Deutschmann Automation

Cam Controls | Fieldbus Gateways | Industrial Ethernet Products

Instruction manual

LOCON 32, LOCON 32-4X
TERM 32

Deutschmann Automation GmbH & Co. KG
Carl-Zeiss-Str. 8 D-65520 Bad Camberg ☎ +49-(0)6434 / 9433-0 +49-(0)6434 / 9433-40
eMail: mail@deutschmann.de Internet: http://www.deutschmann.de

Foreword

This operating manual provides users and OEM customers with all the information necessary for the installation and operation of the product described in this manual.

All details contained in this manual have been checked carefully, however, they do not represent an assurance of product characteristics. No liability can be accepted for errors. DEUTSCHMANN AUTOMATION reserves the right to carry out alterations to the described products in order to improve the reliability, function or design thereof. DEUTSCHMANN AUTOMATION only accepts liability to the extent as described in the terms and conditions of sale and delivery.

Bad Camberg, June 2009

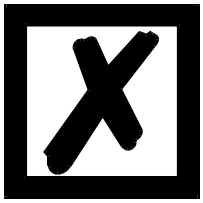
Version 10.4 dated 2.6.09, Art.-No. V3130E

1 Introduction

1.1 On this manual

This manual documents installation, functions and operation of the Deutschmann unit specified on the cover sheet and in the header.

1.1.1 Symbols



Particularly **important text sections** can be seen from the adjacent pictogram.

You should **always** follow this information since, otherwise, this could result in malfunctions or operating errors.

1.1.2 Concepts

The expressions ‘LOCON’ and ’TERM’ are frequently used throughout this manual with no further model specifications. In such cases, the information applies to the entire model series.

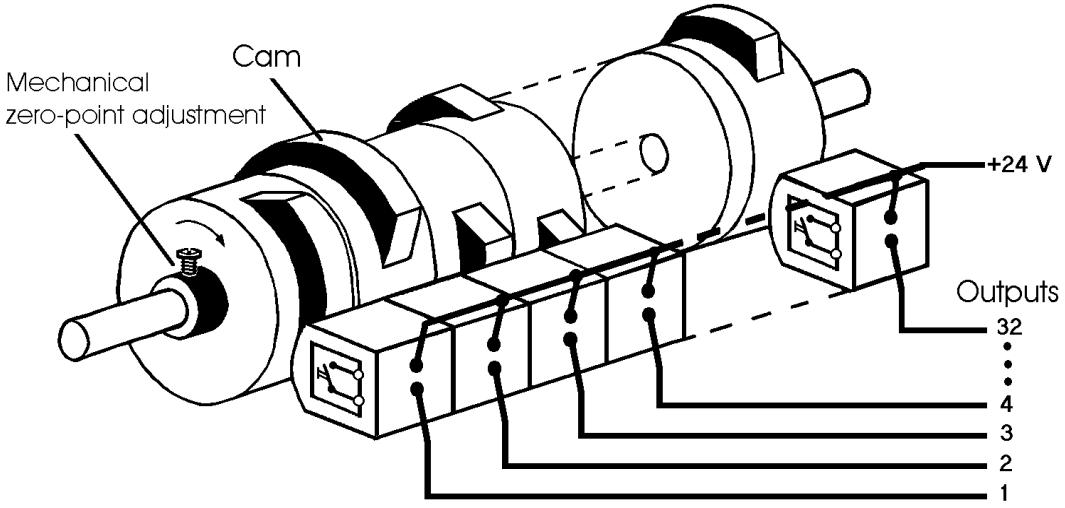
1.1.3 Suggestions

We are always pleased to receive suggestions and wishes etc. and endeavour to allow for these. It is also helpful if you bring our attention to any errors.

1.2 From the mechanical system to an electronic system

The purpose of electronic programming limit switches is not only to take the place of mechanical controllers but to render their function more precise and simpler, to provide a universal range of application and to reduce wear.

The mechanical cam control actuates a switch over sections of a circle, and this switch is closed over the length of this section. Such a section is defined as a "cam".
Each switch represents one output. Several circuits arranged in parallel produce the number of outputs.



Picture 1: Mechanical cam control

This basic principle has been adopted from the mechanical cam controls. A cam is programmed for an output by entering a switch-on point and a switch-off point. The output is switched on between these points.

Thanks to twenty years of experience, consistent further development and the use of ultra-modern technology, DEUTSCHMANN AUTOMATION has now become one of the leading suppliers of electronic cam controls.

1.3 Deutschmann Automation's range of products

See our homepage at http://www.deutschmann.de.

2 EMC-Directives for products of Deutschmann Automation

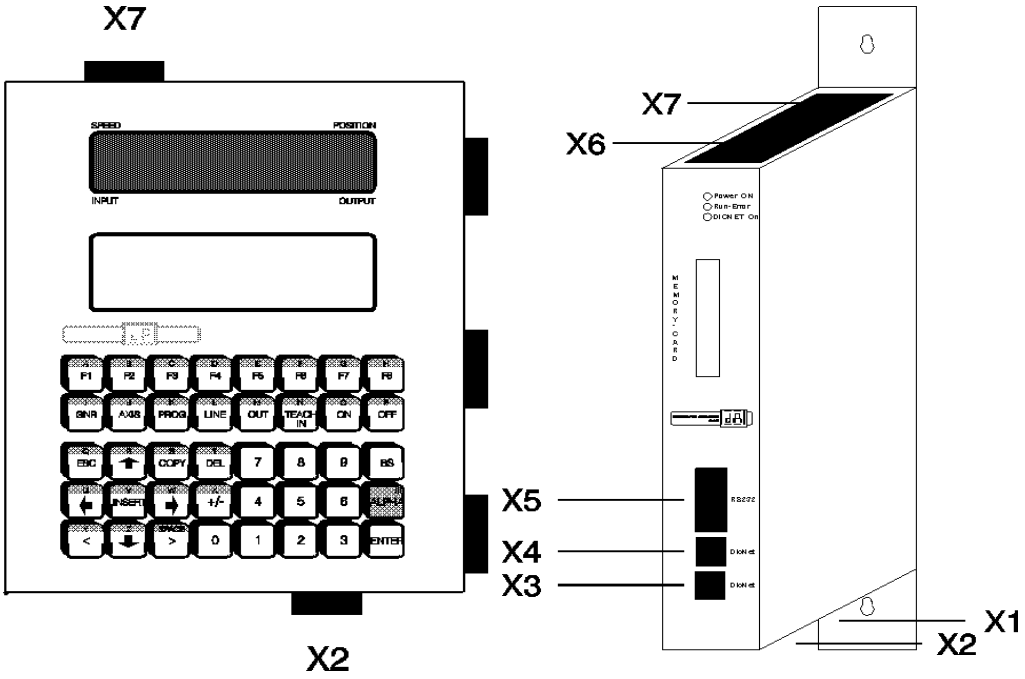
The installation of our products has to be carried out considering the relevant EMC directives as well as our internal instructions.

For more information see ’EMC Directives’ on our homepage at **http://www.deutschmann.de**.

3 Basic instrument LOCON 32 / LOCON 32-4X / TERM 32

LOCON 32 is made in the following two types of construction, as you can see in the picture below:

- with an integrated control unit for a front panel installation with the dimension 213x262x57mm (WxHxD)
- as a "PM-version" (panel mounted) without operation front with the dimension 42x240x190mm (WxHxD)



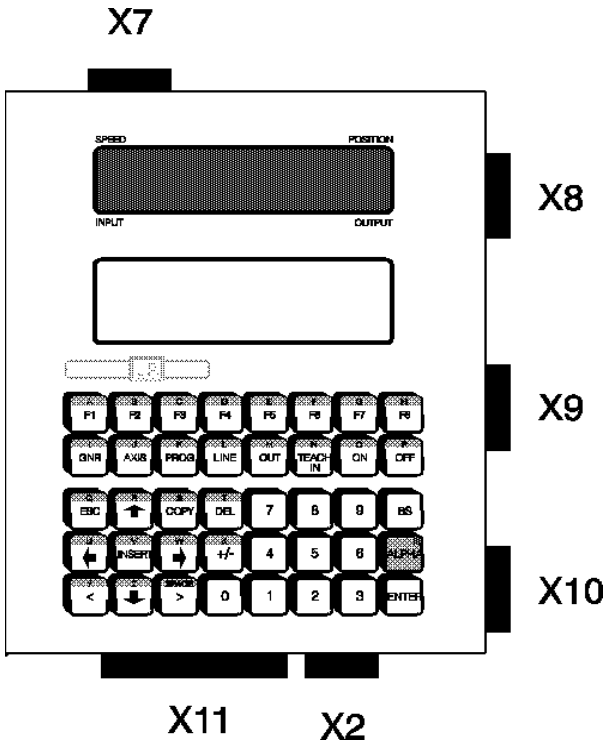
Picture 2: Front view LOCON 32 LOCON 32-PM

The essential difference between the both types of construction consists in the layout of the plugs. In the variant with the integrated operation front the connections can be made from all the four sides, in the PM-variant it is only possible from three sides.

In both cases the hardware and software is absolutely the same.

3.1 Construction LOCON 32 with integrated operation front

In this type of construction the plugs are connected according to the following outline. Only using the plugs X8, X9 and X10 there is a plug-compatibility to the previous model ENA 2.
The remaining plug connections are necessary for new functions of LOCON 32.



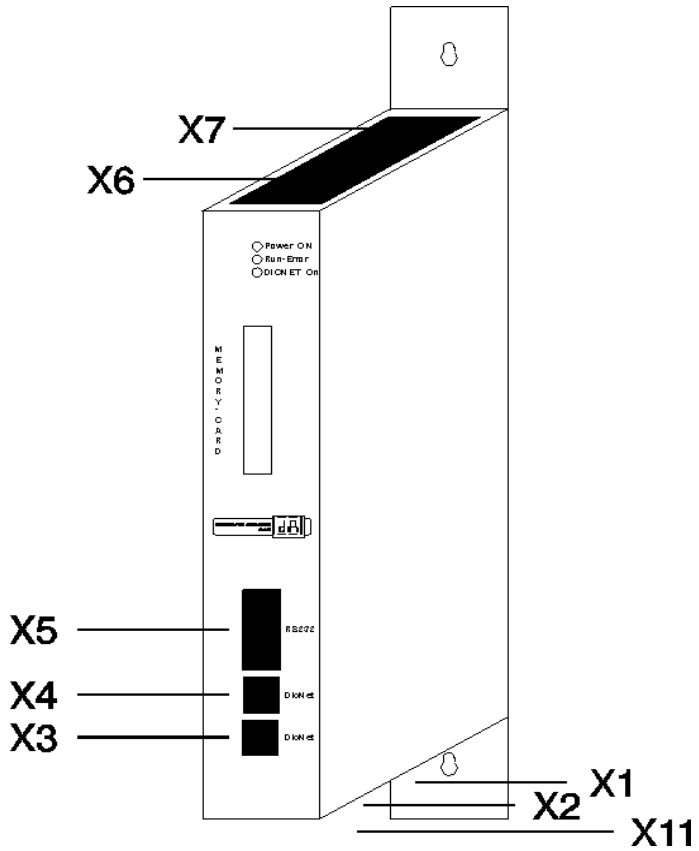
Picture 3: Front view LOCON 32

3.1.1 Switchboard window

For the installation of a LOCON 32 with integrated operation front an opening of 205x245 mm (WxH) is required.

3.2 Construction LOCON 32 in the "PM-version" (panel mounted)

In the PM-variant the plugs are connected according to the following outline:



Picture 4: Wiring of the plugs LOCON 32-PM

3.3 Pin assignment LOCON 32

3.3.1 X1 (2x18pol. screw-plug connector) LOCON 32-PM only

Pin number	Meaning
1	Output 1
2	Output 2
3	Output 3
4	Output 4
5	Output 5
6	Output 6
7	Output 7
8	Output 8
9	Output 9
10	Output 10
11	Output 11
12	Output 12
13	Output 13
14	Output 14
15	Output 15
16	Output 16
17	+24V - outputs
18	GND
19	Output 17
20	Output 18
21	Output 19
22	Output 20
23	Output 21
24	Output 22
25	Output 23
26	Output 24
27	Output 25
28	Output 26
29	Output 27
30	Output 28
31	Output 29
32	Output 30
33	Output 31
34	Output 32
35	Output + 24 V - outputs
36	Output GND

3.3.2 X1 (2x18pol. screw-plug connector) LOCON 32-PM-4x only

Pin number	Meaning
1	Output 1 axis 0
2	Output 2 axis 0
3	Output 3 axis 0
4	Output 4 axis 0
5	Output 5 axis 0
6	Output 6 axis 0
7	Output 7 axis 0
8	Output 8 axis 0
9	Output 1 axis 1
10	Output 2 axis 1
11	Output 3 axis 1
12	Output 4 axis 1
13	Output 5 axis 1
14	Output 6 axis 1
15	Output 7 axis 1
16	Output 8 axis 1
17	+24V - outputs
18	GND
19	Output 1 axis 2
20	Output 2 axis 2
21	Output 3 axis 2
22	Output 4 axis 2
23	Output 5 axis 2
24	Output 6 axis 2
25	Output 7 axis 2
26	Output 8 axis 2
27	Output 1 axis 3
28	Output 2 axis 3
29	Output 3 axis 3
30	Output 4 axis 3
31	Output 5 axis 3
32	Output 6 axis 3
33	Output 7 axis 3
34	Output 8 axis 3
35	+24V - outputs
36	GND

3.3.3 X2 (2x10pol. screw-plug connector)

Pin number	Meaning
1	+24V - supply
2	GND
3	RxD-LOCON 32
4	TxD-LOCON 32
5	GND
6	AnalogOut
7	GND
8	RunOn
9	RunCommon
10	RunOff
11	+24V - supply
12	GND
13	DICNET-
14	DICNET+
15	R-
16	R+
17	SSIDAT-
18	SSIDAT+
19	SSICLK+
20	SSICLK-

3.3.4 X3 (RJ11-DICNET-plug)

Pin number	Meaning
1	R-
2	DICNET-
3	nc
4	nc
5	DICNET+
6	R+

3.3.5 X4 (RJ11-DICNET-plug)

Pin number	Meaning
1	R-
2	DICNET-
3	nc
4	nc
5	DICNET+
6	R+

3.3.6 X5 (9pol. D-SUB socket)

Pin number	Meaning
1	nc
2	RxD-LOCON 32
3	TxD-LOCON 32
4	nc
5	GND
6	nc
7	nc
8	nc
9	nc

3.3.7 X6 (1x18pol. screw-plug connector)

Pin number	Meaning
1	Encoder track 1 / Clear^ (option E only)
2	Encoder track 2 / CountInvert
3	Encoder track 3 / LatchClr
4	Encoder track 4 / SelectCount
5	Encoder track 5 / Clear+
6	Encoder track 6 / OutEnable
7	Encoder track 7 / CountEnable-
8	Encoder track 8 / Clear-
9	Encoder track 9 / IncTrackA / Count^
10	Encoder track 10 / IncTrackB / Down
11	Encoder track 11
12	Encoder track 12
13	+24V - encoder supply
14	GND
15	ProgNr 1
16	ProgNr 2
17	ProgNr 4
18	ProgNr 8

3.3.8 X7 (1x7pol. screw-plug connector)

Pin number	Meaning
1	ProgNr 16
2	ProgNr 32
3	ProgNr 64
4	ProgStart
5	ProgRelease
6	+24V
7	GND

3.3.9 X8 (25pol. D-SUB socket)

Pin number	Meaning
1	Encoder track 1 / Clear^ (option E only)
2	Encoder track 2 / CountInvert
3	Encoder track 3 / LatchClr
4	Encoder track 4 / SelectCount
5	Encoder track 5 / Clear+
6	Encoder track 6 / OutEnable
7	Encoder track 7 / CountEnable-
8	Encoder track 8 / Clear-
9	Encoder track 9 / IncTrackA / Count^
10	Encoder track 10 / IncTrackB / Down
11	Encoder track 11
12	Encoder track 12
13	nc
14	nc
15	nc
16	nc
17	nc
18	nc
19	nc
20	nc
21	nc
22	nc
23	nc
24	+24V - encoder supply
25	GND

3.3.10 X9 (1x15pol. screw-plug connector)

Pin number	Meaning
1	GND
2	ProgNr 1
3	ProgNr 2
4	ProgNr 4
5	ProgNr 8
6	ProgStart
7	+24V
8	GND
9	GND
10	+24V - supply
11	+24V - supply
12	RxD-LOCON 32
13	GND
14	GND
15	TxD-LOCON 32

3.3.11 X10 (2x20pol. flat ribbon plug) LOCON 32 only

Pin number	Meaning
1	Output 2
2	Output 1
3	Output 4
4	Output 3
5	Output 6
6	Output 5
7	Output 8
8	Output 7
9	Output 10
10	Output 9
11	Output 12
12	Output 11
13	Output 14
14	Output 13
15	Output 16
16	Output 15
17	+24V - outputs
18	+24V - outputs
19	GND
20	GND
21	Output 18
22	Output 17
23	Output 20
24	Output 19
25	Output 22
26	Output 21
27	Output 24
28	Output 23
29	Output 26
30	Output 25
31	Output 28
32	Output 27
33	Output 30
34	Output 29
35	Output 32
36	Output 31
37	+24V - outputs
38	+24V - outputs
39	GND
40	GND

3.3.12 X10 (2x20pol. flat ribbon plug) LOCON 32-4X only

Pin number	Meaning
1	Output 2 axis 0
2	Output 1 axis 0
3	Output 4 axis 0
4	Output 3 axis 0
5	Output 6 axis 0
6	Output 5 axis 0
7	Output 8 axis 0
8	Output 7 axis 0
9	Output 2 axis 1
10	Output 1 axis 1
11	Output 4 axis 1
12	Output 3 axis 1
13	Output 6 axis 1
14	Output 5 axis 1
15	Output 8 axis 1
16	Output 7 axis 1
17	+24V - outputs
18	+24V - outputs
19	GND
20	GND
21	Output 2 axis 2
22	Output 1 axis 2
23	Output 4 axis 2
24	Output 3 axis 2
25	Output 6 axis 2
26	Output 5 axis 2
27	Output 8 axis 2
28	Output 7 axis 2
29	Output 2 axis 3
30	Output 1 axis 3
31	Output 4 axis 3
32	Output 3 axis 3
33	Output 6 axis 3
34	Output 5 axis 3
35	Output 8 axis 3
36	Output 7 axis 3
37	+24V - outputs
38	+24V - outputs
39	GND
40	GND

3.3.13 X11 (1x15pol. screw-plug connector)

This plug only comes along with the 4-axis devices (LOCON 32-4X and LOCON 32-4X-ABS) as well as with the corresponding PM-devices.

