

# NON-MANDREL TUBE AND PIPE BENDER

# **CC90**

NS: 2022-138/187



# **INSTRUCTIONS BOOK**

## PRADA NARGESA, S.L

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## NARGESA CLIENTS

Prada Nargesa has more tan 8.000 customers around the world. Some of our clients, those who offer service to third parties with the Nargesa machinery in their workshops, have been pleased to be part of this network that aims to connect them with posible future clients. In this way, all those people or companies that have a need for any part or tool that can be manufactured by using the Nargesa range of machinery, will be able to find a solution in their área to be able to satisfy their production requirements by hiring their services.



We have more than 8.500 customers in 150 different countries around the world

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- 1. Company name
- 2. CIF/Tax Code
- 3. City
- 4. Country
- 5. Machine or machines

## **PRADA NARGESA**

Prada Nargesa S.L. is a family business fonuded in 1970 located near Barcelona, Spain, with more tan 50 years of experience in the sector of manufacturing of industrial machinery, and more tan 10.000m<sup>2</sup> of facilities. Nargesa is a symbol of quality, reliability, warranty and innovation.

Our whole range of machines and accessories is manufactured entirely in Nargesa. We have a constant stock of 400 machines, and we have more tan 16.800 machines sold all over the world.



#### **OUR RANGE OF MACHINERY**

Ironworker Machines Ring Roller Bender and Pipe Bender Non-mandrel Tube and Pipe Bender Twisting / Scroll Bending Machines Horizontal Press Brakes End Wrought Iron Machines Gas Forges Iron Embossing Machines Hydraulic Shear Machines Hydraulic Press Brakes Presses for Locks Broaching Machines Power Hammers

# CERTIFICATES

Prada Nargesa has several certifications that backup both, the design and manufacturing processes, as well as the journey through exporting our products around the world and the quality of the manufacturing components we use for our machines. These facts turn into real advantages for our customers:



## AUTHORIZED EXPORTER

- Faster customs procedures
- Reduction of tariff documentation
- Tariff preferences according to geographical location



#### **INNOVATIVE SME**

- Development in innovation, design and manufacturing technologies
- Certification and aduit of efficiency in product and service
- Ability to foresee customer needs



#### **R+D+I MANAGEMENT**

- Manufacturing based on the R+D+I process
- Technological surveillance system

# SUCCESS STORIES

At Prada Nargesa we believe that the testimony of our clients is our best guarantee, and that is why we like to expose some of the success stories that we have witnessed around the world:



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Company name Testimonial name Post in the Company Country Descriptive text Photography with the machine

## CONTENTS

	3
1.1. Machine Identification	3
1.2. Dimensions	3
1.3. Description of the Machine	3
1.4. Machine Parts	4
1.5. General Characteristics	5
1.6. Description of the Guards	6
2. TRANSPORT AND STORAGE	7
2.1. Transport	7
2.2. Storage Conditions	7
3. MAINTENANCE	8
3.1. Greasing Moving Parts	8
4. INSTALLATION AND START UP	9
4.1. Machine Location	9
4.2. Dimensions and Work Area	9
4.3. Acceptable External Conditions	9
4.4. Instructions for Electrical Connection10	0
5. INSTRUCTIONS FOR USE	1
5.1. Assembling the Roller and Counter-Die	1
5.2. Assembling the Radius Arm 13	3
5.2. Assembling the Radius Arm	3 4
5.2. Assembling the Radius Arm       13         5.3. Changing Rotation Direction       14         5.4. Control Panel       10	3 4 6
5.2. Assembling the Radius Arm       13         5.3. Changing Rotation Direction       14         5.4. Control Panel       10         5.5. Manual Mode       11	3 4 6 7
5.2. Assembling the Radius Arm       13         5.3. Changing Rotation Direction       14         5.4. Control Panel       10         5.5. Manual Mode       11         5.6. Angle Correction       20	3 4 6 7 0
5.2. Assembling the Radius Arm       11         5.3. Changing Rotation Direction       14         5.4. Control Panel       10         5.5. Manual Mode       11         5.6. Angle Correction       20         5.7. Radius Arm       20	3 4 6 7 0
5.2. Assembling the Radius Arm       13         5.3. Changing Rotation Direction       14         5.4. Control Panel       10         5.5. Manual Mode       11         5.6. Angle Correction       20         5.7. Radius Arm       20         5.8. Part Counter       21	3 4 6 7 0 1
5.2. Assembling the Radius Arm135.3. Changing Rotation Direction145.4. Control Panel105.5. Manual Mode115.6. Angle Correction205.7. Radius Arm205.8. Part Counter215.9. Rotation Direction22	3 4 6 7 0 1 2
5.2. Assembling the Radius Arm135.3. Changing Rotation Direction145.4. Control Panel105.5. Manual Mode115.6. Angle Correction205.7. Radius Arm205.8. Part Counter215.9. Rotation Direction225.10. Adjustment Tables24	3 4 6 7 0 1 2 4
5.2. Assembling the Radius Arm135.3. Changing Rotation Direction145.4. Control Panel105.5. Manual Mode115.6. Angle Correction205.7. Radius Arm205.8. Part Counter215.9. Rotation Direction225.10. Adjustment Tables245.11. Automatic Mode20	3 4 6 7 0 1 2 4 6
5.2. Assembling the Radius Arm       13         5.3. Changing Rotation Direction       14         5.4. Control Panel       10         5.5. Manual Mode       11         5.6. Angle Correction       20         5.7. Radius Arm       20         5.8. Part Counter       21         5.9. Rotation Direction       22         5.10. Adjustment Tables       24         5.12. Remote Service       29	3 4 6 7 0 0 1 2 4 6 9
5.2. Assembling the Radius Arm115.3. Changing Rotation Direction145.4. Control Panel105.5. Manual Mode115.6. Angle Correction205.7. Radius Arm215.8. Part Counter225.9. Rotation Direction225.10. Adjustment Tables245.11. Automatic Mode205.12. Remote Service295.13. Import/Export Parameters, Materials and Programs30	3 4 6 7 0 0 1 2 4 6 9 0
5.2. Assembling the Radius Arm115.3. Changing Rotation Direction145.4. Control Panel115.5. Manual Mode115.6. Angle Correction205.7. Radius Arm215.8. Part Counter225.9. Rotation Direction215.10. Adjustment Tables245.11. Automatic Mode205.12. Remote Service225.13. Import/Export Parameters, Materials and Programs305.14. Touchscreen Calibration31	3 4 6 7 0 0 1 2 4 6 9 0 2
5.2. Assembling the Radius Arm115.3. Changing Rotation Direction145.4. Control Panel115.5. Manual Mode115.6. Angle Correction205.7. Radius Arm215.8. Part Counter225.9. Rotation Direction225.10. Adjustment Tables245.11. Automatic Mode265.12. Remote Service295.13. Import/Export Parameters, Materials and Programs305.14. Touchscreen Calibration336. ACCESSORIES33	3 4 6 7 0 0 1 2 4 6 9 0 2 3
5.2. Assembling the Radius Arm       11         5.3. Changing Rotation Direction       14         5.4. Control Panel       14         5.5. Manual Mode       11         5.6. Angle Correction       20         5.7. Radius Arm       21         5.8. Part Counter       22         5.9. Rotation Direction       22         5.10. Adjustment Tables       24         5.11. Automatic Mode       20         5.12. Remote Service       22         5.13. Import/Export Parameters, Materials and Programs       30         5.14. Touchscreen Calibration       32         6. ACCESSORIES       33         6.1. Optional Accessories       34	346700124690236
5.2. Assembling the Radius Arm       11         5.3. Changing Rotation Direction       14         5.4. Control Panel       14         5.5. Manual Mode       11         5.6. Angle Correction       20         5.7. Radius Arm       21         5.8. Part Counter       22         5.9. Rotation Direction       22         5.10. Adjustment Tables       24         5.11. Automatic Mode       24         5.12. Remote Service       24         5.13. Import/Export Parameters, Materials and Programs       30         5.14. Touchscreen Calibration       32         6. ACCESSORIES       33         6.1. Optional Accessories       34	3467001246902362

