Signar
...machinery interrogation

MODEL-BASED VOLTAGE & CURRENT SYSTEMS
SENSOR-TO-RECOMMENDATION AUTONOMY
RUL REPAIR/REPLACE DECISION SUPPORT
INTEGRATED FAILURE MANAGEMENT


# P100 Portable Equipment Health Assessor


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## What is it?

The P100 series Equipment Health Assessor and Energy Monitor is a range of portable devices that give you a snap-shot assessment of your equipment health including mechanical, electrical and operational aspects, using a Model-Based Voltage and Current (MBVI) technique.

By simply measuring the voltage and current drawn by the motor driving your equipment it can identify a wide range of specific failure modes, and assess the degree to which the equipment is suffering from these effects.

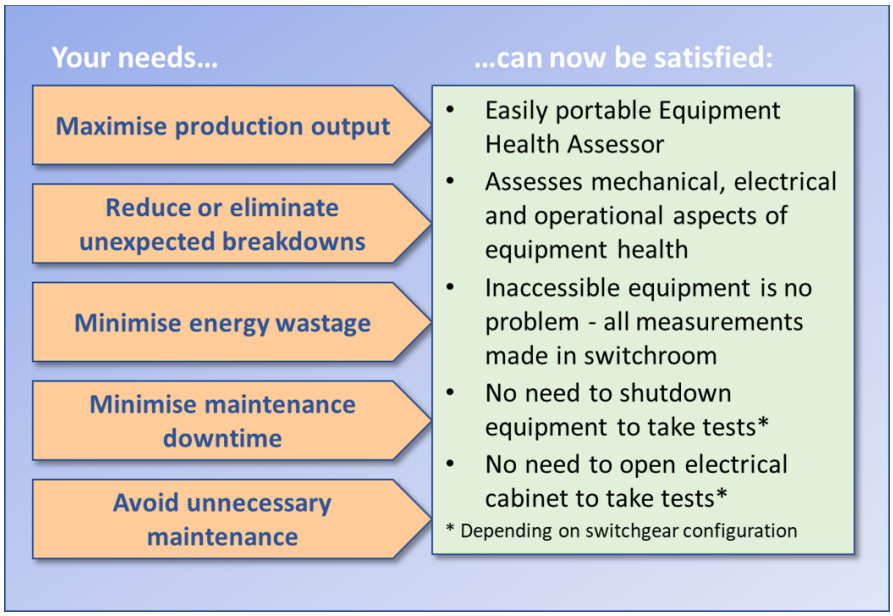
It also measures energy consumption and identifies a range of energy wasting parameters, allowing you to take action to reduce energy consumption.

Testing takes only a few minutes – at the end of which the device creates an automatic written and graphical report that can be edited to add any specific local details, and then emailed to whoever you choose.

## Why do I need it?

The P100 series Equipment Health Assessor can help you to:

- Avoid carrying out unnecessary maintenance work – by only doing it when you can see the need;
- Avoid unexpected breakdowns – by spotting developing problems before they become critical, you can plan remedial work at a convenient time;
- Minimise energy wastage – and quantify the benefits using the energy wastage figures;
- Create a baseline profile of new equipment at a Factory Acceptance Test – and repeat the test on commissioning, to confirm no damage has occurred in the delivery and installation process;
- Monitor the condition of otherwise inaccessible equipment - such as submerged pumps, borehole pumps, in-tank pumps, cryogenic pumps, roof mounted fans, etc.



## How do I use it?

The P100 series Health Assessor works by measuring the voltage and current being drawn by the motor driving the equipment (or the generator being driven by a prime mover). The only connections required are current clamps to measure the current and dolphin connectors to measure the voltage.

All connections and testing is done in the switch room or wherever the motor starter is located – so normally, this is a clean, dry, safe environment in which to do tests, away from hazardous or flammable areas.

If there is a motor protection system fitted to this motor, the measurements are taken from the low voltage (typically 110v) and low current (typically 1A or 5A) signals feeding the protection system. There is no need to disconnect or disturb any existing connections.

In addition, if the switchgear has MMLG-type test blocks fitted for periodic testing of the protection system, the P102 is able to connect direct to these test blocks and carry out the full health check without opening the cabinet. Depending on your internal policies, you can do this without stopping the motor at all.

