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Instruction manual
Electronic cam control

ROTARNOCK 100

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

Manual Art.-No. V3408E

Foreword

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

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

Bad Camberg, July 2017

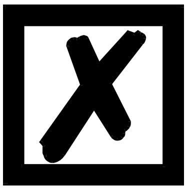
Version 3.5 dated 17.07.17, Art.-No. V3408E
P/C: A

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.

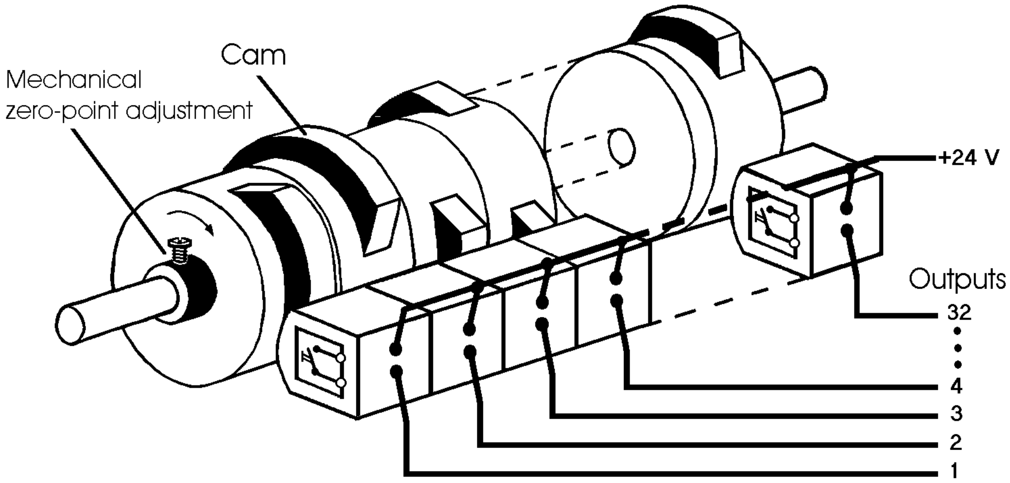
1.1.3 Suggestions

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.

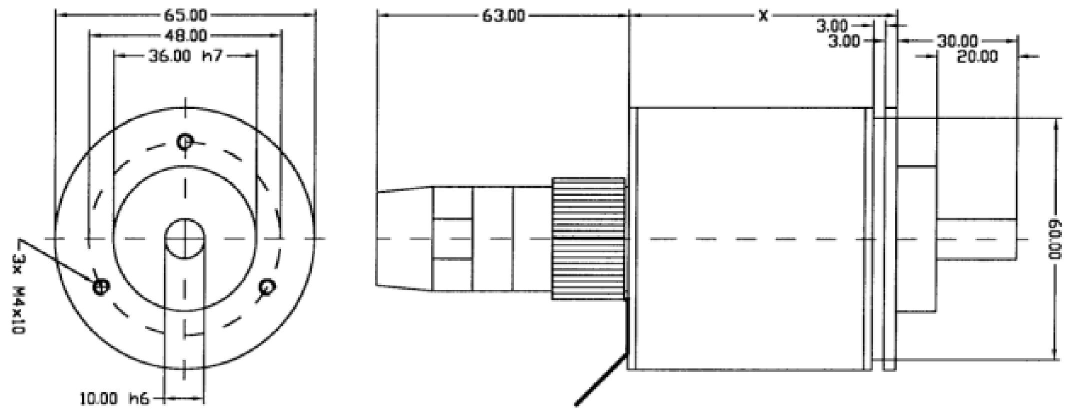
3 Basic device ROTARNOCK

3.1 ROTARNOCK 100 (singleturn)

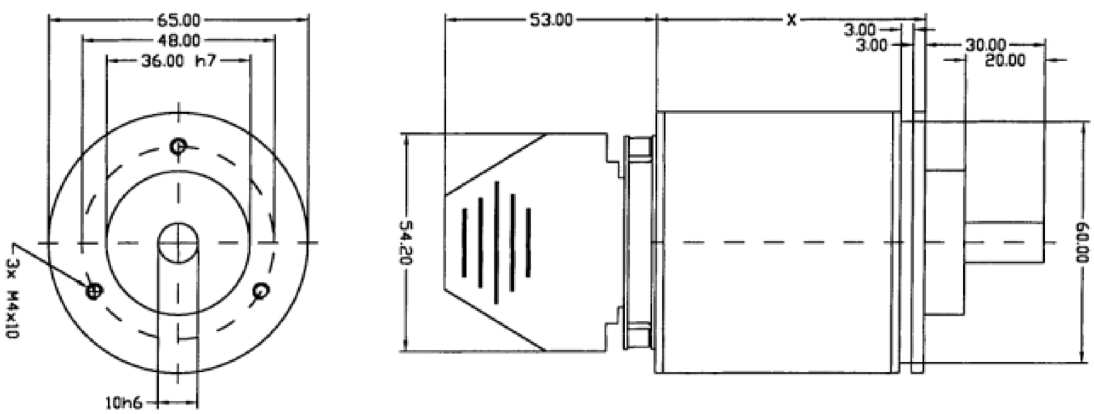
ROTARNOCK is a LOCON cam control, integrated in an encoder housing.
The technical data can be taken from the annex.

The programming is carried out a PC in connection with the software package "WINLOC32" or via an external operating unit, which, however, is not necessary for the operation. The connection between ROTARNOCK and a terminal or a PC can be made at choice by an RS232-interface or by the DICNET-bus (RS485) according to the chapter "Networking terminals with cam controls and PCs".
The devices of the series ROTARNOCK are also available with PROFIBUS-connection.
More information can be found in the instruction manual „Cam controls with Fieldbus connection“.

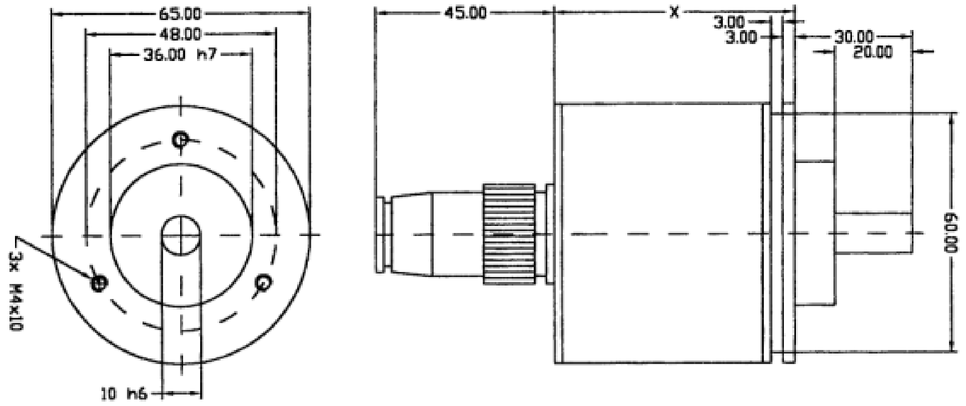
3.1.1 Dimensional drawing ROTARNOCK



Picture 2: Dimensional drawing ROTARNOCK RS232 or RS485, option IF, version IP65



Picture 3: Dimensional drawing ROTARNOCK RS232 or RS485 or PROFIBUS, version IP54



Picture 4: Dimensional drawing ROTARNOCK with PROFIBUS or Fieldbus, version IP65

x = 69 mm at ROTARNOCK with RS-interface, version IP54 or IP65
x = 81 mm at ROTARNOCK with PROFIBUS-interface, version IP54
x = 98 mm at ROTARNOCK with PROFIBUS-interface / Fieldbus, version IP65

ROTARNOCK 100-PROFIBUS is a device optimized for fieldbus connections with a high-end performance range. 16 hardware outputs are complemented with 32 software outputs that are made available via PROFIBUS that makes a total of 48. Angle-time cams and by option 16 software inputs with logic function and numerous further performance characteristics distinguish this device from others.

