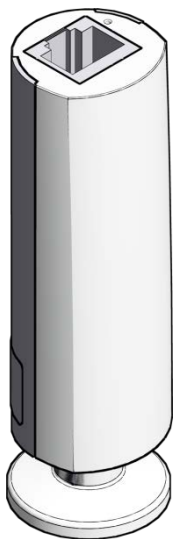


Economic Capacitance Gauge

KJLC XCG






Operating Manual
Incl. EU Declaration of Conformity

Product Identification

In all communications with Kurt J. Lesker Company, please specify the information given on the product nameplate. For convenient reference copy that information into the space provided below.

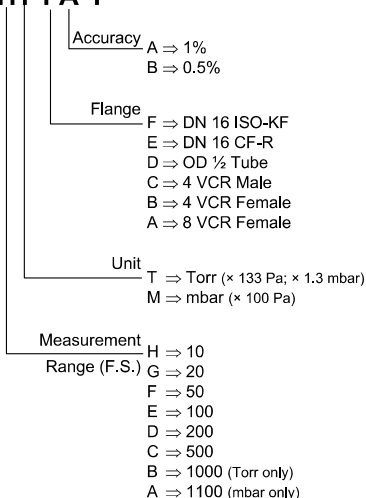


Kurt J. Lesker Company, PA 15025 USA	
Model:	 
PN:	
SN:	
..... V W	

Validity

This document applies to products with the following part numbers:


XCG-HT-FA-1



The part number (PN) can be taken from the product nameplate. If not indicated otherwise in the legends, the illustrations in this document correspond to gauges with DN 16 ISO-KF vacuum connection. They apply to gauges with other vacuum connections by analogy.

We reserve the right to make technical changes without prior notice.

Intended Use

The Economic Capacitance Gauges of the KJLC XCG series are intended for absolute pressure measurement of gases in their respective pressure ranges (→  3).

Function

The Economic Capacitance Gauge consists of a capacitive sensor element made of aluminum oxide ceramics and electronics which convert the capacitance into a (dc) voltage output signal.

The output signal is linear to the measured pressure and independent of the gas type.

Trademarks

VCR® Swagelok Marketing Co.

Patents

EP 1070239 B1, 1040333 B1


US 6528008 B1, 6591687 B1, 7107855 B2, 7140085 B2,
7536915 B2

Scope of Delivery

- 1x gauge KJLC XCG
- 1x pin for adjusting settings via buttons
- 1x Operating Manual

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For cross-references within this document, the symbol (→  XY) is used.

1 Safety

1.1 Symbols Used



DANGER

Information on preventing any kind of physical injury.



WARNING

Information on preventing extensive equipment and environmental damage.



Caution

Information on correct handling or use. Disregard can lead to malfunctions or minor equipment damage.



Notice

1.2 Personnel Qualifications



Skilled personnel

All work described in this document may only be carried out by persons who have suitable technical training and the necessary experience or who have been instructed by the end-user of the product.

1.3 General Safety Instructions

- Adhere to the applicable regulations and take the necessary precautions for the process media used.
Consider possible reactions with the product materials.
- Adhere to the applicable regulations and take the necessary precautions for all work you are going to do and consider the safety instructions in this document.
- Before beginning to work, find out whether any vacuum components are contaminated. Adhere to the relevant regulations and take the necessary precautions when handling contaminated parts.

Communicate the safety instructions to all other users.

1.4 Liability and Warranty

Kurt J. Lesker Company assumes no liability and the warranty becomes null and void if the end-user or third parties

- disregard the information in this document
- use the product in a non-conforming manner
- make any kind of interventions (modifications, alterations etc.) on the product
- use the product with accessories not listed in the product documentation.

The end-user assumes the responsibility in conjunction with the process media used.



Gauge failures due to contamination are not covered by the warranty.

