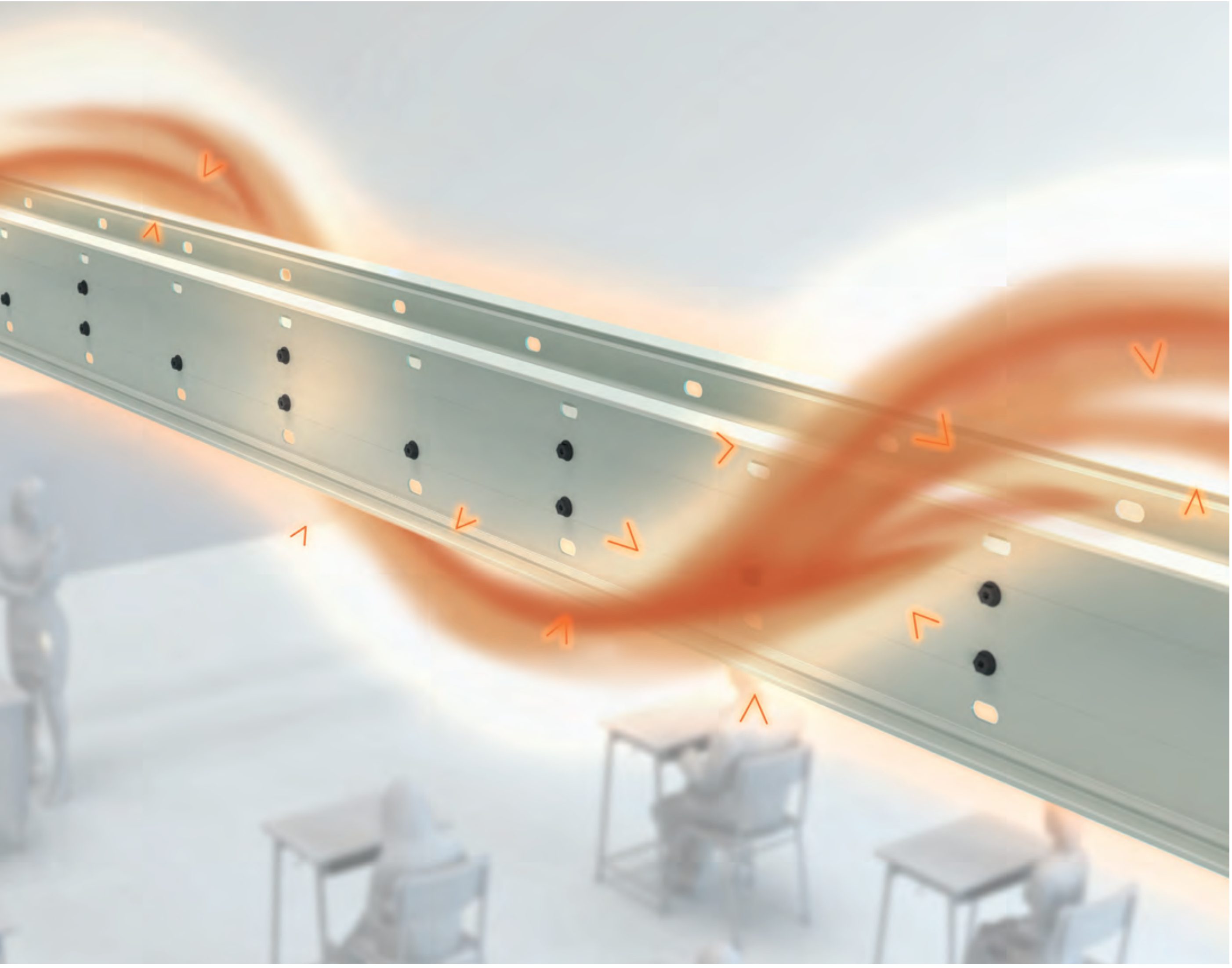
EAE
ELEKTRİK

E-LINE KX EMS

Magnetic Shielding Busbar Systems



www.eaeelectric.com

E-LINE KX-EMS

Please visit our website for the updated version of our catalogues.
www.eaeelectric.com

