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**Instruction manual
Electronic cam control
LOCON 100**

**Deutschmann Automation GmbH & Co. KG
www.deutschmann.de | wiki.deutschmann.de**

Manual Art.-No. V3392E

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.

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Bad Camberg, January 2020

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', 'ROTARNOCK' 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 cam controls 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.
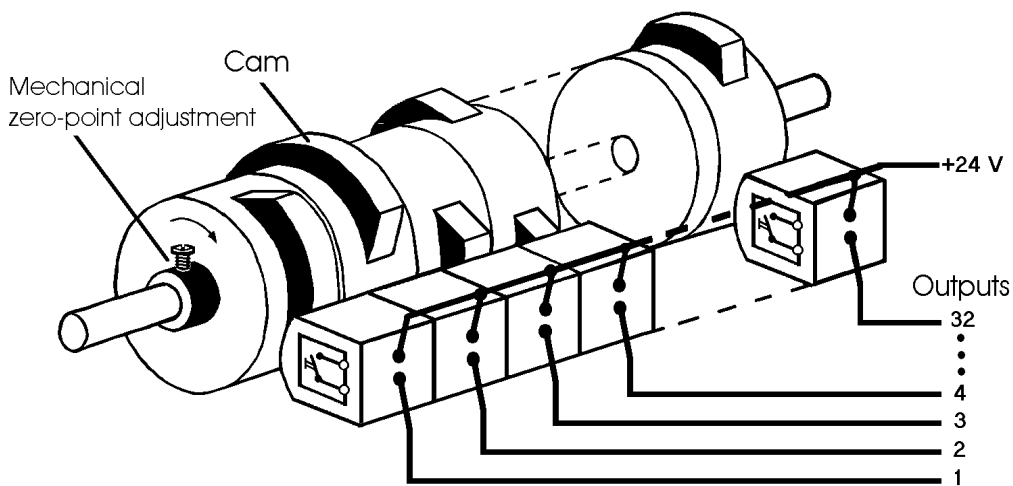
 Picture 1: Mechanical cam control

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

A detailed and up-to-date overview of our product range can be found on 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 unit LOCON 100

LOCON 100 is a modular cam control in industrial design for DIN-rail mounting. The basic device is made for the connection of an SSI-encoder (Singleturn or Multiturn), 12 bit parallel, PLL or for an incremental encoder for a counting area of up to 16 mio.
The cam control that can be configured by the customer as desired features 16 I/Os that can be used any way as inputs or outputs. Optionally LOCON 100 is also available with a PROFIBUS-interface.
Additionally an extension module with 32 I/Os can be ordered.
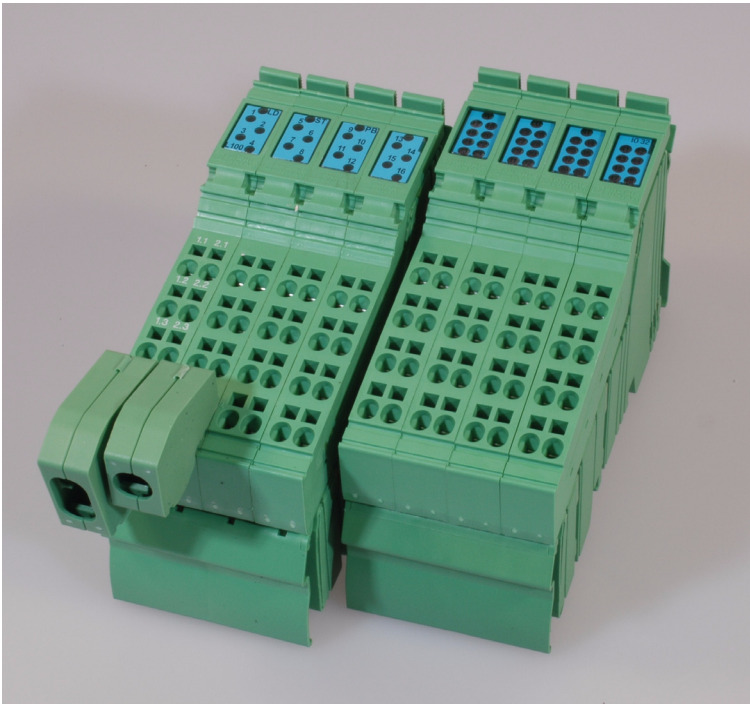
4   Mechanical installation instructions

4.1   Installation

LOCON 100 is a modular cam control in industrial design for DIN-rail mounting.

4.2   Housing dimension

The housing dimension of LOCON 100 results from the dimension of the basic unit and the dimensions of the connectors.

Housing
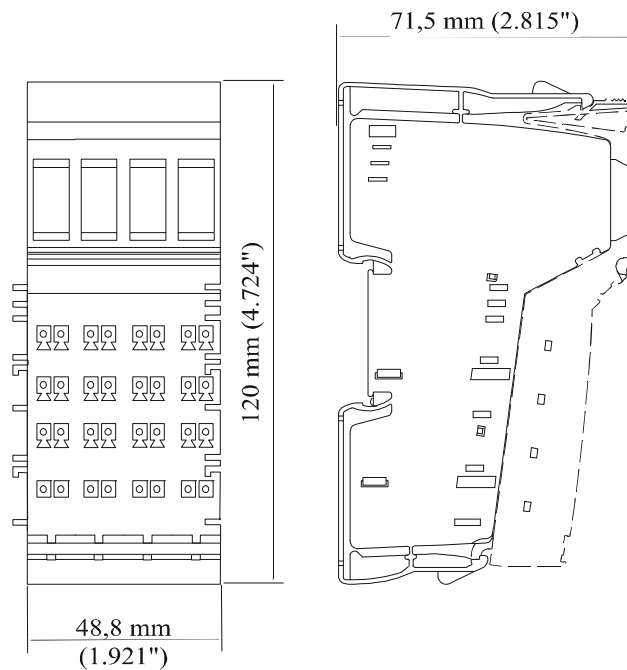
Connectors
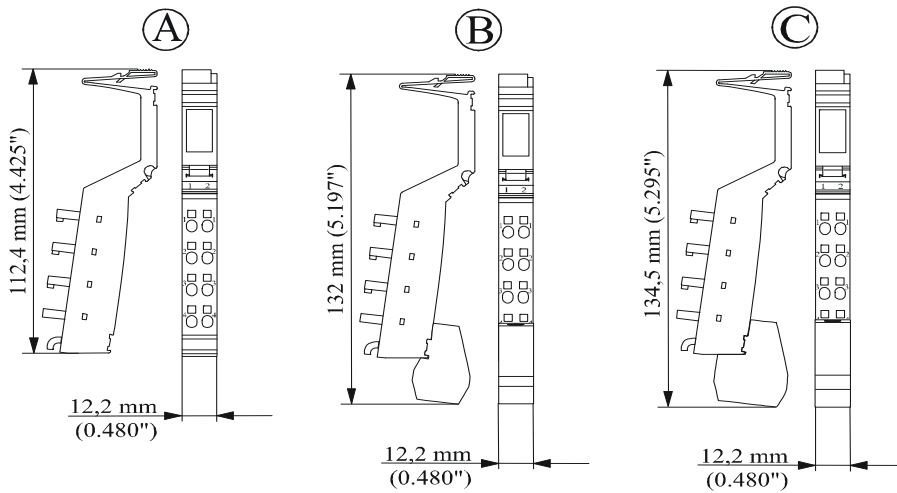
Caption:

A   Standard connector
B   Shield connector
C   Bisignal connector

The depth of the connector is irrelevant since it does not affect the depth of the total housing.

4.3   Mounting / dismounting of the extension module

The extension module is exclusively meant for the use at a LOCON 100.
It is simply attached to the LOCON 100: No further tool is required to do so. By sequencing the potential and the bus signal connection between the components is automatically built up.
A later exchange is possible by pulling out or plugging in without any additional tools.

4.4   Connecting lines

Shielded and unshielded lines are used for the device.
For the connection of the encoder or the communication a shielded line is used. The shield is connected by means of a shield connector, the encoder via the connectors X2 or X3 and X4 and the communication via the connector X1 in accordance with chapter "Electrical connections LOCON 100".
Through the tension spring connection points it is possible to connect lines with a diameter of 0.2 mm^2 up to 1.5 mm^2.

4.4.1　　Connecting lines without shield

Connection example connector
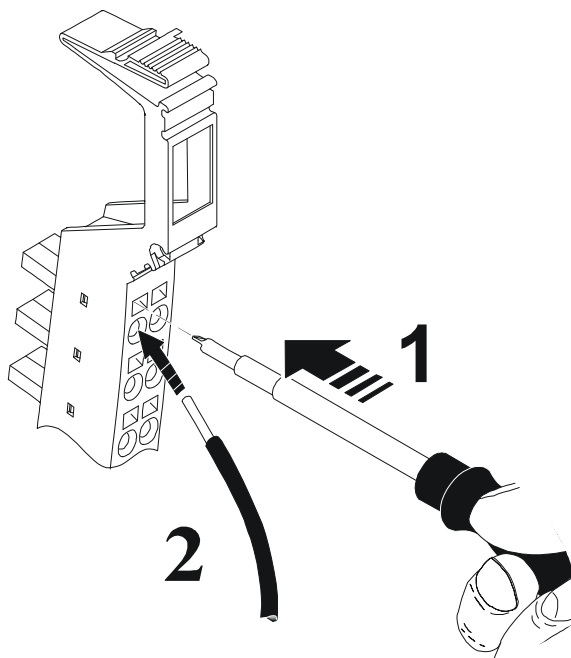
4.4.2   Connecting shielded lines
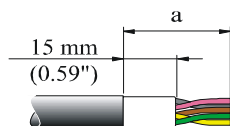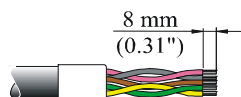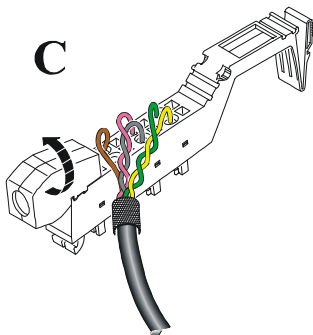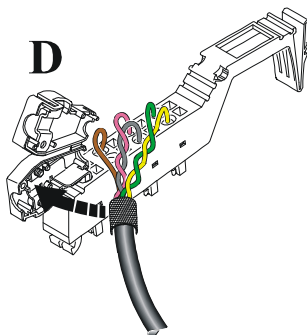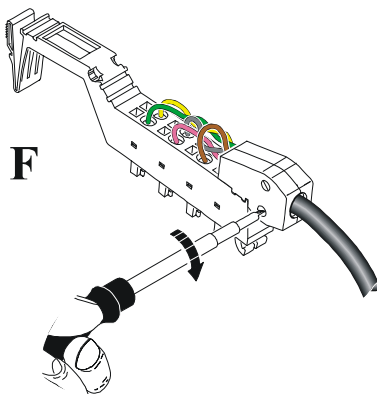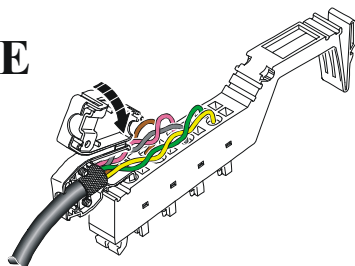
4.4.3   Grounding clip

The grounding clip in the cable screen can be used in accordance to the line cross section: When using thin lines then the curvature of the grounding clip has to be directed towards the line (see pictures D - F), for thicker lines the other way round (see pictures A - C).
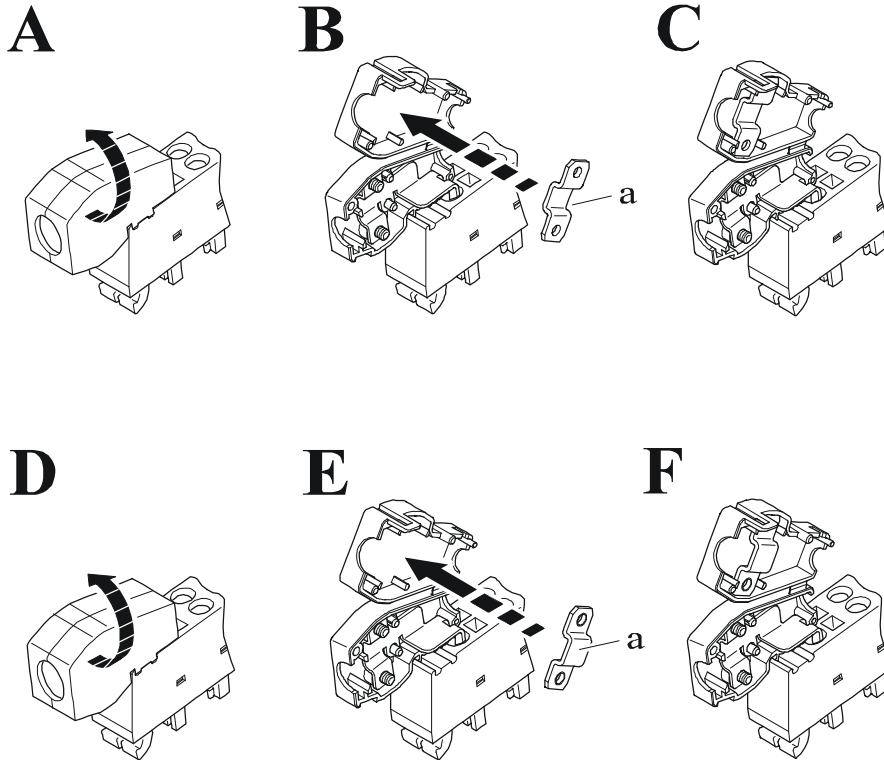
5   Electrical connections LOCON 100

