

# Multichannel Amplifier

## for the Injection Molding Industry

Type 5155A...

The purpose of the multichannel charge amplifier Type 5155A... with 1, 2 or 4 channels is to convert the charge signal from piezoelectric sensors or the signal from thermocouples into a proportional voltage signal. This amplifier has been developed for industrial applications, primarily for injection molding machines.

- Charge amplifier with 2 measuring ranges
- Charge and thermocouple amplifier
- Self-optimizing switch-over output (SmartAmp-Option)
- Industrial case with IP65 protection

### Description

The multichannel charge amplifier Type 5155A... is provided with one, two or four charge amplifier modules (indicated in the circuit diagram as MLV). The two measuring ranges of the charge amplifier inputs can be switched over for each channel individually by remote control. Amplifiers equipped with temperature inputs are provided with 1 charge amplifier and 1 temperature amplifier or 2 charge amplifiers and 2 temperature amplifiers. All charge amplifier modules contain at the input a capacitive negative feedback amplifier in hybrid design with an extremely high insulation resistance.

In thermoplastic injection molding, the SmartAmp option "self-optimizing switch-over detection" automatically detects volumetric filling of the mold, and in each cycle sends a control signal to the injection molding machine. The mold must be equipped with a directly measuring cavity pressure sensor close to the gate.

### Application

The multichannel charge amplifier Type 5155A... is intended for use with all types of piezoelectric sensors and Type K thermocouples. The output signals can be used to monitor, control and optimize the injection molding process.



Photo of version with  
2-channel charge amplifier (TNC) +  
2-channel thermocouple amplifier

The SmartAmp option "self-optimizing switch-over detection" can be easily integrated in machine control systems. For retrofitting, the injection molding machine must be prepared by the machine manufacturer. This option considerably reduce the setting-up time, since the switching point is automatically preset by means of the charge amplifier without the need of manual optimization. During production, the option automatically compensate process fluctuations, thereby producing moldings of greater uniformity.

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MOLDING**  
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## Technical Data

### Charge Amplifier

Number of channels		1, 2 or 4
Measuring range I	pC min.	±5 000
	pC max.	±50 000
adjusted to		
Type 5155A1xxx	pC	±50 000
Type 5155A2xxx	pC	±20 000
Type 5155A3xxx	pC	customer option
Measuring range ratios		
Range I/Range II		
Type 5155Ax1xx		10
Type 5155Ax2xx		4
Type 5155Ax3xx		2
Drift	pC/s	<±0,05
Reset-Operate transient	pC	<±2
Maximum voltage between sensor GND and output/supply GND	V	<±4
Interference signal rejection between sensor GND and output/supply GND (0 ... 0,3 kHz)	dB	>50
Maximum input signal:		
Voltage (continuous)	V	±10
Charge	pC	±150 000

### Voltage Output

Error	%	<1
Zero point error (Reset)	mV	<±10
Output voltage	V	0 ... ±10
Output voltage limitation	V	>11
Output current	mA	0 ... ±5
Output impedance	Ω	10
Output interference signal (0,1 Hz ... 1 MHz)	mV <sub>pp</sub>	<10
Frequency response		
Deviation (-5 %)	kHz	≈0 ... >3,5
Deviation (-3 dB)	kHz	≈0 ... >10

### Current Output 4 ... 20 mA

Option in place of voltage output. Not available for combined charge amplifier and thermocouple amplifier versions.

