



## UNITECH

### Electric and Digital Pipe Benders

User and Maintenance Manual

Electric models: UNI42A UNI60A/ Digital models: UNI42A1 UNI60A1



#### **WARNING**

Read this manual carefully before starting or operating the machine, and before carrying out maintenance or any other work on it.

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# 1. Introduction

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## 1.1 About this manual

This manual covers the installation, operation and maintenance of the Unitech electric and digital pipe benders listed in Section 1.2. Read it carefully before starting, operating or maintaining the machine, and keep it with the machine for future reference.

Sections that apply to the digital (programmable) models only are marked as such. All other sections apply to every model unless a specific model is named.

## 1.2 Models covered

| Model   | Type                   | Installed motor | Moving arm / reinforcing tie-rod       |
|---------|------------------------|-----------------|----------------------------------------|
| UNI42A  | Electric               | 0.55 kW         | Moving arm optional; no tie-rod        |
| UNI42A1 | Digital (programmable) | 0.55 kW         | Moving arm optional; no tie-rod        |
| UNI60A  | Electric               | 1 kW            | Moving arm optional; tie-rod available |
| UNI60A1 | Digital (programmable) | 1 kW            | Moving arm optional; tie-rod available |

Throughout this manual, "42 models" means UNI42A / UNI42A1 and "60 models" means UNI60A / UNI60A1.

## 2. Safety information

### 2.1 Safety alert definitions

This manual uses the following notice types to draw attention to safety and operating information:



#### **WARNING**

Indicates a hazard that could result in serious injury if not avoided.

#### **CAUTION**

Indicates a hazard that could result in minor injury or damage to the machine if not avoided.

#### **NOTE**

Indicates additional information that helps ensure correct operation.

### 2.2 General



#### **WARNING**

Read this manual carefully before starting or operating the machine, and before carrying out maintenance or any other work on it.

### 2.3 Hazards and protective measures

The following hazards were identified during the design of the machine. The table lists the measures adopted for each.

| Hazard                                       | Protective measure                                                                                                                                            |
|----------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Electric shock                               | The control panel (Section 3.4) is designed and built in accordance with applicable electromagnetic compatibility requirements. See also Section 2.4, item 6. |
| Hand crushing                                | Two-hand start control (Section 3.5, control A). See also Section 2.4, item 5.                                                                                |
| Entanglement of clothing or hair             | See Section 2.4, item 8.                                                                                                                                      |
| Noise                                        | Components such as the induction motor were selected at the design stage to limit noise. Maximum internal noise of the motor: 85 dB(A).                       |
| Guide springing back during bending          | See Section 2.4, item 2.                                                                                                                                      |
| Incorrect positioning of the guide or roller | See Section 2.4, item 3.                                                                                                                                      |
| Spring-back of the pipe after bending        | See Section 2.4, item 4.                                                                                                                                      |

## 2.4 Hazard information

1. Check that the "0" mark on the former fitted to the output shaft lines up with the "0" mark on the shaft.
2. When using the quick approach of the guide support, check that the lever is locked (pressed fully down)
3. Check that the pin of the guide (or of the twin-roller guide) is correctly seated and that the support hook is tight.
4. With large-diameter and thick-walled pipe, the machine retains some stored energy at the end of the bending cycle because of the spring-back of the pipe. In this case, release the guide by turning the crank (see warning below).
5. Moving parts of the machine can injure the operator's hands. Never modify the two-hand start control for any reason (see warning below).
6. Check that the supply cable is not damaged.
7. The stated noise level of 75 dB is measured at a distance of 1 m and a height of 1.6 m above the floor.
8. Do not wear loose clothing or ties. Keep hair short or contained in a hair net.



### **WARNING**

**Stored energy:** after bending large-diameter or thick-walled pipe, the pipe and guide remain under load. Release the guide by turning the crank - do not remove the pipe until the load is released.

**Two-hand control:** never modify, bypass or defeat the two-hand start control.

## 2.5 Prohibited uses

- Do not exceed the pipe dimensions given in Tables 1 and 2 (Section 3.7). Do not use the bending tooling in any way other than shown in Tables 3 to 6.
- Do not use any procedure other than those described in Sections 5.1 to 5.4.

## 3. Product overview and specifications

### 3.1 Functional description

The UNI42A, UNI60A, UNI42A1 and UNI60A1 are portable electric pipe benders for bending metal pipe through angles from 0° to 180°. Each machine consists of a geared motor with an output shaft, on which the bending formers are mounted (one former for each pipe outside diameter), and a quick positioner that positions the guide and clamps the pipe against the former.

When the geared motor runs, the former on the output shaft rotates clockwise until the set bending angle is reached. The accessories supplied with the machine are described in Section 3.6, and operation is described in Section 5.

### 3.2 Main components

- **Cast reduction gearbox** containing the gear motor. Reduction ratio approximately 4000:1.
- **Asynchronous induction motor**, 220 V 50 Hz input.
- **Output shaft** (former holder).
- **Quick-positioning device** - used for bending without a mandrel, and for quickly locking and unlocking the guide or the twin-roller guide.
- **Former axis adjustment** - made with the adjusting screw at the rear of the reduction gearbox, marked by a sticker (Figure 1). It adjusts the limit switch so that the output shaft can start a few degrees behind the normal former-to-guide alignment. This improves the bend, particularly on thin-walled pipe.

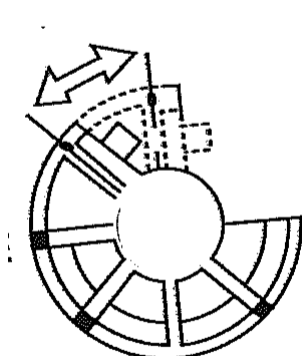


Figure 1 - Former axis adjustment sticker (rear of gearbox)

### 3.3 Dimensions and weight

|                  | UNI42A / UNI42A1 | UNI60A / UNI60A1 |
|------------------|------------------|------------------|
| Weight (approx.) | 35 kg            | 60 kg            |
| Length           | 520 mm           | 580 mm           |
| Width            | 170 mm           | 210 mm           |
| Height           | 350 mm           | 410 mm           |

### 3.4 Electrical system

| Item                        | Specification                          |
|-----------------------------|----------------------------------------|
| Installed motor - 42 models | 0.55 kW                                |
| Installed motor - 60 models | 1 kW                                   |
| Mains supply                | As shown on the machine's rating plate |

| Item          | Specification                                                                     |
|---------------|-----------------------------------------------------------------------------------|
| Power panel   | 220 V 50 Hz, IP55. Fitted inside the gearbox base.                                |
| Control board | Electronic card fitted inside the reduction gearbox.                              |
| Supply cable  | Type SG3 × 1.5 (3-core, 1.5 mm <sup>2</sup> ), fitted with a die-cast Schuko plug |

### 3.5 Controls

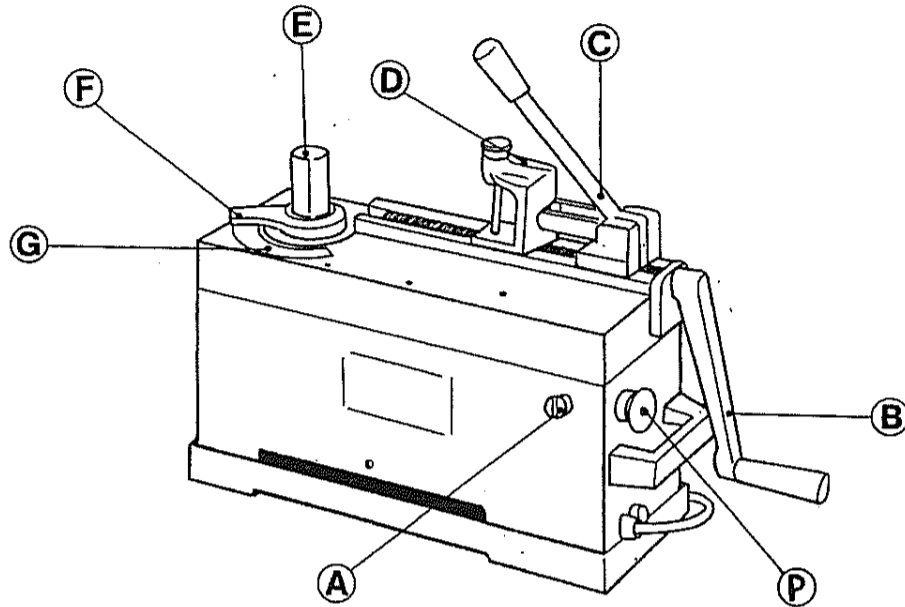


Figure 2 - Machine controls

| Ref. | Control                      | Function                                                                                                                                                                                                                     |
|------|------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A    | Two-hand start buttons       | Control the bending cycle. Both buttons must be held down for the whole bend. A short press on the two-hand buttons returns the die control pin to the start position; the former is returned to the start position by hand. |
| B    | Handwheel / crank            | Adjusts the roller or guide support.                                                                                                                                                                                         |
| C    | Quick-positioning lever      | Quickly positions the guide or roller support.                                                                                                                                                                               |
| D    | Guide / roller support (jaw) | Holds the guide or roller.                                                                                                                                                                                                   |
| E    | Output shaft                 | Carries the former.                                                                                                                                                                                                          |
| F    | Bending angle stop           | Sets the bending angle.                                                                                                                                                                                                      |
| G    | Angle scale                  | Graduated scale for setting the bending angle.                                                                                                                                                                               |
| P    | Emergency stop button        | Stops the machine immediately.                                                                                                                                                                                               |

## 3.6 Accessories

### 3.6.1 Former (bending die) and locking ring

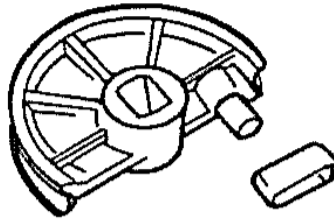


Figure 3 - Former with locking ring

Aluminium or cast-iron former with locking ring, for bending at a standard centreline radius (CLR) of 3D or 4D without a mandrel. Each former is marked with the pipe outside diameter (in mm, gas inch or WHT inch) and the centreline radius (mm).

### 3.6.2 Guide

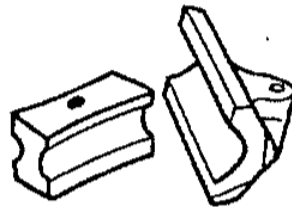


Figure 4 - Guide

Used for bending thin-walled pipe. Each guide is marked with the pipe outside diameter (mm, gas inch or WHT inch).

### 3.6.3 Twin-roller guide

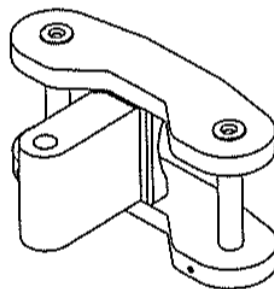


Figure 5 - Twin-roller guide

The twin-roller guide must be used for bending pipe with a wall thickness over 2.5 mm. It is used with two rollers matched to the pipe diameter, and prevents flattening of the outside of the bend.

#### CAUTION

**42 models:** use the twin-roller guide up to a maximum of 1" gas and equivalent mm sizes. For larger diameters, use a single roller.

**60 models:** use the twin-roller guide up to a maximum of 1¼" gas and equivalent mm sizes. For larger diameters, use a single roller.

### 3.6.4 Twin rollers

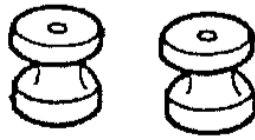


Figure 6 - Twin rollers

The rollers are used in pairs with the twin-roller guide (two rollers for each pipe diameter).

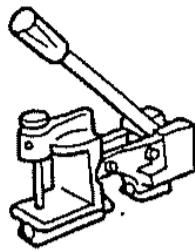
### 3.6.5 Reinforcing tie-rod (60 models only)



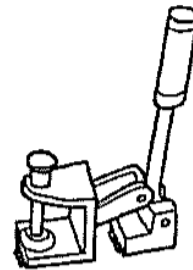
Figure 7 - Reinforcing tie-rod

Connects the former axis to the guide or roller axis during high-stress bending operations. Available for the 60 models only - see also the note in Section 3.7.

### 3.6.6 Quick guide positioner



42 models

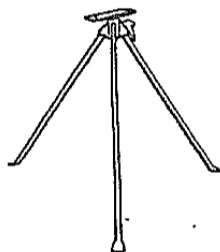


60 models (one hole)

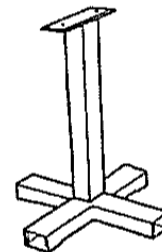
Figure 8 - Quick guide positioners

Quick guide positioning device for locking and unlocking the guide or roller faster during the bending cycle.

### 3.6.7 Folding stand and universal base



Folding stand



Universal base

Figure 9 - Folding stand and universal base (optional)

The metal-profile folding stand and the universal base are used to install the pipe bender correctly. Both are optional.

### 3.6.8 Moving arm (moving plane of bend)

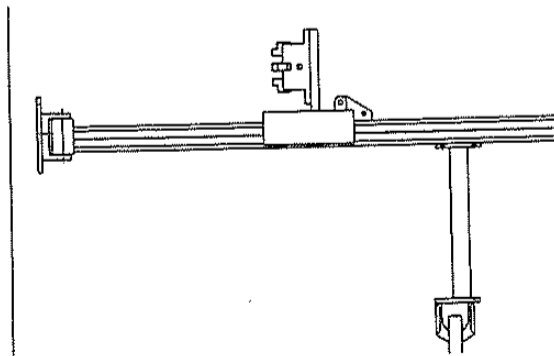


Figure 10 - Moving arm

The moving arm, fitted with a chuck, is used for repeated sequences of bends on different planes and at different distances. Stops are supplied to set the required planes and the distances between bends.

## 3.7 Bending capacity

Maximum bending capacity is given in Tables 1 and 2. The tooling must be used as specified in Tables 3 to 6:

| Table   | Covers                               |
|---------|--------------------------------------|
| Table 3 | Pipe sized by outside diameter in mm |
| Table 4 | Pipe sized in WHT inch               |
| Table 5 | Pipe sized in gas inch               |
| Table 6 | Tight-radius bending without mandrel |

### NOTE

**Reinforcing tie-rod (60 models only):** use the reinforcing tie-rod (Section 3.6.5) when the outside diameter of the pipe is equal to or greater than the maximum capacity given in Table 2 for that pipe material, minus 15 mm.

