Статические датчики наклона

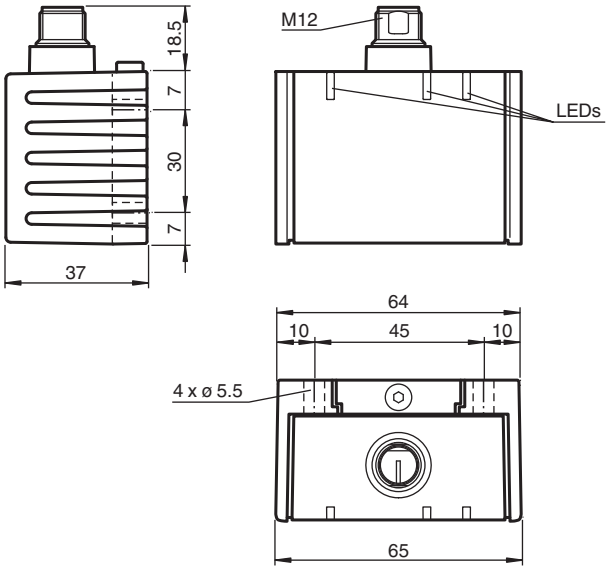
Технические характеристики

Inclination sensor

INY360D-F99-B16-V15

- E1-Type approval
- Measuring range 0 ... 360°
- High shock resistance
- Extended temperature range -40 ... +85 °C
- CANopen interface
- Increased noise immunity 100 V/m

Dimensions



Technical Data

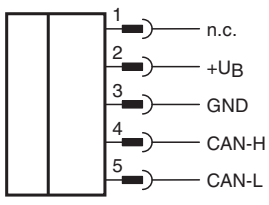
General specifications		
Type		Inclination sensor, 2-axis
Measurement range		0 ... 360 °
Absolute accuracy		≤ ± 0.5 °
Response delay		≤ 25 ms
Resolution		≤ 0.1 °
Repeat accuracy		≤ ± 0.1 °
Temperature influence		≤ 0.027 °/K
Functional safety related parameters		

Release date: 2020-06-22 Date of issue: 2020-06-22 Filename: 212421_eng.pdf

Technical Data

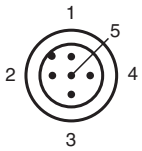
$MTTF_d$		300 a
Mission Time (T_M)		20 a
Diagnostic Coverage (DC)		0 %
Indicators/operating means		
Operation indicator		LED, green
Electrical specifications		
Operating voltage	U_B	10 ... 30 V DC
No-load supply current	I_0	≤ 50 mA
Time delay before availability	t_v	≤ 2.5 s
Interface		
Interface type		CANopen
Device profile		CiA410, Ver. 1.2
Data output code		binary code
Node ID		1 ... 127 , programmable
Transfer rate		125 kBit/s , 250 kBit/s , 500 kBit/s , 1 MBit/s , programmable
Termination		external
Cycle time		≥ 20 ms
Compliance with standards and directives		
Standard conformity		
Shock and impact resistance		100 *g* according to DIN EN 60068-2-27
Standards		EN 60947-5-2:2007 IEC 60947-5-2:2007
Approvals and certificates		
UL approval		cULus Listed, Class 2 Power Source
E1 Type approval		10R-04
Ambient conditions		
Ambient temperature		-40 ... 85 °C (-40 ... 185 °F)
Storage temperature		-40 ... 85 °C (-40 ... 185 °F)
Mechanical specifications		
Connection type		5-pin, M12 x 1 connector
Housing material		PA
Degree of protection		IP68 / IP69K
Mass		240 g
Factory settings		
Node ID		1
Transfer rate		250 kBit/s

Connection



Release date: 2020-06-22 Date of issue: 2020-06-22 Filename: 212421_eng.pdf

Connection Assignment



Wire colors in accordance with EN 60947-5-2

1	BN	(brown)
2	WH	(white)
3	BU	(blue)
4	BK	(black)
5	GY	(gray)

Accessories

	**V15S-T-CAN/DN-V15**	Y-Splitter, M12 socket on M12 connector/socket
	**ICZ-TR-CAN/DN-V15**	Terminal resistor for DeviceNet, CANopen

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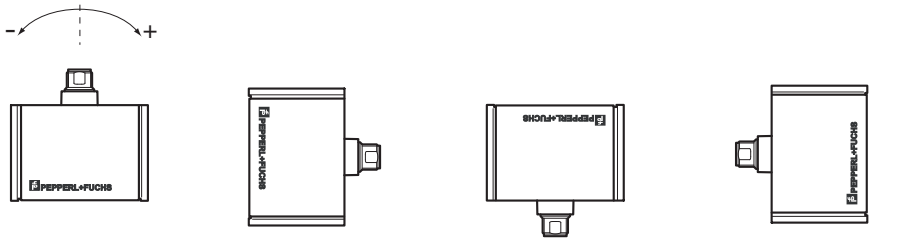
Mounting

Sensor Orientation

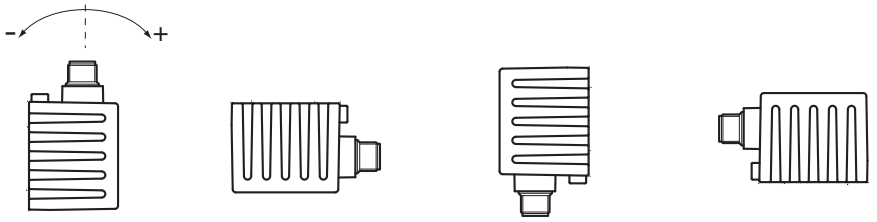
In the default setting the zero position of the sensor is reached, when the electrical connection faces straight upwards.

X Orientation



X = 0° X = 90° X = ±180° X = 270° (-90°)

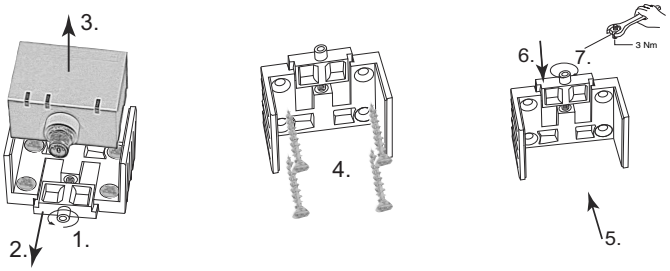
Y Orientation



Y = 0° Y = 90° Y = ±180° Y = 270° (-90°)

Mounting of the sensor

Sensors from the -F99 series consist of a sensor module and accompanying cast aluminum housing. Select a vertical surface with minimum dimensions of 70 mm x 50 mm to mount the sensor.
Mount the sensor as follows:



1. Loosen the central screw under the sensor connection.
2. Slide back the clamping element until you are able to remove the sensor module from the housing.
3. Remove the sensor module from the housing
4. Position the housing at the required mounting location and secure using four countersunk screws. Make sure that the heads of the screws do not protrude.
5. Place the sensor module in the housing.
6. Slide the clamping element flush into the housing. Check that the sensor element is seated correctly.
7. Finally tighten the central screw.

The sensor is now mounted correctly.

Configuration

Baud rate setting

Inclination sensors by Pepperl+Fuchs are supplied with a baud rate of 250 kbit/s. To change the baud rate, write the new baud rate to object 2001h “Baud rate.” If a “Reset sensor” command is issued via an NMT message or the power supply is interrupted, the sensor operates at the new baud rate. The inclination sensor supports the baud rates 125 kbit/s, 250 kbit/s, 500 kbit/s and 1 Mbit/s. Invalid values are not adopted. In this case, the current setting is retained.

Example of modifying the baud rate from 250 kbit/s to 1 Mbit/s:

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601h	2Fh	01h	20h	00h	08h	xxh	xxh	xxh
CAN-ID	Command	Object index		Subindex	New baud rate	not used		
	Data byte 1	Data byte 2	Data byte 3	Data byte 4	Data byte 5	Data byte 6	Data byte 7	Data byte 8

CAN ID: 601h, SDO1 channel of node 1
Command: 2Fh, write object, 1 byte of usable data
Object index: 2001h, note: low byte first, then high byte!
Subindex: 00h
New baud rate: 08h, for 1 Mbit/s
New baud rate: 04h, for 500 kbit/s
New baud rate: 02h, for 250 kbit/s
New baud rate: 01h, for 125 kbit/s

Indication

LED displays

The inclination sensor has three indicator LEDs that allow rapid visual monitoring.

- The green **power** LED indicates the state of the power supply
- The yellow **run** LED indicates the bus and sensor status
- The red **err** LED indicates an error

power (green)	run (yellow)	err (red)	Meaning
Off	Off	Off	No power supply
On	Flashing constantly	Off	Pre-operational
On	1x flashing	Off	Stopped
On	On	Off	Operational
On	Off	On	CAN bus off
On	depending on bus status	1x flashing	Warning, e.g., outside measuring range
On	depending on bus status	2x flashing	Error, e.g., EEPROM checksum incorrect
Flashing constantly	Off	On	Undervoltage

Technical Features

EMC Properties

Interference immunity in accordance with
DIN ISO 11452-2: 100 V/m
Frequency band 20 MHz up to 2 GHz
Mains-borne interference in accordance with ISO 7637-2:

Pulse	1	2 a	2 b	3 a	3 b	4
Severity level	III	III	III	III	III	III
Failure criterion	C	A	C	A	A	C

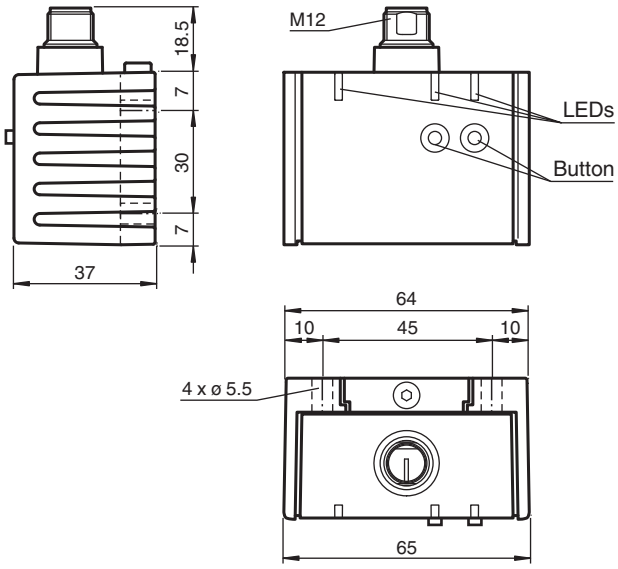
EN 61000-4-2:	CD: 8 kV /	AD: 15 kV
Severity level	IV	IV
EN 61000-4-3:	30 V/m (80...2500 MHz)	
Severity level	IV	
EN 61000-4-4:	2 kV	
Severity level	III	
EN 61000-4-6:	10 V (0.01...80 MHz)	
Severity level	III	
EN 55011:	Klasse A	

Inclination sensor

INY360D-F99-2I2E2-V17

- E1-Type approval
- Measuring range 0 ... 360°
- Analog output 4 mA ... 20 mA
- Evaluation limits can be taught-in
- 2 programmable switch outputs
- High shock resistance
- Increased noise immunity 100 V/m

Dimensions



Technical Data

General specifications		
Type		Inclination sensor, 2-axis
Measurement range		0 ... 360 °
Absolute accuracy		≤ ± 0.5 °
Response delay		≤ 25 ms
Resolution		≤ 0.1 °
Repeat accuracy		≤ ± 0.1 °
Temperature influence		≤ 0.027 °/K
Functional safety related parameters		

Release date: 2020-04-24 Date of issue: 2020-06-03 Filename: 201501_eng.pdf

Technical Data

$MTTF_d$		300 a
Mission Time (T_M)		20 a
Diagnostic Coverage (DC)		0 %
Indicators/operating means		
Operation indicator		LED, green
Teach-In indicator		2 LEDs yellow (switching status), flashing
Button		2 push-buttons (Switch points programming , Evaluation range programming)
Switching state		2 yellow LEDs: Switching status (each output)
Electrical specifications		
Operating voltage	U_B	10 ... 30 V DC
No-load supply current	I_0	≤ 25 mA
Time delay before availability	t_v	≤ 200 ms
Switching output		
Output type		2 switch outputs PNP, NO , reverse polarity protected , short-circuit protected
Operating current	I_L	≤ 100 mA
Voltage drop		≤ 3 V
Analog output		
Output type		2 current outputs 4 ... 20 mA (one output for each axis)
Load resistor		0 ... 200 Ω at U_B = 10 ... 18 V 0 ... 500 Ω at U_B = 18 ... 30 V
Compliance with standards and directives		
Standard conformity		
Shock and impact resistance		100 *g* according to DIN EN 60068-2-27
Standards		EN 60947-5-2:2007 IEC 60947-5-2:2007
Approvals and certificates		
UL approval		cULus Listed, Class 2 Power Source
E1 Type approval		10R-04
Ambient conditions		
Ambient temperature		-40 ... 85 °C (-40 ... 185 °F)
Storage temperature		-40 ... 85 °C (-40 ... 185 °F)
Mechanical specifications		
Connection type		8-pin, M12 x 1 connector
Housing material		PA
Degree of protection		IP68 / IP69K
Mass		240 g
Factory settings		
Analog output (X)		-45 ° ... 45 °
Analog output (Y)		-45 ° ... 45 °
Switching output (X)		-30 ° ... 30 °
Switching output (Y)		-30 ° ... 30 °

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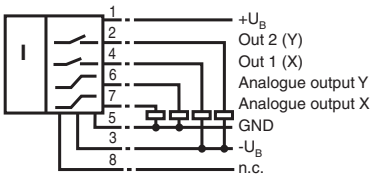
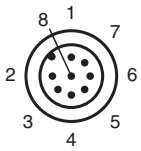
Connection

Standard symbol/Connection:



Connection Assignment



Wire colors

1	WH	(white)
2	BN	(brown)
3	GN	(green)
4	YE	(yellow)
5	GY	(gray)
6	PK	(pink)
7	BU	(blue)
8	RD	(red)

Accessories

	**V17-G-2M-PUR**	Female cordset, M12, 8-pin, shielded, PUR cable
	**V17-G-5M-PUR**	Female cordset, M12, 8-pin, shielded, PUR cable
	**V17-G-10M-PUR**	Female cordset, M12, 8-pin, shielded, PUR cable
	**V17-G-10M-PVC-ABG**	Female cordset, M12, 8-pin, shielded, PVC cable

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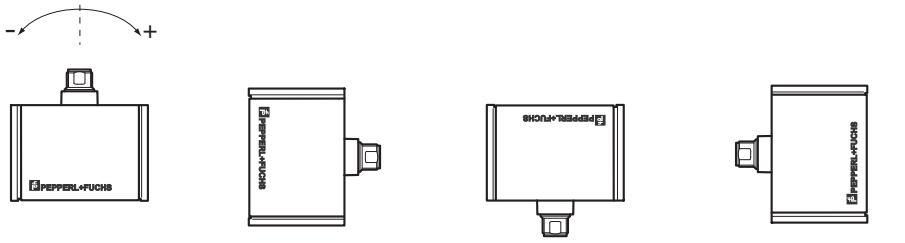
Mounting

Sensor Orientation

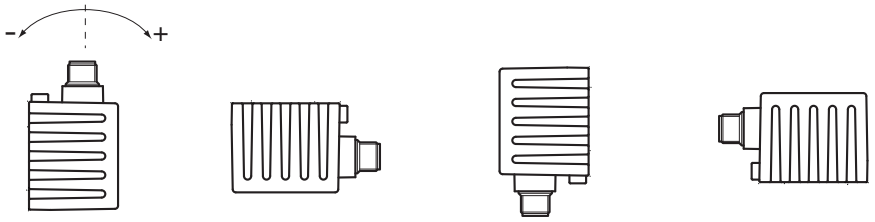
In the default setting the zero position of the sensor is reached, when the electrical connection faces straight upwards.

X Orientation



X = 0° X = 90° X = ±180° X = 270° (-90°)

Y Orientation



Y = 0° Y = 90° Y = ±180° Y = 270° (-90°)

Mounting of the sensor

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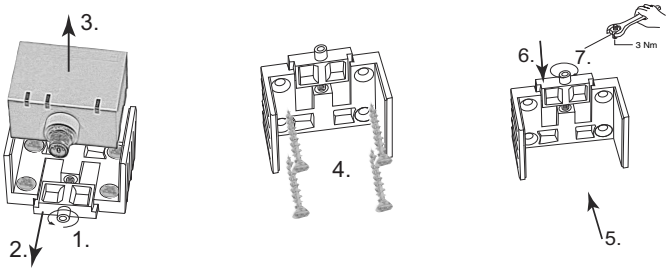
Mount the sensor as follows:



1. Loosen the central screw under the sensor connection.
2. Slide back the clamping element until you are able to remove the sensor module from the housing.
3. Remove the sensor module from the housing
4. Position the housing at the required mounting location and secure using four countersunk screws. Make sure that the heads of the screws do not protrude.
5. Place the sensor module in the housing.
6. Slide the clamping element flush into the housing. Check that the sensor element is seated correctly.
7. Finally tighten the central screw.

The sensor is now mounted correctly.

Additional Information

LED display

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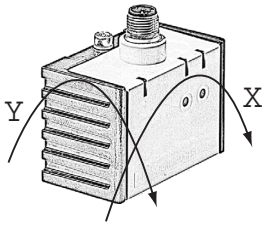
Displays dependent on the operating state	LED green: Power	LED yellow out 1	LED yellow out 2
Teach-in of switching points (X-axis):	off	flashes	off
Teach-in of switching points (Y-axis):	off	off	flashes
Activate teach-in mode for analog limits:	off	flashes	flashes
Teach-in of analog limit (X-axis)	off	flashes	off
Teach-in of analog limit (Y-axis)	off	off	flashes
Normal operation	on	switchings tate	switchings tate
Reset to factory settings: 2 s ... 10 s > 10 s ... end of reset process Followed by normal operation	 off flashes	 flashes off	 flashes off
Undervoltage	flashes	off	off

Axis definition

The definition of the X-axis and Y-axis is shown on the sensor housing by means of imprinted and labeled double arrows.



Teach-in of switching points (X-axis)

1. Press key T1 > 2 s (see LED display)
2. Move sensor to switching position 1
3. Press key T1 briefly. LED "out 1" lights for 1.5 s as confirmation. Switching point 1 has been taught
4. Move sensor to switching position 2
5. Press key T1 briefly. LED "out 1" lights for 1.5 s as confirmation. Switching point 2 has been taught
6. Sensor returns to normal operation (see LED display)

The NC (active output state) is always defined in the range from the 1st configured position to 2nd configured position.
As an example :
Case #1: configure position #1 at +45degree, configure position #2 at +90 degree; NC is from +45 ' +90 in the CW direction
Case #2: configure position #1 at +90degree ; configure position #2 at +45 degree; NC is from +90 ' +45 in the CW direction

Teach-in of switching points (Y-axis)

1. Press key T2 > 2 s (see LED display)
2. Move sensor to switching position 1
3. Press key T2 briefly. LED "out 2" lights for 1.5 s as confirmation. Switching point 1 has been taught
4. Move sensor to switching position 2
5. Press key T2 briefly. LED "out 2" lights for 1.5 s as confirmation. Switching point 2 has been taught
6. Sensor returns to normal operation (see LED display)

The NC (active output state) is always defined in the range from the 1st configured position to 2nd configured position.
See also the example, above.

Teach-in of analog limits (X-axis)

1. Activate the teach-in mode for the analog limits by simultaneously pressing keys T1 and T2 > 2 s (see LED display)
2. Press key T1 > for 2 s (see LED display)
3. Move the sensor into the position of minimum evaluation limit
4. Press key T1 briefly. LED "out 1" lights for 1.5 s as confirmation. The minimum evaluation limit has been taught. In this position the analog output will provide its minimum output value.
5. Move the sensor into the position of maximum evaluation limit
6. Press key T1 briefly. LED "out 1" lights for 1.5 s as confirmation. The maximum evaluation limit has been taught. In this position the analog output will provide its maximum output value.
7. Sensor returns to normal operation (see LED display)

If the sensor inclination exceeds one of the analog limits, the last value of the analog output is retained.

Teach-in of analog limits (Y-axis)

1. Activate the teach-in mode for the analog limits by simultaneously pressing keys T1 and T2 > 2 s (see LED display)
2. Press key T2 > 2 s (see LED display)
3. Move the sensor into the position of minimum evaluation limit
4. Press key T2 briefly. LED "out 2" lights for 1.5 s as confirmation. The minimum evaluation limit has been taught. In this position the analog output will provide its minimum output value.
5. Move the sensor into the position of maximum evaluation limit
6. Press key T2 briefly. LED "out 2" lights for 1.5 s as confirmation. The maximum evaluation limit has been taught. In this position the analog output will provide its maximum output value.
7. Sensor returns to normal operation (see LED display)

If the sensor inclination exceeds one of the analog limits, the last value of the analog output is retained.

Resetting the sensor to factory settings

1. Press keys T1 and T2 > 10 s (see LED display)
2. The sensor has been reset when the green LED "Power" lights again after approx. 10 s.

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Undervoltage detection

If the supply voltage falls below a value of approx. 7 V, all outputs and yellow LEDs are deactivated. The green "Power" LED flashes rapidly. If the supply voltage exceeds a value of approx. 8 V, the sensor continues with normal operation.

Technical Features

EMC Properties

Interference immunity in accordance with
DIN ISO 11452-2: 100 V/m
Frequency band 20 MHz up to 2 GHz
Mains-borne interference in accordance with ISO 7637-2:

Pulse	1	2 a	2 b	3 a	3 b	4
Severity level	I I I	I I I	I I I	I I I	I I I	I I I
Failure criterion	C	A	C	A	A	C

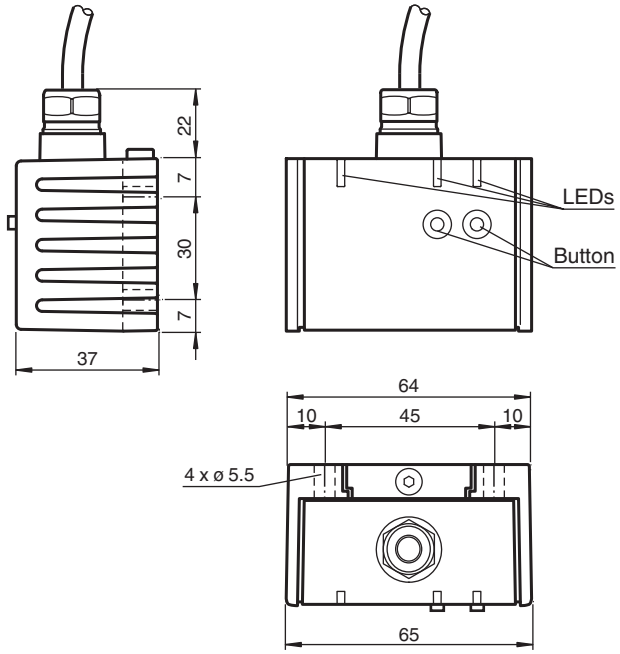
EN 61000-4-2:	CD: 8 kV /	AD: 15 kV
Severity level	IV	IV
EN 61000-4-3:	30 V/m (80...2500 MHz)	
Severity level	IV	
EN 61000-4-4:	2 kV	
Severity level	III	
EN 61000-4-6:	10 V (0.01...80 MHz)	
Severity level	III	
EN 55011:	Klasse A	

Inclination sensor

INY360D-F99-2I2E2-5M

- E1-Type approval
- Measuring range 0 ... 360°
- Analog output 4 mA ... 20 mA
- Evaluation limits can be taught-in
- 2 programmable switch outputs
- High shock resistance
- Increased noise immunity 100 V/m

Dimensions



Technical Data

General specifications		
Type		Inclination sensor, 2-axis
Measurement range		0 ... 360 °
Absolute accuracy		≤ ± 0.5 °
Response delay		≤ 25 ms
Resolution		≤ 0.1 °
Repeat accuracy		≤ ± 0.1 °
Temperature influence		≤ 0.027 °/K
Functional safety related parameters		

Release date: 2020-04-24 Date of issue: 2020-06-03 Filename: 201502_eng.pdf

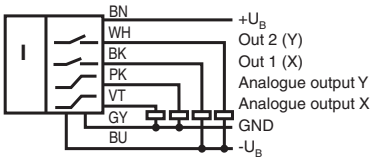
Technical Data

$MTTF_d$		300 a
Mission Time (T_M)		20 a
Diagnostic Coverage (DC)		0 %
Indicators/operating means		
Operation indicator		LED, green
Teach-In indicator		2 LEDs yellow (switching status), flashing
Button		2 push-buttons (Switch points programming , Evaluation range programming)
Switching state		2 yellow LEDs: Switching status (each output)
Electrical specifications		
Operating voltage	U_B	10 ... 30 V DC
No-load supply current	I_0	≤ 25 mA
Time delay before availability	t_v	≤ 200 ms
Switching output		
Output type		2 switch outputs PNP, NO , reverse polarity protected , short-circuit protected
Operating current	I_L	≤ 100 mA
Voltage drop		≤ 3 V
Analog output		
Output type		2 current outputs 4 ... 20 mA (one output for each axis)
Load resistor		0 ... 200 Ω at U_B = 10 ... 18 V 0 ... 500 Ω at U_B = 18 ... 30 V
Compliance with standards and directives		
Standard conformity		
Shock and impact resistance		100 *g* according to DIN EN 60068-2-27
Standards		EN 60947-5-2:2007 IEC 60947-5-2:2007
Approvals and certificates		
UL approval		cULus Listed, Class 2 Power Source
E1 Type approval		10R-04
Ambient conditions		
Ambient temperature		-40 ... 85 °C (-40 ... 185 °F)
Storage temperature		-40 ... 85 °C (-40 ... 185 °F)
Mechanical specifications		
Connection type		5 m, PUR cable 7 x 0.5 mm^2
Housing material		PA
Degree of protection		IP68 / IP69K
Cable		
Bending radius		> 10 x cable diameter
Mass		240 g
Factory settings		
Analog output (X)		-45 ° ... 45 °
Analog output (Y)		-45 ° ... 45 °
Switching output (X)		-30 ° ... 30 °
Switching output (Y)		-30 ° ... 30 °

Release date: 2020-04-24 Date of issue: 2020-06-03 Filename: 201502_eng.pdf

Connection

Standard symbol/Connection:

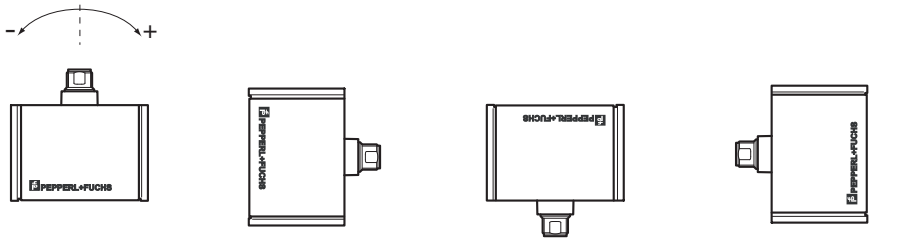


Mounting

Sensor Orientation

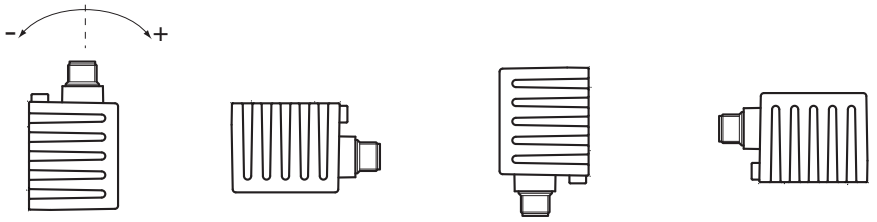
In the default setting the zero position of the sensor is reached, when the electrical connection faces straight upwards.

X Orientation



X = 0° X = 90° X = ±180° X = 270° (-90°)

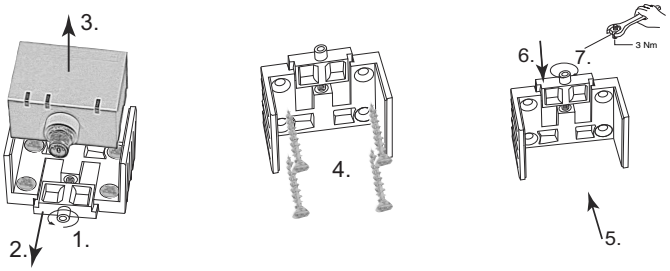
Y Orientation



Y = 0° Y = 90° Y = ±180° Y = 270° (-90°)

Mounting of the sensor

Sensors from the -F99 series consist of a sensor module and accompanying cast aluminum housing. Select a vertical surface with minimum dimensions of 70 mm x 50 mm to mount the sensor.
Mount the sensor as follows:



1. Loosen the central screw under the sensor connection.
2. Slide back the clamping element until you are able to remove the sensor module from the housing.
3. Remove the sensor module from the housing
4. Position the housing at the required mounting location and secure using four countersunk screws. Make sure that the heads of the screws do not protrude.
5. Place the sensor module in the housing.
6. Slide the clamping element flush into the housing. Check that the sensor element is seated correctly.
7. Finally tighten the central screw.

The sensor is now mounted correctly.

Additional Information

LED display

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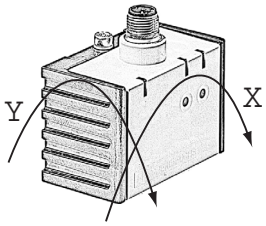
Displays dependent on the operating state	LED green: Power	LED yellow out 1	LED yellow out 2
Teach-in of switching points (X-axis):	off	flashes	off
Teach-in of switching points (Y-axis):	off	off	flashes
Activate teach-in mode for analog limits:	off	flashes	flashes
Teach-in of analog limit (X-axis)	off	flashes	off
Teach-in of analog limit (Y-axis)	off	off	flashes
Normal operation	on	switchings tate	switchings tate
Reset to factory settings: 2 s ... 10 s > 10 s ... end of reset process Followed by normal operation	off flashes	flashes off	flashes off
Undervoltage	flashes	off	off

Axis definition

The definition of the X-axis and Y-axis is shown on the sensor housing by means of imprinted and labeled double arrows.



Teach-in of switching points (X-axis)

1. Press key T1 > 2 s (see LED display)
2. Move sensor to switching position 1
3. Press key T1 briefly. LED "out 1" lights for 1.5 s as confirmation. Switching point 1 has been taught
4. Move sensor to switching position 2
5. Press key T1 briefly. LED "out 1" lights for 1.5 s as confirmation. Switching point 2 has been taught
6. Sensor returns to normal operation (see LED display)

The NC (active output state) is always defined in the range from the 1st configured position to 2nd configured position.
As an example :
Case #1: configure position #1 at +45degree, configure position #2 at +90 degree; NC is from +45 ' +90 in the CW direction
Case #2: configure position #1 at +90degree ; configure position #2 at +45 degree; NC is from +90 ' +45 in the CW direction

Teach-in of switching points (Y-axis)

1. Press key T2 > 2 s (see LED display)
2. Move sensor to switching position 1
3. Press key T2 briefly. LED "out 2" lights for 1.5 s as confirmation. Switching point 1 has been taught
4. Move sensor to switching position 2
5. Press key T2 briefly. LED "out 2" lights for 1.5 s as confirmation. Switching point 2 has been taught
6. Sensor returns to normal operation (see LED display)

The NC (active output state) is always defined in the range from the 1st configured position to 2nd configured position.
See also the example, above.

