

HANDBOOK

CHECKING FIXTURE






INSTITUTO TECNOLÓGICO SUPERIOR DE
URURPAN
VENADOS ITSU



Uruapan Michoacán, México

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INTRODUCTION




Nowadays the manufacturing of automotive and aeronautic industry has a high quality control system. In 1935, after years of discussion The American Standards Association published the first standards, bringing with it new control system, although these had many weaknesses.

In 1940 in the United States, Chevrolet published a manual for a technical drawer but caused conflicts with the US Army, until 1966 after years of debate they created a unified standard published for the American National Standards Institute (ANSI). This was the beginning of engineering sizing.

The checking fixture is a control system of manufacturing used to measure the most important parameters or measuring critical points. These control systems help us to have better quality and to be in continuous improvement in these processes. In these control systems it's also important to make the whole process clear and with it is necessary specifications so that any operator can use in a fast, reliable and safe way for the industry

The checking fixture has the most important devices for the manufacturing industry, these devices include terms of GD&T (Geometry Dimension and Tolerancing), as well as a repeatability study like with others points.

Now the high impact automotive industry is calling on those interested in having this prior knowledge.

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SCOPE

The Checking Fixture is the most important devices control of quality and precision in the manufacture for parts of large lines of production of the automotive sector and not only of aeronautical sector.

In particular, the automotive sector use these devices of the industry, because when they pull out a new model all people will get it.

The big companies put great focus on quality, because all people want to buy high quality stuff. Therefore all companies should do their best to get their customers to buy them.




PURPOSE

The main purpose is to research, analyze, design, and manufacture quality control devices for recognized manufacturing companies as automotive and aeronautical industry.




Introducing us to an industrial research brings us many benefits especially experience, so when we go to work at industrial area we will have previous knowledge.

With this knowledge we can improve everything in the companies because for them it's very important to make the manufacturing processes more efficiently.

We will take measurements of the given piece to be designed, also we will rectify the measures to start dissecting a Checking Fixture, and then we will analyze the design of the Checking Fixture for manufacturing it and obtain the quality statistics.

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PROJECT DEVELOPMENT

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ROUD MAP

SPC	Measuring instrument	X	Y	Z	DESCRIPTION
1	PREASSURE SENSOR	194.10	145.73	45.66	This instrument get's the preassure what has the grill and the car. With a larger bracket the piece has less preassure to the car. It's very important to get the large of this bracket because it can hit on the car.
2	PREASSURE SENSOR	520.66	37.01	125	This instrument get's the preassure what has the grill and the car. If the grill's front is less large will get a diferent preassure and our sensor will read that variation.
3	PREASSURE SENSOR	797.63	167.88	45.66	This instrument get's the preassure what has the grill and the car. With a larger bracket the piece has less preassure to the car. It's very important to get the large of this bracket because it can hit on the car.

All the next measures were taken from Metrology Pin 1

SPC	Measuring instrument	X	Y	Z	DESCRIPTION
1	PREASSURE SENSOR	380.67	4.78	45.66	This instrument get's the preassure what has the grill and the car. With a larger bracket the piece has less preassure to the car. It's very important to get the large of this bracket because it can hit on the car.
2	PREASSURE SENSOR	53.62	103.97	125	This instrument get's the preassure what has the grill and the car. If the grill's front is less large will get a diferent preassure and our sensor will read that variation.
3	PREASSURE SENSOR	380.67	4.78	45.66	This instrument get's the preassure what has the grill and the car. With a larger bracket the piece has less preassure to the car. It's very important to get the large of this bracket because it can hit on the car.

All the next measures were taken from Metrology pin 2

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SPC	Measuring instrument	X	Y	Z	DESCRIPTION
1	PREASSURE SENSOR	380.67	4.78	45.66	This instrument get's the preassure what has the grill and the car. With a larger bracket the piece has less preassure to the car. It's very important to get the large of this bracket because it can hit on the car.
2	PREASSURE SENSOR	53.62	103.97	125	This instrument get's the preassure what has the grill and the car. If the grill's front is less large will get a diferent preassure and our sensor will read that variation.
3	PREASSURE SENSOR	380.67	4.78	45.66	This instrument get's the preassure what has the grill and the car. With a larger bracket the piece has less preassure to the car. It's very important to get the large of this bracket because it can hit on the car.

