Signaling and Alarm Guide
FOR PLANT SAFETY

Pfannenberg
ELECTRO-TECHNOLOGY FOR INDUSTRY

Safety Stats

x 800k

The International Labor Organization estimates 800,000 workers every day suffer a work-related accident (worldwide)

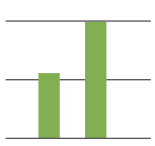
Costs to business from accidents is 4% of GDP

4% GDP

Audible and Visual Alarms

TYPICAL SOUND LEVELS (dBA)	
140:	Threshold of Pain
130:	Jet Taking Off (200 feet away)
120:	Operating Heavy Equipment
110:	Night Club (with music)
100:	Construction Site
90:	Boiler Room
80:	Freight Train (100 feet away)
70:	Classroom Chatter
60:	Conversation (3 feet away)
50:	Urban Residence
40:	Soft Whisper (5 feet away)
30:	North Rim of Grand Canyon
20:	Silent Study Room
10	
0:	Threshold of Hearing (1000 Hz)

Noise



Audible signals should be
6 – 10 decibels ABOVE
ambient noise levels to be clearly heard.

Other factors to consider when designing an audio signaling system:

- Are employees wearing ear protection?
- Does the ambient noise increase and decrease naturally?

Light Intensity

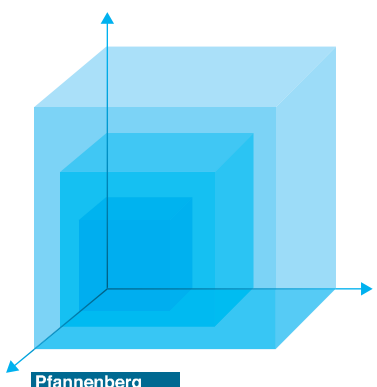
Depending on the respective light source and the various lens colors, different percentages of light will penetrate through.

Color	Filament Lamp	Halogen Lamp	Xenon Lamp
Clear	100%	100%	100%
Yellow	95%	94%	93%
Amber	70%	70%	70%
Red	17%	27%	23%
Green	12%	15%	25%
Blue	15%	20%	24%

The reduction in light intensity must be taken into consideration when selecting the right signaling device.

Due to the narrow spectrum of LED light sources, only a small reduction in the light is to be expected when the color of the lens corresponds with the color of the LED.

3D Coverage
NEW STANDARD



Pfannenberg's 3D-Coverage makes the design and development of signaling solutions easier and more reliable. It focuses on effective performance in a given space rather than on nominal output.

- Defining requirements
- Taking environmental conditions into account
- Comparing product information
- Ensuring optimal sizing

Pfannenberg 3D COVERAGE

Pfannenberg
ELECTRO-TECHNOLOGY FOR INDUSTRY
Protecting Man, Machine and the Environment

Typical Signal Applications

- MACHINERY STARTUP ALARM
- HEAVY EQUIPMENT MOVEMENT ALARM
- PROCESS UPSET
- EVACUATION ALARM
- HAZARDOUS EVENT
- SEVERE WEATHER

Signal Colors

The alarm color can indicate different situations.

RED: EMERGENCY
Message: Danger/Act immediately/ Urgent rescue or protection measure
Example: Acute health risk/ Machine or process critical error/ Maximum tolerance exceeded

GREEN: NORMAL
Message: Normal status/No danger/ Return to normal process
Example: Process is running

YELLOW/AMBER: ABNORMAL
Message: Attention required/ Act if necessary
Example: Moving vehicle or machine/ Corrective action needed on a machine/ Health hazard

BLUE: SPECIFIED MEANING
Message: Action/Protection/ Extraordinary attention/ Safety-relevant regulation
Example: Toxic gas leak (ammonia)

Alarm System Effectiveness

3 factors that compromise alarm system effectiveness:

1. Original manufacturer-specified audible alarms may not perform adequately in a given plant environment
2. Alarm "flood" and confusion (close proximity of multiple pieces of equipment)
3. Improper personnel training and/or poor alarm design; operators must be trained to know what the alarms mean

Planning a Signaling Solution

Planning a signaling solution must factor in the following:

- ✔ Considering the environmental conditions is CRUCIAL – noise and light level, coverage area
- ✔ Where are people situated?
- ✔ What influences and risks are they exposed to?
- ✔ What are the features of the building?

A Robust Signaling System

A robust signaling system has the following:

- Consistent signal characteristics throughout the plant
- Ability to easily add new signals based on changing conditions in the plant (e.g., new equipment)
- Stages and tones adapted to different events