



INSTRUCTION MANUAL

Series 8000-SAN PRESSURE AND LEVEL TRANSMITTERS *According to 3A requirements (option G153)*



WARNING

Read this manual before working with the product. For personal and system safety, and for optimum product performance, make sure you thoroughly understand the contents before installing, using, or maintaining the Series 8000 or Series 8000-SAN.

Manufactured by:

 **KLAY-INSTRUMENTS**

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1 INTRODUCTION

The Series 8000 and Series 8000-SAN are solid state pressure- and level based upon a bridge resistive silicon sensor, with a very high burst pressure.

The sensor element is mounted in a stainless steel foot. A very strong stainless steel flush diaphragm protects the sensor from the process medium. Silicone oil fills the chamber surrounding the sensor and transfers pressure from the flush mounted diaphragm to the sensor.

Pressure exerted on the sensor element creates a very small deflection of the silicon substrate and bridge network. The resulting strain in the silicon resistors causes a change in the bridge resistance that is proportional to the pressure applied. The transmitter electronics detects the change in the bridge resistance and converts it into 4-20 mA. The amplifier system is based on a single Integrated Circuit, which ensures a perfect linearity in the 4-20 mA output. The electronics are fully encapsulated and are there for unaffected by vibrations and moisture.

The Series 8000 and 8000-SAN are available as SIL2, proven in use (Option G200).

1.1 DESCRIPTION SERIES 8000-SAN

The Series 8000-SAN are specially designed to be easy cleanable and capable of being steam sterilized, they have a flush mounted diaphragm so they fully meet the needs of the food, chemical and pharmaceutical industries. The Series 8000-SAN is available as 3-A version (Sanitary Standard - Option G153) and EHEDG (Sanitary standard - Option G150). Standard the wetted parts are made of AISI 316. Other materials are available like Hastelloy C. Various process connections can be delivered according to the 3A (74-07) requirements, such as Tri-Clamps (1,5, 2, or 3”), Varivent baseplate (GEA Tuchenhausen), DRD flange and a sanitary weld-on nipple 85 mm. Other connections such as SMS, IDF, Milk coupling can be supplied but these are not currently available on our transmitters marked with the 3-A Symbol. Please consult Klay Instruments.

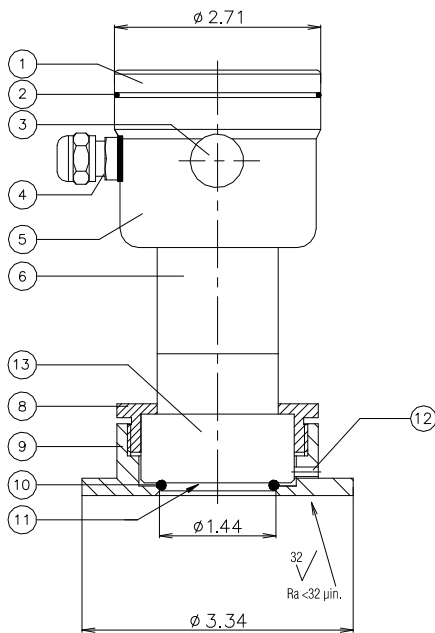
All transmitters are fully temperature compensated, which means that various process temperatures have nearly no effect on the accuracy of the output signal. When a failure occurs, the transmitter is repairable. However, for optimum accuracy the transmitter has to be send back to the factory.

1.3 BAROMETRIC REFERENCE

The Series 8000 and 8000-SAN are in basic so called Relative Transmitters which means that barometric changes will not affect the zero (4 mA). The venting hole (3) is placed at the side of the electronic housing and is the barometric reference to atmospheric pressure. The venting hole must be kept clean.

2. DIMENSIONAL DRAWINGS

2.1 DIMENSIONAL DRAWING 8000-SAN



PARTS DESCRIPTION:

MATERIAL:

1. Cover (drawing no: 1737)	AISI 304
2. O-ring	EPDM
3. Venting	PA
4. PG9 Cable Gland	
5. Electronic Housing	AISI 304
6. Extension	AISI 304
7. Foot with sensor	AISI 316 L
8. Lock ring	AISI 304
9. Weld-on nipple ϕ 85mm	AISI 316 L
10. O-Ring (1.18x0.08 inch)	EPDM (3A)
11. Diaphragm	AISI 316 L
12. Leakage Indication port	

3A-W-WELD-ON-G150



The leakage detection hole in the weld-on-nipple must be on the lowest point.

