

# Inclination and Acceleration Sensors **Highly Resistant in Any Environment**

Whether for leveling cranes, for acceleration control in elevators or for monitoring the condition of large plants, inclination and acceleration sensors from Pepperl+Fuchs always guarantee precise measurements—even in harsh outdoor conditions.

## **Unique Concept for Optimal Protection and Easy Installation**

Based on a two-part mounting concept, the inclination and acceleration sensors always consist of the sensor module and a particularly robust metal retaining bracket. This combination brings many advantages: The metal retaining bracket offers optimal impact protection and simple installation thanks to the integrated hexagon head screw. This makes the entire system even more resistant to mechanical force. It can also be replaced quickly and easily if required. It is not necessary to re-adjust or calibrate.

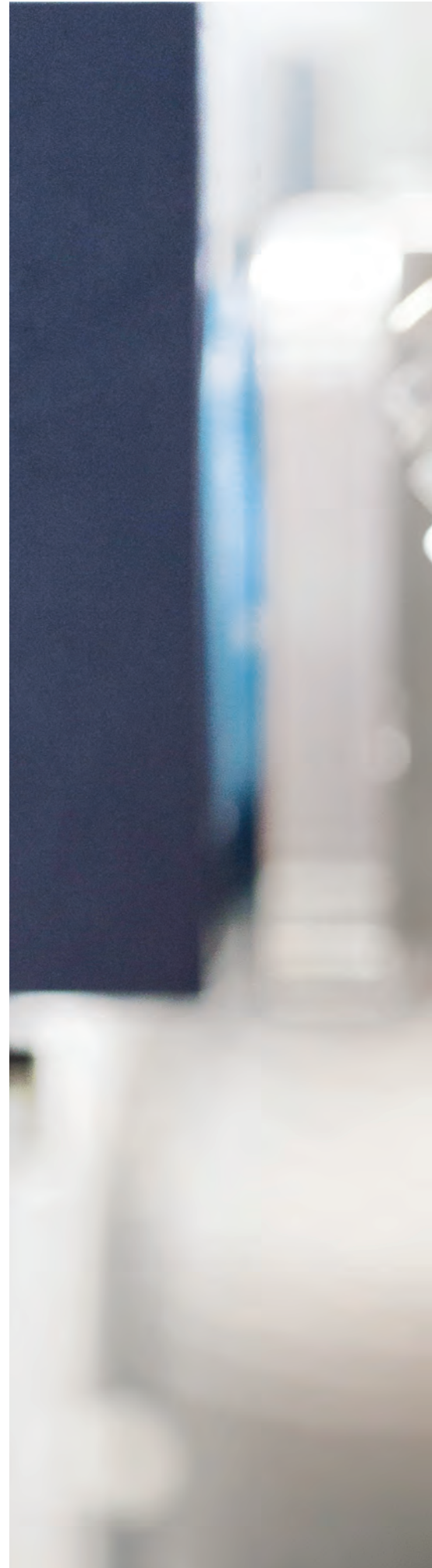
## **The Right Sensor Version for Every Requirement**

Each application has different requirements for the sensor technology. The portfolio of inclination and acceleration sensors from Pepperl+Fuchs therefore consists of different variants which can be selected depending on the application requirement.

In addition to sensors for inclination and acceleration detection, the F99 Fusion inertial measurement units are also available. Specifically designed for use in dynamic applications, they provide precise inclination and acceleration data in 360° at any time thanks to their compensation for external acceleration.



More information is available at:  
[www.pepperl-fuchs.com/fa-f99](http://www.pepperl-fuchs.com/fa-f99)



# Inclination and Acceleration Sensors

## Highly Precise Even with Dynamic Motion

The F99 Fusion inertial measurement unit guarantees error-free inclination detection in dynamic applications. The intelligent combination of the acceleration sensor and gyroscope compensates for external accelerations. This increases efficiency and opens up completely new opportunities.



