

COIL WINDING MACHINE ERN C-VERSION

USER'S GUIDE



ERN 22,32,32S,42,52



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1. INTRODUCTION

Bench-type universal coil winding machine ERN is designed for winding the coils, transformers, chokes, resistors etc with wire up to - see technical data.

1.1 Characteristic features:

- wide range of application for winding simple or complicated coils, multichamber coils, trapezoidal or asymmetric windings
- AC servo, that is used like a spindle drive assure excellent dynamical parameters, constant torque and accurate positioning
- wire guide on ball bearings with a separate stepping motor
- accurate reversible turn counting
- microprocessor-controlled winding cycle without time waste
- wide programming options
- memory 2 Gb (by the CF card capacity), each program up to 350 steps
- viewable and easy reading graphical display
- special functions LAYER-STOP, AUTOMATIC CORRECTION, MANUAL REGIME
- 4 programmable digital outputs
- 4 programmable digital inputs
- 1 programmable analog output
- communication with PC by optically isolated interface RS-232 and USB host port
- possibility for the creation of a wireless network by LAN or BLUETOOTH modules

2. TECHNICAL DATA

	ERN22	ERN32	ERN32S	ERN42	ERN52
Wire diameter (mm):	0,02 - 1,7	0,02 - 2,5	0,02 - 3,0	0,02 - 5,0	0,02 - 5,0
Pitch range (mm/rev):	0,008 - 40	0,008 - 40	0,008 - 40	0,008 - 40	0,008 - 40
Winding width (mm):	0,1 - 210	0,1 - 300	0,1 - 300	0,1 - 300	0,1 - 450
Winding speed / torque (rpm/Nm):	12000 / 0,7	6000 / 1,5	4000 / 3	4000 / 3,5	4000 / 3,5
	6000 / 1,5	1500 / 6	1000 / 12	1000 / 15	1000 / 15
	3000 / 3	750 / 12	500 / 24	500 / 30	500 / 30
Accuracy of spindle stop (rev):	0,01	0,01	0,01	0,01	0,01
Spindle position pre-set (rev):	0,01	0,01	0,01	0,01	0,01
Max.speed of wire guide - shift (mm/s)	100	100	100	100	100
- winding	75	75	75	75	75
Acceleration/deceleration:	table	table	table	table	table
Max.coil diameter (mm):	180	250	250	450	450
Distance between centres (mm):	250	340	340	330	650
Dimensions (mm):	780 x 420	870 x 460	870 x 460	910 x 530	1235 x 530
Weight (kg):	85	120	120	140	180
Power supply (V/Hz):	230 / 50-60	230 / 50-60	3x 400/50-60	3x 400/50-60	3x 400/50-60
Power consumption (kVA):	1	1,2	1,5	1,5	1,5
Noise (dB):	74	74	74	74	74

2.1 Climatic conditions

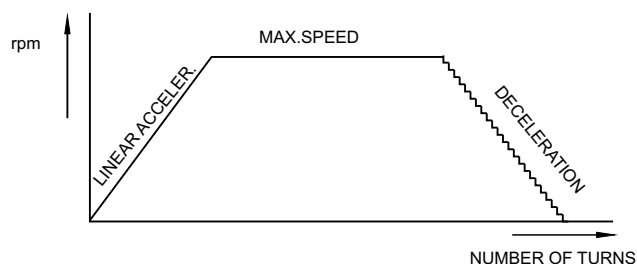
Machine is designed for normal workshop's conditions with relativ air moisture 70% and temperature in the range +15 up to +30°C.

3. DESCRIPTION OF MACHINE

Coil winding machine ERN consists of the following parts:

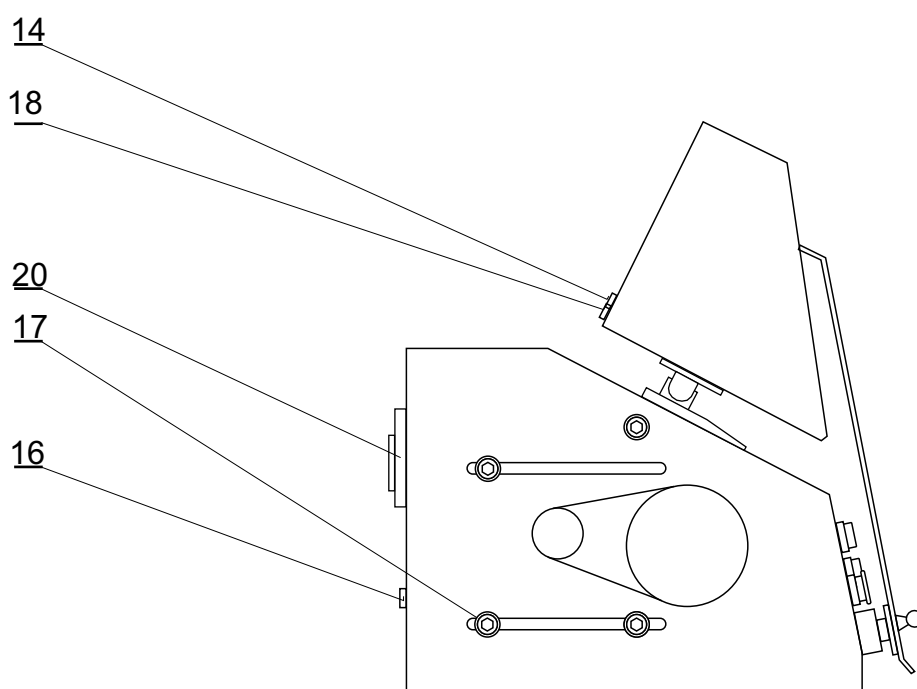
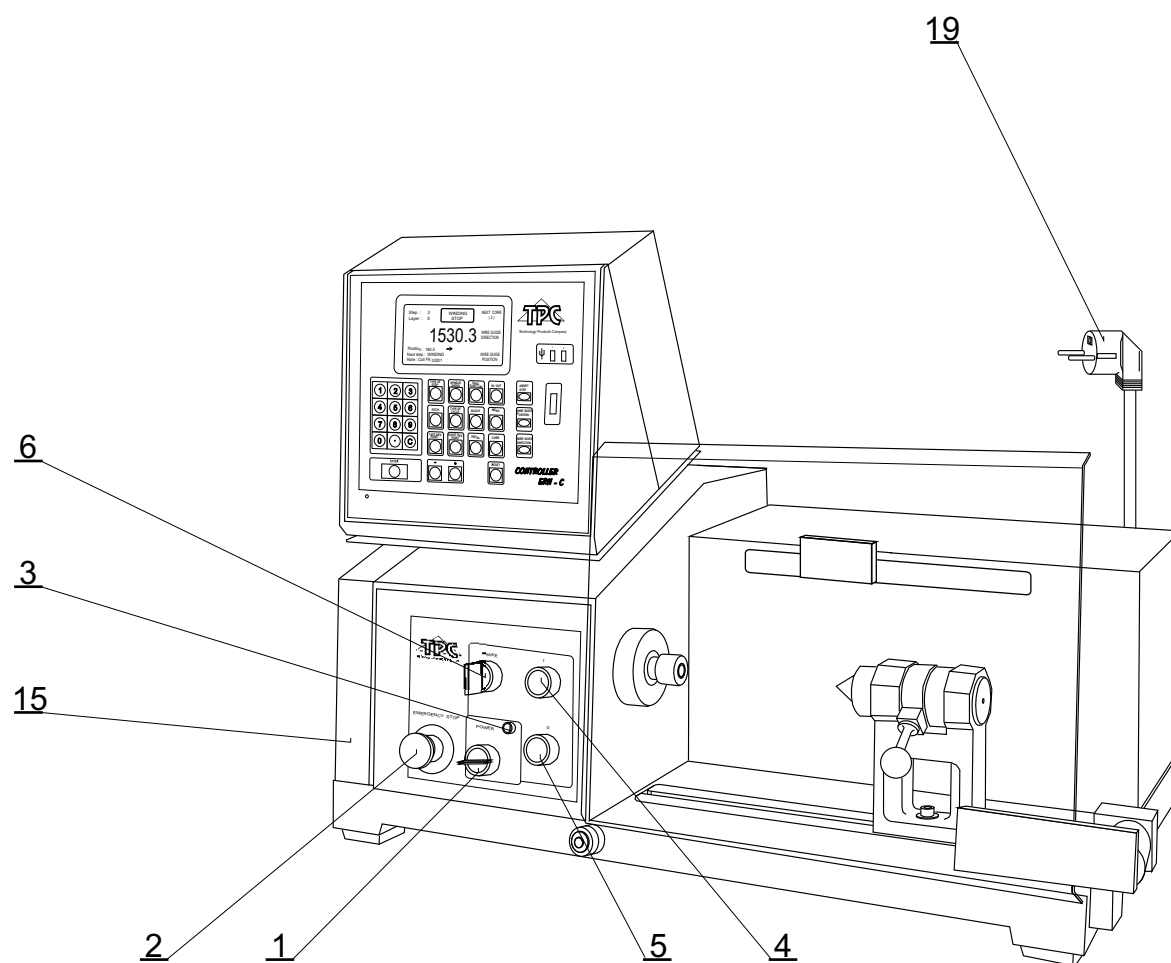
- controller containing control electronics and programming elements
- drive unit containing servomotor with gears, pitch control unit with stepping motor, power electronics and control elements
- base plate
- protection shield
- support with spool holders and dereelers (optional accessories)
- tailstock (optional accessories)
- wire guides (optional accessories)

Winding cycle (linear acceleration, max.speed, linear deceleration and stop) is running automatically after pressing the START-button. Deceleration is controlled by microprocessor to ensure accurate stopping and spindle positioning.



3.1 Description of controls

- 1 - POWER ON / OFF switch
- 2 - EMERGENCY STOP - disconnects power in emergency
- 3 - POWER ON indicator
- 4 - START button - starts winding cycle
- 5 - STOP button - interrupts winding cycle
- 6 - BRAKE ON / OFF - switches on/off the electromagnetic brake
- 7 - DISPLAY
- 8 - ENTER button - enters data to the memory
- 9 - PLUS and MINUS buttons - parameters correction and step choice
- 10 - RESET - sets the initial state
- 11 - Numeric buttons - enter the coil name as well
- 12 - Multifunction buttons - display served options choice
- 13 - Function buttons
- 14 - Connector for serial interface RS 232
- 15 - Gear cover with timing belt
- 16 - Connector for foot pedal
- 17 - Fixing screws
- 18 - Connectors for inputs and outputs
- 19 - Power plug
- 20 - AC circuit breaker
- 21 - USB host port



DESCRIPTION OF CONTROL PANEL

To work with a PC we can use the supplied mouse, which we plug into the USB port No 2. Some advanced computer operations can be performed only with the mouse.

Into USB connectors it is possible to connect also other equipment such keyboard, barcode reader etc.



4. INSTALLATION AND PREPARATION OF WORKING EQUIPMENT

The machine operating is allowed only by skilled person who is acquainted with user's guide and safety formulas. The training is provided by producer or qualified person.

The machine is delivered partly disassembled for easier packing and transport. Before you switch the machine ON, for the first time, assemble it as follows:

- a) Mount the controller on the drive unit. Connect the power plug, the 25-pin connector and 9-pin connector for CAN- BUS on the back panel of the controller
- b) Check and fasten the fuse cartridges on the back panel of the drive unit
- c) Assemble support with spool holders and dereelers
- d) Connect the foot pedal to the connector (16)

Assembly is completed by this and prepared to work.

4.1 Connection to the power

The machine must be powered:

ERN 22,32 - by 230V/50 Hz AC with tolerance $\pm 5\%$ and max. power consumption 1,2 k VA.

ERN 32S,42,52 - by 3 x 400V/50 Hz AC , tolerance $\pm 5\%$, max.power consumption 1,5 kVA.

Before plug in the connection cable make sure that electric power is in accordance with technical requirements. Only professional staff who are qualified in electrical engineering are allowed to install the power connection to the machine.

Since the leakage current to PE is more than 3,5 mA, in compliance with IEC 61800-5-1 the PE connection must be doubled.

USE THE PE TERMINAL ON THE MACHINE BACK SIDE FOR THIS PARALLER PE CONNECTION.

If a residual current protective device is used, we recommend that each winding machine be protected individually using a 30 mA RCD.

There is no guarantee for damages caused by wrong or out of range connection to the power supply.

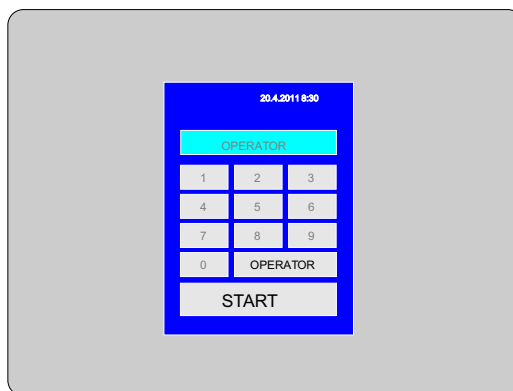
5. WINDING OPERATION

5.1 MACHINE SWITCHING ON AND GEAR SETTING

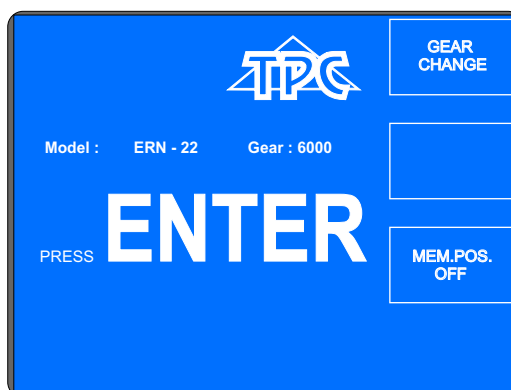
After switching on (1) the start window shows

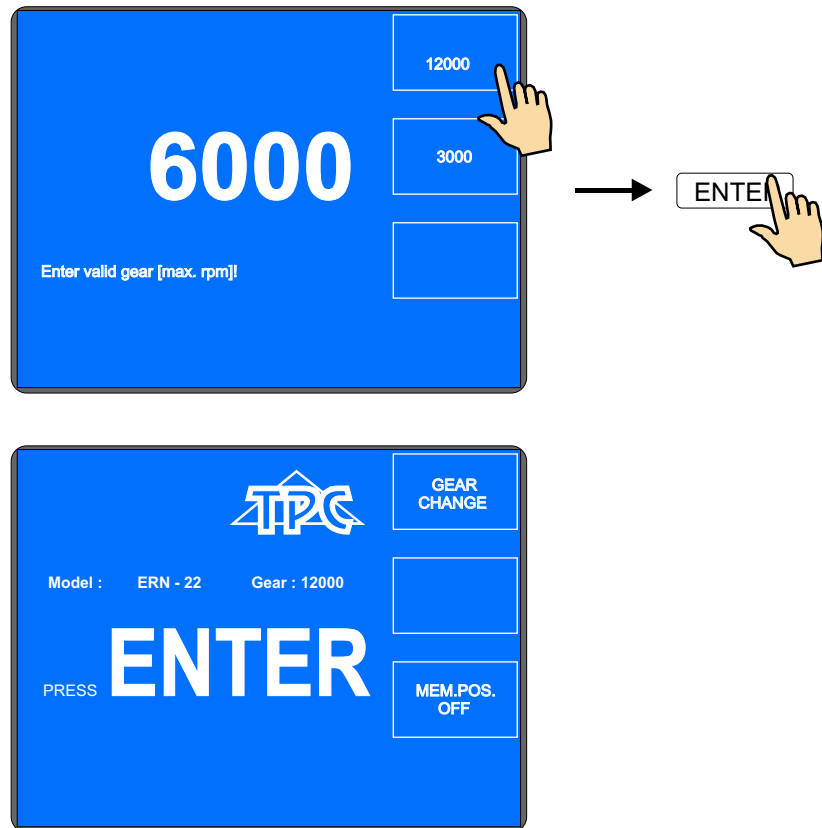


After pressing "OPERATOR" it is possible to choose operator name or continue by pressing START



Display provides informations about, for what type of machine is controller set.
In this window we can change the set gear, which must be in ABSOLUTE ACCORDANCE with the set of mechanical gear.

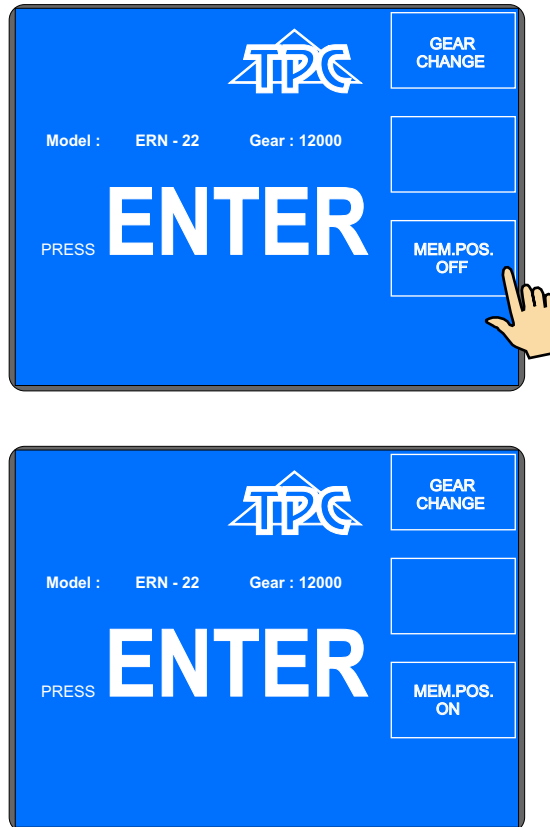




After pressing ENTER-button, the initial set is done, which means, that wire guide is shifted left home (zero position), zero number of turns, zero step and the last set block is set.

5.2 WINDING DATA BACK UP WHILE ELECTRICITY DROP

In this window, we can activate the initial setting of the machine (wire guide position, number of turns and step) for the back up values.



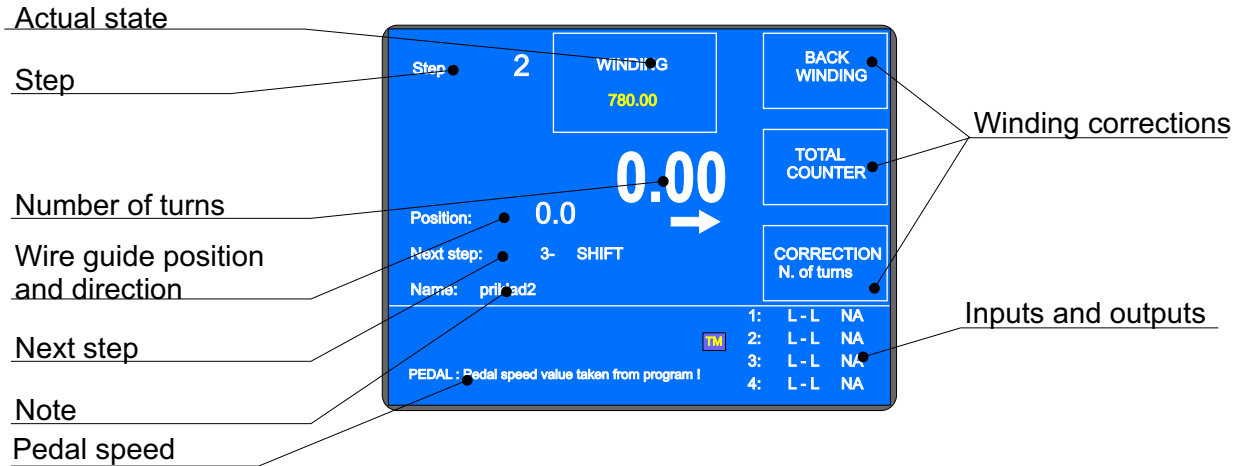
After the activation of this function (MEM.POS.ON) the initial setting will be actualized for the values, memorized while electricity drop.

FOR USING THIS FUNCTION, THE MACHINE MUST BE EQUIPPED WITH THE UNINTERRUPTIBLE POWER SUPPLY UNIT (UPS) AND THE REPORT OF ELECTRICITY DROP (relay for POWER) MUST BE INSTALLED. IF THE MACHINE IS NOT EQUIPPED BY THIS, THE ACTIVATION OF THIS FUNCTION DOES NOT INFLUENCE THE INITIAL SETTING, WHICH IS STILL SET ON ZERO VALUES.

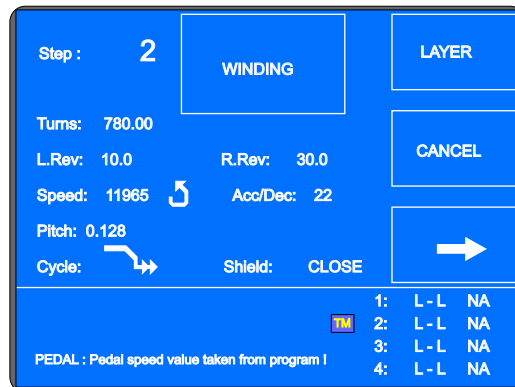
5.3 WINDING AND VIEW WINDOW

These are two basic windows, in which we can start programmed cycle.
Repeated pressing of the ENTER-button caused the switching.

Winding window - provided actual information about winding process



View window - displays the view of programmed step parameters



Winding is possible only in these two windows. If any other window is opened, the cycle start is blocked.

5.4 EXPLANATION OF CONCEPTIONS STANDSTILL, START, STOP

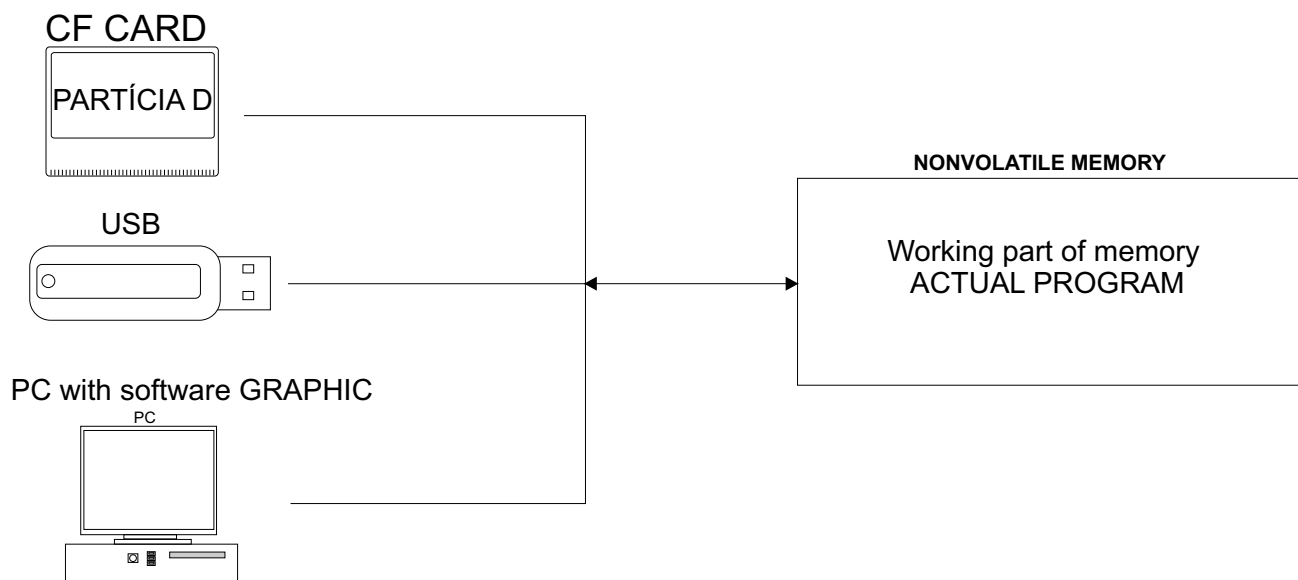
STANDSTILL: State after switching on the machine and pressing ENTER, or after the step finishing. Start from this state shifts program one step forward, generally.
E.g. when we are in the step 0, after starting, the step 1 is running.

START: Active run of some step type (winding, shift, jump and pause).

STOP: State after pressing the STOP-button (cycle interruption).
Repeated start activates interrupted run and there is no step shifting.

5.5 Winding program selection

Winding program, we are just working with(we can perform winding or program creation) is called **ACTUAL PROGRAM**. Actual program is located in so-called working part of memory. Desired winding program can be loaded to the working part of memory either from internal memory of the Winder, USB flash drive or a PC equipped by software GRAPHIC.



Proceeding by program selection:

- internal memory - see section 7, page 50
- USB flash drive - see section 9, page 65
- PC - see GRAPHIC manual

Internal memory and working part of memory store data also when power is off !

5.5 START AND STOP OF WINDING CYCLE (PROGRAM)

Winding cycle is actuated by pressing START-button (4), or foot pedal.

There is a possibility to start program from each step. Required step is set up by the buttons



, or numeric keyboard.

STOP-button (5) interrupts the winding cycle. It is the priority button, what means, that the cycle interruption at incorrect time (while deceleration), may cause inaccurate stopping and positioning of the spindle.

Cycle interruption at the step "Winding" allows almost all corrections and adjustments. Repeated cycle start by START-button or foot pedal activates step, where the program interruption has been done, automatically.

Step types SHIFT, JUMP and PAUSE do not allow any corrections or adjustments during interruption.

