G01L

MEASURING FORCE, STRESS, TORQUE, WORK, MECHANICAL POWER, MECHANICAL EFFICIENCY, OR FLUID PRESSURE (sensing pressure changes for compensating measurements of other variables or compensating readings of instruments for variations in pressure G01D or other relevant subclasses for the variable measured; weighing G01G; converting a pattern of forces into electrical signals G06K 11/00)

Definition statement

This subclass/group covers:

Apparatus or methods for measuring force, stress, torque or the like, and particularly:

- force or stress, in general;
- torque, work, mechanical power, or mechanical efficiency, in general;
- force, e.g. due to impact, work, mechanical power, or torque, adapted for special purposes and for testing brakes.

Apparatus or methods for measuring fluid pressure, and particularly:

- the steady or quasi-steady pressure of a fluid or a fluent solid material by mechanical or fluid pressure-sensitive elements; by electric or magnetic pressure-sensitive elements; by optical or acoustic means, or other means;
- differences of two or more pressure values, or two or more pressure values simultaneously;
- tyre pressure or the pressure in other inflated bodies;

Apparatus or methods for measuring, indicating or recording:

- rapid changes, such as oscillations, in the pressure of steam, gas or liquid;
- work or energy of steam, internal-combustion, or other fluid-pressure engines from the condition of the working fluid;
- knocks in internal-combustions engines.
- pressure in inlet or exhaust ducts of internal-combustion engines.
- Vacuum gauges.

Testing or calibrating of the apparatus as described.

Details or accessories of the apparatus as described.

Relationship between large subject matter areas

For subject matter relating to sensing pressure changes for compensating measurements of other variables or for compensating readings of instruments for variations in pressure, see subclass G01D or other relevant subclasses for the variable measured.

References relevant to classification in this subclass

This subclass/group does not cover:

Weighing	G01G

Examples of places where the subject matter of this class is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Measuring blood pressure for diagnostic purposes	A61B 5/02
Measuring fluid pressure within the human body other than blood pressure for diagnostic purposes	A61B 5/03
Measuring muscular strength or the force of a muscular blow for diagnostic purposes	A61B 5/22
Pressure sensor specially adapted for blood pressure control	A61M 1/3639
Measuring tension, compression or force specially adapted for metal-rolling mills	B21B 38/06, B21B 38/08
Devices for measuring, signalling, controlling, or distributing tyre pressure specially adapted for being mounted on vehicles	B60C 23/00
Applications of tensometers to sewing machine elements	D05B 47/06

Measuring pressure in boreholes or wells	E21B 47/06
Levelling between separate points or surveyors' levels by using barometric means	G01C 5/06
Measuring volume flow, mass flow or volume of fluid by measuring pressure or differential pressure	G01F 1/34, G01F 1/88, G01F 22/02
Measuring or indicating level of liquid or fluent material by measurement of pressure	G01F 23/14
Weighing apparatus wherein the balancing is effected by fluid action, with means for measuring the pressure imposed by the load on a liquid	G01G 5/04
Method of arrangement for converting patterns of mechanical parameter (force) into electrical signal	G06K 11/00
Testing of engines by monitoring pressure in cylinders or fluid ducts	G01M 15/08 - G01M 15/09
Meteorology	G01W 1/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

Torque indicators in wrenches or screwdrivers	B25B 23/14
Tyre-inflating valves	B60C 29/00
Seat occupant detection	B60N 2/002
Supplying air for tyre inflation	B60S 5/04
Application of tension indicators for adjusting or controlling tension in	B65H 59/40

filamentary material	
Devices for indicating tension in warp or cloth	D03D 49/18
Indicating lubricant pressure in machines	F01M 1/20
Indicating coolant pressure in machines or engines	F01P 11/18
Special adaptations of indicating, measuring, or monitoring equipment for the filling or discharging of vessels	F17C 13/02
Embedding pads or other sensitive devices in paving or other road surfaces	E01F 11/00
Measuring the deformation in a solid by mechanical strain gauges	G01B 5/30
Measuring the deformation in a solid by resistance strain gauges	G01B 7/16
Measuring the deformation in a solid by optical strain gauges	G01B 11/16
Measurement of mechanical vibrations or ultrasonic, sonic or infrasonic waves	G01H
Testing of bearings	G01M 13/04
Testing steering behaviour of vehicles	G01M 17/06
Investigating strength properties of solid materials by application of mechanical stress	G01N 3/00
Devices characterised by the determination of the variation of atmospheric pressure with height to measure the vertical components of speed	G01P 3/62
Scanning-probe techniques using	G01Q

