Instruction Manual

English

Applied Standards on InstruMate Electric Contact Gauges:

Process Connections: EN 837

CE

InstruMate®

Electric Contact Gauges
Models: 212, 213 & 214 InstruMate

Contents (English)

Models brief explanation (Default Configuration):

212: Brass wetted parts with snap-action contacts.
213: Stainless Steel 316L wetted parts with snap-actions contacts.
214: Stainless Steel 316L wetted parts with Inductive contacts.

1) Introduction

1-1) All InstruMate Electric Contact gauges are made under the management system certified to ISO9001 and strictly controlled for production process.

1-2) Installation site regulations and local safety requirements are to be observed prior to this instruction manual.

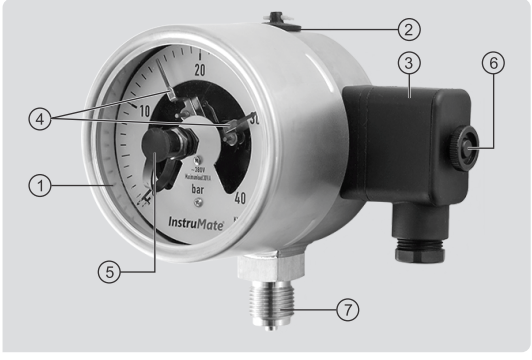
1-3) It is recommended to skilled worker or personnel to study instruction manual before handling the instrument and this manual must be easily accessible at any time and shall be passed to new personnel.

1-4) InstruMate Co., Limited insists on permanent improvement. As a result, technical info are subject to modifications.

Data sheets and more information can be found at: www.instrumate.com
Technical consults: info@instrumate.com

2) About the product

2-1) Overview



① Laminated safety glass
② Oil cap
③ Electrical connection with cable box
④ Set pointer
⑤ Adjustment lock
⑥ Adjustment Key
⑦ Process connection

2-2) Description & application:

In industrial processes, there are times when you need to read the pressure values and at the same time have the ability to alter electric circuits (open/close) at desired set values. Then InstruMate Electric Contact Gauges with their robust design are a smart choice for switching functions (normally closed, normally open, and change-over contacts).

2-2-1) Snap-action Electric Contacts **(EC1)**:

The most common and economical type of contact for switching loads of up to 30W 50VA are magnetic snap-action contacts. There is a permanent magnet there on the contact arm which with its force of magnet attracts the contact pin of moveable contact arm. The special magnet has the necessary holding force so the vibration will not be a trouble for InstruMate snap-action contacts.

EC1 contact series can be used to switch circuits in industrial applications including process control, EXCLUDING hazardous or explosion prone areas.

2-2-2) Inductive Electric Contacts **(EC3)**:

InstruMate Inductive Electric Contacts are proximity-type electrical switching elements working in a non-contact way. Basically they consist of a pair of coils, whose magnetic field is affected by a metal control flag (driven by the pointer), causing a change of output current. When the control flag on the pointer (actual value) approaches the head (on the set value), it increases its internal resistance and as a result the change in the current acts as the input signal for the switching amplifier of the control unit and the control unit has no effect on the work of measuring system.

This 2 or 3 wire contact with PNP output is very much in compliance with PLC. On the other hand, InstruMate Inductive Electric Contacts can be jointly used with InstruMate control units to switch higher electrical loads (as InstruMate control unit integrates AC to DC convertor, switching amplifier and the output relay).

All inductive sensors used in InstruMate EC3 gauges are made in Germany by Pepperl and Fuchs.

InstruMate EC3 contacts can be used both inside and outside Explosion Hazardous areas. Outside EX areas they can be used where there is a need for large number of switching cycles as they are contact-free so there will be no wear. And Inside Hazardous area they can be used in Zone 1 and Zone 2.

*** With non-intrinsically safe control units, inductive contacts must not be operated in explosion hazardous areas.**

2-3) Safety Versions:

As per EN 837, InstruMate Electric Contact gauges are offered in various safety versions.

