A1.1 Cálculos para elección de paneles solares

Para la selección de la cantidad de paneles solares a emplearse en el seguidor solar se empleará el peor de los casos del nivel de radiación promedio para las zonas sierra y selva obtenida del atlas de energía solar del Perú de senhami [7].

Tabla A1.1 Radiación promedio en un día de bajo nivel de radiación

Nivel de radiación promedio (kWh/m2)
4.56

Con el valor anterior se pasa a calcular el consumo de un hogar en zonas rurales estimando el consumo estándar en las zonas rurales.

Tabla A1.2 Consumo eléctrico de un hogar en la zona rural aislada

Consumo eléctrico de un hogar en la zona rural aislada				
Aparato Eléctrico	**potencia consumida(W)**	**Cant.**	**tiempo de uso (h)**	**Potencia(Wh)**
Iluminación (focos)	60	4	3	720
celulares	0.5	2	2	2
Tv	60	1	4	240
Radio	40	1	2	80
consumo extra 1	10	1	2	20
consumo extra 2	10	1	2	20
			Total (W)	1082

Como se aprecia en la tabla A.2 se requiere de un consumo 1082 Wh, con esto se puede sacar la potencia pico de los paneles:

$$Wpico = 1200 * \frac{1082}{1000 * 4.56},$$

$$Wpico = 284.7368\, W\, .$$

Para la selección de los paneles solares se usó la potencia que ofrece cada uno para alimentar el consumo necesario anteriormente calculado (1082W) y para seleccionar cual es el mejor se usó los precios unitarios.

$$Cantidad = \frac{284.7368}{potencia\ de\ posible\ panel}.$$

Se usaron precios referenciales de la página SOLARCORP PERU.

Tabla A1.3 Selección de cantidad y tipo de panel solar

Panel Solar:				
Potencia(W)	**Cantidad**	**Entero**	**Costo unitario (US$)**	**Costo total (US$)**
50	5.69	6	98	588
75	3.80	4	140	560
100	2.85	3	195	585
150	1.90	2	275	550
200	1.42	2	367	734
250	1.14	2	459	918
300	0.95	1	551	551

En la tabla A1.3 se resaltó el tipo de panel seleccionado, que es de 150 W y una cantidad de 2 unidades.

Para la selección del banco de baterías que permitirán almacenar energía para su uso en los tiempos en que el panel no se encuentre en funcionamiento.

Tabla A1.4 valores estándares para la selección de la batería

Baterías	**Valores estándares**
Días de autonomía	0.5
Rendimiento	0.8
Grado de descarga	0.8
Voltaje de Entrada	12

$$I = 1082 * \frac{0.5}{0.8 * 0.8 * 12},$$

$$I = 70.44\ Ah\ .$$

Se requiere de un banco de baterías con la capacidad de amperaje mayor a 70.44 Ah.

Tabla A1.5 Selección de cantidad y tipo del banco de baterías

Amperaje(Ah)	**Cantidad (calculo)**	**Entero**	**Costo unitario (S/.)**	**Costo total (S/.)**
70	1.01	1	300	300
75	0.94	1	253	253
90	0.78	1	378	378
102	0.69	1	330	330

En la tabla A.5 se resaltó el tipo de batería seleccionada, que es de 75 Ah y una cantidad de 1 unidad.

Para la selección del controlador o regulador y del inversor se toman los valores anteriormente hallados.

$$Amperaje\ controlador = \frac{284.7368\ W}{12\ V}.$$

Tabla A1.6 Información para la selección del controlador y el inversor

Controlador	**Amperaje**	**Valor entero**
Carga Máxima	23.72807018 A	24 A
Inversor:		
entrada	12 VDC	
Salida	220VAC	
frecuencia	60 Hz	

En la tabla A1.6 se selecciona un regulador de un amperaje mayor o igual a 24 A. Además de un inversor que convierta de 12 VDC a 220 VAC.

A2.1 Cálculo del ángulo de giro óptimo del módulo fotovoltaico

Para el desarrollo del programa del seguimiento del sol, se presentan los siguientes cálculos que permiten determinar la posición del sol, dependiendo de la hora y la locación en el planeta donde se quiere saber estos valores.

Entradas:

α: latitud,

β: longitud,

ɣ: ángulo anual,

φ: ángulo de los trópicos,

δ: ángulo horario.

Determinación de la posición del sol

Se define el vector unitario de la posición del sol en las direcciones este, sur y z:

$$\bar{v} = \left[v_{ESTE}, v_{SUR}, v_{Z}\right],$$

$$v_{ESTE} = \cos(\varphi)\cdot sen(\delta-\beta),$$
$$v_{SUR} = -sen(\varphi)\cdot\cos(\alpha)+\cos(\varphi)\cdot sen(\alpha)\cdot -\cos(\delta-\beta),$$
$$v_{Z} = sen(\varphi)\cdot sen(\alpha)+\cos(\varphi)\cdot\cos(\alpha)\cdot -\cos(\delta-\beta).$$

Se define el valor Φ; es el ángulo de inclinación de los rayos solares con respecto a la perpendicular al ecuador en ese momento del año:

$$sen(\phi)=sen(\varphi)-\cos(\gamma)\cdot$$

Ángulos representativos de la posición del sol

Se definen los ángulos para definir la posición del sol:

θ_H: ángulo horizontal.

θ_V: ángulo vertical.

Se calcula los valores de estos ángulos con el vector posición del sol:

$$\theta_H = \arctan\left(\frac{v_{ESTE}}{v_{NORTE}}\right) \cdot \arctan\left(\frac{v_{ESTE}}{-v_{SUR}}\right) \cdot \arctan\left(\frac{\cos(\varphi)\cdot sen(\delta-\beta)}{sen(\varphi)\cdot\cos(\alpha)+\cos(\varphi)\cdot sen(\alpha)\cdot\cos(\delta-\beta)}\right),$$

$$arc\cot an\left(\frac{sen(\varphi)\cdot\cos(\alpha)+\cos(\varphi)\cdot sen(\alpha)\cdot\cos(\delta-\beta)}{\cos(\varphi)\cdot sen(\delta-\beta)}\right),$$

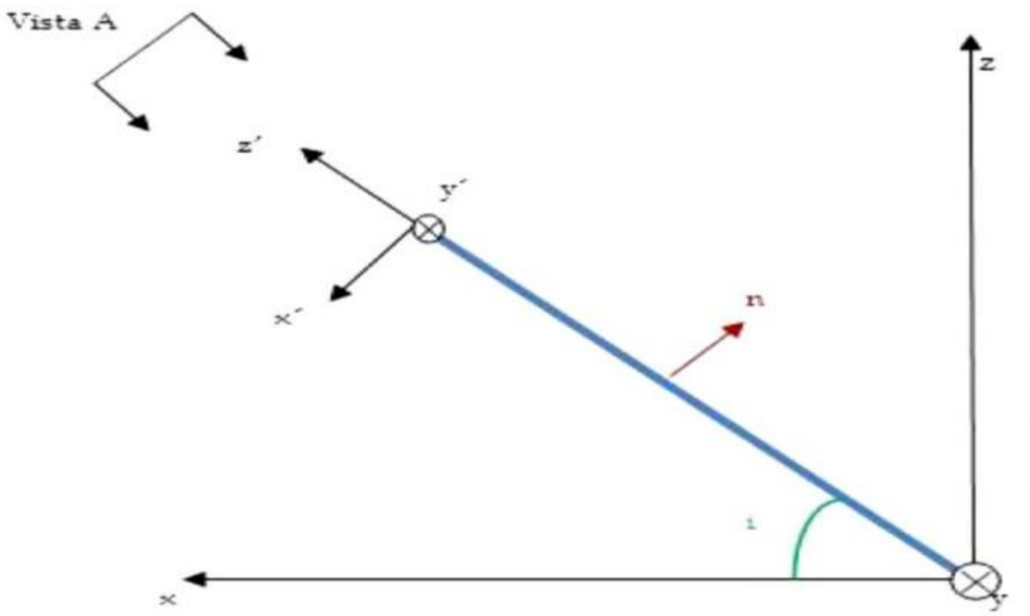
$$arc\cot an\left(\frac{sen(\varphi)\cdot\cos(\alpha)}{\cos(\varphi)\cdot sen(\delta-\beta)}+\frac{\cos(\varphi)\cdot sen(\alpha)\cdot\cos(\delta-\beta)}{\cos(\varphi)\cdot sen(\delta-\beta)}\right),$$

$$\theta_H = arc\cot an\left(\tan(\varphi)\cdot\frac{\cos(\alpha)}{sen(\delta-\beta)}+sen(\alpha)\cdot\cot an(\delta-\beta)\right),$$

$$\theta_V = arcsen(v_z) = arcsen(sen(\varphi)\cdot sen(\alpha)-\cos(\varphi)\cdot\cos(\alpha)\cdot\cos(\delta-\beta)).$$

A2.2 Ángulo de giro óptimo del panel fotovoltaico

Se presenta un diagrama que define el panel solar (vista lateral) y la normal ‘n’ al panel.

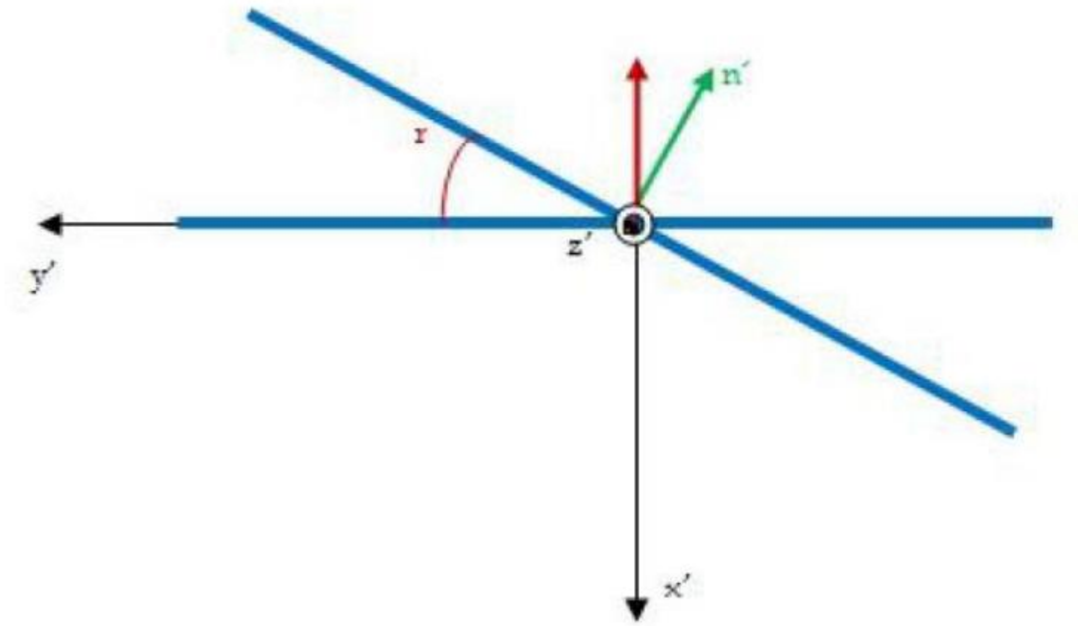


Para realizar los cálculos se usará las coordenadas x’ y’ z’

$$x = (sen(i);0;cos(i))\bullet(x';y';z'),$$

$$y = (0;1;0)\bullet(x';y';z'),$$

$$z = (-cos(i);0;sen(i))\bullet(x';y';z').$$



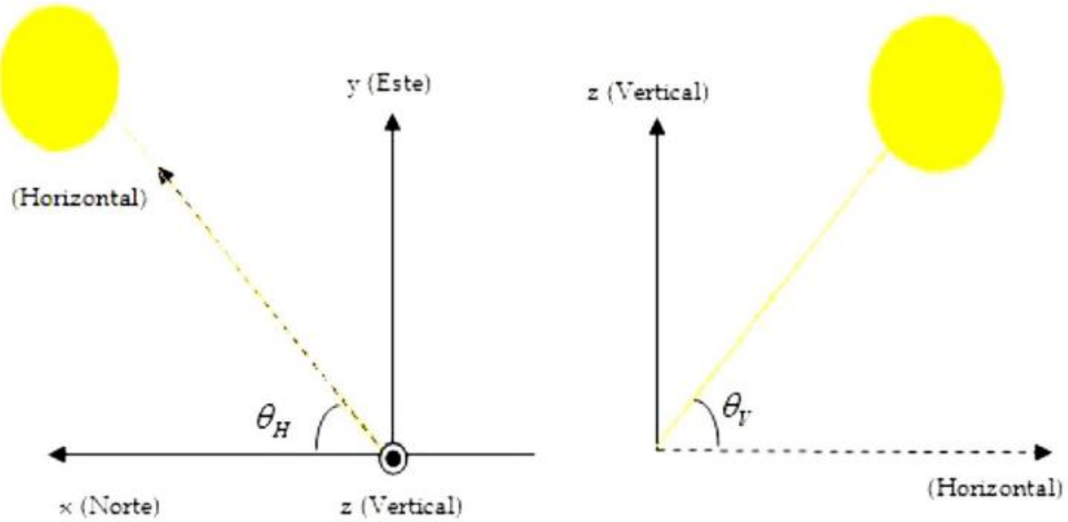
Al girar ‘r’ grados se obtiene el nuevo valor de la normal n’:

$$n' = \left(-\cos(r); -sen(r); 0\right).$$

Expresado en las coordenadas x,y,z:

$$n = \begin{pmatrix} sen(i) & 0 & -\cos(i) \\ 0 & 1 & 0 \\ \cos(i) & 0 & sen(i) \end{pmatrix} \cdot \begin{pmatrix} -\cos(r) \\ -sen(r) \\ 0 \end{pmatrix} = \begin{pmatrix} -\cos(r)\cdot sen(i) \\ -sen(r) \\ \cos(r)\cdot\cos(i) \end{pmatrix}.$$

A2.3 Dirección de los rayos solares



Se el vector en las coordenadas xyz que presenta la dirección de los rayos solares.

$$s = (S_x : S_y : S_z),$$
$$S_x = \cos(\theta_V) \cdot \cos(\theta_H),$$
$$S_y = \cos(\theta_V) \cdot sen(\theta_H),$$
$$S_z = sen(\theta_V) \cdot$$

A2.4 Ángulo óptimo de inclinación

Para lograr que se tenga los vectores s y n sean lo más paralelos posible, mayor incidencia del sol, el producto escalar entre los dos debe ser máxima.

$$\frac{d(s \cdot n)}{dr} = 0 \ ,$$

$$\frac{d(s \cdot n)}{dr} = \frac{d(-S_x \cdot \cos(r) \cdot sen(i) - S_y \cdot sen(r) + S_z \cdot \cos(i) \cdot \cos(r))}{dt} \ ,$$

$$S_x \cdot sen(r) \cdot sen(i) - S_y \cdot \cos(r) - S_z \cdot \cos(i) \cdot sen(r) = 0 \ ,$$

$$tg(r) = \frac{S_y}{S_x \cdot sen(i) - S_z \cdot \cos(i)} \ .$$

De los cálculos se obtiene el ángulo óptimo de giro:

$$r = arctg\left(\frac{Sy}{Sx * \sin(i) - Sz * \cos(i)}\right).$$

TO : ____________________

NiCeRa

DATE : ____________________

LDR CdS PHOTO CELL

SPECIFICATION

MODEL NO. N5AC−501085

Absolute Maximum Ratings

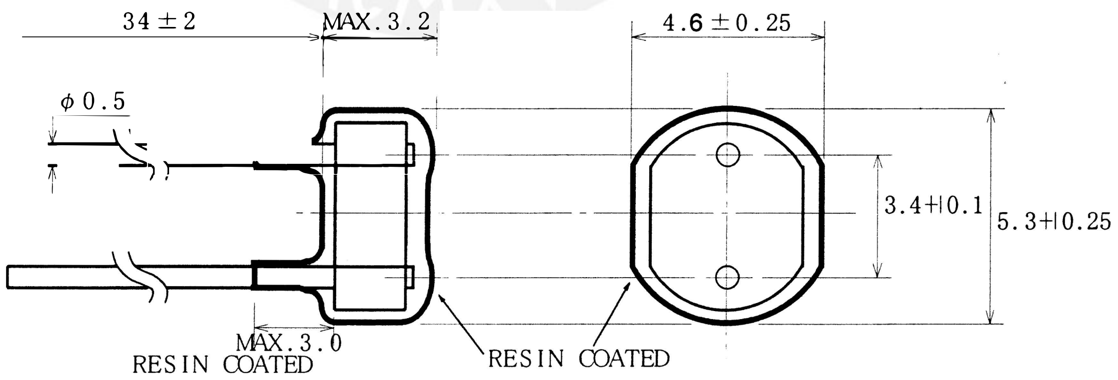
Allowable Power Dissipation (P_D) ········ 50 mW (Derate above 25℃ 1.0 mW/℃)
Maximum Applied Voltage (V_{MAX}) ·········· 100 V_{DC}
Ambient Temperature Range (T_A) ·········· −30 ～ +60 ℃

Photo-electric Characteristics (at 25℃)

PARAMETER	SYMBOL	MIN.	MAX.	UNITS
Light Resistance at 10 Lux	R_L	50	100	kΩ
Gamma Value at 10～100 Lux	γ	0.85 (Typ.)		——
Dark Resistance (10 sec. after shut off 10 Lux)	R_D	5	——	MΩ
Peak Spectral Response	λ_P	550	650	nm

※ Pre-measurement condition Exposed in 500 lux for more than 3 hours.

Dimensions (unit : mm)



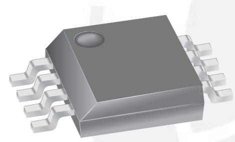
LDR CdS PHOTO CELL	PAGE 1/1	SPEC. NO. NCS-950203-01	REV. A
	NIPPON CERAMIC CO., LTD.		
MODEL NO. N5AC-501085	APPROVED BY	CHECKED BY	

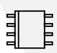
Fully Integrated, Hall Effect-Based Linear Current Sensor with 2.1 kVRMS Voltage Isolation and a Low-Resistance Current Conductor

Features and Benefits

- Low-noise analog signal path
- Device bandwidth is set via the new FILTER pin
- 5 µs output rise time in response to step input current
- 50 kHz bandwidth
- Total output error 1.5% at T_A = 25°C, and 4% at –40°C to 85°C
- Small footprint, low-profile SOIC8 package
- 1.2 mΩ internal conductor resistance
- 2.1 kV_{RMS} minimum isolation voltage from pins 1-4 to pins 5-8
- 5.0 V, single supply operation
- 66 to 185 mV/A output sensitivity
- Output voltage proportional to AC or DC currents
- Factory-trimmed for accuracy
- Extremely stable output offset voltage
- Nearly zero magnetic hysteresis
- Ratiometric output from supply voltage

Package: 8 pin SOIC (suffix LC)



Approximate Scale 1:1 

Description

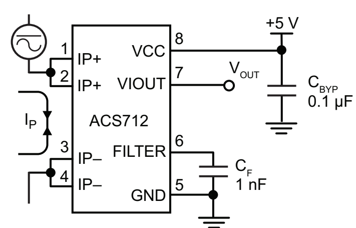
The Allegro® ACS712 provides economical and precise solutions for AC or DC current sensing in industrial, automotive, commercial, and communications systems. The device package allows for easy implementation by the customer. Typical applications include motor control, load detection and management, switched-mode power supplies, and overcurrent fault protection.

The device consists of a precise, low-offset, linear Hall sensor circuit with a copper conduction path located near the surface of the die. Applied current flowing through this copper conduction path generates a magnetic field which is sensed by the integrated Hall IC and converted into a proportional voltage. Device accuracy is optimized through the close proximity of the magnetic signal to the Hall transducer. A precise, proportional voltage is provided by the low-offset, chopper-stabilized BiCMOS Hall IC, which is programmed for accuracy after packaging.

The output of the device has a positive slope (>$V_{IOUT(Q)}$) when an increasing current flows through the primary copper conduction path (from pins 1 and 2, to pins 3 and 4), which is the path used for current sensing. The internal resistance of this conductive path is 1.2 mΩ typical, providing low power

Continued on the next page…

Typical Application



Application 1. The ACS712 outputs an analog signal, V_{OUT}. that varies linearly with the uni- or bi-directional AC or DC primary sensed current, I_P, within the range specified. C_F is recommended for noise management, with values that depend on the application.

Description (continued)

loss. The thickness of the copper conductor allows survival of the device at up to 5× overcurrent conditions. The terminals of the conductive path are electrically isolated from the sensor leads (pins 5 through 8). This allows the ACS712 current sensor to be used in applications requiring electrical isolation without the use of opto-isolators or other costly isolation techniques.

The ACS712 is provided in a small, surface mount SOIC8 package. The leadframe is plated with 100% matte tin, which is compatible with standard lead (Pb) free printed circuit board assembly processes. Internally, the device is Pb-free, except for flip-chip high-temperature Pb-based solder balls, currently exempt from RoHS. The device is fully calibrated prior to shipment from the factory.

Selection Guide

Part Number	Packing*	T_{OP} (°C)	Optimized Range, I_P (A)	Sensitivity, Sens (Typ) (mV/A)
ACS712ELCTR-05B-T	Tape and reel, 3000 pieces/reel	–40 to 85	±5	185
ACS712ELCTR-20A-T	Tape and reel, 3000 pieces/reel	–40 to 85	±20	100
ACS712ELCTR-30A-T	Tape and reel, 3000 pieces/reel	–40 to 85	±30	66

*Contact Allegro for additional packing options.

