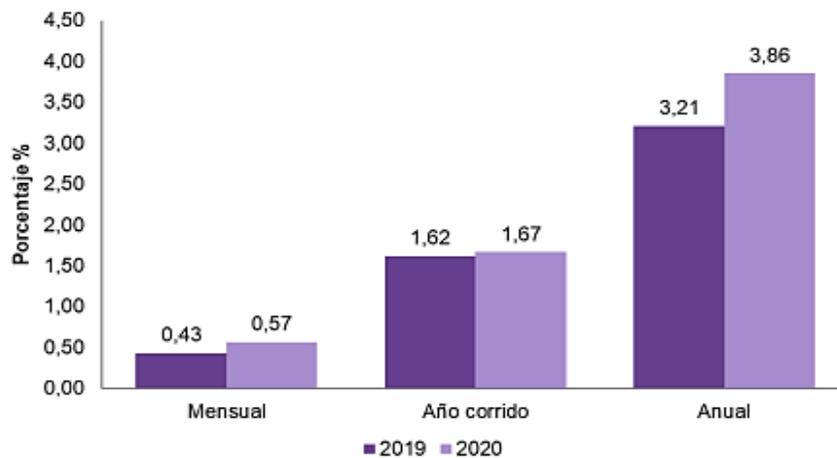


Índice de Precios al Consumidor (IPC)

Marzo 2020

Gráfico 1. IPC Variaciones
Total nacional
Marzo 2019 - 2020



Fuente: DANE, IPC.

- Resultados del mes de marzo
- Resultados año corrido
- Resultado anual
- Resultados según nivel de ingresos por criterio absoluto
- Información adicional
- Ficha metodológica
- Glosario

Coeficiente de fricción (COF) para diferentes polímeros



Fuente: <http://plasticos-mecanizables.com/coeficiente-friccion-plasticos>

Design and Development of Volley Ball Practice Machine

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Abstract - There are many games played in the world. The Volleyball is one of the popular games in the world. Nowadays the players are trained with the help of practice machine. In volleyball the practice machines are only develops the “Pass” skill to the players. In this project the automated volleyball machine was fabricated to develop the skill set of “Pass, Set, Attack, and Dig,” to the players. In Volleyball, the ball motion involves aerodynamic and mechanic principles. It demands superior Bio-mechanical skills acquired by repeated practices. To simulate different varieties of motions, speeds, and trajectories accurately and repeatedly, an automatic volleyball practice machine was designed by iterative design processes (manual calculations) with solid works and AutoCAD. Two counter rotating wheel mechanism imparts both translational and rotational motions with spin. It was portable, flexible, battery powered (suitable for outdoor conditions), operable at various horizontal and vertical planes and desired combinations of both planes. It was fully automatic for the ball feeder mechanism to make it self contained, yet made economical by making the ball shooter mechanism partially automatic/manual. The model was validated. The volleyball practice machine was simple and user friendly, to assist in acquiring the required skills for a trainee independently or for a professional player to enhance his/her skills.

Keywords – Mintonette, spectator, prototype, ball shooter, ball feeder, etc

1.INTRODUCTION

The purpose of this project is to design an automated ball throwing mechanism for training in the sport of Volleyball. Volleyball is a challenging, point-based competitive team sport that is played both outdoors and indoors. The sport is played by two opponent sides which have a 2.43 meter (max.) high net separating the court.

Mr.William G.Morgan invented volleyball in 1895 at the Holyoke, Massachusetts (USA), YMCA (Young Men’s Christian Association) where he served as Director of Physical Education. Morgan originally called his new game of volleyball, “Mintonette”. The name volleyball came about after a demonstration game of the sport, when a spectator commended that the game involved much “volleying” and game was renamed volleyball.



Figure 1: Inventor of volleyball: Mr.William G.Morga

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Skills in Volleyball

There are six basic skills available in this game. They are

- Serve
- Pass
- Set
- Attack
- Block
- Dig

These skills are shown in Figure 3.

This game begins with the server and the opponent side is then allowed to use only hands to make contact with the ball and throw the ball over the net. The rules of the game allow players to make contact to the ball up to three consecutive times per side. During the volleyball game, both teams will make different powerful moves to the ball to go to the opponent side and fall within the boundary line of the court. See Figure 2 for volleyball court dimensions, as specified by the Federation of International Volleyball (FIVB).

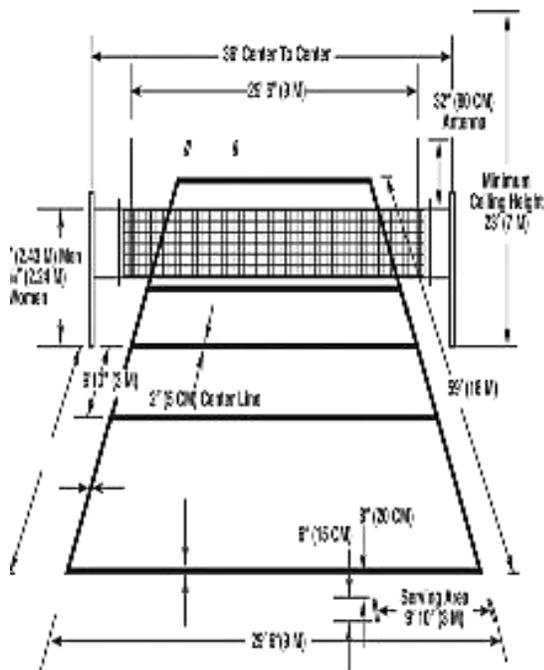


Figure 2: Dimensions of Official Volleyball Court



Figure 3: Basic skills in Volleyball: a) i – Serve (Overhand serve), a) ii – Serve (jump serve), b) Pass, c) Set, d) Attack, e) Block, f) Dig

Although volleyball is a growing sport, there are a limited number of advanced athletes and coaches available to train new players in the world. Since the game requires complex ball control skills, it is important for volleyball players to have sufficient and thorough training. This training can be a time and labour-intensive process. For example, during practice sessions, the team members are trained by coaches who use their labour and manual training techniques to generate a variety of ball motion to train players. Manual training might involve throwing the ball by hand, or hitting the ball with a wooden paddle to athletes for defense and offence drills. It is a difficult and time consuming process because a volley ball coach's arms will get tired after hitting 30 balls consecutively (approx.). For three hours per day of training sessions, a coach may have to hit the ball repeatedly up to 300 times approximately. In addition, the accuracy of human-generated ball motion cannot be controlled, and this can effect development of athlete's throwing skills.

One way to develop ball control, throwing skills and to address the other training problems discussed above is to use an automated mechanism that generates motion of the Volleyball. Although there are ball throwing machines available for other sports, such as baseball, tennis, table tennis, and soccer, none of these machines have been designed to specifically meet the needs of the unique sport of volleyball.

Most volleyball has three levels of construction. The first level is a rubber bladder made from the same material as a bicycle inner tube. The bladder is then attached to a cloth layer made of material similar to cheese cloth and sealed with rubber type glue. The outer layer is made of leather and is glued to the cloth layer. The balls that are used in this game are 0.3-0.35 kg in weight. The ball has a hollow spherical shape 200-225 mm in diameter.

In order to find out what principles are used in other types of ball throwing machines, research on the various types of commercially available ball machines was done as a background of study. There are several ball throwing machines available on the market. The most common principles involved with these machines are rotating lever arm, propulsion system and two counter rotating wheels.

Currently there is no automatic training device for coaching and helping volleyball players to improve their skills commercially available on the market. This study hopes to provide a new educational and training tool for youth and professional volleyball players to practice repeatable drills and a variety of movements to improve their ball control skills.

II. METHODOLOGY

The scope of this project includes gathering kinematic data on the types of ball motion generated in volleyball and using this data and other research in order to design and build a novel automated volleyball throwing mechanism to be used for training athletes. The overall plan for the methodology and design of this study can be described in three main parts:

1. Kinematic Data: Study and measure kinematic data of ball motion in actual performance of volleyball players.
2. Design: Describe design specifications and requirements and generate computer model of a prototype mechanism. Build, assemble and iteratively adjust prototype to ensure mechanism is in working order.
3. Testing Validation: Ensure whether the machine is capable of creating realistic volleyball motion.

III. DESIGN

Most volleyball games are played outdoors and this prototype was designed to meet these conditions. To design a ball throwing mechanism capable of being used for volleyball training it is important that design specifications are identified.

Design Requirements

The prototype must be:

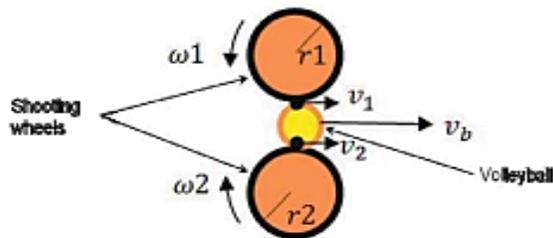
- 1) Portable: Transportable from one location to another location.
- 2) Easy to take apart and assemble.
- 3) Partially automatic: operating by itself or by using only a few controls.
- 4) Sufficient ball capacity: able to contain up to 10 balls.
- 5) Battery powered: able to run the machine without electrical outlet.
- 6) Able to generate ball speeds from 10- 30 m/s.^{[1]-[2]}

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- 7) Able to shoot the ball from 9-18 meter in distance.
- 8) Able to adjust ball release point from 1-2 meter high from the ground.
- 9) Able to provide various time intervals of ball release: 6-10 balls/minute.
- 10) Able to adjust ball launching angle along a vertical plane.
- 11) Able to adjust ball launching angle along a horizontal plane.

SELECTION OF MOTOR

Diagram:



where,

- r_1, r_2 – radius of shooting wheels
- v_1, v_2 – velocity of shooting wheels
- v_b – velocity of the ball
- ω_1, ω_2 – angular velocity of shooting wheels

Data:

1. Mass of the ball – 300 gm
2. Shooting Wheel diameter – 200 mm^[3]
3. Shooting wheel mass – 1.35 kg^[3]
4. Maximum ball velocity – 30 m/s^[1,2]

Calculation:

$$v_b = (v_1 + v_2) / 2$$

$$r = r_1 = r_2$$

$$\omega = \omega_1 = \omega_2$$

$$v = \omega r$$

$$r = 100 \text{ mm} = 0.1 \text{ m}$$

$$\omega = v / r = 30 / 0.1 = 300 \text{ rad/s}$$

$$\text{Convert to RPM :- } \omega / 2\pi = 300 / 2\pi$$

$$= 47.75 \text{ rps}$$

$$= 47.75 \times 60 \text{ rpm}$$

$$= 2865 \text{ rpm}$$

$$= 2865 \text{ rpm}$$

$$= 1.5$$

$$= 2865 \times 1.5$$

$$= 4297.5 \text{ rpm}$$

$$= 4300 \text{ rpm (or)}$$

$$= 450.3 \text{ rad/s}$$

Motor without load requires RPM

Assume that factor of safety of load acting in motor shaft is

Suitable motor speed to generate ball speed at 30 m/s is

Calculate the amount of kinetic energy for ejecting the ball at 30 m/s:

$$KE_b = mv^2 / 2$$

$$= (0.3 \times 30^2) / 2$$

$$KE_b = 135 \text{ J}$$

Calculate the amount of energy stored in a shooting wheel:

$$E_s = I\omega^2 / 2$$

$$I = mr^2 / 2$$

$$= (1.35 \times 0.1^2) / 2$$

$$= 6.75 \times 10^{-3} \text{ kg.m}^2$$

$$E_s = 6.75 \times 10^{-3} \times 450.3^2 / 2$$

$$E_s = 684.4 \text{ J}$$

Calculate the total power needed:

$$\begin{aligned} \text{Total energy} &= Kc_b + E_a \\ &= 135 + 684.4 \\ E &= 819.4 \text{ J} \\ \\ \text{Power (P)} &= E / t \\ &= (10 \times 819.4) / 60 \text{ (assume 10 balls/minute to be ejected)} \\ P &= 136.6 \text{ Watts (or) 0.18 hp} \end{aligned}$$

Assume that the factor of safety is 3.
Therefore $P_{\text{total}} = 3 \times 0.18 = 0.54 \text{ hp}$

Motor specifications needed for shooting balls at 30 m/s & 10 balls/minute are 0.54 hp with 4300 rpm.