When only a few simple parameters - Nominal Voltage, Nominal Current and Nominal Speed - taken from the motor plate, are entered into the system (or if this is a motor that has been tested before, they are simply recalled from the database), the Health Assessor will rapidly create an automated report which covers the following items:

- Unbalance/misalignment
- Bearing problems
- Foundation looseness
- Transmission looseness or rubbing
- Motor rotor bars
- Motor stator problems
- Electrical odd harmonics
- Electrical even harmonics
- Any other spectrum peak beyond the normal expected values

In addition it provides information on the electrical parameters including:

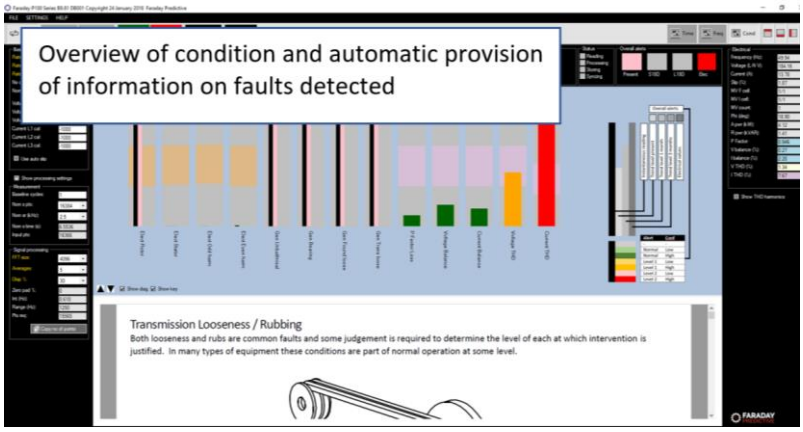
- Active power, reactive power and power factor
- Voltage balance
- Current balance
- Voltage THD
- Current THD

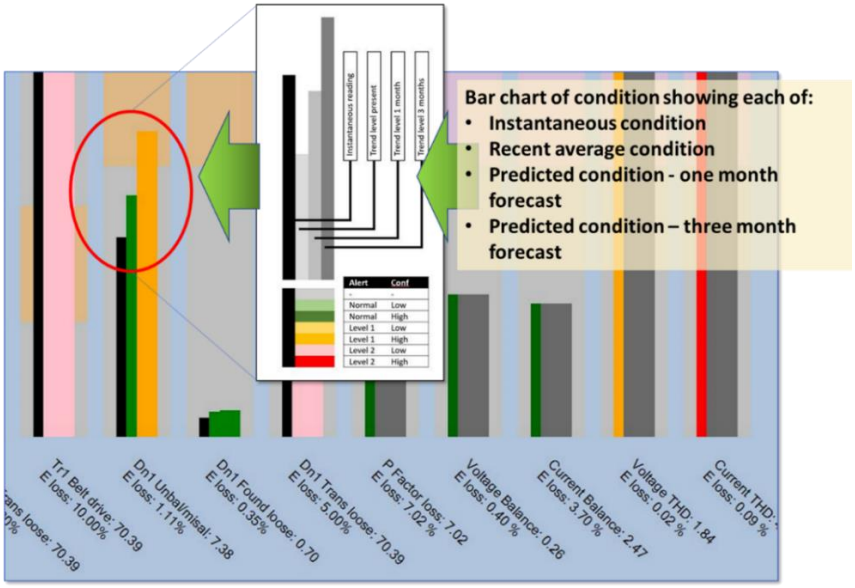
If additional machine specific information is available, such as individual bearing type codes, the number of vanes on a pump, or the ratios of transmission systems, then the report will automatically address these more specific details for the motor, the driven equipment and the transmission (see next section for full listing of specific parameters identified).

