

## **UP100 Ultrasonic Trap Tester**

### **Operators Instructions**



### **Introduction**

The UP100 is a portable battery powered instrument which gives visible and audible indication of ultrasonic frequencies. It is intended for use as a diagnostic tool in the analysis of steam trap operation and can also

be used to detect leaks in steam and compressed air systems. Some experience, together with a working knowledge of steam trap operation, is required to correctly interpret the signals.

## Technical details

The UP100 consists of 4 components:

1. The pistol housing.
2. The stethoscope probe module with extension rods.
3. The headset with extension cable.
4. The flexible carrying case.

### UP100 pistol housing

- A. The UP100 pistol housing (A) requires a 9 volt battery located in a compartment at the base of the handle. When the instrument is not used for an extended period of time, the battery should be removed.

**Note:** Battery not supplied

- B. The bargraph display (B) consists of a ten segment red LED bargraph that will indicate ultrasonic signal strength.
- C. The sensitivity selection knob (C) is located on the back of the pistol next to the bargraph display (B). Sensitivity level is increased or decreased by turning the knob. As the knob is turned up, the sensitivity of the instrument increases, as the knob is turned down, the sensitivity decreases. Therefore, 8 is the highest sensitivity level and 1 is the lowest. It is advisable to start with the sensitivity at a low setting and increase it slowly by adjusting the knob until the required volume is achieved.
- D. The low battery indicator light (D) is located on the back of the pistol and above the sensitivity selection knob (C). This red light illuminates when the battery needs to be replaced.

**Note:** When the trigger on/off switch is pressed to the on position, the low battery indicator light (D) will flicker on and then stay off. This is normal.

- E. The trigger switch (E) is located on the underside of the UP100. The UP100 is always "off" until the trigger switch is pressed. To operate, simply press the trigger; to turn the instrument off, release the trigger.

- F. The headset socket (F) is located next to the sensitivity selection knob. This is where the headphones are plugged in.

### Stethoscope probe module

The stethoscope probe module enables a user to hear internally generated ultrasounds. By touching the probe to various points on steam traps, machinery, valves, pipes, etc. the UP100 indicates the amount of ultrasound emitted. Used as a stethoscope, bearings, compression noises, steam traps, valves, even internal arcing of circuit breaker switches can be monitored. Extension rods to 780 mm are supplied.

### Headset with extension cable

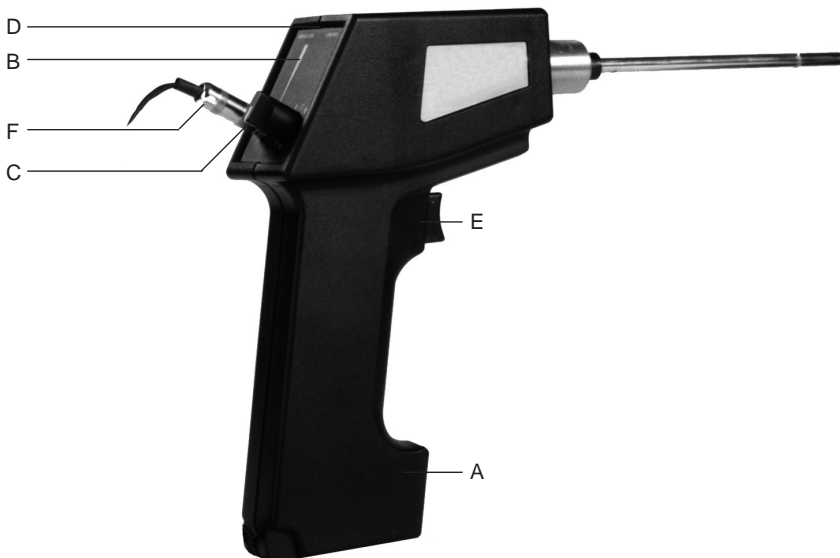
The headset supplied is a lightweight unit ideal for extended periods of use.

### Flexible carrying case

A soft reinforced nylon carrying case complete with belt is supplied. This is large enough to carry the pistol housing, stethoscopic probe module, extension probes and headset.

The UP100 conforms to EN 50082-1 (electromagnetic compatibility).

**Note:** The performance of the product may be affected when used near strong sources of electromagnetic interference such as found in some industrial environments.



## Operation ... testing steam traps

Before testing any steam trap, the following information should be determined so readings from the unit can be properly interpreted:

- A. Type of steam trap ( thermodynamic, inverted bucket, thermostatic, etc.) See below.
- B. Working steam pressure (1,2,10 bar, etc.)
- C. Trap application and expected condensate load. ( tracer, process, etc.)

Knowing the above, it is possible to predict the type and sound level that should be heard and will help set sensitivity level.

Condensate flow produces less ultrasound than does steam leaking through a trap orifice. Crackling or sputtering flow is associated with condensate flashing in the low pressure area downstream of the orifice. Leaking steam generates a constant amount of ultrasound but there will always be some condensate mixed in. By using the UP100 on known good or leaking traps, experience will be gained that will be invaluable in carrying out steam trap checking.

### Steam trap types

**Note:** All traps should be checked with the probe firmly touching the trap outlet area or adjacent pipe. Readings must not be taken while the probe is moving.

#### A. Thermodynamic traps

This has a blast discharge and cycles on and off. The UP100 will give a 0, then 100% reading on this trap so low sensitivity setting is normally recommended. A properly sized trap in good working order will discharge between 0-5 cycles/minute. A trap which operates 10 or more cycles/minute should be inspected for dirt or wear. A continuous discharge means the trap is either severely worn, is subject to high back pressure, or dirt is preventing the disc from closing off.

