control – motion – interface

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DZ 270, 271, 276, 277, 279

Universal Monitors for Speed, Standstill, Direction of Rotation

DZ270:	Monitor with 3 programmable output relays and 1 analogue output
DZ271:	Monitor with 3 programmable transistor outputs and 1 analogue output
DZ276:	Monitor with 1 analogue output only
DZ277:	Monitor with 3 programmable output relays only
DZ279:	Monitor with 3 programmable transistor outputs only

- Compact and most versatile monitor series for control of overspeed, underspeed, standstill and direction of rotation
- Logical monitoring of remote motion enable signals
- Input for connection to sin/cos encoders with 1 Vss format
- Extremely wide frequency range up to 500 kHz
- Easy setup by means of four keys and LCD menu
- All models include serial RS232 interface

Operating Instructions

Safety Instructions

- This manual is an essential part of the unit and contains important hints about function, correct handling and commissioning. Non-observance can result in damage to the unit or the machine or even in injury to persons using the equipment!
- The unit must only be installed, connected and activated by a qualified electrician
- It is a must to observe all general and also all country-specific and application-specific safety standards
- When this unit is used with applications where failure or maloperation could cause damage to a machine or hazard to the operating staff, it is indispensable to meet effective precautions in order to avoid such consequences
- Regarding installation, wiring, environmental conditions, screening of cables and earthing, you must follow the general standards of industrial automation industry
- - Errors and omissions excepted –

General instructions for cabling, screening and grounding can be found in the SUPPORT section of our website http://www.motrona.com

Version:	Description:
DZ27001a_sn_12/12	First edition

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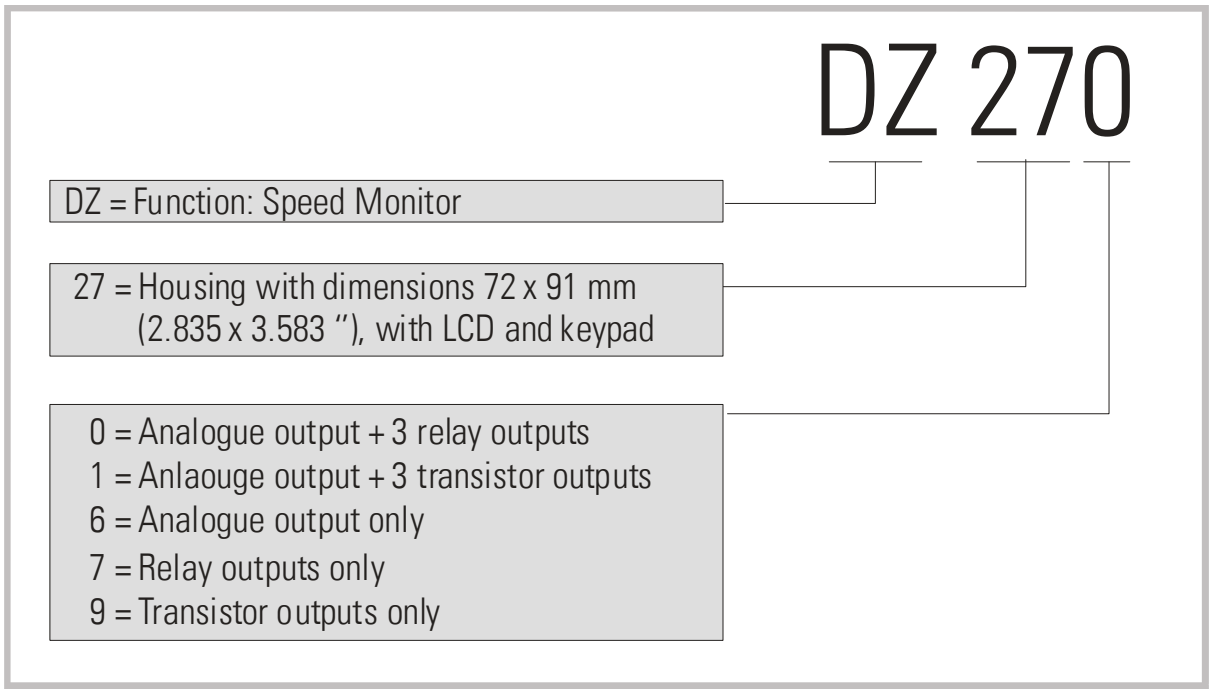
1. Introduction

This new series of monitors has been designed as control modules for mounting inside of electric control cabinets. The units are suitable for speed monitoring of machines, signaling overspeed, underspeed, zero motion and the direction of rotation. Units providing an analogue output can moreover be used for closed-loop control or feedback purpose within a control system.

Very special advantages of these new monitors are the wide frequency range, the extremely fast response and the remarkable versatility with regard to possible programmable monitoring functions.

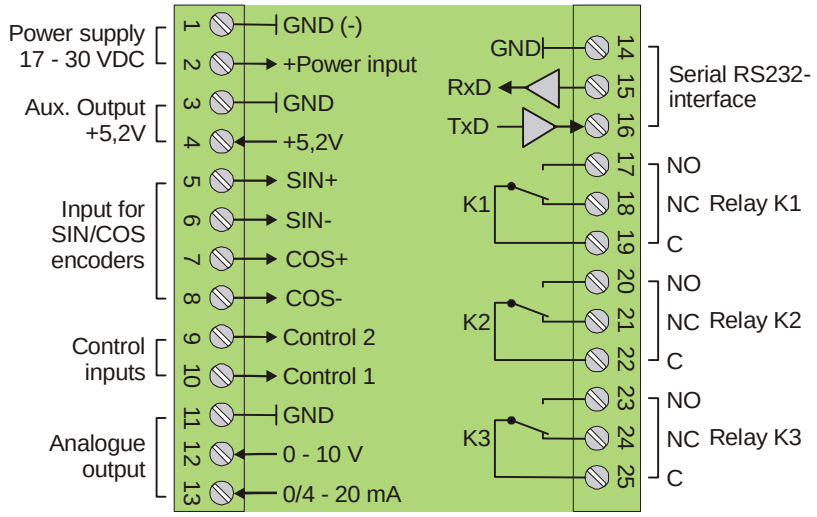
2. Available Models

There are five models available, all with fully similar basic functions, but with different options concerning the outputs.



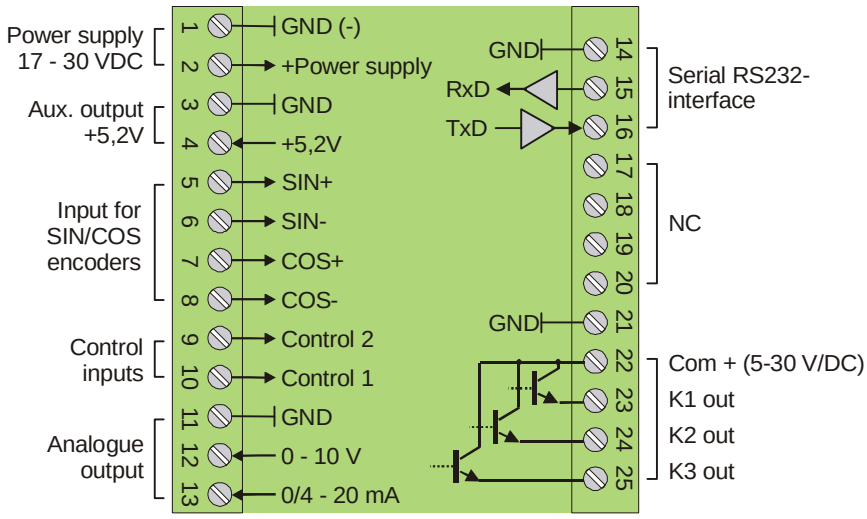
3. Electrical Connections

DZ270



Terminal	Text	Function
01	GND	GND, common minus potential
02	Vin	Power input, +17 – 30 VDC
03	GND	GND, common minus potential
04	+5,2V	Aux. output 5,2V / 200 mA
05	SIN+	SIN+ input for encoder
06	SIN-	SIN- input for encoder
07	COS+	COS+ input for encoder
08	COS-	COS- input for encoder
09	Control 2	Control input with programmable function
10	Control 1	Control input with programmable function
11	GND	GND, common minus potential
12	+10V Out	Analogue output 0 – 10 V
13	20mA out	Analogue output 0 – 20 mA
14	GND	GND, common minus potential
15	RXD	Serial RS232 interface, data input
16	TXD	Serial RS232 interface, data output
17	K1NO	Relay 1, normally open contact
18	K1NC	Relay 1, normally closed contact
19	K1C	Relay 1, common contact
20	K2NO	Relay 2, normally open contact
21	K2NC	Relay 2, normally closed contact
22	K2C	Relay 2, common contact
23	K3NO	Relay 3, normally open contact
24	K3NC	Relay 3, normally closed contact
25	K3C	Relay 3, common contact

