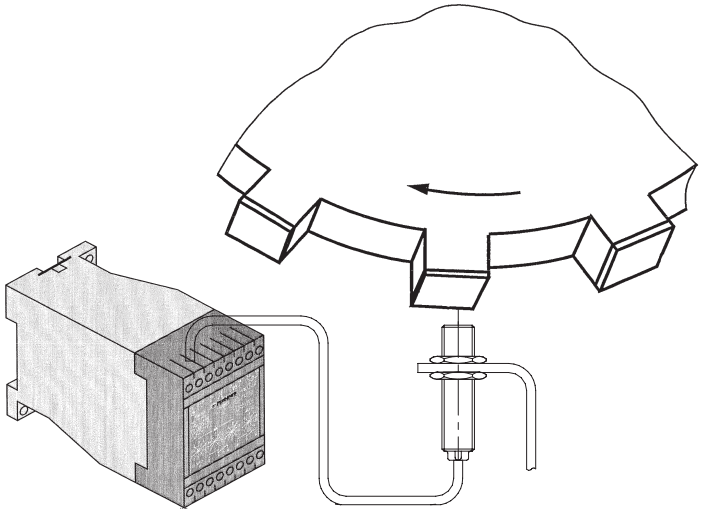
Operating Instructions

BA 1560 EN 11.04

EWD Speed Monitoring Device



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Caution!

Installation and start-up must be carried out by properly trained specialist personnel. Please read these operating instructions carefully before starting up. We accept no liability for personal injury or damage due to incorrect handling.

The EWD complete system must not be used in potentially explosive environments as defined in Guideline 94/9/EC!

1. Application

The "Electrical Speed Monitor" **(EWD)** speed monitoring device has application wherever a set rotary speed is to be monitored for adherence to the setting. It can be used with all rotary drives. This universally applicable speed monitoring device comprises the EWD/20...250VUC speed monitor, a contactless pulse generator and a trip cam made of ferrous metal.

2. Operation

When energising material (e.g. a steel cam) passes through the active switching zone of the pulse generator, a pulse is triggered in the pulse generator. This sequence of pulses is monitored by the EWD/20...250VUC speed monitor for adherence to a set required value.

3. Mounting

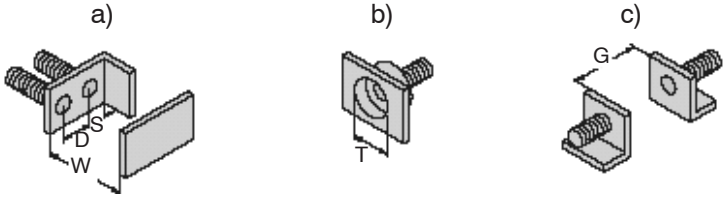
3.1 Pulse generator

The pulse generator must be mounted vibration-free on a fixed bracket or part of the bell housing. The pulse generator of the EWD system can be fitted flush, that is, the active surface of the pulse generator can be set flush in a holder or bell housing made of e.g. steel (screwed in) (see item 3.2).

3.2 Examples of fitting and minimum distances of pulse generators

a) Fitting with two sensors one beside the other
b) Fitting in a cylindrical cavity
c) Two sensors with active surfaces facing each other

Minimum distances:	
Distance D	2 x d
Distance W	3 x S_n
Distance T	3 x d
Distance S	1.5 x d
Distance G	6 x S_n



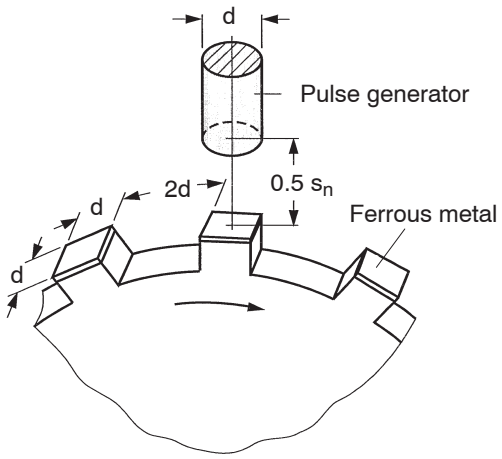
Description abbreviation, see item 4.

3.3 EWD speed monitor

The speed monitor must preferably be installed in a switch cabinet of the existing control system.