The customer can configure ROTARNOCK 100 via WINLOC32 completely, which means that the functions of ROTARNOCK 100, such as logic, angle-time-cams, direction cams can be configured via PC-tool WINLOC32.

The number of outputs is adjustable between 24, 32, 48 and 64. In the state of delivery the number is preset to 64. The first 16 outputs or 12 outputs of the IP65-version respectively are hardware outputs, all remaining outputs can also be transferred via the fieldbus.

The fixed number of outputs is 48.

For the configuration (via WINLOC32) please note the following:

- The following idle time compensations are possible: bitwise, blockwise, blockwise I/O and bitwise I/O. The ex-works condition of the idle time compensation is bitwise. At present, however, the data component generator supports bitwise idle time compensation only.
- The logic inputs are transferred via the bus only.
- The speed display scaling can be adjusted as desired, the default value is 60 rev./min.
- The amount of angle-time outputs is 16 fix.
- The direction cams are always released, the bits are always set in the flags. A presentation via WINLOC is not required.

The device is programmed via the PROFIBUS (with the data component generator) - exactly as ROTARNOCK 2-PROFIBUS. For further information, see instruction manual for “cam controls with fieldbus connection“.

3.1.2 ROTARNOCK 100-PB (PROFIBUS)

3.1.2.1 GSD file (PROFIBUS)

Through the GSD-file the ROTARNOCK can be pre-configured while integrating it into the network. Here a Plug-and-Play-functionality comes about. In case of an exchange the Master sends all parameters to the new ROTARNOCK directly. The GSD-file „R100.GSD“ can be found on our website at www.deutschmann.de or on the support DVD.

3.1.2.2 Configuration via the PROFIBUS interface

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).

3.1.2.3 Operation via the PROFIBUS interface

In ROTARNOCK 100 two modes are selectable through WINLOC32 during operation via the PROFIBUS-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.

The GSD-file „R100.GSD“ can be found on our homepage (www.deutschmann.de) or on the support DVD.

3.1.2.4 PROFIBUS Ident No.

From firmware version V2.1 on the Ident no. equals 3606h. In case you want to exchange a current unit (> V2.1) in an existing project, you can set the Ident no. back to the old version 3231h by pressing „STRG“ and „N“ and confirming the security query.

3.1.2.5 PROFIBUS Slave-ID

The PROFIBUS address (ID) for the ROTARNOCK is set via WINLOC32 or the PROFIBUS Master.

3.1.3 ROTARNOCK 100-PN (PROFINET)

3.1.3.1 GSDML-Datei (PROFINET)

Through the GSDML-file the ROTARNOCK can be pre-configured while integrating it into the network. Here a Plug-and-Play-functionality comes about. In case of an exchange the Master sends all parameters to the new ROTARNOCK directly.
The GSDML-file „GSDML-ROTARNOCK100.zip“ can be found on our website www.deutschmann.com or on the support DVD.

3.1.3.2 Configuration via the PROFINET interface

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

3.1.3.3 Operation via the PROFINET interface

In ROTARNOCK 100 two modes are selectable through WINLOC32 during operation via the PROFINET-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 GSDML-file this results in a configuration error in the Master.

The GSDML-file „GSDML-ROTARNOCK100.zip" can be found on our homepage (www.deutschmann.de) or on the support DVD.

4 Pin assignment ROTARNOCK

ROTARNOCK is delivered in the standard type (RS485-DICNET) with 2 plugs, one 25-polar and another 9-polar D-SUB-plug (pin in each case).

The 9-polar-plug serves only for the installation of a configurator for the DICNET-bus, with which the participant-number in the network and, if necessary, a bus terminating resistor is configured. Ex works this plug has the configuration "Instrument number 0 with bus termination".
If the ROTARNOCK features a RS232-interface, this plug is dropped without being replaced.
A delivery with a 28-pol. roundplug (option IF) is also possible.
Optionally ROTARNOCK is delivered with a PG-screwing and a 16-polar cable.

4.1 25-pol. D-SUB

The pin assignment of the 25-pol. D-SUB-plug (pin),which is the standard is as follows:

Function	**Cable color**	**Pin 25pol. socket**
Output 1	White	1
Output 2	Brown	2
Output 3	Green	3
Output 4	Yellow	4
Output 5	Gray	5
Output 6	Pink	6
Output 7	Violet	7
Output 8	Gray/pink	8
Output 9	White/green	9
Output 10	Brown/green	10
Output 11	White/yellow	11
Output 12	Yellow/brown	12
Output 13	White/grey	13
Output 14	Gray/brown	14
Output 15	White/pink	15
Output 16	Pink/brown	16
DICNET+/Tx-ROTARNOCK	Pink/red	17
DICNET-/Rx-ROTARNOCK	Gray/red	18
ProgSelect1	White/black	19
ProgSelect2	Brown/black	20
ProgSelect4	Gray/green	21
ProgSelect8	Yellow/gray	22
ProgSelectStart	Pink/green	23
24 V-DC	Red + yellow/black	24
GND	Blue + black	25

4.2 Assignment of the configuration plug

The 9-polar D-SUB-plug serves to adjust the device number in the DICNET and allows to activate an internal bus terminating resistor.

The device number is connected to the plug with a binary code, where a connection to GND is made at those pins that are marked with "0" in the list, the other pins remain not wired.
If for instance the device number 6 is to be set, the pins DICNET-No1 and DICNET-No8 must be connected to GND, the remaining connections are not wired.

For activating the bus terminating resistor the pins DICNET+ with R+ and DICNET- with R- must be linked, otherwise the pins remain not wired.

4.3 9-pol. D-SUB (only with DICNET)

The pin assignment of the 9-pol. D-SUB-plug (pin) is as follows:

Pin No.	Significance
1	DICNET No. 1
2	DICNET No. 2
3	DICNET No. 4
4	DICNET No. 8
5	GND
6	DICNET-
7	R-
8	DICNET+
9	R+

4.3.1 9-pol. D-SUB (only with Option X89)

The pin assignment of the 9-pol. D-SUB (socket) is as follows:

Pin No.	Significance
1	+24V/DC (Output)
2	GND (Output)
3	RX
4	TX
5	GND
6	not connected
7	not connected
8	not connected
9	not connected

4.3.2 Pin assignment 9-pol. D-SUB at the PROFIBUS-version

Pin-No.	Name	Function
1	shield	
2	not connected	
3	B	not-inverted input-/output-signal from PROFIBUS
4	not connected	nc
5	M5	DGND-data reference potential
6	P5	5V supply voltage
7	not connected	
8	A	inverting input-/output-signal from PROFIBUS
9	not connected	

4.4 Pin assignment 5-pol. plug M12 at ROTARNOCK PROFIBUS with IP65 (socket + pin)

Pin - incoming bus
Socket - continuing bus

Pin-No.	Name
1	P5
2	A
3	M5
4	B
5	shield

4.5 Pin assignment 16-pol. round plug at ROTARNOCK PROFIBUS with IP65

Pin-No.	Name	Function
1	output 1	
...	...	
8	output 8	

9*	I/O 9	output 9 or external PB-ID-selection 1
10*	I/O 10	output 10 or external PB-ID-selection 2
11*	I/O 11	output 11 or external PB-ID-selection 4
12*	I/O 12	output 12 or external PB-ID-selection 8
13	Tx	
14	Rx	
15	24 VDC	
16	GND	

* The I/O-signals 9 - 12 can either be used as output or as input to the external PROFIBUS-ID-selection. When switching on it is checked if +24V are applied at the pins 9 - 12. If so, then this very pin is read-in as the corresponding ID. Otherwise this pin is available as output.

