S u p p l e m e n t

KEB COMBIVERT S4 **Electronic CAM**

00.S4.01A-K145

KEB ANTRIEBSTECHNIK

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Table of Contents

1. General

The software version 1.45 is based on the standard version 1.40, except for the limited memory area of the Offline-mode of the oscilloscope it has retained the functional extent of the standard version.

Additional functions of software 1.45:

- electronic cam disc
- electronic camshaft

1.1 Electronic Cam Disc

It is the function of the cam disc to bring the motor into a certain slave position appropriate to a master position which is read into the inverter. For that purpose the inverter needs to know which of the slave position belongs to which master position. The value pairs must be entered into a table.

Example:

Master position(°)	Slave position(°)
0	0
10	20
50	100
80	130
85	135
90	130
100	115
110	70
170	40
300	10
360	0

Through a start signal the inverter reads-in the master position, defines the slave position belonging to the master position and carries out a repositioning from the old to the new slave position.

Through download via Combivis or bus the value pairs are loaded into the inverter.

1.2 Electronic Camshaft

For certain applications it is necessary that defined actions are carried out to fixed positions of the motor. Up to now camshafts with cam-operated switches were used, which initiate the actions in the control. Now the inverter can in dependence on its position set or reset an output.

2. Cam Disc (Electronic CAM)

CA.00 Cam disc mode

Switches on the curve disc.

Setting range:	*0 = off, 1 = on*
Factory setting:	*0*
Notice:	*programmable*

CA.01 KP-position

The position controller of the CAM module is a P-controller. With the parameter the amplification of the controller can be preset.

Setting range:	*0 . . . 65535*
Factory setting:	*20*
Notice:	*programmable*

CA.02 Cam disc start

By writing a 1 on this parameter the cam disc can be started.

Setting range:	*0 . . . 1*
Factory setting:	*0*
Notice:	*programmable*

CA.03 CAM start source

Setting range:	*0= starting of cam disc via the inputs* *1= starting of cam disc via parameter CA.02*
Factory setting:	*0*
Notice:	*non-programmable*

CA.04 CAM Start Offset

States the partial revolutions (1° $\hat{=}$ B6h) of the Masters by which the starting signal is delayed. The starting signal must remain set during the deceleration. No offset at virtual master.

Setting range:	*0 . . . 65535*
Factory setting:	*0*
Notice:	*non-programmable*

CA.05 1 cycle

Setting range: *0 = cyclic processing of the cam disc on applying the start signal (see figure 1)*
1 = on applying the start signal the cam disc is processed only one (see figure 2)
Factory setting: *0*
Notice: *non-programmable*

Figure 1

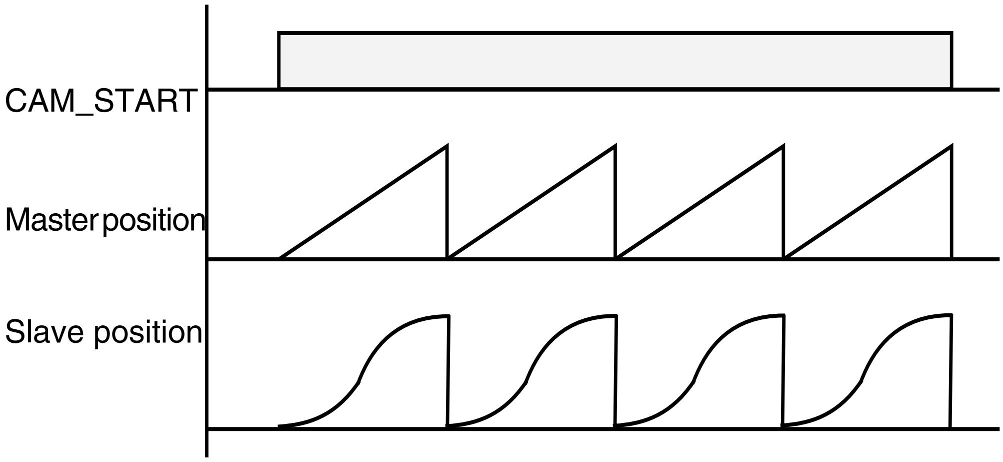
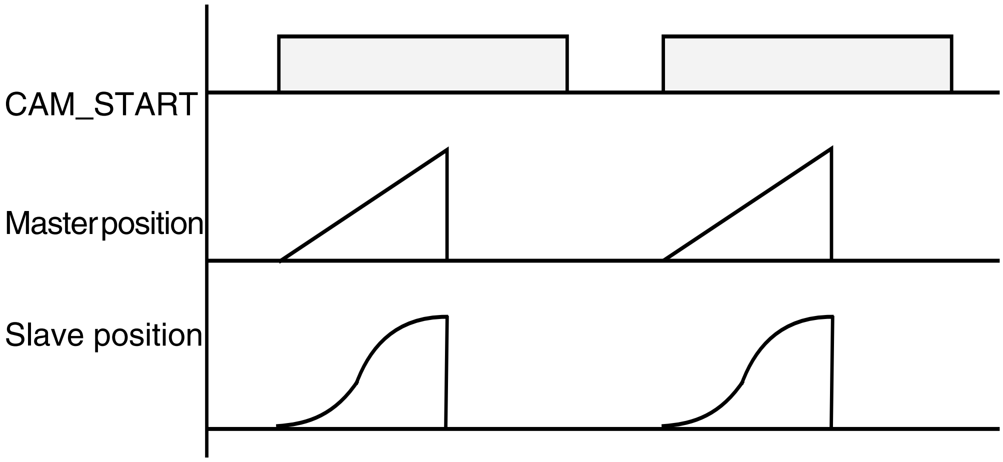