4. Selecting trip cams and calculating the cut-out time

For precise speed monitoring the trip cams, switching flags, screw heads, etc., made of **ferrous metal** must be distributed evenly around the circumference.
To achieve a precise cut-out in the event of a fault, the number of pulses per revolution must be increased by means of a cam. The number of cams must be selected so that the cut-out takes place at the right time for the drive.



n	=	1/min
n_N	=	Number of trip cams
S_n	=	Rated switching distance
d	=	Diameter of pulse generator
2d	=	min. distance trip cams
t_{ab}	=	cut-out time in sec.

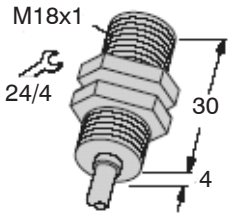
Calculation of the cut-out time

$$t_{ab} = \frac{60}{n \times n_N}$$

5. Component description

5.1 Pulse generator

Type: Bi5-G18-Y1



5.1.1 Technical data pulse generator

Type designation	Bi5-G18-Y1
Rated switching distance S_n	5 mm
Fitting condition	flush
Hysteresis	1 to 10 %
Repeatability	≤ 2 %
Temperature drift	≤ 10 %
Ambient temperature	– 25 °C to + 70 °C
Voltage	nom. 8.2 V
Current requirement unactuated	≥ 2.1 mA
Current requirement activated	≤ 1.2 mA
Switching frequency	≤ 1 kHz
Starting function	two-wire, to EN 60947-5-6 (NAMUR)
approved in accordance with	KEMA 02 ATEX 1090X
Inner inductivity (L_i) / capacity (C_i)	150 nF / 150 µF (values for pre-assembled cables up to 30 m)
Device identification	II 2 G EEx ia IIC T6 (max. U_i = 15 V, I_i = 60 mA, P_i = 200 mW)
Type	Threaded tube, M18 x 1
Dimensions	34 mm
Housing material	metal, CuZn, chromium-plated
Material active surface	plastics; PA12-GF30
Tightening torque housing nut	25 Nm
Wire	LiYY, 2 m; 2 x 0.5 mm^2
Vibration strength	55 Hz (1 mm)
Shock resistance	30 x g (11 ms)
Type of protection	IP 67

Caution! **If other pulse generators are used, the relevant data sheet in the documention must be consulted for the technical data!**

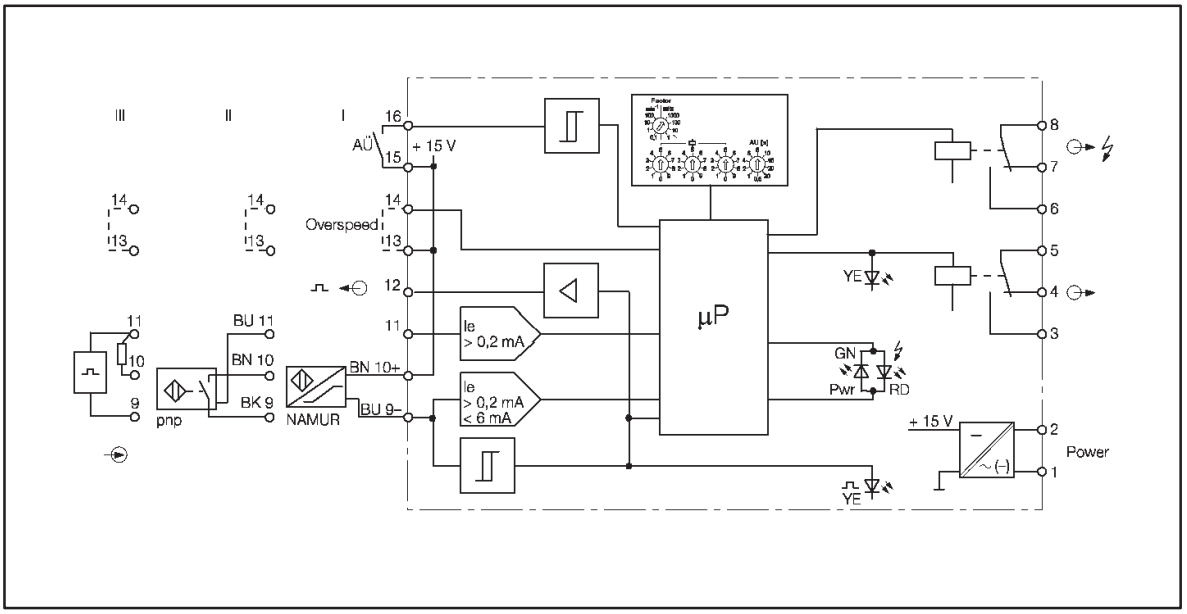
Connection:

The pulse generator and speed monitor are connected by a twin-core cable. The max. cable length is with 1.0 mm^2 cross section 500 m.

