Εθνικό Μετσόβιο Πολυτεχνείο
Σχολή Μηχανολόγων Μηχανικών
Τομέας Μηχανολογικών Κατασκευών και Αυτομάτου Ελέγχου
Εργαστήριο Στοιχείων Μηχανών

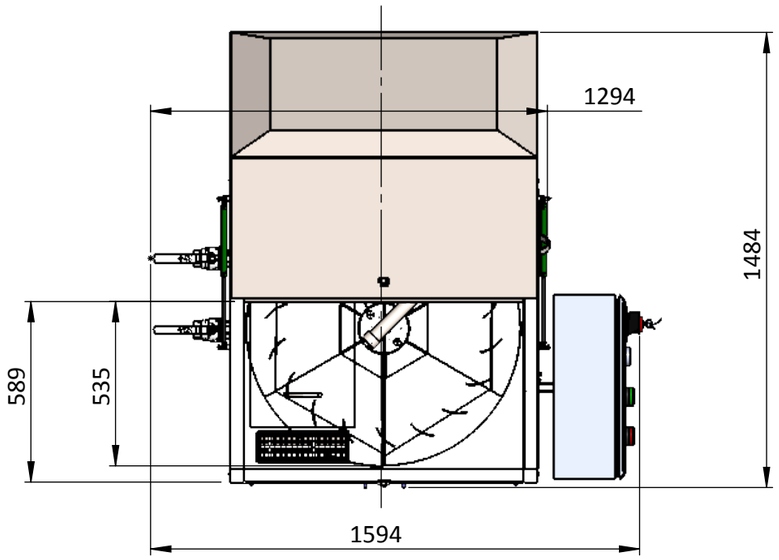
Μελέτη, Σχεδιασμός και Προσομοίωση της Λειτουργίας Βιομηχανικού Πλυντηρίου Εξαρτημάτων με Λογισμικό CAD-CAE

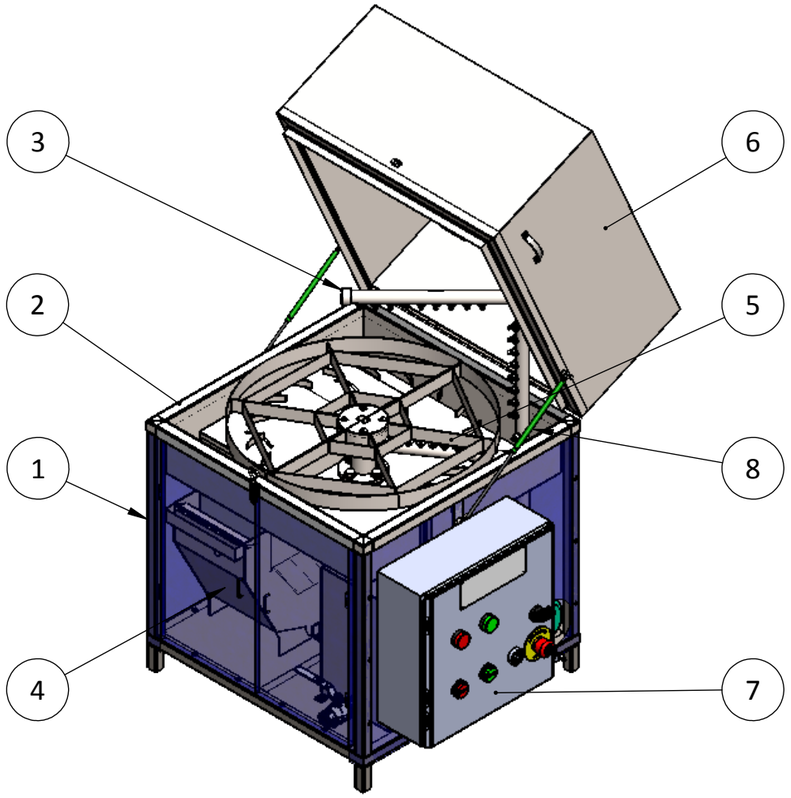
Παράρτημα Β
Φάκελος Μηχανολογικών Σχεδίων

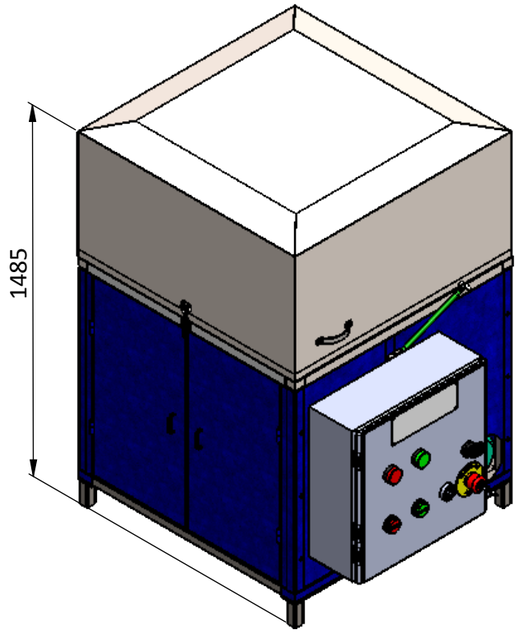
Διπλωματική Εργασία
Χαράλαμπος Μαρκέτος

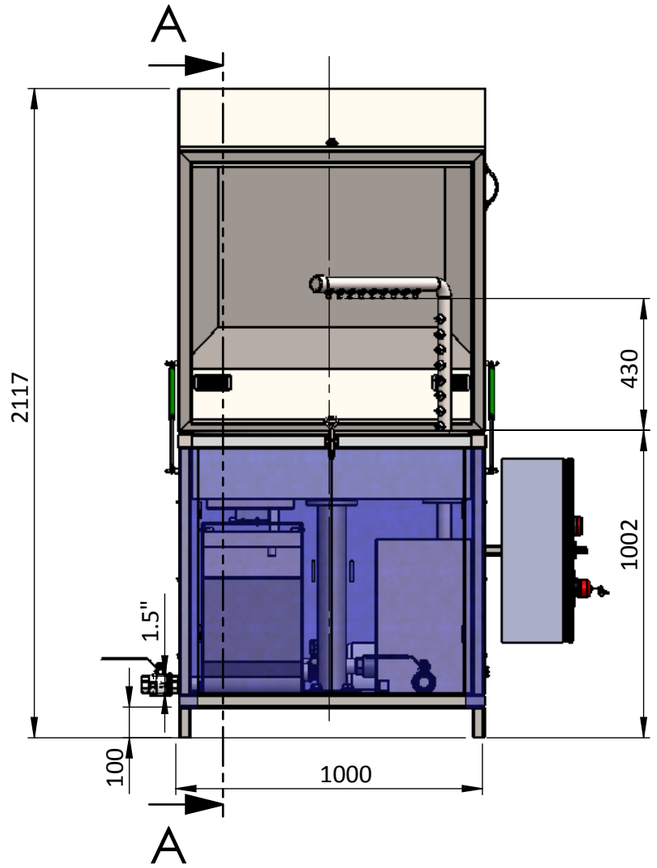
Επιβλέπων: Δρ. Βασίλειος Σπιτάς, Επίκουρος Καθηγητής ΕΜΠ

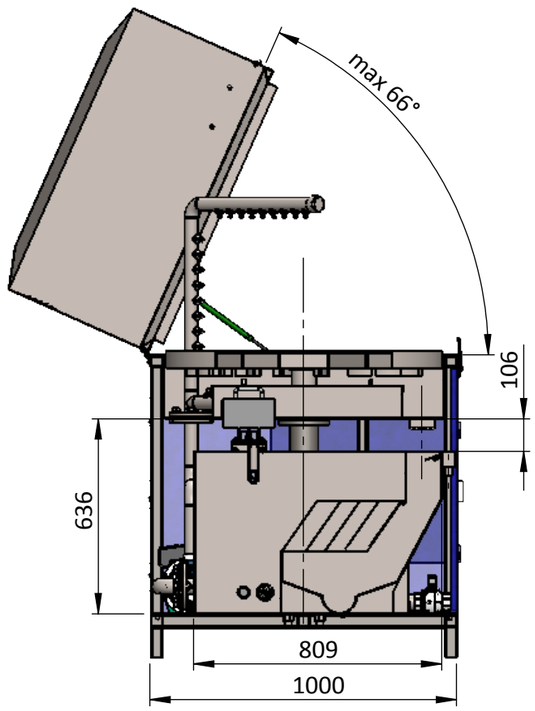
Αθήνα 2018











SECTION A-A

ITEM NO.	DRAWING NO.	DESCRIPTION	QTY.
1	IPW_A_00	main_skeleton_with_covers_assembly	1
2	IPW_B_00	sink_assembly	1
3	IPW_C_00	manifold_assembly	1
4	IPW_D_00	hydraulic_circuit_assembly	1
5	IPW_E_00	rotation_mechanism_assembly	1
6	IPW_F_00	cap_full_assembly	1
7	IPW_G_00	electrical_board_assembly	1
8	IPW_H_00	gas lifter, Pressmair, St. Steel AISI 316	2

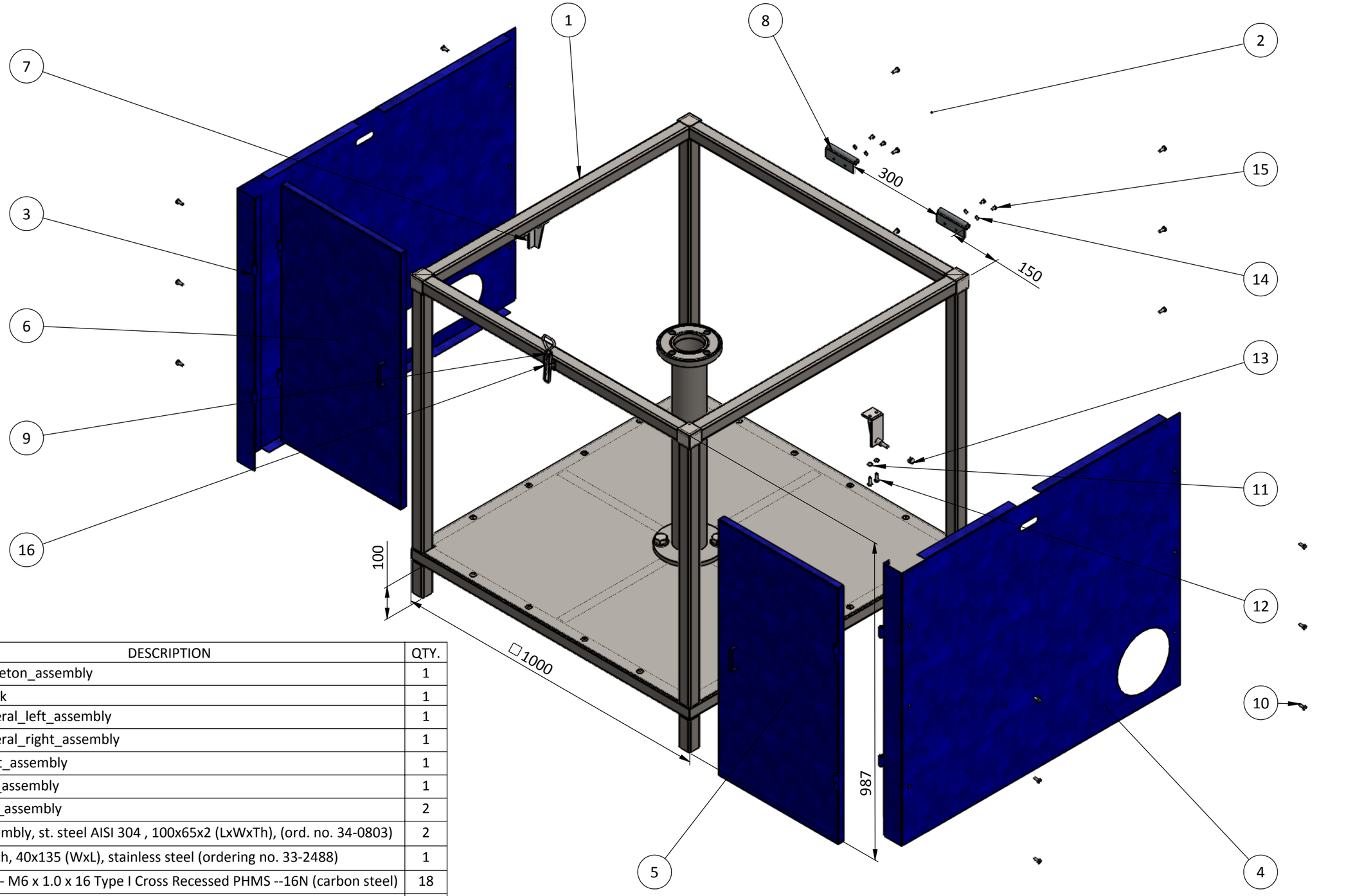
NATIONAL TECHNICAL UNIVERSITY OF ATHENS
DEPARTMENT OF MECHANICAL ENGINEERING
MACHINE DESIGN LABORATORY

Designed by: **Ch. Marketos**
Checked by: **G. Kaisarlis**
Approved by: **V. Spitas**

Drawing No: **IPW_O_00**
Title: *Industrial Parts Washer*
General Tolerances: ISO 2768-m-K

PROJECT: INDUSTRIAL PARTS WASHER

Date	Mass [kg]	Scale	Sheet
July 2018	303	1:10	1 of 1



ITEM NO.	DRAWING NO.	DESCRIPTION	QTY.
1	IPW_A_01	main_skeleton_assembly	1
2	IPW_A_02	cover_back	1
3	IPW_A_03	cover_lateral_left_assembly	1
4	IPW_A_04	cover_lateral_right_assembly	1
5	IPW_A_05	door_right_assembly	1
6	IPW_A_06	door_left_assembly	1
7	IPW_A_07	extension_assembly	2
8	IPW_A_08	hinge assembly, st. steel AISI 304 , 100x65x2 (LxWxTh), (ord. no. 34-0803)	2
9	IPW_A_09	toggle latch, 40x135 (WxL), stainless steel (ordering no. 33-2488)	1
10	IPW_A_10	B18.6.7M - M6 x 1.0 x 16 Type I Cross Recessed PHMS --16N (carbon steel)	18
11	IPW_A_11	B18.22M - Plain washer, 6 mm, narrow (carbon steel)	4
12	IPW_A_12	B18.6.7M - M6 x 1.0 x 20 Type I Cross Recessed PHMS --20N (carbon steel)	4
13	IPW_A_13	DIN 1587 - M8 --NNU (stainless steel)	2
14	IPW_A_14	B18.22M - Plain washer, 5 mm, narrow (carbon steel)	4
15	IPW_A_15	B18.6.7M - M5 x 0.8 x 10 Type I Cross Recessed PHMS --10N (carbon steel)	4
16	IPW_A_16	pan cross head_am (carbon steel)	4

NATIONAL TECHNICAL UNIVERSITY OF ATHENS
DEPARTMENT OF MECHANICAL ENGINEERING
MACHINE DESIGN LABORATORY

Designed by: **Ch. Marketos**
Checked by: **G. Kaisarlis**
Approved by: **V. Spitas**

PROJECT: INDUSTRIAL PARTS WASHER

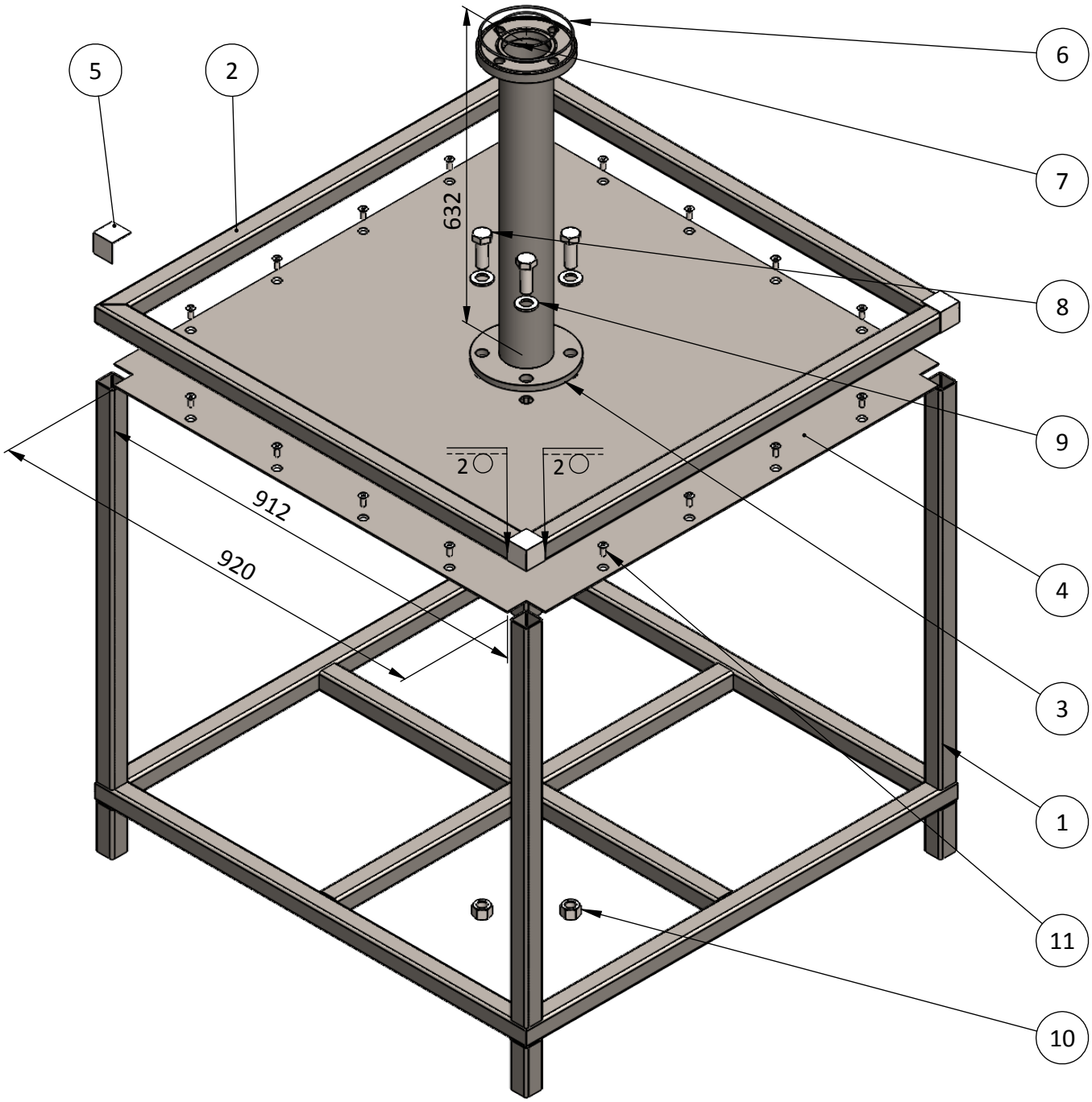
Date: July 2018

Drawing No: **IPW_A_00**

Title: *main_skeleton_full_assembly*

General Tolerances: ISO 2768-m-K

Mass [kg]	Scale	Sheet
108	1:10	1 of 1



ITEM NO.	DRAWING NO.	DESCRIPTION	QTY
1	IPW_A_01_01	welded_skeleton_subassembly	1
2	IPW_A_01_01_01	main_skeleton_up_frame_subassembly	1
3	IPW_A_01_02	support_cylinder_subassembly	1
4	IPW_A_01_03	plate	1
5	IPW_A_01_04	cover_corner	4
6	IPW_A_01_05	o-ring, ID150, cross section 3mm (viton)	1
7	IPW_A_01_06	o-ring, ID94, cross section 2mm (viton)	1
8	IPW_A_01_07	hex cap screw_am (carbon steel)	4
9	IPW_A_01_08	B18.22M - Plain washer, 20 mm, narrow (carbon steel)	4
10	IPW_A_01_09	B18.2.4.2M - Hex nut, Style 2, M20 x 2.5 --W-N (carbon steel)	4
11	IPW_A_01_10	B18.6.7M - M8 x 1.25 x 20 Type I Cross Recessed FHMS --20N (carbon steel)	16

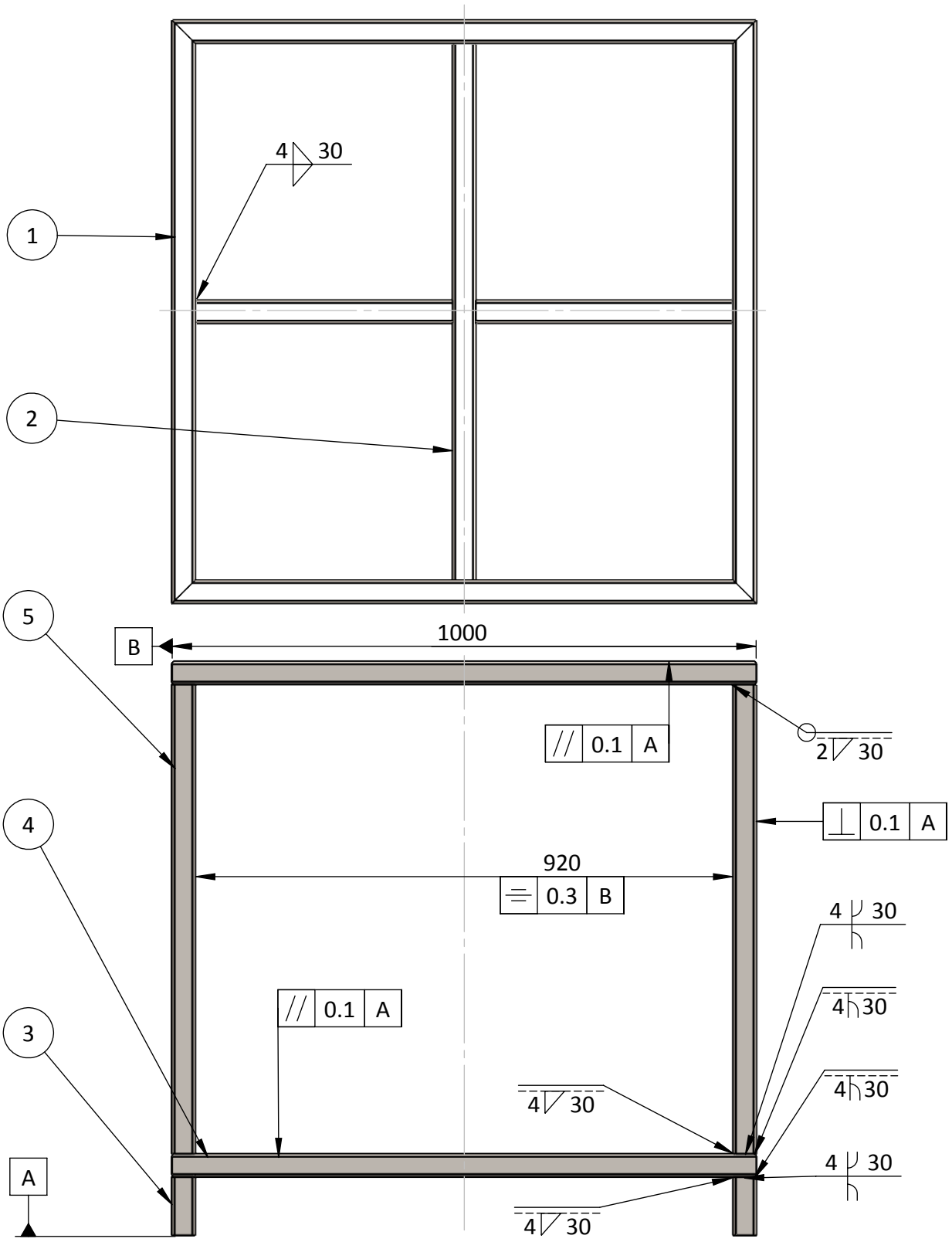
NATIONAL TECHNICAL UNIVERSITY OF ATHENS
DEPARTMENT OF MECHANICAL ENGINEERING
MACHINE DESIGN LABORATORY

Designed by: **Ch. Marketos**
Checked by: **G. Kaisarlis**
Approved by: **V. Spitas**

Drawing No: **IPW_A_01**
Title: *main_skeleton_assembly*
General Tolerances: ISO 2768-m-K

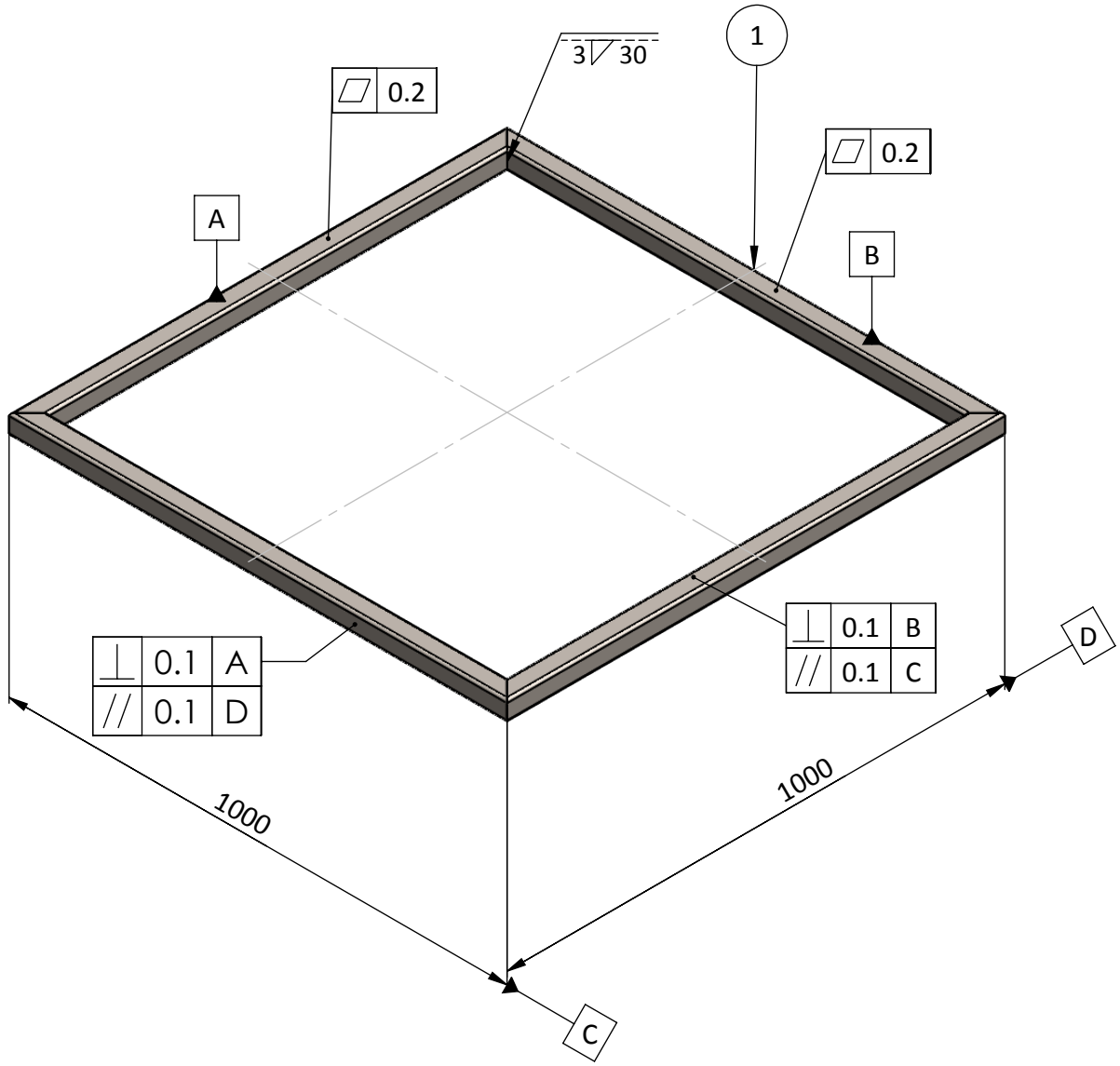
PROJECT: INDUSTRIAL PARTS WASHER

Date	Mass [kg]	Scale	Sheet
July 2018	77.5	1:10	1 of 1



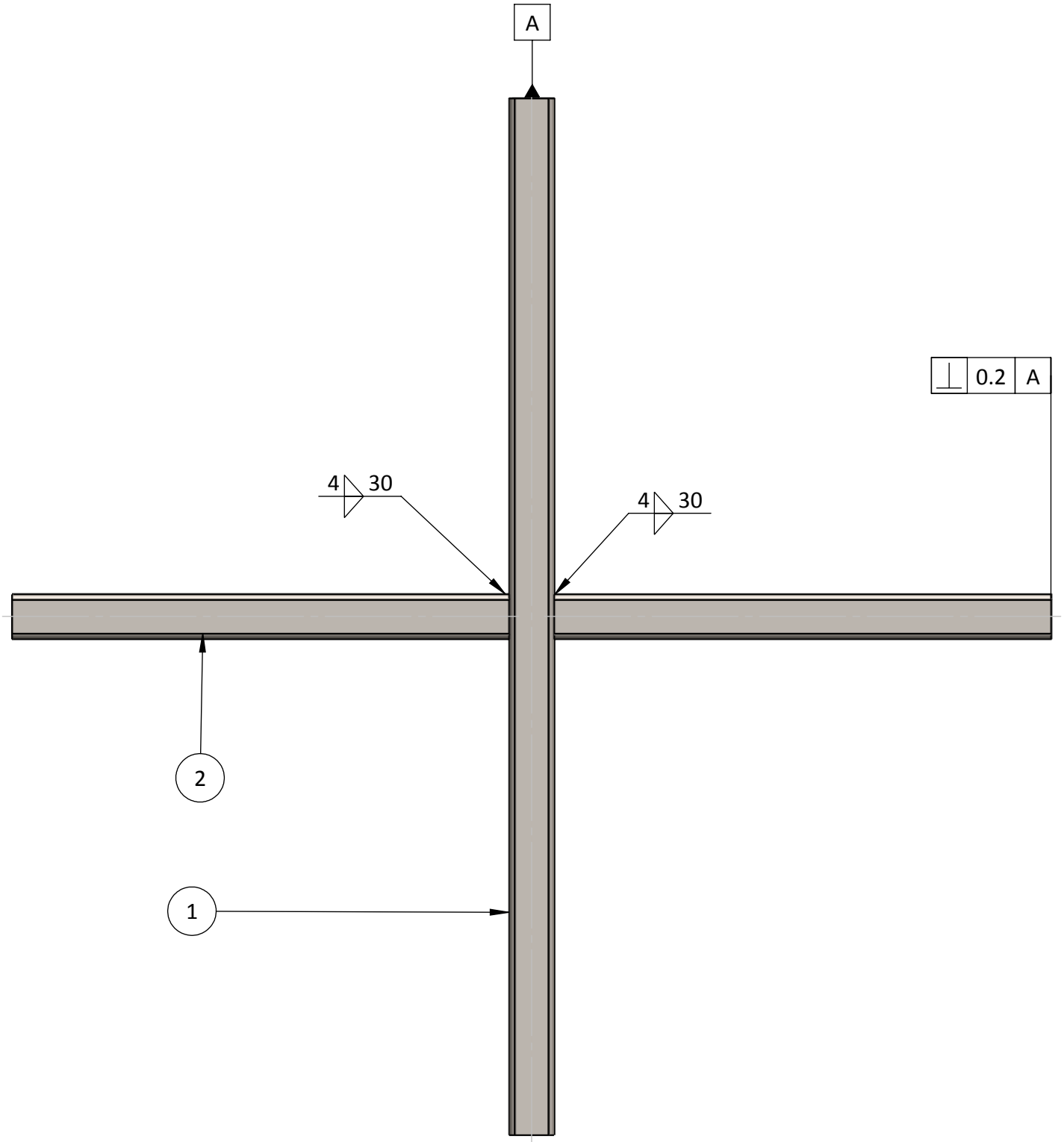
ITEM NO.	DRAWING NO.	DESCRIPTION	QTY.
1	IPW_A_01_01_01	main_skeleton_up_frame_subassembly	1
2	IPW_A_01_01_02	cross_subassembly	1
3	IPW_A_01_01_03	square tube 40x40x3, length 100	4
4	IPW_A_01_01_03	square tube 40x40x3, length 1000	4
5	IPW_A_01_01_03	square tube 40x40x3, length 736	4

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**	Drawing No:**IPW_A_01_01** Title: *welded_skeleton_subassembly* General Tolerances: ISO 2768-m-K			
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Mass [kg] 43.9	Scale 1:10	Sheet 1 of 1	



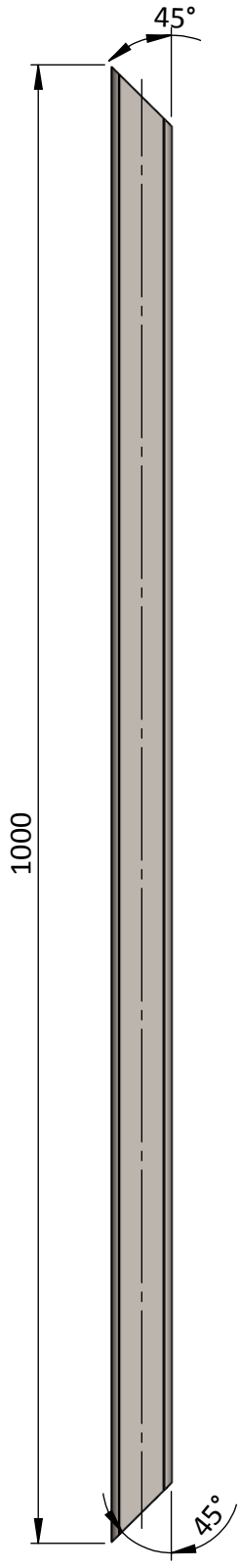
ITEM NO.	DRAWING NO	PART NUMBER	QTY.
1	IPW_A_01_01_03	square tube 40x40x3, length 1000	4

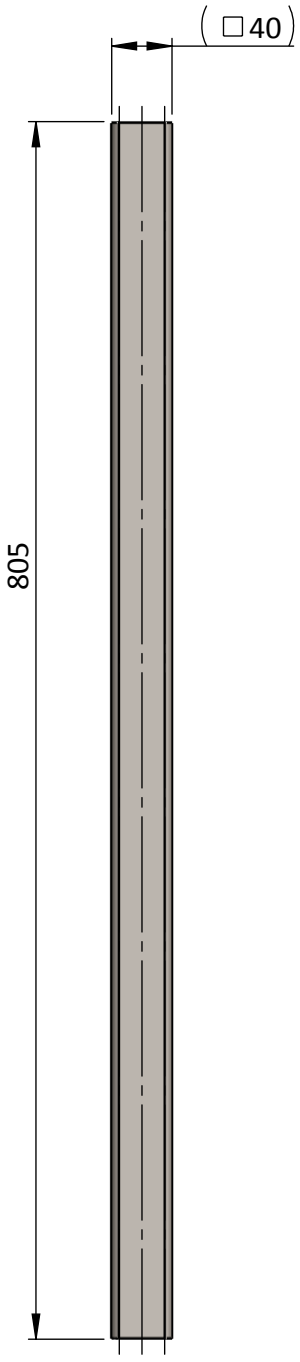
NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**	Drawing No:**IPW_A_01_01_01** Title: *up_frame_subassembly* General Tolerances: ISO 2768-m-K		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Mass [kg] 12.9	Scale 1:10	Sheet 1 of 1

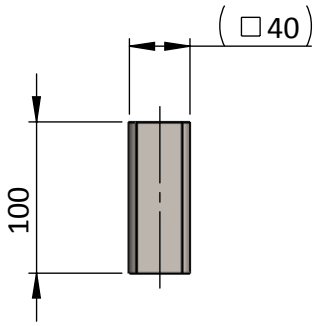


ITEM NO.	DRAWING NO.	DESCRIPTION	QTY.
1	IPW_A_01_01_03	square_tube1	1
2	IPW_A_01_01_03	square_tube2	2

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**	Drawing No:**IPW_A_01_01_02** Title: *cross_subassembly* General Tolerances: ISO 2768-m-K		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Mass [kg] 6.03	Scale 1:5	Sheet 1 of 1

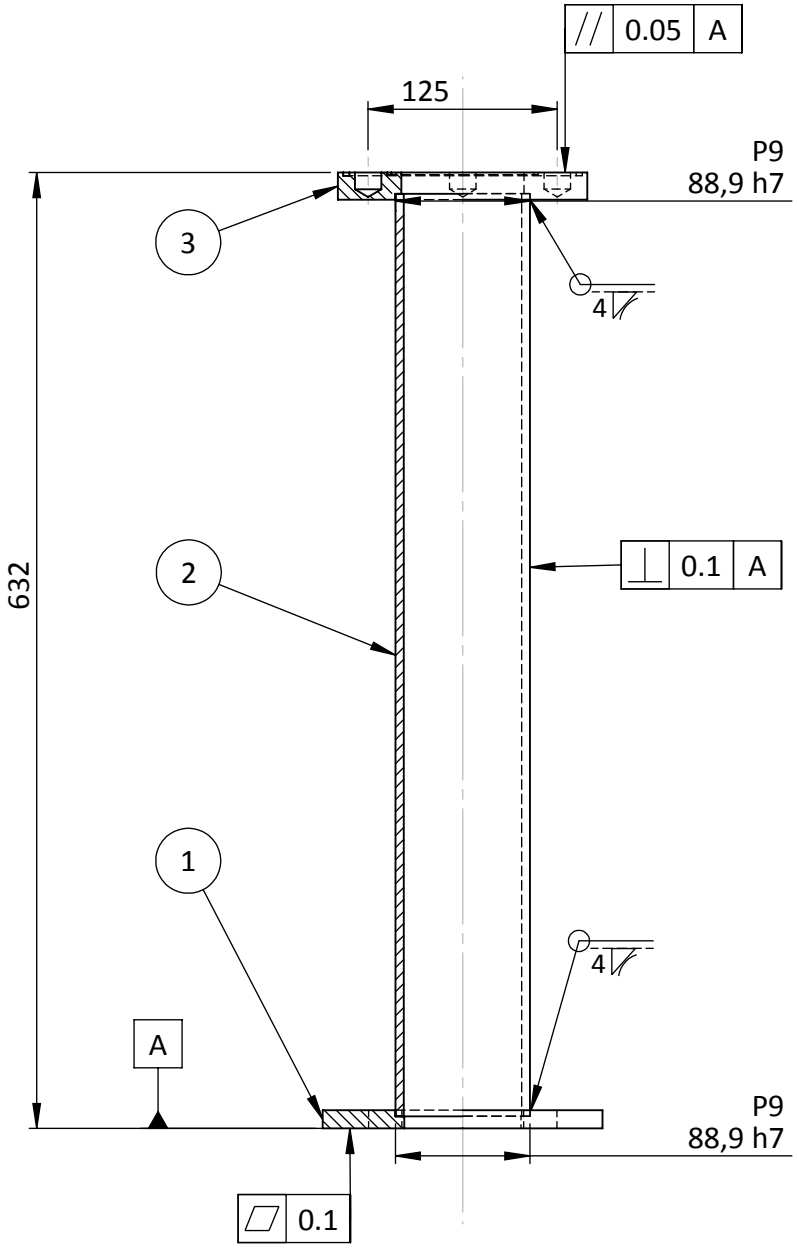






Note: Square tube 40x40x3, length 1000 Square tube 40x40x3, length 805 Square tube 40x40x3, length 100

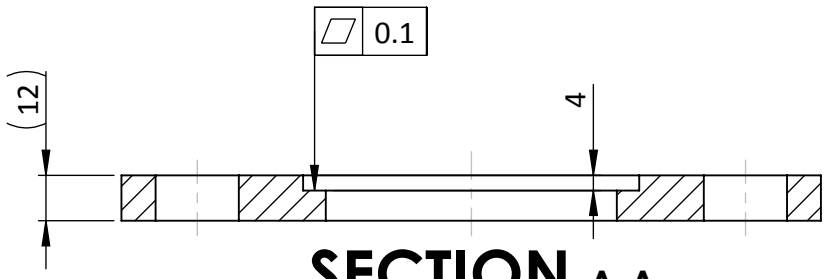
NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_A_01_01_03** Title: *square_tube_different_sizes* General Tolerances: ISO 2768-m-K		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material Carbon Steel	Mass [kg] [-]	Scale 1:10	Sheet 1 of 1



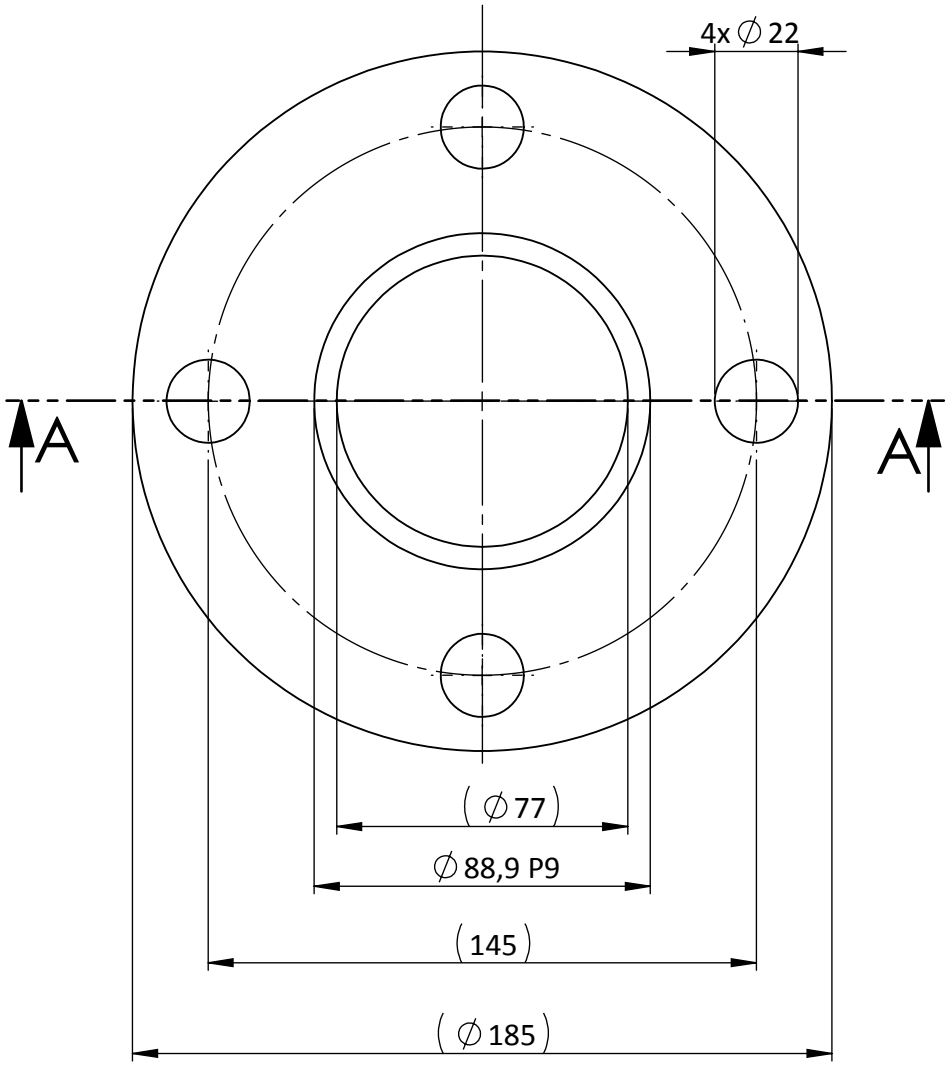
Note: Support tube pressed on the flanges and then the welds

ITEM NO.	DRAWING NO.	DESCRIPTION	QTY.
1	IPW_A_1_2_1	flange_down (2 1/2")	1
2	IPW_A_1_2_2	support_tube (3",OD88.9,t=5.5),length 597	1
3	IPW_A_1_2_3	flange_up (2")	1

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**	Drawing No:**IPW_A_01_02** Title: *support_cylinder_subassembly* General Tolerances: ISO 2768-m-K			
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Mass [kg] 11	Scale 1:5	Sheet 1 of 1	



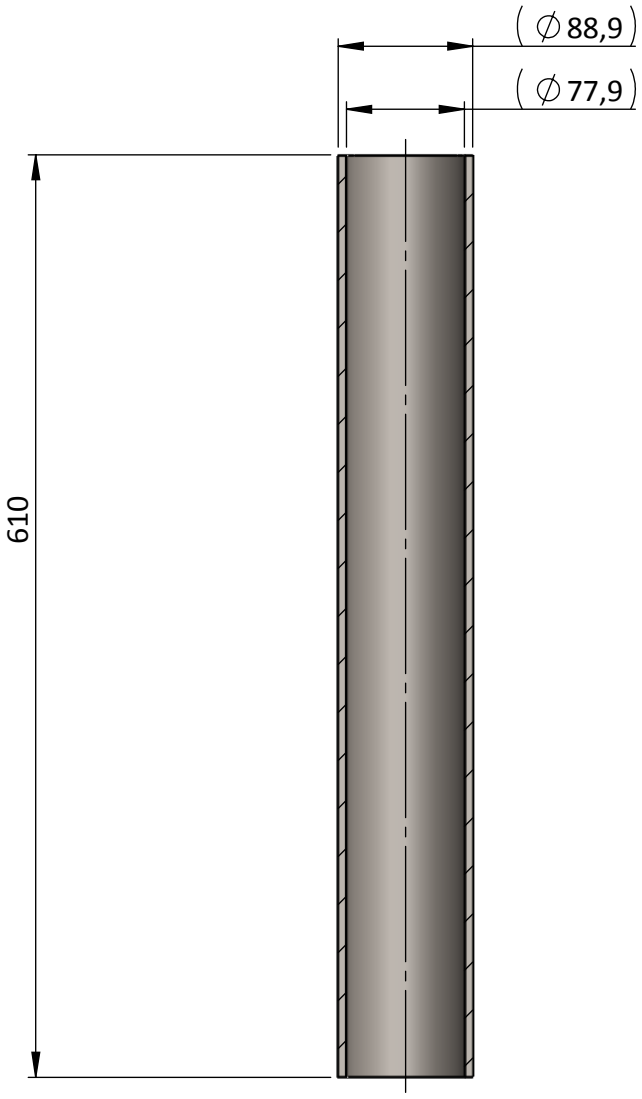
SECTION A-A



Note: Flange 2 1/2",62-1501 (DIN 2576), machine internal from (∅77) to ∅88,9 P9 , ⩛ 4

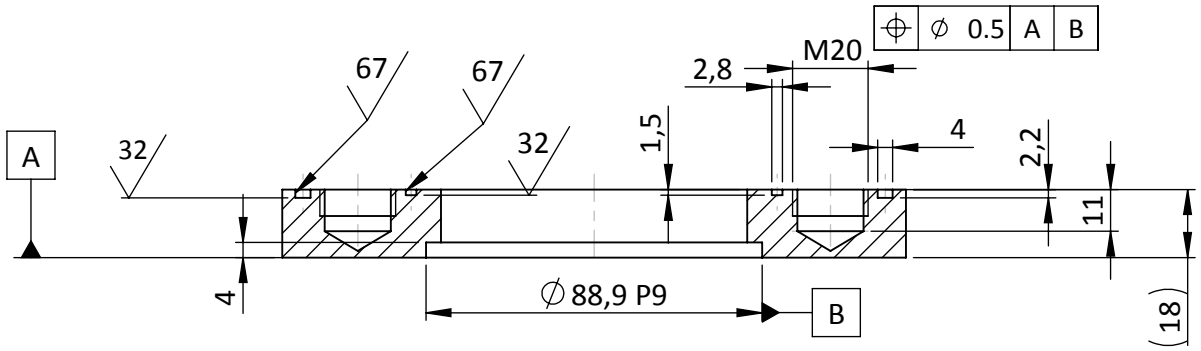
Note: Holes enlargement from ∅ 18 to ∅22 (holes for M20 bolt)

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_A_01_02_01** Title: *flange_down* General Tolerances: ISO 2768-m-K		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material Garbon Steel	Mass [kg] 2	Scale 1:2	Sheet 1 of 1

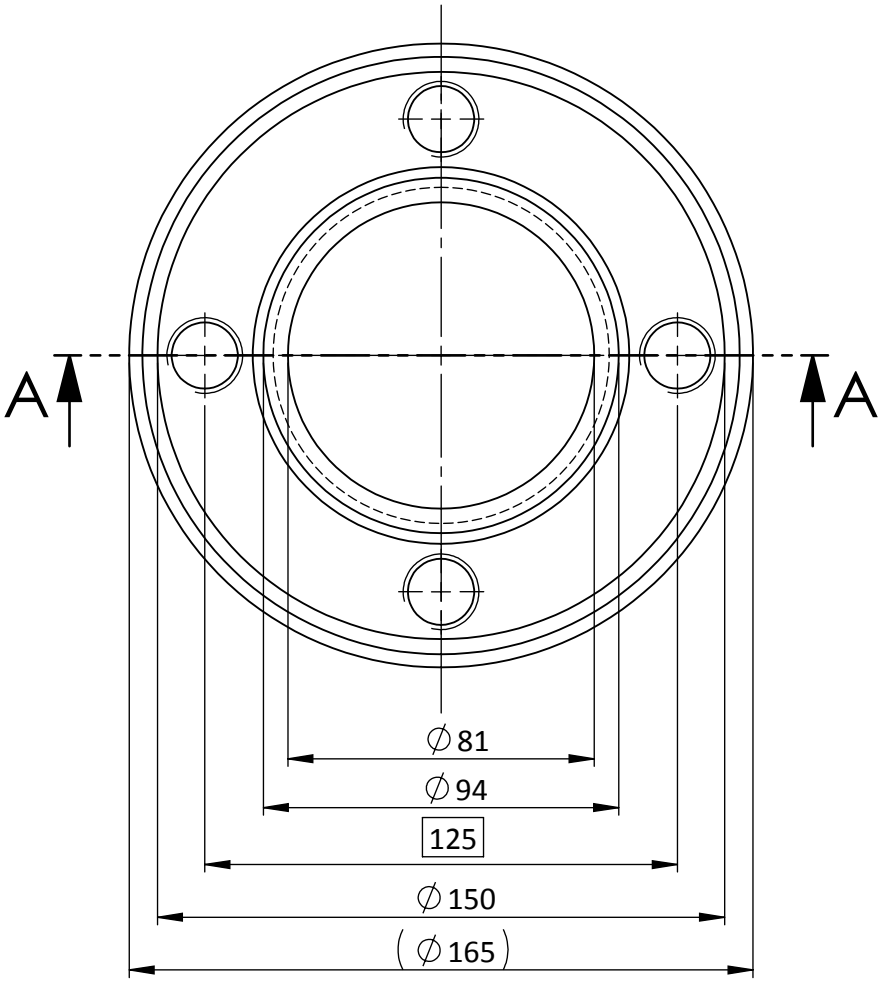


Note: Tube 3" Sch 40S (ASTM A312-2001) , outside diameter 88.9mm, thickness 5.5mm, lenght 610

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_A_01_02_02** Title: *support_tube* General Tolerances: ISO 2768-m-K		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material Garbon Steel	Mass [kg] 6.9	Scale 1:5	Sheet 1 of 1



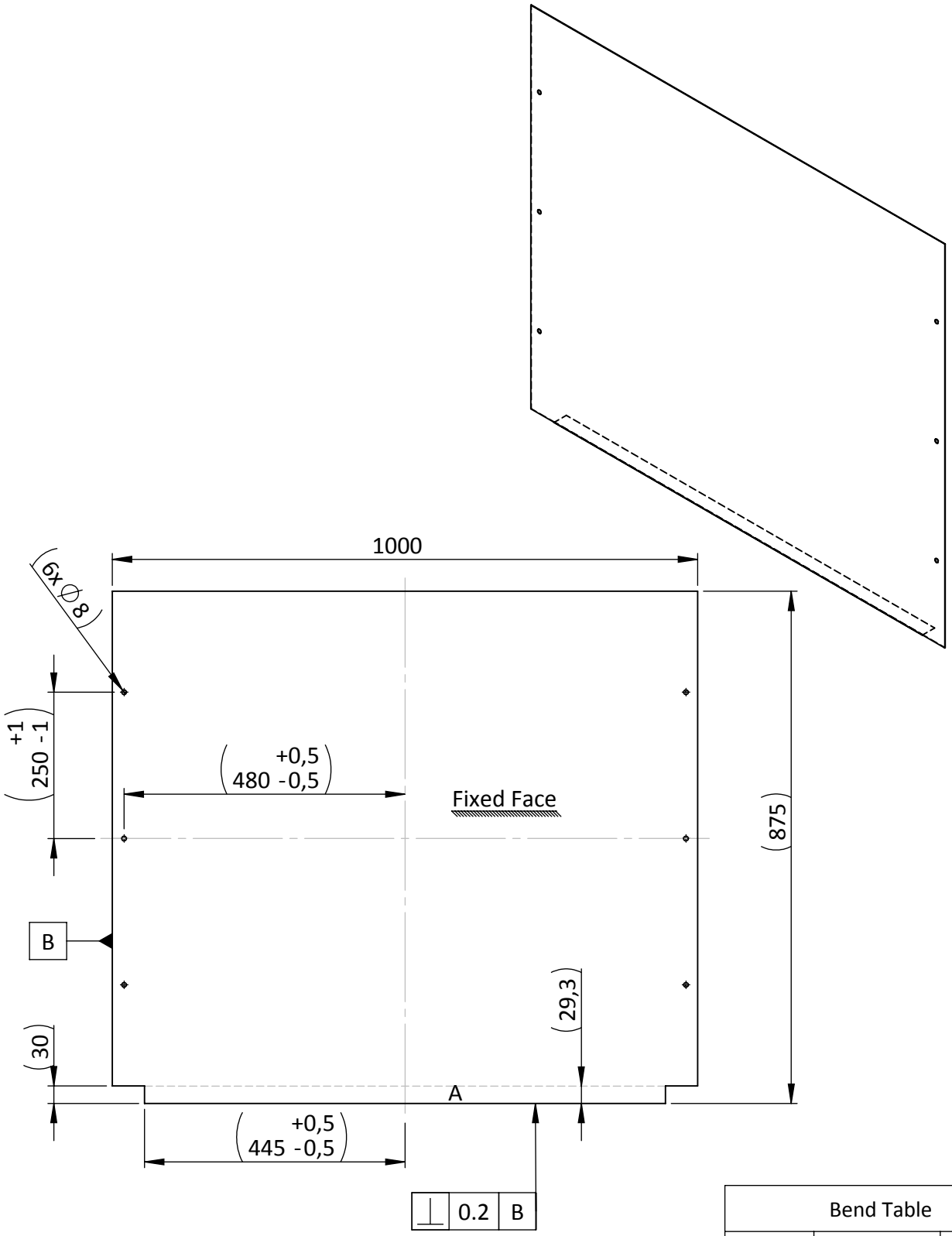
SECTION A-A



Note: Flange 2"without bolt holes, 62-1501 (DIN 2576)

Phase 1: Machine internal from ∅ 61 to ∅81 , THRU ALL
Phase 2: Machine internal from ∅81 to ∅88,9 P9 , ↧ 4
Phase 3: Drill 4x∅18 holes with centre-to-centre distance 125 mm, ↧ 12, threads M20 to ∅18 holes, ↧ 12
Phase 4: O-rings groove ID ∅94 , width 2.8mm, ↧ 1.5
Phase 5: O-rings groove ID ∅150 , width 4mm, ↧ 2.2
Note: All groove radius 0.013-0.51mm

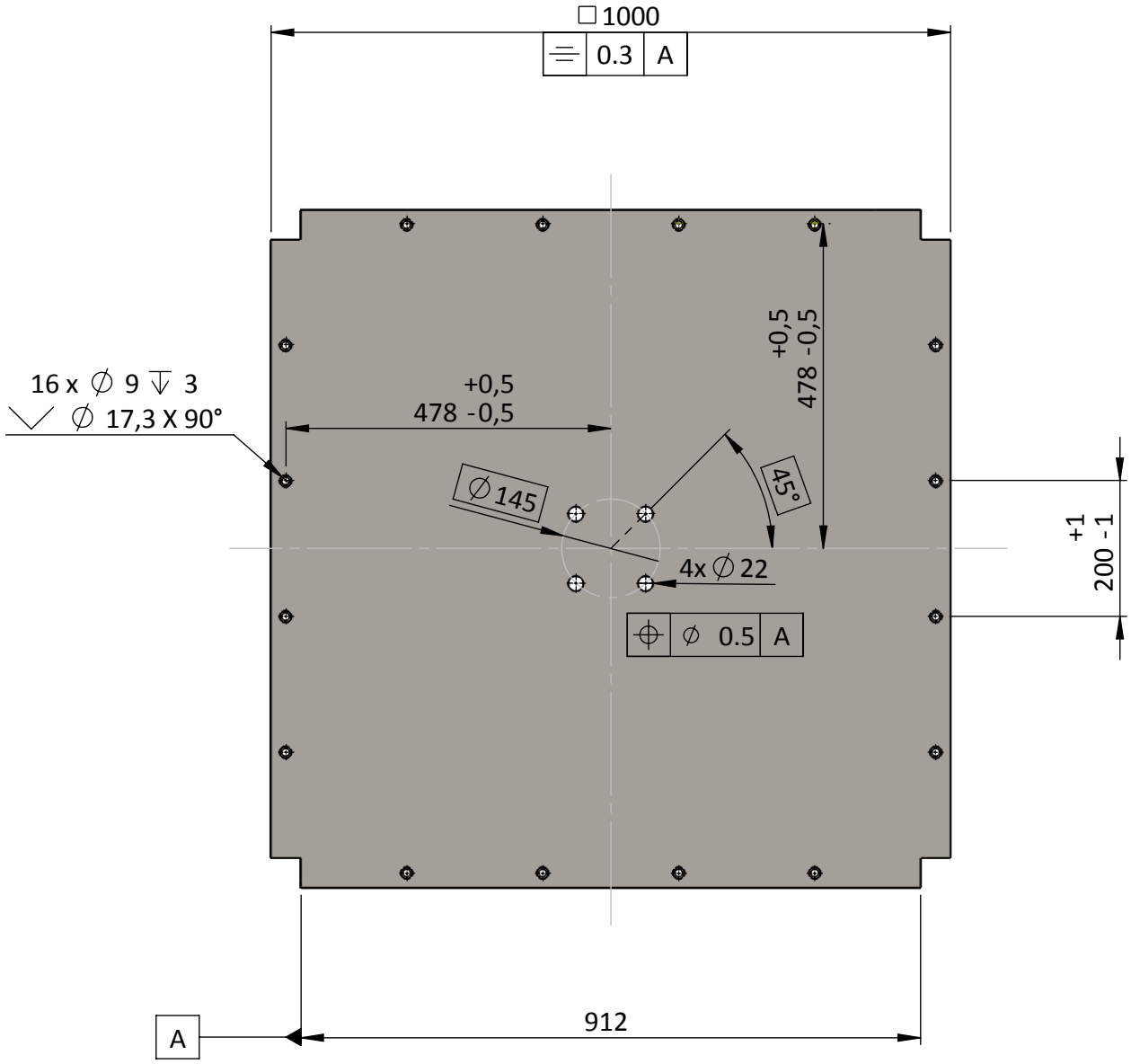
NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_A_01_02_03** Title: *flange_up* General Tolerances: ISO 2768-m-K		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material Garbon Steel	Mass [kg] 2.2	Scale 1:2	Sheet 1 of 1



Bend Table		
Tag	Direction	Angle
A	DOWN	90°

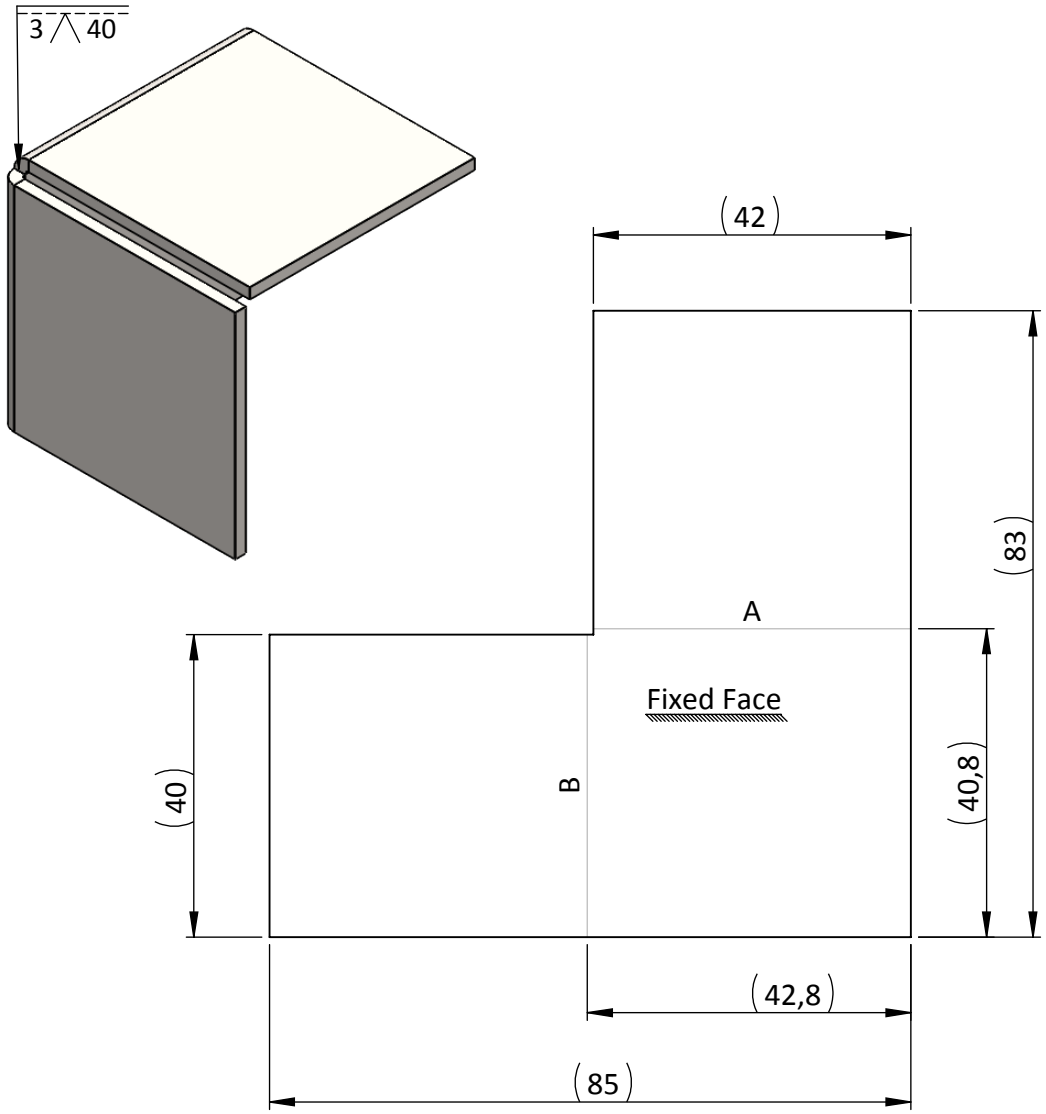
Note: Radius of curvate of the bend sheet as result from the bending machine
Note: Sheet metal thickness=1mm

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_A_02** Title: *cover_back* General Tolerances: ISO 2768-c-L		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material Galvanized Steel	Mass [kg] 6.3	Scale 1:10	Sheet 1 of 1



Note: Sheet metal thickness=3mm

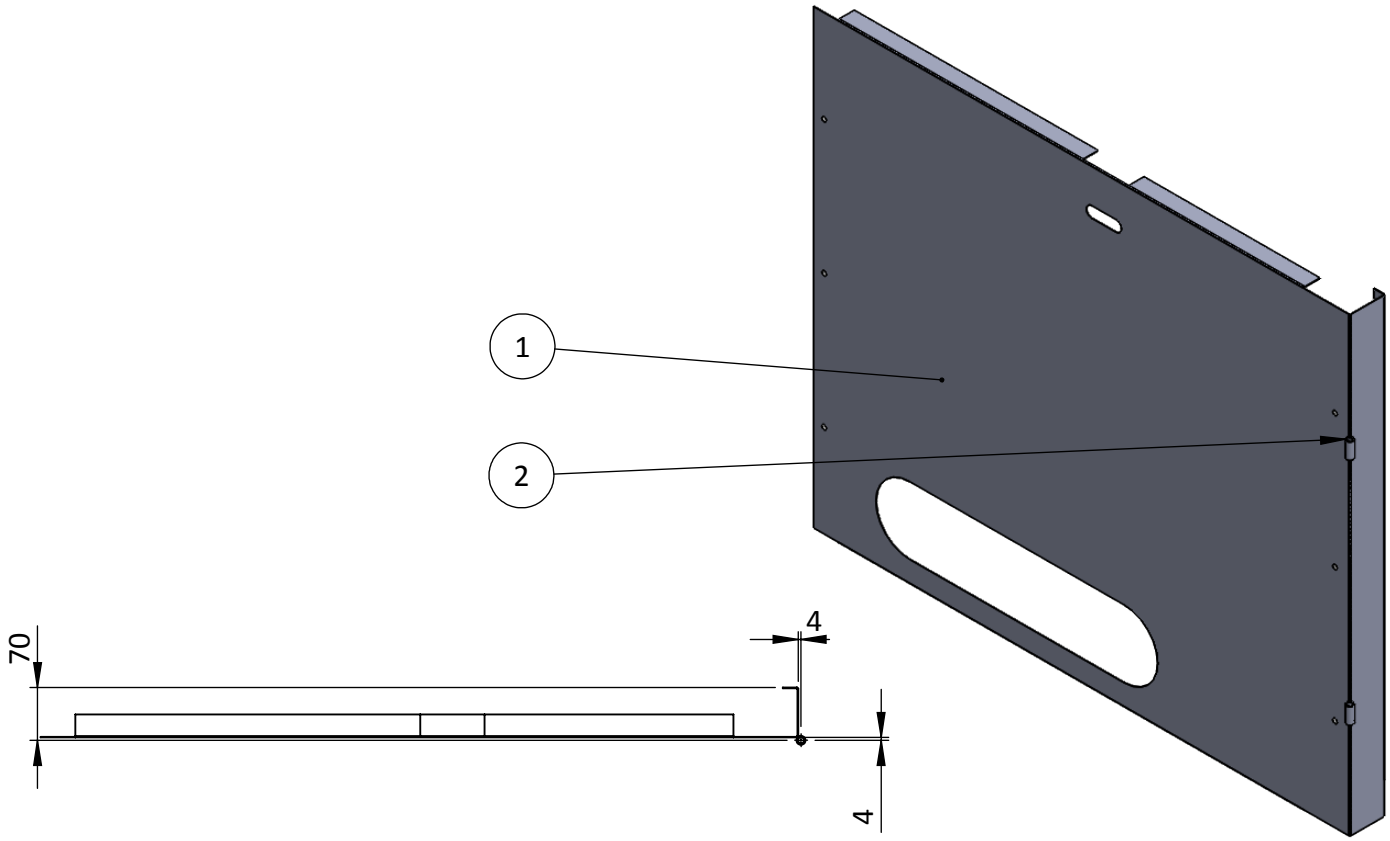
NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_A_01_03** Title: *plate* General Tolerances: ISO 2768-m-K		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material Carbon Steel	Mass [kg] 31.2	Scale 1:10	Sheet 1 of 1