4.6 Pin assignment 4-pol. round plug M12 (socket) d-coded at ROTARNOCK PROFINET with IP65

Pin-No.	**Name**
1	TD + (RJ45 Pin 1)
2	RD + (RJ45 Pin 3)
3	TD - (RJ45 Pin 2)
4	RD - (RJ45 Pin 6)

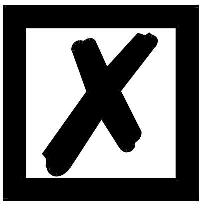
4.7 Pin assignment 16-pol. round plug at ROTARNOCK PROFINET with IP65

Pin-No.	**Name**
1	Output 1
...	...
12	Output 12
13	Tx
14	Rx
15	24 VDC
16	GND

4.7.1 Pin assignment 28pol. round plug (option IF)

Function	**Cable color**	**Pin 28pol. socket**
Output 1	White	1
Output 2	Brown	2
Output 3	Green	3
Output 4	Yellow	4
Output 5	Gray	5
Output 6	Pink	6
Output 7	Violet	7
Output 8	Gray/pink	8
Output 9	White/green	9
Output 10	Brown/green	10
Output 11	White/yellow	11
Output 12	Yellow/brown	12
Output 13	White/grey	13
Output 14	Gray/brown	14
Output 15	White/pink	15
Output 16	Pink/brown	16
DICNET+/Tx ROTARNOCK	Pink/red	17
R+	Gray/blue	18
DICNET-/Rx-ROTARNOCK	Gray/red	19
R-	Pink/blue	20
ProgSelect1	White/black	21
ProgSelect2	Brown/black	22
ProgSelect4	Gray/green	23
ProgSelect8	Yellow/grey	24
ProgSelectStart	Pink/green	25
nc	-	26

24 V-DC	Red + yellow/black	27
GND	Blue + black	28



Note: The DICNET-ID is set through the DIP switch at the back of the unit. The switch is accessible after removing the protecting cover (screw top). Please take the meaning from the below table

DIP switch position	**DICNET-ID**
0	0
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
A	10
B	11
C	12
D	13
E	14
F	15

4.8 Signal description ROTARNOCK

Function	Significance	Standard	PB	PB IP65	PN
Output 1 ... Output 8	Output block 1 Each output 24V / 0.3A plus-switching (PNP), short-circuit-proof Total current of the output block maximum 1 A	X	X	X	X
Output 9 ... Output 16	Output block 2 Each output 24V / 0.3A plus-switching (PNP), short-circuit-proof Total current of the output block maximum 1 A	X	X	-	-
Output 9-12	Output block 2 Each output 24V / 0.3A plus-switching (PNP), short-circuit-proof Total current of the output block maximum 1 A	-	-	X	X
DICNET+, DICNET-	Data line for networking via the DEUTSCHMANN-bus system DICNET (see chapter "DICNET®").	X	-	-	-
Rx	Receive signal RS232	X	X	X	X
Tx	Transmission signal RS232	X	X	X	X
24 V DC	Supply voltage 24 Volt DC	X	X	X	X
GND	Ground potential of the cam control	X	X	X	X
R+, R-	Terminating resistor connections for DICNET. Required, if LOCON 32 is operated as first or last device in DICNET (see also chapter "DICNET®").	X	-	-	-
ProgNo 1 ... ProgNo 8	in case of external program selection the program number is set at these pins. The coding takes place in a binary way referring to the chapter "Coding device numbers".	X	X	-	-
ProgStart	If this pin is connected with 24V, the program number is taken over at the pins ProgNo1 to ProgNo64 (see above).	X	X	-	-
nc	Not connected				
Shield					
A	Inverted input/output signal	-	X	X	-
B	Not-inverted input/output signal	-	X	X	-
P5	5V supply voltage	-	X	X	-
M5	Data reference potential	-	X	X	-
Incremental output	Two output to complement an A/B-signal	-		X	-
Ext. PB-ID selection	An external PB-ID selection from ID 1-15 can be performed at the pins 9-12 through applying 24V.	-		X	-
RD -	Receive Data -	-	-	-	X
RD +	Receive Data +	-	-	-	X
TD -	Transmission Data -	-	-	-	X
TD +	Transmission Data +	-	-	-	X

4.9 Program selection (through TERM)

In total the device supports 64 programs. Please take a look at the manual for the corresponding terminal to learn how the program change-over is made.
The external program change-over of the programs 0 - 15 is another possibility (see also chapter 4.10 ’External program selection’).

4.10 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 0111) is to be activated:

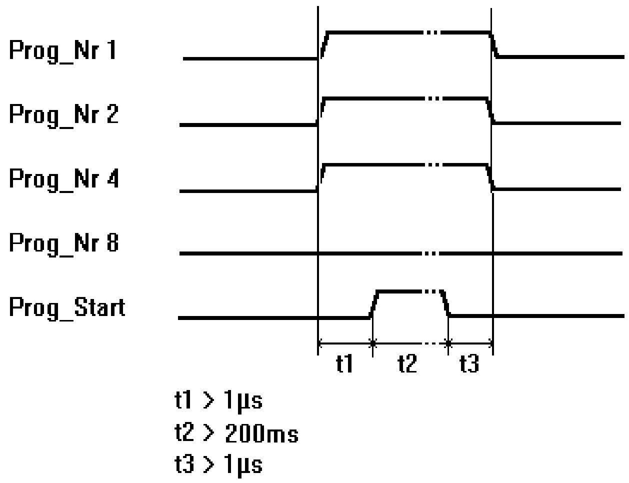
4.10.1 Applying the corresponding voltages

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

4.10.2 Generating the acceptance edge

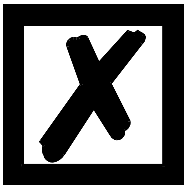
PIN	Volt
PROG_START = 24V	24V
Wait 200ms	
PROG_START = 0V	0V

4.10.3 Graphical representation of program selection



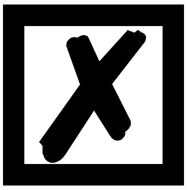
Picture 5: Program selection

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



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

4.11 Installation and initiation of ROTARNOCK 100



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

4.11.1 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 ROTARNOCK 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.

The outputs and the encoder are also powered via this connection.

The typical voltage at the outputs is:
Supply voltage -1V; that means: is the device being supplied with 24V DC, then the typical output- and encoder voltage is 23V DC!

4.11.2 Connection of the inputs and outputs

ROTARNOCK has 16 outputs.

Pins "ProgNo1" to "ProgNo8" and "ProgStart" must be wired only if external program switchover is to occur (for example, via a PLC).

The outputs are powered jointly with the **24V power supply of the total unit**.
The outputs of ROTARNOCK 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.

Free-wheeling diodes must be provided directly on the inductors if switching inductors (coils and valves) (see EMC-standards).

4.11.3 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 ROTARNOCK and the connected unit are reversed (e. g.: Connect TxD ROTARNOCK to RxD PC) and that the "GND" reference potentials of both units will be connected.

4.11.4 Connection of the DICNET bus interface

The DICNET bus (see chapter "DICNET®") is connected via the screw-type plug connector.
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)"!

