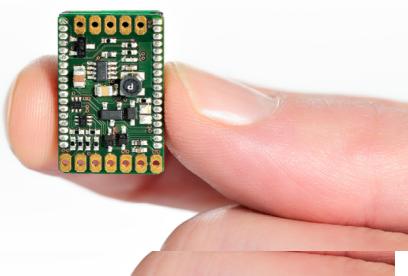




1...6-channel measurement amplifier GSV-6

GSV-6CPU, GSV-6L, GSV-6K

Instruction manual



GSV-6L: 12V/24V supply, output: current / voltage



GSV-6CPU: 4V supply, output: 0...3V; CAN, UART, 6x ADC



GSV-6K: 12V/24V supply, output: current / voltage

Version: 08/05/2024

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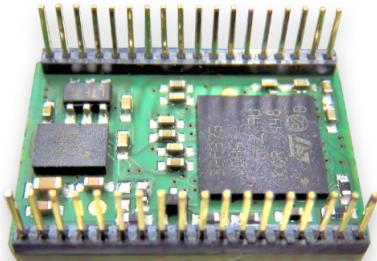


Strain gauges measurement amplifier GSV-6

Contents

Strain gauges measurement amplifier GSV-6.....	2
<u>GSV-6CPU</u>	3
Description.....	3
Dimensions.....	4
Terminal assignment.....	5
Configuration interface.....	5
Connection of Strain gauges.....	6
Voltage supply.....	6
Inputs/outputs.....	6
<u>GSV-6L</u>	8
Description.....	8
Dimensions.....	9
Terminal assignment.....	9
5-pin terminal strip.....	9
7-pin terminal strip.....	9
Functions.....	10
<u>GSV-6K</u>	12
Description.....	12
Functions.....	12
Dimensions.....	13
Terminal assignment.....	13
5-pin socket.....	13
5-pin plug.....	13
Annex.....	14
<u>Technical data of GSV-6CPU</u>	14
Technical data GSV-6L / GSV-6K.....	15
Factory default settings.....	16
LED flashing patterns.....	17
Changelog.....	17

GSV-6CPU



Description

The GSV-6 product series offers signal processing for strain gauges on the smallest area.

The core component of the GSV-6 is a PCB of dimensions 19mm x 14mm.

This "GSV-6CPU" provides many of the required functions to set up a 1- to 6-channel measurement amplifier.

Connections for functions and other applications are also provided via the two 18-pin pin headers with pitch 1.0: UART to Bluetooth, CAN bus driver, GPRS modem, etc.

The GSV-6 CPU already contains (without additional expansion) 6 input channels. One channel provides bridge supply and differential input for connecting strain gauge full bridges, the other five are differential inputs U_{in+} related to 1.5V, the input voltage range is 0.05 to 2.95V.

- Strain gauge bridge excitation: 3V, max. 60mA
- 1x Strain gauge bridge input
- Analogue output 0-2.5V
- LED output
- TEDS input
- Digital inputs for the "Tare" and "Scale" functions
- 5x analogue inputs $1.5V \pm 1.45V$ (nominal)
- Interfaces "UART", "CAN", "I2C" 1) "SPI" 1)
- Supply voltage 3.7V to 5.5V
- 3x Threshold switch outputs 4mA
- 3.3V Voltage output 10mA
- 2.5V Reference output 100 μ A

1) I2C without software support yet, measuring value output via SPI available as special option



