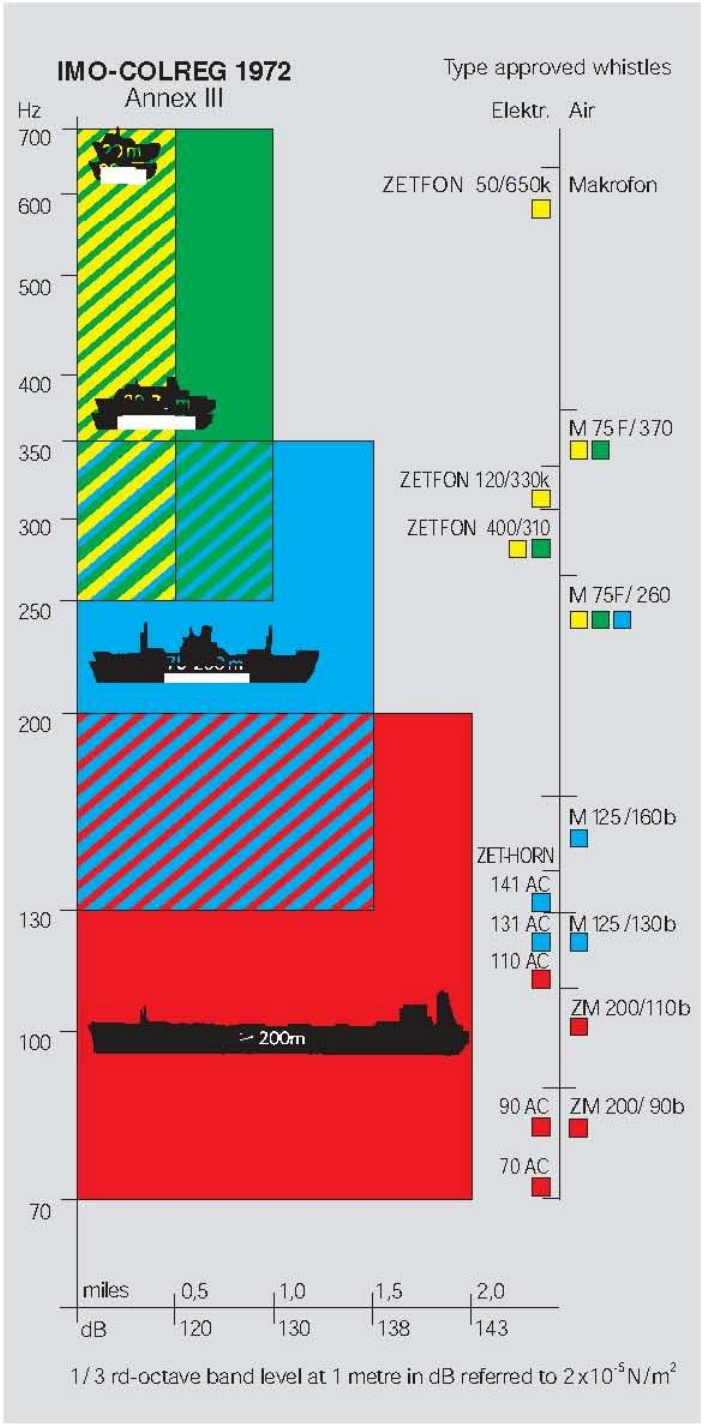
ZÖLLNER

SIGNAL SYSTEM TECHNOLOGIES

FAST DELIVERY
– worldwide –

ZET-HORN®
ZETFON®
MAKROFON®



TECHNICAL DETAILS OF SOUND SIGNAL APPLIANCES COLREG 1972

In Annex III of the "International Regulations for Preventing Collisions at Sea, 1972" (COLREG) technical details of sound signal appliances have been specified. The relation of the fundamental frequencies and intensity of the sound signals to the length of the vessel have been determined and are given in paragraph 1 b and 1 c of this regulation.