5.1   Front view LOCON 100
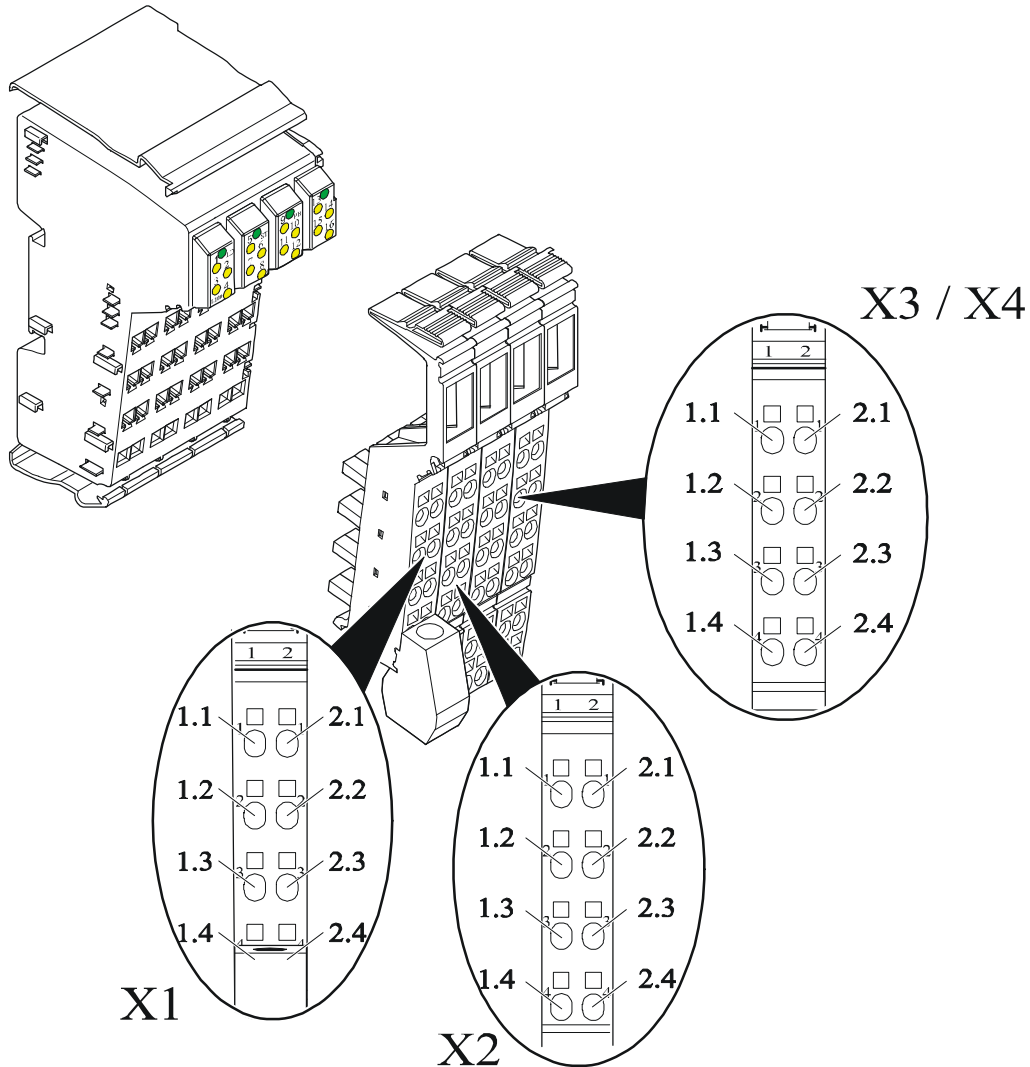
5.2   Assignment X1 (communication)

Pin	RS232		DICNET (RS485)	
1.1 / 2.1	+24V	Gnd	+24V	Gnd
1.2 / 2.2	n. c.	n. c.	n. c.	n. c.
1.3 / 2.3	TxD	RxD	DIC+	DIC-
1.4 / 2.4	PE	PE	PE	PE

Pin	PROFIBUS (optionally)		Modbus RS485 (optionally)		Modbus RS232 (optional)	
1.1 / 2.1	+24V	Gnd	+24V	Gnd	+24V	Gnd
1.2 / 2.2	A	B	n. c.	n. c.	n. c.	n. c.
1.3 / 2.3	TxD	RxD	485+	485-	TxD	RxD
1.4 / 2.4	PE	PE	PE	PE	PE	PE

5.3   Assignment X2 (encoder connection SSI + incremental)

Pin	SSI		Ink 422	
1.1 / 2.1	+24V_Enc.	Gnd_Enc.	+24V_Enc.	Gnd_Enc.
1.2 / 2.2	Clk+	Clk-	A+	A-
1.3 / 2.3	Dat+	Dat-	B+	B-
1.4 / 2.4	PE	PE	PE	PE

5.4   Assignment X3 + X4 (I/Os)

X3 + X4 consist of 16 I/Os that can be configured any way as inputs or outputs including various signals, such as Preset, Out-Enable, external program selection and so on. Further information can be found in the chapter "Signal description LOCON 100". There are exceptions when it comes to a connection of a parallel absolute encoder or an incremental encoder with 24V-signals (see below).

5.4.1   Assignment X3 + X4 basic device

Pin	X3		X4	
1.1 / 2.1	I/O 1	I/O 2	I/O 9	I/O 10
1.2 / 2.2	I/O 3	I/O 4	I/O 11	I/O 12
1.3 / 2.3	I/O 5	I/O 6	I/O 13	I/O 14
1.4 / 2.4	I/O 7	I/O 8	I/O 15	I/O 16

5.4.2   Assignment X3 + X4 for the connection of a parallel absolute encoder

Pin	X3		X4	
1.1 / 2.1	Track 1	Track 2	Track 9	Track 10
1.2 / 2.2	Track 3	Track 4	Track 11	Track 12
1.3 / 2.3	Track 5	Track 6	Track 13	I/O 14
1.4 / 2.4	Track 7	Track 8	I/O 15	I/O 16

A parallel encoder is always connected „from the front". That means the encoder's track 1 is always located on the I/O 1. If, for instance, an encoder with a resolution of 360 is connected, only 9 tracks are required. That way the tracks 10, 11, 12 and 13 are then available again as I/Os 10, 11, 12 and 13.

5.4.3   Assignment X3 + X4 for the connection of an incremental encoder 24V

Pin	X3		X4	
1.1 / 2.1	Track A	Track B	I/O 9	I/O 10
1.2 / 2.2	I/O 3	I/O 4	I/O 11	I/O 12
1.3 / 2.3	I/O 5	I/O 6	I/O 13	I/O 14
1.4 / 2.4	I/O 7	I/O 8	I/O 15	I/O 16

Track A and track B are always steadily assigned to the I/Os 1 or 2 and cannot be assigned as desired.

5.4.4   Assignment extension module

Pin	X1		X2		X3		X4	
1.1 / 2.1	I/O 17	I/O 18	I/O 25	I/O 26	I/O 33	I/O 34	I/O 41	I/O 42
1.2 / 2.2	I/O 19	I/O 20	I/O 27	I/O 28	I/O 35	I/O 36	I/O 43	I/O 44
1.3 / 2.3	I/O 21	I/O 22	I/O 29	I/O 30	I/O 37	I/O 38	I/O 45	I/O 46
1.4 / 2.4	I/O 23	I/O 24	I/O 31	I/O 32	I/O 39	I/O 40	I/O 47	I/O 48

As for the basic device the I/Os of the extension module can be configured as desired (I/O 1 ...16).

5.5   Signal description LOCON 100

Function	Description
I/O1 ... I/O48	When using as output Each output 24V / 0.7 A positive-switching (PNP, temporarily 1A, total current max. 16A or 2 x 16A when using an extra input clamp (see INLINE-component system)), short-circuit-proof
I/O1 ... I/O48	When using as input 24V (max. 10 mA) each input
+24V	24V-voltage supply of the complete device inluding output driver
Gnd	Ground potential of the complete cam control.
TxD-LOCON	RS232-transmission line
RxD-LOCON	RS232-receive line
DIC+, DIC-	Data line for networking via the DEUTSCHMANN-bus system DICNET (see also chapter "DICNET®")
PB+, PB-	PROFIBUS data linesPB+= signal B or red PB- = signal A or green
CLK+, CLK-	RS422-clock line pair for SSI-connection
DAT+, DAT-	RS422-data line pair for SSI-connection
Track 1 - track 13	24V-input (max. 10mA) for encoder leads when using absolute encoders up to 8192 inf./rev. with parallel output
Track A	Connection of track A when using an incremental encoder 24V
Track B	Connection of track B when using an incremental encoder 24V
A+, A-	RS422-track A-pair of the incremental encoder
B+, B-	RS422-track B-pair of the incremental encoder
Preset 1, Preset 2*	As soon as one of the two signals becomes active, the counter level will be set to the pre-set value and it is kept on that value until the condition disappears again. The polarity is adjustable, i. e. if high active or low active.
CountEnable+*	At 24V this signal unlocks the meter, provided that it is mapped. In case 0V are applied at this lead, then the meter reading is frozen. The speed measurement and with it the idle time compensation keeps on running during this time. This signal is evaluated with an accuracy of ±0.5ms.
OutEnable+*	With this signal the outputs can be switched on or switched off when using an incremental encoder. With 0V or unwired the outputs are deactivated, in case of 24V the outputs are set in accordance with the programmed cams. The response to a signal change is carried out with an accuracy of ±0.5ms.
ProgNo 1 ... ProgNo 64*	In case of an external program selection the program number is applied to these pins. The coding is in binary form according to chapter "Coding device numbers"
ProgStart*	If 24V are applied to this pin, the program number is accepted at the pins ProgNo1 to Pro-gNo64 (see above)
ProgEnable*	If 24V are applied to this pin, all parameter changes (incl. change in configuration) are allowed in LOCON. For further details see chapter 'Programming enable".
Dynamic zero offset*	This input serves to set the zero point during operation (only with absolute encoders).
Run-control-output*	Signal to present the status of the cam control
Incremental output*	Two outputs to generate an A/B-signal
PLL-input*	Initiator-input of the PLL-measuring system
Sync-output*	Signal to present the synchronism of the machine at PLL-measuring systems
nc	Not connected

*) These signals are distributable on the I/Os as desired.

*) These signals have to be applied for at least 1ms!

5.5.1   Status LED's
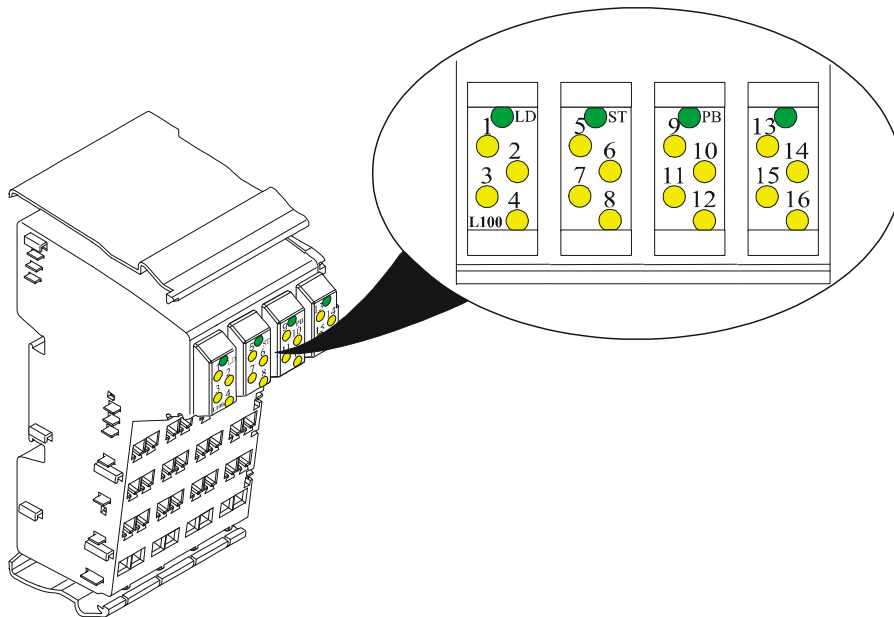
LED	Color	Meaning	State	Description of the states
1	Green	State I/O 1	Off	I/O is not set
:		:	On	I/O is set
:		:	Off	:
16		State I/O 16	On	:
LD	Red	Overload	Off	Device active, no overload on the outputs
			On	Overload on the outputs
ST	Green	State	Off	Device without voltage or not operational
			On	Device active
			Flashing	Error indication
PB	Red	PB-error	Off	PB active (state: data exchange)
			On	No data exchange active
DG	Red	Diagnosis	Off	No error present.
			On	Error present.

