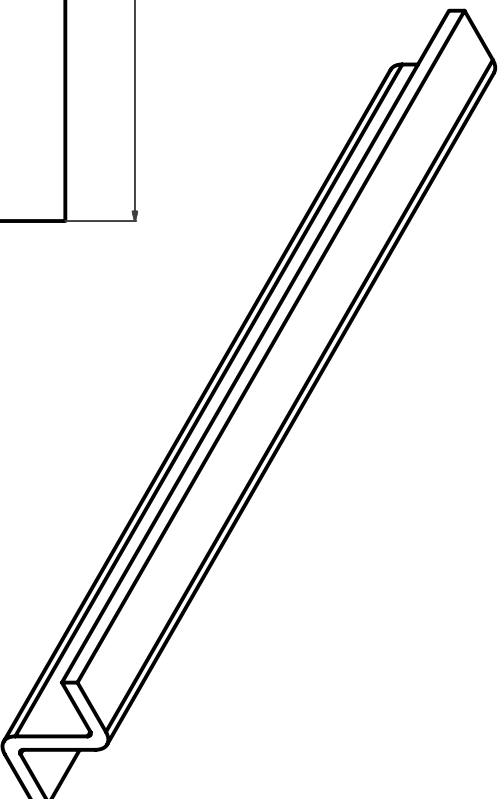
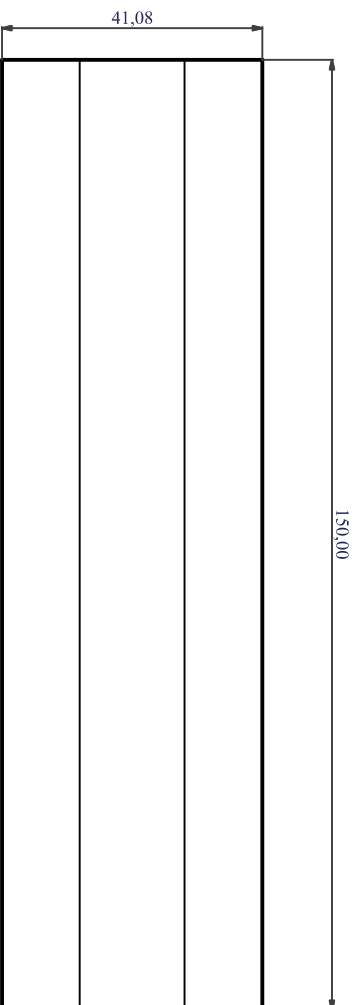
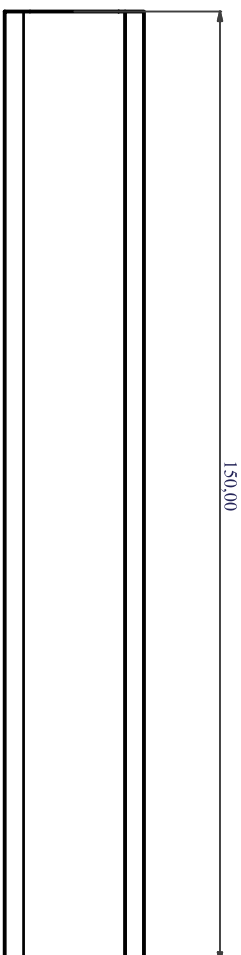
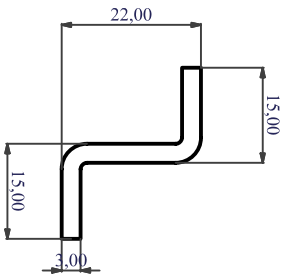
ΣΧΕΔΙΟ 12

DRAWN	11/11/2007	TITLE	
PIKOS		ΒΑΣΗ ΣΤΙΡΗΕΙΣ	
CHECKED		ΣΥΣΣΩΡΕΥΤΗ	
QA		SIZE	DWG NO
MFG		C	12
APPROVED		SCALE	REV
		SHEET 1 OF 1	



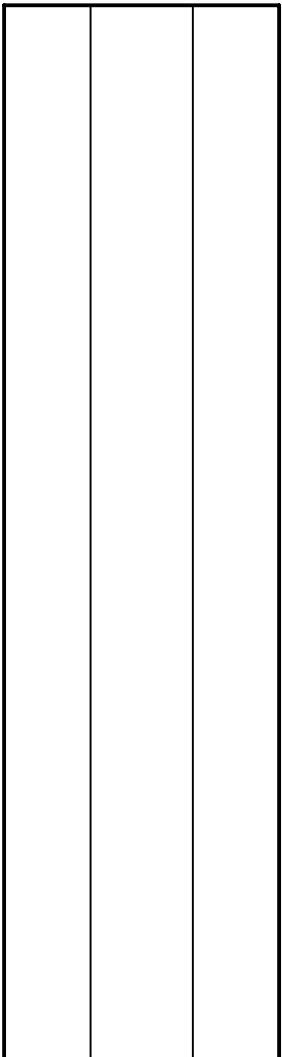
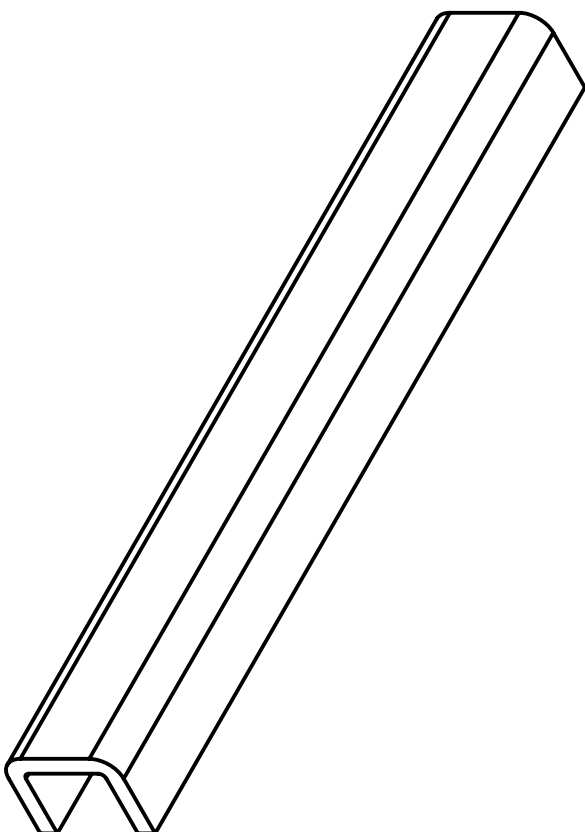
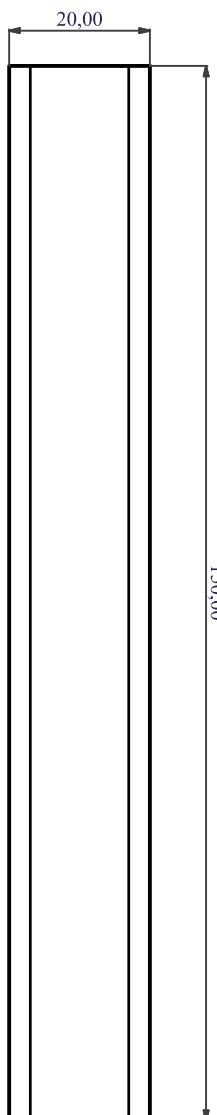
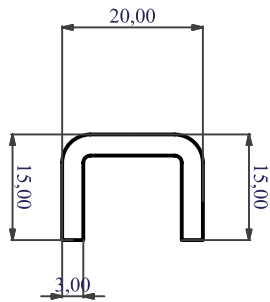
DRAWN		COMPANY	
AUTHOR		ΕΝΑΣΜΑ_ΠΡΟΕΝΤΑΣΗΣ_ΑΝΥΣΙΔΑΣ	
CHECKED		TITLE	
QA		SIZE	
MFG		DWG NO	19
APPROVED		SCALE	
			REV

ΣΧΕΔΙΟ 19



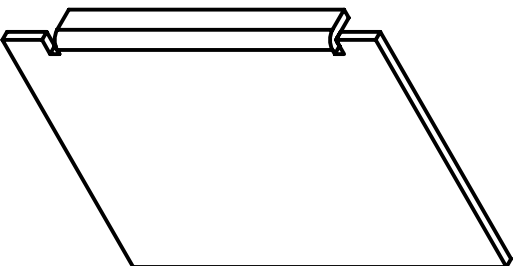
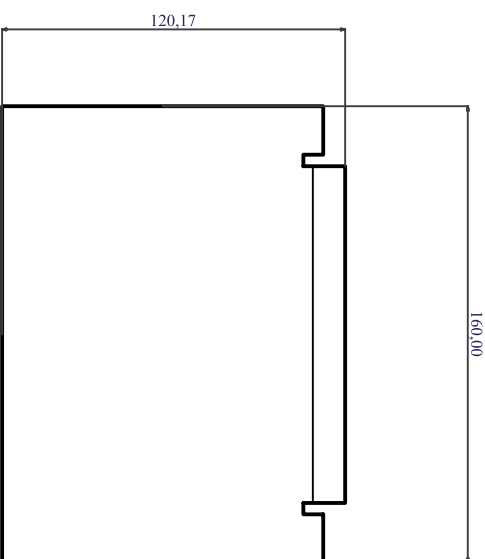
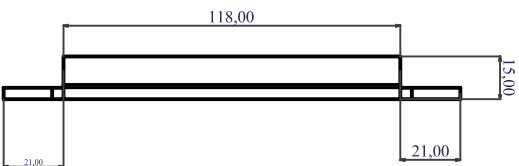
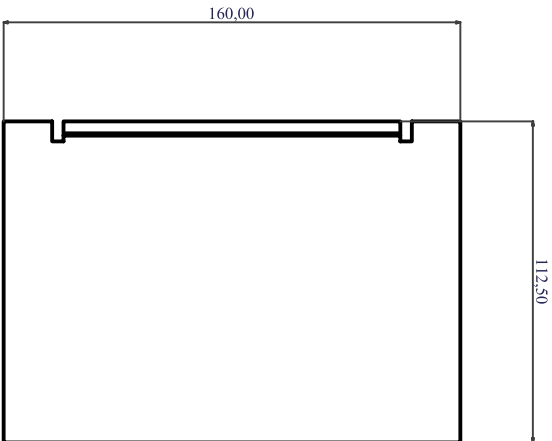
DRAWN		COMPANY	
AUTHOR		ANΩ_EΑΣΜΑ_ΟΔΗΓΟΥ	
CHECKED		TITLE	
QA		SIZE	
MFG		DWG NO	
APPROVED		20	
		REV	
SCALE		SHEET 1 OF 1	

ΣΧΕΔΙΟ 20



DRAWN		COMPANY	
AUTHOR		KATΩ_EΑΣΜΑ_ΩΔΗΓΟΥ	
CHECKED		TITLE	
QA		SIZE	
MFG		DWG NO	21
APPROVED		SCALE	
			REV
			SHEET 1 OF 1

ΣΧΕΔΙΟ 21



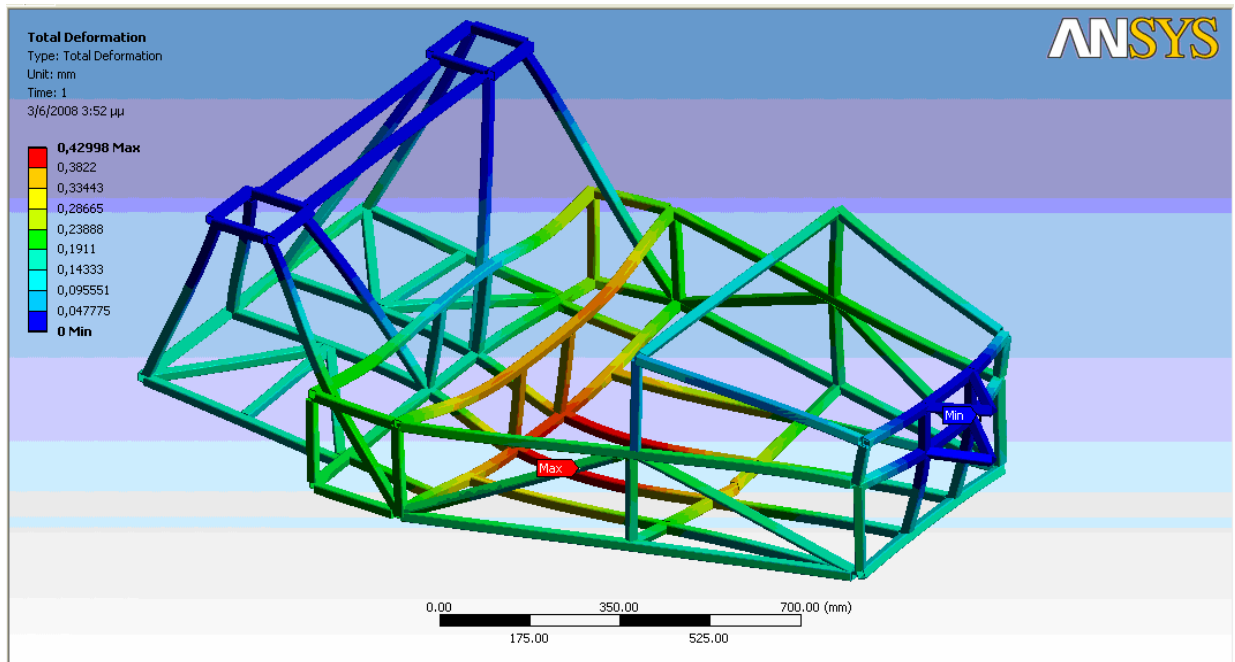
ΣΧΕΔΙΟ 22

DRAWN		COMPANY	
AUTHOR		TITLE	
CHECKED		KATΩ_ΕΡΑΣΜΑ_ΟΔΗΓΟΥ	
QA		SIZE	DWG NO
MFG		22	22
APPROVED		SCALE	REV
		SHEET 1 OF 1	

7.

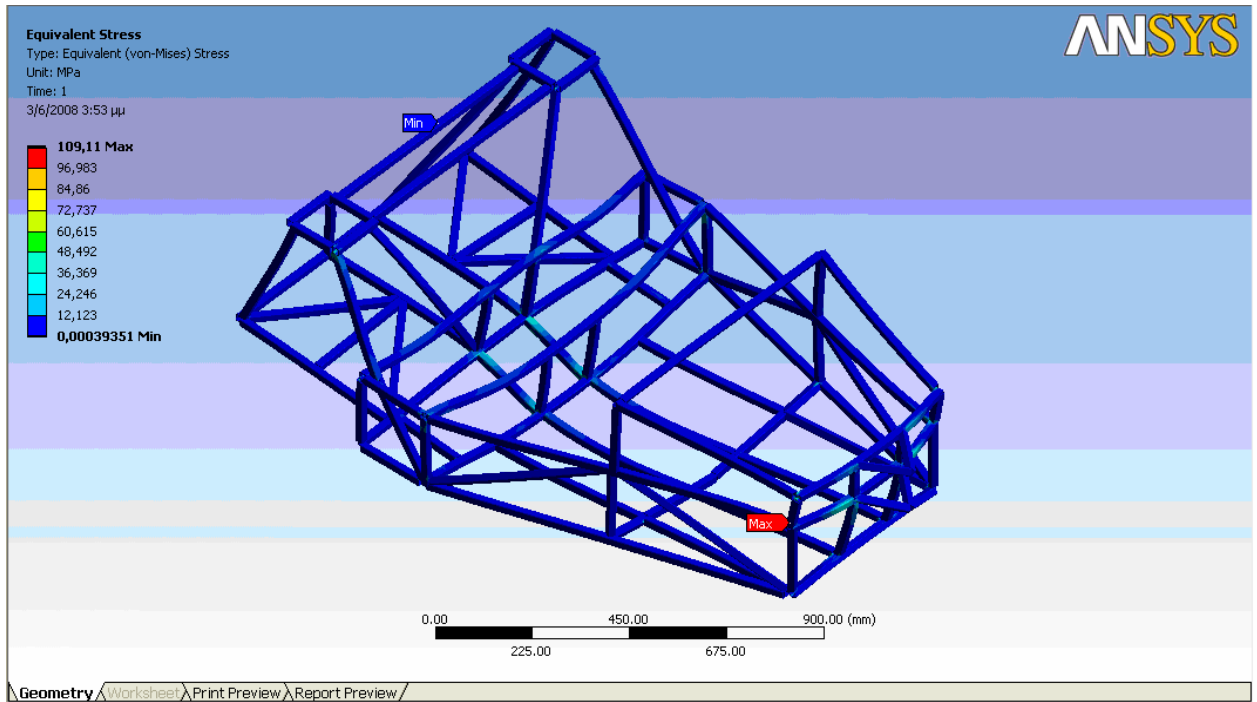
ansys

1,5



0,43mm.