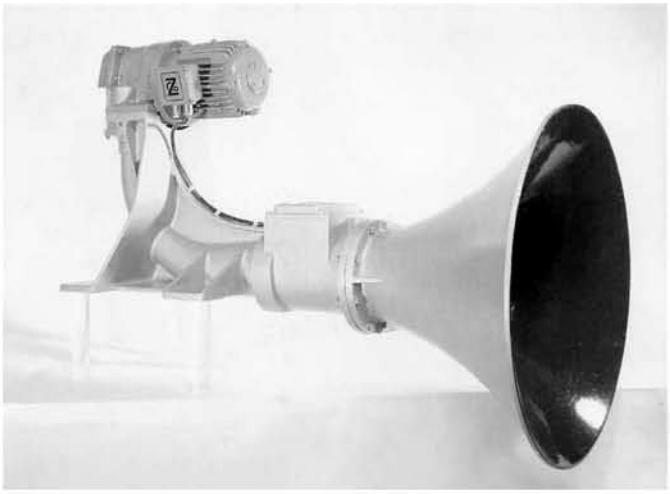
Class	Length of vessel in metres	Limits of fundamental frequencies in Hz	1/3rd-octave band level at 1 metre in dB referred to 2×10^{-5} N/m²	Audibility range in nautical miles
I	200 or more	70 - 200	143	2
II	75 but less than 200	130 - 350	138	1.5
III	20 but less than 75	250 - 700	130	1
IV	less than 20	250 - 700	120	0.5

Important for all Zet-Horns:
1. according to IMO 1972 Annex III
2. with electromotor heating acc. to the rules
3. low installation cost: no pipe, similar electr. cable as for air whistles

ZET-HORNS, MAKROFONS and ZETFONS comply with the requirements governed by "Preventing Collisions at Sea". ZET-HORNS were the first AC 3-phase driven piston-diaphragm sound signal appliances ever produced. Standard appliances are available for 230 Volt up to 440 Volt, 50/60 Hz AC three phase power supplies. Other special designs are available on request.

The ZET-HORNS essentially consists of a piston inside a cylinder with joining horn. The piston is driven by means of a connecting rod, a crankshaft, and two wear-resistant toothwheels of high grade steel (not plastic!) by an AC 3-phase motor. The piston oscillating at the resonance frequency of the horn produces resonant vibrations of air inside the horn. ZET-HORNS have a running-in period of less than 0.15 sec. which guarantees pure concentrated signals, generated accurately. The ZET-HORNS produces rich-sounding signals with a wide range of audibility; higher amplitudes of the harmonics especially make a penetration of the normal background noise level on board possible.

Recommendation for vessels in **North- or South Atlantic or Pacific**: Horns only aluminium with electr. trumpet-heating!



ZET-HORN® 90 AC
with motor heating

ZET-HORN® 131 AC
with motor heating

Electric ZET-HORN® Whistles are designed for the following COLREG-Classes:

Class II – vessels of 75 metres but less than 200 metres in length

1. ZET-HORNS 141 AC, sound frequency 140 Hz
2. ZET-HORNS 131 AC, sound frequency 130 Hz

} 138 dB 1/3rd-octave band level at 1 metre referred to 2×10^{-5} N/m²

Class I – vessels of 200 metres or more in length

1. ZET-HORNS 110 AC, sound frequency 110 Hz
2. ZET-HORNS 90 AC, sound frequency 90 Hz
3. ZET-HORNS 70 AC, sound frequency 70 Hz

} 143 dB 1/3rd-octave band level at 1 metre referred to 2×10^{-5} N/m²

MAKROFON® Air Whistles

are diaphragm sound transmitters, for water road and rail traffic. These whistles are unsurpassed because of their great sound intensity and audibility range. In addition they are widely used in industrial plants as general and specific danger alarm systems and as rest indicating systems. Compressed air, steam, dioxide, etc. may be used to power the Makrofons. For navigation purpose Makrofons in the range of 90 Hz up to 370 Hz are manufactured, for rail traffic higher frequencies are used.

The Makrofon is a reliable whistle, distinguished by its low air consumption. Due to its simple and solid design, the Makrofon is almost **maintenance free. The diaphragm casings are only made of bronze or brass,** plastic is used for the cover. The signal is rich-sounding with a wide range of audibility.

