



KE CSP series pressure sensors are specifically developed for Concentrating Solar Power applications demanding high accuracy process pressure measurement at extreme temperatures of up to 600°C.

Durable high accuracy measurement is guaranteed using bonded foil strain gauge sensing technology and industry proven NaK (Sodium Potassium) high temperature pressure transmission connected directly to the CSP process heating system.

MAIN FEATURES

- Pressure ranges from:
0-20 to 0-100 bar / 0-300 to 0-1500 psi
- Accuracy: $\pm 1.0\%$ FSO (L)
- Hydraulic transmission system for pressure signal guarantees stability at working temperature
- NaK is conformed to RoHS Directive
- NaK is defined as a safe substance (GRAS) by FDA
- NaK contained quantity: 40mm³ (0.00244 in³)
- Standard thread: M18x1.5
- Autozero function on board / external option
- Inconel 718 corrugated diaphragm
- Stem material: Inconel 718

AUTOZERO FUNCTION

All signal variations in the absence of pressure can be eliminated by using the Autozero function. This function is activated by closing a magnetic contact located on the transmitter housing. The procedure has to be performed only when no pressure is applied to the sensor.

TECHNICAL SPECIFICATIONS

Accuracy (1)	L $\pm 1.0\%$FSO @ >250°C (20...100bar)
Resolution	Infinite
Measurement range	0..20 to 0..100bar 0..300 to 0..1500psi
Maximum overpressure (without degrading performances)	2 x FS
Power supply	10...30Vdc
Maximum current absorption	32mA
Insulation resistance (at 50Vdc)	>1000 MOhm
Output signal Full Scale (FSO)	20mA
Zero balance (tolerance $\pm 0.25\%$ FSO)	4mA
Zero signals adjustment (tolerance $\pm 0.25\%$ FSO)	"Autozero" function
Span adjustment within $\pm 5\%$ FSO	See Melt Manual
Maximum allowed load	See chart
Electronic response time (10...90% FSO)	~ 1ms
Output noise (RMS 10-400Hz)	< 0.025% FSO
Calibration signal	80% FSO
Output short circuit and reverse polarity protection	YES
Housing compensated temperature range	0...+85°C
Diaphragm maximum temperature	600°C/1112°F
Temperature zero drift	< 0.5bar/100°C < 7.5psi/100°F
Thermocouple	STD : type "J" (isolated junction)
Protection degree (6-pole female connector)	IP65

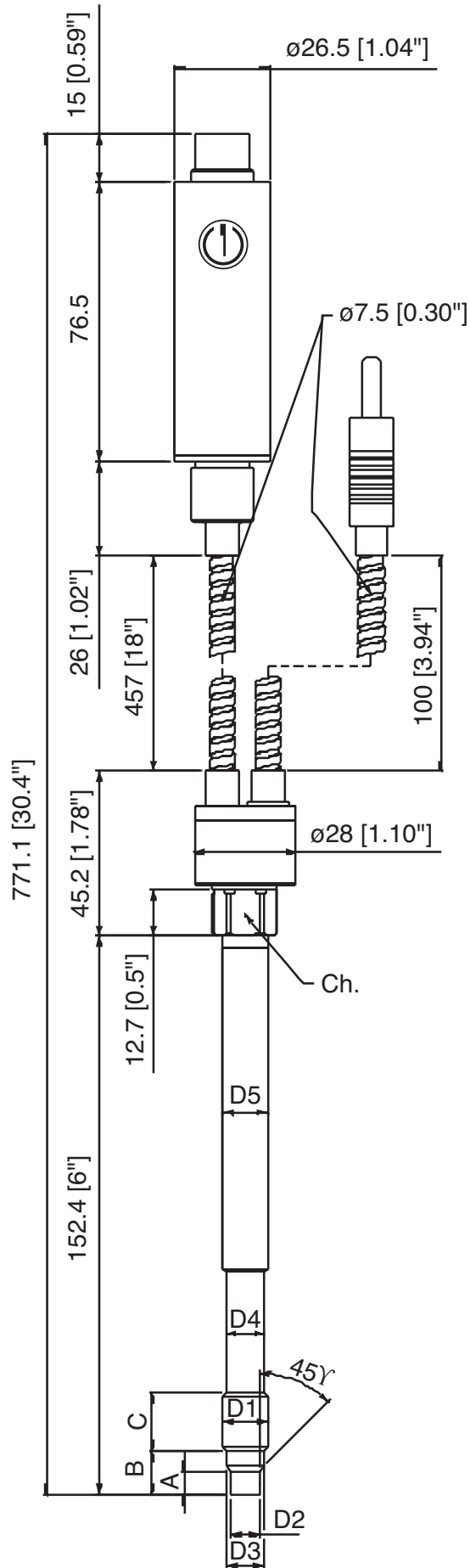
FSO = Full scale output:

(1) BFSL method (Best Fit Straight Line): includes combined effects of Non-Linearity, Hysteresis and Repeatability.



MECHANICAL DIMENSIONS

KE2



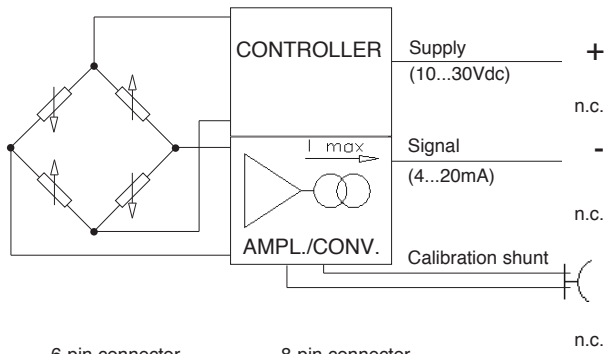
D1	M18x1.5
D2	$\phi 10 -0.05$ [$\phi 0.394'' -0.002$]
D3	$\phi 16 -0.08$ [$\phi 0.63'' -0.003$]
D4	$\phi 16 -0.4$ [$\phi 0.63'' -0.016$]
D5	$\phi 18$ [$\phi 0.71''$]
A	$6 -0.26$ [$0.24'' -0.01$]
B	$14.8 -0.4$ [$0.58'' -0.016$]
C	19 [$0.75''$]
Ch	19 [$3/4''$]

NOTE: dimensions refer to rigid stem length option "4" (153 mm – 6")

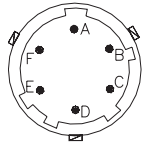
WARNING: For installation use a maximum tightening torque of 56 Nm (500 in-lb)

ELECTRICAL CONNECTIONS

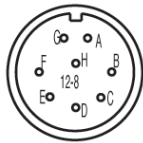
CURRENT OUTPUT (4...20mA, 2 wires)



6-pin connector
VPT07RA10-6PT2
(PT02A-10-6P)



8-pin connector
PC02E-12-8P Bendix



MAGNETIC AUTOZERO

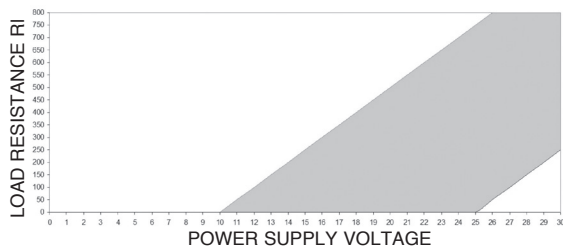
6-pin	8-pin
A	B
C	A
B	D
D	C
E - F	E - F
	G - H

Connect the cable sheathing to the side of the instrument

EXTERNAL AUTOZERO

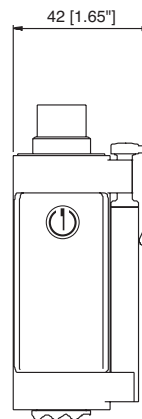
6-pin	8-pin
A	B
C	A
B	D
D	C
E - F	E - F
	G - H

LOAD DIAGRAM



The diagram shows the optimum ratio between load and power supply for transmitters with 4...20mA output. For correct function, use a combination of load resistance and voltage that falls within the shaded area.