2

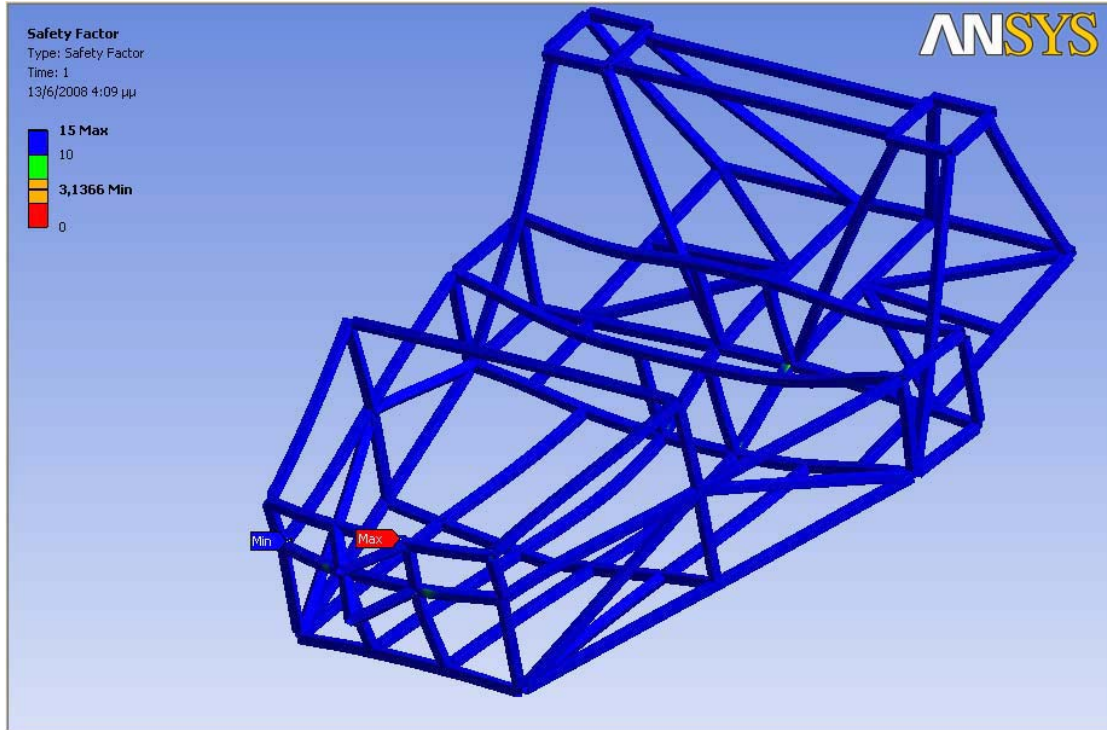


12,123 MPa

15

3,15

:



Ansysis.

(F_w),
(F_f), (F_s)
(F_a) :

$$F = F_w + F_f + F_s + F_a \quad (1)$$

$$F_w = \frac{1}{2} C_w \rho_{air} A v^2 \quad (2)$$

$$F_f = mg C_f \quad (3)$$

$$F_s = F_a = 0, \text{ για κλίση οδοστρώματος } 0 \text{ και επιτάχυνση } 0 \quad (4)$$

(2), (3) (4) (1) :

$$F = \frac{1}{2} 0,015 \cdot 1,19 \cdot 0,5 \cdot 11,11^2 + 300 \cdot 9,81 \cdot 0,015 + 0 + 0 = 77,2N \quad (5)$$

(n)

$$n = \frac{60 \cdot v}{\pi \cdot D} \quad (6)$$

$$n = \frac{60 \cdot 11,11}{\pi \cdot 0,5} = 424,4rpm \quad (7)$$

(),

$$M = \frac{F \cdot D}{2} = \frac{77,2 \cdot 0,5}{2} = 19,3Nm \quad (8)$$

(P),

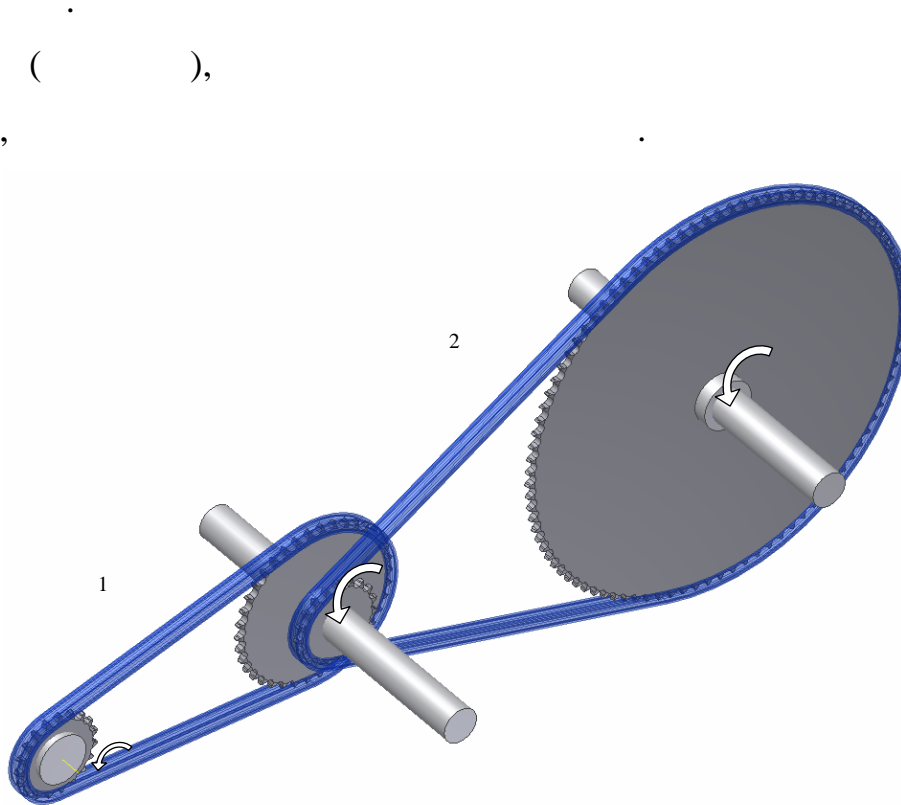
$$P = \frac{2 \cdot \pi \cdot M \cdot n}{60} = \frac{2 \cdot \pi \cdot 19,3 \cdot 424,4}{60} = 857,8W \quad (9)$$

, 0,96, (P_o)

$$P_o = \frac{857,8}{0,96} = 893,15W \quad (10)$$

4244rpm (10), ():

$$M_o = \frac{60 \cdot P_o}{2 \cdot \pi \cdot n} = \frac{60 \cdot 893.15}{2 \cdot \pi \cdot 4244} = 2,01 Nm. \quad (11)$$



10

10

$z_1=19 \quad z_2=38, \quad i=2$

:

$z_1=19 \quad z_2=95, \quad i=5.$

1 2

1 2 .

(P₀)

:

$$P_0 = \frac{P}{k \cdot C_{T1} \cdot C_{T2}} \quad (12)$$

:

k: . (k=0,93 $z_1=19 \quad i=2$

k=1,09 $z_1=19 \quad i=5$)

C : (C =1)

C : (C =0,8

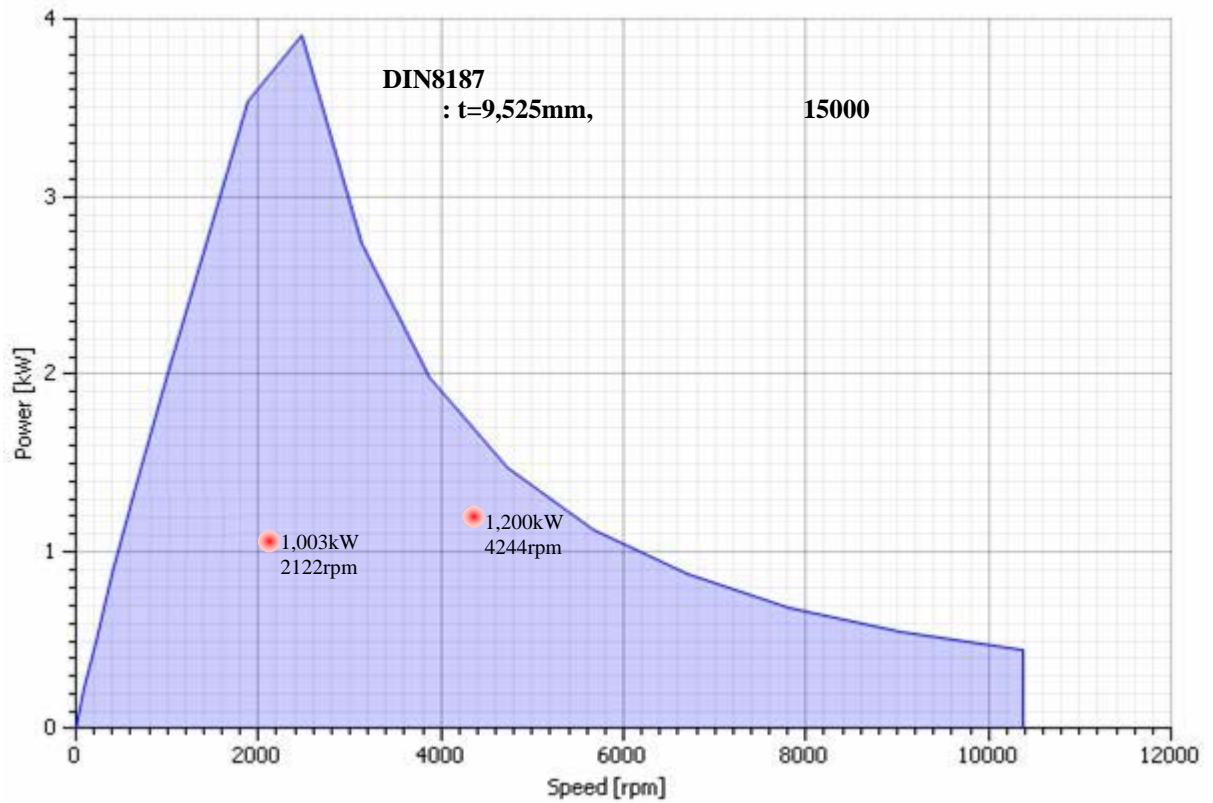
C_s=1,5)

n1,

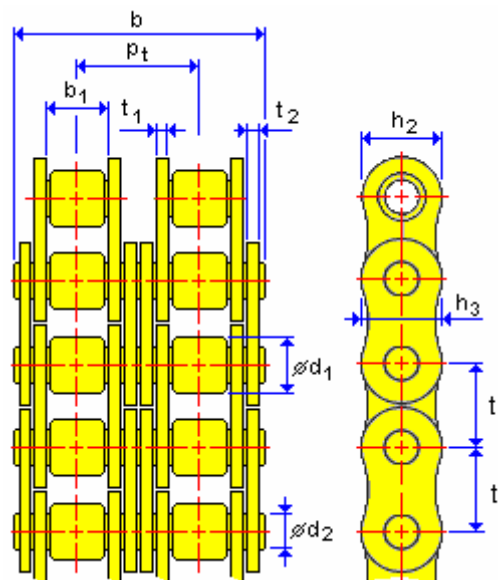
(

) t

DIN8187.



DIN 8187:1984 - Short-pitch transmission precision roller chains (EU)



06B-1-71	
t	9,525 mm
k	1
b ₁	5,720 mm
d ₁	6,350 mm
d ₂	3,280 mm
h ₂	8,260 mm

h_3	8,260 mm
b	13,500 mm
t_1	1,300 mm
t_2	1,000 mm
A	28 mm ²
F	8900 N
q	0,400 kg/m

:

$$X = 2 \frac{a_p}{r} + \frac{z_1 + z_2}{2} + \frac{z_2 - z_1}{2\pi} \cdot \frac{r}{a_p} \quad (13)$$

Z_1, Z_2

d_o

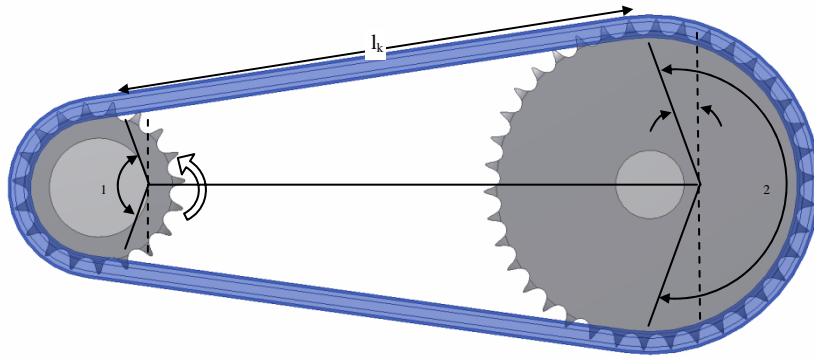
:

$$d a_t = \frac{r}{\sin\left(\frac{\alpha}{2}\right)}, t = 1, 2 \quad (14)$$

1, 2

1

:



$$e_0 = a \sin \left(\frac{d\alpha_2 - d\alpha_1}{2\alpha_0} \right) \quad (15)$$

$$\beta_1 = \frac{\pi}{2} - 2e_0, \quad \beta_2 = \frac{\pi}{2} + 2e_0 \quad (16)$$

$$l_k = \alpha_0 \cdot a \sin \left(\frac{\pi}{2} - \alpha_0 \right) \quad (17)$$

v,

:

$$v = \frac{\pi \cdot d_{o2} \cdot n_2}{60} \quad (18)$$

F_{max},

F₀,

,

:

$$F_{max} = C_s \cdot F_0 = C_s \cdot (F + F_Z + F_\Phi) \quad (19)$$

:

C_s=1,5,

(

)

F₀=F+F_Z+F_Φ,

F,

F,

F,

:

$$F = \frac{P_{in}}{v}, \quad P_{in} \quad (20)$$

$$F_Z = q \cdot g \cdot l_k \cdot \sqrt{\left(\frac{l_k}{g \cdot g} \right)^2 + \left(\frac{1}{2} \right)^2} \quad (21)$$

$$f_d = k_{\kappa} \cdot f_r, \quad f_r = 0,03 \text{ ()},$$

q,

$$F_{\phi} = q \cdot v^2 \quad (22)$$

F_E,

$$F_E = C_{\sigma} \cdot (F + F_{\phi}) + F_E \quad (23)$$

F_{max}

p

S

F

5.

$$S_{\beta} = \frac{F_{\beta}}{F_{max}} > 5 \quad (24)$$

p ,

(p_o) (), _____,

:

$$P_{\text{вн}} = (p_o)_{\text{вн}} \cdot C_T \cdot C_A \cdot C_{\kappa} \cdot C_{vz} \cdot C_A \quad (25)$$

:

$$C_T = \sqrt[3]{\frac{(L_{\text{вн}})_{\text{вн}}}{44,254} \cdot \left(\frac{a_{\text{вн}}}{r(1+i)} + 4,75 \right)} \quad (26)$$

$$C = 0,9 \text{ ()}$$

$$C = 0,8 \text{ (} C_s \text{)}$$

$$C_{vz} = 1 \text{ ()}$$

$$C = 1 \text{ ()}$$

26, $(L_h)_o = 15000h$,

() 3% $L_h = 15000h$,

3%. i, t,

$$p = \frac{F_0}{C_{27} \cdot A} = \frac{F + F_2 + F_3}{C_{27} \cdot A} \leq p_{27\pi} \quad (27)$$

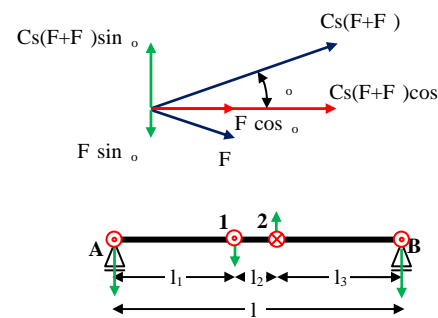
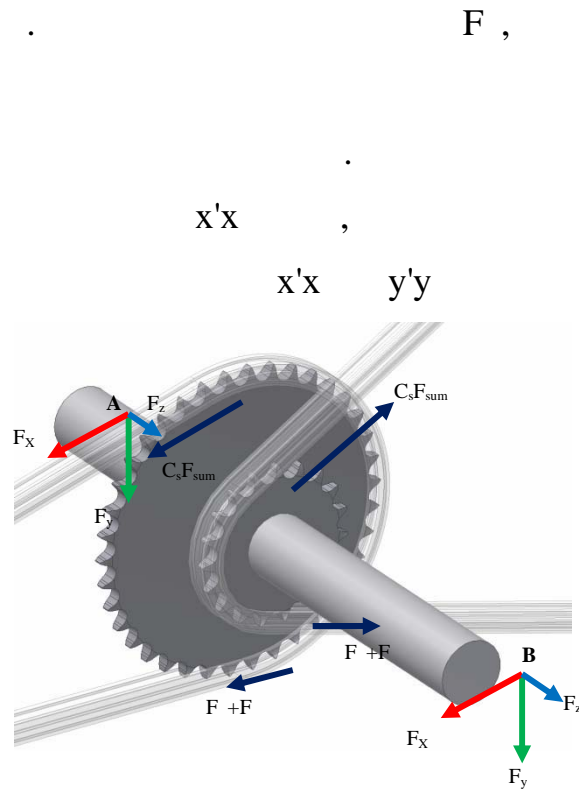
	1	2	
i	2	5	
z_1	19	19	
z_2	38	95	
n_1	4244,1	2122,1	[rpm]
n_2	2122,1	424,4	
a_o	200	300	[mm]
n	0,98	0,98	
	28	28	[mm ²]
P_{in}	893,15	875,29	[W]
M_{in}	2,01	3,94	[Nm]
P_{out}	875,29	857,78	[W]

