SCHISCHEK
E X P L O S I O N P R O O F

Universal
EEx-i Transducer
for passive Sensors

Transducer 24 VAC/DC, with intrinsically safe circuits for passive sensors in hazardous locations Zones 0, 1, 2, 20, 21, 22; with display   **Serie EX-LINE**   **Type EXL-IMU-1**

APPLICATION

The transducer is an associated intrinsically safe device for transmitting signals of passive sensors in hazardous areas into safe area's   like Pt100, Ni1000, resistor sensors .... . The sensor signals are transformed in signals (0...10 V- and 0...20 mA). The programming and adjustments of sensors are carried out on the device. Different sensor characteristics are integrated (see table 1).
Each module has a back light LCD display, which is used for programming, to indicate alarm signals and during operation. The display shows the actual value. A potential free contact is integrated for error recognition.
The measurement ranges of sensors and the output signals can be adjusted to any requirements of the system. For programming no tools are neccesary. The menu prompt is indicated over the display.

TECHNICAL DATAS

Supply/Frequency	24 VAC/DC +/- 20 %, 50...60 Hz
Nomimal current, Power consumption	100 mA, ca. 3,6 W, internal fuse without socket
Sensor input	Intrinsically safe circuit for passive sensors
Suitable sensors	see table 1
Sensor selection	accomplished by the customer, with menu prompt
Programming	direct on device, without additional tools
Sensor connection	2-3-4 wire on light blue terminals
Wire compensation	2-wire push button, 3- and 4 -wire automatically
Acceptable wire resistor	< 100 Ohm
Stability	stability < 0,2 % / year, temperature influence < 0,02 %/K, supply voltage influence < 0,01 %, setting time 0,5 sec.
Accuracy	< 0,3 % end value
Galvanic isolation	between out-, input and supply voltage
A/D-converter	measure range 16 Bit, outputs 12 Bit
Outputs	Voltage U and current I parallel available with tie point (GND)
Outputs are protected	against short circuit and separate source voltage < 30 V
Voltage output U	0...10 V- adjustable, burden < 500 Ω, influence < 0,05%
Current output I	0...20 mA adjustable, burden < 750 Ω, influence < 0,1% open circuit voltage < 26 V
Signals in alarm mode	increase or decrease selectable, 0 V-/0 mA or 10 V-/20 mA
Display	4 1/2 digits LCD-Display + special signs, back light status indication and actual value display (blank)
Buttons	Push button for configuration/active mode, 5 buttons for setup. setup, menu prompt and parameter per display
Failure / alarm indication	over 1 potential free contact + output + display
Detection	faulty sensor connected, short circuit, wire break
Alarm indication 1 and 2	over contact and analogue output U/I, programmable
Failure- / alarm contact	Break contact, 24 V max. 1 A
work-/storage temperature	-10...+ 50 °C / -40 ...+ 80 °C
Electrically connection	Terminal, IP 20, max. 4 mm²
Housing	Plastic, IP 40, for Din Rail mounting acc. to EN 50022
Dimensions and weight	w x h x l 45 x 75 x 110 mm, ca. 190 g
Type of protection	II(1)GD [EEx ia] IIC,acc. to EN 50014/ EN 50020 associated intrinsically safe device
Protection class	PTB 03 ATEX 2092, for sensors in Zone 0, 1, 2, 20, 21, 22
CE 0158	94/9/EG (ATEX), 89/336/EG (EMC)
Included in price	**EXL-IMU-1** EEx-i Module with actual value display
Installation area	Module in safe area, sensors in hazardous locations