Table 1 - Bending capacity, 42 models

| Pipe type                            | Max. outside diameter (mm) | Max. wall thickness (mm) |
|--------------------------------------|----------------------------|--------------------------|
| Hard and soft copper; annealed brass | 42                         | 1.5                      |
| Steel electrical conduit             | 40                         | 1.5                      |
| AISI 304/316 stainless steel         | 30                         | 2                        |
| ST 35.4 phosphated steel (hydraulic) | 42                         | 3                        |
| Furniture tube                       | 42                         | 2                        |
| Iron boiler pipe                     | 42                         | 3                        |
| Aluminium                            | 42                         | 3                        |
| Multilayer (double-coated) aluminium | 50                         | Standard                 |
| Threaded steel gas pipe              | 1¼"                        | Standard                 |
| Standard centreline radius (CLR)     | 3D – 4D                    |                          |

**Table 2 - Bending capacity, 60 models**

| Pipe type                              | Max. outside diameter (mm) | Max. wall thickness (mm) |
|----------------------------------------|----------------------------|--------------------------|
| Hard and soft copper; annealed brass   | 54                         | 2                        |
| Steel electrical conduit               | 50                         | 1.5                      |
| AISI 304/316 stainless steel           | 35                         | 3                        |
| ST 35.4 phosphated steel (hydraulic) * | 48                         | 4                        |
| Furniture tube                         | 48                         | 3                        |
| Iron boiler pipe                       | 48                         | 3                        |
| Aluminium                              | 54                         | 3                        |
| Multilayer (double-coated) aluminium   | 63                         | Standard                 |
| Threaded steel gas pipe                | 1½"                        | Standard                 |
| Standard centreline radius (CLR)       | 3D – 4D                    |                          |

\* For pipe with a wall thickness of 2.5 mm or more, use the twin-roller set, not the guide.

**Table 3 - Tooling for pipe sized in mm (wall thickness in mm)**

| Pipe OD (mm) | CLR (mm) | Guide: min. wall | Guide: max. wall | Twin rollers: min. wall | Twin rollers: max. wall |
|--------------|----------|------------------|------------------|-------------------------|-------------------------|
| 6            | 30       | 1                | 2                | 2.5                     | > 2.5                   |
| 8            | 30       | 1                | 2                | 2.5                     | > 2.5                   |
| 10           | 30       | 1                | 2                | 2.5                     | > 2.5                   |
| 10           | 40       | 1                | 2                | 2.5                     | > 2.5                   |
| 12           | 36       | 1                | 2                | 2.5                     | > 2.5                   |
| 12           | 48       | 1                | 2                | 2.5                     | > 2.5                   |
| 14           | 42       | 1                | 2                | 2.5                     | > 2.5                   |
| 14           | 56       | 1                | 2                | 2.5                     | > 2.5                   |
| 15           | 45       | 1                | 2                | 2.5                     | > 2.5                   |
| 15           | 60       | 1                | 2                | 2.5                     | > 2.5                   |
| 16           | 48       | 1                | 2                | 2.5                     | > 2.5                   |
| 16           | 64       | 1                | 2                | 2.5                     | > 2.5                   |
| 17           | 51       | 1                | 2                | 2.5                     | > 2.5                   |
| 17           | 68       | 1                | 2                | 2.5                     | > 2.5                   |
| 18           | 54       | 1                | 2                | 2.5                     | > 2.5                   |
| 18           | 72       | 1                | 2                | 2.5                     | > 2.5                   |
| 19           | 57       | 1                | 2                | 2.5                     | > 2.5                   |
| 19           | 76       | 1                | 2                | 2.5                     | > 2.5                   |
| 20           | 60       | 1                | 2                | 2.5                     | > 2.5                   |
| 20           | 80       | 1                | 2                | 2.5                     | > 2.5                   |
| 22           | 66       | 1                | 2                | 2.5                     | > 2.5                   |
| 22           | 88       | 1                | 2                | 2.5                     | > 2.5                   |
| 24           | 72       | 1                | 2                | 2.5                     | > 2.5                   |
| 24           | 96       | 1                | 2                | 2.5                     | > 2.5                   |
| 25           | 75       | 1                | 2                | 2.5                     | > 2.5                   |
| 25           | 100      | 1                | 2                | 2.5                     | > 2.5                   |
| 26           | 78       | 1                | 2                | 2.5                     | > 2.5                   |
| 26           | 104      | 1                | 2                | 2.5                     | > 2.5                   |

| Pipe OD (mm) | CLR (mm) | Guide: min. wall | Guide: max. wall | Twin rollers: min. wall | Twin rollers: max. wall |
|--------------|----------|------------------|------------------|-------------------------|-------------------------|
| 28           | 84       | 1                | 2                | 2.5                     | > 2.5                   |
| 28           | 112      | 1                | 2                | 2.5                     | > 2.5                   |
| 30           | 90       | 1                | 2                | 2.5                     | > 2.5                   |
| 30           | 120      | 1                | 2                | 2.5                     | > 2.5                   |
| 32           | 96       | 1                | 2.5              | 3                       | > 3                     |
| 32           | 128      | 1                | 2.5              | 3                       | > 3                     |
| 34           | 102      | 1                | 2.5              | 3                       | > 3                     |
| 34           | 136      | 1                | 2.5              | 3                       | > 3                     |
| 35           | 105      | 1                | 2.5              | 3                       | > 3                     |
| 35           | 140      | 1                | 2.5              | 3                       | > 3                     |
| 37           | 111      | 1                | 2.5              | 3                       | > 3                     |
| 37           | 148      | 1                | 2.5              | 3                       | > 3                     |
| 38           | 114      | 1                | 2.5              | 3                       | > 3                     |
| 38           | 152      | 1                | 2.5              | 3                       | > 3                     |
| 40           | 120      | 1                | 2.5              | 3                       | > 3                     |
| 40           | 160      | 1                | 2.5              | 3                       | > 3                     |
| 42           | 126      | 1                | 1.5              | 2                       | > 3.5                   |
| 42           | 168      | 1                | 1.5              | 2                       | > 3.5                   |
| 45           | 135      | 1                | 1.5              | 2                       | > 3.5                   |
| 45           | 180      | 1                | 1.5              | 2                       | > 3.5                   |
| 50           | 150      | 1                | 1.5              | 2                       | > 3.5                   |
| 50           | 200      | 1                | 1.5              | 2                       | > 3.5                   |
| 54           | 162      | 1                | 1.5              | 2                       | > 3.5                   |
| 54           | 216      | 1                | 1.5              | 2                       | > 3.5                   |
| 63           | 240      | Standard         | -                | -                       | -                       |

**Table 4 - Tooling for pipe sized in WHT inch (wall thickness in mm)**

| Pipe OD, mm (inch) | CLR | Guide: min. wall | Guide: max. wall | Twin rollers: min. wall | Twin rollers: max. wall |
|--------------------|-----|------------------|------------------|-------------------------|-------------------------|
| 6.35 (1/4")        | 3D  | 1                | 2                | 2.5                     | > 2.5                   |
| 7.94 (5/16")       | 3D  | 1                | 2                | 2.5                     | > 2.5                   |
| 9.52 (3/8")        | 3D  | 1                | 2                | 2.5                     | > 2.5                   |
| 12.70 (1/2")       | 3D  | 1                | 2                | 2.5                     | > 2.5                   |
| 12.70 (1/2")       | 4D  | 1                | 2                | 2.5                     | > 2.5                   |
| 15.88 (5/8")       | 3D  | 1                | 2                | 2.5                     | > 2.5                   |
| 15.88 (5/8")       | 4D  | 1                | 2                | 2.5                     | > 2.5                   |
| 19.05 (3/4")       | 3D  | 1                | 2                | 2.5                     | > 2.5                   |
| 19.05 (3/4")       | 4D  | 1                | 2                | 2.5                     | > 2.5                   |
| 22.22 (7/8")       | 3D  | 1                | 2                | 2.5                     | > 2.5                   |
| 22.22 (7/8")       | 4D  | 1                | 2                | 2.5                     | > 2.5                   |
| 25.40 (1")         | 3D  | 1                | 2                | 2.5                     | > 2.5                   |
| 25.40 (1")         | 4D  | 1                | 2                | 2.5                     | > 2.5                   |
| 28.58 (1 1/8")     | 3D  | 1                | 2                | 2.5                     | > 2.5                   |
| 28.58 (1 1/8")     | 4D  | 1                | 2                | 2.5                     | > 2.5                   |

| Pipe OD, mm (inch) | CLR | Guide: min. wall | Guide: max. wall | Twin rollers: min. wall | Twin rollers: max. wall |
|--------------------|-----|------------------|------------------|-------------------------|-------------------------|
| 31.75 (1¼")        | 3D  | 1                | 2.5              | 3                       | > 3                     |
| 31.75 (1¼")        | 4D  | 1                | 2.5              | 3                       | > 3                     |
| 34.92 (1⅝")        | 3D  | 1                | 2.5              | 3                       | > 3                     |
| 34.92 (1⅝")        | 4D  | 1                | 2.5              | 3                       | > 3                     |
| 38.10 (1½")        | 3D  | 1                | 2.5              | 3                       | > 3                     |
| 38.10 (1½")        | 4D  | 1                | 2.5              | 3                       | > 3                     |
| 41.28 (1⅝")        | 3D  | 1                | 1.5              | 2                       | > 3.5                   |
| 41.28 (1⅝")        | 4D  | 1                | 1.5              | 2                       | > 3.5                   |
| 44.45 (1¾")        | 3D  | 1                | 1.5              | 2                       | > 3.5                   |
| 44.45 (1¾")        | 4D  | 1                | 1.5              | 2                       | > 3.5                   |
| 47.62 (1⅞")        | 3D  | 1                | 1.5              | 2                       | > 3.5                   |
| 47.62 (1⅞")        | 4D  | 1                | 1.5              | 2                       | > 3.5                   |
| 50.80 (2")         | 3D  | 1                | 1.5              | 2                       | > 3.5                   |
| 50.80 (2")         | 4D  | 1                | 1.5              | 2                       | > 3.5                   |
| 53.98 (2⅞")        | 3D  | 1                | 1.5              | 2                       | > 3.5                   |
| 53.98 (2⅞")        | 4D  | 1                | 1.5              | 2                       | > 3.5                   |

**Table 5 - Pipe sized in gas inch**

| Nominal size | CLR (mm) | Pipe OD (mm) |
|--------------|----------|--------------|
| 1/4"         | 47       | 13.72        |
| 3/8"         | 53.5     | 17.2         |
| 1/2"         | 59       | 21.3         |
| 3/4"         | 78       | 26.9         |
| 1"           | 100      | 33.70        |
| 1¼"          | 157      | 42.25        |
| 1½"          | 199.5    | 48.2         |

**Table 6 - Tight-radius bending without mandrel**

| Pipe OD range (mm) | Min. CLR | Max. CLR (mm) |
|--------------------|----------|---------------|
| 12 – 20            | 2D       | 43            |
| 22 – 30            | 2D       | 61            |
| 32 – 38            | 2D       | 76            |
| 40 – 42            | 2D       | 91            |
| 42 – 45            | 2D       | 128           |

### CAUTION

**Aluminium formers** must be used with guides only. They are used for bending hard and soft copper, aluminium and annealed brass pipe, and electrical conduit.

**Cast-iron formers** can be used with either guides or the twin-roller guide. They are used for bending hard copper, steel, stainless steel, phosphated steel, furniture tube and gas pipe.

## 4. Installation

---

### 4.1 Lifting and handling

- Lift the machine by the lifting eyebolt screwed into the top casing (Figure 11).
- The machine has handles for carrying by hand.

#### CAUTION

Remove the lifting eyebolt after installation and before operating the machine. It obstructs the working area.

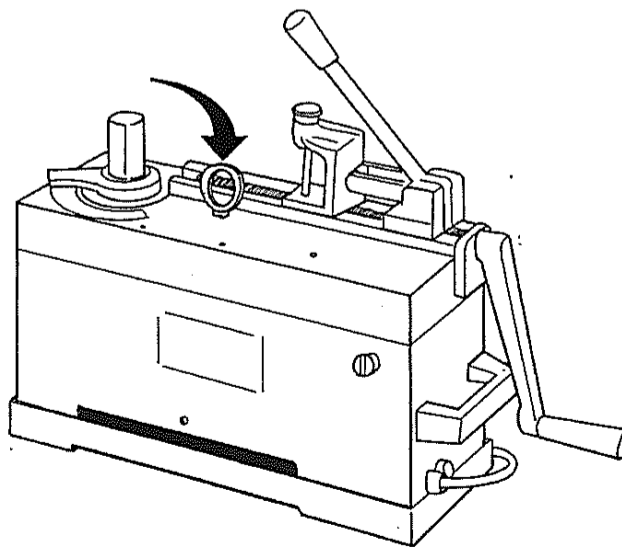


Figure 11 - Lifting eyebolt position

### 4.2 Storage

- The machine is packed in a cardboard box and must be kept upright. The upright position is marked on the packaging with symbols.
- After unpacking, lift the machine as described in Section 4.1. It can then be placed on a flat surface, with or without the optional stand or universal base.
- Store the machine in a covered, dry place. Keep it in its packaging until it is delivered or put into use.

### 4.3 Installing the machine

- Place the machine on a workbench, on the folding stand or on the universal base.
- Remove the lifting eyebolt from the top casing after installation (Section 4.1).

### 4.4 Space requirements

The required working area and safety clearance around the machine are shown in Figure 12. Also allow enough space to store pipes waiting to be bent and pipes that have been bent.