IV. PRINCIPLES AND DESIGN OVERVIEW

Ball Shooter

In reviewing the basic volleyball kinematics, a basic principle that needs to be considered in the design of the volleyball throwing mechanism is projectile motion. After observing volleyball motion in live matches, the ball exhibits both translational and rotational motions. The characteristic of these motions led to the decision to use the principle of the two counter rotating wheels as the main ball shooter component of the mechanism. The two wheels rotate in different directions, generating speed on the wheels' surface which imparts speed on a ball propelled between these wheels. Equation 4.1 is used to calculate velocity of the wheel's surface (v) where ω is angular velocity (rpm) of the wheel and r_w is radius of the wheel.

$$v = \omega r_w \tag{4.1}$$

The following equation can be used to calculate ball linear velocity (v_b) based on the velocities of the two points of contact (v_1 and v_2) between the wheels and the ball:

$$v_b = (v_1 + v_2) / 2 \tag{4.2}$$

A spin may also be produced when the two wheels spin at different speeds. This spin is imparted about an axis which is perpendicular to the ball linear velocity vector.

The radius of the volleyball is 100 mm. Several volleyball movements impart spin on the ball, to create this type of spinning ball motion using the volleyball throwing mechanism, the counter rotating wheels need to spin at two different speeds; if the top wheel spins faster than the bottom wheel it will create a top spin on the ball. On the other hand if the bottom wheel spins faster than the top wheel, the ball will produce an under spin.

Since the volleyball is synthetic rubber surface, the two counter rotating wheels need to provide some cushion on the ball to help propel the ball out; furthermore a hard solid wheel could break the ball; thus pneumatic rubber wheels were selected as the wheel type so that the air pressure could cushion the ball and help avoid ball damage. The two rubber wheels selected for the ball shooter were 200 mm in diameter and 50 mm in width. The two wheels should have a gap size between them that is a little less than the diameter of the volley ball (200 mm) to allow for the wheels to press the ball out when it is received in between the two wheels.

Since the mechanism is portable, a 12 volt rechargeable battery can be used as the power source. The two wheels are driven by two separate DC motors. Calculations are made to determine the size of the motor that is suitable to produce the required ball speeds of up to 30 m/s. The revolutions per minute for a suitable motor to generate ball speed at 30 m/s are 4300 RPM.

Because the design requirements specify the need to adjust the launching angle along a vertical plane, the mechanism of a rotating fixed axis between the frame and the ball shooter was applied. Changing the launching angle is important because the different volleyball movements, such as serving and digging, depend on a variety of angles. This mechanism also allows horizontal angle adjustment. This horizontal angle changing feature is mounted to the base which freely moves along a vertical axis.

Ball Feeder

Since the mechanism must provide volleyballs to the ball shooter automatically, a ball feeder component was designed. The ball feeder needed to vary the individual drop rate of balls by set time intervals. The design of

“DISEÑO Y DESARROLLO DE UNA MÁQUINA PARA PRÁCTICAS DE VOLLEYBALL”.

the ball feeder also needed to meet the size requirements of the volleyball, and hold a capacity of 10 balls at the smallest feeder size possible. Based on the principle of uniform rotation, a rotating wheel was used as the mechanism to transport single balls in different time intervals to the ball shooter. This component is automatically rotates and drops the volleyballs at regular intervals (i.e. every 6 seconds) to the ball shooter.

The ball feeder also consists of a ball hopper where the balls are inserted into a basket, to allow the balls to drop into the wheel one at a time. The rotating wheel is driven by DC Motor. The ball feeder can be taken apart from the ball shooter for ease of transportation of the mechanism and for flexibility in using the mechanism.

Control box

Controllers are needed to switch the motors on, change the speed, and set ball release time intervals. The mechanism design should be as simple as possible using only a few controls. Three DC motor speed controls were selected for the mechanism – two to control the ball shooter motor and one to control the ball feeder motor. In order to vary the time interval of the ball release from the ball feeder, the DC motor speed controller is used to modify time intervals of dropping balls in the ball feeder. Similarly the controllers for the ball shooter are used to change the motor speed of the ball shooter and in turn impact the launch speed of the ball. The three speed controllers are housed in a control box. Refer figure 4 for a block diagram of the motor speed controllers for the volleyball throwing mechanism.

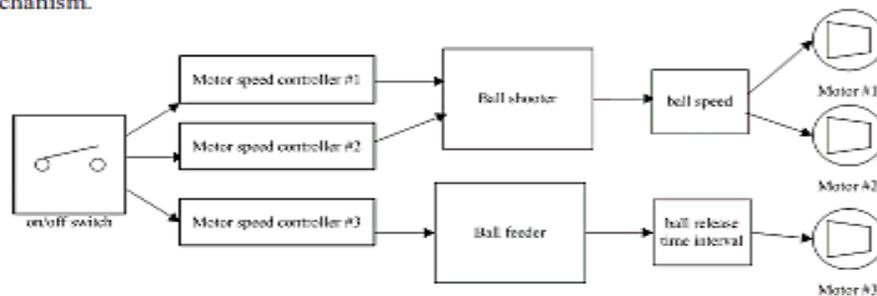


Figure 4: Controllers for ball throwing

Base

Since the mechanism must be portable and needs to hold steady while the balls are released, the base was designed with four lockable caster wheels that can swivel at full 360 degrees of rotation. The height can be adjusted by lifting and placing a telescopic pole into the tube and inserting a bolt into the hole to support the bottom of the telescopic pole. The telescopic adjustable pole is attached to the base to further adjust the height of the mechanism, allowing for the range of required ball releasing heights.

A computer model of the prototype mechanism was designed using Solid works, Education Edition software which provides 3D design functions.

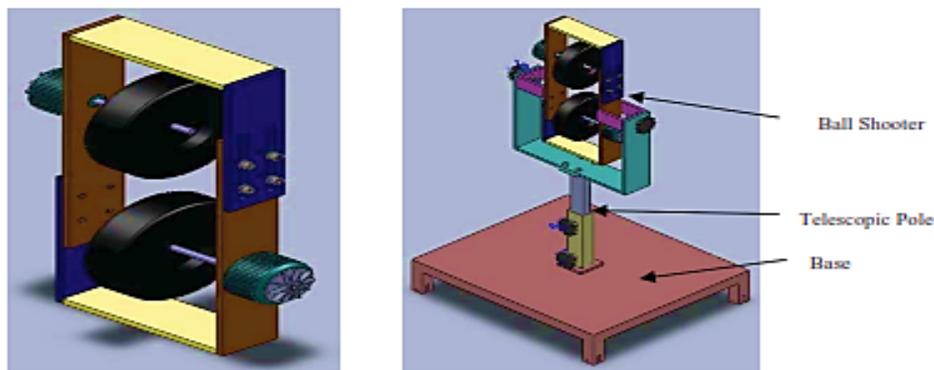


Figure 5: Computer model of volleyball throwing machine prototype

“DISEÑO Y DESARROLLO DE UNA MÁQUINA PARA PRÁCTICAS DE VOLLEYBALL”.

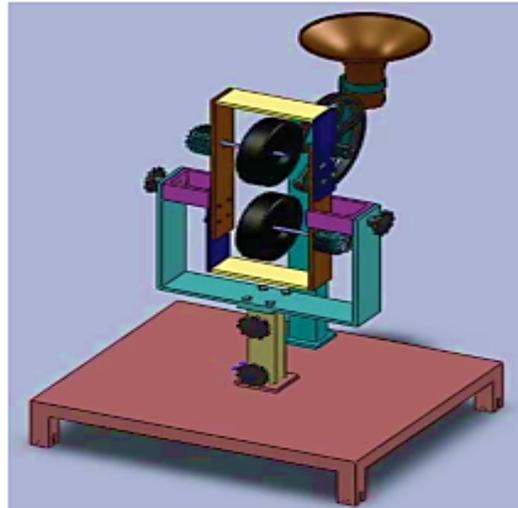


Figure 6: Computer model of volleyball throwing machine prototype showing ball shooter and ball feeder

Design Requirements

The design requirements were reviewed and showed that the volleyball throwing machine is capable of meeting 10 out of 11 design requirements. See Table for details on how the mechanism met the requirements.

Table 1: Comparison of design and actual

| S.No. | Design Requirements | Design | How did the mechanism meet the requirements |
|-------|---|--------|--|
| 1 | Portable: Transportable from one location to another location by vehicle. | ✓ | It can be Transport from one place to another |
| 2 | Easy to take apart and assemble. | ✗ | Did not meet because the weight is high. |
| 3 | Partially Automatic: operating by itself or by using only a few controls. | ✓ | Partially automatic ball feeder. |
| 4 | Sufficient Ball Capacity: Able to contain up to 10 balls. | ✓ | Able to hold 10 balls at a time. |
| 5 | Battery powered: able to run the machine without electrical. | ✓ | Rechargeable battery power can be used. |
| 6 | Able to generate ball speeds from 10- 30 m/s. | ✓ | Speeds up to 30 m/s can be obtained by using the selected motor. |
| 7 | Able to shoot the ball from 9-18 meter in distance. | ✓ | Ball distances up to 18 meter can be obtained by using the selected motor. |
| 8 | Able to adjust ball release point from 1-2 meter high from the ground. | ✓ | Ball release points found at these heights using telescopic adjustable pole. |
| 9 | ball launching angle adjustable along a horizontal plane | ✓ | Used four swivel wheels to adjust horizontal rotation. |
| 10 | Ball launching angle adjustable along a vertical plane. | ✓ | Tilted ball shooter to adjust vertical angles. |
| 11 | Able to generate various time intervals of ball release. | ✓ | Ball release time intervals of 6 seconds and 10 seconds can be obtained. |

The only one design requirement that wasn't met was easy to apart and assembles. This requirement wasn't met because the weight of the machine is high. In the future, more lightweight materials such as aluminum might be

“DISEÑO Y DESARROLLO DE UNA MÁQUINA PARA PRÁCTICAS DE VOLLEYBALL”.

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considered for the ball shooter to minimize weight. Also some of the steel parts could be cut into smaller, lighter sizes with more time and availability of the machine shop. In future designs, plastic could be used to decrease weight of the ball feeder.

During the manufacturing process, the design was iteratively adapted to ensure the machine worked in the desired way. For example, connecting the motor shaft to the counter rotating wheels of the ball shooter and getting the wheels to spin without vibration was a big challenge because the shaft was designed to be supported on one side of the wheel. For future designs, the motor axis support must be more balanced with the wheels and the shaft should be supported on both sides of the wheels to ensure stability and increase performance and accuracy of the mechanism.

Overall the mechanism meets the needs of volleyball players. The volleyball throwing mechanism as designed can generate the serving and train the players for passing, setting, blocking and digging skills which are needed to practice the unique sport of volleyball.

VI. CONCLUSION

In most of the games, players are trained with the help of practice machines. In volleyball, the available practice machines develop only the “Pass” skill to the players. If the practice machine trains the players in the skill set of “Pass, Set, Attack, and Dig” that can produce skilled players. So the automated volleyball practice machine was designed and fabricated to develop the skill set of “Pass, Set, Attack, and Dig” by changing the ball launching angle along vertical and horizontal plane. This new machine has additional features such as portable, battery operated; generate different ball speeds at different heights and automatic ball feeding at a specified time interval.

The objective to build the first prototype for a volleyball throwing mechanism has been met and tested. The new volleyball throwing mechanism is capable of recreating realistic volleyball motion and can even be used by one person. This work can be used as base standard information for future reference for others interested in this kind of ball motion, ball mechanism and the study of developing skills in other games.

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Fuente: S. Perumalsamy, P. Ragupathi y K. R. Rahul, «Design and Development of Volley Ball,» International Journal of Latest Trends in Engineering and Technology (IJLTET), vol. 4, n° 1, p. 8, Mayo 2014.