II(1)GD [EEx ia] IIC
Zone 0, 1, 2, 20, 21, 22
PTB-approved acc. to ATEX

CE Ex

CONNECTABLE SENSORS - TABLE 1

Sensor table	Range	Characteristics	unit
Pt 100 DIN	-200..+850°C	temp.-linear	°C
Pt 500/1000 DIN	-200..+850°C	temp.-linear	°C
Ni100/200/500/1000 DIN	-60..+180°C	temp.-linear	°C
LS-Ni 1000 (Siemens)	-30..+130°C	temp.-linear	°C
KP 250 (Kieback&Peter)	-50..+150°C	temp.-linear	°C
LF 20 (Honeywell Special 1)	-20..+100°C	temp.-linear	°C
Resistor without slider	0... 1 kΩ	resistor-linear	variable
in display figure 2	0... 10 kΩ		
Resistor with slider	0... 10 kΩ	resistor-linear	variable
in display figure 3	0... 1 kΩ		
DFK-.. (Special 2)	x...y Pa	angle linear	Pa
VFK-.. für VAV (Special 3)	x...y m/s	angle SQRT	m/s

EEx-i circuits - TABLE 2

Nominal value		Maximal value on the terminal	
		II(1)GD [EEx ia] IIC	II(1)GD [EEx ia] IIB
Terminals		**22-23-24-25**	**22-23-24-25**
Voltage	U_0	7,5 V	7,5 V
Current	I_0	5 mA	5 mA
Power	P_0	10 mW	10 mW
Capacity	C_0	1,2 µF	4,9 µF
Inductivity	L_0	10 mH	50 mH

The maximum values must not be exceeded!
Please check your external capacities and inductivities in acc. to the length of the cable and the method of installation.
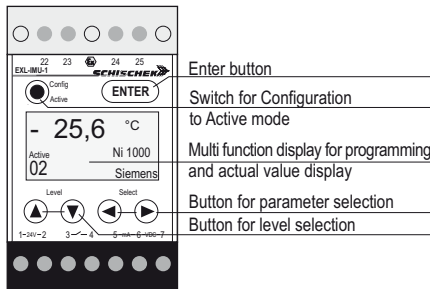
ATTENTION!

- For installation or maintenance official standards and rules must be adhered to!
- The energy of intrinsically safe circuits are below the level to start an explosion in the event of a spark.
- Intrinsic safe circuits must be installed with light blue coloured cables`s and separate installed from non intrinsic safe circuits. Distance between terminals of intrinsic safe circuits and non intrinsic safe circuits must be a minimum of 50mm.
- The EXL-IMU-1 modules must be installed in the safe area. Sensors must be passive and potential free for use in hazardous locations in zone 0, 1, 2 and 20, 21, 22.
- For applications in zone 20 and 21 you may use only sensors which apply the category 1D or 2D. In zone 0 only sensors which apply the category 1G
- Pay attention to the max values for sensors and wiring , listed in table 2.

ELECTRICAL CONNECTION

Temperature-/Humidity sensors   Resistors linear, Potentiometer

Contact* = potential free contact for failure, alarm and limit indication at failure contact is open

Programming and Setup "Step by Step"

| Enter button |
| Switch for Configuration to Active mode |
| Multi function display for programming and actual value display |
| Button for parameter selection |
| Button for level selection |
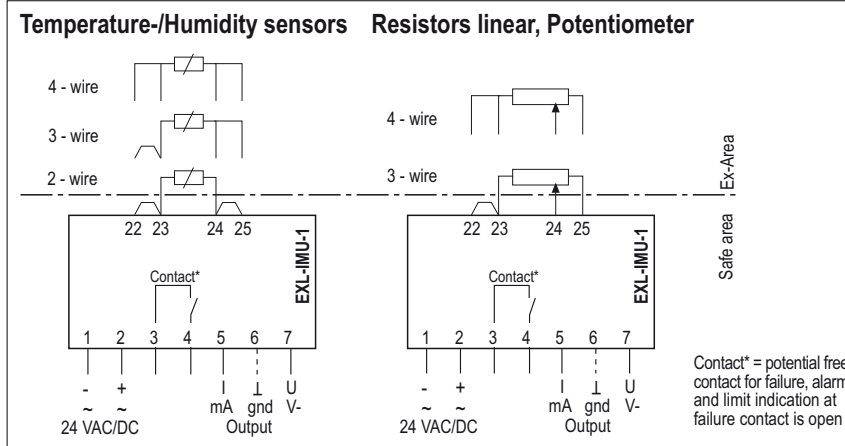
Switching Configuration - Active

With the switching between "Active" = Operating modus and Config" = Configuration mode, changes from the working function into the programming function. The switching from Active to Config is made by pushing one time the Config button (ConF in display) and then push the ENTER and Level up buttons at the same time.
After setup, start the active mode by pushing the config button.

