KUHNKE

Kuhnke Electronics
Instruction Manual

Posi Control KUAX 674
Cam Control Unit

E 375 GB 17 February 1995 / 57.533

This manual is primarily intended for the use of the designing engineer, the project planning engineer, and the developing engineer. It does not give any information about delivery possibilities. Data is only given to describe the product and must not be regarded as guaranteed properties in the legal sense. Any claims for damages against us – on whatever legal grounds – are excluded except in instances of deliberate intent or gross negligence on our part.
We reserve the rights for errors, omissions or modifications.

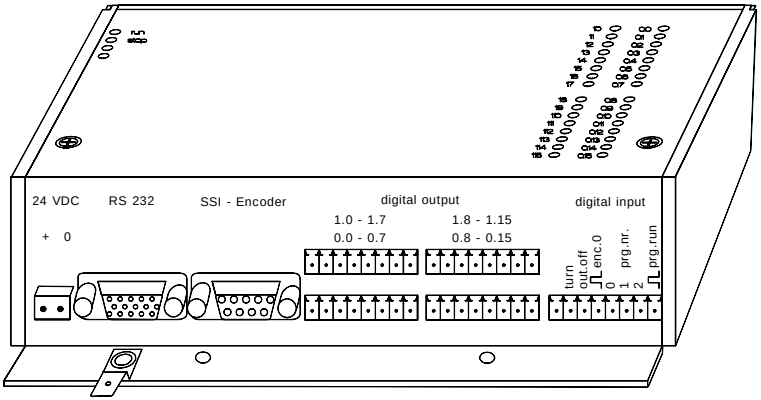
Contents

1. Introduction

Cam control units are used whenever you want to control processes independent from the machine position.

The Posi Control electronic cam control units from the KUAX family are not only intended to replace mechanical program controllers but also to enhance their precision, make them virtually universally applicable and more wear-resistent. You thus gain the possibility of flexible production and the advantage of extremely short setting-up times. Modern electronics make operation and programming very simple.

The KUAX 674 electronic cam control unit is a further development of the proven system KUAX 671.

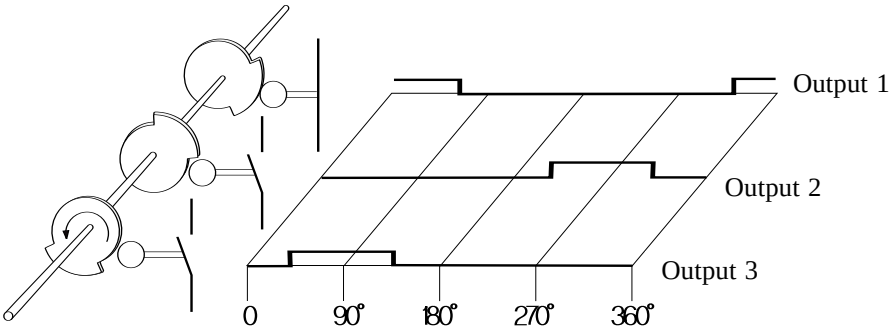


1.1. Principle of a cam control unit

To keep the understanding of operation and programming simple we have taken the basic principle of a mechanical cam control unit as an example in developing the electronic cam control unit.

From mechanical cam control units...

A mechanical cam control unit activates a push-button via the section of a wheel. This section is defined as a "cam". For construction reasons the number of wheels is extremely limited.



...to electronic cam control units

Applied to the electronic cam control unit this means: every output represents a wheel. The number of parallelly arranged wheels therefore corresponds to the number of outputs.

The programming of a cam thus directly corresponds to entering the switch-on and switch-off points of the section. The output is switched on between a switch-on and a switch-off point.

Position recognition

The machine position is detected by an absolute angle encoder. Angle encoders are available with resolutions of 180, 360 or 1,000 partitions per cycle (impulses/rotation).

Further advantages of electronics

- A great number of cams can be programmed with very precise switching points one after the other and allocated to the same output.
- Once programmed, each cam can be modified or deleted without any problems.
- If a cam is programmed that overlaps an already existing cam, both of them are combined into one cam.
- If a cam is programmed that is already contained in an existing cam, it is ignored.
- Once programmed, a cam can also be copied exactly to other cam control units.
- The physical dead times of actuators can be counter-balanced by the adjustable deadtime compensation.
- Timer cams allow time constant cams which depend only on the rising edge of the input impulse.
- The electronic encoder speed reduction (factors 2...8) distributes the resolution of the shaft encoder to 2...8 encoder cycles.

1.2. Programming

Various programming aids are brought into use as required. These allow the programs to be

- created, tested and optimized
- monitored in online operation
- copied to other locations within the same cam control unit
- copied from one cam control unit to another
- saved.

Operating terminal

The PG 674 is a small, handy device equipped with a keyboard and a two-line display.
To keep the application possibilities variable, it comes to you separated from the cam control unit. Using the programming interface, the Operating terminal can be connected to the cam control unit at any time, even while the machine is operating, so that checking or correcting the program can be done at the machine without any problems.
As a portable hand-held terminal you can easily carry and connect the Operating terminal to the control device. The integrated buffered memory also allows you to load programs from one control device to transfer it to another one – by literally carrying it over. As a built-in terminal, the device can be firmly attached to the door of the switching cabinet and turned into a stationary and thus always available device for operation and display.

Instruction Manual E 390 GB
Operating terminal PG 674

PC

Using a Personal Computer for programming is, of course, the much more convenient solution. The NOBES 674 cam programming software is a tool that you can use for entering programs easily as graphic information or text.
You can save the programs you created to floppy disk and print the program documentation out on any printer.

Instruction Manual E 384 GB
NOBES 674

2. Reliability, Security

2.1. Target group

This instruction manual contains all information necessary for the use of the described product (control device, software, etc.) according to instructions. It is written for the **personnel of the construction, project planning, service and commissioning departments**. For proper understanding and error-free application of technical descriptions, instructions for use and particularly of notes of danger and warning, **extensive knowledge of automation technology** is compulsory.

