



**Safety for men  
and machines**



**DNDS Kompakt**

**Original  
Instruction manual**

**Only for replacement  
requirements**

## Declaration of Conformity according to the machinery directive 2006/42/EC attachment II 1A

The protection target of the low voltage directive will be fulfilled according to attachment I. 1. 5. 1 of the machinery directive.

Producer: DINA Elektronik GmbH  
Address: Esslinger Str. 84, D-72649 Wolfschlugen

The producer declares, that the product DNDS Kompakt with the module types as follows

DNDS 1C DNDS 1D DNDS 2C DNDS 2D	With optional external encoder adapter DNIA
DNDS 1FA DNDS 1GA DNDS 2FA DNDS 2GA	With internal encoder adapter

is conform with the regulations of the directives stated above.

is conform with the regulations of the following directives:

- **2004/108/EC: EMC-directive, EN55011 + A1, EN61000-6-2**
- **GS-ET-20:** basic principles for testing and certification of safety switch devices"
- **DIN EN 60947-5-1:** Low-voltage switch gear and control gear; electromechanical control circuit devices
- **DIN EN ISO 13849-1:** Safety-related parts of control systems; Part 1: General principles for design
- **DIN EN ISO 13849-2:** Safety-related parts of control systems; Part 2: Validation

Remarks: The safety relevant functions according to the test report II dated 28th Nov. 2007 will be with category 4 and Ple to perform.

### Type test certificate (ET 08151 from 28.10.2008)

Additional notes:

Certificated by the „Fachausschuss für Elektrotechnik, Prüf- und Zertifizierungsstelle Köln“  
European notified institution Id-number 0340

EMC-directive certificated by “ELMAC GmbH Bondorf”, Reg. No.: DAT-P-206/05-00

QM System certificated according to DIN EN ISO 9001:2008 by “DQS, Frankfurt”, Reg.-No.: 67542 QM 08

Wolfschlugen, 16.12.2009

General Manager

Signed of: Dirar Najib

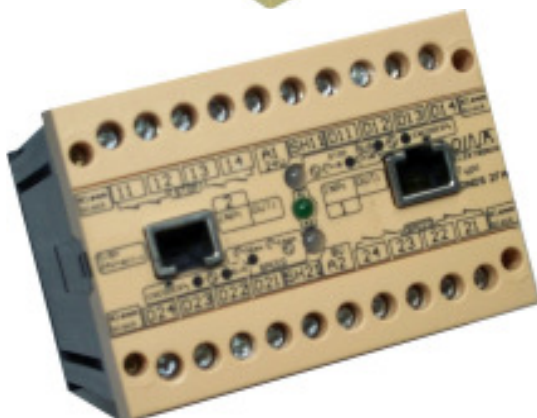
Authorized person for the combination of the technical documents is Dirar Najib.

Address: Esslinger Street. 84, 72649 Wolfschlugen, Germany

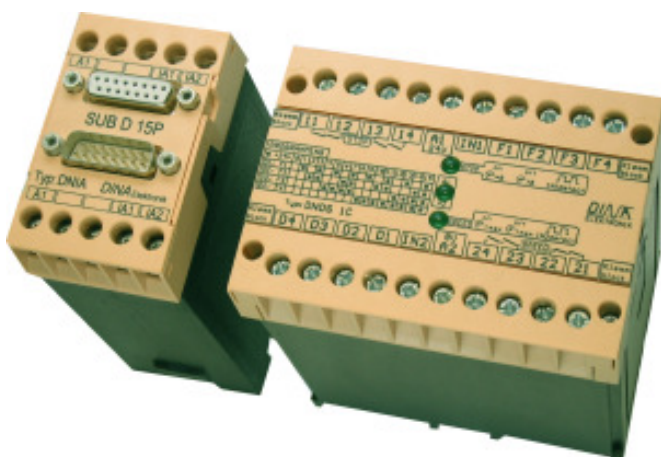
# DNDS Kompakt



**DNDS 1FA**  
**DNDS 1GA**



**DNDS 2FA**  
**DNDS 2GA**



**DNDS 1C**  
**DNDS 1D**  
**DNDS 2C**  
**DNDS 2D**  
**DNIA**

## Safety for men and machines

DINA Elektronik GmbH  
Esslinger Straße 84  
72649 Wolfschlugen

Tel. 07022/9517-0  
Fax 07022/95 17-51

[www.dinaelektronik.de](http://www.dinaelektronik.de)  
[info@dinaelektronik.de](mailto:info@dinaelektronik.de)

Quality management  
system



DQS Certificate  
DIN EN ISO 9001: 2008  
Reg.-Nr.67542 QM 08

BG Verification  
certificate ET 08152



$MTTF_d = 123 \text{ years}$

$DC_{avg} \geq 99\%$

CCF: 95 points

$PFH_d = 2.47 \times 10^{-8}$

PI = e

$T_M = 20 \text{ years}$

The total concept of the specified category must be validated involving the whole control unit.



	Page
Contents	
Safety regulations  .....	5
Intended usage .....	5
Addition's according 13849-1 .....	5
Product variants of motion and standstill monitoring system .....	6
Description of DNDS 1C, 1D, 1FA, 1GA, 2C, 2D and 2GA .....	6
Requirements of the encoder .....	6
Reaction times .....	6
Circuit diagram .....	7
DNDS 1C, 1FA, 2C, 2FA: Applications of the outputs .....	7
SPEED contacts: Motion monitoring .....	7
DNDS 1D, 1GA, DNDS 2D, 2GA: Applications of the outputs .....	8
STOP contacts: Standstill monitoring .....	8
SPEED contacts: Motion monitoring .....	8
Function description: DNDS 1C, 1D, 1FA & 1GA .....	9
Function of the inputs of DNDS 1C, 1D, 1FA & 1GA .....	9
Machine speed setting with DNDS 1C, 1D .....	10
Machine speed setting with DNDS 1FA, 1GA .....	10
Function modes .....	10
Reaction times .....	11
Installation of DNDS 1C, 1D, 1EA, 1GA .....	11
Faults - Errors of DNDS 1C, 1D, 1FA, 1GA .....	11
Function of DNDS 2C, 2D and 2GA .....	12
Function of the inputs of DNDS2 C, 2D .....	12
Machine speed setting with DNDS 2C, 2D .....	12
Machine speed setting with DNDS 2GA .....	12
Reaction times .....	13
Installation of DNDS 2C, 2D, 2GA .....	13
Faults - Errors of DNDS 2C, 2D and 2GA .....	13
Dimensions .....	14
Technical data .....	14
DNIA adaptor to the encoder: product description .....	15
DNIA: function description .....	15
Requirements of the encoder .....	15
DNIA: Installation and operation .....	15
Adjustment of the NC type .....	15
Certificate .....	17

## Safety regulations

- The unit may only be installed and operated by those who are qualified electrical engineers or have received sufficient training and are familiar with both these instructions and the current regulations for safety at work and accident prevention. Follow VDE, EN as well as local regulations especially as regards preventative measures!
- Ignoring the safety regulations can lead to death, serious injury or cause considerable damage!
- In emergency stop applications use the internal function "Speed output restart disable" or a higher level control unit must ensure that the machine cannot start up again automatically!
- Transport, storage and operating conditions should all conform to **EN 60068-2-1, 2-2**. See technical details
- Any guarantee is void following unauthorised modifications. This can lead to death, serious injury or cause considerable damage!
- The unit should be cabinet mounted, otherwise dampness or dust could lead to functional impairment.
- Adequate fuse protection must be provided on all output contacts especially with capacitive and inductive loads.
- The unit must be installed following the specification of **DIN EN 50274, VDE 0660-514** regarding the required distances.
- During operation, parts of the electronic switchgear carry high voltage.
- **DANGER!** During operation the protective covers must not be removed from the electronic switchgear!
- The device must always be replaced after the first malfunction!
- The unit must be disposed of properly when it reaches the end of its service life.
- Keep the operating instructions!

