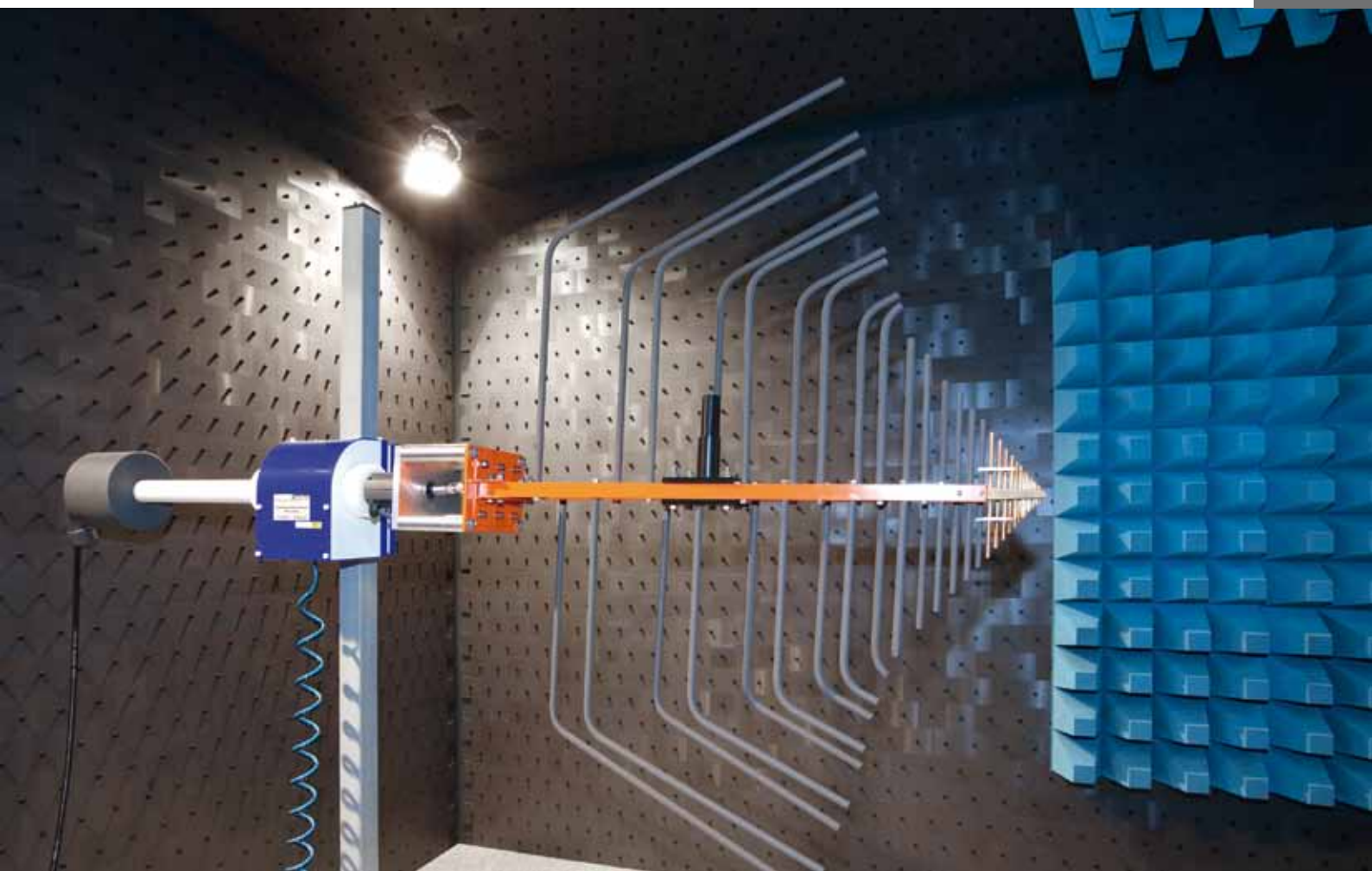
BALLUFF

sensors worldwide

The Balluff Testing Laboratory



The Balluff Testing Laboratory

With over 50 years of sensor experience, Balluff is a leading global sensor specialist with its own line of connectivity products for every area of factory automation. Balluff is based in Germany and has a tight international network of 54 representatives and subsidiaries.

Our product range includes electronic sensors, transducers which use various operating principles, identification systems, bus-capable sensors as well as electromechanical and inductive single and multiple position switches. Balluff products are found wherever accuracy and reliability are in demand.

Wherever processes are automated, objects detected, rotary and linear motion reported to controllers – Balluff is always the right partner.

Innovative technology and application-specific customer solutions are the hallmarks of the entire product range.
Highly-qualified development engineers and experienced designers work closely with the manufactures to ensure mature series products that are used successfully in every area of automation – even under extreme and aggressive operating conditions.

The Balluff GmbH testing laboratory conducts tests in the following areas on behalf of Balluff divisions, other Balluff companies and external customers:
- Electromagnetic compatibility
- Shock, sinusoidal and noise tests
- Product-specific tests, including:
  - Making and breaking capacity
  - Cable anchoring of sensors with integral connection cables
  - Short circuit protection test
  - X-ray analysis
  - HALT test

On 27.08.2010, the testing laboratory was accredited for testing electromagnetic compatibility (registration number D-PL-12017-01-01) by the German Accreditation Institute (Deutsche Akkreditierungsstelle GmbH). Tests in the testing laboratory are conducted according to DIN EN ISO/IEC 17025 "General requirements for the competence of testing and calibration laboratories". The defined regulations are documented in the quality management handbook of the testing laboratory.

DAkkS Deutsche Akkreditierungsstelle

The Balluff Testing Laboratory
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The Balluff Testing Laboratory

Test equipment in the test laboratory

	Tests	Test equipment
1. Electromagnetic compatibility (EMC)	Immunity from discharge of static electricity (EN 61000-4-2)*	ESD generator ESD 30C, EM test ESD generator DITO, EM TEST
	Immunity from electromagnetic fields EN 61000-4-3* EN 61000-4-20	Absorber room 7.00 m × 4.00 m × 3.00 m (L×W×H), Albatross projects GTEM cell 1500, MEB Signal generator SML03, Rohde & Schwarz HF amplifier BLWA 0810-250/200, BONN HF amplifier model CBA9429, SCHAFFNER HF circuit network RFSN, SCHAFFNER Power meter NRVS, Rohde & Schwarz Power sensing head NRV-Z 51, Rohde & Schwarz Directional coupler RK 100, MEB Directional coupler C6187, VERLATONE Electric field probe HI-6005, Holaday Software MEB IMM, SCHAFFNER
	Immunity from fast transients (bursts) (EN 61000-4-4)*	Burst generator EFT 500, EM-Test Capacitive coupler HFK, EM test
	Immunity from voltage surges (EN 61000-4-5)*	Hybrid Generator CE-SURGE, Hilo-Test Coupling / decoupling network CDN 104 Coupling / decoupling network CDN 202
	Immunity from conducted, high-frequency disturbances (EN 61000-4-6)*	Signal generator SMH, Rohde & Schwarz HF amplifier model 150A100A, AR Coupling / decoupling network M2, MS3, S4, S9, AF2, A401, AF3, RJ45/5 EM injection clamp F-203I-23 mm, FCC Software MEB IMM, Schaffner MEB
	Immunity from magnetic fields with power transmission frequencies (EN 61000-4-8)*	Self-built test equipment, Balluff GmbH
	Immunity from voltage dips, short breaks in power supply and voltage fluctuations (EN 61000-4-11)*	Self-built test equipment, Balluff GmbH
	Radiated emissions EN 55011, EN 55016-2-3	GTEM cell 1500, MEB Test receiver SM41, MEB Software, MEB
	Conducted emissions (EN 55011; EN 55022; EN 55016-2-1)*	Test receiver ESHS 30, Rohde & Schwarz Interference test set ESH3-Z5, Rohde & Schwarz
	Emissions, HF magnetic field (DIN EN 300 330-1)	Frame antenna HLA6120, SCHAFFNER Test receiver ESHS 30, Rohde & Schwarz
2. Product-specific tests	Making capacity / breaking capacity (EN 60947-5-2)	Self-built test equipment, Balluff GmbH
	Testing the cable anchoring of proximity switches with integral connection cables (EN 60947-5-2) Short circuit testing (EN 60947-5-2)	Self-built test equipment, Balluff GmbH Self-built test equipment, Balluff GmbH
3. Shock, sinusoidal and noise tests	Shock, sinusoidal and noise tests (EN 60068-2-6) (EN 60068-2-27; EN 60068-2-29) (EN 60068-2-64)	Shock and vibration equipment, model SA15-S092-PB and model H560B-24-LP, Unholtz-Dickie with software modules for: Sinusoidal vibrations Shocks noise tests Signal analysis
4. Other	X-ray analysis Highly Accelerated Life Test, HALT	X-ray inspection equipment RTX 113, HEEB-INOTEC AST 35, THERMOTRON

