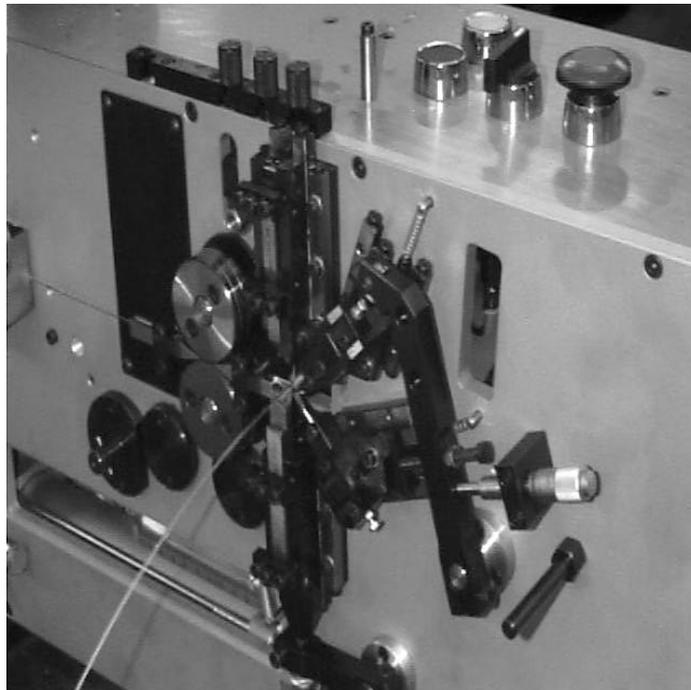


colombi®

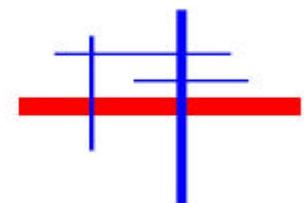
SPRINGCOILERS

C200P / C220P / C300P / C320P



MANUAL

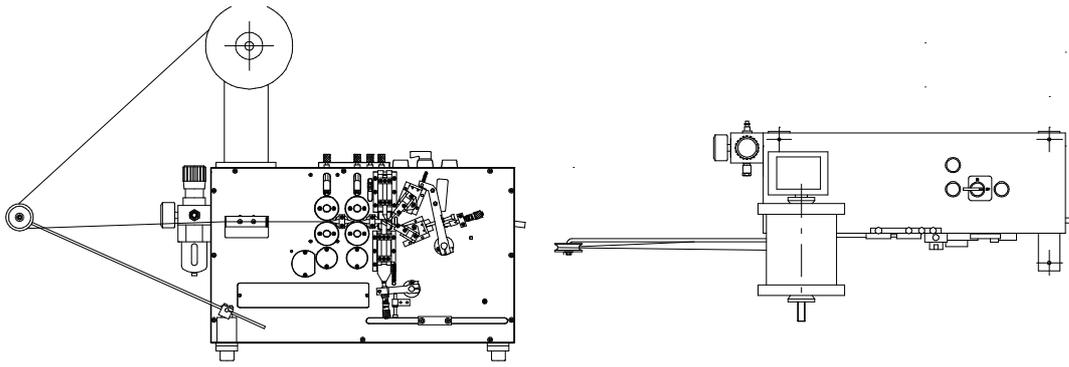
Tekno-Detaljer AB



USERS MANUAL COLOMBI SPRINGCOILERS C200/C220/C300 AND C320

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1 MACHINE DESCRIPTION

Colombi C200, C220, C300 and C320 are pneumatically powered springcoilers, developed to serve as spring feeding units at assembly stations. The Colombi spring coilers are designed to meet demands regarding size, getting springs one and one on demand and finally, simple and understandable handling.

Colombi springcoilers are not as flexible and versatile as springcoilers developed to serve a spring manufacturer. One difference is that a standard Colombi springcoiler is built to do right hand wound springs. For left hand wound springs, "mirrored" machines are available. This manual is based on machines for right hand wound springs. If you are using the manual with a left hand machine, almost everything is mirrored.

The range of Colombi products includes various options to the spring coiler. Some options are described in this manual, other options have separate manuals.

1.1 Machine operator / supervisor

Colombi spring coilers are easy to operate; no specific training is required for an operator to do smaller adjustments such as changing spring diameter and free length. All other adjustments and settings ought to be done by trained supervisors or other experienced personnel.