	$_{out}$	3,94	19,30	[Nm]
	P_o	1200,47	1003,77	[W]
	k	0,93	1,09	
	C	1	1	
C_s	C	0,8	0,8	
	<i>DIN 8187,</i>			
	t	9,525	9,525	[mm]
	q	0,65	0,65	[kg/m]
	F	8900	8900	[N]
	X	71	121	
	do_1	57,9	57,9	[mm]
	do_2	115,3	288,1	[mm]
	l	197,92	277,04	[mm]
		8,3	22,6	[deg]
	b_1	163,48	134,88	[deg]
	b_2	196,52	225,12	[deg]
	v	12,86	6,43	[m/s]
	F	69,45	136,13	[N]
	F	5,30	7,41	[N]
	F	107,49	26,87	[N]
	C_s	1,5	1,5	
	F_{max}	273,37	255,62	[N]
	f_r	0,03	0,03	
	f_d	5,94	8,31	[mm]
	F_E	117,42	222,72	[N]

S	32,6	34,8	
(p_o)	12	15	[Mpa]
Lh_o	15000	15000	[h]
Lh	15000	15000	[h]
C_T	0,81	1,04	
C_L	0,9	0,9	
C_{vz}	1	1	
C_A	1	1	
p	7,00	11,25	[Mpa]
p	6,51	6,09	[Mpa]
L_h	15000	15000	[h]

3%

z,



1 2 :

$$F_{1x}=116,20N \quad F_{1Y}=15,35N$$

$$F_{2x}=-205,38 \quad F_{2Y}=-79,77N,$$

$l, l_1, l_2 \quad l_3$:

$$F_{AX} = F_{2X} - F_{1X} - \frac{1}{i}(F_{2X} \cdot (l_1 + l_2) - F_{1X} \cdot l_1) \quad (28)$$

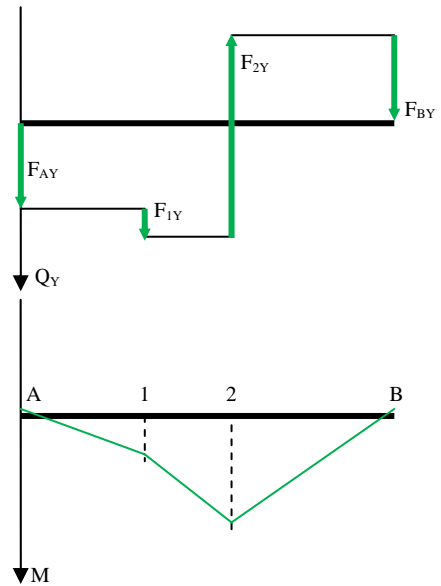
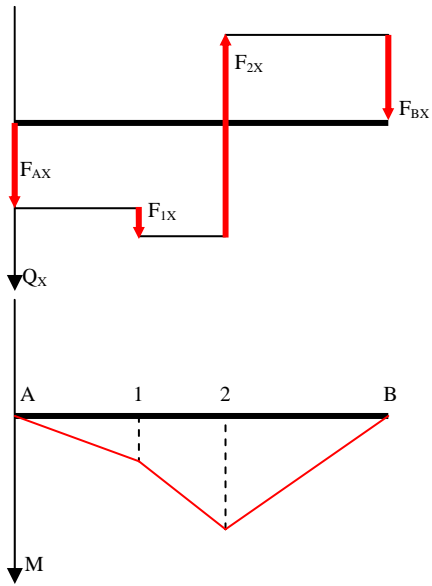
$$F_{BX} = \frac{1}{i}(F_{2X} \cdot (l_1 + l_2) - F_{1X} \cdot l_1) \quad (29)$$

$$F_{AY} = F_{2Y} - F_{1Y} - \frac{1}{i}(F_{2Y} \cdot (l_1 + l_2) - F_{1Y} \cdot l_1) \quad (30)$$

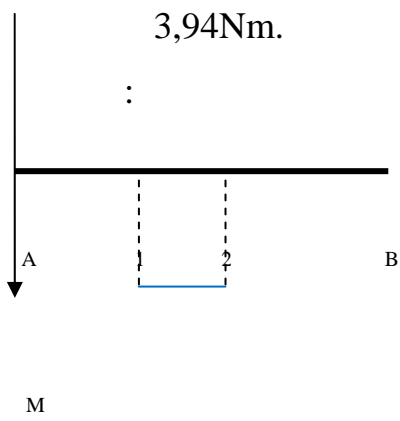
$$F_{BY} = \frac{1}{i}(F_{2Y} \cdot (l_1 + l_2) - F_{1Y} \cdot l_1) \quad (31)$$

Q, M

ZX yz :



z'z



D

$$D \geq 39,4 \sqrt{\frac{C_{gr} M}{\tau_{tp}}}$$

(32)

$C_{st}=1,2,$

$170N/mm^2$

$St\ 50\ \tau_t = 210N/mm^2.$

32

$St\ 37, \tau_t =$

$D_{St37} \geq 12mm$ και για $D_{St50} \geq 12mm$

(33)

.. $\phi 15mm.$

$l_1=l_2=l_3=0,1m$

M_X M_Y

$x=15,34Nm$ $M_Y=17,58Nm.$

$D \geq 35,8 \left(\frac{C_S}{(\sigma_{bA})_p} \right)^{1/3} \cdot \left(M_X^2 + \left(\frac{(\sigma_{bA})_p}{2\tau_t} M \right)^2 \right)^{1/6}$

(34)

$(\sigma_{bA})_o,$

$(\sigma_{bA})_o = 200 /mm^2$

$St\ 37$

$260 /mm^2$

50

$34,$

$D_{St37} \geq 16,96mm$ και για $D_{St50} \geq 15,54mm$

(35)

$D=20mm$ $St\ 37.$

l_2

$$\tau_{xy} = \frac{\sqrt{(F_{1X} + F_{2X})^2 + (F_{1Y} + F_{2Y})^2}}{\frac{\pi D^3}{4}} \quad (36)$$

$$\tau_{xy} = 0,35 \text{ N/mm}^2,$$

170 N/mm², St 37.

20 mm

P,

0,96.

:

$$P = 750 \cdot 0,96 = 720 \text{ W}.$$

n

v

:

$$F = \frac{1}{2} C_{wv} \rho_{\text{air}} A v^2 + mg C_f \quad (37)$$

$$n = \frac{60 \cdot v}{\pi \cdot D} \quad (38)$$

$$M = \frac{F \cdot D}{2} \quad (39)$$

(P),

:

$$P = \frac{2 \cdot \pi \cdot M \cdot n}{60} \quad (40)$$

38

:

$$v = \frac{\pi \cdot D \cdot n}{60} \quad (41)$$

(41)

(37)

(39),

:

$$P = \frac{2 \cdot \pi \cdot \left(\frac{1}{2} C_{10} \rho_{air} A \left(\frac{\pi \cdot D \cdot n}{60} \right)^2 + m_f C_f \right) \cdot D}{60} \quad (42)$$

(42)

n,

,

:

$$n^3 + 240555,2n - 149863937 = 0 \quad (43)$$

$$n = 385,26 \text{rpm} \quad (44)$$

3000rpm

:

$$t = \frac{3000}{385,26} \cong 7,78 \quad (45)$$

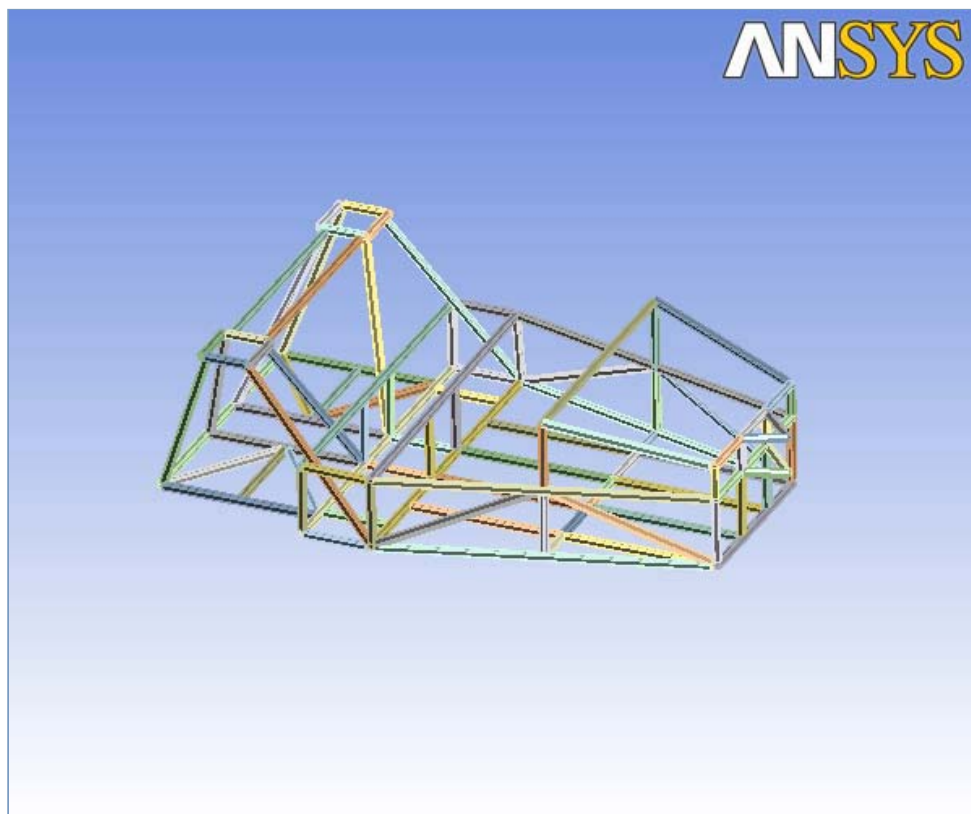
:

$$v = \frac{\pi \cdot D \cdot n}{60} = \frac{\pi \cdot 0,8 \cdot 385,26}{60} = 10,08 \text{ m/s} \text{ ή } 36,31 \text{ km/h.} \quad (46)$$



Project

<i>First Saved</i>	<i>Tuesday, June 03, 2008</i>
<i>Last Saved</i>	<i>Tuesday, June 03, 2008</i>
<i>Product Version</i>	<i>11.0 Release</i>



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Units

TABLE 1

Unit System	Metric (m, kg, N, °C, s, V, A)
Angle	Degrees
Rotational Velocity	rad/s

Model

Geometry

TABLE 2
Model > Geometry

Object Name	<i>Geometry</i>
State	Fully Defined
Definition	
Source	D:\vault2008\SXEDIA\Fram0001.iam
Type	Inventor
Length Unit	Centimeters
Element Control	Program Controlled
Display Style	Part Color
Bounding Box	
Length X	1,028 m
Length Y	1,6774 m
Length Z	0,4824 m
Properties	
Volume	4,5318e-003 m ³
Mass	35,575 kg
Statistics	
Bodies	95
Active Bodies	95
Nodes	271269
Elements	94298
Preferences	
Import Solid Bodies	Yes
Import Surface Bodies	Yes
Import Line Bodies	Yes
Parameter Processing	Yes
Personal Parameter Key	DS
CAD Attribute Transfer	No
Named Selection Processing	No
Material Properties Transfer	No
CAD Associativity	Yes
Import Coordinate Systems	No
Reader Save Part File	No
Import Using Instances	Yes
Do Smart Update	No
Attach File Via Temp File	No

Analysis Type	3-D
Mixed Import Resolution	None
Enclosure and Symmetry Processing	No

TABLE 3
Model > Geometry > Parts

Object Name	Frame00011:1	Frame00012:1	Frame00013:1	Frame00014:1	Frame00015:1
State	Meshed				
Graphics Properties					
Visible	Yes				
Transparency	1				
Definition					
Suppressed	No				
Material	Structural Steel				
Stiffness Behavior	Flexible				
Nonlinear Material Effects	Yes				
Bounding Box					
Length X	0,166 m	0,167 m	0,5056 m	0,1726 m	0,13815 m
Length Y	2,e-002 m				0,44309 m
Length Z	2,e-002 m				0,1202 m
Properties					
Volume	2,2764e-005 m ³	2,2901e-005 m ³	6,9334e-005 m ³	2,3669e-005 m ³	6,3686e-005 m ³
Mass	0,1787 kg	0,17977 kg	0,54427 kg	0,1858 kg	0,49993 kg
Centroid X	0,5 m	0,3335 m	0,5028 m	0,6693 m	0,81607 m
Centroid Y	1,099 m				0,86949 m
Centroid Z	0,3 m		0,2 m	0,3 m	0,35109 m
Moment of Inertia Ip1	1,8764e-005 kg·m ²	1,8877e-005 kg·m ²	5,6799e-005 kg·m ²	1,9509e-005 kg·m ²	8,9385e-003 kg·m ²
Moment of Inertia Ip2	4,18e-004 kg·m ²	4,2548e-004 kg·m ²	1,1527e-002 kg·m ²	4,6904e-004 kg·m ²	5,217e-005 kg·m ²
Moment of Inertia Ip3	4,18e-004 kg·m ²	4,2548e-004 kg·m ²	1,1527e-002 kg·m ²	4,6904e-004 kg·m ²	8,9385e-003 kg·m ²
Statistics					
Nodes	1500		1866	1500	1405
Elements	224		363	224	230

TABLE 4
Model > Geometry > Parts

Object Name	Frame00016:1	Frame00017:1	Frame00018:1	Frame00019:1	Frame000110:1
State	Meshed				
Graphics Properties					
Visible	Yes				
Transparency	1				
Definition					
Suppressed	No				
Material	Structural Steel				
Stiffness Behavior	Flexible				
Nonlinear Material Effects	Yes				
Bounding Box					
Length X	2,4502e-002 m	2,9747e-002 m	0,26893 m	0,26497 m	0,14328 m
Length Y	2,4502e-002 m	2,542e-002 m	0,87741 m	0,8921 m	0,44316 m
Length Z	9,e-002 m	0,19496 m	2,16e-002 m	2,e-002 m	0,12019 m
Properties					
Volume	1,2342e-005 m ³	2,5934e-005 m ³	1,2496e-004 m ³	1,2682e-004 m ³	6,3865e-005 m ³
Mass	9,6885e-002 kg	0,20358 kg	0,98093 kg	0,99551 kg	0,50134 kg
Centroid X	0,7556 m	0,75294 m	0,88167 m	0,12517 m	0,18684 m
Centroid Y	1,099 m	1,0993 m	0,65038 m	0,64303 m	0,86949 m
Centroid Z	0,255 m	0,10545 m	0,2 m		0,35109 m
Moment of Inertia Ip1	6,9912e-005 kg·m ²	6,1597e-004 kg·m ²	6,7369e-002 kg·m ²	7,0416e-002 kg·m ²	9,0142e-003 kg·m ²
Moment of Inertia Ip2	6,9912e-005 kg·m ²	6,1598e-004 kg·m ²	1,0237e-004 kg·m ²	1,0389e-004 kg·m ²	5,2317e-005 kg·m ²
Moment of Inertia Ip3	1,0111e-005 kg·m ²	2,1364e-005 kg·m ²	6,7369e-002 kg·m ²	7,0416e-002 kg·m ²	9,0142e-003 kg·m ²
Statistics					
Nodes	1500	1509	1929	2033	1837
Elements	224	232	322	378	390

TABLE 5
Model > Geometry > Parts

Object Name	Frame000111:1	Frame000112:1	Frame000113:1	Frame000114:1	Frame000115:1
State	Meshed				
Graphics Properties					
Visible	Yes				

Transparency	1			
Definition				
Suppressed	No			
Material	Structural Steel			
Stiffness Behavior	Flexible			
Nonlinear Material Effects	Yes			
Bounding Box				
Length X	2,4562e-002 m	2,e-002 m	0,5 m	
Length Y	2,4562e-002 m	2,e-002 m	2,4537e-002 m	
Length Z	9,e-002 m	0,19505 m	0,18401 m	2,4537e-002 m
Properties				
Volume	1,2342e-005 m ³	2,5982e-005 m ³	2,4611e-005 m ³	6,8566e-005 m ³
Mass	9,6885e-002 kg	0,20396 kg	0,1932 kg	0,53825 kg
Centroid X	0,25 m	0,417 m	0,583 m	0,5 m
Centroid Y	1,099 m	1,0989 m		1,1 m
Centroid Z	0,255 m	0,10524 m	0,10023 m	6,3567e-018 m
Moment of Inertia Ip1	6,9911e-005 kg·m ²	6,194e-004 kg·m ²	5,2757e-004 kg·m ²	5,617e-005 kg·m ²
Moment of Inertia Ip2	6,9911e-005 kg·m ²	6,1942e-004 kg·m ²	5,2758e-004 kg·m ²	1,1149e-002 kg·m ²
Moment of Inertia Ip3	1,0111e-005 kg·m ²	2,1403e-005 kg·m ²	2,0272e-005 kg·m ²	1,1149e-002 kg·m ²
Statistics				
Nodes	1500		1544	1416
Elements	224		240	

