

SECTION G — PHYSICS

G01 MEASURING; TESTING

G01F MEASURING VOLUME, VOLUME FLOW, MASS FLOW, OR LIQUID LEVEL; METERING BY VOLUME (milk flow sensing devices in milking machines or devices A01J 5/01; measuring or recording blood flow A61B 5/02, A61B 8/06; metering media to the human body A61M 5/168; burettes or pipettes B01L 3/02; arrangements of liquid volume meters or volume-flow meters in liquid-delivering apparatus, e.g. for retail sale purposes, B67D 7/16; pumps, fluid motors, details common to measuring or metering devices and pumps or fluid motors F01-F04; locating, determining distance or velocity using reflection or reradiation of radio waves, analogous arrangements using other waves G01S; systems for ratio control G05D 11/00) [2, 5]

Note(s)

Attention is drawn to the Notes following the title of class G01.

Subclass index

MEASURING VOLUME.....	17/00, 19/00, 22/00
MEASURING VOLUME FLOW	
In continuous flow; in discontinuous flow; by proportion of flow.....	1/00, 3/00, 5/00
With multiple measuring ranges.....	7/00
By comparison with another value.....	9/00
LEVEL INDICATORS.....	23/00
METERING BY VOLUME.....	11/00, 13/00
DETAILS, ACCESSORIES.....	15/00
TESTING, CALIBRATING.....	25/00

Measuring volume flow

1/00 Measuring the volume flow or mass flow of fluid or fluent solid material wherein the fluid passes through the meter in a continuous flow (measuring a proportion of the volume flow G01F 5/00; measuring speed of flow G01P 5/00; indicating presence or absence of flow G01P 13/00; regulating quantity or ratio G05D) [2]

Note(s)

Groups G01F 1/704-G01F 1/76 take precedence over groups G01F 1/05-G01F 1/68.

- 1/05 • by using mechanical effects [2]
- 1/06 • • using rotating vanes with tangential admission [2]
- 1/07 • • • with mechanical coupling to the indicating device [2]
- 1/075 • • • with magnetic or electromagnetic coupling to the indicating device [2]
- 1/08 • • • Adjusting, correcting, or compensating means therefor [2]
- 1/10 • • using rotating vanes with axial admission [2]
- 1/11 • • • with mechanical coupling to the indicating device [2]
- 1/115 • • • with magnetic or electromagnetic coupling to the indicating device [2]
- 1/12 • • • Adjusting, correcting, or compensating means therefor
- 1/20 • • by detection of dynamic effects of the fluid flow [2]
- 1/22 • • • by variable-area meters [2]

- 1/24 • • • • with magnetic or electric coupling to the indicating device [2]
- 1/26 • • • • of the valve type [2]
- 1/28 • • • by drag-force, e.g. vane type or impact flowmeter [2]
- 1/30 • • • • for fluent solid material [2]
- 1/32 • • • by swirl flowmeter, e.g. using Karman vortices [2]
- 1/34 • • by measuring pressure or differential pressure [2]
- 1/36 • • • the pressure or differential pressure being created by the use of flow constriction [2]
- 1/37 • • • • the pressure or differential pressure being measured by means of communicating tubes or reservoirs with movable fluid levels, e.g. by U-tubes [2]
- 1/38 • • • • the pressure or differential pressure being measured by means of a movable element, e.g. diaphragm, piston, Bourdon tube or flexible capsule [2]
- 1/40 • • • • Details of construction of the flow constriction devices [2]
- 1/42 • • • • • Orifices or nozzles [2]
- 1/44 • • • • • Venturi tubes [2]
- 1/46 • • • • • Pitot tubes (specially adapted for measuring speed of fluids G01P 5/165) [2]
- 1/48 • • • the pressure or differential pressure being created by a capillary element [2]
- 1/50 • • • Correcting or compensating means [2]