CLEANING PROCEDURE - Clean-Out-of-Place (COP)

On the model 8000-SAN-Range-W(85)-G150-G153 a special O-Ring is used (1.18x0.018 inch, EPDM 3A compound, class II for maximum 8% milk fat). This O-Ring material can perish in due time dependable on the application. For this reason it is strongly recommended to inspect and replace it with a new one at least once a year. Dependable on the application it should be done more frequently.

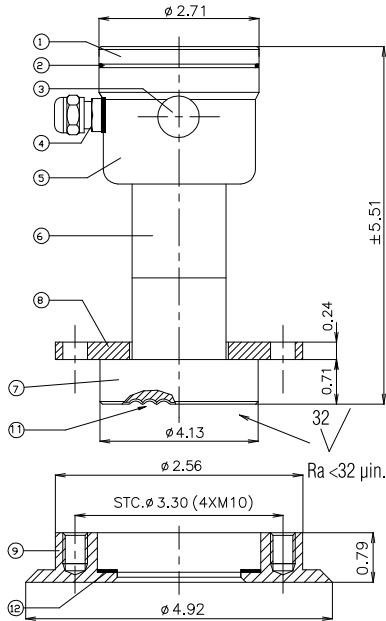
In the event of leakage by the leakage detection port in the weld-on nipple the whole connection should be cleaned (C.O.P.). This Cleaning Out of Place (C.O.P.) operation should be done in the following sequence:

- Shut down the process first.
- Drain the system
- Unscrew the transmitter from the weld-on nipple.
- Discard the broken seal (O-Ring)
- Rinse out any debris.
- Clean the thread and surface carefully with a wet or dry brush, using a cleaning agent.
(*The integrity of sealed product contact and non-product contact surfaces must not be compromised.*)
- Clean with warm water.
- Replace the O-Ring. (Should be ordered from Klay Instruments)
- Replace the transmitter into the weld-on nipple and make sure the transmitter is installed according the requirements according to the 3A instruction manual of the transmitter (Option G153).
- Apply a standard CIP or SIP cleaning activity.

MOUNTING:

- The hole for leakage detection in the process fitting must be visible after mounting and positioned at the lowest point for rapid detection.
- In horizontal pipe lines, avoid mounting in the upper or lower area of the pipe to avoid cavities due to air inclusions or undrainable areas. Lateral installation is recommended.

2.2 DIMENSIONAL DRAWING 8000-SAN



PARTS DESCRIPTION:

MATERIAL:

- | | |
|--|------------|
| 1. Cover (Drawing No. 1737) | AISI 304 |
| 2. O-Ring | EPDM |
| 3. Venting | PA |
| 4. PG9 Cable Gland | |
| 5. Electronic Housing | AISI 304 |
| 6. Extension | AISI 304 |
| 7. Foot with sensor | AISI 316 |
| 8. Flange | AISI 304 |
| 9. Option Weld-on-nipple
(extra price) Drawing no. 1864 | AISI 316 L |
| 11. Diaphragm | AISI 316 L |
| 12. Packing ring
(2.56x1.97x0.04 inch) | EPDM (3A) |

3A-X7-DRD-Flange



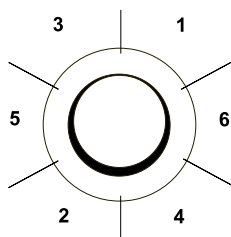
The leakage detection hole in the weld-on-nipple should be on the lowest point. The packing material that we supply with our transmitters (Weld-on or DRD connection) are made by a special compound (no. 55650), EPDM 70 PC.

The transmitters will be delivered with a material certificate for all the wetted parts (diaphragm, diaphragm ring, foot of the transmitter and weld-on nipple). These material certificates are fully traceable and stored for at least 12 years.

2.3 INSTALLING WELD-ON NIPPLE

Installation of the weld-on nipple should be performed by a skilled machinist or welder. Weld Argon, MIG or TIG with the smallest welding pin.

1. Cut a hole in the process vessel/pipe to accept the weld-on nipple. The hole should produce a tight fit when coupled with the weld-on nipple.
2. Prepare the vessel hole by bevelling the edge to accept filler material.
3. Remove the weld-on nipple from the transmitter.
4. Remove the PTFE packing of the Series 8000-SAN.



