

OPERATING MANUAL - BA06.24

Leakage probe PUKK

Floor probe for conductive leakage detection
of electrical conductive liquids



Index	
1. About this document	3
1.1. Dokument function	3
1.2. Terms	3
1.3. Other documents	3
2. Safety instructions	4
2.1. Authorized personnel	4
2.2. Appropriate use	4
2.3. Operational safety	4
3. Product description	5
3.1. Function	5
3.2. Construction	5
3.3. Product label	5
3.4. Product code	5
3.5. Dimensions	6
3.6. Packaging, transport, storage	7
3.7. Accessories	7
4. Installation	7
4.1. Ambient and process conditions	7
4.2. Installation place	7
4.3. Installation notes	7
5. Electrical connection	8
5.1. Electronics - supply / output [02/03-GA] – switching output PNP	8
5.1.1. Terminal assignment	8
5.1.2. Connection notes	8
5.2. Electronics - supply / output [02/03-UB] – relay output	8
5.2.1. Terminal assignment	8
5.2.2. Connection notes	8
5.3. Connection cable	8
6. Operation	9
6.1. Electronics - supply / output [02/03-GA] – switching output PNP	9
6.1.1. Control and display elements	9
6.1.2. Safety circuit	9
6.2. Electronics - supply / output [02/03-UB] – relay output	10
6.2.1. Control and display elements	10
6.2.2. Safety circuit	10
7. Error diagnosis and Troubleshooting	11
8. Maintenance	11
9. Repair	11
9.1. Dismounting	11
9.2. Return	11
9.3. Disposal	11
10. Technical Data	12
10.1. Auxiliary energy supply	12
10.1.1. Electronics - Supply [02-G] – DC voltage 24VDC	12
10.1.2. Electronics - Supply [02-3] – AC/DC voltage 20...30VAC/DC	12
10.2. Resistance/conductivity input	12
10.3. Output	12
10.3.1. Electronics - output [03-A] – switching output PNP	12
10.3.2. Electronics - output [03-B] – relay output	12
10.4. Process conditions	12
10.5. Environmental conditions	13
10.6. Materials	13
11. Revision	14

1. About this document

1.1. Dokument function

These instructions for use describe the structure, functions and the use of the product and will help to operate the product as intended.

Read these instructions carefully before using the product. This is to avoid possible damage to persons, property or the device.

The Operating manual is part of the device and must be kept always accessible nearest its installation location.

All statements within this document correspond to the information available at the time of printing. Subject to change without prior notice.

1.2. Terms

NOTE	Notes to prevent failures, malfunctions, damage to devices or plants.
WARNING	Non-observance of the information may result in serious or fatal personal injury.
[04-5]	Exemplary notice to a type variant (>> chapter Product description - Product code)

1.3. Other documents

Besides this document the following material can be found on the Internet at www.acs-controlsystem.com:

- EU Declaration of Conformity (current version)
- Manufacturer declarations
- Certificates
- 3D-CAD models

2. Safety instructions

2.1. Authorized personnel

Installation, electrical connection, commissioning, operation, maintenance, dismantling and disposal of the device must be made by a qualified and authorized expert according to the information's in the Operating manual and the relevant standards and rules.

This expert must have read and understood the Operating manual and especially the safety instructions. During work on and with the device, the required personal protective equipment must always be worn.

2.2. Appropriate use

The device is a conductive leakage sensor for leakage detection of electrically conductive liquid media.

The operational reliability of the device is ensured only at the intended use. Inappropriate or incorrect use of this product can give risk to application specific hazards, e.g. vessel overflow through incorrect mounting or adjustment. Damage to property and persons or environmental contamination can result. Also, the characteristics of the instrument can be impaired.

An inappropriately use, disregarding the Operating manual and the technical rules, using under-qualified personnel, making unauthorized alterations as well as damage of the device releases the manufacturer from liability for any resulting damage. This renders the manufacturer's warranty null and void.

