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ICAM

Type 5073A...

Industrial Charge Amplifier for Applications in Manufacturing

The ICAM charge amplifier (Industrial Charge Amplifier Manufacturing) converts the piezoelectric charge signal from the sensor into an output voltage proportional to the mechanical input quantity. Depending on the version and application, up to four sensors can be connected and integrated into a production machine. The ICAM control system operates via digital inputs and a serial interface.

- Wide, variable measuring range ±100 … ±1 000 000 pC
- Two independent variable measuring ranges per channel; switchable online
- Adjustment in sealed case via serial interface
- Parametrization Software and Vi-driver Library for LabView
- LED for visualizing the current operating status
- ICAM versions for degrees of protection IP60 and IP65
- Integrated peak value memory for each channel.

Description

The ICAM is housed in a rugged metal case. It has a wide power supply requirement (18 … 30 VDC) and is provided with a degree of protection up to IP65 for industrial environments. The charge amplifier can be supplied with the same case and mounting hole pattern in versions with one, two, three or four channels. In addition, it can be supplied with summing amplifier for four channels. It is outstanding for ease of operation and faithful technical data over a very wide measuring range. In combination with software based on LabView, practically any measuring range can be set, thereby significantly increasing resolution. The charge input is protected against static discharge and, as a differential input, it can effectively compensate for potential differences on the machine. The digital inputs are isolated electrically by optocouplers. In addition to the peak memory with parameter setting facility, an offset can be configured for each channel. In the version with four channels, there are only two peak memory outputs available and no digital test input.

Application

The ICAM is suitable for applications with nearly all piezoelectric sensors. The output signals can be used for monitoring, close-loop control and optimization of an industrial measuring process. Its floating-potential digital inputs for Reset/Measure and measuring range selection are designed for integration in a machine control system.

Technical Data

ICAM Charge Input Versions		
1, 2, 3 or 4 channels		
1 parameter set corresponds to 2 measuring ranges per channel		
Measuring range I	pC	±100 … ±1 000 000
Measuring range II	pC	±100 … ±1 000 000
Note: Above the threshold of ±10 000 pC, switching without measuring error is possible only in the Reset mode.		
4 inputs on 1 channel charge summed		
1 parameter set corresponds to 2 measuring ranges per channel		
Measuring range I (summed charge)	pC	±100 … ±1 000 000
Measuring range II (summed charge)	pC	±100 … ±1 000 000
Note: Above the threshold of ±10 000 pC, switching without measuring error is possible only in the Reset mode.		
Peak memory		
Configurable +Peak, –Peak, (Peak-Peak)/2		
Note: Deleted with Reset.		

Voltage Outputs		
Output voltage	V	0 … ±10
Max. output current	mA	±5
Output impedance	Ω	10
Output voltage limit	V	>±11
Allowed voltage between Sensor-GND and Output/Supply-GND	V	±4
Interference signal rejection between Sensor-GND and Output/Supply-GND (0 … 500 Hz)	dB	>50

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Accuracy of Measurement

Error (transfer factor)	%	<±0,5
Repeatability	%FS	<±0,05
Reset/Measure (Operate) jump	pC	<±2
Zero point deviation	mV	<±30
Output noise (0,1 Hz … 1 MHz)	mV_{pp}	<30
with internal connectible filter (10, 200, 3 000 Hz)	mV_{pp}	<10
Drift at 25 °C	pC/s	<±0,05

Frequency Response

Bandwidth ±3 dB		
<±10 000 pC	kHz	0 … 20
<±1 000 000 pC	kHz	0 … 2
Low pass filter Butterworth (5^{th} order)*	Hz	10
	Hz	200
	Hz	3 000
50 Hz suppression with 10 Hz	dB	60

Group Delay Time

without low pass filter (output)	µs	<15
at 3 kHz low pass filter (output)	µs	<300
at 200 Hz low pass filter (output)	ms	<4
at 10 Hz low pass filter (output)	ms	<80

Offset

Offset adjustable (via RS-232C)	V	±1
Resolution	mV	2

Time Constant

Long	s	100 000

Temperature Range

Operating temperature range [1]	°C	0 … 60
Minimum/maximum temperature [1] [2]	°C	–40/+80
Relative humidity (maximum)	%	60

Supply

Supply voltage	VDC	18 … 30
Current consumption 1 channel	mA	<125
Current consumption each additional channel	mA	<50