All the next measures were taken from Metrology pin 3



CHECKING FIXTURE

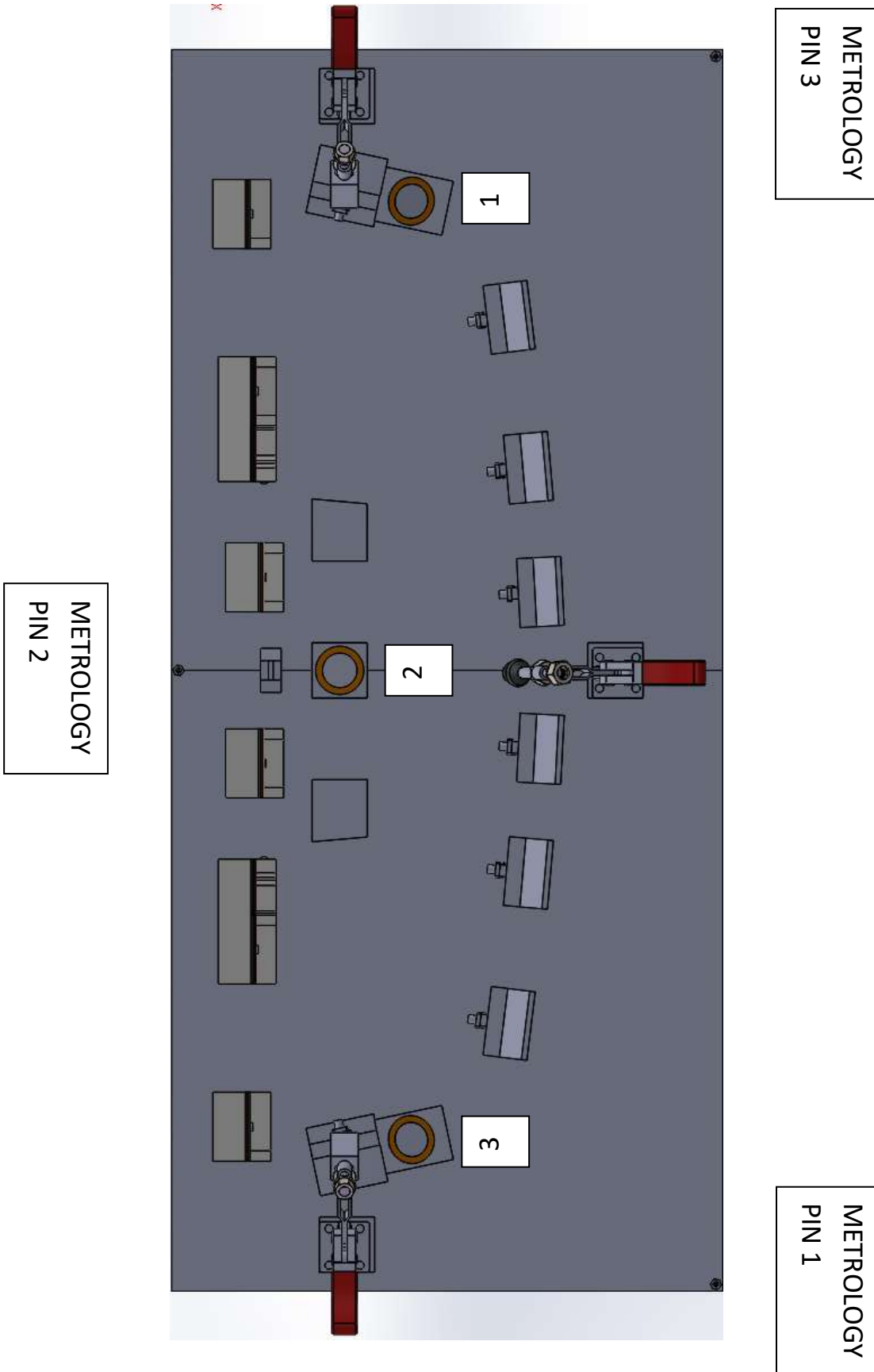
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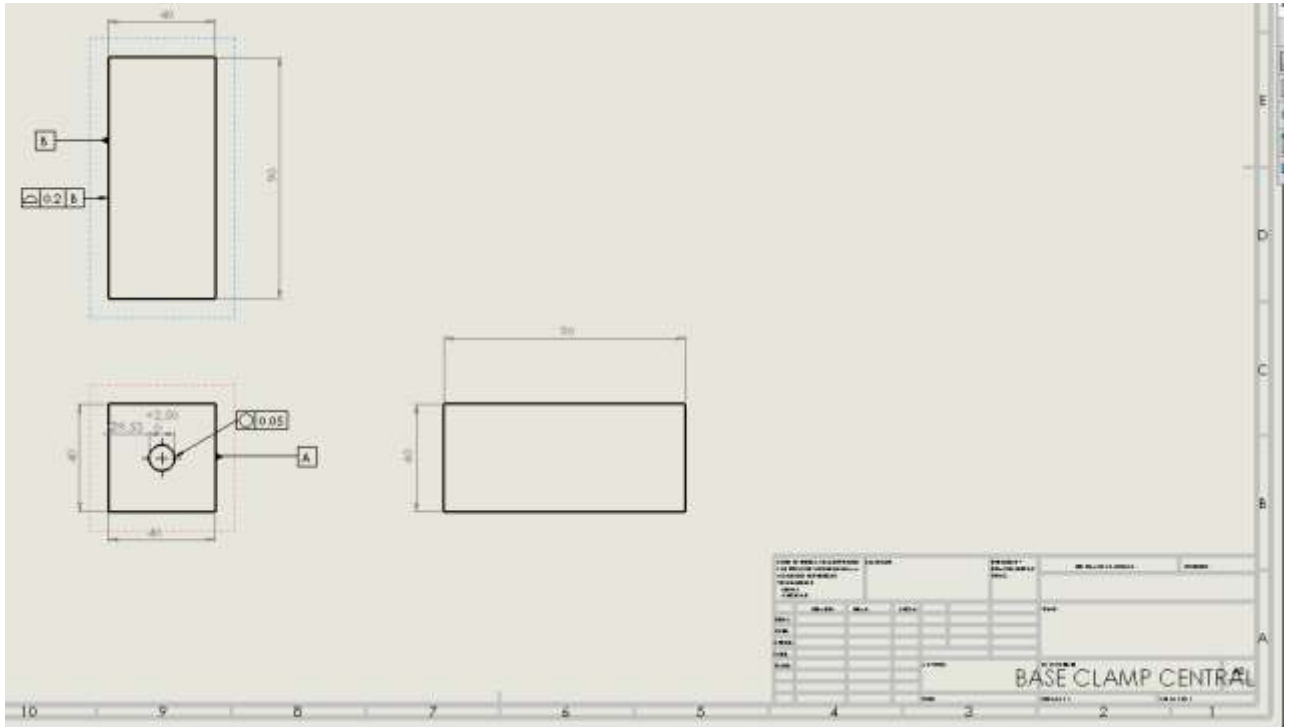
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#	Measuring instrument	TOLERANCE	DESCRIPTION
1	PREASSURE SENSOR	-10	It's important to measure this part of the grill because if we get a large bracket this can hit on our specific dupe.
2	PREASSURE SENSOR	+/-5	This point is important because if is bigger the grill doesnt will fit on the car, we will get a light between these two pieces.
3	PREASSURE SENSOR	-10	It's important to measure this part of the grill because if we get a large bracket this can hit on our specific dupe.
4	GO/NO GO GAUGE	+/-1.63	It Measure's the grill's Height, if this one is longer than the especific tolerance doesnt will fit perfectly on the car. It's important to say what the piece is locate to get all the tolerance on the top on the fixture.