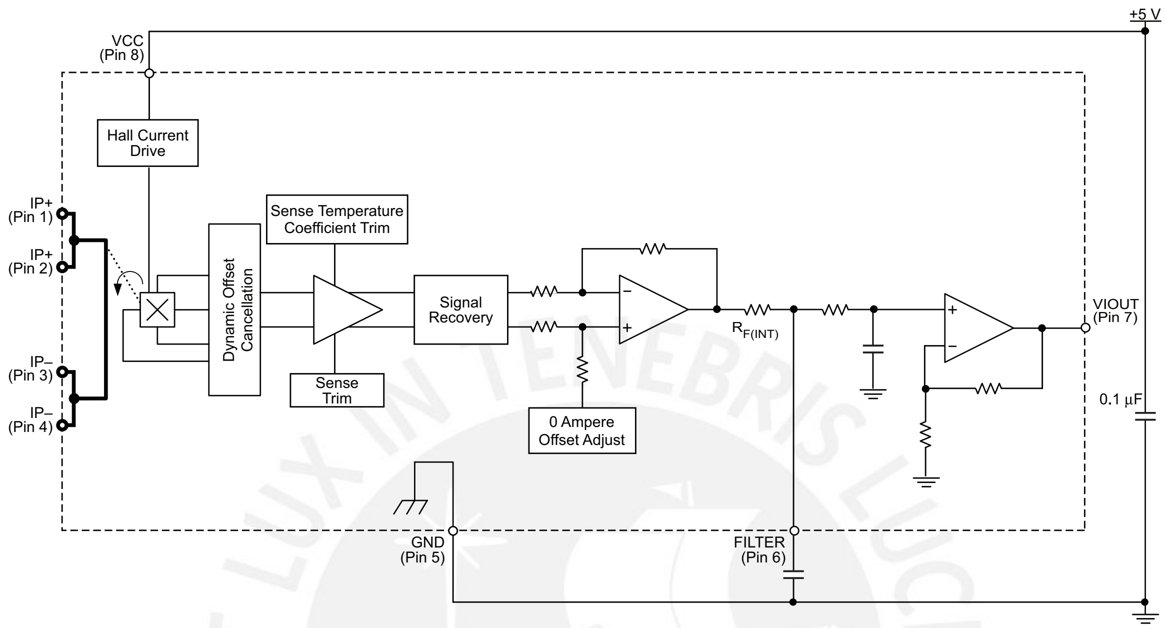
Absolute Maximum Ratings

Characteristic	Symbol	Notes	Rating	Units
Supply Voltage	V_{CC}		8	V
Reverse Supply Voltage	V_{RCC}		–0.1	V
Output Voltage	V_{IOUT}		8	V
Reverse Output Voltage	V_{RIOUT}		–0.1	V
Output Current Source	$I_{IOUT(Source)}$		3	mA
Output Current Sink	$I_{IOUT(Sink)}$		10	mA
Overcurrent Transient Tolerance	I_P	100 total pulses, 250 ms duration each, applied at a rate of 1 pulse every 100 seconds.	60	A
Maximum Transient Sensed Current	I_R(max)	Junction Temperature, $T_J < T_J$(max)	60	A
Nominal Operating Ambient Temperature	T_A	Range E	–40 to 85	ºC
Maximum Junction	T_J(max)		165	ºC
Storage Temperature	T_{stg}		–65 to 170	ºC

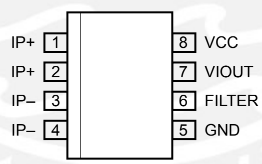
TÜV America
Certificate Number:
U8V 06 05 54214 010

Parameter	Specification
Fire and Electric Shock	CAN/CSA-C22.2 No. 60950-1-03 UL 60950-1:2003 EN 60950-1:2001

Functional Block Diagram



Pin-out Diagram



Terminal List Table

Number	Name	Description
1 and 2	IP+	Terminals for current being sensed; fused internally
3 and 4	IP–	Terminals for current being sensed; fused internally
5	GND	Signal ground terminal
6	FILTER	Terminal for external capacitor that sets bandwidth
7	VIOUT	Analog output signal
8	VCC	Device power supply terminal

COMMON OPERATING CHARACTERISTICS[1] over full range of T_{OP}, C_F = 1 nF, and V_{CC} = 5 V, unless otherwise specified

Characteristic	Symbol	Test Conditions	Min.	Typ.	Max.	Units
ELECTRICAL CHARACTERISTICS						
Supply Voltage	V_{CC}		4.5	5.0	5.5	V
Supply Current	I_{CC}	V_{CC} = 5.0 V, output open	6	8	11	mA
Output Zener Clamp Voltage	V_Z	I_{CC} = 11 mA, T_A = 25°C	6	8.3	–	V
Output Resistance	R_{IOUT}	I_{IOUT} = 1.2 mA, T_A=25°C	–	1	2	Ω
Output Capacitance Load	C_{LOAD}	VIOUT to GND	–	–	10	nF
Output Resistive Load	R_{LOAD}	VIOUT to GND	4.7	–	–	kΩ
Primary Conductor Resistance	$R_{PRIMARY}$	T_A = 25°C	–	1.2	–	mΩ
RMS Isolation Voltage	V_{ISORMS}	Pins 1-4 and 5-8; 60 Hz, 1 minute, T_A=25°C	2100	–	–	V
DC Isolation Voltage	V_{ISODC}	Pins 1-4 and 5-8; 1 minute, T_A=25°C	–	5000	–	V
Propagation Time	t_{PROP}	I_P = I_P(max), T_A = 25°C, C_{OUT} = open	–	3	–	μs
Response Time	$t_{RESPONSE}$	I_P = I_P(max), T_A = 25°C, C_{OUT} = open	–	7	–	μs
Rise Time	t_r	I_P = I_P(max), T_A = 25°C, C_{OUT} = open	–	5	–	μs
Frequency Bandwidth	f	–3 dB, T_A = 25°C; I_P is 10 A peak-to-peak	50	–	–	kHz
Nonlinearity	E_{LIN}	Over full range of I_P	–	±1	±1.5	%
Symmetry	E_{SYM}	Over full range of I_P	98	100	102	%
Zero Current Output Voltage	$V_{IOUT(Q)}$	Bidirectional; I_P = 0 A, T_A = 25°C	–	V_{CC} × 0.5	–	V
Magnetic Offset Error	V_{ERROM}	I_P = 0 A, after excursion of 5 A	–	0	–	mV
Clamping Voltage	V_{CH}		Typ. –110	V_{CC} × 0.9375	Typ. +110	mV
	V_{CL}		Typ. –110	V_{CC} × 0.0625	Typ. +110	mV
Power-On Time	t_{PO}	Output reaches 90% of steady-state level, T_J=25°C, 20 A present on leadframe	–	35	–	μs
Magnetic Coupling[2]			–	12	–	G/A
Internal Filter Resistance[3]	$R_{F(INT)}$			1.7		kΩ

[1]Device may be operated at higher primary current levels, I_P, and ambient, T_A, and internal leadframe temperatures, T_{OP}, provided that the Maximum Junction Temperature, T_J(max), is not exceeded.

[2]1G = 0.1 mT.

[3]$R_{F(INT)}$ forms an RC circuit via the FILTER pin.

COMMON THERMAL CHARACTERISTICS[1]

			Min.	Typ.	Max.	Units
Operating Internal Leadframe Temperature	T_{OP}	E range	–40	–	85	°C
					Value	Units
Junction-to-Lead Thermal Resistance[2]	$R_{\theta JL}$	Mounted on the Allegro ASEK 712 evaluation board			5	°C/W
Junction-to-Ambient Thermal Resistance	$R_{\theta JA}$	Mounted on the Allegro 85-0322 evaluation board, includes the power consumed by the board			23	°C/W

[1]Additional thermal information is available on the Allegro website.

[2]The Allegro evaluation board has 1500 mm[2] of 2 oz. copper on each side, connected to pins 1 and 2, and to pins 3 and 4, with thermal vias connecting the layers. Performance values include the power consumed by the PCB. Further details on the board are available from the Frequently Asked Questions document on our website. Further information about board design and thermal performance also can be found in the Applications Information section of this datasheet.

Allegro MicroSystems, Inc.
115 Northeast Cutoff, Box 15036
Worcester, Massachusetts 01615-0036 (508) 853-5000
www.allegromicro.com

x05A PERFORMANCE CHARACTERISTICS T_{OP} = –40°C to 85°C[1], C_F = 1 nF, and V_{CC} = 5 V, unless otherwise specified

Characteristic	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Optimized Accuracy Range	I_P		–5	–	5	A
Sensitivity[2]	$Sens_{TA}$	Over full range of I_P, T_A = 25°C	–	185	–	mV/A
	$Sens_{TOP}$	Over full range of I_P	178	–	193	mV/A
Noise	$V_{NOISE(PP)}$	Peak-to-peak, T_A= 25°C, 185 mV/A programmed Sensitivity, C_F=4.7 nF, C_{OUT} = open, 20 kHz bandwidth	–	45	–	mV
		Peak-to-peak, T_A = 25°C, 185 mV/A programmed Sensitivity, C_F = 47 nF, C_{OUT} = open, 2 kHz bandwidth	–	20	–	mV
		Peak-to-peak, T_A = 25°C, 185 mV/A programmed Sensitivity, C_F = 1 nF, C_{OUT} = open, 50 kHz bandwidth	–	75	–	mV
Electrical Offset Voltage	V_{OE}	I_P = 0 A	–40	–	40	mV
Total Output Error[3]	E_{TOT}	I_P =±5 A, T_A = 25°C	–	±1.5	–	%

[1]Device may be operated at higher primary current levels, I_P, and ambient temperatures, T_{OP}, provided that the Maximum Junction Temperature, $T_{J(max)}$, is not exceeded.

[2]At –40°C Sensitivity may shift as much 9% outside of the datasheet limits.

[3]Percentage of I_P, with I_P = 5 A. Output filtered.

x20A PERFORMANCE CHARACTERISTICS T_{OP} = –40°C to 85°C[1], C_F = 1 nF, and V_{CC} = 5 V, unless otherwise specified

Characteristic	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Optimized Accuracy Range	I_P		–20	–	20	A
Sensitivity[2]	$Sens_{TA}$	Over full range of I_P, T_A = 25°C	–	100	–	mV/A
	$Sens_{TOP}$	Over full range of I_P	97	–	103	mV/A
Noise	$V_{NOISE(PP)}$	Peak-to-peak, T_A= 25°C, 100 mV/A programmed Sensitivity, C_F=4.7 nF, C_{OUT} = open, 20 kHz bandwidth	–	24	–	mV
		Peak-to-peak, T_A = 25°C, 100 mV/A programmed Sensitivity, C_F = 47 nF, C_{OUT} = open, 2 kHz bandwidth	–	10	–	mV
		Peak-to-peak, T_A = 25°C, 100 mV/A programmed Sensitivity, C_F = 1 nF, C_{OUT} = open, 50 kHz bandwidth	–	40	–	mV
Electrical Offset Voltage	V_{OE}	I_P = 0 A	–30	–	30	mV
Total Output Error[3]	E_{TOT}	I_P =±20 A, T_A = 25°C	–	±1.5	–	%

[1]Device may be operated at higher primary current levels, I_P, and ambient temperatures, T_{OP}, provided that the Maximum Junction Temperature, T_J(max), is not exceeded.

[2]At –40°C Sensitivity may shift as much 9% outside of the datasheet limits.

[3]Percentage of I_P, with I_P = 20 A. Output filtered.

x30A PERFORMANCE CHARACTERISTICS T_{OP} = –40°C to 85°C[1], C_F = 1 nF, and V_{CC} = 5 V, unless otherwise specified

Characteristic	Symbol	Test Conditions	Min.	Typ.	Max.	Units
Optimized Accuracy Range	I_P		–30	–	30	A
Sensitivity[2]	$Sens_{TA}$	Over full range of I_P, T_A = 25°C	–	66	–	mV/A
	$Sens_{TOP}$	Over full range of I_P	64	–	68	mV/A
Noise	$V_{NOISE(PP)}$	Peak-to-peak, T_A= 25°C, 66 mV/A programmed Sensitivity, C_F=4.7 nF, C_{OUT} = open, 20 kHz bandwidth	–	20	–	mV
		Peak-to-peak, T_A = 25°C, 66 mV/A programmed Sensitivity, C_F = 47 nF, C_{OUT} = open, 2 kHz bandwidth	–	7	–	mV
		Peak-to-peak, T_A = 25°C, 66 mV/A programmed Sensitivity, C_F = 1 nF, C_{OUT} = open, 50 kHz bandwidth	–	35	–	mV
Electrical Offset Voltage	V_{OE}	I_P = 0 A	–30	–	30	mV
Total Output Error[3]	E_{TOT}	I_P = ±30 A, T_A = 25°C	–	±1.5	–	%

[1]Device may be operated at higher primary current levels, I_P, and ambient temperatures, T_{OP}, provided that the Maximum Junction Temperature, T_J(max), is not exceeded.

[2]At –40°C Sensitivity may shift as much 9% outside of the datasheet limits.

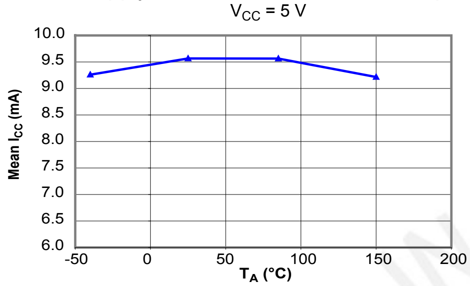
[3]Percentage of I_P, with I_P = 30 A. Output filtered.

Characteristic Performance

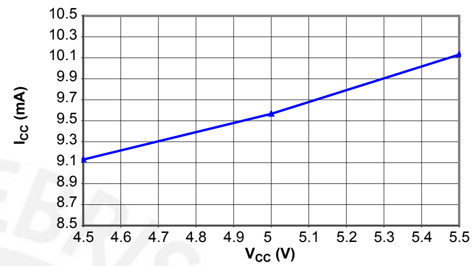
I_P = 5 A, Sens = 185 mV/A unless otherwise specified

Mean Supply Current versus Ambient Temperature

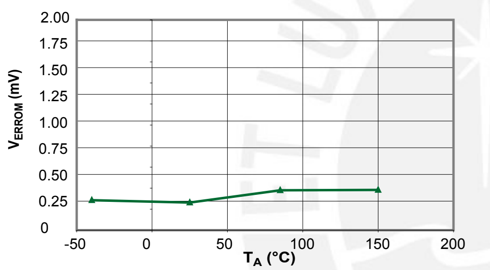
V_{CC} = 5 V



Supply Current versus Supply Voltage

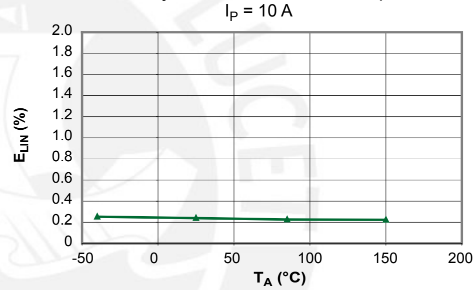


Magnetic Offset versus Ambient Temperature



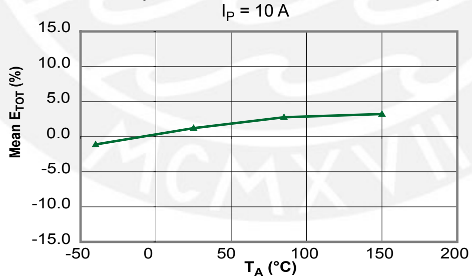
Nonlinearity versus Ambient Temperature

I_P = 10 A

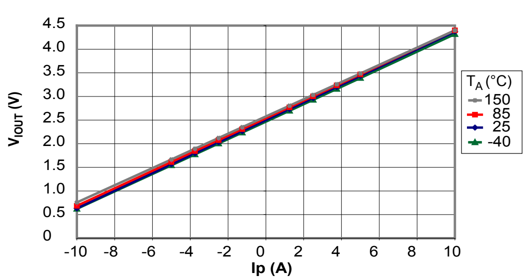


Mean Total Output Error versus Ambient Temperature

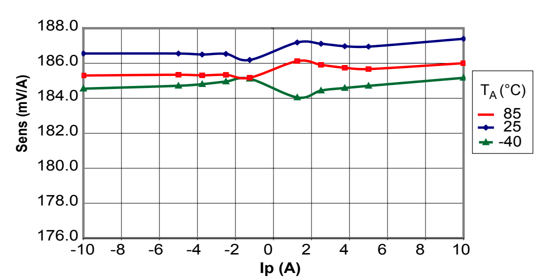
I_P = 10 A



Output Voltage versus Sensed Current



Sensitivity versus Sensed Current

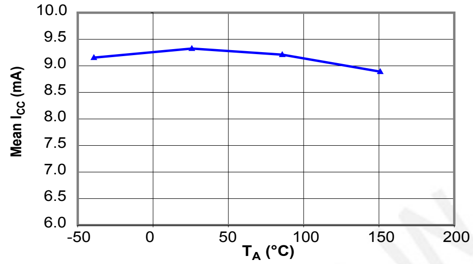


Characteristic Performance

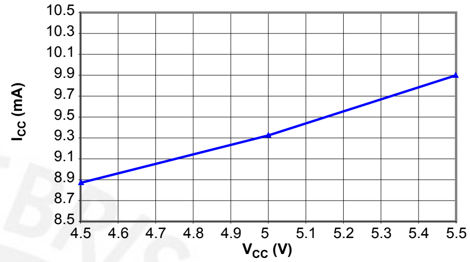
I_P = 30 A, Sens = 66 mV/A unless otherwise specified

Mean Supply Current versus Ambient Temperature

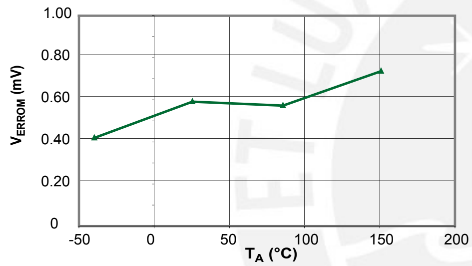
V_{CC} = 5 V



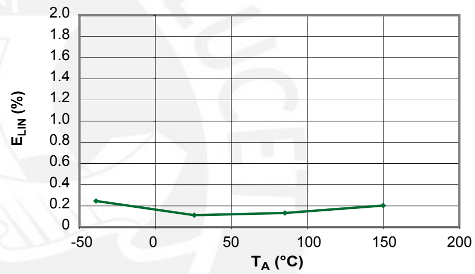
Supply Current versus Supply Voltage



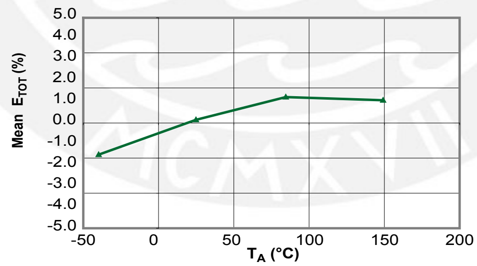
Magnetic Offset Current versus Ambient Temperature



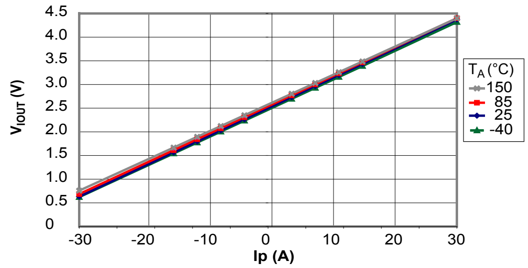
Nonlinearity versus Ambient Temperature



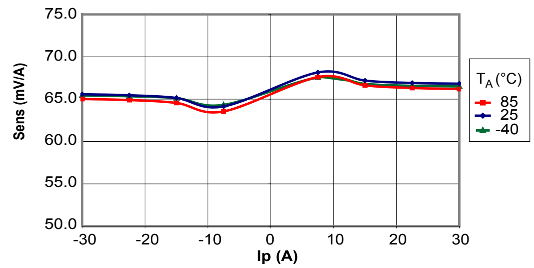
Mean Total Output Error versus Ambient Temperature



Output Voltage versus Sensed Current



Sensitivity versus Sensed Current



Definitions of Accuracy Characteristics

Sensitivity (Sens). The change in sensor output in response to a 1 A change through the primary conductor. The sensitivity is the product of the magnetic circuit sensitivity (G/A) and the linear IC amplifier gain (mV/G). The linear IC amplifier gain is programmed at the factory to optimize the sensitivity (mV/A) for the full-scale current of the device.

Noise (V_{NOISE}). The product of the linear IC amplifier gain (mV/G) and the noise floor for the Allegro Hall effect linear IC (≈1 G). The noise floor is derived from the thermal and shot noise observed in Hall elements. Dividing the noise (mV) by the sensitivity (mV/A) provides the smallest current that the device is able to resolve.

Linearity (E_{LIN}). The degree to which the voltage output from the sensor varies in direct proportion to the primary current through its full-scale amplitude. Nonlinearity in the output can be attributed to the saturation of the flux concentrator approaching the full-scale current. The following equation is used to derive the linearity:

$$100\left\{1-\left[\frac{\Delta\,\text{gain}\times\%\,\text{sat}\,(V_{IOUT\_\text{full-scale amperes}}-V_{IOUT(Q)})}{2\,(V_{IOUT\_\text{half-scale amperes}}-V_{IOUT(Q)})}\right]\right\}$$

where $V_{IOUT\_\text{full-scale amperes}}$ = the output voltage (V) when the sensed current approximates full-scale $\pm I_P$.

Symmetry (E_{SYM}). The degree to which the absolute voltage output from the sensor varies in proportion to either a positive or negative full-scale primary current. The following formula is used to derive symmetry:

$$100\left(\frac{V_{IOUT\_+\text{full-scale amperes}}-V_{IOUT(Q)}}{V_{IOUT(Q)}-V_{IOUT\_-\text{full-scale amperes}}}\right)$$

Quiescent output voltage ($V_{IOUT(Q)}$). The output of the sensor when the primary current is zero. For a unipolar supply voltage, it nominally remains at $V_{CC}/2$. Thus, V_{CC} = 5 V translates into $V_{IOUT(Q)}$ = 2.5 V. Variation in $V_{IOUT(Q)}$ can be attributed to the resolution of the Allegro linear IC quiescent voltage trim and thermal drift.

Electrical offset voltage (V_{OE}). The deviation of the device output from its ideal quiescent value of $V_{CC}/2$ due to nonmagnetic causes. To convert this voltage to amperes, divide by the device sensitivity, Sens.

Accuracy (E_{TOT}). The accuracy represents the maximum deviation of the actual output from its ideal value. This is also known as the total ouput error. The accuracy is illustrated graphically in the output voltage versus current chart at right.

Accuracy is divided into four areas:

- **0 A at 25°C.** Accuracy of sensing zero current flow at 25°C, without the effects of temperature.
- **0 A over Δ temperature.** Accuracy of sensing zero current flow including temperature effects.
- **Full-scale current at 25°C.** Accuracy of sensing the full-scale current at 25°C, without the effects of temperature.
- **Full-scale current over Δ temperature.** Accuracy of sensing full-scale current flow including temperature effects.

