



Multicomponent Sensor K3R

Instruction manual

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Functionality of the K3R sensors

The force sensor K3R110 is suitable for inspection tasks in quality assurance as well as in materials testing because of its compact design.

This precision force sensor is characterized by flat design of only 14 mm thickness up to 20 mm thickness.

With the K3R110 sensor, the connections of the 4 measuring springs are led out individually.

The axial force F_z and the bending moments M_x and M_y around the x- and y- axes are calculated from the strain gage signals of the 4 cantilever springs.

The bending moments M_x and M_y can also be converted into horizontal forces F_x and F_y via the distance of the force application from the sensor surface.

With the aid of a simple calibration matrix the forces and distances can be calculated as well.

Calibration Matrix for K3R Sensors

The sensors of the type K3R allow the measurement of the force F_z and the moments M_x and M_y .

The sensors K3R may be used for displaying 3 orthogonal forces F_x , F_y , and F_z , when the measured torques are divided by the lever arm z (distance of force application F_x , F_y of the origin of the coordinate system).

	ch1	ch2	ch3	ch4
F_z in N / mV/V	100,00	100,00	100,00	100,00
M_x in Nm / mV/V	0,00	-1,30	0,00	1,30
M_y in Nm / mV/V	1,30	0,00	-1,30	0,00
H	0,00	0,00	0,00	0,00

The force in the z direction is calculated by multiplying and summing the matrix elements of the first row A1J with the lines of the vector of the output signals u_j

$$F_z = 100 \text{ N/mV/V } u_1 + 100 \text{ N/mV/V } u_2 + 100 \text{ N/mV/V } u_3 + 100 \text{ N/mV/V } u_4$$

Example: on all 4 raw values is $u_1 = u_2 = u_3 = u_4 = 1.00 \text{ mV/V}$ displayed. Then a force F_z results of 400 N.

The calibration matrix A of K3R sensor has the dimensions 3×4

The vector u of the output signals of the measuring amplifier has the dimensions 4×1

The result vector (F_z , M_x , M_y) has the dimension of 3×1

At the outputs of ch1, ch2 and ch3 after applying the calibration matrix, the force F_z and the moments M_x and M_y are displayed. On the Channel 4 output H is constantly displayed 0V by the fourth line. When using the program GSVmulti, the fourth line H constantly



displays 0 at the output of channel 4, this "dummy" channel can be hidden with menu bar->channel->hide. This setting can also be saved with Save Session and restored with Load Session.

The commissioning of the K3R sensor is very similar to that of the K6D sensor, except:

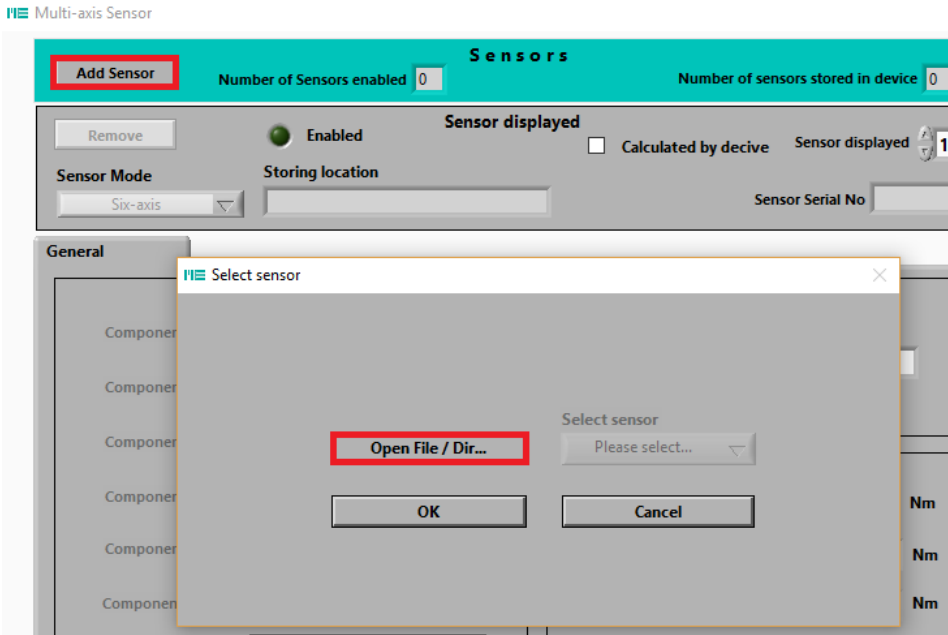
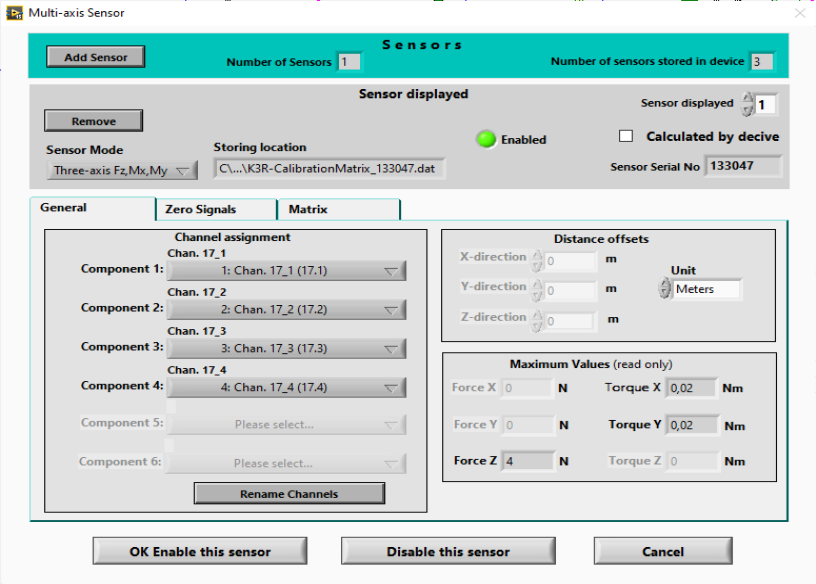
- However, only 4 input channels are required.
- You can choose between different force/torque combinations (Fz,Mx,y or Fx,y,z or Fz,Sx,y); It may be necessary to enter the length of a lever arm.
- All 4 input components must be assigned manually (component 1-4).

Commissioning of the sensor

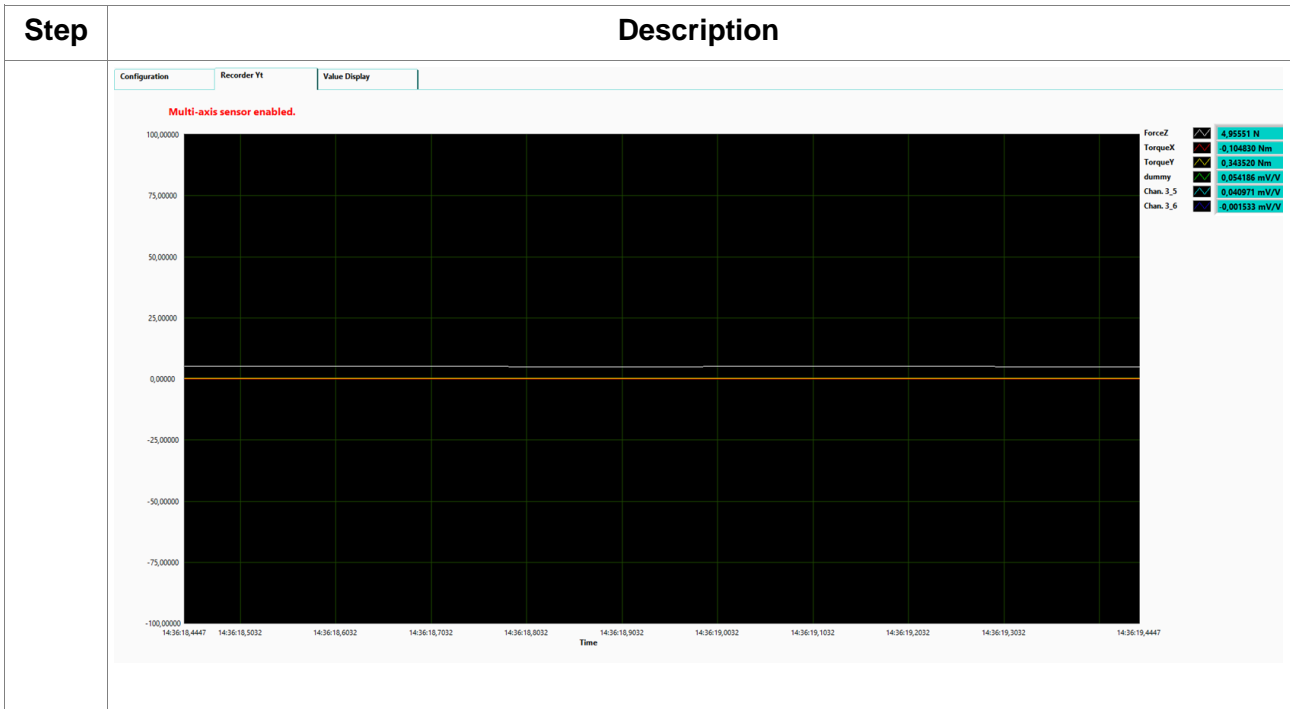
The "GSVmulti" software is used to show the measured forces and moments. The GSVmulti software and related manuals can be downloaded from the website here.

