Delta control

Pressure transmitter Operating manual

1. Safety Guide

Warning

Please pay attention to the warning on the package.

Measured medium freezing is forbidden, otherwise the sensor may be damaged.

Only qualified and authorized people are allowed to undertake installation, electrical connection, operation and maintenance. Qualified people refers to those who have well experience in installation, electrical connection, operation of transmitters or similar devices, and have obtained certificates, such as training, instruction, or authorized certificates for circuit, high voltage and corrosive medium engineering devices or equipment.

ln addition, the relative security regulations of electrical installation and operation must be abided. This transmitter can work under high voltage and corrosive medium circumstance. Incorrect operation may cause great damage to people and materials. When it is used in other countries, the relative regulations of that country must be abided.

O For your safety, please use tools that meet insulation request.

ln addition, the relative security regulations of electrical installation and operation must be abided. This transmitter can work under high voltage and corrosive medium circumstance. Incorrect operation may cause great damage to people and materials. When it is used in other countries, the relative regulations of that country must be abided.

Please follow the instructions to ensure safe operation of K (K l) series pressure transmitter

Please read this operation manual carefully before installation and operation.

To be brief, this operation manual doesn't include detailed information of all models, neither include every detail in installation, operation and maintenance.

If you want further information that isn't provided in this manual, please contact us.

2. Main features and usage

K (K l) series pressure transmitter adopt internationally advanced sensors and are assembled with highly accurate components. Its dry-pressure (without any liquid medium) measurement technology fully exert the advantages of ceramic sensors, and greatly contribute to the superior technological performance of overloading, small temperature offset, high stability and high accuracy.

K Series Universal Pressure Transmitters are of a variety of output signals, spans, process connections and materials, which resulted in suitable application in Petroleum. Chemical, Power, Metallurgy, Pharmacy and foodstuff industries under different conditions and medium. Therefore, they are becoming the ideal pressure measurement instrument for automation as well as perfect substitutes or upgrading products for conventional pressure gauges or pressure

transmitters

3.Operation principle and structure

3-1 K (Kl) series capacitance pressure transmitter operation principle

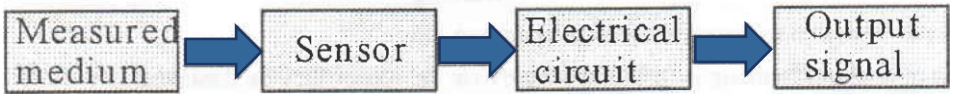
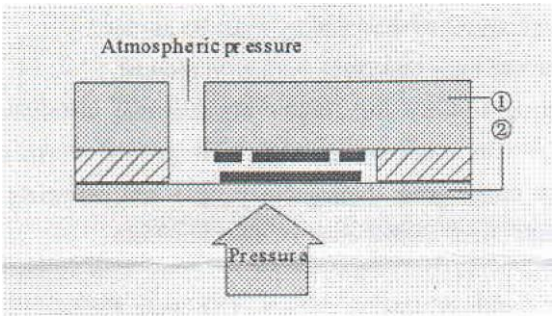


Chart 3 -l

Transmitters are composed by sensor and signal processing circuit. Wheatstone bridge on the sensing surface will produce resistance change when increasing pressure, and after signal process by circuit, the change of resistance can be transmitted to voltage change, and ultimately transmitted to standard signal of 4—20mA. Even if overpressure acts on the diaphragm, the displacement will not exceed 0. Imm, for the distance between diaphragm and solid substrate is just 0. Imm. This construction avoids excessive distortion for diaphragm and ensures its good anti-shock ability and overloading ability. See chart 3-1,3-2.

