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Charge Meter

Type 5015A...

Universally Applicable for Piezoelectric Measuring Technology

This instrument can be used wherever mechanical quantities are measured with piezoelectric sensors. Piezoelectric sensors produce an electric charge which varies in direct proportion to the load acting on the sensor.

- Single-channel charge amplifier
- Piezotron input (option)
- Measure-jump compensated
- Liquid crystal display (128x128 pixels)
- Menu-driven operation
- Direct signal evaluation
- Flexible adjustment of high-pass and low-pass filters
- Compatible with Charge Amplifier Type 5011B...
- PC-Software and Virtual Instrument Driver for LabVIEW

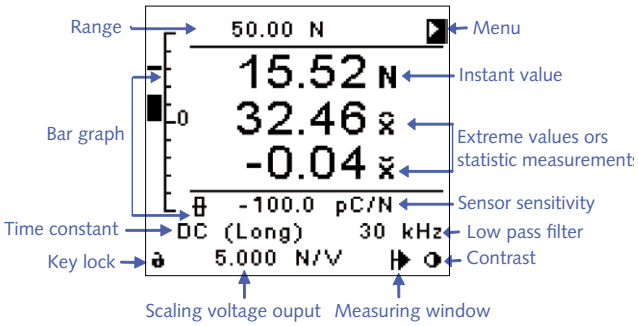
Description

The Type 5015A... is not only a charge amplifier but an universal Charge Meter with a graphical liquid crystal display. However, the 19"-rack module is also suitable for measurements in an industrial environment. It can display instantaneous, peak and average values as well as reference deviations. State-of-the art technology allows the naturally occurring interference to be almost entirely eliminated. The instrument is distinguished firstly by its excellent technical data and secondly by its extremely simple operation.

Application

The instrument has been designed for use in research, development and the laboratory.

Operation



Technical Data

Charge Input		
Connector Type		BNC neg.
Measuring range FS	pC	±2 … 2 200 000
Measurement uncertainty		
Range FS <10 pC	%	<±3
Range FS <100 pC	%	<±1
Range FS ≥100 pC	%	<±0,5
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	typ. <±0,05
at 50 °C, max. relative humidity RH of 50 % (non-condensing)	pC/s	<±0,3
Max. common mode voltage between input and output ground	V	<±30
Overload	%FS	≈±105

Voltage Input (Piezotron)		
Connector Type		BNC neg.
Measuring range FS	mV	±2 … 20 000
Measurement uncertainty		
Range FS <10 mV	%	<±3
Range FS <100 mV	%	<±1
Range FS 100 mV	%	±0,5

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Drift, meas. mode voltage DC (long) (@ Range 10 V FS; Gain = 1)		
at 25 °C, max. relative humidity RH of 60 % (non-condensing)	mV/s	<±0,03
at 50 °C, max. relative humidity RH of 50 % (non-condensing)	mV/s	<±0,3
Max. common mode voltage between input and output ground	V	<±30
Overload	%FS	≈±105
Piezotron mode		
Supply current	mA	4 ±10 %
Input voltage swing	V	0 … 20

