Technical Guideline

‘Ballistic helmet’ overall system

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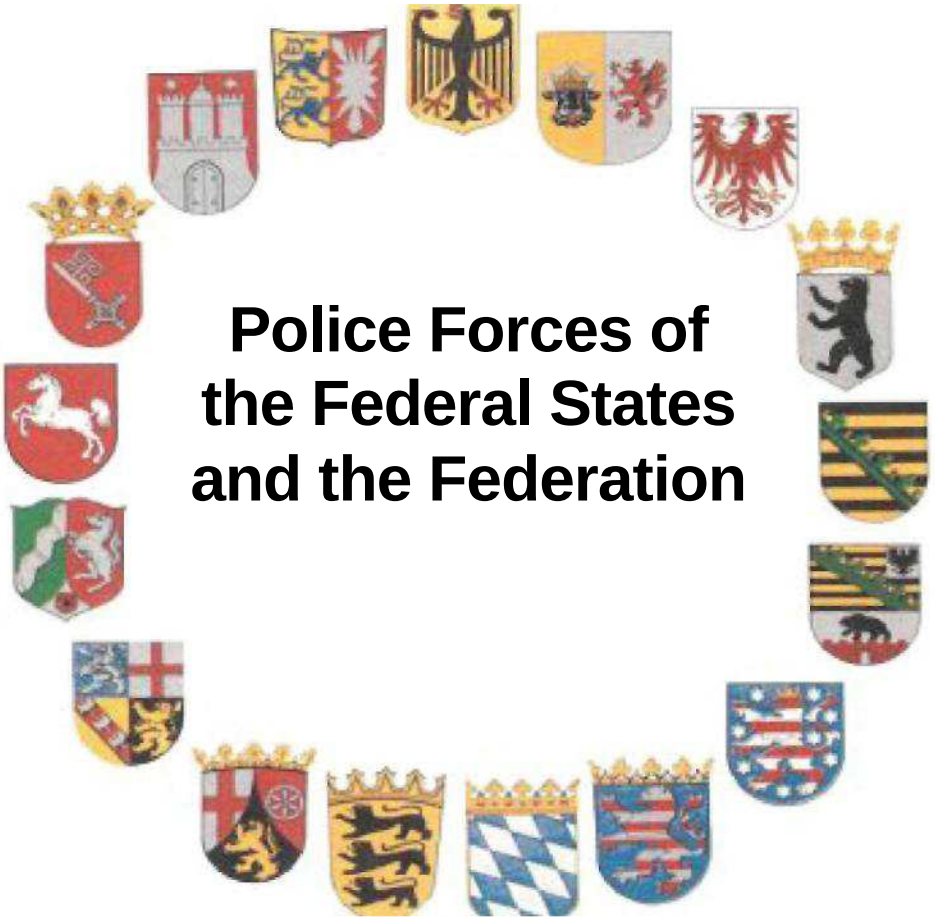

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Englische Übersetzung, es gilt immer die deutsche Originalfassung!

English translation, howewer the original German version always prevails!

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General requirements

1 Preliminary remarks

The following Technical Guideline describes the requirements of a ‘ballistic helmet’ overall system. The overall system comprises the modules of a helmet with internal equipment, visor/face guard, ear protectors, hearing/speaking set and respirator mask with filter.

The respective principal will decide on the equipment of the ballistic helmet with the individual modules.

The ‘ballistic helmet’ overall system is not seen as personal protective equipment for the purpose of the Industrial Safety Act.

The modules must fulfil the minimum requirements described in the individual equipment-specific parts of this Technical Guideline.

The basis for procurements is generally the Technical Delivery Conditions or BOQ which are drafted by the respective principal and made a part of the supply contract. In these, further requirements, for example with regard to quality assurance and final testing can be imposed above and beyond the technical requirements stated in the Technical Guideline.

2 Use

The ballistic helmet is utilized for special police events in which the use of firearms is anticipated in particular.

In order that the helmet can also be worn in conjunction with a ballistic protective vest if necessary, which may be furnished with a neck guard, both items of protective equipment must be finetuned to one another. The freedom of movement of the helmet wearer may only be slightly impaired.

3 Field of application

For participation in calls for tender by authorities in the Federal States and the Federal Government, it must be proven (see No. 6 in this section) that the requirements of this Technical Guideline are fulfilled.

4 Qualification

A company which wants to offer a ballistic helmet with visor/facial protection, ear protectors, hearing/speaking set and a respirator mask for the area of the German police forces or which only manufactures individual modules of the system must maintain a quality assurance system in production and installation in accordance with ISO 9001 (or a comparable quality assurance system) for manufacture and should have at its disposal verified environmental management in accordance with EC Regulation no. 761/2001.

