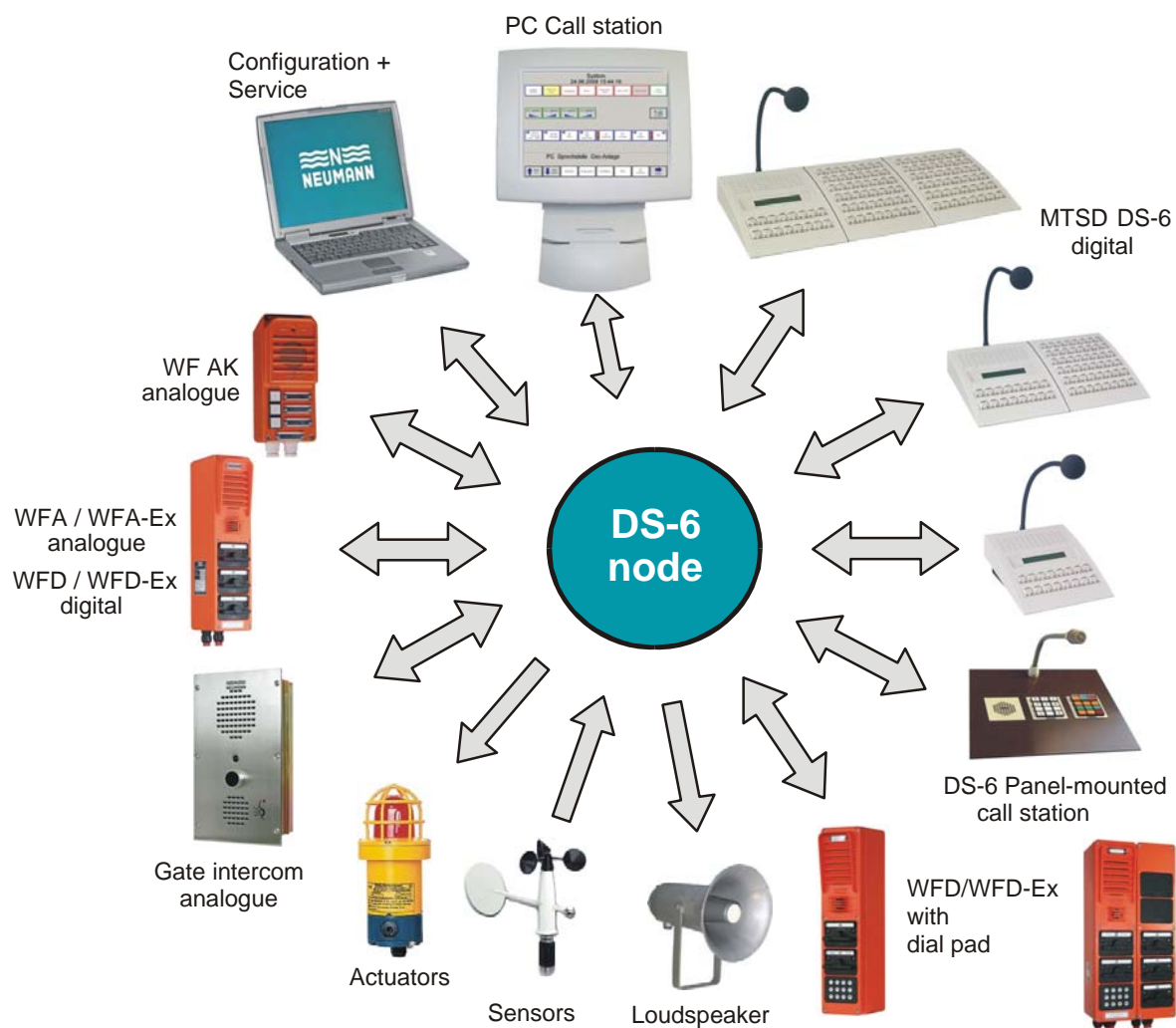


Cabling recommendations for DS-6 intercom and PA/GA systems



PREFACE

*The cabling recommendations from ms Neumann Elektronik refer to the current generally applicable standards.
Furthermore, company specific regulations and guidelines from regional standards have to be considered.*

