

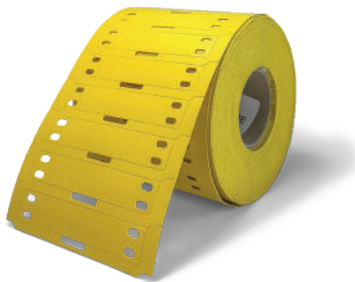


CMZH

Low smoke 0-halogen flame-retardant mass transit marker

TECHNICAL DATA SHEET

Revision Number. 1.5
Last Edited 11. maj 2023



The CMZH all-in-one cable markers are made of halogen-free, flame retardant and low smoke polyolefin extruded flatband with ideal printability properties for identification purposes.

Ideal for applications where limited fire hazard and low smoke characteristics are required.

The zero-halogen material coupled with low smoke and low toxic fume emissions makes this product ideal in enclosed spaces such as mass transit, marine and industrial installations.

The compound is excluded for halogens and offers excellent low fire hazard characteristics combined with minimal smoke emission.

The CMZH material is classified with EN45545-2 Class HL3 requirement set R22 (interior) and R23 (exterior) and can be used without any restrictions for any mass transit application including R24 for Printed circuit boards.

Industry



Industry



Marine



Wind power



Commercial



Aerospace



Construction



Railway



Military



Electrical installations

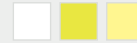


Petrochemical



Telecom

STANDARD COLORS



OTHER COLORS ON REQUEST



MATERIAL

Extruded flat band polyolefin.

OPERATING TEMPERATURE

-55°C up to +105°C
(-67°F to 221°F)

COMPLIANCES

Mark Permanence:
SAE AS-5942

Print Resistance to solvents:

MIL-STD-202

Test method 215

RECOMMENDED BLACK RIBBON

FTI-X - FTI-HXX

ALTERNATIVE BLACK RIBBON

FTI-HX

INDUSTRY STANDARDS

EN45545-2 Class HL3 R22-23-R24
NF F 16-101

London Underground

1-085 A3

BOEING BSS 7239

UNI CEI 11170-3 (LR4)

DIN 5510-2

BS6853: 1999 vehicle category 1a

FLAMMABILITY STANDARD

EN45545-2

STORAGE

Cool and dry in original packaging. Recommended temperature at +10°C to +25°C and 45-55% relative humidity. Use within 2 years from date of manufacture.

APPLICATIONS

Specifically developed to be used in rail, aerospace, marine, industrial marking, wire and cable bundling.

This information and data is believed to be accurate and reliable. Although the information and recommendations set forth herein are presented in good faith and believed to be correct as of this date, Link Solutions makes no representations as to the completeness or accuracy thereof. We place at your disposal the technical information necessary for the correct use of our products. As conditions and methods of use are beyond our control, that the person receiving the same will make their own determination as to the suitability for their purpose. We reserve the right to modify characteristics with the aim of improving the product and adapting it to the requirements of the market.