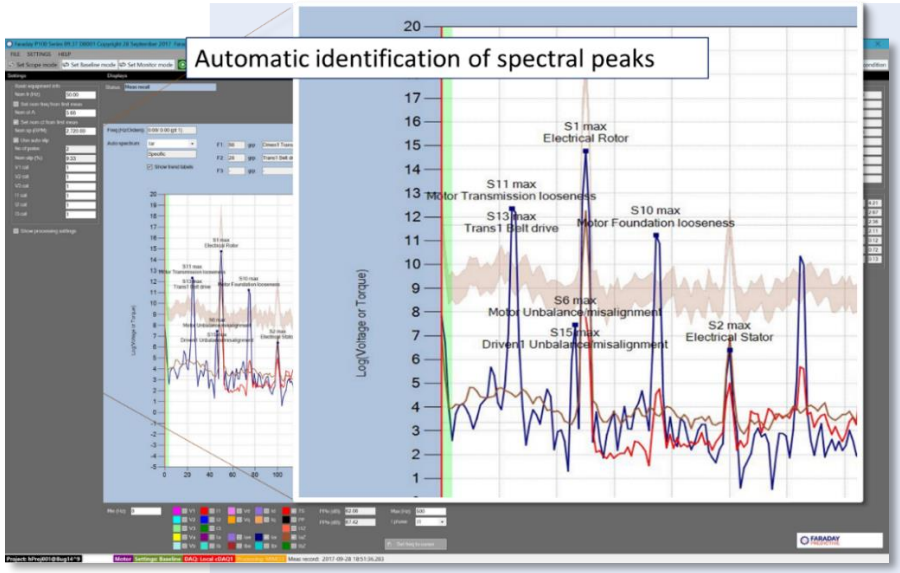
Testing takes around 10 minutes in total, including entry of all data. At the end of this a report is generated in .docx format allowing the addition of notes or comments on the specifics of the test which can then be easily emailed to whoever is appropriate.

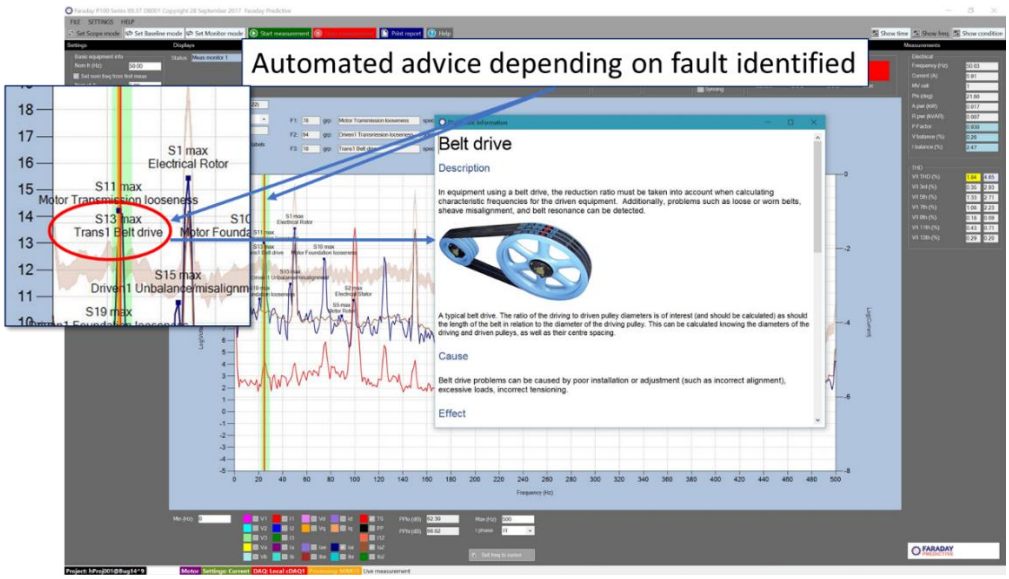
## What outputs will it give me?

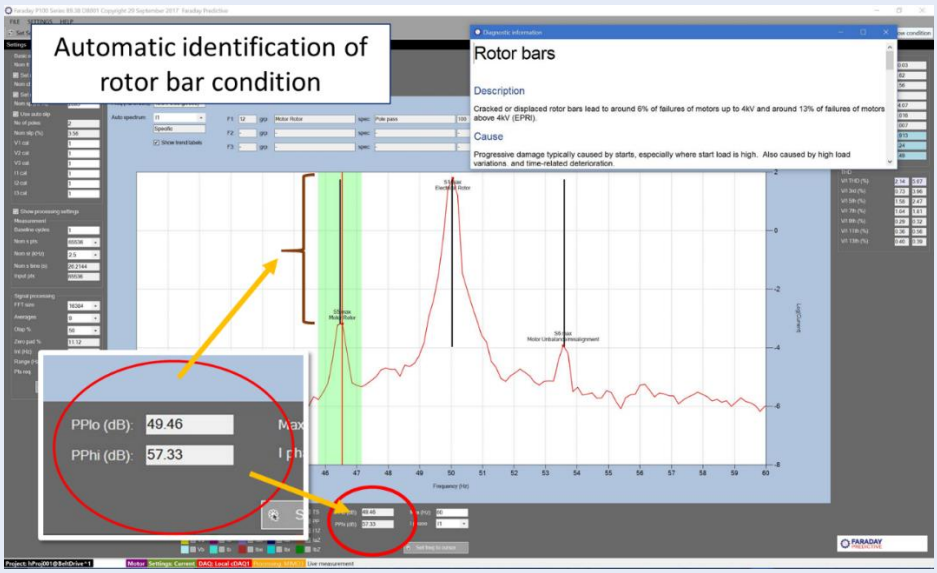
The P100 series Equipment Health Assessment kit provides a wide range of outputs, ranging from basic electrical parameters, right through to advice on corrective action on any faults found. Examples of some of these outputs are shown below:

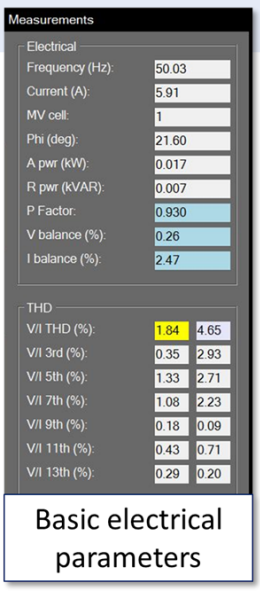


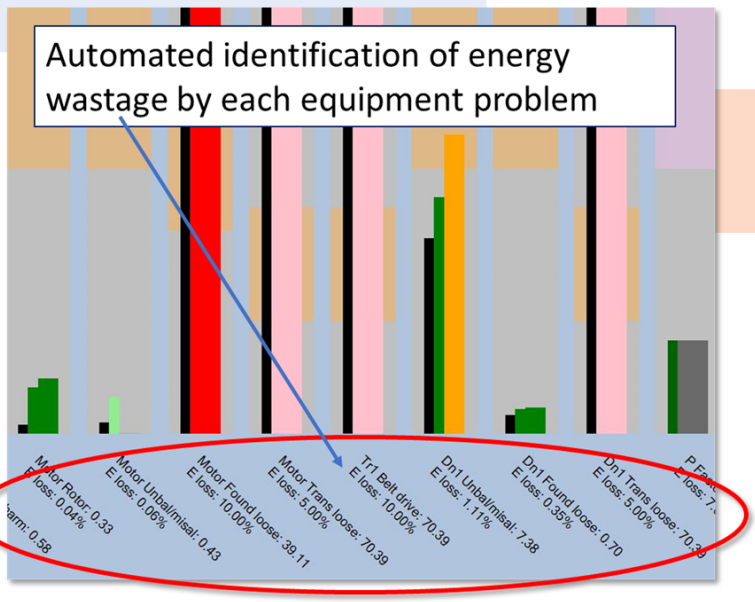





Basic electrical parameters



## Faults detected

The table below shows the standard fault types that can be recognised by the P100 series of equipment health assessment kit.