* included in the accreditation

The Council of the European Union has passed a series of EU Directives to remove trade barriers and allow the free movement of goods within Europe as part of a push towards further European integration.
Balluff products fall within the scope of the following three EU Directives:

EMC directive
2004/108/EC

Low-Voltage Directive
2006/95/EC

Radio Equipment and Telecommunications Terminal Equipment (RTTE) 1995/5/EU

EU Directives are valid European laws integrated into national legislation by the states within the European Union.
All products that fall under the jurisdiction of these three EU Directives must bear the CE mark as a sign of their compliance with the corresponding Directive. Since 01.01.1996, the CE mark has been mandatory for all products governed by the EMC Directive and since 01.01.1997, for all products governed by the Low-Voltage Directive.

The manufacturer is responsible for assigning the CE mark if the stipulations in the relevant EU Directive are observed. The manufacturer conduct a so-called conformity evaluation procedure, shown in the following schematic illustration.

EU Directive
2004/108/EU (EMC Directive) or
2006/95/EC Low-Voltage Directive or
1995/5/EU (RTTE Directive)

Test according to the section in the harmonized product standard or generic standard, which outlines the protection objectives of the corresponding EU Directive

Documentation of test results

Declaration of conformity from the Balluff testing laboratory

CE mark

CE

Electromagnetic Compatibility
EMC standards

	European standard	Contents of standard
1. Generic standards The generic standards define the requirements for products used in specific electromagnetic environments and are based on the Basic Standards. The Generic Standards must always be used when no product standards are available for the relevant products or when the EMC requirements are not specified in the product standard.	EN 61000-6-1*	Generic standard. Immunity for residential environments
	EN 61000-6-2*	Generic standard. Immunity for industrial environments
	EN 61000-6-3*	Generic standard. Emission standard for residential environments
	EN 61000-6-4*	Generic standard. Emission standard for industrial environments

	European standard	Contents of standard
2. Basic standards The basic standards describe the requirements and measuring procedures for individual EMC tests. The basic standards include limit values in the form of different severity levels that are defined for the requirements in the product or generic standard.	EN 61000-4-2*	Immunity from the discharge of static electricity (ESD)
	EN 61000-4-3*	Immunity from electromagnetic fields (RFI)
	EN 61000-4-4*	Immunity from fast transients (bursts)
	EN 61000-4-5*	Immunity from voltage surges
	EN 61000-4-6*	Immunity from conducted interference, induced by high-frequency fields
	EN 61000-4-8*	Immunity from magnetic fields with power transmission frequencies
	EN 61000-4-11*	Immunity from voltage dips, short breaks in power supply and voltage fluctuations
	EN 55011	Emissions; radio interference voltage* and RF emission EN 55022, EN 55016-1-2, EN 55016-2-3

	European standard	Contents of standard
3. Product standard The electromagnetic compatibility requirements for inductive, capacitive, photoelectric and ultrasonic sensors are defined in the product standard.	EN 60947-5-2*	Low-voltage switchgear and controlgear Part 5: Control circuit devices and switching elements Section 2: Proximity switches
	EN 60947-5-6	Low-voltage switchgear and controlgear Part 6: DC interface for proximity sensors and switching amplifiers (NAMUR)
	EN 60947-5-7	Low-voltage switchgear and controlgear Part 7: Control circuit devices and switching elements Requirements for proximity devices with analogue output
	EN 61131-2*	Programmable controllers
	EN 61326-1*	Electrical equipment for measurement, control and laboratory use
	EN 61326-2-3*	Electrical equipment for measurement, control and laboratory use, transducers
4. Harmonized standards for the RTTE Directive The electromagnetic compatibility requirements for BIS read heads are defined in the product family standard.	EN 300330-1	Short Range Devices (SRD) … inductive loop systems in the frequency range 9 kHz to 30 MHz Part 1: Technical characteristics and test methods
	ETSI EN 301489-1	Standard for radio equipment and services Part 1: Common technical requirements
	ETSI EN 301489-3	Standard for radio equipment and services Part 3: Specific conditions for Short Range Devices (SRD) Operating on frequencies between 9 kHz and 40 GHz
Environmental test methods **Standards for shock, sinusoidal and noise tests**	MIL STD 202	International series of standards
	EN 60 068-2-6	Vibration, sinusoidal
	EN 60 068-2-27	Shock
	EN 60 068-2-29	Continuous shock
	EN 60 068-2-64	Vibration, broadband random
	GL	Germanischer Lloyd
	DIN EN 50155 IEC / EN 61373	Standard for rolling stock

* included in the accreditation

Electromagnetic Compatibility

Immunity from the discharge of static electricity (ESD)
ESD = Electrostatic Discharge

Origin
Discharge originates from people wearing well insulated shoes or walking on a carpeted floor who become electrostatically charged on days when air humidity is low and then discharge this electricity when coming into contact with conductive materials (e.g. metal).

Features
Voltages up to 30 kV and a current of several amperes are momentarily discharged once in a matter of nanoseconds.

The European standard
EN 61000-4-2

Test through direct discharge
Areas and components accessible to users during normal operation are tested (e.g. housing, operating panel, cables, connectors, etc.)

