General

Sonar-BERO is a range of ultrasonic sensors for contact-free object recognition and distance logging of distances from 6 cm to 10 m. To do this, the units emit ultrasonic impulses at cyclical intervals, which are reflected by objects and surfaces. The unit can then determine how far away the object is on the basis of the time difference between the emitting of the impulses and the receipt of the reflected impulse.

Objects

The objects to be detected can be solid, liquid, granular or powdery. The material can be transparent or tinted, of any form, with polished or mat surface.

Even at a maximum operating distance, all level or smooth surfaces can be reliably detected up to an angular variation of approximately 3° from the sound cone.

Depending on the peak-to-valley height of the object the angular variation may also be higher.

As a rule, the objects can enter the sound cone from any direction.

Environment

The sound propagation time depends on the air temperature. As a reference an air temperature of 20 °C has been used. A change in temperature of e.g. +10 °C will result in a change of sound propagation time of approx. +1.75% and a change of the operating distance of about +1.75%.

For this reason the sensors of modular range II and compact ranges M 18, II and III are equipped with a temperature sensor to compensate possible deviations from the operating distance caused by changes in temperature.

Average precipitation within the sensing range does not negatively affect the functioning of the Sonar-BERO. However the active transducer surface must not be wetted, damaged or varnished, since this might reduce its sensitivity.

Arrangement

To avoid mutual interference of several Sonar-BERO, please adhere to the following installation instructions:

Mutual interference causing false signals is excluded by sufficient distances between the Sonar-BERO or an appropriate alignment. To avoid mutual interference, BERO switches of compact ranges 0, II, III and M 18 can be synchronized individually.

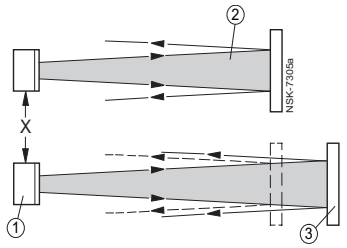
In the case of modular range II a sensor connected to the terminals of sensor B will be activated in common mode with the operating sensor unless sensor B is operated as reference sensor. By this method a mutual interference of these two sensors is excluded.

Explosion protection

The Sonar-BERO of compact ranges 0 to III and M 18 as well as the sensors of modular range II are suitable for installation in Ex Zone 2 and Ex Zone 11.

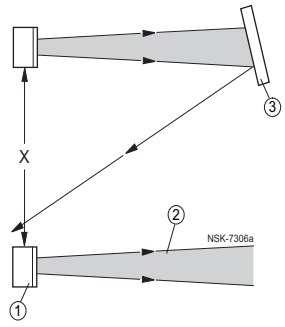
Operating conditions

Distance between two Sonar-BEROs with the same sensing range, arranged in parallel, object vertical to the sound cone axis.



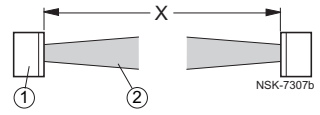
Sonar-BERO with sensing range cm	X cm
6 to 30	> 15
20 to 130	> 60
40 to 300	> 150
60 to 600	> 250
80 to 1000	> 350

Distance between two Sonar-BEROs with the same sensing range, arranged in parallel, object in unfavourable position.



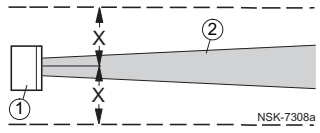
The distance “X” is to be determined experimentally depending on the angle of the object to the Sonar-BERO.

Distance between two Sonar-BEROs with the same sensing range, opposite to each other.



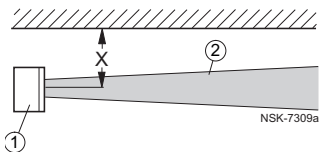
Sonar-BERO with sensing range cm	X cm
6 to 30	> 120
20 to 130	> 400
40 to 300	> 1200
60 to 600	> 2500
80 to 1000	> 4000

Free space around the sound cone axis: this space has to be clear of any objects.



Sonar-BERO with sensing range cm	X cm
6 to 30	> 6
20 to 130	> 30
40 to 300	> 60
60 to 600	> 80
80 to 1000	> 150

Distance between a Sonar-BERO and a plain wall.



Sonar-BERO with sensing range cm	X cm
6 to 30	> 3
20 to 130	> 15
40 to 300	> 30
60 to 600	> 40
80 to 1000	> 70

① = Sonar-BERO
② = Sound cone
③ = Object

3RG6, 3SG1 Sonar-BERO Ultrasonic Proximity Switches

Selection and ordering data

	Connection	Sensing range	Output Switching function	Order No.	Price 1 unit	Weight approx. kg
Thru-beam sensor						
3RG62 43	Sonar-BERO DC 24 V	Transmiss. range 150 cm	pnp-output			
	Cable 3 m[1] M 12 plug, type F M 8 plug, type B	Transmitter Transmitter Transmitter		▶ **3RG62 43–0NN00** ▶ **3RG62 43–3NN00** **3RG62 43–7NN00**		0.11 0.03 0.03
	Cable 3 m[1] M 12 plug, type F M 8 plug, type B	Receiver Receiver Receiver	1 NO 1 NO 1 NO	▶ **3RG62 43–0PB00** ▶ **3RG62 43–3PB00** **3RG62 43–7PB00**		0.11 0.03 0.03
	Cable 3 m[1] M 12 plug, type F M 8 plug, type B	Receiver Receiver Receiver	1 NC 1 NC 1 NC	**3RG62 43–0PA00** **3RG62 43–3PA00** **3RG62 43–7PA00**		0.11 0.03 0.03
Compact range M 18 with temperature compensation and programming capability						
3RG62 3.	Sonar-BERO DC 24 V	SONPROG	pnp-output			
	Plug-in connection Type F	5 to 30 cm 15 to 100 cm 5 to 30 cm 15 to 100 cm	1 NO 1 NO 1 NC 1 NC	▶ **3RG62 32–3AB00** ▶ **3RG62 33–3AB00** ▶ **3RG62 32–3AA00** ▶ **3RG62 33–3AA00**		0.05
			Analog output			
	Plug-in connection Type F	5 to 30 cm 15 to 100 cm	4 to 20 mA 4 to 20 mA	▶ **3RG62 32–3LS00** ▶ **3RG62 33–3LS00**		0.05
			Analog output			
	Plug-in connection Type F	5 to 30 cm 15 to 100 cm	0 to 20 mA 0 to 20 mA	**3RG62 32–3TS00** **3RG62 33–3TS00**		0.05
			Analog output			
	Plug-in connection Type F	5 to 30 cm 15 to 100 cm	0 to 10 V 0 to 10 V	**3RG62 32–3JS00** **3RG62 33–3JS00**		0.05
			Frequency output			
	Plug-in connection Type F	5 to 30 cm 15 to 100 cm	250 to 1500 Hz 150 to 1000 Hz	**3RG62 32–3RS00** **3RG62 33–3RS00**		0.05
Compact form						
3SG16 67	With terminal compartment for cables of 0.5 to 2.5 mm²	20 to 100 cm	pnp-output NEW			
			2 NO	▶ **3SG16 67–1BJ87**		

For plug connections, see pages 10/193 to 10/196.

Special design for compact ranges I to III and M 18

Stainless steel design

All Sonar-BEROs of compact ranges I to III and M 18 are available with stainless steel housing V4A.
Please add "**–Z**" and quote
"–Z = stainless steel housing" in plain text.

▶ **Delivery**
Preferred type.

1) If required, cable lengths of 5, 10 or 20 m can be ordered. Please add "**–Z**" and the cable length required in plain text.

Selection and ordering data

	Connection	Sensing range	Output Switching function	Order No.	Price 1 unit	Weight approx. kg
Compact range 0 with synchronization option						
3RG63 4.-3..00 	Sonar-BERO DC 24 V		pnp-output			
	Plug-in connection Type F	6 to 30 cm	1 NO	▶ **3RG63 42–3AB00**		0.2
		20 to 100 cm	1 NO	▶ **3RG63 43–3AB00**		
		6 to 30 cm	1 NC	**3RG63 42–3AA00**		0.2
		20 to 100 cm	1 NC	**3RG63 43–3AA00**		
			analog output			
	Plug-in connection Type F	6 to 30 cm	DC 0 to 10 V	▶ **3RG63 42–3JK00**		0.2
		20 to 100 cm	DC 0 to 10 V	▶ **3RG63 43–3JK00**		
Compact range 0 with separate sensor[1]						
3RG63 4.–3..01 	Sonar-BERO DC 24 V		pnp-output			
	Plug-in connection Type F	6 to 30 cm	1 NO	▶ **3RG63 42–3AB01**		0.3
		20 to 100 cm	1 NO	▶ **3RG63 43–3AB01**		0.3
		6 to 30 cm	1 NC	**3RG63 42–3AA01**		0.3
		20 to 100 cm	1 NC	**3RG63 43–3AA01**		0.3
			Analog output			
	Plug-in connection Type F	6 to 30 cm	DC 0 to 10 V	▶ **3RG63 42–3JK01**		0.3
		20 to 100 cm	DC 0 to 10 V	▶ **3RG63 43–3JK01**		
Compact range I with 2 adjustable operation range limits						
3RG60 12  3RG60 13 	Sonar-BERO DC 24 V		pnp-output			
	Plug-in connection Type E, F	6 to 30 cm	1 NO	▶ **3RG60 12–3AD00**		0.21
		20 to 130 cm	1 NO	▶ **3RG60 13–3AD00**		0.21
		40 to 300 cm	1 NO	▶ **3RG60 15–3AD00**		0.34
		60 to 600 cm	1 NO	▶ **3RG60 14–3AD00**		0.38
3RG60 15  3RG60 14 	Plug-in connection Type F	6 to 30 cm	1 NC	▶ **3RG60 12–3AC00**		0.21
		20 to 130 cm	1 NC	▶ **3RG60 13–3AC00**		0.21
		40 to 300 cm	1 NC	▶ **3RG60 15–3AC00**		0.34
		60 to 600 cm	1 NC	▶ **3RG60 14–3AC00**		0.38
Compact range I with separate sensor[1]						
3RG60 12–3A.01 	Sonar-BERO DC 24 V		pnp-output			
	Plug-in connection Type E, F	6 to 30 cm	1 NO	**3RG60 12–3AD01**		0.29
		20 to 130 cm	1 NO	**3RG60 13–3AD01**		0.32
	Plug-in connection Type F	6 to 30 cm	1 NC	**3RG60 12–3AC01**		0.29
		20 to 130 cm	1 NC	**3RG60 13–3AC01**		0.32
Compact range I with swivel sensor						
3RG60 2 . 	Sonar-BERO DC 24 V		pnp-output			
	Plug-in connection Type E, F	6 to 30 cm	1 NO	**3RG60 22–3AD00**		0.28
		20 to 130 cm	1 NO	**3RG60 23–3AD00**		0.28
		40 to 300 cm	1 NO	**3RG60 25–3AD00**		0.36
		60 to 600 cm	1 NO	**3RG60 24–3AD00**		0.43
	Plug-in connection Type F	6 to 30 cm	1 NC	**3RG60 22–3AC00**		0.28
		20 to 130 cm	1 NC	**3RG60 23–3AC00**		0.28
		40 to 300 cm	1 NC	**3RG60 25–3AC00**		0.36
		60 to 600 cm	1 NC	**3RG60 24–3AC00**		0.43

Special design see page 10/106.
For plug connections, see pages 10/194 to 10/196.

