

User Friendly Software for the IPAQ Transmitters

IPRO 4 is the software with which all the versatile functions of the IPAQ transmitters can be utilized. The software lets you prepare configurations, save them as files and transfer them to any IPAQ transmitter. Printing of configuration protocols is also possible.

Besides configuring, IPRO 4 can also be used to monitor the input and output signals with real time on-screen presentations.

The program is menu-driven and very easy to learn and use. On-line help is an effective tool for all users.

IPRO 4 will work with all products of the IPAQ family.



System requirements

IPRO 4 is compatible with Windows 3.1, Windows 3.11, Windows 95 and Windows NT Workstation 4.0. To run IPRO 4 you need a PC with 486 processor or better, at least 3 Mb free hard disk space and a VGA-display (640x480) or better.

Communication

The communication kit, IPRO-X, includes the IPRO 4 software on diskettes and an isolated and Ex-approved (CENELEC) communication cable with connector for a 9-pole serial port (RS232).

The basic IPAQ transmitters need to be powered up before communication can start.

The IPAQ^{PLUS} transmitters do not require any power supply for the communication.

True on-line communication is also possible, meaning that the user has full access to all features of the IPAQ transmitters while in operation.

User settings

After the installation of IPRO 4, the user can choose between certain parameters, e.g. the language, which today (May 1998) includes English, German, French, Spanish, Dutch, Finnish and Swedish. Other parameters to be set are the temperature standards, IPTS 68 or ITS 90, and temperature units, °C or °F. The settings can be changed at any time. *See figure 1.*



Fig.1. User settings in IPRO 4.

The same software for all IPAQ transmitters

The IPRO 4 software is used for all the transmitters in the IPAQ family, and whenever a new version of IPRO 4 is released, it will be compatible with previous versions of the IPAQ transmitters. *See figure 2.*

Configuration of input type and measuring range

After choosing the transmitter type to be configured, the first step is normally to set the input type and the measuring range. With IPRO 4 approximately 20 different input types are available including RTDs, resistances, thermocouples, voltage and current (for certain IPAQ transmitters). *See figure 3.*

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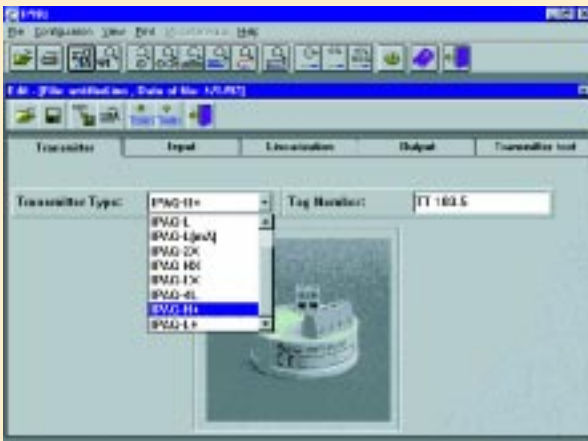


Fig.2. One software for all IPAQ

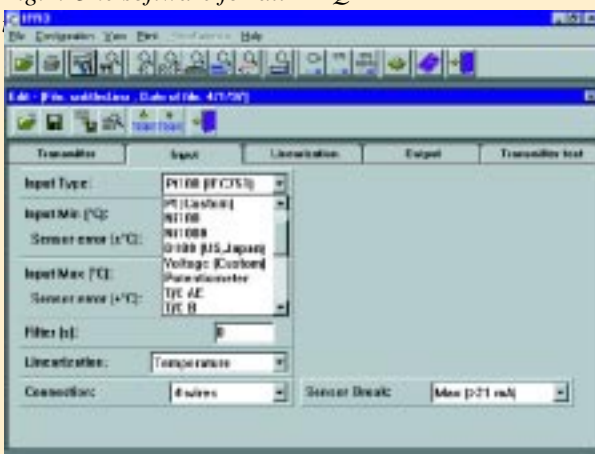


Fig.3. Approximately 20 input types available.