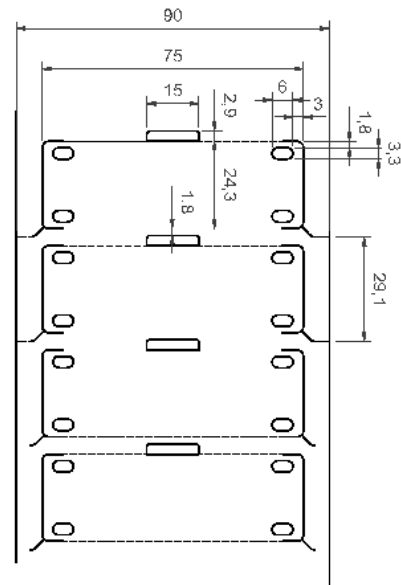
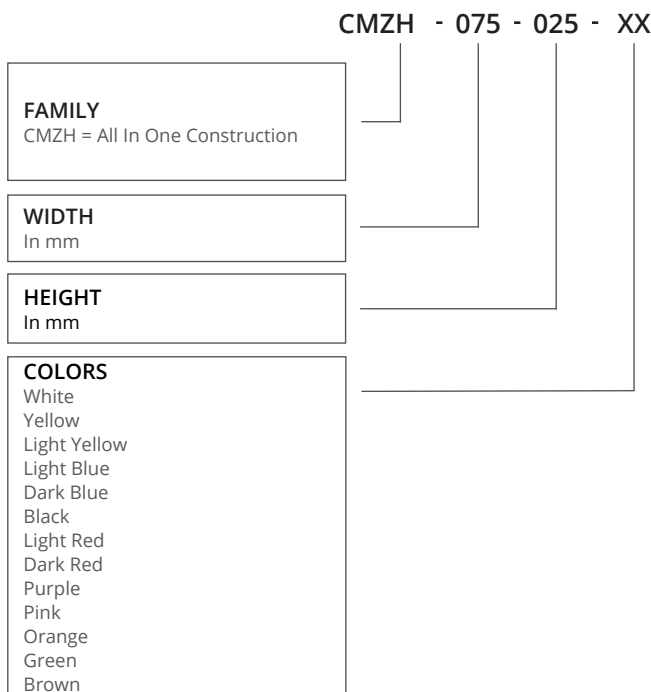
Ordering Example

DIMENSIONS

PART NUMBER	COLOUR	TEXT AREA DIMENSION	MATERIAL	QTY	UOM
CMZH-060x012-YW	Yellow	60x12mm	Polyolefin	1000	Roll
CMZH-075x015-YW	Yellow	75x15 mm	Polyolefin	1000	Roll
CMZH-075x25-YW	Yellow	75x25 mm	Polyolefin	500	Roll
CMZH-060x12-WE	White	60x12mm	Polyolefin	1000	Roll
CMZH-075x015-WE	White	75x15mm	Polyolefin	1000	Roll
CMZH-075x025-WE	White	75x25mm	Polyolefin	500	Roll

Product code

Drawing - Cable marker example 75x25



General Tests for Identification Products

PHYSICAL

PROPERTIES	TEST METHOD	TYPICAL VALUE
Tensile strength	ASTM D 638	10.0 N/mm ² .
Elongation at break	ASTM D 638	≥200%
Water absorption	ASTM D 570	≤ 0,15%
Specific gravity	ASTM D 792	1,40

ELECTRICAL

PROPERTIES	TEST METHOD	TYPICAL VALUE
Dielectric strength	ASTM D 149	20.0 kV/mm ²
Volume resistivity	ASTM D 257	≥ 10 ¹⁴ Ω/cm

CHEMICAL

PROPERTIES	TEST METHOD	TYPICAL VALUE
Chemical resistance	ASTM D 638 (24h @ 23°C ±2K)	Good - Pass
Copper corrosion	ASTM D 2671 B - 24 Hours @ 90%RH	No corrosion
Copper stability	N-A	N-A

THERMAL

PROPERTIES	TEST METHOD	TYPICAL VALUE
Heat shock 4 hours at 175°C	ASTM D 2671 - Internal method	No dripping, cracking or flowing
Heat aging 168 hours at 150°C	ASTM D 638	Elongation ≥ 100%
Flammability	ASTM D 635-HB	Pass » flame retardant
Low temperature flexibility / Bending	1h at - 55°C EN 60684-2 - Internal Method	No cracking, no break, no detachment of coating
Optical density of smoke (D _m)	ASTM E 662	Flaming mode 41 , non flaming mode 111
Smoke index	NF F 16-101	Smoke class F1

FIRE PROPAGATION COMPARISON

NORMATIVES	TOXICITY	LOW OXYGEN INDEX (LOI)	SMOKE DENSITY	FLAMMABILITY INDEX	CAPACITY OF FORMING DROPS
EN45545-2	HL3	HL3	HL3	-	-
NF F 16 101	-	-	Class F1	Class I4	-
BS 6853	1a	1a	1a	-	-
DIN 5510-2	Pass	-	SR2	-	ST1
NFPA130	Pass	-	Pass	-	-
UNI CEI 11170-3	LR4	LR4	-	LR4	-

