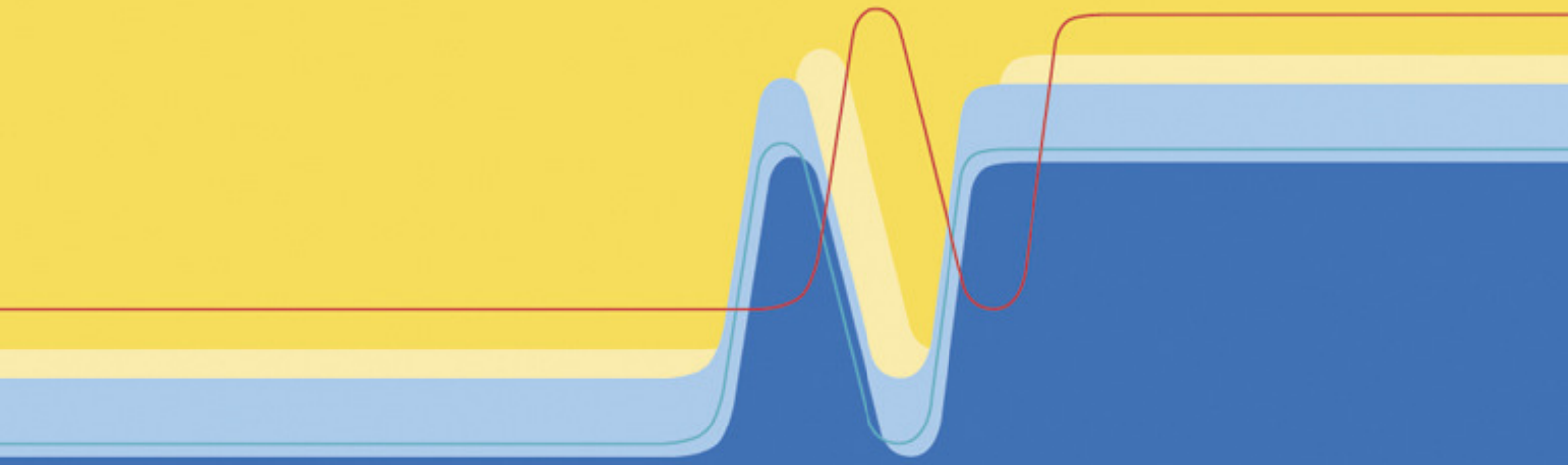
DIA ELEKTRONIK GMBH



Safety for men
and machines

DNDS Modular in metal housing

Original Instruction manual

DINA Elektronik GmbH Tel. 07022/95 17-0, Fax 07022/95 17-51
Esslinger Straße 84, 72649 Wolfschlugen www.dinaelektronik.de, info@dinaelektronik.de

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 Modular in metal housing with the module types as follows

DNDS 1PMG to 8PMG (with DNDS PMG output module)
DNDS 1VMG to 8VMG (with DNDS VMG output module)
DNDS 2GM to 8GMG (with DNDS GMG output module)
DNDS 1EG V7 (Input module for incremental measurement system)
DNDS 1EG V7A, V7C (Input module for incremental measurement system)
DNDS 1EG V9 (Input module for incremental measurement system)
DNDS 1RG V1 (Input module for resolver measurement system)
DNDS 1RG V2, V3C (Input module for resolver measurement system)

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 08001 from 22.01.2008)

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
US LISTED IND.CONT.EQ **227037**
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 Modular
safety category 4

DINA Elektronik GmbH
Esslinger Straße 84
72649 Wolfschlugen

Tel. 07022/95 17-0
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www.dinaelektronik.de
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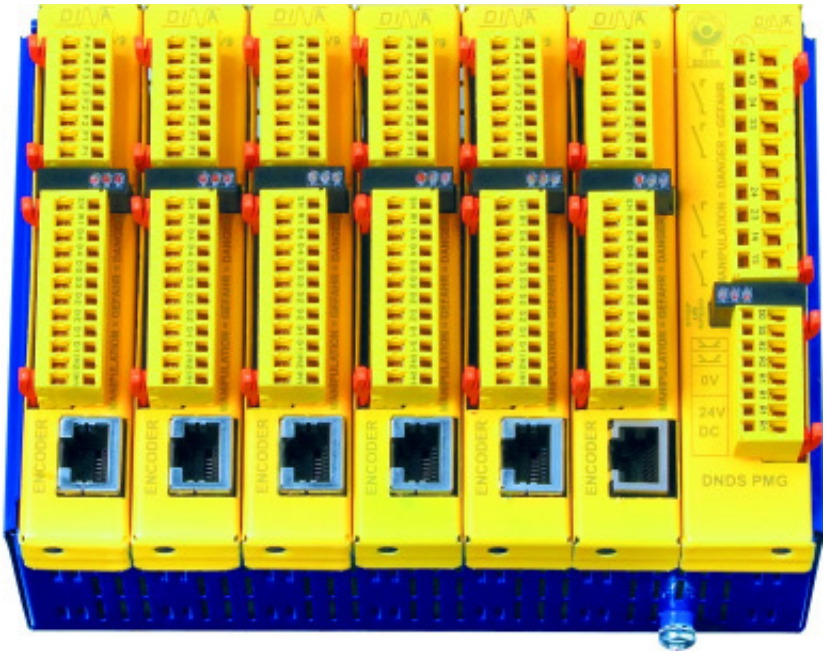
Quality management system

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



Types::
DNDS 1PMG to **DNDS 8PMG**

DBDS 1VMG to **DNDS 8VMG**

DNDS 2GMG to **DNDS 8GMG**

ET 08002

Sicherheit geprüft
tested safety

Safety
for
men and machines

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

$MTTF_d$ = 123 years

DC_{avg}: ≥ 99%

CCF: 95 points

PFH_d: $2.47x10^{-8}$

PI = e

T_M = 20 years

ELEKTRONIK

US LISTED
IND.CONT.EQ
E227037

Contents Page

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 it service life.
- Keep the operating instructions!

Intended usage

The intended usage of the motion and standstill monitor DNDS is:

- Safe motion monitoring according to **EN 60 204-1; VDE 0113-1** and **DIN EN ISO 13849-1 Category 4 PLe** (BG-Nr.: **ET 08001**).
- Safe standstill monitoring according to **EN 60204-1; VDE 0113** **DIN EN ISO 13849-1 Category 4 PLe** (BG-Nr.: **ET 08001**).

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
- **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

The products are according to the requirements of the updated standards, which are listed in this document.

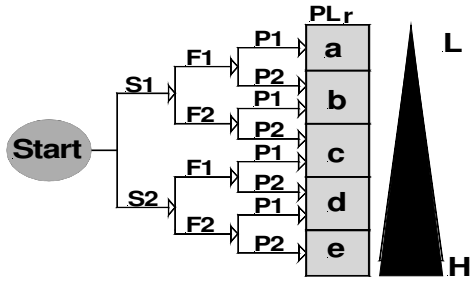
Addition’s according 13849-1

- 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 9, 33 und 36)
- Limits of operation (page 36)
- Indicators and alarms (described module dependent)
- Muting and temporary disabling of the safety functions (page 9, 11, 15, 19 and 20)
- Operation mode’s general description (page 9, 11, 15, 19 and 20).
- Maintenance, Checklists and internal spare parts (not valid here)
- Tools for easy and safe troubleshooting (described module dependent)
- Test intervals (not valid here)

Risk diagram to determine the PL_r for every safety function



Legend

L low impact on risk reduction
H high impact on risk reduction
PL_r 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.

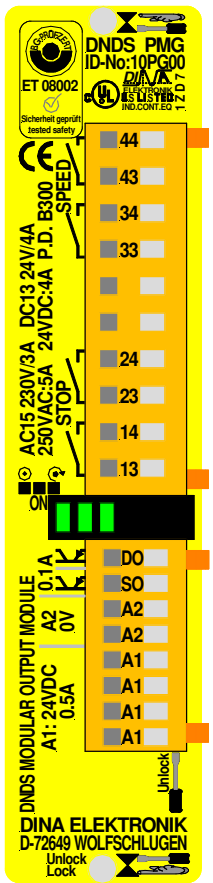
Product variants

Motion and standstill monitoring system

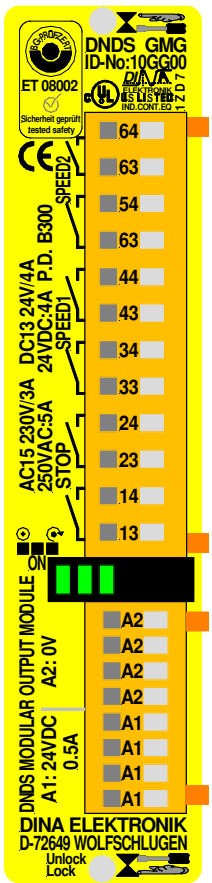
Equipment	Monitored actuations	Input module	Output module	Outputs		
				STOP	SPEED	SPEED 2
DNDS 1PMG	1	DNDS 1EG DNDS 1RG	DNDS PMG	13 / 14 23 / 24 OS	33 / 34 43 / 44 OD	
DNDS 2PMG	2					
DNDS 4PMG	4					
DNDS 6PMG	6					
DNDS 8PMG	8					
DNDS 1VMG	1	DNDS 1EG DNDS 1RG	DNDS VMG	13 / 14 23 / 24	33 / 34 43 / 44	57 / 58 67 / 68 Off delayed
DNDS 2VMG	2					
DNDS 4VMG	4					
DNDS 6VMG	6					
DNDS 8VMG	8					
DNDS 2GMG	2	DNDS 1EG DNDS 1RG	DNDS GMG	13 / 14 23 / 24	33 / 34 43 / 44	53 / 54 63 / 64
DNDS 4GMG	4					
DNDS 6GMG	6					
DNDS 8GMG	8					

Output modules

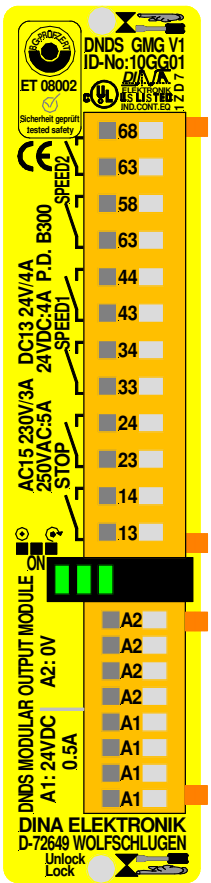
DNDS PMG



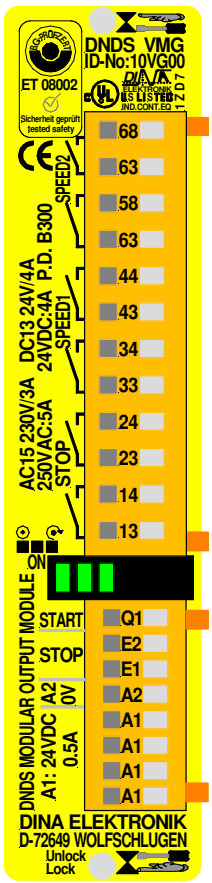
DNDS GMG



DNDS GMG V1



DNDS VMG

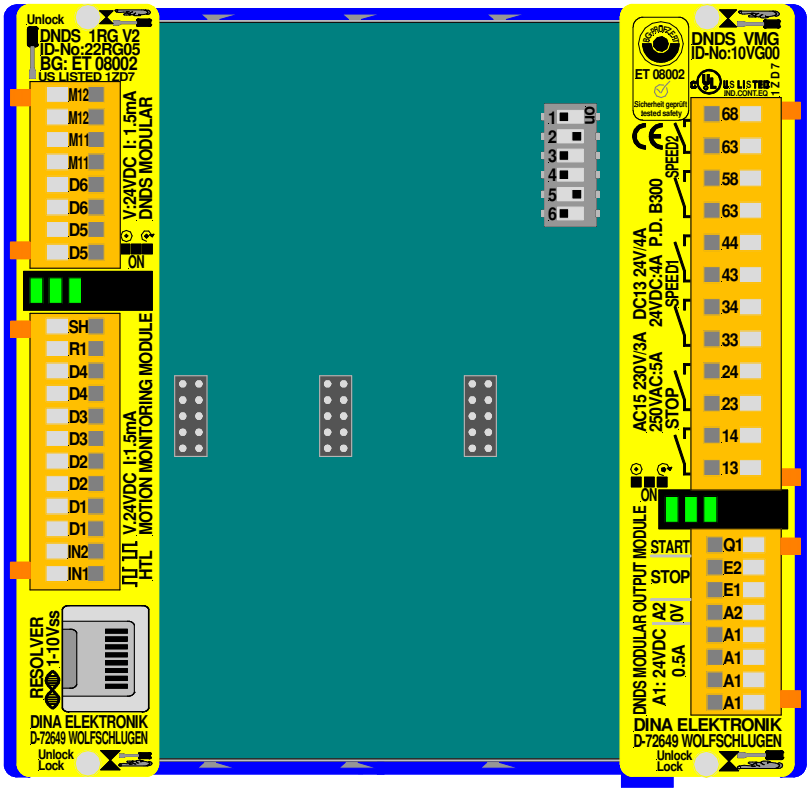


Product Description
The DNDS revolution and standstill monitor uses an 24V DC operating voltage.
The unit is housed in a powder-coated metal case mountable on a 35mm DIN Rail.
Modular design is one of the advantages of the DNDS. It consists of a housing with mounting rails for modules and a back plan with connectors and a set of modules. One module contains the internal power supply and output circuits, and one or more modules contain the motion monitoring electronics. All connections are plug able and have spring loaded clamps.

Input modules, Motion and standstill monitoring systems
The DNDS is designed to failsafe monitor rotary respectively linear motions and standstill.

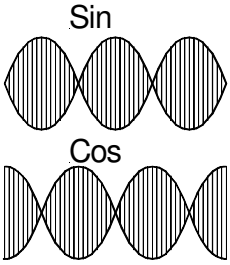
Motion detection of machines
The motion detection of an actuation can be accomplished via an encoder, resolver or 2 PNP-proximity sensors.
The encoder or Resolver is connected via a cable adapter DNDA 15/8 or 25/8 to the DNDS.
For motion detection via 2 PNP proximity sensors the inputs IN1 and IN2 are used. When mounting the proximity sensors on a tooth wheel, attention must be paid to mount them in a way, so always at least one of the two sensors is activated.

Assembling

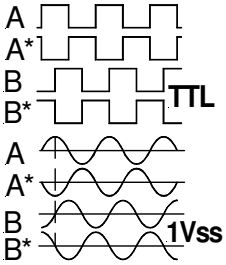


Input modules

1RG Resolver



1EG Incremental encoder

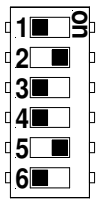


Output modules

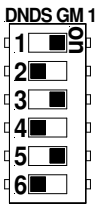
PMG	VMG	GMG V1	GMG
13 14	13 14	13 14	13 14
23 24	23 24	23 24	23 24
33 34	33 34	33 34	33 34
43 44	43 44	43 44	43 44
OS	57 58	57 58	53 54
OD	67 68	67 68	63 64

Adjustment at the Rack

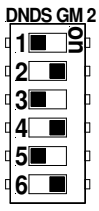
Adjustment with PMG, GMG V1 and VMG



Adjustment with GMG 1. input module left of GMG controls SPEED2

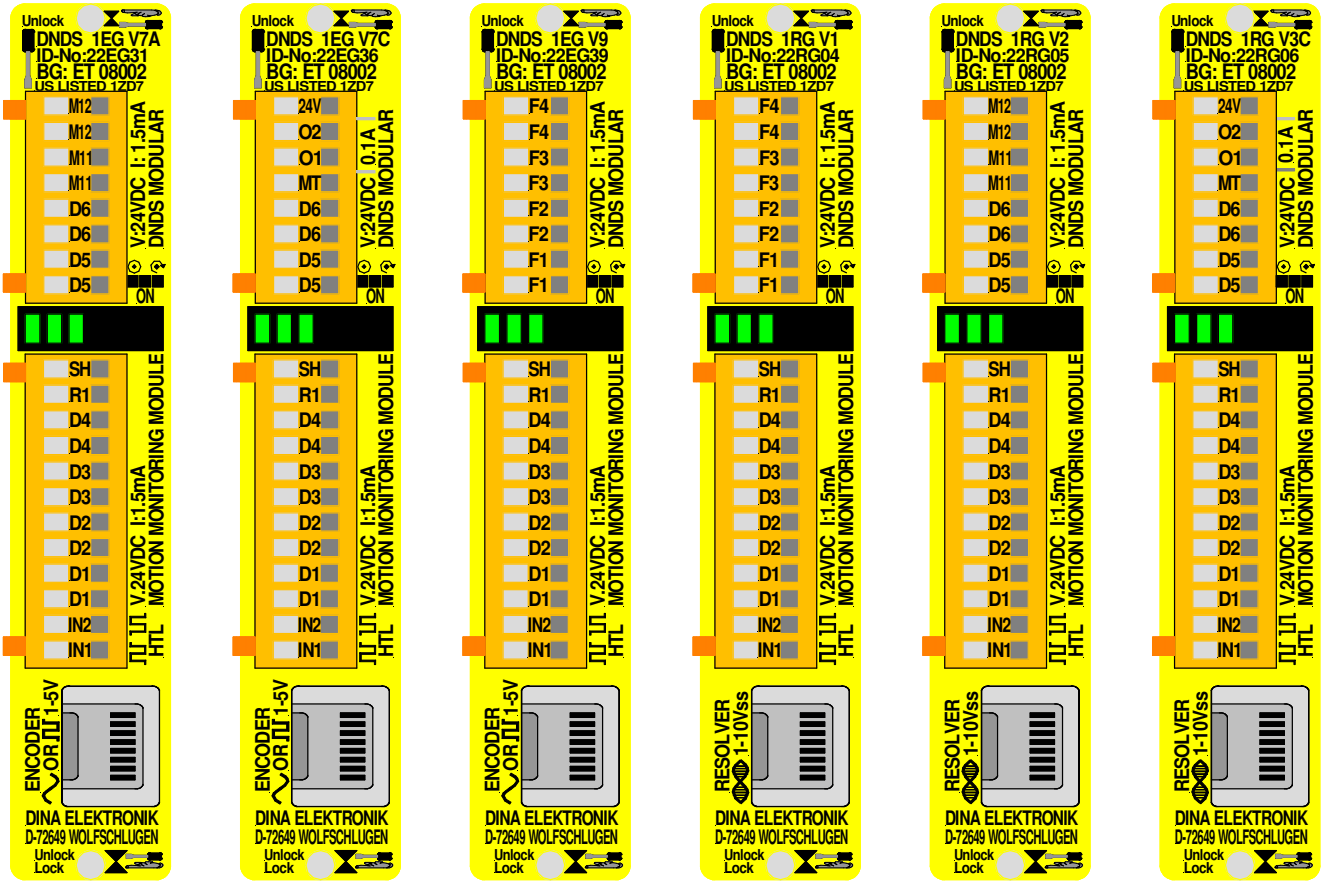


Adjustment with GMG 1. and 2. input module left of GMG control SPEED2



Input modules

DNDS 1EG V7A DNDS 1EG V7C DNDS 1EG V9 DNDS 1RG V1 DNDS 1RG V2 DNDS 1RG V3C



Features

Dual channel motion and standstill monitoring.
Connection for an encoder to the RJ45 jack or 2 PNP-proximity sensors to IN1 and IN2
Status indicators.
Programmable speed setting
The DNDS complies with the safety requirements(see below)
The circuit is redundant with built-in self-monitoring.
The safety function remains effective in the case of a component failure.

