

KiTimer

Airbag Timer

Type K3889A

The KiTimer Type K3889A can be utilized in vehicle and sled crash tests for programmed ignition of airbags and other pyrotechnical restraint devices.

- CrashLink® II interface
- 16 ignition outputs for DC airbags with a 2 A/2,5 ms pulse
- 16 channels with a programmable timing between 0 ... 999,9 ms with 0,1 ms resolution
- Trigger with RS-485 T-zero signal and/or two event inputs with selectable input configurations
- Ignition circuit check with a 7 mA test current, measuring the ignition circuit resistors

Description

All power components on the 16 ignition channels are designed in such a way that possible mistakes in programming or short-circuits will not destroy/damage the device. Further features are:

- Central storage capacitor for ignition power of about 10 000 µF/32 V
- 16 input channels for squib resistors connection and check of electronic control units
- Integrated transient recorder with sampling rate of 20 kHz for recording current/voltage signals of ignition output, with several trigger options
- Internal memory of 0,5 MB (≈26 s storage time) per channel, with 16 bit resolution
- Additional channels for recording of all trigger signals and the voltage of the ignition capacitor
- Recording of the stored charge in the ignition capacitor
- Battery supported buffering of stored measurement data
- Extensive safety concept: Ignition capacitor is always short-circuited except during testing process. Ignition energy can only be released with a certain command before starting a measurement. Two seconds after the ignition the capacitor is again short-circuited
- Complete self-test capability with connected airbag (or other pyrotechnical restraint devices). With the short-circuited ignition capacitor (see above safety concept), the timer channels, which have been programmed before, can be triggered. In the transient recorder the voltage at the timer channels, specified for the 7 mA test current, and the influence on the low-impedance ignition devices can be analyzed
- Command communication in SCPI format
- DC power supply 20 ... 60 V, power consumption of approximately 25 W



For the set-up, check-out and transmission in the 100Base-T Ethernet the KiTimer Type K3889A works as a server for a client and only reacts on demand.

Technical Data

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Number of channels		16
Ignition power	A	2,0 (±0,15)
Ignition delay	ms	2,7 (±0,20)
Timer		
Delay, programmable	ms	0 ... 999,9
Sampling rate	kHz	20
Memory	MB/channel	1
Recording duration	s	26
Trigger		
RS-485		T-zero
Ethernet	Mbit/s	100
Power supply	V	20 ... 60
Power consumption	W	25
Shock	g	100
Operating temperature range	°C	0 ... 35
Weight	grams	3 500
Dimensions (LxWxH)	mm	231x138x97,5

Battery

Type		Nickel-metal hydrite
Cells	units	36
Nominal voltage	V	43,2
Charge capacity	mAh	800
Operating time	h	1

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Description (Continuation)

The airbags can be connected, using 1 of the 16 LEMO 1F connectors on the timer, by means of 2 wires. This means that the line resistors can be measured as well. For this purpose a 7 mA current deriving from the 5 V power supply is impressed using a resistor. As a result the measurement of the voltage at the ignition channel output can be used to evaluate the voltage at the airbag connector with a high amplification for the calculation of the resistor. A short-circuit switch in the voltage acquisition recorder enables a zero measuring to eliminate offset influences. When the airbag timer is armed it is switched to a larger measuring range of 36 V.

The actual ignition step is a 2 A power source, optimized for quick ramp times. The current is fixed by the hardware and can't be varied. The ignition pulse width is set, as a standard, to 2,5 ms. Hall sensor (with a measurement range of ± 6 A) on the plus line are used to acquire the ignition current, each of the channels is equipped with 16 bit A/D convertor for the current and voltage measurement. The return lines of all connected airbags are linked to the housing to avoid disturbances by cable faults.

The function of the ignition step is active even when the ignition voltage is switched off. As such a test can be carried out even when the connected airbag does not actually release, however during this time the transient recorder can record the ignition event. The output of electronic control units can be evaluated as well, so each airbag connector has two pins which lead to an isolated 2 Ω resistor. With this set-up an airbag squib can be simulated. The unknown signal polarity is being assessed by means of internal rectifier which is located for the optocoupler. The signal of the electronic control unit can be evaluated with the transient recorder in the KiTimer.

The KiTimer is equipped with 4 parallel capacitors for the ignition energy. These capacitors are normally short-circuited. When the timer is armed the short-circuit is released and a voltage transformer with 32 V is activated, which charges the condenser in 5 s. The voltage at the capacitor and the supplied charge are measured and thereby controllable. The converter is switched off within two seconds after triggering and the capacitor will be discharged. The input can be a T-zero signal in a differential RS-485 format or two event ports, which can also have special functionality. The input signals of switches, optocoupler or RS-485 drivers can be fed via the event ports.

The transient storage is triggered with T-zero in accordance to the default adjustment and is stopped after a programmed trigger delay, so that the ignition release is recorded with its history. For special requirements it can be triggered with event inputs and with selected OR-operations as well. For the time before T-zero without influence of the ignitions a baseline measurement can be taken, so that offset influences of the converter channels can be subtracted. This means a favorable effect for the power acquisition utilizing the Hall test method.

The 16 times for the controlled airbag release can be programmed in 0,1 ms increments from 0 to 999,9 ms. The timers are set to the programmed value and count down to zero after triggering. When reaching zero, the 2,5 ms timers for the ignition pulse are triggered. The read back process is ensured by hardware in the FPGA directly from the timers. After triggering, the count down to zero can be tracked and controlled.

The timers have an INIT and a RELEASE state. Programming is only possible in the INIT state. In the RELEASE state the programmed value is frozen and can't be changed anymore. Verification of data for control is always possible.

Data Acquisition

- 16 channels for ignition voltage
- 16 channels for ignition current
- 1 channel for voltage at capacitor
- 1 channel, with 16 bit resolution, for the 16 ignition channels
- 1 channel, with 16 bit resolution, for serial ignitions
- 1 channel, with 3 bits, for T-zero and event 1 and 2

Triggering of Measurement

Standard with T-zero, programmable:

Event 1, event 2 and OR-relationships with T-zero

Communication

CrashDesigner 2.8.3 or with SCPI-command:

Device has the functionality as server for a client

Readout of Measurement Data

Sorted by channel, temporally related to the measured data

Ordering Code

- KiTimer Airbag Timer

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