▶ **Delivery**
Preferred type.

1) Separate sensors are conform to degree of protection IP 68.

3RG6 Sonar-BERO Ultrasonic Proximity Switches

Selection and ordering data

	Connection	Sensing range	Output Switching function	Order No.	Price 1 unit	Weight approx. kg
Compact range II with synchronization and programming capability[2] as well as temperature compensation						
3RG60 12 3RG60 13 	Sonar-BERO DC 24 V	SONPROG	pnp-output			
	Plug-in connection Type F	6 to 30 cm	1 NO	▶	**3RG60 12–3AF00**	0.21
		20 to 130 cm	1 NO	▶	**3RG60 13–3AF00**	0.21
		40 to 300 cm	1 NO	▶	**3RG60 15–3AF00**	0.34
		60 to 600 cm	1 NO	▶	**3RG60 14–3AF00**	0.38
3RG60 15 3RG60 14 		6 to 30 cm	1 NC	▶	**3RG60 12–3AE00**	0.21
		20 to 130 cm	1 NC	▶	**3RG60 13–3AE00**	0.21
		40 to 300 cm	1 NC	▶	**3RG60 15–3AE00**	0.34
		60 to 600 cm	1 NC	▶	**3RG60 14–3AE00**	0.38
Compact range II with separate sensor[1] [2]						
3RG60 12–3A.01 	Sonar-BERO DC 24 V	SONPROG	pnp-output			
	Plug-in connection Type F	6 to 30 cm	1 NO		**3RG60 12–3AF01**	0.29
		20 to 130 cm	1 NO		**3RG60 13–3AF01**	0.32
		6 to 30 cm	1 NC		**3RG60 12–3AE01**	0.29
		20 to 130 cm	1 NC		**3RG60 13–3AE01**	0.32
Compact range II with swivel sensor[2]						
3RG60 2 	Sonar-BERO DC 24 V	SONPROG	pnp-output			
	Plug-in connection Type F	6 to 30 cm	1 NO		**3RG60 22–3AF00**	0.28
		20 to 130 cm	1 NO		**3RG60 23–3AF00**	0.28
		40 to 300 cm	1 NO		**3RG60 25–3AF00**	0.36
		60 to 600 cm	1 NO		**3RG60 24–3AF00**	0.43
		6 to 30 cm	1 NC		**3RG60 22–3AE00**	0.28
		20 to 130 cm	1 NC		**3RG60 23–3AE00**	0.28
		40 to 300 cm	1 NC		**3RG60 25–3AE00**	0.36
		60 to 600 cm	1 NC		**3RG60 24–3AE00**	0.43
Compact range II with 2 switching outputs[2]						
3RG60 12 3RG60 13 	Sonar-BERO DC 24 V	SONPROG	pnp-output			
	Plug-in connection Type G	6 to 30 cm	2 NO	▶	**3RG60 12–3AH00**	0.21
		20 to 130 cm	2 NO	▶	**3RG60 13–3AH00**	0.21
		40 to 300 cm	2 NO	▶	**3RG60 15–3AH00**	0.34
		60 to 600 cm	2 NO	▶	**3RG60 14–3AH00**	0.38
3RG60 15 3RG60 14 		6 to 30 cm	2 NC		**3RG60 12–3AG00**	0.21
		20 to 130 cm	2 NC		**3RG60 13–3AG00**	0.21
		40 to 300 cm	2 NC		**3RG60 15–3AG00**	0.34
		60 to 600 cm	2 NC		**3RG60 14–3AG00**	0.38
Sonar-BERO for LOGO! (compact range II with frequency output)						
Selection and ordering data for LOGO! see part 1.						
	Sonar-BERO DC 24 V	SONPROG	pnp-frequency output			
	Plug-in connection Type F	6 to 30 cm	30 to 150 Hz	▶	**3RG60 12–3RS00**	0.21
		20 to 130 cm	20 to 130 Hz	▶	**3RG60 13–3RS00**	0.21
		40 to 300 cm	20 to 150 Hz	▶	**3RG60 15–3RS00**	0.34
		60 to 600 cm	15 to 150 Hz	▶	**3RG60 14–3RS00**	0.38

Special design see page 10/106.
For plug connections, see pages 10/194 to 10/196.

▶ **Delivery**
Preferred type

1) Separate sensors are conform to degree of protection IP 68.

2) Non standard parameters see page 10/114. Extra programming charge for each Sonar-BERO.

Selection and ordering data

Connection	Sensing range	Output Switching function	Order No.	Price 1 unit	Weight approx. kg
Compact range III with switching and analog output, synchronization and programming capability[2] as well as temperature compensation					
3RG61 12 3RG61 13  Sonar-BERO DC 24 V Plug-in connection Type G	SONPROG	pnp-output Analog output 4 to 20 mA			
	6 to 30 cm	1 NO	▶ **3RG61 12–3BF00**		0.21
	20 to 130 cm	1 NO	▶ **3RG61 13–3BF00**		0.21
	40 to 300 cm	1 NO	▶ **3RG61 15–3BF00**		0.34
	60 to 600 cm	1 NO	▶ **3RG61 14–3BF00**		0.38
	80 to 1000 cm³)	2 NO	**3RG61 76–6BH00**		1.93
3RG61 15 3RG61 14 	6 to 30 cm	1 NC	**3RG61 12–3BE00**		0.21
	20 to 130 cm	1 NC	**3RG61 13–3BE00**		0.21
	40 to 300 cm	1 NC	**3RG61 15–3BE00**		0.34
	60 to 600 cm	1 NC	**3RG61 14–3BE00**		0.38
	80 to 1000 cm³)	2 NC	**3RG61 76–6BG00**		0.50
		Analog output 0 to 20 mA			
3RG61 76  With terminal compartment for cables of 0.5 to 2.5 mm²	6 to 30 cm	1 NO	**3RG61 12–3CF00**		0.21
	20 to 130 cm	1 NO	**3RG61 13–3CF00**		0.21
	40 to 300 cm	1 NO	**3RG61 15–3CF00**		0.34
	60 to 600 cm	1 NO	**3RG61 14–3CF00**		0.38
	80 to 1000 cm³)	2 NO	**3RG61 76–6CH00**		0.50
	6 to 30 cm	1 NC	**3RG61 12–3CE00**		0.21
	20 to 130 cm	1 NC	**3RG61 13–3CE00**		0.21
	40 to 300 cm	1 NC	**3RG61 15–3CE00**		0.34
	60 to 600 cm	1 NC	**3RG61 14–3CE00**		0.38
	80 to 1000 cm³)	2 NC	**3RG61 76–6CG00**		0.50
		Analog output 0 to 10 V			
	6 to 30 cm	1 NO	▶ **3RG61 12–3GF00**		0.22
	20 to 130 cm	1 NO	▶ **3RG61 13–3GF00**		0.21
	40 to 300 cm	1 NO	▶ **3RG61 15–3GF00**		0.34
	60 to 600 cm	1 NO	▶ **3RG61 14–3GF00**		0.38
	80 to 1000 cm³)	2 NO	**3RG61 76–6GH00**		0.50
	6 to 30 cm	1 NC	**3RG61 12–3GE00**		0.21
	20 to 130 cm	1 NC	**3RG61 13–3GE00**		0.21
	40 to 300 cm	1 NC	**3RG61 15–3GE00**		0.34
	60 to 600 cm	1 NC	**3RG61 14–3GE00**		0.38
	80 to 1000 cm³)	2 NC	**3RG61 76–6GG00**		0.50
Compact range III with separate sensor[1][2]					
3RG61 12–3..01  Sonar-BERO DC 24 V Plug-in connection Type G	SONPROG	pnp-output Analog output 4 to 20 mA			
	6 to 30 cm	1 NO	**3RG61 12–3BF01**		0.29
	20 to 130 cm	1 NO	**3RG61 13–3BF01**		0.32
	6 to 30 cm	1 NC	**3RG61 12–3BE01**		0.29
	20 to 130 cm	1 NC	**3RG61 13–3BE01**		0.32
		Analog output 0 to 20 mA			
	6 to 30 cm	1 NO	**3RG61 12–3CF01**		0.29
	20 to 130 cm	1 NO	**3RG61 13–3CF01**		0.32
	6 to 30 cm	1 NC	**3RG61 12–3CE01**		0.29
	20 to 130 cm	1 NC	**3RG61 13–3CE01**		0.32
		Analog output 0 to 10 V			
	6 to 30 cm	1 NO	**3RG61 12–3GF01**		0.29
	20 to 130 cm	1 NO	**3RG61 13–3GF01**		0.32
	6 to 30 cm	1 NC	**3RG61 12–3GE01**		0.29
	20 to 130 cm	1 NC	**3RG61 13–3GE01**		0.32

Special design see page 10/106.
For plug connections, see pages 10/194 to 10/196.

▶ **Delivery**
Preferred type.

1) Separate sensors are conform to degree of protection IP 68.

2) Non standard parameters see page 10/114. Extra programming charge for each Sonar-BERO.

3) Degree of protection IP 68 can be obtained if the terminal compartment is filled with epoxy resin. Recommended type: Scotchcast® epoxy resin. Order No. 5GU3 900.