## **TECHNICAL ANNEXES**

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## **1. MACHINE DETAILS**

## 1.1. Machine Identification

Make	NARGESA
Туре	Non-Mandrel Pipe Bender
Model	CC90

#### 1.2. Dimensions



Figure 1. Outside Dimensions of Bender CC90

## 1.3. Description of the Machine

The non-mandrel pipe bender CC90 is a machine specifically designed to bend profiles, mainly metal ones, of different thicknesses and configurations: pipes, solid profiles, T-profiles, angles...

The bender comes standard with a radius arm that must be used to bend thicker pipes of larger diameters. Besides standard rollers, PRADA NARGESA manufactures different types of additional rollers for all types of bending based on the configuration of the material to be worked.

PRADA NARGESA S.L. is not liable for any damages that may be caused due to improper use or a breach of the safety rules by users.

#### 1.4. Machine Parts





<b>N</b> NARGESA®	www.nargesa.com
PRADA NARGESA, S.L CTRA	. DE GARRIGAS A SANT MIQUEL S/N
17476 PALAU DE STA. EULALIA	(GIRONA) SPAIN - TEL.(+34) 972568085
TRADEMARK NARGESA M	ODEL CC90
YEAR OF MANUFACTURE SE	RIAL Nº
DIMENSIONS 700x1300x1360	mm. WEIGHT 860 Kg.
POWER 2,2 Kw. INTENSITY 9/5	A. VOLTAGE V. Hz 50/60

Figure 2. Characteristics plate

#### **1.5. General Characteristics**

Reference	100-17-02-001
Engine power	2,2 Kw / 3 CV
Three-phased tension	230/400 V 50/60 Hz
Automatic rotation speed	From 0,75 to 2,2 r.p.m.
Intensity	9/5 A
Minimum radius of curvature	3 times the pipe diameter
Maximum radius of curvature	390 mm
Maximum working stroke on round steel pipe	90mm or 3" Schedule or 3" 1/2 Whitworth or 3" Gas x 6mm.
Maximum angle of curvature	180°
Dimensions	700x1300x1360 mm
Weight	860 Kg

#### 1.6. Description of the Guards

The gear box and all the gears enabling the machine to operate are inside the main structure which protects the mechanisms.

Despite the fact the main moving parts are protected by the front cover, special precaution must be taken when bending to prevent entrapment between the die, counter-die and part.



Figure 3. Mechanism Protection Guards

#### 2. TRANSPORT AND STORAGE

#### 2.1. Transport

The machine should be transported as follows:

- Along the bottom at the base of the machine using a forklift or lift truck as indicated in the illustration.

Never raise the machine more than 200 mm off the ground or it may tip over.



Figure 4. Moving the machine

## 2.2. Storage Conditions

The pipe bender may not be stored anywhere that does not meet the following requirements:

- Humidity of 30% to 95%

- A temperature of -25°C to 55°C or 75°C over periods not to exceed 24 hours (please remember these temperature are for storage conditions)

- Do not pile machines or place any heavy objects on top
- Do not dismantle for storage

#### **3. MAINTENANCE**

#### 3.1. Greasing the Moving Parts

Keeping the moving parts on the machine clean whenever possible is recommended to ensure proper operation and extend the service life.

To grease the pinions on the CC90, do as follows:

- Remove the front guard and rear guard to access the pinions.
- Apply grease to the teeth of the pinions using a brush or spatula.
- Distribute the grease evenly without creating any excess or accumulation.
- Grease the machine periodically depending on the use. Recommended by the manufacturer: once a year.



**ATTENTION:** To grease the machine, you must stop the machine and press the "Emergency Stop" button.

#### 4. INSTALLATION AND START UP

#### 4.1. Machine Location

Try to position the machine in the proper location so that it does not have to be moved; otherwise, following the steps described in the transport section (no. 2). Position over a smooth, level surface to prevent vibrations and movements during bending operations.

The machine can be secured with bolts as it comes with a base or pedestal on the bottom with four holes as shown in the following figure.



Figure 5. Anchoring points on the machine

#### 4.2. Dimensions and Work Area

Take the dimensions, operator work area and the lengths of any materials to be worked into consideration when positioning the machine.

The pipe bender may be used by a single operator who must stand on one of the two sides of the machine to control the materials during processing.

Before starting the bending process, the operator shall adjust the roller and counter-die to the material while the machine is off.



Figure 6. Operator's work area

#### 4.3. Acceptable External Conditions

- A room temperature of between +5 °C and +40 °C without exceeding an average temperature of +35 °C over 24 hours.

- Moisture between 30% and 90% without water condensation.

## 4.4. Instructions for Electrical Connection

## IMPORTANT

This machine must be connected to an earthed socket.

The pipe bender CC90 is equipped with a 230 V 1.1 kw engine for operation with the Roller. The machine must be connected to 220 V compatible supply voltage compliant with the requirements specified.

Before making any change in the wiring or the electric panel, you need to make sure the machine is not connected to the power supply system.



#### **5. INSTRUCTIONS FOR USE**

## 5.1. Assembling the Roller and Counter-Die

The roller shall be assembled as follows:

1. Place the roller in the machine axis. The builtin centring pin will prevent an incorrect position.





3. Put the counter-die or support rollers in the positioner and secure.



4. Put the material in the roller guide and secure to the drag clamp.





- 5. Lubricate the pipe and the counter-die with BEND8 spray.
- 6. Slide the counter-die positioner until adjusted to the material.





7. Secure the positioning spindle with your hands to the machine table.







#### 5.2. Assembling the Radius Arm

If the radius arm must be used, switch step 2 with 2A as explained below.

And follow step 7 with number 8 as explained below.

2A. Secure the roller with the radius arm.

8. Place the radius arm in the positioner channel and adjust the nut with your hands until secure and fixed.







## 5.3. Changing the Rotation Direction

The non-mandrel pipe bender CC90 is programmed to rotate counter-clockwise. When the rotation direction must be changed, make the following position changes:

## IMPORTANT

Remove the material from the machine to make this change.