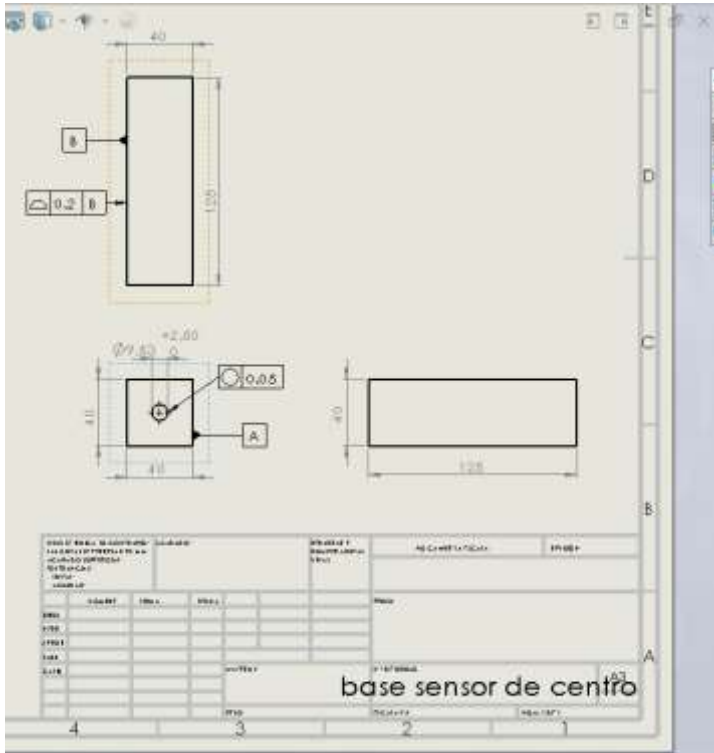
GD&T

Base clamp central



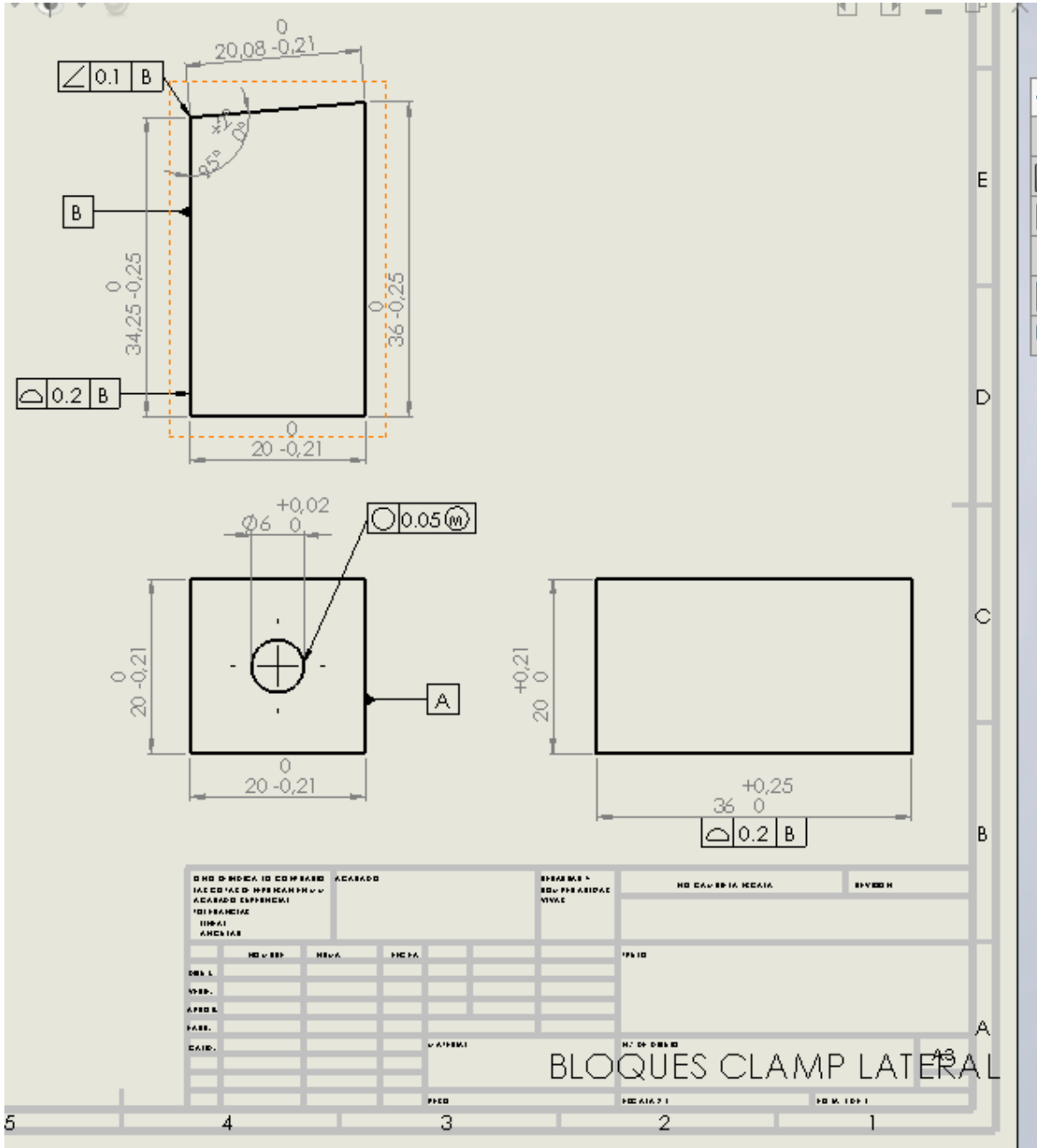


BASE DEL SENSOR





