THERE IS A DVD INCLUDED AS AN ESSENTIAL PART OF THIS BOOK. IT’S GOT THE STEP-BY-STEP PERFORMANCE OF THE MACHINE AND SOME EXAMPLES OF WORKS THAT CAN BE CARRIED OUT WITH IT.
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IMPORTANT

This manual offers all performance and technical instructions required for the proper knowledge of the safety systems of the machine and for its correct use, keeping in mind the operative safety.

Therefore it is very important to read and understand carefully the instructions contained in this book before starting up and work with the machine.

SAFETY

Broaching machines BM25, have been designed and manufactured according to the applicable European regulations, adding up the following safety devices:

* Fixed safety devices for which opening it is necessary the use of a tooling for them to be open just by authorized staff for any repair or maintenance task.

* Risk signs warning.

* Emergency button in the control electrical box.

* Connection and disconnection button in the electrical box to regulate the supply energy.

All these safety devices are integrated in the machine as a part of it. Modification, removal or lack of maintenance of any device on the machine will raise up the risk of breakdown and accident at the same time that it transgresses the Usage Regulation 89/655/CEE.

The manufacturer will not take any responsibility out of the damage caused by the use of the machine with any kind of modification, removal or lack of maintenance of any of its components, carried out without any previous and expressed authorization by the manufacturer.
1. GENERAL INFORMATION

1.1. General dimensions

1.2. Description of the machine

Hydraulic Broaching machine BM25 NARGESA has been fabricated in a welded and mechanized steel monoblock. It's a machine useful for making notches and keyways in all kinds of pieces: sprockets, pulleys, gears, etc...

It is also used like a press to unbolt oxidated parts, assembling and dismantling bearings, etc...

BM25 is made according to the European regulations for the manufacturing of industrial machinery.
1.3. Identification of the machine

1.4. General characteristics

- Motor 2.2 Kw at 1460 r.p.m.
- Consumption 9/5 A
- Pump 7.5 l./m.
- 27 liters tank
- Double acting piston (10 Tm.)
- Maximum pressure 200 Kg.
- Structure of sheet
- Weight 790 Kg.
The machine has got an identification plate on one of the sides where it is printed the information about the manufacturer and the main characteristics of the machine. The plate has got the information detailed below:

1.5. Description of safety devices

The safety devices the broaching machine has got are the ones listed below:

- The door: Located at the front part of the machine to avoid pieces that can be projected out.
1.6. Normal use of the machine
The broaching machine will be basically used for the elaboration of all kind of inner slots by snatching steel wools.

1.7. Contraindications for the machine usage
Never fit elements that are not recommended by the manufacturer.

1.8. Noise caused by the machine
In this machine noise could be considered non-existent, the noise is almost non-existent under a normal working system. The pump is inside the container which is at the time inside the box that serves as the stand for the machine. All this minimizes noise and vibrations so the machine has a steady acoustic pressure level lower than 70dB at the working site.

1.9. Vibrations
Vibrations are almost non-existent, as it has been stated before. The hydraulic pump which is the element that could have a bit higher level of vibrations, is submerged inside an oil container so vibrations are minimized. At the same time the oil container is located on silent rubber blocks that produce a higher muffling of vibrations.

1.10. Operative working place
The broaching machine will only be used by an operative at the time who will be placed in front of the machine, never at a lateral of it because he ought to control the whole set of the machine. Moreover the machine main protection devices are thought for the frontal use of the machine.
2. TRANSPORT AND STORAGE

2.1. Transport
Transport without lifting will be carried out by a forklift truck. Lifting will be carried out by a crane using the clamping spots for it.

