control – motion – interface

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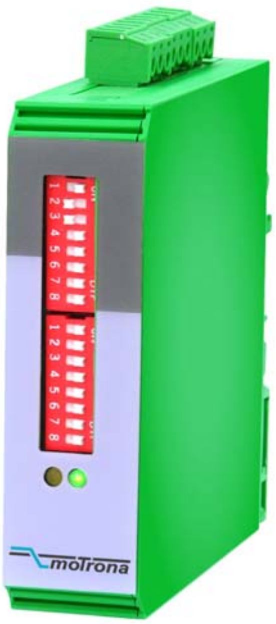
DZ 210

Monitor for Direction of Rotation and Standstill



- Simple and compact unit to monitor forward motion, reverse motion and zero motion
- Universal impulse inputs for use with all common incremental encoders and sensors (HTL, RS422 or TTL)
- Two output relays (dry change-over contacts) as well as two fast-responding power transistor outputs
- Wide input frequency range (up to 500 kHz) and fast response time (<1 msec. with f >1 kHz)

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 –

Version:	Description:
DZ21001a/af/hk_Aud2007	First edition

Table of Contents

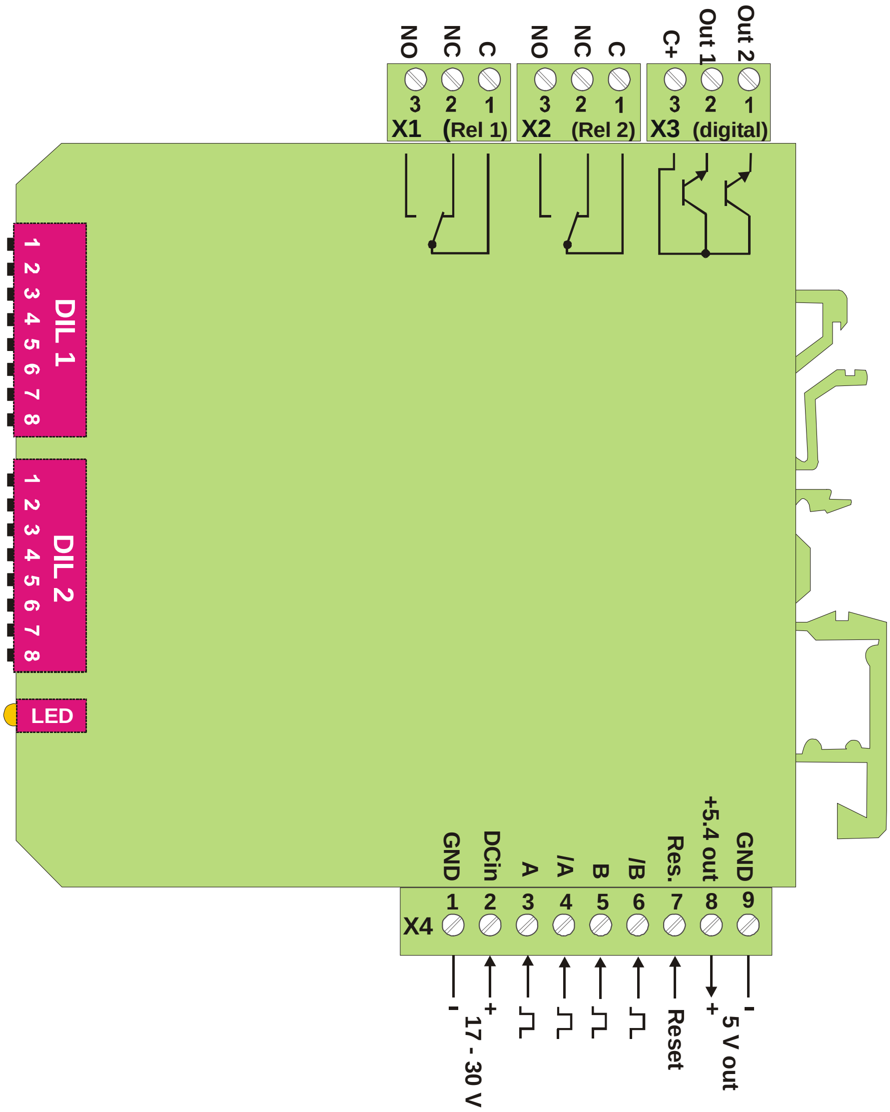
1. Introduction

DZ210 has been designed as a monitor module for assembly in electrical control cabinets. The units are suitable for monitoring the direction of rotation and the zero-motion state with industrial machine applications.