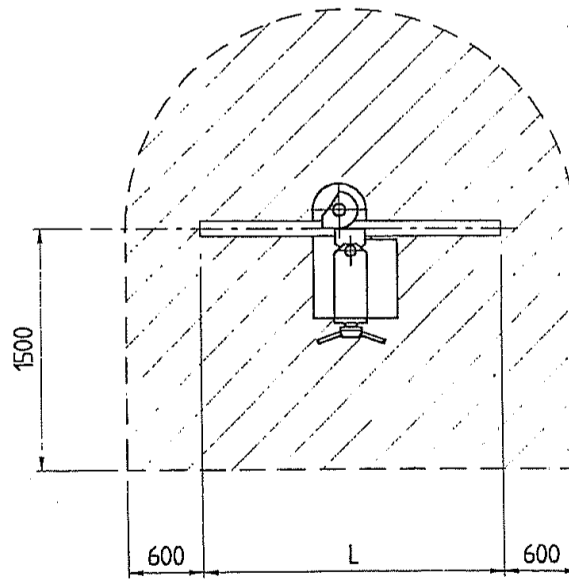


Figure 12 - Space requirements (mm). L = maximum length of pipe in its most awkward position

#### 4.5 Electrical connection

- The mains supply required is shown on the machine's rating plate.
- Before plugging in, check that the outlet voltage matches the machine voltage.

Electrical specifications are given in Section 3.4.

## 5. Operation

---

### 5.1 Bending thin-walled pipe with the guide

For hard copper and thin-walled pipe (maximum wall thickness 1.5 mm).

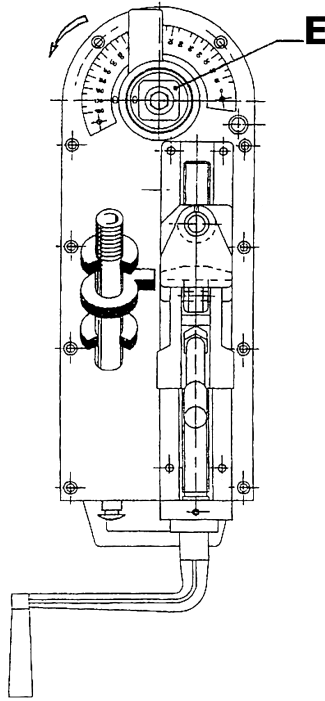


Figure 13 - Output shaft at start position (top view). E = output shaft.

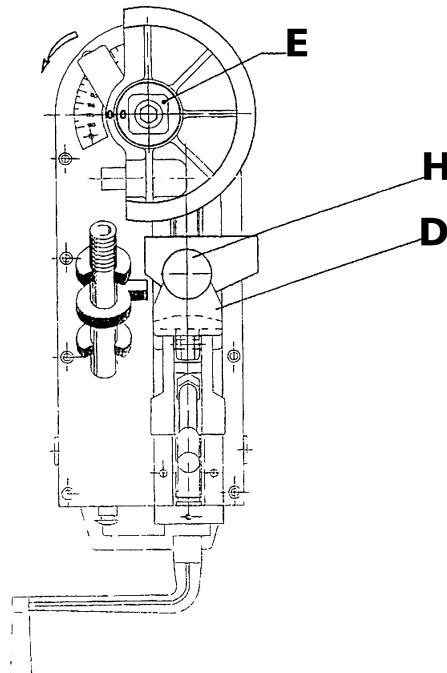
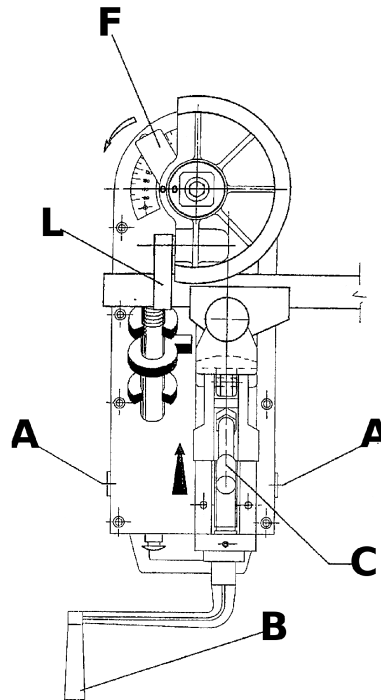


Figure 14 - Former and guide fitted (top view). D = guide support (jaw), E = output shaft, H = guide pin.

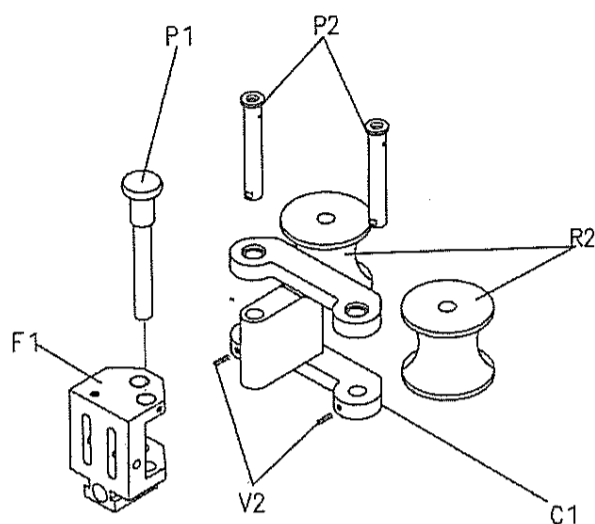


*Figure 15 - Pipe clamped, ready to bend (top view). A = two-hand start buttons, B = handwheel (crank), C = quick-positioning lever, F = bending angle indicator ring, L = locking ring.*

1. Turn the output shaft **E** anticlockwise to the end of its stroke.
2. Fit the former for the required pipe size on shaft **E**.
3. Place the guide in jaw **D** and insert pin **H**.
4. Check that the "0" mark on the former lines up with the "0" mark on the shaft.
5. Move lever **C** of the quick guide positioner in the direction of the arrow, using crank **B**.
6. Bring the guide towards the former by turning crank **B**, leaving a gap for the pipe.
7. Position the pipe as shown, then fit locking ring **L** over the pipe and onto the former pin.
8. For a good result, move the guide forward against the pipe to remove any play between the former, pipe and guide. This avoids excessive pressure.
9. Set the bending angle using ring indicator **F** on the graduated scale.
10. Press both start buttons **A** together and hold them until the end of the bending cycle. If you keep both buttons pressed for a few seconds, the machine returns automatically to its start position.
11. Release the bent pipe, then return the guide to its start position using the crank.
12. Remove the pipe and return the former to its start position by turning it anticlockwise by hand.

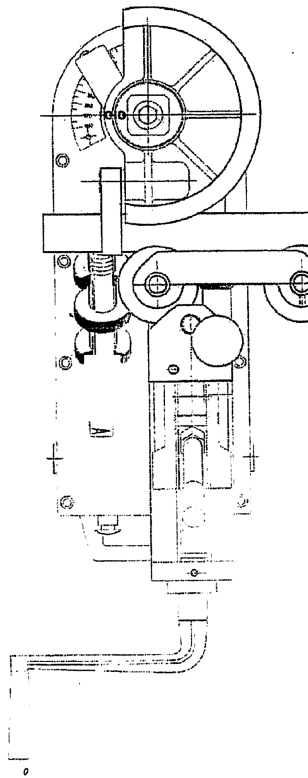
## 5.2 Bending thick-walled pipe with the twin-roller guide

For hydraulic or gas pipe and pipe with a minimum wall thickness of 2 mm.



*Figure 16 - Twin-roller guide assembly*

1. Fit the two rollers **R2** (matched to the pipe diameter) in the twin-roller guide **C1** and secure them with pins **P2**, tightened by the two screws **V2**.
2. Insert the complete guide into the guide support hole **F1** and secure it with pin **P1**.
3. Bring the twin-roller guide up to the pipe without applying any pressure.
4. The machine is now ready for the bending cycle.



*Figure 17 - Twin-roller guide in position (top view)*

### 5.3 Bending thick-walled pipe with a single roller

For hydraulic or gas pipe and pipe with a minimum wall thickness of 2 mm.

1. Position roller **M** by following the instructions for positioning the guide (Section 5.1).
2. Space the roller from the former by at least  $2 \times$  the pipe outside diameter.
3. Set the bending angle, allowing for the shift in the starting angle.

#### **CAUTION**

Use a single roller on the 42 models for pipe larger than 1" gas and equivalent mm sizes.

Use a single roller on the 60 models for pipe larger than 1¼" gas and equivalent mm sizes.

## 5.4 Bending with the moving arm

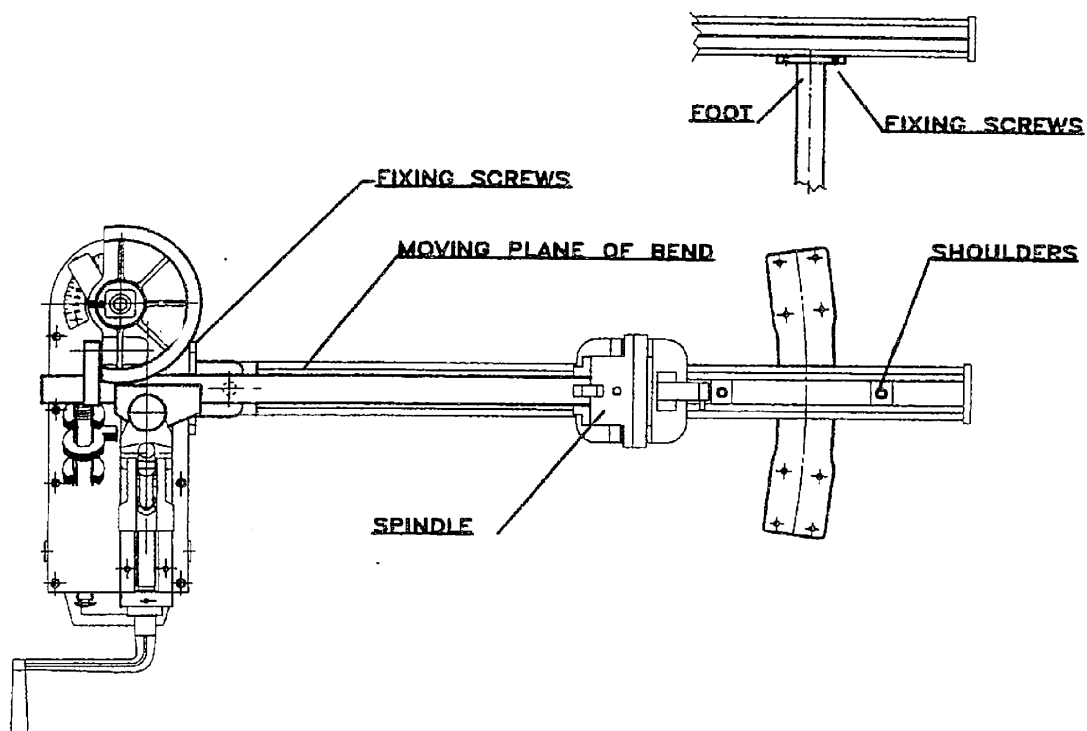


Figure 18 - Moving arm installed

1. Install the support foot approximately 200–300 mm from the end of the arm and secure it with screws.
2. Fix the complete moving arm to the right side of the machine using screws in the holes provided.

## 5.5 Programming (digital models only)

This section applies to the UNI42A1 and UNI60A1 only.

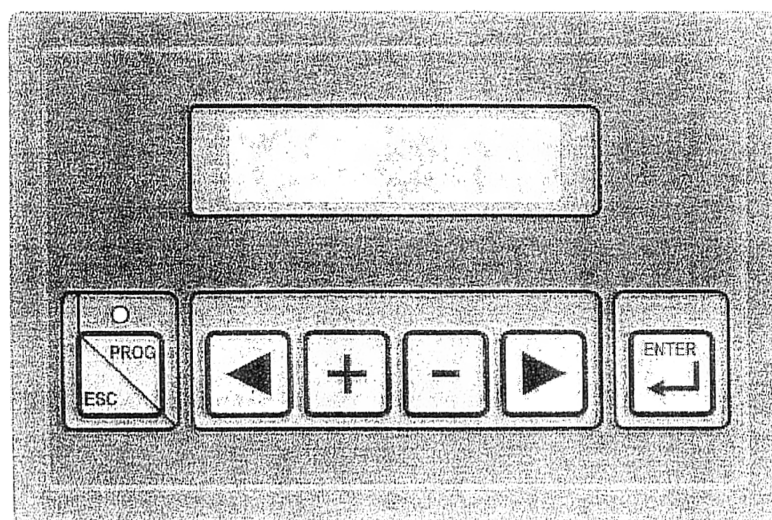


Figure 19 - Digital control panel

### 5.5.1 General information

- A bend always consists of one bending angle and one spring-back angle.

- A program is a series of stored bends.
- A program can store up to 9 bends.
- Up to 50 programs can be stored.
- The maximum total angle that can be stored is 220° - the sum of the bending angle and the spring-back angle (for example, 214° + 6°).
- The angle or program can only be changed with the machine in the "0" position.

### 5.5.2 Operating mode

When the machine is switched on, the bend is loaded automatically and the cursor is shown by the flashing "=" symbol. For example:

**BEND   O=100°   REC=15°**

- Press < and > to move the cursor between the bending angle field "O" and the spring-back angle field "REC".
- Press + and – to increase or decrease the angles.

The machine is now ready to bend.

### 5.5.3 Entering the menus

Press the **PRG** button (first on the left) to enter programming. The display shows four icons; select the required menu by touching it on the screen. From left to right, the icons are: single bend menu, program menu, language menu and maintenance menu.

To enter single bend mode, select the first icon, then press the **ENTER** button (last on the right).

### 5.5.4 Loading a program

1. Press **PRG**.
2. Select the second icon (program menu), then press **ENTER**.
3. Use > and < to select the program number to load.
4. Use + and – to view the bends within the program.
5. Press **ENTER** to confirm the selected program.
6. View the bends within the program by pressing + and –.
7. To change the bending angle or spring-back angle (as in bending mode), first press > or <, then + or –.
8. To end data entry, set the angle of the next bend to zero. For example, if the program has three bends, the fourth must be set to 0.
9. To exit the program, press **PRG** and select the required menu.

### 5.5.5 Changing the language

1. Press **PRG**.
2. Select the third icon (language menu, "ABC"), then press **ENTER**.
3. Select the language/country using + and –.
4. Press **ENTER** to confirm and exit the menu.