Voltage Output

Connector Type		BNC neg.
Output range FS	V	±10/±5/±2,5/±2
Output current	mA	<±2
Output impedance	Ω	≈10
Measure-jump		Compensated
Measure-jump (Long)	mV	<±3
Correction time, inclusive reed-relay delay time	ms	<15 [1]
Zero errors	mV	<±2
Output interference (0,1 Hz ... 1 MHz), Type 5015Axxx0		
Range FS, LP filter off		
2,000 ... 9,999 pC	mVpp	<140 ... <40
10,00 ... 99,99 pC	mVpp	<30 ... <10 [1]
100,0 ... 999,9 pC	mVpp	<15 ... <7 [1]
...	mVpp	<15 ... <7 [1]
0,220 ... 2,200 µC	mVpp	<15 ... <7 [1]
Range FS, LP filter 30 kHz		
2,000 ... 9,999 pC	mVpp	<60 ... <20
10,00 ... 99,99 pC	mVpp	<20 ... <7 [1]
...	mVpp	<10 ... <5 [1]
0,220 ... 2,200 µC	mVpp	<10 ... <5 [1]
Output interference (0,1 Hz ... 1 MHz), Type 5015Axxx1		
Range FS, LP filter off		
2,000 ... 9,999 pC, mV	mVpp	<220 ... <50
10,00 ... 99,99 pC, mV	mVpp	<50 ... <12 [1]
100,0 ... 999,9 pC, mV	mVpp	<20 ... <7 [1]
...	mVpp	<20 ... <7 [1]
0,220 ... 2,200 µC	mVpp	<20 ... <7 [1]
Range FS, LP filter 30 kHz		
2,000 ... 9,999 pC, mV	mVpp	<180 ... <50 [1]
10,00 ... 99,99 pC, mV	mVpp	<30 ... <10 [1]
100,0 ... 999,9 pC, mV	mVpp	<10 ... <5 [1]
...	mVpp	<10 ... <5 [1]
0,220 ... 2,200 µC	mVpp	<10 ... <5 [1]

[1] Values valid from MCC version V2.xx

Frequency Response

DC (Long), LP-filter off		
Bandwidth (–3 dB)	kHz	≈0 ... 200
Group delay	µs	≈10

High-pass Filter (1st order)

Analog high-pass filter		
DC (Long)		
Range FS Charge, (Voltage)		
2 pC, (mV)	s	10 000
1 000 pC, (mV)	s	100 000
Time constants		
Medium	s	10/100/1 000/22 000
Short	s	0,1/1/10/220
Tolerance	%	<±20

Digital high-pass filter computed by DSP

Time constants		
Range FS Charge, (Voltage)		
2 pC, (mV)	s	0,01/0,1/1
100 pC, (mV)	s	0,01/0,1/1/10
≥1 000 pC, (mV)	s	0,01/0,1/1/10/100
Tolerance	%	<±20
Cutoff frequencies		
–3 dB	Hz	16/1,6/0,16/0,016/ 0,0016
–10 %	Hz	30/3/0,3/0,03/0,003
–5 %	Hz	50/5/0,5/0,05/0,005
–1 %	Hz	100/10/1/0,1/0,01

Low-pass Filter

Digital low-pass filter computed by DSP		
Filter Type		IIR, linear phase
Order		2. or 5.
Cutoff frequency (–3 dB)	Hz	5, 10, 20, 30, 50, 100, 200, 300, 500
	kHz	1, 2, 3, 5, 10, 20, 22, 30, (LP off)
Tolerance	%	<±10

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Signal Evaluation

Sample rates		
LP-filter on	ksps	400
LP-filter off	ksps	1 000
Minimum pulse width for peak-peak value detection		
LP-filter 5 Hz ... 30 Hz	µs	>2 500
LP-filter 50 Hz ... 300 Hz	µs	>250
LP-filter 500 Hz ... 3 kHz	µs	>25
LP-filter 5 kHz ... 30 kHz	µs	>2,5
LP-filter off	µs	>1

Max. integration time for mean value	min	<75
Integration time for the updating rate of the liquid crystal display		
Instant value	ms	300
Characteristic values	ms	300
Bar graph	ms	17,5

Remote Control

Connector Type		MiniDin round socked
Pin allocation		
Inputs with internal pull-up resistor		
Pin 4 (input)		Window (remote)
Pin 5 (input)		Measure (remote)
Pin 6		DGND
Input voltage		
logic inactive or input open	V	3,5 ... 30
logic active	V(mA)	0 ... 1 (0 ... 4)
Delay time		
Window (remote)	ms	<0,5
Measure (remote)	ms	<15

Digital Measuring Data Transfer

The instrument provides a continuos measuring data transfer via the serial interface to a PC. For this the PC software (Windows) of the VI driver (LabVIEW) is required. This feature is not available on the IEEE-488 interface.