Dimensions

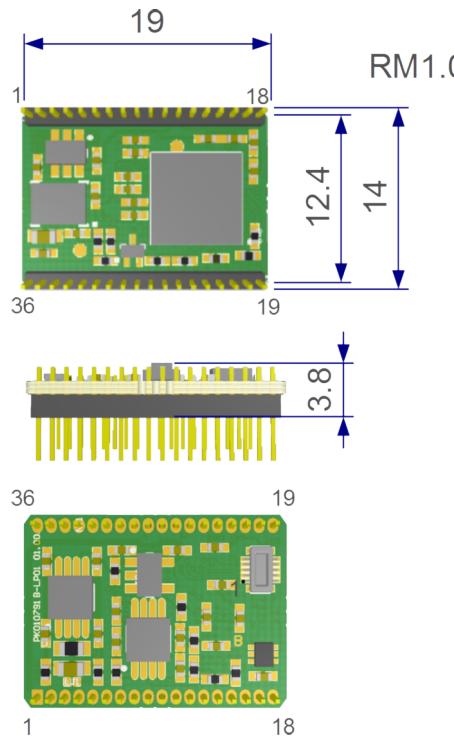


Figure 1: Dimensions GSV-6CPU

The GSV-6 CPU module can be configured via two different UART interfaces or via CAN (bus transceiver not integrated).

There is also the option of configuring the most important settings using the Tare and Scale lines.

The logic levels on the GSV-6CPU are LVTTL 3.3V.

With the help of a suitable interface converter, UART TX (pin 26) and UART-Rx (pin 25) can be connected to a Windows PC, e.g. via USB. The GSV-6CPU can be configured using our GSVmulti software and the measurement data can be visualized.

This binary communication protocol is described in a separate document:

[GSV Protocol Definition](#)

Also, a Windows DLL is available for use as an API.

Terminal assignment

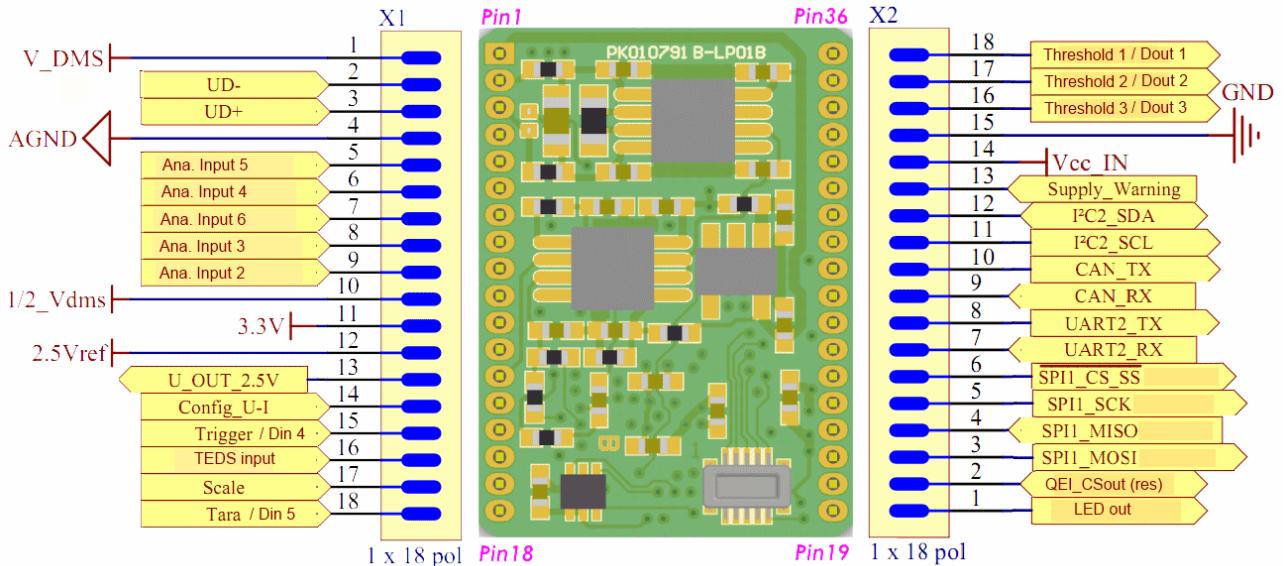


Figure 2: Terminal assignment GSV-6CPU

Configuration interface

A UART interface for the "Monitor" text interface is available via a "BM10B" connector. The parameters are always: 115200 bits/s, 8N1. A terminal program in text mode can be used. The input "help" (ENTER) describes the operation.

