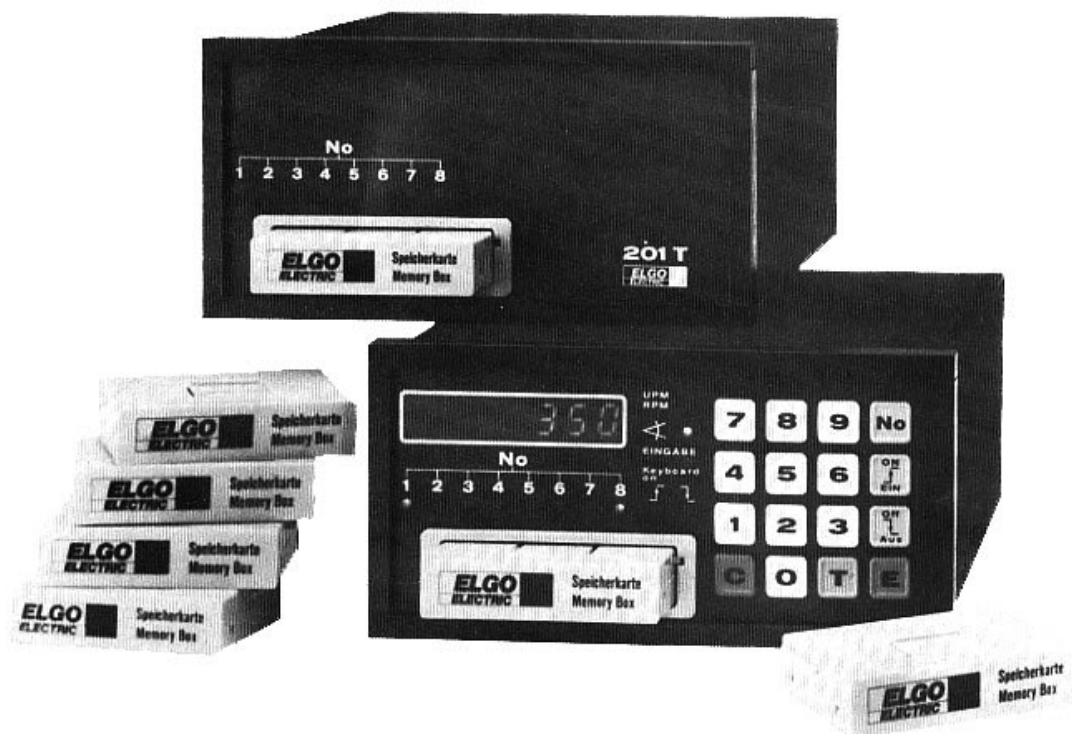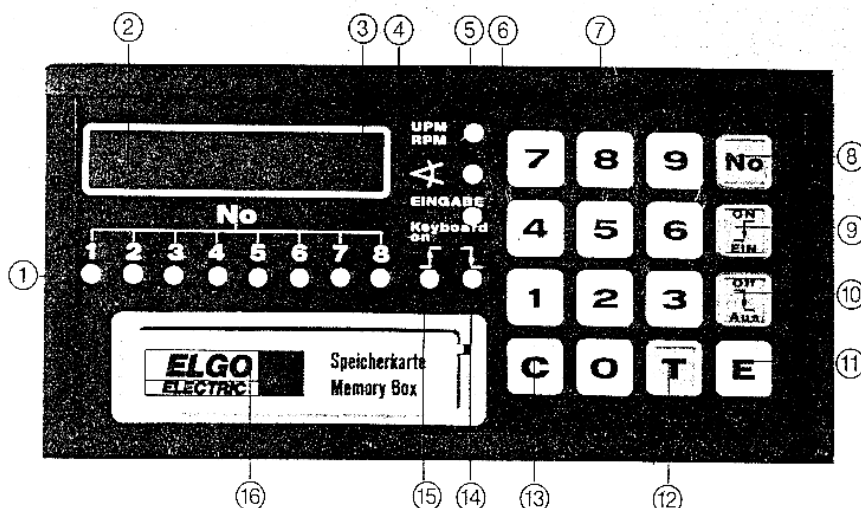# M201 series

Fully Electronic Cam Switch

Functional Description

①   8 LEDs which indicate on/off state of individual output channels, during operation.
Second function is to indicate channel being programmed.

②   Text indication during programming and checking.
On; Off; Clr;

③   Indication of an angle during programming.
Indication of angle or speed during operation.