Caution! **The feed cable is always separate and must not be incorporated into multi-core cables (risk of coupling disturbing voltages in).**

5.2 Connection, operation and setting of the evaluating instrument (speed monitor)

5.2.1 Terminal assignment



1 - 2 Operating voltage connection

3 - 5 Limit relay output

6 - 8 Fault signal relay, is de-energised in the event of a fault (wire breakage or short circuit)

9 - 11 Sensor connection in accordance with block diagram (III: $R_{10\text{-}11}$ = 1 to 10kΩ)
9 bu, 10 bn Pulse generator connection of the EWD system

12 Continuous switching output for further transmission of the sensor switching condition

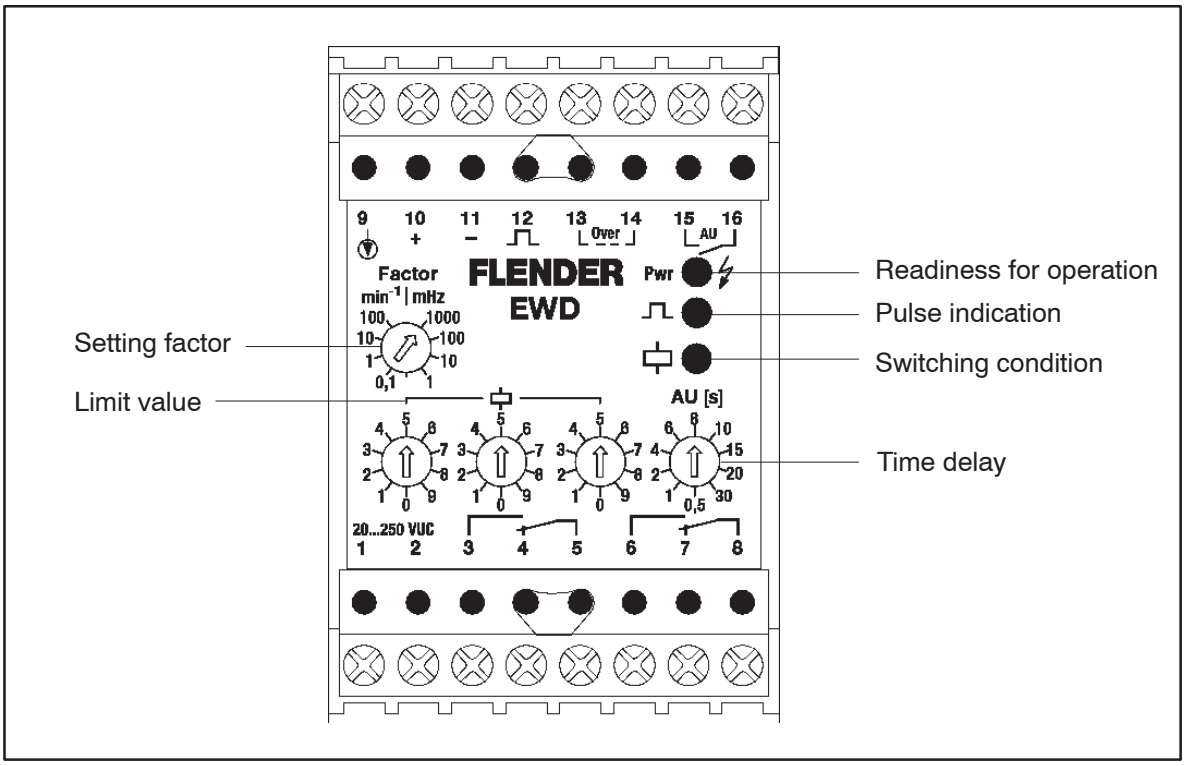
13 - 14 Programming the speed monitoring system:

- Open bridge:
  Monitoring for too low speed, limit relay de-energised in the event of too low speed.
- Closed bridge:
  Monitoring for too high speed, limit relay de-energised in the event of too high speed.

15 - 16 Delayed timing (only with monitoring for too low speed):

- If the operating voltage is switched on with the bridge closed or the bridge closed with the operating voltage on, the limit relay will be forcibly energised for the period of time set on the AU rotary switch and the ”Speed too low” signal blocked in the starting phase.
- Dynamic transmitter-circuit monitoring:
  If during the monitoring for excessive speed and with the bridge closed no pulses are emitted for the time set on the AU rotary switch, the two output relays are de-energised.

5.2.2 LED display function and function setting



5.2.2.1 LED display function

Readiness for operation Pwr

green:	Device is ready for use
red:	Invalid switch setting, or in the case of NAMUR sensors wire breakage or short circuit, relay de-energised.