2 SAFETY

Colombi springcoilers are delivered in two versions:

- a) To meet the safety demands according to European directive 89/392/EEC. and OHSCA. These machines are equipped with guarded safety covers and emergency stop.
- b) The machines are also delivered without guarded covers. These machines are to be built in inside assembly machines that are secured with covers.

2.1 Emergency stop and security covers

When the emergency stop button is pushed, or when the guarded security cover is opened, the are is evacuated and the unit is without pressure.

Resetting after emergency stop requires resetting the emergency stop button, closing the cover and pressing the button "reset".

A machine delivered without safety devices is not to be taken into service until incorporated with a system that complies with the required directives.

3 UNPACKING AND START UP

Installation and starting up operations of Colombi automatic springcoiling machine:

- unpacking and installation on working site
- degreasing
- connection of compressed air; min. 5.5 bar - max. 7 bar
- fitting of wire according to § 4.1.

Normally the springcoiler is delivered with the tools set to do the spring required. This means that your springcoiler is be ready to run your spring directly.

Before starting the machine, check the wire lubrication.

3.1 Wire lubrication

During normal operation it is usually necessary to lubricate the wire in order to obtain perfect results. Certain wire types, e.g. carbon steel and stainless wire with lubrication coating, require very little lubricant; it is enough to add a small amount of thin mineral oil in the lubrication cup (29) when changing wire. When winding polished stainless wire, with the exception of the smallest dimensions, adding lubricant regularly is required. Thin mineral oil is recommended, with such frequency, that there always is a thin layer of oil on the wire.



lubrication cup

3.1.1 Recommended lubricants

For carbon steel (music wire) we recommend the use of a thin mineral oil.

For polished stainless steel, we recommend

- VAX 722 to be dispersed in varsol (white spirit).
- Sandvik SL, a synthetic water soluble lubricator. Involves no health risk whatsoever.

(To be ordered from Sandvik or from Tekno-Detaljer AB)

3.2 Starting the springcoiler

The springcoiler can be started either by pushing the black start button on top of the coiler, or by an external start signal. The selector switch on top of the machine can be set in two positions:

AUTO	start the machine with an external signal.
MANUAL	start the machine with the start button

Before starting the machine, or if restarting after an emergency stop, the machine must be enabled by pressing the yellow button.



Buttons on top of the machine

4 ADJUSTMENTS DURING OPERATION

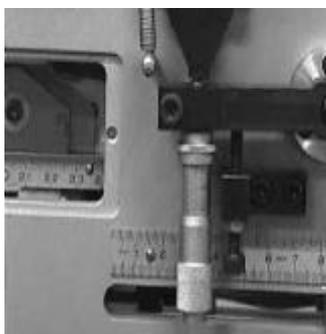
4.1 Smaller adjustments

As the wire's characteristics vary, there is often a need for smaller adjustments of the spring dimensions. (Automatic adjustments are available as options.)

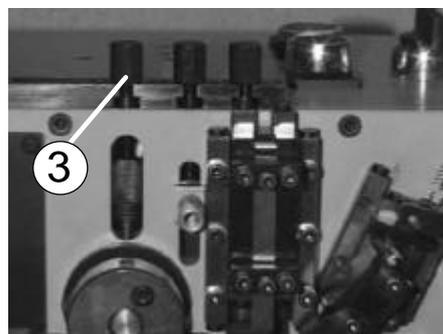
The intention is that any operator shall be capable of doing smaller adjustments of the free length of the spring, and of the diameter of the spring.

4.1.1 Spring length

If the free length is to be adjusted, do that with adjusting micrometer for the pitch tool. To make longer springs, raise the pitch tool with the micrometer. Turn it down to make springs shorter.



Micrometer for pitch tool

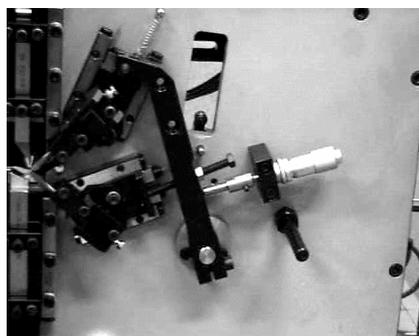


Adjusting screw for feed roll pressure

TIPS. Problems with variations in free length are often related to not having the right pressure on the feed rollers. Check for correct roller pressure first by adjusting screw (3).

