Rotational Speed Monitor  
MC 25-121Ex0-LRP/24VDC

- Intrinsically safe input circuit [EEEx ia] IIIC with static wire-break and short-circuit monitoring
- For use with either NAMUR sensors or 24 VDC input
- Operating range 10 mHz...2 kHz (0.6...120 000 min⁻¹)
- Easy adjustment:
  - upper limit
  - lower limit
  - setpoints 1 and 2
- Adjustable attenuation factor
- Adjustable display scaling 0.001...2000
- Voltage output 0...10 V
  Current output 0/4...20 mA
- One relay and one transistor output each for setpoint 1 and 2
- Hysteresis adjustable for both setpoint outputs (1...30 %)
- Pulse output
- Internal interface for parameter programming via PC

This unit can accommodate the following input devices:
- one intrinsically safe NAMUR input with static monitoring for wire-break and short-circuit condition (II), or
- one non intrinsically safe 24 VDC input without input monitoring function (I).

The type of input device is selected at the time of programming.

The current signal output 0/4...20 mA and the voltage signal output 0...10 V may be used at the same time. Two relay outputs and two pnp short-circuit protected transistor outputs are available for setpoint indication.
Rotational Speed and Motion Controls

Additional control devices can be operated via the short-circuit protected pulse output (d6). Terminal d6 is also used as the input for pnp 3-wire sensors.

The setpoint outputs are independently adjustable. This device offers the ability to change functions from overrange to underrange monitoring. When the speed rate falls between the high and low setpoints, the setpoint outputs are activated (relay contacts open and transistor not conducting). When the speed rate falls below the low preset value or exceeds the high preset value, the setpoint outputs are deactivated (output relay contacts open and transistor not conducting).

The intrinsically safe NAMUR input circuit is monitored for wire-break and short-circuit condition. The setpoint outputs will deactivate during a malfunction, an "err" (Error) message will flash on the four digit display and the green 'Power' LED changes to red.

The parameters for the current monitoring function during a wire-break or a short are programmable. When a fault in the input circuit occurs, then the current output is either 0 mA or ≥ 22 mA.

This unit operates on the digital pulse principle which provides very short response times. To generate the output signal it measures the time between two consecutive input pulses. The next pulse updates the output signal.

The output signal is updated whenever the last measured digital pulse is exceeded or when pulses are suddenly missing. This means if no pulses are received, the output signal continuously drops to 0/4 mA relative to the overrange time of the last measured digital pulse.

For signal steadying an adjustment factor can be set between 1 and 30. When the factor is set to 1 (1 pulse), no signal attenuation takes place. The attenuation principle is based upon the floating average from the adjusted number of pulses.

In addition to the signal attenuation, an extra range factor (scaling factor) can be set. The range factor is a multiplier for the input signal adjustable from 0.01...2000 (0.001...2000 via PC). The range factor allows the display and the indication of the analogue output in measuring units other than Hz. The display shows the actual frequency multiplied by the factor.

Suppose we would be monitoring a shaft key on drives or conveyors to get a display as well as an analogue output indication directly in m/s (conveyor speed). Here it is only necessary to determine the transmission ratio of the motor to the conveyor.

Should only min⁻¹ be displayed instead of Hz, then the factor must be set to 60. Additional targets put on the motor can also be factored in (for instance display in min⁻¹ with two targets = 60/2 = factor 30).

Card parameter programming is accomplished either with two toggle switches in the front, or with personal computer (PC). The following parameters can be pre-selected to display:

- upper limit of range
- lower limit of range
- setpoint 1
- setpoint 2
- current output 0...20 mA/4...20 mA
- NAMUR input/pnp input
- analogue output function during fault condition: 0 mA/ ≥ 22 mA
- attenuation constant
- range factor
- hysteresis of setpoint outputs
- start-up delay
- setpoint function (underrange/overrange)

The selected parameter is indicated by a front LED. The value of the parameter will be displayed on the four digit display.

Start-up Time Delay

During drive system start-up (zero speed) an underspeed control would inhibit the system from starting. Therefore, underspeed controls incorporate an adjustable time delay to allow for start-up time. During the start-up time delay the output relays will be energised.

The start-up time delay is triggered by applying 24 VDC to z6, or when power for the speed monitor is applied.
Type  | MC25-121Ex0-LRP/24VDC  
Ident-No. | 90 545 11  

Supply Voltage $U_B$ | 20.4...27.6 VDC  
Ripple $W_{rp}$ | $\leq 10\%$  
Power/Current consumption  | $< 200\text{ mA}$  
Galvanic isolation  | between input circuit, output circuit and supply voltage for 250 V$_{rms}$, test voltage 2.5 kV$_{rms}$  

Input Circuit  | alternatively: NAMUR input/24 VDC input  
- NAMUR input (zd32)   | intrinsically safe per EN 50014/20 for NAMUR sensors  
- 24 VDC input (d6)   | for 3-wire sensors, mechanical contacts  
- Overrange protection  | NAMUR input: up to $3\text{ kHz}$; 24 VDC input: up to $4\text{ kHz}$  

Output Circuits  |  
Voltage output  | 0...10 V ($R_L = 2\text{ k}\Omega$)  
Current output  | 0/4...20 mA (load $\leq 600\text{ }\Omega$)  
- Transistor output  | pnp, short-circuit protected ($I_L \leq 50\text{ mA}$)  
- Relay output  | 1 dry SPDT contact  
Switching voltage  | $\leq 250\text{ VAC/DC}$  
Switching current  | $\leq 2\text{ A}$  
Switching capacity  | $\leq 500\text{ VA/60 W}$  
Contact material  | silver-alloy + 3 µm Au  
Additional pulse output  | transistor output: pnp, short-circuit protected ($I_L \leq 50\text{ mA}$)  

Ex-Approval acc. to Certification of Conformity  | PTB-Nr. Ex-86.B.2077X  
Input circuit  |  
- Maximum nominal values  |  
No-load voltage $U_0$  | 10.5 V  
Short-circuit current $I_k$  | 13.7 mA  
- Maximum external inductances/capacitances [EEx ia] IIC  | 5 mH/550 nF  

Interface  | RS232 serial/V.24 via adapter MC-IM-232  

Transfer Characteristics  |  
Effective range  | 10 mHz...2.0 kHz (0.6...120 000 min$^{-1}$) upper and lower limit adjustable  
Linearity tolerance  | $\leq 0.1\%$ of final value (typically 0.03 $\%$)  
Effect of load impedance  | $\leq 0.01\%$ of final value  
Effect of input voltage  | negligible  
Ambient temperature sensivity  | $\leq 0.005\% / K$ of final value  

LED Indications  |  
- Power "ON" (2-colour LED)  | green: device operating - red: fault  
- Limit values (2-colour LED)  | green: programming mode - yellow: at preset value  
- Speed range limit selected  | green  
- Programming mode for card parameters  | green  
- Pulse indication  | yellow  
- Multiplier ("x 10", "÷ 10")  | red  
- Display  | red (4 digits)  

Eurocard  |  
Material  | glass-fiber reinforced epoxy resin, quality class FR4  
Front panel  | plastic, $4\text{TE} = 20.32\text{ mm}$ individually interlocking  
Connection  | connector per DIN 41612, type F, 32-pole (series z+d)  
Operating temperature  | -25...+60 °C  
Coding No.  | 15