Function of the inputs

IN- inputs:

IN1 and IN2 are used, if proximity sensors are used for speed monitoring. Two PNP switches are necessary.
By connecting IN2 constantly to 24V DC and IN1 left open, the input module is forced into detecting solid standstill.
In this way the input module is disabled from monitoring.

Inputs for function modes

Input modules: DNDS 1EG V9 and DNDS 1RG V1

D- inputs: 00–15, for setting of the automatic operation mode (mode1).
D-inputs are only of importance if at least one F-input is connected to 24V.
F-inputs: 01-15 for reduction of setting D-inputs setting from 100 to 25%. The F-inputs are a switch over between tool setting mode (mode 2) respectively semi-automatic mode (mode 3), “F are NC” and mode1. At least one F- is connected to 24V.
R1-input: for setting the mode 3
R1-input is only active, if F1-F4 are off.
SH-input: for setting the mode 2
SH-input is only active, if R1 and F-inputs are NC.

Input modules: DNDS 1EG V7A, DNDS 1EGV7C and DNDS 1RG V2, DNDS 1RG V3C

M- rather **MT-inputs:** These inputs can be used, if the automatic mode (mode 1) has not to be monitored. Only D- or M- rather MT-inputs can be used. The M- rather MT-inputs are a switch over between tool setting mode (mode 2) respectively semi-automatic mode (mode3), “M, MT are NC” and mode1. M-, MT-inputs connected to 24V.
D- inputs: D1-D6 = 0-63, for setting of mode 1. The D-inputs are a switch over between mode 2 respectively mode 3 “D = are NC” and mode 1. Any D-input connected to 24V.
R1-input: for setting the mode 3
R1-input is only active, if D-, M- respectively MT-inputs are NC.
SH-input: for setting the mode 2. SH-input is only active, if R1, D-, M- respectively MT-inputs are NC.

DNDS 1EG V9 and DNDS 1RG V1: Setting the function modes via the inputs

SH-input	R1-input	F-inputs	D1 to D4 inputs	Function modes
			Dx at 24V	Standstill
24V			Dx at 24V	Mode 2
	24V		Dx at 24V	Mode 3
		Fx at 24V	Dx at 24V	Automatic

Priority: F-inputs > R1-input > SH-input

DNDS 1EG V7A and DNDS 1RG V2: Setting the function modes via the inputs

SH-input	R1-input	D1 to D6 inputs	M11 & M12 rather MT-inputs	Function modes
				Standstill
24V				Mode 2
	24V			Mode 3
		Dx at 24V		Automatic
			M11 & M12 rather MT at 24V	No monitoring

Priority: M-inputs, rather MT > D-inputs > F-inputs > R1-input > SH-input

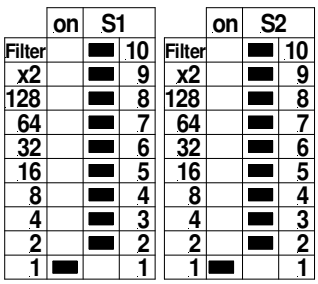
Mode 1: Automatic mode **Mode 2: tool setting mode** **Mode 3: semi automatic mode**

The inputs F1-F4, D1-D6 M11, M12, R1 and SH are delayed 1s on switch off.

10ms switch on decelerated
1,0 switch off decelerated

Setting of division factor

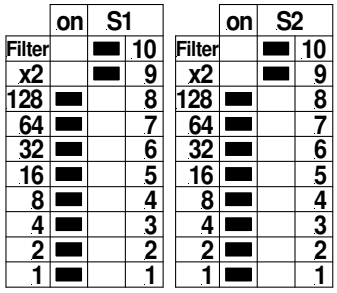
Setting of division factor (÷) for the adaptation of the encoder frequency for the input module. The DIP-switches are located at the input module.



Smallest divisor only position 1 = ON

÷ =

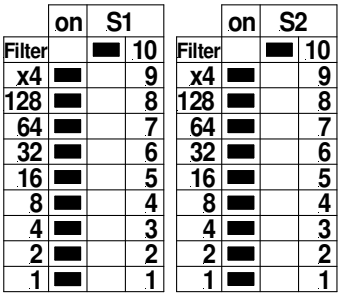
2 x (1+1) = 4



Divisor with position 1 to 8 = ON

÷ =

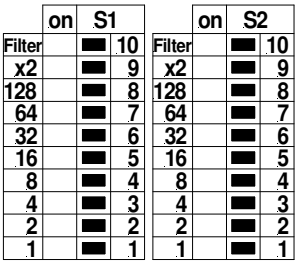
2 **x (1+1+2+4+8+16+32+64+128) = 512**



Divisor with position 1 to 9 = ON

÷ =

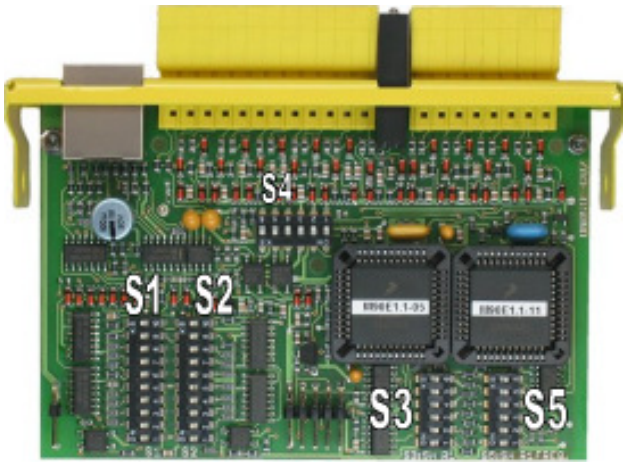
4 **x (1+1+2+4+8+16+32+64+128) = 512**



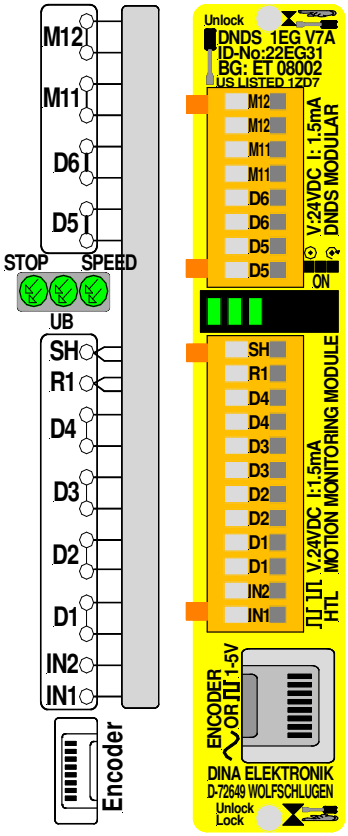
All positions are off is not allowed

Function of the switch position 9 at S1 and S2:
Position 9 off: adjusted divisor via position 1 to 8 will be multiplied by 2.
Position 9 ON: adjusted divisor via position 1 to 8 will be multiplied by 4.
Function of the switch position 10 at S1 and S2:
Position 10 off: Suppression of the Encoder Frequency less than 50Hz. Suppression of single channel encoder Frequency less than 800Hz
Position 10 ON: Suppression of the Encoder Frequency less than 25Hz. Suppression of single channel encoder Frequency less than 400Hz

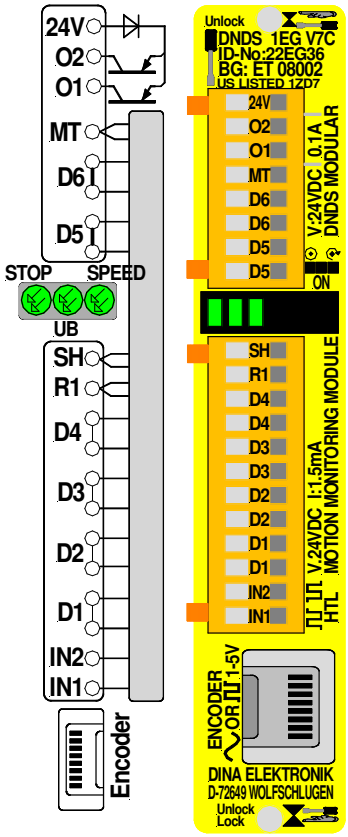
Input modules DNDS 1EG V7A and DNDS 1EG V7C



DNDS 1EG V7A



DNDS 1EG V7C



Function of the DIP switches
S1 & S2 function, Position 1-9: Setting of a division factor (÷) for the encoder adaptation
S3, S5 function: Selection of the monitored frequencies for tool setting mode (mode 2) and semi automatic mode (mode3)
See adjusting table, R1 and SH Table.

S4 function:
Positions 1 & 2 on: Speed output automatic restart disable.
If there is an overspeed, the output contacts SPEED of the output module switch-off and remain switched off also during standstill. The contacts close again, if the power supply will be turned off ≥ 2s**.**
This function is not possible with DNDS 1EG V7C with the item-no. 22EG36-01.
Positions 1 & 2 off: Speed output automatic restart enable.
If there is an overspeed, the output contacts SPEED of the output module switch-off. The contacts close again, if the actual speed is 10% less than the adjusted speed.
This function is possible with all modules.
Positions 3 & 4 on:
The encoder operating voltage is supplied by the DNDS. Only allowed for DNDS with one or 2 input modules.
Positions 5 & 6 off: Divisor (÷) is constant. Switched on positions 1 to 9 of S1, S2 are always active as a divisor.
Positions 5 & 6 on: Divisor (÷) is variable.
If the M-inputs respectively the MT-input or the D-inputs are not connected to 24V, the switched on positions 1 to 5 and position 9 of S1 and S2 are active as a divisor.
If the M-inputs respectively the MT-input or one rather more D-inputs are connected to 24V, all switched on positions 1 to 9 of S1 and S2 are active as a divisor.

Outputs of DNDS 1EG V7C
The modules DNDS 1EG V7C has two positive switching outputs O1 and O2. Normally the outputs are switched to 24V. The power supply for these outputs has to be connected to the terminal 24V at the module.
Output O1 switch off, if there is a sensors failure at the Encoder input or at IN1 or IN2.
O1 switch on again, if the reason for the switching off does not exist.
Output O2 switch off and the LED SPEED is not illuminated, if there is an overspeed, an external or an internal failure, that causes a switch off of the outputs at the output modules.
O2 with overspeed and enabled speed output automatic restart:
O2 switch on again, if the actual speed is ≥10% less than the selected speed. The LED SPEED is illuminated.
O2 with overspeed and disabled speed output automatic restart:
O2 remain switched off and the LED SPEED remain dark also during standstill of the drive. O2 switch on and the LED SPEED illuminates again, if the power supply will be turned off ≥ 2s**.**

The frequency values in Adjusting table are calculated as follows:
Table value = Encoder frequency ÷ (adjusted divisor at S1 and S2) + 1

Adjusting table DNDS 1EG V7A item-no. 22EG31 and DNDS 1EG V7C item-no. 22EG36

R1 and SH Table: Selection of the monitoring frequencies via the DIP switches S3 and S5 for tool setting and semi automatic mode

D-Table: Selection of the monitoring frequencies for the automatic mode via the D-inputs

Mode3 ÷ Mode2		SH Hz	R1 Hz	Switch positions of S3 and S5 Position = ON 1	2	3	4	5	6
00			50	125							
01			240	600	■						
02			20	50		■					
03			96	240	■	■					
04	2,5		40	100			■				
05			30	75	■		■				
06			125	312		■	■				
07			200	500	■	■	■				
08								■			
09					■			■			
10			20	20		■		■			
11	1,0		50	50	■	■		■			
12			125	125			■	■			
13			240	240	■		■	■			
14			20	40		■	■	■			
15	2,0		50	100	■	■	■	■			
16			125	250					■		
17			240	480	■				■		
18			20	65		■			■		
19	3,25		50	162	■	■			■		
20			100	325			■		■		
21			150	487	■		■		■		
22			20	80		■	■		■		
23	4,0		50	200	■	■	■		■		
24			100	400				■	■		
25			150	600	■			■	■		
26			20	95		■		■	■		
27	4,75		50	237	■	■		■	■		
28			100	475			■	■	■		
29			20	110	■		■	■	■		
30	5,5		50	275		■	■	■	■		
31			100	550	■	■	■	■	■		

Mode3 ÷ Mode2		SH Hz	R1 Hz	Switch positions of S3 and S5 Position = ON 1	2	3	4	5	6
32			96	600							
33			70	440	■						
34	6,25		20	125		■					
35			50	312	■	■					
36			75	469			■				
37			20	140	■		■				
38	7,0		50	350		■	■				
39			75	525	■	■	■				
40			20	155				■			
41	7,75		50	387	■			■			
42			75	581		■		■			
43	9,0		20	180	■	■		■			
44			50	450			■	■			
45	10,0		20	200	■		■	■			
46			50	500		■	■	■			
47					■	■	■	■			
48	1,25	240	300					■	■		
49					■				■		
50	1,50	240	360		■			■	■		
51					■	■			■		
52	1,75	240	420			■		■	■		
53					■		■		■		
54						■	■		■		
55					■	■	■		■		
56								■	■		
57					■			■	■		
58	1,5	14	21					■	■		
59	2,4	5	12		■			■	■		
60	2,42	7	17			■		■	■		
61	2,50	10	25	■		■		■	■		
62	2,53	15	38		■	■		■	■		
63				■	■	■		■	■		

	D-Table: D-inputs connected to 24V DC Selection D1-D6 D 1	D 2	D 3	D 4	D 5	D 6	Hz
00							5
01	■						30
02		■					35
03	■	■					40
04			■				45
05	■		■				50
06		■	■				55
07	■	■	■				60
08				■			65
09	■			■			70
10		■		■			75
11	■	■		■			80
12			■	■			85
13	■		■	■			90
14		■	■	■			95
15	■	■	■	■			100
16					■		105
17	■				■		111
18		■			■		117
19	■	■			■		124
20			■		■		131
21	■		■		■		138
22		■	■		■		146
23	■	■	■		■		154
24				■	■		162
25	■			■	■		171
26		■		■	■		180
27	■	■		■	■		190
28			■	■	■		201
29	■		■	■	■		212
30		■	■	■	■		223
31	■	■	■	■	■		236

	Selection D1-D6 D 1	D 2	D 3	D 4	D 5	D 6	Hz
32						■	249
33	■					■	262
34		■				■	277
35	■	■				■	292
36			■			■	308
37	■		■			■	325
38		■	■			■	343
39	■	■	■			■	362
40				■		■	381
41	■			■		■	402
42		■		■		■	425
43	■	■		■		■	448
44			■	■		■	473
45	■		■	■		■	499
46		■	■	■		■	526
47	■	■	■	■		■	555
48					■	■	585
49	■				■	■	618
50		■			■	■	652
51	■	■			■	■	687
52			■		■	■	725
53	■		■		■	■	765
54		■	■		■	■	807
55	■	■	■		■	■	852
56				■	■	■	900
57	■			■	■	■	950
58		■		■	■	■	1000
59	■	■		■	■	■	1050
60			■	■	■	■	1100
61	■		■	■	■	■	1150
62		■	■	■	■	■	1200
63	■	■	■	■	■	■	1250

Using the modules to monitor the function modes of a machine

Using the M-inputs respectively the MT-input for the not monitored automatic function mode (mode 1)
The M-inputs of DNDS 1EG V7A respectively the MT-input of DNDS 1EG V7C can be used, if the mode 1 has to be not monitored. If the automatic function mode has to be not monitored, these inputs have to be connected to 24V. These inputs have to be disconnected from 24V, if the automatic function mode or other function modes have to be monitored. Look to the priority of the inputs.

Using the inputs D1-D6 to monitor the automatic function mode (mode 1)
With the D-inputs 63 different monitoring frequencies for mode 1 can be selected. Mode 1 will be monitored, if one or more D-inputs are connected to 24V. All D-inputs have to be disconnected from 24V, if other function modes have to be monitored. See D-Table.

Using the R1-input to monitor the semi automatic function mode (mode 3)
Mode 3 can be monitored, if the R1-input is connected to 24V. For the monitoring of mode 3 the M-inputs of DNDS 1EG V7A respectively the MT-input of DNDS 1EG V7C and the D-inputs have to be disconnected from 24V.

Using the SH-input to monitor the tool setting function mode (mode 2)
Mode 2 can be monitored, if the SH-input is connected to 24V. For the monitoring of mode 2 the M-inputs of DNDS 1EG V7A rather the MT-input of DNDS 1EG V7C, the D-inputs and the R1-input have to be disconnected from 24V.

For the monitoring of the tool setting and the semi automatic function mode there are a lot of monitoring frequencies. These can be selected via the DIP switches S3 and S5. See R1 and SH Table.

Monitoring of the standstill
To monitor the standstill the inputs M11, M12 of V7A respectively the input MT of V7C, the inputs D1-D6, R1- and SH-input have to be disconnected from 24V.

STOP output of the output modules
The STOP output of all output modules is independent of all function modes. It works autarkic.

DNDS 1EG V7A
Priority of the inputs: M > D D > R1 R1 > SH SH > Standstill

DNDS 1EG V7C
Priority of the inputs: MT > D D > R1 R1 > SH SH > Standstill

Function of the inputs of DNDS 1EG V7C with the item-no. 22EG36-01
The monitoring frequencies of the tool setting mode (mode 2) must be selected via the D-inputs. The selection will be done, if the D-inputs will be connected to 24V. During the Mode 2 the SH-input has to be connected to 24V.
The Function of the MT- and R1-input is the same as with **DNDS 1EG V7C,** item-no **22EG36**

Adjusting table DNDS 1EG V7C item-no 22EG36-01

R1 Table: Selection of the monitoring frequencies via the DIP switches S3 and S5 for semi automatic	**D-Table**: Selection of the monitoring frequencies for the SH-input via D1-D6. The SH-input has to be connected to 24V.

