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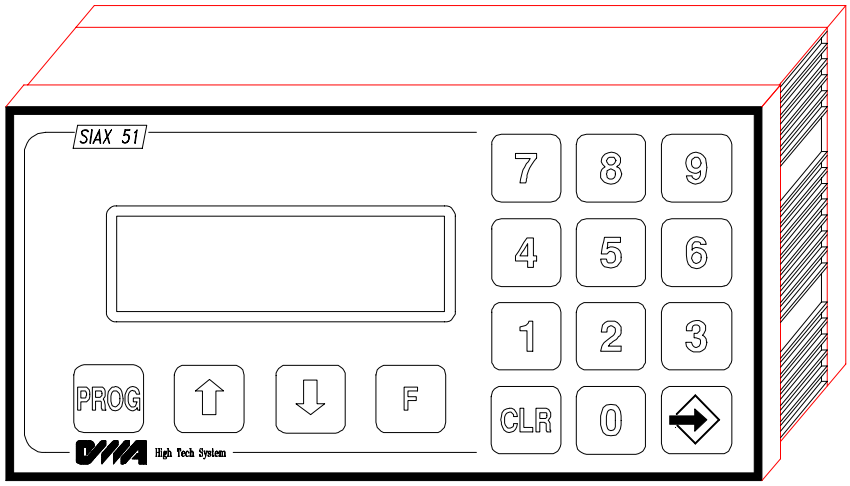
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- SIAX 51 -

BRAIDING MACHINE



Salient technical characteristics

- LCD display (2 lines × 16 columns)
- Numeric keyboard plus 5 function keys
- Built-in encoder supply (Standard +12V, optional 5V)
- 2 inputs from bidirectional incremental push-pull NPN encoder (Count speed: 50 KHz max)
- 1 analog 12 bit output range ±10V (Load resistance: min. 10 KΩ)
- 6 digital NPN or PNP outputs, 30 Vac 100 mA max. (optional 110Vac 75mA)
- 12 digital inputs, 30 Vdc max
- RAM memory (32 KByte)
- Electronically erasable PROM, 8 KBytes
- Frontal dimensions: 144 mm × 72 mm

M0000371

Key functions

Key	Function
	It confirms the datum just entered.
CLR	It is used to exit.
F	It enables to select the type of display required. Usually the value of the step is displayed. By pressing the key once, the meters/hour of the slave are displayed, as well as the revolutions/minute of the master. By pressing the key once again, the meters are displayed in the meter counter and the meters worked. If the *Belt/Flywheel* parameter is set to 1, the programmed *Pipe Diameter* will be displayed when the key is pressed again. By pressing it again, the value of the step is displayed.
⇧	Increases the value of the step. Every time this key is pressed, the step is increased by the amount programmed in the *Step Increase* parameter.
⇩	Decreases the value of the step. Every time this key is pressed, the step is decreased by the amount programmed in the *Step Decrease* parameter.
PROG	It allows to set a new value for the step. After having inserted the new value, press the  key to confirm.
0	When the length counter is displayed in the Automatic mode, this key can be used to set the value on the length counter. After having inserted the new value, press the  key to confirm.
5	If the Belt/Flywheel parameter is set to 1 and the system is in the Automatic mode, this key can be used to set the value of the Pipe Diameter parameter. Press the  key to confirm the new value after entry.
7	When the number of metres processed is displayed in the Automatic mode, this key zeroes the metres processed counter.

Parameter programming

In order to have access to parameter programming, it is necessary to enter the access code: press the following keys in sequence [4] [5] [6] [2] [5] [8]

After entering each function, press the [◆] key to confirm and pass to the following one.

Parameters are scanned with the [⇧] [⇩] key; at the end, press [PROG] to save the modifications and [CLR] to come out.