AUTOZERO FUNCTION



The Autozero function is activated through a magnetic contact (external magnet supplied with the sensor). See the manual for a complete Autozero function explanation.

ACCESSORIES

Connectors

6-pin female connector (IP65 protection degree)
8-pin female connector

Extension cables

6-pin connector with 8m (25 ft) cable
6-pin connector with 15m (50 ft) cable
6-pin connector with 25m (75 ft) cable
6-pin connector with 30m (100 ft) cable
8-pin connector with 8m (50 ft) cable
8-pin connector with 25m (75 ft) cable
8-pin connector with 30m (100 ft) cable
Other lengths

Accessories

Mounting bracket
Dummy plug for M18x1,5
Drill kit for M18 x 1,5
Cleaning kit for M18x1,5
Fixing pen clip
Autozero pen

Thermocouple for KE2 model

Type "J" (153mm - 6" rigid stem)

Adapters

Tailor-made machined part, depending on customer need

CON300
CON307

C08WLS
C15WLS
C25WLS
C30WLS
E15WLS
E25WLS
E30WLS
on request

SF18
SC18
KF18
CT18
PKIT309
PKIT312

TTER601

Cable color code

Conn.	Wire
A	Red
B	Black
C	White
D	Green
E	Blue
F	Orange

GEFRAN EXPERTISE: OUR SOLUTIONS FOR CSP APPLICATIONS

Process pressure is transmitted to the measuring diaphragm by means of a capillary tube filled with NaK. The in-contact diaphragm works as a separator between the process fluid (*Molten Salt*) and the filling fluid (*NaK*). According to the temperature of the “*hot side*” of the sensor, the expansion of the filling fluid produces a zero drift of the sensor. This effect has been optimized and minimized to $< 0.5\text{bar}/100^\circ\text{C}$ in order to meet the CSP applications' requirements.

INFLUENCE OF ENVIRONMENTAL TEMPERATURE (*Day - Night cycle*)

A secondary contribution to the zero drift is also due to the influence of the temperature on the “*cold side*” of the sensor. This effect has been minimized too. Typically, the Day-Night cycle can be responsible for a zero drift of $\pm 100\text{ mbar}$ (1.5 psi).

Suggestions for minimizing the influence of the external environment on the zero drift:

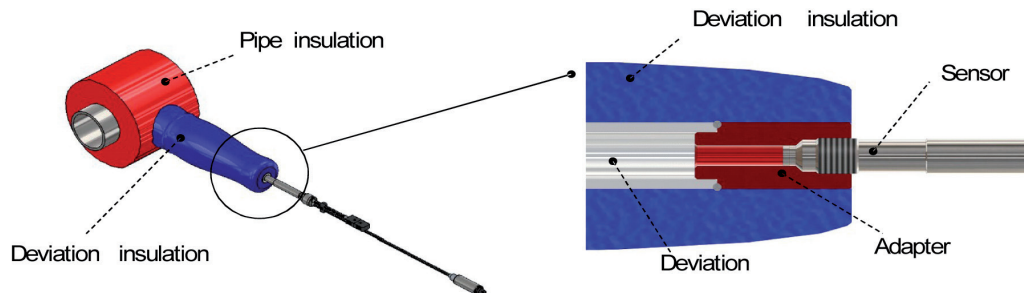
- Do not expose the sensor to the direct radiation of the sun - keep the sensor shaded
- Possibly mount the sensor horizontally, so that there are not heated parts below it

MOUNTING INDICATIONS

The sensor must be mounted into a proper and clean seat. A proper seat can be obtained using the *KF18 Drilling Kit*. Use the *Gefran CT18 Cleaning Tool* to remove salt residuals from the seat until it can turn freely. If the *CT18* tool cannot turn freely this means that the seat is not clean or that the seat is not correctly machined. It is mandatory to put high temperature grease on the threads. When the sensor has to be removed, this must be done when the temperature of the seat is $> 250^\circ\text{C}$ so that the salt is liquid. The interface between the sensor and the process can be an adapter to be welded at the end of the deviation.

