ZÖLLNER
signal system technologies

SOUND SAFETY

Safety at sea from sound signals to sound reception systems

We are there for you

YOUR PARTNER IN SAFETY

Customer-oriented // Flexibility is very important to us - with our experience set in 1946 and the ability to deliver immediately, we are always at your side as a competent and reliable partner.

Team // Behind the name ZÖLLNER is a team of over 180 employees in Kiel. Development, product management, production,sales, after-sales and processing - with us everything is under one roof.

Quality // the ZÖLLNER quality speaks for itself. Our products are reliably in use on all oceans. Some of them have been around for several decades.

Worldwide // Thanks to its numerous partners and branches, ZÖLLNER can support you all over the world.

ZÖLLNER Signal GmbH
Radewisch 40 // 24145 Kiel // GERMANY
+49 431 7027-100 // signal@zoellner.de
www.zoellner.de

Quality „Made in Germany“

ZÖLLNER
signal system technologies

06100024EN6 // 10/23 // Subject to alterations.

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Fig. top ZET-Horn 90AC on the cruise vessel Mein Schiff 1 in Kiel Harbor.

ZÖLLNER sound signal systems since 1946

ZÖLLNER horns

we design your safety solutions.

All ZÖLLNER sound signal appliances for sea going vessels - ZET-Horn, Makrofon, ZETFON – comply with the requirements of the COLREG 1972. Our signal horns have a wide range of frequencies with many higher harmonics for best possible penetration of noise disturbances.

Even at a stage where the actual fundamental frequency is being absorbed by the noise level, it is the residual sound that builds up the keynote in the human ear. The presence of only two higher harmonics make the human ear perceive the fundamental frequency.

ZÖLLNER HORN TYPES		USAGE
	MAKROFON	Air driven horn
	ZET-HORN	Motor-piston driven horn
	ZETFON	Driven by electronic compressed driver

ZÖLLNER HORN VARIANTS	INFORMATION
ARCTIC	ZÖLLNERS arctic horns are equipped with special heaters and can at least resist temperatures up to -55° C.
RUBBER METALS	Optionally you can order additional vibration dampers for your ZÖLLENER ZET-Horn. These rubber metals absorb the natural vibrations of the horn.
YACHT	Beside our Superior Line all ZÖLLNER ZET-Horns and Makrofons can be purchased as a yacht version with a high-end finish and unique design.

mature design

ZÖLLNER products have been on the market for years, but the clear and simple design is a classic.

almost maintenance-free

the high quality of all components and assemblance ensures the longevity of our ZÖLLNER products.

best material

ZÖLLNER products are entirely made of best non-corrosion, seawater resistant materials.

easy installation

all products can be installed with, on-board tools. The self explaning installation can be assisted by the Datasheets and our phone service.

