

SIMATIC KA

This manual provides an overview of procedures and workflows of the **SIMATIC KA** system with colour widescreen touch display.

1. System

The manual is intended for all versions of machines. The options of the individual systems are adjusted according to the client's requirements when ordering the system. Therefore, it can happen that some of the options listed in the manual are not applied on the machine but most of them can be ordered additionally. The machine must be operated only by a person authorized, trained and with the appropriate qualifications.



1.1 Setting values and programming

The colour touch screen displays all the information necessary for operating the control system, programming of machine cycles and parameters. By touching a window with a piece of data this window expands and the data in it can be changed by turning a hand wheel or reset by pressing the RES button. To set the numerical values for the value of absolute coordinates, a button can be used to select step of 10 times or 100 times. The parameters are programmed in the idle state of the machine but some can be changed even during grinding, if appropriate.

Below the touch display there are eight function keys (F1 to F8). Use these buttons to switch to the desired mode.



- F1 - manual mode
- F2 - automatic cycle
- F3 - dressing
- F4 - programming
- F5 - single plunge-grinding
- F6 - longitudinal single
- F7 - program selection
- F8 - move to home position



1.2 Selection of program number and functions



After pressing the **F7** switch on the control system panel, the screen switches to the selection of programs, SETUP, parameters and diagnostics.



By pressing the symbol on the screen the system switches to the selected program or function.

1 to 5 are plunge-grinding programs. The diameter that has been programmed is shown above the number.

6 to 10 are programs for longitudinal grinding. The diameter that has been programmed is shown above the number.

P is a plunge-grinding program with optional infeed speed

A is a simple cycle of longitudinal grinding with automatic increments at the reversal points

SETUP is used for memory deletion and enabling the factory settings, see chapter *Setup*.

Diagnostika (Diagnostics) is used for switching to the diagnostic screen during commissioning or debugging, see chapter *Diagnostics*.

Parametry (Parameters) is used for switching to parameters setting, see chapter *Parameters*.



2. Manual grinding

2.1 F1 Manual plunge-grinding grinding

The manual mode  is the basic method of controlling the grinder and it can be used, for instance, for the travel of the grinding headstock to the position for exchanging the grinding wheel, for moving the grinding headstock to the position of the workpiece allowance, for moving the grinding headstock to the position of the diamond when adjusting the wheel dresser and for manual grinding by single plunge-grinding, as well as lengthwise.

The grinding headstock infeed is controlled by a hand wheel forward or backward and the display can be used to view the position of the grinding headstock.

To set the numerical values for the value of the absolute coordinates, a button can be used to select step of 10 times or 100 times.



If the travel of the grinding headstock to a longer distance is required, use the fast travel buttons on the machine control panel. To move forward, the grinding headstock must be at the front position of fast travel.

After longer (3 sec) pressing of the **F8**  button, the grinding headstock moves to the "0.000" position. This feature can be used when moving into the same point again during manual grinding or for returning to the original position after dressing.

Press the RES X button on the control system panel to reset the relative axis **X** at any time.

2.2 Absolute coordinate A

The absolute position of the **X** axis is marked **A=**.

Setting of the value on the display is performed when installing, replacing the wheel or when the displayed value differs from reality. After grinding a workpiece, the fast travel is used for fast backward movement, the workpiece is measured.

The measured value is written on the display. After pressing the absolute value window, the window expands and the value can be changed with the hand wheel. After setting the desired value, the window is made smaller to its original size with a touch.

Setting the value of the absolute position of the **X** axis does not change the position of the grinding headstock (it changes on the display only).

All positions of the programs will remain unchanged but the final diameter **FV** in the parametric cycles is related to the **X** absolute axis and the change of its position also changes the final position (zero) of all these cycles. This can be used to compensate all the cycles together.