Pulse indication

yellow:	pnp switch closed NAMUR sensor (EWD) not loaded.

Fault diagnosis in the case of NAMUR sensors:

yellow:	Wire breakage in sensor conductor
dark:	Short circuit of sensor conductor

Switching condition

yellow:	Limit relay energised

5.2.2.2 Function setting

Time delay AU [s]

Delay time:
If the value is ”too low”, the time in which the limit relay remains forcibly energised after activation of the time delay is set in seconds on the rotary switch.
Dynamic transmitter-circuit monitoring:
If the value is ”too high”, the time within which pulses must be received from the sensor is set in seconds on the rotary switch, otherwise both output relays are de-energised.

Setting factor (see item 5.2.2)

The rotary switch is used to set the multiplication factor and the unit of limit value (1/min or mHz).

Limit value ⊏|

The rotary switch is used to fix the limit value, multiplied by the setting factor.
(see Setting examples limit value, item 5.2.3)

5.2.3 Examples of limit value settings

a) The three highest-value places of the limit value are set. The value 1 000 is set with the 000 positions.

b) If necessary, a more precise setting of the limit value is possible by converting from 1/min <=> mHz.

c) In the case of limit values below 0.1 1/min conversion (x 16.67) to MHz must be carried out and this value set.

d) In the case of limit values above 1 000 Hz conversion (x 60) to 1/min must be carried out and this value set.

Example	Limit value	Setting factor	Multiplier (Limit value)
a	5.7 Hz	100 mHz	0 5 7
a	1540 1/min	10 1/min	1 5 4
b	1776 1/min	10 1/min	1 7 7
	more precisely:	100 mHz	2 9 6
c	0.06 1/min	1 mHz	0 0 1
d	1200 Hz	100 1/min	7 2 0

Caution!

Care must be taken that the rotary switches lock in the desired positions!

When monitoring for a drop below a set speed, the timing delay must be set to match the acceleration time of the drive at least!

The evaluating instrument has not been preset at the factory!

5.2.4 Technical data speed monitor

Type designation	EWD/20...250VUC
Operating voltage	20 to 250 VAC/DC
Net frequency	40 to 70 Hz
Power requirement	≥ 4.5 VA
Monitoring range	0.01Hz to 1660 Hz or 0.6 to 100 000 1/min
Input frequency	≤150 000 1/min
Pulse time	≥ 0.2 ms
Pulse pause	≥ 0.2 ms
Hysteresis	approx. 10 %
Delayed timing/start monitoring	0.5 to 30 s (in 10 steps)
Reproducibility	≤ 0.1 %
Temperature drift	≤ 0.005 %/K
Air and surface leakage paths	
Input circuit to output circuit	≥ 4 mm
Input circuit to supply	≥ 4 mm (for 230 VAC)
Test voltage	2 kV (for 24 VDC 500 V)
Input circuits	NAMUR/three-wire, pulse-switching
NAMUR input terminal: 9/10	to EN 60947-5-6 (NAMUR)
Working values	U_0 = 8.2 V; I_k = 8.2 mA
Switching threshold	1.4 mA ≤ I_e ≤ 1.8 mA
Wire breakage threshold	≤ 0.15 mA
Short circuit threshold	≥ 6 mA
Three-wire input	pulse-switching, terminals 9 to 11
Working values	U ≤15 V; I≤ 30 mA
0-signal	0 to 5 VDC
1-signal	10 to 30 VDC
Output circuit	two relay outputs and continuous-switching output
Relay output/fault signal output	1 changeover switch each
Switching voltage	≤ 250 V
Switching current	≤ 2 A
Switching power	≤ 500 VA / 60 W
Contact material	AgCdO + 3 µ Au
Continuous-switching output	14 V/10 mA, (terminals 11/12) short-circuit-proof
Mounting housing	WxHxD: 50x75x110 mm, polycarbonate/ABS
Fixing	Floor mounting or snap-on fixture to top head rail (DIN 50 022)
Connection	2 x 8 screw terminals
Terminal cross-section	≤ 2 x 2.5 mm^2 or 2 x 1.5 mm^2 with multi-core cable ends
Type of protection (IEC60529/EN60529)	IP 20
Operating temperature range	– 25 to + 60 °C