5.6 FOOT PEDAL

Winding machine may be equipped by following types of foot pedals:

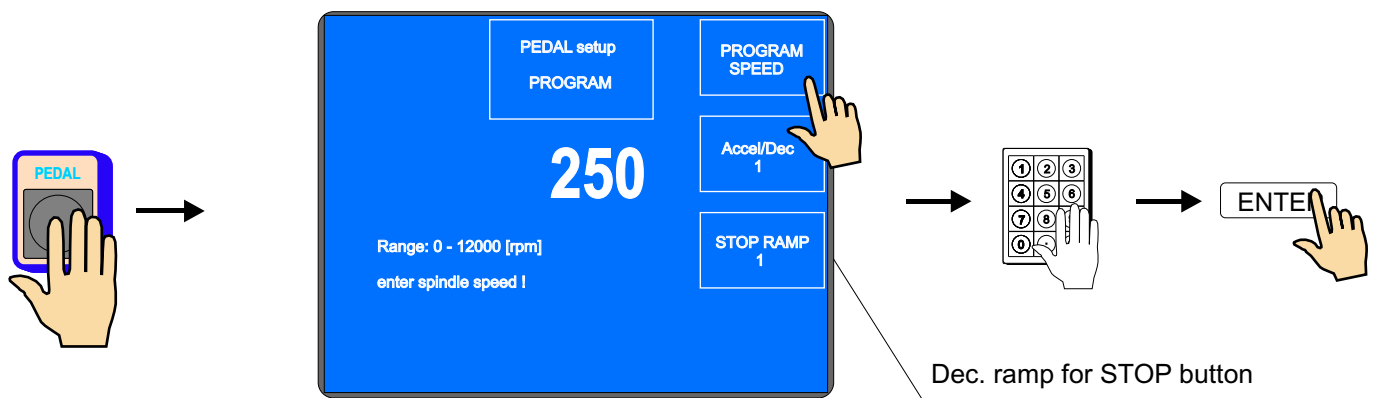
Double foot pedal controls START, BRAKE RELEASE

- left pedal releases the spindle brake
- right pedal works as parallel START-button

Double foot pedal controls SPEED, BRAKE RELEASE

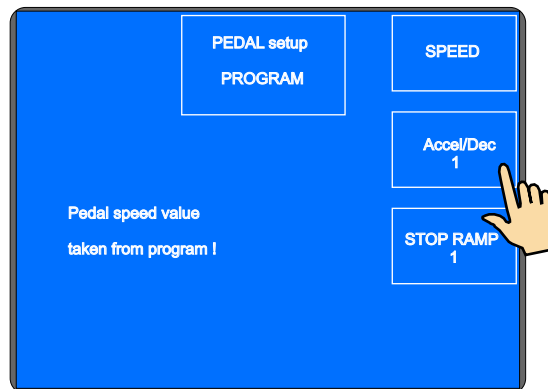
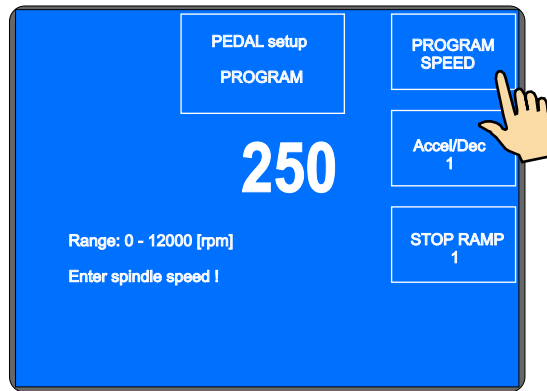
- left pedal releases the spindle brake
- right foot pedal controls spindle speed depending on pressing level

Maximal speed, accelerate and decelerate ramp may be set up by PEDAL button.



Speed set up like this, is valid for assigned block (program) and it is independent on speed programmed, in single program steps. Explain as: max.speed (ordinary lower) set up by START pedal may be different, then max.speed set up by START-button.

If we require the same max.pedal speed as speed, programmed in single program step, we need to press multifunction button PROGRAM.



Accel. and dec. ramp for pedal

CODE	ACC.TIME (sec)	DEC.TIME (sec)
1	1	0,5
2	2	1
3	3	1,5
4	4	2
5	6	3
6	8	4
7	10	5
8	12	6

Max. pedal speed is controlled by values, programmed in single program steps, in this case.

Acceleration and deceleration ramp values are always taken from window PEDAL SETUP.

Winding cycle start continuity

This option is utilized during winding start. Wire application and winding of the first turns is done by pedal and then by pressing START-button (4) cycle continues.

5.7 PROTECTION SHIELD

Protection shield may be programmed as:

CLOSED

There is a possibility of winding only if the protection shield is closed.
When the shield is opened, the cycle is interrupted.

OPENED

There is a possibility of winding if the protection shield is opened, but the spindle speed will be limited for safety value, automatically.
When the shield is closed during the winding, the cycle continues with the speed values programmed previously.

5.9 WINDING CORRECTIONS

Program corrections and adjustments are allowed only in the state "STANDSTILL" or "Winding STOP". Keys are blocked in other states. When there is a beep warning after the key pressing, the operation is illogical or inaccessible.

5.9.1 Spindle reference position setting

The spindle can be positioned in the range $\pm$ a few degrees and exact position is kept for any amount of windings.

Reference (zero) spindle position is set up by follows:

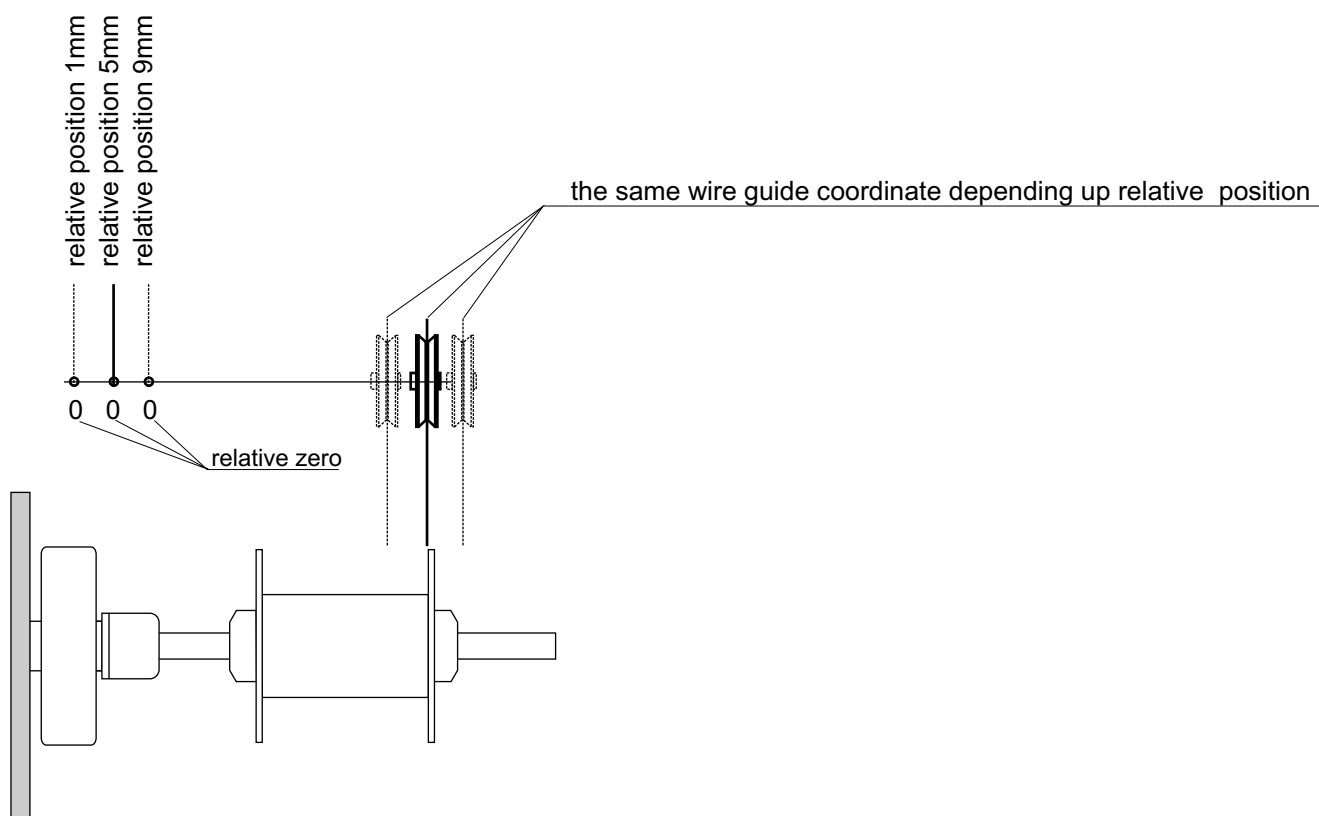
- switch the brake-off by the switch (6)
- turn the spindle manually to the required position and return the switch (6) to the former position
- press RESET then ENTER

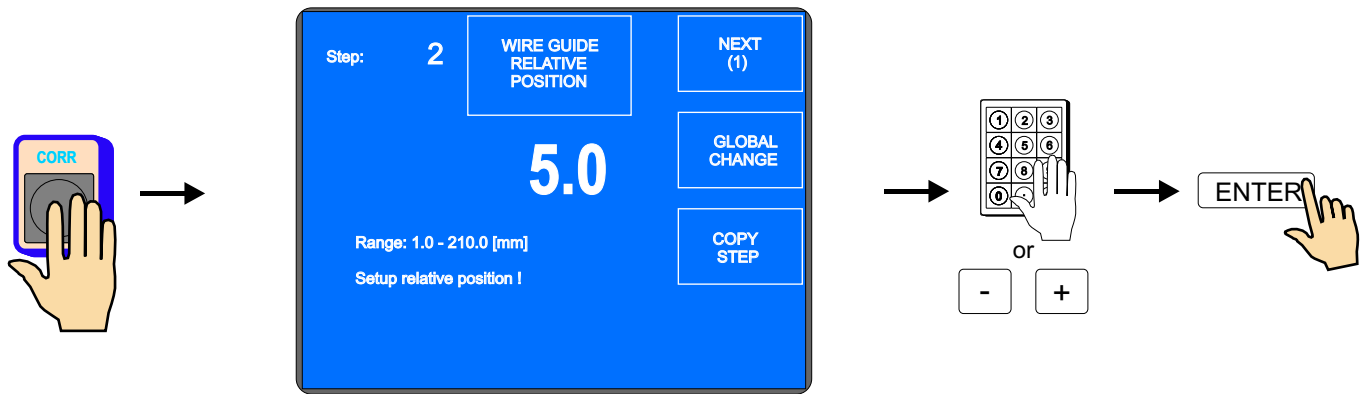
Note: When you switch the machine ON (by switch POWER or EMERGENCY STOP), RESET is running automatically and the spindle position is taken as reference position.

5.9.2. Wire guide relative position setting

This correction shifts zero coordinate of the wire guide (relative zero position). It allows you to correct the wire guide position to be in accordance with the bobbin or winding tool.

Default : 5 mm



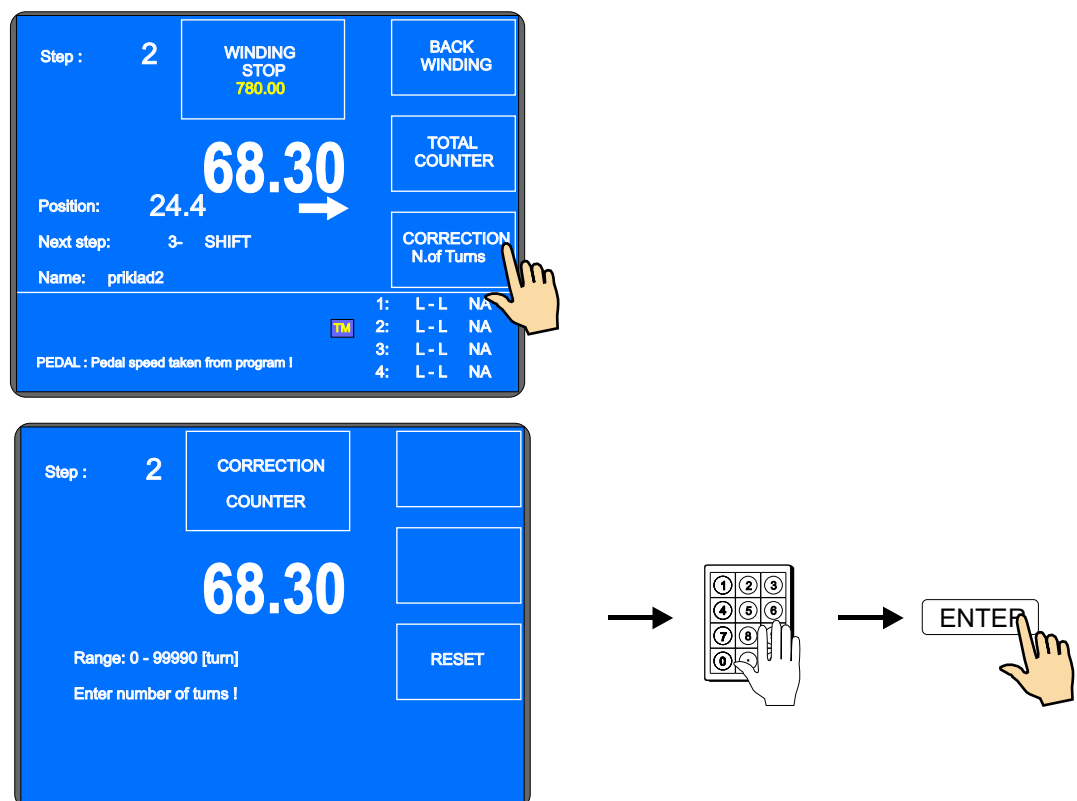


Holding the buttons pressed (cca 0,5 s) moves the wire guide continuously.

5.9.3. Number of turns correction

We can change the number of turns counted actually.

Correction of decimal turn number e.g. XX.3 to XX.0 without adequate spindle turn, leads to the loss of reference position..



Multifunction RESET-button set to zero actual counter state.

5.9.4 Total counter

We can switch between TOTAL COUNTER and COUNTER. TOTAL COUNTER counts all spindle turns until it is set to zero by RESET, or is set differently by numeric keyboard.

Both counters are independent. By switching is only displayed one of it !

Step : 2

WINDING STOP
780.00

BACK WINDING

Position: 24.4 → **68.30**

Next step: 3- SHIFT

Name: priklad2

TOTAL COUNTER

CORRECTION
N.of Turns

1:	L - L	NA
2:	L - L	NA
3:	L - L	NA
4:	L - L	NA

PEDAL : Pedal speed taken from program I

Step : 2

WINDING STOP
780.00

BACK WINDING

Position: 24.4 → **68.30_T**

Next step: 3- SHIFT

Name: priklad2

COUNTER

CORRECTION
N.of Turns

1:	L - L	NA
2:	L - L	NA
3:	L - L	NA
4:	L - L	NA

PEDAL : Pedal speed taken from program I

Step : 2

WINDING STOP
780.00

BACK WINDING

Position: 24.4 → **68.30**

Next step: 3- SHIFT

Name: priklad2

COUNTER

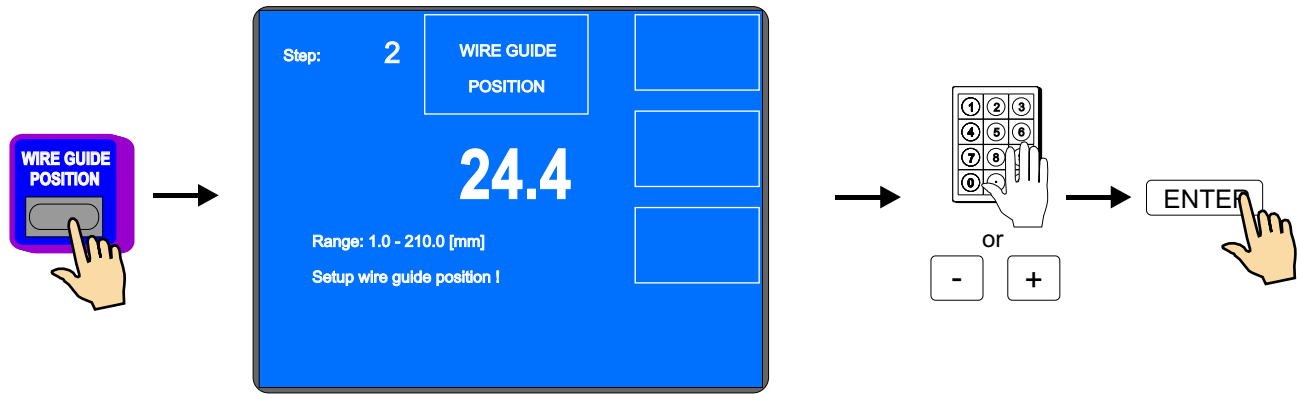
CORRECTION
N.of Turns

1:	L - L	NA
2:	L - L	NA
3:	L - L	NA
4:	L - L	NA

PEDAL : Pedal speed taken from program I

5.9.5. Wire guide correction

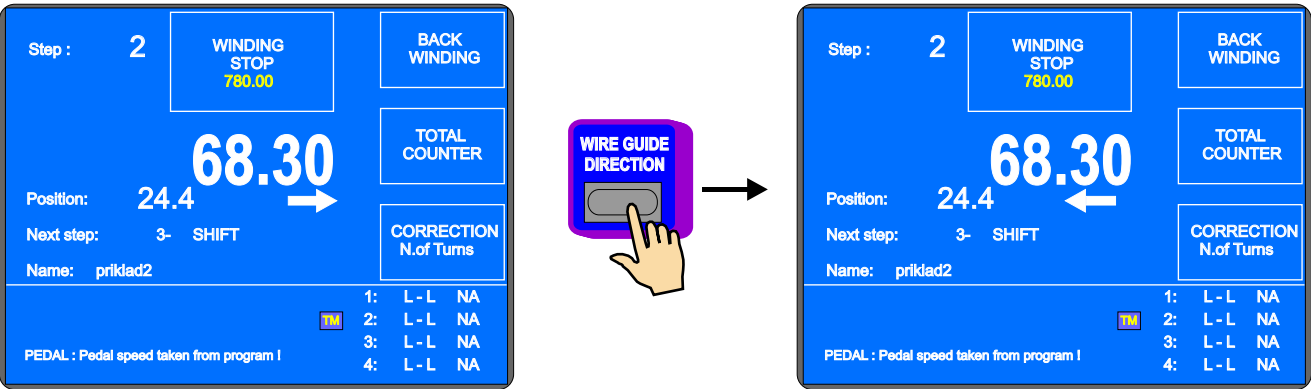
Correction allows you to correct the wire guide position while winding process.



Holding the buttons **-** **+** pressed (cca 0,5 s) moves the wire guide continuously.

5.9.6. Wire guide direction change

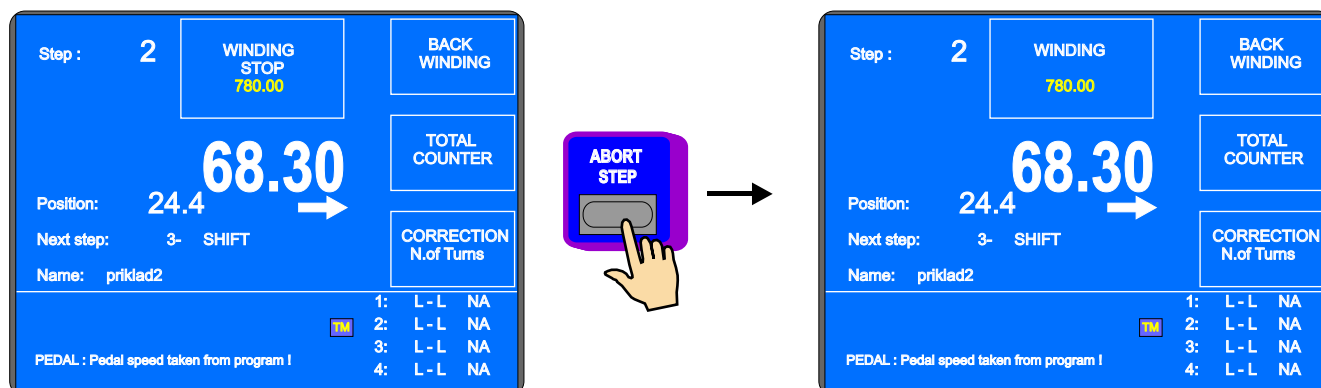
Correction allows you to change the direction of wire guide while winding.



5.9.7. Step abort

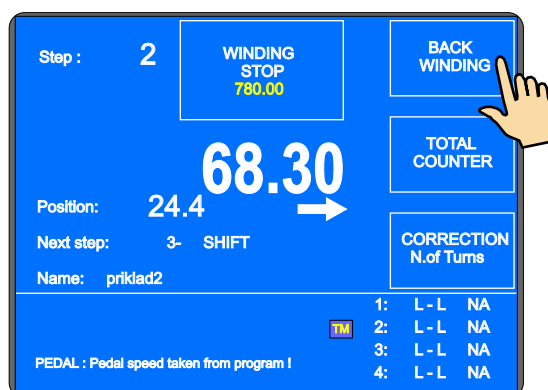
Correction allows you to abort actual running step.

By pressing ABORT STEP button returns the STANDSTILL state.



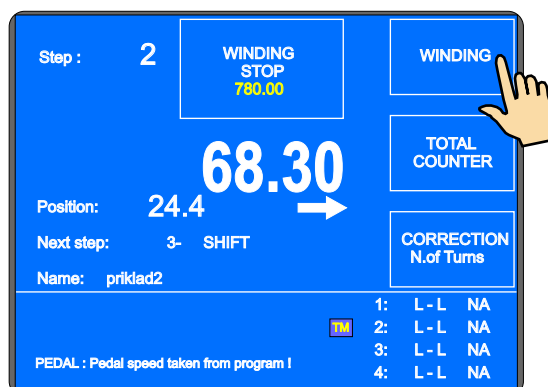
5.9.8. Back winding

Correction allows you to wind back the required number of turns.



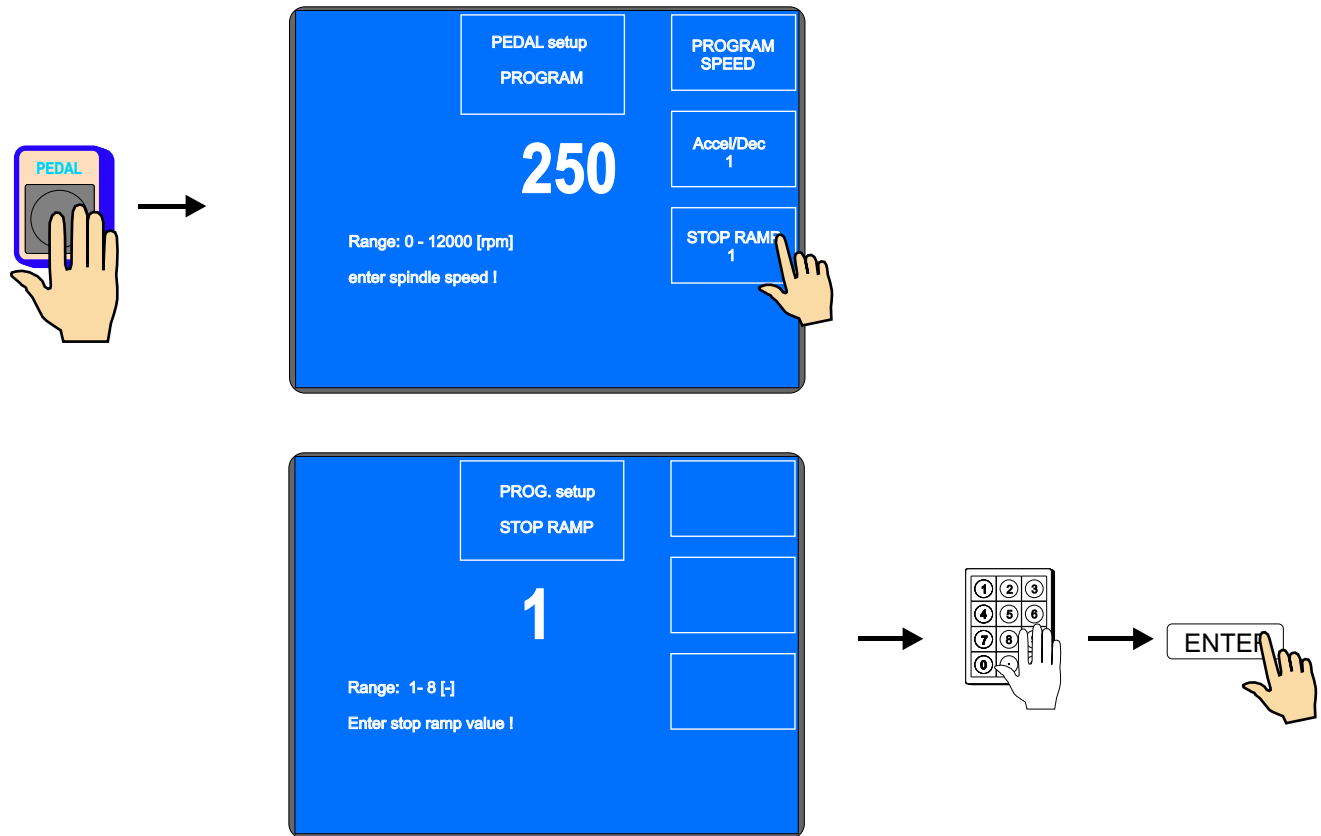
We can wind back required number of turns only by pedal. The number of turns is counted back and the wire guide moves in opposite direction.

Pressing of multifunction button "WINDING" ends back winding.



5.9.9. Deceleration ramp for the STOP-button

Deceleration ramp for the STOP button can be set. This ramp is whenever a bit faster (control by software) than programmed deceleration ramp.

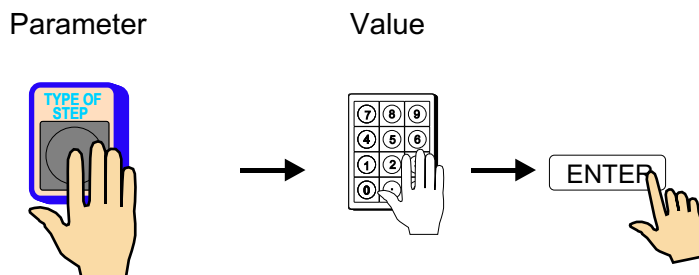


CODE	TIME [s]
1	1,0
2	1,5
3	2,0
4	3,0
5	4,0
6	6,0
7	8,0
8	12,0

Presentated values are valid for max.speed.