As remarkable properties, the DZ 210 units provide a very high input frequency range, a very fast response time and versatile settings for encoder characteristics and evaluation of the signals with respect to direction and standstill detection.

2. Connections and Terminal Assignments

The units provide a 9-position screw terminal strip on the bottom side for power supply and input signals, and three 3-position terminals on the top, for the outputs. The drawing below explains the function and assignment of the screw terminal strips.



2.1. Power Supply

The unit operates with a DC power from 17 to 30 volts, applied to terminals 1 and 2 of terminal strip X4. The power consumption is approx. 30 mA (plus about 30% of the current taken from the auxiliary 5 volts output)

2.2. Auxiliary Power output

Positions 8 and 9 of terminal strip X4 provide an auxiliary, stabilized 5 volts DC output. The real output voltage is a little higher (e.g. 5.4 volts) in order to compensate for voltage drop on connectors and cables. The auxiliary output is intended for supply of encoders and sensors. The output current must not exceed 200 mA.

2.3. Impulse Inputs

The unit features the input channels A, /A (A inverted), B and /B (B inverted). For detection the direction of rotation it is mandatory to apply at least signals A and B, with a distinguishable phase displacement (in general 90°). Inverted signals /A and /B are only needed with differential TTL inputs or RS422 input signals.

The inputs can be set by DIL switch to any of the following characteristics:

Impulse formats:

- HTL level 10 - 30 V
- TTL level (differential) respectively RS422 format (inverted signals included)
- TTL level single-ended (without inverted signals)

Switching characteristics:

- PNP (switching to +)
- NPN (switching to -)
- Tristate (Impedance 10 k)

2.4. Reset Input

A Reset input provides shutdown of all internal functions and forces the unit to "standstill" state. The switching characteristics of the Reset input is always HTL / PNP, i.e. you have to apply a positive signal (10 to 30 volts) to effectuate the Reset state.

2.5. Relay Outputs

There are two output relays available (dry change-over contacts) with a switching capability of 30 volts DC / 2 Amps respectively 230 volts AC / 0.3 Amps. The response time of the relays is in a range of 5 milliseconds.

Relay 1 (terminal X1) is always used to indicate the direction of rotation, according to the actual A / B phase situation. Relay 2 (terminal X2) can be set by DIL switch to either indicate the other direction of rotation, or to monitor "standstill"

2.6. Transistor Outputs

Both transistor outputs "Out1" und "Out2" (terminal X3) operate in parallel to the relay functions, but respond much faster (200 µsec only) than the relays.

The outputs are rated to switch DC voltage from 7 - 30 volts at maximum currents of 350 mA (each).

The transistor outputs are 100% short-circuit-proof, however not both outputs must be short-circuited at the same time for a longer duration.

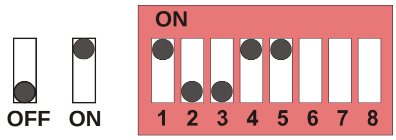
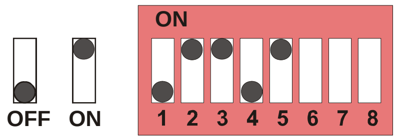
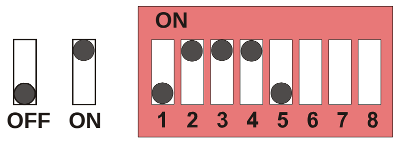
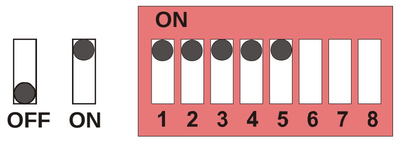
2.7. The Front LEDs

The green LED on the front side of the unit signals that the unit is ready for operation. The yellow LED signals the input frequency, i.e. it will blink or be lit while the unit detects rotation, and it will be off when the unit detects standstill.