TABLE 6
Model > Geometry > Parts

Object Name	Frame000116:1	Frame000117:1	Frame000118:1	Frame000119:1	Frame000120:1
State	Meshed				
Graphics Properties					
Visible	Yes				
Transparency	1				
Definition					
Suppressed	No				
Material	Structural Steel				
Stiffness Behavior	Flexible				
Nonlinear Material Effects	Yes				
Bounding Box					
Length X	0,73534 m	0,14168 m	0,13677 m	2,3216e-002 m	0,13867 m
Length Y	2,4618e-002 m	0,4471 m	0,43202 m	2,3216e-002 m	0,43059 m
Length Z	2,4618e-002 m	0,1801 m	0,18688 m	0,18011 m	0,1806 m
Properties					
Volume	9,9613e-005 m ³	6,2321e-005 m ³	6,2103e-005 m ³	2,4685e-005 m ³	6,1371e-005 m ³
Mass	0,78196 kg	0,48922 kg	0,48751 kg	0,19378 kg	0,48176 kg
Centroid X	0,50018 m	6,2936e-002 m	0,18843 m	0,12638 m	0,81169 m
Centroid Y	0,64996 m	0,42344 m	0,87546 m	0,65 m	0,87622 m
Centroid Z	0,39998 m	9,9378e-002 m	9,9221e-002 m	9,9995e-002 m	9,9469e-002 m
Moment of Inertia Ip1	8,1603e-005 kg·m ²	8,5257e-003 kg·m ²	8,3847e-003 kg·m ²	5,3122e-004 kg·m ²	8,094e-003 kg·m ²
Moment of Inertia Ip2	3,4146e-002 kg·m ²	5,1034e-005 kg·m ²	5,0908e-005 kg·m ²	5,3122e-004 kg·m ²	5,1321e-005 kg·m ²
Moment of Inertia Ip3	3,4146e-002 kg·m ²	8,5262e-003 kg·m ²	8,3838e-003 kg·m ²	2,0347e-005 kg·m ²	8,0965e-003 kg·m ²
Statistics					
Nodes	1680	10193	10442	1500	10038
Elements	288	5055	5186	224	4979

TABLE 7
Model > Geometry > Parts

Object Name	Frame000121:1	Frame000122:1	Frame000123:1	Frame000124:1	Frame000125:1
State	Meshed				
Graphics Properties					
Visible	Yes				
Transparency	1				
Definition					
Suppressed	No				
Material	Structural Steel				
Stiffness Behavior	Flexible				
Nonlinear Material Effects	Yes				
Bounding Box					
Length X	0,25027 m	2,1735e-002 m	2,4808e-002 m	0,12153 m	0,14294 m
Length Y	0,879 m	0,42825 m	2,4808e-002 m		0,45181 m

Length Z	2,e-002 m	0,18058 m	2,4808e-002 m	0,18059 m	
Properties					
Volume	1,2207e-004 m ³	5,8721e-005 m ³	2,4547e-005 m ³	1,6665e-005 m ³	6,2414e-005 m ³
Mass	0,95823 kg	0,46096 kg	0,19269 kg	0,13082 kg	0,48995 kg
Centroid X	0,8849 m	0,75487 m	0,874 m	0,8132 m	0,94099 m
Centroid Y	0,63902 m	0,8749 m	0,65001 m	0,65 m	0,41804 m
Centroid Z	3,99e-017 m	-6,6365e-012 m	9,9503e-002 m	-1,8348e-009 m	9,8378e-002 m
Moment of Inertia Ip1	6,2993e-002 kg·m ²	7,0095e-003 kg·m ²	5,2254e-004 kg·m ²	1,3652e-005 kg·m ²	8,5597e-003 kg·m ²
Moment of Inertia Ip2	9,9802e-005 kg·m ²	4,8106e-005 kg·m ²	5,2254e-004 kg·m ²	1,665e-004 kg·m ²	5,1145e-005 kg·m ²
Moment of Inertia Ip3	6,2993e-002 kg·m ²	7,0095e-003 kg·m ²	2,0232e-005 kg·m ²	1,665e-004 kg·m ²	8,5603e-003 kg·m ²
Statistics					
Nodes	16696	1524	1500	10245	
Elements	8427	280	224	5065	

TABLE 8
Model > Geometry > Parts

Object Name	Frame000126:1	Frame000127:1	Frame000128:1	Frame000129:1	Frame000130:1
State	Meshed				
Graphics Properties					
Visible	Yes				
Transparency	1				
Definition					
Suppressed	No				
Material	Structural Steel				
Stiffness Behavior	Flexible				
Nonlinear Material Effects	Yes				
Bounding Box					
Length X	0,1635 m	2,e-002 m			
Length Y	2,e-002 m	0,434 m		0,438 m	
Length Z	2,e-002 m				
Properties					
Volume	2,2421e-005 m ³	5,9516e-005 m ³		5,9858e-005 m ³	
Mass	0,176 kg	0,4672 kg		0,46989 kg	
Centroid X	0,66568 m	0,417 m	0,583 m		0,417 m
Centroid Y	0,65 m	0,427 m		0,86926 m	
Centroid Z	-1,2365e-016 m	1,7957e-017 m	3,3657e-017 m	-2,725e-005 m	
Moment of Inertia Ip1	1,848e-005 kg·m ²	7,2971e-003 kg·m ²		7,4246e-003 kg·m ²	
Moment of Inertia Ip2	3,9965e-004 kg·m ²	4,8756e-005 kg·m ²		4,9029e-005 kg·m ²	
Moment of Inertia Ip3	3,9965e-004 kg·m ²	7,2971e-003 kg·m ²		7,4246e-003 kg·m ²	
Statistics					
Nodes	1500	1362		8344	8106
Elements	224	220		4156	4032

TABLE 9
Model > Geometry > Parts

Object Name	Frame000131:1	Frame000132:1	Frame000133:1	Frame000134:1	Frame000135:1
State	Meshed				
Graphics Properties					
Visible	Yes				
Transparency	1				
Definition					
Suppressed	No				
Material	Structural Steel				
Stiffness Behavior	Flexible				
Nonlinear Material Effects	Yes				
Bounding Box					
Length X	2,4562e-002 m	2,e-002 m	0,16535 m	0,12297 m	8,0812e-002 m
Length Y	0,438 m	0,434 m	2,e-002 m	2,3216e-002 m	2,e-002 m
Length Z	2,4562e-002 m	2,e-002 m		2,3216e-002 m	2,e-002 m
Properties					
Volume	5,9863e-005 m ³	5,9516e-005 m ³	2,2675e-005 m ³	1,6863e-005 m ³	1,1082e-005 m ³
Mass	0,46993 kg	0,4672 kg	0,178 kg	0,13237 kg	8,6994e-002 kg
Centroid X	0,25 m		0,33372 m	0,18786 m	0,45837 m
Centroid Y	0,86927 m	0,427 m	0,65 m		
Centroid Z	-2,7248e-005 m	8,527e-018 m	-1,7636e-017 m	1,9751e-010 m	1,6553e-016 m
Moment of Inertia Ip1	7,4263e-003 kg·m ²	7,2971e-003 kg·m ²	1,869e-005 kg·m ²	1,3814e-005 kg·m ²	9,0785e-006 kg·m ²
Moment of Inertia Ip2	4,9036e-005 kg·m ²	4,8756e-005 kg·m ²	4,1319e-004 kg·m ²	1,7233e-004 kg·m ²	5,1491e-005 kg·m ²

Moment of Inertia Ip3	7,4264e-003 kg·m ²	7,2971e-003 kg·m ²	4,1319e-004 kg·m ²	1,7233e-004 kg·m ²	5,1491e-005 kg·m ²
Statistics					
Nodes	8298	1308		1500	
Elements	4157	200		224	

TABLE 10
Model > Geometry > Parts

Object Name	<i>Frame000136:1</i>	<i>Frame000137:1</i>	<i>Frame000138:1</i>	<i>Frame000139:1</i>	<i>Frame000140:1</i>
State	Meshed				
Graphics Properties					
Visible	Yes				
Transparency	1				
Definition					
Suppressed	No				
Material	Structural Steel				
Stiffness Behavior	Flexible				
Nonlinear Material Effects	Yes				
Bounding Box					
Length X	8,0445e-002 m	0,25093 m	2,e-002 m	0,10122 m	
Length Y	2,e-002 m	0,879 m	2,e-002 m	9,8412e-002 m	
Length Z	2,e-002 m	2,0141e-002 m	9,e-002 m	4,9944e-002 m	
Properties					
Volume	1,1032e-005 m ³	1,2056e-004 m ³	1,2342e-005 m ³	1,6383e-005 m ³	
Mass	8,6599e-002 kg	0,9464 kg	9,6885e-002 kg	0,12861 kg	
Centroid X	0,542 m	0,1207 m	0,417 m	0,583 m	0,46229 m
Centroid Y	0,65 m	0,63398 m	1,099 m		1,1542 m
Centroid Z	1,9964e-016 m	-8,0196e-005 m	0,245 m		0,18524 m
Moment of Inertia Ip1	9,0372e-006 kg·m ²	6,0932e-002 kg·m ²	6,9912e-005 kg·m ²	1,6092e-004 kg·m ²	
Moment of Inertia Ip2	5,0834e-005 kg·m ²	9,8561e-005 kg·m ²	6,9912e-005 kg·m ²	1,3343e-005 kg·m ²	
Moment of Inertia Ip3	5,0834e-005 kg·m ²	6,0932e-002 kg·m ²	1,0111e-005 kg·m ²	1,6089e-004 kg·m ²	
Statistics					
Nodes	1500	16587	1500	1156	
Elements	224	8361	224	168	

TABLE 11
Model > Geometry > Parts

Object Name	<i>Frame000141:1</i>	<i>Frame000142:1</i>	<i>Frame000143:1</i>	<i>Frame000144:1</i>	<i>Frame000145:1</i>
State	Meshed				
Graphics Properties					
Visible	Yes				
Transparency	1				
Definition					
Suppressed	No				
Material	Structural Steel				
Stiffness Behavior	Flexible				
Nonlinear Material Effects	Yes				
Bounding Box					
Length X	0,10139 m	0,10122 m	2,3215e-002 m	2,3216e-002 m	
Length Y	9,8143e-002 m	9,8412e-002 m	2,3215e-002 m	2,3216e-002 m	
Length Z	4,1171e-002 m	4,9944e-002 m	0,2 m		
Properties					
Volume	1,6177e-005 m ³	1,6383e-005 m ³	2,7426e-005 m ³		
Mass	0,12699 kg	0,12861 kg	0,2153 kg		
Centroid X	0,46226 m	0,53774 m	0,53771 m	0,87396 m	0,12637 m
Centroid Y	1,1541 m	1,1542 m	0,65 m		
Centroid Z	0,29071 m	0,18524 m	0,3 m		
Moment of Inertia Ip1	1,5524e-004 kg·m ²	1,6092e-004 kg·m ²	7,2593e-004 kg·m ²	7,2594e-004 kg·m ²	
Moment of Inertia Ip2	1,3207e-005 kg·m ²	1,3343e-005 kg·m ²	7,2593e-004 kg·m ²	7,2594e-004 kg·m ²	
Moment of Inertia Ip3	1,552e-004 kg·m ²	1,6089e-004 kg·m ²	2,2607e-005 kg·m ²		
Statistics					
Nodes	1156			1500	
Elements	168			224	

TABLE 12
Model > Geometry > Parts

Object Name	<i>Frame000146:1</i>	<i>Frame000147:1</i>	<i>Frame000148:1</i>	<i>Frame000149:1</i>	<i>Frame000150:1</i>
State	Meshed				
Graphics Properties					

Visible	Yes				
Transparency	1				
Definition					
Suppressed	No				
Material	Structural Steel				
Stiffness Behavior	Flexible				
Nonlinear Material Effects	Yes				
Bounding Box					
Length X	0,99938 m	1,0077 m	2,3224e-002 m	2,0729e-002 m	2,e-002 m
Length Y	2,e-002 m	3,4784e-002 m	2,4693e-002 m	3,3628e-002 m	0,18 m
Length Z	2,e-002 m		0,20063 m	0,20134 m	2,e-002 m
Properties					
Volume	1,3705e-004 m ³	1,3817e-004 m ³	2,7435e-005 m ³	2,7484e-005 m ³	2,4684e-005 m ³
Mass	1,0758 kg	1,0846 kg	0,21537 kg	0,21575 kg	0,19377 kg
Centroid X	0,50605 m	0,50403 m	1,0064 m	3,4348e-004 m	1,0057 m
Centroid Y	0,2 m	0,19441 m	0,2039 m	0,19351 m	1,e-001 m
Centroid Z	-5,5301e-018 m	0,2 m	1,e-001 m	0,1 m	3,399e-017 m
Moment of Inertia Ip1	1,1227e-004 kg·m ²	1,1319e-004 kg·m ²	7,2661e-004 kg·m ²	7,3048e-004 kg·m ²	5,3114e-004 kg·m ²
Moment of Inertia Ip2	8,8857e-002 kg·m ²	9,1048e-002 kg·m ²	7,2661e-004 kg·m ²	7,3048e-004 kg·m ²	2,0346e-005 kg·m ²
Moment of Inertia Ip3	8,8857e-002 kg·m ²	9,1048e-002 kg·m ²	2,2614e-005 kg·m ²	2,2654e-005 kg·m ²	5,3114e-004 kg·m ²
Statistics					
Nodes	2076	2155	1500		
Elements	360	390	224		

TABLE 13
Model > Geometry > Parts

Object Name	<i>Frame000151:1</i>	<i>Frame000152:1</i>	<i>Frame000153:1</i>	<i>Frame000154:1</i>	<i>Frame000155:1</i>
State	Meshed				
Graphics Properties					
Visible	Yes				
Transparency	1				
Definition					
Suppressed	No				
Material	Structural Steel				
Stiffness Behavior	Flexible				
Nonlinear Material Effects	Yes				
Bounding Box					
Length X	2,e-002 m				
Length Y	0,18 m				
Length Z	2,e-002 m				
Properties					
Volume	2,4684e-005 m ³				
Mass	0,19377 kg				
Centroid X	0,87574 m	0,58874 m	0,42274 m	0,12986 m	-3,8264e-019 m
Centroid Y	1,e-001 m				
Centroid Z	1,2554e-017 m	2,7995e-017 m	2,6181e-017 m	2,0921e-018 m	-1,4146e-018 m
Moment of Inertia Ip1	5,3113e-004 kg·m ²		5,3114e-004 kg·m ²	5,3113e-004 kg·m ²	
Moment of Inertia Ip2	2,0346e-005 kg·m ²				
Moment of Inertia Ip3	5,3113e-004 kg·m ²	5,3114e-004 kg·m ²		5,3113e-004 kg·m ²	
Statistics					
Nodes	1500				
Elements	224				

TABLE 14
Model > Geometry > Parts

Object Name	<i>Frame000156:1</i>	<i>Frame000157:1</i>	<i>Frame000158:1</i>	<i>Frame000159:1</i>	<i>Frame000160:1</i>
State	Meshed				
Graphics Properties					
Visible	Yes				
Transparency	1				
Definition					
Suppressed	No				
Material	Structural Steel				
Stiffness Behavior	Flexible				
Nonlinear Material Effects	Yes				
Bounding Box					
Length X	1, m	2,e-002 m			0,2945 m

Length Y	2,e-002 m	0,44 m			0,21 m
Length Z	2,e-002 m				
Properties					
Volume	1,3713e-004 m ³	6,0338e-005 m ³			4,7322e-005 m ³
Mass	1,0765 kg	0,47366 kg			0,37148 kg
Centroid X	0,5 m	0,583 m	0,9 m	0,1025 m	0,25531 m
Centroid Y	8,7076e-019 m	-0,23 m			-0,11772 m
Centroid Z	3,4831e-019 m	4,4806e-018 m	1,4897e-018 m	-1,7146e-018 m	-1,0299e-017 m
Moment of Inertia Ip1	1,1234e-004 kg·m ²	7,6033e-003 kg·m ²	7,6032e-003 kg·m ²		3,8958e-005 kg·m ²
Moment of Inertia Ip2	8,9023e-002 kg·m ²	4,943e-005 kg·m ²			3,7064e-003 kg·m ²
Moment of Inertia Ip3	8,9023e-002 kg·m ²	7,6033e-003 kg·m ²	7,6032e-003 kg·m ²		3,7061e-003 kg·m ²
Statistics					
Nodes	2313	1362	1416		6719
Elements	450	220	240		3371

