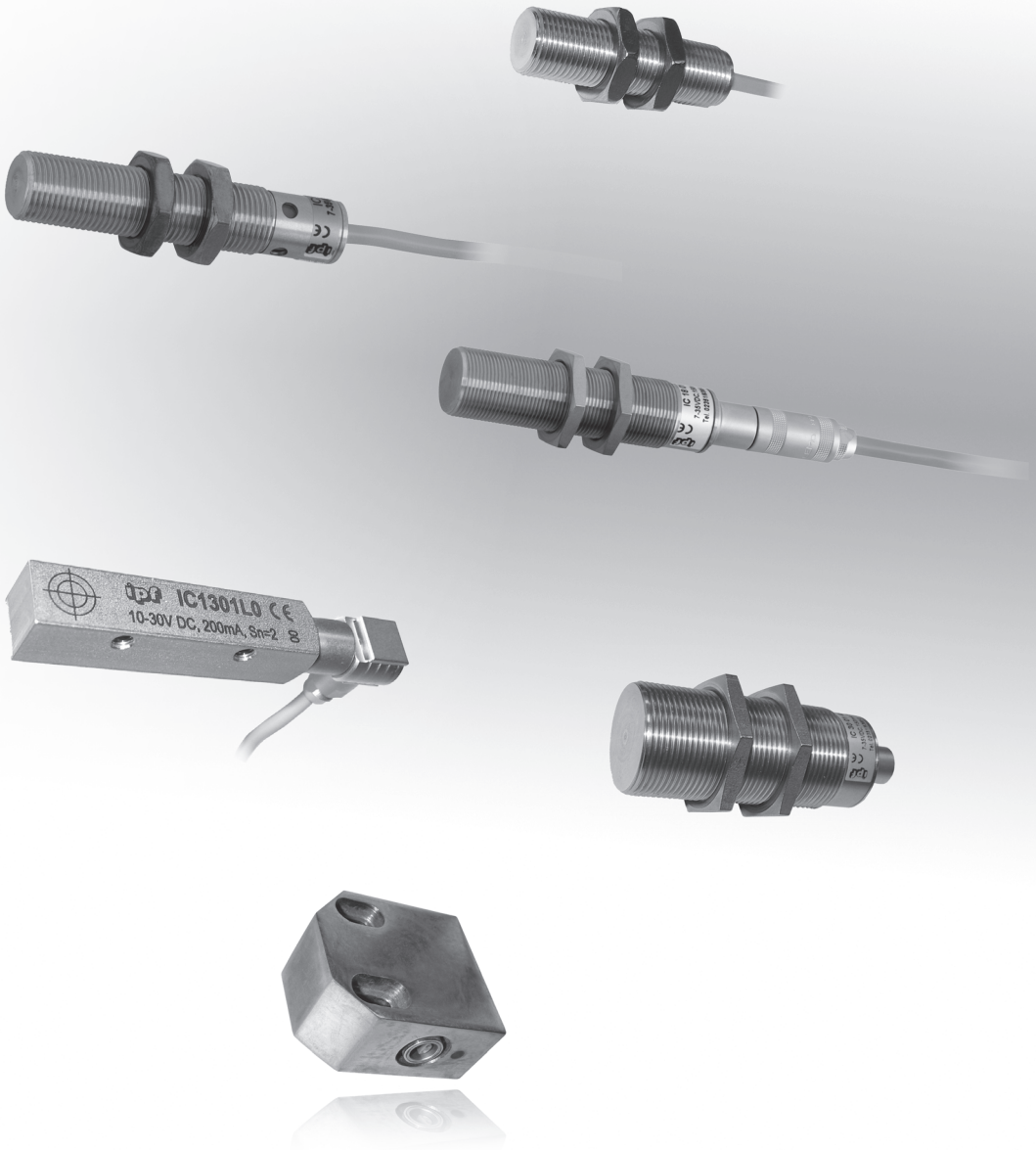

- thread design
- cuboid design
- high temperature devices

all-steel sensors

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Subject to alteration!
Version: April 2009

inductive sensors

1400 all-steel sensors

inductive all-steel sensors

standard devices, temperature range -25 to +70°C

design	sensing range Sn [mm]						flush	non-flush	length [mm]	pnp	npn	7 ... 35V DC	10 ... 30V DC	PUR-cable	silicone-cable	M8-connector	M12-connector	lemo-connector	lemo-mini-connector	page
	2	3	4	5	8	10														
M12x1	X						X		59 ... 71	X		X		X			X			7
M12x1			X					X	71	X		X					X			7
M18x1				X			X		71 ... 86	X		X		X			X			8
M30x1.5						X	X		71 ... 86	X		X		X			X			8
12x12x66	X						X			X			X			X				9