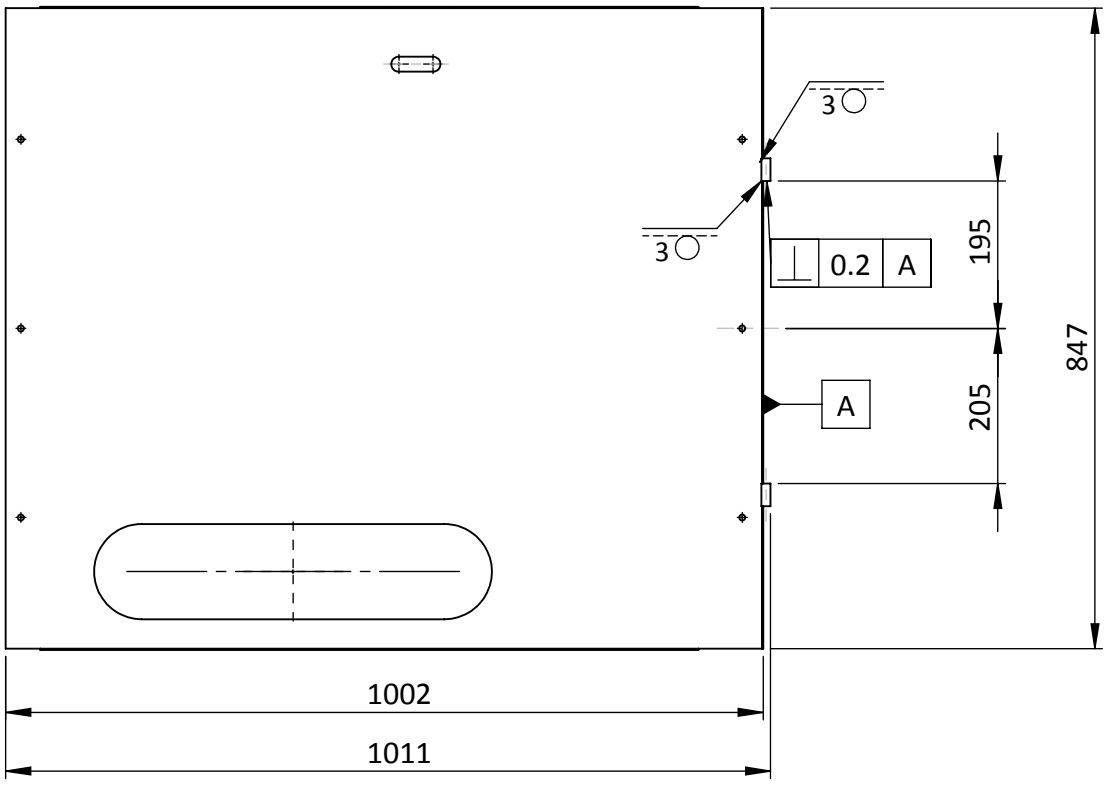


Note: Radius of curvate of the bend sheet as result from the bending machine

Tag	Direction	Angle
A	UP	90°
B	UP	90°

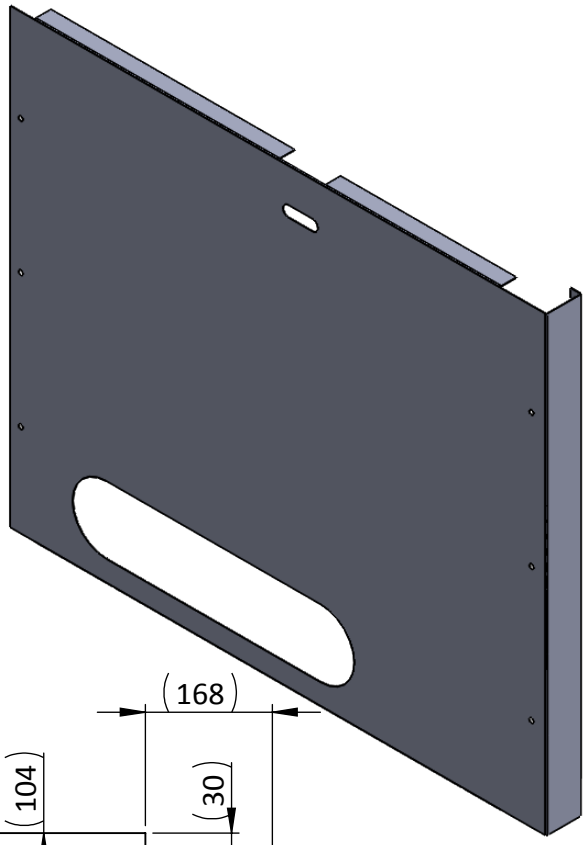
NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_A_01_04** Title: *cover_corner* General Tolerances: ISO 2768-c-L		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material Galvanized Steel	Mass [kg] 0.085	Scale 1:1	Sheet 1 of 1

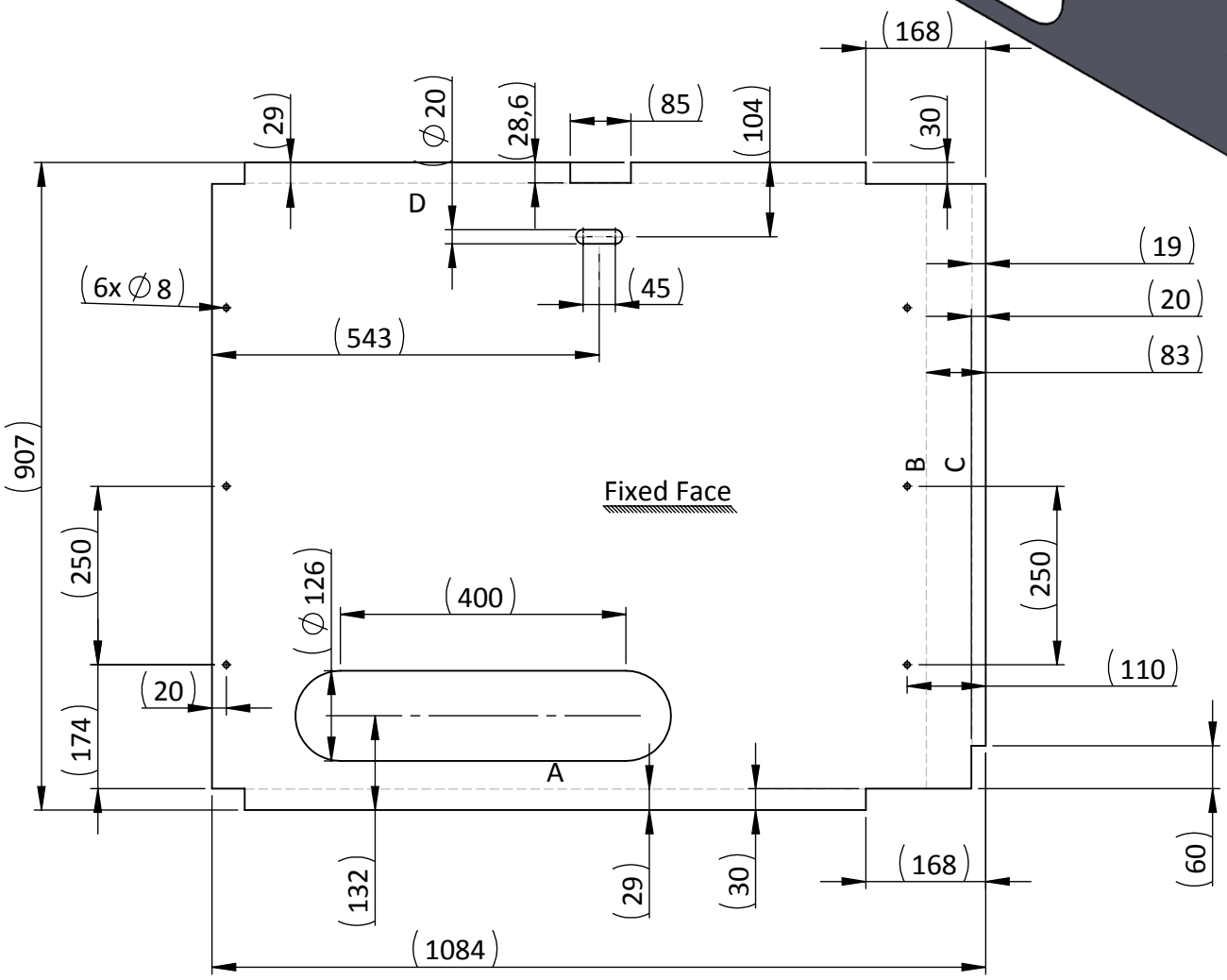




ITEM NO.	DRAWING NO.	DESCRIPTION	QTY.
1	IPW_A_03_01	cover_lateral_left_bend	1
2	IPW_A_03_02	cylinder_cover_lateral_hinge	2

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**	Drawing No:**IPW_A_03** Title: *cover_lateral_left_assembly* General Tolerances: ISO 2768-c-L		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Mass [kg] 7	Scale 1:10	Sheet 1 of 1



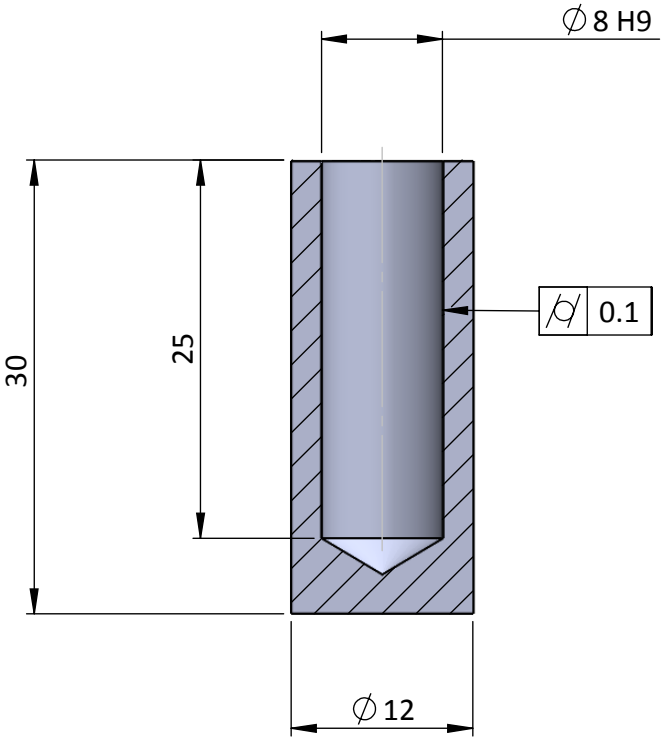


Note: Radius of curvate of the bend sheet as result from the bending machine

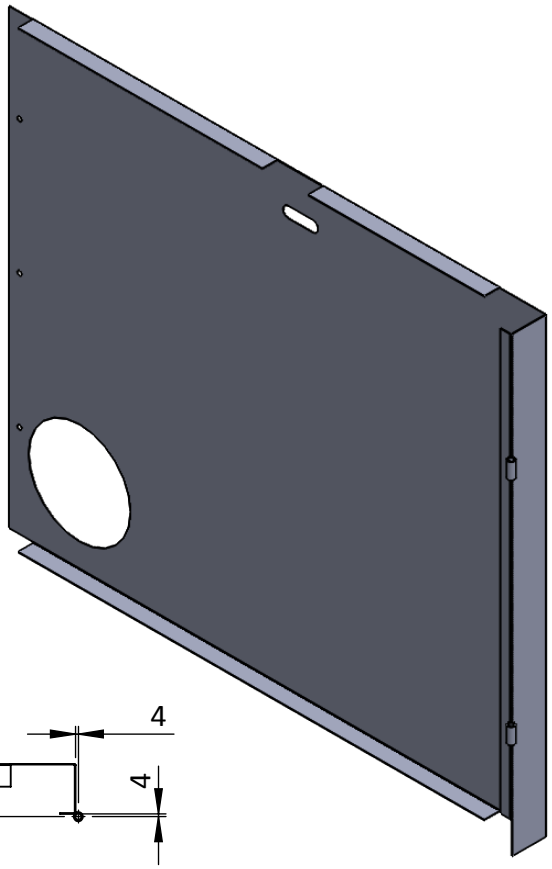
Note: Metal thickness=1mm

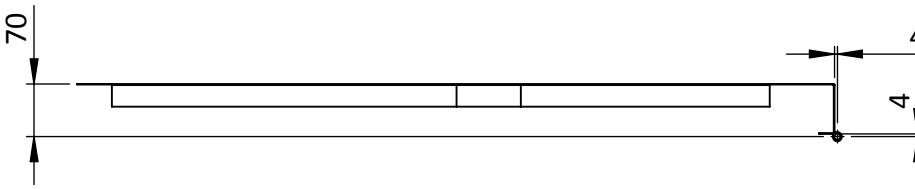
Tag	Direction	Angle
A	DOWN	90°
B	DOWN	90°
C	DOWN	90°
D	DOWN	90°

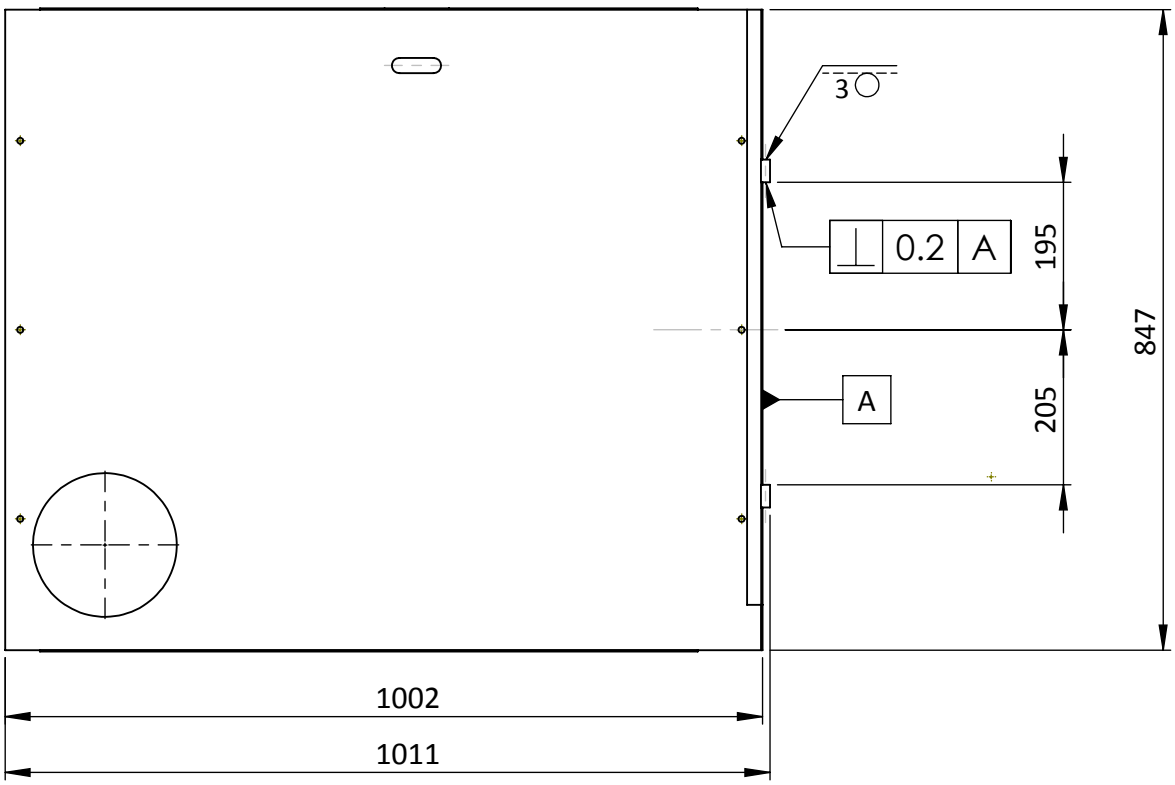
NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No: **IPW_A_03_01** Title: *cover_left_sheet_metal* General Tolerances: ISO 2768-c-L		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material Galvanized Steel	Mass [kg] 7	Scale 1:10	Sheet 1 of 1



NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_A_03_02** Title: *cylinder_cover_lateral_hinge* General Tolerances: ISO 2768-m-K		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material Galvanized Steel	Mass [kg] 0.03	Scale 2:1	Sheet 1 of 1

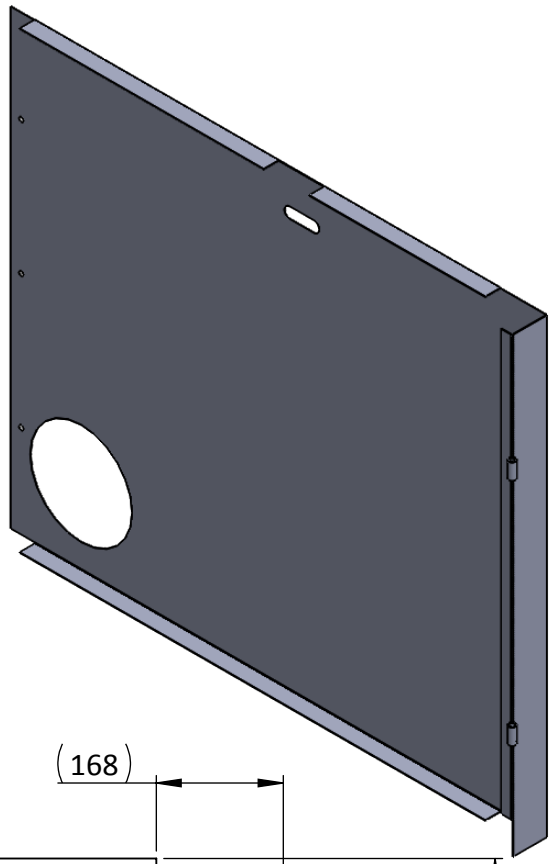


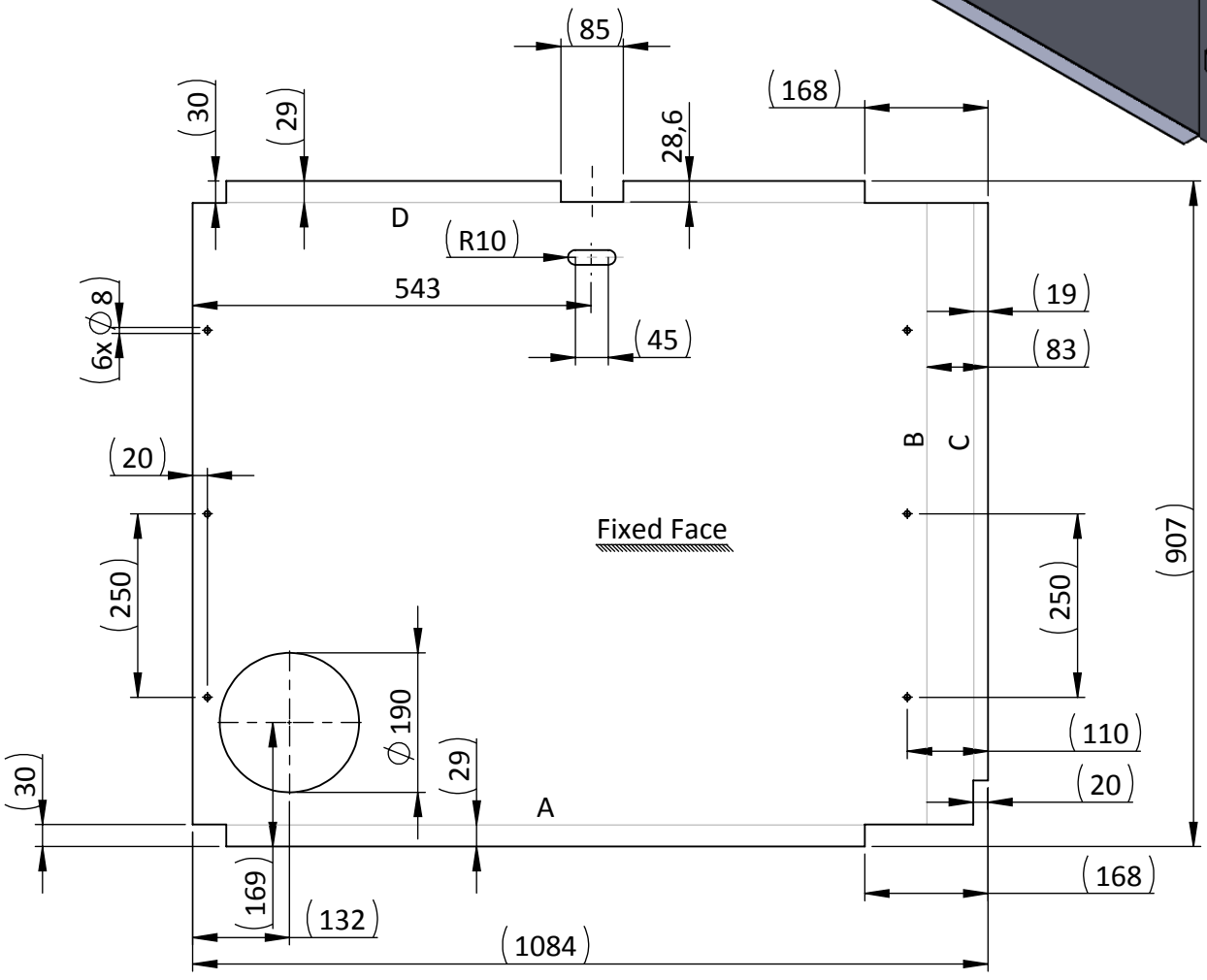




ITEM NO.	DRAWING NO.	DESCRIPTION	QTY.
1	IPW_A_04_01	cover_lateral_right_sheet_metal	1
2	IPW_A_03_02	cylinder_cover_lateral_hinge	2

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**	Drawing No: **IPW_A_04** Title: *cover_lateral_right_assembly* General Tolerances: ISO 2768-m-K		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Mass [kg] 7	Scale 1:10	Sheet 1 of 1



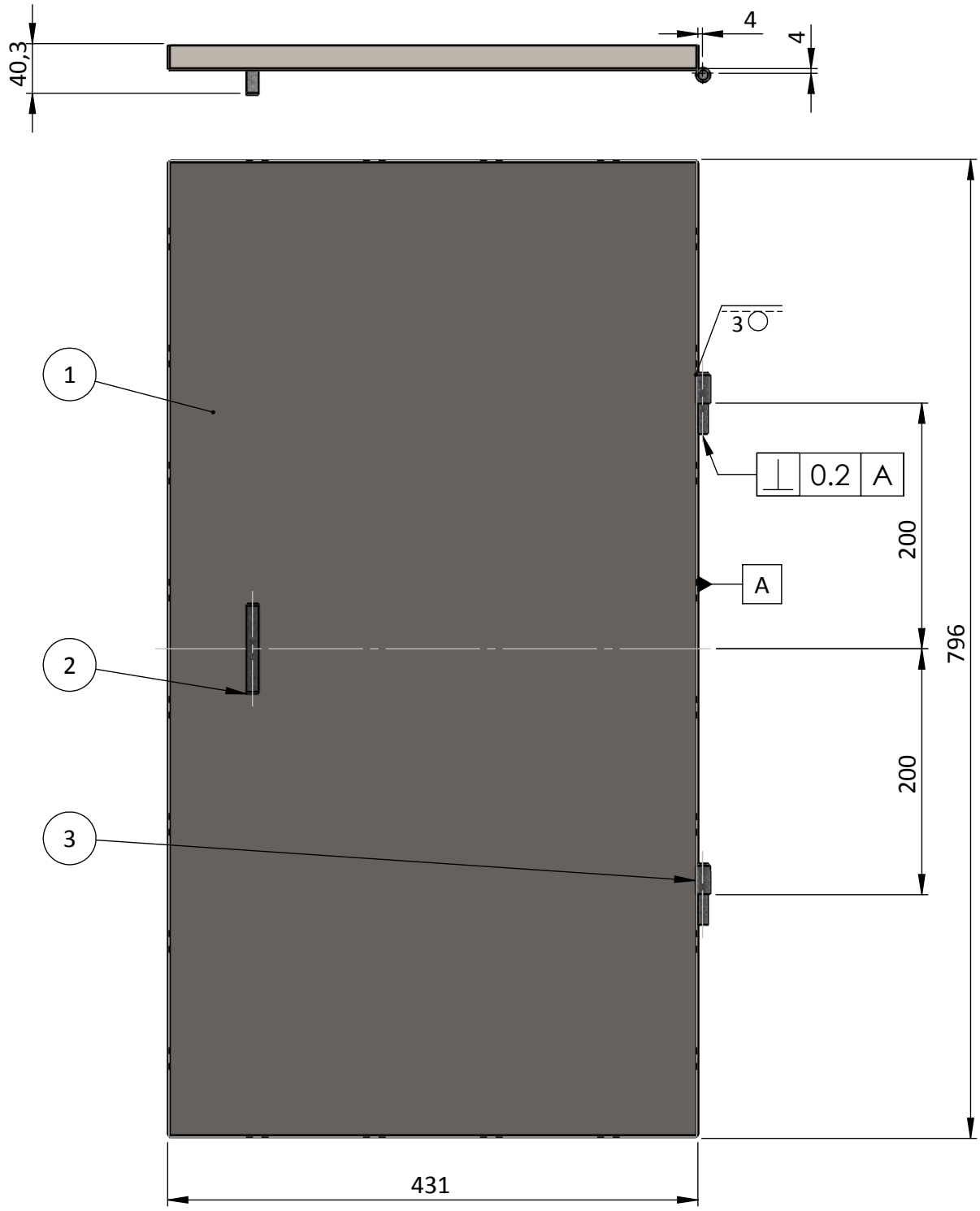


Note: Radius of curvate of the bend sheet as result from the bending machine

Note: Sheet metal thickness=1mm

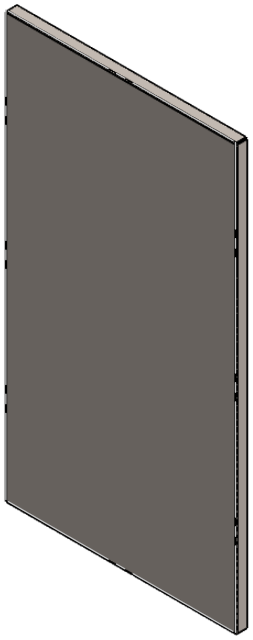
Tag	Direction	Angle
A	UP	90°
B	UP	90°
C	UP	90°
D	UP	90°

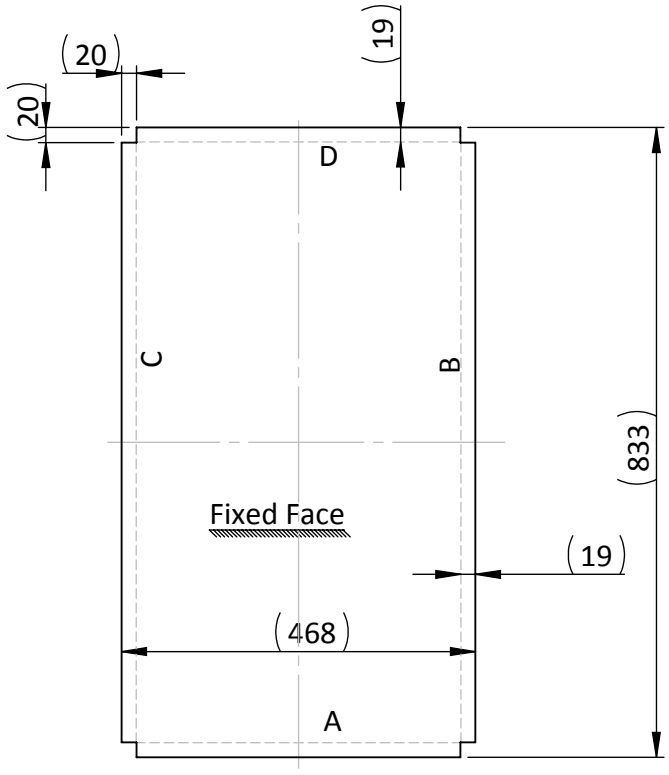
NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No: **IPW_A_04_01** Title: *cover_lateral_right_sheet_metal* General Tolerances: ISO 2768-c-L		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material Galvanized Steel	Mass [kg] 7	Scale 1:10	Sheet 1 of 1



ITEM NO.	DRAWING NO.	DESCRIPTION	QTY.
1	IPW_A_05_01	door_bend	1
2	IPW_A_05_02	door_handle	1
3	IPW_A_05_03	door_hinge	2

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**	Drawing No:**IPW_A_05** Title: *door_right_assembly* General Tolerances: ISO 2768-c-L		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Mass [kg] 2.9	Scale 1:5	Sheet 1 of 1



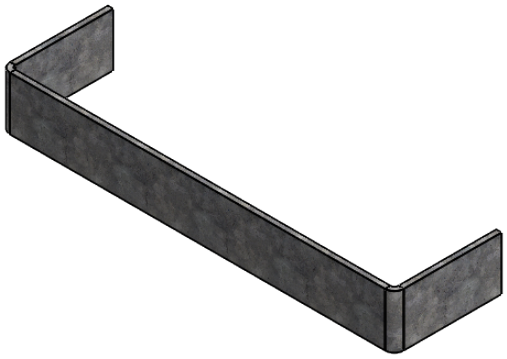


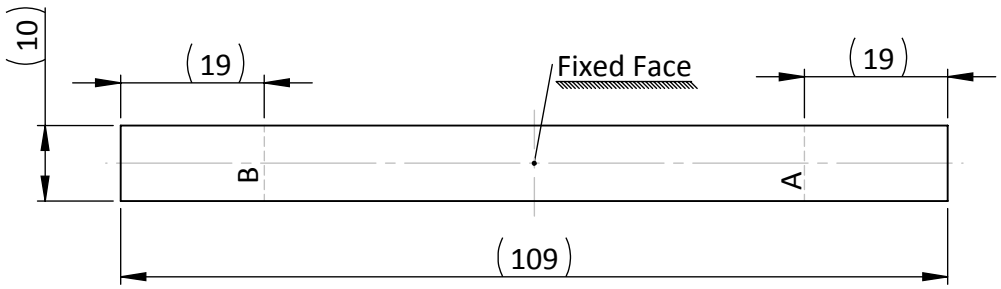
Note: Radius of curvate of the bend sheet as result from the bending machine

Note: Sheet metal thickness=1mm

Tag	Direction	Angle
A	DOWN	90°
B	DOWN	90°
C	DOWN	90°
D	DOWN	90°

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No: **IPW_A_05_01** Title: *door_sheet_metal* General Tolerances: ISO 2768-c-L		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material Galvanized Steel	Mass [kg] 2.9	Scale 1:10	Sheet 1 of 1



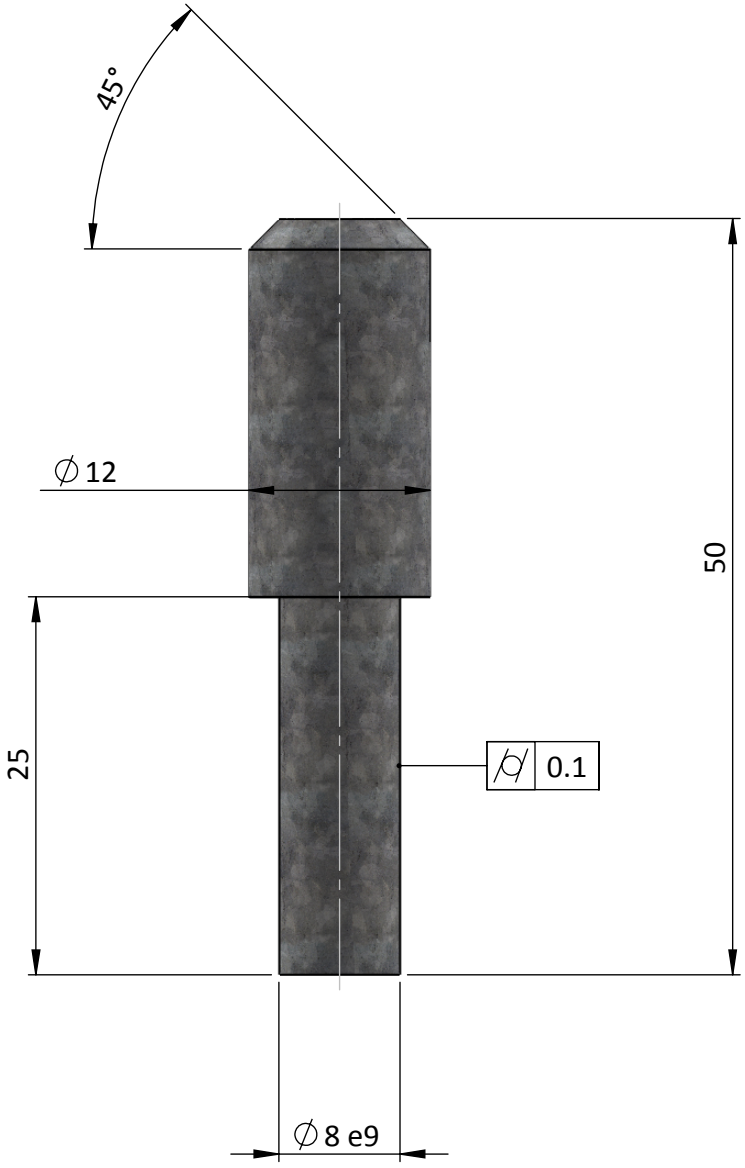


Note: Radius of curvate of the bend sheet as result from the bending machine

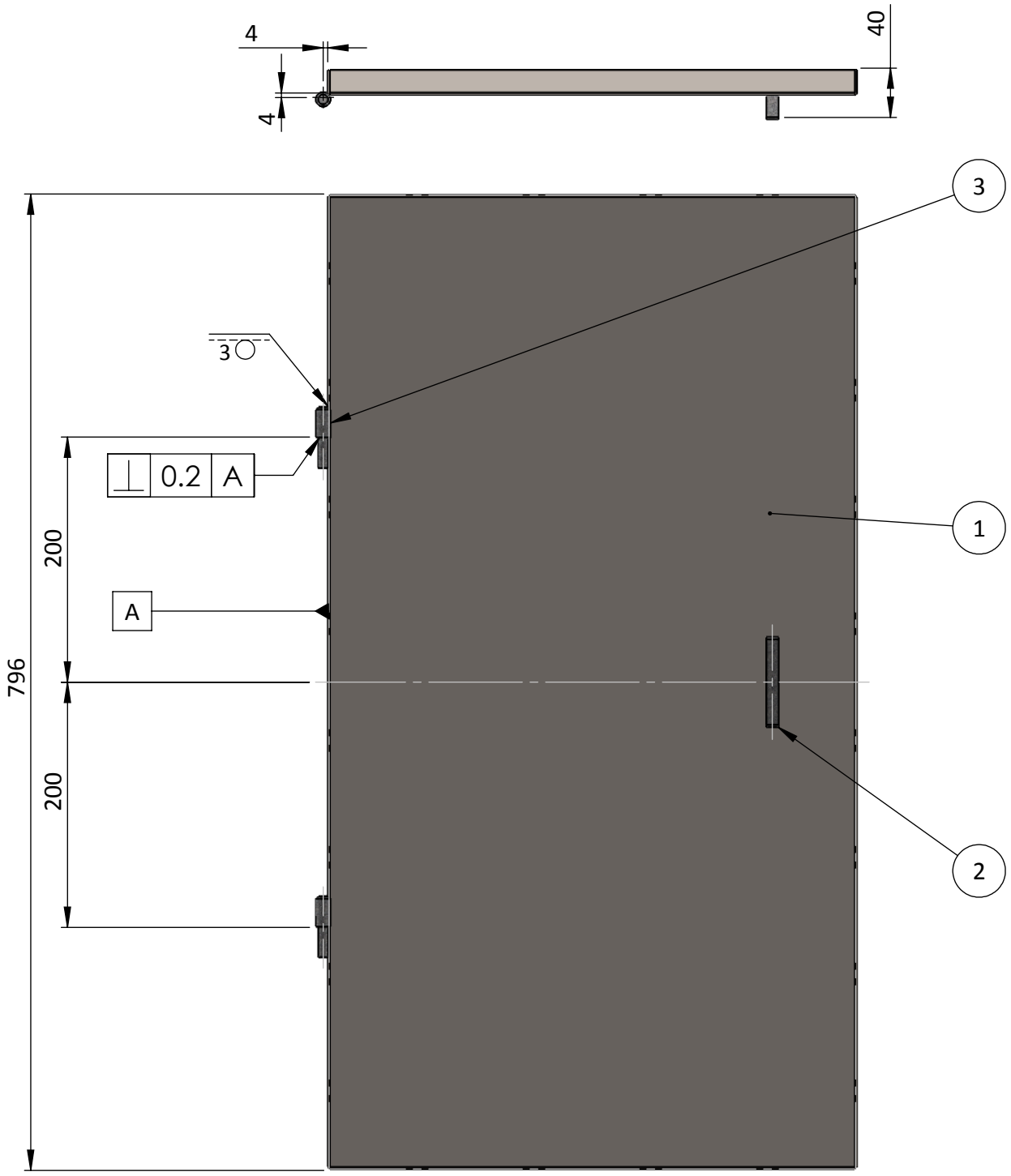
Note: Sheet metal thickness=1mm

Tag	Direction	Angle
A	DOWN	90°
B	DOWN	90°

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_A_05_02** Title: *door_handle* General Tolerances: ISO 2768-c-L		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material Galvanized Steel	Mass [kg] 0.009	Scale 1:1	Sheet 1 of 1

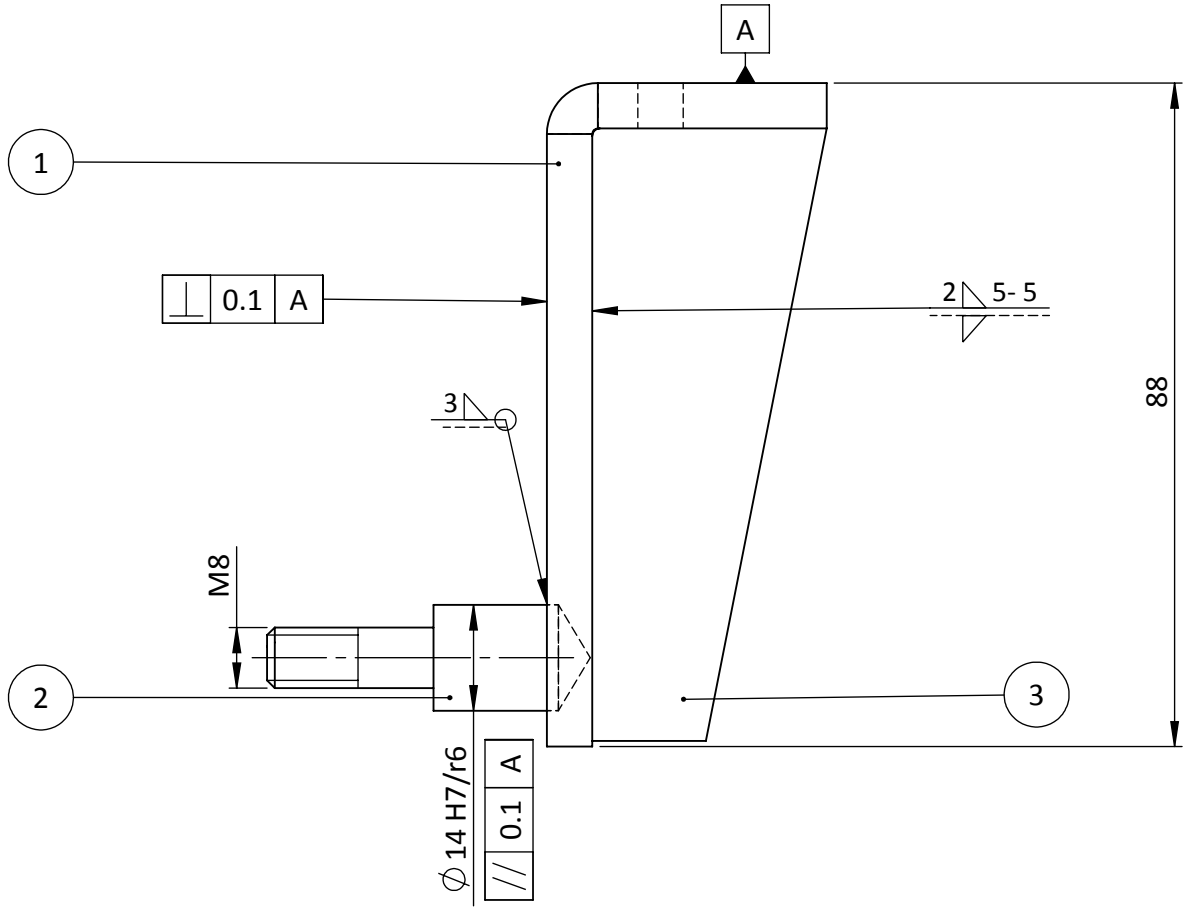


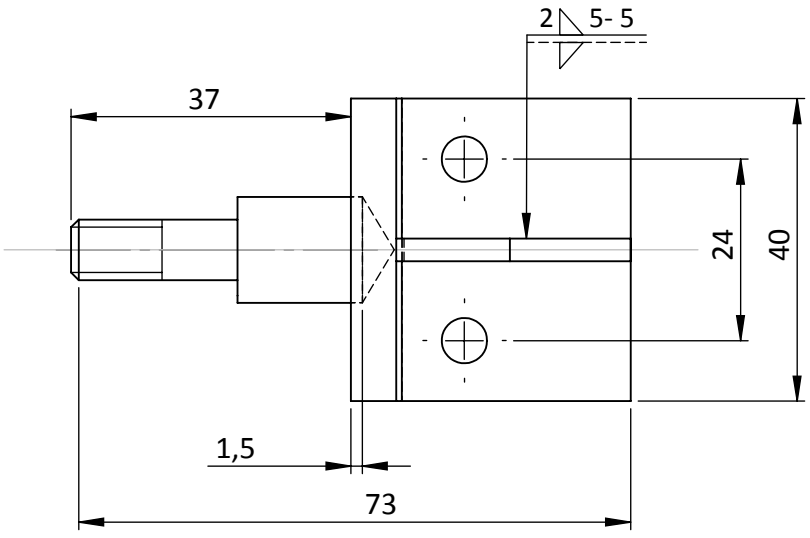
NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_A_05_03** Title: *door_hinge* General Tolerances: ISO 2768-m-K		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material Galvanized Steel	Mass [kg] 0.032	Scale 2:1	Sheet 1 of 1



ITEM NO.	DRAWING NO.	DESCRIPTION	QTY.
1	IPW_A_05_01	door_bend	1
2	IPW_A_05_02	door_handle	1
3	IPW_A_05_03	door_hinge	2

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**	Drawing No:**IPW_A_06** Title: *door_left_assembly* General Tolerances: ISO 2768-c-L		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Mass [kg] 2.9	Scale 1:5	Sheet 1 of 1

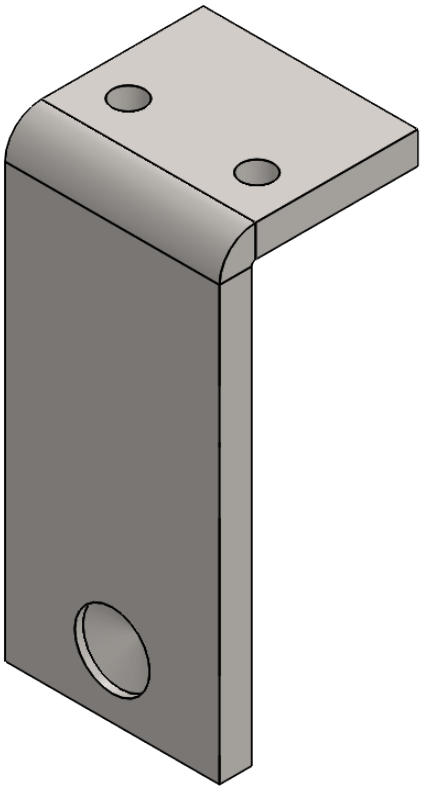


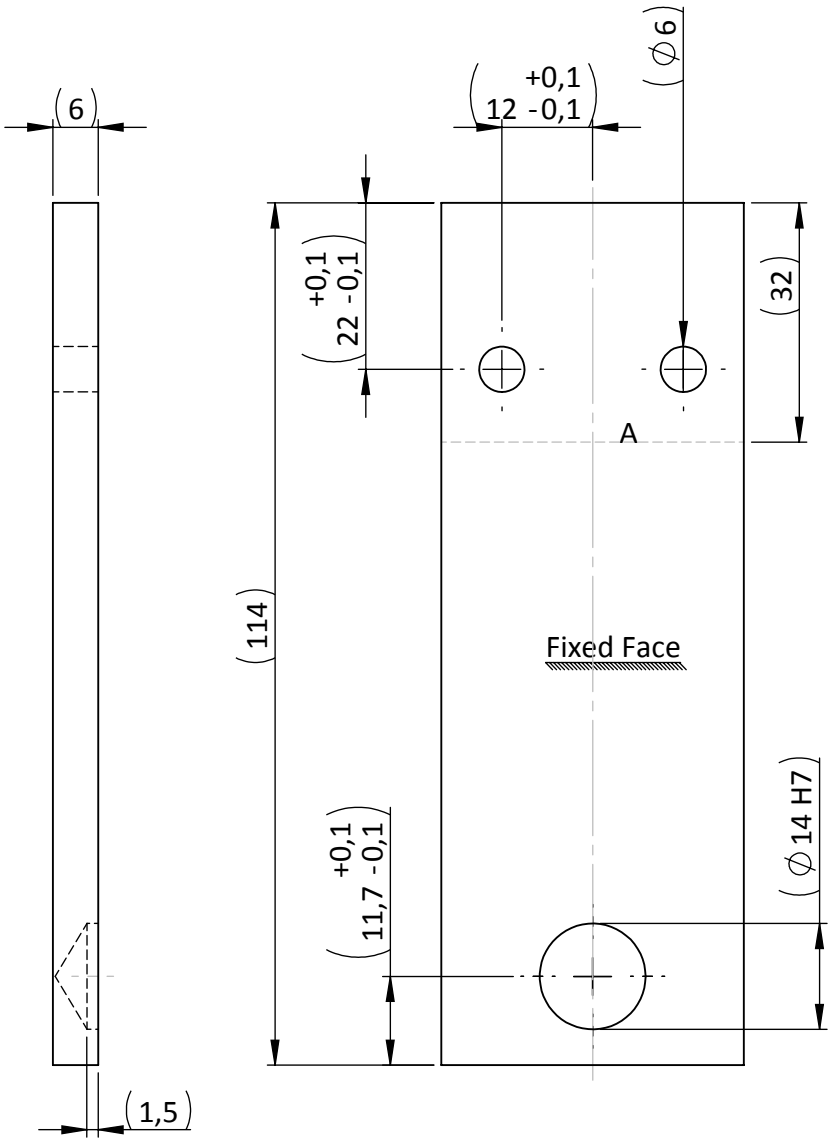


Note: Extension_cylinder first pressed by 1.5mm on the extension_sheet_metal hole ⌀14 and then the peripheral weld.

ITEM NO.	DRAWING NO.	DESCRIPTION	QTY.
1	IPW_A_07_01	extension_sheet_metal_draw	1
2	IPW_A_07_02	extension_cylinder	1
3	IPW_A_07_03	extension_rib	1

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**	Drawing No:**IPW_A_07** Title: *extension_subassembly* General Tolerances: ISO 2768-m-K		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Mass [kg] 0.287	Scale 1:1	Sheet 1 of 1



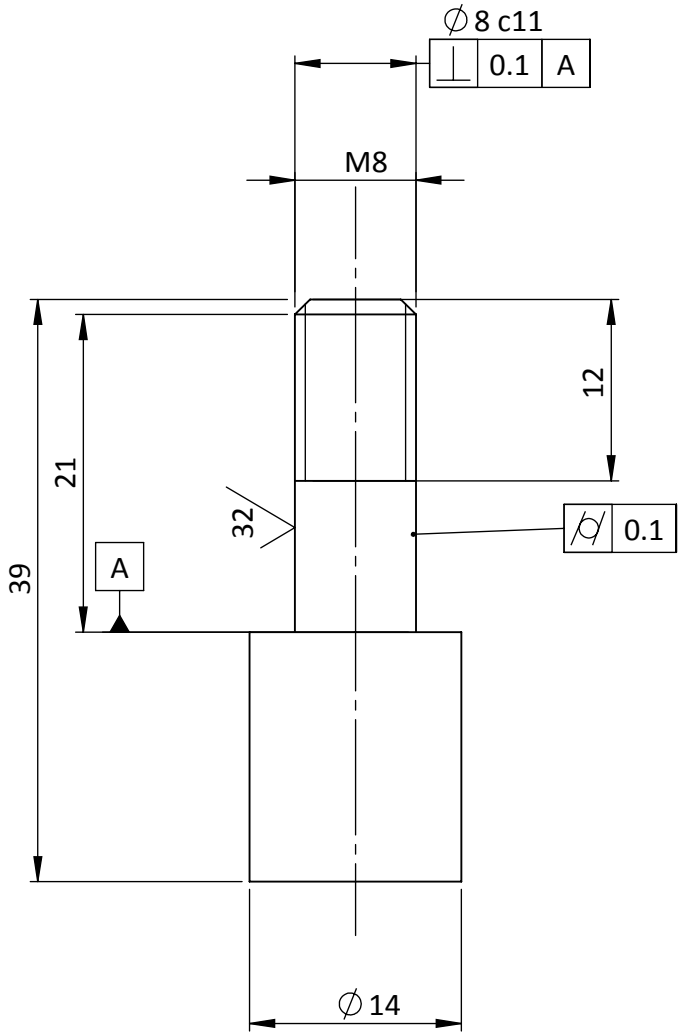


Note: Radius of curvate of the bend sheet as result from the bending machine

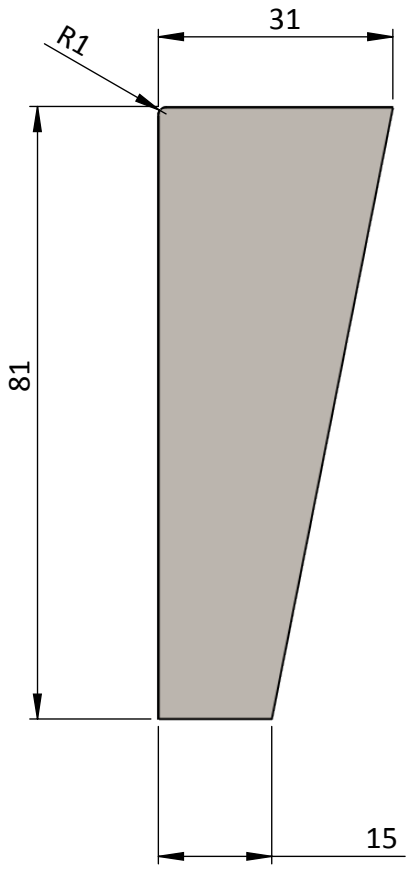
Note: Sheet metal thickness=6mm

Tag	Direction	Angle
A	DOWN	90°

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_A_07_01** Title: *extension_sheet_metal* General Tolerances: ISO 2768-m-K		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material Garbon Steel	Mass [kg] 0.218	Scale 1:1	Sheet 1 of 1

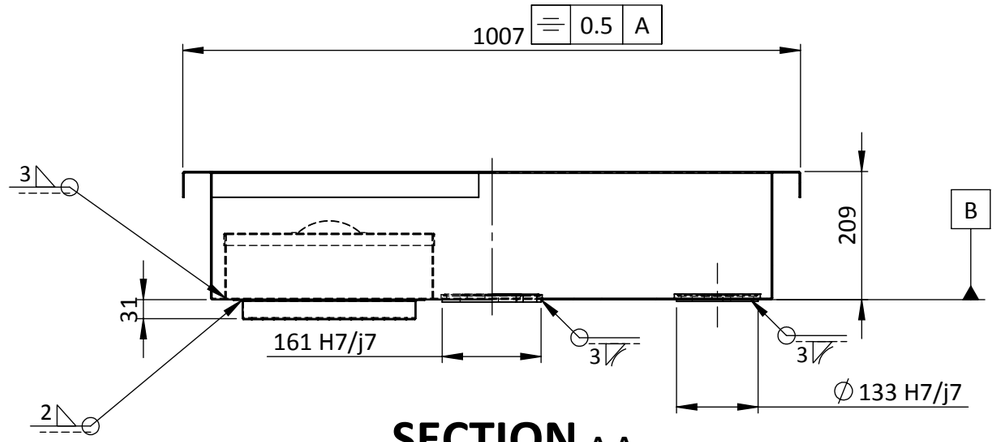


NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_A_07_02** Title: *extension_cylinder* General Tolerances: ISO 2768-m-K		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material Galvanized Steel	Mass [kg] 0.086	Scale 2:1	Sheet 1 of 1

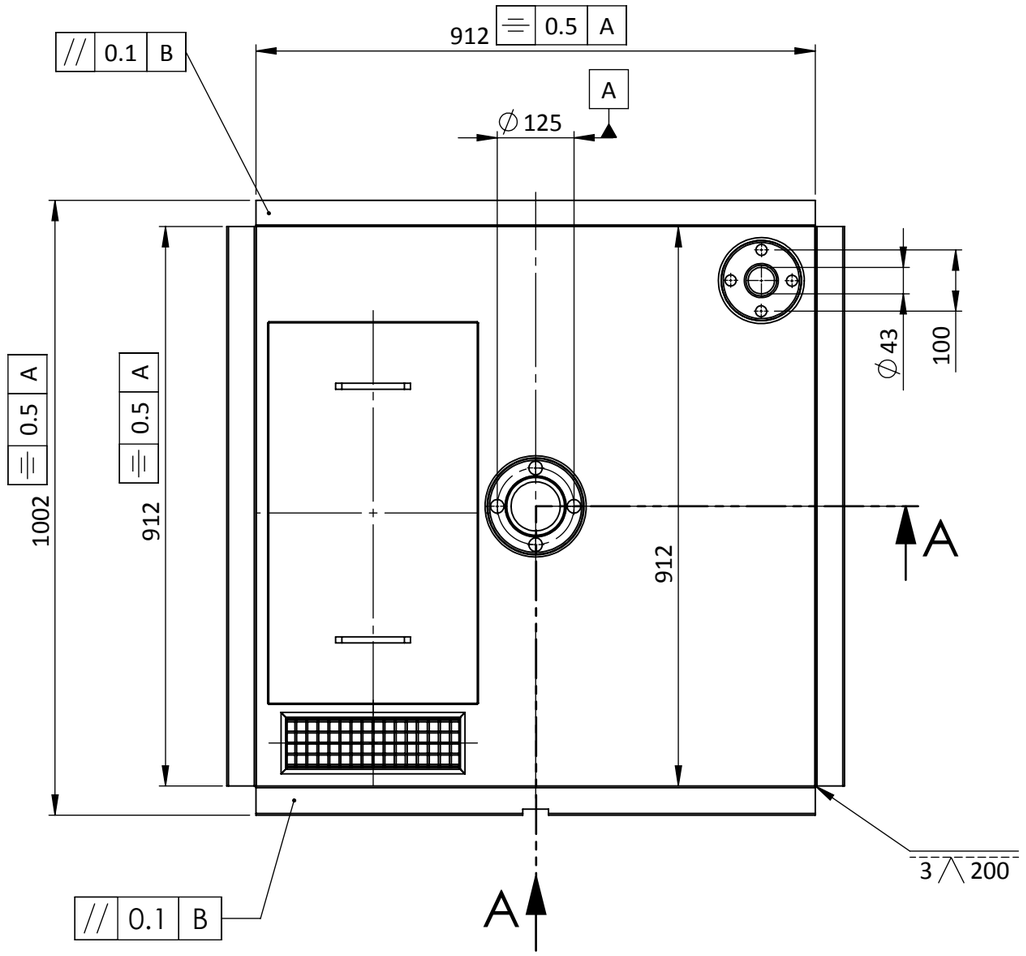


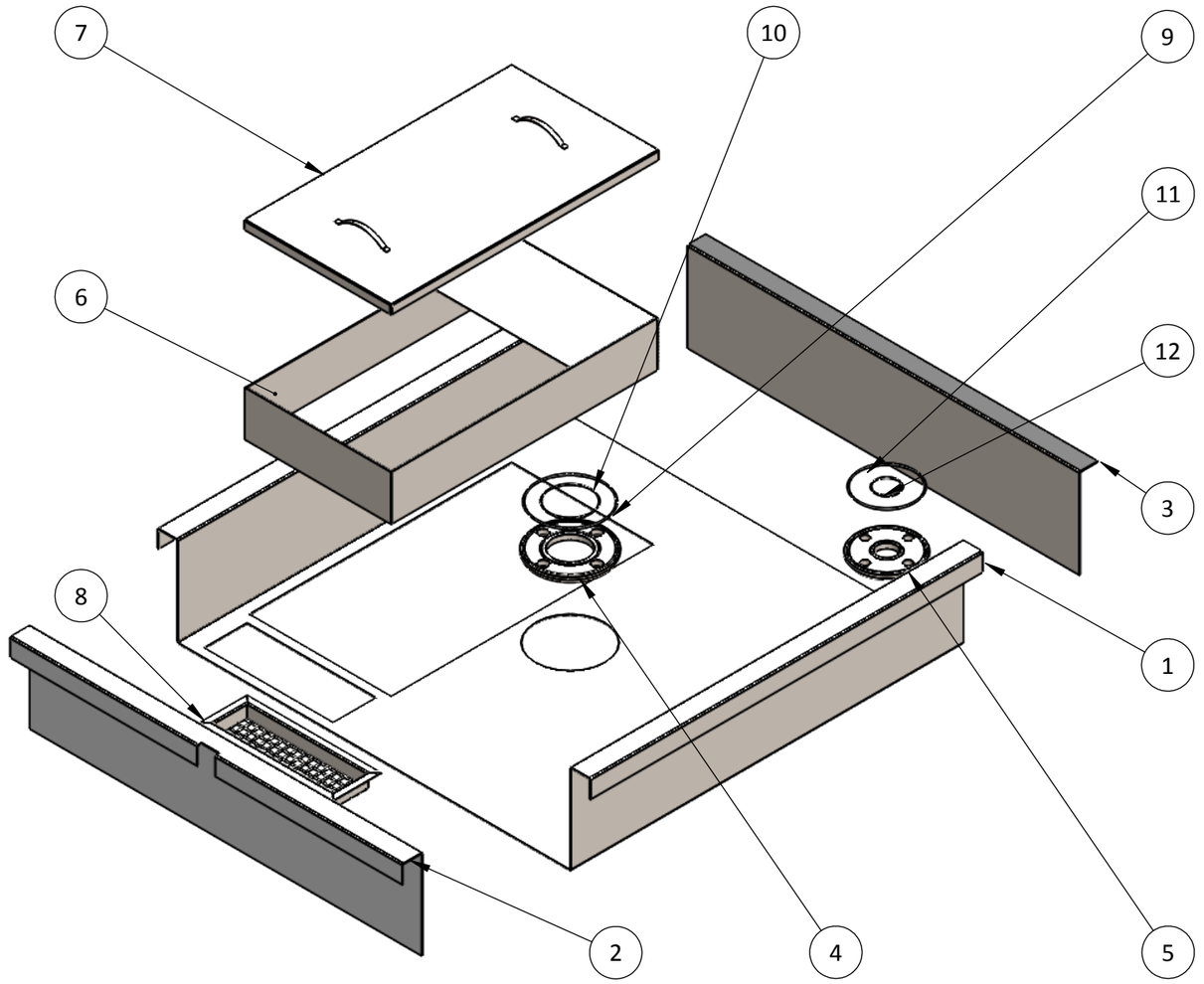
Note: Sheet metal thickness=3mm

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_A_07_03** Title: *extension_rib* General Tolerances: ISO 2768-c-L		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material Garbon Steel	Mass [kg] 0.045	Scale 1:1	Sheet 1 of 1



SECTION A-A





ITEM NO.	DRAWING NO.	DESCRIPTION	QTY.
1	IPW_B_01	sink_part1_sheet_metal	1
2	IPW_B_02	sink_part2_sheet_metal	1
3	IPW_B_03	sink_part3_sheet_metal	1
4	IPW_B_04	flange_sink_2in_OD165mm	1
5	IPW_B_05	flange_sink_1.25in_OD115mm	1
6	IPW_B_06	frame_tank_cap_assembly	1
7	IPW_B_07	tank_cover_assembly	1
8	IPW_B_08	frame_water_out_corner_assembly	1
9	IPW_B_09	o-ring, ID150, cross section 3mm (viton)	1
10	IPW_B_10	o-ring, ID94, cross section 2mm (viton)	1
11	IPW_B_11	o-ring, ID124, cross section 3mm (viton)	1
12	IPW_B_12	o-ring, ID50, cross section 2mm (viton)	1

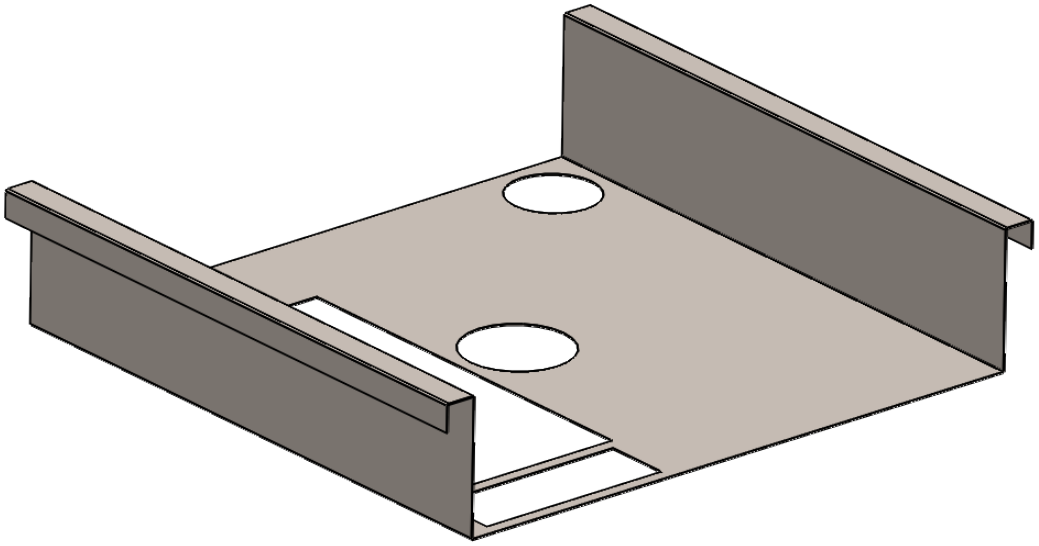
NATIONAL TECHNICAL UNIVERSITY OF ATHENS
DEPARTMENT OF MECHANICAL ENGINEERING
MACHINE DESIGN LABORATORY

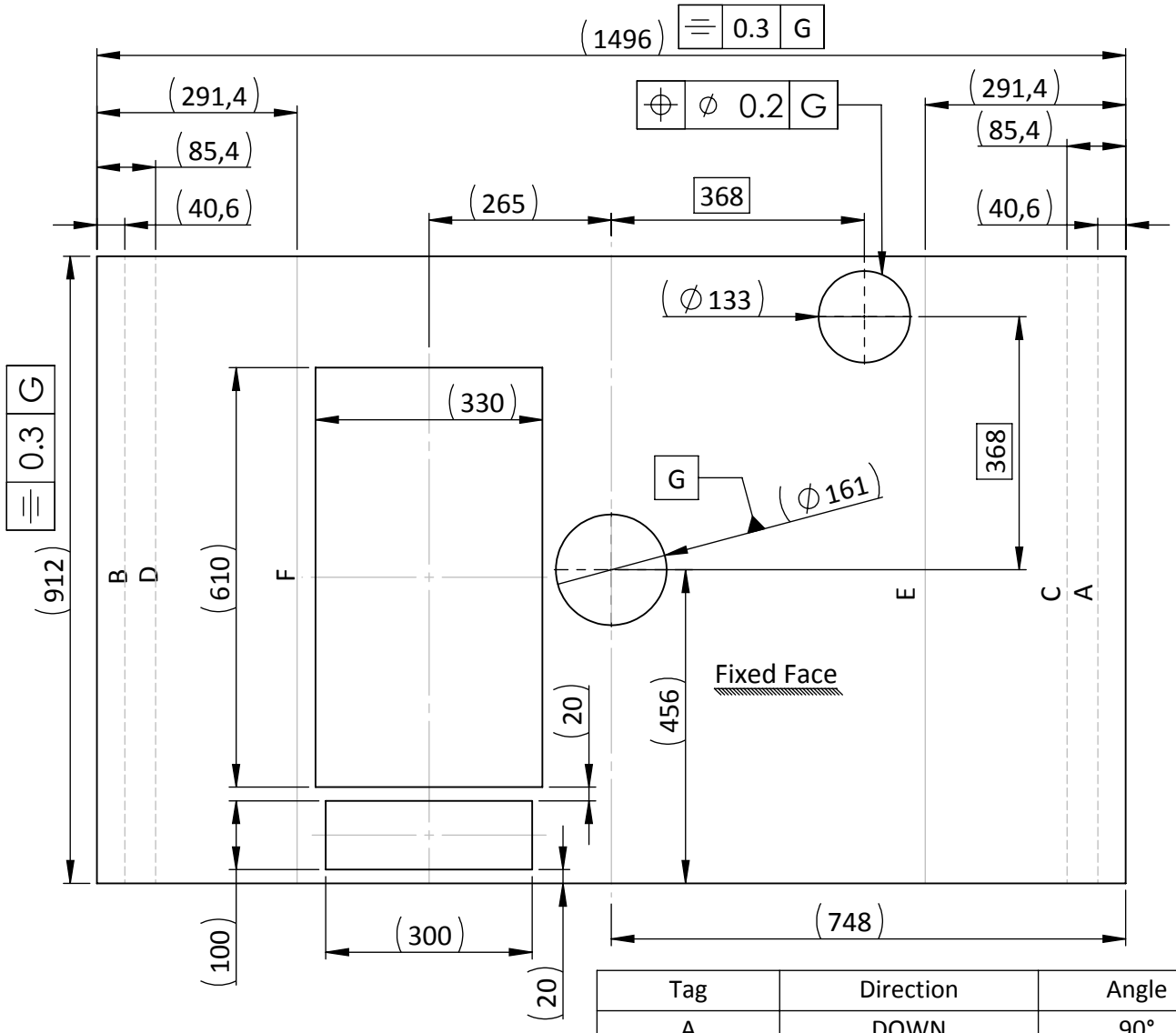
Designed by: **Ch. Marketos**
Checked by: **G. Kaisarlis**
Approved by: **V. Spitas**