3.3.13.1 X11 (incremental expansion)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
24V	GND	A	B	C+	Sel	A	B	C+	Sel	A	B	C+	Sel	Res
Axis		X1			X2			X3						

Caption:

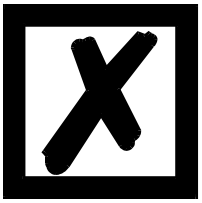
24V	Voltage supply for encoders
GND	Reference for 24V
A	Track A at incremental encoders / counting input at counter (positive edge)
B	Track B at incremental encoders / direction input (0V up / 24V down)
C+	Clear (at 24V active, at least 250µs)
Sel	Select incremental encoder or counter (0V = incremental encoder / 24V = count)
Res	Reverved for prospective applications (do not wire)

3.3.13.2 X11 (SSI-absolute expansion)

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
24V	GND	Clk+	Clk-	Dat+ Ax0	Dat- Ax0	Dat+ Ax1	Dat- Ax1	Dat+ Ax2	Dat- Ax2	Dat+ Ax3	Dat- Ax3	Res	Res	Res

Caption:

24V	Voltage supply for encoders
GND	Reference for 24V
Clk+, Clk-	SSI-clock output
Dat+, Dat-	SSI-data inputs
Res	Reserved for prospective applications (do not wire)



All four axes are read in via the plug X11. A wiring of the plugs X6 and X8 does not take place!

3.4 Pin assignment TERM 32

3.4.1 Pin assignment X2 (10pol. srew-plug-connection)

Pin number	Meaning
1	24 Volt DC
2	GND
3	DICNET -
4	DICNET +
5	GND
6	Rx-TERM
7	Tx-TERM
8	Run-On
9	Run-Common
10	Run-Off

3.4.2 Pin assignment X5 (9pol. D-SUB plug)

Pin number	Meaning
1	nc
2	Rx-TERM 32
3	Tx-TERM 32
4	nc
5	GND
6	nc
7	nc
8	nc
9	nc

3.4.3 Pin assignment X3 and X4 (RJ11) DICNET

Pin number	Meaning
1	R-
2	DICNET -
3	nc
4	nc
5	DICNET +
6	R+

3.5 Pin assignment / characteristics special version LOCON 32-X008

This device is a special version, in order to exchange devices of the series ENS 3.24.xxxx.
The 5 volt encoder that was mostly used in connection with ENS-devices has to be used further.
ENS-devices for 24 volt encoders can not be replaced by this special version.
Merely the 48pol. plug (outputs, encoder information, etc.) and the 3pol. plug for the 5 volt voltage supply of the encoder are to be put on correspondingly.
After the installation the device is operational (after programming) without any further wiring effort.
The switchboard window is to be extended to the measure for LOCON 32 at height (see dimensional drawing LOCON 32).

3.6 Pin assignment / characteristics special version LOCON 32-X009

This device is a special version, in order to exchange devices of the series ENA I-24ABS.

Here the screw-plug connectors of the ENA I-24ABS are to be used as follows:
DC/DC voltage supply as well as inputs E1 on left block of the adapter circuit board mounted at the backside of LOCON 32.
Outputs as well as Run-control on the right block of the adapter circuit board mounted at the backside of LOCON 32.

After the installation the device is operational (after programming) without any further wiring effort.
The switchboard windows ENA I and LOCON 32 are alike.

3.7 Signal description LOCON 32 / LOCON 32-PM

Function	Meaning
Output 1 ... Output 8	Output block 1 Each Output 24V / 0.3A plus-switching (PNP) Total current of the output block maximum 1 A
Output 9 ... Output 16	Output block 2 Each output 24V / 0.3A plus-switching (PNP) Total current of the output block maximum 1 A
Output 17 ... Output 24	Output block 3 Each output 24V / 0.3A plus-switching (PNP) Total current of the output block maximum 1 A
Output 25 ... Output 32	Output block 4 Each output 24V / 0.3A plus-switching (PNP) Total current of the output block maximum 1 A
+24V - outputs	24V-voltage supply for output driver (no connection to the 24V-supply of LOCON 32)
+24V - supply	24V-voltage supply of the total unit except for the output driver (see above)
+24V - encoder supply	24V-output voltage to the encoder (internally connected with 24V-supply)
GND	Mass potential of the whole cam control. All GND-signals are internally connected. A connection to the housing that is to be connected with the potential equalization does not exist.
TxD-LOCON 32	RS232-transmission line
RxD-LOCON 32	RS232-receive line
SSICLK+, SSICLK-	RS422-clock line pair for SSI-connection
SSIDAT+, SSIDAT-	RS422-data line pair for SSI-connection
RunOn, RunCommon, RunOff	Floating alarm switching contact (max. 100ms delay, max 250V-/V~, 1A) Connection Common - On: Device ok Connection Common - Off: Disturbance
AnalogOut	Analog output ±10 V / max. 5mA (reference GND) Optional speed-proportional output (0V = 0 rev./min, 10V = MAX_UMIN U/Min)
DICNET+, DICNET-	Data line for network via the DEUTSCHMANN-bus system DICNET® (see also chapter DICNET). When connecting to the DICNET, the connection "TxD" has to be connected to "RxD"!
R+, R-	Terminal resistance connections for DICNET. Required, if LOCON 32 is operated as first or last device in DICNET.
Encoder track 1 - Encoder track 12	24V-input (max. 10mA) for encoder lines when using absolute shaft encoders up to 4096 inf./rev. with parallel output.
IncTrackA	Connection of track A when using an incremental encoder
InTrackB	Connection of track B when using an incremental encoder
LatchClr	If this input is wired with 24V, the Clear-pulses (see below) will be latched; e. g. a pulse with a minimum length of 40µs is interpreted as Clear. This latch-function is supposed to be used in case of really short Clear-signals only, as in this case the Clear-input is also more sensitive to disturbance signals. If the input is not wired with 0V, a Clear-length of at least 0.5ms is required.

SelectCount, Count^, Down	At 24V on this input the inputs "Encoder track9" and "Encoder track10" are evaluated as count- and direction-input. With each rising edge at "Count" one pulse is counted on. If the input "Down" is set on 24V, it is counted downwards, otherwise upwards. If "SelectCount" is not wired with 0V, an incremental encoder with A/B-tracks is expected.
Clear-, Clear+, Clear^	Clear-pulse axis 0. As soon as one of these signals becomes active (0V at Clear-, 24V at Clear+, rising edge at Clear^), the meter reading is set to 0 and it remains on 0 until the Clear-condition disappears. The pulse width depends on the wiring of the output "LatchClr" (see above). Clear^ is available at option E.
CountEnable-	This signal releases the counter at 0V. In case 24V are applied to that line, the meter reading will be frozen. The speed measurement and with it, the ITC, continues throughout this time period. The reaction to a signal change takes place with an accuracy of ±0.5ms.
OutEnable	When using incremental encoders, with this signal the outputs can be switched on and off. With 0V the outputs ar switched off, at 24V the outputs are set according to the programmed cams. The reaction to a signal change takes place with an accuracy of ±0.5ms.
ProgNr 1 ... ProgNr 64	In case of an external program selection the program number is installed on these pins. The coding takes place in binary form in accordance with the chapter "Coding of device- and program-number".
ProgStart	If 24V are applied to this pin, the program number is taken over at the pins ProgNr1 to ProgNr64 (see above)
ProgEnable	If 24V are applied to this pin, all parameter changes (incl. configuration change) in LOCON 32 are permitted. The user number is not queried. For further details see chapter "Programming release (user number)".

3.8 Status LEDs

The PM-version of LOCON 32 features the following 3 status LEDs, that are shown on the front:

DICNET On	green	Lights when an external control unit communicates with this LOCON 32 / LOCON 32-4X.
Run-Error	red	Lights when an error, that lead to a decrease of the run-control relay, appeared in LOCON 32, or when the LOCON is yet not ready for operation after switching on.
Power-On	green	Lights when the internal 5V-voltage supply is alright and no reset has to be made

The front panel version features 48 LEDs that are placed below the seven-segment display with the following significance:

Number	**Meaning**
1-12	Encoder track 1 .. 12
13	Programming release
14	Voltage supply ok
15	Output driver active (no overload)
16	Programm start active
1-32	Output status (LED on = 24V at the output)

3.9 External program selection

For the external program selection the new program has to be applied as a binary code (see chapter "Coding of device- and program-number“) on the connector strip. Then a rising flank has to be generated at the pin "ProgStart" at which point the high-level (24V) must be kept at least 200ms.

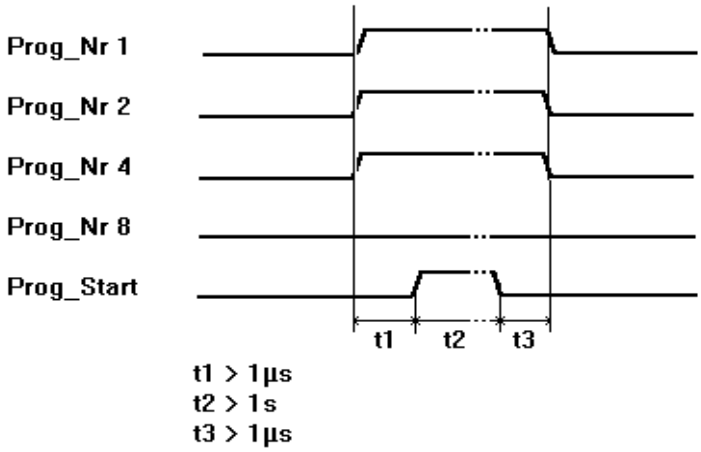
If, for instance, program 7 (binary code 0000111) is to be activated, the following steps are necessary:

Applying the appropriate voltages:

PROG_NR64 = 0V0
PROG_NR32 = 0V0
PROG_NR16 = 0V0
PROG_NR8 = 0V0
PROG_NR4 = 24V1
PROG_NR2 = 24V1
PROG_NR1 = 24V1

Generating the assuming flank:

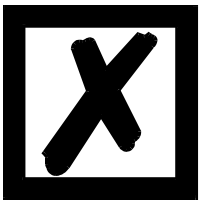
PROG_START = 24V
Wait 200ms
PROG_START = 0V



Picture 5: Program change

The program change through the connector strip is possible at any time.

For LOCON 32-4X/LOCON 32-PM-4X the selected program applies to all 4 axes.



If pin „PROG_START“ is firmly wired with 24V, LOCON 32 takes on the externally applied program any time the device is switched on.

3.10 Memory-card

The memory-card serves in LOCON 32 for the storing of all variable parameters like device-configuration, cam program, idle times etc.
The memory-card is made like an EEROM-card, that means the data can be electronically deleted and described inside the unit. No battery is necessary for the data-saving.

The data will be specified at least 10 years.

As already mentioned, the memory-card of LOCON 32 does not only contain the customized cam program, but also all device configurations. This provides that the device-hardware itself does not have a "DIP-switch" or a "Jumper" which might be a potential error source in the service or when starting up.
Because of that an instrument exchange only requires to take a new LOCON 32, to provide it with the memory-card of the exchanged unit and to install it again. A configuration or a new programming of the replacement device is no longer required, as the memory-card contains all data.

The new configuration of LOCON 32 when starting up is completely made by the client. The following possibilities are available:

Configuration via the integrated operation front

In this case all device-parameters (encoder resolution, choice between absolute- and incremental-encoder, ...) can be entered menu-controlled via the integrated operation front.

Configuration via the external operation front

The external operation front can be configured the same way as the external operation unit. The exact operating sequence is described in the chapter "Configuration LOCON 32".

3.10.1 Connection of the floating alarm contact

The signals "RunOn", "RunOff" and "RunCommon" are three change-over contacts of a relay, at which point "RunCommon" is the common contact, "RunOn" is the normally-open contact and "RunOff" the break contact.
If LOCON 32 runs perfectly, the normally-open contact "RunOn" is connected with "RunCommon", in case of a severe defect (error 1..99 or 100..255) the relay goes down and results in a connection between "RunOff" and "RunCommon".
By using a relay a floating contact to control LOCON 32 is available. This contact can also be serially connected with any other devices.
The state of the relay can optically be read from an LED (LED "RunError").
The relay contacts can maximally be loaded with 250V/~ and 1A.

After switching on, the relay remains in the state „RunOff“ until the LOCON 32 has finished its self-test and is ready for operation.

3.10.2 Connecting the analog output

The analog output supplies a speed-proportional signal in the range 0V..10V according to GND with maximum 5mA. 0V corresponds to a speed of 0 and 10V to a speed of MAX_UMIN which is determined in the system parameters.
In case of disturbance ("RunOff" see above) this output switches to 0V.

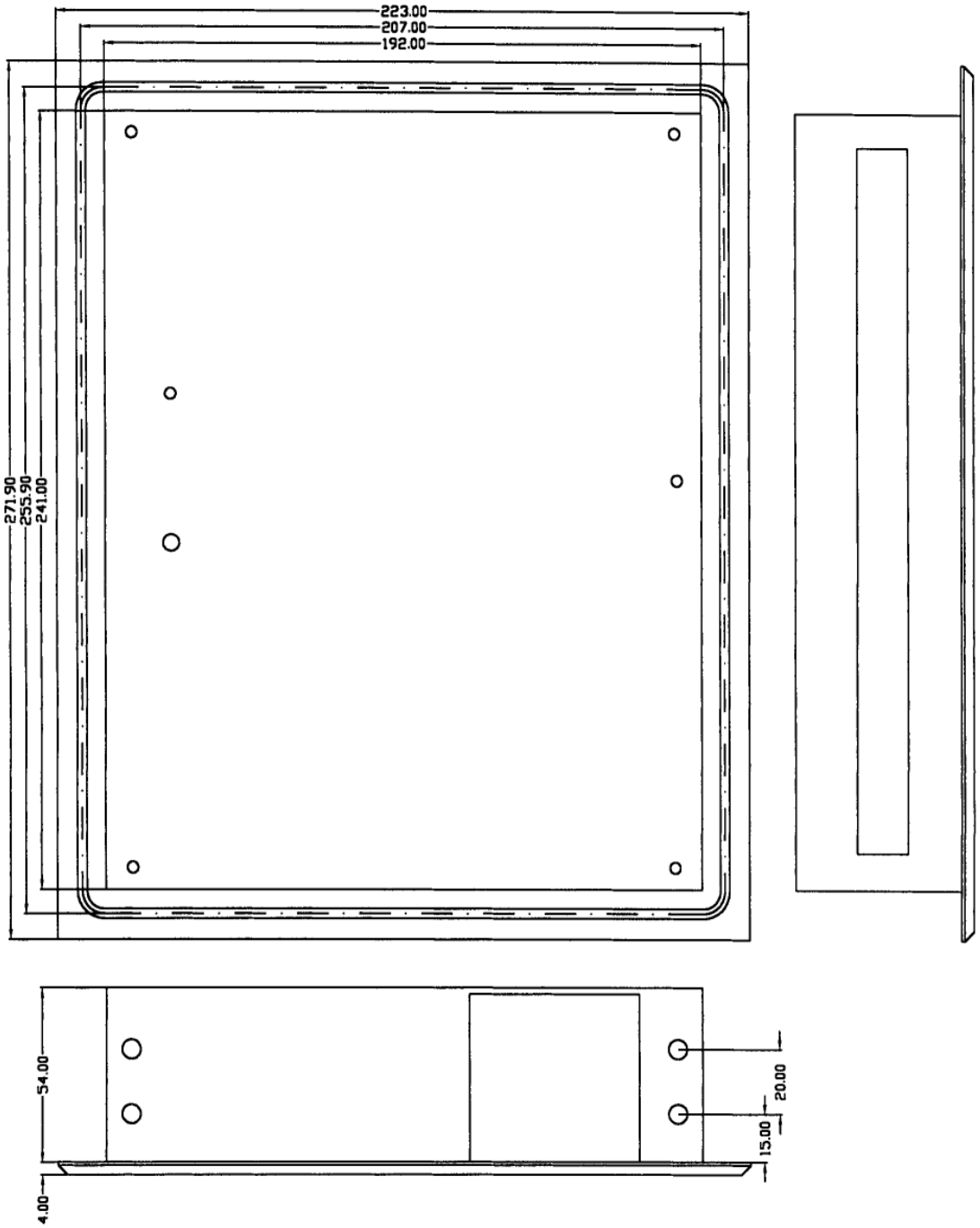
The analog output is only available as an option.

3.10.3 Exchanging the memory-card

The exchange of the memory-card is only allowed to be carried out in a voltageless state of LOCON 32 and is only necessary in case of service or when starting up.
In normal operation the memory-card remains inserted.
For further information see chapter "Memory-card".