2.3. Operational safety

The device is safely built and tested according to state-of-the-art technology. The instrument must only be operated in a technically flawless and reliable condition. The operator is responsible for the trouble-free operation of the instrument. The device may only be used within the permitted operation limits. Every use besides these limits as agreed can lead to serious dangers.

The materials of the device must be checked for compatibility with the respective application requirements before use. An unsuitable material can lead to damage, abnormal behavior or destruction of the device and to the resulting dangers.

The sensors may not be used as sole device for prevention of dangerous conditions in machines and plants.

For safety and warranty reasons, any invasive work on the device beyond that described in the Operating manual may be carried out only by personnel authorized by the manufacturer. Arbitrary conversions or modifications are explicitly forbidden. For safety reasons, only the accessory specified by the manufacturer must be used.

The device meets the legal requirements of all relevant EU directives. This is confirmed by attaching the CE mark to the device. The associated EU-Declaration of Conformity can be ordered or downloaded from the homepage.

3. Product description

3.1. Function

The device is a conductive leakage sensor for leakage detection of electrically conductive liquid media.

The alternating voltage generated by the integrated electronics is present between the electrode contacts.

By using an alternating voltage, corrosion on the electrode and electrolytic decomposition of the filling material are avoided.

As soon as the electrically conductive filling material forms a connection between the electrodes, a measurable current flows, which causes the evaluation electronics to react.

Depending on the safety circuit set, this causes the output relay or the PNP switching output to switch.

The switching status of the output is displayed internally in the device with yellow LEDs.

The leakage probe can be adjusted to adjust the response threshold to the conductivity of the liquid.

3.2. Construction

The leakage probes can be configured variably and are therefore designed for a wide range of applications:

- for conductivities from 5 $\mu\text{S}/\text{cm}$
- for process temperatures from $-20\text{ }^{\circ}\text{C}$ to $+60\text{ }^{\circ}\text{C}$
- Materials also for aggressive filling goods

The leakage probe is intended for floor mounting and is equipped with two mounting holes for this purpose.

3.3. Product label

The product label contains the most important data for identification and use of the instrument.