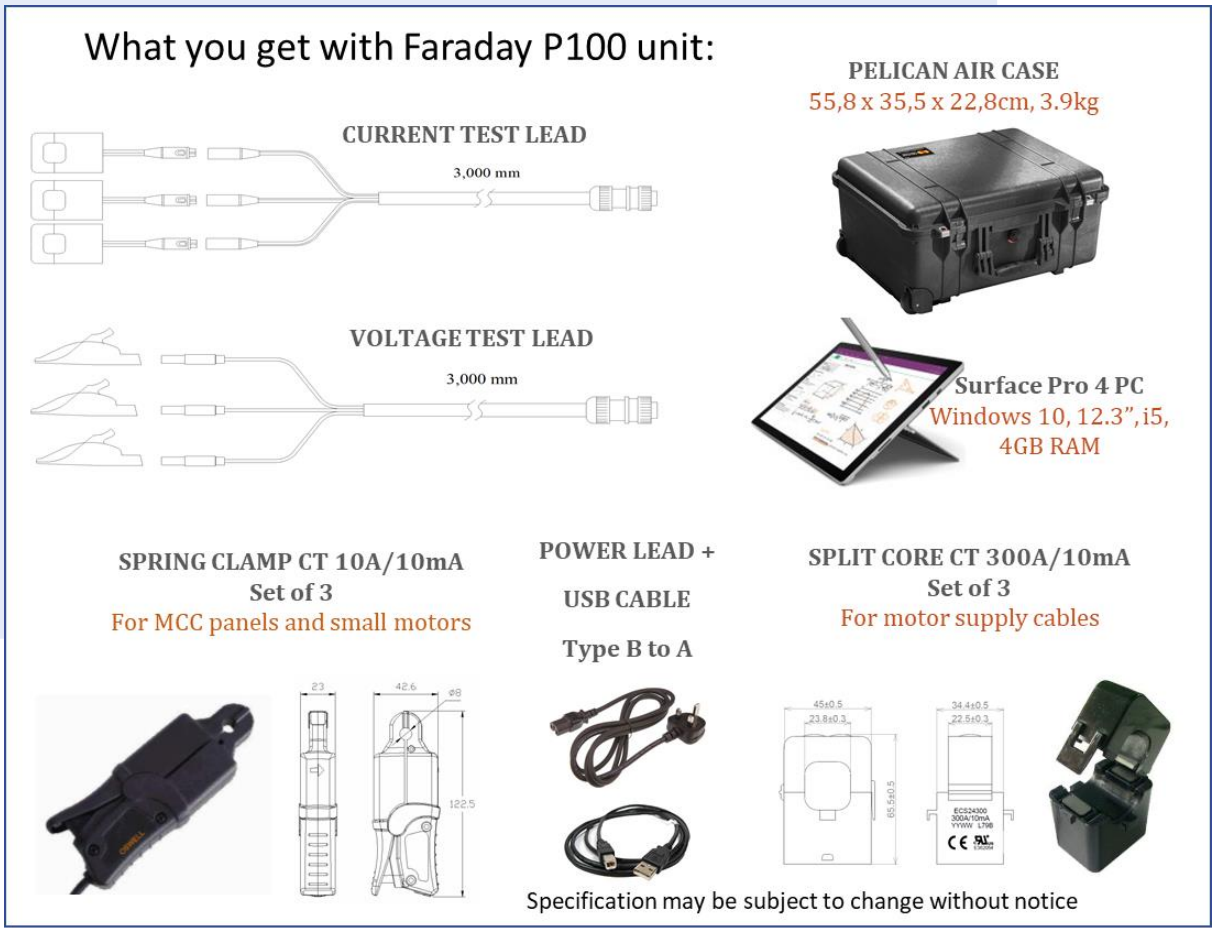
- ***Generic*** faults are those that are detected when there is no special information entered about the equipment apart from its nominal voltage, nominal current and nominal rotational speed.
- ***Specific*** faults are those that can be identified when the appropriate information has been entered into the system – typically, rotating element bearing type code numbers, the ratio of transmissions, and the pulley diameters and separation distance for belt drives.

| | Equipment type | | | | Top 6 KPI | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Fault type** | **Motor** | | **Generator** | | Motor Fault | Electrical Supply problems | Mechanical Rotating Fault | Mechanical Static Fault | Operational Fault inc Blocked Filter | Other |
| | *specific* | *generic* | *specific* | *generic* | | | | | | |
| Electrical Rotor | x | x | x | x | Motor Fault | | | | | |
| Electrical Stator | x | x | x | x | | | | | | |
| Electrical Odd Harmonics | x | x | x | x | | Electrical Supply problems | | | | |
| Electrical Even Harmonics | x | x | x | x | | | | | | |
| Motor Rotor Bars | x | x | x | x | Motor Fault | | | | | |
| Motor Unbalance/Misalignment | x | | x | | | | | | | |
| *Generic unbalance / misalignment* | | x | | x | | | | | | |
| Motor Bearing 1 | x | | x | | | | | | | |
| Motor Bearing 2 | x | | x | | | | | | | |
| Motor Journal 1 | x | | x | | | | | | | |
| *Generic Bearing* | | x | | x | | | | | | |
| Motor Foundation / Looseness | x | | x | | | | | | | |
| *Generic Foundation / Looseness* | | x | | x | | | | | | |
| Motor Transmission Looseness | x | | x | | | | | | | |
| *Generic Transmission Looseness* | | x | | x | | | | | | |
| Motor Resonance | x | | x | | | | | | | |
| Trans 1 Belt Drive | x | | x | | | | | | | |
| Trans 1 Gearbox | x | | x | | | | | | | |
| Driven 1 Unbalance / Misalignment | x | | x | | | | | | | |
| Driven 1 Bearing 1 | x | | x | | | | | | | |
| Driven 1 Bearing 2 | x | | x | | | | | | | |
| Driven 1 Journal 1 | x | | x | | | | | | | |
| Driven 1 Foundation Looseness | x | | x | | | | | | | |
| Driven 1 Transmission Looseness | x | | x | | | | | | | |
| Driven 1 Resonance | x | | x | | | | | | | |
| Driven 1 Impeller 1 | x | | x | | | | | | | |
| Trans 2 Belt Drive | x | | x | | | | | | | |
| Trans 2 Gearbox | x | | x | | | | | | | |
| Driven 2 Unbalance / Misalignment | x | | x | | | | | | | |
| Driven 2 Bearing 1 | x | | x | | | | | | | |
| Driven 2 Bearing 2 | x | | x | | | | | | | |
| Driven 2 Journal 1 | x | | x | | | | | | | |
| Driven 2 Foundation Looseness | x | | x | | | | | | | |
| Driven 2 Transmission Looseness | x | | x | | | | | | | |
| Driven 2 Resonance | x | | x | | | | | | | |
| Driven 2 Impeller 1 | x | | x | | | | | | | |
| Power Factor | x | x | x | x | | | | | | |
| Voltage Balance | x | x | x | x | | Electrical Supply problems | | | | |
| Current Balance | x | x | x | x | | | | | | |
| Voltage THD | x | x | x | x | | | | | | |
| Current THD | x | x | x | x | | | | | | |
| *Active Power: Nominal Power* | | | | | | | | | | |
| Any other spectral fault with Peak exceeding zone of goodness | | | | | | | | | | |

