Accelerometer TP-ACC20

Introduction

The Accelerometer TP-ACC20 is a dual axis accelerometer combined with a manual trigger button, designed to be used with the Handyscope HS3, Handyscope HS4, Handyscope HS4 DIFF, Automotive scope ATS5004D (TP-ACC20-25) and with the Handyscope HS5, Handyscope HS6 DIFF and Automotive Scope ATS610004D-XMSG (TP-ACC20-09).

Accelerometer

The Accelerometer TP-ACC20 is a low power dual axis accelerometer with voltage outputs. It can measure accelerations in two axes, up to ± 2 g. It can measure both dynamic acceleration and static acceleration (gravity).

The accelerator sensor is placed in a small package with a long, thin flexible cable. The package contains strong magnets to attach the sensor to magnetic (steel) surfaces without the need of scews or clamps. One side of the package contains a a patch of velcro, to attach the sensor to fabric surfaces.

The Accelerometer TP-ACC20 is powered by the instrument it is connected to.

Trigger button

The Accelerometer TP-ACC20 also contains a manual trigger button. This button can be used to manually trigger measurements in situations where no trigger condition can be derived from the input signals. The manual trigger button has a solid aluminum body and is fitted with a female BNC connector. A long flexible cable with a male BNC connector is used to connect the button to the instrument.

Setting up the software

Input range

When idle and not moving, the Accelerometer TP-ACC20 has an output offset of approximately 1.5 Volt. The Accelerometer TP-ACC20 has a typical output sensitivity of 420 mV per g acceleration and a range of approximately -2 .. +2 g. This would give a maximum output voltage of approximately 2.5 Volt. A suitable input range for a channel is the 4 Volt range. Auto ranging is not convenient when doing acceleration measurements, therefore, switch Auto ranging off, by clicking the green AR button on the channel toolbar of the required channels.

Calibrating the accelerometer

When idle and not moving, the Accelerometer TP-ACC20 has an output offset of approximately 1.5 Volt and an output sensitivity of 420 mV per g.

To calibrate the sensor, first place it on a stable, not moving surface, with the label facing up. Use the cursors in the software to measure the offset voltage on both channels.

To calibrate the sensitivity, a known acceleration has to be applied and the output voltage has to be measured. Since the Accelerometer TP-ACC20 is capable to measure static acceleration, it can measure the earth's gravity, being 1 g.

To measure the earth's gravity, place the sensor on a stable, not moving surface, with the X axis parallel to the earth surface and the Y axis pointing up or downwards, perpendicular to the earth surface. The Y axis is now experiencing +1 g, measure the voltage on channel 2.

Then rotate the sensor 180 degrees around the X axis, the Y axis is now pointing down, experiencing -1 g. Measure the voltage on Ch2 again.

Repeat this with the Y axis parallel to the earth surface and the X axis pointing up and down and measure the voltages on Ch1.

As a result, six voltages are measured: +1 g, 0 g and -1 g on both axes.

The sensitivity for a channel can now be determined with :

$$sensitivity = (V_{+1g} - V_{-1g})/2$$

Converting the measured values

When displaying the signal of the Accelerometer TP-ACC20 directly, the oscilloscope will display volts, not in g's or in m/s^2. To display the measured accelerations with unit g or m/s^2, the measured values need to be converted.

To convert the measured values, a Gain/Offset I/O is used for each channel of the Accelerometer TP-ACC20. Create them by right-clicking on ***I/O's*** in the object tree and selecting ***Gain/Offset***.

To display the measured values directly in g's, they have to be multiplied by 1 / "determined sensitivity". Right-click the Gain/Offset I/O and select ***Gain ->User defined...*** There is no need to calculate the proper value for the gain, the Gain/Offset I/O can do this by itself, so simply enter **1 / "determined sensitivity"**. To measure in m/s^2, multiply the gain by 9.81.

To compensate for the offset of the Accelerometer TP-ACC20 right-click the Gain/Offset I/O and select ***Input offset ->User defined...*** Then enter the measured offset value, multiplied by -1.

Specifications

Accelerometer sensor

Sensor input range	±2 g
Sensitivity	420 mV/g typical
Zero g bias level	1.5 V typical
Zero g offset vs. temperature	<± 0.5 mg/°C
Bandwidth	500 Hz
Sensor resonant frequency	5.5 kHz typical
Power supply	from instrument extension connector, <0.5 mA
Dimensions (L x W x H)	30 x 36 x 9 mm
Cable length	2.5 m

Manual trigger button

Dimensions	
Length (without cable)	47 mm
Diameter	18 mm
Connector at button	female BNC connector
Connector at cable	isolated male BNC connector
Cable length	2 m

Instrument connector

Connector type	
TP-ACC20-25	25 pin male D-Sub connector
TP-ACC20-09	09 pin male D-Sub connector
Accelerometer signal connections	2
Connection	isolated male BNC connector
Cable length	50 cm
Total weight	200 gram

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