5 Accompanying documentation

The following documentation must be taken into consideration in the respectively applicable version:

- **DIN EN 10204**, Metal products – types of test certifications
- **DIN EN ISO 105-B02**, Textiles – colourfastness tests - Part B02: colourfastness against artificial light; xenon arc light
- **DIN EN ISO 105-E04**, Textiles – colourfastness tests - Part E04: colourfastness to sweat
- **DIN EN ISO 12947-2**, Textiles – determination of scrub resistance of textile surface characteristics with the Martindale procedure - Part 2: Determination of sample destruction
- **DIN EN 136**, Respirator equipment – full masks – requirements, testing, labelling
- **DIN EN 137**, Respirator equipment – container devices with compressed air (compressed air breathing apparatus) with full mask – requirements, testing, labelling
- **DIN EN 141**, Respirator equipment – gas filters and combination filters – requirements, testing, labelling
- **DIN EN 148-1**, Respirator equipment – thread for breathing connections - Part 1: round thread connection
- **DIN EN 167**, Personal eye protection – optical testing procedure
- **DIN EN 228**, Fuels for motor vehicles – unleaded petrols – requirements and test procedures
- **DIN EN 352-4**, Ear protectors – safety-related requirements and tests - Part 4: level-dependent capsule ear protectors
- **DIN EN 352-6**, Ear protectors – safety-related requirements and tests - Part 6: capsule ear protectors with communication equipment
- **DIN EN 352-7**, Ear protectors – safety-related requirements nad tests - Part 7: level-dependent insulating ear plugs
- **DIN EN 397**, Industrial protective helmets
- **DIN EN 469**, Protective clothing for the fire brigade – requirements and test procedures for protective clothing for firefighting
- **DIN ISO 4869-1**, Acoustics; ear protectors; subjective method for the measurement of sound insulation
- **DIN EN 60068-2-27**, Environmental tests - Part 2: tests; Ea test and guideline: shocks
- **DIN EN 60268-4**, Electroacoustic devices - Part 4: microphones
- **DIN EN 60268-7**, Electroacoustic devices - Part 7: headphones and earphones
- **DIN EN 60529**, Protection classes through casing (IP code)

- **DIN EN ISO 9001**, Quality management systems - requirements
- **Act for the Protection of Hazardous Substances** (Chemicals Act) and derived ordinances and policies
- **Öko-Tex-Standard 100**
- **Directive 89/686/EEC** of the Council of 21 December 1989 for the approximation of legal regulations of the member states for personal protective equipment
- **Directive 2003/10/EC** of the European Parliament and Council of 6 February 2003 on minimum regulations for the safeguarding of the health and safety of employees from the risk of physical impacts (noise)
- **Directive 2004/108/EC** of the European Parliament and the Council of 15 December 2004 for the approximation of legal regulations of the Member States regarding electromagnetic compatibility and repeal of the Directive 89/336/ EEC
- **VPAM - APR 2006**, General test bases for ballistic material, construction and product tests of the Association of Test Centres for attack-resistant materials and constructions (VPAM)
- **VPAM - HVN 2009**, 'Bullet-resistant helmet with visor and neck guard' test guideline of the Association of Test Centres for attack-resistant materials and constructions (VPAM)
- **Technical guideline Ear protectors for shooting**
- **Technical guidelines for BOS handheld radio equipment**

6 Testing of the 'Ballistic helmet' overall system

6.1 DHPol/PTI contact point

The Technical Institute of Police (PTI) of the German Police College (DHPol) must be consulted with regard to test execution issues.

Contact details:

German Police College
Technical Institute of Police
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Tel.: +49 (0) 2501 806-259
Fax: +49 (0) 2501 806-239
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6.2 Proof of the requirements

The provider (manufacturer or distributor) of a ‘Ballistic helmet’ overall system or a module of this must prove by means of test reports[1] recognised by testing authorities of the Police Institute that the requirements of this directive are fulfilled. The provider must have the tests conducted at his own expense.

Instead of the testing authorities stated in Appendix 1, another official institution of an EU state is acknowledged after prior consultation with the PTI, insofar as this institution demonstrates the necessary specialist and general knowledge and neutrality to perform the required tests. The specialist and general knowledge of this institution must be proven to the PTI by the provider. The PTI reserves the right to verify the specialist and expert knowledge of the institution commissioned with the testing.

If the requirements stated in this technical guideline in respect of the modules

- Helmet with internal equipment
- Visor/facial protection
- Ear protection
- Hearing/speaking set and
- Respirator mask

are fulfilled, the respective testing institute will issue a test certificate.

The provider must supply the testing authorities and at the request of the principal a description of the modules (material, construction and mass).

After successful examination of modules of the ‘ballistic helmet’ complete documentation (test certificate and test report) must be lodged with the PTI in the German language.

6.3 Test certificate/test certification

A test certificate for the purpose of this Technical Guideline can be issued by a testing authority recognised by the Technical Institute of Police (see above).

If a module (helmet, ear protection, hearing/speaking set or respirator mask) does not fulfil the requirements of the Technical Guideline, the applicant only receives a test report.

If the bullet resistance test of the helmet or visor/facial protection is performed with different ammunition at the request of the applicant, which is not listed in this guideline, a test certificate must not be issued when the stated requirements are fulfilled, but test certification instead.

If the requirements stated in this Technical Guideline with regard to

- the helmet (tests in accordance with numbers 3.1 to 3.6)

[1] A test certificate or expert opinion from a testing authority certifies that the imposed requirements of this guideline have been fulfilled. Only the term ‘test certificate‘ is used hereinafter.