Inclination sensor



Acceleration sensor

### Typical Applications

#### Inclination sensors:

- Leveling of working platforms
- Ensuring optimal alignment of solar systems

#### Acceleration sensors:

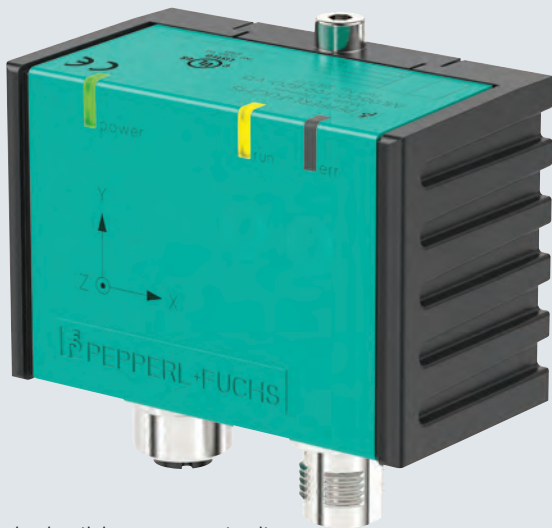
- Monitoring of upper vibration limits in wind energy plants
- Monitoring acceleration in elevators

#### F99 Fusion inertial measurement unit:

- Steering angle limitation in an inclined position on construction machines or material handling equipment
- On-board weighing systems in port crane facilities

### Your Benefits at a Glance

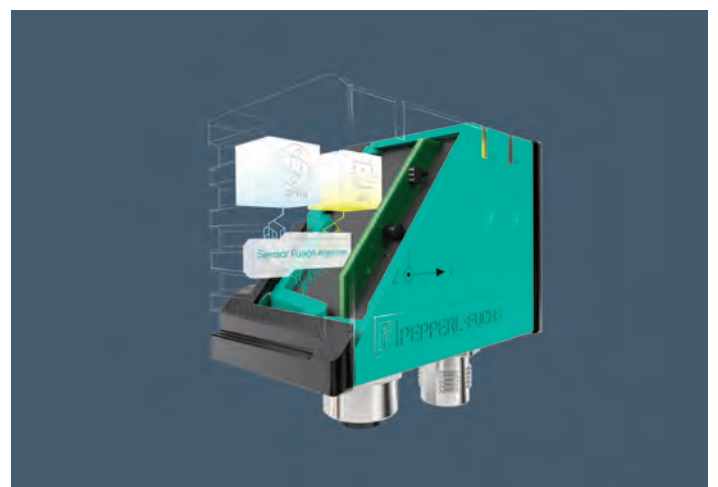
- Precise inclination measurement, even in motion, thanks to compensation for dynamic acceleration without loss of time (F99 Fusion)
- Variable output values and parameterizable filters for optimum adjustment to suit the application (F99 Fusion)
- Simplified installation: 360° inclination and acceleration sensors in three axes in one device. Mounting is independent of the orientation (F99 Fusion)
- Sophisticated mounting concept as well as IP68/IP69K degree of protection for incredible robustness, even when used outdoors
- Wide range of applications: E1 and GL approvals enable use on public roads as well as on the high seas



F99 Fusion inertial measurement unit

### Technical Features

- Optimal sealing due to degree of protection IP68/IP69K
- Increased EMC immunity: Tested according to ISO 7637 and ISO 11452
- Increased shock and vibration resistance of up to 100 g



F99 Fusion inertial measurement unit:  
Intelligent combination of  
acceleration sensor and gyroscopes for  
maximum precision in dynamic motion

# F99 Series Inclination Sensors



## Standard Technical Data

<b>Design</b>	Cuboid shape
<b>Operating voltage (max)</b>	30 V
<b>Housing material</b>	Plastic material
<b>Housing length L</b>	65 mm
<b>Housing width W</b>	45 mm
<b>Housing height H</b>	37 mm
<b>UL</b>	■

For detailed data and description, see the datasheet. Further products can be found online at [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com).