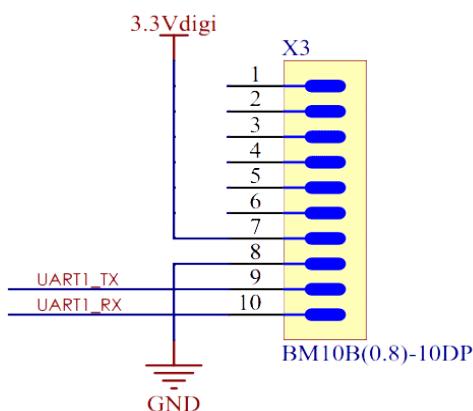


Figure 3: Pin assignment Monitor interface



Connection of Strain gauges

PIN No	Header	Designation	Function	Comment
1	x1.1	+Us (V_DMS)	Positive bridge excitation 3 V	60 mA, short-circuit proof
2	x1.2	-Ud	Negative bridge output / differential input	
3	x1.3	+Ud	Positive bridge output / differential input	
4	x1.4	-Us (AGND)	Negative bridge excitation (AGND)	

Voltage supply

PIN No	Header	Designation	Function	Comment
32	x2.14	Vcc_IN	Supply voltage	3.6 V ... 5.5 V
33	x2.15	GND	Ground supply voltage	
31	x2.13	Supply_Warning	For shutting down by external hardware	To be connected to Vcc_IN

Inputs/outputs

PIN No	Header	Designation	Function	Comment
18	x1.18	Tare	Active >1s in actual-value mode: Zero adjustment Active > 100ms in maximum-value mode: reset maximum-value Active > 2s in maximum-value mode: Zero adjustment and maximum-value reset Active > 100ms in ClickRClackR menu: "Up", go to next menu entry.	Active: With GSV-6CPU/Dev: Connect to GND. Inactive: Leave open or connect to 3.3V
17	x1.17	Scale	Active > 2s: Scaling of the output signal to the signal currently present at the input. Default: set at 100% of the output signal. The autoscale level can be configured to values other than 100% in the ClickRClackR menu and via the configuration interface. Active > 5s during boot-up: Enter the ClickRClackR menu Active > 100ms in ClickRClackR menu: "Enter", executes the current menu entry.	Active: With GSV-6CPU/Dev: Connect to GND. Inactive: Leave open or connect to 3.3V
16	x1.16	TEDS	The connection for 1-wire-EEPROMs works with 3.3V. The EEPROMs (e.g. DS2433+, DS2430A, DS28EC20) of Maxim/Dallas are 3.3V compatible.	With GSV-6CPU/Dev: has internal pull up resistor of 1.5 kOhms to

PIN No	Header	Designation	Function	Comment
			The software supports TEDS sensors with the Bridge Sensor ID 33 and Strain-Gage ID 35 templates.	3.3V.
17	x2.1	LED	Status indicator, e.g.: "TEDS read", "Parameter active", "Parameter set", "Gradient indicator".	max. 4mA, 200 ohm series resistor to GND
36	x2.18	Thresh 1, Dout 1	Threshold output 1, configurable digital output 1	
35	x2.17	Thresh 2, Dout 2	Threshold output 2, configurable digital output 2	
34	x2.16	Thresh 3, Dout 3	Threshold output 3, configurable digital output 3	
15	x1.15	Trigger, Din 4	Trigger Input (e.g. Sync-Slave), configurable digital input 4	

The logic levels on the GSV-6CPU are LVTTL 3.3V.

GSV-6L



Figure 4: GSV-6L

Description

The measurement amplifier GSV-6L adds a configurable analogue output to the GSV-6CPU. The GSV-6L is designed to be built into sensors and fits into the most confined housing enclosures, such as connector housings of the "GSV-6K" type.