- the visor/facial protection (tests in accordance with numbers 3.1 to 3.6)
- ear protection (tests in accordance iwth numbers 3.1 and 3.2)
- hearing/speaking set (tests in accordance with numbers 3.1 to 3.5)
- the respirator mask with breathing filter (tests in accordance with Numbers 3.3 and 3.4)

are fulfilled and if the factory reports required for a module are available, the respective testing authority must prepare a test report. It must be recognisable from the test report that it only applies to the tested model.

In addition to the test reports, it will contain at least the following information:

- Name and address of the testing authority
- Name and address of the principal/provider
- Manufacturer and place of manufacture of the test sample
- Brand name and/or type description of the test sample
- Specification of the test requirements (description of the Technical Guideline with date of issue)
- Classification (protection level)
- Number and publication date of the test certificate / test certification
- Number of the test report
- Date and place of test.

6.4 Test report

The test report must give information on the entire test procedure and must contain at least the following general information:

- Name and address of the testing authority
- Name and address of the principal/provider
- Manufacturer and place of manufacture of the test sample
- Brand name and/or type description of the test sample
- Specification of the test requirements and test specifications (description of TR with date of issue)
- Number and date of test report
- Date of test sample acceptance
- Date of test
- Test sample structure, size, weight and number and other relevant information (e.g. also head size for helmet).

6.5 Validity of test certificate/test certification

The test certificate / test certification only covers the helmets, visors/facial protectors, ear protection equipment, hearing/speaking sets manufactured below if they conform to the respectively tested sample.

Changes or modifications to the construction, the manufacturing process and the materials must be notified to the PTI.

The validity of the test certificate / test certification expires if

- these changes/modifications can have an impact on product conformity and/or
- a subsequent test gives a negative result.

7 Technical documentation

For the testing of the helmet, visor/facial protection, ear protection, hearing/speaking set or respirator mask, the supplier must supply the respective Technical Documentation, e.g. description of the structure and the materials and instructions for use to the testing authorities.

An information brochure must be enclosed when supplying each module of the 'ballistic helmet'.

In addition to the name and address of the manufacturer and/or his agent established in the community the information brochure must contain all useful information, but at least the following points:

- Functional use
- Warnings and special indications
- Technical data for ear protection e.g. sound insulation and details of dimensions (test certificate in accordance with DIN EN 352)
- Lifespan
- Instructions for storage, transportation, use, cleaning, disinfection, verification, care, maintenance, replacement of batteries or spare parts
- The accessories to be used with the product and the characteristics of suitable spare parts
- The packaging suitable for transportation of the product
- The meaning of any markings.

The information brochure must be written in the German language and should be clear and comprehensible. It must also be available in electronic form in a current data format.

8 Environmental compatibility and disposal

Only materials which can be disposed of without risk to the environment in accordance with the respective state of the art may be used in the manufacture of the modules.

Helmet, visor/facial protection

1 General

The ballistic helmet, consisting of a helmet shell, internal equipment with a chin strap, and the ballistic visor/facial protection should protect the wearer in particular from injuries due to shots. But it should also be resistant to thrown, spun or falling objects, such as stones or pieces of metal and it should be and remain punch-, impact- and stab-proof. All external parts must be dimensionally stable at temperatures from -20 °C to +90 °C and be chemically repellent. They may not drip nor ignite in the event of incendiary agent attacks. It must be ensured that the skin on the head and/or the hair of the wearer does not suffer fire damage either by the direct or indirect impact of heat. The helmet and the visor/facial protection must fulfil the minimum requirements cited hereafter.

2 Constructional requirements

The helmet and visor/facial protection must conform to the safety requirements of the generally recognised rules of technology or the state of the art.

2.1 Helmet

The helmet (shape, e.g. half or three-quarter shell) must

- be available in graded sizes from 48 to 65 or with adjustable internal equipment which enables individual adjustment and comfortable wearing; special sizes should be available if required
- be balanced and not overloaded to any side
- enable the wearing of ear protection
- enable the wearing of a hearing/speaking set or have the facility to be equipped with such
- enable the wearing of spectacles
- enable targeted shooting with hand guns and rifles
- when the visor/facial protection is removed the ballistic features of the helmet shells must be retained to the same extent (e.g. shooting of the visor screw connections).

The helmet should

- not restrict the natural field of vision (reference DIN EN 136)
- cover the neck and chin area as far as possible without restricting the freedom of movement of the head and the field of vision

- be equipped with a fold-up or retractable viewing panel (visor) or facial protection which does not restrict the visual field
- enable the wearing of a respirator mask even if the visor/facial protection is closed, if necessary
- have an adaptation option for accommodating additional equipment (lamp, helmet camera, etc.)
- be equipped for carrying with a one hook eyelet.

2.1.1 Internal equipment

The internal equipment must

- guarantee a secure and firm fit of the helmet (individual, replaceable internal padding must also be provided if necessary); if the head size is adjustable, the wearing height must also be variable
- reduce the impacting energies (testing conducted in accordance with No. 3.1 and 3.4)
- have an adjustable chin strap with a safety catch (tensile force for release 200 N ± 50 – testing in accordance with DIN EN 397) which must also be lockable,
- be resistant to body sweat in accordance with DIN EN ISO 105-E04 (min. 3 - 4 (acid/alkaline)[2] and heat-resistant
- be sufficiently scrub-resistant in accordance with DIN EN ISO 12947-2[3]

Materials coming into contact with the head may not impair the health of the wearer according to the current state of the art. All relevant requirements in this regard updated in law and regulations, etc. must be complied with. The materials must be easily replaceable for cleaning and disinfection, should demonstrate good moisture-repellent characteristics and antibacterial protection (the nature and permanence of the protection must be specified), be durably resistant to customary disinfectants and be certified in accordance with the Öko-Tex standard 100 (product class II) or a comparable standard.

