



## **Istat 300** **Electrical Transducers**

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The Istat 300 range of electrical transducers, introduced in 1990, has been successfully sold all around the world, providing high accuracy and reliability at competitive cost. Available in two case sizes, 55mm and 150mm wide, the transducers can be used in a variety of applications.



### Product Features

- 0.2% full scale accuracy for current and voltage transducers
- 0.2%\* of reading accuracy for watt and var transducers
- 4kV isolation withstand
- 3 x continuous current overload rating
- Integral dc auxiliary supply option
- Flexible mounting
- Simple to order
- High packing density
- Tested to IEC 801 for radio frequency and electromagnetic interference immunity.
- Full range of ac and dc measurements
- High stability

### Customer Benefits

- Significant gains in overall system accuracy can result from improvements in source measurement. Istat 300 provides that improvement in source measurement.
- Compliance with all relevant international specifications ensures transducer can be used in any country.
- Ensures long life expectancy and very reliable operation in all climates.
- Provides flexibility in terms of power requirements. The need for dc/dc converters is greatly reduced.
- DIN rail and panel mount options exist. A customer specified mounting plate is also available enabling Istat 300 to be fitted in many retrofit applications.
- Quick and simple means of transducer selection.
- Typically up to three current or voltage transducers can be housed in a single 150mm case.
- Known performance under these types of environmental conditions.
- All requirements can be sourced from one supplier.
- Minimises maintenance costs as readjustment is not required.

\*Referred to as 0.2% in this publication, actually 0.19% reading + 0.01% FSD.

## A History of Transducer Design

ALSTOM T&D Protection & Control has produced electrical transducers for over 30 years and has gained a great deal of knowledge in their design, manufacture and application.

## Application

In the international market for precision electrical measurement

and control, the transducer has become the standard, providing local and remote indication in conjunction with instruments, recorders, data loggers and Supervisory Control and Data Acquisition systems (SCADA).

Transducers with high accuracy and reliability are becoming increasingly important features in the provision of cost effective system control. Istat 300 has been designed to meet these requirements.

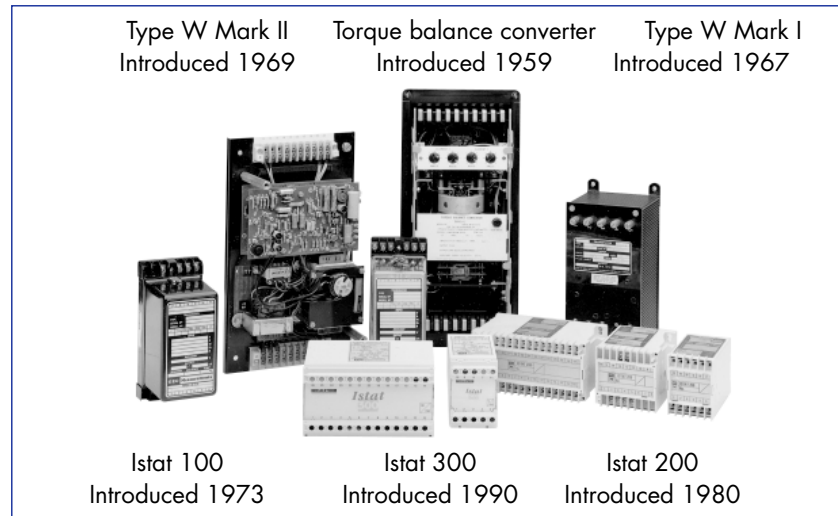
## Why Istat 300?

Istat 300 is the result of extensive market research. The purpose of this was to reconsider the developing needs of the market on an international scale, across applicable industry sectors - electrical utilities, switchgear/switchboard manufacturers, energy management, SCADA, building management and control, process control and instrumentation.

Customers' comments on our own Istat 200 range and those offered by other transducer manufacturers were prime considerations.

Istat 300 is the result of inspired engineering design with the brief to 'design-in' the highest possible quality at the lowest possible cost to the customer.

A high specification transducer with genuine, proven reliability, Istat 300 combines quality and value.



## Inherent Design Quality

ALSTOM T&D Protection & Control manufactures for the highly specialised power system protection market and all products are inspected to ensure ultimate quality at each stage of manufacture within quality systems conforming to ISO 9001.

Quality control procedures start in the Electronic Components Appraisal Department where all low and medium volume

components are individually tested against specified parameters and tolerances. High volume components are sample tested to an AQL of better than 0.25%.