④   Programme mode selected

⑤ & ⑥   Indication during operation as selected, to display speed or angle.

⑦   Numerical keypad to enter required channel or angle during programming.

⑧   'No' button selects programming by means of keypad.

⑨   'ON' button enters selected angle into memory.

⑩   'OFF' button enters selected angle into memory.

⑪   'E' ends programming for each channel.
Second function is to test stored programmes.

⑫   'T' button selects programming in Teach mode.

⑬   'C' cancels incorrect data being entered.
Second function is to select Memory Erase mode.

⑭ & ⑮   Indicate whether on or off angle is being programmed.

⑯   Plug-in programme memory card.

Programming

When the external switch is closed, the unit is initiated into programme mode. The 8 channel LEDs flash and the "keyboard on" LED illuminates.
NB The outputs are inhibited in programme mode. It is not possible to re-programme during operation.

Keyboard Entry Mode

Press : No

Press : Desired channel number
1 --- 8

All channel LEDs stop flashing and the desired channel number LED is permanently illuminated.

As a prompt to the user, the word "ON" is indicated in the display.

Key in the desired switch on angle, e.g. 1 0 0

Press : ON

The word "OFF" is now displayed.

Key in the desired switch off angle e.g. 1 5 0

If these are the only on/off switch points that are required in this channel, press : E

If you require further on/off points, press OFF

You can now programme further on/off points, e.g. 200-250, 300-350. Ensure that at the last off point the button E and not OFF is used.

If you forget and press OFF, operate the external programme switch off and on again. The required programme will be stored and you will return to the flashing LED stage, ready for next channel programming.

When E is pressed, the LEDs flash again and the next channel can be selected and programmed in the same manner, starting with NO.

Should an incorrect value be entered into display, it can be cleared by button C, before it is stored.

The angles are stored when buttons ON, OFF or E are pressed.

If one programmes a single channel with the same off and on angle, this value will be ignored.

A programme spanning 0° can be entered without any special consideration. Should an angle in excess of that set on Jumper 2 be entered e.g. 800, the unit will ignore this value on pressing ON or OFF, indicate " ---- " in the display for a second and reset display to zero and await a valid number entry.

General Description

The purpose of the Electronic Angular Cam Switch is to replace mechanical cams and switches (or proximity devices) on machines operating in a cyclic mode.

Machines such as Forming Presses or Packaging machines rotate a main shaft and require certain functions to operate at various angles during each cycle. Traditionally this has been achieved using mechanical cams to operate switches on and off, perhaps several times during one revolution. Very often it is necessary to change the on and off angles for different products being manufactured. The process of adjusting mechanical cams is laborious, especially as these are often in inaccessible positions on the machines.

The Electronic Cam Switch eliminates all these problems. It provides fast changeover and greater accuracy.

An absolute encoder is fitted to the main shaft and provides a resolution of 1°. An absolute encoder is chosen so that angular information is not lost if machine is rotated with mains power removed.

The encoder is fed to an electronic detector. The detector has 8 channels ("cams") which can be programmed individually to a resolution of 1° i.e. 180 on/off points can be detected.

The on/off points can be programmed either by means of the keypad or by Teach mode.

The programme is stored on a battery backed RAM which is housed on a plug-in card. Each card has a 16 way selector switch, enabling 16 different programmes to be stored on one card. An infinite number of programmes can be stored for future re-use, by use of additional cards. It is then a simple job to change the machine from product to product, saving valuable machine time.

The system can be extended from 8 to 32 channels (in blocks of 8) by connection of Slave units to the Master.

A special Slave unit is also available to operate on its own. This can be used for two purposes. Firstly, some machines have a fixed programme, after initial commissioning. It is therefore unnecessary to use the more sophisticated and costly unit with a keypad. Secondly, in one factory there may be several machines that operate on the same principle and require only one programmer. A special desk-top programmer is available for this purpose and enables programmes to be made in the planning office and issued to the shop floor with a job card.

The outputs of all units comprise an open collector (open emitter an option) transistor for each channel. These can be taken to drive relays or PLC's.

The saving in down time during product changes, the better accuracy and the saving in scrap during setting up ensures that the Electronic Cam Switch will pay for itself within a very short time.
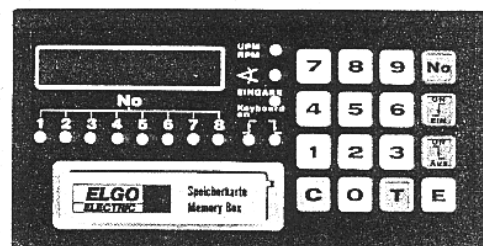
Master Unit 201M

This is a self contained unit, having facilities for both programming and operation. It incorporates:
 Display for angles and speed.
 8 LED's showing on/off state of each output.
 Keypad for programming and interrogating programme.
 8 outputs of NPN (or PNP) open collector transistors.
 Plug-in programme memory card.