Model	Safety Versions available	Description
212	S1	S1: Blow out cap at backside of the instrument S3: Combination of safety glass + solid front wall + blow out cap
213	S1 & S3	
214	S1 & S3	

*S3 versions are option and need to be requested in order confirmation.

3) Proper application and safety measures

3-1) Symbols:

WARNINGS!
Potentially dangerous situation that can result in injury if not avoided.

Potentially dangerous situation that can result in burning if not avoided.

If the instrument has this symbol on its dial, it means it is a safety gauge with solid front wall according to EN 837 (S3).

3-2) Proper Usage:

3-2-1) Only EC3 Inductive contacts can be used inside InstruMate electric contact gauges IF THEY ARE GOING TO BE USED IN HAZARDOUS OR EXPLOSIVE AREAS. Please pay attention to product label.

3-2-2) Only Skilled personnel shall carry out handling of this instrument based on their training or technical knowledge.

3-2-3) The instrument shall not be in direct contact with viscous or crystallizing media. In such cases, InstruMate diaphragm seals must be used in combination with the instrument.

3-3) User / operator responsibility:

3-3-1) It is advised to maintain the product label in a good condition as it contains important information regarding the product.

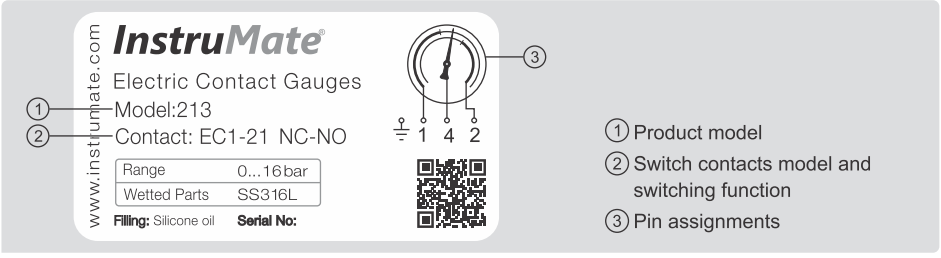
3-3-2) It is obligatory to follow all standards and regulations regarding hazardous, flammable or toxic medias.

3-3-3) Since there is still very low possibility of product failure, you should not use these products with Emergency stop systems.

3-3-4) before using the product, you are responsible to ensure it is completely suitable for your intended application.

3-3-5) The instrument is tested by water, air or oil depending on the pressure range. You must ensure cleanliness of wetted parts for special operations before installation.

3-4) Product Label information:



4) Storage, Package and Transport

4-1) Humidity shall be in a way that no condensation happens. Storage temperature is explained in permissible temperature ranges table.

4-2) Avoid exposure to direct sunlight, hot objects, mechanical vibration and tensions.

* Important notes for Model 214 with EC3 inductive contacts:

A) At any condition, the process and ambient temperature shall not exceed the permissible ranges.

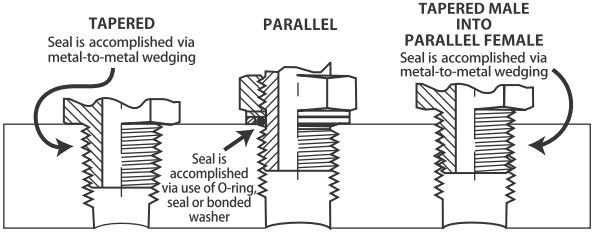
B) Do not install in places where external conditions are capable of creating electro-static discharge. Keep the instrument clean with a damp towel.

4-3) Package is specially designed to protect the instrument from shock and possible damage while transportation. It is advised to keep the package if there is a chance to change the installation site or send for recalibrations.

4-4) Before mounting the instrument, check its appearance for obvious damages possibly caused in transportation.

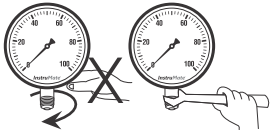
4-5) There is a high risk of damage to the product if not transported properly.

5) Installation



5-1) Gauges with tapered threads: The pressure seal is normally made by the mating of the thread, but it is common practice to apply jointing material to the male thread before assembly like PTFE tape.