atomic force microscopy	
Hollow bodies deformable or displaceable under pressure, e.g. Bourdon tubes, bellows	G12B 1/04
Switches operated by change of fluid pressure	H01H 35/24
Controllable semiconductor devices by variation of applied mechanical force, e.g. of pressure	H01L 29/84
Dynamo-electric clutches; Dynamo-electric brakes	H02K 49/00

Special rules of classification within this subclass

The special rules of classification are given at the main-group level in separate templates (with exception of G01L 11/00, G01L 13/00, G01L 15/00, G01L 21/00, G01L 23/00, G01L 27/00, **G01L29/00**).

Special classification rules for the subgroups are given in the main-group templates. The subgroups that are not covered there, are considered clear and correct as such from the wording of the title.

In G01L, it is not necessary to classify "additional information", i.e. CPC is only to be used for the classification of invention information and not for classifying additional information.

Glossary of terms

In this subclass/group, the following terms (or expressions) are used with the meaning indicated:

Fluid	gas or liquid
Pressure	force induced by a fluid on a surface

Synonyms and Keywords

In patent documents the following abbreviations are often used:

FBG	Fibre Bragg Grating

FSR	Force Sensing Resistor
MEMS	Microelectromechanical Systems
SAW/BAW	Surface/Bulk Accoustic Wave

In patent documents the expression/word "pressure" is often used with the meaning "force". The word "pressure" is adequate only in the case of a force generated by a fluid.

G01L 1/00

Measuring force or stress in general (measuring force due to impact G01L 5/00; measuring deformation of bodies as a result of stress by using gauges G01B)

Definition statement

This subclass/group covers:

Apparatus or methods for measuring force:

- by using hydraulic or pneumatic means, counterbalancing forces, piezo-electric or piezo-resistive devices, wave or particle radiation;
- by measuring elastic or permanent deformation of gauges;
- by measuring variation of frequency of stresses vibrating elements, of magnetic properties or capacitance or inductance or ohmic resistance or optical properties of the stressed material or other electrical means

Auxiliary measure taken on the apparatus or methods for measuring force

References relevant to classification in this group

This subclass/group does not cover:

Measurement of force due to residual stress	G01L 5/0047
Measurement of force due to impact	G01L 5/0052
Measurement of force of explosion	G01L 5/14
Measurement of several components of force	G01L 5/16

Measurement of force due to fluid pressure	G01L 7/00 - G01L 23/00, G01L 27/00

Examples of places where the subject matter of this class is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Force sensor adapted to special purposes	G01L 5/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

Measuring deformation of bodies as a result of stress by using gauges	G01B
Weighing apparatus characterized by the use of elastically deformable member	G01G 3/00

Special rules of classification within this group

Multiple classification is allowed, sometimes necessary since for example some sub-groups are devoted to what is deformed (for instance springs in G01L 1/04), other to what parameter is measured (for instance capacitance/inductance in G01L 1/14). It is the grade of detail of the disclosure of the document which is important (for instance just mentioning that the measurement is done by measuring a capacitance without other precision is not sufficient for a classification in G01L 1/14 or subgroups).

The main Group G01G 3/00 has a similar structure as the main group G01L 1/00, especially between G03G/14 and G01L 1/22.

G01L 1/02; G01L 1/083 take precedence, i.e. when the hydraulic or pneumatic means are used for generating the counter-balancing forces .

This sub-group also contains sensor with elastomeric transmitting means (like rubber).

G01L 1/06; This sub-group contains force measurement system using the print of a pinpoint in material, or using indentation hardness (see also G01N 3/40 hardness testing of material).