An external on/off switch is required to select either programme or operation mode.

An external power supply is required to feed the unit and encoder.

Slave Unit 201T

Up to 3 of these units can be connected to a Master 201M, to extend the number of channels in blocks of 8, up to a maximum of 32. These operate from the same power supply and encoder incorporating:

 8 LEDs showing on/off state of each output.
 8 outputs NPN (or PNP) open collector transistors.
 Plug-in programme memory card.

It is necessary to programme each card individually, by inserting it into the Master Unit. After programming, it can be transferred to the appropriate Slave.

Slave Unit 101M

This basically operates in the same way as the 201T Slave Unit. However, in addition it incorporates a display such that angles or speed can be monitored during operation.

The memory cards can be programmed in the Desk Top Programmer 101P or any Master 201M unit and then transferred.

Desk Top Programmer 101P

The memory cards can be programmed in the office using this desk top unit. This has identical facilities to the Master 201M.

The construction is such that a larger keypad is incorporated and it is a free standing unit with built-in power supply. It does not however have any output transistors, connection for encoders or Teach mode.
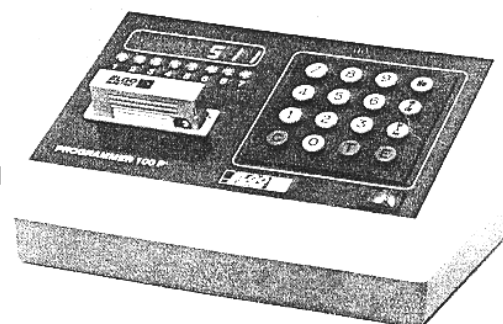
Teach Mode Programming

Instead of using the keypad to enter on and off angles for each channel, the machine is cranked to the desired positions and the appropriate angles stored.

Press : T

Press : Desired channel number 1 --- 8

All channel LEDs stop flashing and the desired channel number LED is permanently illuminated.

The actual encoder angular position is displayed.

As a prompt to the user, the word "On" is indicated in the display.

Crank the machine to the desired position for the "on" angle.

Press : ON . The desired "on angle" as displayed is stored.

Crank the machine to the desired position for the "off" angle.

Press : E if this is the only or last "off" you require in that channel.

or

Press : OFF if more on/off points are to be programmed into that channel.
On pressing E the LEDs start to flash again and the next channel can be programmed by following steps starting with T .

Erasing a Programme

Press : C

The display text shows "CLr" and awaits the selection of channel number. Only one channel can be erased at a time.

Press : 1 --- 8 for the channel to be erased.

Checking the Programme

Press : E

Press : 1 --- 8 for the desired channel

Should there be no programme in a selected channel, the display will indicate " ---- ".

The programmed switch points will be displayed with text and angle in sequence each time button E is pressed.

e.g. "on 100" --- "off 150" ---
"on 200" --- "off 250"
"on 300" --- "off 350"

Should there be no further switch points in this channel, the display will indicate " --- " and reset for next channel entry, ie LEDs flash. The next channel can be checked by starting with E

The Unit starts at 0 and progresses to 360 or 512.

Should a switch angle span zero, e.g. "on 300", "off 70" on a 360° encoder, the text will read out "on 0" -- "off 70" and "on 300" -- "off 0". With both off and on being at zero, this switch point is ignored during operation.

Operation Mode

The programming switch is turned to off. The unit will now operate according to the programme.

As the angle passes the switch points, the channel LEDs illuminate for the angles over which the outputs are on.

By selection, the display can be made to indicate the actual angular position or speed of rotation.

A programme produced in the Master unit can be plugged into a Slave. The channels 1-8 now become 9-16, etc, for the purposes of the machine operation. Since several programmes can be stored on one card, this enables flexibility of operation for common repetitive programmes.

Operation with Stand Alone Slave

A programme card prepared on the 101P (or 201M) can be plugged into the 101M Slave.

In addition to the 8 outputs it also has a display which indicates angle or speed according to selection.

Programming by means of Desk Top Unit 101P

In principle this operates in the same way as the 201M. However, Teach mode and Operation mode are of course not available, as no encoder is connected.