Figure 2



CA.06 Virtual Master

A virtual master can be preset, that rotates with the speed (+ ramps) adjusted under the SP-parameters.

Setting range:	*0 = off*	*master position of X5*
	1 = on	*virtual master active*
Factory setting:	*0 = off*	
Notice:	*non-programmable*	

CA.07 Interpolation

Selection of interpolation procedure that is used for the interpolation between the supporting values.

Setting range:	*0 = linear interpolation*
	1 = quadratic interpolation
Factory setting:	*0*
Notice:	*non-programmable*

CA.08 Lead on

The calculation of a slave position from a given master position requires a calculating time of 2 ms. Consequently the slave position appropriate for the master position always occurs 2 ms later.

If the lead is switched on the master position, which the master would reach after the calculating time for the slave position, is calculated from the actual master speed. This computed master position is then used to determine the appropriate slave position. The delay by calculation is dropped.

Setting range:	*0 =* off	lead off
	1 = an	lead on
Factory setting:	*0*	
Notice:	*non-programmable*	

CA.09 Maximal paired value number
It determines the supporting values and thus the size of the value table.

Setting range: *0 . . . 400*
Factory setting: *400*
Notice: *non-programmable*

CA.10 Paired value number

Setting range: *0 . . . 400*
Factory setting: *0*
Notice: *non-programmable*

CA.11 Master position High

Setting range: *0 . . . 65535*
Factory setting: *0*
Notice: *non-programmable*

CA.12 Master position Low

Setting range: *0 . . . 65535*
Factory setting: *0*
Notice: *non-programmable*

CA.13 Slave position High

Setting range: *-32767 . . . 32767*
Factory setting: *0*
Notice: *non-programmable*

CA.14 Slave position Low

Setting range: *0 . . . 65535*
Factory setting: *0*
Notice: *non-programmable*

Input of paired values:

The supporting values of the position profile are equipped with continuous numbers:

CA.10	paired value numbers:	0 ... maximal paired value number
CA.11+12	master position:	0 ... maximal master position
CA.13+14	slave position:	0 ... maximal slave position

Now every supporting value can be enterd by adjusting the paired value number.

The block must always be entered completely, since otherwise the values cannot be adopted into the table.

The positions are standardized in such a manner that the complete revolutions are in the high part and partial revolutions in the low part (1° ≅ B6h).

The input of the master position must be continuous starting from 0 up to the maximal position. **The difference between the individual supporting values may not exceed 1 revolution = FFFFh.**

The slave position must be started going out from 0. The slave position of the supporting values can be preset either positive or negative, but **the difference between the individual supporting values may not exceed ½ revolution = 7FFFh.**

Reading of paired values:

After the input the positions of the interpolation point can be read out through input of the paired value number.

CA.15 Table input status

To check the input conditions they are queried at every input into the table and indicated under parameter CA.15.