G01L 1/08; See also similar arrangement in G01G 5/00, G01G 5/006, G01G 7/04 and G01G 7/045 in weighing systems.

G01L 1/12; The sub-group G01L 1/127 has to be chosen when it is the material under stress in which inductance is varying, otherwise classify in G01L 1/14.

G01L 1/18; See also semi-conductor devices controllable by variation of applied mechanical force H01L 29/84.

G01L 1/20; Also contains sensor with the resistance material being a part of the mechanical structure of the sensor.

The sub-group contains Force Sensing Resistor or FSR.

G01L 1/22; For search, in the case of ring shaped support adapted for measuring force along a single direction (G01L 1/2231) see also nut tightening force measurement system (G01L 5/24) using washer (G01L 5/243).

The sub-group G01L 1/2287 also contains mounting details of the strain gauges.

G01L 1/24; This group also contains pressure sensitive films or paper or coatings having changes in optical properties when stresses are applied.

The important characteristic to check for classification is to find which means are stressed by the force to be measured.

For the search, in the case of the measurement of a physical variable influencing the optical properties of an optical fibre see G01D 5/353.

For the search, Bragg grating per se see G02B 6/124

G01L 1/26; This group also contains light beam shutters.

G01L 3/00

Measuring torque, work, mechanical power, or mechanical efficiency in general

Definition statement

This subclass/group covers:

Apparatus or methods for measuring torque:

- by using rotary-transmission dynamometer like a flexible shaft or other means;
- by using rotary-absorption dynamometers, for instance of brake type

Apparatus or methods for determining the value of power:

- by measuring torque and velocity, pressure and velocity, tractive or propulsive force and velocity;

Apparatus or methods for measuring efficiency (ratio of power input to power output).

References relevant to classification in this subclass

This subclass/group does not cover:

Measurement of torque moment of a tightening nut	G01L 5/24
Apparatus or method for determining the characteristic of torque in relation to revolution per unit of time	G01L 5/26

Examples of places where the subject matter of this class is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Torque sensor adapted to special purposes	G01L 5/00
Measuring multiple component of torque	G01L 5/16

Informative references

Attention is drawn to the following places, which may be of interest for search:

Measuring angle and encoders therefor	G01D 5/00
Measuring angular speed or differences of angular speed	G01P 3/00

Special rules of classification within this group

G01L 3/24;This group contains all apparatus and method for determining the value of power, not only by measuring torque, but also by measuring force or pressure multiplied by a displacement variable (angular or linear velocity).

This group do not contains measurement of power adapted to special purposes (see G01L 5/0095).

G01L 3/26; For classification and search purpose see also G01M 15/044, testing engines by monitoring power, and G01L 23/00, Indicators for determining work or energy of steam or internal combustion engines.

G01L 5/00

Apparatus for, or methods of, measuring force, e.g. due to impact, work, mechanical power, or torque, adapted for special purposes (measuring pressure of a fluent medium G01L 7/00 to G01L 21/00; measuring rapid changes of pressure in gas, steam or liquid G01L 23/00)

Definition statement

This subclass/group covers:

Apparatus or methods for measuring forces:

- adapted for mounting in a bore of the structure;
- associated with a bearing;
- associated with force applying means;
- due to residual stresses;
- due to impact;
- due to spring-shaped elements, like electrical connectors or paperclips;
- associated with industrial machines or actuator;
- of release of ski safety bindings;
- of explosions;
- in several directions;
- applied to control member.

Apparatus or methods for:

- measuring work or power adapted to special purposes;
- measuring tension in ropes cables, wires, threads, belts, bands or like flexible member;
- measuring axial thrust in rotary shaft;

- measuring the tractive or propulsive power of vehicles;
- measuring the energy of projectiles;
- measuring the ratio of forces;
- measuring wheel side-thrust.

Apparatus or methods for determining the value of torque:

- of a tightening nut;
- in relation to revolution per unit of time;
- associated with torque applying means.