INSTALLATION TIPS

Do not put the sensor tip directly on the main pipe inside the salt flow. Use a piezometric deviation (as shown in the picture below):



The insulation of the piezometric deviation should not embrace the sensor stem. Keep the deviation heated at a temperature $> 250^\circ\text{C}$ (e.g. 300°C). This can help the sensor installation and calibration. The longer is the deviation, the lower will be the sensor working temperature. An interception valve across the deviation should be useful to isolate the sensor from the pressured pipe.

CALIBRATION PROCEDURE GUIDELINES

1. Put the sensor inside the seat without screwing it (so that it measures ambient pressure).
2. Heat the seat up to 300°C .
3. Let the sensor warm up for 30 minutes after a stable temperature is reached.
4. Note the temperature indicated by the sensor thermocouple (T_o) and the signal output of the sensor (mA_o).

These values can be used (if necessary) for the compensation of the Zero drift Vs process temperature according to the following algorithm:

$$\text{Pressure} = (mA - mA_o) \times FS/16 - k (T - T_o)/1000$$

where:

- “ T ” and “ T_o ” are temperature values expressed in $^\circ\text{C}$
- “ mA ” and “ mA_o ” are output values expressed in mA
- “ k ” is the coefficient of pressure drift expressed $\text{mbar}/^\circ\text{C}$ (this coefficient is provided for every single sensor)
- “ FS ” is the pressure range (i.e. Full Scale) of the sensor expressed in bar (or psi)

5. Screw the sensor into the seat.

ORDER CODE

K - [] - [] - [] - [] - [] - [] - [] - [] - [] - [] - **XMD05**

OUTPUT SIGNAL	
4 .. 20mA	E

VERSION	
With thermocouple	2

CONNECTOR	
Standard	
6 pin	6
8 pin	8

ACCURACY CLASS	
1.0% FSO	L

MEASUREMENT RANGE			
bar		psi	
20	B02D	300	P03C
35	B35U	500	P05C
50	B05D	750	P75D
70	B07D	1000	P01M
100	B01C	1500	P15C

E	External autozero
-	Magnetic autozero

CONTACT DIAPHRAGM	
I	Inconel 718

FLEXIBLE STEM LENGTH (mm / inches) (*)		
Standard		
D	457mm	18"
E	610mm	24"
F	760mm	30"

Available on request		
A	76mm	3"
B	152mm	6"
C	300mm	12"

RIGID STEM LENGTH (mm / inches) (*)		
Standard		
4	153mm	6"
5	318mm	12.5"

Available on request		
1	38mm	1.5"
2	50mm	2"
3	76mm	3"
6	350mm	14"
7	400mm	16"
8	456mm	18"

(*) max combined rigid/flexible stem length is 1000mm - 39"

THREAD	
Standard	
4	M18 x 1.5



Example

KE2-6-M-B05D-4-4-D-I-XMD05

Melt pressure transducer with type "J" thermocouple, 4..20mA output, 6-pin connector, M18X1,5 thread, 50 bar pressure range, 1.0% accuracy class, 153 mm (6") rigid stem, 457mm (18") flexible stem, Inconel 718 diaphragm.

Sensors are manufactured in compliance with:
 - EMC compatibility directive
 - RoHS directive

Electrical installation requirements and Conformity certificate are available on our web site: www.gefran.com

GEFRAN spa reserves the right to make any kind of design or functional modification at any moment without prior notice



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