TABLE 15
Model > Geometry > Parts

Object Name	<i>Frame000161:1</i>	<i>Frame000162:1</i>	<i>Frame000163:1</i>	<i>Frame000164:1</i>	<i>Frame000165:1</i>
State	Meshed				
Graphics Properties					
Visible	Yes				
Transparency	1				
Definition					
Suppressed	No				
Material	Structural Steel				
Stiffness Behavior	Flexible				
Nonlinear Material Effects	Yes				
Bounding Box					
Length X	0,2945 m		2,e-002 m	0,297 m	
Length Y	2,e-002 m	0,21 m	0,44 m	2,e-002 m	0,21 m
Length Z	2,e-002 m				
Properties					
Volume	4,0386e-005 m ³	4,7528e-005 m ³	6,0338e-005 m ³	4,0729e-005 m ³	4,7721e-005 m ³
Mass	0,31703 kg	0,37309 kg	0,47366 kg	0,31972 kg	0,37461 kg
Centroid X	0,25975 m	0,2591 m	0,417 m	0,7415 m	
Centroid Y	-0,23 m	-0,3446 m	-0,23 m		-0,345 m
Centroid Z	-1,5338e-018 m	-1,8758e-018 m	7,1244e-018 m	2,6753e-017 m	4,9632e-017 m
Moment of Inertia Ip1	3,3084e-005 kg·m ²	3,9111e-005 kg·m ²	7,6033e-003 kg·m ²	3,3365e-005 kg·m ²	3,9264e-005 kg·m ²
Moment of Inertia Ip2	2,2889e-003 kg·m ²	3,7494e-003 kg·m ²	4,943e-005 kg·m ²	2,3474e-003 kg·m ²	3,7969e-003 kg·m ²
Moment of Inertia Ip3	2,2889e-003 kg·m ²	3,749e-003 kg·m ²	7,6033e-003 kg·m ²	2,3474e-003 kg·m ²	3,7965e-003 kg·m ²
Statistics					
Nodes	976	6892	1362	976	6868
Elements	128	3470	220	128	3415

TABLE 16
Model > Geometry > Parts

Object Name	<i>Frame000166:1</i>	<i>Frame000167:1</i>	<i>Frame000168:1</i>	<i>Frame000169:1</i>	<i>Frame000170:1</i>
State	Meshed				
Graphics Properties					
Visible	Yes				
Transparency	1				
Definition					
Suppressed	No				
Material	Structural Steel				
Stiffness Behavior	Flexible				
Nonlinear Material Effects	Yes				
Bounding Box					
Length X	0,297 m	0,8 m	2,e-002 m	7,8105e-002 m	0,25472 m
Length Y	0,21 m	2,e-002 m	0,434 m	0,37342 m	0,18383 m
Length Z	2,e-002 m			0,44 m	
Properties					
Volume	4,7721e-005 m ³	1,0971e-004 m ³	5,9516e-005 m ³	7,7182e-005 m ³	7,1676e-005 m ³
Mass	0,37461 kg	0,86119 kg	0,4672 kg	0,60588 kg	0,56266 kg
Centroid X	0,7415 m	0,5 m	0,75574 m	3,115e-002 m	0,29567 m
Centroid Y	-0,115 m	-0,46 m	0,427 m	7,6565e-003 m	-8,9822e-002 m
Centroid Z	4,5833e-017 m	9,2229e-018 m	-8,8781e-018 m	0,23372 m	0,23 m
Moment of Inertia Ip1	3,9264e-005 kg·m ²	8,9873e-005 kg·m ²	7,2971e-003 kg·m ²	1,5907e-002 kg·m ²	1,2747e-002 kg·m ²

Moment of Inertia Ip2	3,7969e-003 kg·m ²	4,5596e-002 kg·m ²	4,8756e-005 kg·m ²	1,5907e-002 kg·m ²	1,2748e-002 kg·m ²
Moment of Inertia Ip3	3,7965e-003 kg·m ²	4,5596e-002 kg·m ²	7,2971e-003 kg·m ²	6,2987e-005 kg·m ²	5,8708e-005 kg·m ²
Statistics					
Nodes	6970	1812	1362	11903	1361
Elements	3489	312	220	5930	253

TABLE 17
Model > Geometry > Parts

Object Name	<i>Frame000171:1</i>	<i>Frame000172:1</i>	<i>Frame000173:1</i>	<i>Frame000174:1</i>	<i>Frame000175:1</i>
State	Meshed				
Graphics Properties					
Visible	Yes				
Transparency	1				
Definition					
Suppressed	No				
Material	Structural Steel				
Stiffness Behavior	Flexible				
Nonlinear Material Effects	Yes				
Bounding Box					
Length X	0,25472 m	6,7186e-002 m	0,27947 m	0,27693 m	8,8547e-002 m
Length Y	0,18458 m	0,18238 m		0,18397 m	0,18314 m
Length Z	0,44 m				
Properties					
Volume	7,1707e-005 m ³	6,4572e-005 m ³	7,3078e-005 m ³	7,3048e-005 m ³	6,4934e-005 m ³
Mass	0,5629 kg	0,50689 kg	0,57367 kg	0,57343 kg	0,50973 kg
Centroid X	0,29567 m	8,2902e-002 m	0,71569 m		0,92846 m
Centroid Y	-0,37054 m			-8,9822e-002 m	-0,37054 m
Centroid Z	0,23 m				
Moment of Inertia Ip1	1,2764e-002 kg·m ²	9,3183e-003 kg·m ²	1,351e-002 kg·m ²	1,3494e-002 kg·m ²	9,4763e-003 kg·m ²
Moment of Inertia Ip2	1,2764e-002 kg·m ²	9,3183e-003 kg·m ²	1,351e-002 kg·m ²	1,3494e-002 kg·m ²	9,4763e-003 kg·m ²
Moment of Inertia Ip3	5,8733e-005 kg·m ²	5,2887e-005 kg·m ²	5,9857e-005 kg·m ²	5,9833e-005 kg·m ²	5,3181e-005 kg·m ²
Statistics					
Nodes	1396	1470	1407	1372	1762
Elements	253	260	231		380

TABLE 18
Model > Geometry > Parts

Object Name	<i>Frame000176:1</i>	<i>Frame000177:1</i>	<i>Frame000178:1</i>	<i>Frame000179:1</i>	<i>Frame000180:1</i>
State	Meshed				
Graphics Properties					
Visible	Yes				
Transparency	1				
Definition					
Suppressed	No				
Material	Structural Steel				
Stiffness Behavior	Flexible				
Nonlinear Material Effects	Yes				
Bounding Box					
Length X	6,1544e-002 m	1, m	2,8234e-002 m	2,e-002 m	2,1038e-002 m
Length Y	0,39477 m	2,e-002 m	0,18194 m	0,16715 m	2,1224e-002 m
Length Z	0,44 m	2,e-002 m			0,18 m
Properties					
Volume	7,7362e-005 m ³	1,3713e-004 m ³	2,4956e-005 m ³	2,2902e-005 m ³	2,4685e-005 m ³
Mass	0,60729 kg	1,0765 kg	0,1959 kg	0,17978 kg	0,19378 kg
Centroid X	0,98313 m	0,5 m	1,0035 m	4,6333e-006 m	0,99942 m
Centroid Y	1,3326e-002 m	1,0144e-017 m	0,1009 m	9,3504e-002 m	-6,7972e-004 m
Centroid Z	0,23058 m	0,2 m			0,1 m
Moment of Inertia Ip1	1,6881e-002 kg·m ²	1,1234e-004 kg·m ²	5,4866e-004 kg·m ²	4,2554e-004 kg·m ²	5,312e-004 kg·m ²
Moment of Inertia Ip2	1,6881e-002 kg·m ²	8,9023e-002 kg·m ²	2,0569e-005 kg·m ²	1,8877e-005 kg·m ²	5,312e-004 kg·m ²
Moment of Inertia Ip3	6,2934e-005 kg·m ²	8,9023e-002 kg·m ²	5,4866e-004 kg·m ²	4,2554e-004 kg·m ²	2,0347e-005 kg·m ²
Statistics					
Nodes	11599	2282	1500		
Elements	5789	465	224		

TABLE 19
Model > Geometry > Parts

Object Name	<i>Frame000181:1</i>	<i>Frame000182:1</i>	<i>Frame000183:1</i>	<i>Frame000184:1</i>	<i>Frame000185:1</i>
State	Meshed				

Graphics Properties					
Visible	Yes				
Transparency	1				
Definition					
Suppressed	No				
Material	Structural Steel				
Stiffness Behavior	Flexible				
Nonlinear Material Effects	Yes				
Bounding Box					
Length X	2,e-002 m		0,14 m		2,e-002 m
Length Y	2,e-002 m	2,5409e-002 m	2,e-002 m		0,12 m
Length Z	0,18 m			2,e-002 m	
Properties					
Volume	2,4684e-005 m ³	2,4695e-005 m ³	2,4684e-005 m ³	1,9199e-005 m ³	1,6456e-005 m ³
Mass	0,19377 kg	0,19386 kg	0,19377 kg	0,15071 kg	0,12918 kg
Centroid X	-9,6806e-020 m	0,583 m	0,417 m	0,11961 m	0,18961 m
Centroid Y	2,7031e-019 m	-3,e-003 m	-4,3081e-017 m	-0,16 m	-0,23 m
Centroid Z	1,e-001 m			0,46 m	
Moment of Inertia Ip1	5,3114e-004 kg·m ²	5,3186e-004 kg·m ²	5,3114e-004 kg·m ²	1,5728e-005 kg·m ²	1,6048e-004 kg·m ²
Moment of Inertia Ip2	5,3114e-004 kg·m ²	5,3186e-004 kg·m ²	5,3114e-004 kg·m ²	2,5199e-004 kg·m ²	1,3481e-005 kg·m ²
Moment of Inertia Ip3	2,0346e-005 kg·m ²	2,0355e-005 kg·m ²	2,0346e-005 kg·m ²	2,5199e-004 kg·m ²	1,6048e-004 kg·m ²
Statistics					
Nodes	1500				
Elements	224				

TABLE 20
Model > Geometry > Parts

Object Name	Frame000186:1	Frame000187:1	Frame000188:1	Frame000189:1	Frame000190:1
State	Meshed				
Graphics Properties					
Visible	Yes				
Transparency	1				
Definition					
Suppressed	No				
Material	Structural Steel				
Stiffness Behavior	Flexible				
Nonlinear Material Effects	Yes				
Bounding Box					
Length X	2,e-002 m	0,14 m	2,e-002 m	0,14 m	2,e-002 m
Length Y	0,12 m	2,e-002 m	0,12 m	2,e-002 m	0,12 m
Length Z	2,e-002 m				
Properties					
Volume	1,6456e-005 m ³	1,9199e-005 m ³	1,6456e-005 m ³	1,9199e-005 m ³	1,6456e-005 m ³
Mass	0,12918 kg	0,15071 kg	0,12918 kg	0,15071 kg	0,12918 kg
Centroid X	4,9615e-002 m	0,11961 m	0,83261 m	0,90261 m	0,97261 m
Centroid Y	-0,23 m	-0,3 m	-0,23 m	-0,16 m	-0,23 m
Centroid Z	0,46 m				
Moment of Inertia Ip1	1,6048e-004 kg·m ²	1,5728e-005 kg·m ²	1,6047e-004 kg·m ²	1,5728e-005 kg·m ²	1,6047e-004 kg·m ²
Moment of Inertia Ip2	1,3481e-005 kg·m ²	2,5199e-004 kg·m ²	1,3481e-005 kg·m ²	2,5199e-004 kg·m ²	1,3481e-005 kg·m ²
Moment of Inertia Ip3	1,6048e-004 kg·m ²	2,5199e-004 kg·m ²	1,6047e-004 kg·m ²	2,5199e-004 kg·m ²	1,6047e-004 kg·m ²
Statistics					
Nodes	1500				
Elements	224				

TABLE 21
Model > Geometry > Parts

Object Name	Frame000191:1	Frame000192:1	Frame000193:1	Frame000194:1	Frame000195:1
State	Meshed				
Graphics Properties					
Visible	Yes				
Transparency	1				
Definition					
Suppressed	No				
Material	Structural Steel				
Stiffness Behavior	Flexible				
Nonlinear Material Effects	Yes				
Bounding Box					
Length X					
Length Y					
Length Z					

Length X	0,14 m	0,623 m	2,e-002 m	
Length Y	2,e-002 m		2,496e-002 m	2,e-002 m
Length Z	2,e-002 m		0,18 m	
Properties				
Volume	1,9199e-005 m ³	8,5433e-005 m ³	2,4693e-005 m ³	2,4684e-005 m ³
Mass	0,15071 kg	0,67065 kg	0,19384 kg	0,19377 kg
Centroid X	0,90261 m	0,51111 m	0,58874 m	0,42274 m
Centroid Y	-0,3 m	-0,18 m	-0,28 m	0,19125 m
Centroid Z	0,46 m	0,453 m	1,e-001 m	
Moment of Inertia Ip1	1,5728e-005 kg·m ²	6,9988e-005 kg·m ²	5,3174e-004 kg·m ²	5,3114e-004 kg·m ²
Moment of Inertia Ip2	2,5199e-004 kg·m ²	2,1547e-002 kg·m ²	5,3174e-004 kg·m ²	5,3114e-004 kg·m ²
Moment of Inertia Ip3	2,5199e-004 kg·m ²	2,1547e-002 kg·m ²	2,0353e-005 kg·m ²	2,0346e-005 kg·m ²
Statistics				
Nodes	1500	1578	1616	1500
Elements	224	264		224

Connections

TABLE 22
Model > Connections

Object Name	Connections
State	Fully Defined
Auto Detection	
Generate Contact On Update	Yes
Tolerance Type	Slider
Tolerance Slider	0,
Tolerance Value	5,0641e-003 m
Face/Face	Yes
Face/Edge	No
Edge/Edge	No
Priority	Include All
Same Body Grouping	Yes
Revolute Joints	Yes
Fixed Joints	Yes
Transparency	
Enabled	Yes

TABLE 23
Model > Connections > Contact Regions

Object Name	Contact Region	Contact Region 2	Contact Region 3	Contact Region 4	Contact Region 5
State	Fully Defined				
Scope					
Scoping Method	Geometry Selection				
Contact	1 Face	3 Faces			
Target	1 Face				
Contact Bodies	Frame00011:1				
Target Bodies	Frame00012:1	Frame00014:1	Frame000138:1	Frame000139:1	Frame000141:1
Definition					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				
Suppressed	No				
Advanced					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				
Update Stiffness	Never				
Thermal Conductance	Program Controlled				
Pinball Region	Program Controlled				

TABLE 24
Model > Connections > Contact Regions

Object Name	Contact Region 6	Contact Region 7	Contact Region 8	Contact Region 9	Contact Region 10
State	Fully Defined				
Scope					
Scoping Method	Geometry Selection				
Contact	3 Faces	2 Faces	3 Faces		
Target	1 Face				

Contact Bodies	Frame00011:1	Frame00012:1			
Target Bodies	Frame000142:1	Frame000110:1	Frame000111:1	Frame000138:1	Frame000141:1
Definition					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				
Suppressed	No				
Advanced					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				
Update Stiffness	Never				
Thermal Conductance	Program Controlled				
Pinball Region	Program Controlled				

TABLE 25
Model > Connections > Contact Regions

Object Name	Contact Region 11	Contact Region 12	Contact Region 13	Contact Region 14	Contact Region 15
State	Fully Defined				
Scope					
Scoping Method	Geometry Selection				
Contact	2 Faces	1 Face	3 Faces	2 Faces	
Target	1 Face				
Contact Bodies	Frame00013:1				
Target Bodies	Frame00016:1	Frame00017:1	Frame00018:1	Frame00019:1	Frame000111:1
Definition					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				
Suppressed	No				
Advanced					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				
Update Stiffness	Never				
Thermal Conductance	Program Controlled				
Pinball Region	Program Controlled				

TABLE 26
Model > Connections > Contact Regions

Object Name	Contact Region 16	Contact Region 17	Contact Region 18	Contact Region 19	Contact Region 20
State	Fully Defined				
Scope					
Scoping Method	Geometry Selection				
Contact	1 Face	2 Faces		8 Faces	
Target	1 Face			12 Faces	
Contact Bodies	Frame00013:1				
Target Bodies	Frame000112:1	Frame000113:1	Frame000114:1	Frame000138:1	Frame000139:1
Definition					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				
Suppressed	No				
Advanced					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				
Update Stiffness	Never				
Thermal Conductance	Program Controlled				
Pinball Region	Program Controlled				

TABLE 27
Model > Connections > Contact Regions

Object Name	Contact Region 21	Contact Region 22	Contact Region 23	Contact Region 24	Contact Region 25
State	Fully Defined				
Scope					
Scoping Method	Geometry Selection				
Contact	3 Faces			2 Faces	3 Faces
Target	1 Face				
Contact Bodies	Frame00013:1		Frame00014:1		
Target Bodies	Frame000140:1	Frame000143:1	Frame00015:1	Frame00016:1	Frame000139:1

Definition	
Type	Bonded
Scope Mode	Automatic
Behavior	Symmetric
Suppressed	No
Advanced	
Formulation	Pure Penalty
Normal Stiffness	Program Controlled
Update Stiffness	Never
Thermal Conductance	Program Controlled
Pinball Region	Program Controlled