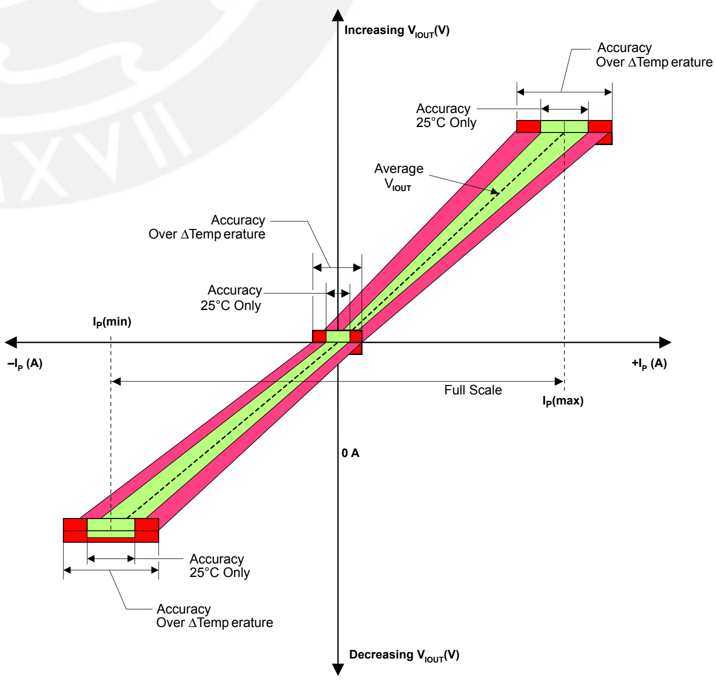
Ratiometry. The ratiometric feature means that its 0 A output, $V_{IOUT(Q)}$, (nominally equal to $V_{CC}/2$) and sensitivity, Sens, are proportional to its supply voltage, V_{CC}. The following formula is used to derive the ratiometric change in 0 A output voltage, $\Delta V_{IOUT(Q)RAT}$ (%).

$$100\left(\frac{V_{IOUT(Q)VCC}\,/\,V_{IOUT(Q)5V}}{V_{CC}\,/\,5\text{ V}}\right)$$

The ratiometric change in sensitivity, $\Delta Sens_{RAT}$ (%), is defined as:

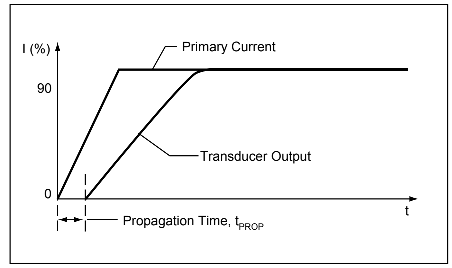
$$100\left(\frac{Sens_{VCC}\,/\,Sens_{5V}}{V_{CC}\,/\,5\text{ V}}\right)$$

Output Voltage versus Sensed Current
Accuracy at 0 A and at Full-Scale Current

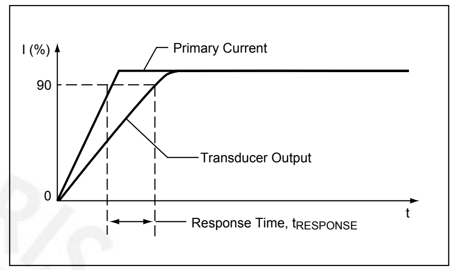


Definitions of Dynamic Response Characteristics

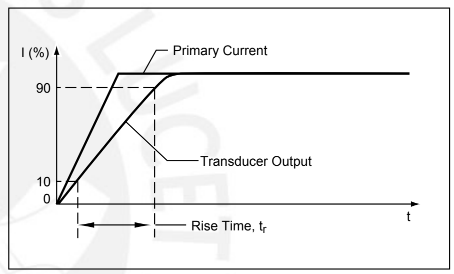
Propagation delay (t_{PROP}). The time required for the sensor output to reflect a change in the primary current signal. Propagation delay is attributed to inductive loading within the linear IC package, as well as in the inductive loop formed by the primary conductor geometry. Propagation delay can be considered as a fixed time offset and may be compensated.

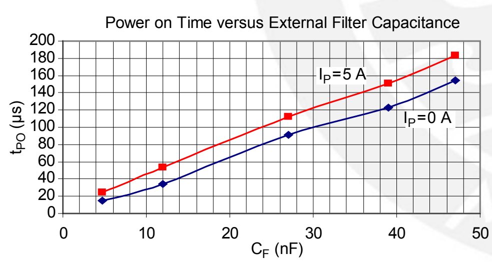


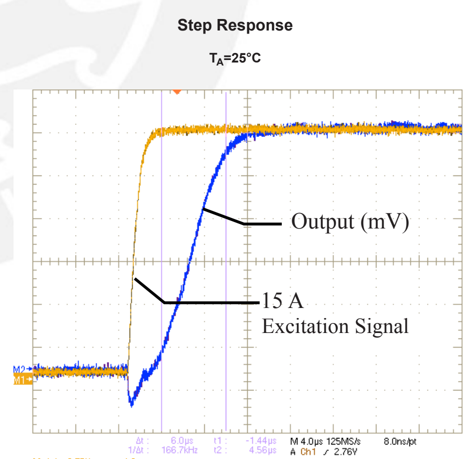
Response time ($t_{RESPONSE}$). The time interval between a) when the primary current signal reaches 90% of its final value, and b) when the sensor reaches 90% of its output corresponding to the applied current.

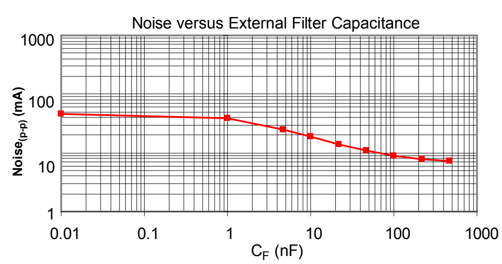


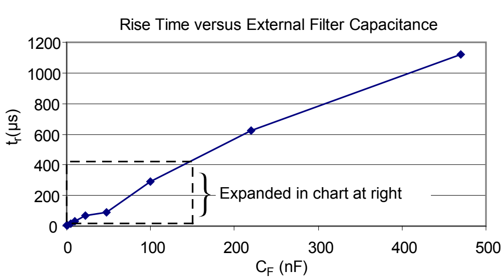
Rise time (t_r). The time interval between a) when the sensor reaches 10% of its full scale value, and b) when it reaches 90% of its full scale value. The rise time to a step response is used to derive the bandwidth of the current sensor, in which $f(-3\text{ dB}) = 0.35/t_r$. Both t_r and $t_{RESPONSE}$ are detrimentally affected by eddy current losses observed in the conductive IC ground plane.



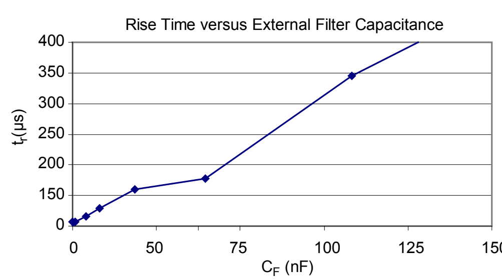








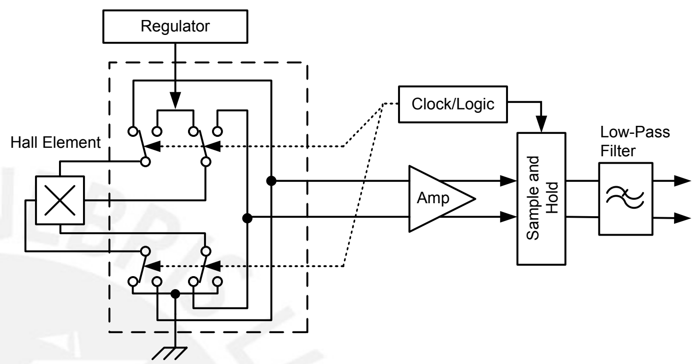
C_F (nF)	t_r (µs)
0	6.647
1	7.74
4.7	17.38
10	32.09087
22	68.15
47	88.18
100	291.26
220	623.02
470	1120



Chopper Stabilization Technique

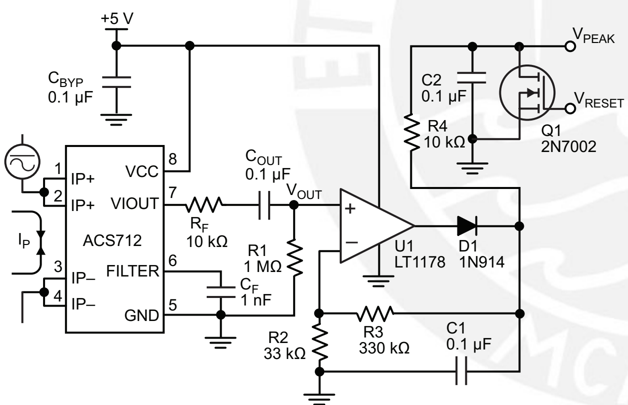
Chopper Stabilization is an innovative circuit technique that is used to minimize the offset voltage of a Hall element and an associated on-chip amplifier. Allegro patented a Chopper Stabilization technique that nearly eliminates Hall IC output drift induced by temperature or package stress effects. This offset reduction technique is based on a signal modulation-demodulation process. Modulation is used to separate the undesired dc offset signal from the magnetically induced signal in the frequency domain. Then, using a low-pass filter, the modulated dc offset is suppressed while the magnetically induced signal passes through the filter. As a result of this chopper stabilization approach, the output voltage from the Hall IC is desensitized to the effects of temperature and mechanical stress. This technique produces devices that have an extremely stable Electrical Offset Voltage, are immune to thermal stress, and have precise recoverability after temperature cycling.

This technique is made possible through the use of a BiCMOS process that allows the use of low-offset and low-noise amplifiers in combination with high-density logic integration and sample and hold circuits.

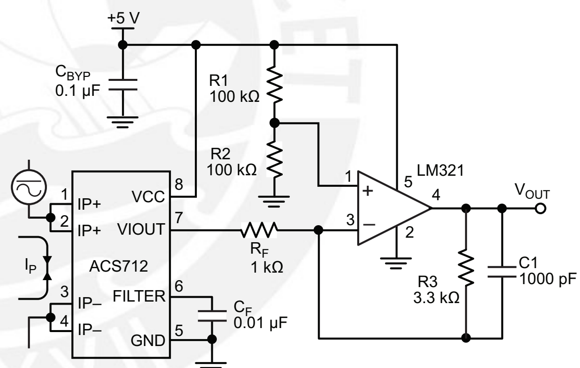


Concept of Chopper Stabilization Technique

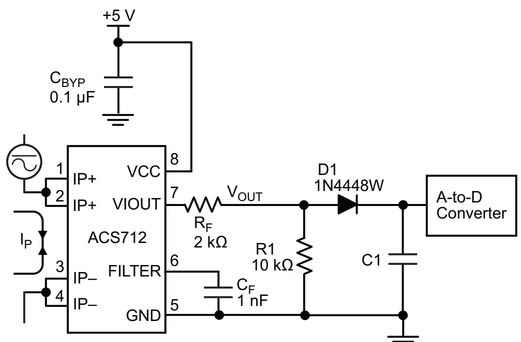
Typical Applications



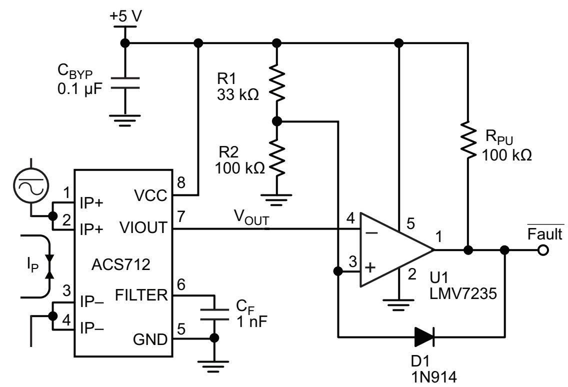
Application 2. Peak Detecting Circuit



Application 3. This configuration increases gain to 610 mV/A (tested using the ACS712ELC-05A).



Application 4. Rectified Output. 3.3 V scaling and rectification application for A-to-D converters. Replaces current transformer solutions with simpler ACS circuit. C1 is a function of the load resistance and filtering desired. R1 can be omitted if the full range is desired.



Application 5. 10 A Overcurrent Fault Latch. Fault threshold set by R1 and R2. This circuit latches an overcurrent fault and holds it until the 5 V rail is powered down.

Improving Sensing System Accuracy Using the FILTER Pin

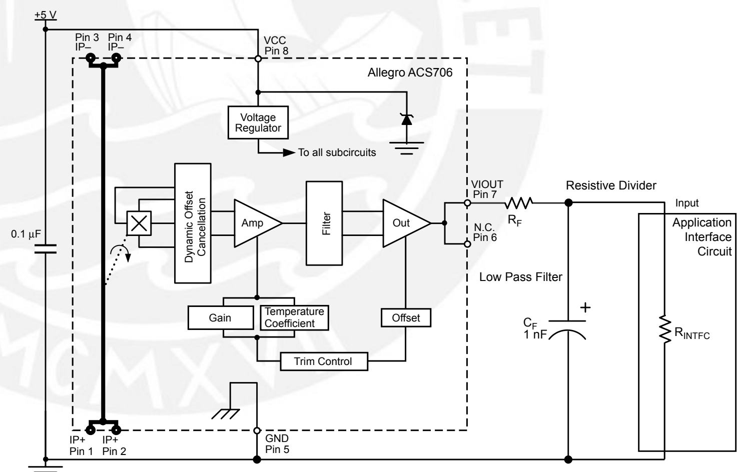
In low-frequency sensing applications, it is often advantageous to add a simple RC filter to the output of the sensor. Such a low-pass filter improves the signal-to-noise ratio, and therefore the resolution, of the sensor output signal. However, the addition of an RC filter to the output of a sensor IC can result in undesirable sensor output attenuation — even for dc signals.

Signal attenuation, ΔV_{ATT}, is a result of the resistive divider effect between the resistance of the external filter, R_F (see Application 6), and the input impedance and resistance of the customer interface circuit, R_{INTFC}. The transfer function of this resistive divider is given by:

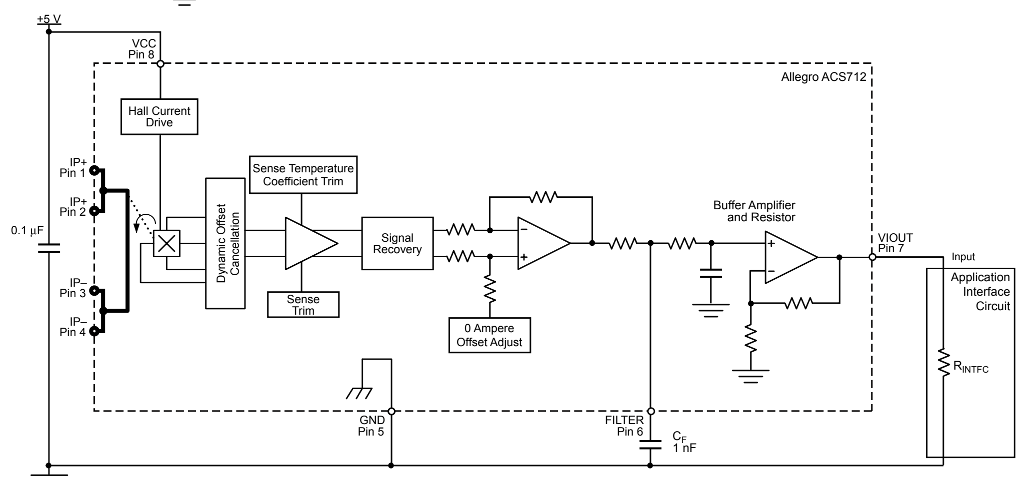
$$\Delta V_{ATT} = V_{IOUT}\left(\frac{R_{INTFC}}{R_F + R_{INTFC}}\right) .$$

Even if R_F and R_{INTFC} are designed to match, the two individual resistance values will most likely drift by different amounts over temperature. Therefore, signal attenuation will vary as a function of temperature. Note that, in many cases, the input impedance, R_{INTFC}, of a typical analog-to-digital converter (ADC) can be as low as 10 kΩ.

The ACS712 contains an internal resistor, a FILTER pin connection to the printed circuit board, and an internal buffer amplifier. With this circuit architecture, users can implement a simple RC filter via the addition of a capacitor, C_F (see Application 7) from the FILTER pin to ground. The buffer amplifier inside of the ACS712 (located after the internal resistor and FILTER pin connection) eliminates the attenuation caused by the resistive divider effect described in the equation for ΔV_{ATT}. Therefore, the ACS712 device is ideal for use in high-accuracy applications that cannot afford the signal attenuation associated with the use of an external RC low-pass filter.

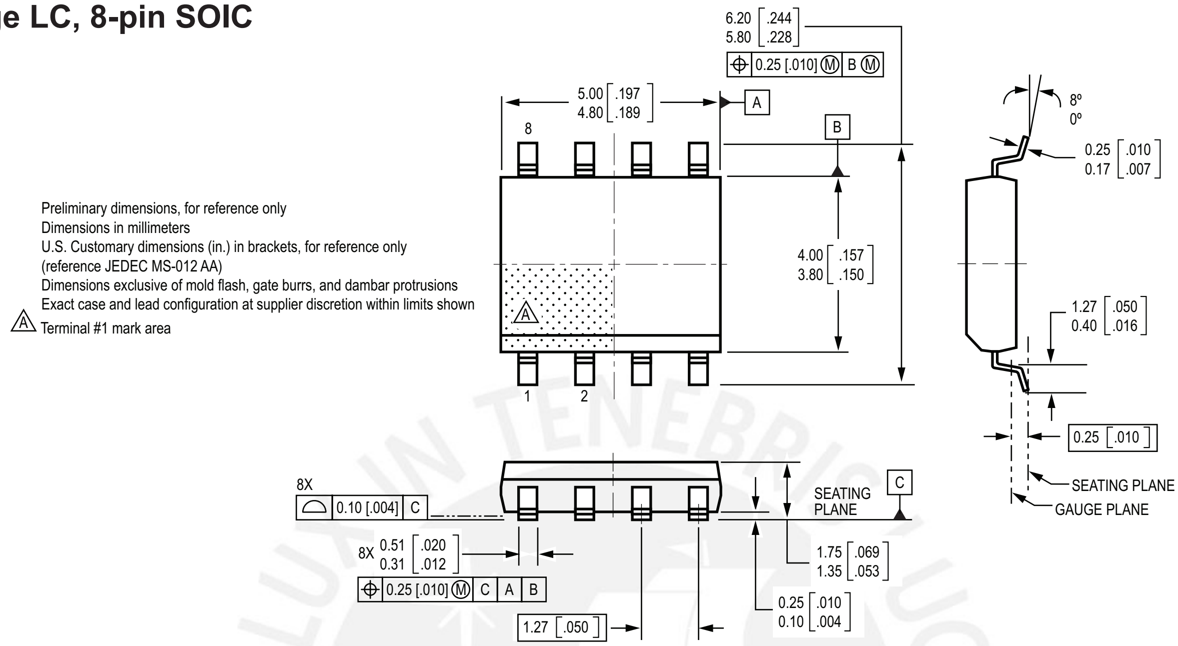


Application 6. When a low pass filter is constructed externally to a standard Hall effect device, a resistive divider may exist between the filter resistor, R_F, and the resistance of the customer interface circuit, R_{INTFC}. This resistive divider will cause excessive attenuation, as given by the transfer function for ΔV_{ATT}.



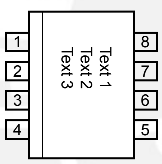
Application 7. Using the FILTER pin provided on the ACS712 eliminates the attenuation effects of the resistor divider between R_F and R_{INTFC}, shown in Application 6.

Package LC, 8-pin SOIC



Package Branding

Two alternative patterns are used



ACS712T *RLCPPP* *YYWWA*	ACS	Allegro Current Sensor
	712	Device family number
	T	Indicator of 100% matte tin leadframe plating
	R	Operating ambient temperature range code
	LC	Package type designator
	PPP	Primary sensed current
	YY	Date code: Calendar year (last two digits)
	WW	Date code: Calendar week
	A	Date code: Shift code

ACS712T *RLCPPP* *L...L* *YYWW*	ACS	Allegro Current Sensor
	712	Device family number
	T	Indicator of 100% matte tin leadframe plating
	R	Operating ambient temperature range code
	LC	Package type designator
	PPP	Primary sensed current
	L...L	Lot code
	YY	Date code: Calendar year (last two digits)
	WW	Date code: Calendar week

The products described herein are manufactured under one or more of the following U.S. patents: 5,045,920; 5,264,783; 5,442,283; 5,389,889; 5,581,179; 5,517,112; 5,619,137; 5,621,319; 5,650,719; 5,686,894; 5,694,038; 5,729,130; 5,917,320; and other patents pending.

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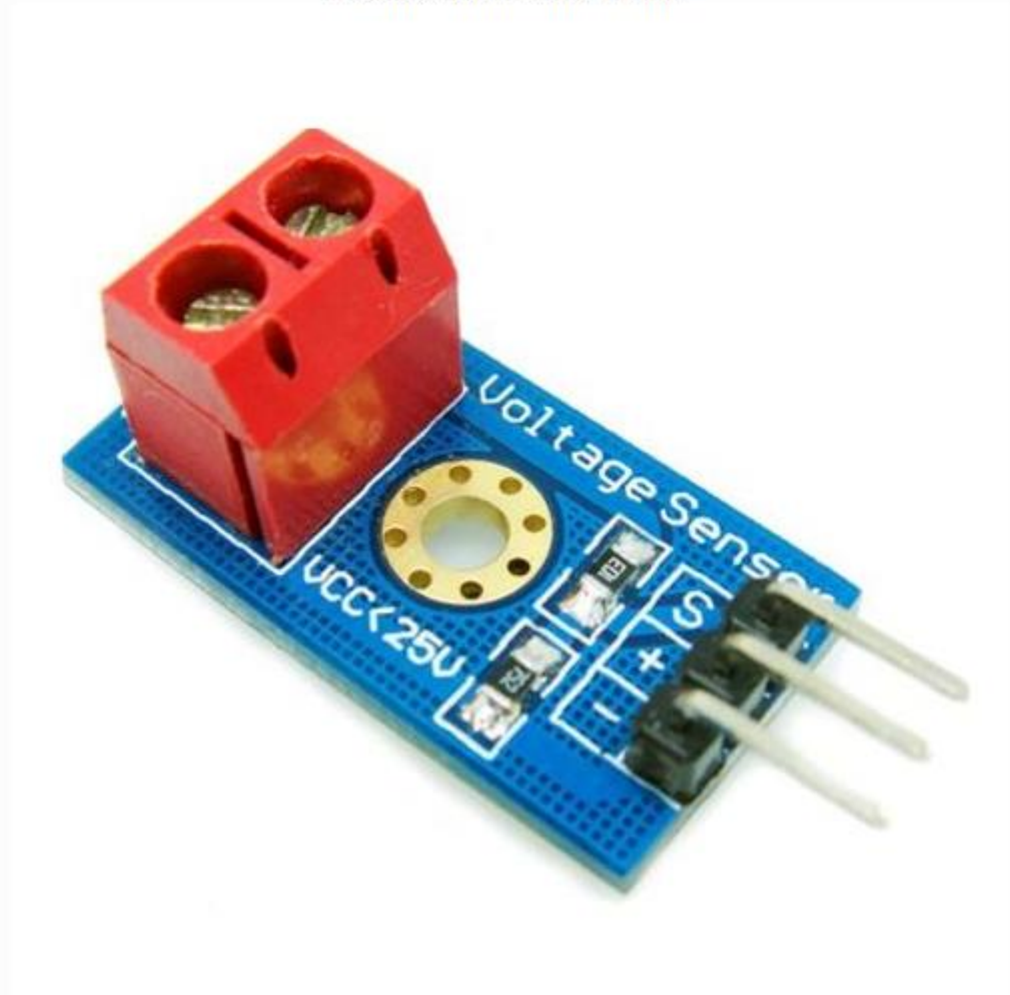
Arduino Voltage Sensor Module



Description :

This module is based on resistance points pressure principle, and it can make the input voltage of red terminal reduce 5 times of original voltage.