Contents

1. General
2. Applicable standards and documents
3. Cabling scheme
4. Cables for call stations
 - 4.1 Basic characteristics of the installation cables to use
 - 4.1.1 Installation instructions
 - 4.2 Terms and cable construction according to DIN VDE 0815 and DIN VDE 0816
 - 4.2.1 Wire
 - 4.2.2 Pair
 - 4.2.3 Star quad
 - 4.2.4 Basic bundle with star quad
 - 4.2.5 Bundle with pairs
 - 4.3 Installation cables for applications within a building according to DIN VDE 0815
 - 4.4 Installation cables for outdoor applications according to DIN VDE 0816
 - 4.5 Installation cables with reinforcement according to EN 60079-14
 - 4.6 Structured cabling in IP networks
5. Cable for loudspeakers
 - 5.1 Maximum cable length with 10% voltage loss (-1dB) at telecommunication lines
 - 5.2 Maximum cable length with 10% voltage loss (-1dB) at power lines

1. General

Cabling of DS-6 systems from ms Neumann Elektronik is an important part of our safety concept. By using standardised cables with the same line quality and line condition, statements concerning the distances and the transmission characteristics can be made. Outside of the netnode, normal telecommunication cables are required for analogue and digital ISDN terminals as well as for modem transmission lines. IP terminals are strictly connected to the netnode according to the standard "structured cabling EN 50173".

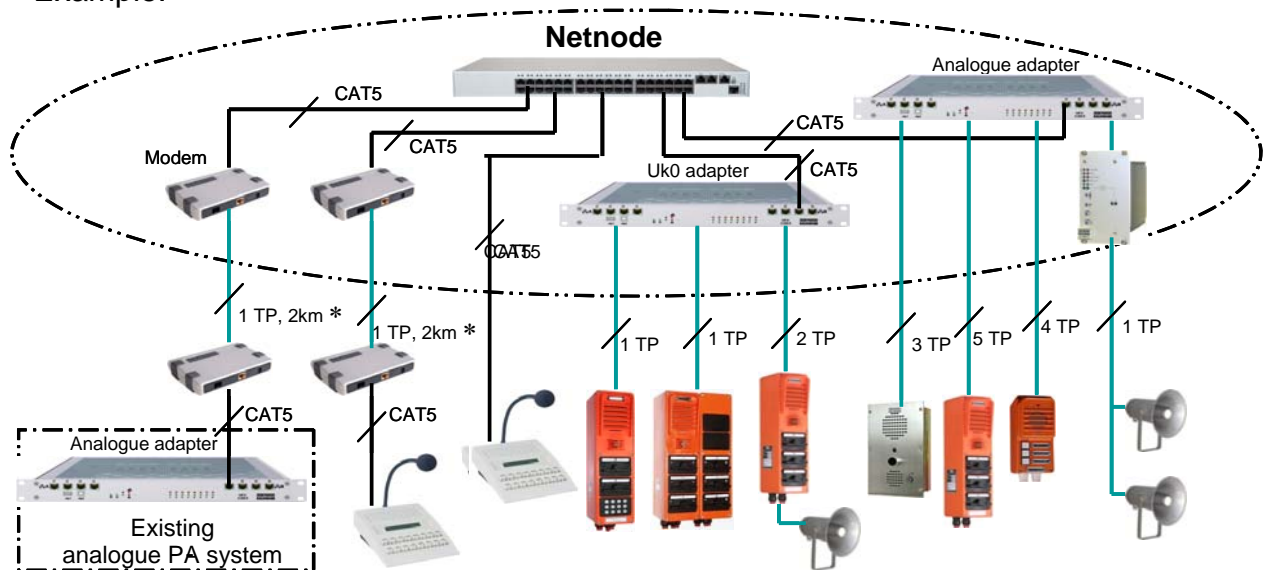
2. Applicable standards and documents

- ms Neumann Elektronik document No. 033 0009 999
Distances of the call stations from ms Neumann Elektronik
- VDE 0100 respectively IEC 364
Erection of power installations with nominal voltages up to 1000 V
- VDE 0165 respectively EN 60079-14
Electrical installations in hazardous areas
- IEC / EN 60079-....Ex-protection classes
- VDE 0800 respectively EN 50310
Telecommunications
- VDE 0815 respectively DIN EN 50441
Wiring cables for telecommunication and data processing systems
- VDE 0816
External cables for telecommunication systems
- DIN EN 50173 and ISO/IEC 11801 and EIA/TIA 568
Structured cabling
- DIN 15905-2
Electro-acoustics used for theatre stages and for multi-purpose halls
Wiring systems for sound purposes

3. Cabling scheme

To get the maximum safety and availability of the DS-6 systems from ms Neumann Elektronik, the terminals and loudspeakers are connected to the different netnodes by the shortest route. Generally, the power supply of the terminals is provided by the netnodes.