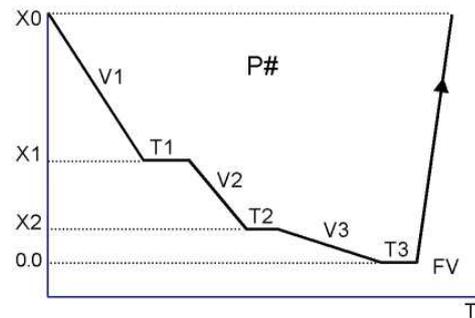


3 Programming

4

3.1 Parameters for plunge-grinding cycle P#

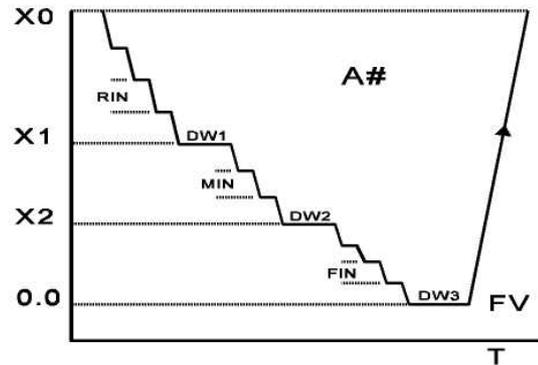
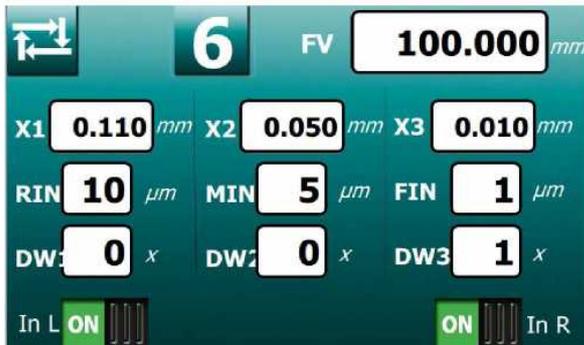
↑↓		1		FV	100.000 mm
		doba broušení		0	30
X1	+0.050 mm	X2	+0.020 mm	X3	+0.010 mm
V1	300 $\frac{\mu m}{min}$	V2	200 $\frac{\mu m}{min}$	V3	100 $\frac{\mu m}{min}$
T1	0 sec	T2	1 sec	T3	2 sec



Value	Meaning
1 to 5	Cycle number.
FV	Workpiece diameter (1 ÷ 700) mm
X0	Grinding allowance + safety (0.01 ÷ 10) mm
X1	End of rough-grinding speed (0.01 ÷ X0) mm
X2	End of grinding speed (0 ÷ X1) mm
X3	End of finish-grinding speed (0 ÷ X2) mm
V1	Rough-grinding speed (20 ÷ 9000) $\mu m/min$
V2	Grinding speed (5 ÷ 5000) $\mu m/min$
V3	Finish-grinding speed */ (5 ÷ 3000) $\mu m/min$
T1	Sparking in X1 (0 ÷ 120) sec
T2	Sparking in X2 (0 ÷ 120) sec
T3	Sparking in zero (0 ÷ 120) sec

7

3.2 Parameters for longitudinal cycle A#



Value	Meaning
A#	The hand wheel is used to select the required cycle number.
FV	The workpiece diameter, related to the X absolute axis. (1 ÷ 700) mm
X0	Grinding allowance + safety (0.01 ÷ 100) mm
X1	End of rough-grinding increment (0.001 ÷ X0) mm
X2	End of grinding increment (0 ÷ X1) mm
RIN	Rough-grinding increment (0.002 ÷ 15) mm
MIN	Grinding increment (0.002 ÷ 10) mm
FIN	Finish-grinding increment (0.001 ÷ 8) mm
Finc	Increment speed (60 ÷ 60000) μm/min
DW1	Number of sparking lifts in X1 (0 ÷ 120)
DW2	Number of sparking lifts in X2 (0 ÷ 120)
DW3	Number of sparking lifts in zero (0 ÷ 120)

There are two switches in the bottom of the screen. They define whether to add on the left, right or at both the reversal points.