Motor 1RF20000DA204AB1



Datasheet for single-phase Squirrel-Cage-Motors

Hoja de datos de motores de jaula de ardilla monofásicos

Ordering data: 1RF20000DA204AB1

Datos de pedido:



Electrical Data / Datos Eléctricos

| | | | |
|--|----------------------|-----|-------|
| Rated motor voltage | 115 V | N/A | 230 V |
| Tensión nominal | N/A | N/A | N/A |
| Frequency | 60Hz | | |
| Frecuencia | 60Hz | | |
| Rated power | 0.5 HP | | |
| Potencia Nominal | 0.5 HP | | |
| Rated motor speed | 3535 rpm | | |
| Velocidad Nominal | 3535 rpm | | |
| Rated motor torque | 1.01 Nm | | |
| Torque Nominal | 1.01 Nm | | |
| Nominal current | 5.6 A | - | 4.3 A |
| Corriente Nominal | 5.6 A | - | 4.3 A |
| Starting / rated motor current (Ia/In) | 5.7 | | |
| Corriente de arranque | 5.7 | | |
| Starting / rated motor torque (Ta/Tn) | 5.5 | | |
| Torque de arranque | 5.5 | | |
| Efficiency class | N/A | | |
| Efficiency: | 4.4 | 62 | |
| Eficiencia | 4.4 | 62 | |
| Power factor | 66.1 | | |
| Factor de potencia | 66.1 | | |
| Service factor | 1.5 | | |
| Factor de servicio | 1.5 | | |
| Motor protection : | Protección del motor | | |

Mechanical Data / Datos mecánicos

| | | | |
|---------------------|------------|---------|--|
| Type of bearing | Bolas | | |
| Tipo de rodamientos | Bolas | | |
| Bearing DE NDE | 6203 ZZ | 6203 ZZ | |
| Rodamiento AS/BS | 6203 ZZ | 6203 ZZ | |
| Lubricants | Lubricante | | |

Explosion protection / Protección contra explosión

| | |
|-----------------------|--|
| Type of protection | Without (Standard) |
| Modo de protección Ex | Without (Standard) |
| Hotline Técnica | Linea Gratuita Nacional: 01 8000 518 884 Opción 1 En Bogotá: 571.294.2323 Opción 1 support.asn.automation@siemens.com www.siemens.com/asn/hotline tecnica |

General data / Datos generales

| | |
|---|-------------------------|
| Frame size | 56 |
| Tamaño constructivo | 56 |
| Type of construction | 56 Eje cufiero |
| Tipo de construcción | 56 Eje cufiero |
| Weight in kg, without optional accessories, | 9 Kg |
| Peso motor, sin opciones | 9 Kg |
| Frame material | Lamina / Cold Roll |
| Material carcasa | Lamina / Cold Roll |
| Degree of protection | IP 23 |
| Grado de protección | IP 23 |
| Method of cooling, TEFC | IC 411 |
| Método de refrigeración | IC 411 |
| Insulation | Class B (135°C) |
| Aislamiento | Class B (135°C) |
| Duty type | S1 |
| Tipo de servicio | S1 |
| Direction of rotation | Bidireccional |
| Sentido de giro | Bidireccional |
| Terminal box position : | Posición caja de bornes |

Environmental conditions / Condiciones ambientales

| | |
|--------------------------------|-------------------|
| Ambient temperature | -20.0 °C - +40 °C |
| Temperatura ambiente | -20.0 °C - +40 °C |
| Altitude above sea level | 1000 m |
| Altitud sobre el nivel del mar | 1000 m |
| Standards and specifications | NEMA MG1 |
| Normas internacionales | NEMA MG1 |

Special design / Versiones especiales

| |
|--|
| |
|--|

Technical data are subject to change! There may be discrepancies between calculated and rating plate values.
Datos técnicos de pedido sujetos a cambios sin previo aviso. Pueden haber discrepancias entre los valores calculados y los datos de placa!

Rueda seleccionada

FICHA TECNICA

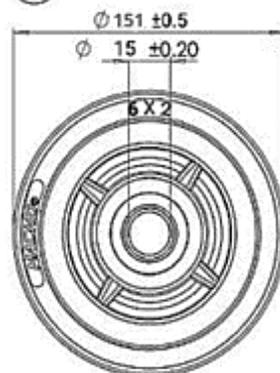


RUEDA 6 X 2" POLIVINIL MACHO®

| | |
|-------------------------|---|
| REFERENCIA: | RUEDA 6 X 2" PVC BAL |
| CÓDIGO: | 114032 |
| DIAMETRO TOTAL: | 151 ± 0,5 MM (6") |
| ANCHO DE RUEDA: | 50 ± 0.8 MM |
| MATERIAL DE LA BANDA: | POLIVINIL |
| DUREZA: | 95±5 SHORE A |
| SUPERFICIE DE LA BANDA: | PLANA |
| MATERIAL DEL RIN: | POLIPROPILENO PP |
| RODAMIENTO: | BALINERA PRECISION 15 MM 6202 INCLUYE BUJE Y TORNILLO DE 12 |
| CAPACIDAD DE CARGA: | 250 KG |
| PROTECCION DE PISO | MEDIA |
| VELOCIDAD DE TRABAJO: | ≤3.5KM/H |
| CARACTERISTICAS: | RUEDAS ESPECIALES PARA TRABAJOS SEMIPESADOS EN SUPERFICIES LISAS |
| RECOMENDACIONES: | USAR EN SUPERFICIES LISAS SIN VIRUTAS DE METAL O VIDRIO, NI ACIDOS. |
| Marca: | MACHO ® |



 **Diametro del eje: 15 mm**

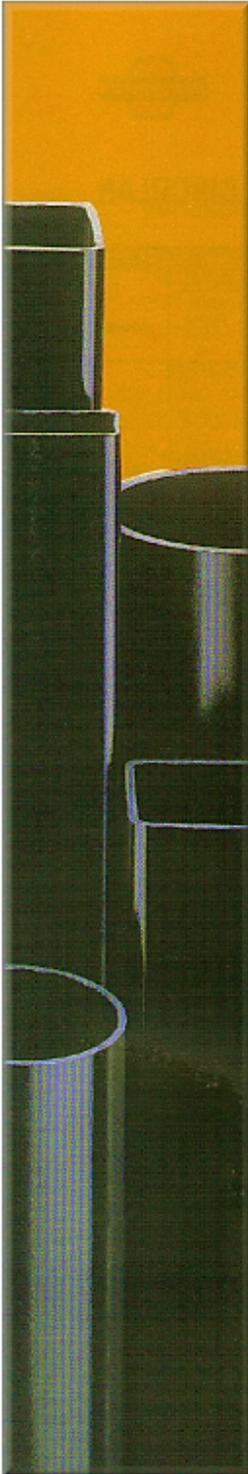


Ancho de Banda: 2"



Longitud del bocin: 2 - 1/4"

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No. Control (C-C620-006)

Linea Estructural

PERFILES CERRADOS (ASTM A 500 GRADO C) NTC 4526 Grado C

Cuando usted especifica un perfil estructural de acero marca Colmena, cuenta con el respaldo y la garantía de calidad de la empresa líder en la fabricación de tubos de acero, con más de 40 años de experiencia atendiendo exitosamente los mercados nacionales e internacionales.

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El sistema de aseguramiento de calidad aplicado se rige bajo los lineamientos de la norma ISO-9002.

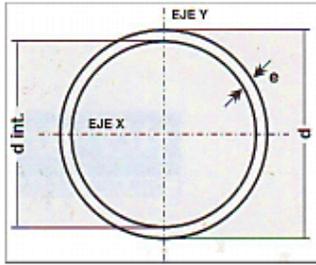


PERFILES DE ACERO

DISTRIBUIDOR MAYORISTA DE MATERIALES PARA LA CONSTRUCCIÓN
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Perfiles estructurales



PERFIL CIRCULAR

| CARACTERISTICAS Y DENOMINACION | | | | | | PROPIEDADES ESTATICAS | | | | | | UND. |
|--------------------------------|-----------------|-----------------|---------------------|-------------|------------------------|-----------------------------------|----------------------------------|---------------------|-----------------------------------|-----------------------------------|-----------------------------------|---------|
| DIAMETRO | | | Espesor pared e mm. | PESO P Kg/m | AREA A cm ² | FLEXION | | | Módulo Elástico Z cm ³ | TORSION | | Empaque |
| Nominal Pulg. | Exterior d cms. | Interior d cms. | | | | Momento Inercia I cm ⁴ | Módulo Sección S cm ³ | Radio de Giro r cm. | | Momento Inercia J cm ⁴ | Módulo Elástico B cm ³ | |
| 1/2" | 2,047 | 1,747 | 1,499 | 0,70 | 0,89 | 0,40 | 0,40 | 0,67 | 0,54 | 0,81 | 0,79 | 127 |
| 1/2" | 2,070 | 1,664 | 2,032 | 0,94 | 1,19 | 0,53 | 0,51 | 0,66 | 0,71 | 1,05 | 1,02 | |
| 1/2" | 2,070 | 1,572 | 2,489 | 1,12 | 1,42 | 0,60 | 0,58 | 0,65 | 0,83 | 1,20 | 1,16 | |
| 3/4" | 2,583 | 2,283 | 1,499 | 0,90 | 1,15 | 0,85 | 0,66 | 0,86 | 0,89 | 1,70 | 1,32 | 91 |
| 3/4" | 2,611 | 2,205 | 2,032 | 1,21 | 1,54 | 1,12 | 0,86 | 0,85 | 1,18 | 2,24 | 1,72 | |
| 3/4" | 2,611 | 2,113 | 2,489 | 1,45 | 1,85 | 1,30 | 1,00 | 0,84 | 1,39 | 2,61 | 2,00 | |
| 3/4" | 2,667 | 2,134 | 2,667 | 1,58 | 2,01 | 1,47 | 1,10 | 0,85 | 1,54 | 2,93 | 2,20 | |
| 1" | 3,292 | 2,992 | 1,499 | 1,16 | 1,48 | 1,83 | 1,11 | 1,11 | 1,48 | 3,66 | 2,22 | 61 |
| 1" | 3,292 | 2,886 | 2,032 | 1,55 | 1,97 | 2,36 | 1,43 | 1,09 | 1,94 | 4,72 | 2,87 | |
| 1" | 3,292 | 2,794 | 2,489 | 1,87 | 2,38 | 2,77 | 1,68 | 1,08 | 2,31 | 5,55 | 3,37 | |
| 1" | 3,340 | 2,690 | 3,251 | 2,42 | 3,08 | 3,54 | 2,12 | 1,07 | 2,97 | 7,08 | 4,24 | |
| 1 1/4" | 4,224 | 3,868 | 1,778 | 1,77 | 2,26 | 4,63 | 2,19 | 1,43 | 2,91 | 9,27 | 4,39 | 37 |
| 1 1/4" | 4,160 | 3,703 | 2,286 | 2,22 | 2,82 | 5,47 | 2,63 | 1,39 | 3,54 | 10,95 | 5,26 | |
| 1 1/4" | 4,224 | 3,691 | 2,667 | 2,60 | 3,32 | 6,52 | 3,09 | 1,40 | 4,18 | 13,04 | 6,17 | |
| 1 1/4" | 4,224 | 3,574 | 3,251 | 3,13 | 3,98 | 7,62 | 3,61 | 1,38 | 4,95 | 15,24 | 7,22 | |
| 1 1/2" | 4,826 | 4,470 | 1,778 | 2,04 | 2,60 | 7,02 | 2,91 | 1,64 | 3,84 | 14,04 | 5,82 | 37 |
| 1 1/2" | 4,788 | 4,331 | 2,286 | 2,57 | 3,27 | 8,53 | 3,56 | 1,61 | 4,76 | 17,06 | 7,13 | |
| 1 1/2" | 4,788 | 4,255 | 2,667 | 2,97 | 3,79 | 9,71 | 4,06 | 1,60 | 5,46 | 19,43 | 8,11 | |
| 1 1/2" | 4,826 | 4,236 | 2,946 | 3,28 | 4,19 | 10,81 | 4,48 | 1,61 | 6,06 | 21,62 | 8,96 | |
| 1 1/2" | 4,826 | 4,176 | 3,251 | 3,61 | 4,60 | 11,70 | 4,85 | 1,60 | 6,60 | 23,40 | 9,70 | |
| 1 1/2" | 4,826 | 4,089 | 3,683 | 4,05 | 5,16 | 12,90 | 5,35 | 1,58 | 7,34 | 25,80 | 10,69 | |
| 2" | 5,994 | 5,638 | 1,778 | 2,55 | 3,25 | 13,75 | 4,59 | 2,06 | 6,02 | 27,50 | 9,18 | 37 |
| 2" | 5,994 | 5,537 | 2,286 | 3,25 | 4,14 | 17,23 | 5,75 | 2,04 | 7,60 | 34,46 | 11,50 | |
| 2" | 5,994 | 5,461 | 2,667 | 3,77 | 4,80 | 19,72 | 6,58 | 2,03 | 8,75 | 39,44 | 13,16 | |
| 2" | 5,994 | 5,344 | 3,251 | 4,55 | 5,79 | 23,34 | 7,79 | 2,01 | 10,46 | 46,67 | 15,57 | |
| 2" | 6,033 | 5,317 | 3,581 | 5,01 | 6,38 | 25,81 | 8,55 | 2,01 | 11,55 | 51,61 | 17,11 | |
| 2" | 6,033 | 5,251 | 3,912 | 5,44 | 6,93 | 27,72 | 9,19 | 2,00 | 12,47 | 55,44 | 18,38 | |
| 2 1/2" | 7,239 | 6,782 | 2,286 | 3,95 | 5,03 | 30,96 | 8,55 | 2,48 | 11,24 | 61,92 | 17,11 | 19 |
| 2 1/2" | 7,239 | 6,706 | 2,667 | 4,59 | 5,84 | 35,55 | 9,82 | 2,47 | 12,97 | 71,10 | 19,64 | |
| 2 1/2" | 7,239 | 6,589 | 3,251 | 5,54 | 7,06 | 42,29 | 11,68 | 2,45 | 15,55 | 84,58 | 23,37 | |
| 2 1/2" | 7,239 | 6,477 | 3,810 | 6,44 | 8,21 | 48,41 | 13,37 | 2,43 | 17,94 | 96,82 | 26,75 | |
| 2 1/2" | 7,239 | 6,401 | 4,191 | 7,05 | 8,98 | 52,40 | 14,48 | 2,42 | 19,52 | 104,80 | 28,96 | |
| 2 1/2" | 7,303 | 6,267 | 5,182 | 8,67 | 11,04 | 63,92 | 17,51 | 2,41 | 23,90 | 127,85 | 35,01 | |
| 2 1/2" | 7,303 | 6,206 | 5,486 | 9,14 | 11,64 | 66,83 | 18,30 | 2,40 | 25,08 | 133,66 | 36,60 | |