Function	Description
Comma position DEFAULT: 2 MIN: 2 MAX: 2	In this application, it must be positioned on 2 because all the calculations are made at a hundreth millimetre precision. *Example*: 9999.99
Pursuit error DEFAULT: 3000 MIN: 0 MAX: 32767	It shows (**in impulses**) the maximum difference accepted between the theorical instantaneous position and the real position, beyond which the axis is blocked and the alarm rings (ENC.2 error).
Axis in position DEFAULT: 100 MIN: 0 MAX: 9999	Non used.
Reference speed DEFAULT: 100000 MIN: 0 MAX: 8388607	It indicates the speed in impulses per second that are sensed by the instrument when the engine is at its maximum speed (axis **slave**). To determinate such parameter: Speed (imp./sec.) = $\frac{\text{revol. minute max engine} \times \text{turn encoder stretches} \times 4}{60}$ Such speed can be sensed automatically (see Maximum frequency test).
Acceleration DEFAULT: 5.000 MIN: 0.000 MAX: 32.767	It is the time, expressed in seconds, the engine required to go from zero to the maximum speed. It also coincides with the deceleration time (only used in manual motions of the **slave** axis).

continue...

Function	Description
Integration mode DEFAULT: 0 MIN: 0 MAX: 1	If 0 - it indicates that the set value of *Integral gain* must be active only when the axis is still. If 1 - it must be active during the whole movement, acceleration and deceleration included.
Proportional gain DEFAULT: 100 MIN: 0 MAX: 32767	It represents the amplification of the system response to a positioning error. The correction is always active, also during the movement. In this case, the error is produced by the immediate real position in relation to the theorical position of that moment.
Integral gain DEFAULT: 0 MIN: 0 MAX: 3000	It is used to help the *Proportional gain* when it cannot take the axis to the position.
Password enable DEFAULT: 0 MIN: 0 MAX: 1	If 0 - the password is disabled. If 1 - the password is required to access the step setting in **Automatic**. The arrow keys, to increase and decrease the step, are also disabled, so that the input only accepts a new value.
Advancement of the Master axis DEFAULT: 0 MIN: 0 MAX: 1	Select the manner in which the speed of advancement of the **Master** axis in **Automatic** will be displayed. (0 = metres/minute; 1 = metres/hour)
Encoder zero DEFAULT: 0.00 MIN: -83886.07 MAX: 83886.07	Not used.
Language selection DEFAULT: 1 MIN: 0 MAX: 3	Defines the language of the messages displayed. (0 = Italian; 1 = English; 2 = French; 3 = German)

continue...

Function	Description
Encoder ratio DEFAULT: 1.00000 MIN: 1.00000 MAX: 9.99999	It represents the ratio between the real shift and the corresponding number of impulses produced by the encoder, multiplied by 4. In this application, the encoder ratio is worth: $E.R. = \frac{\text{diameter of handwheel} \times 3.14}{\text{impulses corresponding to a handwheel turn}}$ *Example*: - diameter handwheel = 500mm = 50000 hundreth of millimetres - engine turns equal to a handwheel turn = 3000 - turn encoder stretches = 500 - impulses corresponding to a handwheel turn = 3000 × 500 × 4 $E.R. = \frac{50000 \times 3.14}{3000 \times 500 \times 4} = 0.02616$
Encoder direction DEFAULT: 0 MIN: 0 MAX: 1	Enables to invert the calculation of the encoder without changing the wiring of the phase.
Home speed DEFAULT: 20.0% MIN: 0.0% MAX: 75.0%	Not used.
Jog speed DEFAULT: 20.0% MIN: 0.0% MAX: 75.0%	Axis speed in percentage during the shifts in manual.
Normal/Inverter DEFAULT: 0 MIN: 0 MAX: 1	If 0 - the analogic output is managed normally, with a swing from -10V to +10V, according to the direction and positioning speed of the axis. If 1 - the analogic output is associated with the slave forward and back outputs. The voltage swing is limited from 0V to +10V, according to the axis speed, while the outputs indicate the direction of motion.

continue...

