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Handheld charge amplifier and transmitter monitoring

Type 5811A01...

Battery-powered charge amplifier and transmitter monitoring with SDCI and integrated data acquisition

This universal handheld device can be used wherever mechanical quantities are measured with piezoelectric sensors, transmitters, and Kistler IO-Link devices. The battery-powered device is designed for environments and applications where the use of a line-powered charge amplifier in combination with a host computer for visualization and data acquisition of the measurement signal is not suitable.
Piezoelectric sensors produce an electric charge which varies in direct proportion with the load acting on the sensor. The handheld amplifier converts this charge directly into proportional output voltage. Handheld device Type 5811A01... has one charge input channel to be used in combination with piezoelectric sensors.
The other two channels with M12 connectors can be configured as transmitter input, analog input or SDCI (Single-drop Digital Communication Interface).

- 1- BNC connector as charge input channel for piezoelectric sensors
- 2-M12 connectors for analog inputs, transmitters, and IO-Link devices of Kistler
- Trigger input/analog output for interaction with external systems
- 4.3″ touchscreen display for simple configuration and control
- Tactile buttons for main controls allowing operation with gloves
- Integrated memory for data acquisition with up to 50 kSps
- Fully flexible low-pass and high-pass filter adjustment
- Robust housing with IP54 protection for harsh environments
- Impact protection to prevent damage to housing and connectors
- Mounting lugs for convenient carrying using a shoulder strap
- Integrated rechargeable and replaceable battery
- USB-C port for battery charging and data exchange
- LED for indication of battery charging and device status

Description

The handheld device Type 5811A01... is not only a portable, battery-powered charge amplifier and monitoring device for dynamic and quasi-static signals, but also a powerful data acquisition system that stores the digitized measurement values directly on the device allowing to export the data to a host computer via a USB interface. Moreover, the Type 5811A01... can be used as a monitoring device for transmitters or other devices/sensors with analog output of ±10 V. In the SDCI mode, the handheld device functions as a master with which IO-Link devices of Kistler can be configured, parametrized, and monitored on-site.
The handheld device is configured and operated via an intuitive user interface on a touchscreen display which is supplemented by side buttons to allow operation of main controls with gloves. The graphical user interface not only provides a simple and intuitive way to configure the device but also displays various measurement values (e.g., live value, peak value, RMS alue) as well as the measurement curve in a y/t graph. An evaluation view allows to check if the measured process signal is within predefined limits.
The handheld device can store presets of user generated measurement configurations. This enables quick changes between repeatedly executed tasks. It also ensures that these tasks are executed with identical settings, resulting in consistent data.

Application

With its ability to measure quasi-static and dynamic signals, the handheld device Type 5811A01... is not only suitable for force measurements but also acceleration, vibration and pulsating pressure measurements below 20 kHz in various applications in the industrial sector, laboratory as well as in research and development.

Some application examples of the handheld device Type 5811A01... are briefly explained below:

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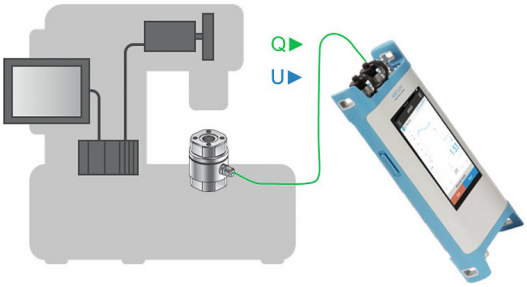
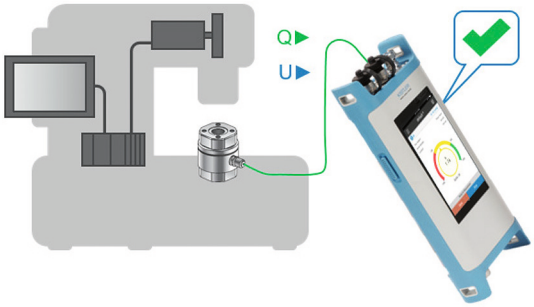
Portable test and measurement device