1. Remove the positioning spindle.

2. Remove the positioner and counter-die.





3. Remove the drag clamp.

4. Remove the counter-die.







- 5. Position the roller with the CNC. See section *5.8. Rotation Direction*.
- 6. Turn the positioner 180° degrees and insert it back in the carriage.



7. Rotate the counter-die  $180^{\circ}$  and secure with the pin.



8. Put the drag clamp back on.



### 5.4. Control Panel





Manual rotation to the left

#### 5.5. Manual Mode

To turn on the machine, place the Start Switch in the Connected position. The initial interface appears on the screen:



The machine is now in Standby; in other words, the machine is active yet at rest waiting for any operation order.

The CC90 is already started and in Standby. To activate it, follow the steps indicated below.

Enter the following operating details:

- Diameter of the material
- Roller radius
- Thickness of the material
- Bending angle

Press each of the items on the screen to enter all these parameters.

Press the []] key to choose the diameter of the material to be curved:

N NARGESA	Select tube section	14:49
	1/8"SCH	
	1/4"SCH	
	3/8"SCH	
- 11	1/2"SCH	
<b>→</b>	3/4"SCH	I Ma.
	1"SCH	
	1-1/4"SCH	
	1-1/2"SCH	





Press  $\rightarrow$  || to choose the thickness of the material:



To determine the bending angle, press the number that appears at the top right of the screen and enter the value; in this case, 90 degrees. Press **example** to accept and **(b)** to start the machine.

NNARG	ESA	Bend angle Min: 0 N	1ax: 180	Calc		<b>= 15</b> 16
				90.0		
M	1/8"				$\square$	
		1	2	3	U	
		4	5	6		
->-		7	8	9		
$\mathbf{T}$	10(		0	+/-	1	
-			SE			
		S		-		NO NO





The machine will work at minimum speed based on the parameters entered.

If necessary, enable the automatic unlocking option by pressing the icon 2. This means the machine will automatically unlock by rotating in the opposite direction of the bending a few degrees to unlock the material. If it is not necessary, disable this icon.



#### 5.6. Angle Correction

If the curving angle needs to be corrected, you must stop the curving process and indicate the necessary correction. Press the icon And enter the number of degrees required for correction; in this case, 2 degrees.



Confirm by pressing the key again to start the cycle.

#### 5.7. Radius Arm

If a large-size pipe is selected, the machine indicates you must install the radius arm. Example:

A pipe with a diameter of 50 mm, a roller radius of 150 and pipe thickness of 2 mm.

If this part must be installed, the icon indicated will appear on the screen:



Install the Radius arm by following the instructions in Section 5.2. Assembling the Radius Arm.

IMPORTANT: Whenever the machine indicates the Radius arm is necessary, it must be installed. Not installing it could cause irreparable damages to the machine.

#### 5.8. Part Counter

Another function on the machine is the part counter.

To activate it, press the number that appears to the right of the icon  $\bigcirc$  and add the number of curves you wish to make. In this case, 25.

Confirm by pressing the set key. NARGESX 0743 0743 0743 -0.0 0.00.0

The second number in this field indicates the curves already made

If the part counter is not used, enter a 0 for this parameter. The machine will do the same curve an infinite number of times.

#### 5.9. Rotation Direction

Bender CC90 is unique in that it can operate in the two rotation directions. This feature is essential for parts that may collide against the machine.

**IMPORTANT:** Before making the rotation change, you must remove the Counter-die and Drag Clamp to make sure there is no pipe in the machine.

To proceed with the change in rotation direction, press the rotation direction change key.



Confirm by pressing  $\checkmark$  . A message appears indicating that you must move the roller to position 0.



Press the i key so the roller rotates to the zero position





Upon making the rotation change, the machine maintains the same program and the same parameters; it only changes the direction of rotation.

**IMPORTANT:** once the rotation change is made, the counter-die and drag clamp must be installed for curving. See section *5.3. Rotation Direction Change.* 



If you want to reverse the rotation direction, just repeat the process by pressing the 0 key.

Accept and proceed in the same way by pressing the 🖕 key until the machine reaches the zero position.

**ATTENTION:** if you do not complete all the steps in the rotation change process, the machine will continue using the previously set rotation direction.

#### 5.10. Correction Tables

**IMPORTANT:** Pipes come in different thicknesses and roughnesses depending on the pipe manufacturer and the country where they are manufactured.

Nargesa has added a capability table to the machine which may be edited and updated. This table may be modified by the customer to adjust the correction levels based on the material processed.

To access the corrections table, press the 🥡 key. The following screen will appear:



Press the 📕 key to access the corrections menu:

Section	Radiu	s Thick	ness Spe	ed Co	orr Bar	Pos	08:17
1/8"SCH	51	2	100	14	0	100	
1/8"SCH		2.65	100			100	$(\mathbf{n})$
1/4"SCH	54	2.235	100	14	0	99	$\mathbf{\nabla}$
1/4"SCH	54	2.9	100	14	0	99	
1/4"SCH	67.5	2.235	100	14	0	99	
1/4"SCH	67.5	2.9	100	14	0	99	
3/8"SCH	51.6	2.311	90	14	0	98	
3/8"SCH	51.6	3.2	90	14	0	98	
3/8"SCH	68.8	2.311	90	14	0	98	
3/8"SCH	68.8	3.2	90	14	0	98	× /
3/8"SCH	86	2.311	90	14	0	98	
2/01/00/1	07	2.2	~~	- 4	^	~~	
Ð							
						1.186	

This screen shows the factory-set parameters: Section, Radius, Thickness, Speed, Corrector, Bar and Position.

Pipes can be corrected with these tables.



To add the parameters for a new pipe, press the  $\bigoplus$  key and complete the fields:

Section 1/8"SCH 1/8"SCH 1/4"SCH 1/4"SCH 1/4"SCH 3/8"SCH 3/8"SCH 3/8"SCH 3/8"SCH 3/8"SCH 3/8"SCH	Radius Thickness Speed Corr 51 Section 54 Radius 54 Thickness 67. Speed 67. Corr 51. Bar 68. Pos 68. Speed 68. Speed 69. S	Bar Pos 08 100 99 99 99 99 99 98 98 98 98 98	) ) )
2/0"℃℃⊔	oc 2.2 00 1/	n no	2.
Ð		I I I	5

Section: refers to the pipe diameter.

Radius: refers to the radius of the roller.

Thickness: refers to the pipe thickness.

Speed: refers to the maximum pipe curving speed.

Corr: refers to the correction required for the roller.

Bar: refers to the need to use the radius arm.

Pos: refers to the position of this new pipe on the list of materials.

Section	F	Radius	Thickness	Speed	Corr Ba	r Pos	08:20
1/8"SCH	51	Castian	.,	100	60	100	
1/8"SCH	51	Section			60	100	
1/4"SCH	54	Radius			180	99	$\cup$
1/4"SCH	54	Thickness	s		3.2	99	
1/4"SCH	67.!	Speed			55	99	
1/4"SCH	67.	Corr			14	99	
3/8"SCH	51.6	D				98	
3/8"SCH	51.6	Bar			1	98	
3/8"SCH	68.8	Pos			101	98	
3/8"SCH	68.8		/			98	
3/8"SCH	86		2.311		1.	98	
2/0"CCU	06		<b>ว</b> า	00	1/ 0	00	
Ð			Î				Ŕ

The changes are saved upon accepting and will be effective immediately.