## Intended usage

The intended usage of the motion and stand-still monitor DNDS is:

- Safe motion monitoring according to **EN 60 204-1; VDE 0113-1** and **DIN EN ISO 13849-1 Category 4 PL<sub>e</sub>**
- Safe stand-still monitor according to **EN 60204-1; VDE 0113-1** and **DIN EN ISO 13849-1 Category 4 PL<sub>e</sub>**  
(Type test certificate No. ET 08151, BG Test certificate No. ET 08152)

## Certification base:

- **2004/108/EC: EMC-directive, EN55011 + A1, EN61000-6-2**
- **GS-ET-20:** basic principles for testing and certification of safety switch devices"
- **DIN EN 60947-5-1:** Low-voltage switch gear and control gear; electromechanical control circuit devices
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## Addition's according 13849-1

- The boundaries of the SRP/CS start at the clamps of the input signals and will end at the clamps of the contact driven enable path
- Changing, Repair and maintenance by the user is not intended. Exclusions of errors made, will stay valid unchanged.

## The requirements below are described in this product information:

- Description of the interfaces to SRP/ CS and safety equipment (described module dependent)
- Reaction time (page 6, 11, 13 and 14)
- Limits of operation (page 14, 16)
- Indicators and alarms (page 11 and 13)
- Muting and temporary disabling of the safety functions (not valid here)
- Operation mode's general description (page 10 and 12)
- Maintenance, Checklists and internal spare parts (not valid here)
- Tools for easy and safe troubleshooting (page 11 and 13))
- Test intervals (not valid here)

## Risk diagram to determine the PL<sub>r</sub> for every safety function

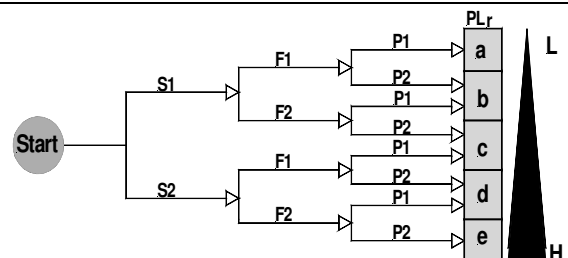
### Legend

- L** low impact on risk reduction
- H** high impact on risk reduction
- PL<sub>r</sub>** necessary performance Level

























































### Risk parameters

- S** severe of injury
- S1** light (normally reversible injury)
- S2** severe (normally irreversible injury including dead)
- F** frequency and/or duration of the danger situation
- F1** seldom to infrequent and/or short exposition to danger situation
- F2** frequent or constant and/or long exposition to danger situation
- P** possibilities to circumvent the danger or limitation of damage
- P1** possible under certain conditions
- P2** nearly impossible

**The requirements of the standards can be fulfilled, if after the operating time the protection device will be activated or the safety functions will be tested.**



## Product variants of motion and standstill monitoring system

Equipment	Monitoring actuations	Outputs									
		STOP		SPEED							
DNDS 1C	1	11 	12 	13 	14 	21 	22 	23 	24 		
DNDS 1D	1			13 	14 	23 	24 	33 	34 	43 	44 
DNDS 1FA	1	11 	12 	13 	14 	21 	22 	23 	24 		
DNDS 1GA	1			13 	14 	23 	24 	33 	34 	43 	44 
DNDS 2C	2	11 	12 	13 	14 	21 	22 	23 	24 		
DNDS 2D	2			13 	14 	23 	24 	33 	34 	43 	44 
DNDS 2GA	2			13 	14 	23 	24 	33 	34 	43 	44 



to use only as reporting contact

### Accessories



Equipment	Equipment function
DNIA	Adapter to the encoder
DNDA	Cable adapter for the encoder



## Description of DNDS 1C, 1D, 1FA, 1GA, 2C, 2D and 2GA

The DNDS is enclosed in a 100mm housing and requires a supply voltage of 24 VDC.

### Features:



#### DNDS 1C, 2C & DNDS 1FA:

for standstill monitoring one safety contacts (13  14) and one NC contact (11  12)

for motion monitoring one safety contacts (23  24) and one NC contact (21  22), positive guided.

#### DNDS 1D, 2D, DNDS 1GA & 2GA:

for standstill monitoring two safety contacts (13  14 23  24)

for motion monitoring two safety contacts (33  34 43  44), positive guided.

#### DNDS 1C, 1D, DNDS 2C & 2D:

Connections for PNP-proximity sensors or an encoder via a DNIA adaptor.

#### DNDS 1FA, DNDS 1GA & 2GA:

The encoder is connected via a DNDA Cable adaptor type DNDA.

Status indicators.

Programmable machine rpm setting.

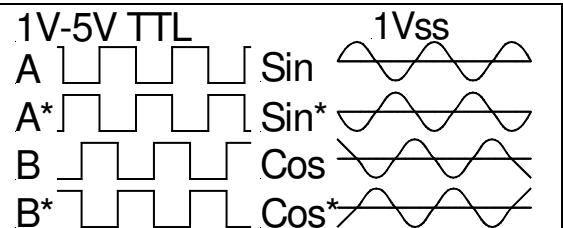
The DNDS complies with the following safety requirements:

- The circuit is redundant with built-in self-monitoring.
- The safety function remains effective in the case of a component failure.
- With every on-off cycle of the machine the relays are automatically tested to make sure they open and close correctly.

## Signals of encoder

### Requirements of the encoder

- Encoder signal: Rectangular with amplitude of 0.5-5 V or sine/cosine signal with 0.5-5 VSS.
- Encoder frequency  $\leq 300\text{KHz}$  TTL, 200KHz Sin/Cos.
- Encoder with high resistance outputs during malfunction.
- 2 tracks 90° out of phase, 2 signals per track that are 180° out of phase
- The signals of encoder are not allowed to be generate synthetically



## Reaction times

The total reaction time is the sum of:

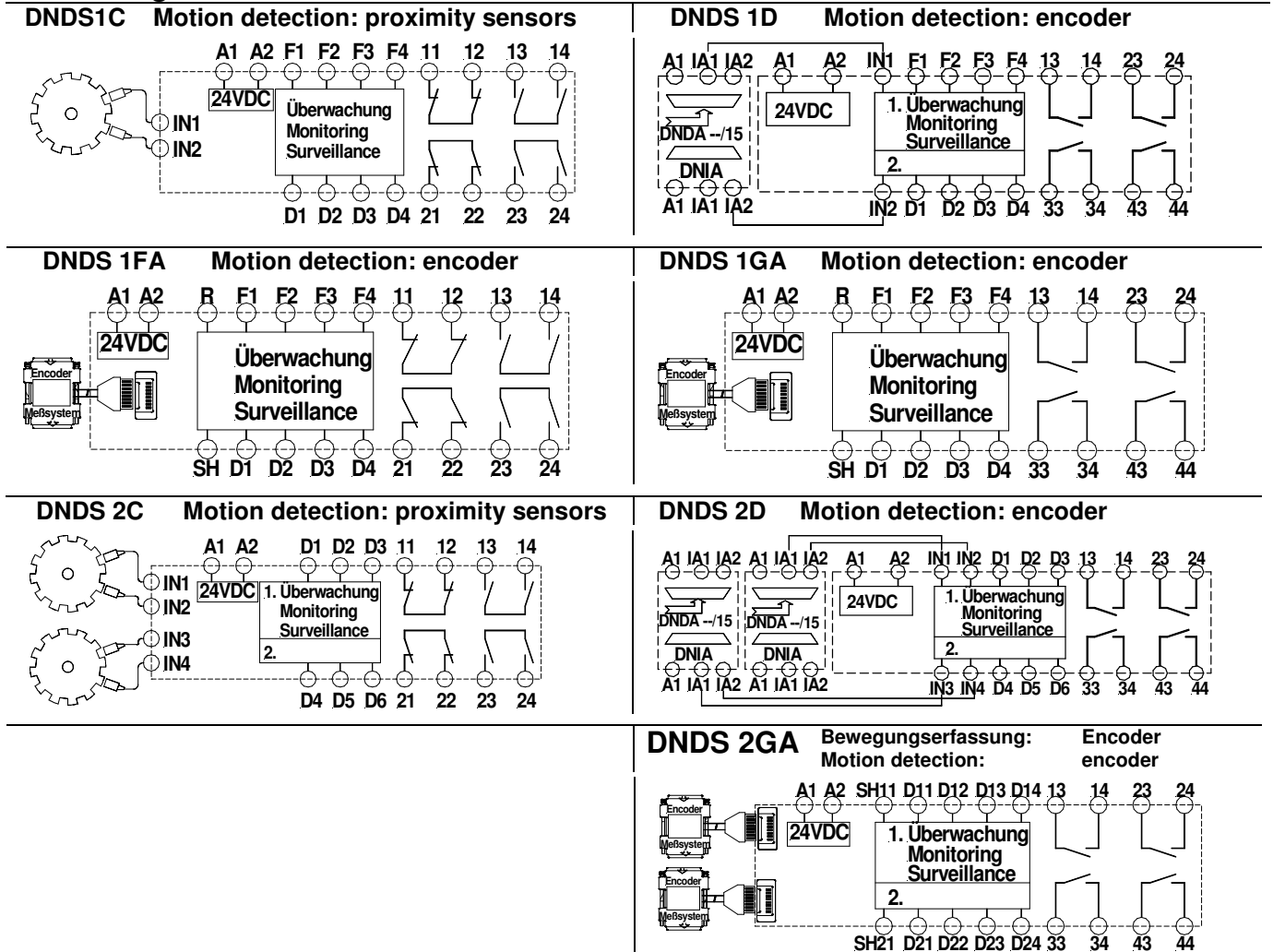
- Reaction time of the motion monitor
- De-energisation time of the output relay (<20ms).
- Delay of de-energisation on any external switching devices.

The reaction time of the motion monitor decreases as the speed to be monitored increases (linear).

It measures at 5 Hz about 200 ms and at 800 Hz about 1 ms



## Circuit diagram



### DNDS 1C, 1FA, 2C, 2FA: Applications of the outputs

#### STOP contacts: Standstill monitoring

If the protection cover is closed and one or more drives are in movement, the NO-contacts **13-14** open immediately. The NC-contacts **11-12** close. The LED STOP is not illuminated. The protection cover cannot be opened.

If all drives are stopped the contacts 13-14 close and 11-12 close. The protection cover can be opened. The LED STOP is illuminated.

#### SPEED contacts: Motion monitoring

If the protection cover is closed, the F-inputs and respectively the D-inputs of DNDS will be connected to 24V DC via the switch of the protection cover. The automatic mode will be monitored.

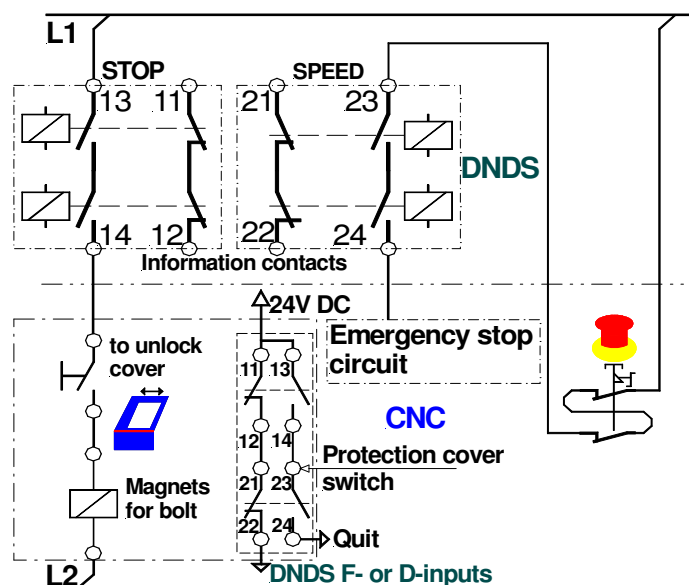
In case of the protection cover is open DNDS monitors the standstill of all drives, if there is no function mode selected.

If there is some function mode selected, as example tool setting via SH-, R-input of DNDS, this function mode will be monitored.

If one or more drives break the standstill as well as the adjusted speed of the function mode, the NO contacts **23-24** open and **21-22** close immediately. The LED SPEED does not illuminate.

The drives will be stopped by emergency stop circuit (STOP category 0). See principal schematic.

The contacts 23-24 close and 21-22 open again, if the actual speed is 10% lower than the adjusted speed. The LED SPEED illuminates.



## DNDS 1D, 1GA, DNDS 2D, 2GA: Applications of the outputs

### STOP contacts: Standstill monitoring

If the protection cover is closed and one or more drives are in movement, the NO-contacts **13-14** and **23-24** open immediately. The LED STOP is not illuminated. The protection cover cannot be opened.

If all drives are stopped the contacts **13-14** and **23-24** close. The protection cover can be opened. The LED STOP is illuminated.

### SPEED contacts: Motion monitoring

If the protection cover is closed, the F-inputs and respectively the D-inputs of DNDS will be connected to 24V DC via the switch of the protection cover. The automatic mode will be monitored.

In case of the protection cover is open DNDS monitors the standstill of all drives, if there is no function mode selected.

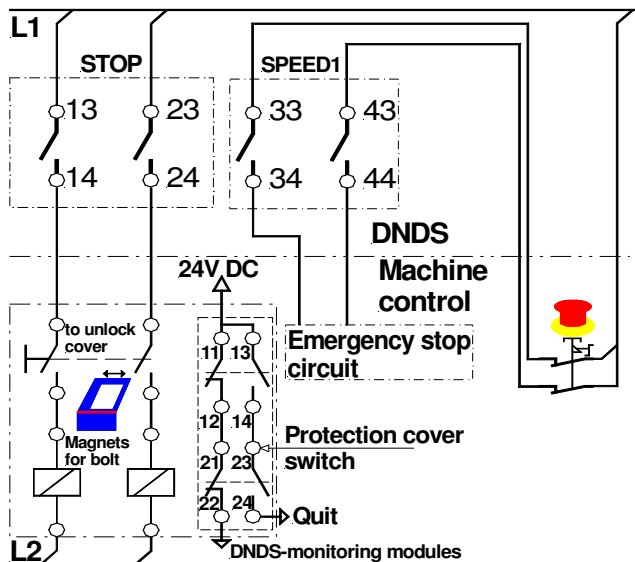
If there is some function mode selected, as example tool setting via SH-input or R-input of DNDS, this function mode will be monitored.