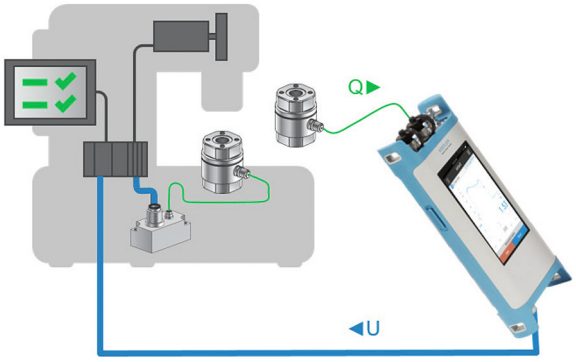
The handheld allows easy on-site measurement and signal recording without the need for a power source. The wide measurement range and powerful signal conditioning make it a great tool for testing and data acquisition for subsequent investigations to determine on-site measuring chain requirements.

Reference tool for process verification test



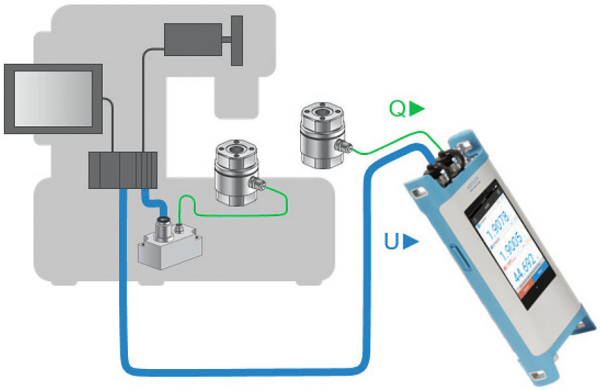
The evaluation mode allows periodic testing of a process according to predefined limits and visualization of the measurement in a customizable bar graph with colors and texts. The result can be stored on the handheld device for documentation purposes, with the possibility of exporting to a PC.

Closed-loop reference measurement



In combination with the accredited calibration service for handheld and sensor, the handheld can be used as a reference measuring device for checking correct machine operation. The integrated voltage output can be used to feedback the measured reference signal to the process control system.

Multi-channel measurement



Multiple signals (up to 3 signals) can be acquired by the handheld device Type 5811A01... for signal comparison, investigation, and verification. The results can be visualized in numerical format, bar graphs and y/t graphs.

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Technical data

Connections

Number of channels		3
Charge input connector type		1x BNC neg.
SDCI master port/voltage input connector type		2x M12, 5 pole
Voltage output/ext. trigger input connector type		BNC neg.
USB interface connector type		USB-C socket

Charge input

Number of channels		1
Measuring ranges	pC	±100 … 1 000 000
Frequency range (–3dB)		
≤10 000 pC	Hz	≈0 … >20 000
>10 000 pC	Hz	≈0 … >10 000
Input noise (typ.) battery powered		
1 Hz ... 20 kHz		
100 pC	pC_{rms}	0.012
1 000 pC	pC_{rms}	0.30
10 000 pC	pC_{rms}	0.5
100 000 pC	pC_{rms}	12
1 000 000 pC	pC_{rms}	40
1 Hz ... 10 kHz		
100 pC	pC_{rms}	0.010
1 000 pC	pC_{rms}	0.25
10 000 pC	pC_{rms}	0.35
100 000 pC	pC_{rms}	9
1 000 000 pC	pC_{rms}	30
Drift, measuring mode DC (Long)		
at 25°C, max. relative humidity RH of 60% (non-condensing)	pC/s	<±0.03
at 25°C, max. relative humidity RH of 70% (non-condensing)	pC/s	<±0.05
at 50°C, max. relative humidity RH of 50% (non-condensing)	pC/s	<±0.2
Measure-jump		Compensated
Measure-jump	pC	<±0.5
Correction time	ms	<20
Deviation		
Measuring range <1 000 pC	%	<0.1 (typ.) <1 (max.)
Measuring range ≥1 000 pC	%	<0.1 (typ.) <0.5 (max.)
Temperature coefficient of sensitivity, typ.	ppm/°C	<50
Linearity error, typ.	%FSO	<0.03
Sensor impedance	Ω	$>10^{12}$