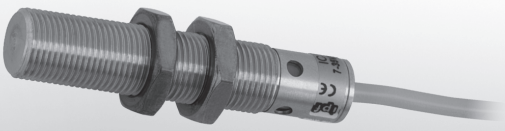
devices with particular attributes, oil-proof, addable, temperature range -25 to +100°C

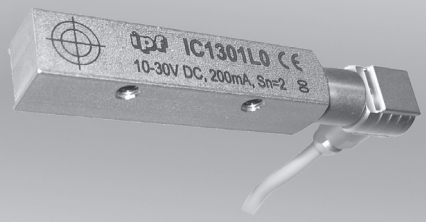
M12x1		X					X		40	X			X		X					10
22x40x46	X						X			X			X				X		X	11

high temperature devices, temperature range -25 to +130°C

M12x1	X						X		59 ... 71	X		X			X		X		X	12
M18x1				X			X		71 ... 83	X		X			X			X		13
M30x1.5						X	X		71 ... 83	X		X			X			X		13
12x12x66	X						X			X			X						X	14

design	**M12 x 1mm** **M18 x 1mm** **M30 x 1.5mm** **12 x 12 x 66mm** **22 x 40 x 46mm**	
flush	sensing range	**2 to 10mm**
non-flush	sensing range	**4mm**





- ✓ **an innovation of ipf electronic**
- ✓ **all-round stainless steel (housing, front and rear)**
- ✓ **devices up to 130°C with integrated amplifier**
- ✓ **short-circuit and reverse polarity protection**
- ✓ **devices with thread to EURONORM**
- ✓ **connection with cable, M8-, M12- or lemosa-connector**

active face made of st. steel, 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. It has key advantages over these: 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. On account of the identical dimensions, the devices can be exchanged with each other without any problems. With the aid of oblong holes, an adjustment of the sensing range 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
- presence check 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

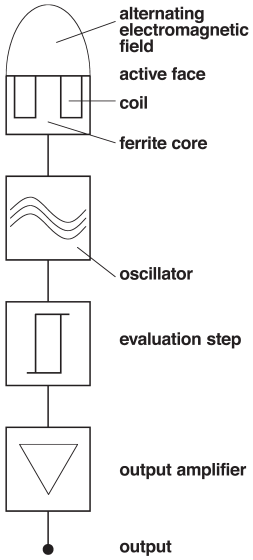
1400 all-steel sensors

notes on inductive proximity switches

I **sensor inductive**

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

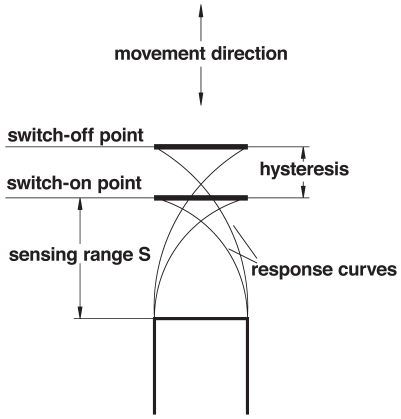
function
The oscillation coil behind the active surface of the proximity switch produces an alternating electromagnetic rotational current field. Any electrically conductive material entering the field will induce rotational currents extracting energy from the oscillating circuit.
The damping of the oscillator is then converted into a switch signal in the output amplifier.
It follows from 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.



