//ASC
GERMAN SENSOR ENGINEERING

# Tactical Grade Gyroscopes

# ASC 281 | ASC 283

Uniaxial, Triaxial
MEMS Vibrating Ring
Measurement Range: ±10 to ±400 °/s
Bias Stability: 0.03 to 0.10 °/hr
Angular Random Walk: 0.005 to 0.010 °/√hr
Aluminum Housing
**Made in Germany**

## Tactical Grade Gyroscopes

The key components in tactical grade gyroscopes are high-quality micro-electro-mechanical systems (MEMS) that feature excellent long-term stability and reliability. The design of the micro-mechanical silicon structures makes the gyroscopes extremely insensitive to external impacts and vibrations. They are therefore ideal suited for use in harsh environmental conditions. Due to their very high performance, the gyroscopes fulfill the requirements of tactical grade applications with respect to the maximum achievable precision, which otherwise can be achieved only with fiber optic gyroscopes (FOG).

## Description

The gyroscopes of types ASC 281 and ASC 283 are based on proven MEMS vibrating ring sensor elements. The integrated electronic circuitry enables a very low noise quasi-differential analog voltage output (±2.0 V FSO) and flexible power supply voltage from 8 to 30 VDC. The tactical grade gyroscopes are available in different measurement ranges (10 °/s to 400 °/s) and providing an outstanding bias stability of <0.1 °/hr and an excellent angular random walk of <0.01 °/√hr.

The uniaxial gyroscopes ASC 281 and triaxial gyroscopes ASC 283 feature a lightweight, reliable aluminum housing with protection class IP65 and a detachable cable with configurable length and connectors.

The excellent bias stability of these gyroscopes allows their use in applications such as gyro compassing, attitude heading reference systems AHRS or for orientation of underwater ROVs (remotely operated vehicles). Furthermore, as component of inertial systems the gyroscopes enable high-precision position measurements and bridging navigation in numerous areas of application, such as automated guided vehicles, ship guidance and control, robots, rail vehicles or aircraft systems.

### Features

- Tactical Grade Gyroscope, FOG-like Performance
- Very Low Noise Differential Voltage Output
- Outstanding Bias Stability and Angular Random Walk
- High Shock and Vibration Resistance
- Temperature Output

### Options

- Customized Cable Length
- Customized Connector

### Applications

- Gyro-Compassing, Ship Guidance and Control
- AHRS, Flight Instruments
- Mid-term Bridging Navigation

More applications in several markets are figured out on our web page **www.asc-sensors.de**

**ASC 281 (Uniaxial)**



**ASC 283 (Triaxial)**

# ASC 281 | ASC 283

# Tactical Grade Gyroscopes
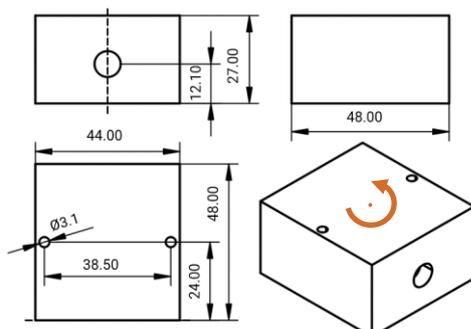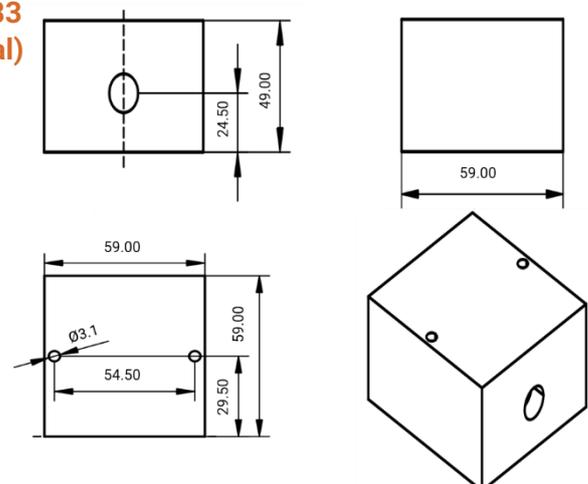
## Typical Specification