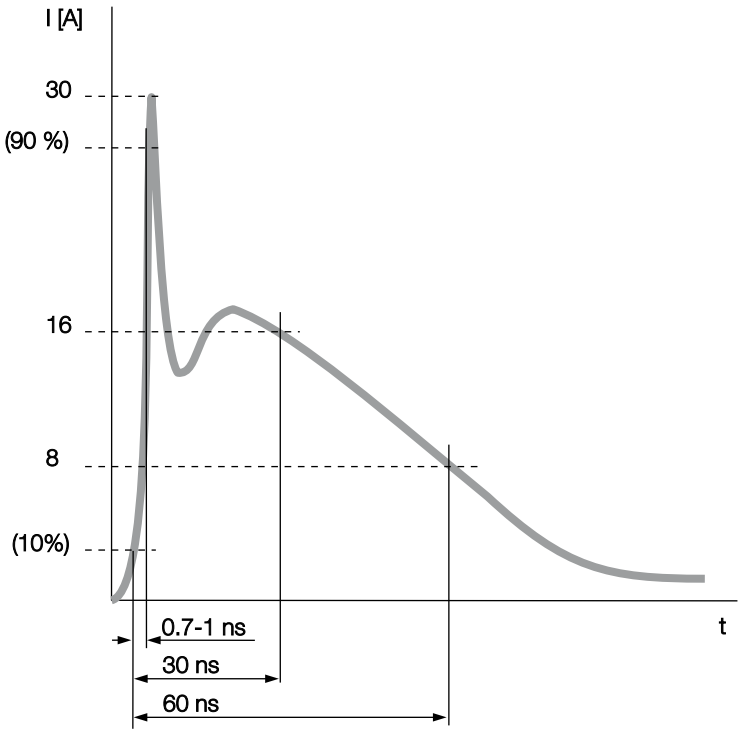
1. Contact discharge
(with relay attachment)
The discharge electrode touches the conductive housing or penetrates the paintwork (without any insulating properties).

2. Air discharge
(with IEC finger)
The discharge electrode is moved towards the test object until the electricity discharges over a spark gap.

Test through indirect discharge
Contact discharge on a horizontal or vertical coupling plate installed at a distance of 10 cm from the test object.

Testing frequency
10 single pulses at a distance of 1 s.

Testing severity	Contact discharge	Air discharge
1	2 kV	2 kV
2	4 kV	4 kV
3	6 kV	8 kV
4	8 kV	15 kV
X	special	special



Electromagnetic Compatibility

Immunity from electromagnetic fields (RFI)
RFI = Radio Frequency Interference

Origin
Electromagnetic radiation from radio transmitters, mobile telephones, "walkie talkies", WLAN, radar systems as well as devices operated in the direct vicinity.

Features
Narrow frequency band concentrated up to 3 GHz, often directed energy, permanent interference, often frequency or amplitude-modulated.

The European standard
EN 61000-4-3

Frequency range
up to 3000 MHz

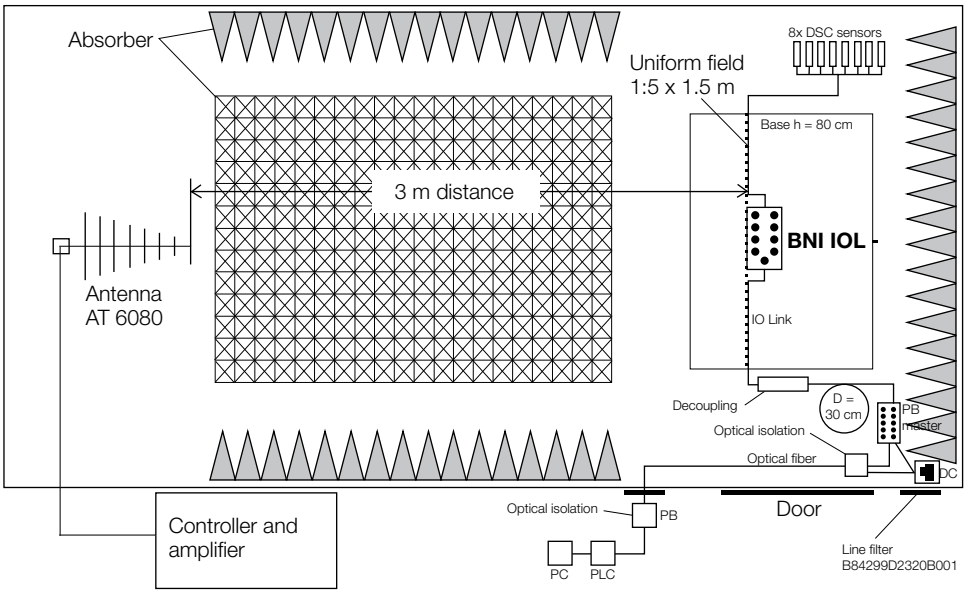
Test field strength (unmodulated)
up to 20 V/m

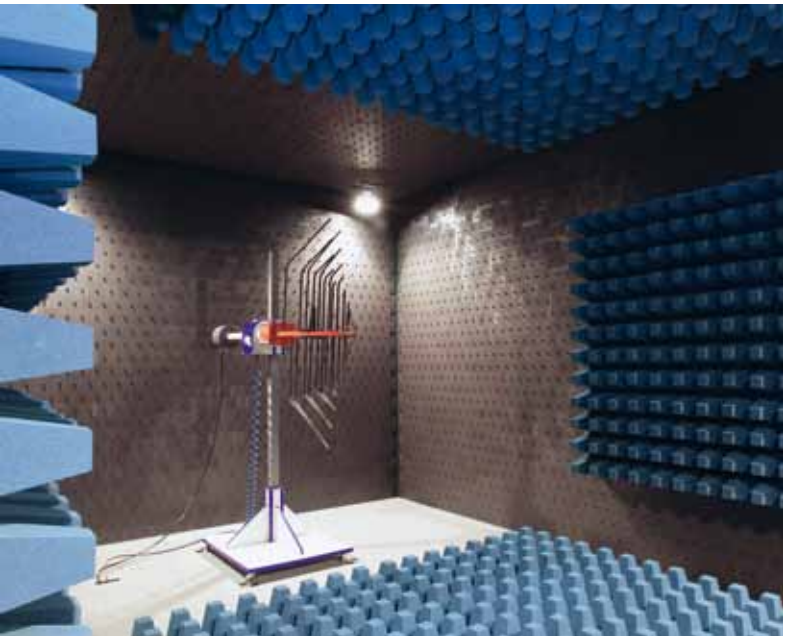
Modulation
80 % amplitude-modulated

Modulation frequency
1 kHz, sinusoidal

Testing severity	Test field strength	
1	1 V/m	
2	3 V/m	
3	10 V/m	
X	special	

Circuit diagram





Electromagnetic Compatibility

Immunity from fast transients (bursts, EFT)

EFT = Electrical Fast Transient

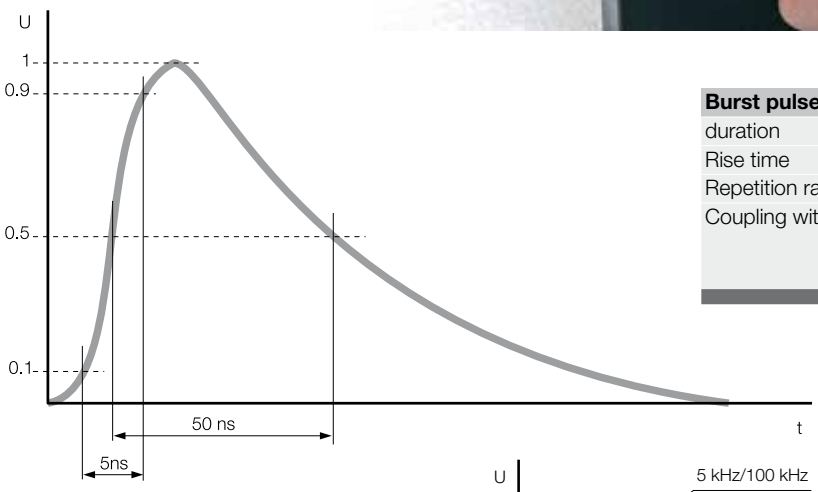
Origin
Switching inductive loads such as relays, motor coils, solenoid valves, transformers, high-voltage mains switches and frequency inverters on and off.

