DESIGN AND FINITE ELEMENT ANALYSIS OF 100 TONS HYDRAULIC PRESS STRUCTURES AND CYLINDER AT T.M.C INDUSTRIAL PUBLIC CO., LTD. THAILAND

FINAL PROJECT REPORT

Submitted to Departement of Mechanical Engineering
Faculty of Industrial Technology in Partial Fulfillment of the Requirement
for the Degree of Sarjana Teknik Mesin at
Universitas Islam Indonesia

Arranged by :

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YOGYAKARTA

2017

DECLARATION LETTER

I hereby declare that the project work entitled "DESIGN AND FINITE ELEMENT ANALYSIS OF 100 TONS HYDRAULIC PRESS STRUCTURES AND CYLINDER AT T.M.C INDUSTRIAL PUBLIC CO., LTD THAILAND" submitted to Department of Mechanical Engineering Faculty of Industrial Technology in Partial Fulfillment of the Requirement for the Degree of Sarjana Teknik Mesin at Universitas Islam Indonesia, is a final project done by me under the guidance of my advisor, Dr.Eng Risdiyono S.T., M.Eng after the completion of three months' work at TMC Industrial Co., Ltd. and Rajamangala University of Tawan-Ok (RMUTTO), Thailand

If someday this project to prove as a plagiarism, Universitas Islam Indonesia has right to revoke its confession.

Yogyakarta, August 5th, 2017

Ulil Fawaaid

13525064

ADVISOR VALIDATION PAGE

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Chonburi, May 2017

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DEDICATION PAGE

"This Bachelor thesis is dedicated to my parents, Abdul Salam and Fatkhiyatul Husnah, and My Sister Abdaus Salamah."

"And I also dedicated to all people who help, supports and prays for my bachelor thesis"

MOTTO

" The Believer is kind and gracious, for there is no goodness in one who is neither kind nor gracious. The best of people are those who are most beneficial to people."

ACKNOWLEDGMENTS

بِسْمِ ٱللَّهِ ٱلرَّحْمَٰنِ ٱلرَّحِيمِ

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Yogyakarta, August 5th, 2017

Author

ABSTRACT

A hydraulic press is a machine using a hydraulic cylinder to generate a compressive force. Frame and cylinder are the main components of the hydraulic press. In this project press frame and cylinder are designed by the design procedure. Press frame and cylinder are analyzed to improve its performance and quality for press working operation. Structural analysis has become an integral part of the product design. The frame and cylinder are modeled by using modeling software Autodesk Inventor 2015. The designed hydraulic press machine should pass through calculation, 3D imaging and be simulated to get a safe hydraulic press machine design. The calculation of each component comprising it was conducted by using simulation feature of Autodesk Inventor 2015 software. From the design, calculation, and simulation processes, the strength of every machine component could be estimated, so that the selection of shape, size, and material of every component could be decided more effectively. The machine employed a hydraulic mechanic system with two actuator cylinders having 100-ton capacities.

Keywords: Hydraulic Press Machine, Design, Finite Element Analysis.

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CHAPTER I
INTRODUCTION

1.1 Background

Development of science and technology are currently progressing very rapidly. Technological advances that can not be separated from the support of the manufacturing industry where there is a large industry, small and medium.

T.M.C Industrial Company Co., Ltd. is one of the largest manufacturing companies in Thailand that manufactures various machines with hydraulic and mechanical systems. For approximately 45 years standing, this company has been producing many kinds of hydraulic tools. Generally, these hydraulic machines are widely used to perform special jobs, such as cutting plates, bending the plate, and destroying the remains of steel pieces [1].

One of the excellent products of T.M.C Industrial Co., Ltd. is a hydraulic press machine. A hydraulic press machine is a machine that uses a hydraulic cylinder to produce a compressive force. The basis of a hydraulic press is Pascal's theory which states that the constant pressure given by liquid in a confined space will be forwarded in all directions of equal value [2].

Making the design is one of the important stages in the manufacture of the hydraulic press machine. Creating engineering from the form of a product allows the designer to learn how the product will behave so that the design can be refined and optimized.

In this research, will be designed for the manufacture of hydraulic press machine with a capacity of 100 tons with specifications that have been determined. This design is done to make a product with same specification but different shape and size. The performance of a hydraulic press depends, largely, upon the behavior of its structure during operation. However, these welded structures are becoming complicated and their accurate analysis under given loading conditions is quite important to the structural designer. Structural analysis has been applied on frame hydraulic press structure by using analyzing software Autodesk Inventor 2015.

It is hoped that the concept of hydraulic press machine design can be used as a new literature on T.M.C Industrial Public Co., Ltd. in order to support the manufacture of hydraulic press machines are effective and optimal.

1.2 Problem Formulation

Based on the problems of the background of the emerging research questions :

1. How to design structure, hydraulic cylinder, motor and pump on a hydraulic press machine.
2. What things are produced after doing the design using finite element method.

1.3 Scope of Research

Based on the explanation above in points 1.1 and 1.2 it is necessary to determine the scope basis the purpose of the research conducted in order to focus. While the scope of research is :

1. This design study was conducted at T.M.C Industrial Company Limited Thailand.
2. Design using Autodesk Inventor 2015 Software.
3. The calculations performed are limited to the determination of hydraulic cylinders, pumps, and motors to be used.
4. Analyses are performed only digitally without making the product.

1.4 Objective of Research

This research aims to make Hydraulic Press Machine with 100T Capacity Using Finite Element Analysis. This design process is done to support the making of hydraulic machine design more effective and optimal.

1.5 Research of Benefit

Regarding this research, the benefit is :

1. As a new design concept for T.M.C Industrial Public Co., Ltd. Thailand.
2. The design is done to support the design of hydraulic machine more effective and optimal.

1.6 Systematics of Writing

Systematics of writing this final project is arranged in order to facilitate the discussion. The writing of this final project is described as follows :

CHAPTER I INTRODUCTION

This chapter describes the background, problem formulation, problem definition, research objectives, research benefits and systematics of writing.

CHAPTER II LITERATURE REVIEW

This chapter will describe inductive and deductive studies. Inductive studies are especially important for determining literature studies from previous studies. The deductive study needs to be elaborated to provide a basic support theory for developing benchmarking assessments.

CHAPTER III RESEARCH METHODOLOGY

This chapter will describe the methodology which is applied in the study. It consists of several parts: flow diagram, Tools and materials, and calculations on design.

CHAPTER IV RESULTS AND DISCUSSION

This chapter contains the results and discussion based on research and design that has been done.

CHAPTER V CONCLUSIONS

This chapter contains the conclusions of the discussions and suggestions for further research.

CHAPTER 2
LITERATURE REVIEW

2.1 Literature Review

A hydraulic system is a form of change or transfer of power by using a liquid carrier conducting medium to obtain power greater than the initial power released [3].

Hydraulic press system, transmission power generation, and amplification are achieved by using fluid under pressure. The liquid system exhibits solid characteristics and generates highly positive and rigid transmission and power amplification media. In simple applications, smaller pistons transfer fluid under high-pressure cylinders that have larger piston areas, thus strengthening the force. There is the ease of transmitting large amounts of energy with unlimited power amplification. It also has a very low inertia effect [4].

(Wibowo et. al., 2014), designs and analyzes the strength of Hydraulic plate bending machine construction using Solidworks 2012 software. The design and analysis are done by modeling machine components, then performing static analysis through finite element method in the software [5].

2.2 Basic Theory

The basic theory is one important component. The theoretical basis is used as a foundation to broaden and deepen the researcher's knowledge in uncovering research problems.

2.2.1 Hydraulic System

A hydraulic system is a form of change or transfer of power by using a liquid carrier conducting medium to obtain power greater than the initial power released. The conductor fluid is driven by pressure-generating pressure pumps and then forwarded to the working cylinder via pipelines and valves. The translational movement of the piston rod from the working cylinder resulting from the fluid pressure in the cylindrical chamber is utilized for forward and backward motion [6].

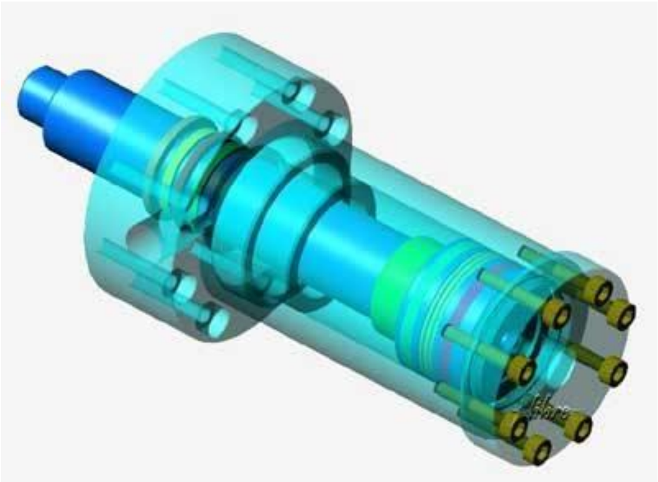

Figure 2. 1 Hydraulic Cylinders

The basic principle of the hydraulic system comes from the Pascal law, where the pressure in the static fluid must have the following properties:

1. Pressure acts perpendicular to the surface of the plane.
2. Pressures at each point are the same for all directions
3. Pressure applied to the fluid in a closed place, propagating uniformly to another part of the fluid.

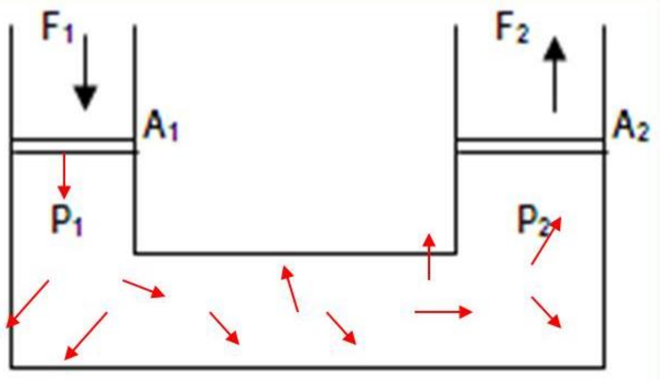

Figure 2. 2 Pascal Law

If the suction on the A_1 cross section is pressed with the F1 force than the suction on the A_2 cross section arises pressure. So the applicable law is:

$$P_1 = P_2$$

$$\frac{F_1}{A_1} = \frac{F_2}{A_2}$$

The above equation shows that if the ratio of A2 to A1 is large, the ratio of force F2 to F1 is also large.

2.2.2 Double Acting Cylinder

A double-acting cylinder is a cylinder in which working fluids work alternately on both sides of the piston. It has a port on each end, fitted with a hydraulic fluid for removal and piston extension. A double working cylinder is used where the external force is not available to pull back the piston or where high force is required in both directions. This condition is usually said to be a retract condition [7].

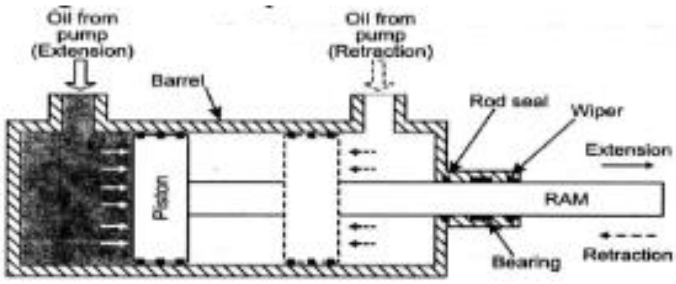

Figure 2. 3 Double Acting Cylinder

2.2.3 Steel

Steel is a metal alloy, iron metal as a basic element with carbon as the main alloying element. Carbon element content in steel ranges from 0.2% to 2.1% by weight according to its grade. The function of carbon in steel is as a hardener by preventing dislocations from shifting to the crystal lattice of iron atoms. This carbon steel is known as black steel because it is black, widely used for agricultural equipment such as crescent and home. Other commonly added alloying elements other than carbon are titanium, chromium (chromium), nickel, vanadium, cobalt, and tungsten (wolfram). By varying the carbon content and other alloying elements, different types of steel qualities can be obtained. The addition of carbon to the steel can increase hardness and tensile strength, but on the other hand, it makes it brittle and ductility [8].

Figure 2. 4 Steel

2.2.4 Material JIS 3101 SS400

Material JIS 3101 SS400 is Japanese steel production category Rolled Steel for a general structure with JIS standard (Japanese Industrial Standard). This material is a type of material that is widely used in building ships, bridges, and structures that require high strength [9]. This is a specification of the SSIS JIS Material :

Table 2. 1 Chemical Composition

Grade	Chemical Composition, % by weight				
	C. max	Si. Max	Manganese	P. max	S. max
SS400	-	-	-	0.050	0.050

Table 2. 2 Mechanical Properties

Grade	Yield Strength min. (MPa)		Tensile Strength (MPa)	Elongation min. %			Impact Resistance min. (J)
	Thickness <16 mm	Thickness >= 16 mm		Thickness <5 mm	Thickness 5-16 mm	Thickness >= 16 mm	
SS400	245	235	400-510	21	17	21	-

Table 2. 3 Comparision of steel grades

SS400 JIS 3101	Comparision of steel grades	
	BS 4360	40 (A) B
	CSAG40-21	230 G

	IS	IS 226
	JIS 3106	SM 400 A
	ISO 630	Fe 360 B
	ASTM	A 36/ A 283 C

2.2.5 Material ST52

Steel DIN17135 ST52 is a type of material widely used for boilers and pressure vessel steels. DIN17135 ST52 is characterized by a minimum yield strength of 280-355 MPa and with good welding capability, so ST52 steel is widely used for boiler manufacturing, pressure vessels and pipes carrying hot liquids [10]. This is a specification of the ST52 material:

Table 2. 4 Chemical analysis - % by mass of ST52 steel

Grade	C. %	Mn. %	S.	N	Cu	Nb	Ti.
A ST52	0.10-0.22	0.10-1.70	0.015	0.012	0.30	0.020	0.03
	Si.	**P.**	**AL**	**Cr.**	**Mo.**	**Ni**	**Vi**
	0.60	0.025	0.020	0.30	0.08	0.30	0.02

Table 2. 5 Mechanical Properties of ST52 Steel

Grade	Type	Thickness (mm)	Yield Strength (MPa)	Tensile Strength (MPa)	Elongation %	Impact Energy (KJ) (min)		
						-20^o	0^o	+20
ST52	Normalized	≤16	355	510-650	20	27	34	40
		16 >to≤40	345	510-650	20	27	34	40
		40>to≤60	335	460-580	20	27	34	40
		60>to≤100	315	490-630	20	27	34	40
		100>to≤150	295	480-630	20	27	34	40
		150>to≤250	280	470-630	20	27	34	40

2.2.6 Pump

A pump is a machine that adds energy to the liquid in order to increase the pressure or to move the liquid through a pipe [11]. In general, there are 2 types of pumps are:

1. Centrifugal pump is a pump that transfers liquid by utilizing the centrifugal force generated by impeller rotation. The centrifugal pump converts the velocity energy into pressure energy. Centrifugal pumps are also referred as speed machines because the faster the round of the pump will be the higher the pressure is generated.

Figure 2. 5 Centrifugal Pump

2. The Positive Displacement Pump is a type of pump which the fluid is pressed by elements in a pump with a certain volume so that it will produce intermittent capacity for fluid flow. This pump works by moving the incoming fluid into the side of the exhaust so there is no backflow or leak from the side of the flue to the entry side.

Figure 2. 6 Positive Displacement Pump

2.2.7 Electric Motors

An electric motor is an electromagnetic device that converts electrical energy into mechanical energy. Electric motors are also called industrial "working horses" because it is estimated that motors use about 70% of the total electrical load in the industry [12].

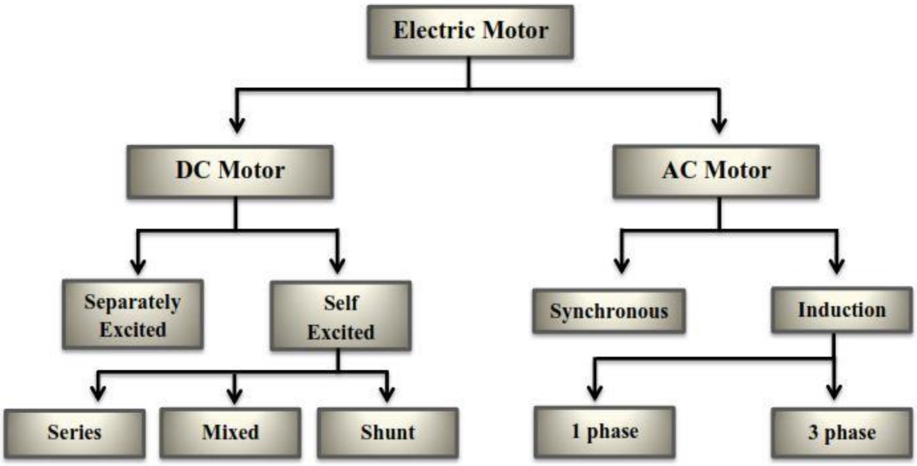

Figure 2. 7 Classification of the Main Types of Electric Motors

Generally, electric motors are classified into 2. Those are:

1. Motor DC

   The DC motor is a one-way current motor. This type of motor uses direct-unidirectional. DC motors are used in special applications where high torque ignition or fixed speed is required for a wide range of speeds. The DC motor has 3 main components :

   a. Pole Magnetic field. The interaction between the two magnetic poles will cause a rotation of the DC motor. The DC motor has a stationary and dynamo field pole that moves the bearings in the space between the field poles.

   b. Dynamo. It functions to convert current into electromagnets. Dynamo rotates in a magnetic field formed by poles to the north and south poles of the magnet to change locations.

   c. Commutator. It functions to reverse the direction of electric current in the dynamo as well as to assist in the transmission of currents between the dynamo and the power source.

2. AC Motor

The AC motor is an alternating current motor that uses an electric current to reverse direction regularly over a specified time range. Electric motors have 2 main components :

a. Rotor. It is part of an electric motor that rotates on the rotor axis. Rotation of the rotor is due to the presence of magnetic field and wire winding on the rotor. While the torque of the rotation of the rotor is determined by the number of wire windings and also its diameter.
b. Stator. Serves as stationary of the rotor system. Placement on the stator usually surrounds the rotor. The stator can be a copper wire coil that interacts with the armature in forming a magnetic field to regulate the rotation of the rotor.

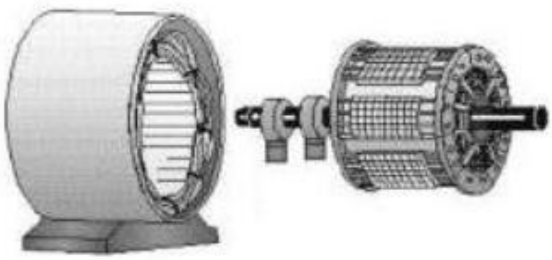

Figure 2. 8 Rotor and Stator

2.2.8 Computer-Aided Design

Computer-Aided Design or commonly called CAD is an information technology in the design process. This CAD system consists of hardware, software, and peripherals which in some specific applications is quite special. The essence of CAD systems is to use graphics to represent database products to store product models and encourage peripherals for product presentation. CAD is used to assist in creating, modifying, analyzing, and design optimization. Any computer program that enables computer graphics and application programs to facilitate engineering functions in the design process can be classified as CAD software. The greatest role of CAD is to define design geometry of mechanical parts, product assembly, architectural structures, electronic circuits, and building layout [13].

2.2.9 Finite Element Method

Finite Element Method (FEM) or Finite Element Analysis (FEA) is a numerical method for solving a differential or integral equation. The finite element method is based on the idea of constructing complex objects or simple units or dividing complex objects over easily handled small units [14]. The finite element analysis on a problem is schematic so that it can be broken down into a set of logical steps that can be implemented on a digital computer and can be used on a variety of problems simply by replacing the input data.

Finite Element Analysis (FEA) is the most widely applied computer simulation method in the manufacturing world. The Finite Element Analysis procedure consists of :

1. Preprocessor, including making, determining the type of material used, material specifications, meshing, and others.
2. The solution, including the determination of boundary conditions, types of analysis, and troubleshooting.
3. The General post processor is a facility to see the simulation results that have been done.

The types of strength testing analysis on a commonly used design are:

1. Stress Analysis or Voltage in continuum mechanics is a quantity that shows the internal forces between particles of a material against other particles. For example, a solid vertical rod that supports the load, each particle of a rod pushes another particle above and below it. The measured macroscopic force is actually the average of a large number of collisions and intermolecular forces within the bar.
2. *Torque Analysis* is a twist that occurs in a straight rod is burdened with a moment that tends to result in a rotation of the longitudinal axis of the rod, the example of a screwdriver.

2.2.10 Safety Factor

The actual strength of a structure must exceed the required strength. The magnitude of the safety factor is the ratio between the yield strength to the design stress of each material formulated as follows.

$$Sf = \frac{YS}{DS} \tag{2.1}$$

Where *Sf* is the safety factor, *YS* is the yield strength and *DS* is the stress design. The comparison of safety factor values should be greater than 1 to avoid failure.

2.2.11 Autodesk Inventor 2015

Autodesk Inventor 2015 is one of the CAD software (Computer Aided Design) created by the American company called Autodesk. As a CAD software, Autodesk Inventor is appropriately applied in mechanical parts design work, mechanical system design to mechanical strength analysis of mechanical components being handled. Autodesk Inventor 2015 provides feature-based, parametric, solid modeling and moves on 3-dimensional modeling. This software is also able to analyze the product to know the strength of products such as force, torque, temperature, and safety factor.

CHAPTER 3
METHODOLOGY

3.1 Research Flow

To easier this research writer, make a Research Flow Diagram in Figure 3.1 below.

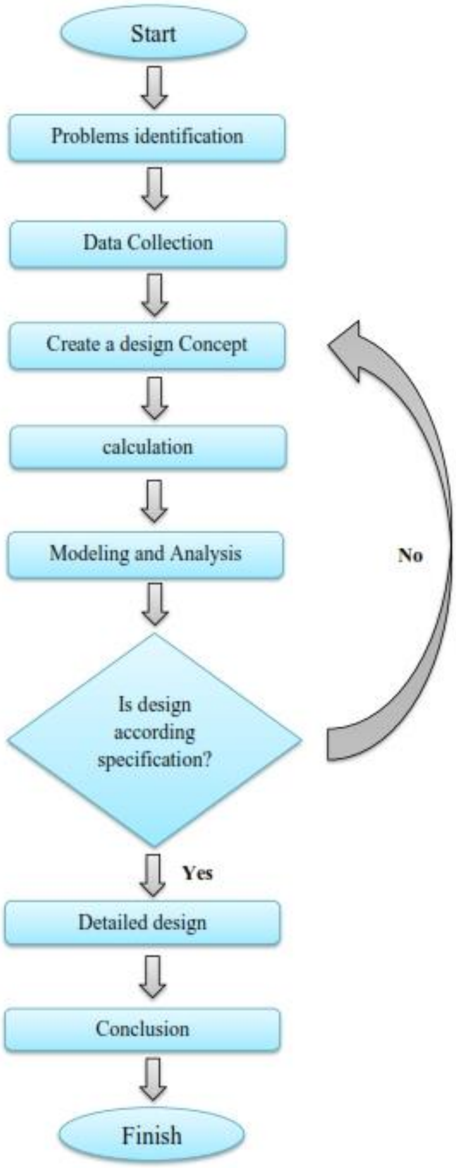

Figure 3. 1 Research Flow Diagram

3.2 Equipment and Materials

The tools and materials used for this research are as follows :

1. A set of laptops with the following specifications :
   a. AMD A10-5750M APU with Radeon HD Graphics (4 CPUs), 2.5GHz
   b. 4096MB of RAM memory
2. Calculator.
3. Autodesk Inventor 2015 software used to create 3D models and simulate.
4. Reference data related to hydraulic press machine design.

3.3 Design

In the process of designing requires a careful planning. This is very important in order to lead in the process of work, so as expected for limiting any issues that need to be resolved in accordance with planning.

3.3.1 Design and Calculation

The design is to design a hydraulic press machine with a capacity of 100 tons. Data specifications as follows :

Table 3. 1 Engine Specifications

MACHINE SPECIFICATIONS	
DATA	**DETAIL**
Model	HP 100
Max. Press Capacity	105 ton
Cylinder Type	Double Acting
Motor/Pump	(7.5 HP)/(8cc/rev)
Press Speed / Up Speed	(3-4 mm/sec) / (4-5 mm/sec)
Cylinder Stroke	334 mm
Maximum Pressure	210 bar

The design of the hydraulic press machine starts from the calculation to determine the hydraulic cylinder specifications to be used. The calculations include: determining the inner diameter of the cylinder, determining the thickness of the cylinder, determining the outer diameter of the cylinder, and determining the length of the cylinder.

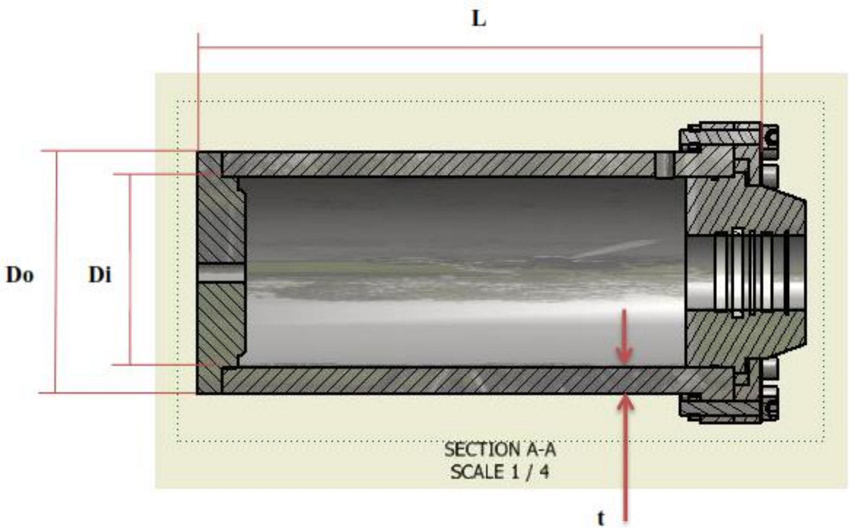

Figure 3. 2 Hydraulic cylinder section

3.3.1.1 Determine Inner Diameter of Cylinder

The known maximum capacity of pressure on data specification at design is equal to 105 Ton or equal to 105000 kg. For a given maximum pressure is 210 bar or equivalent to 210 kg / cm2. From these data, so that can be determined the area of a cylinder by using pressure formula.

$$P = \frac{F}{A}$$

Where :

P = Pressure (kg/cm^2)
F = Gaya (Kgf)
A = Area (cm^2)

Then, the required cylinder area :

$$P = \frac{F}{A} \Rightarrow A = \frac{F}{P}$$

$$\Rightarrow A = \frac{105000 kgf}{210 kg / cm^2}$$

$$\Rightarrow A = 500 cm^2$$

$$\Rightarrow A = \frac{1}{4} \Pi D^2$$

$$\Rightarrow D = \sqrt{\frac{4 \times A}{\Pi}}$$

$$\Rightarrow D = \sqrt{\frac{4 \times 500}{3{,}14}}$$

$$\Rightarrow D = 25{,}3cm = 253mm$$

$\therefore$ Inner Diameter of Cylinder (Di) = 253 mm

3.3.1.2 Determine thickness of Cylinder (t).

The thickness of Cylinder can be calculated using the equation of lame.

$$t_c = \frac{Di}{2}\left(\sqrt{\frac{\sigma_t + P}{\sigma_t - P}} - 1\right)$$

Where :

t_c = Thickness of Cylinder (cm)

Di = Inner Diameter of cylinder (cm)

σ_t = Tensile Strength (kg/cm^2)

P = Pressure (kg/cm^2)

The type of material used in the manufacture of the cylinders is steel. DIN17135 ST52. This type of material is widely used for the boiler and vessel steel press. Steel DIN 17135 ST52 has an average rating of Tensile Strength of 580 Mpa or equivalent of 5800 kg/cm^2. The value of the internal diameter of the pressure was 25,3 cm and 210 bars or equivalent to 210 kg/cm^2. Then, the thickness of Cylinder :

$$t_c = \frac{Di}{2}\left(\sqrt{\frac{\sigma_t + P}{\sigma_t - P}} - 1\right)$$

$$t_c = \frac{25{,}3}{2}\left(\sqrt{\frac{5800 + 210}{5800 - 210}} - 1\right)$$

$$t_c = 3{,}4cm = 34mm$$

$\therefore$ Thickness of Cylinder (t_c) = 34 mm

3.3.1.3 Determine Outside Diameter of Cylinder (Do)

After known the inner of diameter and thickness of cylinder, then the outside diameter of the cylinder can be determined by the following equation :

$Do = Di + 2t$

$Do = 25{,}3 + 2(3{,}4)$

$Do = 32{,}1cm = 321mm$

$\therefore$ Outside diameter of Cylinder (Do) = 321 mm

3.3.1.4 Determine Rod Diameter of Cylinder

The diameter of the rod in the Cylinder can be determined by looking at a catalog company :

Table 3. 2 Specification of Cylinder Rod

Capacity (TON)	Cylinder Rod (mm)
10	36
20	45
30	56
50	80
75	90
100	**100**
150	110
200	140
350	160
550	200

Based on table 3.2, known that diameter of cylinder rod which is used in the machine press capacity 100 T are 100 mm.

$\therefore$ Diameter of Cylinder Rod (Dcr) = 100 mm

3.3.1.5 Determine Length of Cylinder

The length of cylinder required can be determined by summing the values of the thickness of cylinder, the thickness of end-plug, cylinder stroke, the thickness of guide-bush and thickness of the flange. Therefore, we need to do calculations to determine the values:

1. End-plug

The value of end-plug thickness can be determined by this formula:

$$t_e = Di\sqrt{\frac{0.162 \times P}{\sigma_t}}$$

Where :

t = thickness of end-plug (cm)

P = Pressure (kg/cm^2)

σ_t = tensile strength (kg/cm^2)

Di = inner diameter (cm)

$$t_e = Di\sqrt{\frac{0.162 \times P}{\sigma_t}}$$

$$t_e = 25.3\sqrt{\frac{0.162 \times 210}{5800}}$$

$$t_e = 1{,}93cm = 19{,}3mm$$

$$t_e \approx 2cm$$

$\therefore$ Thickness of End-plug is 20 mm

2. Piston

The value of piston thickness can be determined by this formula :

$$t_p = \frac{Di^2 \times P}{4 \times Dcr \times \sigma_s}$$

Where : D = Inner Diameter of Cylinder (cm)

P = Pressure (kg/cm^2)

Dcr = Diameter of cylinder Rod (cm)

σ_s = Shear Stress (kg/cm^2)

t_p = Thickness of Piston (cm)

$$\sigma_s = \frac{F}{A} = \frac{100000}{1/4 \times 3{,}14 \times (25{,}3)^2} = 208\, {kg}/{cm^2}$$

$$\Rightarrow t_p = \frac{D^2 \times P}{4 \times d \times F_s}$$

$$\Rightarrow t_p = \frac{25{,}3^2 \times 210}{4 \times 10 \times 208}$$

$$\Rightarrow t_p = 16{,}16cm = 161{,}6mm$$

$\therefore$ Thickness of Piston is 161,6 mm

3. Guide bush

the value of Guide bush thickness can be determined by this formula :

$$t_g^{\ 2} = \frac{C \times W}{\sigma_t}$$

Where :

C = Empirical constant

W = Load acting of Guide-Bush (Capacity of Cylinder) (kgf)

σ_s = Tensile Stress (kg/cm^2)

t_g = Thickness of Guide-Bush (cm)

Empirical Constant are constants of Value that Cn is gained from a comparison between the center traction bolts with a diameter of ram. The value of C can be chosen based on the table below :

Table 3.3 value of empirical constant of guide-bush

Ratio of R/r	1.25	1.5	2	3	**4**	5
Value of C	0.592	0.976	1.44	1.88	**2.08**	2.195

$$\Rightarrow t_g^{\ 2} = \frac{C \times W}{\sigma_t}$$

$$\Rightarrow t_g = \sqrt{\frac{C \times W}{\sigma_t}}$$

$$\Rightarrow t_g = \sqrt{\frac{2.08 \times 105000}{5800}}$$

$$\Rightarrow t_g = 6.14cm = 61.4mm$$

$\therefore$ Thickness of Guide-Bush is 61.4 mm

4. **Flange**

The value of flange thickness can be determined by this formula :

$$t_f{}^2 = \frac{C \times W}{\sigma_t}$$

Where :

C = Empirical constant

W = Load acting of Flange (Capacity of Cylinder) (kgf)

σ_s = Tensile Stress (kg/cm^2)

t_f = Thickness of Flange (cm)

Empirical Constant are constant that can be gained from the comparison between diameter in a cylinder with cylinder rods diameter. Values of C can be gained based on the table below.

Table 3.4 *Value of Empirical Constant of Flange*

R/r	1.25	1.5	2	**3**	4	5
C	0.13	0.34	0.740	**1.22**	1.46	1.61

$$\Rightarrow t_f{}^2 = \frac{C \times W}{\sigma_t}$$

$$\Rightarrow t_f = \sqrt{\frac{C \times W}{\sigma_t}}$$

$$\Rightarrow t_f = \sqrt{\frac{1{,}22 \times 105000}{5800}}$$

$$\Rightarrow t_f = 4.6cm = 46mm$$

$\therefore$ Thickness of Flange is 46 mm

Based on the calculations above, the value of cylinder length is :

$$L = t_c + t_e + t_p + CS + t_g + t_f$$

$$L = 34 + 20 + 161.6 + 334 + 61.4 + 46$$

$$L = 657mm$$

$\therefore$ Length of Cylinder is 657 mm

3.3.1.6 Determine Flow Rate of Pump

Known from the specification that the desired speed of the press is 3-4 mm / s or 0.3-0.4 cm / s. Whereas, the desired speed while up condition is 4-5 mm / s or 0.4-0.5 cm / s. From these data can be calculated flow rate at the pump using the formula below :

$$Q = \frac{v \times A \times 60}{1450}$$

Where :

Q = Flow Rate of Pump (cc/rev)

V = Velocity (cm/s)

A = Area (cm^2)

1. Flow Rate of Pump When Down Condition

Known: V = 0.3 cm/s

$A_d = A_{bore} = 500\ cm^2$

$$\Rightarrow Q_d = \frac{v \times A_d \times 60}{1450}$$

$$\Rightarrow Q_d = \frac{0.3 \times 500 \times 60}{1450}$$

2. Flow Rate of Pump when Up Condition

known: V = 0.4 cm/s

$$\Rightarrow A_{up} = \frac{1}{4}\Pi\left(D_i - D_{cr}\right)^2$$

$$\Rightarrow A_{up} = \frac{1}{4} \times 3.14\left(25.3 - 10\right)^2$$

$$\Rightarrow A_{up} = 184cm^2$$

$$\Rightarrow Q_{up} = \frac{v \times A_{up} \times 60}{1450}$$

$$\Rightarrow Q_{up} = \frac{0.4 \times 184 \times 60}{1450}$$

$$\Rightarrow Q_{up} = 3cc/rev$$

∴ Q_{down} = 6.2 cc/rev and Q_{up} = 3 cc/rev

3.3.1.7 Determine Size of Motor

Minimum motor power used can be determined using the following formula :

$$SM = \frac{Q \times \frac{1450}{1000} \times P}{600 \times 0.85 \times 0.746}$$

Where :

Q = Flow Rate of Pump (cc/rev)

P = Pressure (kg/cm^2)

A = Area (cm^2)

SM = Size of Motor (HP)

1. Power of required when Down Condition

Known: Q_{down} = 6.2 cc/rev

P = 210 kg/cm^2

$$SM = \frac{Q_{down} \times \frac{1450}{1000} \times P}{600 \times 0.85 \times 0.746}$$

$$SM = \frac{6.2 \times \frac{1450}{1000} \times 210}{600 \times 0.85 \times 0.746}$$

$$SM = 4.9HP$$

2. Power of Motor required when Up Condition

Known: Q_{up} = 3 cc/rev

P = 210 kg/cm^2

$$SM = \frac{Q_{up} \times \frac{1450}{1000} \times P}{600 \times 0.85 \times 0.746}$$

$$SM = \frac{3 \times \frac{1450}{1000} \times 210}{600 \times 0.85 \times 0.746}$$

$$SM = 2.4HP$$

$\therefore$ SM_{down} = 4.9 HP and Q_{up} = 2.4 HP

CHAPTER 4
RESULTS AND DISCUSSION

4.1 Modelling

A research in the form of design with simulation testing method is required modeling of the object to be tested. Modeling is conducted by the software of Autodesk Inventor 2015 so that can be known shape and size of machine components in the 3-dimensional form.