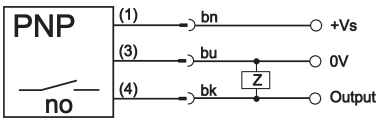
principle of an inductive proximity switch

sensing range / norm trimming plate
The distance to the sensor surface, where a metal causes a change in the state, is called sensing range. This range 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 aluminium. The nominal sensing range is determined by a norm trimming plate. This is a quadratic metal plate made from steel (St37) with a thickness of 1mm and a smoothened face for determining the sensing range Sn. The edge length is 3 x Sn if 3 x Sn is larger than the diameter of the active face, otherwise the edge length is the same as the diameter of the active face.
One differentiates between the normal sensing range S_n, which is determined without consideration for manufacturing tolerances or external influences, and the operational sensing range So.
The safe operational sensing range is between 0 and 81% of S_n ($0 < S_o < 0.81 \times S_n$).

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.



output circuit
The devices have a PNP (no) output. An according wiring diagram is enclosed with every sensor.

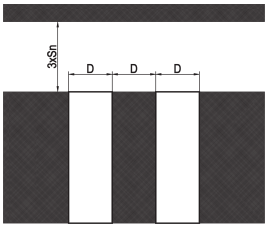


connection in series
When a number of sensors are connected in series, the voltage drop of each device should be taken into account in order to ensure that the final device also received the required operating voltage. The internal electronics permits a maximum of 3 devices to be connected in series.
To be operationally safe the connection in series of 3-wire PNP sensors requires a logical AND-gate, e.g. the **VL250100**.

connection in parallel
When connecting 3-wire PNP sensors in parallel, the internal resistance of the sensor that is driven to full output influences the other proximity switches. This requires decoupling diodes to be inserted into the outputs. A logical OR-gate, e.g. the **VL250120**, can be used to facilitate the connection in parallel.

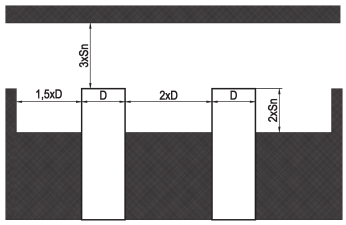
mounting
Please follow the mounting instructions for flush or non-flush sensors when installing inductive proximity switches into a metal carrier material to avoid undefined switching of the device. For a flush device the active face may be on one level with the carrier material.
Non-flush sensors must protrude. As a rule of thumb use 2x the nominal sensing range of the sensor.

mounting parameters for flush sensors



D = diameter of the sensor

mounting parameters for non-flush sensors



sampling frequency
The sampling 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 this puts a limit on the sampling frequency.
For half the nominal sensing range the pulse to pause ratio should be at least 1:2.
When choosing the right proximity switch, a compromise needs to be made between the size of the sensor and the sampling frequency. General rule: The larger the sensor, the smaller the sampling frequency.

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

stainless steel thread

M5	=	2Nm
M8	=	10Nm
M12	=	20Nm
M18	=	55Nm
M30	=	200Nm

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

nominal sensing range (S_n):
The distance, at which a metal part that is approaching the active face of the proximity switch causes a 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%.

power-on delay time:
The time required by the proximity switch after the supply voltage has been applied before it is ready for operation (lies in the millisecond range).

correction factors:
Specify the reduction in the sensing range, if materials other than steel (St37) are used. The variance in the sensing range depends on the type, composition (internal structure), size and geometry of the material to be detected.
Typical correction factors can be found in the “Technical Data” list.
Aluminium won’t be recognized.

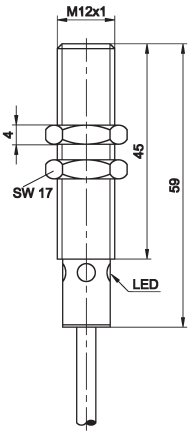
reverse polarity protection:
An internal protection prevents the proximity switch being destroyed if the connecting leads are inverted.

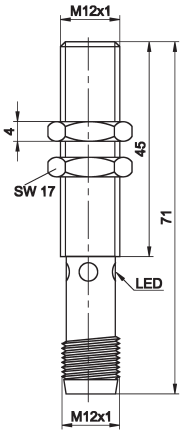
short-circuit protection:
An internal protection prevents the proximity switch being destroyed in the event of overcurrent.

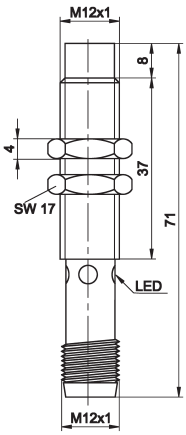
switching point drift:
The switching point shifts due to the change in ambient temperature.