5.6   External program selection

For external program selection, the new program must be applied in the form of a binary code (see chapter "Coding device and program numbers") at the connector strip and **then** a leading edge must be generated at pin "ProgStart", whereby the High level (24V) must be held for at least 200 ms.

The following steps are required if, for example, program 7 (binary 000111) is to be activated:

5.6.1   Applying the corresponding voltages

PIN	Volt	Binary
PROG_NR32	0V	0
PROG_NR16	0V	0
PROG_NR8	0V	0
PROG_NR4	24V	1
PROG_NR2	24V	1
PROG_NR1	24V	1

5.6.2   Generating the acceptance edge

PIN	Volt
PROG_START = 24V	24V
Wait 5ms	
PROG_START = 0V	0V

5.6.3   Graphical representation of program selection

t1 > 1µs
t2 > 5ms
t3 > 1µs
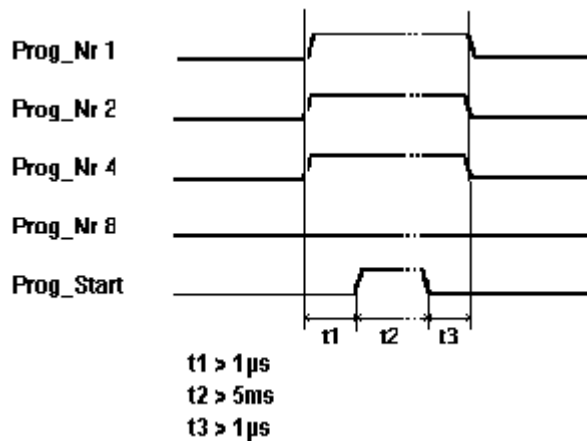
 Picture 2: Program selection

The program can be changed any time using the connector strip.

If pin "PROG_START" is permanently wired to 24V, LOCON accepts the program applied externally each time the unit is powered up.

5.7   Installation and initiation of LOCON 100

The screw-type plug connectors of the LOCON must be plugged in and unplugged only with the power supply disconnected!!!

5.7.1   Connection of the supply voltage

The supply voltage is 24V +/- 20% that is applied to pins "24V DC". The reference ground is wired to "GND". The LOCON requires maximum 200 mA when not under load and not including encoder power supply.

The corresponding inputs and outputs must be wired before switching on the supply voltage in order to avoid malfunctions.
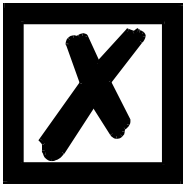
X **The typical voltage at the outputs and for the encoder supply is:**
Supply voltage -1V; that means: is the device being supplied with 24V DC,
then the typical output- and encoder voltage is 23V DC!

5.7.2   Connection of the inputs and outputs

LOCON features up to 48 I/Os, depending on version and capacity stage.

Absolute or incremental encoders are used as the machine's sensors. These encoders are con-
nected at pins "Track1" to "Track12" on encoders with parallel outputs, "CLK+, CLK-" and "DAT+,
DAT-" on SSI encoders or "TrackA" and "TrackB" on incremental encoders.
The encoders' power supply is provided via pins "+24V-Enc" and "GND-Enc" on X2.
24V must be applied to pin "ProgEnable" for programming enable (for example, via a key-oper-
ated switch) if it is configured.

Pins "ProgNo1" to "ProgNo128" and "ProgStart" must be wired only if external program switcho-
ver is to occur (for example, via a PLC).

The outputs and the encoder are powered jointly with the **24V power supply of the total unit**.
The outputs of LOCON 24 are positive-switching 24V, i. e. an active output has a level equal to
the supply voltage less 1V by comparison with GND. An output which has been reset has high
impedance.
The outputs are short-circuit-proof and may drive maximum 700 mA (1A for a short period of
time) each output.

In the event of a sustained short circuit or overload, the corresponding outputs are deactivated
and a corresponding error message is shown on the display.

X **Free-wheeling diodes must be provided directly on the inductors if switch-**
ing inductors (coils and valves) (see chapter "EMC Directives for products
of Deutschmann Automation").

5.7.3   Connection of the serial RS232 interface

The RS232 interface is connected via the plug connector at plug X1.
When connecting, please ensure that the TxD and RxD signals of LOCON and the connected
unit are reversed (e. g.: Connect TxD LOCON to RxD PC) and that the "GND" reference poten-
tials of both units will be connected.

5.7.3.1   Interface-switch (up to Firmware < V3.0)

The interface-switch is located under the sticker with the print RS232/RS485. In the state of
delivery the position of the switch is indicated by the mark on the sticker. The position of the
requested interface can be seen from the sticker at the back of the device.
For switching please use a suitable tool and carefully shift the microswitch to the left or the right.
Attach a new sticker with the corresponding mark.

5.7.3.2   Interface switch (Firmware V3.0 and higher)

From Firmware version V3.0 on the state of delivery is RS232!
The interface switch is not carried out through a changeover switch any more. Now two possibilities are available.
1. The interface switch is made through WINLOC32.
    For it you can select in the configuration of the upload file "Interface's operation mode":
    "RS232"
    "Dicnet/Term_off" (DICNET without bus termination)
    "Dicnet/Term_on" (DICNET with activated bus termination)

2. The interface switch is made through the setting of the rotary coding switches located at the bottom side. Here the following adjustment applies (of the „high" rotary switch):
    Fx: Interface is always RS232 (even when something different is selected in WINLOC)
    Ex: DICNET with activated bus termination (x = DICNET ID)
    Dx: DICNET without bus termination (x = DICNET ID)

Practical advice: For RS232 -> set both rotary switches to "FF"

5.7.4   Connection of the DICNET bus interface

The DICNET bus (see chapter "DICNET®") is connected via the screw-type plug connector at plug X3.
All "DIC+" signals are interconnected and all "DIC-" signals are interconnected on the bus. The signals are not reversed.
However, it must be ensured that the potential differences between the DICNET users do not exceed 7V.

Please always follow the information in chapter "RS485 link (DICNET)"!

6   Configurations LOCON 100

LOCON 100 is a cam control that can be configured as desired.
There are two ways to integrate the desired performance characteristics into LOCON 100.

6.1   WINLOC 32 - wizard

Via the function "Reconfigure" a wizard is started that leads the user through the configuration menu.
With it a predefined sequence is kept, where the LOCON 100 can be adjusted to the relevant requirements step-by-step.

6.2   TERM 6 or PROFIBUS

All alterable parameters can directly be selected either through the configuration menu in TERM 6 or PROFIBUS via communication profile. Here the same sequence as for the WINLOC 32-wizard has to be kept in order to avoid configurations that are not plausible.
In LOCON 100 the following performance characteristics can be configured through a PC with the WINLOC 32®-software.

6.2.1   Reading and changing cam control parameters via TERM 6

All cam control parameters that can be reached via the communication profile with GET/SET-PARAMETER can be read and changed via a "menu point" that is integrated in TERM 6.

Starting from the main menu the keys [+] and [−] are pressed for the same time period. Thereupon the function LED shines and a 1 (current parameter number) appears on the display.

Now this number can be changed with [+] and [−]. (see parameter table in chapter 6.5)

If, for instance, the virtual encoder value is to be read / changed, please select (see parameter table in the manual communication profile) the number 19 (corresponds to 13H = PNR_S-CALED_ENCODER_RES). Confirm with [Enter] and the encoder resolution of the connected cam control is displayed (e. g. 1000). To change this value, please press [Enter] again (long). Then the Prog-LED and the Function LED start to flash. Now the value can be changed with [+] or [−].

Then by pressing [Enter] the new value is loaded into the cam control, the value is rejected with [Esc].

Special parameters in X-options can also be handled as described in this chapter.

Important:
Before the configuration the device should not contain programmed data. After the configuration the device has to be restartet so that the changes will be applied. Restarting the device may take a while.

6.2.2   PROFIBUS

The configuration via PROFIBUS is carried out directly through the 'Communication profile for Deutschmann cam controls' (see corresponding instruction manual with the art.-no.: V2064E).

6.2.3   Possible error messages on the configuration

In case of a wrong application during the configuration might result in error messages:

E34   -> Changing the parameter invalid
E36   -> Parameter not present
E37   -> When programming an angle-time-cam greater than output 16

6.3   Configuration tree

Based on the basic device the encoder type is selected first. The following parameters depend on the chosen encoder type. Therefore it is required to keep the predefined order of the configuration tree.
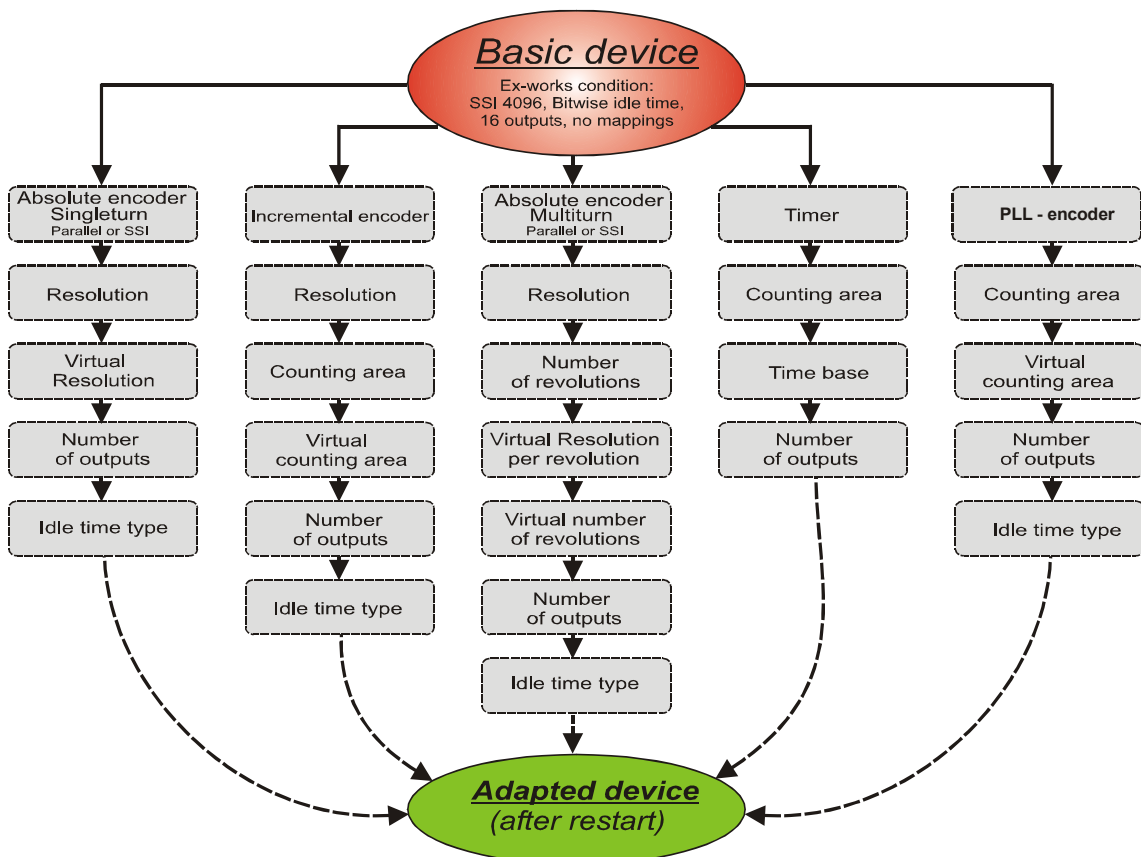
6.4   Configuration example

Based on the ex-works condition (SSI-encoder with 4096 inf./rev., bitwise idle time and 16 outputs) a device for an absolute encoder parallel with 360 inf./rev., a virtual resolution of 1000, blockwise idle time and 8 outputs is to be configured.

	PROFIBUS	TERM 6	Possible choice	Choice
Basic device	Via communication profile with Get-, Set-parameter commands (indication hexadecimal)	Through number in the configuration menu (press keys "+" and "-" at the same time (indication decimal)	Possible configuration	
Encoder type	0x0010	16	1 = Absoluet parallel 2 = Incremental 24V 3 = Absolute SSI 5 = Timer 6 = Multiturn SSI 7 = Incremental 24 bit-24V 8 = Incremental 422 9 = Incremental 24 bit-422 10 = Timer 24 bit 11 = PLL	1
Resolution	0x0011	17	<u>Absolute parallel:</u> 360, 512, 720, 1000, 1024, 2048, 3600, 4096, 8192 <u>SSI:</u> 360, 512, 720, 1000, 1024, 2048, 3600, 4096, 8192 <u>Incremental:</u> 2... 16384	360
Virtual resolution	0x0013	19	2... 24 bit	1000
Number of outputs	0x0020	32	Max. 48 with extension module Less (depending on the encoder type)	7
Idle time type	0x0032	50	0 = None 1 = Blockwise 2 = Bitwise 3 = Blockwise on/off 4 = Bitwise on/off	1
End				

6.5 Parameter table

This Parameter table is used by the commands GET_PARAMETER and SET_PARAMETER.