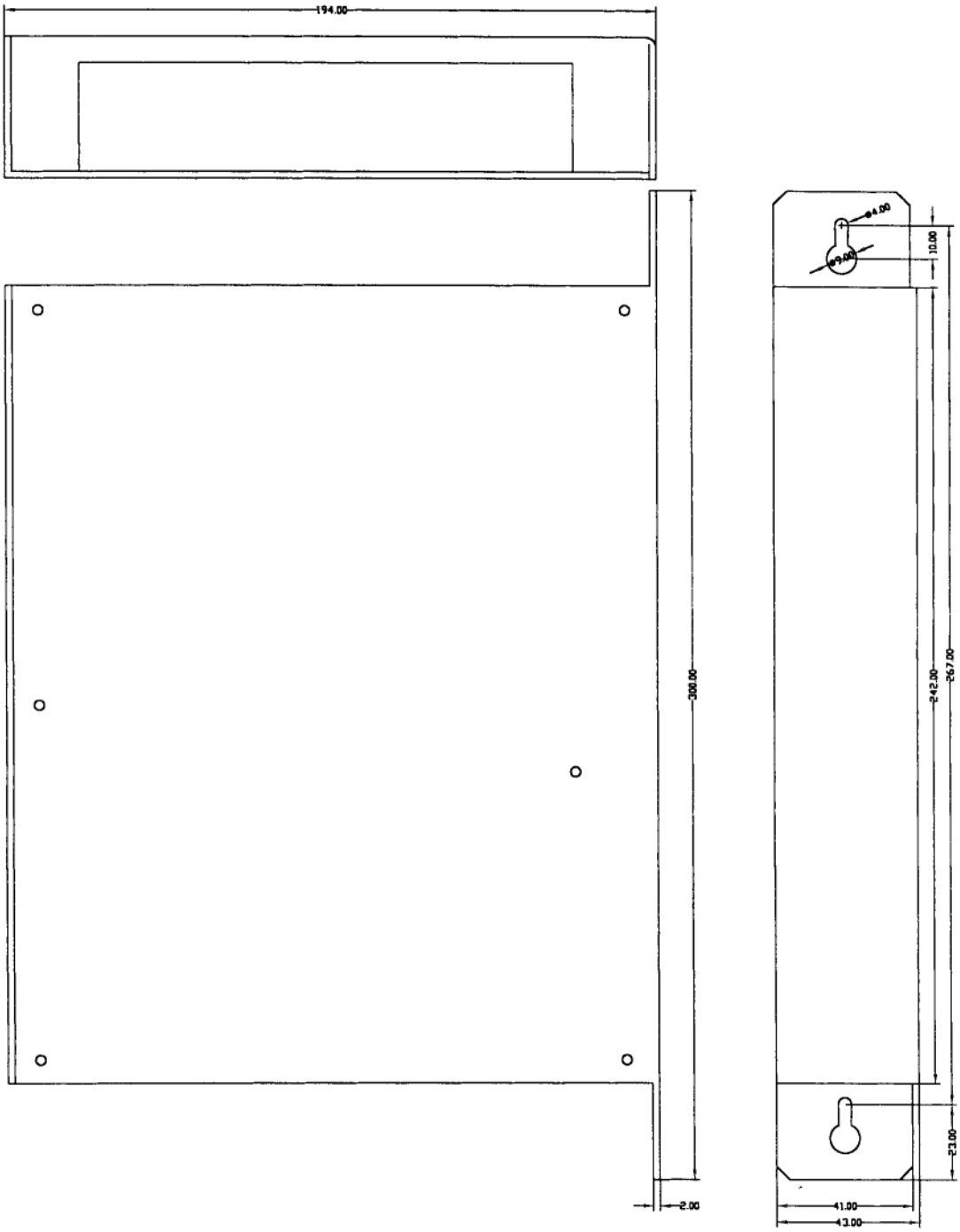
3.11 Dimensional drawings

3.11.1 LOCON 32-HC



Picture 6: Dimensional drawing LOCON 32-HC

3.11.2 LOCON 32-PM



Picture 7: Dimensional drawing LOCON 32-PM

4 Options LOCON 32

The following characteristics of LOCON 32 are available as an option to the basic instrument.

4.1 Interbus-S-Interface

See documentation in the instruction manual „Communication profile“.

4.2 SSI-Interface

The connection of SSI-absolute encoders is supported as an option. The assignment at the SSI-interface can be taken from the chapter "Pin assignment X2".

4.3 Analog output

This output disposes optionally of a speed-proportional analog-signal (0..10V/5mA) according 0...MAX_UMIN, see system parameters.

4.4 Angle-time-cam

Optionally LOCON 32 is available with the option angle-time-cams. A detailed description can be found in the chapter „Angle-time-cams“.

4.5 Standstill disconnection, encoder monitoring, protocol function

These functions are also available as options. A detailed description can be found in the chapter „Special menu“.

4.6 WINLOC programming

LOCON 32 can be programmed offline on a PC, but the device itself does not have to be connected to the PC at the time of programming.
For this purpose the program package "WINLOC" is used, that runs on every PC with Win95/98 or Win-NT.
After programming, the data can be transmitted to LOCON 32 via the serial interface of the PC to LOCON 32.
It is also possible to transmit existing programs from LOCON 32 to the PC, to change them there and then again to reload them into the cam control.

4.7 Backup on PC

The possibility of a backup on the PC is also offered. It is a part of the program package “WINLOC“ (see above) and only consists of the transfer program “WINLOC“ for the connection of PC and LOCON 32.
With it programs of LOCON 32 can be stored on harddisc or disc of a PC and can be reloaded.

5 Basic device TERM 5/6 (external operating unit)

5.1 Assembly of the instrument

This external control- and display unit consists of a plastic housing with overall dimension W72xH96xD18 mm for front sheet installation and W72xH96xT28 mm for DIN-rail mounting.

It is adjusted for programming cam controls (LOCON, ROTARNOCK) and has the same keys, status LEDs and display possibilities as LOCON 1/2 and LOCON 16/17.
In this respect the programming is just like LOCON 1/2 and LOCON 16/17and no additional training is required.
On the 16 LEDs below the seven-segment-display the first 16 outputs of the connected cam controls are displayed with a delay of maximum 500ms.

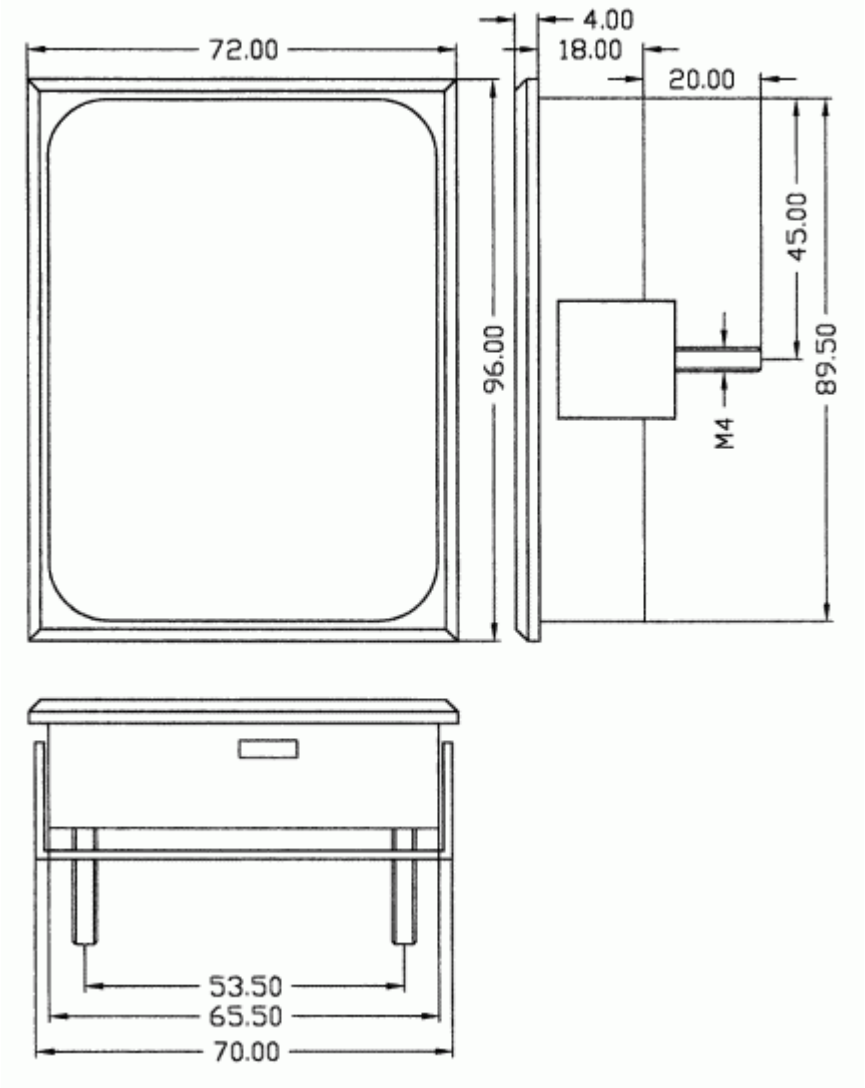
The connection to the cam control takes place via a serial wire. According to the standard type an RS485-connection (DICNET) and optionally an RS232-connection (switchable at the device) is supported.
The correct wiring of the instruments among themselves is described in the chapter "Networking terminals with cam controls and PCs".

5.2 View TERM 5/6

Picture 8: TERM 5 / TERM 6

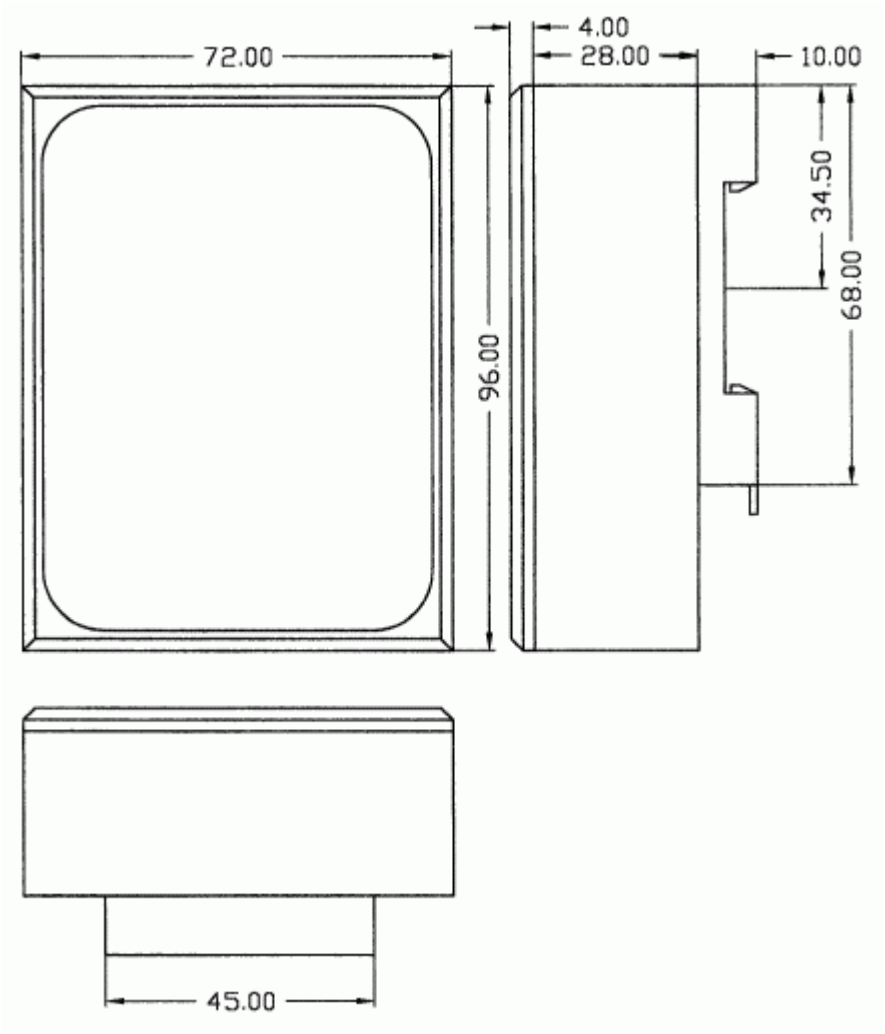
5.3 Technical dimensional drawings

5.3.1 TERM 5 / TERM 6



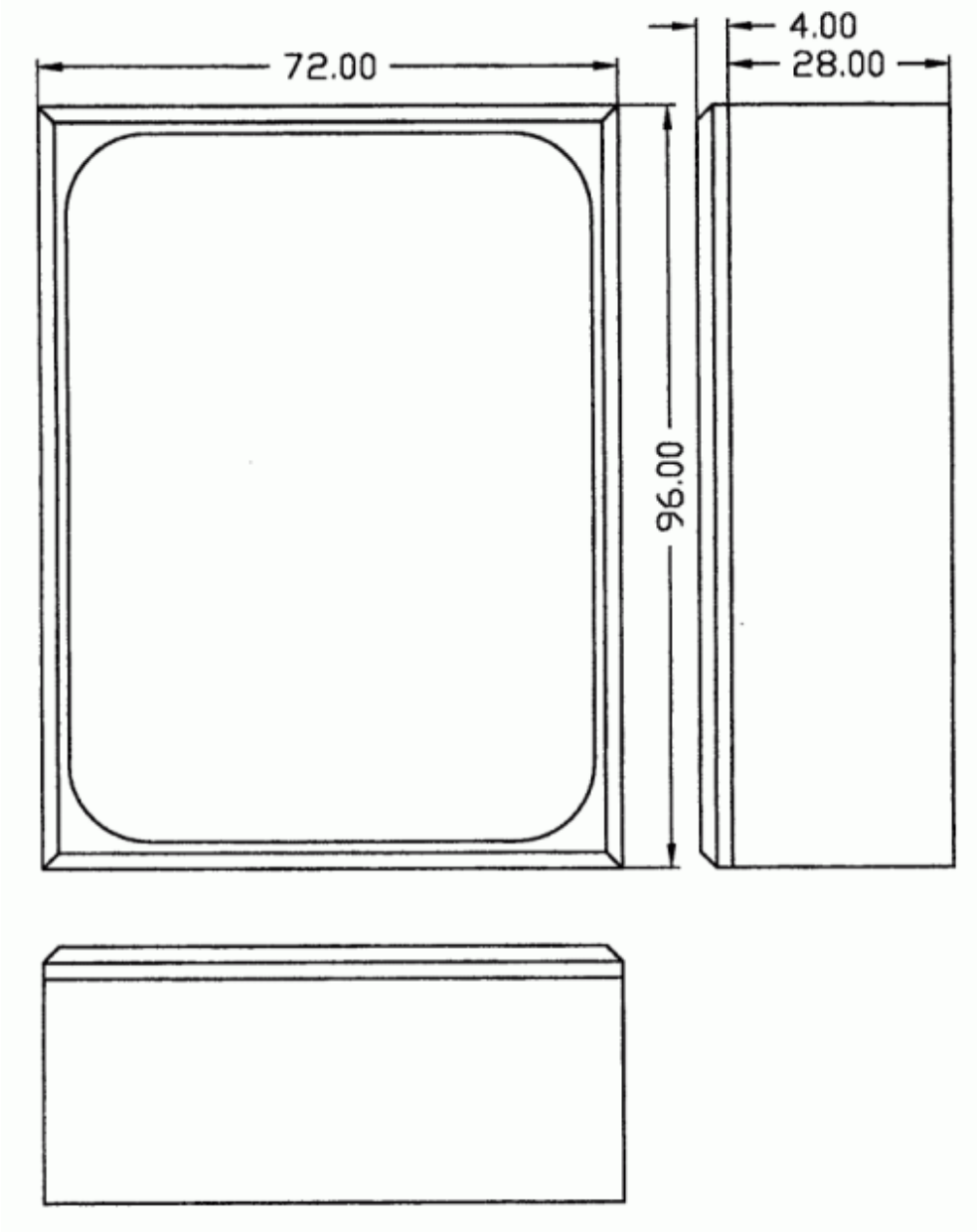
Picture 9: Technical dimensional drawing TERM 5 / TERM 6

5.3.2 TERM 5-H / TERM 6-H



Picture 10: Technical dimensional drawing TERM 5-H / TERM 6-H

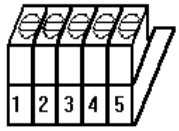
5.3.3 TERM 5-T / TERM 6-T



Picture 11: Technical dimensional drawing TERM 5-T / TERM 6-T

5.4 Pin assignment TERM 5/6

The external control unit is suitable for connection through a 5-pin-screw-plug-connection with the following assignment:

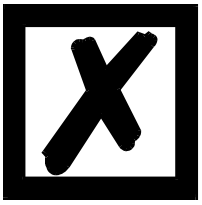


Picture 12: Pin assignment TERM 5 / TERM 6

Pin No.	Significance
1	24 Volt DC
2	GND
3	Rx-TERM (DICNET-)
4	Tx-TERM (DICNET+)
5	GND

5.4.1 Interface switch-over

The interface switch is to be found under the sticker with the imprint RS232/RS485. In the state of delivery it is set as indicated on the marking of the sticker.The position of the desired interface can be taken from the sticker at the back of the device. Please use an appropriate tool to change the position of the microswitch to the left or to the right.



Please note the signal description on the following pages!

6 Networking terminals with cam controls and PCs

The chapter below illustrates certain connection examples between the units both via the DICNET bus and via the RS232 interface.
All DEUTSCHMANN controls (LOCON, ROTARNOCK ...) with a DICNET bus can be included in this network. The following principles apply in general:

6.1 RS232 link

An RS232 link is always a **point-to-point link for 2 users**.
Here, it must be borne in mind that, on connection, the Tx end of one user is connected to the Rx end of the other user and vice versa. Moreover, the device ground potentials must be interconnected.