Selection and ordering data

	Connection	Sensing range	Output Switching function	Order No.	Price 1 unit	Weight approx. kg
Compact range III with swivel sensor[1]						
3RG61 2 	Sonar-BERO DC 24 V Plug-in connection Type G	SONPROG	pnp-output Analog output 4 to 20 mA			
		6 to 30 cm	1 NO	**3RG61 22–3BF00**		0.28
		20 to 130 cm	1 NO	**3RG61 23–3BF00**		0.28
		40 to 300 cm	1 NO	**3RG61 25–3BF00**		0.36
		60 to 600 cm	1 NO	**3RG61 24–3BF00**		0.43
		6 to 30 cm	1 NC	**3RG61 22–3BE00**		0.28
		20 to 130 cm	1 NC	**3RG61 23–3BE00**		0.28
		40 to 300 cm	1 NC	**3RG61 25–3BE00**		0.36
		60 to 600 cm	1 NC	**3RG61 24–3BE00**		0.43
			Analog output 0 to 20 mA			
		6 to 30 cm	1 NO	**3RG61 22–3CF00**		0.28
		20 to 130 cm	1 NO	**3RG61 23–3CF00**		0.28
		40 to 300 cm	1 NO	**3RG61 25–3CF00**		0.36
		60 to 600 cm	1 NO	**3RG61 24–3CF00**		0.43
		6 to 30 cm	1 NC	**3RG61 22–3CE00**		0.28
		20 to 130 cm	1 NC	**3RG61 23–3CE00**		0.28
		40 to 300 cm	1 NC	**3RG61 25–3CE00**		0.36
		60 to 600 cm	1 NC	**3RG61 24–3CE00**		0.43
			Analog output 0 to 10 V			
		6 to 30 cm	1 NO	**3RG61 22–3GF00**		0.28
		20 to 130 cm	1 NO	**3RG61 23–3GF00**		0.28
		40 to 300 cm	1 NO	**3RG61 25–3GF00**		0.36
		60 to 600 cm	1 NO	**3RG61 24–3GF00**		0.43
		6 to 30 cm	1 NC	**3RG61 22–3GE00**		0.28
		20 to 130 cm	1 NC	**3RG61 23–3GE00**		0.28
		40 to 300 cm	1 NC	**3RG61 25–3GE00**		0.36
		60 to 600 cm	1 NC	**3RG61 24–3GE00**		0.43
Sonar-BERO with integrated AS-Interface						
3RG61 12  3RG61 13 	Sonar-BERO with integrated AS-Interface Plug-in connection Type F		AS-Interface			
		6 to 30 cm	3 D + 1 alarm	**3RG61 12–3WS00**		0.21
		20 to 130 cm	3 D + 1 alarm	**3RG61 13–3WS00**		0.21
		40 to 300 cm	3 D + 1 alarm	**3RG61 15–3WS00**		0.34
		60 to 600 cm	3 D + 1 alarm	**3RG61 14–3WS00**		0.38
3RG61 15  3RG61 14 	Sonar-BERO with integrated AS-Interface and with swivel sensor Plug-in connection Type F					
		6 to 30 cm	3 D + 1 alarm	**3RG61 22–3WS00**		0.28
		20 to 130 cm	3 D + 1 alarm	**3RG61 23–3WS00**		0.28
		40 to 300 cm	3 D + 1 alarm	**3RG61 25–3WS00**		0.36
		60 to 600 cm	3 D + 1 alarm	**3RG61 24–3WS00**		0.43
Watch-BERO						
3RG63 84 	Sonar-BERO Plug-in connection Type F	SONPROG 40 to 400 cm	pnp-output 1 NO 1 NC	**3RG63 84–0AF00** **3RG63 84–0AE00**		0.5 0.5
	AS-Interface Connection module FK	40 to 400 cm	AS-Interface	**3RG63 84–4WS00**		0.5
SONPROG interface unit for Windows						
3RX4 00. 	For programming Sonar-BEROs of compact ranges M 18, II and III. With SONPROG software for Windows.	SONPROG	Operation. voltage AC 230 V/DC 24 V AC 115 V/DC 24 V	▶ **3RX4 000** ▶ **3RX4 001**		0.5 0.5

Special design see page 10/106.
For plug connections, see pages 10/194 to 10/196.

▶ **Delivery**
Preferred type.

1) Non standard parameters see page 10/114. Extra programming charge for each Sonar-BERO.

Selection and ordering data

	Connection	Sensing range	Order No.	Price 1 unit	Weight approx. kg
Module range II with temperature compensation and mm/cm resolution					
3RG61 42 3RG61 43	**Sonar sensors**				
 	Block: 72 mm × 42 mm × 36 mm	6 to 30 cm	▶ **3RG61 42–3MM00**		0.27
		20 to 130 cm	▶ **3RG61 43–3MM00**		0.27
		40 to 300 cm	▶ **3RG61 45–3MM00**		0.30
	Plug-in connection Type F	60 to 600 cm	▶ **3RG61 44–3MM00**		0.39
3RG61 45 3RG61 44					
 					
3RG61 52 3RG61 53	**Sonar sensors**				
 	Cylindrical: M 30	6 to 30 cm	▶ **3RG61 52–3MM00**		0.21
		20 to 130 cm	▶ **3RG61 53–3MM00**		0.21
		40 to 300 cm	▶ **3RG61 55–3MM00**		0.30
	Plug-in connection Type F	60 to 600 cm	▶ **3RG61 54–3MM00**		0.38
3RG61 55 3RG61 54					
 					
3RG61 7	**Sonar sensors**[1]				
	Spherical: Ø 160 mm × 112 mm	60 to 600 cm	▶ **3RG61 74–6MM00**		1.85
		80 to 1000 cm	▶ **3RG61 76–6MM00**		1.90
	Terminal compartment with screw terminals for 0.5 to 2.5 mm²				
Signal evaluators for above sensors					
3RX2 110	**Standard design** DC 24 V with integrated analog output, monitoring module, temperature compensation and mm resolution		▶ **3RX2 110**		0.59
	**Extended design** DC 24 V Design as standard design; additionally differential measurement or multiplex operation with 2 sensors, calibration option		▶ **3RX2 110–1A**		0.59

For plug connections, see pages 10/194 to 10/196.

▶ **Delivery**
Preferred type.

1) Degree of protection IP 68 can be obtained if the terminal compartment is filled with epoxy resin. Recommended type: Scotchcast® epoxy resin. Order No. 5GU3 900.

2) Mounting rack and sensor not included in the scope of delivery.

Thru-beam sensor

Description

Design

The Sonar thru-beam sensor consists of an ultrasonic transmitter and a receiver.

Transmitter and receiver are each housed in a cubic moulded plastic box. Depending on design, the electrical connection consists of a moulded cable, an M 8 or M 12 plug.

Mode of operation

The Sonar thru-beam sensor transmitter emits a narrow continuous tone in the direction of the receiver.

The receiver located opposite evaluates this ultrasonic signal. Interruption of the tone by an object will cause the output signal to change.

Adjustability

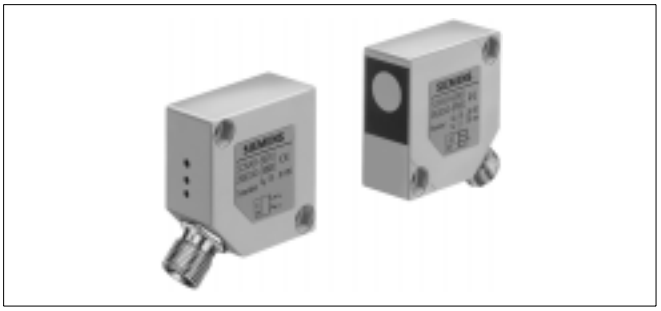
The sensitivity can be adjusted at the receiver module via connection 2 (NO-design) or 4 (NC-design).

XI	Operating frequency	Distance transmitter/ receiver
Not connected	100 Hz	< 150 cm
L–	150 Hz	< 80 cm
L+	200 Hz	< 40 cm

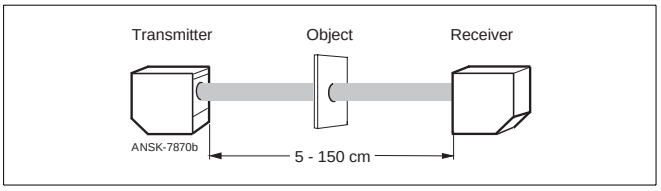
Application information

The minimum size of detectable objects depends on the distance between transmitter and receiver. If the distance is less than 40 cm and the minimum gap width between two objects is at least 3 mm, objects of 2 cm and more will be detected. If the distance is shorter, even gaps of <1 mm can be detected. At maximum distance objects of 4 cm and more will be detected. In this case the gaps between objects must be >1 cm.

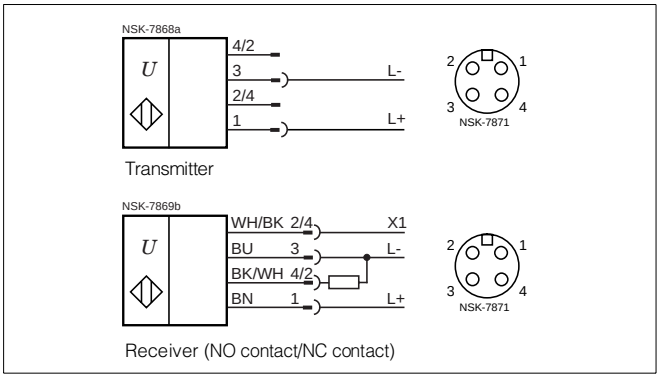
3RG62 43 Sonar thru-beam sensor



Arrangement



Typical circuit



Technical data

		Transmitter 3RG62 43–.NN00	Receiver (NO) 3RG62 43–.PB00	Receiver (NC) 3RG62 43–.PA00
Transmission range	cm	5 to 150		
Operational voltage	V	20 to 30 (±10% residual ripple included)		
Power consumption	mA	30	20	20
Ultrasound frequency	kHz	200		
Function indicator		LED green		
Housing material		Glass-reinforced plastic (PBPT, Crastin)		
Degree of protection		IP 67		
Ambient temperature	°C	in operation: 0 to +70, when stored: –25 to +85		
Fastening		2 × M 4 screws		
Max. operating frequency	Hz	–	200	200
Switching output		–	pnp NO	pnp NC
Load rating	mA	–	100	100
Switching status indication		–	LED yellow	LED yellow

3SG1 Sonar-BERO Ultrasonic Proximity Switches
Compact form

Description

Application

The compact version of the Sonar-BERO for direct voltage is a complete unit which is ready for connection. It is not possible to combine standard and compact modules.