4.1.1 Modeling of Hydraulic Cylinder

Based on the calculation is known that to design hydraulic press machine with 100-ton capacity is needed for a cylinder with diameter value in cylinder 253 mm, cylinder thickness value 34 mm, cylinder outer diameter value 321 mm and cylinder length 567 mm. The material used in the design of this hydraulic cylinder uses ST52 Steel.

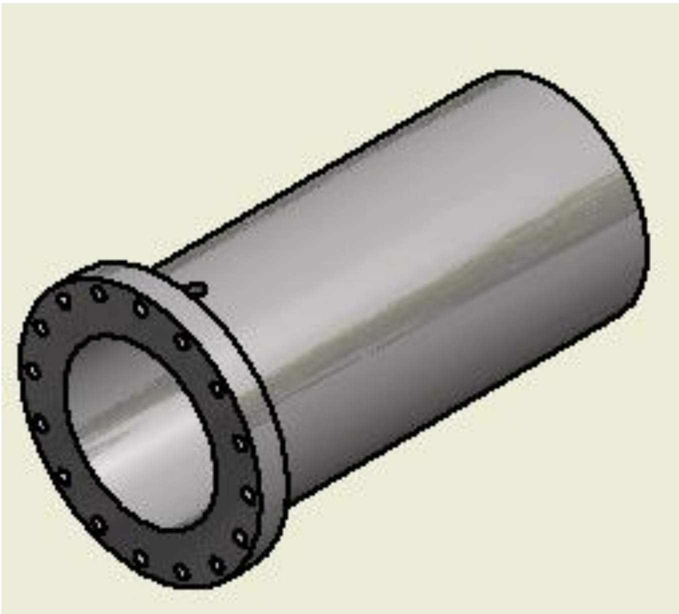

Figure 4. 1 3D Model of Main Cylinder

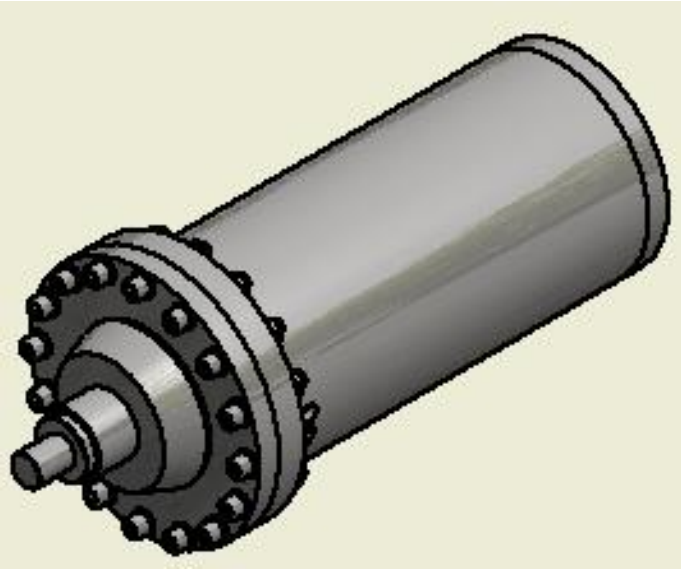

Figure 4. 2 3D Model of Hydraulic Cylinder

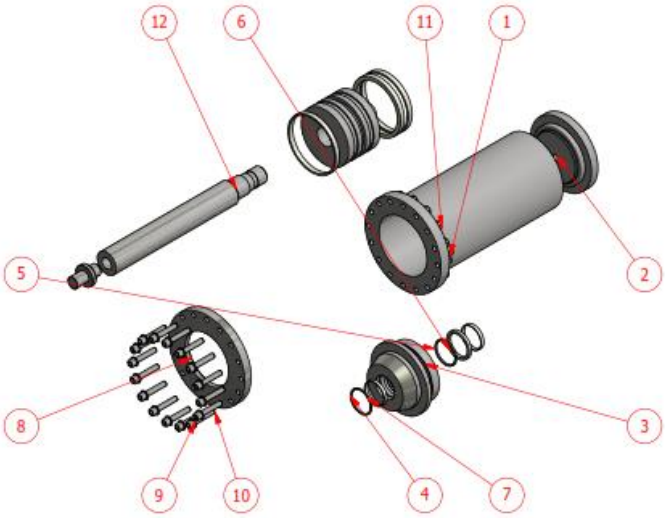

Figure 4. 3 Explode of Hydraulic Cylinder

4.1.2 Modeling of Hydraulic Press Machine Structure

Modeling of machine components is conducted based on the results of the design by providing the size and material in accordance with the actual condition. All components of the machine will be assembled to become one unit of the hydraulic press machine.

Models that have been conditioned to resemble the original design will be analyzed for the strength of construction using the same software.

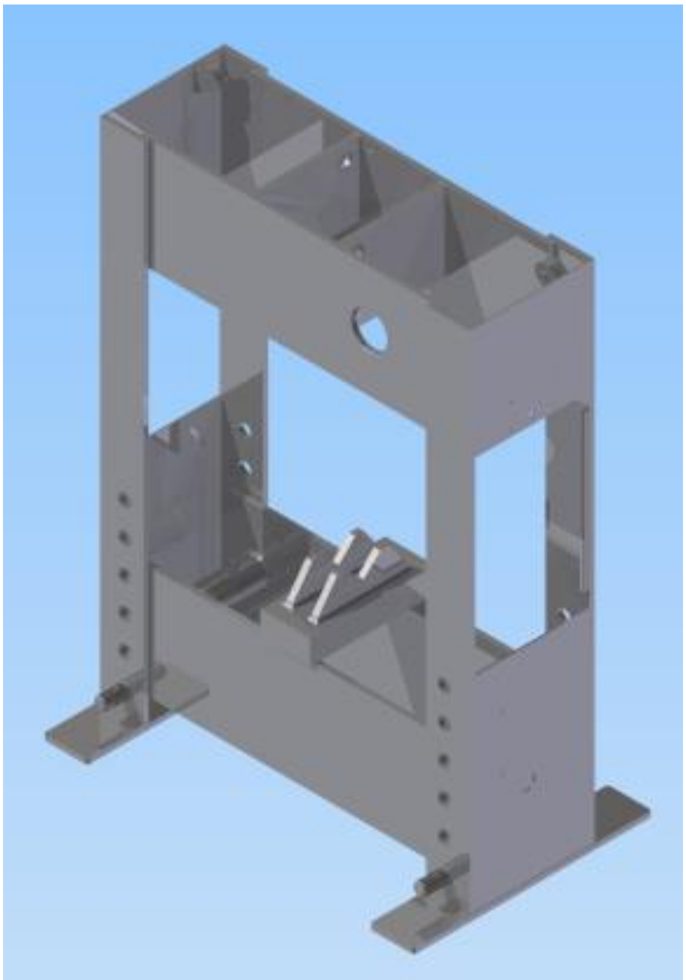

Figure 4. 4 3D Model of Machine Structure

4.2 Analysis and Discussion

The analysis is a thinking activity that contains a number of activities such as parsing, differentiating, sorting out a subject matter. After that, it is reassembled according to certain criteria. This activity aims to determine a characteristic of the specimen so that it can be used as a benchmark in the design process. The analysis performed is an analysis with the software of Autodesk Inventor 2015 based on finite element method. The test analysis is performed on the von misses stress that occurs in the construction to know the safety limits in the selection of size, shape and material type of composition components of the hydraulic press machine.

Based on the analysis can also be known the amount of deformation that occurs in the construction during loading. The following are the Analysis Steps:

1. Making a model of the component with size and material type according to the actual condition.
2. Determining the fulcrum (fixture) of the construction model will be the prop when there is the bending force.
3. Providing of style with type, direction, and magnitude on the construction model in accordance with the actual conditions.
4. The preparation of finite element meshes in the construction model to know the elements of each component to be calculated loading. This step is automatically performed by the software.
5. Analyze the calculation results.

4.2.1 Loading Analysis of Main Cylinder

The load analysis on the main cylinder aims to determine the cylinder strength of the compressive load provided. This method is used as one of the benchmarks of cylinder design. The material used in this hydraulic cylinder design is ST52 Steel Material. This type of material is widely used for boilers and pressure vessel steels. DIN17135 ST52 is characterized by a minimum yield strength of 280-355 MPa and with good welding capability, so ST52 steel is widely used for boiler making, pressure vessels, and pipes that transport hot liquids.

The first step taken on the main cylinder analysis is making the design model in accordance with the size and material that has been selected. The following is a design drawing of the main cylinder shown in Figure 4.5.

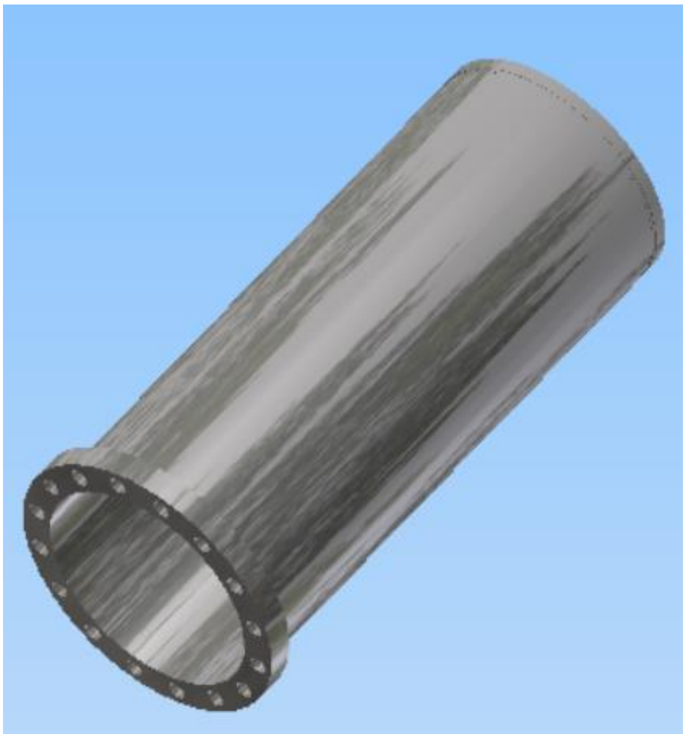

Figure 4. 5 Main Cylinder

The next step is to determine the fixture or the fulcrum of the cylinder construction that will be the prop when there is a compressive force on the cylinder. The provision of the fulcrum on cylinder construction is shown in Figure 4.6.

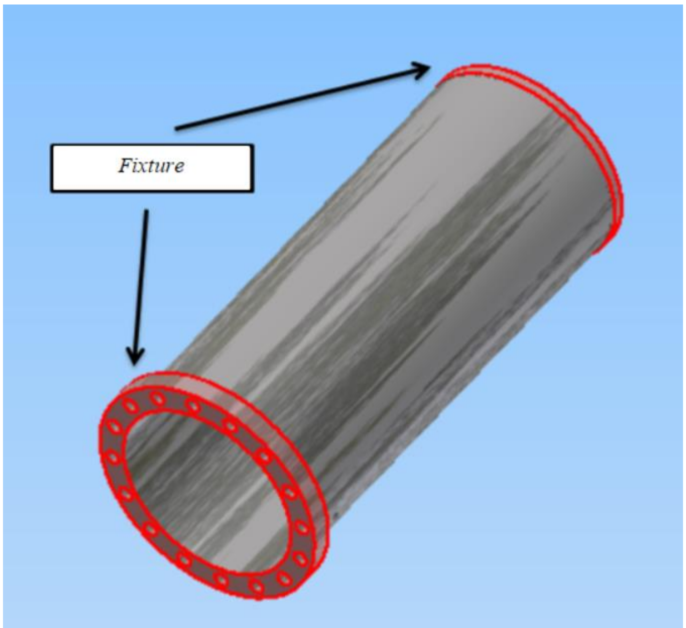

Figure 4. 6 Fixture of Main Cylinder

After the process of determining fixture, the next step is loading on the cylinder construction. The compressive load received by cylinder construction is 210 bar and equal to 2,1 x 10^7 Pascal. The load is simulated spreading equally on the part walls in the cylinder. so that the resulting of compressive force can also be spread evenly on each component of the cylinder composition. The loading process in cylinder construction is shown in Figure 4.7

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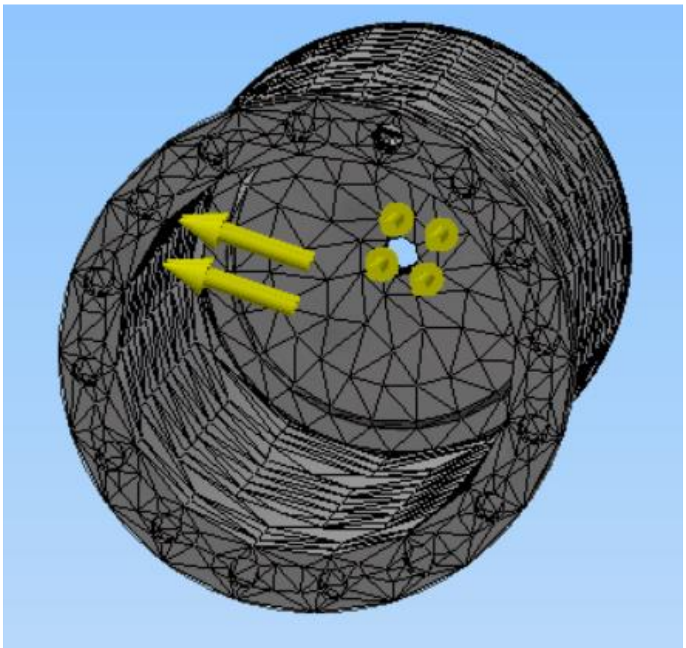

Figure 4. 7 The loading of Main Cylinder

In the analysis of the main cylinder, loading is performed making finite element methods on the construction model to know the elements of each component to be calculated loading. This step is automatically performed by the software. The mesh type in the analysis of the selected type of curvature mesh with low density for the calculation can be more thorough. The making of the finite element meshes on the cylinder is shown in Figure 4.8

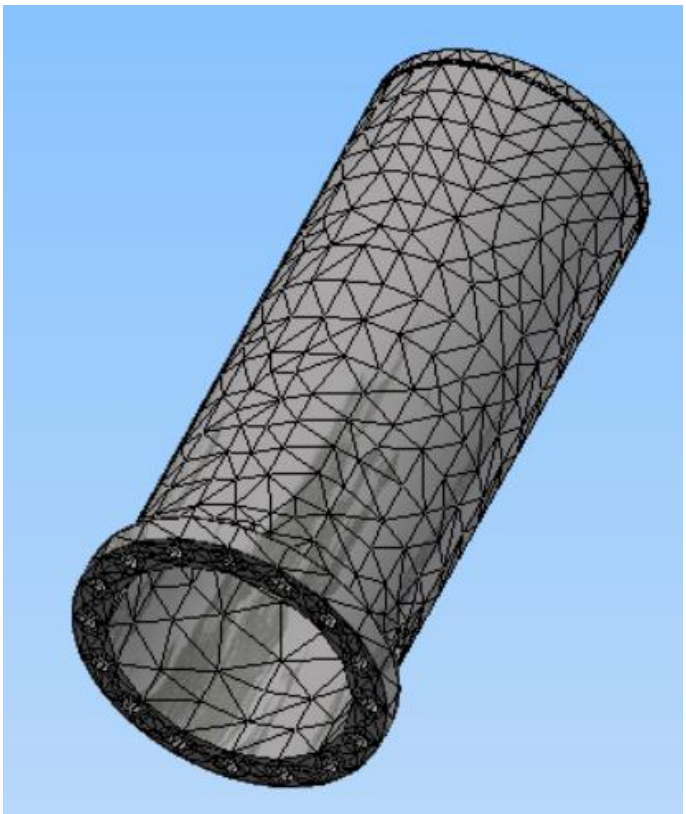

Figure 4. 8 Mesh Type of Main Cylinder

The final step is the simulation process on the main cylinder. This load testing process uses Von Mises Stress type analysis. This analysis can be used as a benchmark for a design. The design can be said to be safe when the maximum value of the analysis of Von Mises Stress is smaller than the yield stress of the material used, and the design can be said to fail when the maximum value of the Von Mises Stress type is greater than the yield stress of the material used. The result of simulation of Von Mises Stress type test analysis which has been conducted on the main cylinder is shown in Figure 4.9

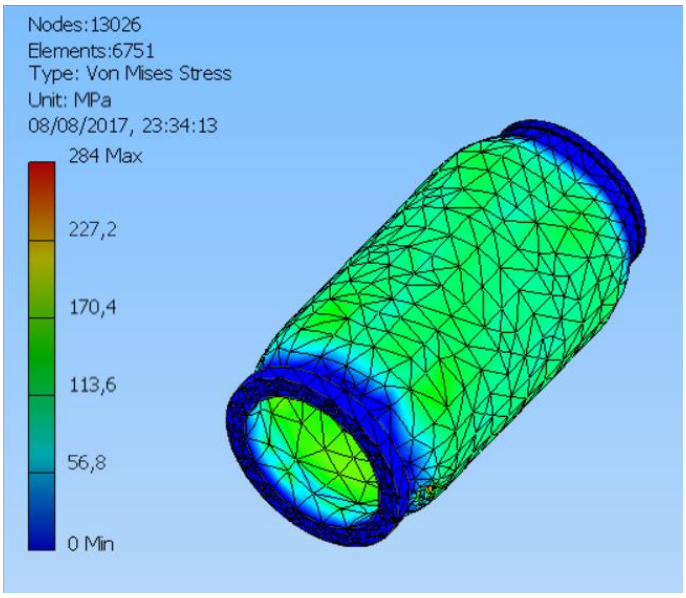

Figure 4. 9 Analysis Result of Main Cylinder

Analysis using software of Autodesk Inventor 2015 is shown in red at maximum voltage and blue at minimum voltage. Based on the simulation calculation results obtained a maximum voltage value of 284 MPa and a minimum voltage of 0 MPa. The following is calculation value of safety factor.

$$SF = \frac{\sigma_{Ijin}}{\sigma_{Max}}$$

$$SF = \frac{355MPa}{284MPa}$$

$$SF = 1,25$$

∴ The value of safety factor is 1,25.

By using the same software aid, the value of the safety factor and the deformation value of the design can also be digitally known. In Figure 4.10, it is shown that the value of the safety factor with red is the minimum value and the blue is the maximum value. Based on the simulation calculation result, the maximum safety factor value is 15 and the minimum safety factor is 1.23. The safety factor values of the simulated load analysis on the main cylinder are shown in the figure 4.10

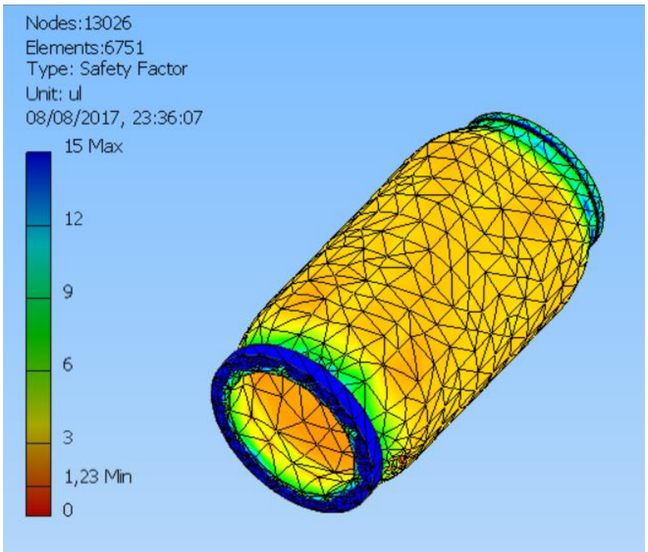

Figure 4. 10 Safety Factor of Main Cylinder

While in figure 4.11, it is shown that the displacement value in red is the maximum value and in the blue is the minimum value. Based on the simulation results, the maximum displacement value is 0.1239 mm and the minimum displacement is 0 mm.

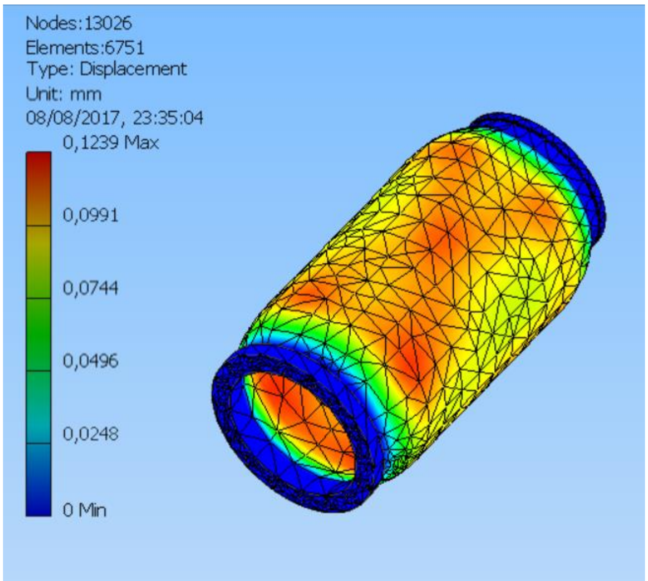

Figure 4. 11 Displacement Value of Main Cylinder

Based on the calculation and simulation, the value of safety factor is greater than 1 and the maximum displacement value is 0.1239. So it can be concluded that the material and design is safe and strong to withstand the compressive load.

4.2.2 Stress Analysis of Hydraulic Press Machine

Analysis on hydraulic press machine construction is done to know the strength of construction to the static load. The loading simulation on the hydraulic press machine is performed on the die, frame, and workbench components.

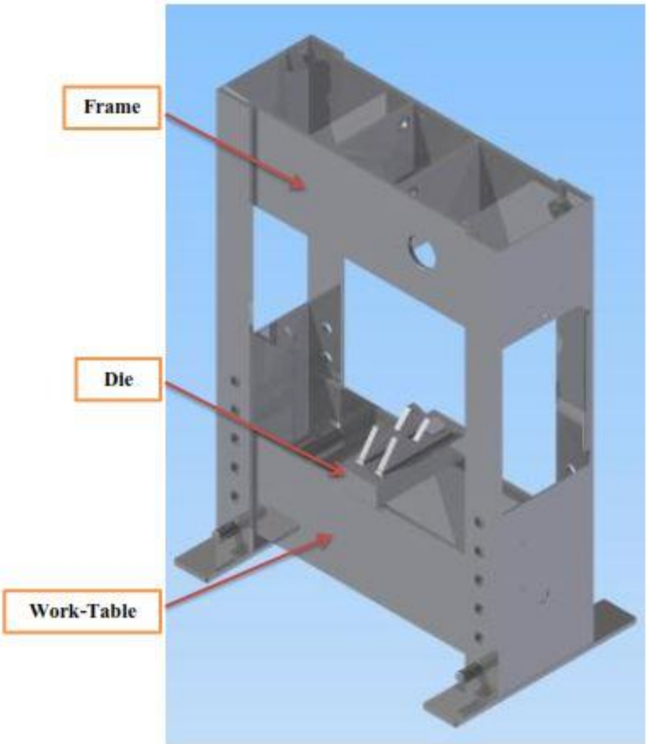

Figure 4. 12 Construction of Hydraulic Press Machine

The material of frame and work table are Material JIS 3101 SS400 which has yield strength 245 MPa and tensile strength 400-510 MPa. The frame construction is connected by the welded joint. The fixture in this construction is the leg part of the frame and the support of the workbench which serves to hold the workbench in the desired position.

4.2.2.1 Stress Analysis of Frame

The maximum force received by frame construction is 105 Ton or equivalent to 105000 kg. To simulate it, the first step is to determine the fixture of the frame which will be the support in case of loading. The provision of the fulcrum on frame is shown in Figure 4.13

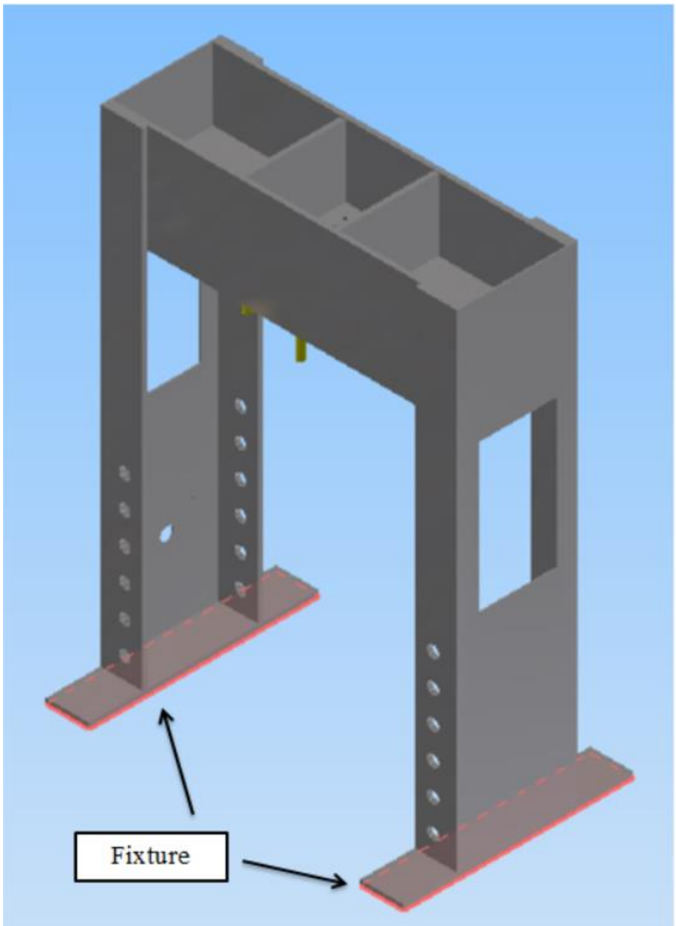

Figure 4. 13 Fixture of Frame

After the process of determining fixture, the next step is loading on the frame construction. The load is applied to the frame affected by the compressive press hydraulic pressure with a maximum capacity of 105 tons or the equivalent of 105000 kg. The loading process on the frame is shown in Figure 4.14

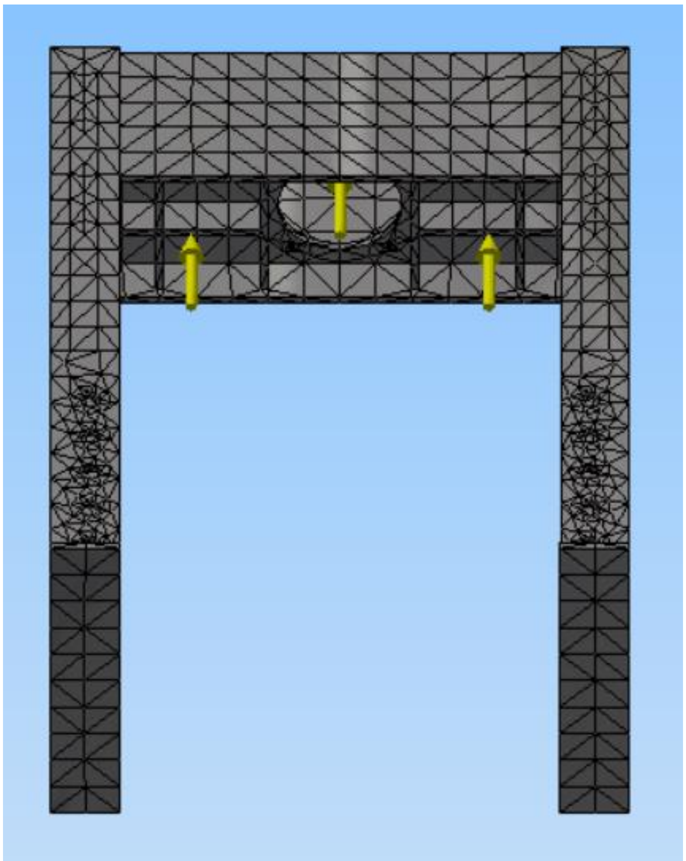

Figure 4. 14 Loading on Frame

The mesh type in the analysis of the selected type of curvature mesh with low density for the calculation can be more thorough. This step is done automatically by the software. The making of the finite element meshes on the frame is shown in Figure 4.15

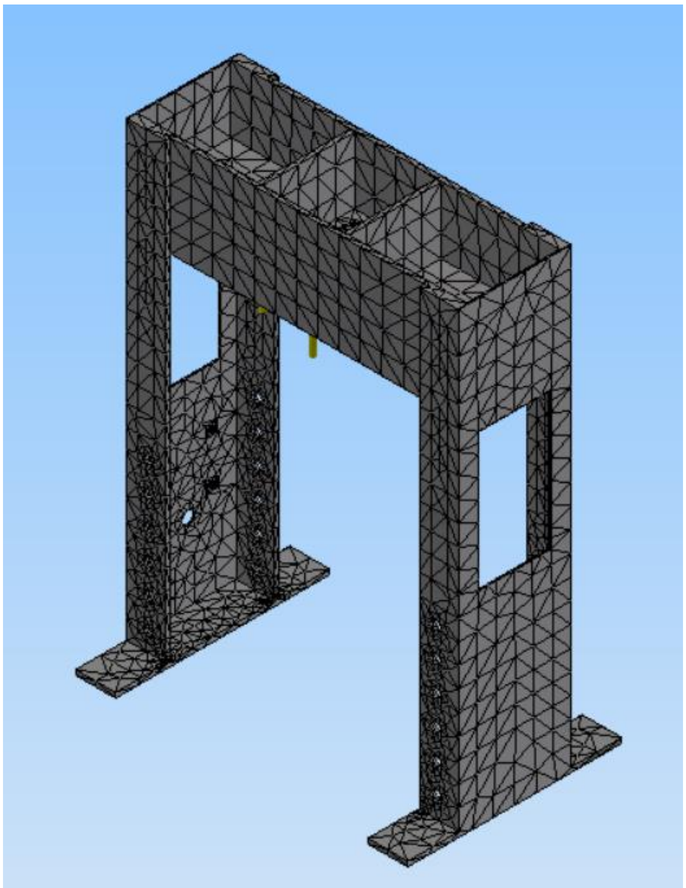

Figure 4. 15 Mesh Type on Frame

The next step is the analysis process using Von Mises Stress type analysis. The design can be said to be safe when the maximum value of the Von Mises Stress analysis is smaller than the yield stress of the material used, and the design can be said to fail when the maximum value of the Von Mises Stress type is greater than the yield stress of the material used. The results of Von Mises Stress which have been conducted on the frame is shown in Figure 4.16

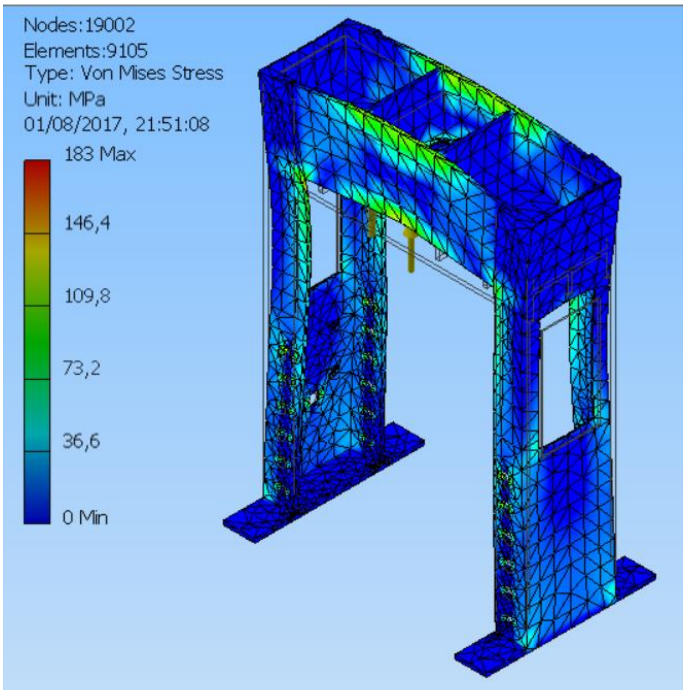

Figure 4. 16Analysis Results of Frame

Based on the results of the analysis, shown that the red is maximum stress with a value of 183 MPa and the blue is minimum stress with a value of 0 MPa. The following is calculation value of safety factor.

$$SF = \frac{\sigma_{Ijin}}{\sigma_{Max}}$$

$$SF = \frac{510MPa}{183MPa}$$

$$SF = 2{,}78$$

$\therefore$ The value of safety factor is 2,78.

By using the same software aid, the value of the safety factor and the deformation value of the design can also be digitally known. In Figure 4.17, it is shown that the value of the safety factor with red is the minimum value and the blue is the maximum value. Based on the simulation calculation result, the maximum safety factor value is 15 and the minimum safety factor is 1.34. The safety factor values of the simulated load analysis on the frame are shown in the figure 4.17

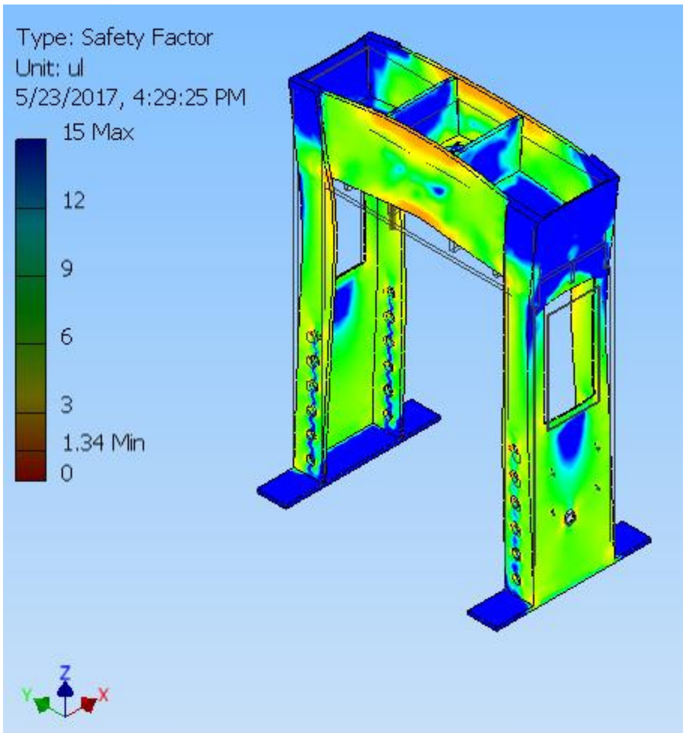

Figure 4. 17 Safety Factor of Frame

While in figure 4.18, it is shown that the displacement value in red is the maximum value and in the blue is the minimum value. Based on the simulation results, the maximum displacement value is 1,105 mm and the minimum displacement is 0 mm. The results of displacement simulation on the frame are shown in Figure 4.18

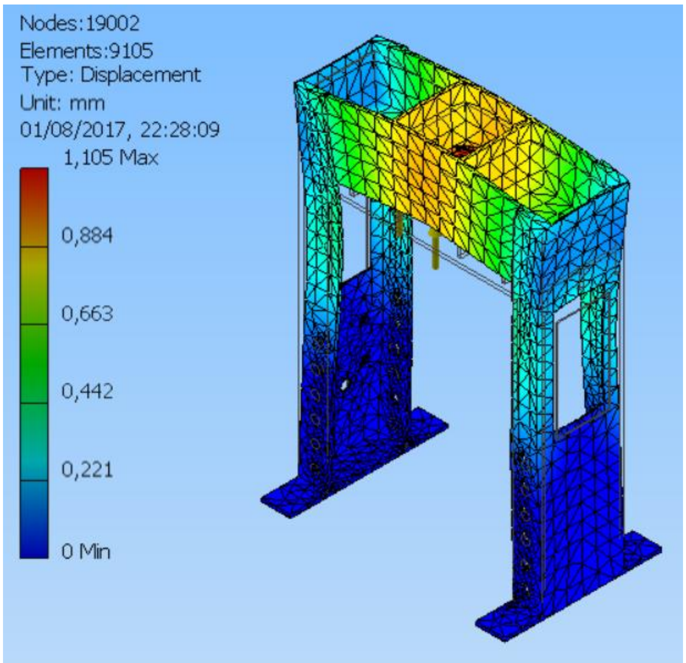

Figure 4. 18 Displacement Value of Frame

Based on the calculation and simulation, the value of safety factor is greater than 1 and the maximum displacement value is 1,106 mm. So it can be concluded that the material and design is safe and strong to withstand the compressive load.