2 Technical Data

Measurement range	→ "Validity"
Accuracy ¹⁾	
XCG-xx-xA-1	≤1% of reading
XCG-xx-xB-1	≤0.5% of reading
Temperature effect on zero	0.02% F.S./ °C
Temperature effect on span	0.02% of reading/ °C
Resolution	0.05% F.S.
Gas type dependence	none
<hr/>	
Output signal analog (measuring signal)	
Voltage range	-0.2 ... +10.24 V
Measuring range	0 ... +10 V
Relationship voltage-pressure	linear
Output impedance	10 Ω (short-circuit proof)
Loaded impedance	>10 kΩ
Response time	100 ms
<hr/>	
Gauge identification	Resistance 13.2 kΩ refer- enced to supply common
<hr/>	

¹⁾ Non-linearity, hysteresis, repeatability in the calibrated range at 25 °C ambient operating temperature without temperature effects after operation of 2 h.

Supply

		DANGER
	<p>The gauge may only be connected to power supplies, instruments or control devices that conform to the requirements of a grounded protective extra-low voltage (PELV) and limited power source (LPS), Class 2. The connection to the gauge has to be fused.</p>	


Supply voltage at the gauge	+13 ... +32 VDC
ripple	Class 2 / LPS ≤50 mV _{pp}
Current consumption	<20 mA
Power consumption	≤0.3 W
Fuse required	1 AT (slow), automatic reset (Polyfuse)

The gauge is protected against reverse polarity of the supply voltage.

Electrical connection	FCC68/RJ45, 8-pin, socket
Sensor cable	8-pin plus shielding
Cable length	≤100 m (0.14 mm ² conductor)

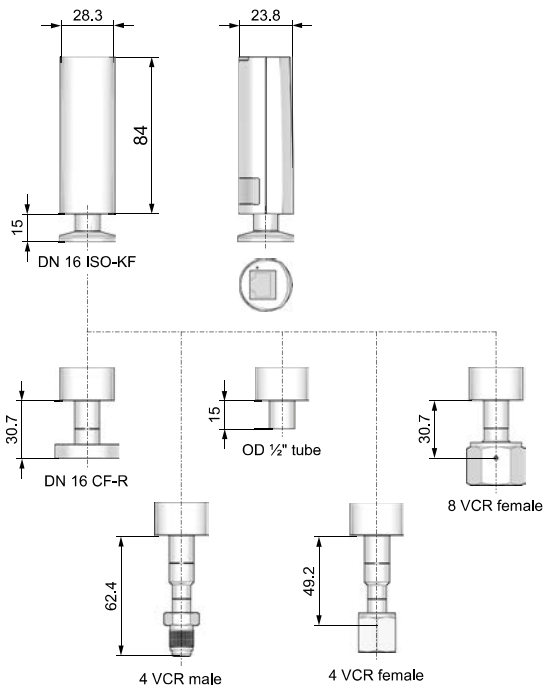
For longer cables, larger conductor cross-sections are required.

Grounding concept

Vacuum flange - signal common	→  "Power Connection"
Supply common - signal common	conducted separately; for differential measurement (10 Ω)

Materials exposed to vacuum	
Flange, tube	stainless steel AISI 316L
Sensor, feedthrough	ceramics ($\text{Al}_2\text{O}_3 \geq 99.5\%$)
Internal volume	
DN 16 ISO-KF	$\leq 3.7 \text{ cm}^3$
DN 16 CF-R	$\leq 3.7 \text{ cm}^3$
OD ½" tube	$\leq 5.0 \text{ cm}^3$
4 VCR male	$\leq 6.1 \text{ cm}^3$
4 VCR female	$\leq 5.6 \text{ cm}^3$
8 VCR female	$\leq 5.1 \text{ cm}^3$
Admissible pressure (absolute)	
≥500 Torr/mbar (F.S.)	4 bar
50 ... 200 Torr/mbar (F.S.)	3 bar
10 ... 30 Torr/mbar (F.S.)	2 bar
Bursting pressure (absolute)	6 bar
<hr/>	
Temperature compensated range	+10 °C ... +50 °C
Admissible temperatures	
Storage	-20 °C ... +85 °C
Operation	0 °C ... +70 °C
Bakeout (not in operation)	≤110 °C at the flange
Relative humidity	
	≤80% at temperatures ≤+31 °C decreasing to 50% at +40°C
Use	indoors only, altitude up to 4000 m NN
Degree of protection	IP 40
<hr/>	