Command's name	Command's value	Parameter number in config-menu of TERM 6	Meaning	Explanation
PNR_SOFT_REV	0x0001	1	s. PNR_HARD_REV	
PNR_HARD_REV	0x0002	2	ASCII z. B: '3"1"2' 't' = V3.12t - gives back the soft- or hardware version	
PNR_UNIT_NAME	0x0003	3	ASCII i. e. 'L' '4' '8 " ' = L48	
PNR_UNIT_TYP	0x0004	4	Device type	
PNR_VNUMBER	0x0005	5	Article number	
PNR_SN	0x0006	6	Serial number	
PNR_OPTION X	0x0007	7	Option X	
PNR_ENCODER_TYP	0x0010	16	Encoder type	chapter 6.5.1
PNR_RESOLUTION_PER_TURN	0x0011	17	Real-resolution per revolution	chapter 6.5.2
PNR_NUMBER_OF_TURNS	0x0012	18	Real-number revolution	
PNR_SCALED_ENCODER_RES	0x0013	19	Virtual encoder value	
PNR_ENCODER_INVERT	0x0014	20	Reversal of rotational direction	chapter 6.5.3
PNR_SCALED_COUNT_RANGE	0x0017	23	Virtual count range	
PNR_COUNT_RANGE	0x0018	24	Counting area at incremental encoders	
PNR_COUNT_RESTORE_VALUE	0x0019	25	At X 16: = brake point	
PNR_TIMEBASE	0x001C	28	Time basis at Timer	
PNR_DEADTIME_BASE_US	0x001D	29	Time unit for idle time compensation in µs (if not defined -> 1000µs)	
PNR_NUMBER_OUTPUTS	0x0020	32	Number of outputs	
PNR_NUMBER_LOCK_OUTPUTS	0x0021	33	Number of locked outputs	
PNR_NUMBER_DATA_RECORDS	0x0022	34	Number of data records	
PNR_NUMBER_LOGIC_INPUTS	0x0023	35	Number of Logic inputs	
PNR_NUMBER_ANGLE_TIME	0x0024	36	Number of angle/time outputs from output 1	
PNR_NUMBER_OUTNAME_CHAR	0x0025	37	Output names	
PNR_NUMBER_PROGRAMS	0x0026	38	Number of programs	
PNR_NUMBER_AXIS	0x0027	39	Number of axes	
PNR_NUMBER_ANALOGOUTPUT	0x0028	40	Number of analog outputs	
PNR_NUMBER_COUNTERCAM	0x0029	41	Number of counter cams	
PNR_FIRST_OUTPUT_NR	0x002A	42	Counting starts at 1	
PNR_SPEED_SCALE	0x0030	48	With reference to rev./ms =>60000 = rev./min 0...9999 (rev./s)	
PNR_LANGUAGE	0x0031	49	Language	chapter 6.5.4
PNR_DEADTIME_TYP	0x0032	50	ITC-type	chapter 6.5.5
PNR_ZEROPOINT_OFFSET	0x0033	51	Scaled preset value at inc.	
PNR_ACTIV_PROGNR	0x0034	52	Active program	0..max program -1
PNR_ACTIV_AXIS	0x0035	53	Active axis	1..max AxisNo.
PNR_CALC_SPEED_START	0x0036	54	IdleStart scaled	
PNR_CALC_SPEED_STOP	0x0037	55	IdleStop scaled	
PNR_DICNET_ID	0x0038	56	Actual value (PLS = 80..95), RS232 = 232	
PNR_CLEAR_LENGTH	0x0039	57	Length clear pulse	
PNR_BREAK_PARA	0x003A	58	(BrakeA*0x10000) + BrakeB	
PNR_OUTPUT_OFF_SPEED	0x003B	59	Speed-threshold value below which the outputs are switched off	
PNR_WZ_MAXTIME	0x003C	60	Time in ms	
PNR_WZ_TIMEBASE	0x003D	61	Time in µs	
PNR_V_LIMIT	0x003E	62	M13 = 1, if V_LIMIT is exceeded	
PNR_DREHSCHALTER	0x003F	63	Read switch position	
PNR_RESTART	0x004E	78	Warmstart with value 1:0x1234 -> 2:0xEDCB	
PNR_CLEAR_EEROM	0x004F	79	General deletion: 1: 0x1234 -> 2:0xEDCB	
PNR_STATUS_FLAGS	0x0050	80		
PNR_PROC_OUT_MAPPING	0x0051	81	Mapping of the process data in the Fieldbus	
PNR_PROC_IN_MAPPING	0x0052	82	Mapping of the process data in the Fieldbus	
PNR_USED_EEROM_LEN	0x0053	83	Actual used EEROM length	
PNR_S7_MODE	0x0054	84	1 = S7 do not copy data into the EEROM	
PNR_RESET_EEROM	0x0055	85	Set to set in factory 1:0x1234 -> 2:0xEDCB	
PNR_CYCLETIME	0x0056	86	Read cycle time	
PNR_AKTIV_STATUS	0x0057	87		
PNR_PROC_LOAD	0x0058	88	Processor utilization	
PNR_ENABLE_OPTION	0x0059	89	Release of options	
PNR_TEACH_IN_ZEROPOINT	0x0060	90	Teach-in zero offset	
PNR_ENABLE_TESTMODE	0x005B	91	With 0x1234 -> Switch to testmode	
PNR_ERROR_QUIT	0x0060		Error quit through Modbus 0 -> 1	

6.5.1   PNR_ENCODER_TYP - Encoder type

1 = Absolute encoder parallel gray
2 = Incremental encoder
3 = Absolute encoder SSI gray
5 = Timer
6 = Multiturn-SSI
7 = Incremental 24-bit
8 = Incremental 422
9 = Incremental 24 bit-422
10 = Timer 24 bit
11 = PLL

6.5.2   PNR_RESOLUTION_PER_TURN

Absolut parallel gray: 360, 512, 720, 1000, 1024, 2048, 3600, 4096, 8192
SSI gray: 360, 512, 720, 1000, 1024, 2048, 3600, 4096, 8192
Incremental: 1024, 4096

6.5.3   PNR_ENCODER_INVERT

0 = Normal
1 = Inverted

6.5.4   PNR_LANGUAGE - language selection

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

6.5.5   PNR_DEADTIME_TYP

0 = None
1 = Blockwise
2 = Bitwise
3 = Blockwise, separate switch-on and switch-off idle times

6.6   Configuration parameters LOCON 100

The following performance characteristics can be configured at LOCON 100.

6.6.1   SSI interface

The SSI-clock frequency is 400 kHz. This results in a maximum cable length of the encoder connection of 50 m.
Three different kinds of SSI-absolute encoders are supported:

1. Singleturn with a resolution of up to 13 bit (8192)
2. Multiturn with a resolution of 24 bit (4096 x 4096).
3. Multiturn with a resolution of 25 bit (8192 x 4096).
   Please note that the evaluation here takes place as for a 24 bit-encoder - that is 4096 x 4096.

The SSI-interface's assignment can be found in chapter "Electrical connections LOCON 100".

6.6.2 Incremental encoder

Alternately, an incremental encoder with any resolution can be connected to LOCON 100, whereby the limit values specified in the technical data must be observed. 24V- and RS422-incremental encoders with two of each 90°-offset tracks A and B are supported, wired in accordance with the chapter "Electrical connections LOCON 100".

6.6.2.1 Prescaler factor at incremental encoders

If a resolution that exceeds the device's counting area is required, then a prescale factor can be built-in, which allows to count only every nth input increment. That way also an application with several revolutions can be realized even with a low resolution and a small counting area.

Example:
A plant is equipped with an incremental encoder (resolution 8192 inc./rev.) and a LOCON 100 (counting area 8192). The application comes to an end after four revolutions of the encoder. Since, however, after one revolution the end of the counting area would be reached, this application would not function like this.
In order to avoid that problem a prescaler factor with the value „4" is programmed. With it only every fourth increment of the encoder is counted. Therefore the cam control jumps again to „0" after the fourth revolution only.

6.7 PLL-input

The PLL(Phase-Lock-Loop)-input is a measuring system which determines the machine's position with one single strobe per revolution, at constant speed. This impulse is captured by an initiator-input that can be mapped as desired. The zero point can be set through one of the two preset-inputs at any point desired. In case no preset-input is mapped, then the initiator-input is considered as zero point signal at the same time.
Besides it is possible to map a PLL-synchronous output. Through the PLL-synchronous window the user determines the extent of the initiator impulse he is allowed to use in order to indicate the synchronism of the machine. For this procedure a speed-difference measurement is used. If the impulse remains within this area, then the output is switched to High (24V). If it is outside of that area, then the output is switched to Low (0V).

Please pay attention to the following advice when using the PLL-measuring system:

1. The signals at the PLL-input and also at both preset-inputs must have a length of at least 1ms.

2. The internal resolution in the PLL-operation is 1ms. Therefore the following condition has to be considered in order to guarantee a correct operation. Otherwise ERROR 47 is the result:

   counting area < 60000 / „rev./min."

i. e. for higher speeds the counting area has to be reduced.
In practise it is to be recommended to work with a counting area of 360 (resolution = 1 degree). Then speeds up to 166 rev. are possible.

6.8 Encoder monitoring

A 'genuine' encoder monitoring can be configured for Singleturn-applications. It compares the encoder value read in each cycle with the value read in before and generates an Error 105 if a deviation greater than +/- 7 increments has been detected for a period equal to eight times the cycle time. This procedure reliably detects a defective encoder or a damaged cable, but brief interference on the encoder line does not result in an error message.

Note:
The most significant encoder track (MSB) cannot be monitored, since the encoder (in case the MSB is defective) acts as if it would permanently jump back and forth between 0...1/2 encoder resolution.

Error 100 is not suppressed if the encoder is not connected on units for absolute shaft encoders with a resolution of 360 or 1,000 increments featuring this option.

6.9   Direction cams

This function allows to define, for each output, with what direction of rotation the outputs are to be switched. Three options (per output) can be used:
• Switching in both directions
• Switching in positive direction only
• Switching in negative direction only

The evaluation only takes place at the cams' edges, that means, in case the control detects an edge (switch on- or switch off edge) the output is always updated whenever the direction of rotation corresponds to the programmed direction.

Example:

set direction for direction cams →

Cam

```
            ┌──────────┐
────────────┘          └────────────
            100        200
```
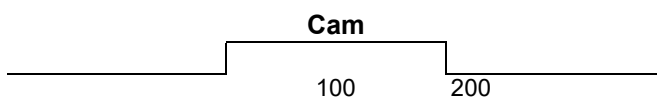
Driving direction		Position	OUT	Comment
→		100	HIGH	Edge is detected, direction is evaluated, output switched
→		200	LOW	Edge is detected, direction is evaluated, output is switched off
←		199	LOW	Edge is detected, direction is evaluated, output is not updated
←	99		LOW	Edge is detected, direction is evaluated, output is not updated
→	100		HIGH	Edge is detected, direction is evaluated, output is set

In the first cycle after switching on the device and after each program change, all outputs are updated (independent of the programmed direction), that means, in this cycle the LOCON acts like a cam control without direction cams.

Afterwards an update of the outputs only takes place if the encoder's direction of rotation corresponds to the programmed direction of the output and a cam edge (switch on- or switch off-point) is present.
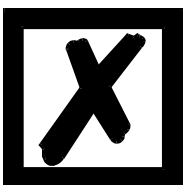
In the first cycle after switching on the device, it acts like a cam control without direction cams!

6.10 Run-control-output

It is possible to assign a run-control-function to an output. In normal operation the output constantly provides 24V here. In case of an error the output drops to 0V.
This function can be mapped as desired to any output.

6.11 Dynamical zero offset

Besides the static zero offset (NPV) a dynamical zero offset can be programmed in LOCON 100. During operation through an initiator signal the position can be offset to „0" at any position of the encoder via an input that can be mapped as desired.
Here it has to be considered that activating the dynamical zero offset results in the fact that the value of the static zero offset will be set to zero and cannot be used any more.
The dynamical zero offset is cancelled by deleting the mapping.

6.12 Angle-time cam

Optionally LOCON 100 also supports angle-time cams. The switch-on point is dependent on the angle, the switch-off point is defined by a time period (1 through 32500 ms).
Please note that an idle time compensation of angle-time cams is not possible.
Note: The switch-on point and the duration must not have the same value.
        -> Otherwise: Error 22.

6.13 Offline programming

It is possible to program the LOCON offline on a PC without the unit itself having to be connected to the PC when programming.
The program package "WINLOC32" which runs on any PC with WIN95/98, WIN-NT, WIN2000, WIN-ME or WIN-XP is used for this purpose.
After programming, the data can then be transferred to the LOCON via the PC's serial port.
It is also possible to transfer existing programs from LOCON to the PC, change these programs on the PC and then re-load them back into the cam control.
The WINLOC32 program package is available free of charge from our sales agents. You can also download the software from our homepage.

6.14 Data backup and documentation on PC

The possibility of a data backup and documentation on a PC is also available. This is a part of the "WINLOC32" program package (see above).
This allows you to back up programs of LOCON to a PC's hard disk or floppy disk, to comfortably print and also reload the programs.

6.15 Program controller function (encoder simulation)

LOCON can also be configured as a program controller (timer). In this case, it behaves in the same way as an incremental cam control. However, the count is changed not via an external incremental encoder (see above) but via an internal timebase (which can be set from 1 ms to 65535 ms).