4.2.2.2 Stress Analysis of Work-Bench

The stress analysis on the workbench aims to determine the workbench strength of the compressive load provided. To simulate the load, the first step is to determine the fixture of the workbench that will be the support in the event of loading. The provision of the fixture on workbench is shown in Figure 4.19

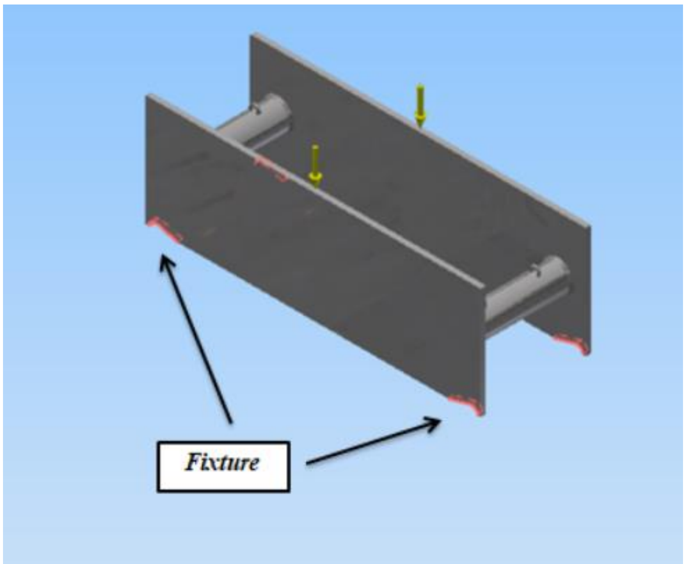

Figure 4. 19 Fixture of Work-Bench

After the process of determining fixture, the next step is loading on the frame construction. The load is applied to the workbench affected by the compressive press hydraulic pressure with a maximum capacity of 105 tons or the equivalent of 105000 kg. The loading process on the frame is shown in Figure 4.20

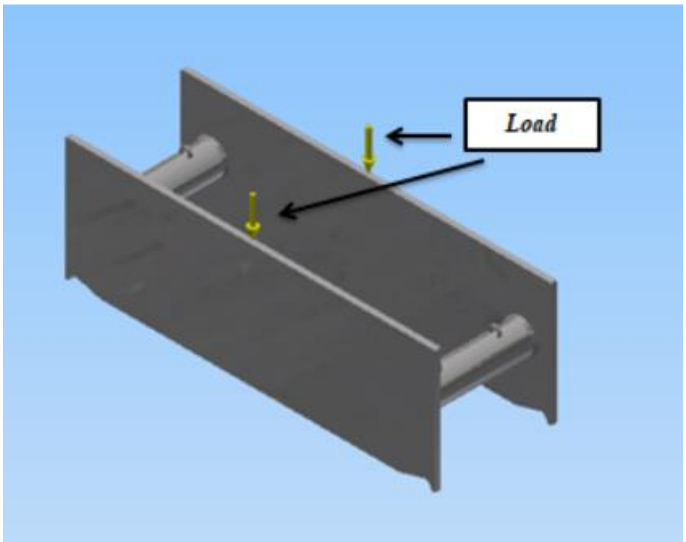

Figure 4. 20 Loading on Work-Bench

The analysis was performed using mesh type with low density so that the calculation can be more accurate. This is done automatically by the software. The making of the finite element meshes on the workbench is shown in Figure 4.21

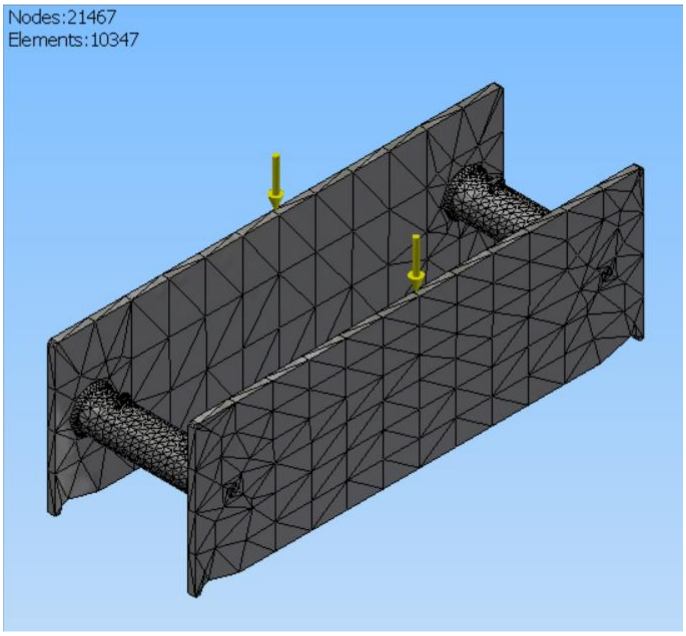

Figure 4. 21 Mesh Type of Work-Bench

The next to step in the analysis process using Von Mises Stress type analysis. The design can be said to be safe when the maximum value of the Von Mises Stress analysis is smaller than the yield stress of the material used, and the design can be said to fail when the maximum value of the Von Mises Stress type is greater than the yield stress of the material used. The results of Von Mises Stress which have been conducted on the workbench is shown in Figure 4.22

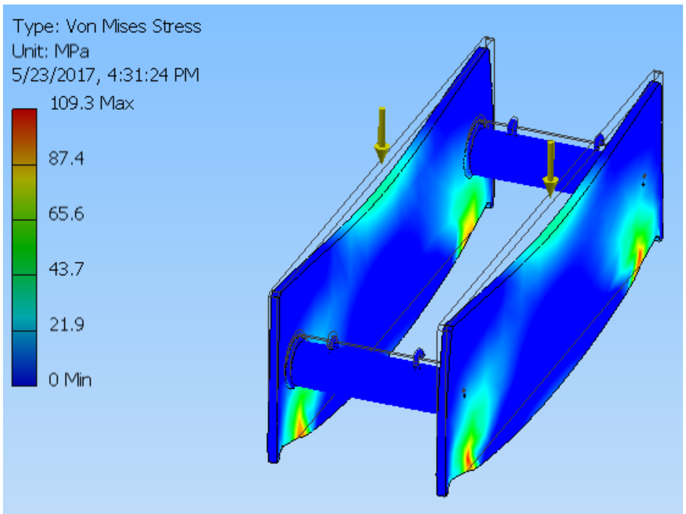

Figure 4. 22 Analysis Result of Work-Bench

Based on the results of the analysis, shown that the red is maximum stress with a value of 109,3 MPa and the blue is minimum stress with a value of 0 MPa. The following is calculation value of safety factor

$$SF = \frac{\sigma_{Ijin}}{\sigma_{Max}}$$

$$SF = \frac{510MPa}{109{,}3MPa}$$

$$SF = 4{,}67$$

$\therefore$ The value of safety factor is 4,67.

The value of the safety factor and the value of displacement in this design can also be known digitally using the same software. In Figure 4.23, it is shown that the value of the safety factor with red is the minimum value and the blue is the maximum value. Based on the simulation calculation result, the maximum safety factor value is 15 and the minimum safety factor is 2,27. The safety factor values of the simulated load analysis on the workbench are shown in the figure 4.23

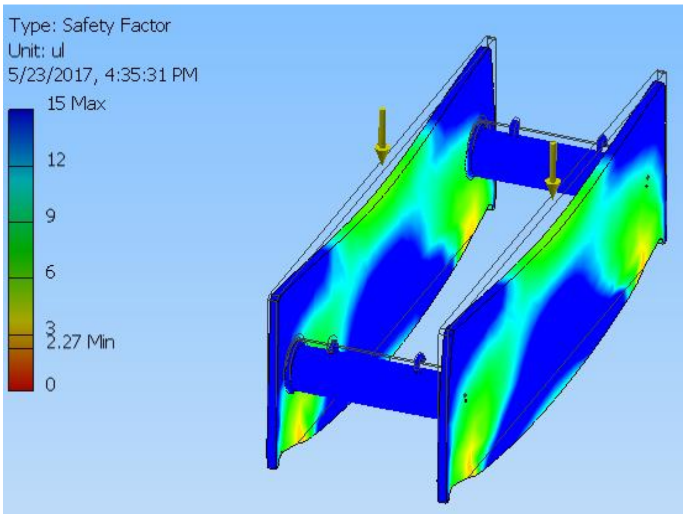

Figure 4. 23 Safety Factor of Work-Bench

While in figure 4.24, it is shown that the displacement value in red is the maximum value and in the blue is the minimum value. Based on the simulation results, the maximum displacement value is 0,2316 mm and the minimum displacement is 0 mm. The results of displacement simulation on the frame are shown in Figure 4.24

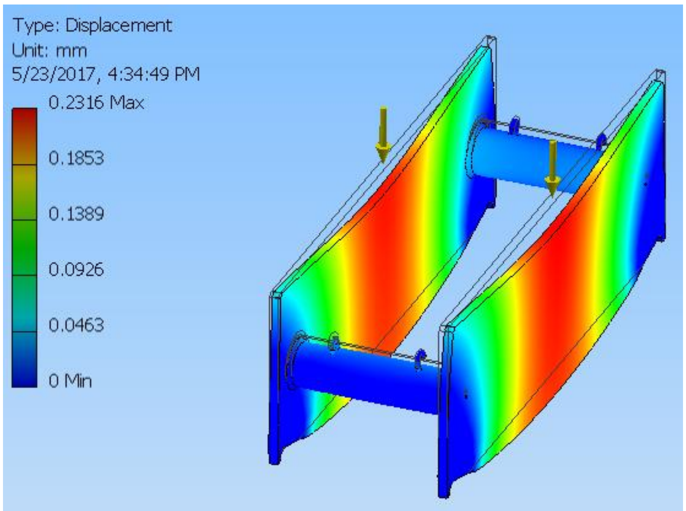

Figure 4. 24 Displacement Value of Work-Bench

Based on the calculation and simulation, the value of safety factor is greater than 1 and the maximum displacement value is 0,2316 mm. So it can be concluded that the material and design is safe and strong to withstand the compressive load.

4.2.2.3 Stress Analysis of Die

The stress analysis on the die aims to determine the die strength of the compressive load provided. To simulate the load, the first step is to determine the fixture of the die that will be the support in the event of loading. The provision of the fixture on die is shown in Figure 4.25

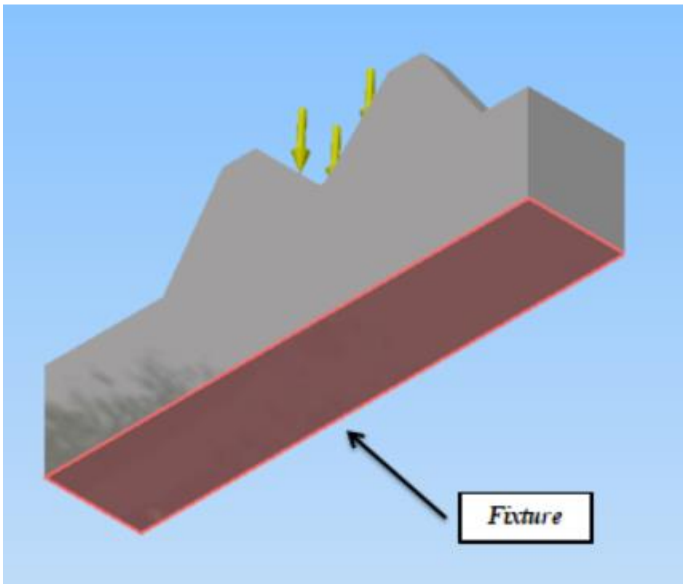

Figure 4. 25 Fixture of Die

After the process of determining fixture, the next step is loading on the die construction. The load is applied to the die affected by the compressive press hydraulic pressure with a maximum capacity of 105 tons or the equivalent of 105000 kg. The loading process on the frame is shown in Figure 4.26

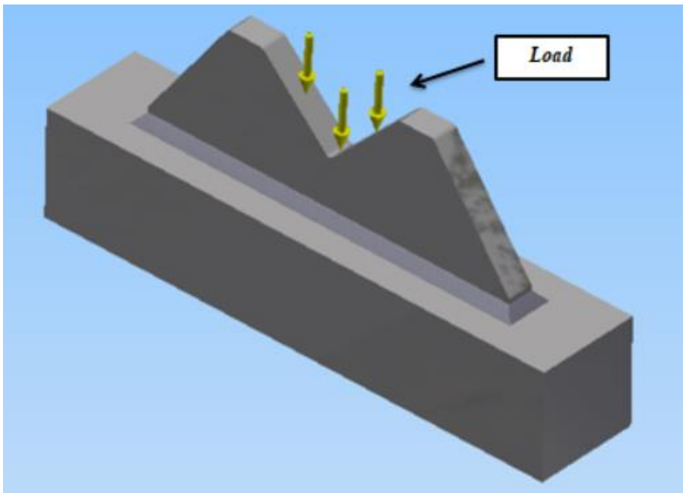

Figure 4. 26 Loading of Die

The analysis was performed using mesh type with low density so that the calculation can be more accurate. This is done automatically by the software. The making of the finite element meshes on the die is shown in Figure 4.27

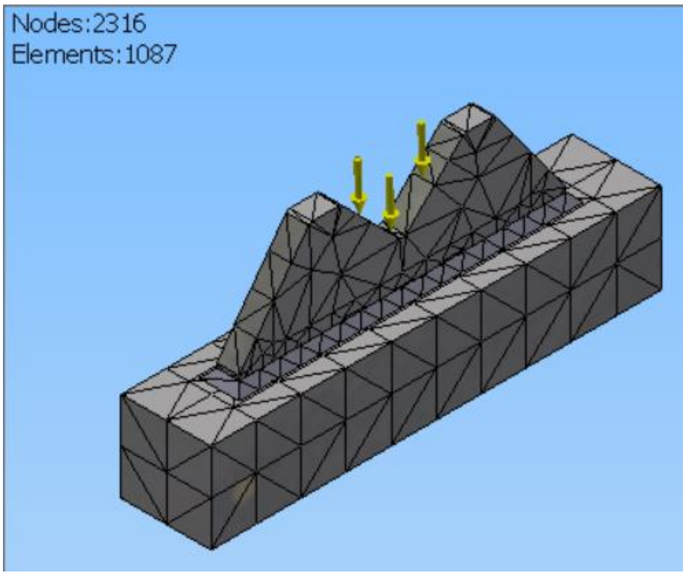

Figure 4. 27 Mesh Type of Die

The next step is the analysis process using Von Mises Stress type analysis. This analysis can be used as a benchmark for a design. The results of Von Mises Stress which have been conducted on die is shown in Figure 4.28

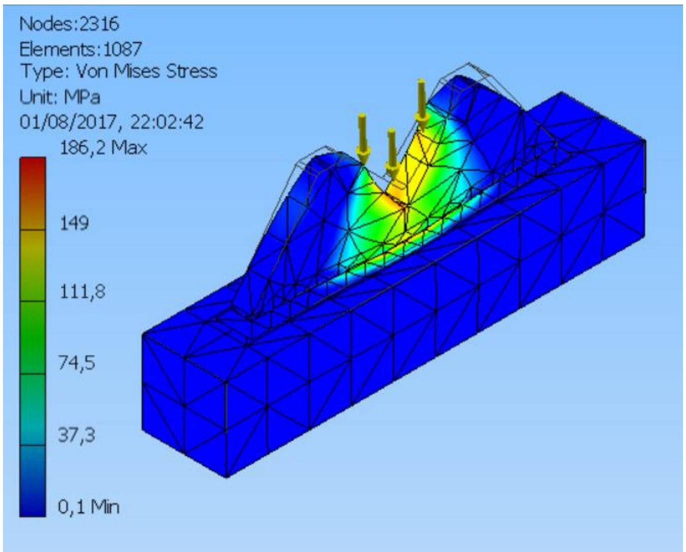

Figure 4. 28 Analysis Result of Die

Based on the results of the analysis, shown that the red is maximum stress with a value of 186,2 MPa and the blue is minimum stress with a value of 0 MPa. The following is calculation value of safety factor

$$SF = \frac{\sigma_{Ijin}}{\sigma_{Max}}$$

$$SF = \frac{510MPa}{186{,}2MPa}$$

$$SF = 2{,}74$$

$\therefore$ The value of safety factor is 2,74

The value of the safety factor and the value of displacement in this design can also be known digitally using the same software. In Figure 4.29, it is shown that the value of the safety factor with red is the minimum value and the blue is the maximum value. Based on the simulation calculation result, the maximum safety factor value is 15 and the minimum safety factor is 1,33. The safety factor values of the simulated load analysis on the die are shown in the figure 4.29

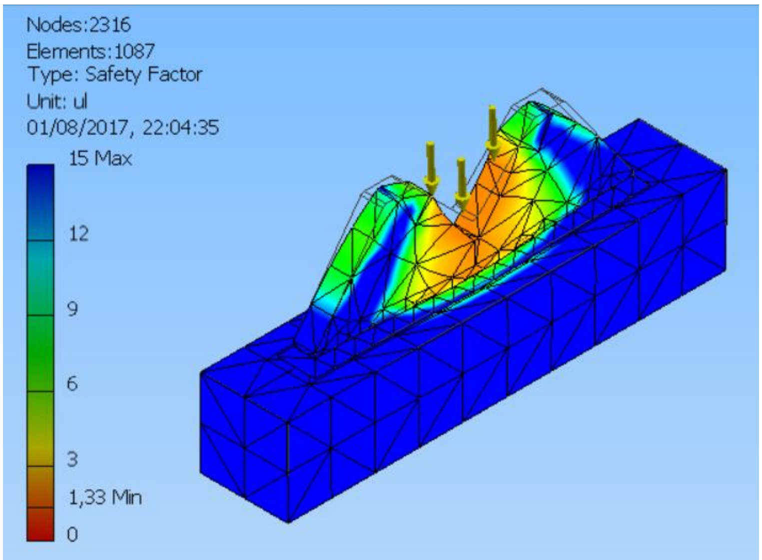

Figure 4. 29 Safety Factor of Die

While in figure 4.30, it is shown that the displacement value in red is the maximum value and in the blue is the minimum value. Based on the simulation results, the maximum displacement value is 0,208 mm and the minimum displacement is 0 mm. The results of displacement simulation on the die are shown in Figure 4.30

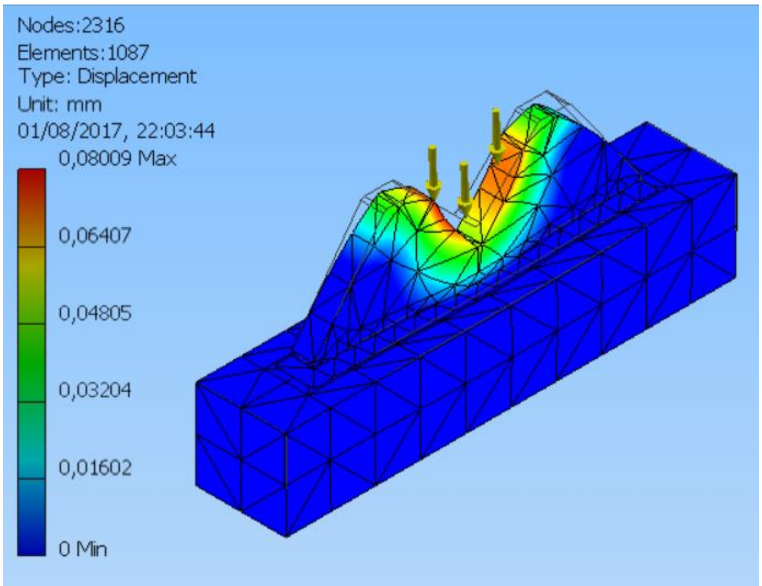

Figure 4. 30 Displacement Value of Die

Based on the calculation and simulation, the value of safety factor is greater than 1 and the maximum displacement value is 0,08 mm. So it can be concluded that the material and design is safe and strong to withstand the compressive load.

CHAPTER 5
CONCLUSIONS

5.1 Conclusion

Based on results of design, modeling, and simulation of strength testing with Autodesk Inventor 2015 software conducted in this study, it can be concluded as follows :

1. Provided hydraulic cylinder design at 100 Ton load with the following specifications:
   a. Inner diameter of cylinder = 253 mm
   b. Thickness of cylinder = 34 mm
   c. Outside of cylinder = 321 mm
   d. Length of cylinder = 657 mm
2. Based on the pump calculation, the results obtained flow rate required, namely: Q_{down} = 6.2 cc / rev and Qup = 3 cc / rev. With the pump specification to be used is 8 cc/rev then it can be concluded the selection of pump is stated SAFE.
3. Based on the motor calculation, obtained motor power required, namely: SM_{down} = 4,9 HP dan SM_{up} = 2,4 HP. With the specifications of the motor used is 7.5 HP then it can be concluded the selection of the motor is stated SAFE.
4. Based on testing of cylinder strength and construction on Hydraulic Press machine, got the value of safety factor more than 1 and result of displacement simulation < 3 mm. So it can be concluded that the selection of materials and design of hydraulic press machine are stated SAFE.

5.2 Recommendation

Based on the research that has been done, the authors have some suggestions to be conveyed :

1. To TMC Industrial Co., Ltd.
    - It is expected that the design of this hydraulic press machine can be utilized as well as possible as a machine literature making tool.
    - In order to face the society of Asian Economy (MEA), it is better for TMC Industrial Co., Ltd. Preparing its employees in English to facilitate communication with people from other countries.
2. To Universitas Islam Indonesia
    - Communication between students and campus parties needs to be improved again to help students who are carrying out the final task abroad.

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ATTACHMENT

1. Design of Hydraulic Cylinder
2. Design of Hydraulic Press Structures
3. Design of Power Unit
4. Design of Hydraulic Press Machine 100 Tons

ATTACHMENT 1

Design of Hydraulic Cylinder

☐ Controlled Document | ☐ Uncontrolled Document
Copy No. : ☐ 01 ☐ 02 ☐ 03 | Date : ____________

General Unless Specification do not show on the drawing												
Machining	√ (√)			Welding a =				a =				
Chamfering												
Ref. : JIS B 0405 (Unit mm.)	Length Tolerance							Angle Tolerance				
up	0.5	3	6	30	120	400	1000	10	50	120	400	
to	3	6	30	120	400	1000	2000	50	120	400	+400	
√ = ∼ = √	-	±0.5	±1	±1.5	±2.5	±4	±6	±2°	±1°	±30'	±20'	
√ = ▽ = √	±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	±1°	±30'	±15'	±10'	
√ = ▽▽ = √	±0.1	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±30'	±20'	±10'	±5'	
√ = ▽▽▽ = √	±0.05		±0.1	±0.15	±0.2	±0.3	±0.5					
√ = ▽▽▽▽ = √	See Drawing											

	Date	Name
Design		
Check		
Verify		

Heat Treatment ---------

Coating ---------

Scale	Sheet No.	Dimension (mm.)

Customer :

TMC INDUSTRIAL PUBLIC CO.,LTD. (THAILAND)
Phone:+66 38271933 WWW.TMC.CO.TH

Model	Mat. / Std.
HYDRAULIC PRESS 100 TON	
Part Name: HYDRAULIC CYLINDER	Weight: N/A
Title	Size: A4
Drawing No.: HPP-07-000-000	Rev.

File Name : assembly main cylinder all.dwg

Revise		Revise Description	Ckd.	Date
00	-	First Issue		

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REV.01 01/11/56

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Copy No. : ☐ 01 ☐ 02 ☐ 03

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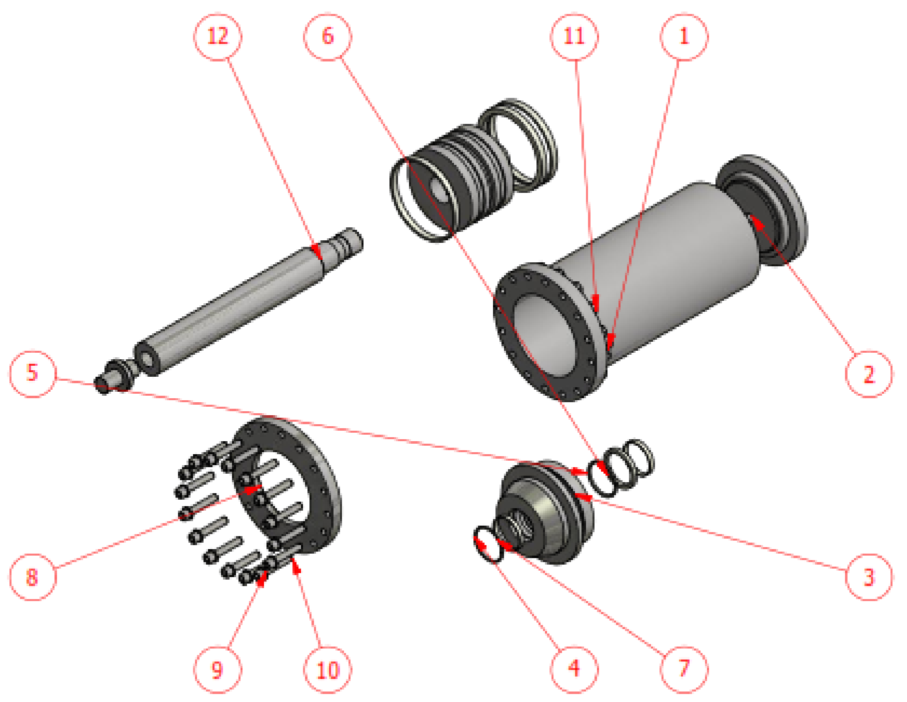

Item	PART NUMBER	MATERIAL	Qty	MASS
1	Main Cylinder	Steel, Carbon	1	178.266 kg
2	End-Plug	Steel, Carbon	1	32.220 kg
3	Gland Bush	Steel, Carbon	1	47.597 kg
4	0-seal 5x2	Polytetrafluoroethylene	1	0.013 kg
5	0-seal 5x6	Polytetrafluoroethylene	1	0.020 kg
6	o-seal 13x15	Polytetrafluoroethylene	1	0.091 kg
7	O-seal 15x5	Polytetrafluoroethylene	2	0.024 kg
8	flange close	Steel, Carbon	1	19.980 kg
9	JIS B 1256 - 21	Steel, Mild	16	0.017 kg
10	JIS B 1176 - M20 x 110	Steel, Mild	16	0.357 kg
11	JIS B 1181 - HN - Class 2 Semi-finished M20	Steel, Mild	16	0.067 kg
12	Assembly Piston rod	Stainless Steel AISI 440C, Welded	1	103.965 kg

General Unless Specification do not show on the drawing

Machining — Welding — Chamfering

Ref. : JIS B 0405 (Unit mm.) — Length Tolerance — Angle Tolerance — See Drawing

	Date	Name
Design		
Check		
Verify		

Heat Treatment
Coating

TMC INDUSTRIAL PUBLIC CO.,LTD. (THAILAND)
Phone:+66 38271933 WWW.TMC.CO.TH

Model — Mat. / Std.
Part Name — Weight N/A
Title — Size A4
Scale — Sheet No. — Dimension (mm.) — Drawing No. — Rev.
Customer :
File Name : assembly main cylinder all hide line.dwg

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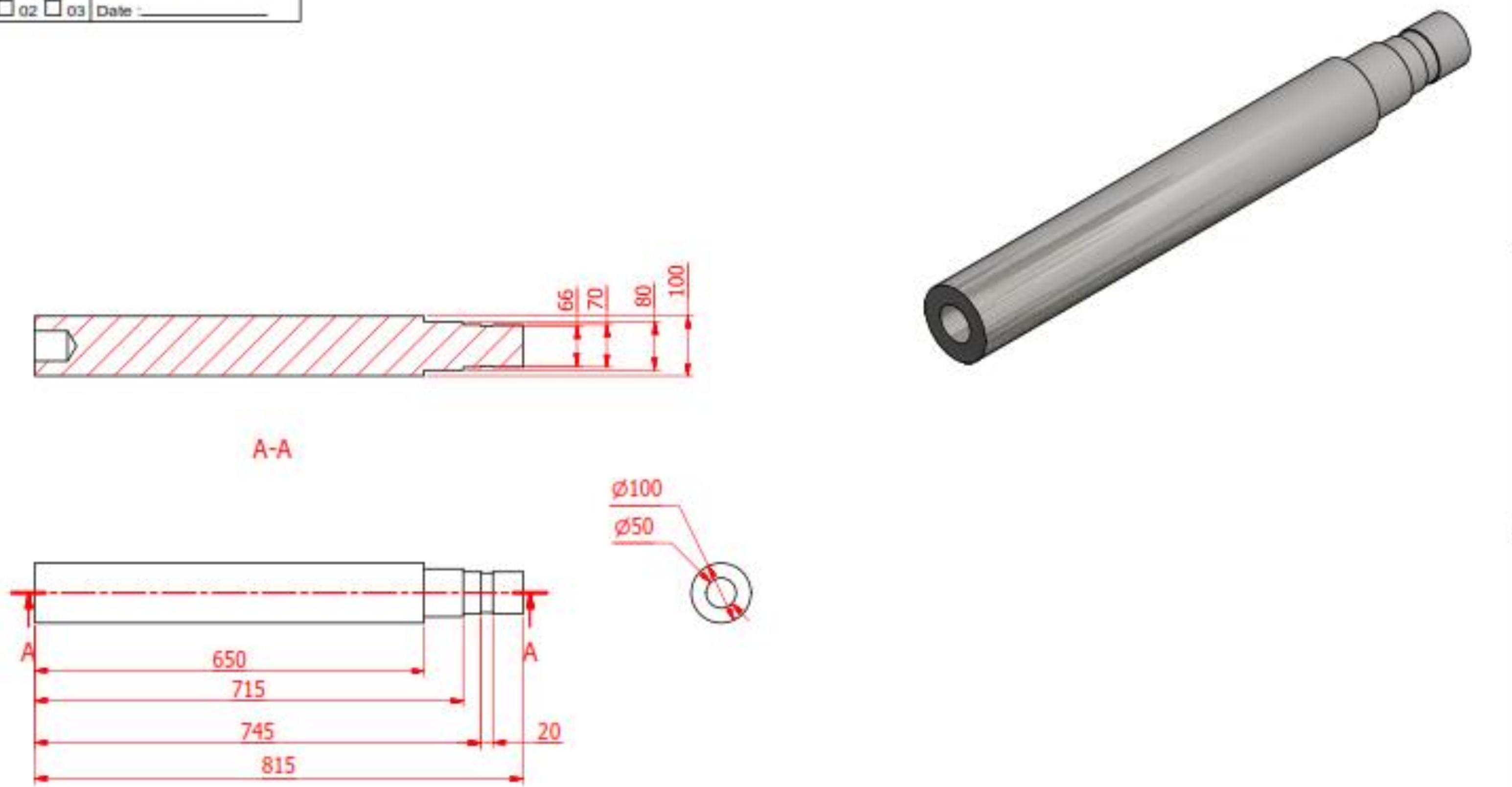

General Unless Specification do not show on the drawing

Machining · Chamfering · Welding a = · a =

Ref. : JIS B 0405 (Unit mm.)	Length Tolerance							Angle Tolerance			
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to	3	6	30	120	400	1000	2000	50	120	400	>400
Row 1	-	±0.5	±1	±1.5	±2.5	±4	±6	±2°	±1°	±30'	±30'
Row 2	±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	±1°	±30'	±15'	±10'
Row 3	±0.1	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±30'	±20'	±10'	±5'
Row 4	±0.05		±0.1	±0.15	±0.2	±0.3	±0.5				
Row 5	See Drawing										

	Date	Name
Design		
Check		
Verify		

Heat Treatment — · — · —

Coating — · — · —

Scale	Sheet No.	Dimension (mm.)

Customer :

TMC INDUSTRIAL PUBLIC CO.,LTD.(THAILAND)
Phone:+66 38271933 WWW.TMC.CO.TH

Model	Mat. / Std.
CYLINDER HYDRAULIC OF 100 TON	
Part Name	**Weight**
CYLINDER ROD	N/A
Title	**Size**
	A4
Drawing No.	**Rev.**
HPP-07-001-000	

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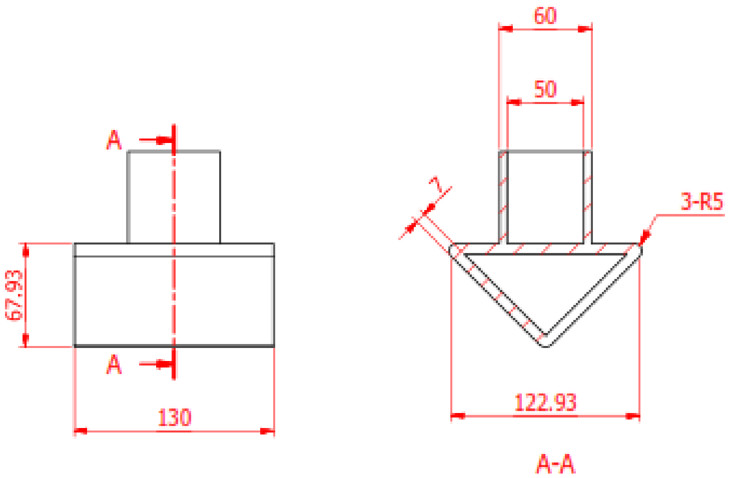

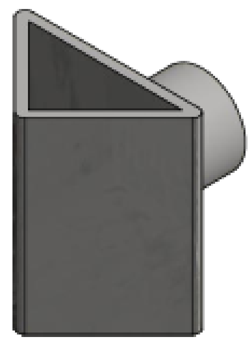

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Machining | Welding | Chamfering

Ref. : JIS B 0405 (Unit mm.)

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to	3	6	30	120	400	1000	2000	50	120	400	>400
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	±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	±1°	±30'	±15'	±10'
	±0.1	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±30'	±20'	±10'	±5'
	±0.05		±0.1	±0.15	±0.2	±0.3	±0.5				
	See Drawing										

	Date	Name
Design		
Check		
Verify		

Heat Treatment — - —— - —

Coating — - —— - —

TMC INDUSTRIAL PUBLIC CO.,LTD.(THAILAND)
Phone:+66 38271933 WWW.TMC.CO.TH

Model: CYLINDER HYDRAULIC OF 100 TON

Mat. / Std.

Part Name: DIE PUNCH

Weight: N/A

Title

Size: A4

Scale | Sheet No. | Dimension (mm.) | Drawing No. HPP-07-002-000 | Rev.