6.2 RS485 link (DICNET)

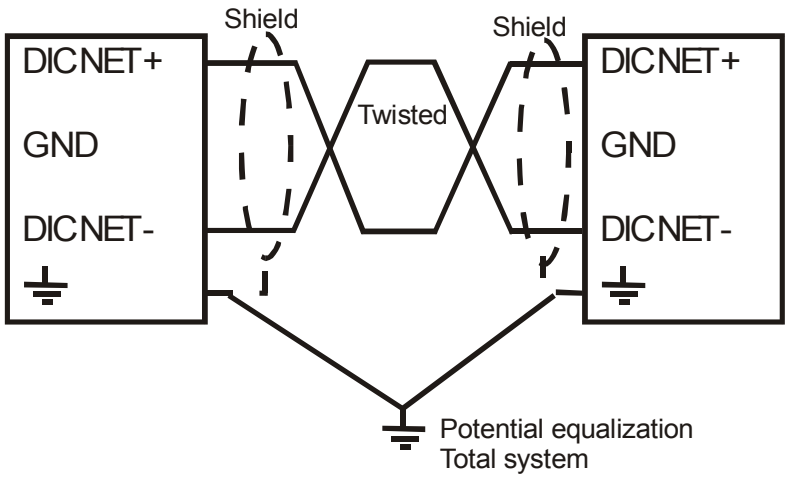
A DICNET link is a bus system to which at maximum configuration level 16 cam controls (LOCON 32, LOCON 24 ...), 16 display units (TERM 4), 16 operator terminals (TERM 6, TERM 24 ...) and 1 PC can be connected **simultaneously** via a **twisted two-wire line** which should be shielded.
All "DICNET+" terminals are interconnected and all "DICNET-" terminals are interconnected. The terminals do not need to be reversed as on the RS232 interface.
Likewise, not necessarily there is a connection of the individual device ground potentials as on the RS232 interface; **however, you must ensure that the potential difference between the individual devices does not exceed 7 V.**
Consequently, equipotential bonding is generally carried out in practice at a central point (for example, in the switch cabinet).
Moreover, please ensure that the two bus users feature bus termination resistors at the start and end of the bus by connecting DICNET+ to R+ and DICNET- to R-, since, otherwise, serious transmission problems could occur.
If the devices are connected to the bus with a stub-end feeder, the length of the stub-end feeder may not exceed 1 m, so as to guarantee trouble-free operation.

6.3 Cable type for DICNET®

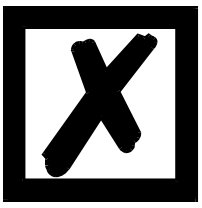
A shielded, twisted, 2-core cable (twisted pair) is recommended as bus cable. The shield serves to enhance electromagnetic compatibility (EMC). However, an unshielded cable may also be used if ambient conditions permit it, i. e. if no electromagnetic interference (EMI) is to be expected.
The characteristic impedance of the cable should be between 100 and 130 *Ω at f > 100 kHz; the cable capacitance should be < 60 pF/m wherever possible and the wire cross-section should be minimum 0.22 mm^2 (24 AWG).

A cable that fully complies with these specifications and that has been developed specifically for use in field bus systems is the UNITRONIC®-BUS LD cable 2 x 2 x 0.22, available on a drum from LAPP KABEL in Stuttgart, or by the metre from DEUTSCHMANN AUTOMATION.

The minimum wiring with shielding between two bus users is shown in the following illustration:



Picture 13: DICNET-wiring



The two signal wires may not be reversed!
<u>GND of the two devices do not necessarily have to be connected.</u>
The potential difference between the data reference potentials GND of all interface connections may not exceed ± 7 V.

6.3.1 Earthing, shielding

If using a shielded bus cable, we recommend that the shield is connected at both ends and with low inductance to PE in order to achieve optimum EMC wherever possible.

6.3.2 Line termination at DICNET®

The two ends of the entire bus cable must each be fitted with a line termination. This avoids signal reflections on the line and ensures a defined open-circuit potential if no user is transmitting (state of rest between the telegrams, so-called idle state).
In this case, please ensure that the line termination is made at the physical ends of the bus cable, i. e. the integrated bus termination resistor must be activated at both devices located at the start and end of the bus.

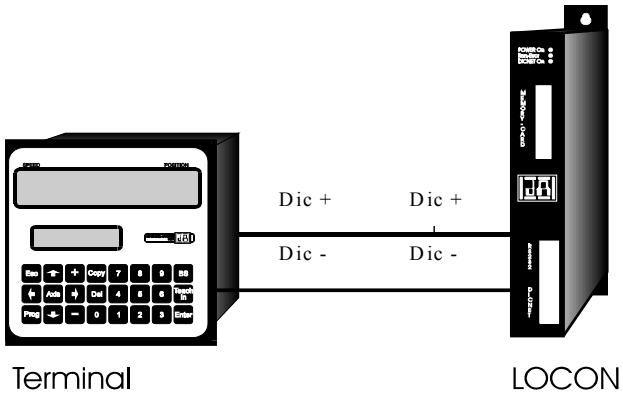
6.4 Comparison DICNET® - RS232

If you intend to set up a permanent link between terminal and one or more cam controls, preference should be given to connection via the DICNET bus and not the RS232 interface since the bus features a higher level of data integrity, i. e. transmission errors which may occur, for instance, as the result of noise pulses are automatically detected and corrected by DICNET up to a certain extent.
Wherever possible, the RS232 interface should be used only for temporary connections (e. g. for connecting a PC).

6.5 Connection examples

6.5.1 DICNET link LOCON - TERM

LOCON and TERM are connected as follows via DICNET:



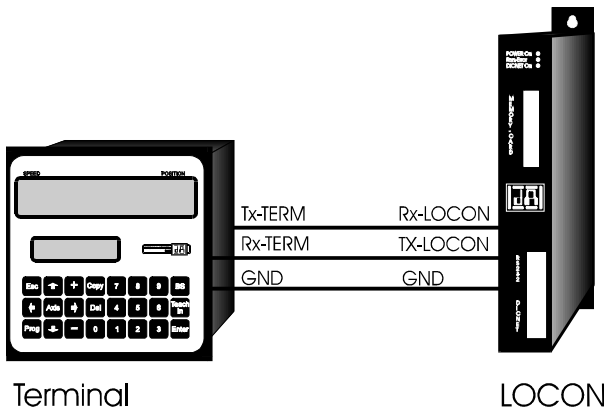
Picture 14: DICNET link terminal - LOCON

The presented devices exemplary stand for Deutschmann terminals and cam controls of the series LOCON / ROTARNOCK respectively.

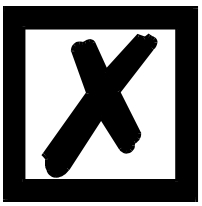
The two ground potentials do not have to be interconnected. However, you must ensure that the GND potential between the individual DICNET bus users does not differ by more than 7 V. Otherwise, equipotential bonding must be used.
The bus termination resistor must be activated on both units.
Consequently, in the case of simple wiring with a LOCON and an external operator control panel, it is the obvious choice to use the same 24 V supply for both units.

6.5.2 RS232 link LOCON - TERM

On the RS232 version, only a point-to-point connection between LOCON and the external operator control panel is possible.
In this case, the Tx LOCON line must be connected to the Rx TERM line of the operator control unit and vice versa, as can be seen from the illustration below.
The two ground potentials **must** be connected.



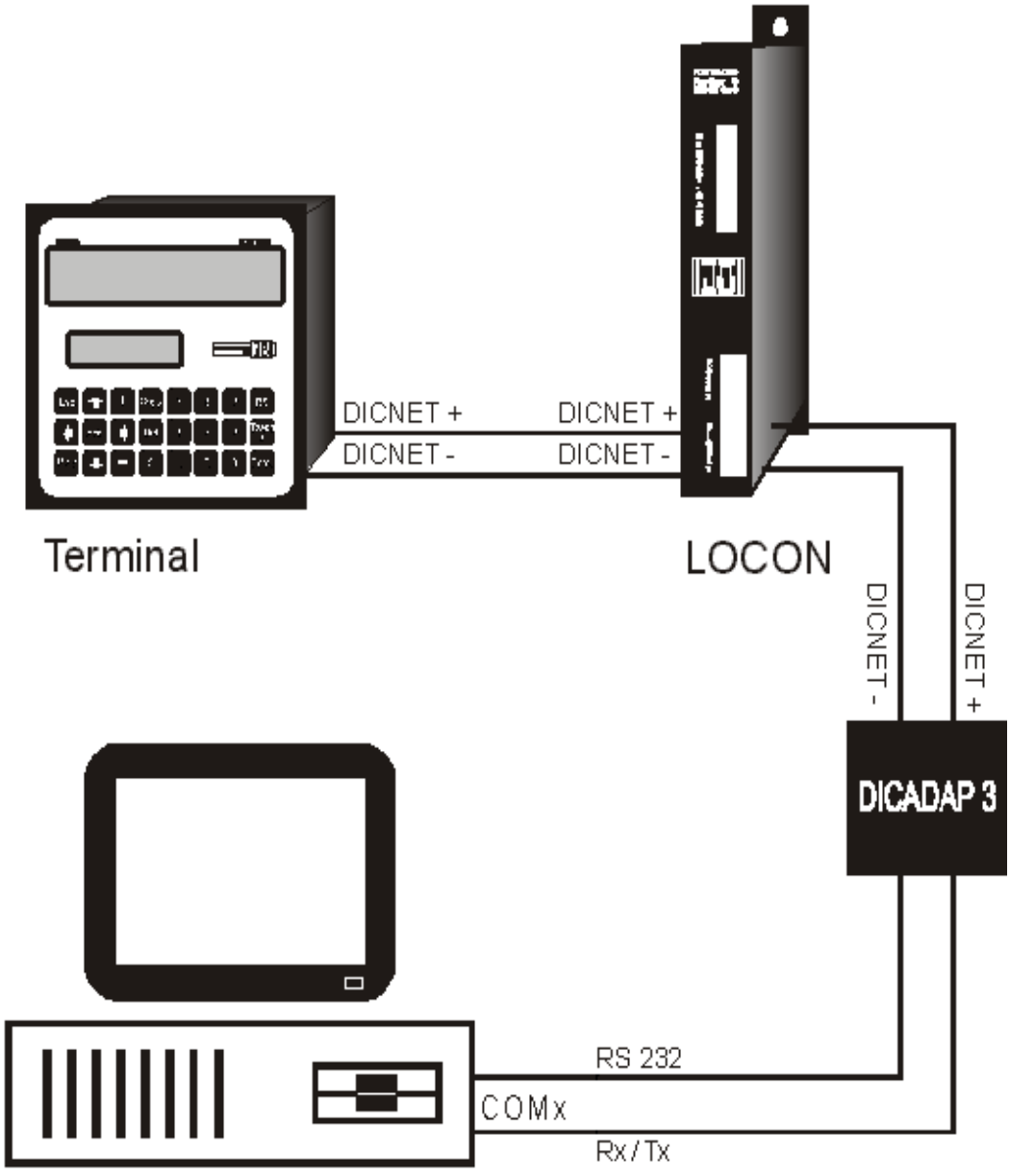
Picture 15: RS232 link Terminal - LOCON



The presented devices exemplary stand for Deutschmann terminals and cam controls of the series LOCON / ROTARNOCK respectively.

6.5.3 DICNET link LOCON - TERM - PC

A PC can be integrated in a DICNET® bus system using a DICNET adapter. The connection to the PC is made at a serial port COMx - see the illustration below.



Picture 16: Link DICNET bus to PC

The presented devices exemplary stand for Deutschmann terminals and cam controls of the series LOCON / ROTARNOCK respectively.

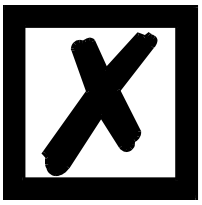
7 Configuration LOCON 32

7.1 Basics

With a software the user can configure all parameters of the cam control LOCON 32. The configuration-data together with the cam-program are deposited in the memory-card. Therefore the user's data as well as the unit's configuration can be exchanged with the exchange of the memory-card.
So in case of a possible service-assignment only the basic device LOCON 32 has to be exchanged and the memory-card has to be inserted into the new device.

There are two different ways to configure the device:

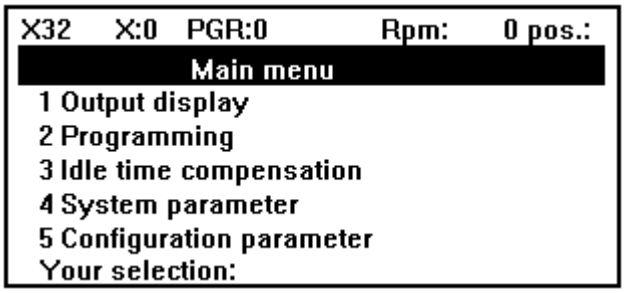
1) Configuration via the installed operation front (not at PM)
2) Configuration via an external operation unit



A configuration change is only possible, if the "ProgEnable"-input is wired up with 24V!

7.2 Configuration via the installed operation front

After switching on the unit the following menu appears on the LCD-display:

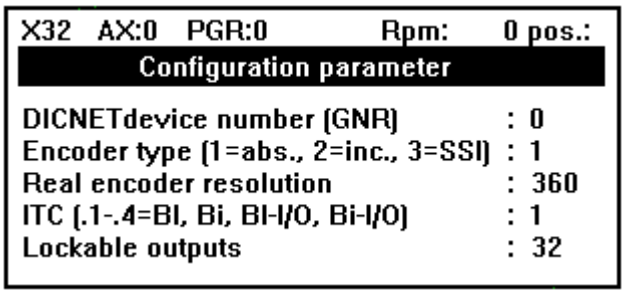


A distinction between configuration parameters which define the device's fundamental mode of operation and which are normally determined once a time, and the system parameters which are defined relative to the machine takes place.

7.2.1 Configuration parameter

In the main menu the configuration menu is selected by the input of the number "5".

The following menu appears:

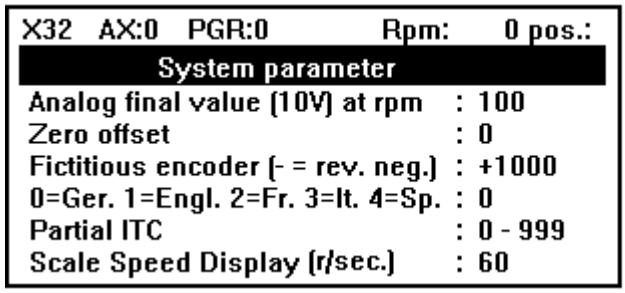


With the help of the cursor-keys the parameter which is to be changed can be selected and changed correspondingly.
Description and value ranges of the single parameters can be taken from the chapter "Parameter description".
As soon as all changes have been carried out, the menu is left with "ESC", whereupon an automatic new start of the device is carried out to take over the new configuration.

Only competent personnel is allowed to carry out the configuration of the instrument, as it might change the device's mode of operation completely.
Prior to the configuration a general deletion must be carried out to prevent plausibility errors during the self-test that might be resulting.

7.2.2 System parameters

The system parameter menu is selected in the main menu by the input of number "4".
After the user-number was queried (see chapter "Programming release (user-number)") the following menu appears:



(Opt. Analog)

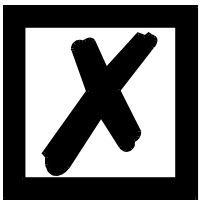
(Only at inc.)

With the help of the cursor-keys the parameter which is to be changed can be selected and changed correspondingly.
Description and value ranges of the single parameters can be taken from the chapter "Description of parameters".

As soon as all parameters has been set as desired, the menu is left with Esc and a return to the main menu takes place.

7.3 Configuration with TERM 5/6

To get to the configuration menu, the key + has to be pressed at least 3 seconds in the normal mode (see chapter "Definitions of the manual TERM 5").
The LEDs "Zero" and "Function" light together to mark the configuration menu.



During the configuration the output are not updated!

Now it is possible to display and change the 16 parameters described in the following "Parameter table".
The parameter-number is displayed by the output-LEDs (1..16), the corresponding value in the right four positions of the seven-segment display (0..9999). The left position of the display states the number of LOCON 32, that is configured then.

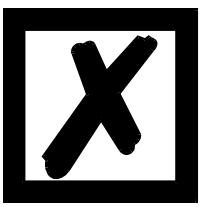
By pressing the key + and − the described parameter number can be selected.
If the parameter, that is supposed to be changed, brought to the display, a change to the programming mode can be made by pressing the key Enter (long) for three seconds.
Then the LEDs "Prg.Mode", "Zero" and "Function" flash.

Now the desired value can be set with the keys + and −.

If the new value is presented on the display, it is stored by pressing the key Enter, provided that it is an approved value (see table). Otherwise the previous value is presented on the display again.

If the set value should be rejected and the old parameter should be restored, this is made by a break-off with the key Esc.

After leaving the programming mode by pressing Enter or Esc, the operator is in the display mode of the configuration menu again.
Further parameters can be changed in the same way.
If all parameters are correctly adjusted, the configuration menu can be completely left by pressing the key Esc.



An automatic restart of the LOCON 32 takes place, in order to initialize the new parameters correctly!

7.3.1 Parameter table

No.	Name	Default	Value range
1	Reversal of rotation	0	0 = normal, 1= inverted
2	Encoder resolution (only incremental)	500	2 .. 8192
3	Partial ITC (start value)	0	0 .. encoder resolution - 1
4	Partial ITC (end value)	Max	0 .. encoder resolution - 1
5	General deletion cams	0	0 = -, 1 = general deletion
6	Reserve		
7	Factor speed display	60	0 .. 9999 (r./sec.)
8	Reserve		
9	Fictitious encoder value	1000	2..65535
10	Encoder type	1	1 = absolute, 2 = incremental, 3 = SSI
11	Encoder resolution (absolute)	1000	256, 360, 1000, 1024, 2048, 4096, 8192
	Counting area (incremental)	8192	1 .. 8192
12	Analog - end value (rpm)	100	1 .. 9999
13	Idle time compensation (detailed description see annex)	1	1 = block, 2 = bit, 3 = block-in-out 11-13 = time-dependent ITC 21-23 = direct ITC (without dynamic brake)
14	Locked outputs	32	0 .. 32
15	Reserve		
16	Device-ID for DICNET®	0	0 .. 15

7.4 Parameter description

7.4.1 Reversal of rotation

The direction of rotation of the connected absolute encoder (parallel, incremental or SSI) can be inverted with this parameter.
If the configuration is carried out via the LCD-display, then the reversal of rotation happens through the key "±" in the line “Fictitious encoder value“.