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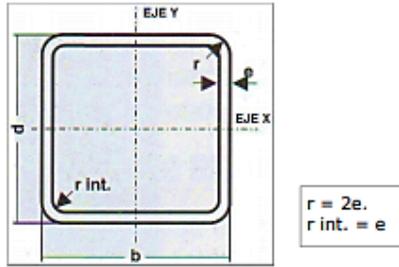
| CARACTERISTICAS Y DENOMINACION | | | | | | PROPIEDADES ESTATICAS | | | | | | UND. |
|--------------------------------|-----------------|----------------------|---------------------|--------------|------------|-----------------------|----------------------|---------------------|-----------------------|-----------------------|-----------------------|---------|
| DIAMETRO | | | Espesor pared e mm. | PESO P Kgm/m | AREA A cm2 | FLEXION | | Radio de Giro r cm. | Módulo Elástico Z cm3 | TORSION | | Empaque |
| Nominal Pulg. | Exterior d cms. | Interior d int. cms. | | | | Momento Inercia I cm4 | Módulo Sección S cm3 | | | Momento Inercia J cm4 | Módulo Elástico B cm3 | |
| 3" | 8,824 | 8,367 | 2,286 | 4,85 | 6,17 | 57,05 | 12,93 | 3,04 | 16,89 | 114,10 | 25,86 | 19 |
| 3" | 8,824 | 8,326 | 2,489 | 5,26 | 6,71 | 61,69 | 13,98 | 3,03 | 18,31 | 123,38 | 27,96 | |
| 3" | 8,824 | 8,174 | 3,251 | 6,81 | 8,68 | 78,49 | 17,79 | 3,01 | 23,50 | 156,98 | 35,58 | |
| 3" | 8,824 | 7,986 | 4,191 | 8,69 | 11,07 | 97,96 | 22,20 | 2,98 | 29,63 | 195,92 | 44,41 | |
| 3" | 8,824 | 7,828 | 4,987 | 10,22 | 13,02 | 113,25 | 25,67 | 2,95 | 34,55 | 226,50 | 51,34 | |
| 3" | 8,890 | 7,793 | 5,486 | 11,29 | 14,38 | 125,58 | 28,25 | 2,96 | 38,23 | 251,15 | 56,50 | |
| 3" | 8,890 | 7,620 | 6,350 | 12,93 | 16,47 | 141,11 | 31,74 | 2,93 | 43,36 | 282,21 | 63,49 | |
| 4" | 11,349 | 10,892 | 2,286 | 6,27 | 7,99 | 123,50 | 21,76 | 3,93 | 28,27 | 247,01 | 43,53 | 7 |
| 4" | 11,349 | 10,851 | 2,489 | 6,81 | 8,68 | 133,76 | 23,57 | 3,93 | 30,68 | 267,51 | 47,14 | |
| 4" | 11,349 | 10,699 | 3,251 | 8,84 | 11,26 | 171,19 | 30,17 | 3,90 | 39,52 | 342,38 | 60,34 | |
| 4" | 11,349 | 10,511 | 4,191 | 11,30 | 14,39 | 215,21 | 37,93 | 3,87 | 50,09 | 430,42 | 75,85 | |
| 4" | 11,349 | 10,353 | 4,978 | 13,32 | 16,97 | 250,32 | 44,11 | 3,84 | 58,66 | 500,64 | 88,23 | |
| 4" | 11,430 | 10,231 | 5,994 | 16,01 | 20,40 | 299,98 | 52,49 | 3,84 | 70,39 | 599,95 | 104,98 | |
| 4" | 11,430 | 10,160 | 6,350 | 16,91 | 21,54 | 314,78 | 55,08 | 3,82 | 74,08 | 629,55 | 110,16 | |
| 5" | 14,130 | 12,860 | 6,350 | 21,13 | 26,92 | 614,20 | 86,94 | 4,78 | 115,73 | 1.228,41 | 173,87 | 7 |
| 5" | 14,130 | 12,809 | 6,604 | 21,94 | 27,95 | 635,29 | 89,92 | 4,77 | 119,91 | 1.270,59 | 179,84 | |
| 6" | 16,830 | 16,114 | 3,581 | 14,55 | 18,53 | 628,85 | 74,73 | 5,83 | 97,19 | 1.257,70 | 149,46 | 1 |
| 6" | 16,830 | 15,560 | 6,350 | 25,36 | 32,31 | 1.060,82 | 126,06 | 5,73 | 166,63 | 2.121,65 | 252,13 | |
| 6" | 16,830 | 15,408 | 7,112 | 28,27 | 36,31 | 1.171,91 | 139,26 | 5,70 | 184,90 | 2.343,82 | 278,53 | |
| 8" | 21,910 | 20,874 | 5,182 | 27,34 | 34,82 | 1.993,07 | 181,93 | 7,57 | 237,16 | 3.986,14 | 363,87 | 1 |
| 8" | 21,910 | 20,640 | 6,350 | 33,32 | 42,44 | 2.403,42 | 219,39 | 7,53 | 287,50 | 4.806,83 | 438,78 | |
| 8" | 21,910 | 20,274 | 8,179 | 42,54 | 54,20 | 3.018,30 | 275,52 | 7,46 | 364,04 | 6.036,60 | 551,04 | |

Los Perfiles Circulares **COLMENA**® cumplen con la Norma ASTM A 500 GRADO C – Esfuerzo de Fluencia $F_y=3.220,00$ Kg/cm² (46.000,00 PSI)

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Perfiles estructurales



PERFILES TUBULARES CUADRADOS

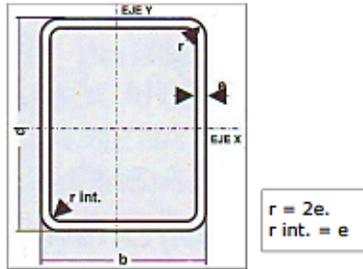
| CARACTERISTICAS Y DENOMINACION | | | | | | | PROPIEDADES ESTATICAS | | | | | | UND. |
|--------------------------------|---------|--------|--------|---------------------|---------------|------------------------|--|---|--|--|-----------------------------------|-----------------------------------|---------|
| TAMAÑO NOMINAL | | REAL | | Espesor pared e mm. | PESO P Kgm/m. | AREA A cm ² | FLEXION | | | Módulo Elástico Z _x =Z _y cm ³ | TORSION | | Empaque |
| Pulg. | mm. | d mm | b mm | | | | Momento Inercia I _x =I _y cm ⁴ | Módulo Sección S _x =S _y cm ³ | Radio de Giro r _x =r _y cm. | | Momento Inercia J cm ⁴ | Módulo Elástico B cm ³ | |
| 7/8x7/8 | 22x22 | 22,10 | 22,10 | 1,194 | 0,72 | 0,91 | 0,69 | 0,62 | 0,87 | 0,74 | 113 | 0,94 | 100 |
| 7/8x7/8 | 22x22 | 22,10 | 22,10 | 1,499 | 0,90 | 1,14 | 0,81 | 0,73 | 0,84 | 0,89 | 1032 | 1,07 | |
| 1x1 | 25x25 | 26,70 | 26,70 | 1,778 | 0,88 | 1,12 | 1,26 | 0,94 | 1,06 | 1,12 | 2,04 | 1,42 | 100 |
| 1x1 | 25x25 | 26,70 | 26,70 | 1,194 | 1,31 | 1,67 | 1,71 | 1,28 | 1,01 | 1,55 | 2,83 | 1,89 | |
| 1x1 | 25x25 | 26,70 | 26,70 | 2,032 | 1,50 | 1,91 | 1,87 | 1,40 | 0,99 | 1,72 | 3,22 | 2,15 | |
| 1x1 | 25x25 | 26,70 | 26,70 | 2,286 | 1,66 | 2,11 | 2,01 | 1,51 | 0,98 | 1,88 | 3,45 | 2,23 | |
| 1½x1x½ | 40x40 | 38,10 | 38,10 | 1,194 | 1,33 | 1,70 | 3,87 | 2,03 | 1,51 | 2,37 | 6,12 | 3,06 | 64 |
| 1½x1x½ | 40x40 | 38,10 | 38,10 | 1,499 | 1,68 | 2,13 | 4,70 | 2,47 | 1,48 | 2,90 | 7,54 | 3,68 | |
| 1½x1x½ | 40x40 | 38,10 | 38,10 | 2,032 | 2,25 | 2,86 | 6,01 | 3,15 | 1,45 | 3,77 | 9,91 | 4,70 | |
| 1½x1x½ | 40x40 | 38,10 | 38,10 | 2,489 | 2,72 | 3,47 | 6,98 | 3,66 | 1,42 | 4,45 | 11,80 | 5,47 | |
| 2x2 | 50x50 | 51,60 | 51,60 | 1,499 | 2,29 | 2,92 | 12,20 | 4,73 | 2,05 | 5,50 | 19,33 | 7,07 | 30 |
| 2x2 | 50x50 | 51,60 | 51,60 | 2,032 | 3,10 | 3,95 | 15,84 | 6,14 | 2,00 | 7,22 | 25,63 | 9,18 | |
| 2x2 | 50x50 | 51,60 | 51,60 | 2,286 | 3,44 | 4,38 | 17,45 | 6,76 | 2,00 | 8,00 | 28,27 | 10,22 | |
| 2x2 | 50x50 | 51,60 | 51,60 | 2,489 | 3,74 | 4,77 | 18,68 | 7,24 | 1,98 | 8,61 | 30,80 | 10,84 | |
| 2¼x2¼ | 70x70 | 70,90 | 70,90 | 1,778 | 3,78 | 4,82 | 38,17 | 10,77 | 2,82 | 12,46 | 59,70 | 16,18 | 25 |
| 2¼x2¼ | 70x70 | 70,90 | 70,90 | 2,032 | 4,32 | 5,50 | 42,98 | 12,12 | 2,79 | 14,09 | 68,31 | 18,15 | |
| 2¼x2¼ | 70x70 | 70,90 | 70,90 | 2,489 | 5,26 | 6,70 | 51,25 | 14,46 | 2,77 | 16,92 | 82,60 | 21,66 | |
| 3x3 | 75x75 | 76,20 | 76,20 | 3,175 | 7,21 | 9,01 | 78,93 | 20,72 | 2,96 | 24,44 | 129,27 | 31,11 | 36 |
| 3x3 | 75x75 | 76,20 | 76,20 | 4,762 | 10,65 | 13,02 | 108,18 | 28,39 | 2,83 | 34,33 | 186,32 | 42,96 | 36 |
| 3x3 | 75x75 | 76,20 | 76,20 | 6,350 | 13,91 | 16,70 | 131,36 | 34,48 | 2,80 | 42,77 | 234,06 | 52,84 | 24 |
| 3½x3½ | 90x90 | 90,20 | 90,20 | 2,032 | 5,57 | 7,10 | 90,77 | 20,13 | 3,58 | 23,22 | 142,66 | 30,15 | 12 |
| 3½x3½ | 90x90 | 90,20 | 90,20 | 2,286 | 6,27 | 7,98 | 100,94 | 22,38 | 3,56 | 25,91 | 159,62 | 33,54 | |
| 3½x3½ | 90x90 | 90,20 | 90,20 | 2,489 | 6,81 | 8,67 | 108,89 | 24,14 | 3,54 | 28,02 | 173,05 | 36,19 | |
| 4x4 | 100x100 | 101,60 | 101,60 | 3,175 | 9,69 | 12,24 | 195,49 | 38,42 | 3,98 | 44,85 | 313,59 | 57,75 | 25 |
| 4x4 | 100x100 | 101,60 | 101,60 | 4,762 | 14,38 | 17,86 | 274,46 | 54,03 | 3,92 | 64,12 | 456,15 | 81,43 | 25 |
| 4x4 | 100x100 | 101,60 | 101,60 | 6,350 | 18,88 | 23,16 | 341,94 | 67,31 | 3,84 | 81,39 | 592,47 | 102,19 | 20 |
| 5x5 | 125x125 | 127,00 | 127,00 | 3,175 | 12,17 | 15,47 | 391,86 | 61,71 | 5,03 | 71,40 | 620,57 | 92,58 | 16 |
| 5x5 | 125x125 | 127,00 | 127,00 | 4,762 | 18,12 | 22,70 | 557,86 | 87,85 | 4,96 | 103,13 | 909,28 | 132,16 | 16 |
| 5x5 | 125x125 | 127,00 | 127,00 | 6,350 | 23,85 | 29,61 | 705,26 | 111,06 | 4,82 | 132,31 | 1.186,72 | 167,86 | 16 |
| 6x6 | 150x150 | 152,40 | 152,40 | 4,762 | 21,86 | 27,54 | 989,59 | 129,87 | 5,99 | 151,35 | 1.591,90 | 195,17 | 9 |
| 6x6 | 150x150 | 152,40 | 152,40 | 6,350 | 28,82 | 36,06 | 1.262,94 | 165,74 | 5,92 | 195,51 | 2.084,23 | 249,88 | |