The tightening torque applied to the connection should be opposed by a spanner fitted to the flat on the shank of the gauge to prevent damaging the gauge.
Do not tighten by grasping the case of the gauge as this may cause damage.



5-2) If the instrument is filled, the oil vent cap must be opened before use.

5-3) When the Gauge incorporates a blowout device or blow-out back, it must be ensured that the free space behind blow-out is at least 20mm.

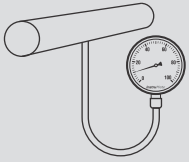
5-4) Do not install in direct sunlight or in a place exposed to heat.

5-5) It is necessary to install the instrument in a stable place with minimum vibration. If there is vibration, you should either fix the instrument with a bracket or use filled versions. If vibration loads cannot be avoided in installation point, the instrument shall be remotely installed using a capillary connection and fixing the instrument at a suitable place in vertical position using brackets.

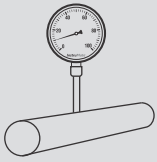
5-6) In some applications, dismounting for test is not convenient. It is advised to use a gauge valve with test connection to test the instrument without dismounting.

5-7) The instrument must be protected from over-load using proper adjustable throttling valve or dampeners.

5-8) pressured media nature decides the instrument assembly relative to the tapping point:



Liquids, liquid & vapour amalgamation, totally condensed gases

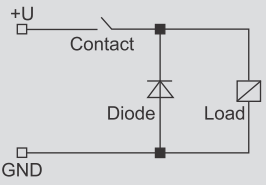


liquid gases, gases, partially condensed gases

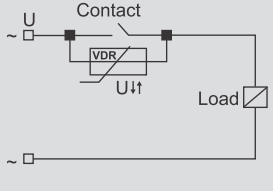
6) Electrical Connection

For InstruMate EC1 contacts, switching current and switching values most always be preserved within specified value under any circumstances. Use protective circuits for both inductive and capacitive loads.

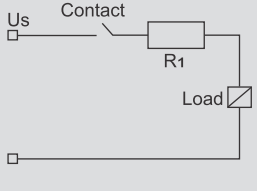
As per experience, the following protective measures are advised:



Diode in parallel with the inductive load with DC voltage



Voltage dependent resistor for inductive load with AC voltage

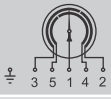


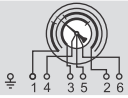
Current limiting resistor for capacitive loads

*** For EC1 snap-action contacts, limit the current in each circuit to ≤1A per circuit.**

Connection details and switching function of contacts are explained on product label and also in product data sheet corresponding to the product code.

Switching Function of InstruMate EC1 snap-action contacts:

Model	Contact type	When the pointer reaches the set-point with the rising pressure…	And if the pointer passes the set-point again by falling pressure…	Wiring (common terminal) default	Wiring (separate terminal) optional
EC1-1	NO	…one Contact will close	…that contact will open again		–
EC1-2	NC	…one Contact will open	…that contact will close again		–
EC1-3	SPDT	...one contact will open and one contact will close at the set-point value	…one contact will close & one contact will open again at the set-point value		–
EC1-33	DPDT	...1st and 2nd contact both will open and close at the set-point value...	...2nd and 1st contact will close and open again at the set-point value...		–
EC1-11	NO-NO	…1st and 2nd contacts will close	…the contacts will open again accordingly		
EC1-22	NC-NC	…1st and 2nd contacts will open	…the contacts will close again accordingly		
EC1-12	NO-NC	…1st contact will close and 2nd contact will open	…2nd contact will close and 1st contact will open again		

Model	Contact type	When the pointer reaches the set-point with the rising pressure…	And if the pointer passes the set-point again by falling pressure…	Wiring (common terminal) default	Wiring (separate terminal) optional
EC1-21	NC-NO	...1st contact will open and 2nd contact will close	…2nd contact will open and 1st contact will close again		
EC1-212	NC-NO-NC	...1st contact will open, 2nd contact will close, 3rd contact will open	…3rd contact will close, 2nd contact will open and 1st contact will close accordingly		