TABLE 28
Model > Connections > Contact Regions

Object Name	Contact Region 26	Contact Region 27	Contact Region 28	Contact Region 29	Contact Region 30
State	Fully Defined				
Scope					
Scoping Method	Geometry Selection				
Contact	3 Faces	2 Faces		5 Faces	1 Face
Target	1 Face	2 Faces	1 Face	5 Faces	1 Face
Contact Bodies	Frame00014:1	Frame00015:1			Frame00016:1
Target Bodies	Frame000142:1	Frame00016:1	Frame000116:1	Frame000144:1	Frame00018:1
Definition					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				
Suppressed	No				
Advanced					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				
Update Stiffness	Never				
Thermal Conductance	Program Controlled				
Pinball Region	Program Controlled				

TABLE 29
Model > Connections > Contact Regions

Object Name	Contact Region 31	Contact Region 32	Contact Region 33	Contact Region 34	Contact Region 35
State	Fully Defined				
Scope					
Scoping Method	Geometry Selection				
Contact	2 Faces	1 Face			2 Faces
Target	2 Faces		1 Face		
Contact Bodies	Frame00017:1				Frame00018:1
Target Bodies	Frame00018:1	Frame000115:1	Frame000120:1	Frame000122:1	Frame000120:1
Definition					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				
Suppressed	No				
Advanced					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				
Update Stiffness	Never				
Thermal Conductance	Program Controlled				
Pinball Region	Program Controlled				

TABLE 30
Model > Connections > Contact Regions

Object Name	Contact Region 36	Contact Region 37	Contact Region 38	Contact Region 39	Contact Region 40
State	Fully Defined				
Scope					
Scoping Method	Geometry Selection				
Contact	2 Faces		1 Face		
Target	1 Face			3 Faces	
Contact Bodies	Frame00018:1				
Target Bodies	Frame000123:1	Frame000125:1	Frame000144:1	Frame000147:1	Frame000148:1
Definition					
Type	Bonded				

Scope Mode	Automatic
Behavior	Symmetric
Suppressed	No
Advanced	
Formulation	Pure Penalty
Normal Stiffness	Program Controlled
Update Stiffness	Never
Thermal Conductance	Program Controlled
Pinball Region	Program Controlled

TABLE 31
Model > Connections > Contact Regions

Object Name	<i>Contact Region 41</i>	<i>Contact Region 42</i>	<i>Contact Region 43</i>	<i>Contact Region 44</i>	<i>Contact Region 45</i>
State	Fully Defined				
Scope					
Scoping Method	Geometry Selection				
Contact	2 Faces		3 Faces		
Target	1 Face	2 Faces	1 Face		
Contact Bodies	Frame00019:1				
Target Bodies	Frame000111:1	Frame000112:1	Frame000117:1	Frame000118:1	Frame000119:1
Definition					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				
Suppressed	No				
Advanced					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				
Update Stiffness	Never				
Thermal Conductance	Program Controlled				
Pinball Region	Program Controlled				

TABLE 32
Model > Connections > Contact Regions

Object Name	<i>Contact Region 46</i>	<i>Contact Region 47</i>	<i>Contact Region 48</i>	<i>Contact Region 49</i>	<i>Contact Region 50</i>
State	Fully Defined				
Scope					
Scoping Method	Geometry Selection				
Contact	4 Faces	1 Face		2 Faces	3 Faces
Target	7 Faces	3 Faces	2 Faces		1 Face
Contact Bodies	Frame00019:1			Frame000110:1	
Target Bodies	Frame000145:1	Frame000147:1	Frame000149:1	Frame000111:1	Frame000116:1
Definition					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				
Suppressed	No				
Advanced					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				
Update Stiffness	Never				
Thermal Conductance	Program Controlled				
Pinball Region	Program Controlled				

TABLE 33
Model > Connections > Contact Regions

Object Name	<i>Contact Region 51</i>	<i>Contact Region 52</i>	<i>Contact Region 53</i>	<i>Contact Region 54</i>	<i>Contact Region 55</i>
State	Fully Defined				
Scope					
Scoping Method	Geometry Selection				
Contact	5 Faces	1 Face			2 Faces
Target	5 Faces	3 Faces	1 Face	2 Faces	1 Face
Contact Bodies	Frame000110:1	Frame000112:1		Frame000113:1	
Target Bodies	Frame000145:1	Frame000115:1	Frame000118:1	Frame000115:1	Frame000140:1
Definition					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				

Suppressed	No
Advanced	
Formulation	Pure Penalty
Normal Stiffness	Program Controlled
Update Stiffness	Never
Thermal Conductance	Program Controlled
Pinball Region	Program Controlled

TABLE 34
Model > Connections > Contact Regions

Object Name	<i>Contact Region 56</i>	<i>Contact Region 57</i>	<i>Contact Region 58</i>	<i>Contact Region 59</i>	<i>Contact Region 60</i>
State	Fully Defined				
Scope					
Scoping Method	Geometry Selection				
Contact	1 Face	2 Faces	1 Face	2 Faces	
Target	2 Faces	1 Face			
Contact Bodies	Frame000114:1		Frame000115:1		
Target Bodies	Frame000115:1	Frame000143:1	Frame000122:1	Frame000129:1	Frame000130:1
Definition					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				
Suppressed	No				
Advanced					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				
Update Stiffness	Never				
Thermal Conductance	Program Controlled				
Pinball Region	Program Controlled				

TABLE 35
Model > Connections > Contact Regions

Object Name	<i>Contact Region 61</i>	<i>Contact Region 62</i>	<i>Contact Region 63</i>	<i>Contact Region 64</i>	<i>Contact Region 65</i>
State	Fully Defined				
Scope					
Scoping Method	Geometry Selection				
Contact	2 Faces	1 Face			
Target	1 Face	2 Faces	3 Faces		
Contact Bodies	Frame000115:1	Frame000116:1		Frame000117:1	
Target Bodies	Frame000131:1	Frame000144:1	Frame000145:1	Frame000119:1	Frame000137:1
Definition					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				
Suppressed	No				
Advanced					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				
Update Stiffness	Never				
Thermal Conductance	Program Controlled				
Pinball Region	Program Controlled				

TABLE 36
Model > Connections > Contact Regions

Object Name	<i>Contact Region 66</i>	<i>Contact Region 67</i>	<i>Contact Region 68</i>	<i>Contact Region 69</i>	<i>Contact Region 70</i>
State	Fully Defined				
Scope					
Scoping Method	Geometry Selection				
Contact	1 Face	2 Faces	1 Face	2 Faces	
Target	1 Face	3 Faces			
Contact Bodies	Frame000117:1		Frame000118:1		
Target Bodies	Frame000146:1	Frame000149:1	Frame000119:1	Frame000131:1	Frame000137:1
Definition					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				
Suppressed	No				
Advanced					

Formulation	Pure Penalty
Normal Stiffness	Program Controlled
Update Stiffness	Never
Thermal Conductance	Program Controlled
Pinball Region	Program Controlled

TABLE 37
Model > Connections > Contact Regions

Object Name	Contact Region 71	Contact Region 72	Contact Region 73	Contact Region 74	Contact Region 75
State	Fully Defined				
Scope					
Scoping Method	Geometry Selection				
Contact	1 Face				
Target	1 Face	3 Faces	2 Faces	3 Faces	2 Faces
Contact Bodies	Frame000119:1		Frame000120:1		
Target Bodies	Frame000134:1	Frame000137:1	Frame000121:1	Frame000122:1	Frame000123:1
Definition					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				
Suppressed	No				
Advanced					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				
Update Stiffness	Never				
Thermal Conductance	Program Controlled				
Pinball Region	Program Controlled				

TABLE 38
Model > Connections > Contact Regions

Object Name	Contact Region 76	Contact Region 77	Contact Region 78	Contact Region 79	Contact Region 80
State	Fully Defined				
Scope					
Scoping Method	Geometry Selection				
Contact	1 Face	2 Faces	1 Face	3 Faces	1 Face
Target	3 Faces	1 Face			3 Faces
Contact Bodies	Frame000121:1				
Target Bodies	Frame000122:1	Frame000123:1	Frame000124:1	Frame000125:1	Frame000146:1
Definition					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				
Suppressed	No				
Advanced					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				
Update Stiffness	Never				
Thermal Conductance	Program Controlled				
Pinball Region	Program Controlled				

TABLE 39
Model > Connections > Contact Regions

Object Name	Contact Region 81	Contact Region 82	Contact Region 83	Contact Region 84	Contact Region 85
State	Fully Defined				
Scope					
Scoping Method	Geometry Selection				
Contact	3 Faces	2 Faces		1 Face	
Target	3 Faces	1 Face	2 Faces	3 Faces	1 Face
Contact Bodies	Frame000121:1		Frame000122:1		Frame000123:1
Target Bodies	Frame000148:1	Frame000176:1	Frame000124:1	Frame000126:1	Frame000124:1
Definition					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				
Suppressed	No				
Advanced					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				

Update Stiffness	Never
Thermal Conductance	Program Controlled
Pinball Region	Program Controlled

TABLE 40
Model > Connections > Contact Regions

Object Name	Contact Region 86	Contact Region 87	Contact Region 88	Contact Region 89	Contact Region 90
State	Fully Defined				
Scope					
Scoping Method	Geometry Selection				
Contact	1 Face		2 Faces	1 Face	8 Faces
Target	1 Face	3 Faces	2 Faces	1 Face	6 Faces
Contact Bodies	Frame000124:1		Frame000125:1		Frame000126:1
Target Bodies	Frame000126:1	Frame000168:1	Frame000146:1	Frame000150:1	Frame000128:1
Definition					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				
Suppressed	No				
Advanced					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				
Update Stiffness	Never				
Thermal Conductance	Program Controlled				
Pinball Region	Program Controlled				

TABLE 41
Model > Connections > Contact Regions

Object Name	Contact Region 91	Contact Region 92	Contact Region 93	Contact Region 94	Contact Region 95
State	Fully Defined				
Scope					
Scoping Method	Geometry Selection				
Contact	8 Faces	1 Face	3 Faces	6 Faces	4 Faces
Target	6 Faces	1 Face	3 Faces	8 Faces	
Contact Bodies	Frame000126:1			Frame000127:1	
Target Bodies	Frame000129:1	Frame000136:1	Frame000168:1	Frame000133:1	Frame000135:1
Definition					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				
Suppressed	No				
Advanced					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				
Update Stiffness	Never				
Thermal Conductance	Program Controlled				
Pinball Region	Program Controlled				

TABLE 42
Model > Connections > Contact Regions

Object Name	Contact Region 96	Contact Region 97	Contact Region 98	Contact Region 99	Contact Region 100
State	Fully Defined				
Scope					
Scoping Method	Geometry Selection				
Contact	1 Face	4 Faces	1 Face	4 Faces	6 Faces
Target	3 Faces	8 Faces	3 Faces	8 Faces	
Contact Bodies	Frame000127:1	Frame000128:1		Frame000129:1	Frame000130:1
Target Bodies	Frame000146:1	Frame000136:1	Frame000146:1	Frame000136:1	Frame000133:1
Definition					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				
Suppressed	No				
Advanced					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				
Update Stiffness	Never				
Thermal Conductance	Program Controlled				

Pinball Region

Program Controlled

TABLE 43
Model > Connections > Contact Regions

Object Name	Contact Region 101	Contact Region 102	Contact Region 103	Contact Region 104	Contact Region 105
State	Fully Defined				
Scope					
Scoping Method	Geometry Selection				
Contact	4 Faces	1 Face	2 Faces	4 Faces	1 Face
Target	8 Faces	2 Faces	1 Face	8 Faces	3 Faces
Contact Bodies	Frame000130:1	Frame000131:1		Frame000132:1	
Target Bodies	Frame000135:1	Frame000133:1	Frame000137:1	Frame000133:1	Frame000146:1
Definition					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				
Suppressed	No				
Advanced					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				
Update Stiffness	Never				
Thermal Conductance	Program Controlled				
Pinball Region	Program Controlled				

TABLE 44
Model > Connections > Contact Regions

Object Name	Contact Region 106	Contact Region 107	Contact Region 108	Contact Region 109	Contact Region 110
State	Fully Defined				
Scope					
Scoping Method	Geometry Selection				
Contact	1 Face		2 Faces	1 Face	
Target	1 Face		4 Faces	1 Face	3 Faces
Contact Bodies	Frame000133:1		Frame000134:1	Frame000135:1	Frame000137:1
Target Bodies	Frame000134:1	Frame000135:1	Frame000137:1	Frame000136:1	Frame000146:1
Definition					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				
Suppressed	No				
Advanced					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				
Update Stiffness	Never				
Thermal Conductance	Program Controlled				
Pinball Region	Program Controlled				

TABLE 45
Model > Connections > Contact Regions

Object Name	Contact Region 111	Contact Region 112	Contact Region 113	Contact Region 114	Contact Region 115
State	Fully Defined				
Scope					
Scoping Method	Geometry Selection				
Contact	1 Face	4 Faces	2 Faces		4 Faces
Target	3 Faces	2 Faces	1 Face		2 Faces
Contact Bodies	Frame000137:1	Frame000138:1		Frame000139:1	
Target Bodies	Frame000149:1	Frame000140:1	Frame000141:1	Frame000142:1	Frame000143:1
Definition					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				
Suppressed	No				
Advanced					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				
Update Stiffness	Never				
Thermal Conductance	Program Controlled				
Pinball Region	Program Controlled				

TABLE 46
Model > Connections > Contact Regions

Object Name	Contact Region 116	Contact Region 117	Contact Region 118	Contact Region 119	Contact Region 120
State	Fully Defined				
Scope					
Scoping Method	Geometry Selection				
Contact	2 Faces	4 Faces	3 Faces	6 Faces	1 Face
Target	2 Faces	4 Faces	2 Faces	7 Faces	1 Face
Contact Bodies	Frame000140:1	Frame000141:1	Frame000146:1		
Target Bodies	Frame000143:1	Frame000142:1	Frame000148:1	Frame000149:1	Frame000150:1
Definition					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				
Suppressed	No				
Advanced					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				
Update Stiffness	Never				
Thermal Conductance	Program Controlled				
Pinball Region	Program Controlled				

TABLE 47
Model > Connections > Contact Regions

Object Name	Contact Region 121	Contact Region 122	Contact Region 123	Contact Region 124	Contact Region 125
State	Fully Defined				
Scope					
Scoping Method	Geometry Selection				
Contact	1 Face				
Target	1 Face				
Contact Bodies	Frame000146:1				
Target Bodies	Frame000151:1	Frame000152:1	Frame000153:1	Frame000154:1	Frame000155:1
Definition					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				
Suppressed	No				
Advanced					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				
Update Stiffness	Never				
Thermal Conductance	Program Controlled				
Pinball Region	Program Controlled				

TABLE 48
Model > Connections > Contact Regions

Object Name	Contact Region 126	Contact Region 127	Contact Region 128	Contact Region 129	Contact Region 130
State	Fully Defined				
Scope					
Scoping Method	Geometry Selection				
Contact	3 Faces	1 Face			6 Faces
Target	1 Face				7 Faces
Contact Bodies	Frame000146:1				Frame000147:1
Target Bodies	Frame000168:1	Frame000176:1	Frame000194:1	Frame000195:1	Frame000148:1
Definition					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				
Suppressed	No				
Advanced					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				
Update Stiffness	Never				
Thermal Conductance	Program Controlled				
Pinball Region	Program Controlled				

TABLE 49
Model > Connections > Contact Regions

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Object Name	Contact Region 131	Contact Region 132	Contact Region 133	Contact Region 134	Contact Region 135
State	Fully Defined				
Scope					
Scoping Method	Geometry Selection				
Contact	6 Faces	3 Faces		2 Faces	3 Faces
Target	6 Faces	1 Face			
Contact Bodies	Frame000147:1				
Target Bodies	Frame000149:1	Frame000178:1	Frame000179:1	Frame000194:1	Frame000195:1
Definition					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				
Suppressed	No				
Advanced					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				
Update Stiffness	Never				
Thermal Conductance	Program Controlled				
Pinball Region	Program Controlled				

TABLE 50
Model > Connections > Contact Regions

Object Name	Contact Region 136	Contact Region 137	Contact Region 138	Contact Region 139	Contact Region 140
State	Fully Defined				
Scope					
Scoping Method	Geometry Selection				
Contact	4 Faces	3 Faces		2 Faces	
Target	2 Faces	1 Face			
Contact Bodies	Frame000148:1		Frame000149:1		
Target Bodies	Frame000176:1	Frame000178:1	Frame000155:1	Frame000169:1	Frame000179:1
Definition					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				
Suppressed	No				
Advanced					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				
Update Stiffness	Never				
Thermal Conductance	Program Controlled				
Pinball Region	Program Controlled				

TABLE 51
Model > Connections > Contact Regions

Object Name	Contact Region 141	Contact Region 142	Contact Region 143	Contact Region 144	Contact Region 145
State	Fully Defined				
Scope					
Scoping Method	Geometry Selection				
Contact	1 Face	3 Faces	1 Face	3 Faces	
Target	3 Faces	1 Face	3 Faces		1 Face
Contact Bodies	Frame000150:1		Frame000151:1	Frame000152:1	
Target Bodies	Frame000156:1	Frame000176:1	Frame000156:1		Frame000194:1
Definition					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				
Suppressed	No				
Advanced					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				
Update Stiffness	Never				
Thermal Conductance	Program Controlled				
Pinball Region	Program Controlled				