Dimensions [mm]

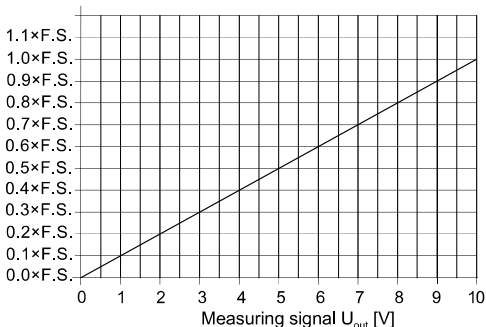


Weight

≤159 g

Analog Measuring Signal vs. Pressure

Pressure p



$$p = (U_{out} / 10 \text{ V}) \times p (\text{F.S.})$$

Conversion Torr \leftrightarrow Pascal

	Torr	mbar ²⁾	Pa ²⁾
c	1.00	$1013.25 / 760 =$ 1.3332...	$101325 / 760 =$ 133.3224...

Example: Gauge with 10 Torr F.S.
Measuring signal $U_{out} = 6 \text{ V}$

$$p = (6 \text{ V} / 10 \text{ V}) \times 10 \text{ Torr}$$

$$= 0.6 \times 10 \text{ Torr} = \mathbf{6 \text{ Torr}}$$

²⁾ Source: NPL (National Physical Laboratory)
Guide to the Measurement of Pressure and Vacuum, ISBN 0904457x / 1998

3 Installation



WARNING



Fragile components

The ceramic sensor may be damaged by impacts. Do not drop the product and prevent shocks and impacts.

3.1 Vacuum Connection



DANGER



Overpressure in the vacuum system >1 bar

Injury caused by released parts and harm caused by escaping process gases can result if clamps are opened while the vacuum system is pressurized.

Do not open any clamps while the vacuum system is pressurized. Use the type clamps which are suited to overpressure.



DANGER



Overpressure in the vacuum system >2.5 bar

KF flange connections with elastomer seals (e.g. O-rings) cannot withstand such pressures. Process media can thus leak and possibly damage your health.

Use O-rings provided with an outer centering ring.



DANGER



Protective ground

Products that are not correctly connected to ground can be extremely hazardous in the event of a fault.

Electrically connect the gauge to the grounded vacuum chamber. This connection must conform to the requirements of a protective connection according to EN 61010:

- CF and VCR flanges fulfill this requirement.
- For gauges with a KF flange, use a conductive metallic clamping ring.
- For gauges with a ½" tube, take appropriate measures to fulfill this requirement.



Caution



Vacuum component

Dirt and damages impair the function of the vacuum component.

When handling vacuum components, take appropriate measures to ensure cleanliness and prevent damages.





Caution



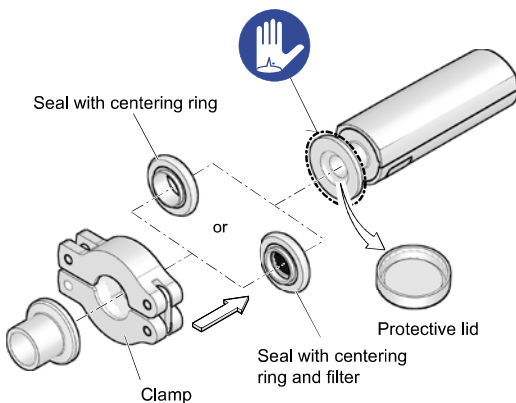
Dirt sensitive area

Touching the product or parts thereof with bare hands increases the desorption rate.

Always wear clean, lint-free gloves and use clean tools when working in this area.

 Mount the gauge so that no vibrations occur. The gauge may be mounted in any orientation. To keep condensates and particles from getting into the measuring chamber preferably choose a horizontal to upright position and possibly use a seal with a centering ring and filter. If adjustment should be possible after the gauge has been installed, be sure to install it so that the button can be accessed with a pin (→  19).

Remove the protective lid and connect the product to the vacuum system.



Keep the protective lid.

3.2 Power Connection



Make sure the vacuum connection is properly made (→ 13).