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

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







TECHNICAL DATA

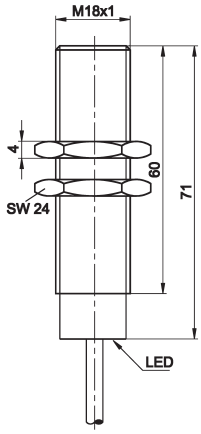
sensing range (Sn)	2mm	2mm	4mm
output signal	pnp, no	pnp, no	pnp, no
operating voltage	7 ... 35V DC	7 ... 35V DC	7 ... 35V DC
current consumption (w/o load)	≤ 15mA	≤ 15mA	≤ 15mA
output current (max. load)	300mA	300mA	300mA
voltage drop (max. load)	2.0V DC	2.0V DC	2.0V DC
norm trimming plate	according to EN 60947-5-2	according to EN 60947-5-2	according to EN 60947-5-2
hysteresis (of Sn) typical	< 15%	< 15%	< 15%
corr. factors (steel/brass/st. steel)	1 / 0.1 / 0.6	1 / 0.1 / 0.6	1 / 0.1 / 0.6
repeat accuracy (of Sr)	*	*	*
sampling frequency	40Hz	40Hz	40Hz
display (status)	red LED	red LED	red LED
display (operation)	-	-	-
short-circuit protection	+	+	+
reverse polarity protection	+	+	+
design	M12x1	M12x1	M12x1
length (thread/complete)	46mm/58mm	46mm/71mm	37mm/71mm
housing material	stainless steel	stainless steel	stainless steel
temperature range	-25 ... +70°C	-25 ... +70°C	-25 ... +70°C
system of protection (EN 60529)	IP67	IP67	IP67
connection	2m PUR-cable, 3-wire	M12-connector, 3-pin	M12-connector, 3-pin
connection accessories	-	e.g. **VK200025**, 2m, PUR	e.g. **VK200025**, 2m, PUR

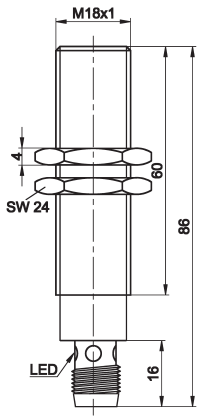
* not specified

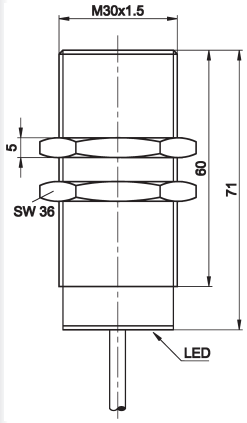
inductive sensors

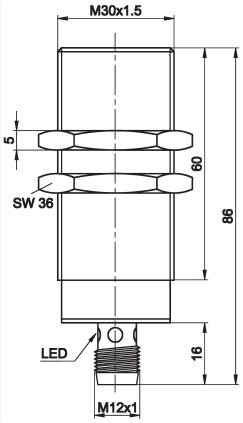
1400 all-steel sensors

article-no.	IC180100	IC180120	IC300100	IC300120
sensing range (Sn)	5mm	5mm	10mm	10mm
mounting	flush	flush	flush	flush
temperature range	-25 ... +70°C	-25 ... +70°C	-25 ... +70°C	-25 ... +70°C
connection	cable	M12-connector	cable	M12-connector