Apparatus for testing brakes (insofar as force is measured or applied to the brake)

References relevant to classification in this subclass

This subclass/group does not cover:

For measuring load distribution on feet	A61B 5/1036
Measurement of force per se	G01L 1/00
Measurement of torque, work and power per se	G01L 3/00
Measurement of work or energy of steam or internal combustion engines, or other fluid pressure engines	G01L 23/00
Touch screens	G06F 3/041

Informative references

Attention is drawn to the following places, which may be of interest for search:

Measuring golf clubs, bats or rackets	A63B 59/00

Special rules of classification within this group

G01L 5/0009; For the search the group G01M 13/04 concerning the testing of bearing is relevant since force sensor can be used for bearing monitoring.

For the search and eventually for the classification the group F16C 19/00 concerning bearing with rolling contact is also relevant.

G01L 5/0028; This sub-group also contain apparatus and methods for measuring the force of driving nails, bolts, bolts threads or other anchoring means, for bonding wires, closing bottle caps, tying raps or other similar system.

G01L 5/0057; This sub-group contains measuring force due to electrical connectors, paperclip and similar devices.

G01L 5/0061; This sub-group covers force sensors associated with industrial machines or actuators except those force sensors associated with pumps, engines, valve actuators, cranes, drilling rods, which are classified in their own technical field (F01, F04, F16, B66, E21).

Apparatus or method for indicating the functioning of a valve are classified in F16K 37/0075.

In the sub-group G01L 5/0066 are classified the documents concerning calibration arrangements adapted to calibrate the force sensor associated with an industrial machine or actuator, otherwise calibration arrangements of force sensor are classified in G01L 25/00.

For the search, see also B25J 9/1692, calibration of robot manipulator.

In the sub-group G01L 5/0076, force sensor of presses, crimping terminals on wires, rolling machines, extruders are not classified, but are in the relevant classes from B21 to B42.

G01L 5/04; For the search and also classification, apparatus or methods adapted for the measuring of web tension are also classified in B65H 23/044;

For the search and also classification, apparatus or methods adapted for the controlling of the tension of bending machines in **B65H13/22**;

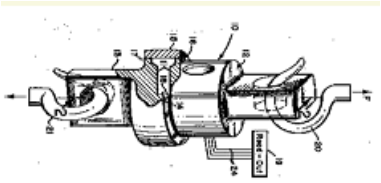
For the search and also classification, apparatus and method for measuring tension in cables, ropes is done in G01G 19/14 (with the difference that the tension is produced by the gravitation), and overload protection is done in G01G 23/005.

For the search and classification crane hooks with load measurement device are in B66C 1/40 or B66C 13/10, and rope, cable or chain winding mechanism with overload protection are in BB66D 1/56.

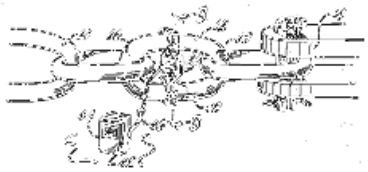
For the search in the sub-group G01L 5/045 (tension across the width of a band-shaped flexible band), measuring flatness in general is G01B 5/285, G01B 7/345, G01B 11/306, G01B 13/22, G01B 15/08, G01B 21/30.

G01L 5/10; The following figures are illustration for a better understanding of

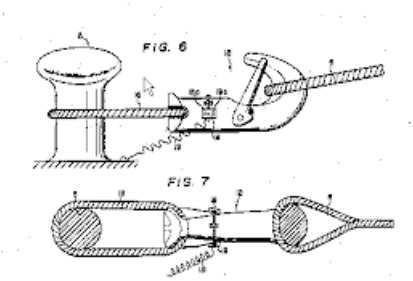
the different sub-groups in G01L 5/10, measuring tension in ropes, cables with electrical means.