Model number	Measuring range	Measuring axes	Measurement accuracy [± °]	Interface	Output type	UB (min)	Operating elements	Connection type	CSA	E1
INX360D-F99-B16-V15	0°...360°	1	0.5	CANopen		10		1 x M12 connector plug		■
INX360D-F99-B20-V15	0°...360°	1	0.5	J1939		5		1 x M12 connector plug, 1 x M12 connector socket		■
INX360D-F99-I2E2-5M	0°...360°	1	0.5	Analog	2 x PNP, current output	10	Push-button	Cable		■
INX360D-F99-I2E2-V15	0°...360°	1	0.5	Analog	2 x PNP, current output	10	Push-button	1 x M12 connector plug		■
INX360D-F99-U2E2-5M	0°...360°	1	0.5	Analog	2 x PNP, voltage output	10	Push-button	Cable		■
INX360D-F99-U2E2-V15	0°...360°	1	0.5	Analog	2 x PNP, voltage output	10	Push-button	1 x M12 connector plug		■
INY030D-F99-2I2E2-25M	-15°...+15°	2	0.2	Analog	2 x PNP, current output	10		Cable	■	■
INY030D-F99-2I2E2-5M	-15°...+15°	2	0.2	Analog	2 x PNP, current output	10		Cable		■
INY030D-F99-2I2E2-V17	-15°...+15°	2	0.2	Analog	2 x PNP, current output	10		1 x M12 connector plug		■
INY030D-F99-B16-V15	-15°...+15°	2	0.2	CANopen		10		1 x M12 connector plug		■
INY030D-F99-B20-V15	-15°...+15°	2	0.2	J1939		5		1 x M12 connector plug, 1 x M12 connector socket		■
INY060D-F99-2I2E2-V17	-30°...+30°	2	0.2	Analog	2 x PNP, current output	10		1 x M12 connector plug		■
INY120D-F99-B20-V15	-60°...+60°	2	0.5	J1939		5		1 x M12 connector plug, 1 x M12 connector socket		■
INY360D-F99-2I2E2-5M	0°...360°	2	0.5	Analog	2 x PNP, current output	10	Push-button	Cable		■
INY360D-F99-2I2E2-V17	0°...360°	2	0.5	Analog	2 x PNP, current output	10	Push-button	1 x M12 connector plug		■
INY360D-F99-2U2E2-5M	0°...360°	2	0.5	Analog	2 x PNP, voltage output	10	Push-button	Cable		■
INY360D-F99-2U2E2-V17	0°...360°	2	0.5	Analog	2 x PNP, voltage output	10	Push-button	1 x M12 connector plug		■
INY360D-F99-B16-V15	0°...360°	2	0.5	CANopen		10		1 x M12 connector plug		■
INY360D-F99-B20-V15	0°...360°	2	0.5	J1939		5		1 x M12 connector plug, 1 x M12 connector socket		■

## Highlights

- Variable output values and parameterizable filters for optimum adjustment to suit the application for products with CAN or J1939 interface
- Simplified installation: 360° inclination sensors in three axes in one device. Mounting is independent of the orientation
- Sophisticated mounting concept as well as IP68/69 degree of protection for maximum robustness, even when used outdoors
- Wide range of applications: E1 and GL approvals enable use on public roads as well as on the high seas

## Brief Description

Based on a two-part mounting concept, F99 series inclination and acceleration sensors are always equipped with a sensor module and an especially robust metal retaining bracket. This combination brings many advantages: The metal retaining bracket offers optimal impact protection and simple installation thanks to the integrated hexagon head screw. This makes the entire system even more resistant to mechanical force.

## Accessories

<b>V15-G-10M-PUR-CAN-V15-G</b>	DeviceNet/CANopen bus cable, M12 to M12
<b>V15-G-2M-PUR</b>	Single-ended female cordset, M12, 5-pin, PUR cable
<b>V15-G-2M-PUR-CAN-V15-G</b>	DeviceNet/CANopen bus cable, M12 to M12
<b>V15-G-5M-PUR-CAN-V15-G</b>	DeviceNet/CANopen bus cable, M12 to M12
<b>V15S-T-CAN/DN-V15</b>	Y-splitter, M12 socket to M12 plug
<b>V17-G-10M-PUR</b>	Single-ended female cordset, M12, 8-pin, shielded, PUR cable
<b>V17-G-10M-PVC-ABG</b>	Single-ended female cordset, M12, 8-pin, shielded, PVC cable
<b>V17-G-2M-PUR</b>	Single-ended female cordset, M12, 8-pin, shielded, PUR cable

# F199 Series Inclination Sensors



## Standard Technical Data

<b>Design</b>	Cuboid shape
<b>Measurement accuracy</b>	0.15°
<b>Operating voltage (max)</b>	30 V
<b>Housing material</b>	Aluminum
<b>Housing length L</b>	107.9 mm
<b>Housing width W</b>	81 mm
<b>Housing height H</b>	27 mm

For detailed data and description, see the datasheet. Further products can be found online at [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com).