DANGER

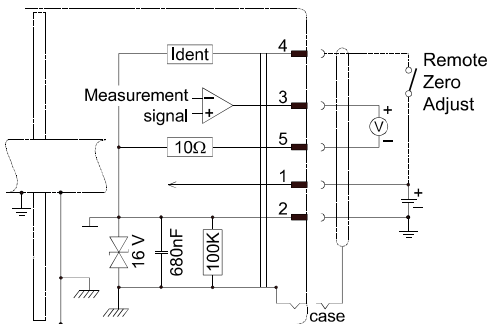
The gauge may only be connected to power supplies, instruments or control devices that conform to the requirements of a grounded protective extra-low voltage (PELV) and limited power source (LPS), Class 2. The connection to the gauge has to be fused.



Ground loops, differences of potential, or EMC problems may affect the measurement signal. For optimum signal quality, please do observe the following notes:

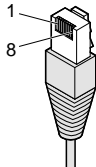
- Use an overall metal braided shielded cable. The connector must have a metal case.
- Connect the cable shield to ground at one side via the connector case. Make sure the connector case has direct contact to the cable's shield on its whole circumference. Do not connect the other side of the shield.
- Connect the supply common with protective ground directly at the power supply.
- Use differential measurement input (signal common and supply common conducted separately).
- Potential difference between supply common and housing ≤ 16 V (overvoltage protection).

If no sensor cable is available, make one according to the following diagram.



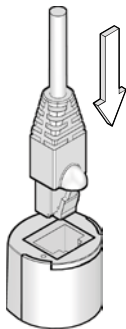
Electrical connection

Pin 1	Supply
Pin 2	Supply common GND
Pin 3	Signal output (measurement signal)
Pin 4	Gauge identification or Remote Zero Adjust
Pin 5	Signal common
Pin 6	n.c.
Pin 7	n.c.
Pin 8	n.c.
case	Connector case



8-pin
FCC68
connector

Connect the sensor cable (cable → 9).



4 Operation

Put the gauge into operation.

Warm-up time: approx. 1 minute.

4.1 Zeroing the Gauge

The gauge is factory calibrated while "standing upright". It requires no maintenance.

Due to mounting orientation, long time operation or contamination, a zero drift could occur and zero adjustment may become necessary.

For adjusting the zero, operate the gauge under the same constant ambient conditions and in the same mounting orientation as normally.



If the gauge is operated via a controller, the zero of the whole measuring system has to be adjusted on the controller: first, adjust the zero of the gauge and then, the zero of the controller.

4.1.1 Zero Adjustment

The zero can be adjusted via

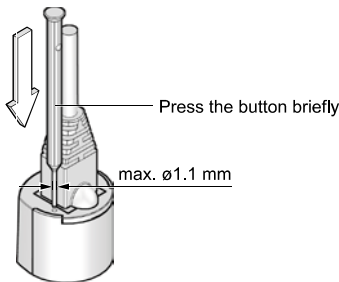
- the button on the gauge, or
- the digital input "Remote Zero Adjust" (briefly apply the supply voltage to pin 4.
- an appropriate controller.


- 1** Evacuate the gauge to a pressure according to the table below:

F.S.	Recommended final pressure for zero adjustment		
1100 mbar	-	$<7 \times 10^0$ Pa	$<5 \times 10^{-2}$ mbar
1000 Torr/mbar	$<5 \times 10^{-2}$ Torr	$<7 \times 10^0$ Pa	$<5 \times 10^{-2}$ mbar
200 Torr/mbar	$<1 \times 10^{-2}$ Torr	$<1 \times 10^0$ Pa	1×10^{-2} mbar
100 Torr/mbar	$<5 \times 10^{-3}$ Torr	$<7 \times 10^{-1}$ Pa	$<5 \times 10^{-3}$ mbar
50 Torr/mbar	$<3 \times 10^{-3}$ Torr	$<3 \times 10^{-1}$ Pa	$<3 \times 10^{-3}$ mbar
20 Torr/mbar	$<1 \times 10^{-3}$ Torr	$<1 \times 10^{-1}$ Pa	1×10^{-3} mbar
10 Torr/mbar	$<5 \times 10^{-4}$ Torr	$<7 \times 10^{-2}$ Pa	$<5 \times 10^{-4}$ mbar

If the final pressure in the gauge is too high for zero adjustment ($>25\%$ of the F.S.), the zero cannot be reached.

