

EMI/EMC standards for industrial equipment and type testing for compliance

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QUALITY IS NOT WHAT THE SUPPLIER PUTS IN; IT IS WHAT THE CUSTOMER GETS AND WHAT HE IS WILLING TO PAY FOR.

- PETER DRUKER

TODAY'S CUSTOMER, IN ADDITION TO GETTING THE BEST FINANCIAL DEAL, ALSO LOOKS FOR THE NECESSARY APPROVALS/CERTIFICATIONS TO ENHANCE HIS CONFIDENCE IN THE PRODUCT.

**ORGANISED STANDARDISATION STARTED
AFTER THE INVENTION OF STEAM ENGINE
& CONSEQUENTIAL INDUSTRIAL REVOLUTION.**

**FIRST DECADE OF 20 TH CENTURY SAW THE
BIRTH OF SEVERAL STANDARDISATION BODIES
LIKE,**

- NATIONAL BUREAU OF STANDARDS (NBS)**
- SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)**
- AMERICAN SOCIETY FOR TESTING & MATERIALS
(ASTM)**
- AMERICAN SOCIETY OF MECHANICAL
ENGINEERS (ASME)**

**STANDARDISATION IS
TO INDUSTRY AND TRADE,
WHAT CULTURE AND MANNERS
ARE TO SOCIETY**

- SHRI C.RAJAGOPALACHARI

Actual product color may vary from image.
Google Inc. 1600 Amphitheatre Parkway,
Mountain View, CA 94043 United States
Designed by Google. Made in China.



MFG: 11/2017

US



SN: 7B17L5K3S9

M: HOA

GOOGLE ASSISTANT (See UL marking ?)



POWER BANK-See CE marking?

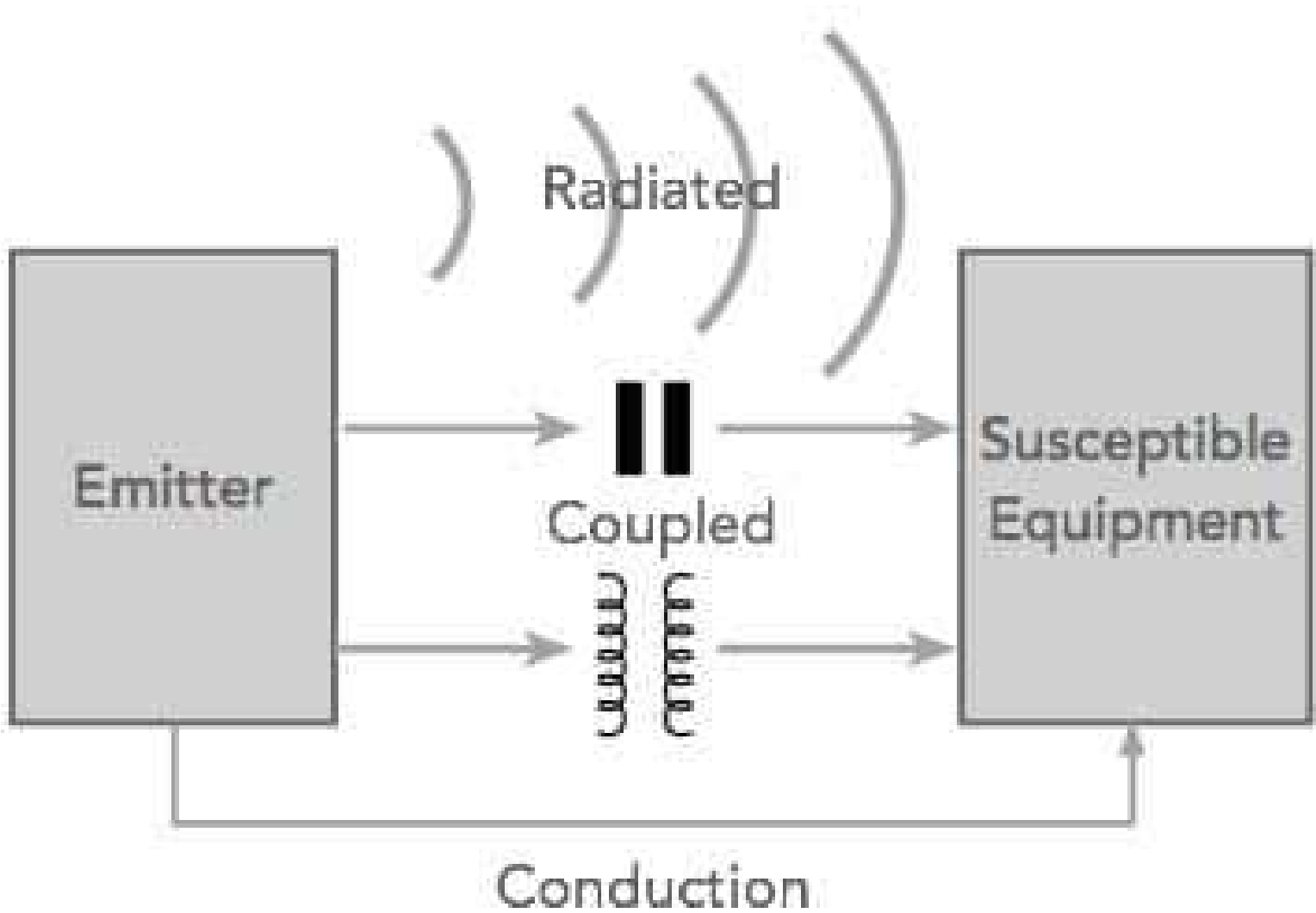
EMC-Electromagnetic compatibility – covers emission and immunity

