CLAIMS

1. A measuring device (1000) configured for coupling to a control device (2000), the measuring device comprising:
a fluid conduit (1200);
a first electrical connector (1480, 1480', 1480'');
a first ultrasound transducer (1410) and a second ultrasound transducer (1420), each electrically connected to the first electrical connector; and
an acoustic coupling medium (1140) coupling the first and second ultrasound transducers (1410, 1420) to the fluid conduit, wherein

the first ultrasound transducer is configured to emit, in response to receiving a control signal, an ultrasound signal along a sound path (1160) extending through the acoustic coupling medium from the first ultrasound transducer to the second ultrasound transducer, and

the second ultrasound transducer is configured to receive an ultrasound signal transmitted along the sound path and to generate a measurement signal based on the received ultrasound signal wherein the fluid conduit is disposed at least in part along the sound path such that the emitted ultrasound signal propagates along the sound path and strikes, in a measurement section (1230) of the fluid conduit, a medium to be measured.

2. The measuring device (1000) of claim 1, wherein the acoustic coupling medium (1140) includes a first portion (1141) a second portion (1142), wherein the first portion couples the first ultrasound transducer (1410) to the fluid conduit (1200) and the second portion couples the second ultrasound transducer (1420) to the fluid conduit.

3. The measuring device (1000) of claim 2, further comprising air backings (1120, 1130) positioned adjacent to the fluid conduit (1200) and separating the first portion (1141) of the acoustic coupling medium (1140) and the second portion (1142) of the acoustic coupling medium from one another; optionally wherein the air backings (1120, 1130) are configured to acoustically decouple the first portion (1141) of the acoustic coupling medium (1140) from the second portion (1142) of the acoustic coupling medium, such that ultrasounds signals propagating along the sound path (1160) do not propagate directly from the first portion (1141) into the second portion (1142).

4. The measuring device (1000) of any one of claims 2 or 3, wherein the sound path (1160) extends from the first ultrasound transducer (1410) to the second ultrasound transducer (1420) through the first portion (1141) of the acoustic coupling medium (1140), through measurement section (1230), and through the second portion (1142) of the acoustic coupling medium.

5. The measuring device (1000) of any one of the preceding claims, wherein the acoustic coupling medium (1140) comprises thermoplastic material, preferably wherein the thermoplastic material includes epoxy resin and/or is substantially homogeneous.

6. The measuring device (1000) of any one of the preceding claims, further comprising a printed circuit board (1400), PCB, including the first electrical connector (1480, 1480') and configured to electrically connect the first (1410) and second (1420) ultrasound transducers to the first electrical connector; optionally
wherein each of the first (1410) and second (1420) ultrasound transducers is mechanically connected to the PCB (1400); or
wherein the first ultrasound transducer (1410) and the first connecting portion (1418) of the first ultrasound transducer form a first transducer module (1411) the second ultrasound transducer (1420) and the second connecting portion (1428) of the second ultrasound transducer form a second transducer module (1421), optionally wherein the first connecting portion (1418) and the second connecting portion (1428) of the PCB (1400) are configure to electrically and mechanically connect the first (1410) and second (1420) ultrasound transducers to the PCB.

7. The measuring device (1000) of claim 6, wherein the first electrical connector (1480) comprises one or more of a USB-C connector, a USB-A connector, a USB-B connector, a Micro USB connector, a Mini USB connector, an HDMI connector, and a SUB-D connector; and/or wherein the first electrical connector (1480', 1480'') comprises a first coil (1481') and a second coil (1482'), optionally wherein the first coil (1481') is configured to inductively couple to a first coil (2281') of a control device (2000) and the second coil (1482') is configured to inductively couple to a second coil (2282') of the control device (2000).

8. The measuring device (1000) of any one of the preceding claims, wherein the first ultrasound transducer (1410) is configured to receive the control signal from a control device (2000) through the first electrical connector (1480, 1480', 1480'') and/or wherein the second ultrasound transducer (1420) is configured to transmit the measurement signal to the control device through the first electrical connector (1480, 1480', 1480'').

9. The measuring device (1000) of any one of the preceding claims, further comprising one or more sensors, wherein the one or more sensors include one or more of

a temperature sensor,

a pressure sensor,

an electrical conductivity sensor, and

an optical sensor.