Error	%	<1,3
Zero point error (Reset)	mA	<±0,016
Output current	mA	4 ... 20
Output current limitation	mA	25
Output impedance	MΩ	>40
Maximum load resistance	Ω	650

### Thermocouple Amplifier

Noise suppression (ground loop) through differential input stage

Number of channels		1 or 2
Thermocouple (switchable to Type J available on request)	Type	K
Measuring range	°C	0 ... 200
Output voltage	V	0 ... 10
Output current	mA	0 ... 2
Input impedance	MΩ	>1
Output impedance	Ω	10
Zero point error	mV	<10
Transmission sensitivity <sup>1)</sup>	mV/K	50
Error (gain)	%	±0,5
Error (non-linearity)	°C	<1,5
Output interference signal (0,1 Hz ... 1 MHz)	mV <sub>pp</sub>	<20
Frequency range	kHz	0 ... >1
Max. voltage between input minus and output/supply GND	V	<±4
Sensor disconnection detection	V	≈-4

<sup>1)</sup> Calibration: 0 °C = 0 V, 100 °C = 5 V

A differential input circuit ensures that common-mode signals of ±4 V between Sensor/Low and Output/Power GND, such as occur in industrial environments, have no disturbing influence.

### Control inputs for Reset/Operate, Measuring Range II, Sensitivity, Test

Actuation is bipolar and electrically isolated via optocouplers. The common input of Test/Operate/Measuring range II/Sensitivity (Control GND, PIN 18 of the D-Sub connector) can be connected internally either with the potential Exct 18 ... 30 VDC or Exct GND. Accordingly Test, Operate, Measuring range II and Sensitivity are actuated with negative voltage or optionally with user specified voltage.

Actuation voltage		
Operate (logic 1)	V	3 ... 30
Reset (logic 0)	V	<2
Measuring range II (logic 1)	V	3 ... 30
Measuring range I (logic 0)	V	<2
Test signal (logic 1)	V	3 ... 30
No Test signal (logic 0)	V	<2
Sensitivity <5 pC/bar (logic 1)	V	3 ... 30
Sensitivity >5 pC/bar (logic 0)	V	<2
Actuation current	mA	0,6 ... 9
Output signal when Test and Measuring range II active		
Voltage output	V	8
Current output 4 ... 20 mA	mA	16,8
Tolerance of test signal	%	5

**FIX/SL**

The outputs are switched via photo MOS relays.

Current rating, continuous	mA	<100
Current rating, pulse (<0,1 s)	mA	<300
Resistance		
when switched on	Ω	<50
typical	Ω	30
Constant voltage	V	<±42
Voltage between outputs and protective ground	V <sub>RMS</sub>	<30

**Power Supply**

Supply voltage	VDC	18 ... 30
Current consumption per		
Charge amplifier channel (without load and without SLP)	mA	≈10
Thermocouple channel (without load)	mA	≈15
Additional current consumption by		
SLP	mA	≈35
Current output per channel (without load)	mA	≈2,5

**Connections**

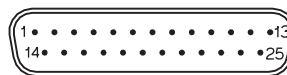
Sensor		
Charge input	Type	TNC neg. or BNC neg. or 4-channel Fischer multipole plug
Thermocouple input	Type	Fischer DBPU 102 A051 female
Supply, signal outputs, Control inputs	Type	D-Sub 25 pin male

**General Data**

Operating temperature range	°C	0 ... 60
Min./max. temperature	°C	-10/70
Vibration resistance (20 ... 2 000 Hz, duration 16 min., cycle 2 min.)	gp	10
Shock resistance (1 ms)	g	200
Degree of protection (only with screwed-on TNC connectors) DIN 40050	IP	65
Housing material		die cast aluminium
Weight	g	≈400

- Recommended mounting position: on perpendicular surface, connections downward
- The case ground is connected to the output or supply ground only via an R/C network. This prevents interference due to a "floating" case.