Emission:

- **Conducted emission**
- **Radiated emission**

Immunity:

Ability of an equipment to function satisfactorily in its electromagnetic environment with out disturbance



EMI coupling mechanism

. ***Conducted*** : Conducted emissions occur when there is a conduction route along which the signals can travel. This may be along power cables or other interconnection cabling. The conduction may be in one of two modes:

1. *Common mode*

2. Differential mode

.....contd

Common mode: This type of EMI coupling occurs when the noise appears in the same phase on the two conductors, e.g. out and return for signals, or +ve and -ve for power cables.

Differential mode: This occurs when the noise is out of phase on the two conductors.

Solution: Use suitable filters

Coupled: What is normally termed coupled EMI can be one of two forms

1. Capacitive coupling
2. Magnetic induction.

Capacitive coupling : This occurs when a changing voltage from the source capacitively transfers a charge to the victim circuitry.

Magnetic coupling: This type of EMI coupling exists when a varying magnetic field exists between the source and victim - typically two conductors may run close together (less than λ apart). This induces a current in the victim circuitry, thereby transferring the signal from source to victim.

Radiated: It is the type of EMI coupling that is normally experienced when the source and victim are separated by a large distance - typically more than a wavelength. The source radiates a signal which may be wanted or unwanted, and the victim receives it in a way that disrupts its performance.

Categorization of EMI

By way of creation:

- Man made EMI
- Naturally occurring EMI

By duration:

- Continuous interference
- Impulse noise

By Bandwidth:

- Narrow band
- Broad band

Design for EMC compliance;

- - Circuit design for minimum radiation
 - EMC filters
 - Circuit partitioning
 - Grounding
 - Screened enclosure
 - Screened lines and cables

EMC Test types:

Conducted emissions

Radiated emissions

Conducted immunity

Radiated immunity

ESD immunity

Transient immunity

Surge immunity

COMMON EMC STANDARDS

ARENA	STANDARD	DETAILS
Aerospace	DO-160	Aircraft EMC requirements
Aerospace	SAE ARP5412B	Aircraft lightning environment and related test waveforms
Aerospace	SAE ARP5416A	Aircraft lightning test methods
Automotive	SAEJ1113	General automotive EMC
Commercial	ANSI C63.4	Methods of measurement
Commercial	<u>CISPR 11</u>	ISM equipment EN 55011
Commercial	<u>CISPR 16</u>	Methods of measurement

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Commercial	<u>CISPR 22</u>	ITE equipment EN 55022
Commercial	<u>FCC Part 15B</u>	ITE equipment
Commercial	IEC 61000-3-2	Harmonics
Commercial	IEC 61000-3-3	Flicker
Commercial	IEC 61000-4-2	Electrostatic Discharge, ESD

Commercial	IEC 61000-4-3	Radiated immunity
Commercial	IEC 61000-4-4	Electrically Fast Transient
Commercial	IEC 61000-4-5	Surge (lightning)
Commercial	IEC 61000-4-6	Conducted immunity
Commercial	IEC 61000-4-8	Magnetic immunity
Commercial	IEC 61000-4-11	Voltage dips, interrupts & variations
Medical	IEC 60601-1-2	Medical products
Military	MIL STD 461F	EMC test requirements

Anechoic chamber



NATIONAL STANDARD BODIES

USA	-	UL
GERMANY	-	TUV,GL,VDE
SWEDEN	-	SEMCO
ITALY	-	IMQ
NETHERLANDS	-	KEMA
CANADA	-	CSA
ENGLAND	-	BSI,LR

(CONTD...)