3.4. Product code

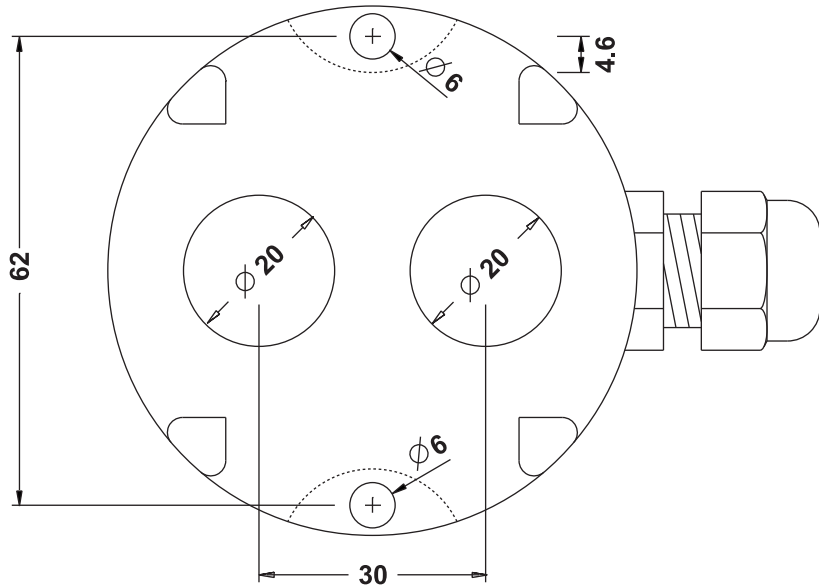
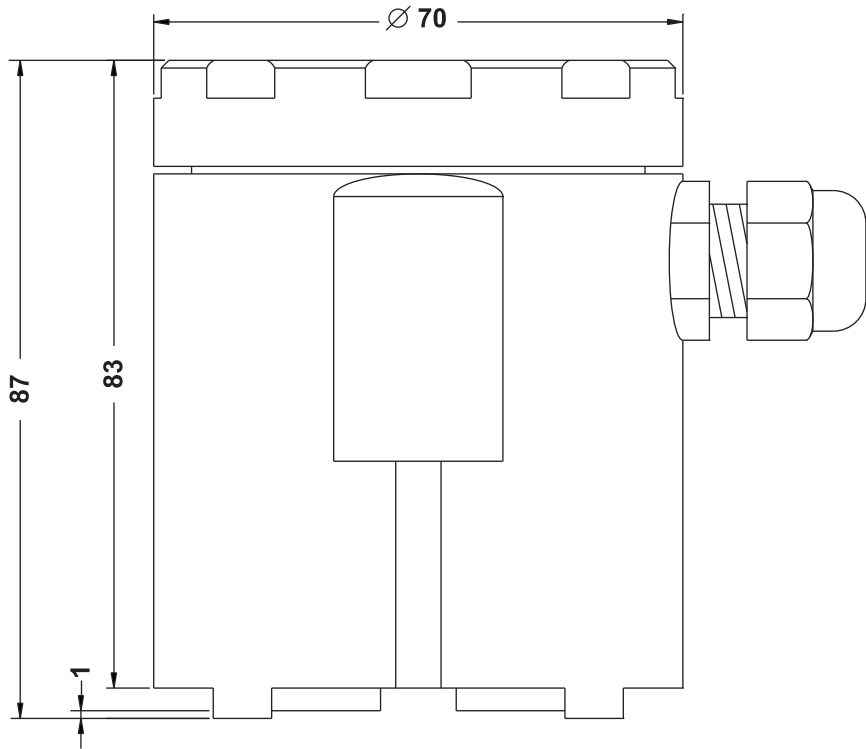
PUKK [01][02][03][04][05][06][07][94][95][98]

01	Electrical connection	K	Terminal box
01		V	Cable L 5m
02	Electronic - Supply	G	DC voltage 24V DC
02		U	Alternating/direct voltage 20...30V AC / DC
03	Electronic - Output	A	Switch output PNP
03		B	Relay output
04	Number of electrodes	2	2 electrodes
05	Process connection	A	Screw mounting
06	Electrode - Material	A	CrNi steel 316L/316Ti
06		D	Hastelloy C 4
07	Enclosure - Material	D	POM
07		P	PP
07		T	PTFE
94	Additional option	-SF	LABS-free, silicone-free / paint compatible version
95		-ML	Measuring point designation / TAG - laser marking
98		-KF	Configuration / default setting

Differing versions are normally marked by the character Y at the product code.

3.5. Dimensions

Dimensions in mm



3.6. Packaging, transport, storage

The device is protected by packaging. It can handle normal loads during transport. Transport must be carried out in due consideration of the notes on the transport packaging. Nonobservance of these instructions can cause damage to the device.

The delivery must be checked for completeness and possible transit damage immediately at receipt. Ascertained transit damage or concealed defects must be appropriately dealt with.

Up to the time of installation, the packages must be left closed and, unless otherwise indicated, must be stored only under the following conditions:

- Not in the open
- Dry and dust free
- Not exposed to corrosive media
- Protected against solar radiation
- Avoiding mechanical shock and vibration
- Storage and transport temperature -20...+85°C
- Relative humidity 20...85%

3.7. Accessories

For installation and electrical connection an extensive portfolio, that is optimally matched to the device is available:

- Gaskets
- Connection cables

4. Installation

4.1. Ambient and process conditions

The correct function of the device within the specific technical data can only be guaranteed, if the permitted ambient and process conditions at the installation place (» chapter Technical Data) will not be exceeded. Hence make sure before mounting that all parts of the instrument exposed to the process (e.g. electrodes, enclosure, enclosure gaskets) are suitable for the existing process conditions (e.g. process pressure, process temperature, chemical properties of the medium, abrasion, mechanical influences).