#### 5.11. Automatic Mode

This operating mode makes it possible to make curves with different curve angles on the same piece. This model also enables saving programs in the CNC to be used whenever needed.

To generate a new program, press the not solve the the solve the solve the the solve t



Press the

key and this will appear on the screen:



Edit the programs from the interface: generate a new program, modify it, generate new folders or delete them.



To generate a new program, press the  $\bigoplus$  key. After pressing it, this screen will appear:

Complete the parameters just like in Manual Mode: enter the pipe section, the radius of the roller, the pipe thickness, the number of pieces needed and the curve angle.



Now add a new curve in the same program. To do so, press the + key at the top of the screen.



**IMPORTANT:** The general data are the same for the entire program; in other words, if they are changed for a specific curve, they will be changed for the entire program.

Enter the angle at which you wish to make the curve in the second operation; in this case, 45 degrees. Now, the program has two curves programmed, the first at 90 degrees and the second at 45 degrees. Add all curves needed by pressing the **+** key and enter a new radius of curving.



For cases where you must make two curves at the same degrees, a new operation does not need to be added to the program. Use the repetition tool by pressing the 2 icon and add the number of times this curve should be repeated. In this case, the machine will make 3 curves at 45 degrees as part of the number 2 curving in the program.



Save the program by pressing the [\*] icon at the top right of the screen.

Save	as:										
Narge	esa :	1									
Esc	1	2	3	4	5	6	7	8	9	0	<-
q	w	е	r	t	у	u	i	ο	р	[	]
Caps	а	s	d	f	g	h	j	k	I	;	•
Shift	z	x	с	v	Ł	>	n	m		١	Del
-	=	,							/	£	Enter

Enter a name for the program and press Enter.

#### 5.12. Remote Service

The bender is ready to be connected to ethernet via the cable supplied for this purpose. The IP address in the local network is 10.10.51.110, which is factory-set. This also makes it possible to configure a remote service for the machine.

This service allows Nargesa, as the bender manufacturer, to connect remotely to the machine to resolve technical incidents and provide the end customer with distance training.





To activate the remote service, press the 🦚 key to access the menu window.

The information shown in the figure above refers to the model and serial number for the bender control as well as the versions of the different digital libraries used in the user interface.

To activate the remote service so the Nargesa technical assistance department may connect to the machine to resolve incidents and/or provide distance training, you need to press

#### 5.13. Import/Export Parameters, Materials and Programs

All the bender configuration parameters as well as the materials defined and programs created can be imported and exported to create backup copies.

Memory Internal USB		08:28
Filters Parameters	Users	
Pulleys  Programs	Styles	
Import	Export	<b>Š</b>

To access the window shown in the figure above, you must press the integration in the figure above, you must press the integration in the figure above, you must press the key

All filters are activated by default as well as the internal memory option. If you now press  $\checkmark$ , all the parameters, materials and programs will be saved in the internal shear control memory and a backup copy will be made. If you would like to make a backup copy on an external device such as a USB flash drive, you must mark the USB option and press again.

It's important to make backup copies frequently to ensure you have the parameters, materials and programs created saved. If you need to recover all or part of this information at any time, just select the data source (internal memory or USB flash drive) and press  $\checkmark$ . Upon doing so, the sequence of information present on the screen will be as follows:

Filters Parameters Pulleys Programs	Styles	08 39
Memory — Internal	•	
USB /Hard disk/		
Import	Export	<b>*</b>





#### 5.14. Calibrating the Touchscreen

The touchscreen is factory-calibrated for use. However, it may need to be calibrated if it does not accurately respond to the actions of the operator using it.

To proceed adequately, first press the key  $\langle q_0 \rangle$  to access the menu window. Once here, press the key  $\langle q_0 \rangle$  Upon doing so, the message shown below will appear on the screen:



If you accept by pressing  $\checkmark$ , the touchscreen calibration process begins. The information on the screen will change to this:



There is a cross in the middle of the window which must be pressed for a few seconds until it moves to a new position. This process is repeated at different points on the screen until the touchscreen calibration has finished.

### 6. ACCESSORIES

The CC90 pipe bender comes with a 400 ml bottle of BEND8 lubricant.

This is a high-additive and low-viscosity aerosol oil. Contains PTFE. Does not contain silicone.



- Enables the finish on the outer bend
- Inhibits roughness and inner marks
- Reduces wear of the tooling
- · Especially designed for tubes of small thickness
- Lubricates to reduce friction
- Avoids and disolves corrosion
- · Gives shine and protects
- Cleans up and removes dirt

REF.	Description	Quantity	Weight
060-SPR-00003	400 ml bottle	400ml	0,39Kg
060-SPR-00004	Box of 12 400 ml bottles	12x400ml	4,83Kg

# Technical Data Sheet for the product BEND8

# A. IDENTIFICATION OF THE SUBSTANCE OR MIXTURE AND COMPANY OR SUPPLIER

A.1. Product identification

BEND8 aerosol

## A.2. Relevant identified uses of the substance or mixture and uses advised against

Relevant uses: Lubricant Uses advised against: Anything not specified in this section or section 7.3.

## A.3. Details of the supplier of the Safety Data Sheet

Prada Nargesa, S.L. Ctra. De Garrigàs a Sant Miquel, s/n 17476 Palau de Santa Eulàlida, Girona, Spain Tel. +34 972568085 nargesa@nargesa.com www.nargesa.com

A.4. Emergency telephone number

+34936629911

## **B. HAZARD IDENTIFICATION**

#### **B.1. Classification of the substance or mixture**

#### Regulation EC No. 1272/2008 (CLP)

This product has been classified pursuant to Regulation No. 1272/2008 (CLP). Aerosol 1: Pressure vessel: It may explode if heated, H229 Aerosol 1: Aerosols, category 1, H222

## **B.2. Label elements**

Regulation No. 1272/2008 (CLP) *Hazard* 



Hazard instructions:

Aerosol 1: H229 - Pressure vessel: It may explode if heated

Aerosol 1: H222 - Extremely flammable aerosol

Precautionary statements:

P101: If medical advice is needed, have product container or label at hand

P102: Keep out of reach of children

P210: Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking

P211: Do not spray on an open flame or other ignition source.

P251: Do not pierce or burn, even after use.

- P410+P412: Protect from sunlight. Do not expose to temperatures exceeding 50°C/122°F
- P501: Dispose of contents/container to the local selective waste system.