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File Name : Hydraulic Cylinder.dwg

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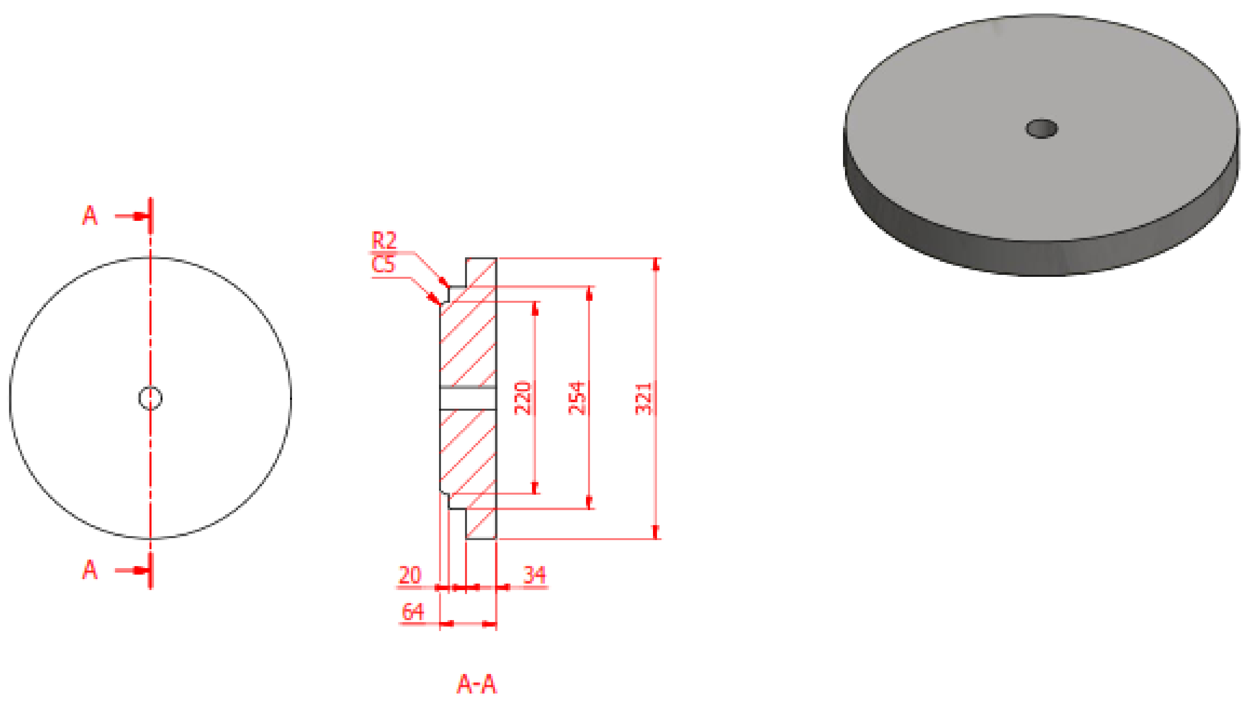

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Machining

Chamfering

Welding a =

a =

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		±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	±1°	±30'	±15'	±10'
		±0.1	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±30'	±20'	±10'	±5'
		±0.05		±0.1	±0.15	±0.2	±0.3	±0.5				
		See Drawing										

(Length Tolerance: columns 0.5–2000; Angle Tolerance: columns 10–>400)

	Date	Name
Design		
Check		
Verify		

Heat Treatment — - — - —

Coating — - — - —

TMC INDUSTRIAL PUBLIC CO.,LTD.(THAILAND)
Phone:+66 38271933 WWW.TMC.CO.TH

Model: CYLINDER HYDRAULIC OF 100 TON	Mat. / Std.	
Part Name: END-PLUG	Weight: N/A	
Title		Size: A4
Scale	Sheet No.	Dimension (mm.)
Drawing No.: HPP-07-003-000	Rev.	
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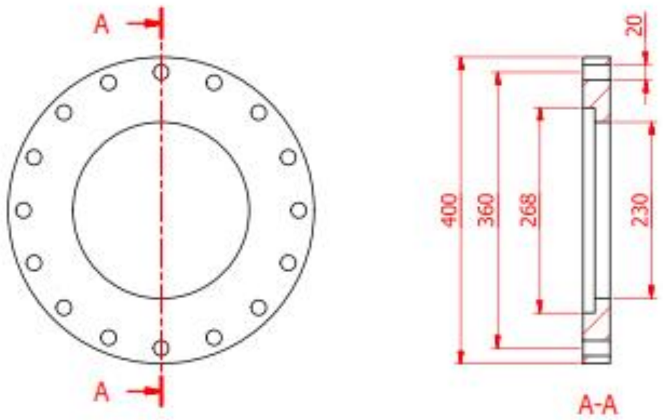

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Machining | Welding
Chamfering

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	to	3	6	30	120	400	1000	2000	50	120	400	+400
		-	±0.5	±1	±1.5	±2.5	±4	±6	±2°	±1°	±30'	±20'
		±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	±1°	±30'	±15'	±10'
		±0.1	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±30'	±20'	±10'	±5'
		±0.05		±0.1	±0.15	±0.2	±0.3	±0.5				
		See Drawing										

	Date	Name
Design		
Check		
Verify		

Heat Treatment —·—·—

Coating —·—·—

Scale	Sheet No.	Dimension (mm.)

Customer :

TMC INDUSTRIAL PUBLIC CO.,LTD. (THAILAND)
Phone:+66 38271933 WWW.TMC.CO.TH

Model: CYLINDER HYDRAULIC OF 100 TON
Mat. / Std.
Part Name: FLANGE CLOSE
Weight: N/A
Title
Size: A4
Drawing No.: HPP-07-004-000
Rev.
File Name : Hydraulic Cylinder.dwg

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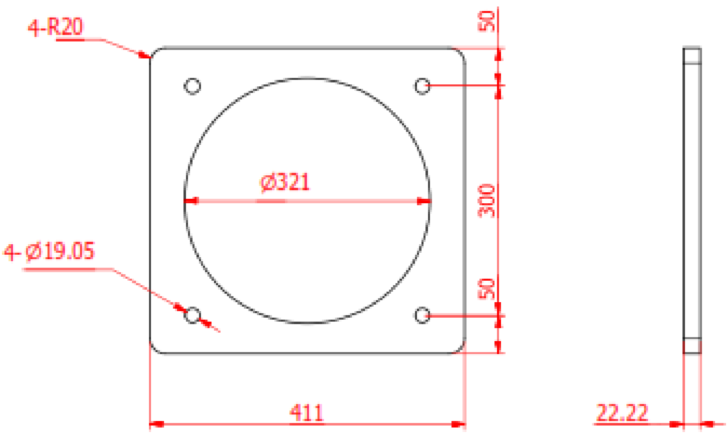

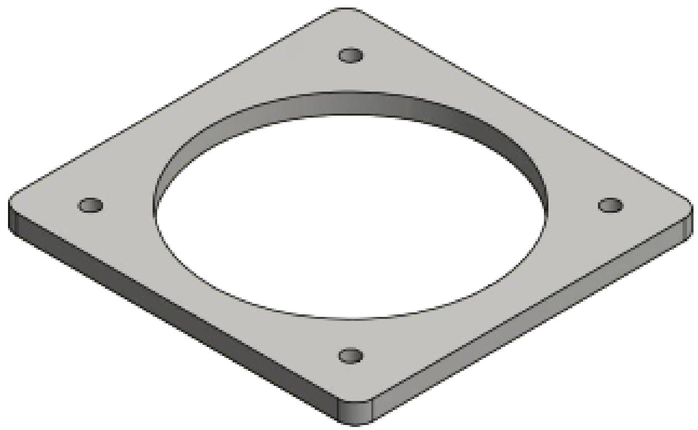

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Machining

Chamfering

Welding

a =

a =

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	to	3	6	30	120	400	1000	2000	50	120	400	>400
		-	±0.5	±1	±1.5	±2.5	±4	±6	±2°	±1°	±30'	±20'
		±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	±1°	±30'	±15'	±10'
		±0.1	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±30'	±20'	±10'	±5'
		±0.05		±0.1	±0.15	±0.2	±0.3	±0.5				
		See Drawing										

(Length Tolerance: columns 0.5–1000; Angle Tolerance: columns 10–400)

	Date	Name
Design		
Check		
Verify		

Heat Treatment — · — · —

Coating — · — · —

Scale	Sheet No.	Dimension (mm.)

Customer :

TMC INDUSTRIAL PUBLIC CO.,LTD.(THAILAND)
Phone:+66 38271933 WWW.TMC.CO.TH

Model: CYLINDER HYDRAULIC OF 100 TON	Mat. / Std.
Part Name: CYLINDER FRAME	Weight: N/A
Title	Size: A4
Drawing No.: HPP-07-005-000	Rev.

File Name : Hydraulic Cylinder.dwg

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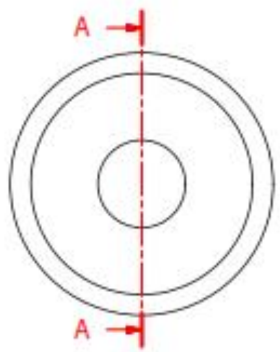

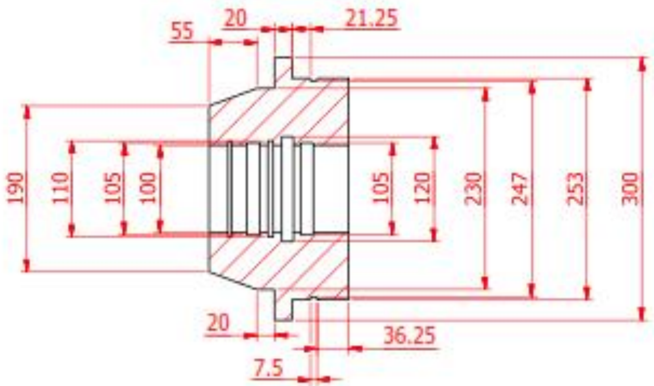

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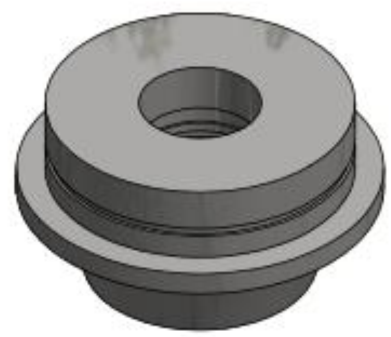

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Machining | Chamfering | Welding a = | a =

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	to	3	6	30	120	400	1000	2000	50	120	400	>400
		Length Tolerance							Angle Tolerance			
▽ = ∼		-	±0.5	±1	±1.5	±2.5	±4	±6	±2°	±1°	±30'	±20'
▽ = ▽		±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	±1°	±30'	±15'	±10'
▽ = ▽▽		±0.1	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±30'	±20'	±10'	±5'
▽ = ▽▽▽		±0.05		±0.1	±0.15	±0.2	±0.3	±0.5				
▽ = ▽▽▽▽		See Drawing										

	Date	Name
Design		
Check		
Verify		

Heat Treatment — - — - —

Coating — - — - —

Scale	Sheet No.	Dimension (mm.)

Customer :

TMC INDUSTRIAL PUBLIC CO.,LTD. (THAILAND)
Phone:+66 38271933 WWW.TMC.CO.TH

Model: CYLINDER HYDRAULIC OF 100 TON	Mat. / Std.
Part Name: GLAND BUSH	Weight: N/A
Title	Size: A4
Drawing No.: HPP-07-006-000	Rev.

File Name : Hydraulic Cylinder.dwg

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REV.01 01/11/56

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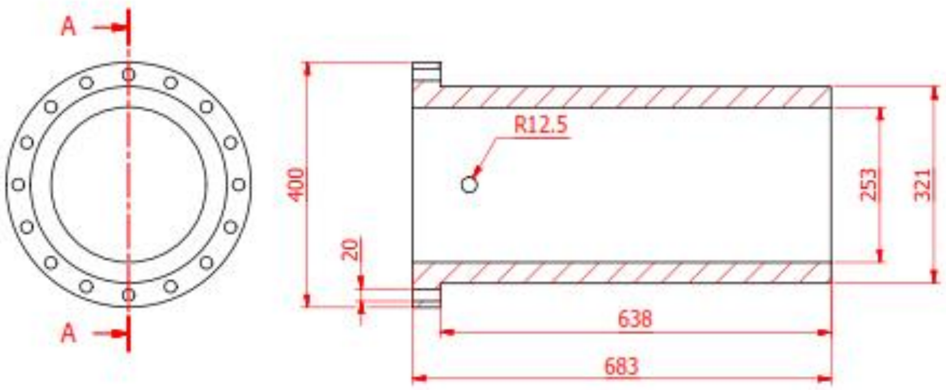

A-A

General Unless Specification do not show on the drawing

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Ref. : JIS B 0405 (Unit mm.) — Length Tolerance — Angle Tolerance — See Drawing

	Date	Name
Design		
Check		
Verify		

Heat Treatment

Coating

Scale	Sheet No.	Dimension (mm.)

Customer :

TMC INDUSTRIAL PUBLIC CO.,LTD. (THAILAND)
Phone:+66 38271933 WWW.TMC.CO.TH

Model	Mat. / Std.
CYLINDER HYDRAULIC OF 100 TON	
Part Name	Weight
MAIN CYLINDER	N/A
Title	Size A4
Drawing No. HPP-07-007-000	Rev.

File Name : Hydraulic Cylinder.dwg

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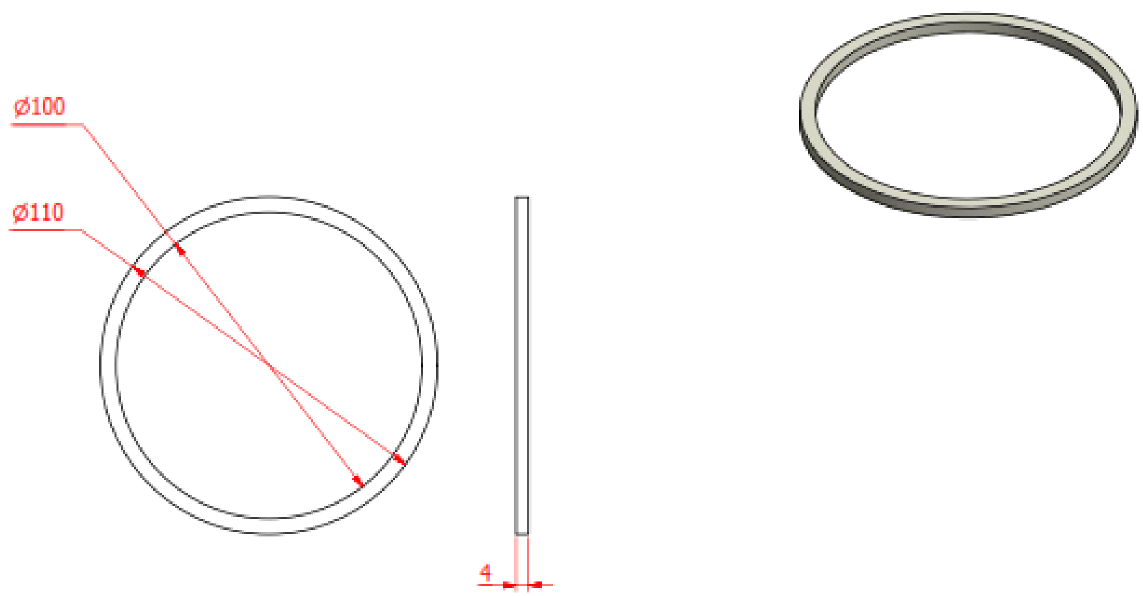


General Unless Specification do not show on the drawing

Machining — Welding — Chamfering

Ref. : JIS B 0405 (Unit mm.)

Length Tolerance							
up	0.5	3	6	30	120	400	1000
to	3	6	30	120	400	1000	2000
	-	±0.5	±1	±1.5	±2.5	±4	±6
	±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3
	±0.1	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2
	±0.05		±0.1	±0.15	±0.2	±0.3	±0.5
	See Drawing						

Angle Tolerance				
up	10	50	120	400
to	50	120	400	>400
	±2°	±1°	±30'	±20'
	±1°	±30'	±15'	±10'
	±30'	±20'	±10'	±5'

	Date	Name
Design		
Check		
Verify		

Heat Treatment — - — - —

Coating — - — - —

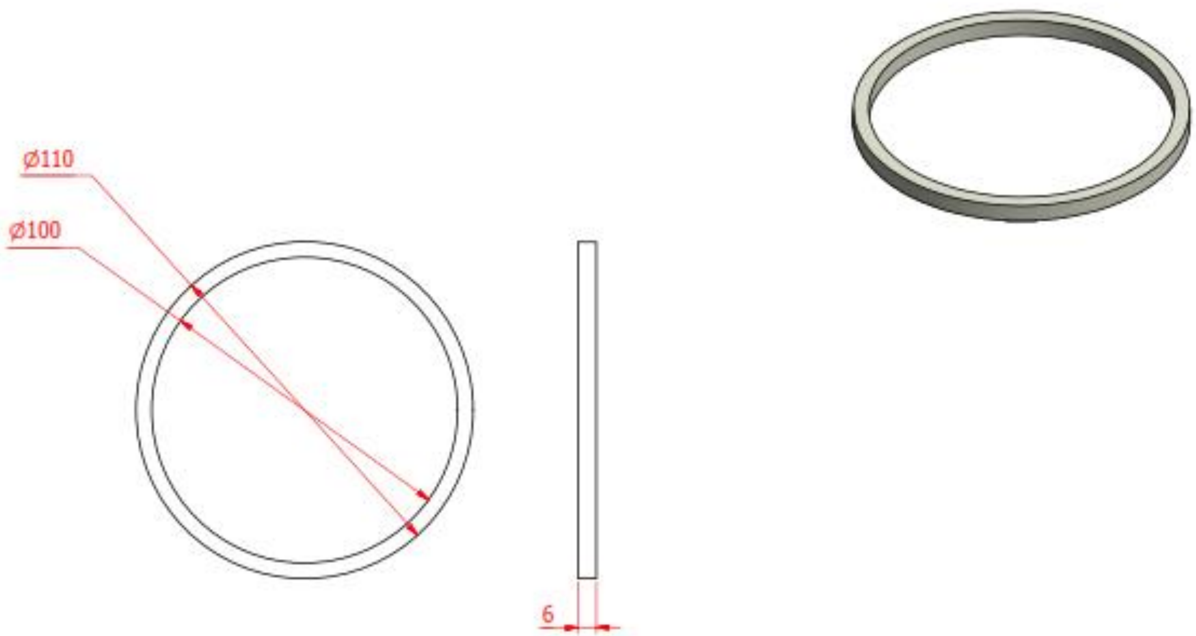
TMC INDUSTRIAL PUBLIC CO.,LTD. (THAILAND)
Phone:+66 38271933 WWW.TMC.CO.TH

Model: CYLINDER HYDRAULIC OF 100 TON	Mat. / Std.
Part Name: O-SEAL 1	Weight: N/A
Title	Size: A4
Scale	Sheet No.
Dimension (mm.)	Drawing No.: HPP-07-008-000
Rev.	
Customer :	File Name : Hydraulic Cylinder.dwg

Revise	Revise Description	Ckd.	Date

F-ED-015
REV.01 01/11/56

Controlled Document | Uncontrolled Document
Copy No. : ☐ 01 ☐ 02 ☐ 03 | Date : ______



General Unless Specification do not show on the drawing

Machining | Welding | Chamfering

Ref. : JIS B 0405 (Unit mm.) — Length Tolerance / Angle Tolerance — See Drawing

	Date	Name
Design		
Check		
Verify		

Heat Treatment
Coating

TMC INDUSTRIAL PUBLIC CO.,LTD. (THAILAND)
Phone +66 38271933 WWW.TMC.CO.TH

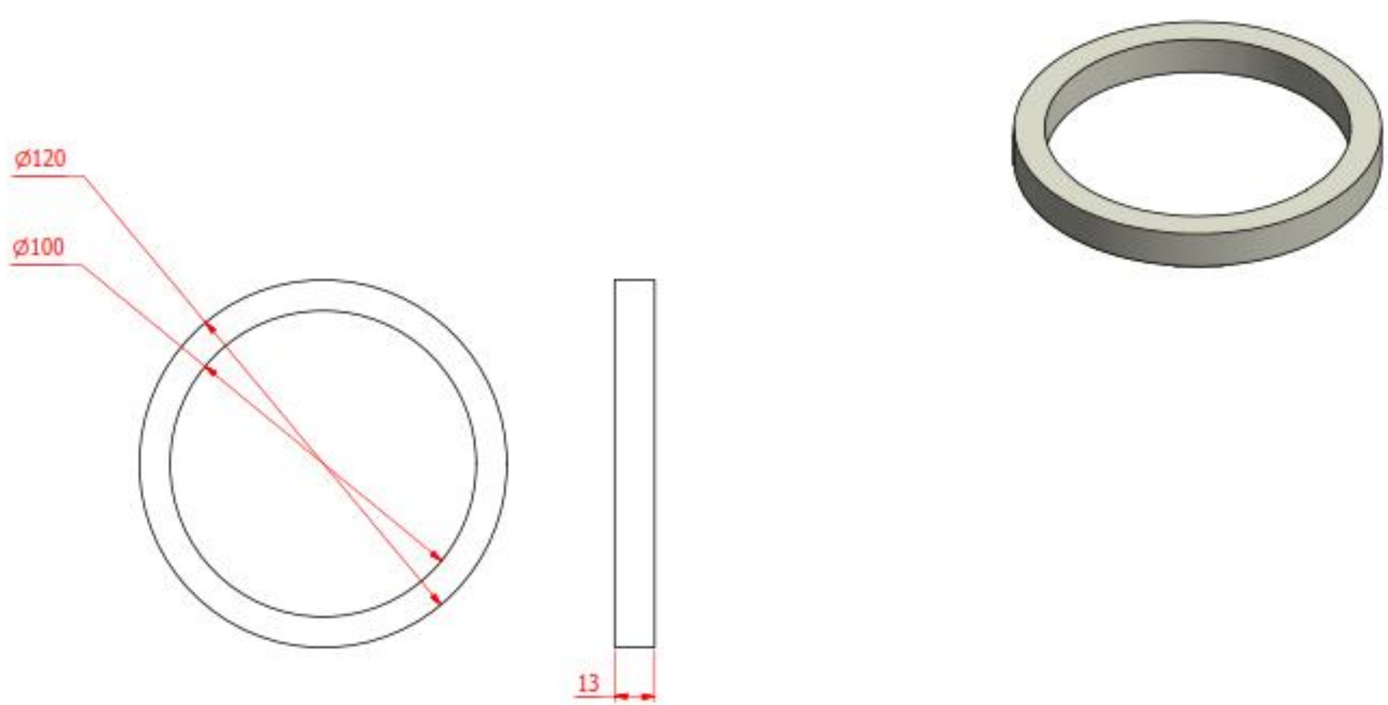
Model: CYLINDER HYDRAULIC OF 100 TON	Mat. / Std.
Part Name: O-SEAL 2	Weight: N/A
Title	Size: A4
Scale / Sheet No. / Dimension (mm.) / Drawing No.: HPP-07-009-000	Rev.

Customer :
File Name : Hydraulic Cylinder.dwg

Revise | Revise Description | Ckd. | Date

F-ED-015
REV.01 01/11/56

Controlled Document	Uncontrolled Document
Copy No. : ☐ 01 ☐ 02 ☐ 03	Date :



General Unless Specification do not show on the drawing

Machining: √ (√)
Chamfering
Welding: a = / a =

Ref. : JIS B 0405 (Unit mm.)	up	0.5	3	6	30	120	400	1000	10	50	120	400
	to	3	6	30	120	400	1000	2000	50	120	400	>400
		Length Tolerance							Angle Tolerance			
√ = ∼ = √		-	±0.5	±1	±1.5	±2.5	±4	±6	±2°	±1°	±30'	±20'
√ = ▽ = √		±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	±1°	±30'	±15'	±10'
√ = ▽▽ = √		±0.1	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±30'	±20'	±10'	±5'
√ = ▽▽▽ = √		±0.05		±0.1	±0.15	±0.2	±0.3	±0.5				
√ = ▽▽▽▽ = √		See Drawing										

	Date	Name
Design		
Check		
Verify		

Heat Treatment — - — - —

Coating — - — - —

Scale	Sheet No.	Dimension (mm.)

Customer :

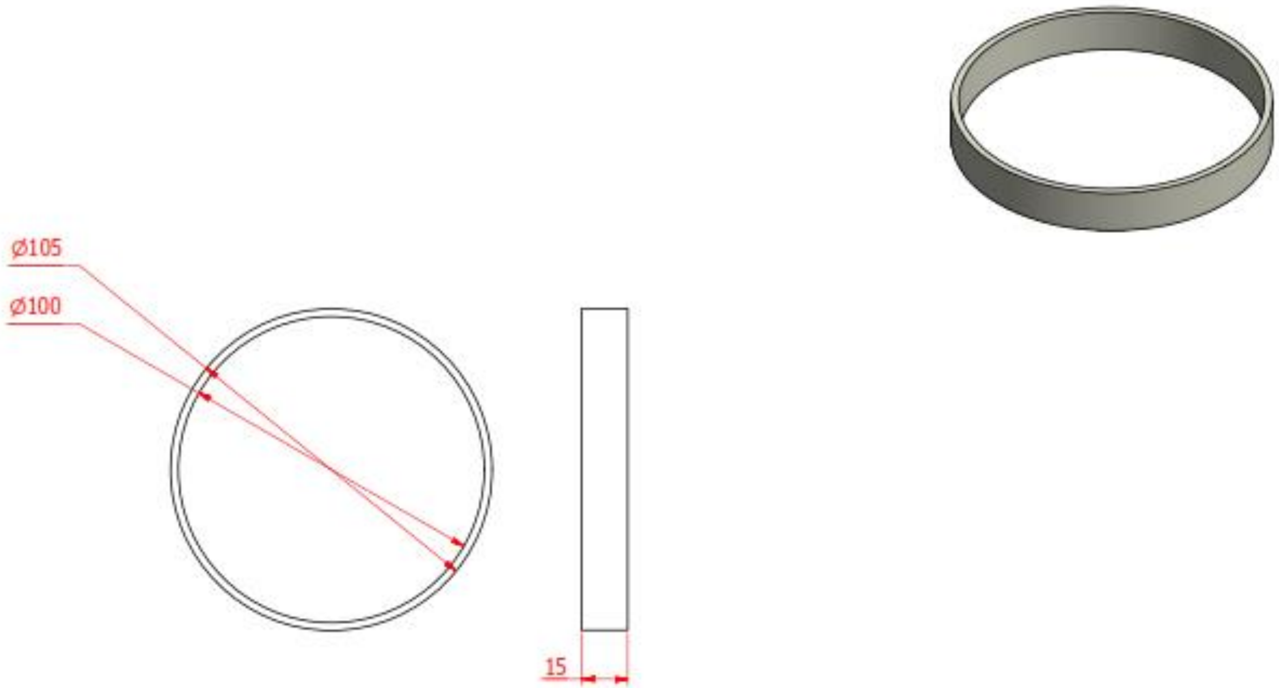
TMC INDUSTRIAL PUBLIC CO.,LTD. (THAILAND)
Phone:+66 38271933 WWW.TMC.CO.TH

Model	Mat. / Std.
CYLINDER HYDRAULIC OF 100 TON	
Part Name	Weight
O-SEAL 3	N/A
Title	Size A4
Drawing No. HPP-07-0010-000	Rev.

File Name : Hydraulic Cylinder.dwg

Revise	Revise Description	Ckd.	Date

Controlled Document	Uncontrolled Document
Copy No. : ☐ 01 ☐ 02 ☐ 03	Date :



General Unless Specification do not show on the drawing

Machining	Welding
Chamfering	a = / a =

Ref. : JIS B 0405 (Unit mm.)	Length Tolerance							Angle Tolerance			
up	0.5	3	6	30	120	400	1000	10	50	120	400
to	3	6	30	120	400	1000	2000	50	120	400	>400
	-	±0.5	±1	±1.5	±2.5	±4	±6	±2°	±1°	±30'	±20'
	±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	±1°	±30'	±15'	±10'
	±0.1	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±30'	±20'	±10'	±5'
	±0.05		±0.1	±0.15	±0.2	±0.3	±0.5				
	See Drawing										

	Date	Name
Design		
Check		
Verify		

Heat Treatment — - — - —

Coating — - — - —

Scale	Sheet No.	Dimension (mm.)

Customer :

TMC INDUSTRIAL PUBLIC CO.,LTD.(THAILAND)
Phone:+66 38271933 WWW.TMC.CO.TH

Model	Mat. / Std.
CYLINDER HYDRAULIC OF 100 TON	
Part Name	Weight
O-SEAL 4	N/A
Title	Size A4
Drawing No. HPP-07-011-000	Rev.

File Name : Hydraulic Cylinder.dwg

Revise	Revise Description	Ckd.	Date

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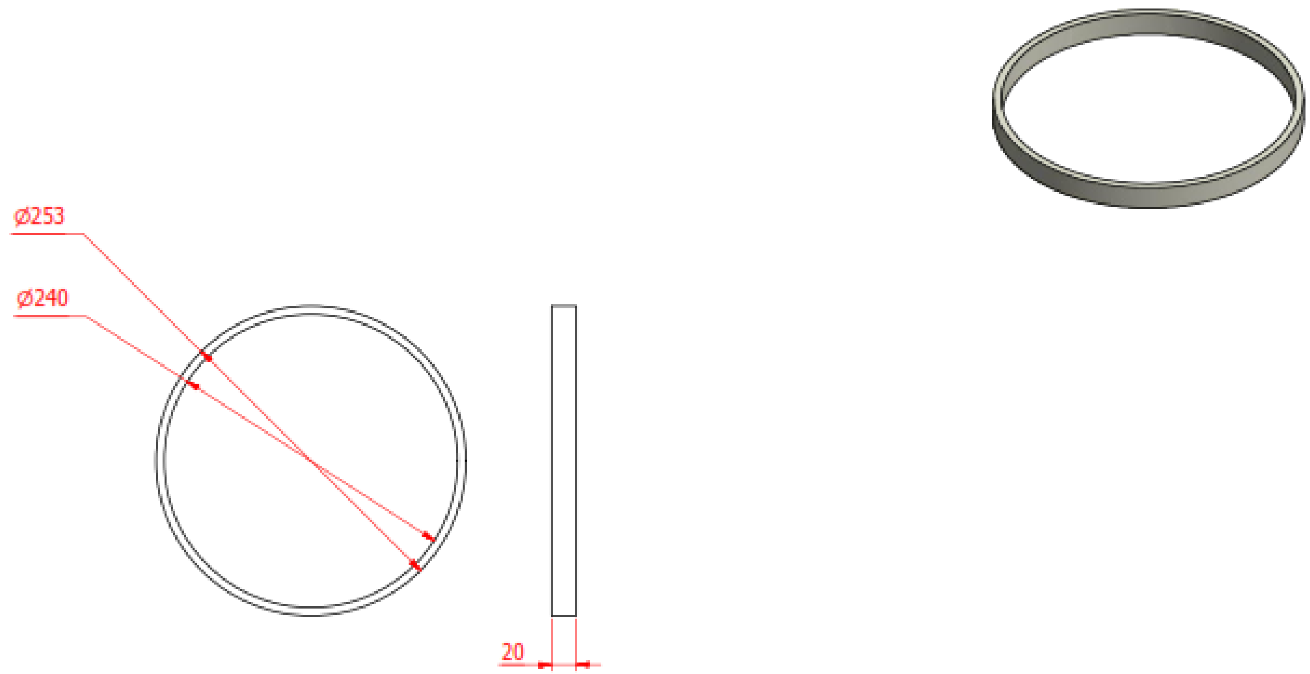
Controlled Document	Uncontrolled Document
Copy No. : ☐ 01 ☐ 02 ☐ 03	Date : ____________



General Unless Specification do not show on the drawing

Machining √ (√)

Chamfering

Welding a =

Ref. : JIS B 0405 (Unit mm.)	up	0.5	3	6	30	120	400	1000	10	50	120	400
	to	3	6	30	120	400	1000	2000	50	120	400	>400
		-	±0.5	±1	±1.5	±2.5	±4	±6	±2°	±1°	±30'	±20'
		±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	±1°	±30'	±15'	±10'
		±0.1	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±30'	±20'	±10'	±5'
		±0.05		±0.1	±0.15	±0.2	±0.3	±0.5				
		See Drawing										

(Columns 0.5–2000: Length Tolerance; columns 10–>400: Angle Tolerance)

	Date	Name
Design		
Check		
Verify		

Heat Treatment —·—·—·—

Coating —·—·—·—

Scale | Sheet No. | Dimension (mm.)

Customer :

TMC INDUSTRIAL PUBLIC CO.,LTD.(THAILAND)
Phone:+66 38271933 WWW.TMC.CO.TH

Model: CYLINDER HYDRAULIC OF 100 TON

Mat. / Std.

Part Name: PISTON SEAL 1

Weight: N/A

Title

Size: A4

Drawing No.: HPP-07-012-000

Rev.

File Name : Hydraulic Cylinder.dwg

Revise	Revise Description	Ckd.	Date

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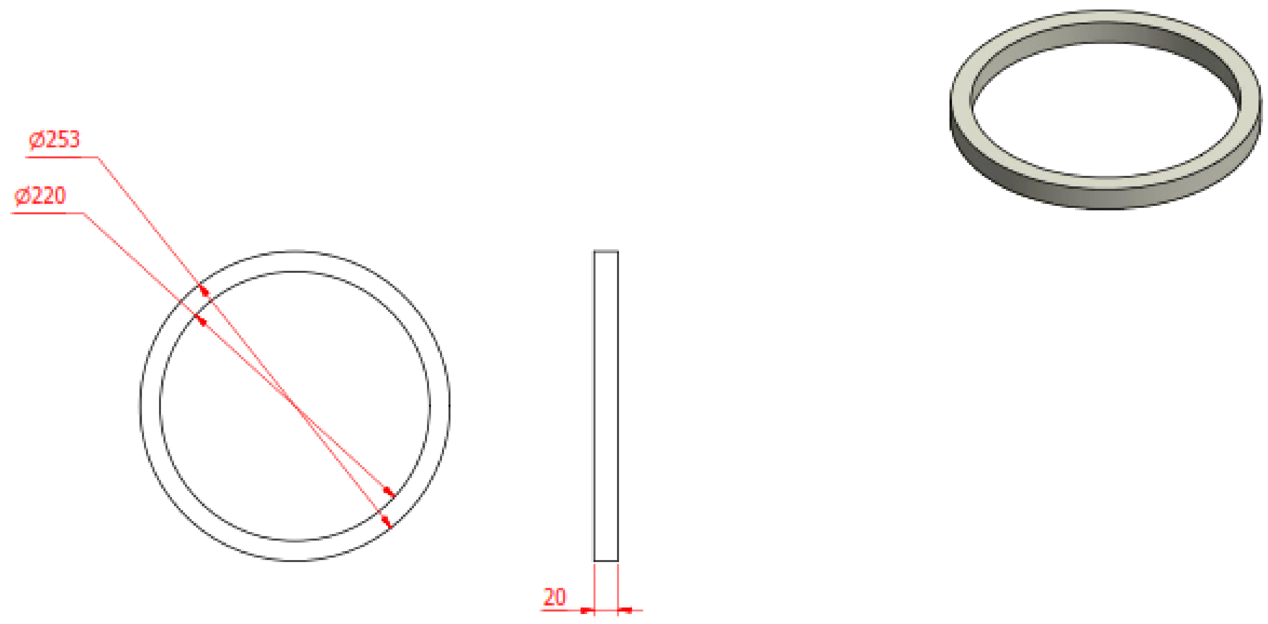

Controlled Document	Uncontrolled Document
Copy No. : ☐ 01 ☐ 02 ☐ 03	Date : ____________

General Unless Specification do not show on the drawing

Machining √ (√)

Chamfering

Welding a = a =

Ref. : JIS B 0405 (Unit mm.)	Length Tolerance							Angle Tolerance			
up	0.5	3	6	30	120	400	1000	10	50	120	400
to	3	6	30	120	400	1000	2000	50	120	400	>400
	-	±0.5	±1	±1.5	±2.5	±4	±6	±2°	±1°	±30'	±20'
	±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	±1°	±30'	±15'	±10'
	±0.1	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±30'	±20'	±10'	±5'
	±0.05		±0.1	±0.15	±0.2	±0.3	±0.5				
	See Drawing										

	Date	Name
Design		
Check		
Verify		

Heat Treatment — - — - —

Coating — - — - —

TMC INDUSTRIAL PUBLIC CO.,LTD.(THAILAND)
Phone:+66 38271933 WWW.TMC.CO.TH

Model: CYLINDER HYDRAULIC OF 100 TON	Mat. / Std.	
Part Name: PISTON SEAL 2	Weight: N/A	
Title		Size: A4
Scale	Sheet No.	Dimension (mm.)
Drawing No.: HPP-07-013-000	Rev.	
Customer :	File Name : Hydraulic Cylinder.dwg	

Revise	Revise Description	Ckd.	Date

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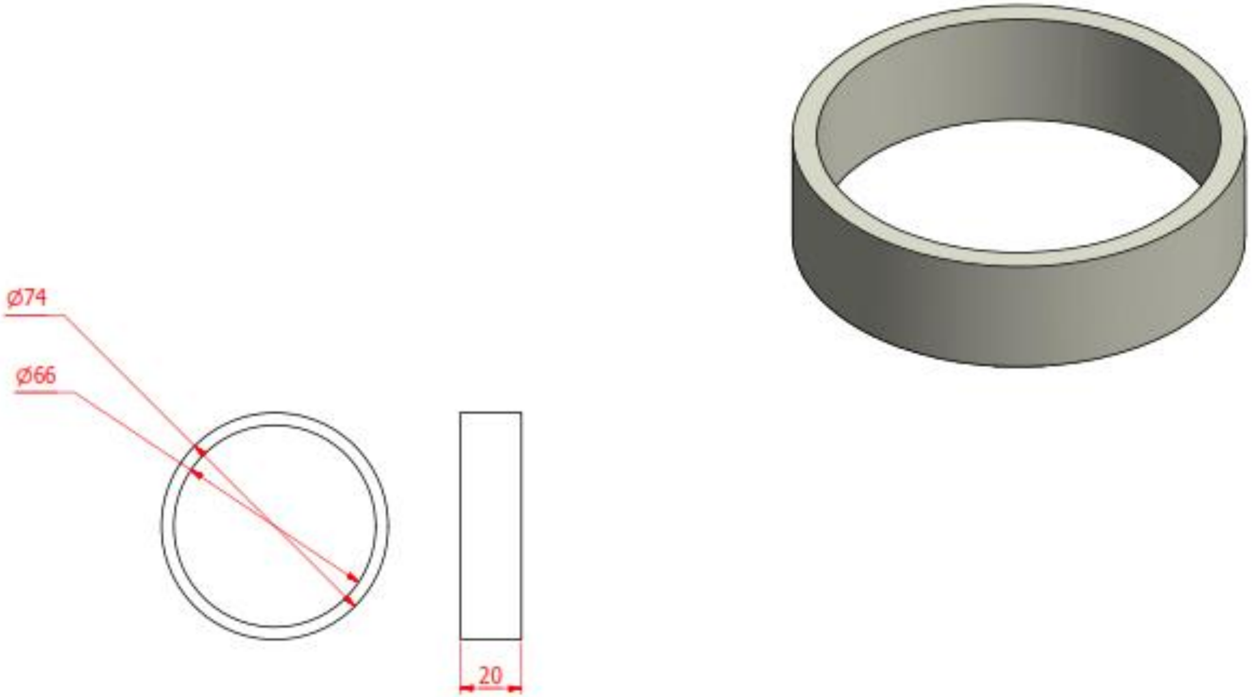
Copy No. : ☐ 01 ☐ 02 ☐ 03 | Date : ____________



General Unless Specification do not show on the drawing

Machining | Welding | Chamfering

Ref. : JIS B 0405 (Unit mm.)