Control Signals Electrically Separated

Actuation voltage	VDC	2,4 … 30
Current capacity	mA	0,3 … 6,2
Reset/Measure all channels jointly, de-energized, Reset		
Reset time <±10 000 pC	ms	<9
Reset time <±1 000 000 pC	ms	<90
Measuring range switching, channel-selective, de-energized, Measuring range 1		
Delay time	ms	<2

Connectors

Signal input, sensor	Type	BNC/TNC (neg.)
Degree of protection (EN60529)	IP	60 (BNC)
	IP	65 (TNC)
Supply, control inputs and signal outputs	Type	D-Sub 15 male
Degree of protection (EN60529) with cable connected	IP	67
RS-232C	Type	D-Sub 09 female
Degree of protection (EN60529) with cover Art. No. 5.211.477 or with cable connected	IP	67

RS-232C

EIA standard		RS-232C
Data bits		8
Stop bit		1
Parity		none
SW handshake		none
Baud rate	bps	115 200
Max. cable length	m	5
Max. input voltage, constant	V	<±20
Voltage between case and protective ground	V_{rms}	<20

General Data

Vibration resistance (20 … 2 000 Hz, constant 16 min., cycle 2 min.	g	10
Shock resistance (1 ms)	g	200
Case material	Aluminum, pressure die casting	
Weight	g	≈320

LED

Measure	green constant
Reset	green flashing
Overload	red flashing
ICAM error	red constant

Digital Input Control Signals

Reset/Measure for all channels	Pin	8
Measuring range switching (1/2/3/4) per channel	Pin	15/14/13/12

[1] not condensing
[2] Unit ready for use, though differences may be possible in the technical data

* additionally with PC software ±30 % adjustment about nominal value

The ICAM meets the EMC regulations EN61000-6-3 (interference emissions) and EN61000-6-2 (interference immunity).

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Description

The digital Reset/Operate signal always acts on all channels simultaneously. The measuring range can be switched for each channel selected via their own digital inputs.

Instantaneous output signal and peak value can be recorded for each channel simultaneously at separate connections. Resetting of the peak value in the memory takes place at the same time as the charge amplifier reset.

The range can even be switched during measurement, i.e. with the charge amplifier in the "Measure" mode. For technical reasons this is only permitted if the measuring ranges I and II lie either in the FS ±100 … ±10 000 pC or the FS >±10 000 … 1 000 000 pC range. If this criterion is breached for one measuring range, a corresponding message is displayed on the PC. During parameter setting this allows the PC program to be used to check whether the criterion could be breached. The digital input has higher priority and switches even if this criterion is breached (unlike the PC software).

The peak memory value initially corresponds to the measurement signal. At the first reversal point, the value is retained. If later this value is again exceeded, the signal is corrected again up to the next reversal point. The peak memory is deleted with Reset.

Overload means that the sensor has produced a higher charge than the ICAM can accept. This can result in measuring errors. The original status can be re-established with a Reset. The LED flashes red to indicate this status until the next Reset.

Settings via RS-232C Serial Interface

Range setup:	Range settings I and II
Range switching:	Range I/II
Measure:	Reset/Operate
Peak measure:	+Peak, –Peak, (Peak-Peak)/2
Offset:	0 … ±1 V
Low pass filter (output):	no filter, 10 Hz, 200 Hz, 3 000 Hz an additional ±30 % can be set

PC Software Program

- ICAM settings (e.g. measuring range)
- Control commands for measuring range switching and Reset/Measure
- English and German languages
- Save and load configurations on the PC
- Print configurations
- Firmware update