The max Arduino analog input voltage is 5 V, so the input voltage of this module should be not more than 5 V x 5 = 25 V (if for 3.3 V system, the input voltage should be not more than 3.3 V x 5 = 16.5 V).

Because the Arduino AVR chip have 10 bit AD, so this module simulation resolution is 0.00489 V (5 V / 1023), and the input voltage of this module should be more than 0.00489 V x 5 = 0.02445 V.

Special Parameters :

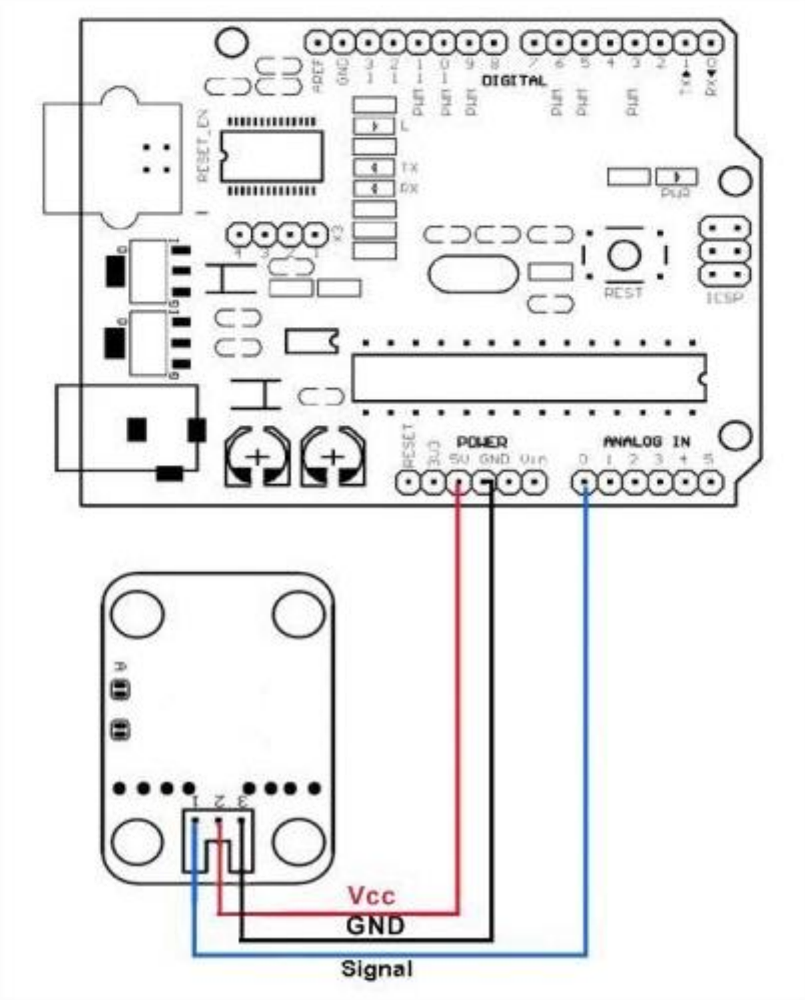
1、Voltage input range : DC0-25 V

2、Voltage detection range : DC0.02445 V-25 V

3、Voltage analog resolution : 0.00489 V

4、DC input interface : red terminal positive with VCC, negative with GND

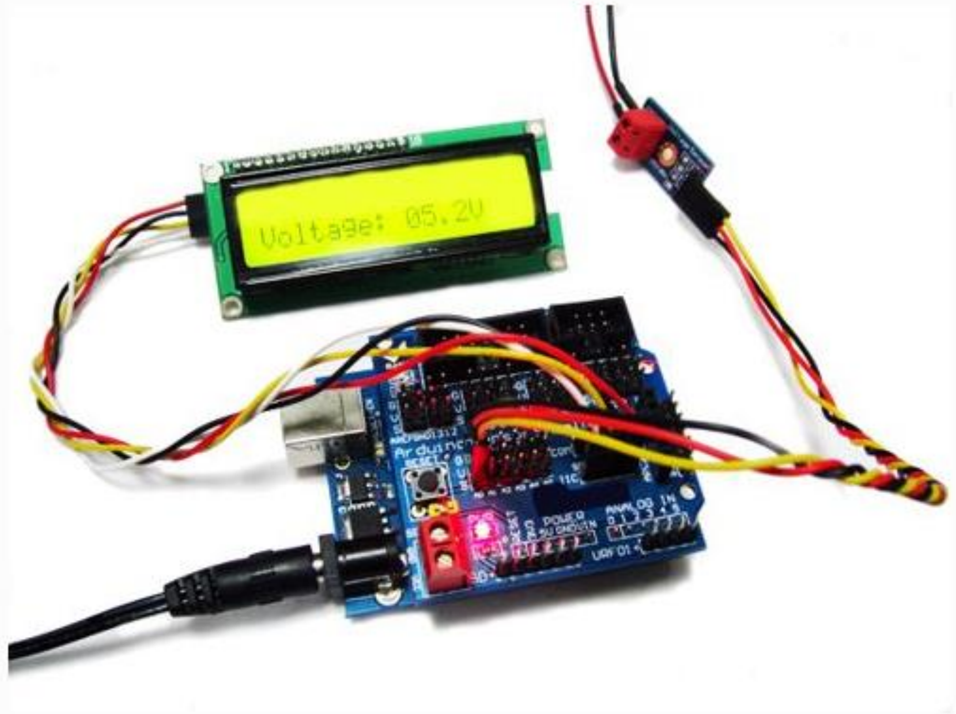
Connecting Diagram :



This sensor module come with 3 Pin Dual-female Jumper Wire length 300mm as below :

Application :

Connect this vlotage sensor module with Arduino sensor shield through 3 Pin sensor cable, not only can easily realize to detect and control the voltage, but also can display the voltage through the IIC LCD1602 LCD module and make voltage monitor, as following :



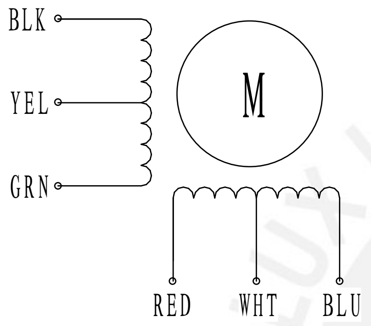
Referrence Test Code :

```
#include <Wire.h>
int val11;
int val2;


void setup()
{
  pinMode(LED1,OUTPUT);
  Serial.begin(9600);
  Serial.println("Emartee.Com");

  Serial.println("Voltage: ");
  Serial.print("V");
}
void loop()
{
     float temp;
     val11=analogRead(1);
     temp=val11/4.092;
     val11=(int)temp;//
     val2=((val11%100)/10);
     Serial.println(val2);


   delay(1000);
}
```

HIGH TORQUE HYBRID STEPPING MOTOR SPECIFICATIONS

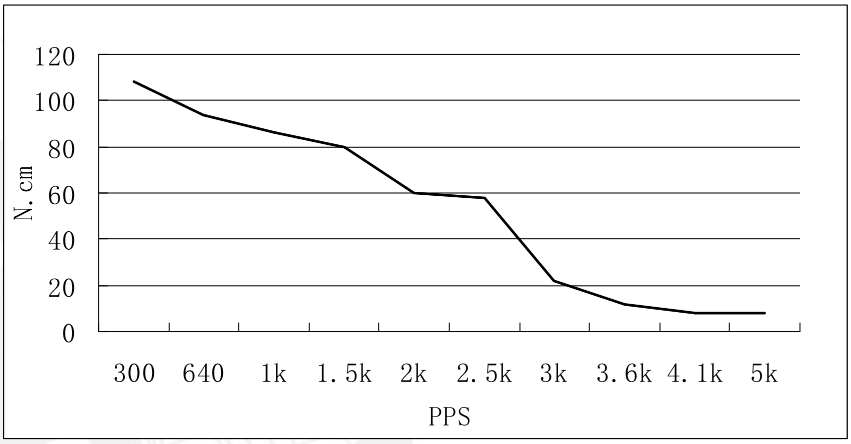
General specifications		Electrical specifications	
Step Angle (°)	1.8	Rated Voltage (V)	3.6
Temperature Rise (℃)	80 Max (rated current, 2 phase on)	Rated Current (A)	2.0
Ambient Temperature (℃)	-20～+50	Resistance Per Phase (±10% Ω)	1.8 (25℃)
Number of Phase	2	Inductance Per Phase (±20% mH)	2.5
Insulation Resistance (MΩ)	100 Min (500VDC)	Holding Torque (N.cm)	90
Insulation Class	Class B		
Max.radial force (N)	28 (20mm from the flange)		
Max.axial force (N)	10		

- Wiring Diagram :



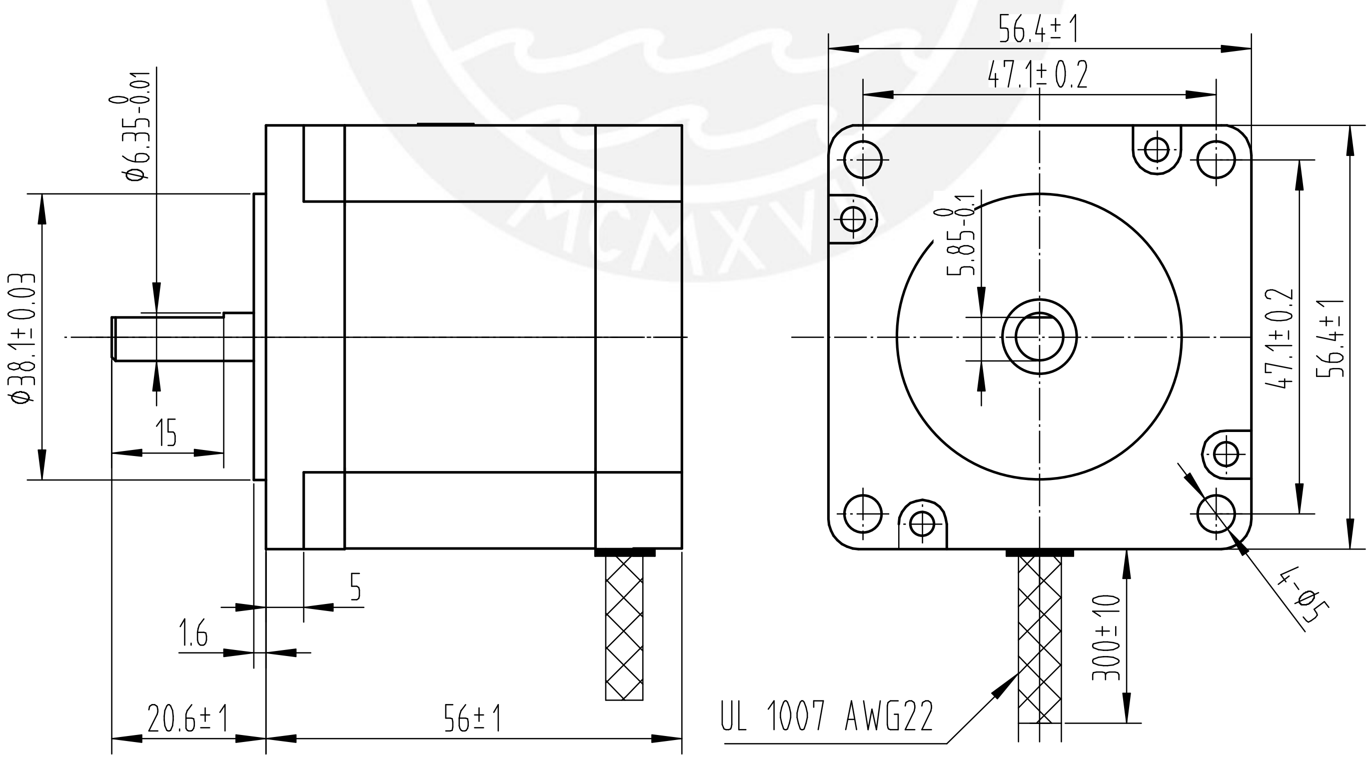
- Pull out torque curve :

VOLTAGE: 30VAC, CONSTANT CURRENT: 2.0A, HALF STEP

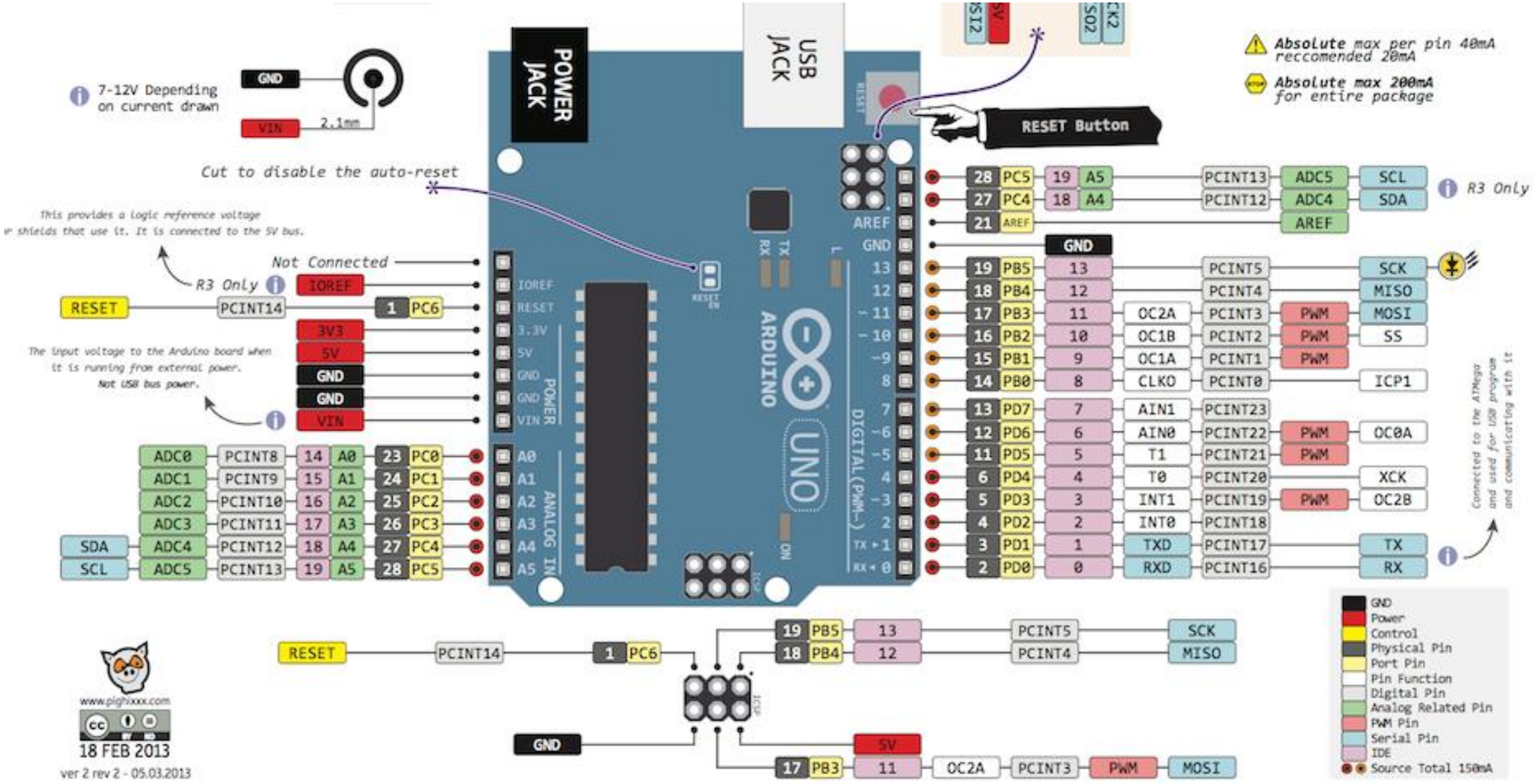


- Dimensions:

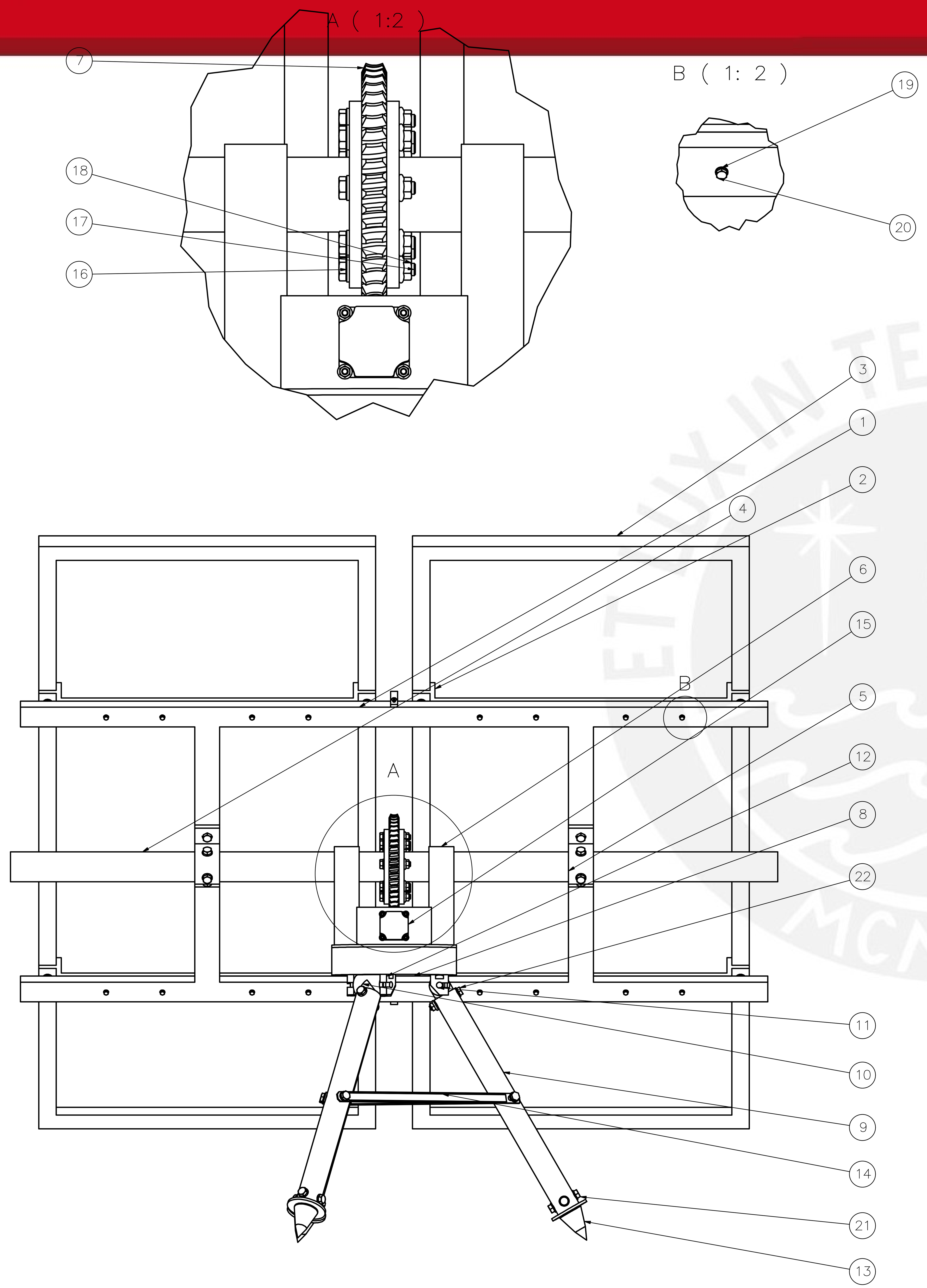
(unit=mm)



REV					SY57STH56-2006A	TECHNICAL CONDITIONS
DRAW						
CHECK	REVISIONS	DESCRIPTION	BY	DATE		
APPROVE	2013/06/12				CHANGZHOU SONGYANG MACHINERY & ELECTRONICS NEW TECHNIC INSTITUTE	080056008