6. PROGRAMMING

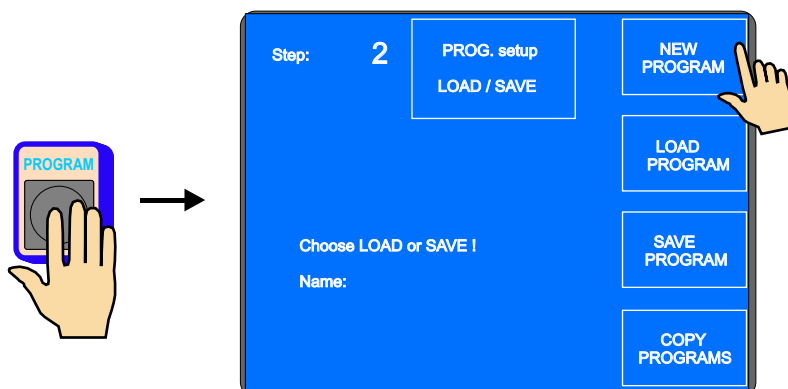
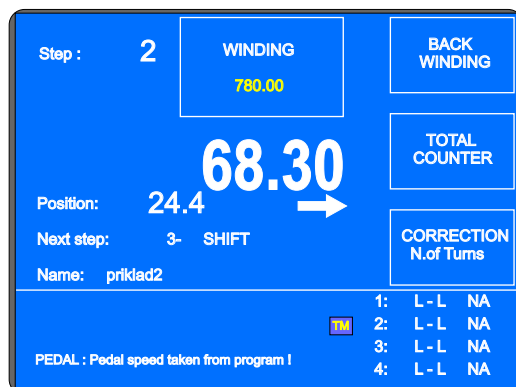
Entering the data:

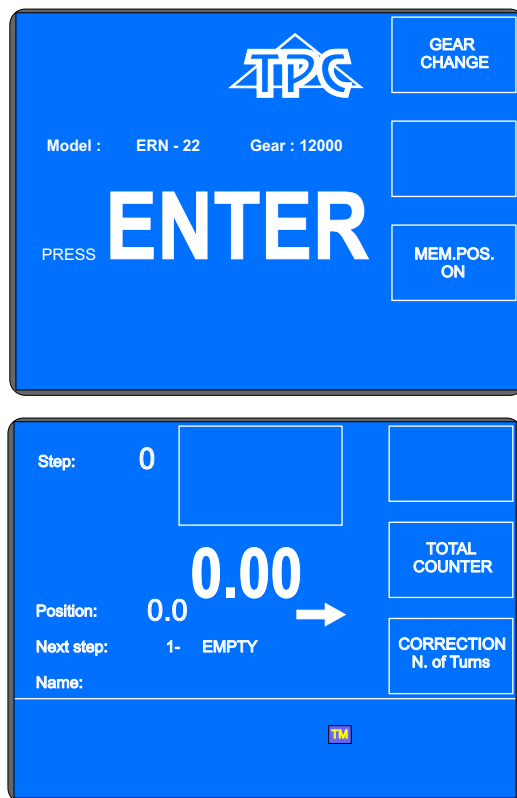


Use the ENTER-button for execution entered value or for return from any function.

Programming is not possible in the step 00. By button  or numeric keyboard we need to choose any other step. When there is beep warning after the keep pressing, the operation is illogical or inaccessible.

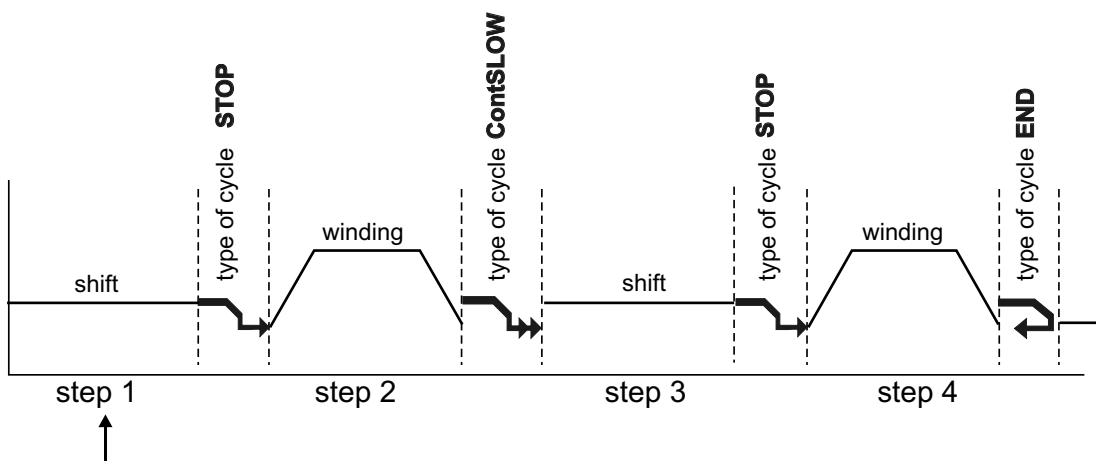
Created program is saved to the working part of memory (program in this memories is designated as a ACTUAL PROGRAM). We can either overwrite (or modify) the already existing program, or open the new one.





6.1 Basis of programming

Winding program is logical sequence of a few(1-350) joined steps.



Joining to the next step is defined by the type of cycle. If the type of cycle "END " is programmed to the specific step, it comes to this, that end of program and after pressing START- button, program is restarted and step 1 is running.

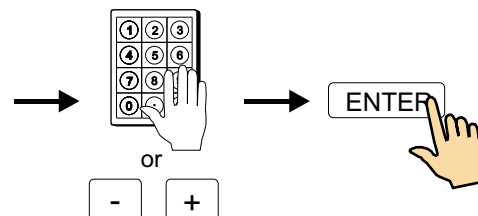
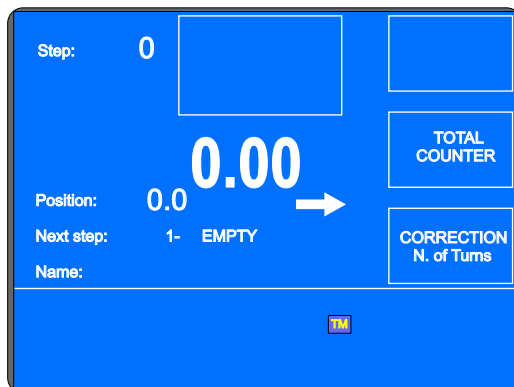
Max.step capacity for the one winding program is 350 !

6.2 Step choice

Only in the winding or viewable window we can choose the required step as follows:

a) directly by numeric keyboard

b) by or buttons



6.3 Step parameters programming

6.3.1 Basic step types

Every step can be programmed as WINDING, SHIFT, JUMP or PAUSE.

Winding - is defined by following parameters: number of turns, speed and spindle direction, pitch, left and right reversal point

Shift - spindle is not turning and the wire guide is shifting to the programmed coordinate

Jump - spindle is not turning and the wire guide is shifting from its position to the left or right, in accordance with the programmed value

Pause - spindle and wire guide are idle and the pause duration depends on programmed time

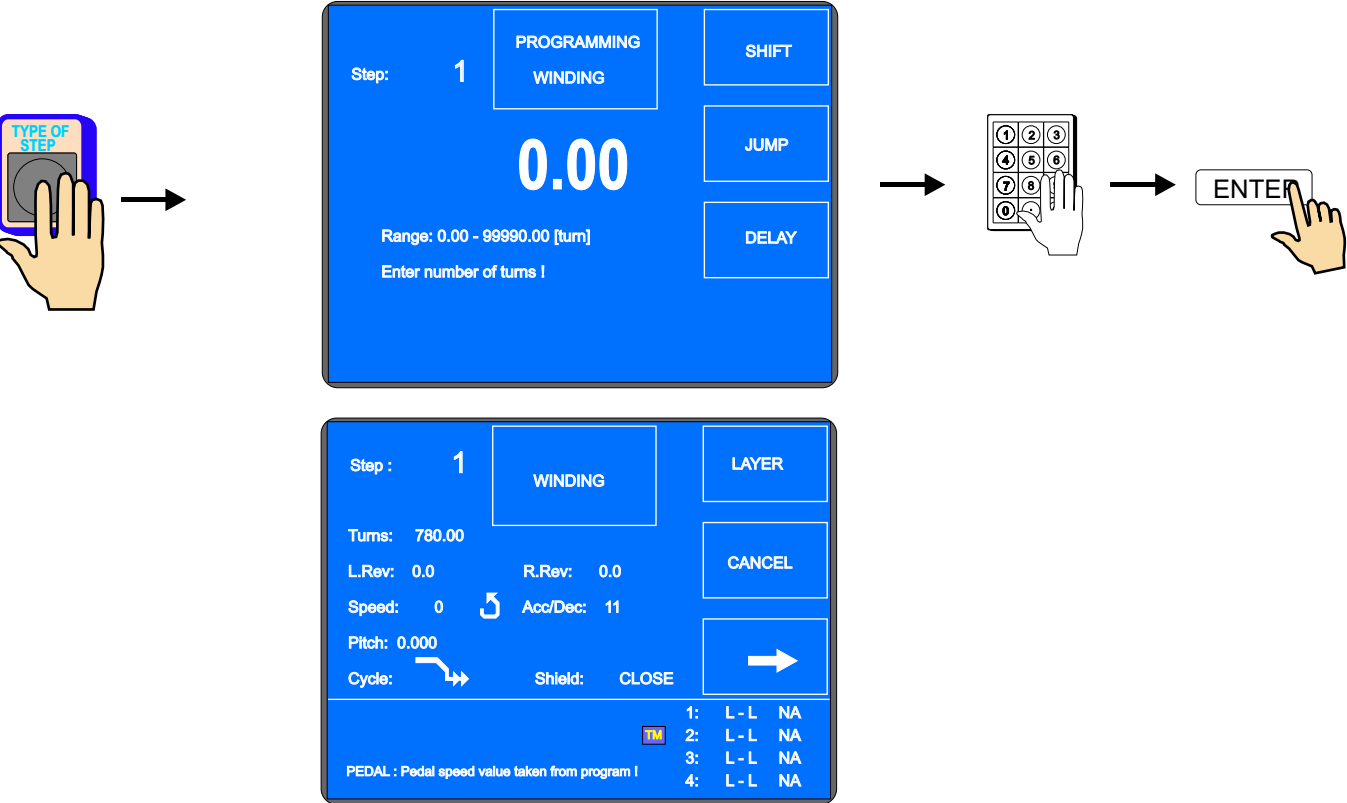
6.3.2 Choice of step type

By pressing the button TYPE OF STEP we can choose and program the desired step type. Concurrently, we can entry the main parameter of the chosen step type, what means: number of turns for winding, coordinate value for shift, lenght for jump and time for pause.



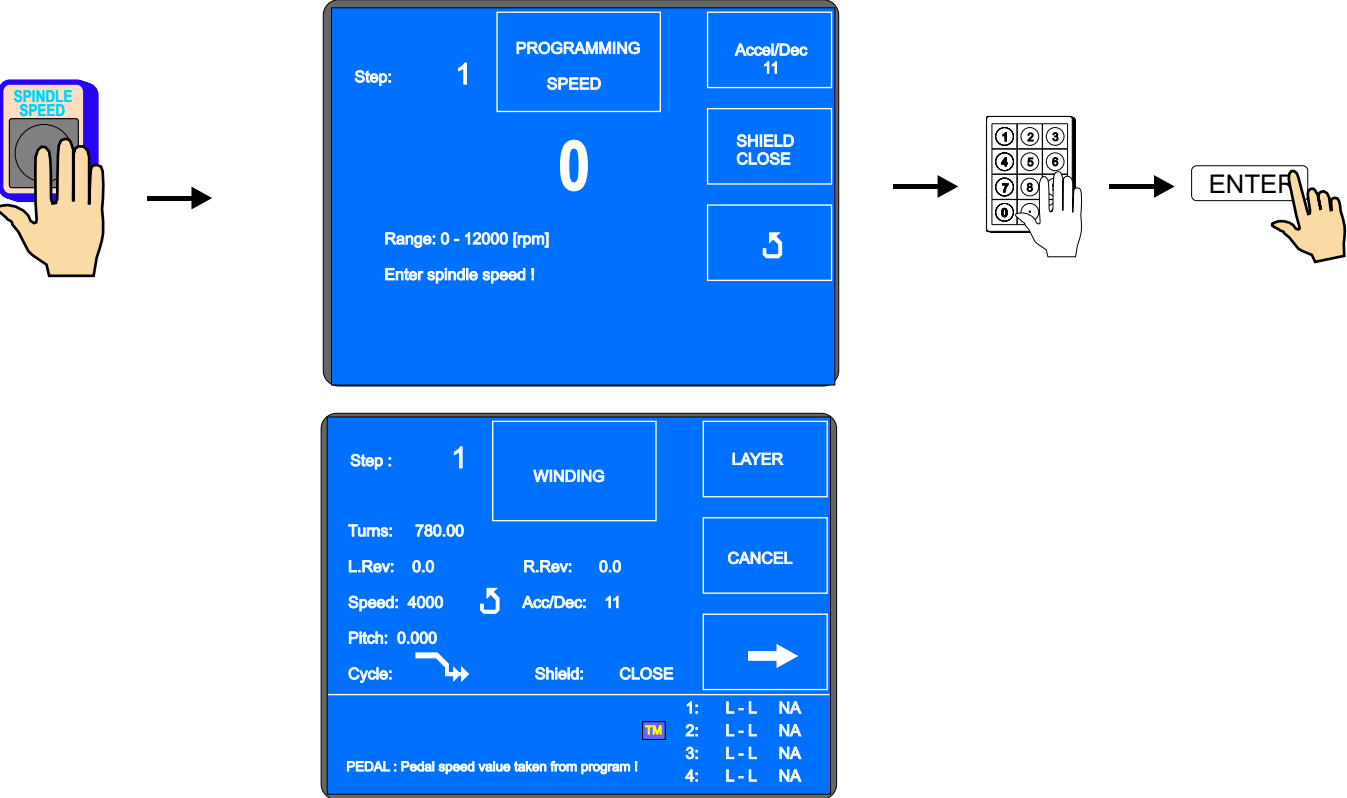
6.3.3 Winding step

Number of turns

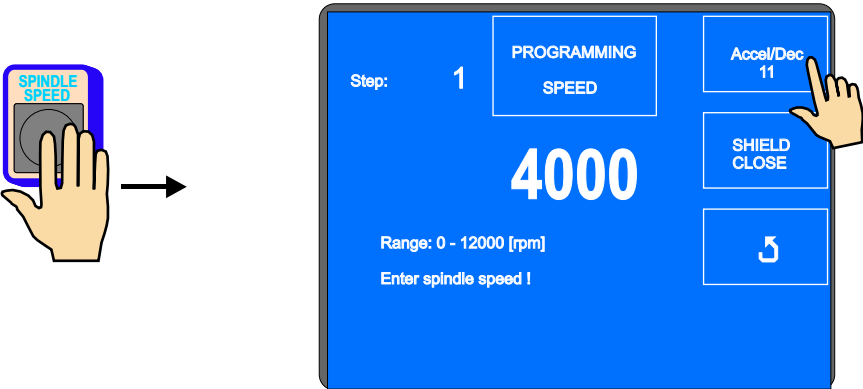


If " 0 " is programmed to the number of turns, this winding step turns the spindle to the zero reference position. Direction of the spindle speed is taken from the previous winding step !

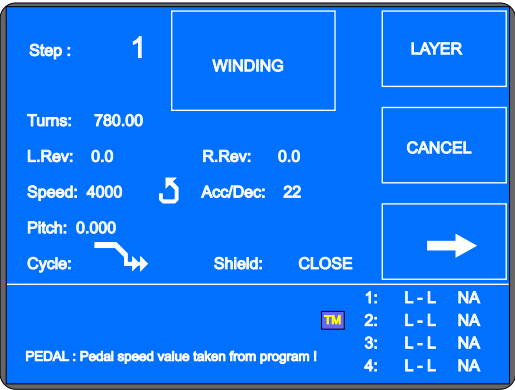
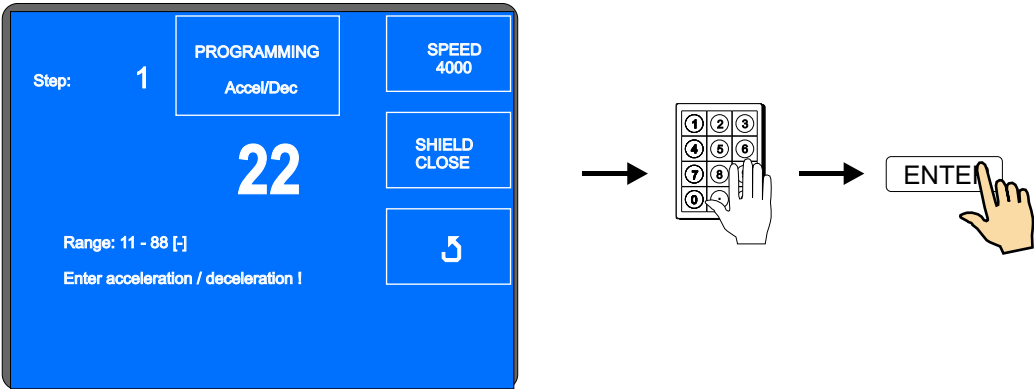
Spindle speed



Spindle acceleration and deceleration

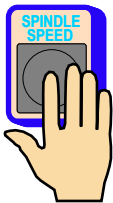


Entry of values 1 to 8 for acceleration and deceleration according to the enclosed table.



CODE	ACCEL. (s)	DECCEL. (s)
1	1,5	1,5
2	2,3	2,3
3	3	3
4	4,5	4,5
5	6	6
6	9	9
7	12	12
8	16	16

Spindle direction and protection shield



→

Step: 1

PROGRAMMING
SPEED

4000

Range: 0 - 12000 [rpm]
Enter spindle speed !

Accel/Dec
22

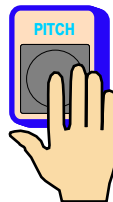
SHIELD
CLOSE

↺

Protection shield programming

Spindle direction programming

Pitch



→

Step: 1

PROGRAMMING
PITCH

0.000

Range: 0.000 - 40.00[mm]
Enter pitch !

123

456

789

0

→

ENTER

Step : 1

WINDING

LAYER

Turns: 780.00

L.Rev: 0.0 R.Rev: 0.0

Speed: 4000 ↺ Acc/Dec: 22

Pitch: 0.300

Cycle: ↻ Shield: CLOSE

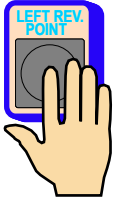
1: L - L NA
2: L - L NA
3: L - L NA
4: L - L NA

PEDAL : Pedal speed value taken from program !

CANCEL

→

Left reversal point



→

Step: 1

PROGRAMMING
LEFT REV.
POINT

0.0

Range: 0.0 - 210.0 [mm]
Enter left reversion point !

123

456

789

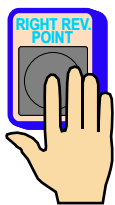
0

→

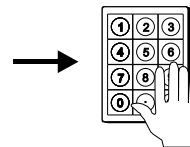
ENTER

Step :	1	WINDING	LAYER
Turns:	780.00		
L.Rev:	10.0	R.Rev:	0.0
Speed:	4000	Acc/Dec:	22
Pitch:	0.300		
Cycle:		Shield:	CLOSE
PEDAL : Pedal speed value taken from program I		1: L - L NA 2: L - L NA 3: L - L NA 4: L - L NA	

Right reversal point



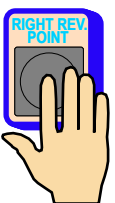
Step:	1	PROGRAMMING RIGHT REV. POINT	SHIFTING ON
0.0			
Range: 0.0 - 210.0 [mm]			
Enter right reversion point I			



Step :	1	WINDING	LAYER
Turns:	780.00		
L.Rev:	10.0	R.Rev:	60.0
Speed:	4000	Acc/Dec:	22
Pitch:	0.300		
Cycle:		Shield:	CLOSE
PEDAL : Pedal speed value taken from program I		1: L - L NA 2: L - L NA 3: L - L NA 4: L - L NA	

Switching OFF the wire guide shifting during programming

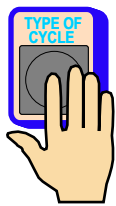
We can switch OFF the wire guide shifting by button SHIFTING ON / OFF during programming.



Step:	1	PROGRAMMING RIGHT REV. POINT	SHIFTING OFF
60.0			
Range: 0.0 - 210.0 [mm]			
Enter right reversion point I			

Type of cycle

Set the type of cycle and choose, how to continue to the next step.



End of program

By pressing START-button, program is restarted and step 1 is running.



Cycle stop

After step finish, program stops and the next step is activated by START-button.



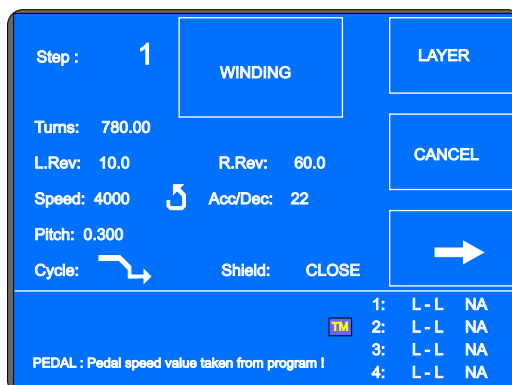
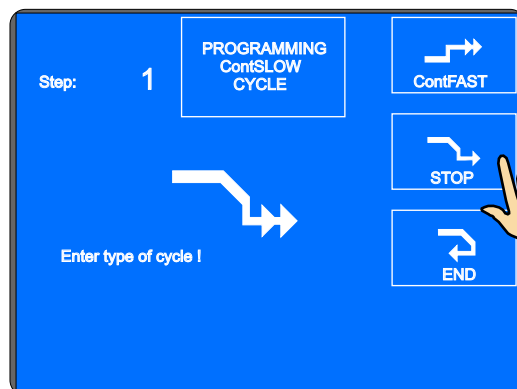
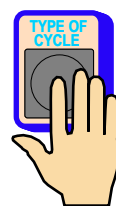
Continual cycle with deceleration

After step finish, program starts the next step automatically, without pressing the START-button. Winding step decelerates to zero, at first.

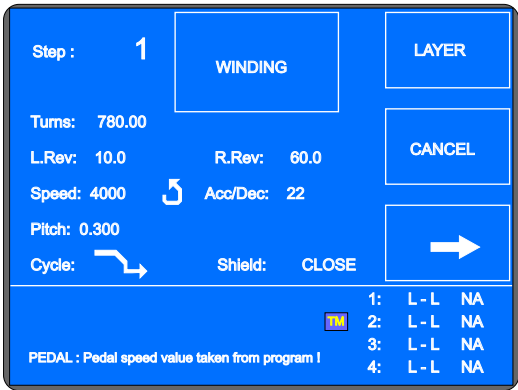


Continual cycle without deceleration

After step finish, program starts the next step automatically, without pressing the START-button. Spindle deceleration is canceled. Only winding steps can be joined by this cycle.



Number of turns cancel and the wire guide direction after start



Number of turns cancel
after start

Wire guide direction
after start

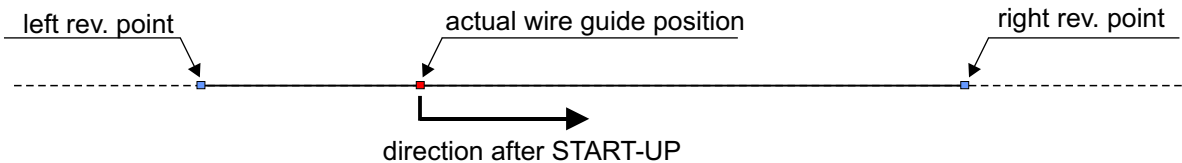
Number of turns cancel

CANCEL - previous counted number of turns is cancelled after START-UP the winding type of step

NOT
CANCEL - counted number of turns is not cancelled

Wire guide direction after start.