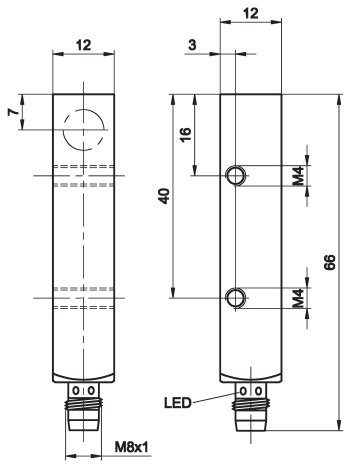




TECHNICAL DATA				
sensing range (Sn)	5mm	5mm	10mm	10mm
output signal	pnp, no	pnp, no	pnp, no	pnp, no
operating voltage	7 ... 35V DC	7 ... 35V DC	7 ... 35V DC	7 ... 35V DC
current consumption (w/o load)	≤ 15mA	≤ 15mA	≤ 15mA	≤ 15mA
output current (max. load)	300mA	300mA	300mA	300mA
voltage drop (max. load)	2.0V DC	2.0V DC	2.0V DC	2.0V DC
norm trimming plate	accord. to EN 60947-5-2	accord. to EN 60947-5-2	accord. to EN 60947-5-2	accord. to EN 60947-5-2
hysteresis (of Sn) typical	< 15%	< 15%	< 15%	< 15%
repeat accuracy (of Sr)	*	*	*	*
corr. factors (steel/brass/st. steel)	1 / 0.1 / 0.6	1 / 0.1 / 0.6	1 / 0.1 / 0.6	1 / 0.1 / 0.6
sampling frequency	30Hz	30Hz	30Hz	30Hz
display (status)	yellow LED	yellow LED	yellow LED	yellow LED
display (operation)	-	-	-	-
short-circuit protection	+	+	+	+
reverse polarity protection	+	+	+	+
design	M18x1	M18x1	M30x1.5	M30x1.5
length (thread/complete)	60mm/71mm	60mm/86mm	60mm/71mm	60mm/86mm
housing material	stainless steel	stainless steel	stainless steel	stainless steel
temperature range	-25 ... +70°C	-25 ... +70°C	-25 ... +70°C	-25 ... +70°C
system of protection (EN 60529)	IP67	IP67	IP67	IP67
connection	2m PUR-cable, 3-wire	M12-connector, 3-pin	2m PUR-cable, 3-wire	M12-connector, 3-pin
connection accessories	-	e.g. **VK200025**, 2m, PUR	-	e.g. **VK200025**, 2m, PUR

* not specified

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



TECHNICAL DATA

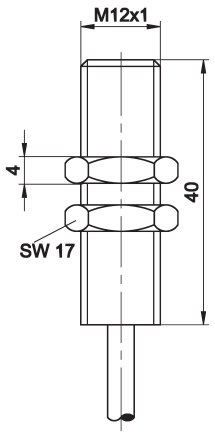
sensing range (Sn)	2mm
output signal	pnp, no
operating voltage	10 ... 30V DC
current consumption (w/o load)	≤ 15mA
output current (max. load)	200mA
voltage drop (max. load)	2.0V DC
norm trimming plate	according to EN 60947-5-2
hysteresis (of Sn) typical	< 15%
repeat accuracy (of Sr)	*
corr. factors (steel/brass/st. steel)	1 / 0.2 / 0.6
sampling frequency	40Hz
display (status)	yellow LED
display (operation)	-
short-circuit protection	+
reverse polarity protection	+
design	12x12x66mm
length (thread/complete)	-/66mm
housing material	stainless steel
temperature range	-25 ... +70°C
system of protection (EN 60529)	IP67
connection	M8-connector, 3-pin
connection accessories	e.g. **VK200075**, 2m, PUR

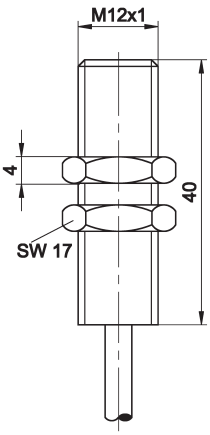
* not specified

inductive sensors

1400 all-steel sensors

article-no.	**IC120104**	**IC120105**
sensing range (Sn)	**3mm**	**3mm**
mounting	**flush, oil-proof**	**flush, oil-proof**
temperature range	**-25 ... +100°C**	**-25 ... +100°C**
connection	**cable**	**cable**