All materials (including seams) should be of low flammability. If combustible or thermally impactable materials are used such as insulating materials, these must be safely covered with low flammability materials.

2.1.2 Helmet cover

For special uses a permanently low flammability flexible helmet cover in slate grey, RAL 7015 for example, or in accordance with the principal's specification must be provided which also has a noise-insulating effect when hit, e.g. on metal components.

[2] Proof by factory certificate
[3] Proof by factory certificate

2.1.3 Colour

The ballistic helmet must be executed in a slate-grey colour, for example RAL 7015, or in accordance with the principal's specification with the greatest possible degree of matting. It must also be weatherproof and light-resistant.

All textile materials of the internal equipment must be black or dark blue. A proof of the colourfastness must be provided in accordance with DIN EN ISO 105-B02[4] (V 2, average effective humidity, requirement: lightfastness number 5).

2.2 Visor/facial protection

If the following requirements placed on the visor are also fulfilled by facial protection, this can be alternatively offered.

The visor must

- have a minimum length, including the anchoring, of 150 mm (measured in the centre from the upper edge to the lower edge)
- be shock- and impact-proof and not allow any inward splintering
- be equipped with a protective panel (scratch protection)
- be able to be engaged in different positions in a low-noise manner
- enable targeted shooting with short- and long-range weapons.

- The visor should
- not restrict the natural field of vision (reference DIN EN 136)
- enable full and largely distortion-free transparency, a light transmission factor of 80 % must be striven towards; testing is in accordance with DIN EN 167[5]
- be executed in such a way that visibility is not restricted to a great extent by misting up, even in different outdoor temperatures (-20°C to +50°C)
- be quickly interchangeable
- permit the use of a hearing/speaking set and the respirator mask
- have a seal which prevents liquid leaking into the face from the helmet

In an open position, the visor may only slightly change the centre of gravity of the helmet.

In order to prevent damage to the visor during transportation, a protective cover must be provided.

[4] Proof by factory certificate

[5] Proof by factory certificate

2.3 Mass helmet with visor/facial protection

The mass of the helmet (three-quarter shell size 57) including visor/facial protection should not be more than 3200 g. A lighter weight must be aimed at.

3 Technical requirements

3.1 Bullet resistance

The helmet and visor/facial protection must be bullet-resistant at least to soft core projectiles, shot from hand guns (including submachine guns) over the entire are in the 9 mm x 19 caliber **(VPAM - APR 2006, test step 3)**. In the helmet/visor or facial protection transitional area bullet resistance must also be ensured. When the visor/facial protection is removed, the ballistic features of the helmet shells must continue to be retained to the same extent (e.g. shooting of the visor screw connections).

The tests must be conducted in accordance with **VPAM - HVN 2009** with the following deviations:

- No. 6.3 – **conditioning of the test samples**
  - before the testing of the helmet at +70 ± 2 °C it must be conditioned for at least 6 hours at +100 ± 2 °C and then for at least 10 hours at +70 ± 2 °C.
  - Instead of the test of the visor/facial protection at +70 ± 2 °C, a test must be conducted at +40 ± 2 °C.
- **Additional test** (not contained in HVN 2009 and not the subject of the tests in accordance with No. 6 of the general requirements)

  If the helmet is furnished with ear protection and/or a hearing/speaking set, the helmet manufacturer must have it verified by shooting whether injuries can occur to the head area as a result of integrated and/or added on additional equipment. The residual energy must be ascertained in accordance with HVN 2009. To this end, the helmet must be placed onto the measuring head and fired at at a normal temperature. The number of shots to be emitted must be determined by the testing authority. The result must be documented.

3.2 Chemical behaviour

The helmet and visor/facial protection must be chemically repellent. The test must be conducted with the following substances

- Sodium hydroxide 40 %
- Hydrochloric acid 36 %
- Sulphuric acid 30 %
- Acetone 100 %
- Turpentine substitute (white spirit 145/200, CSA-no. 64742-82-1)
- Super grade petrol (unleaded) in accordance with DIN EN 228, any make (retained sample)
- Foaming agent AFFF[6] must be mixed with water in accordance with the regulation (3 %) and not foamed up.

[6] Manufacture of chemical preparations by Dr. Richard Sthamer GmbH & Co. KG, Liebigstraße 5, 22113 Hamburg (STHAMEX-AFFF 3% 469)

The helmet with closed visor/facial protection must be placed on a testing head for testing. Then 50 ml of the aforementioned substances in each instance must run onto the centre of the helmet at intervals of 10 cm and a breadth of at least 5 cm in the direction of the facial area. The test with a substance must be complete after 90 seconds.