Drawing No: **IPW_B_00**
Title: *sink_assembly*
General Tolerances: ISO 2768-m-K

PROJECT: INDUSTRIAL PARTS WASHER

Date	Mass [kg]	Scale	Sheet
July 2018	26.3	1:10	1 of 1



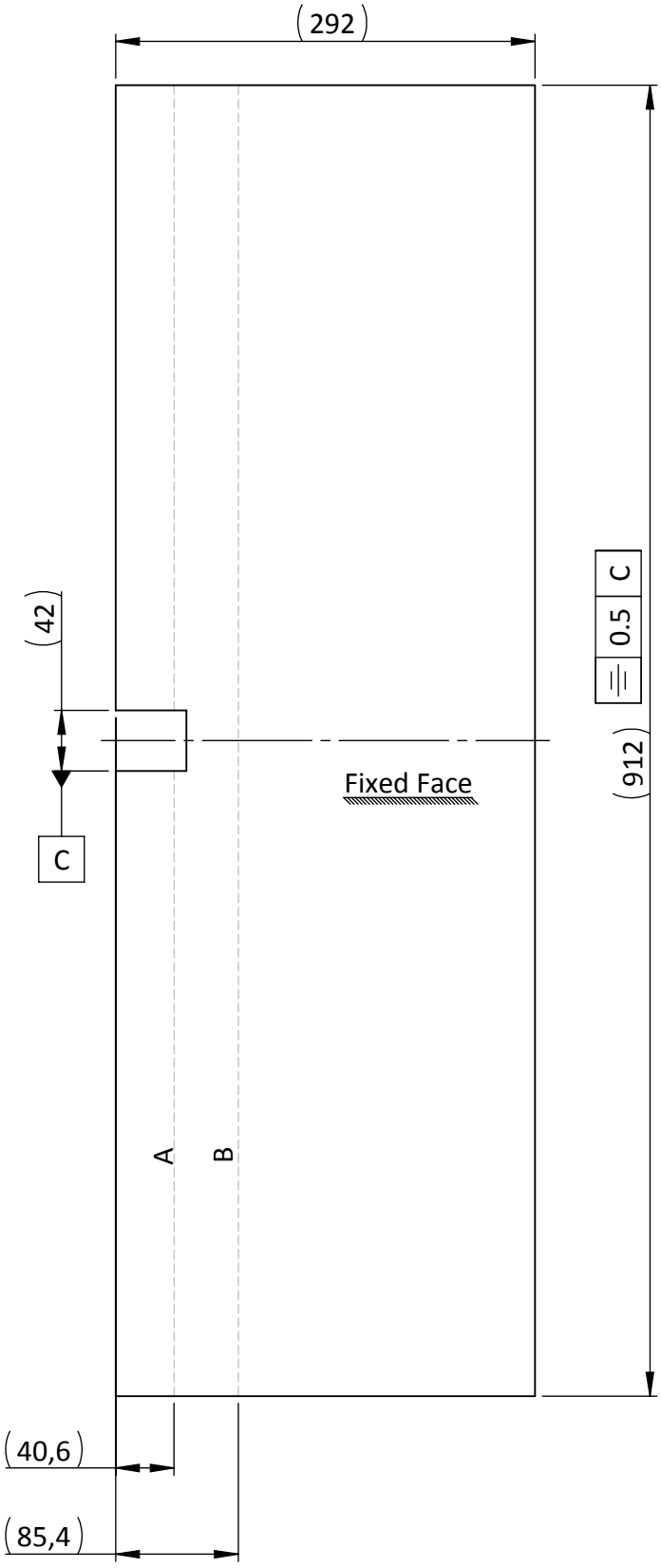


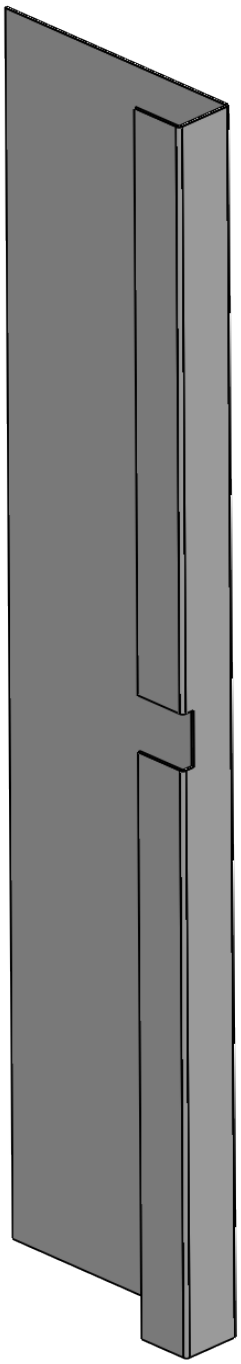
Tag	Direction	Angle
A	DOWN	90°
B	DOWN	90°
C	DOWN	90°
D	DOWN	90°
E	UP	90°
F	UP	90°

Note: Radius of curvate of the bend sheet as result from the bending machine

Note: Sheet metal thickness=2mm

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_B_01** Title: *sink_part1_sheet_metal* General Tolerances: ISO 2768-m-K		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316	Mass [kg] 16.6	Scale 1:10	Sheet 1 of 1



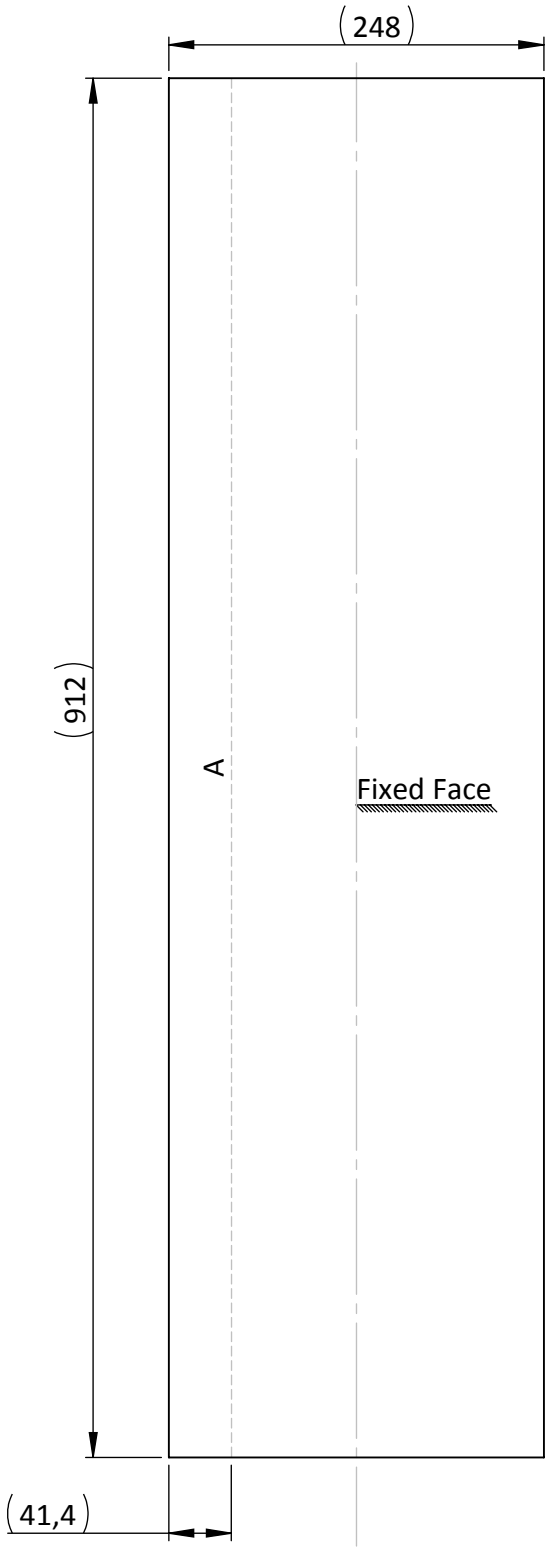


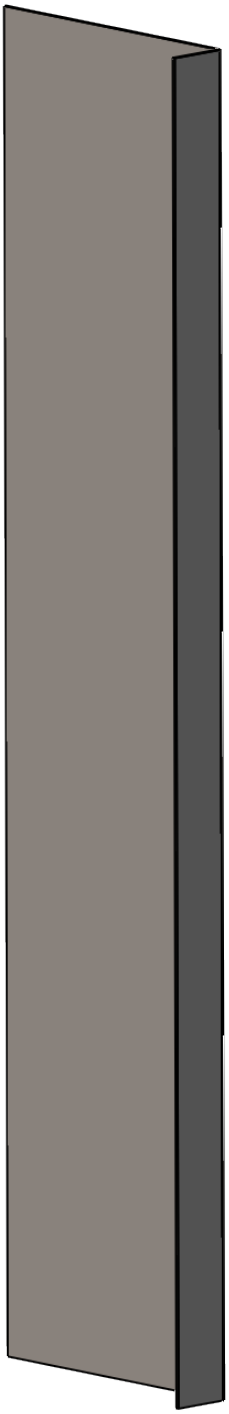
Tag	Direction	Angle
A	DOWN	90°
B	DOWN	90°

Note: Radius of curvate of the bend sheet as result from the bending machine

Note: Sheet metal thickness=2mm

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_B_02** Title: *sink_part2_sheet_metal* General Tolerances: ISO 2768-m-K		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316	Mass [kg] 3.5	Scale 1:5	Sheet 1 of 1



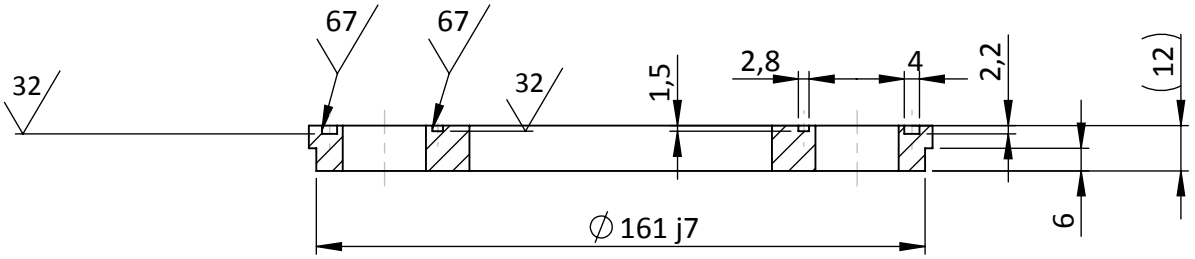


Note: Radius of curvate of the bend sheet as result from the bending machine

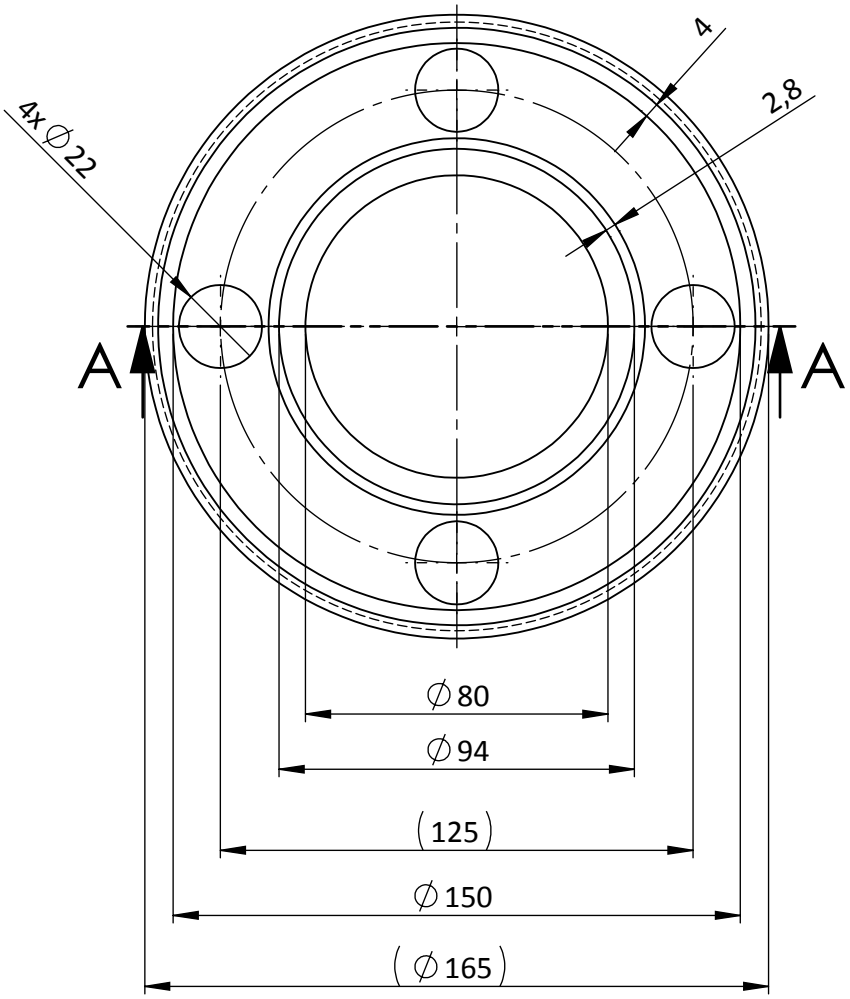
Note: Sheet metal thickness=2mm

Tag	Direction	Angle
A	DOWN	90°

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_B_03** Title: *sink_part3_sheet_metal* General Tolerances: ISO 2768-m-K		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316	Mass [kg] 2.8	Scale 1:5	Sheet 1 of 1



SECTION A-A



Note: Flange 2",62-1501 (DIN 2576)

Phase 1: Machine internal from ∅ 61 to ∅80 , THRU ALL

Phase 2: Machine external from (∅165) to ∅161 j7 , ↧ 6

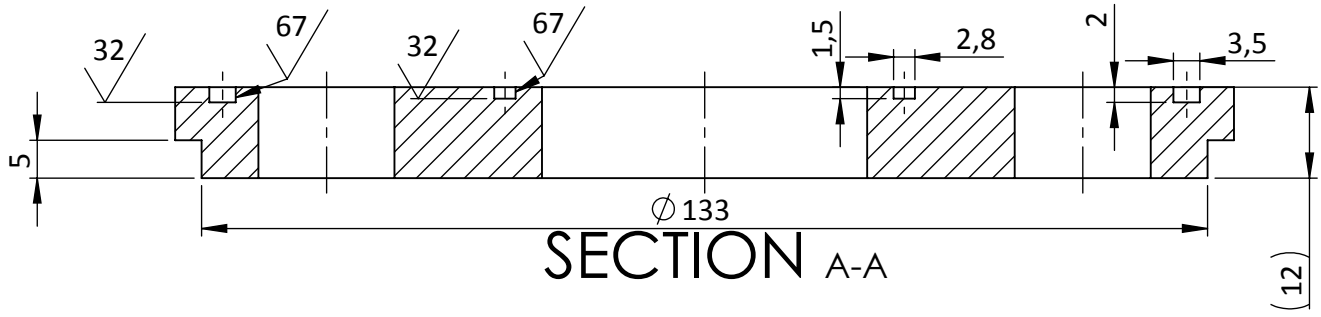
Phase 3: Holes enlargement from ∅ 18 to ∅22 (holes for M20 bolt)

Phase 4: O-rings groove ID ∅94 , width 2.8mm, ↧ 1.5

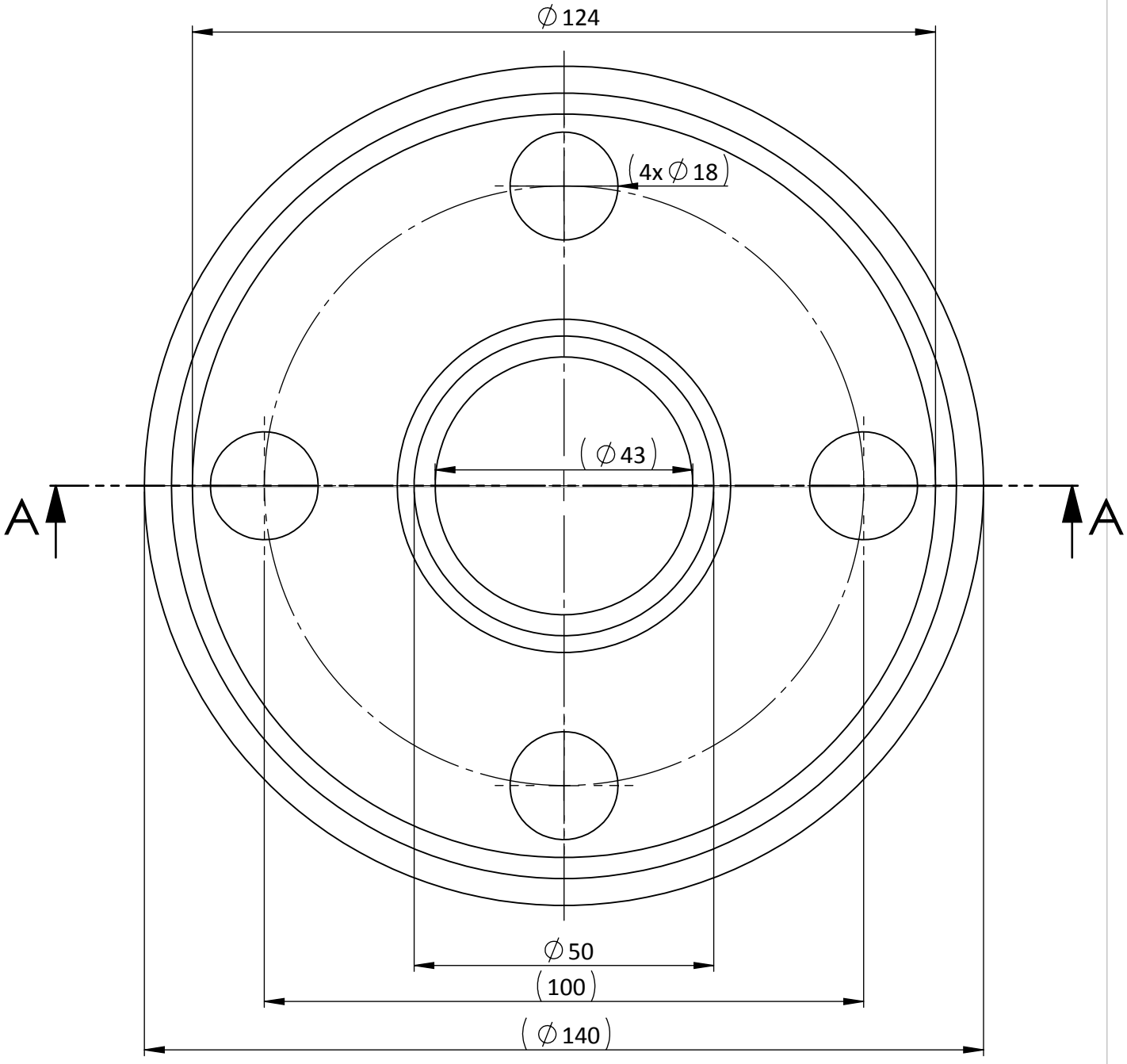
Phase 5: O-rings groove ID ∅150 , width 4mm, ↧ 2.2

Note: All groove radius 0.013-0.51mm

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_B_04** Title: *flange_sink_2in_OD165mm* General Tolerances: ISO 2768-f-H		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316	Mass [kg] 1.4	Scale 1:2	Sheet 1 of 1

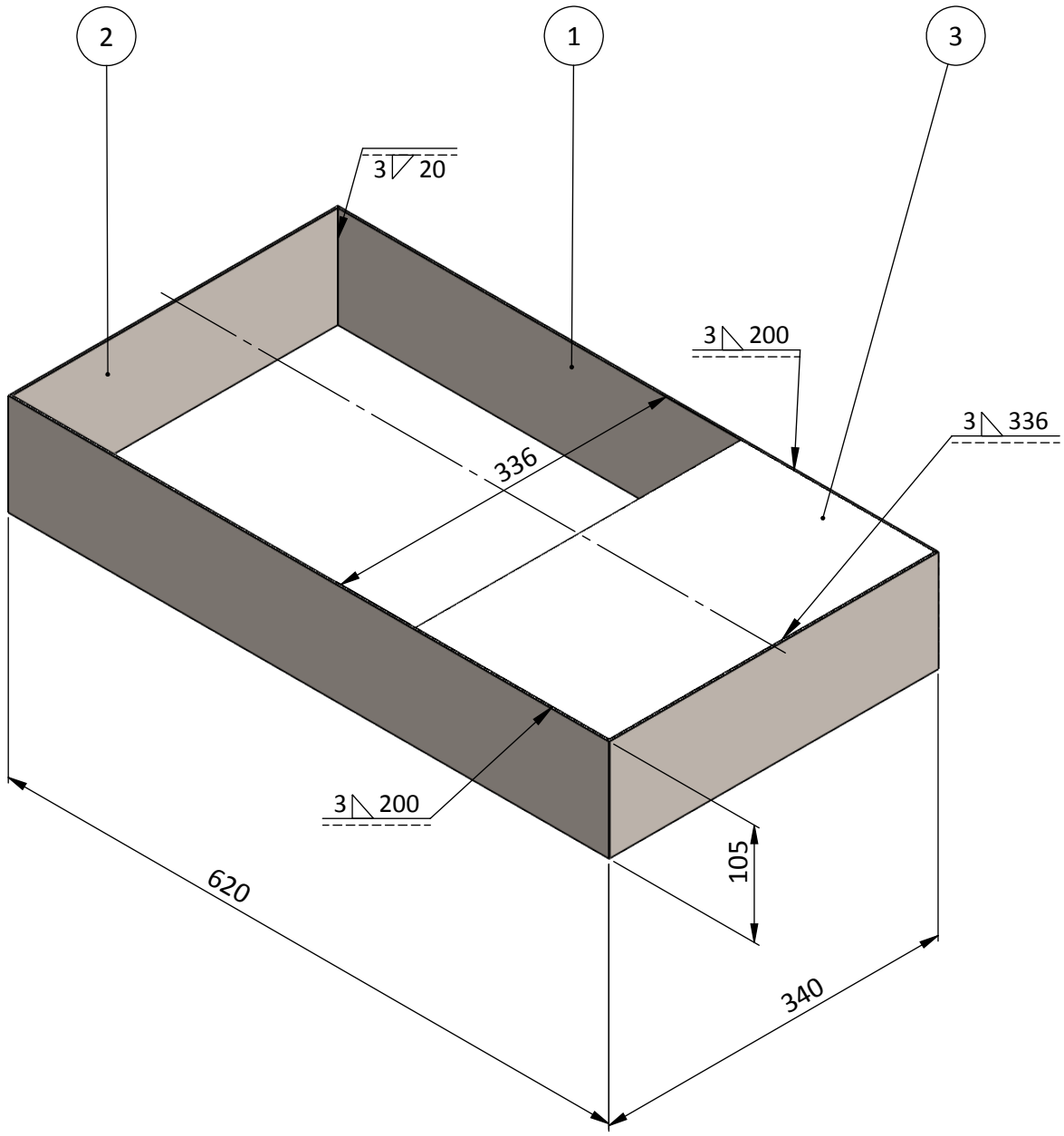


SECTION A-A



Note: Flange 1 1/4",62-1501 (DIN 2576)
Phase 1: Machine external from (∅140) to ∅133 , ↧ 5
Phase 2: O-rings groove ID ∅50 , width 2,8 mm, ↧ 1.5
Phase 3: O-rings groove ID ∅124 , width 2,8 mm, ↧ 2
Note: All groove radius 0.013-0.51mm

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_B_05** Title: *flange_sink_1in_OD115mm* General Tolerances: ISO 2768-f-H		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316	Mass [kg] 0.65	Scale 1:1	Sheet 1 of 1



ITEM NO.	DRAWING NO.	DESCRIPTION	QTY.
1	IPW_B_06_01	Flat bar (26-0004-20), width 20mm, length 570mm, thickness 2mm	2
2	IPW_B_06_01	Flat bar (26-0004-20), width 20mm, length 340mm, thickness 2mm	2
4	IPW_B_06_02	Flat sheet metal, width 320mm, length 200mm, thickness 1mm,	1

NATIONAL TECHNICAL UNIVERSITY OF ATHENS
DEPARTMENT OF MECHANICAL ENGINEERING
MACHINE DESIGN LABORATORY

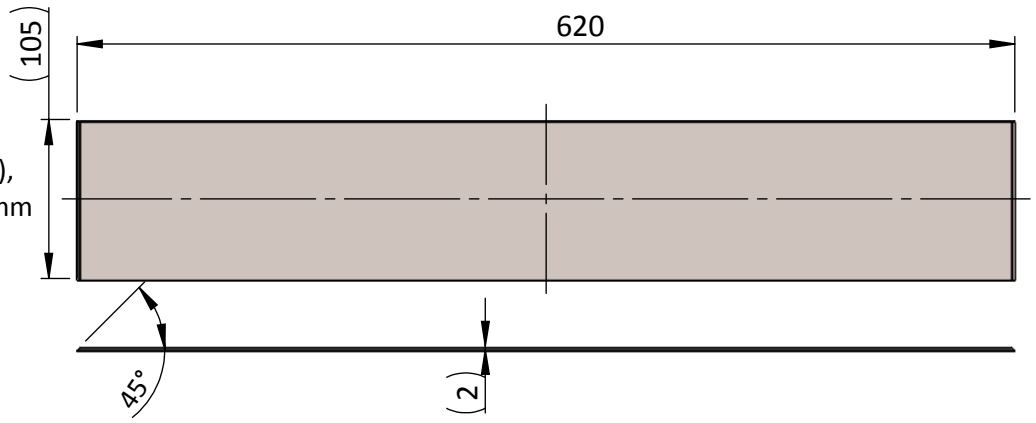
Designed by: **Ch. Marketos**
Checked by: **G. Kaisarlis**
Approved by: **V. Spitas**

Drawing No: **IPW_B_06**
Title: *frame_tank_cap_assembly*
General Tolerances: ISO 2768-c-L

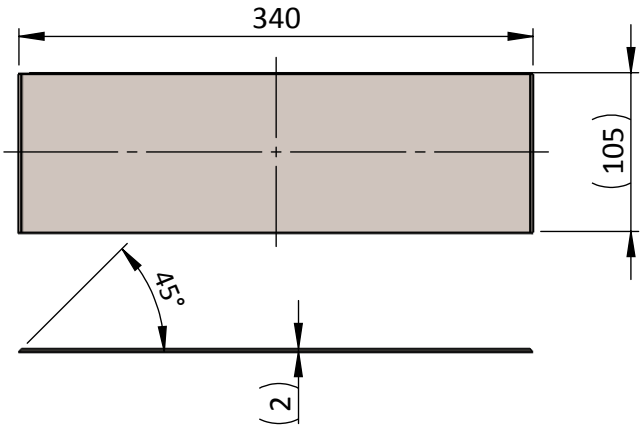
PROJECT: INDUSTRIAL PARTS WASHER

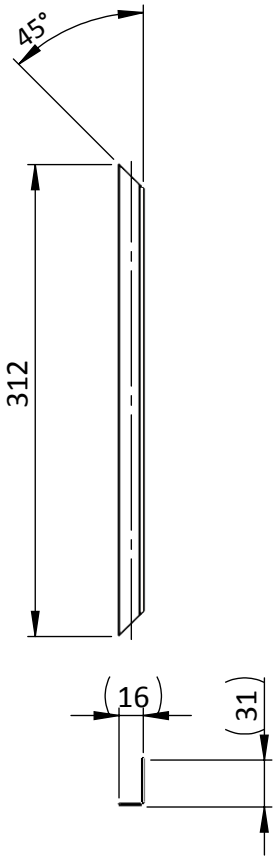
Date	Mass [kg]	Scale	Sheet
July 2018	0.58	1:5	1 of 1

Note:Flat bar (26-0004-20), width 20mm, thickness 2mm length 570mm

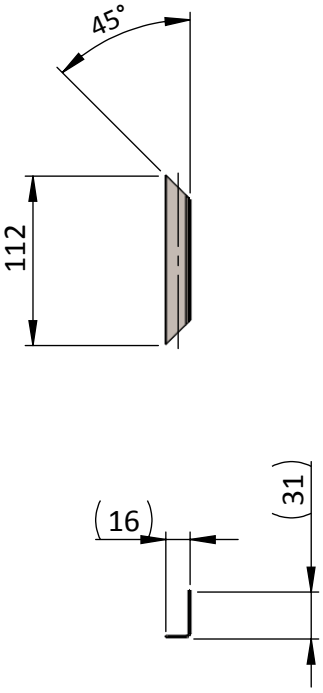


Note:Flat bar (26-0004-20), width 20mm, thickness 2mm length 340mm



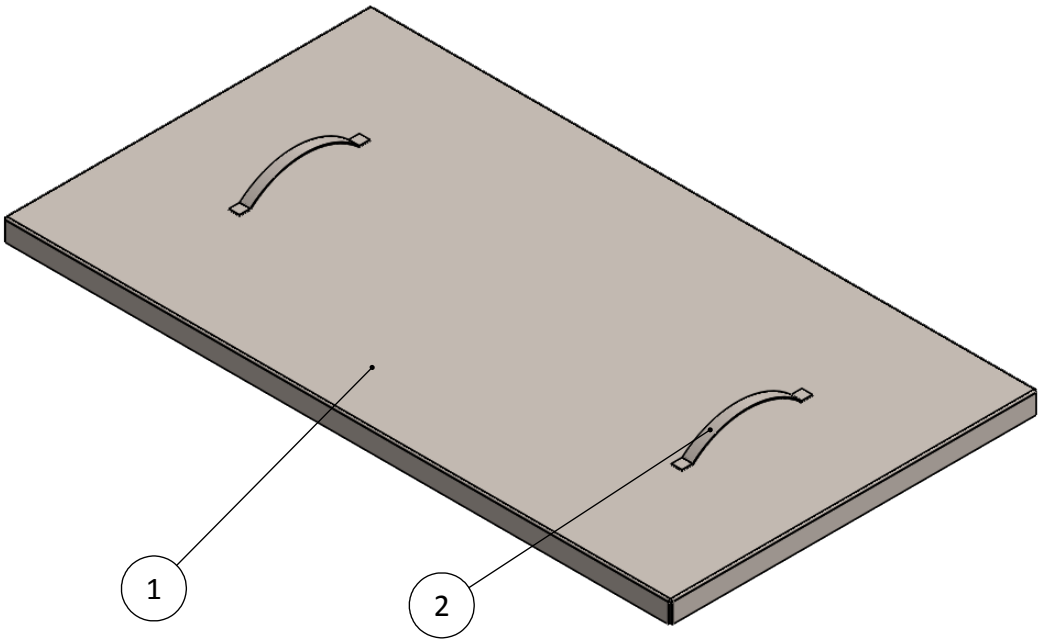


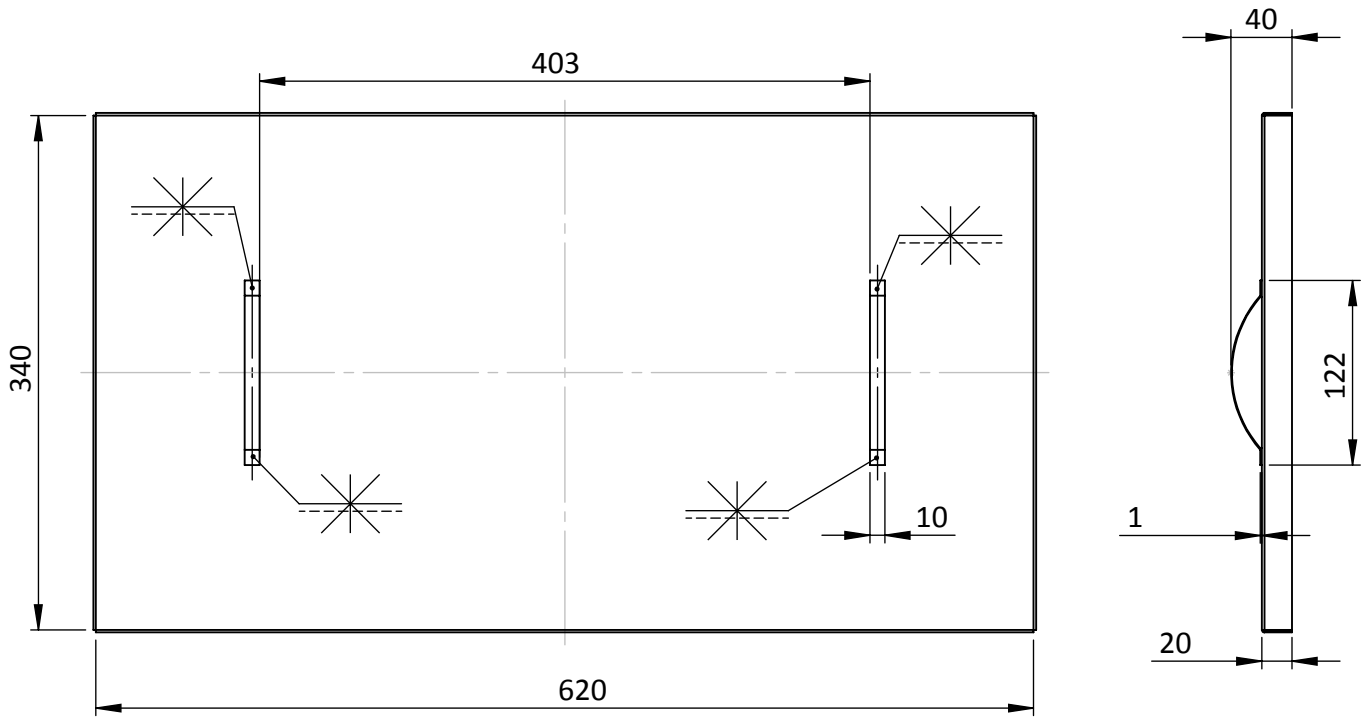
Note:Angle (26-0005-10),16x16, thickness 1mm, length 342



Note:Angle (26-0005-10),16x16, thickness 1mm, length 112

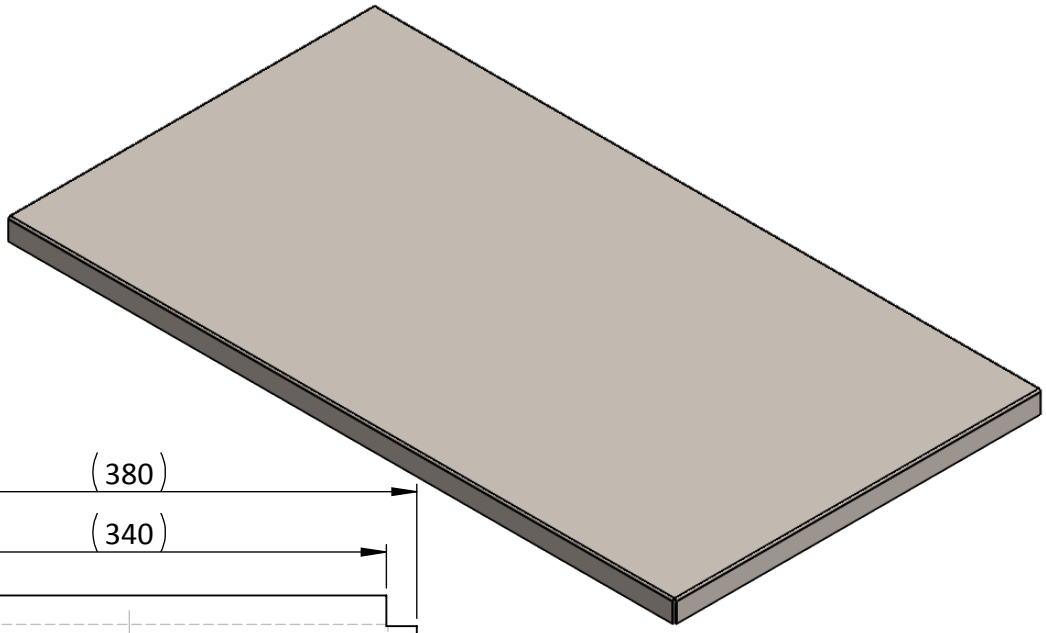
NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_B_06_01** Title: *flat_bars & corners* General Tolerances: ISO 2768-c-L		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316	Mass [kg] [-]	Scale 1:5	Sheet 1 of 1

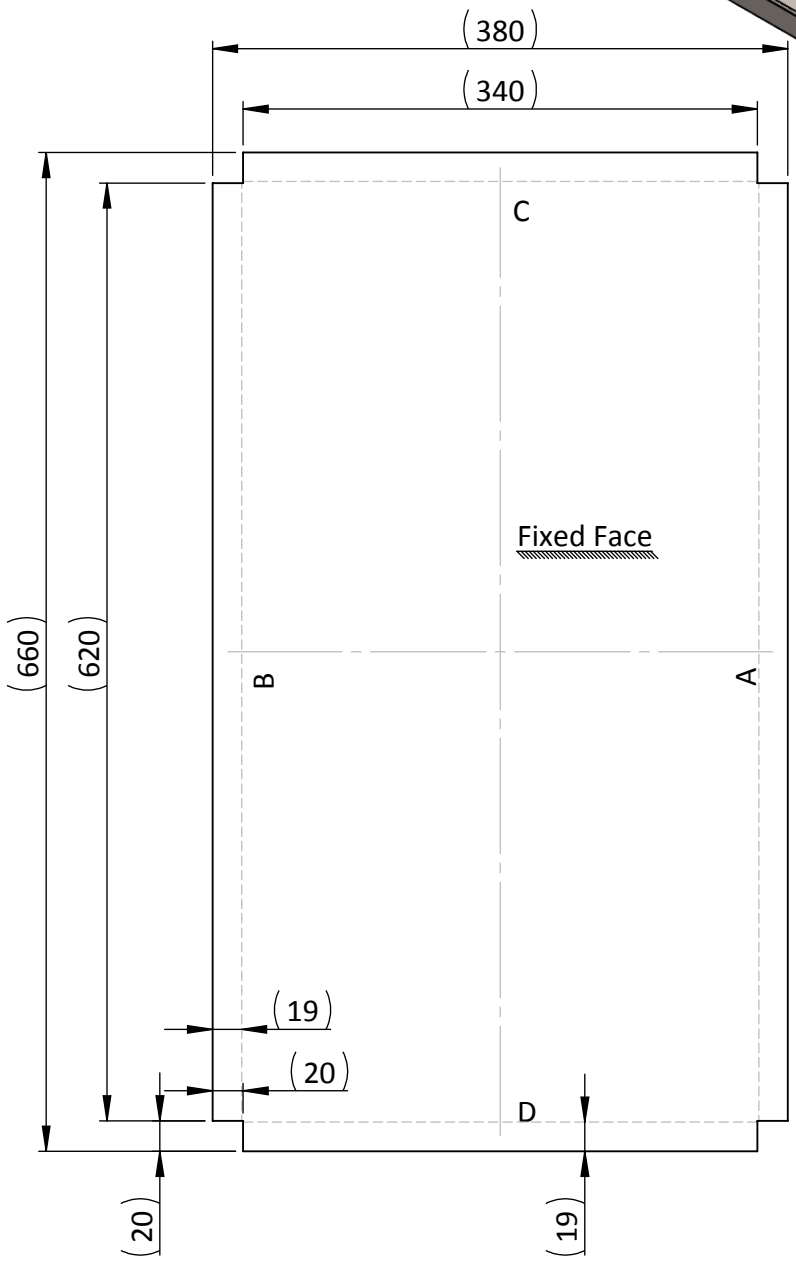




ITEM NO.	DRAWING NO.	DESCRIPTION	QTY.
1	IPW_B_07_01	tank_cover_sheet_metal	1
2	IPW_B_07_02	tank_cover_handle	2

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**	Drawing No:**IPW_B_07** Title: *tank_cover_assembly* General Tolerances: ISO 2768-c-L		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Mass [kg] 2.1	Scale 1:5	Sheet 1 of 1



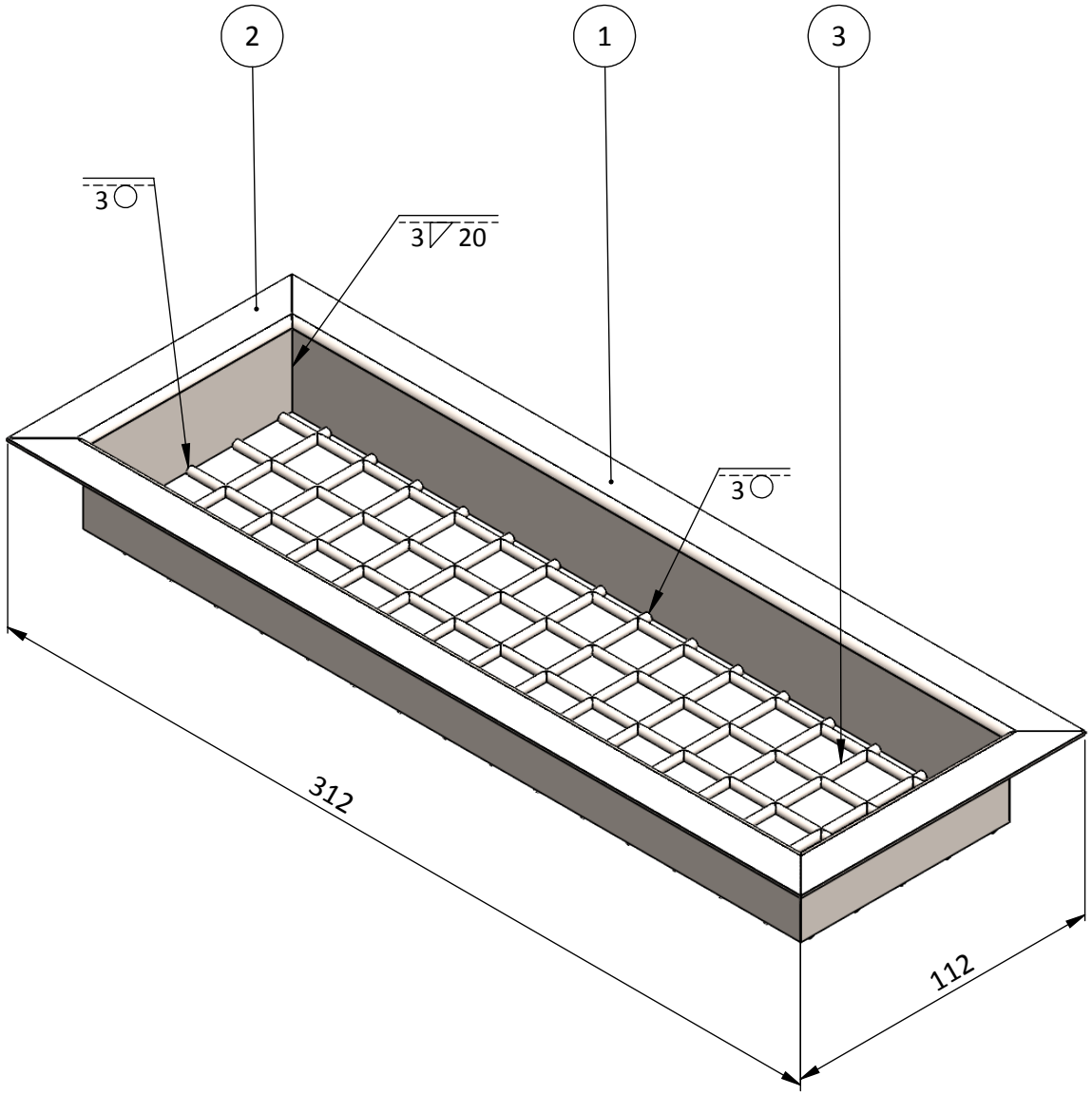


Note: Sheet metal thickness=1mm

Note: Radius of curvate of the bend sheet as result from the bending machine

Tag	Direction	Angle
A	DOWN	90°
B	DOWN	90°
C	DOWN	90°
D	DOWN	90°

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_B_07_01** Title: *tank_cover_sheet_metal* General Tolerances: ISO 2768-c-L		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316	Mass [kg] 2	Scale 1:5	Sheet 1 of 1



ITEM NO.	DRAWING NO.	DESCRIPTION	QTY.
1	IPW_B_06_01	Angle (26-0005-10),16x16,thickness 1mm, length 342	2
2	IPW_B_06_01	Angle (26-0005-10),16x16,thickness 1mm, length 112	2
3	IPW_B_08_04	wire mesh 280x80, gap 18x18, stainless steel	1

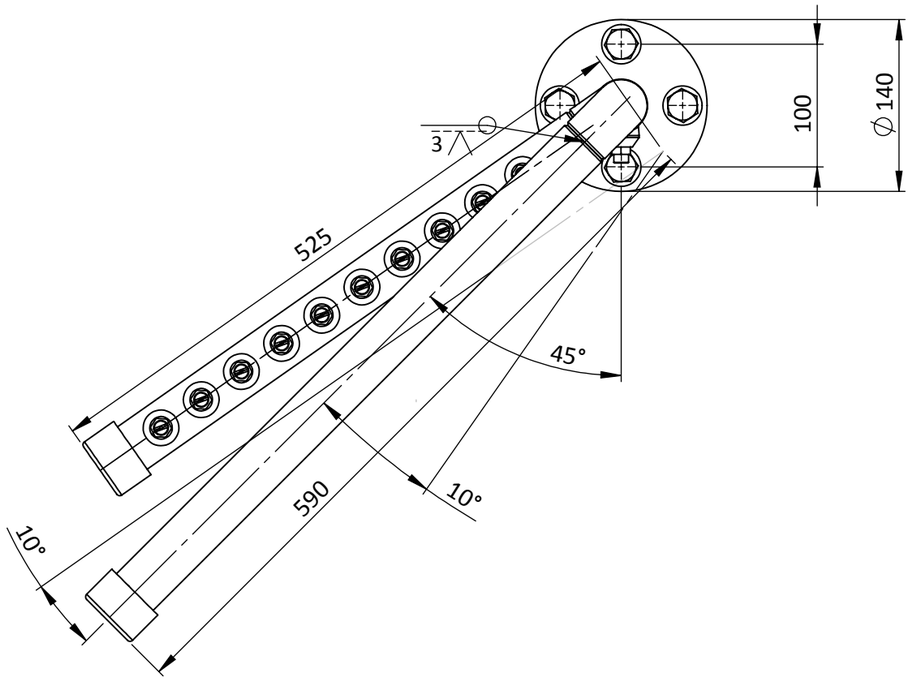
NATIONAL TECHNICAL UNIVERSITY OF ATHENS
DEPARTMENT OF MECHANICAL ENGINEERING
MACHINE DESIGN LABORATORY

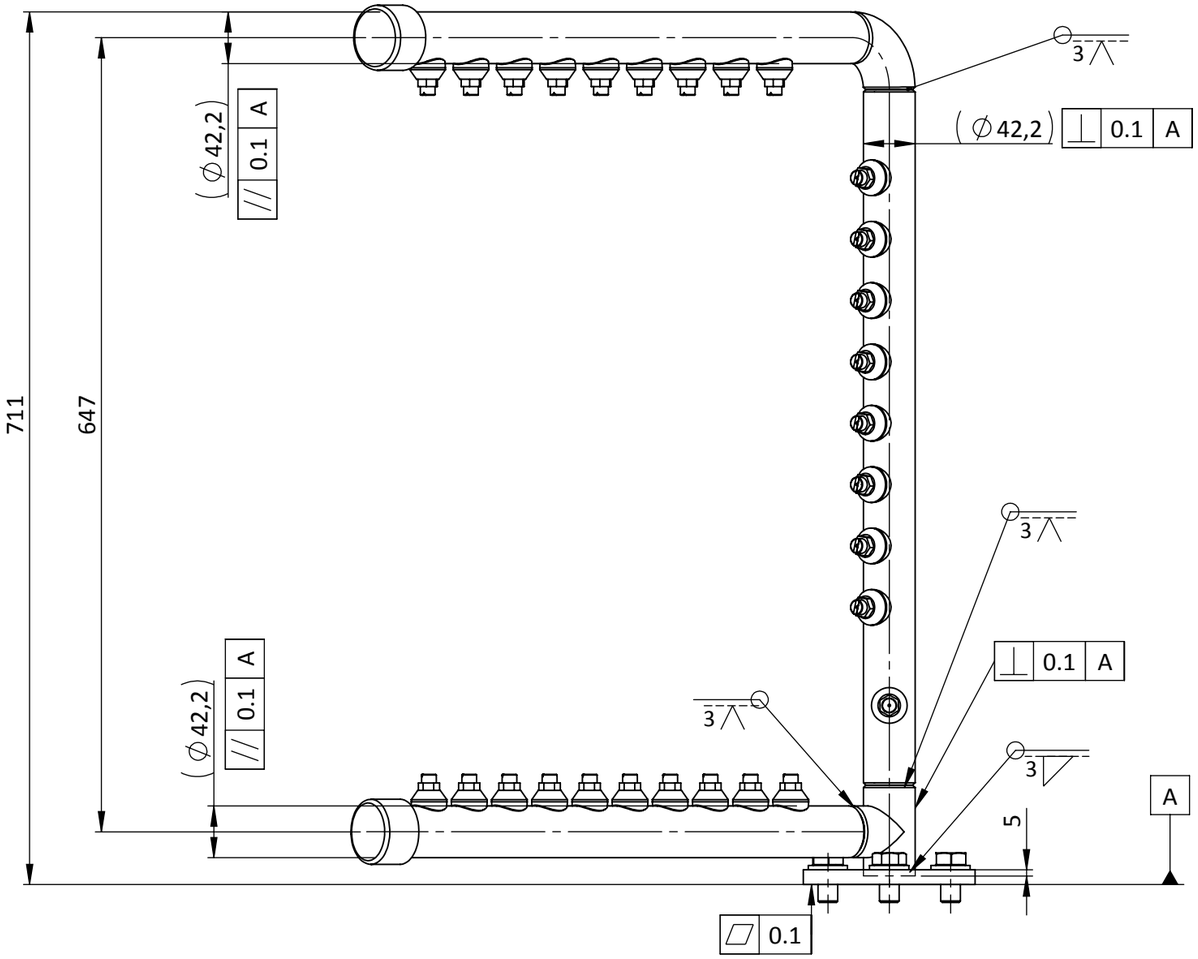
Designed by: **Ch. Marketos**
Checked by: **G. Kaisarlis**
Approved by: **V. Spitas**

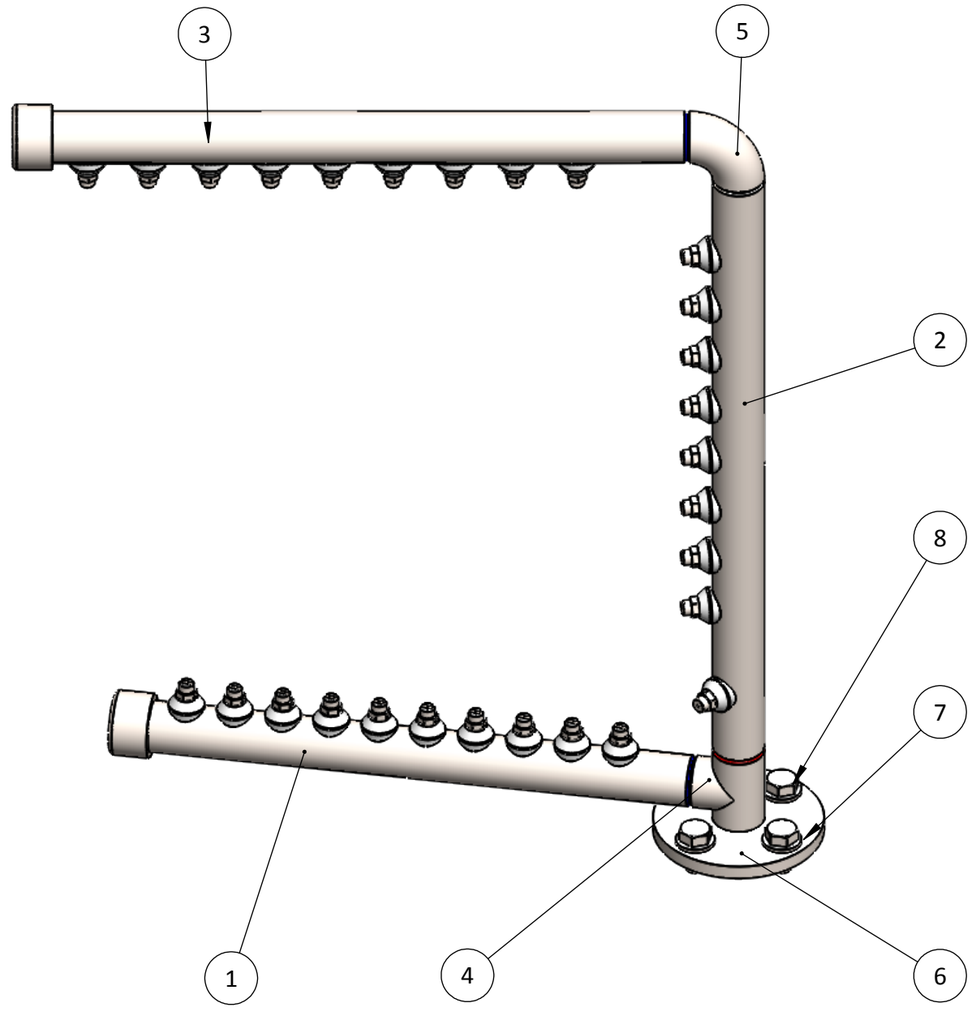
Drawing No: **IPW_B_08**
Title: *frame_water_out_assembly*
General Tolerances: ISO 2768-c-L

PROJECT: INDUSTRIAL PARTS WASHER

Date	Material	Mass [kg]	Scale	Sheet
July 2018	St. Steel AISI 316	0.21	1:2	1 of 1







ITEM NO.	DRAWING NO.	DESCRIPTION	QTY.
1	IPW_C_01	tube_bottom_assembly	1
2	IPW_C_02	tube_central_assembly	1
3	IPW_C_03	tube_up_assembly	1
4	IPW_C_04	welded tee 1.25inch	1
5	IPW_C_04	welded elbow 90degrees (short) 1.25inch	1
6	IPW_C_05	flange_manifold_1.24in_OD140mm	1
7	IPW_C_06	B18.22M - Plain washer, 16 mm, narrow	4
8	IPW_C_07	hex cap screw_am	4

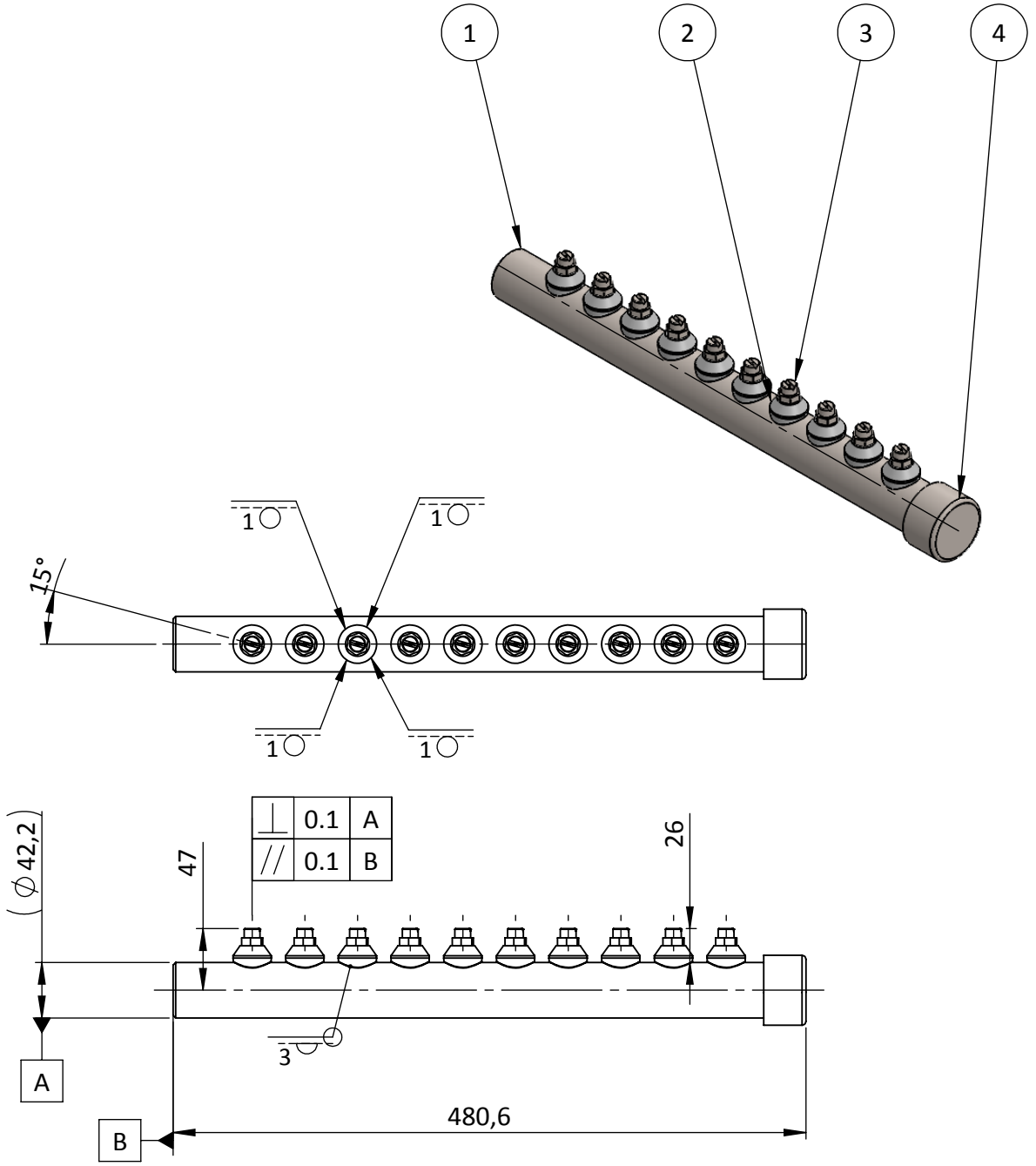
NATIONAL TECHNICAL UNIVERSITY OF ATHENS
DEPARTMENT OF MECHANICAL ENGINEERING
MACHINE DESIGN LABORATORY

Designed by: **Ch. Marketos**
Checked by: **G. Kaisarlis**
Approved by: **V. Spitas**

Drawing No: **IPW_C_00**
Title: *manifold_assembly*
General Tolerances: ISO 2768-m-K

PROJECT: INDUSTRIAL PARTS WASHER

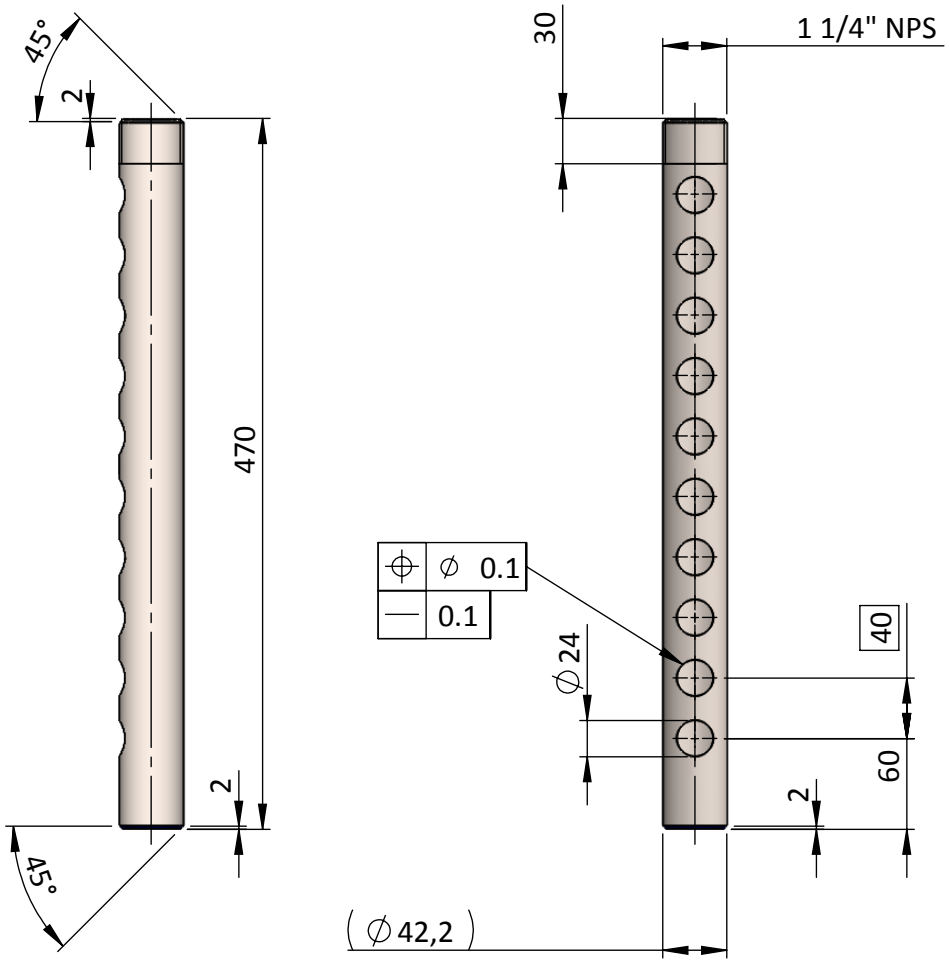
Date	Mass [kg]	Scale	Sheet
July 2018	7.8	1:5	1 of 1



Note: First the four spot welds with a gap of 0.8mm and after the backing run weld

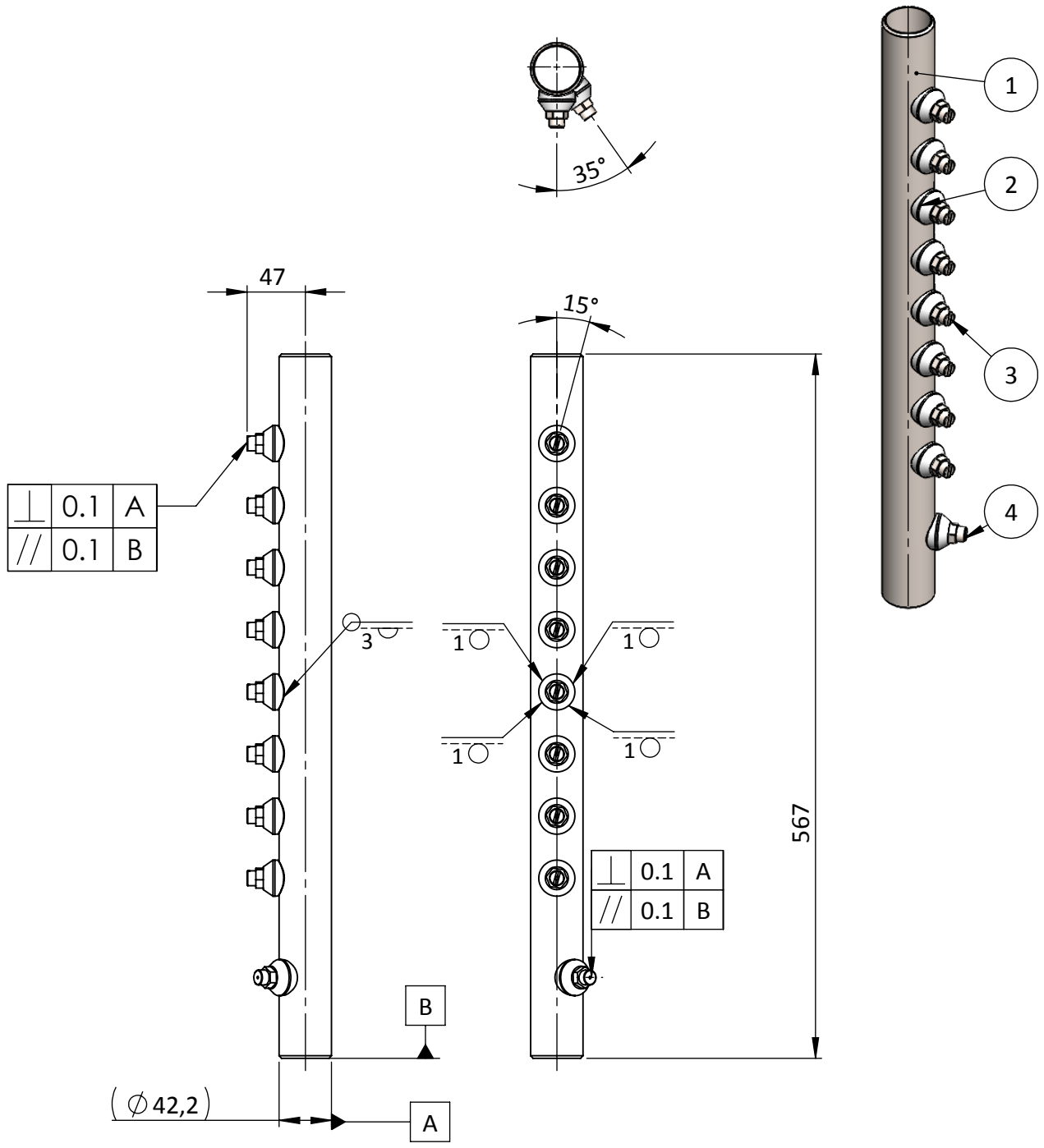
ITEM NO.	DRAWING NO.	DESCRIPTION	QTY.
1	IPW_C_01_01	tube_bottom_1inch	1
2	IPW_C_01_02	1/4" Thread-O-Let 1" Pipe (1/4" #6000 Thread-O-Let (stainless steel)	10
3	IPW_C_01_03	nozzle 1/4" (flat pattern), spray angle 15 degrees (stainless steel)	10
4	IPW_C_01_04	round cap 1inch (stainless steel)	1

