

Designing a PA system

100 V line technique simplifies entry into the field of PA applications

It is not quite easy to understand the concept of Public Address. Basically, you have 2 components, special 100 V speakers and respective amplifiers. You simply add up the power ratings (watts) of all connected speakers and select an amplifier which provides at least that amount of power in watts. You can use thin cables and connect speakers over large distances with the same connection without risk of line loss and performance loss.

1. Analyze what the user of the system wants. What do they want now and how much potential for later expansion of the system is required? Discuss with the system's user if the PA system has to grow with the object or if it has to be louder certain areas, e.g. near to a motorized machine in the workshop or manufacturing facility or when the hall is packed. An open conversation with the user about day-to-day operation is absolutely necessary. Only users or Public system operators know how loud the surroundings and other conditions are.

Important rule: The sound from the PA system reaching the ear should be 10 dB louder than the environment volume. Thus, the PA signal clearly stands out from the ambient noise.

Second step: defining the zones

Though zones in PA applications are not always the same as rooms, they often are: dining room A, dining room B, function room, restroom area, outdoor area A. There is no rule as to how many square metres a zone should have. As installer and planner you should walk through the rooms methodically and write down individual zones. This only works with the future user. You get the most accurate impression while the room is used under real conditions. If that is not possible, it is worth asking more detailed questions:

- Is the room always used in the same way or does it have to be versatile?
- Are announcements, i.e. speech transmissions, planned?
- Which audio sources are planned? CD, MP3, USB; SD/MMC cards, Internet radio, DAB+ or FM radio?

Zones vary basically due to their requirements. Reasons for using several smaller zones instead of one big zone could be:

- The basic volume in operation without PA application varies: are some areas louder than others?
- The type of PA application: is music supposed to be noticeable or unobtrusive?
- Different audio signals in different areas or selective announcements in different areas
- Acoustics within a zone

Third step: calculate the amplifier's power rating and determine which accessories are required

Everything in a room causes a sound reduction and 'swallows' energy, including customers. Therefore, you have to decide how much power is required on a case-by-case basis.

Given volume conditions are relevant to determine the amplifier's power rating. Here are some basics on this

topic: the sound pressure of a loudspeaker in decibels is measured at 1 Watt at a distance of 1 metre. To be more precise, the speaker gets 1 watt power via the amplifier and at a distance of 1 metre a sound level meter measures the sound pressure.

For example, if the speaker gets 1 watt of the amplifier, it will produce a sound pressure of 90 dB at a distance of 1 metre. It is supposed to be louder?

Raising the volume by 3 dB doubles the power requirement.

That means in this case you need 2 watts for 93 dB and for 96 dB 4 watts per speaker are required. We recommend planning amplifiers with power reserves in case you or the users wish to expand the PA system sometime in the future.

By the way, you do not have to measure the sound pressure of our speakers. We already did that for you.

Attention: sound pressure drops at bigger distances to the speaker

Each time the distance to the speaker is doubled, volume decreases by 6 dB. For example, at a distance of 1 metre the speaker provides 96 dB. At a distance of precisely 2 metres you can hear a sound pressure of 90 dB, at 4 metres 84 dB. That way you can estimate the volume which is required for guests who are farther from the sound source. To determine how close to the speakers, guests are in different parts of the property can give guidance when you distribute speakers.

Our example shows 2 standard PA scenarios

Even though requirements are individual, in some fields you can still rely on similar basic conditions. Typical fields are retail as well as educational establishments and workplaces.



Planning a PA system in retail

Whether it is a supermarket, DIY store, boutique, shop or gas station, planners and installers have to take especially the size of each store into account. However, there are some overall requirements all kinds of retail have in common:

- **Pleasant, usually rather calm background music;** ceiling speakers are particularly adequate for this purpose. Stereo sound would be unsuitable as people move around inside the building and stereo sound from different directions would be pointless.
- **The option to make announcements via microphone anytime,** in one or several places and with easy-to-use hardware
- Ball speakers which direct the sound downwards are suitable **for very large rooms with high ceilings**
- **Different speaker zones,** which can be controlled independently
- **The option for automated, timed and recurrent advertising announcements and informative announcements;** for users, you can integrate this feature comfortably via a message and timer insertion

Planning a PA system for educational establishments and workplaces

In this area music is irrelevant, speech intelligibility has priority.

- **High speech quality** and clearly understandable announcements can be achieved with full range speakers
- Is the room very big, e.g. a **lecture hall or a conference hall**? Then column speakers are the right choice, as they provide very dynamic and detailed sound for speech and music.
- Do you need **more bass**? Use an additional subwoofer.

Certainly, there are even more things to consider regarding PA systems. However, we hope this practical knowledge inspires some ideas on how you can implement future projects even better and more efficient.