		Switch positions of S3 and S5								Switch positions of S3 and S5								D-inputs connected to 24V								D-inputs connected to 24V							
	R1	Position = ON							R1	Position = ON								D-inputs connected to 24V								D-inputs connected to 24V							
	Hz	1	2	3	4	5	6		Hz	1	2	3	4	5	6			D1	D2	D3	D4	D5	D6	Hz		D1	D2	D3	D4	D5	D6	Hz
00	125							32	600								00							2	32							7,5
01	600							33	440								01							4	33							7,5
02	50							34	125								02							5	34							7,5
03	240							35	312								03							6	35							7,5
04	100							36	469								04							8	36							7,5
05	75							37	140								05							10	37							7,5
06	312							38	350								06							12	38							7,5
07	500							39	525								07							14	39							7,5
08								40	155								08							16	40							7,5
09								41	387								09							18	41							7,5
10	20							42	581								10							20	42							7,5
11	50							43	180								11							22	43							7,5
12	125							44	450								12							24	44							7,5
13	240							45	200								13							26	45							7,5
14	40							46	500								14							28	46							7,5
15	100							47									15							30	47							7,5
16	250							48	300								16							32	48							7,5
17	480							49									17							34	49							7,5
18	65							50	360								18							36	50							7,5
19	162							51									19							38	51							7,5
20	325							52	420								20							40	52							7,5
21	487							53									21							45	53							7,5
22	80							54									22							50	54							7,5
23	200							55									23							60	55							7,5
24	400							56									24							70	56							7,5
25	600							57									25							80	57							7,5
26	95							58	21								26							90	58							7,5
27	237							59	12								27							100	59							7,5
28	475							60	17								28							125	60							7,5
29	110							61	25								29							150	61							7,5
30	275							62	38								30							180	62							7,5
31	550							63									31							225	63							7,5

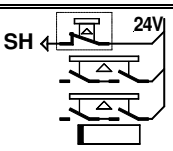
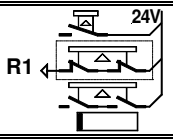
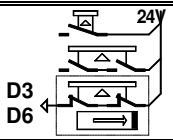
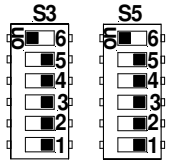
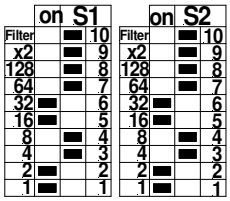
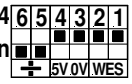
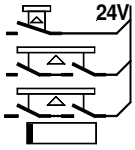
Outputs of DNDS 1EG V7C item-no 22EG36-01
The modules DNDS 1EG V3C has two positive switching outputs O1 and O2. Normally the outputs are switched to 24V. The power supply for these outputs has to be connected to the terminal 24V at the module.
Output O1 switch off, if there is a sensors failure at the Encoder input or at IN1 or IN2.
O1 switch on again, if the reason for the switching off does not exist.
Output O2 switch off and the LED SPEED is not illuminated, if there is an overspeed, an external or an internal failure, that causes a switch off of the outputs at the output modules.

O2 with overspeed:
O2 switch on again, if the actual speed is ≥10% less than the selected speed. The LED SPEED is illuminated.
The function of O2 is independent in an enabled or disabled **speed output automatic restart**

Applications

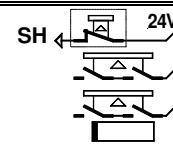
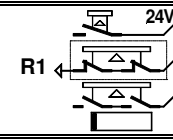
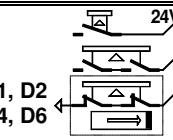
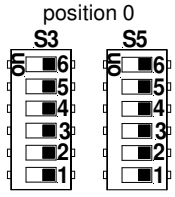
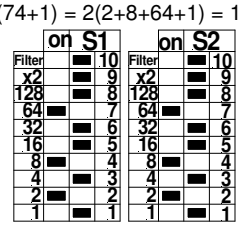
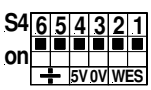
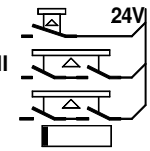
DNDS 1EG V7A, DNDS 1EG V7C: monitoring spindle

	800min^{-1}	Tool setting speed (mode2)	Encoder pulses	256l / ⟲
	5000min^{-1}	Mode3	n_{max} + 10%	**Switch off at** (+10% = Safety distance)
	n_{max} =18000min^{-1}	Automatic operating mode (mode1)		

	Mode	calculation	note	External contacts	Contacts
Mode2	**Step 1 Calculation of the divisor (÷) and the monitoring frequency for mode2**	Ratio mode 3 to mode 2 = 5500min^{-1} /880min^{-1}= 6,25 256l x 880 min^{-1} / 60s = 3755Hz 3755 Hz / **96Hz** = 39,11 ≈ 2(19+**1**) 2(19+**1**) = ÷ BA2, mode2	Adjustment S3, S5 R1 and SH table positions 32 to 36 are possible. Position 32 = **96Hz** = mode2-Frequency		Tip switch Permission key Protection cover
Mode3	**Step 2 Calculation of the monitoring frequency for mode3**	6,25 x 96Hz = **600Hz**	Adjustment S3, S5 R1 and SH table position 32 = **600Hz** = mode3-Frequency		Tip switch **Permission key** Protection cover
Mode1	**Step 3 Calculation of the divisor (÷) and the monitoring frequency for mode1**	19800min^{-1}x 256l/ 60s = 84480Hz 84480Hz / 2(19+1) = 2112Hz Max. Frequency in D-Table =1250Hz 84480Hz / 2(19+1+32) = **812Hz** 2(19+1+32) = ÷ n_{max}	D-Table, position 54 D2, D3, D5 & D6 812Hz ≈ 807Hz = mode1-Frequenz ÷ variable		Tip switch Permission key Protection cover
DIP switches Adjustment	**R1 and SH Table position 32** 	2x(19+32+1)=2(1+2+16+32+1) = 104 	÷ variable 	**Stand-still** 	Tip switch Permission key Protection cover

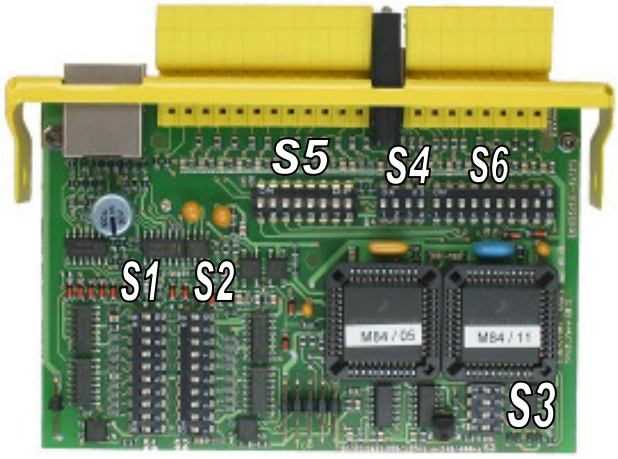
DNDS 1EG V7A, DNDS 1EG V7C: monitoring axis

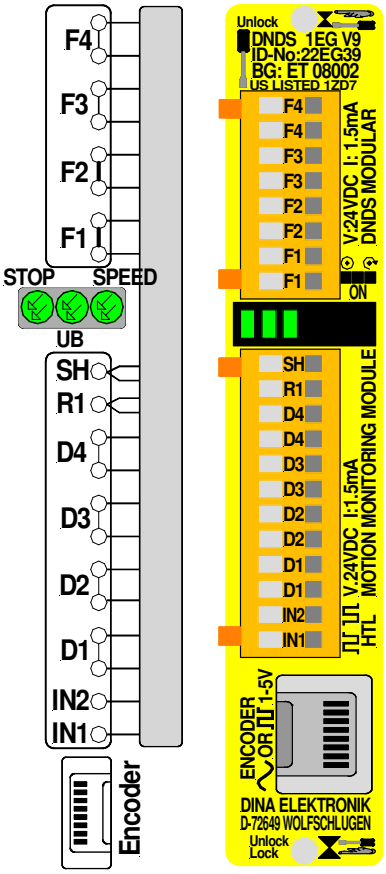
	V = 2m x min^{-1}	Tool setting speed (mode2)	Encoder pulses	2048l / ⟲
	V = 5m x min^{-1}	Mode3	10mm / ⟲	Ascending gradient
	V_{max}=18m x min^{-1}	Automatic operating mode (mode1)	***V*** + 10%	**Switch off at** (+10% = Safety distance)

	mode	calculation	note	External Contacts,	Contacts
Mode2	**Step 1 Calculation of the divisor (÷) and the monitoring frequency for mode2**	Ratio mode 3 to mode 2 = 5,5m / 2,2m = 2,5 2,2m x min^{-1} / 10mm = 220min^{-1} 220min^{-1} x 2048l / 60s = 7509Hz 7509Hz / **50Hz**=150=2(74+**1**) = (÷)	Adjustment S3, S5 R1 and SH table positions 0 to 7 are possible. Position 0 = **50Hz** = mode2-Frequency		**Tip switch** Permission key Protection cover
Mode3	**Step 2 Calculation of the monitoring frequency for mode3**	2,5 x 50Hz = **125Hz** =	Adjustment S3, S5 R1 and SH table position 0 = **125Hz** = mode3-Frequency		Tip switch **Permission key** Protection cover
Mode1	**Step 3 Calculation of the divisor (÷) and the monitoring frequency for mode1**	19,8m x min^{-1} / 10mm = 1980min^{-1} 1980min^{-1} x 2048l / 60s = 67584Hz 67584Hz / 2(74+1) = **450Hz**	D-Table, position 43 D1, D2, D4 & D6 = **450Hz ≈ 448Hz =** mode1-Frequenz ÷ constant		Tip switch Permission key **Protection cover**
DIP switches Adjustment	R1 and SH Table position 0 	2(74+1) = 2(2+8+64+1) = 150 	÷ constant 	**Standstill** 	Tip switch Permission key Protection cover

The switch off limits of the speed monitoring have to be tested.
The safety relevant connection, as example to the SH-, R1-input and to the D-inputs, have to be mounted in a cable channel.
The total concept of the specified category must be validated involving the whole control unit.

Input module DNDS 1EG V9





Function of the DIP switches

S1 & S2 function, Position 1-9:
Setting of a division factor (÷) for the encoder adaptation
S3 function
S3, Position 1 & 2 off: Monitoring
frequency for tool setting mode is 50Hz, for semi automatic mode is 125 Hz
S3, Position 1 & 2 on: Monitoring
frequency for tool setting mode is 240Hz (96Hz), for semi automatic mode is 600Hz. See SH and R1 Table.
S3, position 3 & 4 off: Divisor (÷) is constant.
The switched on positions 1 to 9 of S1 and S2 are always active as a divisor.
S3, position 3 & 4 on: Divisor (÷) is variable.
If the F-inputs are not connected to 24V, the switched on positions 1 to 5 and position 9 of S1 and S2 are active as a divisor.
If one rather more F-inputs are connected to 24V, all switched on positions 1-9 of S1 and S2 are active as a divisor.
S4 function:
Positions 1 & 2 on: Speed output automatic restart disable.
If there is an overspeed, the output contacts SPEED at the output module switch-off and remain switched off also during standstill. The contacts close again, if the power supply will be turned off **≥** 2s**.**
Positions 1 & 2 off: Speed output automatic restart enable. If there is an overspeed, the output contacts SPEED at the output module switch-off. The contacts close again, if the actual speed is 10% less than the adjusted speed.
Positions 3 & 4 on:
The encoder operating voltage is supplied by the DNDS. Only allowed for DNDS with one or 2 input modules.
S5 function, position 1-8 for D-function: Internal setting of the frequencies 100–1250Hz for the automatic mode**.**
S6 function, position 1-8 for F-function: Internal decrease (100-25%) of the frequencies 100-1250Hz internal.
S6 function, position 9 & 10 off:
The decrease of the frequencies 100-1250Hz has to be **internal** via S6 position 1-8.
S6 function, position 9 & 10 on:
The decrease of the frequencies 100-1250Hz has to be **external** via the terminal F1-F4.

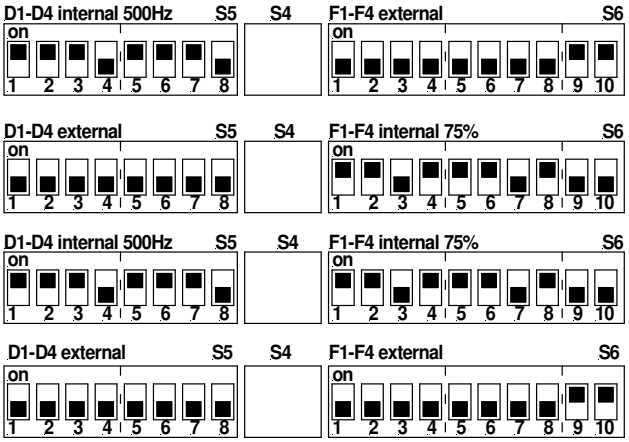
Internal adjustment for the function of the D- and F-inputs
The input module DNDS 1EG V9 has the possibility to set the maximum revolutions internally over the DIP switches S5 and S6. This characteristic saves external programming over cable links. It is possible to adjust the function of the inputs D1-D4 or F1-F4 only or both of them. To use the internal adjustment for the function of F1-F4 the positions 9 and 10 at S6 must be switched off. This positions must be on to use external wiring by the terminal. The frequency values (100Hz to 1250Hz) are internally setting by S5-Table.
The reduction (100% to 25%) is internally setting by S6 position 1 to 8. To select the automatic mode operation by internal programming, the terminal F4 must be connected by a safety contact to 24 VDC (safety cover contact).
By external wiring of D1 to D4 all switches at S5 must be switched off.
By external wiring of F1 to F4 the positions 1 to 8 at S6 must be switched off. The positions 9 and 10 must be on.

Selection of the monitoring frequencies via the DIP switch S3 for the tool setting and semi automatic mode R and SH Table: SH- or R1-input is connected to 24V,F-Inputs are disconnected.

	SH	**R1**			**SH**	**R1**	
	Hz	**Hz**	S3		**Hz**	**Hz**	S3
00	**50**	**125**	1 & 2 off	00	**50**	**125**	1 & 2 off
01	**240**	**600**	1 & 2 on	01	**96**	**600**	1 & 2 on

Internal adjustment for the function of the D- and F-inputs via the DIP switches S5 and S6

Usage example



S5-Tabelle: Mode 1
D1-D4 disconnected

S5 switch positions Position = ON									
on	1	2	3	4	5	6	7	8	Hz
00									100
01	■				■				150
02		■				■			200
03	■	■			■	■			275
04			■				■		355
05	■		■		■		■		400
06		■	■			■	■		450
07	■	■	■		■	■	■		500
08				■				■	550
09	■			■	■			■	630
10		■		■		■		■	700
11	■	■		■	■	■		■	800
12			■	■			■	■	900
13	■		■	■	■		■	■	1000
14		■	■	■		■	■	■	1100
15	■	■	■	■	■	■	■	■	1250

S6-Table: BA1, F1-F3 disconnected, F4 connected to 24V

S6 switch positions Position = ON									
on	1	2	3	4	5	6	7	8	%
00									5Hz
01	■				■				25
02		■				■			30
03	■	■			■	■			35
04			■				■		40
05	■		■		■		■		45
06		■	■			■	■		50
07	■	■	■		■	■	■		55
08				■				■	60
09	■			■	■			■	65
10		■		■		■		■	70
11	■	■		■	■	■		■	75
12			■	■			■	■	80
13	■		■	■	■		■	■	85
14		■	■	■		■	■	■	90
15	■	■	■	■	■	■	■	■	100

External wiring for the automatic function mode via D- and F-terminal

Selection of the monitoring frequencies for the automatic function mode

D-Table: F1-F4 connected to 24V
D-Inputs connected to 24V

24V	D1	D2	D3	D4	Hz
00					100
01	■				150
02		■			200
03	■	■			275
04			■		355
05	■		■		400
06		■	■		450
07	■	■	■		500
08				■	550
09	■			■	630
10		■		■	700
11	■	■		■	800
12			■	■	900
13	■		■	■	1000
14		■	■	■	1100
15	■	■	■	■	1250

F-Table: D-Wiring 0 to 15
F-Inputs connected to 24V

24V	F1	F2	F3	F4	%
00					5Hz
01	■				25
02		■			30
03	■	■			35
04			■		40
05	■		■		45
06		■	■		50
07	■	■	■		55
08				■	60
09	■			■	65
10		■		■	70
11	■	■		■	75
12			■	■	80
13	■		■	■	85
14		■	■	■	90
15	■	■	■	■	100

The frequency values in Adjusting table are calculated as follows:
Table value = Encoder frequency ÷ (adjusted divisor at S1 and S2) + 1

Using the modules to monitor the function modes of a machine

Using the inputs D- and F-inputs to monitor the automatic function mode (mode 1)
With the D-inputs or S5 DIP-switch 16 different monitoring frequencies (100-1250Hz) for mode 1 can be selected. See D-Table. Every value of the 16 frequencies can be decreased from 100 to 25% via the F-inputs or S6 DIP-switch. See F-Table.
Mode 1 will be monitored, if one or more F-inputs are connected to 24V. All F-inputs have to be disconnected from 24V, if other function modes have to be monitored. See F-Table

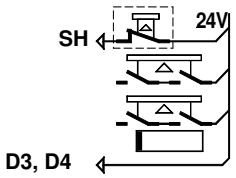
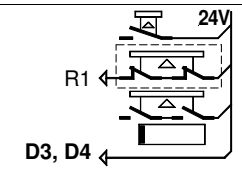
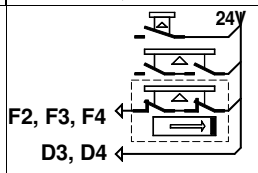
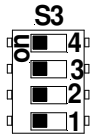
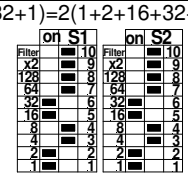
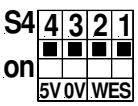
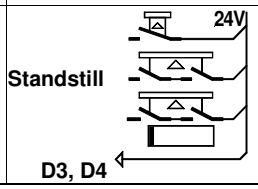
Using the R1-input to monitor the semi automatic function mode (mode 3)
Mode 3 can be monitored, if the R1-input is connected to 24V. For the monitoring of mode 3 the F-inputs have to be disconnected from 24V.

Using the SH-input to monitor the tool setting function mode (mode 2)
Mode 2 can be monitored, if the SH-input is connected to 24V. For the monitoring of mode 2 the F-inputs and the R1-input have to be disconnected from 24V.
For the monitoring of the tool setting and the semi automatic function mode there are 2 monitoring frequencies. These can be selected via the DIP-switch S3. See R1 and SH Table.