## B.3. Other Hazards

The product does not meet PBT/vPvB criteria

#### C. COMPOSITION / INFORMATION ON THE COMPONENTS

#### C.1. Substance

Not applicable

#### C.2. Mixtures

Chemical description: Mixture of mineral oils and additives

Components: Pursuant to Annex II of Regulation (EC) no. 1907/2006 (point 3), the product contains:

	Identification		Chemical name/classification		Concentration
CAS:	112-34-5	2-(2-Butoxyethoxy)etha	nnol <sup>1</sup>	ATP CLP00	
EC: Index:	203-961-6 603-096-00-8	Regulation 1272/2008	Eye Irrit. 2: H319 - Attention	(1)	<0.05 %
CAS:	1330-20-7 215-535-7	Xylene <sup>1</sup>		ATP CLP00	
Index: REACH:	601-022-00-9 01-2119488216-32-XXXX	Regulation 1272/2008	Acute Tox. 4: H312+H332; Flam. Liq. 3: H226; Skin Irrit. 2: H315 - Attention		<0.05 %
CAS:	100-41-4	Ethylbenzene <sup>1</sup>	Se	elf classification	
Index: REACH:	601-023-00-4 01-2119489370-35-XXXX	Regulation 1272/2008	Acute Tox. 4: H332; Aquatic Chronic 3: H412; Asp. Tox. 1: H304; Flam. Liq. 2: H225; STOT RE 2: H373 - Hazard	() 🔿 🚸	<0.05 %

<sup>1</sup> Substance subject to a workplace exposure limit

For more information on the hazards of the substances, see sections 8, 11, 12, 15 and 16.

## D. FIRST AID

#### D.1. Description of first aid measures

Symptoms of intoxication may appear long after exposure. When in doubt, seek medical attention and show them the SDS for this product after direct exposure to the chemical product or if discomfort persists.

**Inhalation:** This product is not classified as an inhalation hazard; however, remove the victim from the exposure site, supply them with clean air and allow them to rest if any intoxication symptoms appear. Seek medical attention if the symptoms persist.

#### 6.1. Optional Accessories

Customers must equip their pipe bender with a specific die to get the desired curving. The diameter and thickness of the pipe as well as the radius of curvature must be taken into account when choosing a roller.

Part Characteristics:

Main Roller made of highly resistant steel which has been thermally hardened with carbonitriding for 50-54 HRC hardness; this roller guide perfectly adapts to the pipe for excellent results.

**Counter-shape** designed by the Nargesa R+D department which reduces friction and ensures optimal curving. It's made of a highly resistant aluminum bronze alloy and mechanized in 3D.

Clamp with a fastener to firmly secure the material during the bending process.

**Two Support holders** made of highly resistant steel which has been thermally treated with carbonitriding for 50-54 HRC hardness; these rollers reduce the surface of contact, therefore, reduces friction.

## ► Accessories for round pipes in millimeters · 12 to 80 mm



Rollers made of treated Steel. Units suitable for bending all types of round pipes 12 to 80 mm The following is supplied with the unit: A main roller, a counter-shape, a clamp with a fastener *Check with the manufacturer for other dimensions* 

REF.	Diam. Ext.	Radius	Min. thickness	Max. thickness	Weight
Set diameter 12mm F	Radius 60				
140-17-01-10012	12mm	60mm	1mm	5mm	3,26Kg
Set diameter 15mm F	Radius 60				
140-17-01-10001	15mm	4D=60mm	1mm	5mm	3,18Kg
Set diameter 18mm F	Radius 60				
140-17-01-10010	18mm	60mm	1mm	5mm	3,11Kg
Set diameter 20mm F	Radius 60				
140-17-01-10002	20mm	3D=60mm	1mm	5mm	3,22Kg
Set diameter 22mm F	Radius 66				
140-17-01-10014	22mm	3D=66mm	1mm	5mm	4,10Kg
Set diameter 25mm F	Radius 75				
140-17-01-10003	25mm	3D=75mm	1,2mm	5mm	5,55Kg
Set diameter 28mm F	Radius 84				
140-17-01-10011	28mm	3D=84mm	1,2mm	5mm	7,28Kg
Set diameter 30mm F	Radius 90				
140-17-01-10004	30mm	3D=90mm	1,2mm	5mm	8,29Kg
Set diameter 32mm F	Radius 98				
140-17-01-10013	32mm	3D=98mm	1,5mm	5mm	10,16Kg
Set diameter 35mm F	Radius 105				
140-17-01-10005	35mm	3D=105mm	1,5mm	5mm	12,14Kg
Set diameter 40mm F	Radius 120				
140-17-01-10006	40mm	3D=120mm	1,5mm	5mm	17,11Kg
Set diameter 50mm F	Radius 150				
140-17-01-10007	50mm	3D=150mm	2mm	5mm	31,41Kg
Set diameter 60mm F	Radius 180				
140-17-01-10008	60mm	3D=180mm	2mm	5mm	40,88Kg
Set diameter 70mm F	Radius 210				
140-17-02-10001	70mm	3D=210mm	3,6mm	6mm	72,40Kg
Set diameter 80mm F	Radius 240				
140-17-02-10002	80mm	3D=240mm	4mm	5mm	88,17Kg

#### Accessories for 90mm round pipes



Rollers made of treated steel. Suitable kit to bend 90mm tube of 4mm wall thickness or thicker. The following is supplied with the unit: A main roller, a clamp with a fastener, a support holder Check with the manufacturer for other dimensions Supporting Roller Kit REF: 140-17-02-00002 is required

REF.	Diam. Ext.	Radius	Min. thickness	Max. thickness	Weight
Set diameter 90mm	Radius 270				
140-17-02-10003	90mm	3D=270mm	4mm	5mm	114,36Kg

\* The walls with more thickness to the established one and the materials with more resistance, reduce the capacities of the machine.

## ► Accessories for round pipes 3/8" to 2" 1/2 Schedule



Rollers made of treated Steel. Units suitable for bending all types of round pipes 3/8" to 2" 1/2 Schedule. The following is supplied with the unit: A main roller, a counter-shape, a clamp with a fastener

Check with the manufacturer for other dimensions

REF.	Diam. Ext.	Diam. Ext.	Radius	SCH10	SCH40	SCH80	SCH160	Weight
Set diameter 17,1	0mm Radiu	s 60mm Diai	neter 3/8" Sche	dule				
140-17-01-20001	3/8"	17,1mm	60mm	1,65mm	2,31mm	3,20mm	—	4,22Kg
Set diameter 21,3	0mm Radiu	s 63,9mm Di	ameter 1/2" Scł	nedule				
140-17-01-20002	1/2"	21,3mm	3D=63,9 mm	2,11mm	2,77mm	3,73mm	4,78mm	3,56Kg
Set diameter 26,7	0mm Radiu	s 80,1mm Di	ameter 3/4" Scł	nedule				
140-17-01-20003	3/4"	26,7mm	3D=80,1mm	2,11mm	2,87mm	3,91mm	5,56mm	6,74Kg
Set diameter 33,7	0mm Radiu	s 101,1mm C	Diameter 1" Sch	edule				
140-17-01-20004	1"	33,7mm	3D=101,1mm	2,77mm	3,38mm	4,55mm	6,35mm	11,18Kg
Set diameter 42,4	0mm Radiu	s 127,2mm D	Diameter 1" 1/4	Schedule				
140-17-01-20005	1" 1/4	42,4mm	3D=127,2mm	2,77mm	3,56mm	4,85mm	6,35mm	18,86Kg
Set diameter 48,3	0mm Radiu	s 144,9mm E	Diameter 1" 1/2	Schedule				
140-17-01-20006	1" 1/2	48,3mm	3D=144,9mm	2,77mm	3,68mm	5,08mm	_	27,05Kg
Set diameter 60,3	0mm Radiu	s 180,9mm E	Diameter 2" Sch	edule				
140-17-02-20001	2"	60,30mm	3D=180,9mm	2,77mm	3,91mm	5,54mm	—	45,75Kg
Set diameter 73m	nm Radius 2	19mm Diamo	eter 2" 1/2 Sche	dule				
140-17-02-20002	2" 1/2	73,0mm	3D=219mm	3,05mm	5,16mm	7,01mm	_	72,00Kg