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- 1/52 • • by measuring the height of the fluid level due to the lifting power of the fluid flow [2]
- 1/54 • • by means of chains, flexible bands, or wires introduced into, and moved by, the flow [2]
- 1/56 • by using electric or magnetic effects (G01F 1/66 takes precedence) [2]
- 1/58 • • by electromagnetic flowmeters [2]
- 1/60 • • • Circuits therefor [2]
- 1/64 • • by measuring electrical currents passing through the fluid flow; by measuring electrical potential generated by the fluid flow, e.g. by electrochemical, contact, or friction effects (G01F 1/58 takes precedence) [2]
- 1/66 • by measuring frequency, phase shift, or propagation time of electromagnetic or other waves, e.g. ultrasonic flowmeters [2]
- 1/68 • by using thermal effects [2]
- 1/684 • • Structural arrangements; Mounting of elements, e.g. in relation to fluid flow [6]
- 1/688 • • • using a particular type of heating, cooling or sensing element [6]
- 1/69 • • • • of resistive type [6]
- 1/692 • • • • Thin-film arrangements [6]
- 1/696 • • Circuits therefor, e.g. constant-current flow meters [6]
- 1/698 • • • Feedback or rebalancing circuits, e.g. self heated constant temperature flowmeters [6]
- 1/699 • • • • by control of a separate heating or cooling element [6]
- 1/704 • using marked regions or existing inhomogeneities within the fluid stream, e.g. statistically occurring variations in a fluid parameter (G01F 1/76, G01F 25/00 take precedence) [4]
- 1/708 • • Measuring the time taken to traverse a fixed distance [4]
- 1/712 • • • using auto-correlation or cross-correlation detection means (measuring speed by using correlation detection means in general G01P 3/80, G01P 5/22) [4]
- 1/716 • • • using electron paramagnetic resonance (EPR) or nuclear magnetic resonance (NMR) [4]
- 1/72 • Devices for measuring pulsing fluid flows [2]
- 1/74 • Devices for measuring flow of a fluid or flow of a fluent solid material in suspension in another fluid [2]
- 1/76 • Devices for measuring mass flow of a fluid or a fluent solid material (weighing a continuous stream of material during flow G01G 11/00) [2]
- 1/78 • • Direct mass flowmeters [2]
- 1/80 • • • operating by measuring pressure, force, momentum, or frequency of a fluid flow to which a rotational movement has been imparted [2]
- 1/82 • • • • using a driven wheel as impeller and one or more other wheels or moving elements which are angularly restrained by a resilient member, e.g. spring member, as the measuring device [2]
- 1/84 • • • • Gyroscopic mass flowmeters [2]
- 1/86 • • Indirect mass flowmeters, e.g. measuring volume flow and density, temperature, or pressure [2]
- 1/88 • • • with differential-pressure measurement to determine the volume flow [2]
- 1/90 • • • with positive-displacement meter or turbine meter to determine the volume flow [2]

- 3/00 **Measuring the volume flow of fluids or fluent solid material wherein the fluid passes through the meter in successive and more or less isolated quantities, the meter being driven by the flow** (measuring a proportion of the volume flow G01F 5/00)
- 3/02 • with measuring chambers which expand or contract during measurement
- 3/04 • • having rigid movable walls
- 3/06 • • • comprising members rotating in a fluid-tight or substantially fluid-tight manner in a housing
- 3/08 • • • • Rotary-piston or ring-piston meters
- 3/10 • • • • Geared or lobed impeller meters
- 3/12 • • • • Meters with nutating members, e.g. discs
- 3/14 • • • comprising reciprocating pistons, e.g. reciprocating in a rotating body
- 3/16 • • • • in stationary cylinders
- 3/18 • • • • • involving two or more cylinders
- 3/20 • • having flexible movable walls, e.g. diaphragms, bellows (diaphragms or bellows therefor G01F 15/16)
- 3/22 • • • for gases
- 3/24 • with measuring chambers moved during operation (wet gas-meters G01F 3/30)
- 3/26 • • Tilting-trap meters
- 3/28 • • on carriers rotated by the weight of the liquid in the measuring chambers
- 3/30 • Wet gas-meters
- 3/32 • • comprising partitioned drums rotating or nutating in a liquid
- 3/34 • • comprising bells reciprocating in a liquid
- 3/36 • with stationary measuring chambers having constant volume during measurement (with measuring chambers which expand or contract during measurement G01F 3/02)
- 3/38 • • having only one measuring chamber
- 5/00 **Measuring a proportion of the volume flow**
- 7/00 **Volume-flow measuring devices with two or more measuring ranges; Compound meters**
- 9/00 **Measuring volume flow relative to another variable, e.g. of liquid fuel for an engine**
- 9/02 • wherein the other variable is the speed of a vehicle

Metering by volume

- 11/00 **Apparatus requiring external operation adapted at each repeated and identical operation to measure and separate a predetermined volume of fluid or fluent solid material from a supply or container, without regard to weight, and to deliver it**
- 11/02 • with measuring chambers which expand or contract during measurement
- 11/04 • • of the free-piston type
- 11/06 • • • with provision for varying the stroke of the piston
- 11/08 • • of the diaphragm or bellows type (diaphragms or bellows therefor G01F 15/16)
- 11/10 • with measuring chambers moved during operation
- 11/12 • • of the valve type, i.e. the separating being effected by fluid-tight or powder-tight movements (involving the tilting or inverting of the supply vessel G01F 11/26)
- 11/14 • • • wherein the measuring chamber reciprocates
- 11/16 • • • • for liquid or semiliquid

- 11/18 • • • • for fluent solid material
- 11/20 • • • wherein the measuring chamber rotates or oscillates
- 11/22 • • • • for liquid or semiliquid
- 11/24 • • • • for fluent solid material
- 11/26 • • wherein the measuring chamber is filled and emptied by tilting or inverting the supply vessel, e.g. bottle-emptying apparatus
- 11/28 • with stationary measuring chambers having constant volume during measurement (with measuring chambers which expand or contract during measurement G01F 11/02)
- 11/30 • • with supply and discharge valves of the lift or plug-lift type
- 11/32 • • • for liquid or semiliquid
- 11/34 • • • for fluent solid material
- 11/36 • • with supply or discharge valves of the rectilinearly-moved slide type
- 11/38 • • • for liquid or semiliquid
- 11/40 • • • for fluent or solid material
- 11/42 • • with supply or discharge valves of the rotary or oscillatory type
- 11/44 • • • for liquid or semiliquid
- 11/46 • • • for fluent solid material