Los Perfiles Cuadrados **COLMENA®** cumplen con la Norma ASTM A 500 GRADO C – Esfuerzo de Fluencia F_y=3.500,00 Kg/cm² (50.000,00 PSI)

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Perfiles estructurales



PERFILES TUBULARES RECTANGULARES

| TAMAÑOS NOMINALES | | CARACTERÍSTICAS Y DENOMINACION | | | | | UND. |
|-------------------|---------|--------------------------------|--------|---------------------|--------------|------------------------|---------|
| Pulgadas | mm | REALES | | Espesor pared e mm. | PESO P Kgm/m | AREA A cm ² | Empaque |
| | | d mm | b mm | | | | |
| 2x1 1/16 | 50x30 | 51,59 | 27,44 | 1,194 | 1,33 | 1,69 | 50 |
| 2x1 1/16 | 50x30 | 51,59 | 27,44 | 1,499 | 1,73 | 2,20 | |
| 2x1 1/16 | 50x30 | 51,59 | 27,44 | 2,032 | 2,32 | 2,95 | |
| 2x1 1/16 | 50x30 | 51,59 | 27,44 | 2,480 | 2,32 | 2,95 | |
| 2 3/8x1 1/2 | 60x40 | 60,00 | 37,85 | 1,194 | 1,71 | 2,18 | 40 |
| 2 3/8x1 1/2 | 60x40 | 60,00 | 37,85 | 1,499 | 2,16 | 2,75 | |
| 2 3/8x1 1/2 | 60x40 | 60,00 | 37,85 | 1,778 | 2,55 | 3,25 | |
| 2 3/8x1 1/2 | 60x40 | 60,00 | 37,85 | 2,032 | 2,91 | 3,71 | |
| 2 3/8x1 1/2 | 60x40 | 60,00 | 37,85 | 2,489 | 3,52 | 4,48 | 28 |
| 2 3/4x1 3/4 | 70x45 | 70,10 | 45,05 | 2,032 | 3,52 | 4,48 | |
| 2 3/4x1 3/4 | 70x45 | 70,10 | 45,05 | 2,489 | 4,29 | 5,46 | 28 |
| 3x1 1/2 | 76x38 | 76,20 | 38,10 | 1,194 | 2,08 | 2,65 | |
| 3x1 1/2 | 76x38 | 76,20 | 38,10 | 1,499 | 2,61 | 3,32 | |
| 3x1 1/2 | 76x38 | 76,20 | 38,10 | 1,778 | 3,09 | 3,94 | |
| 3x1 1/2 | 76x38 | 76,20 | 38,10 | 2,032 | 3,53 | 4,50 | |
| 3x1 1/2 | 76x38 | 76,20 | 38,10 | 2,489 | 4,29 | 5,46 | 28 |
| 3 1/2 x2 | 90x50 | 90,17 | 50,00 | 2,032 | 4,32 | 5,50 | |
| 3 1/2x2 | 90x50 | 90,17 | 50,00 | 2,489 | 5,26 | 6,70 | 28 |
| 3 3/4x1 3/4 | 95x45 | 95,12 | 45,05 | 2,032 | 4,32 | 5,50 | |
| 3 3/4x1 3/4 | 95x45 | 95,12 | 45,05 | 2,489 | 5,26 | 6,70 | |
| 4x1 1/2 | 100x40 | 99,99 | 39,98 | 1,194 | 2,54 | 3,23 | 24 |
| 4x1 1/2 | 100x40 | 99,99 | 39,98 | 1,499 | 3,18 | 4,06 | 24 |
| 4x1 1/2 | 100x40 | 99,99 | 39,98 | 2,032 | 4,317 | 5,50 | 24 |
| 4x1 1/2 | 100x40 | 99,99 | 39,98 | 2,489 | 5,260 | 6,70 | 24 |
| 4x2 | 100x50 | 101,60 | 50,80 | 3,175 | 7,21 | 9,16 | 40 |
| 4x2 | 100x50 | 101,60 | 50,80 | 4,762 | 10,65 | 13,50 | 30 |
| 4 3/4x2 3/8 | 120x60 | 121,78 | 59,90 | 2,032 | 5,58 | 7,11 | 12 |
| 4 3/4x2 3/8 | 120x60 | 121,78 | 59,90 | 2,489 | 6,81 | 8,67 | 12 |
| 6x2 | 150x50 | 152,40 | 50,80 | 3,175 | 9,69 | 12,32 | 27 |
| 6x2 | 150x50 | 152,40 | 50,80 | 4,762 | 14,38 | 18,24 | 24 |
| 6x2 | 150x50 | 152,40 | 50,80 | 6,350 | 18,88 | 24,01 | 24 |
| 6x4 | 150x100 | 152,40 | 101,60 | 3,175 | 1,215 | 15,47 | 15 |
| 6x4 | 150x100 | 152,40 | 101,60 | 4,762 | 18,04 | 22,98 | 15 |
| 6x4 | 150x100 | 152,40 | 101,60 | 6,350 | 23,81 | 30,33 | 15 |

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Perfiles estructurales



| TAMAÑOS NOMINALES | | PROPIEDADES ESTATICAS | | | | | | | | | | | UND. |
|-------------------|---------|------------------------|------------------------|---------------------|------------------------|------------------------|---------------------|-----------------|--------|-----------------------|-----------------------|---------|------|
| | | FLEXION | | | | | | Módulo Plástico | | TORSION | | Empaque | |
| | | EJE X - X | | | EJE Y - Y | | | | | Momento Inercia J | Módulo Elástico B | | |
| Pulgadas | mm | Momento Inercia Ix cm4 | Módulo Elástico Sx cm3 | Radio de Giro rx cm | Momento Inercia Iy cm4 | Módulo Elástico Sy cm3 | Radio de Giro ry cm | Zx cm3 | Zy cm3 | Momento Inercia J cm4 | Módulo Elástico B cm3 | | |
| 2x1 1/16 | 50x30 | 6,29 | 2,44 | 1,93 | 2,37 | 1,73 | 1,18 | 3,00 | 1,94 | 5,56 | 2,96 | 50 | |
| 2x1 1/16 | 50x30 | 6,29 | 2,44 | 1,69 | 2,86 | 2,09 | 1,14 | 3,68 | 2,38 | 6,83 | 3,59 | | |
| 2x1 1/16 | 50x30 | 9,80 | 3,80 | 1,82 | 3,63 | 2,65 | 1,11 | 4,79 | 3,08 | 8,91 | 4,59 | | |
| 2x1 1/16 | 50x30 | 11,39 | 4,42 | 1,97 | 4,19 | 3,05 | 1,19 | 5,64 | 3,61 | 10,53 | 5,34 | | |
| 2 3/8x1 1/2 | 60x40 | 11,29 | 3,76 | 2,28 | 5,57 | 2,94 | 1,60 | 4,53 | 3,31 | 11,81 | 4,89 | 40 | |
| 2 3/8x1 1/2 | 60x40 | 13,82 | 4,61 | 2,24 | 6,80 | 3,59 | 1,57 | 5,58 | 4,07 | 14,58 | 5,98 | | |
| 2 3/8x1 1/2 | 60x40 | 16,02 | 5,34 | 2,22 | 7,86 | 4,15 | 1,56 | 6,51 | 4,74 | 17,05 | 6,93 | | |
| 2 3/8x1 1/2 | 60x40 | 17,92 | 5,97 | 2,20 | 8,77 | 4,63 | 1,54 | 7,32 | 5,33 | 19,22 | 7,76 | | |
| 2 3/8x1 1/2 | 60x40 | 21,11 | 7,04 | 2,17 | 10,28 | 5,43 | 1,51 | 8,72 | 6,33 | 23,98 | 9,14 | 28 | |
| 2 3/4x1 3/4 | 70x45 | 29,69 | 8,47 | 2,57 | 15,00 | 6,66 | 1,83 | 10,29 | 7,60 | 32,13 | 11,08 | | |
| 2 3/4x1 3/4 | 70x45 | 35,19 | 10,04 | 2,54 | 17,72 | 7,87 | 1,80 | 12,31 | 9,07 | 38,56 | 13,13 | | |
| 3x1 1/2 | 76x38 | 20,27 | 5,32 | 2,77 | 6,97 | 3,66 | 1,62 | 6,52 | 4,05 | 16,57 | 6,31 | | |
| 3x1 1/2 | 76x38 | 24,90 | 6,54 | 2,74 | 8,53 | 4,48 | 1,60 | 8,06 | 4,99 | 20,48 | 7,73 | 28 | |
| 3x1 1/2 | 76x38 | 28,96 | 7,60 | 2,71 | 9,88 | 5,19 | 1,58 | 9,43 | 5,83 | 23,96 | 8,98 | | |
| 3x1 1/2 | 76x38 | 32,50 | 8,53 | 2,69 | 11,05 | 5,80 | 1,57 | 10,63 | 6,56 | 27,03 | 10,06 | | |
| 3x1 1/2 | 76x38 | 38,50 | 10,11 | 2,65 | 13,00 | 6,83 | 1,54 | 12,70 | 7,82 | 32,35 | 11,90 | | |
| 3 1/ x2 | 90x50 | 58,97 | 13,08 | 3,27 | 23,73 | 9,49 | 2,08 | 16,01 | 10,67 | 54,42 | 16,16 | 28 | |
| 3 1/2x2 | 90x50 | 70,33 | 15,60 | 3,24 | 28,18 | 11,27 | 2,05 | 19,23 | 12,80 | 65,49 | 19,25 | | |
| 3 3/4x1 3/4 | 95x45 | 62,87 | 13,22 | 3,38 | 19,71 | 8,75 | 1,89 | 16,44 | 9,79 | 48,83 | 15,25 | 28 | |
| 3 3/4x1 3/4 | 95x45 | 74,97 | 15,76 | 3,34 | 23,36 | 10,37 | 1,87 | 19,75 | 11,72 | 58,67 | 18,14 | | |
| 4x4 1/2 | 100x40 | 40,88 | 8,18 | 3,56 | 9,90 | 4,95 | 1,75 | 10,22 | 5,40 | 25,76 | 8,78 | 24 | |
| 4x4 1/2 | 100x40 | 50,42 | 10,09 | 3,53 | 12,14 | 6,07 | 1,73 | 12,66 | 6,68 | 31,88 | 10,79 | 24 | |
| 4x4 1/2 | 100x40 | 66,26 | 13,25 | 3,47 | 15,80 | 7,91 | 1,70 | 16,78 | 8,81 | 2,15 | 14,10 | 24 | |
| 4x4 1/2 | 100x40 | 78,98 | 15,80 | 3,43 | 18,69 | 9,35 | 1,67 | 20,13 | 10,54 | 50,52 | 16,73 | 24 | |
| 4x2 | 100x50 | 117,34 | 23,10 | 3,58 | 39,69 | 15,63 | 2,08 | 28,97 | 17,86 | 98,42 | 27,21 | 40 | |
| 4x2 | 100x50 | 160,94 | 31,68 | 3,45 | 53,54 | 21,08 | 1,99 | 40,70 | 24,90 | 139,04 | 37,26 | 30 | |
| 4 3/4x2 3/8 | 120x60 | 138,63 | 22,77 | 4,42 | 46,42 | 15,50 | 2,55 | 28,01 | 17,17 | 111,53 | 26,72 | 12 | |
| 4 3/4x2 3/8 | 120x60 | 166,39 | 27,33 | 4,38 | 55,47 | 18,52 | 2,53 | 33,80 | 20,69 | 134,64 | 32,10 | 12 | |
| 6x2 | 150x50 | 329,73 | 43,26 | 5,19 | 58,01 | 22,84 | 2,18 | 55,97 | 25,54 | 166,60 | 41,63 | 27 | |
| 6x2 | 150x50 | 462,11 | 60,64 | 5,03 | 79,27 | 31,21 | 2,08 | 79,92 | 36,04 | 235,54 | 57,49 | 24 | |
| 6x2 | 150x50 | 574,42 | 75,38 | 4,89 | 96,06 | 37,82 | 2,00 | 101,29 | 45,11 | 295,94 | 70,61 | 24 | |
| 6x4 | 150x100 | 509,23 | 66,83 | 5,74 | 273,64 | 53,87 | 4,21 | 80,04 | 60,72 | 562,62 | 88,66 | 15 | |
| 6x4 | 150x100 | 725,85 | 95,26 | 5,65 | 387,98 | 76,37 | 4,13 | 115,64 | 87,55 | 817,79 | 126,36 | 15 | |
| 6x4 | 150x100 | 918,68 | 120,56 | 5,50 | 488,49 | 96,16 | 4,01 | 148,40 | 112,12 | 1.057,01 | 160,18 | 15 | |

