6

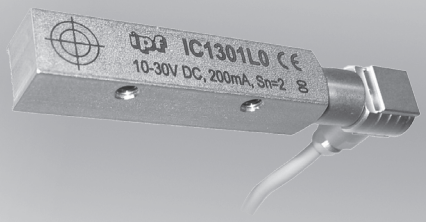
- threaded design
- cuboid design
- high-temperature devices

all-steel sensors

NOTES

ipf electronic gmbh • Kalver Straße 25 - 27 • 58515 Lüdenscheid • Germany | Tel +49 2351 9365-0 • Fax +49 2351 9365-19 |
info@ipf-electronic.com • **www.ipf-electronic.com**

dimensions	**M12 x 1mm** **M18 x 1mm** **M30 x 1.5mm** **12 x 12 x 66mm** **22 x 40 x 46mm**	
flush	switching distance	**2 to 10mm**
non-flush	switching distance	**4mm**



- ✓ **an innovation of *ipf electronic***
- ✓ **all-round stainl. steel (housing, front and rear)**
- ✓ **devices up to 130°C with integrated amplifier**
- ✓ **threaded devices acc. to European standards**
- ✓ **connection via cable, M8-, M12- or Lemosa-connector**

active stainl. steel surface, for multi-limit switches, oil proof versions

description

An important feature of these sensors is the one-piece stainless steel housing. This means that the active surface of the devices is sealed against fluids and gases, to which the whole housing material is resistant. They are much more resistant to mechanical stress than conventional proximity switches.

The **IC120104** and **IC120105** devices relate to a further development of the **IC120100**, specifically for use in roller gap sensors. Due to the limited spatial conditions, the length of the housing is reduced to 40mm.

In these applications, the devices come into contact with abrasive emulsion. For this reason they have a silicone cable, sealing in the cable exit as well as a special compound. The ambient temperature can reach up to +100°C.

The **IC2201L0** has been developed, in order to replace mechanical multi-limit switches on injection molding machines. Compared to these it has the following key advantages: The stainless steel housing is significantly more robust than the plastic housing of mechanical devices. Apart from this, the **IC2201L0** works by detecting objects in a non-contact way, without wear and tear. Due to the identical dimensions, the devices can be exchanged with each other without any problems. With the aid of oblong holes, an adjustment of the switching distance is possible.

In the same way as multi-limit switches, any number of devices can be installed directly next to each other, without causing interference. The ambient temperature can reach up to +100°C.

application examples

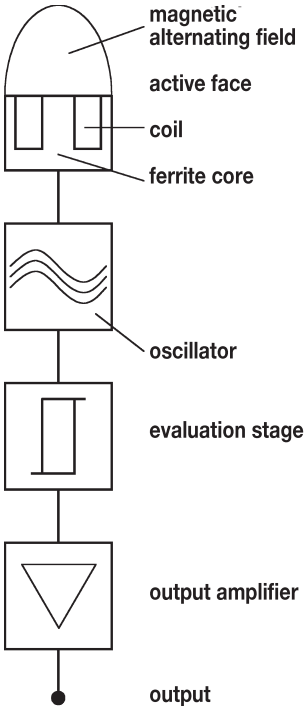
- integration in machine parts subject to rough industrial environments
- checking the presence of metal parts with various dimensions
- detecting object heights, e.g. metal parts on conveyor belts
- detection of objects through the walls of non-metallic containers and tubes

Notes on inductive proximity switches

I **inductive sensor**

IC all-steel **flush**
IO all-steel **non-flush**

functional principle
The oscillation coil behind the active surface of the proximity switch produces an alternating electromagnetic field. Any electrically conductive material entering the field will induce rotational currents extracting energy from the oscillating circuit. The damping of the oscillator is then converted into a switching signal in the output amplifier.
It follows the functional principle that all metals are detected, moving or not. Important: The high frequency field produces no measurable increase in temperature and no magnetic influence inside the object to be detected. That means the sensors operate without interacting with the system.