13/00 Apparatus for measuring by volume and delivering fluids or fluent solid materials, not provided for in the preceding groups

15/00 Details of, or accessories for, apparatus of groups G01F 1/00-G01F 13/00 insofar as such details or appliances are not adapted to particular types of such apparatus

- 15/02 • Compensating or correcting for variations in pressure, density, or temperature
- 15/04 • • of gases to be measured
- 15/06 • Indicating or recording devices, e.g. for remote indication
- 15/07 • Integration to give total flow, e.g. using mechanically-operated integrating mechanism [2]
- 15/075 • • using electrically-operated integrating means [2]
- 15/08 • Air or gas separators in combination with liquid meters; Liquid separators in combination with gas-meters
- 15/10 • Preventing damage by freezing or excess pressure or insufficient pressure
- 15/12 • Cleaning arrangements; Filters (filters in general B01D)
- 15/14 • Casings, e.g. of special material
- 15/16 • Diaphragms; Bellows; Mountings therefor
- 15/18 • Supports or connecting means for meters

Measuring volume

- 17/00 Methods or apparatus for determining the capacity of containers or cavities, or the volume of solid bodies** (measuring linear dimensions to determine volume G01B)
- 19/00 Calibrated capacity measures for fluids or fluent solid material, e.g. measuring cups**
- 22/00 Methods or apparatus for measuring volume of fluids or fluent solid material, not otherwise provided for [5]**

- 22/02 • involving measurement of pressure [5]

Level indicators

23/00 Indicating or measuring liquid level, or level of fluent solid material, e.g. indicating in terms of volume, indicating by means of an alarm (in wells E21B 47/04; adaptation to, or mounting on, steam boilers F22B 37/78; level regulation G05D; alarm devices G08B)

- 23/02 • by gauge glasses or other apparatus involving a window or transparent tube for directly observing the level to be measured or the level of a liquid column in free communication with the main body of the liquid
- 23/04 • by dip members, e.g. dip-sticks
- 23/14 • by measurement of pressure (measuring pressure in general G01L)
- 23/16 • • Indicating, recording, or alarm devices being actuated by mechanical or fluid means, e.g. using gas, mercury, or a diaphragm as transmitting element, or by a column of liquid
- 23/18 • • Indicating, recording, or alarm devices actuated electrically
- 23/20 • by measurement of weight, e.g. to determine the level of stored liquefied gas (weighing in general G01G)
- 23/22 • by measurement of physical variables, other than linear dimensions, pressure, or weight, dependent on the level to be measured, e.g. by difference of heat transfer of steam or water (involving the use of floats G01F 23/30)
- 23/24 • • by measuring variations of resistance of resistors due to contact with conductor fluid
- 23/26 • • by measuring variations of capacity or inductance of capacitors or inductors arising from the presence of liquid or fluent solid material in the electric or electromagnetic fields
- 23/28 • • by measuring the variations of parameters of electromagnetic or acoustic waves applied directly to the liquid or fluent solid material [6]
- 23/284 • • • Electromagnetic waves [6]
- 23/288 • • • • X-rays; Gamma rays [6]
- 23/292 • • • • Light [6]
- 23/296 • • • Acoustic waves [6]
- 23/30 • by floats (switches operated by floats H01H 35/18) [4]
- 23/32 • • using rotatable arms or other pivotable transmission elements [4]
- 23/34 • • • using mechanically actuated indicating means [4]
- 23/36 • • • using electrically actuated indicating means [4]
- 23/38 • • • using magnetically actuated indicating means [4]
- 23/40 • • using bands or wires as transmission elements [4]
- 23/42 • • • using mechanically actuated indicating means [4]
- 23/44 • • • using electrically actuated indicating means [4]
- 23/46 • • • using magnetically actuated indicating means [4]
- 23/48 • • using twisted spindles as transmission elements [4]
- 23/50 • • • using mechanically actuated indicating means [4]
- 23/52 • • • using electrically actuated indicating means [4]

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- 23/54 • • • using magnetically actuated indicating means [4]
- 23/56 • • using elements rigidly fixed to, and rectilinearly moving with, the floats as transmission elements [4]
- 23/58 • • • using mechanically actuated indicating means [4]
- 23/60 • • • using electrically actuated indicating means [4]
- 23/62 • • • using magnetically actuated indicating means [4]
- 23/64 • • of the free float type [4]
- 23/66 • • • using mechanically actuated indicating means [4]
- 23/68 • • • using electrically actuated indicating means [4]
- 23/70 • • • • for sensing changes in level only at discrete points [4]
- 23/72 • • • using magnetically actuated indicating means [4]
- 23/74 • • • • for sensing changes in level only at discrete points [4]
- 23/76 • • characterised by the construction of the float [4]
- 25/00 Testing or calibrating of apparatus for measuring volume, volume flow, or liquid level, or for metering by volume**