### Dynamic

| Measurement Range | °/s | ±10 | ±25 | ±100 | ±200 | ±400 |
|---|---|---|---|---|---|---|
| Scale Factor (sensitivity) | mV/°/s | 200 | 80 | 20 | 10 | 5 |
| Rate Noise Density | °/s/√Hz | 0.007 | 0.007 | 0.012 | 0.012 | 0.012 |
| Bandwidth | Hz | 50 | 50 | 100 | 100 | 100 |
| Amplitude Non-Linearity | % FSO | | | 0.02 (typ) \| 0.05 (max) | | |
| Bias Stability | °/hr | 0.03 | 0.04 | 0.04 | 0.05 | 0.10 |
| Angular Random Walk | °/√hr | 0.005 | 0.006 | 0.006 | 0.008 | 0.010 |

### Electrical

| | | |
|---|---|---|
| Power Supply Voltage | V | 8 to 30 |
| Operating Current Consumption | mA | ASC 281: <40<br>ASC 283: <120 |
| Offset (bias) referred to Reference Output Voltage | mV | ±10 |
| Isolation | | Integrated electronic circuitry is isolated from the sensor housing \| Sensor housing and Comtronic chassis are connected to apply the cable shielding |

### Environmental

| | | | |
|---|---|---|---|
| Scale Factor Error over Temperature Range | % | ±0.15 (typ) \| ±0.50 (max) | ±0.30 (typ) \| ±0.50 (max) |
| Offset (bias) Error over Temperature Range | °/s | ±0.10 (typ) \| ±0.20 (max) | ±0.15 (typ) \| ±0.25 (max) |
| Operating Temperature Range | °C | -40 to +85 | |
| Storage Temperature Range | °C | -40 to +100 | |
| Shock Limit (1 ms, powered) | g | 1000 | |
| Vibration induced Noise | °/s/g$^2$ | 0.01 | |
| Vibration Rectification Error | °/s/g$^2$ | 0.002 | |
| g-Sensitivity | °/s/g | 0.02 | |
| Protection Class | | IP65 | |

### Physical

| | | |
|---|---|---|
| Sensing Element | | MEMS Vibrating Ring |
| Case Material | | Anodized Aluminum |
| Connector Sensor Housing | | ASC 281: 7-pin Comtronic (male)<br>ASC 283: 12-pin Comtronic (male) |
| Connector at Cable End | | Optional |
| Mounting | | Adhesive / Screw Holes |
| Weight (without cable) | gram | ASC 281: 80<br>ASC 283: 250 |
| Cable for uniaxial ASC 281 | | 13 gram per meter \| AWG 30 \| Polyurethane (PUR) \| Diameter 3.0 mm |
| Cable for triaxial ASC 283 | | 30 gram per meter \| AWG 30 \| Polyurethane (PUR) \| Diameter 4.5 mm |

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2/6

# Tactical Grade Gyroscopes

## ASC 281: Sensor Calibration

### Factory Calibration (supplied with the sensor)

| Part Number | | #18287 | #18288 | #17888 | #16147 | #18289 |
|---|---|---|---|---|---|---|
| Measurement Range (sensor) | °/s | 10 | 25 | 100 | 200 | 400 |
| Applied Frequency (min) | Hz | 1 | 1 | 1 | 1 | 1 |
| Applied Frequency (max) | Hz | 50 | 50 | 100 | 100 | 100 |
| Input Amplitude | °/s | 5 | 12.5 | 50 | 100 | 200 |
| Reference Frequency for Determination of Scale Factor | Hz | 16 | 16 | 16 | 16 | 16 |

### Calibration according DIN ISO 17025 (order separately)

| Part Number | | #18275 | #18276 | #18270 | #18271 | #18272 |
|---|---|---|---|---|---|---|
| Measurement Range (sensor) | °/s | 10 | 25 | 100 | 200 | 400 |
| Applied Frequency (min) | Hz | 1 | 1 | 1 | 1 | 1 |
| Applied Frequency (max) | Hz | 50 | 50 | 100 | 100 | 100 |
| Input Amplitude | °/s | 5 | 12.5 | 50 | 100 | 200 |
| Reference Frequency for Determination of Scale Factor | Hz | 16 | 16 | 16 | 16 | 16 |

## ASC 283: Sensor Calibration

### Factory Calibration (supplied with the sensor)

| Part Number | | #18291 | #18292 | #17889 | #16153 | #18290 |
|---|---|---|---|---|---|---|
| Measurement Range (sensor) | °/s | 10 | 25 | 100 | 200 | 400 |
| Applied Frequency (min) | Hz | 1 | 1 | 1 | 1 | 1 |
| Applied Frequency (max) | Hz | 50 | 50 | 100 | 100 | 100 |
| Input Amplitude | °/s | 5 | 12.5 | 50 | 100 | 200 |
| Reference Frequency for Determination of Scale Factor | Hz | 16 | 16 | 16 | 16 | 16 |

