

## Safety

In the European cable market the safety aspect of cable are covered by basically three different aspects of a cable:

- Reaction to fire
- Smoke density in case of a fire
- Halogen acid gas content and degree of acidity of gases

The goal is to develop and produce cables which are not only flame retardant but also do not generate dense, obscuring smoke and toxic or corrosive gases.

To express that safety aspects are covered, many different expressions are used in the cable industry.

See the overview of terms used in the EMEA industry. It also gives an indication which safety aspects are covered by the expression.

	Reaction to fire	Smoke density	Halogen content
LSZH		v	v
LS0H (also LSOH)		v	v
NHFR	v		v
HFFR	v		v
FRNC	v		v
FRLS	v	v	
HFFR-LS	v	v	v
LSNH		v	v

- The ones highlighted in yellow are used in the Belden EMEA datasheets covering the different segments.

“LS” = indicates that low smoke materials are applied in the cable.

“ZH, OH, OH, NH, HF or NC” = indicates that materials are applied which are halogen free.

“FR” = indicates that materials are applied to improve the reaction to fire.

Below an example how safety aspects are covered in a Belden EMEA datasheet:

	Testing standard	Result	Description / Value
Reaction to fire	IEC 60332-1	Pass	
Smoke density	IEC 61034-2	Pass	
Halogen acid gas content	IEC 60754-1	Pass	Zero
Degree of acidity of gases	IEC 60754-2	Pass	Min. 4.3 pH
	IEC 60754-2	Pass	Max. 10 µS/mm

“Reaction to fire” and “Smoke density” are both tests done on a cable.  
“Halogen acid gas content” and “degree of acidity of gases” are material tests.

From the overview it is clear that in most cases the used expression covers only two of the safety aspects.

It is also clear that by using of the mentioned expression a cable manufacturer wants to point out that safety aspects are taken care off.

The technical datasheet gives the exact evidence which safety aspects are covered.

Please notice that claiming that the cable passes IEC 60754-1 and IEC 60754-2 means that all the used materials in the cable pass this test and not only the jacket! Please notice that claiming that an LSZH jacket material is used does not imply that this cable will pass a reaction to fire test or the smoke test. The construction of the cable determines if the claimed reaction to fire test or the claimed smoke test can be passed.

So, the terms give a good indication that the cables are suitable for use in residential, commercial, transit, shipboard, military and other confined-space applications. Only the technical datasheet gives an exact indication which of the three safety aspects is covered and which standards are met.

In EMEA two other safety aspects are used as well.

- Resistance to fire (circuit integrity) of the cable
- Toxicity of the materials used in the cable

Both aspect are not covered by above terms.

In EMEA materials should be

- RoHS compliant
- REACH compliant