Example:



TP= Twisted Pair

* 2 TP for longer distances

The number of wires for analogue call stations results as follows:

- 2 wires for a/b
- 2 wires for power supply
- 1...6 wires for lines

For a call station with 6 lines, 10 wires respectively 5 TP are required.

The number of wires for digital call stations with Uk0 interfaces results as follows:

- 2 wires for data transmission with phantom power
- 2 additional wires for the power supply of an additional amplifier

4. Cables and distances for call stations according to the drawing No. 033 0009 999

4.1 Basic characteristics of the installation cables to use

- copper wires optional 0,4 - 0,6 - 0,8 - 0,9 mm Ø
- twisted pair wires or star quad stranding
- shielding of the whole cable (aluminium foil)

4.1.1 Installation instructions

Cables for terminals outside of the netnode must not be laid directly beside high voltage cables, power cables or cables with a high HF rate.

4.2 Terms and cable constructions according to DIN VDE 0815 and DIN VDE 0816

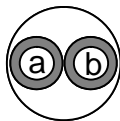
4.2.1 Wire

A wire is a copper conductor with insulating cover.



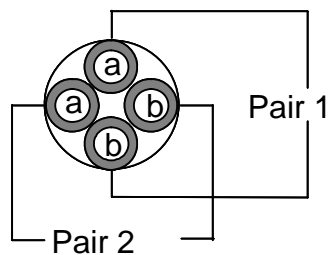
4.2.2 Pair

A pair consists of two stranded wires building a loop.



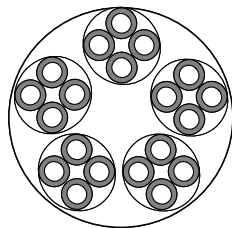
4.2.3 Star quad

A star quad consists of 4 stranded wires, of which in each case two diametrically opposing wires loop (pair). One pair is also named as twisted pair (TP).



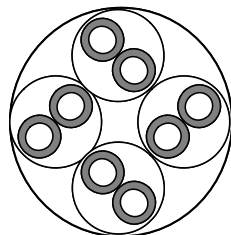
4.2.4 Basic bundle with star quad

One basic bundle consists of 5 combined star quads.



4.2.5 Bundle with pairs

One bundle with pairs consists of 4 combined pairs.



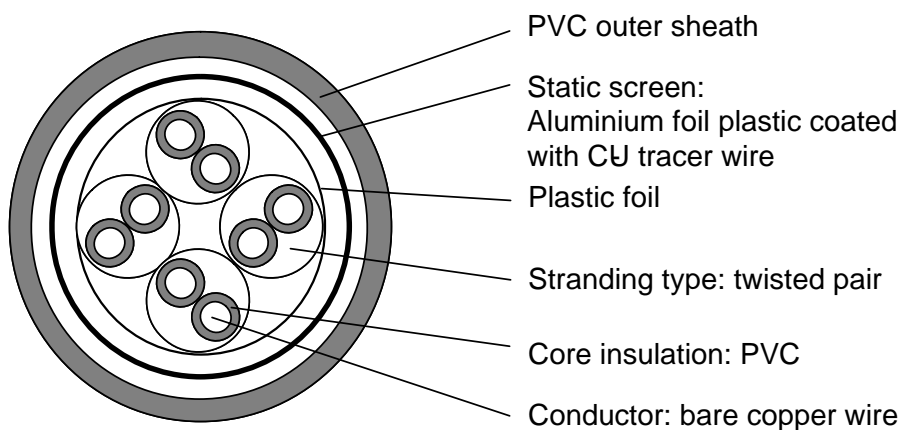
4.3 Installation cables for applications within a building according to DIN VDE 0815

Example: J-Y(ST)Y 4x2x0,8

- J Installation cable
- Y PVC insulating cover
- (ST) static screen
- 4x2x08: 4 pair each 2x0,8 mm

Cables for fire protected areas have to be halogen-free.