### Calibration according DIN ISO 17025 (order separately)

| Part Number | | #18277 | #18278 | #18269 | #18273 | #18274 |
|---|---|---|---|---|---|---|
| Measurement Range (sensor) | °/s | 10 | 25 | 100 | 200 | 400 |
| Applied Frequency (min) | Hz | 1 | 1 | 1 | 1 | 1 |
| Applied Frequency (max) | Hz | 50 | 50 | 100 | 100 | 100 |
| Input Amplitude | °/s | 5 | 12.5 | 50 | 100 | 200 |
| Reference Frequency for Determination of Scale Factor | Hz | 16 | 16 | 16 | 16 | 16 |

Please note: If any other calibration procedure is required, don't hesitate to contact us. Furthermore, sensors have to be calibrated regularly to ensure accurate and precise results. Our services include both factory calibration and calibration in accordance with DAkkS guidelines. On request we will be glad to remind you of the next scheduled calibration of your sensors.

# Tactical Grade Gyroscopes

### ASC 281: Detachable Connecting Cable Code / Pin Configuration

| 7-Pin Sensor Connector (male) | | Color Code ASC AK-281 | Description |
|---|---|---|---|
| 2 | Supply + | Red | Power: supply voltage +8 to +30 VDC |
| 1 | Supply - | Black | Power: GND |
| 3 | Signal + | Green | Positive, analog output voltage signal (+0.4 V to +4.4 V) |
| 4 | Ref. Signal | White | Reference analog output voltage signal for quasi-differential mode (+2.4 V) |
| 5 | Temp | Yellow | Analog output voltage temperature sensor (measured with respect to Ref. Signal) |
| 6 | nc | --- | Not connected |
| 7 | nc | --- | Not connected |

Shielding of the detachable connecting cable is provided as a tinned-copper braiding which is also connected to the Comtronic chassis to apply a corresponding shielding of the sensor housing

### ASC 283: Detachable Connecting Cable Code / Pin Configuration including common Power Supply for all Axes

| 12-Pin Sensor Connector (male) | | Color Code ASC AK-283 | | Description |
|---|---|---|---|---|
| 2 | Supply + | Red | Power: | supply voltage +8 to +30 VDC |
| 1 | Supply - | Black | Power: | GND |
| 11 | Signal + | Green | Z-Axis: | positive, analog output voltage signal (+0.4 V to +4.4 V) |
| 12 | Ref. Signal | White | Z-Axis: | reference analog output voltage signal for quasi-differential mode (+2.4 V) |
| 5 | Temp | Black/Violet | Z-Axis: | analog output voltage temperature sensor |
| 8 | Signal + | Green/Grey | Y-Axis: | positive, analog output voltage signal (+0.4 V to +4.4 V) |
| 10 | Ref. Signal | White/Grey | Y-Axis: | reference analog output voltage signal for quasi-differential mode (+2.4 V) |
| 4 | Temp | Red/Grey | Y-Axis: | analog output voltage temperature sensor |
| 6 | Signal + | Green/Violet | X-Axis: | positive, analog output voltage signal (+0.4 V to +4.4 V) |
| 7 | Ref. Signal | White/Violet | X-Axis: | reference analog output voltage signal for quasi-differential mode (+2.4 V) |
| 3 | Temp | Red/Violet | X-Axis: | analog output voltage temperature sensor |
| 9 | nc | --- | --- | Not connected |

Shielding of the detachable connecting cable is provided as a tinned-copper braiding which is also connected to the Comtronic chassis to apply a corresponding shielding of the sensor housing

### ASC 283: Cable Configuration for detachable Connector Cable (see accessories)

**11 Wire System - 11L (Triaxial)**

Common power supply for all axes, no cable switch

**11 Wire System - 11L3 (Triaxial)**

Common power supply for all axes, including cable switch
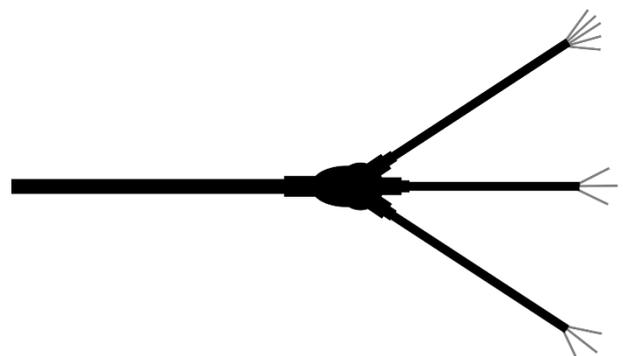
# ASC 281 | ASC 283