4.1.2 Spring diameter

The spring diameter is determined by the winding pins (13). The position of the winding pins is adjusted by adjusting the micrometer.



Micrometer for spring diameter

Small adjustments of the diameter are to be made with the micrometer. On a C2000/2200, the micrometer is the only member controlling the spring diameter. On a

machine for conical springs, a C300/C320, the micrometer is controlling the biggest diameter. The smaller diameters are controlled by curves at the back of the machine. When adjusting the diameter, it is important to ensure that there is a gap between the top of the mandrel and the wire.

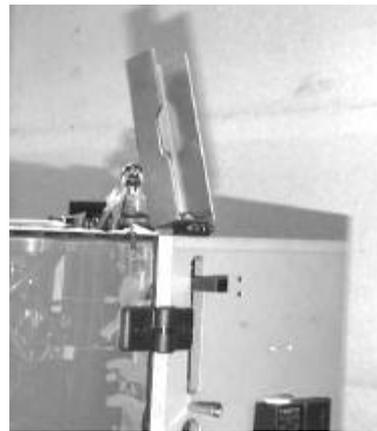
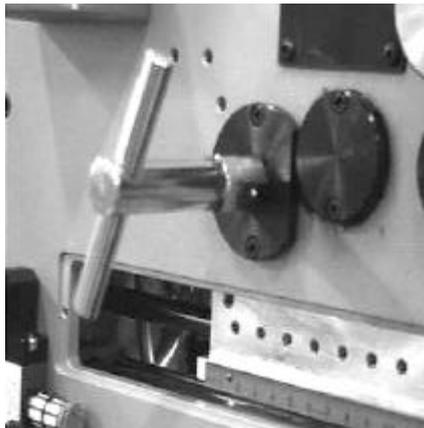
NOTE: Major changes of the spring diameter mean that the position of the mandrel bit (14) must also be adjusted.

4.2 Adjustments to be made by trained personnel

As the adjustments bellow require some skill and experience, our recommendation is to have them performed personnel trained to adjust the equipment.

When adjusting the machine, it should always be operated by hand:

- Press down the stop button (25), or open the security door. This turns the air off, the machine can be operated by hand.
- Operate the machine with the key (27) on the feed rod (21). By turning the key back and forth with short pulls the wire is fed without the pitch control (15) interfering, which facilitates the adjustment because just a close coil spring is coiled.
- It is also possible to directly turn the rollers (2) either by hand or with a key. The most practical way to feed the machine with wire when adjusting.
- When operating the machine manually, you have to cut the wire with the help of the cutting arm (22), that affects the cutter (7). You then have to reverse the machine to starting position (key 27 completely to the left) before raising the cutting arm (22) again.



The manual cutting arm is located on the right side of the machine (left side of a left-hand coiler). The lid must be opened just for manual use of the cutter and must be closed and secured when the machine is in automatic mode.

NOTE!

- when cutting by hand, the cutting arm (22) has to be moved back to upper position, before the next feeding can start.
- the key (27) has to be removed before the machine again can be operated pneumatically.

4.3 Change of wire

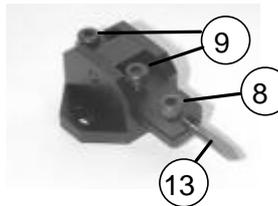
The easiest way to change the wire is to:

- a) Remove the last piece of the old wire using a plyer (operate pneumatically until the rollers do not work).
- b) Install the new bobbin/coil. Cut the wire straight off, remove any burrs and make the wire-end as straight as possible. Put the wire through the swift arm, the oil cup (29) and into the wire guide (1c). Guide the wire towards the rollers (2) and operate the machine by hand (key 27) until the wire reaches the mandrel bit (14).
- c) Feed 30-50 mm wire, bend the wire and place it in the tracks on the winding pins (13). Feed slowly another few millimeters making sure that the wire is secured in the tracks of the winding pins.
- d) Cut the free wire end with the cutter or wire cutters. If necessary, reverse the machine to starting position and make a spring by hand.
- e) Make a couple of springs pneumatically. Do not forget to remove the key (27). Check length, shape and diameter of the springs and compare with the last springs made before wire change. Different wire deliveries can cause deviations in the shape of the spring. If that is the case, adjustment should be made as described below.
- f) If necessary, fill the oil cup with lubricant.

4.4 End coils

After change of wire the endcoils may become too tight (pretension) or too loose (not quite closed).