Monitoring of the standstill
To monitor the standstill the inputs F1-F4, R1- and SH-input have to be disconnected from 24V.
STOP output of the output modules
The STOP output of all output modules is independent of all function modes. It works autarkic.
Priority of the inputs: F > R1 R1 > SH SH > Standstill

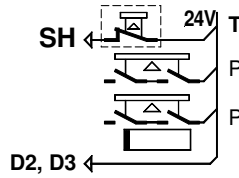
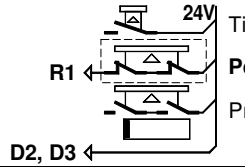
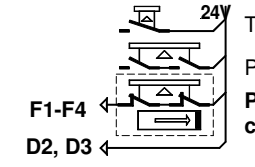
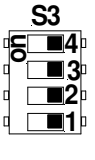
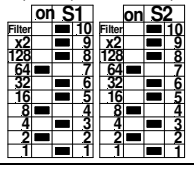
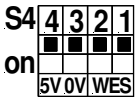
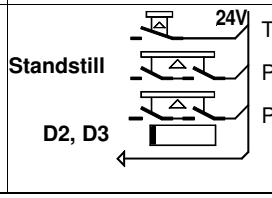
DNDS 1EG V9: monitoring spindle

	800min^{-1}	Tool setting speed (mode2)	Encoder pulses	256I / ⟲
	5000min^{-1}	Mode3	n_{max} + 10%	**Switch off at** (+10% = Safety distance)
	n_{max} =18000min^{-1}	Automatic operating mode (mode1)		

	Mode	**Calculation**	**Note**	Extern Contacts, Contacts
Mode2	**Step 1** **Calculation of the divisor (÷) and the monitoring frequency for mode2**	Ratio mode 3 to mode 2 = 5500min^{-1} /880min^{-1}=6,25 256I x 880 min^{-1} / 60s = 3755Hz 3755 Hz / **96Hz** = 39,11 ≈ 2(19+**1**) 2(19+**1**) = ÷ BA2, mode2	Adjustment S3 R1 and SH table positions 0 is possible = **96Hz**. **96Hz** = mode2-frequency	 **Tip switch** Permission key Protection cover
Mode3	**Step 2** **Calculation of the monitoring frequency for mode3**	6,25 x 96Hz = **600Hz**	Adjustment S3 R1 and SH table positions 0 is possible = **600Hz** **600Hz** = mode3-frequency	 Tip switch **Permission key** Protection cover
Mode1	**Step 3** **Calculation of the divisor (÷) and the monitoring frequency for mode1**	19800min^{-1}x 256I/ 60s = 84480Hz 84480Hz / 2(19+1) = 2112Hz Max. Frequency in D-Table =1250Hz 84480Hz / 2(19+1+32) = **812Hz** 812Hz = 90% of 900Hz 2(19+1+32) = ÷ n_{max}	D-Table, position 12 = D3 and D4 = 900Hz F-Table, position 14 = F2, F3 and F4 = 90% 90% of 900Hz = **812Hz** **812Hz** =mode1-frequency ÷ variable	 Tip switch Permission key **Protection cover**
DIP switches Adjustment	**Table1, ÷ variable** 	2x(19+32+1)=2(1+2+16+32+1)=104 		 Tip switch Permission key Protection cover

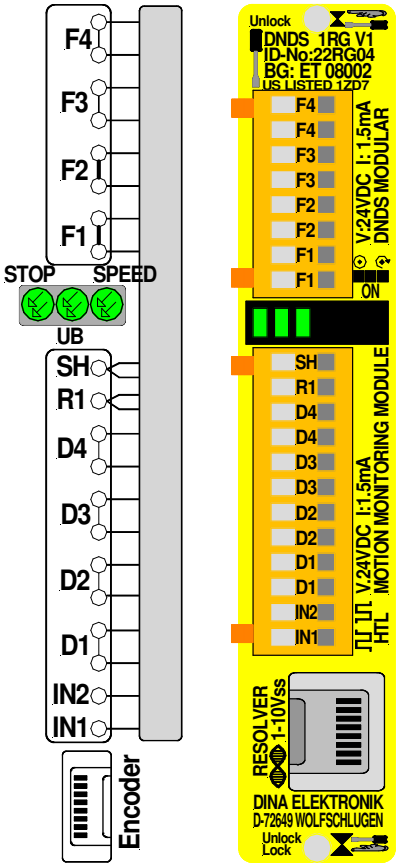
DNDS 1EG V9: monitoring axis

	v = 2m x min^{-1}	Tool setting speed (mode2)	Encoder pulses	2048I / ⟲
	v = 5m x min^{-1}	Mode3	10mm / ⟲	Ascending gradient
	v_{max}=18m x min^{-1}	Automatic operating mode (mode1)	v + 10%	**Switch off at** (+10% = Safety distance)

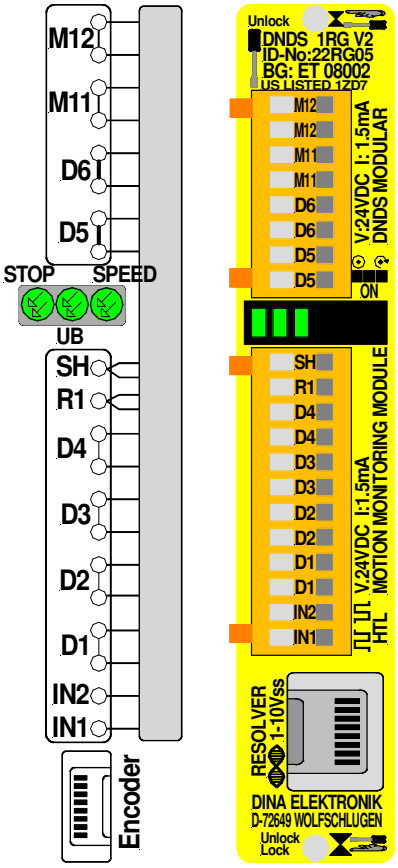
	Mode	**Calculation**	**Note**	Extern Contacts, Contacts
Mode2	**Step 1** **Calculation of the divisor (÷) and the monitoring frequency for mode2**	Ratio mode 3 to mode 2 = 5,5m / 2,2m = 2,5 **2,2m x min^{-1} / 10mm = 220min^{-1}** 220min^{-1} x 2048I / 60s = 7509Hz 7509Hz / **50Hz**=150=2(74+**1**) = (÷)	Adjustment S3 R1 and SH table positions 0 is possible = **50Hz**. **50Hz** = mode2-frequency	 **Tip switch** Permission key Protection cover
Mode3	**Step 2** **Calculation of the monitoring frequency for mode3**	2,5 x 50Hz = **125Hz** =	Adjustment S3 R1 and SH table positions 0 is possible = **125Hz** **125Hz** = mode3-frequency	 Tip switch **Permission key** Protection cover
Mode1	**Step 3** **Calculation of the divisor (÷) and the monitoring frequency for mode1**	19,8m x min^{-1} / 10mm = 1980min^{-1} 1980min^{-1} x 2048I / 60s = 67584Hz 67584Hz / 2(74+1) = **450Hz**	D-Table, position 06 = D2 and D3 = 450Hz F-Table, position 15 = F1-F4 = 100% 100% of 450Hz = **450Hz** **450Hz** = mode1-frequency ÷ constant	 Tip switch Permission key **Protection cover**
DIP switches Adjustment	**Table1 ÷ constant** 	2(74+1) = 2(2+8+64+1) = 150 		 Tip switch Permission key Protection cover

Input modules DNDS 1RG V1, DNDS 1RG V2 and DNDS 1RG V3C

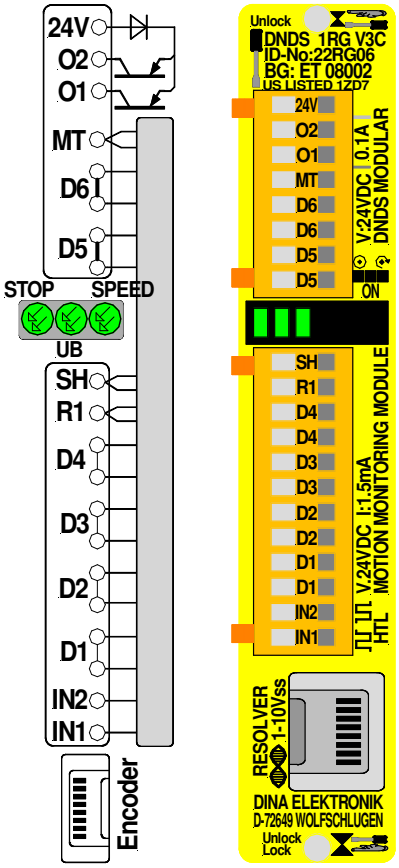
DNDS 1RG V1

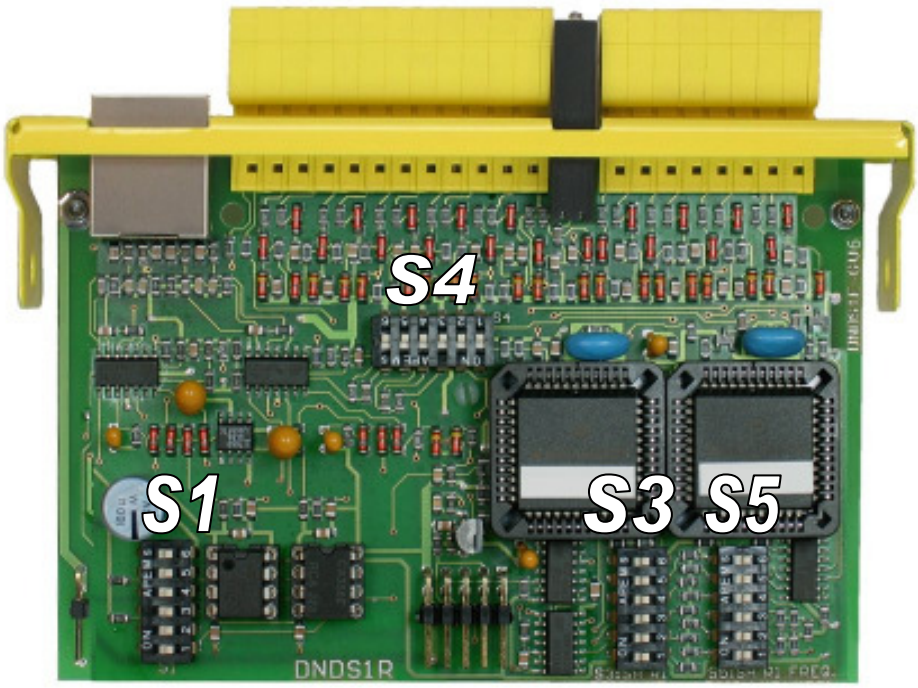


DNDS 1RG V2



DNDS 1RG V3C

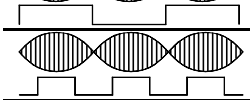




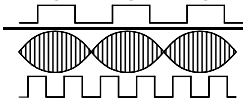
Function of the DIP switches

S1 Function:

Position 3 & 6 on: N**o frequency multiplication**



Position 2 & 5 on**: Frequency doubling (x2)**

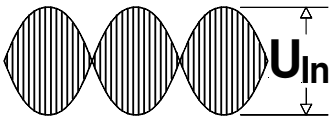


Position 1 & 4 on**: Frequency quadruplicating (x4)**

S3, S5 function:
Selection of monitoring frequencies for tool setting mode (mode 2) and semi automatic mode (mode3).
See adjusting table, R1 and SH Table.

S4 function:
Positions 1 & 2 on: Speed output automatic restart disable.
If there is an overspeed, the output contacts SPEED at the output module switch-off and remain switched off also during standstill. The contacts close again, if the power supply will be turned off ≥ 2s**.**
Positions 1 & 2 off: Speed output automatic restart enable. If there is an overspeed, the output contacts SPEED at the output module switch-off. The contacts close again, if the actual speed is 10% less than the adjusted speed.

S4 Function position 3 to 6: Adjusting of the amplification for the input voltage at the RJ45 connector as follows:



Position 3 to 6 off: U_{In} ≈ 7Vss
Position 3 and 5 on: U_{In} ≈ 5Vss
Position 4 and 6 on: U_{In} ≈ 3,2Vss
Position 3 and 6 on: U_{In} ≈ 2Vss

Product description
The input modules **DNDS 1RG V1, V2 and V3C** are used, if the movement control of a drive is made by a resolver. The resolver can may be connected via the cable adapter DNDA. Different cable adapters are available to meet the individual connector and pin configurations. See product information DNDA.
The connection of the input module to the resolver is high impedance, in order not to affect the resolver signals.
The modulated signals (sine & cosine) are demodulated and amplified on the input module. After the demodulation the frequency is supplied by two channels to the monitoring electronic.
The resolver signals are constantly monitored. If one pair of resolver signals fails as example (+ Sine / -Sine) the module switches the outputs off .
If the module is monitored standstill and a motion is detected, the module will switch off the outputs at the output modules. The outputs will stay off even if there is no more motion. To reset, the SH signal may be applied shortly or the unit may be power cycled.

The frequency values in the follow table = Encoder frequency multiplied with 1, 2 or 4

Adjusting Table DNDS 1RG V1

R1 and SH Table: Selection of the monitoring frequencies via the DIP switches S3 and S5 for tool setting and semi automatic mode

		SH	R1	Switch positions = ON of S3 & S5								SH	R1	Switch positions = ON of S3 & S5						
	R1/SH	Hz	Hz	1	2	3	4	5	6		R1/SH	Hz	Hz	1	2	3	4	5	6	
00		2,0	5,00							32	2,5	30,9	77,3							
01		2,2	5,50							33		34,0	85,0							
02		2,4	6,00							34		37,4	93,5							
03	2,5	2,6	6,50							35		41,1	103							
04		2,8	7,00							36		45,0	123							
05		3,0	7,75							37		49,0	137							
06		3,2	8,00							38		55,0	149							
07		3,4	8,50							39		60,0	164							
08		3,6	9,00							40		66,0	180							
09		3,8	9,50							41		72,0	198							
10		4,0	10,00							42		79,0	218							
11		4,4	11,00							43		87,0	240							
12		4,8	12,00							44		96,0	264							
13		5,2	13,00							45		106	291							
14		5,7	14,25							46		116	320							
15		6,3	15,75							47		128	123							
16		6,9	17,25							48										
17		7,5	18,75							49										
18		8,2	20,50							50										
19		9,0	22,50							51										
20		9,9	24,70							52										
21		10,9	27,25							53										
22		12,0	30,00							54										
23		13,2	33,00							55										
24		14,5	36,25							56										
25		16,0	40,00							57										
26		17,6	44,00							58										
27		19,3	48,25							59										
28		21,2	53,00							60										
29		23,3	58,25							61										
30		25,6	64,00							62										
31		28,1	70,25							63										

Selection of the monitoring frequencies for the automatic mode via the D- and F-inputs

	D-Table = connected to 24V					F-Table = connected to 24V				
	D1	D2	D3	D4	Hz	F1	F2	F3	F4	%
00					50					
01					60					30
02					70					35
03					85					40
04					100					45
05					120					50
06					145					55
07					175					60
08					205					65
09					255					70
10					305					75
11					370					80
12					450					85
13					545					90
14					660					95
15					800					100

DNDS 1RG V1: Using the modules to monitor the function modes of a machine

Using the inputs D- and F-inputs to monitor the automatic function mode (mode 1)
With the D-inputs 16 different monitoring frequencies (100-1250Hz) for mode 1 can be selected. See D-Table.
Every value of the 16 frequencies can be decreased from 100 to 25% via the F-inputs. See F-Table.
Mode 1 will be monitored, if one or more F-inputs are connected to 24V. All F-inputs have to be disconnected from 24V, if other function modes have to be monitored. See F-Table

Using the R1-input to monitor the semi automatic function mode (mode 3)
Mode 3 can be monitored, if the R1-input is connected to 24V. For the monitoring of mode 3 the F-inputs have to be disconnected from 24V.

Using the SH-input to monitor the tool setting function mode (mode 2)
Mode 2 can be monitored, if the SH-input is connected to 24V. For the monitoring of mode 2 the F-inputs and the R1-input have to be disconnected from 24V.

For the monitoring of the tool setting and the semi automatic function mode there is a lot of monitoring frequencies. These can be selected via the DIP-switches S3 and S5. See R1 and SH Table.

Monitoring of the standstill
To monitor the standstill the inputs F1-F4, R1- and SH-input have to be disconnected from 24V.

STOP output of the output modules
The STOP output of all output modules is independent of all function modes. It works autarkic.

Priority of the inputs: F > R1 R1 > SH SH > Standstill

Adjusting Table DNDS 1RG V2 and V3C

R1 and SH Table: Selection of the monitoring frequencies via the DIP switches S3 and S5 for tool setting and semi automatic mode

	BA2 SH	BA3 R1	Switch positions = ON of S3 & S5							BA2 SH	BA3 R1	Switch positions = ON of S3 & S5						
	R1/SH	Hz	Hz	1	2	3	4	5	6	R1/SH	Hz	Hz	1	2	3	4	5	6
00		1,1	2,75							32		30,9	77,3						
01		2,2	5,50							33		34,0	85,0						
02		2,4	6,00							34		37,4	93,5						
03		2,6	6,50							35		41,1	103						
04		2,8	7,00							36		45,0	112						
05		3,0	7,75							37		49,0	123						
06		3,2	8,00							38		55,0	137						
07		3,4	8,50							39		60,0	149						
08		3,6	9,00							40		66,0	164						
09		3,8	9,50							41		72,0	180						
10		4,0	10,00							42		79,0	198						
11		4,4	11,00							43		87,0	218						
12		4,8	12,00							44	2,5	96,0	240						
13	2,5	5,2	13,00							45		106	264						
14		5,7	14,25							46		116	291						
15		6,3	15,75							47		128	320						
16		6,9	17,25							48									
17		7,5	18,75							49									
18		8,2	20,50							50									
19		9,0	22,50							51									
20		9,9	24,70							52									
21		10,9	27,25							53									
22		12,0	30,00							54									
23		13,2	33,00							55									
24		14,5	36,25							56									
25		16,0	40,00							57									
26		17,6	44,00							58									
27		19,3	48,25							59									
28		21,2	53,00							60									
29		23,3	58,25							61									
30		25,6	64,00							62									
31		28,1	70,25							63									

Selection of the monitoring frequencies for the automatic mode via the D-inputs

	D-Table = connected to 24V							D-Table **= connected to 24V**							
	D1	D2	D3	D4	D5	D6	Hz		D1	D2	D3	D4	D5	D6	Hz
00							**00**	32							**200**
01							**50,0**	33							**209**
02							**52,3**	34							**219**
03							**54,7**	35							**229**
04							**57,2**	36							**239**
05							**59,8**	37							**250**
06							**62,5**	38							**262**
07							**65,4**	39							**274**
08							**68,4**	40							**286**
09							**71,5**	41							**299**
10							**74,8**	42							**313**
11							**78,2**	43							**327**
12							**81,8**	44							**342**
13							**85,5**	45							**358**
14							**89,4**	46							**374**
15							**93,5**	47							**391**
16							**97,8**	48							**409**
17							**102**	49							**428**
18							**107**	50							**447**
19							**112**	51							**468**
20							**117**	52							**489**
21							**122**	53							**512**
22							**128**	54							**535**
23							**134**	55							**559**
24							**140**	56							**585**
25							**146**	57							**612**
26							**153**	58							**640**
27							**160**	59							**669**
28							**167**	60							**700**
29							**175**	61							**732**
30							**183**	62							**765**
31							**191**	63							**800**

DNDS 1RG V2 and V3C: Using the modules to monitor the function modes of a machine

Using the M-inputs respectively the MT-input for the not monitored automatic function mode (mode 1)
The M-inputs of DNDS 1RG V2 respectively the MT-input of DNDS 1RG V3C can be used, if the mode 1 has to be not monitored. If the automatic function mode has to be not monitored, these inputs have to be connected to 24V.
These inputs have to be disconnected from 24V, if the automatic function mode or other function modes have to be monitored. Look to the priority of inputs.