DZ271



Terminal	Text	Function
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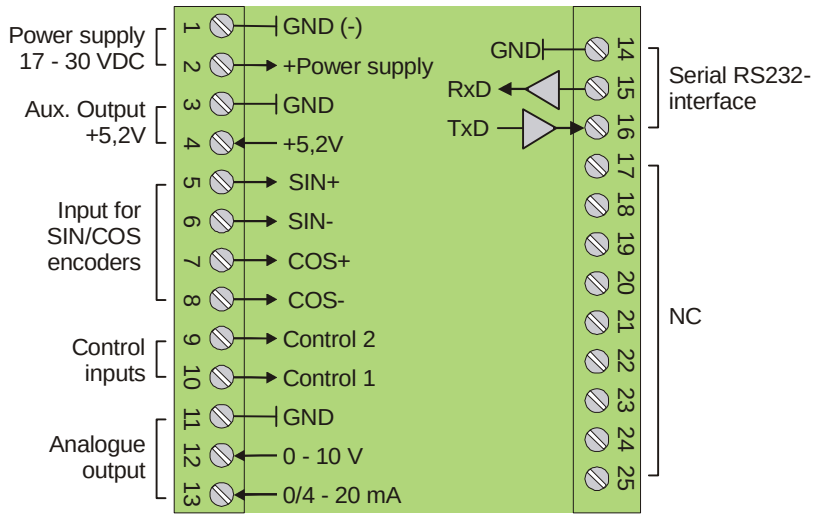
06	SIN-	SIN- input for encoder
07	COS+	COS+ input for encoder
08	COS-	COS- input for encoder
09	Control 2	Control input with programmable function
10	Control 1	Control input with programmable function
11	GND	GND, common minus potential
12	+10V Out	Analogue output 0 – 10 V
13	20mA out	Analogue output 0 – 20 mA
14	GND	GND, common minus potential
15	RXD	Serial RS232 interface, data input
16	TXD	Serial RS232 interface, data output
17	NC	Not connected
18	NC	Not connected
19	NC	Not connected
20	NC	Not connected
21	GND	GND, common minus potential
22	Com +	Common positive input for transistor outputs K1-K3
23	K1 out	Output K1, transistor PNP 30 volts, 350 mA
24	K1 out	Output K2, transistor PNP 30 volts, 350 mA
25	K1 out	Output K3, transistor PNP 30 volts, 350 mA

DZ276



Terminal	Text	Function
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09	Control 2	Control input with programmable function
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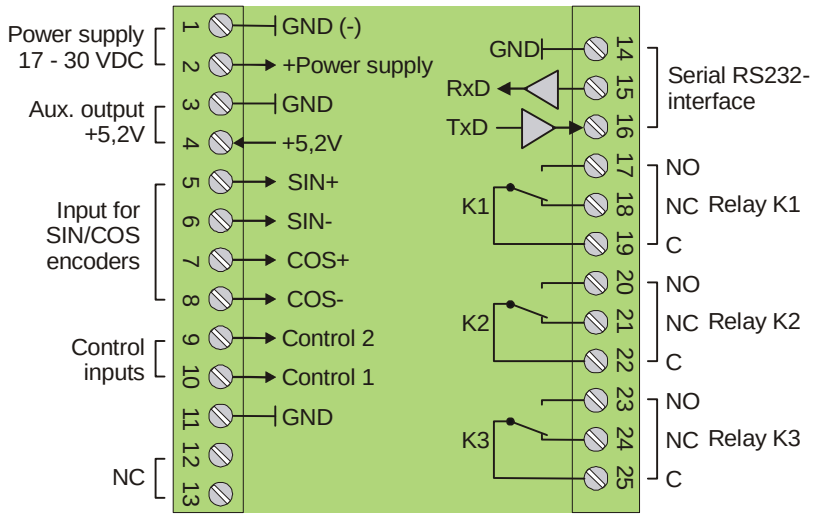
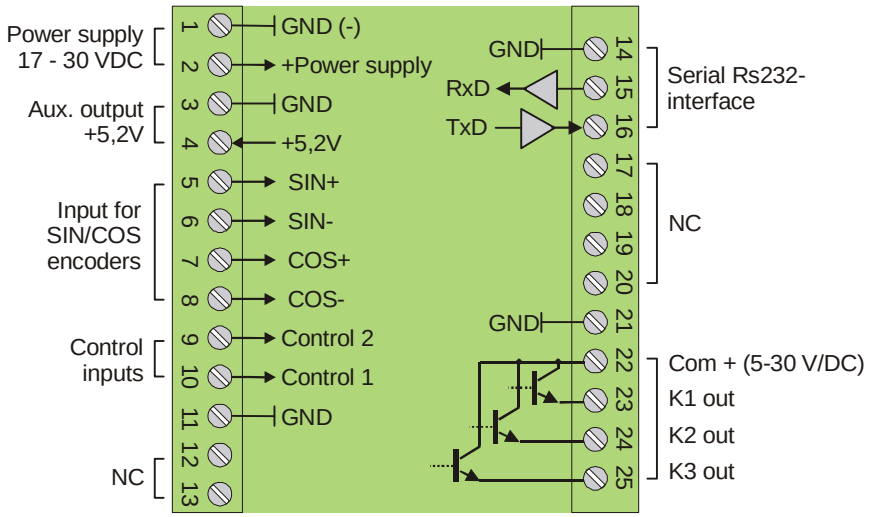
11	GND	GND, common minus potential
12	+10V Out	Analogue output 0 – 10 V
13	20mA out	Analogue output 0 – 20 mA
14	GND	GND, common minus potential
15	RXD	Serial RS232 interface, data input
16	TXD	Serial RS232 interface, data output
17	NC	Not connected
18	NC	Not connected
19	NC	Not connected
20	NC	Not connected
21	NC	Not connected
22	NC	Not connected
23	NC	Not connected
24	NC	Not connected
25	NC	Not connected

DZ277



Terminal	Text	Function
01	GND	GND, common minus potential
02	Vin	Power input, +17 – 30 VDC
03	GND	GND, common minus potential
04	+5,2V	Aux. output 5,2V / 200 mA
05	SIN+	SIN+ input for encoder
06	SIN-	SIN- input for encoder
07	COS+	COS+ input for encoder
08	COS-	COS- input for encoder
09	Control 2	Control input with programmable function
10	Control 1	Control input with programmable function
11	GND	GND, common minus potential
12	NC	Not connected
13	NC	Not connected
14	GND	GND, common minus potential
15	RXD	Serial RS232 interface, data input
16	TXD	Serial RS232 interface, data output
17	K1NO	Relay 1, normally open contact
18	K1NC	Relay 1, normally closed contact
19	K1C	Relay 1, common contact
20	K2NO	Relay 2, normally open contact
21	K2NC	Relay 2, normally closed contact
22	K2C	Relay 2, common contact
23	K3NO	Relay 3, normally open contact
24	K3NC	Relay 3, normally closed contact
25	K3C	Relay 3, common contact

DZ279



Terminal	Text	Function
01	GND	GND, common minus potential
02	Vin	Power input, +17 – 30 VDC
03	GND	GND, common minus potential
04	+5,2V	Aux. output 5,2V / 200 mA
05	SIN+	SIN+ input for encoder
06	SIN-	SIN- input for encoder
07	COS+	COS+ input for encoder
08	COS-	COS- input for encoder
09	Control 2	Control input with programmable function
10	Control 1	Control input with programmable function
11	GND	GND, common minus potential
12	NC	Not connected
13	NC	Not connected
14	GND	GND, common minus potential
15	RXD	Serial RS232 interface, data input
16	TXD	Serial RS232 interface, data output
17	NC	Not connected
18	NC	Not connected
19	NC	Not connected
20	NC	Not connected
21	GND	GND, common minus potential
22	Com +	Common positive input for transistor outputs K1-K3
23	K1 out	Output K1, transistor PNP 30 volts, 350 mA
24	K1 out	Output K2, transistor PNP 30 volts, 350 mA
25	K1 out	Output K3, transistor PNP 30 volts, 350 mA

3.1. Power Supply

The units require a DC supply from 17 to 30 volts which must be applied to terminals 1 and 2. Depending on the input voltage level and internal states, the power consumption may vary and lies in a range of about 70 mA with a 24 volts input (plus encoder currents taken from the auxiliary voltage output).