Teach-in of analog limits (X-axis)

1. Activate the teach-in mode for the analog limits by simultaneously pressing keys T1 and T2 > 2 s (see LED display)
2. Press key T1 > for 2 s (see LED display)
3. Move the sensor into the position of minimum evaluation limit
4. Press key T1 briefly. LED "out 1" lights for 1.5 s as confirmation. The minimum evaluation limit has been taught. In this position the analog output will provide its minimum output value.
5. Move the sensor into the position of maximum evaluation limit
6. Press key T1 briefly. LED "out 1" lights for 1.5 s as confirmation. The maximum evaluation limit has been taught. In this position the analog output will provide its maximum output value.
7. Sensor returns to normal operation (see LED display)

If the sensor inclination exceeds one of the analog limits, the last value of the analog output is retained.

Teach-in of analog limits (Y-axis)

1. Activate the teach-in mode for the analog limits by simultaneously pressing keys T1 and T2 > 2 s (see LED display)
2. Press key T2 > 2 s (see LED display)
3. Move the sensor into the position of minimum evaluation limit
4. Press key T2 briefly. LED "out 2" lights for 1.5 s as confirmation. The minimum evaluation limit has been taught. In this position the analog output will provide its minimum output value.
5. Move the sensor into the position of maximum evaluation limit
6. Press key T2 briefly. LED "out 2" lights for 1.5 s as confirmation. The maximum evaluation limit has been taught. In this position the analog output will provide its maximum output value.
7. Sensor returns to normal operation (see LED display)

If the sensor inclination exceeds one of the analog limits, the last value of the analog output is retained.

Resetting the sensor to factory settings

1. Press keys T1 and T2 > 10 s (see LED display)
2. The sensor has been reset when the green LED "Power" lights again after approx. 10 s.

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Undervoltage detection

If the supply voltage falls below a value of approx. 7 V, all outputs and yellow LEDs are deactivated. The green "Power" LED flashes rapidly. If the supply voltage exceeds a value of approx. 8 V, the sensor continues with normal operation.

Technical Features

EMC Properties

Interference immunity in accordance with
DIN ISO 11452-2: 100 V/m
Frequency band 20 MHz up to 2 GHz
Mains-borne interference in accordance with ISO 7637-2:

Pulse	1	2 a	2 b	3 a	3 b	4
Severity level	I I I	I I I	I I I	I I I	I I I	I I I
Failure criterion	C	A	C	A	A	C

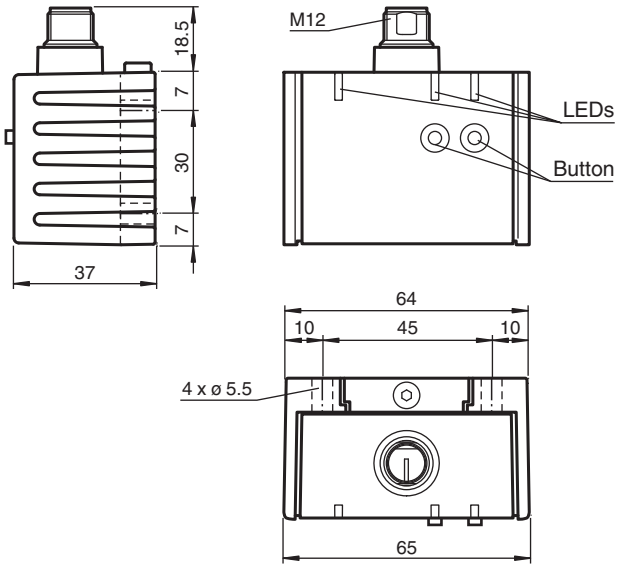
EN 61000-4-2:	CD: 8 kV /	AD: 15 kV
Severity level	IV	IV
EN 61000-4-3:	30 V/m (80...2500 MHz)	
Severity level	IV	
EN 61000-4-4:	2 kV	
Severity level	III	
EN 61000-4-6:	10 V (0.01...80 MHz)	
Severity level	III	
EN 55011:	Klasse A	

Inclination sensor

INX360D-F99-I2E2-V15

- E1-Type approval
- Measuring range 0 ... 360°
- Analog output 4 mA ... 20 mA
- Evaluation limits can be taught-in
- 2 programmable switch outputs
- High shock resistance
- Increased noise immunity 100 V/m

Dimensions



Technical Data

General specifications		
Type		Inclination sensor, 1-axis
Measurement range		0 ... 360 °
Absolute accuracy		≤ ± 0.5 °
Response delay		≤ 20 ms
Resolution		≤ 0.1 °
Repeat accuracy		≤ ± 0.1 °
Temperature influence		≤ 0.027 °/K
Functional safety related parameters		

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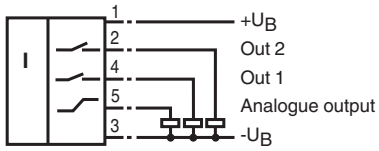
Technical Data

$MTTF_d$		300 a
Mission Time (T_M)		20 a
Diagnostic Coverage (DC)		0 %
Indicators/operating means		
Operation indicator		LED, green
Teach-In indicator		2 LEDs yellow (switching status), flashing
Button		2 push-buttons (Switch points programming , Evaluation range programming)
Switching state		2 yellow LEDs: Switching status (each output)
Electrical specifications		
Operating voltage	U_B	10 ... 30 V DC
No-load supply current	I_0	≤ 25 mA
Time delay before availability	t_v	≤ 200 ms
Switching output		
Output type		2 switch outputs PNP, NO , reverse polarity protected , short-circuit protected
Operating current	I_L	≤ 100 mA
Voltage drop		≤ 3 V
Analog output		
Output type		1 current output 4 ... 20 mA
Load resistor		0 ... 200 Ω at U_B = 10 ... 18 V 0 ... 500 Ω at U_B = 18 ... 30 V
Compliance with standards and directives		
Standard conformity		
Shock and impact resistance		100 *g* according to DIN EN 60068-2-27
Standards		EN 60947-5-2:2007 IEC 60947-5-2:2007
Approvals and certificates		
UL approval		cULus Listed, Class 2 Power Source
CCC approval		CCC approval / marking not required for products rated ≤36 V
E1 Type approval		10R-04
Ambient conditions		
Ambient temperature		-40 ... 85 °C (-40 ... 185 °F)
Storage temperature		-40 ... 85 °C (-40 ... 185 °F)
Mechanical specifications		
Connection type		5-pin, M12 x 1 connector
Housing material		PA
Degree of protection		IP68 / IP69K
Mass		240 g
Factory settings		
Switching output 1		-30 ° ... 30 °
Switching output 2		-30 ° ... 30 °
Analog output		-45 ° ... 45 °

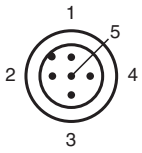
Release date: 2020-04-24 Date of issue: 2020-06-03 Filename: 201503_eng.pdf

Connection

Standard symbol/Connection:



Connection Assignment



Wire colors in accordance with EN 60947-5-2

1	BN	(brown)
2	WH	(white)
3	BU	(blue)
4	BK	(black)
5	GY	(gray)

Accessories

	**V15-G-2M-PUR**	Female cordset, M12, 5-pin, PUR cable

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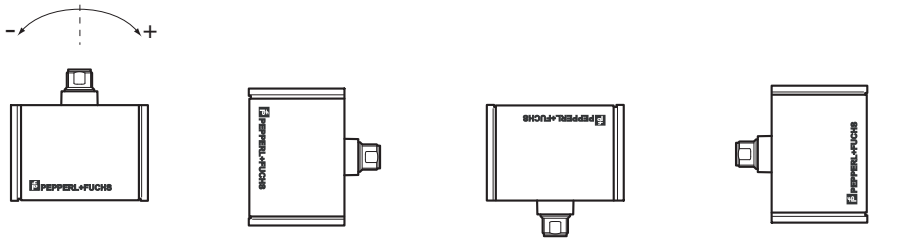
Mounting

Sensor Orientation

In the default setting the zero position of the sensor is reached, when the electrical connection faces straight upwards.

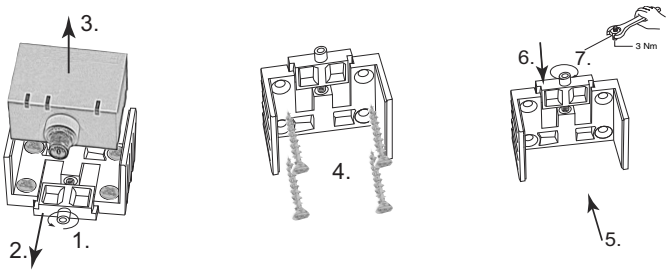
X Orientation



X = 0° X = 90° X = ±180° X = 270° (-90°)

Mounting of the sensor

Sensors from the -F99 series consist of a sensor module and accompanying cast aluminum housing. Select a vertical surface with minimum dimensions of 70 mm x 50 mm to mount the sensor.
Mount the sensor as follows:



1. Loosen the central screw under the sensor connection.
2. Slide back the clamping element until you are able to remove the sensor module from the housing.
3. Remove the sensor module from the housing
4. Position the housing at the required mounting location and secure using four countersunk screws. Make sure that the heads of the screws do not protrude.
5. Place the sensor module in the housing.
6. Slide the clamping element flush into the housing. Check that the sensor element is seated correctly.
7. Finally tighten the central screw.

The sensor is now mounted correctly.

Additional Information

LED display

Displays dependent on the operating state	LED green: Power	LED yellow out 1	LED yellow out 2
Teach-in of switching points (output S1): **Teach-in of switching points (output S2):**	off off	flashes off	off flashes
Activate teach-in mode for analog limits: Teach-in of **analog limits**	off off	flashes flashes	flashes off
Normal operation	on	switchings tate	switchings tate
Reset to factory settings: 2 s ... 10 s > 10 s ... end of reset process Followed by normal operation	 off flashes	 flashes off	 flashes off
Undervoltage	flashes	off	off

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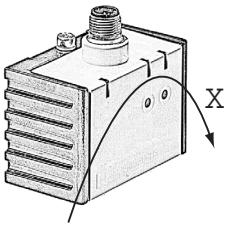
Axis definition

The definition of the X-axis is shown on the sensor housing by means of an imprinted and labeled double arrow. The figure shows the clockwise direction of rotation.



Teach-in of switching points (output S1)

1. Press key T1 > 2 s (see LED display)
2. Move sensor to switching position 1
3. Press key T1 briefly. LED "out 1" lights for 1.5 s as confirmation. Switching point 1 has been taught
4. Move sensor to switching position 2
5. Press key T1 briefly. LED "out 1" lights for 1.5 s as confirmation. Switching point 2 has been taught
6. Sensor returns to normal operation (see LED display)

The NC (active output state) is always defined in the range from the 1st configured position to 2nd configured position.
As an example :
Case #1: configure position #1 at +45degree, configure position #2 at +90 degree; NC is from +45 ' +90 in the CW direction
Case #2: configure position #1 at +90degree ; configure position #2 at +45 degree; NC is from +90 ' +45 in the CW direction

Teach-in of switching points (output S2)

Similar to the process for "Teach-in of switching points (output S1)", but with key T2 instead of key T1.

Teach-in of analog limits

1. Activate the teach-in mode for the analog limits by simultaneously pressing keys T1 and T2 until the green LED is extinguished and the two yellow LEDs flash. Then release the keys.
2. Press key T1 > for 2 s (see LED display)
3. Move the sensor into the position of minimum evaluation limit
4. Press key T1 briefly. LED "out 1" lights for 1.5 s as confirmation. The minimum evaluation limit has been taught. In this position the analog output will provide its minimum output value.
5. Move the sensor into the position of maximum evaluation limit
6. Press key T1 briefly. LED "out 1" lights for 1.5 s as confirmation. The maximum evaluation limit has been taught. In this position the analog output will provide its maximum output value.
7. Sensor returns to normal operation (see LED display)

If the sensor inclination exceeds one of the analog limits, the last value of the analog output is retained.

Resetting the sensor to factory settings

1. Press keys T1 and T2 > 10 s (see LED display)
2. The sensor has been reset when the green LED "Power" lights again after approx. 10 s.

Undervoltage detection

If the supply voltage falls below a value of approx. 7 V, all outputs and yellow LEDs are deactivated. The green "power" LED flashes rapidly. If the supply voltage falls below a value of approx. 8 V, the sensor continues with normal operation.

Technical Features

EMC Properties

Interference immunity in accordance with
DIN ISO 11452-2: 100 V/m
Frequency band 20 MHz up to 2 GHz
Mains-borne interference in accordance with ISO 7637-2:

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Pulse	1	2a	2b	3a	3b	4
Severity level	III	III	III	III	III	III
Failure criterion	C	A	C	A	A	C

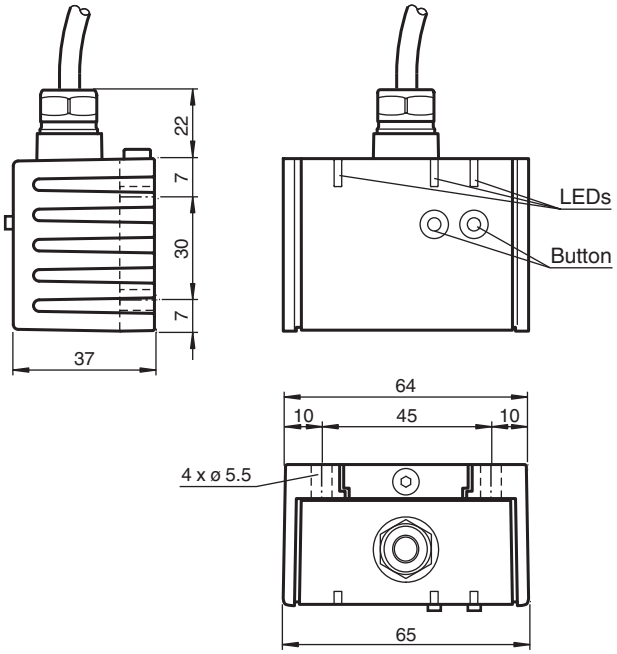
EN 61000-4-2:	CD: 8 kV /	AD: 15 kV
Severity level	IV	IV
EN 61000-4-3:	30 V/m (80...2500 MHz)	
Severity level	IV	
EN 61000-4-4:	2 kV	
Severity level	III	
EN 61000-4-6:	10 V (0.01...80 MHz)	
Severity level	III	
EN 55011:	Klasse A	

Inclination sensor

INX360D-F99-I2E2-5M

- E1-Type approval
- Measuring range 0 ... 360°
- Analog output 4 mA ... 20 mA
- Evaluation limits can be taught-in
- 2 programmable switch outputs
- High shock resistance
- Increased noise immunity 100 V/m

Dimensions



Technical Data

General specifications		
Type		Inclination sensor, 1-axis
Measurement range		0 ... 360 °
Absolute accuracy		≤ ± 0.5 °
Response delay		≤ 20 ms
Resolution		≤ 0.1 °
Repeat accuracy		≤ ± 0.1 °
Temperature influence		≤ 0.027 °/K
Functional safety related parameters		

Release date: 2020-04-24 Date of issue: 2020-06-03 Filename: 201504_eng.pdf

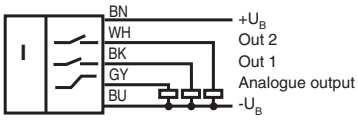
Technical Data

$MTTF_d$		300 a
Mission Time (T_M)		20 a
Diagnostic Coverage (DC)		0 %
Indicators/operating means		
Operation indicator		LED, green
Teach-In indicator		2 LEDs yellow (switching status), flashing
Button		2 push-buttons (Switch points programming , Evaluation range programming)
Switching state		2 yellow LEDs: Switching status (each output)
Electrical specifications		
Operating voltage	U_B	10 ... 30 V DC
No-load supply current	I_0	≤ 25 mA
Time delay before availability	t_v	≤ 200 ms
Switching output		
Output type		2 switch outputs PNP, NO , reverse polarity protected , short-circuit protected
Operating current	I_L	≤ 100 mA
Voltage drop		≤ 3 V
Analog output		
Output type		1 current output 4 ... 20 mA
Load resistor		0 ... 200 Ω at U_B = 10 ... 18 V 0 ... 500 Ω at U_B = 18 ... 30 V
Compliance with standards and directives		
Standard conformity		
Shock and impact resistance		100 *g* according to DIN EN 60068-2-27
Standards		EN 60947-5-2:2007 IEC 60947-5-2:2007
Approvals and certificates		
UL approval		cULus Listed, Class 2 Power Source
CCC approval		CCC approval / marking not required for products rated ≤36 V
E1 Type approval		10R-04
Ambient conditions		
Ambient temperature		-40 ... 85 °C (-40 ... 185 °F)
Storage temperature		-40 ... 85 °C (-40 ... 185 °F)
Mechanical specifications		
Connection type		5 m, PUR cable 5 x 0.5 mm^2
Housing material		PA
Degree of protection		IP68 / IP69K
Mass		240 g
Factory settings		
Switching output 1		-30 ° ... 30 °
Switching output 2		-30 ° ... 30 °
Analog output		-45 ° ... 45 °

Release date: 2020-04-24 Date of issue: 2020-06-03 Filename: 201504_eng.pdf

Connection

Standard symbol/Connection:

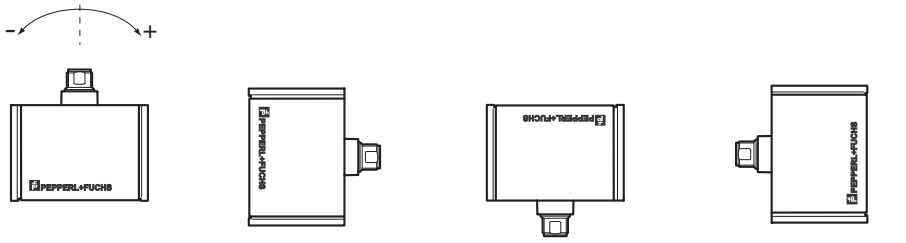


Mounting

Sensor Orientation

In the default setting the zero position of the sensor is reached, when the electrical connection faces straight upwards.

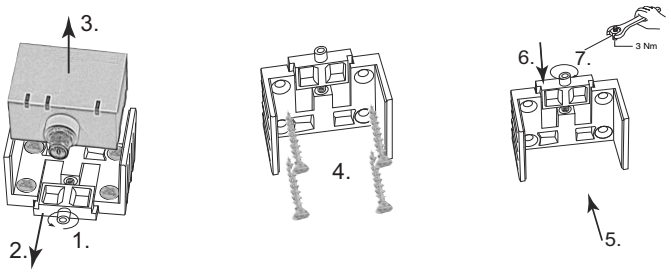
X Orientation



X = 0° X = 90° X = ±180° X = 270° (-90°)

Mounting of the sensor

Sensors from the -F99 series consist of a sensor module and accompanying cast aluminum housing. Select a vertical surface with minimum dimensions of 70 mm x 50 mm to mount the sensor.
Mount the sensor as follows:



1. Loosen the central screw under the sensor connection.
2. Slide back the clamping element until you are able to remove the sensor module from the housing.
3. Remove the sensor module from the housing
4. Position the housing at the required mounting location and secure using four countersunk screws. Make sure that the heads of the screws do not protrude.
5. Place the sensor module in the housing.
6. Slide the clamping element flush into the housing. Check that the sensor element is seated correctly.
7. Finally tighten the central screw.

The sensor is now mounted correctly.

Additional Information

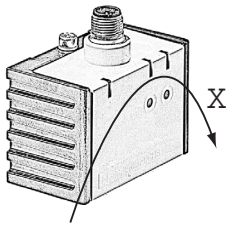
LED display

Displays dependent on the operating state	LED green: Power	LED yellow out 1	LED yellow out 2
Teach-in of switching points (output S1): **Teach-in of switching points (output S2):**	off off	flashes off	off flashes
Activate teach-in mode for analog limits: Teach-in of **analog limits**	off off	flashes flashes	flashes off
Normal operation	on	switchings tate	switchings tate
Reset to factory settings: 2 s ... 10 s > 10 s ... end of reset process Followed by normal operation	 off flashes	 flashes off	 flashes off
Undervoltage	flashes	off	off

Release date: 2020-04-24 Date of issue: 2020-06-03 Filename: 201504_eng.pdf

Axis definition

The definition of the X-axis is shown on the sensor housing by means of an imprinted and labeled double arrow. The figure shows the clockwise direction of rotation.



Teach-in of switching points (output S1)

1. Press key T1 > 2 s (see LED display)
2. Move sensor to switching position 1
3. Press key T1 briefly. LED "out 1" lights for 1.5 s as confirmation. Switching point 1 has been taught
4. Move sensor to switching position 2
5. Press key T1 briefly. LED "out 1" lights for 1.5 s as confirmation. Switching point 2 has been taught
6. Sensor returns to normal operation (see LED display)

The NC (active output state) is always defined in the range from the 1st configured position to 2nd configured position.
As an example :
Case #1: configure position #1 at +45degree, configure position #2 at +90 degree; NC is from +45 ' +90 in the CW direction
Case #2: configure position #1 at +90degree ; configure position #2 at +45 degree; NC is from +90 ' +45 in the CW direction

Teach-in of switching points (output S2)

Similar to the process for "Teach-in of switching points (output S1)", but with key T2 instead of key T1.

Teach-in of analog limits

1. Activate the teach-in mode for the analog limits by simultaneously pressing keys T1 and T2 until the green LED is extinguished and the two yellow LEDs flash. Then release the keys.
2. Press key T1 > for 2 s (see LED display)
3. Move the sensor into the position of minimum evaluation limit
4. Press key T1 briefly. LED "out 1" lights for 1.5 s as confirmation. The minimum evaluation limit has been taught. In this position the analog output will provide its minimum output value.
5. Move the sensor into the position of maximum evaluation limit
6. Press key T1 briefly. LED "out 1" lights for 1.5 s as confirmation. The maximum evaluation limit has been taught. In this position the analog output will provide its maximum output value.
7. Sensor returns to normal operation (see LED display)

If the sensor inclination exceeds one of the analog limits, the last value of the analog output is retained.

Resetting the sensor to factory settings

1. Press keys T1 and T2 > 10 s (see LED display)
2. The sensor has been reset when the green LED "Power" lights again after approx. 10 s.

Undervoltage detection

If the supply voltage falls below a value of approx. 7 V, all outputs and yellow LEDs are deactivated. The green "power" LED flashes rapidly. If the supply voltage falls below a value of approx. 8 V, the sensor continues with normal operation.

Technical Features

EMC Properties

Interference immunity in accordance with
DIN ISO 11452-2: 100 V/m
Frequency band 20 MHz up to 2 GHz
Mains-borne interference in accordance with ISO 7637-2:

Pulse	1	2 a	2 b	3 a	3 b	4
Severity level	I I I	I I I	I I I	I I I	I I I	I I I
Failure criterion	C	A	C	A	A	C

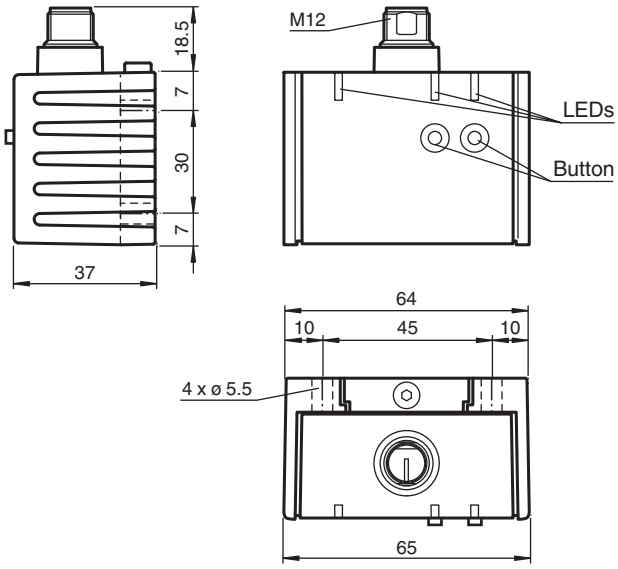
EN 61000-4-2:	CD: 8 kV /	AD: 15 kV
Severity level	IV	IV
EN 61000-4-3:	30 V/m (80...2500 MHz)	
Severity level	IV	
EN 61000-4-4:	2 kV	
Severity level	III	
EN 61000-4-6:	10 V (0.01...80 MHz)	
Severity level	III	
EN 55011:	Klasse A	

Inclination sensor

INY360D-F99-2U2E2-V17

- E1-Type approval
- Measuring range 0 ... 360°
- Analog output 0 V ... 5 V
- Evaluation limits can be taught-in
- 2 programmable switch outputs
- High shock resistance
- Increased noise immunity 100 V/m

Dimensions



Technical Data

General specifications		
Type		Inclination sensor, 2-axis
Measurement range		0 ... 360 °
Absolute accuracy		≤ ± 0.5 °
Response delay		≤ 25 ms
Resolution		≤ 0.1 °
Repeat accuracy		≤ ± 0.1 °
Temperature influence		≤ 0.027 °/K
Functional safety related parameters		

Release date: 2020-04-24 Date of issue: 2020-06-03 Filename: 206771_eng.pdf

Technical Data

$MTTF_d$		390 a
Mission Time (T_M)		20 a
Diagnostic Coverage (DC)		0 %
Indicators/operating means		
Operation indicator		LED, green
Teach-In indicator		2 LEDs yellow (switching status), flashing
Button		2 push-buttons (Switch points programming , Evaluation range programming)
Switching state		2 yellow LEDs: Switching status (each output)
Electrical specifications		
Operating voltage	U_B	10 ... 30 V DC
No-load supply current	I_0	≤ 25 mA
Time delay before availability	t_v	≤ 200 ms
Switching output		
Output type		2 switch outputs PNP, NO , reverse polarity protected , short-circuit protected
Operating current	I_L	≤ 100 mA
Voltage drop		≤ 3 V
Analog output		
Output type		2 voltage outputs 0 ... 5 V (one output for each axis)
Load resistor		≥ 1 kΩ
Compliance with standards and directives		
Standard conformity		
Shock and impact resistance		100 *g* according to DIN EN 60068-2-27
Standards		EN 60947-5-2:2007 IEC 60947-5-2:2007
Approvals and certificates		
UL approval		cULus Listed, Class 2 Power Source
E1 Type approval		10R-04
Ambient conditions		
Ambient temperature		-40 ... 85 °C (-40 ... 185 °F)
Storage temperature		-40 ... 85 °C (-40 ... 185 °F)
Mechanical specifications		
Connection type		8-pin, M12 x 1 connector
Housing material		PA
Degree of protection		IP68 / IP69K
Mass		240 g
Factory settings		
Analog output (X)		-45 ° ... 45 °
Analog output (Y)		-45 ° ... 45 °
Switching output (X)		-30 ° ... 30 °
Switching output (Y)		-30 ° ... 30 °

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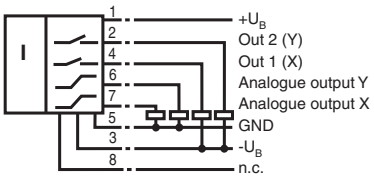
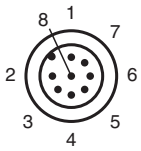
Connection

Standard symbol/Connection:



Connection Assignment



Wire colors

1	WH	(white)
2	BN	(brown)
3	GN	(green)
4	YE	(yellow)
5	GY	(gray)
6	PK	(pink)
7	BU	(blue)
8	RD	(red)

Accessories

	**V17-G-2M-PUR**	Female cordset, M12, 8-pin, shielded, PUR cable
	**V17-G-5M-PUR**	Female cordset, M12, 8-pin, shielded, PUR cable
	**V17-G-10M-PUR**	Female cordset, M12, 8-pin, shielded, PUR cable
	**V17-G-10M-PVC-ABG**	Female cordset, M12, 8-pin, shielded, PVC cable

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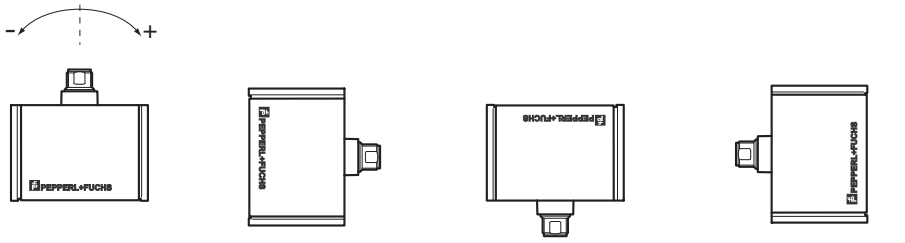
Mounting

Sensor Orientation

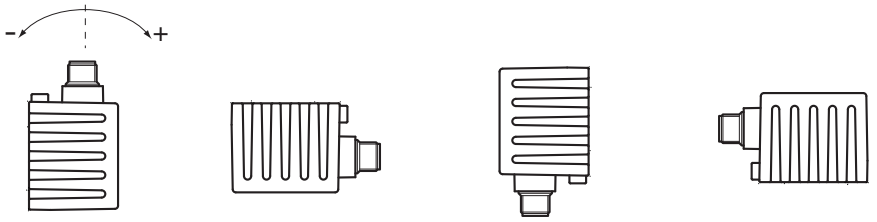
In the default setting the zero position of the sensor is reached, when the electrical connection faces straight upwards.

X Orientation



X = 0° X = 90° X = ±180° X = 270° (-90°)

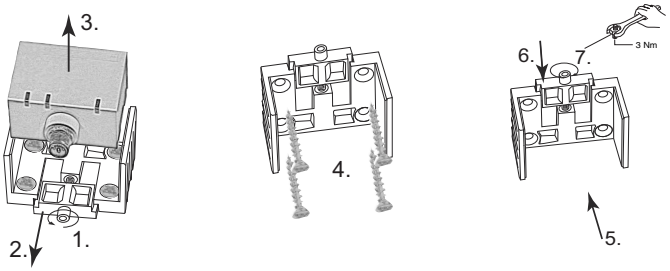
Y Orientation



Y = 0° Y = 90° Y = ±180° Y = 270° (-90°)

Mounting of the sensor

Sensors from the -F99 series consist of a sensor module and accompanying cast aluminum housing. Select a vertical surface with minimum dimensions of 70 mm x 50 mm to mount the sensor.
Mount the sensor as follows:



1. Loosen the central screw under the sensor connection.
2. Slide back the clamping element until you are able to remove the sensor module from the housing.
3. Remove the sensor module from the housing
4. Position the housing at the required mounting location and secure using four countersunk screws. Make sure that the heads of the screws do not protrude.
5. Place the sensor module in the housing.
6. Slide the clamping element flush into the housing. Check that the sensor element is seated correctly.
7. Finally tighten the central screw.

The sensor is now mounted correctly.

Additional Information

LED display

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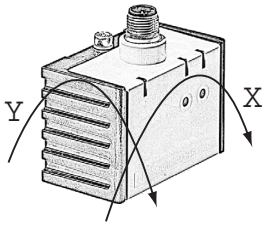
Displays dependent on the operating state	LED green: Power	LED yellow out 1	LED yellow out 2
Teach-in of switching points (X-axis):	off	flashes	off
Teach-in of switching points (Y-axis):	off	off	flashes
Activate teach-in mode for analog limits:	off	flashes	flashes
Teach-in of analog limit (X-axis)	off	flashes	off
Teach-in of analog limit (Y-axis)	off	off	flashes
Normal operation	on	switchings tate	switchings tate
Reset to factory settings: 2 s ... 10 s > 10 s ... end of reset process Followed by normal operation	 off flashes	 flashes off	 flashes off
Undervoltage	flashes	off	off

Axis definition

The definition of the X-axis and Y-axis is shown on the sensor housing by means of imprinted and labeled double arrows.