Using the inputs D1-D6 to monitor the automatic function mode (mode 1)
With the D-inputs 63 different monitoring frequencies for mode 1 can be selected. Mode 1 will be monitored, if one or more D-inputs are connected to 24V. All D-inputs have to be disconnected from 24V, if other function modes have to be monitored. See D-Table.

Using the R1-input to monitor the semi automatic function mode (mode 3)
Mode 3 can be monitored, if the R1-input is connected to 24V. For the monitoring of mode 3 the M-inputs of DNDS 1RG V2 respectively the MT-input of DNDS 1RG V3C and the D-inputs have to be disconnected from 24V.
Using the SH-input to monitor the tool setting function mode (mode 2)
Mode 2 can be monitored, if the SH-input is connected to 24V. For the monitoring of mode 2 the M-inputs of DNDS 1RG V2 rather the MT-input of DNDS 1RG V3C, the D-inputs and the R1-input have to be disconnected from 24V.
For the monitoring of the tool setting and the semi automatic function mode there are a lot of monitoring frequencies. These can be selected via the DIP-switches S3 and S5. See R1 and SH Table.

Monitoring of the standstill
To monitor the standstill the inputs M11, M12 of V2 respectively the input MT of V3C, the inputs D1-D6, R1- and SH-input have to be disconnected from 24V.

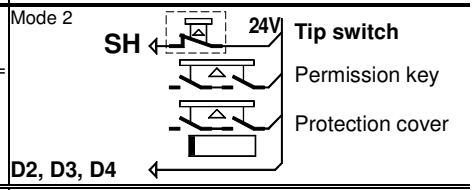
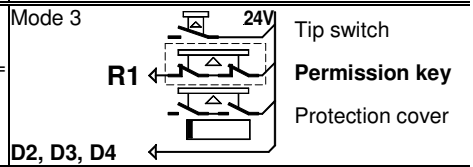
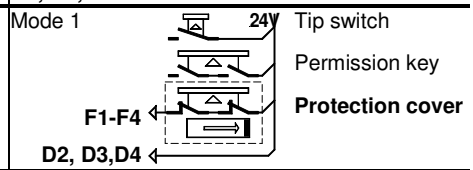
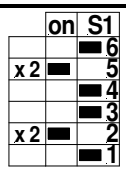
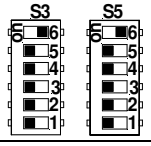
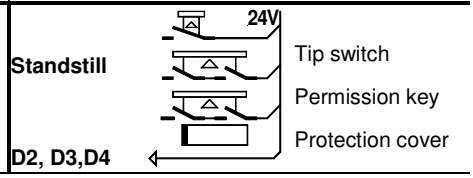
STOP output of the output modules
The STOP output of all output modules is independent of all function modes. It works autarkic.

DNDS 1RG V2 Priority of the inputs:	M > D	D > R1	R1 > SH	SH > Standstill
DNDS 1RG V3C Priority of the inputs:	MT > D	D > R1	R1 > SH	SH > Standstill

Outputs of DNDS 1RG V3C
The modules DNDS 1EG V3C has two positive switching outputs O1 and O2. Normally the outputs are switched to 24V. The power supply for these outputs has to be connected to the terminal 24V at the module.
Output O1 switch off, if there is a sensors failure at the Encoder input or at IN1 or IN2.
O1 switch on again, if the reason for the switching off does not exist.
Output O2 switch off and the LED SPEED is not illuminated, if there is an overspeed, an external or an internal failure, that causes a switch off of the outputs at the output modules.
O2 with overspeed and enabled speed output automatic restart:
O2 switch on again, if the actual speed is ≥10% less than the selected speed. The LED SPEED is illuminated.
O2 with overspeed and disabled speed output automatic restart:
O2 remain switched off and the LED SPEED remain dark also during standstill of the drive. O2 switch on and the LED SPEED illuminates again, if the power supply will be turned off **≥** 2s**.**

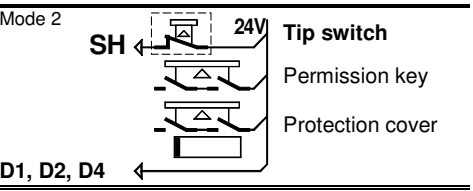
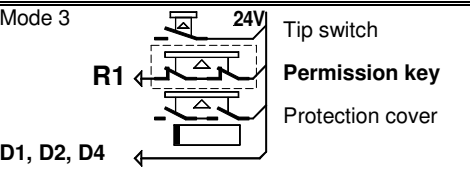
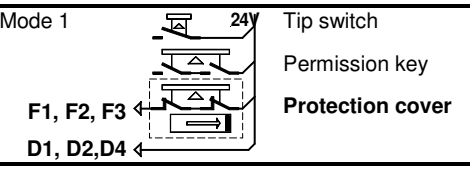
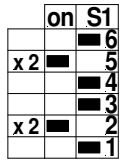
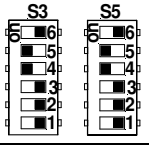
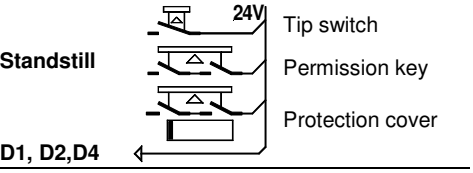
DNDS 1RG V1: monitoring spindle

	800min^{-1}	Tool setting speed (mode2)	Encoder pulses	2 x 1l / ⟲
	2000min^{-1}	Mode3	**n_{max} + 10%**	**Switch off at** (+10% = Safety distance)
	n_{max} =18000min^{-1}	Automatic operating mode (mode1)		

	mode	calculation	note	External Contacts
Mode2	**Step 1 Calculation of the divisor (÷) and the monitoring frequency for mode2**	Ratio mode 3 to mode 2 = 2000min^{-1} /880min^{-1}=2,5 2l x 880min^{-1} / 60s = 29,3Hz 29,3Hz ≈ **28,1Hz**	Adjustment S3, S5 R1 and SH Table positions 31 is possible = **28,1Hz** **28,1Hz** = mod 2-Frequency	
Mode3	**Step 2 Calculation of the monitoring frequency for mode3**	2,5 x 28,1Hz = **70,25Hz**	Adjustment S3, S5 R1 and SH table positions 31 is possible = **70,25Hz** **70,25Hz** = mode 3-Frequency	
Mode1	**Step 3 Calculation of the divisor (÷) and the monitoring frequency for mode1**	19800min^{-1}x 2l/ 60s = **660Hz** **660Hz** = 100% of 660Hz	D & F-Table D2, D3, D4 position 14 F1 to F4 position 15 = **660Hz** **660Hz =** mode 1-Frequency	
DIP setting Adjustment		**Table3: Position 32** 		

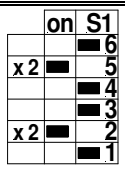
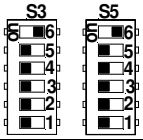
DNDS 1RG V1: monitoring axis

	v = 2m x min^{-1}	Tool setting speed (mode2)	Resolver pulses	2 x 1l / ⟲
	v = 5m x min^{-1}	Mode3 (mode4)	5mm / ⟲	Ascending gradient
	v_{max}= 30m x min^{-1}	Automatic operating mode	***v*** **+ 10%**	**Switch off at** (+ 10% = Safety distance)

	mode	calculation	note	External Contacts
Mode2	**Step 1 Calculation of the divisor (÷) and the monitoring frequency for mode2**	Ratio mode 3 to mode 2 = 5m x min^{-1} /2m x min^{-1}=2,5 2,2m x min^{-1} / 5mm = 440min^{-1} 440min^{-1} x 2l /60s = 14,66Hz 14,66 Hz ≈ **14,5Hz**	Adjustment S3, S5 R1 and SH Table positions 24 is possible = **14,5Hz** **14,5Hz** = mode 2-Frequency	
Mode3	**Step 2 Calculation of the monitoring frequency for mode3**	2,5 x 14,5Hz = **36,25Hz**	Adjustment S3, S5 R1 and SH Table positions 24 is possible = **36,25Hz** **36,25Hz** = mode 3-Frequency	
Mode1	**Step 3 Calculation of the divisor (÷) and the monitoring frequency for mode1**	33m x min^{-1} / 5mm = 6600min^{-1} 6600min^{-1}x 2l / 60s = 220Hz **220Hz = 60% of 370Hz**	D & F-Table D1, D2, D4 position 7 F1, F2, F3 position 11 = **220Hz** **220Hz** = mode 1-Frequency	
DIP setting Adjustment		**Table3: Position 24** 		

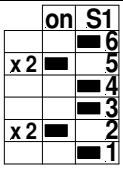
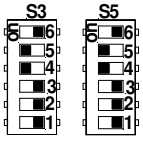
DNDS 1RG V2 and V3C: monitoring spindle

	800min^{-1}	Tool setting speed (mode2)	Encoder pulses	2 x 1I / ↻
	2000min^{-1}	Mode3	n_{max} + 10%	**Switch off at** (+10% = Safety distance)
	n_{max} =18000min^{-1}	Automatic operating mode (mode1)		

	Mode	Calculation	Note	External Contacts
Mode2	**Step 1 Calculation of the divisor (÷) and the monitoring frequency for mode2**	Ratio mode 3 to mode 2 = 2000min^{-1} /880min^{-1}=2,5 2I x 880min^{-1} / 60s = 29,3Hz 29,3Hz ≈ **28,1Hz**	Adjustment S3, S5 R1 and SH Table positions 31 is possible = **28,1Hz** **28,1Hz** = mode 2-Frequenz	SH 24V **Tip switch** / Permission key / Protection cover
Mode3	**Step 2 Calculation of the monitoring frequency for mode3**	2,5 x 28,1Hz = **70,25Hz**	Adjustment S3, S5 R1 and SH Table positions 31 is possible = **70,25Hz** **70,25Hz** = mode 3-Frequency	R1 24V Tip switch / **Permission key** / Protection cover
Mode1	**Step 3 Calculation of the divisor (÷) and the monitoring frequency for mode1**	19800min^{-1}x 2I/ 60s = **660Hz** **660Hz** = 100% of 660Hz	D-Table D1, D2, D4, D5, D6 position 59 = **660Hz** **660Hz =** mode 1-Frequency	D1, D2, D4, D5, D6 24V Tip switch / Permission key / **Protection cover**
DIP Adjustment		**Table3: Position 32** 		**Stand-still** 24V Tip switch / Permission key / Protection cover

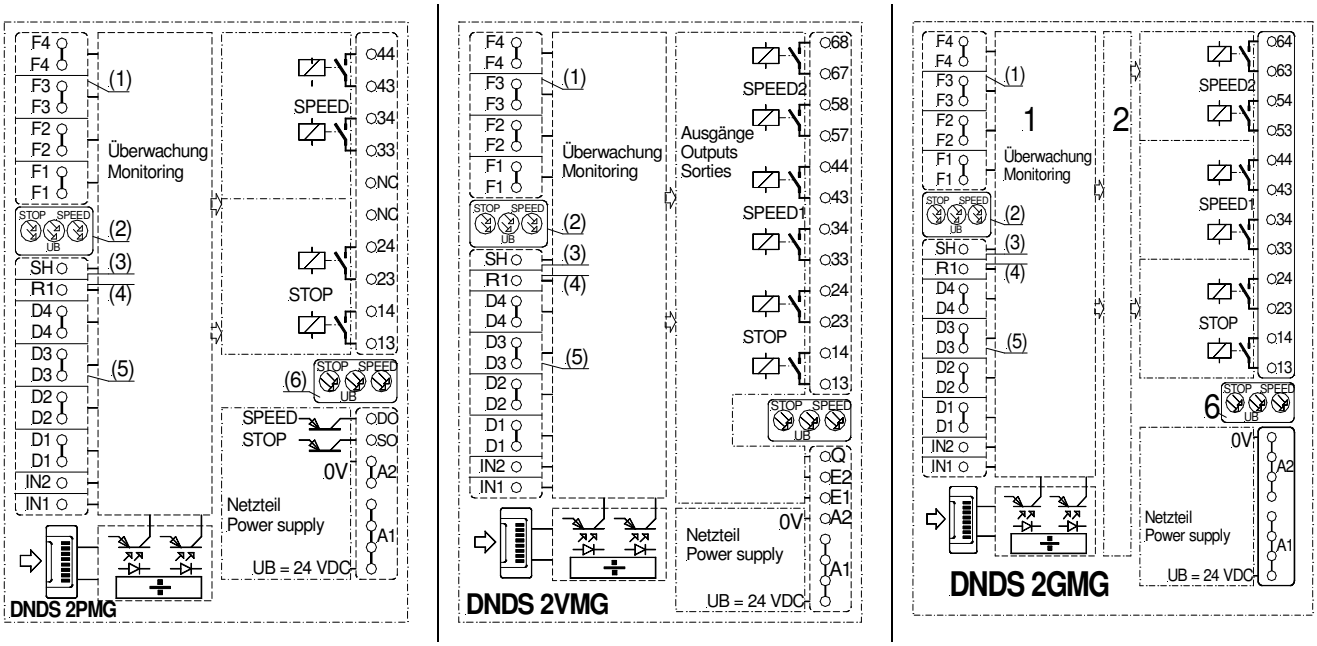
DNDS 1RG V2 and V3C: monitoring axis

	v = 2m x min^{-1}	Tool setting speed (mode2)	Resolver pulses	2 x 1I / ↻
	v = 5m x min^{-1}	Mode3 (mode4)	5mm / ↻	Ascending gradient
	v_{max}= 30m x min^{-1}	Automatic operating mode	v + 10%	**Switch off at** (+ 10% = Safety distance)

	Mode	Calculation	Note	External Contacts
Mode2	**Step 1 Calculation of the divisor (÷) and the monitoring frequency for mode2**	Ratio mode 3 to mode 2 = 5m x min^{-1} /2m x min^{-1}=2,5 **2,2m x min^{-1} / 5mm = 440min^{-1}** 440min^{-1} x 2I /60s = 14,66Hz 14,66Hz ≈ **14,5Hz**	Adjustment S3, S5 R1 and SH Table positions 24 is possible = **14,5Hz** **14,5Hz** = mode 2-Frequency	SH 24V **Tip switch** / Permission key / Protection cover
Mode3	**Step 2 Calculation of the monitoring frequency for mode3**	2,5 x 14,5Hz = **36,25Hz**	Adjustment S3, S5 R1 and SH Table positions 24 is possible = **36,25Hz** **36,25Hz** = mode 3-Frequency	R1 24V Tip switch / **Permission key** / Protection cover
Mode1	**Step 3 Calculation of the divisor (÷) and the monitoring frequency for mode1**	33m x min^{-1} / 5mm = 6600min^{-1} 6600min^{-1}x 2I / 60s = 220Hz **220Hz = 60% of 370Hz**	D-Table D2, D6 position 34 = **220Hz** **220Hz** = mode 1-Frequency	D2, D6 24V Tip switch / Permission key / **Protection cover**
DI Adjustment		**Table3: Position 24** 		**Stand-still** 24V Tip switch / Permission key / Protection cover

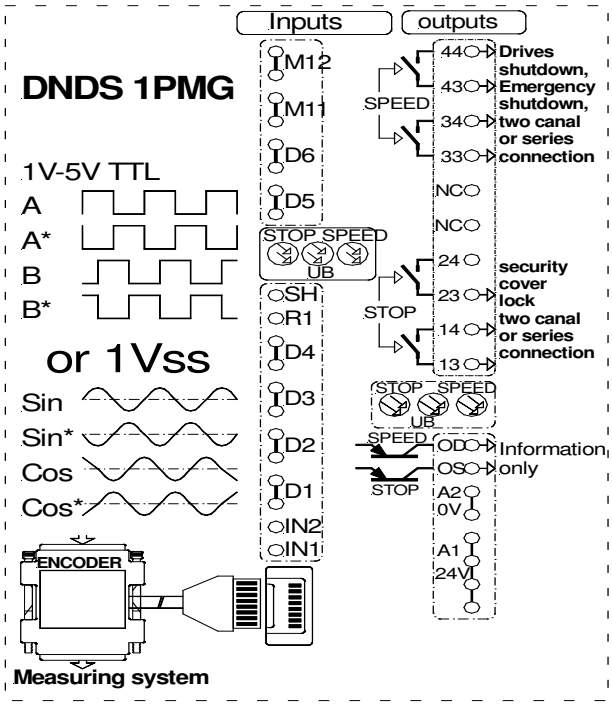
The switch off limits of the speed monitoring have to be tested.
The safety relevant connection, as example to the SH-, R1-input and to the D-inputs, have to be mounted in a cable channel.
The total concept of the specified category must be validated involving the whole control unit.

