



Tangential cutting module

TCM-3

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1. General remarks

The TCM-3 is a processing unit for CNC-machines that is generally designed to cut various materials such as foils and flocking materials. Nevertheless it's finally up to the user to test the cuttability of respective materials. It's not possible to assure the cuttability of certain materials because of the wide variety of applications and combinations of materials, blades and feed rates.

The EOT-2 is a processing unit that is designed for the operation on a CNC machine with a closed and safety controlled working space. The manual usage of the unit is not allowed.

Important security advise !



The TCM-3 is intended to be used as a single component within a complete machining system. It is delivered as an incomplete unit that is not able to operate without a specified stepper or servo motor driver. It is strictly forbidden to operate the unit without implementing all necessary safety regulations.

The combination of the cutting unit and the machining system has to be done by an expert only. It is not allowed to put the unit in operation before all necessary and required country-specific safety regulations have been observed and checked carefully.

Only the operator of the facility (i.e. machining system) is responsible for observing all relevant safety regulations.

2. Operation and maintenance

2.1 Fixation of the material to be cut

The TCM-3 can be used for cutting various materials. It is necessary to fix the material on the cutting board. In most cases it is essential to use a vacuum table in combination with a special air-permeable cutting mat (Art.-No. 230200).

2.2 Mounting the processing unit

The processing unit can be installed to the machining system similar to a conventional milling motor because of its 43mm clamp collar. It is strictly required to observe the machine builders mounting instructions to prevent the unit from loosening or turning out of position.

2.3 Mounting the blades

First the blade has to be mounted to the collet. Then it has to be tightened on the weldon surface with a screw. Because of the danger of cuts it is necessary to proceed with utmost care and to wear appropriate security clothing (e.g. cut-proof gloves). The processing unit is designed for using specialized blades. Any other or additional employment is not according to the intended use.

Important security advise !



The blades may only be replaced if it is ensured that no actuator or drive motor of the processing system or the machining system can move. Therefore it is necessary to shut off the machining system or to remove the processing unit mechanically and electrically. It is strongly advised to observe the safety regulations of the respective machine manufacturer.

There is a high risk of injury to hands and fingers because of very sharp blades.

2.4 Reference run and alignment of the blade

Before using the tool it is required to perform a reference run of the machining system to ensure that the blade is adjusted to the cutting direction. In most cases it is necessary to parameterize a blade offset.

This is a function of the respective machine control. For example, proceed as follows:

1. Do a reference run to the internal switch of the processing unit.
2. Check the blade's position.
3. If the blade is not yet adjusted to the correct cutting direction, it is necessary to parameterize a blade offset for the rotating axis of the cutting unit.

Warning !



If the blade is not adjusted correctly by an offset value several components could be damaged seriously (e.g. the work piece, the cutting mat, the blade, the machining system or the processing unit).

2.5 Adjusting the pressing force

The pressing force of the gliding element can be adjusted sensitively by a latching adjustment wheel for pre-tensioning the springs. An indicator visualizes the selected value.

The coarse adjustment depends on type and number of chosen springs; 1 to 2 single springs can be mounted to the kinematics. For replacing the springs 4 screws of the cover plate have to be untightened before removing or adding springs with a forceps.