BLOQUES CLAMPS LATERAL





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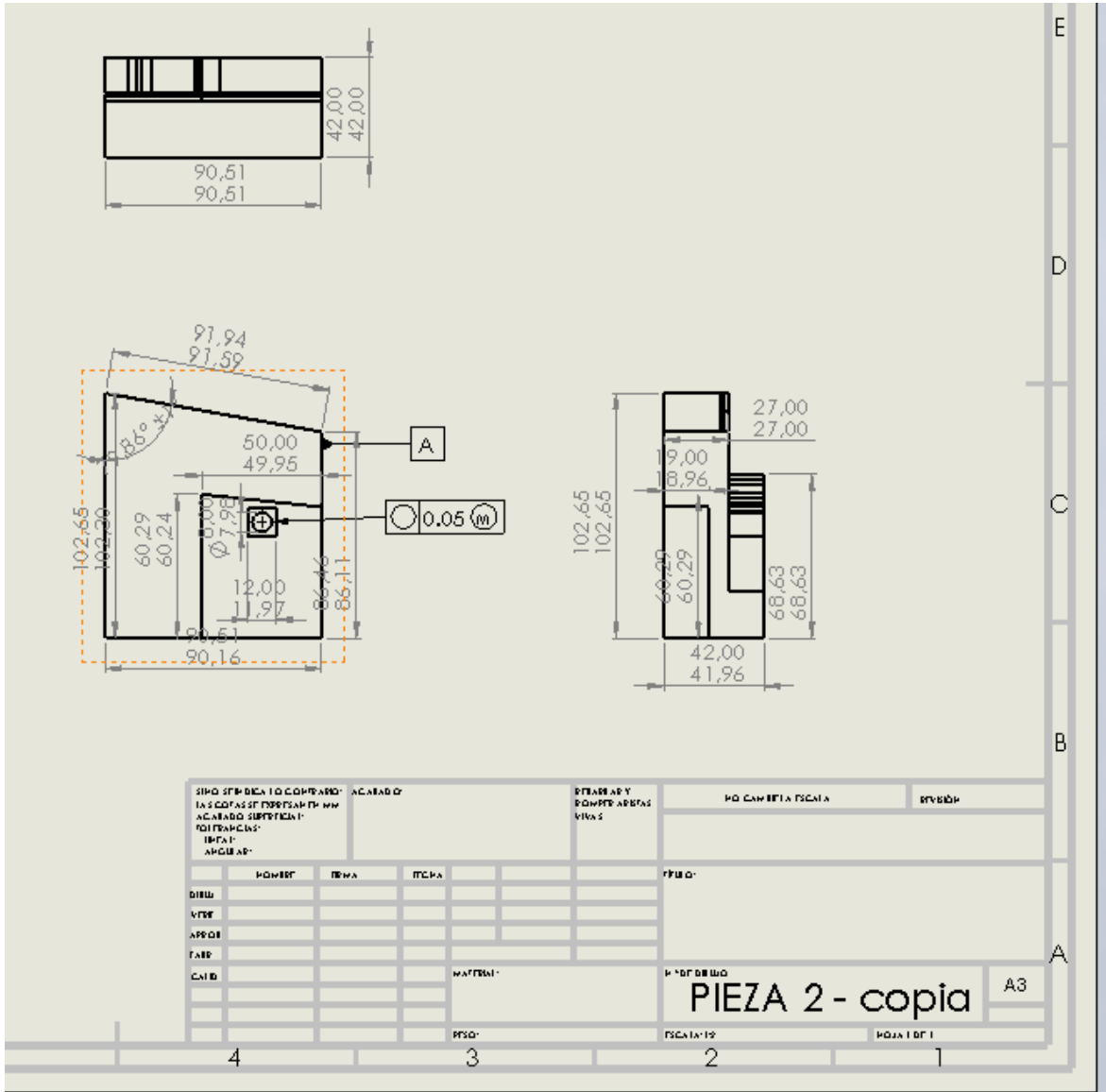