2.2. Storage conditions
The broaching machine could never be stored in a place that does not fulfil the following requirements:
* Humidity between 30% and 95% without water condensation.
* Temperature from -25°C to 55°C or 75°C for periods of time no longer than 24h (Bear in mind that this temperatures are just for storage conditions. Performance temperatures are described in chapter 4.3)
* Do not pile up machines or heavy objects above.
* Do not dismantle for its storage.
3. MAINTENANCE

3.1. General maintenance

- Every 500 hours of use, check the oil level in the tank. In the front of tank is oil level. In the absence of oil, fill until the level cap show 3/4 full.
- Replace every 2000 hours or every 3 years the hydraulic oil tank

Type: CEPSA HIDRAULICO HM 68
4. INSTALMENT AND STARTING UP

4.1 Instructions to fix it
When the machine is put down by a crane it is necessary to place it down correctly so it doesn’t have to be moved once it is on the floor. In case it is not possible, then a moveable base must be placed below aways caring for its inclination to avoid any possible turn over.

4.2 Assembling to reduce noise and vibrations
The machine will be fixed on the floor due to its own weight, therefore it needs to be located in a flat and leveled surface so any possible vibration could be also reduced.

4.4 Admissible outer conditions
* Environment temperature: between +5ºC and +40ºC without exceeding +35ºC as average temperature within 24 hours.
* Humidity: Between 30% and 90% without water condensation.

4.5 Connection to power supply
In order to carry out the electrical connections of the machine, first make sure it is not plugged to the electrical supply and that there is no tension in any of its pieces. The machine should be connected to only one source as well as to a proper ground socket to avoid possible accident and keep the equipment saved from any possible power leaking.

The standard machine is prepared to be connected to a 400V three phased system. In case the supply three phase tension was 230V a change must be carried out in the connections inside the machine to adapt it to that tension.

The machine has a 230/400V three-phased engine that comes star like connected. If the three phase line tension is 230V it must be connected triangularly. The engine is inside the box that serves as stand for the machine. The lateral of the machine must be opened and the cover of the engine connection box must be removed. The engine bobs will be accessible then and it will be possible to carry out the change from triangle to star connections as it is indicated in the following pictures:

![Star picture](preset)
For tension 400V

![Triangle picture](For tension 230V)

Once the engine bobs connection is finished, the cover of the box connections must be closed as well as the lateral door by fastening the screws.

In order to do the change of tension from 400V to 230V it is required to change the bobin from the Stop/Go button.
5. DESCRIPTIVE MEMORY
5.1. All parts
5.2. Electric map
5.3. Hydraulic map

1. Filter
2. Hydraulic Pump
3. Electric motor
4. Pressure Control (regulator)
5. Solenoid “Bending”
6. Main Manual Distributor
7. Manometer valve
8. Manometer
6. OPERATION MANUAL
6.1. Methods and stop systems of the machine

6.1.1. Pump stop
In order to stop only the pump, press the red button “PARO”. With the pump stopped, the piston movement is cancelled.

6.1.2. Emergency stop
The machine is provided with an EMERGENCIA stop, located in the frontal part. All functions are neutralized by pressing the EMERGENCY button and so the machine is stopped as well.

6.2. Samples to make a correct broaching operation
1 - Place the piece in the middle of the table.
2 - Insert the bushing.
3 - Place the broach in the bushing, lubricate abundantly in order to achieve a perfect broaching operation, especially during the first operation.
4 - Get the piston down from 20 to 40 mm until having the broach inserted in the bushing, then slightly raise up the piston so the broach recovers its vertical position and then repeat the same procedure 2 or 3 times until the broach overtakes the piece and it could be taken by the down part of the piece.
5 - It will be necessary to gradually insert 1, 2 or 3 thick parts depending on the broach since these are the ones that give the exact depth. (NEVER PUT THE THREE OF THEM AT THE TIME)
6 - Clean up all steel wool from the broach once the broaching operation is finished (it is very important for the broach not to be broken).
7 - Causes of an incorrect broaching.
   - The use of oil in bad conditions.
   - Do not place the broach in vertical position.
   - Do not intercalate the piston thrust.