Voltage input

Number of channels		2
Input type		differential
Measuring range	V	±10
Input common mode range	V	±30
Max. deviation	%FS	<0.5
Linearity error, typ.	%FS	<0.05
Frequency range (–3dB)	kHz	20
Input noise typ.		
1 Hz … 20 kHz	mV_{rms}	0.40
1 Hz … 10 kHz	mV_{rms}	0.35
Temperature coefficient, typ.	ppm/°C	<50
Input impedance.		
differential (DC)	kΩ	900
common mode (DC)	kΩ	495
Crosstalk	dB	<-80

Voltage output / Ext. trigger input (shared connector)

Voltage output		
Nominal output range	V	±10
Output current, max.	mA	±5
Output impedance	Ω	10
Max. voltage between input and output ground	V	500
Output noise (all ranges)		
1 Hz … 20 kHz, typ.	mV_{rms}	0.35
1 Hz … 10 kHz, typ.	mV_{rms}	0.25
Frequency range (–3 dB)	Hz	0 … 20 000
Group delay (input to output, filters off)	µs	≤30
Zero error	mV	<±5
DAC resolution (analog out)	Bit	16
Trigger input		
5 V logic input levels (internal 100 kΩ pullup to +5 V)		
High (Reset, Stop trigger)	V	>3.5 or input open
Low (Measure, Start trigger)	V	<1.5
24 V logic input levels		
High (Measure, Start trigger)	V	>11
Low (Reset, Stop trigger)	V	<5 or input open
Max. input voltage	V	±30

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Technical data (continuation)

Data acquisition [1)]

ADC resolution	Bit	16
Internal ADC sampling rate	kSps	500
Acquisition data rate per channel (adjustable), max.	kSps	50
File formats		csv/mdf (binary)
Recording capacity	GB	6
Recording duration, max.		
1 channel at 10 kSps, csv	h	≈9
1 channel at 50 kSps, csv	h	≈1.75
1 channel at 10 kSps, mdf	h	≈22
1 channel at 50 kSps, mdf	h	≈4.5

Note: For the data acquisition with <25 kSps an anti-aliasing filter is automatically set with a cut-off frequency of 7kHz. From 25 kSps on the filter is set to 0.39 ... 0.43 x selected output update rate.

Digital high-pass filter

Order		1.
Cutoff-frequency (–3 dB) selection in 0.1 Hz steps	Hz	0.1 … 10 000
Tolerance (typ.)	%	<1

Digital low-pass filter

Filter type		Bessel or Butterworth
Order		2./4.
Cutoff-frequency (–3 dB) selection in 0.1 Hz steps	Hz	10 … 20 000
Tolerance (typ.)	%	<1

SDCI

Number of channels		2
Connector		M12, 5 pole
Function		Master
Min. cycle time	µs	600
Signal group delay (uncompensated to acquisition	µs	<10 000
Supported data rates		
COM 1	kBaud	4.8
COM 2	kBaud	38.4
COM 3	kBaud	230.4
Output power supply		
Output voltage, typ.	V	24
Output voltage, max.	V	22.8 … 25.2
Output current per port, max.	mA	80
Reduction in typ. operation time		
2 sensors sinking 80 mA each	h	4
2 sensors sinking 20 mA each	h	1.5
1 sensor sinking 20 mA	h	1
Digital IO		
Logic input levels		
High	V	>13
Low	V	<5
Max. input voltage	V	30

USB interface

Version		2.0
Data rate	Mbit/s	480
Connector type		USB-C socket

WLAN interface*

Supported countries/areas		EU**/EFTA**/UK USA/Canada/Japan
WLAN standards		IEEE 802.11 b/g/n
Frequency band	MHz	2 400 … 2 480
Power	mW	<100
Channel bandwidth	MHz	20
Supported WLAN channels		1 to 11
Modes		Micro-AP (max. 8 clients)

*Available in future firmware releases (feature disabled)
** Required approvals pending