EAE
ELEKTRİK

CONTENTS

E-LINE KX-EMS

E-LINE KX EMS

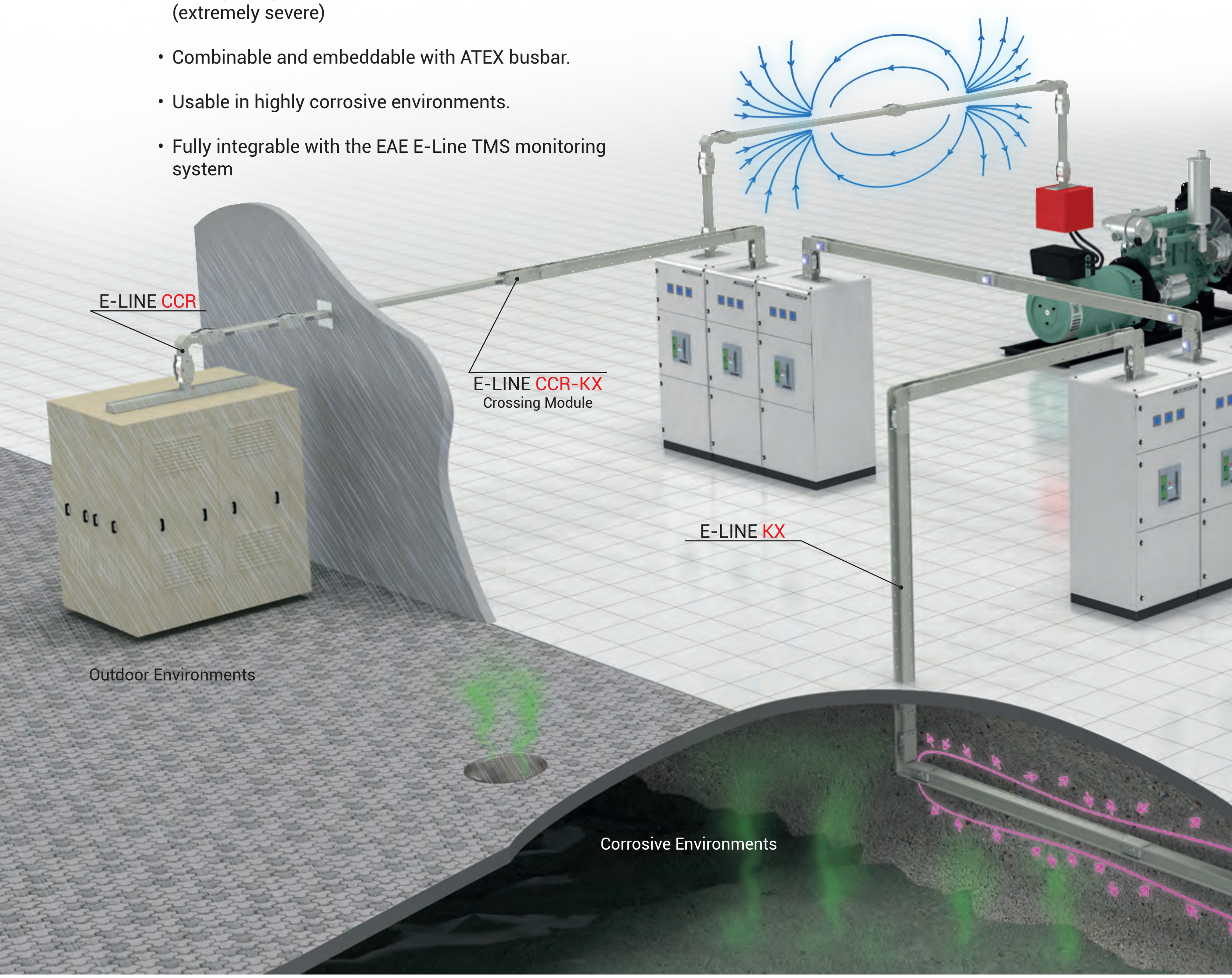
▶▶Introduction

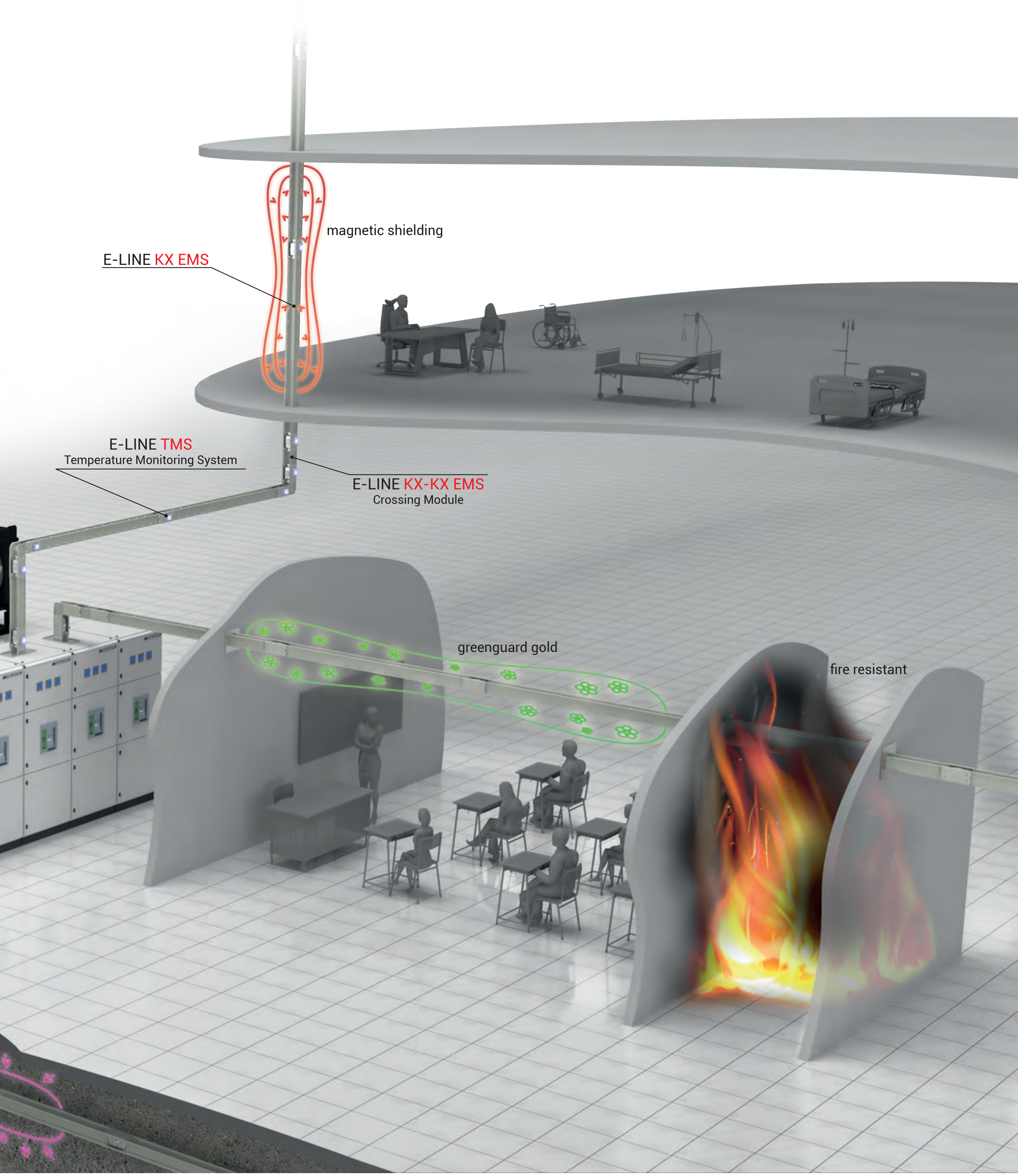
Traditionally, carrying high currents (transformer to switchboards, main distribution lines, power distribution for factories) was achieved using multiples of large cross-section cables in parallel.
In order to support these cables in the buildings, there were used a lot of cable trays, cable ladders, under-floor cable channels, etc.

Using “Busbars” in outdoor environments, educational institutions, healthcare, gallery transitions, chemical plants, harbour applications, tunnels instead of cables that are applied as mandatory offers many advantages.

A global busbar in a single solution:

- Combinable and embeddable with IP68 (full immersion in water): KX+CCR
- Dekra certified magnetic shielding: KX EMS
- Configurable as plug-in (plugs along the housing) and bolt-on (plugs on the joints): KX-P+KX-B
- Fireproof and totally fire resistant.
- Earthquake proof for seismic areas above zone 4 (extremely severe)
- Combinable and embeddable with ATEX busbar.
- Usable in highly corrosive environments.