	Date	Name
Design		
Check		
Verify		

TMC INDUSTRIAL PUBLIC CO.,LTD. (THAILAND)
Phone:+66 38271933 WWW.TMC.CO.TH

Model: CYLINDER HYDRAULIC OF 100 TON

Mat. / Std.

Heat Treatment

Part Name: PISTON SEAL 3

Weight: N/A

Coating

Title

Size: A4

Scale | Sheet No. | Dimension (mm.) | Drawing No. HPP-07-014-000 | Rev.

Customer :

File Name : Hydraulic Cylinder.dwg

Revise	Revise Description	Ckd.	Date

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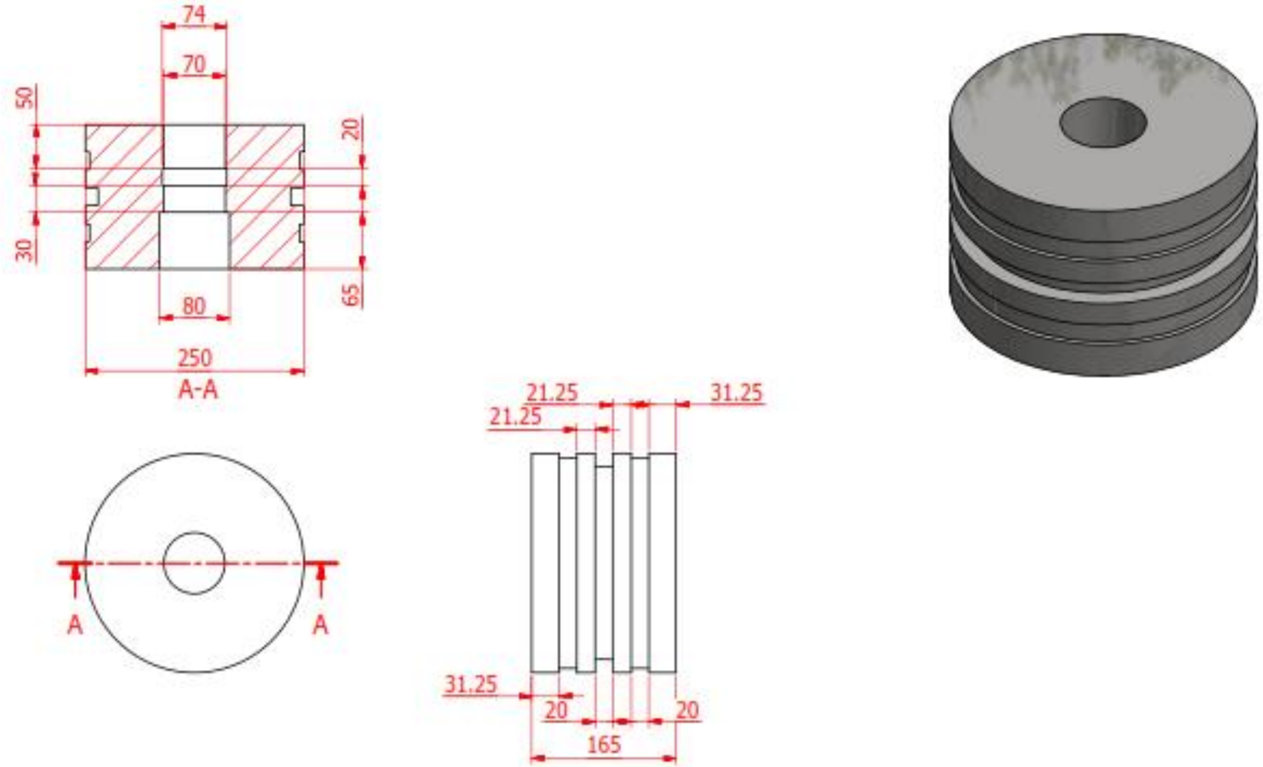
Copy No. : ☐ 01 ☐ 02 ☐ 03	Date : ___________



General Unless Specification do not show on the drawing												
Machining	√ (√)	Welding a =										
Chamfering												
Ref. : JIS B 0405 (Unit mm.)	Length Tolerance							Angle Tolerance				
up	0.5	3	6	30	120	400	1000	10	50	120	400	
to	3	6	30	120	400	1000	2000	50	120	400	>400	
∼	-	±0.5	±1	±1.5	±2.5	±4	±6	±2°	±1°	±30'	±20'	
▽	±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	±1°	±30'	±15'	±10'	
▽▽	±0.1	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±30'	±20'	±10'	±5'	
▽▽▽	±0.05	[illegible]	±0.1	±0.15	±0.2	±0.3	±0.5	[illegible]				
▽▽▽▽	See Drawing											

	Date	Name
Design		
Check		
Verify		

Heat Treatment - - — - -

Coating - - — - -

Scale	Sheet No.	Dimension (mm.)

Customer :

TMC INDUSTRIAL PUBLIC CO.,LTD. (THAILAND)
Phone +66 38271933 WWW.TMC.CO.TH

Model: CYLINDER HYDRAULIC OF 100 TON	Mat. / Std.
Part Name: HEAD PISTON	Weight: N/A
Title	Size: A4
Drawing No.: HPP-07-0015-000	Rev.

File Name : Hydraulic Cylinder.dwg

Revise	Revise Description	Ckd.	Date

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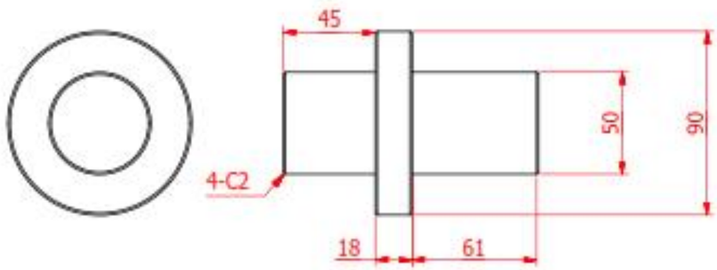
Copy No. : ☐ 01 ☐ 02 ☐ 03 Date : ____________



General Unless Specification do not show on the drawing

Machining / Chamfering / Welding

Ref.: JIS B 0405 (Unit mm.) — Length Tolerance / Angle Tolerance

See Drawing

	Date	Name
Design		
Check		
Verify		

Heat Treatment — - — - —

Coating — - — - —

Scale	Sheet No.	Dimension (mm.)

Customer :

TMC INDUSTRIAL PUBLIC CO.,LTD. (THAILAND)
Phone +66 38271933 WWW.TMC.CO.TH

Model: CYLINDER HYDRAULIC OF 100 TON

Mat. / Std.

Part Name: PUNCH

Weight: N/A

Title

Size: A4

Drawing No.: HPP-07-0016-000

Rev.

File Name : Hydraulic Cylinder.dwg

Revise	Revise Description	Ckd.	Date

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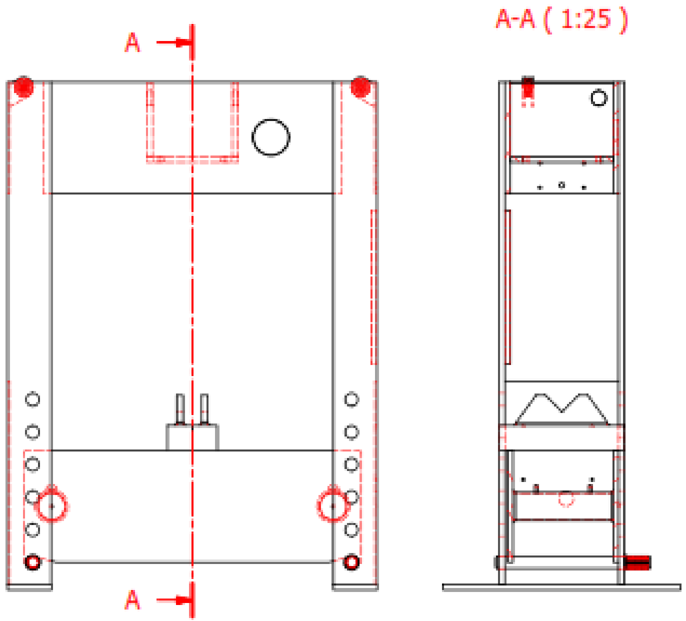
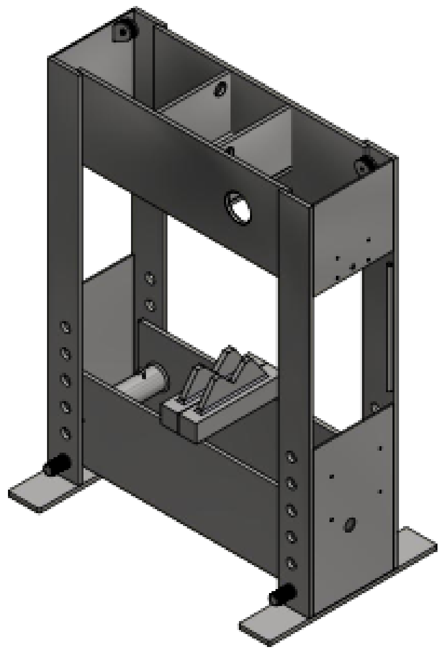
REV.01 01/11/56

ATTACHMENT 2

Design of Hydraulic Press Structures

Controlled Document	Uncontrolled Document
Copy No. : ☐ 01 ☐ 02 ☐ 03	Date : ____________





Revise		Revise Description	Ckd.	Date
00	-	First Issue		

General Unless Specification do not show on the drawing

Machining — Chamfering — Welding a = a =

Ref. : JIS B 0405 (Unit mm.)	Length Tolerance							Angle Tolerance			
up	0.5	3	6	30	120	400	1000	10	50	120	400
to	3	6	30	120	400	1000	2000	50	120	400	>400
	-	±0.5	±1	±1.5	±2.5	±4	±6	±2°	±1°	±30'	±20'
	±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	±1°	±30'	±15'	±10'
	±0.1	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±30'	±20'	±10'	±5'
	±0.05		±0.1	±0.15	±0.2	±0.3	±0.5				
	See Drawing										

	Date	Name
Design		
Check		
Verify		

Heat Treatment — - — — - —

Coating — - — — - —

TMC INDUSTRIAL PUBLIC CO.,LTD.(THAILAND)
Phone:+66 38271933 WWW.TMC.CO.TH

Model	Mat. / Std.
HYDRAULIC PRESS 100 TON	
Part Name	**Weight**
FRAME	N/A
Title	**Size**
	A4

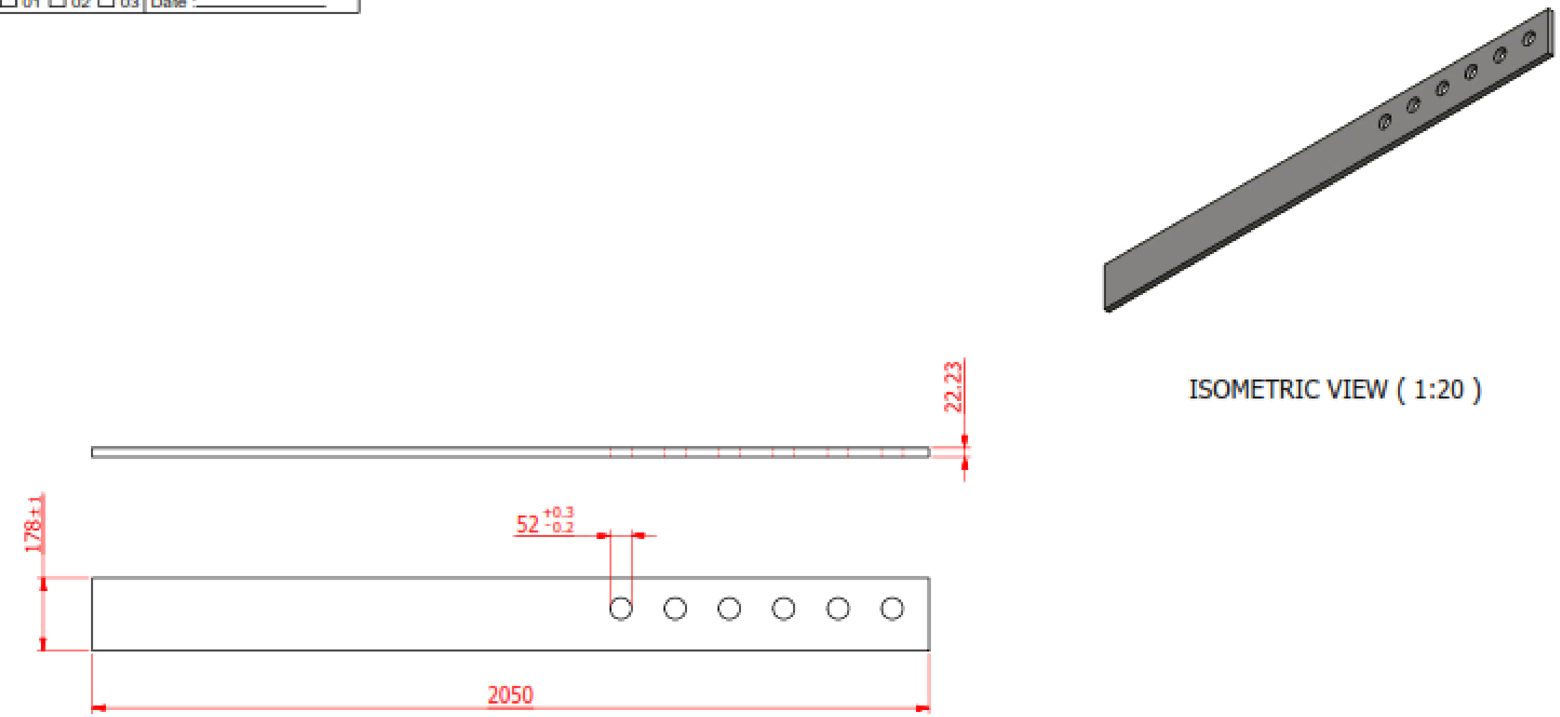
Scale	Sheet No.	Dimension (mm.)	Drawing No.	Rev.
			HPP-02-000-000	

Customer :

File Name : Frame Hydraulic Press Machine.dwg

F-ED-015
REV.01 D1/11/56

Controlled Document	Uncontrolled Document
Copy No. : ☐ 01 ☐ 02 ☐ 03	Date : ____________



ISOMETRIC VIEW (1:20)

General Unless Specification do not show on the drawing

Machining | Welding | Chamfering

Ref. : JIS B 0405 (Unit mm.)	up	0.5	3	6	30	120	400	1000
	to	3	6	30	120	400	1000	2000
		-	±0.5	±1	±1.5	±2.5	±4	±6
		±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3
		±0.1	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2
		±0.05	[illegible]	±0.1	±0.15	±0.2	±0.3	±0.5
		See Drawing						

Angle Tolerance

up	10	50	120	400
to	50	120	400	>400
	±1°	±30'	±15'	±10'
	±30'	±20'	±10'	±5'

	Date	Name
Design		
Check		
Verify		

Heat Treatment — - — - —

Coating — - — - —

Scale	Sheet No.	Dimension (mm.)	Drawing No. HPP-02-001-000	Rev.

Customer :

TMC INDUSTRIAL PUBLIC CO.,LTD.(THAILAND)
Phone:+66 3827 1933 WWW.TMC.CO.TH

Model	HYDRAULIC PRESS 100 TON	Mat. / Std.
Part Name	FRAME	Weight N/A
Title		Size A4

File Name : Hydraulic Press Frame.dwg

Revise	Revise Description	Ckd.	Date
00	- First Issue		

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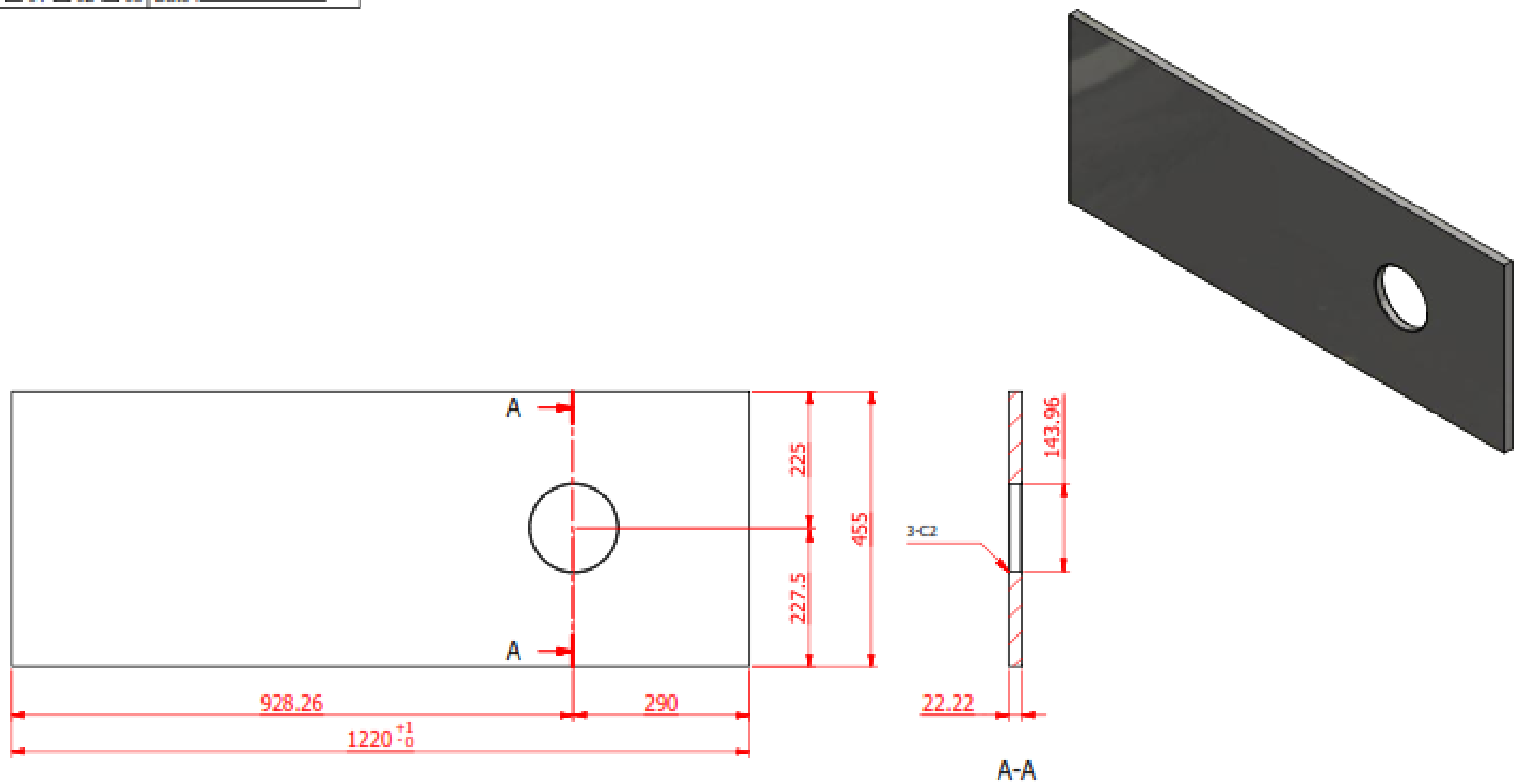
Copy No. : ☐ 01 ☐ 02 ☐ 03	Date : ____________



General Unless Specification do not show on the drawing

Machining | Welding | Chamfering

Ref. : JIS B 0405 (Unit mm.)	Length Tolerance							Angle Tolerance			
up	0.5	3	6	30	120	400	1000	10	50	120	400
to	3	6	30	120	400	1000	2000	50	120	400	>400
	-	±0.5	±1	±1.5	±2.5	±4	±6	±2°	±1°	±30'	±20'
	±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	±1°	±30'	±15'	±10'
	±0.1	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±30'	±20'	±10'	±5'
	±0.05		±0.1	±0.15	±0.2	±0.3	±0.5				
	See Drawing										

	Date	Name
Design		
Check		
Verify		

Heat Treatment —·—·—

Coating —·—·—

Scale | Sheet No. | Dimension (mm.)

Customer :

TMC INDUSTRIAL PUBLIC CO.,LTD.(THAILAND)
Phone:+66 38271933 WWW.TMC.CO.TH

Model: HYDRAULIC PRESS 100 TON

Mat. / Std.

Part Name: FRAME

Weight: 93,97 kg

Title

Size: A4

Drawing No.: HPP-02-002-000

Rev.

File Name : Hydraulic Press Frame.dwg

Revise	Revise Description	Ckd.	Date

F-ED-015
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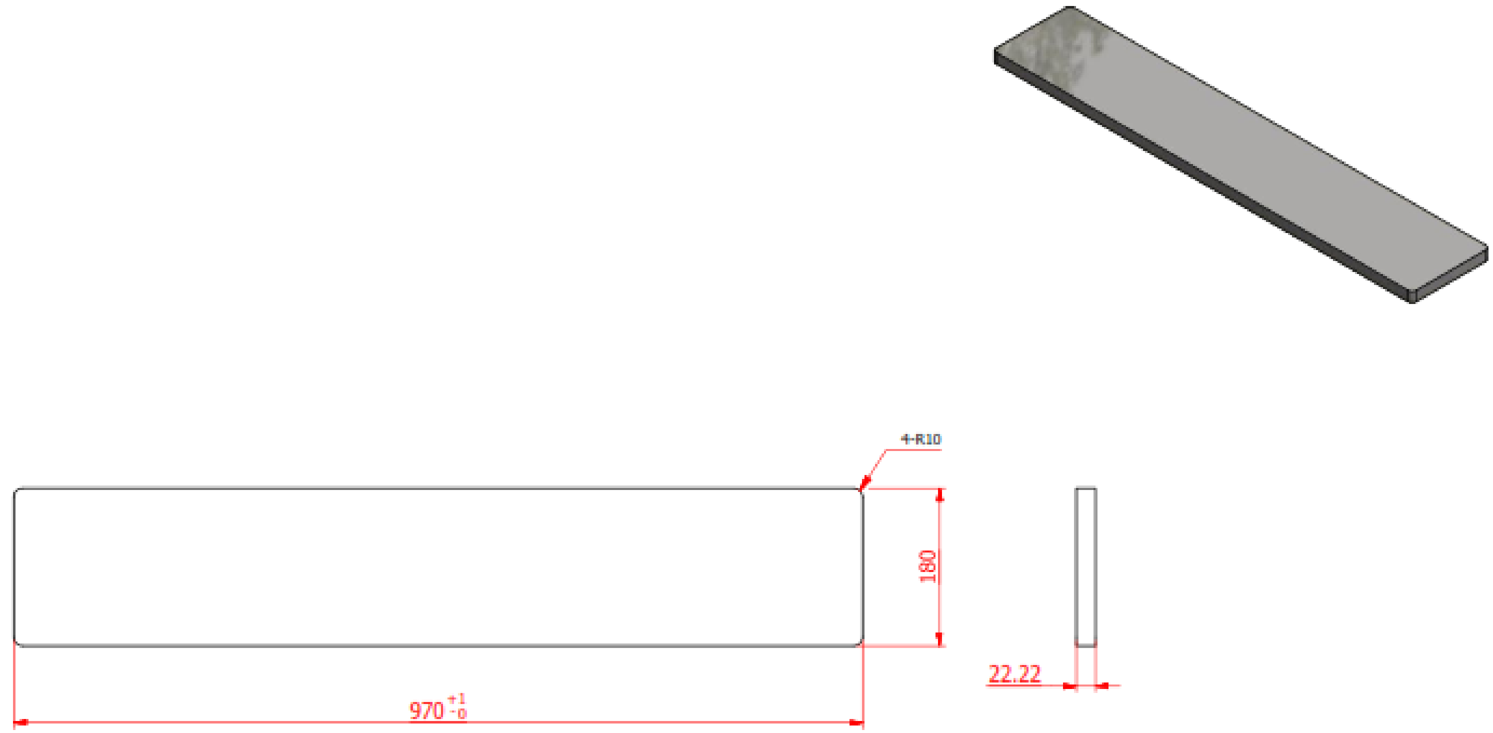
Controlled Document	Uncontrolled Document
Copy No. : ☐ 01 ☐ 02 ☐ 03	Date : ____________



General Unless Specification do not show on the drawing

Machining
Chamfering
Welding a =
a =

Ref. : JIS B 0405 (Unit mm.)	Length Tolerance							Angle Tolerance			
up	0.5	3	6	30	120	400	1000	10	50	120	400
to	3	6	30	120	400	1000	2000	50	120	400	>400
	-	±0.5	±1	±1.5	±2.5	±4	±6	±2°	±1°	±30'	±20'
	±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	±1°	±30'	±15'	±10'
	±0.1	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±30'	±20'	±10'	±5'
	±0.05		±0.1	±0.15	±0.2	±0.3	±0.5				
	See Drawing										

	Date	Name
Design		
Check		
Verify		

Heat Treatment — - — - —

Coating — - — - —

Scale	Sheet No.	Dimension (mm.)

Customer :

TMC INDUSTRIAL PUBLIC CO.,LTD.(THAILAND)
Phone:+66 38271933 WWW.TMC.CO.TH

Model	Mat. / Std.
HYDRAULIC PRESS 100 TON	
Part Name: FRAME	Weight: N/A
Title	Size: A4
Drawing No.: HPP-02-003-000	Rev.

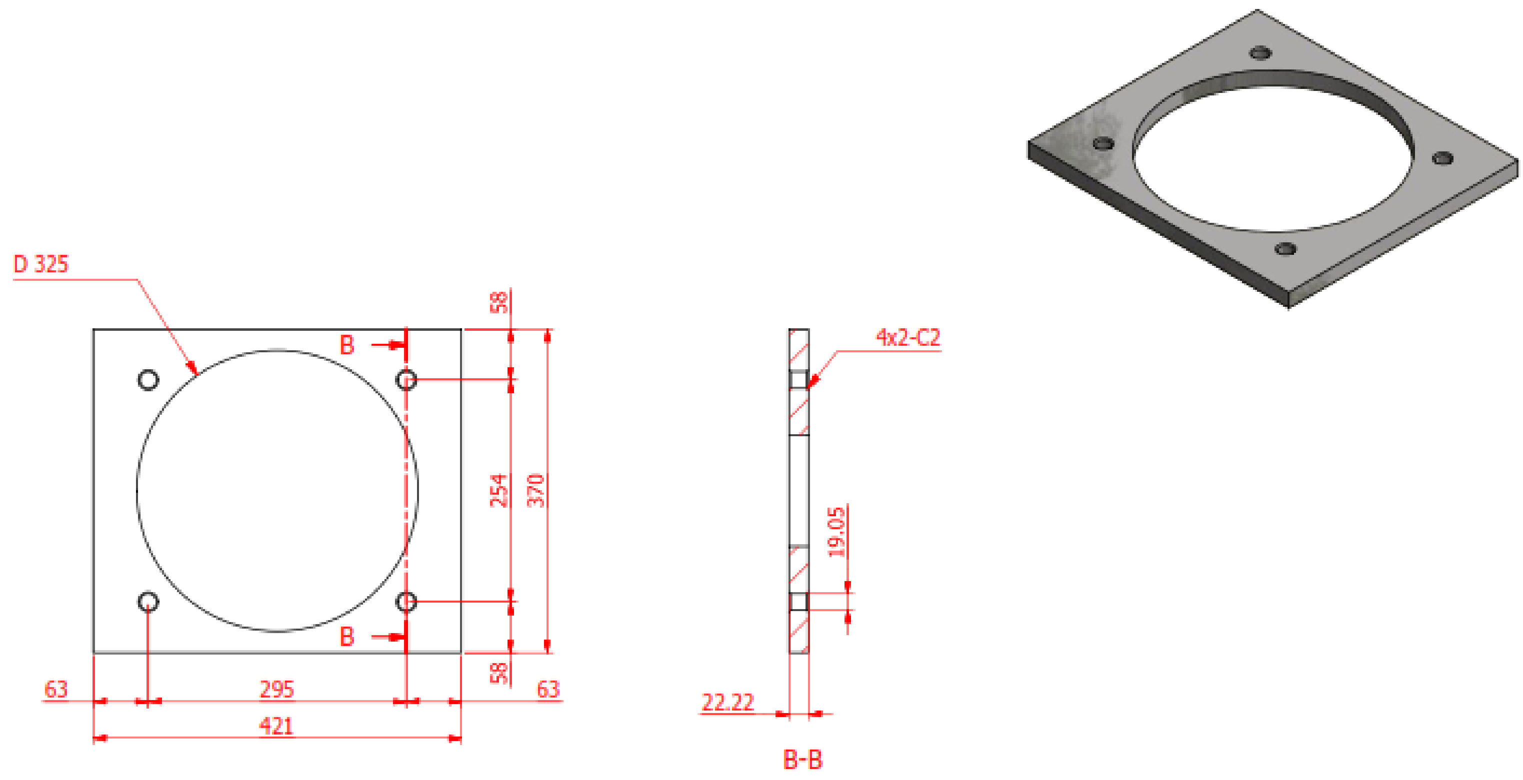
File Name : Hydraulic Press Frame.dwg

Revise	Revise Description	Ckd.	Date

F-ED-015
REV.01 01/11/56

Controlled Document
Copy No. : ☐ 01 ☐ 02 ☐ 03

Uncontrolled Document
Date : ____________



General Unless Specification do not show on the drawing

Machining | Welding | Chamfering

Ref. : JIS B 0405 (Unit mm.)

Length Tolerance								Angle Tolerance			
up 0.5 to 3	3 to 6	6 to 30	30 to 120	120 to 400	400 to 1000	1000 to 2000		10 to 50	50 to 120	120 to 400	400 to =400
-	±0.5	±1	±1.5	±2.5	±4	±6		±2°	±1°	±30'	±20'
±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3		±1°	±30'	±15'	±10'
±0.1	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2		±30'	±20'	±10'	±5'
±0.05		±0.1	±0.15	±0.2	±0.3	±0.5					
See Drawing											

	Date	Name
Design		
Check		
Verify		

Heat Treatment — - — - —

Coating — - — - —

INDUSTRIAL PUBLIC CO.,LTD.(THAILAND)
Phone:+66 38271933 WWW.TMC.CO.TH

Model: HYDRAULIC PRESS 100 TON

Mat. / Std.

Part Name: FRAME

Weight: N/A

Title

Size: A4

Scale | Sheet No. | Dimension (mm.) | Drawing No. HPP-02-004-000 | Rev.

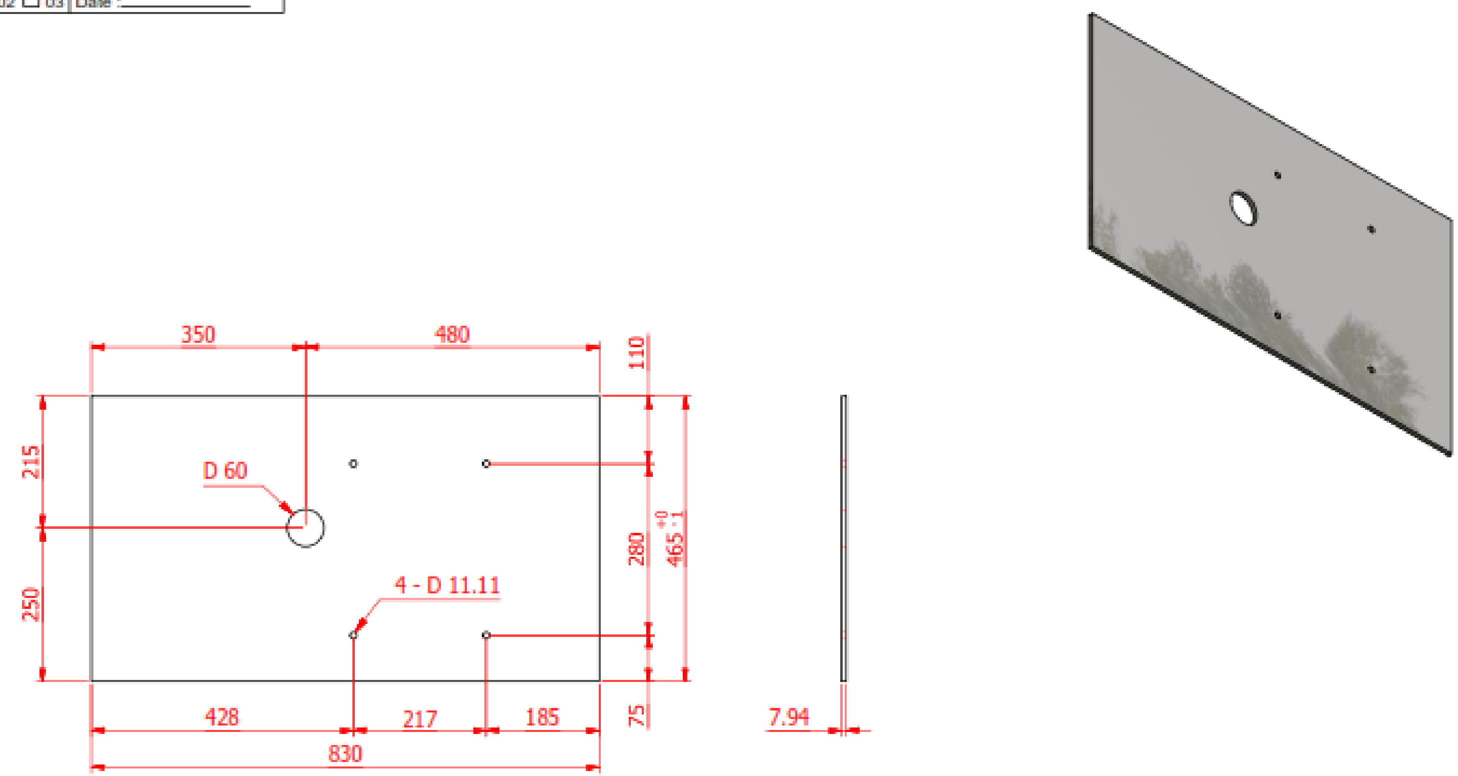
Customer :

File Name : Hydraulic Press Frame.dwg

Revise	Revise Description	Ckd.	Date

F-ED-015
REV.01 01/11/56

☐ Controlled Document	☐ Uncontrolled Document
Copy No. : ☐ 01 ☐ 02 ☐ 03	Date : ____________



General Unless Specification do not show on the drawing

Machining

Welding

Chamfering

Ref. : JIS B 0405 (Unit mm.)

Length Tolerance							
up	0.5	3	6	30	120	400	1000
to	3	6	30	120	400	1000	2000
	-	±0.5	±1	±1.5	±2.5	±4	±6
	±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3
	±0.1	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2
	±0.05		±0.1	±0.15	±0.2	±0.3	±0.5

Angle Tolerance				
up	10	50	120	400
to	50	120	400	>400
	±2°	±1°	±30'	±20'
	±1°	±30'	±15'	±10'
	±30'	±20'	±10'	±5'

See Drawing

	Date	Name
Design		
Check		
Verify		

Heat Treatment

Coating

Scale | Sheet No. | Dimension (mm.)