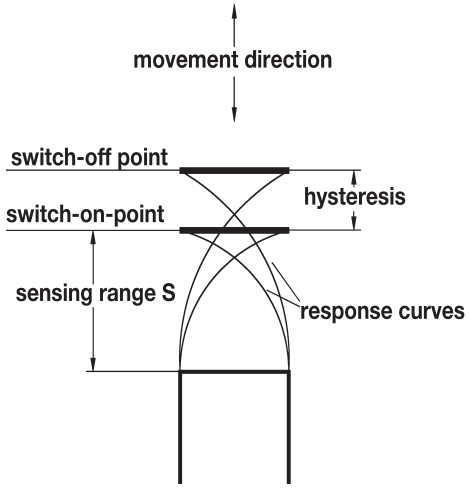
functional principle of an inductive proximity switch

switching distance / norm measuring plate
The distance to the sensor surface, where a metal causes a change in the switching state, is called switching distance. This distance is not the same for all metals. That is why a so-called correction factor has been specified for the respective metal, e.g. copper or aluminum. The nominal switching distance is determined by a norm measuring plate. This is a quadratic metal plate made from steel (St37) with a thickness of 1mm and a smoothened surface for determining the rated switching distance S_n. The edge length is 3 x S_n if 3 x S_n is larger than the diameter of the active surface, otherwise the edge length is the same as the diameter of the active surface.

ipf electronic gmbh • Kalver Straße 25 - 27 • 58515 Lüdenscheid • Germany | Tel +49 2351 9365-0 • Fax +49 2351 9365-19 |
info@ipf-electronic.com • **www.ipf-electronic.com**

One differentiates between the normal switching distance S_n, which is determined without consideration for manufacturing tolerances or external influences, and the operational switching distance S_a.
The safe operational switching distance is between 0 and 81% of S_n ($0< S_a< 0.81 \times S_n$).

switching hysteresis
During the approach and subsequent removal of the measuring plate from the initiator there will be a difference between switch-on point and switch-off point. This integrated hysteresis prevents the switching output from oscillating during mechanical vibrations. Usually the hysteresis is between 5 to 15% of S_n.



series connection
To be operationally safe the connection in series of 3-wire PNP sensors requires a logical AND-gate, e.g. **VL250100**.

parallel connection
A logical OR-gate, e.g. the **VL250120**, can be used to facilitate the connection in parallel.

mounting
For the reliable operation of the devices, it is essential that the installation conditions are adhered to.

switching frequency
The switching frequency states the maximum number of available switching operations per second. Every switching operation of the inductive proximity switch causes the oscillating circuit to move.
The time needed for the oscillation puts a limit on the switching frequency.
For half the nominal switching distance the pulse to pause ratio should be at least 1 : 2.
I.e. when choosing the right proximity switch, a compromise needs to be made between the size of the sensor and the switching frequency. General rule: The larger the sensor, the lower the switching frequency.

tightening torques
To avoid damage when mounting proximity switches, never exceed the tightening torque given.

stainless steel thread
M12 = 20Nm
M18 = 50Nm
M30 = 150Nm

active switching zone / active surface:
The active switching zone is the area in front of the active surface, within which the proximity switch reacts to the approach of metal parts, i.e. changes the state of the output.

nominal switching distance (Sn):
The distance at which a metal part that is approaching the active surface of the proximity switch causes a status change in the state of the switching output.

repeatability:
Repeat accuracy of two measurements under standardized conditions. The difference in the measured values should be less than 10%.

readiness delay:
Time required by the proximity switch to be functional after the supply voltage is applied (lies in the millisecond range).

correction factors:
Specify the reduction in the switching distance, if materials other than steel St37 are used. The change in the switching distance depends on the type, characteristics (internal structure), size and the geometry of the material that is to be detected.
Typical correction factors can be found in the "Technical Data" list.
Aluminum won't be recognized.

reverse polarity protection:
An internal protection prevents destruction of the proximity switch if the connection lines are accidentally swapped.

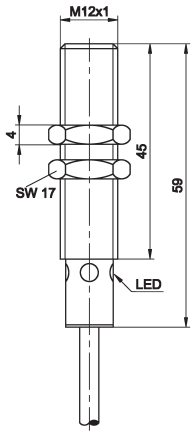
short-circuit protection:
An internal protection prevents destruction of the proximity switch in case of an overcurrent.