2.2. Reliability

Reliability of Kuhnke controllers is brought to the highest possible standards by extensive and cost-effective means in their design and manufacture.

Amongst which are:

- selecting high-quality components,
- quality arrangements with our sub-suppliers,
- measures for the prevention of static charge during the handling of MOS circuits,
- Worst-Case dimensioning of all circuits,
- inspections during various stages of fabrication,
- computer aided tests of all assembly groups and their coefficiency in the circuit,
- stress-test in raised ambient temperatures during 72 hours realtime,
- statistic assessment of the quality of fabrication and of all returned goods for immediate taking of adjustment measures.

Despite these measures, the occurrence of errors in electronic control units - even if most highly improbable - must be taken into consideration.

2.3. Notes

Please pay particular attention to the additional notes which we have marked by symbols in this instruction manual:

2.3.1. Danger

This symbol warns you of dangers which may cause death, (grievous) bodily harm or material damage if the described precautions are not taken.

2.3.2. Dangers caused by high contact voltage

This symbol warns you of dangers of death or (grievous) bodily harm which may be caused by high contact voltage if the described precautions are not taken.

2.3.3 Important information / cross reference

This symbol draws your attention to important additional information concerning the use of the described product. It may also indicate a cross reference to information to be found elsewhere.

2.4. Security

Our product normally becomes part of larger systems or installations. The following notes are intended to help integrating the product into its environment without dangers for man or material/equipment.

2.4.1. To be observed during project planning and installation

- 24V DC power supply:
  · provide sufficient separation of low voltage,
  · apply power packs in accordance with IEC 364-4-41 or CENELEC HD 384.4.41 (VDE 0100, Part 410) respectively.
- In case of power breakdowns or power fades: the program has to be structured in such a way as to create a defined state at restart that excludes dangerous states.
- Emergency switches or other emergency installations have to be realized in accordance with EN 60204/IEC 204 (VDE 0113). They have to be effective at any time.
- Safety and precautions regulations for qualified applications have to be observed.
- Please pay particular attention to the notes of warning (→ 2.3. Notes) which, at relevant places, will make you aware of possible sources of errors.
- The relevent standards and VDE regulations are to be observed in every case.
- Control elements have to be installed in such a way as to exclude unintended operation.
- Control cables have to be layed in such a way as to exclude interference (inductive or capacitive) which could influence the operation of the controller.

To achieve a high degree of conceptual safety in planning and installing an electronic controller it is essential to follow the instructions given in the manual exactly because wrong handling could lead to rendering measures against dangerous failures ineffective or to creating additional dangers.

2.4.2. To be observed during maintenance and servicing

- During measuring and checking operations on a controller in a power-up condition, precaution regulation VBG 4.0 has to be observed and §8 (Admissible deviations during working on parts) in particular.
- Repairs must only be executed by the trained Kuhnke personnel (usually in the main factory in Malente). Warranty expires in any other case.
- Spare parts:
  Only use parts approved of by Kuhnke. Only genuine Kuhnke modules must be used in modular controllers.
- Modules must only be connected to or disconnected from the controller with no voltage supplied. Otherwise they may be destroyed or (possibly not immediately recognizably!) detracted from their proper functioning.
- Always deposit batteries and accumulators as special waste.

2.4.3. Measures for the prevention of electrostatic charge

Electrostatic charge is dangerous for components and assembly groups. It is a peculiarity of electrostatics to not destroy the sensitive components but to damage them in a not immediately conceivable way. It is because of this that devices stop functioning after some time of service.
The ESD measures (ESD = electrostatic discharge) executed in the factory are only guaranteed to be effective if they are also regarded by the user (service).

Please note:

- Only store parts in their factory-packing or in an antistatic packing of similar quality.
- Assembly groups must only be touched by persons who are grounded via a wrist bracelet and/or a discharging mat and shoe-grounding strips (⚠ observe protection of people!).
- Only ship assembly groups in their factory-packing or in an antistatic packing of similar quality.

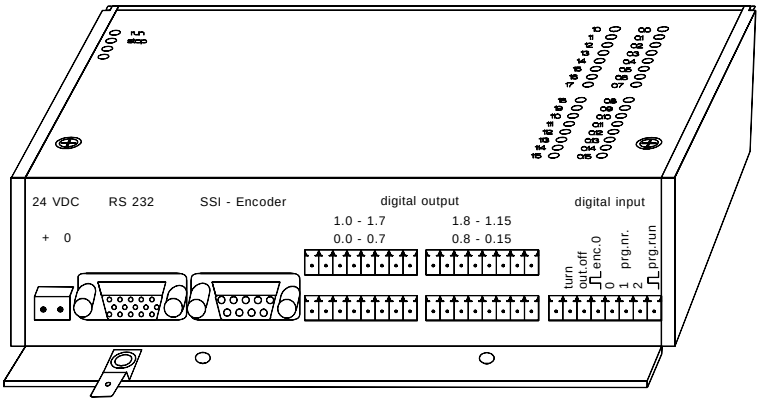
Reference to literature (Fa. 3M Deutschland GmbH, Neuss): Information brochure
Interesting Facts about Electrostatics in Micro-Electronics

3. Hardware

The KUAX 674 has been designed as a compact device. It can be supplied in 2 configuration levels:

- with 16 outputs Order no: 674.010.16
- with 32 outputs Order no: 674.010.32

Light emitting diodes (LEDs) in the lid indicate the current status of the control device and the outputs.
The front panel provides connectors for supply voltage, programming device, outputs, inputs and protective ground.