Function	Description
Impulses for turn master axis DEFAULT: 100000 MIN: 0 MAX: 8388607	Shows the number of impulses necessary for the **master** axis to make a complete turn. The formula to determinate such parameter is as follows. impulses/master turn = $\frac{\text{speed of master engine} \times \text{stretch of encoder turn} \times 4}{\text{revolutions/min master axis}}$ *Example*: If the reduction ratio between the engine and the axis is such to have the axis make 10 revolutions per minute, the number of impulses per revolution is worth: $\text{imp/master turn} = \frac{1140 \times 500 \times 4}{10}$
Max. step DEFAULT: 55.00 MIN: 0.00 MAX: 83886.07	Maximum step to be set in **Automatic**.
Carter opening DEFAULT: 0 MIN: 0 MAX: 1	If 0 - in **Manual** the Open carter alarm is active, which makes the machine stop. If 1 - in **Manual** the Open carter alarm is impaired, which enables the functioning of the machine even with the carter open.
Set Unit Of Measurement DEFAULT: 0 MIN: 0 MAX: 1	If 0 - distances are displayed in millimetres. If 1 - distances are displayed in inches.
Step Increase DEFAULT: 0 MIN: 0 MAX: 8388607	The value the step is increased or decreased in the **Automatic** mode by pressing the ⇧ and ⇩ keys. The value can be increased until it reaches the value programmed for the *Maximum Step* parameter.

Function	Description
Belt/Flywheel DEFAULT: 0 MIN: 0 MAX: 1	If 0 - the programmed value for the Master Encoder Ratio is used. If 1 - the Master Encoder ratio is automatically calculated by NC as follows: $\frac{((\textit{Pipe Diameter} / 2) + \textit{Flywheel Diameter}) \times \Pi}{\textit{Master Pulses per Flywheel Revolution}}$ The *Master Encoder Ratio* parameter is then updated accordingly. This calculation is performed every time the *Pipe Diameter*, the *Flywheel Diameter* or the number of *Master Pulses per Flywheel Revolution* is changed using the **Parameter Editor**. During operation in the Automatic mode, the F and 5 keys can be used to display and change the Pipe Diameter.
Flywheel Diameter DEFAULT: 400.00 MIN: 0.00 MAX: 86886.07	Diameter of the flywheel (expressed in millimetres). This value is used to calculate the Master Encoder Ratio (when the *Belt/Flywheel* parameter is set to 1).
Master Pulses per Flywheel Revolution DEFAULT: 1500000 MIN: 0 MAX: 8688607	Number of master encoder pulses that correspond to one revolution of the flywheel. This value is used to calculate the Master Encoder Ratio (when the Belt/Flywheel parameter is set to 1).
Pipe Diameter DEFAULT: 0.00 MIN: 0.00 MAX: 86886.07	Diameter of the pipe (expressed in millimetres). This value is used to calculate the Master Encoder Ratio (when the *Belt/Flywheel* parameter is set to 1).

Automatic

When it is switched on, the instrument is ready for the **Automatic** cycle, showing the step that was used in the previous processing.
If it is switched on for the first time, it is necessary to carry out the calibrating, by setting the parameters mentioned below in the right way. To make this operation, press the CLR key.
The instrument sets to the Main menu, that is made of three items:

1 - AUTOMATIC	Automatic cycle
2 - PARAMETERS	Set-up parameters
3 - TEST	Machine test

With the arrow keys, it is possible to sort an entry of the menu. To set the parameters, press ⇧ or ⇩ until the display visualizes the writing

```
FUNCTION CHOICE
PARAMETERS
```

Then press the ◈ key to confirm. An access code is required (4-5-6-2-5-8) which, when pressed, enables to enter the page in order to set parameters.
To select parameters, use the arrow keys. After having selected the required value, confirm with the ◈ key. At the end of the setting, before returning to the Main menu through the PROG key, it is necessary to press the CLR key. The parameters chosen are thus transferred on the not volatile storage.
In the **Automatic** cycle, the **Slave** axis tracks the **Master** axis, based on the step set on the instrument.

Digital inputs

Input	Function
START (I1)	The **Automatic** cycle starts. The FORWARD MASTER AXIS output is selected and the **slave** follows.
STOP (I2)	The **Automatic** cycle stops. The FORWARD MASTER AXIS exit is disabled.
JOG + (I3)	Select the FORWARD MASTER AXIS output and the **slave** follows. Setting this input on OFF, the exit is impaired. In **Manual** the Rupture of wire alarm is impaired.
JOG - (I4)	Select the BACKWARD MASTER AXIS output and the **slave** follows. Setting this input on OFF, the exit is impaired. In **Manual** the Rupture of wire alarm is impaired.