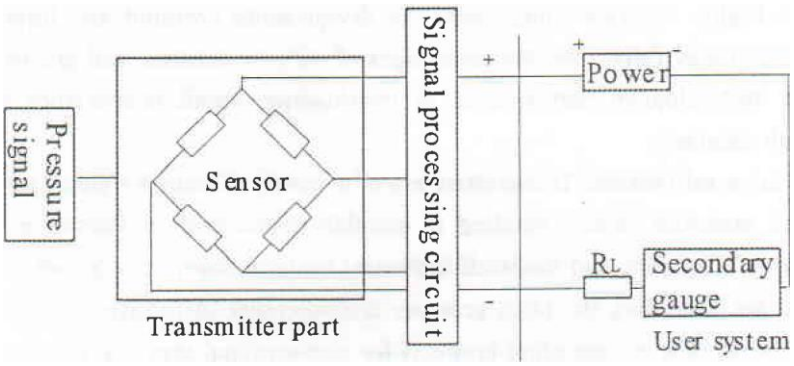


1.C e ra mic unit 2. membra ne

Chart 3-2.

3-2 K (Kl) series silicon diffused pressure transmitter operation principle

The transmitter is consisted of the sensor and the signal processing circuit. The wheat-stone bridge is set up in the sensor's pressure sensing surface. When the pressure increases, all arm resistances' values will change. The different values of the resistances are measured by the signal processing circuit, and are amplified, converted into 4-20mA standard current signal. The principle diagram is showed. See char 3-3.



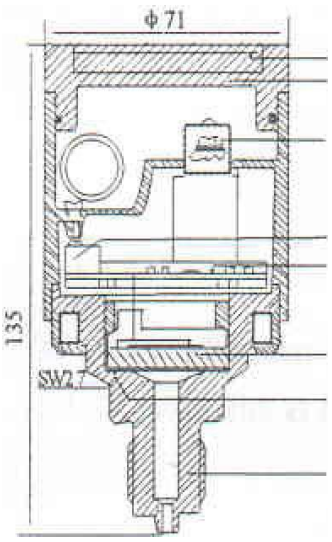
Char 3-3

3-3 K (Kl) series sapphire pressure transmitter operation principle

K (K l) series sapphire pressure transmitter adopts sapphire pressure sensor. Temperature compensation, linear compensation makes it great linearity, superior temperature specialty and wonderful long-term stability, especially fit chilliness and high temperature places

When the pressure is added on the diaphragm, change of resistance value delta R appears on every arm resistance, and produces output voltage signal delta V. The value is convert into 4—20mA standard signal through convert circuit.

3-4 K (K1) series pressure transmitter structure



Digital/pointer display

Back cover

Terminal

Zero-full range adjusting

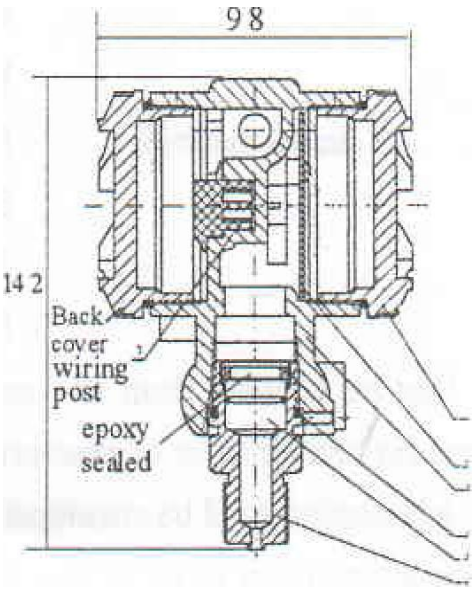
Circuit bo ard

Membrane

Air in pro of loop

Process connection part

k series pressure transmitter



Front cover

circuit board /shell

airproof loop membrane

membrance / process connection part

Kl series pressure transmitter

4. Main technical parameters of models

K (K l) Ai, Bi, Ci are intrinsic safety type , Ad, Bd, Cd are explosion-proof type.