6.16 Incremental output (generation of A/B-track)

Via WINLOC32 two A/B-tracks can be generated, like those of an incremental encoder, which are generated at the outputs of the LOCON. In this case both tracks can be mapped on any two outputs.

The length of the increments themselves, the amount of the increments between track A and track B as well as the Offset can be set here.

6.17   Mapping

In LOCON 100 the following input and output signals (see also chapter "Signal description LOCON 100") can be distributed as desired among the I/Os via a mapping in WINLOC32:

Function	Significance
Preset 1, Preset 2*	As soon as one of the two signals becomes active, the counter level will be set to the pre-set value and it is kept on that value until the condition disappears again. The polarity is adjustable, i. e. if high active or low active.
CountEnable+*	At 24V this signal unlocks the meter, provided that it is mapped. In case 0V are applied at this lead, then the meter reading is frozen. The speed measurement and with it the idle time compensation keeps on running during this time. This signal is evaluated with an accuracy of ±0.5ms.
OutEnable+*	With this signal the outputs can be connected or disconnected when using an incremental encoder. With 0V or unwired the outputs are deactivated, in case of 24V the outputs are set in accordance with the programmed cams. The response to a signal changeis carried out with an accuracy of ±0.5ms.
ProgNo 1 ... ProgNo 64*	In case of an external program selection the program number is applied to these pins. The coding is in binary form according to chapter 'Coding of device and program number'.
ProgStart*	If 24V are applied to this pin, the program number is accepted at the pins ProgNo1 to Pro-gNo64 (see above).
ProgEnable*	If 24V are applied to this pin, all parameter changes (incl. change in configuration) are allowed in LOCON. For further details see chapter 'Programming enable".
Dynamic zero offset*	This input serves to set of the zero point during operation (only with absolute encoders).
Run-control-output*	Signal to present the status of the cam control.
Incremental output*	Two outputs to generate an A/B-signal.
PLL-input*	Initiator-input of the PLL-measuring system.
Sync-output*	Signal to present the synchronism of the machine at PLL-measuring systems.

6.18   PRESET and CLEAR

With the configuration of Inc., Timer or PLL a preset-value can be set that displaces the position to that value after receipt of a preset-signal.
(Ex-works condition: Preset = 0 corresponds to Clear)
The preset-inputs 1 and 2 can be logically connected by AND-function or OR-function.
Besides, it is up to the user if these inputs are supposed to be high- or low-active.

6.19   X-options

6.19.1   Option X39

In the past the option X39 was only available for a Multiturn ROTARNOCK (MTR), with the effect that a resolution of 4 x 1024 was interpreted by a cam control like a 12-bit encoder, that means the cam control read in and evaluated an area of 0..4095, which, however, was distributed to 4 revolutions in reality. Since MTRs are not available any more now a LOCON 100 with a standard 24-bit SSI-Mulltiturn encoder can be used as replacement. For this the LOCON 100 has to be configured as SSI-Singleturn (12 bit) and at the same time the option X has to be set to 39 via WINLOC32. With this it is possible to achieve the same behavior as before with the MTR-X39.

7　Networking terminals with cam controls and PCs

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

7.1　RS232 link

An RS232 link is always a **point-to-point link for 2 users**.
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.

7.2　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 7V.**
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.

7.3　Cable type for DICNET

A shielded, twisted, 2-core cable (twisted pair) is recommended as the bus cable. The shield serves to enhance electromagnetic compatibility (EMC). However, an unshielded cable may also be used if ambient conditions permit, i.e. if no electromagnetic interference (EMI) is anticipated. The characteristic impedance of the cable should be between 100 and 130 $*\Omega$ 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 which fully complies with these specifications and which 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:
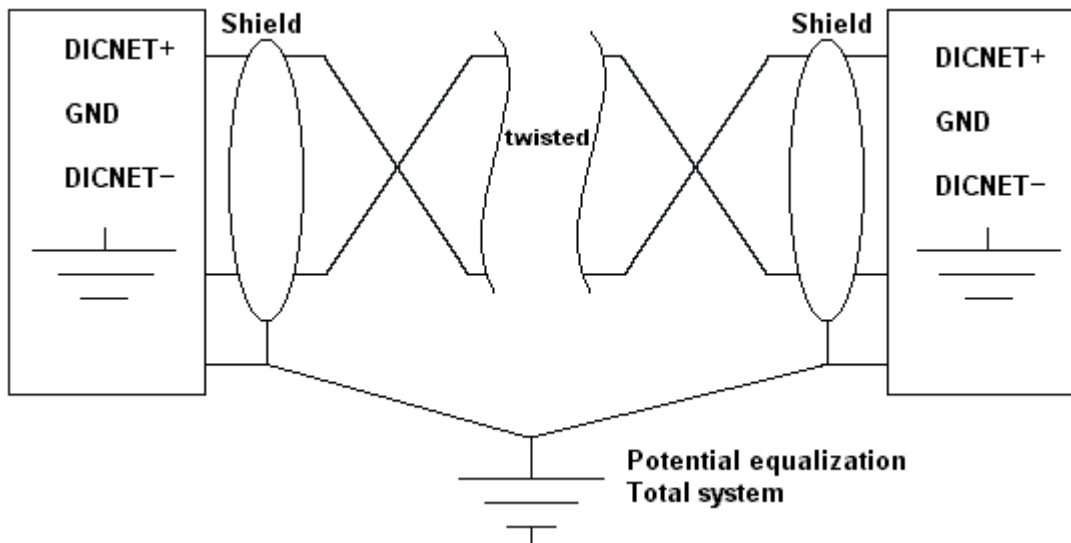
Picture 3: DICNET-wiring

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

7.3.1   Earthing, shielding

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

7.3.2   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.

7.4   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).

7.5   Connection examples

7.5.1   DICNET link LOCON-TERM

LOCON and TERM are connected as follows via DICNET
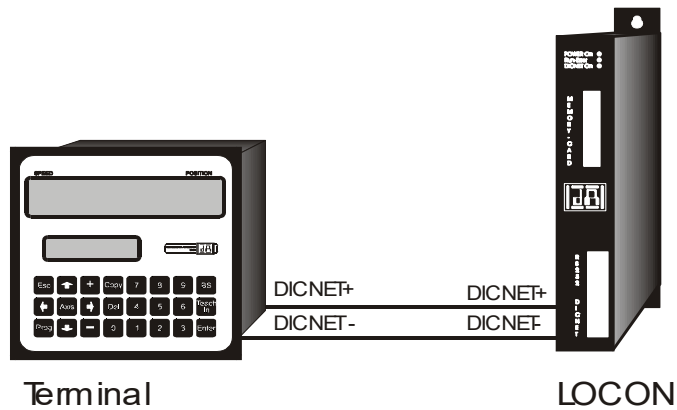
Picture 4: DICNET link terminal - LOCON

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 7V. 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 24V supply for both units.

7.5.2   RS232 link LOCON - TERM

On the RS232 version, only a point-to-point connection between LOCON and the external opera-
tor 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 **<u>must</u>** be connected
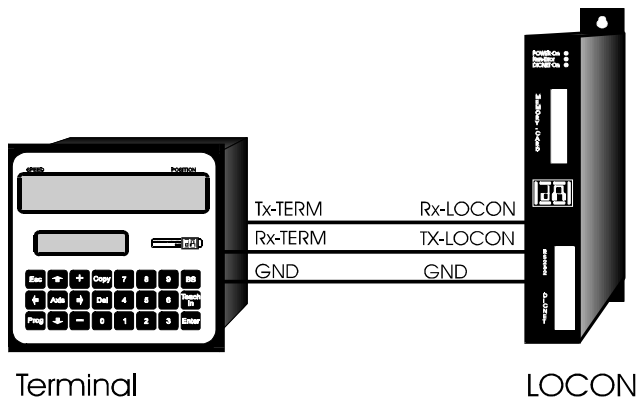
Picture 5: RS232 link Terminal - LOCON

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

7.5.3   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
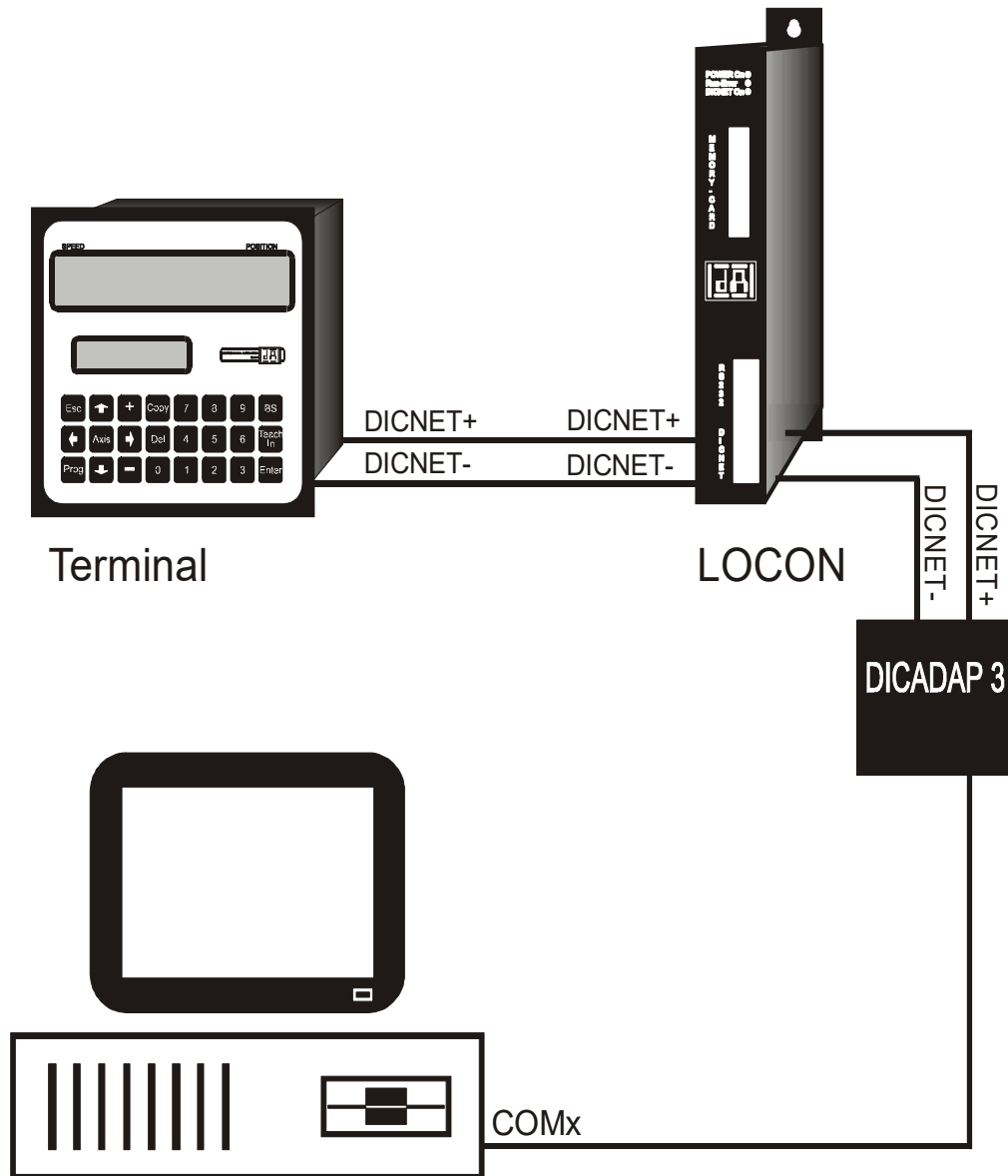
Picture 6: Link DICNET bus to PC
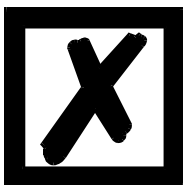
The presented devices exemplary stand for Deutschmann terminals and cam controls of the series LOCON / ROTARNOCK respectively.