### 5.5.6 Maintenance menu

This menu gives a quick check of the electrical inputs.

1. Press **PRG**.
2. Select the fourth icon (maintenance menu), then press **ENTER**.
3. Activate an input (for example, the right-hand button). The corresponding status in the first row, "INP", changes from 0 to 1. Check the other inputs the same way.
4. To exit, press **PRG**.

To check the outputs, contact Capital Machinery Sales.

## CAUTION

Maintenance menu checks must only be carried out by skilled personnel.

### 5.5.7 Menu structure

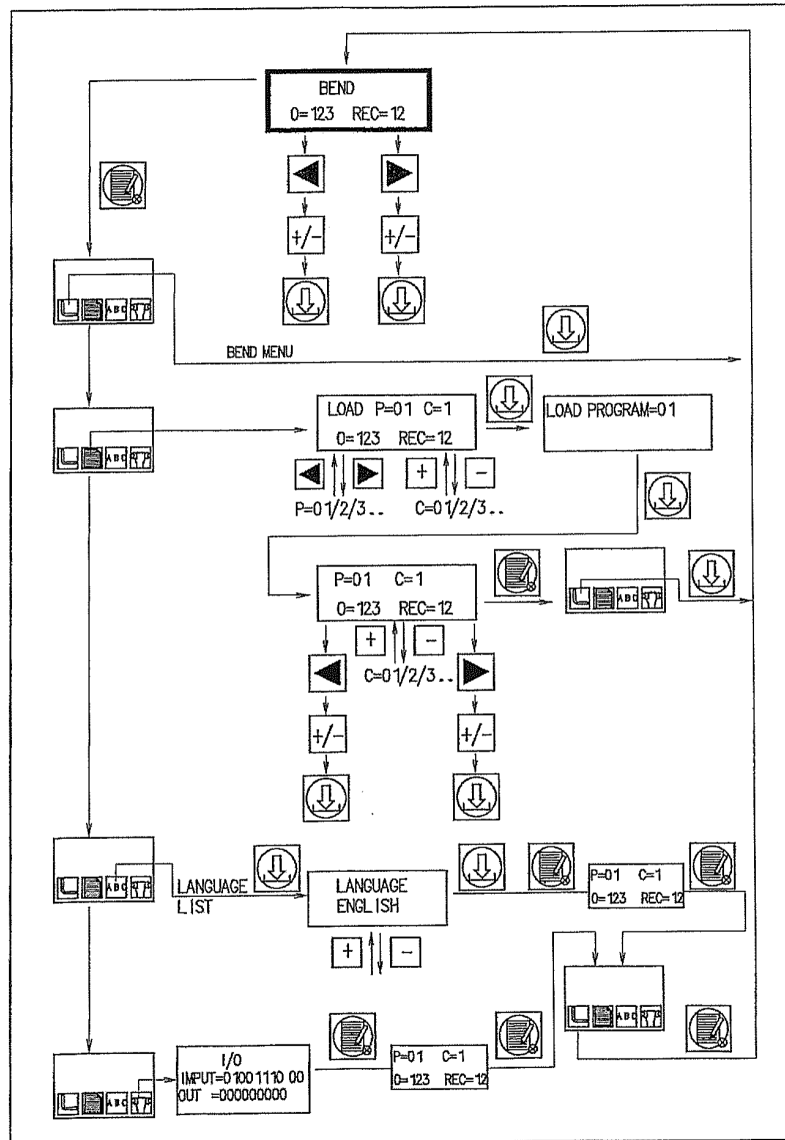


Figure 20 - Programming menu flowchart

### 5.6 Pipe development table

Use Table 7 to calculate cut lengths for 90° bends. In the formulas below, A is the dimension shown in Figure 21, R is the centreline radius and SV is the developed length of the 90° bend.

$$X = A - R \quad Y = A - R + SV$$

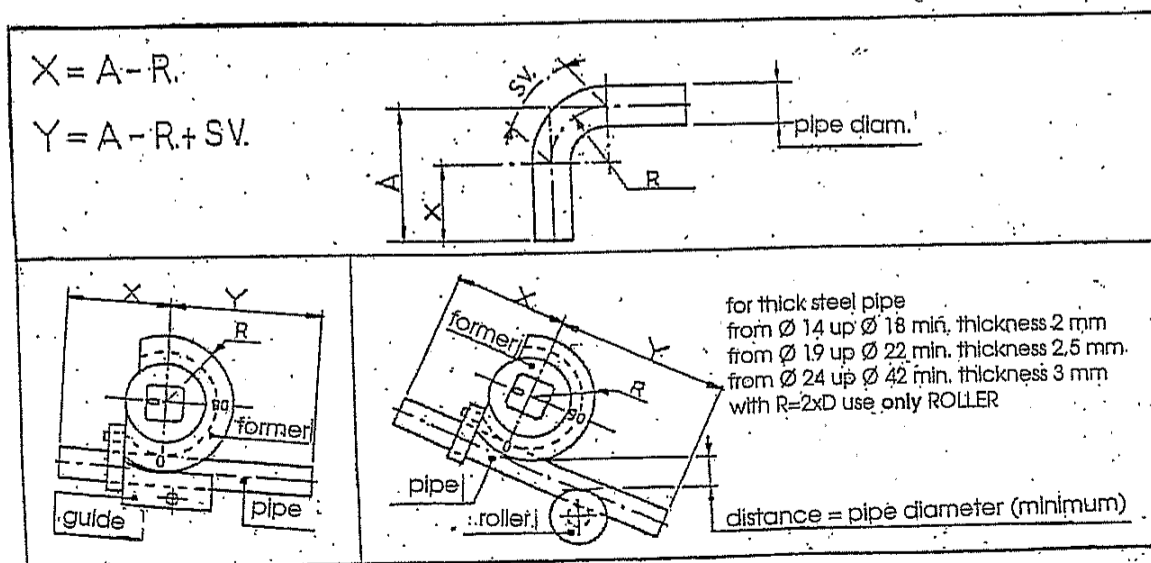


Figure 21 - Pipe development dimensions (with guide, left; with roller, right)

#### NOTE

For thick steel pipe at  $R = 2 \times D$ , use the roller only. Minimum wall thickness: 2 mm for Ø14–18; 2.5 mm for Ø19–22; 3 mm for Ø24–42.

Minimum distance between roller and former = pipe diameter.

For each pipe diameter and centreline radius, read R and SV from Table 7, then calculate  $X = A - R$  and  $Y = X + SV$ .

Table 7 - Pipe development for 90° bends (dimensions in mm)

| Pipe Ø | R = 2D | SV (2D) | R = 3D | SV (3D) | R = 4D | SV (4D) |
|--------|--------|---------|--------|---------|--------|---------|
| 10     | -      | -       | 30     | 47      | 40     | 63      |
| 12     | 24     | 37.5    | 36     | 56.5    | 48     | 75      |
| 14     | 28     | 44      | 42     | 66      | 56     | 88      |
| 15     | 30     | 47      | 45     | 70.5    | 60     | 94      |
| 16     | 32     | 50      | 48     | 75      | 64     | 100.5   |
| 17     | 34     | 53      | 51     | 80      | 68     | 106.5   |
| 18     | 36     | 56.5    | 54     | 84.5    | 72     | 113     |
| 19     | 38     | 59.5    | 57     | 89.5    | 76     | 119     |
| 20     | 40     | 62.5    | 60     | 94      | 80     | 125.5   |
| 22     | 44     | 69      | 66     | 103.5   | 88     | 138     |
| 24     | 48     | 75      | 72     | 113     | 96     | 150     |
| 25     | 50     | 78.5    | 75     | 117.5   | 100    | 157     |
| 26     | 52     | 81.5    | 78     | 122     | 104    | 163     |
| 27     | 54     | 84.5    | 81     | 127     | 108    | 169.5   |
| 28     | 56     | 87.5    | 84     | 131.5   | 112    | 175.5   |
| 30     | 60     | 94      | 90     | 141     | 120    | 188     |
| 32     | 64     | 100     | 96     | 150     | 128    | 201     |
| 34     | 68     | 106     | 102    | 160     | 136    | 213     |
| 35     | 70     | 109.5   | 105    | 164.5   | 140    | 219.5   |
| 37     | 74     | 116     | 111    | 174     | 148    | 232     |

| Pipe Ø | R = 2D | SV (2D) | R = 3D | SV (3D) | R = 4D | SV (4D) |
|--------|--------|---------|--------|---------|--------|---------|
| 38     | 76     | 119     | 114    | 179     | 152    | 238     |
| 40     | 80     | 125     | 120    | 188     | 160    | 251     |
| 42     | 84     | 131.5   | 126    | 197.5   | 168    | 263.5   |
| 45     | -      | -       | 135    | 212     | 180    | 282     |
| 50     | -      | -       | -      | -       | 200    | 314     |
| 54     | -      | -       | -      | -       | 216    | 339     |
| 60     | -      | -       | -      | -       | 240    | 376.5   |

## 6. Maintenance

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### 6.1 Inspections

Check the run-out of the output shaft: run the motor with a dial indicator mounted on a ground, flat surface and correctly aligned. The maximum permitted run-out is 0.05 **[mm - confirm unit]**. If the run-out exceeds this, replace the shaft.

### 6.2 Routine maintenance

| Task                                  | Frequency |
|---------------------------------------|-----------|
| Clean and lubricate the guide support | Daily     |
| Check the supply cable                | Daily     |
| General cleaning (dust and debris)    | Weekly    |

### 6.3 Gearbox service

Every 1,000 operating hours:

1. Open the gearbox.
2. Thoroughly clean out the old grease. Do not use solvents.
3. Regrease with Molykote grease.
4. Close the gearbox.

### 6.4 Decommissioning and disposal

- Move the machine to a suitably equipped area.
- Dismantle the machine, separating the metal parts by material (iron, aluminium, brass) from the electrical parts. The lubricants do not need to be collected separately, as the quantity is negligible.
- Metal parts can be sent to a metal recycler or foundry.
- Electrical parts, consisting of metals and plastics (motors, cables, instruments), must be sent to an authorised disposal service.

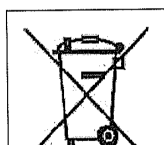


Figure 22 - Crossed-out wheeled bin symbol

The crossed-out wheeled bin symbol on the machine means that, at the end of its life, the machine must be taken to an e-waste collection point and must not be disposed of with general waste. Disposal must be carried out in accordance with applicable regulations.

Separating and recycling the machine's components helps avoid harm to the environment and health. For information on local collection services, contact your local council or waste authority.

## 7. Troubleshooting

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### 7.1 Alarms (digital models only)

The machine performs the following checks during operation:

| Display message    | Cause                                                                                                                                                                             | Action                                        |
|--------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|
| MAX. ANGLE 200°    | A bending angle and spring-back angle have been entered whose sum exceeds 210°.                                                                                                   | The entry is not accepted. Reduce the angles. |
| ENCODER EMERG.     | No signal from the encoder for 1.25 seconds after the motor starts (encoder damaged and/or blocked). The motor stops.                                                             | Press ESC to clear the alarm.                 |
| "0" STOP EMERGENCY | The "0" stop was not detected in RETURN mode (within a 20° margin of the expected position). The motor stops automatically.                                                       | Press ESC to clear the alarm.                 |
| ENCODER EMERG.     | The machine reached the "0" stop unexpectedly during operation (e.g. the encoder is not working correctly or the reading is affected). The machine returns to its start position. | Press ESC to clear the alarm.                 |
| EMERGENCY          | Emergency stop active.                                                                                                                                                            | Clear the emergency by turning anticlockwise. |

For any other problem, contact Capital Machinery Sales (Section 8).

## Appendix A - Spare parts

Item codes are shown exactly as supplied. 220 V and 110 V variants are listed where they differ (positions marked A and B).

### A.1 UNI42A - electric

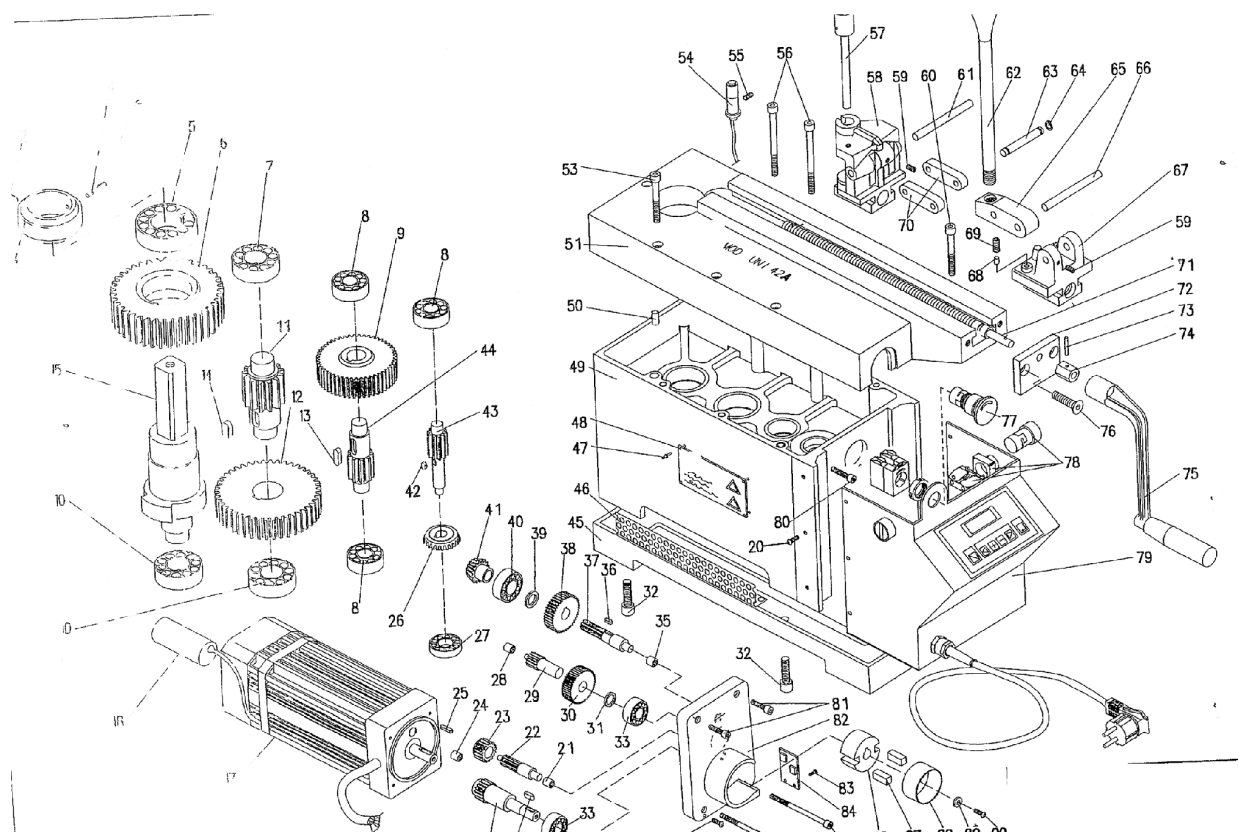


Figure 23 - Exploded view, UNI42A (electric). Reference drawing: digital model shown; parts that differ on the electric model are identified in the parts table below.