Active → Config
1. ●
2. (ENTER) + (▲)

Config → Active
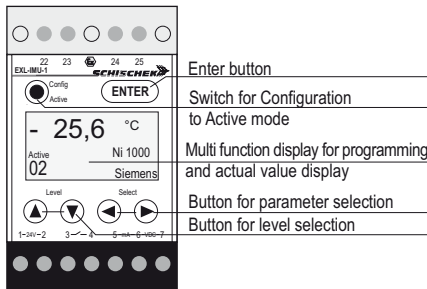1. ● 1 x

Failure- and Alarm Indication

Different failure or alarm signals are indicated by contact and by display warnings. The following pictures show the most common errors and there cause.

Display — **Failure**

Actual display value is flashing at low measuring range

Sensor error, actual value is lower than adjusted range or there is a short circuit fault at wiring. Contact is active - display shows Error Sensor Range

Display actual value is blinking at high measuring range

Sensor error, actual value is higher than ajusted range or the wiring is open. Contact is active - display shows Error Sensor Range

value over or under measurement range

Value is over or under adjusted range Display shows Error Range, Contact isn`t active

Error status at wire compensation

Wire resistors more than 100 Ohm aren`t accepted.

Notes to Sensors

For the following sensors there are separate datasheets for programming and setup available:
Sensor type   Ring balance, Potentiometer

Resistors with and without slider are different in the setup Level 01. Without slider is figure 2 + resistor value and with slider is figure 3 + resistor value.

Ring balance linear and root extraction (m/s) are different in Level 01 Sensor selection. Special 2 is linear for Δp and Special 3 for m/s

TEMPERATURE SENSORS

Connection	**Example**: Pt100 DIN 2-wire
Range	- 20...100 °C
Output	2-10 V, 4-20 mA
Limit low	0°C
Limit high	80°C

Active → Config   1. ● 1x   2. (ENTER) + (▲)

Level	Function	Display	Select
01	Select sensor type	Sensor Pt 100 DIN 01	Pt 100 DIN
02	Select 2-3-4 wire	2 Pt 100 DIN 02 Wire	2-wire
03	wire compensation	Start Pt 100 DIN 03 Wire Compensation	ENTER Sensor short circiut, ENTER
04	Select start of measuring range	- 20.0 °C Range Pt 100 DIN 04 Start	- 20 °C
05	Select end of measuring range	100 °C Range Pt 100 DIN 04 End	100 °C
06	Select unit		
07	Select decimal point	The functions in Level 06 .. 09 are at temperture sensors preseted. Unit is °C, Decimal point is 0.1°C Begin and end measuring values depends on sensor type	
08	Select start of display value		
09	Select end of display value		
10	Output V/mA in fault conditions high or low	Pt 100 DIN 10 Error Output	low
11	Analogue output V start value	2.0 V Range Pt 100 DIN 11 Start Output	2.0 V
12	Analogue output V end value	10.0 V Range Pt 100 DIN 12 End Output	10.0 V
13	Analogue output mA start value	4.0 mA Range Pt 100 DIN 13 Start Output	4.0 mA
14	Analogue output mA end value	20.0 mA Range Pt 100 DIN 14 s End Output	20.0 mA
15	Contact low limit value	0.0 °C Limit Pt 100 DIN 15	0.0°C
16	Contact low limit On/Off	Pt 100 DIN Limit 16 On	On
17	Contact high limit value	80.0°C Limit Pt 100 DIN 17	80.0°C
18	Contact high limit On/Off	Pt 100 DIN Limit 18 On	On
19	Actual value On/Off	Pt 100 DIN 19 Display On	