The substance residue which has not run off will remain on the protective helmet for a further 4 hours at a room temperature of 20 °C.

A visual inspection must then take place. Superficial loosening of the helmet surface, visor sealing lip, visor/facial protection (e.g. clouding of the visor) must be accepted; a functional deterioration must not have occurred. If the visual inspection leads to a suspicion of more extensive damage, functionality must be proven by means of tests in accordance with No. 3.1 and 3.4 of this Technical Guideline.

After the test, it must be possible to read a text of 4 letters selected at random through the visor/facial protection (font: Arial, height: 100 mm) from a distance of 6 m.

3.3 Combustion behaviour

Helmet shells with the visible materials of the internal equipment, visor/facial protection and respirator mask with breathing filters must be executed with permanent low flammability.

Testing of combustion behaviour (flame resistance) must be conducted in accordance with DIN EN 137, No. 7.4.1.4.

Visual inspections must be performed during the combustion behaviour tests. The materials of the helmet, visor/facial protection and respirator mask with a breathing filter must **not**

- melt (with the exception of preliminary melting at the visor edge and on the visor clasps)
- drip off
- combust
- break open (including the seams)
- be subject to afterburn for more than 2 seconds
- be subject to afterglow for more than 2 seconds
- shrink by more than 3%.

3.4 Shock absorption

The helmet must be verified for its shock absorption qualities. The testing must be conducted in accordance with DIN EN 397, industrial protective helmets, sections 5 and 6; pre-treated helmets must be used to this end at -20 ± 2 ºC and +70 ± 2 ºC.

3.5 Labelling

On the inside of the helmet shell and the visor/facial protection, a unique identification number must be permanently written for the ascertainment of manufacturer, type, test stage in accordance with VPAM - APR 2006,

month and year of manufacture; alternatively, identification can also take place by specifying the manufacturer, type, test stage in accordance with VPAM - APR 2006, month and year of manufacture.

The helmet also requires a specification of size and the application of a name plate for the helmet wearer is necessary on the inside of the helmet.

3.6 Functional test

The helmet and visor/facial protection must be verified with regard to the processing. In so doing, it must be ascertained whether sharp or protruding edges, for example, could lead to injuries to the wearer. The webbing of the safety clasp on the chin strap and the visor/facial protection must be subjected to a functional test.

3.7 Long-term behaviour

The protective effect of the helmet must be guaranteed for at least 10 years with storage and use in accordance with the instructions for use, and that of the visor/facial protection for at least 5 years. Verification of these requirements can be initiated by the principal during these periods in accordance with HVN 2009.

Ear protection

1 General

The impact of impulse noise due to the use of one's own weapons or exploders on the hearing must be reduced to such an extent by means of level-dependent insulating ear protection that noise deafness is prevented. Hearing must be possible in the 360° environment.

2 Constructional requirements

2.1 Configuration/execution

The ear protection must

- be integrated into the helmet or be compatible with this (e.g. ear protection otoplastics) and must enable individual adaptation
- have hearing devices for both ears which also enable communication via the handheld radio equipment and/or mobile phone
- fulfil the requirements of Nos. 2.1.2 or 2.1.4 of the ear protector for shooting Technical Guideline.

2.2 Power supply

The power supply with the customary batteries/rechargeable batteries must be housed in the ear protection or the helmet.

3 Technical requirements

3.1 General test

The testing of a noise-dependent, insulating ear protection must take place in accordance with the type of execution in accordance with DIN EN 352-4 or 7. EC type examination certification in accordance with EC Directive 89/686/EEC must be submitted to a notified body in respect of the successful testing of a product.

3.2 Special tests

For level-dependent ear plugs (e.g. otoplastics) or capsule ear protectors it must be proven by a testing authority that

- the maximum generated sound level of the hearing capsules of 114 dB(peak) is not durably exceeded (proof for capsule ear protectors by means of MIRE procedure, DIN EN ISO 11904-1 and for earplugs (e.g. otoplastics) with the measuring doll, DIN EN ISO 11904-2) and

- the electronics after restriction of the impulse noise is released again to the communication channel after 0.8 s[7] at the earliest but after 1.5 s at the latest or
- for digital systems which can release the communication channel sooner, are also not exceeded by reflections of the impulse noise of the noise level of the hearing capsule of 114 dB(peak).

[7] It should thus be ensured that reflections of the impulse noise which occur in closed shooting ranges, for example, do not reach the ear undamped.

Communication set

1 General

The communication set is envisaged for operation with the handheld radio equipment introduced to the Police forces of the Federal Government and the Federal States and authorised in accordance with Technical Guidelines BOS and with digital handheld radio equipment in accordance with BDBOS and mobile phones. In so doing, the wiring of the radio equipment plug described in this section of the guideline under No. 2.5 and the safety plug-in connector with mechanical switching is crucial. The cable of radio equipment and mobile phones is connected via relevant adapters. However, if necessary, hearing/speaking sets which are specially configured for these devices can also be used. In a further configuration variant, a wireless connection via Bluetooth is permissible.