Also related to the input are features like Sensor Error Correction, Dampening, Sensor Break Monitoring and Sensor Isolation Monitoring. *Figure 4 shows an example of an input configuration.*

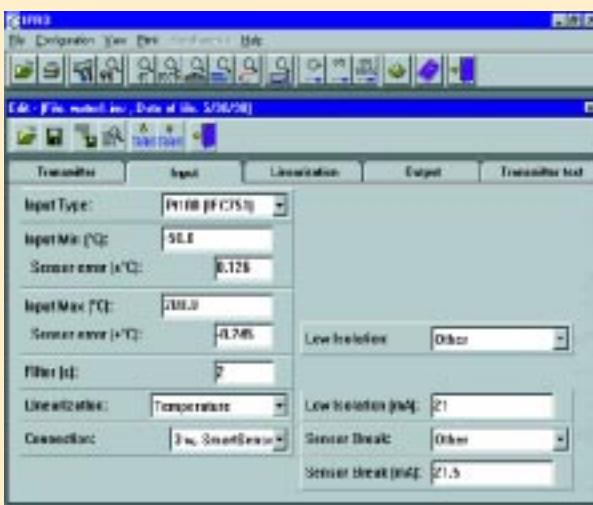


Fig.4. Example of an input configuration.

Temperature measurements with RTDs and other resistances

The IPAQ transmitters can be configured for inputs from standardized Platinum and Nickel RTDs like Pt10 to Pt1000 acc. to IEC 751 ($\alpha=0.00385$), Pt100 acc. to JIS 1604 ($\alpha=0.003916$) and Ni100/Ni1000 acc. to DIN 43760, as well as inputs from plain resistance sensors such as potentiometers (max. 2000 ohm).

3- or 4-wire connection can be chosen.

Sensor break monitoring, and a Sensor isolation monitoring are standard features. *See below.*

Measurements with thermocouples, voltage and current

The configuration possibilities also covers inputs from 11 types of standardized thermocouples (T/Cs) as well as plain mV, V or mA input (mA only for certain transmitter types).

For T/C input, the CJC (cold junction compensation) is normally set as fully automatic, by means of an accurate measurement of the terminal temperature. Some IPAQ transmitters can also be configured for an external CJ temperature.

Sensor break monitoring (for T/Cs), and Sensor isolation monitoring are standard features. *See below.*

Dampening function

The dampening function can be used to effectively dampen undesired instabilities on the input signal.

For the IPAQ^{PLUS} transmitters, the dampening time can be set to values between 0 and 10 seconds in intervals of 1 second.

For the other IPAQ transmitters an approximately 2 seconds dampening time can be activated.

The dampening time is the time, in addition to the update time of the transmitter, for the output to go from 0 to 90% of its final value after a step change has been applied to the input.

Sensor or System error correction

By means of IPRO 4 the IPAQ transmitters can be configured to improve the measurement with temperature sensors in two different ways:

Sensor error correction

Known sensor errors compared to the standard curve, e.g. for a calibrated sensor, are entered, and the transmitter automatically corrects for the sensor errors.

See figure 5.

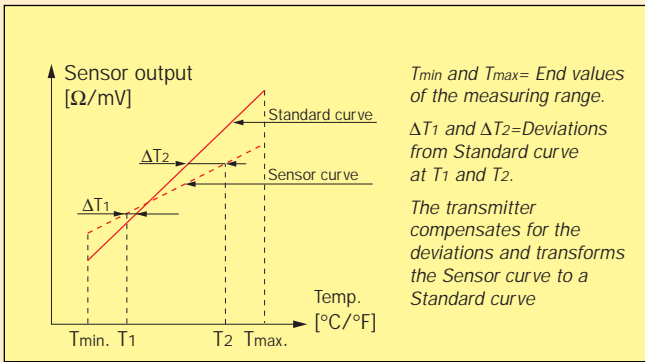


Fig.5. Sensor error correction.