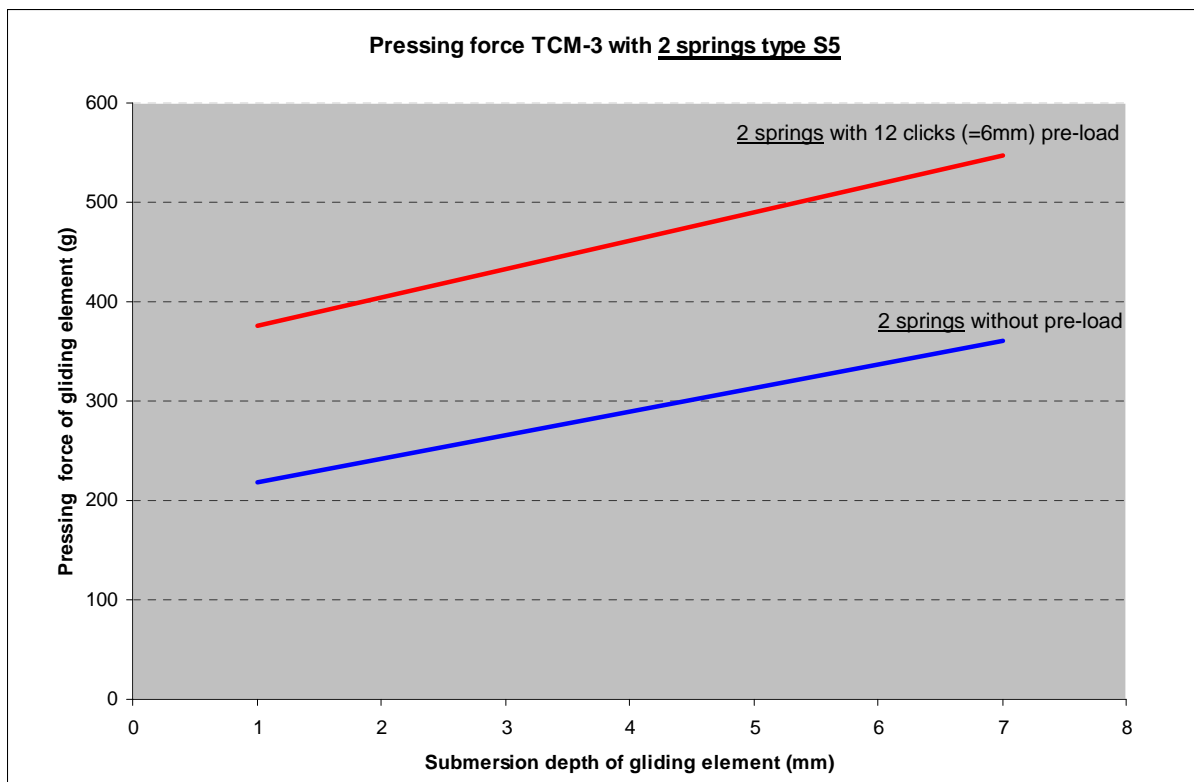
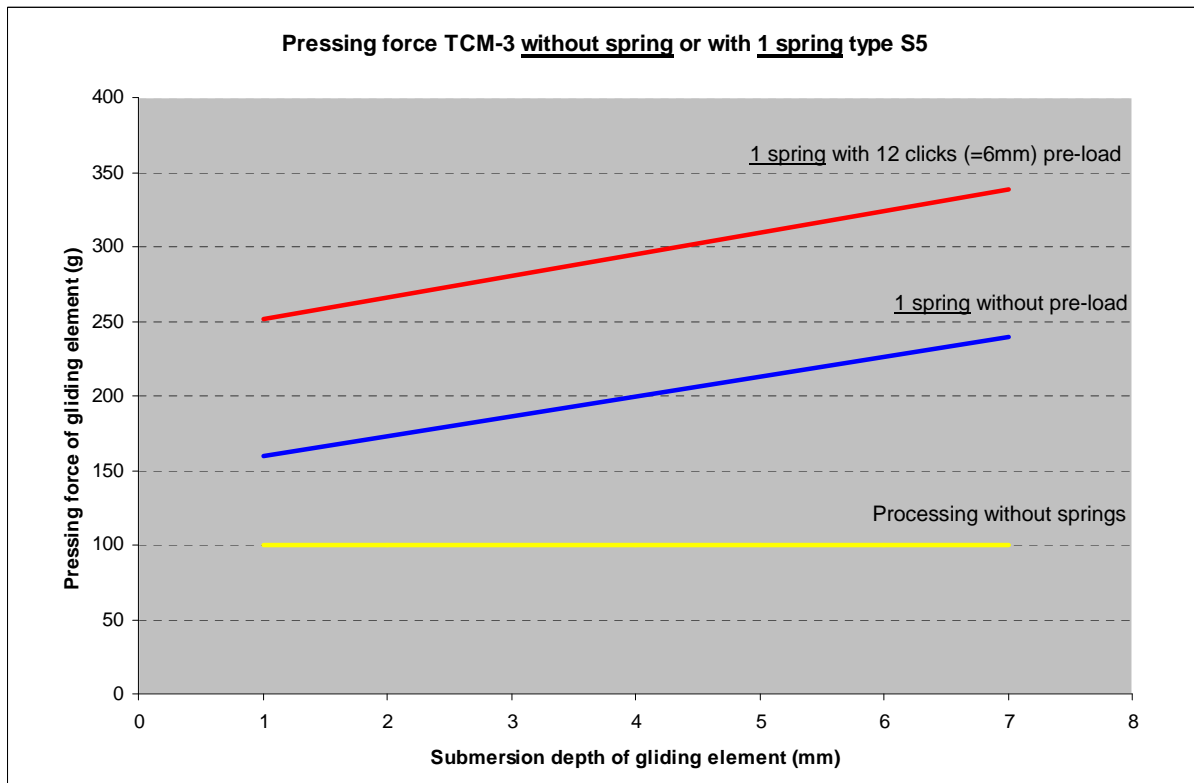