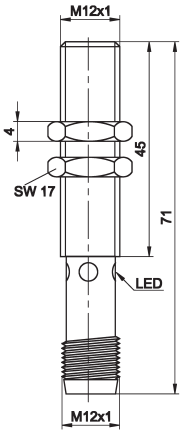
switching point drift:
The switching point shifts due to the change in ambient temperature.

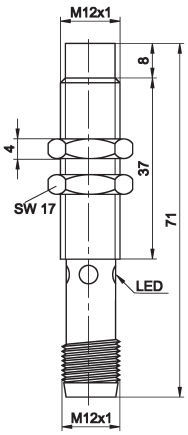
Note: Never use these devices in applications where the safety of a person depends on their functionality!

ipf electronic gmbh • Kalver Straße 25 - 27 • 58515 Lüdenscheid • Germany | Tel +49 2351 9365-0 • Fax +49 2351 9365-19 |
info@ipf-electronic.com • **www.ipf-electronic.com**

article-no.	IC120100	IC120120	IO120120
switching distance (Sn)	2mm	2mm	4mm
mounting	flush	flush	non-flush
operating temperature	-25 ... +70°C	-25 ... +70°C	-25 ... +70°C
connection	cable	M12-connector	M12-connector

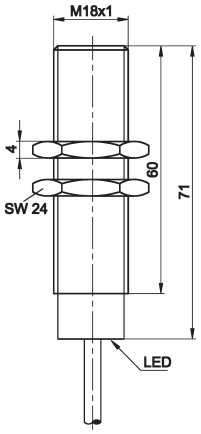
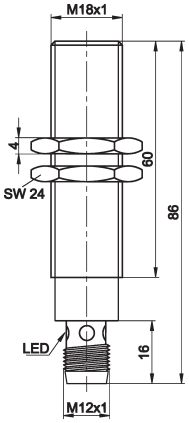
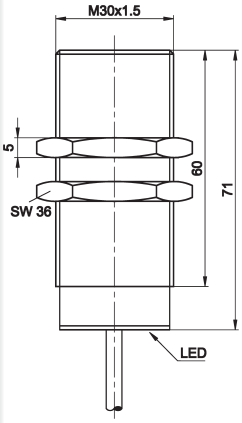
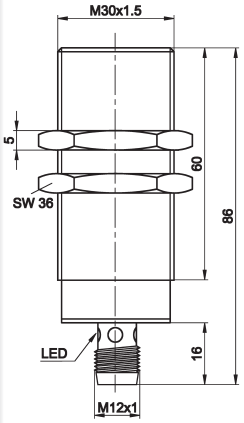