Sampling rates	ksps	0,1/0,25/0,5

RS-232C Interface (Electrically Separated)

EIA-standard		RS-232C
Connector Type		DB-9S (D-Sub)
Pin allocation		
Pin 2		RxD
Pin 3		TxD
Pin 5		SG
Max. cable length at		
9 600 bps	m	<15
19 200 bps	m	<15
38 400 bps	m	<12
57 600 bps	m	<10
115 200 bps	m	<5
Max. input voltage, continues	V	<±20
Max. voltage between signal ground and protective ground	V_{RMS}	<20
Baud rates	bps	1 200/9 600/ 19 200/38 400/ 57 600/115 200
Data-bit		8
Stop-bit		1
Parity		none
SW handshake		none

IEEE-488 Interface (Option)

Standard		IEEE-488.1-1987
Connector Type		Microribbon series 57 (24-pole)
Max. distance between devices	m	2
Max. bus length	m	20
Max. number of devices		15
Adress range		0 ... 30
Functions		Listener and Talker
Interface functions		SH1, AH1, L4, LE0, T6, TE0, SR1, RL2, PP0,DC1, DT1, C0, E1
Multiline commands		DCL, SDC, GET, UNL, UNT, SPE, SPD
Uniline commands		IFC, REN, EOI, SRQ, ATN

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Power Supply Connection

Power plug (2P+E, protect. class I)		IEC 320C14
Supply voltage setable	V~	115/230
Supply voltage tolerance	%	–22, +15
Supply frequency	Hz	48 ... 62
Consumption	VA	≈20
Voltage between Signal ground and protective ground	V_{RMS}	<50
Fuses		
F1 (slow)	mA	100
F2 (slow)	mA	100

Remaining Data

IP-Degree of protection		IP40, IEC 60529
Operating temperature	°C	0 ... 50
Storage temperature	°C	–10 ... 70
Rel. humidity, not condensing	%	10 ... 80
Vibration steadiness (20 Hz ... 2 kHz, duration 16 min, cycle 2 min.)	g	<10
Shock steadiness (1 ms)	g	<200
Housing dimensions		
with frame (wxhxd)	mm	105,3x142x253,15
without frame (wxhxd)	mm	71,12x128,7x230
Front panel (according DIN 41494, part 5/IEC 60297)	HE/TE	3/14
Weight	kg	≈2,3