If one or more drives break the standstill as well as the adjusted speed of the function mode, the NO contacts **23-34** and **43-44** open immediately. The LED SPEED does not illuminate.

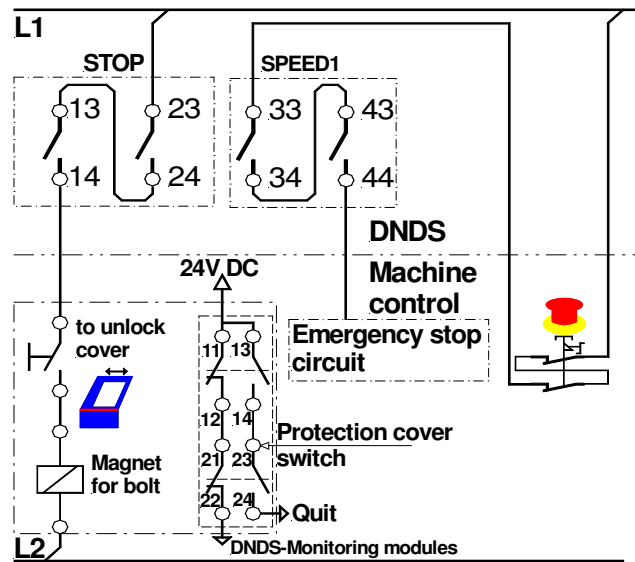
The drives will be stopped by emergency stop circuit (STOP category 0). See principal schematic below.

The contacts close again, if the actual speed is 10% lower than the adjusted speed. The LED SPEED illuminates.

### Parallel connection of the outputs

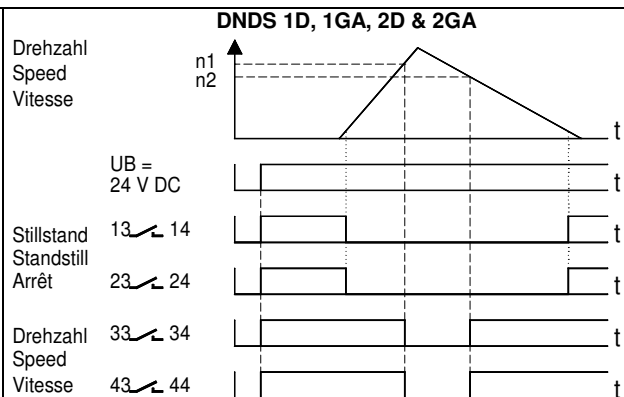
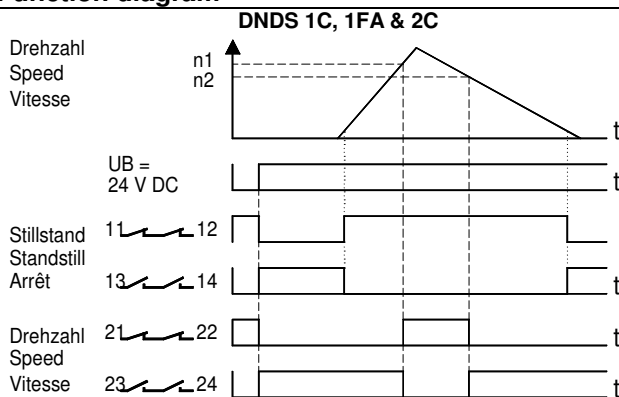


### Serial connection of the outputs



If it necessary the stop contacts can be serial, the speed contact can be parallel and contrary.

### Function diagram





## Function description: DNDS 1C, 1D, 1FA & 1GA

### DNDS 1C, 1D, 1FA & 1GA:

The DNDS acts as a failsafe monitor of a rotary respectively linear motion and standstill. The speed monitor shutdown trigger point can be programmed via 4 inputs (D1–D4). This shutdown trigger point can be further modified from 100% down to 5 % via the 4 inputs (F1–F4)

**DNDS 1C, 1D** has an internal (R) input to switch between constant and variable creep velocity (see table 1 and 2). The motion detection can be monitored via 2 PNP-proximity sensors or a rotary encoder. If PNP-proximity sensors are used, attention must be paid to mount them in a way, so always one of the two sensors is activated.

Rotary encoders can only be connected using a DNIA adaptor (for the rotary encoder specifications, see the DNIA operating instructions).

**DNDS 1FA, 1GA** has an external (R) input to switch between constant and variable creep velocity. A further external (SH) input is used for switching over between creep velocity and standstill (see table 1 and 2).

For motion monitoring a rotary encoder is required. The Rotary encoder is connected via a DNDA 15/8 or DNDA 25/8 adaptor to the DNDS 1FA, 1GA

## Function of the inputs of DNDS 1C, 1D, 1FA & 1GA

### D-inputs:

- Setting the automatic operation mode speed in 16 steps (00-15 = 100 – 800 Hz, table 1)
- D-inputs are only of importance if at least one F-input is connected to 24V
- If the F-inputs are not active (open) and the R-input is active, the active D-inputs determine the value of the tool setting speed.

### F-inputs:

- F-inputs reduce the setting value via the D-inputs in 15 steps, 01-15 = 25-100%.
- The F-inputs are also a switch over between tool setting (all F= open) and automatic operation mode (any F connected with 24V). The tool setting speed is variable between 1-20 Hz or constant 5 Hz.
- The F-inputs setting is stored internally to determine the tool setting speed, if all F inputs are switched off. The stored F setting is valid until the equipment is powered off.
- The value of the tool setting speed is determined by the stored F-inputs, if the D-inputs are open and the R-input is active.

### R-input:

- R-input works only if the F-inputs are switched off (open).
- If the R- and D-inputs are active the creep rate is determined by the active D-inputs. (see Table 1)
- If the D-inputs are open the tool setting speed is determined by the stored F setting .
- If the R-input and the F-inputs are not active, the standstill is monitored.
- R- and SH inputs must not be connected to 24V at the same time.

### SH-input: DNDS 1FA, 1GA only

- The SH input is used to switch between tool setting speed and standstill (50Hz and 5Hz)
- The SH-input works only if the R-input and all F-inputs are switched off (open).
- If the SH-input and the F-inputs are open the standstill will be monitored.
- If the SH-input is active (SH connected to 24V) and the F-inputs are open the tool setting speed will be monitored.