An additional feature therefore of this unit is a special test programme, which can be used to check out the memory card. The programme is selected by means of a switch. All tests are carried out only on one of the 16 programmes at a time, as selected by the rotary switch.

Memory Erasure

Press : C

All channels of the selected programme will be fully erased. If correct erasure takes place, "CLr io" is displayed.

Load Memory with Special Test Programme

Press : T

A Special combination of addresses is programmed, which tests the input/output, the RAM and lithium battery.
If correct, "Adr io" is displayed.

Check Storage Capability

Press : E

The previously loaded test programme is read and verified. If correct, "InF io" is displayed. Should there be any fault, a message is displayed e.g. "Err 100", meaning reading fault on address 100.

Technical Information

General Data

Power supply voltage	: 12v dc ± 5%
Power consumption	: 201M — 250 mA
	201T — 150 mA
	101M — 250 mA
	Encoder — 500 mA
Outputs	: Open collector NPN transistor UCN2803A Max 300 mA/channel 40v dc max (peak). PNP available on request. UDN2981A.
Maximum speed	: 400 rpm (1000 rpm on request)
Display	: 10mm bright red LED
Internal temperature rise	: 25°C
Ambient temperature	: −10°C to +50°C
Dimensions	: H:72 × B:144 × D:210 including connectors
Cut out	: H:67 × B:139
Mounting attitude	: Any
Mass	: 0.6 Kg
Connection	: By means of rear mounted 'D' type connectors
Memory	: up to 12 months
External power supply	: 220v ± 10% input (110v on request) 12v 2A output

Internal Selection

Jumpers are fitted inside the unit to provide alternative functions.

J1: Selects English or German text
Open: English
Closed: German

J2: Selects encoder with 360 or 512 pulses per resolution.
Open: 360
Closed: 512

J3: Selects indication during operation, either speed or angle.
Open: Angle
Closed: Speed
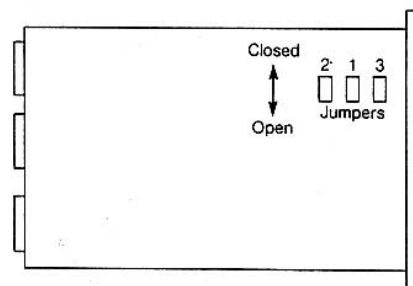
External Selection (opto coupled)

SW1: Switch to select either programme or operational mode
Open: Operation
Closed: Programme

SW2: Optional switch for external selection of indication during operation, either speed or angle. The selected mode is indicated in the front display, on LEDs.
(Internal jumper J3 must be open.)
Open: Angle
Closed: Speed

Ordering Code

Master unit	: 201M .....
Slave unit	: 201T .....
Stand alone Slave unit	: 101M
Desk Top Programmer	: 101P

Options:

PNP output	: ..... PNP

Additional equipment:

Programme card	: ...../32M
Connection cable with plugs (approx 300 mm)	: ...../ST1/BU2
External power supply	: ...../NG50 (specify 220 or 110v ac input)

Hints for Users

Use screened cable for encoder and interconnections between Master and Slave units.

Keep away from ac and high voltage equipment.

Keep within ambient temperature limits.

Suppress all external coils.

Encoder and Power Supply Pin Connections

201M

PIN	BU2	ST1
1	2^0 ⌉	2^7 ⌉
2	2^1	2^6
3	2^2	2^5
4	2^3 ⌐in	2^4
5	2^4	2^3 ⌐out
6	2^5	2^2
7	2^6	2^1
8	2^7 ⌋	2^0
9	—	2^8
10	Ov out	2^9
11	Ov out	+12 v in
12	2^9	+12 v in
13	+12 v out	Ov in
14	+12 v out	Ov in
15	2^8 in	switch SW1 in

201T

PIN	BU2	ST1
1	2^0 ⌉	2^7 ⌉
2	2^1	2^6
3	2^2	2^5
4	2^3 ⌐in	2^4
5	2^4	2^3 ⌐out
6	2^5	2^2
7	2^6	2^1
8	2^7 ⌋	2^0
9	switch SW1 out	2^8
10	Ov out	2^9
11	Ov out	+12 v in
12	+12 v out	+12 v in
13	+12 v out	Ov in
14	2^9 ⌉	Ov in
15	2^8 ⌋ in	switch SW1 in