TABLE 52
Model > Connections > Contact Regions

Object Name	Contact Region 146	Contact Region 147	Contact Region 148	Contact Region 149	Contact Region 150
State	Fully Defined				

Scope				
Scoping Method	Geometry Selection			
Contact	1 Face	3 Faces	1 Face	3 Faces
Target	3 Faces	1 Face	3 Faces	1 Face
Contact Bodies	Frame000153:1		Frame000154:1	Frame000155:1
Target Bodies	Frame000156:1	Frame000195:1	Frame000156:1	Frame000169:1
Definition				
Type	Bonded			
Scope Mode	Automatic			
Behavior	Symmetric			
Suppressed	No			
Advanced				
Formulation	Pure Penalty			
Normal Stiffness	Program Controlled			
Update Stiffness	Never			
Thermal Conductance	Program Controlled			
Pinball Region	Program Controlled			

TABLE 53
Model > Connections > Contact Regions

Object Name	<i>Contact Region 151</i>	<i>Contact Region 152</i>	<i>Contact Region 153</i>	<i>Contact Region 154</i>	<i>Contact Region 155</i>
State	Fully Defined				
Scope					
Scoping Method	Geometry Selection				
Contact	3 Faces				
Target	1 Face				
Contact Bodies	Frame000156:1				
Target Bodies	Frame000157:1	Frame000158:1	Frame000159:1	Frame000160:1	Frame000163:1
Definition					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				
Suppressed	No				
Advanced					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				
Update Stiffness	Never				
Thermal Conductance	Program Controlled				
Pinball Region	Program Controlled				

TABLE 54
Model > Connections > Contact Regions

Object Name	<i>Contact Region 156</i>	<i>Contact Region 157</i>	<i>Contact Region 158</i>	<i>Contact Region 159</i>	<i>Contact Region 160</i>
State	Fully Defined				
Scope					
Scoping Method	Geometry Selection				
Contact	3 Faces	2 Faces		3 Faces	
Target	1 Face				
Contact Bodies	Frame000156:1				
Target Bodies	Frame000166:1	Frame000170:1	Frame000174:1	Frame000180:1	Frame000181:1
Definition					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				
Suppressed	No				
Advanced					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				
Update Stiffness	Never				
Thermal Conductance	Program Controlled				
Pinball Region	Program Controlled				

TABLE 55
Model > Connections > Contact Regions

Object Name	<i>Contact Region 161</i>	<i>Contact Region 162</i>	<i>Contact Region 163</i>	<i>Contact Region 164</i>	<i>Contact Region 165</i>
State	Fully Defined				
Scope					
Scoping Method	Geometry Selection				

Contact	2 Faces		3 Faces		
Target	1 Face				
Contact Bodies	Frame000156:1		Frame000157:1		
Target Bodies	Frame000182:1	Frame000183:1	Frame000164:1	Frame000165:1	Frame000166:1
Definition					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				
Suppressed	No				
Advanced					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				
Update Stiffness	Never				
Thermal Conductance	Program Controlled				
Pinball Region	Program Controlled				

TABLE 56
Model > Connections > Contact Regions

Object Name	Contact Region 166	Contact Region 167	Contact Region 168	Contact Region 169	Contact Region 170
State	Fully Defined				
Scope					
Scoping Method	Geometry Selection				
Contact	1 Face	2 Faces		3 Faces	
Target	3 Faces	1 Face			
Contact Bodies	Frame000157:1				Frame000158:1
Target Bodies	Frame000167:1	Frame000173:1	Frame000174:1	Frame000182:1	Frame000164:1
Definition					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				
Suppressed	No				
Advanced					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				
Update Stiffness	Never				
Thermal Conductance	Program Controlled				
Pinball Region	Program Controlled				

TABLE 57
Model > Connections > Contact Regions

Object Name	Contact Region 171	Contact Region 172	Contact Region 173	Contact Region 174	Contact Region 175
State	Fully Defined				
Scope					
Scoping Method	Geometry Selection				
Contact	3 Faces		1 Face	2 Faces	1 Face
Target	1 Face	3 Faces		1 Face	
Contact Bodies	Frame000158:1				Frame000159:1
Target Bodies	Frame000165:1	Frame000166:1	Frame000167:1	Frame000175:1	Frame000160:1
Definition					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				
Suppressed	No				
Advanced					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				
Update Stiffness	Never				
Thermal Conductance	Program Controlled				
Pinball Region	Program Controlled				

TABLE 58
Model > Connections > Contact Regions

Object Name	Contact Region 176	Contact Region 177	Contact Region 178	Contact Region 179	Contact Region 180
State	Fully Defined				
Scope					
Scoping Method	Geometry Selection				
Contact	1 Face		2 Faces		1 Face
Target	1 Face	3 Faces		1 Face	3 Faces

Contact Bodies	Frame000159:1				Frame000160:1
Target Bodies	Frame000161:1	Frame000162:1	Frame000167:1	Frame000172:1	Frame000161:1
Definition					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				
Suppressed	No				
Advanced					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				
Update Stiffness	Never				
Thermal Conductance	Program Controlled				
Pinball Region	Program Controlled				

TABLE 59
Model > Connections > Contact Regions

Object Name	<i>Contact Region 181</i>	<i>Contact Region 182</i>	<i>Contact Region 183</i>	<i>Contact Region 184</i>	<i>Contact Region 185</i>
State	Fully Defined				
Scope					
Scoping Method	Geometry Selection				
Contact	1 Face	3 Faces	1 Face		
Target	3 Faces	1 Face	3 Faces		
Contact Bodies	Frame000160:1	Frame000161:1		Frame000162:1	
Target Bodies	Frame000163:1	Frame000162:1	Frame000163:1		Frame000167:1
Definition					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				
Suppressed	No				
Advanced					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				
Update Stiffness	Never				
Thermal Conductance	Program Controlled				
Pinball Region	Program Controlled				

TABLE 60
Model > Connections > Contact Regions

Object Name	<i>Contact Region 186</i>	<i>Contact Region 187</i>	<i>Contact Region 188</i>	<i>Contact Region 189</i>	<i>Contact Region 190</i>
State	Fully Defined				
Scope					
Scoping Method	Geometry Selection				
Contact	2 Faces	1 Face	2 Faces		3 Faces
Target	1 Face	3 Faces	1 Face		
Contact Bodies	Frame000162:1	Frame000163:1			Frame000164:1
Target Bodies	Frame000172:1	Frame000167:1	Frame000170:1	Frame000171:1	Frame000165:1
Definition					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				
Suppressed	No				
Advanced					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				
Update Stiffness	Never				
Thermal Conductance	Program Controlled				
Pinball Region	Program Controlled				

TABLE 61
Model > Connections > Contact Regions

Object Name	<i>Contact Region 191</i>	<i>Contact Region 192</i>	<i>Contact Region 193</i>	<i>Contact Region 194</i>	<i>Contact Region 195</i>
State	Fully Defined				
Scope					
Scoping Method	Geometry Selection				
Contact	3 Faces	1 Face	2 Faces	1 Face	
Target	1 Face	3 Faces	1 Face		
Contact Bodies	Frame000164:1	Frame000165:1		Frame000167:1	
Target Bodies	Frame000166:1	Frame000167:1	Frame000175:1	Frame000171:1	Frame000172:1

Definition	
Type	Bonded
Scope Mode	Automatic
Behavior	Symmetric
Suppressed	No
Advanced	
Formulation	Pure Penalty
Normal Stiffness	Program Controlled
Update Stiffness	Never
Thermal Conductance	Program Controlled
Pinball Region	Program Controlled

TABLE 62
Model > Connections > Contact Regions

Object Name	Contact Region 196	Contact Region 197	Contact Region 198	Contact Region 199	Contact Region 200
State	Fully Defined				
Scope					
Scoping Method	Geometry Selection				
Contact	1 Face				
Target	1 Face			2 Faces	
Contact Bodies	Frame000167:1		Frame000169:1		
Target Bodies	Frame000173:1	Frame000175:1	Frame000177:1	Frame000184:1	Frame000186:1
Definition					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				
Suppressed	No				
Advanced					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				
Update Stiffness	Never				
Thermal Conductance	Program Controlled				
Pinball Region	Program Controlled				

TABLE 63
Model > Connections > Contact Regions

Object Name	Contact Region 201	Contact Region 202	Contact Region 203	Contact Region 204	Contact Region 205
State	Fully Defined				
Scope					
Scoping Method	Geometry Selection				
Contact	1 Face				
Target	2 Faces				
Contact Bodies	Frame000170:1		Frame000171:1		Frame000172:1
Target Bodies	Frame000184:1	Frame000185:1		Frame000187:1	Frame000186:1
Definition					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				
Suppressed	No				
Advanced					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				
Update Stiffness	Never				
Thermal Conductance	Program Controlled				
Pinball Region	Program Controlled				

TABLE 64
Model > Connections > Contact Regions

Object Name	Contact Region 206	Contact Region 207	Contact Region 208	Contact Region 209	Contact Region 210
State	Fully Defined				
Scope					
Scoping Method	Geometry Selection				
Contact	1 Face				
Target	2 Faces				
Contact Bodies	Frame000172:1	Frame000173:1		Frame000174:1	
Target Bodies	Frame000187:1	Frame000188:1	Frame000191:1	Frame000188:1	Frame000189:1
Definition					
Type	Bonded				

Scope Mode	Automatic
Behavior	Symmetric
Suppressed	No
Advanced	
Formulation	Pure Penalty
Normal Stiffness	Program Controlled
Update Stiffness	Never
Thermal Conductance	Program Controlled
Pinball Region	Program Controlled

TABLE 65
Model > Connections > Contact Regions

Object Name	<i>Contact Region 211</i>	<i>Contact Region 212</i>	<i>Contact Region 213</i>	<i>Contact Region 214</i>	<i>Contact Region 215</i>
State	Fully Defined				
Scope					
Scoping Method	Geometry Selection				
Contact	1 Face		4 Faces	1 Face	
Target	2 Faces		5 Faces	2 Faces	
Contact Bodies	Frame000175:1			Frame000176:1	
Target Bodies	Frame000190:1	Frame000191:1	Frame000178:1	Frame000189:1	Frame000190:1
Definition					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				
Suppressed	No				
Advanced					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				
Update Stiffness	Never				
Thermal Conductance	Program Controlled				
Pinball Region	Program Controlled				

TABLE 66
Model > Connections > Contact Regions

Object Name	<i>Contact Region 216</i>	<i>Contact Region 217</i>	<i>Contact Region 218</i>	<i>Contact Region 219</i>	<i>Contact Region 220</i>
State	Fully Defined				
Scope					
Scoping Method	Geometry Selection				
Contact	1 Face		3 Faces		
Target	1 Face				
Contact Bodies	Frame000177:1				
Target Bodies	Frame000178:1	Frame000179:1	Frame000180:1	Frame000181:1	Frame000182:1
Definition					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				
Suppressed	No				
Advanced					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				
Update Stiffness	Never				
Thermal Conductance	Program Controlled				
Pinball Region	Program Controlled				

TABLE 67
Model > Connections > Contact Regions

Object Name	<i>Contact Region 221</i>	<i>Contact Region 222</i>	<i>Contact Region 223</i>	<i>Contact Region 224</i>	<i>Contact Region 225</i>
State	Fully Defined				
Scope					
Scoping Method	Geometry Selection				
Contact	3 Faces			1 Face	2 Faces
Target	1 Face			3 Faces	1 Face
Contact Bodies	Frame000177:1	Frame000184:1		Frame000185:1	
Target Bodies	Frame000183:1	Frame000185:1	Frame000186:1	Frame000187:1	Frame000192:1
Definition					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				

Suppressed	No
Advanced	
Formulation	Pure Penalty
Normal Stiffness	Program Controlled
Update Stiffness	Never
Thermal Conductance	Program Controlled
Pinball Region	Program Controlled

TABLE 68
Model > Connections > Contact Regions

Object Name	<i>Contact Region 226</i>	<i>Contact Region 227</i>	<i>Contact Region 228</i>	<i>Contact Region 229</i>	<i>Contact Region 230</i>
State	Fully Defined				
Scope					
Scoping Method	Geometry Selection				
Contact	2 Faces	1 Face			2 Faces
Target	1 Face	3 Faces			1 Face
Contact Bodies	Frame000185:1	Frame000186:1	Frame000188:1		
Target Bodies	Frame000193:1	Frame000187:1	Frame000189:1	Frame000191:1	Frame000192:1
Definition					
Type	Bonded				
Scope Mode	Automatic				
Behavior	Symmetric				
Suppressed	No				
Advanced					
Formulation	Pure Penalty				
Normal Stiffness	Program Controlled				
Update Stiffness	Never				
Thermal Conductance	Program Controlled				
Pinball Region	Program Controlled				

TABLE 69
Model > Connections > Contact Regions

Object Name	<i>Contact Region 231</i>	<i>Contact Region 232</i>	<i>Contact Region 233</i>
State	Fully Defined		
Scope			
Scoping Method	Geometry Selection		
Contact	2 Faces	3 Faces	1 Face
Target	1 Face		3 Faces
Contact Bodies	Frame000188:1	Frame000189:1	Frame000190:1
Target Bodies	Frame000193:1	Frame000190:1	Frame000191:1
Definition			
Type	Bonded		
Scope Mode	Automatic		
Behavior	Symmetric		
Suppressed	No		
Advanced			
Formulation	Pure Penalty		
Normal Stiffness	Program Controlled		
Update Stiffness	Never		
Thermal Conductance	Program Controlled		
Pinball Region	Program Controlled		

Mesh

TABLE 70
Model > Mesh

Object Name	<i>Mesh</i>
State	Solved
Defaults	
Physics Preference	Mechanical
Relevance	0
Advanced	
Relevance Center	Coarse
Element Size	Default
Shape Checking	Standard Mechanical
Solid Element Midside Nodes	Program Controlled
Straight Sided Elements	No

Initial Size Seed	Active Assembly
Smoothing	Low
Transition	Fast
Statistics	
Nodes	271269
Elements	94298

Static Structural

TABLE 71
Model > Analysis

Object Name	<i>Static Structural</i>
State	Fully Defined
Definition	
Physics Type	Structural
Analysis Type	Static Structural
Options	
Reference Temp	22, °C

TABLE 72
Model > Static Structural > Analysis Settings

Object Name	<i>Analysis Settings</i>		
State	Fully Defined		
Step Controls			
Number Of Steps	1,		
Current Step Number	1,		
Step End Time	1, s		
Auto Time Stepping	Program Controlled		
Solver Controls			
Solver Type	Program Controlled		
Weak Springs	Program Controlled		
Large Deflection	Off		
Inertia Relief	Off		
Nonlinear Controls			
Force Convergence	Program Controlled		
Moment Convergence	Program Controlled		
Displacement Convergence	Program Controlled		
Rotation Convergence	Program Controlled		
Line Search	Program Controlled		
Output Controls			
Calculate Stress	Yes		
Calculate Strain	Yes		
Calculate Results At	All Time Points		
Analysis Data Management			
Solver Files Directory	\\Metronsr\	\	\\ANSYS-PT\Fram001 Simulation Files\Static Structural (2)\
Future Analysis	None		
Save ANSYS db	No		
Delete Unneeded Files	Yes		
Nonlinear Solution	No		

TABLE 73
Model > Static Structural > Loads

Object Name	<i>Fixed Support</i>	<i>Fixed Support 2</i>	<i>Fixed Support 3</i>	<i>Force</i>	<i>Force 2</i>
State	Fully Defined				
Scope					
Scoping Method	Geometry Selection				
Geometry	2 Faces	4 Faces	1 Face		
Definition					
Type	Fixed Support			Force	
Suppressed	No				
Define By				Vector	
Magnitude				750, N (ramped)	
Direction				Defined	