Working voltage: 12.5—30VDC (Explosion-proof certificate of the relative device is required)

Output signal: 4—20mA (Analog, two-wire)

Measuring range: gauge pressure Max0.0—30.0MPa

MinO.O-1.OKPa

absolute pressure Max0.0—60MPa

MinO.O-7.OKPa

negative pressure -0.1~7.0MPa

Accuracy: A accuracy rank 0.1, 0.2, 0.5

B temperature drift ±0.15%F

C stability better than 0. I %FS/year

D direction influence installing direction doesn't influence zero

Working condition: A normal working temperature -20 ^{Q}C— +70 ^{Q}C

B diaphragm -20 ^{0}C— +80 °c (can reach 130 ^{O}C for short time)

C storage temperature -20 ^{0}C —+80 ^{0}C

D High/Low temperature type -65 ~+150 ^{0}C

10 ~+200•c

10 ~+350•c

E comparative temperature 0—95%RH

F atmospheric pressure 86—106KPa

Material of Contact Part with Measured Medium:

A process connection Stainless steel 316L

Stainless steel 1.4581

Stainless steel 1 Gri 8Ni9Ti

Hutchinson alloy C

B sealed material Fluorine rubber

Buna N

Teflon

Full sealed welding

Wire eduction: Can be educted from any outlet, and we recommend industrial cable of Min. 010 as down-lead for convenience of pressurization. The educted tie-in is universal PGI 6, and the other end (no eduction) should be enveloped with cover.

Structure: A explosion-proof (ExdIICT6), intrinsic safety (ExiaIICT6)

B protection class of shell IP65

C K series shell is Aluminum die-casting, total weight0.8Kg

Load characteristics:

The relationship of Load resistance and power supply

voltage see chart 4- I •

1620
1500

Load resistance 1000
(Ω)
500

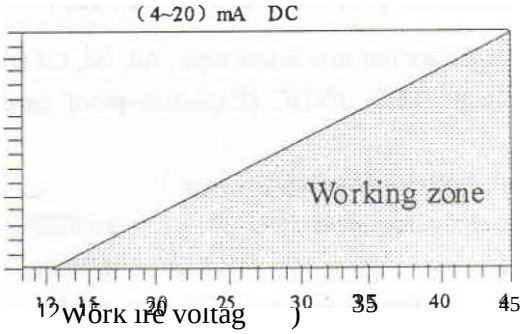


Chart 4- I

5. Operation instruction of explosion-proof transmitter

5-1 Explosion-proof type and symbol

This kind of transmitter is intrinsic safety type. It has got explosion-proof certificate after checked by nationally designated authority

Intrinsic safety: ExiaIICT6
Certificate No: CNE X 03.823

5-2 Explosion-proof electric device type, class and• temperature rank in explosion ambient

A. Type:

Type I: Electric devices used under coal mine

Type Il: Electric devices used in other factories except coal mine.

This transmitter is type Il

B. Class and temperature group.

The type Il electric devices could be divided into A,B,C classes according to the ratio of MESG(Maximum Experiment Safety Gap) and MIC (Minimum Ignite Current), and into groups of Tl - T6 in terms of the maximum surface temperature. (See table 1-2)

Table 1-1 MICR

Grade	MESG(mm)	MIC
IIA	MESG> 0.9	MIC>O.8
11B	0.9≥MESG≥0.5	0.8≥MIC≥0.45
	0.5 >MESG	0.45 >MIC

Table I -2 Tolerant surface temperature table

Temperature groups						
Tolerant surface temperature	450	300	200	135	100	85

6.Notices about operating and installing permissible transmitter

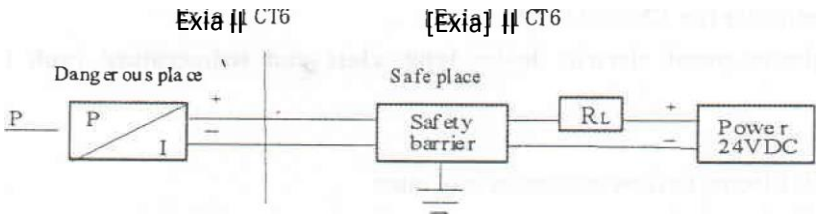
The transmitters should be installed strictly in terms of GB 3836.15-2000 "Chapter 15 of electric devices run under the explosion gas environment: Electric installation in dangerous space (except coal mine)".