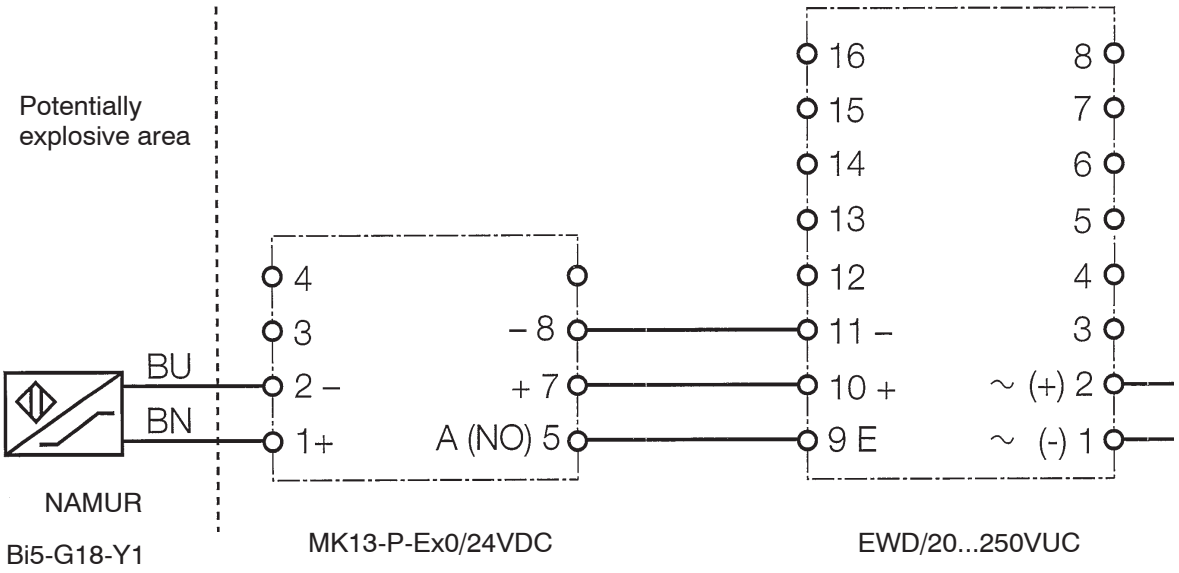
6. Use in potentially explosive environments

When using the EWD system in a potentially explosive environment, an isolation amplifier must be connected in series with the EWD/20...250VUC speed monitor (see item 6.1.1). Here only the pick-up current circuit is designed to be intrinsically safe (EEx-i). The isolation amplifier and speed monitor must not be located in the potentially explosive area.

If an isolation amplifier is used for the ”potentially explosive environment”, only the wire-breakage identification must be active for the power supply lines. Wire breakage and short circuit on the output conductor of the pick-up are not signalled via the fault signal relay but via the output relay through too low speed.

6.1 Isolation amplifier

6.1.1 Connection values



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6.1.2 Technical data isolating switch amplifier

Type designation	MK13-P-Ex0/24VDC
Operating voltage U_B	10 to 30 VDC
Residual ripple W_{ss}	≤ 10 %
Current requirement	approx. 20 mA
Electrical isolation	Input circuit to output circuit and supply voltage for 250 V_{eff}, test voltage 2.5 kV_{eff}
Input circuit	to EN 60947-5-6 (NAMUR)
Working values	
Voltage	8.2 V
Current	8.2 mA
Switching threshold	1.55 mA
Hysteresis	typically 0.4 mA
Wire breakage threshold	≤ 0.1 mA
Short circuit threshold	≥ 6 mA
Output circuit	two transistor outputs
Drop in voltage	≤ 2.5 V
Switching current per output	≤ 100 mA, short-circuit-proof, pulse-switching
Switching frequency	≤ 3 kHz
Approval for use in potentially explosive areas according to Certificate of Conformity	TÜV 03 ATEX 2235
Maximum values	
No-load voltage U_0	≤ 9.9 V
Short circuit current I_k	≤ 12 mA
Power P_0	≤ 30 mW
Max. external inductances/capacitances	
[EEx ia] IIB	2/10/20 mH/5/3.6/3.2 µF
[EEx ia] IIC	1/5/10mH/1.1/0.79/0.7 µF
Device identification	II (1) GD [EEx ia] IIC
LED displays	
Readiness for operation	green
Switching condition/fault signal	yellow/red (two-colour LED)
Mounting housing	WxHxD: 18x89x70 mm, polycarbonate/ABS
Fixing	Floor mounting or snap-on fixture to top head rail (DIN 50 022)
Type of protection	IP20
Terminal cross-section	≤ 2 x 2.5 mm^2 or 2 x 1.5 mm^2 with multi-core cable ends
Operating temperature	– 25 to + 70 °C