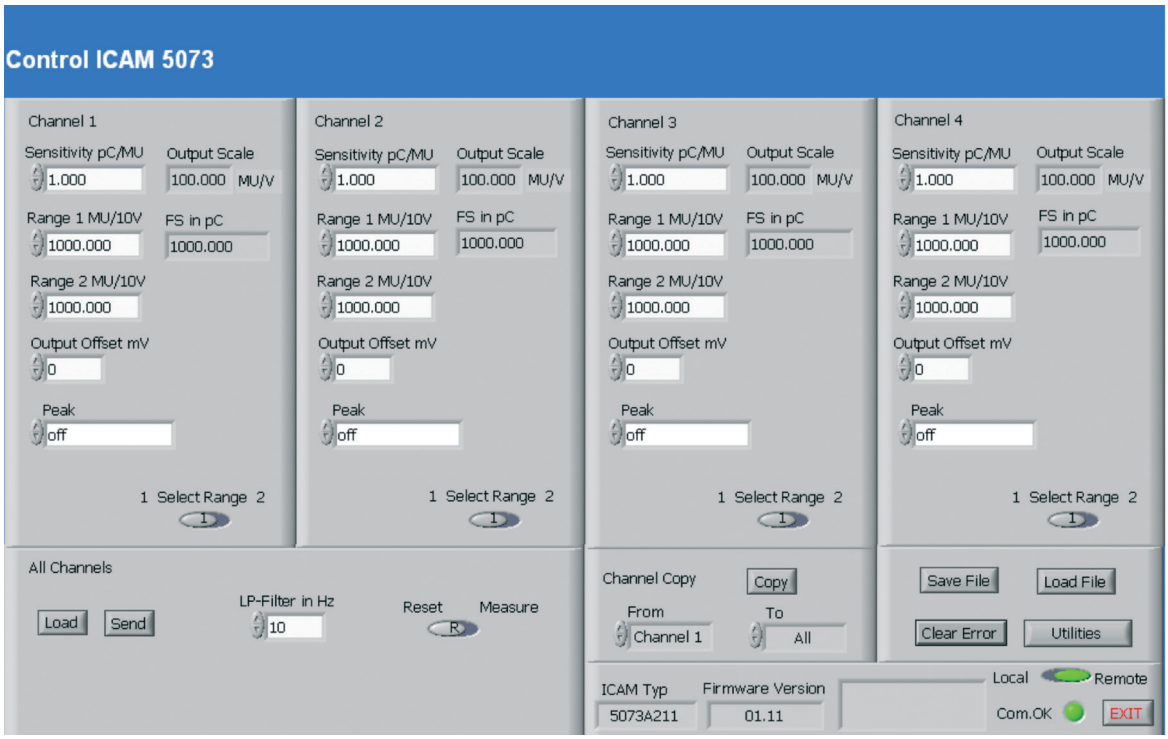

Fig. 1: Man-machine interface, LabView software

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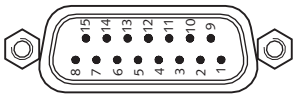
Pin Allocation: Analog Outputs, Supply, Control Inputs and Outputs (Machine)

D-Sub 15 male IP67 (with connector)

1	Output_Ch3
2	Output_Ch2
3	Output_Ch1 (or summing signal for Type 5073A5…)
4	Output_Ch4 (or Peak_Ch3 for Type 5073A3…)
5	Peak_Ch2
6	Peak_Ch1
7	Common Control
8	Measure
9	Exct. GND
10	Signal GND
11	+Exct. 18 … 30 VDC
12	Range_Ch4
13	Range_Ch3
14	Range_Ch2
15	Range_Ch1

Exct/Control/Signal Out

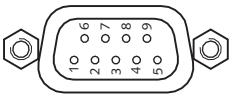


Pin Allocation: RS-232C Serial Interface

D-Sub 09 female IP65 (with connector)