When the permissible transmitters are used in the dangerous zones, the cover of transmitters must be tightened for safe operating. The safety regulations should be observed strictly. It's not allowed to open the cover of transmitters when on-position.

Please ensure that the outlet of cables must be sealed very well when installing explosion-proof transmitters.

The housing of transmitters should be rounded very well.

Only when the intrinsic safety type transmitters are equipped with the safety barriers, they could be used in the dangerous space with the explosion mixtures. The safety barriers accord with demands of GB3836.4-2000" chapter 4 of electric devices run under explosion gas environment: Intrinsic safety 'I' and the explosion-proof testing must be done by the designated safety department, and the certification of explosion-proof must be obtained.



Ui ,Ii, 10, Po, co, Lo

UiU8WC li=30mADC Pi=O. 84W Cio. 04uF Li0. 1mH Um-250VDC

IJ0<Ui 10<11 Po<Pi Co=Cp+Ci Lo=Lp+Li

see CJB3836, 4-2000

Installations must be done according to the requirements of operating manuals._ System's wiring is shown as chart 6-1

Chart 6-1

To be safe, the intrinsic safe loops must be distinguished strictly from other electric loops. The intrinsic safe loops and other electric loops should be laid separately.

When the internals of the transmitters are damaged and need to maintain and replace. In principle, manufacturers should do it. If users repair it by themselves, the notices about maintenances should be observed. Pleased refer to chapters and sections about maintenances for detailed methods. (The maintenance ranges of intrinsic safety transmitters are limited to the ranges recounted by the manuals. Other maintenances should not be done, users must contact with the manufacturers.) The repaired transmitters could not be rerun until they are carefully checked.

The maintenances, which users could operate, are with in the limits of using general tools except electric iron. After transmitter's power is cut-off, the external connecting wires arc removed and the failed devices are moved into safe-zone. The repairing could be done.

Changing wire system or specifications are forbidden.

The products with explosion-proof certificates are not allowed to replace the elements and structure that world influence explosion-proof performances.

The power transformers of safety barriers must meet the requirement of N08.l item in GB3836.4-2000.

When measuring high temperature medium, be careful not to let medium telnperature exceed the working temperature limit of the transmitter, if necessary , pressure-lead tube or other cooling device should be installed.

7.Calibration

The span and accuracy of the transmitter have been adjusted into the best state according to the user's requirement before leaving factory. Calibration is not needed generally. But in

following situations, the transmitters should be calibrated again.

A. During transportinu, falling or colliding or strong shocking happened.
B. The storage-time is over one year.
C. After running for long time, the error is larger than the accuracy range.
D. Routine inspection of user's unit.

7-1 Wiring for calibration.

A. Calibrating system of transmitters is shown as chart 7-1

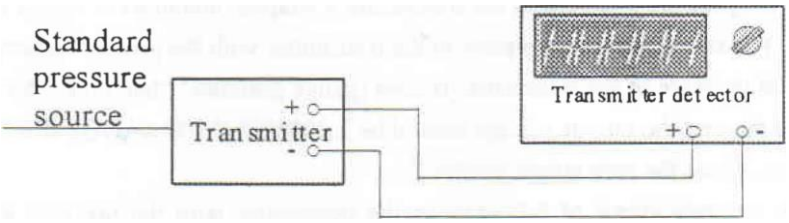
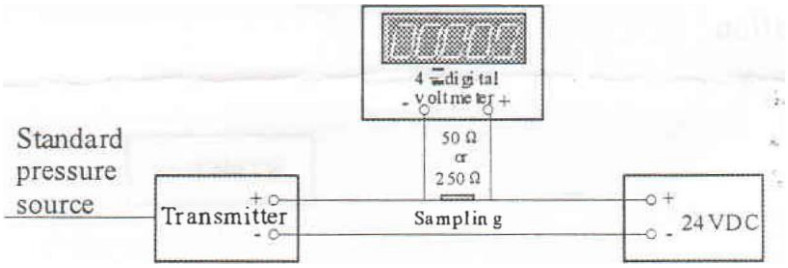


Chart 7-1

B If there is no detecting instrument of transmitters, you could substitute the 24VDC regulated supply, the standard resistance (250 Q or 50 Q) , or displaced by 5 V or 2V five digit voltmeter. Wiring as char 7-2.