3.2. Auxiliary Output for Encoder Supply

Terminals 4 and 3 provide a +5.2 VDC / 200 mA auxiliary output for supply of encoders and sensors.

3.3. Inputs for SinCos Encoders and Sensors

The encoder shall be connected at the screw-type terminal 5-8 of the device. Only encoders with differential sine-cosine signals of 1 Vpp can be used (0.8 Vpp - 1.2 Vpp). At any time the signals sin+/sin- and cos+/cos- must be available.

Pins 3 (GND) and 4 (+5,2 V) of the screw-type terminal provide an auxiliary power output for the encoder supply.

3.4. Control Inputs

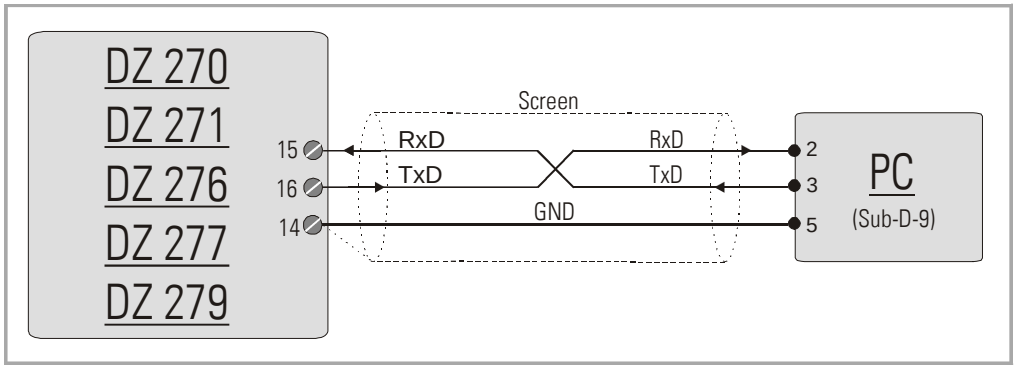
Two programmable control inputs allow the assignment of functions like remote start-up-delay, reset of relay lock, hardware interlock of the keypad and similar.
Both inputs provide PNP characteristics and require HTL level. Also it is possible to set the control function to "active LOW" or "active HIGH".
For evaluation of dynamic events the desired "active edge" can be set (rising or falling edge)

3.5. Serial Interface

The serial RS232 interface in general may be used

- for easy setup and commissioning of the units (with use of the OS32 operator software)
- to change settings and parameters by PC or PLC during the operation
- to read out internal states and actual measuring values by PC or PLC

The subsequent drawing shows how to link the monitor with a PC, using the standard 9-pin Sub-D-9 connector



3.6. Relay Outputs K1 – K3 (DZ270 and DZ 277 only)

The units provide three programmable relay outputs (all dry changeover), providing a switching capability of 30 volts / 2 amps DC or 125 volts / 0.6 amps AC or 230 volts / 0.3 amps AC. Both, switching characteristics and monitoring function may be programmed for each of the relays individually.

3.7. Tansistor Outputs K1 – K3 (DZ271 and DZ 279 only)

The units provide three outputs with programmable switching characteristics.
K1 – K3 are fast-switching and short-circuit-proof transistor outputs with a switching capability of 5 – 30 volts / 350 mA each. The switching voltage of the outputs must be applied remotely to the Com+ input (terminal 22). Both, switching characteristics and monitoring function may be programmed for each of the outputs individually.

3.8. Scalable Analogue Output (DZ270, DZ271 and DZ 276 only)

The units provide a voltage output with a +/-10 volts range (max. load 2 mA) and a current output with ranges 0 – 20 mA respectively 4 – 20 mA (load 0 – 270 Ω). Beginning and end of the desired conversion range can be set by the operator menu. The common potential of both outputs refers to GND.

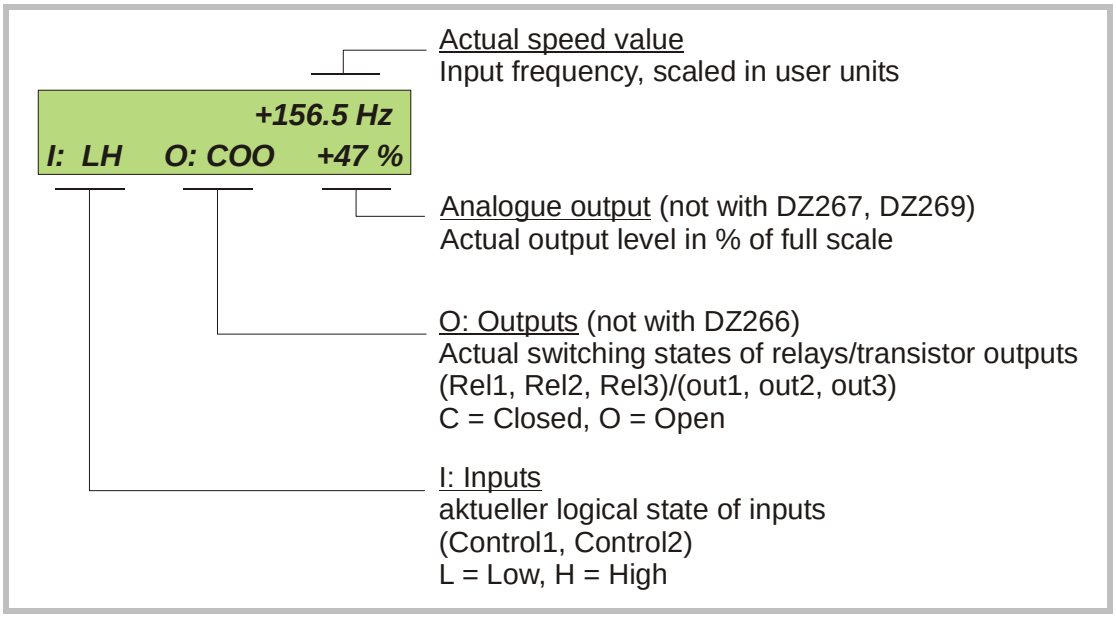
The total resolution is 14 bits. A settling time of approx. 200µs. is required. The overall response time of the analogue outputs primarily depends on the selected Sampling Time setting. After volatile jumps of the input signal, the analogue outputs may need up to two Sampling Time cycles (plus 200 µsec.) to stabilize.

4. LCD Display and Keys

The units provide a back-lit LCD displays with 2 lines at 16 characters each, and four keys for setup and command control.

During the setup procedure the LCD display indicates the menu with all parameter texts and the set values of the parameters.

During normal operation, the LCD display indicates the following information:



The "Display Menu" allows free scaling of the speed measuring values and the speed-related parameters to any kind of engineering units.

5. Keypad Operation

A summary of all parameters and a detailed description of parameter functions is available under section 6.

For all operation, the units provide four front keys which subsequently will be named as shown below:

PROG	UP	DOWN	ENTER

The key functions depend on the actual operating state of the units. Basically we have to distinguish between **Normal Operation** and **Setup Operation**

5.1. Normal Operation

While in normal operation state, the units monitor the speed according to the selected operational parameters and settings. Each of the front keys provides the command functions as attached to it upon setup in the "Command Menu"

5.2. Keypad Interlock

There is a 3-stage conception to protect the keys against unauthorized changes of the configuration respectively against activation of commands.

Stage	Protected Range	Protection by	Key Operations	
			Change of Parameters	Commands
1	---	---	permitted	permitted
2	Menu	Password upon activation of menu	Protection of selectable parts of the menu via password	permitted
3	Keyboard	Hardware-Latch 1	interlocked	permitted
		Hardware Latch 2	All functions interlocked	

The "Key Pad" menu allows to define an individual password for each group of parameters. This function can be used to provide individual access rights to different operators. Upon access to an interlocked section the unit asks for the corresponding password. If the correct password is not entered in time, the unit denies access and automatically returns to normal operation.