easy repair

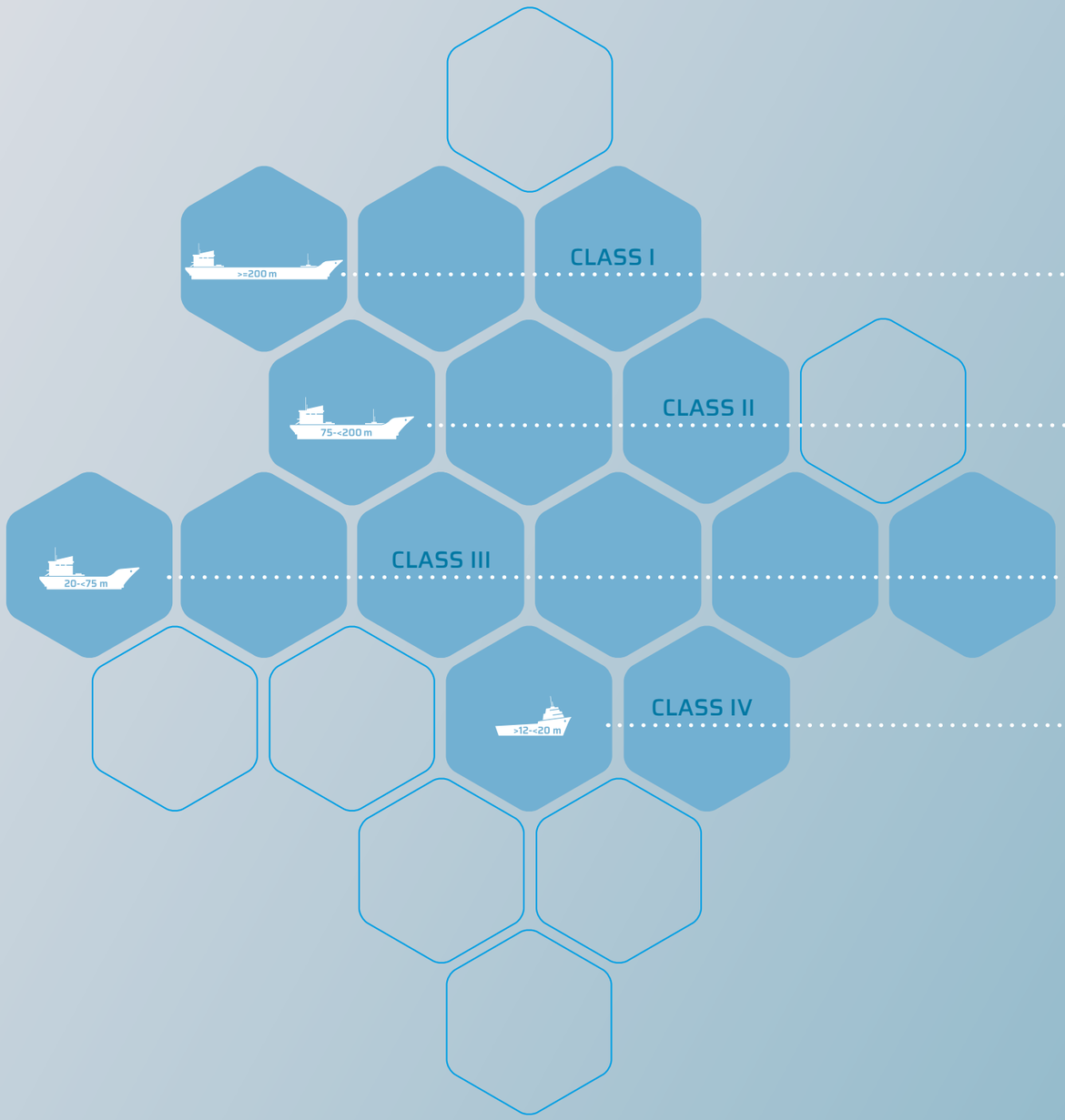
in the event that repairs are necessary, all main parts can simply be replaced. Our sales team will be happy to help you find the needed spare parts.

COLREG compliance

all ZÖLLNER horns are produced in full compliance with the COLREG 1972 Annex III.

Vessel classes

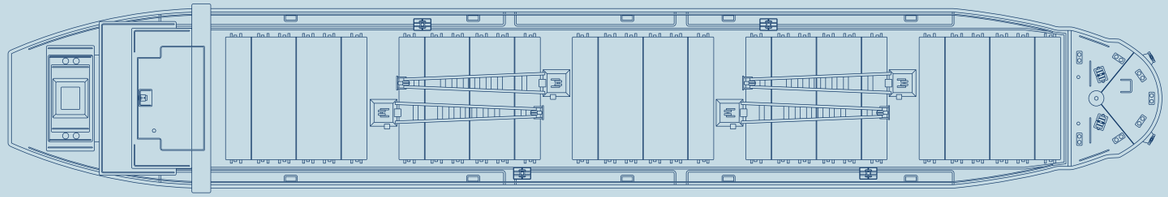
we provide signal horns for all vessel classes



Technical details of sound signal suppliances COLREG 1972

Technical details of sound signal appliances are specified in Annex III of the “International Regulations for Preventing Collisions at Sea, 1972” (COLREG). Among others the rules 1(b) and 1(c) of Annex III define fundamental frequencies and intensities of sound signals in relation to the length of the vessel, they read as follows:
With design and performance standards determined by the COLREG 1972, it goes without saying that all ZÖLLNER whistles meet the requirements and this is given proof of by the type approval certificates from numerous international maritime authorities such as the BSH Germany, RINA Italy, CCS China, RMRS Russia, just to name a few.