Besides the alarm exits are controlled. In case of alarm, the FORWARD MASTER AXIS is impaired and the message relative to the alarm is displayed. To regenerate the alarm, it is necessary to press the CLR key, except for the OPEN CARTER, which regenerates on its own.

Test

There is a Test Menu: with ⇩ and ⇧ keys, the different selections can be sorted.

Semiautomatic test

To have access to this test, it is necessary to insert the code (4 - 5 - 6 - 2 - 5 - 8).
On the upper line of the display, a ratio can be selected. When the ◈ key is pressed, the axis leaves and positions on the selected ratio. On the lower line, the current ratio of the axis is displayed.
Press the CLR key to return to the Test Menu.

EPROM version test

The screen will display:

```
SIAX51 OMA D1252   ← EPROM
V 1.35  17.12.98   ← Date
```

Press the CLR key to return to the Test Menu.

Keyboard test

When a key is pressed, a message relative to the key which has been pressed id displayed. If no key is pressed, the writing `NO KEY` shows.
Pressing the CLR key, the `CLEAR` message shows and after about one second returns to the Test Menu.

Encoder test

The value in encoder impulses is displayed.
Press the CLR key to return to the Test Menu.

Digital inputs test

The input state is displayed (0/1).
Correspondence between the details on the display and the physical inputs on the base connector:

```
DIGITAL INPUTS 1
     000000
```

Input	*Pin*
I1	*17*
I2	*18*
I3	*19*
I4	*20*
I5	*21*
I6	*22*

Use the ⇧ ⇩ keys to display the other inputs:

```
DIGITAL INPUTS 2
     000000
```

Input	*Pin*
I7	*9*
I8	*10*
I9	*11*
I10	*12*
I11	*13*
I12	*14*

Press the CLR key to return to the Test Menu.

Digital outputs test

It is possible to force 0 or 1 in the outputs. Use the ⇧ ⇩ keys to move to the desired output. Press 1 and 0 to activate and deactivate the output.
Correspondence between the details on the display and the physical outputs on the base connector:

```
DIGITAL OUTPUTS1
     000000
```

Output	*Pin*
O1	*7*
O2	*8*
O3	*9*
O4	*10*
O5	*11*
O6	*12*

Press the CLR key to return to the Test Menu.

Analog outputs test

It is possible to select a rating value on the A/D converter (range -10,0 ÷ +10,0).
Press the CLR key to return to the Test Menu.

Display test

An automatic test of the display is carried out.
Press the CLR key to return to the Test Menu.

Maximum frequency test

Pressing the ◈ key, the speed test is carried out; the axis is moved at half the maximum speed for about 2 seconds; at the and, the speed is displayed in impulses per minute. Such value must be set in parameter *Reference speed*. Make sure the axis can move for about 2 seconds at half the *Maximum speed*.
Press the CLR key to return to the Test Menu.

Wiping of values in EEPROM

This function is protect by a code (4 - 5 - 6 - 2 - 5 - 8).
Press the CLR key to return to the Test Menu. Selecting the code, the screen will display:

```
ENTER DELETE
CLEAR EXIT
```

Press the CLR key to return to the Test Menu without delete.
If the ◈ key is pressed, the storage is cancelled.
During the wiping, the flashing letter «d» shows on the display. At the end, it returns automatically to the Test Menu.
N.B.: The storage wiping process can be rather long (it can even go on for 1 minute).