**Contact Assignment D-Sub 25 Connector**



- 1 Signal Out Ch1
- 2 Signal Out Ch2 a)
- 3 Signal Out Ch3 b)
- 4 Signal Out Ch4 b)
- 5 NC
- 6 Exct 18 ... 30 VDC
- 7 Exct 18 ... 30 VDC
- 8 Exct GND
- 9 NC
- 10 NC
- 11 Common FIX/SL
- 12 FIX c)
- 13 SL c)
- 14 Signal GND
- 15 NC
- 16 NC
- 17 NC
- 18 Common Control
- 19 Operate
- 20 Sensitivity c)
- 21 Test
- 22 Range II Ch1
- 23 Range II Ch2 a) d)
- 24 Range II Ch3 b) d)
- 25 Range II Ch4 b) d)

- a) with 1 channel version: NC  
 b) with 1 and 2 channel version: NC  
 c) with version without SmartAmp "self-optimizing switching-point detection": NC  
 d) with temperature input: NC

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This information corresponds to the current state of knowledge. Kistler reserves the right to make technical changes. Liability for consequential damage resulting from the use of Kistler products is excluded.

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Block Schematic Diagram

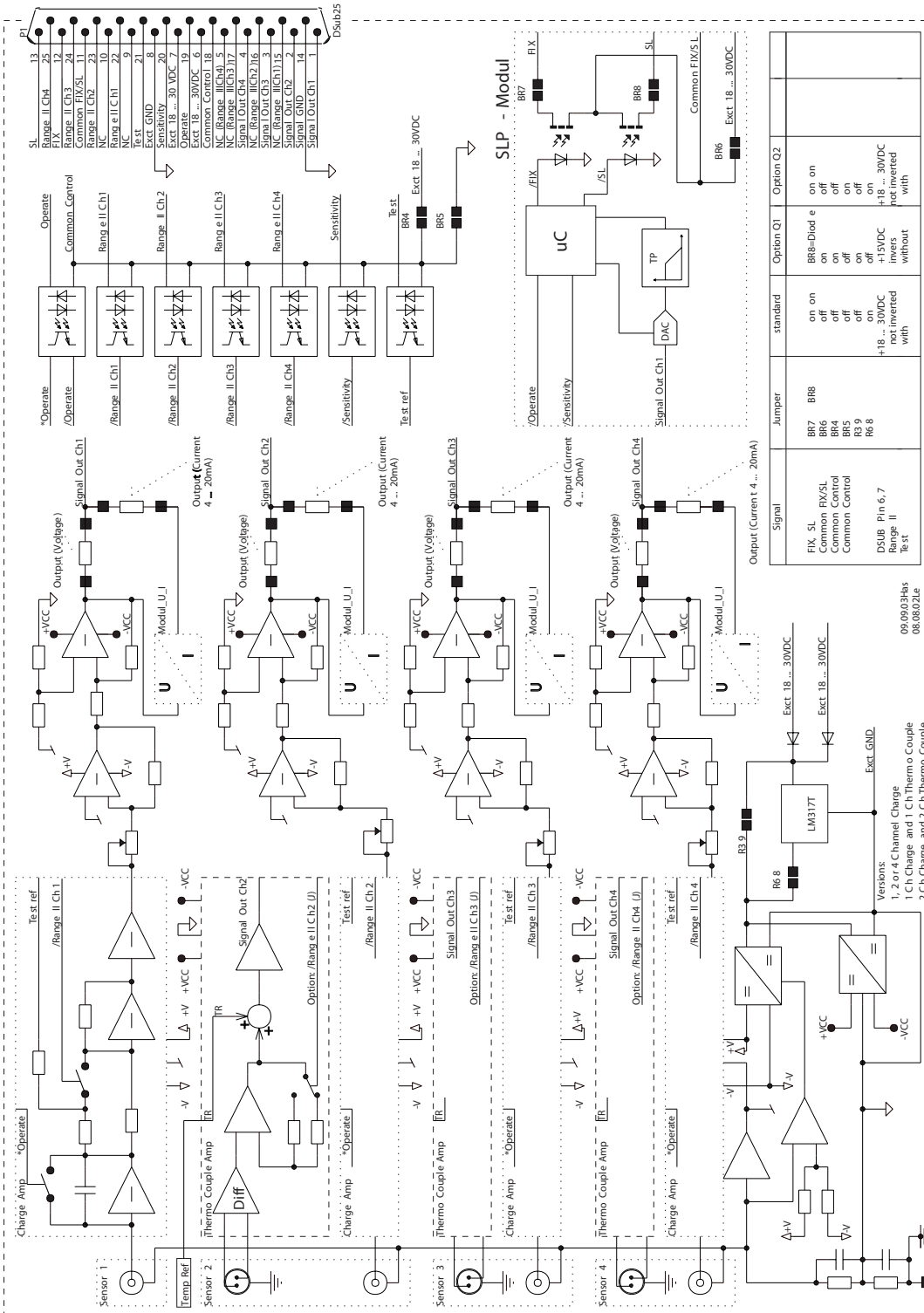


Fig. 1: Block schematic diagram for Type 5155A... with SmartAmp "self-optimizing switching-point detection"

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**Dimensions**

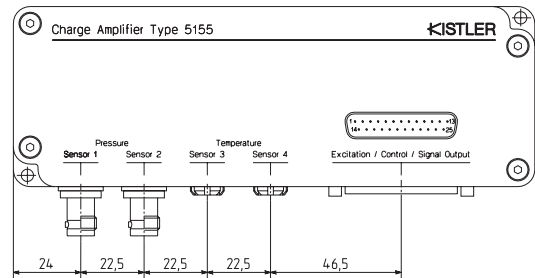
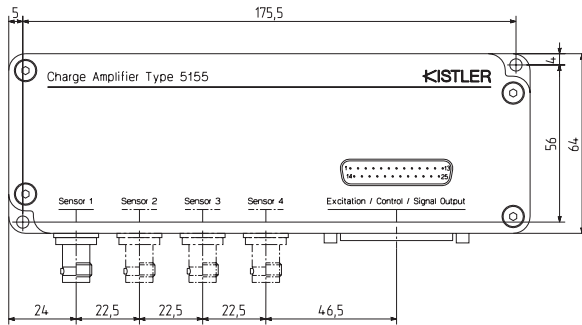
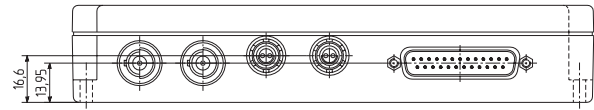
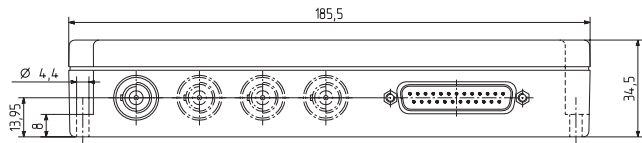


Fig. 2: Dimensions of charge amplifier Type 5155Axx7x, 5155Axx8x, 5155Axx3x, 5155Axx4x, 5155Axx1x, 5155Axx2x (1-, 2-, 4-channel charge amplifier)

Fig. 4: Dimensions of charge amplifier Type 5155AxxCx, 5155AxxDx (2-channel charge amplifier, 2-channel thermocouple amplifier)

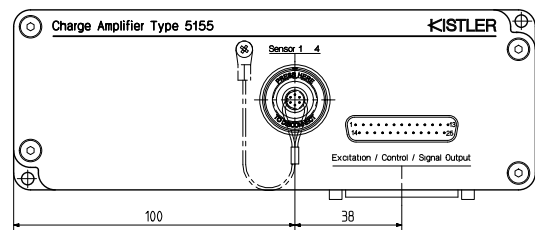
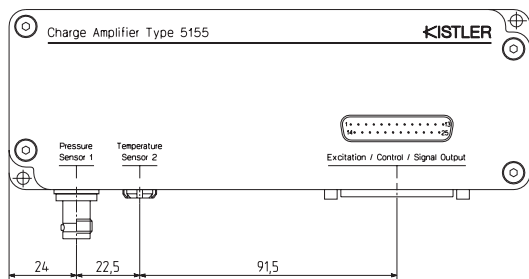
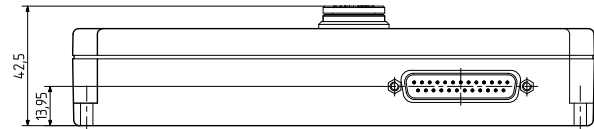
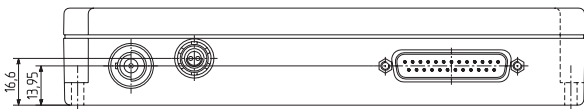