Los Perfiles Tubulares **COLMENA®** cumplen con la Norma ASTM A 500 GRADO C — Esfuerzo de Fluencia Fy=3.500,00 Kg/cm² (50.000,00 PSI)

DISTRIBUIDOR MAYORISTA DE MATERIALES PARA LA CONSTRUCCIÓN
 Este documento lo encuentra en Internet: www.coval.com.co - E-mail: info@coval.com.co





MATERIAL DE FABRICACION

Los perfiles se fabrican con acero laminado en caliente (H.R.) de bajo contenido de carbono, alta soldabilidad y ductilidad, según normas AISI / SAE 1008, 1010, 1015; JIS SPHT 3132, o cualquier otro acero equivalente con los siguientes contenidos máximos en su composición química:

| | |
|-----------|---------------|
| CARBONO | 0.27% máximo |
| MANGANESO | 1,40% máximo |
| FOSFORO | 0.045% máximo |
| AZUFRE | 0.045% máximo |

El esfuerzo mínimo de fluencia del acero es de 3.220,00 Kg./cm² (46.000,00psi) La relación entre esfuerzo último y esfuerzo de fluencia está entre 1,25 y 1,3 satisfaciendo la relación mínima recomendada para forjado en frío de 1,2.

PROCESO DE PRODUCCION

Los perfiles estructurales se fabrican partiendo de bandas de acero laminado en caliente, que al pasar por una serie de rodillos sufre un proceso de formado en frío dando la geometría de cada perfil, para el caso de los perfiles tubulares el cerrado se hace mediante soldadura por inducción con alta frecuencia (electrofundición RW).

PROPIEDADES MECANICAS DEL PERFIL CONFORMADO

| Esfuerzos | Redondos ASTM-A 500 Grado C | Cuadrados y Rectangulares ASTM-A 500 Grado C |
|------------------|--------------------------------|--|
| Fluencia Fy | 3.220,00 Kg/cm ² | 3.500,00 Kg/cm ² |
| Ultimo Fu | 4.320,00 Kg/cm ² | 4.340,00 Kg/cm ² |
| Elongación en 2" | 21% | 21% |





DIMENSIONES Y TOLERANCIAS DE FABRICACION

os perfiles se fabrican de acuerdo con las dimensiones reales indicadas en las tablas, las dimensiones nominales son las de común manejo.

os perfiles se fabrican en longitud de 6,00 m, para largos diferentes consultar.

| TOLERANCIAS | |
|---|------------------------------|
| Longitud | -5mm/+40mm |
| Diámetro en redondos | +/- 0,25mm |
| Dimensiones exteriores en cuadrados y rectangulares | +/- 0,50mm |
| Espesor de material | +/- 10% |
| Cuadratura en cuadrados y rectangulares | +/- 2° |
| Radio en esquinas | 1 a 3 veces espesor e |
| Rectitud para tubulares medido al centro | 2,08mm/m |

ACABADO

os perfiles se entregan en acero negro en caso de que se requieran otros tipos de acabados o recubrimientos tales como pintura por inmersión o galvanizado por favor consultar.

IDENTIFICACION

os perfiles tubulares se identifican con el logotipo COLMENA o TUBOCARIBE estampado en bajo relieve o marcado con esténcil y la leyenda "COLMENA COLOMBIA ASTM A 500 C" Esp. ____ ó "TUBOCARIBE COLOMBIA ASTM A 500 C"Esp



Rodamiento para subsistema de tracción

Unidades de visualización: Metric Imperial Ordenar por: Diámetro del agujero ▾

| Dimensiones principales | | | Capacidad de carga básica | | Velocidades nominales | | Designaciones | |
|-------------------------|-----------|--------|---------------------------|---------------------|-----------------------|----------------|----------------|-----------|
| d [mm] | ↑↓ D [mm] | B [mm] | dynamic | static | Reference speed | Limiting speed | Bearing | Snap ring |
| | | | C [kN] | C ₀ [kN] | [r/min] | [r/min] | | |
| 20 | 27 | 4 | 0.585 | 0.39 | 50 000 | 26 000 | W 61704 R-2Z5 | |
| 20 | 27 | 4 | 0.585 | 0.39 | 50 000 | 26 000 | W 61704-2Z5 | |
| 20 | 27 | 4 | 0.585 | 0.39 | 50 000 | 32 000 | W 61704 | |
| 20 | 27 | 4 | 0.585 | 0.39 | 50 000 | 32 000 | W 61704 R | |
| 20 | 27 | 4 | 0.585 | 0.39 | | 14 000 | W 61704-2RS1 | |
| 20 | 32 | 7 | 3.12 | 2.08 | 48 000 | 24 000 | W 61804-2RZ | |
| 20 | 32 | 7 | 3.12 | 2.08 | 48 000 | 24 000 | ☆ W 61804-ZZ | |
| 20 | 32 | 7 | 3.12 | 2.08 | | 13 000 | ☆ W 61804-2RS1 | |
| 20 | 32 | 7 | 3.97 | 2.6 | 45 000 | 22 000 | W 61804 R-ZZ | |
| 20 | 32 | 7 | 3.97 | 2.6 | 45 000 | 28 000 | W 61804 R | |
| 20 | 32 | 7 | 4.03 | 2.32 | 45 000 | 22 000 | ☆ 61804-2RZ | |
| 20 | 32 | 7 | 4.03 | 2.32 | 45 000 | 28 000 | ☆ 61804 | |
| 20 | 32 | 7 | 4.03 | 2.32 | | 13 000 | ☆ 61804-2RS1 | |
| 20 | 32 | 10 | 3.12 | 2.08 | 48 000 | 24 000 | W 63804 R-ZZ | |
| 20 | 32 | 10 | 3.12 | 2.08 | 48 000 | 24 000 | W 63804-ZZ | |
| 20 | 32 | 10 | 3.12 | 2.08 | 48 000 | 30 000 | W 63804 | |
| 20 | 32 | 10 | 3.12 | 2.08 | 48 000 | 30 000 | W 63804 R | |
| 20 | 32 | 10 | 3.12 | 2.08 | | 13 000 | W 63804-2RS1 | |
| 20 | 37 | 9 | 5.53 | 3.65 | 43 000 | 20 000 | W 61904 R-ZZ | |
| 20 | 37 | 9 | 5.53 | 3.65 | 43 000 | 20 000 | W 61904-ZZ | |
| 20 | 37 | 9 | 5.53 | 3.65 | 43 000 | 26 000 | W 61904 | |
| 20 | 37 | 9 | 5.53 | 3.65 | 43 000 | 26 000 | W 61904 R | |
| 20 | 37 | 9 | 5.53 | 3.65 | | 12 000 | ☆ W 61904-2RS1 | |
| 20 | 37 | 9 | 6.37 | 3.65 | 43 000 | 20 000 | ☆ 61904-2RZ | |
| 20 | 37 | 9 | 6.37 | 3.65 | 43 000 | 26 000 | ☆ 61904 | |
| 20 | 37 | 9 | 6.37 | 3.65 | | 12 000 | ☆ 61904-2RS1 | |
| 20 | 42 | 8 | 7.28 | 4.05 | 38 000 | 24 000 | ☆ ■ 16004 | |
| 20 | 42 | 12 | 8.06 | 5 | 38 000 | 19 000 | ☆ W 6004-ZZ | |
| 20 | 42 | 12 | 8.06 | 5 | 38 000 | 24 000 | W 6004 | |
| 20 | 42 | 12 | 8.06 | 5 | | 11 000 | ☆ W 6004-2RS1 | |

■ = SKF Explorer
☆ = Producto popular

Fuente: <https://www.skf.com/co/products/rolling-bearings/ball-bearings/deep-groove-ball-bearings>

Motor SIEMENS 1LA5

Motores trifásicos

Motores trifásicos 1LA5

Armazón 48Y / Carcasa de aluminio, totalmente cerrados con ventilación exterior. TCCVE, caja de conexiones en la parte superior.

Aislamiento clase F

Factor de servicio 1.15

220YY / 440Y Volt, 60Hz

| HP | Polos | Tipo* | Horizontal Catálogo Spiridon | B/C + Patas espiga c/cuña Spiridon |
|------|-------|-------------|------------------------------------|--|
| 0.25 | 2 | 1LA58432YK3 | 1LA58432YK30 | 1LA58432YK31 |
| | 4 | 1LA58434YK3 | 1LA58434YK30 | 1LA58434YK31 |
| 0.33 | 2 | 1LA58442YK3 | 1LA58442YK30 | 1LA58442YK31 |
| | 4 | 1LA58444YK3 | 1LA58444YK30 | 1LA58444YK31 |
| 0.50 | 2 | 1LA58452YK3 | 1LA58452YK30 | 1LA58452YK31 |
| | 4 | 1LA58454YK3 | 1LA58454YK30 | 1LA58454YK31 |
| 0.75 | 2 | 1LA58462YK3 | 1LA58462YK30 | 1LA58462YK31 |
| | 4 | 1LA58464YK3 | 1LA58464YK30 | 1LA58464YK31 |
| 1.00 | 2 | 1LA58472YK3 | 1LA58472YK30 | 1LA58472YK31 |
| 1.5 | 2 | 1LA58482YK3 | 1LA58482YK30 | 1LA58482YK31 |

* Última posición en el tipo:

0 = Horizontal con patas

1 = Con brida "C" + patas y espiga con cuñero

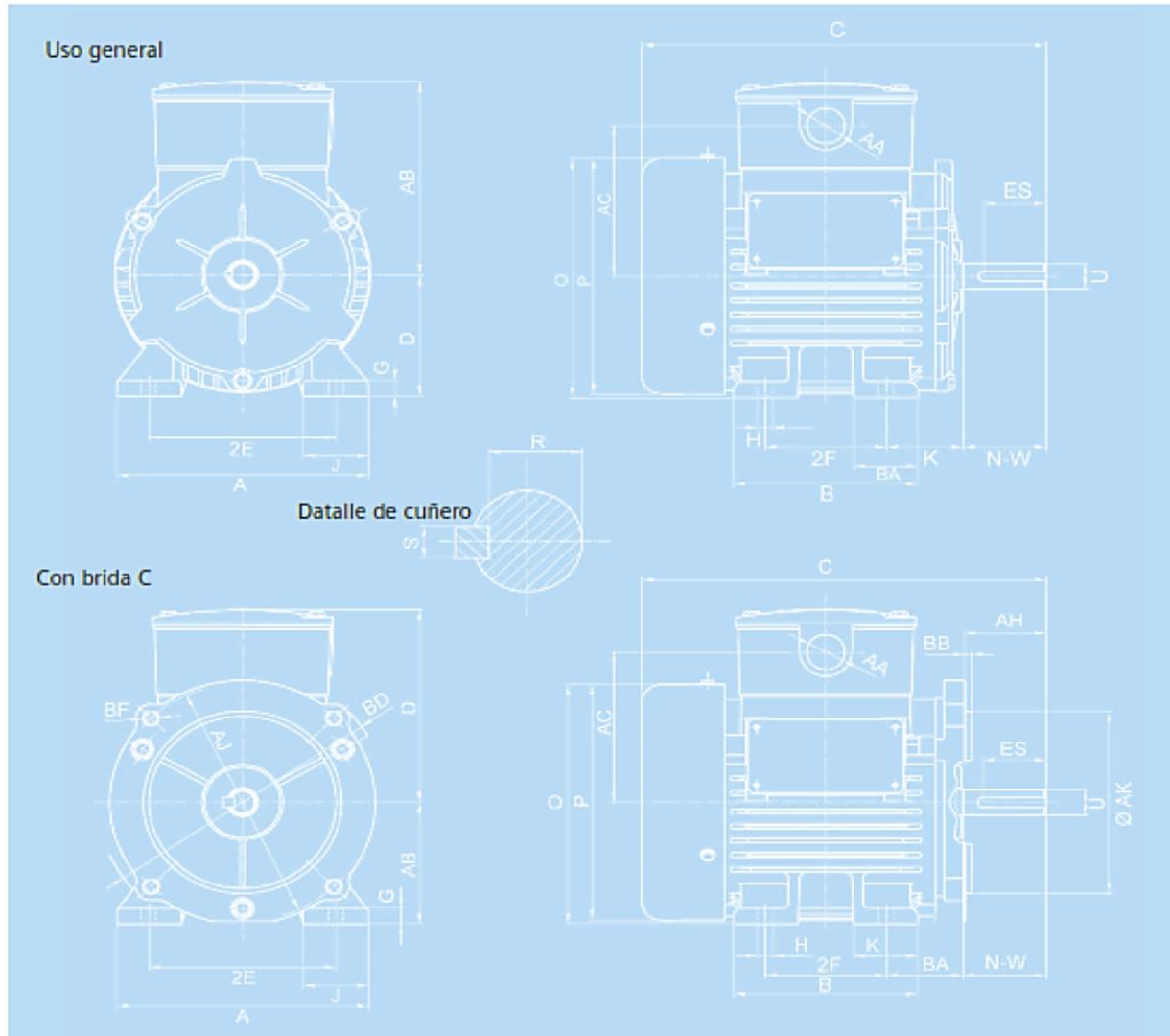


| HP | Polos | Tipo* | Velocidad nominal RPM | Tension nominal V | Corriente nominal A | Eficiencia nominal % | Letra de código | Par nominal Nm | Par Arranque % del nom. | Máximo % del nom. | Peso neto aprox. Kg |
|------|-------|----------------|-----------------------------|-------------------------|---------------------------|----------------------------|-----------------------|----------------------|-------------------------------|----------------------|---------------------------|
| 0.25 | 2 | 1LA5 843-2YK30 | 3470 | 220/440 | 1.1/0.55 | 64.0 | L | 0.6 | 260 | 400 | 5.8 |
| | 4 | 1LA5 843-4YK30 | 1720 | 220/440 | 1.2/0.60 | 62.0 | J | 1.0 | 165 | 280 | 6.1 |
| .033 | 2 | 1LA5 844-2YK30 | 3480 | 220/440 | 1.3/0.65 | 68.0 | L | 0.7 | 200 | 440 | 6.1 |
| | 4 | 1LA5 844-4YK30 | 1720 | 220/440 | 1.6/0.80 | 66.0 | J | 1.3 | 215 | 280 | 6.7 |
| 0.50 | 2 | 1LA5 845-2YK30 | 3485 | 220/440 | 1.8/0.90 | 74.0 | L | 1.0 | 350 | 420 | 6.6 |
| | 4 | 1LA5 845-4YK30 | 1715 | 220/440 | 2.0/1.00 | 70.0 | J | 2.0 | 230 | 275 | 7.5 |
| 0.75 | 2 | 1LA5 846-2YK30 | 3450 | 220/440 | 2.3/1.15 | 75.5 | K | 1.5 | 290 | 550 | 7.4 |
| | 4 | 1LA5 846-4YK30 | 1710 | 220/440 | 3.0/1.50 | 72.0 | J | 3.0 | 240 | 320 | 8.9 |
| 1.00 | 2 | 1LA5 847-2YK30 | 3440 | 220/440 | 2.8/1.40 | 75.5 | J | 2.0 | 290 | 430 | 8.2 |
| 1.5 | 2 | 1LA5 848-2YK30 | 3415 | 220/440 | 4.2/2.10 | 77.0 | J | 3.0 | 270 | 320 | 9.2 |



Motores trifásicos
1LA5

Dimensiones en pulgadas



| BD | AJ | AK | AH | BB | Cant. | BF diam |
|------|-------|-----|------|------|-------|-----------|
| 6.58 | 5.875 | 4.5 | 1.85 | 0.16 | 4 | 3/8"-16NC |

| S | R | C | D | 2E | 2F | BA | N-W | O | P | AB | U | AC | H | B | K | R-0.015 | G | J | A | AA | ES |
|------|-------|------|-----|------|------|------|------|------|------|------|-------|-----|------|------|------|---------|------|------|-----|------|------|
| 3/16 | 0.517 | 9.17 | 3.0 | 4.24 | 2.75 | 1.74 | 1.88 | 5.91 | 5.82 | 4.76 | 0.625 | 3.7 | 0.34 | 4.17 | 1.46 | 0.517 | 0.39 | 1.48 | 5.7 | 0.87 | 1.41 |

FACTURAS PROTOTIPO

DISIPADOR ELECTRONICO
CRA. 9a No. 19-30 LOC. 109
TEL. 286 5412 • BOGOTA

04-11-2020

CUENTA DE COBRO PEDIDO COTIZACION REMISION

Cliente: **JAIRO**

Forma de pago:

| CANT. | ARTICULO | VR. UNIT. | VR. TOTAL |
|-------|-----------------------|-----------|-----------|
| 2 | motores 110 de a 2500 | 3000 | 6000 |
| 2 | prentes | 4500 | 9000 |

CANCELADO

VENDEDOR: COMPRADOR: **S9000**

DISIPADOR ELECTRONICO

LUZ MELIDA BERMEO
NIT. 28.150.996-7 REGIMEN SIMPLIFICADO
ACTIVIDAD ECONOMICA 4773 - TARIFA 11.000.000
Carrera 9a. No. 19 - 30 - L. 109 - Tel.: 286 5412
Bogotá, D.C.

FACTURA DE VENTA
Nº 17261

Fecha: **06/11/2020** NIT: **101545645**

Cliente: **Jairo Usabegui**

Dirección: _____ Tel: _____

Condiciones: _____

| CANT. | ARTICULOS | VR.UNIT. | VR.TOTAL |
|-------|-------------------------|----------|----------|
| 1 | motor Reductor de 24VDC | 30000 | |
| 1 | Reductor de 24V | 1500 | |

CANCELADO

TOTAL \$ 48000

CASTILLO ELECTRONICO
REGIMEN SIMPLIFICADO
C.C. 1026590264 Bogota
CRA 9 #19-30 LOC 105-106
TEL: 2837769 Bogota D.C.

FECHA: 05/Dic/2020
TIQUETE: F-06891
NIT: 1-0
CLIENTE: VENTAS POR MOSTRADOR
CIUDAD: BOGOTA

| CANT | PRODUCTO | UNIT. | SUBTOTAL |
|---------------|----------|---------------------|--------------|
| 2 | 470-250V | Dep: @ELIM 4,900 | 9,800 |
| TOTAL: | | | 9,800 |

LAS PARTES ELECTRONICAS NO TIENE CAMBIO
PARA CUALQUIER RECLAMO, PRESENTAR ESTA
TIRILLA DE VENTA

RODACHINES

INDUSTRIALES Y CÍA LTDA

www.rodachines.co

Nit. 860522181-5
 CALLE 17 No. 25-18 Paloquemao TEL 3600518
 EMAIL.: administracion@rodachines.co
 BOGOTA D.C - COLOMBIA

IVA - Régimen Común
 No somos grandes contribuyentes, ni autorretenedores
 Somos contribuyentes de Impuesto de Industria y Comercio en Bogotá
 Tarifa Industria y Comercio 11.04 x 1000
 Actividad Económica ICA No. 4752

Autorización Numeración Facturación DIAN No. 18764000122623 del
 16/06/2020. Autoriza de ROD 1 a ROD 5000. Vigencia 18 meses.

SEÑORES:

JAIRO ARMANDO USCATEGUI RODRIGUEZ
 1015456465
 CL 74B 69P 41
 3017793420
 Bogota D.C.
 jairo.uscategui@estudiantes.uamerica.edu.co

Factura Electrónica De Venta No ROD 2200
 Fecha Factura: 06/11/2020
 Fecha de Vencimiento: 06/11/2020
 Forma de Pago: Contado 0 Dias
 Medio de Pago: Medios de Pago: Efectivo
 Vendedor: CESAR IVAN OROZCO SOLANILLA
 Orden de Compra:
 Contacto:

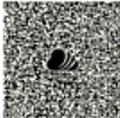
| Item | Código | Descripción | Cantidad | U Medida | Valor Unitario | IVA | Total |
|------|-----------|--|----------|----------|----------------|-----|--------|
| 1 | 2TPM19 RX | RX-Rod 2" Termoplastic Amarillo Gira S/F | 2 | Und. | 8.403 | 19% | 16.807 |

Valor en Letras
 VEINTE MIL PESOS M/CTE

Total líneas o ítems: 1

| | |
|------------------------------|---------------|
| SUBTOTAL | 16.807 |
| IVA | 3.193 |
| TOTAL DE LA OPERACIÓN | 20.000 |

¡ Su marca preferida !



No se aceptan cambios ni devoluciones, después de 5 días posteriores a la entrega de la mercancía.

Cuenta Corriente Bancolombia No. 04452218107
 Cuenta Corriente Banco Occidente No. 202019295
 Cuenta Corriente Banco Davivienda No. 473969995272

Fecha y Hora de Generación: 06/11/2020 16:30:58



TODO BANDAS SOCIEDAD POR ACCIONES SIMPLIFICADA

NIT 900250636-0

Régimen: Responsable del impuesto sobre las ventas -IVA

Persona Jurídica

CR 48 65 SUR 156, Sabaneta, Antioquia, Colombia

Tel. 4441418

Autorización factura electrónica de venta No. 18763002982262 válida desde 2019-12-27 hasta 2021-12-27 rango desde BOG50000 hasta BOG60000.

NO SOMOS AUTORETENEDORES
NO SOMOS GRANDES CONTRIBUYENTES
SOMOS RETENEDORES DE IVA
ACTIVIDAD PRINCIPAL 2219

| | |
|-----------------------------|--|
| Ciudadanía: | 1015456465 |
| Dirección: | CLL 74 B # 69 P BIS - 41, Bogotá, D.C., Bogotá, Colombia |
| Teléfono: | 3017793420 |
| Email: | jairo.uscategui@estudiantes.uamerica.edu.co |
| Tipo de negociación: | Contado |
| Medio de Pago: | Transferencia Débito Bancaria |
| Fecha de Pago: | 11/11/2020 |
| Total de Líneas: | 1 |

| | | | | | |
|--------------------------------------|----------------------------|------|-----|-----|------|
| FACTURA ELECTRÓNICA DE VENTA: | BOG50689 | | | | |
| MONEDA: | COP Colombia, Pesos | | | | |
| HORA EMISIÓN: | 15:44:20 | | | | |
| FECHA FIRMADO: | 11/11/2020 20:44:16 | | | | |
| FECHA DE EMISIÓN | | | | | |
| DIA | MES | AÑO | DIA | MES | AÑO |
| 11 | 11 | 2020 | 11 | 11 | 2020 |

| # | CÓDIGO | DESCRIPCIÓN | U. MEDIDA | CANTIDAD | PRECIO U. | IVA | DCTO. | TOTAL |
|---|--------|---|-----------|----------|-------------|-------|-------|-------------|
| 1 | 049 | BANDA TRANS ASTER 0708 de 80mm de anchura por 583mm de longitud sin fin | WSD | 1,00 | \$56.400,00 | 19,00 | 0,00 | \$56.400,00 |

| | | |
|---|-------------------------------|-------------|
| Notas: Vendedor: LILIANA RESTREPO | Subtotal: | \$56.400,00 |
| | Cargos: | \$0,00 |
| | Descuento: | \$0,00 |
| | IVA: | \$10.716,00 |
| | Total de la operación: | \$67.116,00 |

SON (sesenta y siete mil ciento dieciséis pesos)
CUFE: 2c02dd1e63117310ccb71De9c56a2186eb561edb6aa88886ce249f0de588fb5901062ea89a9da72ee3458715e68b119

| IMPUESTO | BASE | TARIFA | IMPORTE |
|------------------|-------------|--------|-------------|
| IMPUESTOS | | | |
| 01 IVA | \$56.400,00 | 19,00% | \$10.716,00 |



Firma Digital
LMMGnkaKacY8BsqWlvEEL12yq25+asAmFrdJZXWV/RURcesOuOK/7dVXnN8jwK3EazcT1VlyAhd7auCVX3HCOKJ1tFAN7BfgEe9jLjGRQZ6m+odDBhacCf9NehH9polm3MEbqzr1GKzjQy882wclUy+YYJ47a
FgC7R3qgAG7mEYerV22941VCFxzXQOV3NXWwll+OUwYU9p9ouGCh7XNVLNzedsJAJwwwAvodMRF53pukZXH4uqFNMJQCWusdP9vBnON8qysW+Db2zTrAOjwQp55BEhacJH1gFGHQJBTg+*

Este comprobante corresponde al periodo de: 01/11/2020 hasta: 30/11/2020.
FAVOR CONSIGNAR EN LA CUENTA CORRIENTE DE BANCOLOMBIA No. 55145911367 A NOMBRE DE TODO BANDAS S.A.S
Esta factura es un título valor de acuerdo al art. 774 del C.C. y una vez aceptada declara haber recibido los bienes y servicios a satisfacción

Representación Gráfica de la Factura de Venta Electrónica.