Fire behavior standard classification for identification products

STANDARDS	CLASSIFICATION	USAGE
EN 45545-2 (R22:R23)	HL3	Unlimited Usage All Vehicles
BS6853	1a	Unlimited Usage All Vehicles
UNI CEI 11170-3	LR4	Unlimited Usage All Vehicles
DIN 5510-2	SR2, ST1	Usage Limited
NF F 16-101	F1 & I4	Usage Limited to External Vehicles
NFPA 130	-	Usage Permitted upon agreement with end user

Compliance on fire behavior for identification products

TEST METHOD

STANDARDS	FLAME PROPAGATION	TOXICITY	SMOKE DENSITY	LOW OXYGEN INDEX
BS6853		BS 6853 appendix B1 or NF X-70-100	BS 6853 D8.3	ISO 4589-2
NF F-16 101	NF EN 60-695-2	NF X 70-100	NF X 10-702-1 & 2	ISO 4589-2
NFPA130	ASTM E 162	BSS 7239	ASTM E 662	
EN 45545-2		NF X 70-100 600°C	EN ISO 5659-2	ISO 4589-2
DIN 5510-2	DIN 54837	DIN ISO 5510-2	DIN 54837	

Environmental UV stability

PROPERTIES	TEST METHOD	TYPICAL VALUE
UV-A	ASTM G154 - Machine setup Temp 50-60°C (140°F) Cycle 8 hours light 4 hours condensation UV wavelength 280-400nm Test duration 1000 hours of exposure.	Pass - No damage to the marker and print legible after 20 rubs in accordance with SAE AS 81531.

PROPERTIES	TEST METHOD	TYPICAL VALUE
UV-B	ASTM G154 - Machine setup Temp 50-60°C (140°F) Cycle 4 hours light @45°C & 4 hours condensation @45°C UV wavelength 200-400nm Test duration 1500 hours	Material meet set requirements from EN 60684-3-216 sheet in scope of tensile strength & elongation at break properties. Material do not crack. All colors obtained average ΔE value between $1 < \Delta E < 2$ that is mean color difference visible only by experienced operator.

Short description UV-B test method

Q.U.V accelerated weathering tester uses UV-B fluorescent lamps.

The chamber is equipped on the bottom with a vessel containing water. By means of a serpentine, the water can be heated.

The steam resulting, raises the humidity into the chamber close to 100%, whereas the cooling air entering on the two sides of the chamber, results in the condensation upon the surface of the specimens.

The machine can switch from light to dark simulating the day / night cycle. During the dark period, the condensation increases.

The presence of water onto the surface of the specimen brings an extradegradation due to an oxidative process of the polymer. This is a simulation of an outdoor application, where the dew may form onto the surface of the compound.

Requirements / Evaluation

PROPERTY	TEST METHOD	TYPICAL VALUE	REQUIREMENTS / EVALUATION
Tensile strength	EN 60684-1-19	Mpa	7
Elongation at break	EN 60684-1-19	%	200
Color	In-house	Delta E	0 < ΔE < 1 – not noticeable 1 < ΔE < 2 –noticeable only by experienced observer 2 < ΔE < 3,5 – noticeable also by not experienced observer 3,5 < ΔE < 5 – easily noticeable difference ΔE > 5 – impression of two different colors
Visual	-	-	No cracking

Results: All results are average values

TEST METHOD	INITIAL SAMPLE	AFTER 500 HOURS	AFTER 750 HOURS	AFTER 1000 HOURS	AFTER 1250 HOURS	AFTER 1500 HOURS	NOTES
Tensile Strength	Sample from lab	13,051	12,772	13,519	12,646	12,607	Material does not crack. No shape changes has been observed.
Elongation at break %	Sample from lab	362,200	333,716	329,862	336,109	340,614	Material does not crack. No shape changes has been observed.
Color changes Delta E	Sample from spectrophotometer	1,25	1,75	1,36	1,15	0,98	Average 1,30