Bluetooth interface*

Supported countries/areas		EU**/EFTA**/UK USA/Canada/Japan
Supported radio modes		BR/EDR/BLE
Supported BR/EDR data rates	Mbps	1/2/3
Supported BLE data rates	Mbps	1/2
Version		5.2
Frequency band	MHz	2 400 ... 2 480
Power	mW	<10
Channel bandwidth	MHz	1

*Available in future firmware releases (feature disabled)
** Required approvals pending

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Technical data (continuation)

Display with touchscreen		
Display size (diagonal)	"	4.3
Display resolution	pixel	800 x 480
Touchscreen type		Capacitive
Buttons		
Right side button		Device on/off Measure/reset Start/stop test
Left side button		Save result Start/stop record.

LED status indicator		
Device on		
Device booting		Yellow
Device ready		LED off
Device in stand-by		Blue pulsating
Device off, charger connected		
Device charging		Red
Charging completed		LED off
Charger error		Red flashing

Power supply		
Battery (rechargeable and exchangeable by end-user)		
Type		RRC2057 Lithium-Ion
Supply voltage	VDC	7.2
Capacity	Ah	6.9
Energy	Wh	49.7
Operating time, typ.		
Active, backlight level 100%	h	≈8
80% active, 20% standby, backlight level 50%	h	≈11
20% active, 80% standby, backlight level 50%	h	≈22
Standby	h	≈33
Charging time[1], typ. (device off)		
external power supply	h	≤4.5
external charging station	h	≤2.5
USB 3.x port type A (5 V/0.9 A)	h	≤12
USB 2.0 port type A (5 V / 0.5 A), USB port type C	h	≤20[2]
External power supply		
Input voltage range	VAC	90 … 264
Output voltage	VDC	5
Output current	A	3
Output power	W	15

General data		
Temperature range		
Operating from battery	°C °F	–20 … +50 –4 … +122
Operating & charging	°C °F	0 … +35 +32 …+95
Charging (device off)	°C °F	0 … +40 +32 … +104
Storage (device off)	°C °F	–20 … +40 –4 … +104
Rel. humidity, not condensing	%	≤90
Degree of protection (EN 60529)		IP54
Vibration resistance		MIL-STD-810H Method 514.8C-3/ Cat. 4 5 … 500 Hz/ 1.17grms
Shock resistance		IEC 60068-2-27 25 g/6 ms/half-sine
Free fall resistance		DIN EN 60068-2-31 0.8 m/Method 1
Outer dimensions incl. connector impact protection (WxHxD)	mm in	250 x 100 x 44 9.84 x 3.94 x 1.73
Weight (incl. battery)	g oz	860 30

[1] Supplies providing less than 0.5 A might be damaged by the device.

[2] The battery safety circuit prevents charging durations longer than 18 h. The battery may not be fully charged at 0.5 A. When using the USB 2.0 interface for charging while the device is running, the battery will discharge.

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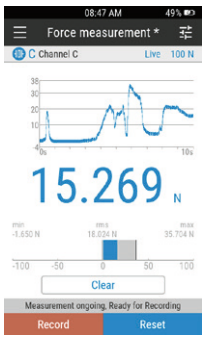
Firmware packages

There is one basic functionality package "Charge amplifier & Transmitter monitoring" and one feature package "Graphs & Recording" available. Main features of these packages are mentioned below:

Modes & Features		Basic functionalities	Feature package
		Charge amplifier & Transmitter monitoring	Graphs & Recording
	"Measurement" mode: • Display of live, min, max and RMS values • Numeric display and bar graph • Adjustable digital filters: low-pass and high-pass • Flexible analog output scaling (±10 V) • Measure/reset control via external trigger input • Single measurement value storage • Saving/loading of user generated measurement configurations (presets) • Multi-channel measurement up to 3 channels (1 charge input and 2 voltage/transmitter/SDCI input)	X	
	Y/t graph and recording: • Y/t graph for the display of the measurement signal curve • Recording of measurement data on device with up to 50 kSps • Start/stop recording via external trigger input • Simultaneous visualization of 2 Y/t graphs		X
	"Evaluation" mode: • Numeric display • Gauge graph with user defined evaluation limits (3 ranges with user defined color and text) • Adjustable digital filters: low-pass and high-pass • Switchable time constant: "DC (long)" and "Short" • Flexible analog output scaling (±10 V) • Start/stop of evaluation via external trigger input • Storage of evaluation result and value • Saving/loading of user generated evaluation configurations (presets)	X	