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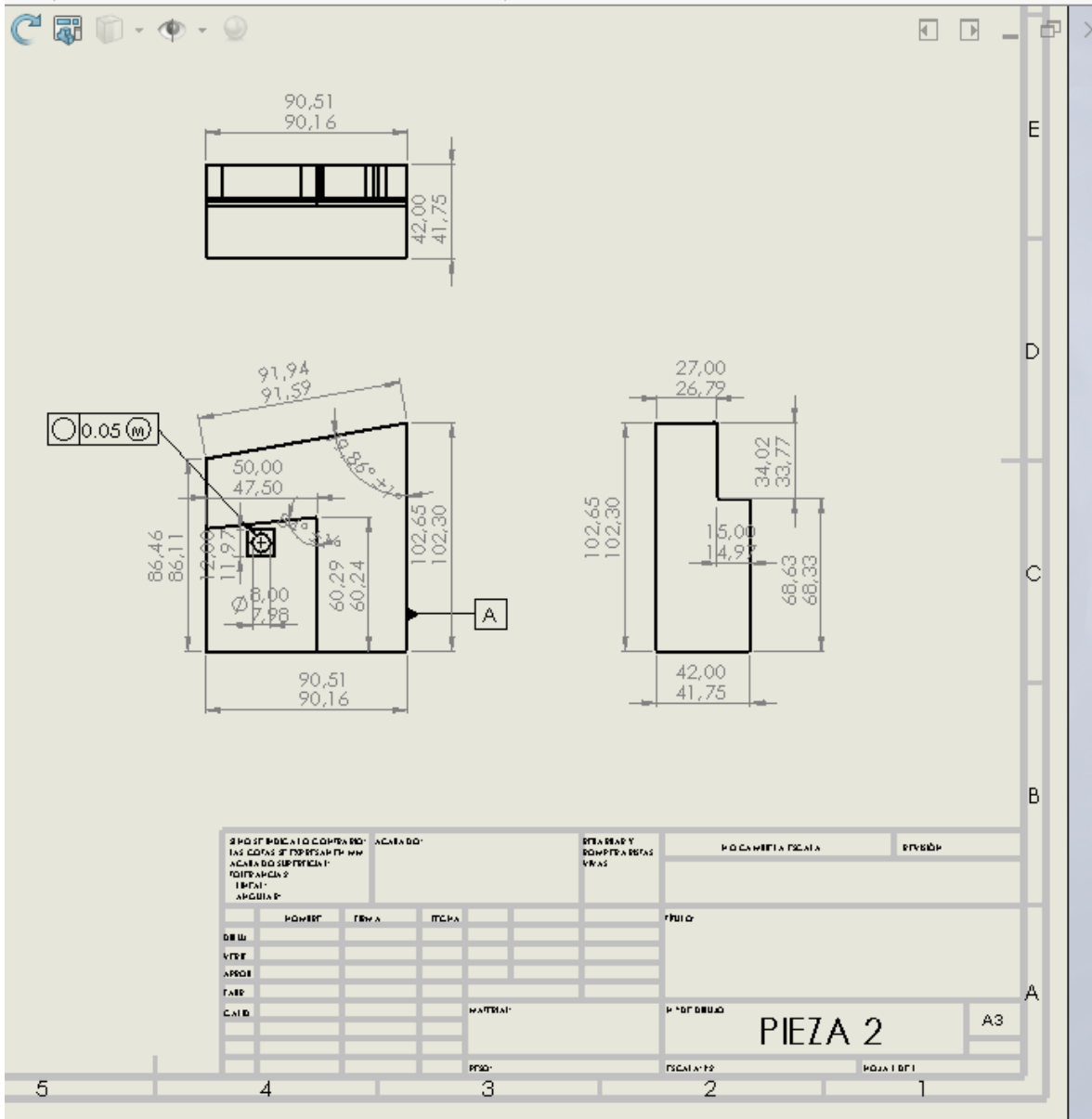