5 Configurations ROTARNOCK 100

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

5.1 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 ROTARNOCK 100 can be adjusted to the relevant requirements step-by-step.

5.2 TERM 6 or PROFIBUS

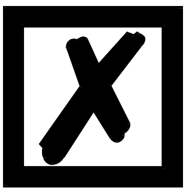
All alterable parameters can be selected directly through the configuration menu in TERM 6 or through PROFIBUS via GSD-file or communication profile. Here the same order as for the WINLOC 32-wizard has to be kept in order to avoid configurations that are not plausible.

5.2.1 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 5.3)
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_SCALED_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.

5.2.2 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

5.3 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 5.3.1
PNR_RESOLUTION_PER_TURN	0x0011	17	Real-resolution per revolution	chapter 5.3.2
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 5.3.3
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 5.3.4
PNR_DEADTIME_TYP	0x0032	50	ITC-type	chapter 5.3.5
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	

5.3.1 PNR_ENCODER_TYP - Encoder type

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

5.3.2 PNR_RESOLUTION_PER_TURN

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

5.3.3 PNR_ENCODER_INVERT

0 = Normal
1 = Inverted

5.3.4 PNR_LANGUAGE - language selection

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

5.3.5 PNR_DEADTIME_TYP

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

5.4 Configuration parameters ROTARNOCK 100

The following performance characteristics can be configured at ROTRANOCK 100.

5.4.1 Inputs and logic functions

ROTARNOCK 100 is optionally available with 16 inputs (through PROFIBUS). Chapter "Logic functions (optional)" contains a detailed description. Beyond it all marked signals (see chapter "Signal description ROTARNOCK")

5.5 Angle-time cam

Optionally ROTARNOCK 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.

5.6 Direction cams

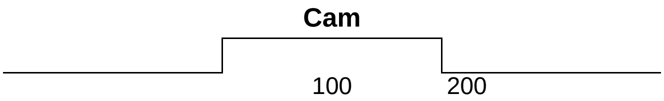
This function allows to define, for each output, with what direction of rotation the outputs are to be switched. Three options (per output) can be used:

- 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:

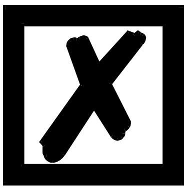
set direction for direction cams →



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 ROTARNOCK 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!

5.7 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.

5.8 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 (for the PROFIBUS-version on the outputs 1-16 only).

From Firmware version V3.54 on and current WINLOC32 it is possible to change the run control type from "static" to "flashing" (Run-control-frequency = 500ms). In this case the output changes from 24V to 0V every 500ms.

From firmware version V3.7 on (standard from November 2010 on) and with the current WINLOC32 the Run-ontrol-frequency can be set additionally.

The extra term for this setting is “Run-control-interval“ and it is adjustable from 0 (static) to 255 (equals 2.55 seconds). By default the value is set to 50, whereby a toggle of 500 ms is achieved.

5.9 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 ROTARNOCK. 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.

5.10 Logic functions (optional)

16 external hardware outputs of the cam control and 16 internal outputs (markers; 'M' on the display) can be programmed and assigned with a switch-off delay time if necessary (outputs 1..8). Each output and marker may consist of a maximum of any three logic operations (AND, OR, AND_NOT, OR_NOT) and 4 operands. The following operands for the logic functions can be used:

- 16 inputs (E01..E16)
- 16 internal cam outputs (N01..N16)
- 16 internal markers (M01..M16)
- A 32-bit shift register

The outputs and markers may be inverted.

5.10.1 Logic functions and explanation of the used symbols

The following logic functions are available for selection:

Function	Symbol represented in the display of a connected TERM 24
UND AND	$\wedge$
UND_NICHT AND_NOT	$\overline{\wedge}$
ODER OR	$\vee$
ODER_NICHT OR_NOT	$\overline{\vee}$
Switch-off delay (time) for outputs 1-8 only	TOFF↑ = 000
Output inverted	a
Marker inverted	m
Marker	M
Cam track (internal output)	N
Output	A
Shift register	S

„Not“ = the corresponding symbol in WINLOC32 is: „/“.

The following applies in the condition as delivered:

- Ax = Nx
- Mx = Nx

5.10.2 Priorities of the logic operations

Execution always takes place from left to right. There are no priorities.

In field 'TOFF', it is possible to enter a time from 0 to 255 ms for outputs 1 to 8 and the edge for triggering can be defined, i. e. the output is switched off only after the entered time. The time starts with the selected edge and is restarted (re-triggered) with each trigger condition.

5.10.3 Operation mode of the shift register

The parameters of the shift register “data, pulse and reset“ are firmly assigned to the upper markers.

Here the following assignment applies:

M16 = Shift register - Reset, if 1
M15 = Shift register - Data input
M14 = Shift register - Pulse (leading edge)

5.10.3.1 Example for the use of a shift register

Referring to bottle manufacturing the finished product has to be analyzed for various criterions. Therefore the bottles are handed over to a rotary table. For the examination they are placed in a mechanically fixed position, in order to be driven past the different inspection equipment. The initialization of the test equipment is carried out through the standard outputs of the cam switch unit.
Since it can always happen that no bottle is available when it comes to the supply of the part under test, for instance due to a tailback on the feed belt or when a batch is coming to an end, this would result in an error message of the camera. A possibility to avoid this is to use the shift register integrated in the cam control.would be, to place an approximating pick-up at any test position and to report the existence of a bottle to the test equipment. In order to realize that possibility, one single approximating pick-up at the intake to the rotary table is required. The informa-

tion about the existence of a specimen is reported from the approximating pick-up through the input of the cam switch unit to the shift register. Each Bit of the shift register corresponds to taking up one bottle in the rotary table. A binary One in the shift register shows the existence of a bottle, whereas a Zero indicates the lack of a bottle. The Bit, that corresponds to the position of the inspection equipment, is now linked to the output of the cam switch unit with an AND-connection, so that the camera belonging to it will only be triggered, in case a bottle for the inspection is actually available.

5.10.4 Trigger conditions

Symbol	Significance
↑	Leading edge
↓	Trailing edge

5.10.5 Example 1

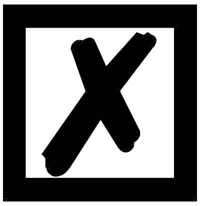
An example with 3 inputs and a switch-off delay is given below

```
I00  A01  TOFF ⇧ = 123
=N01∧E07⊼E16∨E03
```

The above example is displayed on an operating panel TERM 24

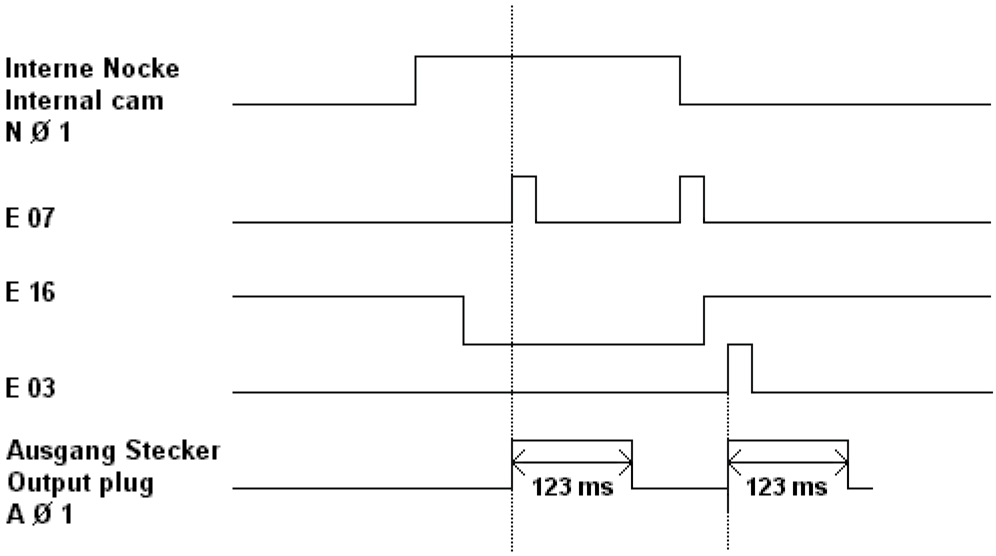
In this example, the status of output 1 results as follows:
The programmed cams of track 1 (N01) are first AND-ed with input 7 (E07) and with the negated input 16 (E16) (NAND). After this, this result is OR-ed with input 3 (E03). This state is then output at output 1 until the switch-off delay has elapsed (see illustration).