Switching Function of InstruMate EC3 Inductive contacts:

Model	Contact type	When the pointer reaches the set-point with the rising pressure, the metal flag…	and after that …	Wiring (common terminal) default	Wiring (separate terminal) optional
EC3-1	NO	…leaves the control head	…the contact will close		–
EC3-2	NC	…enters the control head	…the contact will be open		–
EC3-11	NO-NO	…leaves 1st control head …leaves 2nd control head	…1st contacts will close …2nd contact will close		–
EC3-22	NC-NC	…enters 1st control head …enters 2nd control head	…1st contacts will open …2nd contact will open		–
EC3-12	NO-NC	…leaves 1st control head …enters 2nd control head	…1st contacts will close …2nd contact will open		–

Model	Contact type	When the pointer reaches the set-point with the rising pressure, the metal flag…	and after that …	Wiring (common terminal) default	Wiring (separate terminal) optional
EC3-21	NC-NO	…enters 1st control head …leaves 2nd control head	…1st contacts will open …2nd contact will close		–

A) Pay attention to switch contacts voltage requirements.

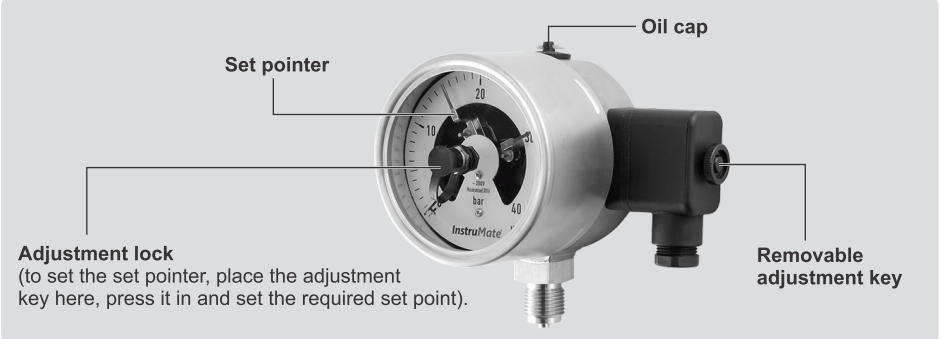
B) Choose the cable according to the highest current strength in the circuits. Only use quality standard cables. (cable gland size is M20x1.5).

C) Isolation of the instrument with the electrical supply shall be made to be used in necessary circumstances.

D) Connecting protective connection to protective earth is necessary to avoid electric shock.

7) Adjusting the contacts at desired set points

Adjustment Key is delivered with all models. Use it gently to adjust switching points between 10% to 90% of the full span no matter which model (212, 213 or 214) you are using.



Caution: pressure shock can damage the instrument. Use proper instrument valves and open slowly.

8) Faults & Errors

Faults and errors possible to be noticed with both EC1 and EC3 contacts:

Faults	Causes	Measures
Contact is not switching any longer	Interruption in electrical connection	Check continuity on electrical connections
	Unsuitable electrical load	Observe the permissible electrical loads
	Polluted contact	
Residual current protection device for the circuit is tripped	Insulation failure	Replace the instrument
Contact short-duration opening and closing	Vibrations	Try remote installation of the instrument
Pointer does not move despite the increase in pressure	Mechanical failure	Replace the instrument

Faults and errors possible to be noticed with EC3 contact:

Faults	Causes	Measures
Switching state remains unchanged despite reaching the switch point / reset point	Contacts defective (e.g. fused contact zone)	Replace the instrument. Before re-commissioning the new instrument, provide a protective circuit for the contact

9) Maintenance and cleaning

InstruMate Electric Contact gauges are maintenance-free. It is advised that they are checked by an expert once a year regarding their accuracy and contact operation. For the filled versions, you should check oil level not to drop to less than 75% of the instrument diameter.

The instrument must be dismounted from process and electric connections before cleaning. Cleaning can be done with a moist towel. Beware not to moist electrical connections.