System error correction

This method is used to correct the system errors (sensor and /or transmitter error) by exposing the sensor to one (one-point correction) or two (two-point correction) accurately measured temperatures (true temperatures). The true temperature(s) and the corresponding transmitter reading(s) are entered, and the transmitter automatically corrects for the system errors. See figure 6.

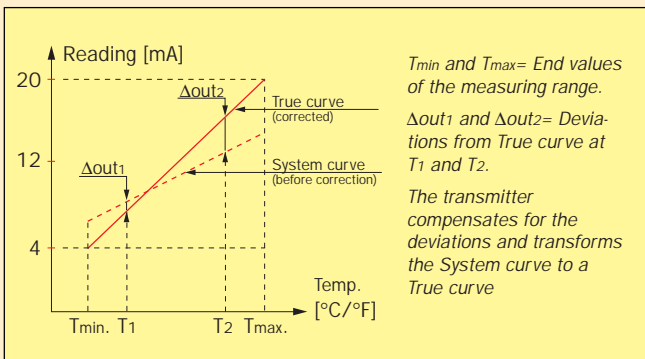


Fig.6. Two-point System error correction.

Sensor break monitoring

The Sensor break monitoring checks the sensor leads and forces the output signal to a user defined level, if any of sensor leads is broken or disconnected. When performing the input configuration, this function can be activated and the output signal under fail conditions will be defined.

SmartSense - Sensor isolation monitoring

SmartSense continuously monitors the isolation resistance of thermocouples and 3-wire connected RTDs as well as the cabling between sensor and transmitter. The transmitter will react by forcing the output to a user defined level if the isolation is below a preset level. When performing the input configuration, this function can be activated and the output signal under fail conditions will be defined. For detailed information, see section Theory and Facts.

Engineering units

An outstanding feature in IPRO 4 is the ability to use Engineering units for directly specifying the measuring range of the primary process value, e.g. °C, °F, mbar, mS etc. For the IPAQ^{PLUS} transmitters, customized engineering units can also be entered. A change of the transmitter’s measuring range can be done directly in engineering units. See figure 7.

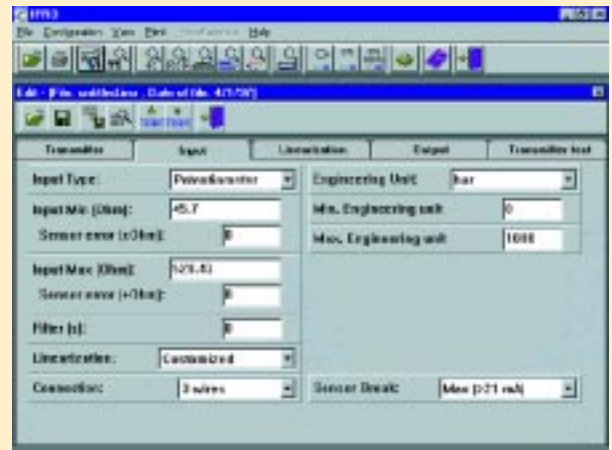


Fig.7. Engineering units is a useful tool

Customized linearization

A very accurate and versatile 40-point Customized linearization is available for the IPAQ^{PLUS} transmitters. A simplified version (with 9 linearization points) is available for the other IPAQ transmitters. The 40-point linearization can be used to create almost any type of linearization curve for RTD, T/C, resistance and mV inputs. By combining Customized linearization with the use of Engineering units (see above), the transmitters can be programmed to give a linear output corresponding to a specific measuring range of the primary process value. Figure 8 shows an example of how to use the Customized linearization.