Teach-in of switching points (X-axis)

1. Press key T1 > 2 s (see LED display)
2. Move sensor to switching position 1
3. Press key T1 briefly. LED "out 1" lights for 1.5 s as confirmation. Switching point 1 has been taught
4. Move sensor to switching position 2
5. Press key T1 briefly. LED "out 1" lights for 1.5 s as confirmation. Switching point 2 has been taught
6. Sensor returns to normal operation (see LED display)

The NC (active output state) is always defined in the range from the 1st configured position to 2nd configured position.
As an example :
Case #1: configure position #1 at +45degree, configure position #2 at +90 degree; NC is from +45 ' +90 in the CW direction
Case #2: configure position #1 at +90degree ; configure position #2 at +45 degree; NC is from +90 ' +45 in the CW direction

Teach-in of switching points (Y-axis)

1. Press key T2 > 2 s (see LED display)
2. Move sensor to switching position 1
3. Press key T2 briefly. LED "out 2" lights for 1.5 s as confirmation. Switching point 1 has been taught
4. Move sensor to switching position 2
5. Press key T2 briefly. LED "out 2" lights for 1.5 s as confirmation. Switching point 2 has been taught
6. Sensor returns to normal operation (see LED display)

The NC (active output state) is always defined in the range from the 1st configured position to 2nd configured position.
See also the example, above.

Teach-in of analog limits (X-axis)

1. Activate the teach-in mode for the analog limits by simultaneously pressing keys T1 and T2 > 2 s (see LED display)
2. Press key T1 > for 2 s (see LED display)
3. Move the sensor into the position of minimum evaluation limit
4. Press key T1 briefly. LED "out 1" lights for 1.5 s as confirmation. The minimum evaluation limit has been taught. In this position the analog output will provide its minimum output value.
5. Move the sensor into the position of maximum evaluation limit
6. Press key T1 briefly. LED "out 1" lights for 1.5 s as confirmation. The maximum evaluation limit has been taught. In this position the analog output will provide its maximum output value.
7. Sensor returns to normal operation (see LED display)

If the sensor inclination exceeds one of the analog limits, the last value of the analog output is retained.

Teach-in of analog limits (Y-axis)

1. Activate the teach-in mode for the analog limits by simultaneously pressing keys T1 and T2 > 2 s (see LED display)
2. Press key T2 > 2 s (see LED display)
3. Move the sensor into the position of minimum evaluation limit
4. Press key T2 briefly. LED "out 2" lights for 1.5 s as confirmation. The minimum evaluation limit has been taught. In this position the analog output will provide its minimum output value.
5. Move the sensor into the position of maximum evaluation limit
6. Press key T2 briefly. LED "out 2" lights for 1.5 s as confirmation. The maximum evaluation limit has been taught. In this position the analog output will provide its maximum output value.
7. Sensor returns to normal operation (see LED display)

If the sensor inclination exceeds one of the analog limits, the last value of the analog output is retained.

Resetting the sensor to factory settings

1. Press keys T1 and T2 > 10 s (see LED display)
2. The sensor has been reset when the green LED "Power" lights again after approx. 10 s.

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Undervoltage detection

If the supply voltage falls below a value of approx. 7 V, all outputs and yellow LEDs are deactivated. The green "Power" LED flashes rapidly. If the supply voltage exceeds a value of approx. 8 V, the sensor continues with normal operation.

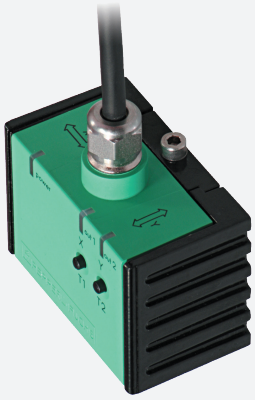
Technical Features

EMC Properties

Interference immunity in accordance with
DIN ISO 11452-2: 100 V/m
Frequency band 20 MHz up to 2 GHz
Mains-borne interference in accordance with ISO 7637-2:

Pulse	1	2 a	2 b	3 a	3 b	4
Severity level	I I I	I I I	I I I	I I I	I I I	I I I
Failure criterion	C	A	C	A	A	C

EN 61000-4-2:	CD: 8 kV /	AD: 15 kV
Severity level	IV	IV
EN 61000-4-3:	30 V/m (80...2500 MHz)	
Severity level	IV	
EN 61000-4-4:	2 kV	
Severity level	III	
EN 61000-4-6:	10 V (0.01...80 MHz)	
Severity level	III	
EN 55011:	Klasse A	

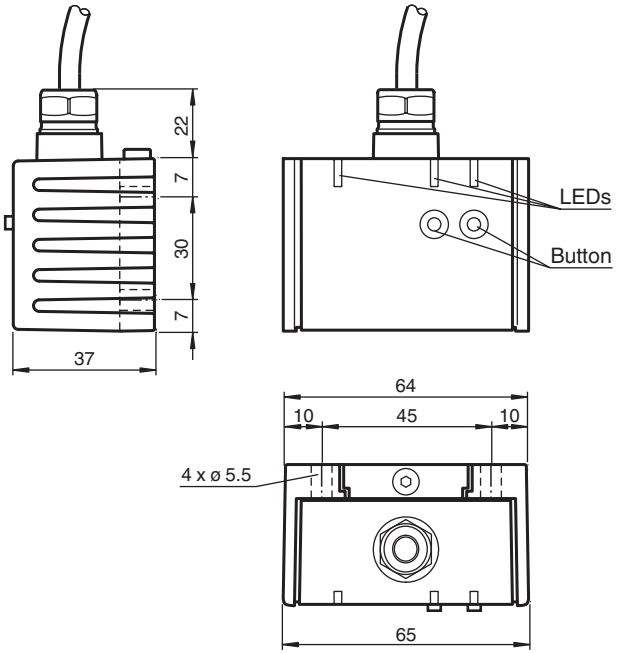


Inclination sensor

INY360D-F99-2U2E2-5M

- E1-Type approval
- Measuring range 0 ... 360°
- Analog output 0 V ... 5 V
- Evaluation limits can be taught-in
- 2 programmable switch outputs
- High shock resistance
- Increased noise immunity 100 V/m

Dimensions



Technical Data

General specifications		
Type		Inclination sensor, 2-axis
Measurement range		0 ... 360 °
Absolute accuracy		≤ ± 0.5 °
Response delay		≤ 25 ms
Resolution		≤ 0.1 °
Repeat accuracy		≤ ± 0.1 °
Temperature influence		≤ 0.027 °/K
Functional safety related parameters		

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Technical Data

$MTTF_d$		390 a
Mission Time (T_M)		20 a
Diagnostic Coverage (DC)		0 %
Indicators/operating means		
Operation indicator		LED, green
Teach-In indicator		2 LEDs yellow (switching status), flashing
Button		2 push-buttons (Switch points programming , Evaluation range programming)
Switching state		2 yellow LEDs: Switching status (each output)
Electrical specifications		
Operating voltage	U_B	10 ... 30 V DC
No-load supply current	I_0	≤ 25 mA
Time delay before availability	t_v	≤ 200 ms
Switching output		
Output type		2 switch outputs PNP, NO , reverse polarity protected , short-circuit protected
Operating current	I_L	≤ 100 mA
Voltage drop		≤ 3 V
Analog output		
Output type		2 voltage outputs 0 ... 5 V (one output for each axis)
Load resistor		≥ 1 kΩ
Compliance with standards and directives		
Standard conformity		
Shock and impact resistance		100 *g* according to DIN EN 60068-2-27
Standards		EN 60947-5-2:2007 IEC 60947-5-2:2007
Approvals and certificates		
UL approval		cULus Listed, Class 2 Power Source
E1 Type approval		10R-04
Ambient conditions		
Ambient temperature		-40 ... 85 °C (-40 ... 185 °F)
Storage temperature		-40 ... 85 °C (-40 ... 185 °F)
Mechanical specifications		
Connection type		5 m, PUR cable 7 x 0.5 mm^2
Housing material		PA
Degree of protection		IP68 / IP69K
Mass		240 g
Factory settings		
Analog output (X)		-45 ° ... 45 °
Analog output (Y)		-45 ° ... 45 °
Switching output (X)		-30 ° ... 30 °
Switching output (Y)		-30 ° ... 30 °

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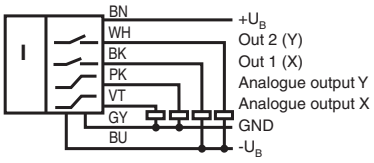
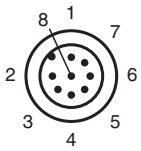
Connection

Standard symbol/Connection:



Connection Assignment



Wire colors

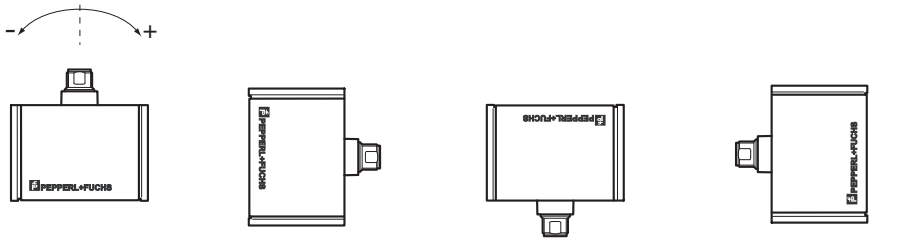
1	WH	(white)
2	BN	(brown)
3	GN	(green)
4	YE	(yellow)
5	GY	(gray)
6	PK	(pink)
7	BU	(blue)
8	RD	(red)

Mounting

Sensor Orientation

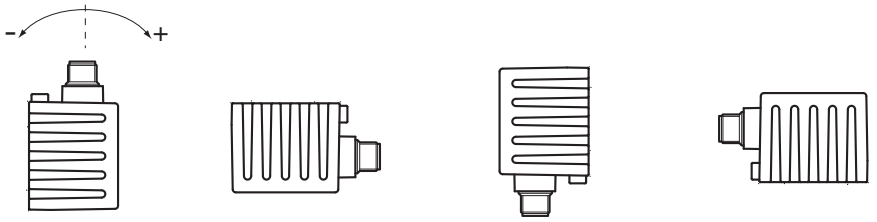
In the default setting the zero position of the sensor is reached, when the electrical connection faces straight upwards.

X Orientation



X = 0° X = 90° X = ±180° X = 270° (-90°)

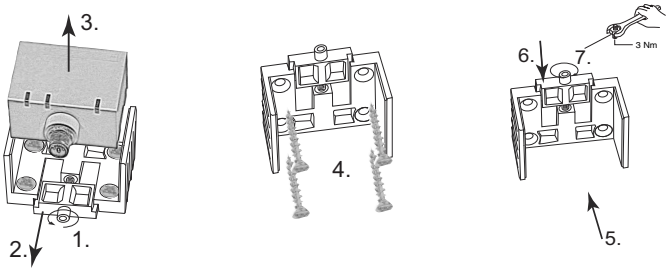
Y Orientation



Y = 0° Y = 90° Y = ±180° Y = 270° (-90°)

Mounting of the sensor

Sensors from the -F99 series consist of a sensor module and accompanying cast aluminum housing. Select a vertical surface with minimum dimensions of 70 mm x 50 mm to mount the sensor.
Mount the sensor as follows:



1. Loosen the central screw under the sensor connection.
2. Slide back the clamping element until you are able to remove the sensor module from the housing.
3. Remove the sensor module from the housing
4. Position the housing at the required mounting location and secure using four countersunk screws. Make sure that the heads of the screws do not protrude.
5. Place the sensor module in the housing.
6. Slide the clamping element flush into the housing. Check that the sensor element is seated correctly.
7. Finally tighten the central screw.

The sensor is now mounted correctly.

Additional Information

LED display

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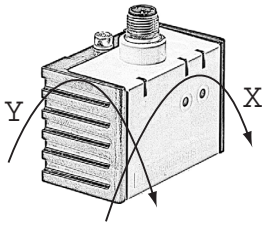
Displays dependent on the operating state	LED green: Power	LED yellow out 1	LED yellow out 2
Teach-in of switching points (X-axis):	off	flashes	off
Teach-in of switching points (Y-axis):	off	off	flashes
Activate teach-in mode for analog limits:	off	flashes	flashes
Teach-in of analog limit (X-axis)	off	flashes	off
Teach-in of analog limit (Y-axis)	off	off	flashes
Normal operation	on	switchings tate	switchings tate
Reset to factory settings: 2 s ... 10 s > 10 s ... end of reset process Followed by normal operation	 off flashes	 flashes off	 flashes off
Undervoltage	flashes	off	off

Axis definition

The definition of the X-axis and Y-axis is shown on the sensor housing by means of imprinted and labeled double arrows.



Teach-in of switching points (X-axis)

1. Press key T1 > 2 s (see LED display)
2. Move sensor to switching position 1
3. Press key T1 briefly. LED "out 1" lights for 1.5 s as confirmation. Switching point 1 has been taught
4. Move sensor to switching position 2
5. Press key T1 briefly. LED "out 1" lights for 1.5 s as confirmation. Switching point 2 has been taught
6. Sensor returns to normal operation (see LED display)

The NC (active output state) is always defined in the range from the 1st configured position to 2nd configured position.
As an example :
Case #1: configure position #1 at +45degree, configure position #2 at +90 degree; NC is from +45 ' +90 in the CW direction
Case #2: configure position #1 at +90degree ; configure position #2 at +45 degree; NC is from +90 ' +45 in the CW direction

Teach-in of switching points (Y-axis)

1. Press key T2 > 2 s (see LED display)
2. Move sensor to switching position 1
3. Press key T2 briefly. LED "out 2" lights for 1.5 s as confirmation. Switching point 1 has been taught
4. Move sensor to switching position 2
5. Press key T2 briefly. LED "out 2" lights for 1.5 s as confirmation. Switching point 2 has been taught
6. Sensor returns to normal operation (see LED display)

The NC (active output state) is always defined in the range from the 1st configured position to 2nd configured position.
See also the example, above.

Teach-in of analog limits (X-axis)

1. Activate the teach-in mode for the analog limits by simultaneously pressing keys T1 and T2 > 2 s (see LED display)
2. Press key T1 > for 2 s (see LED display)
3. Move the sensor into the position of minimum evaluation limit
4. Press key T1 briefly. LED "out 1" lights for 1.5 s as confirmation. The minimum evaluation limit has been taught. In this position the analog output will provide its minimum output value.
5. Move the sensor into the position of maximum evaluation limit
6. Press key T1 briefly. LED "out 1" lights for 1.5 s as confirmation. The maximum evaluation limit has been taught. In this position the analog output will provide its maximum output value.
7. Sensor returns to normal operation (see LED display)

If the sensor inclination exceeds one of the analog limits, the last value of the analog output is retained.

Teach-in of analog limits (Y-axis)

1. Activate the teach-in mode for the analog limits by simultaneously pressing keys T1 and T2 > 2 s (see LED display)
2. Press key T2 > 2 s (see LED display)
3. Move the sensor into the position of minimum evaluation limit
4. Press key T2 briefly. LED "out 2" lights for 1.5 s as confirmation. The minimum evaluation limit has been taught. In this position the analog output will provide its minimum output value.
5. Move the sensor into the position of maximum evaluation limit
6. Press key T2 briefly. LED "out 2" lights for 1.5 s as confirmation. The maximum evaluation limit has been taught. In this position the analog output will provide its maximum output value.
7. Sensor returns to normal operation (see LED display)

If the sensor inclination exceeds one of the analog limits, the last value of the analog output is retained.

Resetting the sensor to factory settings

1. Press keys T1 and T2 > 10 s (see LED display)
2. The sensor has been reset when the green LED "Power" lights again after approx. 10 s.

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Undervoltage detection

If the supply voltage falls below a value of approx. 7 V, all outputs and yellow LEDs are deactivated. The green "Power" LED flashes rapidly. If the supply voltage exceeds a value of approx. 8 V, the sensor continues with normal operation.

Technical Features

EMC Properties

Interference immunity in accordance with
DIN ISO 11452-2: 100 V/m
Frequency band 20 MHz up to 2 GHz
Mains-borne interference in accordance with ISO 7637-2:

Pulse	1	2a	2b	3a	3b	4
Severity level	I I I	I I I	I I I	I I I	I I I	I I I
Failure criterion	C	A	C	A	A	C

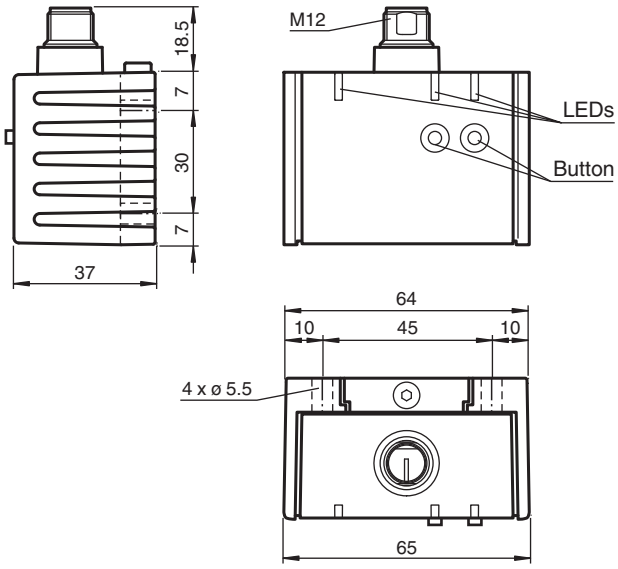
EN 61000-4-2:	CD: 8 kV /	AD: 15 kV
Severity level	IV	IV
EN 61000-4-3:	30 V/m (80...2500 MHz)	
Severity level	IV	
EN 61000-4-4:	2 kV	
Severity level	III	
EN 61000-4-6:	10 V (0.01...80 MHz)	
Severity level	III	
EN 55011:	Klasse A	

Inclination sensor

INX360D-F99-U2E2-V15

- E1-Type approval
- Measuring range 0 ... 360°
- Analog output 0 V ... 5 V
- Evaluation limits can be taught-in
- 2 programmable switch outputs
- High shock resistance
- Increased noise immunity 100 V/m

Dimensions



Technical Data

General specifications		
Type		Inclination sensor, 1-axis
Measurement range		0 ... 360 °
Absolute accuracy		≤ ± 0.5 °
Response delay		≤ 20 ms
Resolution		≤ 0.1 °
Repeat accuracy		≤ ± 0.1 °
Temperature influence		≤ 0.027 °/K
Functional safety related parameters		

Release date: 2020-04-24 Date of issue: 2020-06-03 Filename: 206773_eng.pdf

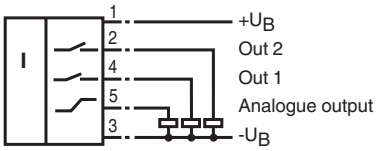
Technical Data

$MTTF_d$		390 a
Mission Time (T_M)		20 a
Diagnostic Coverage (DC)		0 %
Indicators/operating means		
Operation indicator		LED, green
Teach-In indicator		2 LEDs yellow (switching status), flashing
Button		2 push-buttons (Switch points programming , Evaluation range programming)
Switching state		2 yellow LEDs: Switching status (each output)
Electrical specifications		
Operating voltage	U_B	10 ... 30 V DC
No-load supply current	I_0	≤ 25 mA
Time delay before availability	t_v	≤ 200 ms
Switching output		
Output type		2 switch outputs PNP, NO , reverse polarity protected , short-circuit protected
Operating current	I_L	≤ 100 mA
Voltage drop		≤ 3 V
Analog output		
Output type		1 voltage output 0 ... 5 V
Load resistor		≥ 1 kΩ
Compliance with standards and directives		
Standard conformity		
Shock and impact resistance		100 *g* according to DIN EN 60068-2-27
Standards		EN 60947-5-2:2007 IEC 60947-5-2:2007
Approvals and certificates		
UL approval		cULus Listed, Class 2 Power Source
CCC approval		CCC approval / marking not required for products rated ≤36 V
E1 Type approval		10R-04
Ambient conditions		
Ambient temperature		-40 ... 85 °C (-40 ... 185 °F)
Storage temperature		-40 ... 85 °C (-40 ... 185 °F)
Mechanical specifications		
Connection type		5-pin, M12 x 1 connector
Housing material		PA
Degree of protection		IP68 / IP69K
Mass		240 g
Factory settings		
Switching output 1		-30 ° ... 30 °
Switching output 2		-30 ° ... 30 °
Analog output		-45 ° ... 45 °

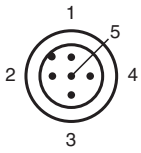
Release date: 2020-04-24 Date of issue: 2020-06-03 Filename: 206773_eng.pdf

Connection

Standard symbol/Connection:



Connection Assignment



Wire colors in accordance with EN 60947-5-2

1	BN	(brown)
2	WH	(white)
3	BU	(blue)
4	BK	(black)
5	GY	(gray)

Accessories

	**V15-G-2M-PUR**	Female cordset, M12, 5-pin, PUR cable

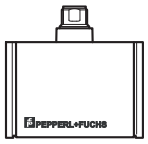
Release date: 2020-04-24 Date of issue: 2020-06-03 Filename: 206773_eng.pdf

Mounting

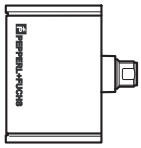
Sensor Orientation

In the default setting the zero position of the sensor is reached, when the electrical connection faces straight upwards.

X Orientation



X = 0°



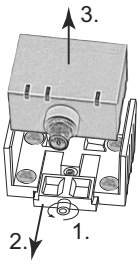
X = 90°

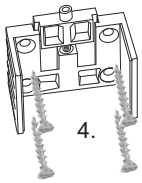
X = ±180°

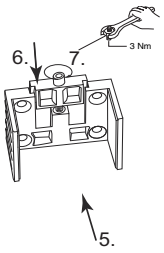
X = 270° (-90°)

Mounting of the sensor

Sensors from the -F99 series consist of a sensor module and accompanying cast aluminum housing. Select a vertical surface with minimum dimensions of 70 mm x 50 mm to mount the sensor.
Mount the sensor as follows:







1. Loosen the central screw under the sensor connection.
2. Slide back the clamping element until you are able to remove the sensor module from the housing.
3. Remove the sensor module from the housing
4. Position the housing at the required mounting location and secure using four countersunk screws. Make sure that the heads of the screws do not protrude.
5. Place the sensor module in the housing.
6. Slide the clamping element flush into the housing. Check that the sensor element is seated correctly.
7. Finally tighten the central screw.

The sensor is now mounted correctly.

Additional Information

LED display

Displays dependent on the operating state	LED green: Power	LED yellow out 1	LED yellow out 2
Teach-in of switching points (output S1): **Teach-in of switching points (output S2):**	off off	flashes off	off flashes
Activate teach-in mode for analog limits: Teach-in of **analog limits**	off off	flashes flashes	flashes off
Normal operation	on	switchings tate	switchings tate
Reset to factory settings: 2 s ... 10 s > 10 s ... end of reset process Followed by normal operation	 off flashes	 flashes off	 flashes off
Undervoltage	flashes	off	off

Factory settings

see Technical Data

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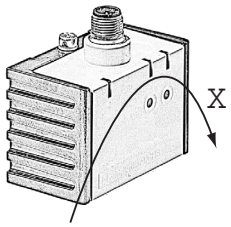
Axis definition

The definition of the X-axis is shown on the sensor housing by means of an imprinted and labeled double arrow. The figure shows the clockwise direction of rotation.



Teach-in of switching points (output S1)

1. Press key T1 > 2 s (see LED display)
2. Move sensor to switching position 1
3. Press key T1 briefly. LED "out 1" lights for 1.5 s as confirmation. Switching point 1 has been taught
4. Move sensor to switching position 2
5. Press key T1 briefly. LED "out 1" lights for 1.5 s as confirmation. Switching point 2 has been taught
6. Sensor returns to normal operation (see LED display)

The NC (active output state) is always defined in the range from the 1st configured position to 2nd configured position.
As an example :
Case #1: configure position #1 at +45degree, configure position #2 at +90 degree; NC is from +45 ' +90 in the CW direction
Case #2: configure position #1 at +90degree ; configure position #2 at +45 degree; NC is from +90 ' +45 in the CW direction

Teach-in of switching points (output S2)

Similar to the process for "Teach-in of switching points (output S1)“, but with key T2 instead of key T1.

Teach-in of analog limits

1. Activate the teach-in mode for the analog limits by simultaneously pressing keys T1 and T2 until the green LED is extinguished and the two yellow LEDs flash. Then release the keys.
2. Press key T1 > 2 s (see LED display)
3. Move the sensor into the position of evaluation limit 0 V
4. Press key T1 briefly. LED "out 1" lights for 1.5 s as confirmation. Evaluation limit 0 V has been taught
5. Move the sensor into the position of evaluation limit 5 V
6. Press key T1 briefly. LED "out 1" lights for 1.5 s as confirmation. Evaluation limit 5 V has been taught
7. Sensor returns to normal operation (see LED display)

If the sensor inclination exceeds one of the analog limits, the last current value of the analog output is retained.

Resetting the sensor to factory settings

1. Press keys T1 and T2 > 10 s (see LED display)
2. The sensor has been reset when the green LED "Power" lights again after approx. 10 s.

Undervoltage detection

If the supply voltage falls below a value of approx. 7 V, all outputs and yellow LEDs are deactivated. The green "power" LED flashes rapidly. If the supply voltage falls below a value of approx. 8 V, the sensor continues with normal operation.

Technical Features

EMC Properties

Interference immunity in accordance with
DIN ISO 11452-2: 100 V/m
Frequency band 20 MHz up to 2 GHz
Mains-borne interference in accordance with ISO 7637-2:

Pulse	1	2a	2b	3a	3b	4
Severity level	III	III	III	III	III	III
Failure criterion	C	A	C	A	A	C

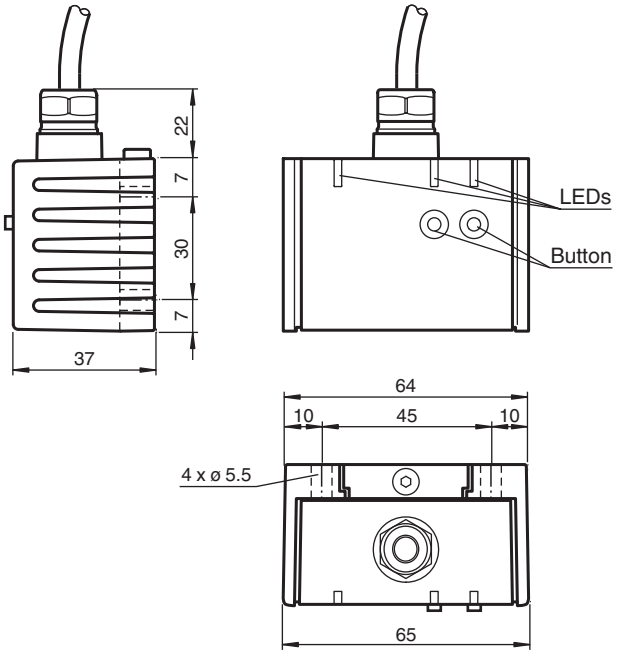
EN 61000-4-2:	CD: 8 kV /	AD: 15 kV
Severity level	IV	IV
EN 61000-4-3:	30 V/m (80...2500 MHz)	
Severity level	IV	
EN 61000-4-4:	2 kV	
Severity level	III	
EN 61000-4-6:	10 V (0.01...80 MHz)	
Severity level	III	
EN 55011:	Klasse A	

Inclination sensor

INX360D-F99-U2E2-5M

- E1-Type approval
- Measuring range 0 ... 360°
- Analog output 0 V ... 5 V
- Evaluation limits can be taught-in
- 2 programmable switch outputs
- High shock resistance
- Increased noise immunity 100 V/m

Dimensions



Technical Data

General specifications		
Type		Inclination sensor, 1-axis
Measurement range		0 ... 360 °
Absolute accuracy		≤ ± 0.5 °
Response delay		≤ 20 ms
Resolution		≤ 0.1 °
Repeat accuracy		≤ ± 0.1 °
Temperature influence		≤ 0.027 °/K
Functional safety related parameters		

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Technical Data

$MTTF_d$		390 a
Mission Time (T_M)		20 a
Diagnostic Coverage (DC)		0 %
Indicators/operating means		
Operation indicator		LED, green
Teach-In indicator		2 LEDs yellow (switching status), flashing
Button		2 push-buttons (Switch points programming , Evaluation range programming)
Switching state		2 yellow LEDs: Switching status (each output)
Electrical specifications		
Operating voltage	U_B	10 ... 30 V DC
No-load supply current	I_0	≤ 25 mA
Time delay before availability	t_v	≤ 200 ms
Switching output		
Output type		2 switch outputs PNP, NO , reverse polarity protected , short-circuit protected
Operating current	I_L	≤ 100 mA
Voltage drop		≤ 3 V
Analog output		
Output type		1 voltage output 0 ... 5 V
Load resistor		≥ 1 kΩ
Compliance with standards and directives		
Standard conformity		
Shock and impact resistance		100 *g* according to DIN EN 60068-2-27
Standards		EN 60947-5-2:2007 IEC 60947-5-2:2007
Approvals and certificates		
UL approval		cULus Listed, Class 2 Power Source
CCC approval		CCC approval / marking not required for products rated ≤36 V
E1 Type approval		10R-04
Ambient conditions		
Ambient temperature		-40 ... 85 °C (-40 ... 185 °F)
Storage temperature		-40 ... 85 °C (-40 ... 185 °F)
Mechanical specifications		
Connection type		5 m, PUR cable 5 x 0.5 mm^2
Housing material		PA
Degree of protection		IP68 / IP69K
Mass		240 g
Factory settings		
Switching output 1		-30 ° ... 30 °
Switching output 2		-30 ° ... 30 °
Analog output		-45 ° ... 45 °

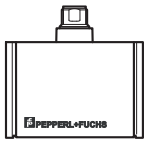
Release date: 2020-04-24 Date of issue: 2020-06-03 Filename: 206774_eng.pdf

Mounting

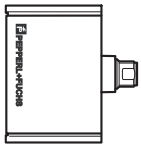
Sensor Orientation

In the default setting the zero position of the sensor is reached, when the electrical connection faces straight upwards.

X Orientation



X = 0°



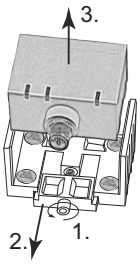
X = 90°

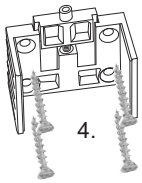
X = ±180°

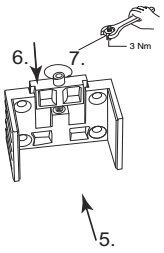
X = 270° (-90°)

Mounting of the sensor

Sensors from the -F99 series consist of a sensor module and accompanying cast aluminum housing. Select a vertical surface with minimum dimensions of 70 mm x 50 mm to mount the sensor.
Mount the sensor as follows:







1. Loosen the central screw under the sensor connection.
2. Slide back the clamping element until you are able to remove the sensor module from the housing.
3. Remove the sensor module from the housing
4. Position the housing at the required mounting location and secure using four countersunk screws. Make sure that the heads of the screws do not protrude.
5. Place the sensor module in the housing.
6. Slide the clamping element flush into the housing. Check that the sensor element is seated correctly.
7. Finally tighten the central screw.

The sensor is now mounted correctly.

Additional Information

LED display

Displays dependent on the operating state	LED green: Power	LED yellow out 1	LED yellow out 2
Teach-in of switching points (output S1): **Teach-in of switching points (output S2):**	off off	flashes off	off flashes
Activate teach-in mode for analog limits: Teach-in of **analog limits**	off off	flashes flashes	flashes off
Normal operation	on	switchings tate	switchings tate
Reset to factory settings: 2 s ... 10 s > 10 s ... end of reset process Followed by normal operation	 off flashes	 flashes off	 flashes off
Undervoltage	flashes	off	off

Factory settings

see Technical Data

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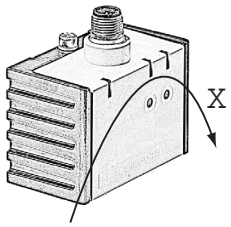
Axis definition

The definition of the X-axis is shown on the sensor housing by means of an imprinted and labeled double arrow. The figure shows the clockwise direction of rotation.