Schematic diagram

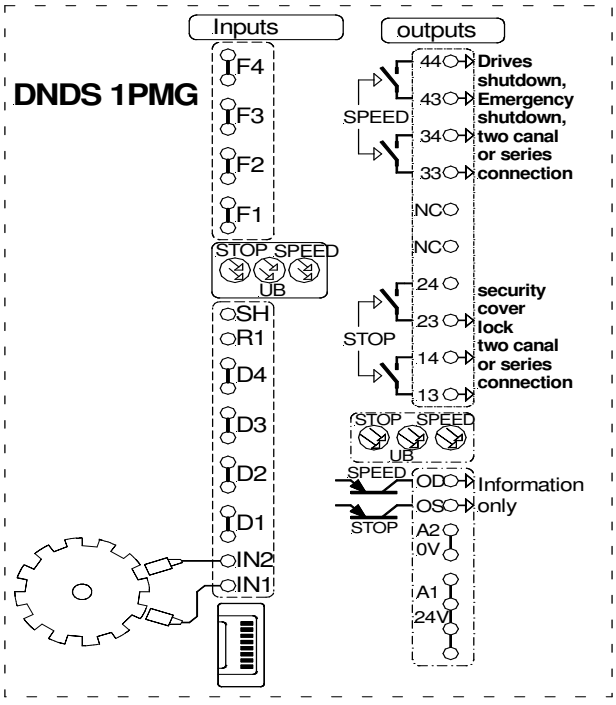


(1) Input to reduce the maximal speed (selected using D-inputs) in 5% steps
(2) LED to display of the monitoring status and power supply
(3) Input to select the tool setting function mode
(4) Input to select the semiautomatic function mode
(5) Inputs to adjust the maximal speed for the automatic function mode
(6) LED to display the switching status of the outputs and power supply

Motion detection via an encoder



Motion detection via 2 PNP proximity sensors



Requirements of the encoder

- Encoder signal: Rectangular with amplitude of 0.5-5 V or sine/cosine signal with 1VSS.
- Encoder frequency ≤ 300KHz
- 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 generated synthetically

Regard:
The breakage of the shaft of the encoder respectively resolver cannot be detected by the monitoring.

Fundamental

- The monitoring of the Standstill on zero is not possible.
- The monitored standstil frequency is 5Hz after the divisor with Encoder measurement messsystem. With resolver measurement messsystem the change of the phase is monitored.
- With Encoder select a large relationship mode2/ Standstill as possible: With axis 10 to 20, with spindles 20 to 50.
- The divisor with mode 2 is if possible > 10.
- With (mode 1/ mode 2)>(1250Hz/ mode 2-Freq) requires divisor variable
- With divisor variable the divisor with mode 2 must be ≤ 2(31+1) or ≤ 4(31+1).

Monitoring not used

If less than the available monitoring should be monitored, the not used input modules must be removed from the Rack and replaced by a bridge circuit connector.
Bridge Circuit connectors can be ordered from DINA.

Disable monitoring

If one monitoring system should be disabled, this could be done by connecting the input IN2 to 24V.

Faults and Errors

- LED “SPEED” and “STOP” on the input and output modules do not light:
  - The encoder is not connected.
  - A proximity sensor failure.
- LED “SPEED” and “STOP” on the input module flash in 1 Hz intervals:
  - Track A or B of encoder is missing.
  - Proximity sensor at IN1 or IN2 is defective.
- LED “SPEED” dos not light
  - Registration of last crossing of the adjusted maximum speed.

To clear a fault the supply voltage must be switched off for at least 2s to reset the equipment (disconnect A1).

- LED “STOP” and LED “SPEED” on the input module flash in 2 Hz intervals:
  - DNDS internal error.
  - Error by improperly installed external signal lines.

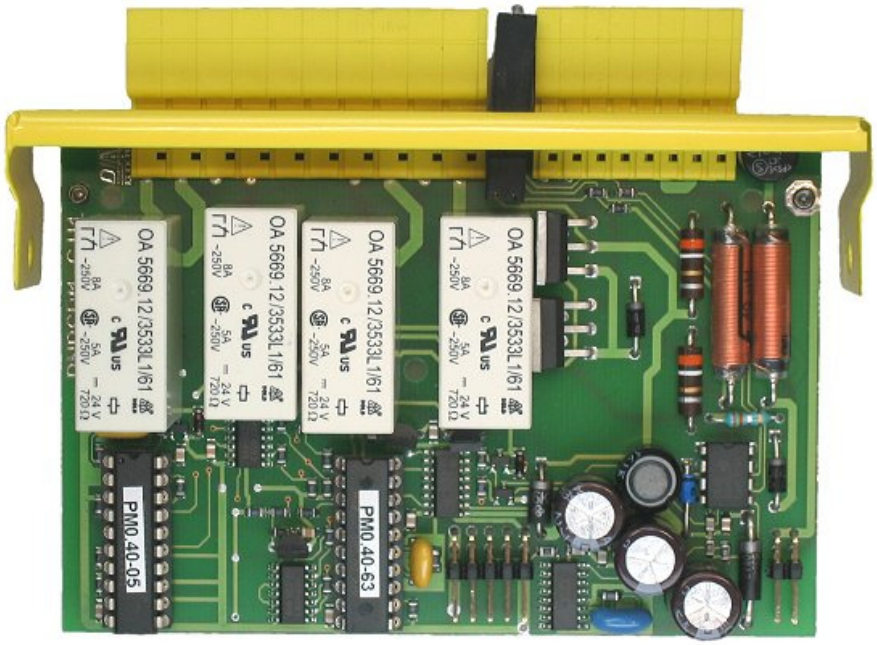
The fault can possibly be eliminated by interruption of A1 for at least 2s.

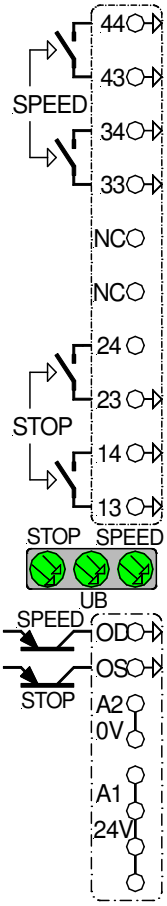
Output modules

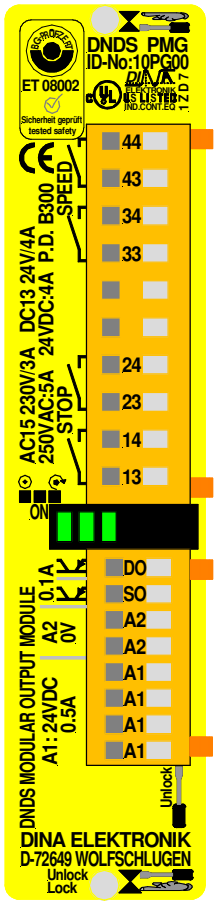
Features

- Status indicators.
- 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.

DNDS PMG







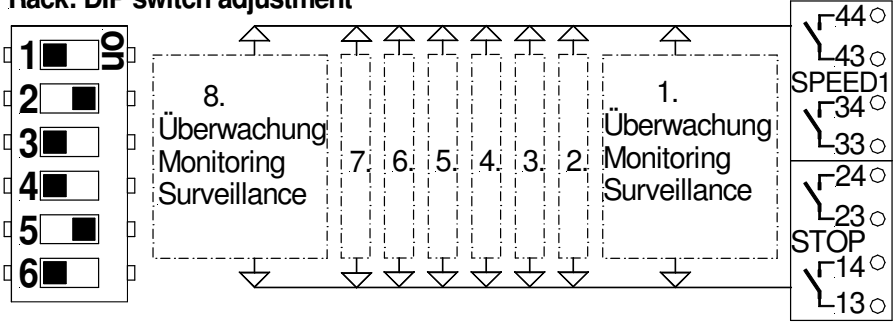
Features

2 safety contacts for standstill (13 14 23 24)positive guided and 1 semi-conductor output (PNP),

2 safety contacts for motion monitoring (33 34 43 44),positive guided and 1 semi-conductor output (PNP)

Adjusting at the rack for DNDS PMG: adjusted by DINA.

Rack: DIP Schalter Einstellung
Rack: DIP switch adjustment



DNDS PMG: Usage of 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 output SO switch off. 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 output SO switch on, 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 a function mode is selected, as example tool setting via SH-input or semi automatic mode via R1-input of DNDS, this function mode will be monitored.

If one or more drives break the standstill or the programmed speed of the function mode, the NO contacts **33-34** and **43-44** open immediately. The output OD switches off. The LED SPEED does not illuminated.

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

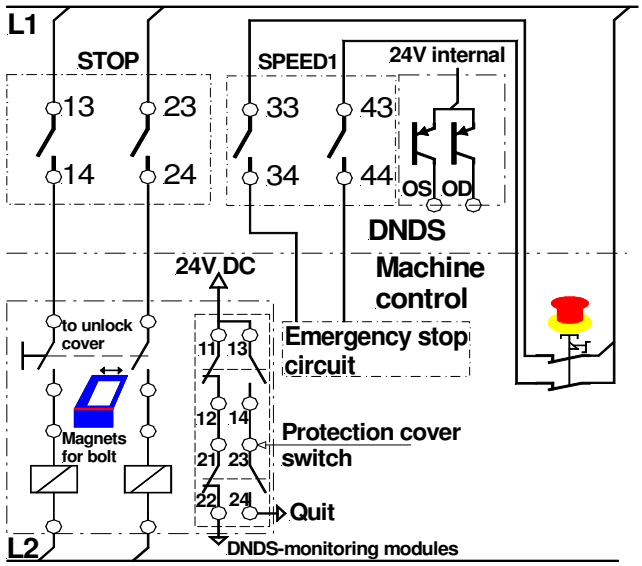
The contacts close again, if the actual speed is 10% less than the programmed speed. The output OD switches on. The LED SPEED illuminates.

The break of the programmed speed will be stored via LED SPEED at the input module. The LED SPEED is dark, also if all drives are in standstill. This makes it possible to know, which drive broke the speed. If the drives are running, the LED SPEED illuminates. After interruption the power supply of DNDS for ≥ 2s the stored information will be cleared.

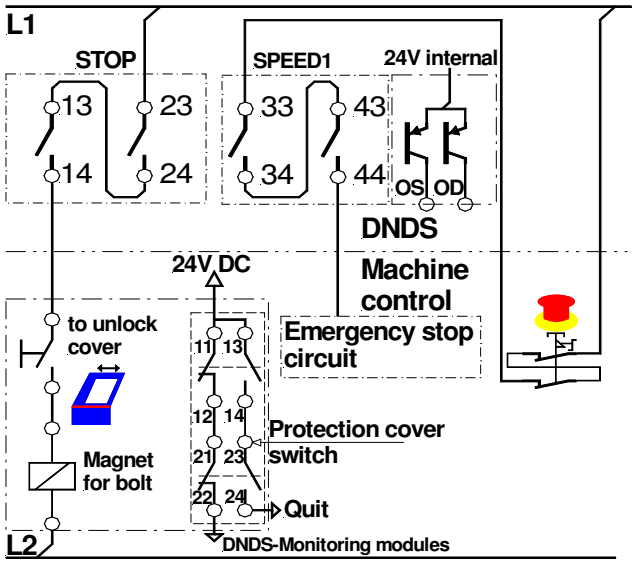
If the function “restart disable” is selected the contacts close again, if the drives are in standstill and the power supply will be turn off ≥ 2s**.**

Usage of outputs

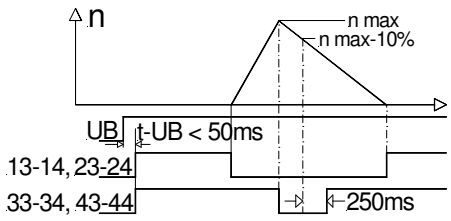
Parallel connection of the outputs



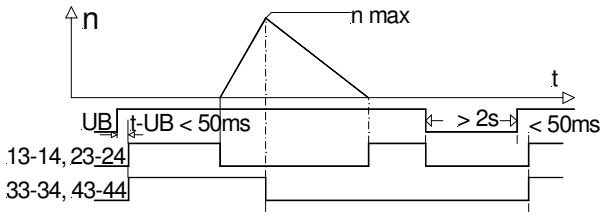
Serial connection of the outputs



Function diagram
Speed output **without** restart disable



Function diagram
Speed output **with** restart disable.



DNDS PMG: Faults and errors

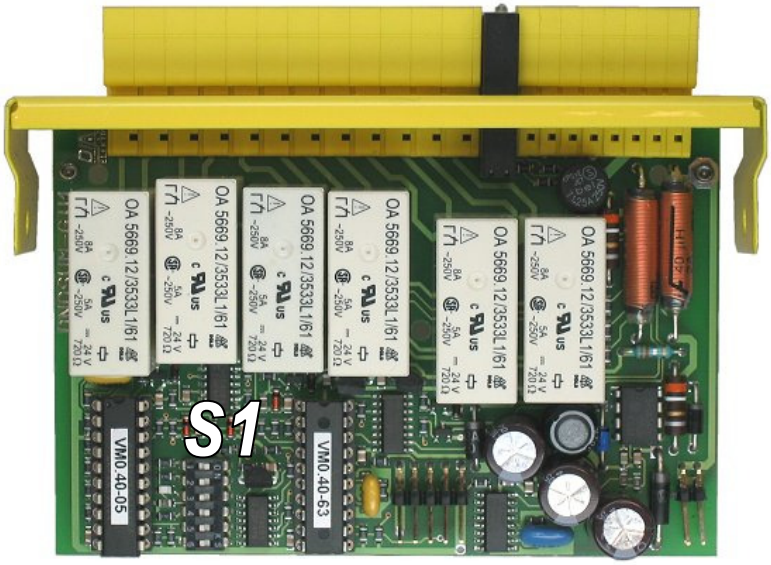
- The second output contact can not be switched on when the other output contact is welded.
- LED “SPEED” and “STOP” on the monitoring and output module do not illuminate.

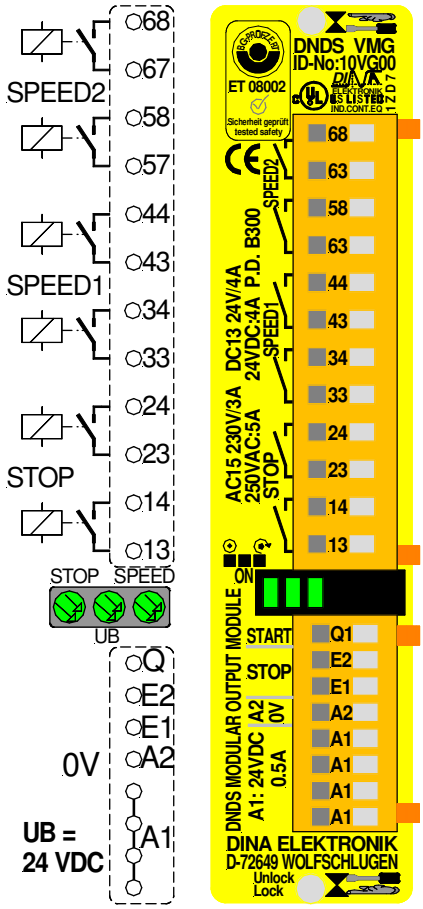
Reason: The encoder is not connected.
Proximity sensor failure.

- The LED STOP and SPEED on the output module flash: short illuminated, long not illuminated.

Reason: A contact does not close

DNDS VMG

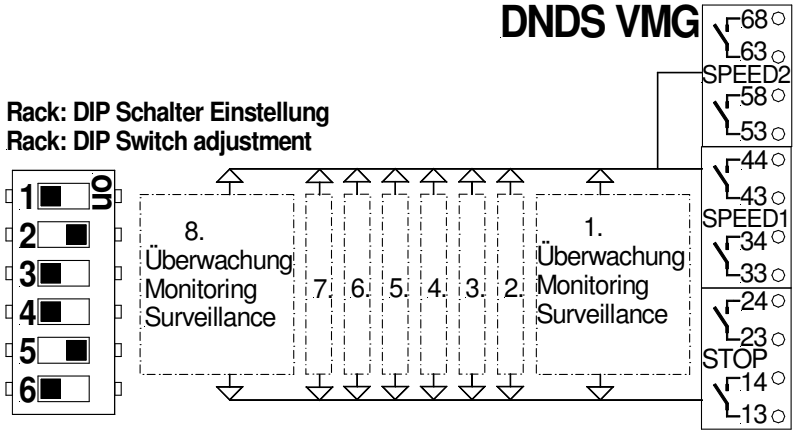




Features:
Relay outputs: Two safety contacts for standstill monitoring, positive guided (13—14, 23—24).
For motion monitoring two sets of positive guided safety contacts (33—34, 43—44) non delayed and (57—58,.67—68) off delayed.
Off delayed time adjustment via S1. See S1 function, side 19.

Warning: in the case of fault the delay time can be short or the contacts open at once

Adjusting at the rack for DNDS VMG: adjusted by DINA.



DNDS VMG: 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 output SO switch off. 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 output SO switch on, the LED STOP is illuminated.

SPEED contacts: Motion monitoring

The two SPEED outputs are triggered by all mounted input modules.
The output contacts (33 34, 43 44) are non delayed contacts
The output contacts (57 58, 67 68) are off delayed contacts.

Non delayed contacts:

If the speed of a monitored Motion exceeds the programmed speed, the SPEED safety contacts (33 – 34 and 43 – 44) open without delay. The LED “SPEED” will go off .
The contacts (33 34, 43 44) and will close again if all of the following condition are meet:

1. The speed of the monitored motions is less then the programmed speed limit and the speed of the motion causing the switch off is at least less than 10% of the programmed speed
2. the delayed contacts (57 58,.67 68) have been open for 250ms
3. the conditions of the external triggering are fulfilled. See below.

If this conditions are meet, all SPEED output contacts will close simultaneously.
If the programmed speed is exceeded this is also logged by the involved monitor module and can be seen when the monitored motion is in standstill. The LED “SPEED” of this input module will not light in this case. During normal operation this LED will light.
To clear the “speed exceeded” log on the input module, the supply voltage must be switched off for ≥ 2s.

Delayed contacts

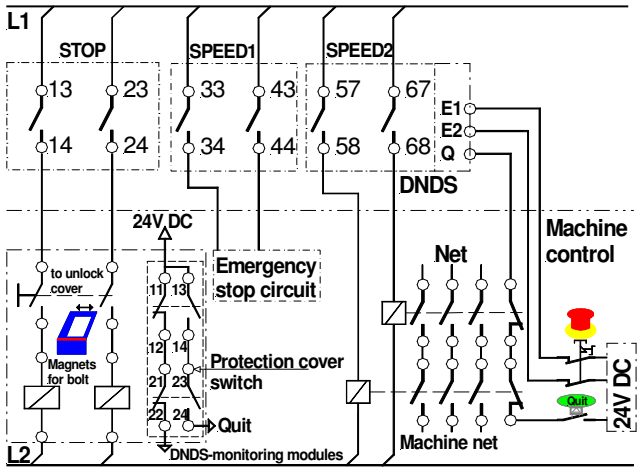
If the speed of a monitored Motion exceeds the programmed speed the delayed SPEED safety contacts (57 58,.67 68) open after the delay time, set by DIP-switches on the output module, has expired. See delay time table.
The contacts (57 58,.67 68 will close again if all of the following condition are meet:

1. The speed of the monitored motions is less then the programmed speed limit and the speed of the motion causing the switch off, is at least less than 10% of the programmed speed.
2. The non delayed contacts (33 34, 43 44) are open.
3. the delayed contacts (57 58,.67 68) have been open for 250ms If this conditions are meet, all SPEED output contacts will close simultaneously.