Even after it is enclosed, there is complete scope to configure all the properties of the GSV-6L via two control lines "Tare" and "Scale".

The calibration data from the sensor's electronic data sheet is automatically transferred via the TEDS input. The analog output is then automatically adjusted to the gradient stored in the TEDS EEPROM of the sensor.

The measuring amplifier GSV-6L operates from a supply voltage of 9V to a maximum of 28V.

The active signal level for the digital inputs "Tare" and "Scale" correspond to the supply voltage used for the GSV-6L, but at least 9V.

Dimensions

Terminal assignment

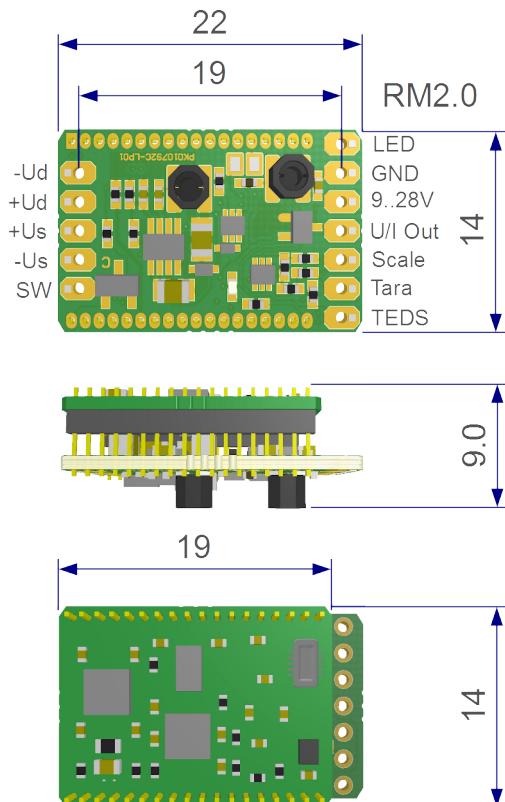


Figure 5: Dimensions GSV-6L

5-pin terminal strip

Designation	Function	Comment
+Us (V_DMS)	Positive bridge excitation 3 V	60 mA, short-circuit proof
-Ud	Negative bridge output / differential input	
+Ud	Positive bridge output / differential input	
-Us (AGND)	Negative bridge excitation (AGND)	
SW	Threshold switch output, OpenDrain 200mA, 30V	

7-pin terminal strip

Designation	Function	Comment
LED	Connection for LED	max. 4mA, 200 ohm series resistor to GND
GND	Ground supply voltage	
9...28V	Supply voltage	with polarity reversal

Designation	Function	Comment
		protection
U/I Out	Analogue Output	Output voltage or current
Scale	Control line for "Scale" or "ENTER"	High-active; duration as with GSV-6CPU; Signal level: supply voltage
Tare	Control line for "Tare" or "UP"	High-active; duration as for GSV-6CPU; Signal level: supply voltage
TEDS	Input for TEDS (pull-up resistor included)	Vdd=Vio of TEDS EEPROM directly connectable

Functions

The functions can be adjusted using the "Tare" and "Scale" control cables.

A simulator to configure the GSV-6 via control cables is also available via

https://www.me-systeme.de/produkte/elektronik/gsv-6/anleitungen/ba-clickrclackr_en.pdf