#### Accessories for 3" Schedule round pipes



Rollers made of treated steel. Suitable kit to bend 3" Schedule tube of 3,05mm wall thickness or thicker. The following is supplied with the unit: A main roller, a clamp with a fastener, a support holder Check with the manufacturer for other dimensions Supporting Roller Kit REF: 140-17-02-00002 is required

REF.	Diam. Ext.	Diam. Ext.	Radius	SCH10	SCH40	SCH80	SCH160	Weight
Set diameter 88,9	mm Radius	266,7mm Di	ameter 3" Sche	dule				
140-17-02-30003	3"	88,9mm	3D=266,7mm	3,05mm	5,49mm	_	_	110,80Kg

\* All capacities are based on the norm of carbon steel tubes according to ASTM, Standard A-53 grade A with a maximum resistance strength of 330MPa. The walls with more thickness to the established one and the materials with more resistance, reduce the capacities of the machine. Check with your material supplier for the specifications of this one.

► Accessories for round pipes in inches · 1/2" to 3" inches



Rollers made of treated Steel. Units suitable for bending all types of round pipes 1/2" to 3" The following is supplied with the unit: A main roller, a counter-shape, a clamp with a fastener *Check with the manufacturer for other dimensions* 

REF.	Diam. Ext.	Diam. Ext.	Radius	Min. thickness	Max. thickness	Weight
Set diameter 12,7r	nm Radius 60	mm Diameter	1/2" inches			
140-17-01-30011	1/2"	12,7mm	60mm	1mm	4mm	3,37Kg
Set diameter 15,88	3mm Radius 6	0mm Diamete	er 5/8" inches			
140-17-01-30001	5/8"	15,88mm	60mm	1mm	4mm	3,61Kg
Set diameter 19,05	5mm Radius 6	0mm Diamete	er 3/4" inches			
140-17-01-30002	3/4"	19,05mm	60mm	1mm	4mm	2,79Kg
Set diameter 22,22	2mm Radius 6	6mm Diamete	er 7/8" inches			
140-17-01-10014	7/8"	22,22mm	66mm	1mm	5mm	4,10Kg
Set diameter 25,40	)mm Radius 7	6,20mm Diam	eter 1" inches			
140-17-01-30003	1"	25,4mm	3D=76,2mm	1,2mm	5mm	5,72Kg
Set diameter 31,75	5mm Radius 9	5,25mm Diam	eter 1" 1/4 inches			
140-17-01-30004	1" 1/4	31,75mm	3D=95,25mm	1,5mm	6mm	10,21Kg
Set diameter 38,10	0mm Radius 1	14,30mm Diai	meter 1" 1/2 inche	S		
140-17-01-30005	1" 1/2	38,10mm	3D=114,3mm	1,5mm	7mm	15,69Kg
Set diameter 44,48	5mm Radius 1	33,35mm Diai	meter 1" 3/4 inche	S		
140-17-01-30010	1" 3/4	44,45mm	3D=133,35mm	2mm	5mm	21,86Kg
Set diameter 50,8r	nm Radius 15	2,4mm Diame	ter 2" inches			
140-17-01-30006	2"	50,80mm	3D=152,4mm	2mm	5mm	32,24Kg
Set diameter 57,15	5mm Radius 1	71,45mm Diai	meter 2" 1/4 inche	S		
140-17-01-30007	2" 1/4	57,15mm	3D=171,45mm	2mm	5mm	36,13Kg
Set diameter 63,5r	nm Radius 19	0,5mm Diame	ter 2" 1/2 inches			
140-17-02-30001	2" 1/2	63,50mm	3D=190,5mm	3mm	8,64mm	40,50Kg
Set diameter 76,2r	nm Radius 22	8,6mm Diame	ter 3" inches			
140-17-02-30002	3"	76,20mm	3D=228,6mm	3mm	7,21mm	80,68Kg

#### Accessories for 3" 1/2 round pipes



Rollers made of treated Steel. Suitable kit to bend 3" 1/2 tube of 4mm wall thickness or thicker. The following is supplied with the unit: A main roller, a clamp with a fastener, a support holder

Check with the manufacturer for other dimensions Supporting Roller Kit REF: 140-17-02-00002 is required

REF.	Diam. Ext.	Diam. Ext.	Radius	Min. thickness	Max. thickness	Weight
Set diameter 88,9	9mm Radius 2	66,7mm Diam	eter 3" 1/2 inches	;		
140-17-02-30003	3" 1/2	88,9mm	3D=266,7mm	4mm	6,05mm	110,80Kg

#### Supporting Roller Kit CC90



#### REF: 140-17-02-00002

The CC90 Supporting Roller Kit is used to bend:

- · 90mm tube of 4mm wall thickness or thicker
- · 3" Schedule tube of 3,05mm wall thickness or thicker
- $\cdot$  3" 1/2 tube of 4mm wall thickness or thicker.

#### Weight: 24,573 kg

\* The walls with more thickness to the established one and the materials with more resistance, reduce the capacities of the machine.

#### Accessories for square pipes in millimeters · 20 to 50 mm



Rollers made of treated Steel. Units suitable for bending all types of square pipes 20 to 50mm. The following is supplied with the unit: A main roller, a counter-shape, a clamp with a fastener

Check with the manufacturer for other dimensions

REF.	Section	Radius	Min. thickness	Max. thickness	Weight
Square Tube Die Set	20mm Radius 10	)0mm			
140-17-01-10101	20x20mm	5D=100mm	1,5mm	4mm	11,1Kg
Square Tube Die Set	25mm Radius 11	I5mm			
140-17-01-10102	25x25mm	115mm	2mm	4mm	14,75Kg
Square Tube Die Set	30mm Radius 13	35mm			
140-17-01-10103	30x30mm	135mm	2mm	4mm	22Kg
Square Tube Die Set	40mm Radius 16	65mm			
140-17-01-10104	40x40mm	165mm	2mm	5mm	34,15Kg
Square Tube Die Set	50mm Radio 180	)mm			
140-17-02-10101	50x50mm	180mm	2,5mm	5mm	45,7Kg



#### Accessories for square pipes in inches · 3/4" to 2" inches



Rollers made of treated Steel. Units suitable for bending all types of square pipes 3/4" to 2" inches.