- Fully integrable with the EAE E-Line TMS monitoring system




magnetic shielding
E-LINE KX EMS
E-LINE TMS
Temperature Monitoring System
E-LINE KX-KX EMS
Crossing Module
greenguard gold
fire resistant

E-LINE KX EMS

▶▶Technical Characteristics

Aluminium Conductor (Al)

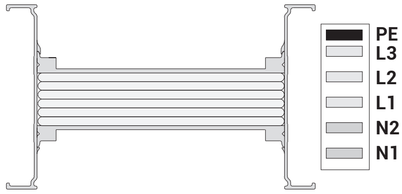
Standards	IEC 61439-6, TS EN 61439-6, IEC 61439-1, TS EN 61439-1										
Rated Isolation Voltage	Ui	V	1000	at Cat IV							
Max. Rated Operational Voltage	Ue	Vac	1000								
Rated Impulse Withstand Voltage	Uimp	kV	12								
Rated Frequency	f	Hz	50								
Pollution Degree	III										
Protection Degree	IP55 / IP65										
External Mechanical Impacts (IK Code)*	Bolt-on Busbar IK10+, Plug-in Busbar IK08										
Rated Current	**I n**	**A**	**400**	**500**	**630**	**800**	**1000**	**1000**	**1250**	**1350**	**1600**
Busbar Code			**04**	**05**	**06**	**08**	**11**	**10**	**12**	**14**	**16**
MAGNETIC FIELD IN THE VICINITY OF THE BTS AT 100 CM											
Axis A(+y)		μT	0,053	0,053	0,053	0,053	0,053	0,053	0,053	0,053	0,053
Axis C(x)		μT	0,068	0,068	0,068	0,068	0,068	0,068	0,068	0,068	0,068

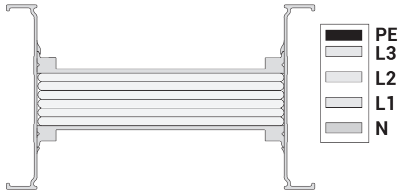
Copper Conductor (Cu)