MAKROFON® M 125/160 b ZVE H

Makrofons are designed for the following COLREG-Classes:

Class III + IV – vessels of less than 75 metres in length

1. Makrofon M 75F/370 Hz, sound frequency 370 Hz 2. Makrofon M 75F/260 Hz, sound frequency 260 Hz	130 dB 1/3rd-octave band level at 1 metre referred to 2 x 10^{-5} N/m²

Class II – vessels of 75 metres but less than 200 metres in length

1. Makrofon M 75F/260 Hz, sound frequency 260 Hz 2. Makrofon M 125/160b Hz, sound frequency 160 Hz 3. Makrofon M 125/130b Hz, sound frequency 140 Hz	138 dB 1/3rd-octave band level at 1 metre referred to 2 x 10^{-5} N/m²

Class I – vessels of 200 metres or more in length

1. Makrofon ZM 200/110b Hz, sound frequency 105 Hz 2. Makrofon ZM 200/ 90b Hz, sound frequency 90 Hz	143 dB 1/3rd-octave band level at 1 metre referred to 2 x 10^{-5} N/m²

ZET-HORNS and Makrofons have found worldwide approval. They have a wide range of frequencies with many higher harmonics, making better penetration of an existing noise disturbance possible. 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.

MAKROFON® M 75F/260 ZVE H

Positioning of whistles

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).

Best position: as high as possible on the foremast.

In order to keep installation costs within limits, it is beneficial to install an electric Zet-Horn since this needs only a three-conductor cable as a supply line. The current for motor heating is conducted through the same cable.

If compressed air whistles are installed on the foremast, it is necessary to supply in addition to the compressed air pipe – which could ice-up at low temperatures – cables for the solenoid operated valve, as well as a pullrope for manual release.

The electro-pneumatic Makrofon valves are equipped with a lever for a hand pullrope. The expensive installation of a pull-rope, which must be guided by pulleys and through tubes, may be avoided by adding a second electromagnet for the emergency current on board to the Makrofon valve ZVE. This release meets SOLAS 1960 and 1974 regulations. ZVE valves are made of solid brass and can be used for pressures of 6 to 40 bar. All components of the valves are, of course, made of stainless material.

Combined whistle systems

(e.g. with 2, 3, or 4 sound transmitters)

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 these 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.

Due to the wide range of Zet-Horns and Makrofons the above "Combined Whistle Systems" – Rule may easily be adhered to. For Class II – **vessels of 75 metres but less than 200 metres in length** – the following combinations may be applied:

1. One electric ZET-HORN 141 AC and one electric ZET-HORN 131 AC requiring:
   1 cable to main switch board
   1 cable to emergency switch board
   (no piping!)

2. One electric ZET-HORN 141 AC and one compressed air Makrofon M 75F/260 ZVE H requiring:
   1 cable from Zet-Horn to main switch board
   1 cable to solenoid valve for Makrofon
   1 cable to heating of Makrofon
   for which the piping is required!

3. One Makrofon M 75F/260 ZVE H and one Makrofon M125/160b ZVE H requiring:
   2 cables to solenoid valves
   2 cables to heating of Makrofons
   for which 2 pipings are required!

(The combination itself is inexpensive, but installation costs are high. This is especially significant, taking into consideration an installation on the foremast, as is usually practised nowadays.)

4. Two Zet-Horns 141 AC/131 AC and one Makrofon M 125/160b ZVE H:
   This combination is the standard equipment on passenger ships, it guarantees greatest possible safety.

The following combinations may be used **for vessels of 200 metres or more in length,** as specified under Class I:

1. Two Zet-Horns: One 110 AC and one 90 AC
2. One Zet-Horn 90 AC and one Makrofon ZM 200/110b Hz
3. Two Makrofons: One ZM 200/90b Hz and one ZM 200/110b Hz

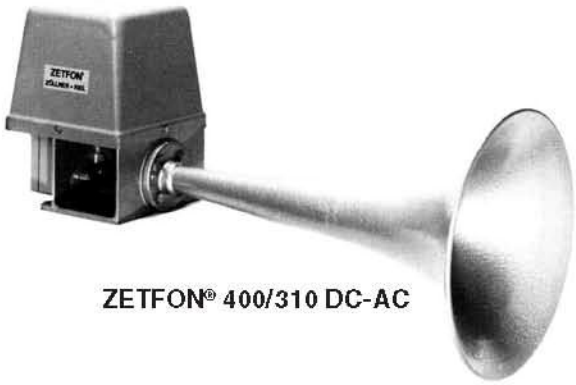
Electric ZETFON®

for vessels of less than 20 m and 20 m but less than 75 m in length.