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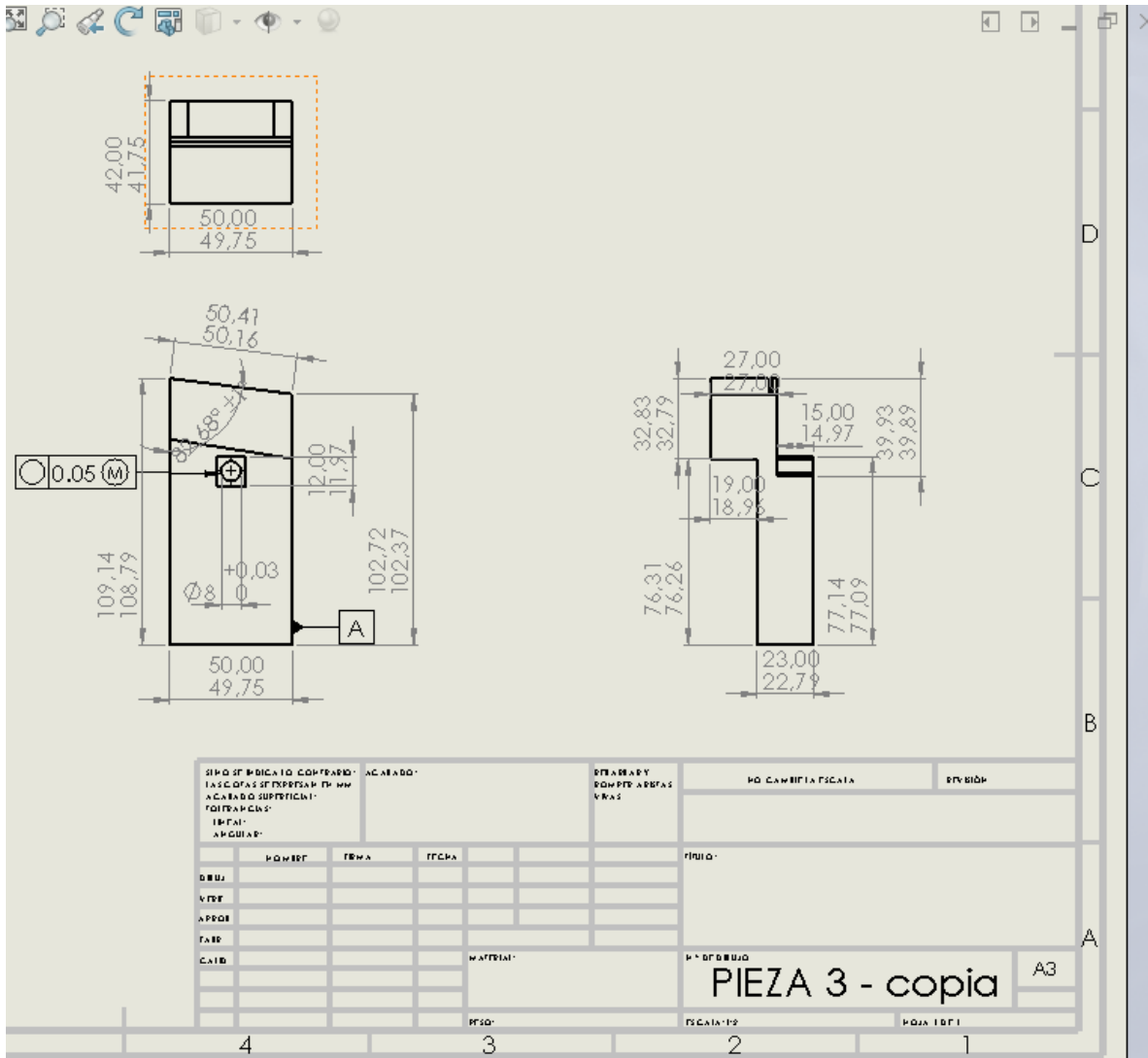
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PIEZA 2



