

PART B

TECHNICAL PROJECT SPECIFICATION

TECHNICAL PROJECT SPECIFICATION FOR THE SUPPLY,
DELIVERY,
INSTALLATION, COMMISSIONING AND TESTING FOR THE
ELECTRICAL INSTALLATION AT
TROTSMVILLE PRIMARY SCHOOL

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TECHNICAL PROJECT SPECIFICATION

1 GENERAL

1.1 SITE INFORMATION

This is the technical specification for electrical installation for Trotsville Primary School.

1.2 SCOPE OF WORK

- Supply, delivery, installation, commissioning, testing and handing over in working condition of:
 - Building general electrical installations,
 - Low Voltage Distribution Panels,
 - Electrical Cable Reticulation,
- Twelve (12) months free maintenance, after first delivery certificate.

1.3 SUMMARY OF WORKS

- Install new electrical installation in accordance with the drawings, Client's Technical Specifications and SANS 10142.
- Electrical connection from the supply authority end point.
- Provide a free maintenance of the electrical installation for a period of twelve (12) months, after the issuing of the first delivery certificate.

2. REGISTRATION AS ELECTRICAL CONTRACTOR

Electrical contractors must register with the Department, prior to the commencement of any service. This registration must be done at the Regional Office

The Electrical contractor must provide the following documents, when registering with the department:

- (a) Electrical Installer Certificate
- (b) Electrical contractor's license.
- (c) Industrial council registration certificate.
- (d) Registration certificates and latest receipts of payment to the Workman's Compensation as required by the Workman's Compensation Act of 1941, as amended.
- (e) A valid and original TAX Clearance Certificate.

3. SUPPLY BOARDS

The Contractor shall provide and install new distribution boards located as indicated on the layout drawings complete with all switchgears and accessories as per the Distribution Boards drawings. The contractor shall supply a set of workshop drawings on all distribution boards for engineer's approval before manufacture of the distribution boards commences.

3.1 ELECTRICAL DISTRIBUTION BOARDS

The contractor shall supply a set of approved workshop drawings on all low voltage distribution panels for engineer's approval before manufacture of the low voltage distribution panel commences.

The following types of distribution boards are required for the service:

- a) Main DB: DB A: Floor Standing
- b) Sub DB: DB B: Flush Mounted
- c) Sub DB: DB C: Flush Mounted
- d) Sub DB: DB D: Flush Mounted
- e) Sub DB: DB E: Flush Mounted
- f) Sub DB: DB F: Flush Mounted
- g) Sub DB: DB G: Flush Mounted
- h) Sub DB: DB H: Flush Mounted
- i) Sub DB: DB I: Flush Mounted

The Distribution Board shall have pad-lockable doors and security bars. Provide Spare Capacity: 25% spare capacity

4 CHANNELS AND CONDUITS

4.1 CONDUITS

Conduit installation shall be of limited length only. Most of the wiring shall be in the wiring channels from which the conduits shall T-off.

APPLICATION	CONDUIT SYSTEMS				
	SCREWED STEEL	PLAIN-END STEEL			PVC
	Black	Galv.	Black	Galv	
Surface: in accessible roof space	Yes	Yes	Yes	Yes	Yes
Surface above accessible ceiling with other services	Yes	Yes	Yes	Yes	No
Surface above accessible ceiling without other services	Yes	Yes	Yes	Yes	Yes
Surface above accessible ceiling with gang-planks as walkways	Yes	Yes	Yes	Yes	No
Spaces between concrete slabs and false ceilings	Yes	Yes	Yes	Yes	Yes
Surface visible	Yes	Yes	Yes	Yes	No
Surface on open slabs	Yes	Yes	Yes	Yes	No
Covered walkways	No	Yes	No	Yes	No
Hazardous areas	Yes	Yes	No	No	No
Built or cut into brick walls	Yes	Yes	Yes	Yes	Yes
Cast in concrete	Yes	Yes	Yes	Yes	Yes
In damp areas	No	Yes	No	Yes	Yes
Exposed to weather	No	Yes	No	No	No
In floors of laundries and other damp areas	No	Yes	No	Yes	Yes
Fire detection	Yes	Yes	Yes	Yes	Yes

4.2 WIRING CHANNELS

Wiring channels shall form main part of the wire ways along the passage-ceiling void/side walls with conduits making T-offs from the wiring channels in a limited length.