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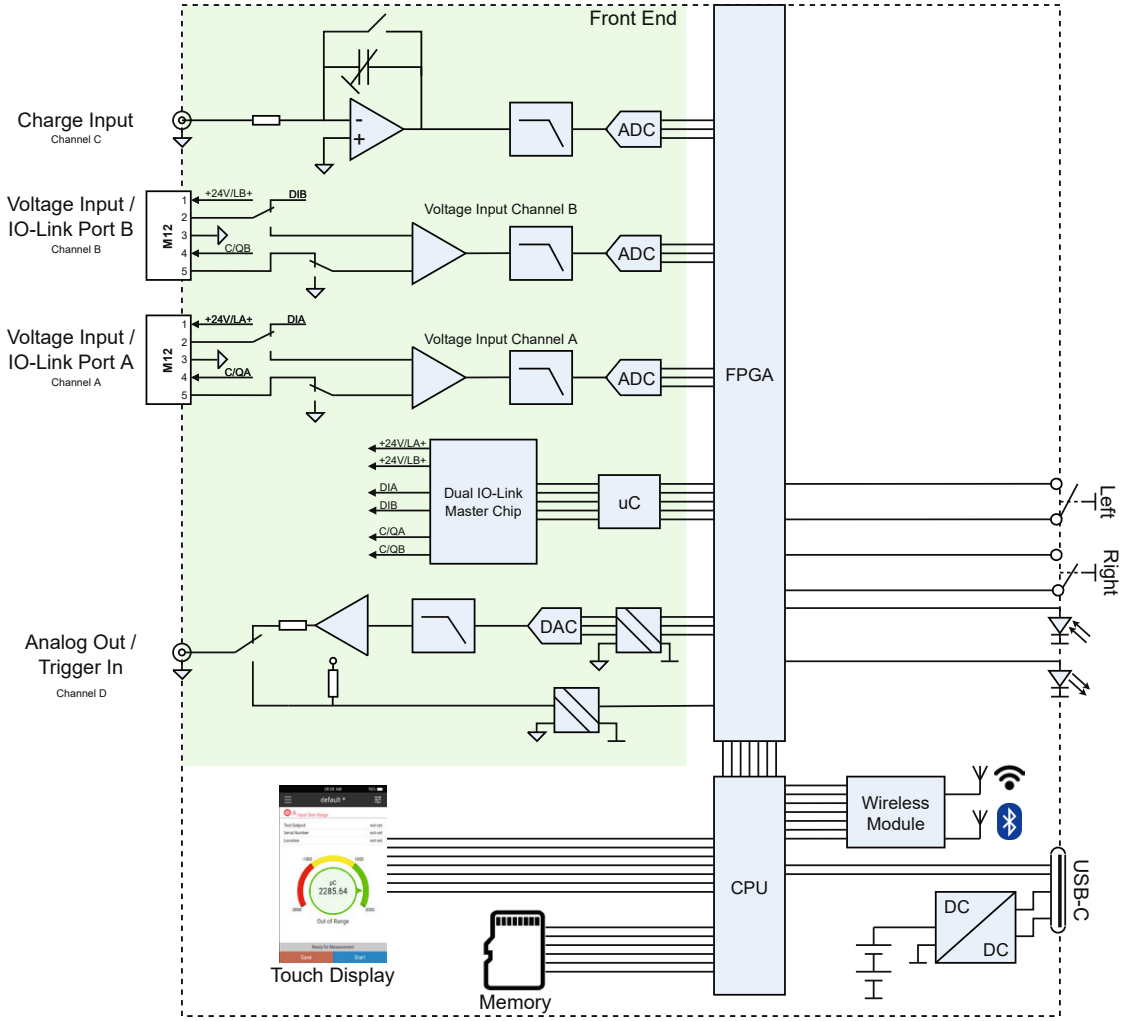
Block diagram