Function	Settings
Analogue output "Type"	0...10V, ±10V, 0...5V, ±5V, 4...20mA, 0...20mA
Analogue output "Offset"	0%, 10%, 12.5%, 20%, 25%, 30%, 37.5%, 40%, 50% Example: an offset of 50% with an analogue output 0...10V shifts the zero point at 0 mV/V to 5V. With an output of 4...20mA, the zero point is shifted to 12mA with an offset of 50%. The input sensitivity is shown at all times on the remaining "End Value - Offset" area.
Data frequency in Hz (Updating of measurement values at the analogue output or interface)	0.1, 0.2, 0.5, 1, 2, 10, 20, 50, 100, 200, 500, 1k, 2k, 5k, 10k, 20k, 25k; The smallest data frequency at the output is 10Hz. At levels below 10Hz, a second-order IIR filter is used.
Input sensitivity in mV/V	0.1, 0.2, 0.3, 0.4, 0.5, 1, 2, 3, 4, 5, 8 (standard mode) 0.1, 0.2, 0.3, 0.4, 0.5, 1, 2, 3, 4, 5, 8 (high-res. mode) In high-res. mode the physical measuring range is restricted, which means there is less "reserve" available for a zero adjustment with the Tare function. Available physical measuring ranges: 8 mV/V, 4 mV/V, 2 mV/V, 1 mV/V The input sensitivity can also be set to 5-digit precision using the Tare and Scale cables in the ClickRClackR menu ("seamless").
Adjust autoscale level	The autoscale level allows the output signal to be defined as a % of the end value, which is shown by implementing "Scale" with the current weight limit. Default setting: 100% (a weight limit of 100% is expected). The autoscale level can be adjusted in stages, from 5% within the

Function	Settings
	range 0 to 100%. When "0%" is set, the autoscale function is deactivated.
Level for threshold value indicator "On"	The switch-on threshold of the threshold value indicator can be adjusted in steps of 5% within the range 0 to 100%. When 0% is set, the threshold value indicator is deactivated.
Level for threshold value indicator "Off"	The switch-off threshold of the threshold value indicator can be adjusted in steps of 5% within the range 3 to 98%. The switch-off threshold should be set lower than the switch-on threshold. If "0%" is set, the switch-off threshold is deactivated.
Operating mode	"Actual value display" (Default), Maximum value display, Inversion of the display, Non-volatile Tare setting (default) or volatile when switched off, "Gradient" setting (special function, not included in the standard configuration), TEDS activated (default) / deactivated.
Load pre-setting	Selecting this menu option loads the default settings included on delivery. ±10V, 2mV/V, 100Hz, Actual value display, TEDS active, Non-inverted display,

This "ClickRclackR" menu is described in detail in a separate document:

[Manual ClickRclackR](#)

GSV-6K



Description

The GSV-6K measuring amplifier provides a strain gauge input via a 5-pin M12 housing socket and an analogue output via a 5-pin M12 housing plug.

The GSV-6K is used to convert the bridge signal from force, torque or strain sensors to an analogue output signal.

If present, an electronic data sheet of the sensor can be read via a TEDS interface. If read successfully, the measurement amplifier scales the sensors rated output signal to the end value of the configured output type.

The output signal can be set as a voltage or current output.

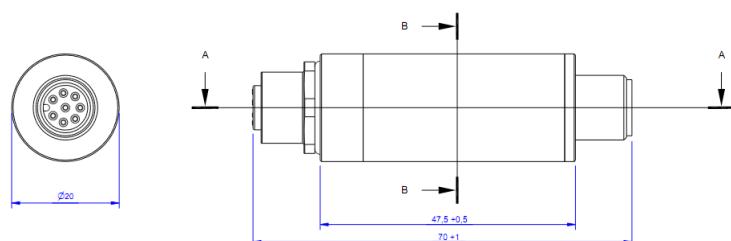
The outputs 0...10V, ±10V, 0...5V, ±5V, 4...20mA, 0...20mA can be set using the "Tare" and "Scale" control cables (ClickRclackR menu). Similarly, an offset or sampling frequency can also be set.

Functions

The unit is factory-configured to the output signal as ordered by the customer; otherwise, to ±10V. The configuration can be modified using the "Tare" and "Scale" control lines. Functions (Page 10).

The active signal level for the digital inputs "Tare" and "Scale" correspond to the supply voltage used for the GSV-6K, but at least 9V.