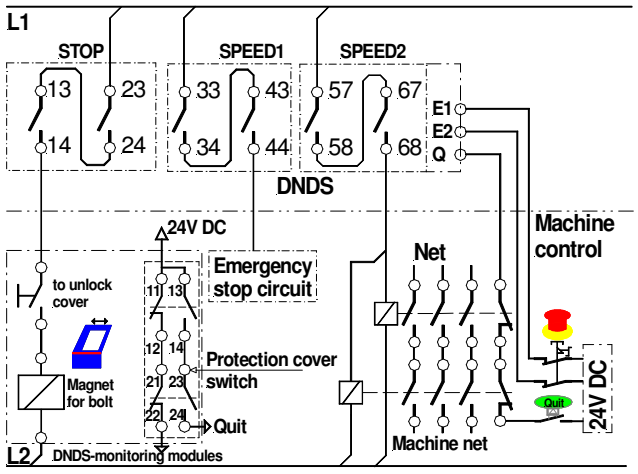
The delay of 250ms will make sure, the machine control is able to react properly to the emergency off condition.

Usage of outputs

Parallel connection of the outputs



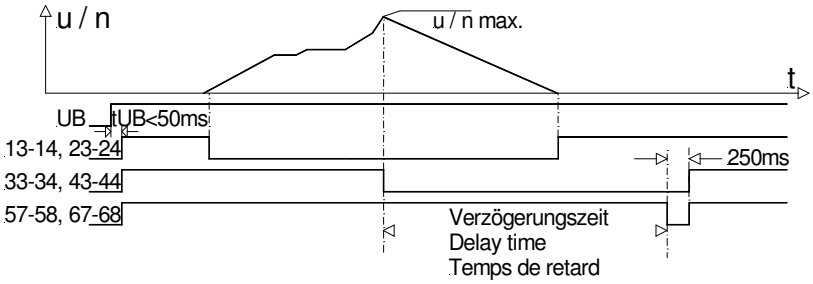
Serial connection of the outputs



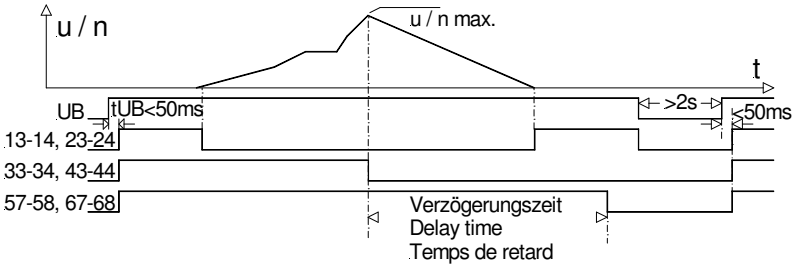
Usage the DNDS VMG

The non-delayed output contacts 33-34 and 43-44 could be used for the removal of the automatic control release of the actuations. With the delayed output contacts 57-58 and 67-68 the supply voltage for the Actuation could be interrupted.

Function diagram
Speed output **without** restart disable



Function diagram
Speed output **with** restart disable.



External triggering

The output contacts SPEED 1 (33-34, 43-44) and SPEED 2 (57-58, 67-68) my be triggered external. The inputs E1, E2 and Q on the output module provide this function.

If the supply voltage is applied to the DNDS and the following conditions are meet, the contacts of the SPEED 1 and 2 outputs close:

1. The speed of the actuations is less then the programmed speed on the input modules.
2. The inputs E1, E2 and Q are connected to 24 VDC. Q can go tensionless afterwards.

If the input E1 or E2 or both become tensionless the contacts of outputs SPEED1 and 2 open according to the above described function.

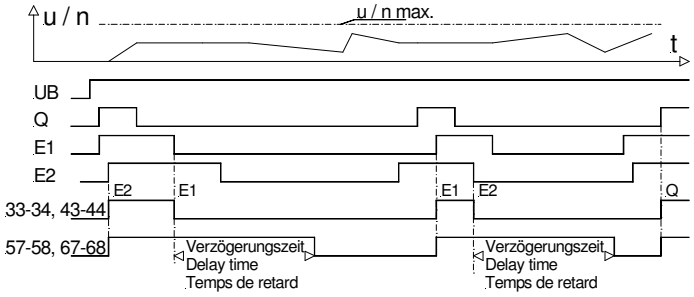
The contacts of output SPEED 33-34, 43-44, 57-58 and 67-68 close again as shown in the function diagram!

Use of inputs E1, E2,Q

The inputs E1, E2 and Q can be used as inputs for an emergency shutdown button.

If this functionality is not used, the inputs Q, E1 and E2 must be connected permanently to 24 VDC. This can best be done with short wire bridges between the input terminals and the terminals A1.

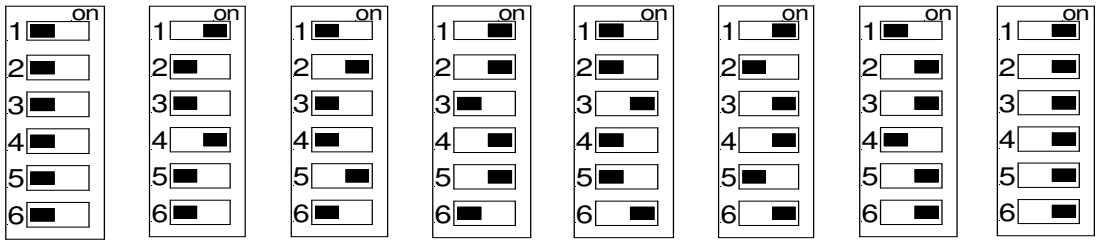
Function diagram
External triggering



DNDS VMG: Time delay Table

S1 function Channel 1 position 1-3

S1 function Channel 2 position 4-6



Standard	**0s**	**0,5s**	**1,0s**	**2,0s**	**5,0s**	**10,0s**	**15,0s**	**20,0s**
10VG00-02	**0s**	**0,1s**	**0,5s**	**1,0s**	**2,0s**	**5,0s**	**10,0s**	**20,0s**

DNDS VMG: Faults and Errors

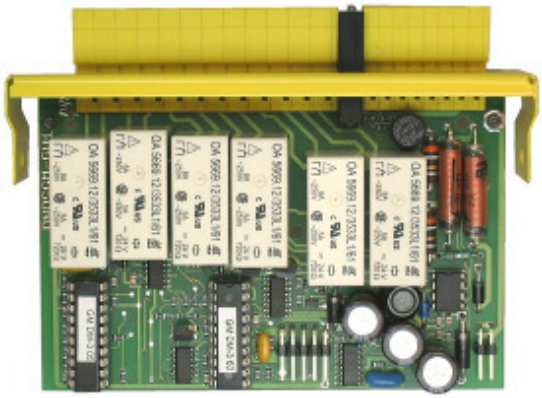
- The second output contact can not be switched on when the other output contact is welded.
- LED “SPEED” and “STOP” on the monitoring and output module do not illuminate.

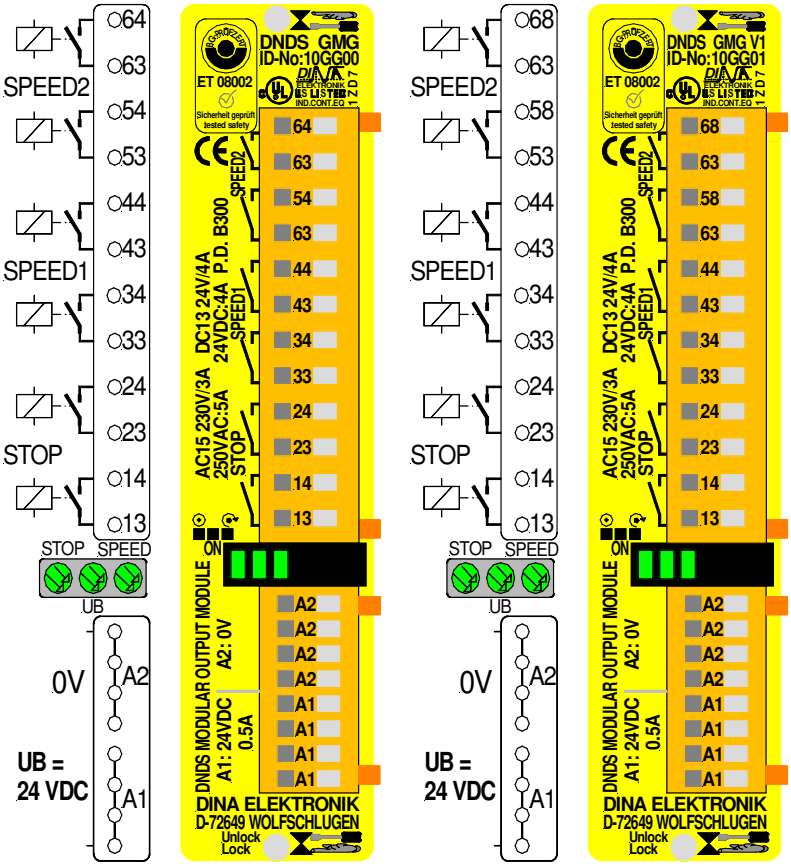
Reason: The encoder is not connected.

- Proximity sensor failure.
- The LED STOP and SPEED on the output module flash: short illuminated, long not illuminated.

Reason: A contact does not close or open or
The time adjustment of the output module differs between channel1 and channel2.

DNDS GMG





Features: Relay outputs
For standstill monitoring one output “STOP” with 2 positive guided safety contacts (13—14, 23—24),

For motion monitoring two independent outputs (SPEED1 and SPEED2) with 2 positive guided safety contacts

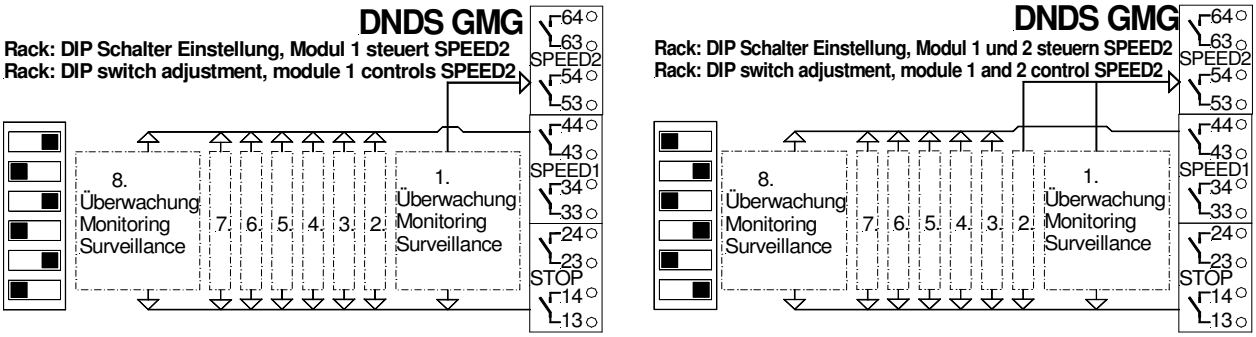
DNDS GMG:
SPEED 1 (33—34, 43—44) and
SPEED 2 (53—54,.63—64),
non delayed

DNDS GMG V1:
SPEED1 (33—34, 43—44)
non delayed.
SPEED 2 (57—58,.67—68)
0,5s off delayed.

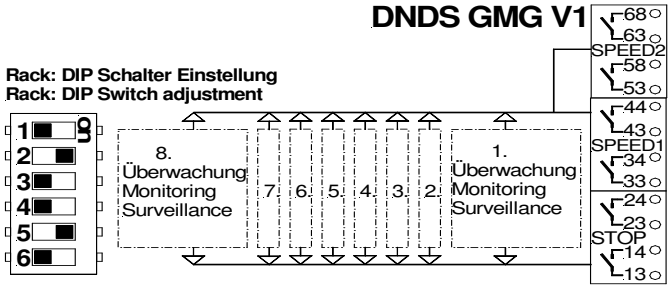
DNDS GMG T2:
The same Function as DNDS GMG but SPEED1 (33—34, 43—44) and
SPEED 2 (53—54,.63—64) **2s off delayed**

Warning: in the case of fault the delay time can be short or the contacts open at once.

Adjusting at the rack for DNDS GMG: adjusted by DINA.
The adjustment is as follows:
The 1. input module, left of the output module, control the contacts (53—54,.63—64).
The 1. and 2. input modules, left of the output module, control the contacts (53—54,.63—64).
This adjustment is only for equipment with more than 2 input modules useful.
The numeration of the input modules is from right to left.



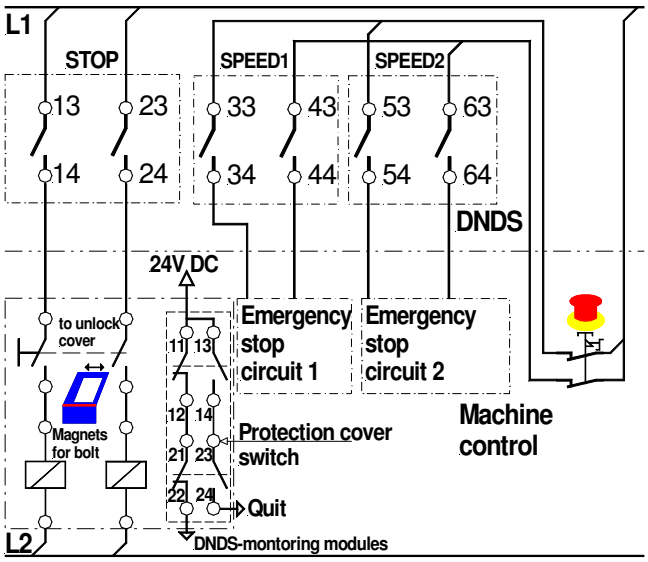
Adjusting at the rack for DNDS GMG V1: adjusted by DINA.



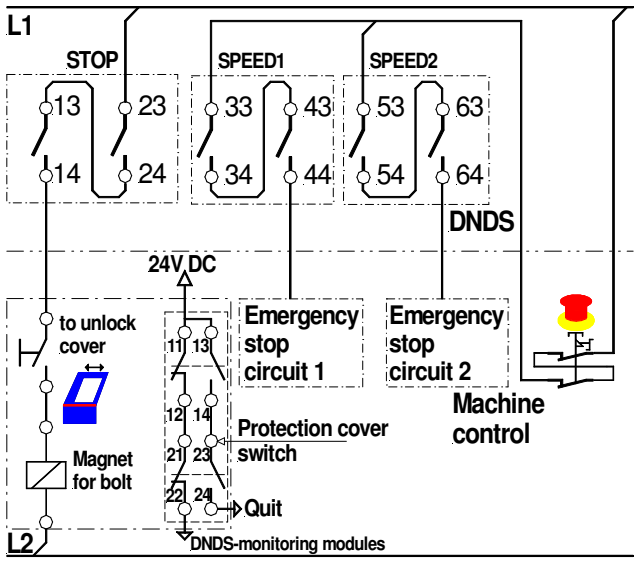
DNDS GMG: Applications of the outputs
STOP contacts Standstill monitoring
If one or more drives begin to move, the NO-contacts 13-14 and 23-24 open immediately. The output SO switch off. The LED STOP is not illuminated.
If all drives are in standstill the contacts **13-14** and **23-24** close. The output SO switch on, the LED STOP is illuminated.
SPEED contacts Motion monitoring:
The **Speed 1** NO contacts **33-34** and **43-44** for circuit 1 respectively **Speed 2** NO contacts **53-54** and **63-64** for circuit 2 are closed, if the speed of all monitored drives in the corresponding circuit are ≤ the programmed speed for the selected operation mode. (Standstill, mode1,mode2 or mode 3)
If one or more drives exceed the programmed speed of the function mode, the NO contacts **33-34** and **43-44** open respectively **53-54** and **63-64** for circuit 2 immediately. The LED SPEED goes off.
The drives may be stopped by emergency stop circuit (STOP category 0). See principal schematic below.
The contacts close again and the LED SPEED illuminates, if the actual speed on the triggering input module is 10% less then the programmed speed and the “automatic restart disable” function on the input module is inactive..
The overstepping of the programmed speed will be stored via LED SPEED at the triggering input module. The LED SPEED of this card stays dark, only if the drive is in standstill. This feature allows to see, which drive exceeded the programmed speed. If the drive is running within the allowed range, the LED SPEED illuminates. The stored information will be cleared by interrupting the power supply of DNDS for ≥ 2s. If the “automatic restart disable” function is selected on the triggering input module the power to the DNDS must be interrupted for ≥ 2s to reset the condition and get the output contacts closed again.

Usage of the contacts

Parallel connection of the outputs

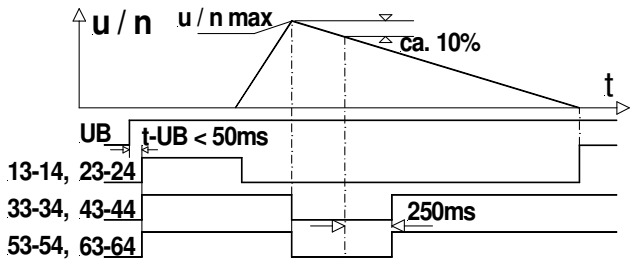


Serial connection of the outputs

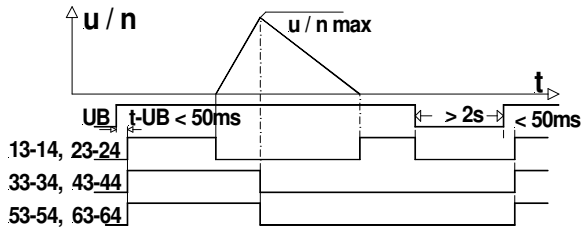


If it necessary the stop contacts can be serial, the speed contact can be parallel and contrary.