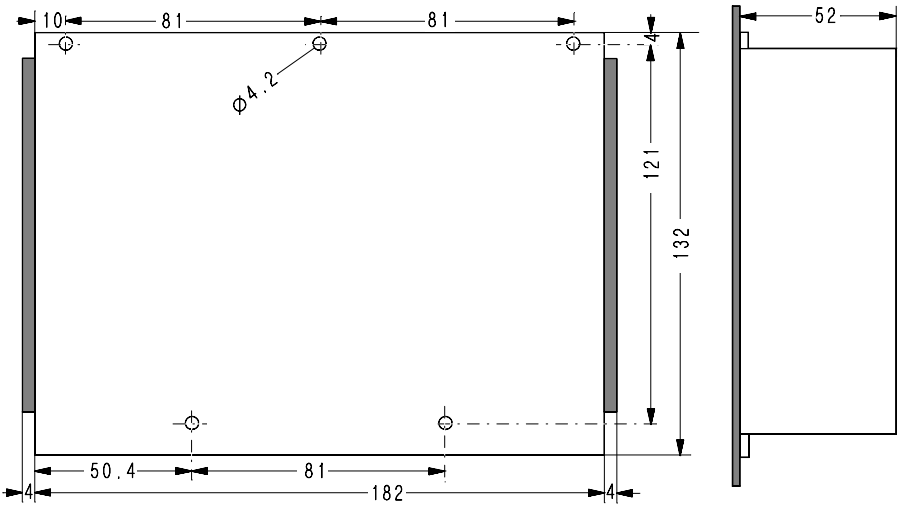


3.1. Technical Data

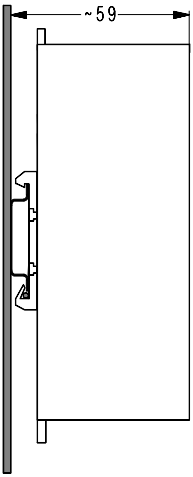
Ambient Conditions	
- operating temperature	0...55 °C
- rel. humidity	50...95 %
- storage temperature	-20...+75 °C
- contamination level	1
Power Supply	
primary (external)	24 V DC ± 20 %
- current consumption	max. 4 A (incl. supply encoder and operating terminal)
- residual ripple	< 5 %
- connection	screw-type locking connector
secondary (internal)	5 V DC
Program Memory	RAM, buffered with accumulator (option: Flash-EPROM)
- number of programs	max. 8 programs (0...7)
- number of cams	max. 128000, apportion at random
Interfaces	
programming interface	RS 232 (connection PG 674 or PC with NOBES)
shaft encoder connection	SSI interface
Inputs	7 digital inputs, 24 V DC
turn	rotation direction
out. off	outputs off
enc. 0	zeroize encoder
prg. no (0, 1, 2)	select external program
prg. run	startP program run
Outputs	16 or 32 digital outputs, 24 V DC, maximum load 80...350 mA (see chapter 3.3.5.)
device with 16 outputs	output 0.0...0.15
device with 32 outputs	output 0.0...1.15
Dynamic Functions	
- dead time compensation	up to 5000 ms
- timer cam	up to 5000 ms
- shaft encoder speed reduc.	factor 1 (normal) to 8
Shaft Encoder Speed max.	
normal operation	
- encoder 180 steps/rev.	1700 1/min
- encoder 360 steps/rev.	1500 1/min
- encoder 1000 steps/rev.	600 1/min
operation with encoder reduction	
- encoder 180 steps/rev.	1200 1/min
- encoder 360 steps/rev.	700 1/min
- encoder 1000 steps/rev.	250 1/min
operation with deadtime compensation or timer cam	
- encoder 180 steps/rev.	800 1/min
- encoder 360 steps/rev.	500 1/min
- encoder 1000 steps/rev.	180 1/min

3.2. Dimensions and Attachment of the Control Device

3.2.1. Attachment by screwing



3.2.2. Attachment to top hat rail



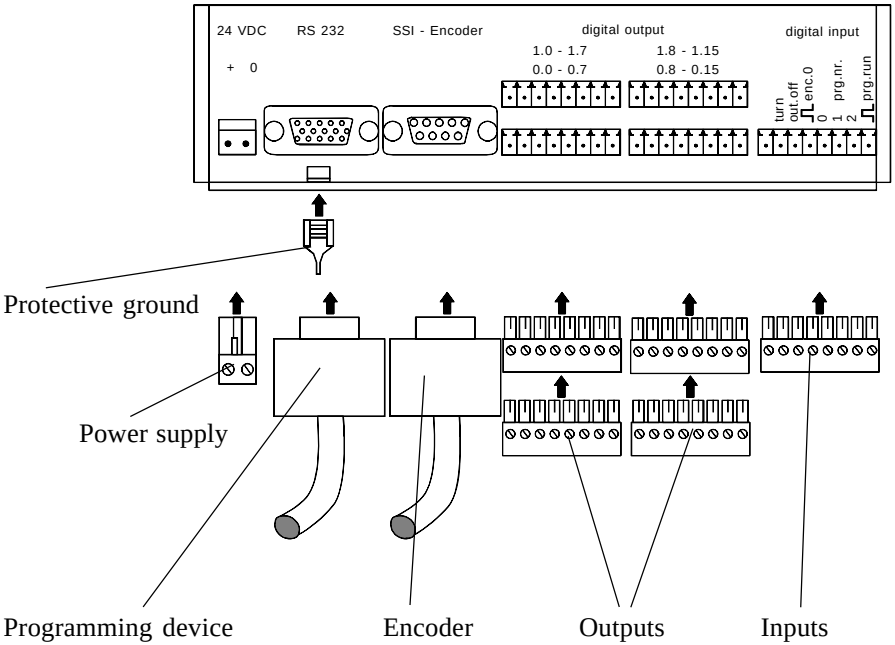
The basic device can be attached to a mounting rail in accordance with DIN EN 50022 (35 + 7.5 mm). To do so, screw two quick-fixing devices for mounting rails into the base plate:

- unscrew one of the side covers of the device,
- insert the nuts at the correct distance into the guiding grooves in the base plate,
- screw on the quick-fixing devices,
- screw the side cover back on again.

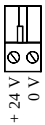
The device is now ready for assembly on a mounting rail.