Dimensions



Terminal assignment

M12 plug connector with A-coding;

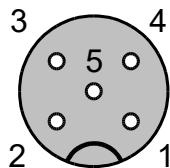


Figure 6: Contact configuration M12 socket

5-pin socket

Pin No.	Terminal assignment	ME (Type 1)	ME (Type 2)	Phoenix SAC-5P
1	+U _S Positive bridge excitation	brown	red	brown
2	-U _S Negative bridge excitation	white	black	white
3	+U _D Positive bridge output / differential input	green	green	blue
4	-U _D Negative bridge output / differential input	yellow	white	black
5	TEDS input	grey		grey

A memory module containing TEDS data can be connected directly to pin 5, the ground is connected to pin 2 (-Us). Minimum required connection: Pins 1-4.

5-pin plug

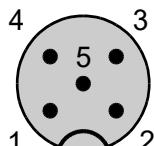


Figure 7: Contact configuration M12 plug

Pin No.	Terminal assignment	ME (Type 1)	Phoenix SAC-5P
1	Supply voltage 12V ... 24V DC	brown	brown
2	Analogue output 4...20mA / ±10V	white	white
3	Ground	green	blue
4	Tare (Control input for zero adjustment)	yellow	black
5	Scale (Control input for autoscale)	grey	grey

Minimum required connection: **3-wires** pins 1-3. Pin 3 is the supply minus pole and also the GND for the analog output, which preferably is connected to two ground wires (one for supply minus, one for output ground).

Annex

Technical data of GSV-6CPU

Accuracy	Value	Unit
Accuracy class	0,1	%
Resolution	16	Bits
Strain gauge inputs for full bridge	60 ... 20000	Ohms
Input sensitivity (FS)	0.1 ... 8 (configurable)	mV/V
Common-mode rejection ratio DC-60Hz 5 kHz	110 100	dB dB
Noise amplitude Peak-to-peak 1 Hz 10 Hz 100 Hz 1 kHz 10 kHz	20 µV/V (2 mV/V / 10000) 31 µV/V (2 mV/V / 6500) 80 µV/V (2 mV/V / 2500) 140 µV/V (2 mV/V / 1400) 240 µV/V (2 mV/V / 840)	µV/V
Zero point drift (at 2 mV/V FS)	<0.05 %FS/10K (1 µV/V / 10K)	
Sensitivity drift (at 2 mV/V FS)	<0.01%RD/10K	
Analogue input Number Resolution Input range (nominal) Zero point drift	6 16 1.5 ± 1.45 150 µV / 10K	Bit V
Measuring frequency		
Updating of analogue output	1 ...25000	Hz
Sampling frequency	50	kHz
Adjustment range of averaging filter	1 ...25000	Hz
Outputs		
Bridge supply voltage Max. bridge supply current Short-circuit resistant	3.0 60 Yes	Volts mA
Analogue output Resolution Output resistance Max. output current	1.5 V ± 1 V at 0 mV/V ± FS 13 bit 47 10	Ohm mA
Threshold value output, Supply_Warning LED Level Max. current	LVTTL level 200 ohm series resistor required >2.4V High; <0.4V Low 4	mA
Voltage source Max. current	3.3 10	V mA
Interfaces		
	2x UART, CAN, TEDS (SPI, I2C)	

Voltage supply		
Nominal voltage	4	V
Current consumption	35	mA
Min. supply voltage	3.6	V
Max. supply voltage	5.5	V
Operating temperature		
Nominal temperature	-10°C ...85°C	
Working temperature	-40°C ... 125°C	
Dimensions		
L x W x H	19 x 14 x 4	mm x mm x mm
Protection Class		
	IP00	