The hardware latch function can be activated and deactivated by one of the Control Inputs, or by means of serial access to the corresponding locking register.

Using the Hardware Latch function may accidentally cause a total locking of all functions, when the Control Inputs characteristics have been set inauspiciously.
In this exceptional case you can release the key functions again by either

a) applying the correct logical state (High or Low) to the inputs
b) or resetting the parameters to their default values (see section 5.6.)
c) or change the parameters being responsible for the locking by PC

5.3. General Setup Procedure

To change over from normal operation to the setup state, please keep down the PROG key for at least 2 seconds. After this the menu appears and you can select one of the menu groups. Inside each group you can select the desired parameter and edit the setting according to need. After this you are free to edit more parameters, or to return to normal operation.
The function of the different keys during setup is shown in the table below.

Key	Menu Level	Parameter Level	Setting Level
PROG	Save settings and return to normal operation	Return to Menu Level	Check entry, store result, then go back to Parameter Level
UP	Switch over to next menu	Select next parameter	Increment the highlighted digit or scroll the setting upwards
DOWN	Go back to previous menu	Select previous parameter	Decrement the highlighted digit or scroll the setting downwards
ENTER	Switch over to the Parameter Level of the current menu	Switch over to Setting Level	Shifts the highlighted digit one position to the left, or from utmost left to utmost right

5.4. Changing Parameters on the Setting Level

With signed parameters, the front digit can only be changed between „+" (positive) and „-„ (negative). The subsequent example explains how to change a parameter from originally 1024 to a new value of 250 000.
The example assumes that you are already on the Setting Level, i.e. you have already selected the corresponding parameter and read its actual value on the display. Highlighted (blinking) digits are marked by background color and indicate the cursor position.

No.	Display	Key action	Comment
00	001024		The actual value 1024 is displayed, with the last digit blinking
01		4 x	Change last digit to 0
02	001020		Shift cursor to left
03	001020	2 x	Change highlighted digit to 0
04	001000	2 x	Shift curser to left by 2 positions
05	001000		Change highlighted digit to 0
06	000000		Shift cursor to left
07	000000	5 x	Change highlighted digit to 5
08	050000		Shift cursor to left
09	050000	2 x	Change highlighted digit to 2
10	250000	P	Save new setting and return to Parameter Level

5.5. Return from the Menu, Time-Out Function

At any time the PROG key changes the Menu by one level backwards or fully back to the normal operation mode. The menu also switches automatically one level backwards, every time when for 10 seconds no key has been touched (Time-Out-Function).

5.6. Reset all Parameters to Factory Default Values

If applicable, the whole set of parameters can be reset to factory default values (e.g. because a code for the keypad interlocking has been forgotten, or because the unit does no more work correctly for reasons of bad settings). All default values are indicated in the following parameter tables.
To execute this Reset procedure, you have to take the following steps:

- Power the unit down
- Press and simultaneously
- Switch power on with both keys held down

Where you decide to execute this action, please be aware that all parameter settings will be lost, and you will have to repeat the whole setup procedure

6. Menu Structure and Parameter Description

All parameters are combined to groups, arranged in several menus. You must only set those parameters which are really relevant for your individual application.

6.1. Survey of Menus

This section provides an overview of the menus and their assignments to the different functions of the units. The menu names are printed bold, and associated parameters are arrayed directly under the menu names.

Menu texts are in English, according to the presentation on the LCD display

Preselect.-Menu*
Preselection 1
Preselection 2
Preselection 3

Encoder-Menu
Encoder Proper
Direction
Sampling Time
Wait Time
Filter
Set Value

Ser.Readout Menu
Multiplier
Divider
Offset

Special-Menu
Linear Mode**
Freq. Control
Input Filter

Key-Pad-Menu
Protect Menu M01
Protect Menu M02
Protect Menu M03
…
Protect Menu M09
Protect Menu M10
Protect Menu M11

Command-Menu ***
Key Up Func.
Key Down Func.
Key Enter Func.
Input 1 Config.
Input 1 Func.
Input 2 Config.
Input 2 Func.

Analogue-Menu**
Analogue Format
Analogue Start
Analogue End
Analogue Swing
Analogue Offset

Serial-Menu
Unit Number
Serial Baud Rate
Serial Format
Serial Protocol
Serial Timer
Register Code

Switching-Menu*
Pulse Time 1
Pulse Time 2
Pulse Time 3
Hysteresis 1
Hysteresis 2
Hysteresis 3
Preselect Mode 1
Preselect Mode 2
Preselect Mode 3
Output Polarity
Start up Mode
Start up Relay
Lock Relay
Standstill Time

Linear.-Menu**
P1(x)
P1(y)
P2(x)
P2(y)
..
P14(x)
P14(y)
P15(x)
P15(y)

Display-Menu
Up-Date-Time
Display Mode
Encoder Factor
Multiplier

(*)	not relevant with DZ 276
(**)	not relevant with DZ 277, DZ 279
(***)	partially inactive with DZ 276

6.2. Parameter Descriptions

6.2.1. Preselections

Preselection parameters are not relevant for model DZ276

These parameters assign the desired switching points to the relays/outputs. The preselections use the same engineering units as the display of the actual speed (see **Display-Menu**).

Preselection Menu	Code	Setting Range	Default
Preselection1 Switching point of relay 1/ out 1 (engineering units)	„00“	-1 000 000.0 ... +1 000 000.0	100.0
Preselection2 Switching point of relay 2/ out 2 (engineering units)	„01“	-1 000 000.0 ... +1 000 000.0	200.0
Preselection3 Switching point of relay 3/ out 3 (engineering units)	„02“	-1 000 000.0 ... +1 000 000.0	300.0

6.2.2. Definitions for the Encoder or Speed Sensor

Encoder-Menu	Code	Setting Range	Default
Encoder Proper Encoder properties 0 SIN+/SIN-/COS+/COS- 1 SIN+/SIN-	„A0“	0..1	0
Direction Definition of the direction of rotation with quadrature encoders 0 forward when A leads B 1 forward when B leads A	„A1“	0, 1	0
Sampling Time Internal time base for sampling of the input frequency (sec.)	„A2“	0.001..9.999	0.001
Wait Time Time to wait before unit detects zero speed (sec.) Impulse distances greater than this time will be takes as zero	„A3“	0.01..9.99	1.00
Filter Digital filter for smoothing of unstable frequencies 0 Filter off (very fast response to frequency changes) 1 T (63%) = 1,9 msec. with Sampling Time = 1msec. 2 T (63%) = 3,8 msec. with Sampling Time = 1msec. etc. 7 T (63%) = 122 msec. with Sampling Time = 1msec. (very slow response to frequency changes)	„A4“	0..7	0
Set Value Fixed frequency set value for encoder simulation (Hz) (see also "Command"-Menu)	„A5“	-1 000 000.0 ... +1 000 000.0	0

6.2.3. Serial Readout Menu

An actual value proportional to the input frequency can be read out via serial link, accessing the serial readout register (code :8) As a Basic Value this register uses the scaling set for the analogue output, i.e. a range from 0 to 10 000 units corresponding to 0 - 100,00% of the full scale output (see "Analogue Menu"). This readout can still be rescaled to user-friendly engineering units, using the following parameters:

Serial Readout Menu	Code	Setting Range	Default
Multiplier	„A8“	-99999…99999	10000
Divider	„A9“	0…99999	0
Offset (absolute term)	„B0“	-99999999…99999999	0

$$\text{Readout (:8)} = \text{Basic Value} \times \frac{\text{Multiplier}}{\text{Divider}} + \text{Offset}$$

- The definition of the "Basic Value" occurs in the "Analogue Menu" and is also available for the DZ277 units without analogue output
- the ratio Multiplier / Divider must never be greater than 15 000
- Setting "Divider" to zero will skip the rescaling procedure, resulting in a shorter response time with all functions of the unit

More details about serial communication can be found in the appendix.