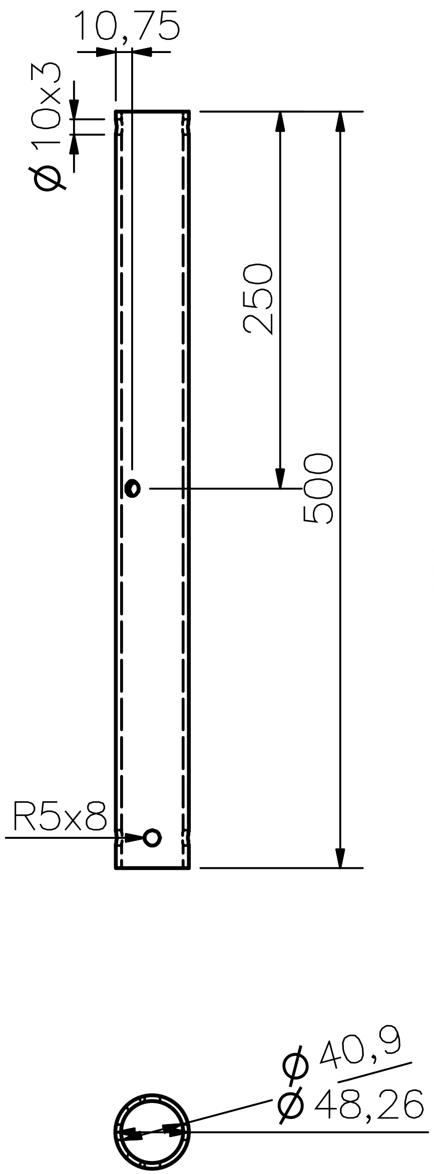
POWER JACK
USB JACK
7-12V Depending on current drawn
GND
VIN
2.1mm
Absolute max per pin 40mA reccomended 20mA
Absolute max 200mA for entire package
RESET Button
Cut to disable the auto-reset
This provides a logic reference voltage for shields that use it. It is connected to the 5V bus.
Not Connected
R3 Only
IOREF
RESET
PCINT14
1 PC6
3V3
5V
The input voltage to the Arduino board when it is running from external power. Not USB bus power.
GND
VIN
ADC0 PCINT8 14 A0 23 PC0
ADC1 PCINT9 15 A1 24 PC1
ADC2 PCINT10 16 A2 25 PC2
ADC3 PCINT11 17 A3 26 PC3
SDA ADC4 PCINT12 18 A4 27 PC4
SCL ADC5 PCINT13 19 A5 28 PC5
28 PC5 19 A5 PCINT13 ADC5 SCL
27 PC4 18 A4 PCINT12 ADC4 SDA
R3 Only
21 AREF AREF
GND
19 PB5 13 PCINT5 SCK
18 PB4 12 PCINT4 MISO
17 PB3 11 OC2A PCINT3 PWM MOSI
16 PB2 10 OC1B PCINT2 PWM SS
15 PB1 9 OC1A PCINT1 PWM
14 PB0 8 CLKO PCINT0 ICP1
13 PD7 7 AIN1 PCINT23
12 PD6 6 AIN0 PCINT22 PWM OC0A
11 PD5 5 T1 PCINT21 PWM
6 PD4 4 T0 PCINT20 XCK
5 PD3 3 INT1 PCINT19 PWM OC2B
4 PD2 2 INT0 PCINT18
3 PD1 1 TXD PCINT17 TX
2 PD0 0 RXD PCINT16 RX
Connected to the ATMega and used for USB programming and communicating with it
ARDUINO
UNO
DIGITAL (PWM~)
ANALOG IN
POWER
RESET
19 PB5 13 PCINT5 SCK
18 PB4 12 PCINT4 MISO
RESET PCINT14 1 PC6
GND
5V
17 PB3 11 OC2A PCINT3 PWM MOSI
www.pighixxx.com
18 FEB 2013
ver 2 rev 2 - 05.03.2013
GND
Power
Control
Physical Pin
Port Pin
Pin Function
Digital Pin
Analog Related Pin
PWM Pin
Serial Pin
IDE
Source Total 150mA

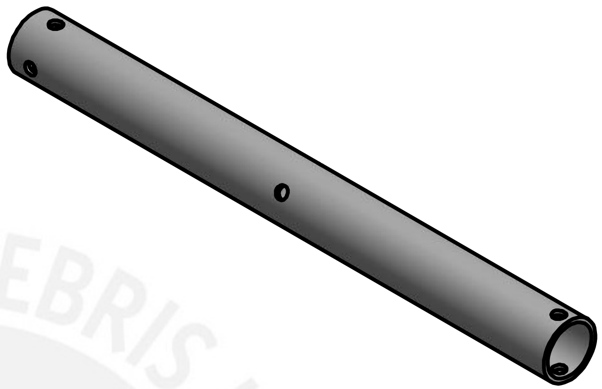


POS.	CANT.	DESCRIPCIÓN	NORMA	MATERIAL	OBSERVACIONES
41	1	ISO 10642 – M5 x 8	ISO 10642	Steel	
22	3	ISO 4014 – M10 x 65	ISO 4014	Stainless Steel, 440C	
21	36	ANSI B18.2.3.5M – M10 x 1.5 x 16	ANSI B18.2.3.5M	Steel, Mild	
20	22	ISO 4014 – M5 x 40	ISO 4014	Stainless Steel, 440C	
19	33	ISO 7089 – 5 – 140 HV	ISO 7089	Stainless Steel	
18	11	ISO 4161 – M10	ISO 4161	Stainless Steel	
17	8	ISO 4014 – M10 x 55	ISO 4014	Stainless Steel, 440C	
16	35	ISO 7089 – 10 – 140 HV	ISO 7089	Stainless Steel	
15	1	Motor		Generic	
14	3	Sujetador patas tripode		A 6061	
13	3	Soporte trípode		AISI 1020	
12	6	Acople eje trípode		A 6061	
11	3	Eje trípode		AISI 1020	
10	3	Acople en T		A 6061	
9	3	Tubo tripode		AISI 1020	
8	1	Acople para patas tripode		A 6061	
7	1	Corona– Sin fin		–	
6	1	Placa de soporte motor		A 6061	
5	2	Abrazadera para eje		A 6061	
4	2	Eje de soporte		A 6061	
3	2	Panel solar		–	
2	4	Eje para acople		A 6061	
1	1	Soporte estructura		A 6061	

PONTIFICIA UNIVERSIDAD CATÓLICA DEL PERÚ
CIENCIAS E INGENIERÍA – INGENIERÍA MECATRONICA

MÉTODO DE PROYECCIÓN	TRABAJO DE FIN DE CARRERA	ESCALA
	ENSAMBLE GENERAL	1:5
20101354	MANCCO LEANDRO, PAULO CESAR	FECHA: 2014.11.14
		LÁMINA: A1



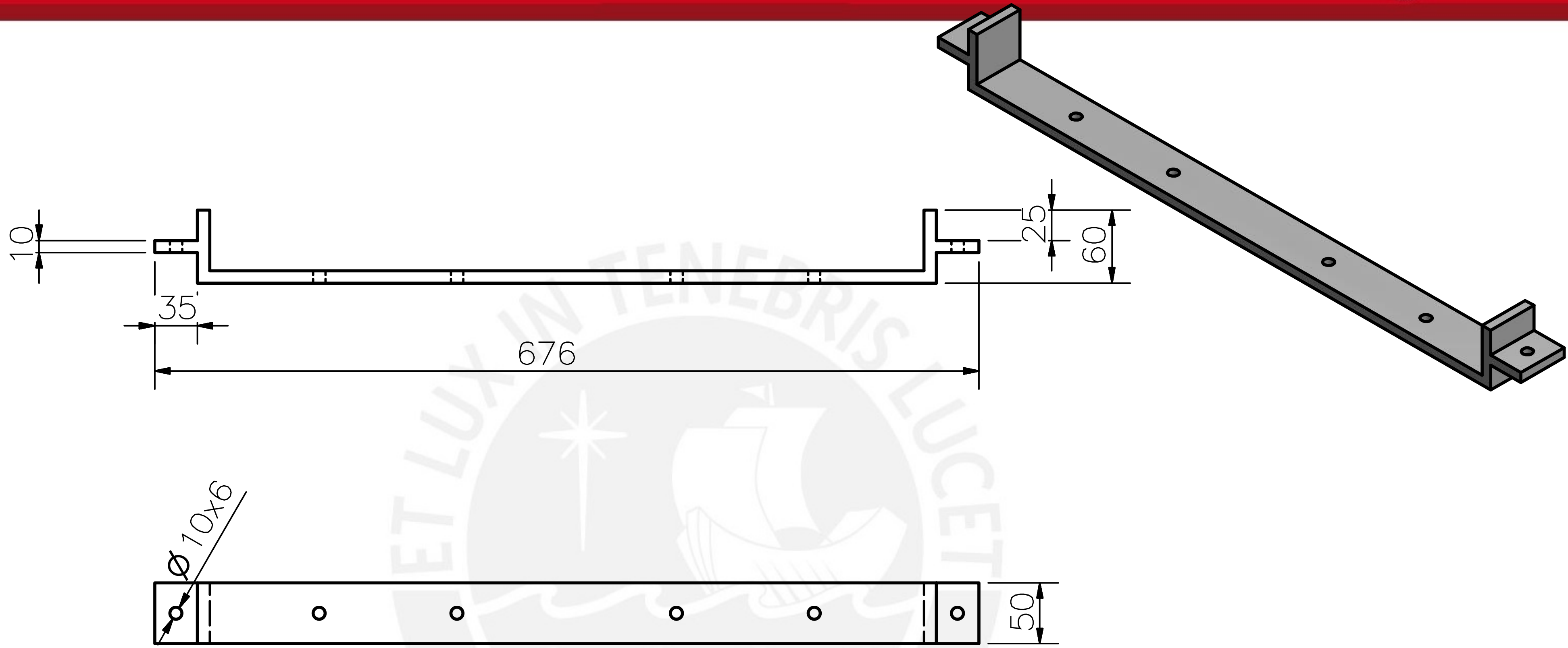


ACABADO SUPERFICIAL 1.4	TOLERANCIA GENERAL	MATERIAL A 6061

PONTIFICIA UNIVERSIDAD CATÓLICA DEL PERÚ

CIENCIAS E INGENIERIA – INGENIERIA MECATRONICA

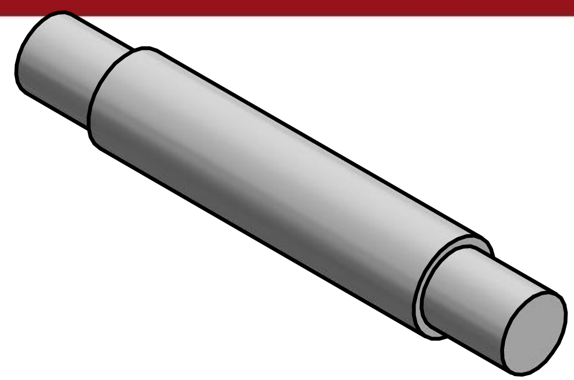
MÉTODO DE PROYECCIÓN	TRABAJO DE FIN DE CARRERA TUBO TRIPODE	ESCALA 1:5
20101354	MANCCO LEANDRO, PAULO CESAR	FECHA: 2014.11.18
		LÁMINA: A4

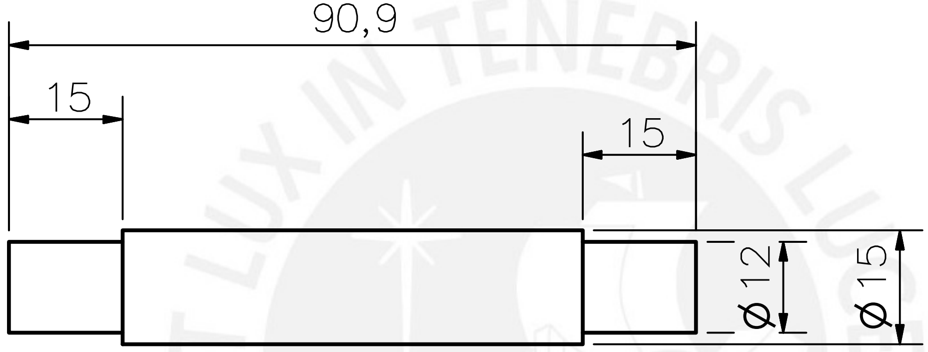


ACABADO SUPERFICIAL	TOLERANCIA GENERAL	MATERIAL
1.4		A 6061

PONTIFICIA UNIVERSIDAD CATÓLICA DEL PERÚ
CIENCIAS E INGENIERÍA – INGENIERÍA MECATRÓNICA

MÉTODO DE PROYECCIÓN	TRABAJO DE FIN DE CARRERA	ESCALA
	EJE PARA ACOPLE	1:5
20101354	MANCCO LEANDRO, PAULO CESAR	FECHA: 2014.11.14
		LÁMINA: A4



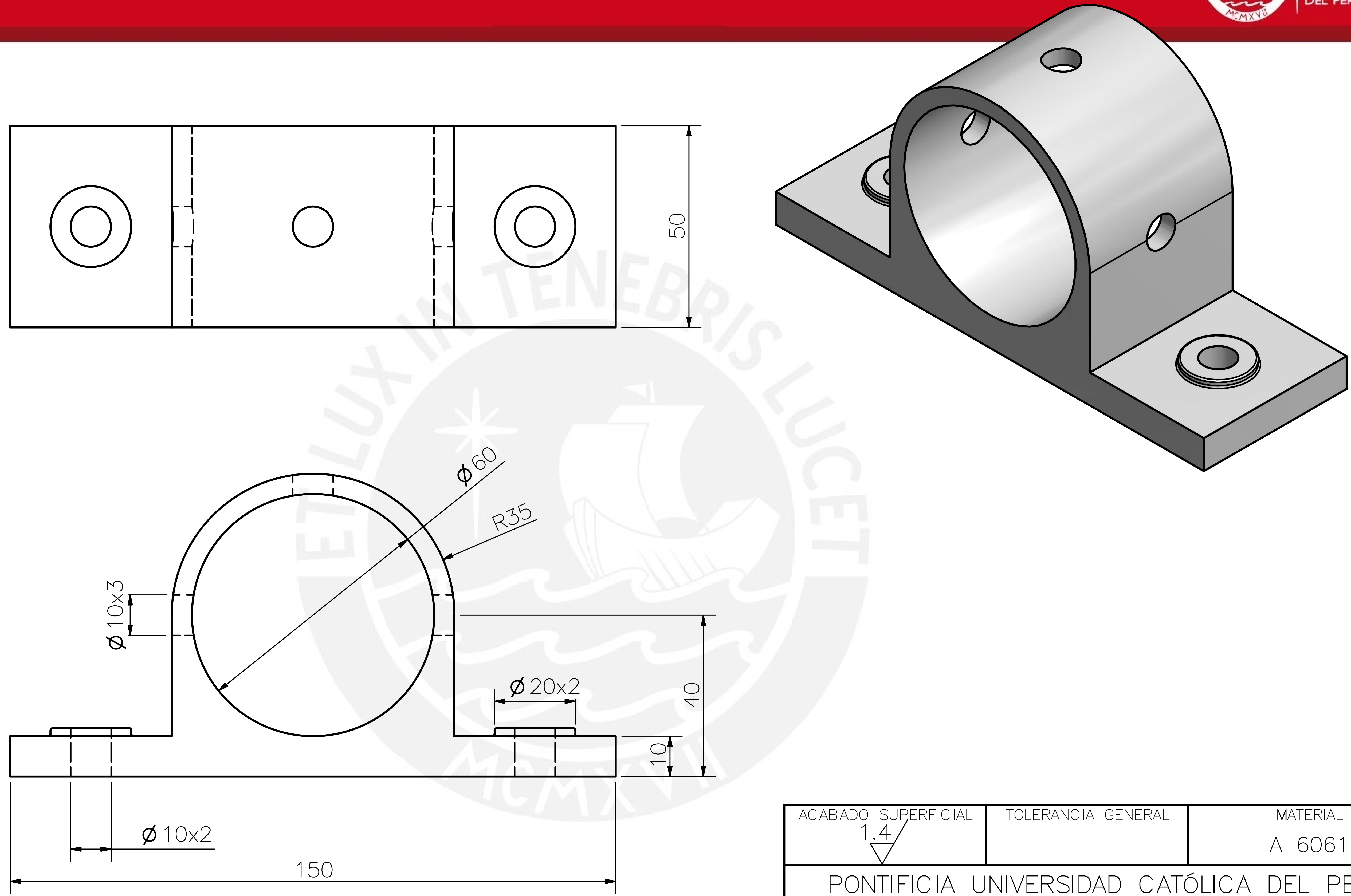


ACABADO SUPERFICIAL	TOLERANCIA GENERAL	MATERIAL
1.4		AISI 1020

PONTIFICIA UNIVERSIDAD CATÓLICA DEL PERÚ

CIENCIAS E INGENIERÍA – INGENIERÍA MECATRÓNICA

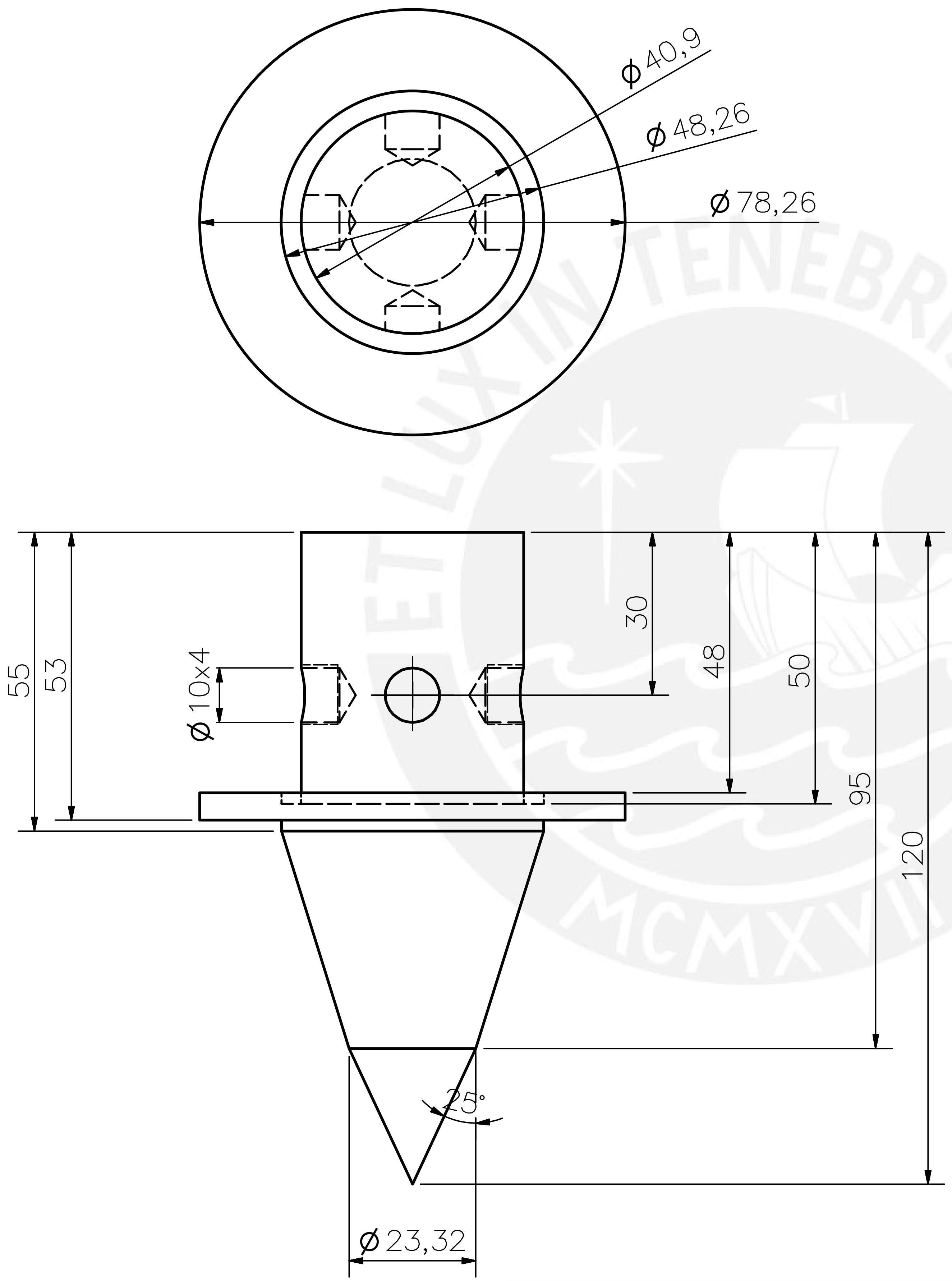
MÉTODO DE PROYECCIÓN	TRABAJO DE FIN DE CARRERA	ESCALA
	EJE TRÍPODE	1:1
20101354	MANCCO LEANDRO, PAULO CESAR	FECHA: 2014.11.14
		LÁMINA: A4

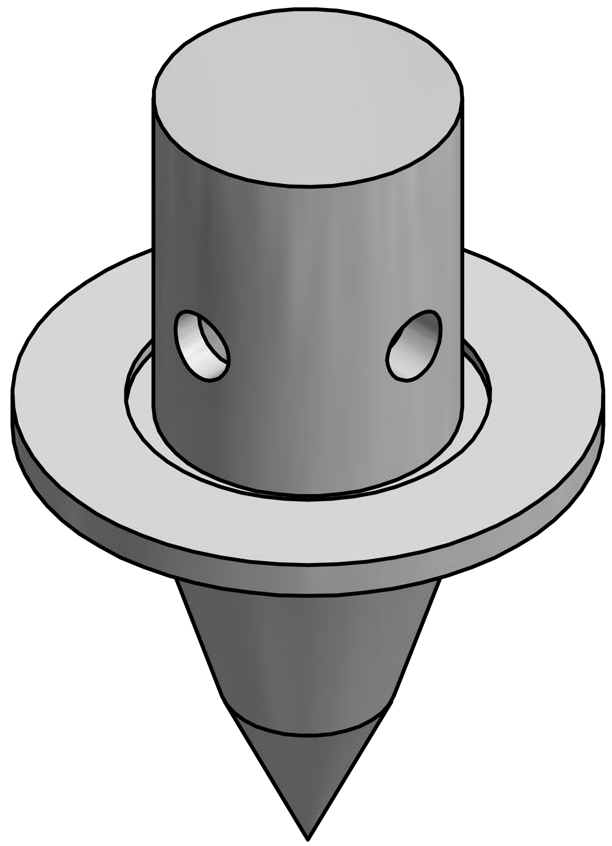


ACABADO SUPERFICIAL	TOLERANCIA GENERAL	MATERIAL
1.4		A 6061

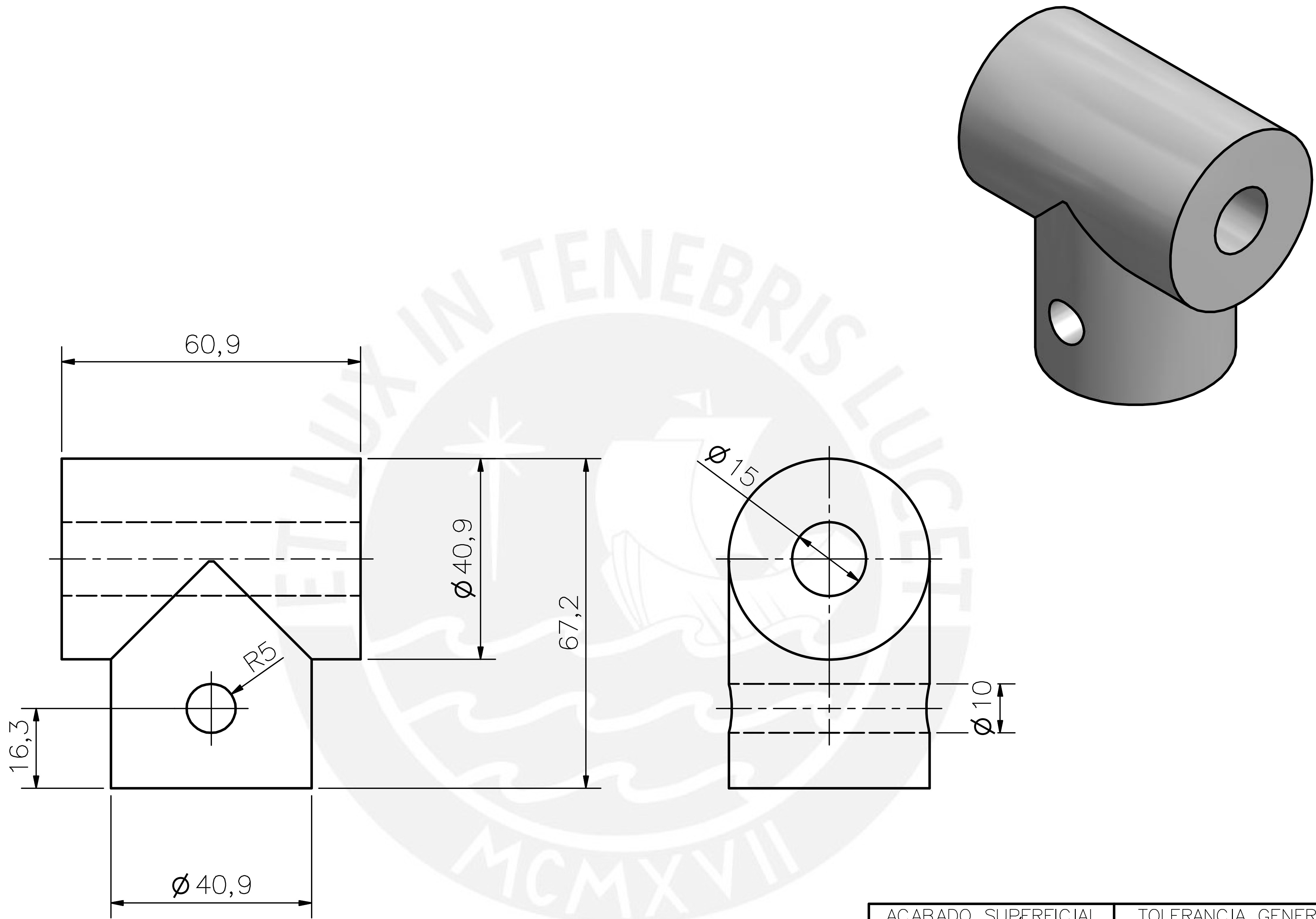
PONTIFICIA UNIVERSIDAD CATÓLICA DEL PERÚ
CIENCIAS E INGENIERIA – INGENIERIA MECATRONICA