Fig. 3: Dimensions of charge amplifier Type 5155AxxAx, 5155AxxBx (1-channel charge amplifier, 1-channel thermocouple amplifier)

Fig. 5: Dimensions of charge amplifier Type 5155A2251 (4-channel charge amplifier)

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**Optional Accessories**

- 2 cheese-head screws M4 x 16
- 2 spring washers M4
- TNC-BNC adapter
- Connecting cable (with open end) for connection to the injection molding machine

**Art. No./Type**

- 6.120.013
- 6.230.063
- 1709
- 1200A73

**Optional Accessories**

- D-Sub plastic cover, water-tight, shielded and 25 pin D-Sub connector (CONEC 165 X 15039X)
- Connecting cable (equalizing cable) for the connection of temperature sensors  
Length = 2 m  
Length = 5 m

**Art. No./Type**

- 1557A10
- 2295A2
- 2295A5

**Ordering Key**

**Measuring Range I (Calibrated)**

±50 000 pC	1
±20 000 pC	2
According to order	3

**Ratio Measuring Range I/Measuring Range II**

10	1
4	2
2	3

**Channels, Sensor Connection**

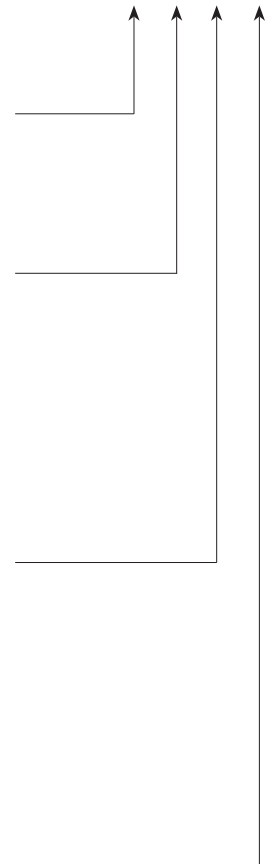
1 channel charge, TNC neg. (IP65)	1
1 channel charge, BNC neg. (IP60)	2
2 channel charge, TNC neg. (IP65)	3
2 channel charge, BNC neg. (IP60)	4
4 channel charge, TNC neg. (IP65)	7
4 channel charge, BNC neg. (IP60)	8
4 channel charge, 4 channel connector for cable type 1995A...	5****
1 channel charge, TNC neg., 1 channel temperature (IP65)	A***
1 channel charge, BNC neg., 1 channel temperature (IP60)	B***
2 channel charge, TNC neg., 2 channel temperature (IP65)	C***
2 channel charge, BNC neg., 2 channel temperature (IP60)	D***

**SmartAmp**

SmartAmp without SmartAmp, voltage output	1
without SmartAmp, current output	2*
with SmartAmp "self-optimizing switching-point detection", voltage output	3**
with SmartAmp "self-optimizing switching-point detection", current output	4**

- \* Not possible in combination with thermocouple amplifier
- \*\* Charge amplifiers are supplied only with Range I = 20 000 pC and ratio Range I/Range II = 4
- \*\*\* Charge and thermocouple amplifier only available with Range I = 20 000 pC and ratio Range I/Range II = 4
- \*\*\*\* Charge amplifiers are supplied only with Range I = 20 000 pC and ratio Range I/Range II = 4; without SmartAmp; current output not available

Type 5155A



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