Features
Broadband spectrum up to 300 MHz, stress amplitudes up to several kV. Burst packets with duration of 20 µs to several ms or permanent spectrum (motor collectors). Flank increase in ns range, low power.

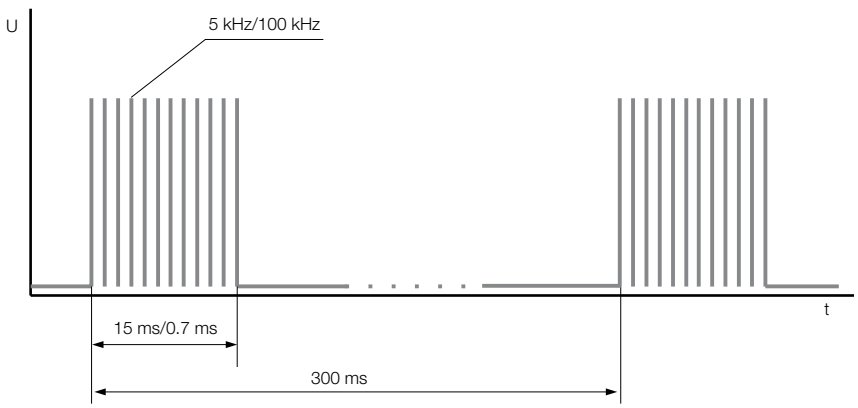
The European standard
EN 61000-4-4

Testing severity
According to the adjacent table.

Testing severity	AC/DC or ground line	I/O data line
1	0.5 kV	0.25 kV
2	1.0 kV	0.5 kV
3	2.0 kV	1.0 kV
4	4.0 kV	2.0 kV
X	special	special



Burst pulse	
duration	50 ns ±30 %
Rise time	5 ns ±30 %
Repetition rate	5.0 kHz or 100 Hz
Coupling with	Coupling/decoupling network for AC/DC mains power supply lines, capacitive coupler for input/output, data and control lines



Electromagnetic Compatibility
Immunity from abrupt voltage surges

Origin
Lightning strike, short circuits and switching operations in high-energy networks.

Features
High energies, voltages of kilo volts, current of kilo amperes. Rise times in µs range, broad-band spectrum up to several MHz.

The European standard
EN 61000-4-5

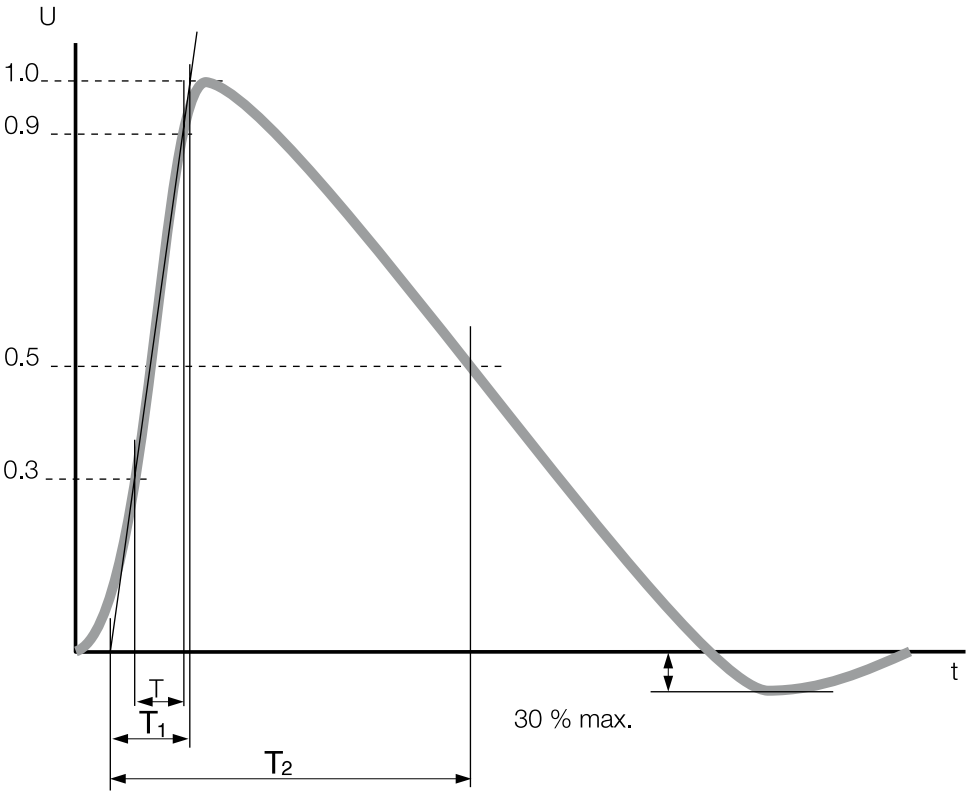
Testing severity
as per EN 61000-4-5
According to the adjacent table

Test with CDN 104 or CDN 202 coupling/decoupling network

Pulse shape
1.2/50 µS

Testing severity	Open circuit voltage	
1	0.5 kV	
2	1.0 kV	
3	2.0 kV	
4	4.0 kV	
X	special	

Surge pulse
T1 = 1.2 µs = 1.67 × T
T2 = 50 µs



Electromagnetic Compatibility

Immunity from conducted interference induced by high-frequency fields

Origin
Conducted interference that originates from electromagnetic fields interspersed by cables.

Features
Narrow frequency band, frequency or amplitude-modulated, permanent interference.

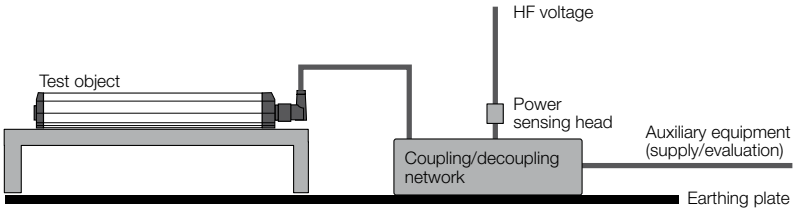
The European standard
EN 61000-4-6

Frequency range
150 kHz...80 MHz

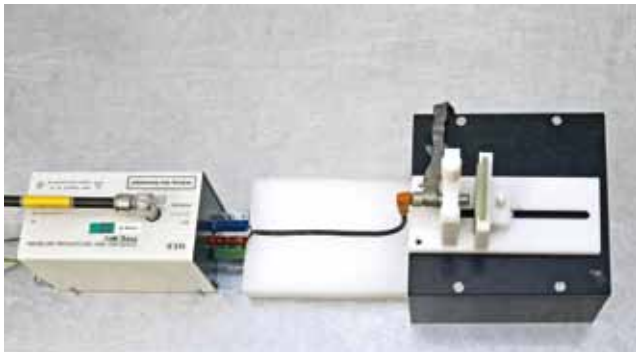
Modulation
80 % amplitude-modulated

Modulation frequency
1 kHz, sinusoidal

Testing severity	U_O	U_O
1	120 dBµV	1 V
2	130 dBµV	3 V
3	140 dBµV	10 V
X	special	special



The interference voltage is supplied either via a coupler (injection clamp) or coupling/decoupling networks (CDN).
Search for interference threshold by automatically decreasing the interference field strength.