MÉTODO DE PROYECCIÓN	TRABAJO DE FIN DE CARRERA	ESCALA
	ABRAZADERA PARA EJE	1:1
20101354	MANCCO LEANDRO,PAULO CESAR	FECHA: 2014.11.17
		LÁMINA: A3





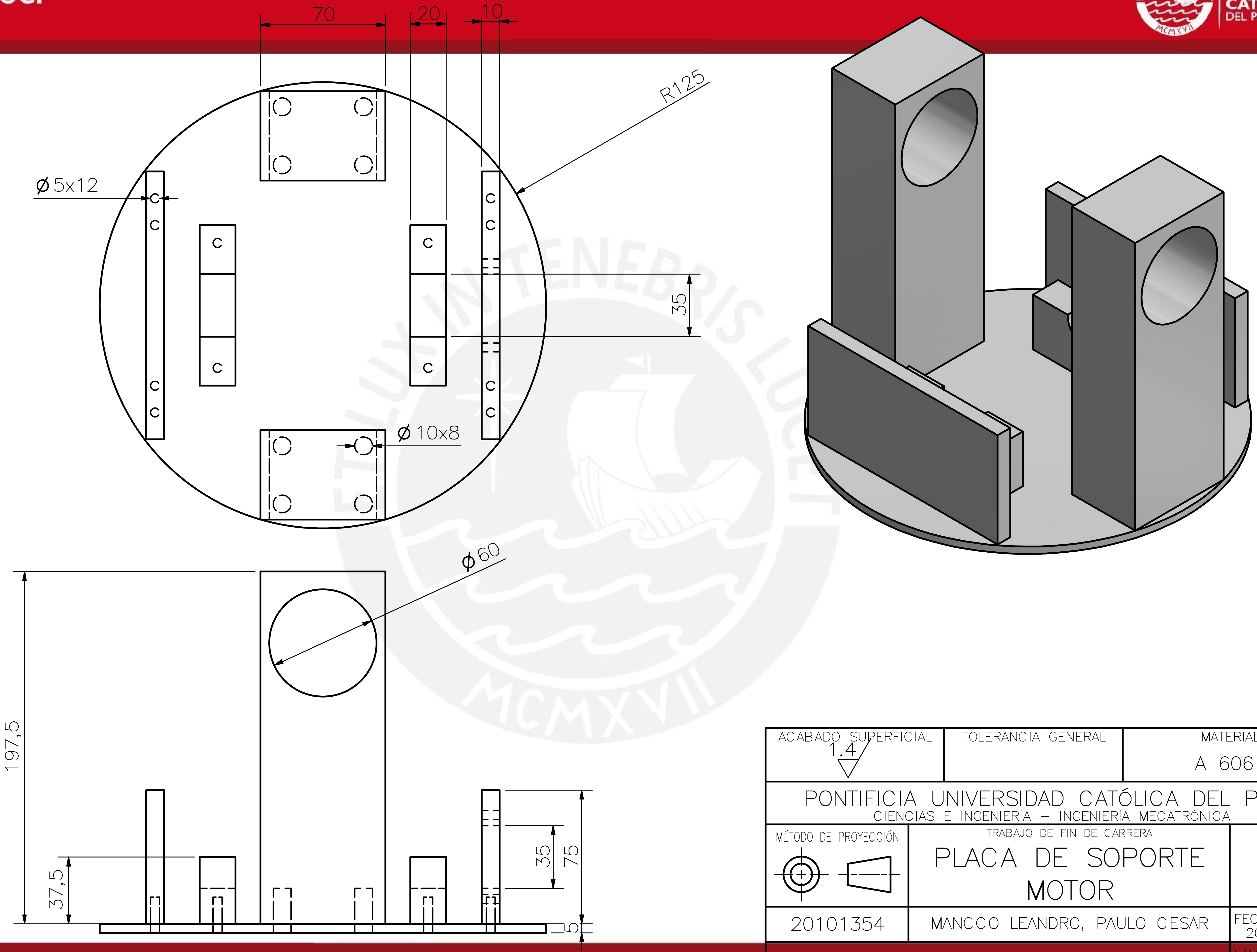
ACABADO SUPERFICIAL 1,2	TOLERANCIA GENERAL	MATERIAL AISI 1020	
PONTIFICIA UNIVERSIDAD CATÓLICA DEL PERÚ CIENCIAS E INGENIERÍA – INGENIERÍA MECATRÓNICA			
MÉTODO DE PROYECCIÓN	REABAJO DE FIN DE CARRERA SOPORTE TRÍPODE		ESCALA 1:1
20101354	MANCCO LEANDRO, PAULO CESAR		FECHA: 2014.11.15
			LÁMINA: A3



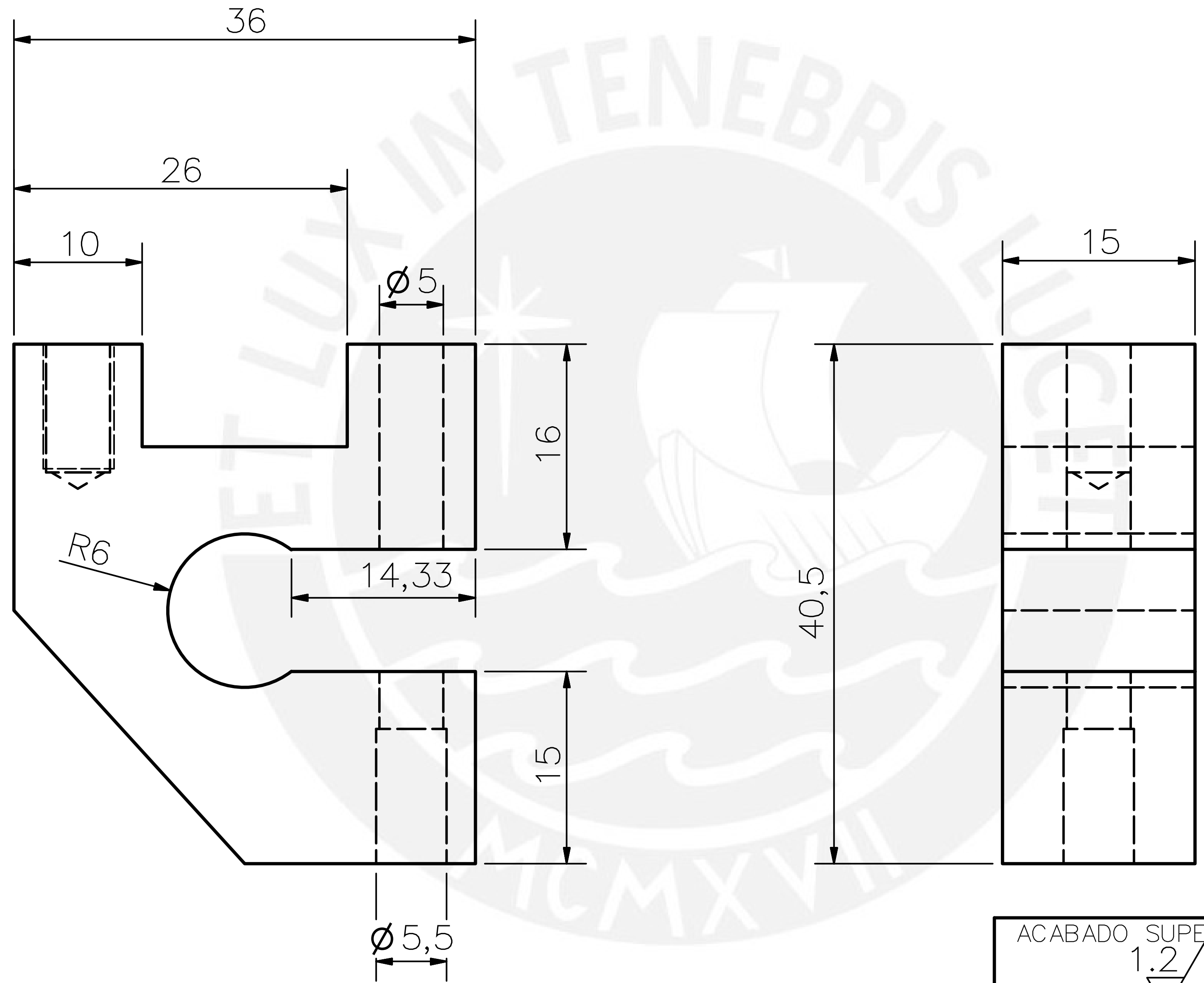
ACABADO SUPERFICIAL	TOLERANCIA GENERAL	MATERIAL
1.4		AISI 1020

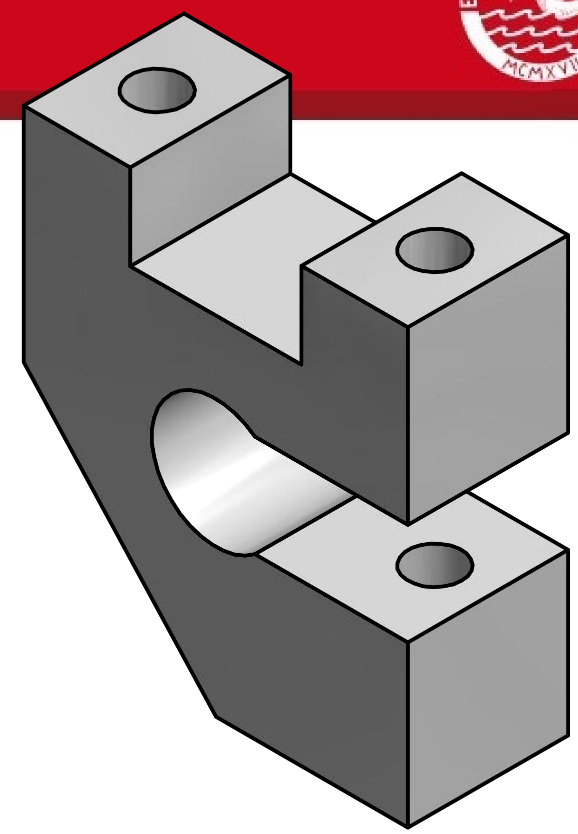
PONTIFICIA UNIVERSIDAD CATÓLICA DEL PERÚ
CIENCIAS E INGENIERÍA – INGENIERÍA MECATRÓNICA

MÉTODO DE PROYECCIÓN	TRABAJO DE FIN DE CARRERA	ESCALA
	ACOPLE EN T	1:1
20101354	MANCCO LEANDRO, PAULO CESAR	FECHA: 2014.11.14
		LÁMINA: A3

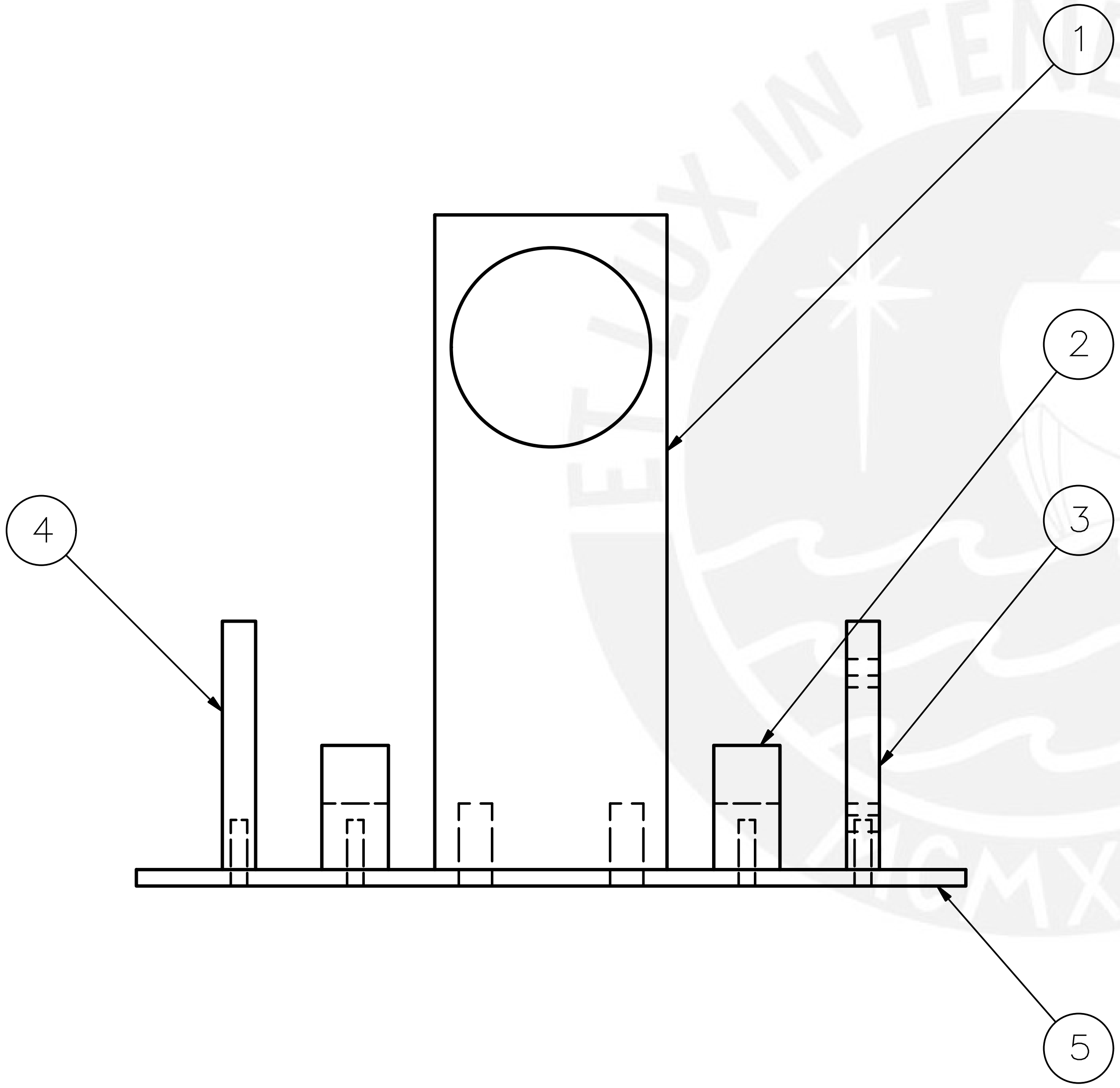


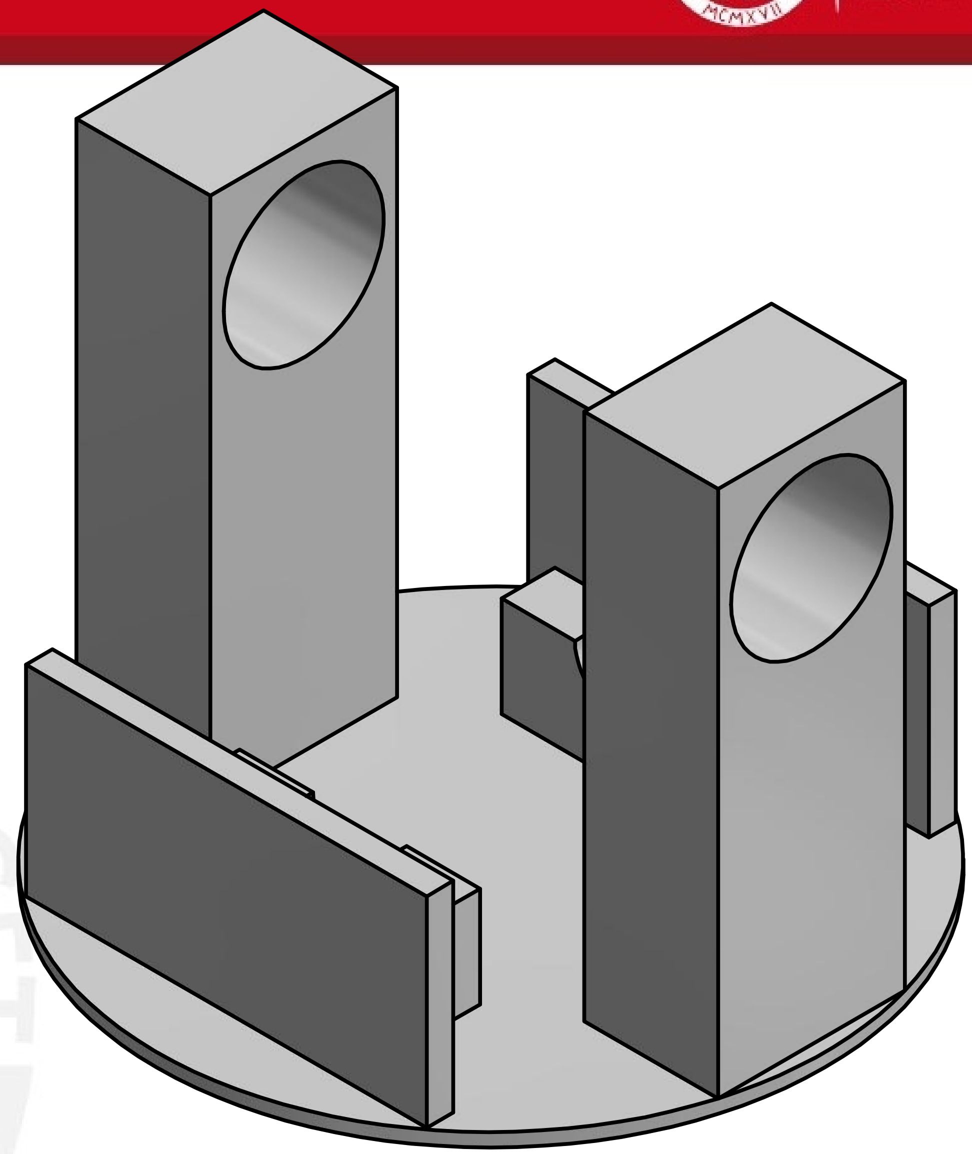
ACABADO SUPERFICIAL 1.4	TOLERANCIA GENERAL	MATERIAL A 6061
PONTIFICIA UNIVERSIDAD CATÓLICA DEL PERÚ CIENCIAS E INGENIERÍA – INGENIERÍA MECATRÓNICA		
MÉTODO DE PROYECCIÓN	TRABAJO DE FIN DE CARRERA PLACA DE SOPORTE MOTOR	ESCALA 1:2
20101354	MANCCO LEANDRO, PAULO CESAR	FECHA: 2014.11.14
		LÁMINA: A3





ACABADO SUPERFICIAL 1.2	TOLERANCIA GENERAL	MATERIAL A 6061
PONTIFICIA UNIVERSIDAD CATÓLICA DEL PERÚ CIENCIAS E INGENIERÍA – INGENIERÍA MECATRÓNICA		
MÉTODO DE PROYECCIÓN	TRABAJO DE FIN DE CARRERA ACOPLE EJE TRÍPODE	ESCALA 2:1
20101354	MANCCO LEANDRO, PAULO CESAR	FECHA: 2014.11.14
		LÁMINA: A3