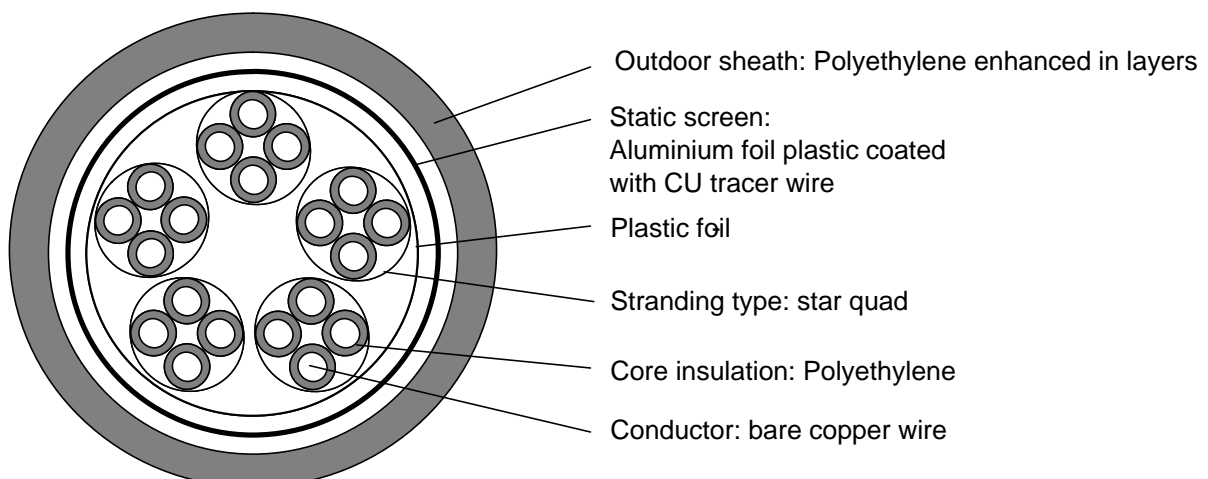
In case of fire, the duration of functional integrity of electrical cable systems has to be at least 30 minutes (E30). This applies to systems for alerting and giving instructions to visitors and employees, if these systems have to be active in case of fire.



4.4. Installation cables for outdoor applications according to DIN VDE 0816

Example: A-2Y(L)2Y 5x4x0,8

- A Outdoor cable
- 2Y PE insulating cover
- (4) Layer coat
- 5x2x08: 5 star quads each 2x0,8 mm



4.5 Installation cables with reinforcement according to EN 60079-14

Example: **A-2YYBC 8x2x0,8 LG**

A	Outdoor cable
2Y	PE insulating cover
Y	PVC insulating cover
B	Reinforcement
C	Protective coating of jute and viscous mass
8x2x08:	8 pairs each 2x0,8 mm
LG	Stranding in layers

In heavy environments it is required to use cables with reinforcement (EN 60079-14).

The reinforcement is used for an increased protection, but it can also be used simultaneously as shielding.

A potential equalisation by the reinforcement must not be carried out.

That means that the reinforcement as electrical shield may only be connected to earth on one side. The reinforcement ends at the call station in a plastic screw.

4.6 Structured cabling in IP networks

DS-6 systems from ms Neumann Elektronik are designed for the use of IP networks. All IP terminal connections meet the regulations of structured cabling according to DIN EN 50173 Class D.

Class D = Standard designation for symmetrical copper cabling up to 100MHz operating frequency

CAT5 = Twisted Pair cable Class D

The maximum cable length between a switch in the netnode and the terminal must not exceed 100 m. If longer distances should be bridged, modems are used, which allows distances up to 2000 m by a normal 2-wire telecommunication cable. FO modems can also be used for bridging distances, of course.

For further information concerning spacious cabling, please see the standard DIN EN 50173.

Example indication of the manufacturer for CAT5 installation cable:

4x2x AWG 24 SF-UTP CAT5e 100 MHz

suitable for structured building cabling

4x2 4 twisted pairs

AWG24 Wire diameter 0,5mm

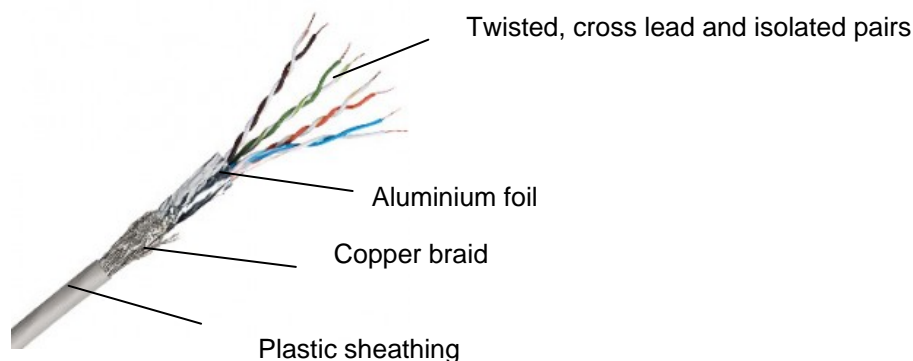
(AWG = Coding for bare CU wire derived from inch size.)