7.6 Short instuction

Initialisation

Program turn-direction → Invert turn-direction

Display CA Clear All

Save turn-direction

Display zero-point-moving

Program zero-point → Change display

Save zero-point
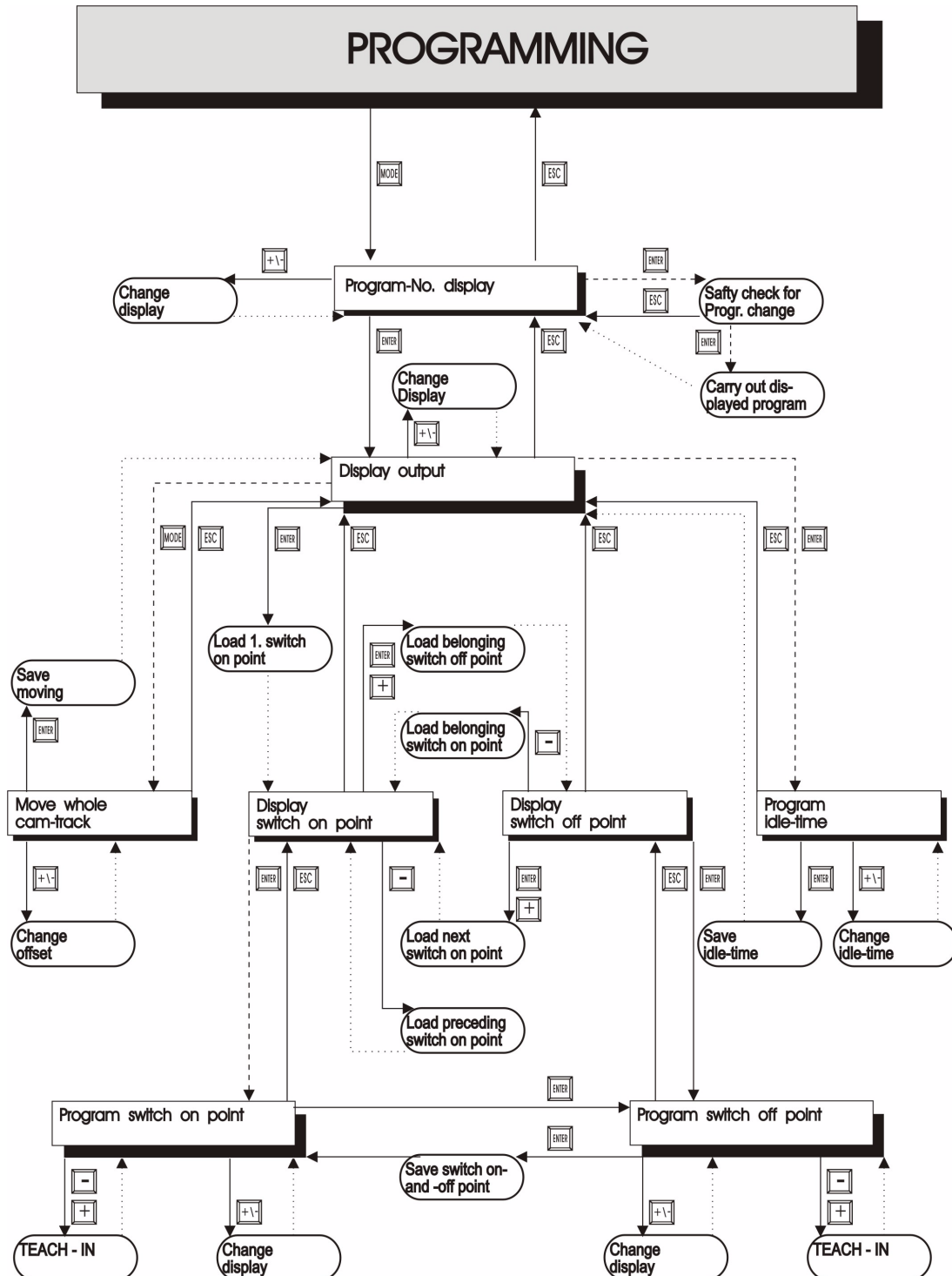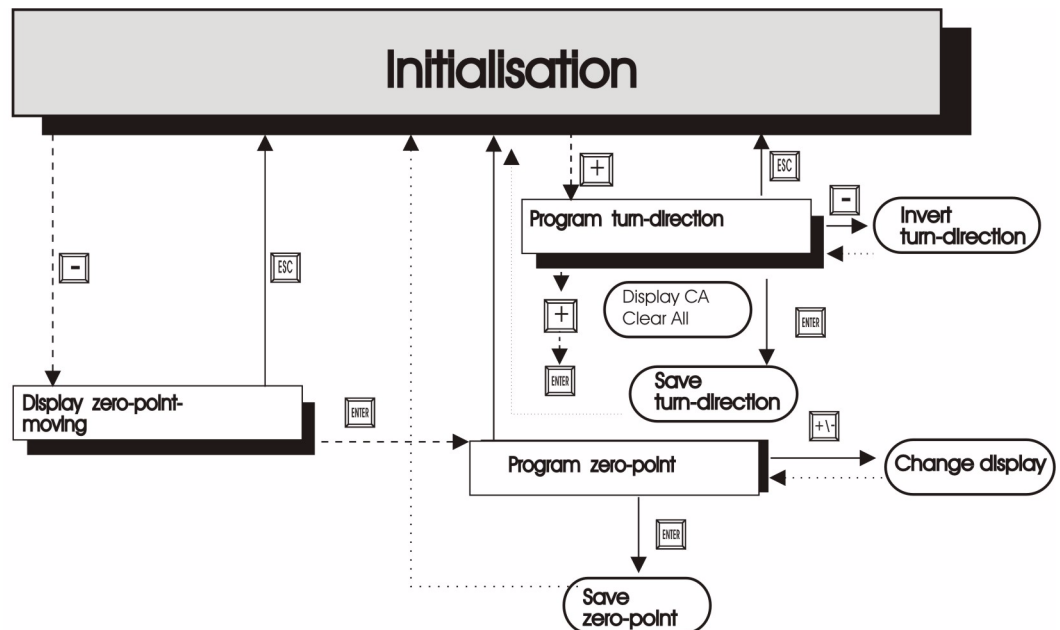
LEGEND

At the graph are only standardfunctions considered.
All functionkeys are arranged on the right or above.
———— Keypush normal
- - - - - - Keypush long
·············· Remove automatically
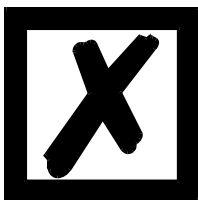
A more detailed description on how the device is programmed via TERM 6 can be found in the instruction manual for "LOCON 16 / 17". The described ways of proceeding for LOCON 16 / 17 also apply for TERM 6.

A more detailed description on how the device is programmed via TERM 24 can be found in the instruction manual for "LOCON 24 / 48 / 64". The described ways of proceeding for LOCON 24 / 48 / 64 also apply for TERM 24.

8   LOCON 100 with Modbus

LOCON 100 is always a Modbus-RTU-Slave. The device supports the Modbus-RTU-command "03 (0x03) Read Holding Registers" and "16 (0x10) Preset Multiple Regs".

The interfaces are changed by adjusting the rotary coding switches, located at the bottom side. Here the following setting applies:
Fx: RS232-standard interface
Ex: RS485-Modbus with activated bus termination (x = Modbus ID)
Dx: RS485-Modbus without bus termination (x = Modbus ID)
Cx: RS232-Modbus (X = Modbus ID)

In the condition as supplied to customer, the device acts as if there are no cams available after it has been switched on and they always have to be transmitted into the LOCON 100-MB through the Modbus-master.
There is the possibility to change this mode so that the LOCON 100-MB saves the cam values in the EEROM permanently. To do so the parameter "DataInRamOnly" in the configuration area has to be set to "No" in WINLOC 32 from version V3.26 on.

The device itself supports the following addresses:
Address assignment from the Modbus' point of view:

==
Address 4_0001 describes the holding-register 1. In the telegram it represents the address 0, since the counting starts with 0, the holding-registers, however, start counting with 1.
Besides, it has to be considered that the holding-registers are word-registers, that always have a size of 2 bytes

Process data (read only):

4_0001..	4_0002	Position
	4_0003	Speed
	4_0004	Actual program
	4_0005	Error number
4_0006..	4_000D	Output state 1..128

DTC (read-write):

4_0101	DTC on output 1
4_0102	DTC off output 1
4_0103	DTC on output 2
4_0104	DTC off output 2
...	
...	
4_01FF	DTC on output 128
4_0200	DTC off output 128

Parameter in accordance with paramater table in the instruction manual (read-write):

4_0401..4_0402   Parameter 1

... ...

4_05FF..4_0600   Parameter 256

! Parameter 256 = ModbusProgNr (default = 0) !

Parameter address = 0401H+((p-1*2))

Cams (read-write):

4_1001..4_1002   Cam 1 switch on output1
4_1003..4_1004   Cam 1 switch off output1
4_1005..4_1006   Cam 2 switch on output1
4_1007..4_100   Cam 2 switch off output1
...
4_107D..4_107E   Cam 32 switch on output1
4_107F..4_1080   Cam 32 switch off output1

4_1081..4_1082   Cam 1 switch on output2
4_1083..4_1084   Cam 1 switch off output2
...
4_10FD..4_10FE   Cam 32 switch on output2
4_10FF..4_110   Cam 32 switch off output2

...

...
4_4F01..4_4F0   Cam 1 switch on output128
4_4F03..4_4F04   Cam 1 switch off output128
...
4_4FFD..4_4FFE   Cam 32 switch on output128
4_4FFF..4_5000   Cam 32 switch off output128

Modbus-start-address from cam c on output o = 4_1001H + ((o-1) * 80H) + ((c-1) * 4)

ATTENTION:
A maximum of 32 cams each output can be programmed!

Process data - Example: The process data "Position" are supposed to be read out from the L100-Modbus with the Modbus address = 1:

Request:		Reply:	
01	Slave address	01	Slave Address
03	Function	03	Function
00	Starting address H	04	Length in byte
00	Starting address L	00	Pos H 1. byte
00	Length in words H	00	Pos H 2. byte pos. = 720 (dec.)
02	Length in words L	02	Pos L 1. byte
xx	CRC	D0	Pos L 2. byte
xx	CRC		

Idle times - Example: Set an idle time of 100.0 ms (-> 03 E8 hex) on output1.

Transmission:		Receipt:	
01	Slave addresse	01	Slave address
10	Function	10	Function
01	Starting address H	01	Startind address H
00	Starting address L	00	Starting address L
00	Length in words H	00	Length in words H
01	Length in words L	01	Length in words L
02	Length in bytes	xx	CRC
03	DTC H		
E8	DTC L		
xx	CRC		

and the following read-out with:

Request:		Reply:	
01	Slave address	01	Slave address
03	Function	03	Function
01	Starting address H	02	Length in byte
00	Starting address L	03	DTC H
00	Length in words H	E8	DTC L
01	Length in words L	xx	CRC
xx	CRC		

Parameter - Example: Acknowledging a pending error through Modbus.

Transmission:		Receipt:	
01	Slave address	01	Slave address
10	Function	10	Function
04	Starting address H	04	Starting address H
BE	Starting address L	BE	Starting address L
00	Length in wortds H	00	Length in words H
02	Length in words L	02	Length in words L
04	Length in bytes	xx	CRC
00	Parameter H 1. byte		
00	Parameter H 2. byte		
00	Parameter L 1. byte		
01	Parameter L 2. byte		
xx	CRC		

Cams - Example: Setting the 1. cam on output 1 from position 1000 - 2000.

Transmission:		Receipt:	
01	Slave address	01	Slave address
10	Function	10	Function
10	Starting address H	10	Starting address H
00	Starting address L	00	Starting address L
00	Length in words H	00	Length in words H
04	Length in words L	04	Length in words L
08	Length in bytes	xx	CRC
00	Pos On H 1. byte		
00	Pos On H 2. byte		
03	Pos On L 1. byte		
E8	Pos On L 2. byte		
00	Pos Off H 1. byte		
00	Pos Off H 2. byte		
07	Pos Off L 1. byte		
D0	Pos Off L 2. byte		
xx	CRC		

and reading out the switching point and stop position:

Request:		Reply:	
01	Slave address	01	Slave address
03	Function	03	Function
10	Starting address H	08	Length in byte
00	Starting address L	00	Pos On H 1. byte
00	Length in words H	00	Pos On H 2. byte
04	Length in words L	03	Pos On L 1. byte
xx	CRC E8 pos On L 2. byte		
00	Pos Off H 1. byte		
00	Pos Off H 1. byte		
07	Pos Off H 1. byte		
D0	Pos Off H 1. byte		
xx	CRC		

Cams - Example: Setting the stop position "2000" of the 32. cam on output 16.

Transmission:		Receipt:	
01	Slave address	01	Slave address
10	Function	10	Function
17	Starting address H	17	Starting address H
FE	Starting address L	FE	Starting address L
00	Length in words H	00	Length in words H
02	Length in words L	02	Length in words L
04	Length in bytes	xx	CRC
00	Pos Off H 1. byte		
00	Pos Off H 2. byte		
07	Pos Off L 1. byte		
D0	Pos Off L 2. byte		
xx	CRC		

and reading out the stop position:

Request: Reply:
01   Slave address   01   Slave address
03   Function   03   Function
17   Starting address H   04   Length in byte
FE   Starting address L   00   Pos Off H 1. byte
00   Length in words H   00   Pos Off H 2. byte
02   Length in words L   07   Pos Off L 1. byte
xx   CRC   D0   Pos Off L 2. byte
xx   CRC

Error output:
In case an error occurs, then the reply will appear in the "Function byte" = executed function + 80 hex. If a value is supposed to be read, then the result is as follows:
Function code = 03 + 80 = 83 hex. In the following byte (usually length byte) the corresponding error code is displayed according to the Modbus RTU specification.

8.1   Angle-time-cam at LOCON 100 with Modbus

The LOCON 100 with Modbus supports a single-turn application with a maximum encoder resolution of 13 bits. This corresponds to an input and output value of a maximum of 8192 increments. This means that the most significant bit is always 0. To program a time, the most significant bit of the "turn off point" must be set to 1. The corresponding time in ms can then be programmed into the remaining bits. The maximum time is 32500ms.
See the example below.

Angle-time cam Example: Setting the 1st cam on the output 1 from position 1000 for 250ms.