Customer :

TMC INDUSTRIAL PUBLIC CO.,LTD.(THAILAND)

Phone:+66 38271933 WWW.TMC.CO.TH

Model: HYDRAULIC PRESS 100 TON	Mat. / Std.
Part Name: FRAME	Weight: 23,84 kg
Title	Size: A4
Drawing No.: HPP-02-005-000	Rev.

File Name : Hydraulic Press Frame.dwg

Revise	Revise Description	Ckd.	Date

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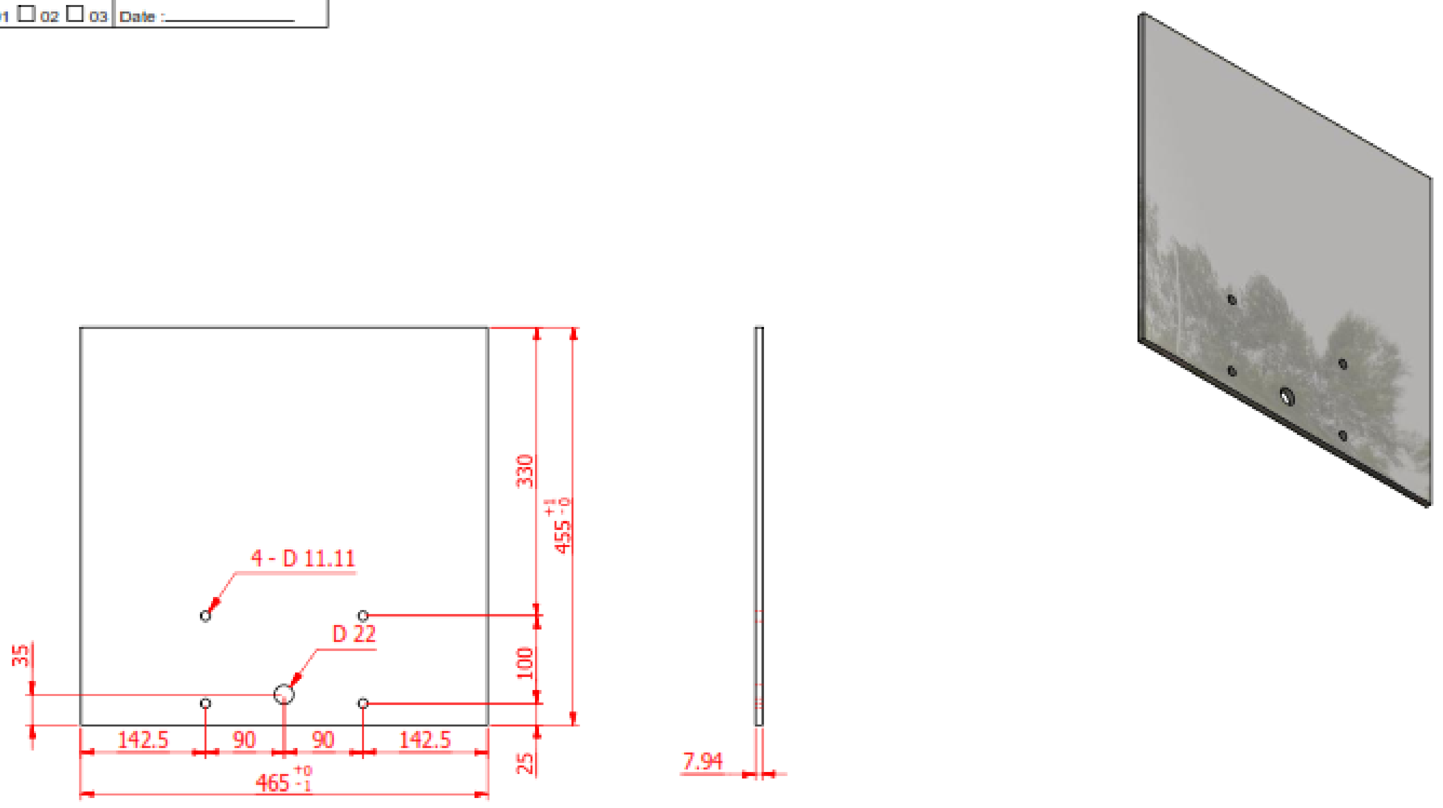

General Unless Specification do not show on the drawing

Machining √ (√)

Chamfering

Welding a = a =

Ref. : JIS B 0405 (Unit mm.)	up	0.5	3	6	30	120	400	1000	10	50	120	400
	to	3	6	30	120	400	1000	2000	50	120	400	>400
		-	±0.5	±1	±1.5	±2.5	±4	±6	±2°	±1°	±30'	±20'
		±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	±1°	±30'	±15'	±10'
		±0.1	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±30'	±20'	±10'	±5'
		±0.05		±0.1	±0.15	±0.2	±0.3	±0.5				
		See Drawing										

(Length Tolerance: columns 0.5–2000; Angle Tolerance: columns 10–>400)

	Date	Name
Design		
Check		
Verify		

Heat Treatment ——————

Coating ——————

TMC INDUSTRIAL PUBLIC CO.,LTD.(THAILAND)
Phone:+66 38271933 WWW.TMC.CO.TH

Model	Mat. / Std.
HYDRAULIC PRESS 100 TON	
Part Name: FRAME	Weight: N/A
Title	Size: A4

Scale	Sheet No.	Dimension (mm.)	Drawing No.	Rev.
			HPP-02-006-000	

Customer :

File Name : Hydraulic Press Frame.dwg

Revise	Revise Description	Ckd.	Date

F-ED-015
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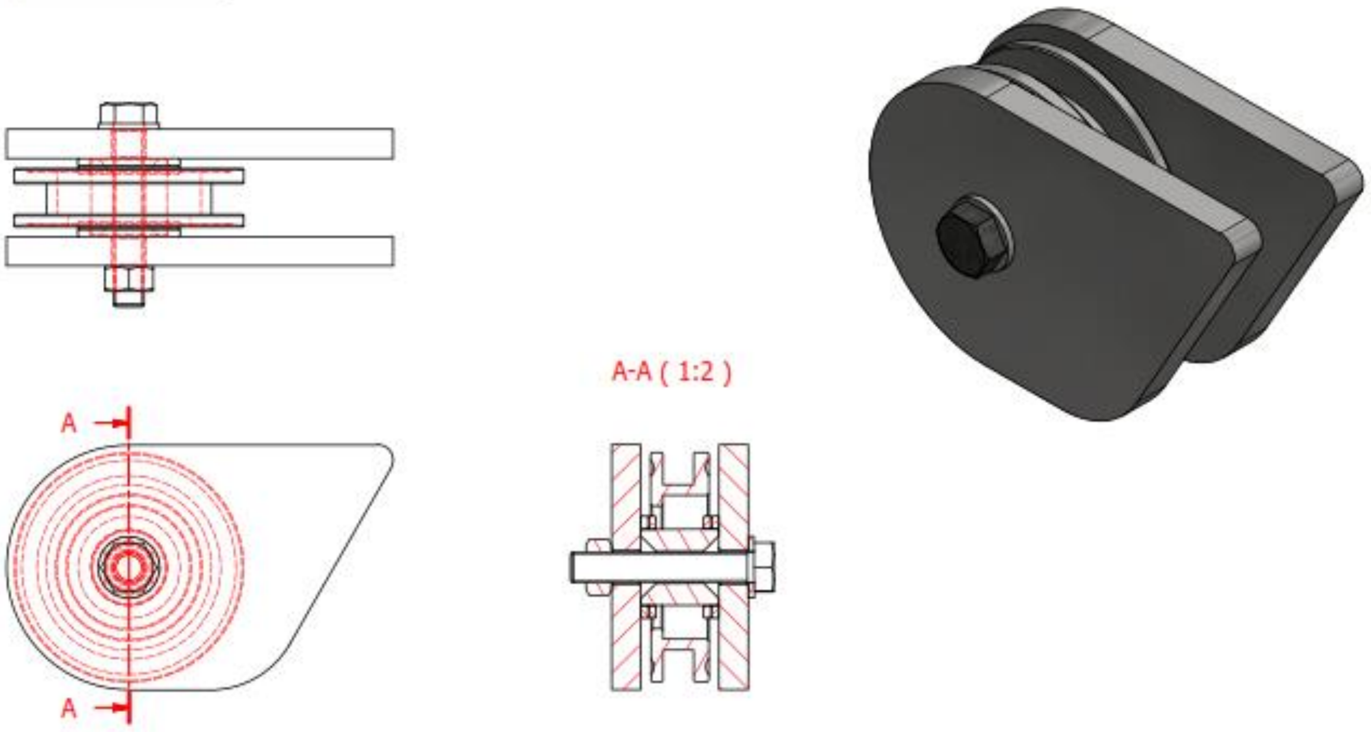

Controlled Document
Copy No. : ☐ 01 ☐ 02 ☐ 03
Uncontrolled Document
Date : ______

General Unless Specification do not show on the drawing

	Date	Name
Design		
Check		
Verify		

Heat Treatment
Coating

INDUSTRIAL PUBLIC CO.,LTD. (THAILAND)
Phone:+66 38271933 WWW.TMC.CO.TH

Model: HYDRAULIC PRESS 100 TON	Mat. / Std.
Part Name: FRAME	Weight: N/A
Title	Size: A4
Scale / Sheet No. / Dimension (mm.) / Drawing No.: HPP-02-007-000	Rev.

Customer :
File Name : assembly HPP-02-07-000.dwg

Revise		Revise Description	Ckd.	Date
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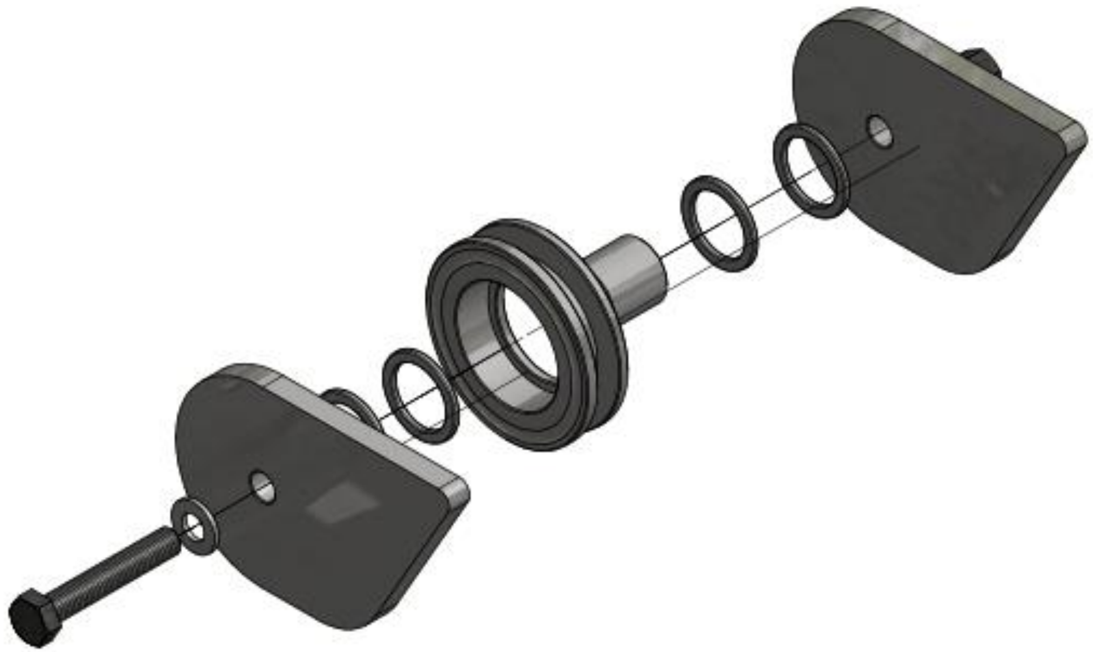

General Unless Specification do not show on the drawing

Machining √ (√)

Chamfering

Welding a = / a =

Ref. : JIS B 0405 (Unit mm.)		Length Tolerance							Angle Tolerance			
	up	0.5	3	6	30	120	400	1000	10	50	120	400
	to	3	6	30	120	400	1000	2000	50	120	400	>400
√ = ∼ = √		-	±0.5	±1	±1.5	±2.5	±4	±6	±2°	±1°	±30'	±20'
√ = ▽ = √		±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	±1°	±30'	±15'	±10'
√ = ▽▽ = √		±0.1	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±30'	±20'	±10'	±5'
√ = ▽▽▽ = √		±0.05		±0.1	±0.15	±0.2	±0.3	±0.5				
√ = ▽▽▽▽ = √		See Drawing										

	Date	Name
Design		
Check		
Verify		

Heat Treatment —·—·—

Coating —·—·—

Scale	Sheet No.	Dimension (mm.)

Customer :

TMC INDUSTRIAL PUBLIC CO.,LTD. (THAILAND)
Phone:+66 38271933 WWW.TMC.CO.TH

Model: HYDRAULIC PRESS 100 TON	Mat. / Std.	
Part Name: FRAME KATROL	Weight: N/A	
Title		Size: A4
Drawing No.: HPP-02-007-000-EXP		Rev.

File Name : Frame katrol.dwg

Revise		Revise Description	Ckd.	Date
00	-	First Issue		

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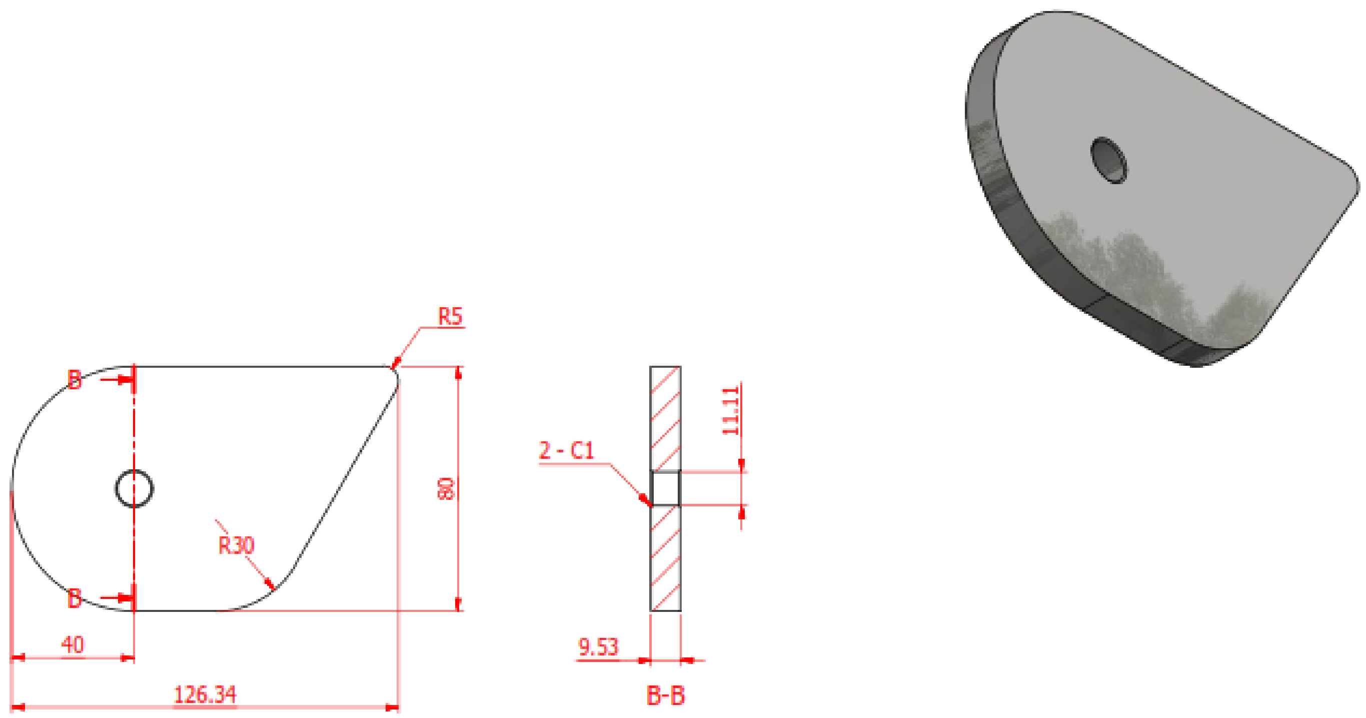

General Unless Specification do not show on the drawing

Machining
Chamfering
Welding a =
a =

Ref. : JIS B 0405 (Unit mm.)		Length Tolerance							Angle Tolerance			
	up	0.5	3	6	30	120	400	1000	10	50	120	400
	to	3	6	30	120	400	1000	2000	50	120	400	>400
		-	±0.5	±1	±1.5	±2.5	±4	±6	±2°	±1°	±30'	±20'
		±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	±1°	±30'	±15'	±10'
		±0.1	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±30'	±20'	±10'	±5'
		±0.05		±0.1	±0.15	±0.2	±0.3	±0.5				
		See Drawing										

	Date	Name
Design		
Check		
Verify		

Heat Treatment ——-———-—

Coating ——-———-—

TMC INDUSTRIAL PUBLIC CO.,LTD.(THAILAND)
Phone:+66 38271933 WWW.TMC.CO.TH

Model: HYDRAULIC PRESS 100 TON	Mat. / Std.
Part Name: FRAME	Weight: N/A
Title	Size: A4
Scale	Sheet No.
Dimension (mm.)	Drawing No.: HPP-02-007-001
Rev.	
Customer :	File Name : HPP-02-007-000.dwg

Revise	Revise Description	Ckd.	Date

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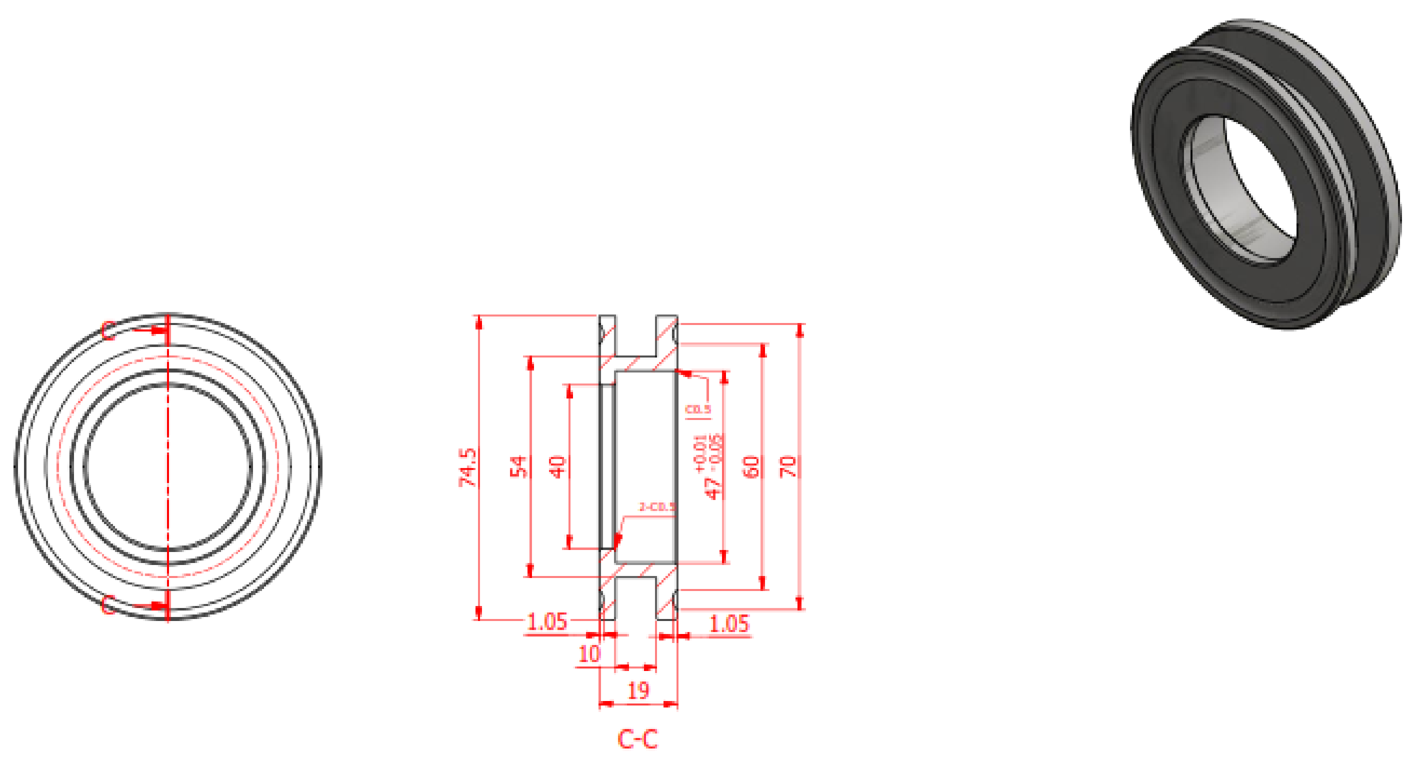
Copy No. : ☐ 01 ☐ 02 ☐ 03	Date : ____________



General Unless Specification do not show on the drawing

Machining

Chamfering

Welding a =

Ref. : JIS B 0405 (Unit mm.)	up	0.5	3	6	30	120	400	1000	10	50	120	400
	to	3	6	30	120	400	1000	2000	50	120	400	>400
		-	±0.5	±1	±1.5	±2.5	±4	±6	±2°	±1°	±30'	±20'
		±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	±1°	±30'	±15'	±10'
		±0.1	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±30'	±20'	±10'	±5'
		±0.05		±0.1	±0.15	±0.2	±0.3	±0.5				
		See Drawing										

	Date	Name
Design		
Check		
Verify		

Heat Treatment —·—·—

Coating —·—·—

Scale	Sheet No.	Dimension (mm.)

Customer :

TMC INDUSTRIAL PUBLIC CO.,LTD.(THAILAND)
Phone:+66 38271933 WWW.TMC.CO.TH

Model	Mat. / Std.
HYDRAULIC PRESS 100 TON	
Part Name	**Weight**
FRAME	N/A
Title	**Size**
	A4
Drawing No.	**Rev.**
HPP-02-007-002	

File Name : HPP-02-007-000.dwg

Revise	Revise Description	Ckd.	Date
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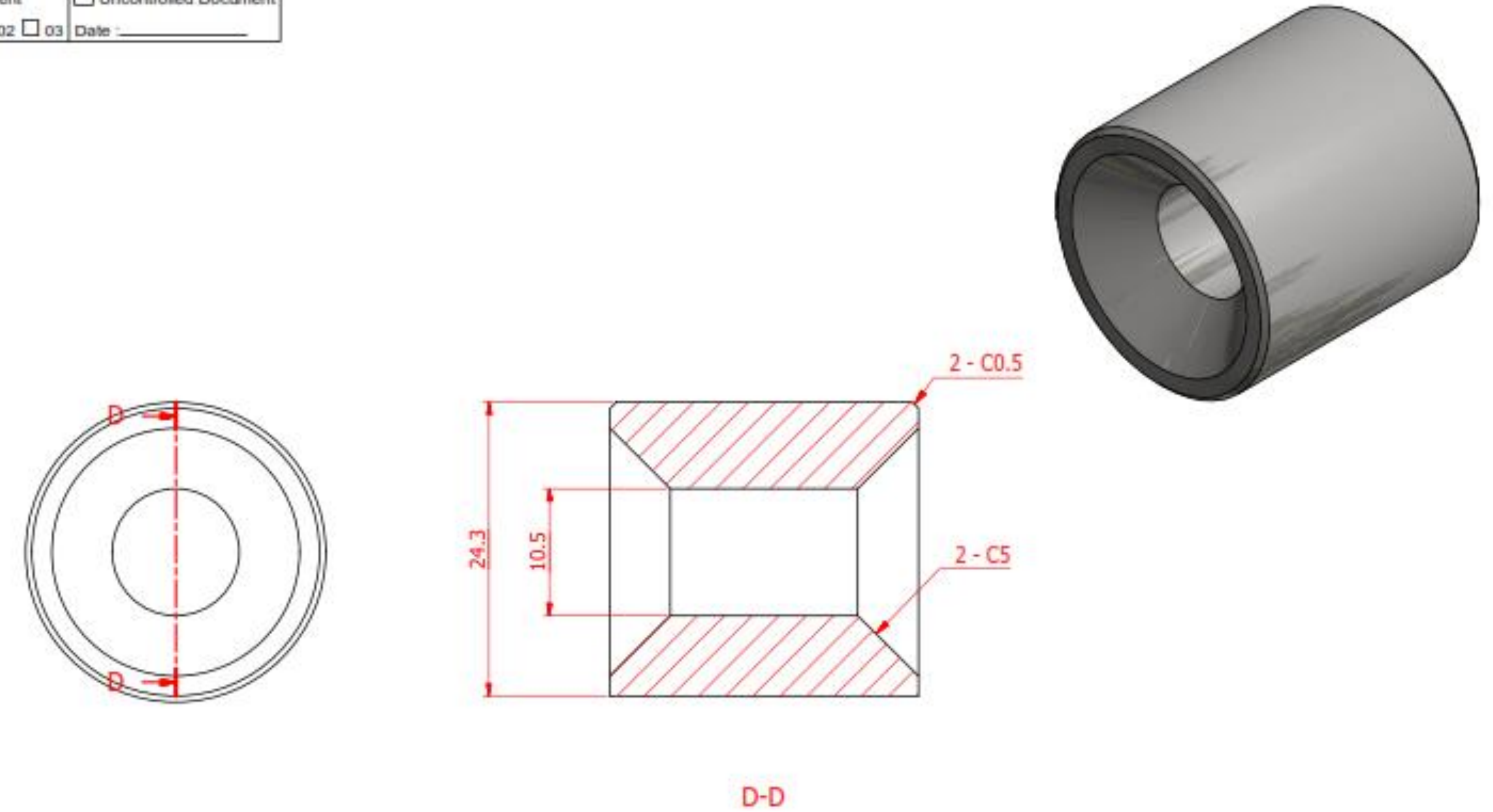

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Copy No. : ☐ 01 ☐ 02 ☐ 03	Date :

General Unless Specification do not show on the drawing

Machining | Welding a = | a =
Chamfering

Ref. : JIS B 0405 (Unit mm.)	up	0.5	3	6	30	120	400	1000
	to	3	6	30	120	400	1000	2000
		-	±0.5	±1	±1.5	±2.5	±4	±6
		±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3
		±0.1	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2
		±0.05		±0.1	±0.15	±0.2	±0.3	±0.5

Angle Tolerance

up	10	50	120	400
to	50	120	400	>400
	±2°	±1°	±30'	±20'
	±1°	±30'	±15'	±10'
	±30'	±20'	±10'	±5'

See Drawing

	Date	Name
Design		
Check		
Verify		

Heat Treatment ——
Coating ——

Scale	Sheet No.	Dimension (mm.)

Customer :

TMC INDUSTRIAL PUBLIC CO.,LTD. (THAILAND)
Phone:+66 38271933 WWW.TMC.CO.TH

Model: HYDRAULIC PRESS 100 TON	Mat. / Std.
Part Name: FRAME	Weight: N/A
Title	Size: A4
Drawing No.: HPP-02-007-003	Rev.

File Name : HPP-02-007-000.dwg

Revise	Revise Description	Ckd.	Date

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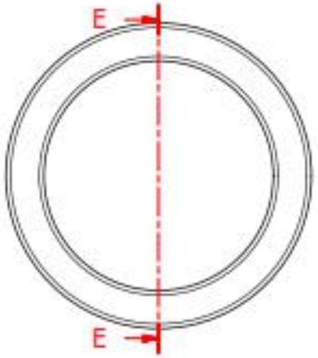

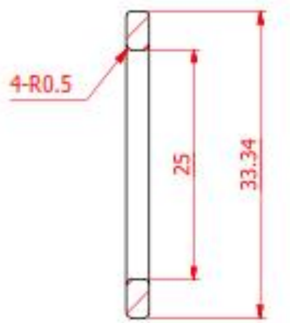

E-E

General Unless Specification do not show on the drawing

Machining: √ (√)

Chamfering

Welding: a = a =

Ref.: JIS B 0405 (Unit mm.)	Length Tolerance							Angle Tolerance			
up	0.5	3	6	30	120	400	1000	10	50	120	400
to	3	6	30	120	400	1000	2000	50	120	400	>400
	-	±0.5	±1	±1.5	±2.5	±4	±6	±2°	±1°	±30'	±20'
	±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	±1°	±30'	±15'	±10'
	±0.1	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±30'	±20'	±10'	±5'
	±0.05		±0.1	±0.15	±0.2	±0.3	±0.5				
	See Drawing										

	Date	Name
Design		
Check		
Verify		

Heat Treatment — - — - —

Coating — - — - —

Scale	Sheet No.	Dimension (mm.)

Customer :

TMC INDUSTRIAL PUBLIC CO.,LTD. (THAILAND)
Phone:+66 38271933 WWW.TMC.CO.TH

Model	Mat. / Std.
HYDRAULIC PRESS 100 TON	
Part Name	**Weight**
FRAME	N/A
Title	**Size**
	A4
Drawing No.	**Rev.**
HPP-02-007-004	

File Name : HPP-02-007-000.dwg

Revise	Revise Description	Ckd.	Date

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REV.01 01/11/56

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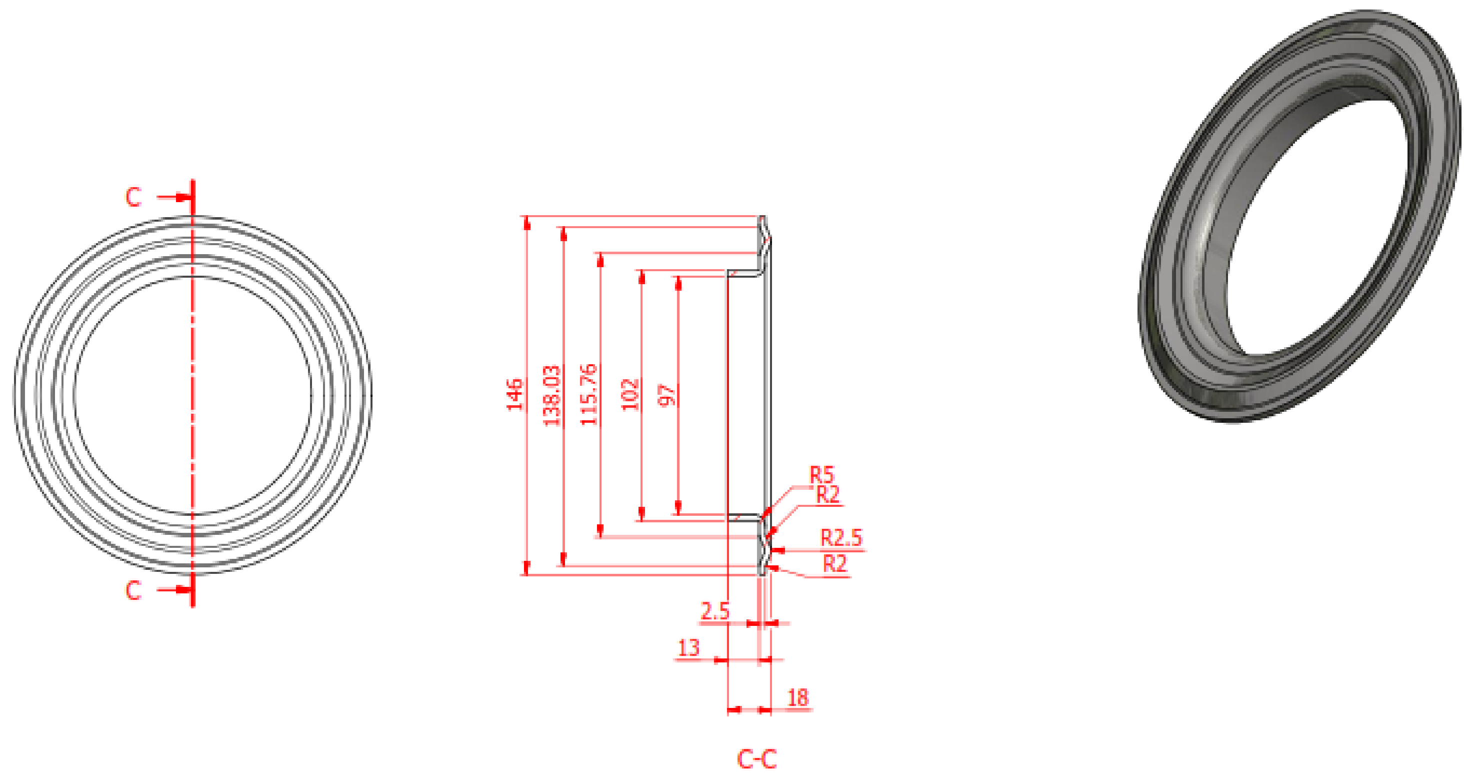
Date : ____________



General Unless Specification do not show on the drawing

Machining

Chamfering

Welding

a =

a =

Ref. : JIS B 0405 (Unit mm.)

Length Tolerance								Angle Tolerance			
up 0.5	3	6	30	120	400	1000	10	50	120	400	
to 3	6	30	120	400	1000	2000	50	120	400	>400	
-	±0.5	±1	±1.5	±2.5	±4	±6	±2°	±1°	±30'	±20'	
±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	±1°	±30'	±15'	±10'	
±0.1	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±30'	±20'	±10'	±5'	
±0.05		±0.1	±0.15	±0.2	±0.3	±0.5					
See Drawing											

	Date	Name
Design		
Check		
Verify		

Heat Treatment —·—·—·—

Coating —·—·—·—

TMC INDUSTRIAL PUBLIC CO.,LTD. (THAILAND)
Phone:+66 3827 1933 WWW.TMC.CO.TH

Model: HYDRAULIC PRESS 100 TON

Mat. / Std.

Part Name: FRAME

Weight: N/A

Title

Size: A4

Scale | Sheet No. | Dimension (mm.) | Drawing No. HPP-02-010-000 | Rev.

Customer :

File Name : Hydraulic Press Frame.dwg

Revise	Revise Description	Ckd.	Date

F-ED-015
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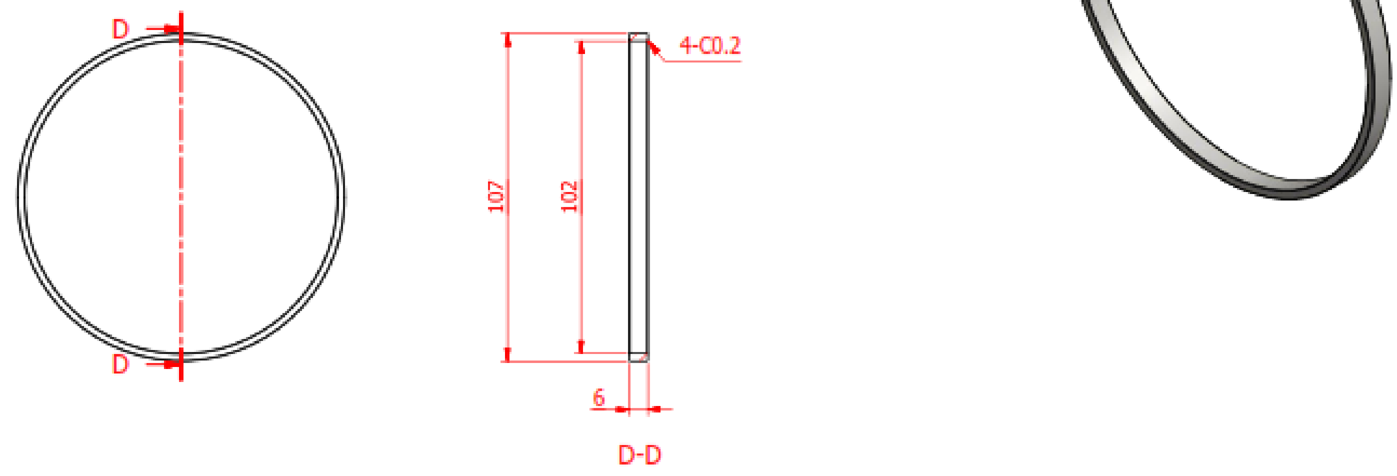
Controlled Document	Uncontrolled Document
Copy No. : ☐ 01 ☐ 02 ☐ 03	Date :



General Unless Specification do not show on the drawing

Machining

Chamfering

Welding

a =

a =

Ref. : JIS B 0405 (Unit mm.)