Order no. for quick-fixing devices: 680.180.05

3.3. Connector locations on the control device



3.3.1. Connecting the power supply

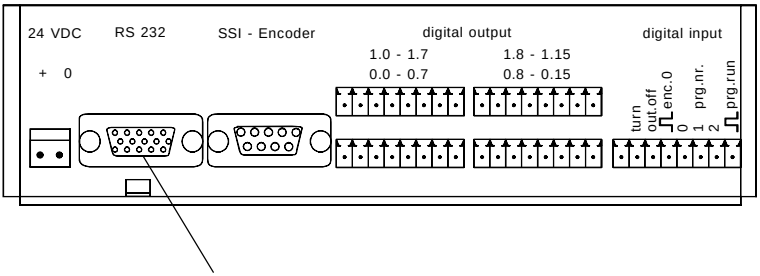


The supply voltage for the control device, the outputs, the encoder and the PG 674 hand-held terminal are applied to the connection "24V DC"

- Connector: 2pin screw-type locking connector
- Voltage: 24 V DC, residual ripple = 5%
- Total current consumption: 4 A

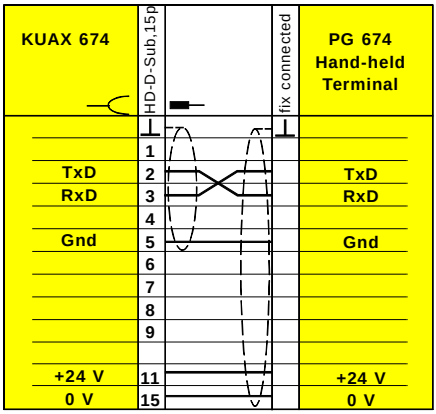
3.3.2. Connecting a programming device (RS 232)

The programming device is applied to the "RS 232" socket. This is a 15 pin female sub-D connector. Programming is either carried out through an Operating terminal PG 674 or a PC running the NOBES 674 programming software.



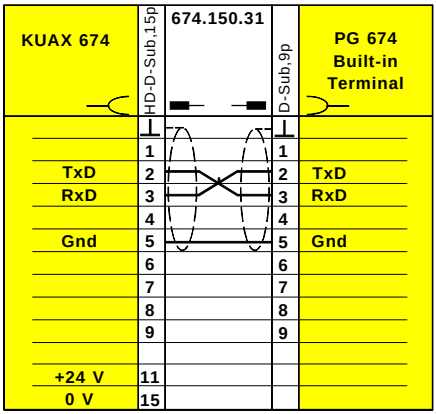
Connector for programming device

3.3.2.1. Connecting a PG 674 Hand-held Terminal (674.001.00)



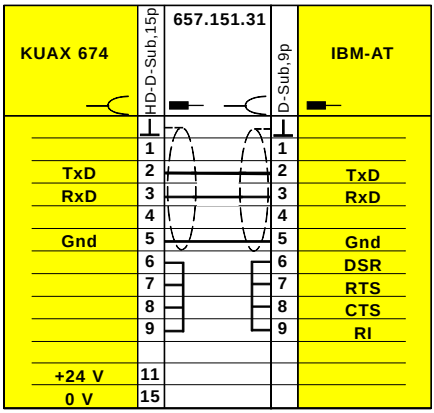
The cable is firmly attached to the PG 674. The 24 V DC voltage is supplied by the control device.

3.3.2.2. Connecting a PG 674 as a built-in terminal (674.010.00)



Order no. cable: 674.150.31
The power supply (24 V DC) is to be connected separately to the control terminal. The terminal is provided with a 2pin screw-type locking connector.

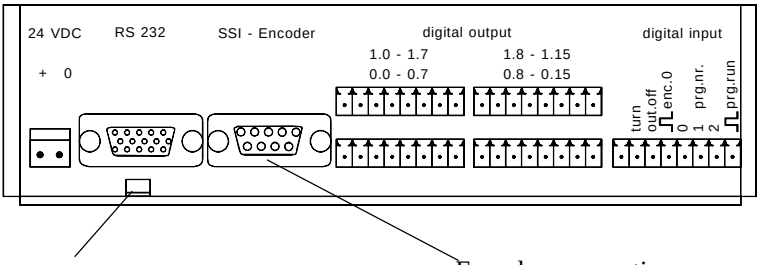
3.3.2.3. Connecting a PC running the NOBES 674 programming software



Order no. cable: 657.151.31

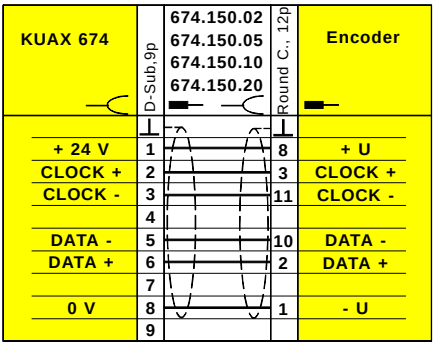
3.3.3. Connecting the Encoder (674.359.01/02)

The connection for the encoder is labeled "SSI-Encoder". This is a 9pin female Sub-D connector.



Encoder connection

Protective ground connection



The following connecting cables and cable lengths are available:

Cable length	Order no.
2.5 m	674.150.02
5 m	674.150.05
10 m	674.150.10
20 m	674.150.20

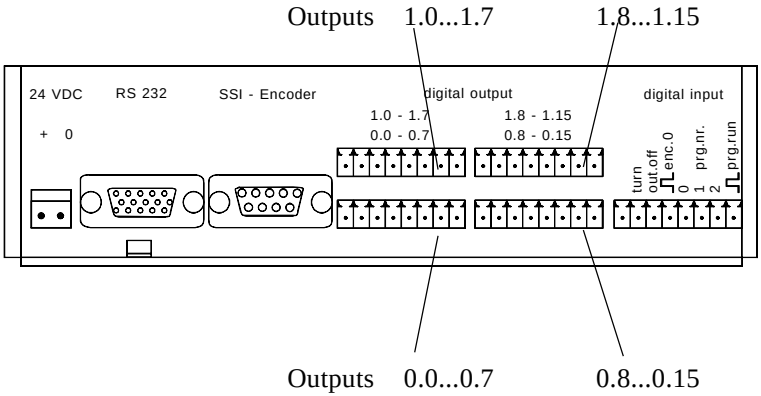
Switch the power supply of the control device off before connecting or disconnecting the encoder.