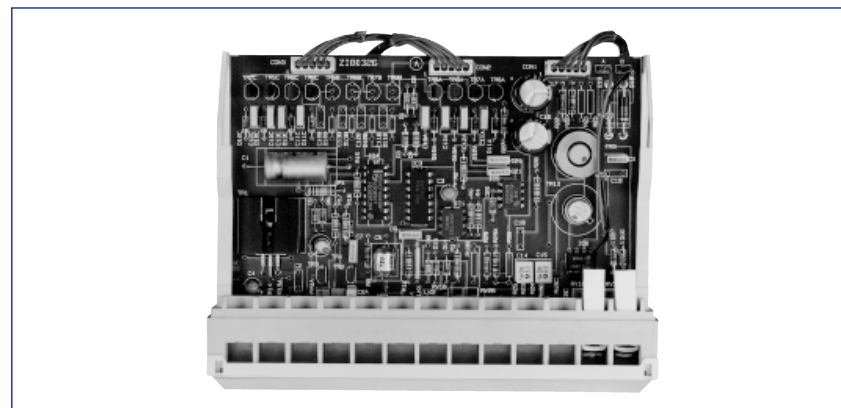
## Durability and Reliability

Careful selection of components and inherent design quality ensure that Istat 300 transducers have the highest combined specification of

any transducer in the world. This not only results in outstanding performance but also has the additional benefits of extreme reliability and unparalleled durability. Mean time between failure analysis predicted times of between 50 years and 25 years for transducers with low and high component counts respectively.

## Stability

Long term drift has always been a problem in the design of analogue transducers, leading to the use of zero and span adjustment potentiometers to 'trim out' resulting errors. The annual readjustment of a transducer by this method not only requires system downtime, which can be very expensive, but is also self-defeating. Adjustment potentiometers are highly susceptible to changes in



Typical circuit board shown

temperature, producing further drift.

Careful attention to design and the provision of only a minimal amount of adjustment, guarantees that Istat 300 transducers have a stability of 0.1% per annum non-cumulative. This level of stability means that Istat 300 transducers can endure a lifetime of maintenance-free operation.

In keeping with our policy of offering the most enhanced transducer specification available, Istat 300 will only be supplied with significant span adjustment, up to  $\pm 20\%$ , when specially asked for by our customers.

### Testing Istat 300

Istat 300 transducers are adjusted and calibrated using specially commissioned test equipment, having current and voltage dispensers which are stable to within 0.05% and have total harmonic distortion levels of less than 0.02%. Precision digital voltmeters and wattmeters, accurate to 0.02%, are used to calibrate to within 0.2% of full scale for current and voltage transducers and 0.2% of reading for power transducers. This accuracy is not stated at specific reference conditions but is guaranteed for a complete range of operating conditions including a temperature range of 0 to 50°C.

The test equipment used in manufacture is computer controlled, thus substantially eliminating human error. Software storage of all test results ensures a permanent record of transducer performance and is directly traceable back to international standards assured by Company quality control procedures.

An example of a hard copy linearity plot is shown in Figure 1. shown in Figure 1.