NATIONAL STANDARD BODIES

SWITZERLAND - SEV
FRANCE - UTE
DENMARK - DEMCO
AUSTRALIA - TICK MARK
JAPAN - NK
NORWAY - NEMCO
FINLAND - FIMCO

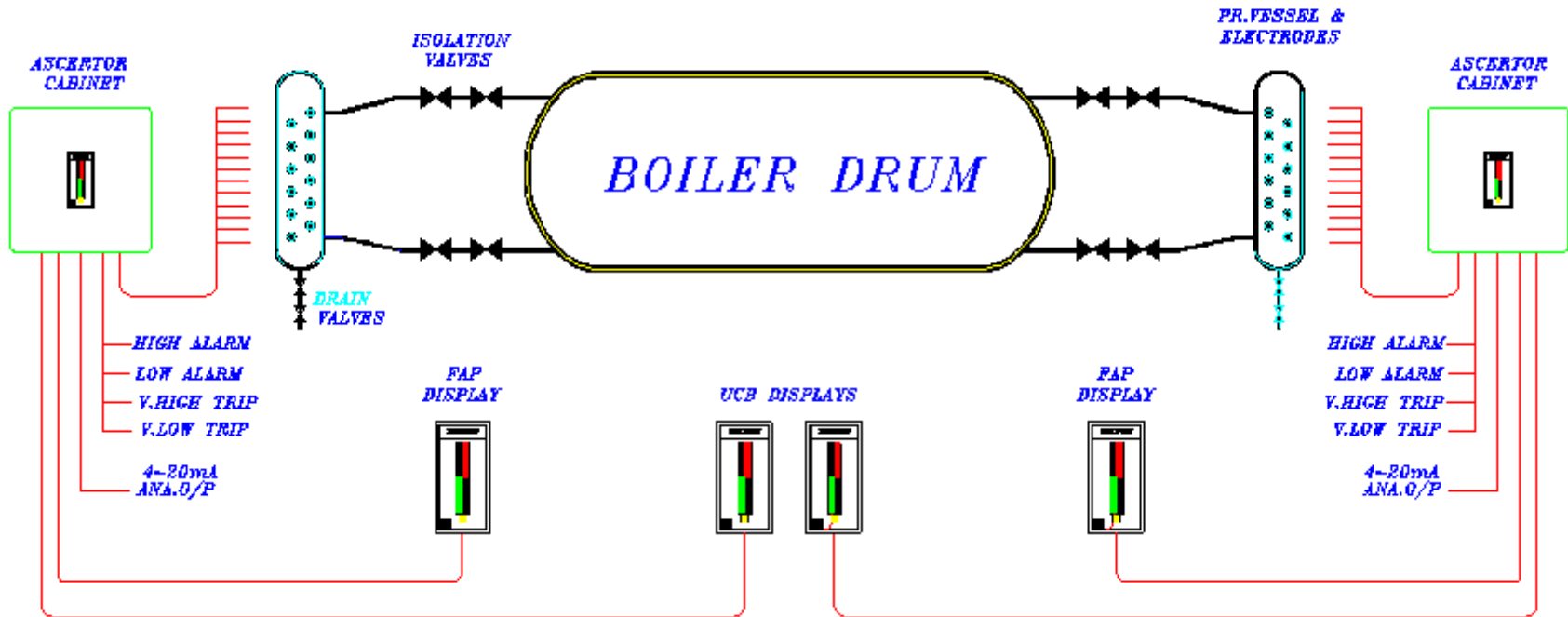
CERTIFICATION SERVICES IN **INDIA**

- * CANADIAN STANDARDS
ASSOCIATION (CSA)**
- * UNDERWRITERS
LABORATORIES (UL)**
- * VERBAND DEUTSCHER
ELECTROTECHNIKER e.V (VDE)**
- * BIS-BERAUE OF INDIAN STANDARDS**

CASE STUDY

**EMC CERTIFICATION OF
ELECTRONIC WATER LEVEL INDICATOR
MANUFACTURED BY BHEL**

BHELVISION 20M



Electronic water level indicator for boiler drum-Bhelvision 20M
Taken up for CE marking through CSA