ZETFON signal sets have been type approved and correspond to the regulations of IMO 1972, Annex III. They consist of a ZETFON® to be mounted on the mast and a control and amplifier unit for wheelhouse installation.

The control and amplifier unit (electronic sound generator and amplifier with protection against cross-connection of terminals and special transformer) is installed in a casing (protection type: IP 65). Thus **all electronic components including the heavy transformer are not positioned on the mast** but within easy reach inside the vessel.

ZETFON® 50/650k



ZETFON® 400/310 DC-AC

Technical Data

Length of vessel	less than 20 m	less than 20 m	20 m but less than 75 m	20 m but less than 75 m
Type	50/650k **(high pitched)**	120/330k **(low pitched)**	400/310 DC **(low pitched)**	400/310 AC **(low pitched)**
Sound pressure level	120 dB/1/3rd-octave/1 m	120 dB/1/3rd-octave/1 m	130 dB/1/3rd-octave/1 m	130 dB/1/3rd-octave/1 m
Sound frequency	650 Hz	330 Hz	310 Hz	310 Hz
Voltage	24 V DC (12 V)	24 V DC	24 V DC	230/380/440VAC 24VDC
Max. input	50 Watt	120 Watt	360 Watt	400 Watt with standstill heating (recommendation)

Automatic Control Device

For releasing sound signals in "restricted visibility", ZÖLLNER Sound Signal Appliances are provided with an electronic time switch relay. This way the prescribed signals can be given automatically. The signal automatons for use in sea navigation are supplied as combined systems for connection of one or respectively two whistles and a manoeuvre signal lamp required according to rule 34 (b) of the **"International Regulations for Preventing Collisions at Sea, 1972".** No additional lamp control is necessary. The automatons are provided with connections for light and sound signal keys as well as for a data printer.

Rule 34 Manoeuvring and Warning Signals

When vessels are in sight of one another, a power-driven vessel underway, when manoeuvring as authorized or required by these Rules, shall indicate that manoeuvre by whistle signals. Any vessel may supplement the whistle signals by light signals, repeated as appropriate, whilst the manoeuvre is being carried out.

(a) + (b) • = I am alterating my course to starboard
•• = I am alterating my course to port
••• = I am operating astern propulsion
(d) ••••• = warning signal
This signal, which is not repeated automatically, may be supplemented by a light signal.

Rule 35 Sound Signals in Restricted Visibility

In or near an area of restricted visibility, whether by day or night, whistle signals shall be used.

(a) ▬ = vessel making way through water
(b) ▬▬ = vessel making no way through water
(c) ▬•• = vessel not under command, vessel restricted in her ability to manoeuvre, vessel engaged in fishing, or towing or pushing another vessel
(e) ▬••• = vessel towed
(g) •▬• = vessel at anchor

Automaton with Light Signal Control A3

enables the automatic release of three different signals according to rule 35 (a, b, c) of the COLREGS 1972. The automaton is provided with a connection for one whistle.

SIGNAL AUTOMATON A3
dim. 144 x 72 x 200 mm

New combined Timer for whistles and Bell+Gong see page 6!

Automaton with Light Signal Control 5+S

enables the automatic release of five different signals according to rule 35 (a, b, c, e, g) of the COLREGS 1972. The automaton is available for ships
with one whistle – Automat 5+S Type "A"
two whistles with distance more than 100 m between Automat 5+S Type "B"
two whistles with distance less than 100 m between Automat 5+S Type "C"

SIGNAL AUTOMATON 5+S Type B
dim. 144 x 96 x 100 mm

Automaton with Light Signal Control 9+S

enables the automatic release of nine different signals according to rule 34 (a, b, d) and rule 35 (a, b, c, e, g) of the COLREGS 1972. The automaton is provided with connections for two whistles.