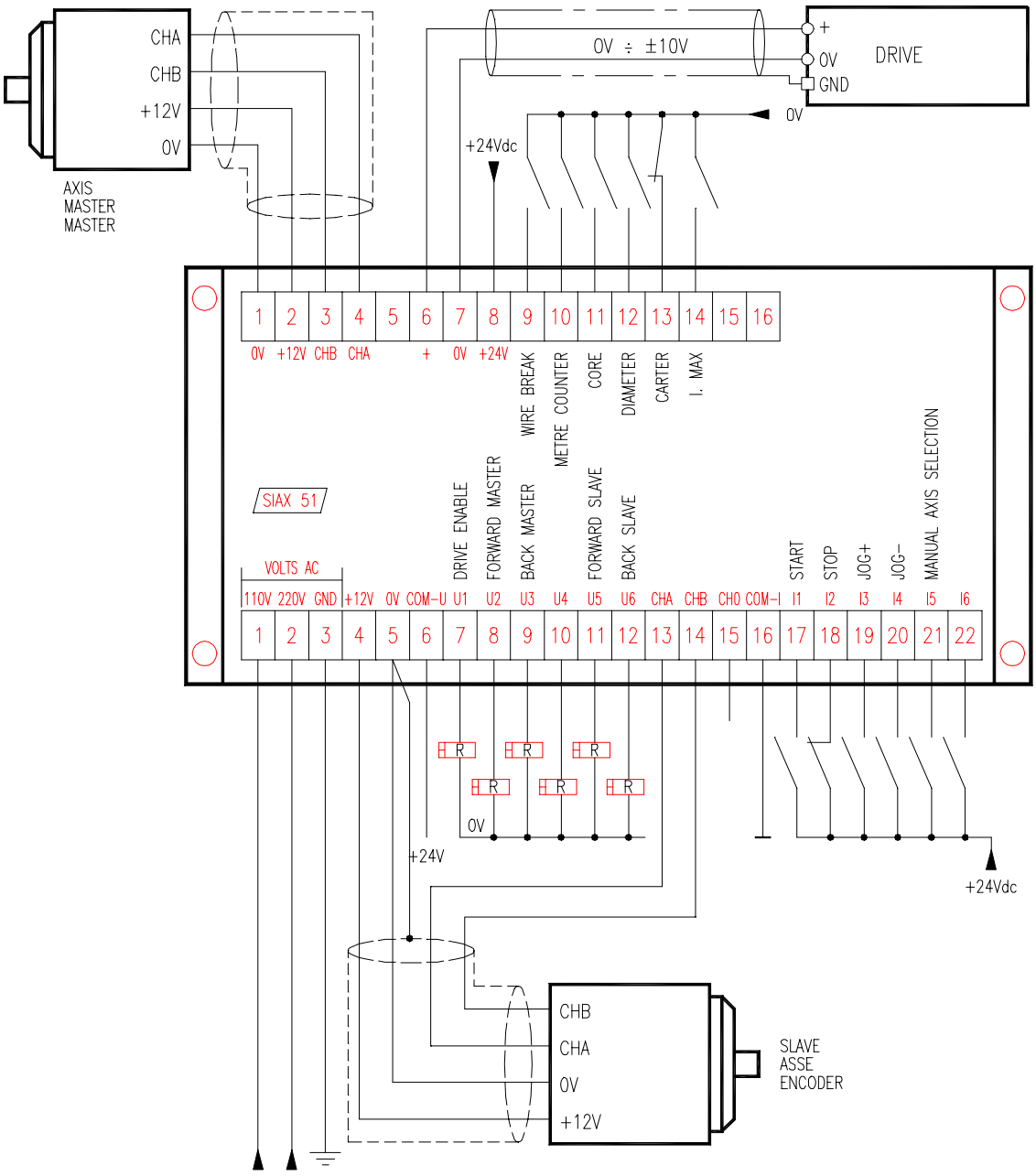
Hours test

Display the work hours. Press the PROG key and the code (4 - 5 - 6 - 2 - 5 - 8) to reset the counter.

Watch dog test

On pressing the ◈ key, the watch dog test is carried out, and the display flashes for about a second. If the test result positive, the control carries out a complete reset (simulates a new start).

Connection



Analog output

Analog resolution:	12 bit ±10V
Load resistance:	10Ω min.