Available Formats



FLAT BAND

Special shapes can be manufactured to your requirements

Single-sided format with print on one side



ALL-IN-ONE CONSTRUCTION

Single-sided format with print on one side

Related Standard Test Methods And Documents

Document	Description
ASTM D638	Tensile strength and ultimate elongation
ASTM D638	Heat ageing 168 hours at 150°C
ASTM D2671 heat shock (section 26-30), procedure b	Heat shock 4 hours at 175°C
ASTM D2671	Longitudinal change
ASTM D2671 (Section 79-80) ASTM D570	Water absorption. 2 % maximum
ASTM D149	Dielectric strength. 20 minimum
ASTM D2671B	Copper corrosion (Section 93 procedure A) damaged area of copper mirror,
EN 60684-2-36	Chemical resistance to selected fluids
ASTM D257	Volume resistivity
ASTM D 635-HB -	Flammability resistance - Fire propagation
ASTM D E 662	Optical density of smoke (D _m) measured in flaming mode and non flaming mode in single smoke chamber test.
ASTM D792 Method A	Specific gravity
Boeing BS 7239	Toxic gas generation M7. Gases produced for analysis are generated in a specified, calibrated smoke chamber during standard rate of smoke generation testing (ASTM E 662), in both flaming combustion and non-flaming pyrolytic decomposition test modes
BS EN ISO 4589-1: 1999 - Oxygen Index	Limited Oxygen Index- flammability hazard rating.Determination of burning behavior by oxygen index - part 2: ambient temperature test. 32% minimum
BS 6853 (1999) vehicle category 1a	Code of practice for fire precautions in the design and construction of passenger carrying trains
DIN 54837	DIN 54837 Testing of materials, small components and component sections for rail vehicles- determination of burning behaviour using a gas burner
DIN 5510-2	German railway normative related to fire protection on railway vehicles
ISO 5659-2: 2017	Optical density of smoke (D _m) measured in flaming mode and non flaming mode in single smoke chamber test.
EN45545-2	Railway applications. Rolling stock fire protection on railway vehicles. - Part 2 requirements for fire behavior of materials and components. Fire hazard class. 1,2 & 3 R22 (Interior) & R23 (exterior)
IEC 60684-2 - 14	Low temperature flexibility
London Underground Standard 1-085	Revision A3, Fire safety performance of materials
NF C 20-455	Fire hazard testing glowin/hot-wire based test methods. Glow-wire apparatus and common test procedure. Replaced by EN ISO 60695-2-11
NF F 16-101: 1988	Railway rolling stock fire behavior choice of materials rolling stock classification A1.
NF X 70-100: 1986	Fire tests analysis of pyrolysis and combustion gases tube furnace method
NF X 10-702-1/2	Determination of the opacity of smoke in a non-renewed atmosphere. The resulting density /time curve is used to calculate the smoke index
NF T 51-071: 1999	Oxygen index test. This test have been replaced by IEC 60695-2-11/EN 60965-2-11
MIL 202 Method 215	Resistance to-of solvents. Test methods for electronic and electrical component parts
SAE AS5942;2014	Marking of insulation materials- Print permanence testing using the mechanical crockmeter
UNI CEI 11170-3 "Replaced"	Italian railway normative related to fire protection on railway vehicles. This standard has been replaced by EN 45545-2

Available grade material

PRODUCT GROUP	TUBE GRADE	CHARACTERISTICS	COMPLIANCES
CMZH	ZH	<p>The ZH material is made of halogen-free, flame retardant, polyolefin tubing with ideal printability properties for identification purposes. The compound of the tubing is excluded for halogens and offers excellent fire safety characteristics combined with minimal smoke emission. The material meet Boeing BS 7239 for toxic gas generation M7 specification-</p> <p>The ZH material is classified with EN45545-2 Class HL3 requirement set R22 (interior) and R23 (exterior) and be used without any restriction for any application.</p>	<p>EN 45545-2 HL3, R22/R23/R24 LUL 1-085 A3 compliant BS 6853 (1999) cat 1a DIN5510-2 UNI CEI 11170-3 NF F 16 101 ASTM E 662, BSS 7239 SAE 5942 MIL-STD-202 method 215</p>



Notes.