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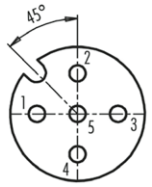
Connections

Port A and Port B (M12 Connector)

Pinout	Pin	SDCI	Transmitter	Analog Input Single-ended	Analog Input differential
 (Front view)	1	Supply +24 V	Supply +24 V	Not used	Not used
	2	I/Q	AIN+	AIN+	AIN+
	3	GND	GND	GND	GND
	4	C/Q	Not used	Not used	Not used
	5	Not used	Not used	Not used	AIN-

Port C Charge Input (BNC)

Pinout	Pin	Function
C Charge 	Pin	Charge input
	Shield	GND

Port D Analog Output/Trigger (BNC)

Pinout	Pin	Voltage Output	Ext. Trigger Input
D Output ±10 V Trigger Input 	Pin	Voltage output	Trigger voltage input
	Shield	GND	GND

Cable compatibility

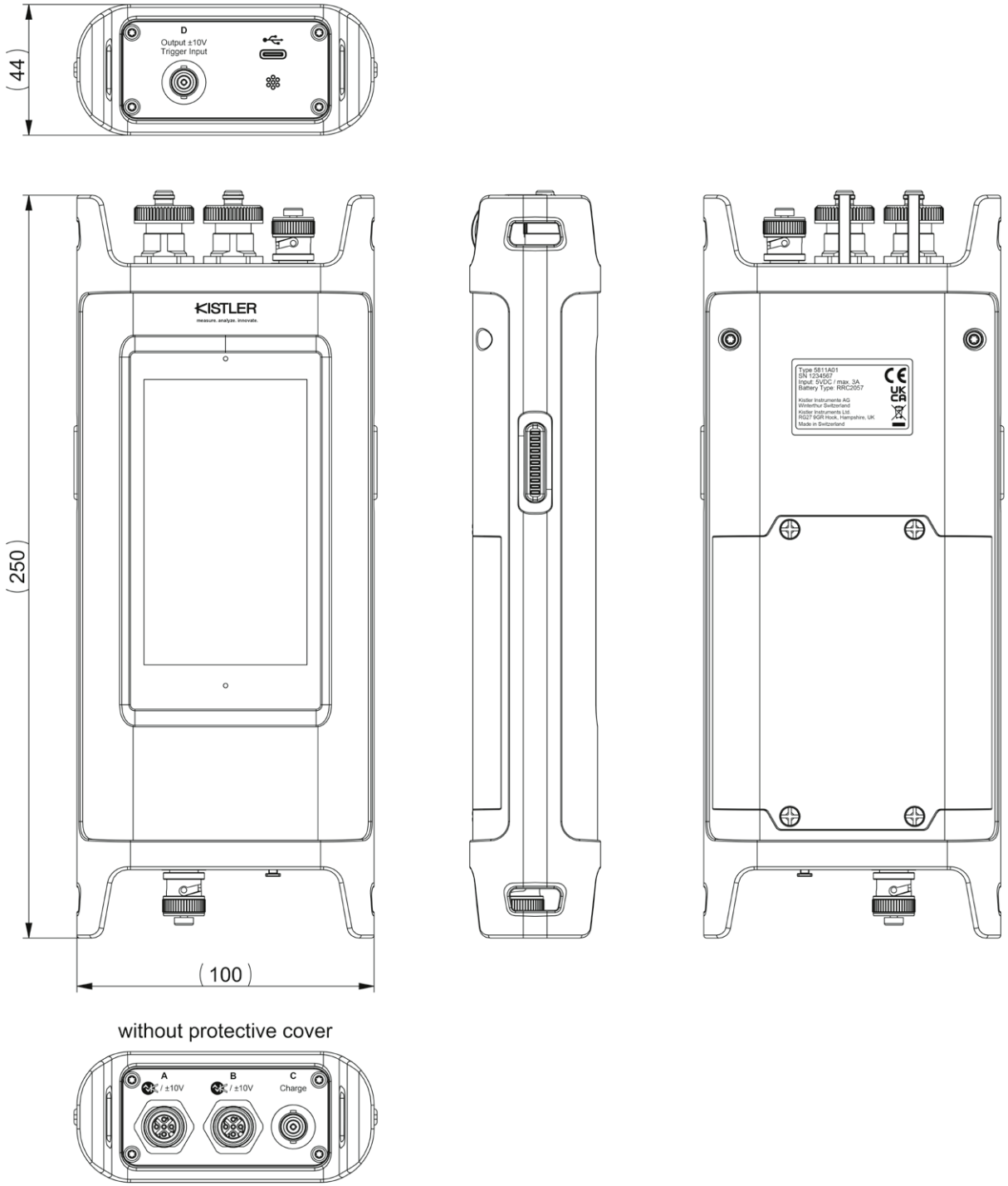
The compatibility table below shows which cable can be used with which device. To be able to perform measurements in different ranges of 5030A…, 5030Q.. and 9234B… different cables have to be used.