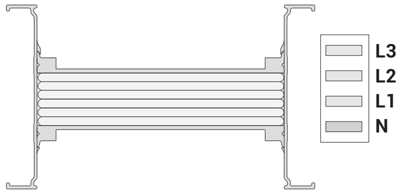
Standards	IEC 61439-6, TS EN 61439-6, IEC 61439-1, TS EN 61439-1							
Rated Isolation Voltage	Ui	V	1000	at Cat IV				
Max. Rated Operational Voltage	Ue	Vac	1000					
Rated Impulse Withstand Voltage	Uimp	kV	12					
Rated Frequency	f	Hz	50					
Pollution Degree	III							
Protection Degree	IP55 / IP65							
External Mechanical Impacts (IK Code)*	Bolt-on Busbar IK10+, Plug-in Busbar IK08							
Rated Current	**I n**	**A**	**550**	**650**	**800**	**1000**	**1250**	**1350**
Busbar Code			**05**	**06**	**08**	**10**	**12**	**14**
MAGNETIC FIELD IN THE VICINITY OF THE BTS AT 100 CM								
Axis A(+y)		μT	0,053	0,053	0,053	0,053	0,053	0,053
Axis C(x)		μT	0,074	0,074	0,074	0,074	0,074	0,074

* Duration 0,3 sec.

1600	2000	2000	2500	2500	2500	3200	3200	4000	4000	5000	6000
17	18	20	29	27	25	32	33	40	41	51	60
0,053	0,053	0,053	0,053	0,053	0,110	0,110	0,110	0,110	0,110	0,110	0,223
0,068	0,068	0,068	0,068	0,068	0,162	0,162	0,162	0,162	0,162	0,162	0,334





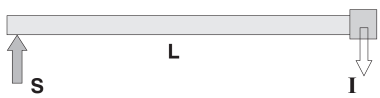


Voltage Drop Calculation
Generally Voltage drop of a busbar system can be calculated with the following formula.

1600	2000	2500	2000	2500	3300	3600	4000	5000	6300
17	23	25	22	27	32	36	40	50	63
0,053	0,053	0,053	0,148	0,148	0,148	0,148	0,148	0,148	0,151
0,074	0,074	0,074	0,258	0,258	0,258	0,258	0,258	0,258	0,315

$\Delta U = \sqrt{3}.L.I.(R\ .Cos\varphi + X\ .Sin\varphi)\ 10^{-3}$ [V]

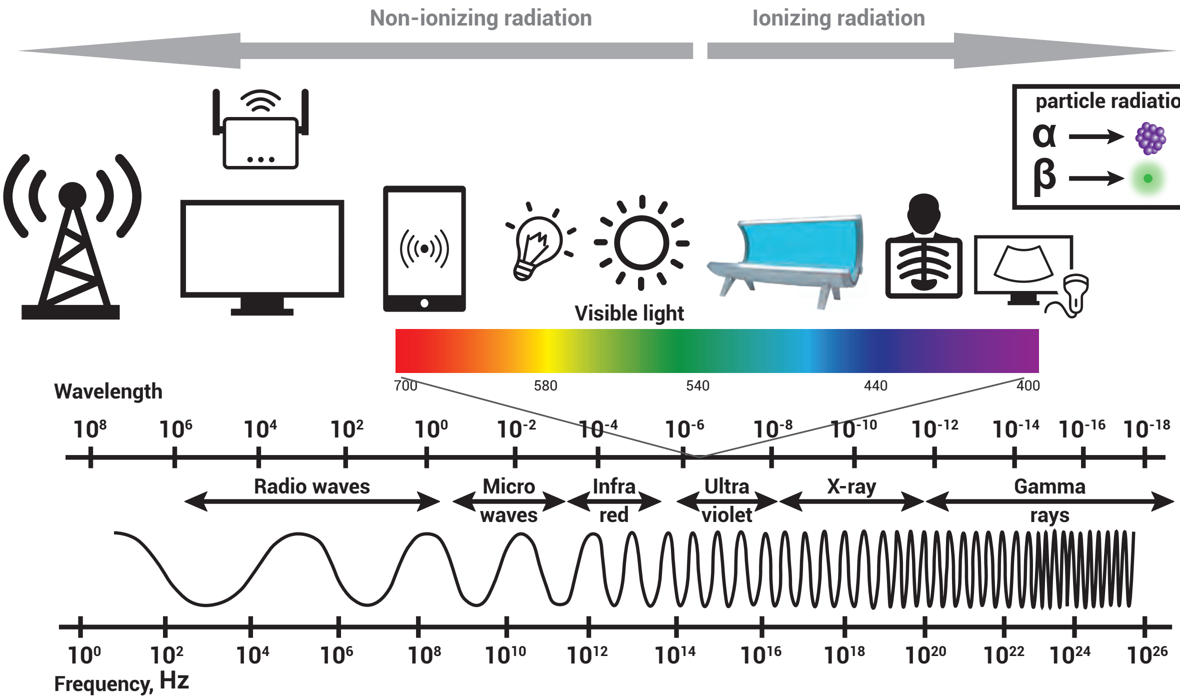
ΔU = Voltage Drop (V)
L = Line Length (m)
I = Line Current or Load (A)
R = Resistance (mW/m)
X = Reactance (mW/m)