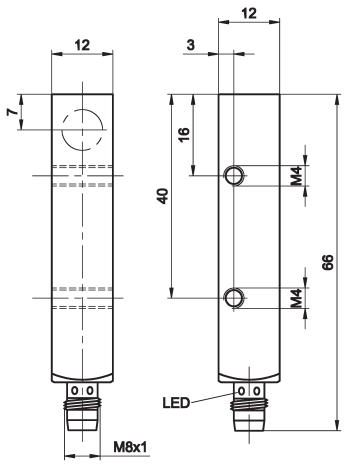
TECHNICAL DATA

switching distance (Sn)	2mm	2mm	4mm
output signal	pnp, no	pnp, no	pnp, no
operating voltage	7 ... 35V DC	7 ... 35V DC	7 ... 35V DC
current consumption (w/o load)	≤ 15mA	≤ 15mA	≤ 15mA
output current (max. load)	300mA	300mA	300mA
voltage drop (max. load)	2.0V DC	2.0V DC	2.0V DC
norm measuring plate	acc. to EN 60947-5-2	acc. to EN 60947-5-2	acc. to EN 60947-5-2
hysteresis	typ. < 15%	typ. < 15%	typ. < 15%
correction factors (St37/Alu/Ms)	1.0 / - / 0.1	1.0 / - / 0.1	1.0 / - / 0.1
correction factors (stainl. steel/Cu)	0.6 / -	0.6 / -	0.6 / -
switching frequency	40Hz	40Hz	40Hz
display (signal)	yellow LED	yellow LED	yellow LED
short-circuit protection	+	+	+
reverse polarity protection	+	+	+
dimensions	M12x1	M12x1	M12x1
length (thread/complete)	46mm/58mm	46mm/71mm	37mm/71mm
housing material	stainl. steel	stainl. steel	stainl. steel
operating temperature	-25 ... +70°C	-25 ... +70°C	-25 ... +70°C
degree of protection (EN 60529)	cable side: IP65 front: IP68	connector side: IP65 front: IP68	connector side: IP65 front: IP68
connection	2m PUR-cable, 3-wire	M12-connector, 3-pin	M12-connector, 3-pin
connection accessories	-	e.g. **VK200025**	e.g. **VK200025**

article-no.	IC180100	IC180120	IC300100	IC300120
switching distance (Sn)	5mm	5mm	10mm	10mm
mounting	flush	flush	flush	flush
operating temperature	-25 ... +70°C	-25 ... +70°C	-25 ... +70°C	-25 ... +70°C
connection	cable	M12-connector	cable	M12-connector
				
TECHNICAL DATA				
switching distance (Sn)	5mm	5mm	10mm	10mm
output signal	pnp, no	pnp, no	pnp, no	pnp, no
operating voltage	7 ... 35V DC	7 ... 35V DC	7 ... 35V DC	7 ... 35V DC
current consumption (w/o load)	≤ 15mA	≤ 15mA	≤ 15mA	≤ 15mA
output current (max. load)	300mA	300mA	300mA	300mA
voltage drop (max. load)	2.0V DC	2.0V DC	2.0V DC	2.0V DC
norm measuring plate	acc. to EN 60947-5-2	acc. to EN 60947-5-2	acc. to EN 60947-5-2	acc. to EN 60947-5-2
hysteresis	typ. < 15%	typ. < 15%	typ. < 15%	typ. < 15%
correction factors (St37/Alu/Ms)	1.0 / - / 0.1	1.0 / - / 0.1	1.0 / - / 0.1	1.0 / - / 0.1
correction factors (stainl. steel/Cu)	0.6 / -	0.6 / -	0.6 / -	0.6 / -
switching frequency	30Hz	30Hz	30Hz	30Hz
display (signal)	yellow LED	yellow LED	yellow LED	yellow LED
short-circuit protection	+	+	+	+
reverse polarity protection	+	+	+	+
dimensions	M18x1	M18x1	M30x1.5	M30x1.5
length (thread/complete)	60mm/71mm	60mm/86mm	60mm/71mm	60mm/86mm
housing material	stainl. steel	stainl. steel	stainl. steel	stainl. steel
operating temperature	-25 ... +70°C	-25 ... +70°C	-25 ... +70°C	-25 ... +70°C
degree of protection (EN 60529)	cable side: IP65 front: IP68	connector side: IP65 front: IP68	connector side: IP65 front: IP68	connector side: IP65 front: IP68
connection	2m PUR-cable, 3-wire	M12-connector, 3-pin	2m PUR-cable, 3-wire	M12-connector, 3-pin
connection accessories	-	e.g. **VK200025**	-	e.g. **VK200025**

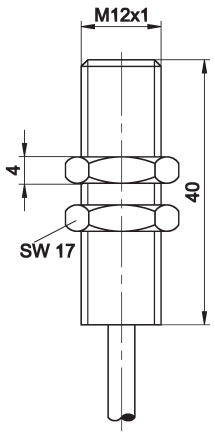
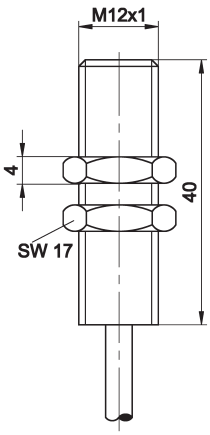
ipf electronic gmbh • Kalver Straße 25 - 27 • 58515 Lüdenscheid • Germany | Tel +49 2351 9365-0 • Fax +49 2351 9365-19 |
info@ipf-electronic.com • **www.ipf-electronic.com**

article-no.	**IC130170**
switching distance (Sn)	**2mm**
mounting	**flush**
operating temperature	**-25 ... +70°C**
connection	**M8-connector**