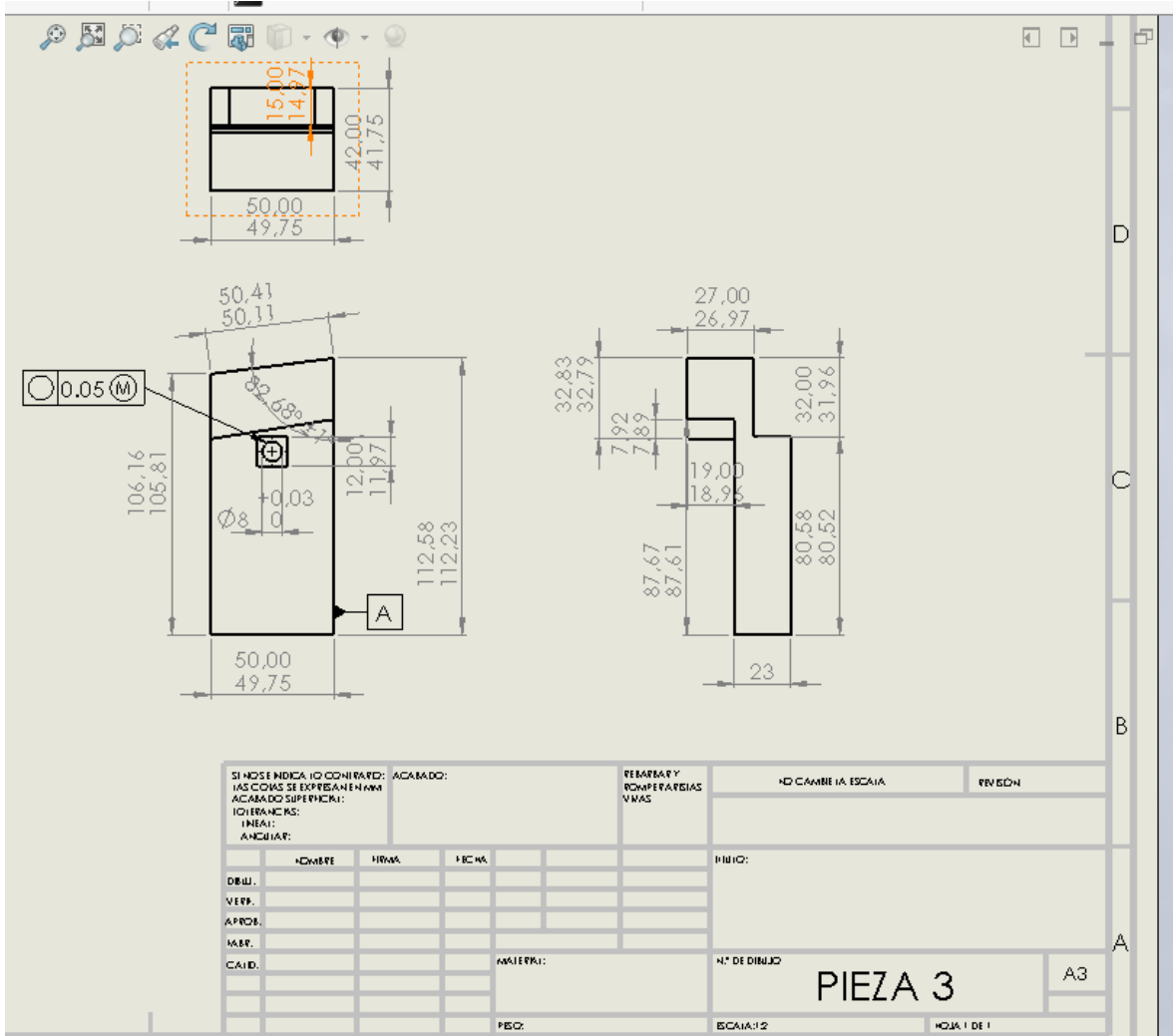


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PIEZA 3





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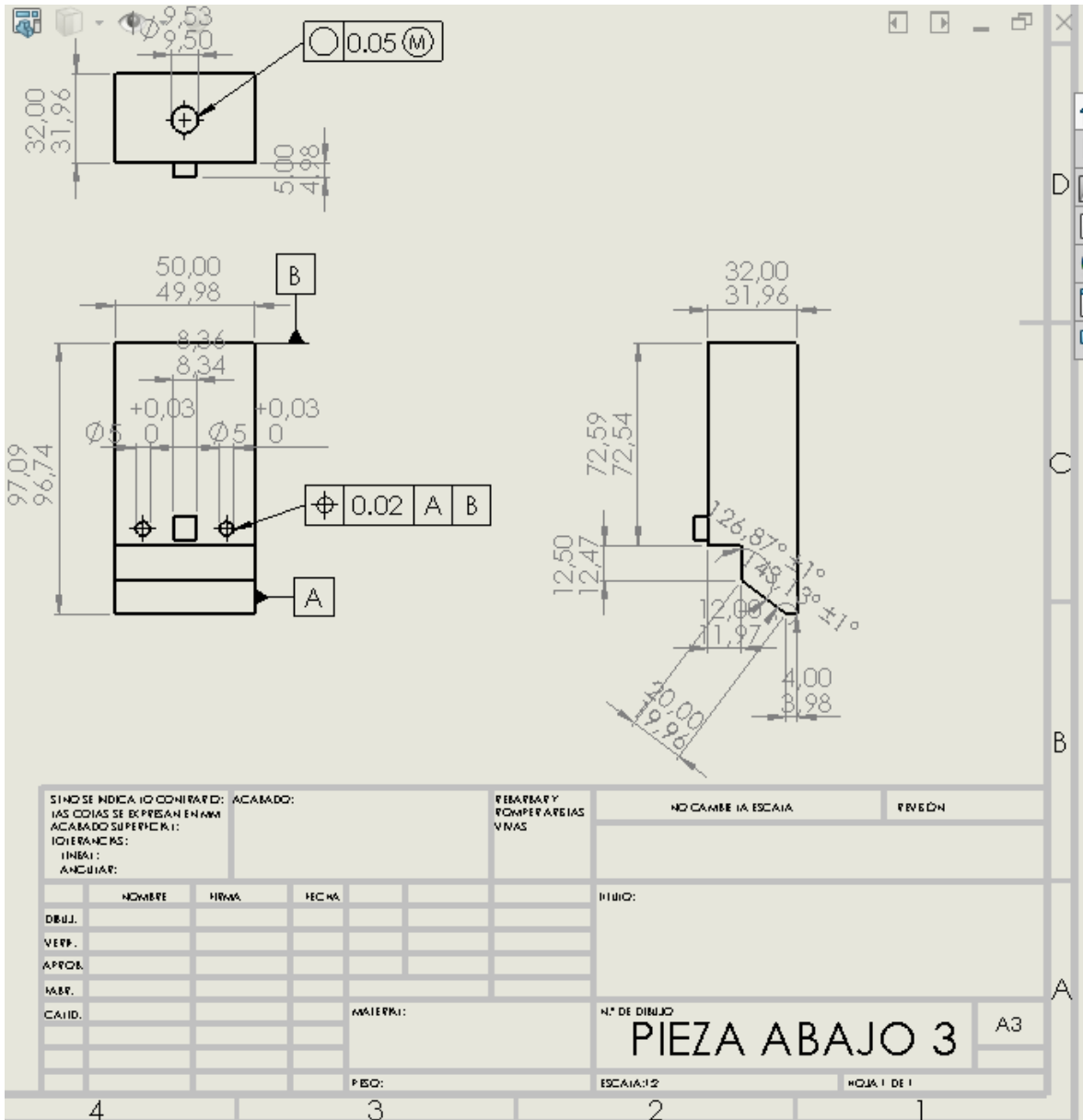