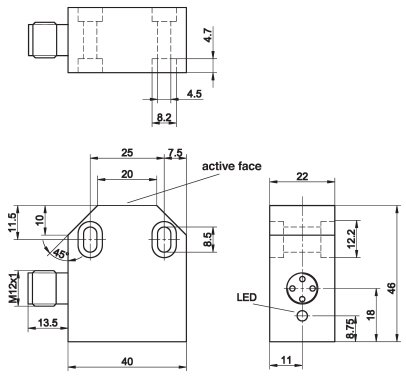


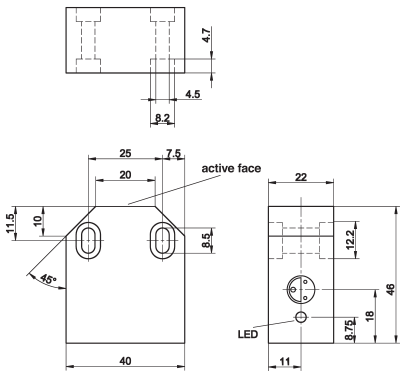
TECHNICAL DATA

sensing range (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 trimming plate	according to EN 60947-5-2	according to EN 60947-5-2
hysteresis (of Sn) typical	< 15%	< 15%
repeat accuracy (of Sr)	*	*
corr. factors (steel/brass/st. steel)	1 / 0.25 / 0.6	1 / 0.25 / 0.6
sampling frequency	30Hz	30Hz
display (status)	-	-
display (operation)	-	-
short-circuit protection	+	+
reverse polarity protection	+	+
design	M12x1	M12x1
length (thread/complete)	40mm/40mm	40mm/40mm
housing material	stainless steel	stainless steel
temperature range	-25 ... +100°C	-25 ... +100°C
system of protection (EN 60529)	IP67	IP67
connection	2m silicone-cable, 3-wire	5m silicone-cable, 3-wire
connection accessories	-	-

* not specified

article-no.	**IC220120**	**IC2201L0**
sensing range (Sn)	**2mm**	**2mm**
mounting	**flush, addable**	**flush, addable**
temperature range	**-25 ... +100°C**	**-25 ... +100°C**
connection	**M12-connector**	**lemosa mini-connector**





TECHNICAL DATA

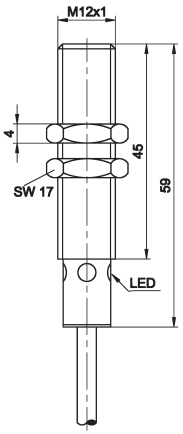
sensing range (Sn)	2mm	2mm
output signal	pnp, no	pnp, no
operating voltage	10 ... 30V DC	10 ... 30V DC
current consumption (w/o load)	≤ 15mA	≤ 15mA
output current (max. load)	300mA	300mA
voltage drop (max. load)	2.0V DC	2.0V DC
norm trimming plate	according to EN 60947-5-2	according to EN 60947-5-2
hysteresis (of Sn) typical	< 15%	< 15%
repeat accuracy (of Sr)	*	*
corr. factors (steel/brass/st. steel)	1 / 0 / 0.25	1 / 0 / 0.25
sampling frequency	25Hz	25Hz
display (status)	yellow LED	yellow LED
display (operation)	-	-
short-circuit protection	+	-
reverse polarity protection	+	+
design	22x40x46	22x40x46
length (thread/complete)	-/-	-/-
housing material	stainless steel	stainless steel
temperature range	-25 ... +100°C	-25 ... +100°C
system of protection (EN 60529)	IP65	IP65
connection	M12-connector, 3-pin	lemosa mini-connector, 3-pin
connection accessories	e.g. **VK200025**, 2m, PUR	e.g. **VK2000L5**, 2m, teflon

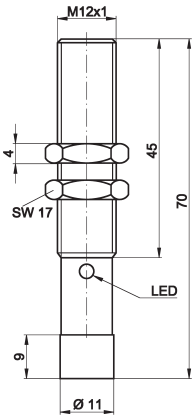
* not specified

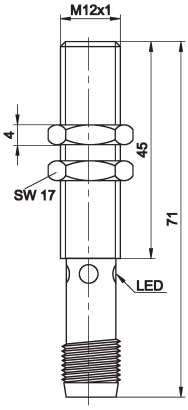
inductive sensors

1400 all-steel sensors

article-no.	**IC120155**	**IC1201L0**	**IC12012W**
sensing range (Sn)	**2mm**	**2mm**	**2mm**
mounting	**flush**	**flush**	**flush**
temperature range	**-25 ... +130°C**	**-25 ... +130°C**	**-25 ... +130°C**
connection	**cable**	**lemosa mini-connector**	**M12-connector**