Teach-in of switching points (output S1)

1. Press key T1 > 2 s (see LED display)
2. Move sensor to switching position 1
3. Press key T1 briefly. LED "out 1" lights for 1.5 s as confirmation. Switching point 1 has been taught
4. Move sensor to switching position 2
5. Press key T1 briefly. LED "out 1" lights for 1.5 s as confirmation. Switching point 2 has been taught
6. Sensor returns to normal operation (see LED display)

The NC (active output state) is always defined in the range from the 1st configured position to 2nd configured position.
As an example :
Case #1: configure position #1 at +45degree, configure position #2 at +90 degree; NC is from +45 ' +90 in the CW direction
Case #2: configure position #1 at +90degree ; configure position #2 at +45 degree; NC is from +90 ' +45 in the CW direction

Teach-in of switching points (output S2)

Similar to the process for "Teach-in of switching points (output S1)“, but with key T2 instead of key T1.

Teach-in of analog limits

1. Activate the teach-in mode for the analog limits by simultaneously pressing keys T1 and T2 until the green LED is extinguished and the two yellow LEDs flash. Then release the keys.
2. Press key T1 > 2 s (see LED display)
3. Move the sensor into the position of evaluation limit 0 V
4. Press key T1 briefly. LED "out 1" lights for 1.5 s as confirmation. Evaluation limit 0 V has been taught
5. Move the sensor into the position of evaluation limit 5 V
6. Press key T1 briefly. LED "out 1" lights for 1.5 s as confirmation. Evaluation limit 5 V has been taught
7. Sensor returns to normal operation (see LED display)

If the sensor inclination exceeds one of the analog limits, the last current value of the analog output is retained.

Resetting the sensor to factory settings

1. Press keys T1 and T2 > 10 s (see LED display)
2. The sensor has been reset when the green LED "Power" lights again after approx. 10 s.

Undervoltage detection

If the supply voltage falls below a value of approx. 7 V, all outputs and yellow LEDs are deactivated. The green "power" LED flashes rapidly. If the supply voltage falls below a value of approx. 8 V, the sensor continues with normal operation.

Technical Features

EMC Properties

Interference immunity in accordance with
DIN ISO 11452-2: 100 V/m
Frequency band 20 MHz up to 2 GHz
Mains-borne interference in accordance with ISO 7637-2:

Pulse	1	2a	2b	3a	3b	4
Severity level	III	III	III	III	III	III
Failure criterion	C	A	C	A	A	C

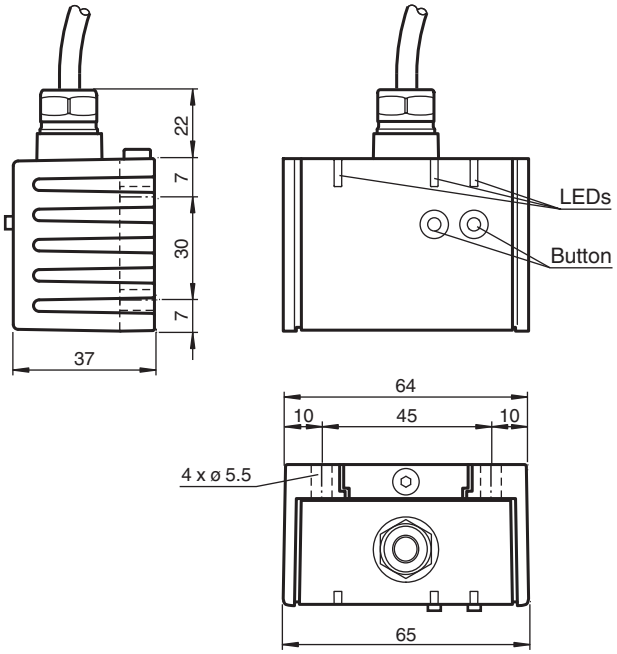
EN 61000-4-2:	CD: 8 kV /	AD: 15 kV
Severity level	IV	IV
EN 61000-4-3:	30 V/m (80...2500 MHz)	
Severity level	IV	
EN 61000-4-4:	2 kV	
Severity level	III	
EN 61000-4-6:	10 V (0.01...80 MHz)	
Severity level	III	
EN 55011:	Klasse A	

Inclination sensor

INX360D-F99-I2E2-7M

- E1-Type approval
- Measuring range 0 ... 360°
- Analog output 4 mA ... 20 mA
- Evaluation limits can be taught-in
- 2 programmable switch outputs
- High shock resistance
- Increased noise immunity 100 V/m

Dimensions



Technical Data

General specifications		
Type		Inclination sensor, 1-axis
Measurement range		0 ... 360 °
Absolute accuracy		≤ ± 0.5 °
Response delay		≤ 20 ms
Resolution		≤ 0.1 °
Repeat accuracy		≤ ± 0.1 °
Temperature influence		≤ 0.027 °/K
Functional safety related parameters		

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Technical Data

$MTTF_d$		300 a
Mission Time (T_M)		20 a
Diagnostic Coverage (DC)		0 %
Indicators/operating means		
Operation indicator		LED, green
Teach-In indicator		2 LEDs yellow (switching status), flashing
Button		2 push-buttons (Switch points programming , Evaluation range programming)
Switching state		2 yellow LEDs: Switching status (each output)
Electrical specifications		
Operating voltage	U_B	10 ... 30 V DC
No-load supply current	I_0	≤ 25 mA
Time delay before availability	t_v	≤ 200 ms
Switching output		
Output type		2 switch outputs PNP, NO , reverse polarity protected , short-circuit protected
Operating current	I_L	≤ 100 mA
Voltage drop		≤ 3 V
Analog output		
Output type		1 current output 4 ... 20 mA
Load resistor		0 ... 200 Ω at U_B = 10 ... 18 V 0 ... 500 Ω at U_B = 18 ... 30 V
Compliance with standards and directives		
Standard conformity		
Shock and impact resistance		100 *g* according to DIN EN 60068-2-27
Standards		EN 60947-5-2:2007 IEC 60947-5-2:2007
Approvals and certificates		
UL approval		cULus Listed, Class 2 Power Source
CCC approval		CCC approval / marking not required for products rated ≤36 V
E1 Type approval		10R-04
Ambient conditions		
Ambient temperature		-40 ... 85 °C (-40 ... 185 °F)
Storage temperature		-40 ... 85 °C (-40 ... 185 °F)
Mechanical specifications		
Connection type		7 m, PUR cable 5 x 0.5 mm^2
Housing material		PA
Degree of protection		IP68 / IP69K
Mass		240 g
Factory settings		
Switching output 1		-30 ° ... 30 °
Switching output 2		-30 ° ... 30 °
Analog output		-45 ° ... 45 °

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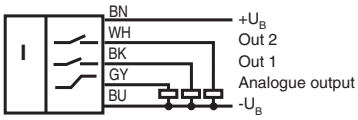
Connection

Standard symbol/Connection:



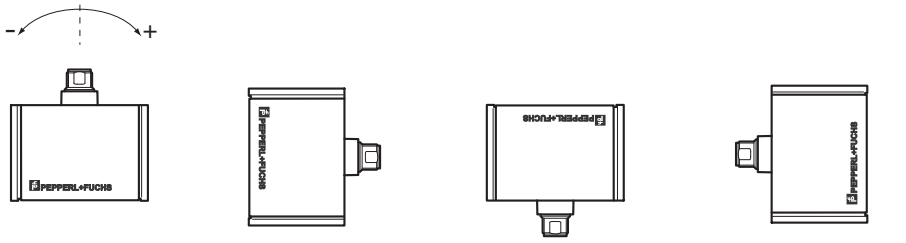
Release date: 2020-04-24 Date of issue: 2020-06-03 Filename: 209308_eng.pdf

Mounting

Sensor Orientation

In the default setting the zero position of the sensor is reached, when the electrical connection faces straight upwards.

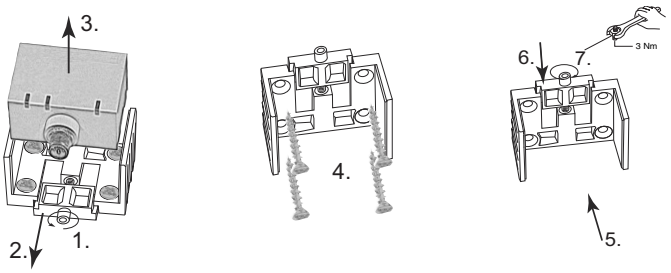
X Orientation



X = 0° X = 90° X = ±180° X = 270° (-90°)

Mounting of the sensor

Sensors from the -F99 series consist of a sensor module and accompanying cast aluminum housing. Select a vertical surface with minimum dimensions of 70 mm x 50 mm to mount the sensor.
Mount the sensor as follows:



1. Loosen the central screw under the sensor connection.
2. Slide back the clamping element until you are able to remove the sensor module from the housing.
3. Remove the sensor module from the housing
4. Position the housing at the required mounting location and secure using four countersunk screws. Make sure that the heads of the screws do not protrude.
5. Place the sensor module in the housing.
6. Slide the clamping element flush into the housing. Check that the sensor element is seated correctly.
7. Finally tighten the central screw.

The sensor is now mounted correctly.

Additional Information

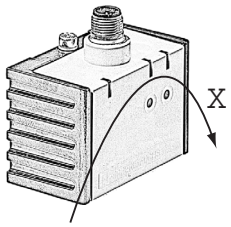
LED display

Displays dependent on the operating state	LED green: Power	LED yellow out 1	LED yellow out 2
Teach-in of switching points (output S1): **Teach-in of switching points (output S2):**	off off	flashes off	off flashes
Activate teach-in mode for analog limits: Teach-in of **analog limits**	off off	flashes flashes	flashes off
Normal operation	on	switchings tate	switchings tate
Reset to factory settings: 2 s ... 10 s > 10 s ... end of reset process Followed by normal operation	 off flashes	 flashes off	 flashes off
Undervoltage	flashes	off	off

Release date: 2020-04-24 Date of issue: 2020-06-03 Filename: 209308_eng.pdf

Axis definition

The definition of the X-axis is shown on the sensor housing by means of an imprinted and labeled double arrow. The figure shows the clockwise direction of rotation.



Teach-in of switching points (output S1)

1. Press key T1 > 2 s (see LED display)
2. Move sensor to switching position 1
3. Press key T1 briefly. LED "out 1" lights for 1.5 s as confirmation. Switching point 1 has been taught
4. Move sensor to switching position 2
5. Press key T1 briefly. LED "out 1" lights for 1.5 s as confirmation. Switching point 2 has been taught
6. Sensor returns to normal operation (see LED display)

The NC (active output state) is always defined in the range from the 1st configured position to 2nd configured position.
As an example :
Case #1: configure position #1 at +45degree, configure position #2 at +90 degree; NC is from +45 ' +90 in the CW direction
Case #2: configure position #1 at +90degree ; configure position #2 at +45 degree; NC is from +90 ' +45 in the CW direction

Teach-in of switching points (output S2)

Similar to the process for "Teach-in of switching points (output S1)", but with key T2 instead of key T1.

Teach-in of analog limits

1. Activate the teach-in mode for the analog limits by simultaneously pressing keys T1 and T2 until the green LED is extinguished and the two yellow LEDs flash. Then release the keys.
2. Press key T1 > for 2 s (see LED display)
3. Move the sensor into the position of minimum evaluation limit
4. Press key T1 briefly. LED "out 1" lights for 1.5 s as confirmation. The minimum evaluation limit has been taught. In this position the analog output will provide its minimum output value.
5. Move the sensor into the position of maximum evaluation limit
6. Press key T1 briefly. LED "out 1" lights for 1.5 s as confirmation. The maximum evaluation limit has been taught. In this position the analog output will provide its maximum output value.
7. Sensor returns to normal operation (see LED display)

If the sensor inclination exceeds one of the analog limits, the last value of the analog output is retained.

Resetting the sensor to factory settings

1. Press keys T1 and T2 > 10 s (see LED display)
2. The sensor has been reset when the green LED "Power" lights again after approx. 10 s.

Undervoltage detection

If the supply voltage falls below a value of approx. 7 V, all outputs and yellow LEDs are deactivated. The green "power" LED flashes rapidly. If the supply voltage falls below a value of approx. 8 V, the sensor continues with normal operation.

Technical Features

EMC Properties

Interference immunity in accordance with
DIN ISO 11452-2: 100 V/m
Frequency band 20 MHz up to 2 GHz
Mains-borne interference in accordance with ISO 7637-2:

Pulse	1	2 a	2 b	3 a	3 b	4
Severity level	I I I	I I I	I I I	I I I	I I I	I I I
Failure criterion	C	A	C	A	A	C

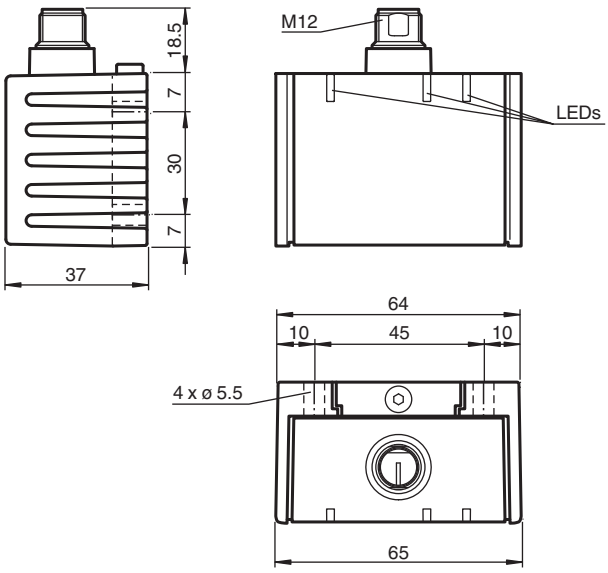
EN 61000-4-2:	CD: 8 kV /	AD: 15 kV
Severity level	IV	IV
EN 61000-4-3:	30 V/m (80...2500 MHz)	
Severity level	IV	
EN 61000-4-4:	2 kV	
Severity level	III	
EN 61000-4-6:	10 V (0.01...80 MHz)	
Severity level	III	
EN 55011:	Klasse A	

Inclination sensor

INX360D-F99-B16-V15

- E1-Type approval
- Measuring range 0 ... 360°
- High shock resistance
- Extended temperature range -40 ... +85 °C
- CANopen interface
- Increased noise immunity 100 V/m

Dimensions



Technical Data

General specifications		
Type		Inclination sensor, 1-axis
Measurement range		0 ... 360 °
Absolute accuracy		≤ ± 0.5 °
Response delay		≤ 20 ms
Resolution		≤ 0.1 °
Repeat accuracy		≤ ± 0.1 °
Temperature influence		≤ 0.027 °/K
Functional safety related parameters		

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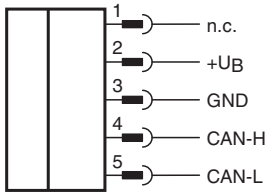
Technical Data

$MTTF_d$		300 a
Mission Time (T_M)		20 a
Diagnostic Coverage (DC)		0 %
Indicators/operating means		
Operation indicator		LED, green
Electrical specifications		
Operating voltage	U_B	10 ... 30 V DC
No-load supply current	I_0	≤ 50 mA
Time delay before availability	t_v	≤ 2.5 s
Interface		
Interface type		CANopen
Device profile		CiA410, Ver. 1.2
Data output code		binary code
Transfer rate		125 kBit/s , 250 kBit/s , 500 kBit/s , 1 MBit/s , programmable
Node ID		1 ... 127 , programmable
Termination		external
Cycle time		≥ 20 ms
Compliance with standards and directives		
Standard conformity		
Shock and impact resistance		100 *g* according to DIN EN 60068-2-27
Standards		EN 60947-5-2:2007 IEC 60947-5-2:2007
Approvals and certificates		
UL approval		cULus Listed, Class 2 Power Source
CCC approval		CCC approval / marking not required for products rated ≤36 V
E1 Type approval		10R-04
Ambient conditions		
Ambient temperature		-40 ... 85 °C (-40 ... 185 °F)
Storage temperature		-40 ... 85 °C (-40 ... 185 °F)
Mechanical specifications		
Connection type		5-pin, M12 x 1 connector
Housing material		PA
Degree of protection		IP68 / IP69K
Mass		240 g
Factory settings		
Node ID		1
Transfer rate		250 kBit/s

Connection



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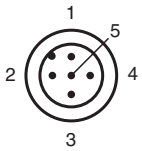
Connection Assignment



Wire colors in accordance with EN 60947-5-2

1	BN	(brown)
2	WH	(white)
3	BU	(blue)
4	BK	(black)
5	GY	(gray)

Accessories

	**V15S-T-CAN/DN-V15**	Y-Splitter, M12 socket on M12 connector/socket
	**ICZ-TR-CAN/DN-V15**	Terminal resistor for DeviceNet, CANopen

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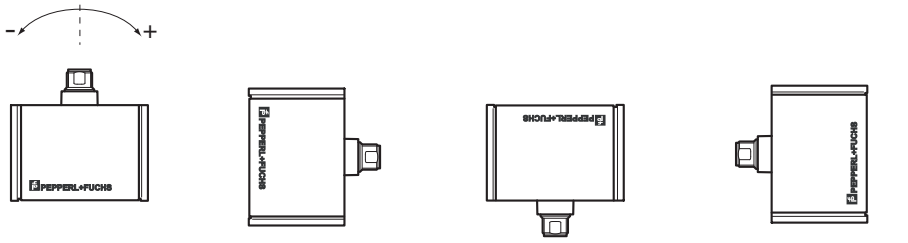
Mounting

Sensor Orientation

In the default setting the zero position of the sensor is reached, when the electrical connection faces straight upwards.

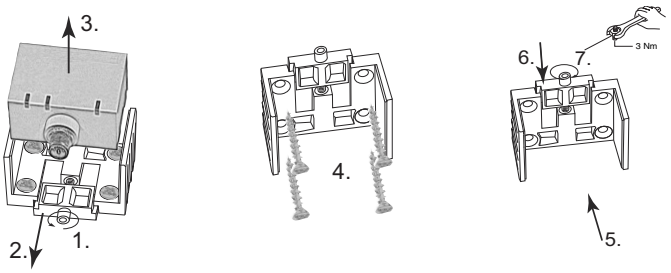
X Orientation



X = 0° X = 90° X = ±180° X = 270° (-90°)

Mounting of the sensor

Sensors from the -F99 series consist of a sensor module and accompanying cast aluminum housing. Select a vertical surface with minimum dimensions of 70 mm x 50 mm to mount the sensor.
Mount the sensor as follows:



1. Loosen the central screw under the sensor connection.
2. Slide back the clamping element until you are able to remove the sensor module from the housing.
3. Remove the sensor module from the housing
4. Position the housing at the required mounting location and secure using four countersunk screws. Make sure that the heads of the screws do not protrude.
5. Place the sensor module in the housing.
6. Slide the clamping element flush into the housing. Check that the sensor element is seated correctly.
7. Finally tighten the central screw.

The sensor is now mounted correctly.

Configuration

Node ID setting

Inclination sensors by Pepperl+Fuchs are supplied with node ID 1. To change the node ID, write the new node ID to object 2000h “Node ID.” If a “Reset sensor” command is issued via an NMT message or the power supply is interrupted, the sensor operates with the new node ID. Node ID values between 1 and 127 can be sent in hexadecimal format (01h ... 7Fh). Invalid values are not adopted. In this case, the current setting is retained.

Example of modifying node ID from 1 to 15:

601h	2Fh	00h	20h	00h	0Fh	xxh	xxh	xxh
CAN-ID	Command	Object index		Subindex	New ID	not used		
	Data byte 1	Data byte 2	Data byte 3	Data byte 4	Data byte 5	Data byte 6	Data byte 7	Data byte 8

CAN ID: 601h, SDO1 channel of node 1
Command: 2Fh, write object, 1 byte of usable data
Object index: 2000h, note: low byte first, then high byte!
Subindex: 00h
New ID: 0Fh, only values between 01h ... 7Fh (1 ... 127) permitted

Configuration

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Baud rate setting

Inclination sensors by Pepperl+Fuchs are supplied with a baud rate of 250 kbit/s. To change the baud rate, write the new baud rate to object 2001h “Baud rate.” If a “Reset sensor” command is issued via an NMT message or the power supply is interrupted, the sensor operates at the new baud rate. The inclination sensor supports the baud rates 125 kbit/s, 250 kbit/s, 500 kbit/s and 1 Mbit/s. Invalid values are not adopted. In this case, the current setting is retained.

Example of modifying the baud rate from 250 kbit/s to 1 Mbit/s:

601h	2Fh	01h	20h	00h	08h	xxh	xxh	xxh
CAN -ID	Command	Object index		Subindex	New baud rate	not used		
	Data byte 1	Data byte 2	Data byte 3	Data byte 4	Data byte 5	Data byte 6	Data byte 7	Data byte 8

CAN ID: 601h, SDO1 channel of node 1
Command: 2Fh, write object, 1 byte of usable data
Object index: 2001h, note: low byte first, then high byte!
Subindex: 00h
New baud rate: 08h, for 1 Mbit/s
New baud rate: 04h, for 500 kbit/s
New baud rate: 02h, for 250 kbit/s
New baud rate: 01h, for 125 kbit/s

Indication

LED displays

The inclination sensor has three indicator LEDs that allow rapid visual monitoring.

- The green **power** LED indicates the state of the power supply
- The yellow **run** LED indicates the bus and sensor status
- The red **err** LED indicates an error

power (green)	run (yellow)	err (red)	Meaning
Off	Off	Off	No power supply
On	Flashing constantly	Off	Pre-operational
On	1x flashing	Off	Stopped
On	On	Off	Operational
On	Off	On	CAN bus off
On	depending on bus status	1x flashing	Warning, e.g., outside measuring range
On	depending on bus status	2x flashing	Error, e.g., EEPROM checksum incorrect
Flashing constantly	Off	On	Undervoltage

Technical Features

EMC Properties

Interference immunity in accordance with
DIN ISO 11452-2: 100 V/m
Frequency band 20 MHz up to 2 GHz
Mains-borne interference in accordance with ISO 7637-2:

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Pulse	1	2a	2b	3a	3b	4
Severity level	III	III	III	III	III	III
Failure criterion	C	A	C	A	A	C

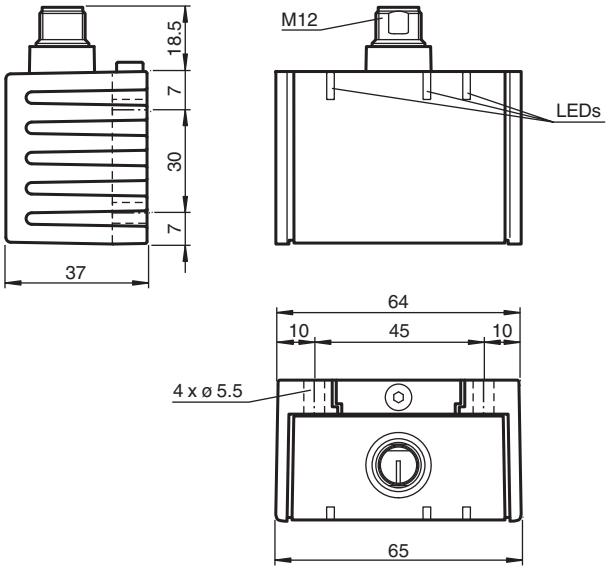
EN 61000-4-2:	CD: 8 kV /	AD: 15 kV
Severity level	IV	IV
EN 61000-4-3:	30 V/m (80...2500 MHz)	
Severity level	IV	
EN 61000-4-4:	2 kV	
Severity level	III	
EN 61000-4-6:	10 V (0.01...80 MHz)	
Severity level	III	
EN 55011:	Klasse A	

Inclination sensor

INY030D-F99-2I2E2-V17

- E1-Type approval
- Measuring range -15° ... +15°
- Analog output 4 mA ... 20 mA
- Fixed evaluation limits
- High shock resistance
- Increased noise immunity 100 V/m

Dimensions



Technical Data

General specifications		
Type		Inclination sensor, 2-axis
Measurement range		-15 ... 15 °
Absolute accuracy		≤ ± 0.2 °
Response delay		≤ 25 ms
Resolution		≤ 0.01 °
Repeat accuracy		≤ ± 0.02 °
Temperature influence		≤ 0.004 °/K
Functional safety related parameters		

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Technical Data

$MTTF_d$		304 a
Mission Time (T_M)		20 a
Diagnostic Coverage (DC)		0 %
Indicators/operating means		
Operation indicator		LED, green
Switching state		2 yellow LEDs: Switching status (each output)
Electrical specifications		
Operating voltage	U_B	10 ... 30 V DC
No-load supply current	I_0	≤ 25 mA
Time delay before availability	t_v	≤ 200 ms
Switching output		
Output type		2 switch outputs PNP, NO , reverse polarity protected , short-circuit protected
Operating current	I_L	≤ 100 mA
Voltage drop		≤ 3 V
Analog output		
Output type		2 current outputs 4 ... 20 mA (one output for each axis)
Load resistor		0 ... 200 Ω at U_B = 10 ... 18 V 0 ... 500 Ω at U_B = 18 ... 30 V
Compliance with standards and directives		
Standard conformity		
Shock and impact resistance		100 *g* according to DIN EN 60068-2-27
Standards		EN 60947-5-2:2007 IEC 60947-5-2:2007
Approvals and certificates		
UL approval		cULus Listed, Class 2 Power Source
E1 Type approval		10R-04
Ambient conditions		
Ambient temperature		-40 ... 85 °C (-40 ... 185 °F)
Storage temperature		-40 ... 85 °C (-40 ... 185 °F)
Mechanical specifications		
Connection type		8-pin, M12 x 1 connector
Housing material		PA
Degree of protection		IP68 / IP69K
Mass		240 g
Factory settings		
Analog output (X)		-15 ° ... 15 °
Analog output (Y)		-15 ° ... 15 °
Switching output (X)		-15 ° ... 15 °
Switching output (Y)		-15 ° ... 15 °

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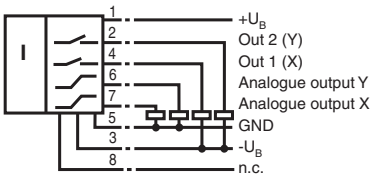
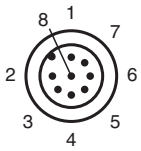
Connection

Standard symbol/Connection:



Connection Assignment



Wire colors

1	WH	(white)
2	BN	(brown)
3	GN	(green)
4	YE	(yellow)
5	GY	(gray)
6	PK	(pink)
7	BU	(blue)
8	RD	(red)

Accessories

	**V17-G-2M-PUR**	Female cordset, M12, 8-pin, shielded, PUR cable
	**V17-G-5M-PUR**	Female cordset, M12, 8-pin, shielded, PUR cable
	**V17-G-10M-PUR**	Female cordset, M12, 8-pin, shielded, PUR cable
	**V17-G-10M-PVC-ABG**	Female cordset, M12, 8-pin, shielded, PVC cable

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Mounting

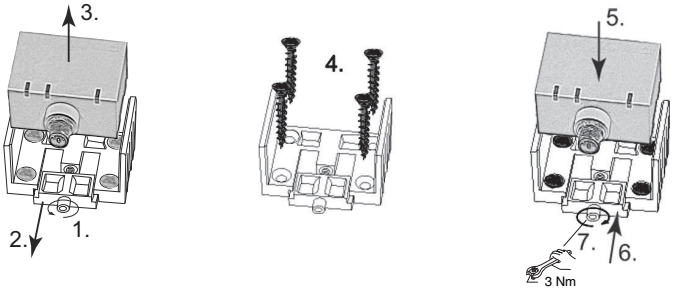
Sensor Orientation

In the default setting the zero position of the sensor is reached, when the sensor is mounted on a horizontal plane and electrical connection faces sidewards.

Mounting

Mounting of the sensor

Sensors from the -F99 series consist of a sensor module and accompanying cast aluminum housing. Select a horizontal flat surface with minimum dimensions of 70 mm x 50 mm to mount the sensor.
Mount the sensor as follows:



1. Loosen the central screw under the sensor connection.
2. Slide back the clamping element until you are able to remove the sensor module from the housing.
3. Remove the sensor module from the housing
4. Position the housing at the required mounting location and secure using four countersunk screws. Make sure that the heads of the screws do not protrude.
5. Place the sensor module in the housing.
6. Slide the clamping element flush into the housing. Check that the sensor element is seated correctly.
7. Finally tighten the central screw.

The sensor is now mounted correctly.

Technical Features

EMC Properties

Interference immunity in accordance with
DIN ISO 11452-2: 100 V/m
Frequency band 20 MHz up to 2 GHz
Mains-borne interference in accordance with ISO 7637-2:

Pulse	1	2 a	2 b	3 a	3 b	4
Severity level	I I I	I I I	I I I	I I I	I I I	I I I
Failure criterion	C	A	C	A	A	C
EN 61000-4-2:	CD: 8 kV /			AD: 15 kV		
Severity level	IV			IV		
EN 61000-4-3:	30 V/m (80...2500 MHz)					
Severity level	IV					
EN 61000-4-4:	2 kV					
Severity level	III					
EN 61000-4-6:	10 V (0.01...80 MHz)					
Severity level	III					
EN 55011:	Klasse A					

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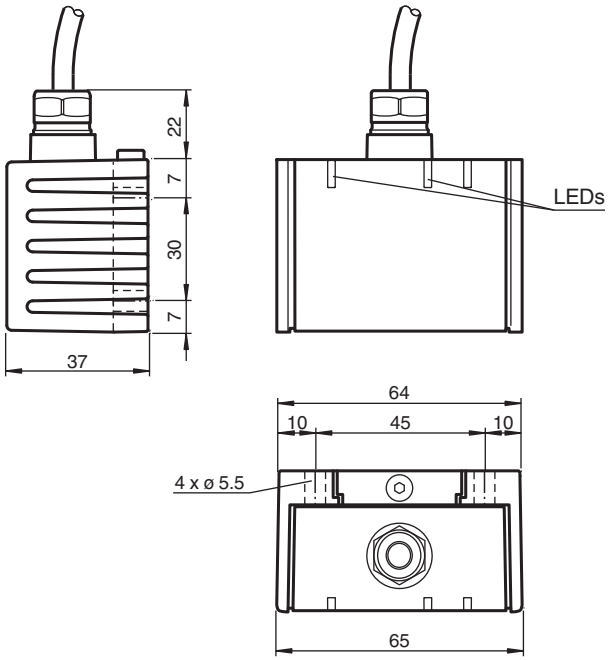
Inclination sensor

INY030D-F99-2I2E2-5M

- E1-Type approval
- Measuring range -15° ... +15°
- Analog output 4 mA ... 20 mA
- Fixed evaluation limits
- High shock resistance
- Increased noise immunity 100 V/m

Dimensions



Technical Data

General specifications		
Type		Inclination sensor, 2-axis
Measurement range		-15 ... 15 °
Absolute accuracy		≤ ± 0.2 °
Response delay		≤ 25 ms
Resolution		≤ 0.01 °
Repeat accuracy		≤ ± 0.02 °
Temperature influence		≤ 0.004 °/K
Functional safety related parameters		

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Technical Data

$MTTF_d$		304 a
Mission Time (T_M)		20 a
Diagnostic Coverage (DC)		0 %
Indicators/operating means		
Operation indicator		LED, green
Switching state		2 yellow LEDs: Switching status (each output)
Electrical specifications		
Operating voltage	U_B	10 ... 30 V DC
No-load supply current	I_0	≤ 25 mA
Time delay before availability	t_v	≤ 200 ms
Switching output		
Output type		2 switch outputs PNP, NO , reverse polarity protected , short-circuit protected
Operating current	I_L	≤ 100 mA
Voltage drop		≤ 3 V
Analog output		
Output type		2 current outputs 4 ... 20 mA (one output for each axis)
Load resistor		0 ... 200 Ω at U_B = 10 ... 18 V 0 ... 500 Ω at U_B = 18 ... 30 V
Compliance with standards and directives		
Standard conformity		
Shock and impact resistance		100 *g* according to DIN EN 60068-2-27
Standards		EN 60947-5-2:2007 IEC 60947-5-2:2007
Approvals and certificates		
UL approval		cULus Listed, Class 2 Power Source
E1 Type approval		10R-04
Ambient conditions		
Ambient temperature		-40 ... 85 °C (-40 ... 185 °F)
Storage temperature		-40 ... 85 °C (-40 ... 185 °F)
Mechanical specifications		
Connection type		5 m, PUR cable 7 x 0.5 mm^2
Housing material		PA
Degree of protection		IP68 / IP69K
Mass		240 g
Factory settings		
Analog output (X)		-15 ° ... 15 °
Analog output (Y)		-15 ° ... 15 °
Switching output (X)		-15 ° ... 15 °
Switching output (Y)		-15 ° ... 15 °

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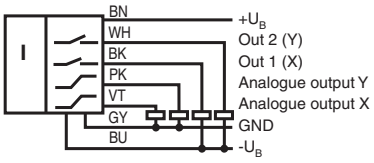
Connection

Standard symbol/Connection:



Mounting

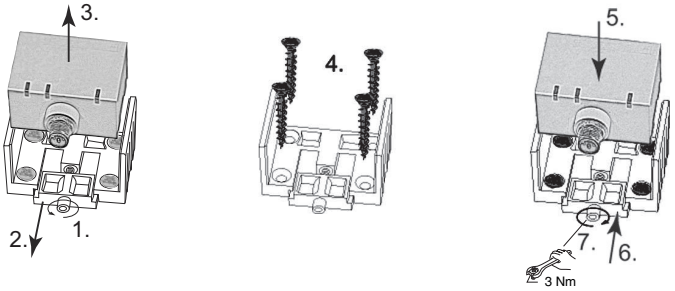
Sensor Orientation

In the default setting the zero position of the sensor is reached, when the sensor is mounted on a horizontal plane and electrical connection faces sidewards.