Technical data GSV-6L / GSV-6K

Accuracy		
Accuracy class	0,1	%
Resolution	16	Bit
Strain gauge inputs for full bridge	60 ... 20000	Ohm
Input sensitivity (FS)	0.1 ... 8 (configurable)	mV/V
Common-mode rejection ratio DC-60Hz	110	dB
5 kHz	100	dB
Noise amplitude "Pk-Pk"		
1 Hz	20 µV/V (2 mV/V / 10000)	
10 Hz	31 µV/V (2 mV/V / 6500)	
100 Hz	80 µV/V (2 mV/V / 2500)	
1 kHz	140 µV/V (2 mV/V / 1400)	
10 kHz	240 µV/V (2 mV/V / 840)	
Zero point drift (at 2 mV/V FS)	<0.05 %FS/10K (1 µV/V / 10K)	
Sensitivity drift (at 2 mV/V FS)	<0.01%RD/10K	
Measuring frequency		
Updating of analogue output	1 ...25000	Hz
Sampling frequency	50	kHz
Adjustment range of averaging filter	1 ...25000	Hz
Outputs		
Bridge supply voltage	3.0	Volt
Max. bridge supply current	60	mA
Short-circuit resistance	Yes	
Analogue output	Configurable	
Resolution	13 bit	
Output resistance	0.12	Ohm
Max. output current	10	mA

Threshold value output, Current carrying capacity:	Open drain 200 mA, 30V	
Interfaces		
	TEDS	
Voltage supply		
Nominal voltage Current consumption Min. supply voltage Max. supply voltage	12V ... 24V 22 9 28	V mA V V
Operating temperature		
Nominal temperature	-10°C ... 70°C	
Working temperature	-25°C ... 85°C	
Dimensions		
GSV-6L (L x W x H) GSV-6K (\emptyset x L)	22mm x 14mm x 9mm / \emptyset 20mm x 70mm	
Protection class		
GSV-6L GSV-6K	IP00 / IP66	

Factory default settings

	GSV-6L, GSV-6K
Input sensitivity	2 mV/V
Physical measuring range	\pm 4 mV/V
Analogue output	\pm 10 V
Offset	0%
Data frequency	10 Hz
Sign	Not inverted
Sesnor level for scale	100%
Level for threshold switch 1	90%
Zero adjustment	stored to non-volatile memory
TEDS	activated
Peak value output	inactive
Gradient	\pm 1 (mV/V) / s
Configuration interface "Monitor"	115200 bits/s, 8n1(GSV-6K: only internal)

LED flashing patterns

GSV-6K and newer versions of the GSV-6L have a built-in LED that can be used to indicate some device states. The LED also has a meaning in the "ClickRclackR" configuration menu,

e.g. it lights up when the value currently set in the menu is reached.

Flashing sequence	Repetitions	Meaning
50ms on, 100ms off	infinite	Error (see below)
200ms on, 200ms off	11 x	TEDS read successfully
100ms on, 100ms off	2 x	Gradient recognized
100ms on, 100ms off, 100 ms on, 1s off	infinite	In the menu: function executed
50ms on, 50ms off	infinite	In the menu: Entry actually configured
700ms on, 300 ms off	infinite	GSV-6BT: File on SD-card open for writing

Possible causes for the error blink pattern:

- TEDS should be read because configured accordingly, TEDS module is also connected, but data or communication errors have occurred
- Error in setting(s) in ClickRclackR menu
- GSV-6BT: RTC clock should be set, e.g. because the battery has been reconnected
- GSV-6BT: Error opening a file on SD card

Changelog

Version	Changes
25.11.16	updated formatting of document
21.06.17	Analog input 1.5V +-1.45V
01.02.18	GSV-6L, Typ, 7-pole terminal, typo corrected
23.02.18	Signal level for control inputs documented at GSV-6L and GSV-6K
13/07/2022	LED patterns added, reviewed, updated
03/12/2023	corrected GSV6K connector, reviewed
08/05/2024	Formatting, address, TEDS pullup on GSV-6CPU

Subject to changes.

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