CLASS	SHIP LENGTH	LIMITS OF FREQUENCIES	1/3RD- OCTAVE BAND LEVEL AT 1 M	AUDIBILITY RANGE (NAUTICAL MILES)
I	>= 200 m	70-200 Hz	143 dB	2 nm
I;	75-<200 m	130-350 Hz	138 dB	1,5 nm
III	20-<75 m	250-700 Hz	130 dB	1 nm
IV	less than 20 m	180-450 Hz 450-800 Hz 800-2100 Hz	120 dB 115 dB 110 dB	0,5 nm 0,5 nm 0,5 nm



ZET-Horn

Advantages:
» decades of experience
» simple but matured design
» highest quality standards
» almost maintenance-free

Installation:
» only one three-core cable required for connection to board mains
» low weight
» not affected by voltage and frequency fluctuations of board mains

The ZET-Horn essentially consists of a piston inside a cylinder driven by an AC 3-phase motor and a joining sound horn. The piston oscillates at a certain frequency making the air inside the sound projector vibrate in resonance to produce a clean sound audible over a wide range. Higher amplitudes of the harmonics ensure best possible penetration of the normal background noise level on board. The ZET-Horn has a run-up time of less than 0.15 seconds which guarantees a pure, concentrated sound with best directional properties.

The following ZET-Horns are available:

CLASS I - VESSELS OF 200 M OR MORE IN LENGTH		
ZET-HORN 70 AC	sound frequency 70 Hz	143 dB in 1/3rd-octave band level at 1 m
ZET-HORN 90 AC	sound frequency 90 Hz	
ZET-HORN 110 AC	sound frequency 110 Hz	

CLASS II – VESSELS OF 75 METRES BUT LESS THAN 200 METRES IN LENGTH		
ZET-HORN 131 AC	sound frequency 130 Hz	138 dB in 1/3rd-octave band level at 1 m
ZET-HORN 141 AC	sound frequency 140 Hz	

Fig. top ZET-Horn 131 AC is on daily duty when crossing the Elbe on the pilot vessel.

Fig. left & right The known research vessel „Polarstern" had a Zet-Horn 141AC/H and a Makrofon M125/160b on board when working in the arctic. During this year the ZÖLLNER horns got exposed to extreme weather conditions and have proven its quality and reliance.

Further information

The ZET-Horn was the first AC 3-phase driven piston-diaphragm sound transmitter ever produced. Standard units are available for connection to all common 3-phase voltages. Special arctic and military designs are available, same as high-end units for luxury yachts.

MAKROFON

Advantages:
» sound horn made of reliable materials
» low air consumption, strong sound intensity and wide range of audibility

Installation:
» easy installation, no special tools required

The Makrofon is a compressed air powered diaphragm sound transmitter. It is most commonly installed on board of all types of vessels , as well as on rail vehicles. Makrofons are reliable whistles distinguished by their low air consumption, strong sound intensity and wide range of audibility. Due to the simple and solid design, Makrofons are practically maintenance-free.
The diaphragm housings are made of reliable materials, seawater resistant plastic is used for the protective cover only. For vessels the sound frequencies of Makrofons range between 90 Hz and 370 Hz and go up to 660 Hz for rail vehicles and may exceed 1000 Hz for alarm purposes.

Following Makrofons are available for seagoing vessels:

CLASS I - VESSELS OF 200 M OR MORE IN LENGTH		
ZM200/90B	sound frequency 90 Hz	143 dB in 1/3rd-octave band level at 1 m
ZM200/110B	sound frequency 110 Hz	
CLASS II – VESSELS OF 75 METRES BUT LESS THAN 200 METRES IN LENGTH		
M125/130B	sound frequency 130 Hz	
M125/160B	sound frequency 160 Hz	138 dB in 1/3rd-octave band level at 1 m
M75F/260	sound frequency 260 Hz	
CLASS III – VESSELS OF LESS THAN 75 METRES IN LENGTH		
M75F/260	sound frequency 260 Hz	130 dB in 1/3rd-octave band level at 1 m
M75F/370	sound frequency 370 Hz	

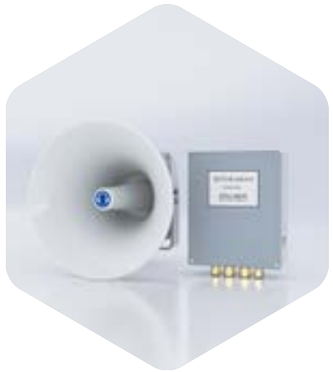
Fig. top The ZÖLLNER Makrofons are used around the world. Here the vessel Pinta crosses the world's most frequented artificial water way Kiel Canal with a M75F/260 on board.