Step	Description
1	Install the Software GSVmulti
2	Connect the GSV-8DS measurement amplifier via the USB port; Connect the K3R sensor with the measurement amplifier. Note: use only the socket 1/6! For multi-pin connectors with seal, the union nut or the locker is stiff. Alternatively press the connector and tighten the union nut/lock. Switch on the measuring amplifier.
3	Copy directory with calibration matrix (supplied with USB-stick) on appropriate drive and appropriate path.
4	Start the Software GSVmulti
5	Main window: Button AddChannel ; Select Device type: GSV-8 Select COMport Number: e. g. COM3 ; please find the proper COM-port in device manager, or when installing the driver on the appropriate system message Windows Input Channel: select Channels 1 to 4 Button Connect

Step	Description
6	<p>Main window: Button Special Sensor Select Multi-axis sensor</p>
7	<p>Window „Multi-axis sensor settings: Button Add Sensor</p> <p>a) Button Open File/Dir select the directory with the file Serial number.dat. This file contains e. g. Measuring ranges of the sensor and cross-references to the file with calibration matrix (.matrix)</p> <p>b) Button OK</p>

Step	Description
	
8	<p>Assign the 4 input components by selecting the first input channel for Component 1 under Channel assignment, the second channel for components 2, and so on.</p> 
9	<p>If you want to measure 3 forces $F_{x,y,z}$, change the "Sensor Mode" to "Three axis F_x, F_y, F_z" and enter the length of the lever arm on the left in Distance Offsets Z-direction. You can also measure the force F_z and the distances S_x and S_y in m (Three axis F_z, s_x, s_y).</p>
10	<p>c) Button Auto Rename Channels d) if necessary, select the displacement of the force application point</p>

Step	Description
	<p>The screenshot shows the 'Multi-axis Sensor' configuration window. At the top, there are buttons for 'Add Sensor' and 'Remove'. Below that, the 'Sensors' section shows 'Number of Sensors' as 1 and 'Number of sensors stored in device' as 0. The 'Sensor displayed' section is checked and shows 'Sensor displayed' as 1. The 'Sensor Mode' is set to 'Three-axis Fz,Mx,My' and the 'Storing location' is 'Z:\...17305828.dat'. The 'Sensor Serial No' is 17305828. The 'General' tab is selected, showing 'Channel assignment' and 'Distance offsets'. The 'Channel assignment' section has six components: ForceZ, TorqueX, TorqueY, dummy, and two 'Please select...' options. The 'Distance offsets' section has X, Y, and Z directions, all set to 0 m. The 'Maximum Values (read only)' section shows Force X (0 N), Torque X (2 Nm), Force Y (0 N), Torque Y (2 Nm), Force Z (100 N), and Torque Z (0 Nm). The 'Auto-Rename Channels' button is highlighted with a red box.</p>
11	Button OK enable this sensor
12	In the Configuration tab: Click Save Session button and save file. This can be reopened the next time the program is started with Open Session, so that the above procedure is executed automatically by the program.
13	Select Window „Recorder Yt“, start measuring;



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Changelog

Version	Date	Changes
ba-k3r-en.odt	26.09.18	the first version
ba-k3r-en_v1_1.odt	15.03.23	Corrected, commissioning edited



Änderungen vorbehalten.

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