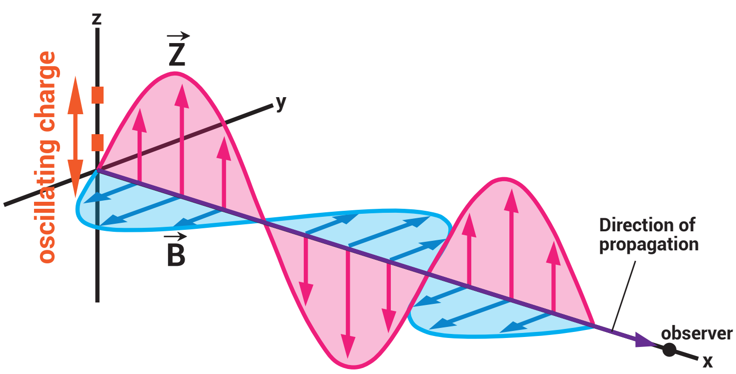
S = Supply Point

■ All phase conductor characteristics had been determined according to Annex BB of IEC / EN 61439-6.
■ Fault-loop zero-sequences impedances had been determined according to Annex CC of IEC / EN 61439-6.
■ Fault-loop resistances and impedances had been determined according to Annex DD of IEC / EN 61439-6.
* IK10 corresponds to impact energy of 20J according to IEC 62262.

All living beings are immersed in an electromagnetic background which is defined as natural and which mainly depends on the earth's magnetic field and solar electromagnetic radiation. The electromagnetic background is generally not dangerous and is compatible with life thanks to the fact that its development took place totally immersed in this background.



With the progress of technology, it was realized that in addition to the natural electromagnetic background, it would have been necessary to evaluate the other generating sources as sources superimposed on those of the natural electromagnetic field. Overlapping and “accumulation” have been the subject of numerous studies aimed at identifying possible risk thresholds for living beings. Although the studies are still ongoing, it is appropriate to underline the scientific certainty of the penetration of the electromagnetic field inside the tissues. This certainty has made it necessary to seriously approach the question of shielding and the production of busbars with particular characteristics and “barriers” to fully protect the biological tissues in its vicinity.
This special busbar is named: **E-Line KX EMS**.
Before talking about shielded busbar **E-Line KX EMS**, however, it is necessary to introduce the fundamental concepts of electromagnetism: Electric field, magnetic field and electromagnetic field.



▶▶Electric Field

Let Q be a fixed electric charge. Q alters the properties of the surrounding space. The evidence lies in the fact that if we consider another fixed point charge, q, it experiences a force expressed by Coulomb's law:

$$\vec{F}=K\frac{Qq}{r^2}\hat{r}$$

where r is the distance between the charges, r is the position unit versor of q relative to Q, and K is a proportionality factor equal to

$$\frac{1}{4\pi\varepsilon}$$

with ε being the dielectric constant of the medium. The dielectric constant in a vacuum is ε_0 and is equal to $8.854\ 10^{-12}$ Farad/m [F/m].

The modification of the surrounding space can be measured in a point-wise manner in terms of vectors. The vector quantity in question is defined as the electric field $\vec{E}$. It is evident, therefore, that to evaluate the force acting on q at a point, we write:

$$\vec{E}(\vec{r})=\vec{E}(x, y, z)=\frac{\vec{F}}{q}=\frac{1}{4\pi\varepsilon}\frac{Q}{r^2}\hat{r}$$

Here Q is called the source of the field and, having been considered fixed by hypothesis, it is said to be the source of an Electrostatic Field. This Electrostatic Field can be reduced, in accordance with the equation

$\vec{E}(x, y, z)=\frac{\vec{F}}{q}=\frac{1}{4\pi\varepsilon}\frac{Q}{r^2}\hat{r}$, by acting on Q (i.e.decreasing it), by acting on r (i.e.decreasing it) or by acting on ε (i.e.increasing it).

If we move from vacuum to matter, we observe that in the presence of an electric field within a conductor, a movement of the outermost electrons is generated due to the thermal drift motion. This motion is in the direction of the field (which, by convention, originates from positive charges) and defines the electric current.
In the absence of an internal electric field, the electrons do not move, and the conductor is said to be in electrostatic equilibrium.

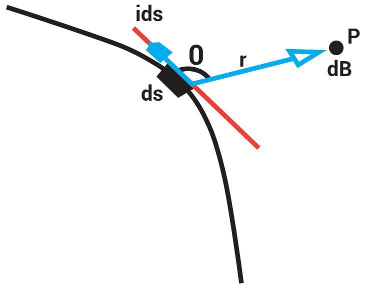
▶▶Magnetic Field

The magnetic field is based on the existence of magnetic forces generated by the flow of current within a circuit, which generates a magnetic induction field $\vec{B}$. Thus, as for the electric field, it is possible to measure the force that the field exerts on a moving charge.