#### B. Inverted bucket traps

The discharge pattern is usually semi-cyclical. On medium to heavy loads, the trap will have a definite on/off cycle. The ultrasonic tester reading will be a sweeping motion, back and forth. Light loads will change the discharge pattern to a modulating low flow and the UP100 will give a low continuous reading. When the trap is malfunctioning, the readout will be a full 100% reading for steam leaks and an erratic on/off type operation for lost water seal.

#### C. Float and thermostatic traps

The discharge pattern of this trap is a continuously modulating flow. First, determine the type of application; process or light load condition. If the condensate load is light, such as found on main drips and tracers, sound levels will normally be low

and give a low level continuous readout. A high level readout means that some part of the trap has failed. When testing, be aware that this type of trap has two orifices, the main orifice located below the normal condensate level, and the thermostatic air vent at the top in the steam space.

In normal operation on process equipment such as heat exchangers and air handlers, the flow will be continuous and at a high sound level. For the ultrasonic test to be accurate, the load must be removed or lightened to allow the trap to shut or throttle back considerably.

Readings should be compared at high and low loads. To reduce the load, the air flow on a coil should be shut off; on a heat exchanger, the liquid flow turned off or a blowdown valve before the trap opened to reduce the load. In any case, the trap should shut off or throttled back to a point where a good test can be made. When load has been reduced or cut off, the ultrasound reading should be very low or at zero level if the orifice is tightly closed.

#### D. Thermostatic/radiator trap

These traps are often on low pressure and the usual discharge pattern is a dribbling type action. The load on convectors and radiators is normally low and should give a very low or zero readout when the unit is on and operating. Since thermostatic traps are wide open when cold, the trap can be tested for both opening and closing by turning off the steam supply to the trap and allowing the trap to cool. When trap is cool, open steam valve while UP100 is contacting the trap outlet. Trap discharge should start wide open, then quickly shut. This test proves full function of the trap and should be used if normal test proves inconclusive.

#### E. Thermostatic/general purpose trap

Element design and filling contained will vary, but generally this trap dribbles on light load and modulates on heavy loads but can also cycle on/off. Main drips and tracers where loads are light should give a low readout and cycle on/off. On most process use, the trap will tend to modulate or some times cycle. For testing, the same procedure given above for process on float and thermostatic traps should be used. Closing the trap off and letting it cool will open the valve fully. When turning the trap back on, the trap will blast full open and then shut down within a minute. The UP100 will be able to indicate both full flow and shutoff condition. This method should be used if the reading that is normally given by the trap is unclear as to whether it is good or leaking steam.

#### **F. Bimetallic trap**

Bimetal traps do not respond to load change as fast as other types and the discharge pattern is normally modulating or dribbling. Bimetal traps are usually found on drips, tracers and light load applications, so discharge would normally be continuous with a low sound level. Draining condensate ahead of the trap should shut it off, and ultrasound levels should drop to zero. Bimetal traps are wide open when cold so when initially turned on the trap will blast full open until the bimetal expands and closes.

Ultrasound readout should be high on startup and should throttle near to zero or zero when trap heats and closes. The "cool down/startup" test should be run if normal test methods are not conclusive. Care must be taken as many bimetal traps will take a "set" in operation. These traps can leak steam if the valve stem is not readjusted periodically to the operating conditions.

#### **G. Orifice drain devices**

These are not automatic traps but are units designed for continuous flow with some steam loss on low load. The ultrasonic tester can only tell that the unit is passing either steam or condensate and is not clogged shut. Excessive steam leakage will be indicated only if the orifice is oversized for the load.

### **Other uses for the UP100**

#### **A. Shutoff valves in closed piping (Ball, gate, globe, etc.)**

Shut valve; place probe on valve outlet. Ultrasonic reading should be zero if valve is tightly closed and not leaking. Replace valve as necessary.

#### **B. Control valves and temperature regulators**

Shut valve by diverting control signal to valve, or turn temperature adjustment below set temperature so valve shuts. Place UP100 on valve discharge side. With valve closed, ultrasound reading should be zero. Be aware that some valves (e.g. cooling controls) contain a constant bleed or bypass flow.

#### **C. Parallel pressure reducing valves**

The ultrasound test can be used to check which reducing valve is operating under various load conditions. It can also be used to aid in setting sequential operation of parallel valves at set pressure + 0.2 bar apart. Place probe on outlet of each valve to check operation as the demand changes the reduced pressure.

#### **D. Troubleshooting pilot-operated pressure reducing valves and temperature controls**

On a valve which is overshooting, the UP100 can be used to determine whether the pilot or the main valve is leaking. To test, shut pilot off by reducing the pressure or temperature set point and place sonic probe on bypass transmission tube. A zero reading should be shown if pilot is closed fully. If pilot is leaking, significant readings should be picked up and pilot trim must be changed. If pilot is working properly, main valve leakage or transmission tube orifice blockage is occurring and must be repaired.

### **Maintenance**

There are no user servicable parts in the UP100. When the instrument is not used for an extended period of time, the battery should be removed.

### **Return of faulty equipment**

Please provide the following information with any equipment being returned:-

1. Your name, company name, address and telephone number, order number and invoice and return delivery address.
2. Description and serial number of equipment being returned.
3. Description of the fault or repair required.
4. If the equipment is being returned under warranty, please indicate:
  - (i) Date of purchase
  - (ii) Original order number

#### **PLEASE RETURN ALL ITEMS TO:**

Returns Investigation Department  
Runnings Road  
Kingsditch Trading Estate,  
Cheltenham,  
Glos, GL51 9NX.  
United Kingdom

Alternatively, please return any items to your local Spirax Sarco branch.

Please ensure all items are suitably packed for transit (preferably in the original cartons).