Further fault types can be identified by expert analysis of the spectral outputs.

## What is in the box?

The P100 series come complete in a strong, lightweight Pelican Air case, to allow for easy transport of all the necessary elements and protection from damage. The contents of the kit include:




- P100 data capture unit, preloaded with the latest signal processing firmware;
- P100 signal cables for voltage – 3m long;
- Insulated dolphin connectors for voltage signal sensing connections for 110v up to 400v;
- P100 signal cables for current – 3m long;
- 1 set of spring-clamp CTs rated at 1 – 10A, suitable for measuring protection system inputs;
- 1 set of split-core CTs rated at 10 – 300A, suitable for measuring on 400v motor cables;
- Communications cable from P100 to PC;
- Surface Pro touchscreen laptop preloaded with Faraday diagnostic software and reporting and visualisation tools, all mounted in a tough protective case;
- Power supply cable;
- All of the above neatly stowed in a moulded protective housing.

The **P101** comes complete with all the above items.

The **P102** additionally comes with a complete set of cables, connectors and fittings and all the necessary software to take inputs from MMLG test blocks, allowing you to assess your equipment health without even opening your electrical cabinet.

# Power Users Programme details – helping us to help you

The Power Users Programme is a support programme aimed at new users and those wishing to derive the full value from the P100 kit. It gives you **free diagnostic and technical support** for 3 months, in exchange for feedback on your experiences of the product. We are keen to hear about your user experience, in order to continue to improve the product. Each time you ask for diagnostic support we will ask you to complete a simple feedback questionnaire. In return, you will receive **free upgrades to the software** for three years, updates that will incorporate improvements based on the feedback received. This way, people like you who give valuable feedback will be the ones who benefit from the improved product that results.

- What you get:
  - Technical support and assistance to cover everyday issues such as:
    - Using the P100 in general
    - How to connect it to equipment
    - Choosing the right settings
    - "How To…" for any specific issues
    - Understanding the outputs
    - Editing the outputs
    - Communicating the outputs
  - Diagnostic interpretation:
    - Interpretation of basic plots – eg what the histogram bars mean
    - Interpretation of spectra – identification of peaks
    - Interpretation of trends – condition and confidence levels
    - Enhancement beyond automated diagnostics – what and how
  - Free upgrades to the software &/or firmware for 3 years:
    - So that you will benefit from the feedback you have provided, which we will use to continue to improve and develop the product.
- What you need to do:
  - Complete a simple questionnaire on each request for support. The questionnaire will cover ease of use, layout and content of displays, value of the outputs and any other improvement suggestions.
- How it works:
  - You click on a link that takes you to the survey questionnaire
  - At the end of the questionnaire, you are prompted to upload the data to us
  - We provide the support – by phone, email, Skype or whatever works best for you. This includes screen sharing onto your P100 SurfacePro to demonstrate particular points or procedures etc.
- What is not included:
  - Installation
  - Comprehensive diagnostic reporting from scratch
  - Diagnostic reporting for third parties.

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