Max. 1.5 ms may elapse after an input change until output of the result. The input pulses must be at least as long as the cycle time (see technical data).



Please note that the programmed switch-off delay time of 123ms (in this example) which is started with each leading edge ↑ has an even higher priority than the result of the logic operation, i. e. the output remains at 24V if the delay time has not yet elapsed even if the logic operation would deactivate the output.

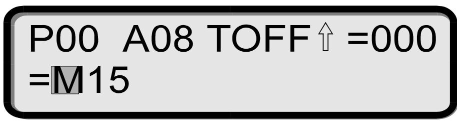
5.10.6 Graphical illustration of example 1



Picture 6: Example, logic operation

5.10.7 Example 2

Following please find an example whose result causes output 8 to blink: (represented on operating panel TERM 24)



5.11 Count cam

The user has the possibility to have switched a certain output only on the revolution set by himself (1... 32). The count cam is realized through the logic function.
Following please find an example which shows the output 1 only switches every fifth 5 revolution:

A1 (output1)	**=**	**N1 and M1**
M1	**=**	**N1 and M1 or M16**
M14	**=**	**N1**
M15	**=**	**N1**
M16	**=**	**S5 (5. revolution)**

5.12 Offline programming

It is possible to program the ROTARNOCK 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 ROTARNOCK via the PC's serial port.
It is also possible to transfer existing programs from ROTARNOCK 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.

5.13 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 ROTARNOCK to a PC's hard disk or floppy disk, to comfortably print and also reload the programs.

6 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:

6.1 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.

6.2 RS485 link (DICNET)

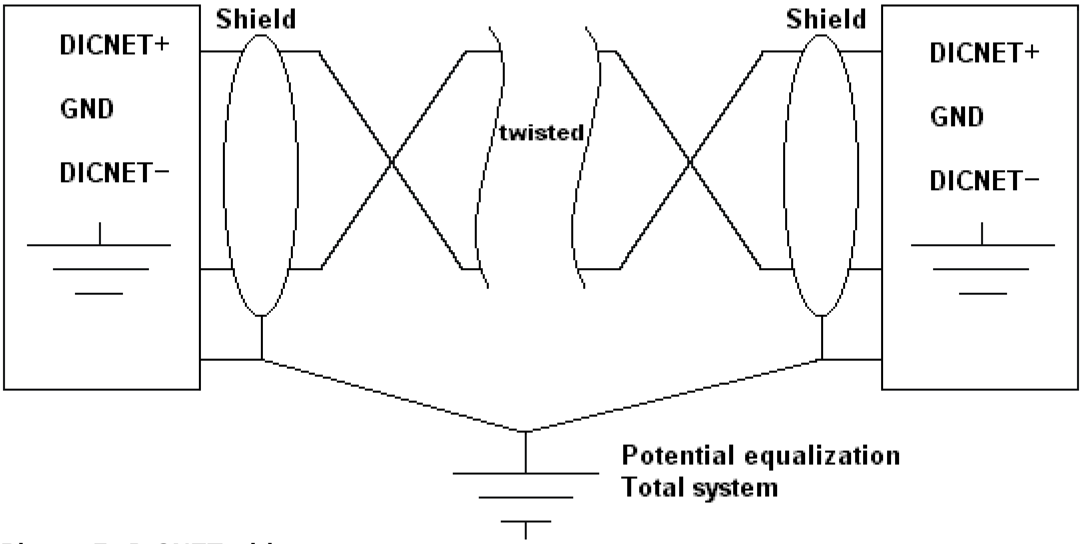
A DICNET link is a bus system to which at maximum configuration level 16 cam controls (LOCON 32, LOCON 24 ...), 16 display units (TERM 4), 16 operator terminals (TERM 6, TERM 24 ...) and 1 PC can be connected **simultaneously** via a **twisted two-wire line** which should be shielded.
All "DICNET+" terminals are interconnected and all "DICNET-" terminals are interconnected. The terminals do not need to be reversed as on the RS232 interface.
Likewise, not necessarily there is a connection of the individual device ground potentials as on the RS232 interface; **however, you must ensure that the potential difference between the individual devices does not exceed 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.

6.3 Cable type for DICNET

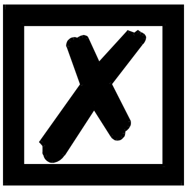
A shielded, twisted, 2-core cable (twisted pair) is recommended as the bus cable. The shield serves to enhance electromagnetic compatibility (EMC). However, an unshielded cable may also be used if ambient conditions permit, i.e. if no electromagnetic interference (EMI) is anticipated.
The characteristic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

A cable 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 7: DICNET-wiring



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

6.3.1 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.

6.3.2 Line termination at DICNET

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

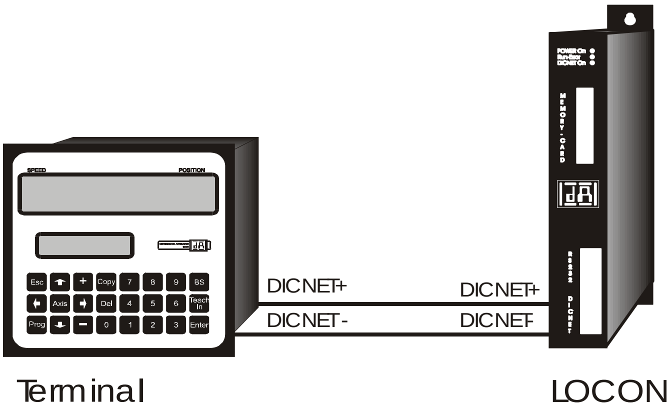
6.4 Comparison DICNET - RS232

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

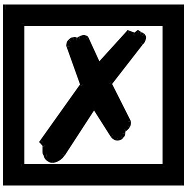
6.5 Connection examples

6.5.1 DICNET link LOCON-TERM

LOCON and TERM are connected as follows via DICNET



Picture 8: DICNET link terminal - LOCON

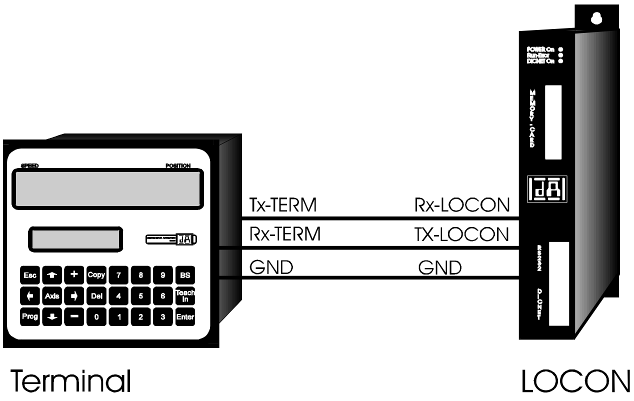


The presented devices exemplary stand for Deutschmann terminals and cam controls of the series LOCON / ROTARNOCK respectively.

