

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 areas 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 necessary. The menu prompt is indicated over the display.

TECHNICAL DATAS

Supply/Frequency	24 VAC/DC +/- 20 %, 50...60 Hz
Nominal 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. < 0,3 % end value
Accuracy	between out-, input and supply voltage
Galvanic isolation	measure range 16 Bit, outputs 12 Bit
A/D-converter	Voltage U and current I parallel available with tie point (GND)
Outputs	against short circuit and separate source voltage < 30 V
Outputs are protected	0...10 V- adjustable, burden < 500 Ω, influence < 0,05%
Voltage output U	0...20 mA adjustable, burden < 750 Ω, influence < 0,1%
Current output I	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 over 1 potential free contact + output + display
Failure / alarm indication	faulty sensor connected, short circuit, wire break
Detection	over contact and analogue output U/I, programmable
Alarm indication 1 and 2	Break contact, 24 V max. 1 A
Failure- / alarm contact	-10...+ 50 °C / -40 ...+ 80 °C
work-/storage temperature	Terminal, IP 20, max. 4 mm ²
Electrical connection	Plastic, IP 40, for Din Rail mounting acc. to EN 50022
Housing	w x h x l 45 x 75 x 110 mm, ca. 190 g
Dimensions and weight	II(1)GD [EEx ia] IIC, acc. to EN 50014/ EN 50020
Type of protection	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**



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

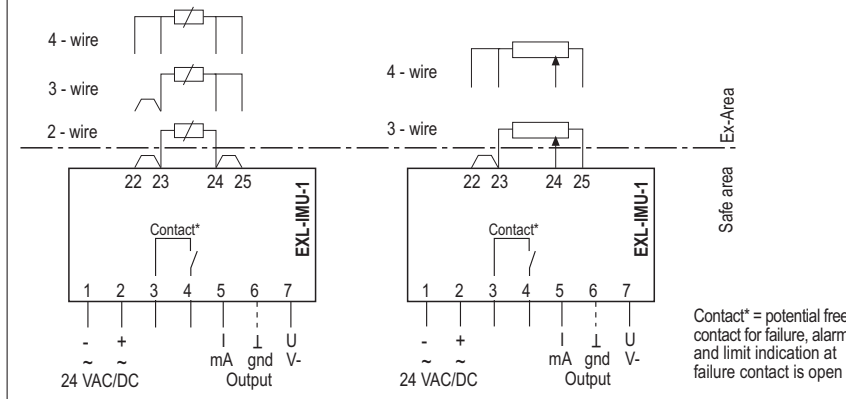
The maximum values must not be exceeded!
Please check your external capacities and inductivities in acc. to the length of the cable and the method of installation.

ATTENTION!

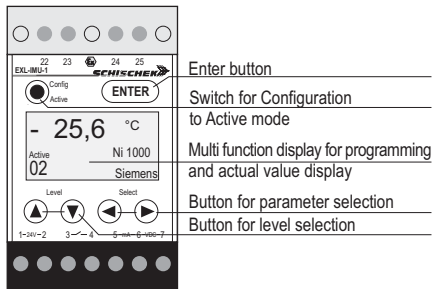
- For installation or maintenance official standards and rules must be adhered to!
- The energy of intrinsically safe circuits are below the level to start an explosion in the event of a spark.
- Intrinsic safe circuits must be installed with light blue coloured cables and separate installed from non 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



Subject to change



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 Config → Active
1. 1. 1x
2. +

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 adjusted 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

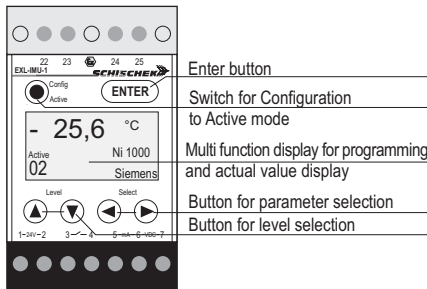
Resistors with and without slider are different in the setup Level 01. Without slider is figure 2 + resistor value and with slider is figure 3 + resistor value.