The cable type 1700A137A2 has been designed to be used when the channel with M12 connector is configured as "Analog Input". This cable can only be used in differential signal mode. The differential signaling is resistant to electromagnetic interferences. Thus, it is recommended to use differential mode whenever noise is a problem.

Please contact Kistler sales representative in your country for questions regarding cable compatibility or requests for customized cables.

	5030A … &5030Q40	9234B…	5030Q41 … 5030Q43
Cable 1700A135H2	Range 1	Range 1	Range 2
Cable 1700A135L2	Range 2	Range 2	Range 1

Dimensions



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Included accessories	Type/Mat. No.
• Calibration certificate	–
• Quick start guide	–

Optional accessories	Type/Mat. No.
• Plug-in power supply 5 V/3 A with USB type C plug incl. country-specific plug, cable length 1 m	5791A1*
• USB cable type A to type C, 1 m	1200A259A1*
• USB cable type C to type C, 1 m	1200A261A1
• Carrying strap with shoulder pad	5811AZ111*
• Carrying case incl. foam insert	5811AZ121*
• Battery compartment key	5811AZ141*
• Li-Ion battery (spare battery)	RRC2057**
• Battery charging station incl. country-specific power cable (only required in case of external charging of spare battery(s))	5811AZ221
• Cable M12 5 pole (m) - BNC (f), L = 2 m	1700A137A2
• Cable M12 8 pole (f) Pin2 GND – M12 4 pole (m), L = 2 m	1700A135L2
• Cable M12 8 pole (f) Pin2 Vcc – M12 4 pole (m), L = 2 m	1700A135H2
• Sensor/Actuator cable 3-pole, plug M12 A-coded straight female to plug M12 A-coded straight male	1700A127AX
• Sensor/Actuator cable 4-pole, shielded plug M12 A-coded straight female to open end	1700A129AX
• Sensor/Actuator cable 4-pole, shielded plug M12 A-coded straight female to plug M12 A-coded straight male	1700A131AX

Spare parts	Type/Mat. No.
• Protective cover for BNC neg. connector	65009665

* Available as combined kit together with the handheld in a carrying case.

** To be obtained from local distributor. Please contact your Kistler sales representative for ordering information.

Ordering key

Type 5811A01 ☐☐ **00** ☐

Kit with handheld (incl. battery) in a carrying case incl. 5 V plug-in power supply, USB cable type A to type C, carrying strap, battery compartment key	**K1**
Handheld (incl. battery) only or SW order for existing device	**--**
Hardware & Software (new device with SW features)	**H**
SW order for existing device	**S**
No Graphs & Recording	**0**
Graphs & Recording	**1**

Configuration examples:

5811A01K1H001: Handheld Type 5811A01 device incl. carrying case with accessories (plug-in power supply, USB cable type A to type C and carrying strap), incl. charge amplifier, incl. y/t graph visualization & recording

5811A01--S001: Graphs and Recording functionality for an existing Type 5811A01 device

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