➡ -right moving the wire guide after START -UP,if its position is between left and right reversal point

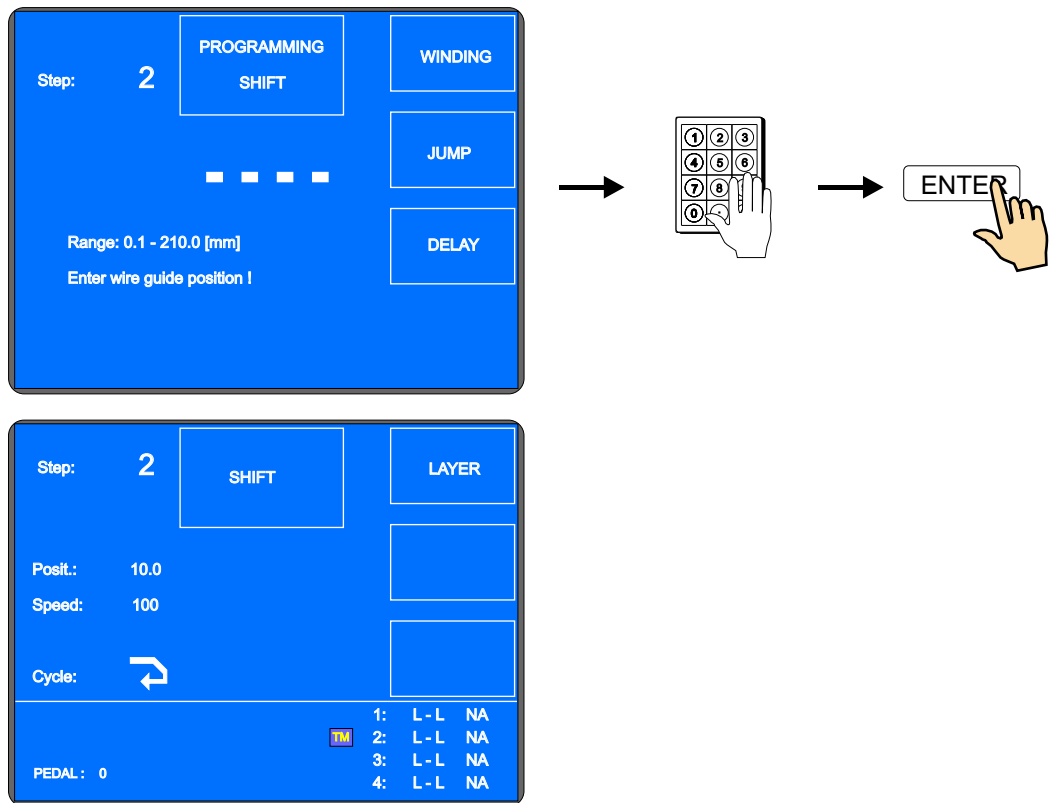


⬅ - the same,but left moving

6.3.4 Wire guide shift

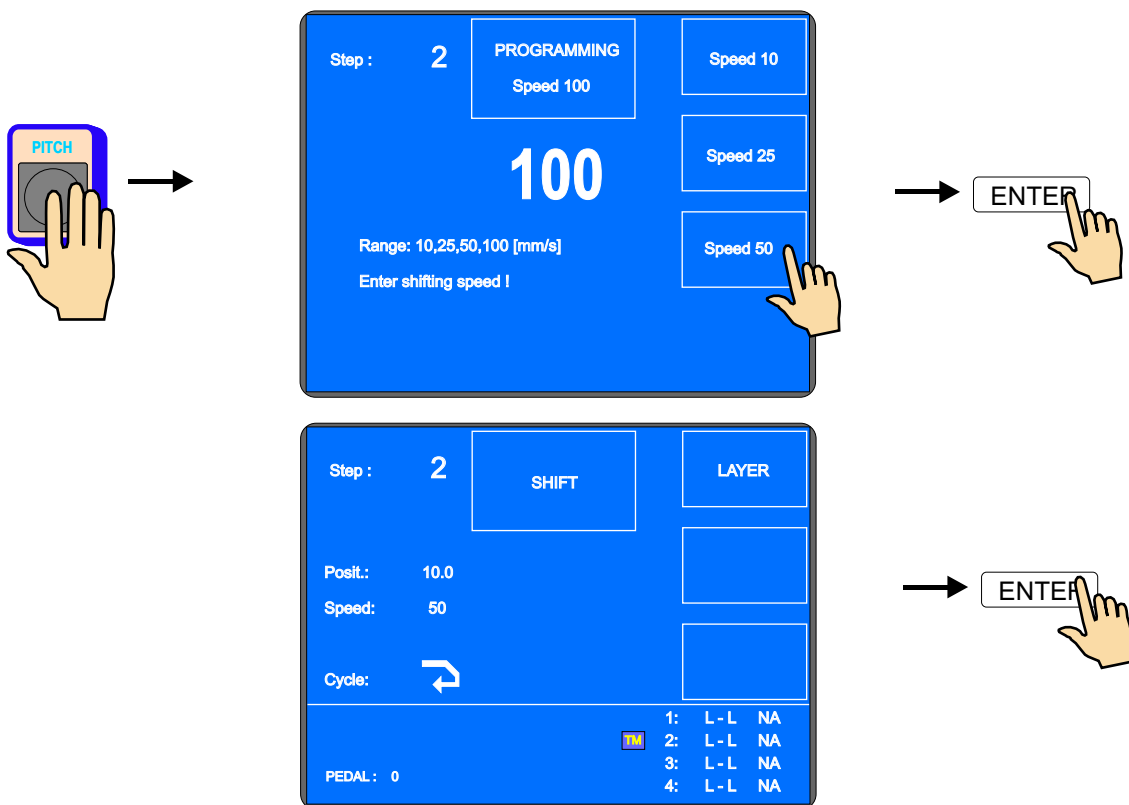
Coordinate of shift



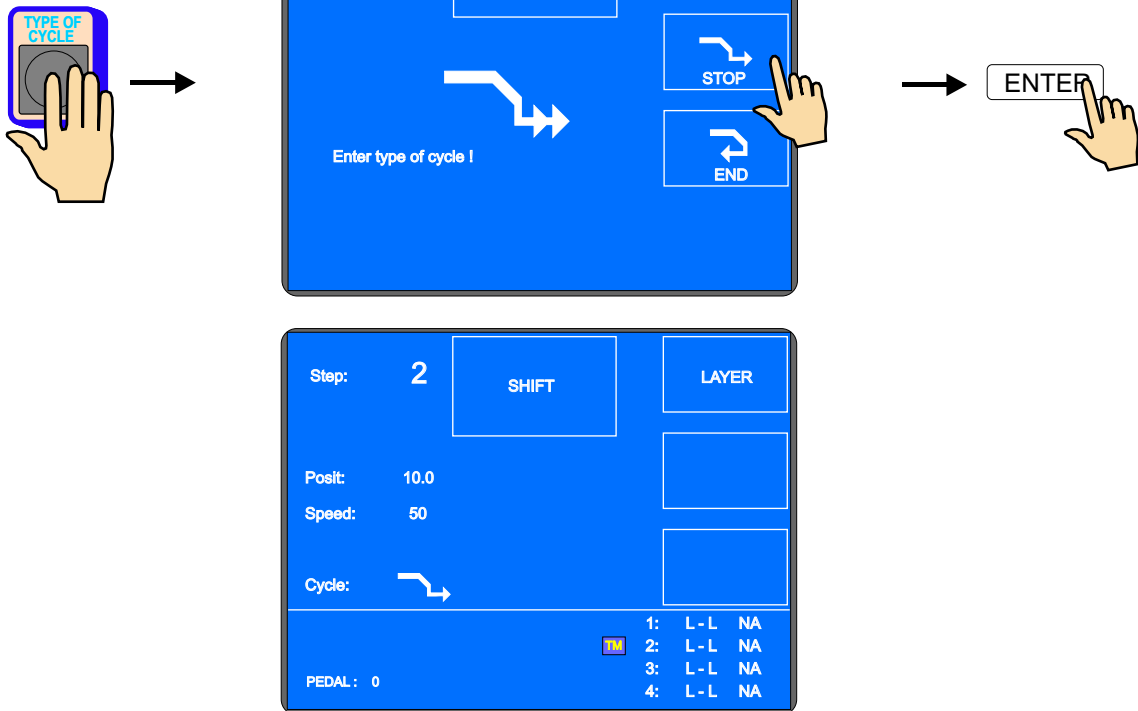


Speed of the shift

The speed of shift is set at 100 mm/sek automatically, while programming.
If lower speed is required, we can change it as follows:

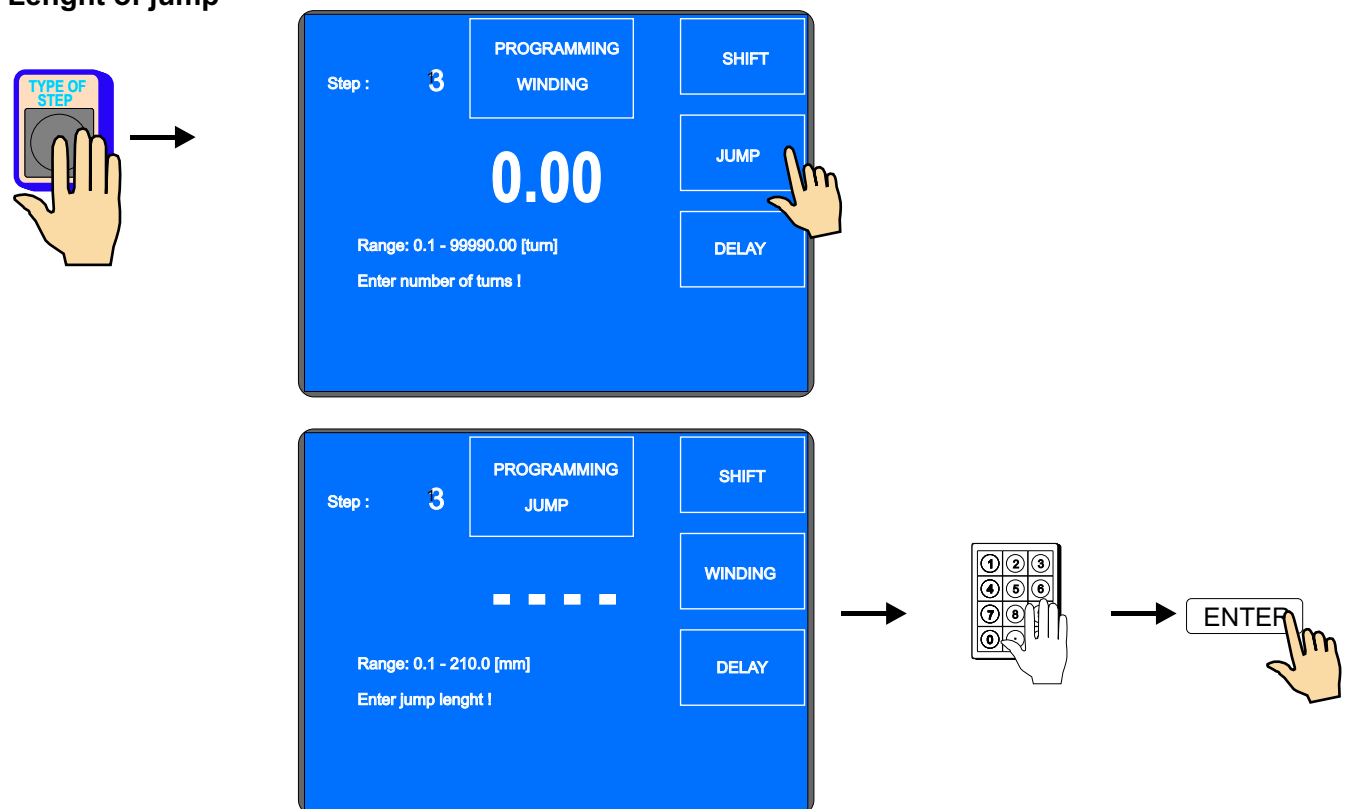


Type of cycle

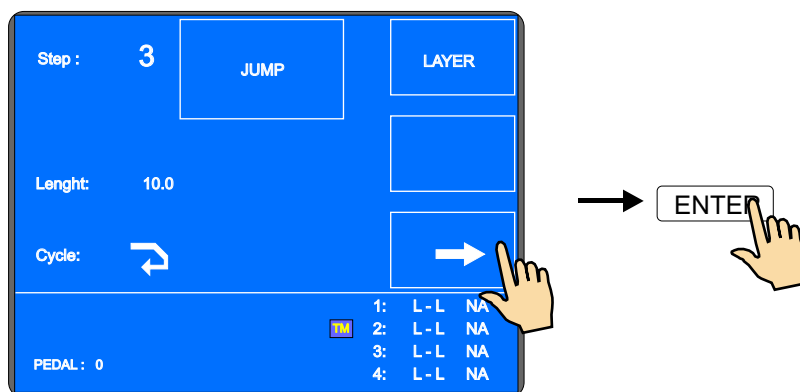


6.3.5 Wire guide jump

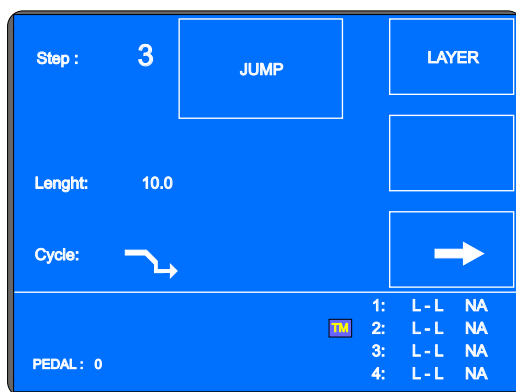
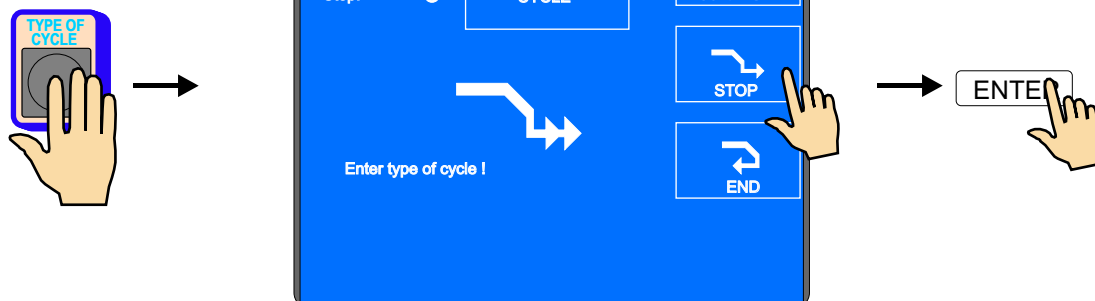
Lenght of jump



Jump direction



Type of cycle



6.3.6 Delay

Time of delay



Step : 4

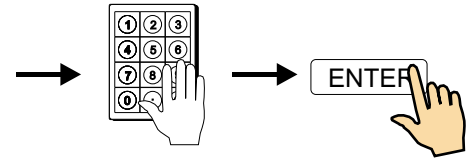
PROGRAMMING
DELAY

Range: 1 - 99990 [msec]
Enter time of delay !

SHIFT

JUMP

WINDING



Step : 4

DELAY

Delay: 1200

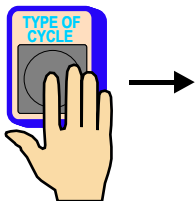
Cycle:

PEDAL : 0

1:	L - L	NA
2:	L - L	NA
3:	L - L	NA
4:	L - L	NA

TM

Type of cycle



Step : 4

PROGRAMMING
ContSLOW
CYCLE

Enter type of cycle !

ContFAST

STOP

END



Step : 4

DELAY

Delay: 1200

Cycle:

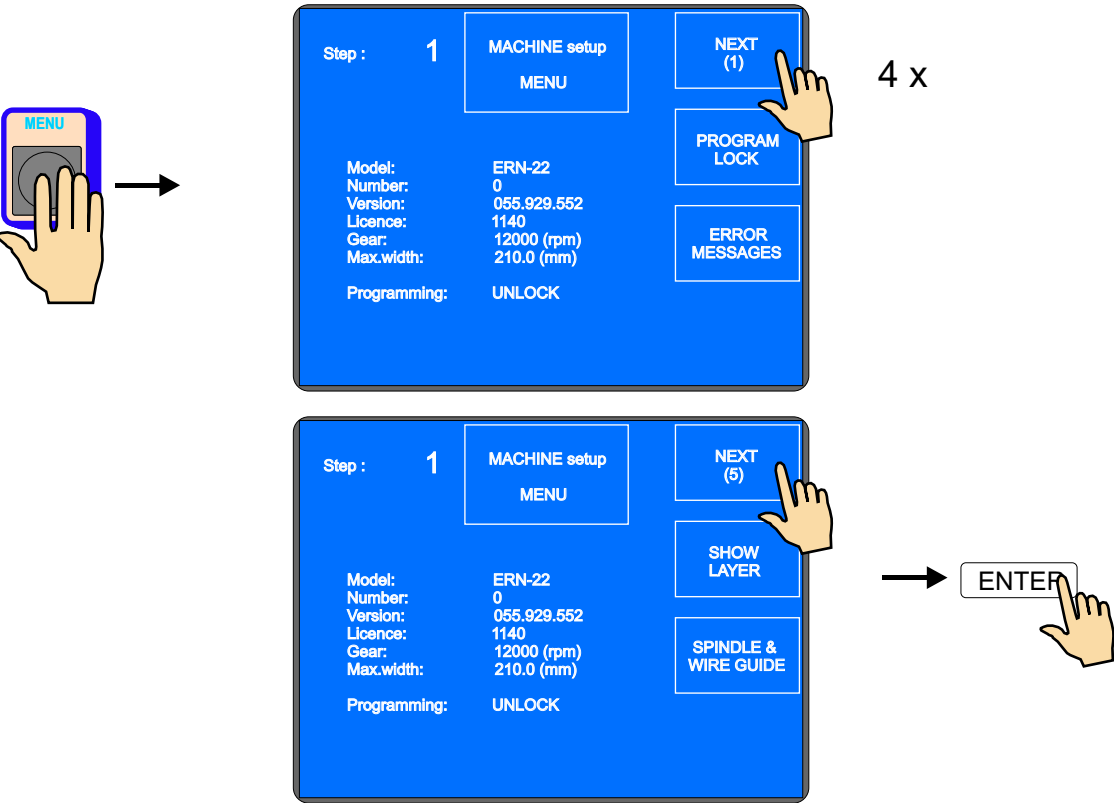
PEDAL : 0

1:	L - L	NA
2:	L - L	NA
3:	L - L	NA
4:	L - L	NA

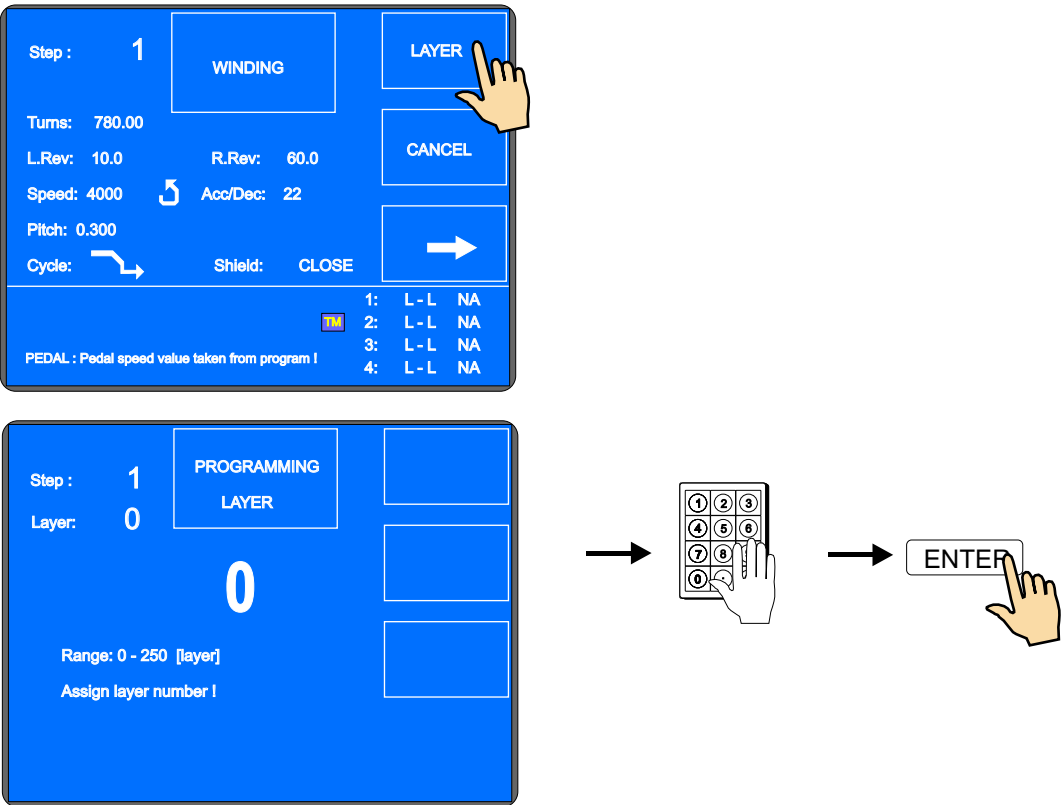
TM

6.4 Display and assignment of the layer

We can display the number of layer instead of program. Readout showed on display can be switched by multifunction button.



We can assign the layer number to every step, according to winding instruction. The same number of layer can be assigned to a few consecutive steps. While winding, the assignment is displayed as it is programmed.



Step :	1	WINDING	LAYER												
Layer:	1														
Turns:	780.00														
L.Rev:	10.0	R.Rev:	60.0												
Speed:	4000	Acc/Dec:	22												
Pitch:	0.300														
Cycle:		Shield:	CLOSE												
PEDAL : Pedal speed value taken from program I		<table border="1"> <tr><td>1:</td><td>L - L</td><td>NA</td></tr> <tr><td>2:</td><td>L - L</td><td>NA</td></tr> <tr><td>3:</td><td>L - L</td><td>NA</td></tr> <tr><td>4:</td><td>L - L</td><td>NA</td></tr> </table>		1:	L - L	NA	2:	L - L	NA	3:	L - L	NA	4:	L - L	NA
1:	L - L	NA													
2:	L - L	NA													
3:	L - L	NA													
4:	L - L	NA													

6.5 Programming corrections

Following functions simplify programming or corrections.

6.5.1 Empty step insertion

Empty step can be insert anywhere inside the program and then can be completed with required parameters. Following steps are shifted in value "+1", automatically.




Step : 2

WIRE GUIDE
RELATIVE
POSITION

5.0

Range: 1.0 - 210.0 [mm]
Setup relative position I

NEXT (1)

GLOBAL CHANGE

COPY STEP

Step : 2

WIRE GUIDE
RELATIVE
POSITION

5.0

Range: 1.0 - 210.0 [mm]
Setup relative position I

NEXT (2)

INSERT STEP

DELETE STEP

Position for step insertion is chosen by buttons

Step : 2

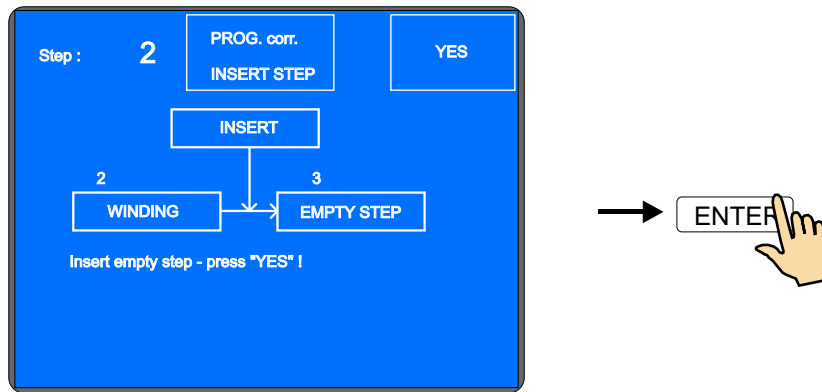
PROG. corr.
INSERT STEP

YES

INSERT

2 WINDING → 3 WINDING

Insert empty step - press "YES" I



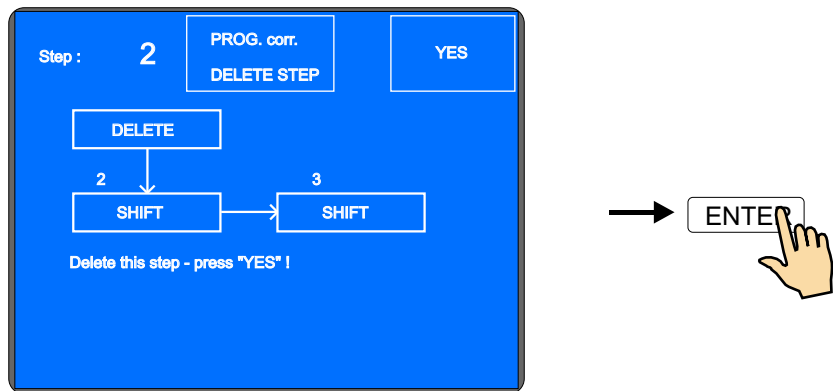
6.5.2 Step cancel

Each step in program can be canceled. Following steps are shifted in value " -1", automatically.



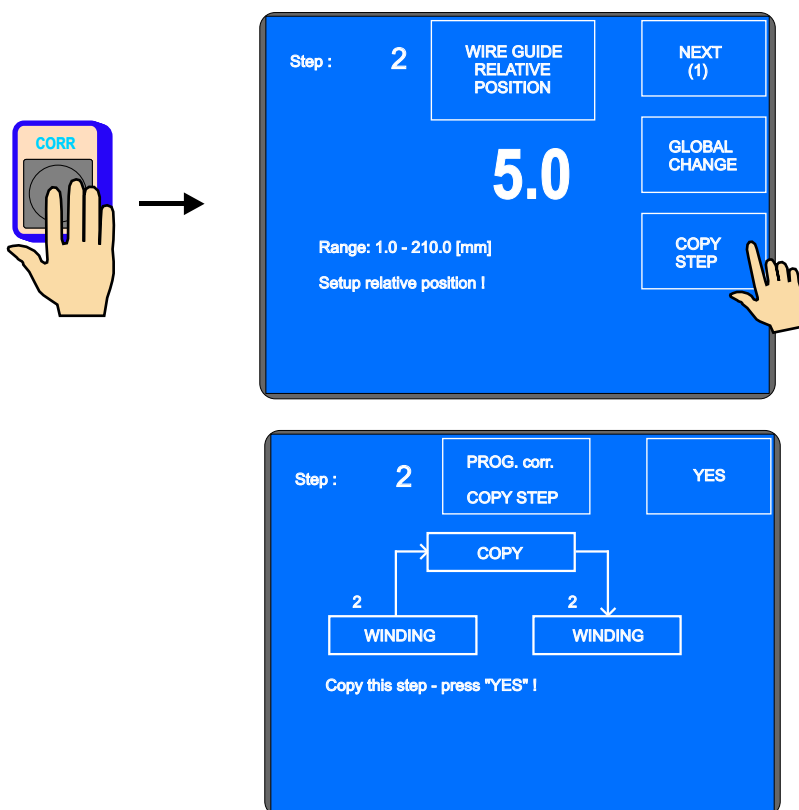
Step, which we wish to cancel is chosen by buttons **-** **+**



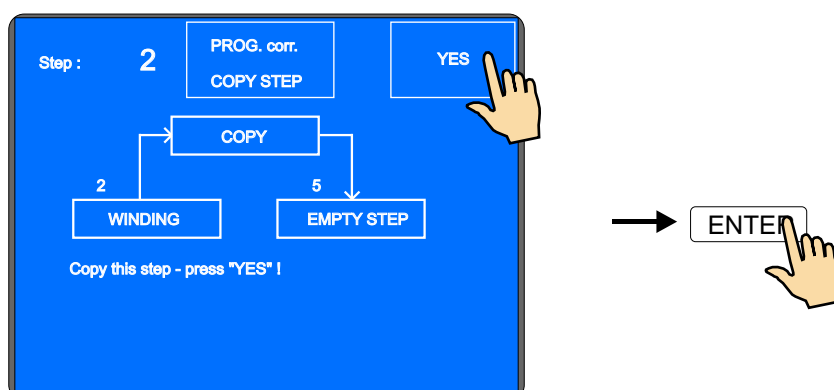


6.5.3 Step copy

Each step, already programmed, can be copied to another step (previous or next).