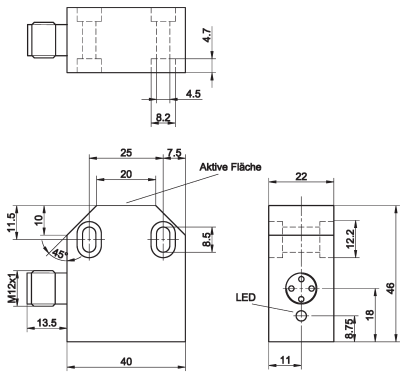
TECHNICAL DATA

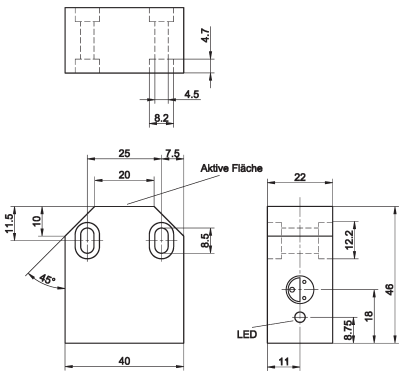
switching distance (Sn)	2mm
output signal	pnp, no
operating voltage	10 ... 30V DC
current consumption (w/o load)	≤ 15mA
output current (max. load)	200mA
voltage drop (max. load)	2.0V DC
norm measuring plate	acc. to EN 60947-5-2
hysteresis	typ. < 15%
correction factors (St37/Alu/Ms)	1.0 / - / 0.2
correction factors (stainl. steel/Cu)	0.6 / -
switching frequency	40Hz
display (signal)	yellow LED
short-circuit protection	+
reverse polarity protection	+
dimensions	12x12x66mm
length (thread/complete)	-/66mm
housing material	stainl. steel
operating temperature	-25 ... +70°C
degree of protection (EN 60529)	IP65
connection	M8-connector, 3-pin
connection accessories	e.g. **VK200075**

article-no.	**IC120104**	**IC120105**
switching distance (Sn)	**3mm**	**3mm**
mounting	**flush, oil-proof**	**flush, oil-proof**
operating temperature	**-25 ... +100°C**	**-25 ... +100°C**
connection	**cable**	**cable**
		
TECHNICAL DATA		
switching distance (Sn)	3mm	3mm
output signal	pnp, no	pnp, no
operating voltage	10 ... 30V DC	10 ... 30V DC
current consumption (w/o load)	≤ 15mA	≤ 15mA
output current (max. load)	200mA	200mA
voltage drop (max. load)	2.0V DC	2.0V DC
norm measuring plate	acc. to EN 60947-5-2	acc. to EN 60947-5-2
hysteresis	typ. < 15%	typ. < 15%
correction factors (St37/Alu/Ms)	1.0 / - / 0.25	1.0 / - / 0.25
correction factors (stainl. steel/Cu)	0.6 / -	0.6 / -
switching frequency	30Hz	30Hz
display (signal)	-	-
short-circuit protection	+	-
reverse polarity protection	+	+
dimensions	M12x1	M12x1
length (thread/complete)	40mm/40mm	40mm/40mm
housing material	stainl. steel	stainl. steel
operating temperature	-25 ... +100°C	-25 ... +100°C
degree of protection (EN 60529)	IP67	IP67
connection	2m silicone cable, 3-wire	5m silicone cable, 3-wire
connection accessories	-	-

ipf electronic gmbh • Kalver Straße 25 - 27 • 58515 Lüdenscheid • Germany | Tel +49 2351 9365-0 • Fax +49 2351 9365-19 | info@ipf-electronic.com • **www.ipf-electronic.com**