coarse adjustment = number and type of springs

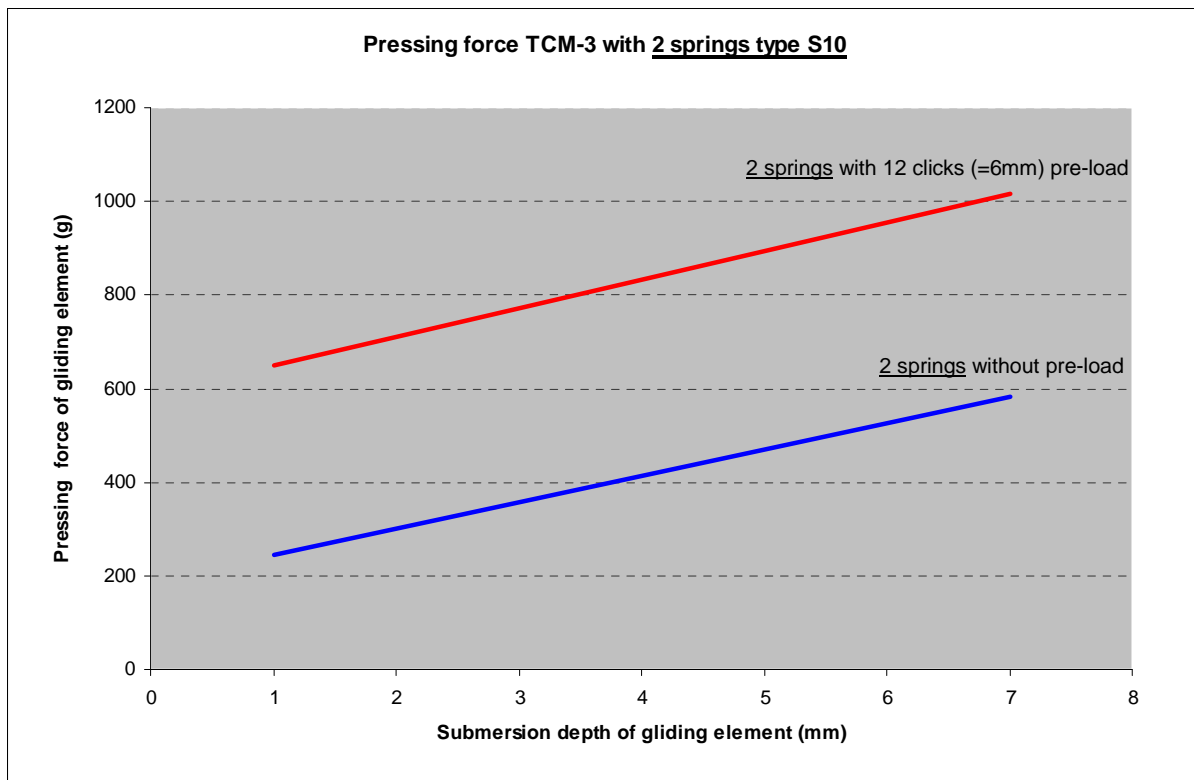
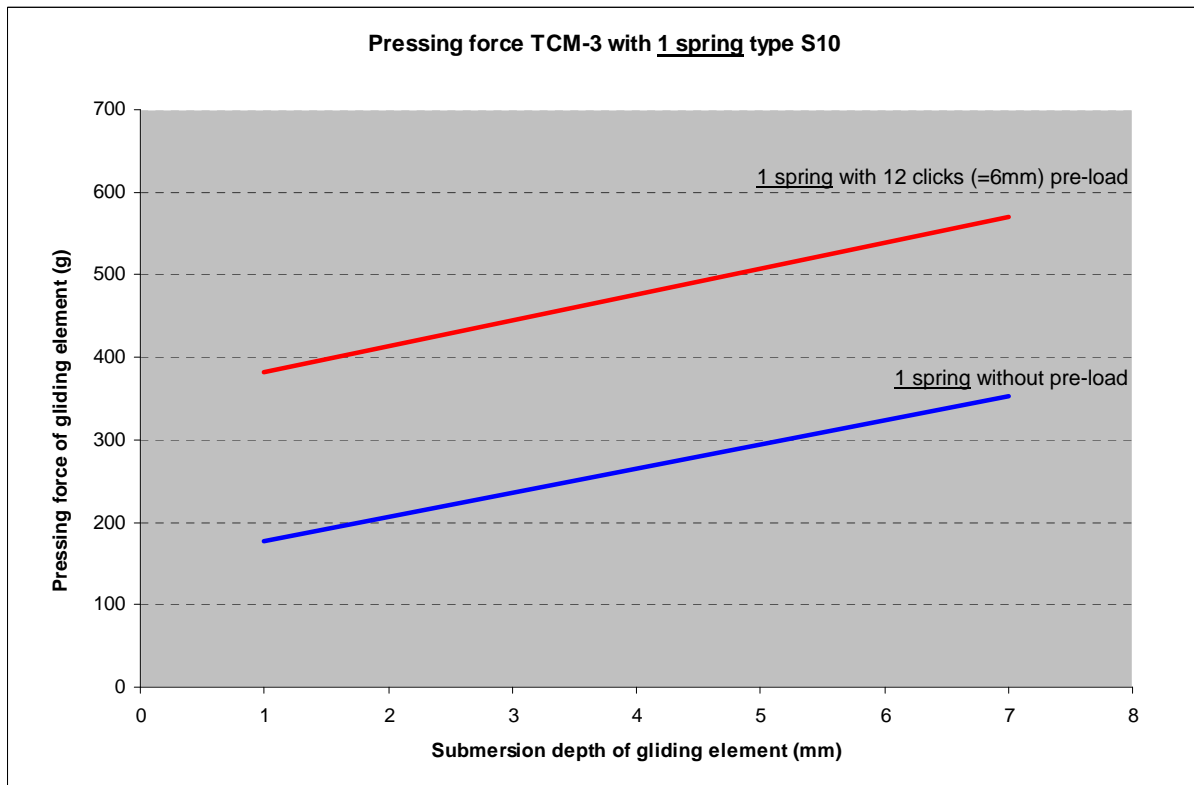
fine adjustment = adjustment wheel changes pre-load of spring set