Fig. left Our Makrofon M125/130b is on daily duty when crossing the Elbe on its pilot vessel.

Further information

Typically the Makrofon will operate on air pressures between 7 and 40 bar. For electric release and operation of the heating a connection to 230 V or 115 V AC 1 phase or 24 V DC power supply is required. Special models for naval use, EX components and yacht designs are available.

ZETFON



Advantages:
» latest technical standard
» highest quality standards

Installation:
» only two cables required for connection to board mains
» relatively low weight
» not affected by voltage and frequency fluctuations of board mains

The ZETFON is an electronic sound transmitter.
It consists of the ZETFON (sound emitter) itself mounted on the mast and a control and amplifier unit for wheel-house installation. The control and amplifier unit contains all electronic components including the heavy transformer. This way heavy weight on the mast is avoided and vital components are within easy reach.
The ZETFON is an economic alternative to air whistles on small vessels without air compressor.

CLASS III – VESSELS OF 20 METRES BUT LESS THAN 75 METRES IN LENGTH	
ZETFON 300/310 DC	130 dB in 1/3rd-octave band level at 1 m
ZETFON 400/310 AC AND DC	

CLASS IV – VESSELS OF LESS THAN 20 METRES IN LENGTH	
ZETFON 120/330 K	120 dB in 1/3rd-octave band level at 1 m
ZETFON 50/650 K	

Fig. top In reliable duty, the ZETFON 70s supports the police work in the distric of the baltic sea.

Fig. left The ZETFON 400/310 aboard the coast patrol boat Falshöft.

Further information

Typically the ZETFON operates as land alarm, i.e. in bunker stations, oil refineries, airports, power plants or factories. But this horn type can of course also be used on vessels of class III and IV. Special models with intercom system and/or extra heating are available.

» latest technical standard
» best material and workmanship
» decades of experience
» highest quality standards
» almost maintenance-free

Whistles for inland vessels

From the different types of whistles for seagoing vessels several are type approved for installation on inland vessels. In addition two electronic types are available meeting the special requirements for the river Danube emitting a triple-tone signal:
ZETFON Fonomat 1x70s and ZETFON Fonomat 4x70s.
Whistles for inland vessels are type approved by the German authorities.

Generally whistles for vessels sailing on inland waterways must meet the following requirement:

	SOUND INTENSITY	SOUND FREQUENCY
VESSELS <20 M	122 (± 2) dB(A)/1 m	250 – 700 Hz
VESSELS >=20 M	132 (+2 / -3) dB(A)/1 m	130 – 350 Hz

Fig. left Fonomat 4x70s on board of the river cruise ship A-Rosa Aqua.

Fig. right Fonomat 4x70s on regular duty for one of the Viking ships.

General positioning of whistles on board of a vessel

When a directional whistle is to be used as the only whistle on a vessel, it shall be installed with its maximum intensity directed straight ahead.
A whistle shall be placed as high as practicable on a vessel, in order to reduce interception of the emitted sound by obstructions and also to minimize hearing damage risk to the personnel. The sound pressure level of the vessel's own signal at listening posts shall not exceed 110 dB(A) and so far as practicable should not exceed 100 dB(A).

Basic connection requirements

» ZET-Horn: one 3-core cable only which also feeds the anti-condensation heating
» Makrofon: one to three cables for solenoid valves and heating plus a compressed air pipe and possibly a hand pull-rope
» ZETFON: one to three cables depending on type

Combined whistle systems

If due to the presence of obstructions the sound field of a whistle is likely to have a zone of greatly reduced signal level, it is recommended that a combined whistle system be fitted so as to overcome this reduction. For the purpose of the rules a combined whistle system is to be regarded as a single whistle. The whistles of a combined system shall be located at a distance apart of not more than 100 metres and arranged to be sounded simultaneously. The frequency of any one whistle shall differ from those of the others by at least 10 Hz. If whistles are fitted at a distance apart of more than 100 metres, it shall be so arranged that they are not sounded simultaneously. The many different types of ZET-Horns and Makrofons allow all possible combinations within the limitations set by the rules. A typical example is shown below, more examples are available on request.