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**	Drawing No:**IPW_C_01** Title: *support_cylinder_subassembly* General Tolerances: ISO 2768-m-K		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Mass [kg] 2	Scale 1:5	Sheet 1 of 1



Note: Tube 1" (ASTM A312-2001), thickness 2.77 (Sch 10S), length 470mm

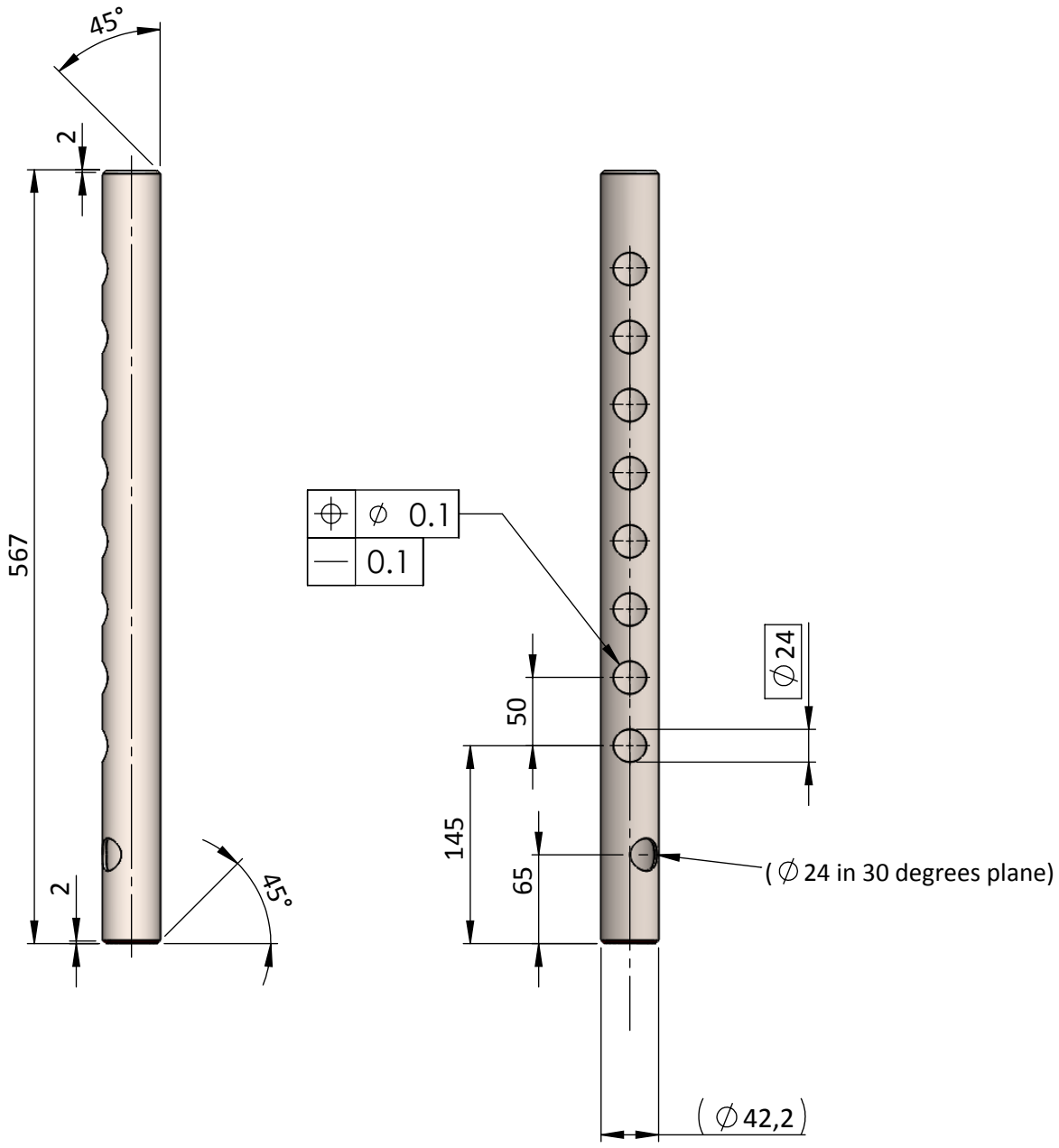
NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_C_01_01** Title: *tube_bottom* General Tolerances: ISO 2768-m-K		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316L	Mass [kg] 1.2	Scale 1:5	Sheet 1 of 1



Note: First the four spot welds with a gap of ~0.8mm and after the backing run weld

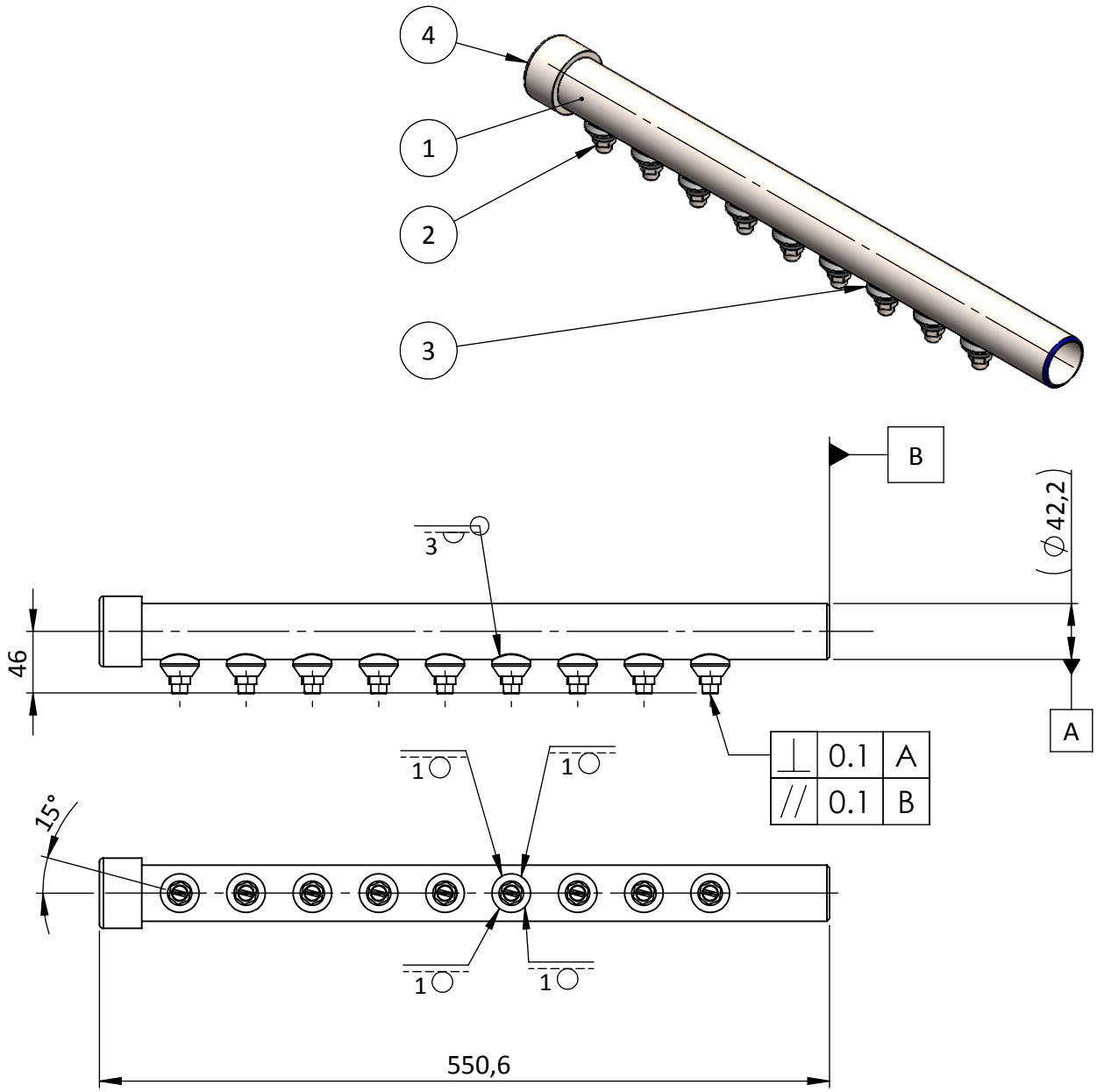
ITEM NO.	DRAWING NO.	DESCRIPTION	QTY.
1	IPW_C_01_01	tube_central_1_25inch	1
2	IPW_C_01_02	1/4" Thread-O-Let 1" Pipe (1/4" #6000 Thread-O-Let (stainless steel)	9
3	IPW_C_01_03	nozzle 1/4" (flat pattern), spray angle 15 degrees (stainless steel)	8
4	IPW_C_01_04	nozzle (impact), spray angle 0 degrees (stainless steel)	1

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**	Drawing No:**IPW_C_02** Title: *tube_central_assembly* General Tolerances: ISO 2768-m-K		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Mass [kg] 2	Scale 1:5	Sheet 1 of 1



Note: Tube 1" (ASTM A312-2001), thickness 2.77mm (Sch 10S), length 553mm

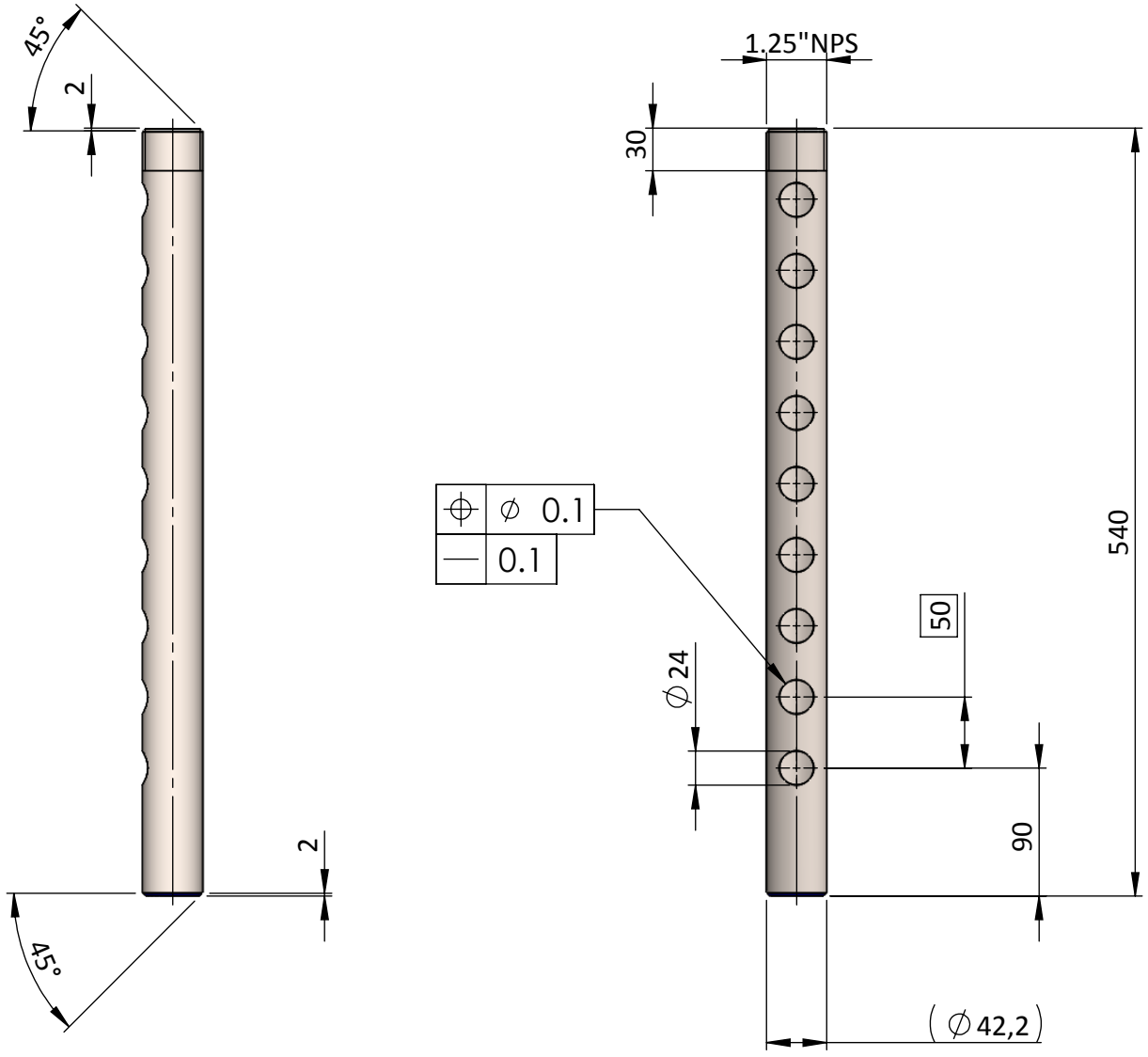
NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_C_02_01** Title: *tube_central* General Tolerances: ISO 2768-m-K		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316L	Mass [kg] 1.5	Scale 1:5	Sheet 1 of 1



Note: First the four spot welds with a gap of ~0.8mm and after the backing run weld

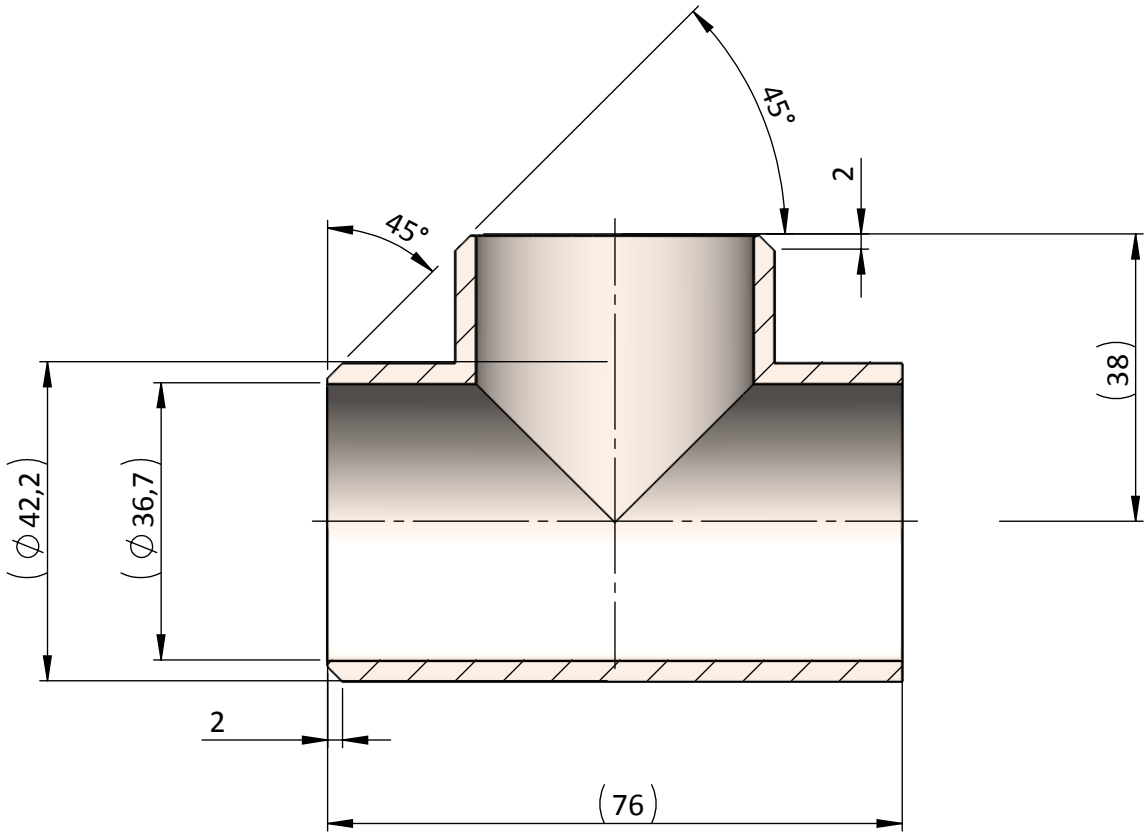
ITEM NO.	DRAWING NO.	DESCRIPTION	QTY.
1	IPW_C_03_01	tube_up_1_25inch	1
2	IPW_C_01_02	nozzle 1/4" (flat pattern), spray angle 15 degrees (stainless steel)	9
3	IPW_C_01_03	1/4" Thread-O-Let 1" Pipe (1/4" #6000 Thread-O-Let (stainless steel)	9
4	IPW_C_01_04	round cap 1inch (stainless steel)	1

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**	Drawing No:**IPW_C_03** Title: *tube_up_assembly* General Tolerances: ISO 2768-m-K			
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Mass [kg] 2.2	Scale 1:5	Sheet 1 of 1	



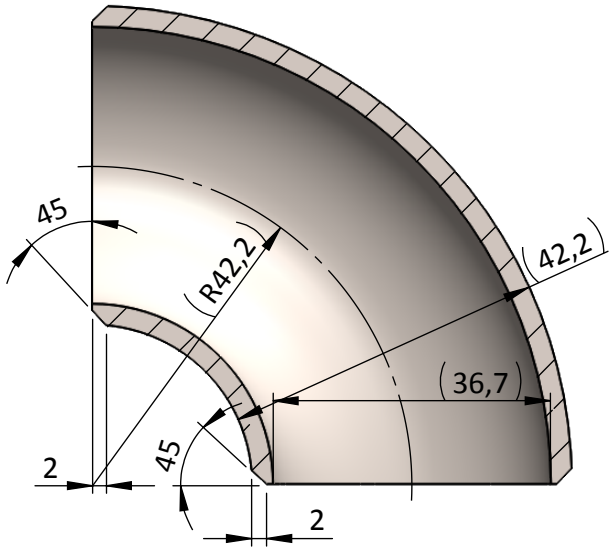
Note: Tube 1 1/4" (ASTM A312-2001), thickness 2.77 (Sch 10S), length 540mm

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_C_03_01** Title: *pipe_up* General Tolerances: ISO 2768-m-K		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316L	Mass [kg] 1.4	Scale 1:5	Sheet 1 of 1



Note: Welded tee 1 1/4" (ASTM A403-2000B/ ASME SA403-1992/ANSI B16.9-1993), thickness 2.77mm (Sch 10S), mass 0.24kg

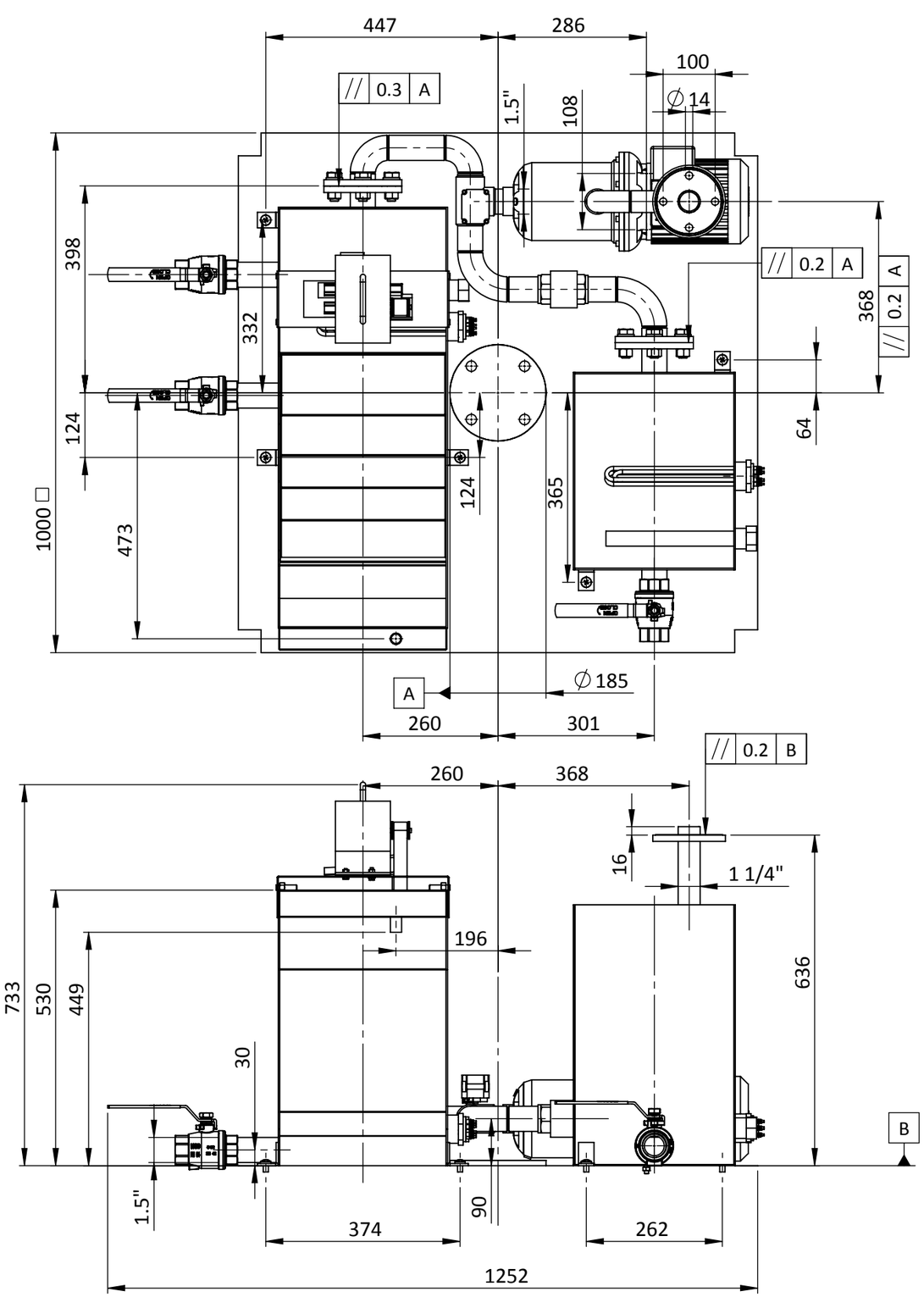
Note: Machine chamfering at 45 degrees, depth 2mm

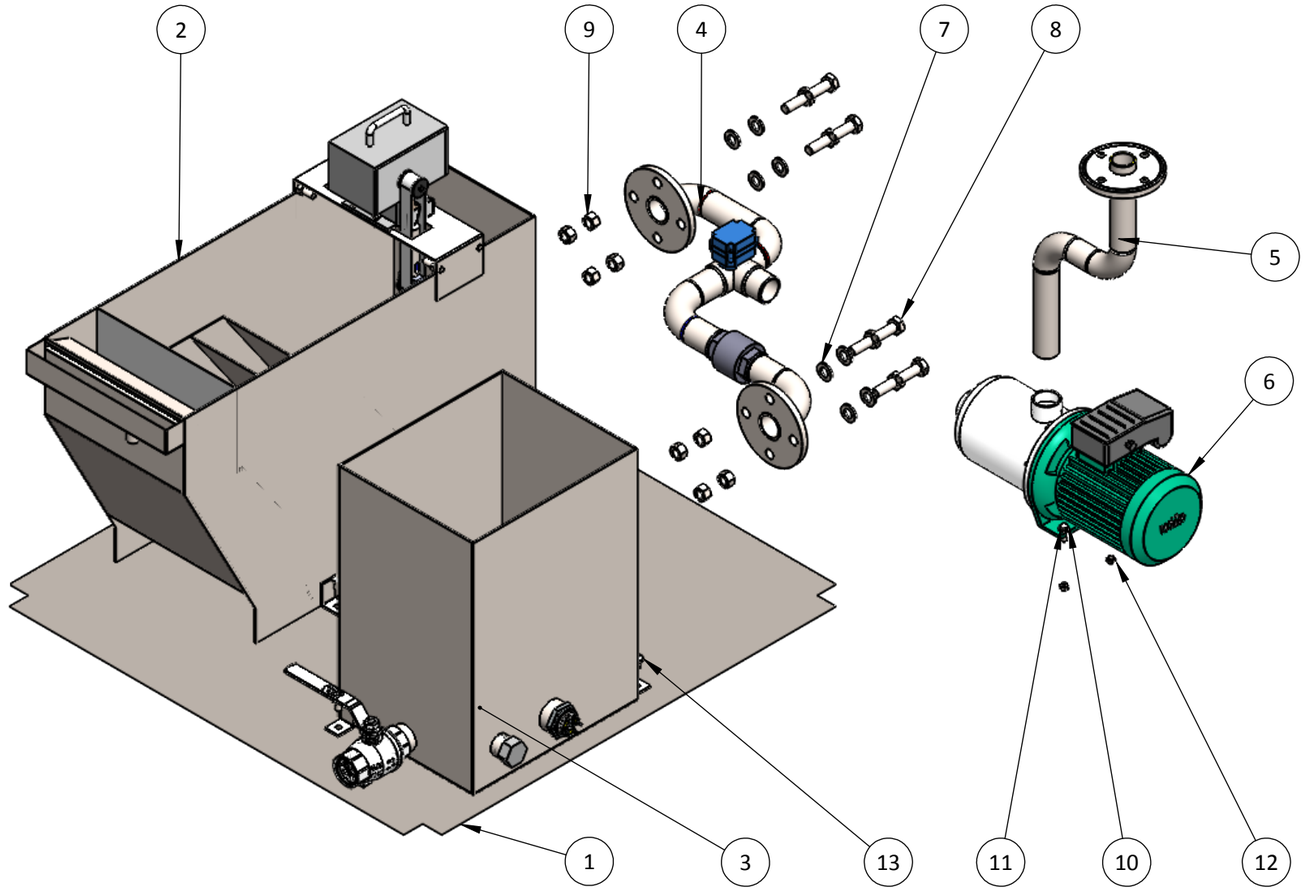


Note: Welded elbow 90° 1" (ASTM A403-20DB/ASME SA-403 1992, ANSI B16.9-1993), thickenss 2.77mm (Sch 10S), mass 0.18kg

Note: Machine chamfering at 45 degrees, depth 2mm

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_C_04** Title: *welded tee & elbow 1 1/4"* General Tolerances: ISO 2768-m-K		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316L	Mass [kg] [-]	Scale 1:1	Sheet 1 of 1





ITEM NO.	DRAWING NO.	DESCRIPTION	QTY.
1	IPW_A_01_03	main_skeleton_plate	1
2	IPW_D_01	tank1_assembly	1
3	IPW_D_02	tank2_assembly	1
4	IPW_D_03	pump_suction_line_assembly	1
5	IPW_D_04	pump_pressure_line_assembly	1
6	IPW_D_05	Wilo MHI804-2_V_1-230-50-2-4015700 (~230V FKM)	1
7	IPW_D_06	B18.22M - Plain washer, 16 mm, narrow	8
8	IPW_D_07	heavy hex screw_am	8
9	IPW_D_08	B18.2.4.1M - Hex nut, Style 1, M16 x 2 --D-N	8
10	IPW_D_09	hex cap screw_am	2
11	IPW_D_10	B18.22M - Plain washer, 8 mm, narrow	2
12	IPW_D_11	B18.2.4.1M - Hex nut, Style 1, M8 x 1.25 --D-N	2
13	IPW_D_12	B18.6.7M - M10 x 1.5 x 16 Type I Cross Recessed PHMS --16N	5

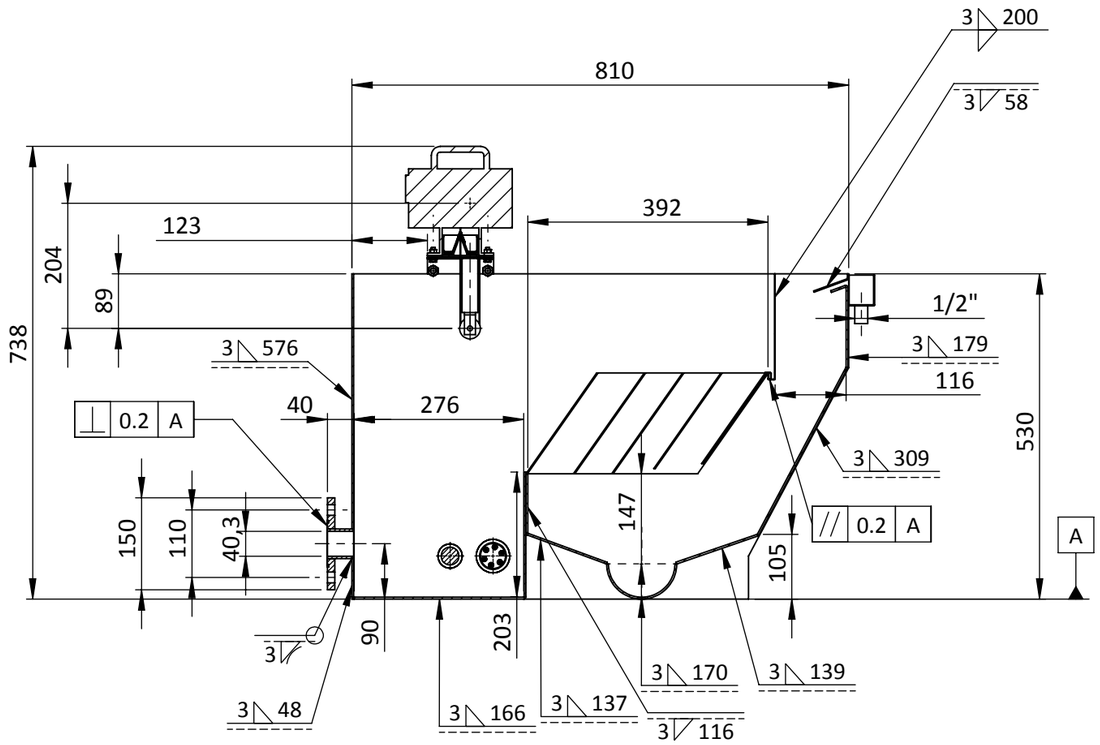
NATIONAL TECHNICAL UNIVERSITY OF ATHENS
DEPARTMENT OF MECHANICAL ENGINEERING
MACHINE DESIGN LABORATORY

Designed by: **Ch. Marketos**
Checked by: **G. Kaisarlis**
Approved by: **V. Spitas**

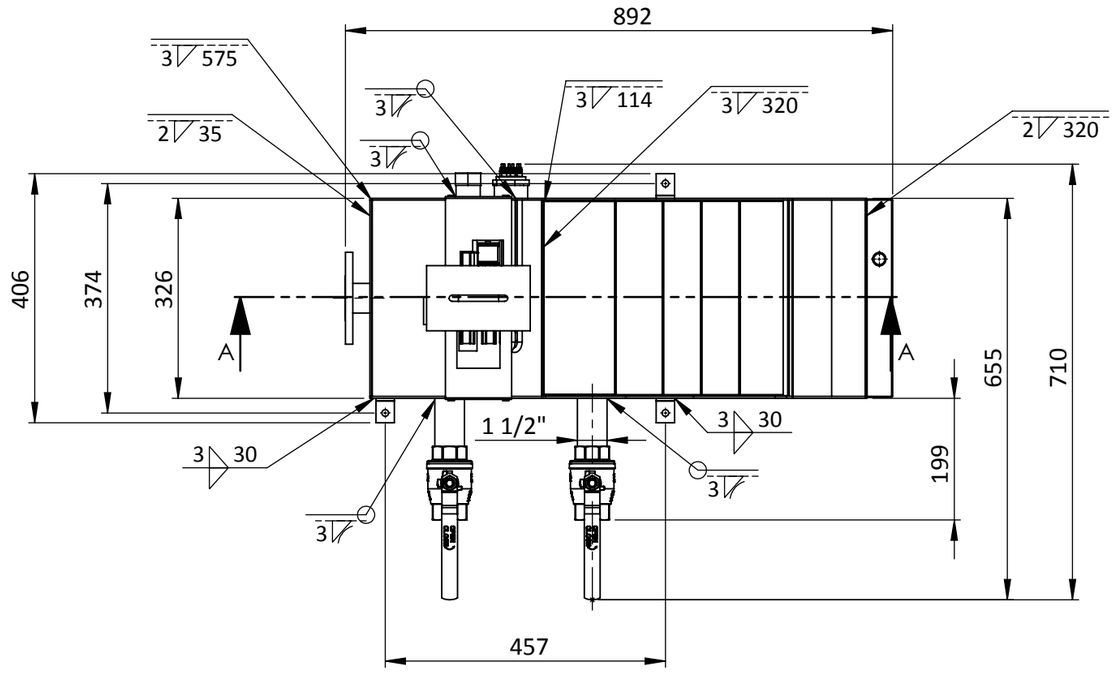
Drawing No: **IPW_D_00**
Title: *hydraulic_circuit_assembly*
General Tolerances: ISO 2768-c-L

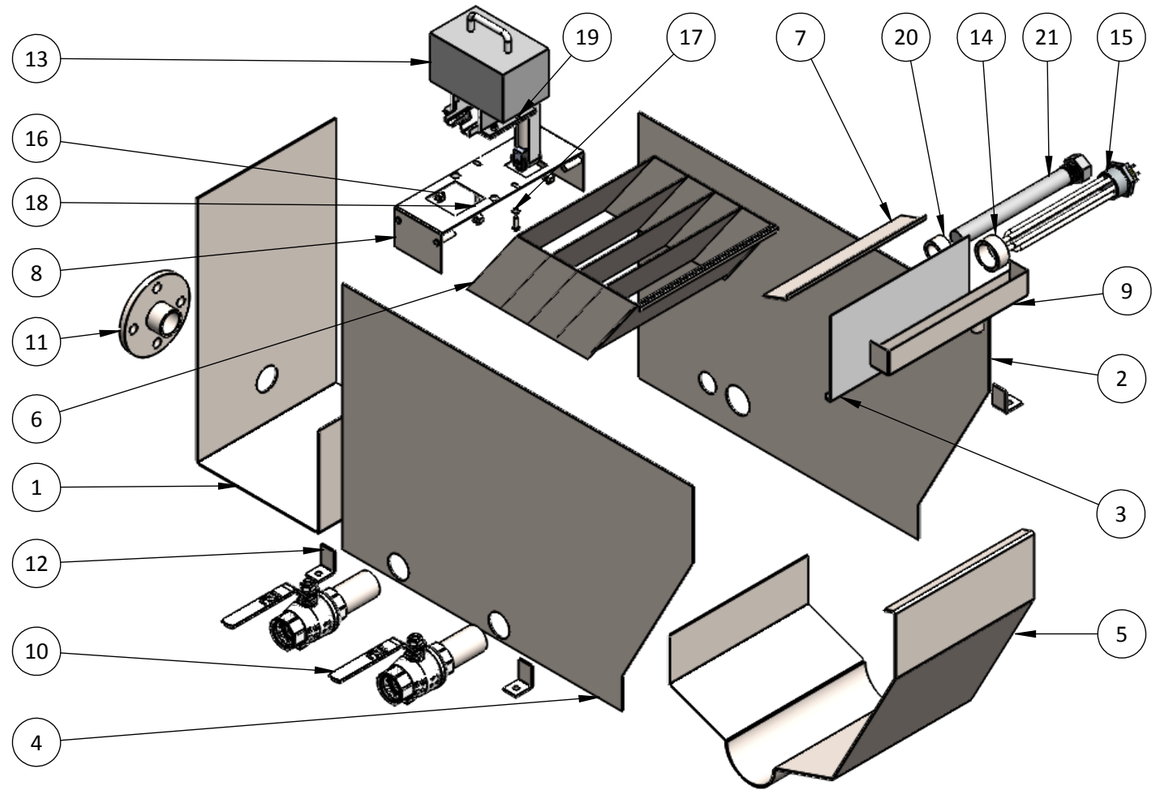
PROJECT: INDUSTRIAL PARTS WASHER

Date	Mass [kg]	Scale	Sheet
July 2018	90	1:10	1 of 1



SECTION A-A





ITEM NO.	DRAWING NO.	DESCRIPTION	QTY.
1	IPW_D_01_01	tank1_part1_sheet_metal	1
2	IPW_D_01_02	tank1_part2_sheet_metal	1
3	IPW_D_01_01	tank1_part3_sheet_metal	1
4	IPW_D_01_02	tank1_part4_sheet_metal	1
5	IPW_D_01_03	tank1_bottom_assembly	1
6	IPW_D_01_04	tank1_sheet_metal_filter_assembly	1
7	IPW_D_01_05	tank1_oil_water_separator_flat_bar_part	1
8	IPW_D_01_06	tank1_oil_skimmer_mount_assembly	1
9	IPW_D_01_07	tank1_oil_collector_assembly.SLDPRT	1
10	IPW_D_01_08	tank1_handle_valve_assembly_(1 1/2")	2
11	IPW_D_01_09	tank1_suction_asssembly	1
12	IPW_D_01_05	tanks_sheet_metal_mount	3
13	IPW_D_01_10	Belt Oil Skimmer Abanaki Mighty Mini SST 1"	1
14	IPW_D_01_11	tank1 half coupling 1 1/2" (stainless steel)	1
15	IPW_D_01_12	water electrical heater 1.5inch, 6kW	1
16	IPW_D_01_13	B18.2.4.2M - Hex nut, Style 2, M10 x 1.5, with 16mm WAF --D-N	4
17	IPW_D_01_14	B18.22M - Plain washer, 6 mm, narrow	2
18	IPW_D_01_15	hex cap screw_am	2
19	IPW_D_01_16	B18.2.4.2M - Hex nut, Style 2, M6 x 1 --D-N	2
20	IPW_D_01_17	half coupling 1" (stainless steel)	1
21	IPW_D_01_18	magnesium anode rod 1", length 250mm	1

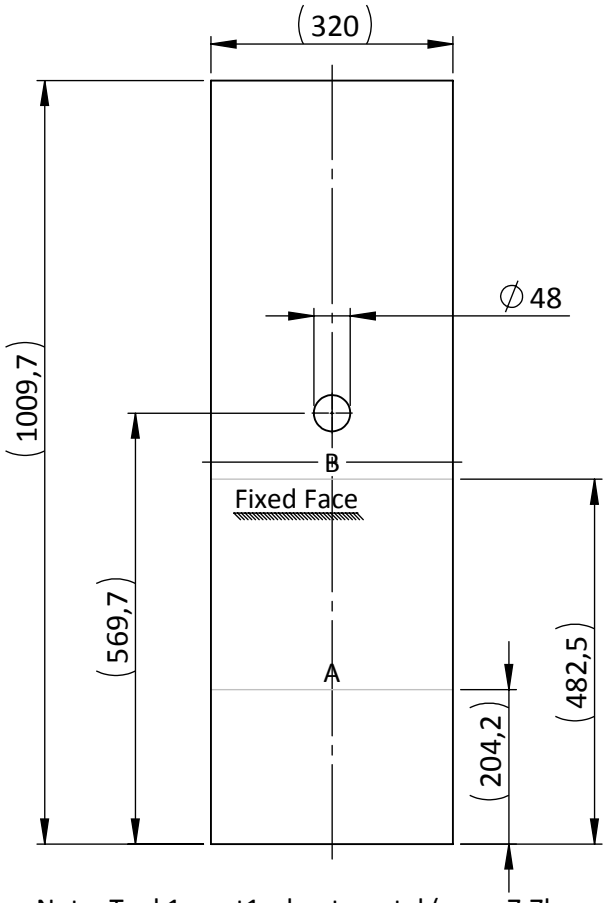
NATIONAL TECHNICAL UNIVERSITY OF ATHENS
DEPARTMENT OF MECHANICAL ENGINEERING
MACHINE DESIGN LABORATORY

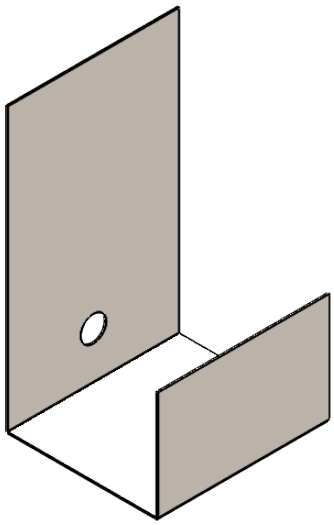
Designed by: **Ch. Marketos**
Checked by: **G. Kaisarlis**
Approved by: **V. Spitas**

Drawing No: **IPW_D_01**
Title: *tank1_assembly (110L)*
General Tolerances: ISO 2768-m-K

PROJECT: INDUSTRIAL PARTS WASHER

Date	Mass [kg]	Scale	Sheet
July 2018	48	1:10	1 of 1

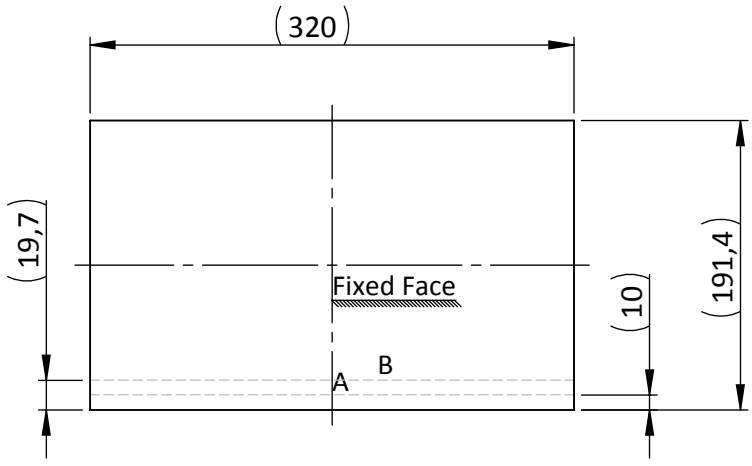


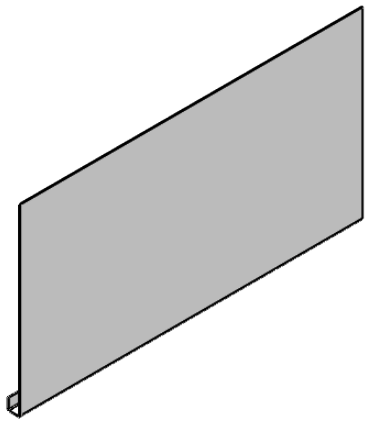


Tag	Direction	Angle
A	UP	90°
B	UP	90°

Note: Tank1_part1_sheet_metal (mass 7.7kg, scale 1:10)

Note: Sheet metal thickness 3mm





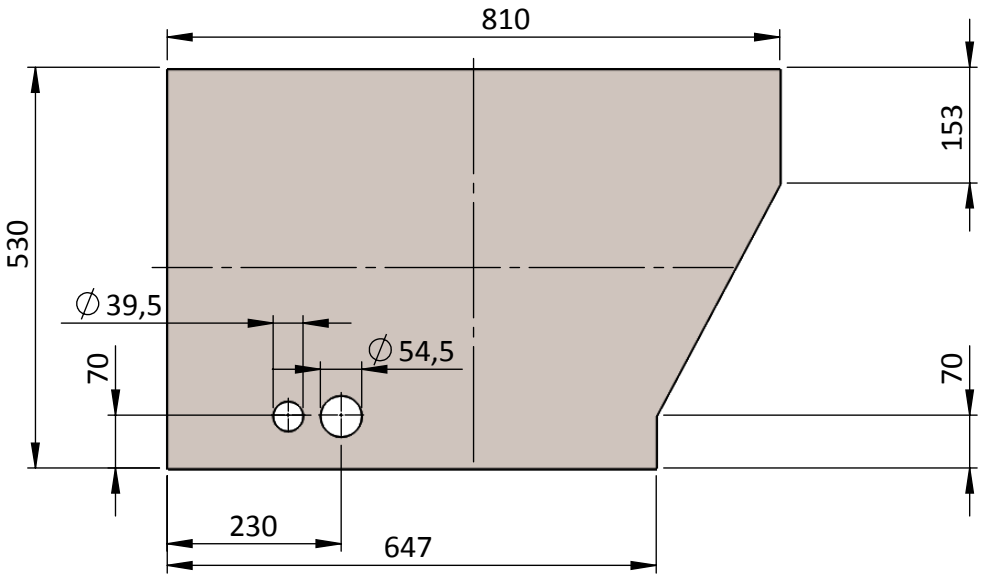
Tag	Direction	Angle
A	DOWN	90°
B	DOWN	90°

Note: Tank1_part3_sheet_metal (mass 0.5kg, scale 1:5)

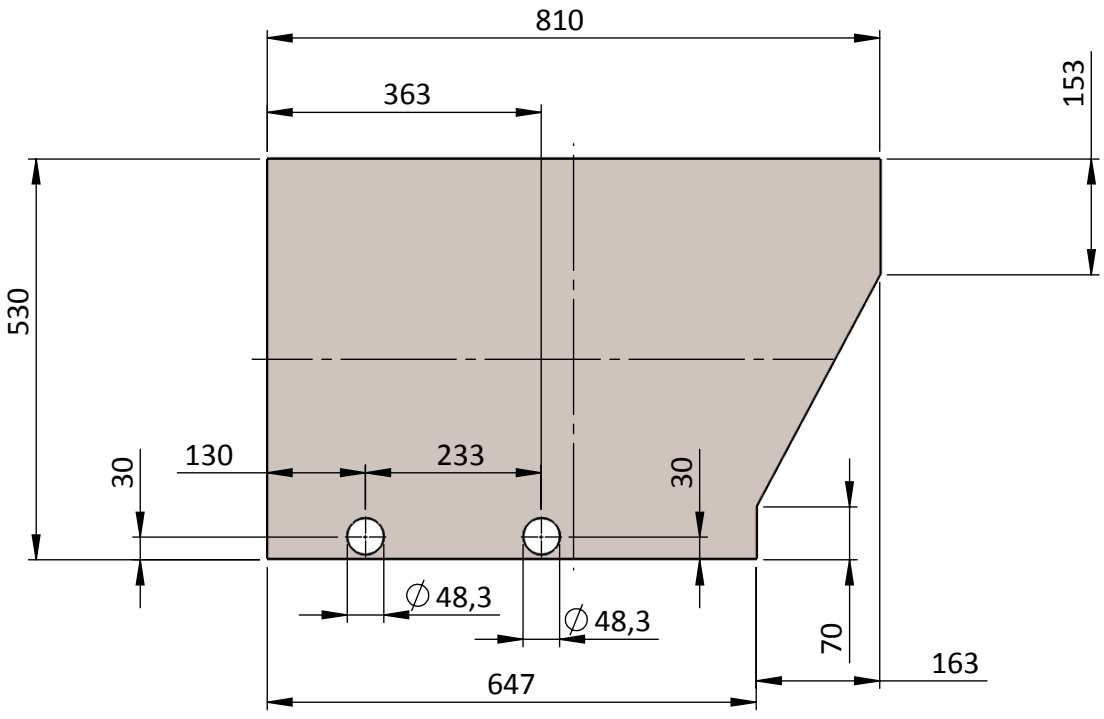
Note: Sheet metal thickness 1mm

Note: Radius of curvate of the bend sheet
as result from the bending machine

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_D_01_01** Title: *tank1 part 1 & 3 sheet metals* General Tolerances: ISO 2768-m-K		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316	Mass [kg] [-]	Scale [-]	Sheet 1 of 1

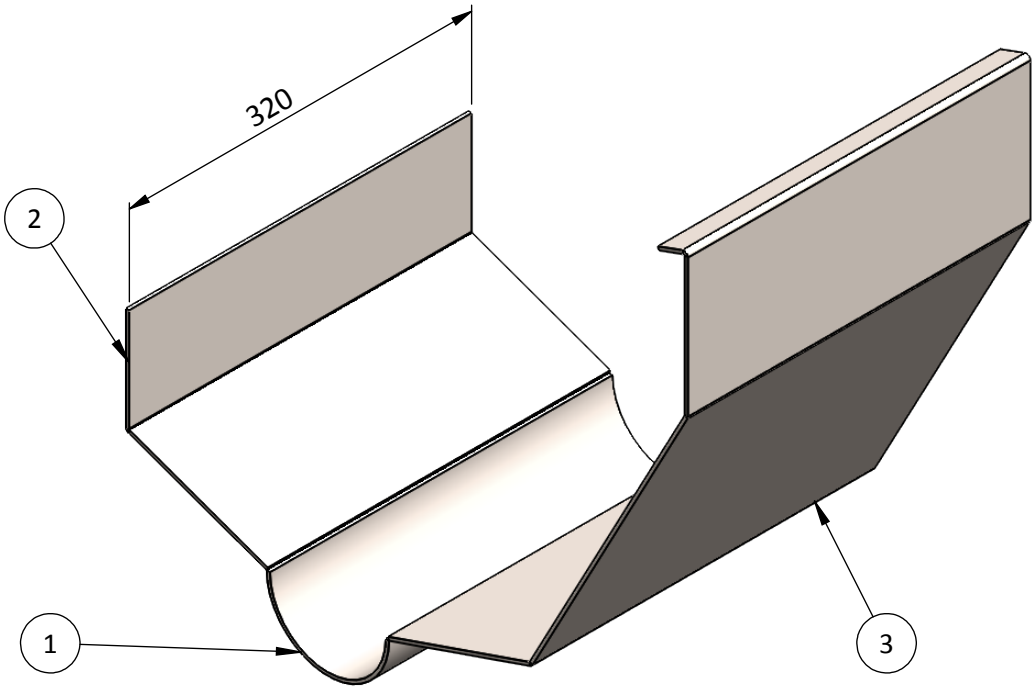


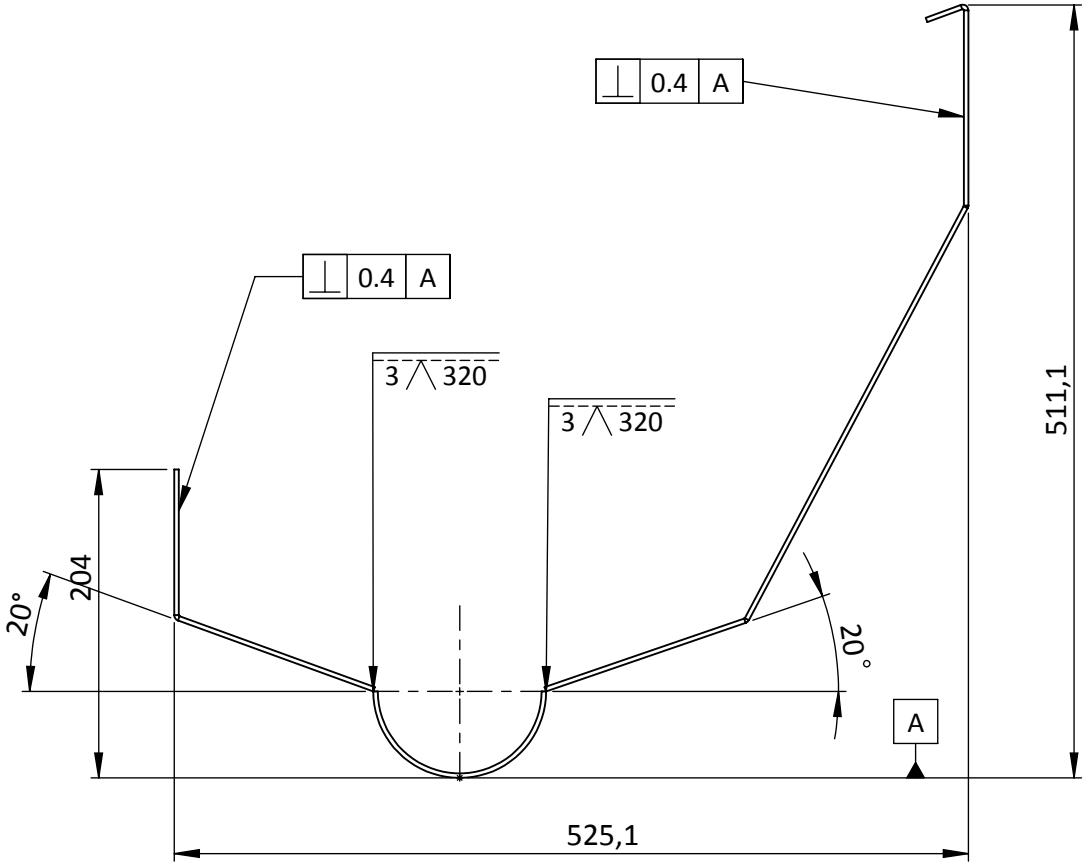
Tank1_part3_sheet_metal (mass 9.4kg)
Note: Sheet metal thickness 3mm



Tank1_part4_sheet_metal (mass 9.3kg)
Note: Sheet metal thickness 3mm

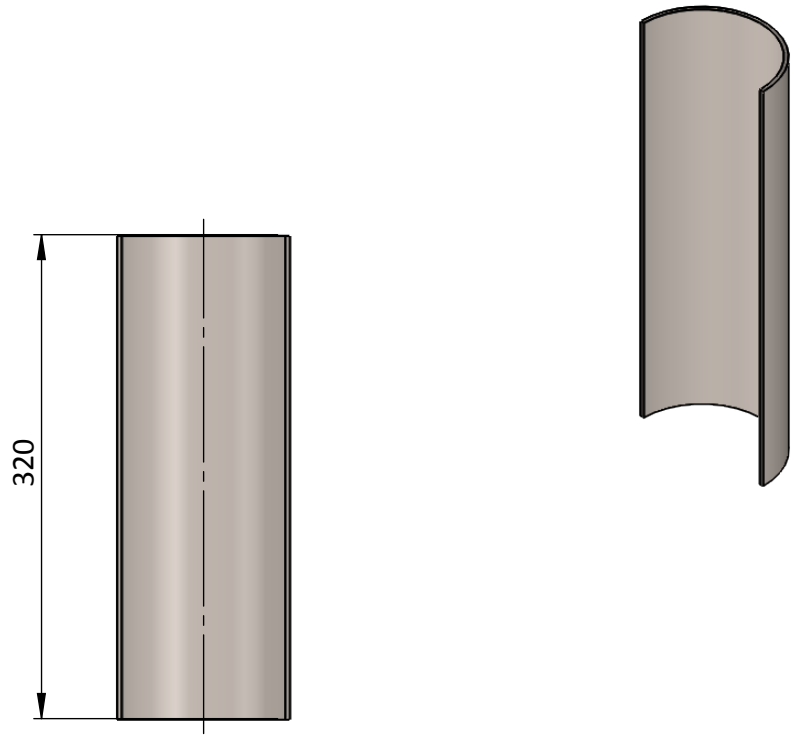
NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_D_01_02** Title: *tank1 part 2 & 4 sheet metals* General Tolerances: ISO 2768-m-K		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316	Mass [kg] [-]	Scale 1:10	Sheet 1 of 1

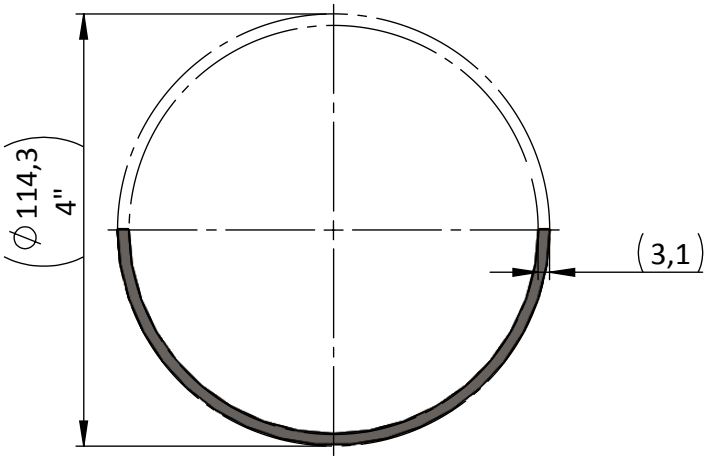




ITEM NO.	DRAWING NO.	DESCRIPTION	QTY.
1	IPW_D_01_03_01	tank1_half_tube	1
2	IPW_D_01_03_02	tank1_bottom_lateral_sheet_metal_1	1
3	IPW_D_01_03_02	tank1_bottom_lateral_sheet_metal_2	1

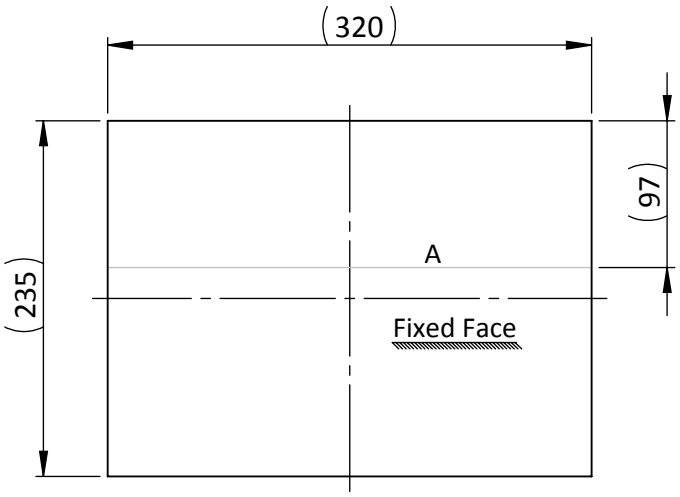
NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**	Drawing No:**IPW_D_01_03** Title: *tank1_bottom_assembly* General Tolerances: ISO 2768-m-K		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Mass [kg] 7.8	Scale 1:5	Sheet 1 of 1

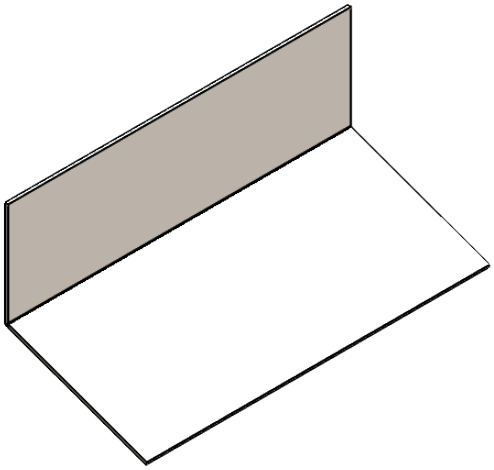




Note: Half tube 4", length 320, thickness 3.05mm (Sch10S), ASTM A312-2001

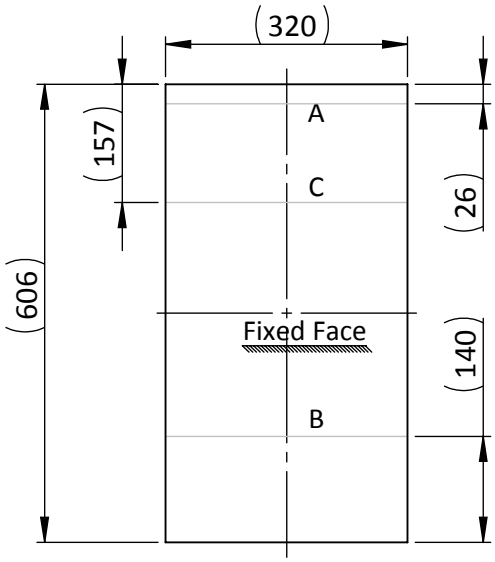
NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No: IPW_D_01_03_01 Title: *tank1_half_tube_4"* General Tolerances: ISO 2768-m-K		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316	Mass [kg] 1.4	Scale 1:5	Sheet 1 of 1

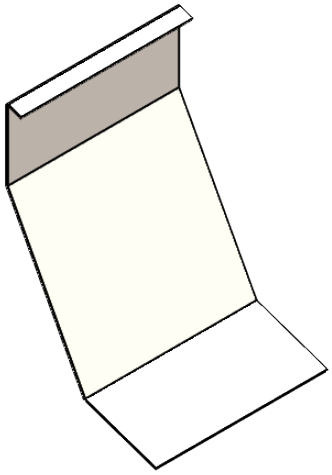




Note: Tank1_bottom_sheet_metal_part1 (mass 2kg, scale 1:5)
Note: Sheet metal thickness 3mm

Tag	Direction	Angle
A	UP	70°



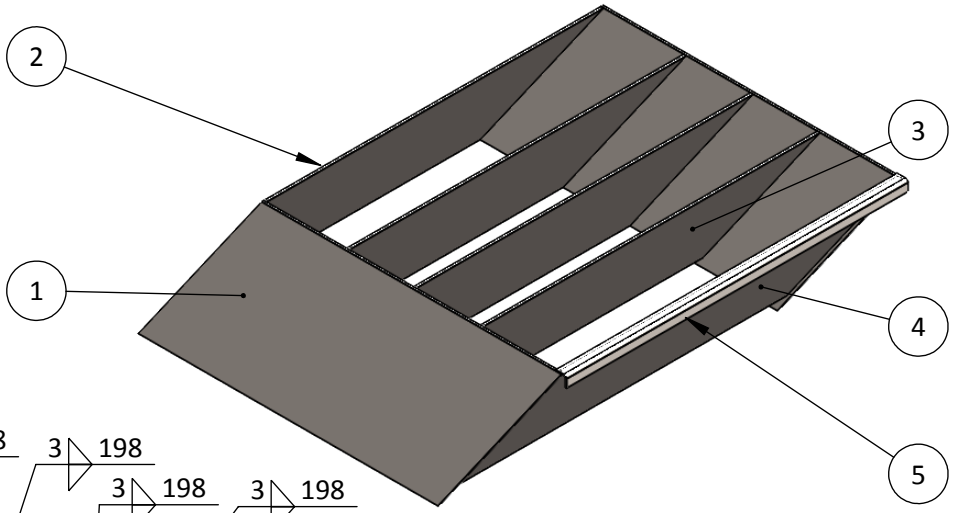


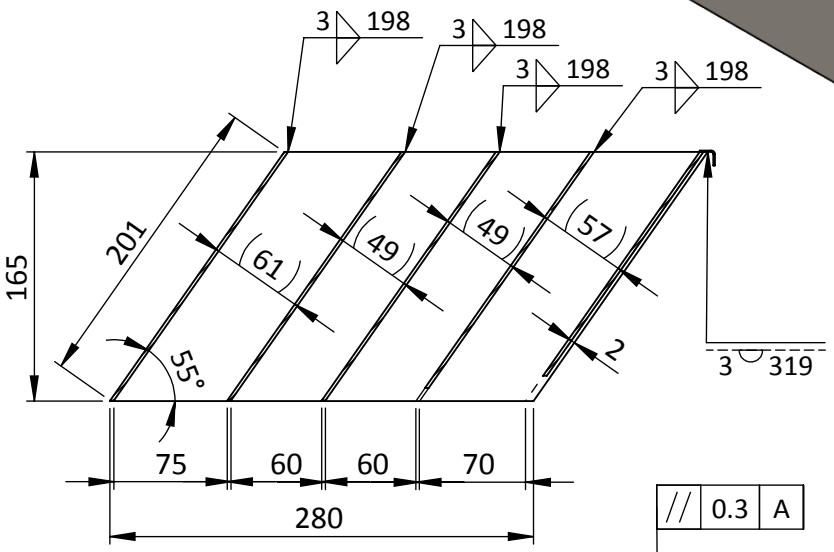
Note: Tank1_bottom_sheet_metal_part2 (mass 4.6kg, scale 1:10)
Note: Sheet metal thickness 3mm

Tag	Direction	Angle
A	UP	110°
B	UP	43°
C	UP	28°

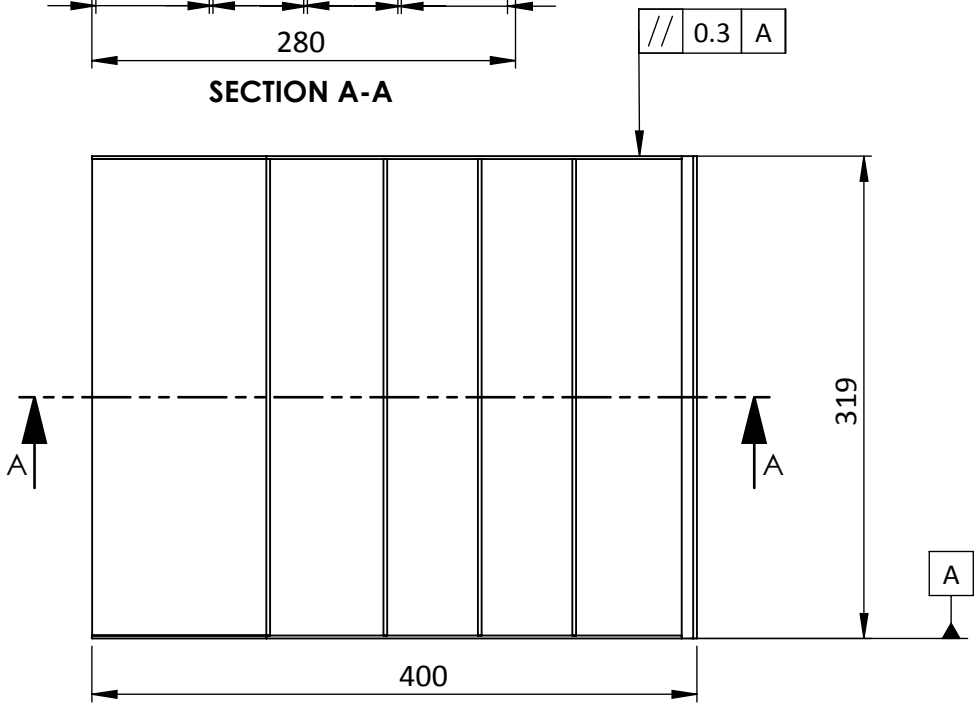
Note: Radius of curvate of the bend sheet as result from the bending machine

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No: IPW_D_01_03_02 Title: *tank1 bottom sheet metals part 1 & 2* General Tolerances: ISO 2768-m-K		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316	Mass [kg] [-]	Scale [-]	Sheet 1 of 1





SECTION A-A



ITEM NO.	DRAWING NO.	DESCRIPTION	QTY.
1	IPW_D_01_04_01	tank_filter_lateral_plate	2
2	IPW_D_01_04_01	tank_filter_plate1	3
3	IPW_D_01_04_01	tank_filter_plate2	1
4	IPW_D_01_04_01	tank_filter_plate3	1
5	IPW_D_01_04_01	Angle "L" (26-0005-10),16x16,thickness 1mm, length 119	1