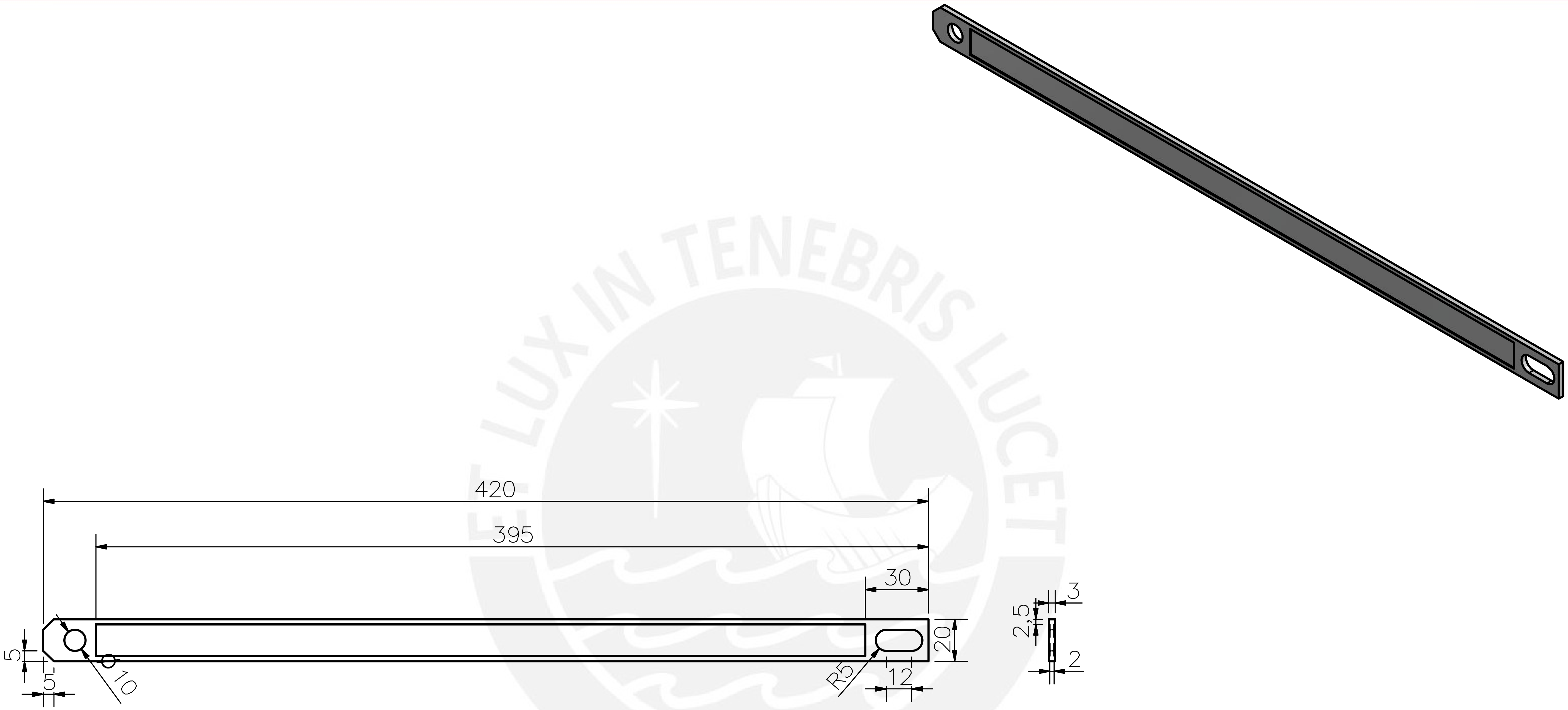




5	1	Base para soporte		A 6061	
4	1	Soporte trasero tornillo sin fin		A 6061	
3	1	Placa para motor		A 6061	
2	2	Soporte tornillo sin fin		A 6061	
1	2	Soporte ejes panel		A 6061	
POS.	CANT.	DESCRIPCIÓN	NORMA	MATERIAL	OBSERVACIONES

PONTIFICIA UNIVERSIDAD CATÓLICA DEL PERÚ
CIENCIAS E INGENIERÍA – INGENIARÍA MECATRÓNICA

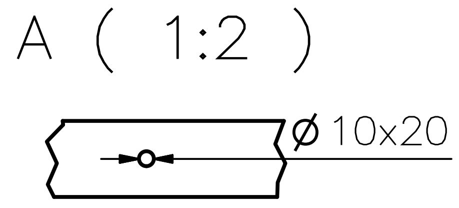
MÉTODO DE PROYECCIÓN	TRABAJO DE FIN DE CARRERA PLACA DE SOPORTE MOTOR	ESCALA 1:2
20101354	MANCCO LEANDRO, PAULO CESAR	FECHA: 2014.11.14
		LÁMINA: A3

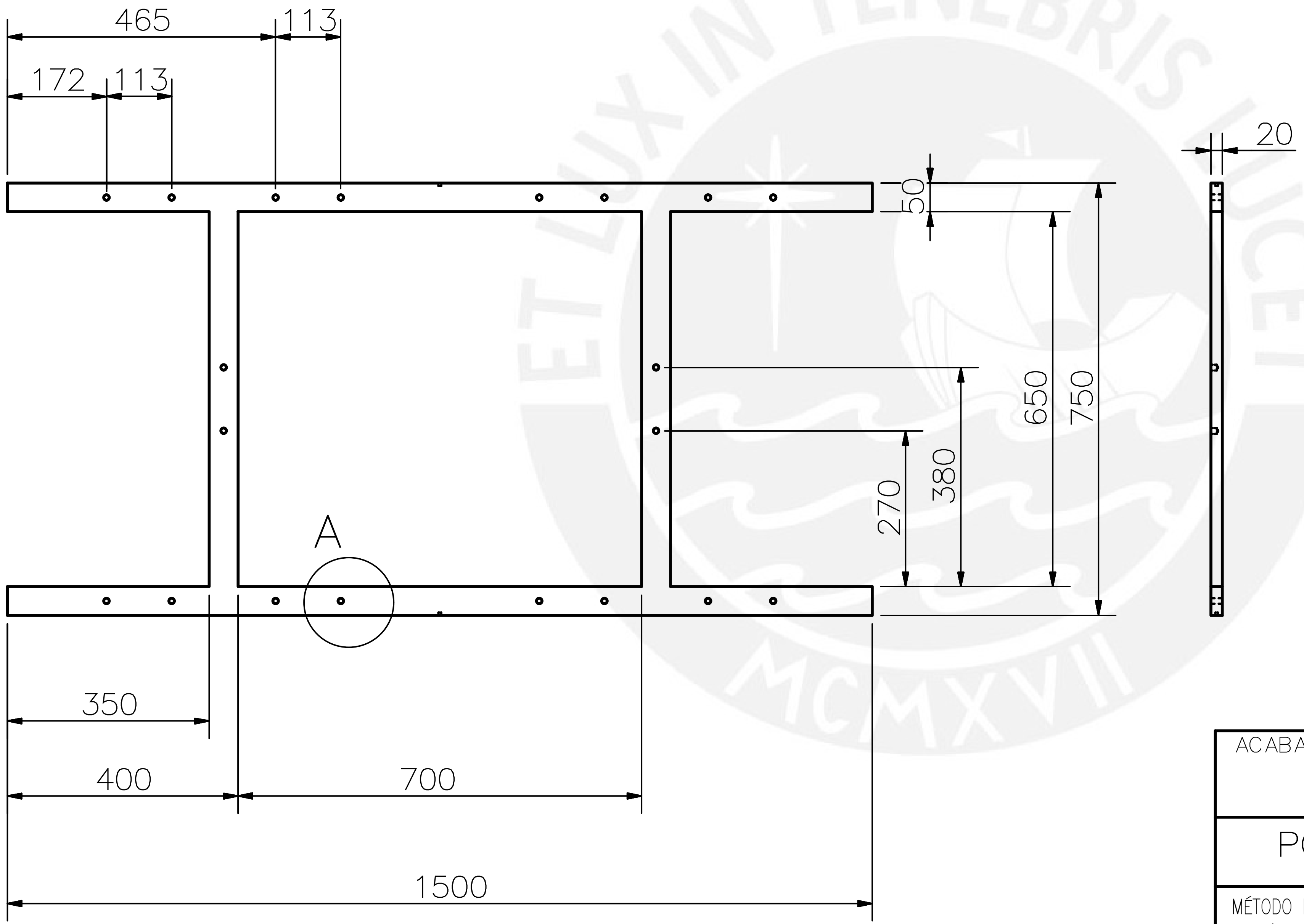


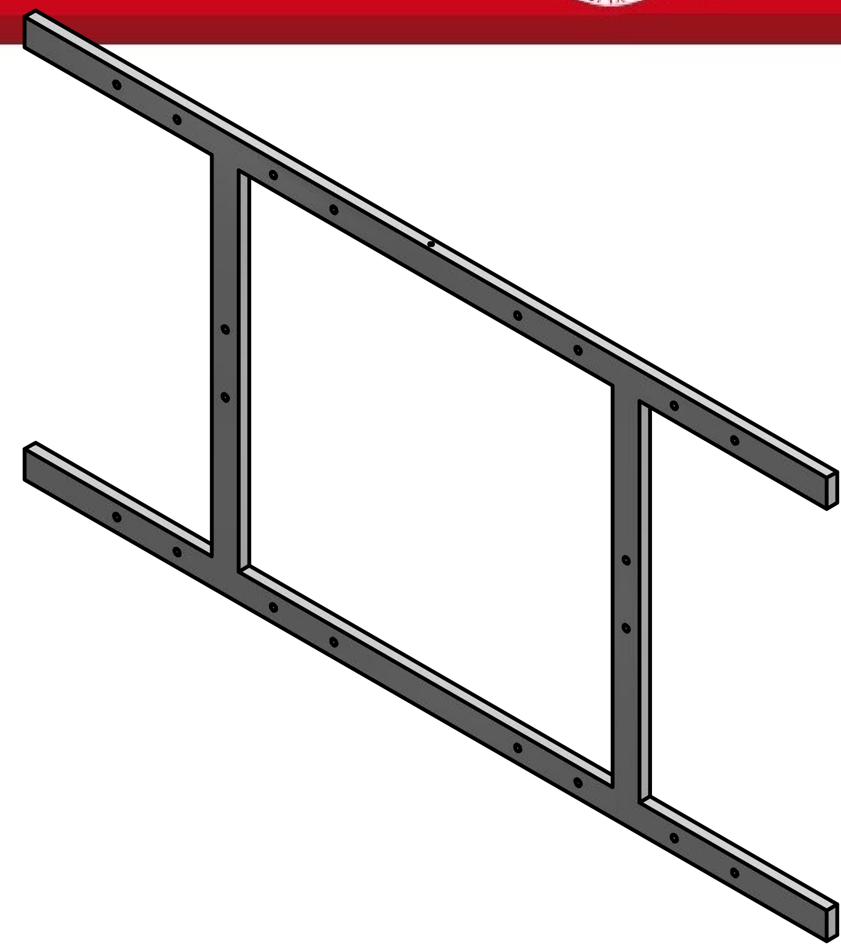
ACABADO SUPERFICIAL	TOLERANCIA GENERAL	MATERIAL
		AISI 1020

PONTIFICIA UNIVERSIDAD CATÓLICA DEL PERÚ
CIENCIAS E INGENIERÍA – INGENIERÍA MECATRÓNICA

MÉTODO DE PROYECCIÓN	TRABAJO DE FIN DE CARRERA SUJETADOR PATAS TRIPODE	ESCALA 1:2
20101354	MANCCO LEANDRO, PAULO CESAR	FECHA: 2014.11.15
		LÁMINA: A3

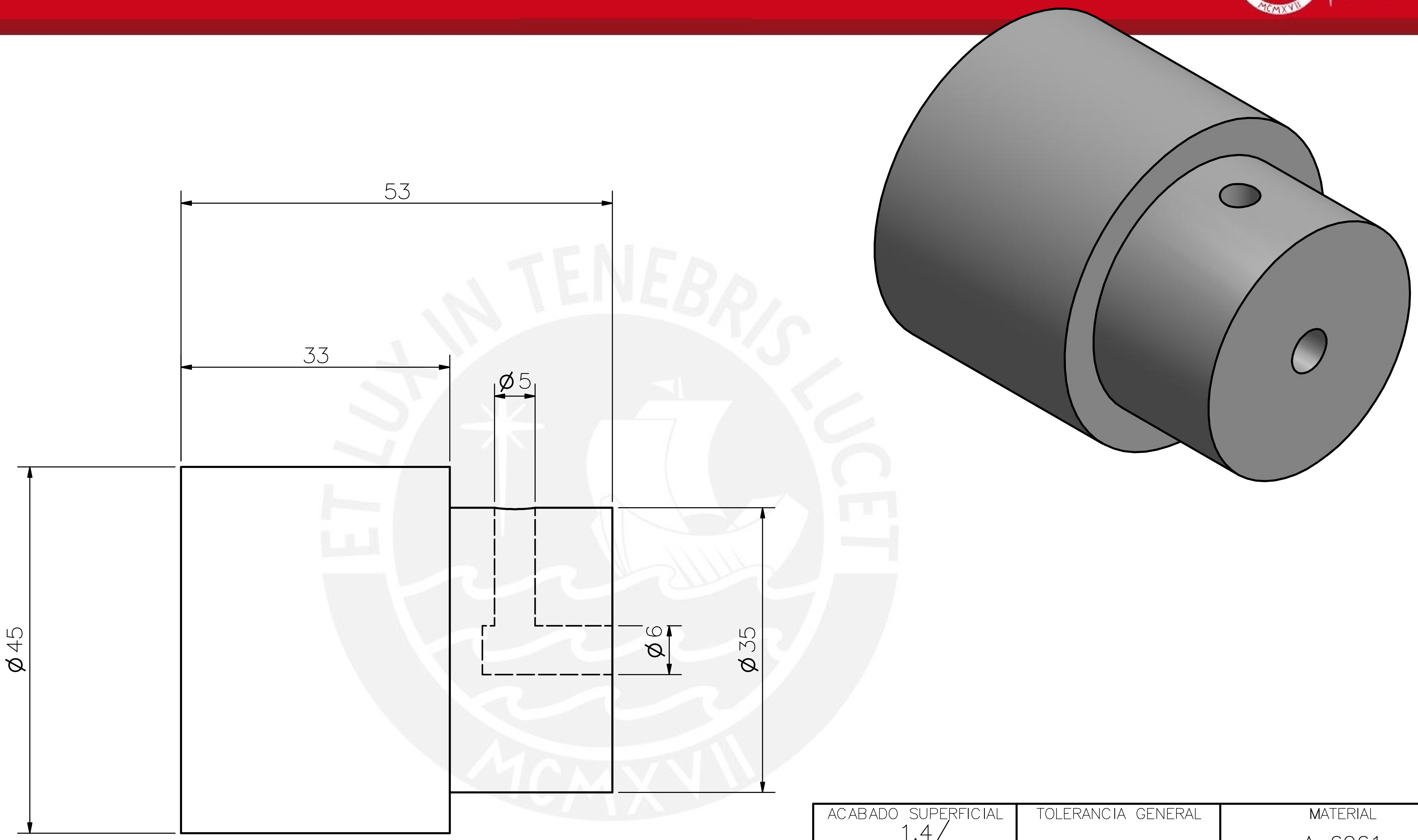




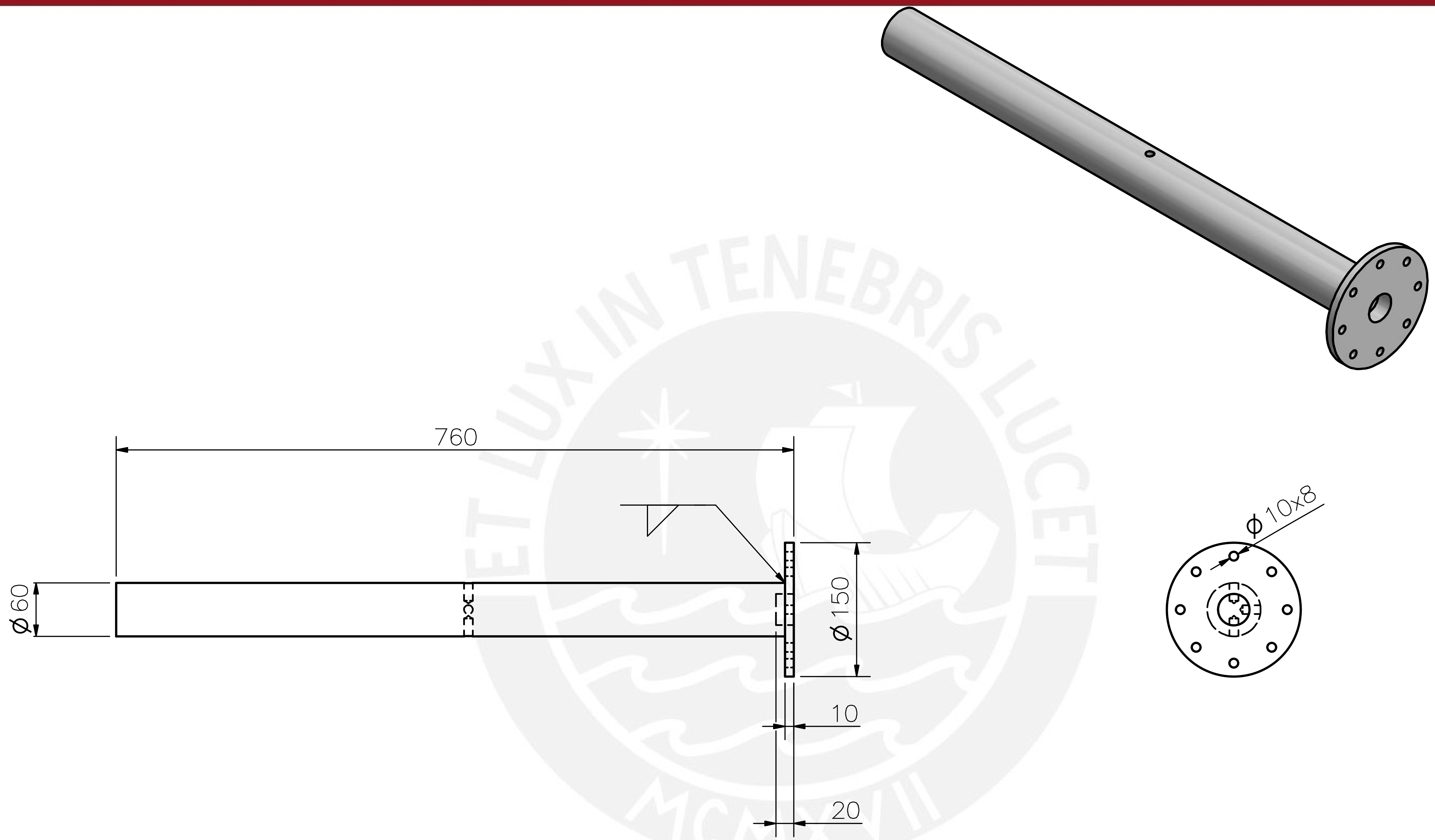


ACABADO SUPERFICIAL	TOLERANCIA GENERAL	MATERIAL
1.4		A6061

PONTIFICIA UNIVERSIDAD CATÓLICA DEL PERÚ CIENCIAS E INGENIERÍA – INGENIERÍA MECATRÓNICA		
MÉTODO DE PROYECCIÓN	TRABAJO DE FIN DE CARRERA SOPORTE ESTRUCTURA	ESCALA 1:10
20101354	MANCCO LEANDRO, PAULO CESAR	FECHA: 2014.11.15
		LÁMINA: A3



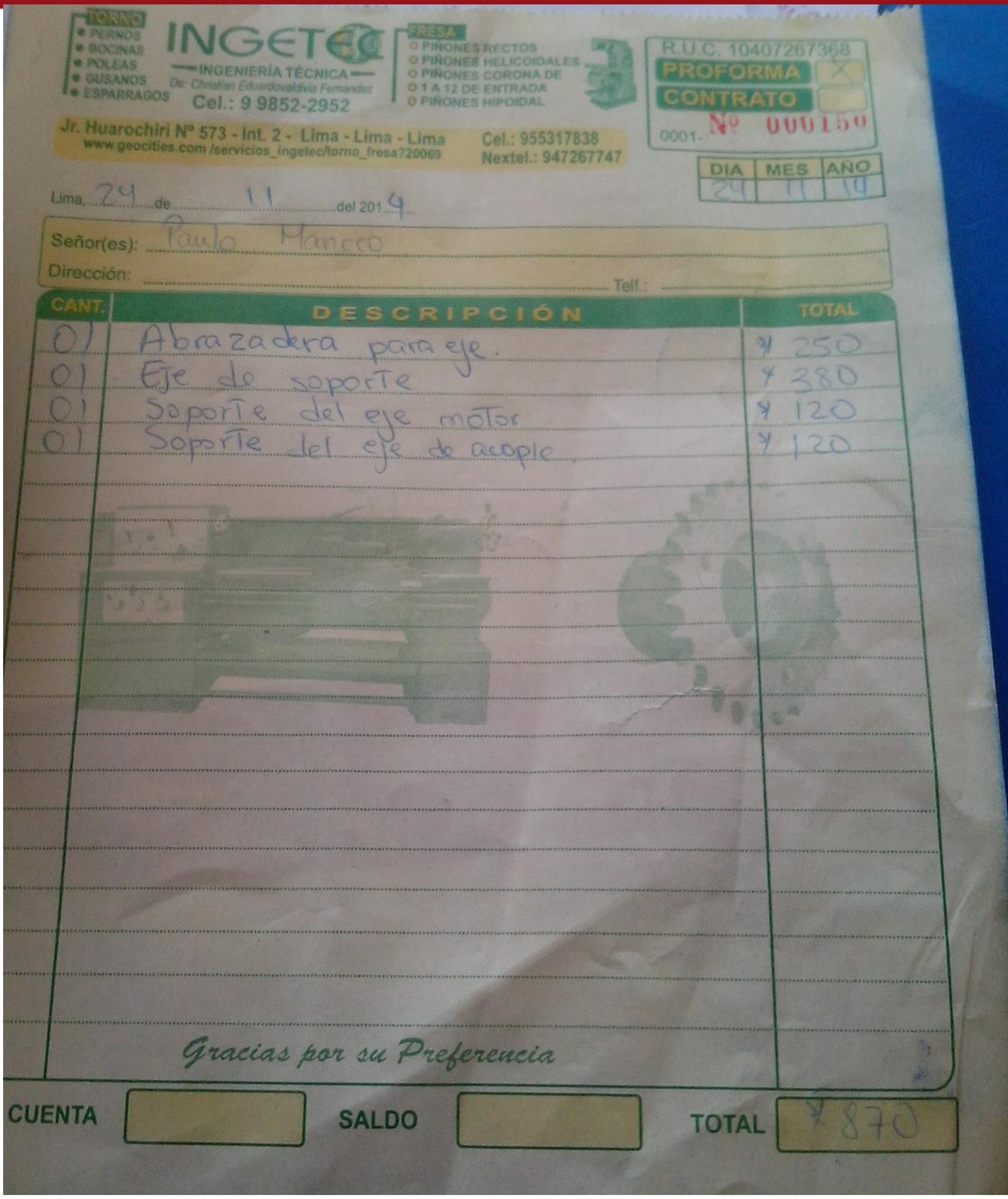
ACABADO SUPERFICIAL 1.4	TOLERANCIA GENERAL	MATERIAL A 6061
PONTIFICIA UNIVERSIDAD CATÓLICA DEL PERÚ CIENCIAS E INGENIERÍA – INGENIERÍA MECATRÓNICA		
MÉTODO DE PROYECCIÓN	TRABAJO DE FIN DE CARRERA EJE SUJECION DE MOTOR	ESCALA 2:1
20101354	MANCCO LEANDRO, PAULO CESAR	FECHA: 2014.11.14
		LÁMINA: A3