## Machine speed setting with DNDS 1C, 1D

connected to 24 VDC								NC = open							
T1 speed setting								T2 Reduction in % for each position of D in T1							
Automatic mode Programmable inputs				F1-F4 = NC Mode 2 internal				Automatic mode Programmable inputs				D = 0-15 Mode 2 internal			
100%				R R				R R				R R			
T1	D1	D2	D3	D4	HZ	Hz	Hz	T2	F1	F2	F3	F4	%	Hz	Hz
00					100	2,5		00							5
01	■				112	2,8		01	■				25	1,0	
02		■			140	3,5		02		■			30	1,1	
03			■		180	4,5		03			■		35	1,2	
04				■	200	5,0		04				■	40	1,3	
05	■				224	5,6		05	■				45	1,4	
06		■			275	7,0		06		■			50	1,5	
07			■		315	8,0	5	07			■		55	1,6	
08				■	355	9,0		08				■	60	1,7	
09	■				400	10,0		09	■				65	1,8	
10		■			450	11,0		10		■			70	1,9	
11			■		500	12,5		11			■		75	2,0	
12				■	550	14,0		12				■	80	2,1	
13	■				630	16,0		13	■				85	2,2	
14		■			700	17,5		14		■			90	2,3	
15			■		800	20,0		15			■		100	2,5	

The frequencies are the input frequencies at the IN1, IN2 Inputs of the DNDS 1C, DNDS 1D.

Reduction in % This is valid for each position in T1

Mode 2 internal: internal adjustment only by DINA Elektronik. Mode 2 ist only active if F = NC

## Machine speed setting with DNDS 1FA, 1GA

connected to 24 VDC								NC = open							
T1 Automatic mode speed setting (mode 1)								T2 Reduction in % for each position of D in T1 (mode 1)							
Programmable inputs				F = 100% F = NC R SH R&SH				Programmable inputs				D = 0-15 R SH R&SH			
T1	D1	D2	D3	D4	HZ	Hz	Hz	T2	F1	F2	F3	F4	%	Hz	Hz
00					100	2,5		00							
01	■				112	2,8		01	■				25	1,0	
02		■			140	3,5		02		■			30	1,1	
03			■		180	4,5		03			■		35	1,2	
04				■	200	5,0		04				■	40	1,3	
05	■				224	5,6		05	■				45	1,4	
06		■			275	7,0		06		■			50	1,5	
07			■		315	8,0	50	07			■		55	1,6	50
08				■	355	9,0	5	08				■	60	1,7	
09	■				400	10,0		09	■				65	1,8	
10		■			450	11,0		10		■			70	1,9	
11			■		500	12,5		11			■		75	2,0	
12				■	550	14,0		12				■	80	2,1	
13	■				630	16,0		13	■				85	2,2	
14		■			700	17,5		14		■			90	2,3	
15			■		800	20,0		15			■		100	2,5	

The frequencies are the frequencies at the output of the intermediate adaptor

Reduction in % This is valid for each position in T1

- R: Selection of tool setting function mode for spindle operation, F = NC
- SH: Selection of tool setting function mode for linear movement, F = NC
- F & SH = NC: Standstill monitoring

### Function modes

SH-input	R-input	F-inputs	D-input	Monitored modes
			Dx at 24V or open	Standstill
24V			Dx at 24V or open	Tool setting
	24V		Dx at 24V or open	Tool setting
		Fx=24V	Dx at 24V or open	Automatic

Priority of the inputs: F > R > standstill, F > SH > standstill

## Reaction times

The total reaction time is the sum of:

- Reaction time of the motion monitor
- De-energisation time of the output relay (<20ms).
- Delay of de-energisation on any external switching devices.

The reaction time of the motion monitor decreases as the speed to be monitored increases (linear).

It measures at 5 Hz about 200 ms and at 800 Hz about 1 ms

## Installation of DNDS 1C, 1D, 1EA, 1GA

- The equipment must be cabinet mounted min. IP 54). The Equipment is equipped with a latch for DIN-rail attachment.
- Supply operating voltage of 24V to terminals A1 (+) and A2 (-). Connect button (reset fault memory) to terminal A2.
- Input circuit: **DNDS 1C, 1D**
  - Proximity sensor (PNP):  
Connect output of the first proximity sensor to IN1 and the 2nd to IN2. Both proximity sensors should be connected to supply voltage A1 and A2.
  - Encoder with DNIA adaptor:  
Connect output IA1 of the DNIA to terminal IN1; connect output IA2 of the DNIA to terminal IN2; A1 of both units should be connected together.
- **Programming**
  - rpm setting: Connect 24 VDC to the terminals D1-D4 according to desired rpm (see table 1).
  - Reduction in %: Connect 24 VDC to the terminals F1-F4 according to table 2.
- Input circuit: **DNDS 1FA, 1GA**
  - Connect the Equipment by using a DNDA 15/8 or DNDA 25/8 adapter cable to the encoder.

### Please note for operation

- To prevent a welding together of the contacts, a fuse (6 A slow acting) must be connected before the output contacts.
- The total of the reaction times must not lead to a dangerous status.
- Use copper wiring that will withstand 60/75 °C.
- Tighten screws to terminals with 0.8 Nm max.
- Important details in the section "Technical Data" should be noted and adhered to.

## Faults - Errors of DNDS 1C, 1D, 1FA, 1GA

- Welding of one contact makes it impossible for the other contact to be switched on.
- LED "SPEED" and "STOP" do not light:
  - A PNP proximity sensor failure.
  - PNP proximity sensor not connected.
  - PNP proximity sensor is not installed on the tooth wheel.
  - There is a line break to the DNIA.
  - The encoder is not connected.
- LED "SPEED" flashes with 1 Hz interval:
  - The peripheral equipment belonging to input IN2 is defective or there is a line break at that input, or Track A of the encoder is missing.
- LED "STOP" flashes with 1 Hz interval:
  - The peripheral equipment belonging to input IN1 is defective or there is a line break at that input or Track B of the encoder is missing.

To reset the error disconnect the operating voltage for at least 2s (disconnect A1)

- LED "STOP" and LED "SPEED" flashes in 2 Hz intervals:
  - R and SH connected to 24V simultaneously.
  - DNDS 1C disturbance.
  - Error by improperly installed external signal lines.

The fault can possibly be eliminated by interruption of the operating voltage for at least 2s (disconnect A1).

## Function of DNDS 2C, 2D and 2GA

The DNDS 2C, 2D, 2GA includes 2 independent monitoring systems for failsafe monitoring of a rotary respectively linear motion and standstill .

### DNDS 2C, 2D:

The machine rpm setting is done by 3 programmable inputs for each system.

The motion detection can be monitored by 2 PNP proximity sensors or one encoder per monitoring system. If PNP-proximity sensors are used, attention must be paid to mount them in a way, so always one of the two sensors is activated.

Rotary encoders can only be connected using a DNIA adaptor (for the rotary encoder specifications, see the DNIA operating instructions).

### DNDS 2GA:

The machine rpm setting is done by 4 programmable inputs for each systems.

Each system uses its own encoder to monitor the motion. The encoder can only be connected using a DNDA 15/8 or 25/8 adaptor (for specifications of the rotary encoder, see the impulse diagram)

## Function of the inputs of DNDS2 C, 2D

### D-inputs:

- Position 0-7 (T1), DNDS 2C, 2D
- Position 0-15 (T2), DNDS 2GA
- The D-inputs are a switch over between tool setting (D= open) and automatic operation mode (D connected with 24V).

### SH-input: DNDS 2GA only

- If the SH-input and the D-inputs are open standstill will be monitored.
- After the D-inputs are switched off it can be switched over between tool setting speed (SH connected to 24V) and standstill (SH open).