Depending on type and number of springs the following pressing forces may be realized by different pre-loadings:

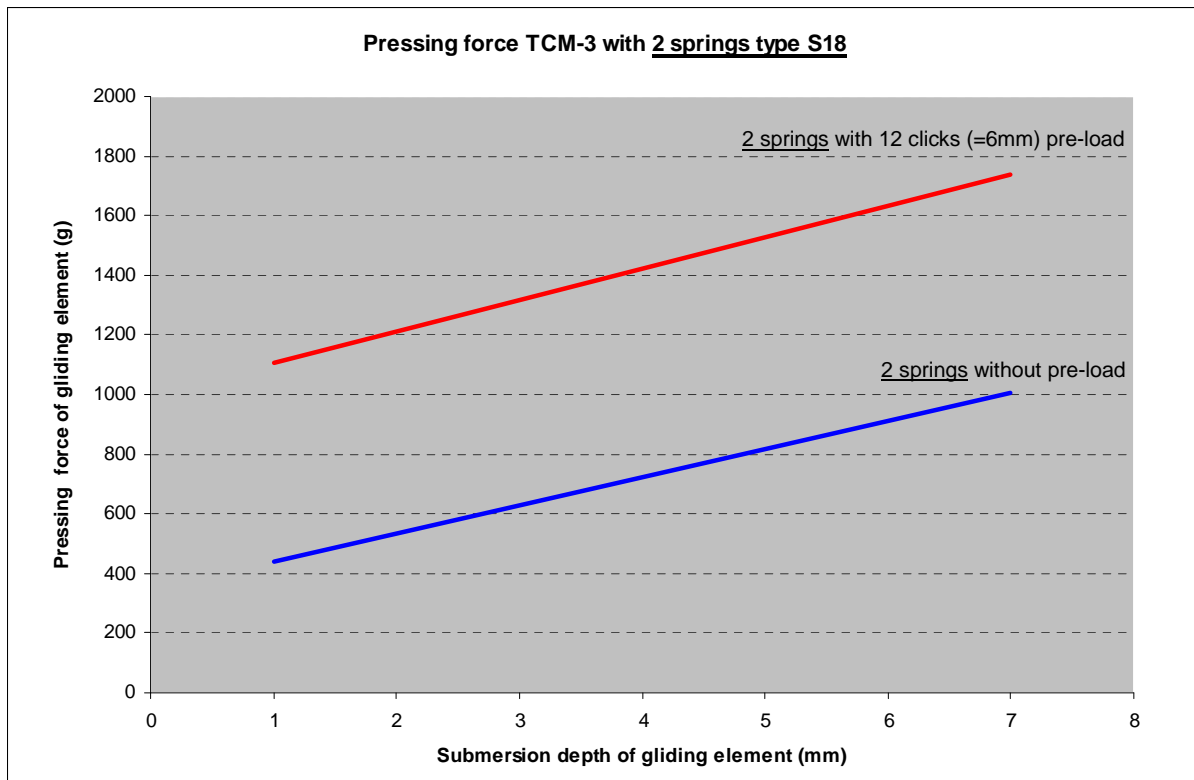
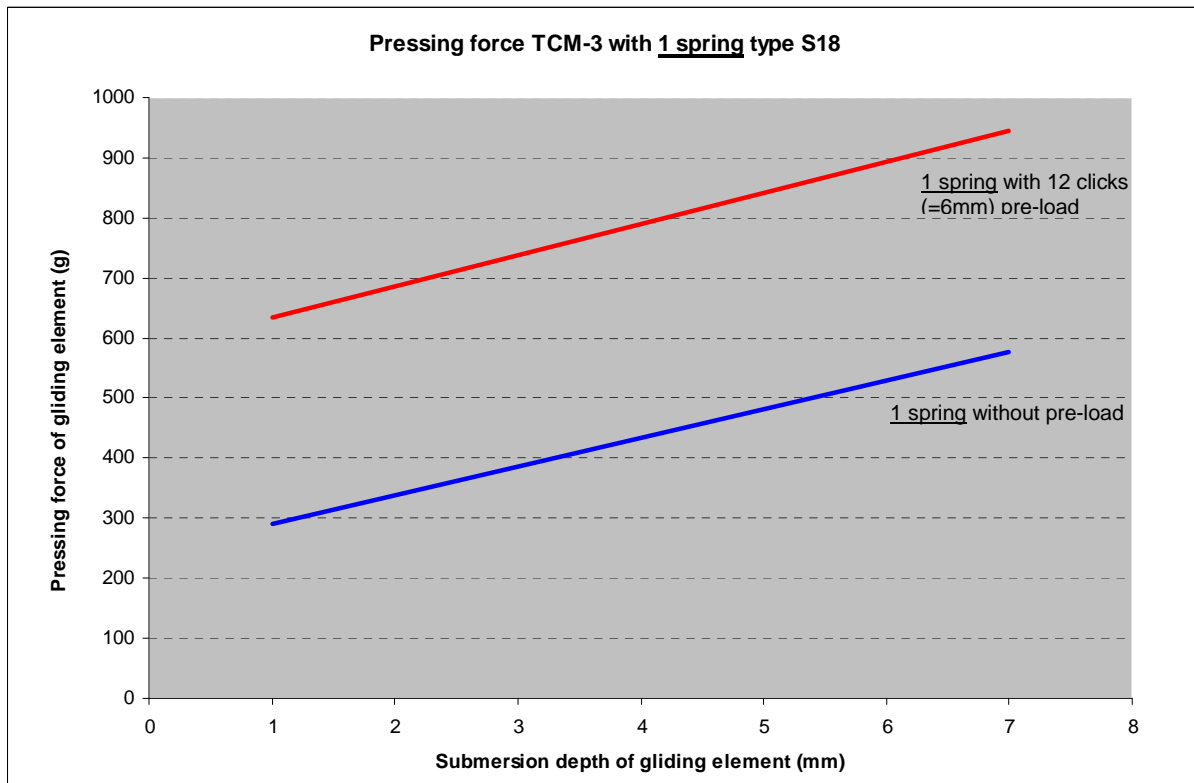
2.5.1 Pressing forces with spring set S5:



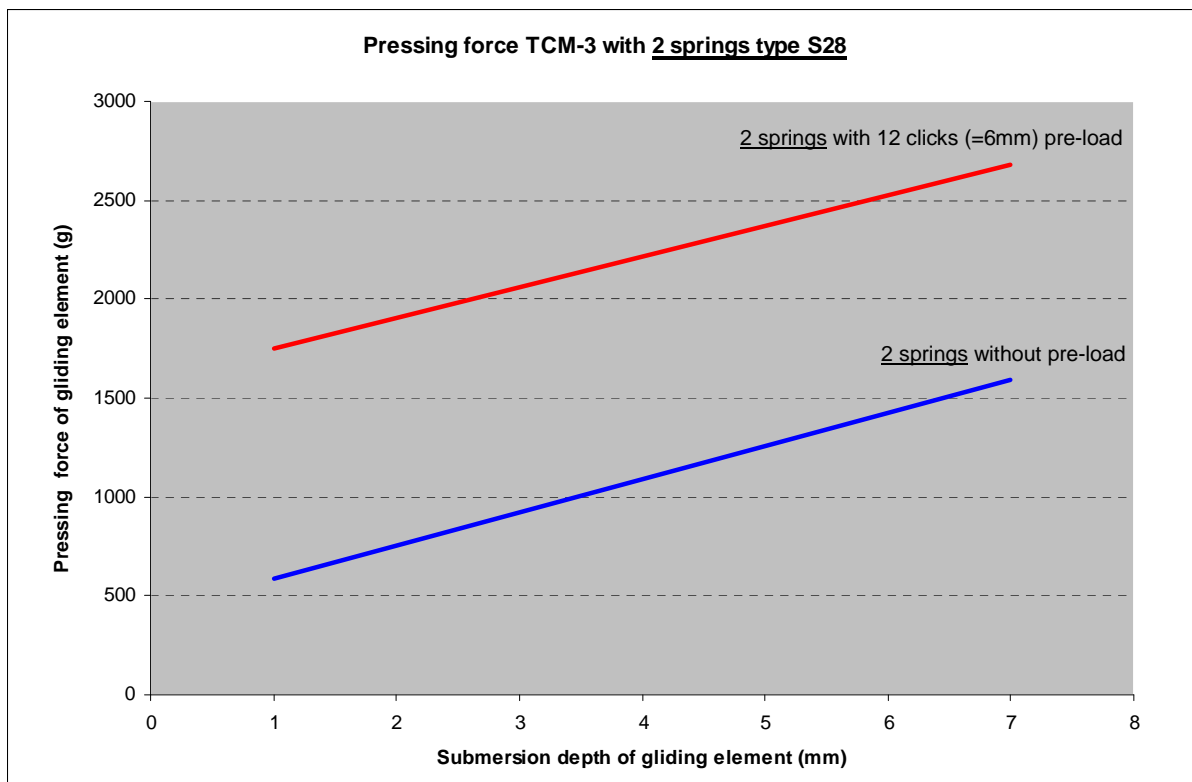
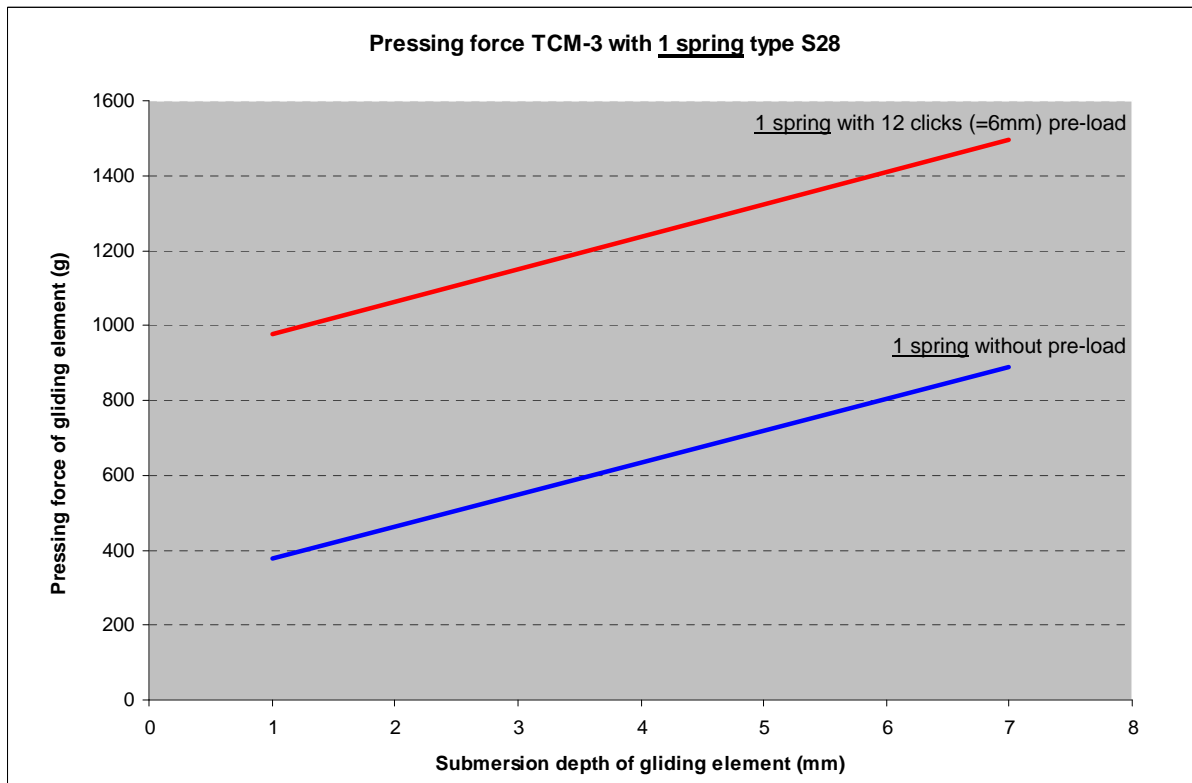
2.5.2 Pressing forces with spring set S10:



2.5.3 Pressing forces with spring set S18:



2.5.4 Pressing forces with spring set S28:



2.6 Adjusting the cutting depth

The cutting depth can be adjusted precisely if the gliding element is mounted.

The cutting depth increases 1.0mm per revolution. In practice it's possible to adjust the depth in increments of 0.05 - 0,1mm.



2.7 Operation without gliding element

Some materials are indicated to be cut without the gliding element. In this case the cutting depth has to be chosen by the plunging depth of the z-axis.



2.8 Maintenance

The processing unit has to be checked and cleaned periodically. Blunt blades have to be replaced immediately, since they negatively affect the cutting results, increase the load on the kinematics and shorten the lifetime of wear parts.

Warning !



Before carrying out any maintenance work it is necessary to ensure that no actuator or drive motor of the processing system or the machining system can move. Therefore it is essential to shut off the machining system or to remove the processing unit mechanically and electrically. It is strongly advised to observe the safety regulations of the respective machine manufacturer. There is a high risk of injury because of moving parts and very sharp blades.

3. Technical specifications

	TCM-3 stepper motor	TCM-3 servomotor
Height approx.	192 mm	219 mm
Width approx.	58 mm	
Depth approx.	86 mm	
Distance from center clamp collar to back side of body appr.	29 mm	
Weight (approx.)	2.500 g	
Diameter of clamp collar	43 mm	
Vertical travel of the blade	approx. 8 mm	
Blade shaft	6mm-h7 with Weldon clamping surface	
Blade alignment	by Weldon clamping surface	
Turning range	360 degrees, turning range not arrested, possibility of continuous circular operation	
Gliding element	PTFE – different diameters	
Connector	Sub-D 25 pins	Sub-D 25 pins + connector for power supply of servomotor
Power supply for electronics	12V-DC	
Control of actuator	external stepper driver (not included in delivery)	external servo driver (not included in delivery)

4. Connector assignment

The following table 1 shows the assignment of the integrated 25-pin D-Sub connector.



Important security advise !



The mechanical and electrical combination of the cutting unit and the machining system has to be done by an expert only. It is not allowed to put the unit in operation before all necessary and required country-specific safety regulations have been observed and checked carefully. Only the operator of the facility (i.e. machining system) is responsible for observing all relevant safety regulations.