WARNING:

Improper installation may result in distortion of the weld-on nipple. Excessive heat will distort the weld-on nipple. Weld in sections as shown in the figure left. Allow adequate cooling between passes. To reduce the chances of distortion to the weld-on nipple, use a mandrel.

Series 8000-SAN Part.no: 1019



The leakage detection hole in the weld-on nipple should be on the lowest point.

5. Position the weld-on nipple in the vessel hole and tack six places. The weld sequence is shown in the figure above.
6. Weld the weld-on nipple in place using 0.03 to 0.045 in. (0.762 to 1.143 mm) stainless rod as filler material in the bevelled area. Adjust amperage for penetration.
7. Remove mandrel after the welding operation.
8. **Edges and the welds must be polished after welding to make sure that the roughness is < 32 micrometers.**

2.4 INSTALLING TRANSMITTER

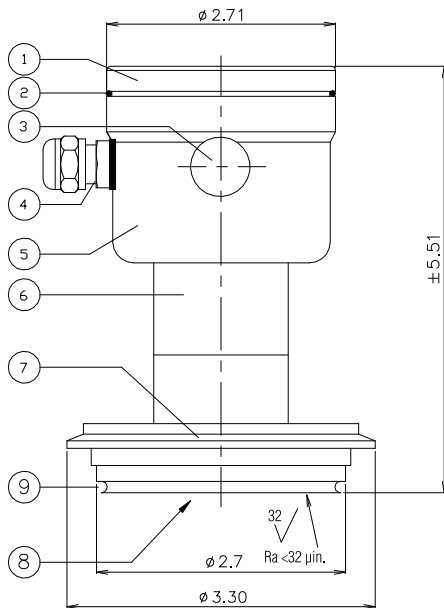
The diaphragm of the transmitter is protected with a special protection cap. Protect the diaphragm until installation takes place. **Do not damage the diaphragm.**

2.5 INSTALLING TRANSMITTER SERIES 8000-SAN

1. Improper installation at the packing can cause a process leak.
2. Make sure to correctly locate the packing within the weld-on nipple.
3. Position the transmitter into the weld-on nipple and begin engaging threads. The transmitter can be rotated prior to seating enabling the user to optimize access to calibration adjustments, cable entry, and local indicator.
4. Once Lockring (8) has been hand tightened, snug an additional turn with adjustable pliers (1/8").

3. DIMENSIONAL DRAWINGS

3.1 DIMENSIONAL DRAWING 8000-SAN:



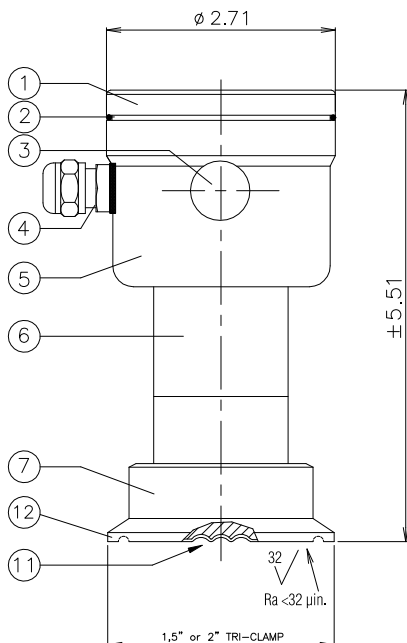
PARTS DESCRIPTION:

MATERIAL:

- | | |
|--------------------------------|-----------|
| 1. Cover (Drawing no: 1737) | AISI 304 |
| 2. O-ring | EPDM |
| 3. Venting | PA |
| 4. PG9 Cable Gland | |
| 5. Electronic Housing | AISI 304 |
| 6. Extension | AISI 304 |
| 7. Varivent Baseplate | AISI 316 |
| 8. Diaphragm | AISI 304 |
| 9. O-Ring(option, extra price) | EPDM (3A) |