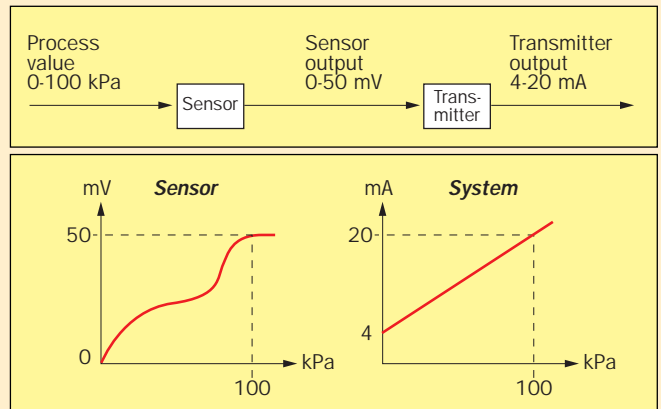


Fig.8. Exemple of a system (sensor + transmitter) with an output linear to the process value, in spite of a non-linear sensor.

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Editing a linearization

Customized linearization is utilized in two ways with the IPAQ^{PLUS} transmitters: either by entering data pairs or by entering the coefficients of polynomials. The other IPAQ transmitters work with 9 data pairs and not with polynomials. The following description apply to the IPAQ^{PLUS} transmitters.

Data pairs

Up to 40 data pairs can be entered to describe the sensor characteristics. In addition up to 7 data pairs can be entered to describe the cold junction compensation (CJC) of a thermocouple. See figure 9.

No.	In	Out	No.	In	Out	No.	In	Out	No.	In	Out
1	0	05.7	10	245	115.502	20	503	200.700	30	753	267.702
2	25	54.9399	12	372	121.546	22	579	208.778	32	764	371.620
3	36	63.8071	14	250	121.220	23	507	258.311	33	725	208.407
4	133	68.8389	14	475	138.479	24	808	308.313	34	879	407.827
5	165	74.8099	15	438	143.8	25	825	307.343	35	895	425.796
6	189	81.3185	16	475	158.818	26	837	314.307	36	885	444.978
7	230	87.7654	17	508	158.207	27	870	325.364	37	914	464.981
8	260	94.3027	18	501	155.701	28	863	327.349	38	943	485.031
9	288	100.980	19	518	157.462	29	895	338.391	39	972	508.586
10	317	108.146	20	536	157.818	30	908	342.397	40	1000	528.43

Fig.9. Linearization with data pairs.

Polynomials

The sensor characteristics can be described by third order polynomials. To achieve the highest possible accuracy, the signal to be linearized can be divided into a maximum of 8 parts where each part is individually described by a separate polynomial. Interesting parts of the signal can therefore be linearized with a higher degree of accuracy. Similarly the cold junction compensation of a thermocouple can be divided into a maximum of 4 polynomial parts. Figure 10 shows an example with 2 polynomial parts.

Polynomial	Low limit	High limit	p0	p1	p2	p3
Polynomial 1	0	1000	4.927481	1.627481	1.279481	2.109481
Polynomial 2	500	1800	1.002482	1.442481	1.432481	2.172481

Fig.10. Linearization with polynomials.

Output signal - Limitation

The output signal corresponding to the selected measuring (input) range can be chosen anywhere between 4 and 20 mA, e.g. 6 to16 mA or reversed, e.g. 20 to 4 or 15.6 to 5.3 mA.

The output of the IPAQ^{PLUS} transmitters can also be limited to high and low selectable values. This function is overridden by the Sensor break monitoring and the Sensor isolation monitoring. See figure 11.



Fig.11. Output limitation in IPAQ^{PLUS}.

Transmitter text

For transmitters in the IPAQ^{PLUS} family, a text can be entered and stored in the transmitter. The text can be up to 128 characters long with up to four text lines. The text could include vital information such as last calibration or check up, connected sensors, transmitter location etc. See figure 12.

