

Intelligent Strain Gauge Amplifier

SGA

Technical Data

The amplifier supplies a stabilized voltage for 2 full bridges of strain gauges, filters and amplifies the differential voltages of the strain gauges and provides an interface to a data recorder.

- Intelligent error recognition logic
- Supports 4-pole 350 Ohm SG bridges
- Differential input signal
- Inputs protected from too high voltage
- Input signal impedance > 5 MOhm at 25°C
- Common mode rejection at ± 5 V:
 - ▶ 110 dB (gain 1000)
 - ▶ 110dB (gain 500)
 - ▶ 95 dB (gain 200)
- Optional output voltage offset of ± 5 V
- Accuracy including output filter: +1%
- Accuracy guaranteed at temperatures between 40°C and +70°C
- Output noise less than 20 mV

New Product



- Output filter: Active Butterworth low-pass filter
 - ▶ Decay: 24 dB/octave
 - ▶ Cut-off frequency: 10 Hz \pm 2 Hz
- SG supply: 10 V DC
 - ▶ Control \leq 0.25% from no load until full load
 - ▶ Stability \leq 0.1% over the whole temperature range

Test Functions of the intelligent SGA

The amplifier contains an intergrated selftesting function. This detects and identifies internal errors of the amplifier (internal test) and/or of the strain gauge measuring circuit (external test). After the voltage supply is switched on, all tests individually for each channel are started automatically.

The test results are transferred as serial bit pattern on the respective output of either channel.



Applications

- Coupling / Adjustment of sensor signals to data loggers (crash recorder / monitoring systems)
- Monitoring of structures / stress measurements, especially in case of scarcely accessible sensors, e.g. in wings and structural components (CFK)

Approvals

Ambient conditions according to **MIL-STD-810E**
 Electromagnetic compatibility according to **MIL-STD-416D**
 On-board supply according to **MIL-STD-704E**

Test Functions of the Intelligent SGA

Besides the common features of conventional amplifiers, this SGA, Type G85521, contains a testing function that detects and identifies internal errors of the SGA (internal test) and of the strain gauge measuring circuit (external test). When the voltage supply (+28V) is on, both tests are automatically started after a time delay. The test results are conveyed as serial bit pattern (status word) on the respective output of the two channels.

External Test

These tests examine the connection of the strain gauge related to an outage or short-circuit of one or several lines. In this connection the bridge current and the short-circuit current on one of the two signal lines serve as measuring quantity. The bridge current is compared with the set point and the compliance is indicated in each case by a bit in the status word. This test cannot verify, if the strain gauge is correctly bonded, i.e. whether a strain gauge responds to a load.

Internal Test

The SGA's correct function is ensured by verifying the following parameters:

- Internal voltage supply
- Bridge voltage supply
- Bridge current supply
- Gain

Compliance with the tolerances for the first three parameters is represented by bits in the status word. The gain is verified by disconnecting the SG from the output and applying an internally generated reference voltage. The status bit for the gain shows a variable amplitude depending on the set gain.

Status Word

The results of the tests can be read out with the status word generated by the SGA and recorded by the data logger. The bit sequence in the status word consists of a constant number of bits. The values of the bits ("true" or "false") indicates, if

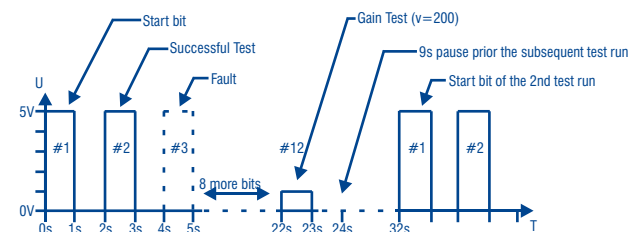
the test was successful or not. The value "true" is indicated by an output level of approx. 5V which indicates a successful test run. A level of approx. 0V ("false") suggests a failure.

For synchronisation purposes the status word starts with a start bit ("1" bit). In order to clarify the bit allocation to the various tests, the output level returns to 0V after each bit. The pulse width is approx. 1 sec. The test bit sequence inclusive start bit and gain test consists of 12 bits. The test bit sequence is released four times in series. This also ensures significant results in case of any transmission and recording errors. The outputs of the SGA are only cleared for the SG measuring data (permanently), after the status word is transmitted.

Automatic Reporting Function

Prevents an extensive troubleshooting in case of scarcely accessible SG measuring spots.

Example of the Status Word



For reliability reasons each status word is repeated three times and contains a defined 12 bit sequence. Thereby each bit is allocated to fault reasons. The table below is designed to systematically isolate external and internal errors and thus to reduce time and effort for fault repair in the measuring circuit.

#1	#2	#3	#4	#5	#6	#7	#8	#9	#11	#11	#12	Fault description	Fault location
1	1	1	1	1	1	1	1	1	1	1	*	No fault: SGA and SG measuring circuit ok	
0	x	x	x	x	x	x	x	x	x	x	*	Internal reference voltage fault	internal
1	0	0	x	x	x	x	x	x	x	x	*	Fault at selftest	internal
1	0	1	x	x	x	x	x	xx	x	x	*	Internal voltage supply fault	internal

1	1	1	x	x	x	x	0	1	x	x	*	Failure of +measuring voltage circuit	external
1	1	1	x	x	x	x	1	0	x	x	*	Short-circuit of +measuring voltage circuit	external

* Level is depending on the gain