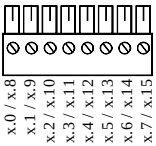
3.3.4. Connecting the device to protective ground

To establish an effective protection against electromagnetic interference, the housing of the device must be connected to ground using the faston connector provided.

3.3.5. Connecting the outputs

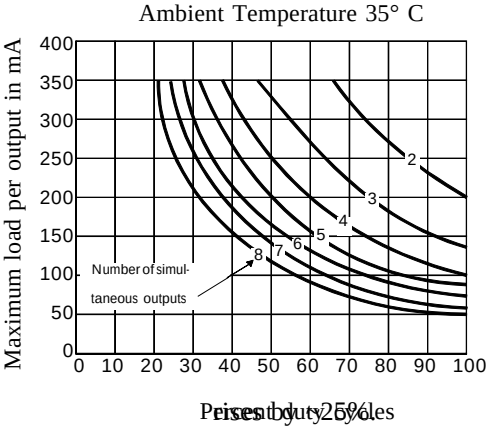
The connections for the outputs are labeled "digital output". They are connected to the control device in groups of 8 outputs via 8pin screw-type locking devices:





The appropriate number of screw-type locking devices is provided with the control device.

The outputs are supplied together with the control device via the connection "24 V DC". Each output group of 8 outputs (x.0...x.7 or x.8...x.15) is activated by a driver module.

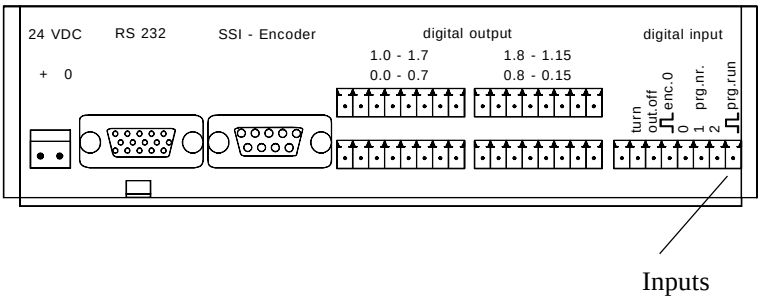


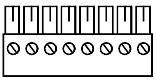
The diagram shows the maximum load of the individual outputs for differing loads on an output group for an ambient temperature of 35° C (outside the KUAX 674). If the temperature rises by 15 K, the maximum possible load drops by ~25%.
If the temperature drops by 15 K, the maximum possible load

A protective resistor of 33 Ohms / 0.5 W must be provided when using filament lamps.

3.3.6. Connecting the Inputs

The connections for the inputs are labeled "digital input". They are connected to the control device via an 8pin screw-type locking connector.





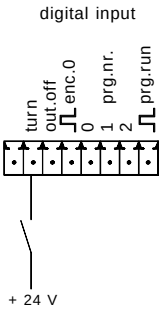
The screw-type locking connector is provided with the control device.

The inputs are connected to 24 V DC.

A potential compensation is necessary if inputs and control device are supplied from different power sources. To provide it, connect the "0V" and "-" connections with each other.

The functions that can be selected with the inputs can also be operated via the connected programming device.

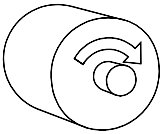
3.3.6.1. Counting direction of the shaft encoder



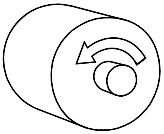
Use the "turn" input to determine how the control device interprets the rotation direction of the shaft encoder:

Input "turn"	*Function*
on	clockwise rotation counts up
off	counter-clockwise rotation counts up

Rotation direction looking at the encoder shaft:



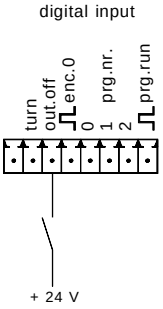
clockwise rotation



counter-clockwise rotation

The setting of the switch is only read when switching the device on. This ensures that the counting direction cannot be altered during operation.

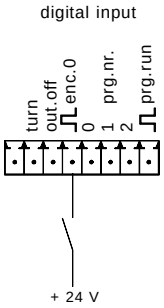
3.3.6.2. Switching off outputs



Use the "out.off" input to switch off the outputs. This command overrules the switching states of all outputs as defined by the program:

Input "out.off"	*Function*
on	outputs switched off
off	outputs released

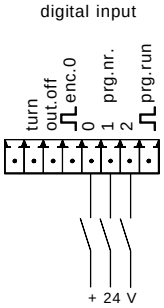
3.3.6.3. Setting the Encoder Zero Point



The current setting of the encoder is defined as zero point with a positive edge on input " ⎍ enc.0". This function allows adjustment of the control system without troublesome mechanical setting:

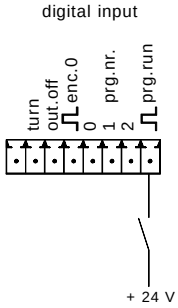
Input " ⎍ enc.0"	*Function*
rising edge	set encoder zero point

3.3.6.4. External Program Selection



Selecting the program:
The cam control unit can contain up to 8 programs. The program you want to work with is set either by software or by connecting inputs "prg.nr.0,1,2":

Input "prg.no			*Program no.*
0	*1*	*2"*	
off	off	off	0
on	off	off	1
off	on	off	2
on	on	off	3
off	off	on	4
on	off	on	5
off	on	on	6
on	on	on	7