Wiring channels must not be loaded to more than 60% of their capacity.

The following accessories shall form part of wiring channels installation. Snap-in Cover plate, Distribution Board Outlet, 90° Elbow (bends), Tee piece, Hangers, End Caps, and 4-Way pieces.

Services

Install multiple duct runs or internal metal partitions where conductors for power, control, communication and other services are present.

5. WIRING

Except where otherwise specified, all wiring shall be carried out in conduit throughout. **Only one circuit per conduit will be permitted.**

No wiring shall be drawn into conduit until the conduit installation has been completed and all conduit ends provided with bushes. All conduits and wiring channels to be clear of moisture and debris before wiring is commenced.

CIRCUIT	PVC WIRE SIZE	BARE COPPER EARTH
Lighting circuits	2.5 mm ²	2.5 mm ²
Socket outlet circuits	4.0 mm ²	2.5 mm ²
Geyser Power Points	4.0 mm ²	2.5 mm ²
Stove Power Points	6.0 mm ²	2.5 mm ²
Geyser Power Points	4.0 mm ²	2.5 mm ²

Sizes of conductors not specified must be in accordance with the "Wiring Code".

The loop-in system shall be followed throughout, and no joints of any description will be permitted.

Where cable ends connect onto switches, fittings, etc. the end strands must be neatly and tightly twisted together and firmly secured. Cutting away of wire strands of any cable will not be allowed.

6. LIGHTS AND SOCKET OUTLET POINTS

The contractor shall supply and install all light switches, socket outlets, isolators complete with cover plates as specified on the drawings and in the bill of quantities. They shall all be labelled.

6.1 **LIGHT SWITCHES - Normal power (Earthed neutral supply)**

Rating

Light switches must be rated at 16 A, 250 V except where otherwise specified.
Switches must have protected terminals for safe wiring. Switches must have silver contacts.

Wiring and Protection

Each lighting circuit must be protected in the distribution board with a 10 A moulded case circuit breaker.

Lighting circuit wiring must consist of two PVC insulated, 2,5 mm² stranded copper conductors plus a 2,5 mm² bare stranded copper earth continuity conductor or a 4 mm² green-yellow PVC insulated, stranded copper earth continuity conductor as specified.

For single-phase circuits the colour of the PVC insulated conductors must be as follows:

Live conductor	:RED
Neutral conductor	:BLACK
Earth continuity conductor	:GREEN-YELLOW or Bare as specified
Return conductor	:WHITE or YELLOW

In three-phase installations, ensure that all the socket outlets in any one room are connected to the same phase.

Type	Single pole rocker switch
Rating	16 A
Earthing	Earth terminal on the yoke
Installation or mounting type	100 mm x 50 mm x 50 mm galvanised steel wall box
Circuit wiring	2 x 2,5 mm ² black and red PVC insulated copper conductors and a 2,5 mm ² bare copper earth conductor
Mounting height	1300 mm above final floor level
Wire way	Galvanised trunking and/or 20 mm diameter conduit

6.2 SOCKET OUTLETS

Install socket outlets in the area as specified. Install normal power socket outlets in accordance with applicable standards except where specified otherwise in this section.

For single-phase circuits the colour of the PVC insulated conductors must be as follows:

Live conductor	:RED
Neutral conductor	:BLACK
Earth continuity conductor	:GREEN-YELLOW or Bare as specified

In three-phase installations, ensure that all the socket outlets in any one room are connected to the same phase.

Socket outlets - Normal power

Type	3-pin, single,
Switch	Single pole rocker switch
Rating	16 A
Wall box	100 mm x 100 mm x 50 mm galvanised steel
Circuit wiring	4 mm ² black and red PVC insulated copper conductors and a 2,5 mm ² bare copper earth conductor
Wire way	Galvanised trunking and/or 20 mm diameter conduit

Mounting height for socket outlets

Position	Height
General purpose outlets in entrance lobbies, offices, stores, passages	400 mm affl
Outlets above counters	100 mm acl
Kitchens and laundries	1200 mm affl

Position	Height
Offices, residences, hospital wards, corridors, nurses' homes, stores, dining rooms, reception, rest rooms	400 mm
Manual training centres, work shops	900 mm
Classrooms, measured between the bottom edge of the blackboard and the centre of the outlet box	230 mm
Kitchens, domestic science centres, laundries	1,2 m

7 **POWER POINTS**

Allow for the installation of power points and equipment as listed in the schedule and indicated on the drawings.