Refilling and repairing can only be done by authorized and certificated bodies.

10) Uninstallation and disposal

Due to the process media characteristics, the instrument might be infected with hazardous media like corrosive, toxic, radioactive or flammable substances. So the personnel shall wear the protective equipment, and start dismounting after de-pressurizing the instrument and disconnecting the electrical connections.

If the media is hot, it is advised to wait until cool down of the instrument before unmounting.

You shall follow your country regulations in case of the disposal of the instrument.

11) Specifications

11-1) General Specifications for Model 212:

Pressure Limitation	Steady	90% of full scale
	Fluctuating	80% of full scale
	Short time over pressure	120% of full scale
Temperature effect		±0.035% x (t_2-t_1) % of the span * t_1 is the Reference temperature in degrees Celsius * t_2 is the Ambient temperature in degrees Celsius
Wetted materials	Process connection	Copper alloy - ½ BSP
	Pressure element	Copper alloy C-type for ≤ 60bar Helical for > 60bar
Non-wetted materials	Case, bayonet ring	Stainless steel
	Dial	Aluminium, white, black lettering
	Instrument pointer	Aluminium, black
	Set pointer	Aluminium, red
	Window	Laminated safety glass
Ingress protection per IEC/EN 60529		IP54

11-2) General Specifications for Models 213 & 214:

Pressure Limitation	Steady	100% of full scale
	Fluctuating	90% of full scale
	Short time over pressure	130% of full scale
Temperature effect		±0.035% x (t_2-t_1) % of the span * t_1 is the Reference temperature in degrees Celsius * t_2 is the Ambient temperature in degrees Celsius
Wetted materials	Process connection, Pressure element	Stainless Steel 316L (other materials per request)
Non-wetted materials	Case, movement, bayonet ring	Stainless steel
	Dial	Aluminium, white, black lettering
	Instrument pointer	Aluminium, black
	Set pointer	Aluminium, red
	Window	Laminated safety glass
Ingress protection per IEC/EN 60529	IP65 [1)]	

1) Ingress protection IP54 with safety version and lower back mount.

11-3) Maximum Contact Ratings for EC1 snap-action contacts:

Max. contact ratings with resistive loads	Not filled instrument	Filled instrument
Contact closing	1.0 A	1.0 A
Contact opening	1.0 A	1.0 A
Continuous load	0.6 A	0.6 A
Maximum load	30 W / 50 VA	20 W / 20 VA
Ambient temperature	-20…+60°C	-25…+60°C

11-3-1) Snap-action change-over contacts **(SPDT, DPDT)** are supplied without magnet unless magnet is requested by the customer. As a result, the maximum load will be 10 W/ ~18VA and maximum thermal current will be 0.38 A, and the contact rating will be approximately 30% less than the magnetic version.

11-3-2) In an instrument with two EC1 contacts, if the range is lower than 2.5bar it is advised to consider half of the table values as maximum.

11-3-3) It is advised to follow recommended contact ratings to ensure longtime durability of the instrument.

11-4) Recommended Contact Ratings for EC1 snap-action contacts:

Voltage	Magnetic Snap-action EC1 Untilled Instrument	
	Resistive load (mA)	Inductive load (mA)
24V DC	400	250
24V AC	600	250
48V DC	300	200
48V AC	450	200
110V DC	200	125
110V AC	240	125
230V DC	100	65
230V AC	120	65

11-4-1) Abovementioned values are reduced by approximately 40% if the instrument is filled. It is advisedthat switching current does not fall below 25 mA and the switching voltage shall not fall below 24 V. It is highly recommended to use contact protection relays for higher loads and liquid filled instruments.

11-5) Safety-related maximum values for EC3 contacts:

Contact version	Ui	Ii	Pi	Ci	Li
EC3	20V	60 mA	130 mW	250 nF	350 µH

05/2019

InstruMate®

InstruMate Co., Limited

15# Lane 777# Qingfeng Road, Cicheng Town, Jiangbei district, Ningbo, China

www.instrumate.com | info@instrumate.com | +86-574-87620997