Length Tolerance							
up	0.5	3	6	30	120	400	1000
to	3	6	30	120	400	1000	2000
	-	±0.5	±1	±1.5	±2.5	±4	±6
	±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3
	±0.1	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2
	±0.05		±0.1	±0.15	±0.2	±0.3	±0.5
	See Drawing						

Angle Tolerance			
10	50	120	400
50	120	400	=400
[illegible]	[illegible]	[illegible]	[illegible]

	Date	Name
Design		
Check		
Verify		

Heat Treatment —·—·—

Coating —·—·—

Scale | Sheet No. | Dimension (mm.)

Customer :

TMC INDUSTRIAL PUBLIC CO.,LTD.(THAILAND)
Phone:+66 38271933 WWW.TMC.CO.TH

Model: HYDRAULIC PRESS 100 TON	Mat. / Std.
Part Name: FRAME	Weight: N/A
Title	Size: A4
Drawing No.: HPP-02-011-000	Rev.

File Name : Hydraulic Press Frame.dwg

Revise	Revise Description	Ckd.	Date

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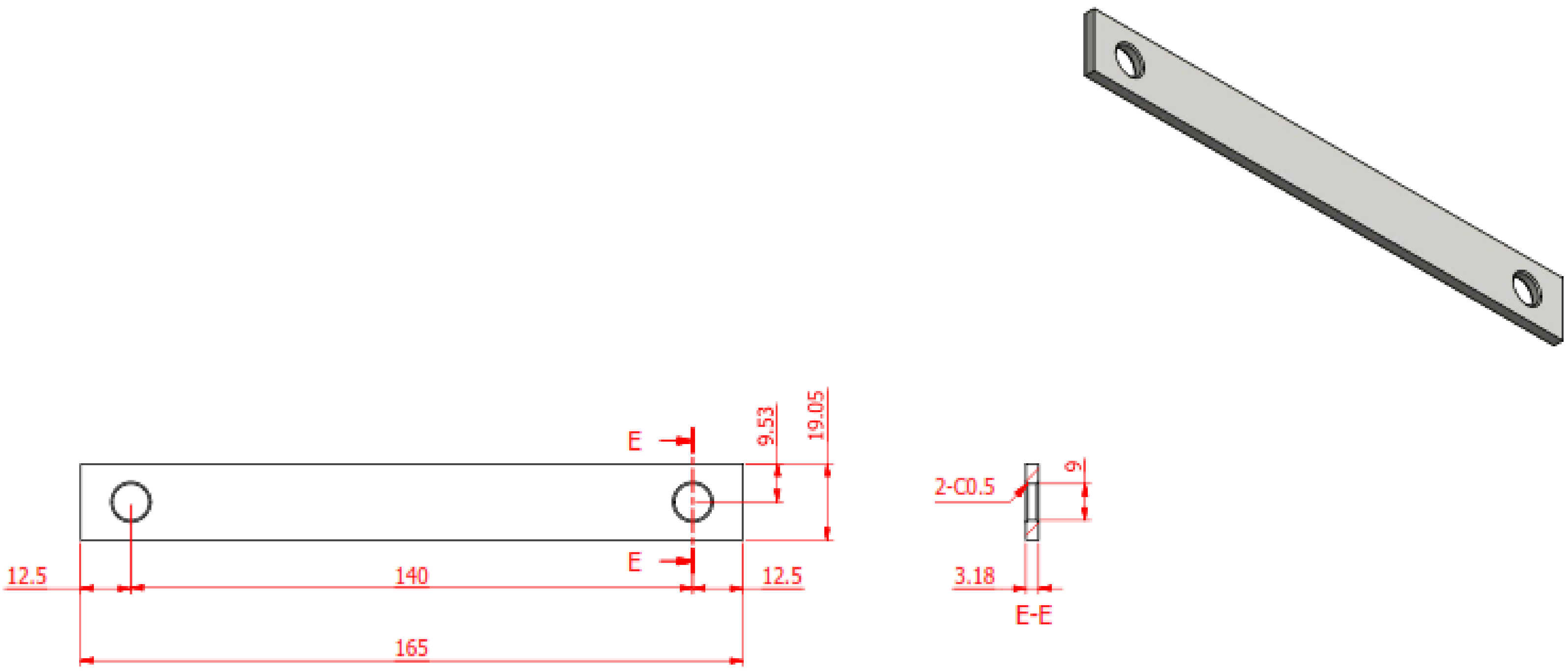
Date : ____________



General Unless Specification do not show on the drawing

Machining
Chamfering
Welding a =
a =

Ref. : JIS B 0405 (Unit mm.)	up	0.5	3	6	30	120	400	1000	10	50	120	400
	to	3	6	30	120	400	1000	2000	50	120	400	>400
		-	±0.5	±1	±1.5	±2.5	±4	±6	±2°	±1°	±30'	±20'
		±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	±1°	±30'	±15'	±10'
		±0.1	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±30'	±20'	±10'	±5'
		±0.05		±0.1	±0.15	±0.2	±0.3	±0.5				
		See Drawing										

Length Tolerance / Angle Tolerance

	Date	Name
Design		
Check		
Verify		

Heat Treatment — - — — - —
Coating — - — — - —

TMC INDUSTRIAL PUBLIC CO.,LTD.(THAILAND)
Phone:+66 3827 1933 WWW.TMC.CO.TH

Model: HYDRAULIC PRESS 100 TON
Mat. / Std.
Part Name: FRAME
Weight: N/A
Title
Size: A4
Scale | Sheet No. | Dimension (mm.) | Drawing No.: HPP-02-012-000 | Rev.
Customer :
File Name : Hydraulic Press Frame.dwg

Revise	Revise Description	Ckd.	Date

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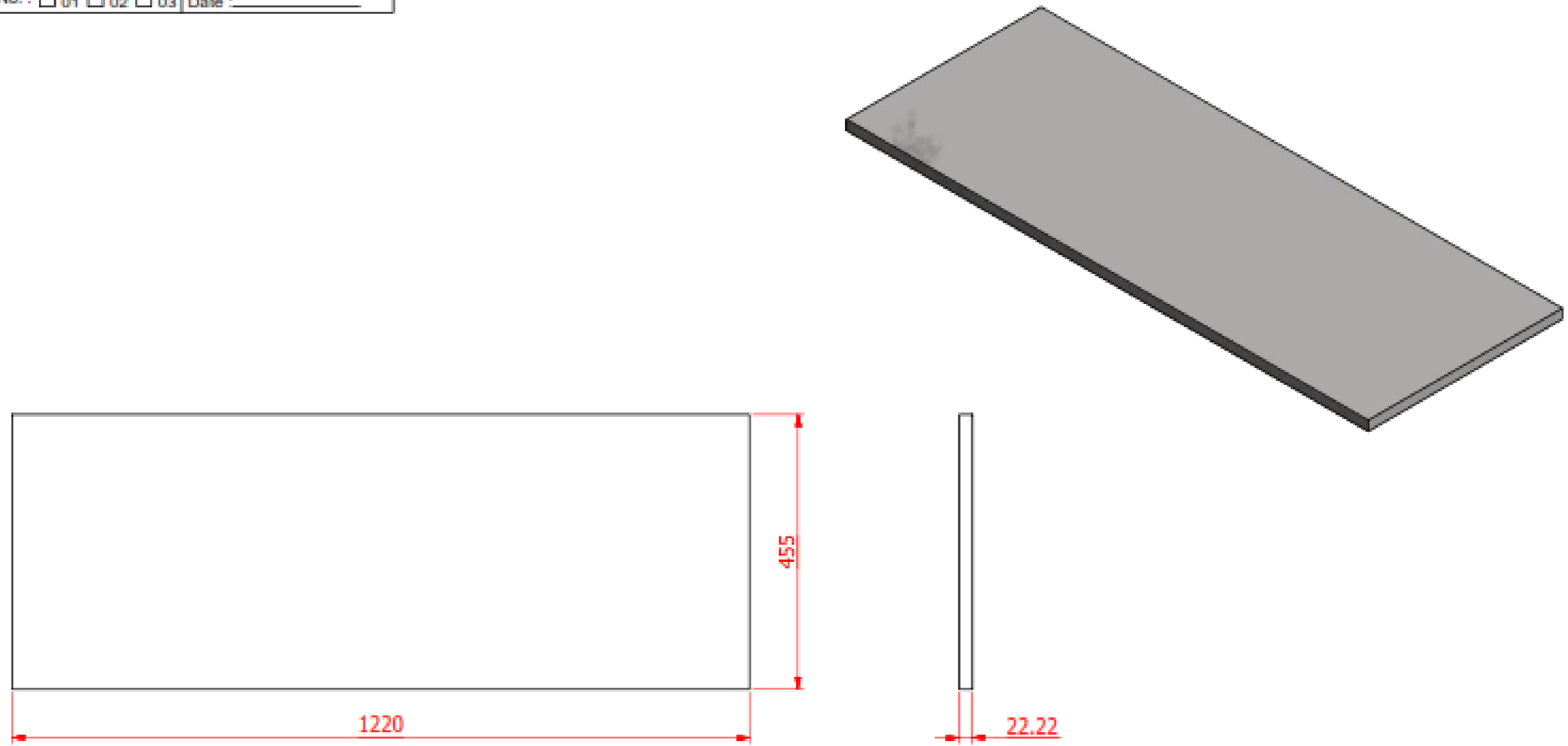
Copy No. : ☐ 01 ☐ 02 ☐ 03	Date : ___________



General Unless Specification do not show on the drawing

Machining

Chamfering

Welding

a =

a =

Ref. : JIS B 0405 (Unit mm.)	Length Tolerance							Angle Tolerance			
up	0.5	3	6	30	120	400	1000	10	50	120	400
to	3	6	30	120	400	1000	2000	50	120	400	>400
	-	±0.5	±1	±1.5	±2.5	±4	±6	±2°	±1°	±30'	±20'
	±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	±1°	±30'	±15'	±10'
	±0.1	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±30'	±20'	±10'	±5'
	±0.05		±0.1	±0.15	±0.2	±0.3	±0.5				
	See Drawing										

	Date	Name
Design		
Check		
Verify		

Heat Treatment — - — - —

Coating — - — - —

TMC INDUSTRIAL PUBLIC CO.,LTD.(THAILAND)

Phone:+66 3827 1933 WWW.TMC.CO.TH

Model: HYDRAULIC PRESS 100 TON

Mat. / Std.

Part Name: FRAME

Weight: N/A

Title

Size: A4

Scale	Sheet No.	Dimension (mm.)	Drawing No.	Rev.
			HPP-02-013-000	

Customer :

File Name : Hydraulic Press Frame.dwg

Revise	Revise Description	Ckd.	Date

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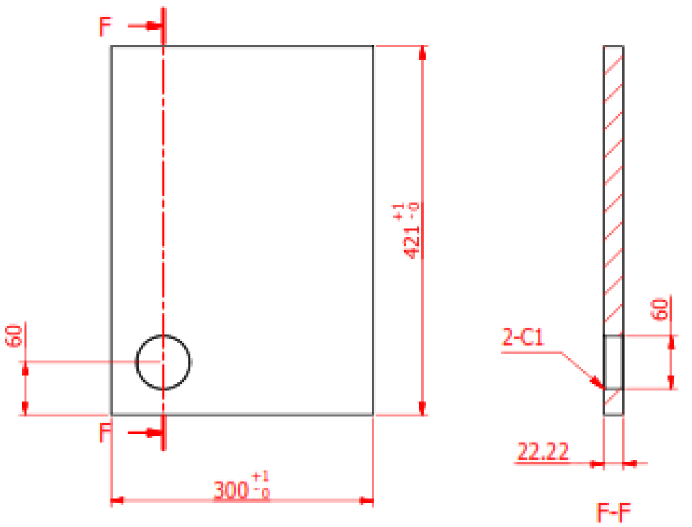
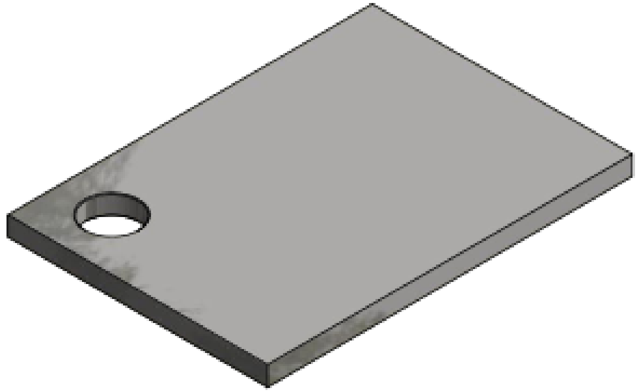
Controlled Document	Uncontrolled Document
Copy No. : ☐ 01 ☐ 02 ☐ 03	Date : ____________





General Unless Specification do not show on the drawing

Machining √ (√)

Chamfering

Welding a = a =

Ref. : JIS B 0405 (Unit mm.)		Length Tolerance							Angle Tolerance			
	up	0.5	3	6	30	120	400	1000	10	50	120	400
	to	3	6	30	120	400	1000	2000	50	120	400	>400
		-	±0.5	±1	±1.5	±2.5	±4	±6	±2°	±1°	±30'	±20'
		±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	±1°	±30'	±15'	±10'
		±0.1	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±30'	±20'	±10'	±5'
		±0.05		±0.1	±0.15	±0.2	±0.3	±0.5				
		See Drawing										

	Date	Name
Design		
Check		
Verify		

Heat Treatment —·—·—

Coating —·—·—

Scale	Sheet No.	Dimension (mm.)	Drawing No. HPP-02-014-000	Rev.

Customer :

TMC INDUSTRIAL PUBLIC CO.,LTD.(THAILAND)
Phone:+66 38271933 WWW.TMC.CO.TH

Model: HYDRAULIC PRESS 100 TON	Mat. / Std.
Part Name: FRAME	Weight: N/A
Title	Size: A4

File Name : Hydraulic Press Frame.dwg

Revise	Revise Description	Ckd.	Date

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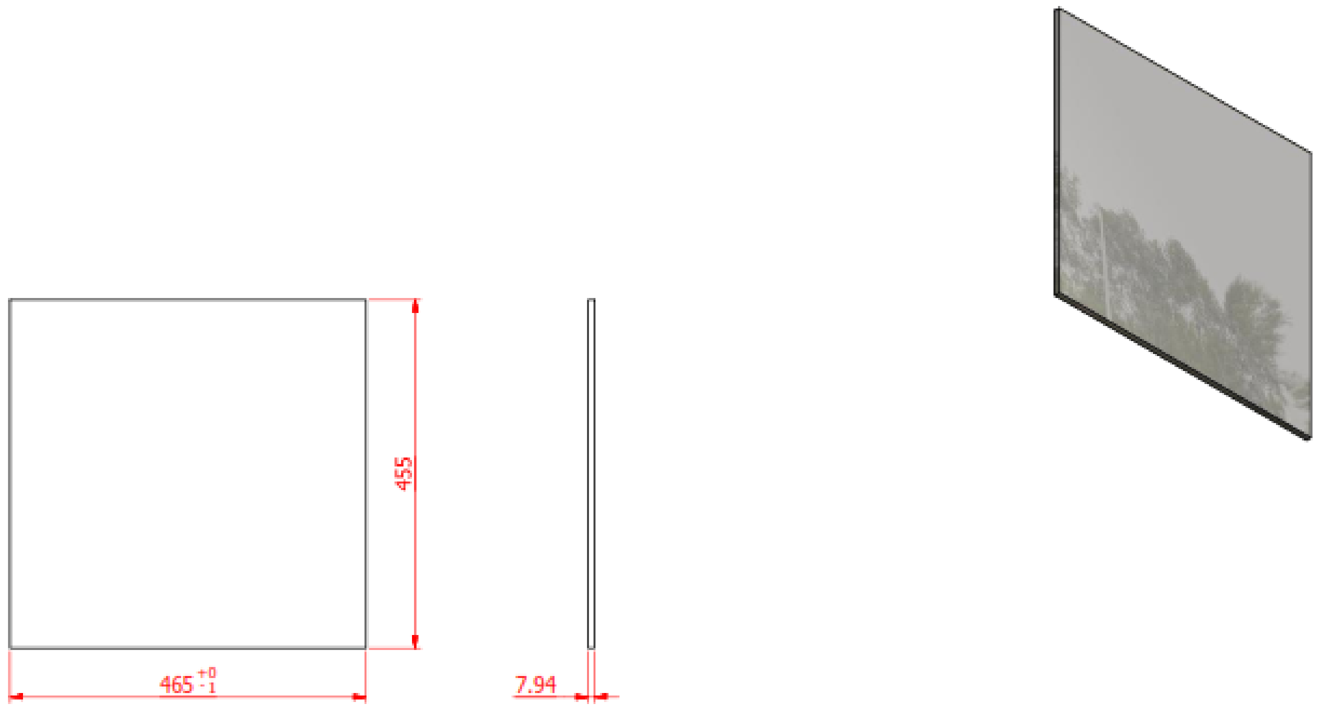

General Unless Specification do not show on the drawing

Machining | Welding a = | a =

Chamfering

Ref. : JIS B 0405 (Unit mm.)

	Length Tolerance							Angle Tolerance			
up	0.5	3	6	30	120	400	1000	10	50	120	400
to	3	6	30	120	400	1000	2000	50	120	400	>400
	-	±0.5	±1	±1.5	±2.5	±4	±6	±2°	±1°	±30'	±20'
	±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	±1°	±30'	±15'	±10'
	±0.1	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±30'	±20'	±10'	±5'
	±0.05		±0.1	±0.15	±0.2	±0.3	±0.5				
	See Drawing										

	Date	Name
Design		
Check		
Verify		

Heat Treatment —·—·——·—

Coating —·—·——·—

TMC INDUSTRIAL PUBLIC CO.,LTD.(THAILAND)
Phone:+66 38271933 WWW.TMC.CO.TH

Model: HYDRAULIC PRESS 100 TON	Mat. / Std.
Part Name: FRAME	Weight: N/A
Title	Size: A4
Drawing No.: HPP-02-015-000	Rev.

Scale | Sheet No. | Dimension (mm.)

Customer :

File Name : Hydraulic Press Frame.dwg

Revise	Revise Description	Ckd.	Date

F-ED-015
REV.01 01/11/56

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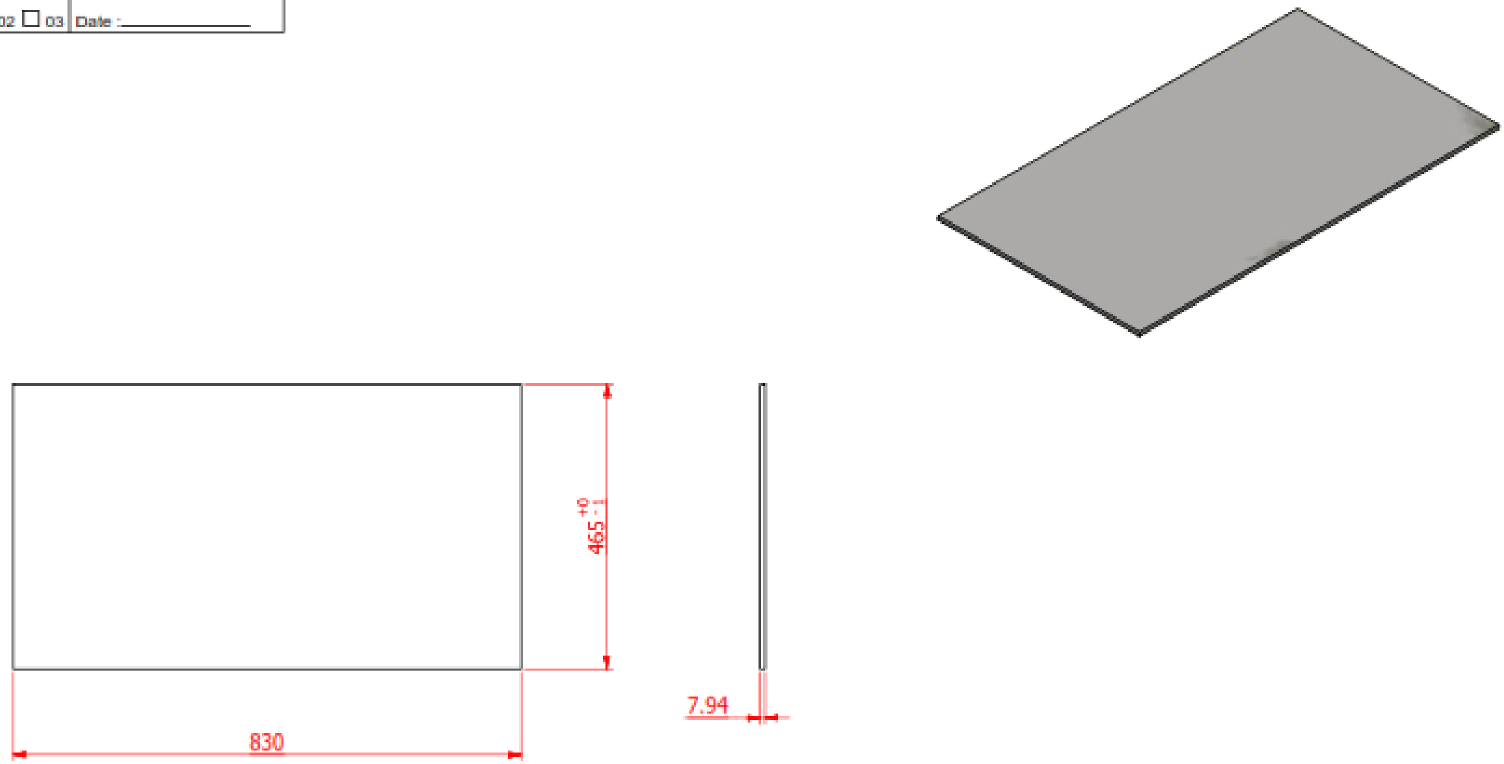
Copy No. : ☐ 01 ☐ 02 ☐ 03

☐ Uncontrolled Document
Date : ____________



General Unless Specification do not show on the drawing

Machining
Chamfering
Welding a =

Ref. : JIS B 0405 (Unit mm.)	Length Tolerance							Angle Tolerance			
up	0.5	3	6	30	120	400	1000	10	50	120	400
to	3	6	30	120	400	1000	2000	50	120	400	>400
	-	±0.5	±1	±1.5	±2.5	±4	±6	±2°	±1°	±30'	±20'
	±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	±1°	±30'	±15'	±10'
	±0.1	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±30'	±20'	±10'	±5'
	±0.05		±0.1	±0.15	±0.2	±0.3	±0.5				
	See Drawing										

	Date	Name
Design		
Check		
Verify		

Heat Treatment — - — - —
Coating — - — - —
Scale | Sheet No. | Dimension (mm.)
Customer :

TMC INDUSTRIAL PUBLIC CO.,LTD.(THAILAND)
Phone:+66 38271933 WWW.TMC.CO.TH

Model: HYDRAULIC PRESS 100 TON
Mat. / Std.
Part Name: FRAME
Weight: N/A
Title
Size: A4
Drawing No.: HPP-02-016-000
Rev.
File Name : Hydraulic Press Frame.dwg

Revise	Revise Description	Ckd.	Date

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REV.01 01/11/56

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Copy No. : ☐ 01 ☐ 02 ☐ 03

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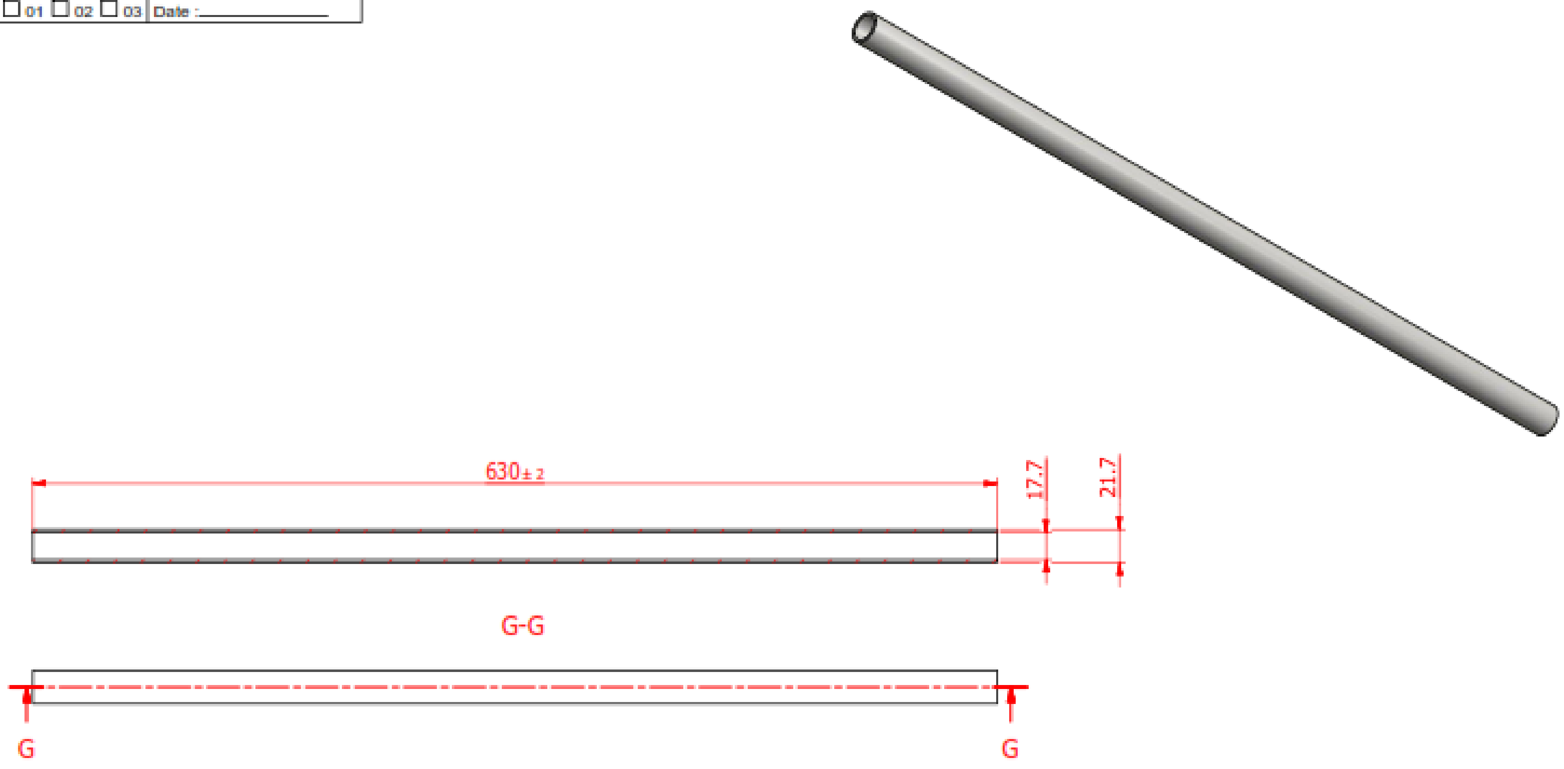
Date : ____________



General Unless Specification do not show on the drawing

Machining
Chamfering
Welding
Ref. : JIS B 0405 (Unit mm.)
Length Tolerance
Angle Tolerance
See Drawing

	Date	Name
Design		
Check		
Verify		

Heat Treatment
Coating

TMC INDUSTRIAL PUBLIC CO.,LTD.(THAILAND)
Phone:+66 38271933 WWW.TMC.CO.TH

Model: HYDRAULIC PRESS 100 TON
Mat. / Std.
Part Name: FRAME
Weight: N/A
Title
Size: A4
Scale
Sheet No.
Dimension (mm.)
Drawing No.: HPP-02-017-000
Rev.
Customer :
File Name : Hydraulic Press Frame.dwg

Revise	Revise Description	Ckd.	Date

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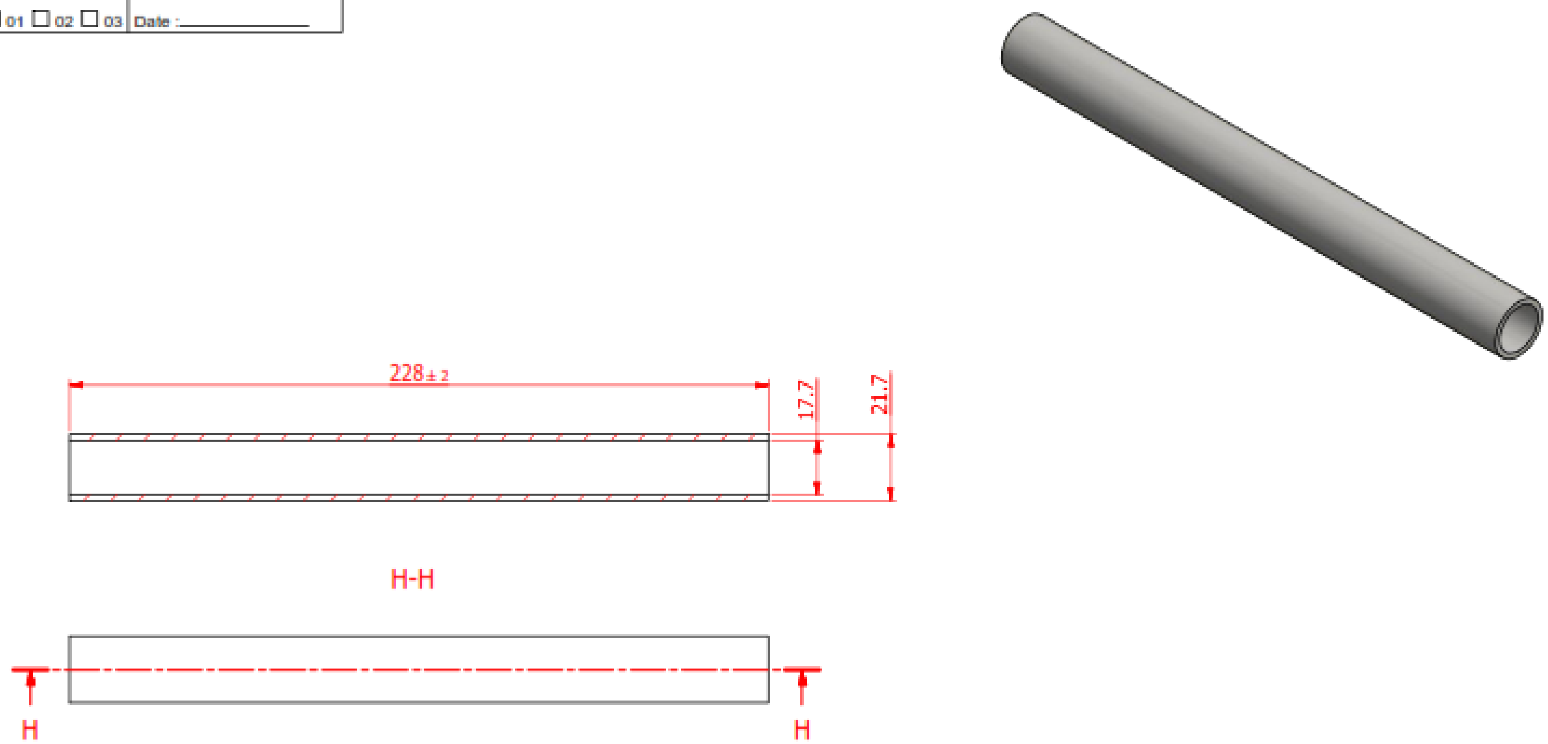
Copy No. : ☐ 01 ☐ 02 ☐ 03

☐ Uncontrolled Document
Date : ____________



General Unless Specification do not show on the drawing

Machining

Chamfering

Welding

Ref. : JIS B 0405 (Unit mm.)

Length Tolerance

Angle Tolerance

See Drawing

	Date	Name
Design		
Check		
Verify		

Heat Treatment

Coating

TMC INDUSTRIAL PUBLIC CO.,LTD.(THAILAND)
Phone:+66 38271933 WWW.TMC.CO.TH

Model: HYDRAULIC PRESS 100 TON

Mat. / Std.

Part Name: FRAME

Weight: N/A

Title

Size: A4

Scale | Sheet No. | Dimension (mm.) | Drawing No. HPP-02-018-000 | Rev.