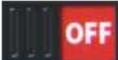


4. Automatic cycle

4.1 Plunge-grinding in automatic cycle



After switching to the automatic cycle with the **F2**  button, press the **F8**  button. The grinding headstock moves to the home position for grinding. Grinding is started with a hand lever. During grinding the infeed speed of the grinding wheel may be changed within the range from 5 % to 150 % by rotating the hand wheel.

The infeed can be stopped at any time by pressing the machining permission  button. Move the wheel backwards with the hand lever while the infeed is stopped, the grinding headstock stops. After measuring the actual dimension, the absolute coordinate **A** can be corrected according to the measurement result. Touching the A window expands it and the correction is performed with the hand wheel. Press the window again to close it.

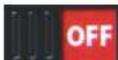
Pressing the  button enables machining again and the automatic cycle is restarted with the hand lever.

4.2 Longitudinal grinding in automatic cycle

After switching to the automatic cycle with the **F2** button, press the **F8** button. The grinding headstock



moves to the home position for grinding. Grinding is started with a hand lever. Increments at the reversal points can be switched off while grinding with the left/right bottom buttons.

The infeed can be stopped at any time by pressing the machining permission  button. Move the wheel backwards with the hand lever while the infeed is stopped, the grinding headstock stops. After measuring the actual dimension, the absolute coordinate **A** can be corrected according to the measurement result. Touching the A window expands it and the correction is performed with the hand wheel. Press the window again to close it.

Pressing the  button enables machining again and the automatic cycle is restarted with the hand lever.



5. Plunge-grinding with programmable speed – cycle P

In this mode, it is possible to plunge-grind with programmed speed. During grinding the infeed speed may be changed within the range from 5 % to 150 % by rotating the hand wheel (OVERRIDE).

Preparation for grinding in the manual mode. Deflect the main lever forward to move the grinding headstock forward along the fast travel track. The workpiece is ground slightly by turning the hand wheel. Deflect the main lever backward to move the grinding headstock backward along the fast travel track. The allowance is measured.

Switch over to the **P**  mode. Program the infeed speed **V1** and the final sparking **T1**.

Reset the **X** value using the **RES X** button. Turn the hand wheel to the right (to the cut) to set the X value of the detected *allowance* on the display (the grinding headstock is stopped; only the value on the display is changing).

If an error occurs, reset the display by pressing the **RES** button and a new value is set. For plunge-grinding without oscillation, the table is turned off with a switch; for grinding with table oscillation, the table stops are set and the table is turned on.

By moving the main lever forward, an automatic cycle is started in which the workpiece is ground to “zero” at the set speed **V1**, it is sparked during the time **T1**. Then the cycle is stopped automatically by moving the grinding headstock to the allowance and moving the fast infeed away.

The value of the allowance may be changed at the rear position by turning the hand wheel in the corresponding direction. After the start, this new position of the allowance is loaded into memory and, after an automatic cycle, the grinding headstock returns automatically to this new position.

The correction of the final workpiece diameter is performed by correcting the **A** axis by turning the hand wheel.



6. Longitudinal grinding with automatic increments at reversal points – cycle A

In this mode, it is possible to grind longitudinally with programmed increments to the left/right.

Preparation for grinding in the manual mode. Deflect the main lever forward to move the grinding headstock forward along the rapid adjustment track. The workpiece is ground slightly by turning the hand wheel. Deflect the main lever backward to move the grinding headstock backward along the rapid travel track. The allowance is measured.

Switch over to the **A**  mode. Program the left/right increment and the number of crossings for sparking at the end of grinding **DW1**.

The value of the allowance is changed at the rear position by turning the hand wheel in the corresponding direction. After the start, this new position of the allowance is loaded into memory and, after an automatic cycle, the grinding headstock returns automatically to this new position.

Deflect the main lever forward to move the grinding headstock forward along the rapid travel track.

At the left and right reversal points, the size of the automatic increments is adjusted at each different reversal point (it may vary at both of them).

At the table position between the reversal points, the hand wheel can be turned backward by one step to cancel increments at both the reversal points simultaneously. Further turning of the hand wheel backward will move the grinding headstock away from the workpiece by an arbitrary value. Turning the hand wheel forward at the table position between the reversal points will move the grinding headstock to the cut. The forward motion is limited by the zero on the display.