Table 1: Connector assignment

PIN	Cable colour	Function / description	Remark																																																															
1	red	+12V electronics for position sensor and optional motor cooler	A																																																															
2	brown	Relay PIN 4	B																																																															
3	blue	Relay PIN 5																																																																
4	not assigned																																																																	
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6	blue-white	<table border="1"> <thead> <tr> <th colspan="4">TYPE OF CONNECTION (EXTERN)</th> <th colspan="2">MOTOR</th> </tr> <tr> <th rowspan="2">UNIPOLAR</th> <th colspan="2">BIPOLAR</th> <th rowspan="2">PARALLEL</th> <th rowspan="2">LEADS</th> <th rowspan="2">WINDING</th> </tr> <tr> <th>1WINDING</th> <th>SERIAL</th> </tr> </thead> <tbody> <tr> <td>A —</td> <td>A —</td> <td>A —</td> <td>A —</td> <td>BLK</td> <td>A</td> </tr> <tr> <td>COM —</td> <td>A —</td> <td>—</td> <td>—</td> <td>BLK/WHT</td> <td>A\</td> </tr> <tr> <td>A\ —</td> <td>—</td> <td>A\ —</td> <td>A\ —</td> <td>GRN/WHT</td> <td>A</td> </tr> <tr> <td>B —</td> <td>B —</td> <td>B —</td> <td>B —</td> <td>GRN</td> <td>B</td> </tr> <tr> <td>COM —</td> <td>B —</td> <td>—</td> <td>—</td> <td>RED</td> <td>B</td> </tr> <tr> <td>B\ —</td> <td>—</td> <td>B\ —</td> <td>B\ —</td> <td>RED/WHT</td> <td>B</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td>BLU/WHT</td> <td>B\</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td>BLU</td> <td>B\</td> </tr> </tbody> </table>		TYPE OF CONNECTION (EXTERN)				MOTOR		UNIPOLAR	BIPOLAR		PARALLEL	LEADS	WINDING	1WINDING	SERIAL	A —	A —	A —	A —	BLK	A	COM —	A —	—	—	BLK/WHT	A\	A\ —	—	A\ —	A\ —	GRN/WHT	A	B —	B —	B —	B —	GRN	B	COM —	B —	—	—	RED	B	B\ —	—	B\ —	B\ —	RED/WHT	B					BLU/WHT	B\					BLU	B\	C
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The notes following on the next page must be observed carefully.

4.1 Remarks to the connector assignment

Remark	Description
A	The electronic system for the position sensor has to be supplied with a direct current of 12V (DC). The polarity must be respected carefully because otherwise electronics and/or fan may be damaged.
B	<p>The position sensor controls an integrated relay that can be used by the supervising CNC controller as a limit or reference switch:</p> <ul style="list-style-type: none"> • Once the blade has reached the homing point during a reference run, there is contact between PIN3 and PIN15 of the Sub-D connector. • If the blade is located outside the reference position, there is contact between PIN2 and PIN15 of the Sub-D connector. • Depending on the applied CNC controller, the integrated relay can be used as a normally closed switch (NC) or as a normally open switch (NO).
C	The connection of the stepper motor depends on the driver used. The following documentation has to be observed carefully.

Warning !



The electrical and mechanical connection of the processing unit has to be done with utmost accuracy by an expert only. It is not allowed to put the unit in operation before all necessary and required country-specific safety regulations have been observed and checked carefully. Only the operator of the facility (i.e. machining system) is responsible for observing all relevant safety regulations.

4.2 Stepper motor specifications

SPECIFICATION	CONNECTION		BIPOLAR		PERMISSIBLE RADIAL+AXIAL FORCE
	UNIPOLAR OR BIPOLAR-1 WINDING	SERIAL	SERIAL	PARALLEL	
VOLTAGE (VDC)	4.8				
AMPS/PHASE	2.0	1.41	2.82		
RESISTANCE/PHASE (Ohms) @25°C	2.4±10%	4.8±10%	1.2±10%		
INDUCTANCE/PHASE (mH) @1kHz	5.1±20%	20.4±20%	5.1±20%		
HOLDING TORQUE (Nm) [lb-in]	1.2 [10.62]	1.7 [15.02]	1.7 [15.02]		
DETTENT TORQUE (Nm) [lb-in]		0.068 [0.602]			
STEP ANGLE (°) ± ACCURACY		1.8±5% (NON-ACCUM)			
BACK-EMF (V) (300 U/min)		29.60			
ROTOR INERTIA (kg-m²) [lb-in²]		4.8x10 ⁻³ [0.164]			
WEIGHT (kg) [lb]		1.0 [2.2]			
TEMPERATURE RISE: MAX.80°C (MOTOR STANDSTILL; FOR 2 PHASE ENERGIZED)					
AMBIENT TEMPERATURE -10~ 50°C [14F ~ 122F]					
INSULATION RESISTANCE 100 Mohm (UNDER NORMAL TEMPERATURE AND HUMIDITY)					
INSULATION CLASS B 130° [266°F]					
DIELECTRIC STRENGTH 500VAC FOR 1 MIN. (BETWEEN THE MOTOR COILS AND THE MOTOR CASE)					
AMBIENT HUMIDITY MAX. 85% (NO CONDENSATION)					

AXIAL-FORCE Fa (N)		RADIAL-FORCE Fr (N)		SHAFT PLAY (mm)	
5	10	15	20	AXIAL	RADIAL
Fa=15		Fr=150		0.08	0.02
AT LOAD MAX. (N)				4.5	4.5