3A-X4-Varivent

3.2 DIMENSIONAL DRAWING 8000-SAN:

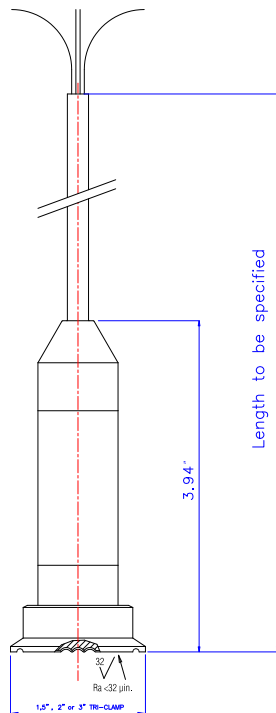


PARTS DESCRIPTION:

MATERIAL:

- | | |
|-----------------------------|------------------------------|
| 1. Cover (Drawing no: 1737) | AISI 304 |
| 2. O-ring | EPDM |
| 3. Venting | PA |
| 4. PG9 Cable Gland | |
| 5. Electronic Housing | AISI 304 |
| 6. Extension | AISI 304 |
| 7. Foot with sensor | AISI 316 L |
| 11. Diaphragm | AISI 316 L |
| 12. Tri-Clamp | AISI 316 L |
| | (1,5" or 2" to be specified) |

3A-L(...)-TRI CLAMP



Hydrobar-Cable(xx)-FR-L(1.5", 2" or 3")-G10-G153.

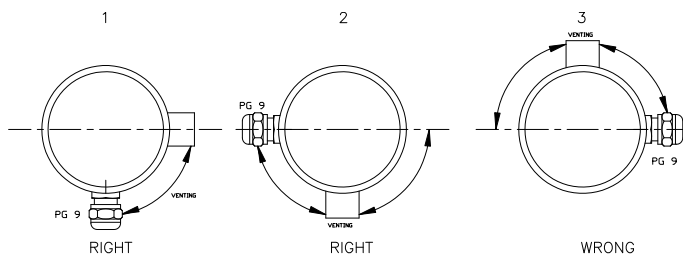
(As standard a Polyethylene cable is applied, optional a Hytrel Cable can be applied.)

3A-L(...)-TRI CLAMP



As standard we do not supply an O-ring for the Varivent connection. Make sure the O-Ring material is 3A approved. As standard we do not supply a packing ring nor a clamp for the Tri-Clamp connection. Make sure that the packing material is 3A approved. If we have to supply the O-Ring or the packing ring (option and extra price), the material is a special compound (No: 55650 EPDM 70 PC). The transmitters will be delivered with a material certificate for all the wetted parts (diaphragm, diaphragm ring, foot of the transmitter). These material certificates are fully traceable and stored for at least 12 years.

3.3 MOUNTING POSITION



When the transmitter is mounted horizontal, the venting MUST be pointed horizontal to downwards. See figure left.

- 1 = Right (= Preferred Position)
- 2 = Right
- 3 = Wrong All other mounting positions are NOT allowed

3.4 MOUNTING POSITION EFFECT

All transmitters are calibrated in horizontal position. If the transmitter is mounted vertical (up or down), there will be a zero shift. Up results in a small zero shift < 4 mA. Down results in a small zero shift > 4 mA. After installation of the transmitter the zero must be set at 4 mA with the zero potentiometer. **Do not change the span.**

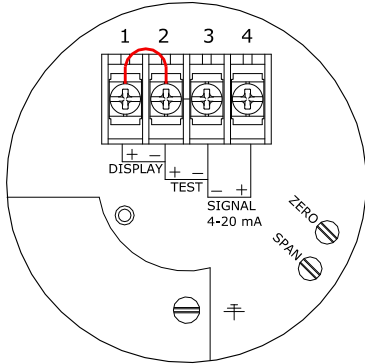
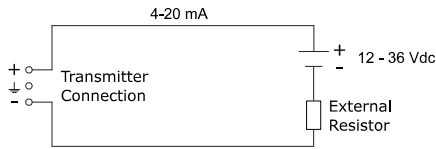
3.5 CALIBRATION

All transmitters are fully calibrated at the factory, to customer specified range. When no calibration is requested, the transmitter will be calibrated at the lowest span. It is advisable to recalibrate the transmitter after shipment.

The calibration sequence is as follows:

1. The output of the transmitter must be set at 4 mA (Zero-potentiometer).
2. Air pressure in accordance with the process pressure must be applied on the test nipple.
3. The output of the transmitter must be set at 20 mA (Span-potentiometer).
4. Remove the air pressure.
5. Check if the output of the transmitter is 4 mA. (Otherwise repeat steps 1 till 4)
6. Install transmitter (See above). The output must be set at 4 mA (dependable of mounting position).