Software e-Factura Proveedor tecnológico: Cadena S.A. NIT 890390534-0

Disipador
 cr 4 Ne A-30
 Ant 108
 12/11/20

CUENTA DE COBRO PEDIDO COTIZACION REMISION

Cliente:
 Dirección: Tel:
 Forma de pago: Nit:

| CANT. | ARTICULO | Vr. UNIT. | Vr. TOTAL |
|-------|--------------|-----------|-----------|
| 2 | Resistencias | | 2000 |
| 1 | Amplificador | | 10000 |

Cancelado

72000

ESTE DOCUMENTO SE ASIMILA EN TODOS SUS EFECTOS LEGALES A UNA LETRA DE CAMBIO SEGUN ART 774 DEL C.C.

VENDEDOR _____ COMPRADOR _____

No. 18 NOV 20

CLIENTE
 DIR.: TEL.
 CIUDAD: VENDEDOR: NIT.

| CANT. | DESCRIPCIÓN DEL ARTICULO | V/UNID. | V/TOTAL |
|-------|--------------------------|---------|---------|
| 2 | Resistencias | | 2000 |
| 3 | Resistencias 2x1/4W | | 2700 |
| 2 | Resistencias 2x22 | | 800 |
| 3 | Ind 3 P10 4P | | 8100 |

\$ 16800 =

FIRMA _____ TOTAL \$

UD Nit: 1022972666-6
 ELECTRONICS Tel: 320 8576038
 Carrera 9 #19-30 Local 206
 udelectronicbogota@gmail.com

COMPROBANTE DE VENTA No. _____

ORDEN DE COMPRA DIA MES AÑO 27 11 20

VENDIDO A: Jairo Usategui
 DIRECCION: VENDEDOR POR: _____
 CIUDAD: TELEFONO: _____

| CANTIDAD | CONCEPTO | Vr. UNITARIO | Vr. TOTAL |
|----------|-------------|--------------|-----------|
| 3 | Resistor DC | 9000 | 18000 |

SON _____ SUB-TOTAL TOTAL \$ 18000

ACEPTADA (DEUDOR) _____ VENDEDOR _____
 C.C. o NIT _____ C.C. o NIT _____

UD Nit: 1022972666-6
 ELECTRONICS Tel: 320 8576038
 Carrera 9 #19-30 Local 206
 udelectronicbogota@gmail.com

COMPROBANTE DE VENTA No. _____

ORDEN DE COMPRA DIA MES AÑO 1 12 20

VENDIDO A: Jairo Usategui
 DIRECCION: VENDEDOR POR: _____
 CIUDAD: TELEFONO: _____

| CANTIDAD | CONCEPTO | Vr. UNITARIO | Vr. TOTAL |
|----------|-------------------------------|--------------|-----------|
| | Transfer de la deuda Motor Ac | | 45000 |

SON _____ SUB-TOTAL TOTAL \$ 45000

ACEPTADA (DEUDOR) _____ VENDEDOR _____
 C.C. o NIT _____ C.C. o NIT _____

COTIZACIONES FABRICACIÓN MÁQUINA LANZADORA DE BALONES DE VOLEIBOL

**HIERROS
EL DORADO**
NIT: 800153677-4
Dir. Cr 29 B 34 Tel: 2019715

IVA REGIMEN COMÚN
Autorretenedores RES. 000979 del 13/02/2015
NO EFECTUAR RETE ICA SOMOS GRANDES CONTRIBUYENTES
SHD RES. DDI-042065 DEL 13/10/2017

BOGOTÁ, D.C., sábado, 12 de diciembre de 2020 CTC-201211390

VENTAS MOSTRADOR
CR 29 B 34
BOGOTÁ, D.C

Asunto : Cotización al cliente 12-12-2020

| CODIGO | DESCRIPCION | CANTIDAD | PESO | VALOR UNIT | DCTO. | VALOR TOTAL |
|--------------|---|----------|--------|--------------|-------|---------------------|
| 08040302 | LAMINA H.R. 1/8 (3.42) DE 4X6 (1.21X2.40) | 1 UND | 78 | \$ 260.000 | | \$ 260.000 |
| 08040804 | LAMINA H.R. 3/8 DE 1.20X6 | 1 UND | 511 | \$ 1.695.000 | | \$ 1.695.000 |
| 03010110 | VARILLA RED. LISA DE 1" | 5 MT | 23.808 | \$ 15.600 | | \$ 93.600 |
| 03020106 | VARILLA CUAD. DE 3/4 | 6 MT | 17.238 | \$ 11.500 | | \$ 69.000 |
| 08040502 | LAMINA H.R. 3/16 DE 4X8 | 1 UND | 102 | \$ 388.500 | | \$ 388.500 |
| PARCIAL | | | | | | \$ 2.105.966 |
| DESCUENTO | | | | | | |
| IVA | | | | | | \$ 400.134 |
| TOTAL | | | | | | \$ 2.506.100 |

----- VIGENCIA DE LA COTIZACION -----

| | | | |
|----------------------|------------|---------------|---------|
| Validez de la oferta | 2 dias | Forma de pago | CONTADO |
| Fecha en que caduca | 15/12/2020 | | |

Atentamente,

LUZ MARLEN CELIS SALCEDO

Teléfono 2019715
Cel./Móvil 3174014044
Email : asesor.luz@hierroseldorado.com

FRM-029V1 Impreso con ContaPyme V. 4 - InSoft Nit 810.000.630-9 www.contapyme.com

CTC-201211390 Page 1 of 1



Autop. Medellín km 2.5 vía Siberia
pbx 3702200-8773700

Cotización

SUCURSAL
CALLE 17 No 22-41 PALOQUEMAD
POX: 3752200 - 2722977
FAX: 3658921 - 2770599

7 DE AGOSTO
CALLE 68 No 25-37
741115

SUCURSAL
CRA 16 No 11-35 TELEFONOS: 2862
FAX: 2431883 BOGOTÁ D.C.

219784

SUCURSAL FONTIBON
CALLE 17 No 127-95 TELEFONO: 741684
BOGOTÁ D.C.

Pag. 1

| | | | | | |
|--|--------------------------------|-----|-----|--------|------------|
| ECH SOLUCIONES S A S CALLE 69 # 21-36 BOGOTÁ Colombia 900877069-8 3017793420 BOGOTÁ DISTRITO CAPITAL | CODIGO: COM P02 F-3 VERSION 1 | | | | |
| | Año | Mes | Día | Ciudad | ID Cliente |
| | 2020 | 12 | 12 | BOGOTÁ | 900877069 |
| | Asesor Comercial | | | | |
| | RICAURTE - M. ANGELICA NARANJO | | | | |

Agente retenedor de IVA e Ica - imponentas régimen común 03-2271-20
Somos grandes contribuyentes resolución 2509 del 03/12/93. Somos autorretenedores resolución 0025 del 21/04/1992

NOTA: De acuerdo a nuestra conversación el día de hoy nos permitimos cotizar lo siguiente:

| Cantidad | Unidad/Med | Descripción | Precio/Unit. | Total |
|----------|------------|--|-----------------|-----------------|
| 6,00 | UN | TUBO CERRAMIENTO ESP 1.50 UN 50X50 PRIMERA | \$ 48.440,00 | \$ 290.640,00 |
| 1,00 | UN | LAMINA HOT ROLLED ESP 3.00 UN 1000X2000 PRIMERA | \$ 135.883,50 | \$ 135.883,50 |
| 1,00 | UN | LAMINA HOT ROLLED ESP 9.00 UN 1200X2400 PRIMERA | \$ 587.010,95 | \$ 587.010,95 |
| 1,00 | UN | VARILLA CUADRADA ESP 10 UN 6.00 MT PRIMERA DIACO | \$ 15.405,00 | \$ 15.405,00 |
| 1,00 | UN | PLANCHA HOT ROLLED ESP 19.0 UN 1219X2440 PRIMERA | \$ 1.265.400,00 | \$ 1.265.400,00 |
| 1,00 | UN | LAMINA HOT ROLLED ESP 4.50 UN 1000X2000 PRIMERA | \$ 203.825,25 | \$ 203.825,25 |

| | |
|------------------------|---------|
| Condiciones Generales: | 0,000 |
| Forma de Pago: | Contado |
| Origen: | |
| Fob: | |

| | |
|--------------|------------------------|
| Subtotal | \$ 2.498.164,70 |
| 19% IVA | \$ 474.651,29 |
| Total | \$ 2.972.816,00 |

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www.rodachines.co

COTIZACION No. 152

| | | | | |
|-----------|---------------------------|-------------------|------------------------------|-----------|
| CLIENTE | ECH SOLUCIONES SAS | | FECHA DOCUMENTO | 12-dic-26 |
| NIT | 900877069-6 | | FECHA VENCIMIENTO | 12-dic-20 |
| DIRECCION | CR19 7DA 91 | | FORMA DE PAGO | 0 Dias |
| TELEFONO | 3142684352 | CIUDAD | Bogota D.C. | |
| CONTACTO | | | VENDEDOR | |
| EMAIL | echsoluciones@hotmail.com | TELEFONO CONTACTO | JENYFER ANGELICA SUAREZ CRUZ | |
| | | | 3142684352 | |

| Código | Descripción | Cantidad | Valor Unitario | Total |
|-----------|--------------------------------------|----------|----------------|---------|
| 5PVGX2 | IR-Rueda 6" PVC Rojo C/Bal | 2,00 | 17.310 | 34.620 |
| 4TPR28 CF | IR-Rod 4" Termoplástico Gira C/Freno | 4,00 | 26.555 | 106.218 |

Valor en Letras

CIENTO SESENTA Y SIETE MIL QUINIENTOS NOVENTA Y OCHO PESOS M/CTE

| | |
|-----------------|---------|
| SUBTOTAL | 140.838 |
| DESCUENTO | 0 |
| IVA | 26.759 |
| TOTAL DOCUMENTO | 167.598 |

Firma Responsable _____ Verificado Por _____

Bogotá, Noviembre 14 de 2020

Cotización No 001-20

Señor:
JAIRO USCATEGUI
Ciudad

Referencia: Cotización

De acuerdo a su solicitud les estamos cotizando:

Una (1) Banda de PVC blanca de 4mm de espesor, de 300mm de ancho por 5520mm de longitud sin fin, con empujadores fabricados de 80mm de altura colocados cada 21cm y de 250mm de largos.

Valor: \$995.000 más IVA

TODOBANDAS S.A.S.

CONDICIONES COMERCIALES:

| | |
|-------------------------|--------------------|
| IVA: | Vigente a la fecha |
| Forma de pago: | Contado |
| Entrega: | 4 días hábiles |
| Vigencia de cotización: | 15 días |

Estamos para servirles.

Cordialmente,

Liliana Restrepo D.
Directora Comercial Bogotá
Cel: 318 7129627
Email: ventas3@todobandas.com