Char 7-2

7-2 Devices for checking

No	Device name	Measuring span and accuracy	Notes
1	Detecting device	0-30mA, ±0.05% with 24VDC	
2	Digital pressure gauge	0~20KPa±0.05%FS	Selecting in terms of span
3	Digital pressure gauge	0~2000KPa±0.05%FS	
4	Piston gauge	0~60MPa±0.05%FS	
5	Pressure signal source	Pneumatic setting value-generator, micro-pressure regulator	
6	24V regulated power	24VDC±10%	Used when detecting devices is unavailable
7	Standard resistance	250Q(or 500)	
8	Digital voltmeter	4 digits display accuracy:0.01 %	

7-3. Adjusting methods

Before adjusting, please check the polarity of the power supply and the voltage. Don't connect the transmitter to the 220VAC supply directly. Then check whether the air pipe is at leakage. After everything is normal, close up power supply, stabilize them for 5 minutes.

The potentiometers of adjusting zero and full span are mounted in the integral metal cell. Please remove the sealed plastic spacer marked "Z" and "S" first. "Z" is for zero and "S" is for full span; Potentiometers for zero of explosion-proof transmitter is in the side cell. A. Connect the pressure source with the transmitter's adapter, and make it sealed well.

B. Input the pressure signal of zero point to the transmitter with the pressure source.

If zero-point pressure of the transmitter is zero (gauge pressure), then make the transmitter open to the air, and the output voltage should be 1.000V(or 4.000mADC). If it is not equal to this value, adjust the zero potentiometer Z.

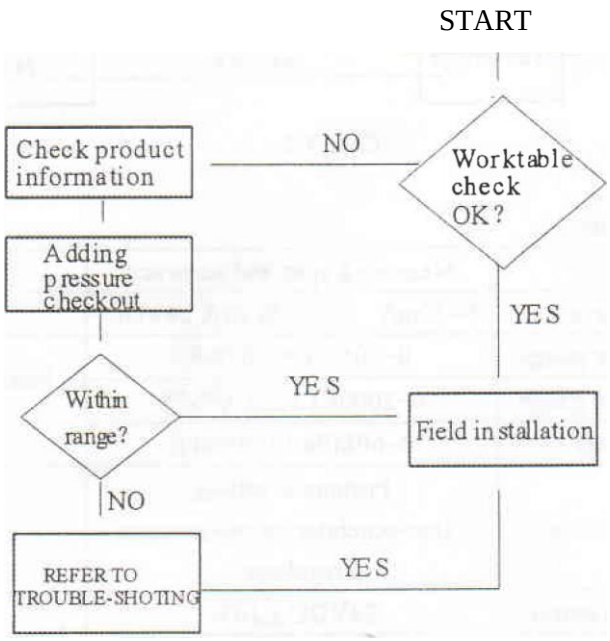
C. Input the pressure signal of full scale to the transmitter with the pressure source. The output of the transmitter should be 5.000V(or 20.00mA), if it's not, please adjust scale potentiometer S.