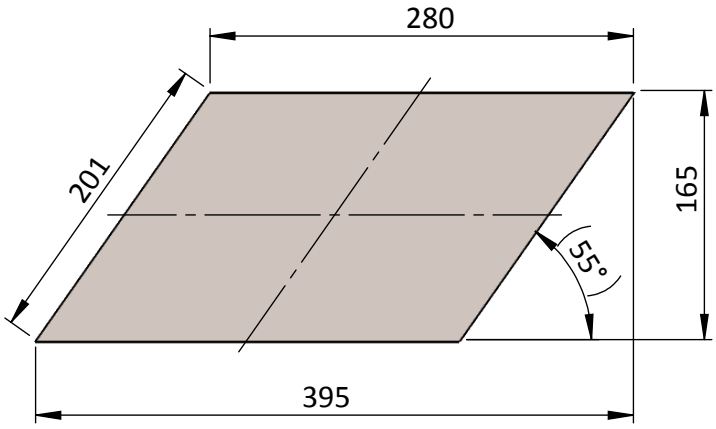
NATIONAL TECHNICAL UNIVERSITY OF ATHENS
DEPARTMENT OF MECHANICAL ENGINEERING
MACHINE DESIGN LABORATORY

Designed by: **Ch. Marketos**
Checked by: **G. Kaisarlis**
Approved by: **V. Spitas**

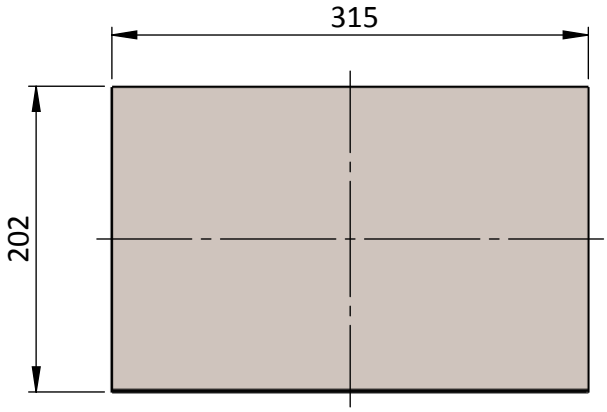
Drawing No: **IPW_D_01_04**
Title: *tank1_sheet_metal_filter_assemlby*
General Tolerances: ISO 2768-m-K

PROJECT: INDUSTRIAL PARTS WASHER

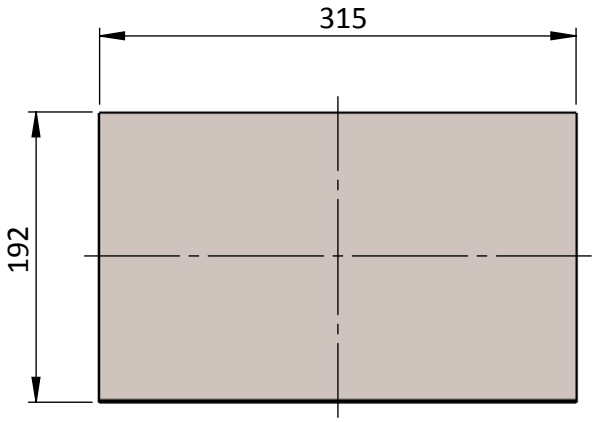
Date	Mass [kg]	Scale	Sheet
July 2018	6.5	1:5	1 of 1



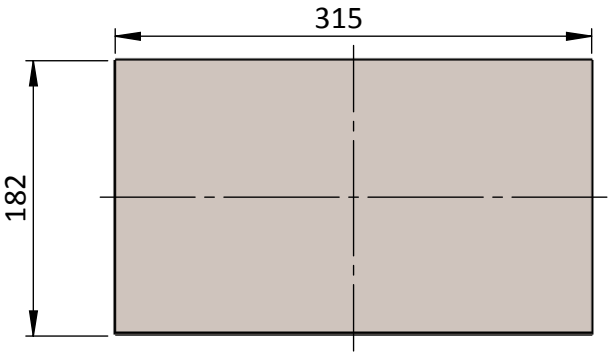
Tank1_filter_lateral_plate_plate (mass 0.75kg, scale 1:5)
Note: Sheet metal thickness 3mm



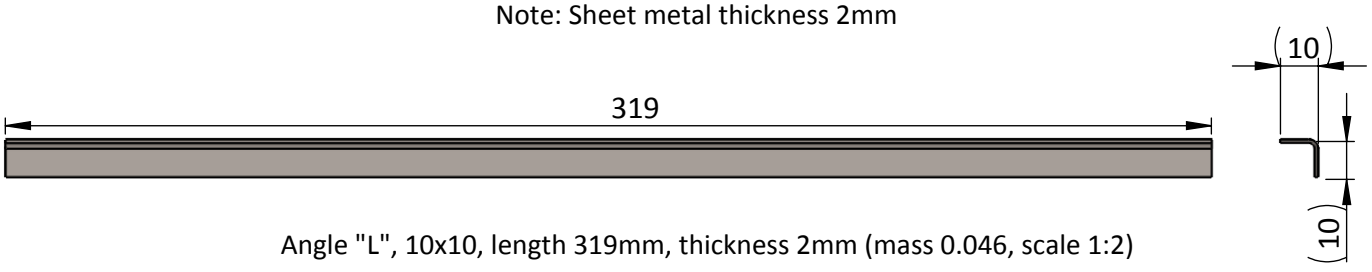
Tank1_filter_plate_1 (mass 1kg, scale 1:5)
Note: Sheet metal thickness 2mm



Tank1_filter_plate_2 (mass 0.95kg, scale 1:5)
Note: Sheet metal thickness 2mm

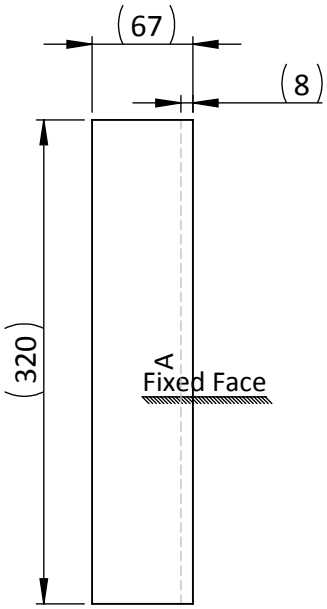


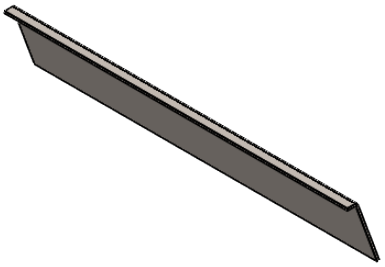
Tank1_filter_plate_3 (mass 0.91kg, scale 1:5)
Note: Sheet metal thickness 2mm



Angle "L", 10x10, length 319mm, thickness 2mm (mass 0.046, scale 1:2)

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_D_01_04_01** Title: *tank1_sheet_metal_filter_parts* General Tolerances: ISO 2768-c-L		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316	Mass [kg] [-]	Scale [-]	Sheet 1 of 1



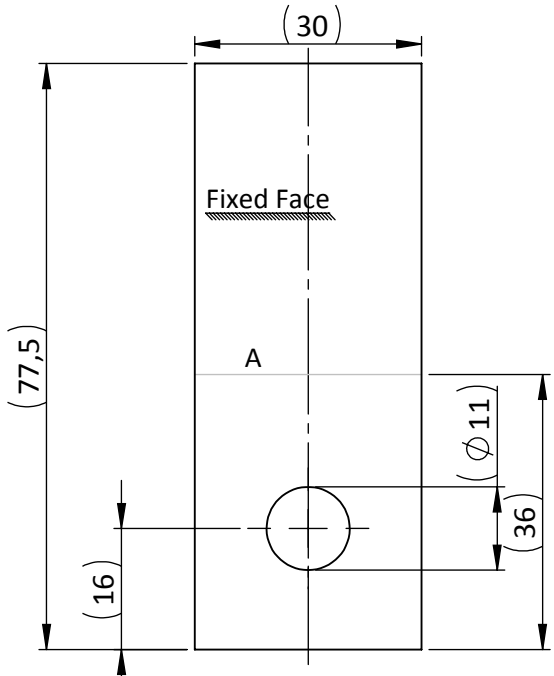


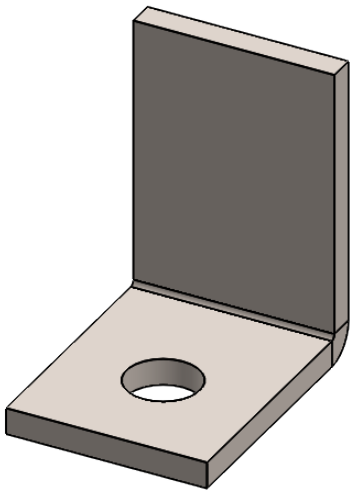
Note: Tank1_flat_bar_oil_water_separator (mass 0.35 kg, scale 1:5)

Note: Sheet metal thickness 2mm

Note: Radius of curvate of the bend sheet as result from the bending machine

Tag	Direction	Angle
A	DOWN	70°





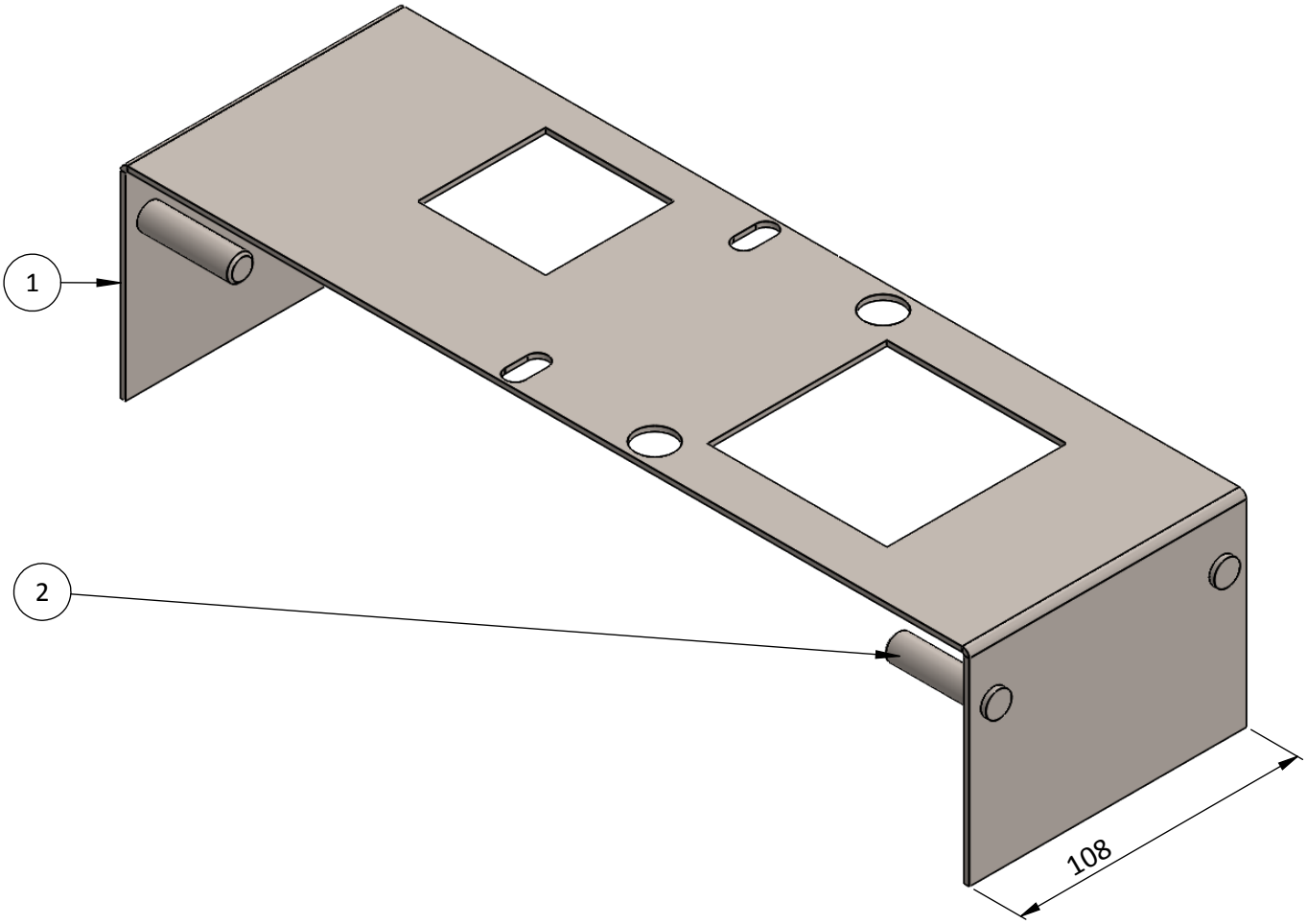
Note: tanks_sheet_metal_mount (mass 0.75 kg, scale 1:1)

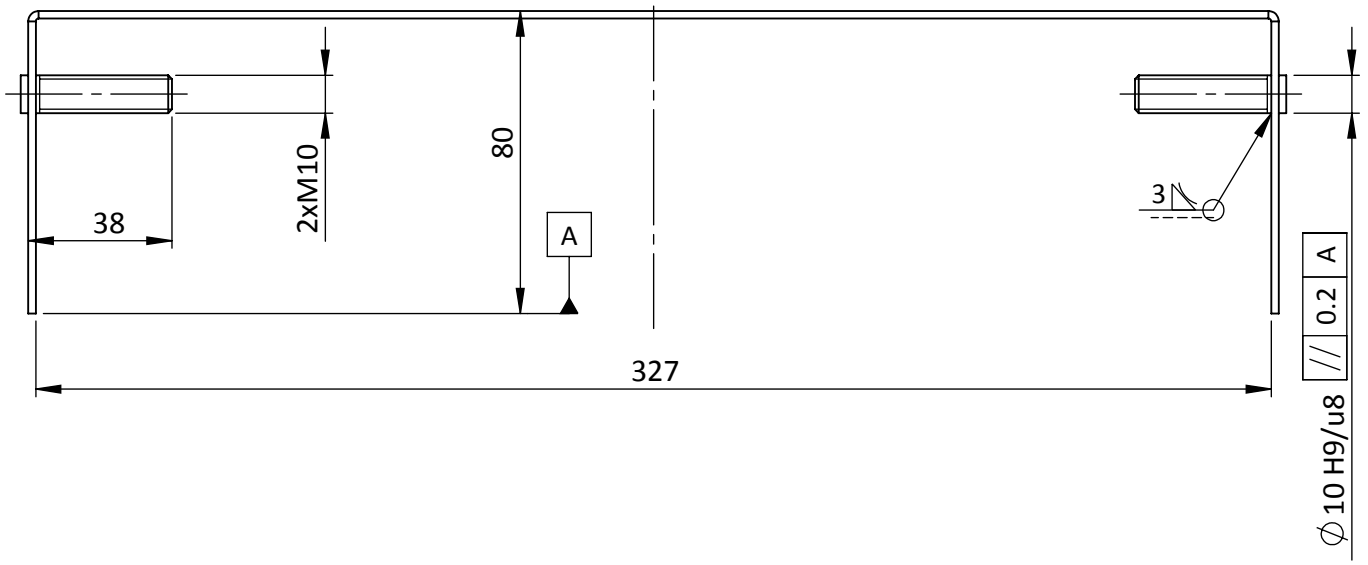
Note: Flat bar 800x35, thickness 4mm

Note: ∅11 holes for M10

Tag	Direction	Angle
A	UP	90°

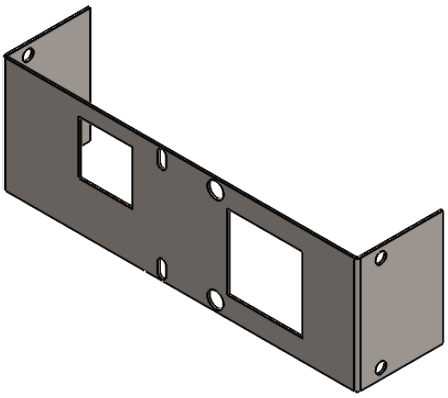
NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No: **IPW_D_01_05** Title: *tank1 flat bar & tanks sheet metal mount* General Tolerances: ISO 2768-c-L		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316	Mass [kg] [-]	Scale [-]	Sheet 1 of 1

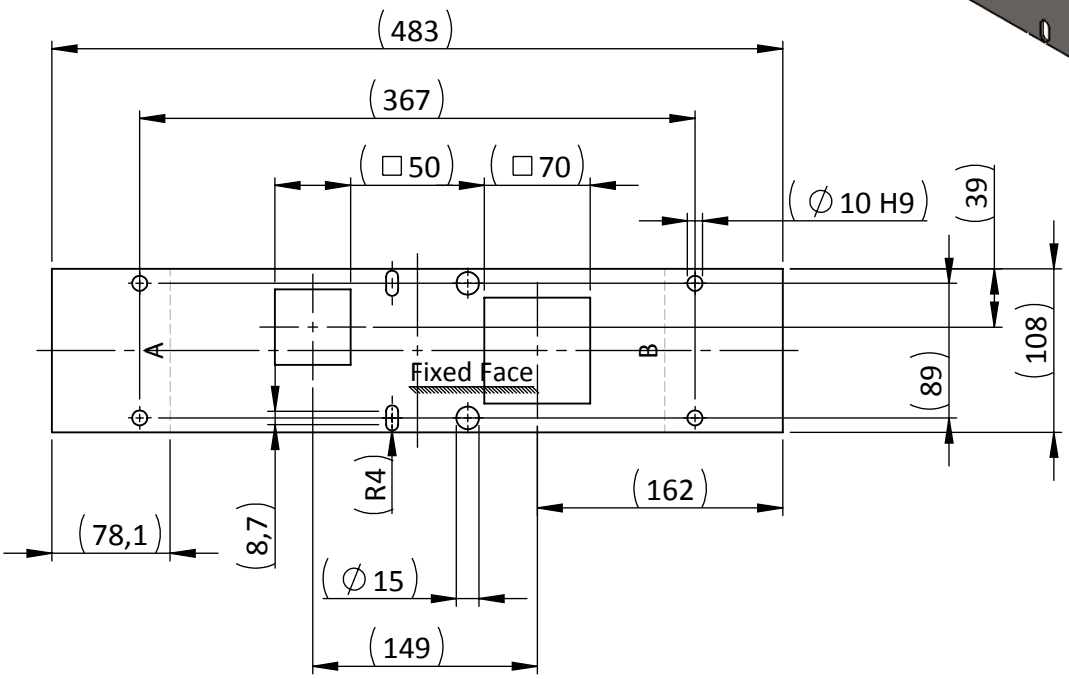




ITEM NO.	DRAWING NO.	DESCRIPTION	QTY.
1	IPW_D_01_06_01	oil_skimmer_universal_mount	1
2	IPW_D_01_06_01	oil_skimmer_universal_mount_thread_cylinder	4

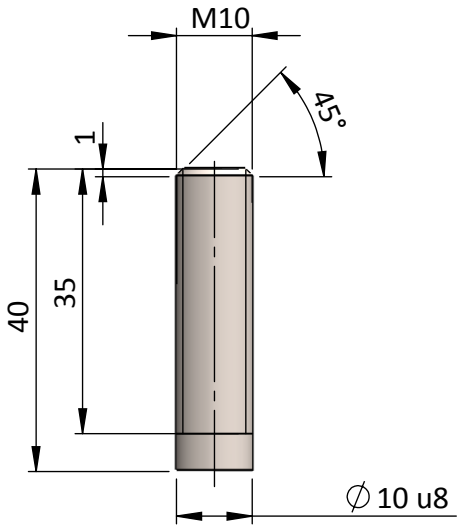
NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**	Drawing No:**IPW_D_01_06** Title: *oil_skimmer_mount_assembly* General Tolerances: ISO 2768-m-K		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Mass [kg] 0.8	Scale 1:2	Sheet 1 of 1





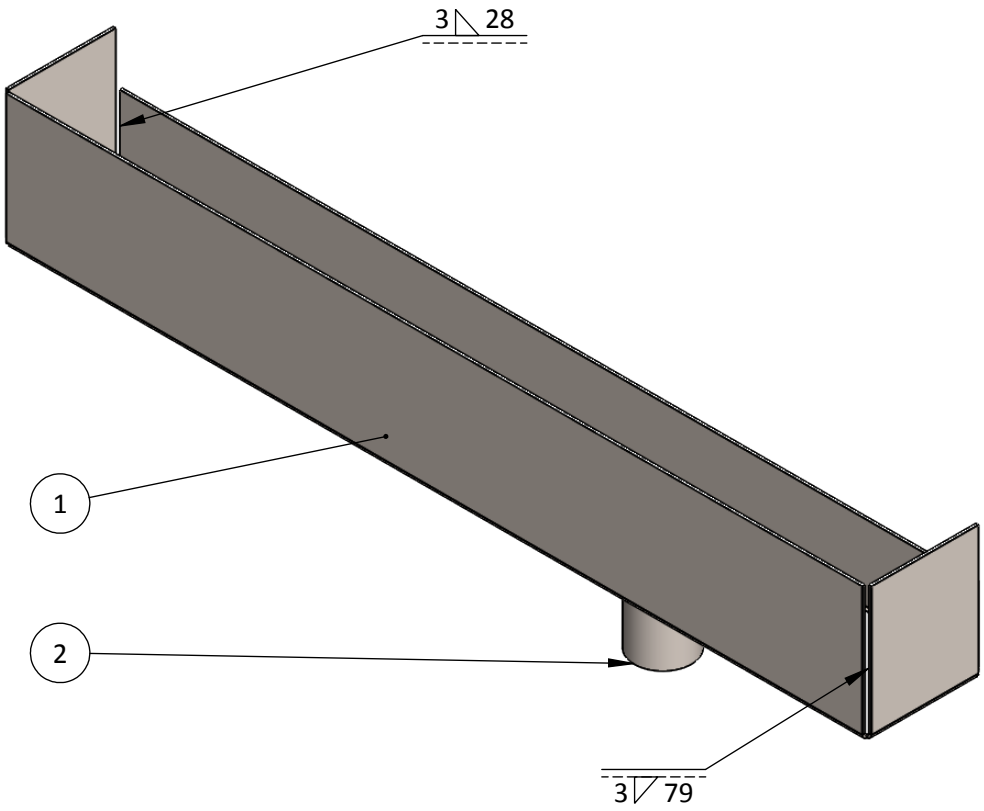
Tag	Direction	Angle
A	DOWN	90°
B	DOWN	90°

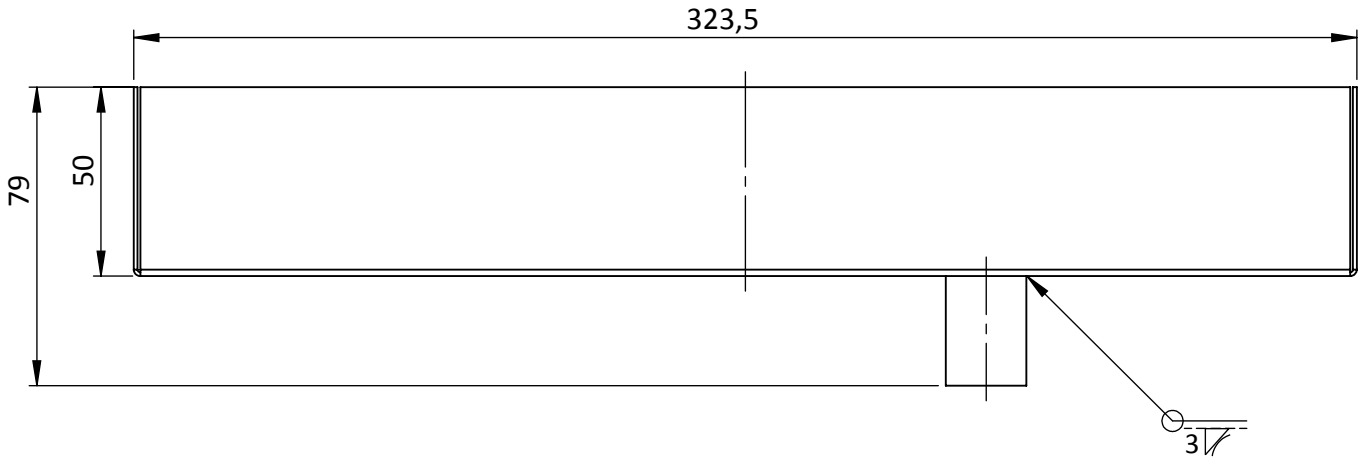
Oil skimmer mount (mass 0.7, scale 1:5)
Note: Sheet metal thickness 2mm
Note: Radius of curvate of the bend sheet as result from the bending machine



Oil skimmer thread cylinde M10 (mass 0.03 scale 1:1)

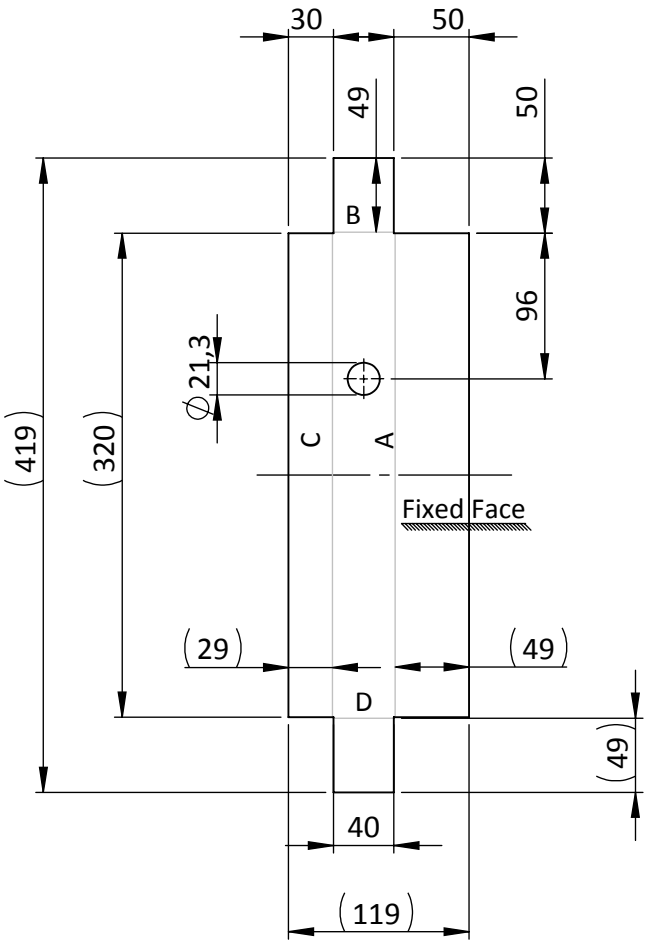
NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_D_01_06_01** Title: *oil skimmer mount & thread cylinder* General Tolerances: ISO 2768-m-K		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316	Mass [kg] [-]	Scale [-]	Sheet 1 of 1



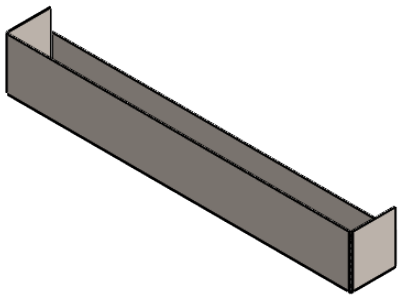


ITEM NO.	DRAWING NO.	DESCRIPTION	QTY.
1	IPW_D_01_07_01	tank1_oil_collector	1
2	IPW_D_01_07_01	tank1_oil_collector_tube	1

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**	Drawing No:**IPW_D_01_07** Title: *tank1_oil_collector_assembly* General Tolerances: ISO 2768-m-K		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Mass [kg] 0.43	Scale 1:5	Sheet 1 of 1



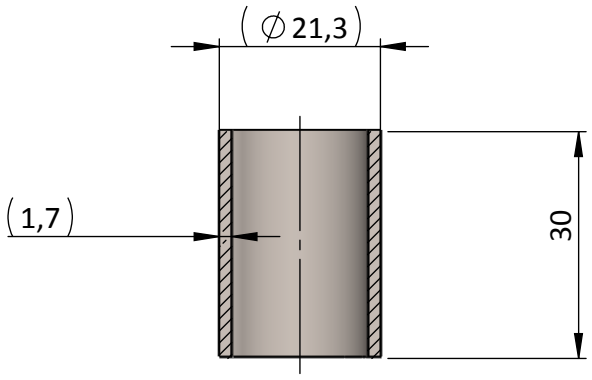
Note: Oil_collector_sheet_metal (mass 0.4, scale 1:5)



Tag	Direction	Angle
A	UP	90°
B	UP	90°
C	UP	90°
D	UP	90°

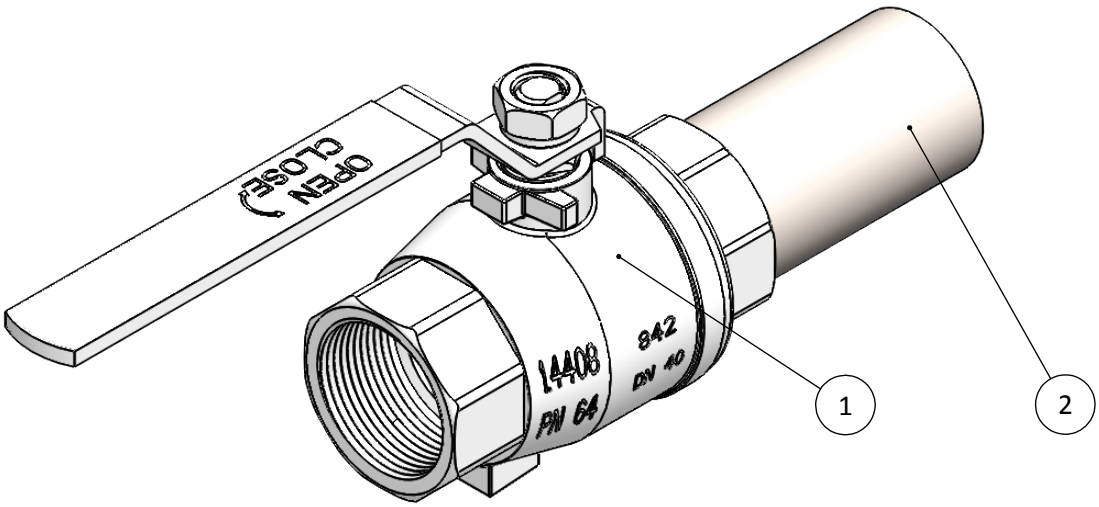
Note: Sheet metal thickness 1mm

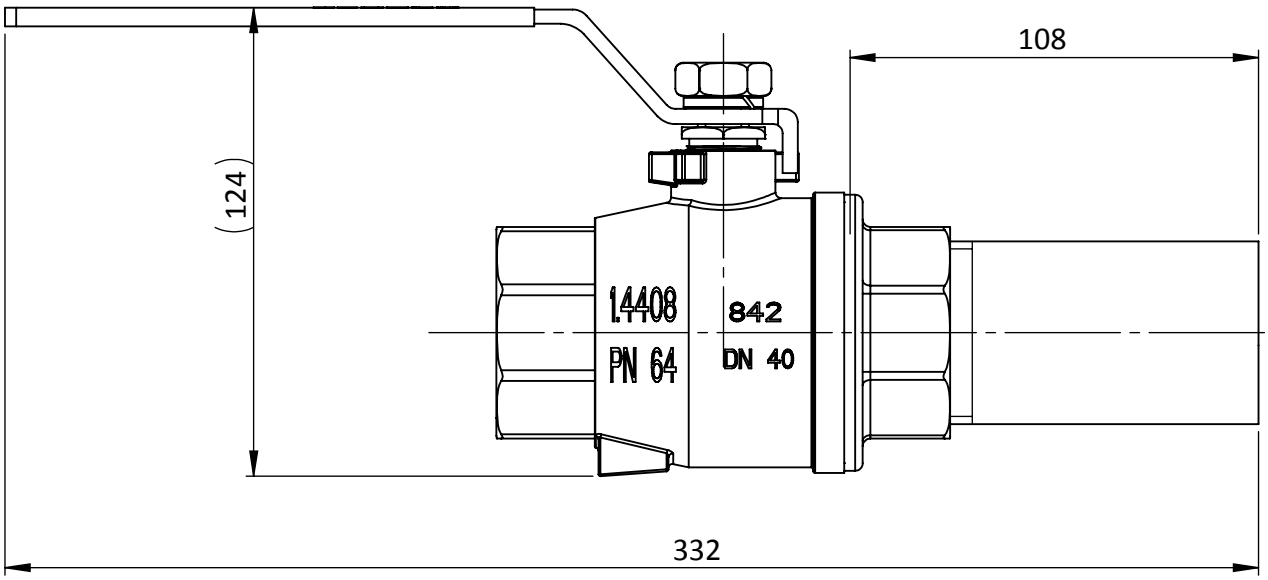
Note: Radius of curvate of the bend sheet as result from the bending machine



Oil_collector_tube (mass 0.03, scale 1:1), tube 1/2" (ASTM A312-2001), length 30mm, thickness 1.65mm (Sch 5S)

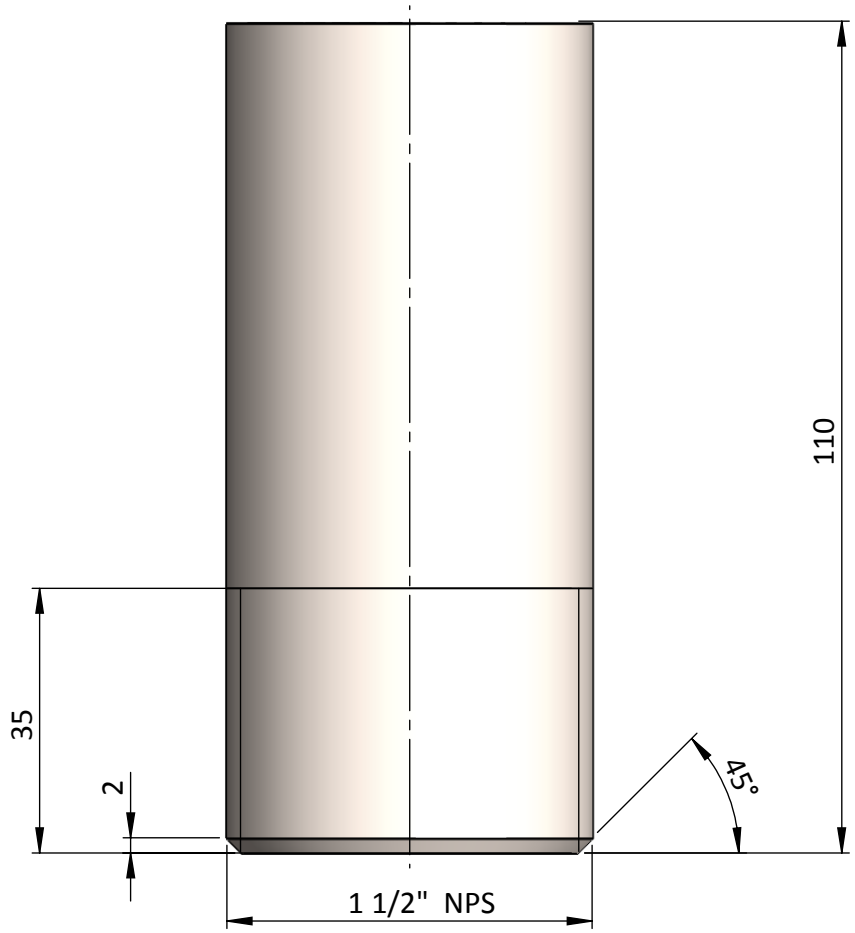
NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_D_01_07_01** Title: *tank1_oil_collector & tube* General Tolerances: ISO 2768-m-K		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316	Mass [kg] [-]	Scale [-]	Sheet 1 of 1



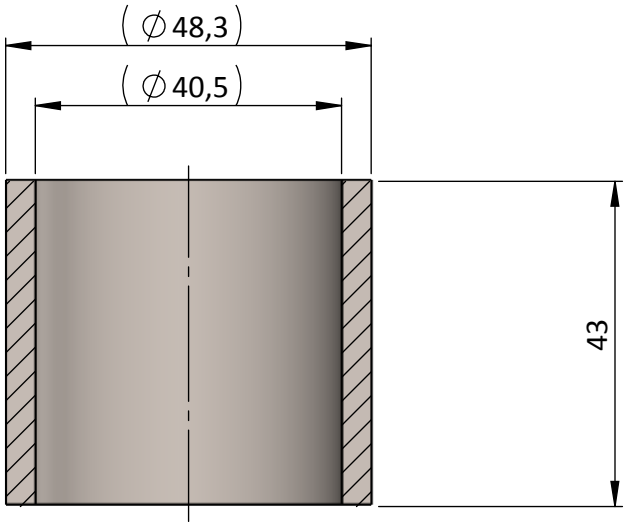


ITEM NO.	DRAWING NO.	DESCRIPTION	QTY.
1	IPW_D_01_08_01	handle valve 842 (1 1/2")	1
2	IPW_D_01_08_02	tank1 valve tube (1 1/2")	1

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**	Drawing No:**IPW_D_01_08** Title: *tank1_handle_valve_assembly* General Tolerances: ISO 2768-c-L		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Mass [kg] 0.44	Scale 1:2	Sheet 1 of 1

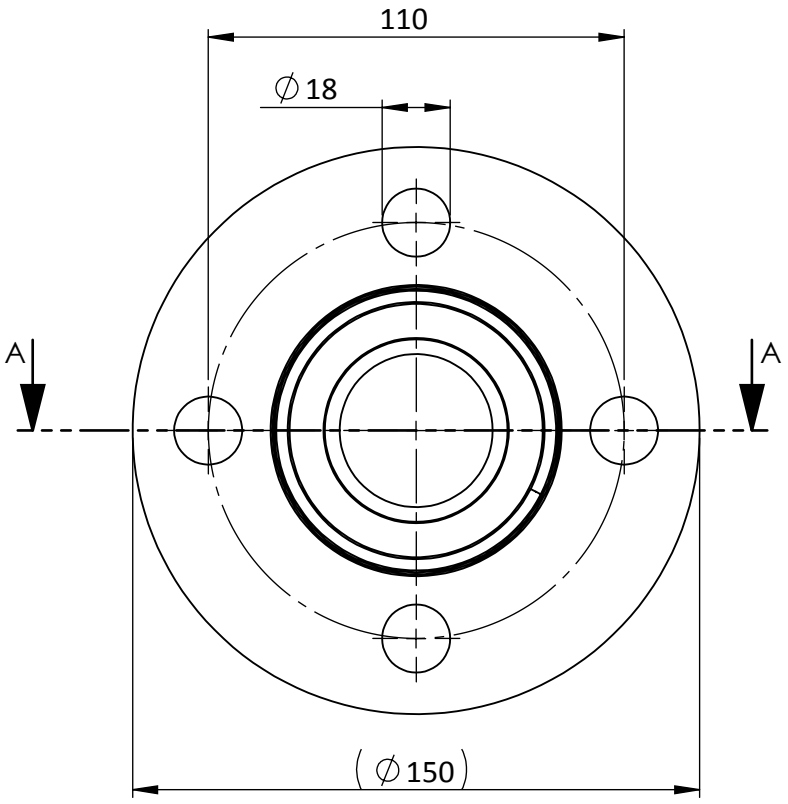


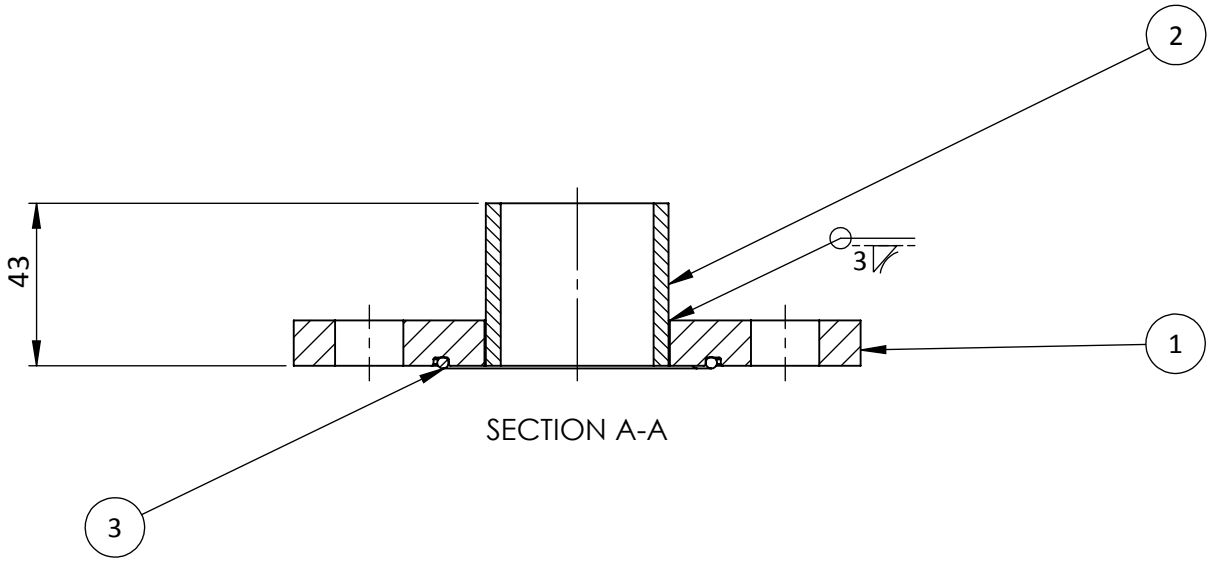
Tank1 handle valve tube (mass 0.35 , scale 1:1),
Note: Tube 1 1/2" (ASTM A312-2001), length 90mm, thickness 2.77mm (Sch 10S)



Tank1 suction assembly tube (mass 0.14 , scale 1:1),
Note: Tube 1 1/2" (ASTM A312-2001), length 70mm, thickness 2.77mm (Sch 40S)

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_D_01_08_02** Title: *valve & suction assembly tubes* General Tolerances: ISO 2768-c-L		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316L	Mass [kg] [-]	Scale 1:1	Sheet 1 of 1

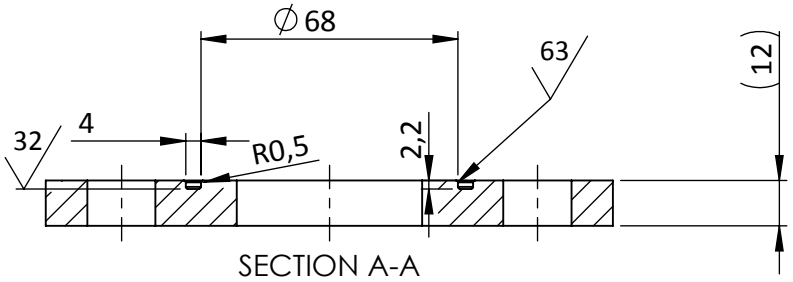


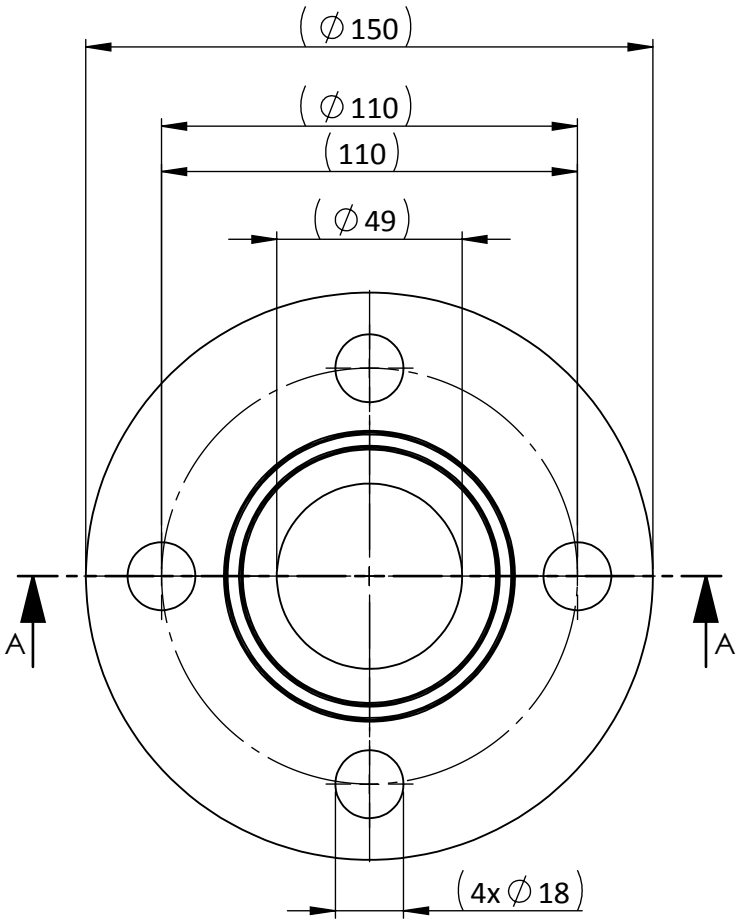


SECTION A-A

ITEM NO.	DRAWING NO.	DESCRIPTION	QTY.
1	IPW_D_01_09_01	tank suction flange (1 1/2")	1
2	IPW_D_01_08_02	tank1 suction tube (1 1/2")	1
3	IPW_D_01_09_02	O-ring (ID 68mm, cross section 3mm)	1

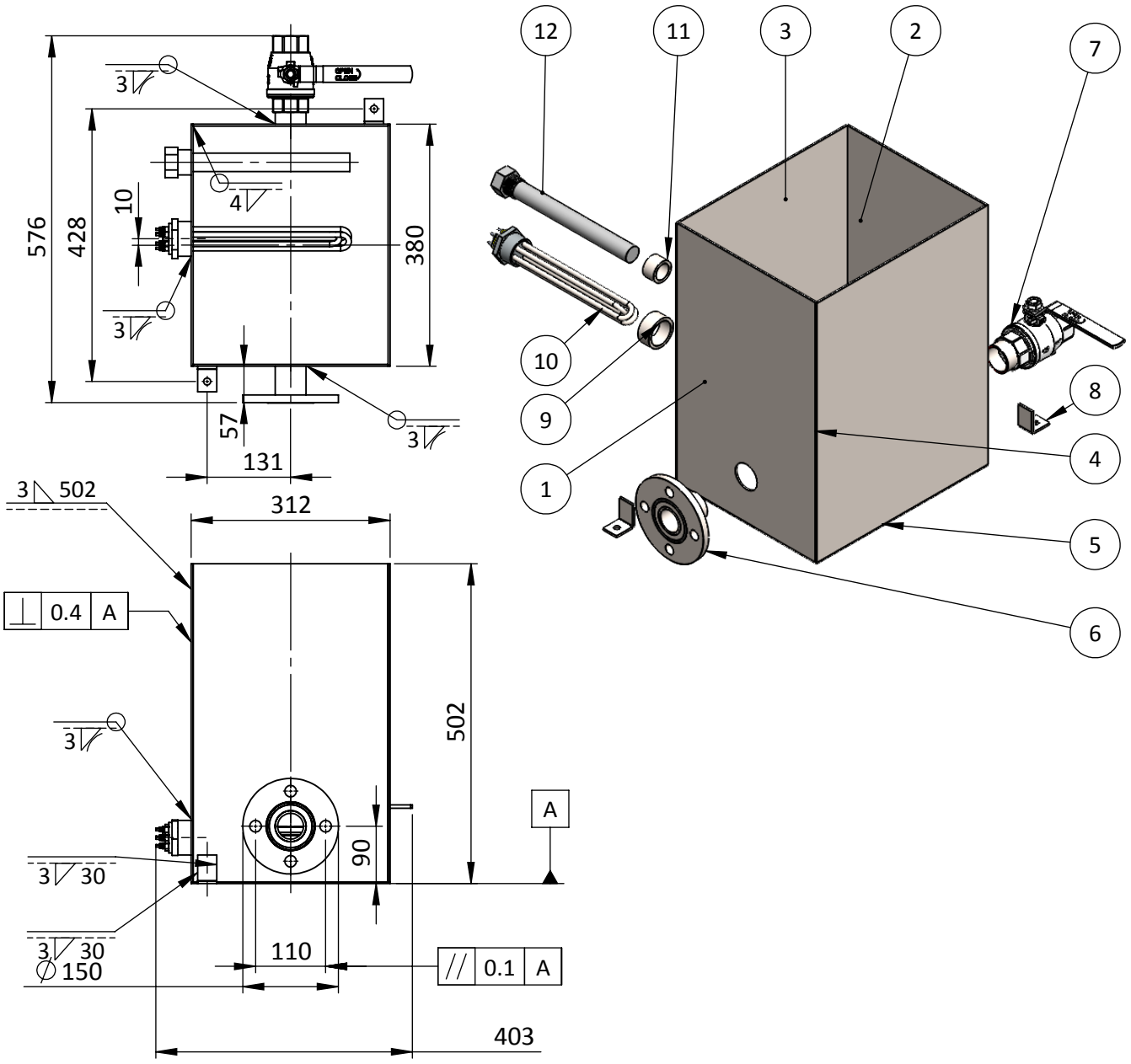
NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**	Drawing No:**IPW_D_01_09** Title: *tank1_suction_assembly* General Tolerances: ISO 2768-m-K		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Mass [kg] [-]	Scale 1:2	Sheet 1 of 1





Note: Flange 1 1/2" (DIN 2576)
Phase 1: O-rings groove ID68, width 2.8mm, ⩛ 1.5
Note: Groove radius 0.013-0.51mm

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No: **IPW_D_01_09_01** Title: *tank suction flange (1 1/2")* General Tolerances: ISO 2768-m-K		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316	Mass [kg] 1.4	Scale 1:2	Sheet 1 of 1



ITEM NO.	DRAWING NO.	DESCRIPTION	QTY.
1	IPW_D_02_01	tank2_sheet_metal_part1	1
2	IPW_D_02_01	tank2_sheet_metal_part2	1
3	IPW_D_02_01	tank2_sheet_metal_part3	1
4	IPW_D_02_02	tank2_sheet_metal_part4	1
5	IPW_D_02_02	tank2_sheet_metal_part5	1
6	IPW_D_02_03	tank2_suction_asssembly	1
7	IPW_D_02_04	tank2_handle_valve_assembly_(1 1/2")	1
8	IPW_D_01_05	tanks_sheet_metal_mount	2
9	IPW_D_02_06	half coupling 1 1/2" (stainless steel)	1
10	IPW_D_02_07	water electrical heater 1.5inch, 6kW	1
11	IPW_D_02_08	half coupling 1" (stainless steel)	1
12	IPW_D_02_09	magnesium anode rod 1", length 250mm	1

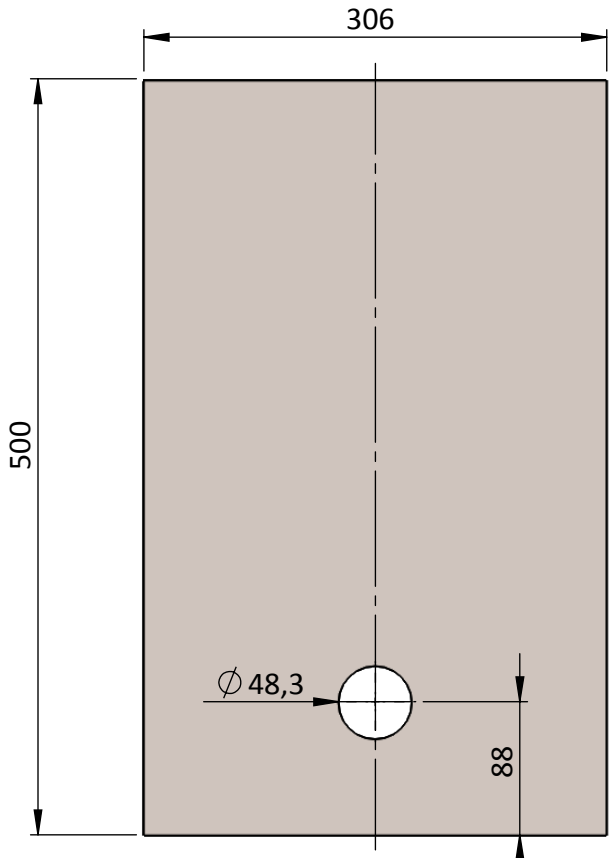
NATIONAL TECHNICAL UNIVERSITY OF ATHENS
DEPARTMENT OF MECHANICAL ENGINEERING
MACHINE DESIGN LABORATORY

Designed by: **Ch. Marketos**
Checked by: **G. Kaisarlis**
Approved by: **V. Spitas**

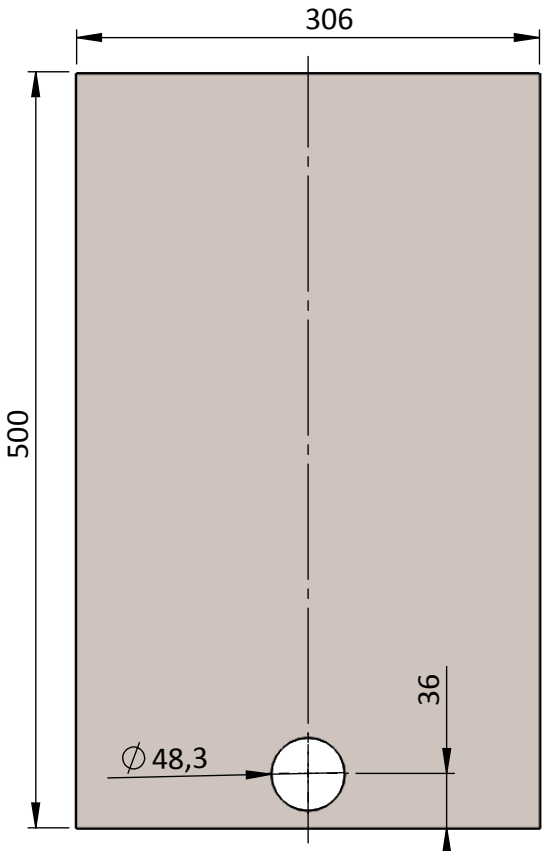
Drawing No: **IPW_D_02_00**
Title: *tank2_assembly (60L)*
General Tolerances: ISO 2768-m-K

PROJECT: INDUSTRIAL PARTS WASHER

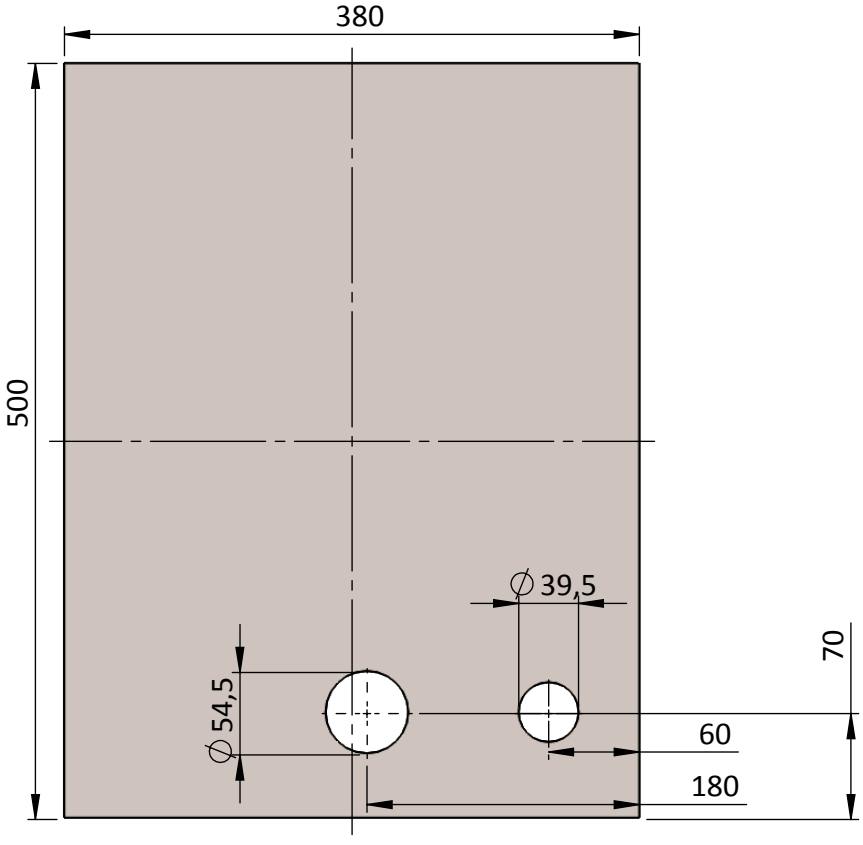
Date	Mass [kg]	Scale	Sheet
July 2018	20.9	1:10	1 of 1



Tank2_sheet_metal_part1 (mass 3.6kg)
Sheet metal 500x306x3

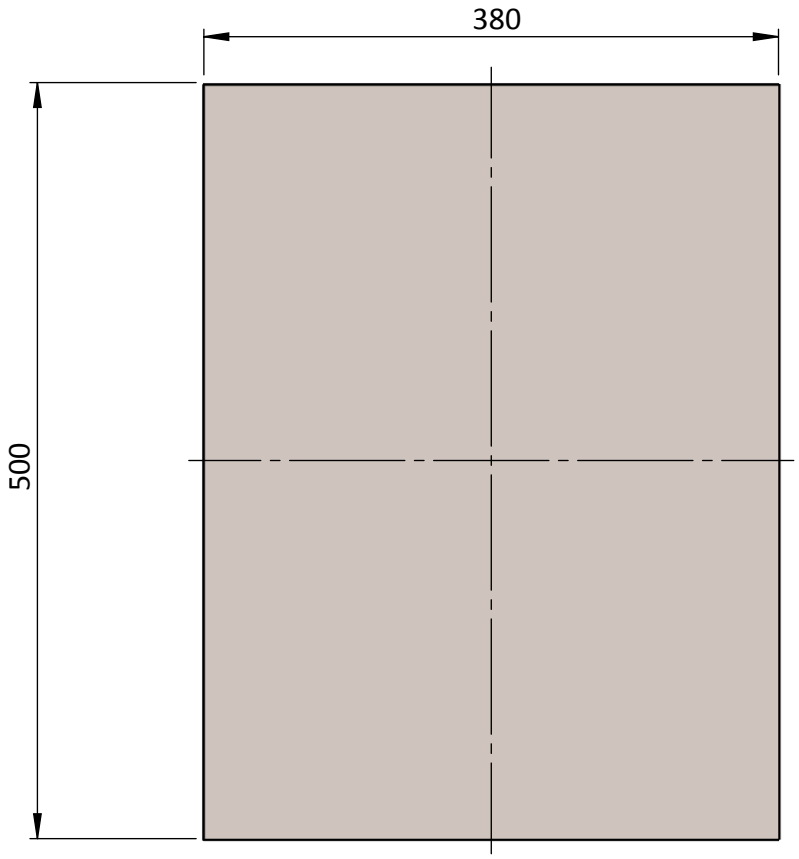


Tank2_sheet_metal_part2 (mass 3.6kg)
Note: 500x306x3

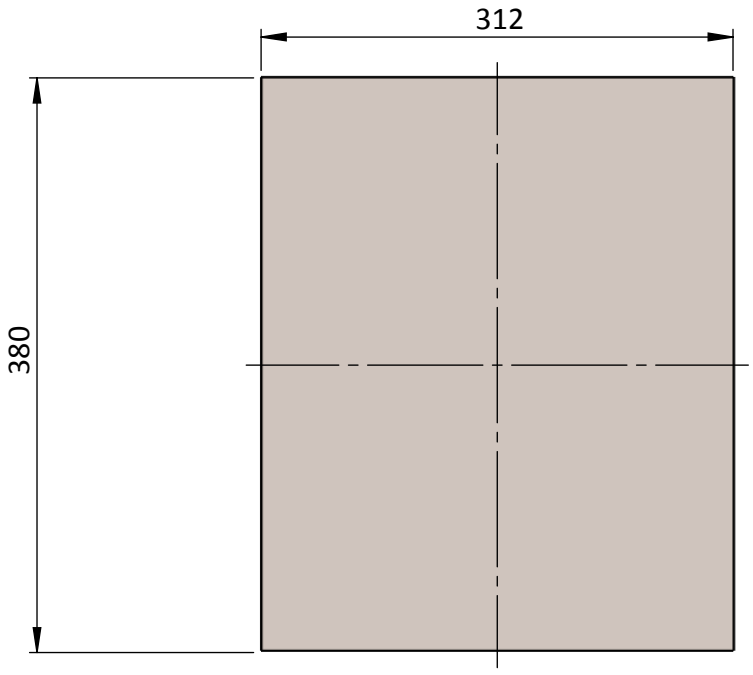


Tank2_sheet_metal_part3 (mass 4.5kg)
Note: 500x380x3

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No: **IPW_D_02_01** Title: *tank2 sheet metal part1 & part2 & part3* General Tolerances: ISO 2768-c-L		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316	Mass [kg] [-]	Scale 1:5	Sheet 1 of 1

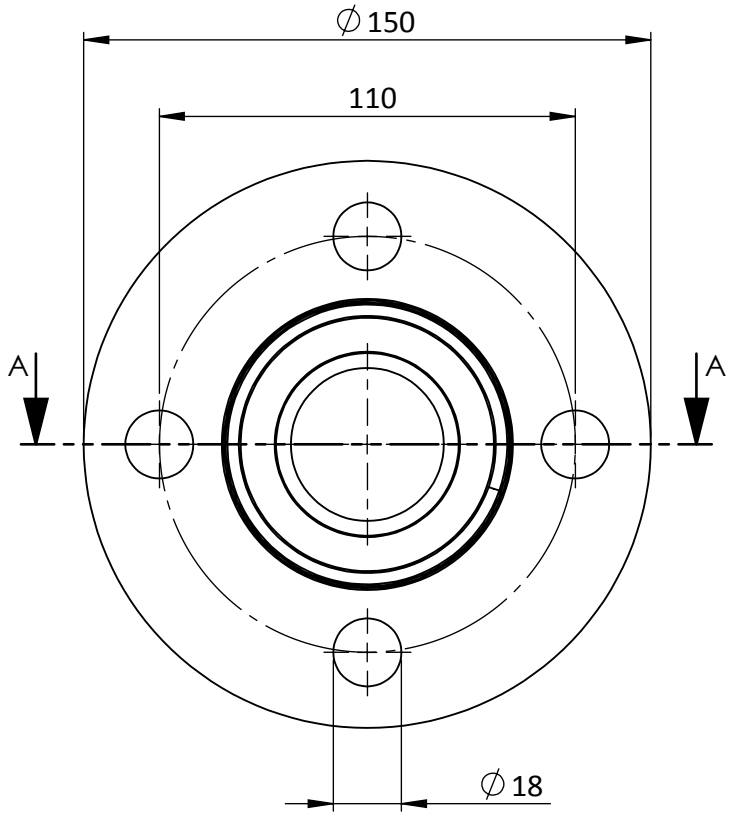


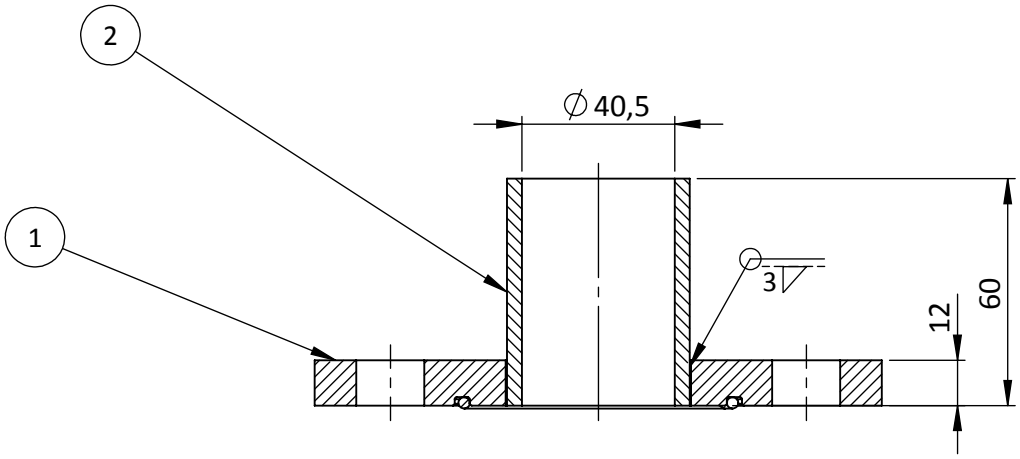
Tank2_sheet_metal_part4 (mass 5.56kg)
Note: 500x380x2



Tank2_sheet_metal_part5 (mass 1.9kg)
Note: 380x312x2

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_D_02_02** Title: *tank2 sheet metal part4 & part5* General Tolerances: ISO 2768-c-L		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316	Mass [kg] [-]	Scale 1:5	Sheet 1 of 1

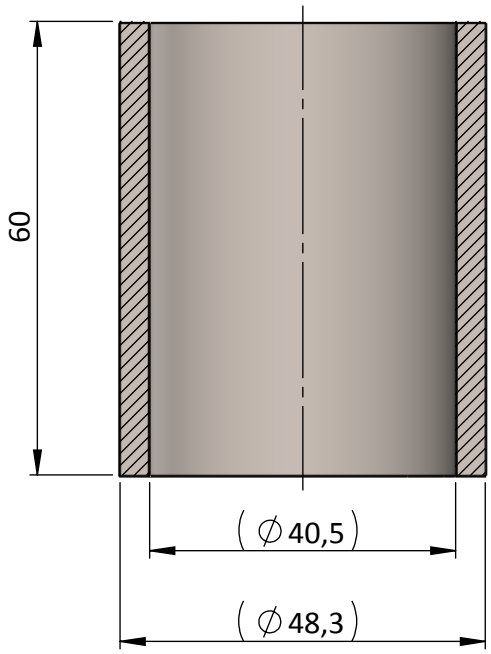




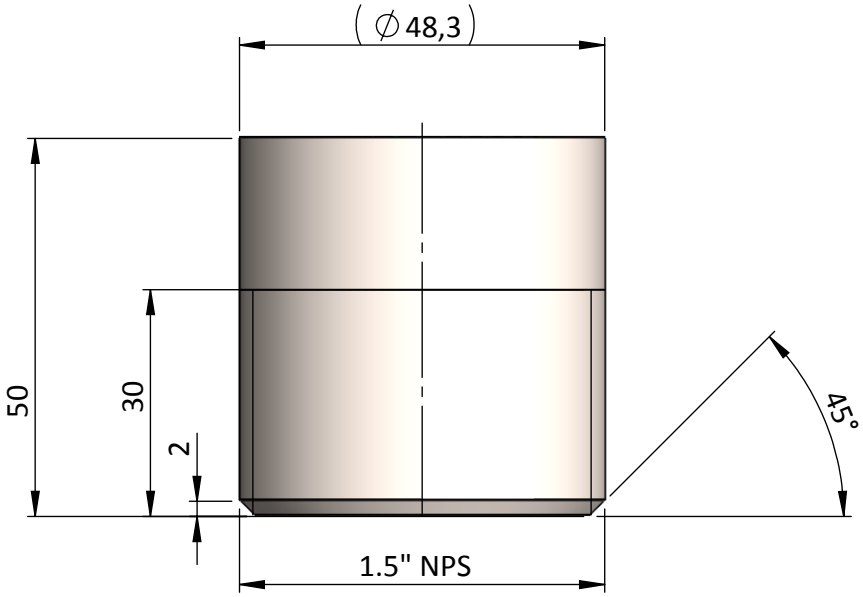
SECTION A-A

ITEM NO.		DESCRIPTION	QTY.
1	IPW_D_01_09_01	tank suction flange (1 1/2")	1
2	IPW_D_02_03_01	tank2_suction_tube	1
3	IPW_D_01_09_02	suction O-ring (ID 68mm, cross section 3mm)	1