The communication set is intended to facilitate safe talking over the radio equipment or mobile phone and perfect reproduction of received radio news when wearing the protective helmet, with and without the respirator mask. For perfect speech comprehensibility an interference ratio between the useful and interference signal (language/ noise) of at least 10 dB must be guaranteed. The set consists of the actual hearing/speaking equipment, a separate language button, the radio equipment/mobile plug and the relevant connection cables. By plugging in the radio equipment plug on the device the device's own microphone loudspeaker is switched off, on the mobile this may occur in pairing. If necessary, a security plug-in coupling must be integrated into the connection cable to the handheld radio equipment/mobile.

2 Constructional requirements

The communication set must conform to the safety requirements in accordance with the generally recognised rules of engineering or the state of the art.

2.1 Configuration/execution

The communication set should consist of cold- and heat-resistant materials (temperature range -20 °C to +70 °C) with a smooth surface and be resistant to cleaning agents which are listed in the instructions for use. Due to appropriate configuration and execution, pressure points on the head and the risk of injury must be precluded.

Materials which come into contact with the head must not trigger allergies[8] (e.g. due to nickel) and must be easily replaceable for cleaning and disinfecting and must be permanently resistant to disinfectants which are listed in the instructions for use.

The communication set must demonstrate appropriate noise immunity compared to customary electromagnetic radiation in its entirety and must be labelled in accordance with CE.

[8] Proof by factory certificate

For possible repairs or service works, parts of the communication set must be available individually and detailed service documentation must be provided. To this end, a list of individual parts from the procuring agency must be handed over.

2.2 Anchoring

The communication equipment must be able to be worn with or without a helmet. If necessary, it must be able to be installed and removed on/in the protective helmet on both the right and left sides.

2.3 Hearing/speaking equipment

2.3.1 Hearing equipment

The hearing equipment should be optionally be able to operate in one ear (on the right or left side) or in both ears. It must not exert any additional mechanical pressure on the ear. A distortion or shifting of the hearing equipment must be prevented.

Characteristics	Conditions / specifications
Permissible impedance range of the hearing capsule	At least 32 Ohm, at most 600 Ohm
Transmission range of the hearing capsule at least	from 300 Hz to 3000 Hz
Limitation of the sound pressure level[9]	to 135 or 137 dB (C) peak related to 20 µPa in accordance with directive 2003/10/EC

2.3.2 Speaking equipment

The sound pick-up can occur via a

- lip microphone
- ear microphone
- tube microphone with a flexible sound conducting tube
- body sound microphone
- microphone on the forechamber of the respirator mask
- microphone on the chin strap of the protective helmet.

With appropriate measures (e.g. use of a noise-compensated microphone) speech comprehensibility should also be possible with environmental noise levels up to 90 dB (A) and in conjunction with the respirator mask.

The transmission range of the microphone must be at least from 300 Hz to 3000 Hz.

[9] The limit value for the noise pressure level is determined by the principal within the scope of the procurement of the headset.

A microphone pre-amplifier which may be necessary for the correct control of the radio equipment or the mobile must be housed in the hearing/speaking set or the pertaining speech button and must be supplied with power from the radio equipment or an external source. The power consumption should be as low as possible, but should not exceed 5 mA in any case.

2.3.3 Hearing and speaking equipment (otolaryngal system)

As an alternative to the hearing equipment (No. 2.3.1) and speaking equipment (No. 2.3.2) a set of equipment can also be envisaged in which the earphones and microphone form one unit which can be inserted into the auditory canal. Ear moulds must be envisaged for the different auditory canals.

The transmission range must be at least 300 Hz to 3000 Hz here too.

An amplifier module which may be necessary must be supplied with power from the radio equipment or an external source. The other interface conditions (amplifier module/radio equipment) must be complied with.

2.4 Speech button

A speech button separate from the hearing/speaking set with a rotatable or flexible fastening clip between the hearing/speaking equipment and radio equipment/a mobile phone must be provided for which can easily be attached to different sites in or on the riot gear and can also safely be operated with gloves.

By means of appropriate constructional measures (e.g. fixed rotary collar) unintentional activation of the speech button (button diameter approx. 50 mm) must be prevented.

The switching mechanism of the speech button should be as low-noise as possible with a perceptible pressure point.

Other solutions e.g. ring, pin or radio PTTs must also be able to be used for precision guards for special applications.

2.5 Connection to the radio equipment/mobile

2.5.1 Cable connection

The connections from the radio equipment/mobile plugs to the hearing/speaking equipment (length 100 cm) and to the speech button (length 60 cm) must be produced by separate, uncoiled and flexible cables which are resistant to heat, oil and brittleness. The cable ends must be provided with cable kink protection and a mains lead cleat.

For radio equipment/mobiles a connector plug of the respective terminal manufacturer must be made up, a relevant adaptor must also be offered in addition. The interface data for Tetra devices specified by BDBOS must be complied with.