This force is known as the Lorentz force and is given by $\vec{F}=q\vec{v}\times\vec{B}$ This gives us $\vec{B}=\frac{\vec{F}}{qv}$

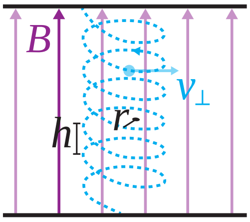
Furthermore, the Lorentz force can be extended to the following, by considering the presence of an electric field: $\vec{F}=q\vec{v}\times\vec{B}\times q\vec{E}$
It should be noted that the sources of the electric field are the electric charges, while those of the magnetic induction field are the electric currents.

To arrive at the definition of the magnetic field, starting from the considerations of magnetic induction field made earlier, let us consider an infinite straight conductor traversed by a steady current I. We will have that. It is easy to see that the intensity of B depends only on I or r (with I = current and r = distance from the wire). This equation is known as Biot-Savart's law and μ turns out to be a magnetic permeability constant (in a vacuum, $\mu=4\pi\ 10^{-7}$Tm/a). The geometric characterization of this law can be represented as follows:



and rewritten as: $dB=\frac{\mu_{0}\, ids\, \sin\Theta}{4\pi r^2}$ with dB directed inwards to the page.

For an infinitely long conductor, the magnetic induction field lines are concentric circles (with the center on the conductor) and are located on a plane perpendicular to the direction of the conductor itself. As predicted by vector theory, of which the vector $\vec{B}$ is a part, once the direction of the current is identified, it is possible, using the right-hand rule, to identify the direction of the magnetic field. The magnetic field that is invaded by matter behaves by influencing matter through a mechanical action, while at the same time being modified by the presence of matter itself. From an atomic point of view, the magnetic field can be explained by likening each electron orbiting around the nucleus to a spiral:



It is easy to see that from a vector point of view, we no longer have a vector, but a Moment $\vec{M}$ (magnetic polarization) that acts on the spiral itself by orienting it perpendicular to the field.
At this point, we have all the necessary components to define the general formula for the magnetic field:

$$\vec{H}=\vec{B}/\mu - \vec{M}$$

At this point, from the dimensional analysis (A/m), it is noted that to reduce a magnetic field, we can intervene:

1- On the currents
2- On the distance from the conductor
3- On the type of material

▶▶Shielded Busbar E-Line KX EMS

Consider that in low voltage (LV) conditions, and therefore in the field of application of busbar consistent with IEC61439-6, it is correct to assume that the magnetic field is the field to be addressed. This starting point is also supported by the fact that the magnetic field is equal to the external field in both the static case and in the case of temporal variability with frequencies belonging to the ELF range, due to the fact that the magnetic permeabilities of tissues and those of free space coincide.

For objectivity and clarity, it is important to consider that an organism interacting with an electromagnetic field experiences a disturbance of its internal electric field; that the molecular systems on which studies and observations have been developed have actually undergone morphological variations, but the development of these variations on complex systems has yet to be demonstrated; and that a biological effect induced by the electromagnetic field cannot automatically be translated into damage, although theoretically, it is very possible.

Given the above, by observing the magnetic field and neglecting the electric field, the technology that leads us to have the new E-Line KX EMS starts precisely from the three points of the previous paragraph. It has been stated, in fact, that to reduce the magnetic field, one can act on:

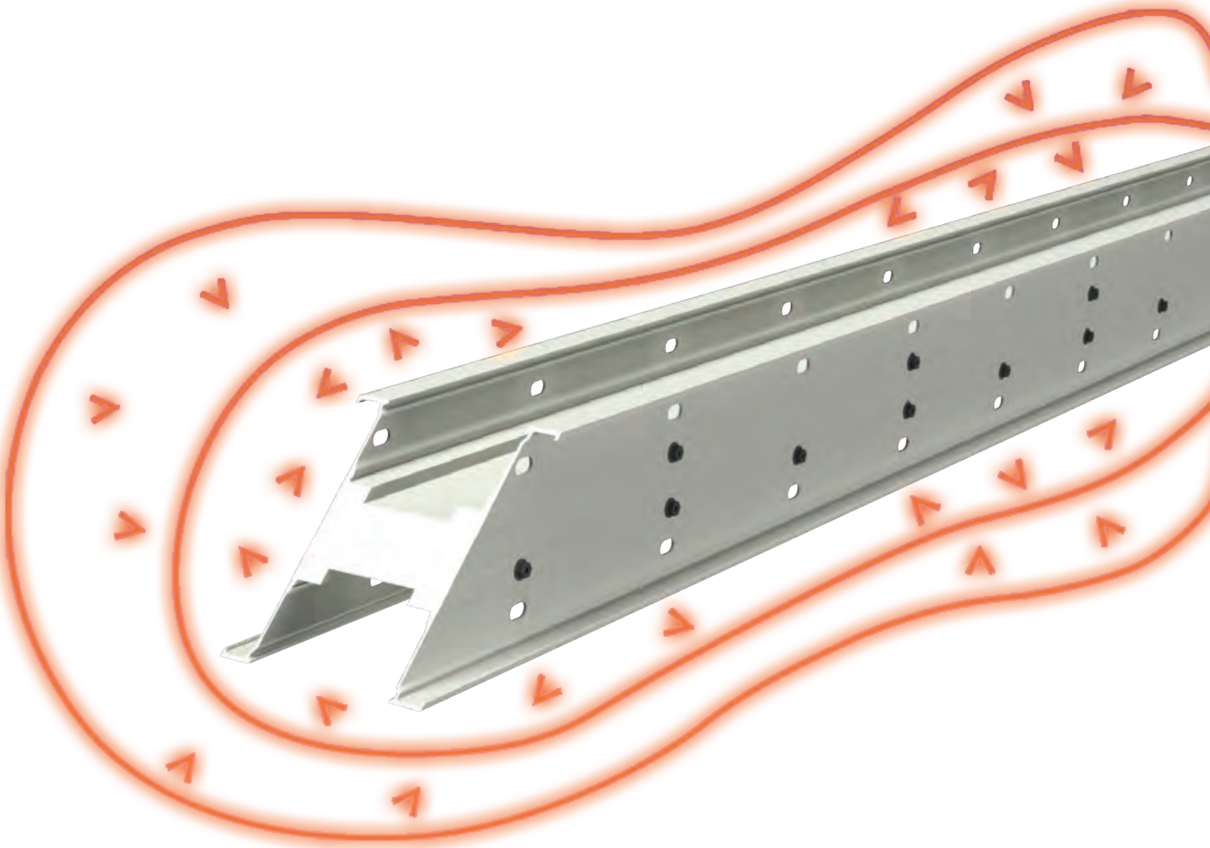
1- Currents
2- Distance from the conductor
3- Type of material

Regarding the first point, it is obvious that for low currents (in some cases even up to 2500A), it is more than sufficient to use a standard type E-Line KX, as its revolutionary configuration in the vicinity of conductors and the extruded aluminum casing attenuate the generated magnetic field significantly.

Regarding the second point, it is understood that it is not always necessary to provide an E-Line KX EMS, as the busbar may be positioned far from biological tissues. Generally, the rule is to evaluate the magnetic field one meter from the source and verify if this value is lower than 3μT (in some European countries, the value of 3μT is a quality target. In Italy, for example). In EAE, it has been decided to go beyond this value and evaluate values close to 0μT, to ensure maximum safety in any country in the world and for any application.

E-LINE KX EMS

▶▶Electric Field



Finally, for the third point, the E-Line KX EMS is the best solution by far. The shielding technology is protected intellectually (patent pending), but essentially is based on an inner high-efficiency shield in the busbar, incredible proximity to the conductive sources (thanks to the double Mylar/epoxy resin insulation, the distance r between the sources is eliminated), and the attenuating capacity of the 2.5mm thick extruded aluminum casing (during tests for Dekra certification, the extruded aluminum casing contributed about 8% more to the attenuating capacity of the magnetic field).

The advantages of the E-Line KX EMS busbar are:

1- Almost complete cancellation of the magnetic field.

2- Prompt availability. It is often not necessary to shield an entire busbar line. E-Line KX EMS can be used where it is actually necessary, as it can be combined freely and anywhere with E-Line KX. This reduces costs and uses a shielded product only where it is needed.

3- It is the only busbar that, thanks to its combinability, provides the possibility to evaluate: IP68, ATEX, fire resistance, and earthquake resistance.

EAE ELEKTRİK

CE DECLARATION OF CONFORMITY

Product Group E-Line KX Busbar Energy Distribution System

Manufacturer EAE Elektrik Asansor End. Insaat San. ve Tic. A.S.

Akcaburgaz Mahallesi, 3114. Sokak,
No:10 34522 Esenyurt-Istanbul

The objects of the declaration described below is in conformity with the relevant Union harmonisation legislation. This declaration of conformity is issued under the sole responsibility of the manufacturer.

Standard :

TS EN 61439-6
Low-voltage switchgear and controlgear assemblies - Part 6: Busbar trunking systems

CE - Directive

2014/35/EU "The Low Voltage Directive"

2014/30/EU "Electromagnetic Compatibility (EMC) Directive"

2011/65/EU "Restriction of the use of certain hazardous substances (RoHS)"

Technical Document Preparation Official:

EAE Elektrik Asansor End. Insaat San. ve Tic. A.S.
Akcaburgaz Mahallesi, 3114. Sokak, No:10 34522 Esenyurt-Istanbul