Design

All the components are housed in a rectangular housing. The ultrasound converter and the terminal compartment are arranged in one level of the housing. The electrical connection is via screw terminals in the terminal compartment. Cables are introduced via an M 20 fitting.

Range definition and adjustability

The Sonar-BERO emits a signal for as long as an object is within the preset operating range or blocking range within an angle of approx. 5° (see diagram).

The sensing range between 0.2 and 1 m is divided up into 8 equal operating ranges of 0.1 m each. Each operating range (B1 to B8) can be selected using a plug in the terminal compartment.

In each case the Sonar-BERO signals with an output and an LED whether there are objects in the preset operating range or in the area in front, known as the blocking range.

Using diode plugs, it is possible to amalgamate two to eight of the individual operating ranges (B1 to B8) into one extended operating range. A diode plug (3SX6 257) is required for each operating range which can only be combined with the ranges directly adjacent to it. There is a plug connector in the device terminal compartment to accommodate these plugs. The possible plug assignments are displayed inside the lid of the terminal compartment.

Modes of operation

Standard mode
Diffuse sensor

If there is an object anywhere in the sound cone, the Sonar-BERO triggers output 14 (S) and emits 1 signal if the object is in a preset operating range (B1 to B8). Output 24 (SX), 1 signal if the object is in the blocking range. Objects in the blind zone result in a non-usable exchange of signals at outputs 14 and 24.

Reflex sensor

If a reflector is fixed within a preset operating range, the ultrasound can be interrupted by any objects (even sound-absorbing ones) in the blocking range.

If this is the case, output 14 (S) changes to 0 signal. If objects are reflected in the blocking range, output 24 (SX) changes to 1 signal at the same time.

Parallel and series connection

The Sonar-BERO (connection 2 or 4) can be connected in series. However, attention should be paid to the voltage drops.

It is also possible to connect the outputs in parallel. If the Sonar-BEROs connected in parallel are connected to different voltage supplies, the outputs must be decoupled using diodes (diodes for 300 mA, 150 to 300 V block voltage, recommended diode type 1N4004, for example).

Compact form

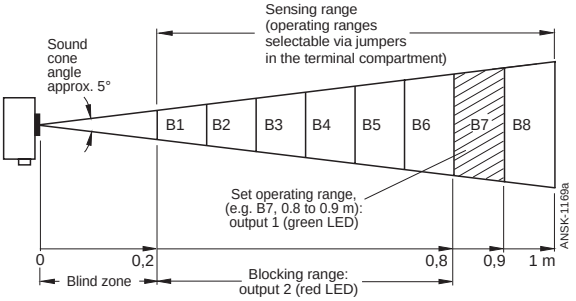
Adjustment mechanism

In order to make it easier to set up the Sonar-BERO with the object to be monitored, we can also provide an adjustment mechanism 3SX6 287. This mechanism can be swivelled along a horizontal or vertical axis around a maximum angle of 30° in each case.

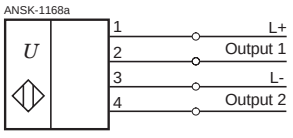
Technical data

Operational voltage		DC 20 to 30 V (incl. 10 % residual ripple)
Power consumption Residual current		< 60 mA < 0.01 mA
Switching output	Load rating Voltage drop Switching function Type of output	150 mA 2 V NO pnp
Standard target		2 cm x 2 cm
Sensing range		20 to 100 cm
Ultrasound frequency		200 kHz
Operating frequency		4 Hz
Switching hysteresis (actuation in axial direction)		1 cm
Repeat precision (actuation in axial direction)		2 mm
Max. closing and opening delay (response time)		120 ms
Ambient temperature	In operation When stored	–25 to +70 °C –40 to +85 °C

Sound cone



Connection



Compact ranges

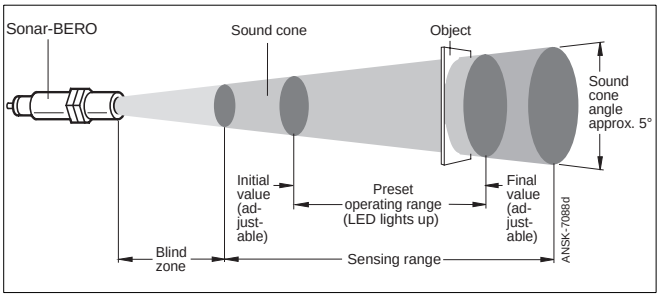
Description

Compact ranges I to III

Compact range M 18

Compact range 0

Sound cone



The Sonar-BERO of the compact ranges are autonomous units ready for connection. Their differences lie in their range, their functionality and their adjustability / programmability. The overview table on the following page shows the functions of the individual ranges.

Range definition and adjustability

Within a cone angle of approx. 5°, objects in the preset operating or analog range are detected reliably and signalled to the switching or analog output.

The blind zone must be kept clear of any objects since this might cause false signals. Objects at a distance to the sensor greater or smaller than the preset operating range are not signalled at the output.

Modes of operation

Standard mode
Diffuse sensor

An object entering the sound cone from any direction causes the output signal to be changed when the object is in the preset operating range.

Reflex sensor

The Sonar-BERO can be actuated by all objects (including sound-absorbing objects) when it is situated between a sonar sensor and a reflector which is fixed-mounted within a set operating range.

Thru-beam sensor

Only finds whether there is an object between the transmitter and the receiver. This means the range of the system is doubled compared to the range of a single sensor.

Active measurement system

The running time of the ultrasonic signal is evaluated to determine the distance between the transmitter and the receiver. The sensing range of the system is doubled in comparison to a single detector. The system is insensitive to objects in the measurement path as long as these do not shield the receiver from the transmitter totally.

Programming

SONPROG

For optimum adjustment to the application requirements, all devices of compact ranges M 18, II and III can be programmed by means of a PC and the SONPROG 3RX4 000 or 3RX4 001 interface unit. Among others the following parameters can be changed:

- Lower and upper limit of the operating range
- Lower and upper limit of the analog range
- Switching hysteresis
- Mean-value generation
- Analog characteristic curve rising/falling
- NO/NC-switching output function
- Operating frequency
- End of blind zone
- End of sensing range
- Multiplex function
- Sensitivity

The proximity switch can also be ordered with values which deviate from the standard. To do this, please quote the values in plain text with your order.

Synchronization

Up to 10 Sonar-BEROs can be synchronized merely by connecting the release inputs, terminal 2 (for NO-function) or 4 (for NC-function) of all sensors involved.

Multiplex mode

Up to 10 units in the M 18, II and III compact ranges can be connected together. In order to do this, the release inputs of all the units involved simply have to be connected to one another. At the programming stage, each unit is told how many Sonar-BEROs are connected together and at what point (address) the Sonar-BERO in question can be found. This means that the following operating modes are possible:

Serial multiplex

Each sensor in the assembly is given an individual address. The Sonar-BERO units are activated one after another in sequence.

Parallel multiplex mode

If more than one Sonar-BEROs in an assembly are given the same address, they then form a group. The BERO groups are activated one after another in the sequence of their addresses. All the Sonar-BEROs within a group are active at the same time.

Parallel and series connection

Series connection of the Sonar-BERO (terminal 2 or 4) is possible. But the voltage drop must be considered.

Parallel connection of the outputs is also possible. If the Sonar-BEROs are connected to different power supplies, the outputs have to be decoupled via diodes (diodes load rating: 300 mA; reverse voltage 150 to 300 V; recommended diode type 1N4004, or similar).

Form Transmission ranges	Block 6 to 100 cm			Cylindrical M 18 5 to 100 cm		Cylindrical M 30 6 to 1000 cm		
	Compact form	Compact range 0 with switching output	Compact range 0 with analog output	Compact range M 18 with switching output	Compact range M 18 with analog output	Compact range I	Compact range II	Compact range III
Modes of operation:								
Reflex slot	■	■	■	■	■	■	■	■
Reflex sensor	■	■ *)		■		■	■	■
Thru-beam sensor				■	■		■	■
Outputs:								
1 switching output		■		■		■	■	■
2 switching outputs	■						■	
Analog output			■		■			■
Frequency output				■			■	
Adjustability using plug-in jumpers	■							
Adjustability using potentiometer:								
Start of operating range						■	■	■
End of operating range		■		■		■	■	■
Start of analog range								■ *)
End of analog range			■					■ *)
Parameterisable using SONPROG:								
Start of operating range				■			■	■
End of operating range				■			■	■
Switching hysteresis				■			■	■
Start of analog range					■			■
End of analog range					■			■
Analog characteristic curve rising/falling					■			■
Blind zone				■	■		■	■
End of sensing range				■	■		■	■
Mean-value generation				■	■		■	■
Multiplex function				■	■		■	■
Switching output NC/NO				■			■	■
Operating frequency				■			■	■
Switching from reflex mode/transmitter/receiver				■	■		■	■
Temperature compensation On/Off				■	■		■	■
Potentiometer/Programming analog range setting					■			■
Analog output 0 .. 20 mA / 4 .. 20 mA					■			■

*) Special design

Types of output

Design with switching output

The switching output is active as soon as there is a reflector (object) in the preset operating range.

For the compact ranges 0 and M 18, the final value for the operating range (background suppression) can be set using a potentiometer.

For the compact ranges I to III, the initial value and the final value for the operating range can be set to any point using potentiometers. Looking from the plug - the initial value can be set using the left potentiometer and the final value using the right potentiometer.

If the initial value is to be fixed as the final value for the blind zone, the potentiometer for the initial value must be as far as it can go to the left.

The signal status of the output can be seen on an LED which lights up if there is an object in the preset operating range.

A flashing LED indicates a setting error (e.g. initial value > final value).

Design with 2 switching outputs

The units in the compact range II can also be supplied with two switching outputs.

With these units, the operating range is set by using 2 potentiometers or by programming the start and final values of the operating range. As with the units of the modular range II, a blocking range is formed between the blind zone and the operating range. One switching output (connection 5) is active when an object is in the blokking range, the other one (connection 4/2) is active when an object is in the operating range.

Design with analog output

The functioning of all devices with analog output is based on the overall sensing range of the respective type. The output will supply a signal proportional to the voltage or current signal (0 to 20 mA, 4 to 20 mA or 0 to 10 V).

The limits of the analog range and a rising or falling characteristic curve can be programmed via SONPROG.

Design with frequency output

In units with frequency output a rectangular pulse signal is given at the switching output which has a frequency proportional to the distance of the object. The signal can be processed by any frequency counter or frequency input of control systems (e.g. SIMATIC) or small control systems (e.g. LOGO!, see Part 1).