Output Pin Connections BU1

External power supply required

PINS		NPN (standard)	PNP (optional)
1	14	Angle/RPM. Sw2	Angle/RPM. Sw2
	15 ⌉	Zero of ext. PSU	Position of ext. PSU
	16 ⌋		
4 ⌉		Positive of ext. PSU	Zero of ext. PSU
5 ⌋			
6	18	Output Ch. 1	Output Ch. 1
7	19	Output Ch. 2	Output Ch. 2
8	20	Output Ch. 3	Output Ch. 3
9	21	Output Ch. 4	Output Ch. 4
10	22	Output Ch. 5	Output Ch. 5
11	23	Output Ch. 6	Output Ch. 6
12	24	Output Ch. 7	Output Ch. 7
13	25	Output Ch. 8	Output Ch. 8

Internally
linked pins

Connections

Master unit alone

Master unit with Slave

SW1
Open – in operation
Closed – programme mode
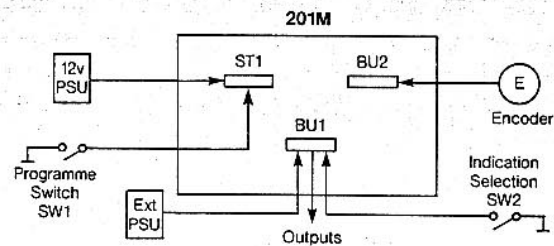
SW2
open – speed
closed – angle
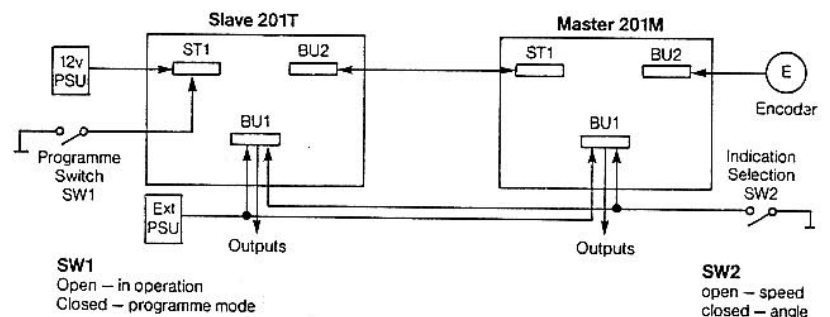
Output Circuit (Standard)

Example of Channel 1

Fig. 1
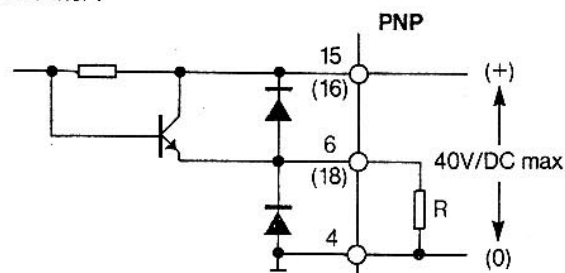

NPN

40V/DC max
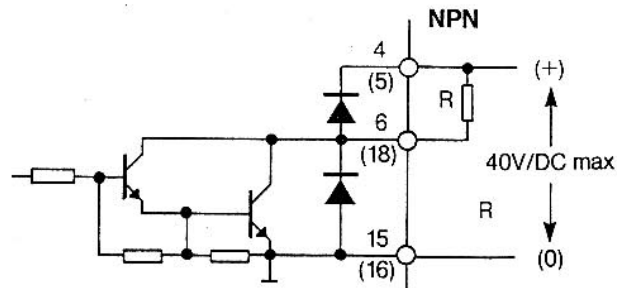
Output circuit (Optional)

Example of Channel 1

Fig. 2

PNP

40V/DC max

6

Liability exclusion

We have checked the contents of this instruction manual carefully, to the best of our knowledge and belief for conformity with the described hardware and software. Nevertheless errors, mistakes or deviations can not be excluded, therefore we do not guarantee complete conformity. Necessary corrections will be included in the subsequent editions. We appreciate your ideas and improvement suggestions very much.

Reprint, duplication and translation, even in extracts, are only allowed with a written authorization by the company ELGO Electric GmbH. We constantly strive for improving our products, therefore we keep all rights reserved for any technical modifications without any notice. ELGO Electric does not assume any liability for possible errors or mistakes.

ELGO - Electric - GmbH
Measure - Control - Position
Carl - Benz - Straße 1, D-78239 Rielasingen
phone.: 0049-7731/93 39 - 0, Fax: 2 88 03
Internet: www.elgo.de, Mail: info@elgo.de

For further details visit

www.elgo.de