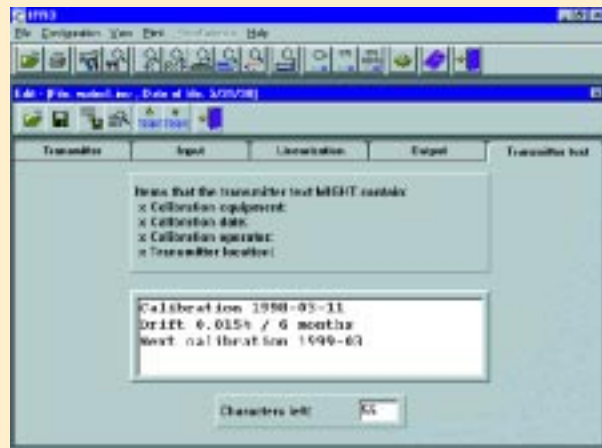


Fig.12. Storing of transmitter text

Controlled output for instrument calibration

For control and calibration of instruments in the output loop, the IPAQ transmitters can be set from IPRO 4 to generate very accurate output signals regardless of the input signal.

For the IPAQ^{PLUS} transmitters, the output can be either a fixed value between 3.5 and 22.8 mA or three recurring values. In recurring mode, the period time is selectable between 30 and 1000 seconds and the output levels can be set between 3.5 and 22.8 mA. The Controlled output will continue until it is stopped from the PC.

See figure 13.

The other IPAQ transmitters will work in recurring mode with fixed levels (0, 50 and 100 %) in 15 seconds each. The Controlled output will continue for defined time or until it is stopped from the PC.

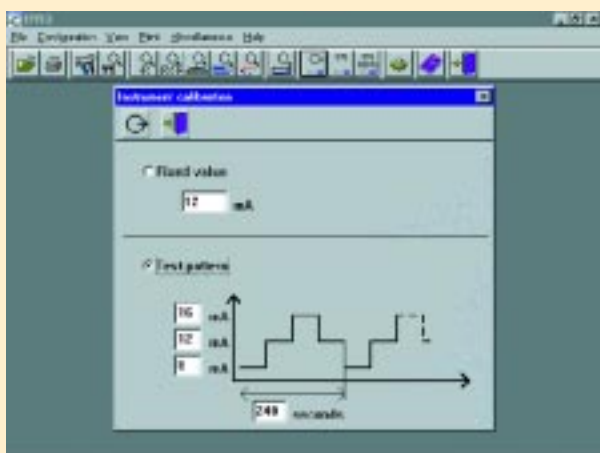


Fig.13. Controlled output in IPAQ^{PLUS}.

File handling

Transmitter configurations can be saved as files for future use. TAG numbers can be associated with the files and to open a file, just click on the TAG number.

See figure 14.

IPRO 4 has the ability to save configuration data in ASCII text format (tabulator separated). ASCII text format can be read by most database programs like Excel.

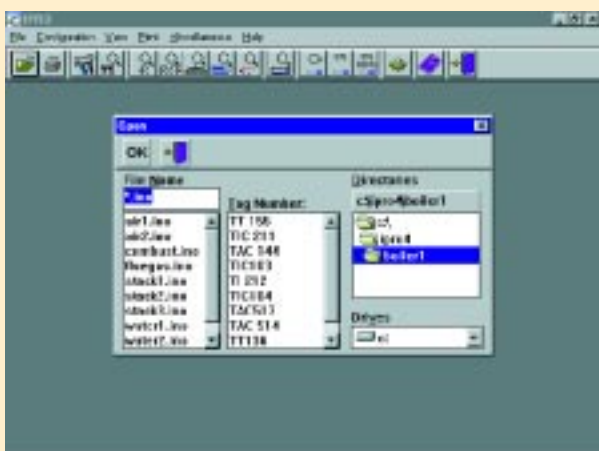


Fig.14. Easy file handling.

On screen indication

IPRO 4 offers on-screen real time presentation of measured values and output signal in the form of numericals, meters and bar graphs. A line recorder function is a useful feature for start-up and fault tracing procedures. The updating time is user selectable.