Compact ranges

Description

Sonar-BERO with separate sensor

Sonar-BERO with swivel sensor

Forms

Design with separate sensor

The performance features of these switches are identical to those of the other switches of compact range I to III. The small physical size of the sensors makes them ideal for applications where space is limited.

The ultrasonic sensor is separated from the other parts of the electronics and housed in a cylindrical case. Switches of type 3RG6. 12 have the sensor in an M 18 screwed sleeve and of type 3RG6. 13 in an M 30 screwed sleeve, each 25 mm long.

Two nuts are included for securing the screwed sleeves. The 1.6 m long connecting lead is permanently moulded into the sensor. A prefitted coaxial plug provides the connection to the signal evaluator which is contained in an M 30 housing in the compact range. The socket is built-in on the back of the housing.

Design with swivel sensor

The characteristics of these units correspond functionally with those of the other units of the compact ranges I to III. They are particularly suitable for applications where the standard sensors cannot be used due to space limitations.

The ultrasound sensor is hinged with a swivel arm to the cylindrical housing of the evaluation electronics. This allows rotations of the sensor around the axis of the cylinder as well as tilting by approx. 100° rectangularly to the axis.

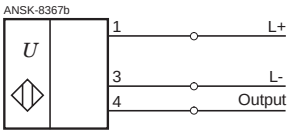
Deviation reflector

For Sonar-BEROs of compact ranges I to III a deviation reflector can be clamped onto the sensor head (see page 10/189).

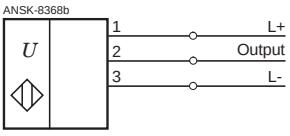
In low-space applications objects can be detected which are at a right angle to the Sonar-BERO (reduction of mounting depth). This will reduce the blind zone by approx. 6 cm.

Connection diagrams

Compact range I



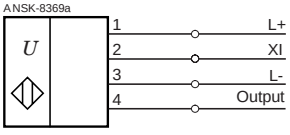
NO



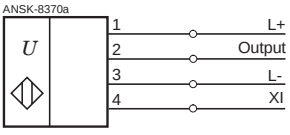
NC

Plug assignment

Compact ranges 0, II and M 18



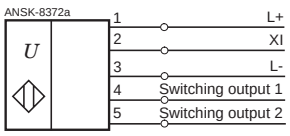
NO or analog output



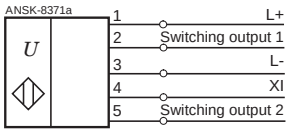
NC

Plug assignment

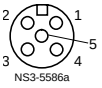
Compact range II with 2 switching outputs



NO

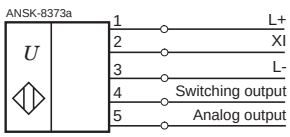


NC

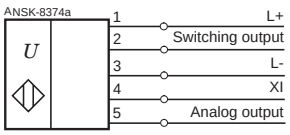


Plug assignment

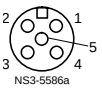
Compact range III



NO



NC



Plug assignment

Sonar sensors		Compact range 0	Compact range I	Compact range II
Operational voltage		DC 18 to 35 V (±10% residual ripple included; DC 10 to 18 V with sensitivity reduced by approx. 30%)	DC 20 to 30 V (±10% residual ripple included)	DC 20 to 30 V (±10% residual ripple included; DC 12 to 20 V with sensitivity reduced by approx. 20%)
Power consumption		< 35 mA (no load)	≤ 50 mA (no load)	≤ 50 mA (no load)
Residual current		≤ 0.01 mA	≤ 0.01 mA	≤ 0.01 mA
Switching output	Load rating Voltage drop Switching function Type of output	100 mA Max. 2 V (at 100 mA) NO (NC) pnp	300 mA Max. 3 V (at 300 mA) NO or NC pnp	300 mA Max. 3 V (at 300 mA) NO or NC pnp
Analog output	Voltage Load	0 to 10 V (resolution 8 bits) ≥ 1 kΩ	– –	– –
Spurious switching signal		Suppressed		
Protective measures		Short-circuit and overload protection Polarity reversal protection Wire-break protection Inductive interference protection		
Function indication		LED		
Standard target (min. sensing face at max. final value)		3RG63 42 1 cm × 1 cm 3RG63 43 2 cm × 2 cm	3RG60 12 1 cm × 1 cm 3RG60 13 2 cm × 2 cm 3RG60 14 10 cm × 10 cm 3RG60 15 5 cm × 5 cm	3RG60 12 1 cm × 1 cm 3RG60 13 2 cm × 2 cm 3RG60 14 10 cm × 10 cm 3RG60 15 5 cm × 5 cm
Sensing range		3RG63 42 6 to 30 cm 3RG63 43 20 to 100 cm	3RG60 12 6 to 30 cm 3RG60 13 20 to 130 cm 3RG60 14 60 to 600 cm 3RG60 15 40 to 300 cm	3RG60 12 6 to 30 cm 3RG60 13 20 to 130 cm 3RG60 14 60 to 600 cm 3RG60 15 40 to 300 cm
Ultrasound frequency		3RG63 42 400 kHz 3RG63 43 200 kHz	3RG60 12 400 kHz 3RG60 13 200 kHz 3RG60 14 80 kHz 3RG60 15 120 kHz	3RG60 12 400 kHz 3RG60 13 200 kHz 3RG60 14 80 kHz 3RG60 15 120 kHz
Operating frequency		3RG63 42 8 Hz 3RG63 43 5 Hz	3RG60 12 8 Hz 3RG60 13 4 Hz 3RG60 14 1 Hz 3RG60 15 2 Hz	3RG60 12 8 Hz 3RG60 13 4 Hz 3RG60 14 1 Hz 3RG60 15 2 Hz
Switching hysteresis (actuation in axial direction, in radial direction not defined)		3RG63 42 0.5 cm 3RG63 43 1 cm	3RG60 12 1 cm 3RG60 13 1 cm 3RG60 14 6 cm 3RG60 15 2 cm	3RG60 12 1 cm 3RG60 13 1 cm 3RG60 14 6 cm 3RG60 15 2 cm
Repeat precision (actuation in axial direction)		3RG63 42 ±0.45 mm 3RG63 43 ±1.5 mm	3RG60 12 ±0.45 mm 3RG60 13 ±1.5 mm 3RG60 14 ±9 mm 3RG60 15 ±5 mm	3RG60 12 ±0.45 mm 3RG60 13 ±2 mm 3RG60 14 ±9 mm 3RG60 15 ±5 mm
Max. closing or opening delay (response time)		3RG63 42 70 ms 3RG63 43 90 ms	3RG60 12 70 ms 3RG60 13 100 ms 3RG60 14 400 ms 3RG60 15 200 ms	3RG60 12 80 ms 3RG60 13 110 ms 3RG60 14 400 ms 3RG60 15 200 ms
Availability delay (when the operational voltage is applied)		3RG63 42 7 ms 3RG63 43 7 ms	3RG60 12 280 ms 3RG60 13 280 ms 3RG60 14 280 ms 3RG60 15 280 ms	3RG60 12 280 ms 3RG60 13 280 ms 3RG60 14 280 ms 3RG60 15 280 ms
Ambient temperature	In operation When stored	0 to +55 °C –40 to +85 °C	–25 to +70 °C –40 to +85 °C	–25 to +70 °C –40 to +85 °C
Degree of protection		IP 65		
Installation		4 mounting holes of 5.3 mm dia.	M 30 × 1.5 thread	M 30 × 1.5 thread
Mounting position		Any		
Maximum permissible cable length		300 m (100 m for "enabling" input) (When several electrical interferences prevail, the use of a shield cable is recommended, e.g. 3RX1 556, see page 10/189)		
Resistance to shock and vibration				
Continuous oscillation:	Frequency range Deflection	10 to 55 Hz ±1 1 mm ±15%		
Shock test:	Shock wave form Shock amplitude Shock duration	Half-sine 30 × *g* 11 ms		
Bidirectional connection "enabling"				
– as "enabling" input			–	
max. input voltage		Operational voltage	–	Operational voltage
max. L-level (Sonar-BERO inactive)		2 V	–	3 V
min. H-level (Sonar-BERO active)		5 V or high resistive	–	15 V or high resistive
input resistance (current drain)		1500 Ω	–	900 Ω
min. enabling time		3RG63 42 53 ms 3RG63 43 68 ms	– –	3RG60 12 65 ms 3RG60 13 90 ms 3RG60 14 300 ms 3RG60 15 150 ms
– for synchronization max. number of synchronously operating Sonar-BEROs		6	–	10

For suitable power supply units for the Sonar-BERO see pages 10/191 and 10/192.