6.2.4. Special-Menu

Special-Menu	Code	Setting Range	Default
Linear Mode Programmable linearization for Basic Value and Analogue Output 0 Linearization off 1 Linearization range 0 – +10V 2 Linearization range -10V … +10V	„B3“	0..2	0
Freq. Control Defines behavior and response of the unit to sudden interruptions of the input frequency. This parameter must only be changed in very special cases and under special instruction of an motrona engineer. Otherwise please use always the default setting "2"!	„B4“	0..2	2
Input Filter Digital filter for limitation of the input frequency 0 Filter off, the full range of frequency will be evaluated 1 Filter to cut frequencies higher than 500 kHz 2 Filter to cut frequencies higher than 100 kHz 3 Filter to cut frequencies higher than 10 kHz	„B5“	0..3	0

Using the Input Filter will cause wrong frequency measurement when you use the unit with frequencies higher than indicated above.

6.2.5. Key-Pad-Menu

Key-Pad-Menu (Passwords for menu groups)	Code	Setting Range	Default
Protect Menu 01 (Preselect.-Menu)	„C0“	0..999999 0 = no interlock 1 – 999 999 = Password for the corresponding group	0
Protect Menu 02 (Encoder-Menu)	„C1“		
Protect Menu 03 (Ser.Readout.-Menu)	„C2“		
Protect Menu 04 (Special-Menu) a)	„C3“		6079
Protect Menu 05 (Key-Pad-Menu)	„C4“		
Protect Menu 06 (Command-Menu)	„C5“		
Protect Menu 07 (Analogue-Menu)	„C6“		
Protect Menu 08 (Serial-Menu)	„C7“		
Protect Menu 09 (Switching-Menu)	„C8“		
Protect Menu 10 (Linear-Menu)	„C9“		
Protect Menu 11 (Display-Menu)	„D0“		

a) This menu is protected by the password 6079 due to factory setting. After entry of the password please press the Enter button ↵ at least 2 seconds.

6.2.6. Command-Menu

Command-Menu (assignment of functions)	Code	Setting Range	Default
Key Up Func. Supplementary command function of the UP key 0 no function 1 Activation of a serial data transmission 2 Force programmed relay/output states / freeze (a)(c) 3 Frequency simulation according to parameter "Set Value" 4 Freeze actual input frequency 5 Remote start-up-delay function (a) 6 Release lock of relay 1 (a) 7 Release lock of relay 2 (a) 8 Release lock of relay 3 (a) 9 Release lock of all relays 1-3 (a)	„D7“	0..9	0
Key Down Func. Supplementary command function of the DOWN key (see UP)	„D8“	0..9	0
Key Enter Func. Supplementary command function of the ENTER key (see UP)	„D9“	0..9	0
Input 1 Config. Switching characteristics of input „Control1“ 0 Static low 1 Static High 2 Dynamic, rising edge 3 Dynamic, falling edge	„E0“	0..3	0
Input 1 Func. Control function of input „Control1“ 0 no function 1 Activation of a serial data transmission 2 Force programmed relay/output states / Freeze (a)(c) 3 Frequency simulation according to parameter "Set Value" 4 Freeze actual input frequency 5 Remote start-up-delay function (a) 6 Release lock of relay 1/transistor output 1 (a) 7 Release lock of relay 2/transistor output 2 (a) 8 Release lock of relay 3/transistor output 3 (a) 9 Release lock of all relays 1-3/output 1-3 (a) 10 Interlock for parameter access via keypad (b) 11 Total keypad interlock (b) 12 Command monitor for remote motion enable signal	„E1“	0..12	0
Input 2 Config. (see Input 1 Config.)	„E2“	0..3	0
Input 2 Func. (see Input 1 Func.)	„E3“	0..12	0

(a) these parameters are not relevant for model DZ276.

(b) see section 5.2 **(c)** see section 8.3 **(d)** see section 8.4

6.2.7. Analogue-Menu

Analogue-Menu (settings for analogue outputs)	Code	Setting Range	Default
Analogue Format Output format of the analogue output 0 Range -10V to +10V 1 Range 0V to +10V 2 Range 4mA to 20mA 3 Range 0mA to 20mA	„E6“	0..3	0
Analogue Start Start value (engineering units) for 0V or -10V or 0mA or 4mA	„E7“	-10000000 ..10000000	0
Analogue End End value (engineering units) for 10V or 20mA	„E8“	-10000000 ..10000000	10000
Analogue Swing Max. output value (100 = 10V or 20mA)	„E9“	0..1000	100
Analogue Offset Shift of the zero position (mV)	„F0“	-9999..9999	0

The settings above are at the same time used to generate the Basic Value 0 - 10 000 (corresponding to 0 - 100,00 %), which finally can be read out from the serial register with access code :8 (see 6.2.3)

6.2.8. Serial Menu

Serial transmissions will operate in either the "PC Mode" or in "Printer Mode".

With "PC-Mode", the unit receives a request string and responds with a corresponding data string. For details of the protocol see separate description "SERPRO".
With "Printer Mode" the unit sends data without any request and under Timer control as described subsequently.
As soon as the unit receives a character, it automatically switches over to PC Mode and operates according to protocol. When for a period of 20 sec. no character has been received, the unit switches automatically back to "Printer Mode" and starts cyclic data transmission again.

Serial -Menu (Configuration of the serial link)	Code	Setting Range	Default
Unit Number (Serial device address) A unit number between 11 and 99 can be assigned to each unit. The address must not contain any zeros (0) since these addresses are reserved for collective addressing of several units.	„90"	11 ... 99	11
Serial Baud Rate (Transmission speed) 0= 9600 Baud 1= 4800 Baud 2= 2400 Baud 3= 1200 Baud 4= 600 Baud 5= 19200 Baud 6= 38400 Baud	„91"	0..6	0
Serial Format (Format of transmit data) 0= 7 Data, Parity even, 1 Stop 1= 7 Data, Parity even, 2 Stop 2= 7 Data, Parity odd, 1 Stop 3= 7 Data, Parity odd, 2 Stop 4= 7 Data, no Parity, 1 Stop 5= 7 Data, no Parity, 2 Stop 6= 8 Data, Parity even, 1 Stop 7= 8 Data, Parity odd, 1 Stop 8= 8 Data, no Parity, 1 Stop 9= 8 Data, no Parity, 2 Stop	„92"	0 ... 9	0

<table>
<tr><th>Serial -Menu (Configuration of the serial link)</th><th>Code</th><th>Setting Range</th><th>Default</th></tr>
<tr><td><u>Serial Protocol</u>
Determines the sequence of characters sent, when you use the serial output for cyclic data transmission under timer control
(xxxxxxx is the measuring value transmitted).

0= Transmission = Unit Nr. – Data, LF, CR
1= Transmission = Data, LF, CR

Setting "1" removes the unit address from the string which allows a slightly faster transmission cycle.

<table><tr><th></th><th colspan="10">Unit No.</th></tr><tr><td>0:</td><td>1</td><td>1</td><td>+/-</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>LF</td><td>CR</td></tr><tr><td>1:</td><td></td><td></td><td>+/-</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>X</td><td>LF</td><td>CR</td></tr></table></td><td>„F3“</td><td>0 ... 1</td><td>0</td></tr>
<tr><td><u>Serial Timer</u>
This register determines the cycle time in seconds for cyclic transmission when the Printer Mode is switched on.
Range 0.001 to 9.999 seconds.
With setting “0” all cyclic transmission is switched off and the unit will only send data upon request (PC mode)</td><td>„F4“</td><td>0 ... 9.99</td><td>0</td></tr>
<tr><td><u>Register Code</u>
Serial access code of the register which, in Printer Mode, should be transmitted with every cycle.
The most important registers are shown below.