Mounting

Mounting of the sensor

Sensors from the -F99 series consist of a sensor module and accompanying cast aluminum housing. Select a horizontal flat surface with minimum dimensions of 70 mm x 50 mm to mount the sensor.
Mount the sensor as follows:



1. Loosen the central screw under the sensor connection.
2. Slide back the clamping element until you are able to remove the sensor module from the housing.
3. Remove the sensor module from the housing
4. Position the housing at the required mounting location and secure using four countersunk screws. Make sure that the heads of the screws do not protrude.
5. Place the sensor module in the housing.
6. Slide the clamping element flush into the housing. Check that the sensor element is seated correctly.
7. Finally tighten the central screw.

The sensor is now mounted correctly.

Technical Features

EMC Properties

Interference immunity in accordance with
DIN ISO 11452-2: 100 V/m
Frequency band 20 MHz up to 2 GHz
Mains-borne interference in accordance with ISO 7637-2:

Pulse	1	2 a	2 b	3 a	3 b	4
Severity level	I I I	I I I	I I I	I I I	I I I	I I I
Failure criterion	C	A	C	A	A	C
EN 61000-4-2:	CD: 8 kV /			AD: 15 kV		
Severity level	IV			IV		
EN 61000-4-3:	30 V/m (80...2500 MHz)					
Severity level	IV					
EN 61000-4-4:	2 kV					
Severity level	III					
EN 61000-4-6:	10 V (0.01...80 MHz)					
Severity level	III					
EN 55011:	Klasse A					

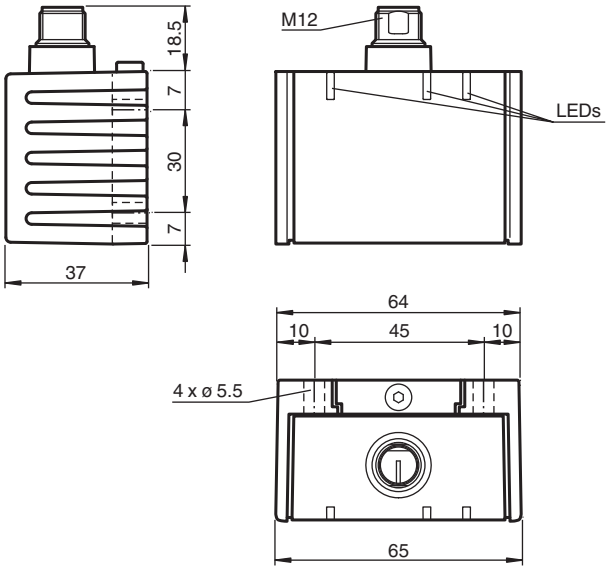
Release date: 2020-04-24 Date of issue: 2020-06-03 Filename: 222357_eng.pdf

Inclination sensor

INY030D-F99-B16-V15

- E1-Type approval
- High shock resistance
- Extended temperature range -40 ... +85 °C
- CANopen interface
- Measuring range -15° ... +15°
- Increased noise immunity 100 V/m

Dimensions



Technical Data

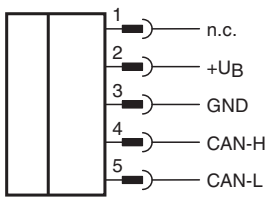
General specifications	
Type	Inclination sensor, 2-axis
Measurement range	-15 ... 15 °
Absolute accuracy	≤ ± 0.2 °
Response delay	≤ 25 ms
Resolution	≤ 0.01 °
Repeat accuracy	≤ ± 0.02 °
Temperature influence	≤ 0.004 °/K
Functional safety related parameters	

Release date: 2020-06-22 Date of issue: 2020-06-22 Filename: 230436_eng.pdf

Technical Data

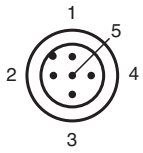
$MTTF_d$		300 a
Mission Time (T_M)		20 a
Diagnostic Coverage (DC)		0 %
Indicators/operating means		
Operation indicator		LED, green
Electrical specifications		
Operating voltage	U_B	10 ... 30 V DC
No-load supply current	I_0	≤ 50 mA
Time delay before availability	t_v	≤ 2.5 s
Interface		
Interface type		CANopen
Device profile		CiA410, Ver. 1.2
Data output code		binary code
Node ID		1 ... 127 , programmable
Transfer rate		10 ... 1000 kBit/s , programmable
Termination		external
Cycle time		≥ 20 ms
Compliance with standards and directives		
Standard conformity		
Shock and impact resistance		100 *g* according to DIN EN 60068-2-27
Standards		EN 60947-5-2:2007 IEC 60947-5-2:2007
Approvals and certificates		
UL approval		cULus Listed, Class 2 Power Source
E1 Type approval		10R-04
Ambient conditions		
Ambient temperature		-40 ... 85 °C (-40 ... 185 °F)
Storage temperature		-40 ... 85 °C (-40 ... 185 °F)
Mechanical specifications		
Connection type		5-pin, M12 x 1 connector
Housing material		PA
Degree of protection		IP68 / IP69K
Mass		240 g
Factory settings		
Node ID		1
Transfer rate		250 kBit/s

Connection



Release date: 2020-06-22 Date of issue: 2020-06-22 Filename: 230436_eng.pdf

Connection Assignment



Wire colors in accordance with EN 60947-5-2

1	BN	(brown)
2	WH	(white)
3	BU	(blue)
4	BK	(black)
5	GY	(gray)

Accessories

	**V15S-T-CAN/DN-V15**	Y-Splitter, M12 socket on M12 connector/socket
	**ICZ-TR-CAN/DN-V15**	Terminal resistor for DeviceNet, CANopen

Mounting

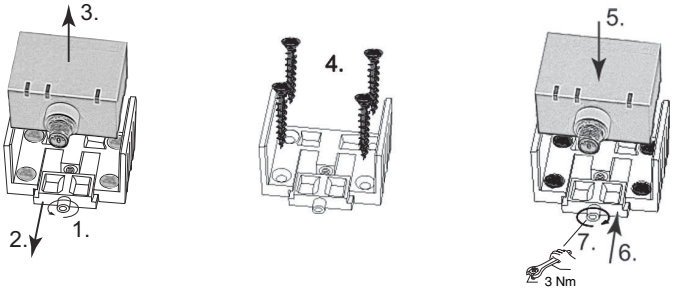
Sensor Orientation

In the default setting the zero position of the sensor is reached, when the sensor is mounted on a horizontal plane and electrical connection faces sidewards.

Mounting

Mounting of the sensor

Sensors from the -F99 series consist of a sensor module and accompanying cast aluminum housing. Select a horizontal flat surface with minimum dimensions of 70 mm x 50 mm to mount the sensor.
Mount the sensor as follows:



1. Loosen the central screw under the sensor connection.
2. Slide back the clamping element until you are able to remove the sensor module from the housing.
3. Remove the sensor module from the housing
4. Position the housing at the required mounting location and secure using four countersunk screws. Make sure that the heads of the screws do not protrude.
5. Place the sensor module in the housing.
6. Slide the clamping element flush into the housing. Check that the sensor element is seated correctly.
7. Finally tighten the central screw.

The sensor is now mounted correctly.

Configuration

Baud rate setting

Inclination sensors by Pepperl+Fuchs are supplied with a baud rate of 250 kbit/s. To change the baud rate, write the new baud rate to object 2001h “Baud rate.” If a “Reset sensor” command is issued via an NMT message or the power supply is interrupted, the sensor operates at the new baud rate. Invalid values are not adopted. In this case, the current setting is retained.

Example of modifying the baud rate from 250 kbit/s to 1 Mbit/s:

601h	2Fh	01h	20h	00h	08h	xxh	xxh	xxh
CAN-ID	Command	Object index		Subindex	New baud rate	not used		
	Data byte 1	Data byte 2	Data byte 3	Data byte 4	Data byte 5	Data byte 6	Data byte 7	Data byte 8

CAN ID: 601h, SDO1 channel of node 1
Command: 2Fh, write object, 1 byte of usable data
Object index: 2001h, note: low byte first, then high byte!
Subindex: 00h
New baud rate: 08h, for 1 Mbit/s
New baud rate: 07h, for 800 kbit/s
New baud rate: 06h, for 500 kbit/s
New baud rate: 05h, for 250 kbit/s
New baud rate: 04h, for 125 kbit/s
New baud rate: 03h, for 100 kbit/s
New baud rate: 02h, for 50 kbit/s
New baud rate: 01h, for 20 kbit/s
New baud rate: 00h, for 10 kbit/s

Indication

LED displays

The inclination sensor has three indicator LEDs that allow rapid visual monitoring.

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- The green **power** LED indicates the state of the power supply
- The yellow **run** LED indicates the bus and sensor status
- The red **err** LED indicates an error

power (green)	run (yellow)	err (red)	Meaning
Off	Off	Off	No power supply
On	Flashing constantly	Off	Pre-operational
On	1x flashing	Off	Stopped
On	On	Off	Operational
On	Off	On	CAN bus off
On	depending on bus status	1x flashing	Warning, e.g., outside measuring range
On	depending on bus status	2x flashing	Error, e.g., EEPROM checksum incorrect
Flashing constantly	Off	On	Undervoltage

Technical Features

EMC Properties

Interference immunity in accordance with
DIN ISO 11452-2: 100 V/m
Frequency band 20 MHz up to 2 GHz
Mains-borne interference in accordance with ISO 7637-2:

Pulse	1	2 a	2 b	3 a	3 b	4
Severity level	I I I	I I I	I I I	I I I	I I I	I I I
Failure criterion	C	A	C	A	A	C

EN 61000-4-2:	CD: 8 kV /	AD: 15 kV
Severity level	IV	IV
EN 61000-4-3:	30 V/m (80...2500 MHz)	
Severity level	IV	
EN 61000-4-4:	2 kV	
Severity level	III	
EN 61000-4-6:	10 V (0.01...80 MHz)	
Severity level	III	
EN 55011:	Klasse A	

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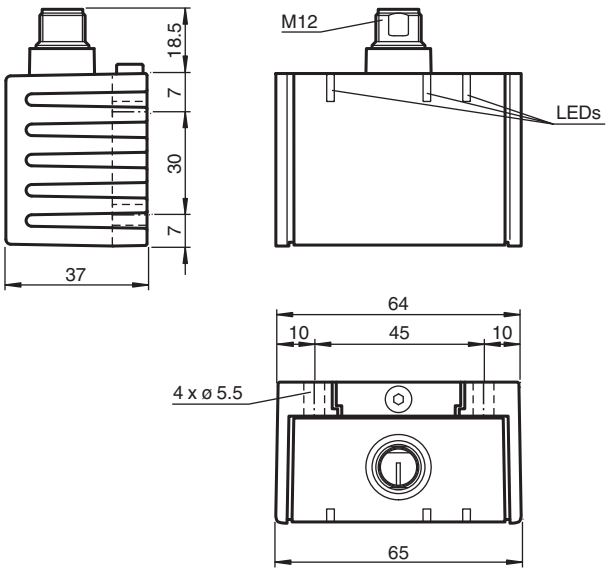
Inclination sensor

INY030D-F99-2U-V15

- E1-Type approval
- Measuring range -15° ... +15°
- Analog output 0 ... 10 V
- Fixed evaluation limits
- High shock resistance
- Increased noise immunity 100 V/m

Dimensions



Technical Data

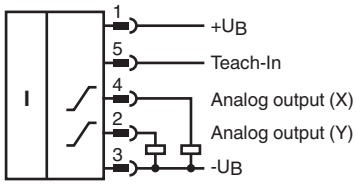
General specifications		
Type		Inclination sensor, 2-axis
Measurement range		-15 ... 15 °
Absolute accuracy		≤ ± 0.2 °
Response delay		≤ 25 ms
Resolution		≤ 0.01 °
Repeat accuracy		≤ ± 0.02 °
Temperature influence		≤ 0.004 °/K
Functional safety related parameters		

Release date: 2020-04-24 Date of issue: 2020-06-03 Filename: 239183_eng.pdf

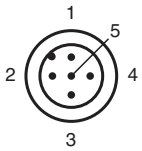
Technical Data

$MTTF_d$		390 a
Mission Time (T_M)		20 a
Diagnostic Coverage (DC)		0 %
Indicators/operating means		
Operation indicator		LED, green
Teach-In indicator		LED, yellow
Electrical specifications		
Operating voltage	U_B	18 ... 30 V DC
No-load supply current	I_0	≤ 25 mA
Time delay before availability	t_v	≤ 200 ms
Analog output		
Output type		2 voltage outputs 0 ... 10 V (one output for each axis)
Load resistor		≥ 1 kΩ
Compliance with standards and directives		
Standard conformity		
Shock and impact resistance		100 *g* according to DIN EN 60068-2-27
Standards		EN 60947-5-2:2007 IEC 60947-5-2:2007
Approvals and certificates		
UL approval		cULus Listed, Class 2 Power Source
CCC approval		CCC approval / marking not required for products rated ≤36 V
E1 Type approval		10R-04
Ambient conditions		
Ambient temperature		-40 ... 85 °C (-40 ... 185 °F)
Storage temperature		-40 ... 85 °C (-40 ... 185 °F)
Mechanical specifications		
Connection type		5-pin, M12 x 1 connector
Housing material		PA
Degree of protection		IP68 / IP69K
Mass		240 g
Factory settings		
Analog output (X)		-15 ° ... 15 °
Analog output (Y)		-15 ° ... 15 °

Connection



Connection Assignment



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Wire colors in accordance with EN 60947-5-2

1	BN	(brown)
2	WH	(white)
3	BU	(blue)
4	BK	(black)
5	GY	(gray)

Accessories

	**V15-G-2M-PUR**	Female cordset, M12, 5-pin, PUR cable

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Mounting

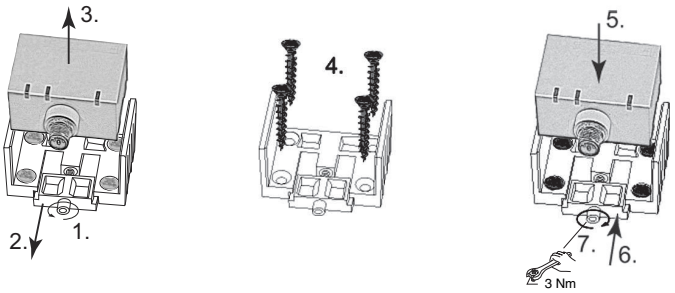
Sensor Orientation

In the default setting the zero position of the sensor is reached, when the sensor is mounted on a horizontal plane and electrical connection faces sidewards.

Mounting

Mounting of the sensor

Sensors from the -F99 series consist of a sensor module and accompanying cast aluminum housing. Select a horizontal flat surface with minimum dimensions of 70 mm x 50 mm to mount the sensor.
Mount the sensor as follows:



1. Loosen the central screw under the sensor connection.
2. Slide back the clamping element until you are able to remove the sensor module from the housing.
3. Remove the sensor module from the housing
4. Position the housing at the required mounting location and secure using four countersunk screws. Make sure that the heads of the screws do not protrude.
5. Place the sensor module in the housing.
6. Slide the clamping element flush into the housing. Check that the sensor element is seated correctly.
7. Finally tighten the central screw.

The sensor is now mounted correctly.

Additional Information

LED display

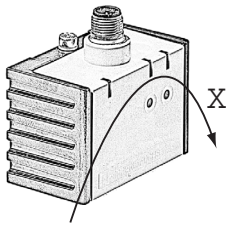
Displays dependent on the operating state	LED green: Power	LED yellow Teach In
Normal operation	on	off
Teach In of reference point **Teach In connected to +U_B for 1 s ... 10 s** falling slope at Teach In input then sensor returns to normal operation.	 on on on	 on flashes 3 x off
Reset to factory settings: **Teach In connected to +U_B for 20 s ... 25 s** falling slope at Teach In input then sensor returns to normal operation.	 on on on	 on flashes 3 x off
Undervoltage	flashes	off

Factory settings

see Technical Data

Axis definition

The definition of the X-axis is shown on the sensor housing by means of an imprinted and labeled double arrow. The figure shows the clockwise direction of rotation.



Teach-in of reference point (output S1)

1. Move sensor to reference position
2. Apply supply voltage (+Ub) to Teach In input for 1 s ... 10 s
3. Teach In LED lights up for confirmation
4. Disconnect Teach In input (Pin 4) before the 10 s time elapses
5. Teach In LED flashes 3 x for confirmation
6. Reference point is now programmed and the sensor returns to normal operation (see LED display)

Resetting the sensor to factory settings

1. Apply supply voltage (+Ub) to Teach In input for 20 s ... 25 s
2. Teach In LED lights up for confirmation
3. Disconnect Teach In input (Pin 4) before the 25 s time elapses

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4. Teach In LED and Out LED flash 3 x for confirmation
5. The sensor is now reseted to factory settings and returns to normal operation (see LED display)

Undervoltage detection

If the supply voltage falls below a value of approx. 7 V, all outputs and yellow LEDs are deactivated. The green "power" LED flashes rapidly. If the supply voltage rises above a value of approx. 8 V, the sensor continues with normal operation.

Technical Features

EMC Properties

Interference immunity in accordance with
DIN ISO 11452-2: 100 V/m
Frequency band 20 MHz up to 2 GHz
Mains-borne interference in accordance with ISO 7637-2:

Pulse	1	2a	2b	3a	3b	4
Severity level	I I I	I I I	I I I	I I I	I I I	I I I
Failure criterion	C	A	C	A	A	C

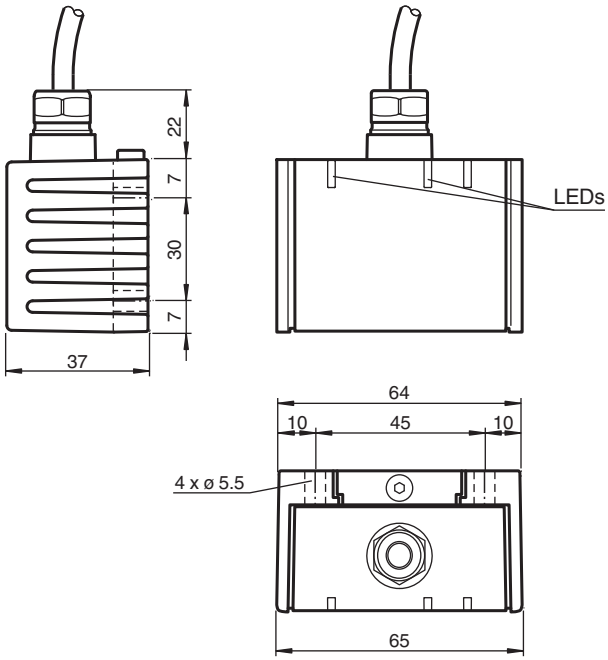
EN 61000-4-2:	CD: 8 kV /	AD: 15 kV
Severity level	IV	IV
EN 61000-4-3:	30 V/m (80...2500 MHz)	
Severity level	IV	
EN 61000-4-4:	2 kV	
Severity level	III	
EN 61000-4-6:	10 V (0.01...80 MHz)	
Severity level	III	
EN 55011:	Klasse A	

Inclination sensor

INY030D-F99-2U-5M

- E1-Type approval
- Measuring range -15° ... +15°
- Fixed evaluation limits
- High shock resistance
- Increased noise immunity 100 V/m
- Analog output 0 ... 10 V

Dimensions



Technical Data

General specifications		
Type		Inclination sensor, 2-axis
Measurement range		-15 ... 15 °
Absolute accuracy		≤ ± 0.2 °
Response delay		≤ 25 ms
Resolution		≤ 0.01 °
Repeat accuracy		≤ ± 0.02 °
Temperature influence		≤ 0.004 °/K
Functional safety related parameters		

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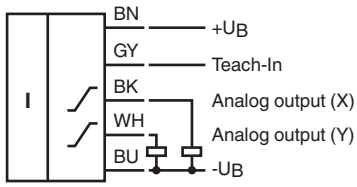
Technical Data

$MTTF_d$		390 a
Mission Time (T_M)		20 a
Diagnostic Coverage (DC)		0 %
Indicators/operating means		
Operation indicator		LED, green
Teach-In indicator		LED, yellow
Electrical specifications		
Operating voltage	U_B	18 ... 30 V DC
No-load supply current	I_0	≤ 25 mA
Time delay before availability	t_v	≤ 200 ms
Analog output		
Output type		2 voltage outputs 0 ... 10 V (one output for each axis)
Load resistor		≥ 1 kΩ
Compliance with standards and directives		
Standard conformity		
Shock and impact resistance		100 *g* according to DIN EN 60068-2-27
Standards		EN 60947-5-2:2007 IEC 60947-5-2:2007
Approvals and certificates		
UL approval		cULus Listed, Class 2 Power Source
CCC approval		CCC approval / marking not required for products rated ≤36 V
E1 Type approval		10R-04
Ambient conditions		
Ambient temperature		-40 ... 85 °C (-40 ... 185 °F)
Storage temperature		-40 ... 85 °C (-40 ... 185 °F)
Mechanical specifications		
Connection type		5 m, PUR cable 5 x 0.5 mm^2
Housing material		PA
Degree of protection		IP68 / IP69K
Mass		240 g
Factory settings		
Analog output (X)		-15 ° ... 15 °
Analog output (Y)		-15 ° ... 15 °

Connection



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Mounting

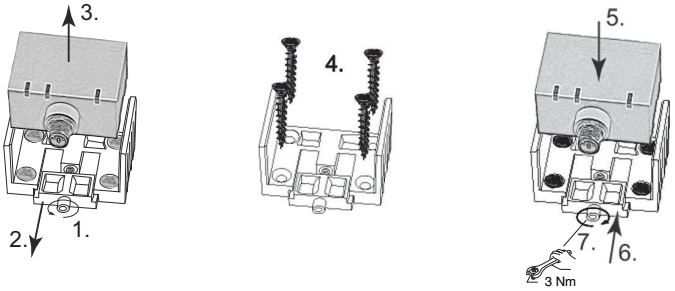
Sensor Orientation

In the default setting the zero position of the sensor is reached, when the sensor is mounted on a horizontal plane and electrical connection faces sidewards.

Mounting

Mounting of the sensor

Sensors from the -F99 series consist of a sensor module and accompanying cast aluminum housing. Select a horizontal flat surface with minimum dimensions of 70 mm x 50 mm to mount the sensor.
Mount the sensor as follows:



1. Loosen the central screw under the sensor connection.
2. Slide back the clamping element until you are able to remove the sensor module from the housing.
3. Remove the sensor module from the housing
4. Position the housing at the required mounting location and secure using four countersunk screws. Make sure that the heads of the screws do not protrude.
5. Place the sensor module in the housing.
6. Slide the clamping element flush into the housing. Check that the sensor element is seated correctly.
7. Finally tighten the central screw.

The sensor is now mounted correctly.

Additional Information

LED display

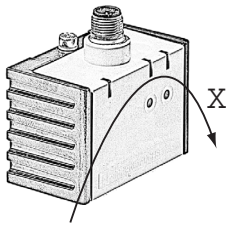
Displays dependent on the operating state	LED green: Power	LED yellow Teach In
Normal operation	on	off
Teach In of reference point **Teach In connected to +U_B for 1 s ... 10 s** falling slope at Teach In input then sensor returns to normal operation.	 on on on	 on flashes 3 x off
Reset to factory settings: **Teach In connected to +U_B for 20 s ... 25 s** falling slope at Teach In input then sensor returns to normal operation.	 on on on	 on flashes 3 x off
Undervoltage	flashes	off

Factory settings

see Technical Data

Axis definition

The definition of the X-axis is shown on the sensor housing by means of an imprinted and labeled double arrow. The figure shows the clockwise direction of rotation.



Teach-in of reference point (output S1)

1. Move sensor to reference position
2. Apply supply voltage (+Ub) to Teach In input for 1 s ... 10 s
3. Teach In LED lights up for confirmation
4. Disconnect Teach In input (Pin 4) before the 10 s time elapses
5. Teach In LED flashes 3 x for confirmation
6. Reference point is now programmed and the sensor returns to normal operation (see LED display)

Resetting the sensor to factory settings

1. Apply supply voltage (+Ub) to Teach In input for 20 s ... 25 s
2. Teach In LED lights up for confirmation
3. Disconnect Teach In input (Pin 4) before the 25 s time elapses

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4. Teach In LED and Out LED flash 3 x for confirmation
5. The sensor is now reseted to factory settings and returns to normal operation (see LED display)

Undervoltage detection

If the supply voltage falls below a value of approx. 7 V, all outputs and yellow LEDs are deactivated. The green "power" LED flashes rapidly. If the supply voltage rises above a value of approx. 8 V, the sensor continues with normal operation.

Technical Features

EMC Properties

Interference immunity in accordance with
DIN ISO 11452-2: 100 V/m
Frequency band 20 MHz up to 2 GHz
Mains-borne interference in accordance with ISO 7637-2:

Pulse	1	2 a	2 b	3 a	3 b	4
Severity level	I I I	I I I	I I I	I I I	I I I	I I I
Failure criterion	C	A	C	A	A	C

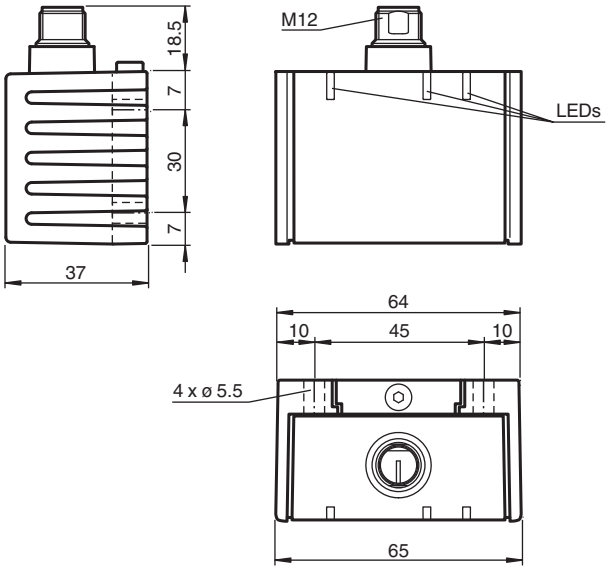
EN 61000-4-2:	CD: 8 kV /	AD: 15 kV
Severity level	IV	IV
EN 61000-4-3:	30 V/m (80...2500 MHz)	
Severity level	IV	
EN 61000-4-4:	2 kV	
Severity level	III	
EN 61000-4-6:	10 V (0.01...80 MHz)	
Severity level	III	
EN 55011:	Klasse A	

Inclination sensor

INY060D-F99-2I2E2-V17

- Analog output 4 mA ... 20 mA
- Fixed evaluation limits
- High shock resistance
- Increased noise immunity 100 V/m
- Measuring range -30° ... +30°

Dimensions



Technical Data

General specifications		
Type		Inclination sensor, 2-axis
Measurement range		-30 ... 30 °
Absolute accuracy		≤ ± 0.2 °
Response delay		≤ 25 ms
Resolution		≤ 0.02 °
Repeat accuracy		≤ ± 0.04 °
Temperature influence		≤ 0.004 °/K
Functional safety related parameters		

Release date: 2020-04-24 Date of issue: 2020-06-03 Filename: 241157_eng.pdf

Technical Data

$MTTF_d$		304 a
Mission Time (T_M)		20 a
Diagnostic Coverage (DC)		0 %
Indicators/operating means		
Operation indicator		LED, green
Switching state		2 yellow LEDs: Switching status (each output)
Electrical specifications		
Operating voltage	U_B	10 ... 30 V DC
No-load supply current	I_0	≤ 25 mA
Time delay before availability	t_v	≤ 200 ms
Switching output		
Output type		2 switch outputs PNP, NO , reverse polarity protected , short-circuit protected
Operating current	I_L	≤ 100 mA
Voltage drop		≤ 3 V
Analog output		
Output type		2 current outputs 4 ... 20 mA (one output for each axis)
Load resistor		0 ... 200 Ω at U_B = 10 ... 18 V 0 ... 500 Ω at U_B = 18 ... 30 V
Compliance with standards and directives		
Standard conformity		
Shock and impact resistance		100 *g* according to DIN EN 60068-2-27
Standards		EN 60947-5-2:2007 IEC 60947-5-2:2007
Approvals and certificates		
UL approval		cULus Listed, Class 2 Power Source
Ambient conditions		
Ambient temperature		-40 ... 85 °C (-40 ... 185 °F)
Storage temperature		-40 ... 85 °C (-40 ... 185 °F)
Mechanical specifications		
Connection type		8-pin, M12 x 1 connector
Housing material		PA
Degree of protection		IP68 / IP69K
Mass		240 g
Factory settings		
Analog output (X)		-30 ° ... 30 °
Analog output (Y)		-30 ° ... 30 °
Switching output (X)		-30 ° ... 30 °
Switching output (Y)		-30 ° ... 30 °

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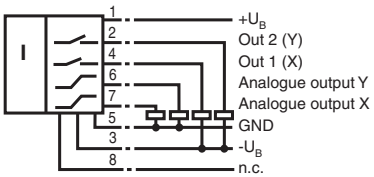
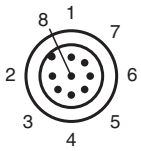
Connection

Standard symbol/Connection:



Connection Assignment



Wire colors

1	WH	(white)
2	BN	(brown)
3	GN	(green)
4	YE	(yellow)
5	GY	(gray)
6	PK	(pink)
7	BU	(blue)
8	RD	(red)

Accessories

	**V17-G-2M-PUR**	Female cordset, M12, 8-pin, shielded, PUR cable
	**V17-G-5M-PUR**	Female cordset, M12, 8-pin, shielded, PUR cable
	**V17-G-10M-PUR**	Female cordset, M12, 8-pin, shielded, PUR cable
	**V17-G-10M-PVC-ABG**	Female cordset, M12, 8-pin, shielded, PVC cable

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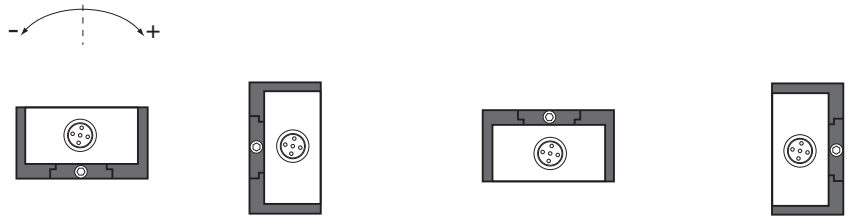
Mounting

Sensor Orientation

In the default setting the zero position of the sensor is reached, when the sensor is mounted on a horizontal plane and electrical connection faces sidewards.