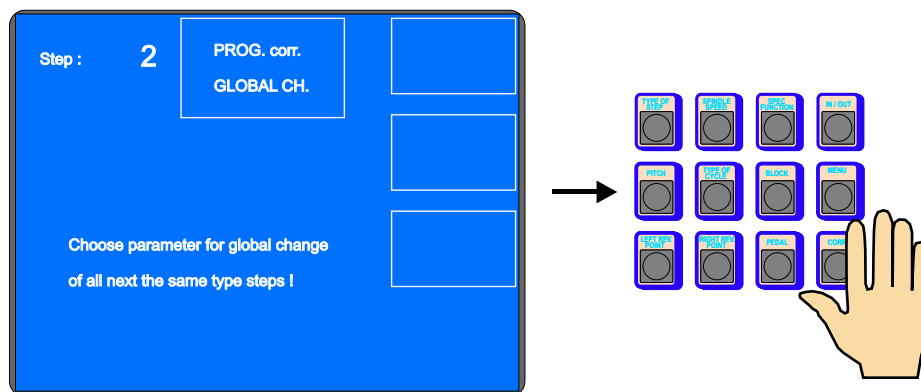
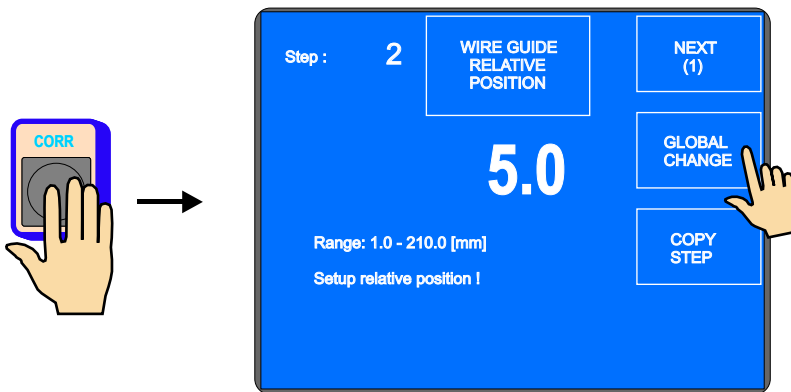


Actual step is copied and inserted to the step, which is chosen by buttons



6.5.4 Global change

Function allows you to change one chosen parameter in all the following steps, which must be the same type. For example: if the actual step is winding, chosen parameter will be changed in all following winding steps. This is valid for all other step types (SHIFT, JUMP, PAUSE).



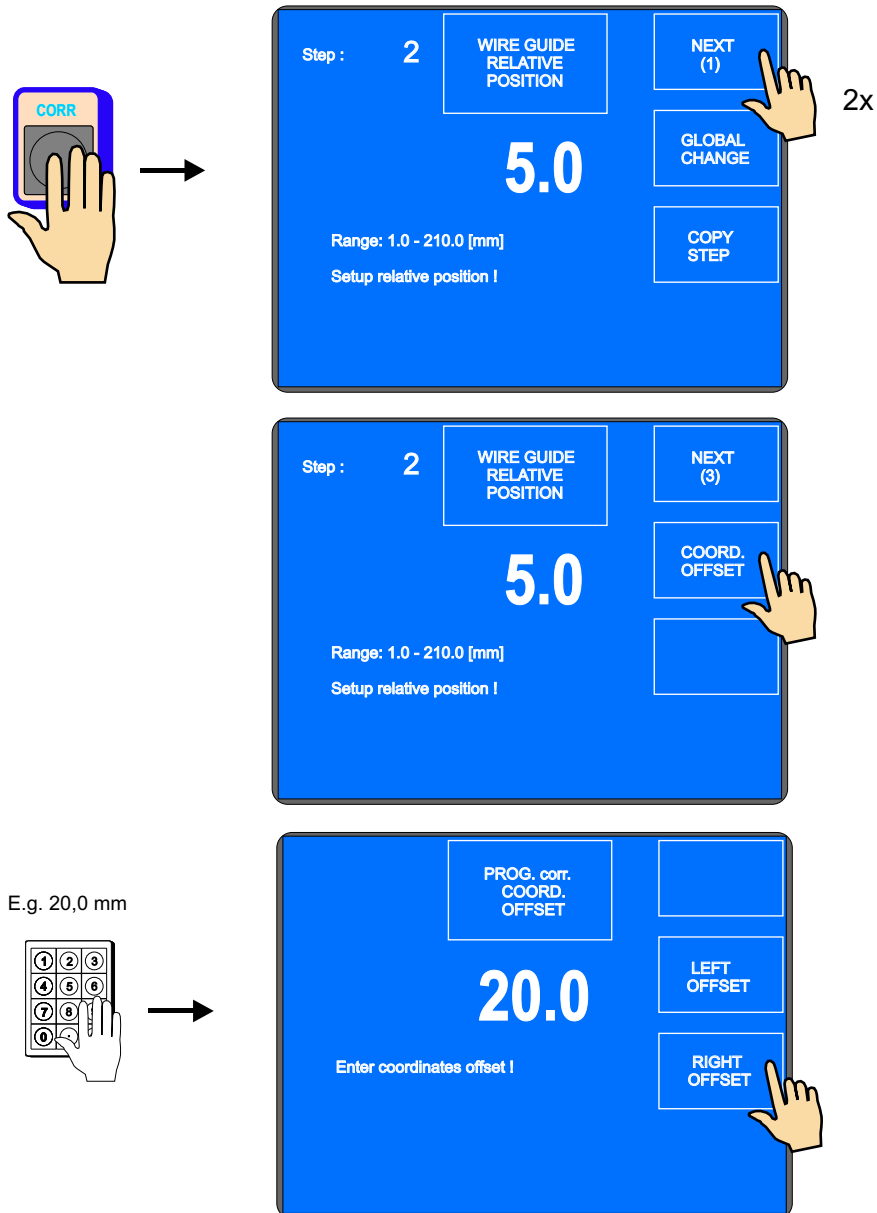
Choose the parameter for changing - e.g. pitch



The pitch is changed in all other consecutive winding steps.

6.5.5 Coordinate offset

Correction provides offset all coordinates in program to the left or right about entered value.

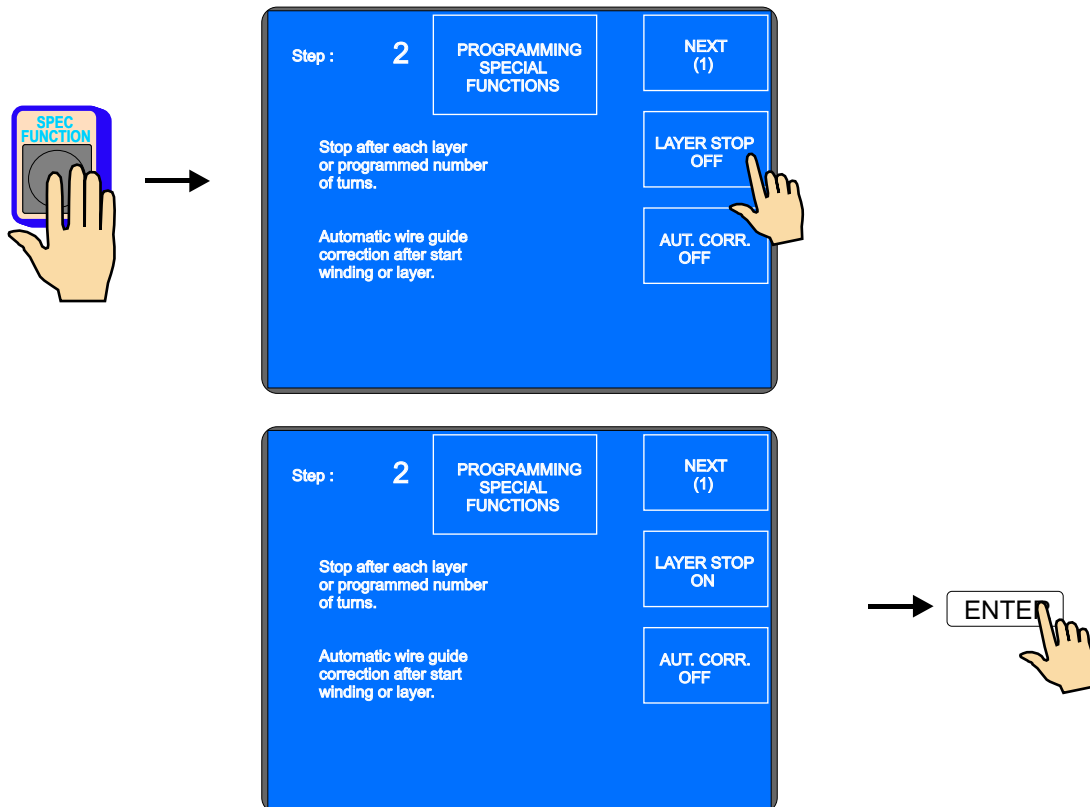


All programmed coordinates / left, right reversal points and shifts/ are incremented about value 20,0 mm.

6.6 Special functions

6.6.1 Layer stop

This function activates winding step STOP, after each wound layer.

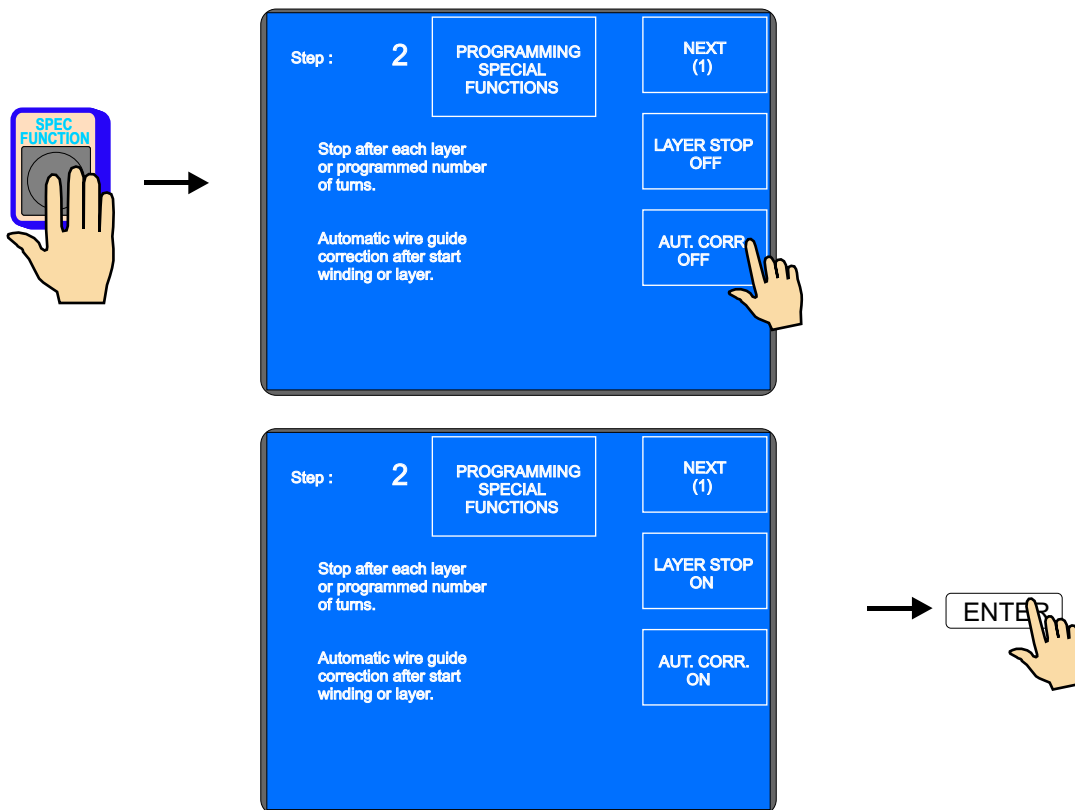


Until programmed number of turns is not reached, machine stops after each layer on the left or right reversal point.

If the assigned layer is displayed, this function will increment its value automatically, after each layer.

6.6.2 Automatic correction

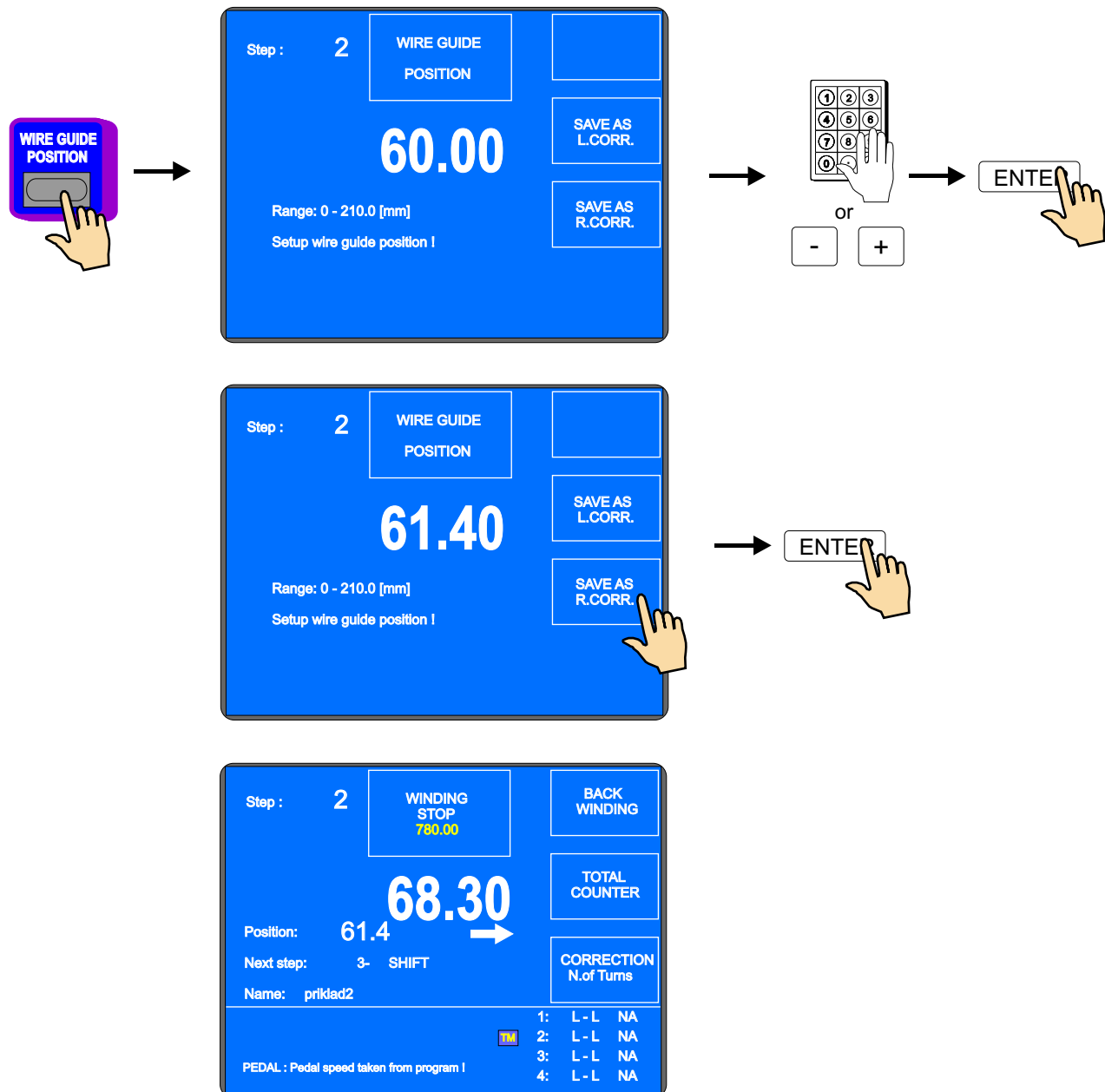
Utilization of this function is mainly related to previous function LAYER STOP. It allows you to correct wire guide position after following start of the layer.



After the first layer is wound (e.g. from left to the right), press the wire guide correction button and correct the wire guide position. This corrected position is saved by pressing SAVE AS RIGHT CORRECTION button. Likewise, we insert and save the left correction after the second layer (from right to the left) is wound. For all the following layers in this step, all the corrections are done automatically, after start.

The screenshot shows the machine's control screen during a winding operation. The screen is divided into several sections. At the top left, it says 'Step : 2'. To its right is a box labeled 'WINDING STOP' with the value '780.00' in yellow. Below this, the current 'Position' is '60.0' and the 'Next step' is '3- SHIFT'. A large '68.30' is displayed in the center with a right-pointing arrow. To the right of the position display is a 'TOTAL COUNTER' button. Below the position display is a 'Name: priklad2' field. At the bottom left, it says 'PEDAL : Pedal speed taken from program I'. At the bottom right, there is a table with 4 rows and 2 columns:

	CORRECTION N.of Turns
1:	L - L NA
2:	L - L NA
3:	L - L NA
4:	L - L NA

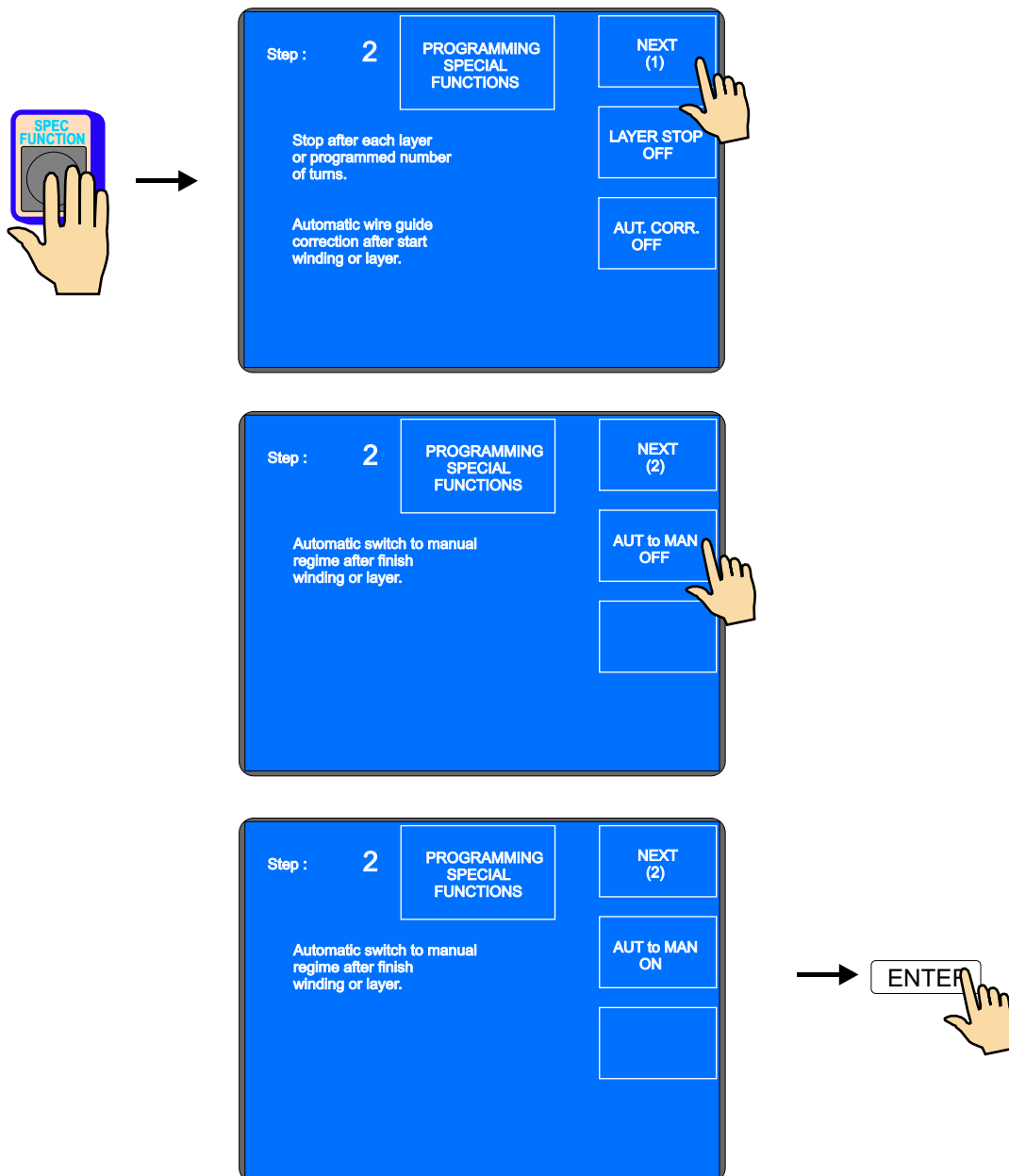


Maximal value for wire guide correction can not overreach ± 10 mm position diversion, after the layer is wound. Higher values are not accepted !

6.6.3 Automatic switch to manual regime

Function provides automatically machine switch to manual regime, after the layer or whole winding step is completed.

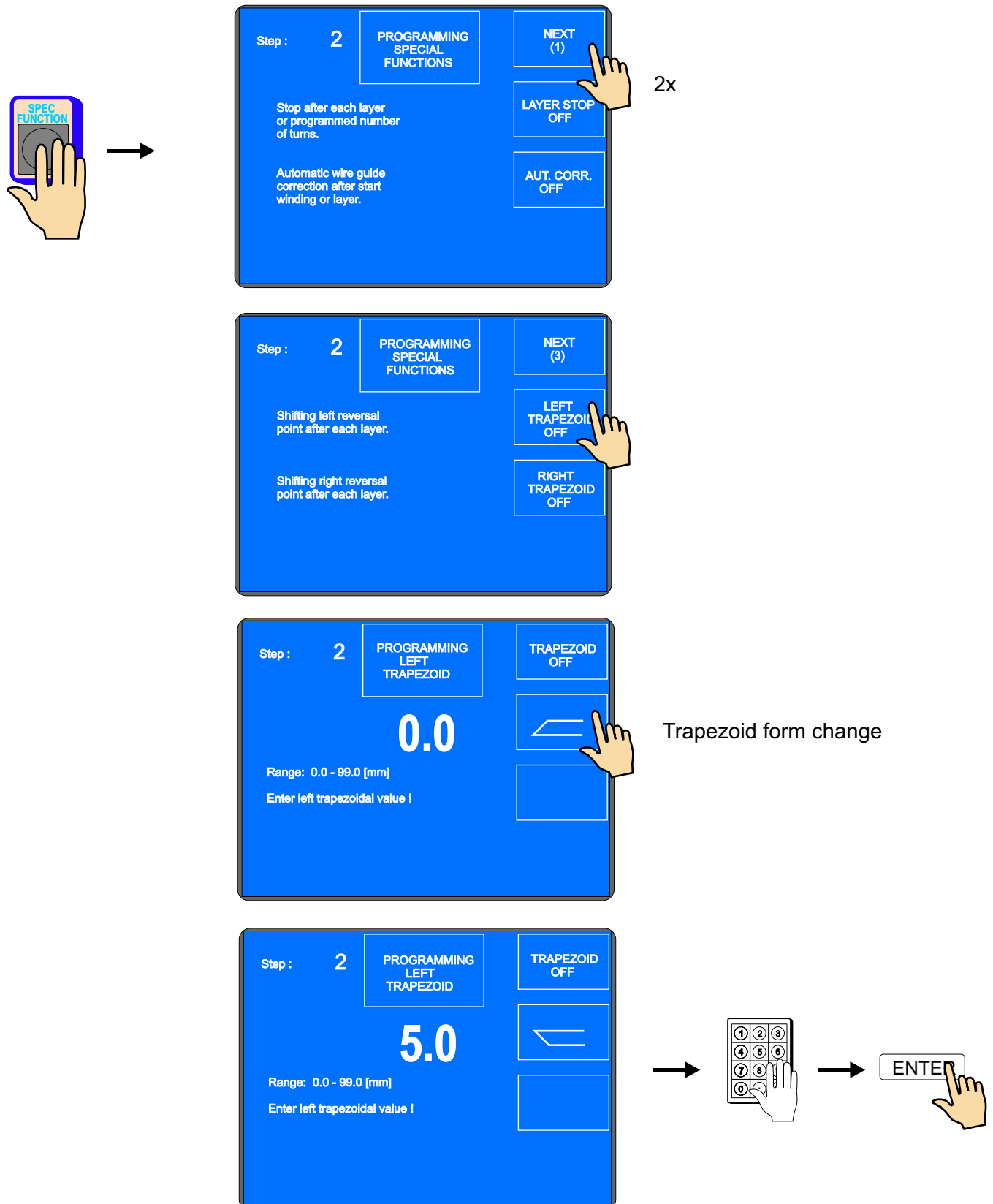
We can wind, just by foot pedal in manual regime. Also, the value of the pitch is taken from the actual step. The wire guide direction is controlled by multifunction button WIRE GUIDE DIRECTION. The number of turns, that is wound in this regime is not defined.