Military design available.

SIGNAL AUTOMATON 9+S
dim. 96 x 192 x 200 mm

2. Combined electronic system Bell-Gong ZBG 110 Automaton 10+SBG

(Certificate BSH 49/20G/94) with integrated whistle control

This combined electronic system is designed to take the following **functions**:

2.1 Whistles control (for 1 and/or two horns)
2.2 Bell control
2.3 Gong control
2.4 4 Signals acc. Rule 34 a, b, d
2.5 5 Signals acc. Rule 35 a, b, c, e, g
2.6 SOS-Signal acc. Rule 37-1d
2.7 Bell ZB 110 and Gong ZG 110 (each)
volume >110 dB/1 m omni-directional
d = max. 250 mm x height max. 290 mm
weight: approx. 2 kgs
2.8 power amplifier ZBG 110 (each)
power consumption: max. 100 W
protection class: IP 65
dimensions: 260 x 160 x 90 mm, with cable glands 1x M24 x 1,5, 1x PG11
weight: approx. 3 kgs
2.9 Timer 10+SBG*
dim.: 144 x 144 mm, acc. DIN 43700
hole: 139 x 139 mm
weight: approx. 1.4 kgs

* This combined Signal-Automaton 10+SBG controls the whistle as well as the bell-and-gong system

Advantages:
1. Reduced unit costs – (1 timer controlling whistle, bell and gong instead of 2 or 3 for single unit controls)
2. Less cabling = reduced installation costs
3. Saves space in the bridge control desk (only one hole 139 x 139 mm)
4. The built-in digital micro-processor produces a natural sound character identical to conventional bell and gong but at higher sound power
5. Type Certificate by BSH without extra charge

SRD SOUND RECEPTION DEVICE

Elephant Ears®

Sound Reception System

(Certificate BSH/49/40P/96)

Sound reception systems are acoustical electronic navigational aids to enable the officer of the watch to hear outside sound signals inside a totally enclosed bridge in order to perform the look-out function as required in the International Regulations for Preventing Collisions at Sea 1972.

1. IMO/ Solas-Application: 1.1 enclosed bridge
1.2 one man bridge operated ships

2. IMO-Colreg: *Rule 5:* Every vessel shall at all times maintain a proper look-out by sight and hearing ...
Rule 6 (b)(iv): the possibility that ... not be detected by radar ...
Rule 19 (d): close-quarters situation
(i) alternation of course to port for a vessel forward of the beam ...

4D – Direction display (dim. 144 x 192)

Operating unit

Offshore ZETFON system OZS 660

The Z llner Offshore ZETFON System OZS 660 is a sound signal system which is specially designed for the application on offshore structures according to the **IALA** recommandation. This unique design combines a very efficient sound system with very low power consumption and a highly competitive price.

Signals for Inland Navigation (RIVER BOATS)

According to the Regulations for the rivers Rhine, Danube, Elbe and several canals are Triple-Tone Signal necessary.

Length of all	Type	Control	Timer	24 V DC fuse	Intercom.GSA 1 way	Intercom.GSA 2 way	"Ex" plos. protection	Certificate
<20 m	ZETFON 1 x 70 s	ZP 9 Mi	Fonomat	6.3 A	incl.	option	option	-
>20 m	ZETFON 4 x 70 s	ZP 9 Mi	Fonomat	6.3 A	incl.	option	-	DHI 49/07

Option: spec. signals for Police, Customs etc. available
Certificate: from Deutsches Hydrographisches Institut (DHI)
now Bundesamt for Seeschiffahrt und Hydrogaphie (BSH) without extra cost.
Attention: Combined River-Sea-Ships need additionally Sound Signal Appliances acc. to IMO Collisions Regulations 1972, Annex III

4 x 70 s (electronic)