3. Switch Settings

3.1. Setup of the Impulse Inputs

Positions 1 to 5 of switch DIL1 are used to set levels and switching characteristics of the impulse inputs. Most of all practical applications would require one of the following three standard settings:

Eingangssignal	Einstellung von DIL1
RS422 or TTL symmetric (differential signals A, /A, B und /B)	
HTL signal, asymmetric, PNP (switch to +) (channels A and B only, no inverted signals)	
HTL signal, asymmetric, NPN (switch to -) (channels A and B only, no inverted signals) This setting is also suitable for NAMUR sensors (2-wire). Observe special hint below.	
TTL signal asymmetric (single-ended) (only A und B, no inverted signals)	

More combinations can be set with consideration of the individual function of each switch position, according to the following table:

1	**OFF:** HTL level (all of the 4 input lines)	**ON:** TTL level (all of the 4 input lines)
2	**OFF:** Input B is symmetric (needs /B)	**ON:** Input B is asymmetric (single-ended, no /B)
3	**OFF:** Input A is symmetric (needs /A)	**ON:** Input A is asymmetric (single-ended, no /A)
4	---	**ON:** internal pull-up resistor towards + *)
5	---	**ON:** internal pull-down resistor towards GND *)

*) Positions 4 and 5 both ON = Tristate, input impedance = 10 kOhms

- At any time one of the positions 4 and 5 must be "ON".
  With 4 and 5 both OFF, the unit may produce undefined operations
- Unused inputs should always be set to HTL level
- With use of Namur (2-wire) sensors, please connect the positive wire to the corresponding input, and the negative wire to GND.
- With setting HTL and NPN all impulse inputs are tied to the positive potential of the power supply (+24V) via internal pull-up resistors. To avoid damage with use of TTL encoders, it is advisable to first set the unit to TTL level prior to connection of the encoder to the unit.

3.2. Basic Switching Functions

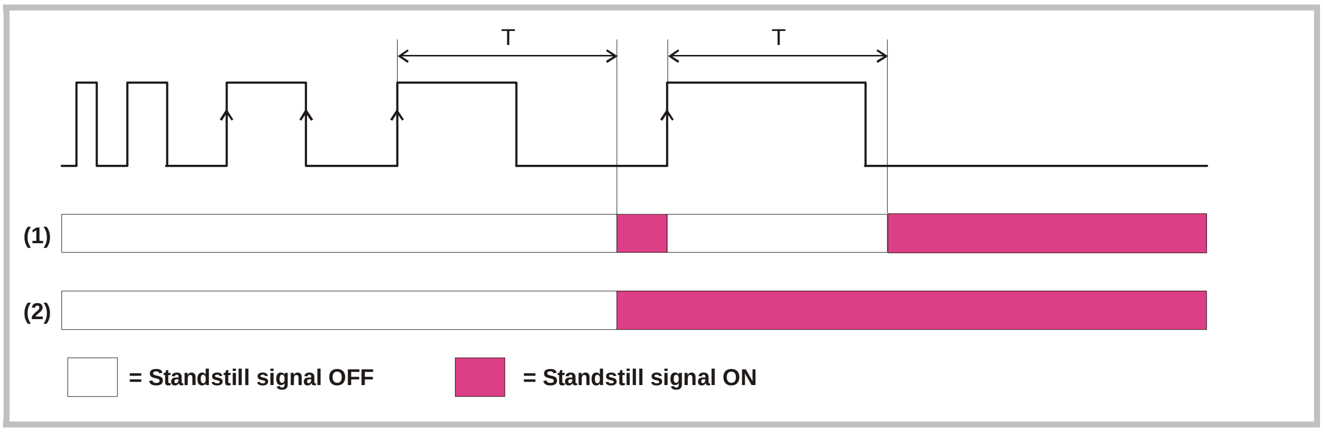
Positions 6, 7 and 8 of switch DIL1 allow selecting the following functions:

	DIL 1	DIL 1
6	**OFF:** Standstill detection without post-trigger function (see clarification below)	**ON:** Standstill detection with post-trigger function (see clarification below)
7	**OFF:** Relay 2 and Out 2 to signal the opposite direction of the Rel1/Out1 indication	**ON:** Relay 2 and Out 2 to signal zero motion (standstill)
8	**OFF:** Upon detection of standstill, the direction signal is cleared (no indication)	**ON:** Upon detection of standstill, the information of the last actual direction remains active

The subsequent drawing explains the difference between "post trigger function on" and "post trigger function off". In order to get a standstill signal at all, the time distance between two positive edges must become greater than the setting "T".

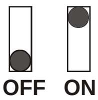
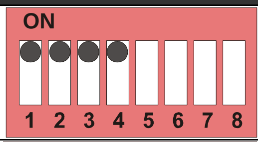
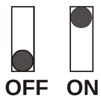
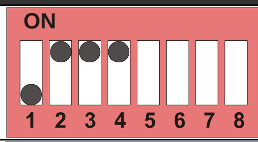
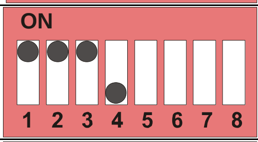
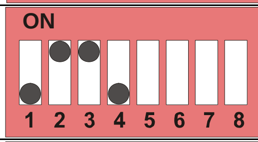
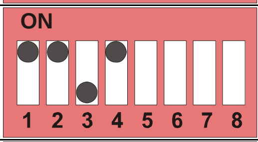
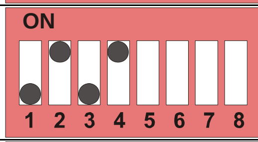
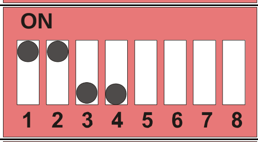
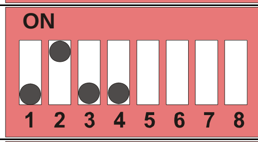
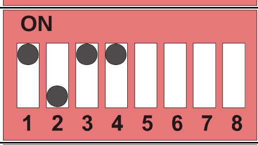
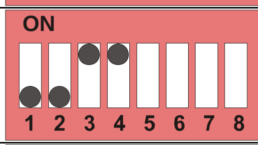
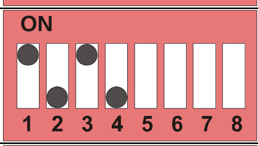
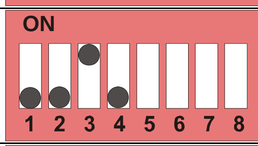
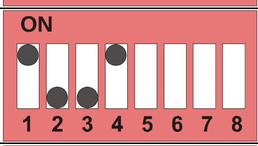
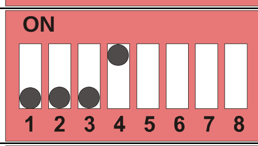
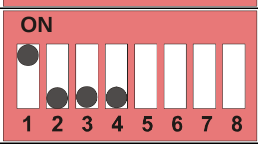
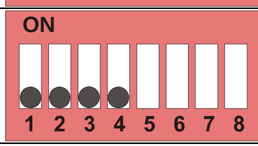
Case (1) shows the post-trigger on.
The standstill signal immediately switches off again when another active edge is detected (no matter after which time). In this case, during slow-down of the machine, the output and the relay might therefore produce multiple on-off cycles before the standstill signal becomes stationary. However this method could be considered as "more safe", because it would detect any motion, no matter how slow it is.

Case (2) shows the post-trigger off.
After the standstill signal has switched on, it will remain on and only switch off again after two subsequent edges have been detected where the time distance was less than T.