(A) Bushing
(B) Thick
(C) Broach
(D) Piece

[Diagram showing (A) Bushing, (B) Thick, (C) Broach, (D) Piece, and Thick part]
Depending on the carve depth, request 7. TABLE OF CHARACTERISTICS OF BRUSHES

Examples of works
6.3. Samples to make cotter slots

1. Place the bushing on the part
2. Place the broach. First pass With just the broach
3. Get the piston down
4. Place the thick part
5. Place the broach
6. Get the piston down
7. Place the thick part
8. Place the broach
9. Get the piston down

Follow the steps 8-9 and 10 until achieving the Desired size for the slot.
7. TABLE OF CHARACTERISTICS OF BRUSHES

<table>
<thead>
<tr>
<th>Width</th>
<th>Measures</th>
<th>Wedges</th>
<th>Nº wedges</th>
<th>Cut min.</th>
<th>Cut máx.</th>
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<tbody>
<tr>
<td>2 mm</td>
<td>3.175 mm x 133.35 mm</td>
<td>2 mm x 2 mm</td>
<td>0</td>
<td>5.15 mm</td>
<td>28.57 mm</td>
</tr>
<tr>
<td>3 mm</td>
<td>3.175 mm x 133.35 mm</td>
<td>3 mm x 3 mm</td>
<td>1</td>
<td>5.15 mm</td>
<td>28.57 mm</td>
</tr>
<tr>
<td>4 mm</td>
<td>6.35 mm x 177.8 mm</td>
<td>4 mm x 4 mm</td>
<td>1</td>
<td>7.54 mm</td>
<td>42.86 mm</td>
</tr>
<tr>
<td>5 mm</td>
<td>6.35 mm x 177.8 mm</td>
<td>5 mm x 5 mm</td>
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<td>7.54 mm</td>
<td>42.86 mm</td>
</tr>
<tr>
<td>5 mm</td>
<td>9.525 mm x 301.25 mm</td>
<td>5 mm x 5 mm</td>
<td>1</td>
<td>10.31 mm</td>
<td>63.50 mm</td>
</tr>
<tr>
<td>6 mm</td>
<td>9.525 mm x 301.25 mm</td>
<td>6 mm x 6 mm</td>
<td>1</td>
<td>10.31 mm</td>
<td>63.50 mm</td>
</tr>
<tr>
<td>7 mm</td>
<td>9.525 mm x 301.25 mm</td>
<td>7 mm x 7 mm</td>
<td>1</td>
<td>10.31 mm</td>
<td>63.50 mm</td>
</tr>
<tr>
<td>8 mm</td>
<td>9.525 mm x 301.25 mm</td>
<td>8 mm x 7 mm</td>
<td>1</td>
<td>10.31 mm</td>
<td>63.54 mm</td>
</tr>
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<td>19.05 mm</td>
<td>152.40 mm</td>
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<td>2</td>
<td>19.05 mm</td>
<td>152.40 mm</td>
</tr>
<tr>
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<td>14.28 mm x 359.22 mm</td>
<td>14 mm x 9 mm</td>
<td>2</td>
<td>19.05 mm</td>
<td>152.40 mm</td>
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<td>16 mm x 10 mm</td>
<td>3</td>
<td>19.05 mm</td>
<td>152.40 mm</td>
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<td>152.40 mm</td>
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<tr>
<td>20 mm</td>
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<td>3</td>
<td>19.05 mm</td>
<td>152.40 mm</td>
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<tr>
<td>22 mm</td>
<td>25.4 mm x 488.95 mm</td>
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<td>24 mm x 14 mm</td>
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</tr>
<tr>
<td>25 mm</td>
<td>25.4 mm x 488.95 mm</td>
<td>25 mm x 14 mm</td>
<td>4</td>
<td>19.05 mm</td>
<td>152.40 mm</td>
</tr>
</tbody>
</table>
8. FORMULES FOR BROACHING

1. Mechanize bushing (Picture 1)
2. Take the measurement of the tooth bottom of the brush. In this case the 18mm broach. (Picture 2)
3. Next step: to reduce the bushing in the milling center. Milling height “d” will be obtained from summing up the constante “h” and “b” (Picture 3)
4. The milling cutter to use in this case is the constante “a”, that is to say, 19.5 mm (Picture 2)