Encoder inputs

Encoder type:	push-pull (NPN) 12Vdc (Imax 100mA)
Counting type:	up/down quadruple
Counting speed:	50KHz max from encoder

Digital inputs I1÷I14

Nominal value:	24Vdc (+9 ÷ 30V)
Max current:	10mA (a 24V)

Digital outputs U1÷U6

Standard version

Output voltage:	+5 ÷ 24Vdc/ac
Max value:	50V
Max current:	100mA

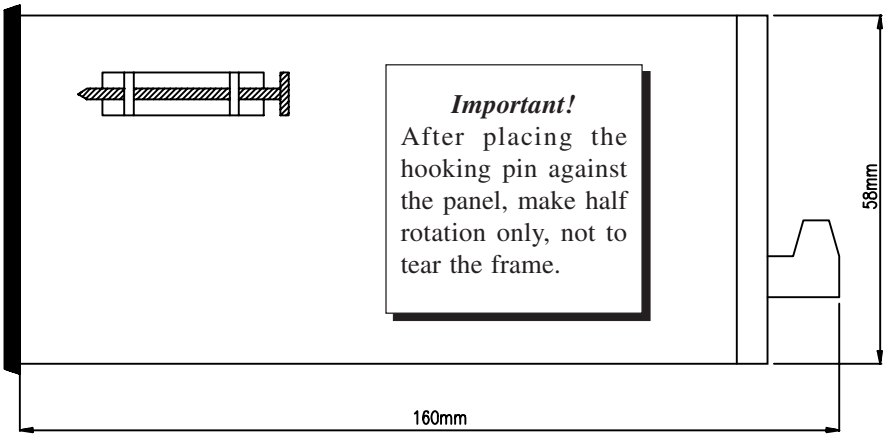
High voltage version (optional)

Output voltage:	+5 ÷ 110Vdc/ac
Max value:	150V
Max current:	100mA

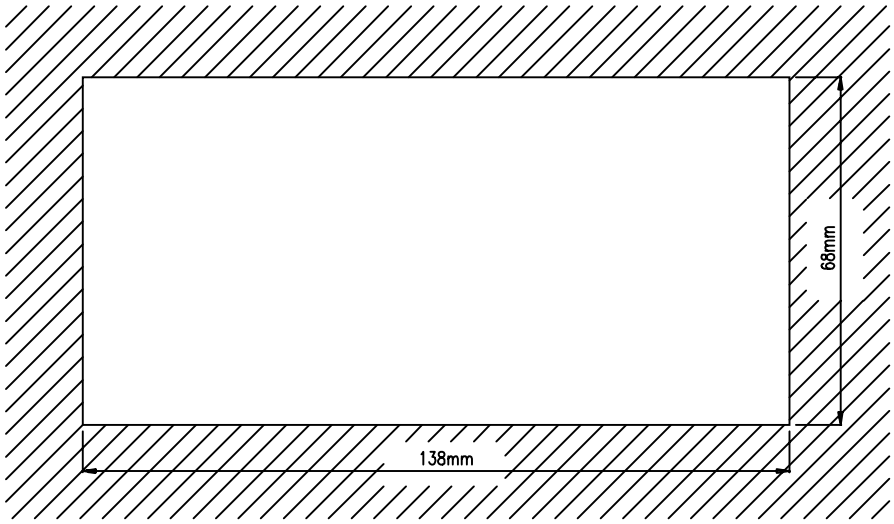
Supply voltage

Vac ±10% 50/60Hz
220V - (110V) - (24V)

Side view



Drilling template



Physical characteristics

Self-extinguishing PVC container	
Operating temperature:	0 ÷ 50°C
Storage temperature:	-20 ÷ 70°C
Room humidity:	80% max without condensation
Weight:	600 gr.

Index

Page

Salient technical characteristics 1
Key functions 2
Parameter programming 3
Automatic 8
  Digital inputs 9
Test 10
  Semiautomatic test 10
  EPROM version test 10
  Keyboard test 10
  Encoder test 10
  Digital inputs test 10
  Digital outputs test 11
  Analog outputs test 11
  Display test 11
  Maximum frequency test 11
  Wiping of values in EEPROM 11
  Hours test 11
  Watch dog test 11
Connection 12
Side view 13
Drilling template 13

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