**TWO SEPARATE SYSTEMS WITH
INDEPENDENT OUTPUTS**

CERTIFICATION PROCESS

- 1) APPLY**
- 2) TEST SAMPLE OF PRODUCT**
- 3) EVALUATE**
- 4) REPORT FINDINGS**
- 5) PREPARE DESCRIPTIVE REPORT**
- 6) ISSUE CERTIFICATE OF COMPLIANCE**

CE MARKING

(CONFORMITE EUROPEENNE)

ELECTROMAGNETIC
COMPATIBILITY

SAFETY REQUIREMENTS

ELECTROMAGNETIC COMPATIBILITY **TESTS**

1.CONDUCTED EMISSION TEST
(EN500081-2,1994)

2.RADIATED EMISSION TEST
(EN50081-2,1994)

3.RADIATED SUSCEPTIBILITY TEST
(EN50082-2,1995)

4.ELECTRICAL FAST TRANSIENTS TEST
(EN50082-2,1995)

(CONTD...)

ELECTROMATIC COMPATIBILITY **TESTS (CONTINUATION)**

- 5.ELECTROSTATIC DISCHARGE IMMUNITY TEST
(EN50082-2,1995)**
- 6.HIGH ENERGY SURGE IMMUNITY TEST
(EN50082-2,1995)**
- 7.POWER FREQUENCY MAG.FIELD TEST
(IEC 61326,1997)**
- 8.CONDUCTED RF IMMUNITY TEST
(IEC 61326,1997)**

SAFETY TESTS (IEC1010-DIRECTIVE)

- 1. ADHERENCE TO MARKING & DOCUMENTATION PROCEDURES**
- 2. PROTECTION AGAINST ELECTRIC SHOCK**
 - A) SINGLE FAULT TEST**
 - B) EARTH LEAKAGE TEST**
 - C) CREEPAGE & CLEARANCE TEST**
 - D) ACCESSABLE PARTS WITH TEST FINGURE**
 - E) DIELECTRIC STRENGTH TEST
BEFORE & AFTER HUMIDITY TEST)**
 - F) CHORD ANHORAGE TEST**

(CONTD.....)

Certificate of Compliance

Certificate: 1054042

Master Contract: 200740

Edition: 1

Date Issued: April 8, 2000

Issued to: Bharat Heavy Electricals Limited
Building No. 79
620014 Tiruchirappalli
India

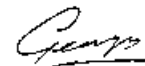
*The products listed below are eligible to bear the CSA Mark
with indicator as shown below*



IEC 1010-1

Issued by: Sebastian George, P. Eng.

Signature: _____



PRODUCTS

CLASS 9091 01 - MISCELLANEOUS

Electronic Water Level Indicator, Model BHELVISION 20, permanently connected, rated 110 V, 50 Hz, 200 VA,
Pollution Degree I, Overvoltage Category II.

APPLICABLE REQUIREMENTS

IEC 61010-1: 1990 + A1: 1992 + A2: 1995 - Safety Requirements for Electrical Equipment for Measurement,
Control and laboratory Use



CSA INTERNATIONAL

Standards
Development

QMS
Management Systems Registration

Certification
and Testing

CSA File No: 200740-2500001916

Letter of Attestation

*CSA international has completed an evaluation of
Electronic water Level Indicator, Model BHELVISION -26,
Manufactured by Bharath Heavy Electrical Ltd. (BHEL),
High Pressure Boiler plant, Tiruchirapalli, 620014, India*

*and hereby attests that the above Equipment complies with the
following standards/requirements, to the extent applicable:*

1. Conducted Emission Test as Per EN 50081-2-1994
2. Radiated Emission as Test as Per EN 50081-2-1994
3. Radiated Susceptibility Test as Per EN 50082-2-1995
4. Electrical Fast Transient Test as Per EN 50082-2-1995
5. Electrostatic Discharge Immunity Test as Per EN 50082-2-1995
6. High Energy Surge Immunity Test as Per EN 50082-2-1995

Condition for acceptability:

*The above devise must be used with Computer Surge protection unit Model SP-3,
Manufactured by Namtech, Bangalore*

Issued By:

Sebastian George, P. Eng.
Senior Engineer

Date Issued: December 20, 1999

Signature: 

This Letter of Attestation is not an endorsement of any of CSA's registered Marks.

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