If this is not corrected by adjustment of spring length, you should adjust the winding pins with the screws (9) so that:



- a) the spring is just closed coils, without much pretension, when the key (27) is turned back and forth in the "starting position" or when the rollers (2) are manually directly turned. (with the pitch tool is down)
- b) the resulting close-coil spring moves forward horizontally when winded, pointing slightly above the horizontal position, leaning neither to the right or to the left.

If satisfactory results cannot be reached, please check that:

- a) the winding pins are correctly set
- b) the curve template (16) is correctly set

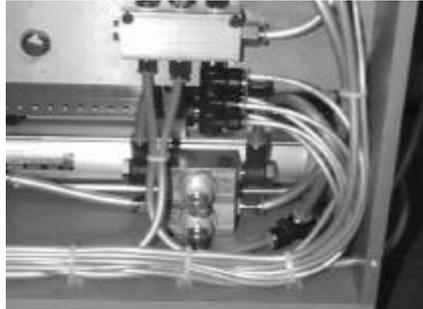
- c) the wire is not exceptionally lopsided; a loop cut on the spool/coil must not have a too great helix. Wire of very good quality is required for a good result. All attempts to produce desired springs can be spoiled by using bad wire.

4.5 Production speed

The pneumatic cylinder drives the machine in two strokes, one stroke forth to coil the spring and one inactive stroke back. The double action machines do not have inactive stroke, a spring being coiled at each movement of the position.

Two speeds can be adjusted (see picture)

- forth movement of the piston, i.e. coiling speed, with the back throttle valve.
- back movement of the piston with the back throttle valve.



Valves for adjusting speed Upper valve for return stroke

The cylinder for cutting the spring has two speed regulating valves as well. The speed can be adjusted from outside the machine through the holes in the side, just under the cutting arm.

The speed of the machine shall be adjusted so that your requirement is met, but with the machine operating as smoothly as possible.

5 ASSEMBLING OF TOOLS

The machine is delivered with the tools assembled. When replacing a tool, there might be some adjustments needed. Some tools will automatically come in the same position as the original tool had, some will need some adjustment.

5.1 Feed rollers

The wire is fed in between the upper and lower rollers (2). There are two feed rollers for the small diameter wires and 4 for the big diameter wires. The rollers have two threads, thus they are reversible. They are specially made for a given wire diameter.

The rollers are assembled and disassembled with the upper rollers in their upper position. The upper roller can be raised with the adjusting screw (3). With the screw (3) the correct roller pressure is set in order to feed the wire without skidding. Too high pressure will damage the wire. Suitable roller pressure is generally obtained by pulling the adjusting screw fairly hard by hand.

The lower roller is tightly mounted so as to have no play. The upper roller is self-guided axially in relation to the lower when the wire is fed in between the rollers.

5.2 Wire guides

The wire guides (1) are placed at the right and at the left of the rollers. They are assembled in pairs, one tracked and one cover plate. The tracked one is to be placed inside the cover plate.



5.2.1 **Position of the wire guides:**

The wire guides are mounted in their holders. The holders are adjustable, to get the exact lining of the track in the lower feed roller with the track in the wire guide. The adjustment is made by loosening the locking screw and adjusting the position of the wire guide holder with the adjusting screw that is inside the hole (see picture).

When assembling, the wire guides are to be placed as close to the rollers as possible, at the same distance of each roller, about 5/100 to 10/100 mm; the smaller the wire, the closer the wire guides.

The setting is to be made with the rollers set to the correct roller pressure and with wire between wire guide and rollers. When the wire guides are assembled correctly, the threading of the wire through the wire guides can be made easily by turning the rollers. The correctly assembled wire guides are to be hardly locked.

NOTE: The wire guides should not touch the rollers!