After setting the increments, automatic infeed movement is performed at the reversal points to the zero the display. Then table movements are performed (according to the DW set value) without the increments (sparking) and the grinding headstock moves to the allowance and backward. The

place of the grinding headstock backward movement is determined by the values of the allowance and both the increments. At the time of a new start, the workpiece is ground to “zero” with the hand lever using the same procedure.

The value of the allowance is changed by turning the hand wheel in the corresponding direction. After the start, this new position of the allowance is loaded into memory and, after an automatic cycle, the grinding headstock returns automatically to this new position. The correction of the final workpiece diameter is performed by correcting the A axis by turning the hand wheel.



7. Dressing

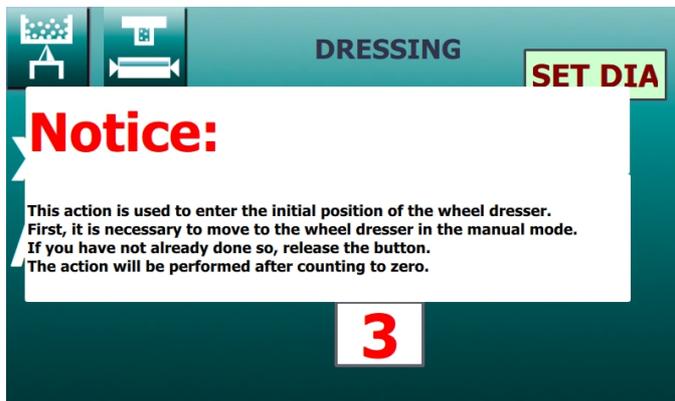
7.1 Wheel dresser calibration

Prior the first dressing, it is necessary to adjust the wheel dresser position. Turn the hand wheel in the manual mode to move the grinding wheel infeed to touch with the diamond it is trued up. Press F3 to switch to the dressing mode.



Press the **SET DIA** button for 10 seconds. This will set the new position of the diamond dresser and the calibration has been completed.

Prior wheel dresser calibration



Countdown with SET DIA

7.1 Dressing

Whenever you switch from a mode to the dressing position , the display shows **X** always relative distance of the grinding wheel from the diamond. Press the **F8**  button to move the grinding headstock to the “0.000” position where it stops automatically. The movement is controlled so as to determine the play in the infeed mechanism. This means that, during infeed to the diamond, the machine moves automatically beyond the diamond and returns to the “0.000” position.

Use the button on the machine panel to start automatic movement of the table with a pre-

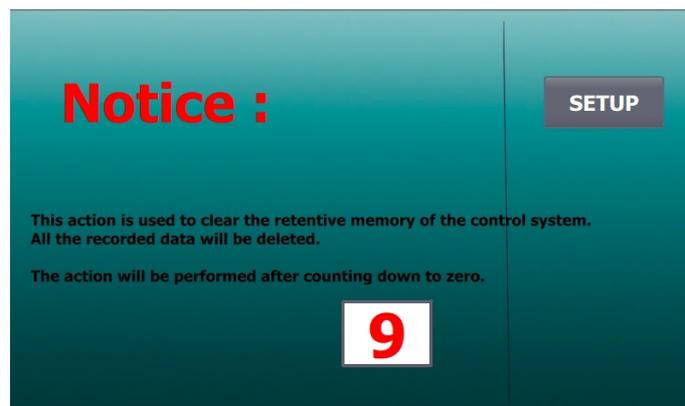
selected dressing speed. Turn the hand wheel to move the grinding wheel forward dressing by a dressing increment and the wheel is trued up. When dressing is complete, press the **KOMPENZACE** button. This compensates the wheel position for the dressing amount. The **KOMPENZACE** button is accessible after pressing **F8**.

After dressing, it is necessary to take into account the changes in wheel diameter due to wheel wear prior dressing and the wear of the diamond. Therefore, pay increased attention when returning to the workpiece. The wheel after dressing seems to be larger than before dressing. Even prior completing the grinding process (prior zero), it is advisable to interrupt grinding, to check the workpiece diameter and to correct the absolute axis.