Compact ranges III and M 18

Technical data

Sonar sensors		Compact range III	Compact range M 18
Operational voltage		DC 20 to 30 V (±10% residual ripple included; DC 10 to 20 V with sensitivity reduced by approx. 20%)	
Power consumption		< 60 mA (3RG61 76 ≤ 75 mA)	
Residual current		< 0.01 mA	
Switching output	Load rating Voltage drop Switching function Type of output	300 mA (NO), 150 mA (NC) 3 V NO or NC pnp	150 mA 2 V NO or NC pnp
Spurious switching signal		Suppressed	
Protective measures		Short-circuit, overload and polarity reversal protection (not analog output), wire-break and inductive interference protect.	
Function indication		LED	
Standard target (min. sensing face at max. final value) (aluminium sheet)		3RG61 12 1 cm × 1 cm 3RG61 13 2 cm × 2 cm 3RG61 14 10 cm × 10 cm 3RG61 15 5 cm × 5 cm 3RG61 76 10 cm × 10 cm	3RG62 32 1 cm × 1 cm 3RG62 33 2 cm × 2 cm
Sensing range		3RG61 12 60 to 300 mm 3RG61 13 200 to 1300 mm 3RG61 14 600 to 6000 mm 3RG61 15 400 to 3000 mm 3RG61 76 800 to 10000 mm	3RG62 32 50 to 300 mm 3RG62 33 150 to 1000 mm
Ultrasound frequency		3RG61 12 400 kHz 3RG61 13 200 kHz 3RG61 14 80 kHz 3RG61 15 120 kHz 3RG61 76 60 kHz	3RG62 32 400 kHz 3RG62 33 200 kHz
Operating frequency		3RG61 12 5 Hz 3RG61 13 4 Hz 3RG61 14 1 Hz 3RG61 15 2 Hz 3RG61 76 0.5 Hz	3RG62 32 5 Hz 3RG62 33 4 Hz
Switching hysteresis (actuation in axial direction, in radial direction not defined)		3RG61 12 10 mm 3RG61 13 10 mm 3RG61 14 60 mm 3RG61 15 20 mm 3RG61 76 80 mm	3RG62 32 10 mm 3RG62 33 10 mm
Repeat precision (actuation in axial direction)		3RG61 12 ±0.45 mm 3RG61 13 ±2 mm 3RG61 14 ±9 mm 3RG61 15 ± 5 mm 3RG61 76 ±15 mm	3RG62 32 ±1 mm 3RG62 33 ±2 mm
Max. closing or opening delay (response time)		3RG61 12 100 ms 3RG61 13 120 ms 3RG61 14 400 ms 3RG61 15 200 ms 3RG61 76 800 ms	3RG62 32 100 ms 3RG62 33 120 ms
Availability delay (when the operational voltage is applied)		3RG61 12 280 ms 3RG61 13 280 ms 3RG61 14 280 ms 3RG61 15 280 ms 3RG61 76 280 ms	3RG62 32 280 ms 3RG62 33 280 ms
Ambient temperature	In operation When stored	–25 to +70 °C –40 to +85 °C	
Degree of protection		IP 65[1]	IP 67
Installation		M 30 × 1.5 thread (with 3RG61 76 with fixing flange)	M 18 × 1 thread
Mounting position		Any	
Maximum permissible cable length		300 m	
Resistance to shock and vibration			
Continuous oscillation:	Frequency range Deflection	10 to 55 Hz ±1 1 mm ±15%	
Shock test:	Shock wave form Shock amplitude Shock duration	Half-sine 30 × *g* 11 ms	
Bidirectional connection "enabling"			
– as "enabling" input max. input voltage max. L-level (Sonar-BERO inactive) min. H-level (Sonar-BERO active) input resistance (current drain)		Operational voltage 3 V 15 V or high resistive 900 Ω	Operational voltage 3 V 15 V or high resistive 900 Ω
min. enabling time		3RG6. 12: 75 ms; 3RG6. 13: 90 ms; 3RG6. 14: 300 ms; 3RG6. 15: 150 ms; 3RG6. 76: 600 ms	3RG62 32: 78 ms; 3RG62 33: 108 ms
– for synchronization max. number of synchronously operating Sonar-BERO		10	10
Analog output			
Design		3RG61 . .–3B.00, 3RG62 3.–3LS00	3RG61 . .–3C.00, 3RG62 3.–3TS00	3RG61 . .–3G.00, 3RG62 3.–3JS00
Output current		4 to 20 mA	0 to 20 mA	–
Output voltage		–	–	0 to 10 V
Load		0 to 300 Ω	0 to 300 Ω	> 2 kΩ
Characteristic curve		Rising		
Accuracy		±1.5% in the permissible temperature range		Rising ±2.5% in the permissible temperature range
Resolution		12 bits (4095 steps)		12 bits (4095 steps)
Refresh cycle		3RG6. .2: 40 Hz; 3RG6. .3: 30 Hz; 3RG6. 14: 10 Hz; 3RG6. 15: 20 Hz; 3RG6. 76: 5 Hz		3RG62 32: 40 Hz; 3RG62 33: 36 Hz
Frequency output	Frequency	–		3RG62 32: 250 to 1500 Hz; 3RG62 33: 150 to1000 Hz
	Loading capacity Type of output			150 mA pnp

For suitable power supply units for the Sonar-BERO see pages 10/191 and 10/192.

1) Degree of protection IP 68 can be obtained for 3RG61 7 if the terminal compartment is filled with epoxy resin. Recommended type: Scotchcast® epoxy resin. Order No. 5GU3 900.

PC-Interface SONPROG

Description

PC-Interface-Unit SONPROG

By means of the PC-Interface-unit SONPROG and its software all Sonar-BEROs of compact ranges M 18 as well as II and III can be adjusted to the various application requirements. For each BERO the following parameters (among others) can be set:

- Start and end of operating range
- Switching hysteresis
- Blind zone
- End of sensing range
- Start and end of analog characteristic
- Analog characteristic rising or falling
- NO or NC switching function
- Mean-value generation
- Multiplex function
- Function as diffuse sensor or reflex sensor
- Operating frequency

SONPROG

The programmed parameters are saved in the BERO and are maintained, even if there is no interface or the operating voltage is interrupted.

The programmed parameters can be printed and stored so that they are available when a Sonar-BERO is exchanged.

The interface 3RX4 001 corresponds to 3RX4 000, but is also supplied with a power supply unit for connection to AC 115 V.

Scope of delivery

PC-Interface, power supply unit adapter, connection leads for the PC and Sonar-BERO, SONPROG software for Windows and DOS.

PC-Interface and SONPROG software for Windows

Technical data

Required hardware		PC with VGA graphics card Serial interface COM1 or COM2
Required software		MS-DOS from version 3.1 Windows 3.X, Windows 95, Windows NT
Operational voltage	3RX4 000	AC 230 V/DC 24 V
	3RX4 001	AC 115 V/DC 24 V

3RG6 Sonar-BERO Ultrasonic Proximity Switches with integrated AS-Interface

Description

The 3RG6 Sonar-BEROs with integrated AS-Interface evaluate three operating ranges and one alarm signal. In addition to the AS-Interface terminal, they have a synchronization input. The detection of an object within one of the three operating ranges is indicated by the relevant LED. The devices are temperature-compensated.

The following operating parameters of the Sonar-BERO devices can be programmed:

- Initial and final values for the three operating ranges
- Final value for the blind zone
- End of the sensing range
- Mean-value generation
- Operating frequency
- Switching hysteresis
- Damping (sensitivity)

Allocation of data bits:

D0 Operating range 1
D1 Operating range 2
D2 Operating range 3
D3 Alarm output (sensor monitoring)

For further information see product description leaflet, Order No. E200001–P285–A497.

Technical data

Type	3RG61 12	3RG61 13	3RG61 15	3RG61 14
Sensing range	6 to 30 cm	20 to 130 cm	40 to 300 cm	60 to 600 cm
Operational voltage	From AS-Interface			
Power consumption	< 75 mA			
Spurious switching signal	Suppressed			
Function indication	3 LED, one per operating range			
Standard target	1 cm × 1 cm	2 cm × 2 cm	5 cm × 5 cm	10 cm × 10 cm
Operating frequency (preset)	8 Hz	4 Hz	2 Hz	1 Hz
Switching hysteresis (preset)	10 mm	10 mm	20 mm	60 mm
Resolution	1 mm	1 mm	1 mm	2 mm
Connection	M 12 cable plug see Accessories (e.g. 3RX1 505, 3RX1 502, 3RX1 542, 3RX1 543, 3RX1 512)			

Description

Sonar-BERO proximity switches from modular range II are suitable for an operational voltage of 20 to 30 V DC and comprise

a sonar sensor and a signal evaluator.

The signal evaluators are suitable for all sonar sensors of the modular range II and adapt themselves automatically to whichever type they are connected to. The parameters can be set by means of four input keys through menu-assisted programming in English or German.

Additional notes for operation and usage can be obtained from the product description leaflet, Order No. E20001–P285–A371.

3RX2 110 signal evaluator and 3RG61 sonar sensors

Technical data

Signal evaluators

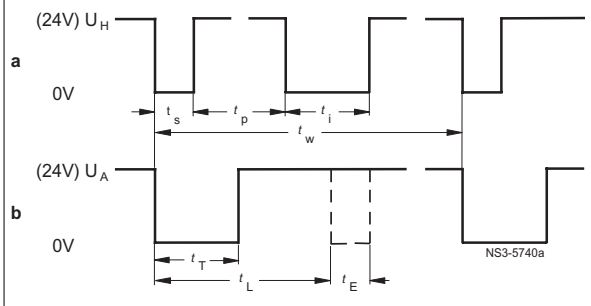
Type		3RX2 110 and 3RX2 110–1A
Vibration strain	In acc. with IEC 68-2-6	10 to 55 Hz at 0.35 mm amplitude
Shock resistance	In acc. with IEC 68-2-27	15 *g*/11 ms
Ambient temperature	In operation When stored	0 to +55 °C –10 to +70 °C
Relative humidity	In acc. with DIN 40 040	Class F
Electromagnetic compatibility (EMC)	In acc. with IEC 801 Part 2 In acc. with IEC 801 Part 3 In acc. with IEC 801 Part 4	Level 3 Level 3 Level 3
Polarity reversal protection		Built-in
Wire-break protection		Built-in
Short-circuit protection of sensor outputs		Built-in
Inductive interference protection		Built-in
Degree of protection		IP 20
Rated voltage U_e		DC 24 V
Operational voltage range U_b		DC 20 to 30 V (±10% residual ripple included), use stabilized power supply unit
Power consumption I_e		150 mA
Switching outputs	Blocking and operating range	Each with one changeover relay
	Measured operating current I_n	I_e/AC-12 at 230 V 3.0 A I_e/DC-12 at 230 V 0.1 A
	Endurance	30 million operating cycles (at an operating frequency of 5000/h)
Analog output	Output current	4 to 20 mA
	Overflow range	3.7 to 4 mA and 20 to 21 mA
	Load	0 to 500 Ω
	Output voltage	Max. DC 10 V
	Peak of the output signal	Max. 3%
	Resolution	8 bits
Sensor output	Rated voltage U_e	DC 24 V
	Permissible voltage range U_b	DC 20 to 30 V
	Output current I_s	Max. 30 mA
	Sending pulse amplitude	Minimal U_b –3 V Typical U_b –1 V
Mounting possibilities		Switchgear cubicle, encapsulated housing
Suitable for mounting side by side		Possible
Mounting		Snap-on fitting (standard DIN rail) Screw fitting
Maximum permissible cable length	Evaluator unit 2 and sensor	100 m, shielded
Reference measurement	Min. interval between 2 measurements Max. interval between 2 measurements	1 min. 60 min.
Repeat precision		< 1 mm