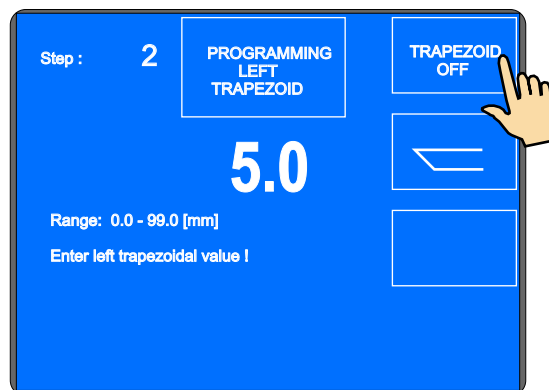
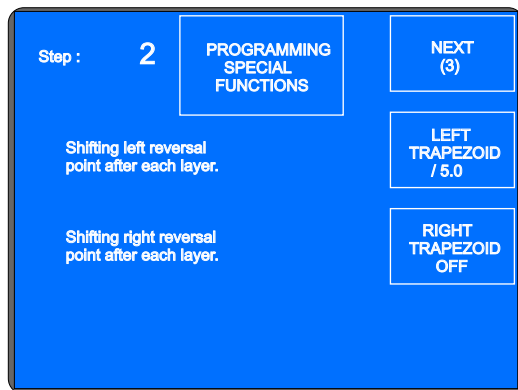


Manual regime switch OFF is done by simultaneous pressing  and  buttons.

6.6.4 Trapezoidal winding

Function provides shifting of reversal points after each layer automatically.





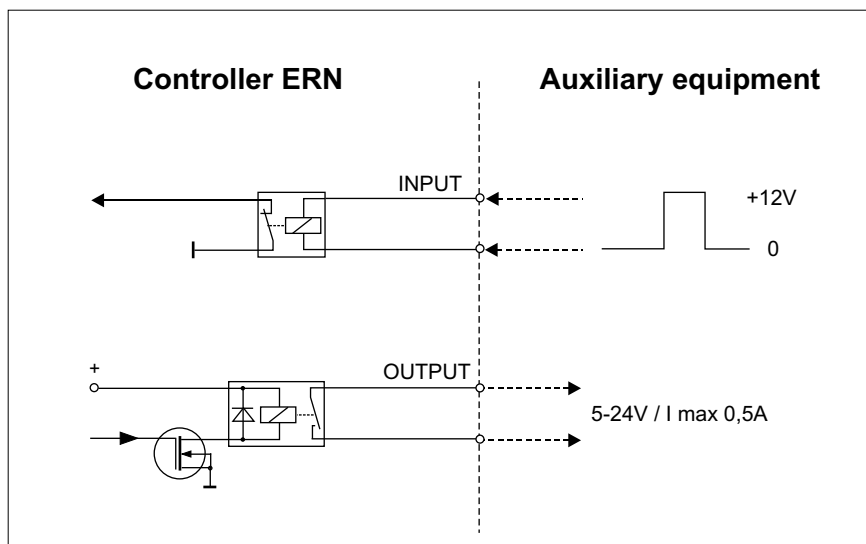
Switch function off

Available form of trapezoidal windings :

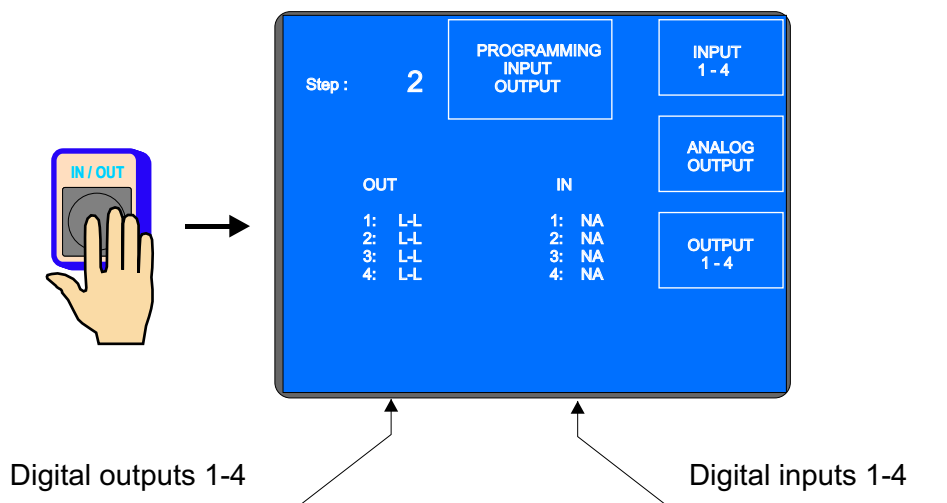
	left trapezoid : OFF	right trapezoid : / X,X
	left trapezoid : OFF	right trapezoid : \ X,X
	left trapezoid : \ X,X	right trapezoid : OFF
	left trapezoid : / X,X	right trapezoid : OFF
	left trapezoid : \ X,X	right trapezoid : / X,X
	left trapezoid : / X,X	right trapezoid : \ X,X
	left trapezoid : \ X,X	right trapezoid : \ X,X
	left trapezoid : / X,X	right trapezoid : / X,X

6.7 Auxiliary inputs and outputs

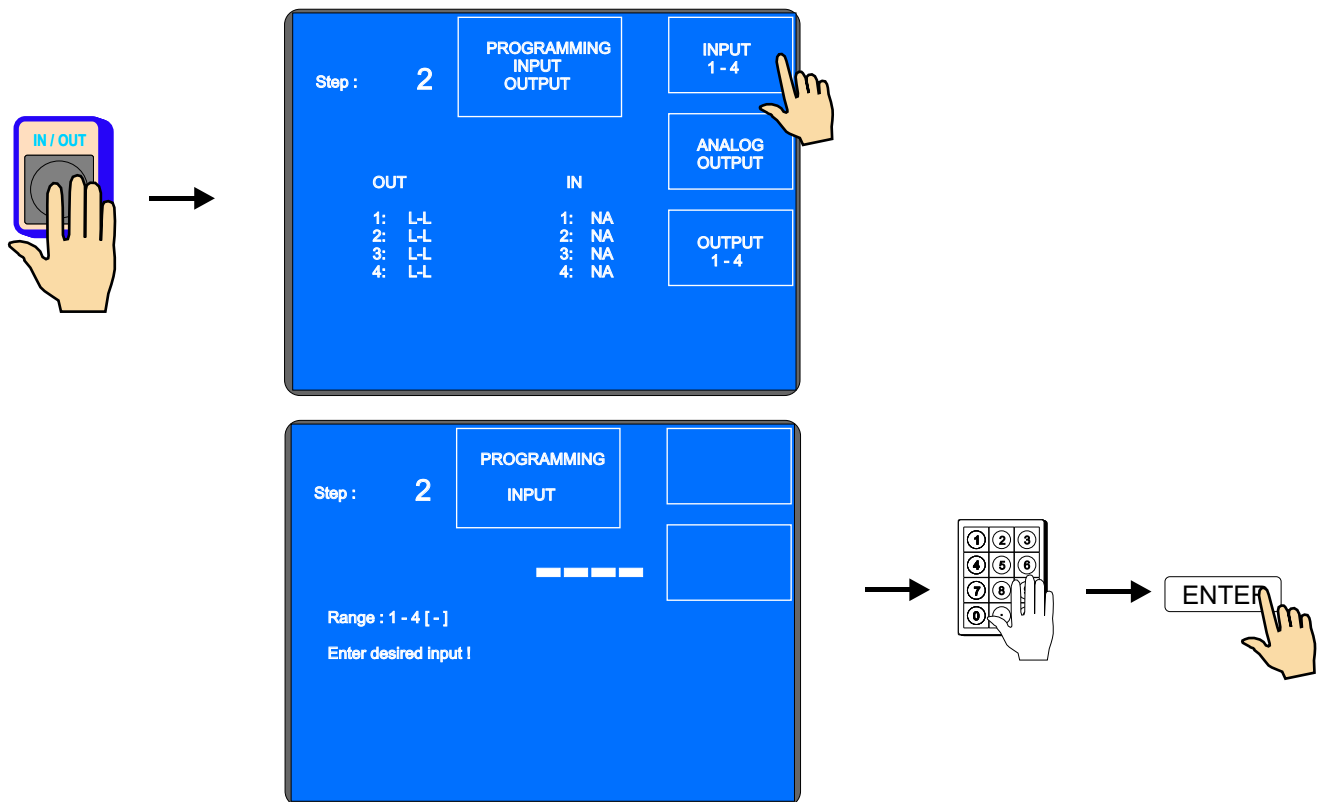
Machine provides an opportunity to program and control up to 4 auxiliary digital outputs, 4 digital inputs and 1 analog output in each step. Digital inputs and outputs are galvanise isolated. Relay is applied in standard equipment.



6.7.1 View window for inputs and outputs

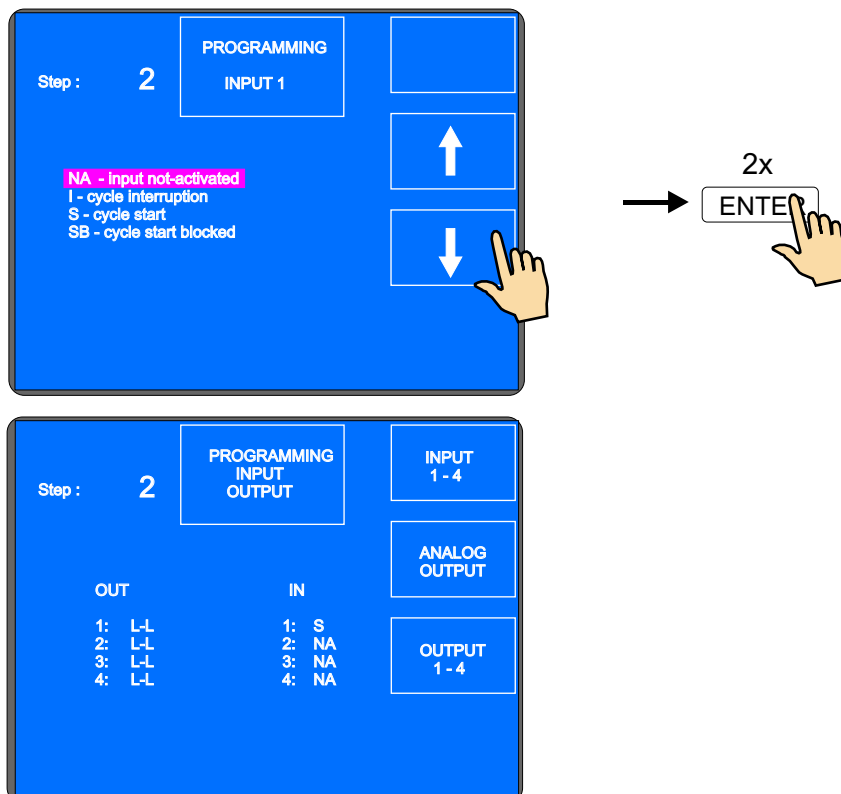


6.7.2 Digital inputs programming



Each digital input can be programmed as:

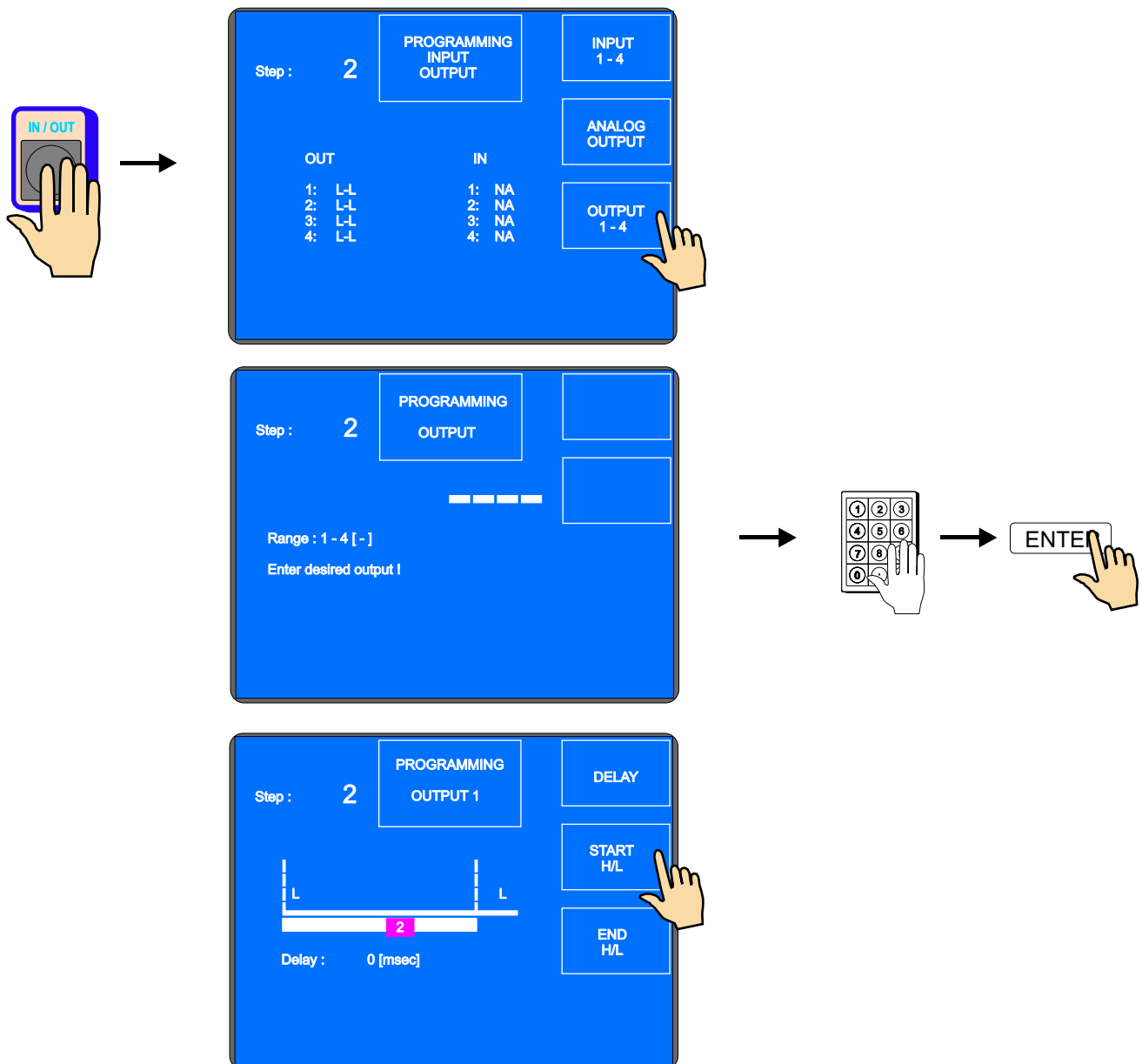
- NA** - input is inactive
- I** - winding cycle interruption is done, if input is high (+ 12 V)
- S** - winding cycle start is done, if input is high (+12 V)
- SB** - start is blocked, while duration of high (+ 12V)

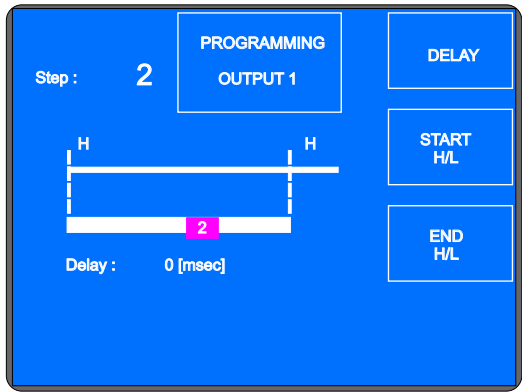
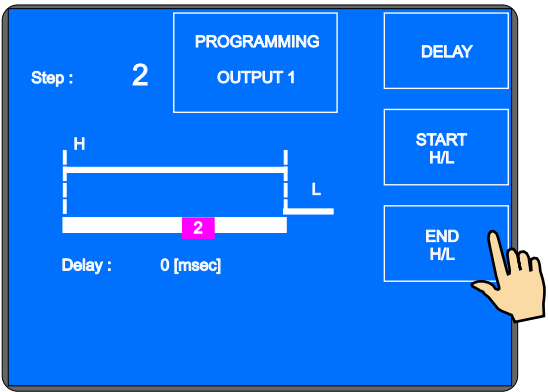


6.7.3 Digital outputs 1 - 4

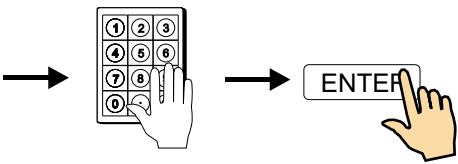
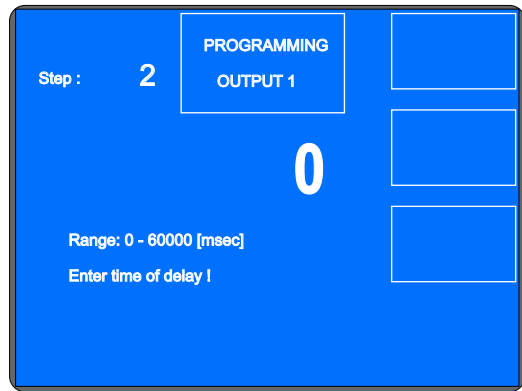
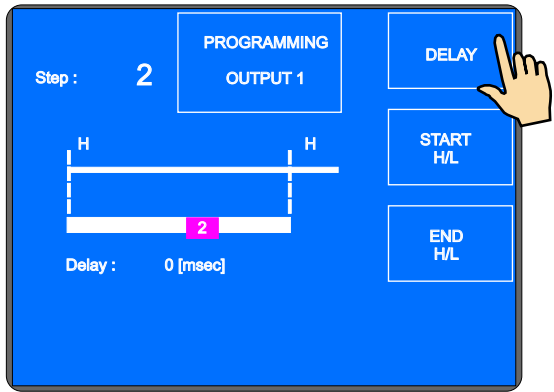
3 following parameters can be programmed in digital outputs 1 - 4:

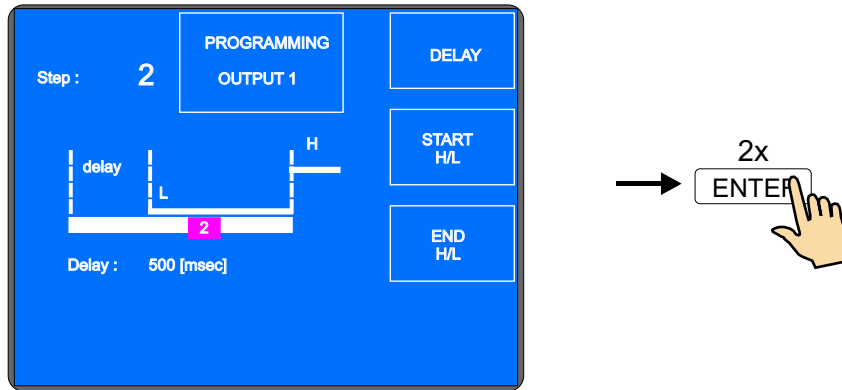
- level of output, after step start - up (L - relay on, H - relay off)
- level of output, after step finish - up (L - relay on, H - relay off)
- delay of output action





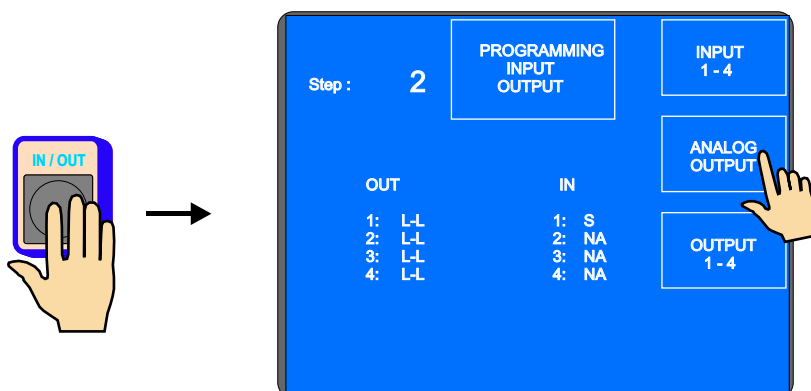
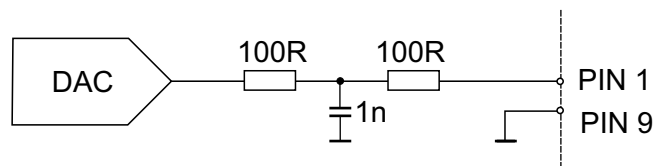
Delay



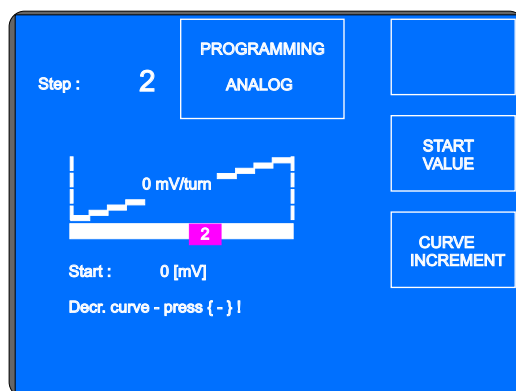


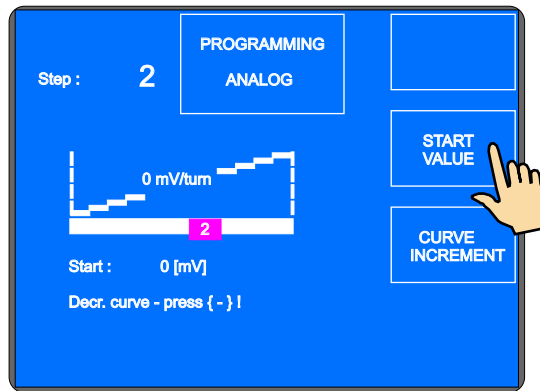
6.7.4 Analog output

This analog output can change voltage (0 - 10 V DC) depending on wound number of turns.

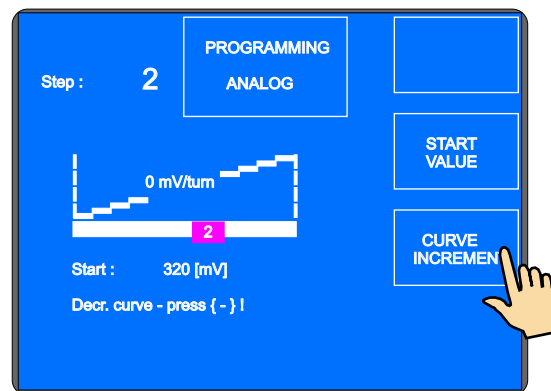
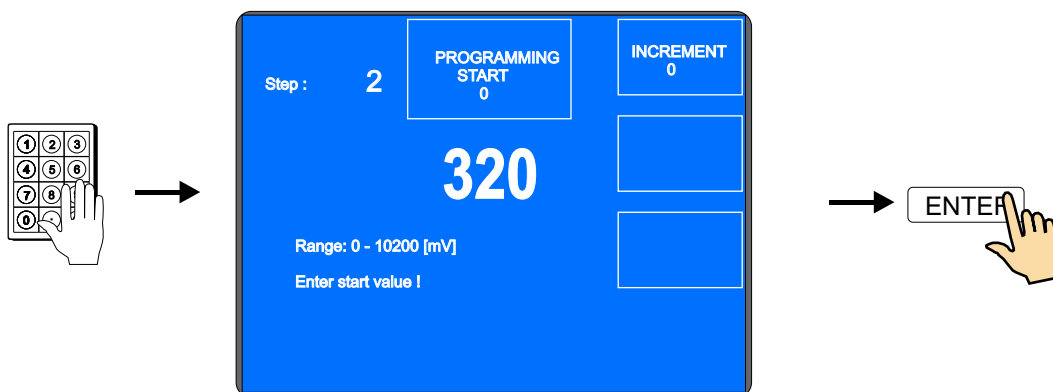


INCREMENT or DECREMENT curve - by - +

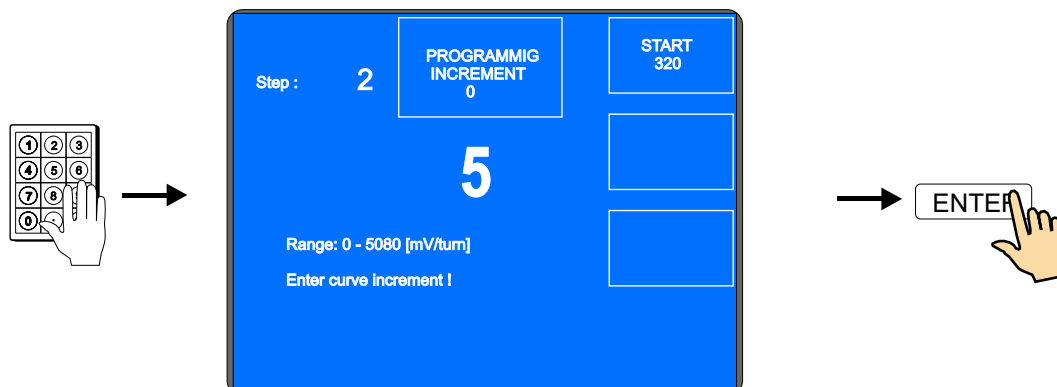


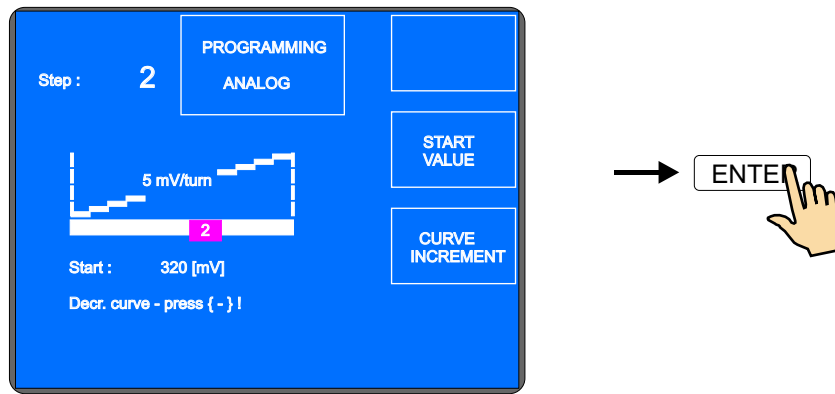


Enter desired start value.