7.4.2 Partial idle time compensation

Partial idle time compensation means that the speed measurement which builds the basis for the ITC, is not realized on the whole encoder field, but only on a part of it.
With it also cams can be shifted dynamically on processes, that do not run with a constant speed on the whole rotation.

The programming of the partial idle time compensation is described in the chapter "Configuration LOCON 32".
With the parameters "start value partial ITC“ and "end value partial ITC" the range is determined, through which the speed determination is carried out.
Values between 0 and encoder resolution -1 can be entered.

7.4.3 General deletion

With this parameter it is possible to completely delete all operator-data (cams and idle times) and the configuration of the LOCON 32 can be set back to its original set in factory. For this purpose it becomes necessary to determine 1 as a parameter which is automatically reset to 0 after deletion.
This parameter is only available in connection with TERM 5.

A general deletion with the integrated operation front is carried out from the main menu (see chapter "Programming LOCON 32 - General deletion“).

7.4.4 Encoder type

With this parameter the encoder type is determined. At the time the following encoders are supported:

1 = Gray-absolute encoder (parallel) 24V (max. 12 bit = 4096)
2 = Incremental encoder 24V (max. resolution 8192)
3 = Gray-SSI-singleturn-absolute encoder (SSI specification see annex)
4 = Timer (the device acts like an incremental cam control, where the position counter is not changed by external pulses, but by an internal time basis. The time basis is determined by the parameter “Encoder resolution“ (see below).

7.4.5 Encoder resolution

With this parameter the resolution (inf./rev.) of the encoder is determined.

The following absolute encoders are supported (only gray-code):

Parallel: 360 (lopped), 1000 (lopped), 256, 512, 1024, 2048 and 4096
SSI: 360 (lopped), 1000 (lopped), 256, 512, 1024, 2048 and 4096

At the encoder type „Timer“ the internal time basis is defined at this point, where a range of 1..65535ms is allowed.
For incremental encoders every resolution up to 8192 inf./rev. is supported at present.
For incremental encoders it is possible to define a maximum counter range additionally, as described in the next chapter.

7.4.6 Counting area (for incremental encoders only)

By default a counter-overflow at 8192 happens when using an incremental encoder, that means after a counter reading of 8192 it is counted to 0000, provided that no external clear-signal occurred before. This counting area can be adjusted from 2..8192 with this parameter.

7.4.7 Kind of idle time compensation

Idle times can be programmed either blockwise, that means a set idle time is always valid for a block of 8 outputs or bitwise, whereas it is possible to select different switch-on and switch-off delay periods at blockwise ITC.

The adjustment takes place through the following values:

1 (11, 21) = blockwise idle time compensation
2 (12, 22) = bitwise idle time compensation
3 (13, 23) = blockwise idle time compensation with separate switch-on and switch-off times

The values 1 - 3 apply to a path-dependent idle time compensation (standard), 11 - 13 to a time-dependent and 21 - 23 to a direct idle time compensation.
A detailed description of the function idle time compensation can be found in the chapter “Operation mode of the idle time compensation“.

7.4.8 Lockable outputs

In the normal case the programming of LOCON 32 is only possible, if the pin "ProgRelease" is connected with 24 Volt (see chapter "Programming release (User-number)").
For applications that require the transfer of simple programming functions to the operator, it is possible to allow the programming for special outputs, even though the pin "ProgEnable" is not connected with 24 Volt.
It can be specified, how many of the 32 outputs are lockable by means of this parameter. Then the upper "n" outputs can only be programmed in connection with "ProgEnable", the remaining outputs are open. If, for instance, the parameter is set to 10, the outputs 1 to 22 can always be programmed, the outputs 23 to 32 only, if the pin "ProgEnable" is connected with 24 Volt.

A special case is the parameterization with 0, as no output is locked any more. In that case the LOCON 32 acts exactly as if the „ProgEnable“-input was connected with 24V, however, the configuration can not be changed.

7.4.9 DICNET-device number (GNR)

When working with the RS232-interface this parameter is without any meaning.
The device number with which LOCON 32 logs on the DICNET-bus and with which it is addressed by WINLOC or communicates with TERM 4, is adjustable with this parameter.
A value between 0 and 15 can be selected, 0 is entered as default.
This parameter is insignificant if the RS232-interface is used.

7.4.10 Menu - Language selection

In connection with the integrated operation front it is possible to select the menu-language with this parameter.
The following assignment applies:

0	=	German (default)	5	=	Flemish
1	=	English	6	=	Dutch
2	=	French	7	=	Swedish
3	=	Italian	8	=	Finnish
4	=	Spanish	9	=	Danish

7.4.11 Zero offset (only with absolute encoders)

The zero offset or zero-point-correction is used to synchronize the mechanical zero-point of a machine with the zero-point of an absolute encoder. It makes it possible that the encoder can be installed in every position; the mechanical zero-point of the machine does not have to correspond with the zero-point of the encoder.
The programmed value of the zero offset is deducted by LOCON 32 from the actual encoder-value; that means if the absolute encoder provides the 100 as a position and a zero offset of 10 is programmed, LOCON 32 processes the value as if position 90 was read in.
If a shift to higher values is supposed to happen, the value that is to be shifted has to be deducted from the encoder resolution and it has to be input as zero offset. If in the example above the position 110 is to be processed and an encoder with 1000 inf./rev. is connected, a correction factor of 990 (1000-10) has to be entered.
As in practice in most cases a zero offset takes place at the zero point of the machine, it is sufficient to enter the displayed item value as correction factor.

If LOCON 32 is operated with an incremental encoder, the zero point correction is not applicable.

7.4.12 Scaling for speed indication

With this parameter the speed indication can be adjusted to the given application. A scaling ranking from 0...9999 rev./sec. is possible.
As a default a value of 60 is preset; that means the speed is indicated in rev./min.

7.4.13 Analog output - end value

The)optional) analog output always provides a voltage between 0V and 10V, that is proportional to the speed.
With it 0V corresponds to the speed 0, an offset can not be programmed. The upper speed limit, from which 10V are given, can be configured as desired through this parameter from 0 to 9999. The unit of this parameter is determined by the parameter “Scaling of the speed indication“ (see above), that means, if the speed is indicated in rev./min., then the analog-end value also refers to rev./min.
By standard a speed of 100 rev./min. as analog-end value is set, which means, that at a speed that equals or exceeds 100 rev./min., 10V are issued, in case of 50 rev./min., 5V are issued.

7.4.14 Fictitious encoder value (gear factor)

Regardless of the resolution of the actually connected encoder, a “fictitious encoder value“ can be programmed, with which an electronic gear can be realized. If, for instance, an encoder with a real resolution of 360 increments per revolution is used, and the complete revolution corresponds to a process distance of 1000mm, then a “fictitious revolution“ of 1000 increments has to be entered, in order to carry out the programming of the cam control in “mm“.
At LOCON 32 the unit of the position display in the LCD-display (in the example “mm“) can be programmed as desired in the parameter menu by switching with “ALPHA“ and the subsequent input of letters. With it a maximum of three letters is possible, from which the first one is always represented as capital letter.
Please note, that the input and display always has to be in integer from. A decimal presentation is not possible. For results with a remainder that exceeds 0.5, it is rounded up to the next higher number.

8 Configuration LOCON 32-4X

8.1 Basics

With a software the user can configure all parameters of the cam control LOCON 32-4X. The configuration-data together with the cam-program are deposited in the memory-card. Therefore the user's data as well as the unit's configuration can be exchanged with the exchange of the memory-card.
So in case of a possible service-assignment only the basic device LOCON 32-4X has to be exchanged and the memory-card has to be inserted into the new device.

There are two different ways to configure the device:

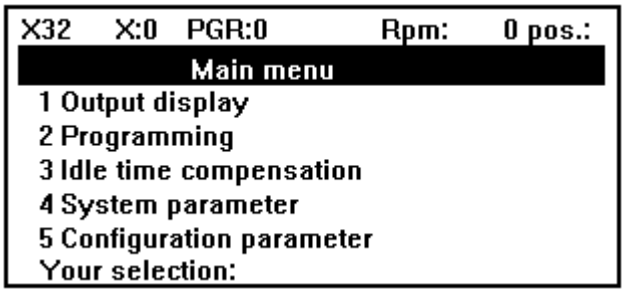
1) Configuration via the installed operation front (not at PM)
2) Configuration via an external operation unit

A configuration change is only possible, if the "ProgEnable"-input is wired up with 24V!

Following please find a more detailed description of the differentiation between the two different main menus for single-axis- and multiple-axis operation for LOCON 32-4X.

8.2 Configuration via the integrated operation front for axis 0

After switching on the unit the following menu appears on the LCD-display:

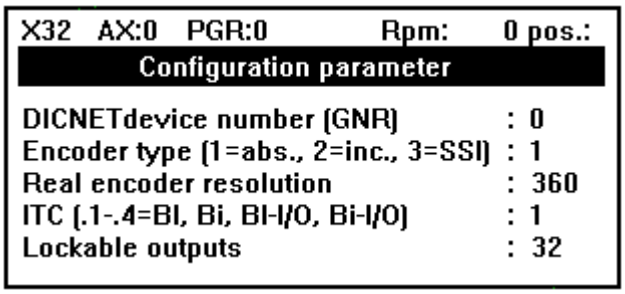


A distinction between configuration parameters which define the device's fundamental mode of operation and which are normally determined once a time, and the system parameters which are defined relative to the machine takes place.

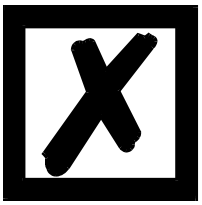
8.2.1 Configuration parameters

In the main menu the configuration menu is selected by the input of the number "5".

The following menu appears:



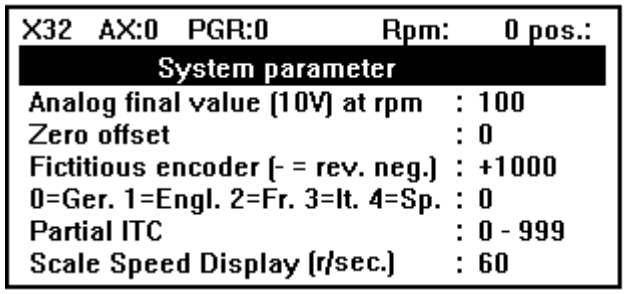
With the help of the cursor-keys the parameter which is to be changed can be selected and changed correspondingly.
Description and value ranges of the single parameters can be taken from the chapter "Parameter description".
As soon as all changes have been carried out, the menu is left with "ESC", whereupon an automatic new start of the device is carried out to take over the new configuration.



Only competent personnel is allowed to carry out the configuration of the instrument, as it might change the device's mode of operation completely.
Prior to the configuration a general deletion must be carried out to prevent plausibility errors during the self-test that might be resulting.

8.2.2 System parameters

The system parameter menu is selected in the main menu by the input of number "4".
After the user-number was queried (see chapter "Programming release (user-number)") the following menu appears:



(Opt. Analog)

(Only at inc.)

With the help of the cursor-keys the parameter which is to be changed can be selected and changed correspondingly.
Description and value ranges of the single parameters can be taken from the chapter "Description of parameters".
As soon as all parameters has been set as desired, the menu is left with "ESC" and a return to the main menu takes place.

8.3 Configuration via the installed operation front for the axes 1-3

For the axes 1 - 3 only the axis-specific parameters are indicated on the display, as at the 4-axis device the general parameters (e. g. menu language) are specified together with the axis 0.

8.3.1 Configuration parameter axis 1 - 3

As configuration parameter for the axes 1 - 3 only the encoder resolution is available.
The allowed values can be taken from the chapter “Parameter description“.

8.3.2 System parameter axis 1 - 3

Only in the SSI-4-axis version system parameters are available for the axes 1 - 3.
For each axis it is possible to define its own zero offset.

8.4 Parameter description LOCON 32-4X

8.4.1 Idle time compensation

As stated in the technical data in the annex, LOCON 32-4X always operates with bitwise idle time compensation on the axis 0 and on the axes 1 - 3 it always operates with blockwise idle time compensation.
This setting can not be changed!

8.4.2 Parameter description axis 0

The parameters of the axis 0 are identical to those of the single-axis device LOCON 32 and can be read up in the previous chapter "Configuration LOCON 32".

8.4.3 Parameter description axis 1 - 3

At this point once again a differentiation between incremental and absolute (SSI) 4-axis devices has to be made.

Incremental:

Encoder resolution	2..8192	Default: 500
Counting area	8192 (fixed)	Default: 8192

Absolute-SSI:

Encoder resolution	256, 360, 512, 1000, 1024, 2048, 4096, 8192	Default: 360
Zero offset	0..encoder resolution-1	Default: 0

9 Programming LOCON 32

9.1 Basics

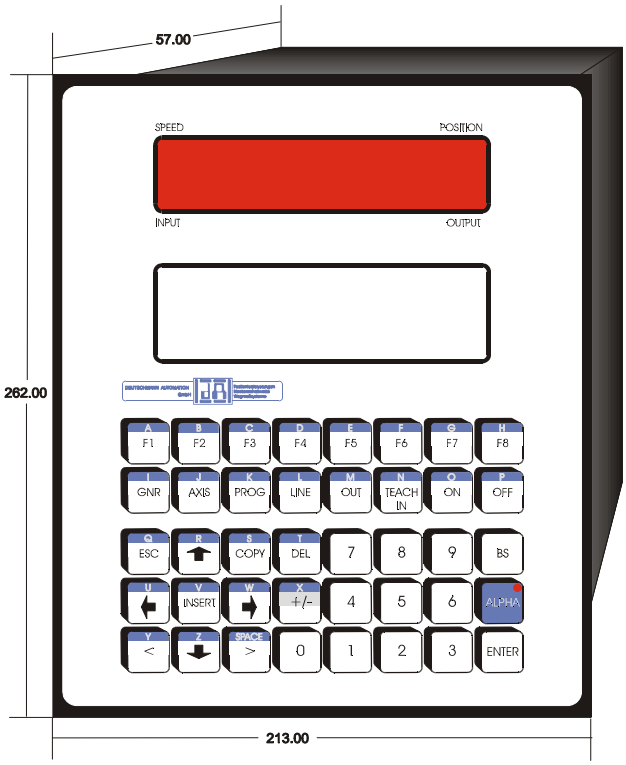
There are three possibilities to program LOCON 32:

- Input of data via the integrated operation front
- Input via the external operation unit
- Programming of LOCON offline on a PC with a subsequent download of the program via a serial interface
- Via a Fieldbus by using a Fieldbus Gateway

At this point the offline programming is not described more detailed, as it can be taken from the separate program description “WINLOC“.

The two ways of programming is elaborated on in the following chapters.

In general a complete programming of the LOCON 32 is possible by means of the keys and the 7-segment display.



Picture 17: LOCON 32

9.1.1 Programming release (user protection)

To protect LOCON 32 from unauthorized operation the following four-stage programming backup exists, that is also summarized in a table:

1. All parameters (including the device configuration) can be changed, if the "ProgEnable"-input is wired with 24V.
   In this case the user number (password) is not queried when selecting the single menus.
   The “ProgEnable“-input should only be connected with 24V when the device is put into operation, as with it a lot of manipulations at the LOCON 32 are possible. Alternatively this input can connected with 24V by means of a key-switch.

2. All parameters except the device configuration can be changed, if the parameter "Lockable outputs" is set to 0 in the configuration menu.
   The user number is not queried when selecting the different menus.

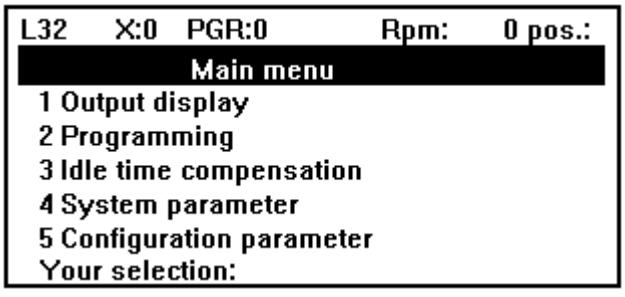
3. Only certain outputs (cam tracks) can be changed, if the parameter "Lockable outputs" (see also corresponding chapter in the parameter description) is programmed between 1 and 31.
   Changes of the configuration- and system-parameters are not possible, but they can be read out.
   The user number is queried when selecting the menus.

4. None of the parameters can be changed, if "Lockable outputs" is set to 32, however, it is possible to read out all parameters.
   The only allowed action is the change of the active program (see chapter "Change of the active program via keys").
   Anyway the user name is queried.

ProgEnable Lockable outputs	24 V 0..32	0V 0	0V 1..31	0 V32
Menu 1 (program selection)	change	change	change	change
Menu 2 (programming)	change	change	change/read	read
Menu 3 (idle time compensation)	change	change	change/read	read
Menu 4 (system parameter)	change	change	read	read
Menu 5 (device configuration)	change	read	read	read
User-number query	no	yes		yes

9.2 Programming via the integrated operation front

The programming by means of the integrated operation front always starts from the main menu (see picture) by selecting the corresponding sub menu.