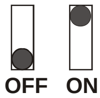
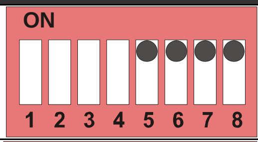
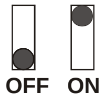
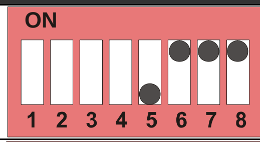
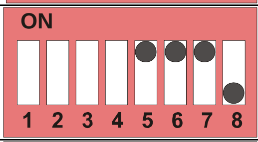
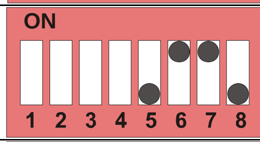
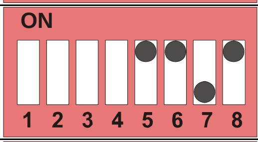
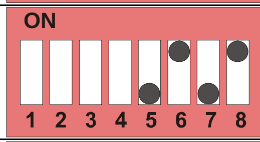
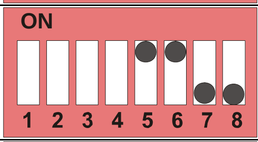
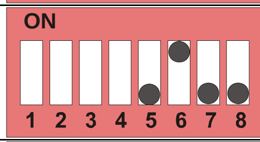
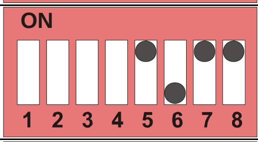
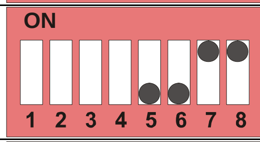
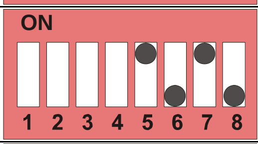
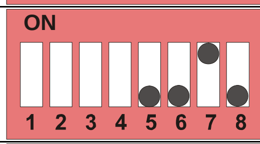
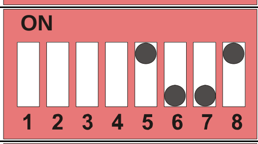
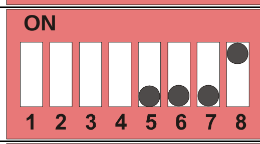
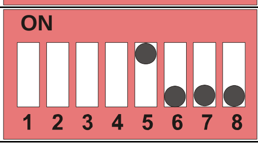
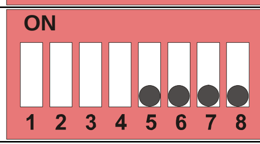
3.3. Setting of the Standstill Time (T)

Provided that the standstill function has been assigned to relay 2 and output 2 by setting DIL switch 1 position 7 to ON, a standstill definition can be set by means of positions 1 - 4 of the switch DIL2. The table indicates the pause time between two input pulses that must be exceeded in order to signal "standstill".

DIL 2			DIL 2	
1 msec 			256 msec 	
2 msec			512 msec	
4 msec			1.024 sec	
8 msec			2.048 sec	
16 msec			4.096 sec	
32 msec			8.192 sec	
64 msec			16.384 sec	
128 msec			32.768 sec	