Electromagnetic Compatibility

Immunity from magnetic fields with power transmission frequencies

Origin
From currents in power supplies, power rails, high-voltage cables, devices or earth connections for protective equipment and high-power electrical equipment in the direct vicinity.

Features
Constant magnetic fields up to 100 A/m in the vicinity of equipment under normal operating conditions.

Momentarily high magnetic fields up to 1000 A/m when protective equipment responds.
Power transmission frequencies e.g. 50 Hz, 60 Hz

The European standard
EN 61000-4-8

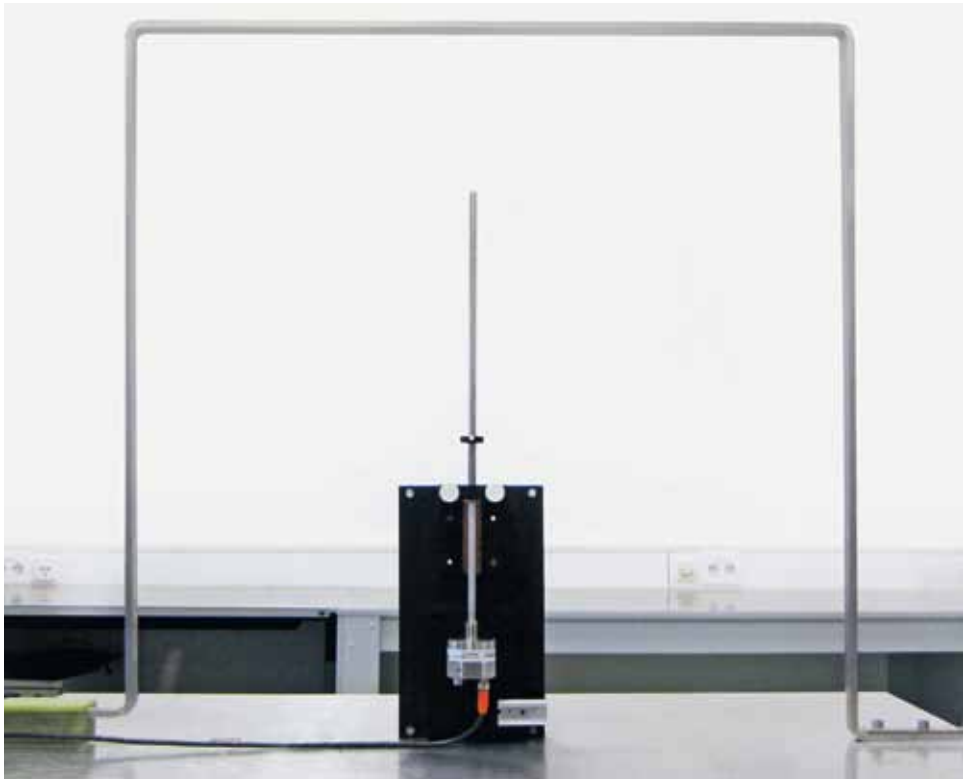
Testing severity
as per EN 61000-4-8
According to the adjacent table.

Testing severity	Permanent field [A/m]	Short duration 1...3 s [A/m]
1	1 A/m	–
2	3 A/m	–
3	10 A/m	–
4	30 A/m	300 A/m
5	100 A/m	1000 A/m
X	special	special

Test equipment

Test generator

Induction coil:
1 m × 1 m square



Electromagnetic Compatibility

Immunity from voltage dips, short breaks in power supply and voltage fluctuations

Origin
Voltage dips and fluctuations in the power supply caused by sudden load changes or the connection of other devices.

Features
Voltage dips occur sporadically. The size, frequency and duration of the dips can vary.

The European standard
EN 61000-4-11
EN 61000-4-29

Standard	Voltage reduction of U_N	Duration
EN 61000-4-11 For devices intended for connection to AC low-voltage power supply networks.	0 % 40 % 100 %	0.5, 1, 5, 10, 25 and 50 semi-vibrations at 50 Hz, correspond to: 5, 10, 50, 100, 250 and 500 ms
EN 61000-4-29 For devices intended for connection to DC low-voltage power supply networks.	0 % 40 % 70 %	at 0 %: 1, 3, 10, 30, 100, 300, 1000 ms at 40 and 70 %: 10, 30, 100, 300, 1000 ms