Mounting

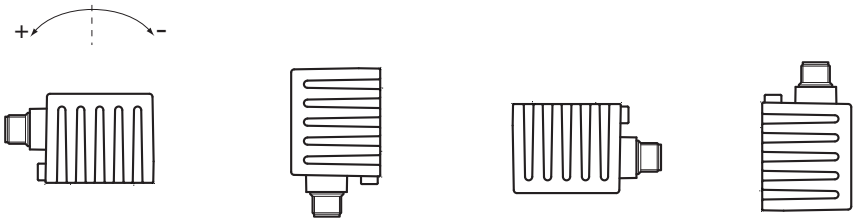
X Orientation



X = 0° X = 90° X = ±180° X = 270° (-

Mounting

Y Orientation

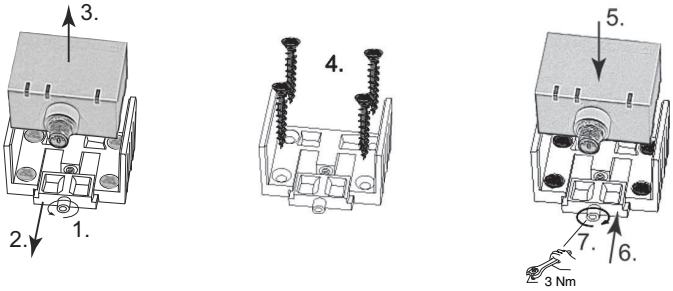


Y = 0° Y = 90° Y = ±180° Y = 270° (-

Mounting

Mounting of the sensor

Sensors from the -F99 series consist of a sensor module and accompanying cast aluminum housing. Select a horizontal flat surface with minimum dimensions of 70 mm x 50 mm to mount the sensor.
Mount the sensor as follows:



1. Loosen the central screw under the sensor connection.
2. Slide back the clamping element until you are able to remove the sensor module from the housing.
3. Remove the sensor module from the housing
4. Position the housing at the required mounting location and secure using four countersunk screws. Make sure that the heads of the screws do not protrude.
5. Place the sensor module in the housing.
6. Slide the clamping element flush into the housing. Check that the sensor element is seated correctly.
7. Finally tighten the central screw.

The sensor is now mounted correctly.

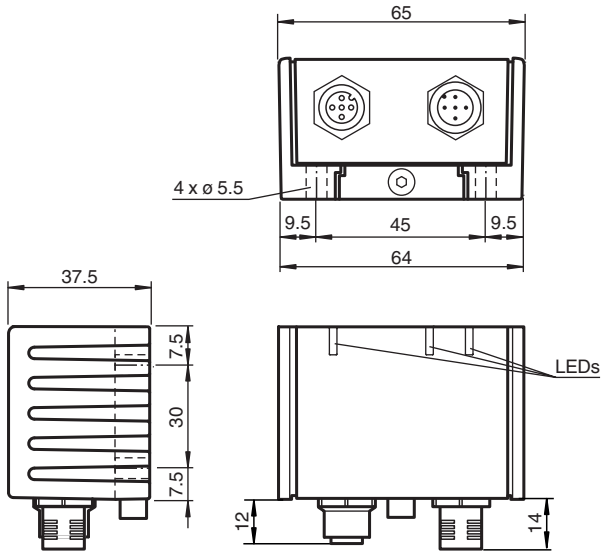
Release date: 2020-04-24 Date of issue: 2020-06-03 Filename: 241157_eng.pdf

Inclination sensor

INY030D-F99-B20-V15

- E1-Type approval
- High shock resistance
- Extended temperature range -40 ... +85 °C
- Measuring range -15° ... +15°
- CAN bus with SAE J1939 protocol

Dimensions



Technical Data

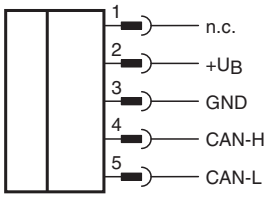
General specifications		
Type		Inclination sensor, 2-axis
Measurement range		-15 ... 15 °
Absolute accuracy		≤ ± 0.2 °
Response delay		≤ 25 ms
Resolution		≤ 0.01 °
Repeat accuracy		≤ ± 0.02 °
Temperature influence		≤ 0.004 °/K
Functional safety related parameters		

Release date: 2020-04-24 Date of issue: 2020-06-03 Filename: 241680_eng.pdf

Technical Data

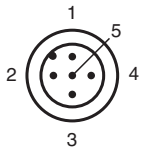
$MTTF_d$		650 a
Mission Time (T_M)		20 a
Diagnostic Coverage (DC)		0 %
Indicators/operating means		
Operation indicator		LED, green
Status indicator		LED, yellow
Error indicator		LED, red
Electrical specifications		
Operating voltage	U_B	5 ... 30 V DC
No-load supply current	I_0	≤ 100 mA
Power consumption	P_0	≤ 0.7 W
Interface		
Interface type		J1939
Data output code		binary code
Transfer rate		10 ... 1000 kBit/s , programmable
Node ID		0 ... 253 , programmable
Termination		external
Cycle time		programmable
SLOT Range		-15 ... 15 °
SLOT Offset		180 °
Compliance with standards and directives		
Standard conformity		
Shock and impact resistance		100 *g* according to DIN EN 60068-2-27
Standards		EN 60947-5-2:2007 IEC 60947-5-2:2007
Approvals and certificates		
UL approval		cULus Listed, Class 2 Power Source
E1 Type approval		10R-04
Ambient conditions		
Ambient temperature		-40 ... 85 °C (-40 ... 185 °F)
Storage temperature		-40 ... 85 °C (-40 ... 185 °F)
Mechanical specifications		
Connection type		5-pin, M12 x 1 connector 5-pin, M12 x 1 socket internal bridged
Housing material		PA
Degree of protection		IP68 / IP69K
Mass		240 g
Factory settings		
Node ID		128
Transfer rate		250 kBit/s

Connection

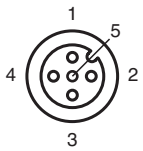


Release date: 2020-04-24 Date of issue: 2020-06-03 Filename: 241680_eng.pdf

Connection Assignment



Connection Assignment



Wire colors in accordance with EN 60947-5-2

1	BN	(brown)
2	WH	(white)
3	BU	(blue)
4	BK	(black)
5	GY	(gray)

Accessories

	**V15S-T-CAN/DN-V15**	Y-Splitter, M12 socket on M12 connector/socket
	**ICZ-TR-CAN/DN-V15**	Terminal resistor for DeviceNet, CANopen

Release date: 2020-04-24 Date of issue: 2020-06-03 Filename: 241680_eng.pdf

Mounting

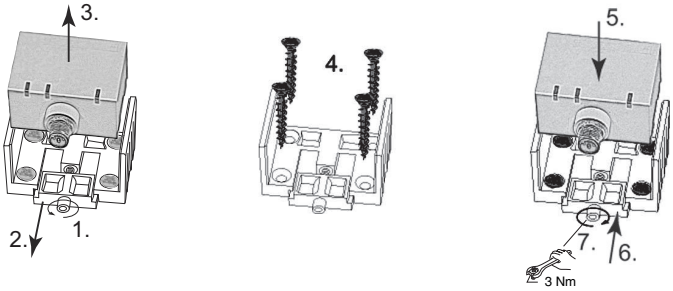
Sensor Orientation

In the default setting the zero position of the sensor is reached, when the sensor is mounted on a horizontal plane and electrical connection faces sidewards.

Mounting

Mounting of the sensor

Sensors from the -F99 series consist of a sensor module and accompanying cast aluminum housing. Select a horizontal flat surface with minimum dimensions of 70 mm x 50 mm to mount the sensor.
Mount the sensor as follows:



1. Loosen the central screw under the sensor connection.
2. Slide back the clamping element until you are able to remove the sensor module from the housing.
3. Remove the sensor module from the housing
4. Position the housing at the required mounting location and secure using four countersunk screws. Make sure that the heads of the screws do not protrude.
5. Place the sensor module in the housing.
6. Slide the clamping element flush into the housing. Check that the sensor element is seated correctly.
7. Finally tighten the central screw.

The sensor is now mounted correctly.

Technical Features

EMC Properties

Interference immunity in accordance with
DIN ISO 11452-2: 100 V/m
Frequency band 20 MHz up to 280 MHz and 295 MHz up to 2 GHz
Mains-borne interference in accordance with ISO 7637-2:

Pulse	1	2a	2b	3a	3b	4	5
Severity level	III	III	III	III	III	III	IV
Failure criterion	C	A	C	A	A	C	A

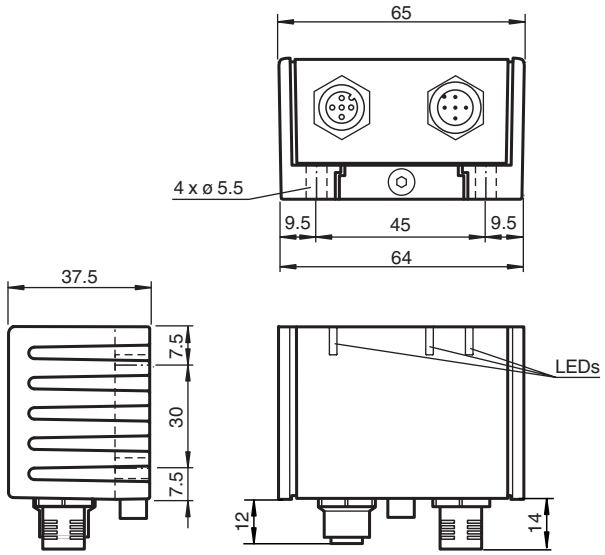
EN 61000-4-2:	CD: 8 kV /	AD: 15 kV
Severity level	IV	IV
EN 61000-4-3:	30 V/m (80...2500 MHz)	
Severity level	IV	
EN 61000-4-4:	2 kV	
Severity level	III	
EN 61000-4-6:	10 V (0.01...80 MHz)	
Severity level	III	
EN 55011:	Klasse A	

Inclination sensor

INX360D-F99-B20-V15

- E1-Type approval
- Measuring range 0 ... 360°
- High shock resistance
- Extended temperature range -40 ... +85 °C
- CAN bus with SAE J1939 protocol

Dimensions



Technical Data

General specifications		
Type		Inclination sensor, 1-axis
Measurement range		0 ... 360 °
Absolute accuracy		≤ ± 0.5 °
Response delay		≤ 20 ms
Resolution		≤ 0.1 °
Repeat accuracy		≤ ± 0.1 °
Temperature influence		≤ 0.027 °/K
Functional safety related parameters		

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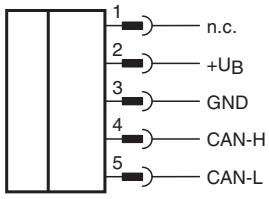
Technical Data

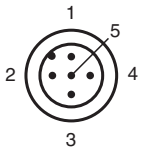
$MTTF_d$		650 a
Mission Time (T_M)		20 a
Diagnostic Coverage (DC)		0 %
Indicators/operating means		
Operation indicator		LED, green
Status indicator		LED, yellow
Error indicator		LED, red
Electrical specifications		
Operating voltage	U_B	5 ... 30 V DC
No-load supply current	I_0	≤ 100 mA
Power consumption	P_0	≤ 0.7 W
Interface		
Interface type		J1939
Data output code		binary code
Transfer rate		10 ... 1000 kBit/s , programmable
Node ID		0 ... 253 , programmable
Termination		external
Cycle time		programmable
SLOT Range		0 ... 359.99 °
SLOT Offset		0 °
Compliance with standards and directives		
Standard conformity		
Shock and impact resistance		100 *g* according to DIN EN 60068-2-27
Standards		EN 60947-5-2:2007 IEC 60947-5-2:2007
Approvals and certificates		
UL approval		cULus Listed, Class 2 Power Source
E1 Type approval		10R-04
Ambient conditions		
Ambient temperature		-40 ... 85 °C (-40 ... 185 °F)
Storage temperature		-40 ... 85 °C (-40 ... 185 °F)
Mechanical specifications		
Connection type		5-pin, M12 x 1 connector 5-pin, M12 x 1 socket internal bridged
Housing material		PA
Degree of protection		IP68 / IP69K
Mass		240 g
Factory settings		
Node ID		128
Transfer rate		250 kBit/s

Connection

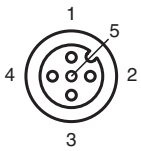


Release date: 2020-04-24 Date of issue: 2020-06-03 Filename: 241681_eng.pdf

Connection Assignment



Connection Assignment



Wire colors in accordance with EN 60947-5-2

1	BN	(brown)
2	WH	(white)
3	BU	(blue)
4	BK	(black)
5	GY	(gray)

Accessories

	**V15S-T-CAN/DN-V15**	Y-Splitter, M12 socket on M12 connector/socket
	**ICZ-TR-CAN/DN-V15**	Terminal resistor for DeviceNet, CANopen

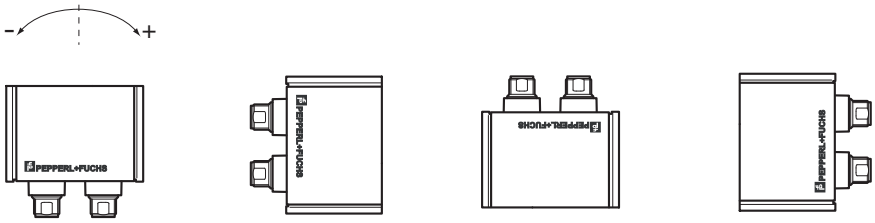
Release date: 2020-04-24 Date of issue: 2020-06-03 Filename: 241681_eng.pdf

Mounting

Sensor Orientation

In the default setting the zero position of the sensor is reached, when the electrical connection faces straight downwards.

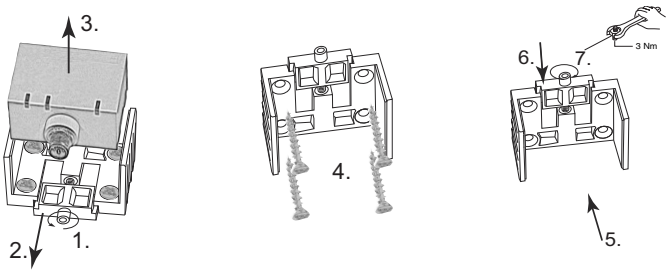
X Orientation



X = 0° X = 90° X = ±180° X = 270° (-

Mounting of the sensor

Sensors from the -F99 series consist of a sensor module and accompanying cast aluminum housing. Select a vertical surface with minimum dimensions of 70 mm x 50 mm to mount the sensor.
Mount the sensor as follows:



1. Loosen the central screw under the sensor connection.
2. Slide back the clamping element until you are able to remove the sensor module from the housing.
3. Remove the sensor module from the housing
4. Position the housing at the required mounting location and secure using four countersunk screws. Make sure that the heads of the screws do not protrude.
5. Place the sensor module in the housing.
6. Slide the clamping element flush into the housing. Check that the sensor element is seated correctly.
7. Finally tighten the central screw.

The sensor is now mounted correctly.

Technical Features

EMC Properties

Interference immunity in accordance with
DIN ISO 11452-2: 100 V/m
Frequency band 20 MHz up to 280 MHz and 295 MHz up to 2 GHz
Mains-borne interference in accordance with ISO 7637-2:

Release date: 2020-04-24 Date of issue: 2020-06-03 Filename: 241681_eng.pdf

Pulse	1	2a	2b	3a	3b	4	5
Severity level	III	III	III	III	III	III	IV
Failure criterion	C	A	C	A	A	C	A

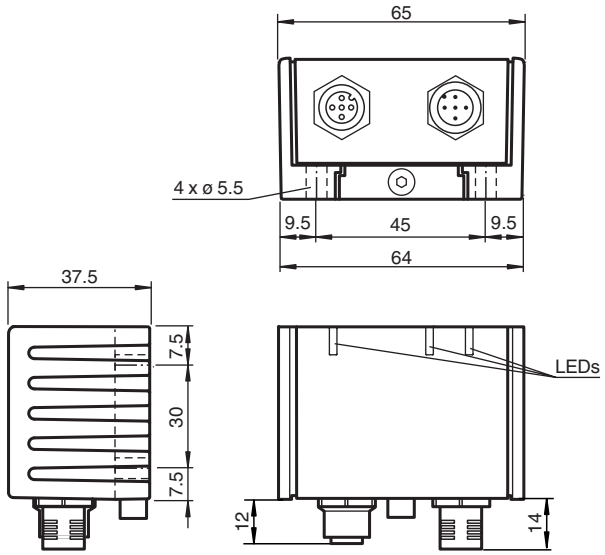
EN 61000-4-2:	CD: 8 kV /	AD: 15 kV
Severity level	IV	IV
EN 61000-4-3:	30 V/m (80...2500 MHz)	
Severity level	IV	
EN 61000-4-4:	2 kV	
Severity level	III	
EN 61000-4-6:	10 V (0.01...80 MHz)	
Severity level	III	
EN 55011:	Klasse A	

Inclination sensor

INY360D-F99-B20-V15

- E1-Type approval
- Measuring range 0 ... 360°
- High shock resistance
- Extended temperature range -40 ... +85 °C
- CAN bus with SAE J1939 protocol

Dimensions



Technical Data

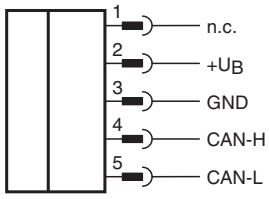
General specifications		
Type		Inclination sensor, 2-axis
Measurement range		0 ... 360 °
Absolute accuracy		≤ ± 0.5 °
Response delay		≤ 25 ms
Resolution		≤ 0.1 °
Repeat accuracy		≤ ± 0.1 °
Temperature influence		≤ 0.027 °/K
Functional safety related parameters		

Release date: 2020-04-24 Date of issue: 2020-06-03 Filename: 241682_eng.pdf

Technical Data

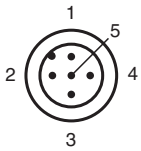
$MTTF_d$		650 a
Mission Time (T_M)		20 a
Diagnostic Coverage (DC)		0 %
Indicators/operating means		
Operation indicator		LED, green
Status indicator		LED, yellow
Error indicator		LED, red
Electrical specifications		
Operating voltage	U_B	5 ... 30 V DC
No-load supply current	I_0	≤ 100 mA
Power consumption	P_0	≤ 0.7 W
Interface		
Interface type		J1939
Data output code		binary code
Transfer rate		10 ... 1000 kBit/s , programmable
Node ID		0 ... 253 , programmable
Termination		external
Cycle time		programmable
SLOT Range		0 ... 359.99 °
SLOT Offset		0 °
Compliance with standards and directives		
Standard conformity		
Shock and impact resistance		100 *g* according to DIN EN 60068-2-27
Standards		EN 60947-5-2:2007 IEC 60947-5-2:2007
Approvals and certificates		
UL approval		cULus Listed, Class 2 Power Source
E1 Type approval		10R-04
Ambient conditions		
Ambient temperature		-40 ... 85 °C (-40 ... 185 °F)
Storage temperature		-40 ... 85 °C (-40 ... 185 °F)
Mechanical specifications		
Connection type		5-pin, M12 x 1 connector 5-pin, M12 x 1 socket internal bridged
Housing material		PA
Degree of protection		IP68 / IP69K
Mass		240 g
Factory settings		
Node ID		128
Transfer rate		250 kBit/s

Connection

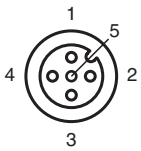


Release date: 2020-04-24 Date of issue: 2020-06-03 Filename: 241682_eng.pdf

Connection Assignment



Connection Assignment



Wire colors in accordance with EN 60947-5-2

1	BN	(brown)
2	WH	(white)
3	BU	(blue)
4	BK	(black)
5	GY	(gray)

Accessories

	**V15S-T-CAN/DN-V15**	Y-Splitter, M12 socket on M12 connector/socket
	**ICZ-TR-CAN/DN-V15**	Terminal resistor for DeviceNet, CANopen

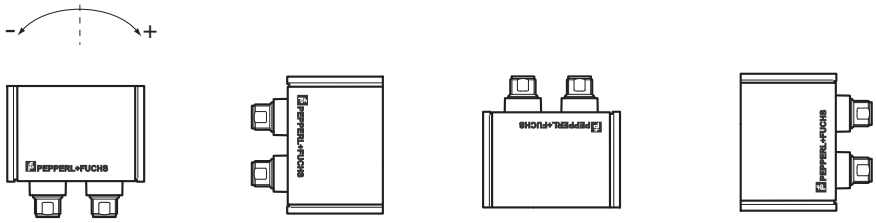
Release date: 2020-04-24 Date of issue: 2020-06-03 Filename: 241682_eng.pdf

Mounting

Sensor Orientation

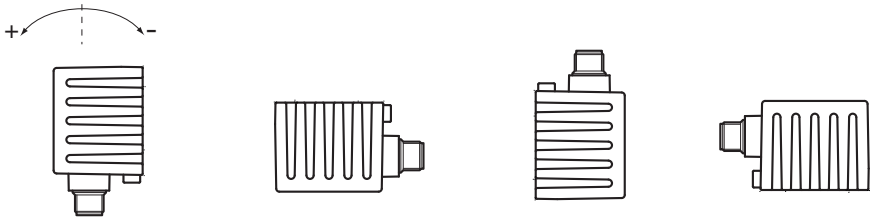
In the default setting the zero position of the sensor is reached, when the electrical connection faces straight downwards.

X Orientation



X = 0° X = 90° X = ±180° X = 270° (-

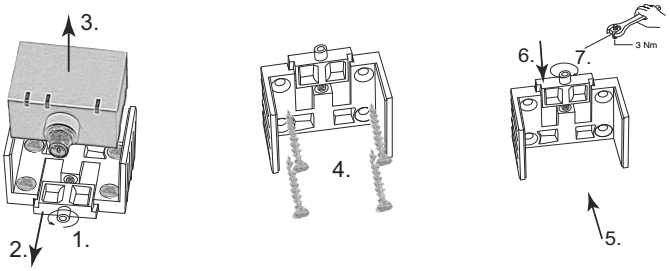
Y Orientation



Y = 0° Y = 90° Y = ±180° Y = 270° (-

Mounting of the sensor

Sensors from the -F99 series consist of a sensor module and accompanying cast aluminum housing. Select a vertical surface with minimum dimensions of 70 mm x 50 mm to mount the sensor.
Mount the sensor as follows:



1. Loosen the central screw under the sensor connection.
2. Slide back the clamping element until you are able to remove the sensor module from the housing.
3. Remove the sensor module from the housing
4. Position the housing at the required mounting location and secure using four countersunk screws. Make sure that the heads of the screws do not protrude.
5. Place the sensor module in the housing.
6. Slide the clamping element flush into the housing. Check that the sensor element is seated correctly.
7. Finally tighten the central screw.

The sensor is now mounted correctly.

Technical Features

EMC Properties

Interference immunity in accordance with
DIN ISO 11452-2: 100 V/m
Frequency band 20 MHz up to 280 MHz and 295 MHz up to 2 GHz
Mains-borne interference in accordance with ISO 7637-2:

Release date: 2020-04-24 Date of issue: 2020-06-03 Filename: 241682_eng.pdf

Pulse	1	2a	2b	3a	3b	4	5
Severity level	III	III	III	III	III	III	IV
Failure criterion	C	A	C	A	A	C	A

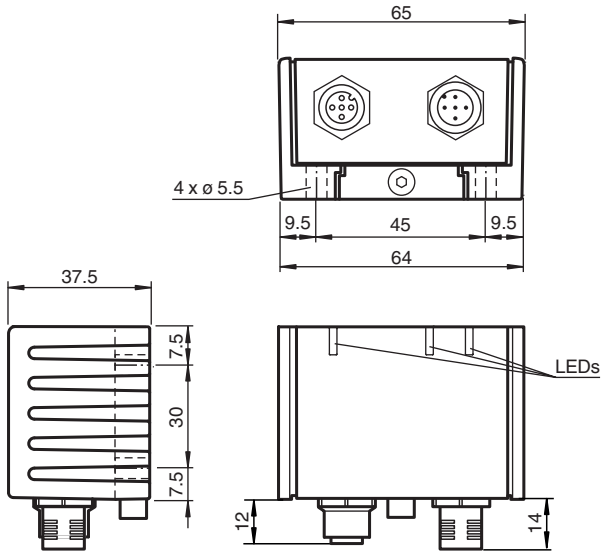
EN 61000-4-2:	CD: 8 kV /	AD: 15 kV
Severity level	IV	IV
EN 61000-4-3:	30 V/m (80...2500 MHz)	
Severity level	IV	
EN 61000-4-4:	2 kV	
Severity level	III	
EN 61000-4-6:	10 V (0.01...80 MHz)	
Severity level	III	
EN 55011:	Klasse A	

Inclination sensor

INY120D-F99-B20-V15

- E1-Type approval
- High shock resistance
- Extended temperature range -40 ... +85 °C
- Measuring range -60° ... +60°
- CAN bus with SAE J1939 protocol

Dimensions



Technical Data

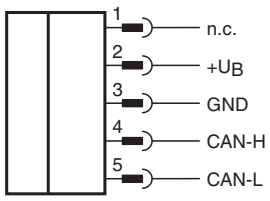
General specifications		
Type		Inclination sensor, 2-axis
Measurement range		-60 ... 60 °
Absolute accuracy		≤ ± 0.5 °
Response delay		≤ 25 ms
Resolution		≤ 0.1 °
Repeat accuracy		≤ ± 0.1 °
Temperature influence		≤ 0.027 °/K
Functional safety related parameters		

Release date: 2020-04-24 Date of issue: 2020-06-03 Filename: 255236_eng.pdf

Technical Data

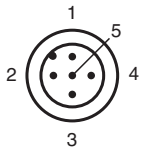
$MTTF_d$		650 a
Mission Time (T_M)		20 a
Diagnostic Coverage (DC)		0 %
Indicators/operating means		
Operation indicator		LED, green
Status indicator		LED, yellow
Error indicator		LED, red
Electrical specifications		
Operating voltage	U_B	5 ... 30 V DC
No-load supply current	I_0	≤ 100 mA
Power consumption	P_0	≤ 0.7 W
Interface		
Interface type		J1939
Data output code		binary code
Transfer rate		10 ... 1000 kBit/s , programmable
Node ID		0 ... 253 , programmable
Termination		external
Cycle time		programmable
SLOT Range		-60 ... 60 °
SLOT Offset		180 °
Compliance with standards and directives		
Standard conformity		
Shock and impact resistance		100 *g* according to DIN EN 60068-2-27
Standards		EN 60947-5-2:2007 IEC 60947-5-2:2007
Approvals and certificates		
UL approval		cULus Listed, Class 2 Power Source
E1 Type approval		10R-04
Ambient conditions		
Ambient temperature		-40 ... 85 °C (-40 ... 185 °F)
Storage temperature		-40 ... 85 °C (-40 ... 185 °F)
Mechanical specifications		
Connection type		5-pin, M12 x 1 connector 5-pin, M12 x 1 socket internal bridged
Housing material		PA
Degree of protection		IP68 / IP69K
Mass		240 g
Factory settings		
Node ID		128
Transfer rate		250 kBit/s

Connection

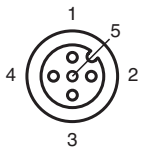


Release date: 2020-04-24 Date of issue: 2020-06-03 Filename: 255236_eng.pdf

Connection Assignment



Connection Assignment



Wire colors in accordance with EN 60947-5-2

1	BN	(brown)
2	WH	(white)
3	BU	(blue)
4	BK	(black)
5	GY	(gray)

Accessories

	**V15S-T-CAN/DN-V15**	Y-Splitter, M12 socket on M12 connector/socket
	**ICZ-TR-CAN/DN-V15**	Terminal resistor for DeviceNet, CANopen

Release date: 2020-04-24 Date of issue: 2020-06-03 Filename: 255236_eng.pdf

Mounting

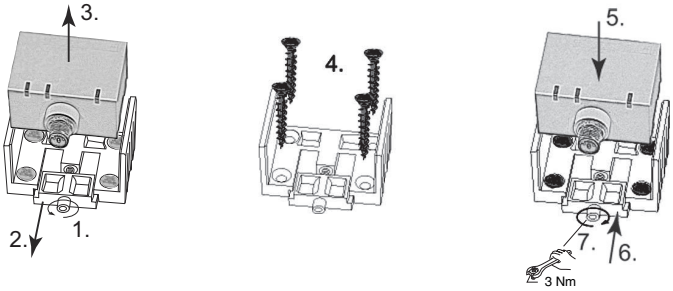
Sensor Orientation

In the default setting the zero position of the sensor is reached, when the sensor is mounted on a horizontal plane and electrical connection faces sidewards.

Mounting

Mounting of the sensor

Sensors from the -F99 series consist of a sensor module and accompanying cast aluminum housing. Select a horizontal flat surface with minimum dimensions of 70 mm x 50 mm to mount the sensor.
Mount the sensor as follows:



1. Loosen the central screw under the sensor connection.
2. Slide back the clamping element until you are able to remove the sensor module from the housing.
3. Remove the sensor module from the housing
4. Position the housing at the required mounting location and secure using four countersunk screws. Make sure that the heads of the screws do not protrude.
5. Place the sensor module in the housing.
6. Slide the clamping element flush into the housing. Check that the sensor element is seated correctly.
7. Finally tighten the central screw.

The sensor is now mounted correctly.