| Pos. | Item code | Description            | Qty | Pos. | Item code | Description                    | Qty |
|------|-----------|------------------------|-----|------|-----------|--------------------------------|-----|
| 1    | 500067    | Positioning ring       | 1   | 48   | 025201    | Plate                          | 1   |
| 2    | 019017    | Screw                  | 2   | 49   | 110136.1  | Gearbox                        | 1   |
| 4    | 701017    | Friction plate         | 1   | 50   | 595085    | Bushing                        | 2   |
| 5    | 001004    | Bearing                | 1   | 51   | 110132    | Gearbox cover                  | 1   |
| 6    | 544298.1  | Gear                   | 1   | 52   | 025020    | Graduated ring                 | 1   |
| 7    | 001098    | Bearing                | 3   | 53   | 015003    | Screw                          | 1   |
| 8    | 001001    | Bearing                | 2   | 54   | 008125    | Sensor                         | 2   |
| 9    | 544074    | Crown gear             | 1   | 55   | 019007    | Screw                          | 2   |
| 11   | 544348    | Driven pinion          | 1   | 56   | 015037    | Screw                          | 2   |
| 12   | 544349    | Crown gear             | 1   | 57   | 500318    | D.14 guide support pin         | 1   |
| 13   | 020008    | Key                    | 1   | 58   | 220498.1  | D.14 guide support             | 1   |
| 14   | 020016    | Key                    | 1   | 60   | 015038    | Screw                          | 5   |
| 15   | 544326.1  | Shaft                  | 1   | 62   | 514326    | Lever                          | 1   |
| 16   | 008260    | Capacitor              | 1   | 63   | 526070    | Pin and circlip                | 2   |
| 17A  | 007105.2  | 220 V motor with brake | 1   | 64   | 023047    | Circlip                        | 6   |
| 17B  | 007160.2  | 110 V motor with brake | 1   | 65   | 514339    | Locking lever con rod          | 1   |
| 18   | 544307.1  | Motor pinion           | 1   | 66   | 526044    | Con rod pin                    | 1   |
| 19   | 001169    | Bearing                | 1   | 67   | 220462.1  | Quick guide positioner support | 1   |
| 20   | 015057    | Screw                  | 10  | 68   | 315029.1  | Friction plate                 | 2   |
| 22   | 544067.1  | Motor pinion           | 1   | 69   | 019018    | Screw                          | 2   |
| 23   | 544308.1  | Motor crown gear       | 1   | 70   | 514075    | Quick guide positioner con rod | 2   |
| 24   | 001005    | Bearing                | 2   | 71   | 524019.1  | Guide support adjusting screw  | 1   |
| 25   | 020026    | Key                    | 1   | 71A  | 001160    | Bearing                        | 1   |
| 26   | 534039    | Bevel crown gear       | 1   | 71B  | 001158    | Bearing                        | 1   |
| 27   | 001040    | Bearing                | 1   | 71C  | 001159    | Bearing                        | 1   |
| 28   | 001170    | Bearing                | 2   | 72   | 515483.1  | Adjusting screw flange         | 1   |
| 29   | 544368.1  | Toothed pinion         | 1   | 73   | 018002    | Pin                            | 1   |
| 30   | 544068.1  | Crown gear             | 1   | 74   | 515482    | Adjusting screw hexagon        | 1   |
| 31   | 517022    | Spacer                 | 1   | 75   | 000955    | Operating lever                | 1   |
| 32   | 015016    | Screw                  | 4   | 76   | 016042    | Screw                          | 2   |
| 33   | 001039    | Bearing                | 2   | 77   | 008304    | Emergency stop button          | 1   |
| 35   | 018074    | Centring pin           | 3   | 78   | 008155    | Start button                   | 2   |
| 36   | 544070.1  | Crown gear             | 1   | 79A  | 0001062   | 220 V PCB                      | 1   |
| 37   | 020002    | Key                    | 1   | 79B  | 0001065   | 110 V PCB                      | 1   |
| 38   | 544284.1  | Toothed shaft          | 1   | 80   | 015009    | Screw                          | 2   |
| 39   | 595010    | Bushing                | 1   | 81   | 015008    | Screw                          | 2   |
| 40   | 001008    | Bearing                | 1   | 82   | 135165.1  | Flange                         | 1   |
| 41   | 534025    | Bevel pinion           | 1   | 83   | 015003    | Screw                          | 2   |
| 42   | 020004    | Key                    | 1   | 84   | 015146    | Screw                          | 1   |
| 43   | 544283    | Pinion                 | 1   | 85A  | 315079    | Washer                         | 1   |
| 44   | 544075    | Pinion                 | 1   | 85B  | 023066    | Circlip                        | 1   |
| 45   | 110055    | Gearbox base           | 1   | 86   | 514801    | Set screw                      | 1   |
| 46   | 601003    | Protection sheet       | 2   | 87   | 515710    | Sensor plate                   | 1   |
| 47   | 024005    | Rivet                  | 4   | 88   | 595191    | Sensor bushing                 | 1   |

## A.2 UNI42A1 - digital

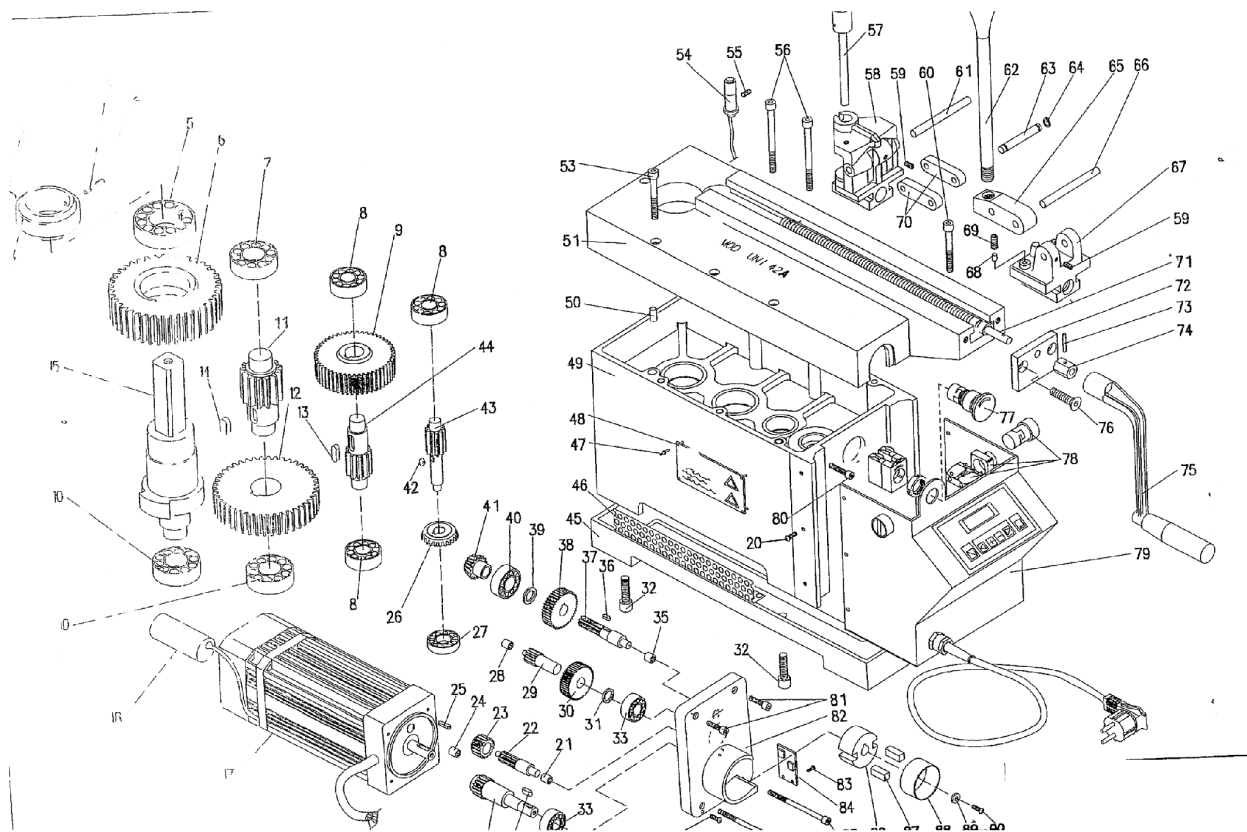


Figure 24 - Exploded view

| Pos. | Item code | Description      | Qty | Pos. | Item code | Description                      | Qty |
|------|-----------|------------------|-----|------|-----------|----------------------------------|-----|
| 1    | 517031    | Positioning ring | 1   | 53   | 015003    | Screw                            | 1   |
| 5    | 001004    | Bearing          | 1   | 54   | 008125    | Sensor                           | 1   |
| 6    | 544298.1  | Gear             | 1   | 55   | 019007    | Screw                            | 2   |
| 7    | 001098    | Bearing          | 3   | 56   | 015037    | Screw                            | 2   |
| 8    | 001001    | Bearing          | 2   | 57   | 500318    | D.14 guide support pin           | 1   |
| 9    | 544074    | Crown gear       | 1   | 58   | 220498.1  | D.14 guide support               | 1   |
| 11   | 544348    | Driven pinion    | 1   | 60   | 015038    | Screw                            | 5   |
| 12   | 544349    | Crown gear       | 1   | 62   | 514326    | Lever                            | 1   |
| 13   | 020008    | Key              | 1   | 63   | 526070    | Pin with circlip                 | 2   |
| 14   | 020016.RR | Key              | 1   | 64   | 023047    | Circlip                          | 6   |
| 15   | 544326.1  | Shaft            | 1   | 65   | 514339    | Locking lever con rod            | 1   |
| 16   | 008260    | Capacitor        | 1   | 66   | 526044    | Con rod pin                      | 1   |
| 17A  | 007105.2  | 220 V motor      | 1   | 67   | 220462.1  | Quick guide positioner support   | 1   |
| 17B  | 007160.2  | 110 V motor      | 1   | 68   | 315029.1  | Friction plate                   | 2   |
| 18   | 544343.1  | Motor pinion     | 1   | 69   | 019018    | Screw                            | 2   |
| 19   | 020010    | Key              | 1   | 70   | 514075    | Quick guide positioner con rod   | 2   |
| 20   | 015057    | Screw            | 10  | 71   | 524019.1  | Guide support adjusting screw    | 1   |
| 21   | 001169    | Bearing          | 1   | 71A  | 001160    | Bearing                          | 1   |
| 22   | 544067.1  | Motor pinion     | 1   | 71B  | 001158    | Bearing                          | 1   |
| 23   | 544308.1  | Motor crown gear | 1   | 71C  | 001159    | Bearing                          | 1   |
| 24   | 001005    | Bearing          | 2   | 72   | 515483.1  | Adjusting screw flange           | 1   |
| 25   | 020026    | Key              | 1   | 73   | 018002    | Pin                              | 1   |
| 26   | 534039    | Bevel crown gear | 1   | 74   | 515482    | Adjusting screw hexagon          | 1   |
| 27   | 001040    | Bearing          | 1   | 75   | 000955    | Operating lever                  | 1   |
| 28   | 001170    | Bearing          | 2   | 76   | 016042    | Screw                            | 2   |
| 29   | 544368.1  | Pinion           | 1   | 77   | 008304    | Emergency stop button            | 1   |
| 30   | 544068.1  | Crown gear       | 1   | 78   | 008331    | Start button                     | 2   |
| 31   | 517022    | Spacer           | 1   | 79A  | 0001060   | 220 V PCB with metal front panel | 1   |
| 32   | 015016    | Screw            | 4   | 79B  | 0001071   | 110 V PCB with metal front panel | 1   |
| 33   | 001039    | Bearing          | 2   | 80   | 015009    | Screw                            | 2   |
| 35   | 018074    | Centring pin     | 3   | 81   | 015008    | Screw                            | 2   |
| 36   | 544070.1  | Crown gear       | 1   | 82   | 135165.1  | Flange                           | 1   |
| 37   | 020002    | Key              | 1   | 83   | 017026    | Screw                            | 2   |
| 38   | 544284.1  | Toothed shaft    | 1   | 84   | 008392.1  | Encoder card                     | 1   |
| 39   | 515253    | Bushing          | 1   | 85   | 015003    | Screw                            | 2   |
| 40   | 001008    | Bearing          | 1   | 86   | 135149    | Magnet flange                    | 1   |
| 41   | 534025    | Bevel pinion     | 1   | 87   | 008391    | Magnet                           | 2   |
| 42   | 020004    | Key              | 1   | 88   | 008307    | Magnet sheath                    | 1   |
| 43   | 544283    | Pinion           | 1   | 89   | 021015    | Washer                           | 1   |
| 44   | 544075    | Pinion           | 1   | 90   | 015071    | Screw                            | 1   |
| 45   | 110055    | Gearbox base     | 1   | 91   | 015146    | Screw                            | 1   |
| 46   | 601003    | Protection sheet | 2   | 92A  | 315079    | Friction washer                  | 1   |
| 47   | 024005    | Rivet            | 4   | 92B  | 315079    | Circlip                          | 1   |
| 48   | 025201    | Plate            | 1   | 93   | 514801    | Set screw                        | 1   |
| 49   | 110136.1  | Gearbox          | 1   | 94   | 515710    | Sensor plate                     | 1   |
| 50   | 595085    | Bushing          | 2   | 95   | 595191    | Sensor bushing                   | 1   |
| 51   | 110132    | Gearbox cover    | 1   |      |           |                                  |     |