<table><tr><th>Setting</th><th>Code</th><th>Register contents</th></tr><tr><td>7</td><td>:7</td><td>Actual analogue output value
10000 = 10 V = 20 mA</td></tr><tr><td>8</td><td>:8</td><td>User-defined readout value
(see 6.2.3)</td></tr><tr><td>9</td><td>:9</td><td>Frequency detected on the input
(Scaling is 0.1 Hz)</td></tr><tr><td>11</td><td>;1</td><td>Actual LCD display value</td></tr></table></td><td>„F5“</td><td>0 ... 19
(:0) … (;9)</td><td>8</td></tr>
</table>

6.2.9. Switching –Menu

These parameters are not relevant for model DZ276.
Indications | f | mean that only the absolute value of the frequency is considered. With all other indications, frequencies are categorically signed (+ with forward and - with reverse)

Switching -Menu (Switching characteristics of relays/outputs)	Code	Setting Range	Default
Pulse Time 1 Rel.1: Duration of timed output, sec. (0=static)	„F8“	0 ... 9.99	0
Pulse Time 2 Rel.2: Duration of timed output, sec. (0=static)	„F9“	0 ... 9.99	0
Pulse Time 3 Rel.3: Duration of timed output, sec. (0=static)	„G0“	0 ... 9.99	0
Hysteresis 1 Rel.1: Switching Hysteresis (engineering units)	„G1“	0 ... 99999.9	0
Hysteresis 2 Rel.2: Switching Hysteresis (engineering units)	„G2“	0 ... 99999.9	0
Hysteresis 3 Rel.3: Switching Hysteresis (engineering units)	„G3“	0 ... 99999.9	0
Preselect Mode 1 (switching operation for relay 1/output 1) 0 |f| >= |Preselection| (catch*) 1 |f| <= |Preselection| with start-up-delay (catch*) 2 |f| == |Preselection| with start-up-delay (catch*) 3 Standstill (f=0) after expiration of standstill time 4 f >= Preselection (catch*) (also suitable for signalization of forward direction) 5 f <= Preselection (catch*) (also suitable for signalization of reverse direction) 6 f == Preselection (catch*) 7 Relay/output signals "forward" when a positive frequency (f > 0) is detected. This information disappears upon detection of "standstill" 8 Relay/output signals "reverse" when a negative frequency (f < 0) is detected. This information disappears upon detection of "standstill"	„G4“	0..8	0
Preselect Mode 2 (switching operation for relay 2/output 2) see Preselection Mode 1	„G5“	0..8	0
Preselect Mode 3 (switching operation for relay 3/output 3) see Preselection Mode 1	„G6“	0..8	0
Output Polarity (Relay/output active „on“ or active „off“ **) Parameter with binary interpretation 0 all Relays are energized when the assigned event occurs 1 Relay 1/transistor output 1 inverted 2 Relay 2 transistor output 2 inverted 3 Relay 1&2 transistor output 1&2 inverted 4 Relay 3 transistor output 3 inverted 5 Relays 1&3 transistor output 1&3 inverted 6 Relays 2&3 transistor output 2&3 inverted 7 All relays inverted	„G7“	0..7	0

*) The corresponding relay/output can be used with catch operation, when a catch function has been assigned to it under parameter „Lock Relay“

**) Active "on" means the relay/output will be energized upon occurrence of the assigned event
Active "off" means the relay/output will be de-energized upon occurrence of the assigned event

Switching -Menu (Switching characteristics of the relays/outputs)	Code	Setting Range	Default
Start up Mode Start-up-delay after power-up and after standstill 0 No start-up-delay 1 Start-up-delay 1 second 2 Start-up-delay 2 seconds 3 Start-up-delay 4 seconds 4 Start-up-delay 8 seconds 5 Start-up-delay 16 seconds 6 Start-up-delay 32 seconds 7 Start-up-delay 64 seconds 8 Start-up-delay 128 seconds 9 Automatic delay until to first overstepping of the set value 10 Start-up-delay by remote signal	„G8“	0..10	0
Start up Relay Assignment of a start-up-delay function to the relays/outputs 0 No start-up-delay for any of the relays 1 Relay 1/transistor output 1 provides start-up-delay 2 Relay 2/transistor output 2 provides start-up-delay 3 Relays 1&2/transistor output 1&2 provide start-up-delay 4 Relay 3/transistor output 3 provides start-up-delay 5 Relays 1&3/transistor output 1&3 provide start-up-delay 6 Relays 2&3/transistor output 2&3 provide start-up-delay 7 All relays provide start-up-delay	„G9“	0..7	0
Lock Relay Assignment of a catch function to the relays *) 0 No catch function for any of the relays 1 Relay 1/output 1 with catch (release by key/control input) 2 Relay 2/output 2 with catch (release by key/ control input) 3 Relays 1&2/output 1&2 with catch (release by key/control input) 4 Relay 3/output 3 with catch (release by key/control input) 5 Relays 1&3/output 1&3 with catch (release by key/control input) 6 Relays 2&3/output 2&3 with catch (release by key/control input) 7 all Relays/outputs with catch (release by key/control input) 8-15 similar to 0 - 7, but catch to release by key/by control input and automatically upon standstill	„H0“	0..15	0
Standstill Time Time setting for standstill definition A time of xx.xx seconds after detection "zero input frequency" the unit signals "standstill" and re-activates the start-up-delays	„H1“	0..99.99	0

*) According to parameter settings, the catch situation can be released by either pressing one of the front keys or by a remote control signal or automatically upon detection of standstill (see "Command menu"

<table>
<tr><th>Switching Menu (switching characteristics of the relays/outputs)</th><th>Code</th><th>Range</th><th>Default</th></tr>
<tr><td><u>Relay Action</u> (for more details see section 8.3)
Selection of the relays/transistor outputs of which the switching state should be overridden by key command or remote command (non-selected relays will continue normally)
0 No relay/transistor output selected
1 Relay 1/transistor output 1
2 Relay 2/transistor output 2
3 Relays 1 & 2/transistor output 1&2
4 Relay 3/transistor output 3
5 Relays 1 & 3 /transistor output 1&3
6 Relays 2 & 3/transistor output 2&3
7 All relays/transistor outputs selected
8 Freeze actual switching state of all relays/transistor outputs</td><td>„K8“</td><td>0…8</td><td>0</td></tr>
<tr><td><u>Action Polarity</u> (for more details see section 8.3)
Desired override state of the corresponding relays/transistor outputs (parameter is out of function when “Relay Action” is set to “8”)

<table>
<tr><th>Setting</th><th>Relay/out K1</th><th>Relay/out K2</th><th>Relay/out K3</th></tr>
<tr><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td>0</td></tr>
<tr><td>2</td><td>0</td><td>1</td><td>0</td></tr>
<tr><td>3</td><td>1</td><td>1</td><td>0</td></tr>
<tr><td>4</td><td>0</td><td>0</td><td>1</td></tr>
<tr><td>5</td><td>1</td><td>0</td><td>1</td></tr>
<tr><td>6</td><td>0</td><td>1</td><td>1</td></tr>
<tr><td>7</td><td>1</td><td>1</td><td>1</td></tr>
</table>
0 = Coil of the relay is de-energized – transistor output off.
1 = Coil of the relay is energized – transistor output on</td><td>„K9“</td><td>0…7</td><td>0</td></tr>
</table>

6.2.10. Linear.-Menu

Linear.-Menu (Interpolation points for linearization)	Code	Setting Range	Default
P1(x) % Interpolation point 1, original value	„H2“	-100.000...100.000	100.000
P1(y) % Interpolation point 1, substitute value	„H3“		
P2(x) etc.	„H4“		
P2(y) etc.	„H5“		
P3(x)	„H6“		
P3(y)	„H7“		
P4(x)	„H8“		
P4(y)	„H9“		
P5(x)	„I0”		
P5(y)	„I1”		
P6(x)	„I2”		
P6(y)	„I3”		
P7(x)	„I4”		
P7(y)	„I5”		
P8(x)	„I6”		
P8(y)	„I7”		
P9(x)	„I8”		
P9(y)	„I9”		
P10(x)	„J0“		
P10(y)	„J1“		
P11(x)	„J2“		
P11(y)	„J3“		
P12(x)	„J4“		
P12(y)	„J5“		
P13(x)	„J6“		
P13(y)	„J7“		
P14(x)	„J8“		
P14(y)	„J9“		
P15(x)	„K0“		
P15(y)	„K1“		
P16(x)	„K2“		
P16(y)	„K3“		