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

Programming and Setup "Step by Step"

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. +		
Level	Function	Display	Select
01	Select sensor type	Pt 100 DIN	
02	Select 2-3-4 wire	2-wire	
03	wire compensation	ENTER Sensor short circuit, ENTER	
04	Select start of measuring range	- 20.0 °C -20 °C	
05	Select end of measuring range	100 °C 100 °C	
06	Select unit	The functions in Level 06 .. 09 are at temperature sensors preseted. Unit is °C, Decimal point is 0.1°C Begin and end measuring values depends on sensor type	
07	Select decimal point		
08	Select start of display value		
09	Select end of display value		
10	Output V/mA in fault conditions high or low	low	
11	Analogue output V start value	2.0 V 2.0 V	
12	Analogue output V end value	10.0 V 10.0 V	
13	Analogue output mA start value	4.0 mA 4.0 mA	
14	Analogue output mA end value	20.0 mA 20.0 mA	
15	Contact low limit value	0.0 °C 0.0°C	
16	Contact low limit On/Off	On	
17	Contact high limit value	80.0°C 80.0°C	
18	Contact high limit On/Off	On	
Config → Active 1. 1x			

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



Switching Configuration - Active

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 Config → Active
1. +
 2. +

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
	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 adjusted range or the wiring is open. Contact is active - display shows Error Sensor Range
	value over or unter measurement range Value is over or unter ajusted range Display shows Error Range, Contact isn't active
	No value in display Select in Level 19 configuration mode Display On.
	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, Humidity 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 Δp and Special 3 for m/s

Programming and Setup "Step by Step"

RING BALANCE (Δp , m/s)				POTENTIOMETER			
Range		Example: 0... 40 Pa		Connection		Example: 0-10 kOhm with slider	
Output		U/I 0...10 VDC/0...20 mA		Range		0...10 kOhm	
Output in alarm situation		increase to 10 V / 20 mA		Output		0-10 V, /0-20 mA	
Limits		not applied		Output in alarm situation		increase to 10 V / 20 mA	
Limits				Limits		1.000 kOhm, 9.000 kOhm	
Active → Config		1. 1x 2. +		Active → Config		1. 1x 2. +	
Level	Function	Display	Select	Level	Function	Display	Select
01	Select sensor type	01 Special 2	Special 2 (linear)	01	Select sensor type	01 0-10k Ω 3	0-10 kOhm (3) 3 means slider connenction
02			preselect no function	02	Select 2-3-4 wire	02 0-10 k Ω 3	3
03	Calibration modus	CAL 03 Start Special 2	ENTER (Start) draw the needle to 0Pa ENTER	03	Wire compensation	03 0-10k Ω 3	push ENTER potentiometer turn left (low limit) push ENTER
		CAL 03 End Special 2	End value needle per hand to 40Pa ENTER	04	Select begin of measuring range	0.000 k Ω 04 Start 0-10k Ω 3	0.000 kOhm
04			preselect no function	05	Select end of measuring range	10.000 k Ω 05 End 0-10k Ω 3	10.000 kOhm
05			preselect no function	06	Select unit	k Ω 06 Range 0-10k Ω 3	kOhm
06	Select unit	Pa 06 Range Special 2	Pa	07	Select decimal point	--.-- k Ω 07 Range 0-10k Ω 3	--.--
07	Select decimal point	--.-- Pa 07 Range Special 2	--.--	08	Select start of display value	0.000 k Ω 08 Start 0-10k Ω 3	0.000kOhm
08	Select start of display value	0.00 Pa 08 Start Special 2	0.00	09	Select end of display value	10.000 k Ω 09 End 0-10k Ω 3	10.000 kOhm
09	Select end of display value	40.00 Pa 09 End Special 2	40.00	10	Output V/mA in fault conditions high or low	high 10 Output 0-10k Ω 3	high
10	Output V/mA in fault conditions high or low	high 10 Error Special 2	high	11	Analogue output V start value	0.00 V 11 Start Special 2	0.0 V
11	Analogue output V start value	0.00 V 11 Output Special 2	0.0 V	12	Analogue output V end value	10.0 V 12 End Special 2	10.0 V
12	Analogue output V end value	10.0 V 12 Output Special 2	10.0 V	13	Analogue output mA start value	0.00 mA 13 Start Special 2	0.0 mA
13	Analogue output mA start value	0.00 mA 13 Output Special 2	0.0 mA	14	Analogue output mA end value	20.0 mA 14 End Special 2	20.0 mA
14	Analogue output mA end value	20.0 mA 14 Output Special 2	20.0 mA	15	Contact low limit value	0.00 Pa 15 Limit Special 2	0.0
15	Contact low limit value	0.00 Pa 15 Limit Special 2	0.0	16	Contact low limit On/Off	Off 16 Limit Special 2	Off
16	Contact low limit On/Off	Off 16 Limit Special 2	Off	17	Contact high limit value	40.00 Pa 17 Limit Special 2	40.0
17	Contact high limit value	40.00 Pa 17 Limit Special 2	40.0	18	Contact high limit On/Off	Off 18 Limit Special 2	Off
18	Contact high limit On/Off	Off 18 Limit Special 2	Off				
Config → Active 1. 1x				Config → Active 1. 1x			