For fuse protection against unauthorized operation the menus except for the output-display are secured by an user number.
If the user number is entered correctly after request, the selected menu is presented, otherwise a return to the main menu follows.
The user number is defined in the annex.

9.2.1 Menu output-display

In this menu the programming of all 32 outputs is shown in a drawing from "encoder position -20" to "encoder position +20" at the same time.
Further in this menu a change of the performed program is possible, as described in the following chapter.

The menu output-display can also be left with 

.

9.2.2 Change of the active program with the keys

To change the active program in the menu "Output-display" the key 

is pressed. After the correct input of the user number (see chapter "User number") the program number, which is now shown inversely, can be changed.

The real execution of the new program starts after quitting with 

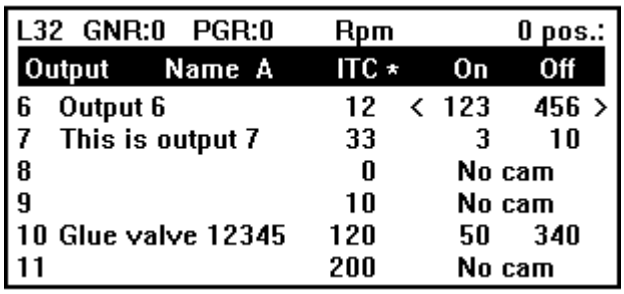
.

The input can be broken off by 

at any time.

9.2.3 Menu programming LOCON 32 / LOCON 32-PM

The following picture is presented on the LCD-display:



On principle the menu-point is a screen-based editor as all parameters (fields) can be reached and changed with the cursor keys.
The following parameters can be changed or entered:

- Program, which is to by processed
- Output, which is to be processed
- Name of the outputs (valid for all programs)
- Idle time compensation of the selected program and output
- Switch-on- and switch-off-points of the selected program and output

Generally the following key-functions are valid:

: Breaking off of the function just carried out

: Ending of the function just carried out and taking over of the value

: To increase the actual value by 1

: To decrease the actual value by 1

: To take over the encoder position as the actual value

: To dial the program, which is to be processed

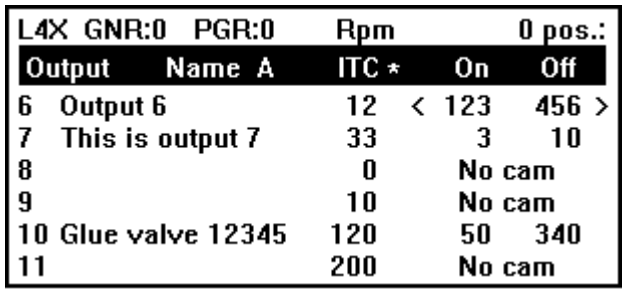
: To dial the output, which is to be processed

: To dial the switch-on point

: To delete an actual parameter

9.2.4 Menu programming LOCON 32-4X / LOCON 32-PM-4X

The following picture is presented on the LCD-display:



The programming is identical to the programming of LOCON 32, the axis is selected with the key 

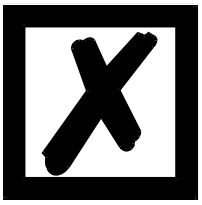
. After pressing 

the cursor goes to the actual axis. The value is presented inversely. After entering the new axis-number and confirming with 

the values of the selected axis are displayed.

9.2.4.1 Selecting a program

By pressing the key PROG the current program number is switched inversely in the status line. Now a new program number can be entered. After confirming with ENTER the new program number is taken over, and all further inputs refer to the new program. By pressing ESC the program-input can be broken off and the old program number is retained.



The selected program number only refers to the programming. The "active program" is carried out furthermore. It can be changed in the menu "Output-display".

9.2.4.2 Copying a program

If the selected program is to be copied, the key COPY has to be pressed after pressing PROG. Then the program number, to which the program is to be copied, is queried.

The copy-process is started with ENTER, with ESC a breaking off is possible.

All cams and idle times are copied.

9.2.4.3 Deleting a program

If the selected program is to be deleted completely, the key-sequence PROG DEL must be entered.

If the following security query is confirmed with ENTER, a complete deletion follows, ESC breaks off the deletion process.

9.2.4.4 Selecting an output

By pressing the key OUT or positioning the cursor the output number of the actual line is switched inversely and can be changed.

ENTER has to be pressed for confirmation, ESC breaks off the process.

9.2.4.5 Copying an output

All cams and the idle time of an output can be copied into another output with the key COPY.

For that the output number of the output which is to be copied must be switched inversely (see above); the number of the target-output is queried.

9.2.4.6 Deleting an output

All cams of an output can be deleted completely with the key 

, if the corresponding output-number is switched inversely (see above).

9.2.4.7 Shifting cam tracks

If all cams of the selected output are to be shifted, the key 

has to be pressed.

The amount of increments that are to be shifted is queried afterwards. When shifting to lower cam values (to the left), the value that is to entered, is calculated by "Encoder resolution - increments to be shifted". If, for instance, on a encoder with 1000 inc. a shift to the left is supposed to be carried out, 990 (1000 - 10) has to be entered.

9.2.4.8 Changing output names

With the cursor keys the field output name can be selected. If this field is activated, the output name is inversely presented and can be changed.
The entered name has maximum 17 signs and is valid for all programs.
It must be considered that before the letters are entered a corresponding conversion with the key 

is necessary. This conversion can be identified by a flashing log right down on the LCD-display and remains active until the output-name-field is left.

9.2.4.9 Changing the idle time compensation

As in the menu "Idle time compensation" the idle time compensation of the selected output and program can be changed at this point. To do so, the desired idle time is activated with the cursor keys (value appears inversely) and can then be changed.

In contrast to the others parameters the idle time is directly processed (without entering 

), if the just programmed program corresponds to the active program and the idle time change is carried out with the keys 

or 

. Therefore it is possible to adapt the idle time with the machine running.

If a block-wise idle time with separate switch-on- and switch-off-points is selected, at this point only the switch-on-point is changed. (See chapter “Menu idle time compensation“)

9.2.4.10 Completing, deleting or changing cams

If cams are to be entered or changed, the corresponding input field can be selected either with the help of the cursor keys or directly with the key 

.

The program also stays that way after entering a cam in that mode, so that, if required, several cams can be programmed and changed in series. A change to the field ITC can be made with the key Q ESC.

If more than one cam is programmed on one output, Y < appears in the corresponding line, if cams with higher switch-on-points are programmed, SPACE > appears if cams with lower switch-on-points are programmed.
A concentration of overlapping cams does not happen, however, a solid cam is shown on the LCD-display by "HIGH", and it can only be removed by deleting the complete output.

If one cam is to be deleted, the switch-on-point must be set like the switch-off-point, or the key T DEL has to be pressed after positioning on the switch-on-point.

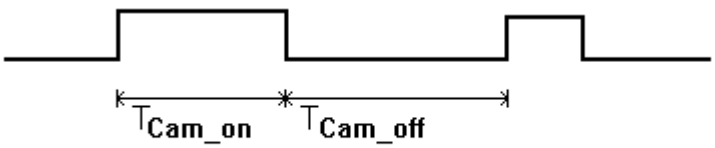
It is not allowed to program two cams with the same switch-on-point on one output!

9.2.5 Menu Idle time compensation

In this menu all idle times (if necessary switch-on- and switch-off-point) are presented according to the selected type of idle time (bit- or block wise) at the same time and can be changed.
For that the cursor is adjusted to the appropriate idle time and is changed with the ten-keyboard or the keys Y < and SPACE >.

If a correction is made with Y < and SPACE > the displayed time will become active at the outputs directly, as far as the current program is identical to the active program. Therefore an idle time correction can be carried out in a simple way with the machine running.

With separate switch-on- and switch-off-idle times it is very important that the difference between switch-on-idle time and switch-off-idle time does never exceed one of the times T_{Cam_On} or T_{Cam_Off} (see below), as otherwise a not foreseeable output-behavior might appear!
The cycle-time is lower than having a common switch-on- and switch-off-idle time (see technical data)!



$|ITC_{on} - ITC_{off}| < t_{cam\_off}$; $|ITC_{on} - ITC_{off}| < t_{cam\_on}$

Picture 18: Switch-on and switch-off idle time

9.2.5.1 Program-dependent idle times

Different idle times can be programmed for different programs. To reduce the programming-efforts, an idle time, which is programmed in the program 0, is regarded as a default-idle time, that is valid for all other programs, as far as it is not explicitly programmed in this program with another value.
If, for instance, in program 0 at the output 1 an idle time of 10ms and in the program at the output 1 an idle time of 20ms is programmed, the idle time of program 0 is valid as a default for all programs, only in program 1 an idle time of 20ms at the output 1 is carried out.

Idle times, set in program 0 can be changed in all other programs to any desired value except for 0ms. That means, if in program 0 an idle time is programmed, it can not be deleted in any other program, but only be changed to the minimum value of 1ms.

9.2.6 General deletion

If all programmed cams and idle times are to be deleted and the memory-card is to be newly initialized completely to the set in factory, this can be initiated with the key-sequence C, A. It must be considered that before the letters are entered a corresponding conversion with the key 

is necessary.
Then the user number is queried and after a correct input a new initialization of the device with the default-values and a subsequent warm start takes place.

The device number (ID) is preserved!

10 Operation / programming via TERM 32

The operation of a Deutschmann cam control via TERM 32 is carried out as described in the previous chapters with the following differences:

10.1 Indication of the selected participant / selected axis

Ax: 0 Selected axis (in the example 0; connected cam control)

L32 Connected device. “L“ stands for LOCON, the numbers stand for the device type.

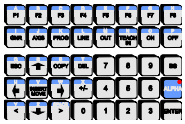
L1	=	LOCON 1
L2	=	LOCON 2
L16	=	LOCON 16
L17	=	LOCON 17
L32	=	LOCON 32, LOCON 32-PM
X32	=	LOCON 32-4X, LOCON 32-PM-4X
R 1	=	ROTARNOCK 1
R 2	=	ROTARNOCK 2
MR2	=	Multiturn-ROTARNOCK

10.2 Device-dependent parameters

In dependence on the connected device the described menus might vary a little. Furthermore some menu points are of no account, depending on the connected device.
A detailed description of the parameters can be taken from the instruction manual of the connected cam control.

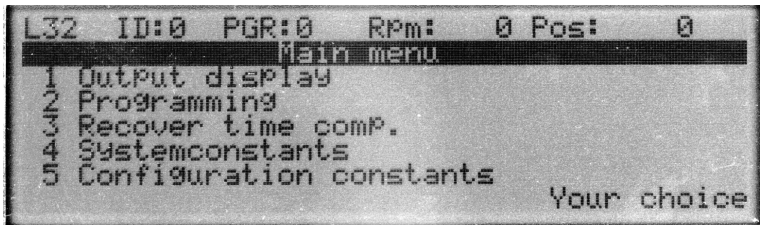
11 Brief instruction LOCON 32 / TERM 32

Key assignment



ALPHA	Switch over to Alpha mode for text entry in the field output name (Programming menu)	V INSERT MOVE	Insert or Move key
J AXIS	Selection of a different axis (TERM 32 only)	L LINE	Line select
BS	Backspace	P OFF	Select switch-off point
S COPY	Copy key	O ON	Select switch-on point
T DEL	Delete key	M OUT	Select output
ENTER	Confirm entry	K PROG	Select program
Q ESC	Abort entry Back	N TEACH IN	Save for Teach-In
I GNR	Change device number	X +/-	Change sign
U ←	Move cursor to the left	W →	Move cursor to the right
R ↑	Move cursor up	Z ↓	Move cursor down
Y <	Current value -1	SPACE >	Current value +1

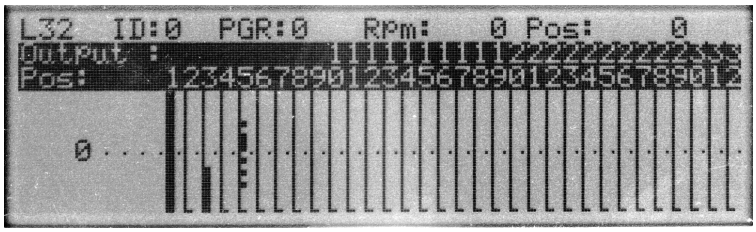
Main menu



Significance of the status line

L32	Display of device type
ID: 0	Device number / axis number
PGR: 0	Program currently being executed
RPM: 0	Current speed
Pos: 0	Current position of encoder or count value at incremental encoders or time at timer function
1 to 5	Selection of the required menu by entering the corresponding digit

Output-display

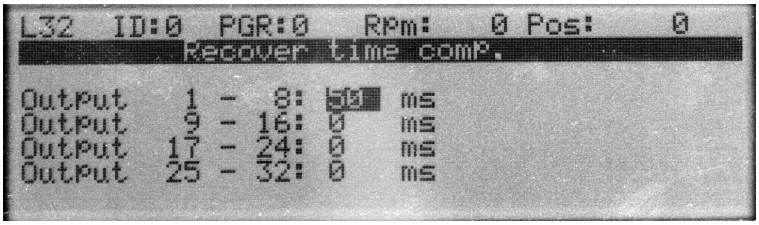


This menu item displays the cam tracks graphically.

Moreover, this menu can be used to change the program currently being executed. By pressing the key 

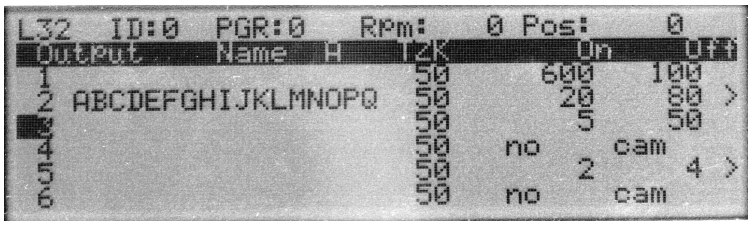
the desired program number can be entered.

Idle time compensation (ITC)



An idle time can be entered either in the Programming menu in column ITC or in this menu item. An idle time is entered in ms in the range 0 to 999. Depending on the method of idle time compensation used, the entry can be made for each output (bit-wise ITC) or for a block of 8 outputs (block-wise ITC). Moreover, it is possible to enter a separate switch-on and switch-off time depending on selected type.

Programming



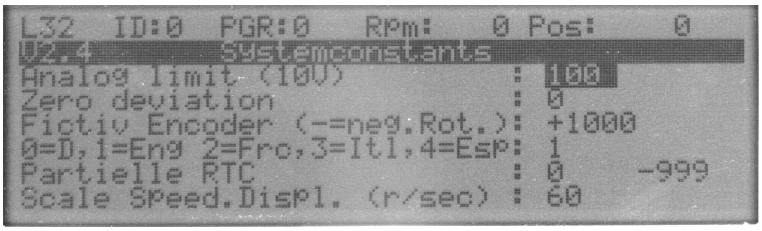
Select the individual fields with keys W U Z Z Q ESC. Press key ENTER to save new values. If you wish to discard entries, press key Q ESC. You may be prompted to enter a password, depending on the wiring of your unit.

Selection of the output	Z or R or M OUT and entry of the output number and ENTER
Entry of an output name (if supported by the connected device)	Switch to the mode with ALPHA and enter the name. Characters can be deleted with BS.
Entry of an idle time	Enter value in column ITC or press Y < SPACE > and ENTER.
Entry of cams	Move the cursor to the required output in column On. Enter the value and save it with ENTER or discard it with Q ESC. Enter the switch-off point in the same way. You can then enter another cam. Using keys U and W, you can view the individual cams. Symbols < and > indicate that there are more cams. Pressing key Q ESC moves you back. Alternatively, the machine can be moved to position and you can program the current value as switch-on or switch-off point (depending on cursor position) with N TEACH IN. Pressing keys Y < SPACE > decrements or increments switch-on or switch-off points by one increment in each case.
Deleting individual cams	Set switch on and switch-off point to same value or move cursor to switch-on point and press key T DEL.

Deleting all cams of the output	Move cursor to output number. Press T DEL and confirm that you really do wish to delete.
Copying all cams of an output	Move cursor to output number. Press S COPY and enter the number of the destination output.
Moving all cams of an output	Move cursor to output number. Press V INSERT MOVE Enter the increment by which all cams at this output are to be moved.
Selection of another program for programming	After pressing key K PROG , enter the required program number.
Deleting an entire program	Move the cursor to the status line with key K PROG . Press T DEL and confirm that you really wish to delete.
Copying an entire program	Move the cursor to the status line with key K PROG . Press S COPY and enter the destination program.

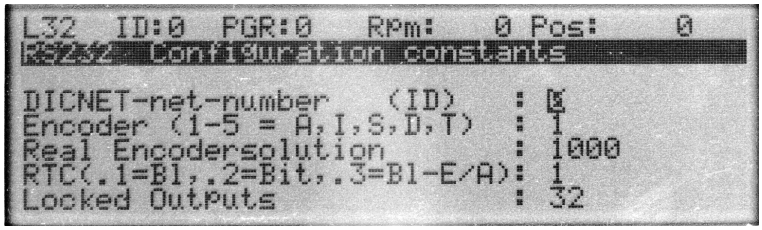
Changes in the System parameters and Configuration parameters menus require in-depth machine knowledge. Changes may lead to incorrect behavior of the machine and, under certain circumstances, even to damage. Consequently, these settings should be carried out only by specialist staff. **Depending on the particular device, it may be the case that only some of the parameters listed can be changed or that none of the parameters listed can be changed.**

System parameters



Analogue limit (10V)	This function is available only on appropriately equipped units. The rpm at which 10 V is output must be entered. There is a linear breakdown in-between.
Zero offset	Number of increments by which the zero point is to be offset.
Fictitious encoder (-= Leg. Rot.)	The actual encoder resolution may 'be scaled' by entering another value. Example: One encoder revolution corresponds to a path of 650 mm. After changing the value to 650, entire programming is carried out on the basis of unit 'mm'.
0=D, 1=Eng, 2=Frc, 3= Itl, 4=Esp 5=Fl, 6=Nl, 7=S, 8=Sf, 9=Dk	Language selection: 0=German; 1=English; 2=French; 3=Italian; 4=Spanish; 5=Flemish; 6=Dutch; 7=Swedish; 8=Finnish; 9=Danish
Partial ITC	The speed and, thus, also the idle time compensation are computed only in the entered value range.
Scale speed display (r/sec)	This value is used to scale the speed display. The default value 60 corresponds to display rpm.