FIGURE 1
Model > Static Structural > Force

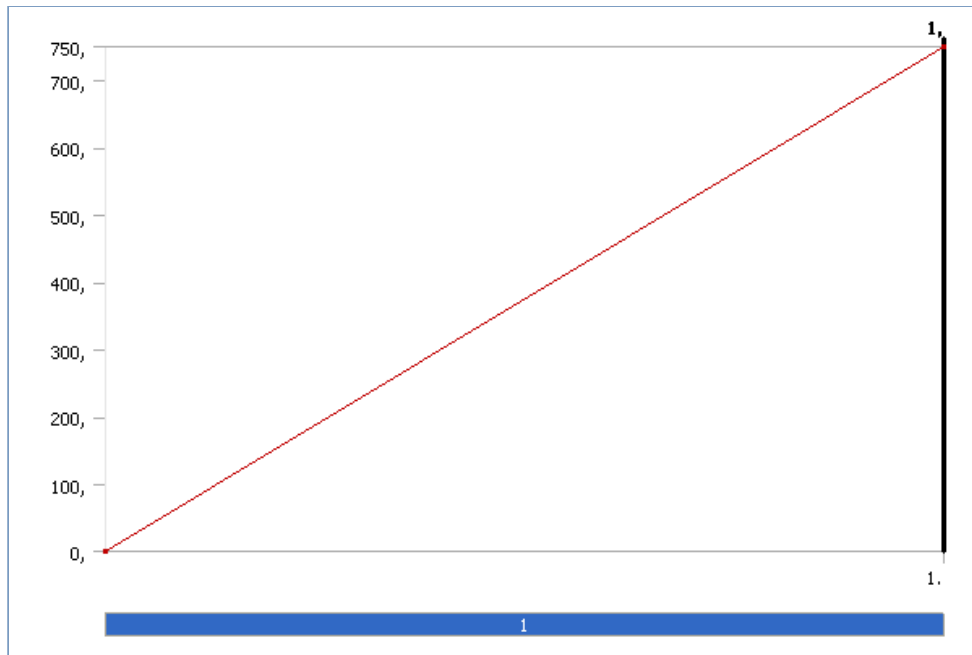


FIGURE 2
Model > Static Structural > Force 2

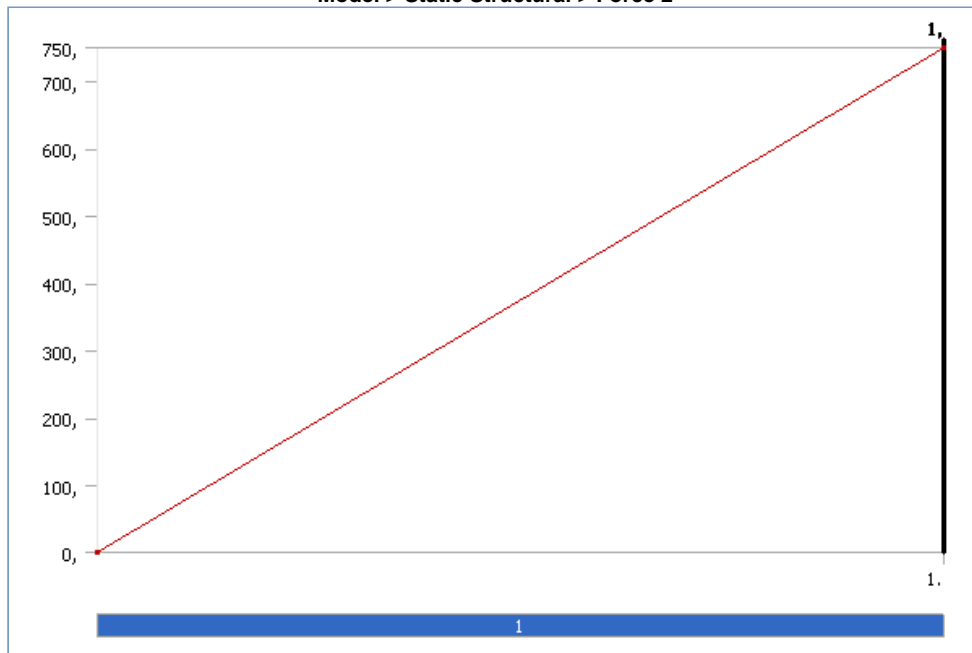


TABLE 74
Model > Static Structural > Loads

Object Name	Force 3	Force 4	Force 5
State	Fully Defined		
Scope			
Scoping Method	Geometry Selection		
Geometry	1 Face		
Definition			
Define By	Vector	Components	
Type	Force		
Magnitude	100, N (ramped)		
Direction	Defined		
Suppressed	No		
X Component	0, N (ramped)		
Y Component	0, N (ramped)		
Z Component	-200, N (ramped)		

FIGURE 3
Model > Static Structural > Force 3

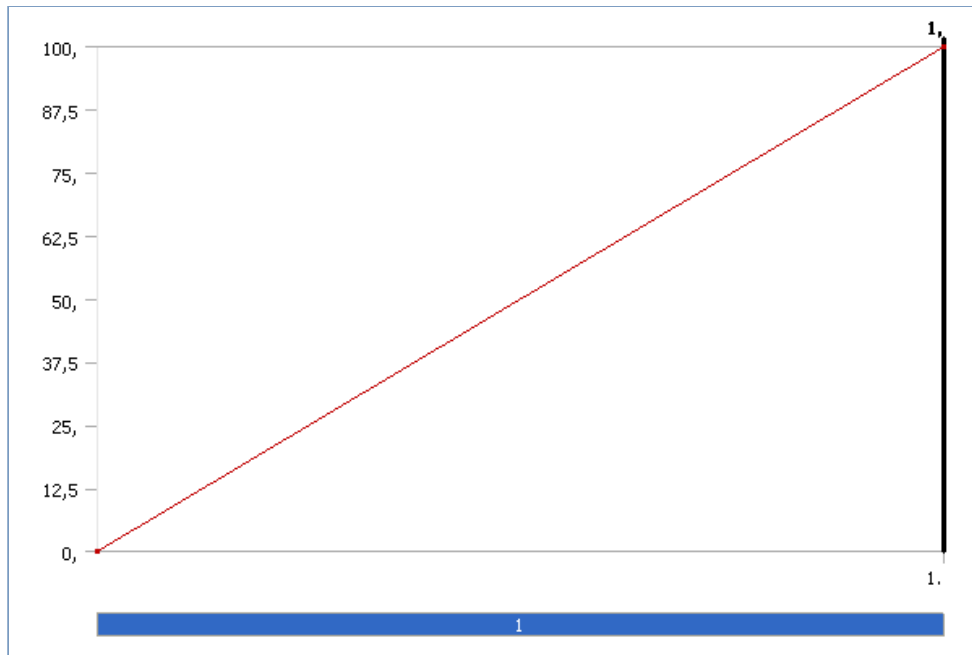


FIGURE 4
Model > Static Structural > Force 4

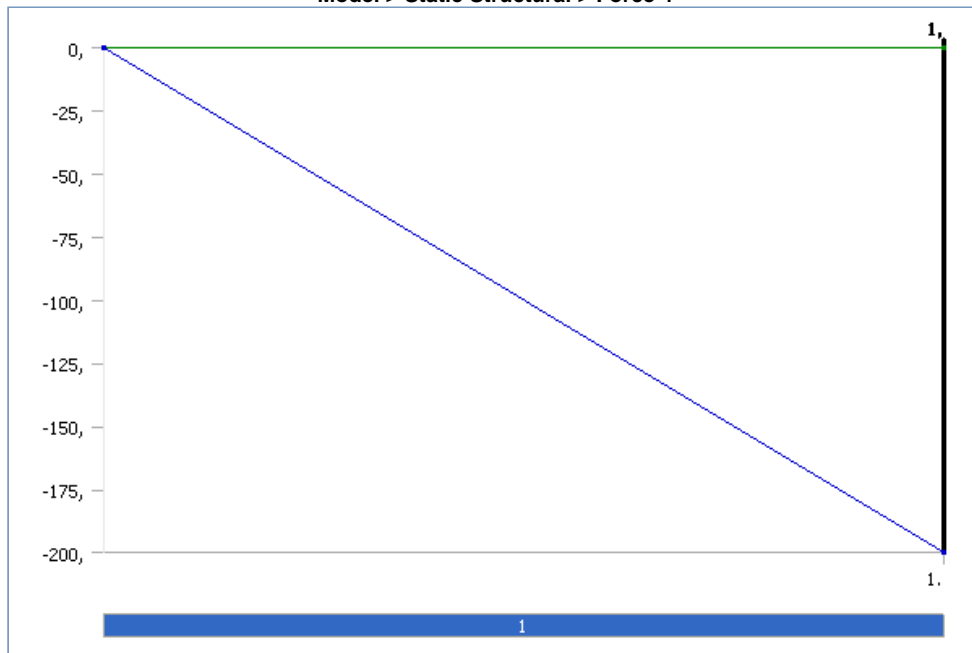
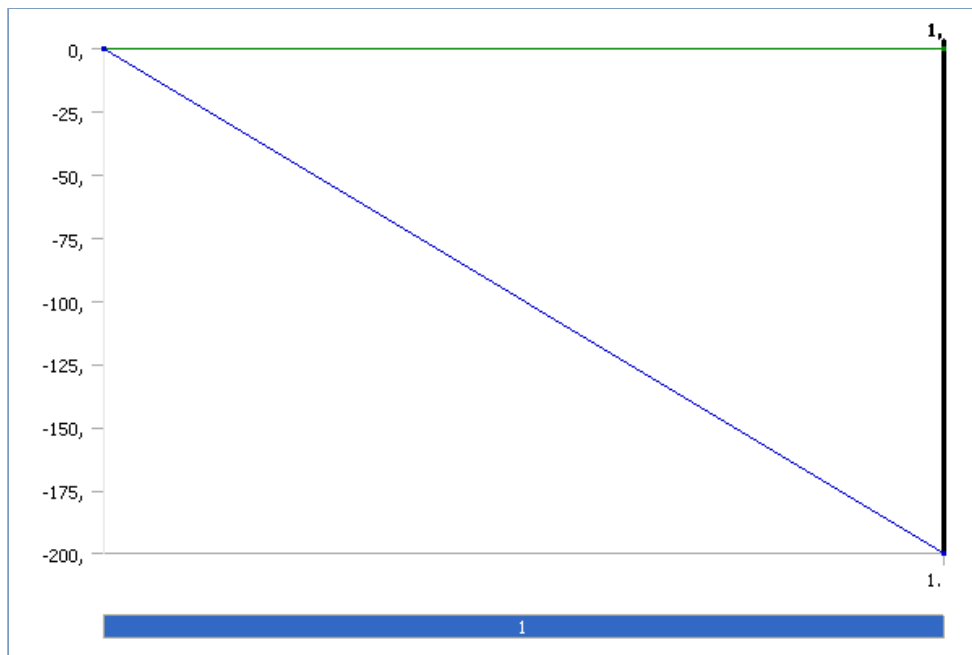


FIGURE 5
Model > Static Structural > Force 5



Solution

TABLE 75
Model > Static Structural > Solution

Object Name	<i>Solution</i>
State	Solved
Adaptive Mesh Refinement	
Max Refinement Loops	1,
Refinement Depth	2,

TABLE 76
Model > Static Structural > Solution > Solution Information

Object Name	<i>Solution Information</i>
State	Solved
Solution Information	
Solution Output	Solver Output
Newton-Raphson Residuals	0
Update Interval	2,5 s
Display Points	All

TABLE 77
Model > Static Structural > Solution > Results

Object Name	<i>Total Deformation</i>
State	Solved
Scope	
Geometry	All Bodies
Definition	
Type	Total Deformation
Display Time	End Time
Results	
Minimum	0, m
Maximum	4,2998e-004 m
Minimum Occurs On	Frame000140:1
Maximum Occurs On	Frame000128:1
Information	
Time	1, s
Load Step	1
Substep	1
Iteration Number	1

TABLE 78
Model > Static Structural > Solution > Command Snippet

Object Name	<i>Commands</i>
State	Solved

File	
File Name	
File Status	File not found
Definition	
Suppressed	No
Output Search Prefix	my_
Input Arguments	
ARG1	
ARG2	
ARG3	
ARG4	
ARG5	
ARG6	
ARG7	
ARG8	
ARG9	
Results	

Model > Static Structural > Solution > Commands

! Commands inserted into this file will be executed immediately after the Ansys /POST1 command.
! Active UNIT system in Workbench when this object was created: Metric (mm, kg, N, C, s, mV, mA)

Material Data

Structural Steel

TABLE 79
Structural Steel > Constants

Structural	
Young's Modulus	2,e+011 Pa
Poisson's Ratio	0,3
Density	7850, kg/m ³
Thermal Expansion	1,2e-005 1/°C
Tensile Yield Strength	2,5e+008 Pa
Compressive Yield Strength	2,5e+008 Pa
Tensile Ultimate Strength	4,6e+008 Pa
Compressive Ultimate Strength	0, Pa
Thermal	
Thermal Conductivity	60,5 W/m·°C
Specific Heat	434, J/kg·°C
Electromagnetics	
Relative Permeability	10000
Resistivity	1,7e-007 Ohm·m

FIGURE 6
Structural Steel > Alternating Stress

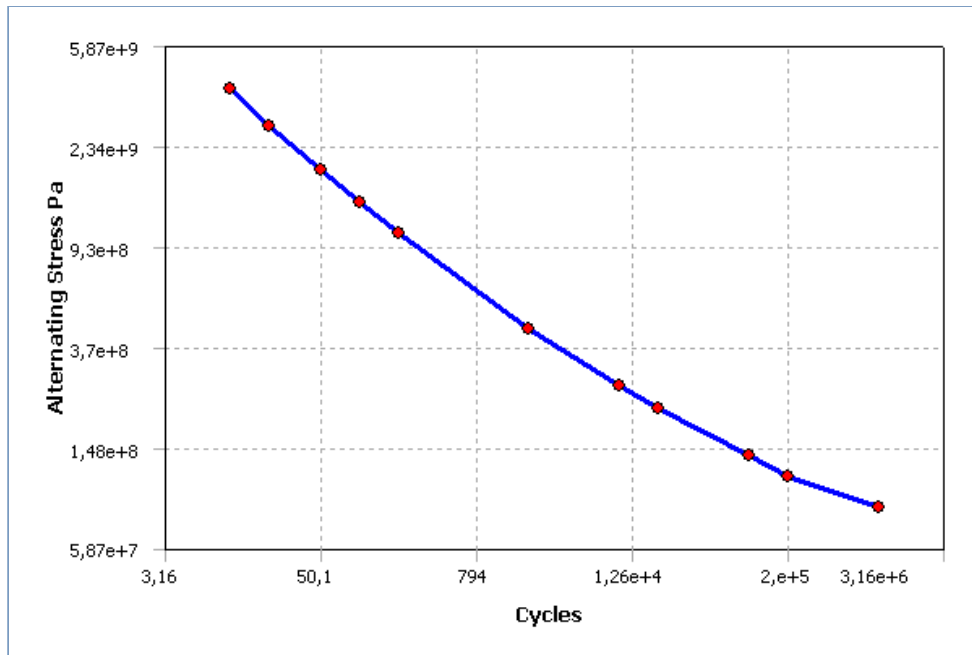


TABLE 80
Structural Steel > Alternating Stress > Property Attributes

Interpolation	Log-Log
Mean Curve Type	Mean Stress

TABLE 81
Structural Steel > Alternating Stress > Alternating Stress Curve Data

Mean Value Pa
0,

TABLE 82
Structural Steel > Alternating Stress > Alternating Stress vs. Cycles

Cycles	Alternating Stress Pa
10,	3,999e+009
20,	2,827e+009
50,	1,896e+009
100,	1,413e+009
200,	1,069e+009
2000,	4,41e+008
10000	2,62e+008
20000	2,14e+008
1,e+005	1,38e+008
2,e+005	1,14e+008
1,e+006	8,62e+007

FIGURE 7
Structural Steel > Strain-Life Parameters

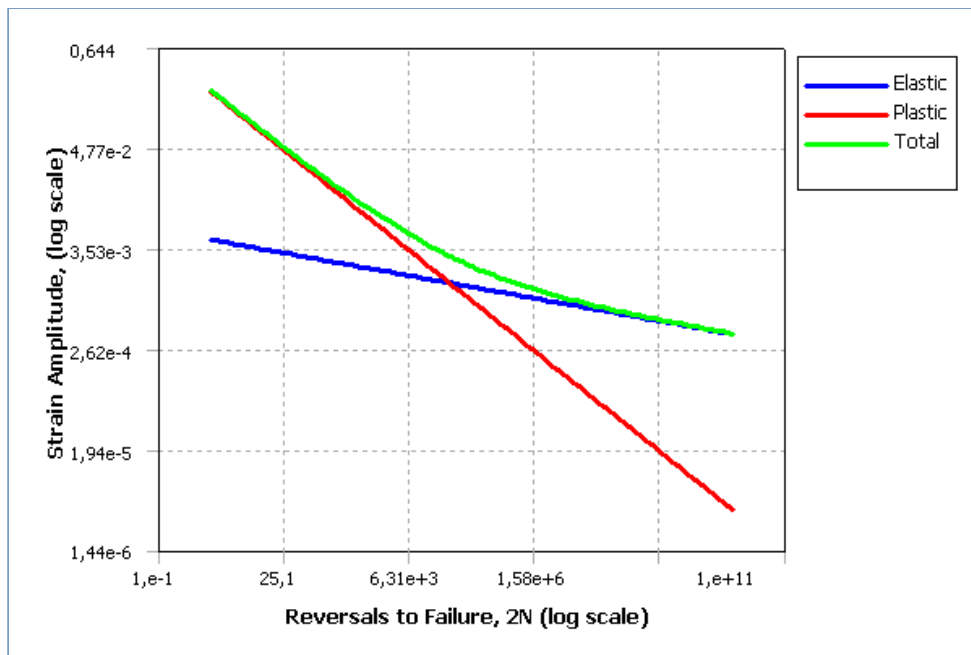


TABLE 83
Structural Steel > Strain-Life Parameters > Property Attributes
 Display Curve Type Strain-Life

TABLE 84
Structural Steel > Strain-Life Parameters > Strain-Life Parameters

Strength Coefficient Pa	9,2e+008
Strength Exponent	-0,106
Ductility Coefficient	0,213
Ductility Exponent	-0,47
Cyclic Strength Coefficient Pa	1,e+009
Cyclic Strain Hardening Exponent	0,2

-
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