Fonomat

Audible and visual alarms, calls and indicators

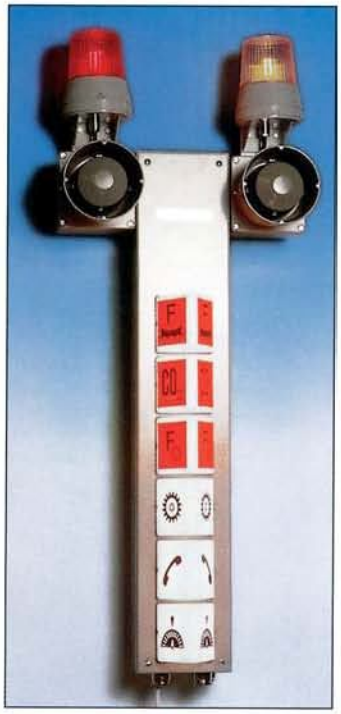
Attention. New IMO-Resolution!

according to IMO-Resolution A.686(17) adopted on 06. November 1991
more information: see ZÖLLNER catalogue SW 88

UA 115
115 dB (A)

UA 120
120 dB (A)

Indicator Columns



Alarm Indicator Columns visual + audible

M 75 / 660 Hz
134 - 137 dB (A)

M 75 / 404 / 660 Hz
112 - 132 dB (A)

Flash Lamps

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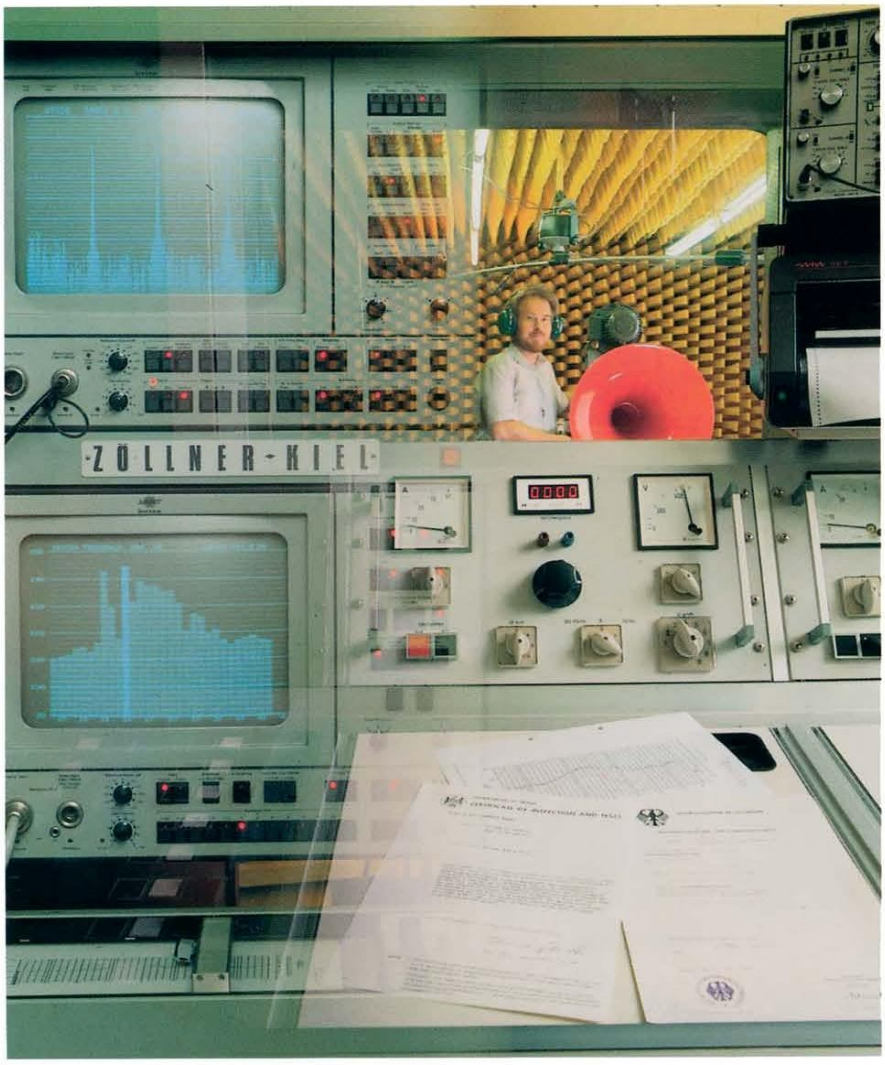

Subject to alteration!