Equipment	Position/ Mounting Height	Wiring
Geyser	In Ceiling Void	4 mm ² PVC insulated conductors plus 2.5 mm ² bare copper earth wire
Stove	Wall Mounted	6 mm ² PVC insulated conductors plus 2.5 mm ² bare copper earth wire
Siren	Wall Mounted	4 mm ² PVC insulated conductors plus 2.5 mm ² bare copper earth wire
Air Con	Wall Mounted	4 mm ² PVC insulated conductors plus 2.5 mm ² bare copper earth wire
Gate Motor	Wall Mounted	10 mm ² Cable plus 2.5 mm ² bare copper earth wire

8 **EARTHING OF A GENERAL ELECTRICAL INSTALLATION**

The contractor for this contract shall be responsible for all internal and external earthing such as the bonding of all fixed appliances like geysers, water pipes, etc. in accordance with SANS 10142, Part I and the Cliental Standard Specifications for General Electrical Installations

9 **SUPPORT SERVICES**

Only wire ways with draw wires for the following support services installation shall be installed as per the drawing layout:

- Communications systems
- Public Addresser

Wire Ways: - 25 mm DIA Conduits
 - Wiring Channels

The actual wiring of the support services shall be done through a specialist contractor.

10 **CABLE**

Supply, install and connect all the low voltage cables specified. The cables must comply with the standard specification. The type of cable specified is an Earth Continuity Conductor (ECC) cable type.

Installation of cables shall consist of the following, laid in ducts or trenches or sleeves, and fixing support.

Cable Schedule

Supply, install and connect the following cables:

FROM	TO	CABLE SIZE
Meter Kiosk	Main DB-A	70 mm ² x 4-core PCV SWA PVC copper cable and 50 mm ² bare copper earth wire
Main DB-A	Sub DB-B	25 mm ² x 4-core PCV SWA PVC copper cable and 16 mm ² bare copper earth wire
Main DB-A	Sub DB-C	16 mm ² x 4-core PCV SWA PVC copper cable and 6 mm ² bare copper earth wire
Main DB-A	Sub DB-D	16 mm ² x 4-core PCV SWA PVC copper cable and 6 mm ² bare copper earth wire
Main DB-A	Sub DB-E	16 mm ² x 4-core PCV SWA PVC copper cable and 6 mm ² bare copper earth wire
Main DB-A	Sub DB-F	16 mm ² x 4-core PCV SWA PVC copper cable and 6 mm ² bare copper earth wire
Main DB-A	Sub DB-G	16 mm ² x 4-core PCV SWA PVC copper cable and 6 mm ² bare copper earth wire
Main DB-A	Sub DB-H	16 mm ² x 4-core PCV SWA PVC copper cable and 6 mm ² bare copper earth wire
Main DB-A	Sub DB-I	16 mm ² x 4-core PCV SWA PVC copper cable and 6 mm ² bare copper earth wire

11. SCHEDULE OF DRAWINGS

The list of drawings is for all drawings associated with the Electrical Engineering Services. They are listed together for completeness and for information purposes only.

DRAWING No.	DESCRIPTION	Size	Rev
...5(1)/1	LIGHTING LAYOUT	A1	TD
...5(1)/2	POWER LAYOUT	A1	TD
...5(1)/3	ELECTICAL DISTRIBUTION BOARD LAYOUT	A3	TD

12 EARTHING AND LIGHTNING PROTECTION INSTALLATION

A specialist company to be appointed will install earthing and lightning protection. The contractor shall provide wire ways where required for the earthing and lightning protection.

Lightning protection installations must comply with SABS 03.

13. **SCHEDULE OF LUMINAIRES**

The light fittings and accessories are to be according to the specifications and shall be approved by the Client, complete with SANS mark of approval. Each light fitting shall be supplied complete with relevant lamps.