Mustafa AKÇELİK

Date

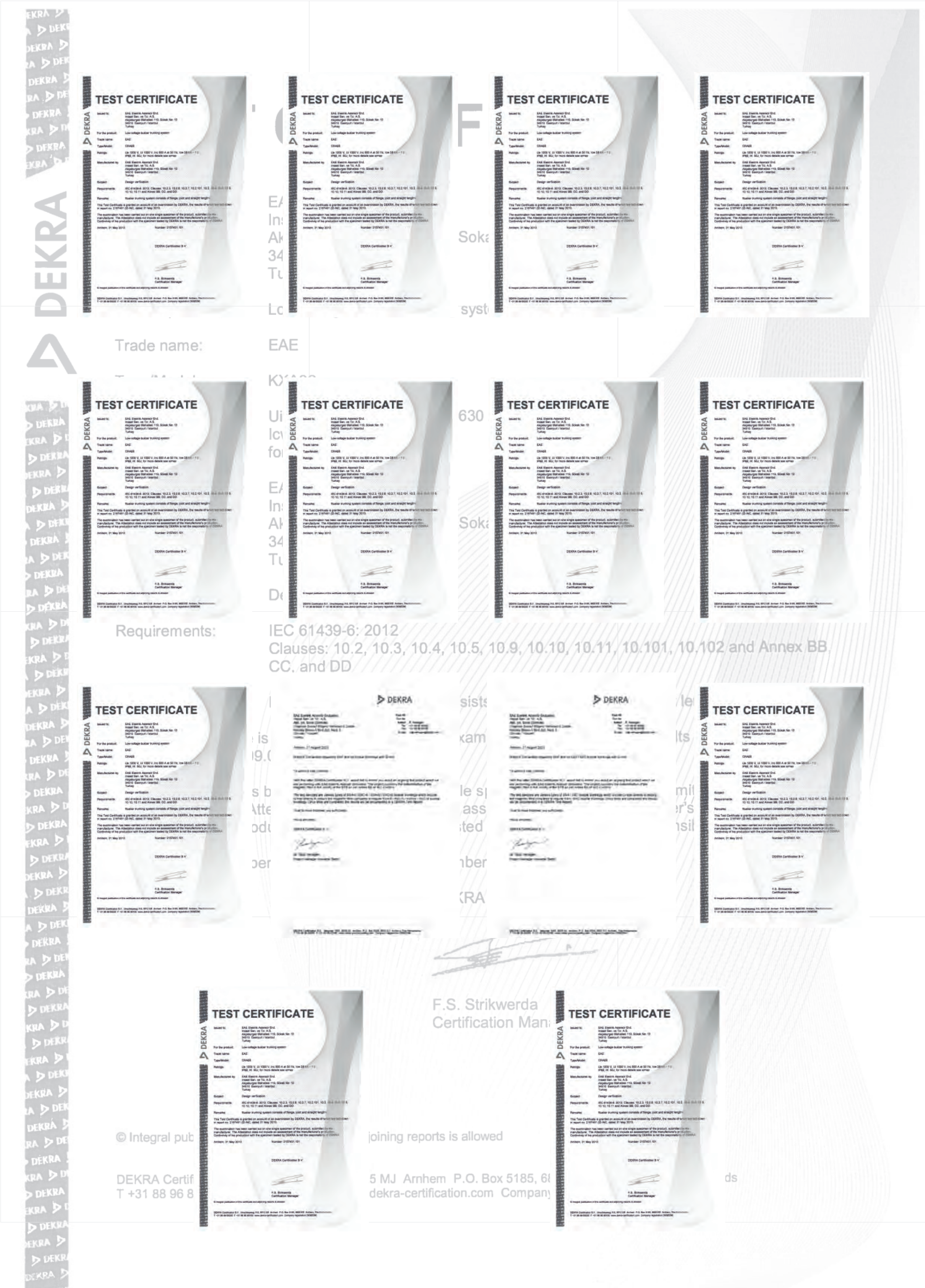
20.04.2024

Document Authorized Signatory

Elif Gamze KAYA OK
Deputy General Manager

E-LINE KX EMS

▶▶Certificate



E-LINE KX EMS

▶▶Project Design Form

EAE ELEKTRİK

Component List

Item	Component	Quantity

Company :
Project :
Project No :

Prepared by
Name :
Date :
Signature :

Please duplicate this page for your own use.

PRODUCT TYPES

BUSBAR ENERGY DISTRIBUTION SYSTEMS

CABLE TRAYS

TROLLEY BUSBAR ENERGY DISTRIBUTION SYSTEMS

INDOOR SOLUTIONS

SUPPORT SYSTEMS

EAE Elektrik A.S.
Head Office
Akcaburgaz Mahallesi,
3114. Sokak, No:10 34522
Esenyurt - Istanbul - TURKEY
Tel: +90 (212) 866 20 00
Fax: +90 (212) 886 24 20

EAE DL 3 Factory
Busbar
Gebze IV Istanbul Makine ve Sanayicileri
Organize Bolgesi, 6. Cadde,
No: 6 41455 Demirciler Koyu,
Dilovası - Kocaeli - TURKEY
Tel: +90 (262) 999 05 55
Fax: +90 (262) 502 05 69

Please visit our website for the updated version of our catalogues.
www.eaeelectric.com

E 344805

Catalog 75-En. / Rev 01 00 Pcs. 07/10/2024
D.S.