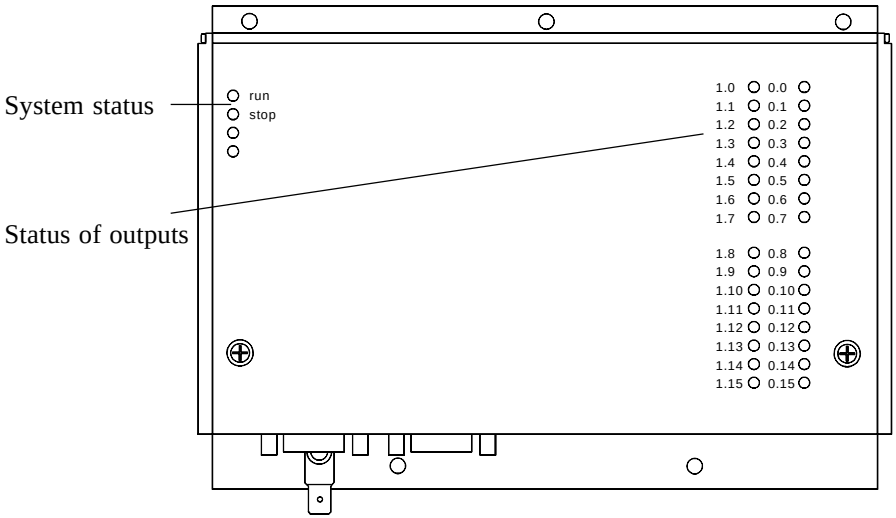


Starting the selected program:
The program selected via inputs prg.no 0,1,2 is switched on and started (only if the encoder shaft does not move!) with a positive edge at input " ⎍ prg.run":

Input " ⎍ prg.run"	*Function*
rising edge	start program

3.4. Status indicators (LEDs)

The control cam unit monitors itself. The current status is indicated by the LEDs "run" and "stop" in the top left-hand corner of the device. In the event of software errors or hardware failures, more detailed information can be documented using either a hand-held terminal or a PC with NOBES 674.
On the right side, the control device indicates the switch status of the individual outputs:



Error and failure messages

In the event of failures, the LED "stop" flashes in a rhythm that reflects the failure number:

No.	Flashing rhythm
1	
2	
3	
4	

etc.

The flashing impulses are close together (250/250 ms). Then there is a break of 1 s and then the counting impulses are repeated.

LEDs messages

LED run/green	LED stop/red	Priority *)	Significance	
Positive Messages:				
Steady Light	*Steady Light*			
on	off	-	Operation	KUAX 674 in op. (running)
off	on		Stop	KUAX 674 stopped (by Terminal 674 or NOBES)
Error Messages:				
Perm.Light	*FlashLight*			
off	4x	1	Encoder	Hardware-error on encoder or connection cable, or permissible speed exceeded by more than 50%.
	2x	2	Under-voltage	Supply voltage too low for more than 20 ms .
	6x	3	Checksum	Checksum error in selected program. Remedy: clear program and re-enter.
	3x	4	Watchdog	Program run disturbed. Remedy: restart device (switch on and off).
on	1x	5	Short Circuit	Short circuit on output. The device keeps running but the output concerned is switched off. Release of the output through restart or command sequence "outputs off-on".
	5x	6	Speed	Permissible speed exceeded by up to 50%. The device keeps running

*) If several messages occur at the same time, then the message with the lowest priority number is displayed.

3.5. Encoders - Absolute angle encoders

The electronic cam control units require an absolute angle encoder for recognizing the position of a drive (on a wheel). This encoder must work with a clipped Gray code.
This means that only the status of one data bit changes per impulse (1/180, 1/360, 1/1000 of the complete circle). Wrong interpretations, such as those which can occur when reading binary or BCD codes, are thus impossible.
As opposed to the incremental encoder, the absolute angle encoder has the advantage of being able to give the actual position of the drive at any time, even when there is a power cut.

3.5.1. Types of Shaft Encoders

Two types of shaft encoders are used. These differ in their resolution. The resolution is told the cam control unit during initialization.

The shaft encoders for the cam control units KUAX 671 and KUAX 673 cannot be used for the KUAX 674, as they have no SSI interface.

The necessary connecting cables have to be ordered separately (see "A.1. Order information").

3.5.1.1. Resolution 180 or 360 imp./revolution (674.359.01)

The shaft encoder devides the complete circle up into 360 sections. If the resolution 180 is selected during initializion of the cam control unit, a factor 2 speed reduction is made in the cam control unit. Advantage. a higher speed is possible (see Technical Data).

3.5.1.2. Resolution 1000 imp./revolution (674.359.02)

The encoder divides the complete circle up into 1,000 sections.