For examples, see figures 15 and 16.

Information of the sensor status, i.e. Sensor break or Sensor isolation can also be shown on the screen.

See figure 17.

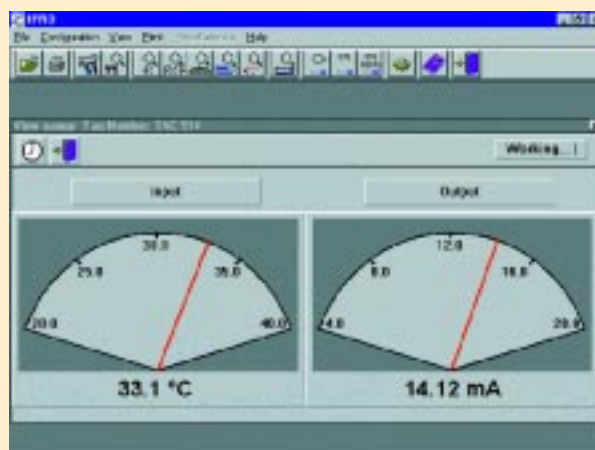


Fig.15. Presentation of input and output values.

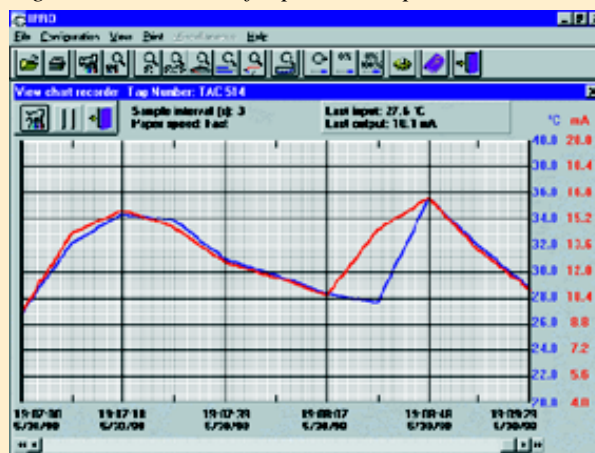


Fig.16. Line recorder presentation.

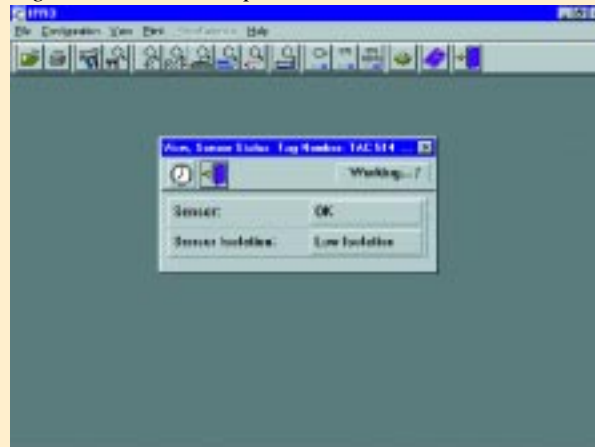


Fig.17. Sensor status information.

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Documentation

Transmitter configurations in the PC as well as in a connected transmitter can be printed as protocols for documentation and future use. The protocols are time-stamped for traceability and furnished with user space for calibration notes.

Utilities

Field calibration, permitting adjustment of the transmitter in one or two points, is easily performed with IPRO 4. For this function the transmitter is subjected to a calibration source (e.g. a process calibrator), the transmitter outputs are entered and IPRO 4 will automatically correct the transmitter.

On-line help and user instructions

IPRO 4 includes an extensive help function. The User Instructions are available in the software, and the user finds the proper part by means of the Search function or the Context sensitive function (by just pressing the F1 button on the PC). *See figure 18.*



Fig.18. On-line help is part of the Software

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