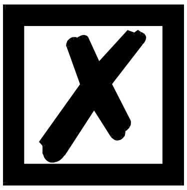
The two ground potentials do not have to be interconnected. However, you must ensure that the GND potential between the individual DICNET bus users does not differ by more than 7V. Otherwise, equipotential bonding must be used.
The bus termination resistor must be activated on both units.
Consequently, 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.

6.5.2 RS232 link LOCON - TERM

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



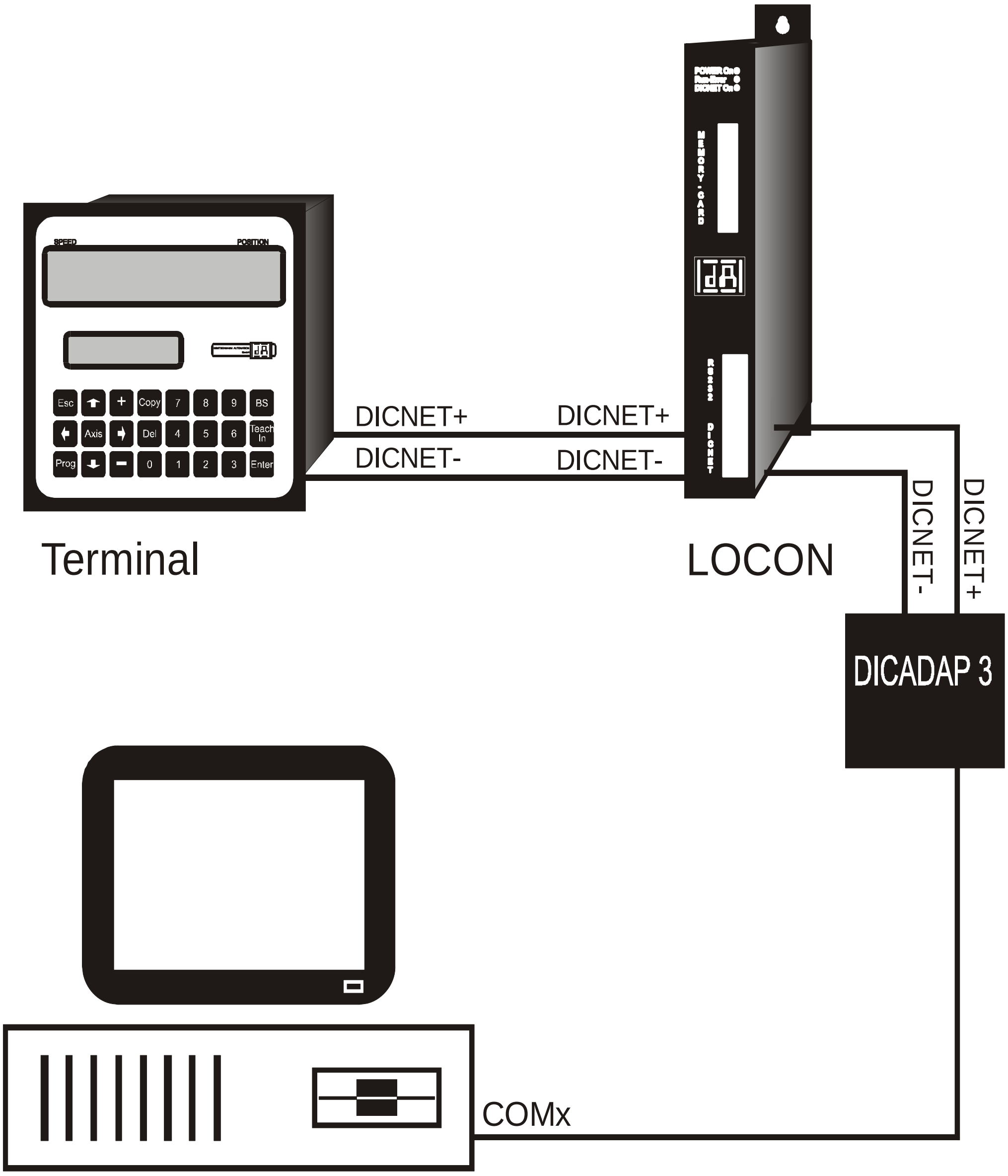
Picture 9: RS232 link Terminal - LOCON



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

6.5.3 DICNET link LOCON-TERM-PC

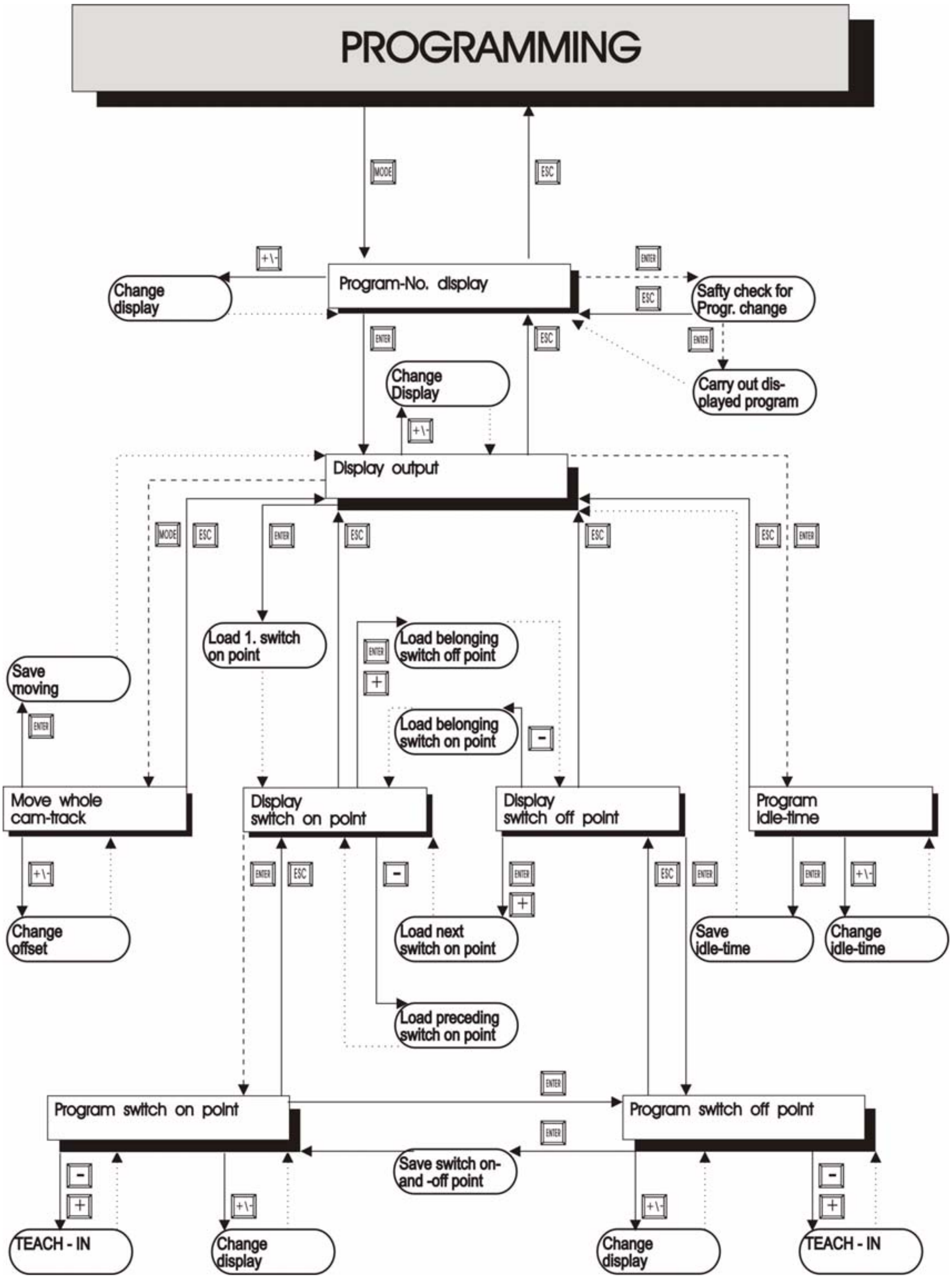
A PC can be integrated in a DICNET bus system using a DICNET adapter. The connection to the PC is made at a serial port COMx - see the illustration below