- 2** Briefly press the button with a pin (max. $\varnothing 1.1$ mm). The zero adjustment runs automatically (duration ≤ 8 s).



-  After zero adjustment the gauge automatically returns to measurement mode.

5 Deinstallation



WARNING



Fragile components

The ceramic sensor may be damaged by impacts. Do not drop the product and prevent shocks and impacts.



DANGER



Contaminated parts

Contaminated parts can be detrimental to health and environment.

Before beginning to work, find out whether any parts are contaminated. Adhere to the relevant regulations and take the necessary precautions when handling contaminated parts.



Caution



Vacuum component

Dirt and damages impair the function of the vacuum component.

When handling vacuum components, take appropriate measures to ensure cleanliness and prevent damages.



Caution



Dirt sensitive area

Touching the product or parts thereof with bare hands increases the desorption rate.

Always wear clean, lint-free gloves and use clean tools when working in this area.

- 1** Vent the vacuum system.
- 2** Put the gauge out of operation.
- 3** Disconnect the sensor cable.
- 4** Remove the gauge from the vacuum system and install the protective lid.

6 Maintenance, Repair

The product requires no maintenance.



Gauge failures due to contamination are not covered by the warranty.

We recommend checking the zero at regular intervals.

Kurt J. Lesker Company assumes no liability and the warranty becomes null and void if any repair work is carried out by the end-user or third parties.

7 Returning the Product



WARNING



Forwarding contaminated products

Contaminated products (e.g. radioactive, toxic, caustic or microbiological hazard) can be detrimental to health and environment.

Products returned to Kurt J. Lesker Company should preferably be free of harmful substances. Adhere to the forwarding regulations of all involved countries and forwarding companies and enclose a duly completed declaration of contamination (for further information please contact your Kurt J. Lesker Company accounting).

Products that are not clearly declared as "free of harmful substances" are decontaminated at the expense of the customer. Products not accompanied by a duly completed declaration of contamination are returned to the sender at his own expense.

8 Disposal



DANGER



Contaminated parts

Contaminated parts can be detrimental to health and environment.

Before beginning to work, find out whether any parts are contaminated. Adhere to the relevant regulations and take the necessary precautions when handling contaminated parts.



WARNING



Substances detrimental to the environment

Products or parts thereof (mechanical and electric components, operating fluids etc.) can be detrimental to the environment.

Dispose of such substances in accordance with the relevant local regulations.

Separating the components

After disassembling the product, separate its components according to the following criteria:

- Contaminated components
Contaminated components (radioactive, toxic, caustic or biological hazard etc.) must be decontaminated in accordance with the relevant national regulations, separated according to their materials, and disposed of.
- Other components
Such components must be separated according to their materials and recycled.

EU Declaration of Conformity



We, Kurt J. Lesker Company, hereby declare that the equipment mentioned below comply with the provisions of the following directives:

- 2014/30/EU, OJ L 96/79, 29.3.2014
(EMC Directive; directive relating to electromagnetic compatibility)
- 2011/65/EU, OJ L 174/88, 1.7.2011
(RoHS Directive; directive on the restriction of the use of certain hazardous substances in electrical and electronic equipment)

Product

Economic Capacitance Gauge

KJLC XCG

Standards

Harmonized and international/national standards and specifications:

- EN 61000-6-2:2005 (EMC: generic immunity standard)
- EN 61000-6-3:2007 + A1:2011 (EMC: generic emission standard)
- EN 61010-1:2010 (Safety requirements for electrical equipment for measurement, control and laboratory use)
- EN 61326:2013; Group 1, Class B (EMC requirements for electrical equipment for measurement, control and laboratory use)

Manufacturer / Signatures

Kurt J. Lesker Company, 1925 Route 51, Jefferson Hills
PA 15025, USA

30 August 2018

John Lubic, Vice President

Notes

Notes

Original: English



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