Technical data

Sonar sensors

Type		3RG61 42–3MM00 3RG61 52–3MM00	3RG61 43–3MM00 3RG61 53–3MM00	3RG61 44–3MM00 3RG61 54–3MM00 3RG61 74–6MM00	3RG61 45–3MM00 3RG61 55–3MM00	3RG61 76–6MM00
Rated voltage		DC 24 V				
Operational voltage range		DC 20 to 30 V (±10% residual ripple included)				
No-load current		< 30 mA				
Permissible residual ripple		±10%				
Sensing range		6 to 30 cm	20 to 130 cm	60 to 600 cm	40 to 300 cm	80 to 1000 cm
Availability delay	3RG61 4., 3RG61 7., 3RG61 5.	50 ms 20 ms				
Rated ultrasound availability		400 kHz	200 kHz	80 kHz	120 kHz	60 kHz
Sending cycle time		13 ms	25 ms	100 ms	50 ms	130 ms
Rated temperature		25 °C				
Ambient temperature	In operation	–25 to +70 °C				
	When stored	–40 to +85 °C				
Polarity reversal protection		Built-in				
Wire-break protection		No				
Inductive interference protection		Built-in				
Electromagnetic compatibility (EMC)		IEC 801-2 Level 3 IEC 801-3 Level 2 IEC 801-4 Level 3				
Degree of protection		IP 65				
Shock resistance		30 *g*, 18 ms				
Vibration strain		10 to 55 Hz, 1 mm amplitude				
Break torque		120 Nm				
Max. locked rotor torque		60 Nm				
Permissible cable lengths		100 m, shielded				
Permissible cable length for temperature sensor		6 m				
Connection		Plug M 12 x 1 for cable plug 3RX1 502, 3RX1 505, 3RX1 542 and 3RX1 536 With 3RG61 7. terminal compartment with screw terminals for 0.5 to 2.5 mm²				
Operating frequency		1 to 20 Hz	1 to 10 Hz	1 to 3 Hz	1 to 4 Hz	1 to 2 Hz
Standard target		1 cm × 1 cm	2 cm × 2 cm	10 cm × 10 cm	5 cm × 5 cm	20 cm × 20 cm
Resolution (adjustability of switching points)		1 mm	1 mm	1 cm	1 cm	1 cm
Sending pulse width t_s		70 to 80 µs	140 to 160 µs	330 to 370 µs	235 to 265 µs	470 to 530 µs
Cycle time t_w		≥ 13 ms	≥ 25 ms	≥ 95 ms	≥ 50 ms	≥ 130 ms
Temperature impulse time t_p		9 to 12 ms	18 to 24 ms	45 to 60 ms	30 to 40 ms	60 to 80 ms
Temperature impulse width t_i		350 to 700 µs	350 to 700 µs	350 to 700 µs	350 to 700 µs	350 to 700 µs
Sending dead time t_T		≤ 0.35 ms	≤ 1.17 ms	≤ 3.50 ms	≤ 2.33 ms	≤ 4.66 ms
Echo duration t_E		40 to 400 µs	100 to 800 µs	200 to 5000 µs	100 to 800 µs	200 to 5000 µs

Time diagram • Plug assignment



t_L = sound propagation time

Time diagram
a: input “SEND”, output “TEMP”
b: output “REC”

Plug assignment

1: L+
2: REC
3: L–
4: SEND/TEMP

Concept

The Watch-BERO with integrated AS-Interface is an especially developed ultrasonic sensor which is able to detect exactly stationary and moving objects on the basis of ultrasonic echo time measurement. The bus connection as well as installation and connection are executed as required by the AS-Interface specification.

Light diodes at the Watch-BERO signal the "occupied" state of the area to be controlled.

Design/Installation

The Watch-BERO is a compact device with plug-in technique. The data and energy transfer is executed through a 2-core AS-Interface line. After the coupling module FK has been installed and the AS-Interface line inserted the connection will be completed by screwing the Watch-BERO to the coupling module FK.

After screw-connection of the Watch-BERO the housing with the integrated LED part can be turned or aligned up to an angle of 330° maximum.

Function

Due to its design the Watch-BERO can only be used for barrier operation, i.e. it determines the parking space occupation by comparison of measured values to reference values. If a difference between measured distance and reference distance is found, Watch-BERO will signal the parking lot as "occupied". If the measured distance from floor to Watch-BERO corresponds to the reference value, the parking lot will be signalled as "free".

If internal malfunctions occur, Watch-BERO will set a fault signal. This is executed to be fail-safe meaning that the fault signal will be set also when a Watch-BERO is being dismantled.

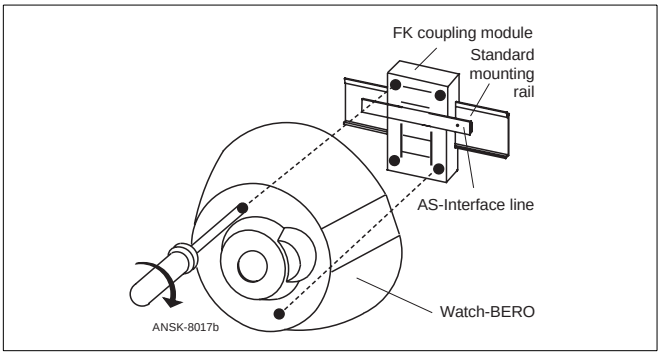
A Watch-BERO is one system component in the networking hierarchy of a plant. The required addressing is carried out by means of the programming and diagnostics device. Through the AS-Interface line, which can be installed like a standard electrical cable, the master communicates with up to 31 Watch-BEROs. For the energy supply an additional AS-Interface power supply unit is required.

Watch-BERO with switching output

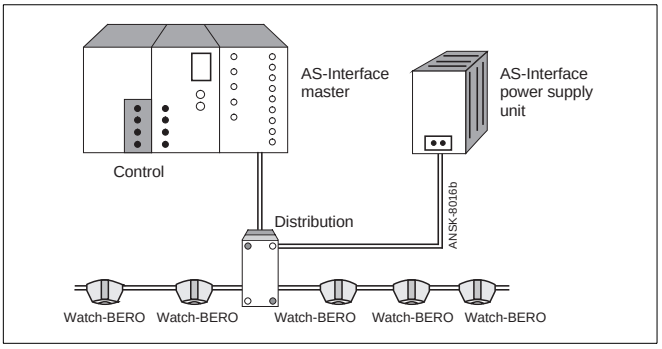
The Watch-BERO with switching output has the same housing and mounting as the unit with the integrated AS-Interface. However, it is not connected via an AS-Interface cable, but via a moulded lead (4 pin, length 5 m) and an M12 plug. The function and the electrical specifications of the Watch-BERO are the same as those for the compact range II (see page 10/117).

The PC interface SONPROG 3RX4 000/001 is used for programming the operating ranges and other parameters (see compact range II). This means that the Watch-BERO can be operated as a reflex sensor or a diffuse sensor like a Sonar-BERO from the compact range.

Installation of Watch-BERO



System representation



Technical data

Operational voltage	From AS-Interface
Power consumption	< 35 mA
Function indication	LED green/red
Sensing range	40 to 400 cm
Degree of protection	IP 65
Ambient temperature	–25 to +70 °C
Connection technique	AS-Interface coupling module FK
Housing material	Crastin SK 645 FR

Allocation of data

D0	Input	Allocation status	1 = busy 0 = free
D1	Input	Error	1 = yes 0 = no
D2	Output	Trigger	Multiplex function
D3	Output	Display	1 = LED switched to RED
			0 = LED switched to GREEN

SIPARK Car-Park Routing System

Description

Introduction

The SIPARK© range offers a number of different parking management systems from Siemens, which can be used in multistorey car parks around the world for monitoring single parking spots and for counting vehicles.

SIPARK improves the capacity of multistorey car parks by indicating where spots are free, creates parking space by using the space more efficiently, logs the spaces filled and provides a statistical report. SIPARK meets all the requirements for effective, economical car park administration.

The system range essentially consists of three lines:
- SIPARK MC – the complete car park routing system for up to 20 000 spaces
- SIPARK SC – the module for small systems up to 62 spaces
- SIPARK CC – reliable counting, complete from Siemens or as a module.

Highlights

- Error-free and non-sensitive to environmental factors thanks to ultrasound technology
- Tried and tested industrial components from the SIMATIC range
- Optimum precision
- Simple assembly and penetration technology
- Rapid set-up thanks to self-adjusting system
- Low maintenance costs
- Modern, user-friendly PC interface for SIPARK MC.

SIPARK MC – Car park management system

SIPARK MC is a solution which can be used anywhere, from the smallest car park to large multistorey car parks with up to 20 000 spaces.

On the basis of single space monitoring using ultrasound technology, SIPARK MC provides the following functions:
- Monitoring of every single parking spot
- The driver is specifically led to a free parking space with arrows
- Drivers can be specifically led to different zones, e.g. spaces for women, for the disabled, for visitors
- Reservation of parking spaces
- Monitoring of parking time
- Logging usage information for the car park
- Interface to higher level systems, e.g. city management system.

Technical data

Comprehensive technical data can be found in the system description.

SIPARK SC – the modular car-park routing system

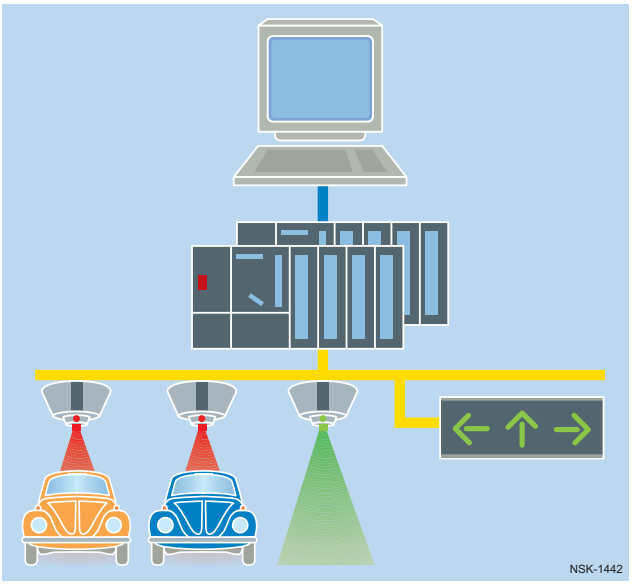
SIPARK SC is a modular system - a practical solution for smaller car parks with up to 62 parking spaces. All the modules have already been prepared, so that you can configure your system yourself without prior knowledge.