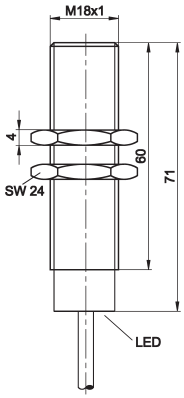


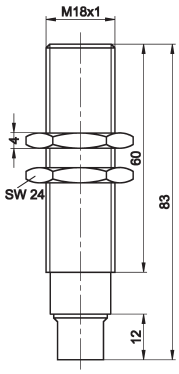


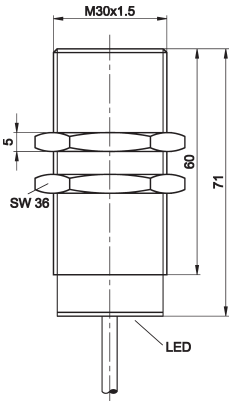
TECHNICAL DATA			
sensing range (Sn)	2mm	2mm	2mm
output signal	pnp, no	pnp, no	pnp, no
operating voltage	7 ... 35V DC	7 ... 35V DC	7 ... 35V DC
current consumption (w/o load)	≤ 15mA	≤ 15mA	≤ 15mA
output current (max. load)	150mA	150mA	150mA
voltage drop (max. load)	2.0V DC	2.0V DC	2.0V DC
norm trimming plate	according to EN 60947-5-2	according to EN 60947-5-2	according to EN 60947-5-2
hysteresis (of Sn) typical	< 15%	< 15%	< 15%
repeat accuracy (of Sr)	*	*	*
corr. factors (steel/brass/st. steel)	1 / 0.1 / 0,6	1 / 0.1 / 0.6	1 / 0.1 / 0.6
sampling frequency	40Hz	40Hz	40Hz
display (status)	red LED	red LED	red LED
display (operation)	-	-	-
short-circuit protection	+	+	-
reverse polarity protection	+	+	+
design	M12x1	M12x1	M12x1
length (thread/complete)	45mm/59mm	45mm/70mm	45mm/71mm
housing material	stainless steel	stainless steel	stainless steel
temperature range	-25 ... +130°C	-25 ... +130°C	-25 ... +130°C
system of protection (EN 60529)	IP65	IP65	IP65
connection	2m silicone-cable, 3-wire	lemosa mini-connector, 3-pin	M12-connector, 3-pin
connection accessories	-	e.g. **VK2000L5**, 2m, teflon	e.g. **VK200025**, 2m, PUR

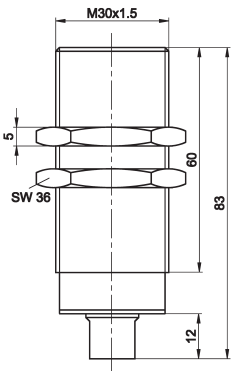
* not specified

article-no.	IC180155	IC180145	IC300155	IC300145
sensing range (Sn)	5mm	5mm	10mm	10mm
mounting	flush	flush	flush	flush
temperature range	-25 ... +130°C	-25 ... +130°C	-25 ... +130°C	-25 ... +130°C
connection	cable	lemosa-connector	cable	lemosa-connector