TYPE OF CONNECTION (EXTERI)		CONNECTION		MOTOR	
UNIPOLAR	BIPOLAR	CONNECTOR	PARALLEL	LEADS	WINDING
TWINDING	SERIAL	PN NO.			
A	A	1	A	BLK	A
A	A	3	A	BLK/WHT	A
COM	A	2	A	GRN/WHT	A
B	A	4	A	GRN	A
B	B	5	B	RED	B
COM	B	7	B	RED/WHT	B
B	B	6	B	BLU/WHT	B
B	B	8	B	BLU	B

WIRING DIAGRAM

FULL STEP 2 PHASE-Ex. WHEN FACING MOUNTING END (X)





STEP	A	B	A'	B'	CCW	CW
1	+	+	-	-	↑	↓
2	-	+	+	-	↓	↑
3	-	-	-	+	↑	↓
4	+	-	+	+	↓	↑






SCALE	FREE	APVD
X	±0.5	CHKD
1PL	±0.2	DRN
2PL	±0.1	SIGNATURE
ANGLE	±30'	



REV	DESCRIPTION	DATE	APVD
2	TECHNICAL DATE	09.04.08	J.W.
1	PIN-Belegung	04.01.08	J.W.

5. Accessories

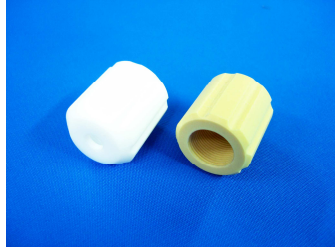
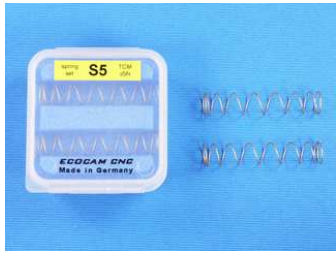


5.1 General accessories for TCM and EOT

Article No.	Description	
220012	<p>E12 - Universal blade for various materials, as cardboard, gasket material, foam rubber, cork, useable on both sides</p> <p>Length of cutting edge : 12 mm Total length : 25 mm Cutting edges : 2 Type : 6mm h7 / Weldon</p>	
220018	<p>E18 - Universal blade for various materials, as cardboard, gasket material, foam rubber, cork, one-sided blade for fine lines</p> <p>Length of cutting edge : 13,5 mm Total length : 25 mm Cutting edges : 1 Type : 6mm h7 / Weldon</p>	
220025	<p>E25 - Universal blade for various materials, as cardboard, gasket material, foam rubber, cork, one-sided blade for fine lines</p> <p>Length of cutting edge : 25 mm Total length : 39 mm Cutting edges : 1 Type : 6mm h7 / Weldon</p>	
220028	<p>E28 - Universal blade for various materials, as cardboard, gasket material, foam rubber, cork, one-sided blade for fine lines</p> <p>Length of cutting edge : 30 mm Total length : 45 mm Cutting edges : 1 Type : 6mm h7 / Weldon</p>	

<p>220030</p>	<p>E30 - Special blade for TCM module; wedge blade 30 degrees for normal foils and writings</p> <p>Length of cutting edge : 2,5 mm Total length : 25 mm Cutting edges : 1 Type : 6 mm h7 / Weldon</p>	
<p>220050</p>	<p>E50 - Special blade for TCM module; wedge blade 50 degrees for flock textile foils, felt, cardboard</p> <p>Length of cutting edge : 3,5 mm Total length : 25 mm Cutting edges : 1 Type : 6 mm h7 / Weldon</p>	
<p>220070</p>	<p>E70 - Special blade for TCM module; wedge blade 70 degrees for flock textile foils, felt, cardboard, rubber</p> <p>Length of cutting edge : 8 mm Total length : 25 mm Cutting edges : 1 Type : 6 mm h7 / Weldon</p>	
<p>220085</p>	<p>E85 - Special blade for EOT module; e.g. for soft polyurethane foam panels</p> <p>Length of cutting edge : 50 mm Total length : 65 mm Cutting edges : 1 Type : 6mm h7 / Weldon</p>	
<p>220087</p>	<p>E87 - Special blade for EOT module; e.g. for soft polyurethane foam panels</p> <p>Length of cutting edge : 70 mm Total length : 83 mm Cutting edges : 1 Type : 6mm h7 / Weldon</p>	

<p>220092</p>	<p>E92 - Special blade for EOT module; e.g. for soft polyurethane foam panels</p> <p>Length of cutting edge : 120 mm Total length : 133 mm Cutting edges : 1 Type : 6mm h7 / Weldon</p>	
<p>230200</p>	<p>EC4 - Long life cutting mat; intended to be used on vacuum tables; useable on both sides</p> <p>Material Thickness : 4mm Roll width : 2000 mm Colour : grey</p>	

5.2 Special accessories for the TCM

Article No.	Description	
250010	Gliding element PTFE; plain	
250011	Gliding element PTFE; tapered	
250020	S5 - Spring set; pressing force up to approx. 5N / 500g	
250021	S10 - Spring set; pressing force up to approx. 10N / 1.000g	
250022	S18 - Spring set; pressing force up to approx. 18N / 1.800g	
250023	S28 - Spring set; pressing force up to approx. 28N / 2.800g	