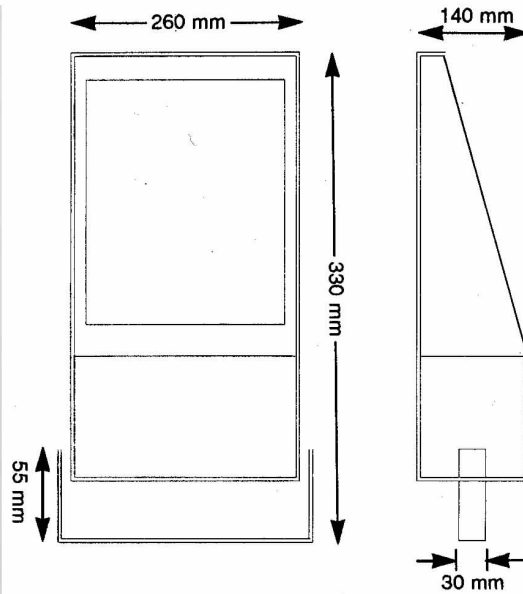
All the conduits and the wiring to the light points are part of this contract.

SYMBOL / TYPE	DESCRIPTION
A	Open Channel Fluorescent Luminaire, 2x58W fluorescent tubes. The fitting to have electronic control gear and telescopic lamp holders. Similar to (F22)
B	Shallow Surface Mounted Luminaire, 2x58W fluorescent tubes. The diffuser to have conical design and double
C	Wall Mounted Round Bulkhead, 2 x PL9W with a aluminum base and electronic control gear. The color of the diffuser to be clear and base to be black. Similar to (B11)
C	Ceiling Mounted Round Bulkhead with a decorative ring, 2 x PL9W with a aluminum base and electronic control gear. The color of the diffuser to be polycarbonate and base to be White
D	Flood Light Luminaire 125W HPS (High Pressure Sodium Lamp). Similar to (B2)
B	Vapour proof fluorescent luminaire 2x58 W with polycarbonate diffuser and an electronic control gear.

14. **SPECIFICATION OF LIGHT FITTINGS**

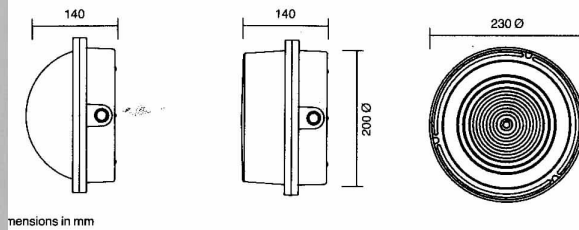
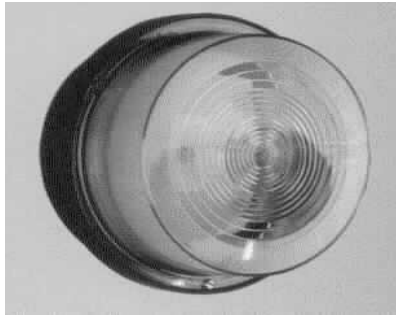
TYPE B11: EXTERIOR LUMINAIRE C
TYPE B15: EXTERIOR LUMINAIRE D
TYPE F22: OPEN CHANNEL FLUORESCENT LUMINAIRE A

BULKHEAD LUMINAIRE (B2)