Technical Features

EMC Properties

Interference immunity in accordance with
DIN ISO 11452-2: 100 V/m
Frequency band 20 MHz up to 280 MHz and 295 MHz up to 2 GHz
Mains-borne interference in accordance with ISO 7637-2:

Pulse	1	2a	2b	3a	3b	4	5
Severity level	III	III	III	III	III	III	IV
Failure criterion	C	A	C	A	A	C	A

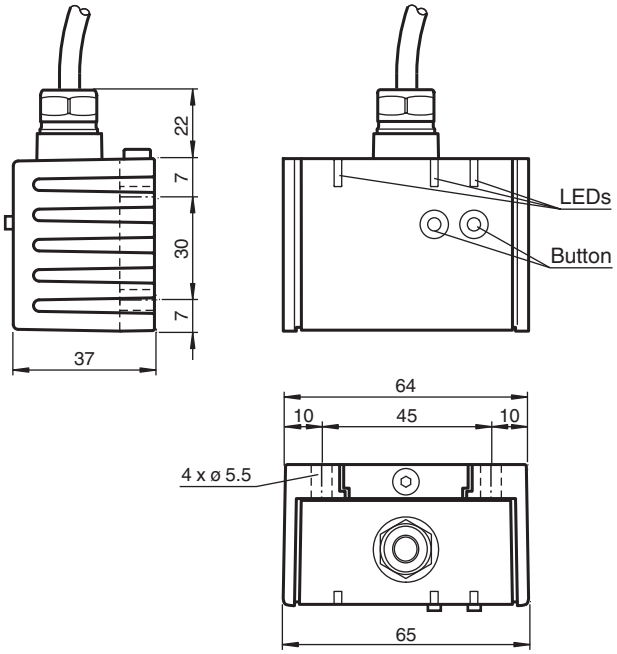
EN 61000-4-2:	CD: 8 kV /	AD: 15 kV
Severity level	IV	IV
EN 61000-4-3:	30 V/m (80...2500 MHz)	
Severity level	IV	
EN 61000-4-4:	2 kV	
Severity level	III	
EN 61000-4-6:	10 V (0.01...80 MHz)	
Severity level	III	
EN 55011:	Klasse A	

Inclination sensor

INX360D-F99-I2E2-8,5M

- E1-Type approval
- Measuring range 0 ... 360°
- Analog output 4 mA ... 20 mA
- Evaluation limits can be taught-in
- 2 programmable switch outputs
- High shock resistance
- Increased noise immunity 100 V/m

Dimensions



Technical Data

General specifications		
Type		Inclination sensor, 1-axis
Measurement range		0 ... 360 °
Absolute accuracy		≤ ± 0.5 °
Response delay		≤ 20 ms
Resolution		≤ 0.1 °
Repeat accuracy		≤ ± 0.1 °
Temperature influence		≤ 0.027 °/K
Functional safety related parameters		

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Technical Data

$MTTF_d$		300 a
Mission Time (T_M)		20 a
Diagnostic Coverage (DC)		0 %
Indicators/operating means		
Operation indicator		LED, green
Teach-In indicator		2 LEDs yellow (switching status), flashing
Button		2 push-buttons (Switch points programming , Evaluation range programming)
Switching state		2 yellow LEDs: Switching status (each output)
Electrical specifications		
Operating voltage	U_B	10 ... 30 V DC
No-load supply current	I_0	≤ 25 mA
Time delay before availability	t_v	≤ 200 ms
Switching output		
Output type		2 switch outputs PNP, NO , reverse polarity protected , short-circuit protected
Operating current	I_L	≤ 100 mA
Voltage drop		≤ 3 V
Analog output		
Output type		1 current output 4 ... 20 mA
Load resistor		0 ... 200 Ω at U_B = 10 ... 18 V 0 ... 500 Ω at U_B = 18 ... 30 V
Compliance with standards and directives		
Standard conformity		
Shock and impact resistance		100 *g* according to DIN EN 60068-2-27
Standards		EN 60947-5-2:2007 IEC 60947-5-2:2007
Approvals and certificates		
UL approval		cULus Listed, Class 2 Power Source
CCC approval		CCC approval / marking not required for products rated ≤36 V
E1 Type approval		10R-04
Ambient conditions		
Ambient temperature		-40 ... 85 °C (-40 ... 185 °F)
Storage temperature		-40 ... 85 °C (-40 ... 185 °F)
Mechanical specifications		
Connection type		8.5 m , PUR cable , 5 x 0.5 mm^2
Housing material		PA
Degree of protection		IP68 / IP69K
Mass		240 g
Factory settings		
Switching output 1		-30 ° ... 30 °
Switching output 2		-30 ° ... 30 °
Analog output		-45 ° ... 45 °

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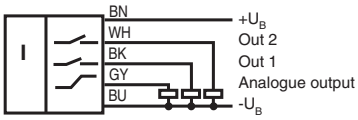
Connection

Standard symbol/Connection:



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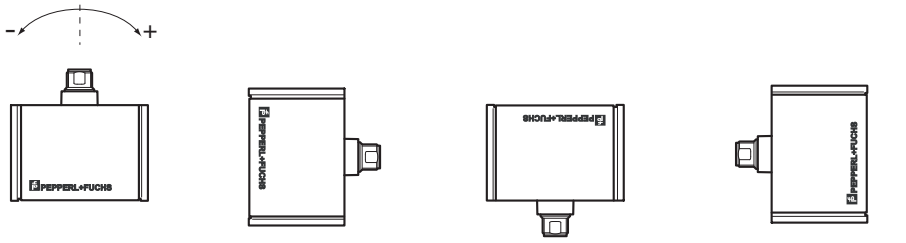
Mounting

Sensor Orientation

In the default setting the zero position of the sensor is reached, when the electrical connection faces straight upwards.

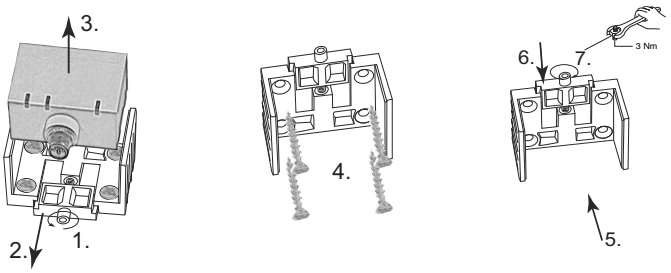
X Orientation



X = 0° X = 90° X = ±180° X = 270° (-90°)

Mounting of the sensor

Sensors from the -F99 series consist of a sensor module and accompanying cast aluminum housing. Select a vertical surface with minimum dimensions of 70 mm x 50 mm to mount the sensor.
Mount the sensor as follows:



1. Loosen the central screw under the sensor connection.
2. Slide back the clamping element until you are able to remove the sensor module from the housing.
3. Remove the sensor module from the housing
4. Position the housing at the required mounting location and secure using four countersunk screws. Make sure that the heads of the screws do not protrude.
5. Place the sensor module in the housing.
6. Slide the clamping element flush into the housing. Check that the sensor element is seated correctly.
7. Finally tighten the central screw.

The sensor is now mounted correctly.

Additional Information

LED display

Displays dependent on the operating state	LED green: Power	LED yellow out 1	LED yellow out 2
Teach-in of switching points (output S1): **Teach-in of switching points (output S2):**	off off	flashes off	off flashes
Activate teach-in mode for analog limits: Teach-in of **analog limits**	off off	flashes flashes	flashes off
Normal operation	on	switchings tate	switchings tate
Reset to factory settings: 2 s ... 10 s > 10 s ... end of reset process Followed by normal operation	 off flashes	 flashes off	 flashes off
Undervoltage	flashes	off	off

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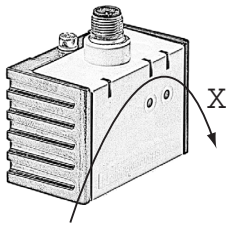
Axis definition

The definition of the X-axis is shown on the sensor housing by means of an imprinted and labeled double arrow. The figure shows the clockwise direction of rotation.



Teach-in of switching points (output S1)

1. Press key T1 > 2 s (see LED display)
2. Move sensor to switching position 1
3. Press key T1 briefly. LED "out 1" lights for 1.5 s as confirmation. Switching point 1 has been taught
4. Move sensor to switching position 2
5. Press key T1 briefly. LED "out 1" lights for 1.5 s as confirmation. Switching point 2 has been taught
6. Sensor returns to normal operation (see LED display)

The NC (active output state) is always defined in the range from the 1st configured position to 2nd configured position.
As an example :
Case #1: configure position #1 at +45degree, configure position #2 at +90 degree; NC is from +45 ' +90 in the CW direction
Case #2: configure position #1 at +90degree ; configure position #2 at +45 degree; NC is from +90 ' +45 in the CW direction

Teach-in of switching points (output S2)

Similar to the process for "Teach-in of switching points (output S1)", but with key T2 instead of key T1.

Teach-in of analog limits

1. Activate the teach-in mode for the analog limits by simultaneously pressing keys T1 and T2 until the green LED is extinguished and the two yellow LEDs flash. Then release the keys.
2. Press key T1 > for 2 s (see LED display)
3. Move the sensor into the position of minimum evaluation limit
4. Press key T1 briefly. LED "out 1" lights for 1.5 s as confirmation. The minimum evaluation limit has been taught. In this position the analog output will provide its minimum output value.
5. Move the sensor into the position of maximum evaluation limit
6. Press key T1 briefly. LED "out 1" lights for 1.5 s as confirmation. The maximum evaluation limit has been taught. In this position the analog output will provide its maximum output value.
7. Sensor returns to normal operation (see LED display)

If the sensor inclination exceeds one of the analog limits, the last value of the analog output is retained.

Resetting the sensor to factory settings

1. Press keys T1 and T2 > 10 s (see LED display)
2. The sensor has been reset when the green LED "Power" lights again after approx. 10 s.

Undervoltage detection

If the supply voltage falls below a value of approx. 7 V, all outputs and yellow LEDs are deactivated. The green "power" LED flashes rapidly. If the supply voltage falls below a value of approx. 8 V, the sensor continues with normal operation.

Technical Features

EMC Properties

Interference immunity in accordance with
DIN ISO 11452-2: 100 V/m
Frequency band 20 MHz up to 2 GHz
Mains-borne interference in accordance with ISO 7637-2:

Pulse	1	2a	2b	3a	3b	4
Severity level	III	III	III	III	III	III
Failure criterion	C	A	C	A	A	C

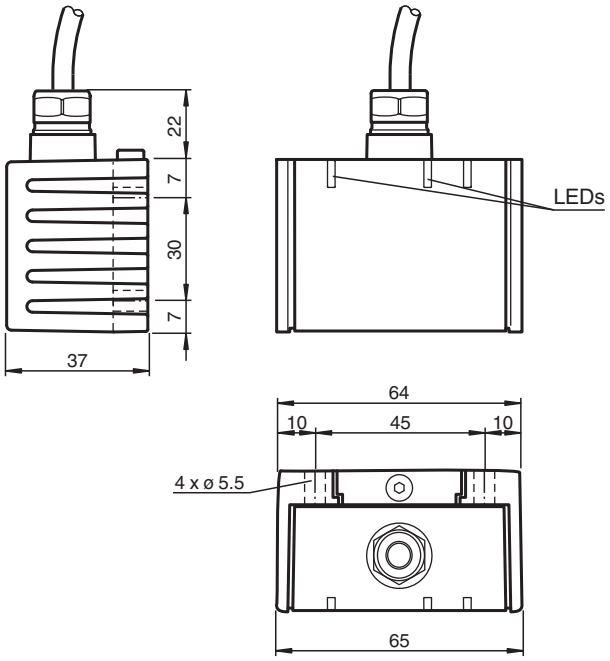
EN 61000-4-2:	CD: 8 kV /	AD: 15 kV
Severity level	IV	IV
EN 61000-4-3:	30 V/m (80...2500 MHz)	
Severity level	IV	
EN 61000-4-4:	2 kV	
Severity level	III	
EN 61000-4-6:	10 V (0.01...80 MHz)	
Severity level	III	
EN 55011:	Klasse A	

Inclination sensor

INY030D-F99-2I2E2-25M

- E1-Type approval
- Measuring range -15° ... +15°
- Analog output 4 mA ... 20 mA
- Fixed evaluation limits
- High shock resistance
- Increased noise immunity 100 V/m

Dimensions



Technical Data

General specifications		
Type		Inclination sensor, 2-axis
Measuring range		-15 ... 15 °
Absolute accuracy		≤ ± 0.2 °
Response delay		≤ 25 ms
Resolution		≤ 0.01 °
Repeat accuracy		≤ ± 0.02 °
Temperature influence		≤ 0.004 °/K
Functional safety related parameters		
$MTTF_d$		304 a
Mission Time (T_M)		20 a
Diagnostic Coverage (DC)		0 %

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Technical Data

Indicators/operating means		
Operation indicator		LED, green
Switching state		2 yellow LEDs: Switching status (each output)
Electrical specifications		
Operating voltage	U_B	10 ... 30 V DC
No-load supply current	I_0	≤ 25 mA
Time delay before availability	t_v	≤ 200 ms
Switching output		
Output type		2 switch outputs PNP, NO , reverse polarity protected , short-circuit protected
Operating current	I_L	≤ 100 mA
Voltage drop		≤ 3 V
Analog output		
Output type		2 current outputs 4 ... 20 mA (one output for each axis)
Load resistor		0 ... 200 Ω at U_B = 10 ... 18 V 0 ... 500 Ω at U_B = 18 ... 30 V
Compliance with standards and directives		
Standard conformity		
Shock and impact resistance		100 *g* according to DIN EN 60068-2-27
Standards		EN 60947-5-2:2007 IEC 60947-5-2:2007
Approvals and certificates		
UL approval		cULus Listed, Class 2 Power Source
E1 Type approval		10R-04
Ambient conditions		
Ambient temperature		-40 ... 85 °C (-40 ... 185 °F)
Storage temperature		-40 ... 85 °C (-40 ... 185 °F)
Mechanical specifications		
Connection type		25 m PUR cable 7 x 0.5 mm^2
Housing material		PA
Degree of protection		IP68 / IP69K
Mass		240 g
Dimensions		
Height		37 mm
Width		45 mm
Length		65 mm
Factory settings		
Analog output (X)		-15 ° ... 15 °
Analog output (Y)		-15 ° ... 15 °
Switching output (X)		-15 ° ... 15 °
Switching output (Y)		-15 ° ... 15 °

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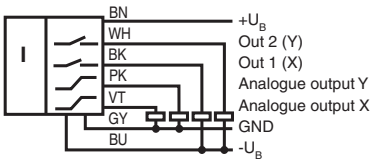
Connection

Standard symbol/Connection:



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Mounting

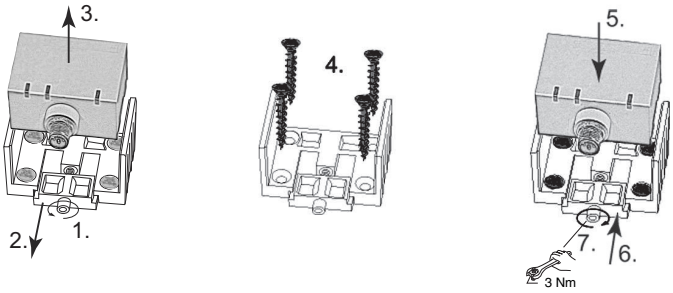
Sensor Orientation

In the default setting the zero position of the sensor is reached, when the sensor is mounted on a horizontal plane and electrical connection faces sidewards.

Mounting

Mounting of the sensor

Sensors from the -F99 series consist of a sensor module and accompanying cast aluminum housing. Select a horizontal flat surface with minimum dimensions of 70 mm x 50 mm to mount the sensor.
Mount the sensor as follows:



1. Loosen the central screw under the sensor connection.
2. Slide back the clamping element until you are able to remove the sensor module from the housing.
3. Remove the sensor module from the housing
4. Position the housing at the required mounting location and secure using four countersunk screws. Make sure that the heads of the screws do not protrude.
5. Place the sensor module in the housing.
6. Slide the clamping element flush into the housing. Check that the sensor element is seated correctly.
7. Finally tighten the central screw.

The sensor is now mounted correctly.

Technical Features

EMC Properties

Interference immunity in accordance with
DIN ISO 11452-2: 100 V/m
Frequency band 20 MHz up to 2 GHz
Mains-borne interference in accordance with ISO 7637-2:

Pulse	1	2a	2b	3a	3b	4
Severity level	III	III	III	III	III	III
Failure criterion	C	A	C	A	A	C

EN 61000-4-2:	CD: 8 kV	/	AD: 15 kV
Severity level	IV		IV
EN 61000-4-3:	30 V/m (80...2500 MHz)		
Severity level	IV		
EN 61000-4-4:	2 kV		
Severity level	III		
EN 61000-4-6:	10 V (0.01...80 MHz)		
Severity level	III		
EN 55011:	Klasse A		

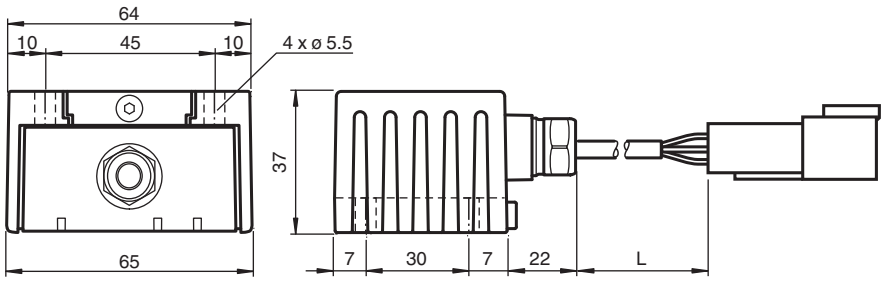
Release date: 2024-11-15 Date of issue: 2024-11-15 Filename: 279886_eng.pdf

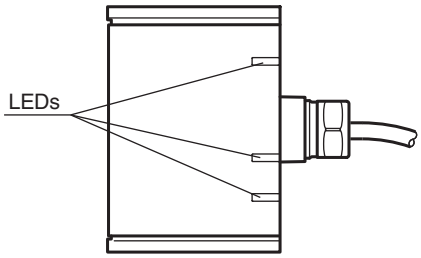
Inclination sensor

INY170D-F99-B20-0,6M-6DTM04

- E1-Type approval
- High shock resistance
- Extended temperature range -40 ... +85 °C
- CAN bus with SAE J1939 protocol
- Measuring range -85° ... +85°

Dimensions





Technical Data

General specifications		
Type		Inclination sensor, 2-axis
Measurement range		-85 ... 85 °
Absolute accuracy		≤ ± 0.5 ° [-60°...+60°]
Response delay		≤ 25 ms
Resolution		≤ 0.1 °
Repeat accuracy		≤ ± 0.1 °
Temperature influence		≤ 0.004 °/K
Functional safety related parameters		
$MTTF_d$		650 a

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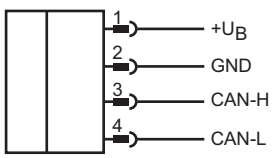
Technical Data

Mission Time (T_M)		20 a
Diagnostic Coverage (DC)		0 %
Indicators/operating means		
Operation indicator		LED, green
Status indicator		LED, yellow
Error indicator		LED, red
Electrical specifications		
Operating voltage	U_B	5 ... 30 V DC
No-load supply current	I_0	≤ 100 mA
Power consumption	P_0	≤ 0.7 W
Interface		
Interface type		J1939
Data output code		binary code
Node ID		0 ... 253 , programmable
Transfer rate		10 ... 1000 kBit/s , programmable
Termination		external
Cycle time		programmable
SLOT Range		-85 ... 85 °
SLOT Offset		180 °
Compliance with standards and directives		
Standard conformity		
Shock and impact resistance		100 *g* according to DIN EN 60068-2-27
Standards		EN 60947-5-2:2007 IEC 60947-5-2:2007
Approvals and certificates		
UL approval		cULus Listed, Class 2 Power Source
E1 Type approval		10R-04
Ambient conditions		
Ambient temperature		-40 ... 85 °C (-40 ... 185 °F)
Storage temperature		-40 ... 85 °C (-40 ... 185 °F)
Mechanical specifications		
Connection type		0.6 m, PUR cable 5 x 0.5 mm² Deutsch connector DTM04-6P
Housing material		PA
Housing length		65 mm
Housing width		45 mm
Housing height		37 mm
Degree of protection		IP68 / IP69K
Mass		240 g
Factory settings		
Node ID		30
Transfer rate		250 kBit/s

Connection



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Mounting

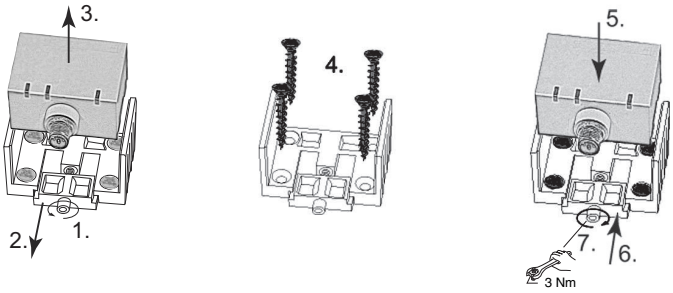
Sensor Orientation

In the default setting the zero position of the sensor is reached, when the sensor is mounted on a horizontal plane and electrical connection faces sidewards.

Mounting

Mounting of the sensor

Sensors from the -F99 series consist of a sensor module and accompanying cast aluminum housing. Select a horizontal flat surface with minimum dimensions of 70 mm x 50 mm to mount the sensor.
Mount the sensor as follows:



1. Loosen the central screw under the sensor connection.
2. Slide back the clamping element until you are able to remove the sensor module from the housing.
3. Remove the sensor module from the housing
4. Position the housing at the required mounting location and secure using four countersunk screws. Make sure that the heads of the screws do not protrude.
5. Place the sensor module in the housing.
6. Slide the clamping element flush into the housing. Check that the sensor element is seated correctly.
7. Finally tighten the central screw.

The sensor is now mounted correctly.

Technical Features

EMC Properties

Interference immunity in accordance with
DIN ISO 11452-2: 100 V/m
Frequency band 20 MHz up to 280 MHz and 295 MHz up to 2 GHz
Mains-borne interference in accordance with ISO 7637-2:

Pulse	1	2a	2b	3a	3b	4	5
Severity level	III	III	III	III	III	III	IV
Failure criterion	C	A	C	A	A	C	A

EN 61000-4-2:	CD: 8 kV	/	AD: 15 kV
Severity level	IV		IV
EN 61000-4-3:	30 V/m (80...2500 MHz)		
Severity level	IV		
EN 61000-4-4:	2 kV		
Severity level	III		
EN 61000-4-6:	10 V (0.01...80 MHz)		
Severity level	III		
EN 55011:	Klasse A		

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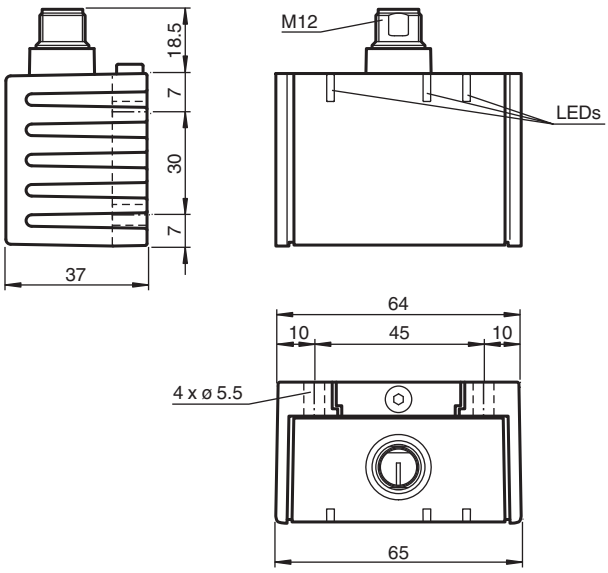
Inclination sensor

INY340D-F99-2I-V15-Y310917

- E1-Type approval
- Analog output 4 mA ... 20 mA
- High shock resistance
- Increased noise immunity 100 V/m

Dimensions



Technical Data

General specifications	
Type	Inclination sensor, 2-axis
Measurement range	X-axis : 10 ... 350 ° Y-axis : 135 ... 225 °
Absolute accuracy	≤ ± 0.5 °
Response delay	≤ 25 ms
Resolution	≤ 0.1 °
Repeat accuracy	≤ ± 0.1 °
Temperature influence	≤ 0.027 °/K

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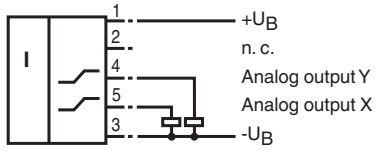
Technical Data

Functional safety related parameters		
$MTTF_d$		300 a
Mission Time (T_M)		20 a
Diagnostic Coverage (DC)		0 %
Indicators/operating means		
Operation indicator		LED, green
Electrical specifications		
Operating voltage	U_B	10 ... 30 V DC
No-load supply current	I_0	≤ 25 mA
Time delay before availability	t_v	≤ 200 ms
Analog output		
Output type		2 current outputs 4 ... 20 mA (one output for each axis)
Load resistor		0 ... 200 Ω at U_B = 10 ... 18 V 0 ... 500 Ω at U_B = 18 ... 30 V
Compliance with standards and directives		
Standard conformity		
Shock and impact resistance		100 *g* according to DIN EN 60068-2-27
Standards		EN 60947-5-2:2007 IEC 60947-5-2:2007
Approvals and certificates		
UL approval		cULus Listed, Class 2 Power Source
E1 Type approval		10R-04
Ambient conditions		
Ambient temperature		-40 ... 85 °C (-40 ... 185 °F)
Storage temperature		-40 ... 85 °C (-40 ... 185 °F)
Mechanical specifications		
Connection type		5-pin, M12 x 1 connector
Housing material		PA
Degree of protection		IP68 / IP69K
Mass		240 g
Factory settings		
Analog output (X)		10 ° ... 350 °
Analog output (Y)		135 ° ... 225 °

Connection



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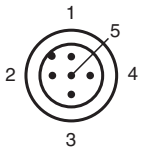
Connection Assignment



Wire colors in accordance with EN 60947-5-2

1	BN	(brown)
2	WH	(white)
3	BU	(blue)
4	BK	(black)
5	GY	(gray)

Accessories

	**V15-G-2M-PUR**	Female cordset, M12, 5-pin, PUR cable
	**V15-W-2M-PUR**	Female cordset, M12, 5-pin, PUR cable

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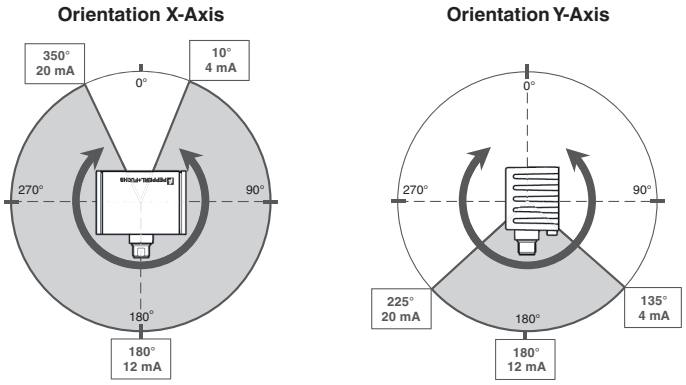
Mounting

Sensor Orientation

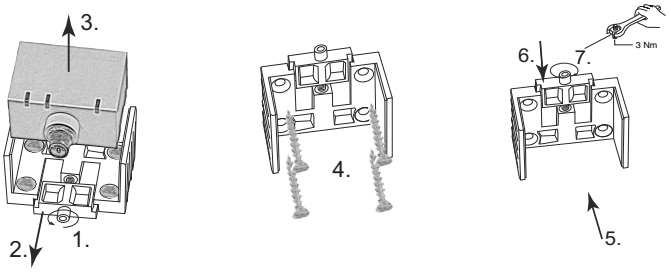
In the default setting the zero position of the sensor is reached, when the electrical connection faces straight downwards.

Mounting



Mounting of the sensor

Sensors from the -F99 series consist of a sensor module and accompanying cast aluminum housing. Select a vertical surface with minimum dimensions of 70 mm x 50 mm to mount the sensor.
Mount the sensor as follows:



1. Loosen the central screw under the sensor connection.
2. Slide back the clamping element until you are able to remove the sensor module from the housing.
3. Remove the sensor module from the housing
4. Position the housing at the required mounting location and secure using four countersunk screws. Make sure that the heads of the screws do not protrude.
5. Place the sensor module in the housing.
6. Slide the clamping element flush into the housing. Check that the sensor element is seated correctly.
7. Finally tighten the central screw.

The sensor is now mounted correctly.

Technical Features

EMC Properties

Interference immunity in accordance with
DIN ISO 11452-2: 100 V/m
Frequency band 20 MHz up to 2 GHz
Mains-borne interference in accordance with ISO 7637-2:

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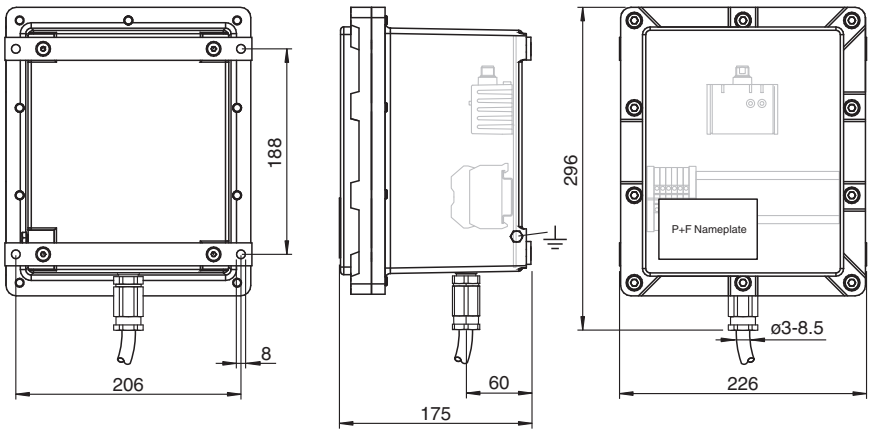
Pulse	1	2 a	2 b	3 a	3 b	4
Severity level	III	III	III	III	III	III
Failure criterion	C	A	C	A	A	C
EN 61000-4-2:	CD: 8 kV /			AD: 15 kV		
Severity level	IV			IV		
EN 61000-4-3:	30 V/m (80...2500 MHz)					
Severity level	IV					
EN 61000-4-4:	2 kV					
Severity level	III					
EN 61000-4-6:	10 V (0.01...80 MHz)					
Severity level	III					
EN 55011:	Klasse A					

Inclination sensor

INX360D-F99-I2E2-V15-Ex

- Explosion-proof housing
- Installation in Zone 1 and Zone 21
- E1-Type approval
- Measuring range 0 ... 360°
- Analog output 4 mA ... 20 mA
- Evaluation limits can be taught-in
- 2 programmable switch outputs
- High shock resistance
- Increased noise immunity 100 V/m

Dimensions



Technical Data

General specifications	
Type	Inclination sensor, 1-axis
Measurement range	0 ... 360 °
Absolute accuracy	≤ ± 0.5 °
Response delay	≤ 20 ms
Resolution	≤ 0.1 °
Repeat accuracy	≤ ± 0.1 °
Temperature influence	≤ 0.027 °/K
Functional safety related parameters	
$MTTF_d$	300 a
Mission Time (T_M)	20 a
Diagnostic Coverage (DC)	0 %
Indicators/operating means	
Operation indicator	LED, green
Teach-In indicator	2 LEDs yellow (switching status), flashing
Button	2 push-buttons (Switch points programming , Evaluation range programming)
Switching state	2 yellow LEDs: Switching status (each output)

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Technical Data

Electrical specifications		
Operating voltage	U_B	10 ... 30 V DC
No-load supply current	I_0	≤ 25 mA
Time delay before availability	t_v	≤ 200 ms
Switching output		
Output type		2 switch outputs PNP, NO , reverse polarity protected , short-circuit protected
Operating current	I_L	≤ 100 mA
Voltage drop		≤ 3 V
Analog output		
Output type		1 current output 4 ... 20 mA
Load resistor		0 ... 200 Ω at U_B = 10 ... 18 V 0 ... 500 Ω at U_B = 18 ... 30 V
Compliance with standards and directives		
Standard conformity		
Shock and impact resistance		100 *g* according to DIN EN 60068-2-27
Standards		EN 60947-5-2:2007 IEC 60947-5-2:2007
Approvals and certificates		
IECEx approval		IECEx INE 14.0029X
ATEX approval		INERIS 14 ATEX 0022X Device type: EJB4A.D.CP-INX360D-F99-I2E2
Marking		Ⓔx II 2 GD Ex db IIB+H_2 T6 Gb, II 2 GD Ex tb IIIC T85 °C Db
E1 Type approval		10R-04
Ambient conditions		
Ambient temperature		-40 ... 60 °C (-40 ... 140 °F)
Storage temperature		-40 ... 60 °C (-40 ... 140 °F)
Mechanical specifications		
Connection type		Connection terminals, max. conductor cross-section 2.5 mm²
Conductor cross section		0.14 ... 2.5 mm²
Cable gland		for cable diameter 3 ... 8.5 mm
Cover fixing		stainless steel socket cap head screws
Screws		M6
Housing material		Seawater-resistant aluminum
Finish		epoxy coated RAL 7005 (grey)
Flamepath grease		Greasil MS4 or NEVER SEEZ Marine Grade
Degree of protection		IP66
Mass		9 kg
Factory settings		
Switching output 1		-30 ° ... 30 °
Switching output 2		-30 ° ... 30 °
Analog output		-45 ° ... 45 °

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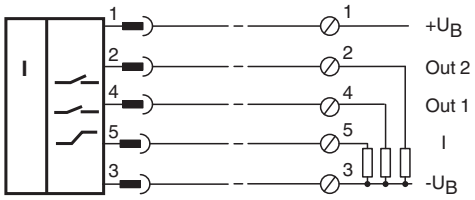
Connection

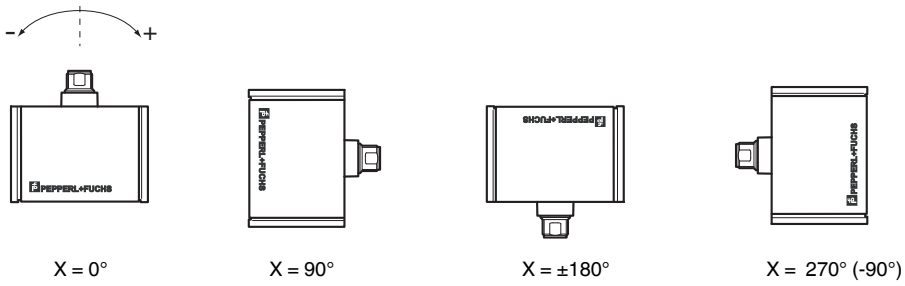


Mounting

Sensor Orientation

In the default setting the zero position of the sensor is reached, when the electrical connection faces straight upwards.