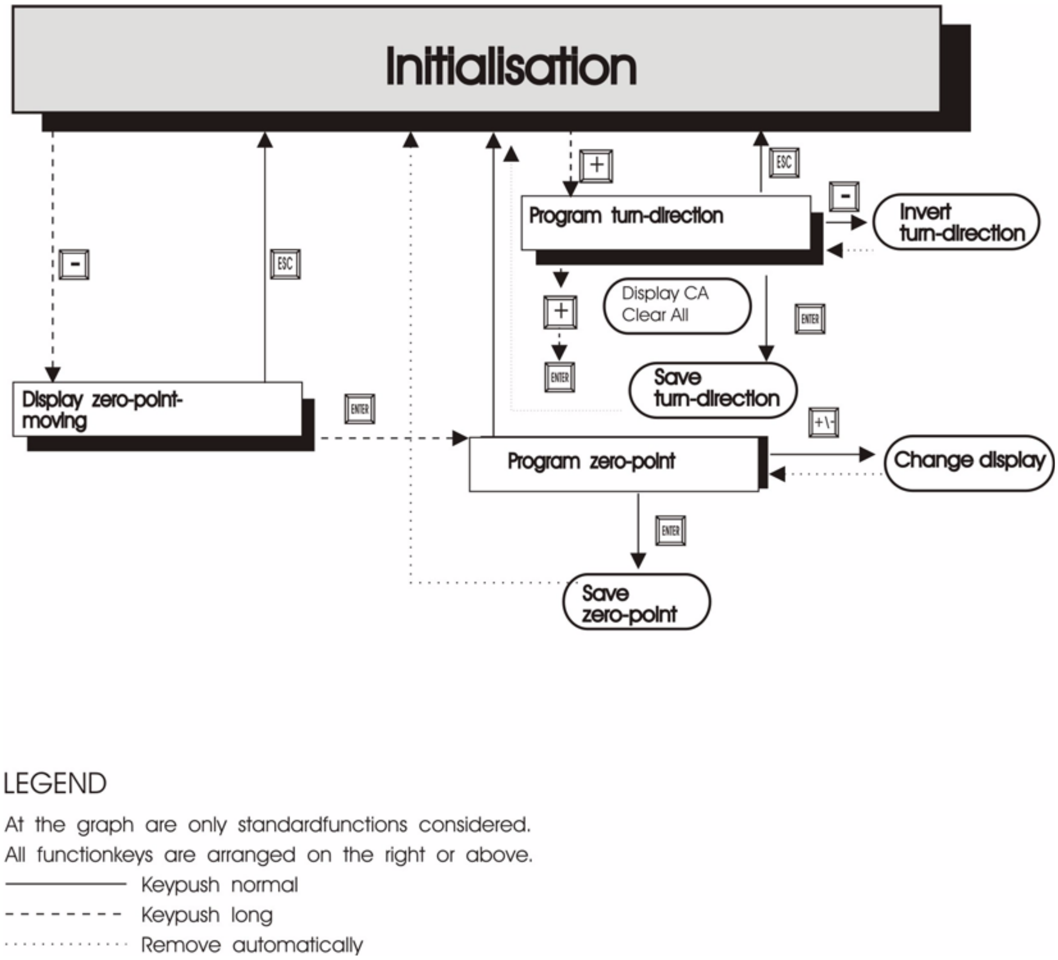


Picture 10: Link DICNET bus to PC

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

6.6 Short instuction





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.

7 Commissioning and self-test

7.1 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.

7.1.1 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).

7.2 Commissioning of the cam control

The commissioning procedure for the ROTARNOCK is as follows:

1) Connection of the encoder
2) Connection of the external program selection if required
3) Connection of the status signals if an incremental encoder is used
4) Connection of the outputs used
5) Connection of the serial interface, if required
6) Connection of the 24V power supply

The ROTARNOCK 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 ROTARNOCK 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.

7.2.1 Self-test of the cam control

After power-up of the ROTARNOCK it 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).

7.3 Configuration and initialisation

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

7.3.1 ROTARNOCK 100 parameter table

Designation	Default	Value range
Initialisation parameters		
Counting range	4096 (ST)	For incremental encoder
Zero offset	0	
Reversal	0	0 = Normal 1 = Inverted
Factor speed display	60	0 .. 9999 (rev./sec.)
Virtual encoder value	Encoder resolution	2.. 32500
Configuration parameters		
Encoder resolution	4096	
Idle time compensation ITC	Bitwise ITC	Blockwise ITC Bitwise ITC Blockwise, separate switch-on and switch-off idle time Bitwise, separate switch-on and switch-off idle time
PROFIBUS-ID	126	0 .. 126
Device ID for DICNET (hardware configurable)	Config-plug	0 ... 15
Encoder type	Absolute encoder parallel gray	
Outputs	16	
Direction cams	Standard	No, yes
Reverse rotational direction encoder	Standard	No, yes
Angle-time-cam	Standard	Firmly integrated, not configurable

7.3.2 Parameter description

7.3.2.1 Reverse rotational direction, encoder

The direction of rotation of the internal encoder can be inverted with this parameter.

7.3.2.2 Encoder resolution

The encoder resolution is always 4096, fix. For other resolutions see chapter "Virtual encoder value (gear factor)".

7.3.2.3 Virtual encoder value (gear factor)

Regardless of the resolution of the internal encoder, 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.

7.3.2.4 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

7.3.2.5 DICNET-device number (GNR)

This parameter can be used to set the device number with which the ROTARNOCK logs on to the DICNET bus and with which, for example, it is addressed by WINLOC32 or communicates with TERM.
This value can be changed only with the config-plug and not in the menu.
If you use the RS232 interface, this parameter is of no significance.

7.3.2.6 Zero offset

The zero offset or the zeroing is used to synchronize the machine's mechanical zero point with the zero point. 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 ROTARNOCK 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, ROTARNOCK 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).

7.3.2.7 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.