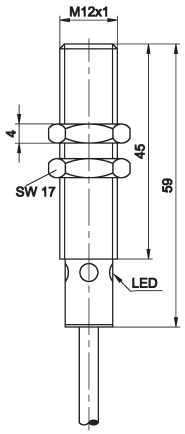
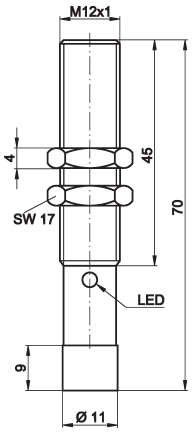
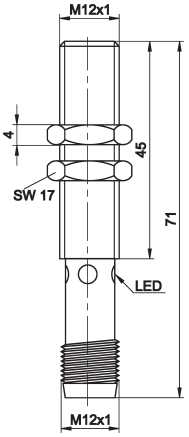
article-no.	**IC220120**	**IC2201L0**
switching distance (Sn)	**2mm**	**2mm**
mounting	**flush, addable**	**flush, addable**
operating temperature	**-25 ... +100°C**	**-25 ... +100°C**
connection	**M12-connector**	**Lemosa mini-connector**





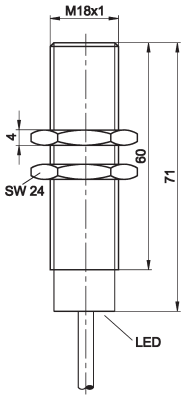
TECHNICAL DATA

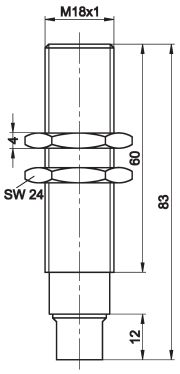
switching distance (Sn)	2mm	2mm
output signal	pnp, no	pnp, no
operating voltage	10 ... 30V DC	10 ... 30V DC
current consumption (w/o load)	≤ 15mA	≤ 15mA
output current (max. load)	300mA	300mA
voltage drop (max. load)	2.0V DC	2.0V DC
norm measuring plate	acc. to EN 60947-5-2	acc. to EN 60947-5-2
hysteresis	typ. < 15%	typ. < 15%
correction factors (St37/Alu/Ms)	1.0 / - / -	1.0 / - / -
correction factors (stainl. steel/Cu)	0.25 / -	0.25 / -
switching frequency	25Hz	25Hz
display (signal)	yellow LED	yellow LED
short-circuit protection	+	-
reverse polarity protection	+	+
dimensions	22x40x46	22x40x46
length (thread/complete)	-/-	-/-
housing material	stainl. steel	stainl. steel
operating temperature	-25 ... +100°C	-25 ... +100°C
degree of protection (EN 60529)	IP65	IP65
connection	M12-connector, 3-pin	Lemosa mini-connector, 3-pin
connection accessories	e.g. **VK200025**	e.g. **VK2000L5**

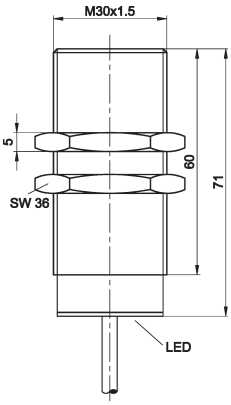
article-no.	IC120155	IC1201L0	IC12012W
switching distance (Sn)	2mm	2mm	2mm
mounting	flush	flush	flush
operating temperature	-25 ... +130°C	-25 ... +130°C	-25 ... +130°C
connection	cable	Lemosa mini-connector	M12-connector
			