Function diagram
Speed output **without** restart disable

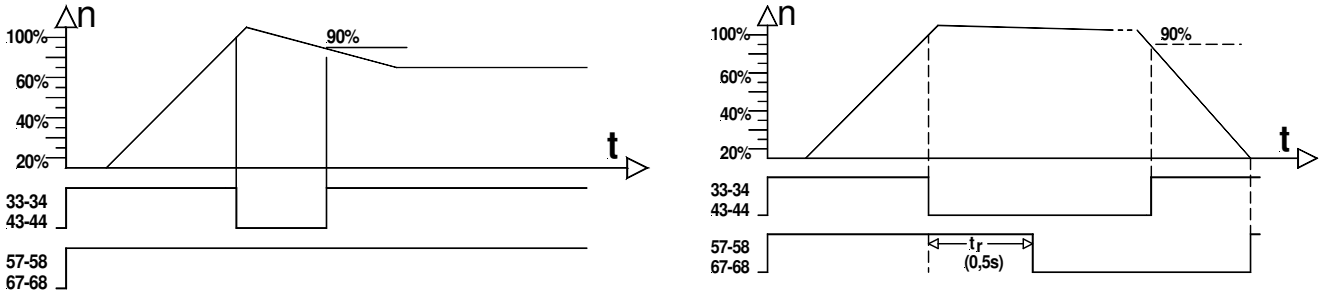


Function diagram
Speed output **with** restart disable.



Motion monitoring with DNDS GMG V1

The two SPEED outputs are triggered by all mounted monitoring cards.
The output contacts (33–34, 43–44) are non delayed.
The output contacts (57–58, 67–68) are 0,5s off delayed.
If the speed (Vmax) set on one of the monitoring cards is exceeded the NO contacts (33–34, 43–44) open. This contacts close again if the monitored speed falls to ≤ 90% of Vmax. If the speed of the monitored motion stays above 90% of (Vmax) for 0,5s after the speed (Vmax) was exceeded, the delayed NO contacts (57–58, 67–68) open. This contacts will only close again, if all monitored motions are in standstill.



DNDS GMG: Faults and Errors

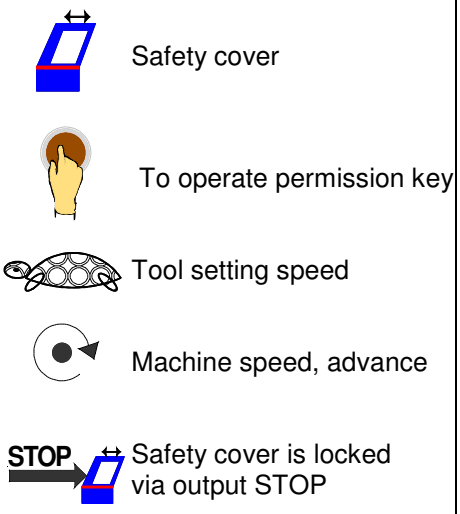
- The second output contact can not be switched on when the other output contact is welded.
- LED “SPEED” and “STOP” on the monitoring and output module do not illuminate.

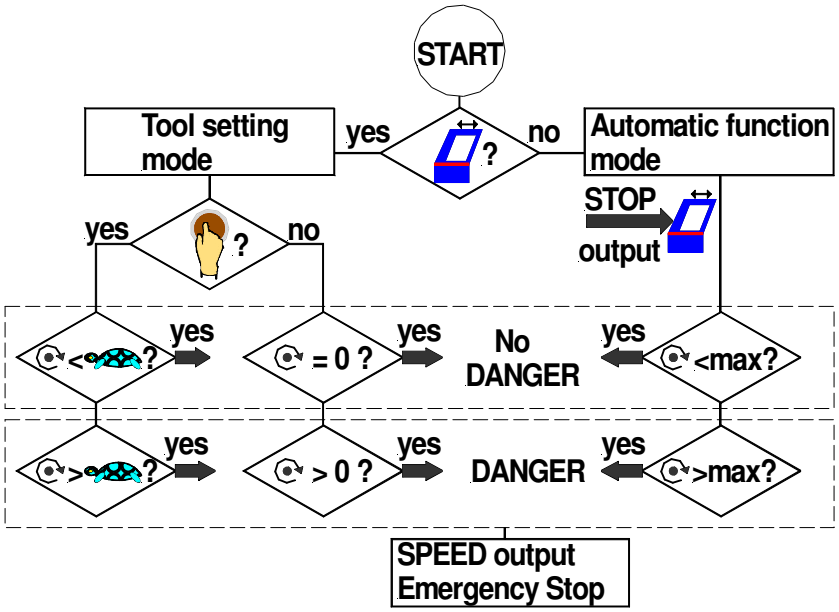
The encoder is not connected.
Proximity sensor failure.

- The LED STOP and SPEED on the output module flash: short illuminated, long not illuminated.

A contact does not close.

Function flow chart





Important remarks

Reaction times

The total reaction time is the sum of:

- Reaction time of the motion monitor and
- Fall time of the output relay (<20ms). and
- Fall time of any external 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 1000 Hz about 1 ms.

Fault trip will be stored in the unit and will be displayed via LED (see “Fault-Errors”). To reset the fault memory terminal A1 must be disconnected.

Installation

The safety relay must be cabinet mounted (min. IP 54). There are 2 screws left and right at the housing for DIN-rail attachment.

Operation

Please note for operation:

- To prevent a welding together of the contacts, a fuse (6 A slow acting) must be present in the output circuit.
- The total of the reaction times must not lead to a dangerous status.
- Use copper wiring that will withstand 60/75°C.

Important details in the section “Technical Data” should be noted and adhered to.

- Supply operating voltage to terminals A1 (+) and A2 (-).
- Programming

Wiring of the automatic mode at input modules with D- and F-inputs

The necessary D-inputs for the monitored speed have to connect directly to 24V DC.
The necessary F-inputs for the monitored speed have to connect to 24V DC via the switch of protection cover.

Wiring of the automatic mode at input modules with only D-inputs

The necessary D-inputs for the monitored speed have to connect to 24V DC via the switch of protection cover.

Wiring of the tool setting and the semi automatic mode at all input modules

Connect the SH-input for tool setting mode via safety switch to 24V DC.
Connect the R1-input for semi automatic mode via safety switch to 24V DC.

Measurement system

Connect an encoder for each monitoring system to the NC and DNDS via DNDA or use 2 PNP-proximity sensors for each monitoring system connected to IN1 and IN2.

Definition of the product type depending on the monitored drives and the used output module

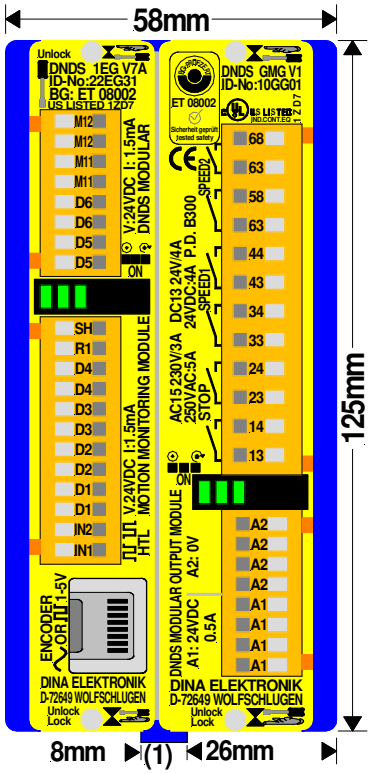
Equipment type	Number of the monitoring	Equipment type	Number of the monitoring	Equipment type	Number of the monitoring	Width in mm	Wight in g
DNDS 1PMG	1	DNDS 1VMG	1			58	500
DNDS 2PMG	2	DNDS 2VMG	2	DNDS 2GMG	2	80	600
DNDS 4PMG	4	DNDS 4VMG	4	DNDS 4GMG	4	125	900
DNDS 6PMG	6	DNDS 6VMG	6	DNDS 6GMG	6	170	1150
DNDS 8PMG	8	DNDS 8VMG	8	DNDS 8GMG	8	215	1400

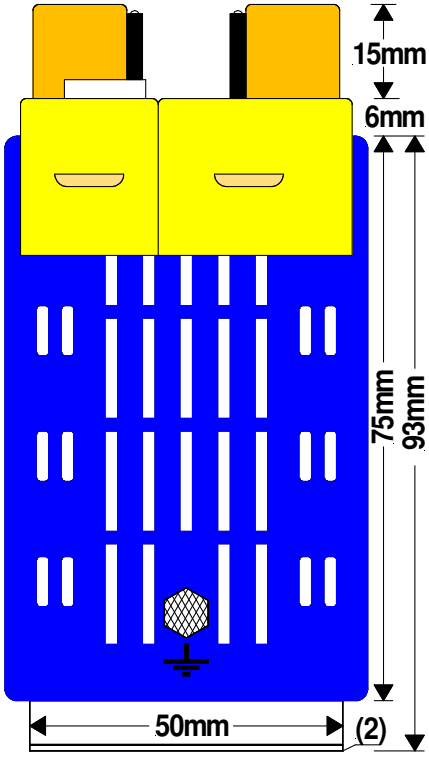
A blind cover can be used for the 4., 6. or 8. plug-in position, if the monitored machine has only 3, 5 or 7 drives.

Dimensions

DNDS 1VMG

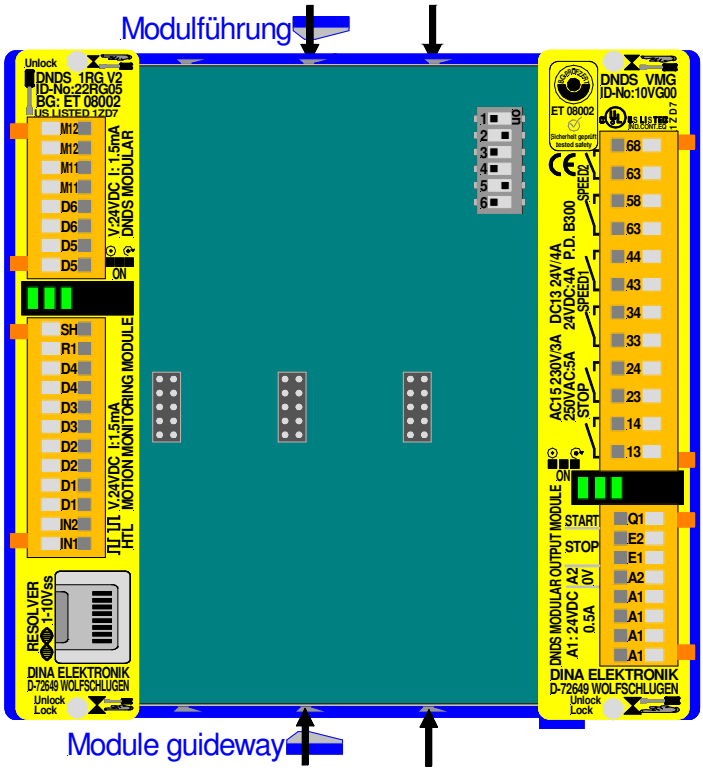
1)Earth screw 2)Attachment on rail



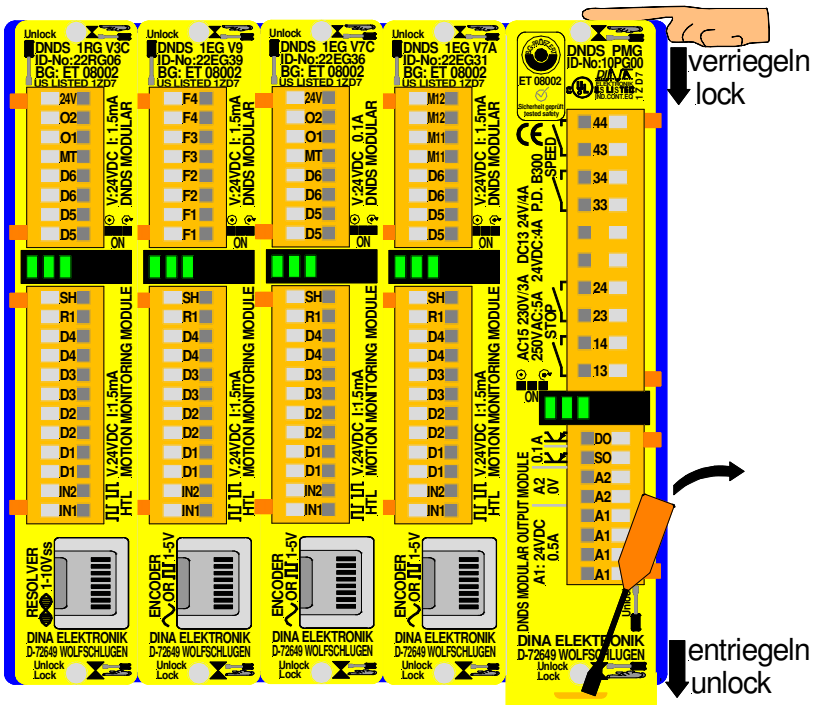


Installation

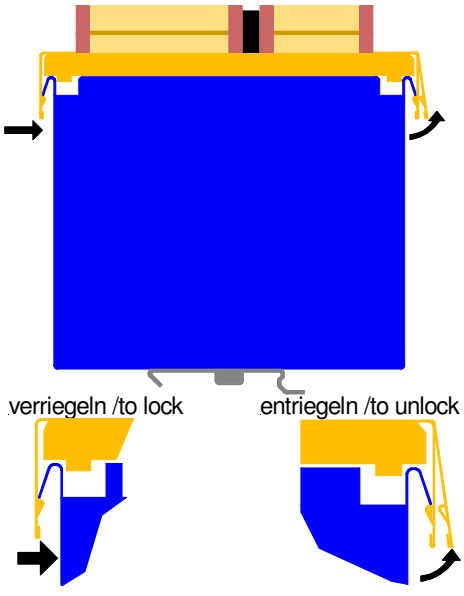
Module Installation



Module demounting, method 1



Module demounting, method 2



Technical data

Electrical data

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

Contacts

Safety contacts	
Standstill monitor STOP	13 14, 23 24
Motion monitor SPEED 1	33 34, 43 44
Motion monitor SPEED 2	53 54, 63 64 DNDS 2GMG to 8GMG only
Motion monitor SPEED 2	57 58, 67 68 DNDS 1VMG to 8VMG only
Contact material	AgNi10 + 5µm Au
Switching capability to Short-circuit strength	**EN 60947-4-1** **EN 60947-5-1** AC15: 230V / 3A DC13: 24V / 4A 200A/automat B6, 800A/safety fuse 6Agl
Switching voltage min./max.	AC/DC 10V/250V
Switching current min./max.	10ma/8A
Carry current	5A contingent on the environmental temperature
Mechanical life cycles	50 x 10^6
Electrical life cycles	AC 230V 6A cosφ (0,5Hz) > 1 x 10^5
Sum of currents for all contacts	≤ 16A
Typical response time/ fall-back time of the contact output	≤ 15ms
OS, Standstill monitor	0,1 A / PNP
OD, Motion monitor	0,1 A / PNP
O1 and O2 at DNDS 1EG V7C and 1RG V3C	0,1 A / PNP
Operating time	100 %

Loading capacity limit

Contact fuse protection, slow acting	6 A
Internal unit fuse protection	Minimal 1,25 A Maximal: Conductor protection

Maximum contact voltage	250V AC
Surge voltage strength	4KV, pollution degree 2

Environment conditions

Operating temperature	**DIN IEC 60068-2-3,** -10 → + 60°C
Storage temperature	**DIN IEC 60068-2-3,** -40 → + 85°C
Vibration tolerance on all 3 levels	Sinus 10 – 55Hz, 0,35mm, 10 Zyklen, 1 Oktave / min

Features

Maximal frequency at the RJ45 connector	300KHz, only DNDS 1EG VX
Maximal modulation frequency at the RJ45 connector	500Hz, only DNDS 1RG VX
Maximal frequency at IN1 and IN2	1500Hz
Repetition accuracy	**± 0,1 %**
Temperature dependency of the trigger point	**0,02 %/°C**

General information for the unit

Airgap creepage to	**VDE 0110 Teil1**
Max. lead cross section, Single-lead or core with crimpconnector	Input: 1 x 1,0 mm^2 Outputs: 1 x 1,5 mm^2
Housing material	Sheet steel, powder-coated

Protection

Only for cabinet mounting with minimal protection	IP 54
Snap-On clip	

Certificate

Deutsche Gesetzliche Unfallversicherung

Fachausschuss Elektrotechnik
Prüf- und Zertifizierungsstelle im BG-PRÜFZERT

certificate
no. **ET 08001**
dated **22.02.2008**

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 Modular (components: see attachment I)
Intended purpose:	

Testing based on:

2006/95/EG	„Low Voltage Directive"	
2004/108/EG	„EMC-Directive"	
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 with category 4 and PI e to perform.

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: **31.12.2012**

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.520.33/06-151-206 Gom/Ow

i.V. Dipl.-Ing. Stefan [illegible]
Manager of the Certification Body

Prüf- und Zertifizierungsstelle DGUV Fachausschuss ET

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@bgfe.de • www.bgfe.de/pruefstelle

PZB10E
09.07

In any case, the German original shall prevail.

Deutsche Gesetzliche Unfallversicherung

Fachausschuss Elektrotechnik
Prüf- und Zertifizierungsstelle im BG-PRÜFZERT

certificate
no. **ET 08002**
dated **22.02.2008**

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 modular (components: see attachment I)
Intended purpose:	

Testing based on:

2006/95/EG	„Low Voltage Directive"	
2004/108/EG	„EMC-Directive"	
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)
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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 with category 4 and PI e to perform.

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: **31.12.2012**

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.520.33/06-151-206 Gom/Ow

i. V.
Dipl.-Ing. Stefan Gommel
Manager of the Certification Body

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09.07

In any case, the German original shall prevail.

Deutsche Gesetzliche Unfallversicherung

Fachausschuss Elektrotechnik
Prüf- und Zertifizierungsstelle
Im BG-PRÜFZERT

Attachment I

to Type Test Certificate 08001
and BG Test Certificate 08002

Holder of the certificate:	DINA Elektronik GmbH
Product designation:	Drehzahl- und Stillstandswächter
Type:	DNDS Modular

Hereinafter performed products are part and parcel of the certitificates:

DNDS 1M bis 8M	(with DNDS OM output module)
DNDS 1PM bis 8PM	(with DNDS PM output module)
DNDS 1VM bis 8VM	(with DNDS VM output module)
DNDS 2GM bis 8GM	(with DNDS GM output module)
DNDS 1E V6	(input module for an incremental encoder measurement system)
DNDS 1E V7	(input module for an incremental encoder measurement system)
DNDS 1E V7A	(input module for an incremental encoder measurement system)
DNDS 1E V9	(input module for an incremental encoder measurement system)
DNDS 1R V1	(input module for a resolver measurement system)
DNDS 1R V2	(input module for a resolver measurement system)

In plastic and metal housing. Metal housing components have the letter „G" add-on at the end of component name. Example: DNDS 1EG V7A

Az.: NP.520.33/06-151-206 Gom/Ow
Köln, den 22.02.2008

Prüf- und Zertifizierungsstelle DGUV Fachausschuss ET

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