On the basis of monitoring single spaces, SIPARK SC provides the following functions:
- Access control with a view to allowing only authorised persons to enter the car park
- Drivers can be specifically led to different zones, e.g. spaces for women, for visitors, for management.
- Reservation of parking spaces

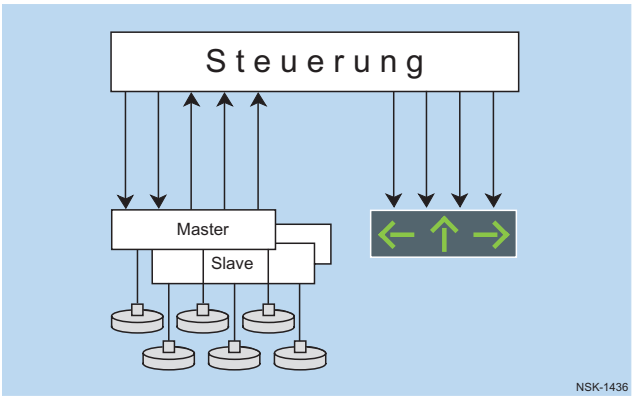
Technical data

- Self-adjusting SIPARK-BEROs (max. 62)
- Zone displays on the basis of a matrix of green LEDs, arrows can then be displayed singly or in combination.
- All the SIPARK-SC components are connected with an AS-i cable which also transports the energy and control information.
- The control program in the SIMATIC S7-200 has already been prepared so that only the number of parking spots needs to be configured.

SIPARK MC car-park routing system



SIPARK CC vehicle counting



SIPARK CC – Vehicle counting

SIPARK CC is a secure, cost-effective solution for counting cars coming into and going out of your car park. In addition to counting cars coming into the car park, vehicles can also be counted in the different zones - this means visitors can be shown to an area or a floor of the car park which has free spaces.

SIPARK CC can easily be incorporated into existing parking systems.

Technical data

- Display of free spaces per storey or zone with data transfer to higher level systems.
- All data relating to the occupation of the car park can be logged and used for statistical analysis.
- The areas contain the current occupation status. The S7 program can be configured to automatically overwrite all the zone values with a preset value at a defined time.
- The counting units are designed so that they can easily recognise vehicles moving in the opposite direction.
- The SIPARK counting units can easily be mounted on the ceiling without concrete work.
- Can be combined with single parking spot monitoring.

Order data and further information is available from:

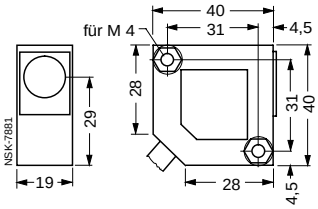
Siemens AG
SIPARK Competence Center
Düsseldorf
Mr Wolf

Tel.: +49 (0) 211 3 99–11 03
Fax: +49 (0) 211 3 99–24 48

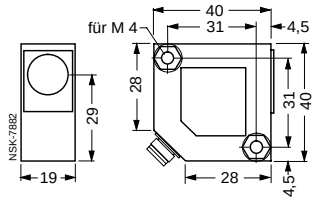
Dimension diagrams

Thru-beam sensor

3RG62 43–0..0

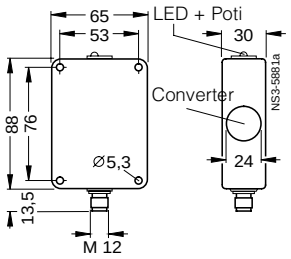


3RG62 43–3P.00, –7P.00



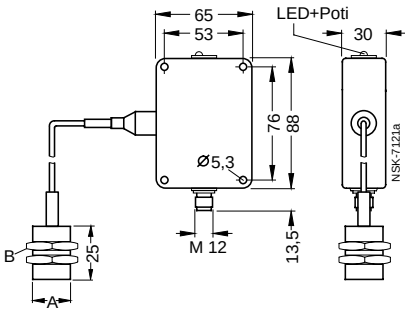
Compact range 0

3RG63 4.–3..00



Compact range 0, with separate sensor

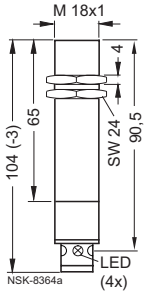
3RG63 4.–3..01



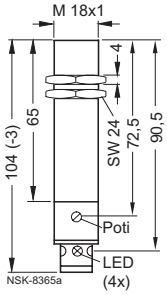
Type	A	B
3RG63 42–3..01	M 18	SW 24
3RG63 43–3..01	M 30	SW 36

Compact range M 18

3RG62 3.–3AA00, –3AB00



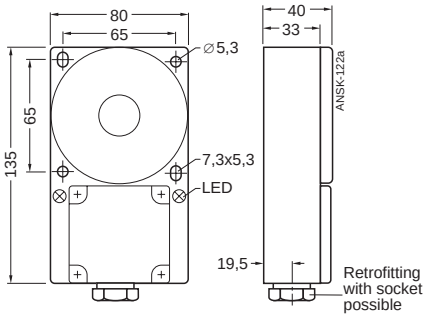
3RG62 3.–3.S00



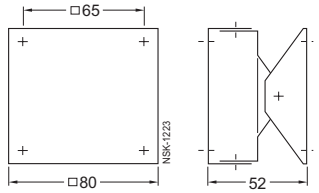
If mounting in metal components, a Ø 20 mm mounting hole is required for types 3RG62 33.

Compact form

3SG16 67

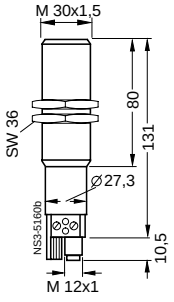


Adjustment mechanism 3SX6 287

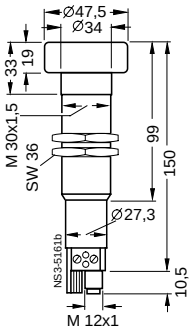


Compact range I to III

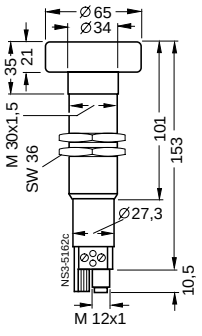
3RG6. 12, 3RG6. 13



3RG6. 15

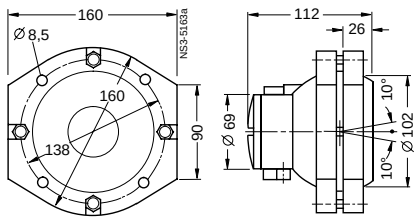


3RG6. 14



Compact range III

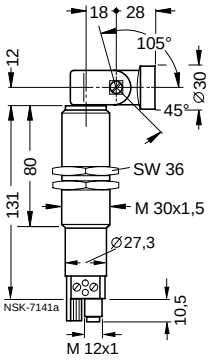
Ball sensor 3RG61 77



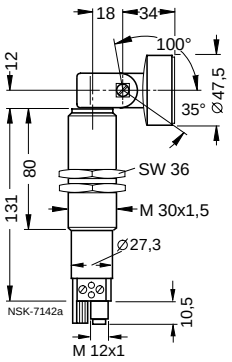
Dimension diagrams

Compact range I to III, with swivel sensor

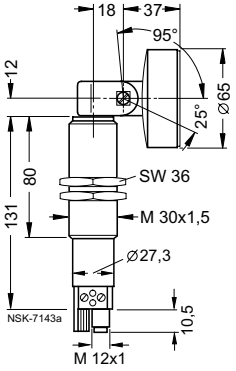
3RG6. 22, 3RG6. 23



3RG6. 25

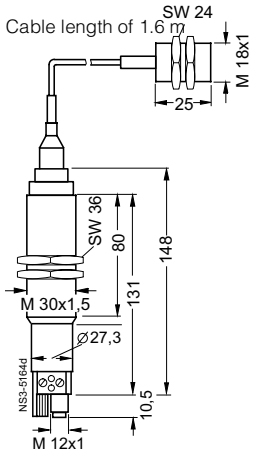


3RG6. 24

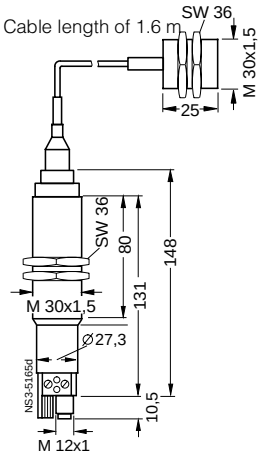


Compact range I to III, with separate sensor

3RG6. 12–3..01

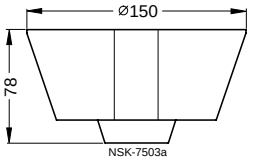


3RG6. 13–3..01



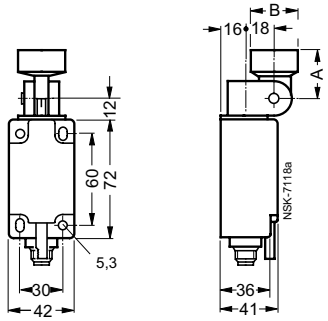
Watch-BERO

3RG63 84



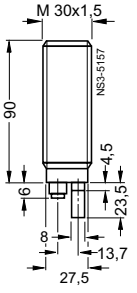
Module range II

3RG61 4.

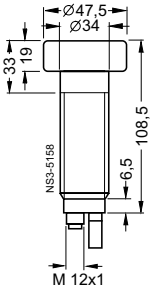


Type	A	B
3RG61 42	28	Ø 30
3RG61 43	28	Ø 30
3RG61 44	36	Ø 30
3RG61 45	36	Ø 47.5

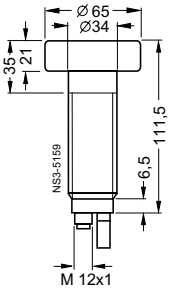
3RG61 52–3MM00
3RG61 53–3MM00



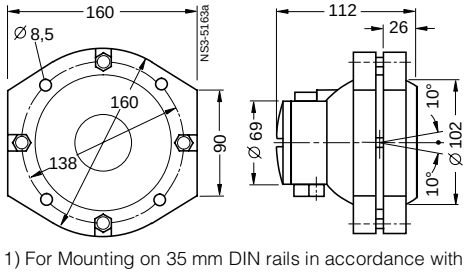
3RG61 55–3MM00



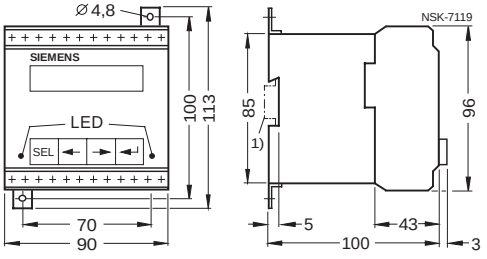
3RG61 54–3MM00



Ball sensor 3RG61 7.



Analysis unit II 3RX2 110



1) For Mounting on 35 mm DIN rails in accordance with EN 50 022.