### A.3 UNI60A - electric

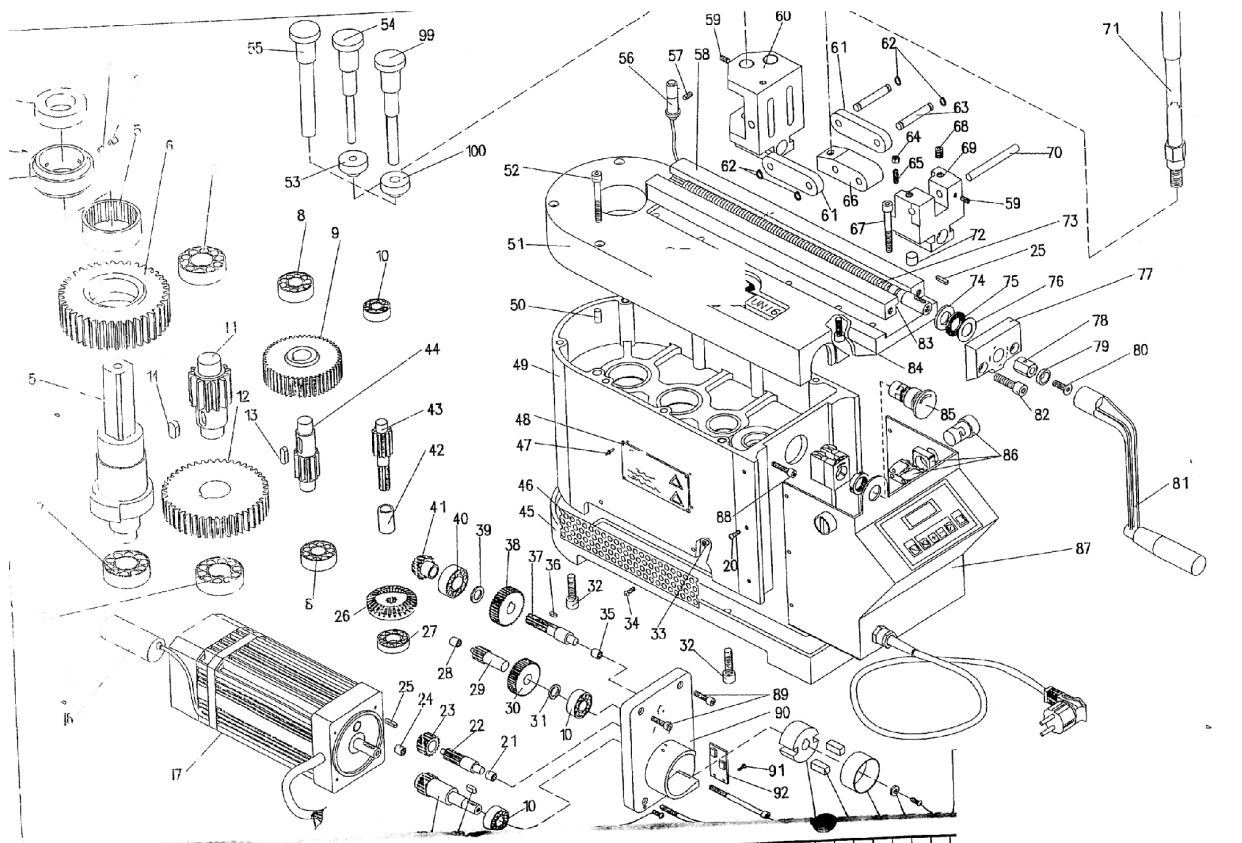


Figure 25 - Exploded view, UNI60A (electric). Reference drawing: digital model shown; parts that differ on the electric model are identified in the parts table below.

| Pos. | Item code | Description            | Qty | Pos. | Item code | Description                    | Qty |
|------|-----------|------------------------|-----|------|-----------|--------------------------------|-----|
| 1    | 210034    | Positioning ring       | 1   | 48   | 025021    | Aluminium plate                | 1   |
| 2    | 019017    | Screw                  | 2   | 49   | 110137.1  | Gearbox                        | 1   |
| 3    | 517025    | Output shaft spacer    | 1   | 50   | 595086    | Bushing                        | 2   |
| 4    | 701018    | Friction plate         | 1   | 51   | 110134    | Gearbox cover                  | 1   |
| 5    | 001029    | Bearing                | 1   | 52   | 025020    | Graduated scale                | 1   |
| 6    | 544352    | Gear                   | 1   | 53   | 015006    | Screw                          | 8   |
| 7    | 001021    | Bearing                | 2   | 54   | 008125    | Sensor                         | 2   |
| 7A   | 001063    | Bearing                | 1   | 55   | 019007    | Screw                          | 2   |
| 8    | 001003    | Bearing                | 1   | 56   | 514516    | Right guide support housing    | 1   |
| 8A   | 001098    | Bearing                | 1   | 59   | 015007    | Screw                          | 2   |
| 9    | 544076    | Crown gear             | 1   | 60   | 000660    | Guide support pin              | 1   |
| 10   | 001039    | Bearing                | 2   | 63   | 524019    | Guide support adjusting screw  | 1   |
| 11   | 544094    | Driven pinion          | 1   | 66A  | 001160    | Bearing                        | 1   |
| 12   | 544093    | Crown gear             | 1   | 66B  | 001158    | Bearing                        | 1   |
| 13   | 020009    | Key                    | 1   | 66C  | 001159    | Bearing                        | 1   |
| 14   | 020011    | Key                    | 1   | 67   | 515483.1  | Adjusting screw flange         | 1   |
| 15   | 544351    | Output shaft           | 1   | 68   | 018002    | Pin                            | 1   |
| 16   | 008261    | Capacitor              | 1   | 69   | 515482    | Adjusting screw hexagon        | 1   |
| 17A  | 007110.2  | 220 V motor with brake | 1   | 71   | 000955    | Crank handle                   | 1   |
| 17B  | 007165.2  | 110 V motor with brake | 1   | 72   | 015028    | Screw                          | 3   |
| 18   | 544307.1  | Motor pinion           | 1   | 73   | 514515    | Left guide support housing     | 1   |
| 19   | 001169    | Bearing                | 1   | 74   | 015016    | Screw                          | 12  |
| 20   | 015057    | Screw                  | 11  | 75   | 008304    | Emergency stop button          | 1   |
| 22   | 544067.1  | Motor pinion           | 1   | 76   | 008155    | Start button                   | 2   |
| 23   | 544308.1  | Motor crown gear       | 1   | 77A  | 0001063   | 220 V complete PCB             | 1   |
| 24   | 001005    | Bearing                | 2   | 77B  | 0001066   | 110 V complete PCB             | 1   |
| 25   | 020026    | Key                    | 2   | 78   | 015009    | Screw                          | 2   |
| 26   | 534038    | Crown wheel            | 1   | 79   | 015008    | Screw                          | 2   |
| 27   | 001006    | Bearing                | 1   | 80   | 135165.1  | Flange                         | 1   |
| 28   | 001170    | Bearing                | 2   | 81   | 015003    | Screw                          | 2   |
| 29   | 544368.1  | Toothed pinion         | 1   | 82   | 515328    | D.18/14 guide support pin      | 1   |
| 30   | 544068.1  | Crown gear             | 1   | 83   | 515329    | D.14 guide support pin ring    | 1   |
| 31   | 517021    | Spacer                 | 1   | 84   | 514518    | Guide support                  | 1   |
| 32   | 014012    | Screw                  | 3   | 85   | 514061    | Operating con rod              | 2   |
| 33   | 002034    | Nut                    | 2   | 85A  | 018058    | Pin                            | 1   |
| 34   | 017007    | Screw                  | 4   | 86   | 023047    | Circlip                        | 4   |
| 35   | 018074    | Centring pin           | 3   | 87   | 526044    | Con rod pin                    | 1   |
| 36   | 544070.1  | Crown gear             | 1   | 88   | 019018    | Screw                          | 2   |
| 37   | 020002    | Key                    | 1   | 89   | 315029.1  | Friction plate                 | 2   |
| 38   | 544284.1  | Toothed shaft          | 1   | 90   | 514339    | Locking lever con rod          | 1   |
| 39   | 515253    | Washer                 | 1   | 92   | 220462.1  | Quick guide positioner support | 1   |
| 40   | 001008    | Bearing                | 1   | 93   | 526070    | Pin                            | 1   |
| 41   | 534024    | Bevel pinion           | 1   | 94   | 514326    | Locking lever                  | 1   |
| 42   | 115004    | Spacer                 | 1   | 95   | 595191    | Sensor bushing                 | 1   |
| 43   | 544286    | Output pinion          | 1   | 96   | 515718.1  | Sensor plate                   | 1   |
| 44   | 544077    | Pinion                 | 1   | 97   | 514801    | Set screw                      | 1   |
| 45   | 110052    | Gearbox base           | 1   | 98   | 015018.1  | Screw                          | 1   |
| 46   | 601004    | Protection sheet       | 2   | 99   | 315079    | Washer                         | 1   |
| 47   | 024005    | Rivet                  | 4   | 100  | 023066    | Circlip                        | 1   |