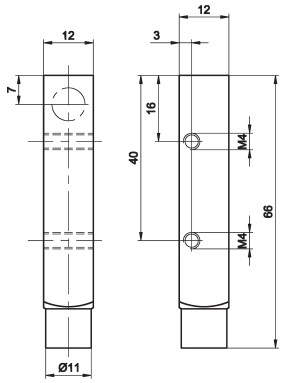


TECHNICAL DATA				
sensing range (Sn)	5mm	5mm	10mm	10mm
output signal	pnp, no	pnp, no	pnp, no	pnp, no
operating voltage	7 ... 35V DC	7 ... 35V DC	7 ... 35V DC	7 ... 35V DC
current consumption (w/o load)	≤ 15mA	≤ 15mA	≤ 15mA	≤ 15mA
output current (max. load)	150mA	150mA	150mA	150mA
voltage drop (max. load)	2.0V DC	2.0V DC	2.0V DC	2.0V DC
norm trimming plate	accord. to EN 60947-5-2	accord. to EN 60947-5-2	accord. to EN 60947-5-2	accord. to EN 60947-5-2
hysteresis (of Sn) typical	< 15%	< 15%	< 15%	< 15%
repeat accuracy (of Sr)	*	*	*	*
corr. factors (steel/brass/st. steel)	1 / 0.1 / 0.6	1 / 0.1 / 0.6	1 / 0.1 / 0.6	1 / 0.1 / 0.6
sampling frequency	30Hz	30Hz	30Hz	30Hz
display (status)	yellow LED	-	yellow LED	-
display (operation)	-	-	-	-
short-circuit protection	+	+	+	+
reverse polarity protection	+	+	+	+
design	M18x1	M18x1	M30x1.5	M30x1.5
length (thread/complete)	60mm/71mm	60mm/83mm	60mm/71mm	60mm/83mm
housing material	stainless steel	stainless steel	stainless steel	stainless steel
temperature range	-25 ... +130°C	-25 ... +130°C	-25 ... +130°C	-25 ... +130°C
system of protection (EN 60529)	IP65	IP65	IP65	IP65
connection	2m silicone-cable, 3-wire	lemosa-connector, 3-pin	2m silicone-cable, 3-wire	lemosa-connector, 3-pin
connection accessories	-	e.g. **VK500941**, 5m, teflon	-	e.g. **VK500941**, 5m, teflon

* not specified

1400 all-steel sensors

article-no.	**IC1301L0**
sensing range (Sn)	**2mm**
mounting	**flush**
temperature range	**-25 ... +130°C**
connection	**lemosa-connector**



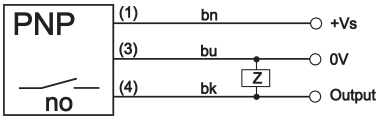
TECHNICAL DATA

sensing range (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 trimming plate	according to EN 60947-5-2
hysteresis (of Sn) typical	< 15%
repeat accuracy (of Sr)	*
corr. factors (steel/brass/st. steel)	1 / 0.1 / 0.6
sampling frequency	40Hz
display (status)	-
display (operation)	-
short-circuit protection	+
reverse polarity protection	+
design	12x12x66mm
length (thread/complete)	-/66mm
housing material	stainless steel
temperature range	-25 ... +130°C
system of protection (EN 60529)	IP65
connection	lemosa mini-connector, 3-pin
connection accessories	e.g. **VK2000L4**, 5m, teflon

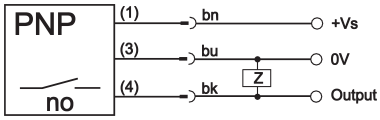
* not specified

connection

cable device

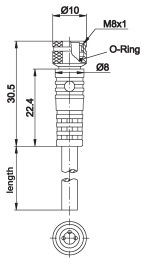


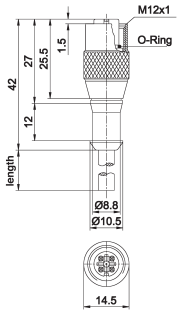
connector device



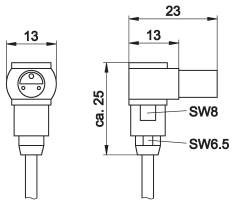
wire colors: bn = brown (1), bu = blue (3), bk = black (4)

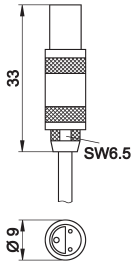
cable socket	M8, angular	M12, angular
number of pins (assigned)	3-pin	3-pin
article-no.	VK200075, PUR	VK200025, PUR
length	2m	2m
article-no.	VK500075, PUR	VK500025, PUR
length	5m	5m
article-no.	VKA00075, PUR	VKA00025, PUR
length	10m	10m

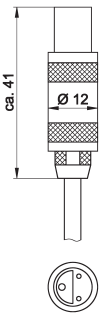




cable socket:	lemosa mini, angular	lemosa mini, central	lemosa, central
number of pins (assigned):	3-pin	3-pin	3-pin
article-no.	VK2000L0, silicone	VK2000L4, silicone	-
length	2m	2m	-
article-no.	VK5000L0, silicone	VK5000L4, silicone	VK500940, silicone
length	5m	5m	5m
article-no.	VKA000L0, silicone	VKA000L4, 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

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