Bit 0	Master difference to predecessor	≤	0
Bit 1	Master difference to predecessor	>	FFFFh
Bit 2	Master difference to successor	≤	0
Bit 3	Master difference to successor	>	FFFFh
Bit 4	Slave difference to predecessor	>	7FFFh
Bit 5	Slavedifferenz to successor	>	7FFFh
Bit 6			
Bit 7	Gearbox factor > 20		

If a successor difference is entered too large then the table from the paired value number must be entered again.

If a predecessor difference is shown as too large then the current paired value number remains as well as the old values belonging to it. The paired value must be entered again.

Notice: *read-only parameter*

CA.20 Gearbox factor numerator

Setting range: *0 . . . 32767*
Factory setting: *1*
Notice: *programmable*

CA.21 Gearbox factor denominator

Setting range: *0 . . . 32767*
Factory setting: *1*
Notice: *programmable*

With parameters CA.20 and CA.21 the gearbox factor can be preset, which readjusts the external master position to the internal master position. Thus the position profile of the slave with regard to the master position can be stretched or compressed.

Example:
The supporting values are preadjusted with a master position from 0 to 10000h and any chosen slave position. If the same slave position profile should now be processed, but the master position changes from 0 to 20000h, then the master position can be adapted with the gearbox factor.

Max. internal master position: 10000h CA.20 gearbox factor numerator = 1
Max. external master position: 20000h ==> CA.21 gearbox factor denominator = 2

The ratio between the factors may be 20:1 up to 1:20.

CA.22 Gearbox factor matching time

So that it does not come to jerks during changeover of the gearbox factor, it can be adjusted from the old value to the new value in the preadjusted time under CA.22.

Setting range: *0 = off . . . 10,00 s*
Factory setting: *0 = off*
Bemerkung: *non-programmable*

3. Electronic Camshaft

At the most 23 cams can be assigned, which can be distributed over 3 paths.

no.00 **Number of cams**
Defines the number of the cams.

Setting range: *0 . . . 31*
Factory setting: *31*
Notice: *non-programmable*

no.01 **Cam number**

Setting range: *0 . . . 31*
Factory setting: *0*
Notice: *non-programmable*

no.02 **Cams on High**

Setting range: *-32767 . . . 32767*
Factory setting: *0*
Notice: *non-programmable*

no.03 **Cams on Low**

Setting range: *0 . . . 65535*
Factory setting: *0*
Notice: *non-programmable*

no.04 **Cams off High**

Setting range: *-32767 . . . 32767*
Factory setting: *0*
Notice: *non-programmable*

no.05 **Cams off Low**

Setting range: *0 . . . 65535*
Factory setting: *0*
Notice: *non-programmable*

no.06 **Path**

Setting range: *0 . . . 7*
Factory setting: *0*
Notice: *non-programmable*

Input of the values:

The cams are equipped with continuous numbers.

no.01	Cam number:	0 . . . Number of cams
no.02+03	Cam on:	0 . . . maximal position
no.04+05	Cam off:	0 . . . maximal position
no.06	Path:	0 . . . 7

Now every cam can be entered by the input of the cam number.

The block must always be entered completely, since otherwise the values are not accepted.

The positions are standardized in such a manner that the complete revolutions are in the high part and partial revolutions in the low part (1° ≅ B6h).

The cam is on "1", when the position of the inverter is within the range preset through **no.02-03 cam on** and **no.04.+05 cam off**.

With **no.06** the cam can now be distributed over 3 paths:

Bit 0	path 1	starting condition 26
Bit 1	path 2	starting condition 27
Bit 2	path 3	starting condition 28

With the aid of the starting conditions **do.01-do.08 = 26-28** the paths can be given onto the outputs.

Reading of the values:
After the input the positions of the cams can be read out through the input of the cam number.

no.07 Cam-Mode

Setting range: *0 . . . 1*
Factory setting: *0*
Notice: *non-programmable*

Selects the position reference for all cams.
0: cam on absolute actual position (ru.35...37)
1: cam on CAM position (ru.61...63)

4. Position Display

Display of position related to the given cam disc.

ru.61 actual pos-CAM sign

ru.62 actual pos-CAM high

ru.63 actual pos-CAM low

Notice: read-only parameter

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