Configuration parameters



DICNET device number (ID)	Defines the address of the device in a DICNET® bus
Encoder (1-5 = A, I, S, T)	Defines the type of encoder used: 1 = **A**bsolute encoder, parallel 2 = **I**ncremental encoder 3 = Absolute encoder **S**SI 5 = **T**imer function (device generates an internal time base)
Real encoder resolution	Actual resolution (number of increments/rev.) of the encoder If the device is used as a timer, this value is used to define the internal time base (1 to 65000 ms)
ITC: 1=Bl., 2=Bit., 3=Bl-E/A	Type of idle time compensation used: 1 = Block-wise idle time compensation 2 = Bit-wise idle time compensation 3 = Block-wise idle time compensation with separate switch-on/switch-off times
Lockable outputs	Number of locked outputs

12 Special versions

12.1 Angle-time cams

Optionally LOCON 32 is available as a version with angle-time cams.
This device is identical to the standard LOCON 32 except for the following differences:

- The number of outputs, that are to be programmed with angle-time cams can be configured freely from 0 to 32 by the customer. As a default, the remaining outputs are programmed with angle-angle cams.
- A bit-wise idle time compensation only is supported for all 32 outputs, regardless whether the outputs are programmed with angle-time cams or angle-angle cams.
- Outputs that are configured for angle-time cams can only be programmed with a cam in the field of 1..29999 ms. On the remaining outputs, as many cams as desired can be set.
- The cycle time for all outputs is 1ms.
- The menu "Output-display" is dropped.

12.1.1 Configuration of the number of the angle-time cams

As this device always has a bit-wise idle time compensation, the selection of the kind of ITC in the configuration menu (see chapter 7 ’Configuration LOCON 32’, on page 44) is not required. Instead of this, the following line appears at this point:

Number of angle-time outputs: 0

The default value that is adjusted after a general deletion or in the ex-works condition is 0. In this case the LOCON 32 acts like a standard LOCON 32 without angle-time cams.
At this point a value between 0 and 32 can be configured by the customer. This value is stored in the memory-card as all the other configuration parameters.
The outputs for angle-time cams are always before the outputs for angle-angle cams, i. e. if 5 outputs are configured for angle-time cams, these are always the outputs 1 to 5.

12.1.2 Programming of angle-time cams

The programming of the angle-time cams is carried out as described in chapter "Menu programming LOCON 32 / LOCON 32-PM" for an angle-angle cam.
The only difference is, that the switch-on time of the angle-time cam is entered instead of the output point. For the differentiation of angle-angle cams the time unit ’ms’ is presented in the display after the switch-on time.
The switch-on time can be changed in the 1 ms - pattern from 1 ms to 29999 ms. Only one angle-time cam can be programmed per output.

12.1.3 Deleting angle time cams

An angle-time cam can be deleted in two ways:

1. After the cursor was positioned at the switch-on point (switch-on point presented inversely), the key 

is pressed.
2. The switch-on point is set to 0ms.

12.2 Special configuration

Optionally LOCON 32 is available with a special configuration, that allows the functions, described in the subsequent subsections.
This special configuration is selected by entering the number "6" in the main menu.

12.3 Protocol function

Through the following line of the special configuration, the protocol function can be switched on or switched off:

Protocol (0 = Off 1 = On): 0

After a general deletion or in the ex-works condition, the function is switched off. The protocol function can be activated by the user by entering a 1, provided that the LOCON 32 is equipped with a 16k memory card. Otherwise a corresponding error report is presented.
The state of this function is stored in the memory card and is therefore still available after switching off.

All changes carried out by the user (changing cams, programming idle times,...) are stored in a ring buffer of 340 entries together with a time stamp, if the protocol function is activated. Beyond it, all occurring errors are logged.
The time stamp either consists of the time period that past since the LOCON 32 was switched on the last time or of an absolute date-time indication, in case a real-time-clock-module is installed or the absolute time was transferred from a connected PC.
If more than 340 entries are logged, always the oldest entry is overwritten.

The stored data can be read out via a PC that is either connected at the RS232- of the DICNET®-interface.

12.4 Encoder monitoring

The encoder monitoring can be switched on or switched off through the following line of the special configuration:

Encoder test (0 = Off, 1 = On): 0

If this function is activated, the LOCON 32 checks every time the encoder is read in, whether the current read in value deviates for more than 1 increment from the preceding value. Should this be the case, it results in a corresponding error report and the current as well as the last encoder value is presented on the LCD-display.

Failures on the encoder wire or cable defects can certainly be detected with this function.

It has to be considered that activating this function may result in a corruption of the speed calculation and with it the idle time compensation, when it comes to high speeds, as the encoder monitoring requires a considerable CPU time of the processor.
For this reason this function is always off after the LOCON 32 is switched on, that means, starting this function is not stored in the memory card.

Further it has to be considered that when the specified maximum speed is exceeded, the corresponding error can also be presented, as in this case it can not be guaranteed that every encoder position is registered.
The maximum speed is calculated from the cycle time as follows:

$$\textbf{Max. speed [rpm]} = \frac{\textbf{60,000,000}}{\textbf{Cycle time [µs] x encoder resolution [increment]}}$$

12.5 Standstill disconnection

The standstill disconnection can be configured through the following line of the special configuration:

Output-disconnection threshold: 0

After a general deletion or in the ex-works condition, the threshold is configured to 0, that means, the outputs are always active.
At this point the user can enter a value between 0 and 9999. If the adjusted threshold is higher than, all outputs are switched off, if the presented speed falls below the value that had been entered here. The other way round, the outputs will be activated again, if the threshold speed is exceeded.
The input of 0 deactivates this function.

Here it has to be considered that the scaling of the speed display is also taken into consideration in the menu „System parameters“, that means, if a display is parameterized in rpm there, the input of the threshold value also occurs in rpm.

13 Commissioning and self-test

13.1 Commissioning of the terminal

Please follow the procedure below when commissioning the terminal:

1) Connect the terminal to the required cam control
2) Connect the 24 V supply voltage

The terminal now conducts the self-test described in the following chapter, checks whether a user with the No. in accordance with the DIP switch setting is connected and then establishes the connection (provided this user is present).
The duration of the power-up phase, until the unit is ready for operation, depends on the number of network users and may take up to 10 seconds.

You will see message "not present" if no user is found with the set No.

13.1.1 Self-test of the terminal

After power-up of the terminal, the terminal conducts a self-test which takes a few seconds. The unit is then ready for operation.

The following tests are conducted during the self-test:

- Test of the entire RAM area or defective memory addresses
- Checksum test of the EPROM
- Display test; all output indicators light

Should errors occur during the self-test, these are displayed on the display if possible (see chapter "Error messages").

13.2 Commissioning of the cam control

The commissioning procedure for the LOCON is as follows:

1) Connection of the encoder
2) Connection of the "ProgEnable" input if programming is to be allowed
3) Connection of the external program selection if required
4) Connection of the status signals if an incremental encoder is used
5) Connection of the outputs used
6) Connection of the serial interface, if required
7) Connection of the 24 V power supply

The LOCON now conducts the self-test described in the following chapter, then generates the cam tables, after which it is ready for operation, i.e. the program last active (the last time the system was powered down) is executed.
The duration of the power-up phase until the unit is ready for operation depends on the number of programmed cams and may take up to 10 seconds.
A status message together with the software version information is displayed on any optionally connected PC.

If any error conditions which LOCON can detect itself have occurred, a corresponding error number is displayed. Please refer to chapter "Error messages" for the significance of this number and the actions required.
Moreover, the optional Run-Control relay remains in dropped-out condition and the corresponding status LED "Run Error" lights.

13.2.1 Self-test of the cam control

After power-up of the LOCON, the LOCON conducts a self-test which takes a few seconds.
The unit is then ready for operation.

The following tests are conducted during this self-test:

- Test the entire RAM area for defective memory addresses
- Checksum test of the EPROM
- Checksum and plausibility test of the EEROM
- Plausibility test of the cam program

Should errors occur during the self-test, these are represented on the display if possible (see chapter "Error messages").

14 Technical data

14.1 Technical data LOCON 32 / LOCON 32-PM

Characters	Basic equipment	Option
Operating voltage	24 Volt DC 20%, max. 12 W	
Data protection	EEPROM-card (at least 100 years); no battery	Via WINLOC
Programs	128 (external selection)	
Number of cams	896 cams, optionally distributable to channels and programs cams are interchangeable linewise	1920 cams, optionally distributable to channels and programs
Zero-point offset	Programmable over the entire range	Angle-time cams
Position recording	Absolute parallel up to 4096 incremental up to 8192 (25 kHz) internal time base (1..65535 ms)	Absolute SSI up to 4096 (+50µs cycle time)
Encoder voltage	24 volt	Online encoder monitoring
Outputs	32, short-circuit proof, plus-switching 24 volt/0.3A (max. 1A/8 outputs) floating run-control	Analog output
Inputs	12 inputs for encoder signals 7 inputs for program selection 1 input program start 1 input program enable	
Idle time compensation (ITC)	0 ... 999ms (partial, bit- or blockwise)	
Cycle time	< 250µs (blockwise ITC) < 300µs (blockwise, on-off ITC) < 500µs (bitwise ITC)	
Programming	Via integrated operating front	Offline via PC via external operating front
Display	Encoder position and rotational speed status of the inputs and outputs	Protocol function
Interface	RS232 or 485 (DICNET)	Interbus-S
Installation	Frontplate installation	On mounting plate (PM-version)
Type of protection	Frontplate IP65	
Dimensions	213 x 262 x 57 mm (WxHxD)	43 x 240 x 190 mm (WxHxD)
Switcheroo opening	195 x 246 (WxH)	

14.2 Technical data LOCON 32-4X / LOCON 32-PM

Characters	Basic equipment	Option
Operating voltage	24 Volt DC 20%, max. 12 W	
Data protection	EEPROM-card (at least 100 years); no battery	Via WINLOC
Programs	128 (external selection)	
Number of cams	896 cams, optionally distributable to channels and programs cams are interchangeable linewise	1920 cams, optionally distributable to channels and programs
Zero-point offset	Programmable over the entire range	
Position recording **Axis 0** **Axes 1 - 3**	Absolute parallel up to 4096 incremental up to 8192 (25 kHz) incremental up to 8192 (10 kHz)	Absolute SSI up to 4096 x 4096
Encoder voltage	24 volt	
Outputs	8 per axis, short-circuit proof, plus-switching 24 volt/0.3A (max. 1A/8 outputs) floating run-control	Analog output
Inputs	12 inputs for encoder signals 7 inputs for program selection 1 input program start 1 input program enable	
Idle time compensation (ITC)	0 ... 999ms partial bit- or blockwise	
Cycle time	< 1ms	
Programming	Via integrated operating front	Offline via PC via external operating front
Display	Encoder position and rotational speed status of the inputs and outputs	Protocol function
Interface	RS232 or 485 (DICNET)	Interbus-S
Installation	Frontplate installation	On mounting plate (PM-version)
Type of protection	Frontplate IP65	
Dimensions	213 x 262 x 57 mm (WxHxD)	43 x 240 x 190 mm (WxHxD)
Switch gear opening	195 x 246 (WxH)	

14.3 Technical data TERM 5/6

Characters	TERM 5	TERM 6
Device type	**Display unit**	**Display- and operating unit**
Connection to	LOCON 1/2 LOCON 7 LOCON 9 LOCON 16/17 LOCON 32/32PM ROTARNOCK 1/2	LOCON 1/2 LOCON 7 LOCON 9 LOCON 16/17 LOCON 24 LOCON 32/32PM LOCON 32-HC-4X-INK/32PM-4X-INK LOCON 32-HC-4X-ABS/32PM-4X-ABS LOCON 48 LOCON 64 ROTARNOCK 1/2 MULTITURN-ROTARNOCK
Display	6 digit 7-segment display, thereof 4 digits for encoder position/rotational speed 1 digit for device no. (at DICNET®) 1 digit for displaying the executed program (at RS232)	8 digit 7-segment display for encoder position/rotational speed
Interface	RS485 DICNET®-and RS232 (V.24) (switchable)	RS485 DICNET®-and RS232 (V.24) (switchable) up to 3 terminals in one network possible for DICNET-operation
Connections	With screw-plug connector	With screw-plug connector
Installation	Front panel installation DIN-rail mounting	Front panel installation DIN-rail mounting portable version
Type of protection	IP54	IP54
Dimensions	72 x 96 x 18 mm (WxHxD) 72 x 96 x 28 mm (WxHxD) DIN-rail version	72 x 96 x 18 mm (WxHxD) 72 x 96 x 28 mm (WxHxD) DIN-rail version
Weight	Appr. 200 g	Appr. 200 g
Switch gear opening	66 x 90 mm	66 x 90 mm
Operating voltage	10 - 30 VDC	10 - 30 VDC

14.4 Technical data TERM 32

Characters	TERM 32-HC
Device type	**Display- and operating unit**
Connection to	All Deutschmann cam controls with open communication profile
Display	9 digit 7-segment display, thereof 4 digits for encoder position 4 digits for speed or 9 digits for the encoder position at Multiturn-ROTARNOCK
LCD-Anzeige	8-line zeiliges LCD graphic display with CCFL-back lighting 40 characters/line operator guidance in ten languages
Interface	RS485 DICNET, max. any 3 Deutschmann terminals in one bus or RS232 (V. 24)
Run-control	Floating
Function LED	Output display
Connections	Screw-plug connector, 9 pol. D-SUB and RJ11-plug
Installation	Frontplate installation
Type of protection	Frontplate IP54
Dimensions	222 x 270 x 57 (WxHxD)
Switchgear opening	195 x 246

14.5 Specification of the RS232-transmission protocol

On request LOCON is in the position to provide information on

- speed
- encoder position
- state of the outputs

via the RS232-interface (9600 baud, 8 data bits, 1 start- and 1 stop bit, no parity bit).

The following 4-byte-order sequence must be sent to LOCON via the RS232-interface (all values binary coded):

24 04 04 Cycle time

The first 3 bytes serve to start a cyclic transmission of the above information, where the 4. byte (cycle-time) gives the time-raster in 10ms-steps. If for instance the sequence 24 04 04 100 is transferred, LOCON sends every second its information via the serial interface.
LOCON sends a data record of 8 bytes cyclically, which is coded as follows:

1. Byte: Identification (always 26)
2. Byte: If > 127, speed follows then, otherwise position
3. Byte: Speed/position (low byte)
4. Byte: Speed/position (high byte)
5. Byte: Status (without meaning)
6. Byte: Output state 9..16
7. Byte: Output state 1..8
8. Byte: Actual program

15 Technical details

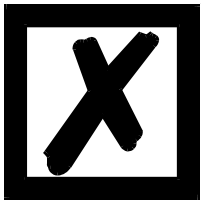
15.1 Specification of the input levels

Logical High: > 16 Volt < 10mA (typ. 5mA)
Logical Low: < 4 Volt < 1mA

15.2 Specification of the output drivers

The used outputs in LOCON are short circuit proof and can drive maximum 300mA per output with a normal ambient temperature. 8 outputs of a driver (1..8 9..16, 17..24, 25..32, 33..40, 41..48, 49..56, 57..64) that belong together can be loaded with maximum 1A.
If more than 300mA per output should be required, it is possible to switch more outputs together (up to 3 outputs per driver). In this case up to 900mA can be driven.
If several outputs are switched together, the switch-on- and switch-off points in LOCON must be programmed absolute identically. Otherwise the short circuit control reacts.

In case of a durable short-circuit or an overload the necessary outputs are switched off, and a corresponding error message is indicated on the display.



When switching inductances (coils, valves) free-wheeling diodes have to be put directly at the inductances (see chapter "EMC-Directives for products of Deutschmann Automation").

15.3 Switching accuracy of Deutschmann cam controls

The accuracy of cam controls is influenced by four parameters:

1) Switch delay (SD)

This time is constant and results from the calculating time the cam control requires from reading-in the encoder value up to setting the output driver.

2) Repeat precision (RP)

This tolerance range results from the asynchronous scanning of the encoder. Ideally the encoder is directly scanned after a change, in the worst case the encoder value changes directly after reading-out the cam control.

3) Resolution

This value indicates the length of the shortest cam, which is definitely evaluated by the cam control.

4) Idle time resolution (ITR)

This error appears only, if an idle time is programmed for the adequate output. It's given in ms and represents the scanning time of the encoder speed, which serves as a basis of the ITR.

Generally the SD and the RP are lower than the cycle time of the cam control. That means, the real switch point is between the moment "switch-on point + SD" and "switch-on point + SD + RP", as it is explained in the following graph.

Without idle time compensation (ITC) the resolution is one increment, as long as the maximum encoder speed is not exceeded; i. e. also a 1-increment-long cam is perfectly recognized and set.
By exceeding the encoder speed ($V_{encoder}$) n-times, the resolution increases appropriate to n increments.
By working with idle time compensation the error increases only by one increment, because the correction of ITC, which is caused by the implemented "dynamic brake" at LOCON, comes to maximum $\pm$ 1 increment at each change of the encoder position.