## Machine speed setting with DNDS 2C, 2D

T1		Selection of function mode via D-inputs			Internal only by DINA Elektronik			
24 V	NC	D1/D4	D2/D5	D3/D6	Hz	Hz	Hz	Hz
Machine speed setting for 1 and 2 monitoring system.	0				45	5	20	20
	1				60	41	80	40
	2				115	72	160	60
	3				145	450	240	80
	4				360	206	320	100
	5				420	500	400	250
	6				480	550	480	500
	7				630	630	560	1000

## Machine speed setting with DNDS 2GA

T2		24 V	NC	Setting the speed for automatic mode via D-inputs				D = NC	
								SH11, SH21	SH = NC
				D11/D21	D12/D22	D13/D23	D14/D24	Hz	Hz
Machine speed setting for 1 and 2 monitoring system.	00								
	01							200	
	02							250	
	03							315	
	04							355	
	05							400	
	06							450	
	07							500	50
	08							550	
	09							630	
	10							700	
	11							800	
	12							900	
	13							1000	
	14							1100	
	15							1250	

SH11, SH21: Selection of tool setting mode , D = NC

SH & D = NC: Standstill monitoring

## Reaction times

The total reaction time is the sum of:

- Reaction time of the motion monitor
- De-energisation time of the output relay (<20ms).
- Delay of de-energisation on any external switching devices.

The reaction time of the motion monitor decreases as the speed to be monitored increases (linear).

It measures at 5 Hz about 200 ms and at 800 Hz about 1 ms

## Installation of DNDS 2C, 2D, 2GA

- The equipment must be cabinet mounted min. IP 54). The Equipment is equipped with a latch for DIN-rail attachment.
- Supply 24V operating voltage to terminals A1 (+) and A2 (-). Connect button (reset fault memory) to terminal A2.
- Input circuit: **DNDS 2C, 2D**
  - Proximity sensor (PNP):  
Connect output of the first proximity sensor to IN1(IN3) and the 2nd to IN2 (IN4).  
Both proximity sensors should be connected to supply voltage A1 and A2.
  - Encoder with DNIA adaptor:  
Connect output IA1 of the DNIA to terminal IN1 (IN3); connect output IA2 of the DNIA to terminal IN2 (IN4). A1 of both units should be connected together.
- **Programming**
  - Normal rpm setting: connect 24 VDC to the terminals D1-D3 (D4-D6) according to T1.
- Input circuit: **DNDS 2GA**
  - Connect the equipment by using DNDA 15/8 or DNDA 25/8 adapter cables to the encoder.

Please note for operation

- To prevent a welding together of the contacts, a fuse (6 A slow acting) must be connected before the output contacts.
- The total of the reaction times must not lead to a dangerous status.
- Use copper wiring that will withstand 60/75 °C.
- Tighten screws to terminals with 0.8 Nm max.
- Important details in the section "Technical Data" should be noted and adhered to.

## Faults - Errors of DNDS 2C, 2D and 2GA

- Welding of one contact makes it impossible for the other contact to be switched on.
- LED "SPEED" and "STOP" do not light:
  - A PNP proximity sensor failure.
  - PNP proximity sensor not connected.
  - PNP proximity sensor is not installed on the tooth wheel.
  - There is a line break to the DNIA.
  - The encoder is not connected.
- LED "SPEED" flashes green with 1 Hz interval, the sensor at input IN3 is defective or there is a line break at that input, or Track A of the encoder 2 is missing, **ELSE** LED flashes red IN4 or Track B failure.
- LED "STOP" flashes green with 1 Hz interval, the sensor at input IN1 is defective or there is a line break at that input, or Track A of the encoder 1 is missing, **ELSE** LED flashes red IN2 or Track B failure.

To reset the error disconnect the operating voltage for at least 2s (disconnect A1)

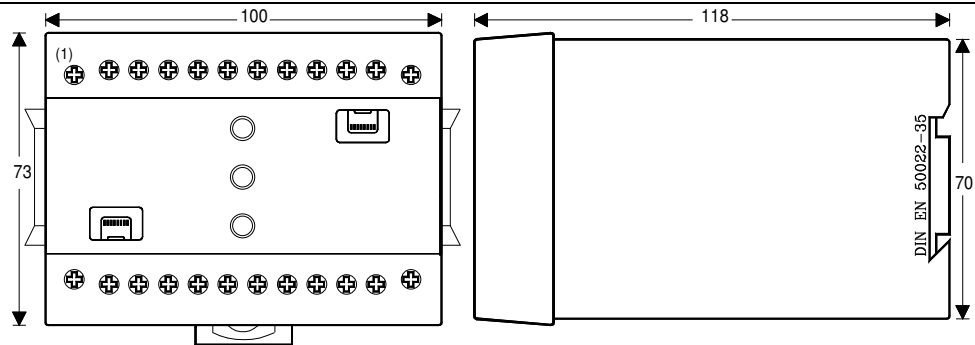
- LED "STOP" and LED "SPEED" flashes in 2 Hz intervals:
  - DNDS disturbance.
  - Error by improperly installed external signal lines.

The fault can possibly be eliminated by interruption of the operating voltage for at least 2s (disconnect A1).).


## Dimensions

in mm

**DNDS 1C**  
**DNDS 1FA**  
**DNDS 1D**  
**DNDS 1GA**  
**DNDS 2C**  
**DNDS 2D**  
**DNDS 2GA**



## Technical data

<b>Electrical data</b>	
Operating voltage $U_B$	24 V DC
Voltage tolerance $U_B$	90 - 110%
Residual ripple $U_B$ (DC)	max. 10 %
Power consumption at $U_B$	max 10 W
<b>Contacts</b>	
Safety contacts	
Contact material	AgNi10 5um Au
Switching Capability to NO in DNDS 1C, 1FA and 2C	<b>EN 60947-5-1: 2005-02</b> AC15: 230V AC / 3A DC13: 24V DC/ 2A
NC in DNDS 1C, 1FA und 2C	AC15: 230V AC/ 2A DC13: 24V DC/ 2A
NO in DNDS 1D, 1GA, 2D und 2GA	AC15: 230V AC/ 3A DC13: 24V DC/ 4A
Short-circuit-strength, 3 minutes intervall	200A/automat B6, 800A/safety fuse 6AgI
Switch voltage min./max.	AC/DC 10V/250V
Switch current min./max.	10mA/8A
Limit current	5A (dependent of the envirmental temperture)
Mechanical life cycles	$5 \times 10^7$
Electrical life cycles DNDS 1C, 1FA, 2C: AC 230V 5A $\cos\varphi = 1$	$>3 \times 10^5$
DNDS 1D, 1GA, 2D, 2GA: AC 230V 6A $\cos\varphi = 1$	$>1 \times 10^5$
Sum of currents for all contacts	$\leq 16A$
Operating time	100 %
<b>Loading capacity limit</b>	
Contact Fuse Protection <b>slow acting</b>	6 A
/ Unit Fuse Protection	1,25 A
<b>Environment conditions</b>	
Operating temperature	<b>DIN IEC 60068-2-3</b> -10 → + 60 °C
Storage temperature	<b>DIN IEC 60068-2-3</b> -40 → + 85 °C
Vibration tolerance on all 3 levels	3 g, 32 Hz
<b>Features</b>	
Maximal frequency at the RJ45 connector	$\leq 200KHz$ Sin/Cos, 1Vss or $\leq 300KHz$ TTL, 5V
Maximal frequency at IN1, IN2, IN3 and IN4	1200Hz
Repetition accuracy	$\pm 0,1 \%$
Temperature dependency of the trigger shift point	0,02 %/°C
<b>General information for the unit</b>	
Airgap creepage to	<b>VDE 0110 Teil1</b>
Max. lead cross section	1 x 2,5 mm <sup>2</sup>
Torque setting for connection (terminal screw)	0,8 Nm
Housing material	Noryl SE 100
Dimensions (H x W x D)	118 x 100 x 73 mm (4.65" x 3.94" x 2.9")
Weight	800 g
<b>Protection</b>	
Only for cabinet mounting with minimal protection	IP 54



## DNIA adaptor to the encoder: product description

The DNIA Adapter is enclosed in a 45 mm housing.