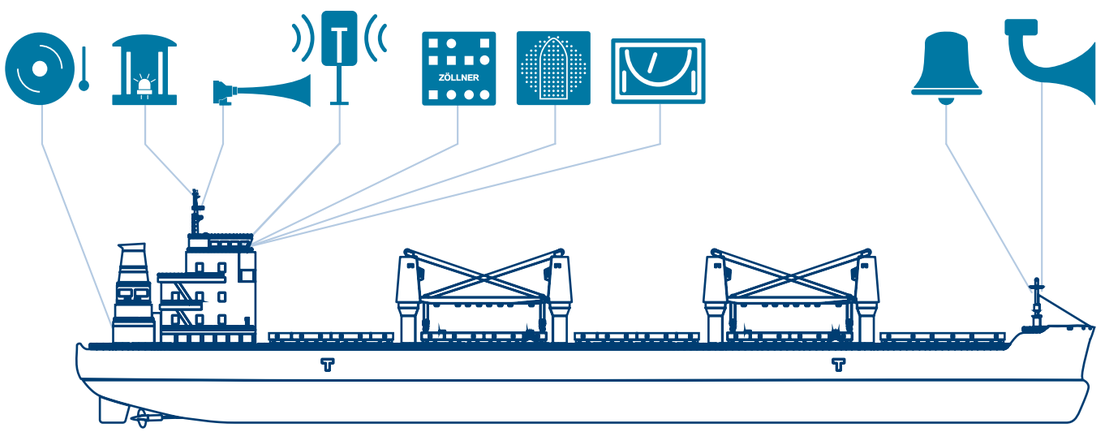


Fig. top equipment positioning

// ZET-Horn 90AC
on the cruise vessel
Mein Schiff 4

„Maritime expertise for the world‘s oceans!“

// Signal automaton 10+SGA

Beside our sound signal horns, ZÖLLNER provides several supplementing products for your safety.

Additional equipment

In addition to the ZÖLLNER whistles the product range holds a broad range of additional equipment. All of it concerning the safety on board.

Automatic signal controls

Signal Automatons 6+S and 10+SGA serve to automatically release warning and manoeuvering signals. Depending on the type, one to two whistles, a manoeuver signal lamp, electronic bell and gong and any number of separate push-buttons can be connected.
Muting contact to the sound reception system and interface for connection with the general alarm system are provided. Optionally type 10+SGA can be supplied with integrated general alarm function.

Signal automaton 10+SGA

The signal automaton 10+SGA provides all relevant signals usually needed as manoeuvering signals according to rule 34 (a,b,d), and signal in restricted visibility according to rule 35 (a,b,c,e,g) of the COLREG 1972 and SOS.
Additionally it can operate electronic (ZBG 110) or electro-mechanical (350EL + 500EL) bell & gong system
It can be connected to one or two whistles, manoeuver signal lamp and has an interface to GA.
Optionally a general emergency alarm function can be included with external key set. Also a special model without panel is available.

Signal automaton 6+S

The most common signal automaton 6+S provides 6 automatic signals needed in restricted visibility according to rule 35 (a,b,c,e,g) of COLREG 1972 and additionally SOS.
It can be connected to one or two whistles, manoeuver signal lamp and has an interface to GA.

Signal automaton 6+S

Signal automaton 10+SGA

Bell and gong systems

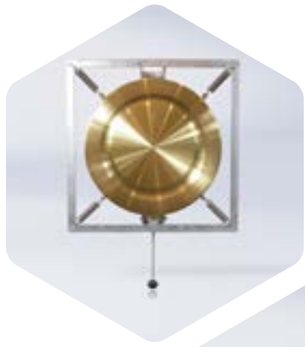
Different bell and gongs systems area availble: electro-mechanical, electronic and pure mechanical.
According to COLREG 1972 – Rule 33(a) a vessel of 20 metres or more in length shall be provided with a bell in addition to a whistle, and a vessel of 100 m or more in length shall, in addition, be provided with a gong. Manual sounding of bell and gong shall always be possible.