3.5.2. Technical data of the shaft encoders

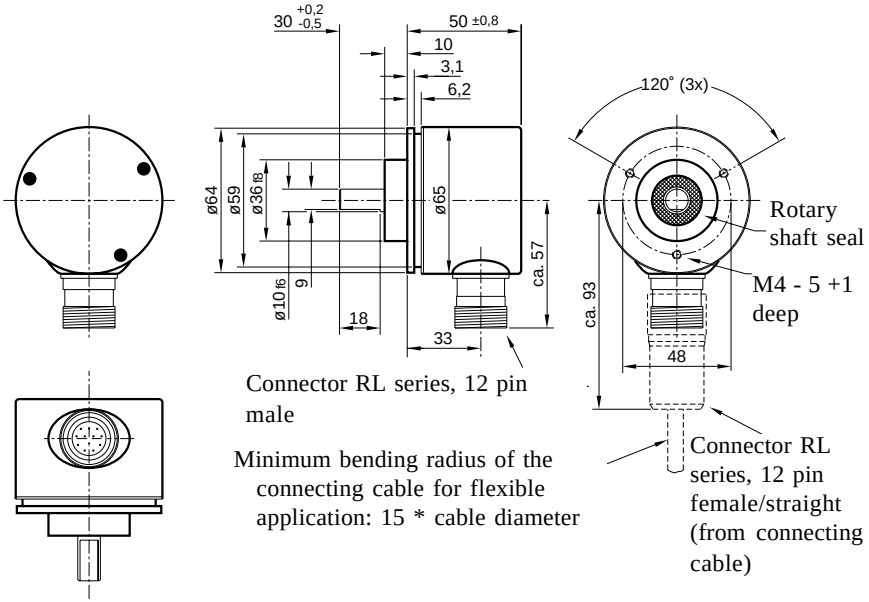
Electrical Data

Sensor system:	GaA1As diode - photo array, precision comparators, photo transistors
Resolution:	360 or 1000 steps / 360°
Measuring range:	1 revolution (monotour)
Output code:	Gray excess
Output SSI:	differential data output in acc. with RS 485/422
Clock input SSI:	differential clock input (optocoupler) for data driver in acc. with RS485/422
Clock frequency SSI:	max. 1 MHz
Monoflop time:	10 ... 30 µs
Code progression:	CW fixed adjusted, incrementing code during clockwise rotation of the shaft (looking at shaft)
Operating voltage range:	+ 19 V ... + 29 V DC
Operating current:	50 mA typ./ 70 mA max.
Electrical connection:	12pin round-connector on housing; plug orientation N

Mechanical Data

Measuring step deviation:	≤ ± 10' 48" (resolution 1,000). ≤ ± 30' 00" (resolution 0360)
Division code:	Gray excess
Operating speed:	3,000 min^{-1} max. (permanent) 4,000 min^{-1} max. (short time)
Operating torque:	≤ 8 Ncm (at 1,000 min^{-1})
Starting torque:	≤ 4 Ncm
Angle acceleration:	10^5 rad/s^2 max.
Moment of inertia of rotor:	30gcm²
Permissible shaft load:	100 N axial and radial
Durability of bearing:	10^9 rotations
Operating temperature range:	- 20° C to + 60° C
Storage temperature range:	- 25° C to + 70° C
Permissible relative humidity:	85 % without condensation
Resistence	
-to shock:	200 m/s^2; 11 ms (DIN IEC 68)
-to vibration:	5 Hz...1,000 Hz; 100 m/s^2 (DIN IEC 68)
System of protection (DIN 40 050):	IP 66 (only when plugs are connected)
Weight:	approx. 0.35 kg

3.5.3. Dimensions



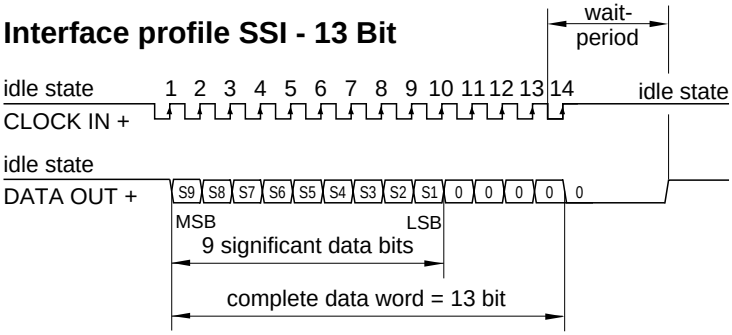
3.5.4. Pin assignment of the Shaft Encoder

Connector: Round connector 12pin/S

Contact no.:	Assignment
1	$-U_B = 0$ V
2	DATA OUT + [1)] Differential data driver as specified in standard RS 485/422
3	CLOCK IN + [1)] Differential clock input (optocoupler) for data driver as specified in standard RS 485/422
4...7	not connected
8	$+ U_B$ = 19...29 Volt Io < 70 mA (typ. Io = 50 mA)
9	not connected
10	DATA OUT - [1)] Differential data driver as specified in standard RS 485/422
11	CLOCK IN - [1)] Differential clock input (optocoupler) for data driver as specified in standard RS 485/422
12	not connected

[1)] Use twisted pair cables for clock and data lines. The code direction is fixed to CW setting.

3.5.5. Interface profile SSI



4. Description of functions

The basic principle of a cam control unit has already been described in chapter "1.1 Principle of a cam control unit".

Chapter 4 deals with the functions of the electronic cam control unit KUAX 674.

4.1. Device Configuration

The KUAX 674 is designed as a compact device (see "3. Hardware"). It can be supplied in 2 configurations with either 16 or 32 outputs.

Minimal configuration:

- Basic device KUAX 674
- Encoder (see Chap. 3.4.)
- Operating terminal PG 674
- or PC with NOBES 674

4.2. Principle of operation

- The encoder continuously indicates the absolute position of the driving axle in 180ths, 360ths or 1,000ths of a complete circle.
- Via the SSI interface, the data from the encoder are passed on to the cam control unit.
- The CPU switches outputs on and off depending on both the commands in the user program running in the cam control unit and the encoder position.

4.3. Initialization

The cam control unit must be initialized before programming. This is done with the Operating terminal or with a PC running the NOBES 674 cam user software.

The following are set:
- number of outputs (16 or 32)
- encoder resolution in steps/revolution
- encoder zero point (define current position as zero point)
- dynamic mode of operation (active or inactive)

4.4. Dynamic Operation

Dead time compensation, timer cam and shaft encoder reduction belong to the dynamic operation. As soon as one of these functions is switched on, the CPU needs more time for calculating the switching points. This reduces the permissible speed of the shaft encoder:

Encoder-resolution [steps/rev.]	Maximum speed [1/min]		
	Normal operation	Operation with encoder- reduction	Operation with deadtime compensation or timer cam
180	1700	1200	800
360	1500	700	500
1000	600	250	180

The indicated values are minimal values, i.e. the worst case. Only in exceptional cases will all special functions be used simultaneously or to their maximum. The permissible speed thus lies between the maximum values indicated here.

Dynamic operation can be assumed to be error-free with speeds of up to approx. 150% of the maximum speed. Once the speed is exceeded, however, the resolution is halved.