D. Repeat step B and step C several times, the span could be calibrated.

E. Zero adjusting range ± 5%; Span adjusting range ± 20%.

5. Installation

8-1. Install flow chart

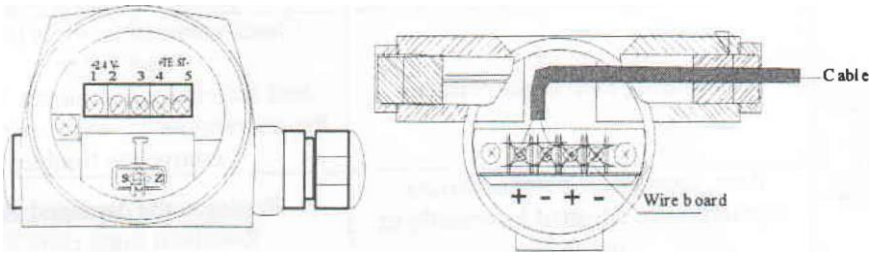


8-1. Flow chart

8-2. Wiring

K (Kl)series pressure transmitter's signal terminals are in a single cell, in wiring, screw off the back cover, there are two terminals connecting to testing or indicating gauge(see chart 8-2). The current on testing terminal is the same as signal terminal, both are 4—20mA DC. They can be used for indicating or testing gauge. Power connects to transmitter through signal wire, do not connect the power signal wire to testing terminal. Otherwise the power would burn a diode in the testing terminal, if the diode is bum out, another terminal or short two testing terminals, transmitter would work normally.

Connecting hole on two sides of the transmitter's top are sealed with cable or assembled by signal wire, signal cable is lock up by nut, the connecting hole not in use should be sealed. The explosion-proof transmitter's shell cover has lock up structure, so after wiring the shell cover should be locked up reliably.



8-2. Flow chart

8-3. Basic requirements for installation and operation

A. The transmitter could be mounted in the measuring points directly (any angle). If the dimensions of interface don't meet to the actual dimensions, the converters connector could be made by yourselves.

B. The transmitter should be installed in the place where the temperature gradient is very small if possible. At the same time, strong vibration and shock must be avoided.

C. When mounting outdoor, put the transmitter into the protector from shining and raining to keep its stability and extending its life.

D. When measuring steam or other high temperature medium, pay attention to keeping the medium temperature from exceeding the operating temperature limit of the transmitter. If necessary, mount the leading pipe or cooler.

E. When installing, please mount a pressure cut-off valve between the transmitter and medium in order to make checking easily and prevent the pressure outlet from jamming, as not to influence measuring accuracy. When the pressure fluctuation is large the pressure-buffer should be mounted.

6. Maintenance and trouble-shouting

After the transmitters are put into operation, please check the basic features and adjust zero point regularly. Please replace the invalid parts and remove the troubles in order to assure the smooth operation. Now, the common troubles and shooting methods are listed in the following table:

Note: Too high working temperature or frequent overload would make sensor bad performance or damaged.

Trouble	Cause	Methods
No output	Power voltage is not correct. Load resistance is not correct.	Relationship between power voltage and load resistance answers to the formula
	Polari of power supply is wrong	Correct the fault
	The output loop is cutoff	Close the output 1000
Error is large or output values are either 100% or 0%	Measuring loop is not correct	Check connecting wires between distributor And secondary instrument whether the operating statuses are normal and remove the troubles
	Zero, span linear potentiometers, regulators are adjusted incorrectly or damaged	Replaces the damaged parts. Re-adjust them carefully
	Rough adjusting position of scale potentiometer is wrong	Correct the fault

[f the above methods could not make it right, please send it back to us for repairing.

7. Notices about ordering

10-1. Pay attention to following suggestions while ordering.

A. Kl series pressure transmitters have explosion-proof type and intrinsic safety type. User should choose according to GB3836.15-2000 "chapter15 of electric devices under the explosion gas environment, electric installation in dangerous place (except coal mine)" and the field special requirement.

B. Make clear the composition of flammable and explosive medium and location. Then check the explosion-proof class and temperature groups in terms of standard GB3836.

C. The explosion-proof class and the temperature group of the transmitter selected should be higher than the explosive medium class.