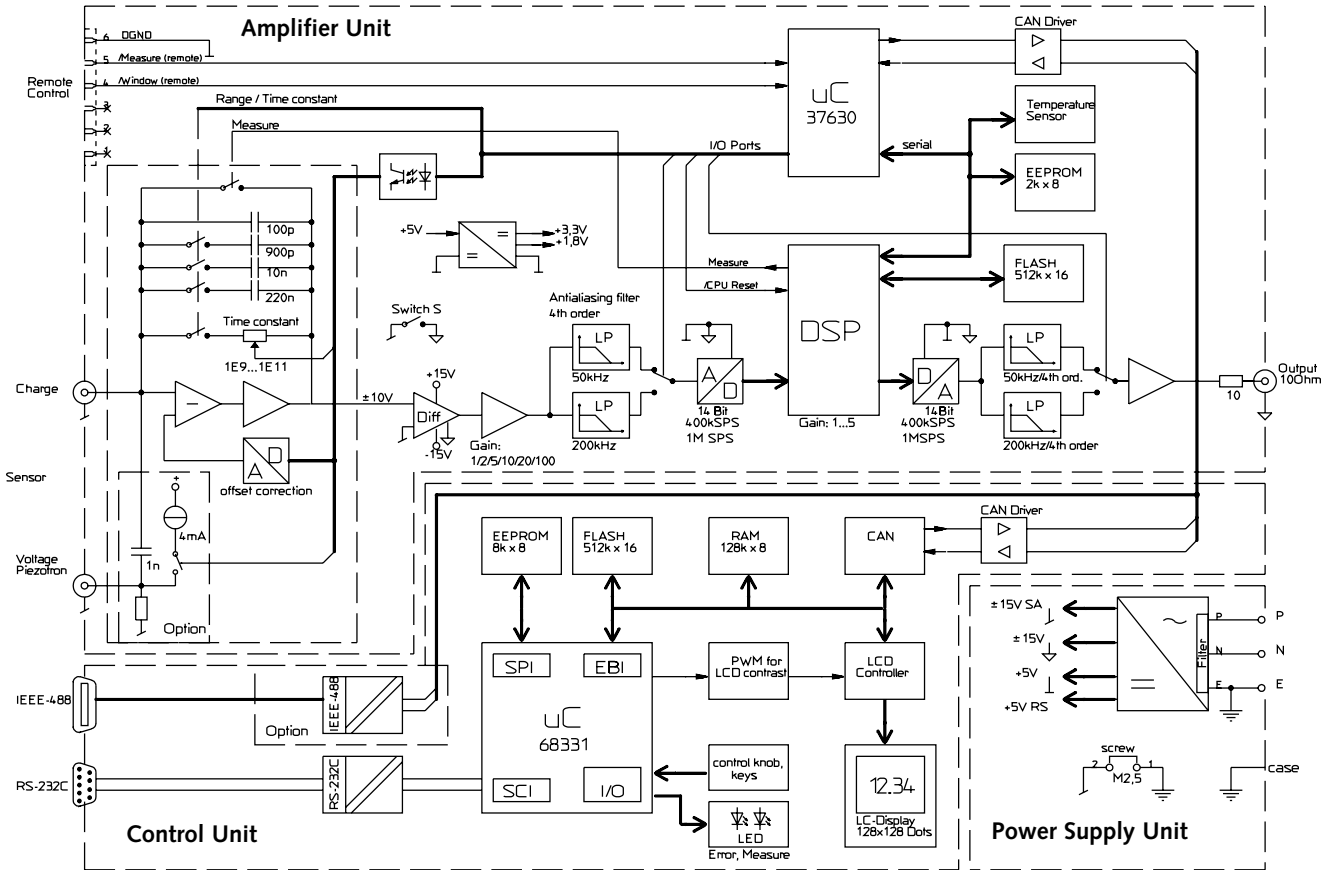

Fig. 1: Block Diagram of charge meter Type 5015A…

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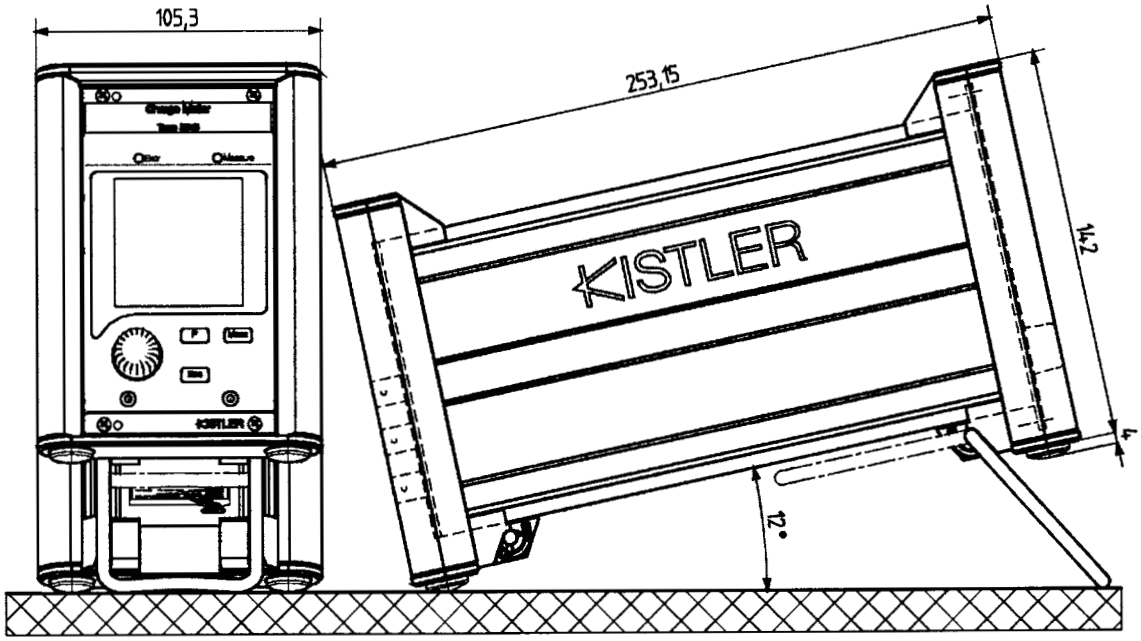