4.2. Installation place

The device is intended for floor mounting.

The device can be fixed at the desired installation position using two holes.

Mount the device in a place or recess where there is sufficient space in the event of a leak
Filling material can accumulate.

The filling height at the installation site must be at least 2mm.

4.3. Installation notes

Do not remove packaging until just before mounting and check the device for any damage.

When installed, the uninsulated electrode contacts must not touch the floor if it is made of metal or electrically conductive plastic.

5. Electrical connection

5.1. Electronics - supply / output [02/03-GA] – switching output PNP

5.1.1. Terminal assignment

Electrical connection [01-K] - Terminal box	Electrical connection [01-V] - Cable L5m
1 2 3 4 5 6 CH2 - 2 CH1 - 1 REF - C L+ L- S1 24V DC +/-10%	1 2 3 L+ L- S1 24V DC +/-10% $\leq 0,5A$

5.1.2. Connection notes

WARNIGG	Install the device only in de-energized state.
NOTE	For start-up deactivate all connected control devices.

Please note the maximum permissible supply voltage U_s at the connections L+/L-:

- $U_s = 21.6...26.4VDC$

The supply voltage and switching output are galvanically isolated from the electrode circuit.

The load connected to the PNP switching output is connected contactlessly and therefore without bounce via a semiconductor switch with supply +L. In the activated switching state, there is a positive signal close to the supply voltage at terminal S1. If the switching state is deactivated and the supply voltage fails, the semiconductor switch blocks.

Only operate inductive loads, e.g. relays, auxiliary contactors with a freewheeling diode or RC element.

5.2. Electronics - supply / output [02/03-UB] – relay output

5.2.1. Terminal assignment

Electrical connection [01-K] - Terminal box	Electrical connection [01-V] - Cable L5m
1 2 3 7 8 S1 N / L- L / L+ $\leq 30V AC/DC$ $\leq 2A / \leq 60W$ 20...30V AC/DC 50/60 Hz	N 8 L 7 S1 3 2 1 2 — N / L- 20...30V AC/DC 1 — L / L+ 50/60 Hz 3 — S1-NO $\leq 30V AC/DC$ 4 — S1-C $\leq 2A / \leq 60W$ 5 — S1-NC

5.2.2. Connection notes

WARNIGG	Install the device only in de-energized state.
NOTE	For start-up deactivate all connected control devices.

Please note the maximum permissible supply voltage U_s at the connections L/L+, N/L- and at the relay contacts:

- $U_s = 20...30VDC$

The supply voltage, electrode circuit and relay contacts are galvanically isolated from each other.

Only operate inductive loads, e.g. relays, auxiliary contactors with a freewheeling diode or RC element.

5.3. Connection cable

For the connection, only use suitable cables that meet the requirements, for example in terms of temperature, material or routing at the installation location.

In the event of strong electromagnetic radiation, shielded signal and measuring cables must be used.