D. Operating ambient temperature for explosion-proof products is -20—+70 C

E. When ordering intrinsic safety transmitters, user must order and wire intrinsic safety barrier in terms of the demands of the name plate and the manual. (generally provided by us)

10-2 Please pay attention to the following parameters

A. Sensor materials

B. Mounted in explosive space

C. Connector materials and connecting mode.

D. Sealed materials

E. Accuracy

F. Span

G. Other attachments

10-3 Example: diffused silicon pressure transmitter

Standard type, M20>< 1.5 interface thread, stainless steel, air tight packing, fluorine rubber, accuracy 0.5, span(gauge pressure) 0-1.6tv1Pa Model: KCSlGIF2B5G18

11. K(K1) series pressure transmitter catalog of models

11-1. Catalog of models

pressure transmitter

Code	Type
K	Aluminum die-casting shell
K1	Aluminum moulding shell

Code	Diaphragm Type
A	Silicon-diffused [A1-default A2-overstable A3-healthy(flush membrane) A4-corrosion-proof type (membrane material is Ta)]
B	High-low temperature [B1:(-65℃~150℃) B2: (10℃~200℃) B3:(10℃~350℃)]
C	Ceramic capacitance

Code	Explosion-proof rank
S	Standard(no explosion-proof)
D	Explosion-proof type ExdⅡCT6
I	Intrinsic safety type ExiaⅡCT6

Code	Process connection material
1	Stainless steel 316L
2	Stainless steel 1.4581
3	Stainless steel 1Gr18Ni9Ti
4	Hutchinson alloy C
9	Special requirement

Code	Process connection mode	Code	Process connection mode
R	Male screw G 1/2 (big hole)	A	Male screw 1/2NPT (small hole)
G	Male screw M 20×1.5 (small hole)	N	Male screw M 20×1.5(big hole)
M	Male screw G 1/2 (small hole)	Y	Special requirement

Code	Airproof material
1F	Flurine rubber
2F	Nitrile rubber
3F	Teflon
4F	Full-sealed welding

Code	Signal output mode
2	4~20mA two-wire
9	Special requirement

Code	Display mode	Code	Display mode
A	No field indication	E	LCD digital 0~100% display
B	100% linear indication	F	LED digital 0~100% display
C	LCD digital span display	Y	Special requirement
D	LED digital span display		

Code	Accuracy class
1	0.1
2	0.2
5	0.5
9	special requirement

Code	Measuring range(see K serial standard range table)
G	Gauge pressure code
A	Absolute pressure code
B	Reference sealed pressure (please provide reference pressure value)

K	C	S	1	G	1F	2	B	5	G18

Note: The diffused silicon standard type and health-type transmitter measuring range: 0~20KPa(Min), 0~35MPa(Max)

The diffused silicon overstable type transmitter measuring range: 0~100KPa(Min), 0~60MPa(Max)