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No: **IPW_D_02_03** Title: *tank2_suction_assembly* General Tolerances: ISO 2768-m-K		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316	Mass [kg] 1.6	Scale 1:2	Sheet 1 of 1

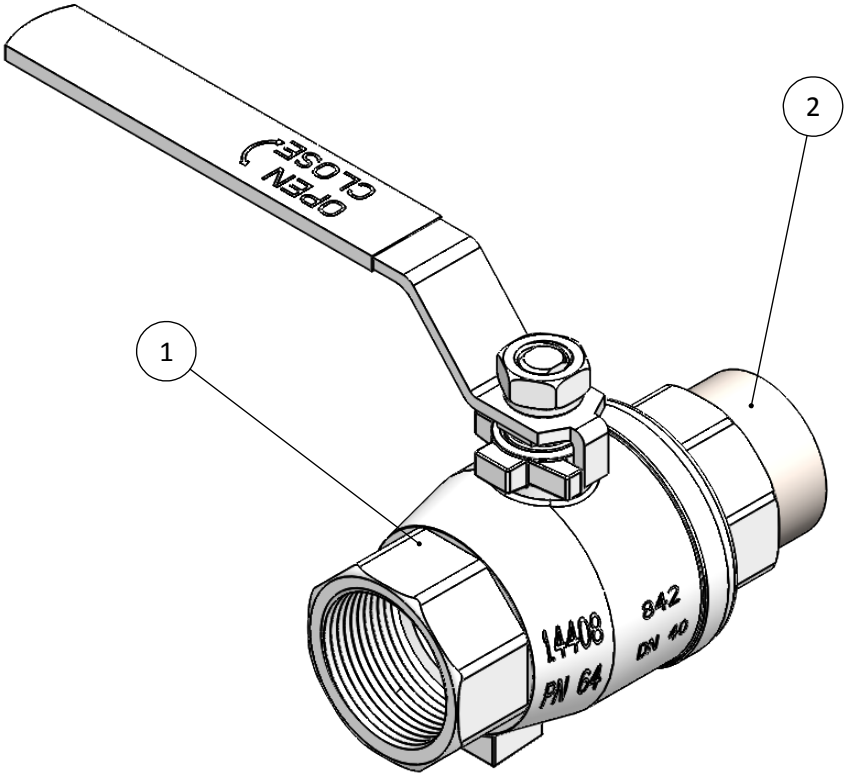


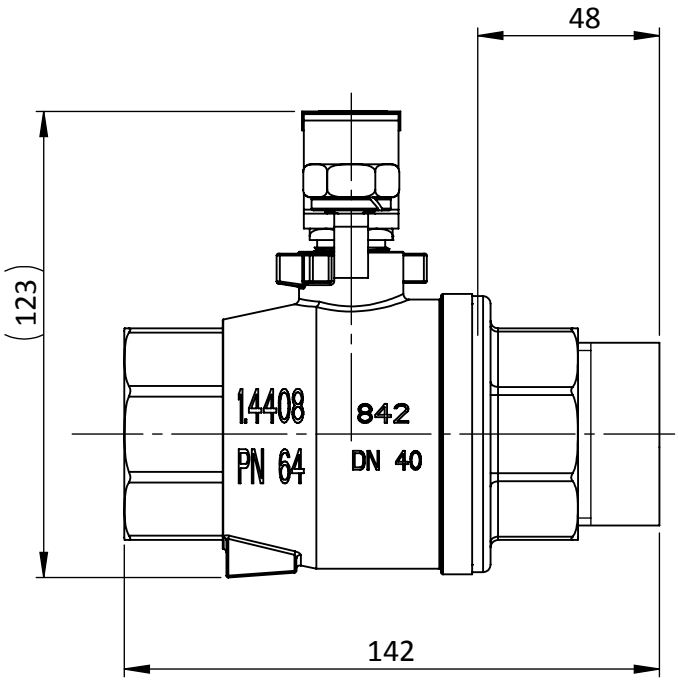
Tank2_suction_tube (mass 0.25)
Note: Tube 1 1/2", length 60mm, thickness 3.91mm (Sch40S), ASTM A312-2001



Tank2_valve_tube (mass 0.16)
Note: Tube 1 1/2", length 50mm, thickness 2.77mm (Sch10S), ASTM A312-2001

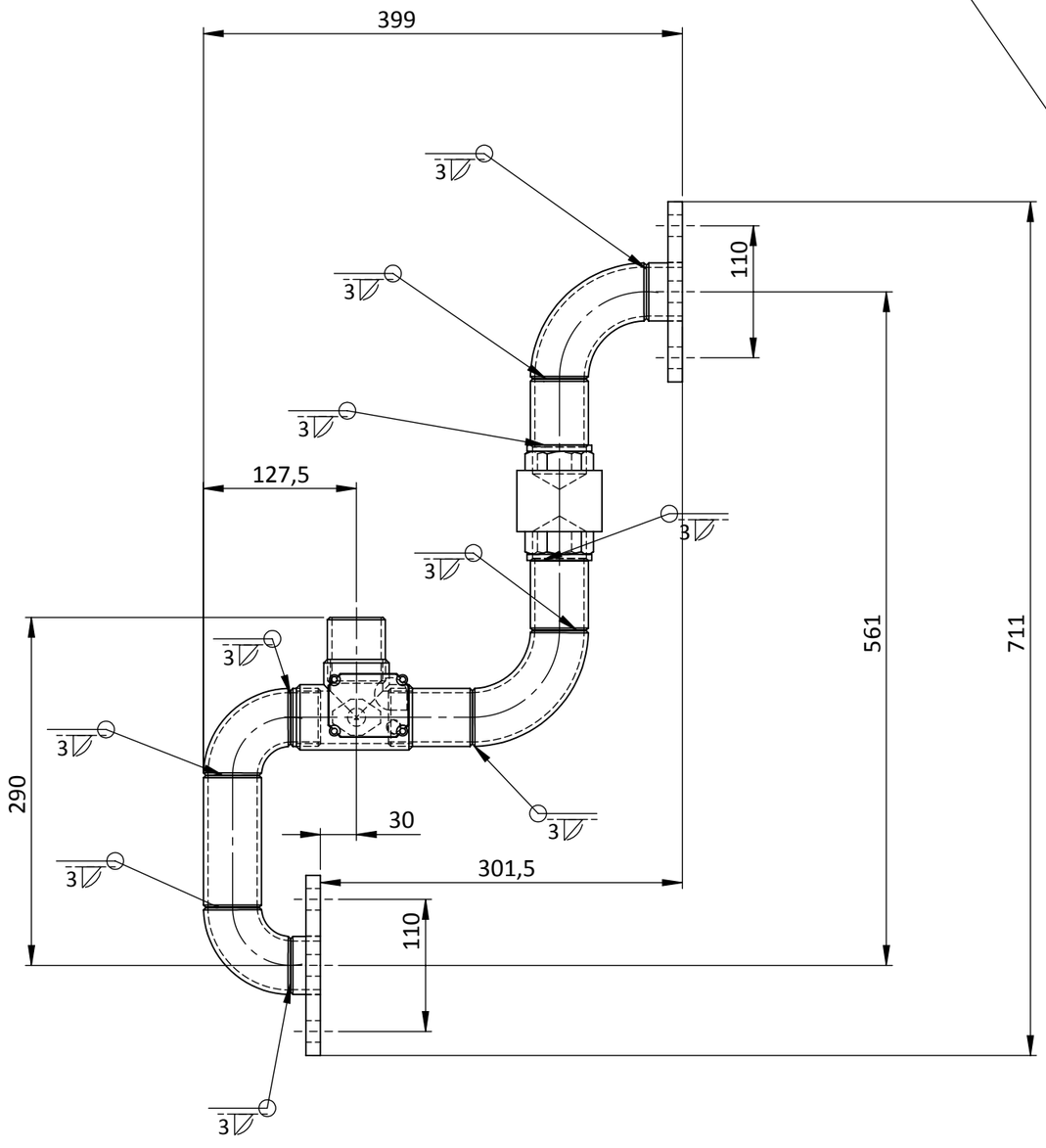
NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_D_02_03_01** Title: *tank2_suction_tube* General Tolerances: ISO 2768-c-L		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316L	Mass [kg] [-]	Scale 1:1	Sheet 1 of 1

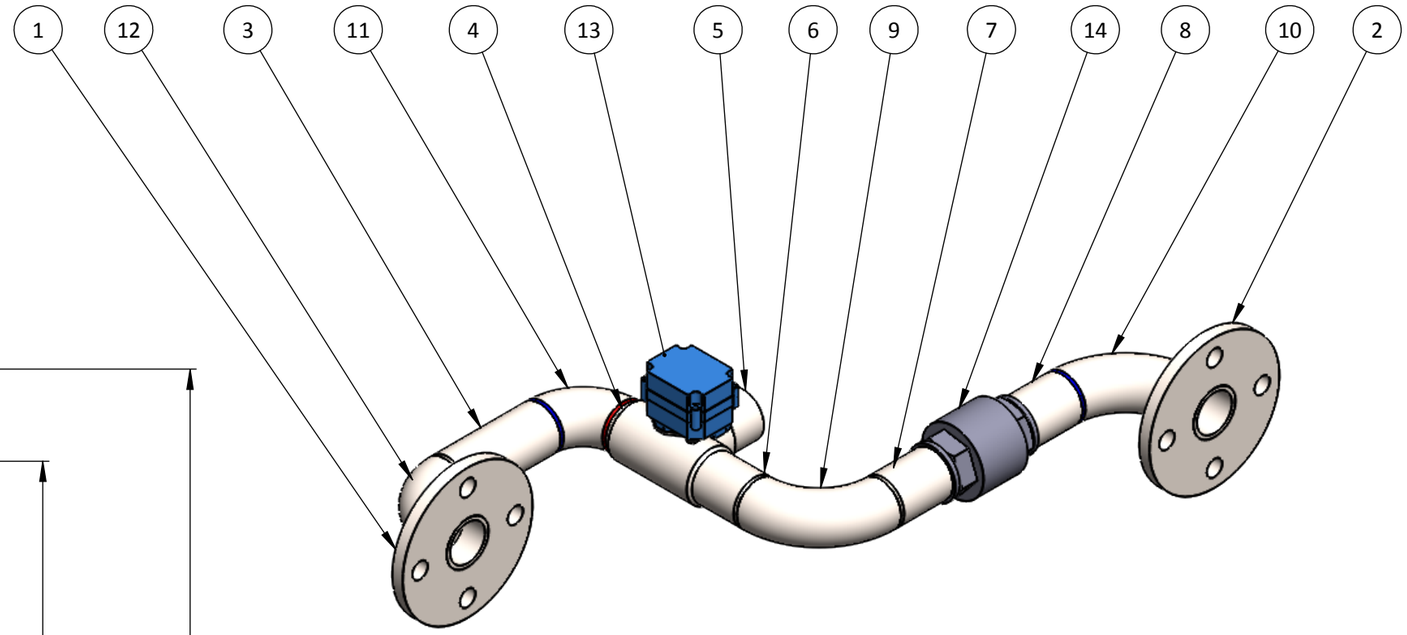




ITEM NO.	DRAWING NO.	DESCRIPTION	QTY.
1	IPW_D_01_08_01	handle valve 842 (1 1/2")	1
2	IPW_D_02_03_01	tank2_valve_tube (1 1/2")	1

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**	Drawing No:**IPW_D_02_04** Title: *tank2_handle_valve_assembly* General Tolerances: ISO 2768-c-L		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Mass [kg] 0.25	Scale 1:2	Sheet 1 of 1





ITEM NO.	DRAWING NO.	DESCRIPTION	QTY.
1	IPW_D_03_01	pump_tank1_suction_asssembly	1
2	IPW_D_03_02	pump_tank2_suction_asssembly	1
3	IPW_D_03_03	pump_suction_line_tube_1.5inch_Sch40S_part1	1
4	IPW_D_03_03	pump_suction_line_tube_1.5inch_Sch40S_part2	1
5	IPW_D_03_04	pump_suction_line_tube_1.5inch_Sch40S_part3	1
6	IPW_D_03_04	pump_suction_line_tube_1.5inch_Sch40S_part4	1
7	IPW_D_03_05	pump_suction_line_tube_1.5inch_Sch40S_part5	1
8	IPW_D_03_05	pump_suction_line_tube_1.5inch_Sch40S_part6	1
9	IPW_D_03_06	pump_suction_line_long_elbow_1.5inch_Sch40S	1
10	IPW_D_03_06	pump_suction_line_long_elbow_1.5inch_Sch40S	1
11	IPW_D_03_06	pump_suction_line_short_elbow_1.5inch_Sch40S	1
12	IPW_D_03_06	pump_suction_line_short_elbow_1.5inch_Sch40S	1
13	IPW_D_03_07	3 way ss304 stainless steel electric motorized ball valve, 1.5" (http://www.tonheflow.com/3-Way-motorized-Valve/)	1
14	IPW_D_03_07	non return valve 1.5inch	1

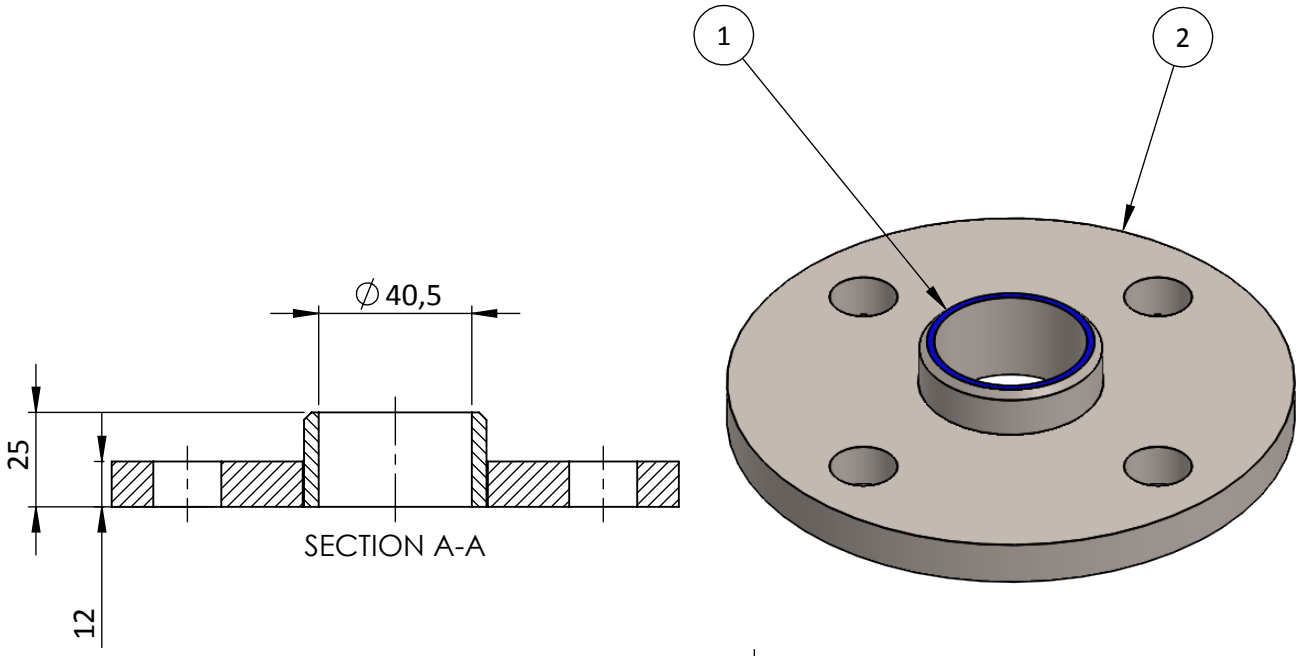
NATIONAL TECHNICAL UNIVERSITY OF ATHENS
DEPARTMENT OF MECHANICAL ENGINEERING
MACHINE DESIGN LABORATORY

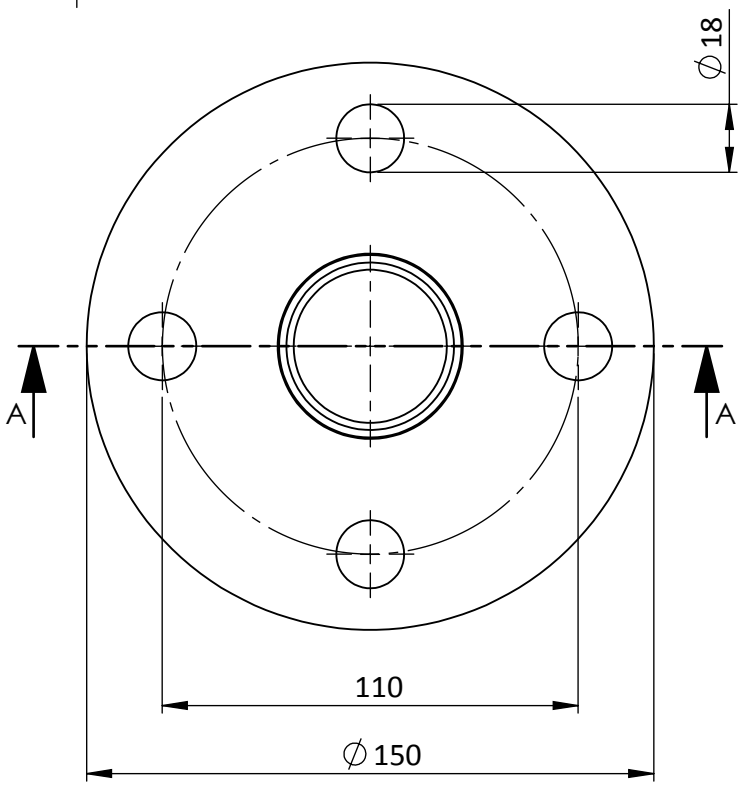
Designed by: **Ch. Marketos**
Checked by: **G. Kaisarlis**
Approved by: **V. Spitas**

Drawing No: **IPW_D_03**
Title: *pump_suction_line_assembly*
General Tolerances: ISO 2768-c-L

PROJECT: INDUSTRIAL PARTS WASHER

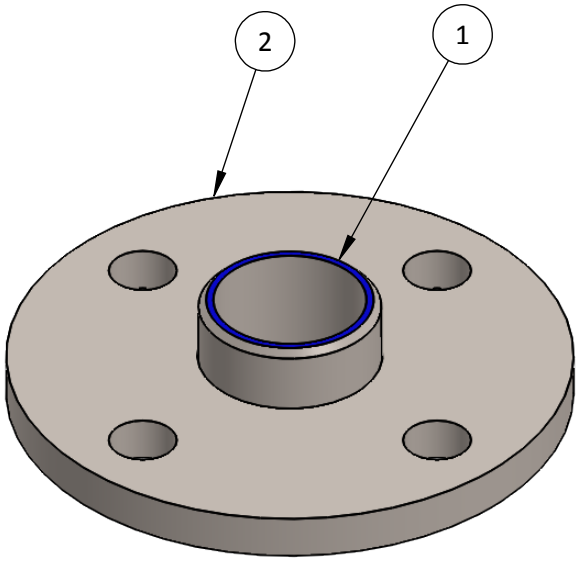
Date	Mass [kg]	Scale	Sheet
July 2018	7	1:5	1 of 1

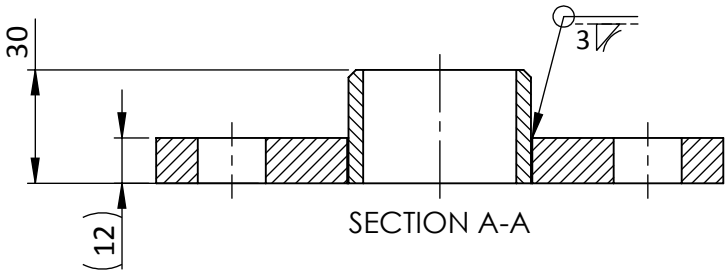


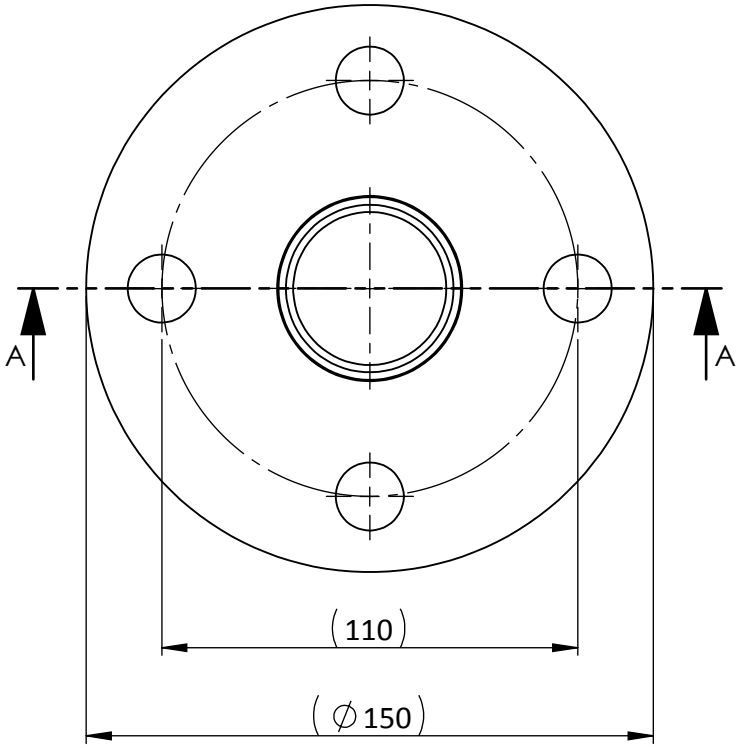


ITEM NO.	DRAWING NO.	DESCRIPTION	QTY.
1	IPW_D_03_01_01	tank1 suction tube 1 1/2"	1
2	IPW_D_03_01_02	flang 1 1/2" (DIN 2576)	1

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**	Drawing No: **IPW_D_03_01** Title: *pump_tank1_suction_assembly* General Tolerances: ISO 2768-c-L		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Mass [kg] 1.5	Scale 1:2	Sheet 1 of 1

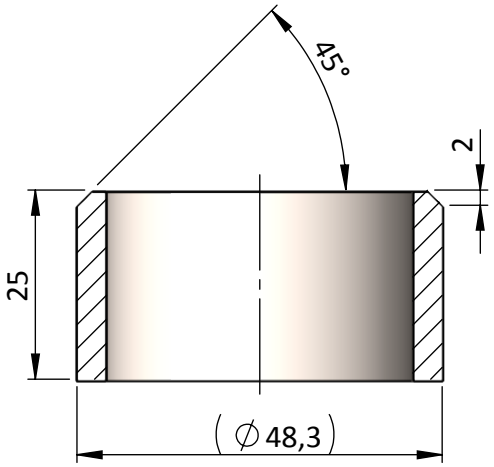




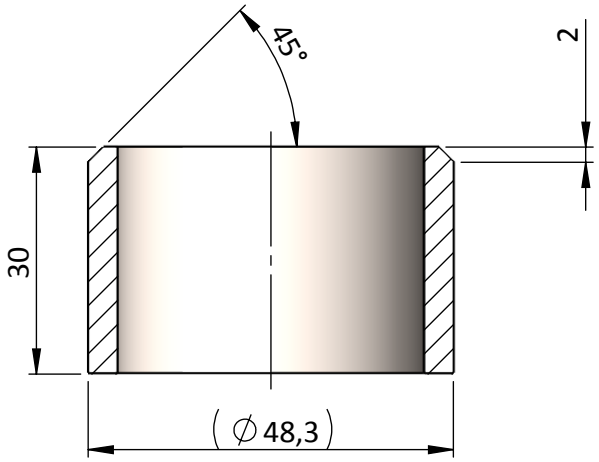


ITEM NO.	DRAWING NO.	DESCRIPTION	QTY.
1	IPW_D_03_01_01	tank2 suction tube 1 1/2"	1
2	IPW_D_03_01_02	flange 1 1/2" (DIN 2576)	1

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**	Drawing No:**IPW_D_03_02** Title: *pump_tank2_suction_assembly* General Tolerances: ISO 2768-m-K		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Mass [kg] 1.5	Scale 1:2	Sheet 1 of 1

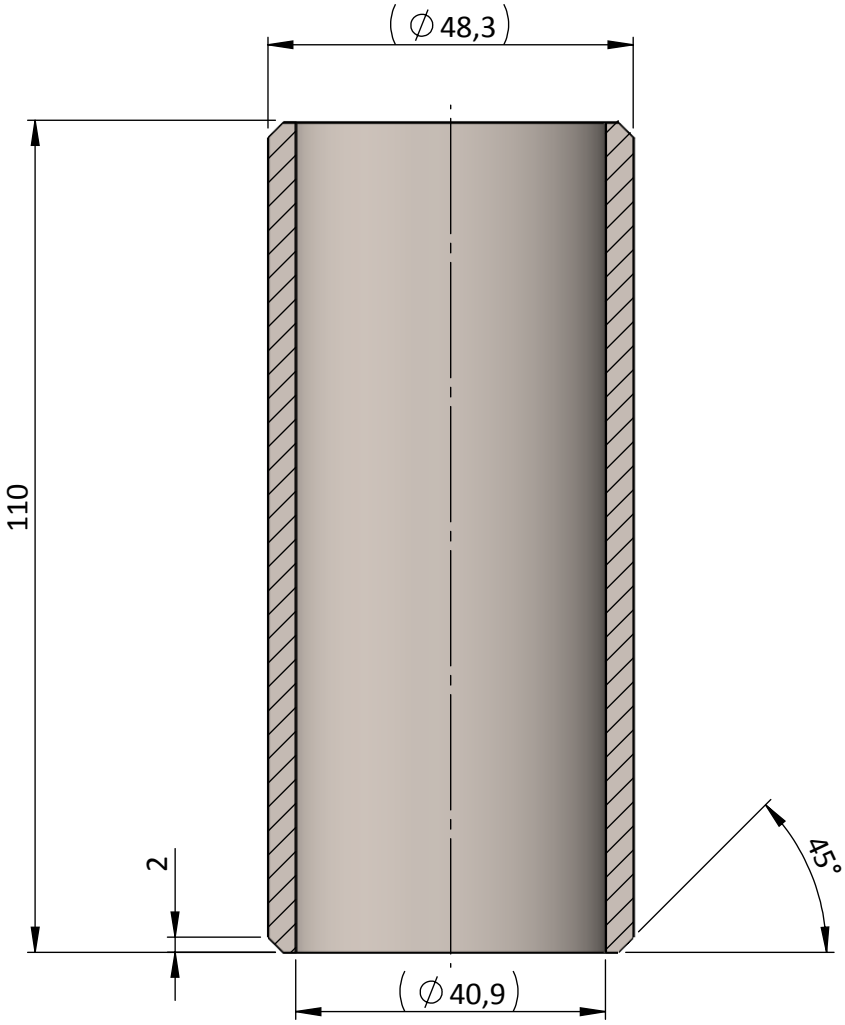


Tank1_suction_tube (mass 0.08)
Note: Tube 1 1/2", length 25mm, thickness 3.91mm (Sch40S), ASTM A312-2001

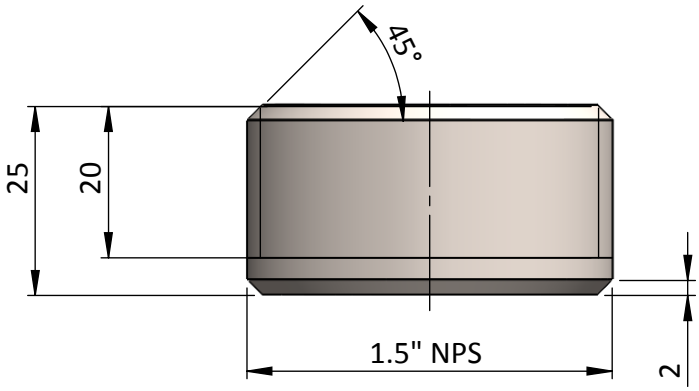


Tank2_suction_tube (mass 0.09)
Note: Tube 1 1/2", length 30mm, thickness 3.91mm (Sch40S), ASTM A312-2001

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_D_03_01_01** Title: *tank 1 & 2 suction tubes (pressure line)* General Tolerances: ISO 2768-c-L		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316L	Mass [kg] [-]	Scale 1:1	Sheet 1 of 1

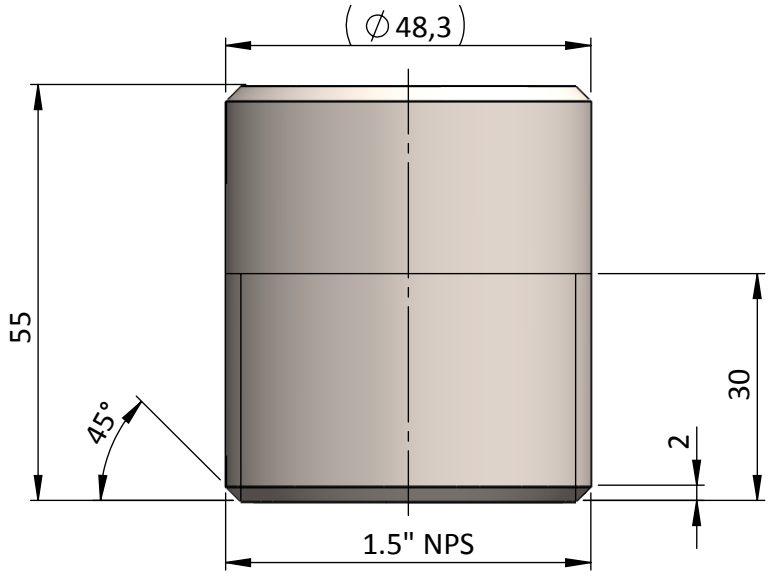


Pump_suction_line_tube_1.5inch_Sch40S_part1 (mass 0.45)
Note: Tube 1 1/2", length 110mm, thickness 3.91mm (Sch40S), ASTM A312-2001

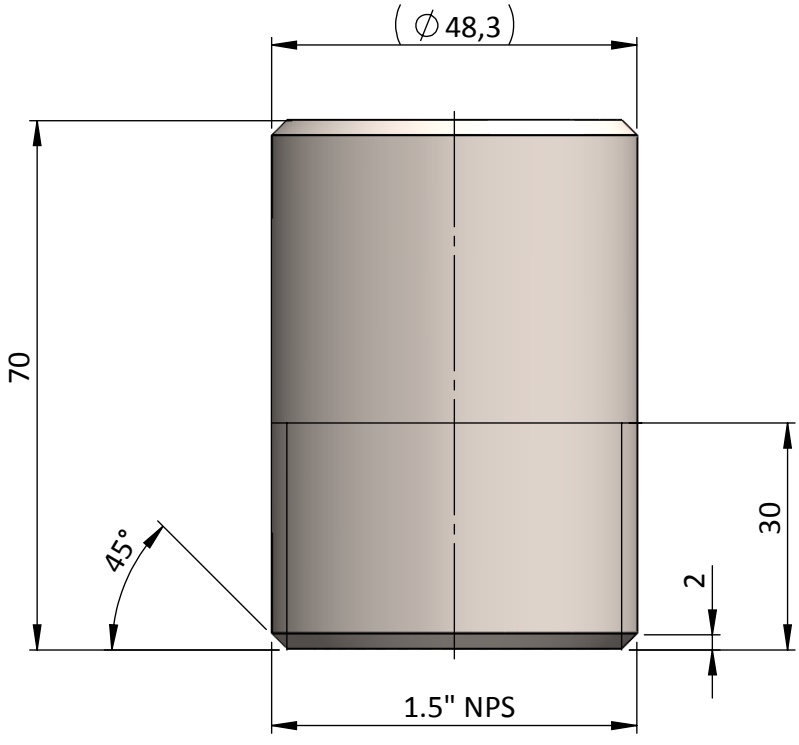


Pump_suction_line_tube_1.5inch_Sch40S_part2 (mass 0.1)
Note: Tube 1 1/2", length 25mm, thickness 3.91mm (Sch40S), ASTM A312-2001

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_D_03_03** Title: *pump suction line tubes part1 & part2* General Tolerances: ISO 2768-c-L		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316L	Mass [kg] [-]	Scale 1:1	Sheet 1 of 1

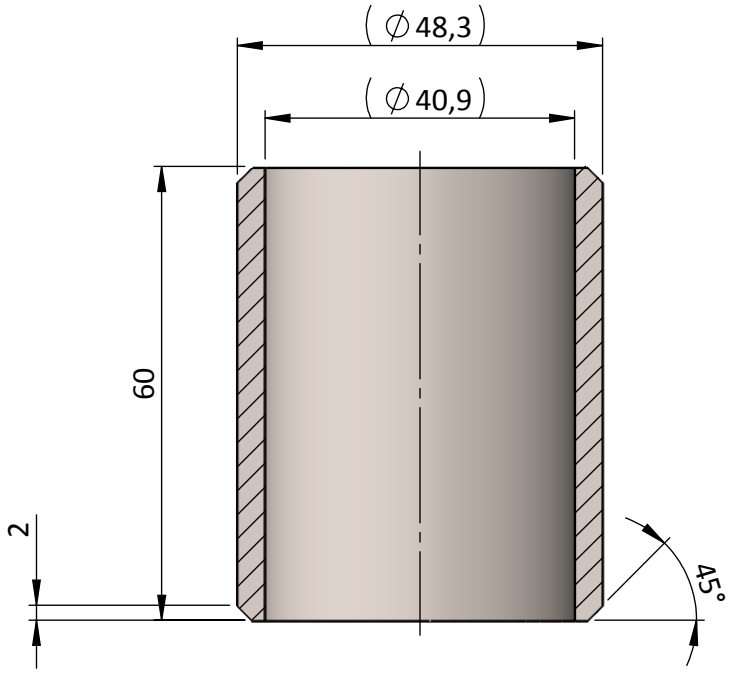


Pump_suction_line_tube_1.5inch_Sch40S_part3 (mass 0.24)
Note: Tube 1 1/2", length 55mm, thickness 3.91mm (Sch40S), ASTM A312-2001

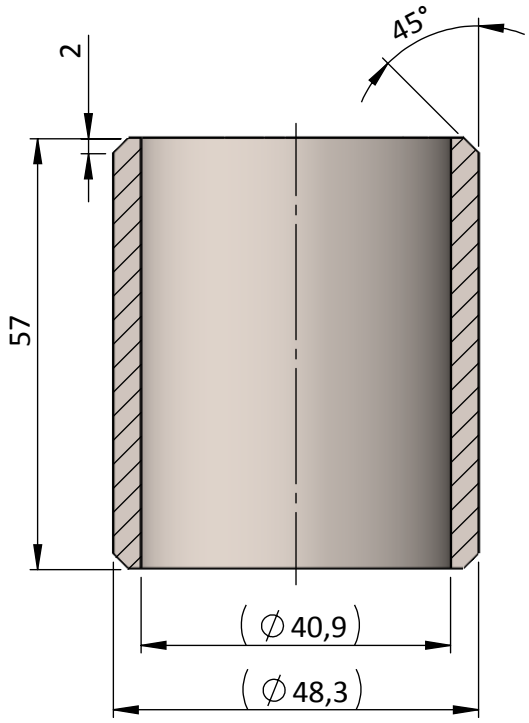


Pump_suction_line_tube_1.5inch_Sch40S_part4 (mass 0.29)
Note: Tube 1 1/2", length 70mm, thickness 3.91mm (Sch40S), ASTM A312-2001

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_D_03_04** Title: *pump suction line tubes part3 & part4* General Tolerances: ISO 2768-c-L		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316L	Mass [kg] [-]	Scale 1:1	Sheet 1 of 1

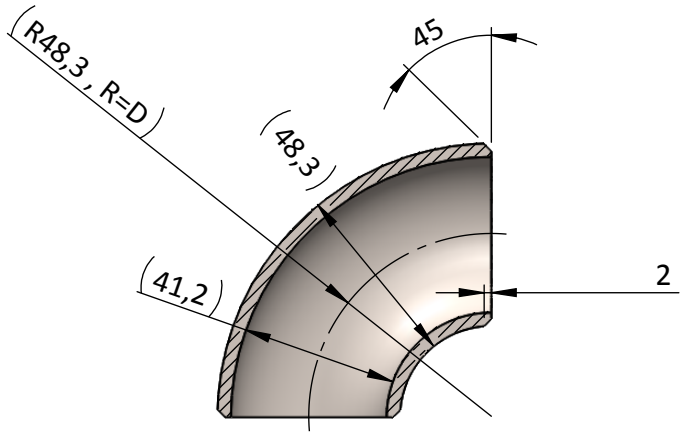


Pump_suction_line_tube_1.5inch_Sch40S_part5 (mass 0.24)
Note: Tube 1 1/2", length 60mm, thickness 3.91mm (Sch40S), ASTM A312-2001

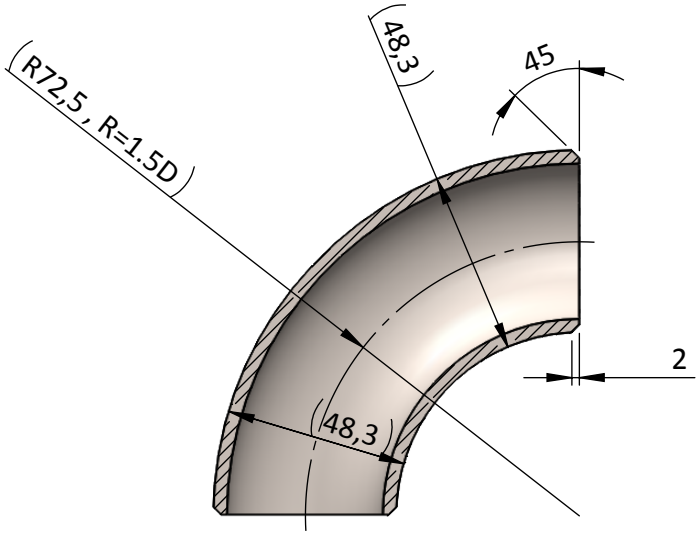


Pump_suction_line_tube_1.5inch_Sch40S_part6 (mass 0.23)
Note: Tube 1 1/2", length 57mm, thickness 3.91mm (Sch40S), ASTM A312-2001

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_D_03_05** Title: *pump_suction_line_tubes_part5_part6* General Tolerances: ISO 2768-c-L		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316L	Mass [kg] [-]	Scale 1:1	Sheet 1 of 1

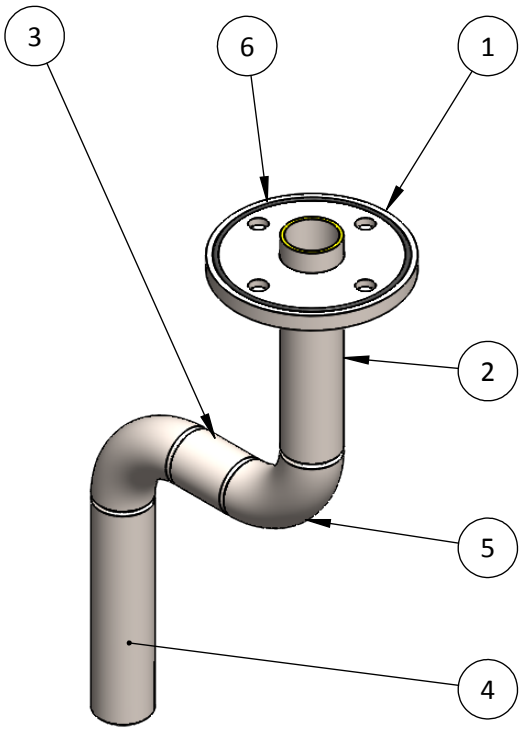


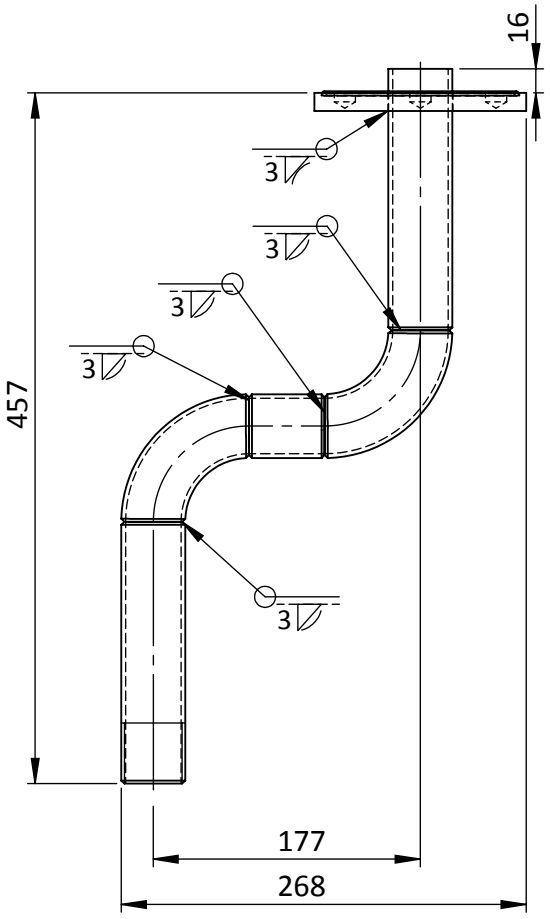
Pump_suction_line_welded_short_elbow_1.5inch_Sch40S (mass 0.3)
Note: Welded elbow 1 1/2" (short), radius 48.3mm, thickness 3.56mm (Sch40S), ANSI B16.9-1993



Pump_suction_line_welded_long_elbow_1.5inch_Sch40S (mass 0.45)
Note: Welded elbow 1 1/2" (long), radius 48.3mm, thickness 3.56mm (Sch40S), ANSI B16.9-1993

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_D_03_06** Title: *pump_suction_line_welded_elbows* General Tolerances: ISO 2768-m-K		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316	Mass [kg] 16.6	Scale 1:10	Sheet 1 of 1





ITEM NO.	DRAWING NO.	DESCRIPTION	QTY.
1	IPW_D_04_01	pump_pressure_line_flange	1
2	IPW_D_04_02	pump_pressure_line_tube_1.25inch_Sch10S_part1	1
3	IPW_D_04_02	pump_pressure_line_tube_1.25inch_Sch10S_part2	1
4	IPW_D_04_02	pump_pressure_line_tube_1.25inch_Sch10S_part3	1
5	IPW_D_04_03	pump_pressure_line_welded_elbow_90_long_1.25inch	2
6	IPW_D_04_04	O-ring (ID 68mm, cross section 3mm)	1

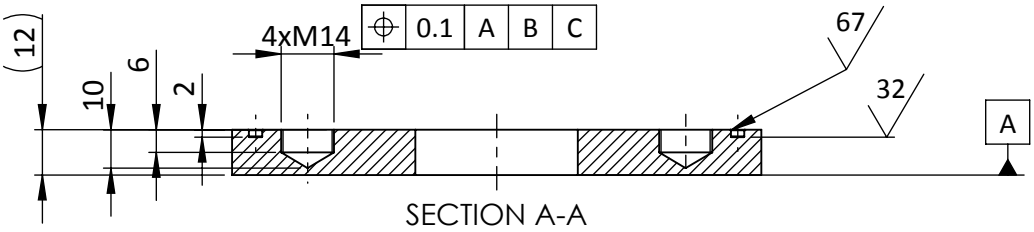
NATIONAL TECHNICAL UNIVERSITY OF ATHENS
DEPARTMENT OF MECHANICAL ENGINEERING
MACHINE DESIGN LABORATORY

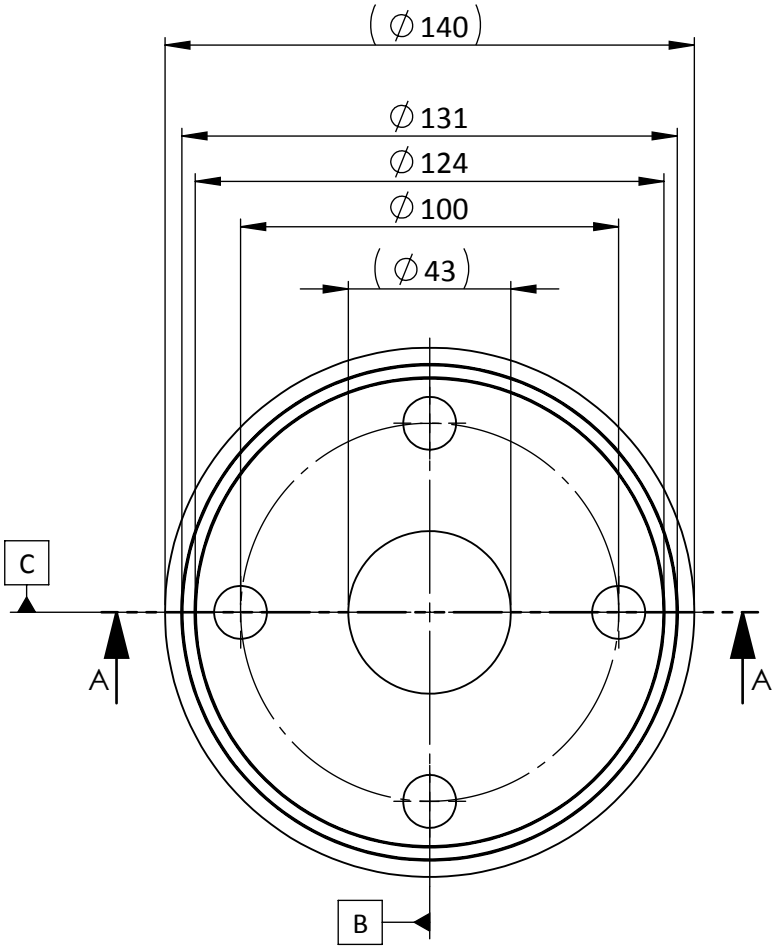
Designed by: **Ch. Marketos**
Checked by: **G. Kaisarlis**
Approved by: **V. Spitas**

Drawing No: **IPW_D_04**
Title: *pump_pressure_line_assembly*
General Tolerances: ISO 2768-c-L

PROJECT: INDUSTRIAL PARTS WASHER

Date	Mass [kg]	Scale	Sheet
July 2018	2.9	1:5	1 of 1



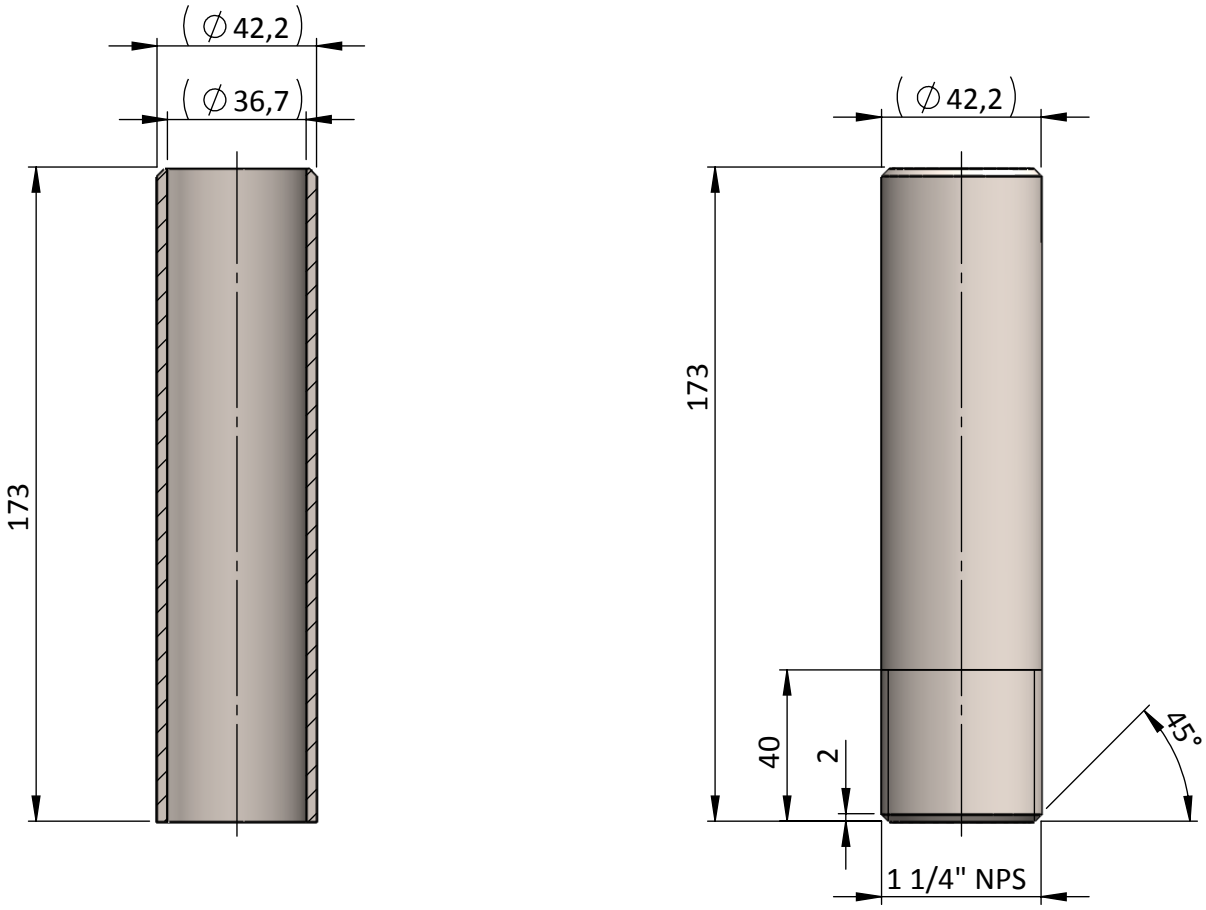


Note: Flange 1 1/4", without bolt holes, 62-1501 (DIN 2576)

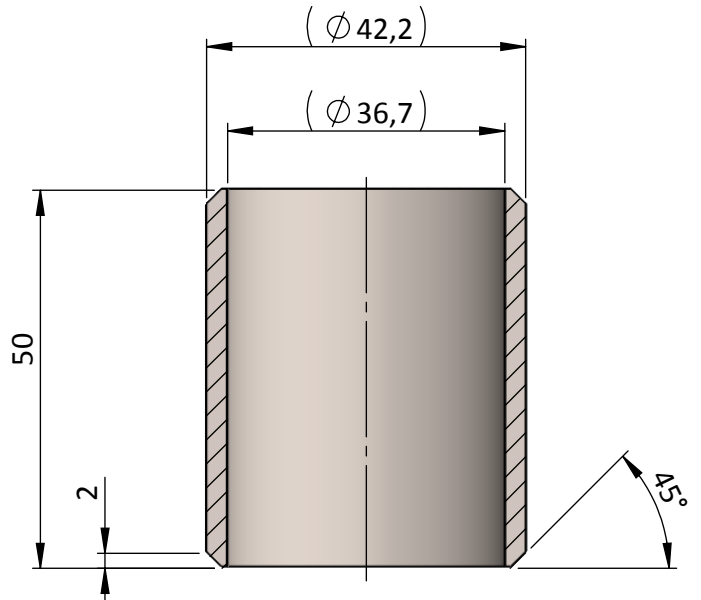
Note: Drill 4x ∅12 holes with centre-to-centre distance ∅100 , ↧ 10 , threads M12 to ∅12 holes

Note: Groove radius 0.013-0.51mm

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_D_04_01** Title: *pump_pressure_line_flange* General Tolerances: ISO 2768-m-K		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316	Mass [kg] 16.6	Scale 1:2	Sheet 1 of 1

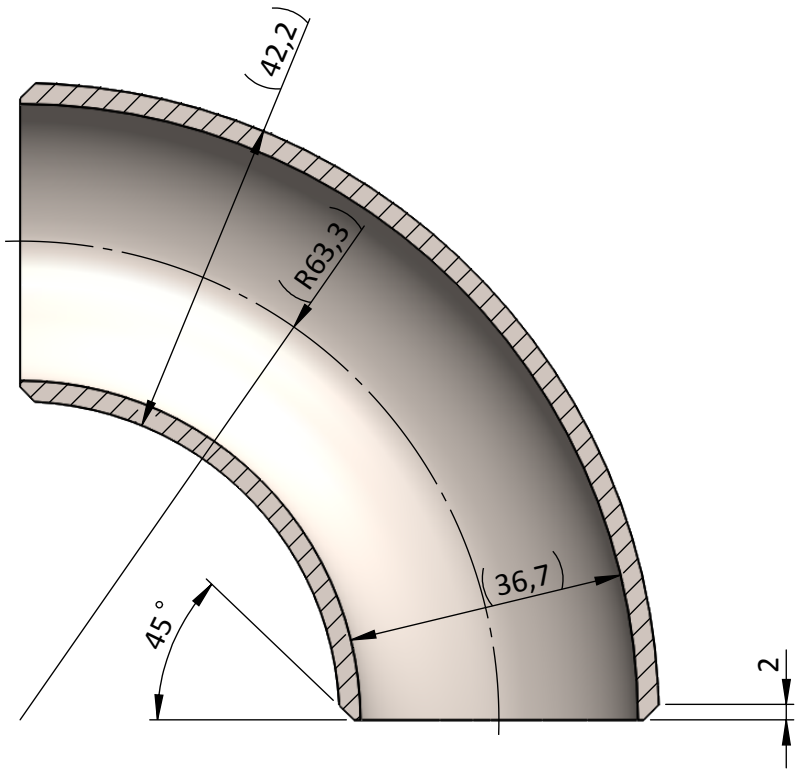


Pump pressure line tube 1.25inch Sch10S part1 & part 3 (mass 0.47, scale 1:2)
Note: Tube 1 1/4", length 165mm, thickness 2.77mm (Sch10S), ASTM A312-2001



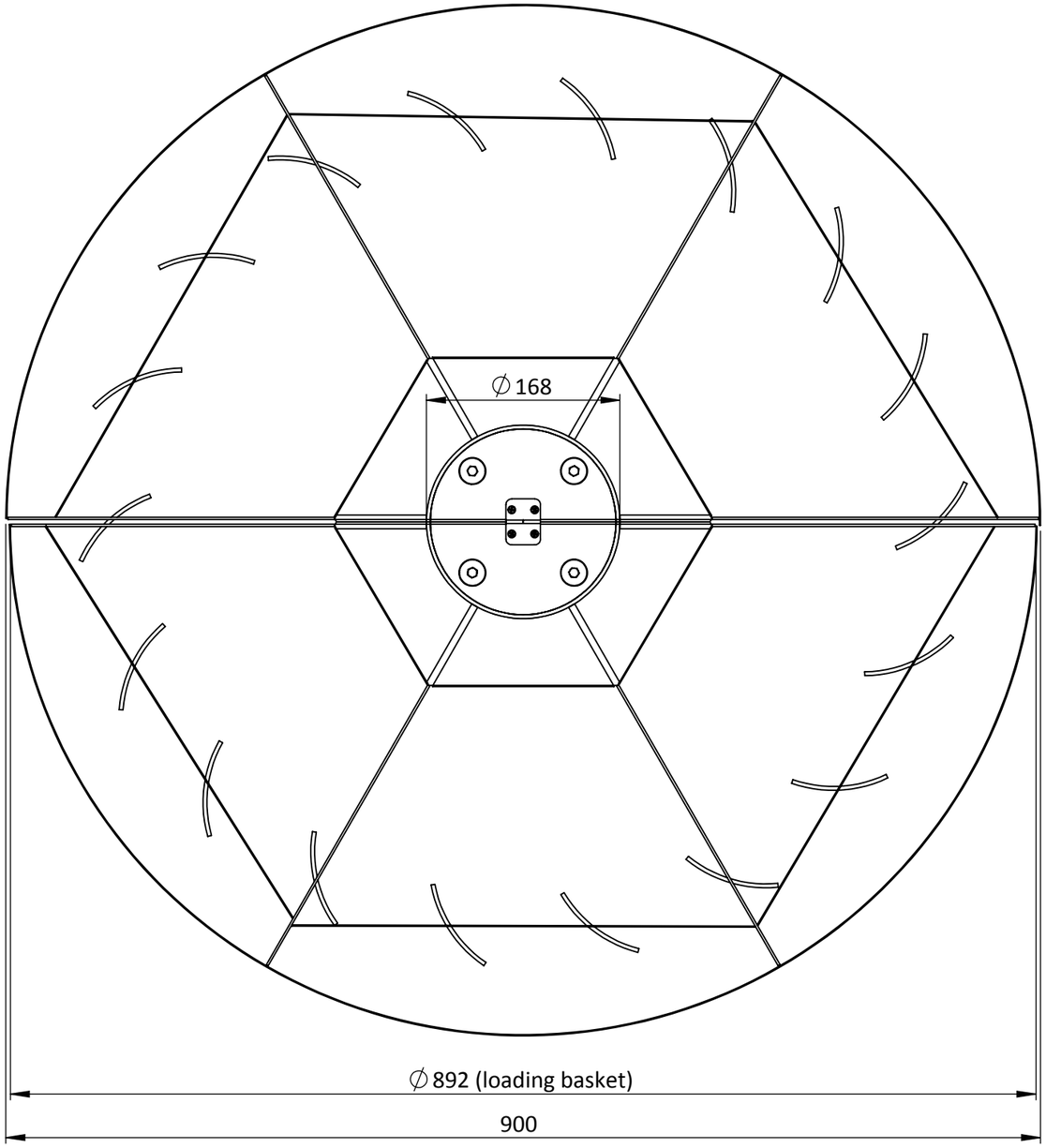
Pump_pressure_line_tube_1.5inch_Sch10S_part2 (mass 0.13, scale 1:1)
Note: Tube 1 1/4", length 50mm, thickness 2.77mm (Sch10S), ASTM A312-2001

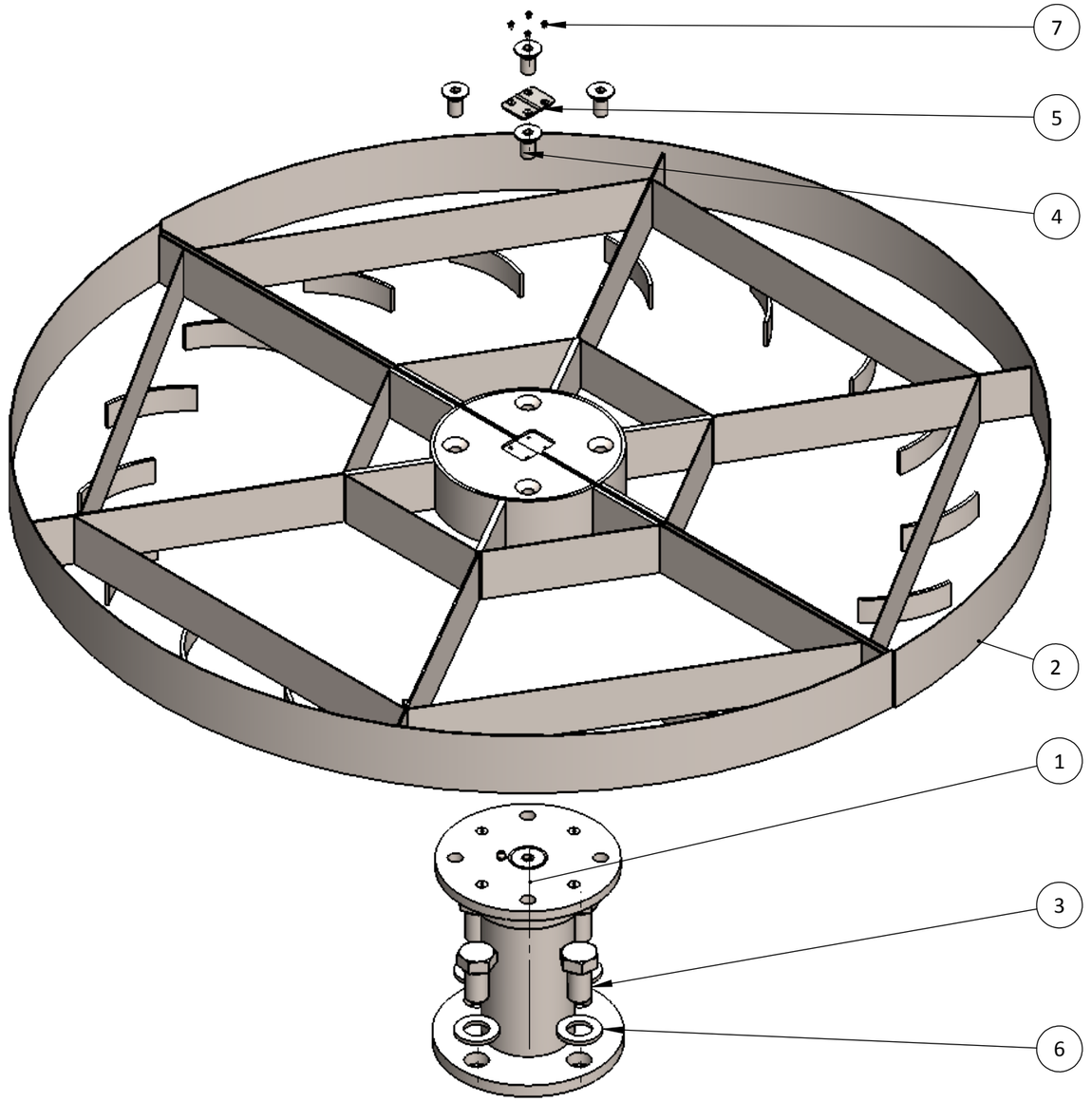
NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_D_04_02** Title: *sink_part1_sheet_metal* General Tolerances: ISO 2768-c-L		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316L	Mass [kg] [-]	Scale [-]	Sheet 1 of 1

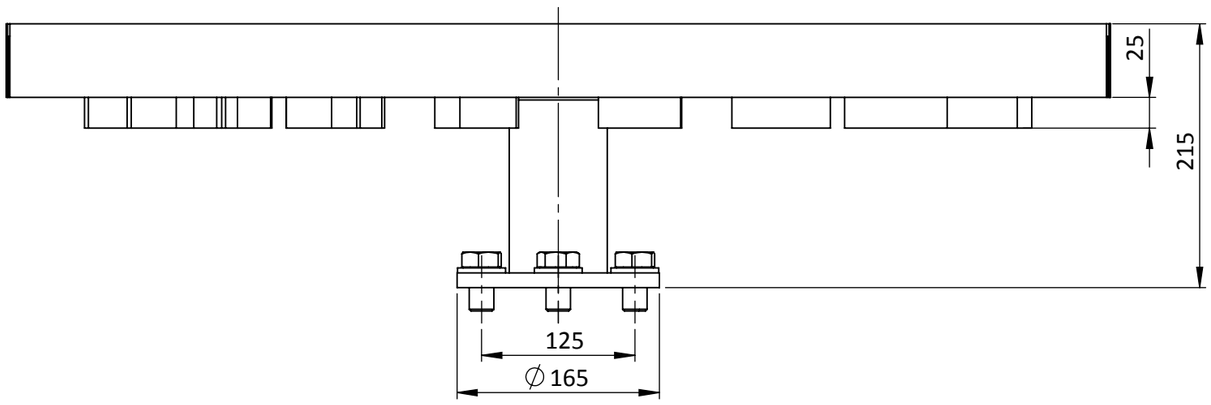


Pump_pressure_line_welded_long_elbow_1.5inch_Sch10S
Note: Welded elbow 1 1/4", long radius (1.5D), thickness 2.77mm (Sch10S), ANSI B16.9-1993

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_D_04_03** Title: *welded elbow 90 degrees (long radius)* General Tolerances: ISO 2768-c-L		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316L	Mass [kg] 0.27	Scale 1:1	Sheet 1 of 1







ITEM NO.	DRAWING NO.	DESCRIPTION	QTY.
1	IPW_E_01	rotation_mechanism_subassembly	1
2	IPW_E_02	rotation_disc_full_assembly	1
3	IPW_E_03	hex cap screw_am	4
4	IPW_E_04	B18.3.5M - 12 x 1.75 x 25 Socket FCHS -- 25N (stainless steel)	4
5	IPW_E_05	hinge small 30x20 (stainless steel)	2
6	IPW_E_06	B18.22M - Plain washer, 20 mm, narrow (stainless steel)	4
7	IPW_E_07	B18.6.7M - M3 x 0.5 x 5 Type I Cross Recessed FHMS --5N (stainless steel)	4

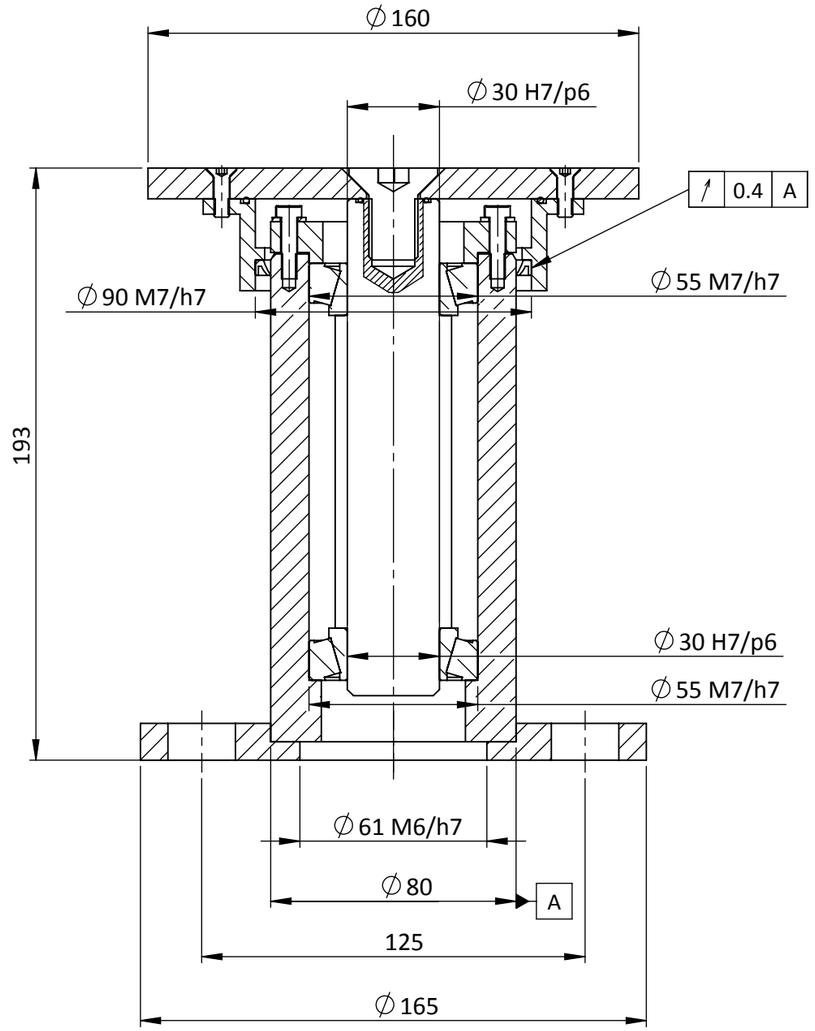
NATIONAL TECHNICAL UNIVERSITY OF ATHENS
DEPARTMENT OF MECHANICAL ENGINEERING
MACHINE DESIGN LABORATORY

