Notice Inviting Quotations

Sealed quotations in separate envelops of technical and commercial bid kept in one sealed outer envelope, are invited for purchase of “Complete Automation Solution for Research Mould” including the hardware and software as per specifications given below. Your sealed quotation should reach within 15 days (latest by 25th June 5.00 pm) from the date of advertisement, to the undersigned. Your quotation must be super-scribed “Quotation for Complete Automation Solution for Research Mould”.

Specifications desired for the purchase “Complete Automation Solution for Research Mould”

1. System supported with single user licensed version of data acquisition and control software for MS-windows OS.
2. Data acquisition and control hardware should be capable to meet the following control & automation tasks (see appendix-I);

   (a). Control of Permanent Magnet Servo Motor (Make: Electrocraft Corp.) without driver circuit. The system should be able to control the RPM of motor and encoder feedback about the movement.
   
   Note: Only motor (without driver and encoder) will be provided by the IIT-D.

(b). Control of Mold Heating
   (i).Sensor: Two thermocouple (J-type) each mounted on fixed and moving halves of mould.
   (ii).Controller: Based on PID Logic
   (iv).Heaters: There will 8 heaters (750W/230V – 4No. and 400W/230V – 4No.).
   
   Note: The heaters and thermocouples will be provided by the IIT-D.

(c). Pressure and Temperature Data acquisition from the PT-sensor (Piezoelectric) make Kisler, model PT-sensor 6189ASP and model Charge amplifier: 5155A21D1 (see appendix-II for detailed specification of PT sensor and charge amplifier).
   
   Note: The above mentioned PT sensor and charge amplifier will be provided by the IIT-D.

(d). Control of centrifugal pump (Mold cooling)
   (i).Controller: On/Off type

(e). Control of Pneumatic Cylinder
   (i).Controller: On/Off type
   (ii). Actuation: Via Solenoid operated pneumatic direction control valve.
   (iii). Pneumatic Cylinder: dia 50mm, stroke 70mm, working pressure 6 – 8 bar make: Festo.
Note: The Pneumatic Cylinder and compressed air facility will be provided by the IIT-D.

3. Include the wiring, insulation cable, connectors etc. required for connection between the sensors/ FCE and control hardware.

4. A PC/ Laptop along with UPS installed with MS-Windows (XP) will be provided by IIT-Delhi.

5. Include the housing/ cabinet (if needed) for hardware attached with PC.

6. The user interface should be designed in coordination with IIT-Delhi.

7. The system should be synchronized with injection molding machine make Battenfeld, Austria having B&R PLC as controller. Also the system should get the information from the injection molding machine’s controller about the start and end time of each molding operations such as start of injection phase to end of injection phase, etc.

8. Export of acquired data in popular formats such as .xls, .txt etc.

9. Should provide the source code as well as .exe file to IIT-Delhi as its sole property.

Terms & Conditions:
1. The quotations must have validity of at least four months.
2. Sealed quotations should be in separate envelopes of technical and commercial bid kept in one sealed outer envelope.
3. The products will be used for educational purposes. Any applicable academic institution discounts should be offered and stated.
4. Detailed Brochures should accompany the offer.
5. If the bidder is an authorized dealer then the authorized Indian dealership certificate from the principles should be enclosed.
6. Two year comprehensive warranty of smooth running of supplied system.
7. Payment will be 100% after successful installation and commissioning only.
8. In case the items are proprietary products of the company, a proprietary item certificate stating the same must be provided.
9. Institute reserves the right to accept or reject any or all the quotations without assigning reasons thereof.

Prof. Naresh Bhatnagar
Room 178, Block 3,
Mechanical Engineering Department
IIT Delhi
Multichannel Amplifier
for the Injection Molding Industry

The purpose of the multichannel charge amplifier Type 5155A... 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 (Smartlep-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 MUX). 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 an input capacitor for negative feedback amplifier in hybrid design with an extremely high insulation resistance.

In thermoplastic injection molding, the Smartlep 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 I thermocouples. The output signals can be used to monitor, control and optimize the injection molding process.
### Technical Data

**Change Amplifier**
- Number of channels: 1 or 2
- Measuring range: ±5,000
- Input impedance: >1 MΩ
- Output impedance: 10

**Thermocouple Regulator**
- Type of channels: 1 or 2
- Measuring range: 0°C to 100°C
- Output voltage: ±10 mV
- Input impedance: >1 MΩ
- Output impedance: 10
- Zero point error: ±10 mV
- Sensitivity: ±50 mV/V
- Error (range): ±0.5% of measurement
- Zero point error: ±1.5°C
- Sensitivity: ±20 mV/V
- Frequency range: 0...1 kHz
- Sensitivity: ±4 V

- 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 Relay/Operator, Measuring Range II, Sensitivity, Test

- Action voltage Input is electrically isolated via optocoupler. The common input of Test/Operator/Measuring ranges I & Sensitivity (Control) GND, Pin 18 of the D-sub connector can be connected internally either with the potential Ext 18...30 V DC or Ext GND. Accordingly, Test, Operator, Measuring range 2 and Sensitivity are actuated with negative voltage or optionally with user-specified voltage.