ACABADO SUPERFICIAL	TOLERANCIA GENERAL	MATERIAL
1.4		A 6061

PONTIFICIA UNIVERSIDAD CATÓLICA DEL PERÚ
CIENCIAS E INGENIERÍA – INGENIERÍA MECATRÓNICA

MÉTODO DE PROYECCIÓN	TRABAJO DE FIN DE CARRERA	ESCALA
	EJE DE SOPORTE	1:5
20101354	MANCCO LEANDRO, PAULO CESAR	FECHA: 2014.11.18
		LÁMINA: A3



TORNO
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- BOCINAS
- POLEAS
- GUSANOS
- ESPARRAGOS

INGETEC
INGENIERÍA TÉCNICA
De: Christian Eduardovaldivia Fernandez
Cel.: 9 9852-2952

FRESA
- PIÑONES RECTOS
- PIÑONES HELICOIDALES
- PIÑONES CORONA DE 1 A 12 DE ENTRADA
- PIÑONES HIPOIDAL

R.U.C. 10407267368
PROFORMA X
CONTRATO
0001- Nº 000150

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Cel.: 955317838
Nextel.: 947267747

DIA	MES	AÑO
24	11	14

Lima 24 de 11 del 2014

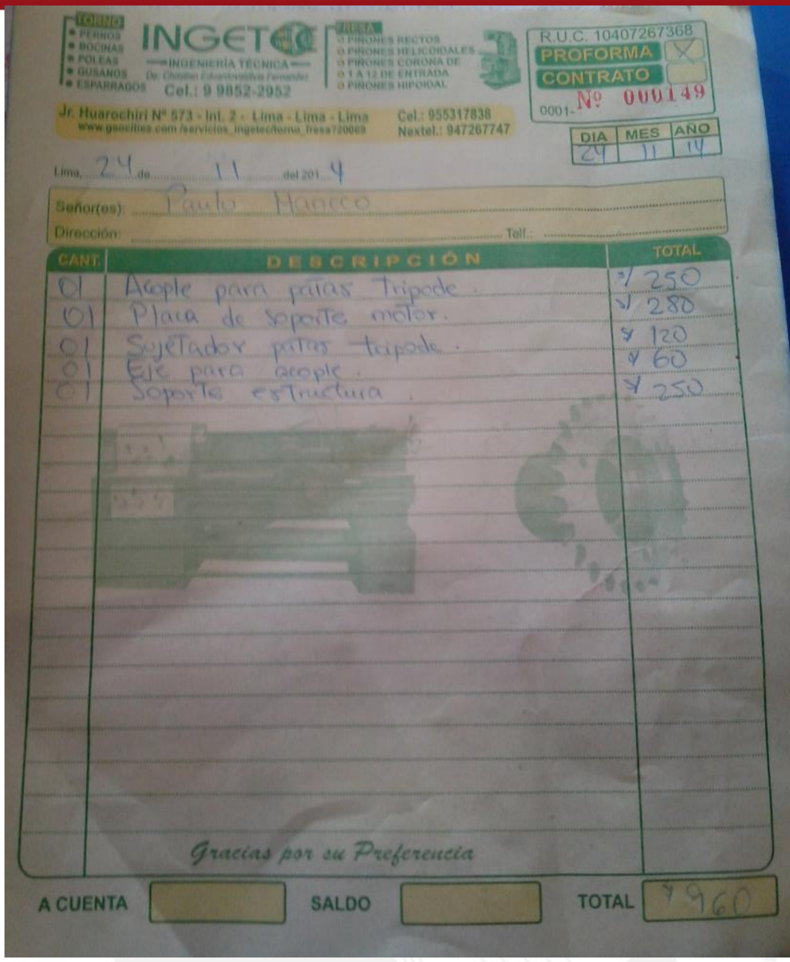
Señor(es): Paulo Mancco

Dirección: Telf.:

CANT.	DESCRIPCIÓN	TOTAL
01	Abrazadera para eje.	S/ 250
01	Eje de soporte	S/ 380
01	Soporte del eje motor	S/ 120
01	Soporte del eje de acople	S/ 120

Gracias por su Preferencia

CUENTA | SALDO | TOTAL S/ 870



TORNO
- PERNOS
- BOCINAS
- POLEAS
- GUSANOS
- ESPARRAGOS

INGETEC

INGENIERÍA TÉCNICA

Cel.: 9 9852-2952

FRESA
- PIÑONES RECTOS
- PIÑONES HELICOIDALES
- PIÑONES CORONA DE
- 1 A 12 DE ENTRADA
- PIÑONES HIPOIDAL

R.U.C. 10407267368

PROFORMA [X]

CONTRATO [ ]

0001- Nº 000149

Jr. Huarochiri Nº 573 - Int. 2 - Lima - Lima - Lima

Cel.: 955317838

Nextel.: 947267747

DIA	MES	AÑO
24	11	14

Lima, 24 de 11 del 2014

Señor(es): Paulo Mancco

Dirección: Telf.:

CANT.	DESCRIPCIÓN	TOTAL
01	Acople para patas Tripode.	S/ 250
01	Placa de soporte motor.	S/ 280
01	Sujetador patas tripode.	S/ 120
01	Eje para acople.	S/ 60
01	Soporte estructura.	S/ 250

Gracias por su Preferencia

A CUENTA | SALDO | TOTAL S/ 960

ACROPOLIS CONTRATISTAS GENERALES SAC
Av. los Ángeles Mz. E Lt. 2
Lima- Ate
RUC 20433840152

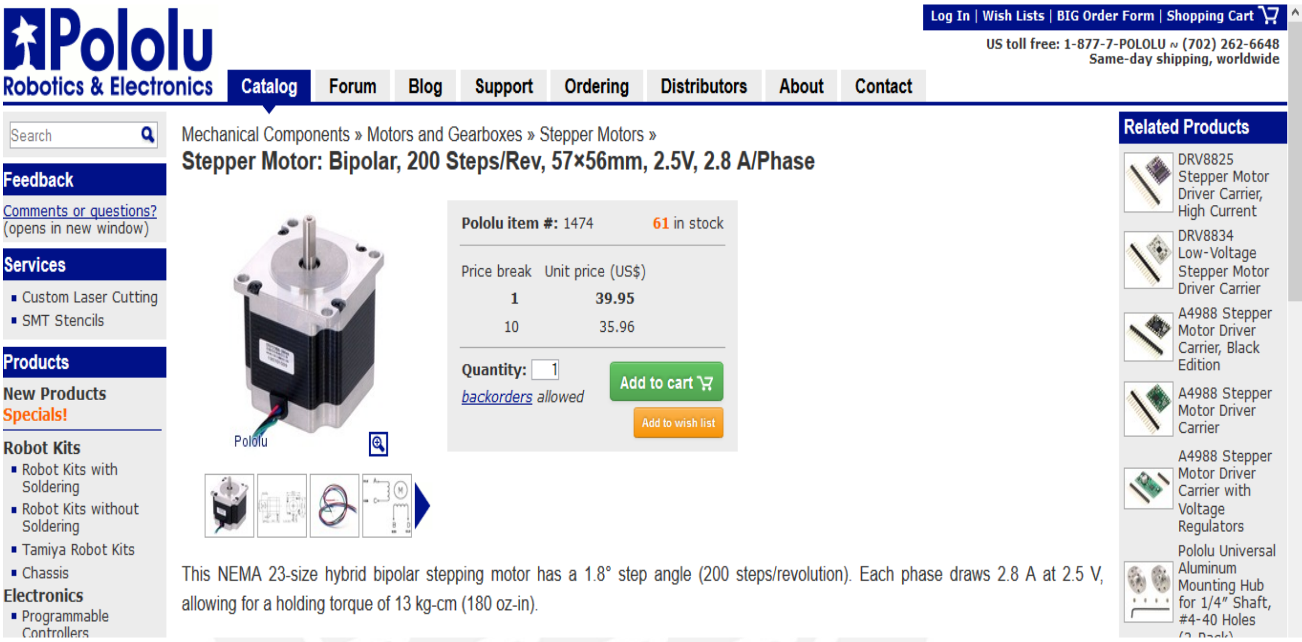
PROFORMA

Cliente: Paulo Mancco Leandro
Dirección: ----------------
RUC: 10704943915
Fecha: 14/11/14
Validez: 30 días

Se realiza la cotización de 5 piezas de acero inoxidable según los planos enviados, por una cantidad de 100 unidades. Esta proforma incluye el mecanizado de las piezas más no el costo de envío.

ITEM	DESCRICIÓN	PRECIO UNITARIO	CANTIDAD	PRECIO TOTAL
1	Tubo trípode	S/.34.00	100	S/.3400.00
2	Acople en T	S/.43.00	100	S/.4300.00
3	Acople eje trípode	S/.42.00	100	S/.4200.00
4	Soporte trípode	S/.51.50	100	S/.5150.00
5	Eje trípode	S/.30.50	100	S/.3050.00
			TOTAL	S/.20100.00
			TOTAL+ IGV (18%)	**S/.23718.00**

Proforma realizada por el ingeniero Abelardo Jara F., para la realización de los productos se requiere un adelanto del 30% del precio total. El plazo de entrega de los productos es 20 días como máximo después de haber recibido el pago, día en el cual se deberá cancelar el saldo total.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Mechanical Components » Motors and Gearboxes » Stepper Motors »
Stepper Motor: Bipolar, 200 Steps/Rev, 57×56mm, 2.5V, 2.8 A/Phase
Pololu item #: 1474
61 in stock
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Unit price (US$)
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35.96
Quantity: 1
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backorders allowed
Add to wish list
This NEMA 23-size hybrid bipolar stepping motor has a 1.8° step angle (200 steps/revolution). Each phase draws 2.8 A at 2.5 V, allowing for a holding torque of 13 kg-cm (180 oz-in).
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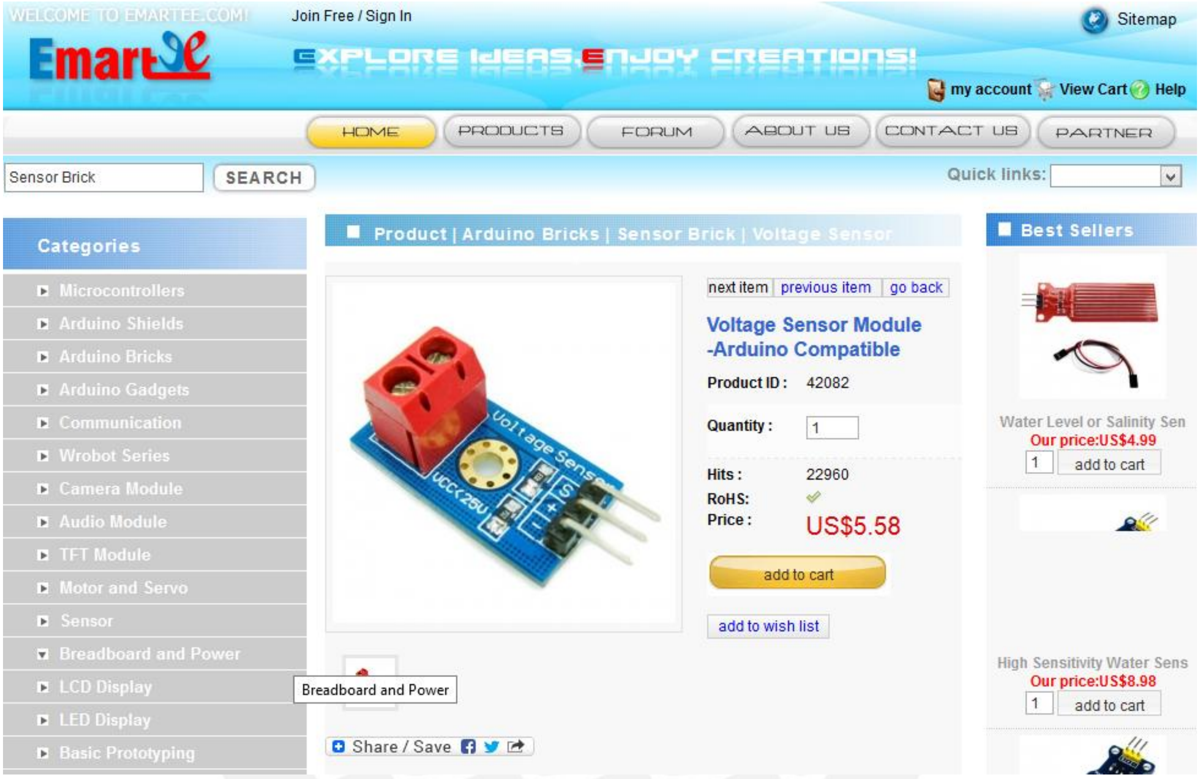
DRV8834 Low-Voltage Stepper Motor Driver Carrier
A4988 Stepper Motor Driver Carrier, Black Edition
A4988 Stepper Motor Driver Carrier
A4988 Stepper Motor Driver Carrier with Voltage Regulators
Pololu Universal Aluminum Mounting Hub for 1/4" Shaft, #4-40 Holes



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LED Display
Basic Prototyping
Product | Arduino Bricks | Sensor Brick | Voltage Sensor
next item
previous item
go back
Voltage Sensor Module -Arduino Compatible
Product ID : 42082
Quantity : 1
Hits : 22960
RoHS:
Price : US$5.58
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(0 reviews)
SKU: 326523 (Añadido el 24/06/2014)
Precio: US$ 3,35
Envío: el envío gratis A PERU
Despachado: Se enviará en los siguientes 7-10 días laborables
Color: Light Blue
Cantidad: 1
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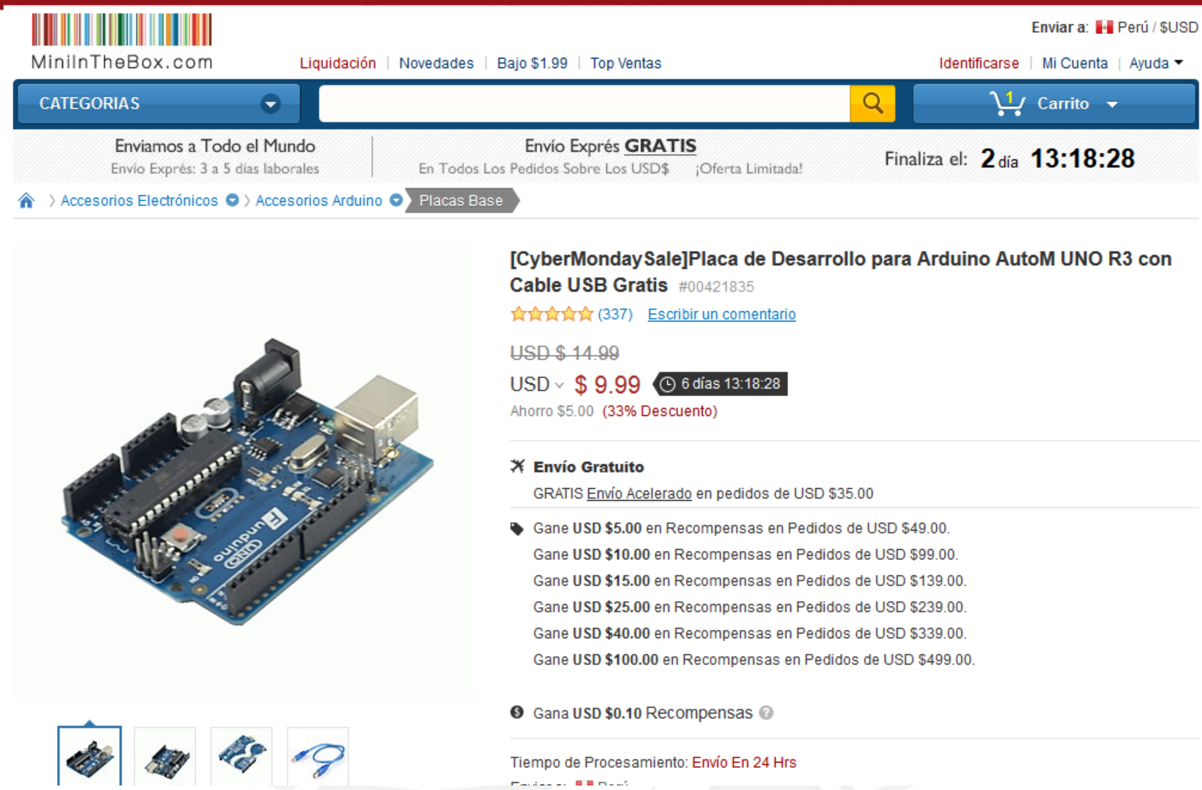
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Gana **USD $0.05** Recompensas

Tiempo de Procesamiento: 1-5 días laborables

A6.1 Selección de los grados de libertad del sistema mecatrónico.

Los seguidores solares pueden estar definidos por uno o dos grados de libertad. Para la selección de estos se basó en las consideraciones del movimiento del sol y de los accesorios extras que requiere uno a diferencia del otro.

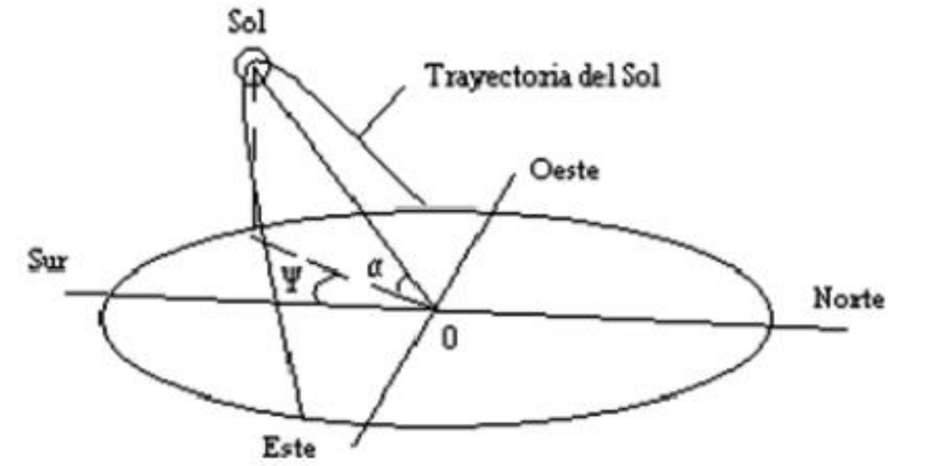


Figura A6.1 Movimiento del Sol, inclinado en los ejes α y ψ

En la figura A6.1 se muestra el movimiento del Sol entre polos debido al movimiento rotacional de la tierra y en su eje cada 3 meses en el año, lo que da lugar a las estaciones. El análisis de todo el movimiento de la tierra dependiendo de en qué zona de la tierra se quiera hacer el estudio.

La trayectoria del sol con mayor relevancia es la que se realiza a diario desde el Este hacia el Oeste. La inclinación del Sol debido al ángulo α y ψ varia debido cada 3 meses y de la posición a la que se sitúe el usuario. Por los cálculos realizados en el anexo 2, se puede llegar a saber la posición del sol en las diferentes posibilidades de estos ángulos. Notándose una variación de 35° de α, cada 6 meses (de verano a otoño y de invierno a primavera) y una variación de 3° en los cambios de estación de primavera a verano y de otoño a invierno. Por lo que la radiación en la trayectoria de norte a sur no es muy variada.

Para la elaboración de un seguidor de 1 o 2 grados de libertad se enlistaron la diferencia en cantidad de componentes necesarios a utilizar:

Tabla A6.1 Diferencia de un seguidor de 1 grado con uno de 2 grados de libertad

	1 grado de libertad	**2 grados de libertad**
Cantidad de motores	1	2
Conexiones	pocas	Muchas
Facilidad de ensamblaje	fácil	media
Aumenta la eficiencia con respecto a un panel solar de 0 grados de libertad	25%	35%

Analizando la tabla A6.1, se aprecia que la eficiencia ganada al poseer 2 grados de libertad es del 10 % con respecto a la de un panel solar de cero grados de libertad; sin embargo, se requiere de un motor adicional y de un aumento de conexiones, lo cual hace que la instalación más sencilla sea la de 1 grado de libertad. Por ende, siendo la principal causa la variación del ángulo del sol y la posible complejidad del diseño e instalación de un mecanismo para obtener 2 grados de libertad, se eligió el diseño de un seguidor solar de un grado de libertad.

A7.1 Selección del motor a pasos

Para la selección del motor que será el encargado del desplazamiento del panel solar se realizaron los siguientes cálculos.

Se define:

$$Tm = \frac{w}{2} * d\,.$$

Tm: torque que ejerce el peso de los paneles y la estructura de sujeción de este.

w : peso de los 2 paneles (11Kg cada uno) más la estructura que la sujeta.

d: distancia desde el eje al centro de gravedad de los paneles.

w = 25 kg

d = 130mm = 13cm

$$Tm = 162.5\; kg.cm\,.$$

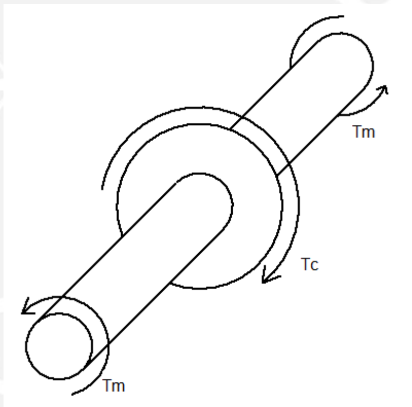
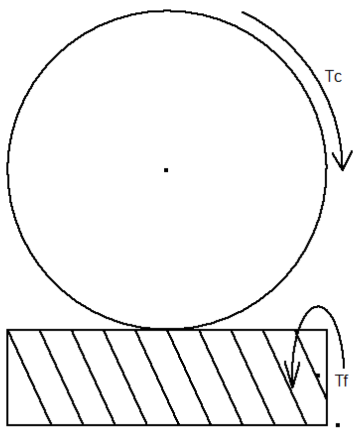


Figura A7.1 Esquema de la corona acoplada a los ejes de transmisión de torque

Tc: Torque soportado por la corona (Kg.cm).
Tf: Torque soportado por el tornillo sin fin (kg.cm).

$$Tc = 2 * Td = 325\; kg.cm\,.$$



Se eligió un tornillo sin fin- corona de un ratio de 1: 50 de 50 dientes, obteniéndose una relación de Tf a Tc de la siguiente forma:

$$\frac{Tf}{Tc} = \frac{1}{50},$$

$$Tf = \frac{325}{50} = 6.5\ Kg.cm\ .$$

Debido a que el eje del tornillo sin fin, esta acoplado en directo con el motor

Tmot: Torque del motor a seleccionar (kg.cm).

$$\Rightarrow \text{Tmot} \geq 6.5\text{Kg.cm}$$

Por tanto se pasó a seleccionar un motor del doble de capacidad con las especificaciones detallad as en anexo 3.

$$Tmotor = \ 13\ Kg.cm\ .$$