In summary the following formula can be set up:

Without idle time compensation:

Real switch-point = ideal switch-point + SD (const.) + RP

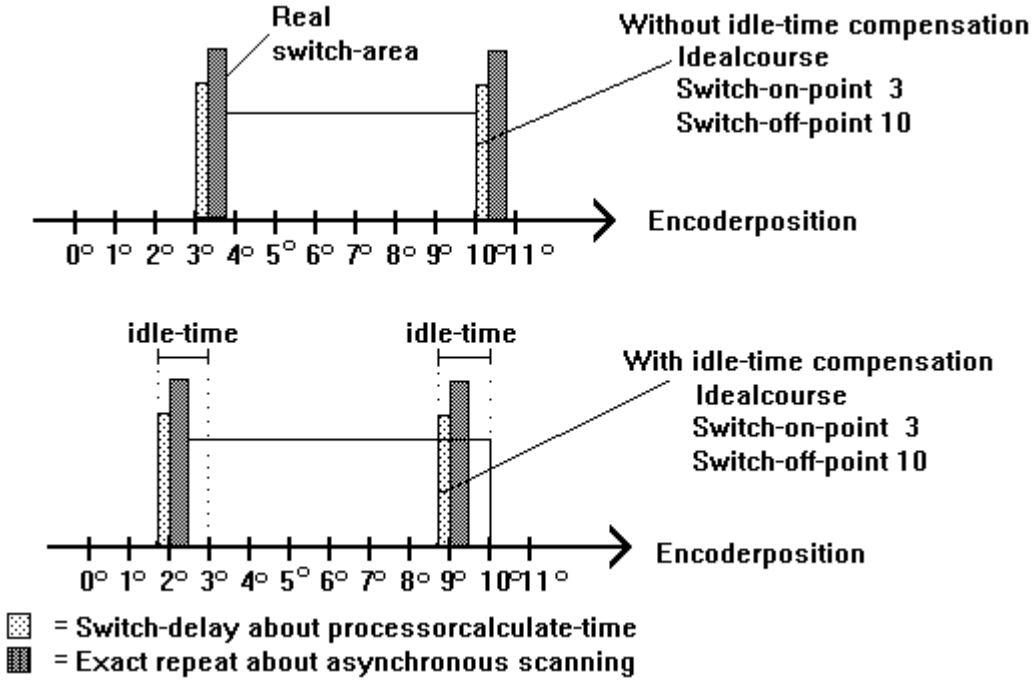
SD < Cycle time (const. typical cycle time/2)
RP < Cycle time (varying between 0..cycle time)
Resolution = n increments, when $V_{encoder} < n * V_{encoder\ Max}$

With idle time compensation:

Real switch-point = ideal switch-point + SD (const.) + RP + ITR

SD < Cycle time (const. typical cycle time/2)
RP < Cycle time (varying between 0.. cycle time)
ITR = Resolution of the ITC (typical 1ms)
Resolution = n increments, when $V_{encoder} < n * V_{encoder\ max}$, with $V_{encoder}$ const.
Resolution = n + 1 increments, when $V_{encoder} < n * V_{encoder\ max}$, with $V_{encoder}$ variable

15.3.1 Time diagram



Picture 19: Time diagram - Idle time compensation

15.4 Environmental specifications of cam controls of the LOCON series

Storage temperature:	-25°C.. + 70°C
Operating temperature:	0°C .. 45°C (without forced convection) 0°C .. 65°C (with forced convection)
Relative humidity:	Max. 80% no condensation, no corrosive atmosphere
Enclosure:	IP 20 (in the case of front-panel installation IP 54 from the front)
Shock:	15 G/11 ms
Vibration:	0.15 mm/10..50 Hz, 1G/50..150 Hz
Weight:	1,050 g (LOCON 32-PM)

15.5 Operation mode of the idle time compensation

All mechanical circuit components which are usually connected to a cam control (e.g.: floodgates, magnetic valves...) feature idle time that means, between accessing the circuit component and the mechanical reflex lies a constant time, the idle time.

The compensation of this idle time depends on the speed of the cam control.

The following processes of idle time compensation are possible:

- path-dependent idle time compensation (standard process in every Deutschmann cam control)
- time-controlled idle time compensation
- direct idle time compensation (without dynamic brake)

Each of the above methods has advantages and disadvantages and is suitable better or worse for a defaulted application.
All methods have in common, that the required idle time value is determined again in every cycle of the cam control in dependence of the current speed. In this case, the idle time value indicates for how many increments the outputs must be activated earlier in order to compensate the idle time of the connected circuit component.
If the machine - at which the cam control is operated - is in an acceleration stage, the current computed required idle time value deviates from the actual idle time value. In this case, the difference between actual and required value only depends on the acceleration. The following methods now differ in the kind and manner when and how the actual idle time value is changed.

15.5.1 Path-dependent idle time compensation

With this method the actual idle time value is adapted for maximal ± 1 increment during every item modification. By that it is guaranteed that no cams are skipped over during the acceleration stage of the machine and that during the braking phase no double cams (see chapter "Time-controlled idle time compensation") occur. The worse dynamics is disadvantageous in the case of this procedure and therefore combined the fact, that with a brake application, that is more rapid as the adjusted idle time, the outputs are frozen on a wrong value in the standstill, as only during a machine movement as well as an item modification a change of the idle time actual value is allowed.

15.5.2 Time-controlled idle time compensation

With this method the actual idle time value is adapted for maximal ± 1 increment in every cycle of the cam control. By that it is guaranteed that no cams are skipped over during the acceleration stage of the machine, but double cams can occur during the braking phase; that means if a complete cam is between the actual encoder position and the encoder position which was slipped by the idle time compensation, the cam appears twice at the output.

15.5.3 Direct idle time compensation

With this method, the required idle time value is undertaken in every cycle as an actual idle time value. Because of this a very high dynamics is achieved but cams can be skipped over during the acceleration and during braking double cams can occur.

15.5.4 Optimization of dynamics

In order to achieve an adaptation of the cam shift to a changed speed (high dynamics) as fast as possible, the cam tracks which are idle time compensated should be placed onto the first outputs (independent of the chosen method of idle time compensation), as - depending on the system - the last compensated output determined the cycle time of the idle time calculation. In this case, the cycle time corresponds to the last compensated output in ms. If the outputs 10, 12, 14, 15 are idle time compensated for example, it results an idle time compensation - cycle time of 15 ms. But if these 4 cam tracks are programmed on the outputs 1..4, a cycle time of 4 ms is achieved.

15.6 DICNET®

DICNET® (**D**EUTSCHMANN **I**ndustrial **C**ontroller **Net**) is a multi-master fieldbus whose physical layer complies with the ISO-OSI Layer Model of DIN 19245, part 1, i. e. a connection is established between all users in the network with one RS485 two-wire line.
The physical arrangement is thus a bus system on which the users can be connected and disconnected as required.

Logically, the system comprises a token ring, i. e. only the user granted bus access authorization (token) may send on the bus. If this user has no data for another user, it forwards the token to its neighbor which was determined in a configuration phase.
This principle achieves a deterministic bus cycle time, i.e. the time (worst-case) until a data packet can be sent can be computed precisely.
Automatic reconfiguration occurs when a user is connected or disconnected.

The transmission baud rate is 312.5 kbaud with a length of 11 bits/byte. A maximum of 127 users may be operated on one bus, whereby data packets of maximum 14 bytes per cycle can be sent. An automatic check of the received information is conducted and an error message is issued should a transmission error occur twice.

The maximum extent of the network may not exceed 500 m.
In order to avoid transmission errors, it must be ensured that both ends of the bus are terminated correctly.

15.7 Communication interface

DEUTSCHMANN AUTOMATION encourages the use of cam controls with remote control and display unit in order to meet market requirements.

Since different combinations of cam control and terminal have been required repeatedly, specific to the particular application, it has been necessary to define a standard interface (communication profile) supported by all terminals and cam controls from the DEUTSCHMANN AUTOMATION range.
This makes it possible for each user to select the most suitable combination for his application.
Through this it is also possible to make the LOCON capable for fieldbuses with Deutschmann UNIGATES (Profibus, Interbus, CANopen, Ethernet, ...).

By making the communication profile an open profile, this means that the user also has the option of communicating with DEUTSCHMANN cam controls and thus using existing information (encoder position, speed, ...) for his own applications or operating the cam control via his own terminal.
Moreover, with Deutschmann UNIGATEs it is possible to make the LOCON-family capable for fieldbuses (Profibus, Interbus, CANopen, Ethernet, ...).
On request, we are able to supply information on this interface in the form of the manual "Communication profile for DEUTSCHMANN AUTOMATION cam controls".

15.8 Coding device numbers

The device number is set in hexadecimal code on the rotary switch.
The following assignment applies:

ProgNo.	Coding						
	64	32	16	8	4	2	1
0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	1
2	0	0	0	0	0	1	0
3	0	0	0	0	0	1	1
4	0	0	0	0	1	0	0
5	0	0	0	0	1	0	1
6	0	0	0	0	1	1	0
7	0	0	0	0	1	1	1
8	0	0	0	1	0	0	0
9	0	0	0	1	0	0	1
10	0	0	0	1	0	1	0
.							
127	1	1	1	1	1	1	0
128	1	1	1	1	1	1	1

16 Error messages

A ROTARNOCK error message can be seen from the fact that an error code is shown on the display.

All errors must be acknowledged with Esc.

A distinction can be made between the following error types:

16.1 Error number 1..19 (irrecoverable error)

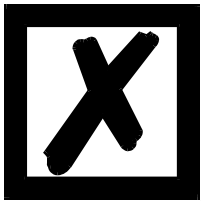
These errors are errors occurring during the self-test routine. If one of the errors 1 to 19 occurs, the unit must be returned to the manufacturer. When returning the unit, please provide the information specified in chapter "Returning a unit".

16.2 Error number 20..99 (warning)

The cam control continues running in the background in the case of all errors of this chapter, i.e. the outputs are still updated as a function of the encoder value in the specified cycle time.

Error No.	Significance	Remarks
20	Error writing to EEPROM	
21	Error saving zero-point offset	
22	Error saving a cam value	
23	Error deleting a data record	
24	Error deleting a program parameter	Parameters can be deleted only in program 0
25	Error copying a program Error shifting a cam track	
26	Time-out accessing LCD	Acknowledge error. If the error occurs again, the unit must be returned specifying the information described in chapter ‘Returning a unit’.
27	Error saving a pattern value	
28	Error programming an idle time	Only in the case of pattern units
29	Error in function CLEAR_CAM	X97 only
30	No programming enable	The program can be modified only if signal ”Prog Enable) is at 24 V on the connector or if parameter ”Lockable outputs” is set appropriately
31	Overload switch-off of the output driver	The output drivers are short-circuit-proof. If LOCON or ROTARNOCK senses an overcurrent for a long period (under certain circumstances, also in the case of incandescent lamps with high power rating), this error message is issued. The corresponding output load must then be reduced and after that the error then be acknowledged. Only the overloaded output is switched off. The other outputs continue to operate.
32	EEPROM full	All data records in the EEPROM are used. Either you must remove cams no longer required or the unit must be equipped with a higher-capacity memory card (LOCON 32 only).

33	Duplicate switch-on point	An attempt has been made to program two cams with the same switch-on point at an output (cam track).
34	Error programming a partial idle time compensation	Unit does not feature the 'Y' partial idle time compensation option
35	Illegal encoder resolution, no power of 2	Program a valid value
36	An attempt has been made to activate the protocol function but no 16k memory card is fitted (LOCON 32 only)	Insert 16k memory card
37	Reserved	
38	Error programming an idle time	On LOCON 17 only - idle times are permitted only for outputs 1 to 8
39	ERROR No ITC No ITC possible	e.g. LOCON 7
40	DICNET® - transmit error Duplicate error on transmit	Duplicate error on transmit
41	DICNET® - receive error	Duplicate error on receive
42	DICNET® - ID error	There is already a user with the same device number (GNR) in the network or the network line is faulty (missing bus termination, line discontinuity or non-twisted lines).
43	DICNET® bus error	
44	Overflow of the serial receive buffer	
45		External fault signal (X26 only)
46	Save blank cam	Data record incomplete
47		Direction-dependent output update illegal
50		Outputs deactivated (brake cam option only)



All outputs are switched briefly to 0 V when error 31 is acknowledged.

16.3 Error number 100..199 (serious error)

All outputs are switched to 0 V until the error has been remedied in the case of errors from this chapter since it is no longer feasible to set the outputs.

Error No.	Significance	Remarks
100	Error in Gray code	The (excess) Gray code read in by the encoder is chekked for plausibility in each cycle. If an illegal code is detected, this error message is issued. If the error occurs only occasionally, this probably involves a fault on the encoder line, and this fault can be remedied by improved cable shielding or different cable routing. Should the error be repeated frequently or be pending constantly, the encoder and the encoder line must be checked and exchanged if necessary. If the error still persists, the unit must be returned (see chapter ‘Returning a unit’).
101	Checksum error on the memory card or in EEPROM	If a checksum error on the memory card or in the EEPROM is detected on power-up, you will see the corresponding error message. After acknowledgement by the user, the memory is written with the default configuration data and all user data is deleted. You then have the option of reprogramming or, if the old data has been backed up on a PC, of reloading this data.
102	Error initializing the cam array	Illegal cams detected. Carry out a general reset
103	New memory card	
104	Plausibility error (illegal device configuration)	A device configuration which is illegal has been saved (e.g. absolute encoder with 127 increments resolution). Carry out a general reset
105	Encoder error (only in the case of ”Special configuration" LOCON 32 option or LOCON 24, 48, 64 units with encoder monitoring option)	An encoder error has been detected. The current encoder value and the last encoder value read in are shown at the top right on the LCD (LOCON 32). LOCON 24, 48, 64, see chapter Options: Encoder monitoring.
108	SSI Time-out error	
111	SSI Gray code error	

16.4 Error number 200-299 (terminal errors)

The following errors occur only on terminals (or if using cam controls of the LOCON 24, 48, 64 series as a terminal)

Error No.	Significance	Remarks
201	Self-test error	
202	Internal error	
206	Error initializing the RS485 interface	
207	RS232 error	
210	RX overflow error	
211	TX overflow error	
212	TX change ID error	
213	Time-out accessing LCD	Acknowledge the error. If the error occurs again, the unit must be returned, specifying the information described in chapter ‘Returning a unit’
214	Undefined field error	
215	Get key error	
216	LCD XY error	
220	Time-out connecting to cam control	
221	Incorrect data record on transmission to cam control	
222	Checksum error on reception from cam control	
223	Checksum error on transmission to cam control	
224	Unknown command on transmission to cam control	
230	Incorrect configuration data record or not possible to configure the cam control	
231	Incorrect initialisation data record	
240	DICNET® transmit error	
241	DICNET® receive error	
242	Duplicate device number in DIC-NET® or connection problems	Assign a different device number. Check for cable discontinuity, short circuit, non-twisted cable....
243	Too many terminals in network (max. 3 allowed)	Reduce to 3 terminals
244	Max. 1 external terminal in the case of multiple-axis version of the LOCON 32	
251	Internal error	
252	CMD UNKNOWN ERROR	
253	CMD CHECKSUM ERROR	

17 Servicing

Should an error message occur, first off all please take all measures described in chapter Error messages.

Should questions occur that are not covered by this manual, please contact the responsible sales partner (see internet: http://www.deutschmann.de) or contact us directly.

Please keep the following information ready at hand when you call:

Device designation
Serial number (S/N)
Item No.
Error number and error description (see also following chapter ‘Returning a unit’)

You can reach us on the following Hotline number. Lines are open from

Monday to Thursday from 8 am to 12 pm and from 1 pm to 4 pm, Friday from 8 am to 12 pm

Central office & sales department: +49-(0)6434-9433-0
Technical hotline: +49-(0)6434-9433-33

Fax Central office & sales department: +49-(0)6434-9433-40
Fax technical hotline: +49-(0)6434-9433-49

17.1 Returning a unit

If you return a unit to us, we require as comprehensive a description of the error as possible. We require the following information in particular:

- What error no. is indicated
- How is the unit externally wired (outputs, ..)? Please state all connections of the unit.
- What were you last doing on the unit (error on power-up, ...)?

The more precise your information and error description, the more precisely we can check the possible causes.
For devices that are returned without an error description a standard test is made. We have to charge this standard test even if no error was found.

17.2 Internet

On our Internet-homepage (URL) you can find topical information on Deutschmann products, instruction manuals and a list of our distribution partners.

URL: **www.deutschmann.de**

18 Appendix

18.1 Description and connection of the DICNET®-adapter

18.1.1 DICNET®-adapter DICADAP 3

The DICNET-adapter serves to connect a PC to a DICNET-network of the company DEUTSCHMANN AUTOMATION.

It converts both the network protocol as well as the physical RS485-signals, so that a PC with the WINDOWS-software "WINLOC" will be in the position to communicate with those control units from DEUTSCHMANN AUTOMATION, existing in the net through a serial interface (COMx).

"WINLOC" is able to run under WIN 3.1x, WIN95/98 and WIN NT. The basic version is available free of charge.

The DICNET-adapter is directly connected to a serial interface of the PC through the 9-pin D-SUB plug.

On the other side of the adapter (25-pin D-SUB plug) the DICNET-bus and the supply voltage, which is allowed to range between 10V and 30V, is fed according to the below pin-assignment.

In case the DICNET-adapter is connected as the last subscriber in the bus, the internal bus-terminating resistor has to be activated by means of bridges of the PIN's DICNET+ with R+ and DICNET- with R-. (More detailed information to the bus-termination and to the connection to the DICNET can be found in the instruction manual of the used control unit.)

Pin assignment 25-pin:

Pin No.	Name
1-15	Reserved (do not wire)
16	R+
17	DICNET +
18	DICNET -
19	R-
20-23	Reserved (do not wire)
24	+24 V
25	GND

Pin assignment 9-pin:

Pin No.	Name
2	Rx
3	Tx
5	GND
Others	nc

19 User number

Ther user number that allows a programming of LOCON 32 is:

3037