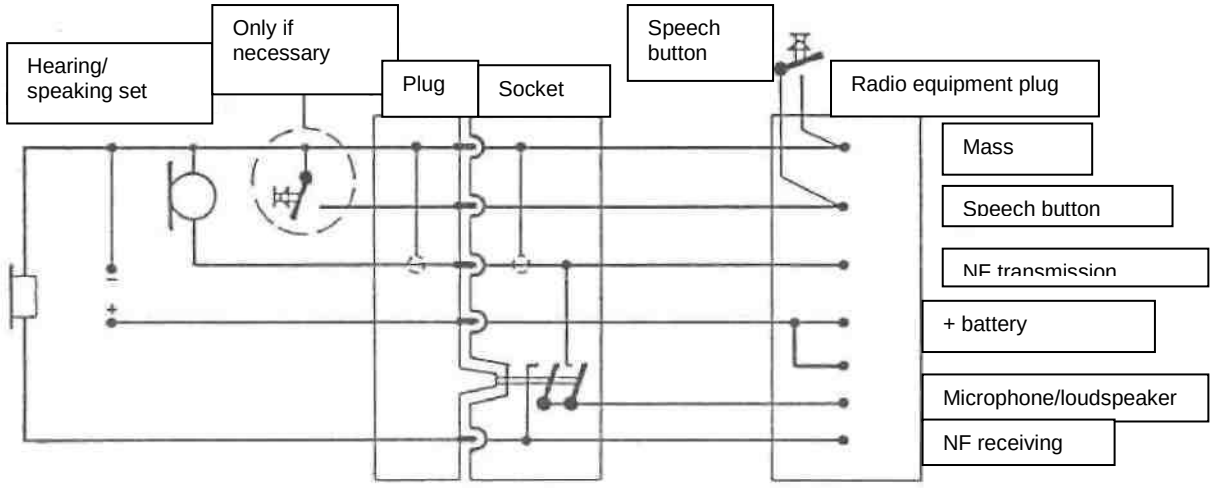
The interface data for terminals for BOS digital networks specified by the Federal Institute for Digital Radio Networks of the BOS (BDBOS) must be complied with.

If necessary, a safety plug-in connector must be integrated into the connection cable of the hearing/speaking set to the radio equipment/mobile plug which is furnished with cable kink protection on both sides and a mains lead cleat. The plug part of the connector must be attached to the cable of the hearing/speaking equipment (cable length 40 cm), the socket part must be attached to the cable to the radio equipment/mobile plug (cable length 60 cm).

The safety plug-in connector must enable automatic switch-on of the microphone-loudspeaker in the radio equipment/mobile if it is intentionally or unintentionally disconnected. Switchover can either be electronic or mechanical (see wiring).

In the electronic switchover, the power consumption from the radio equipment/mobile must only be low and not exceed 0.6 mA with connected plug-in connector and not exceed 0.3 mA with disconnected plug-in connector in the voltage range from 3.6 V to 12 V.

Wiring of the radio equipment connector and the safety plug-in connector with mechanical switchover.



2.5.2 Bluetooth connection

Optionally, the connection from the handheld radio/mobile to the hearing/speaking equipment can be made by a Bluetooth connection. The most recent recommendations of the Federal Office for Safety In Information Technology (BSI) for protective measures in the use of Bluetooth radio connections for the wireless connection of operating devices of digital BOS radio equipment must be able to be taken into consideration in the process.

2.6 Mass

The complete hearing/speaking set should not weigh more than 400 g.

2.7 Battery capacity for external supply

The battery capacity must be calculated in such a way that an eight-hour continuous operation of the hearing/speaking equipment is guaranteed.

3 Technical requirements

3.1 Measurement values of the hearing capsules

Measurements must be conducted in accordance with DIN EN 60268-7. The measurement of the coupler transfer dimension must be made with a 1/2" microphone from a distance of 1 cm.

Furthermore, the starting noise pressure level must be determined in accordance with DIN EN 352-6**.**

3.2 Measurement values of the microphones

Measurements must be conducted in accordance with DIN EN 60268-4.

3.2.1 Structure-borne noise microphones

When using structure-borne noise microphones these must be dimensioned in such a way that the microphone input level required by the radio equipment/mobile is emitted with the envisaged positioning of the microphone on the head of the speaker and with normal to slightly raised speech volume for attainment of the test amplitude.

3.3 Climatic test

The climatic test in the wet room is performed by running through a 24-hour temperature cycle between -20 °C and +70 °C seven times. The minimum values of the relative humidity should at the same time be 80 % at +20 °C and 90 % at +70 °C. The dew point must be passed through for a short time in each cycle.

3.4 Shock stress

The mechanical shock stress of the separate hearing/speaking set must be undertaken in accordance with DIN EN 60068-2-27. The following conditions apply:

Shock form:	Half sinus
Peak acceleration:	30 g
Shock duration:	11 ms

The 3 axes standing vertically to one another must each have 3 consecutive shocks performed in both directions (a total of 18 shocks). The functionality of the device must be verified before and after complete shock stress.

3.5 Protection class

The hearing/speaking set must fulfil the requirements of protection class IP 54 in accordance with DIN EN 60529 in its idle state.

3.6 Saliva and sweat resistance

The hearing/speaking set must be resistant to saliva and sweat.

3.7 Combustion behaviour

All visible materials of the hearing/speaking set must be permanently executed with low flammability in accordance with EN 352[10]. If combustible or thermally impactable materials are used, these must be safely covered with permanently low-flammability materials.

[10] Proof by factory certificate

Respirator mask

1 General

The respirator mask must be able to be worn with a ballistic helmet. It must protect the eyes and the respiratory organs of the wearer from irritants and toxins in conjunction with a filter. It must be possible to communicate via the hearing/speaking set when the respirator mask, including filters, is being worn.