6.2.11. Display –Menu

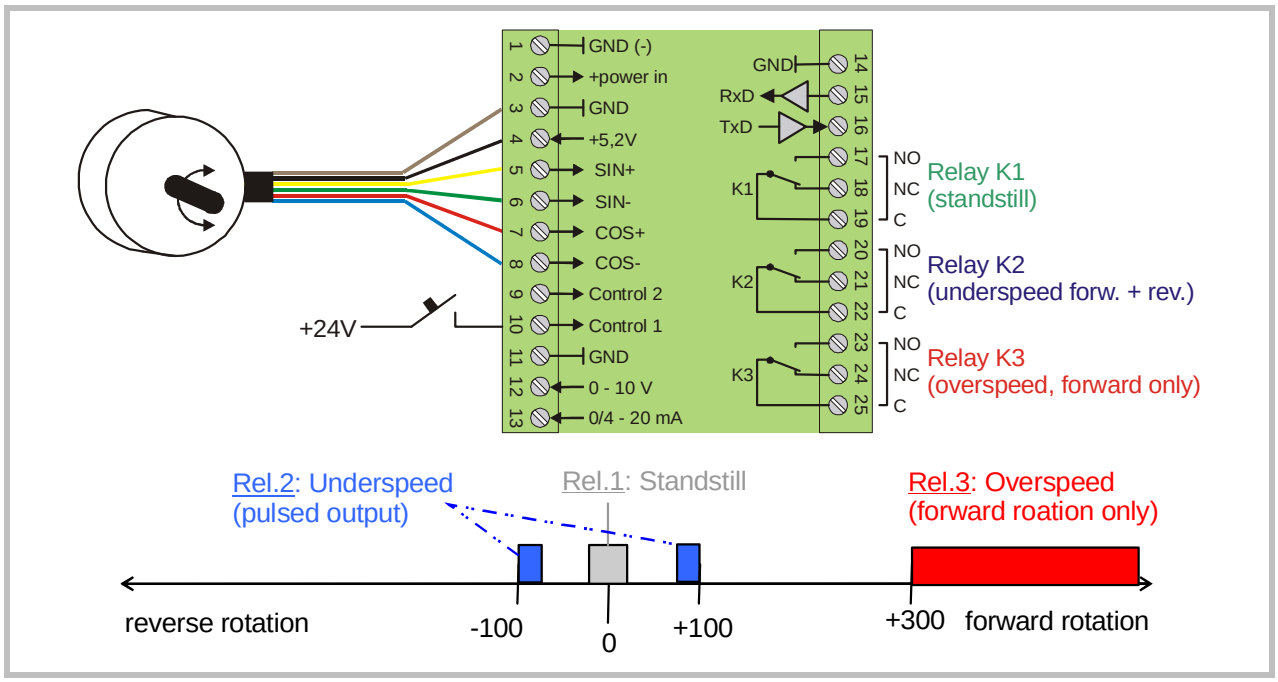
Display -Menu	Code	Setting Range	Default
Up-Date-Time Update time of the LCD display (seconds)	„K4“	0.05...1.00	0.10
Display Mode Scaling of the unit's engineering units and the actual LCD display 0 Hz 1 kHz (switch points and analogue output remain in Hz) 2 RPS (revolutions per second) = f / Encoder Factor (*) 3 RPM (revolutions per minute) = 60 x f / Encoder Factor (*) 4 Customer-specific units set by Encoder-Factor und Multiplier Display = f x Multiplier / Encoder Factor (*)	„K5“	0..4	0
Encoder Factor ppr, number of impulses per revolution (with Display-Modes 2 – 4 only)	„K6“	1..99999	1
Multiplier Impulse multiplier (with display-Mode 4 only) Display = f x Multiplier / Encoder Factor	„K7“	1..200	1

*) f = Input frequency in Hz
With display modes 2 – 4 also the switching point settings will use the same engineering units as set for the display

7. Example for Commissioning

The following example is to explain setup and commissioning of the units with a typical application.

- A shaft should be monitored with respect to speed and standstill
- For speed pick-up we use a SinCos encoder
- Relay 1 should signal "standstill" when one second after detection of "zero frequency" no further input impulse has been registered
- Relay 2 should generate a timed output pulse of 0.3 seconds when the speed drops below 100 RPM in either forward or reverse direction.
- Relay 3 should switch on and catch when, with forward direction only, the speed exceeds 300 RPM. With reverse direction relays 3 should not respond at all
- Release of the relay 3 catch state should be possible by either a positive signal applied to input "Control1", or by activating the ENTER key



The table below shows the setup procedure for an application according to the previous example. Parameters which are not mentioned are optional, but not relevant for this function.

Nr,	Menu	Parameter	Value	Function
1	Preselect Menu	Preselection1	---	unimportant (relay 1 is used for standstill)
		Preselection2	100	Switching point for "underspeed"
		Preselection3	300	Switching point for "overspeed"
2	Command Menu	Key Enter Func.	=7	ENTER key to release the relay 3 catch
		Input 1 Config.	=1	Function of "Control1" input is static HIGH
		Input 1 Func.	=7	"Control1" input to release the relay 3 catch
3	Switching Menu	Pulse Time 1	=0	Relay 1 static
		Pulse Time 2	=0.30	Relay 2 timed output 0.3 seconds
		Pulse Time 3	=0	Relay 3 static
		Presel. Mode1	=3	Relay 1 energizes after lapse of standstill time
		Presel. Mode2	=1	Relay 2 energizes when absolute value underpassed
		Presel. Mode3	=4	Relay 3 energizes with positive overstepping only
		Output Polarity	=0	All relays with non-inverted function (energize)
		Start-up Mode	=0	No start-up-delay function
		Start-up Relay	=0	No relay assignment to start-up-delay
		Lock Relay	=4	Relay 3 to operate with catch function
		Standstill Time	=1.00	Standstill output 1 second after detection of "frequency = 0" (i.e. 6 seconds after the last input pulse)
4	Display Menu	Display Mode	=3	Engineering units are RPM
		Encoder Factor	=32	Tooth wheel generates 32 pulses per revolution
		Multiplier	=1	No specific impulse scaling

8. Appendix

8.1. Hints for Use of the Linearization Function

The linearization function of these units allow to convert a linear input frequency into a non-linear developing, which can be indicated on the LCD display and which is also available as analogue signal or as serial data, for further processing.

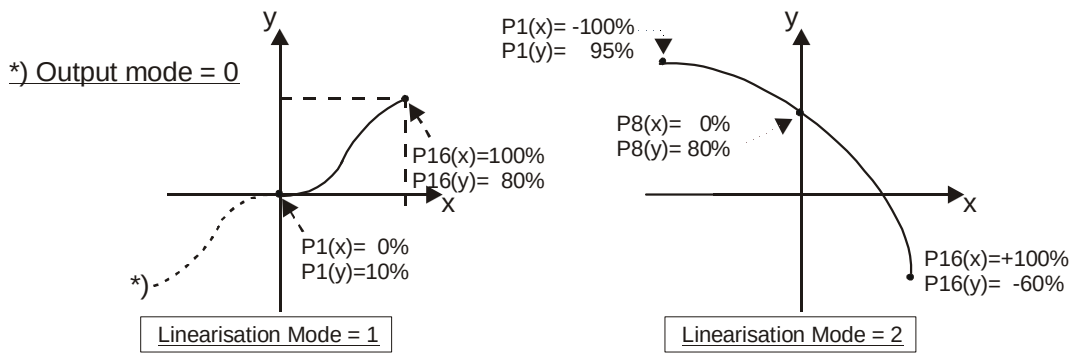
There are 16 programmable x/y coordinates available, which can be set in any desired distance over the full conversion range. Between two coordinates, the unit uses linear interpolation. Therefore it is advisable to use more coordinates in a range with strong curves and only a few coordinates where the curvature is less.

To specify your desired linearisation curve, you must first set the „Linearisation Mode" register to either 1 or 2.

Use registers P1(x) to P16(x) to specify the coordinates on the x-axis. These are the measuring values that the unit normally would generate according to the actual input frequency. These settings must be in % of full scale.

Now enter the attached values to registers **P1(y)** to **P16(y)**. These are the values that the unit will generate instead of the x- values, i.e. P2(y) will substitute P2(x) etc.

- x-registers must use continuously increasing settings, i.e. P1(x) must have the lowest and P16(x) must have the highest setting
- All entries use a percental format of xx.xxx% full scale.
  Setting 000.000% means zero output and
  setting 100.000% means full scale output.
- With Linearisation Mode set to 1, it is a must to set P1(x) to 0% and P16(x) to 100%. Linearisation is defined in the positive range only and the negative range will be a mirror image of the positive range with reference to zero.
- With Linearisation Mode set to 2, it is a must to set P1(x) to –100% and P16(x) to +100%. This enables the user to set curves which are not symmetric to the zero position.