Request: Reply:
01   Slave address   01   Slave address
10   Function   10   Function
10   Starting address H   10   Starting address H
00   Starting address L   00   Starting address L
00   Length in words H   00   Length in words H
04   Length in words L   04   Length in words L
08   Length in Bytes   xx   CRC
00   Pos On H 1. Byte
00   Pos On H 2. Byte
03   Pos On L 1. Byte
E8   Pos On L 2. Byte
00   Pos Off H 1. Byte(Time On)
00   Pos Off H 2. Byte (Time On)
80   Pos Off L 1. Byte (Time On)
FA   Pos Off L 2. Byte (Time On)
xx   CRC

9 LOCON 100 with PROFIBUS

In LOCON 100 two modes are selectable through WINLOC32 during operation via the PROFI-BUS-interface.

1. S7-mode (ex-works condition) for an operation at a Simatic S7 (see also instruction manual, art.-no.: V3058E „Cam controls with fieldbus connection").

2. Communication profile mode for the operation via the „Communication profile for Deutschmann cam controls" (see also instruction manual art.-no.: V2064E).

If the selected mode in the device is not the same as the one in the GSD-file this results in a configuration error in the Master.

9.1 GSD file

The GSD-file „L100.GSD" can be found on our homepage (www.deutschmann.de) or on the support CD.

9.2 PROFIBUS Slave ID

The PROFIBUS-address (ID) at the LOCON 100 is set through the rotary coding switches at the device's underside, through WINLOC32 or the PROFIBUS-Master. If an ID between 1...7E (126 dec.) is set this address is always valid for the device.
If the rotary coding switch is on position „00" or ≥ 7E hex (126 dec.) then any desired address can be assigned either through WINLOC32 or the PROFIBUS-Master.

9.3 Error handling for the PROFIBUS version

In case there is an error at the device, then the data component is not processed any more and it waits for the "Error_Quit". Otherwise a chain reaction may occur and the device behaves in an uncontrolled manner

9.4 Bus terminating resistor

Beneath the „PROFIBUS-Termination" sticker is a slide switch. You can activate and deactivate the bus termination with it. On delivery, the bus terminating resistor is disabled.
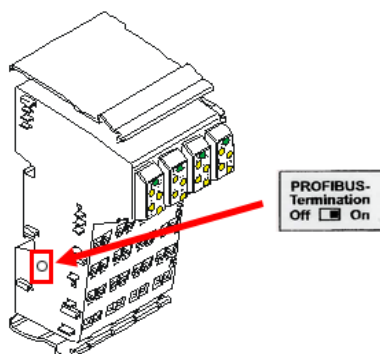
10 Commissioning and self-test

10.1 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 24V 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 the message "not present" if no user is found with the set no.

10.1.1 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).

10.2 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 24V 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.

10.2.1   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 displayed on the display if possible (see chapter Error messages).

10.3   Configuration and initialization

The parameters specified in the parameter table below can be configured/initialized by the user with the DIP SWITCH.

10.3.1   LOCON 100 parameter table

Designation	Default	Value range
Initialization parameters		
Counting range	16777216 (MT) 8192 (ST)	For incremental encoder
Zero offset / preset value	0	
Reversal	0	0 = Normal 1 = Inverted
Factor speed display	60	0 .. 9999 (rev./sec.)
Virtual encoder value	Encoder resolution	**Units with absolute encoder:** 2.. 32500 **Units with incremental encoder:** 2..32500 (ST) 2..16777216 (MT)
Configuration parameters		
Encoder resolution	4096	Abs. parallel Gray: 360, 720, 1000, 3600, 7200 2^n (n=0..13 bit) 2 .. 8192 SSI Gray: 360, 720, 1000, 3600, 7200 2^n (n=0..13 bit) 2 .. 8192 MT: 24 bit (4096 x 4096) MT: 25 bit (8192 x 4096, evaluation 4096 x 4096) Incremental: 2 .. 16384 (ST) 2.. 16777216 (MT) TIMER: Counting range can be set from 1 ms to 65535 ms
Idle time compensation ITC	Bitwise	Blockwise ITC Bitwise ITC Blockwise, separate switch-on and switch-off idle time Bitwise, separate switch-on and switch-off idle time
PROFIBUS-ID	DIP-switch	0 .. 15 (at position „0" ID can be set via WINLOC32 or PROFIBUS-Master)
Device ID for DICNET (hardware configurable)	DIP-switch	0 ... 15
Encoder type	SSI	Absolute encoder, parallel Gray Incremental encoder Absolute encoder, SSI, Gray Timer Multiturn PLL
Inputs, outputs	Configurable	Altogether 16 I/Os
Direction cams	Standard	No, yes
Reverse rotational direction encoder	Standard	No, yes

Angle-time-cam	Standard	Firmly integrated, not configurable

10.3.2   Parameter description

10.3.2.1   Reverse rotational direction, encoder

The direction of rotation of the connected encoder (parallel, incremental or SSI) can be inverted with this parameter.

10.3.2.2   Encoder type

This parameter defines the encoder type. The following encoders are currently supported:

Gray absolute encoders (parallel), 24V
Incremental encoders, 24V
Incremental encoders RS422
Gray-SSI absolute encoders
TIMER (value is generated internally)
PLL (Phase-Lock-Loop)

All encoder types, except for PLL can be configured as singleturn or multiturn.

10.3.2.3   Encoder resolution

This parameter defines the resolution of the encoder (inf./rev.).
The available resolutions are specified in the parameter table

10.3.2.4   Counting range (only for incremental encoders)

By default, a counter overflow occurs if the counting range limit is reached if using an incremental encoder. Example: At 8192, i. e. after count 8191, the counter counts to 0000 unless an external preset signal has been issued before.
The counting range can be set with this parameter. Please refer to the parameter table for the limited values.

10.3.2.5   Type of idle time compensation

The term "idle time" means the time which elapses from setting a PLS output through to the actual response of the connected unit (e. g. opening a valve).
This idle time is normally constant.

A PLS must shift a programmed cam as a function of the actual encoder speed in order to compensate for this idle time dynamically. This means that a valve which is to open at position 100 must, for example, already be opened at position 95 at a speed of 1 m/s and must already be opened at position 90 at a speed of 2 m/s.
This function is designated dynamic cam shifting or idle time compensation (ITC).

Idle times may be programmed blockwise, i. e. a set idle time always applies to a block of 8 outputs, or bitwise, which provides the option of choosing different switch-on and switch-off delay times in the case of blockwise ITC.The setting is made with the following values:

1 = Blockwise idle time compensation
2 = Bitwise idle time compensation
3 = Blockwise idle time compensation with separate switch-on and switch-off times
4 = Bitwise idle time compensation with separate switch-on and switch-off times

10.3.2.6   DICNET-device number (GNR)

This parameter can be used to set the device number with which the LOCON logs on to the DIC-NET bus and with which, for example, it is addressed by WINLOC32 or communicates with TERM 4.
This value can be changed only with the rear-panel DIP switch and not in the menu.
If you use the RS232 interface, this parameter is of no significance.

10.3.2.7   Zero offset (only for absolute encoders)

The zero offset or the zeroing is used to synchronize the machine's mechanical zero point with the zero point of an absolute encoder. With it the encoder can be installed in any desired position and the machine's mechanical zero point does not have to correspond to the one of the encoder.

The programmed zero offset value is subtracted by LOCON from the actual encoder value, i. e. if the absolute encoder supplies the value 100 as position and a zero offset of 10 is programmed, LOCON processes the value as if position 90 had been read in.
If an offset towards higher values is supposed to be made, the value to be offset must be subtracted from the encoder resolution and entered as zero offset. In the above example, if position 110 is to be processed and an encoder with 1000 inf./rev. is connected, a correction value of 990 (1000-10) had to be entered.
Since in practise zeroing generally occurs at the machine's zero point, it is sufficient to enter the displayed position value as the correction value (TEACH-IN).

If LOCON is used with an incremental encoder, zeroing is not applicable.

10.3.2.8   Scaling for speed display

This parameter permits the speed display to be matched to the given application. Scaling in the range 0...9999 revolutions/second is possible.
A value of 60 is preset at the default. This means that the speed in rpm is displayed.

10.3.2.9   Virtual encoder value (gear factor)

Regardless of the resolution of the encoder actually connected, it is possible to program a "virtual encoder resolution", thus implementing an electronic transmission. If, for example, an encoder with a real resolution of 360 increments per revolution is used and one complete revolution corresponds to a traverse path of 1,000 mm, a "fictitious revolution" of 1,000 increments must be entered in order to program the cam control in "mm".
Please note that the entry and display are always integer. Floating-point display is not possible. In case of results with a remainder larger than 0.5, the system rounds up to the next number.

The following restriction applies for the MT-configuration:
If „real value' is not equal to „fictitious value" (i. e. if you work with fictitious counting areas or encoder resolutions), then both values must not exceed 65535.

11 Technical details

11.1 Technical data LOCON 100

Characters	Basic equipment	Configurable by the customer
Operating voltage	24 Volt DC ±20%, max. 0.2A (without load, max. 8A with load) see chapter 11.2	
Data protection	EEPROM (at least 100 years); no battery required	Via WINLOC32 on PC
Programs	64	
Number of cams	1000 data records, optionally distributable to channels and programs; cams are inter-changeable linewise (in the basis segment)	
Position recording	Absolute encoder SSI Gray-code: 4096	Incremental encoder, counting area 2...16777216 (max. counting frequency 75 kHz) Absolute encoder clipped. Gray-code: up to 13 bit Absolute encoder SSI Gray-code: up to 13 bit Absolute encoder SSI Multiturn: 24 or 25 bit
Outputs / Inputs	16	With expansion module: up to 48
Idle time compen-sation (ITC)	Bitwise	Blockwise Separate I/O Input of the idle time in steps: 0.1 ms - 999.9 ms
Cycle time	Dynamical from 100µs on	
Programming	Via external operating unit Through PC via WINLOC32 Via PROFIBUS	
Display	For outputs / inputs: 16 Status: 4	
Interface	RS485 DICNET-network for up to 16 axes RS232 (switchable)	PROFIBUS-interface (only optional, instead of RS485) RS485
Connections	Outputs etc. through plug-connectors	
Installation	DIN-rail mounting	
Type of protection	IP20	
Dimensions	5 x 12 x 6.8 cm (W x H x D)	

11.2 Max. sum current LOCON 100

Through the supply connectors a maximum of 8A can be fed. That implies that the load of the max. 16 outputs may not exceed 8A.

For the operation with an extension module also the load of the max. 48 outputs may not exceed 8A.

In case a higher current is required, it is possible to insert a power terminal block (standard pro-gram PHOENIX, designation: IB IL 24 PWR IN-PAC, art.-no.: 2861331) between the basic device and the extension module. With this power terminal block another 8A can be fed.

This way it is possible to provide 8A via the basic device and again 8A via the extension module which means that in this constellation LOCON 100 can drive a maximum of 16A.

11.3 LOCON 100 memory structure

Memory size	Number of data records
8 kbyte	1000 data records

8 bytes are required for each data record. The remaining data records are required by the firm-ware.

The following data record usage applies:

Type	Usage
1 cam	1 data record
1 idle time	1 data record
1 output name (max. 30 characters)	5 data records (6 characters/data record)

11.4   Specification of the input levels

Logical HIGH: > 16V   < 10 mA (typically 5 mA)
Logical LOW: < 4V   < 1 mA

11.5   Specification of the output drivers

The outputs used in the LOCON are short-circuit-proof and can drive maximum 700 mA per output at normal ambient temperature.
If more than 700 mA per output are required it is possible to interconnect several outputs.
If several outputs are interconnected, the switch-on and switch-off points in the LOCON must be programmed absolutely identically since, otherwise, the short-circuit monitor responds.

In the event of a sustained short circuit or an overload (up to max. 1 A for a short period of time), the corresponding outputs are deactivated and a corresponding error message is presented on the display.

When switching inductances (coils, valves) free-running diodes are to be placed directly at the inductances (see chapter "EMC Directives for products of Deutschmann Automation" on page 10).

11.6   Estimation of the cycle time

The cycle times are calculated dynamically by the cam control depending on the selected configuration and programming.
In order to be able to carry out a rough estimation (e. g. for the planning) in advance the following **standard values** can be taken to work with:

Basic cycle time

		blockwise idle time	bitwise idle time	blockwise I/O-idle time	bitweise I/O-idle time	Multiturn
	w/o idle time					
output 1 - 8	100µs	130µs	165µs	135µs	190µs	900µs
output 9 - 16	110µs	145µs	225µs	165µs	270µs	900µs
output 17 - 24	120µs	160µs	285µs	195µs	350µs	900µs
output 25 - 32	130µs	175µs	345µs	225µs	430µs	900µs
output 33 - 40	140µs	190µs	405µs	255µs	510µs	900µs
output 41 - 48	150µs	205µs	465µs	285µs	590µs	900µs

At LOCON 100 the number of outputs is determined by the last used output minus the last possible input. If, for instance, 4 inputs are configured, Pin I/O4 is the last possible input then since I/O1.. I/O4 operate as inputs. Supposing that the last cam is on Pin I/O23 the number of outputs is 23 - 4 = 19; with it the line output 17 - 24 has to be taken as basis.