Model number	Measuring range	Measuring axes	Interface	Output type	UB (min)	Connection type
INX360DH-F199-B16-2V15	0°...360°	1	CANopen		10	1 x M12 connector plug, 1 x M12 connector socket
INX360DH-F199-B16-V15	0°...360°	1	CANopen		10	1 x M12 connector plug
INX360DH-F199-B30-2V15	0°...360°	1	MODBUS RTU		4.5	1 x M12 connector plug, 1 x M12 connector socket
INX360DH-F199-B30-V15	0°...360°	1	MODBUS RTU		4.5	1 x M12 connector plug
INX360DH-F199-IE2-V19	0°...360°	1	Analog	Current output	10	1 x M12 connector plug
INX100DH-F199-IE2-V19	-50°...+50°	2	Analog	Current output	10	1 x M12 connector plug
INX160DH-F199-B16-2V15	-80°...+80°	2	CANopen		10	1 x M12 connector plug, 1 x M12 connector socket
INX160DH-F199-B16-V15	-80°...+80°	2	CANopen		10	1 x M12 connector plug
INX160DH-F199-B30-2V15	-80°...+80°	2	MODBUS RTU		4.5	1 x M12 connector plug, 1 x M12 connector socket
INX160DH-F199-B30-V15	-80°...+80°	2	MODBUS RTU		4.5	1 x M12 connector plug
INX160DH-F199-IE2-V19	-80°...+80°	2	Analog	Current output	10	1 x M12 connector plug

## Highlights

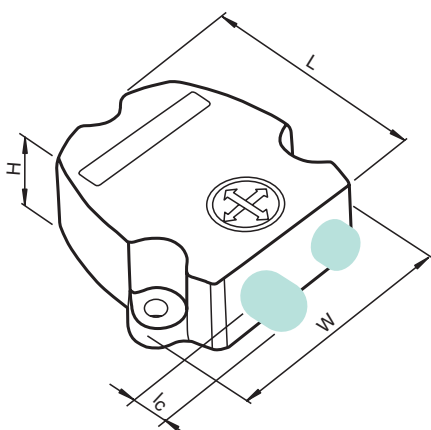
- Variable output values and parameterizable filters for optimum adjustment to suit the application for products with CAN or J1939 interface
- Simplified installation: 360° inclination sensors in three axes in one device. Mounting is independent of the orientation
- Sophisticated mounting concept as well as IP68/69 degree of protection for maximum robustness, even when used outdoors
- Wide range of applications: E1 and GL approvals enable use on public roads as well as on the high seas

## Brief Description

Acceleration sensors from Pepperl+Fuchs offer the option of selectively adapting the sensing range to any application. Specific software filters and the angle range to be monitored can be set quickly and easily. The sensor captures the specific data required in the application. Each application has different requirements for the sensor technology. The portfolio of inclination and acceleration sensors from Pepperl+Fuchs therefore consists of different variants which can be selected depending on the application requirement.

## Accessories

V15-G-10M-PUR-CAN-V15-G	DeviceNet/CANopen bus cable, M12 to M12
V15-G-2M-PUR-CAN-V15-G	DeviceNet/CANopen bus cable, M12 to M12
V15-G-5M-PUR-CAN-V15-G	DeviceNet/CANopen bus cable, M12 to M12
V15S-T-CAN/DN-V15	Y-splitter, M12 socket to M12 plug
V19-G-0,5M-PVC-SUBD9	Adapter cable, M12 x 1 to D-sub
V19-G-2M-PUR-ABG	Single-ended female cordset, M12, 8-pin, shielded, PUR cable
V19-G-2M-PUR-ABG-V19-G	Cordset, M12 to M12, PUR cable



# F99 Series Acceleration Sensors



## Standard Technical Data

<b>Design</b>	Cuboid shape
<b>Operating voltage (min)</b>	10 V
<b>Operating voltage (max)</b>	30 V
<b>Connection type</b>	1 x M12 connector plug
<b>Housing material</b>	Plastic material
<b>Housing length L</b>	65 mm
<b>Housing width W</b>	45 mm
<b>Housing height H</b>	37 mm
<b>UL</b>	■

For detailed data and description, see the datasheet. Further products can be found online at [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com).