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PIEZA ABAJO 3



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ESTUDIO DE REPETIBILIDAD

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ESTIMATED COST ANALYSIS VS REALCOST

Estimated Cost

1.- Raw material

Item	Unit Cost (MXN)	Quantity	Subtotal
Aluminum	\$4,500.00	1	\$4,500.00
Clamps	\$180.00	6	\$1,080.00
Signal Indicators	\$300.00	2	\$600.00
		TOTAL	\$6,180.00

2.- Shipping and transport




Item	Unit Cost (MXN)	Quantity	Subtotal
Aluminium Shipping with Fedex	\$300.00	1	\$300.00
Transport to Queretaro	\$570.00 with person	4	\$2,280
		TOTAL	\$2,580.00

3.- Machines and tools

Item	Unit Cost (MXN)	Quantity	Subtotal
CNC machine	\$110,000	1	\$110,000
Lathe	\$60,000	1	\$60,000
Tools (with CNC)	\$600.00	1	\$600.00
Computer for design	\$26,000	2	\$52,000
Software license	\$13,000	2	\$26,000
Measuring tools	\$10,000	1	\$10,000
		TOTAL	\$258,600.00

4.- Operating Cost

Item	Cost for months/year	Quantity	Subtotal
Energy	\$2,900.00 for 2 months	1	\$2,900.00
Water	\$4,000.00 for year	1	\$4,000.00
Telephone and	\$400.00 for month	1	\$400.00

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internet			
Industrial property rent	\$30,000 for month	1	\$30,000.00
		TOTAL	\$37,300.00

5.- Human Talent

Employee	Cost for month	Quantity	Subtotal
Mechatronics engineer	\$18,000.00	3	\$54,000.00
Manager	\$18,500.00	1	\$18,500.00
Sales manager	\$17,000.00	1	\$17,000.00
Sales Agent	\$11,000.00	3	\$33,000.00
Marketing manager	\$18,000.00	1	\$18,000.00
Janitor	\$1,200.00	2	\$2,400.00
		TOTAL	\$142,900

CHECKING FIXTURE TOTAL COST OPERATING INITIAL

\$446,960.00




COST OF SALES

\$652,561.60 with 46% profit margin

Real Cost

1.- Raw material

Item	Unit Cost (MXN)	Quantity	Subtotal
Nylamid	\$6,500.00	1	\$6,500.00
Clamps	\$180.00	6	\$1,080.00
Signal Indicators	\$300.00	2	\$600.00
Sensors	\$580.00	4	\$2,320
		TOTAL	\$10,500.00

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2.- Shipping and transport

Item	Unit Cost (MXN)	Quantity	Subtotal
Nylamid Shipping with Fedex	\$300.00	1	\$300.00
		TOTAL	\$300.00

3.- Machines and tools




Item	Unit Cost (MXN)	Quantity	Subtotal
CNC machine	\$110,000	1	\$110,000
Lathe	\$60,000	1	\$60,000
Tools (with CNC)	\$600.00	1	\$600.00
Computer for design	\$56,000	2	\$112,000.00
Software license	\$13,000	2	\$26,000
Measuring tools	\$10,000	1	\$10,000
		TOTAL	\$318,000.00

4.- Operating Cost

Item	Cost for months/year	Quantity	Subtotal
Energy	\$4,900.00 for 2 months	1	\$4,900.00
Water	\$4,000.00 for year	1	\$4,000.00
Telephone and internet	\$400.00 for month	1	\$400.00
Industrial property rent	\$60,000 for month	1	\$60,000.00
		TOTAL	\$69,300.00

5.- Human Talent

Employee	Cost for month	Quantity	Subtotal
Mechatronics engineer	\$18,000.00	3	\$54,000.00
Manager	\$18,500.00	1	\$18,500.00
Sales manager	\$17,000.00	1	\$17,000.00
Sales Agent	\$11,000.00	3	\$33,000.00
Marketing manager	\$18,000.00	1	\$18,000.00
Janitor	\$1,200.00	2	\$2,400.00
		TOTAL	\$142,900.00

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INITIAL STIMATED CHECKING FIXTURE TOTAL OPERATING COST

\$446,960.00

TOTAL STIMATED SALE COST

\$652,561.60 with 46% profit margin



TOTAL REAL OPERATING CHECKING FIXTURE COST

\$541,000.00




TOTAL REAL COST OF SALE

\$789,860.00 with 46% margin profit

represents a 17.38% discount to the actual cost

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CONCLUSION

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LESSONS LEARNED (LECCIÓN APRENDIDA)

We are grateful with General Motors and Metrology School for this great learning opportunity, with this Project we obtained a lot of knowledge, but especially in the quality parts of manufacturing and in engineering drawings.

Is important to place the Geometric Dimension and Tolerancing (GD&T) in the engineering drawings for the manufacturing industries so that the operator can understand better how to machine and manufacture, with this we reduce to the maximum the mistake range.

The Repeatability and reproducibility study (R&R) serves us to verify the reliability of our quality device, this study consists of doing a statistical analysis, through a review of the number of parts and number of operators to make an average deviation.

Also we make a study cost to know how much we will earn, this is a deep analysis since it is the simulation in a company, for them it's very important to know how expensive it's going to be in order to be able to decide, then we see how feasible is to carry out this project.

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