1	NC
2	RxD
3	TxD
4	NC
5	GND RS
6	NC
7	NC
8	NC
9	NC

RS-232C



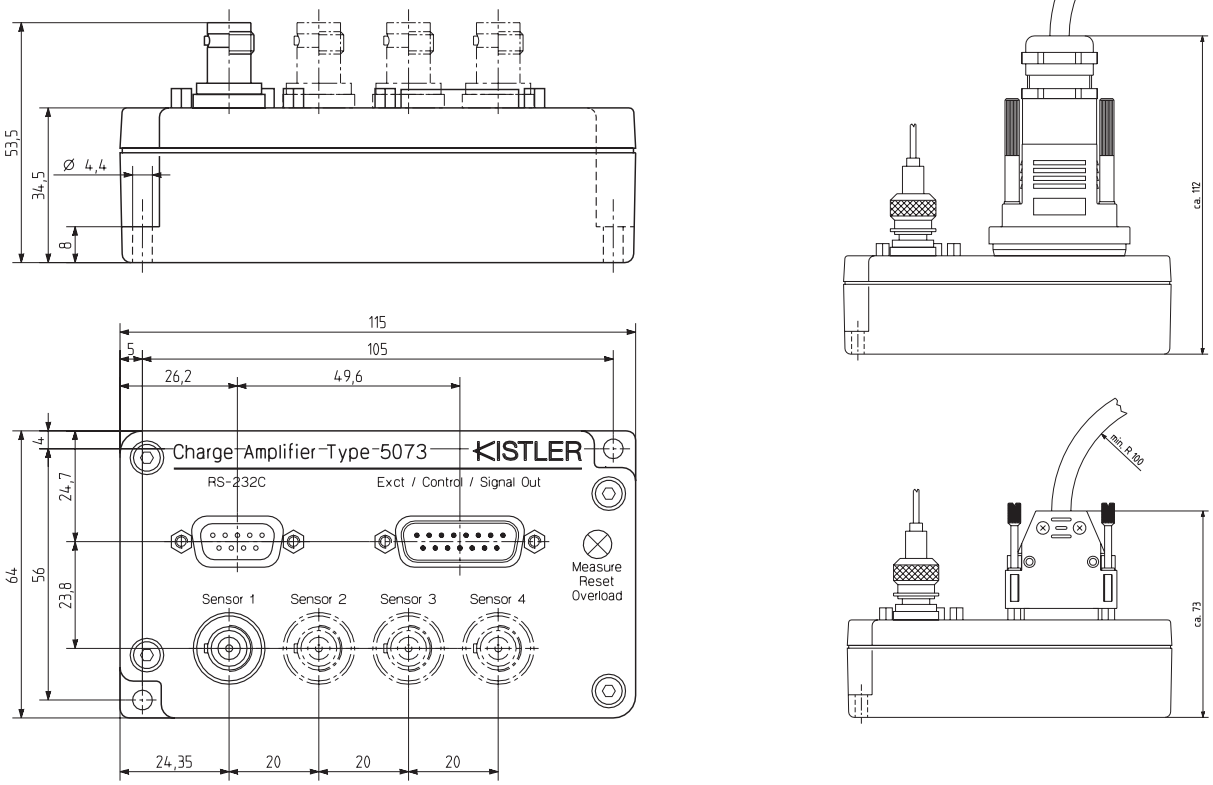


Fig. 2: Dimensions ICAM Type 5073A…

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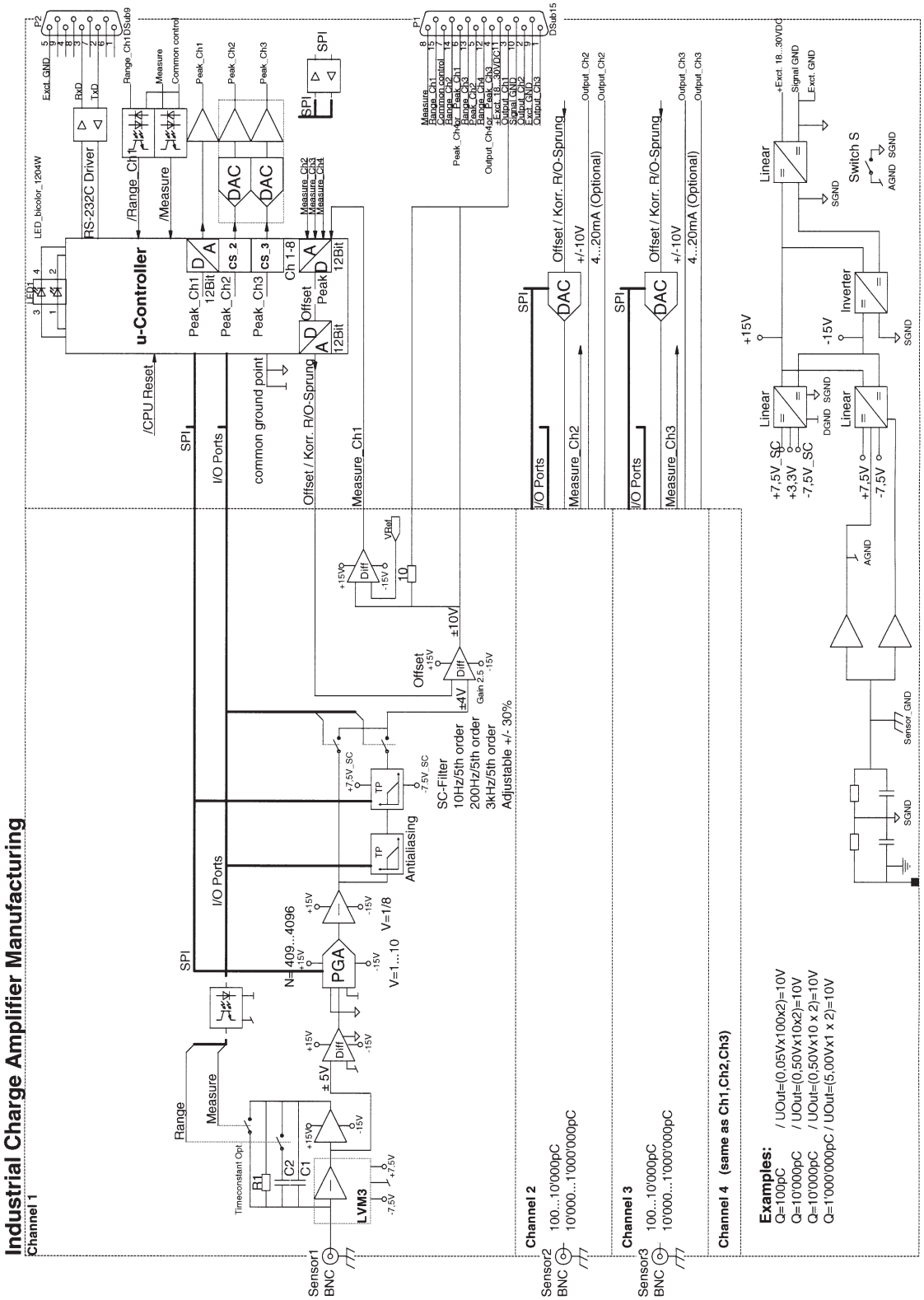