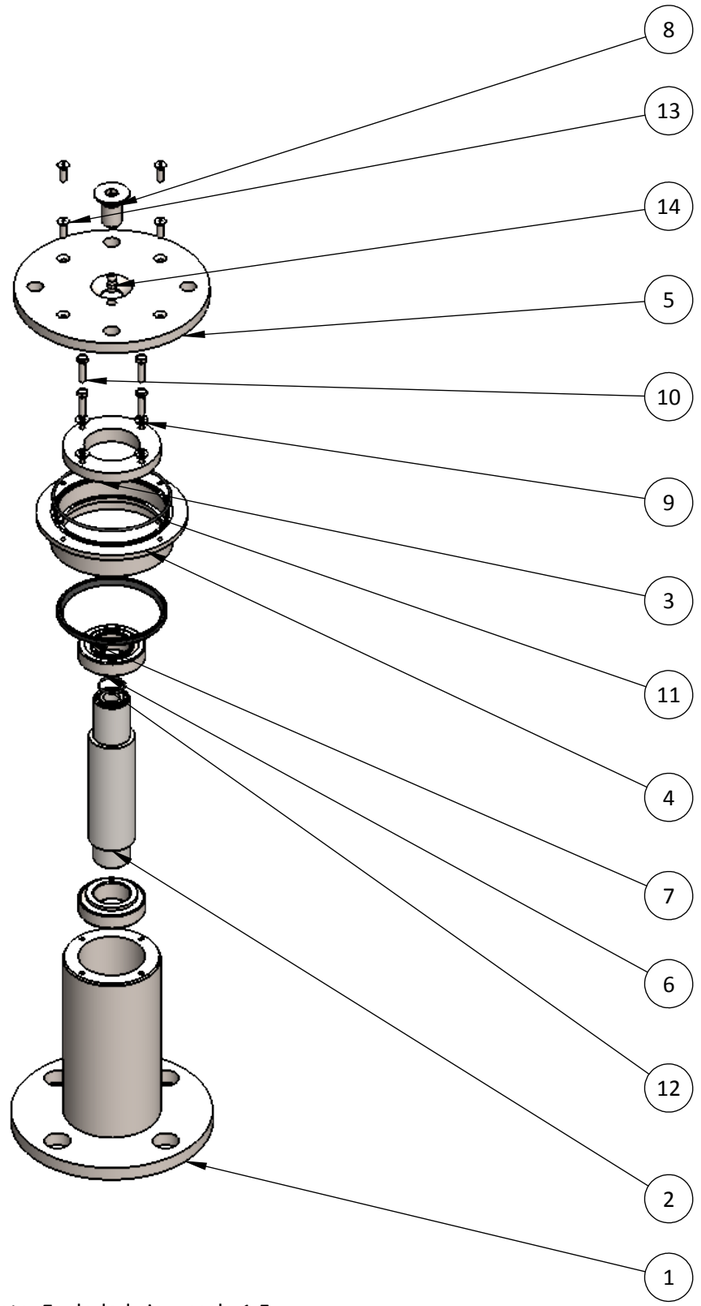
Designed by: **Ch. Marketos**
Checked by: **G. Kaisarlis**
Approved by: **V. Spitas**

Drawing No: **IPW_E_00**
Title: *rotation_mechanism_assembly*
General Tolerances: ISO 2768-m-K

PROJECT: INDUSTRIAL PARTS WASHER

Date	Mass [kg]	Scale	Sheet
July 2018	19.7	1:5	1 of 1





Note: Exploded view scale 1:5

ITEM NO.	DRAWING NO.	DESCRIPTION	QTY.
1	IPW_E_01_01	hub_assembly	1
2	IPW_E_01_02	shaft	1
3	IPW_E_01_03	hub_cap	1
4	IPW_E_01_04	glass	1
5	IPW_E_01_05	flange_OD160mm	1
6	IPW_E_01_06	SKF - 32006 X - 18,SI,NC,18	2
7	IPW_E_01_07	sealing ring, single lip, NBR, G80x90x5	1
8	IPW_E_01_08	B18.3.5M - 16 x 2.0 x 30 Socket FCHS -- 30N (stainless steel)	1
9	IPW_E_01_09	B18.22M - Plain washer, 5 mm, narrow (carbon steel)	4
10	IPW_E_01_10	B18.6.7M - M5 x 0.8 x 20 Indented HHMS --20N (carbon steel)	4
11	IPW_E_01_11	o-ring, ID94, cross section 2mm (viton)	1
12	IPW_E_01_12	o-ring, ID20, cross section 2mm (viton)	1
13	IPW_E_01_13	B18.3.5M - 5 x 0.8 x 16 Socket FCHS -- 16N (stainless steel)	4
14	IPW_E_01_15	Grease nipple hydraulic type DIN 71412 (stainless steel)	1

NATIONAL TECHNICAL UNIVERSITY OF ATHENS
DEPARTMENT OF MECHANICAL ENGINEERING
MACHINE DESIGN LABORATORY

Designed by: **Ch. Marketos**
Checked by: **G. Kaisarlis**
Approved by: **V. Spitas**

PROJECT: INDUSTRIAL PARTS WASHER

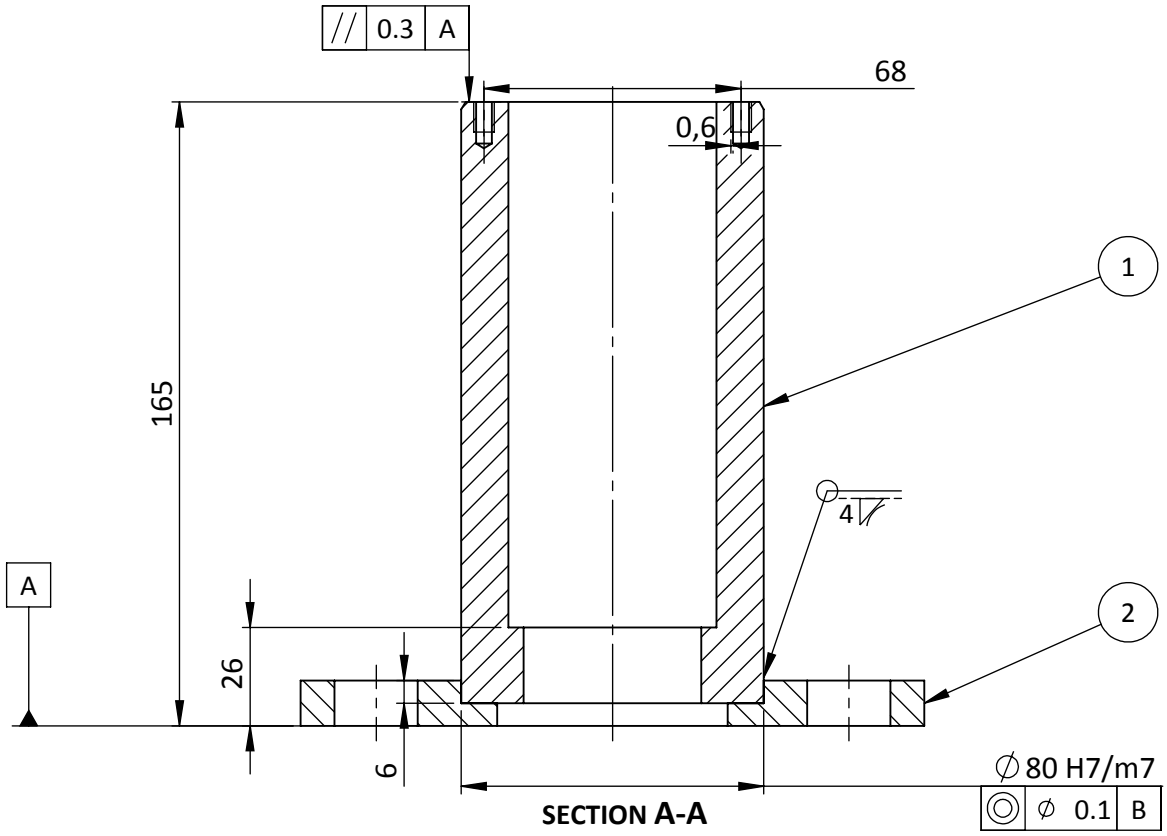
Date: July 2018

Drawing No: **IPW_E_01**

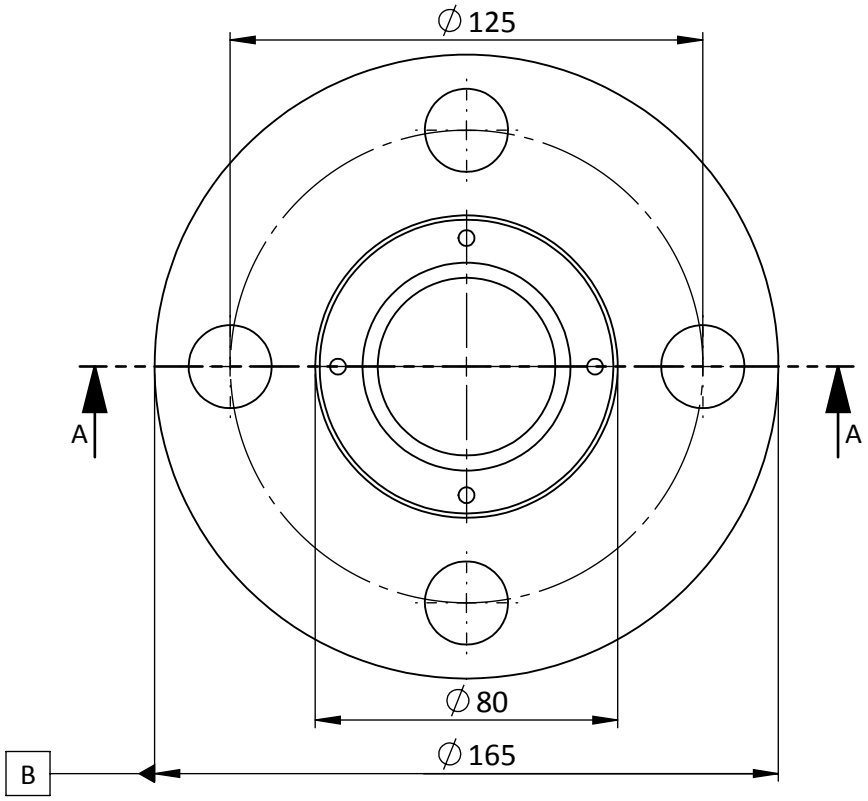
Title: *rotation_mechanism_subassembly*

General Tolerances: ISO 2768-m-K

Mass [kg]	Scale	Sheet
6.19	1:2	1 of 1



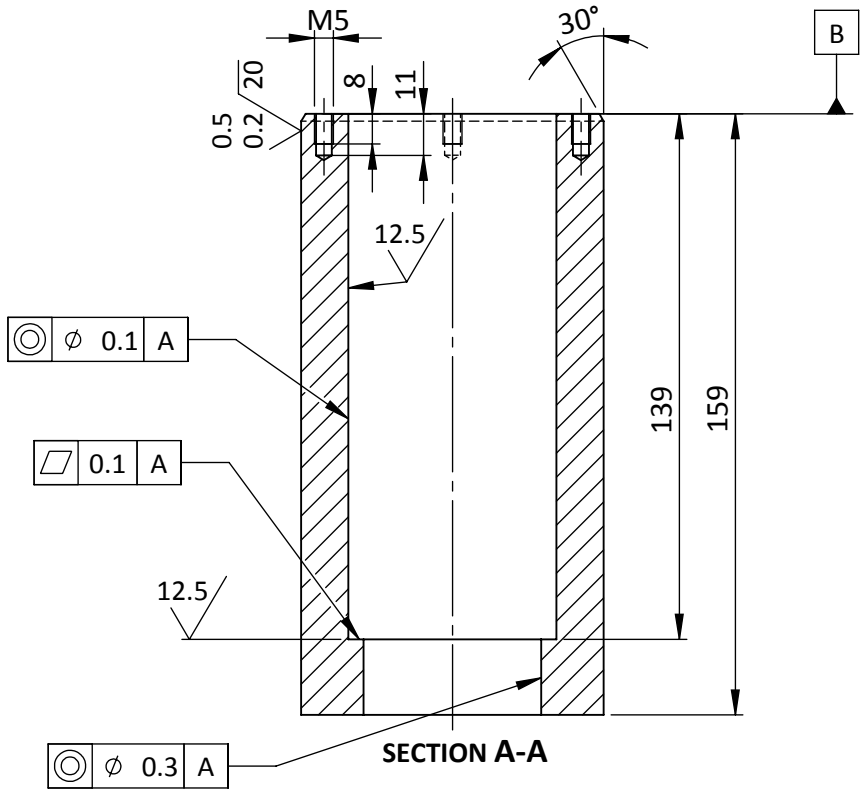
SECTION A-A

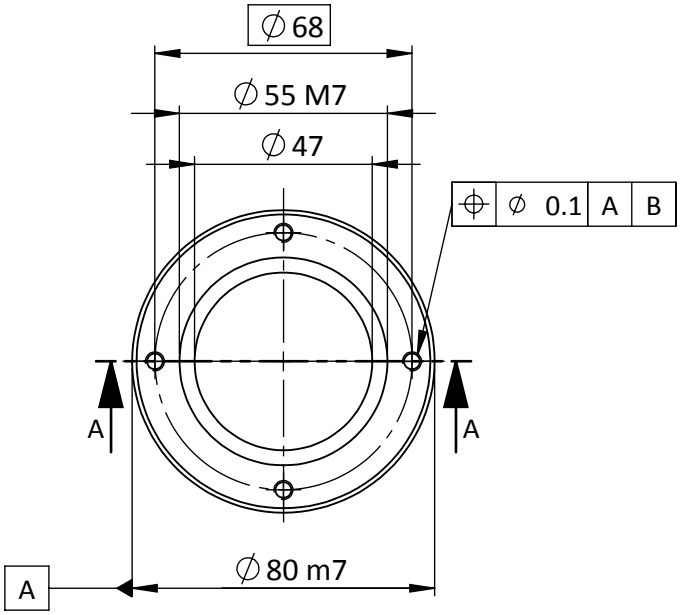


Note: Hub cylinder pressed on the flange and then the peripheral fillet weld.

ITEM NO.	DRAWING No.	DESCRIPTION	QTY.
1	IPW_E_01_01_01	hub_cylinder	1
2	IPW_E_01_01_02	hub_flange	1

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**	Drawing No:**IPW_E_01_01** Title: *hub_assembly* General Tolerances: ISO 2768-f-H		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Mass [kg] 5	Scale 1:2	Sheet 1 of 1

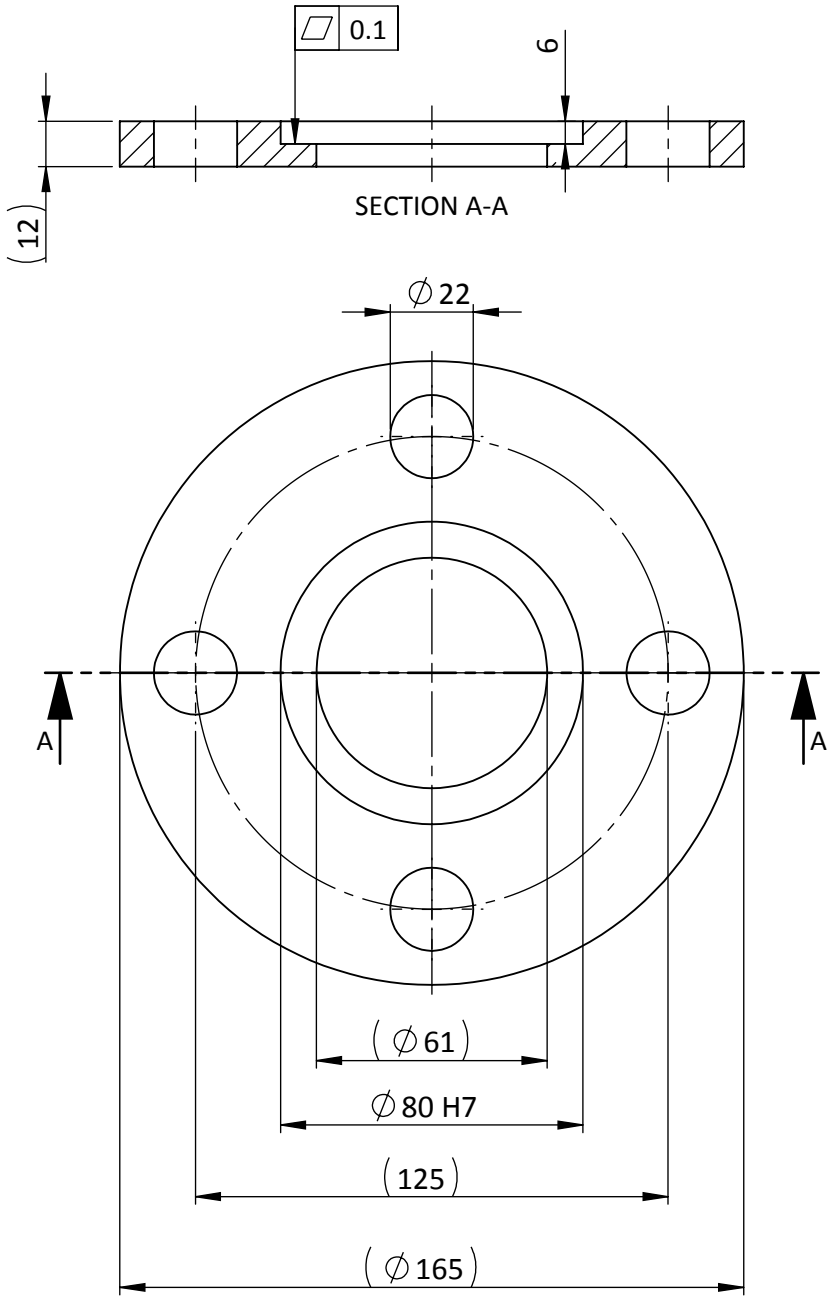




Note: Hollow bar O.D. ⌀85 , I.D. ⌀45, length 159mm
Phase 1: Machine internal from ⌀45 to ⌀47 , THRU ALL
Phase 2: Machine interna from ⌀47 to ⌀55 M7 ↧ 139
Phase 3: Machine external (roughing) for ⌀85 to ⌀81, THRU ALL
Phase 4: Machine external (finishing) for ⌀81 to ⌀80, THRU ALL
Phase 5: Drill 4x ⌀4 holes with centre-to-centre distance ⌀68 mm , ↧ 11 , threads M5 to ⌀4 holes

Note:The surface finish $\sqrt{^{0.5}_{0.2}\,20}$ will be apply only for 20mm length from the top of the cylinder

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_C_01_01_01** Title: *hub_cylinder* General Tolerances: ISO 2768-f-H		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316	Mass [kg] 3.5	Scale 1:2	Sheet 1 of 1

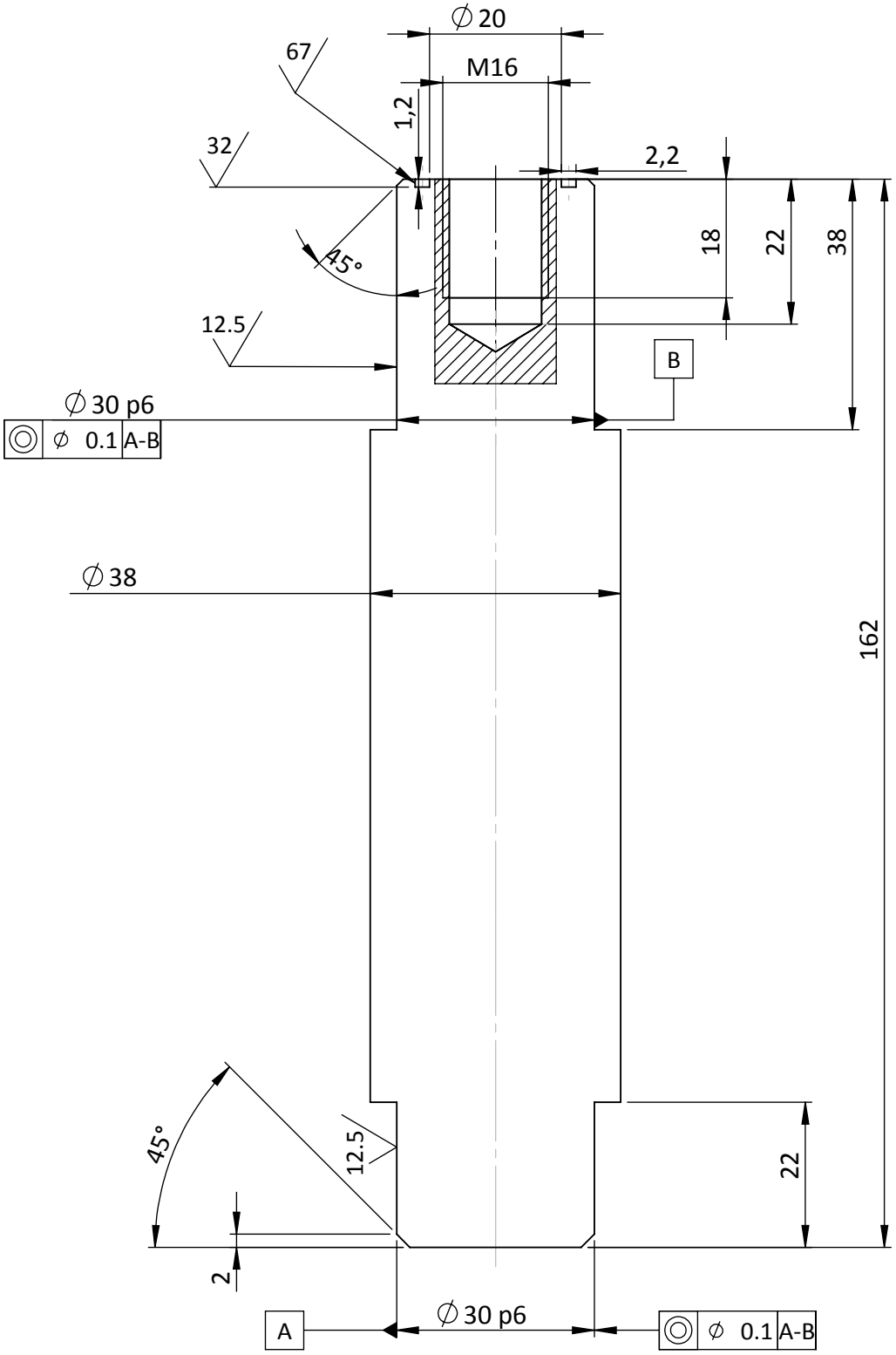


Note: Hollow bar O.D. ∅85 , I.D. ∅45, length 159mm

Note: Flange 2 1/2",62-1501 (DIN 2576), machine internal from (∅61) to ∅80 H7 , ↧ 6

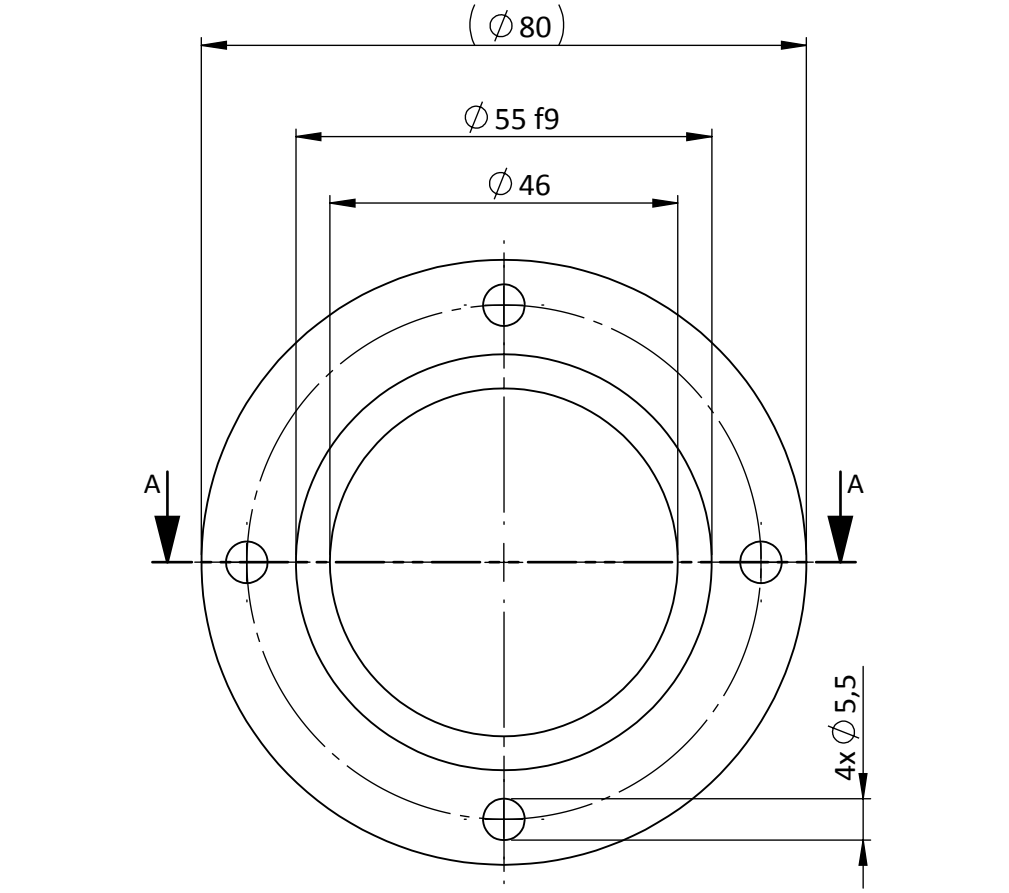
Note: Holes enlargement from ∅ 18 to ∅22 (holes for M20 bolt)

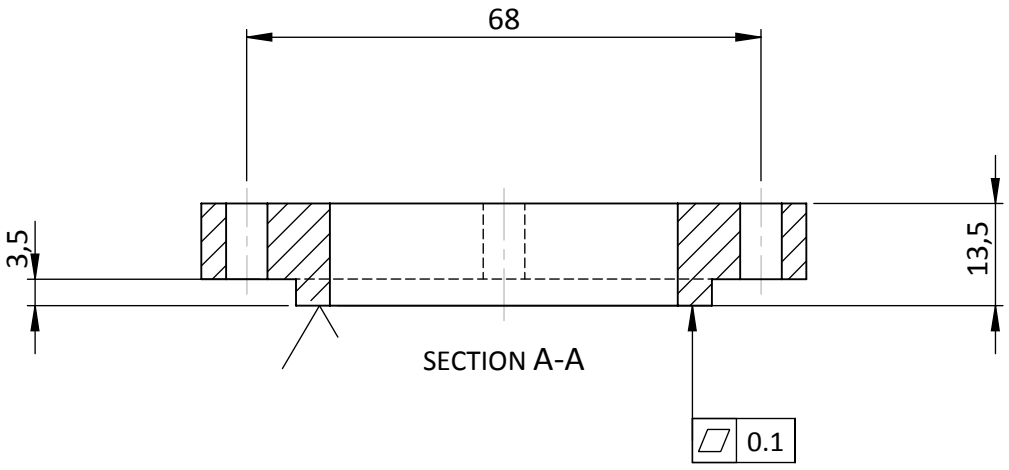
NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_E_01_01_02** Title: *hub_flange* General Tolerances: ISO 2768-f-H		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316	Mass [kg] 1.5	Scale 1:2	Sheet 1 of 1



Note: Machine from roundbar ∅40 , length 162mm
Note: Groove radius 0.013-0.51mm

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_C_01_02** Title: *shaft* General Tolerances: ISO 2768-m-K		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316	Mass [kg] 1.4	Scale 1:1	Sheet 1 of 1

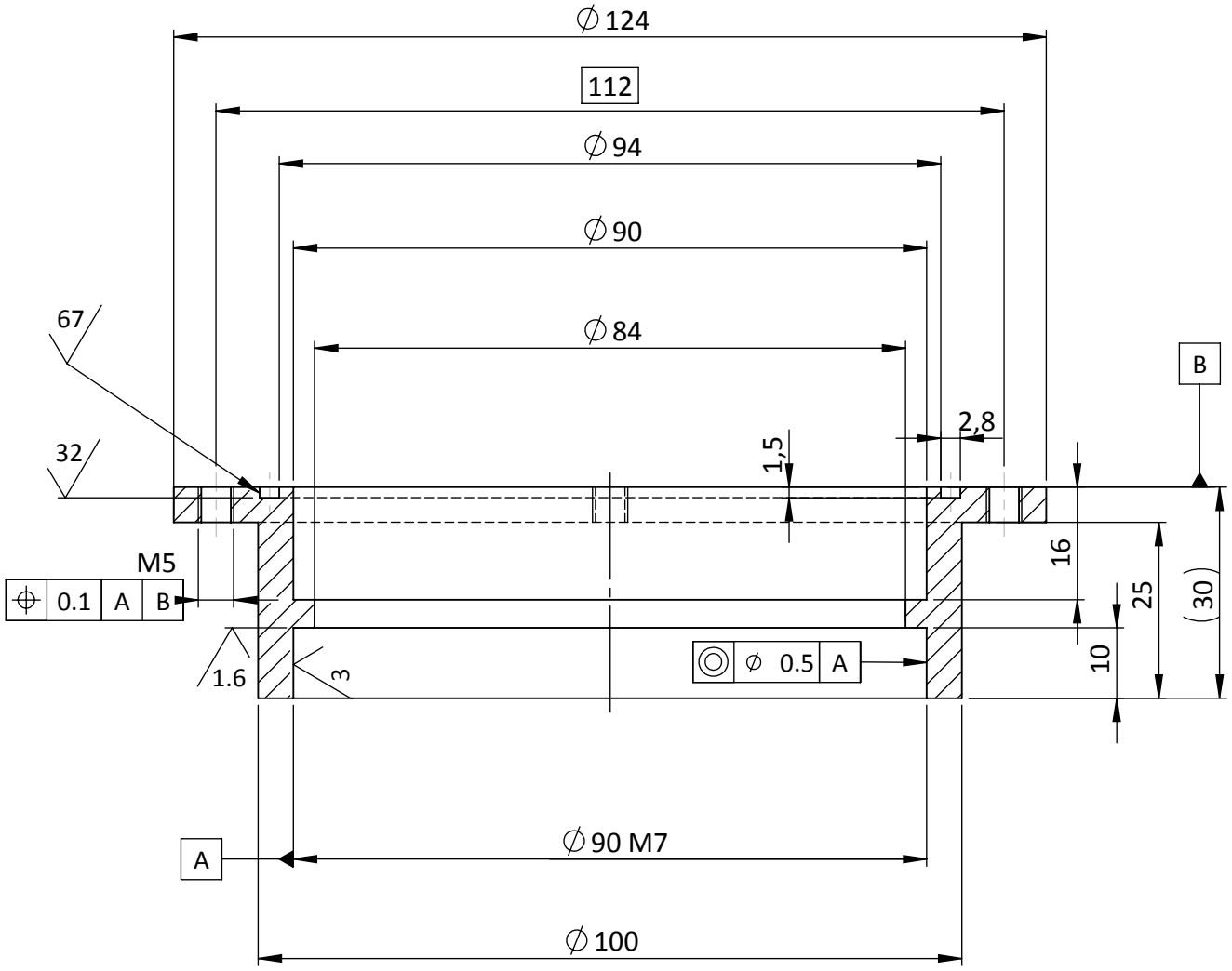




Note: Hollow bar O.D. ∅80 , I.D. ∅40, length 13,5mm

Phase 1: Machine external from (∅80) to ∅55 f9 ↧ 3,5
Phase 2: Machine internal from ∅40 to ∅46 , THRU ALL
Phase3: Drill 4x∅5,5 (holes for M5 bolts) with centre-to-centre distance 68 mm

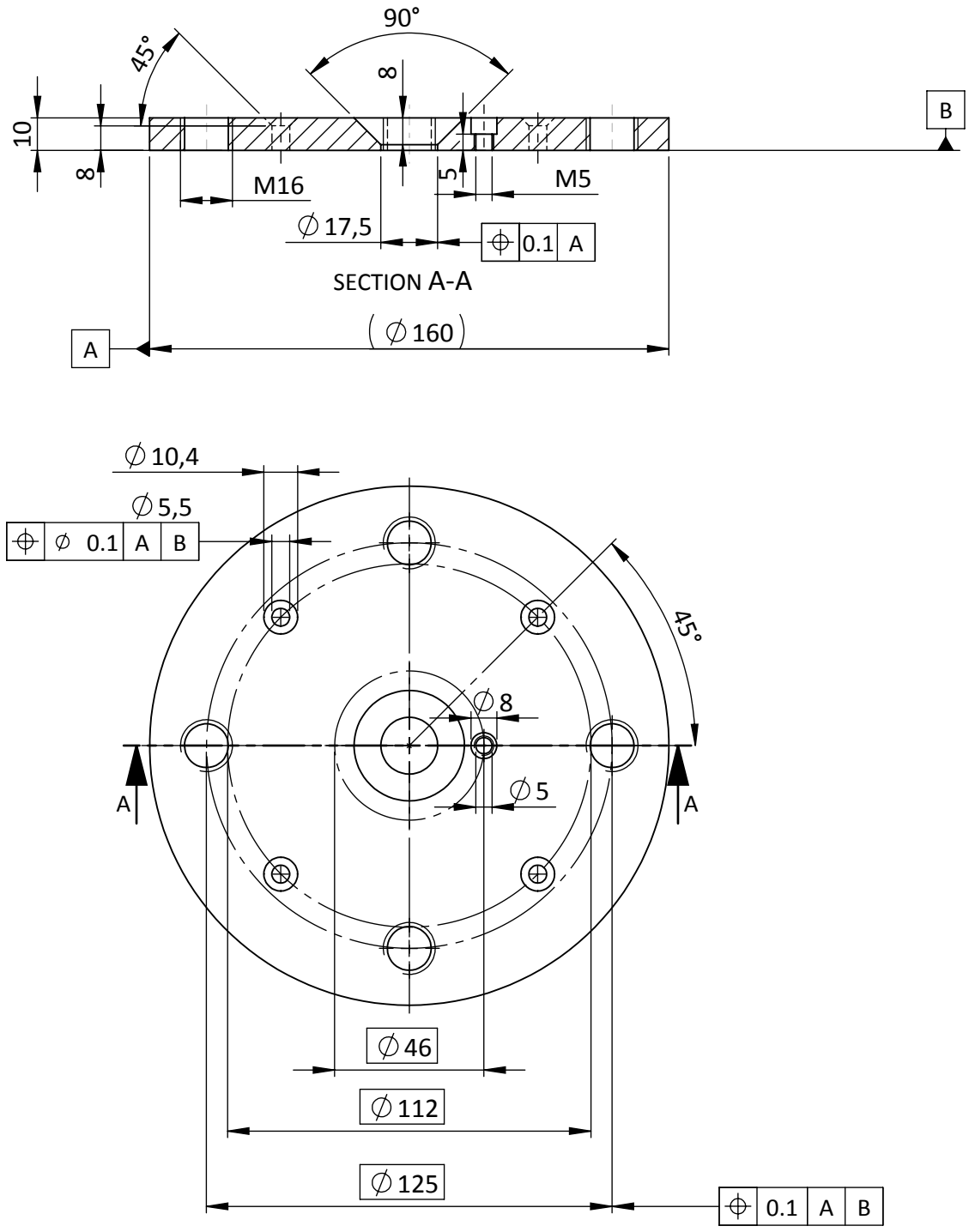
NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_E_01_03** Title: *hub_cap* General Tolerances: ISO 2768-f-H		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316	Mass [kg] 0.245	Scale 1:1	Sheet 1 of 1



Note: Hollow bar O.D. ∅125 , I.D. ∅80, length 30mm

Phase 1: Machine external from ∅ 125 to ∅124 , THRU ALL
Phase 2: Machine external (roughing) from ∅124 to ∅100 , ↧ 25
Phase 3: Machine internal from ∅80 to ∅84 , THRU ALL
Phase 4: Machine internal from ∅80 to ∅90 M7 , ↧ 16
Phase 5: Machine internal from ∅80 to ∅90 M7 , ↧ 10
Phase 3: Drill 4x ∅3 holes with centre-to-centre distance 112 mm, threads M5 to ∅3 holes
Phase 4: O-rings groove ID ∅94 , width 2.8mm, ↧ 1.5
Note: Groove radius 0.013-0.51mm

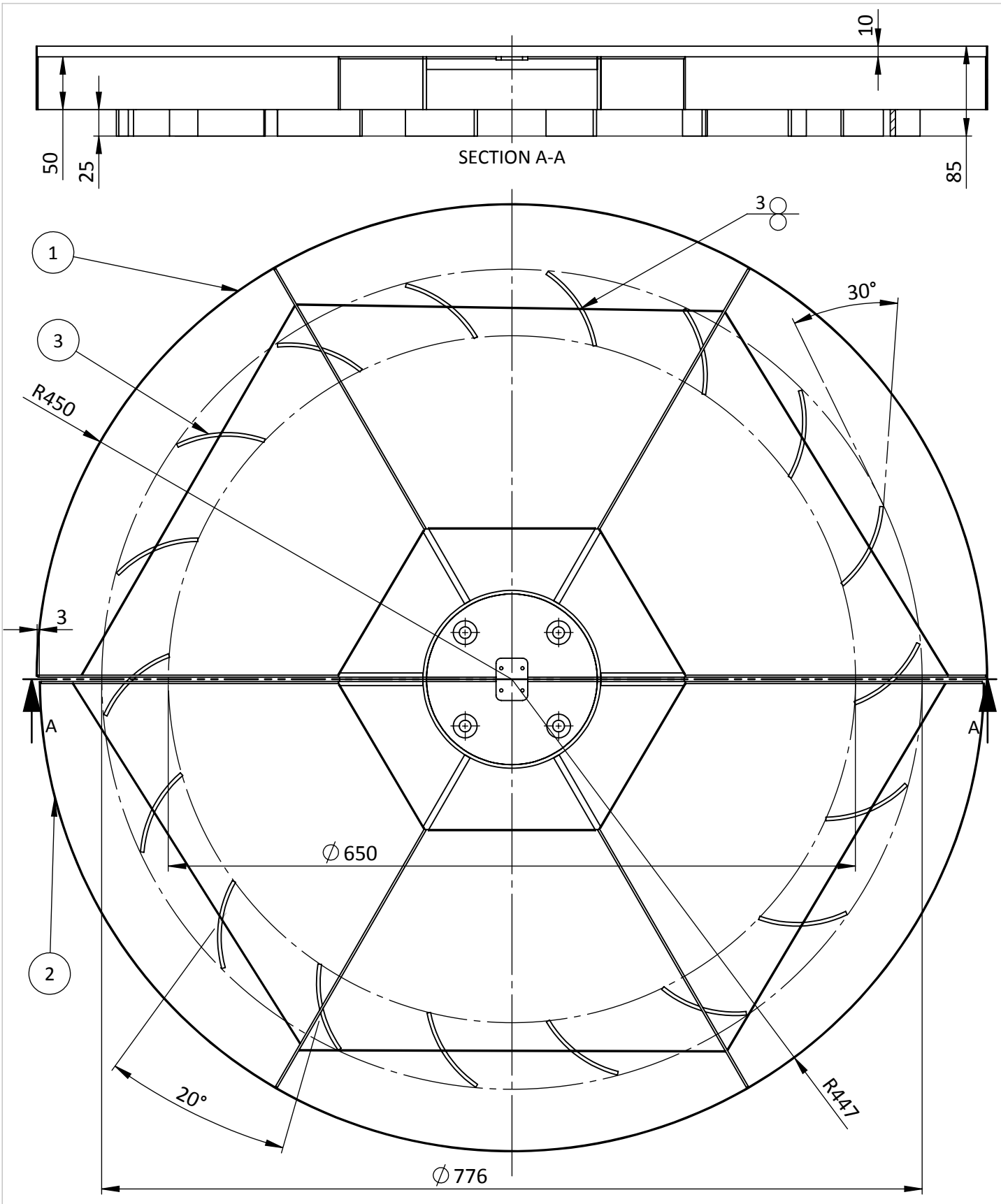
NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_E_01_04** Title: *glass* General Tolerances: ISO 2768-f-H		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316	Mass [kg] 0.5	Scale 1:1	Sheet 1 of 1



Note: Flange 2", blind & without bolt holes, 62-1501 (DIN 2576)

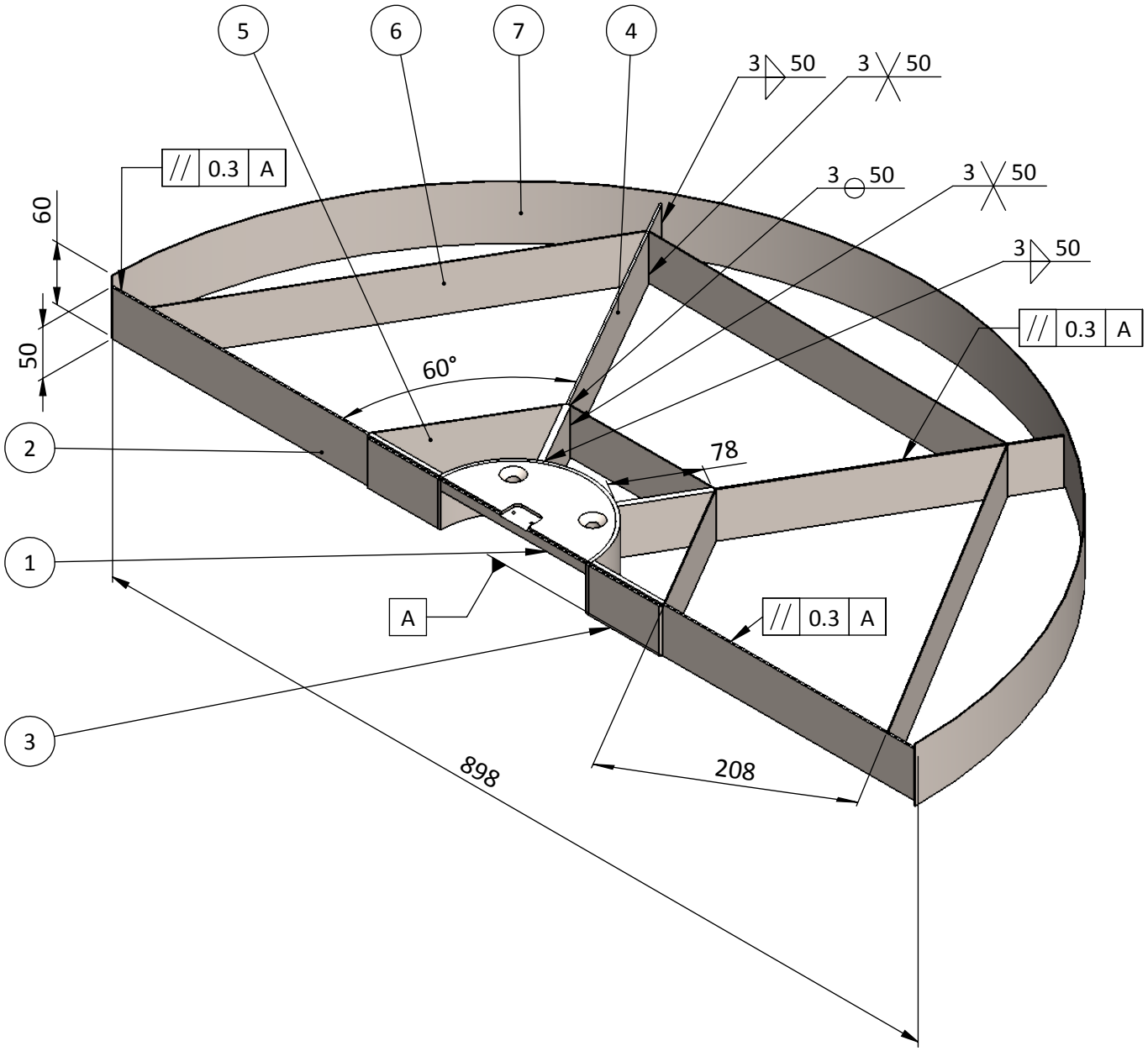
Note: Machine external from ∅ 165 to ∅160 , THRU ALL
Machine flange thickness from ⏬ 12 to ⏬ 10
Drill 4x∅10 holes with centre-to-centre distance M16 mm ,THRU ALL, threads M12 to ∅10 holes

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_E_01_05** Title: *flange* General Tolerances: ISO 2768-f-H		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316	Mass [kg] 1.52	Scale 1:2	Sheet 1 of 1



ITEM NO.	DRAWING NO.	DESCRIPTION	QTY.
1	IPW_E02_01	rotation_disc1_assembly	1
2	IPW_E02_02	rotation_disc2_assembly ,3mm shorter (in radius) than rotation_disc1_assembly	1
3	IPW_E02_03	blades	18

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**	Drawing No:**IPW_E_02** Title: *rotation_disc_full_assembly* General Tolerances: ISO 2768-c-L		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Mass [kg] 9.5	Scale 1:5	Sheet 1 of 1



ITEM NO.	DRAWING NO.	DESCRIPTION	QTY.
1	IPW_E_02_01_01	rotation_disc_center_subassembly	1
2	IPW_E_02_01_02	rotation_disc1_radius1a_subassembly	1
3	IPW_E_02_01_03	rotation_disc1_radius1b_subassembly	1
4	IPW_E_02_01_04	rotation_disc1_radius1c_subassembly	2
5	IPW_E_02_01_02_02	rotation_disc_flat_bar_rib1	3
6	IPW_E_02_01_02_02	rotation_disc_flat_bar_rib2	3
7	IPW_E_02_01_05	rotation_disc_circular_semicycle_1	1

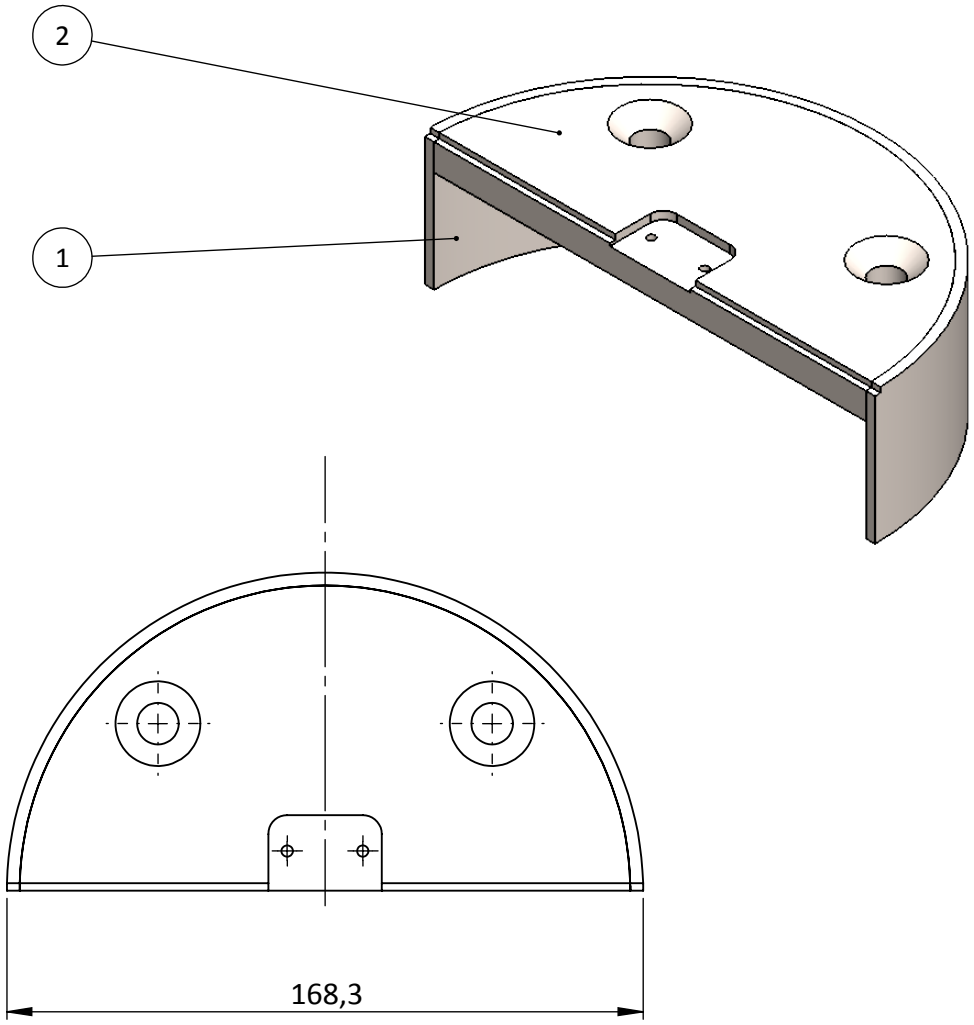
NATIONAL TECHNICAL UNIVERSITY OF ATHENS
DEPARTMENT OF MECHANICAL ENGINEERING
MACHINE DESIGN LABORATORY

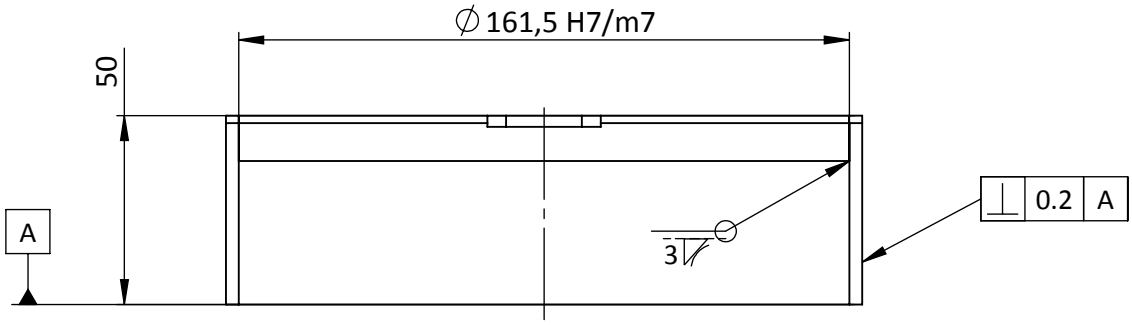
Designed by: **Ch. Marketos**
Checked by: **G. Kaisarlis**
Approved by: **V. Spitas**

Drawing No: **IPW_E_02_01**
Title: *rotation_disc1_assembly*
General Tolerances: ISO 2768-c-L

PROJECT: INDUSTRIAL PARTS WASHER

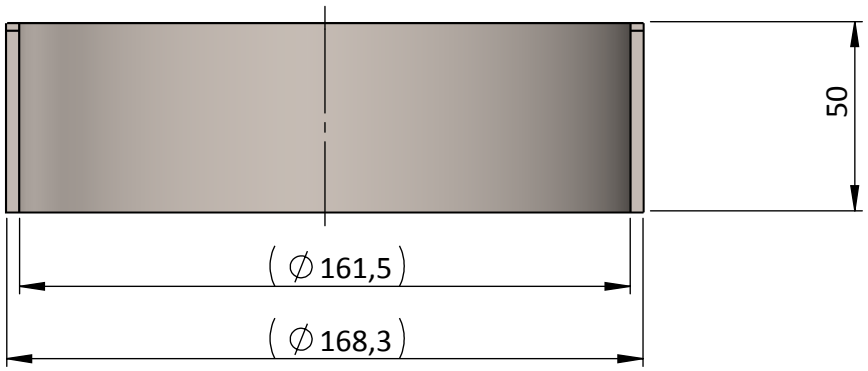
Date	Material	Mass [kg]	Scale	Sheet
July 2018	St. Steel AISI 316	5	1:5	1 of 1





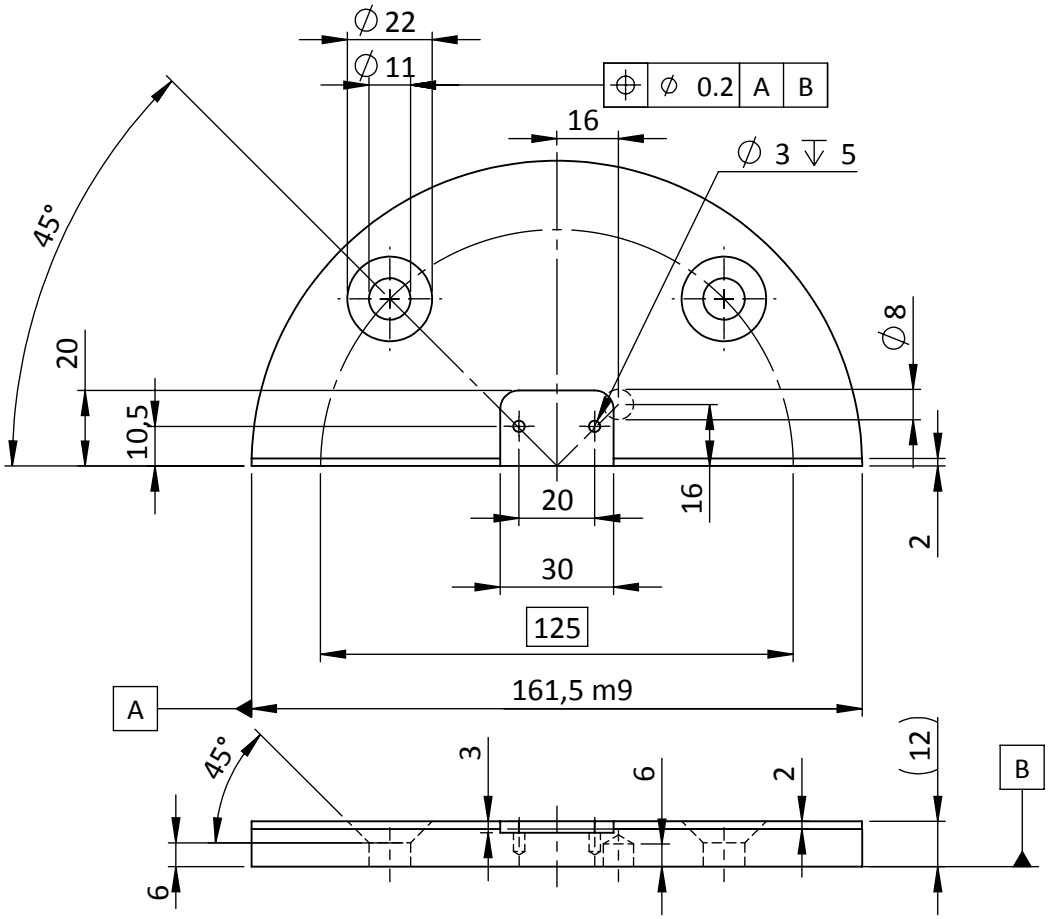
ITEM NO.	DRAWING NO.	PART NUMBER	QTY.
1	IPW_E_02_01_01_01	rotation_disc_6inch_tube	1
2	IPW_E_02_01_01_01	rotation_disc_flange (2" flange)	1

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**	Drawing No: **IPW_E_02_01_01** Title: *rotation_disc_center_subassembly* General Tolerances: ISO 2768-m-K		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Mass [kg] 1.3	Scale 1:2	Sheet 1 of 1



Rotation_disc_6inch_tube (mass 0.35kg)

Note: Half tube 4", length 50, thickness 3.4mm (Sch10S), ASTM A312-2001



Rotation_disc_flange (mass 9.4kg)

Note: Flange 2", blind & without bolt holes, 62-1501 (DIN 2576)

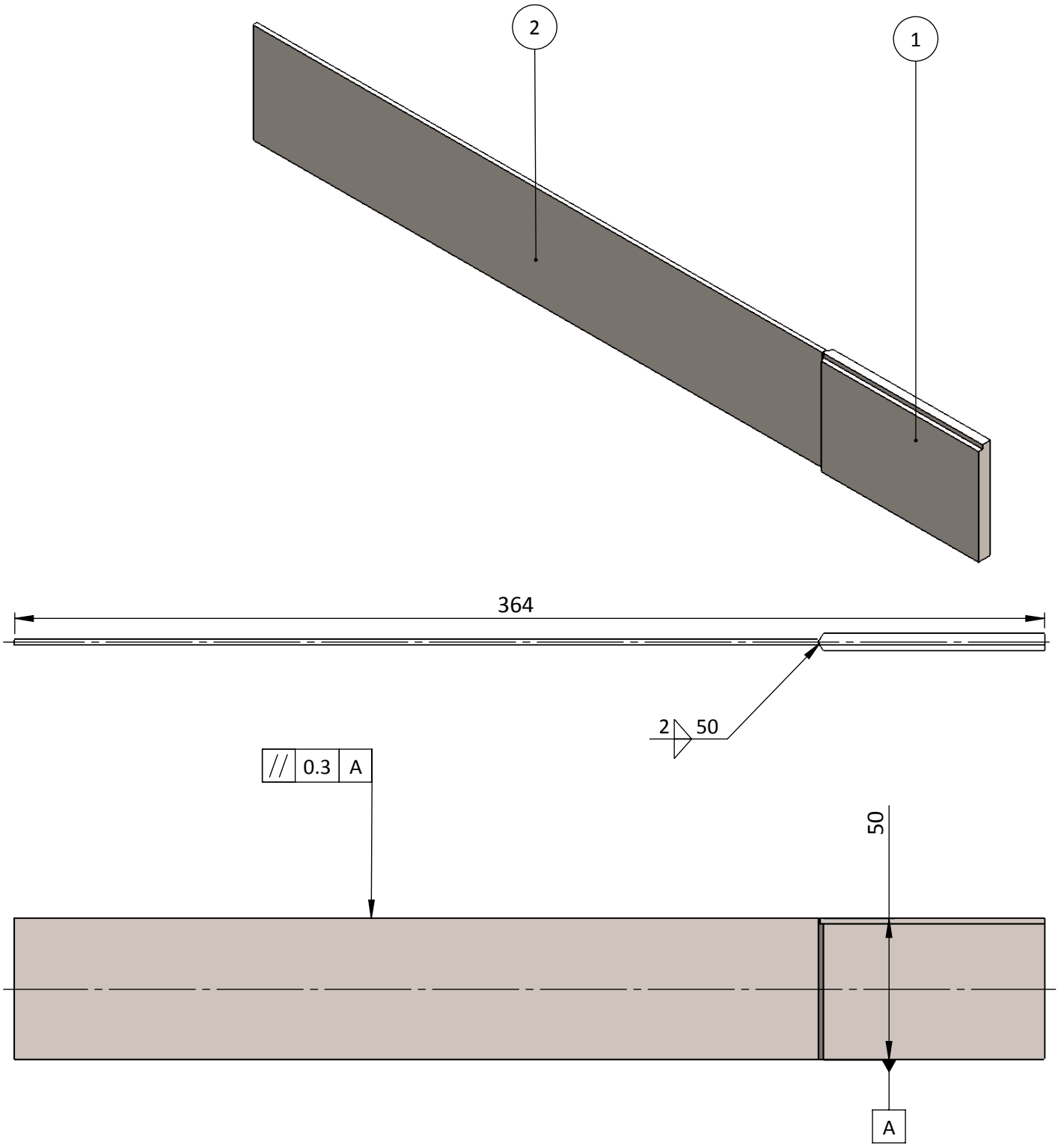
Phase 1: Machine external from ∅16 to ∅ 161,5 m9

Phase 2: Drill 2x∅11 THRU ALL ⌵ 22.1x90˚ holes with centre-to-centre distance M16 mm, with an anglee 90˚,THRU ALL

Phase3: Cutting the flange in half

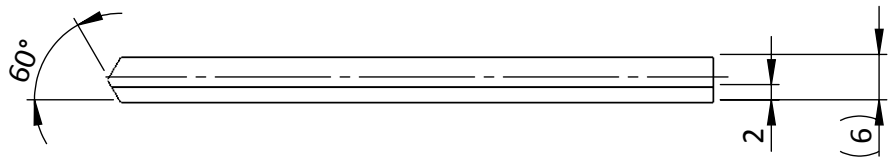
Phase4: Machine hinge groove

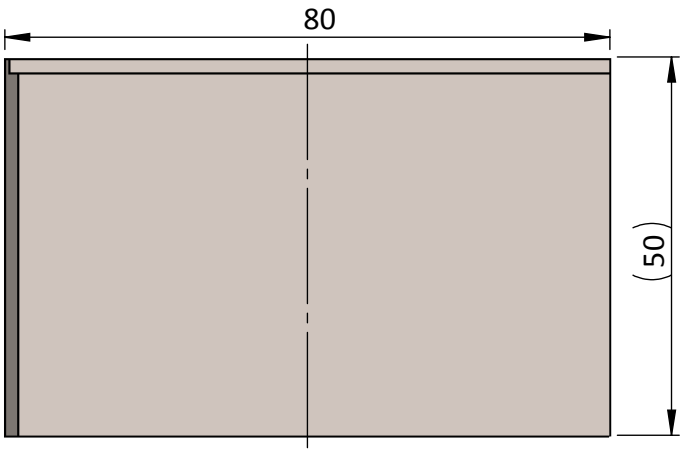
NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_E_02_01_01_01** Title: *rotation disc center flange & tube* General Tolerances: ISO 2768-m-K		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316	Mass [kg] [-]	Scale [-]	Sheet 1 of 1



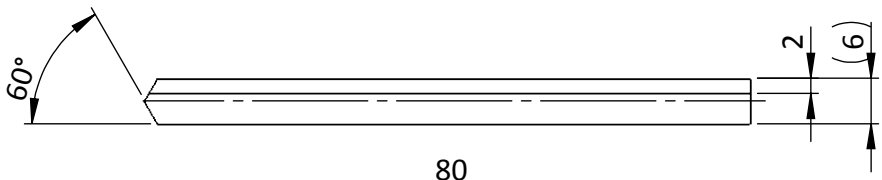
ITEM NO.	DRAWING NO.	DESCRIPTION	QTY.
1	IPW_02_01_02_01	rotation_disc_flat_bar_spoke1a	1
2	IPW_02_01_02_02	rotation_disc_flat_bar_spoke2	1

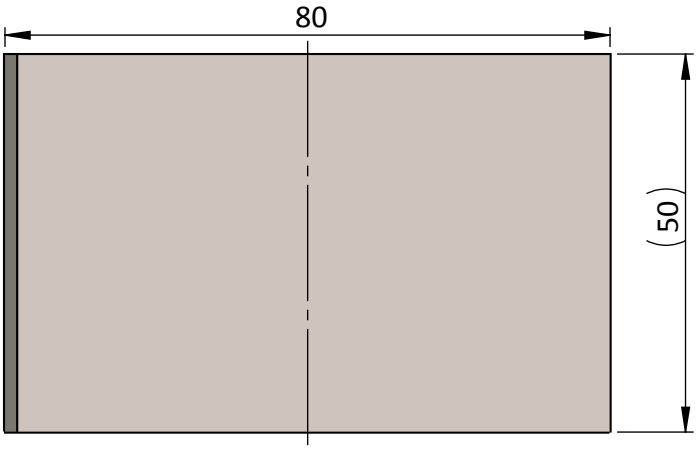
NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_E_02_01_02** Title: *rotation_disc1_radius1a_subassembly* General Tolerances: ISO 2768-c-L		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316	Mass [kg] 0.42	Scale 1:5	Sheet 1 of 1