Config → Active 1. ● 1 x

HUMIDITY SENSORS

Connection	**Example**: 1kOhm 4 wire
Range	0...100 %
Output	0-10 V, 0-20 mA
Output in alarm situation	decrease to 0 V / 0 mA
Limits	not applied

Active → Config   1. ● 1x   2. (ENTER) + (▲)

Level	Function	Display	Select
01	Select sensor type	Sensor 0-1k 2 01	0-1kOhm (2)
02	Select 2-3-4 wire	4 0-1k 2 02 Wire	4-wire
03	wire compensation		This Level is automatically Passed
04	Select start of measuring range	0.0 Ω Range 0-1kΩ 2 04 Start	0 Ohm
05	Select end of measuring range	1000.0 Ω Range 0-1kΩ 2 05 End	1000 Ohm
06	Select unit	%rF Range 0-1k 2 06 Display	%rF
07	Select decimal point	- --.-- %rF Range 0-1k 2 07 Display	- - . - -
08	Select start of display value	0.00 %rF Range 0-1k 2 08 Start Display	0.00 %rF
09	Select end of display value	100.00 %rF Range 0-1k 2 09 End Display	100.00 %rF
10	Output V/mA in fault conditions high or low	0-1k 2 10 Error Output	low
11	Analogue output V start value	0.0 V Range 0-1kΩ 2 11 Start Output	0.0 V
12	Analogue output V end value	10.0 V Range 0-1kΩ 2 12 End Output	10.0 V
13	Analogue output mA start value	0.0 mA Range 0-1kΩ 2 13 Start Output	0.0 mA
14	Analogue output mA end value	20.0 mA Range 0-1kΩ 2 14 End Output	20.0 mA
15	Contact low limit value	0.00 %rF Limit 0-1kΩ 2 15	0.00 %rF
16	Contact low limit On/Off	0-1kΩ 2 Limit 16 Off	Off
17	Contact high limit value	100.00 %rF Limit 0-1kΩ 2 17	100.0 %rF
18	Contact high limit On/Off	0-1kΩ 2 Limit 18 Off	Off
19	Actual value On/Off	0-1k 2 19 Display On	

Config → Active 1. ● 1 x

Switching Configuration - Active

Enter button

Switch for Configuration to Active mode

Multi function display for programming and actual value display

Button for parameter selection

Button for level selection

With the switching between "Active" = Operating mode and "Config" = Configuration mode, changes from the working function into the programming function. The switching from Active to Config is made by pushing the Config button (ConF in display) and then push the ENTER and Level up button at the same time. After setup, start the active mode by pushing the config button.

Active → Config
1. ●
2. ENTER + ▲

Config → Active
1. ● 1 x

Failure- and Alarm Signalisation

Different failure or alarm signal are indicated by contact and by display warnings. Following pictures shows the most indicated errors and there cause.

Display	Failure
Active Sensor Error / Range	Actual display value is flashing at low measuring range. Sensor error actual value is lower than ajusted range or there is a short circuit fault at wiring. Contact is active - display shows Error Sensor Range
Active Sensor Error / Range	Display actual value is blinking at high measuring range. Sensor error actual value is higher than ajusted range or the wiring is open. Contact is active - display shows Error Sensor Range
Active Error / Range	value over or unter measurement range. Value is over or unter ajusted range Display shows Error Range, Contact isn`t active
Active	No value in display. Select in Level 19 configuration mode Display On.
Error 03 Wire Compensation	Error status at wire compensation. Wire resistors more than 100 Ohm aren`t accepted.

Notes to Sensors

For the following sensors there are separate datasheets for programming and setup available:
Sensor type   Temperatur sensor, Humiditiy sensor

Resistors with and without slider are different in the setup Level 01. Without slider is figure 2 + resistor value and with slider is figure 3 + resistor value.

Ring balance linear and root extraction (m/s) are different in Level 01 Sensor selection. Special 2 is linear for ∆p and Special 3 for m/s.