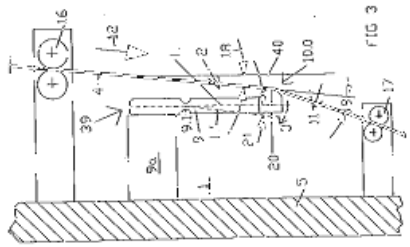
G01L 5/101: [N: in which the sensor is inserted into the member]



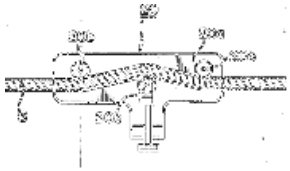
G01L 5/102: [N: in which the sensor is located at a non-interrupted part of the member]



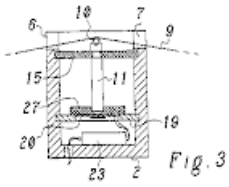
G01L 5/103: [N: in which the sensor is fixed at one end of the member]



G01L 5/106: by measuring a reaction force applied on a cantilever beam



G01L 5/107 : by measuring a reaction force applied on an element disposed between two supports



G01L 5/108: by measuring a reaction force applied on a single support or glider

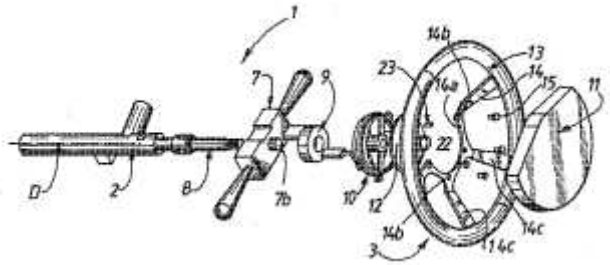
For classification: a document has to be classified with respect to the placement of the sensor on the apparatus (G01L 5/101, G01L 5/102, G01L 5/103) and by the way the reaction force is measured (G01L 5/106, G01L 5/107, G01L 5/108).

G01L 5/13; For the search and classification, the control of draught load or tractive force of lifting devices mounted on tractors see A01B 63/112.

G01L 5/16; In this group are also classified multiple torque measurements and combinations of torque and force measurements.

G01L 5/22; For search and classification, the controls for manipulator by means of force, torque, or other sensor see B25J/08.

For the search and classification, hand worn input/output device see G06F 3/014; The sub-group G01L 5/221 concerning force sensors in steering wheels has an overlap with the group B62D 5/00, power assisted steering in general. The following figure is an example of document (FR2774349) classified in this group:



For search and classification in G01L 5/225 see also A61B 5/221 (Measuring muscular forces by using bicycle type apparatus) and A63B 69/16 (Cycling sport training apparatus).

G01L 5/24; This sub-group does not cover arrangements for torque limiters or torque indicators in wrenches or screwdrivers which are classified in B25B 23/14.

G01L 5/28; This group does not cover monitoring or checking brake system integrated in vehicles (B60T 17/22) and also do not cover testing or monitoring of railways brakes (B60T 17/228).

For classification and search see also electrical control system of brakes (**B60T17/66**).

Glossary of terms

In this subclass/group, the following terms (or expressions) are used with the meaning indicated:

Adapted for special purposes	not easily possible to adapt the device or method to another purpose or to a more general purpose, i.e. that the device or method has been designed to solve a specific technical problem

G01L 7/00

Measuring the steady or quasi-steady pressure of a fluid or a fluent solid material by mechanical or fluid pressure-sensitive elements [N: G01L 11/004 takes precedence] (transmitting or indicating the displacement of mechanical pressure-sensitive elements by electric, [N: e.g. photoelectric] or magnetic means G01L 9/00; measuring differences of two or more pressure values G01L 13/00; measuring two or more pressure values simultaneously G01L 15/00; measuring tyre pressure or the pressure of other inflated bodies G01L 17/00; vacuum gauges G01L 21/00; hollow bodies deformable or displaceable under internal pressure, per se G12B 1/04; [N: pressure sensitive switches using Bourbon gauges H01H 9/00; pressure sensitive fluidum level or volume measuring devices G01F 17/00; G01F 23/14, G01F 23/16 pressure sensitive depth meters G01C 13/008; aircraft altitude meters G01C 5/005])

Definition statement

This subclass/group covers:

Apparatus or methods for measuring fluid pressure:

- by using elastically deformable gauges;
- by using flexible deformable tubes, likes Bourdon gauges;
- by using bellows;
- by using flexible diaphragm;
- by using capsules;
- by using pistons;

- by using liquid as pressure sensitive medium, like liquid column gauges.