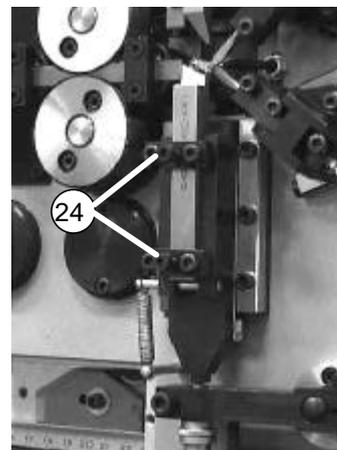
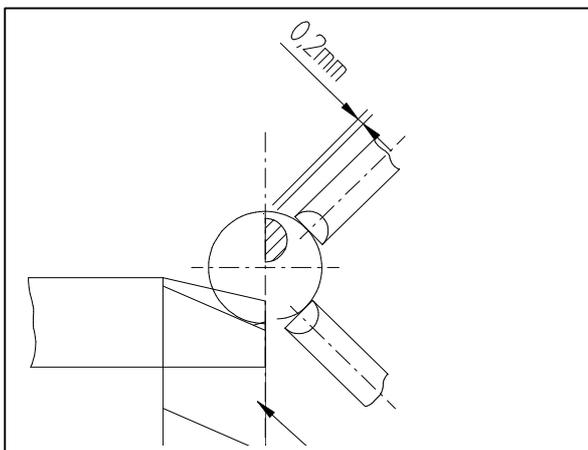
When assembling new wire guides it should be noted that it might be necessary to grind the wire guide (1A) closest to mandrel bit (14).

5.3 Pitch control tool

The pitch control tool (15) has the function to separate the coils which influences the free length of the spring. The higher it is set, the longer the spring will be, and vice versa. The pitch control is delivered either ungrounded or with standard grinding.

Position of the pitch control:

- The back and forth position of the pitch control tool is made when tightening with the screws (24). The tool should be adjusted without friction as close to wire guide as possible in order to maintain the wire in its thread.
- The vertical position of the tool is adjusted with the micrometer and with screw (18), which sets the lower turning point of the tool.
- The range within the pitch tool can move is determined by the curves that controls the movement via the two arms and the shaft. A normal setting is to let the adjusting screw (18) control the lower position, and the cam follower will then hang loose. When the curve reaches the cam follower, the pitch tool goes upwards.



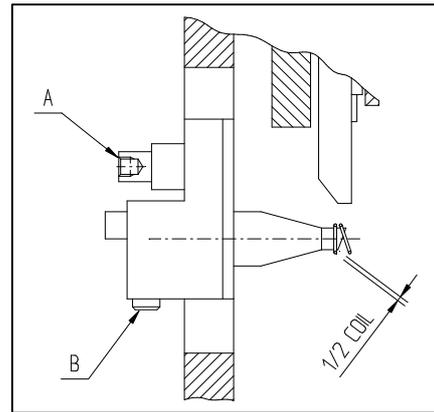
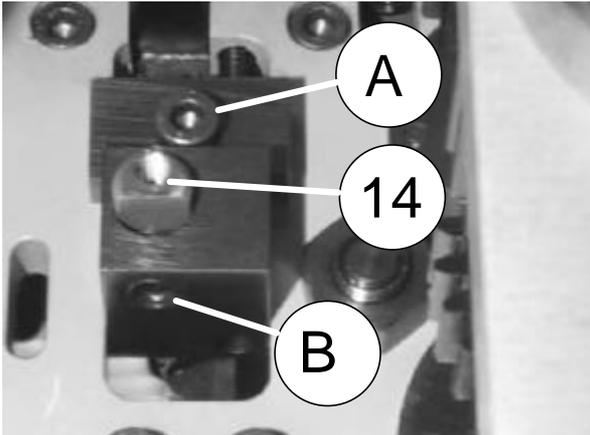
5.4 Mandrel bit

The only function for this member is to cut the wire. The mandrel bit shall not touch the wire during the coiling.

Before the mandrel (14) is disassembled, any air connection must be loosened and the back cover removed.

The mandrel is assembled and disassembled backwards (see picture). This means the back cover must be opened.

- axial locking of the mandrel is made with locking screw 'B'. For axial adjusting screw 'B' is loosened and the bit adjusted axially so that the first row of wire rests on the bit - not exactly on it's end but about half a coil back.
- when vertically adjusting the mandrel, locking screw 'A' has to be loosened and adjustment made with adjustment screw (6). The adjustment of the mandrel vertically is to be made so that a column of approximately 0,2 mm is formed between the upper part of the mandrel and the spring.