Fig. 3: Block schematic diagram ICAM Type 5073A…

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Accessories Included	Art. No./Type
• D-Sub 15, female, IP40 with metallized cover and lifting screws	7.640.063
• Null modem mini adapter (gender changer) D-Sub 09, male –> D-Sub 09, female	1489
• Installation CD including - Parametrization software "Control ICAM Type 5073A..." - Vi-driver Library for LabView - Flash loader for firmware-updates	7.643.024
• IP67 cover for RS-232C, D-Sub 09, female, connector	5.211.477
• Instruction manual	
• Calibration certificate	

with ICAM Type 5073A5xx:
- 2 sealing caps for connectors

Optional Accessories	Art. No./Type
• RS-232C cable, l = 5 m, null modem, D-Sub 09, male, D-Sub 09, female	1200A27
• D-Sub 15, female, IP67 with M20x1,5 lifting screws for cable diameter of 6 … 12 mm	7.640.085
• D-Sub 15, female, IP40 with open ends, l = 5 m	1500A41A5
• D-Sub 15, female, IP40 with open ends, length according to order (L_{min} = 1 m/L_{max} = 10 m)	1500A41Asp
• D-Sub 15, female, IP65 with open ends, l = 5 m	1500A42A5
• D-Sub 15, female, IP65 with open ends, length according to order (L_{min} = 1 m/L_{max} = 10 m)	1500A42Asp
• Converter USB 1.1 to RS-232C D-Sub 09, male, USB 1.1	2867
• Transitional coupling TNC pos. – BNC neg.	1709

In order to control an amplifier with a PC or a control system via the RS-232C interface, a null modem cable is required, which crosslinks pin 2 and pin 3. This ensures that the transmitter and receiver can communicate with one another over a single cable. In the case of standard cables (e.g. extension cables) without this crossing, the Mini Adapter Type 1489 must additionally be fitted in the connection at the amplifier end. Crossing with the Mini Adapter is also necessary for using RS-232C adapters on USB. On the other hand, Kistler null modem cables such as Type 1200A89 or Type 1200A27 do not require the Mini Adapter.

Ordering Key

Type 5073A □ □ □

1 channel/1 peak memory	**1**
2 channels/2 peak memories	**2**
3 channels/3 peak memories	**3**
4 channels/2 peak memories	**4**
1 channel (4x1 channel summed)	**5**
BNC neg. connector	**1**
TNC neg. connector	**2**
0 … ±10 V output signal	**1**

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