References relevant to classification in this subclass

This subclass/group does not cover:

Pressure sensor specially adapted for blood pressure control	A61M 1/3639
Diver equipments	B63C 11/02
Measuring depth of open water	G01C 13/008
Measuring heights (altimeter for aircraft, with barometer) or depth	G01C 5/00
General determination of the capacity of containers	G01F 17/00
Pressure sensitive fluid level or volume measuring devices	G01F 23/14
Pressure sensor using counterbalancing forces	G01L 11/004
Measurement differences of two or more pressure values	G01L 13/00
Measurement two or more pressures values simultaneously	G01L 15/00
Measuring tyre pressure or the pressure of other inflated bodies	G01L 17/00
Vacuum gauges	G01L 21/00
Transmitting or indicating the displacement of mechanical pressure sensitive elements by electric means	G01L 9/00
Hollow bodies deformable or displaceable under internal pressure per se	G02B 1/04
Pressure sensitive switches using Bourdon gauges	H01H 9/00

Special rules of classification within this group

G01L 7/02; This group does not cover blood pressure control and pressure transducer specially adapted therefor A61M 1/3639.

G01L 7/14; This sub-group also contain temperature compensating means.

G01L 9/00

Measuring steady or quasi-steady pressure of a fluid or a fluent solid material by electric or magnetic pressure-sensitive elements [N: (G01L 11/004 takes precedence)]; Transmitting or indicating the displacement of mechanical pressure-sensitive elements, used to measure the steady or quasi-steady pressure of a fluid or fluent solid material by electric or magnetic means (measuring differences of two or more pressure values G01L 13/00; measuring two or more pressure values simultaneously G01L 15/00; vacuum gauges G01L 21/00; transferring the output of the sensing member to the indicating or recording part in general G01D 5/00)

Definition statement

This subclass/group covers:

Apparatus or methods for measuring fluid pressure:

- by using elastically deformable gauges with electric and other similar detection means;
- by using flexible deformable tubes, likes Bourdon gauges with electric and other similar detection means;
- by using bellows with electric and other similar detection means ;
- by using flexible diaphragm with electric and other similar detection means;
- by using capsules with electric and other similar detecting means;
- by using pistons with electric and other similar detection means;
- by using liquid as pressure sensitive medium, like liquid column gauges, with electric and other similar detection means;
- using semi-conductor body comprising PN-junction as detecting

element;

- circuits of sensors making use of variation in ohmic resistance;
- circuits of sensors making use of piezo-electric devices;
- circuits of sensors making use of variation of inductance;
- circuits of sensors making use of variation of capacitance;
- involving the displacement of magnets;
- sensors making use of variation in the magnetic properties resulting from the application of stress;
- sensors making use of electrokinetic cells

References relevant to classification in this subclass

This subclass/group does not cover:

Pressure sensor specially adapted for blood pressure control	A61M 1/3639
Measuring depth of open water	G01C 13/008
Measuring heights (altimeter for aircraft, with barometer) or depth	G01C 5/00
Transducer not specially adapted to a specific variable	G01D 5/00
General determination of the capacity of containers	G01F 17/00
Pressure sensitive fluid level or volume measuring devices	G01F 23/14
Pressure sensor using counterbalancing forces	G01L 11/004
Measurement differences of two or more pressure values	G01L 13/00
Measurement two or more pressures values simultaneously	G01L 15/00
Measuring tyre pressure or the pressure of other inflated bodies	G01L 17/00

Vacuum gauges	G01L 21/00
Transmitting or indicating the displacement of mechanical pressure sensitive elements by non electric means	G01L 7/00
Hollow bodies deformable or displaceable under internal pressure per se	G02B 1/04
Pressure sensitive switches using Bourdon gauges	H01H 9/00

Special rules of classification within this group

G01L 9/0041; For search or classification in construction details associated to semi-conductive diaphragm sensor (G01L 9/0042), see also H01L 21/00, process or apparatus for manufacturing semiconductor devices, and B81C 1/00158, manufacturing of devices on a diaphragm.

For search and classification in **G01L9/00D2F**, mounting arrangement of diaphragm sensor with resistance sensors, see also H05K 7/00, constructional details common to different types of electric apparatus.