3.4. Definition of Direction of Rotation

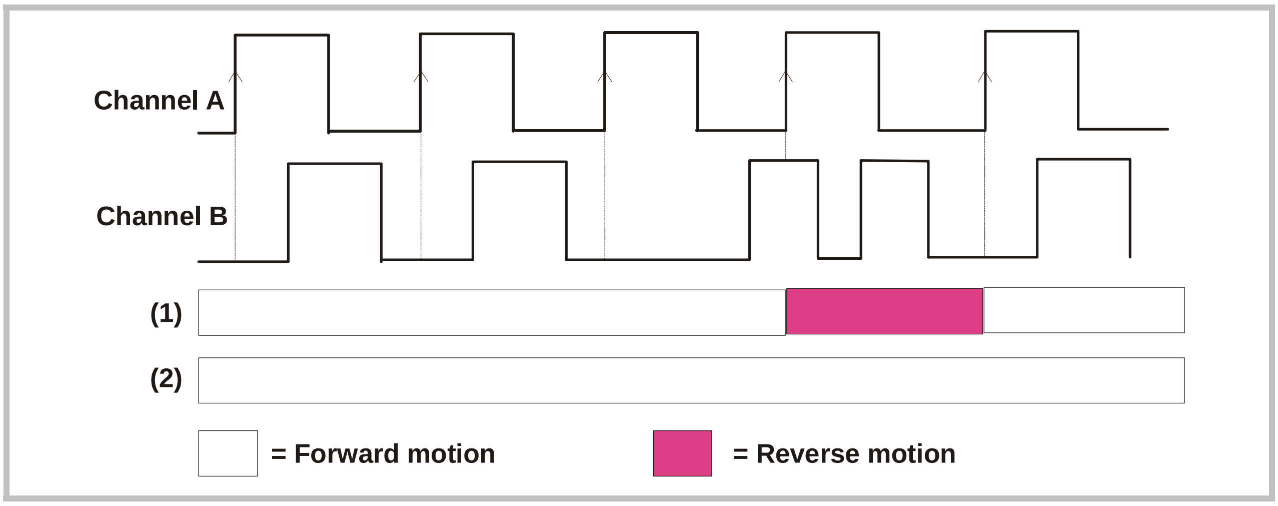
In order to achieve a stable indication of the actual direction of rotation even under vibration and mechanical oscillation, positions 5 - 8 of switch DIL2 provide setting of an impulse window. Before detecting a direction or changing the direction signal, the unit must receive a consecutive number of impulses in the corresponding direction. The table shows how to set the switches to define the number of impulses required for detection of the direction.

DIL 2			DIL 2	
1 Imp. 			9 Imp. 	
2 Imp.			10 Imp.	
3 Imp.			11 Imp.	
4 Imp.			12 Imp.	
5 Imp.			13 Imp.	
6 Imp.			14 Imp.	
7 Imp.			15 Imp.	
8 Imp.			16 Imp.	

The drawing below explains the operation of the direction outputs upon a change of direction.

With case (1) the window has been set to 1 impulse only. As a result the unit immediately changes the output already after the very first impulse into the opposite direction.

With case (2) a window >1 has been set, wherewith the short change of the phase between channels A and B does not affect the direction signal.



4. Technical Specifications

Power supply	: 17 - 30 V DC
Current consumption (Aux. output unloaded)	: ca. 30 mA
Auxiliary output	: 5.4 V, max. 200 mA
Maximum input frequency	: 500 kHz (RS422 and TTL-differential) 350 kHz (HTL and TTL single-ended)
Impulse inputs	: A, /A, B, /B, versatile, for use with RS422 signals HTL signals (differential, single-ended, PNP, NPN) TTL signals (differential, single-ended, PNP, NPN)
Input levels	: RS422: voltage difference >=1 V HTL: LOW <4 V, HIGH >9 V TTL: LOW < 0,5 V, HIGH >2,5 V
Input Impedance	: NPN and PNP: 4.7 kOhms Tristate: 10 kOhms
Relays :	Dry change-over, switching delay approx. 5 msec. Switching capability: 30 VDC/2A or 125 VAC/0,6A or 230 VAC/0,3 A
Transistor outputs	: High-side driver, switching delay 200 µsec. Switching voltage: 7 - 30 VDC Switching current: max. 350 mA 100% short circuit proof (not both outputs at a time for a long period)
Ambient temperature	: Operation: 0° - 45°C (32° - 113° F) Storage: , -25° - +70°C (-13° - 158° F)
Weight	: approx. 100 g
Conformity and standards	: EMC 89/336/EEC: EN 61000-6-2 EN 61000-6-3 LV73/23/EEC: EN 61010-1

5. Dimensions