## A.4 UNI60A1 - digital

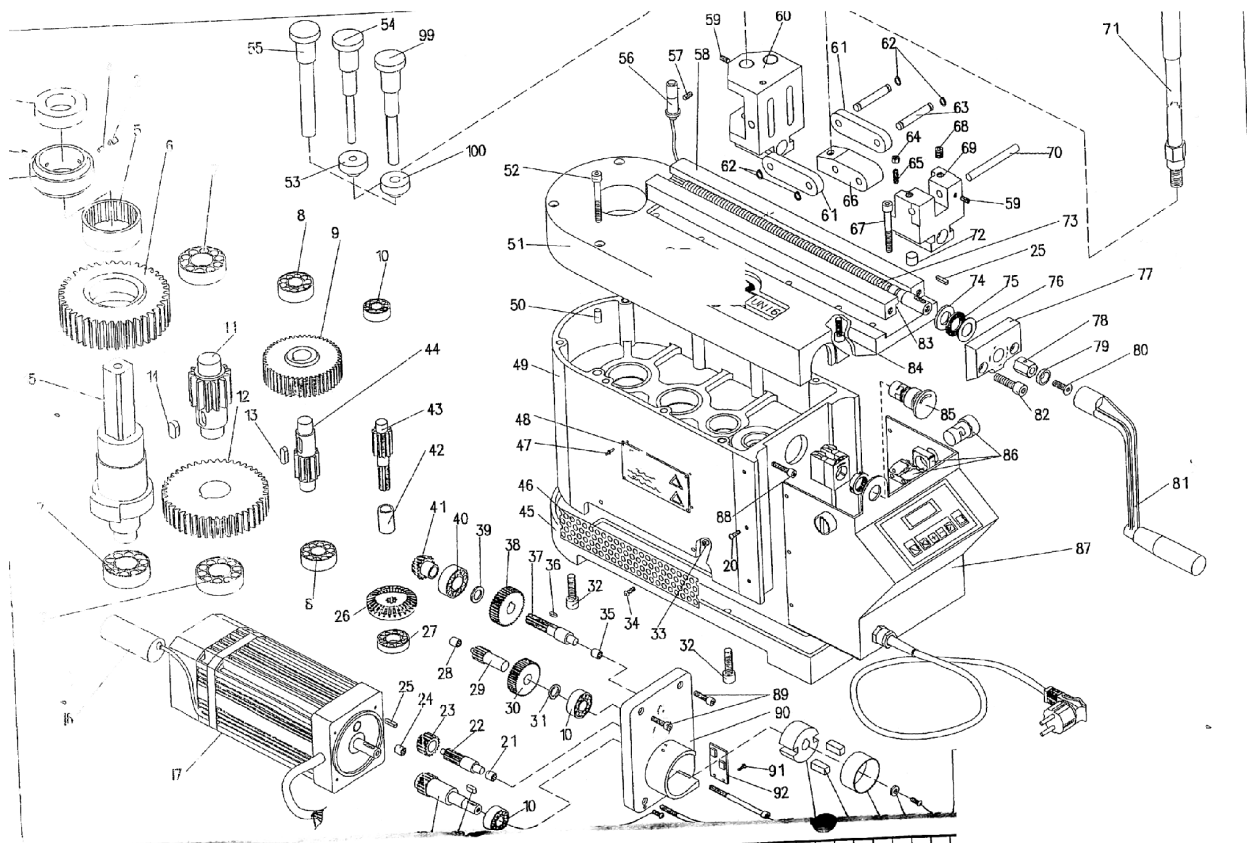


Figure 26 - Exploded view

| Pos. | Item code | Description            | Qty | Pos. | Item code | Description                    | Qty |
|------|-----------|------------------------|-----|------|-----------|--------------------------------|-----|
| 1    | 517049    | Positioning ring       | 1   | 52A  | 524075    | Sensor closing stopper         | 1   |
| 3    | 517025    | Output shaft spacer    | 1   | 52B  | 019023    | Screw                          | 1   |
| 5    | 001029    | Bearing                | 1   | 53   | 015018.1  | Screw                          | 1   |
| 6    | 544352    | Output gear            | 1   | 54A  | 315079    | Friction washer                | 1   |
| 7    | 001021    | Bearing                | 2   | 54B  | 023066    | Circlip                        | 1   |
| 7A   | 001063    | Bearing                | 1   | 55   | 000660    | Guide support pin              | 1   |
| 8    | 001003    | Bearing                | 2   | 56   | 008125    | Sensor                         | 1   |
| 8A   | 001098    | Bearing                | 2   | 57   | 514801    | Set screw                      | 1   |
| 9    | 544076    | Crown gear             | 1   | 57A  | 515718.1  | Sensor plate                   | 1   |
| 10   | 001039    | Bearing                | 2   | 57B  | 595191    | Sensor bushing                 | 1   |
| 11   | 544094    | Driven pinion          | 1   | 58   | 514516    | Right guide support housing    | 1   |
| 12   | 544093    | Crown gear             | 1   | 59   | 019023    | Screw                          | 1   |
| 13   | 020009    | Key                    | 1   | 60   | 514518    | Guide support                  | 1   |
| 14   | 020011    | Key                    | 1   | 60A  | 018058    | Pin                            | 1   |
| 15   | 544351    | Output shaft           | 1   | 61   | 514061    | Operating con rod              | 2   |
| 16   | 008261    | Capacitor              | 1   | 62   | 023047    | Circlip                        | 4   |
| 17A  | 007110.2  | 220 V motor with brake | 1   | 63   | 526044    | Con rod pin                    | 1   |
| 17B  | 007165.2  | 110 V motor with brake | 1   | 64   | 019018    | Pin                            | 2   |
| 18   | 544343.1  | Motor pinion           | 1   | 65   | 315029.1  | Friction plate                 | 2   |
| 19   | 020010    | Key                    | 1   | 66   | 514339    | Locking lever con rod          | 1   |
| 20   | 015057    | Screw                  | 7   | 67   | 015007    | Socket screw                   | 8   |
| 21   | 001169    | Bearing                | 1   | 69   | 220462.1  | Quick guide positioner support | 1   |
| 22   | 544067.1  | Motor pinion           | 1   | 70   | 526070    | Pin                            | 1   |
| 23   | 544308.1  | Motor crown gear       | 1   | 71   | 514326    | Locking lever                  | 1   |
| 24   | 001005    | Bearing                | 2   | 73   | 524019.1  | Adjusting screw                | 1   |
| 25   | 020026    | Key                    | 1   | 76A  | 001160    | Bearing                        | 1   |
| 26   | 534038    | Bevel crown gear       | 1   | 76B  | 001158    | Bearing                        | 1   |
| 27   | 001006    | Bearing                | 1   | 76C  | 001159    | Bearing                        | 1   |
| 28   | 001170    | Bearing                | 2   | 77   | 515483.1  | Adjusting screw flange         | 1   |
| 29   | 544368.1  | Toothed pinion         | 1   | 78   | 018002    | Pin                            | 1   |
| 30   | 544068.1  | Crown gear             | 1   | 79   | 515482    | Adjusting screw hexagon        | 1   |
| 31   | 517022    | Spacer                 | 1   | 81   | 000955    | Operating handle               | 1   |
| 32   | 015028    | Socket screw           | 3   | 82   | 016042    | Screw                          | 2   |
| 33   | 002034    | Nut                    | 4   | 83   | 514515    | Left guide support housing     | 1   |
| 34   | 017007    | Screw                  | 4   | 84   | 015016    | Screw                          | 12  |
| 35   | 018074    | Centring pin           | 3   | 85   | 008304    | Emergency stop button          | 1   |
| 36   | 544070.1  | Crown gear             | 1   | 86   | 008331    | Start button                   | 1   |
| 37   | 020002    | Key                    | 1   | 87A  | 0001061   | 220 V complete PCB             | 1   |
| 38   | 544284.1  | Toothed shaft          | 1   | 87B  | 0001072   | 110 V complete PCB             | 1   |
| 39   | 515253    | Washer                 | 1   | 88   | 015009    | Screw                          | 2   |
| 40   | 001008    | Bearing                | 1   | 89   | 015008    | Screw                          | 2   |
| 41   | 534024    | Bevel pinion           | 1   | 90   | 135165.1  | Flange                         | 1   |
| 42   | 115004    | Spacer                 | 1   | 91   | 017026    | Screw                          | 2   |
| 43   | 544286    | Output pinion          | 1   | 92   | 008392.1  | Encoder card                   | 1   |
| 44   | 544077    | Pinion                 | 1   | 93   | 015003    | Screw                          | 2   |
| 45   | 110052    | Gearbox base           | 1   | 94   | 135149.1  | 4-magnet flange                | 1   |
| 46   | 601004    | Protection sheet       | 2   | 95   | 008391    | Magnet                         | 4   |
| 47   | 024005    | Rivet                  | 4   | 96   | 008307    | Magnet sheath                  | 1   |
| 48   | 025201    | Aluminium plate        | 1   | 97   | 021015    | Washer                         | 1   |
| 49   | 110137.1  | Gearbox                | 1   | 98   | 015071    | Screw                          | 1   |
| 50   | 595086    | Bushing                | 2   | 99   | 515328    | D.18/14 guide support pin      | 1   |
| 51   | 110134    | Gearbox cover          | 1   | 100  | 515329    | D.14 guide support pin ring    | 1   |
| 52   | 015006    | Socket screw           | 2   |      |           |                                |     |

## A.5 UNI60A1 - digital, small-size shaft version

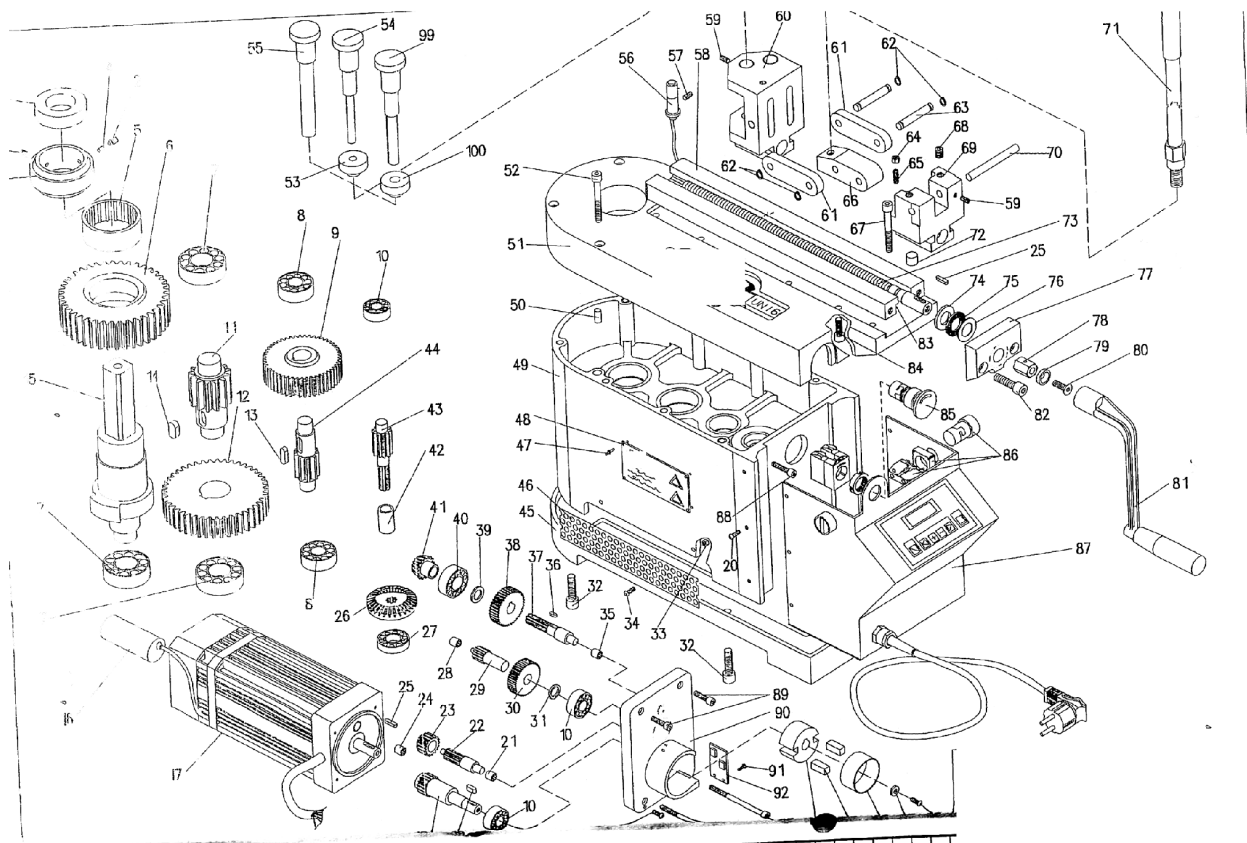


Figure 27 - Exploded view, UNI60A1 small-size shaft version. Reference drawing: standard shaft shown; positions 2 and 4 are replaced by the small-size shaft parts listed below.

| Pos. | Item code | Description            | Qty | Pos. | Item code | Description                    | Qty |
|------|-----------|------------------------|-----|------|-----------|--------------------------------|-----|
| 1    | 517057    | Positioning ring       | 1   | 52   | 015006    | Socket screw                   | 2   |
| 2    | 544454    | Small-size shaft       | 1   | 52A  | 0001167   | Guide support adaptor          | 1   |
| 3    | 517025    | Output shaft spacer    | 1   | 52B  | 545010    | D.8 guide pin                  | 1   |
| 4    | 544455    | D.32 square shaft      | 1   | 53   | 315079    | Screw friction washer          | 1   |
| 5    | 001029    | Bearing                | 1   | 54A  | 023066    | Circlip                        | 1   |
| 6    | 544352    | Output gear            | 1   | 54B  | 015018.1  | Screw                          | 1   |
| 7    | 001021    | Bearing                | 2   | 55   | 000660    | Guide support pin              | 1   |
| 7A   | 001063    | Bearing                | 1   | 56   | 008125    | Sensor                         | 1   |
| 8    | 001003    | Bearing                | 2   | 57   | 514801    | Set screw                      | 1   |
| 8A   | 001098    | Bearing                | 2   | 57A  | 515718.1  | Sensor plate                   | 1   |
| 9    | 544076    | Crown gear             | 1   | 57B  | 595191    | Sensor bushing                 | 1   |
| 10   | 001039    | Bearing                | 2   | 58   | 514516    | Right guide support housing    | 1   |
| 11   | 544094    | Driven pinion          | 1   | 59   | 019023    | Screw                          | 1   |
| 12   | 544093    | Crown gear             | 1   | 60   | 514518    | Guide support                  | 1   |
| 13   | 020009    | Key                    | 1   | 60A  | 018058    | Pin                            | 1   |
| 14   | 020011    | Key                    | 1   | 61   | 514061    | Operating con rod              | 2   |
| 15   | 544453    | Output shaft           | 1   | 62   | 023047    | Circlip                        | 4   |
| 16   | 008261    | Capacitor              | 1   | 63   | 526044    | Con rod pin                    | 1   |
| 17A  | 007110.2  | 220 V motor with brake | 1   | 64   | 019018    | Pin                            | 2   |
| 17B  | 007165.2  | 110 V motor with brake | 1   | 65   | 315029.1  | Friction plate                 | 2   |
| 18   | 544343.1  | Motor pinion           | 1   | 66   | 514339    | Locking lever con rod          | 1   |
| 19   | 020010    | Key                    | 1   | 67   | 015007    | Socket screw                   | 8   |
| 20   | 015057    | Screw                  | 7   | 69   | 220462.1  | Quick guide positioner support | 1   |
| 21   | 001169    | Bearing                | 1   | 70   | 526070    | Pin                            | 1   |
| 22   | 544067.1  | Motor pinion           | 1   | 71   | 514326    | Locking lever                  | 1   |
| 23   | 544308.1  | Motor crown gear       | 1   | 73   | 524019.1  | Adjusting screw                | 1   |
| 24   | 001005    | Bearing                | 2   | 76A  | 001160    | Bearing                        | 1   |
| 25   | 020026    | Key                    | 1   | 76B  | 001158    | Bearing                        | 1   |
| 26   | 534038    | Bevel crown gear       | 1   | 76C  | 001159    | Bearing                        | 1   |
| 27   | 001006    | Bearing                | 1   | 77   | 515483.1  | Adjusting screw flange         | 1   |
| 28   | 001170    | Bearing                | 2   | 78   | 018002    | Pin                            | 1   |
| 29   | 544368.1  | Toothed pinion         | 1   | 79   | 515482    | Adjusting screw hexagon        | 1   |
| 30   | 544068.1  | Crown gear             | 1   | 81   | 000955    | Operating handle               | 1   |
| 31   | 517021    | Spacer                 | 1   | 82   | 016042    | Screw                          | 2   |
| 32   | 015028    | Socket screw           | 3   | 83   | 514515    | Left guide support housing     | 1   |
| 33   | 002034    | Nut                    | 4   | 84   | 015016    | Screw                          | 12  |
| 34   | 017007    | Screw                  | 4   | 85   | 008304    | Emergency stop button          | 1   |
| 35   | 018074    | Centring pin           | 3   | 86   | 008331    | Start button                   | 1   |
| 36   | 544070.1  | Crown gear             | 1   | 87A  | 0001061   | 220 V complete PCB             | 1   |
| 37   | 020002    | Key                    | 1   | 87B  | 0001072   | 110 V complete PCB             | 1   |
| 38   | 544284.1  | Toothed shaft          | 1   | 88   | 015009    | Screw                          | 2   |
| 39   | 515253    | Washer                 | 1   | 89   | 015008    | Screw                          | 2   |
| 40   | 001008    | Bearing                | 1   | 90   | 135165.1  | Flange                         | 1   |
| 41   | 534024    | Bevel pinion           | 1   | 91   | 017026    | Screw                          | 2   |
| 42   | 115004    | Spacer                 | 1   | 92   | 008392.1  | Encoder card                   | 1   |
| 43   | 544286    | Output pinion          | 1   | 93   | 015003    | Screw                          | 2   |
| 44   | 544077    | Pinion                 | 1   | 94   | 135149.1  | 4-magnet flange                | 1   |
| 45   | 110052    | Gearbox base           | 1   | 95   | 008391    | Magnet                         | 4   |
| 46   | 601004    | Protection sheet       | 2   | 96   | 008307    | Magnet sheath                  | 1   |
| 47   | 024005    | Rivet                  | 4   | 97   | 021015    | Washer                         | 1   |
| 48   | 025201    | Aluminium plate        | 1   | 98   | 015071    | Screw                          | 1   |
| 49   | 110137.1  | Gearbox                | 1   | 99   | 515328    | D.18/14 guide support pin      | 1   |
| 50   | 595086    | Bushing                | 2   | 100  | 515329    | D.14 guide support pin ring    | 1   |
| 51   | 110134    | Gearbox cover          | 1   |      |           |                                |     |