11-2. K (K1)series pressure transmitter standard span table

Gauge pressure code	Absolute pressure code	Measuring range	Adjusting range	Capacitance type overload	Diffused silicon or H/L temperature overload	Capacitance type	Diffused silicon	H/L temperature
G01	✗	0-4kPa	-1.6kPa5-kPa	✗	6.0kPa	√	✗	✗
G02	✗	0-6kPa	-4kPa-10kPa	0.6MPa	9.0kPa	√	✗	✗
G03	✗	0-10kPa	-4kPa-20kPa	0.6MPa	15kPa	√	√	✗
G04	✗	0-16kPa	-6.4kPa-20kPa	0.6MPa	25kPa	√	√	✗
G05	A1	0-20kPa	-8kPa-35kPa	0.6MPa	30kPa	√	√	✗
G06	A2	0-35kPa	-10kPa-35kPa	0.6MPa	40kPa	√	√	✗
G07	A3	0-30kPa	-12kPa-35kPa	0.6MPa	45kPa	√	√	✗
G08	A4	0-35kPa	-14kPa-35kPa	0.6MPa	55kPa	√	√	✗
G09	A5	0-40kPa	-16kPa-70kPa	0.6MPa	60kPa	√	√	✗
G10	A6	0-60kPa	-24kPa-70kPa	0.6MPa	90kPa	√	√	✗
G11	A7	0-100kPa	-40kPa-100kPa	1.0MPa	150kPa	√	√	✗
G12	A8	0-160kPa	-64kPa-200kPa	1.0MPa	250kPa	√	√	√
G13	A9	0-200kPa	-80kPa-200kPa	1.0MPa	300kPa	√	✗	✗
G14	A10	0-250kPa	-100kPa-350kPa	1.0MPa	400kPa	✗	✗	√
G15	A11	0-400kPa	-160kPa-700kPa	1.0MPa	600kPa	√	√	✗
G16	A12	0-600kPa	-240kPa-700kPa	2.0MPa	1.0MPa	✗	✗	✗
G17	A13	0-1.0MPa	-0.4MPa-1.0MPa	2.0MPa	1.5MPa	✗	✗	✗
G18	A14	0-1.6MPa	-0.64MPa-2.0MPa	4.0MPa	2.5MPa	√	√	√
G19	A15	0-2.0MPa	-0.8MPa-2.0MPa	4.0MPa	3.0MPa	√	√	√
G20	✗	0-2.5MPa	-1.0MPa-3.5MPa	6.0MPa	4.0MPa	√	√	√
G21	✗	0-4.0MPa	-1.6MPa-4.0MPa	6.0MPa	6.0MPa	√	√	√
G22	✗	0-6.0MPa	-2.4MPa-7.0MPa	✗	9.0MPa	✗	√	√
G23	✗	0-10MPa	-4.0MPa-10MPa	✗	15MPa	✗	√	√
G23	✗	0-20MPa	-8MPa-20MPa	✗	30MPa	✗	√	√
G24	✗	0-30MPa	-12MPa-35MPa	✗	45 MPa	✗	√	√
G25	✗	0-40MPa	-16MPa-40MPa	✗	60MPa	✗	√	√
G26	✗	0-60MPa	-24MPa-60MPa	✗	90MPa	✗	√	√
G27	✗	-2kPa-2kPa	-1.6kPa-2.5kPa	✗	✗	✗	√	√
G28	✗	-5kPa-5kPa	-3kPa-5kPa	0.6MPa	✗	√	✗	√
G29	✗	-10kPa-10kPa	-6kPa-10kPa	0.6MPa	30kPa	√	✗	√
G30	✗	-20kPa-20kPa	-13kPa-20kPa	0.6MPa	60kPa	√	√	√
G31	✗	-50kPa-50kPa	-33kPa-50kPa	0.6MPa	150kPa	√	√	√
G32	✗	-100kPa-60kPa	-66kPa-100kPa	1.0MPa	250kPa	√	√	√
G33	✗	-100kPa-100kPa	-66kPa-100kPa	1.0MPa	300kPa	√	√	√
G34	✗	-100kPa-150kPa	-100kPa-200kPa	1.0MPa	400kPa	✗	√	√
G35	✗	-100kPa-300kPa	-100kPa-350kPa	1.0MPa	600kPa	√	√	√
G36	✗	-100kPa-500kPa	150kPa-500kPa	1.0MPa	1.0MPa	√	√	√
G37	✗	-100kPa-900kPa	0.24MPa-1.0MPa	2.0MPa	1.5MPa	√	√	√
G38	✗	-100kPa-1.5MPa	0.5MPa-1.9MPa	4.0MPa	3.0MPa	√	√	√
G39	✗	-100kPa-2.0MPa	0.5MPa-2.0MPa	4.0MPa	3.0MPa	√	√	√

Note: ✗ for None; √ for provided as standard span

Note: The diffused silicon standard type and health-type transmitter measuring range: 0-20KPa(Min), 0-35MPa(Max)

The diffused silicon overstable type transmitter measuring range: 0-100KPa(Min), 0-60MPa(Max)

12 .Unpacking and whole set of the product

12-1 Unpacking

Unpack to see whether the package is in good condition, and check the model, specification and contract, whether the files attached are complete.

12-2 Whole set

(l) Transmitter

(2) Operation manual 1

(3) Quality certificate 1

(4) Guarantee card 1

(5) Testing certificate 1

13. Transport and storage

(l) This transmitter fits the requirement of transporting by land , by water, and by air.

(2) The transmitter and spares in original package, the storage temperature indoor is -20—+40 ^{0}C, relative humidity not over 90%, and there should not be bad substance caused transmitter corrosive.