#### Output Current

<table>
<thead>
<tr>
<th>Error (%)</th>
<th>±1.3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output current</td>
<td>±0.01 mA</td>
</tr>
<tr>
<td>Output current limit</td>
<td>±16 mA</td>
</tr>
<tr>
<td>Maximum load resistance</td>
<td>±600 ohms</td>
</tr>
</tbody>
</table>

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

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**FK/SL**

The outputs are switched via photo MOS relays.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current rating, continuous</td>
<td>mA</td>
</tr>
<tr>
<td>Current rating, pulse (0.1 s)</td>
<td>mA</td>
</tr>
<tr>
<td>Resistance when switched on</td>
<td>Ω</td>
</tr>
<tr>
<td>leakage</td>
<td>Ω</td>
</tr>
<tr>
<td>Contact voltage</td>
<td>V</td>
</tr>
<tr>
<td>Voltage between outputs and protective ground</td>
<td>V</td>
</tr>
</tbody>
</table>

### Power Supply

<table>
<thead>
<tr>
<th>Supply voltage</th>
<th>V DC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current consumption per channel</td>
<td>mA</td>
</tr>
<tr>
<td>Charge amplifier channel (without load and without SLP)</td>
<td>10</td>
</tr>
<tr>
<td>Thermocouple channel (without load)</td>
<td>15</td>
</tr>
<tr>
<td>Additional current consumption</td>
<td>mA</td>
</tr>
<tr>
<td>SLP</td>
<td>15</td>
</tr>
<tr>
<td>Current output per-channel (without load)</td>
<td>mA</td>
</tr>
<tr>
<td>2.5</td>
<td></td>
</tr>
</tbody>
</table>

### Connections

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Charge Input</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>THC reg. or BHC reg. or 4-channel flusher multiple plug</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Thermocouple Input</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>FFC/F</td>
<td></td>
</tr>
<tr>
<td>DIPU102 A051 female</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Supply, signal outputs; Control inputs</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>D-Sub</td>
<td></td>
</tr>
</tbody>
</table>

### General Data

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating temperature range</td>
<td>°C</td>
</tr>
<tr>
<td>Min./Max. temperature</td>
<td>°C</td>
</tr>
<tr>
<td>Vibration resistance</td>
<td>g</td>
</tr>
<tr>
<td>2000 Hz, duration 16 min., cycle 2 min.</td>
<td></td>
</tr>
<tr>
<td>Shock resistance</td>
<td>g</td>
</tr>
<tr>
<td>2000 g</td>
<td></td>
</tr>
<tr>
<td>Degree of protection (only with screw-on THC connection)</td>
<td>IP</td>
</tr>
<tr>
<td>NEMA 4X</td>
<td></td>
</tr>
<tr>
<td>Housing material</td>
<td>Material</td>
</tr>
<tr>
<td>Aluminum</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>g</td>
</tr>
</tbody>
</table>

- Recommended measuring 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.
Block Schematic Diagram

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

** 2 cheese-head screws M4 x 16
632.0102

** 2 spring washers M4
6230.0693

** TNC-BNC adapter
1706

** Connecting cable (with open end) for connection to the injection molding machine
1204A73

Optional Accessories

** D-Sub plastic cover, water-tight, shielded and 25 pin-D-Sub connector (CONBUS 160 X 16095X)
1557A19

** Connecting cable (equalizing cable) for the connection of temperature sensors
Length = 2 m
2295A2

Length = 5 m
2295A3

Ordering Key

Measuring Range E (in Kelvin)

<table>
<thead>
<tr>
<th>Art. No./Type</th>
<th>1</th>
<th>2</th>
<th>According to order</th>
</tr>
</thead>
<tbody>
<tr>
<td>E20 0 00 Tc</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E30 0 00 Tc</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Ratio Measuring Range E/Measuring Range I

| 10 | 1 |
| 5 |   |
| 2 |   |
| 3 |   |

Channels, Sensor Connection

1 channel charge, TNC ngt. (IP65)
1

2 channel charge, TNC ngt. (IP65)
2

3 channel charge, TNC ngt. (IP65)
3

4 channel charge, TNC ngt. (IP65)
4

4 channel charge, 4 channel connector for cable type 1005A
5***

1 channel charge, TNC ngt., 1 channel thermometer (IP65)
6***

1 channel charge, TNC ngt., 1 channel temperature (IP65)
7***

2 channel charge, TNC ngt., 2 channel temperature (IP65)
8***

2 channel charge, TNC ngt., 2 channel temperature (IP65)
9***

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 = 30 000 pC and ratio Range I/Range: 1:4
*** Charge amplifiers are supplied only with range I = 20 000 pC and ratio Range I/Range: 1:4
**** Charge amplifiers are supplied only with range I = 20 000 pC and ratio Range I/Range: 1:4, without Smartamp, current output not available

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