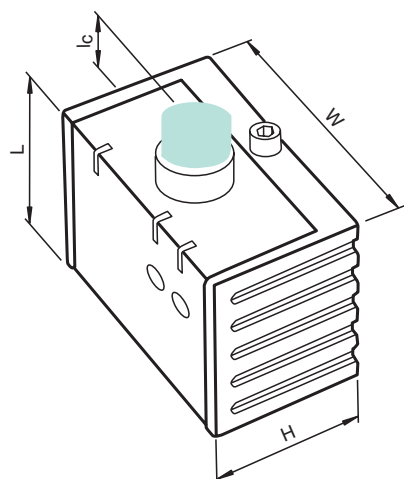
Model number	Measuring range	Measuring axes	Interface	Output type	E1 type approval
ACX01-F99-E02-V1-Y256775	0.4 g...1.6 g	1		1 x PNP	
ACX04-F99-I-V15	-2 g...2 g	1	Analog	Current output	■
ACY04-F99-2I-V15	-2 g...2 g	2	Analog	Current output	■

## Highlights

- Sophisticated mounting concept and IP68/69 degree of protection for maximum robustness, even when used outdoors
- Wide range of applications: E1 and GL approvals enable use on public roads as well as on the high seas

## Brief Description

Based on a two-part mounting concept, series F99 inclination and acceleration sensors are always equipped with a sensor module and a particularly robust metal retaining bracket. This combination brings many advantages: The metal retaining bracket offers optimal impact protection and simple installation thanks to the integrated hexagon head screw. This makes the entire system even more resistant to mechanical force. It can also be replaced quickly and easily if required. It is not necessary to re-adjust or calibrate. Acceleration sensors from Pepperl+Fuchs offer the option of selectively adapting the sensing range to any application. Specific software filters and the angle range to be monitored can be set quickly and easily. The sensor captures the specific data required in the application. E1 approval for use on public roads and GL approval for use on the high seas mean that the inclination and acceleration sensors from Pepperl+Fuchs reliably contribute to the efficient realization of countless projects across industry sectors around the world.



## Accessories

V15-G-2M-PUR	Single-ended female cordset, M12, 5-pin, PUR cable
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# F99 Series Inertial Measurement Units



Standard Technical Data	
Design	Cuboid shape
Measuring range	0°...360°
Measuring axes	3
Interface	J1939
Operating voltage (min)	5 V
Operating voltage (max)	30 V
Connection type	1 x M12 connector plug, 1 x M12 connector socket
Housing material	Plastic material
Housing length L	65 mm
Housing width W	45 mm
Housing height H	37 mm
UL	■
E1 type approval	■

For detailed data and description, see the datasheet. Further products can be found online at [www.pepperl-fuchs.com](http://www.pepperl-fuchs.com).

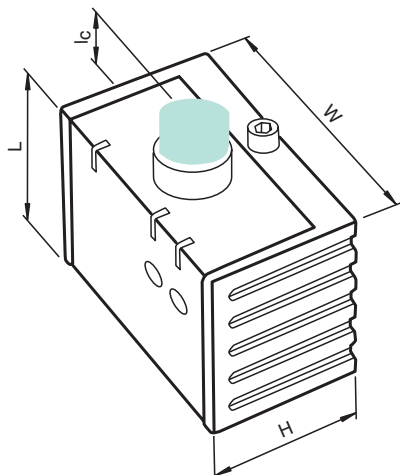
Model number
IMU360D-F99-B20-V15

## Highlights

- Inclination, acceleration and yaw rate measurement in three axes
- Compensation of dynamic faults
- F99 Fusion technology
- CAN bus with SAE J1939 protocol
- Increased EMC resistance

## Brief Description

Conventional inclination sensors are based on the principle of acceleration measurement and provide reliable information about the current orientation of the sensor. However, this measuring principle reaches its limits when other forces as well as gravity—such as those caused by acceleration, braking, or cornering—affect the sensor. This results in measurement errors, which in the worst case can cause damage, but certainly result in efficiency losses. The F99 Fusion was therefore specially developed to compensate for this external acceleration and to ensure precise inclination data even with dynamic movement.



Accessories	
V15-G-10M-PUR-CAN-V15-G	DeviceNet/CANopen bus cable, M12 to M12, 5-pin PUR cable
V15-G-2M-PUR-CAN-V15-G	DeviceNet/CANopen bus cable, M12 to M12, 5-pin PUR cable
V15-G-5M-PUR-CAN-V15-G	DeviceNet/CANopen bus cable, M12 to M12, 5-pin PUR cable