Now depending on the configuration the following cycle times have to be added to this basic cycle time:

PROFIBUS:	150 µs
DICNET:	40 µs
Encoder monitoring active:	10 µs
Angle-time cams active:	150 µs
SSI:	40 µs
Incremental encoder / Timer:	30 µs
Direction cams active:	60 µs
MT-configuration:	1... 9 ms
LOCON 100-I/O32-extension:	50 µs

So for instance for a LOCON 100 with PROFIBUS, bitwise idle time and with cams on the first 16 outputs an **approximate** cycle time of 225 µs (basic cycle time) + 150 µs (PROFIBUS) = 375 µs is determined.

11.7   Switching accuracy of the Deutschmann cam controls

The accuracy of cam controls is influenced by four parameters:

1) **Switching delay (SV)**
   This time is constant and results from the computing time required by the cam control from read-in of the encoder value to setting the output driver.

2) **Repeat accuracy (WG)**
   This tolerance band results from asynchronous sampling of the encoder. Ideally, the encoder is scanned directly after a change. Under worst-case condition, the encoder value changes directly after read-out of the cam control.

3) **Resolution**
   This value indicates how long the shortest cam which can still definitely be evaluated by the cam control is.

4) **Idle time resolution (TZA)**
   This error occurs only if an idle time is programmed for the corresponding output. It is speci-fied in ms and represents the sampling time of the encoder speed, serving as the basis of TZK (idle time compensation).

In general, the SV and WG are each shorter than the cycle time of the cam control. This means that the actual switch point lies between instants "Switch-on time + SV" and "Switch-on time + SV + WG", as indicated in the diagram below.
Without idle time compensation, the resolution is 1 increment, provided the maximum encoder speed is not exceeded, i.e. even a cam with a length of 1 increment is still reliably detected and set by the cam control.
If the encoder speed ($V_{encoder}$) is exceeded n-fold, the resolution increases accordingly to n increments.
If you work **with** idle time compensation, the error merely increases by 1 increment since the cor-rection of the TZK is maximum ±1 increment with each change of the encoder position owing to the "dynamic brake" implemented in LOCON.

To summarize, we can state the following formula:

Without idle time compensation:
Actual switch point = ideal switch point + SV (const) + WG

SV   < cycle time (constant, typically cycle time/2)
WG   < cycle time (fluctuating between 0 and cycle time)
Resolution   = n increments with $V_{encoder} < n * V_{encoderMax}$

With idle time compensation:
Actual switch point = ideal switch point + SV (const) + WG + TZA

SV   < cycle time (constant, typically cycle time/2)
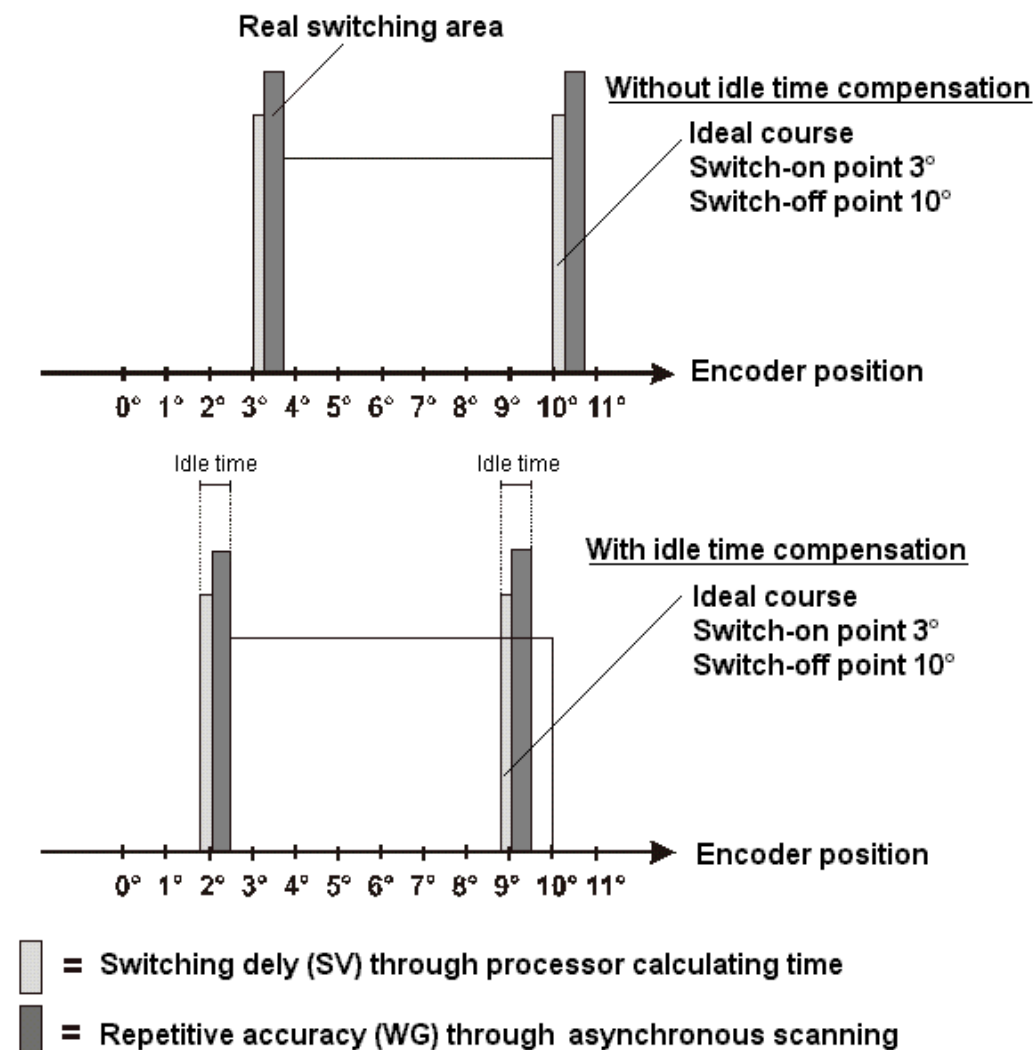WG   < cycle time (fluctuating between 0 and cycle time)
TZA   = Resolution of the TZK (typically 1 ms)
Resolution   = n   increments, with $V_{encoder} < n * V_{encoderMax}$, whereby $V_{encoder}$ const.
Resolution   = n+1 increments, with $V_{encoder} < n * V_{encoderMax}$, whereby $V_{encoder}$ variable.

11.7.1   Timing diagram

Picture 7: Timing diagram - idle time compensation

11.8   Function of the idle time compensation

All mechanical circuit components which are usually connected to a cam control (e. g.: flood-gates, 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 dynamics brake)

Each of the above-mentioned methods has its 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 required 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.

11.8.1   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 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.

11.8.2   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.

11.8.3   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.

11.8.4   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 - system-dependently - 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.

11.9   Environmental specifications of cam controls of the LOCON series

Storage temperature:	-25°C.. + 70°C
Operating temperature:	0°C .. 50°C (without 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:	200 g

11.10   DICNET®

DICNET® (**D**EUTSCHMANN **I**ndustrial **C**ontroller **Net**) is a multi-master-field bus 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.

11.11   Modbus

The transmission baud rate is 19200 baud; no parity. Only the Modbus-addresses 1... 15 are supported (rotary switch on the right = low ID). The broadcast address "0" is not supported.
Other regulations referring the maximum cable length and topologies can be found in the manual "Modicon Modbus Protocol Reference Guide" from the company Modicon.

11.12   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.

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.

Furthermore it is also possible to make the LOCON capable for fieldbuses with Deutschmann UNIGATES (PROFIBUS, Interbus, CANopen, Ethernet, ...).

On request, we are able to supply information on this interface in the form of Manual "Communication profile for DEUTSCHMANN AUTOMATION cam controls".

11.13 Coding device numbers

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

ID HIGH

Display	Device number	Binary coding			
		8	4	2	1
0x	0	0	0	0	0
1x	16	0	0	0	1
2x	32	0	0	1	0
3x	48	0	0	1	1
4x	64	0	1	0	0
5x	80	0	1	0	1
6x	96	0	1	1	0
7x	112	0	1	1	1
8x	128	1	0	0	0
9x	144	1	0	0	1
Ax	160	1	0	1	0
Bx	176	1	0	1	1
Cx	192	1	1	0	0
Dx	208	1	1	0	1
Ex	224	1	1	1	0
Fx	240	1	1	1	1

ID LOW

Display	Device number	Binary coding			
		8	4	2	1
x0	0	0	0	0	0
x1	1	0	0	0	1
x2	2	0	0	1	0
x3	3	0	0	1	1
x4	4	0	1	0	0
x5	5	0	1	0	1
x6	6	0	1	1	0
x7	7	0	1	1	1
x8	8	1	0	0	0
x9	9	1	0	0	1
xA	10	1	0	1	0
xB	11	1	0	1	1
xC	12	1	1	0	0
xD	13	1	1	0	1
xE	14	1	1	1	0
xF	15	1	1	1	1

12 Error messages

A LOCON error message can be seen from the fact that the „Error-LED" flashes.
In addition, the optional Run-Control output drops if a serious error (1..19, 31, 100..255) has occurred.

All errors must be acknowledged via a terminal with `Esc` .

A distinction can be made between the following error types:

12.1   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'.

12.2   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 offset	
22	Error saving a cam value	
23	Error deleting a data record	
24	Error deleting a program parameter	Parameter can be deleted in program 0 only
25	Error copying a program Error shifting a cam track	
26	Error programming an idle time	
27	Record-number not available	At S7-data block
30	No programming enable	The program can be modified only if signal "Prog-Freigabe" (Program Enable) is at 24V on the connector or if parameter "Lockable outputs" is set appropriately (see chapter "Program enable")
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 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).
33	Too many angle-time cams have been set	

34	Error programming a partial idle time compensation	Unit does not feature the 'Y' partial idle time compensation option
34	Error setting a parameter	
35	Error logic programming	
35	Prohibited encoder resolution, no power of 2	Program a valid value
36	Parameter not available	
37	Error setting a prohibited angle-time cam	
38	Logic not unlocked	Configure logic
39	Idle time compensation or direction cam not possible	For configuration without idle time compensation or direction cam
40	DICNET - transmit error Duplicate error on transmit	Duplicate error on transmission
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	E. g. missing or wrong bus termination
43	No connection to the PROFIBUS-Master	Only for devices with PROFIBUS-interface
44	Overflow of the serial receive buffer	
45	Overflow of the serial transmit buffer	
46	Error save blank cam	Data record incomplete
47	Error programming a direction cam	Direction cam prohibited
47	PLL-error	Counting area too high for speed
51	Area of the transferred cams is wrong	

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

12.3   Error number 100..199 (serious error)

All outputs are switched to 0V 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 (clipped) Gray code read in by the encoder is checked 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	Prohibited cams detected. Carry out a general deletion
104	Plausibility error (prohibited device configuration)	A prohibited device configuration been saved (e. g. absolute encoder with 127 increments resolution). Carry out a general reset
105	Encoder error (only when encoder monitoring is on)	See chapter "Encoder monitoring".
108	SSI Timeout error	
111	SSI Gray code error	

12.4   Error number 200-299 (terminal error)

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
210	RX overflow error	Receive buffer overflow
211	TX overflow error	Transmit buffer overflow
212	TX change ID error	Error changing the ID
213	Timeout accessing LCD-display	Acknowledge the error. If the error occurs again, the unit must be returned, specifying the information described in chapter "Returning a unit"
220	Timeout 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 initialization data record	
240	DICNET transmit error	
241	DICNET receive error	
242	Duplicate device number in DICNET 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	Unknown command	Internal error
253	Checksum error detected by the cam control	Internal error

13 Order Code

13.1   Cam control LOCON 100

13.1.1   Explanation of the order designation

LOCON 100 is available in three different versions.

1. LOCON 100 with switchable RS232/RS485 (DICNET)-interface
2. LOCON 100-PB PROFIBUS- and RS232-interface
3. LOCON 100-MB with switchable RS232/RS485 (Modbus-RTU)-interface

13.2   Scope of delivery

13.2.1   Scope of delivery LOCON 100

The scope of delivery consists of a device with all associated terminal elements.

14 Servicing

Should questions arise that are not covered in this manual you can find further information in our

- FAQ/Wiki area on our homepage www.deutschmann.com or directly in our Wiki on www.wiki.deutschmann.de

If your questions are still unanswered please contact us directly.

Please note down the following information before calling:
- Device designation
- Serial number (S/N)
- Article number
- Error number and error description

Your request will be recorded in the Support center and will be processed by our Support Team as quickly as possible (Usually in 1 working day, rarely more than 3 working days.).

Technical Support hours are as follows:
Monday to Thursday from 8 am to midday and from 1 pm to 4 pm, Friday from 8 am to midday (CET).

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Fax sales department	+49 6434 9433-40
Fax Technical Support	+49 6434 9433-44
E-mail Technical Support	support@deutschmann.de

14.1   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 number was displayed?
- How is the unit externally wired (encoders, outputs, ..)? Please state all connections of the unit.
- What is the magnitude of the 24V supply voltage (± 0.5V) with connected LOCON?
- What were you last doing on the unit (programming, error on power-up, ...)?

The more precise your information and error description, the more precisely we can check the possible causes.
Devices, that are sent in without an error description undergo a standard test. You have to bear the costs for that test even though no defect was found.

14.2   Internet

The current software WINLOC32 is available for download from our Internet-homepage www.deutschmann.com. There you can also find topical information on Deutschmann products, instruction manuals and a list of our distribution partners.