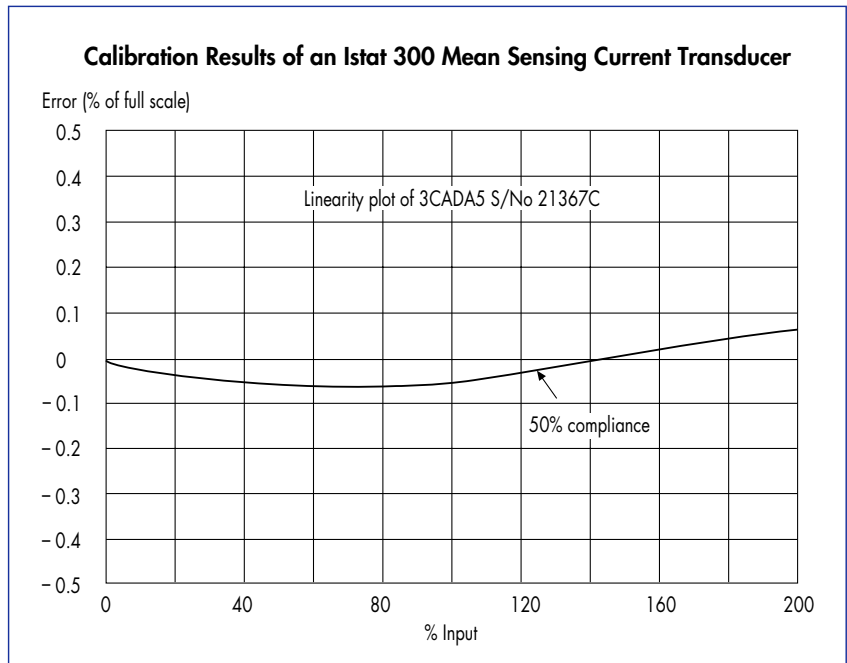


Figure 1

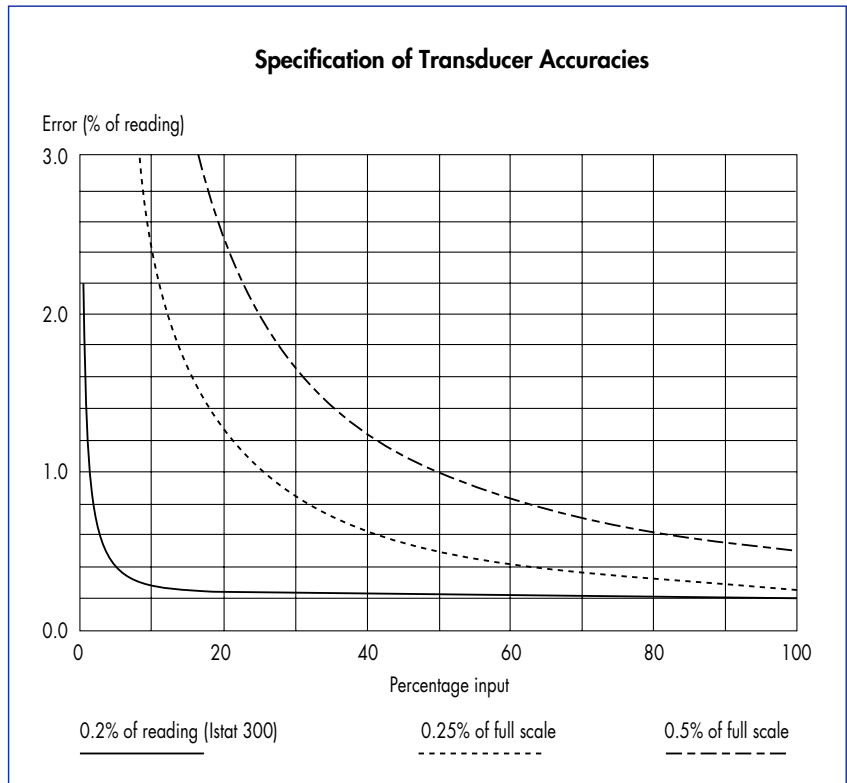


Figure 2

### 0.2% Accuracy

The accuracy of Istat 300 transducers allows significant gains in overall system accuracy to be achieved.

Istat 300 power transducers, at 0.2% of reading are especially accurate.

Figure 2 shows that the transducer remains accurate right down to low level of power input which is a significant improvement compared with transducers having accuracies of 0.25% or 0.5% of full scale.

## True RMS Transducers

Modern power systems are subject to distortion whether it be from electronic control systems or non-linear loads. The level of harmonic distortion can be substantial; up to 5% 3rd harmonic is common. When evaluating the use of measuring equipment, any errors resulting from harmonic distortion should be taken into consideration.

Istat 300 current and voltage transducers are available in two basic types; mean sensing and true r.m.s.

Although calibrated in true r.m.s. terms, the mean sensing device measures the average of the input signal and hence will only be within the claimed limits of accuracy when used to monitor pure sinusoidal waveforms. As shown in Figure 3, even low levels of 3rd harmonic distortion can easily result in a 1% error on the output of a mean sensing transducer.

It should be noted that calibrating or checking a mean sensing voltage or current transducer using anything but a high stability source with low total harmonic distortion, can result in an erroneous output.

True r.m.s. current and voltage transducers utilise square-law circuitry to measure the true r.m.s. value of the input waveform within the claimed limits of distortion. Consequently, these devices are immune to all but high levels of distortion as shown in Figure 3.

Power transducers utilise pulse height-width modulation of a square wave as the basic measurement technique and, as such, respond correctly up to tenth harmonic.