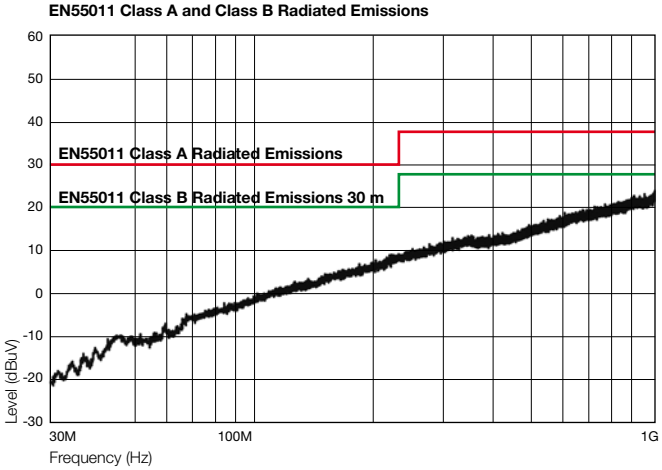
Measurement of radiated emissions

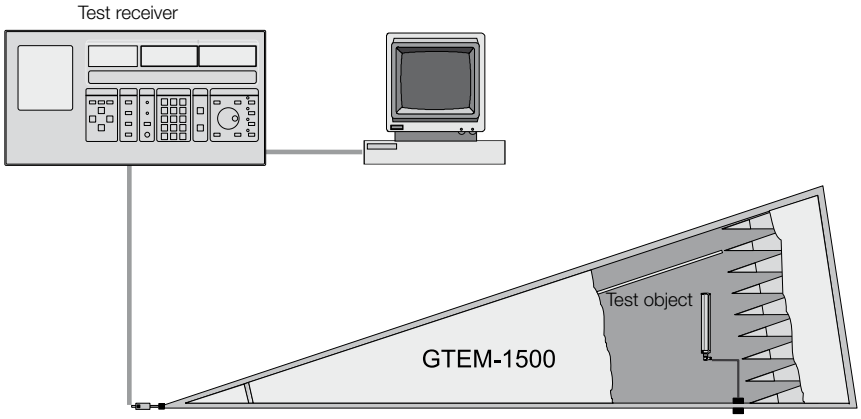
Frequency range
30...1000 MHz

Limit values as per EN 55011

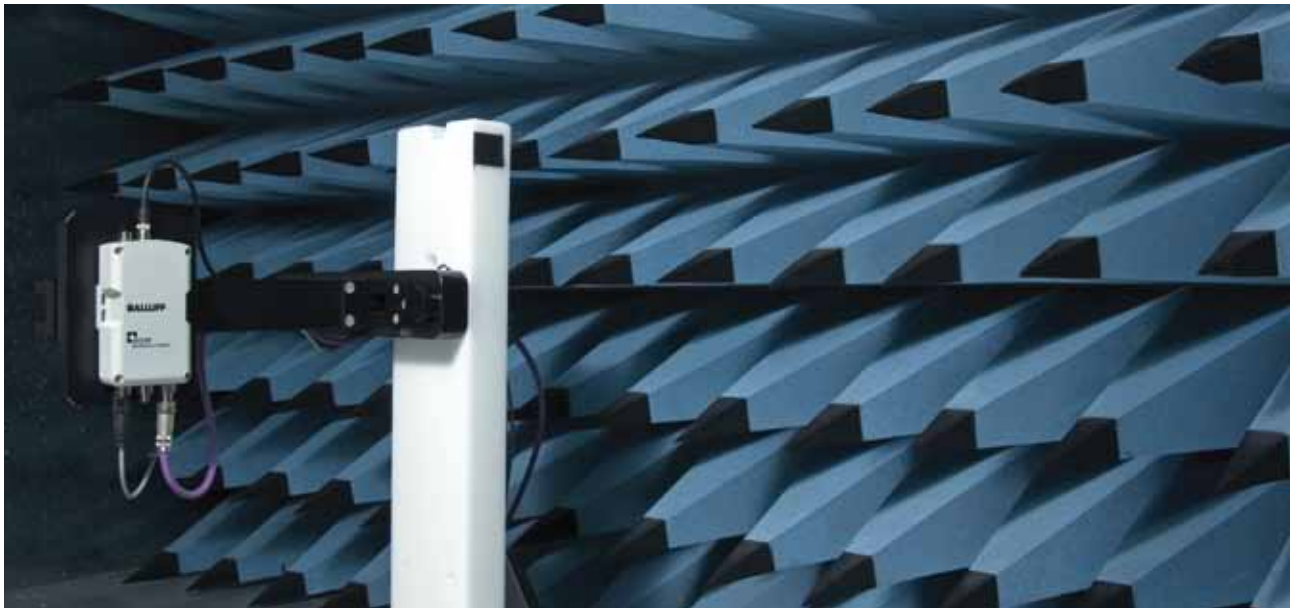
Group 1, class A
(industrial environments)
30...230 MHz
40 dBµV/m (quasi peak)
230...1000 MHz
47 dBµV/m (quasi peak)
10 m measuring range

Group 1, class B
(residential environments)
30...230 MHz
30 dBµV/m (quasi peak)
230...1000 MHz
37 dBµV/m (quasi peak)
10 m measuring range





Measurement of RF emissions in the GTEM cell



Measurement of conducted emissions on AC supply lines

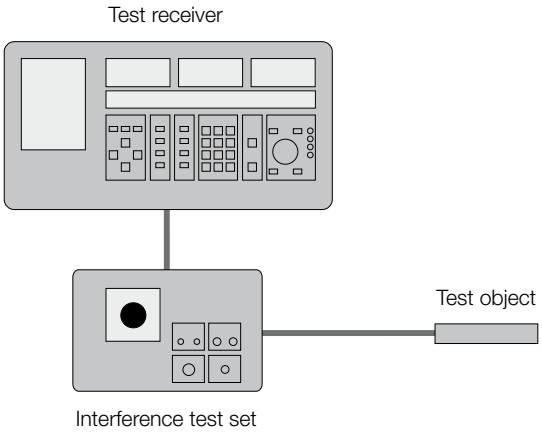
Frequency range
150 kHz...30 MHz

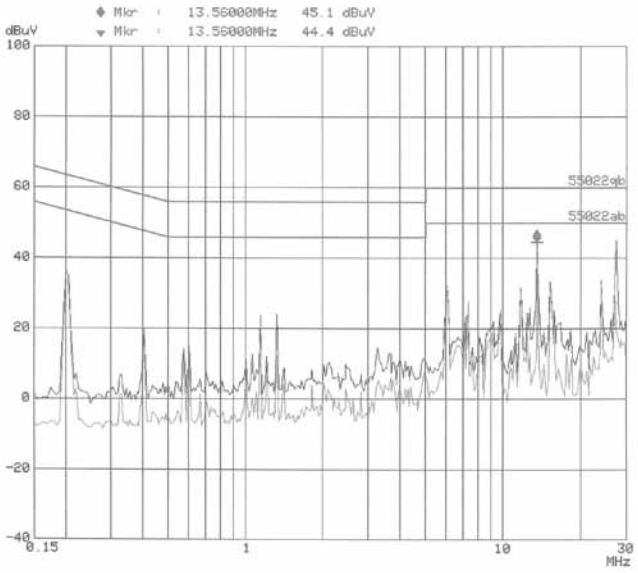
Limit values as per EN 55011

for devices used in industrial environments:
0.15...0.5 MHz
79 dBµV (quasi peak)
66 dBµV (average value)
0.5...30 MHz
73 dBµV (quasi peak)
60 dBµV (average value)

for devices used in residential environments:
0.15...0.5 MHz
66...56 dBµV (quasi peak*)
56...46 dBµV (average value*)
0.5...5 MHz
56 dBµV (quasi peak)
46 dBµV (average value)
5...30 MHz
60 dBµV (quasi peak)
50 dBµV (average value)

*linear with the logarithm for the falling frequency





Electromagnetic Compatibility
Emission testing, HF magnetic field

Measurement of the HF magnetic field from read heads and remote sensors with frame antenna

Frequency range
9 kHz...30 MHz

Limit value according to DIN EN 300330-1 for coils with A < 0.05 m² at 10 m distance, quasi peak

9...30 kHz	62 dBµA/m
30...70 kHz	62...58.5 dBµA/m, falling 3dB/oct
70...119 kHz	32 dBµA/m
119...135 kHz	56...55.6 dBµA/m, falling 3 dB/oct
135 kHz...1 MHz	27.7...19 dBµA/m, falling 3dB/oct
1...4.642 MHz	19...–1 dBµA/m, falling 9 dB/oct
4.642...30 MHz	–1 dBµA/m

Product-specific Tests

Testing the making and breaking capacity of proximity switches

Origin
By activating resistor and semiconductor loads, auxiliary contactors or electromagnets.

Features
The proximity switches must be able to make or break these loads without error.

The European standard
EN 60947-5-2
Sections 7.2.4 and 8.3.3.5

UL 508

Utilization categories for proximity switches, EN 60947-5-2

	Category	Typical applications
Alternating current	AC-12	Controlling resistor and semiconductor loads
	AC-140	Controlling small electromagnetic loads with a holding current ≤ 0.2 A (e.g. auxiliary contactors)
Direct current	DC-12	Controlling resistor loads and semiconductor loads
	DC-13	Controlling electromagnets

Table for verifying the making and breaking capacity of switch elements under normal conditions according to their utilization categories, EN 60947-5-2

Normal operating conditions

Utilization category	Make[1)]			Break			Number and switching frequency of make and break operations		
	I/Ie	U/Ue	cosφ or $T_{0.95}$	I/Ie	U/Ue	cosφ or $T_{0.95}$	Number of Switching operations	Switching frequency per min	Break duration MS
AC-12	1	1	0.9	1	1	0.9	6050	6	50
AC-140	6	1	0.3	1	1	0.3	6050	6	20
DC -12	1	1	1 ms	1	1	1 ms	6050	6	1
DC -13	1	1	6×P ms	1	1	6×P ms	6050	6	$T_{0.95}$

U_e Nominal operating voltage
$T_{0.95}$ Time in milliseconds until the stationary current reaches 95 %
P $U_e \times I_e$, stationary power
I Making and breaking current
U Voltage before make

Product-specific Tests

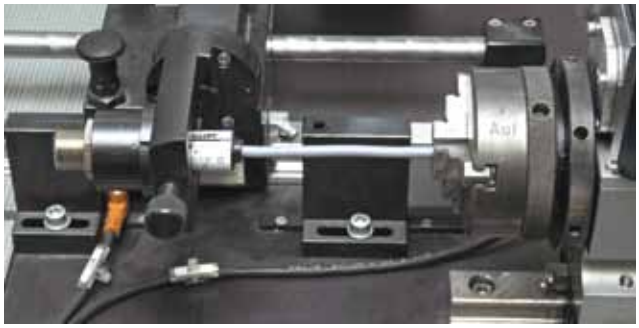
Testing the cable anchoring of proximity switches with integral connection cables

Origin
Tensile, pressure, torsional and bending loads may be exerted on the cable during assembly or when a proximity switch with integral connection cable is operated.