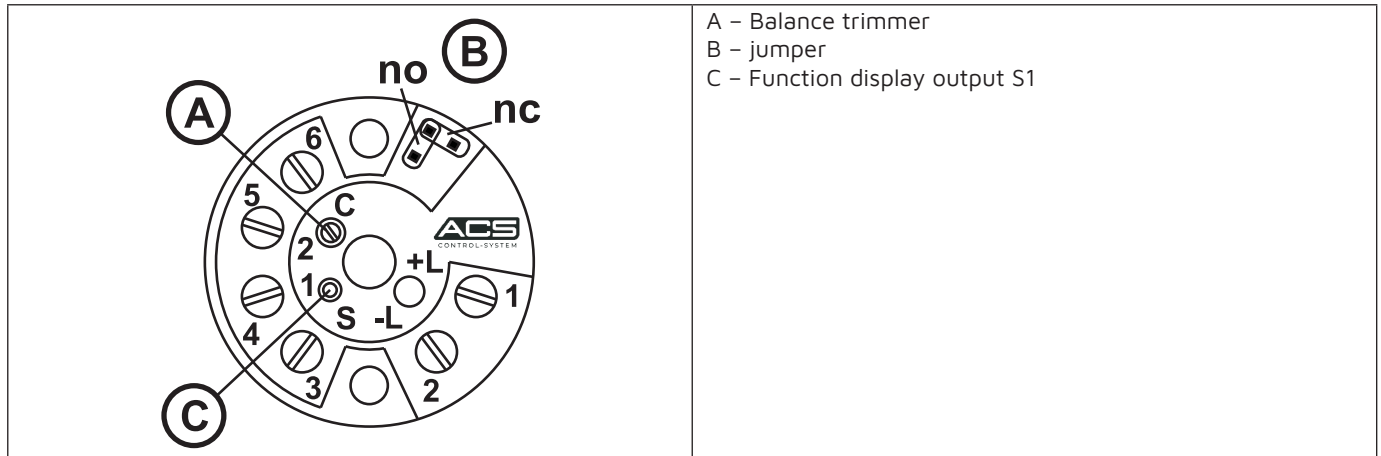
Lay cables separately from power lines and ground the cable shield on one side.

Impedance	$\leq 25\Omega/\text{wire}$
Cable diameter	4...10mm
Cable cross section	$\leq 1,5 \text{ mm}^2$

6. Operation

6.1. Electronics - supply / output [02/03-GA] - switching output PNP

6.1.1. Control and display elements



Trimmer (A) - Responsiveness

- Clockwise rotation: Switching reaction occurs at higher fluid resistance or lower conductance.
- Counterclockwise rotation: Switching reaction occurs at lower fluid resistance or higher conductance.

Alignment (safety circuit - maximum protection - nc):

- Medium must form an electrically conductive connection between the electrodes:
- Turn the adjustment trimmer to the left (counterclockwise) until the output drops out - LED off
- Turn the trimmer to the right (clockwise) until the output switches on - LED lights up
- Turn the adjustment trimmer half a turn to the right (clockwise).

Configuration jumper (B) - safety circuit

- Minimum protection = bridge inserted to „no“ - normally open)
- Maximum protection = bridge inserted to „nc“ - normally closed

Function display (C)

- LED yellow PNP switching output active

6.1.2. Safety circuit

Minimum security - no

The output signal drops:

- if there is no conductive liquid connection between the two electrodes
- if the supply voltage fails

Maximum security - nc

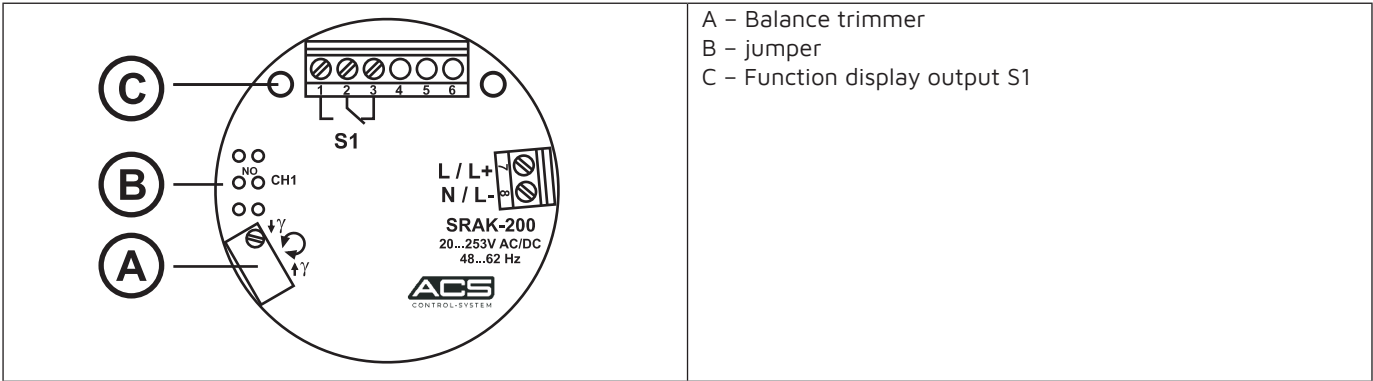
The output signal drops:

- if there is conductive liquid connection between the two electrodes
- if the supply voltage fails

	Minimum - no		Maximum - nc	
	S1	LED	S1	LED
$U_s = 0V$		S1 ●		S1 ●
		S1 ●		S1 ☀ YE
		S1 ☀ YE		S1 ●
		S1 ●		S1 ☀ YE

6.2. Electronics - supply / output [02/03-UB] – relay output

6.2.1. Control and display elements



Trimmer (A) - Responsiveness

- Counterclockwise rotation: Switching reaction occurs at higher fluid resistance or lower conductance.
- Clockwise rotation: Switching reaction occurs at lower fluid resistance or higher conductance.

Alignment (safety circuit – maximum protection – nc):

- Medium must form an electrically conductive connection between the electrodes
- Turn the adjustment trimmer to the right (clockwise) until the output drops out – LED off
- Turn the trimmer to the left (counterclockwise) until the output switches on – LED lights up
- Turn the adjustment trimmer half a turn to the left (counterclockwise).

Configuration jumper CH1 (B) - safety circuit

- Minimum protection = bridge inserted (no – normally open)
- Maximum protection = bridge open (nc – normally closed)

CH2 / Δs without function

Function display (C)

- LED yellow Output relay S1 energized

6.2.2. Safety circuit

Minimum security - no

The output relay drops:

- if there is no conductive liquid connection between the two electrodes
- if the supply voltage fails

Maximum security - nc

The output relay drops:

- if there is conductive liquid connection between the two electrodes
- if the supply voltage fails

	Minimum - no		Maximum - nc	
	S1	LED	S1	LED
$U_s = 0V$		S1 ●		S1 ●
		S1 ●		S1 ☀ YE
		S1 ☀ YE		S1 ●
		S1 ●		S1 ☀ YE

7. Error diagnosis and Troubleshooting

The operator of the system is responsible for taking suitable measures to rectify faults.

In case of malfunction check:

Component / area	Check	Troubleshooting
Enclosure	Damage	Replace device or send in for repair
Electrodes	Pollution	Clean device or send in for repair
	Damage	Replace device or send in for repair
Supply voltage	Operating voltage available	Switch-on resp. repair operating voltage
		Check terminals resp. repair
	Operating voltage reverse connected	Reverse operation voltage connection
	Operating voltage too low	Adapt resp. repair
	Operating voltage too high	Send in the device for repair
	Connection cable damaged	Replace or repair cable

If the malfunction cannot be eliminated, please contact the manufacturer.

8. Maintenance

At appropriate use, the device is free of maintenance.

Solid coatings on the electrode contacts can lead to faulty measurement results. In this case the sensor lens must be regularly cleaned. Don't use sharp resp. hard tools, pressured air or aggressive chemicals.

9. Repair

The device is not intended for repair by the user. A repair may only be carried out by the manufacturer.

9.1. Dismounting

Use suitable protective clothing, e.g. goggles, gloves.

WARNING	Let the device and the system cool down sufficiently fore dismounting it. There is a risk of hot surfaces as well as dangerous and hot media escaping.
----------------	--

9.2. Return

Returns can only be accepted if the device has been equipped with a Decontamination declaration enclosed. The decontamination declaration is available at <https://www.acs-controlsystem.com> at the download area and must be completely filled in, and affixed securely and weather-proof to the outside of the packaging.