Height “h” will be obtained from applying the following formula

\[ h = r - \frac{c}{2} \sqrt{4 \frac{r^2}{2} - c^2} \]

\[ h = 30 - \frac{18}{2} \sqrt{4 \times 30^2 - 18^2} \]

\[ h = 30 - \frac{18}{2} \sqrt{3600 - 324} \]

\[ h = 30 - 0.5 \times 57,236 = 57,236 \]

\[ h = 0.5 \times 57,236 = 28,618 \]

\[ h = 30 - 28,618 = 1,381 \]

\[ h = 1,38 \]

INSTRUCTIONS BOOK OF VERTICAL BROACHER BM25
### Broaches 20, 22, 24 and 25mm

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<th>Tolerance</th>
<th>JS9</th>
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<tbody>
<tr>
<td>Size</td>
<td>Width 25.40 mm Length 488.95 mm</td>
</tr>
<tr>
<td>Model</td>
<td>VI</td>
</tr>
<tr>
<td>Keyway number</td>
<td>4 units</td>
</tr>
<tr>
<td>Min. Cutting length</td>
<td>19.05 mm</td>
</tr>
<tr>
<td>Max. Cutting length</td>
<td>152.40 mm</td>
</tr>
<tr>
<td>For holes of</td>
<td>75 mm to 115 mm</td>
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<tr>
<td>Weight</td>
<td>3.5 Kg approx.</td>
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### Broaches de 16 and 18mm

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<tbody>
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</tr>
<tr>
<td>Model</td>
<td>V</td>
</tr>
<tr>
<td>Keyway number</td>
<td>3 units</td>
</tr>
<tr>
<td>Min. Cutting length</td>
<td>19.05 mm</td>
</tr>
<tr>
<td>Max. Cutting length</td>
<td>152.40 mm</td>
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<td>For holes of</td>
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### Broaches de 10, 12 and 14mm

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<tr>
<td>Model</td>
<td>IV</td>
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<td>Min. Cutting length</td>
<td>19.05 mm</td>
</tr>
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<td>Max. Cutting length</td>
<td>152.40 mm</td>
</tr>
<tr>
<td>For holes of</td>
<td>32 mm to 56 mm</td>
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<td>Weight</td>
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### Broaches 5 Long, 6 and 8mm

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<tbody>
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</tr>
<tr>
<td>Model</td>
<td>III</td>
</tr>
<tr>
<td>Keyway number</td>
<td>1 units</td>
</tr>
<tr>
<td>Min. Cutting length</td>
<td>10.31 mm</td>
</tr>
<tr>
<td>Max. Cutting length</td>
<td>63.54 mm</td>
</tr>
<tr>
<td>For holes of</td>
<td>17 mm to 36 mm</td>
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<tr>
<td>Weight</td>
<td>0.350 Kg aprox.</td>
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### Broaches 4mm and 5mm short

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<tbody>
<tr>
<td>Size</td>
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</tr>
<tr>
<td>Model</td>
<td>II</td>
</tr>
<tr>
<td>Keyway number</td>
<td>1 units</td>
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<tr>
<td>Min. Cutting length</td>
<td>7.54 mm</td>
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<tr>
<td>Max. Cutting length</td>
<td>42.86 mm</td>
</tr>
<tr>
<td>For holes of</td>
<td>11 mm to 19 mm</td>
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<tr>
<td>Weight</td>
<td>0.100 Kg aprox.</td>
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### Broaches 2mm and 3mm

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<th>JS9</th>
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<tbody>
<tr>
<td>Size</td>
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</tr>
<tr>
<td>Model</td>
<td>I</td>
</tr>
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<td>0 units</td>
</tr>
<tr>
<td>Min. Cutting length</td>
<td>5.15 mm</td>
</tr>
<tr>
<td>Max. Cutting length</td>
<td>28.57 mm</td>
</tr>
<tr>
<td>For holes of</td>
<td>6 mm to 10 mm</td>
</tr>
<tr>
<td>Weight</td>
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