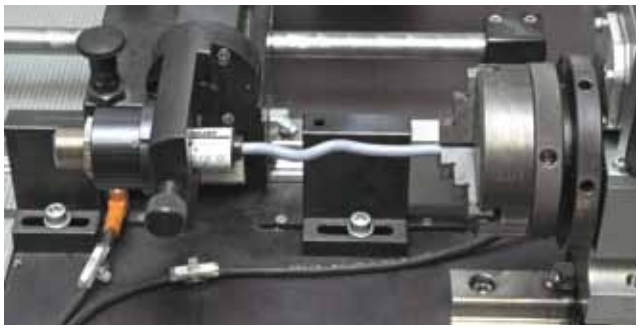
Features
The integral connection cable must withstand the loads and must not be pulled out of the proximity switch.

The European standard
EN 60947-5-2
Appendix B, appendix C

Each of the following four tests must be conducted three times with a break of one minute between each test.

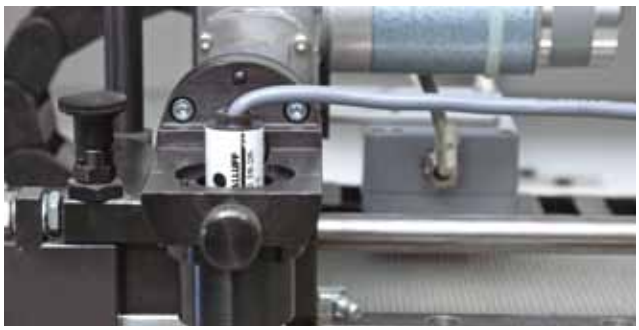


1. Tensile test



2. Torsion test

3. Push test

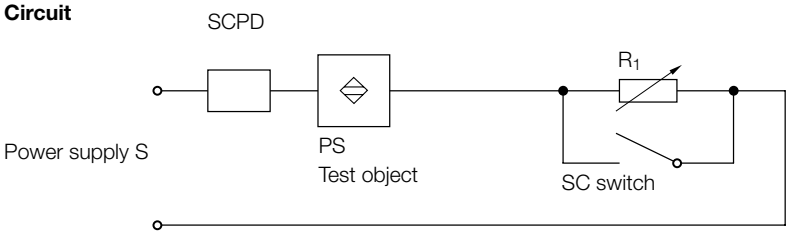


4. Bend test

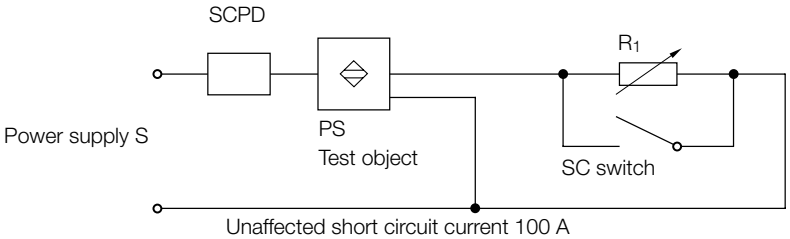
Balluff products are fitted either with a thermal or a cyclic short circuit protection. The short circuit protection is tested using an instrument that can generate a short circuit current of 100 A.

The European standard
EN 60947-5-2, section 8.3.4

Circuit



Unaffected short circuit current 100 A
a) 2 AC connections or 2 DC connections



Unaffected short circuit current 100 A
b) 3 DC connections

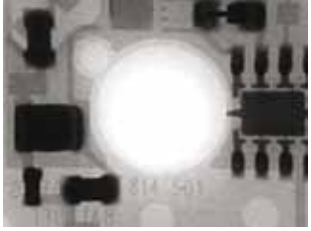
The switch must be installed in the open air under normal operating conditions.
Sensor ON: NO contact damped
NC contact not damped

R1 is configured so that rated operating current I_e flows.
Open circuit voltage: 1.1 × rated operating voltage or highest voltage within the voltage range

The power supply must be configured so that a current of 100 A flows in the event of a short circuit!

The test is conducted three times by actuating the SC switch.
The time between tests must be at least 3 min!

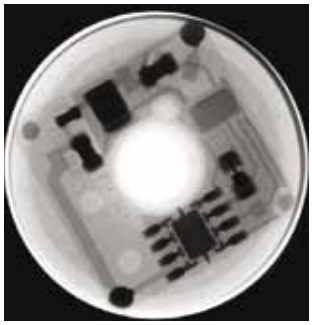
X-ray Analysis



High-resolution realtime X-ray machine for inspecting solde-ring points for defects such as bridges, inclusions and missing or open soldering points as well as the option of measuring coils and pot core caps on molded switches using PC software (dhs image database).

Technical data	
Field of view	D = 25 mm
Max. test object height	30 mm
Max. test object size	500×600 mm
Max. enlargement	15-way
Anode voltage	35...65 kV
Anode current	20...50 µA

X-ray and inspection machine RTX 113 by HEEB INOTEC



Printed circuit board

Switch element

Distance measurement

HALT Tests
HALT = Highly Accelerated Life Test

The objective is to accelerate the aging process during the development of a product to identify potential design faults or other weaknesses and as a result, launch reliable products onto the market.

Process:

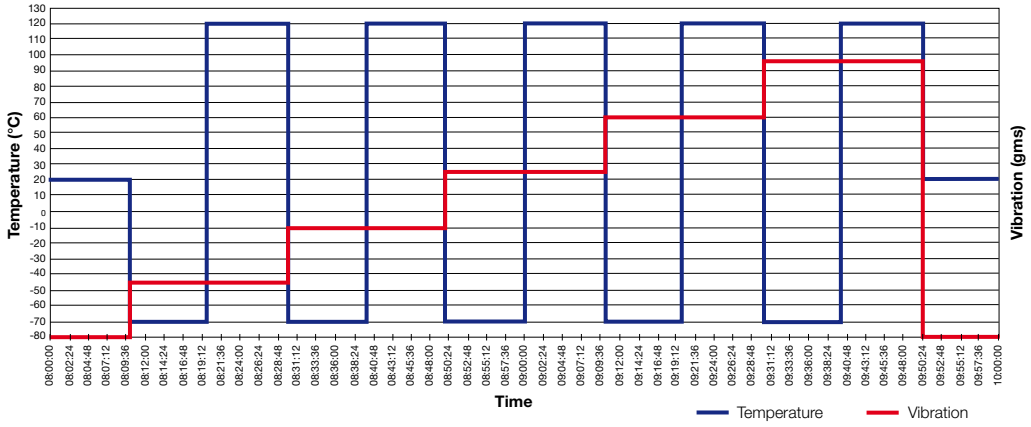
Phase 1: Temperature level test – cold and heat. The function and destruction limits are established during this phase.