The following is supplied with the unit: A main roller, a counter-shape, a clamp with a fastener

Check with the manufacturer for other dimensions

REF.	Section	Section	Radius	Radius	Min. Thick.	Max. Thick.	Weight
Square Tube Die S	et ¾" (19,05mn	า) Radius 4" (101,6เ	nm)				
140-17-01-30101	3/4"x3/4"	19,05x19,05mm	4"	101,6mm	1,5mm	4mm	11,5Kg
Square Tube Die S	et 1" (25,4mm)	Radius 4,5" (114,3r	nm)				
140-17-01-30102	1"x1"	25,4x25,4mm	4" 1/2	114,3mm	2mm	4mm	14,6Kg
Square Tube Die S	et 1" 1/4 (31,75	mm) Radius 5,5" (1	39,7mm)				
140-17-01-30103	1" 1/4x1"1/4	31,75x31,75mm	5" 1/2	139,7mm	2mm	4mm	23,3Kg
Square Tube Die S	et 1" 1/2 (38,1m	nm) Radius 6,5" (16	5,1mm)				
140-17-01-30104	1" 1/2x1"1/2	38,1x38,1mm	6" 1/2	165,1mm	2mm	5mm	34,6Kg
Square Tube Die S	et 1" 3/4 (44,45	mm) Radius 6,75" (	171,45mm	1)			
140-17-02-30101	1" 3/4x1"3/4	44,45x44,45mm	6" 3/4	171,45mm	2,5mm	5mm	39Kg
Square Tube Die S	et 2" (50,8mm)	Radius 7" (177,8m	n)				
140-17-02-30102	2"x2"	50,8x50,8mm	7"	177,8mm	2,5mm	5mm	44Kg

### CC90 2-axis positioning gauge



The gauge of the CC90 allows to make mass produced parts, much faster, more accurate and repetitively.

- Adjustable longitudinal positioning with 6 positions
- Angular head rotation every 5 degrees
- · Four-clamp plate adjustable to round and square tube
- · Longitudinal movement with high precision linear guides
- Automatic anti-collision control
- · Easy handling and preparation for difficult parts

REF.	Gauge length	Maximum capacity	Weight
140-17-02-50000	3000mm	90 mm, 3" Schedule	135Kg

## 7. TROUBLESHOOTING

PROBLEM	CAUSE	SOLUTION
Internal wrinkle	The pipe moved out of the clamp	Make sure the clamp is in good conditions
Internal wrinkle	Counter-die with low pressure	Tighten the counter-die
Internal wrinkle	Lack of lubrication	Use BEND8 or another similar lubricant
Internal wrinkle	The diameter of the die is too small for the pipe thickness	Increase the pipe thickness a little or buy a die with a diameter of more than 3 times the pipe diameter
Internal wrinkle	Worn counter-die	Buy a new counter-die
Excessive final deformation on the bend	Counter-die with too much pressure	Loosen the counter-die
Flattening on the outside of the bend	Counter-die with too much pressure	Loosen the counter-die
Flattening on the outside of the bend	Pipe not thick enough	Increase the pipe wall
The machine can't bend	The material hardness is much higher than recommended by the manufacturer	Contact the pipe manufacturer
The machine can't bend	Lack of lubrication	Use BEND8 to reduce friction

# **Technical annex** Non-mandrel tube and pipe bender CC90 CNC

General exploded view Upper unit Electrical cabinet Wiring diagrams Wiring diagram · THREE PHASE MACHINE Wiring diagram · SINGLE PHASE MACHINE

## **General Exploded View**





Elemento	Miniatura	№ de pieza	Descripción	CTDAD
1		130-17-02-00001	CONJUNTO SUPERIOR CC90	1
2		130-17-02-00002	ESTRUCTURA CC90	1
3		120-17-02-00025	SOPORTE CUADRO ELECTRICO CC90	1
4		130-17-02-00003	CONJUNTO ESTANTERIA CC90	2
5		020-I7380-M6X10	Tornillo Allen Abombado ISO 7380 M6X10	48
6		120-17-01-00043	Metacrilato Nego CC60	2
7		130-17-02-00004	CONJUNTO EJE FIJACION PORTAGUIAS CC90	1
8		120-17-02-00029	TORNILLO APRIETE CC90	1
9		120-17-02-00034	ANAGRAMA NARGESA 2 CC90	1
10		120-17-02-00035	ANAGRAMA NARGESA CC90	1
11	J	120-17-02-00036	ENVOLVENTE DE CHAPA CC90	1
12		120-17-02-00037	ENVOLVENTE POSTERIOR CC90	1
13		120-17-02-00038	SOPORTE ENVOLVENTE TRASERO CC90	2
14		130-17-02-00006	CONJUNTO CARRO PORTAGUIAS CC90	1

Elemento	Miniatura	№ de pieza	Descripción	CTDAD
15	0	130-17-02-00007	CONJUNTO EMPUJE CARRO CC90	1
16	4000	122-CAL-1101-002	Calca MC, CC i NOA	1
17		120-17-02-00063	Soporte Cuadro Eléctrico Lado Puerta CC90	1
18	•	120-17-02-00039	TAPA ENCODER CC90	1
19		130-17-01-00008	CONJUNTO PANTALLA CC60	1
20		020-D934-M8	TUERCA HEXAGONALI DIN934 M8	24
21	G	020-D127-M16	Arandela Glower DIN 127 Para M16	6
22		020-D912-M16X35	Tornillo Allen DIN 912 M16X35	6
23		050-ENC-00007	ENCODER QR30N	1
24		020-I7380-M6x60	Tornillo Allen Abombado ISO7380 M6X60	2
25		050-KIE-1701-001		1
26	<b>A</b>	050-IG-00001 Interruptor General Kg10Ak300		1
27		130-17-02-00009	CONJUNTO BRAZO REACCIONCC90	1
28	25	120-17-02-00049	FIJACIÓN RULINA BRAZO REACCION CC90	1



Elemento	Miniatura	№ de pieza	Descripción	CTDAD
29		130-17-02-00010	CONJUNTO PORTA GUIAS CC90	1
30		120-17-02-00052	TUERCA BRAZO REACCIÓN CC90	1
31		020-D9021-M12	Arandela Ancha DIN9021 Para M12	1
32		020-I7380-M12X20	Tornillo Allen Abombado ISO7380 M12X20	1
33		050-PE-00003	Prensaestopa GFPT 212 50043 M20X150 PG13.5	1
34		020-D7985-M3X10	TORNILLO DIN7985 M3X10 Zincado	2
35	AND I	050-BE-00003	Zocalo Recto Ck03I	1
36	Ø	120-17-02-00054	FIJACIÓN RULINA CC90	1
37		DIN 933 - M30 x 50	Perno de cabeza-hex	1
38		020-D125B-M4	Arandela Biselada DIN125B Para M4	4
39	0	020-D125B-M8	Arandela Biselada DIN125B Para M8	24
40		122-PLC-0000-001	Placa Caracteristicas General	1
41		020-D7337-3X8	Remache De Clavo DIN7337 De Al D3X8	4
42		020-I7380-M8X12	M8X12 Tornillo Allen Abombado ISO7380 M8X12	