## A.6 Moving arm - all models

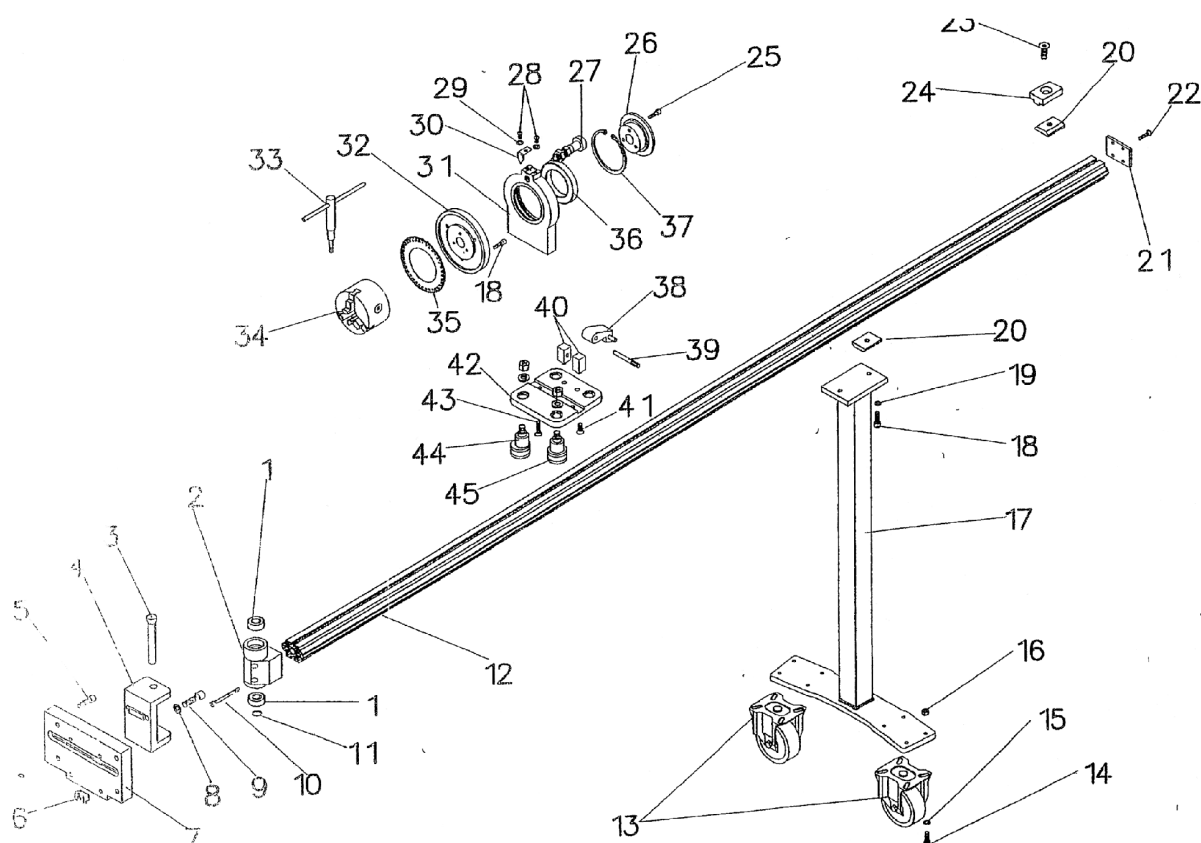


Figure 28 - Moving arm exploded view

The moving arm is the same for both machine sizes except positions 5 and 17, where codes are shown as **42 models / 60 models**.

| Pos. | Item code       | Description    | Qty | Pos. | Item code | Description                 | Qty |
|------|-----------------|----------------|-----|------|-----------|-----------------------------|-----|
| 1    | 001039          | Bearing        | 2   | 22   | 016011    | Screw                       | 1   |
| 2    | 135152          | Joint          | 1   | 23   | 016008    | Screw                       | 5   |
| 3    | 514461          | Pin            | 1   | 24   | 514488    | Upper stop                  | 5   |
| 4    | 135153          | Fork           | 1   | 25   | 015009    | Screw                       | 3   |
| 5    | 015016 / 015028 | Screw          | 4   | 26   | 135143    | Rear centring               | 1   |
| 6    | 099023          | Fixing plate   | 2   | 27   | 001109    | Spindle rotation stop block | 1   |
| 7    | 135154          | Clamping plate | 1   | 28   | 015071    | Screw                       | 2   |
| 8    | 021018          | Washer         | 2   | 29   | 021015    | Washer                      | 2   |
| 9    | 014035          | Bolt           | 2   | 30   | 514946    | Reference mark              | 1   |
| 10   | 015003          | Screw          | 4   | 31   | 135157    | Spindle support flange      | 1   |
| 11   | 515253          | Washer         | 1   | 32   | 524074    | Flange                      | 1   |
| 12A  | 136010          | 1 m profile    | 1   | 33   | 000840    | Spindle key                 | 1   |
| 12B  | 136011          | 2 m profile    | 1   | 34   | 004094    | Spindle                     | 1   |
| 12C  | 136013          | 3 m profile    | 1   | 35   | 025046    | Graduated ring              | 1   |
| 12D  | 136012          | 4 m profile    | 1   | 36   | 001104    | Bearing                     | 1   |
| 13   | 004124          | Wheel          | 2   | 37   | 023052    | Compression ring            | 1   |
| 14   | 015031          | Screw          | 8   | 38   | 535008    | Catch                       | 1   |
| 15   | 021011          | Washer         | 8   | 39   | 018049    | Dowel                       | 1   |
| 16   | 002011          | Nut            | 8   | 40   | 515469    | Catch support               | 2   |
| 17   | 500189 / 500190 | Support        | 1   | 41   | 016007    | Screw                       | 2   |
| 18   | 015008          | Screw          | 5   | 42   | 135155    | Sliding surface             | 1   |
| 19   | 021015          | Washer         | 2   | 43   | 016024    | Screw                       | 2   |
| 20   | 514489          | Lower stop     | 7   | 44   | 004123    | Eccentric wheel             | 2   |
| 21   | 135204          | Cover plate    | 1   | 45   | 004122    | Fixed wheel                 | 2   |

## Appendix B - Electrical schematics

### B.1 Motor schematic (motor type EM 48 S CEG)

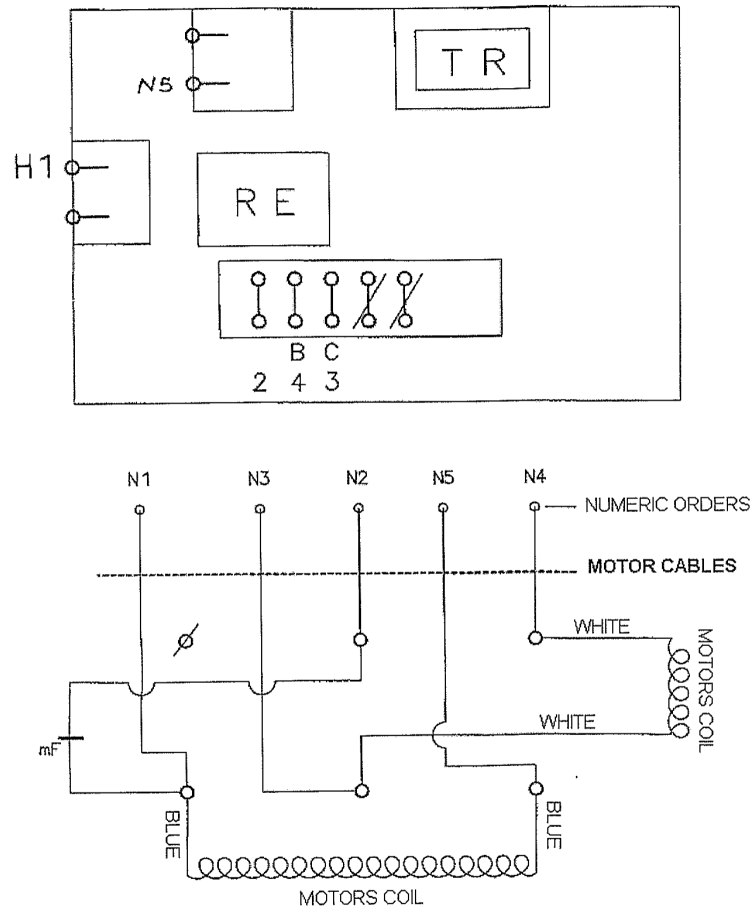


Figure 29 - Motor schematic, motor type EM 48 S CEG

## B.2 Motor schematic - digital models

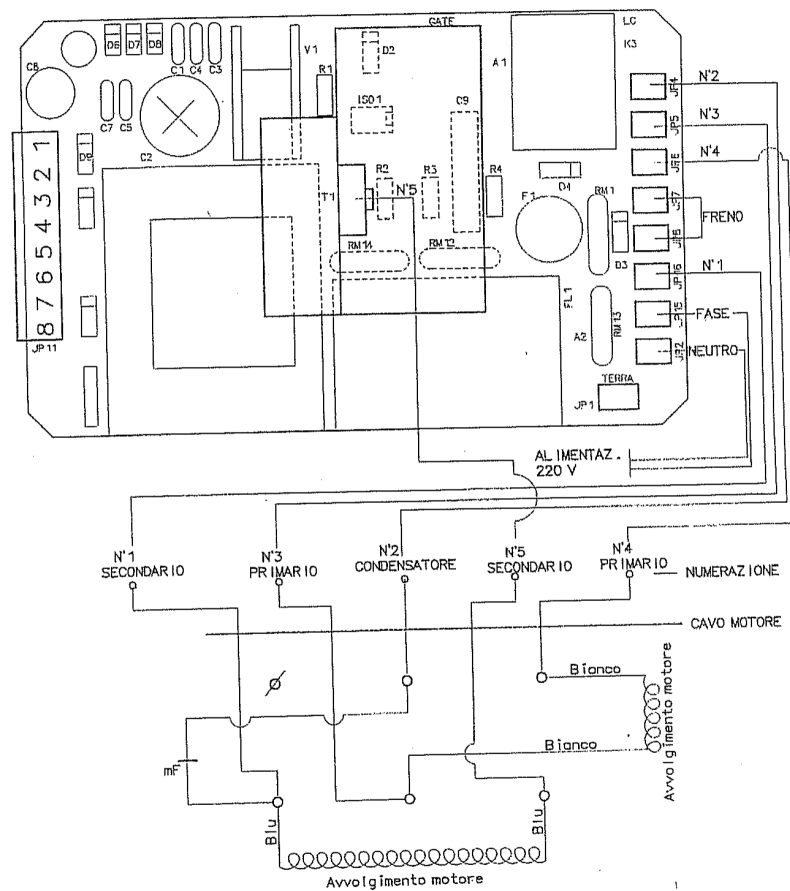


Figure 30 - Motor schematic, digital models (labels in Italian - see glossary below)

### Glossary of diagram labels

| Label on diagram    | Meaning             |
|---------------------|---------------------|
| ALIMENTAZ. 220 V    | 220 V supply        |
| FASE                | Active (phase)      |
| NEUTRO              | Neutral             |
| TERRA               | Earth               |
| FRENO               | Brake               |
| PRIMARIO            | Primary (winding)   |
| SECONDARIO          | Secondary (winding) |
| CONDENSATORE        | Capacitor           |
| NUMERAZIONE         | Wire numbering      |
| CAVO MOTORE         | Motor cable         |
| Avvolgimento motore | Motor winding       |
| Bianco              | White               |
| Blu                 | Blue                |

### B.3 Wiring diagram - digital models (220 V)

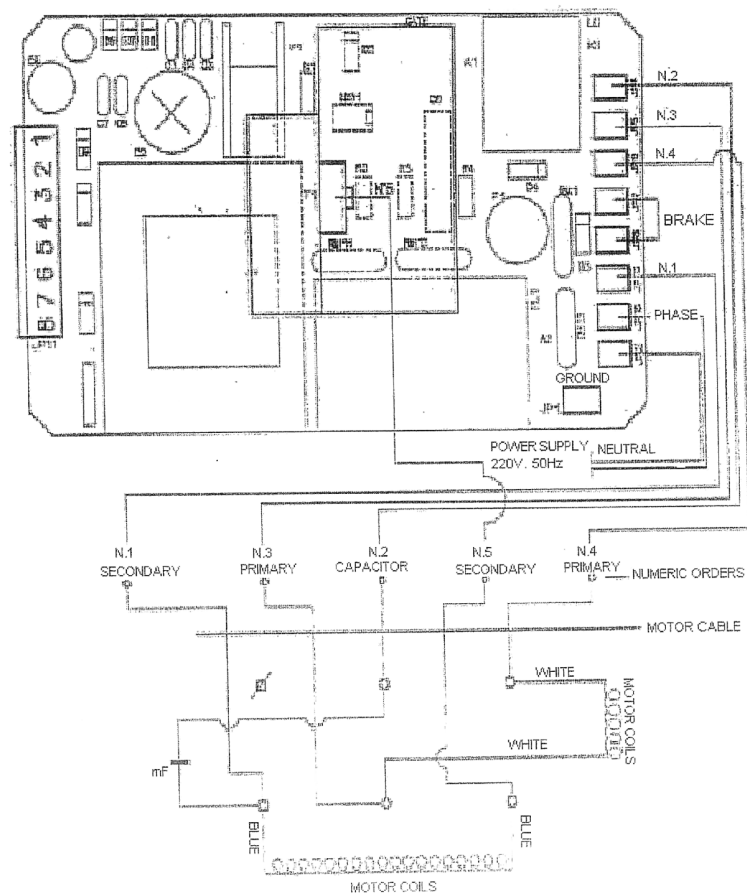


Figure 31 - Wiring diagram, digital models (220 V)