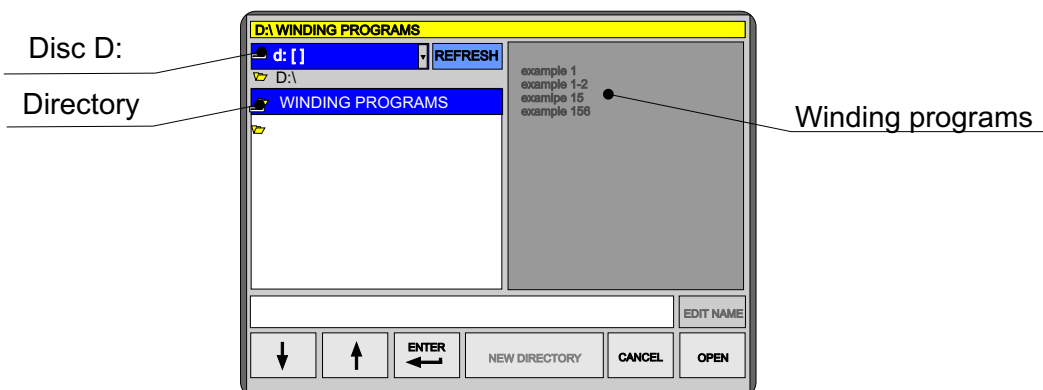
Enter increment or decrement per turn.



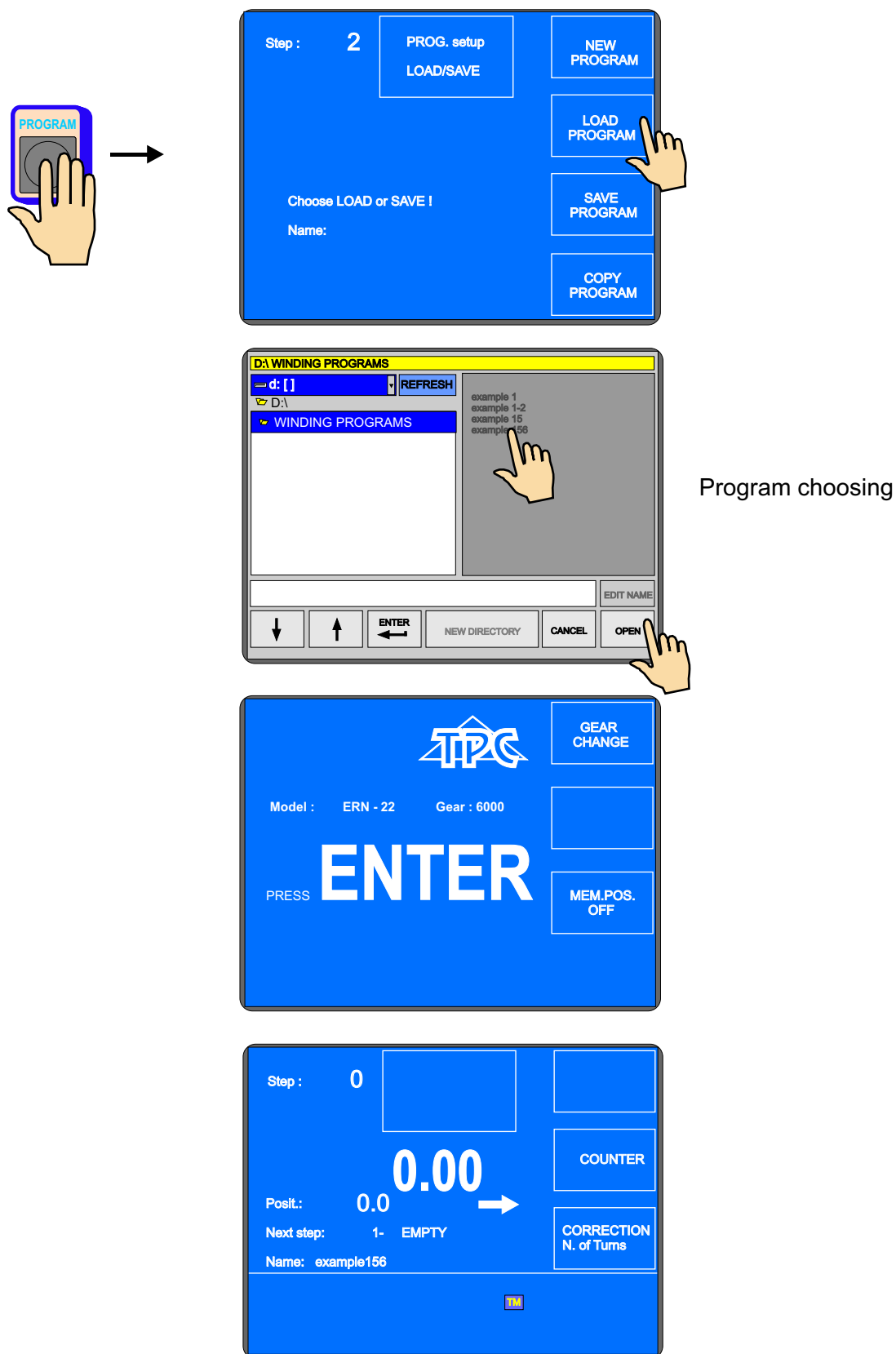


7. PROGRAM SAVING AND OPENING

C-version is equipped with computer control with touch screen and Windows XP EMBEDDED. PC memory space is divided into two discs C: and D:. As the storage medium is used CF card. On the C: drive is installed operating system, entry on disc C: is not allowed. So PC is protected against viruses and unauthorized intervention. For manufacturer application programs and winding programs is used disc D:, which can be entered.



7.1 Program opening

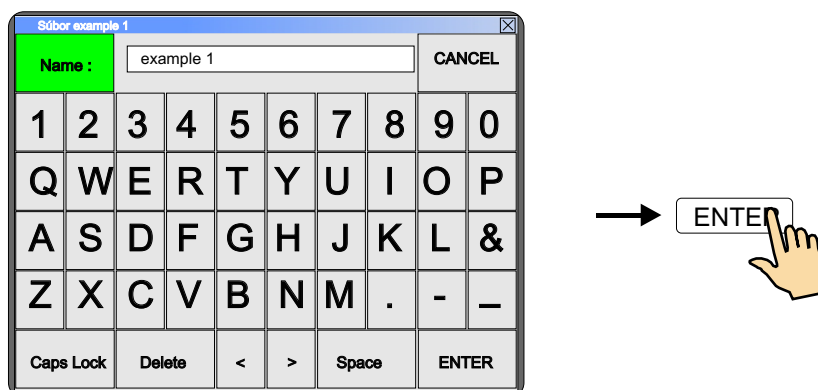


7.2 Program saving

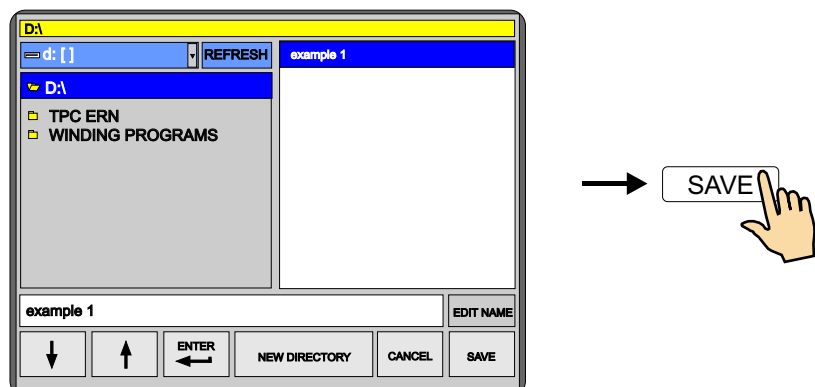
After program creating with max. capacity of 350 steps we can save it into the memory. We give the name and save into directory (or underdirectory).



Name creating or change

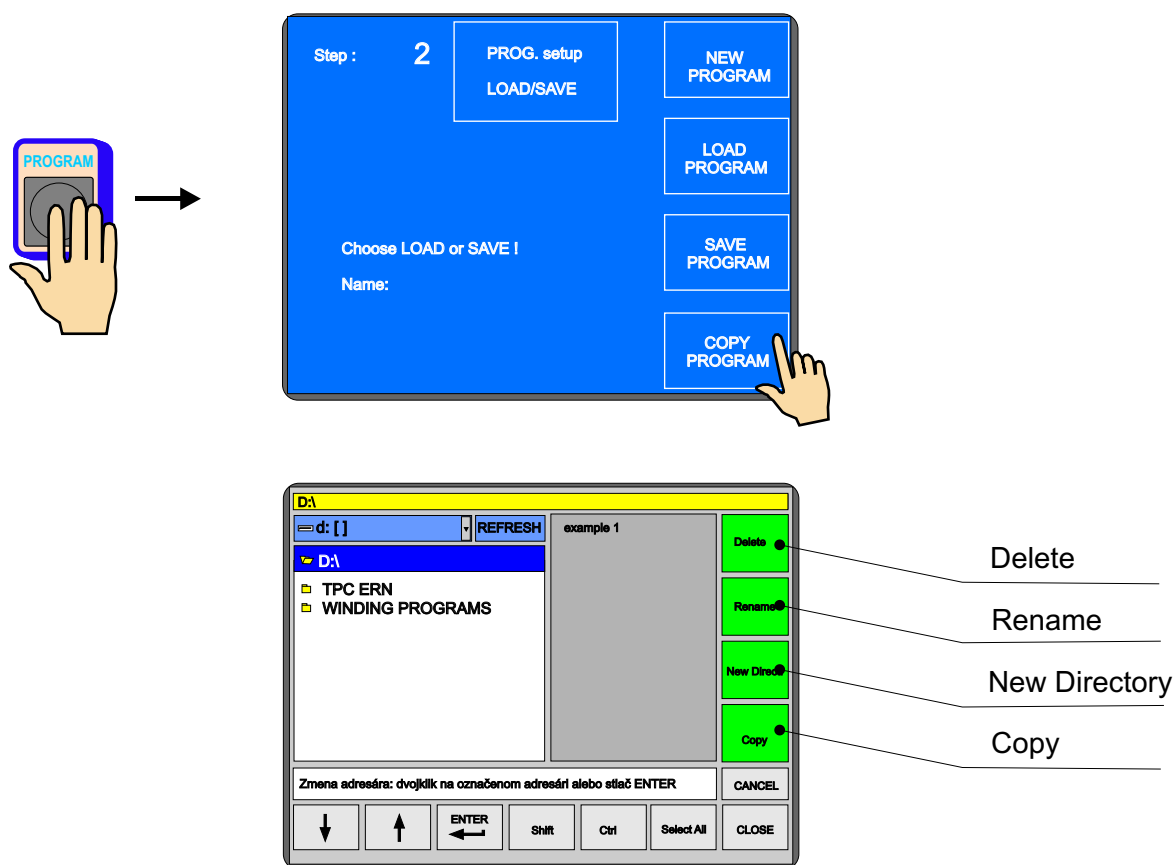


Directory choosing, where to store the program



7.3 Program copy

Function allows to copy programs already created.



How to copy from directory into directory:

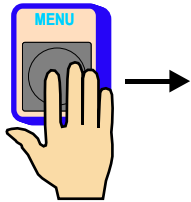
- choose the file for copy from directory
- press COPY
- choose the directory, where do you want to copy
- press PASTE

How to copy from USB flash memory:

- plug USB flash into connector No 1
- choose the disc E: and file, which would you like to copy
- press COPY
- choose disc D: and directory, where do you want to copy
- press PASTE

8. MENU

Displays and allows to change some machine basic setting.



Step :	1	MACHINE setup MENU	NEXT (1)
Model:	ERN-22		
Number:	0		
Version:	055.929.552		
Licence:	1140		
Gear:	12000 (rpm)		
Max.width:	210.0 (mm)		
Programming:	UNLOCK		
			PROGRAM LOCK
			ERROR MESSAGES

Program locking

Error messages

Step :	1	MACHINE setup MENU	NEXT (2)
Model:	ERN-22		
Number:	0		
Version:	055.929.552		
Licence:	1140		
Gear:	12000 (rpm)		
Max.width:	210.0 (mm)		
Programming:	UNLOCK		
			MODEL
			LANGUAGE

Model choosing

Language choosing

Step :	1	MACHINE setup MENU	NEXT (3)
Model:	ERN-22		
Number:	0		
Version:	055.929.552		
Licence:	1140		
Gear:	12000 (rpm)		
Max.width:	210.0 (mm)		
Programming:	UNLOCK		
			JOYST.UP MODE 1
			JOYST.DOWN MODE 1

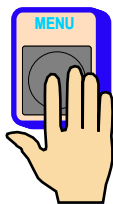
Joystick function

Joystick function

Step :	1	MACHINE setup MENU	NEXT (4)
Model:	ERN-22		
Number:	0		
Version:	055.929.552		
Licence:	1140		
Gear:	12000 (rpm)		
Max.width:	210.0 (mm)		
Programming:	UNLOCK		
			MACHINE NUMBER
			PIN CODE

Machine number setting

PIN code setting



Step :	1	MACHINE setup MENU	NEXT (5)
Model:	ERN-22		
Number:	0		
Version:	055.929.552		
Licence:	1140		
Gear:	12000 (rpm)		
Max.width:	210.0 (mm)		
Programming:	UNLOCK		
			SHOW LAYER
			SPINDLE& WIRE GUIDE

Display layer

This option is inactive in standard version

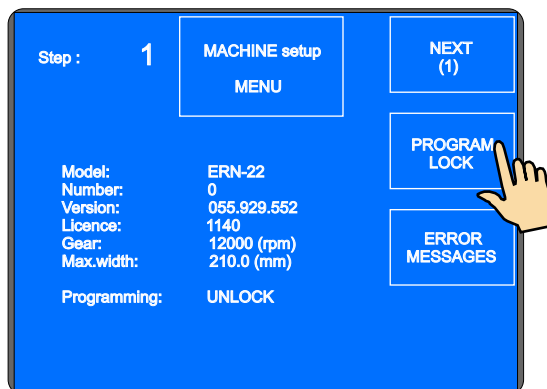
Step :	1	MACHINE setup MENU	NEXT (6)
Model:	ERN-22		
Number:	0		
Version:	055.929.552		
Licence:	1140		
Gear:	12000 (rpm)		
Max.width:	210.0 (mm)		
Programming:	UNLOCK		
			NOT CANCEL HUNDRETHS
			FACTORY SETTINGS

Counter clearing mode

Factory settings

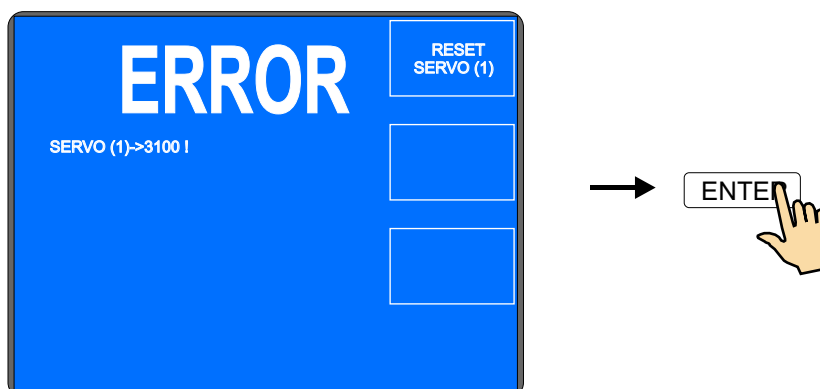
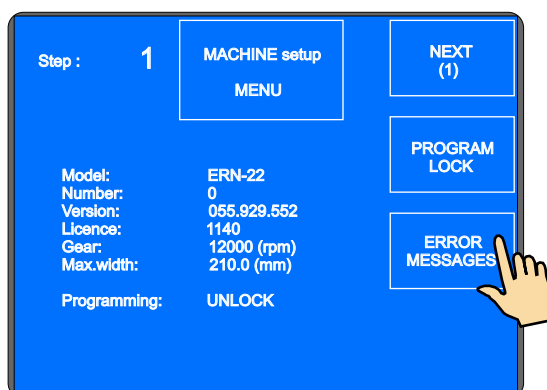
8.1 Program locking

Programming can be locked or unlocked by entering MASTER or PIN code. Corrections which are performed during winding process (wire guide correction, back winding, abort step e.t.c.) are not blocked.



8.2 Error messages

Digital control by CAN- bus provides to store and display eventual errors of Servo Drive. Displayed errors are dedicated for service.



8.3 Model choosing

Step : 1

MACHINE setup
MENU

Model: ERN-22
Number: 0
Version: 055.929.552
Licence: 1140
Gear: 12000 (rpm)
Max.width: 210.0 (mm)
Programming: UNLOCK

NEXT (2)

MODEL

LANGUAGE

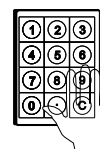


MACHINE setup.
MASTER CODE

Range: 0 - 999999 [-]

Enter master code !

Enter
MASTER code



ENTER



MACHINE setup
MACHINE

ERN-22
ERN-32
ERN-32S
ERN-42
ERN-52
ERN-100
ERN-150
ERN-200

WINDING
WIDTH

↑

↓



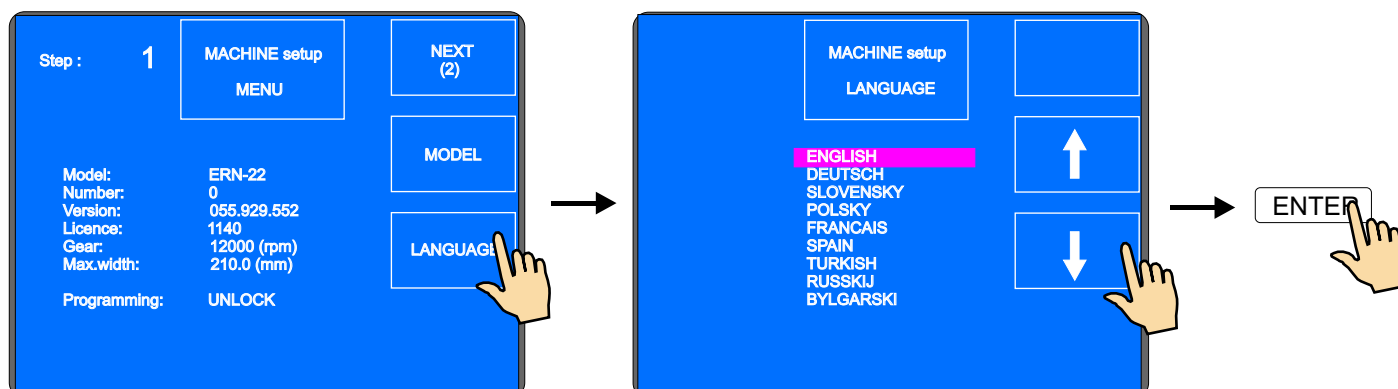
Winding width limitation

ENTER



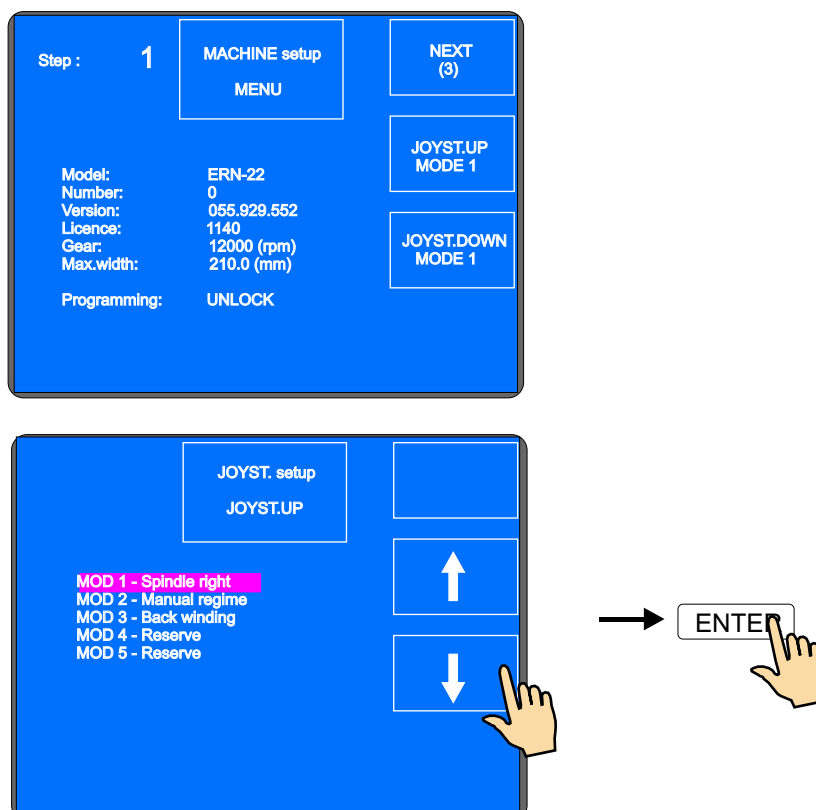
8.4 Display language

Allows you to choose display language.



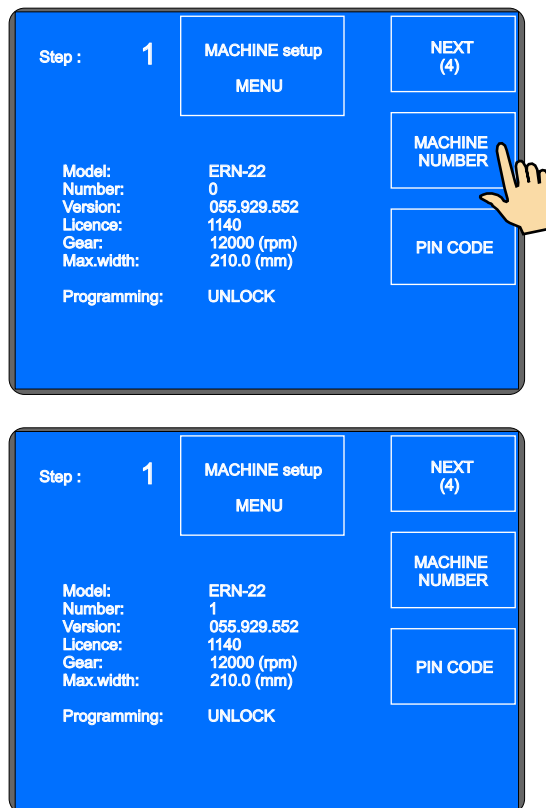
8.5 Joystick action

If winder is equipped with four-way joystick the action of its UP and DOWN position can be programmed. Left and right position is fixed for wire guide correction.



8.6 Winder number

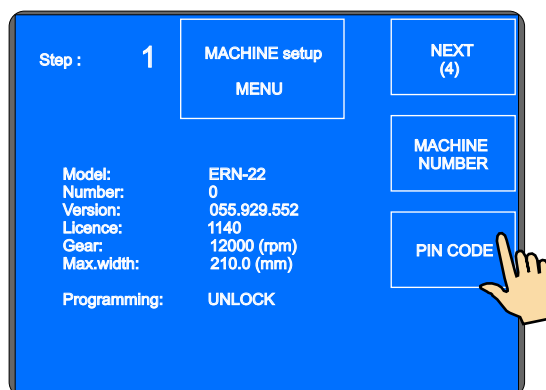
Winder number can be set for easy network identification.



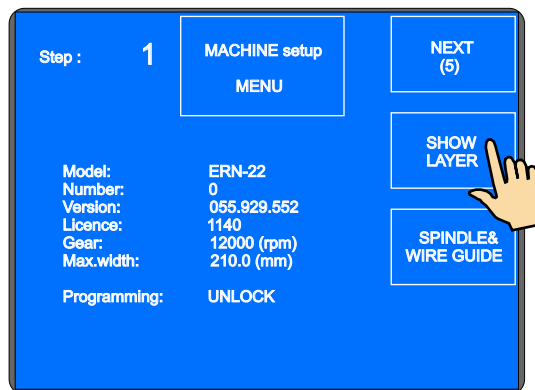
8.7 Access PIN code setting

Available codes for user :

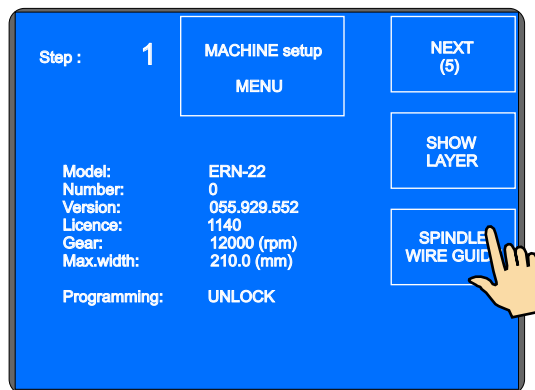
- MASTER code - allows you to change all settings in menu. This code is fixed by producer and is referred to guarantee certificate.
- PIN code - lock and unlock programming. This code can be set by user in range 0 - 999999
Default : "0"



8.8 Displaying of layer

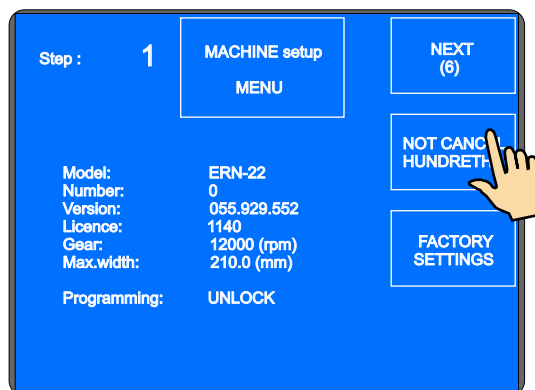


8.9 Winder version choosing



This option is inactive in standard version

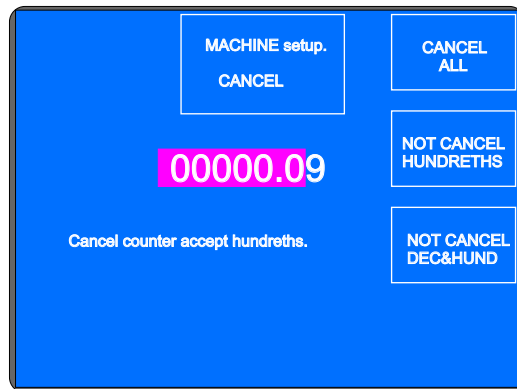
8.10 Counter clearing mode



NOT CANCEL HUNDRETHS - zero spindle position is kept in range $\pm 0,1$ turn (default)

NOT CANCEL DECIMALS AND HUNDRETHS - zero spindle position is kept in all manual spindle handling

CANCEL ALL - mode of cancel if zero spindle position is not required (e.g. winding of resistors)



Producer sets the value not cancel hundreths, which fits most applications.