SF Braid and foil screen as overall screen

UTP Unshielded Twisted Pair

CAT5e Category 5 guarantees 100 MHz

Fig. CAT5 installation cable



5. Cables for loudspeakers

Our PA concepts base in the power range on the 100 V transmission technology. In case of using and cabling of the 100 V loudspeaker cables the standard DIN VDE 0800 is applicable. Basically, telecommunication cables should be used for cabling of the loudspeakers. We recommend use of shielded twisted pairs. The following wire diameters are used: 0,6 mm, 0,8 mm and 0,9 mm.

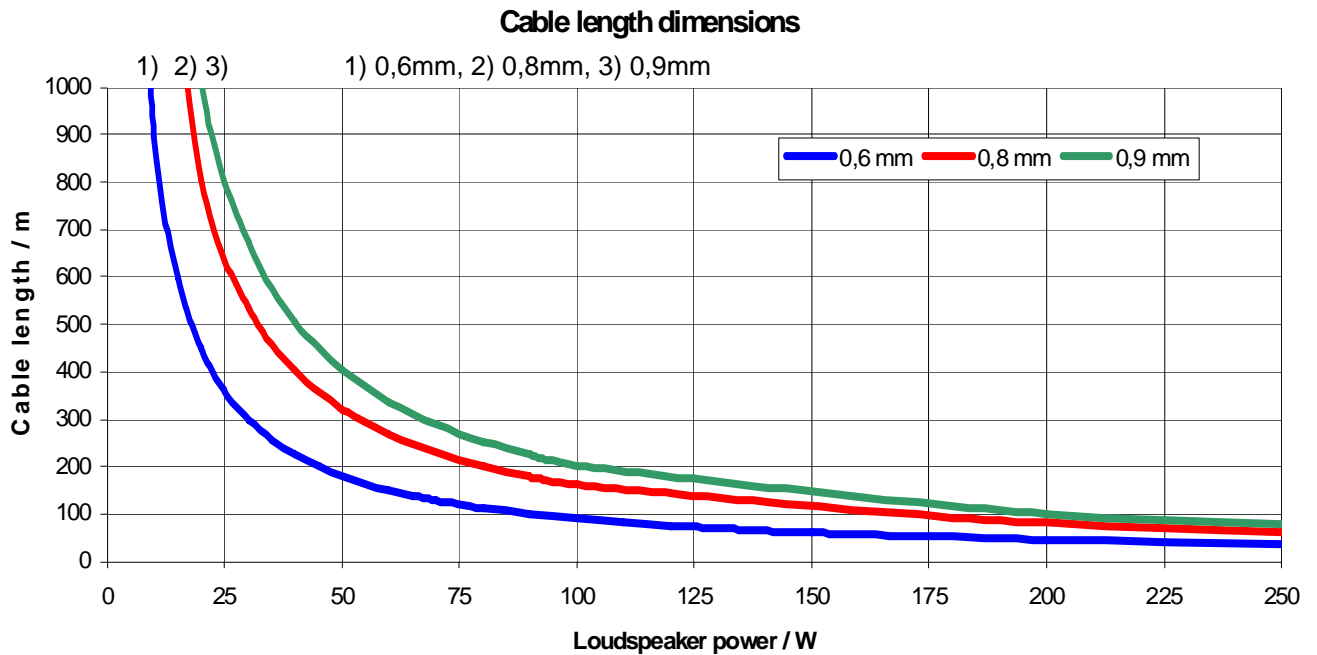
Here, a sufficient proof voltage is important. Also a sufficient wire size shall be provided. If systems are used for alerting purposes, the attenuation must not be audible. Therefore, the wire sizes are calculated so that the voltage losses are then 10% (recommendation of ZVEI, see also standard DIN 15905-2).

If a telecommunication cable is used as a loudspeaker line, all other wire pairs must not be used for other types of communication like e.g. telephony or audio signal transmitting.

In case of higher power, power lines can also be used. But the cable must not contain a green yellow wire (protective earth).

The wires should be pair-twisted so that high crosstalk attenuation can be achieved. Independently of these recommendations, the legal specifications and standards have to be considered in the operation area.

5.1 Maximum cable length with 10% voltage loss (-1dB) at telecommunication lines



5.2 Maximum cable length with 10% voltage loss (-1dB) at power lines

- 4) — 1,5 mm²
- 5) — 2,5 mm²
- 6) — 4 mm²
- - - max. distance for loudspeaker impedance measurement: 1000 m