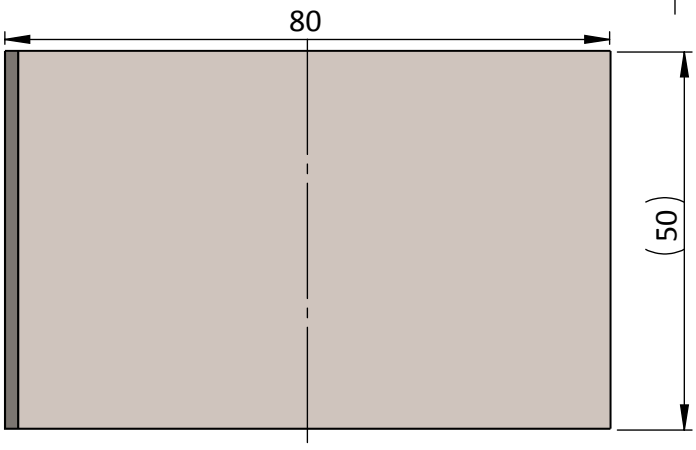


Rotation_disc_flat_bar_spoke1a
Note:Flat bar 50x80 ,thickness 6mm



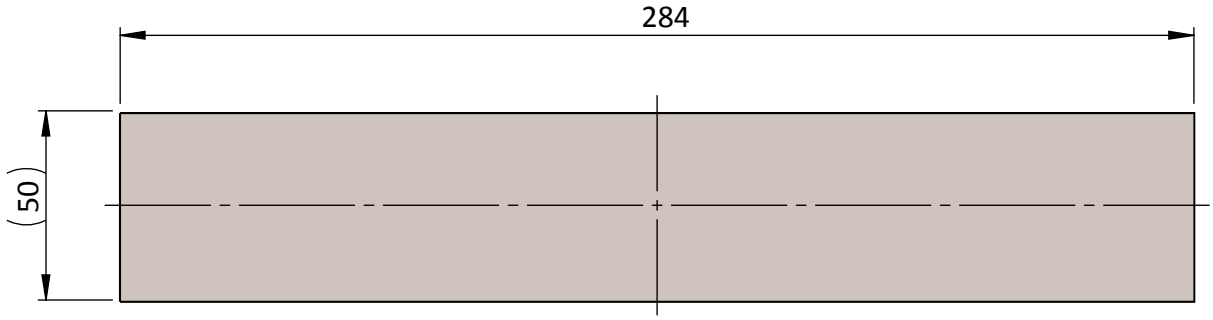


Rotation_disc_flat_bar_spoke1b
Note:Flat bar 50x80 ,thickness 6mm

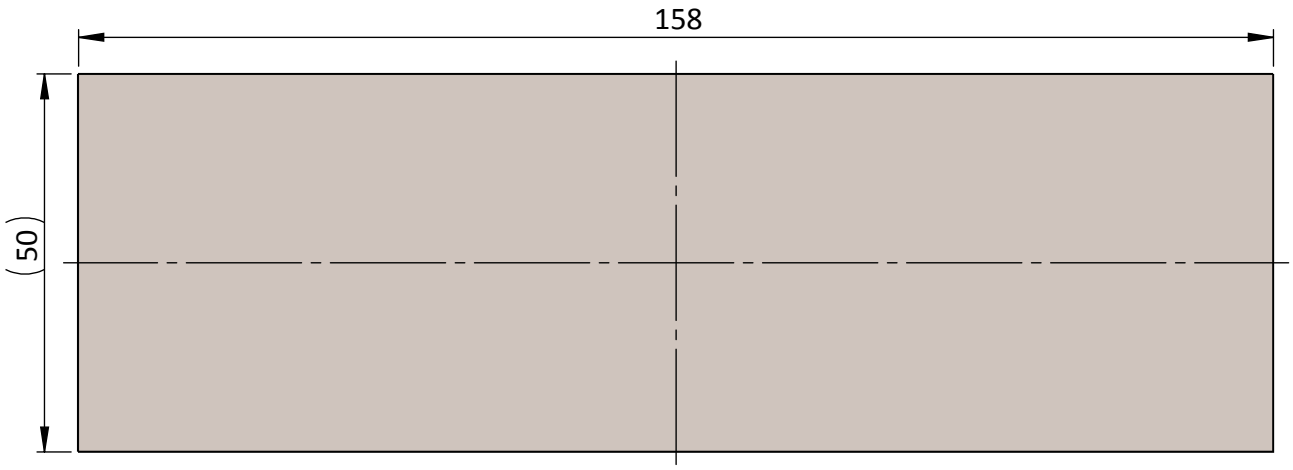


Rotation_disc_flat_bar_spoke1_without_groove
Note:Flat bar 50x80 ,thickness 6mm

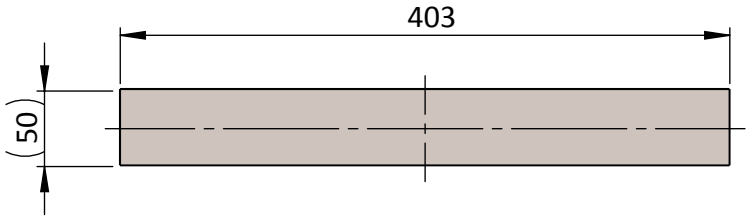
NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_02_01_02_01** Title: *rotation disc flat bar spoks1* General Tolerances: ISO 2768-c-L		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316	Mass [kg] 0.19	Scale 1:1	Sheet 1 of 1



Rotation_disc_flat_bar_spoke2 (mass 0.23kg, scale 1:2)
Note: Flat bar 50x284 ,thickness 2mm

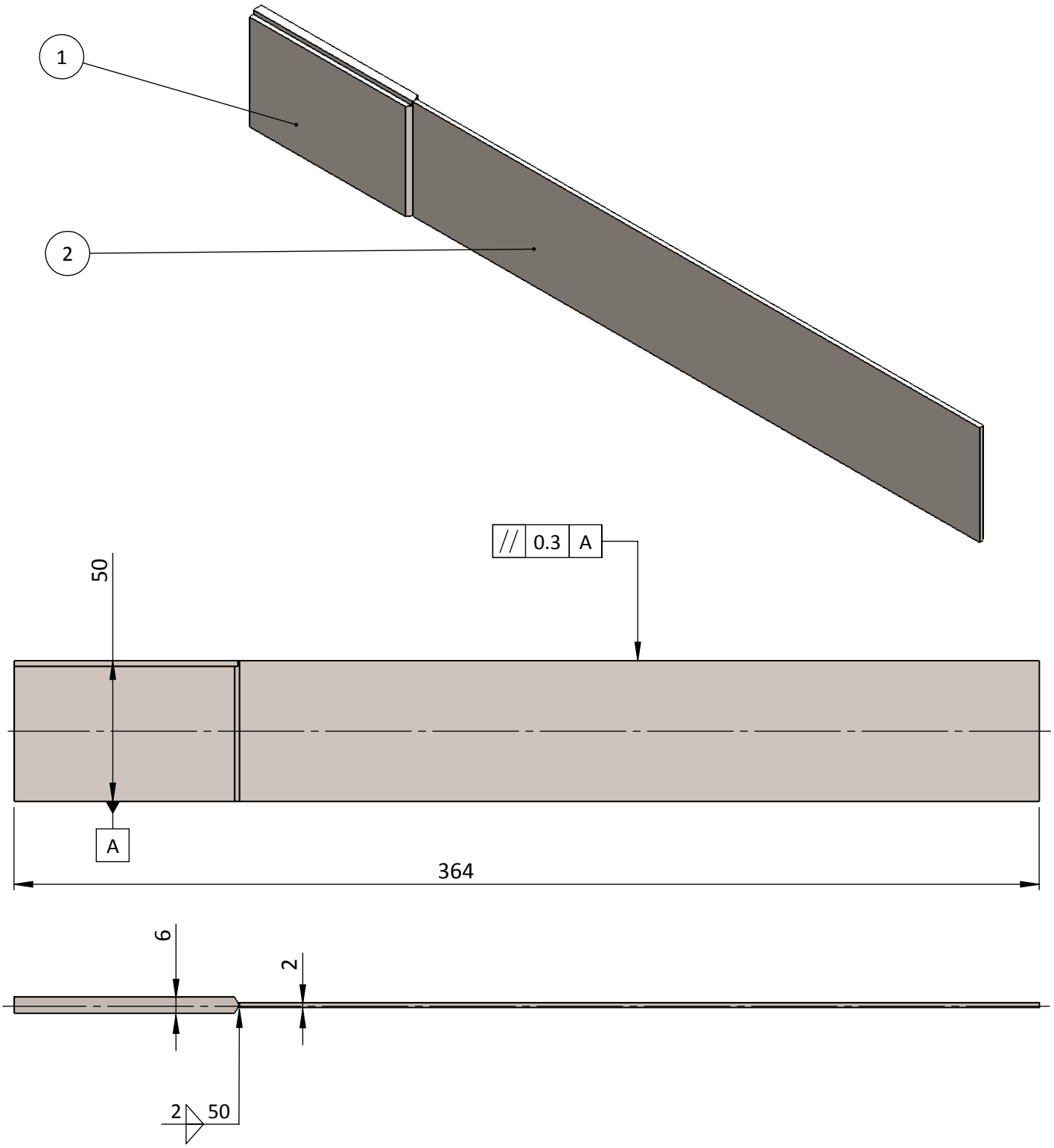


Rotation_disc_flat_bar_rib1 (mass 0.06kg, scale 1:1)
Note: Flat bar 50x158, thickness 1mm



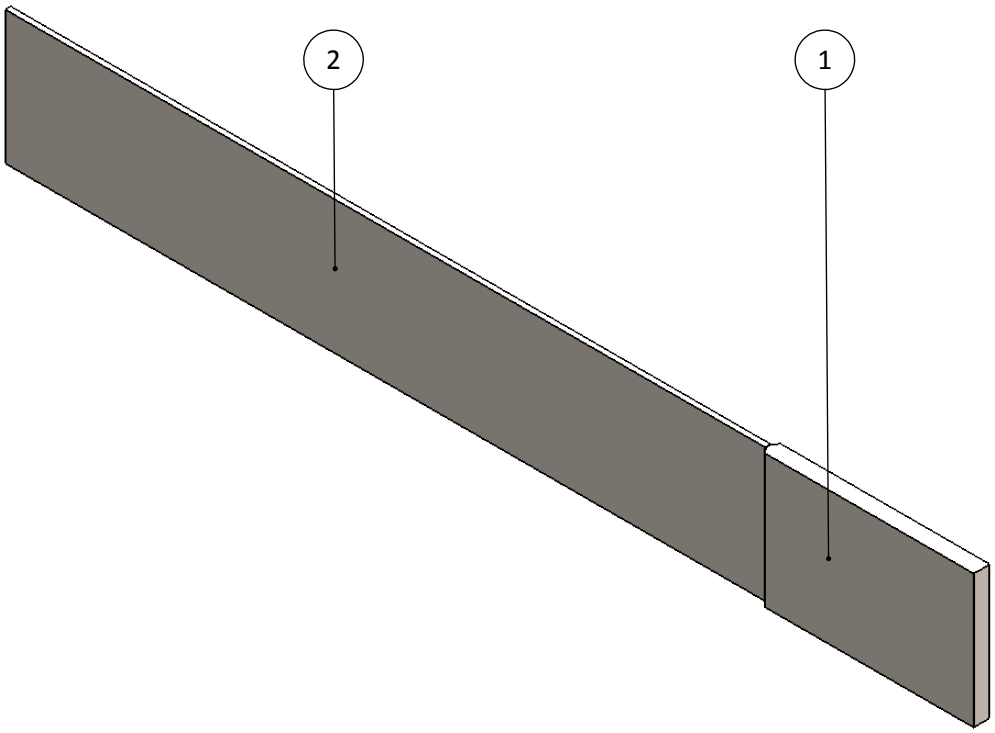
Rotation_disc_flat_bar_rib2 (mass 0.16kg, scale 1:5)
Note: Flat bar 50x403, thickness 1mm

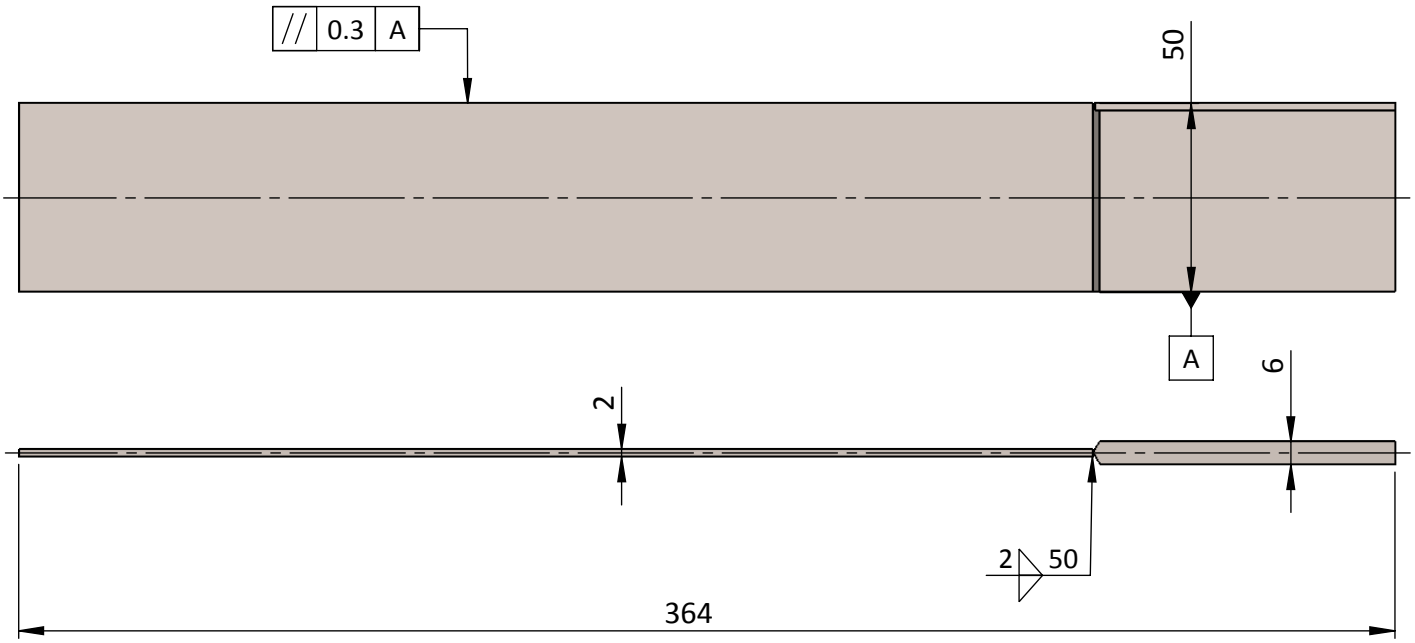
NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_02_01_02_02** Title: *flat bars (spoke & ribs)* General Tolerances: ISO 2768-c-L		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316	Mass [kg] [-]	Scale [-]	Sheet 1 of 1



ITEM NO.	DRAWING NO.	DESCRIPTION	QTY.
1	IPW_02_01_02_01	rotation_disc_flat_bar_spoke1b	1
2	IPW_02_01_02_02	rotation_disc_flat_bar_spoke2	1

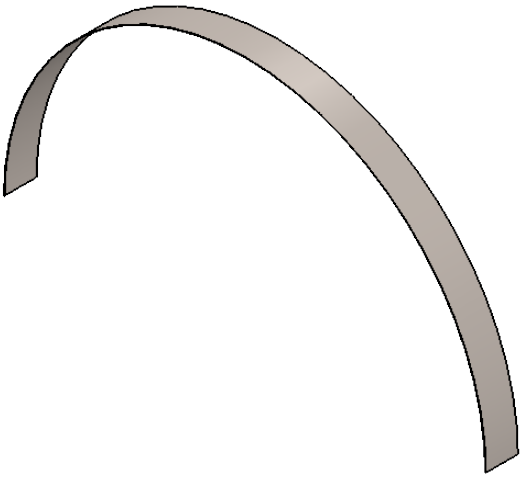
NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_E_02_01_03** Title: *rotation_disc1_radius1a_subassembly* General Tolerances: ISO 2768-c-L		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316	Mass [kg] 0.42	Scale 1:2	Sheet 1 of 1

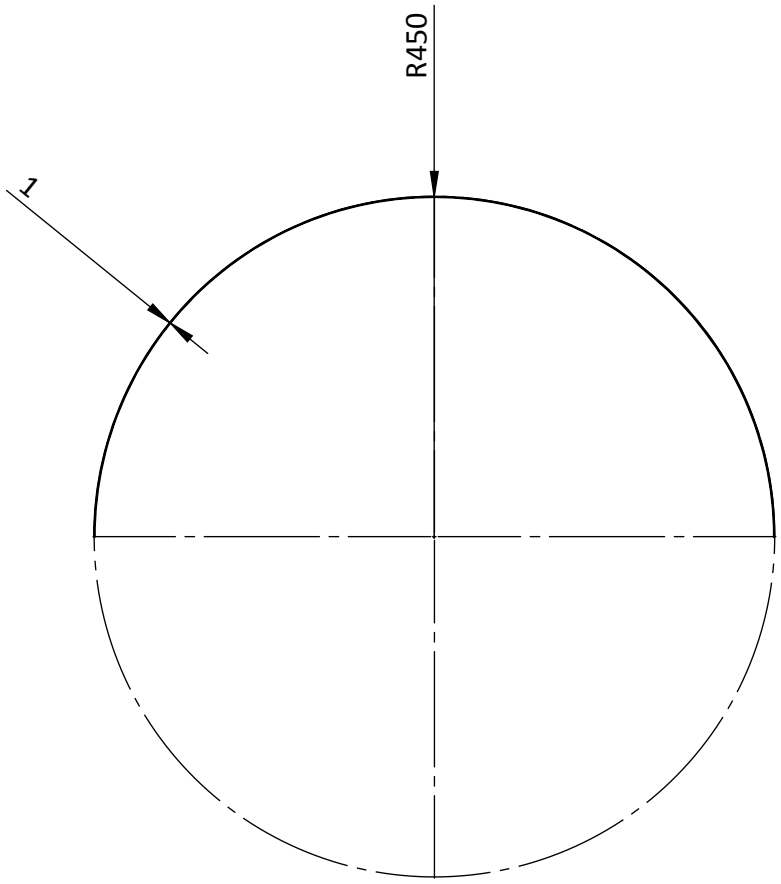




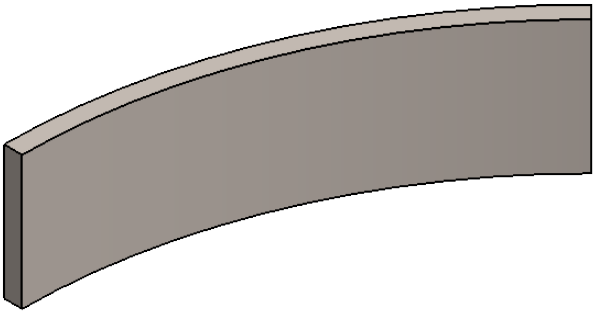
ITEM NO.	DRAWING NO.	DESCRIPTION	QTY.
1	IPW_02_01_02_01	rotation_disc_flat_bar_spoke1a	1
2	IPW_02_01_02_02	rotation_disc_flat_bar_spoke2	1

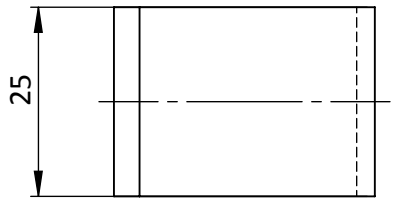
NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No: **IPW_E_02_01_04** Title: *rotation_disc1_radius1a_subassembly* General Tolerances: ISO 2768-c-L		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316	Mass [kg] 0.41	Scale 1:2	Sheet 1 of 1

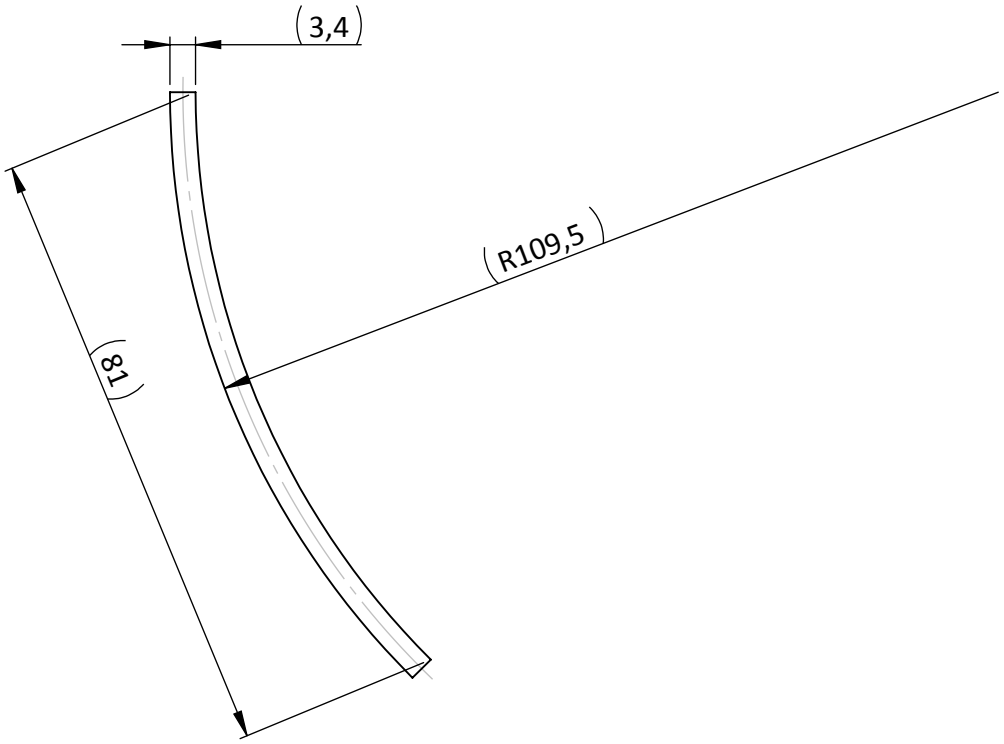




NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No: **IPW_E_02_01_05** Title: *rotation_disc_circular_semicycle_1* General Tolerances: ISO 2768-v-L		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316	Mass [kg] 0.68	Scale 1:10	Sheet 1 of 1

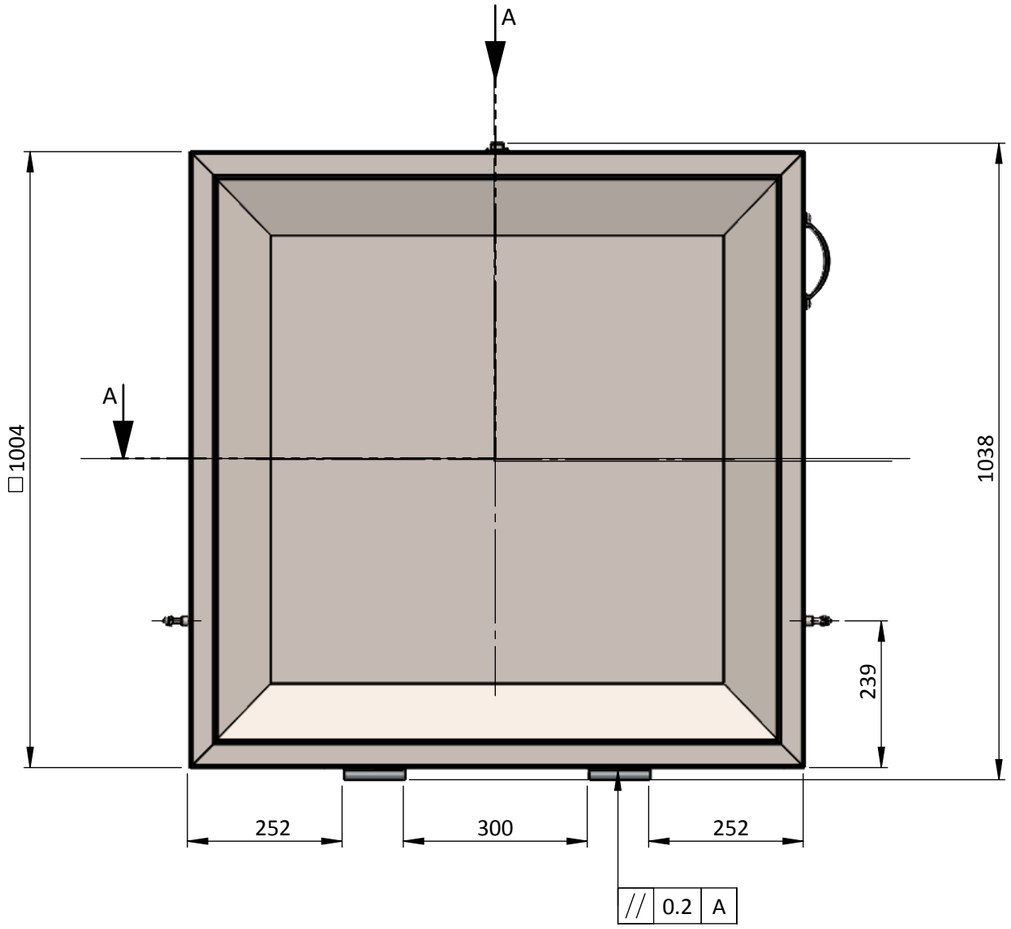


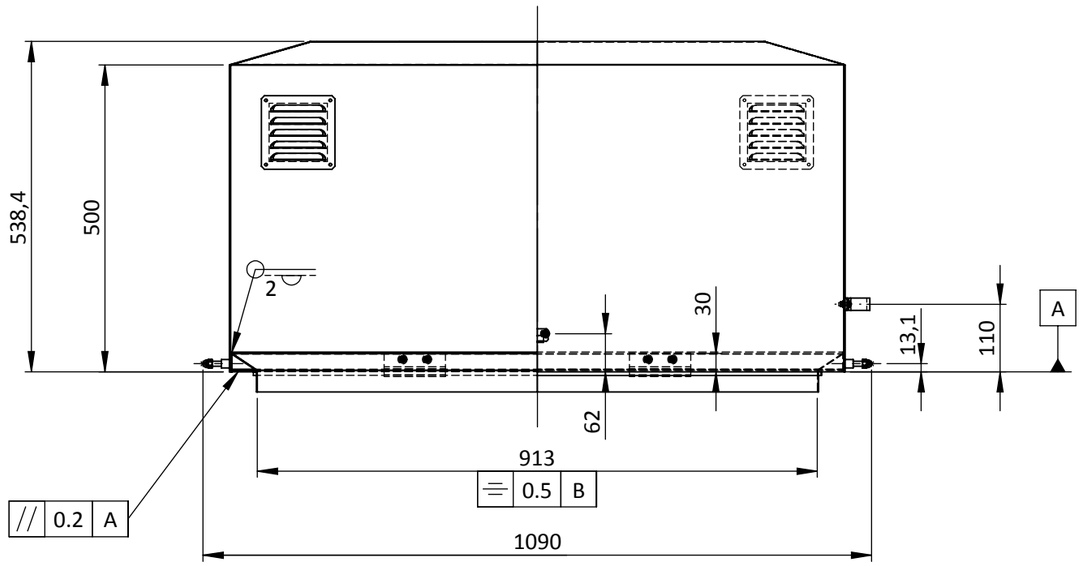




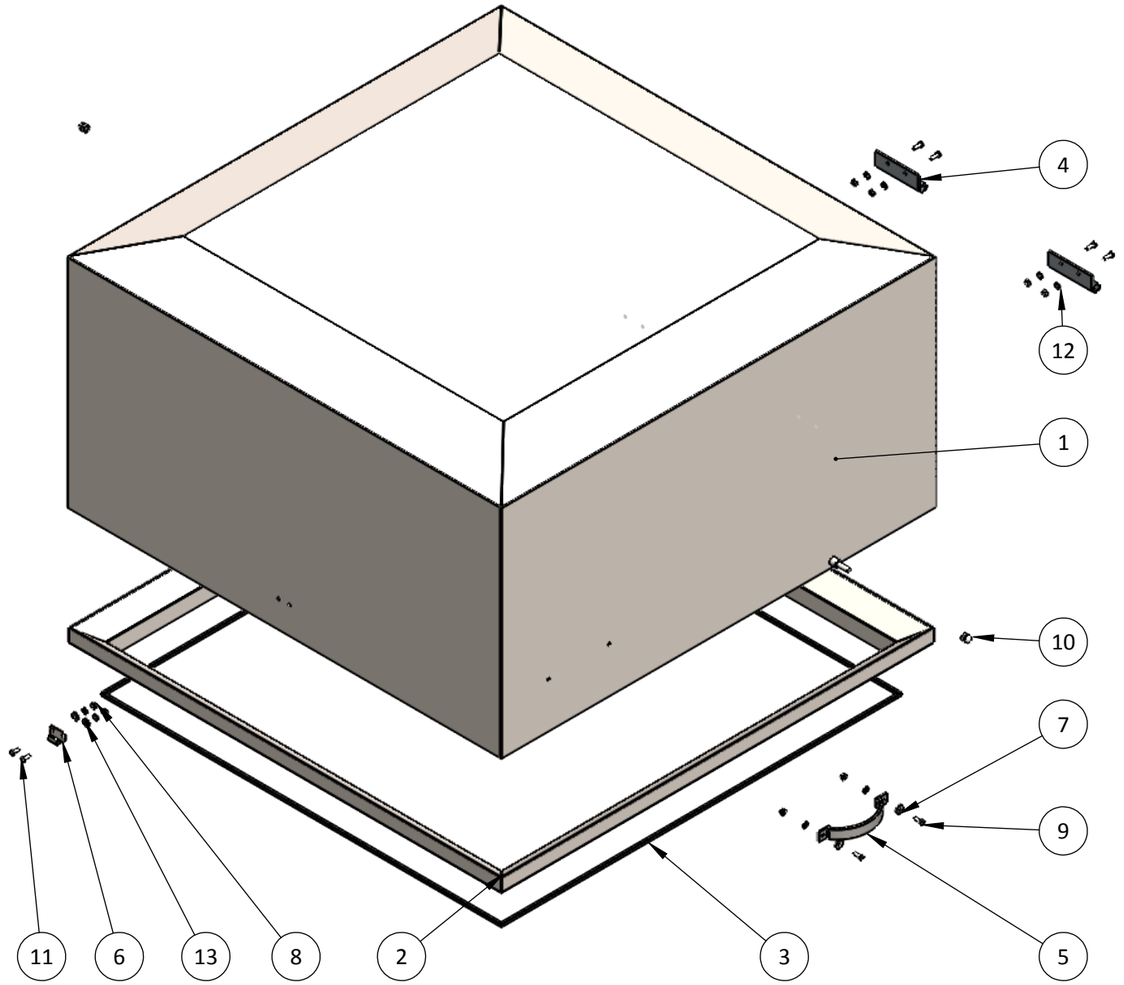
Note: One eighth (1/8) of 8" tube, thickness 3.4 (Sch 10S), length 25mm

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_E_02_03** Title: *blade* General Tolerances: ISO 2768-c-L		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316L	Mass [kg] 0.05	Scale 1:1	Sheet 1 of 1





SECTION A-A



ITEM NO.	DRAEING NO.	DESCRIPTION	QTY.
1	IPW_F_01	cap_assembly	1
2	IPW_F_02	cap_frame	1
3	IPW_F_03	cellular silicone, BF-2000	1
4	IPW_F_04	hinge assembly, st. steel AISI 304 , 100x65x2 (LxWxTh), (ord. no. 34-0803)	2
5	IPW_F_05	handle, Lamp, L158, stainless steel (ordering no. 33-0155)	1
6	IPW_F_06	gripper, stainless steel (component with toggle lantch, IPW_A_09)	1
7	IPW_F_07	B18.22M - Plain washer, 4 mm, wide (stainless steel)	2
8	IPW_F_08	B18.2.2.4M - Hex flange nut, M5 x 0.8 --N (stainless steel)	8
9	IPW_F_09	B18.6.7M - M5 x 0.8 x 16 Type I Cross Recessed PHMS --16N (stainless steel)	6
10	IPW_F_10	DIN 1587 - M8x1.0 --NNU (stainless steel)	2
11	IPW_F_11	pan cross head_am (stainless steel)	2
12	IPW_F_12	sealing_ring (stainless steel)	8
13	IPW_F_13	B18.22M - Plain washer, 5 mm, regular (stainless steel)	6

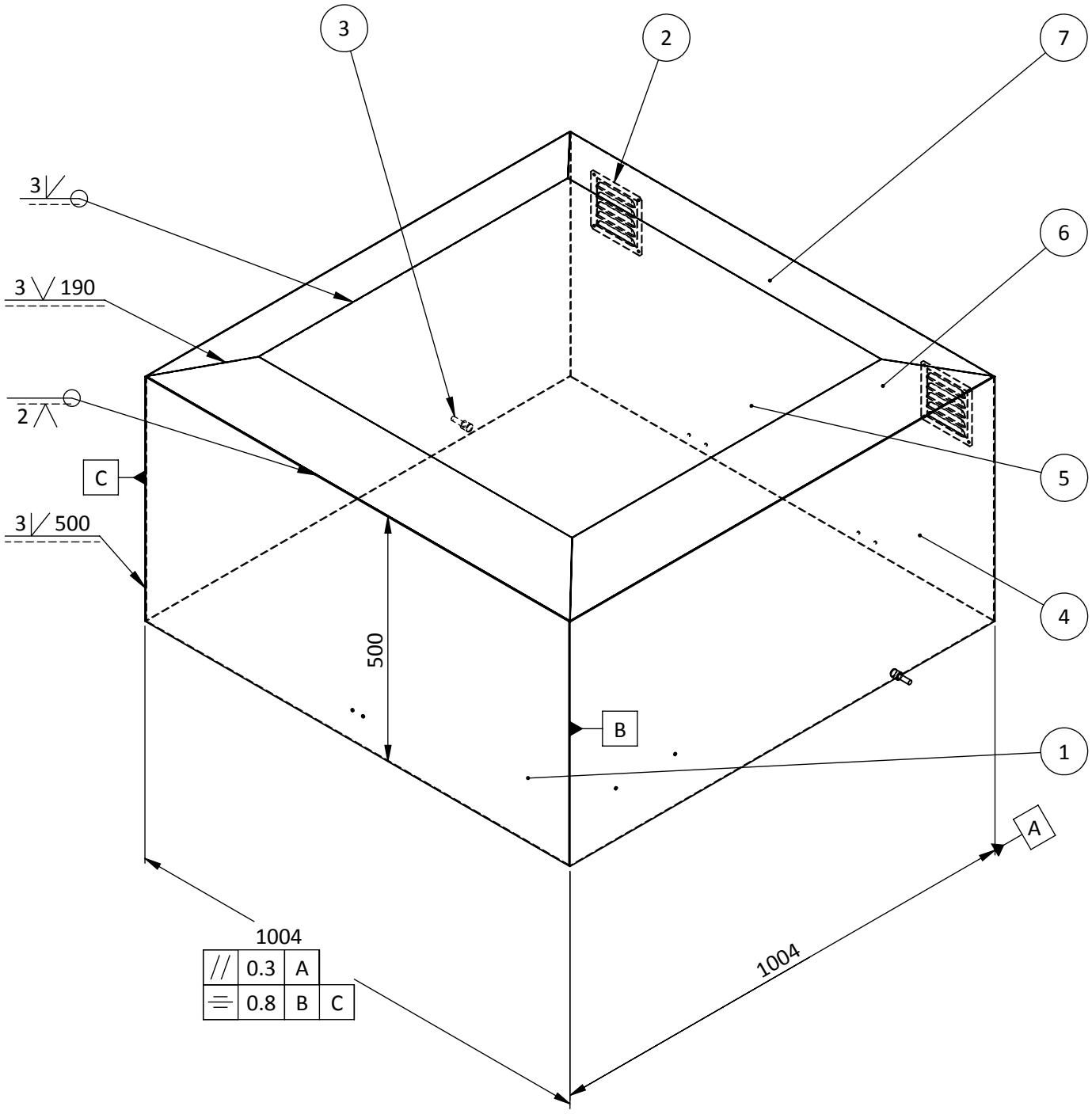
NATIONAL TECHNICAL UNIVERSITY OF ATHENS
DEPARTMENT OF MECHANICAL ENGINEERING
MACHINE DESIGN LABORATORY

Designed by: **Ch. Marketos**
Checked by: **G. Kaisarlis**
Approved by: **V. Spitas**

Drawing No: **IPW_F_00**
Title: *cap_full_assembly*
General Tolerances: ISO 2768-m-K

PROJECT: INDUSTRIAL PARTS WASHER

Date	Mass [kg]	Scale	Sheet
July 2018	50	1:10	1 of 1



ITEM NO.	DRAWING NO.	DESCRIPTION	QTY.
1	IPW_F_01_01	cap_sheet_metal_part1	1
2	IPW_F_01_02	cap_back_part_assembly	1
3	IPW_F_01_03	cap_lateral_left_assembly	1
4	IPW_F_01_03	cap_lateral_right_assembly	1
5	IPW_F_01_04	cap_sheet_metal_part3	1
6	IPW_F_01_04	cap_sheet_metal_part4	2
7	IPW_F_01_04	cap_sheet_metal_part5	2

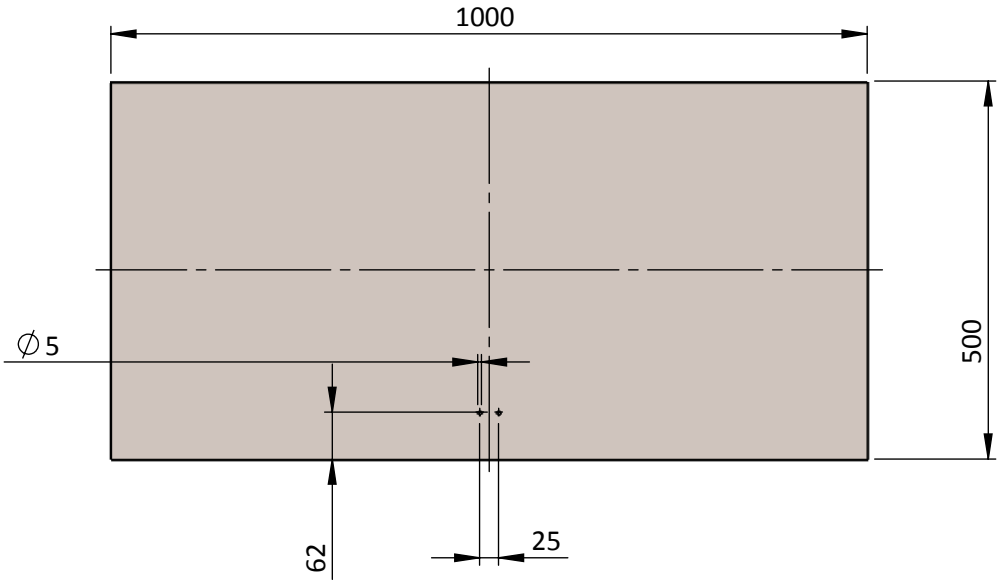
NATIONAL TECHNICAL UNIVERSITY OF ATHENS
DEPARTMENT OF MECHANICAL ENGINEERING
MACHINE DESIGN LABORATORY

Designed by: **Ch. Marketos**
Checked by: **G. Kaisarlis**
Approved by: **V. Spitas**

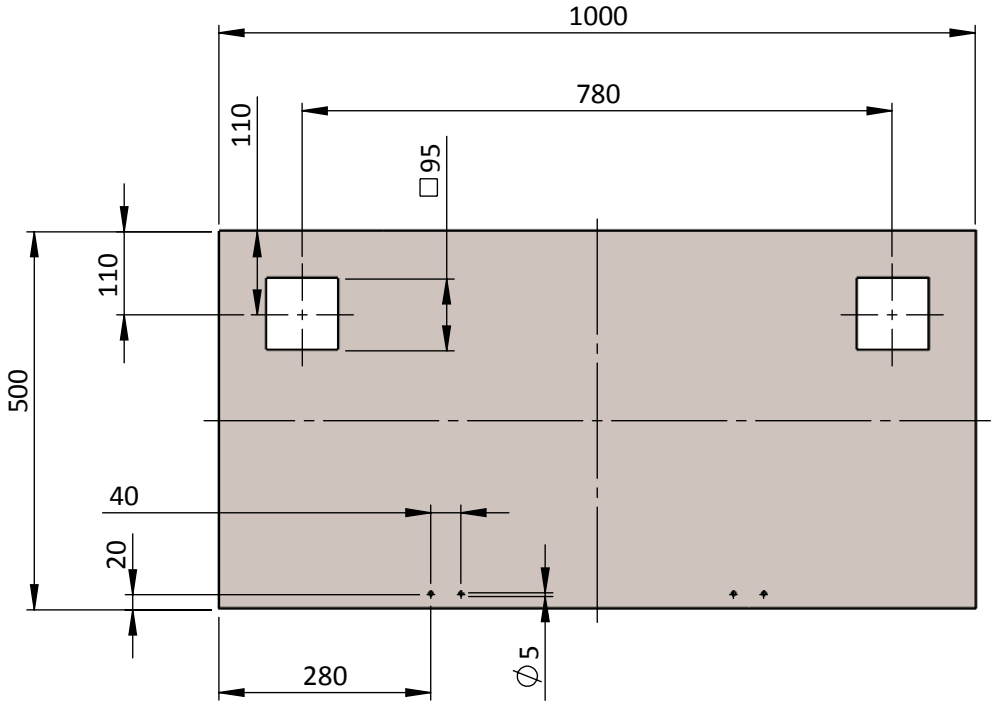
Drawing No: **IPW_F_01**
Title: *cap_assembly*
General Tolerances: ISO 2768-m-K

PROJECT: INDUSTRIAL PARTS WASHER

Date	Mass [kg]	Scale	Sheet
July 2018	40	1:5	1 of 1

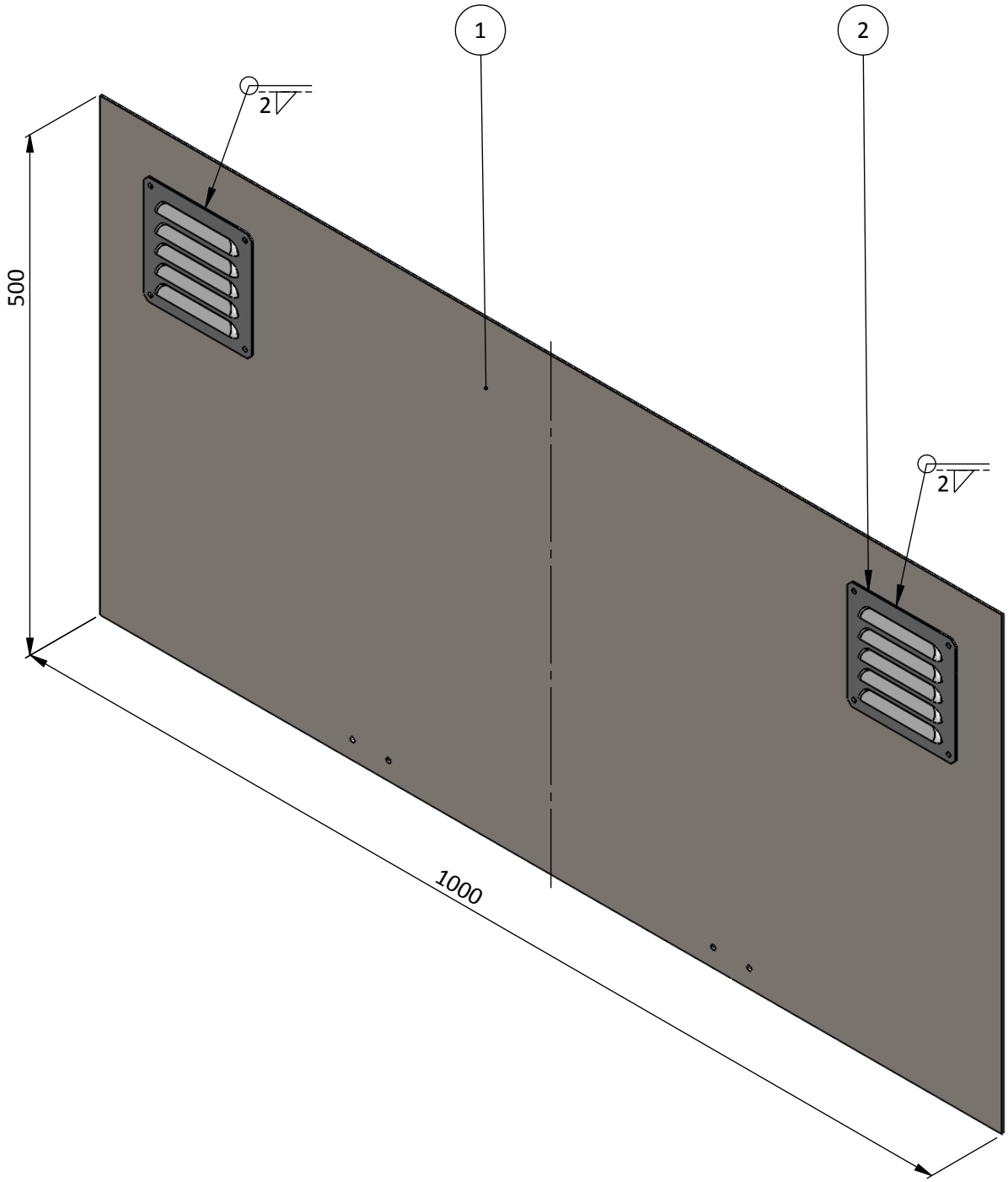


Note: Cap_sheet_metal_part1, 50x1000, thickness 2mm (mass 8kg)



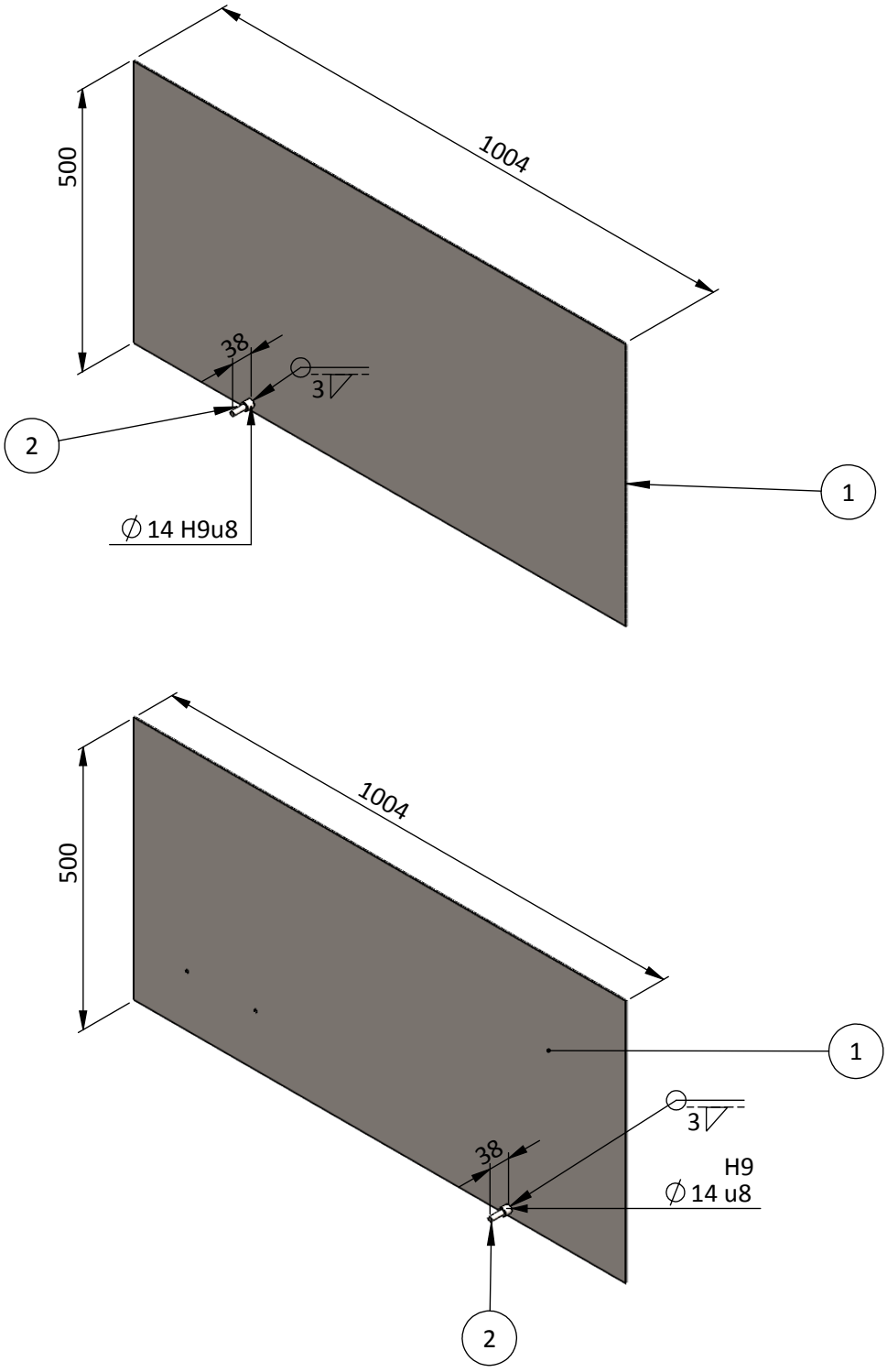
Note: Cap_back_sheet_metal, 50x1000, thickness 2mm (mass 7.7kg)

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_F_01_01** Title: *cap_sheet_metals* General Tolerances: ISO 2768-m-K		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316	Mass [kg] 16.6	Scale 1:10	Sheet 1 of 1



ITEM NO.	DRAWING NO.	DESCRIPTION	QTY.
1	IPW_F_01_01	cap_sheet_metal_back	1
2	IPW_F_02_01	louvered vent, stainless steel, 90x90x1.5 (LxWxTh)	2

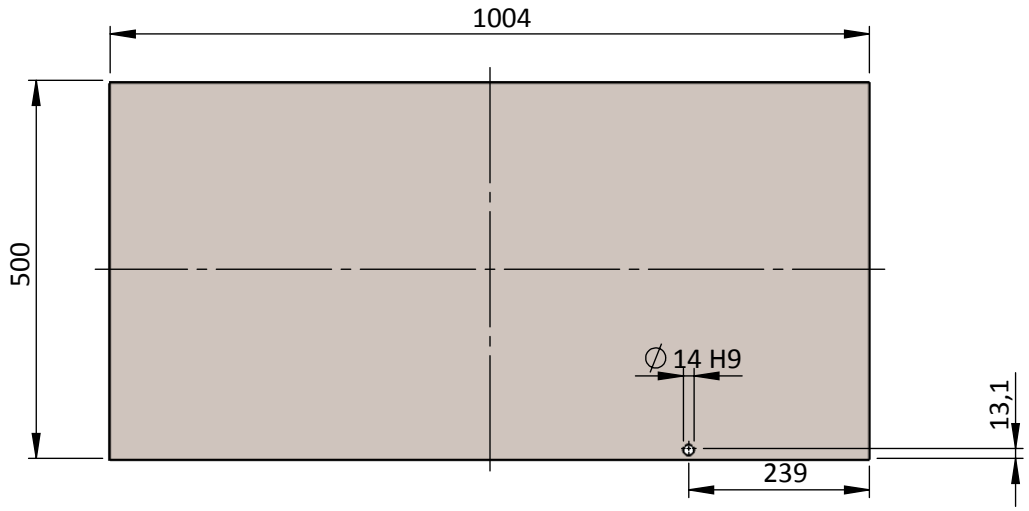
NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**	Drawing No: **IPW_F_01_02** Title: *cap_back_part_assembly* General Tolerances: ISO 2768-m-K			
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Mass [kg] 7.8	Scale 1:5	Sheet 1 of 1	



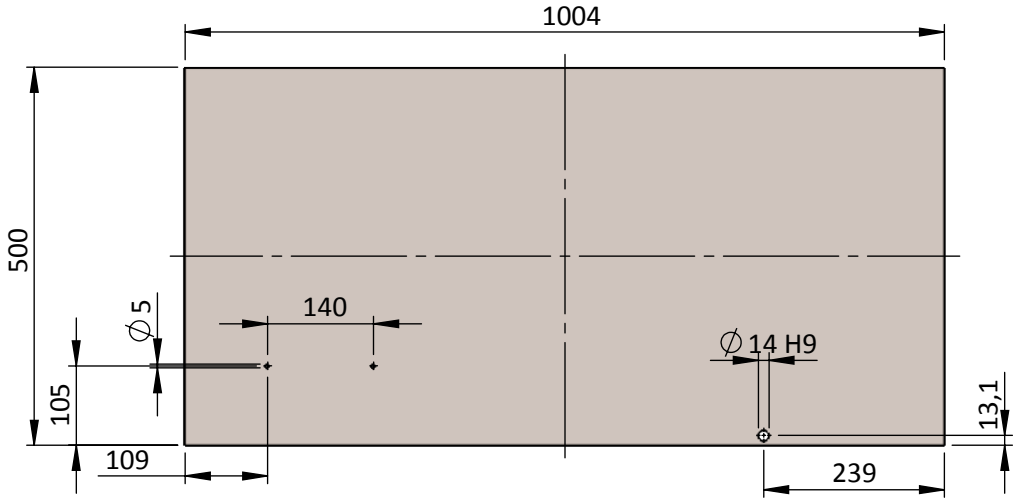
Note: Cap cylinders pressed on the sheet metals and then the welds

ITEM NO.	DRAWING NO.	DESCRIPTION	QTY.
1	IPW_F_01_03_01	cap_sheet_metal_part2_left	1
2	IPW_F_01_03_01	cap_cylinder	1

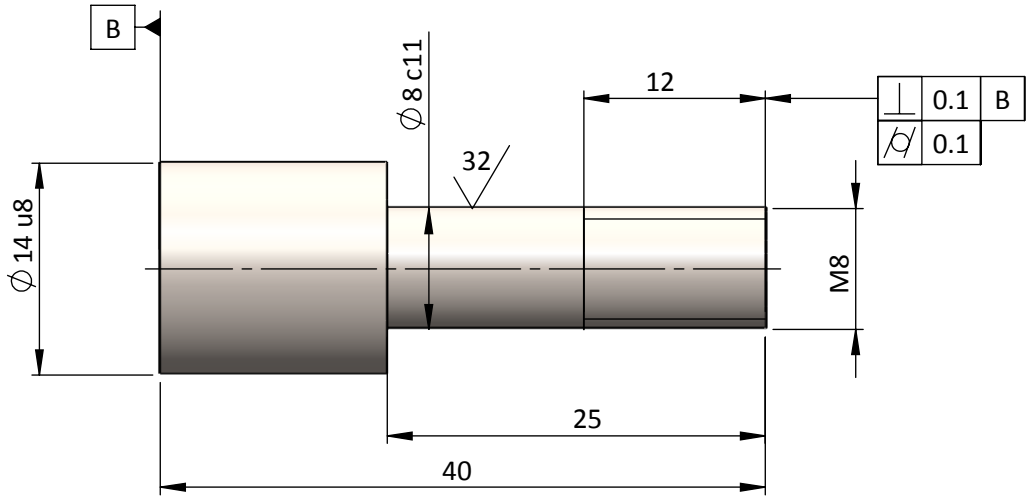
NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**	Drawing No:**IPW_F_01_03** Title: *cap_lateral_right_left_assembly* General Tolerances: ISO 2768-m-K		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Mass [kg] 8	Scale 1:10	Sheet 1 of 1



Note: Cap_lateral_left_sheet_metal, 500x1004, thickness 2mm (mass 8kg, scale 1:10)

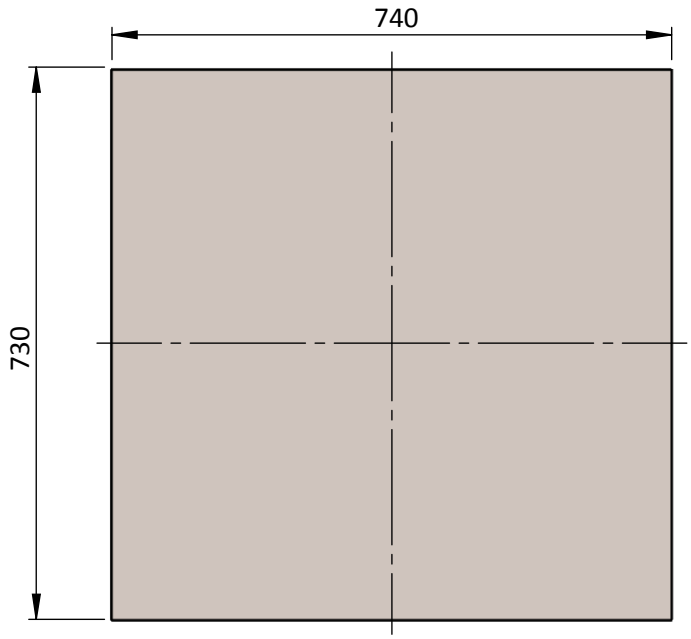


Note: Cap_lateral_right_sheet_metal, 500x1004, thickness 2mm (mass 8kg, scale 1:10)

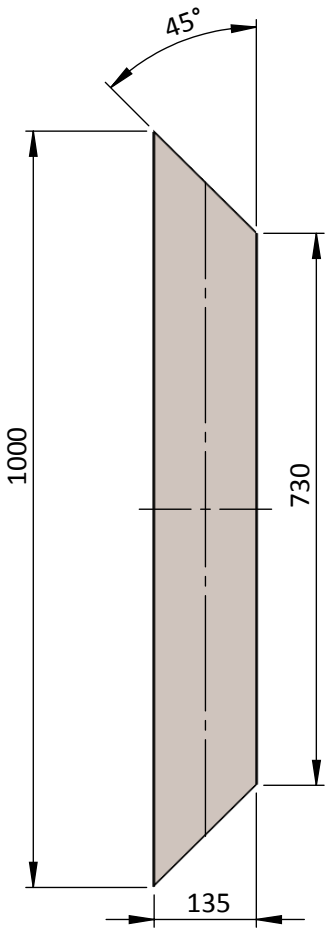


Note: Cap_cylinder (mass 0.03kg, scale 2:1)

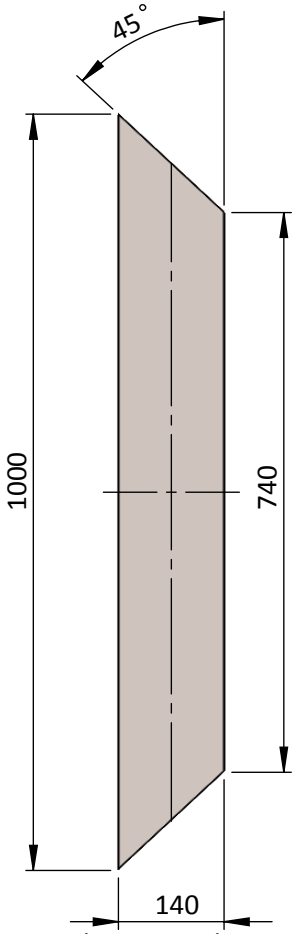
NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No: **IPW_C_03_01** Title: *cap_lateral_sheet_metal & cap_cylinder* General Tolerances: ISO 2768-m-K		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316	Mass [kg] [-]	Scale [-]	Sheet 1 of 1



Note: Cap_sheet_metal_part3, 730x740x1 (mass 4.3kg, scale 1:10)



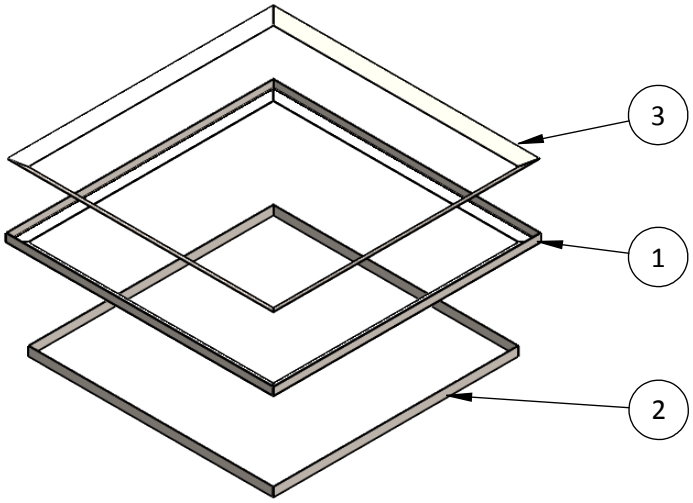
Note: Cap_sheet_metal_part3, 1000x135x1
(mass 0.9kg, scale 1:10)

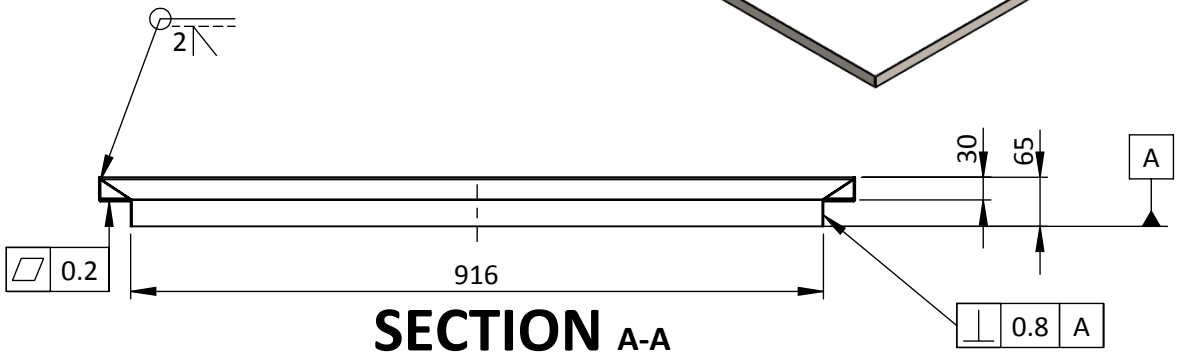


Note: Cap_sheet_metal_part3, 730x740x1
(mass 1kg, scale 1:10)

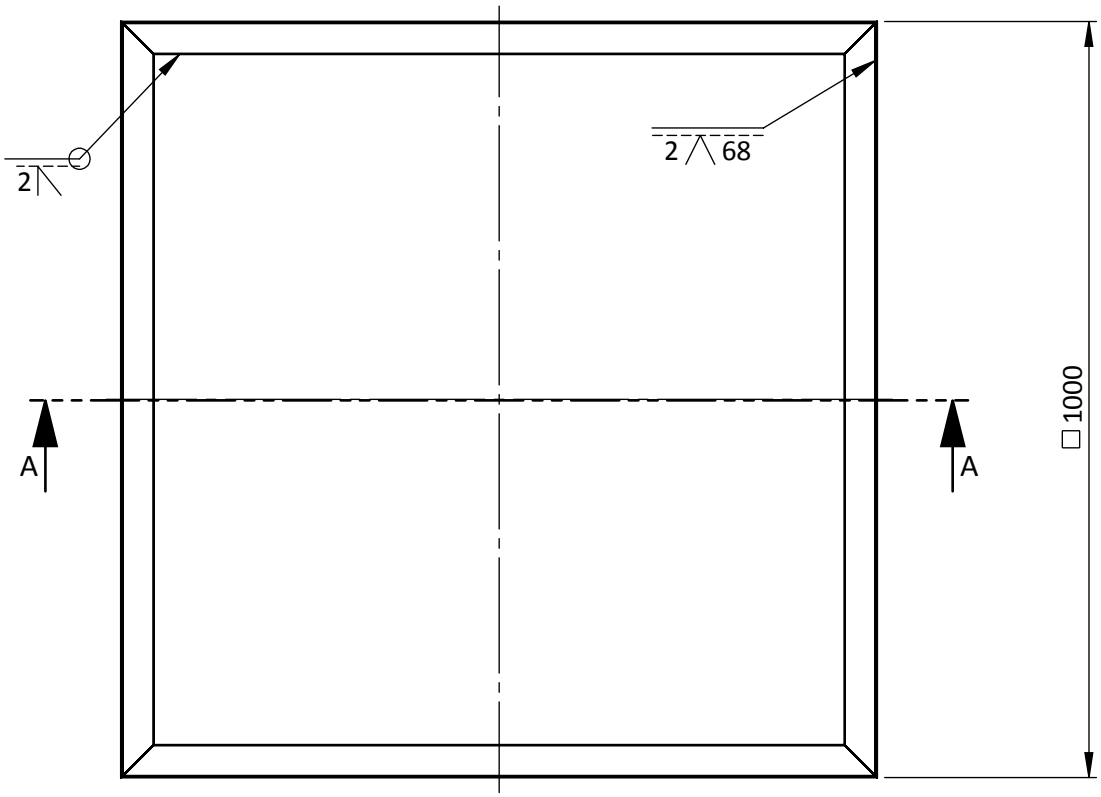
NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No: **IPW_F_01_04** Title: *cap_sheet_metal_part_3_4_5* General Tolerances: ISO 2768-m-K		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316	Mass [kg] [-]	Scale [-]	Sheet 1 of 1

Note: Exploded view scale 1:20



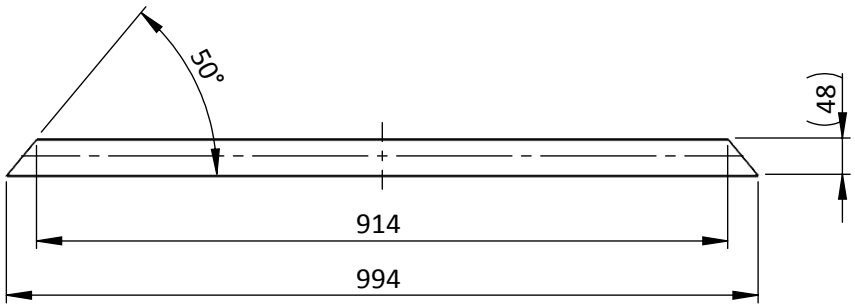


SECTION A-A

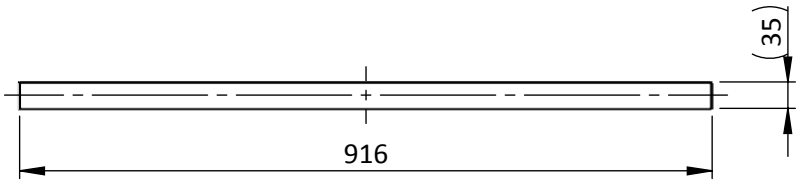


ITEM NO.	DRAWING NO.	DESCRIPTION	QTY.
1	IPW_F_02_01	angle "L", 1000x32x42, thickness 2mm	4
2	IPW_F_02_01	flat_bar 916x35, thickness 1.5mm	4
3	IPW_F_02_01	flat_bar 996x48, thickness 1mm	4

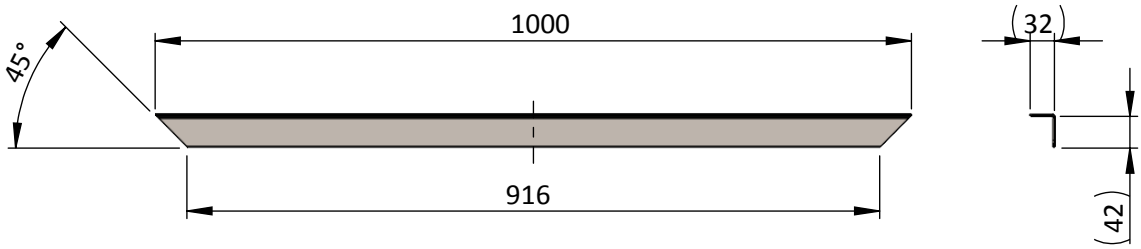
NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**	Drawing No:**IPW_F_02** Title: *cap_frame_assembly* General Tolerances: ISO 2768-m-K			
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Mass [kg] 7.5	Scale 1:10	Sheet 1 of 1	



Note: Flat bar 994x48x1 (mass 0.37kg, scale 1:10)



Note: Flat bar 916x35x1.5 (mass 0.38kg, scale 1:10)



Note: Angle "L" 1000x32x42, thickness 2mm (mass 1.2kg, scale 1:10)

NATIONAL TECHNICAL UNIVERSITY OF ATHENS **DEPARTMENT OF MECHANICAL ENGINEERING** **MACHINE DESIGN LABORATORY**	Designed by: **Ch. Marketos** Checked by: **G. Kaisarlis** Approved by: **V. Spitas**		Drawing No:**IPW_F_02_01** Title: *cap frame flat bars & corners* General Tolerances: ISO 2768-m-K		
PROJECT: INDUSTRIAL PARTS WASHER	Date July 2018	Material St. Steel AISI 316	Mass [kg] [-]	Scale [-]	Sheet 1 of 1