Programming and Setup "Step by Step"

RING BALANCE (∆p, m/s)

	Example: 0 ... 40 Pa
Range	U/I 0...10 VDC/0...20 mA
Output	increase to 10 V / 20 mA
Output in alarm situation	not applied
Limits	

Active → Config   1. ● 1x   2. ENTER + ▲

Level ▲▼	Function	Display	Select ◀▶
01	Select sensor type	Sensor 01 / Special 2	Special 2 (linear)
02			preselect no function
03	Calibration modus	CAL 03 Start Special 2	ENTER (Start) draw the needle to 0Pa ENTER
03		CAL 03 End Special 2	End value needle per hand to 40Pa ENTER
04 05			preselect no function
06	Select unit	Pa Range 06 Display Special 2	Pa
07	Select decimal point	- --.-- Pa Range 07 Display Special 2	--.--
08	Select start of display value	0.00 Pa Range 08 Start Display Special 2	0.00
09	Select end of display value	40.00 Pa Range 09 End Display Special 2	40.00
10	Output V7mA in fault conditions high or low	high 10 Error Special 2	high
11	Analogue output V start value	0.00 Range V 11 Start Output Special 2	0.0 V
12	Analogue output V end value	10.00 Range V 12 End Output Special 2	10.0 V
13	Analogue output mA start value	0.00 Range mA 13 Start Output Special 2	0.0 mA
14	Analogue output mA end value	20.00 Range mA 14 End Output Special 2	20.0 mA
15	Contact low limit value	0.00 Pa Limit 15 Special 2	0.0
16	Contact low limit On/Off	Limit 16 Special 2	Off
17	Contact high limit value	40.00 Pa Limit 17 Special 2	40.0
18	Contact high limit On/Off	Limit 18 Off Special 2	Off
19	Actual value On/Off	19 Display On Special 2	

Config → Active 1. ● 1 x

POTENTIOMETER

	Example: 0-10 kOhm with slider
Connection	0...10 kOhm
Range	0-10 V, /0-20 mA
Output	increase to 10 V / 20 mA
Output in alarm situation	1.000 kOhm, 9.000 kOhm
Limits	

Active → Config   1. ● 1x   2. ENTER + ▲

Level ▲▼	Function	Display	Select ◀▶
01	Select sensor type	Sensor 01 0-10k 3	0-10 kOhm (3) 3 means slider connenction
02	Select 2-3-4 wire	3 02 Wire 0-10 kΩ	3
03	Wire compensation	Start 03 Wire Compensation 0-10k Ω 3	push ENTER potentiometer turn left (low limit) push ENTER
04	Select begin of measuring range	0.000 kΩ Range 04 Start 0-10k 3	0.000 kOhm
05	Select end of measuring range	10.000 kΩ Range 05 End 0-10k 3	10.000 kOhm
06	Select unit	kΩ Range 06 Display 0-10k 3	kOhm
07	Select decimal point	- --.-- kΩ Range 07 Display 0-10k 3	--.--
08	Select start of display value	0.000 kΩ Range 08 Start Display 0-10k 3	0.000kOhm
09	Select end of display value	10.000 kΩ Range 09 End Display 0-10k 3	10.000 kOhm
10	Output V/mA in fault conditions high or low	Output 10 Error 0-10k 3	high
11	Analogue output V start value	0.0 V Range Output 11 Start 0-10k 3	0.0 V
12	Analogue output V end value	10.0 V Range Output 12 End 0-10k 3	10.0 V
13	Analogue output mA start value	0.0 mA Range Output 13 Start 0-10k 3	0.0 mA
14	Analogue output mA end value	20.0 mA Range Output 14 End 0-10k 3	20.0 mA
15	Contact low limit value	1.000 kΩ Limit 15 0-10k Ω	1.000 kOhm
16	Contact low limit On/Off	Limit 16 On 0-10k Ω	On
17	Contact high limit value	9.000 kΩ Limit 17 0-10k Ω	9.000 kOhm
18	Contact high limit On/Off	Limit 18 0-10k Ω	On
19	Actual value On/Off	19 Display On 0-10k Ω	

Config → Active 1. ● 1 x