An ambient atmosphere of at least 17 Vol.-% oxygen and ambient pressure of 1 (+0.2/-0.3) bar are pre-requisites for the use of the ambient air-dependent respirator mask.

The respirator mask must at least satisfy the following minimum requirements.

2 Constructional requirements

The respirator mask (single panel full mask or dual panel mask) must conform to the safety requirements of the generally recognised engineering practice or the state of the art. The applicable requirements of DIN EN 136 must be fulfilled.

2.1 Configuration/execution

The respirator mask must

- guarantee a perfect sealed fit when wearing the helmet under operating conditions; a further mask unit must be offered for very narrow faces
- offer sufficient wearing comfort; it must be able to be worn under the ballistic helmet for at least one hour without pain or pressure
- have a knuckle thread (approx 40 thread, DIN EN 148-1) or a plug connection for the connection of a breathing filter
- enable the wearing of pertaining mask correction spectacles
- enable the use of a hearing/speaking set

The respirator mask should be configured in such a way that the helmet visor can be completely lowered and does not come into contact with the visor, even when the wearer moves.

A pocket (or a container) must be offered for the respirator mask which can be carried on the equipment belt (breadth: according to the manufacturer's specifications) and/or on its own strap-on device.

2.2 Mass

The respirator mask without a filter may not exceed 700 g in weight.

2.3 Filters

Only breathing filters in accordance with DIN EN 141 or the Technical Supply Conditions of the German Armed Forces 4240-0017 must be used. These should at least be combination filters of gas filter class 2 and particle filter class 3.

The filter must be executed in a weather- and light-resistant manner, either in black in accordance with RAL 9004 or in accordance with the principal's specifications.

3 Technical requirements

3.1 Labelling

The respirator mask must be labelled in accordance with DIN EN 136. Furthermore, individual labelling (e.g. via laser, bar code or chip, on which specific data can be saved for maintenance too) must be possible.

3.2 Long-term behaviour

With storage under normal conditions[11] in the supplied transportation container a lifespan of at least 15 years is expected for the respirator mask[12]. The maintenance periods for full masks must be taken into consideration in accordance with BGR 190.

3.3 Testing of respirator mask

The respirator mask must be tested in accordance with DIN EN 136.

In the tests in accordance with DIN EN 136, Section 8.16 and 8.18 riot gear with a protective vest must be worn by the respective testing personnel.

Furthermore, the respirator mask with a breathing filter and helmet must be subjected to a test in accordance with No. 3.3, Combustion Behaviour, in the ‘Helmet, visor/facial protection’ section.

3.4 Testing of breathing filter

The testing of the breathing filter must be performed with the respirator mask and protective helmet in accordance with No. 3.5, Combustion Behaviour, in the ‘protective helmet’ section.

[11] Storage in a clean and dry condition. The storeroom must be cool, frost-free, dry, free from pollutants and protected from light and heat radiation.
[12] Proof by factory certificate

Appendix

Addresses of the testing authorities

Testing of bullet resistance:

By a testing authority of the Association of Test Centres for attack-resistant materials and constructions (VPAM)

Internet: www.vpam.eu

Testing of shock absorption and combustion behaviour of the helmet:

DEKRA EXAM GmbH
Am Technologiepark 1
45307 Essen

Tel.: +49 (0) 201 52319-410
Fax: +49 (0) 201 52319-401
E-Mail: gert.mueller@dekra.com
Internet: www.wde.bg-exam.de

Expert committee 'Personal protective equipment', testing and certification agency in the BG-PRÜFZERT, Centre for Safety Technology of the Professional Association of the Construction Industry
Arbeitsschutzzentrum Haan
Zwengenberger Straße 68 D-
42781 Haan

Tel.: 49(0)2129 576-431
Fax: 49(0)2129 576-400
E-Mail: psa-zs@bgbau.de

Testing of ear protection:

PZT GmbH
An der Junkerei 48 F
D-26389 Wilhelmshaven

Tel.: +49 (0) 44 21) 7 03 40
Fax: +49 (0) 44 21) 7 04 21
E-Mail: office@pzt-lab.de
Internet: http://www.pzt-lab.de

Defence Agency for Weapons and Ammunition
GF 630 Acoustics, Noise Measuring Point 1 of the German Armed Forces
Postfach 1764
49707 Meppen

Tel.: +49 (0)5931 43-0 (Vermittlung)
E-Mail: wtd91@bwb.org
Internet: http://www.bwb.org

Testing of hearing/speaking set:

PZT GmbH
An der Junkerei 48 F
D-26389 Wilhelmshaven

Tel.: +49 (0) 44 21) 7 03 40
Fax: +49 (0) 44 21) 7 04 21
E-Mail: office@pzt-lab.de
Internet: http://www.pzt-lab.de

Testing of respirator mask and chemical behaviour of the helmet:

DEKRA EXAM GmbH Am Technologiepark 1 45307
Essen

Tel.: +49 (0) 201 52319-411
Fax: +49 (0) 201 52319-401
E-Mail: michael.siebrecht@dekra.com
Internet: www.wde.bg-exam.de