Customer :

File Name : Hydraulic Press Frame.dwg

Revise	Revise Description	Ckd.	Date

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Copy No. : ☐ 01 ☐ 02 ☐ 03	Date :

General Unless Specification do not show on the drawing

Machining / Chamfering / Welding

Ref.: JIS B 0405 (Unit mm.) — Length Tolerance / Angle Tolerance — See Drawing

	Date	Name
Design		
Check		
Verify		

Heat Treatment —
Coating —

TMC INDUSTRIAL PUBLIC CO.,LTD. (THAILAND)
Phone: +66 38271933 WWW.TMC.CO.TH

Model	HYDRAULIC PRESS 100 TON	Mat. / Std.
Part Name	LOW BEAM	Weight N/A
Title		Size A4
Scale	Sheet No.	Dimension (mm.)
Drawing No.	HPP-03-000-000	Rev.
Customer :	File Name : standard.dwg	

Revise	Revise Description	Ckd.	Date
00 -	First Issue		

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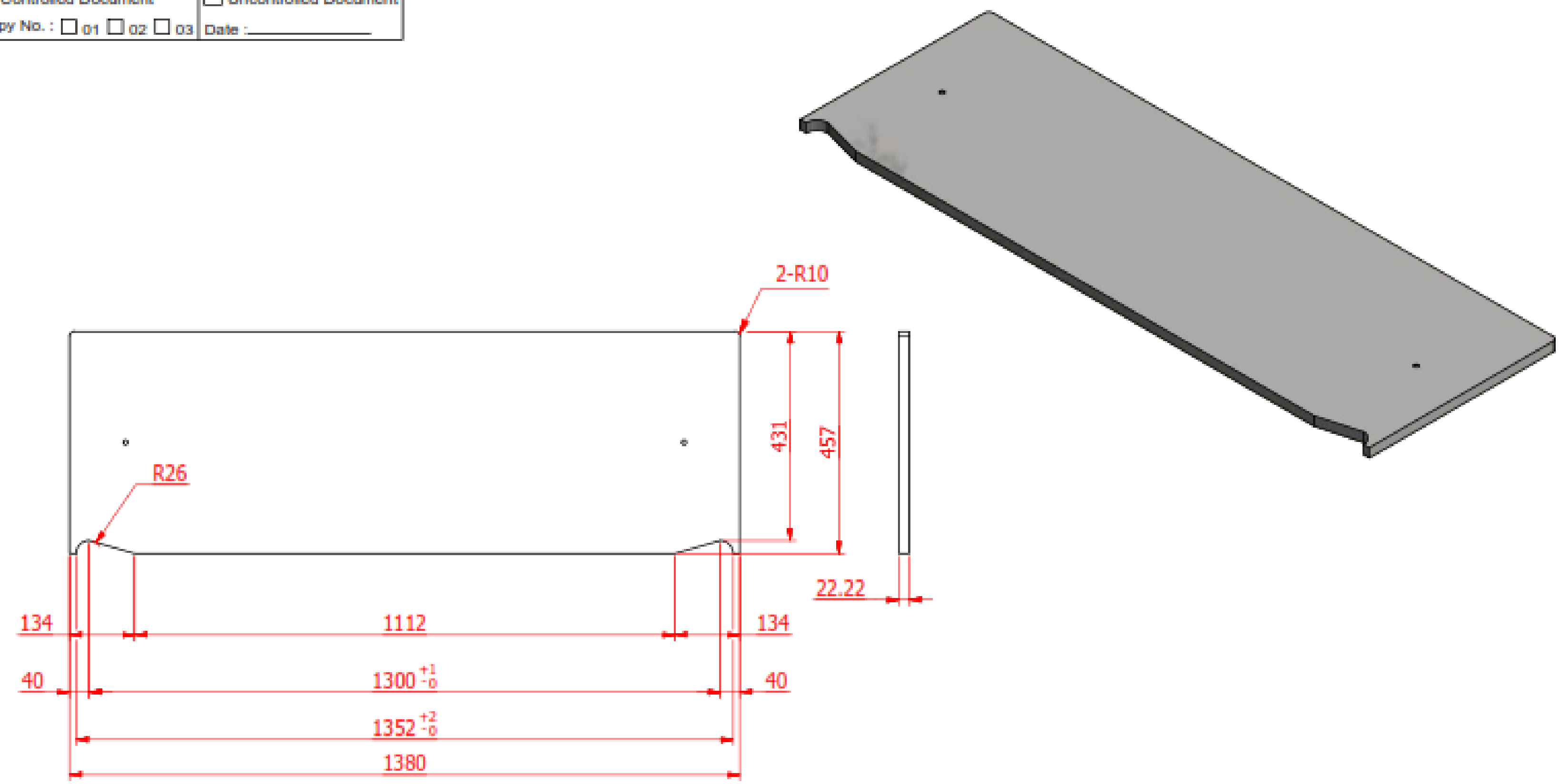

General Unless Specification do not show on the drawing

Machining √ (√)

Chamfering

Welding a = a =

Ref. : JIS B 0405 (Unit mm.)	up	0.5	3	6	30	120	400	1000	10	50	120	400
	to	3	6	30	120	400	1000	2000	50	120	400	>400
		-	±0.5	±1	±1.5	±2.5	±4	±6	±2°	±1°	±30'	±20'
		±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	±1°	±30'	±15'	±10'
		±0.1	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±30'	±20'	±10'	±5'
		±0.05		±0.1	±0.15	±0.2	±0.3	±0.5				
		See Drawing										

(Length Tolerance: columns 0.5–2000; Angle Tolerance: columns 10–>400)

	Date	Name
Design		
Check		
Verify		

Heat Treatment — - — - —

Coating — - — - —

TMC INDUSTRIAL PUBLIC CO.,LTD. (THAILAND)
Phone:+66 38271933 WWW.TMC.CO.TH

Model	Mat. / Std.
HYDRAULIC PRESS 100 TON	
Part Name: FRAME	Weight: N/A
Title	Size: A4

Scale	Sheet No.	Dimension (mm.)	Drawing No.	Rev.
			HPP-03-001-000	

Customer :

File Name : HPP-03-000-000.dwg

Revise		Revise Description	Ckd.	Date
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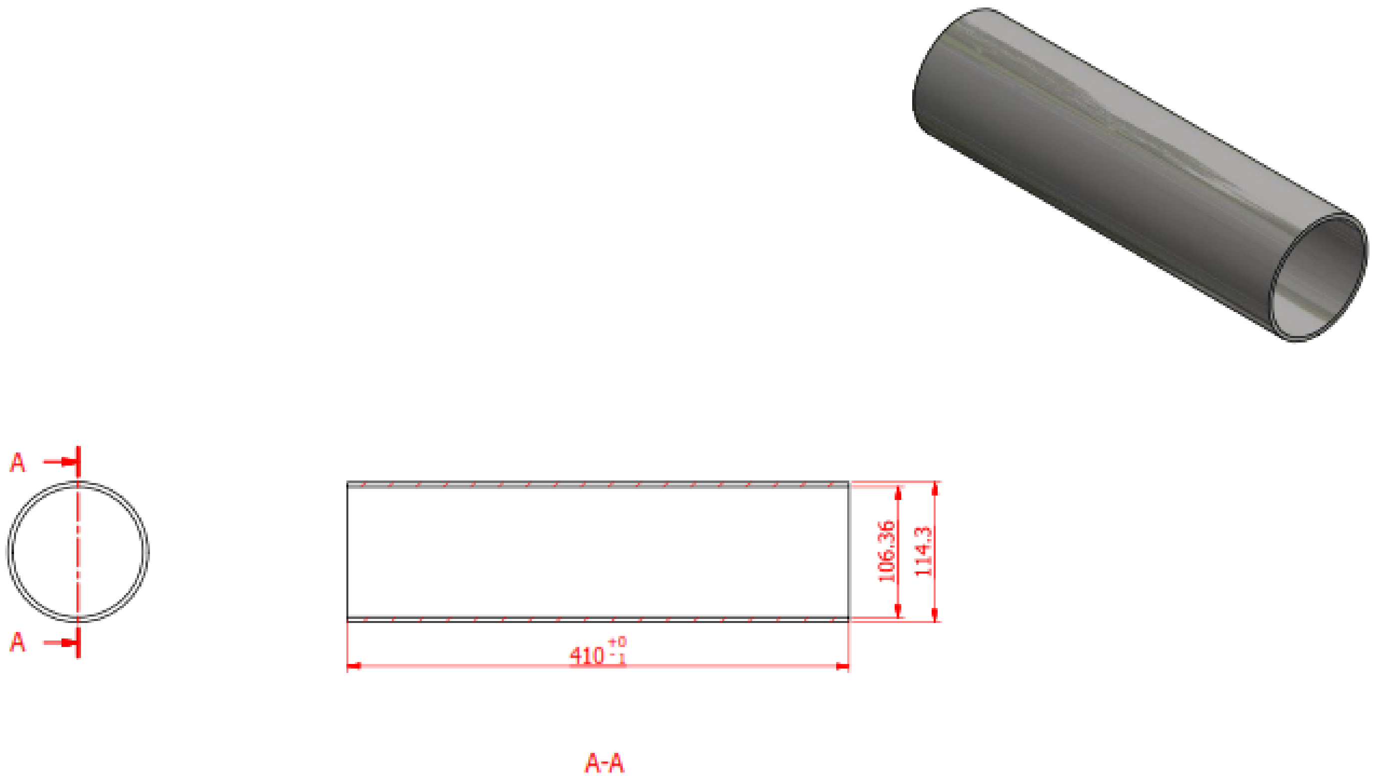

General Unless Specification do not show on the drawing

Machining √ (√)

Chamfering

Welding a = a =

Ref. : JIS B 0405 (Unit mm.)

up	0.5	3	6	30	120	400	1000
to	3	6	30	120	400	1000	2000
Length Tolerance	-	±0.5	±1	±1.5	±2.5	±4	±6
	±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3
	±0.1	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2
	±0.05		±0.1	±0.15	±0.2	±0.3	±0.5
	See Drawing						

Angle Tolerance	10	50	120	400
	50	120	400	>400
	±2°	±1°	±30'	±20'
	±1°	±30'	±15'	±10'
	±30'	±20'	±10'	±5'

	Date	Name
Design		
Check		
Verify		

Heat Treatment —·—·—

Coating —·—·—

TMC INDUSTRIAL PUBLIC CO.,LTD.(THAILAND)
Phone:+66 38271933 WWW.TMC.CO.TH

Model: HYDRAULIC PRESS 100 TON

Mat. / Std.

Part Name: FRAME

Weight: 4,43 kg

Title

Size: A4

Scale | Sheet No. | Dimension (mm.) | Drawing No. HPP-03-002-000 | Rev.

Customer :

File Name : HPP-03-000-000.dwg

Revise	Revise Description	Ckd.	Date

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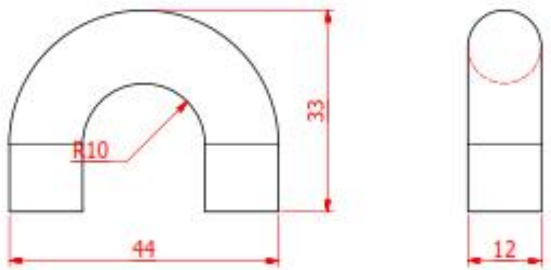

General Unless Specification do not show on the drawing

Machining | Welding
Chamfering

Ref. : JIS B 0405 (Unit mm.)

	Design	Check	Verify
Date			
Name			

Heat Treatment
Coating
Scale | Sheet No. | Dimension (mm.)
Customer :

TMC INDUSTRIAL PUBLIC CO.,LTD.(THAILAND)
Phone:+66 38271933 WWW.TMC.CO.TH

Model: HYDRAULIC PRESS 100 TON
Mat. / Std.
Part Name: FRAME
Weight: 0,06 kg
Title
Size: A4
Drawing No.: HPP-03-003-000
Rev.
File Name : HPP-03-000-000.dwg

Revise	Revise Description	Ckd.	Date

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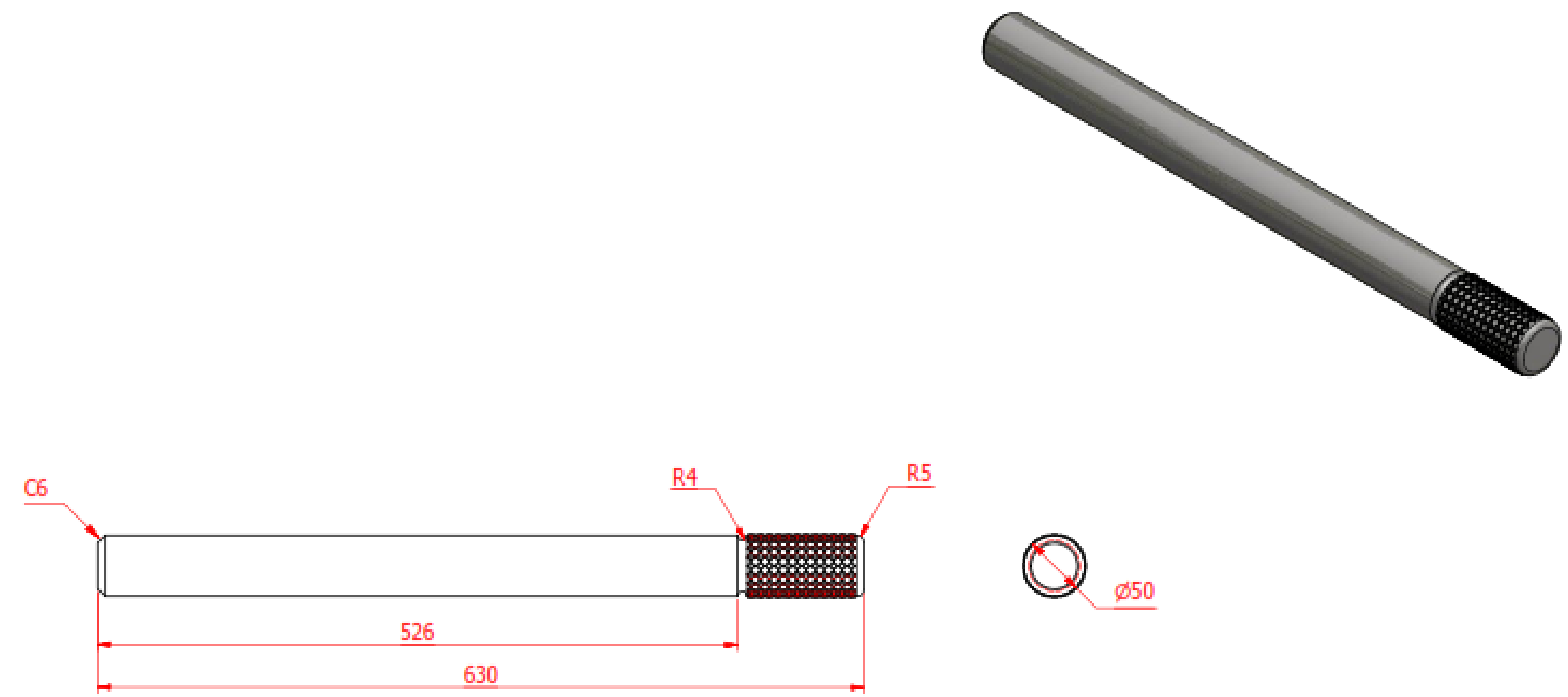

Revise	Revise Description	Ckd.	Date
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General Unless Specification do not show on the drawing

Machining √ (√) | Chamfering | Welding a = | a =

Ref. : JIS B 0405 (Unit mm.)	Length Tolerance							Angle Tolerance			
up	0.5	3	6	30	120	400	1000	10	50	120	400
to	3	6	30	120	400	1000	2000	50	120	400	>400
	-	±0.5	±1	±1.5	±2.5	±4	±6	±2°	±1°	±30'	±20'
	±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	±1°	±30'	±15'	±10'
	±0.1	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±30'	±20'	±10'	±5'
	±0.05		±0.1	±0.15	±0.2	±0.3	±0.5				
	See Drawing										

	Date	Name
Design		
Check		
Verify		
Heat Treatment — - — - —		
Coating — - — - —		

TMC INDUSTRIAL PUBLIC CO.,LTD.(THAILAND)
Phone:+66 38271933 WWW.TMC.CO.TH

Model: HYDRAULIC PRESS 100 TON	Mat. / Std.
Part Name: FRAME	Weight: N/A
Title	Size: A4
Scale	Sheet No.
Dimension (mm.)	Drawing No.: HPP-05-001-000
Rev.	
Customer :	File Name : HPP-05-000-000.dwg

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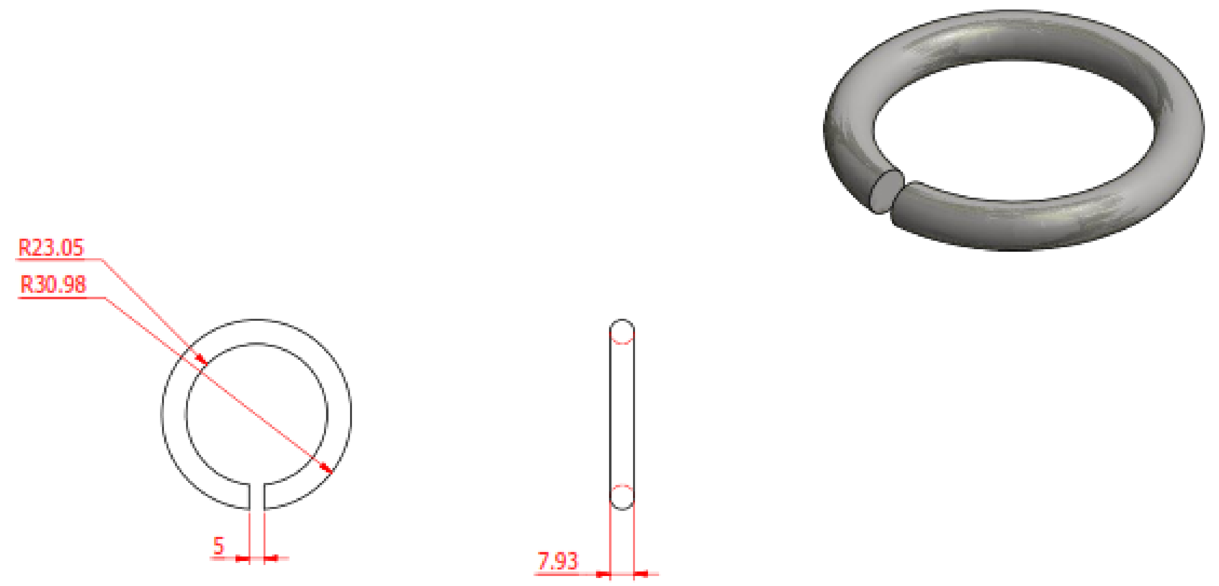
Copy No. : ☐ 01 ☐ 02 ☐ 03

☐ Uncontrolled Document
Date : ____________



General Unless Specification do not show on the drawing

Machining
Chamfering
Welding

Ref. : JIS B 0405 (Unit mm.)

Length Tolerance up	0.5	3	6	30	120	400	1000
to	3	6	30	120	400	1000	2000
	-	±0.5	±1	±1.5	±2.5	±4	±6
	±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3
	±0.1	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2
	±0.05		±0.1	±0.15	±0.2	±0.3	±0.5
	See Drawing						

Angle Tolerance up	10	50	120	400
to	50	120	400	>400
	±2°	±1°	±30'	±20'
	±1°	±30'	±15'	±10'
	±30'	±20'	±10'	±5'

	Date	Name
Design		
Check		
Verify		

Heat Treatment — - — - —
Coating — - — - —

TMC INDUSTRIAL PUBLIC CO.,LTD.(THAILAND)
Phone:+66 38271933 WWW.TMC.CO.TH

Model	HYDRAULIC PRESS 100 TON	Mat. / Std.	
Part Name	FRAME	Weight	N/A
Title		Size	A4

Scale	Sheet No.	Dimension (mm.)	Drawing No. HPP-05-002-000	Rev.

Customer :
File Name : HPP-05-000-000.dwg

Revise	Revise Description	Ckd.	Date

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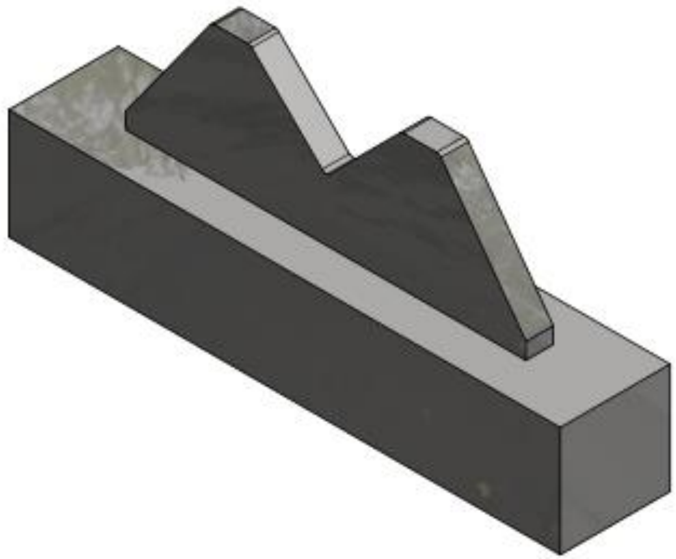
Copy No. : ☐ 01 ☐ 02 ☐ 03 Date : ____________



General Unless Specification do not show on the drawing

Machining / Chamfering / Welding a = / a =

Ref. : JIS B 0405 (Unit mm.)		Length Tolerance								Angle Tolerance			
up	0.5	3	6	30	120	400	1000		10	50	120	400
to	3	6	30	120	400	1000	2000		50	120	400	>400
	-	±0.5	±1	±1.5	±2.5	±4	±6		±2°	±1°	±30'	±20'
	±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3		±1°	±30'	±15'	±10'
	±0.1	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2		±30'	±20'	±10'	±5'
	±0.05		±0.1	±0.15	±0.2	±0.3	±0.5					
	See Drawing											

	Date	Name
Design		
Check		
Verify		

Heat Treatment —·—·—
Coating —·—·—

Scale	Sheet No.	Dimension (mm.)

Customer :

TMC INDUSTRIAL PUBLIC CO.,LTD.(THAILAND)
Phone:+66 38271933 WWW.TMC.CO.TH

Model	Mat. / Std.
HYDRAULIC PRESS 100 TON	
Part Name: SUPPORT BEAM	Weight: N/A
Title	Size: A4
Drawing No.: HPP-02-001-000	Rev.

File Name : HPP-04-000-000 (support beam).dwg

Revise		Revise Description	Ckd.	Date
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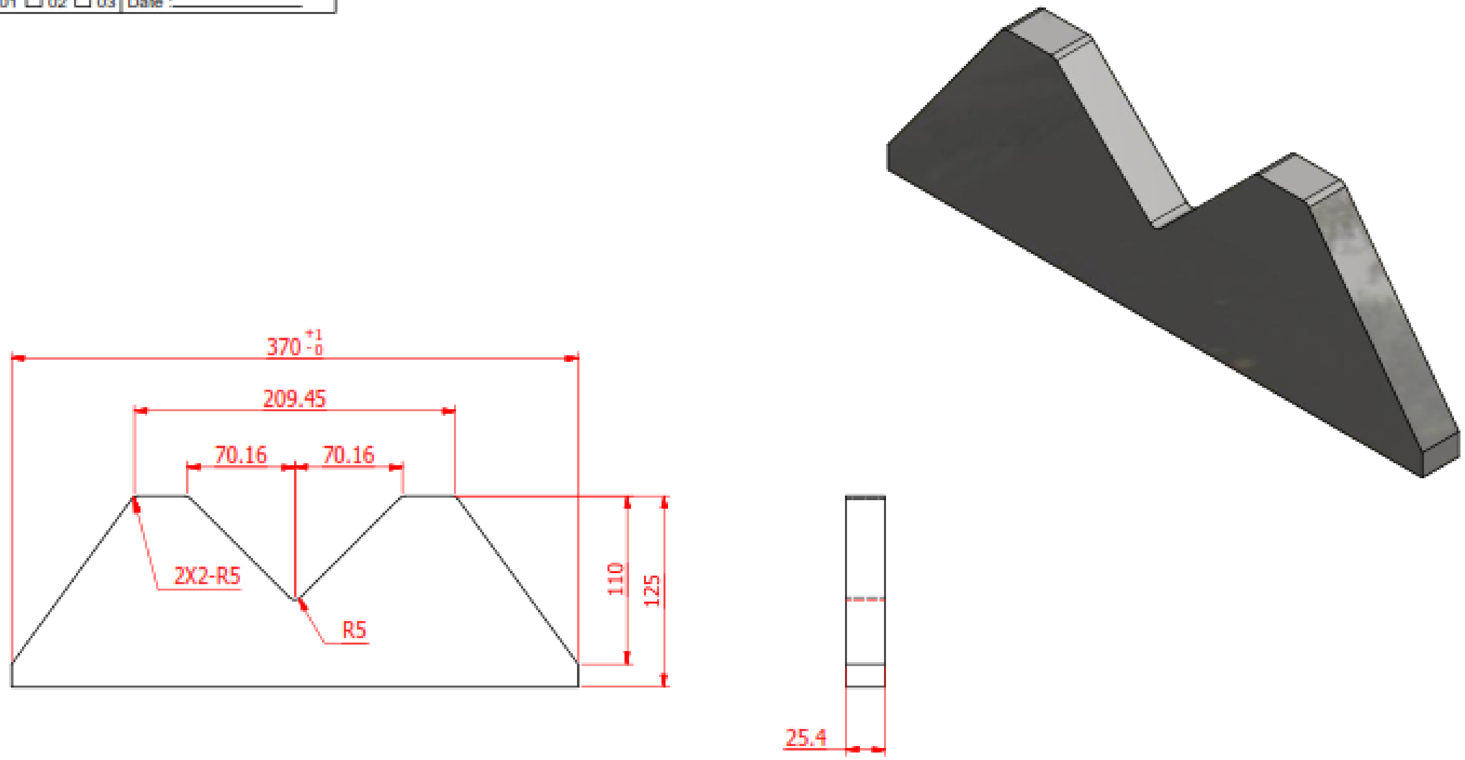

General Unless Specification do not show on the drawing

Machining √ (√) | Welding a = | a =

Chamfering

Ref. : JIS B 0405 (Unit mm.)		Length Tolerance							Angle Tolerance			
	up	0.5	3	6	30	120	400	1000	10	50	120	400
	to	3	6	30	120	400	1000	2000	50	120	400	>400
		-	±0.5	±1	±1.5	±2.5	±4	±6	±2°	±1°	±30'	±20'
		±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	±1°	±30'	±15'	±10'
		±0.1	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±30'	±20'	±10'	±5'
		±0.05		±0.1	±0.15	±0.2	±0.3	±0.5				
		See Drawing										

	Date	Name
Design		
Check		
Verify		

Heat Treatment —·—·—

Coating —·—·—

TMC INDUSTRIAL PUBLIC CO.,LTD.(THAILAND)
Phone:+66 38271933 WWW.TMC.CO.TH

Model: HYDRAULIC PRESS 100 TON	Mat. / Std.	
Part Name: FRAME	Weight: N/A	
Title		Size: A4
Scale	Sheet No.	Dimension (mm.)
Drawing No.: HPP-04-001-000	Rev.	
Customer :	File Name : HPP-04-000-000.dwg	

Revise		Revise Description	Ckd.	Date
00	-	First Issue		

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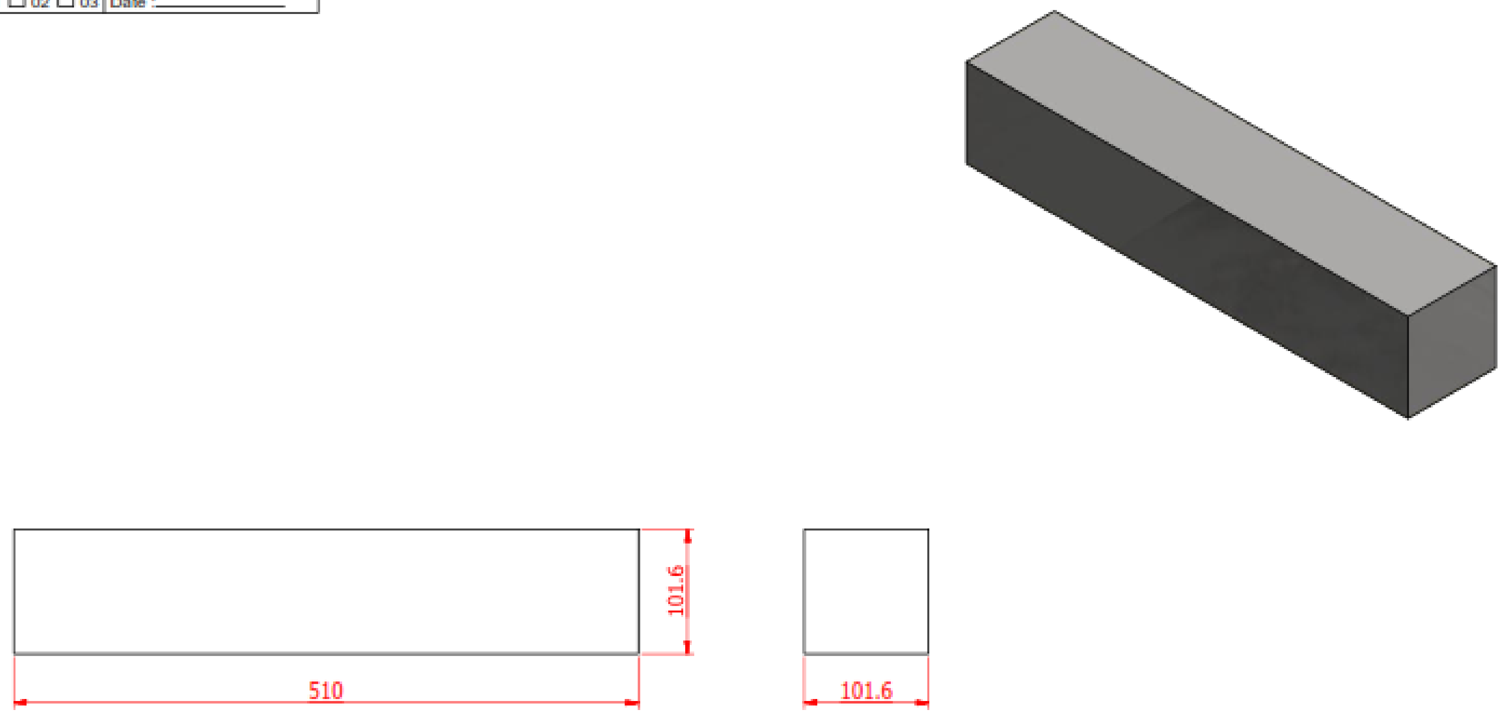

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Copy No. : ☐ 01 ☐ 02 ☐ 03 Date : ____________

General Unless Specification do not show on the drawing

Machining | Welding | Chamfering

Ref. : JIS B 0405 (Unit mm.)	Length Tolerance							Angle Tolerance			
up	0.5	3	6	30	120	400	1000	10	50	120	400
to	3	6	30	120	400	1000	2000	50	120	400	>400
	-	±0.5	±1	±1.5	±2.5	±4	±6	±2°	±1°	±30'	±20'
	±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	±1°	±30'	±15'	±10'
	±0.1	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±30'	±20'	±10'	±5'
	±0.05		±0.1	±0.15	±0.2	±0.3	±0.5				
	See Drawing										

	Date	Name
Design		
Check		
Verify		

Heat Treatment —·—·—
Coating —·—·—

TMC INDUSTRIAL PUBLIC CO.,LTD.(THAILAND)
Phone:+66 38271933 WWW.TMC.CO.TH

Model: HYDRAULIC PRESS 100 TON	Mat. / Std.
Part Name: FRAME	Weight: N/A
Title	Size: A4
Scale	Sheet No.
Dimension (mm.)	Drawing No.: HPP-04-002-000
Rev.	
Customer :	File Name : HPP-04-000-000.dwg

Revise	Revise Description	Ckd.	Date

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ATTACHMENT 3

Design of Power Unit

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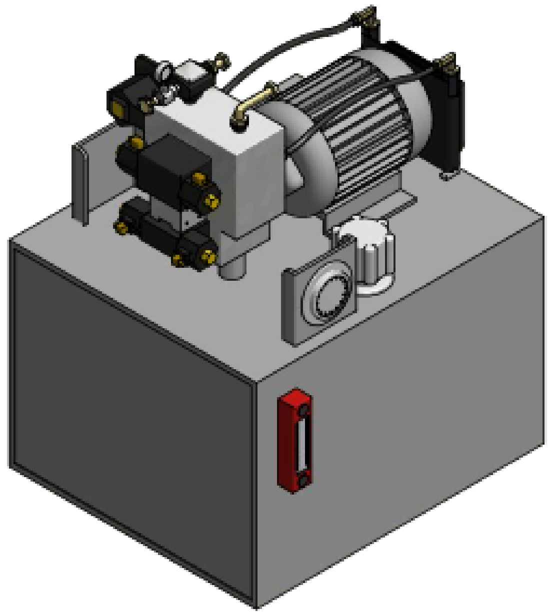

General Unless Specification do not show on the drawing

Machining | Welding
Chamfering

Ref. : JIS B 0405 (Unit mm.)		Length Tolerance							Angle Tolerance			
	up	0.5	3	6	30	120	400	1000	10	50	120	400
	to	3	6	30	120	400	1000	2000	50	120	400	=400
		-	±0.5	±1	±1.5	±2.5	±4	±6	±2°	±1°	±30'	±20'
		±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	±1°	±30'	±15'	±10'
		±0.1	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±30'	±20'	±10'	±5'
		±0.05		±0.1	±0.15	±0.2	±0.3	±0.5				
		See Drawing										

	Date	Name
Design		
Check		
Verify		

Heat Treatment — - — - —
Coating — - — - —

TMC INDUSTRIAL PUBLIC CO.,LTD.(THAILAND)
Phone:+66 38271933 WWW.TMC.CO.TH

Model	Mat. / Std.
HYDRAULIC PRESS 100 TON	
Part Name: FRAME	Weight: N/A
Title	Size: A4

Scale	Sheet No.	Dimension (mm.)	Drawing No.	Rev.
			HPP-02-001-000	

Customer :
File Name : power unit-1.dwg

Revise		Revise Description	Ckd.	Date
00	-	First Issue		

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ATTACHMENT 4

Design of Hydraulic Press Machine 100 Tons

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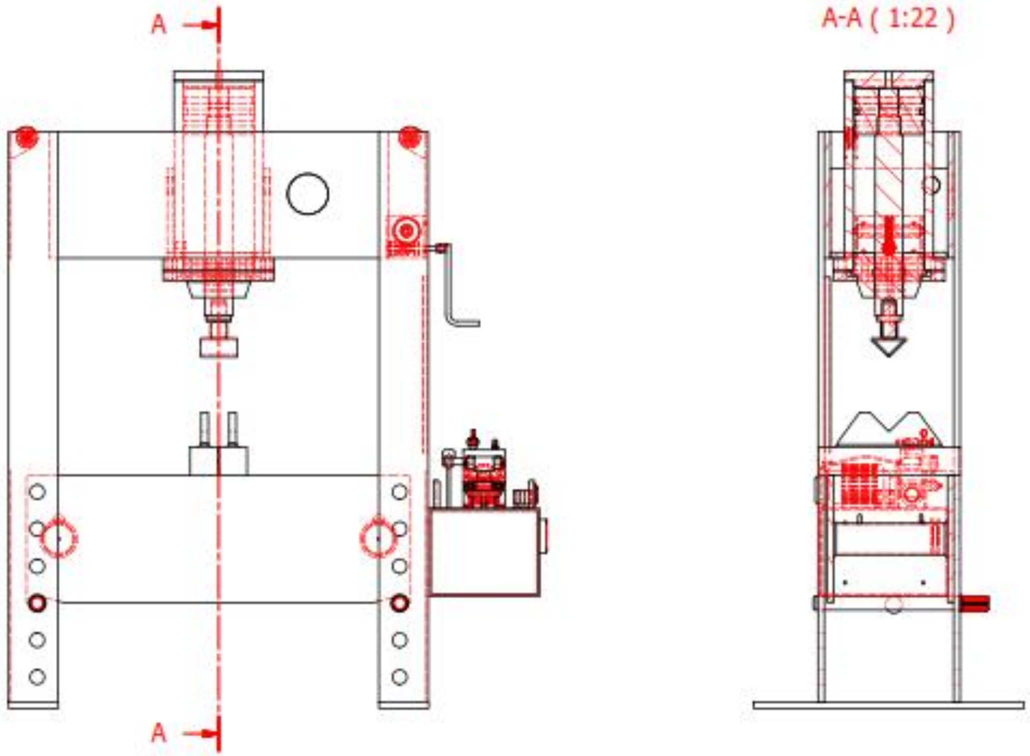

General Unless Specification do not show on the drawing

Machining | Welding | Chamfering

Ref. : JIS B 0405 (Unit mm.)	up 0.5 to 3	3–6	6–30	30–120	120–400	400–1000	1000–2000
	-	±0.5	±1	±1.5	±2.5	±4	±6
	±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3
	±0.1	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2
	±0.05		±0.1	±0.15	±0.2	±0.3	±0.5

See Drawing

	Date	Name
Design		
Check		
Verify		

Heat Treatment ---------

Coating ---------

TMC INDUSTRIAL PUBLIC CO.,LTD.(THAILAND) Phone:+66 38271933 WWW.TMC.CO.TH

Model: HYDRAULIC PRESS 100 TON | Mat. / Std.

Part Name: DESIGN HYDRAULIC PRESS | Weight: N/A

Title | Size: A4

Scale | Sheet No. | Dimension (mm.) | Drawing No.: HPP-01-000-000 | Rev.

Customer : | File Name : Assembly All FIX.dwg

Revise		Revise Description	Ckd.	Date
00	-	First Issue		

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REV.01 01/11/56

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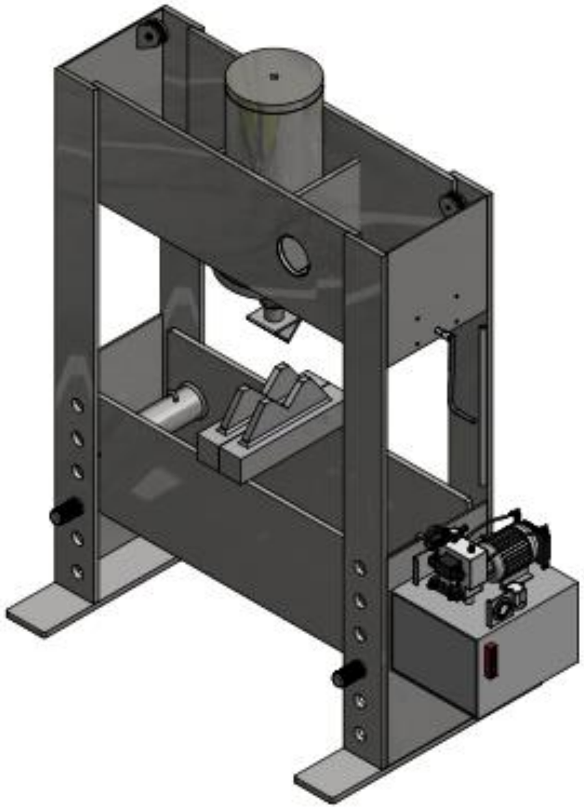

General Unless Specification do not show on the drawing

Machining √ (√)

Chamfering

Welding a =

Ref. : JIS B 0405 (Unit mm.)		Length Tolerance							Angle Tolerance			
	up	0.5	3	6	30	120	400	1000	10	50	120	400
	to	3	6	30	120	400	1000	2000	50	120	400	>400
∇ = ∼		-	±0.5	±1	±1.5	±2.5	±4	±6	±2°	±1°	±30'	±20'
∇ = ∇		±0.2	±0.3	±0.5	±0.8	±1.2	±2	±3	±1°	±30'	±15'	±10'
∇ = ∇∇		±0.1	±0.1	±0.2	±0.3	±0.5	±0.8	±1.2	±30'	±20'	±10'	±5'
∇ = ∇∇∇		±0.05		±0.1	±0.15	±0.2	±0.3	±0.5				
∇ = ∇∇∇∇		See Drawing										

	Date	Name
Design		
Check		
Verify		

Heat Treatment —·—·—

Coating —·—·—

Scale	Sheet No.	Dimension (mm.)

Customer :

TMC INDUSTRIAL PUBLIC CO.,LTD. (THAILAND)
Phone:+66 38271933 WWW.TMC.CO.TH

Model: HYDRAULIC PRESS 100 TON	Mat. / Std.
Part Name: 3D MODEL OF HYDRAULIC PRESS	Weight: N/A
Title	Size: A4
Drawing No.: HPP-01-000-000 VIEW	Rev.

File Name : Assembly All FIX.dwg

Revise	Revise Description	Ckd.	Date

F-ED-015
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