To avoid ill-control, the **F8** button for moving to the diamond is enabled only after performing **SET DIA**. Similarly, the **KOMPENZACE** button and the movements with the hand wheel are accessible after pressing the **F8** button.

It is important to be aware of the difference when using the **KOMPENZACE** button in the dressing mode and performing **SET DIA** for the diamond. After pressing the **KOMPENZACE** button, even after performing **SET DIA**, the display resets and the position of the diamond for dressing moves to this point. The difference is that after performing **SET DIA** the absolute position of the programmed diameters does not change and their relative position to the diamond position is recalculated. After pressing the **KOMPENZACE** button the relative position of the programmed diameters to the diamond position remains unchanged and their absolute position is recalculated. Therefore, as mentioned above, the **KOMPENZACE** button is used after dressing to compensate for the loss of wheel and **SET DIA** is used to set the new diamond position after its replacement.

8. Setup



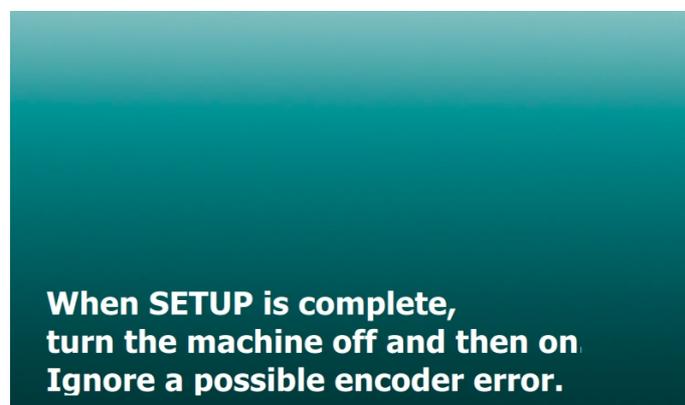
Notice :

This action is used to clear the retentive memory of the control system.
All the recorded data will be deleted.

The action will be performed after counting down to zero.

9

SETUP



**When SETUP is complete,
turn the machine off and then on
Ignore a possible encoder error.**

9. Diagnostics

The screenshot displays the Diagnostics screen with the following data:

INPUTS	STATUS	DESCRIPTION	OUTPUTS	STATUS	DESCRIPTION
I 4.0	Off	balluff KM	Q 4.0	Off	Impulzy KM
I 4.1	Off		Q 4.1	Off	Směr KM
I 0.0	On	A	Q 0.0	Off	....
I 0.1	On	B RK	Q 0.1	Off	....
I 0.2	Off	....	Q 0.2	Off	....
I 0.3	On	hydraulika/SAC	Q 0.3	Off	KAC
I 0.4	Off	urychlení	Q 0.4	Off	ruční
I 0.5	Off	....	Q 0.5	Off	Z STOP
I 0.6	Off	PU	Q 0.6	Off	KAC
I 0.7	Off	LU	Q 0.7	Off	X < WSP
I 1.0	Off	UAC	Q 1.0	Off	podélné br
I 1.1	Off	POB	Q 1.1	Off	X > WSP
I 1.2	On	ZPS			
I 1.3	On	PPS			
I 1.4	Off	dozadu			
I 1.5	Off	dopředu			

Additional information on the screen includes a counter for 'balluff KM' showing '0', a 'RK-KM' button, and a '200000' value. On the right side, there are control buttons: 'zapnout ladění', 'Alarms', 'Stop HMI', 'START PLC', 'TEST KM', 'SCHEMA', and 'Analog'.

Press the **RK-KM** button to connect the hand wheel with a stepping motor.

Input signals are indicated on the left side. Individual output signals for checks can be turned on or off on the right side.

This page should be accessed only by qualified and trained staff; it is not intended for normal operation of the machine.

10. Disposal

When disposing of the machine, the control system is submitted to a specialized company for environmentally friendly disposal and recycling of its electronic components. The control system includes precious metals and a lithium battery.