8.2. Data Readout via Serial Interface

All register codes shown in the "Serial Menu" are available for serial readout by PC or PLC. For communication the monitors use the Drivecom Protocol according to ISO 1745. All protocol details can be found in our manual **SERPRO_2a.doc** which is available for download from our homepage

www.motrona.de

To request for a data transmission you must send the following request string to the converter:

EOT		AD1	AD2	C1	C2	ENQ
EOT = control character (Hex 04) AD1 = unit address, High Byte AD2 = unit address, Low Byte C1 = register code, High Byte C2 = register code, Low Byte ENQ = control character (Hex 05)						

The following example shows the request string for readout of the actual input frequency of a monitor (code :9) from a unit with unit address 11:

ASCII Code:	EOT	1	1	:	9	ENQ
Hex Code:	04	31	31	3A	39	05
Binary Code:	0000 0100	0011 0001	0011 0001	0011 1010	0011 1001	0000 0101

After a correct request, the unit will respond:

STX	C1	C2	x x x x x x	ETX	BCC
STX = control character (Hex 02) C1 = register code, High Byte C2 = register code, Low Byte xxxxx = readout data ETX = control character (Hex 03) BCC = block check character					

For all further details see SERPRO_2a.doc.

8.3. "Relay Action", override relay states by programmed states

Models providing relay outputs allow to temporary change the actual relay states according to a programmable ON / OFF pattern, or to temporary freeze the actual switching states. These override functions can be activated by either touching a front key or by a remote command.

8.3.1. Override relay/output states by programmable ON / OFF states

Parameter "**Relay Action**" allows to select which of the relays/outputs should be affected by the override action. Parameter **"Action Polarity"** provides setting of the desired "ON / OFF" pattern»
(see section 6.2.9, "Switching Menu").
The desired way of activation this override command can be set by the "**Command-Menu**" (see 6.2.6).

Application example:
You would like to temporary de-energize relays K1 and K3 by touching the key "UP", whilst relay K2 should continue to function normally.

	Action	Parameter settings
1	Assign the Override Command to key "UP"	Key Up Func. = 2
2	Select relays/outputs K1 and K3	Relay Action = 5
3	Set the desired switching state of the relays/outputs (both de-energized)	Action Polarity = 2

8.3.2. Freeze the actual switching state of all relays

This function will temporary freeze all relays in their actual state for the duration where you press a key or apply a remote command. During the freeze period the relays will no more follow any changes of the input frequency

Application example:
You would like to freeze all relays by applying a "High" signal to input "Control1"

	Action	Parameter settings
1	Assign the Freeze command to input "Control1"	Input 1 Func. = 2
2	Set the input to "Active High" characteristics	Input 1 Config = 1
3	Assign the "Freeze relays" function to the input	Relay Action = 8

- **These commands will override the switching states of the selected relays/outputs. All relays/outputs will immediately return to the actual control state after removing the override command. All internal measuring and control cycles will continue normally.**
- **To use these functions, please set the corresponding key and input characteristics to static operation only, since dynamic (edge-triggered) operation would make no sense**

8.4. Monitoring of remote motion enable signals

The unit provides a special "Command Monitor" function for logical control of a motion enable signal and the resulting response of the system. In addition to the normal monitoring functions this mode is suitable to generate alarm outputs under any of the following conditions:

- motion is disabled, but still the system moves
- motion is enabled, but the system does not move at all (mechanical deadlock), or the system does not reach the scheduled speed within an expected time (overload)
- the motion command changes over from "enable" to "disable" but the system does not come down to standstill within an expected time

The following parameter settings will activate the Command Monitor function:

8.4.1. Definition of a speed window

The application requires one of the relays to operate in overspeed mode (Preselect Mode = 0) and another relay to operate in underspeed mode (Preselect Mode = 1). This will define a window for the expected speed under regular motion conditions (see 6.2.9)

8.4.2. Assignment of a control input

One of the two control inputs has to be set to the control function "12" to activate the monitoring of the command. This input must be connected to the remote Enable/Disable signal (see parameters "Input Function" under 6.2.6)

8.4.3. Assignment of the control polarity

Parameter "Input Config" provides setting of the input polarity as follows:

Input Config = 0	=>	Motion **disabled** (stop) corresponds to input level **"LOW"** Motion **enabled** (run) corresponds to input level **"HIGH"**
Input Config = 1	=>	Motion **disabled** (stop) corresponds to input level **"HIGH"** Motion **enabled** (run) corresponds to input level **"LOW"**

8.4.4. Setting of a Start-up delay time

Any signal changes from "disable" to "enable" or vice-versa will require some delay until the system could really follow the command (acceleration or deceleration). Therefore it is mandatory to set an appropriate start-up delay time (to the relay/output responsible for "underspeed" only). See "Start Up Mode" and "Start Up Relay" under 6.2.9

8.4.5. Setting of an appropriate Standstill definition

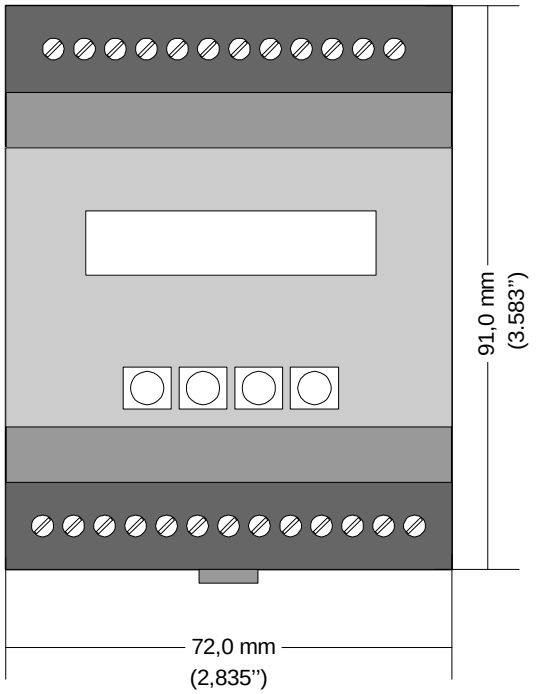
Under parameter "Standstill Time" an appropriate time must be set.
It is important to set a time higher than the Start-up delay time!

- The command monitor uses always the same relay/transistor output to which the underspeed function has been assigned
- While the command monitor function is active, you can see an indicator box in the PI/PO column of the PC screen. The "Command Monitor" box shines blue when the motion command is in "Disable" state

9. Specifications and Dimensions

Power supply	:	17 VDC - 30 VDC
Ripple		≤ 10% @ 24VDC
Current consumption	:	approx. 70mA @ 24 VDC
Aux. output for encoder supply	:	5.2V max. 200mA
Inputs Control 1 / 2	:	Ri = 3,9 kOhms, LOW < 2,5V, HIGH > 10V (max.30V) minimum duration of dynamic signals: 50 µsec. minimum duration of static signals: 2 msec.
Encoder inputs	:	Symmetric differential sin/cos - input (sin+, sin-, cos+, cos),Signal level 0,8 Vpp - 1,2 Vpp, Signal offset approx. 2 - 3 V to GND
Input frequency	:	500 kHz
Analogue output (not with DZ 277 or DZ 279)	:	+/- 10V, max. 2 mA 0 – 20 mA, 4 – 20 mA (load: max 270 Ohm) Resolution 14 bits, accuracy 0.1% Settling time approx. 200us Step response = 2 x sampling time + 200us
Relays (DZ 270 and DZ 277 only)	:	Dry change-over contacts, switching capability 30V / 2A DC or 125V / 0.6A AC or 230V / 0.3A AC Response time approx. 4 msec.
Transistor outputs (DZ 271 and DZ 279 only)	:	3 fast, short-circuit-proof PNP-outputs 5 - 30V, 350 mA, response time < 1 msec.
Serial interface	:	RS232 / 2400-38400 Bauds
Ambient temperature	:	Operation: 0 - 45°C (32 – 113°F) Storage: -25 - +70°C (-13 – 158°F)
Housing	:	Plastic housing, suitable for mounting to standard DIN rails (35 mm)
Display	:	LCD with backlight 2 lines at 16 characters, 3,5 mm size
Protection class	:	IP20
Connections	:	25 position screw terminals for cross sections of max. 1.5 mm^2 (0.0023 in^2)
Conformity and Standards	:	EMC2004/108/EC: EN 61000-6-2 EN 61000-6-3 LV2006/95/EC: EN 61010-1

Dimensions:



Front view

Side view