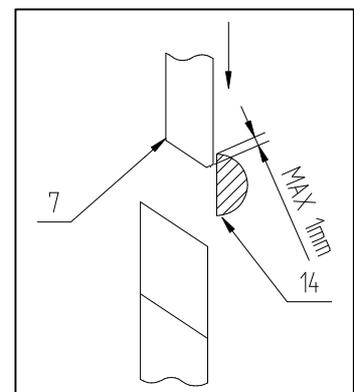
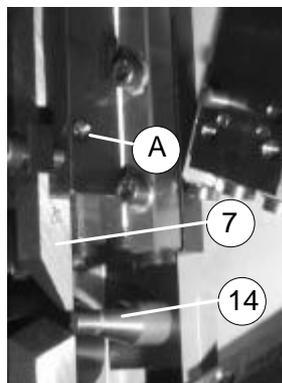
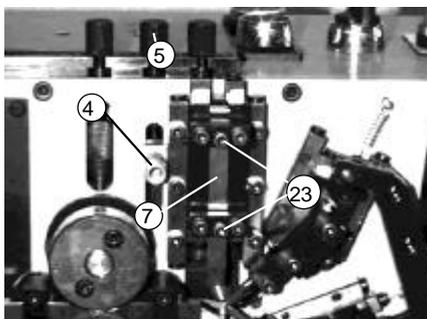


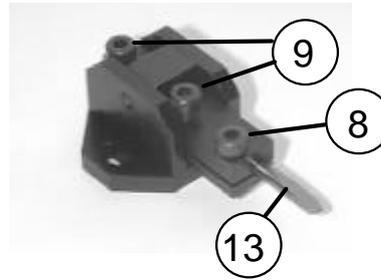
NOTE: When winding, the spring is not to come in contact with the mandrel!

5.5 Cutter

The basic adjustment of the cutter (7) is made by tightening with the screws (23). The cutter must be in line with the mandrel (14) in order to cut exactly on the first coil of the spring. The fine adjustment of the cutter's lower position is made with adjusting screw (5). Locking nut (4) locks the cutter. The lower turning position of the cutter is to be max. 1 mm below the upper edge of the mandrel.

There are 4 locking screws (A) that lock the cutter sideways. When locking these, the cutter ought to be in it's lower position.





5.6 Winding pins

The winding pins (13) are installed in their holders and are locked with the locking screw (8). The winding pins are rotating along their longitudinal axis, and their holders can be orientated.

5.6.1 Position of the winding pins in their holders

When assembling the pins, they should both be turned so that the tracks run parallel to the front of the machine. In order to facilitate adjustment it might be useful to loosen the winding pin holders, put them on a flat surface, and turn the pins until the tracks are parallel to the surface. Wire running through both tracks should remain straight and exactly parallel to the machine front.

5.6.2 Orientation of the holders

By loosening the screw (12), the holder of the winding pin can be turned round its axle tap. As a basic position put the pins pointing towards the center of the coil. When winding, the winding pins should be at right angles to the spring tangent.

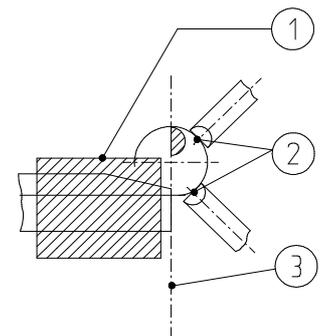
TIP: When the setting is OK, make a mark on the base plate holding the winding pin holder. This way you can remove a holder and get it back in the same position again.

When a coil is formed, its upper point should coincide with the cutting point.

5.6.3 Setting the pins

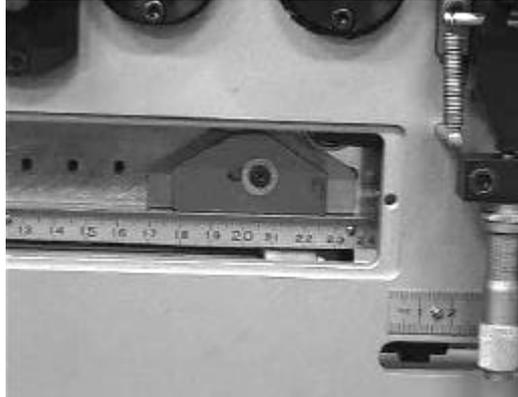
For basic positioning, both winding pins should be adjusted so that the tracks appear right in front of the wire, in the arrival plane of the wire. The winding pins are then adjusted with the adjusting screws (9) so that:

- a) the spring is just closed coils, without much pre-tension, when the key (27) is turned back and forth in the "starting position" or when the rollers (2) are manually directly turned. (when the pitch tool is down)
- b) the resulting close-coil spring moves forward horizontally when wended, pointing slightly above the horizontal position, leaning neither to the right or to the left.
- a) The coil can be "moved" sideways by adjusting screw 32 and the diameter. micrometer. The ideal setting is to have the round coil formed with it's centerline aligned with the "cutting line". This is the same as saying the spring shall be cut off at the highest point.