For search and classification in **G01L9/00D2F2**, diaphragm pressure sensor using additional isolating diaphragms, see also G01L 13/025, devices for measuring differences of two or more pressure value using diaphragms, and **G01L9/00D2E4**, pressure sensor using strain gages with fluid coupling.

For search and classification in G01L 9/0079, pressure sensor with diaphragm using a Fabry-Perrot arrangement, see also G01D 5/266, Transducer not specially adapted to a specific variable using interferometer, and G01D 5/268, Transducer not specially adapted to a specific variable using fiber.

For search and classification in **G01L19/00D2F12** and lower see also G01L 19/14, housings of pressure sensor in general.

G01L 9/02, G01L 9/04, G01L 9/06, G01L 9/08, G01L 9/10 and G01L 9/12

In these groups documents are only classified therein if there are details about the circuits of the pressure sensor. For details about the physical way of measuring the pressure see the corresponding subgroups in G01L 9/00.

G01L 11/00

Measuring steady or quasi-steady pressure of a fluid by

means not provided in groups G01L 7/00 or G01L 9/00

Special rules of classification within this group

The documents concerning pressure sensor are classified in this group if the pressure measurement method do not fit in G01L 7/00 or G01L 9/00. Especially classification in G01L 11/02 (using optical means) cannot be given if the document fit with for instance G01L 9/0076 (diaphragm pressure sensor using optical means). See G01L 7/00 or G01L 9/00 before classifying here.

G01L 13/00

Devices or apparatus for measuring differences of two or more pressure values

G01L 15/00

Devices or apparatus for measuring two or more pressure values simultaneously

G01L 17/00

Devices or apparatus for measuring tyre pressure or the pressure in other inflated bodies (specially adapted for mounting on vehicles or tyres B60C 23/00)

References relevant to classification in this main group

This subclass/group does not cover:

Examples of places where the subject matter of this group is covered when specially adapted, used for a particular purpose, or incorporated in a larger system:

Specially adapted for mounting on vehicles or tyres	B60C 23/00

Informative references

Attention is drawn to the following places, which may be of interest for search:

Connection of valves to inflatable elastic bodies	B60C 29/00

G01L 19/00

Details or accessories for pressure sensors insofar as such details are not special to particular types of pressure gauges

Definition statement

This subclass/group covers:

- Connecting means of pressure sensor;
- Pressure sensor associated with other sensor;
- Arrangement for compensating or preventing effects of inclination or acceleration;
- Temperature compensation means;
- Overload and other protection means;
- Recording means;
- Housings of pressure sensor;
- Dials and mounting of dials.

Special rules of classification within this group

G01L 19/0007; For search or classification in connecting means for flowthrough system having a flexible pressure transmitting element (G01L 19/0023), see also measuring deformation of fluid transporting tubes in G01L 7/02 and G01L 9/0001.

G01L19/00D; For search and classification: this sub-group only concerns the measurements of pressure plus another variable and for not only compensation purposes. Measurements of a plurality of variable see G01D 21/02. For compensation purposes see relevant group in G01L 19/00,02, G01L 19/04, G01L 9/025, G01L 9/045, G01L 9/065, G01L 9/085, G01L 9/105, G01L 9/125.

G01L 19/02; This sub-group also contains humidity, static pressure, range adjusting or extension means, and zero setting means with exception of aneroid barometers (see G01L 7/14).

G01L 19/04; For search an classification: this sub-group only concerns non electrical compensating means. With electrical compensation means see relevant group in G01L 19/00,02, G01L 19/04, G01L 9/025, G01L 9/045, G01L 9/065, G01L 9/085, G01L 9/105, G01L 9/125. For temperature compensation of aneroid barometers (see G01L 7/14).

G01L 19/06; For search or classification in the sub-group G01L 19/0672, leakage or rupture detection in pressure sensor, see also leak detection per see in G01M 3/00, and leak detection in membrane, B01D 65/102.

G01L 19/12; This subgroup does not cover pressure switches (H01H 35/24 to H01H 35/40).