9.3. Disposal



As required by the Directive 2012/19/EU on waste electrical and electronic equipment (WEEE), products of ACS are marked with the depicted symbol in order to minimize the disposal of WEEE as unsorted municipal waste. Such products may not be disposed of as unsorted municipal waste and can be returned to ACS for disposal.

The return follows the conditions stipulated in the General Terms and Conditions or as individually agreed by ACS.

10. Technical Data

Reference conditions	Ta = +15°C..+25°C (+59°F..+77°F) / pa = 860..1060kPa / r.F. = 45..75%
----------------------	---

10.1. Auxiliary energy supply

10.1.1. Electronics - Supply [02-G] - DC voltage 24VDC

Supply voltage	24VDC ±10%, reverse polarity protected / residual ripple ≤ 2Vpp
Power consumption	≤ 1W (S1=0mA)
Overvoltage category	II
Protection class	II
Isolation voltage	1kVac

10.1.2. Electronics - Supply [02-3] - AC/DC voltage 20...30VAC/DC

Supply voltage	20..30VAC/DC, 48...62Hz, reverse polarity protected
Power consumption	≤ 1,75VA / 1W
Overvoltage category	II
Protection class	II
Isolation voltage	2,5kVac

10.2. Resistance/conductivity input

Sensor type	conductive
Measuring range	≥ 5μS/cm / ≤ 200kOhm
Measuring voltage	±9Vpp ±1V / 90Hz / ≤ 1,5mA

10.3. Output

10.3.1. Electronics - output [03-A] - switching output PNP

Specification	PNP, switching to +L/-L
Output signal	Uo ≤ 0,2V...≥ (Us - 2V) / Io = 0...500mA (current limited ≤ 500mA, short circuit proof)
Leakage current	≤ 100μA
Switching cycles	≥ 100.000.000
Standby time	ton ≤ 1s
Step response time	t90 ≤ 2s

10.3.2. Electronics - output [03-B] - relay output

Specification	potential-free changeover contact
Switching data	≤ 30VAC/DC - 2A - 62,5VA/60W / ≥ 100μV
Switching cycles	≥ 100.000 (Pmax/Imax)
Standby time	ton ≤ 1s
Step response time	t90 ≤ 2s

10.4. Process conditions

Process temperature Tp	-20...+60°C (+14°F...+212°F)
Process pressure	pressureless

10.5. Environmental conditions

Ambient temperature Ta	-20...+60°C (+14°F...+212°F)
Protection level	IP68 [$\leq$ 1 mWs-1h] (EN/IEC 60529)
Climatic classification	4K4H (EN/IEC 60721-3-4)
Shock classification	15g [11ms] (EN/IEC 60068-2-27)
Vibration classification	4g [10...2000 Hz] (EN/IEC 60068-2-6)
EM compatibility	Operation device class B / Industrial range (EN/IEC 61326)
Protection class	III
Pollution degree	2
Altitude above sea level	2000m above sea level
MTTF	TBD
Weight	0,25kg

10.6. Materials

Process wetted	[06-A]: Steel 1.4404/316L or 1.4571/316Ti / [06-D]: Hastelloy C4
	[07-D]: POM / [07-P]: PP / [07-T]: PTFE
	[07-D/P]: NBR / [07-T]: FFKM
Not process wetted	[01-K]: PA, CR/NBR,
	[01-V]: PA, PUR, NBR, silicone

11. Revision

Version	Changes
TA10.13	Original version
TA09.15	[02-U]: Supply voltage 20-30VAC/DC
BA06.24	[02/03-GA]: Exchange electronic module



FEEL FREE TO
CONTACT US

ACS-CONTROL-SYSTEM GmbH
Lauterbachstr. 57
84307 Eggenfelden - Germany
info@acs-controlsystem.de
www.acs-controlsystem.com
+49 (0) 8721-9668-0

YOUR PARTNER FOR MEASUREMENT & AUTOMATION