5.7 Curve template

The curve templates for the pitch tool (16) are installed in their place behind the small lid. Shifting the templates laterally affects the movements of the pitch control tool and thereby the pitch of the spring and the shape of the endcoil.



Curves for pitch control

There is a scale under the curve to help you to document different settings.

The curve for diameter control is located inside the machine. The back cover has to be opened to see the curve.

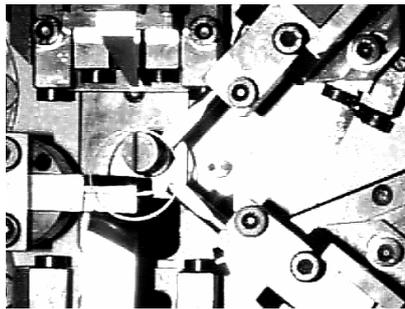
6 SETTING OF REQUESTED SPRING

6.1 Preliminary setting

6.1.1 Basic setting

The basic setting is the same for all the machines intending to obtain a perfect close-coil cylindrical spring (for conical machines at the smallest diameter). When all tools, except the curve (16), are installed and have been positioned

- a) Set up the wire colt and thread the wire according to above.
- b) Feed the wire by turning the key (27) back and forth or manually with the rollers (2)
- c) Wind approximately one turn. NOTE that the cutter must be in its highest position.
- d) Adjust the winding pins
- e) When the wire forms a tightly, but not too tightly wound spring, cut it , and adjust the spring diameter approximately as desired with the help of the adjusting screws (10). It is important that the center of the spring is positioned right opposite the vertical center line of the mandrel bit.
- f) Adjust the cutter and mandrel bit according to above. If the spring is correctly positioned, it is cut on its "highest point".



Correctly adjusted spring.
The spring is centered according to the cutting line

6.1.2 Setting for conical machines

For the conical machines, the diameter changes when a spring is wounded, and the machine has to be adjusted for the bigger diameter.

6.1.2.1 Conical machines principle

The movements of the winding pins, and consequently, the form of the spring, are determined by the lever arm (30). During the coiling process the lever arm is influenced by a curve on the back of the main cylinder, inside the machine. the adjusting screw (10) is used as back stop to the lever arm for the bigger spring diameter.

When cutting, the wheel (28) on the lever arm (22) influences the curve (31) on the lever arm (30), which pushes the lever arm (30) to the smaller diameter.

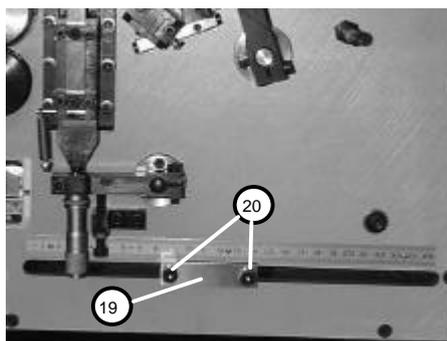
6.1.2.2 Adjustment for conical springs

- a) Check that the wheel (28) is just in contact with the curve (31) when the arm (22) is down in cutting position and when the tools are adjusted for the smaller diameter as explained in part 1); the wheel (28) can move laterally, it is locked by a screw on the back of the arm.
- b) Put the arm up; while unscrewing screw (10), wind manually a spring, to the maximal spring diameter; lock the screw (10) at the desired maximal diameter.
- c) While manually winding a spring, bring the arm (22) down and cut the spring.

6.2 Setting of wire length

The wire length is set with stop (19). The main cylinder stops against stopper (19). There is no standard procedure how to do this, but here is a suggestion.

- a) Have the wire loaded into the wire guides, have it coiling a spring with the diameter you want to have. Have the wire cut for starting a new spring.
- b) The machine shall be without air pressure when doing this.
- c) Turn the handle to get the cylinder drawn back. (means turn left to stop)
- d) Loosen the stop (19) and move it to the left end position.
- e) Feed the wire to the correct length by the key. Count the coils in order to know when to stop. The stopper (19) moves with the cylinder rod.
- f) When you have the right number of coils, stop and
- g) secure the locking screws (20).
- h) Make a spring manually to check that you got the right number of coils.