Elemento	Miniatura	№ de pieza	Descripción	CTDAD
43		120-17-02-00056	PLACA FIJACION VARIADOR CC90	1
44			DELTA_VFD-E-C1-PD-3D00_CC90	1
45		020-D912-M4X10	TORNILLO ALLEN DIN 912 M4X10	4
46	P	120-17-02-00055	Suplemento portaguias CC90	1
47		130-17-01-00004	CONJUNO EJE FIJACION PORTAGUIAS CC60	1
48		020-I7380-M8X20	TORNILLO ALLEN ABOMBADO ISO7380 M8X20	8
49	2	050-PED-00002	Pedal Doble Con Paro De Emergencia	1
50		120-17-02-00057	CHAPA INFERIOR CC90	1
51		020-17380-M6X8	Tornillo Allen Abombado ISO7380 M6X8	7
52		020-I7380-M4X10	Tornillo Allen ISO 7380 M4X10	2
53		020-D934-M4	Tuerca Hexagonal DIN934 M4	2
54		120-17-01-00075	Chapa Pantalla Variador	1
55		020-I7380-M6X30	Tornillo Allen Abombado ISO7380 M6X30	2
56		020-AET-M6	Arandela Especial para DIN912 AET - M6	2



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Elemento	Miniatura	№ de pieza	Descripción	CTDAD
57	60)	050-TAP-D22	Tapon Obturador Ø22mm - Harmony XB5 - Plastico	1

## **Upper Ensemble**





Elemento	Miniatura	Nº de pieza	Descripción	CTDAD
1.1	8	120-17-02-00001	PLACA BASE CC90	1
1.2	Н	120-17-02-00002	PLACA SUPERIOR CC90	1
1.3		120-17-02-00003	PASAMANO LATERAL REDUCTOR CC90	2
1.4		120-17-02-00004	SOPORTE GUIA INFERIOR CC90	1
1.5		120-17-02-00005	SEPARADOR ESTRUCTURACC90	4
1.6		120-17-02-00006	REFUERZO INTERIOR CC90	1
1.7	0	120-17-02-00007	CASQUILLO PORTA COJINETE CC90	
1.8	0	120-17-02-00008	CASQUILLO PORTA COJINETE INFERIOR CC90	1
1.9	9	120-17-02-00009	D9 EJE ENGRANAJE Z56 CC90	
1.10	0	120-17-02-00010	ENGRANAJE HELICOIDAL Z56 M6 CC90	1
1.11	6	120-17-02-00011	ENGRANAJE HELICOIDAL Z40 M6 CC90	1
1.12		120-17-02-00012	ENGRANAJE HELICOIDAL Z20 M6 CC90	1
1.13		120-17-02-00013	EJE ENGRANAJE Z40 CC90	1
1.14	0	120-17-02-00014	SEPARADOR ENGRANAJE Z56 CC90	1

Elemento	Miniatura	Nº de pieza	Descripción	CTDAD
1.15	0	120-17-02-00015	ARANDELA FIJACIÓN PIÑÓN CC90	1
1.16		020-D912-M12X35	TORNILLO ALLEN DIN 912 M12X35	34
1.17	9	030-CJ-00034	Rodamiento 3220B 2rs tvh	1
1.18	0	030-CJ-00035	Rodamiento 3218B 2rs tvh	1
1.19	0	030-CJ-00036	Rodamiento de bolas 6214 2rs	2
1.20	030-D471-00018		Circlip Eje Din471 D90	
1.21		030-D472-00021	Circlip Eje Din472 D160	
1.22		030-D471-00019	Circlip Eje Din471 D70	
1.23		030-D472-00020	Circlip Agujero Din472 D180	1
1.24		020-D7991-M20X60	Tornillo Allen Avellanado DIN7991 M20X60	1
1.25		030-D7979D-00026	Pasador Cilindrico Con Rosca Int. DIN7979/D D14X40	15
1.26		030-D7979D-00027	Pasador Cilindrico Con Rosca Int. DIN7979/D D14X60	
1.27		020-D912-M12X55	Tornillo Allen DIN912 M12X55	55
1.28		050-RT-00007	Motor-Reductor planetario EP, R 4EL 006A 452Y C065M1 F30b I28X250 V3, Motor Freno TX (ErP) HBZ 100LA 230.400 - Pn[kW]=2.2	1

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Elemento	Miniatura	Nº de pieza	Descripción	CTDAD
1.29	29 030-D6885A-00042		Chaveta Paralela Din6885A 28X16X90	
1.30		020-D7991-M20X50	TORNILLO ALLEN AVELLANADO DIN7991 M20X50	1
1.31	0	040-RET-00015	Reten D145XD170x13	1
1.32	1	120-17-02-00064	Chapa anticaida Pasadores CC90	1
1.33		020-17380-M6X12	Tornillo Allen Abombado ISO7380 M6X12	8

**Electrical Cabinet** 



PLACE THE LABELS ON THE TOP OF THE TERMINALS. PLACE THE TERMINALS WITH THE OPEN SIDE TO THE LEFT.





-CONTROL1

DESCRIPTION	MESH WITH SIGNAL WIRES		INVERTER EMERGENCY		ETHERNET	PEDAL		INVERTER SUPPLY	POWER INPUT AFTER MAIN SWITCH -S1
ELECTRIC WIRE	MULTIPLE	UNUSED	MG12	UNUSED	MG9	MG5	UNUSED	MG11	MG2
PLASTIC CABLE GLAND	M25	PG9	PG9	PG9	-	M20	M20	M20	M20
PLATE HOLE NUMBER	1	2	3	4	5	6	7	8	6



# **N** NARGESA<sup>®</sup>





Wiring Diagrams



SF1 : PEDAL EMERGENCY STOP SEG1 : EMERGENCY SAFETY MODULE

![](_page_63_Figure_1.jpeg)

![](_page_64_Figure_0.jpeg)

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![](_page_64_Figure_1.jpeg)

![](_page_65_Figure_1.jpeg)

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#### Wiring Diagram · THREE PHASE MACHINE

![](_page_66_Figure_2.jpeg)

## Wiring Diagram · SINGLE PHASE MACHINE

![](_page_67_Figure_2.jpeg)

# OUR RANGE OF MACHINERY

![](_page_68_Picture_1.jpeg)

**IRON WORKERS** 

![](_page_68_Picture_3.jpeg)

SECTION BENDING MACHINES

![](_page_68_Picture_5.jpeg)

TWISTING/SCROLL BENDING MACHINES

![](_page_68_Picture_7.jpeg)

GAS FORGES

![](_page_68_Picture_9.jpeg)

BROACHING MACHINES

![](_page_68_Picture_11.jpeg)

NON-MANDREL PIPE BENDER

![](_page_68_Picture_13.jpeg)

HYDRAULIC PRESS BRAKES

![](_page_68_Picture_15.jpeg)

IRON EMBOSSING MACHINES

![](_page_68_Picture_17.jpeg)

POWER HAMMERS

![](_page_68_Picture_19.jpeg)

HORIZONTAL PRESS BRAKE

![](_page_68_Picture_21.jpeg)

HYDRAULIC SHEAR MACHINES

![](_page_68_Picture_23.jpeg)

END WROUGHT IRON MACHINES

![](_page_68_Picture_25.jpeg)

PRESSES FOR LOCKS