If the maximum speed is exceeded by up to 50%., the "stop" LED flashes (5x, rhythmically, see also "3.4. Status indicators"). The control device, however, keeps working. If the speed increases any further, the program is stopped. The stop LED then flashes 4x and the "run" LED goes out.

4.4.1. Dead time compensation (dynamic operation)

Problem

When altering the encoder speed, the physical dead times of mechanical actuators (relays, magnetic valves, rotary magnets etc.) may occur as interference.
By dead time we mean the time that the actuator needs to switch from one state to another. For a relay, for example, this is the time between activation of the coil and the target position of the contact (open/closed).

Solution

To compensate this disturbance it is necessary to move the switch-on and switch-off points of the cam forward. The cam control unit takes this speed-independent time constant into consideration for every encoder speed by switching the outputs to be activated on and off earlier by the set dead time.
The KUAX 674 reserves 16 outputs (0.0-0.15) for the dead time compensation. These can be provided with a dead time independent of one another in the millisecond range of up to max. 5,000 ms.

Programming

The dead times are entered with the Operating terminal PG 674 or via a PC running the NOBES 674 cam user software.

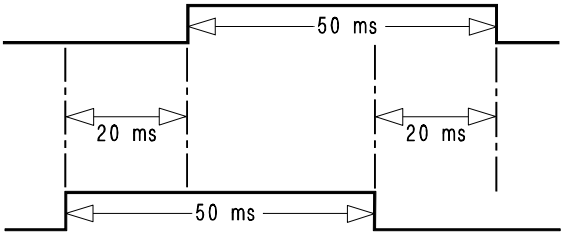
- The dead time compensation is also effective in connection with timer cams and/or encoder speed reduction.
- It only works in positive counting direction, i.e. when counting upwards.
- Use the "turn" input of the cam control unit to toggle between the up and down counting directions (see "3.3.6.1. Counting direction of the shaft encoder").

Example: Dead time compensation of 20 ms

For every encoder speed, an output switches before the programmed switch-on/switch-off values by the set 20 ms . In this example, the cam is moved forward as the speed increases.

Programmed original cam

Moved switching points



4.4.2. Timer cam (dynamic operation)

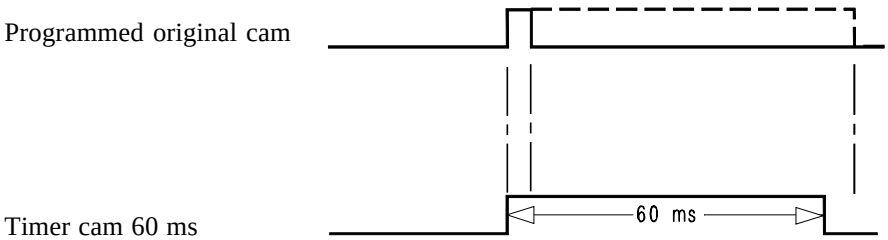
A timer cam is a cam with a programmable time constant. It is speed-independant and is switched on by the rising edge of the impulse. The switched-on-time is determined by the time programmed. The time range is between 1 and 5,000 ms. The falling edge is of no significance for the on-time of the cam.

- The timer cam is also effective in connection with dead time compensation and/or encoder speed reduction.
- The parameters are entered with the hand held terminal PG 674 or via a PC running the NOBES 674 cam user software.

Programming

Entered with the hand held terminal PG 674 or via a PC running NOBES 674.

Example: Timer Cam with 60 ms



4.4.3. Encoder speed reduction / Electronic gear

The encoder speed reduction function allows the stretching out of the usual number of steps of one encoder rotation (360°) over up to 8 rotations. This produces an electronic gearbox with the following possible reductions:

1:1, 2:1, 3:1, 4:1, 5:1, 6:1, 7:1, 8:1

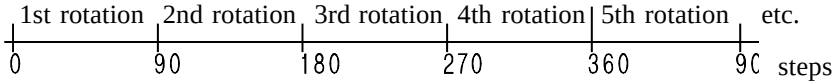
Use the programming device to select the outputs that you want to switch with reduction. In any one program, all selected outputs work with the same reduction.

Programming

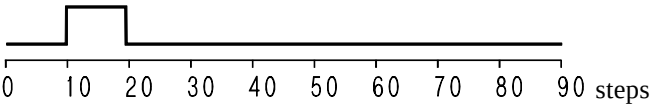
Entered with the hand held terminal PG 674 or via a PC running NOBES 674.

Example: 360-encoder, output 0.00, reduction 4:1

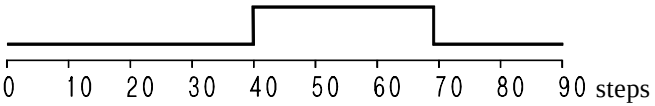
The reduction represents itself basically as follows:



Programmed cam: switch-on point 10, switch-off point 19



Actual switch points: switch-on point 40, switch-off point 79



starting with the first and then at every following fourth rotation.

A. Order information

Cam control units			
	KUAX 674 with 16 outputs		674.010.16
	KUAX 674 with 32 outputs		674.010.32
Shaft Encoders			
	Resolution 360 steps/rotation (also applicable for 180 steps/rotation)		674.359.01
	Resolution 1,000 steps/rotation		674.359.02
Operating Terminal			
	Hand held terminal PG 674	German	674.001.00
		English	674.001.10
	Built-in terminal PG 674	German	674.010.00
		English	674.002.10
Connecting Cable			
	KUAX 674 - Shaft Encoder	2.5 m	674.150.02
		5 m	674.150.05
		10 m	674.150.10
		20 m	674.150.20
	KUAX 674 - Built-in Terminal		674.150.31
	KUAX 674 - PC (NOBES)		657.151.31
Programming Software for PC			
	NOBES 674	German	674.502.00
		English	on request
Assembly Material			
	Quick-fixing devices for mounting rail assembly (2 pcs)		680.180.05

Index

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