4 WIRING:



Reversing the polarity will not damage the transmitter, but the transmitter will not function until + and – are properly connected.

The connector, and zero/span potentiometers are under the cover. Test nipples for calibration are available on request.

External load must be placed in the negative side of the 2-wire loop.

The figure left shows the wiring connection of the transmitter. The 2-wires must be connected to connectors 3 (-) and 4 (+) of the terminal board.

The transmitter must always be connected to earth.

The transmitter must be connected with standard two-wire shielded cable. **DO NOT** run signal wiring in open trays with power wiring, or near heavy electrical equipment (Example: frequency controllers or heavy pumps). Shielding must always be connected at the power supply side. When the mounting position is already connected to ground (for example by tank or pipe line) do NOT connect the instrument to ground. **Please ensure that the instrument is not connected to ground twice to prevent an Earth loop.**

4.1 DIGITAL LOCAL INDICATOR

The local indicator displays a digital value that is proportional to the pressure measured by the transmitter. The full scale point may be set to any value between 0000 and 1999. The local indicator can be mounted afterwards. Remove the bridge which is placed between connector (1) and (2). Connect the red (+) wire to (1) and the black (-) wire to (2). When using a local indicator the minimum power supply must be **15,5 Vdc**.

4.2 HAZARDOUS AREA

The Series 8000 and Series 8000-SAN are certified for applications in hazardous areas. Use a certified power supply, from 13 - 26,5 Vdc. Installation must be carried out by a certified mechanic or installer.

CERTIFICATIONS

ATEX - II 1 G Ex ia IIC T4 Ga

Certificate : KEMA 03ATEX1219 X

$U_i = 26,5 \text{ Vdc}$, $I_i = 110 \text{ mA}$, $C_i = 1 \text{ nF}$, $L_i = 1.2 \text{ mH}$, $P_i = 0,9 \text{ W}$

$-30^\circ \text{ C} < T_{\text{amb}} < 70^\circ \text{ C}$

The X in the certificate number refers to a special condition only applicable for our submersible level transmitter "HYDROBAR" –Cable and –FR. See for this conditions the ATEX-certificate. The maximum length of the cable for the Series-8000-cable, Series-8000-SAN-cable and Hydrobar-cable is 32 m. Electrostatic charging of the cable and the protection cap by the flow of non-conductive media (e.g. in stirring vessels or pipes) shall be avoided.

IECEX - Ex ia IIC T4 Ga

Certificate: DEK 13.0060X

$U_i = 26.5 \text{ Vdc}$, $I_i = 110 \text{ mA}$, $C_i = 1 \text{ nF}$, $L_i = 1.2 \text{ mH}$, $P_i = 0.9 \text{ W}$

$-30^\circ \text{ C} < T_{\text{amb}} < 70^\circ \text{ C}$

All certifications are in compliance with IECEx scheme rules, and the International Standards: IEC 60079-0:2011, IEC 60079-11:2011, IEC 60079-26:2007 and IEC 17050-1. They are certified for use in hazardous areas by DEKRA B.V.



DO NOT REMOVE THE SCREW COVER(S) WHEN AN EXPLOSIVE ATMOSPHERE MAY BE PRESENT.

4.3 FUNCTIONAL SAFETY - SIL

The device is certified as "Proven in use" for a Functional safety environment of SIL2 according to IEC-61511 and SIL2 according to IEC-61508.

Note 1 : According to IEC 61511, 11.4.4 SIL3 is possible in 1oo2 configuration (two-channel redundant architecture)

Note 2: Option SIL (Proven in use) is valid on transmitters with a serial number > 10509426

When ordered as a SIL (Proven in use) transmitter, the safety manual will be supplied. (Option G200) Detailed information can be found in the Safety manual of the instrument. The most recent version of the Safety manual is available on: www.klay-instruments.com under section Downloads.

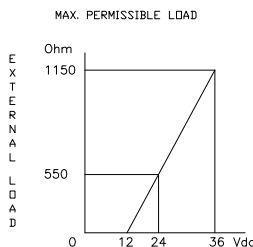
4.4 TRACEABILITY YEAR OF MANUFACTURING

The year of manufacturing can be traced as follows: take the first two numbers from the serial number transmitter and add 1908. For example: if the serial number is 10509426. The year of manufacturing is 1908 + 105 = 2013. For older transmitters, for example with serial number 9302123, the first **two** numbers must be add to 1908.