9. ERROR report

Mistakes in program are displayed by writing ERROR messages:

ERROR Microswitch

Mechanical displace of the wire guide. It appears in case, that the lateral power on the wire guide overcomes the torque of the step motor.

Next procedure: press RESET

ERROR Protection shield is open

Next procedure: press ENTER and close the shield

ERROR Spindle speed versus pitch

Pitch or spindle speed is too high (exceed the max.wire guide speed 75 mm/sek)

Next procedure: press ENTER and correct either spindle speed or pitch

ERROR Wire guide position out of range

Winding width is out of range.

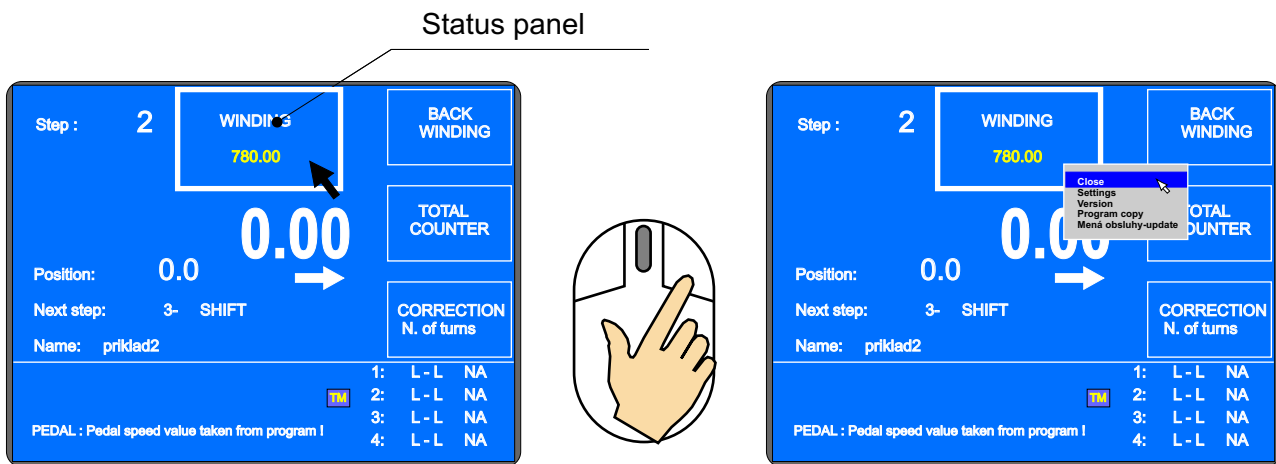
Next procedure: press ENTER and correct either relative position or reversal points

ERROR Program is not logic

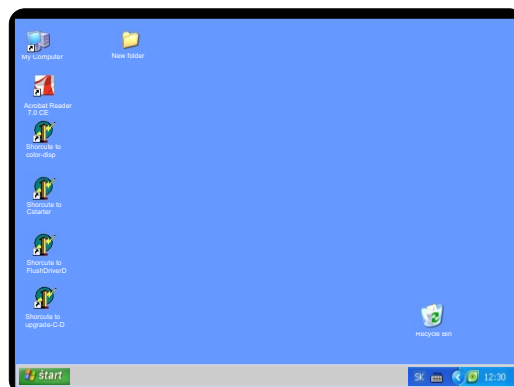
Program is not logic in the case type of cycle ContFAST, next step can not be the shift, jump or winding with the opposite speed direction.

10. Application programme closing (Color_Disp)

Mouse usage is necessary.



For the application programme closing click the mouse right button over the status panel and in the displayed menu click on the „Close“ option (entering Master code is necessary).



Data seemingly written by us on the disc is actually held only in RAM and it is physically recorded to the disc later on after some conditions are fulfilled. However, there is a possibility to enforce data saving on the disc immediately by the assistance of our programme: therefore all the changes you are performing in winding machine are saved immediately.

If you close our application programme and make some changes in the D: partition through other programmes (e.g. Windows Explorer), these changes are not saved right away. So would you turn off winding machine after data changing, the data seemed to be saved would be lost in fact. For that reason there is a shortcut for FlushDriveD programme on the desktop window; after the „Write to Disc D:“ option button clicking on the data is physically recorded to the disc (message Flush:True) and you can turn off the winding machine.

Mentioned above is valid only for disc D:; it is not true for flash discs or USB discs.

11. Firmware upgrade

Upgrade files can be delivered via e-mail.

There are three types of upgrade files:

- Color_Dispatch – the PC application programme upgrade
- tpccrxxx.tpc – control board upgrade
- tpcdpxxx.tpc – keyboard upgrade

where xxx stands for a number of version (e.g. tpccr439.tpc)

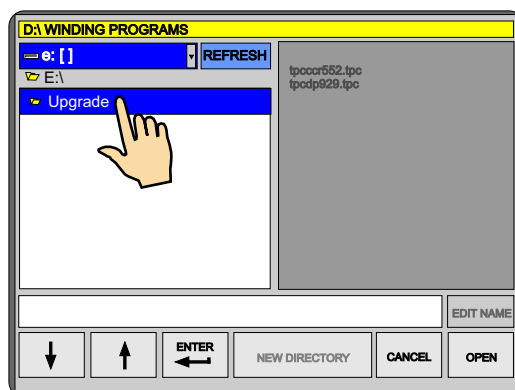
11.1. Upgrade of the application programme Color_Dispatch

Procedure of the application programme upgrade is as follows:

- make an empty folder on the flash disc
- Into this new empty folder copy (unpack) received upgrade file precisely as it is
- connect flash disc and mouse to the USB ports of the winding machine
- right click over the status panel and by choosing "Close" close the application (entering Master code is necessary)
- at the desktop window click on the «Upgrade_C_D» shortcut and start the programme
- select START UPGRADE; a dialog box for the file selection is displayed
- In the folder on the flash disc select received upgrade file and push button OPEN
- after button OPEN is pushed received upgrade files are automatically copied to the disc D: and old files are replaced by the new ones (FlushDriveD is automatically performed too)
- after copying the START UPGRADE button becomes not available and programme responses UPGRADE SUCCESSFUL FINISHED
- close the upgrade programme and by the Cstarter shortcut start the standard programme, or turn off and on the winding machine.

11.2. Upgrade of the control board/keyboard

- connect flash disc to the connector 1
- select disc E: and file tpccrxxx.tpc (tpcdpxxx.tpc)
- by doubleclick on file start the upgrade (entering Master code is necessary)

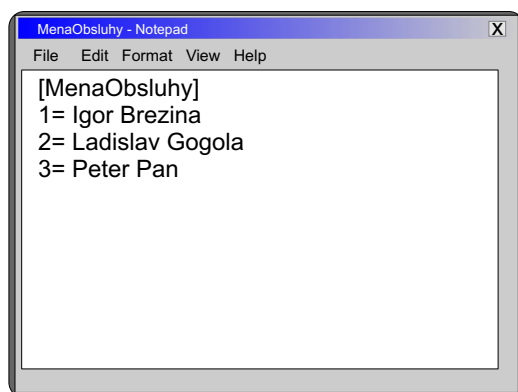


12. Creation and modification of the operators list

Operator's name is used for the identification when creating winding machine production log. If the creation of the production log is enabled the code of his own must be assigned to each operator, which is entered after the winding machine is turned on. The names and codes information is stored in the file D:\TPCERN\MenaObsluhy.ini.

When modifying this file do as follows:

- make an empty folder on the flash disc and into this empty folder copy the file D:\TPCERN\MenaObsluhy.ini (the file already exists on the delivered flash disc)
- connect flash disc to other computer with a keyboard, open the file MenaObsluhy.ini in the proper programme (wordpad, notepad, etc.) and make necessary changes:

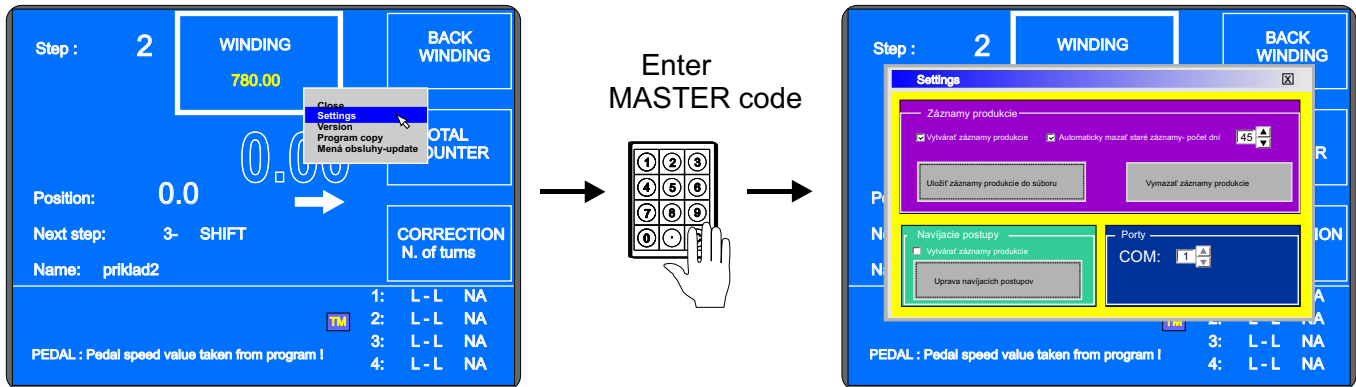


- never change header, it has to remain on the first row, in the form [MenaObsluhy]
- all the following rows have to be in form: numerical code of the operator = name and surname of the operator, e. g. 127 = John Smith
- save the changes to the file and connect the flash disc and the mouse to the winding machine
- right click over the Status panel, select "Close" and close the application (entering the Master code is necessary)
- on the desktop window select the «upgrade_C_D» shortcut and start the programme
- select START UPGRADE; a dialog box for the file selection is displayed
- in the folder on the flash disc select the file MenaObsluhy.ini (in the folder there has not to be present any other file or subfolder) and push OPEN
- after button OPEN is pushed file is automatically copied to the disc D: and an old file is replaced by the new one (FlushDriveD is automatically performed too)
- after copying the START UPGRADE changes into UPGRADE SUCCESSFUL
- close the programme and by the Cstarter shortcut start the standard programme, or turn off and on the winding machine.

13. Production log settings and terminal mode

Mouse usage is necessary.

Right click over the Status panel and select „Settings“.



13.1 Production log

Create log records – check this option if you want to monitor coil production

Delete old records automatically – check this option if you want the old records to be deleted automatically and set number of days

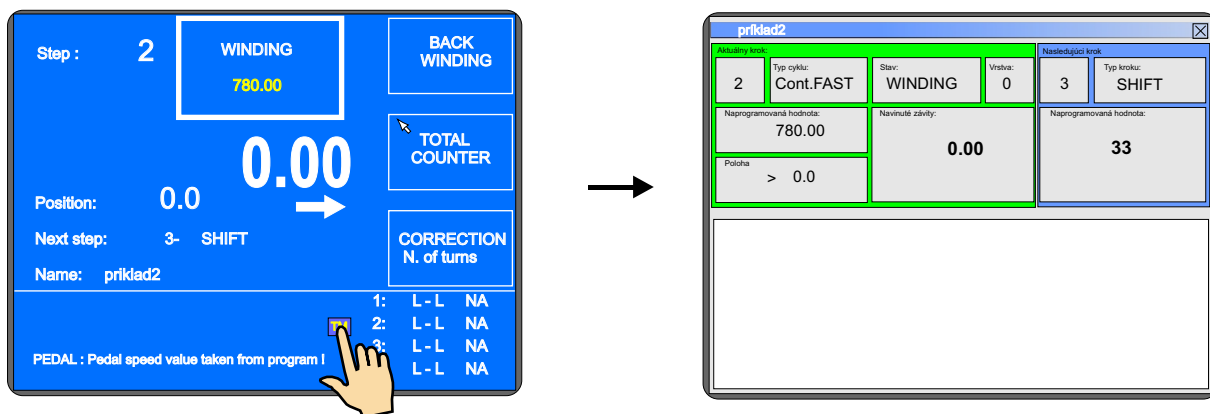
Save production log to file – production records will be saved to a XML file. After pressing the button a dialog box appears for the file saving and a preset file name is proposed: „TabProd_ERN_num_X“, where X= numerical code of the winding machine. The production log can be transferred via the flash disc from the winding machine into the PC for further processing e.g. with the help of the MonitorERN programme.

Delete production log – all the records of the winding machine production will be deleted. If you do not use the function of the automatic deletion of the old records it is a good practise to save them to the xml file regularly, transfer it for further processing on the PC and delete them in the winding machine.

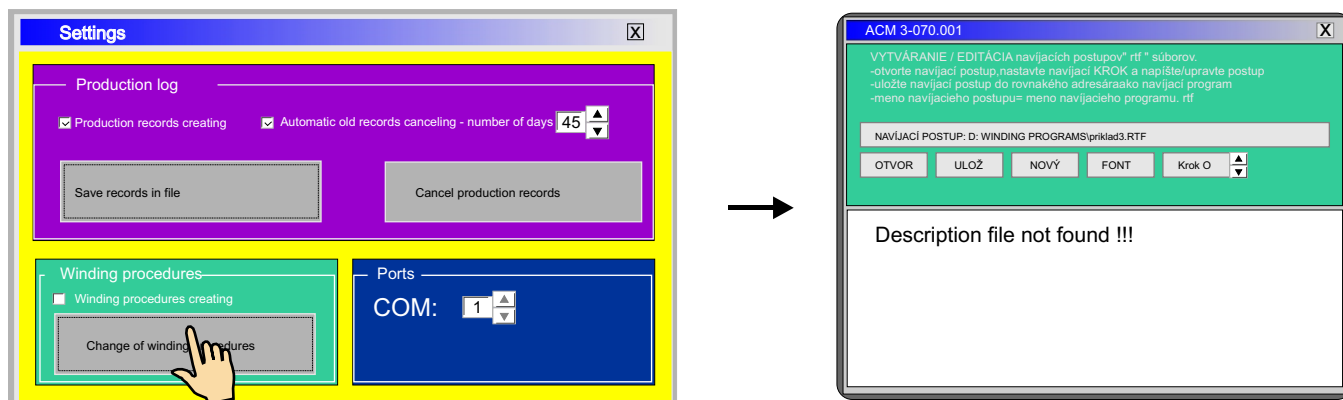
COM – computer serial port used for the communication with the winding machine control board.

13.2 Terminal mode

TERMINAL = displaying the winding instructions – if this option is selected as the main window during the winding automatically will be the window displaying the winding procedures.



Modification of the winding procedures – if this option is selected winding programmes can be created and edited directly in the winding machine. The keyboard usage is necessary.

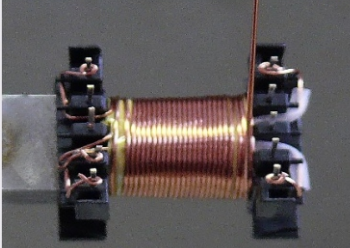


The winding machine screen has a limited area of display and fonts size is chosen to fit this limited area. It is recommended to try out to create one winding procedure directly in the winding machine so as to verify a proper font size and an amount of texts used for a single step description, to transfer this winding procedure into the PC like a sample and, using this sample, to create winding procedures for further winding programmes. Winding procedures creation itself is described in other chapter of this manual. Winding procedures can be also designed with the help of an stand-alone programme for the PC.

Actual step				Next step	
2	Type of cycle: Stop	WINDING 175.00	Layer: 1	3	Type of step: WINDING
Position: < 10.0		Wound turns: 175.01		Programmed value: 2.00	

Winding 175 turns, cut the wire, insert black tube, fix the wire to the shaft.
Prepare isolation band and press
START -- winding 2 turns

Actual step				Next step	
10	Type of cycle: Stop	WINDING 25.00	Layer: 1	11	Type of step: SHIFT
Position: < 22.4		Wound turns: 24.99		Programmed value: 120.00	



Winding procedures

Winding procedures are able to provide winding machine operators with additional important information on winding. If a winding programme is accompanied with a corresponding winding procedure a current winding step technological operation description is displayed on the winding machine monitor automatically. This information comes from the winding procedure and it can be represented in form of texts or images.

Application of the winding procedures can:

- support a technological discipline and reduce a frequency of operator failures according to ISO standards requirements
- help to change produced assortment operatively even in the case of complicated winding procedures
- quicken and simplify new personnel training

Winding procedures creation programmes for the winding machine ERN-C:

WD_TEXT.EXE - text winding procedures creation (text document ".rtf").

The programme makes possible to enter text descriptions of individual programme steps in the order they will be displayed during the winding process. The whole procedure description is stored in a single file with a filename "WindingProgrammeName.rtf" (e.g. the winding procedure description for the winding programme "trafo.475" is to be saved under the filename "trafo.475.rtf") in the same directory as the winding programme is.

The programme is provided with the animated help for the quick programme mastering.

Winding procedures in the form of the text

The screenshot shows a software window titled "example1" with a blue title bar and a red close button. The window is divided into several sections. At the top, there are two main sections: "Actual step" and "Next step". The "Actual step" section contains a table with the following data:

Step	Type of cycle	Winding	Layer
2	Stop	WINDING 175.00	1

Below this table, there are two input fields: "Position:" with a value of "< 10.0" and "Wound turns:" with a value of "175.01". The "Next step" section contains a table with the following data:

Step	Type of step
3	WINDING

Below this table, there is a "Programmed value:" field with a value of "2.00". At the bottom of the window, there is a large text area containing the following instructions:

Winding 175 turns, cut the wire, insert black tube, fix the wire to the shaft. Prepare isolation band and press
START -- winding 2 turns

WD_JPG.EXE - image winding procedures creation (images ".jpg").

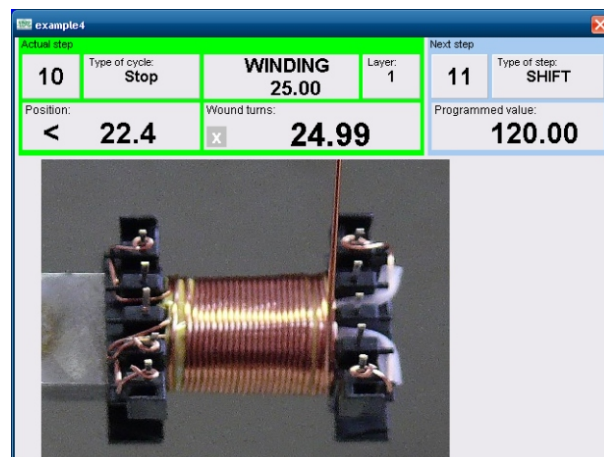
Firstly, some proper photographs of individual steps of the winding programme steps are to be prepared. Photographs are not to be of the high quality, 16:9 ratio has proved to be advantageous.

Place the photographs in a new directory in the PC. Start the WD_JPG.EXE programme and open the winding programme and prepared photographs. The programme makes possible to link individual photographs to the corresponding steps of winding. After linking the photographs are reduced in size, renamed and saved under new filenames in the directory where the winding programme is stored. The original photographs remain without changes.

The programme can start a photo-editor provided that it is necessary to add some text to the image or to highlight some important information. The winding procedure images are named "WindingProgramme.StepXY.jpg", where XY stands for a number of the step and it is necessary to keep them in the same directory the winding programme is.

The programme is provided with the animated help for the quick programme mastering.

Winding procedures in the form of images



14. New devices drivers and hibernation

The application programme is delivered in a hibernated state – it is able to recognize some hardware and drivers for it is already installed (e. g. delivered flash disc). Loading from the hibernated state is much more faster in the comparison with the standard loading.

If you want to use another flash disc, after connection to the machine the standard process of a new device drivers installation is performed. But to save the drivers next hibernation is necessary. Without this next hibernation the drivers will be lost with the machine turn off and after the next connection the device would be recognized like a new one once again.

Next hibernation for the new device drivers saving can be performed as follows:

- connect the mouse and close the Color_disp programme
- connect a new device, wait for its installation and test its function
- click on the Cstarter shortcut in the desktop window
- right click on the OPERATOR LOGIN box
- after the button HIBERNATE is displayed, push it
- yellow window alerting to disconnect all USB devices is displayed
- disconnect all USB devices
- push OK button (on the touchscreen)
- the system performs hibernation, after its ending the message „It is now safe to turn off your computer” is displayed
- turn off the winding machine
- turn on the winding machine (the drivers for the new device are saved) and work as usual

15. Network connection

Communication interface for winding parameters setting and display in the C-version winding machine is based on the solution of an industrial computer with a touchscreen and the WINDOWS XP EMBEDDED operating system. Such a solution makes possible winding machines connection to the local area network (Ethernet) and access to the winding machines from the central PC. from the central PC winding programmes and procedures to the individual winding machines can be dispatched, production databases of the individual winding machines can be accessed to, and production data from the individual machines to the common database created on the central PC can be transferred.

The network connection is the most effective way of the winding process data management and transfer.

Building up a functioning computer network is not an easy job so it is recommended to entrust it to a specialist who will be responsible for its functionality, safety and modifications.

The network connection calls for:

- assigning to each winding machine unique name and address
- defining and setting up data sharing
- defining users, their access rights, passwords and login,
- making all safety settings.

The WINDOWS XP EMBEDDED operating system is based on the WINDOWS XP, but it is much more a particular-computer- oriented and of the prompt-loading-reason it is operated in a hibernation state. Therefore if it is necessary to make some settings in the winding machine, you have to dehibernate it, make and test your settings and to hibernate the system again.

Dehibernation of the operating system

To dehibernate the system do as follows:

- select START
- select RUN
- in the Open box enter command «cmd» and press OK
- the command prompt window opens
- type command «ewfmgr c: -deactivatehorm» and press ENTER
- the system responds with a message «Disabling Overlay» with some parameters
- type command «xpepm –restart» and press ENTER
- the computer restarts and the system is dehibernated, the Windows operating system is loading in an usual way with the welcoming window

You shall make all system settings, applications installation and testing in this standard dehibernated state!!!

Both discs C: и D: are available.

Hibernation of the operating system

To hibernate the system do as follows:

- select START
- select RUN
- in the Open box enter command «cmd» and press OK
- the command prompt window opens
- type command «ewfmgr c: -enable» and press ENTER
- the system responds with a message «Enabling Overlay» following with some parameters
- type command «xppepm –restart» and press ENTER
- the computer restarts and the system is loading in an usual way
- open the command prompt window again
- type command “ewfmgr c: -activatehorm” and press ENTER
- the system responds with a message „Activating HORM“ following with some parameters
- close the command prompt window
- close all the applications
- in the desktop window select the Cstarter shortcut
- right click on the OPERATOR LOGIN box
- the HIBERNATE option is displayed
- press the HIBERNATE option

16. Gear change

Timing belt drive is under the cover (15).
The machine is delivered with the default "middle" gear.

Changing the gear:

- switch OFF the machine and unplug it
- remove the cover (15), attached by 3 screws
- loosen 4 screws (17) and remove the timing belt

Changing to the gear "low"

- remove the "middle" timing gear and replace it with the "low" gear.
- use the longer timing belt, put on, tension and attach it with the screws (17)

Changing to the gear "high"

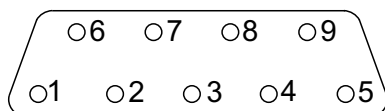
- remove both timing gears. Put the gear with the arm flange on the spindle shaft and gear "high" on the motor shaft.
- Put on the shorter narrower timing belt, tension and attach it with the screws (17).

After each gear change is necessary to rewrite the new gear to the controller.

17. Serial interface RS 232

The machine is equipped with the optically isolated serial interface RS 232 for communication with PC. Connecting cable and software, offered by producer as optional accessories, allows to create and file winding program in PC.

Connector scheme



Pin	Signal
1	
2	S in
3	S out
4	
5	GND
6	
7	
8	
9	12V DC/100mA

18. PACKAGE CONTENTS

Documents delivered with the machine:

1 pc certificate of quality and completeness
1 pc user's guide

Supplied Accessories :

	ERN 22	ERN 32	ERN 32S	ERN 42,52
2 pcs fuse	T 630mA/250V	T 630mA/250V	T 630mA/250V	T 630mA/250V
2 pcs fuse	T 6,3A/250V	T 6,3A/250V		
1 pc microswitch	WN 559 00	WN 559 00	WN 559 00	WN 559 00
1 pc timing gear	25 teeth	100 teeth	100 teeth	100 teeth
1 pc timing gear	64 teeth	32 teeth	32 teeth	32 teeth
1 pc timing belt	XL 160	046 019	PGGT-5MR-650 -25	PGGT -5MR-650 -25
1 pc timing belt	XL 210	042 012	PGGT-5MR-500 -25	PGGT-5MR-500 -25
allen key	4 pcs	4 pcs	4 pcs	4 pcs
2 pcs spanner	No 19, 24	No 27, 32	No 27, 32	No 36,41

19. FUSE CHANGE

Change the wrong fuses at the power switch OFF and the main power plug disconnected.
The fuses are on the back panel of the drive box. Be sure to use only the types of fuses specified by the producer.

20. MAINTENANCE

As the machine contains a minimum number of mechanical gears, the maintenance is simple.
To ensure trouble-free work, following operations are recommended:

- clean regularly the winding space of dust, dirt and wire ends
- check tension of the timing belt
- the ball bearings have permanent grease filling, no lubrication is needed

21. WARRANTY PERIOD AND SERVICE

Warranty period is 24 months from the date of delivery.
Warranty and after warranty repairs are provided by the producer.