X Orientation



X = 0° X = 90° X = ±180° X = 270° (-90°)

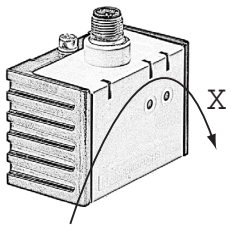
Additional Information

LED display

Displays dependent on the operating state	LED green: Power	LED yellow out 1	LED yellow out 2
Teach-in of switching points (output S1): **Teach-in of switching points (output S2):**	off off	flashes off	off flashes
Activate teach-in mode for analog limits: Teach-in of **analog limits**	off off	flashes flashes	flashes off
Normal operation	on	switchingstate	switchingstate
Reset to factory settings: 2 s ... 10 s > 10 s ... end of reset process Followed by normal operation	off flashes	flashes off	flashes off
Undervoltage	flashes	off	off

Axis definition

The definition of the X-axis is shown on the sensor housing by means of an imprinted and labeled double arrow. The figure shows the clockwise direction of rotation.



Teach-in of switching points (output S1)

1. Press key T1 > 2 s (see LED display)
2. Move sensor to switching position 1
3. Press key T1 briefly. LED "out 1" lights for 1.5 s as confirmation. Switching point 1 has been taught
4. Move sensor to switching position 2
5. Press key T1 briefly. LED "out 1" lights for 1.5 s as confirmation. Switching point 2 has been taught
6. Sensor returns to normal operation (see LED display)

The NC (active output state) is always defined in the range from the 1st configured position to 2nd configured position.
As an example :
Case #1: configure position #1 at +45degree, configure position #2 at +90 degree; NC is from +45 ' +90 in the CW direction
Case #2: configure position #1 at +90degree ; configure position #2 at +45 degree; NC is from +90 ' +45 in the CW direction

Teach-in of switching points (output S2)

Similar to the process for "Teach-in of switching points (output S1)“, but with key T2 instead of key T1.

Teach-in of analog limits

1. Activate the teach-in mode for the analog limits by simultaneously pressing keys T1 and T2 until the green LED is extinguished and the two yellow LEDs flash. Then release the keys.
2. Press key T1 > for 2 s (see LED display)
3. Move the sensor into the position of minimum evaluation limit
4. Press key T1 briefly. LED "out 1" lights for 1.5 s as confirmation. The minimum evaluation limit has been taught. In this position the analog output will provide its minimum output value.
5. Move the sensor into the position of maximum evaluation limit
6. Press key T1 briefly. LED "out 1" lights for 1.5 s as confirmation. The maximum evaluation limit has been taught. In this position the analog output will provide its maximum output value.
7. Sensor returns to normal operation (see LED display)

If the sensor inclination exceeds one of the analog limits, the last value of the analog output is retained.

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Resetting the sensor to factory settings

1. Press keys T1 and T2 > 10 s (see LED display)
2. The sensor has been reset when the green LED "Power" lights again after approx. 10 s.

Undervoltage detection

If the supply voltage falls below a value of approx. 7 V, all outputs and yellow LEDs are deactivated. The green "power" LED flashes rapidly. If the supply voltage falls below a value of approx. 8 V, the sensor continues with normal operation.

Technical Features

EMC Properties

Interference immunity in accordance with
DIN ISO 11452-2: 100 V/m
Frequency band 20 MHz up to 2 GHz
Mains-borne interference in accordance with ISO 7637-2:

Pulse	1	2a	2b	3a	3b	4
Severity level	III	III	III	III	III	III
Failure criterion	C	A	C	A	A	C

EN 61000-4-2:	CD: 8 kV	/	AD: 15 kV
Severity level	IV		IV
EN 61000-4-3:	30 V/m (80...2500 MHz)		
Severity level	IV		
EN 61000-4-4:	2 kV		
Severity level	III		
EN 61000-4-6:	10 V (0.01...80 MHz)		
Severity level	III		
EN 55011:	Klasse A		

Inertial measurement unit

IMUF99PL-SC3600-0KB20V1501

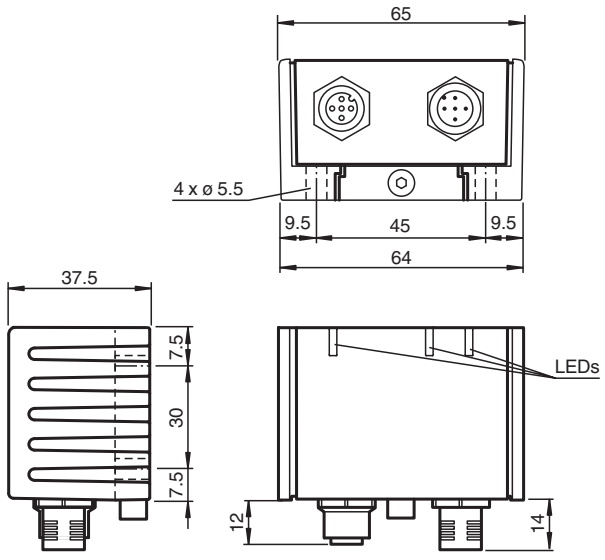
- Dynamic inclination measurement despite external acceleration
- Adjustable ranges for compensation of external accelerations, disturbances
- Adjustable thresholds for detection of measured value overruns
- Measurement of inclination, acceleration and rotation rate in 3 axis each
- CAN bus with SAE J1939 protocol

Inertial measurement unit for inclination, acceleration and rotation rate measurement in 3-axis each

Function

The IMUF99 is optimized to provide stabilized inclination and acceleration data as well as rotation rate data. The horizontal inclination can be reliably determined using the 3 measuring axis. The dynamic angle accuracy can be individually configured by selecting a compensation range to counteract the influence of external accelerations.
Different output types are selectable for the angle definition (Euler angle, Euler vector, quaternions). In addition, accelerations and rotation rates are reliably measured in the 3 measuring axis. For further optimization of the measured value quality, filters can be set to suppress external vibrations.

Dimensions



Technical Data

General specifications		
Type		Inertial measurement unit 3-axis
Measuring technology		MEMS
Inclination measurement		
Measurement range		0 ... 360 °
Static accuracy		± 0.15 ° at 25 °C for inclination range ±45 ° ± 0.2 ° at 25 °C for inclination range ±90 ° ± 0.3 ° at 25 °C for inclination range 360 °
Dynamic accuracy		< 0.5 ° absolute, absolut, bei 25 °C über 360 ° Neigungsbereich
Resolution		0.01 °

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Technical Data

Repeat accuracy		± 0.1 °
Temperature influence		± 0.015 ° / K
Acceleration measurement		
Measurement range		± 4 g
Linearity		± 0,5% of the measured value, up to ±1 g for -40 ... +85 °C
Resolution		0.001 g
Frequency range		0 ... 30 Hz
Rotation rate measurement		
Measurement range		± 250 °/s
Accuracy		± 0.2 °/s at 25 °C in the measuring range ±45 °/s ± 0.5 °/s at 25 °C in the measuring range ±120 °/s ± 1 °/s at 25 °C in the measuring range ±250 °/s
Resolution		0.01 °/s
Functional safety related parameters		
$MTTF_d$		628 a
Mission Time (T_M)		10 a
Diagnostic Coverage (DC)		0 %
Indicators/operating means		
Operation indicator		LED, green
Status indicator		LED, yellow
Error indicator		LED, red
Electrical specifications		
Operating voltage	U_B	5 ... 30 V DC
No-load supply current	I_0	≤ 80 mA
Power consumption	P_0	≤ 0.6 W
Interface		
Interface type		CAN bus with SAE J1939 protocol
Node ID		0 ... 253 , programmable
Transfer rate		10 ... 1000 kBit/s , programmable
Termination		external
Cycle time		10 ... 655350 ms , programmable
Standard conformity		
Climatic testing		EN IEC 60068-2-38 , cyclic 12h + 12h, 94% humidity EN 60068-2-14 , test Na, -50 ... +85 °C, 10 cycles
Salt spray test		IEC 60068-2-52 , cyclic
Emitted interference		EN IEC 61000-6-4:2019 , EN 55011:2016+A1:2017+A11:2020
Noise immunity		EN IEC 61000-6-2:2019 , ISO 7637-2:2011 , ISO 7637-3:2016 , ISO 16750-2:2012
Shock resistance		EN 60068-2-27, 100 g, 6 ms
Vibration resistance		EN 60068-2-6, 20 g, 10 ... 2000 Hz
Approvals and certificates		
UL approval		E87056 , cULus Listed, General Purpose, Class 2 Power Source, Type 1 enclosure , if UL marking is marked on the product. For use in NFPA 79 Applications only. adapters providing field wiring on request
E1 Type approval		10R-06
Ambient conditions		
Ambient temperature		-40 ... 85 °C (-40 ... 185 °F)
Storage temperature		-40 ... 85 °C (-40 ... 185 °F)
Mechanical specifications		
Connection type		5-pin, M12 x 1 connector 5-pin, M12 x 1 socket internal bridged
Housing material		PA
Degree of protection		IP68 / IP69
Mass		265 g
Dimensions		
Height		37 mm

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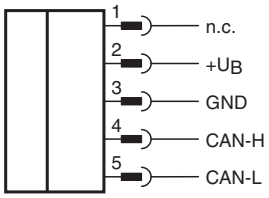
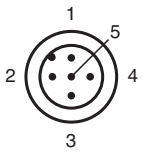
Technical Data

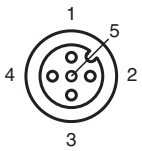
Width	45 mm
Length	65 mm
Factory settings	
Node ID	128
Transfer rate	250 kBit/s
Cycle time	10 ms
Compensation range	4

Connection



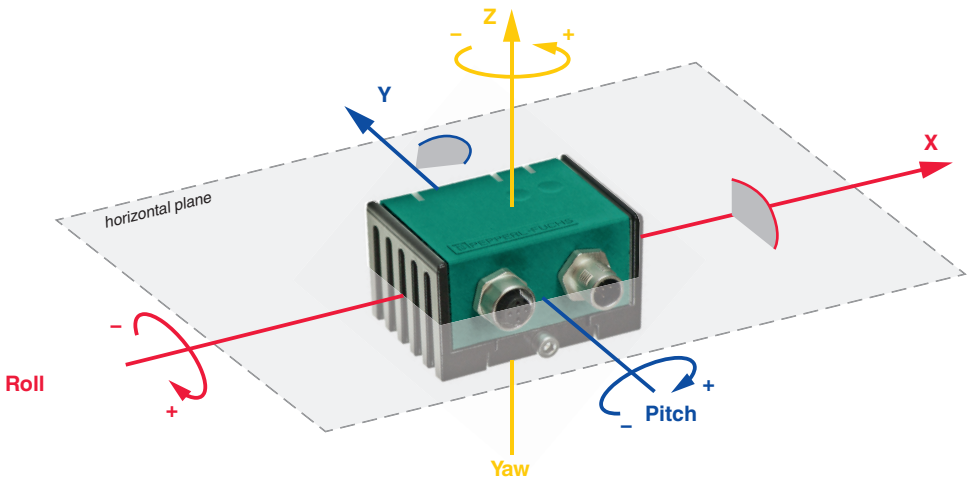
Connection Assignment





Operation

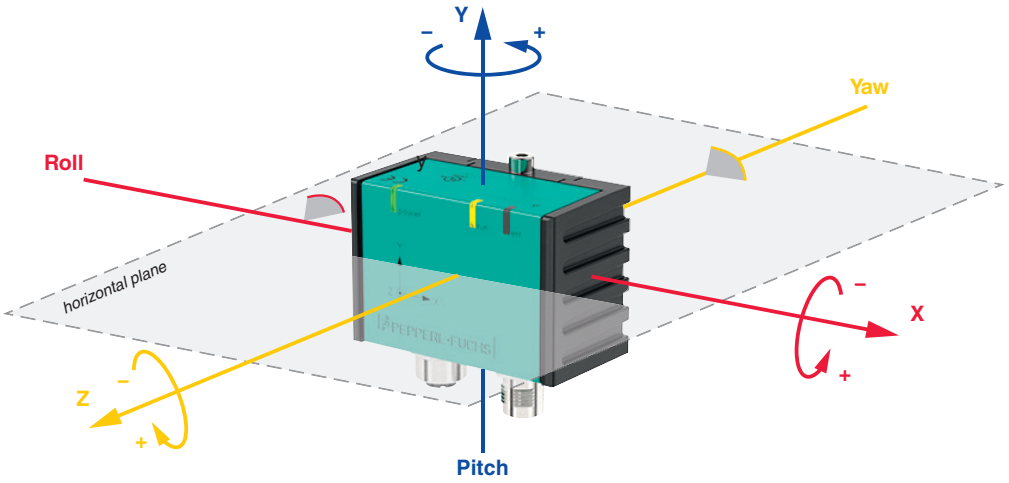
Spatially fixed coordinate system (extrinsic reference to the horizontal plane) for P+F angles INX or INY



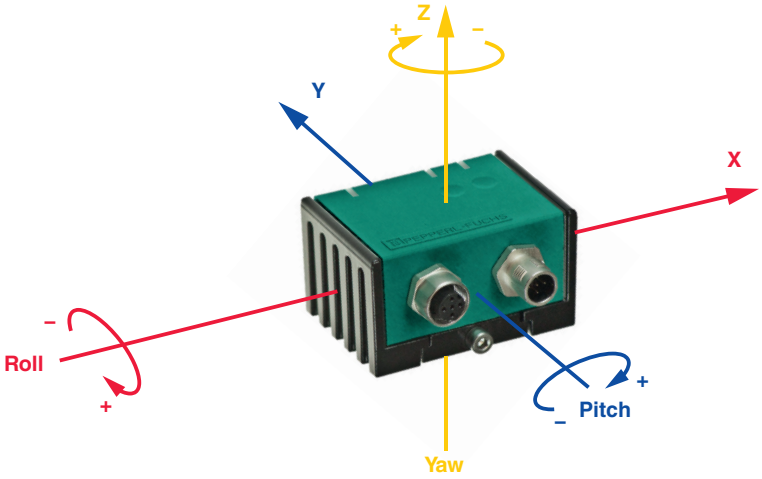
Release date: 2024-09-10 Date of issue: 2024-09-10 Filename: 70130406_eng.pdf

Operation

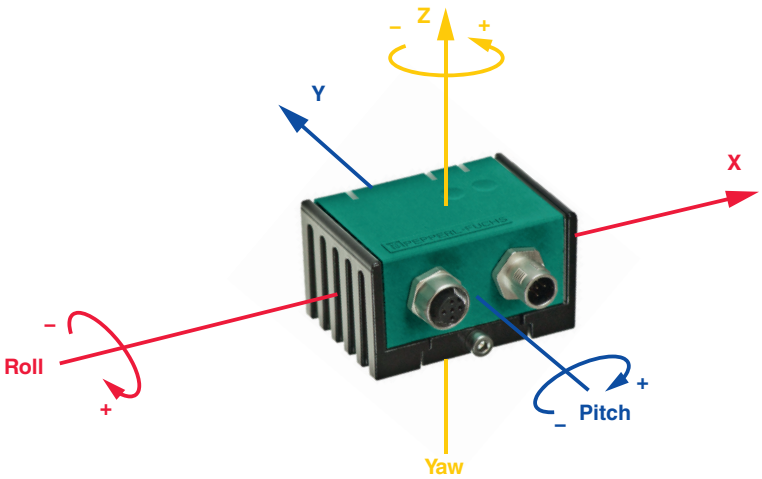
Spatially fixed coordinate system (extrinsic reference to the horizontal plane) for Euler angle ZXZ



Body fixed coordinate system (intrinsic or co-rotating) for Euler angle zy'x''



Body fixed coordinate system (intrinsic or co-rotating) for P+F angle INZ

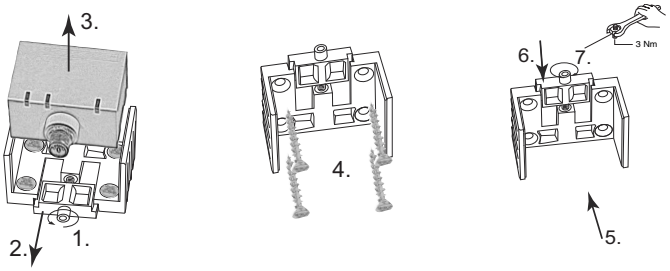


Release date: 2024-09-10 Date of issue: 2024-09-10 Filename: 70130406_eng.pdf

Mounting

Mounting of the sensor

Sensors from the -F99 series consist of a sensor module and accompanying cast aluminum housing. Select a flat surface with minimum dimensions of 70 mm x 50 mm to mount the sensor.
Mount the sensor as follows:



1. Loosen the central screw under the sensor connection.
2. Slide back the clamping element until you are able to remove the sensor module from the housing.
3. Remove the sensor module from the housing
4. Position the housing at the required mounting location and secure using four countersunk screws. Make sure that the heads of the screws do not protrude.
5. Place the sensor module in the housing.
6. Slide the clamping element flush into the housing. Check that the sensor element is seated correctly.
7. Finally tighten the central screw.

The sensor is now mounted correctly.

Inertial measurement unit

IMUF99PL-SC3600-0KB16V1501

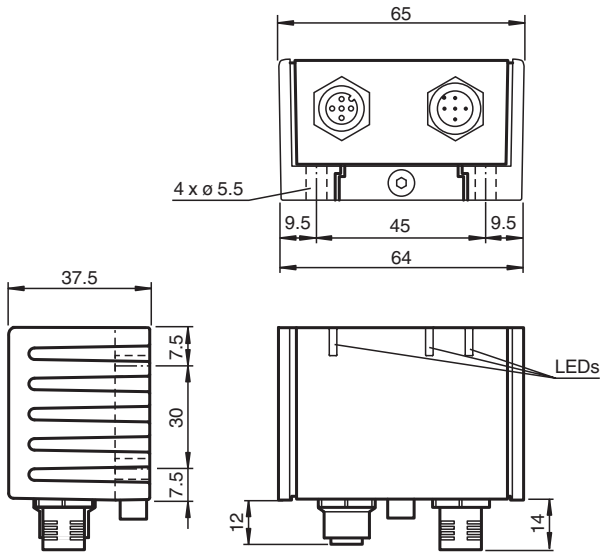
- Dynamic inclination measurement despite external acceleration
- Adjustable ranges for compensation of external accelerations, disturbances
- Adjustable thresholds for detection of measured value overruns
- Measurement of inclination, acceleration and rotation rate in 3 axis each
- CAN bus with CANopen

Inertial measurement unit for inclination, acceleration and rotation rate measurement in 3-axis each

Function

The IMUF99 is optimized to provide stabilized inclination and acceleration data as well as rotation rate data. The horizontal inclination can be reliably determined using the 3 measuring axis. The dynamic angle accuracy can be individually configured by selecting a compensation range to counteract the influence of external accelerations.
Different output types are selectable for the angle definition (Euler angle, Euler vector, quaternions). In addition, accelerations and rotation rates are reliably measured in the 3 measuring axis. For further optimization of the measured value quality, filters can be set to suppress external vibrations.

Dimensions



Technical Data

General specifications		
Type		Inertial measurement unit 3-axis
Measuring technology		MEMS
Inclination measurement		
Measurement range		0 ... 360 °
Static accuracy		± 0.15 ° at 25 °C for inclination range ±45 ° ± 0.2 ° at 25 °C for inclination range ±90 ° ± 0.3 ° at 25 °C for inclination range 360 °
Dynamic accuracy		< 0.5 ° absolute, absolut, bei 25 °C über 360 ° Neigungsbereich
Resolution		0.01 °

Release date: 2024-09-10 Date of issue: 2024-09-10 Filename: 70159687_eng.pdf

Technical Data

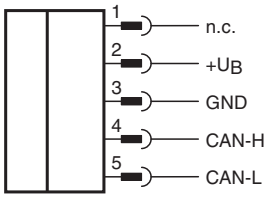
Repeat accuracy		± 0.1 °
Temperature influence		± 0.015 ° / K
Acceleration measurement		
Measurement range		± 4 g
Linearity		± 0,5% of the measured value, up to ±1 g for -40 ... +85 °C
Resolution		0.001 g
Frequency range		0 ... 30 Hz
Rotation rate measurement		
Measurement range		± 250 °/s
Accuracy		± 0.2 °/s at 25 °C in the measuring range ±45 °/s ± 0.5 °/s at 25 °C in the measuring range ±120 °/s ± 1 °/s at 25 °C in the measuring range ±250 °/s
Resolution		0.01 °/s
Functional safety related parameters		
$MTTF_d$		628 a
Mission Time (T_M)		10 a
Diagnostic Coverage (DC)		0 %
Indicators/operating means		
Operation indicator		LED, yellow
Status indicator		LED, green
Error indicator		LED, red
Electrical specifications		
Operating voltage	U_B	5 ... 30 V DC
No-load supply current	I_0	≤ 80 mA
Power consumption	P_0	≤ 0.6 W
Interface		
Interface type		CANopen
Node ID		0 ... 126 , programmable
Transfer rate		125 ... 1000 kBit/s , programmable
Termination		external
Cycle time		10 ... 655350 ms , programmable
Standard conformity		
Climatic testing		EN IEC 60068-2-38 , cyclic 12h + 12h, 94% humidity EN 60068-2-14 , test Na, -50 ... +85 °C, 10 cycles
Salt spray test		IEC 60068-2-52 , cyclic
Emitted interference		EN IEC 61000-6-4:2019 , EN 55011:2016+A1:2017+A11:2020
Noise immunity		EN IEC 61000-6-2:2019 , ISO 7637-2:2011 , ISO 7637-3:2016 , ISO 16750-2:2012
Shock resistance		EN 60068-2-27, 100 g, 6 ms
Vibration resistance		EN 60068-2-6, 20 g, 10 ... 2000 Hz
Approvals and certificates		
UL approval		E87056 , cULus Listed, General Purpose, Class 2 Power Source, Type 1 enclosure , if UL marking is marked on the product. For use in NFPA 79 Applications only. adapters providing field wiring on request
E1 Type approval		10R-06
Ambient conditions		
Ambient temperature		-40 ... 85 °C (-40 ... 185 °F)
Storage temperature		-40 ... 85 °C (-40 ... 185 °F)
Mechanical specifications		
Connection type		5-pin, M12 x 1 connector 5-pin, M12 x 1 socket internal bridged
Housing material		PA
Degree of protection		IP68 / IP69
Mass		265 g
Dimensions		
Height		37 mm

Release date: 2024-09-10 Date of issue: 2024-09-10 Filename: 70159687_eng.pdf

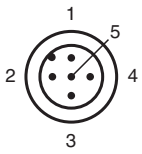
Technical Data

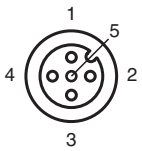
Width	45 mm
Length	65 mm
Factory settings	
Node ID	16
Transfer rate	250 kBit/s
Cycle time	10 ms
Compensation range	4

Connection



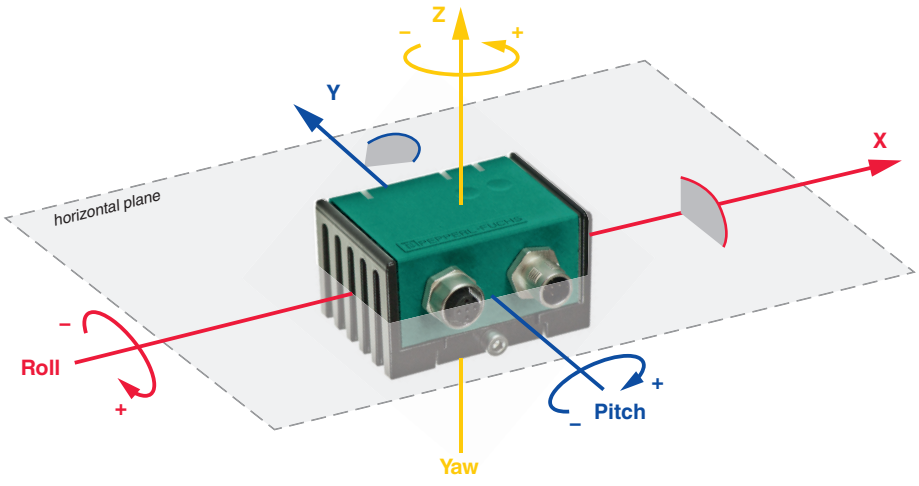
Connection Assignment





Operation

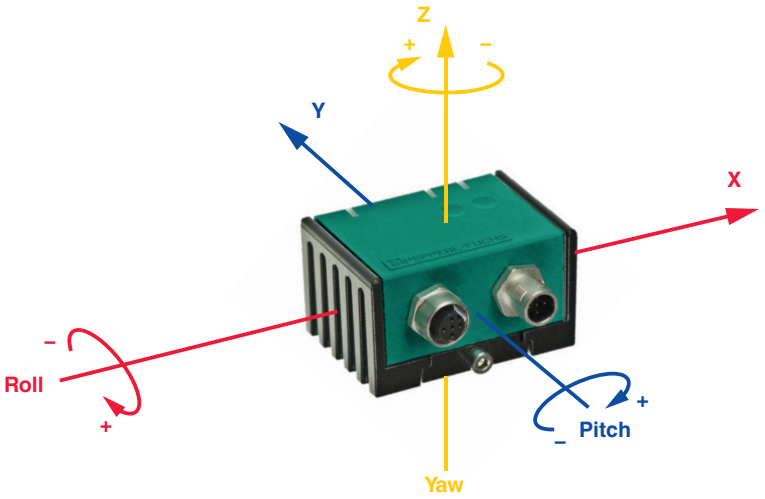
Spatially fixed coordinate system (extrinsic reference to the horizontal plane) for P+F angles INX or INY
Angle range 0 ° ... 360 °



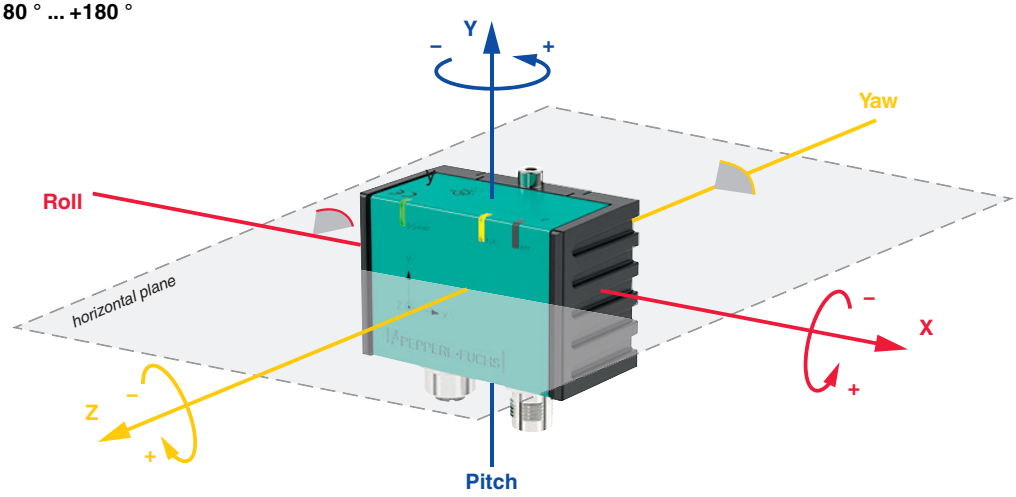
Release date: 2024-09-10 Date of issue: 2024-09-10 Filename: 70159687_eng.pdf

Operation

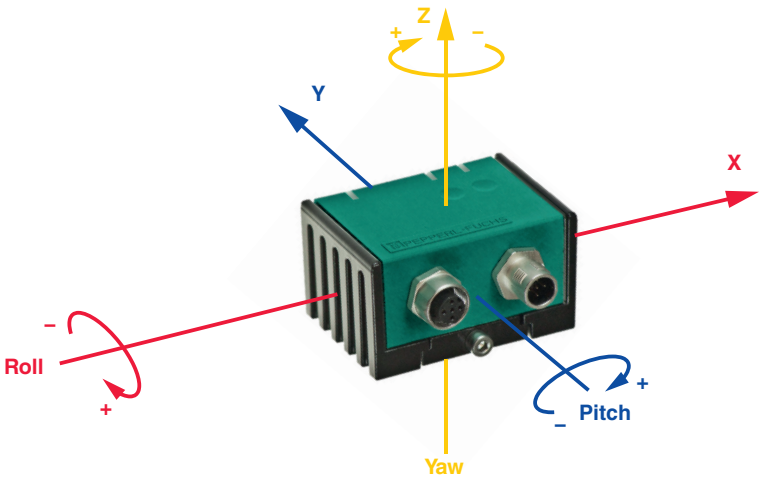
Body fixed coordinate system (intrinsic or co-rotating) for P+F angle INZ
Angle range 0 ° ... 360 °



Spatially fixed coordinate system (extrinsic reference to the horizontal plane) for Euler angle ZXZ
Angle range - 180 ° ... +180 °



Body fixed coordinate system (intrinsic or co-rotating) for Euler angle zy'x''
Angle range -180 ° ... +180 °

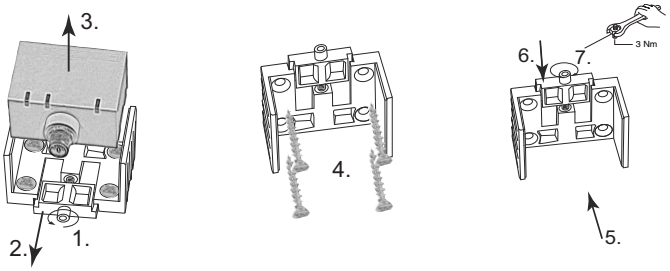


Release date: 2024-09-10 Date of issue: 2024-09-10 Filename: 70159687_eng.pdf

Mounting

Mounting of the sensor

Sensors from the -F99 series consist of a sensor module and accompanying cast aluminum housing. Select a flat surface with minimum dimensions of 70 mm x 50 mm to mount the sensor.
Mount the sensor as follows:



1. Loosen the central screw under the sensor connection.
2. Slide back the clamping element until you are able to remove the sensor module from the housing.
3. Remove the sensor module from the housing
4. Position the housing at the required mounting location and secure using four countersunk screws. Make sure that the heads of the screws do not protrude.
5. Place the sensor module in the housing.
6. Slide the clamping element flush into the housing. Check that the sensor element is seated correctly.
7. Finally tighten the central screw.

The sensor is now mounted correctly.

По вопросам продаж и поддержки обращайтесь:

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Россия +7(495)268-04-70
Казахстан +7(727) 345-47-04
Беларусь +(375) 257-127-884
Узбекистан +998(71)205-18-59
Киргизия +996(312)96-26-47

эл.почта: phb@nt-rt.ru || сайт: https://pepperl-fuchs.nt-rt.ru/