TECHNICAL DATA			
switching distance (Sn)	2mm	2mm	2mm
output signal	pnp, no	pnp, no	pnp, no
operating voltage	7 ... 35V DC	7 ... 35V DC	7 ... 35V DC
current consumption (w/o load)	≤ 15mA	≤ 15mA	≤ 15mA
output current (max. load)	150mA	150mA	150mA
voltage drop (max. load)	2.0V DC	2.0V DC	2.0V DC
norm measuring plate	acc. to EN 60947-5-2	acc. to EN 60947-5-2	acc. to EN 60947-5-2
hysteresis	typ. < 15%	typ. < 15%	typ. < 15%
correction factors (St37/Alu/Ms)	1.0 / - / 0.1	1.0 / - / 0.1	1.0 / - / 0.1
correction factors (stainl. steel/Cu)	0.6 / -	0.6 / -	0.6 / -
switching frequency	40Hz	40Hz	40Hz
display (signal)	yellow LED	yellow LED	yellow LED
short-circuit protection	+	+	-
reverse polarity protection	+	+	+
dimensions	M12x1	M12x1	M12x1
length (thread/complete)	45mm/59mm	45mm/70mm	45mm/71mm
housing material	stainl. steel	stainl. steel	stainl. steel
operating temperature	-25 ... +130°C	-25 ... +130°C	-25 ... +130°C
degree of protection (EN 60529)	IP65	IP50	IP65
connection	2m silicone cable, 3-wire	Lemosa mini-connector, 3-pin	M12-connector, 3-pin
connection accessories	-	e.g. **VK2000L5**	e.g. **VK200025**

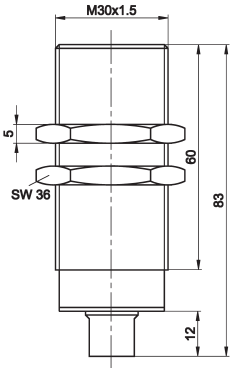
ipf electronic gmbh • Kalver Straße 25 - 27 • 58515 Lüdenscheid • Germany | Tel +49 2351 9365-0 • Fax +49 2351 9365-19 | info@ipf-electronic.com • **www.ipf-electronic.com**

article-no.	IC180155	IC180145	IC300155	IC300145
switching distance (Sn)	5mm	5mm	10mm	10mm
mounting	flush	flush	flush	flush
operating temperature	-25 ... +130°C	-25 ... +130°C	-25 ... +130°C	-25 ... +130°C
connection	cable	Lemosa connector	cable	Lemosa connector





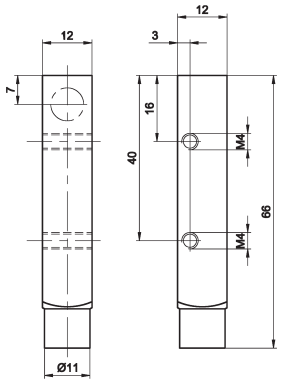




TECHNICAL DATA

switching distance (Sn)	5mm	5mm	10mm	10mm
output signal	pnp, no	pnp, no	pnp, no	pnp, no
operating voltage	7 ... 35V DC	7 ... 35V DC	7 ... 35V DC	7 ... 35V DC
current consumption (w/o load)	≤ 15mA	≤ 15mA	≤ 15mA	≤ 15mA
output current (max. load)	150mA	150mA	150mA	150mA
voltage drop (max. load)	2.0V DC	2.0V DC	2.0V DC	2.0V DC
norm measuring plate	acc. to EN 60947-5-2	acc. to EN 60947-5-2	acc. to EN 60947-5-2	acc. to EN 60947-5-2
hysteresis	typ. < 15%	typ. < 15%	typ. < 15%	typ. < 15%
correction factors (St37/Alu/Ms)	1.0 / - / 0.1	1.0 / - / 0.1	1.0 / - / 0.1	1.0 / - / 0.1
correction factors (stainl. steel/Cu)	0.6 / -	0.6 / -	0.6 / -	0.6 / -
switching frequency	30Hz	30Hz	30Hz	30Hz
display (signal)	yellow LED	-	yellow LED	-
short-circuit protection	+	+	+	+
reverse polarity protection	+	+	+	+
dimensions	M18x1	M18x1	M30x1.5	M30x1.5
length (thread/complete)	60mm/71mm	60mm/83mm	60mm/71mm	60mm/83mm
housing material	stainl. steel	stainl. steel	stainl. steel	stainl. steel
operating temperature	-25 ... +130°C	-25 ... +130°C	-25 ... +130°C	-25 ... +130°C
degree of protection (EN 60529)	IP65	IP50	IP65	IP50
connection	2m silicone cable 3-wire	Lemosa connector 3-pin	2m silicone cable 3-wire	Lemosa connector 3-pin
connection accessories	-	e.g. **VK500941**	-	e.g. **VK500941**

article-no.	**IC1301L0**
switching distance (Sn)	**2mm**
mounting	**flush**
operating temperature	**-25 ... +130°C**
connection	**Lemosa mini-connector**