8 Technical details

8.1 Technical data ROTARNOCK 100

Characters	**Basic equipment**	**Further features**
Operating voltage	24V ± 20%, max 150mA (no load)	
Data protection	EEPROM (at least 100 years) no battery required)	Via WINLOC32 on PC
Programs	64	Thereof 16 externally selectable
Number of cams	1000 data records, distributable to channels and programs; cams are inter-changeable line wise	
Zero-point offset	Programmable over the entire range	Optical zero point indication
Position recording	4096 inf./rev. absolute encoder	
Outputs	To be programmed as desired, short-circuit proof, plus-switching, 24 volt/0.7A	For version with IP65 only 12 hard-ware-outputs
Idle time compensation (ITC)	Bitwise	Blockwise, separate I/O, input of the idle time with steps 0.1 ms - 999.9 ms
Cycle time	Dyn. from 85 µs on	
Rotational speed of the encoder shaft	Error: 1 inc. 2 inc. 3 inc. without ITC 98 195 294 blockwise ITC 73 146 219 bitwise ITC 26 53 80	
Programming	Via external operating unit with PC via WINLOC32 via PROFIBUS	
Display (on external front)	Encoder position / rotational speed	
Interface	RS485 DICNET®	PROFIBUS + RS232 / RS232
Optoelectronic lifetime	At least 1,000,000 hours	
Shaft	Diameter 10	
Shaft load	Axial 40 N, radial 110 N	
Max. permissible rotational speed	6000 rev./min.	
Initial torque at 120 °	1 Ncm (typ)	
Moment of inertia	$\leq$ 30 gcm	
Lifetime of the ball bearings	At least 400 x 10^6 rev.	
Weight	Appr. 400 g	

8.2 ROTARNOCK 100 memory expansion

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 logic record	1 data record
1 output name (max. 30 characters)	5 data records (6 characters/data record)

8.3 Specification of the input levels

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

8.4 Specification of the output drivers

The outputs used in the ROTARNOCK 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 ROTARNOCK 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 11).

8.5 Estimation of the cycle time

Basic cycle time

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

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

Logic active: 450 µs
PROFIBUS: 150 µs
DICNET: 40 µs
Encoder monitoring active: 10 µs
Direction cams active: 60 µs

So for instance for a ROTARNOCK 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.

8.6 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 specified 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 correction of the TZK is maximum ±1 increment with each change of the encoder position owing to the "dynamic brake" implemented in ROTARNOCK.

To summarize, we can state the following formula:

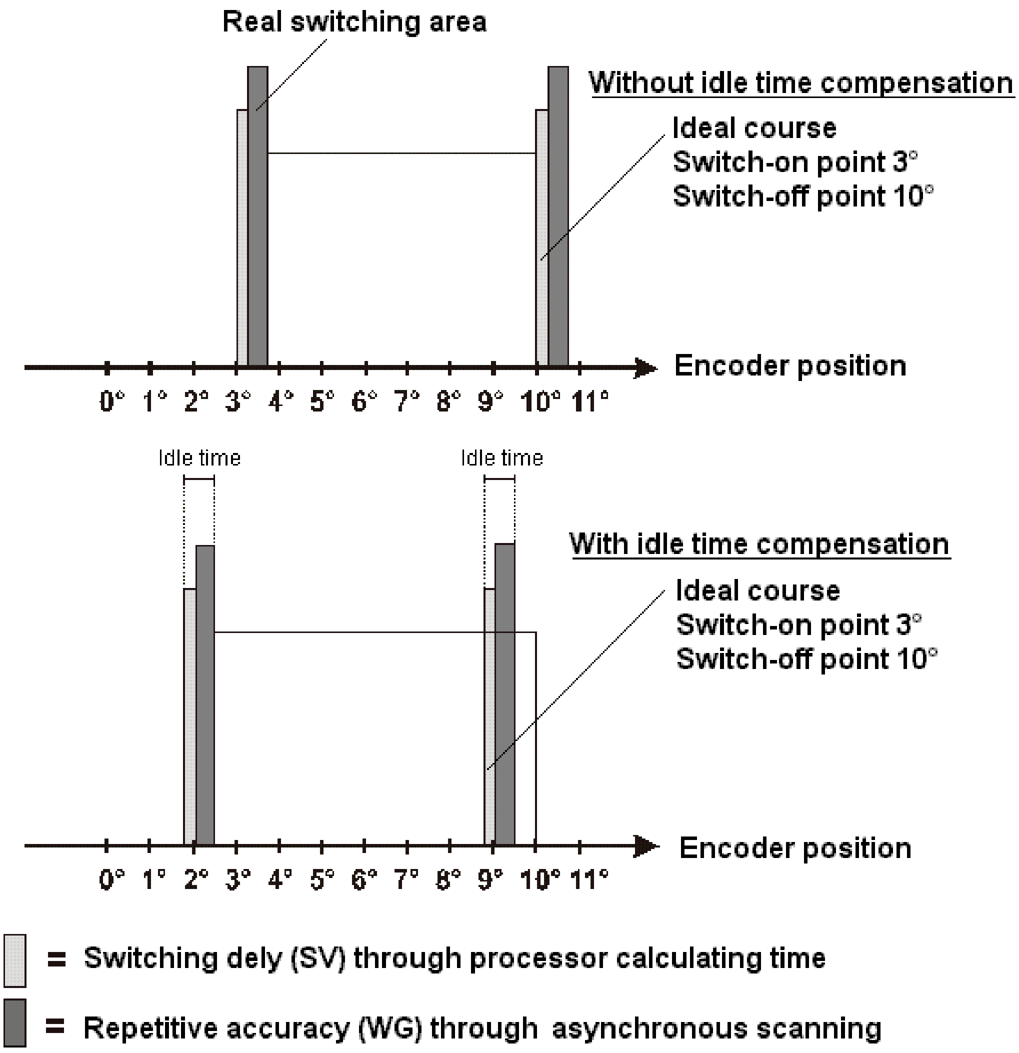
Without idle time compensation:
Actual switch point = ideal switch point + SV (const) + WG

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.

8.6.1 Timing diagram



Picture 11: Timing diagram - idle time compensation

8.7 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.

8.7.1 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.

8.7.2 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.

8.7.3 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.

8.7.4 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.

8.8 Environmental specifications of the ROTARNOCK-series

Storage temperature:	-25°C.. + 70°C
Operating temperature:	0°C .. 45°C (without forced convection) 0°C .. 65°C (with forced convection)
Relative humidity:	max. 80% no condensation, no corrosive atmosphere
Enclosure:	IP54
Shock:	15 G / 11 ms
Vibration:	0.15 mm / 10..50 Hz, 1G / 50..150 Hz
Weight:	400 g

8.9 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.

8.10 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 ROTARNOCK 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".

8.11 Coding device numbers

The device number is set in hexadecimal code on the config-plug.
The following assignment applies:

Display	Device number	Binary coding			
		8	4	2	1
0	0	0	0	0	0
1	1	0	0	0	1
2	2	0	0	1	0
3	3	0	0	1	1
4	4	0	1	0	0
5	5	0	1	0	1
6	6	0	1	1	0
7	7	0	1	1	1
8	8	1	0	0	0
9	9	1	0	0	1
A	10	1	0	1	0
B	11	1	0	1	1
C	12	1	1	0	0
D	13	1	1	0	1
E	14	1	1	1	0
F	15	1	1	1	1

9 Error messages

A ROTARNOCK error message can be seen from the fact that the „Error-LED“ flashes.

l**All errors must be acknowledged via a terminal with** Esc .

A distinction can be made between the following error types:

9.1 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'.

9.2 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.

9.3 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	

9.4 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 initialisation 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

10 Order Code

10.1 Cam control ROTARNOCK 100

10.1.1 Explanation of the order designation

ROTARNOCK 100 is available in three different versions.

1. ROTARNOCK 100 with RS232-interface
2. ROTARNOCK 100 with RS485 (DICNET)-interface
3. ROTARNOCK 100-PB with PROFIBUS- and RS232-interface

10.2 Scope of delivery

10.2.1 Scope of delivery ROTARNOCK 100

The scope of delivery consists of a device with all associated terminal elements and a support-CD (for each delivery)

11 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
- Corresponding Manual of the used Cam Control

If your questions are still unanswered please contact the responsible sales partner (see www.deutschmann.com) or 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

11.1 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.

11.2 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.