Fig. 2: Desktop Type 5015A1… (stackable)

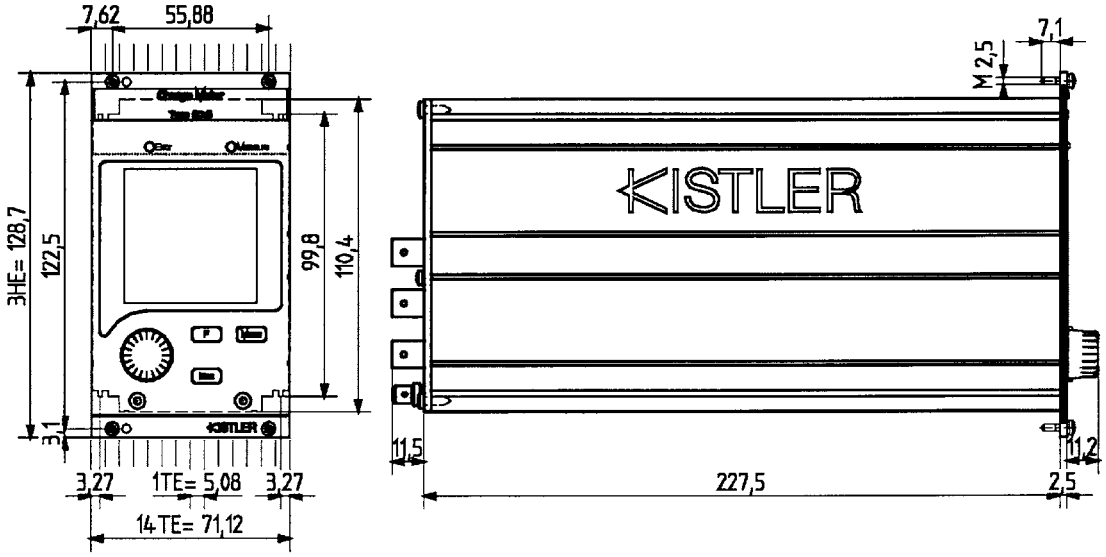

Fig. 3: 19"-Rack plug-in Type 5015A0…

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Included Accessories

Charge Meter Type 5015A... with
- Country-specific power cord
- Plug for 'Remote Control'
- Self-adhesive label with supply voltage details
- Flash-Loader with current firmware
- Demo-Program for visualization of the display on a PC
- PC-Software and VI-Driver for LabVIEW for the equipment configuration and measured data acquisition
- Instruction manual
- Calibration sheet

Optional Accessories	Type/Art. No.
• RS-232C cable, l = 5 m, null-modem, DB-9P/DB-9S	1200A27
• or PC-link cable RS-232C, l = 3 m, DB-25P/DB-9S	1465A3
• with suitable D-Sub adapter, DB-9P/DB-25S	1479

Instrument Configurations

The complete type designation of the Charge Meter is made up of the basic type designation Type 5015A... and four additional digits.
The basic type contains a single-channel Charge Meter (with charge input for piezoelectric sensors) with display unit and RS-232C interface in the following versions:

Ordering Key

Type 5015A □ □ □ □

Size/Measuring Range	
19" rack module version according to DIN 41494; width 14 TE and height 3 HE	**0**
Desktop version with support bracket	**1**
Without interface option	**0**
With IEEE-488 interface (option)	**1**
Adjusted in the factory to 230 V~; switching to 115 V~ supply by the user possible at any time	**0**
Adjusted in the factory to 115 V~; switching to 115 V~ supply by the user possible at any time	**1**
Without voltage input	**0**
With voltage input for sensors with integrated Piezotron circuitry (option)	**1**

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