Phase 2: Rapid temperature change. First practical test
Extreme stress = rapid aging

Phase 3: Vibration test. Determining the vibration limit

Phase 4: Combined environment – rapid temperature change with vibration: combined cycles are run in line with the limits identified in phase 1 and 3. The combination of loads above the specification makes this phase a high stress factor for the product.

Combined environment stress test



Technical data

HALT system

Manufacturer:	Thermotron Industries, USA
Dimensions H×W×T:	230×164×227 cm
Test bench:	106×106 cm
Frequency range:	2...10,000 Hz
Acceleration:	up to 50 g rms
Excitation:	9 pneumatic cylinders, Noise spectrum, triple-axis, 3 linear and 3 rotary degrees of freedom
Temperature range:	–100...+200 °C
Temperature gradient:	70 K/min
Power:	96 kW
Process:	electric heating, cooled by liquid nitrogen (17 liter/min.)

Vibration and Shock Tests

Sinusoidal vibration test, shock test and noise test

Sinusoidal vibration test

Objective: determine the resonance frequencies. Simulation of applications with speed-proportional vibrations e.g. in the vicinity of engine.

Standard:
EN 60068-2-6

Description: amplitude and acceleration profile between the start and end frequency, usually at logarithmic tuning speed so that resonances of the same quality are processed at the same speed.

Shock test

Objective: simulate e.g. the transport and handling of goods, switching impacts, earthquakes and equivalent machines, e.g. presses.

Standard:
EN 60068-2-27
EN 60068-2-29

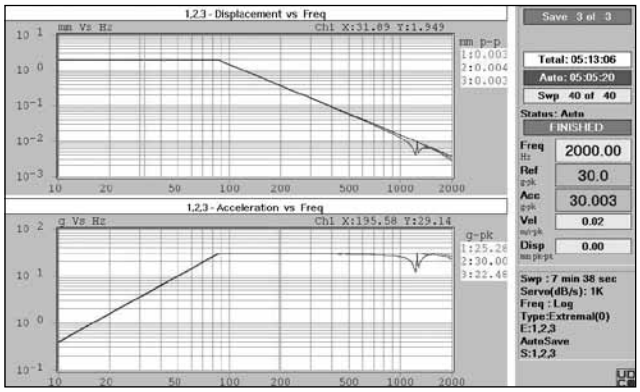
Description: as an acceleration time signal, usually semi-sinusoidal, but also trapezoidal or in saw tooth form.

Noise test

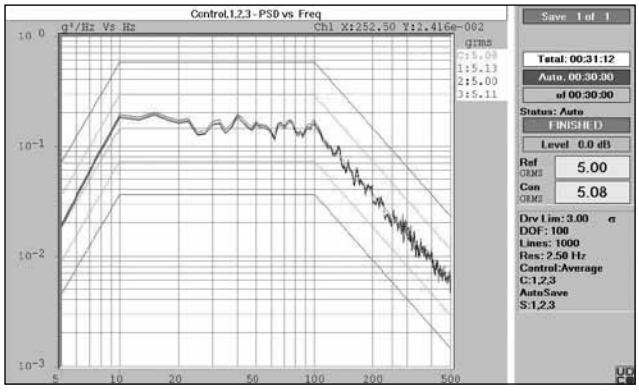
Objective: simulate applications with broad vibration range e.g. in processing machines, vehicles, etc.

Standard:
EN 60068-2-64

Description: with spectral power density between the lower and upper limit frequency.



Sinusoidal test diagram



Noise spectrum diagram

Vibration and Shock Tests

Sinusoidal vibration test, shock test and noise test

Objective: Simulate the mechanical loads of a product over its working life. Balluff products are often used in machines in which mechanical shock and vibration occur. To make sure they function reliably, they must be designed such that they are insensitive to shock and vibration. In the Balluff testing laboratory all products are therefore tested for mechanical stability before they are released for production.

The vibration testing equipment at Balluff has the following characteristics:

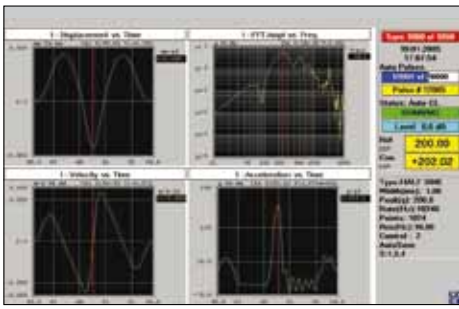
Manufacturer	**Unholtz-Dickie Corporation**	
Model	SA 15-S092-BP	SAI60-H560B-24-LP
Sinusoidal force vector	4.4 kN	35.6 kN
Random force vector	4.4 kN	35.6 kN
Shock force vector	8.8 kN	73 kN
Max. sinusoidal acceleration	100 g	89 g
Max. random acceleration	100 g	74 g
Max. shock acceleration	200 g	210 g
Max. sinusoidal speed	2.0 m/s	1.9 m/s
Max. shock speed	5.1 m/s	3.5 m/s
Max. displacement	51 mmp-p	51 mmp-p
Frequency range	up to 3.5 kHz	up to 2.7 kHz

The following tests can be performed on this equipment:

– Sinusoidal test
– Noise test
– Shocks

The system is also equipped with an FFT analyzer.

Tests can be performed to the following standards:
MIL STD 202
EN 60068-2-6
EN 60068-2-27
EN 60068-2-29
EN 60068-2-64
DIN EN 50155
IEC / EN 61373
GL



BALLUFF

sensors worldwide

Object Detection

Inductive sensors BES, cylinder sensors BMF, magnetic field sensors BMF, capacitive sensors BCS for object detection, ultrasonic sensors BUS for object detection, photoelectric sensors BOS, fiber optic devices BFB, fiber optics BFO, angle sensors BWL, through-beam fork sensors BGL, optical window sensors BOW, light grids BLG, contrast sensors BKT, luminescence sensors BLT, color sensors BFS, mechanical and inductive single and multiple position switches BNS

Linear Position Sensing

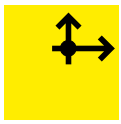
Micropulse® transducers BTL, magnetic linear encoder system BML, incremental encoders BDG, absolute encoders BRG, inductive displacement system BIW, inductive positioning system BIP, inductive distance sensors BAW, magnetoinductive distance sensors BIL, capacitive distance sensors BCW, photoelectric distance sensors BOD, ultrasonic sensors BUS for analog distance measurement

Fluid Sensors

Pressure sensors BSP, capacitive sensors BCS for level detection

Industrial Identification

Industrial RFID systems BIS, vision sensors BVS



Industrial Networking and Connectivity

Connectors and connection cables BCC, valve connectors BCC, passive splitter boxes BPI, active splitter boxes BNI, IO-Link, bus systems (Profibus, Profinet, CC-Link, DeviceNet, EtherNet), inductive couplers BIC, wireless systems BWT, power supplies BAE, electrical devices BAE

Accessories

Brackets and mountings, assembly system BMS

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