Features:

- 2 semi-conductor outputs.
- Input to connect a encoder (15 pin D-sub-socket connector).
- Output to machine control (15 pin D-sub-socket connector).
- Unit variations available for encoder with different impulse/rpm ratios.

The circuit is dual channel. The monitoring is carried out in the DNDS.

## DNIA: function description

If an encoder is used for motion detection, the DNIA equipment is needed to convert the encoder impulses to "PNP proximity sensor" like signals. This signals are then used by the DNDS to monitor the motion.

Functions of the DNIA adaptor :

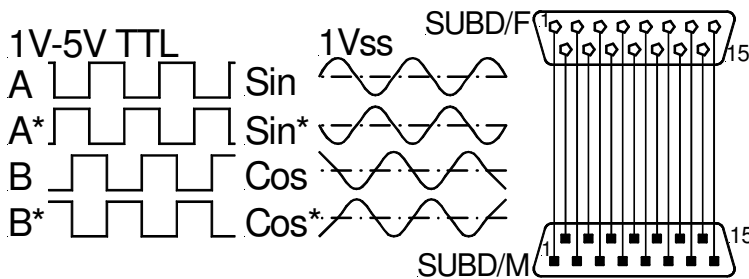
- Electrical separation between the encoder and DNDS.
- Adjustment of the encoder frequency and the potential on the DNDS

Suppression from the encoder impulses if standstill: Related motion speed of suppressed impulse <0.2 m/min or < 15 rpm

## Requirements of the encoder

- Encoder signal: Rectangular with amplitude of 0.5-5 V or sine/cosine signal with 0.5-5 VSS.
- Encoder frequency  $\leq 200\text{KHz Sin/Cos}$ , 1Vss or  $\leq 300\text{KHz TTL}$ , 5V,
- Encoder with high resistance outputs during malfunction.
- 2 tracks 90° out of phase, 2 signals per track that are 180° out of phase
- The signals of encoder are not allowed to be generate synthetically

Encoder signals: TTL or Sinus / Cosinus



Pin	SINUM 800	SIMO DRIVE 611D
1	Ua1	+ 5 VDC Encoder
2	0 Vsens	0 V Encoder
3	*Ua2	Ua1
4	Ua0	*Ua1
5	+ 5 Vsens	
6		Ua2
7	Uas	*Ua2
8		
9	*Ua1	+ 5 Vsens
10	Ua2	Ua0
11	0 V Encoder	0 Vsens
12	*Ua0	*Ua0
13		
14	5V DC Encoder	Uas
15	*Uas	*Uas

\*Signal negiert/signal inverted

## DNIA: Installation and operation

The equipment must be cabinet mounted min. IP 54).

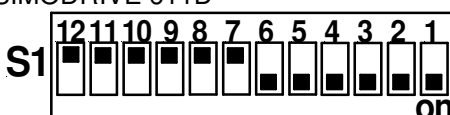
The Equipment is equipped with a latch for DIN-rail attachment.

### Please note for operation:

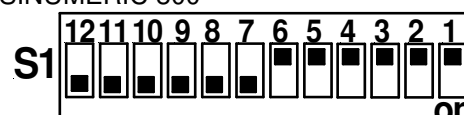
- D-sub-socket and D-sub plug connectors are pin to pin connected.
- The output terminals IA1 on the upper and lower terminal strip are connected internally the same applies for IA2.
- Use copper wiring that can withstand 60/75°C.
- The torque setting for connection terminal screw is max. 0,8 Nm.
- Important details in the „Technical data“ should be noted and adhered to.
- Connect terminal A1 with terminal A1 of the DNDS.
- Connect encoder to the D-sub-socket.
- Connect Machine control to the D-sub-plug.
- Output IA1 of the DNIA with terminal IN1 respectively IN3 of the DNDS.
- Output IA2 of the DNIA with the terminal IN2 respectively IN4 of the DNDS

## Adjustment of the NC type

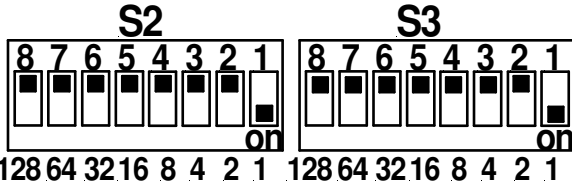
SIMODRIVE 611D



SINUMERIC 800



## Setting of division factor (÷) for the encoder adaptation on the monitoring card



S3 & S3 Position 1, 2, 5 & 7 = on  
 $(\div) = 2(1+1+2+16+64) = 2 \times 84 = 168$

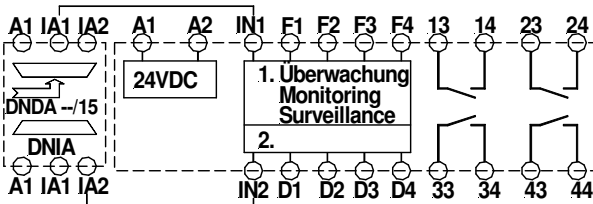
S2 & S3 must have the same adjustment.

$$(\div) \geq 2(1+1)$$

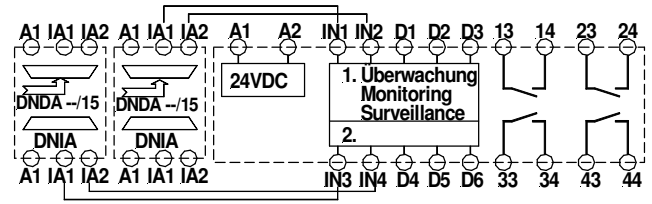
### Example for application

Monitored-motion: 2000 mm/min  
 Impulse of encoder / rotation: 2500 l  
 Ascending gradient / rotation: 10 mm  
 Frequency setting at DNDS: 45 Hz  
 Dividing factor in DNIA =  $2500 \text{ l} \times 2000 \text{ mm} / 10 \text{ mm} \times 60 \text{ S} \times 45 \text{ Hz} = 185,18$   
 $185,18 / 2 \approx 92 + 1$   
 Recommended Setting:  $92+10\% \approx 101$