The machine is designed for a maximum wire length of 1200 mm. In order to obtain the best possible precision when making a spring of shorter wire length, the machine is normally delivered with an gearing suited for spring in question. The unit can be delivered for a maximum wire length of 100, 200, 300, 400, 600, 900 and 1200 mm. To replace the gear, Please contact your sales representative.

6.3 Setting of the pitch

the pitch tool is assembled and set basically according to § 3.3. The movements of the pitch tool are determined by the curve template (16). By changing the measurement of the curve template, a change is obtained from close coiled coils into coils with pitch.

The pitch of those spring coils which have pitch can be influenced by adjusting the micrometer. The lower position of the pitch tool is controlled with adjustment screw (18), normally in order to have the pitch tool tangent to the first coil when in its lower position.

When the spring is roughly set according to assembling of tools, a fine adjustment should be made according to above.

7 TROUBLE SHOOTING

The machine does not start when pressing the start button		
	Action	Check the air supply, faucets and valves. Check that the selector switch on top of the machine is in position MAN
The machine does not start on external signal		
	Action	Check the air supply, faucets and valves. Check that the selector switch on top of the machine is in position AUTO
The machine runs heavily		
	Feed rollers touch the wire guides	Adjust the wire guides according to above.
	The wire runs with difficulty through the winding pins	Adjust the winding pins
The machine squeaks, the pins cut chips in the wire		
	There is not enough lubrication on the wire.	Check the lubrication. The problem might be solved by changing to another lubricant.
	The wire is too thick or the winding pins are too narrow or damaged.	Check the thickness of the wire, possibly change the wire or the winding pins
	The tools are not well adjusted	Go through the adjusting of wireguides and winding pins again.
Too long or too short springs		
	The pitch tool is not correctly adjusted	Check the pitch tool setting
Springs are of different length		
	<i>1. Different number of wire turns</i>	
	Wire skids or breaks	Check and adjust roller pressure
	Resistance or pull from wire dereeler.	Check that the wire is correctly wound and does not "cut" the roller or slow down
	Too low air pressure	Check that the air pressure never falls below 5 bar; if needed, adjust

		the speed of the dereeler motor with the throttle valve under hasp arm
	One or both feed rollers are not pushing the wire through as it shall.	Check that the gears inside are not loose on the shafts, check that the hub that holds the feed roller is not loose on it's shaft.
	A freewheel is sliding..	Dismount the feeding unit from the back of the machine. Take the shafts with the freewheels out and check by hand that the wheel grips directly when changing direction of turning.
2. Same number of wire turns		
	The pitch tool does not return to resting position	Check that the pitch tool runs without friction against wire guide and cover plate.
	The wire is too warped or incorrectly wound	Change the wire!
	The winding pins are not tightened	Check that the winding pins are fixed.
The spring is not cut or is damaged when cut		
	The cutting tools are badly adjusted or dull	Adjust mandrel and cutter or replace if necessary
The wire "collides" with the wire guides, winding pins or runs backwards		
	Action	Check adjustment of tools.

NOTE! To obtain a perfect result, it is mandatory to use wire of very good quality. Rewound wire can not be recommended!

8 **MAINTENANCE**

Lubricating:

Gear-wheel, ball bushing, hub, ball bearings and other wear parts should be lubricated every 400 hours. Use a sticky gear grease for the gear wheels and a normal machine oil for the other parts.

Pneumatic system:

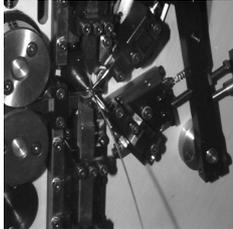
The system is lubrication free.

The water trap must be emptied regularly. The interval depends on the humidity in the air system used.

9 OPTIONS

9.1 Guide wire for feeding short springs

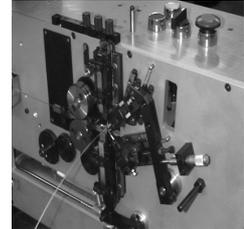
Short springs, that can not be fed in a tube, can often be fed by using a wire that guides the spring from the coiling point to a pick-up position. The pick-up position must be just in front of the spring coiler. The guide wire is mounted in the mandrel. The wire is secured with a locking screw on top of the machine.



The guide wire



Locking screw



Guide wire