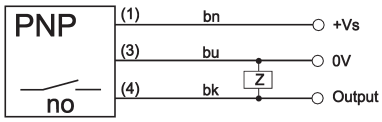
TECHNICAL DATA

switching distance (Sn)	2mm
output signal	pnp, no
operating voltage	10 ... 30V DC
current consumption (w/o load)	≤ 15mA
output current (max. load)	200mA
voltage drop (max. load)	2.0V DC
norm measuring plate	acc. to EN 60947-5-2
hysteresis	typ. < 15%
correction factors (St37/Alu/Ms)	1.0 / - / 0.2
correction factors (stainl. steel/Cu)	0.6 / -
switching frequency	40Hz
display (signal)	-
short-circuit protection	+
reverse polarity protection	+
dimensions	12x12x66mm
length (thread/complete)	-/66mm
housing material	stainl. steel
operating temperature	-25 ... +130°C
degree of protection (EN 60529)	IP50
connection	Lemosa mini-connector, 3-pin
connection accessories	e.g. **VK2000L5**

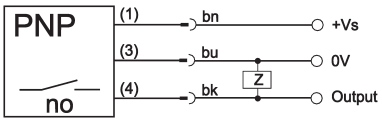
ipf electronic gmbh • Kalver Straße 25 - 27 • 58515 Lüdenscheid • Germany | Tel +49 2351 9365-0 • Fax +49 2351 9365-19 | info@ipf-electronic.com • **www.ipf-electronic.com**

connection

cable device

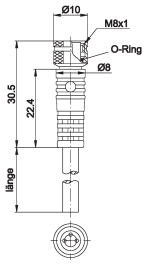


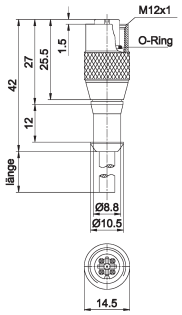
connector device



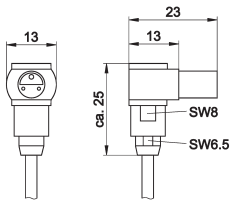
wire colors: bn = brown (1), bu = blue (3), bk = black (4)

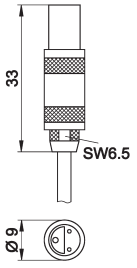
cable socket:	M8, straight	M12, straight
number of pins (assigned):	3-pin	3-pin
article-no.	VK200075, PUR	VK200025, PUR
length	2m	2m
article-no.	VK500075, PUR	VK500025, PUR
length	5m	5m
article-no.	VKA00075, PUR	VKA00025, PUR
length	10m	10m

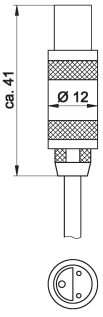




cable socket	Lemosa mini, angular	Lemosa mini, straight	Lemosa, straight
number of pins (assigned)	3-pin	3-pin	3-pin
article-no.	VK2000L0, silicone	VK2000L4, silicone	-
length	2m	2m	-
article-no.	VK5000L0, silicone	VK5000L4, silicone	VK500940, silicone
length	5m	5m	5m
article-no.	VKA000L0, silicone	VKA000L4, silicone	VKA00940, silicone
length	10m	10m	10m
article-no.	VK2000L1, teflon	VK2000L5, teflon	-
length	2m	2m	-
article-no.	VK5000L1, teflon	VK5000L5, teflon	VK500941, teflon
length	5m	5m	5m
article-no.	VKA000L1, teflon	VKA000L5, teflon	VKA00941, teflon
length	10m	10m	10m







NOTES

ipf electronic gmbh • Kalver Straße 25 - 27 • 58515 Lüdenscheid • Germany | Tel +49 2351 9365-0 • Fax +49 2351 9365-19 |
info@ipf-electronic.com • **www.ipf-electronic.com**