10. The measuring device (1000) of any one of the preceding claims, wherein

an inner diameter of the fluid conduit (1200) is in a range of 0.1 to and 0.5 inch (0.254 to 1.27 cm), preferably wherein the inner diameter is 0.25 inch (0.635 cm); or

the inner diameter of the fluid conduit is in a range of 0.5 to 1.5 inches (1.27 to 3.81 cm), preferably wherein the inner diameter is 1 inch (2.54 cm).

11. The measuring device (1000) of any one of the preceding claims, wherein the fluid conduit (1200) has a first end (1210) and a second end (1220) in fluid communication with one another and configured to attach to a fluid circuit; optionally wherein the first end (1210) and/or the second end (1220) includes one of the following: a sanitary connector, an Aseptic Quick Connector, and an MPX Insert.

12. The measuring device (1000) of any one of the preceding claims, further comprising a main body (1100); optionally wherein the main body (1100) includes a coupling portion (1300) configured for coupling the measuring device to a control device (2000), and/or wherein the main body (1100) defines the fluid conduit (1200) as an integral portion thereof, and/or wherein the main body (1100) is configured to fixedly position the PCB (1400) relative to the fluid conduit (1200).

13. A control device (2000) comprising:
a housing (2100) including a coupling portion (2300) configured for receiving a measuring device (1000);
a second electrical connector (2280, 2280', 2280'');
an electronic control unit (2200), ECU, electrically connected to the second electrical connector and configured for sending one or more control signals to the measuring device and for receiving one or more measurement signals from to the measuring device.

14. The control device (2000) of claim 13, wherein the coupling portion (2300) comprises a locking mechanism configured to selectively lock a measuring device (1000) in a coupled position when coupled to the control device, or to selectively unlock the measuring device; optionally wherein the locking mechanism comprises a Bayonet-type locking mechanism.

15. The control device (2000) of any one of claims 12 or 13, further comprising a switch (2360) configured to selectively lock and unlock the locking mechanism, optionally wherein selectively locking and unlocking includes haptic and/or audible feedback; and/or further comprising a cover (2330) configured to cover at least part of the coupling portion (2300), optionally wherein the cover (2330) is configured to cover the second electrical connector (2280) in the absence of a measuring device (1000) coupled to the control device (2000).

16. The control device (2000) of any one of claims 12 to 14, further comprising a status indicator (2210) connected to the ECU (2200) and configured to indicate an operating status of the control device and/or an operating status of a measuring device (1000) when coupled to the control device (2000); and/or

wherein the second electrical connector (2280, 2280', 2280'') is configured to distribute electrical signals, optionally wherein the electrical signals include control signals and measurement signals; and/or

wherein, when a measuring device (1000) is coupled to the control device, the control device is configured to

send a control signal to the control device, and

receive a measurement signal from the measuring device, the measurement signal indicating properties of fluid flow in a measurement section (1230) of a fluid conduit (1200) of the measuring device; and/or

wherein the second electrical connector (2280) comprises one or more of a USB-C connector, a USB-A connector, a USB-B connector, a Micro USB connector, a Mini USB connector, an HDMI connector, and a SUB-D connector; and/or

wherein the second electrical connector (2280', 2280'') comprises a first coil (2281') and a second coil (2282'); and/or

wherein the first coil (2281') is configured to inductively couple to a first coil (1481') of a measuring device (1000) and the second coil (2282') is configured to inductively couple to a second coil (1482') of the measuring device (1000); and/or

wherein the control device (2000) is configured to determine on or more of a presence of a coupled measuring device (1000), an operating status of a coupled measuring device, and a type of a couple measuring device based on an inductive coupling of the third coils (1483', 1483'', 2283', 2283'') of the control device and of the measuring device; and/or

wherein the ECU (2200) comprises functionality to control one or more sensors of a measuring device (1000) and to receive measurement signals for the one or more sensors, wherein the one or more sensor include one or more of

temperature sensor,

a pressure sensor,

an electrical conductivity sensor, and

an optical sensor .

17. A system (100) for measuring fluid flow, the system comprising:
a measuring device (1000) according to any one of claims 1 to 11; and
a control device (2000) according to any one of claims 13 to 15.