4.5 CE / EMC - Rules

All Klay transmitters are manufactured in accordance with the RFI / EMC directives and comply with the CE standard. All transmitters are fitted with RFI filters, which provide optimum, trouble-free operation. Our products are in conformity with EMC-Directive 2004/108/EC based on test results using harmonized standards.

4.6 EXTERNAL LOAD:



The maximum permissible load (Ri max.) in case of 24 Vdc is 550 Ω (Ohm).

By increasing the power supply, the external load can be increased to 1150 Ohm / 36 Vdc. (see figure left).

$$Ri \text{ max.} = \frac{\text{Power Supply} - 13 \text{ Vdc (min. power supply)}}{20 \text{ mA}}$$

5 SPECIFICATIONS

Manufacturer	Klay Instruments	
Instrument	Series 8000 Series 8000-SAN	
Output	4-20 mA	
Power Supply	12 - 36 Vdc Ex-version: 13 - 26.5 Vdc	
Accuracy	0.2 % of adjusted span	
Process Temperature ¹	Series 8000 -4 °F to 176 °F Series 8000-SAN -4 °F to 212 °F Series 8000-Cable -4 °F to 176 °F Series 8000-SAN-Cable -4 °F to 176 °F	
Ambient Temperature	-4 °F to 158 °F	
Protection Grade	IP 66 IP 68 (8000-cable and 8000-SAN-Cable submersed parts)	
Material	Housing Wetted Parts	AISI 304 AISI 316 L

¹ For higher process temperatures please use Series 8000-SAN with option HT and specify the exact process temperature, or contact Klay Instruments.

6.

PRECAUTIONS and WARNINGS:

- * Check if the specifications of the transmitter meet the needs of the process conditions.
 - * When the Series 8000 or 8000-SAN is used as a level transmitter, be aware of the place where the transmitter is mounted. Here are some advises:
 1. DO NOT mount a level transmitter in- or near filling or discharging pipes.
 2. In case of automatic cleaning systems or hand cleaning: never point the water jets on the diaphragm, take necessary steps to avoid this. Guarantee will not be granted.
 - * When the SERIE 8000 or Series 8000-SAN is used as a pressure transmitter, be aware of the following points:
 1. Rapid closing valves in combination with high flow velocity will cause water hammer(spikes) and can destroy the transmitter. DO NOT mount a transmitter near such valves, always a few pipe bends away up or down stream (avoid suction).
 2. Install a pressure transmitter a few pipe bends away from pumps, as well on the suction or pressure side of the pump.
 - * **WELDING ADVISEMENT:**
When using the Series 8000 or 8000-SAN code "W" the welding advisements on page 3 must be followed exactly. This is very important to prevent distortion of the weld-on nipples. It also prevents the screw thread from the Series 8000-SAN (M56 x 1,25) from not get deformed.
 - * The diaphragm of the transmitter is protected with a special protection cap. Protect the diaphragm until installation takes place, to prevent damaging of the diaphragm.
 - * As soon as the wiring is brought inside through the PG9 cable gland and connected to the terminal board, make sure the cable gland is tightly fixed, so that moisture cannot enter into the electronic housing.
 - * NEVER unscrew the venting (3), because it is especially designed to prevent moisture from entering into the electronic housing. If the ambient conditions are very wet, we advise to use a venting through the cable. A special vented cable can be delivered on request.
 - * Avoid high pressure water-jets pointed at the venting.
 - * The cover must be fully engaged, so that moisture cannot ingress into the electronic housing. The cover must only be capable of being released or removed with the aid of a tool.
 - * The warranty is 1 year from delivery date. Klay Instruments does not accept liability for consequential damage of any kind due to use or misuse of the Series 8000 or Series 8000-SAN. Warranty will be given, to be decided by the manufacturer. Transmitter must be shipped prepaid to the factory on manufacturer's authorization.
- Klay Instruments reserves the right to change its specifications at any time, without notice. Klay Instruments is not an expert in the customer's process (technical field) and therefore does not warrant the suitability of its product for the application selected by the customer.

Manufactured by:

 **KLAY-INSTRUMENTS**

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