Electro mechanical bell and gong 350EL & 500EL

The system consists of an electro-mechanical bell 350EL, an electro-mechanical gong 500EL and the switch box 1+. It can be operated either with automaton 10+SGA or automaton 1+.
Optionally a special Arctic version with heating available.

Bell ZB110 and gong ZG110

The sound emitters ZB110 and ZG110 produce signals with unequivocal sound characteristics identical to conventional bell and gong. As required by the rules, they have a sound pressure level of 110 dB at 1 metre distance. The electronic sound emitters must be supplemented by manual bell and gong. Even this being the case, this bell and gong system is the most economical solution to comply with the rules.



Electro-mechanical gong 500EL
» for ship classes I, II
» manual operation possible

Electro-mechanical bell 350EL
» for ship classes I, II, III
» manual operation possible

Electronic bell / gong ZBG 110
» easy installation
» addtional mechanical bell (and gong) are needed.

Additional equipment

Sound reception device

General features

The SRD414/4 is an acoustic electronic navigational aid to enable the officer on the watch to perceive incoming sound signals inside a totally enclosed bridge in order to perform the look-out function as required according to the Colreg 1972.

The device complies with the requirements of

» Directive 2014/90/EU of 23 July 2014 on marine equipment (MED)
» SOLAS 74 as amended, Regulation V/18, V/19 & X/3
» MO Res. A.694(17), IMO Res. MSC.36(63), IMO Res. MSC.86(70), IMO Res. MSC.97(73), IMO Res. MSC.191(79), IMO Res. MSC.302(87).

The system is capable of receiving sound signals from all directions in the audio band 70 Hz to 2100 Hz. Incoming sound signals are displayed acoustically and optically inside the bridge. The device consists of one microphone sensor unit with five microphones and one master control panel with loudspeaker and optical display.

Functional characteristics

Incoming sound (warning) signals are scrutinized electronically and further processed for optic and visual display on the bridge panel.

Advantages

ZÖLLNER Signal GmbH is the pioneer in sound reception systems. Through continuous improvement the system is at the latest technical standard. It combines technical requirements with economic requests.

Installation

Microphone sensor unit: Ideally on the signal mast, in any case in safe distance to the magnetic compass and as far away from noise sources in the ship as is reasonably practicable and wind induced noise and mechanical vibrations are reasonably reduced. Master control panel: Visible at least from the conning position and so that incoming sound signals are audible at all positions inside the bridge.

SRD 414/4
» Incoming sound (warning) signals are scrutinized electronically and further processed for acoustic and visual display on the bridge panel.

Electronic inclinometer

The electronic inclinometer is a heel and pitch measuring system which needs to be fully compliant with IMO recommendations (MSC.363(92)).
Zöllner has two different brands in their portfolio:

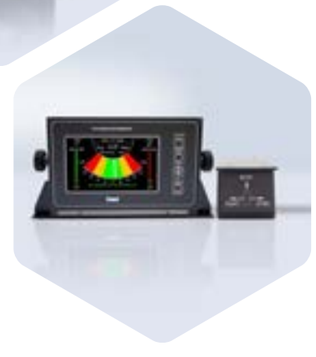
ZEI-1 (T)

ZEI-1 and ZEI-1T Electronic inclinometers are measuring instruments, which are not affected by horizontal and vertical accelerations, due to sophisticated MEMS technology. Hence it displays true inclination and roll period in very high accuracy.
The tug boat version ZEI-1T uses a so-called traffic light indication for safe, cautious & dangerous operating situation. It is especially designed to meet the stringent requirements of escort operation (to meet BV rules NR 467 - July 2017), to generate audible and visible warnings and alarms, when permissible heeling angle limits are exceeded.

Sestrel

Sestrel Electronic Pitch & Roll (EPR) Inclinometer is a heel and pitch measuring system. It is a robust and accurate instrument.
The standard display screen shows the actual heel angles at port and starboard side in red & green. A second display screen is available for Escort Tug operations. The Tug Master is able to monitor heel angles. In the event of exceeding preset safe levels, will visual and audible alarm be signalled for corrective action to be taken.