Connected with DNDS 1D or DNDS 1C



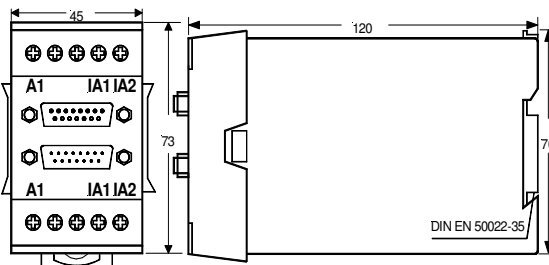
Connected with DNDS 2D or DNDS 2C



### Technical data

Electrical data	
Operating voltage $U_B$	24V DC
Power consumption at $U_B$	max 0,4 W
Output power	10 mA
Operating time	100 %
Maximal frequency at the SUB D connector	Sin/Cos, $1V_{ss} \leq 200\text{KHz}$ TTL $\leq 300\text{KHz}$
Operating temperature	<b>DIN IEC 60068-2-3</b> -10 → + 60°C
Storage temperature	<b>DIN IEC 60068-2-3</b> -40 → + 85°C
Vibration tolerance on all 3 levels	Sinus 10 – 55Hz, 0,35mm, 10 cycle, 1 Octave / min
Torque setting for connection (terminal screw)	0,8 Nm
Max. lead cross section, Single-lead or core with crimp connector	$2 \times 1,5 \text{ mm}^2$ $1 \times 2,5 \text{ mm}^2$
Housing material	Noryl SE 100
Dimensions (H x W x D)	120 x 70 x 45 mm
Weight	200 g
Protection, only for cabinet mounting with minimal protection	IP 54

Dimensions  
in mm



MTTF<sub>d</sub>: 100 years

DC<sub>avg</sub>: ≥ 99%

CCF: 95 points

PFH<sub>d</sub>:  $2.47 \times 10^{-8}$   
PI = e

## Certificate

Deutsche Gesetzliche  
Unfallversicherung



Fachausschuss Elektrotechnik  
Prüf- und Zertifizierungsstelle im BG-PRÜFZERT

certificate  
no. ET 08151  
dated 28.10.2008

Translation

## Type Test Certificate

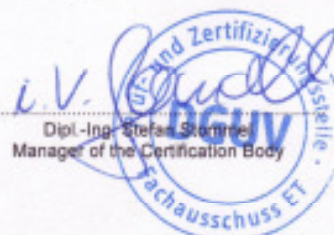
Name and address of the holder of the certificate: (customer)	DINA Elektronik GmbH Esslinger Straße 84 72649 Wolfschlugen												
Name and address of the manufacturer	See customer												
Product designation:	Motion and standstill monitoring system												
Type:	DNDS Compact (components: see attachment I)												
Intended purpose:													
Testing based on:	<table border="0"> <tr> <td>2006/95/EG GS-ET-20</td> <td>„Low Voltage Directive“ "Basic principles for testing and certification of safety switch devices"</td> <td>(2006-04)</td> </tr> <tr> <td>DIN EN 60947-5-1</td> <td>"Low-voltage switchgear and control gear; electromechanical control circuit devices"</td> <td>(2005-02)</td> </tr> <tr> <td>DIN EN ISO 13849-1</td> <td>"Safety-related parts of control systems; Part 1: General principles for design"</td> <td>(2007-07)</td> </tr> <tr> <td>DIN EN ISO 13849-2</td> <td>"Safety-related parts of control systems; Part 2: Validation"</td> <td>(2003-12)</td> </tr> </table>	2006/95/EG GS-ET-20	„Low Voltage Directive“ "Basic principles for testing and certification of safety switch devices"	(2006-04)	DIN EN 60947-5-1	"Low-voltage switchgear and control gear; electromechanical control circuit devices"	(2005-02)	DIN EN ISO 13849-1	"Safety-related parts of control systems; Part 1: General principles for design"	(2007-07)	DIN EN ISO 13849-2	"Safety-related parts of control systems; Part 2: Validation"	(2003-12)
2006/95/EG GS-ET-20	„Low Voltage Directive“ "Basic principles for testing and certification of safety switch devices"	(2006-04)											
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DIN EN ISO 13849-2	"Safety-related parts of control systems; Part 2: Validation"	(2003-12)											
Remarks:	The safety relevant functions according to the test report II dated 28th Nov. 2007 will be performed with category 4 and PI e.												

The type tested complies with the provisions laid down in the directive 98/37/EC (**Machinery**).

The present certificate will become invalid at the latest on: **30.06.2013**

Further provisions concerning the validity, the extension of the validity and other conditions are laid down in the Rules of Procedure for Testing and Certification of April 2004.

Az: NP.520.33/07-136-206 Gorn/san



Postal address: Postfach 50580 • 50941 Köln • Office: Gustav-Heinemann-Ufer 130 • 50868 Köln  
Phone +49 (0) 221 3778 - 6301 • Fax +49 (0) 221 3778 - 6322 • E-Mail pruefstelle@bgetf.de • www.bgetf.de/pruefstelle

PZB10E  
09.08

In any case, the German original shall prevail.

Deutsche Gesetzliche  
Unfallversicherung



**Attachment I**

**to Type Test Certificate**                    **08151**  
**and BG Test Certificate**                    **08152**

Holder of the certificate:                    DINA Elektronik GmbH  
 Product designation:                        Motion- and standstillmonitoring system  
 Type:    DNDS Compact

Hereinafter performed products are part and parcel of the certificates:

DNDS 1C DNDS 1D DNDS 2C DNDS 2D	With optional external encoder adapter DNIA
DNDS 1FA DNDS 1GA DNDS 2FA DNDS 2GA	With integrated encoder adapter DNDI

Az.: NP.520.33/07-137-206 Gom/san  
 Köln, den 28.10.2008





Deutsche Gesetzliche  
Unfallversicherung



Fachausschuss Elektrotechnik  
Prüf- und Zertifizierungsstelle im BG-PRÜFZERT

certificate  
no. **ET 08152**  
dated **28.10.2008**

Translation

## BG Test Certificate

Name and address of the holder of the certificate: (customer)	DINA Elektronik GmbH Esslinger Straße 84 72649 Wolfschlugen		
Name and address of the Manufacturer:	See customer		
Product designation:	Motion and standstill monitoring system		
Type:	DNDS Compact (components: see attachment I)		
Intended purpose:			
Testing based on:	GS-ET-20	"Basic principles for testing and certification of safety switch devices"	(2006-04)
	DIN EN 60947-5-1	"Low-voltage switchgear and control gear; electromechanical control circuit devices"	(2005-02)
	DIN EN ISO 13849-1	"Safety-related parts of control systems; Part 1: General principles for design"	(2007-07)
	DIN EN ISO 13849-2	"Safety-related parts of control systems; Part 2: Validation"	(2003-12)
Remarks:	The safety relevant functions according to the test report II dated 28th Nov. 2007 will be performed with category 4 and Pl e.		

The type tested meets the requirements specified in article 4 para. 1 of the German Equipment and Product Safety Act. Thus, the type also complies with the provisions laid down in the directive 98/37/EC (**Machinery**). The holder of the certificate is entitled to affix the BG-mark shown overleaf to the products complying with the type tested, including the specification given under the heading 'remarks'.

The present certificate will become invalid at the latest on: **30.06.2013**

Further provisions concerning the validity, the extension of the validity and other conditions are laid down in the Rules of Procedure for Testing and Certification of September 2008.

Az: NP.520.33/07-136-206 Gorn/san



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Phone +49 (0) 221 3778 - 6301 • Fax +49 (0) 221 3778 - 6322 • E-Mail [pruefstelle@bgef.de](mailto:pruefstelle@bgef.de) • [www.bgef.de/pruefstelle](http://www.bgef.de/pruefstelle)

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09 08

In any case, the German original shall prevail.



DINA Elektronik GmbH  
Esslinger Straße 84  
D-72649 Wolfschlugen  
Germany

Phone +49 7022 9517-0  
Fax +49 7022 9517-51  
info@dinaelektronik.de  
www.dinaelektronik.de