## Tactical Grade Gyroscopes

### Ordering Information

All types of the tactical grade gyroscopes ASC 281 and ASC 283 are fabricated for operating with a detachable cable including configurable length and connectors at the cable end. For connecting the sensor housing of the uniaxial ASC 281, a 7-pin Comtronic connector (female) is used and already assembled while the triaxial ASC 283 features a 12-pin Comtronic connector (female) which used and also already assembled.

| Series | Model | - | Range [g] | - | Cable Length [m] | Connector & Pinout |
|--------|-------|---|-----------|---|------------------|--------------------|
| ASC 28 | 1 (uniaxial) | | 010 | | 6 | A |
| | | | 025 | | | |
| | | | 100 | | | |
| | | | 200 | | | |
| | | | 400 | | | |

*Example:*

**ASC 281-010-6A**

| Series | Model | - | Range [g] | - | Cable Length [m] | Connector & Pinout | - | Cable Configuration |
|--------|-------|---|-----------|---|------------------|--------------------|---|--------------------|
| ASC 28 | 3 (triaxial) | | 010 | | 6 | A | | 11L |
| | | | 025 | | | | | 11L3 |
| | | | 100 | | | | | |
| | | | 200 | | | | | |
| | | | 400 | | | | | |

*Example:*

**ASC 283-010-6A-11L**

Ordering information are based on standard configurations. All customized versions regarding connector and/or pinout will lead to a change or extension of the corresponding product match code:

- Standard length of the detachable cable is 6 meters. However, different customized cable lengths are possible on request.
- Standard version has no connector at the cable end which is identified by "A" in the product match code. However, it is possible to assemble almost all connector types during production.
- Different cable configurations are only available for the triaxial gyroscope ASC 283.

# Tactical Grade Gyroscopes

## Safety Precaution for Installing and Operating

This data sheet is a part of the product. Read the data sheet carefully before using the product and keep it available for future operation. Handling, electrical connections, mounting or any other work performed at the sensor must be carried out by authorized experts only. Appropriate safety precautions must be taken to exclude any risk of personal injury and damage to operating equipment as a result of a sensor malfunction.

### Handling

The sensor is packaged in a reliable housing to protect the sensing elements and integrated electronic components from the ambient environment. However, poor handling of the product can lead to damages that may not be visible and cause electrical failure or reliability issues. Handle the component with caution:

- Avoid shocks and impacts on the housing, such as dropping the sensor on hard surface
- Never move the sensor by pulling the cable
- Make sure that the sensor is used within the specified environmental conditions
- Transport and store the sensor in its original or similar packaging
- The sensor should be mounted on a stable flat surface with all screws tightened or other mounting options
- When adhesives are used to mount the sensors, please select the corresponding products according to permanent or removable mounting, ambient temperature range as well as quality of the mounting surface
- Avoid any deformation during mounting the sensor
- Mounting tolerances may have an influence on the measured result

### Electrical

ASC's inertial sensors are working with many established data acquisition systems. However, make sure that a proper DAQ is used, for the corresponding operation principle of the sensor. Furthermore, suitable precautions shall be employed during all phases of shipment, handling and operating:

- Active sensor pins are susceptible to damage due to electrostatic discharge (ESD)
- Make sure that the sensor is used within the specified electrical conditions
- Check all electrical connections prior to initial setup of the sensor
- An incorrect wiring of the signal or power supply connections will lead to damages of the sensor
- Completely shield the sensor and connecting cable according to your application
- Do not perform any electrical modifications at the sensor
- Do not perform any adaptions on the wiring or connectors while the device under power
- Never plug or unplug the electrical connection while the sensor is under power
- When a certain pin is not used during operation, make sure that the pin is insulated

### Quality

- We have a quality management system according to **ISO 9001:2015**.
- The Deutsche Akkreditierungsstelle GmbH (DAkkS) has awarded to our calibration laboratory the **DIN EN ISO/IEC 17025:2018** accreditation for calibrations and has confirmed our competence to perform calibrations in the field of mechanical acceleration measurements. The registration number of the certificate is **D-K-18110-01-00**.

**Made in Germany**

analyzing     monitoring     testing     measuring

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