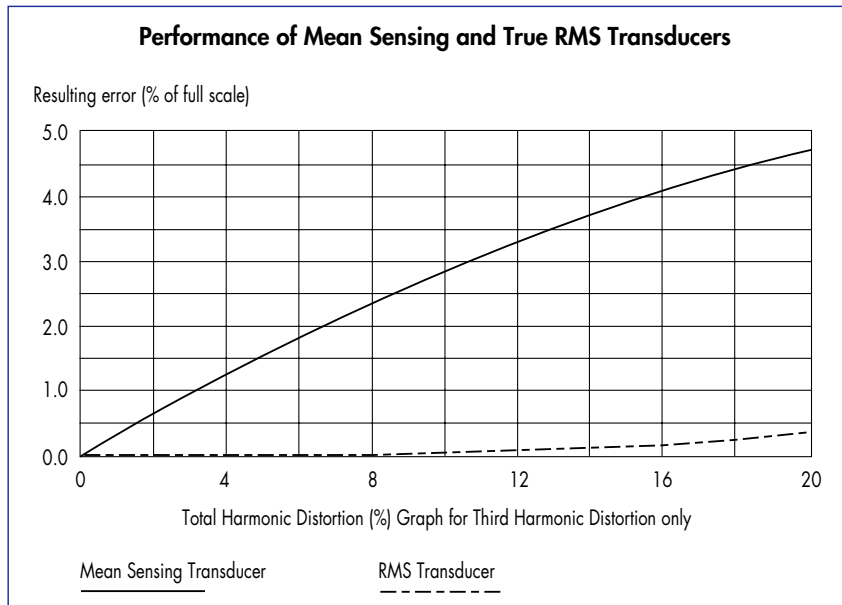


Figure 3

## Three Phase Power Measurements

Where power systems are of an unbalanced nature, three types of power transducer are available.

Three phase, three wire systems can be monitored by using a device with two measuring elements - the classic 'two wattmeter method.'

Devices for measuring three phase, four wire systems require an additional measuring element to ensure a correct mathematical solution and hence utilise three elements. However, it should be recognised that, if the voltages on such a system are balanced, which is often the case, then the mathematically correct "2<sup>1/2</sup> element" solution can be used without losing measurement integrity.

2<sup>1/2</sup> element versions of Istat 300 watt and var transducers are available as standard and offer the user a precise and cost effective solution to applications involving four - wire unbalanced load systems.

## Energy management

A kilowatt-hour energy measuring transducer is available as a 1, 2, 2<sup>1/2</sup> & 3 element device for measuring energy on single or three phase power systems. An accurate analogue output at 0.2% of reading represents the system power while a pulsed relay output (150ms pulsed or 50% duty cycle) provides the energy measurement with accuracy of 0.5% of reading.

## Fast Response

Istat 300 transducers are designed to, and comply with, international standard IEC 688-1 and, as such, offer response times of typically 500 ms for a step change of the input of 0...99%, equivalent to 300 ms for 0...90%.

Some applications require fast response devices, for example, where low frequency modulation of the input signal occurs. An example of such an application would be to monitor power swings at the connection points of a power system network which are often at frequencies of 2 to 3 Hz.

To monitor modulated waveforms requires a response time of around 55 ms for step input changes of 0...90%. Specialised Istat 300 transducers have been used and are available for such applications.

## Istat 300 Transducer Range

The following types of transducer are available within the Istat 300 range.

### AC Measurements

Current	Mean sensing True r.m.s. Single or triple element
Voltage	Mean sensing True r.m.s. Single or triple element Suppressed zero true r.m.s.

### Power Watts and vars

1, 2, 21/2, 3 elements
Combined watt/var, 2 element
kWh 1, 2, 21/2, 3 elements

### Phase Angle

Frequency	0.1% standard 0.01% precision
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### DC Measurements

Current	up to 10A dc
Voltage	up to 1500V dc
Summation	up to 12 inputs
Resistance	2 or 3 wire
Tap Position	
Temperature	Thermocouple or RTD

Each transducer has an analogue dc output linearly proportional to the input.

## Other Information

For technical data and ordering information see Publication I4-028.

Application Guide for Electrical Measuring Transducers  
Publication I9 - 113

## Specify Istat 300

The following will help you to incorporate Istat 300 transducers into your specification.

"Transducers should be of the case-mounted type having the following specification.

- 0.2 CLASS INDEX accuracy with 0.19% of reading +0.01% FSD accuracy for watt and var transducers.
- 3 times continuous current overload capability at 25°C
- 4 kV isolation between all inputs and outputs for 1 minute

All transducers should be capable of either DIN rail mounting or surface mounting. Removable terminal covers to be provided which protect M4 terminals.

Each transducer is to have three labels.

- Removable front label providing indication of terminal numbers
- Metallised polyester foil side label containing rating information
- Metallised polyester foil side label containing wiring diagram

Any adjustment potentiometers should only be accessible from the front of the transducer after first removing the front label, thus preventing unauthorised adjustment.

Transducer housing to be of two part construction with the terminal plate being made of flame retardant glass filled modified PPO to UL94 V1 with a minimum comparative tracking index of 200 to IEC-60112.

The case material should be flame retardant polycarbonate to UL94 V0.

Transducers should have provision for being powered by a dc

### Electromagnetic Compatibility Directive 89/336/EEC

Emissions standard	EN 50081-2 1994 Industrial environment
Immunity standard	EN 50082-2 1995 Industrial environment (IEC 60801 parts 2, 3 and 4)

Susceptibility to Electrostatic Discharge 8kV air discharge/4kV contact. Warning: This specification applies when the front cover is fitted. If the front cover is removed to gain access to the adjustment potentiometers then appropriate ESD protection must be taken.

### Low Voltage Directive 72/23/EEC







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