ZEI-1 (T)
» extra high accuracy
» special design interface
» very easy installation



Sestrel
» High accurate
» robust design

Superior line for yachts

The signal horns of the Superior Line from ZÖLLNER serve to underline the very special personality of a yacht with their materiality and handcrafted workmanship, and represent a sense of unique perfection, both optically and acoustically.

All Superior Line models are manufactured in accordance with the most stringent technical and aesthetic standards. And they are the personification of a level of expertise gathered upon a global scale over many decades. ZÖLLNER Signal GmbH in Kiel, Germany has been manufacturing signal horns for ships of all sizes and purposes for over 65 years. Superior Line – representing excellence made in Germany.

OUR SIGNAL HORNS FOR SUPERYACHTS			
DIAMOND TRIPLE ZM125	CLASS II & III	sound frequency 220 Hz	138 dB in 1/3rd-octave band level at 1 metre
ZET-HORN Y 131 AC	CLASS II	sound frequency 130 Hz	138 dB in 1/3rd-octave band level at 1 metre
YM125/130B	CLASS II	sound frequency 130 Hz	138dB in 1/3rd-octave band level at 1 metre
YM75F/260	CLASS II & III	sound frequency 260 Hz	138 dB in 1/3rd-octave band level at 1 metre
YM75F/370	CLASS III & IV	sound frequency 370 Hz	130 dB in 1/3rd-octave band level at 1 metre

NEW IN
» Diamond Triple Makrofon ZM125

About ZÖLLNER

Since ZÖLLNER was founded in 1946, sound signalling systems for ships of all classes have been an essential pillar of the company. All horns and their accessories comply with the latest technical standards and are type-tested according to their application on the basis of the international regulations according to SOLAS, COLREG 1972 and EU standards

The ZET-Horn is an electrically operated horn, where an alternating current motor drives a piston located in a cylinder, causing the air in the funnel to vibrate and generate the signal tone. Due to its very pleasant low sound frequency of 70 Hz, the ZET-Horn 70 AC is preferably installed on luxury passenger ships. Further variants of the ZET-Horn are available, for example for use in the Arctic, with special heating, and there are also special versions for the luxury yacht sector or for installation on military ships.

The Makrofon is a compressed-air operated horn, where the signal tone is generated by a vibrating membrane in the housing.

The ZETFON is available as an electric as well as an electronic horn, depending on the type, the sound is generated electro-mechanically or by an electro-magnetic pressure chamber.

Our product portfolio is in demand worldwide, whether for new constructions or retrofits. While most of the new constructions are manufactured in China and Korea, the European shipyards also play a major role beyond the cruise sector.

Figs. top aerial photo of the headquater ZÖLLNER in Kiel and an insight into the production workshop.

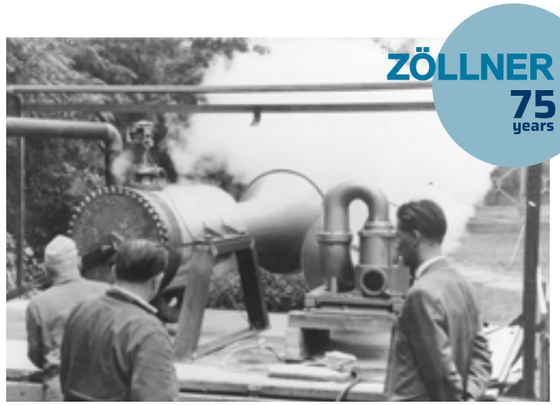


Fig. left Steam-powered ZÖLLNER horn with managing director Mr. Matthiesen sen. during performance check.

ZÖLLNER worldwide

The ZÖLLNER Holding is represented worldwide – from Alaska to New Zealand with eight of its own branches in Germany, six in Europe and three in Asia, the USA and Australia as well as agencies in over 40 countries.

ZÖLLNER Signal GmbH
Your contact partner: Maren Gadischke
Radewisch 40 // 24145 Kiel // Germany
+49 431 7027-100 // zoellner.de

Get in touch!

WE DESIGN YOUR SAFETY SOLUTIONS.

ZÖLLNER HOLDING GMBH // RADEWISCH 40
24145 KIEL // GERMANY // ZOELLNER.DE