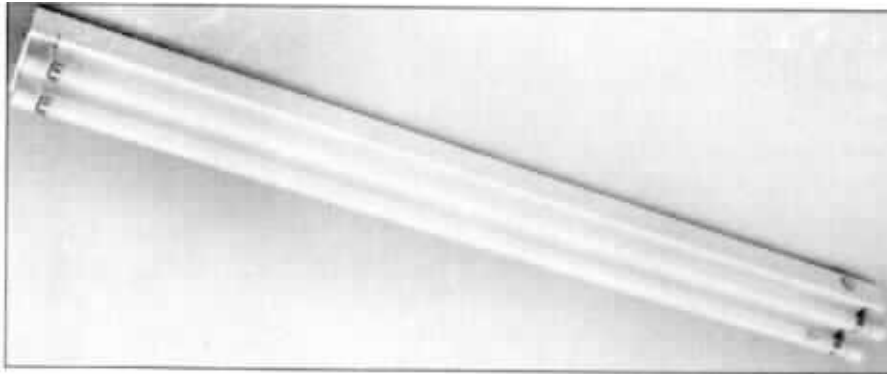
Identification symbol	B2
Application	Exterior lighting
Type	Bulkhead
Mounting	Surface
Shape	Rectangular
Approximate dimensions	Width: 260 mm Height: 330 mm Depth: 140 mm
Base	<ul style="list-style-type: none"> ➤ Glass reinforced plastic with double O-ring type silicon gasket ➤ Central 20 mm diameter entry hole in the bottom of the base for cable entry through a compression gland ➤ Threaded blind holes for equipment mounting ➤ Three way terminal block secured independently ➤ Flexible silicone insulated 1 mm² copper internal wiring in a protective sleeve
Control gear	<ul style="list-style-type: none"> ➤ Extruded aluminium gear tray, secured to the base with screws in threaded holes ➤ Gear tray must be easily removable
Finish	Polyurethane powder coated
Colour	Black
Diffuser	Clear 4 mm thick toughened glass
Lamp	125 W Mercury Vapour discharge lamp
Lamp holder	The design must prevent loosening of the lamp caused by vibrations Porcelain outer with brass inserts
Ingress protection rating	IP65
SABS mark	Safety mark for luminaire Safety and/or approved performance mark for control gear components

EXTERIOR LUMINAIRE (B11)



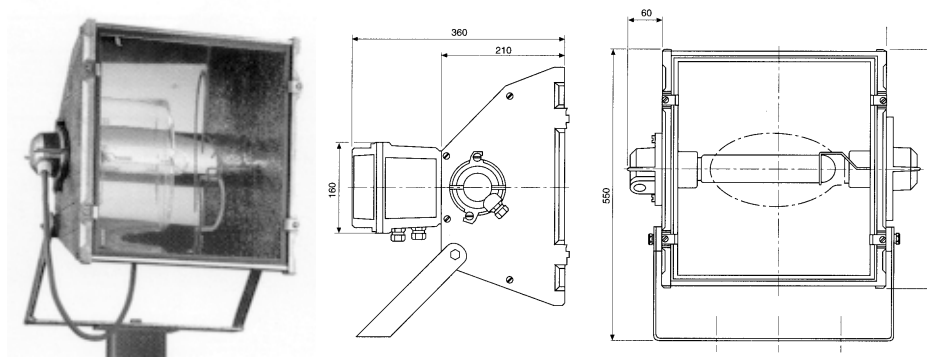
Identification symbol	B11
Application	Exterior lighting Interior: Corridor or stairway
Type	Bulkhead
Mounting	Surface
Shape	Round
Approximate dimensions	Diameter: 230 mm Height: 140mm
Base	<ul style="list-style-type: none"> ➤ Die-cast aluminium with recessed fitted sealing gasket ➤ One die-formed fixing centre (65 mm diameter and 4 mm high) with central 20 mm diameter wire or conduit entry and four "C" guides in circular formation (to be drilled through on site) for fixing to 60 mm diameter round conduit boxes ➤ One 20 mm diameter side knock-out ➤ Threaded blind holes for equipment mounting ➤ Rigid 1 mm thick angle bracket for lamp holder ➤ Three way terminal block, independently secured, with a copper earth connection to the base ➤ Flexible silicone insulated 1 mm² copper internal wiring in a protective sleeve
Control gear	<ul style="list-style-type: none"> ➤ Gear tray must be secured to the base with screws in threaded holes ➤ When disconnected the gear tray must be suspended with a removable flexible holding strap ➤ Provide separate chokes for the two lamps
Finish	Polyurethane powder coated
Colour	Black
Diffuser	<ul style="list-style-type: none"> ➤ Clear prismatic polycarbonate diffuser with smooth outside ➤ Secure diffuser to the base with three screws
Lamp	2 x 9 W Compact fluorescent lamps
Lamp holder	2 x Compact fluorescent 2 pin
Ingress protection rating	IP55
SABS mark	Safety mark for luminaire Safety and/or approved performance mark for control gear components

OPEN CHANNEL FLUORESCENT LUMINAIRE (F22)



Identification symbol	F22
Application	Perimeter lighting built into kitchen canopy
Type	Open channel
Mounting	Surface
Shape	Rectangular
Approximate dimensions	Length: 1500 mm Width: 70 mm Depth: Body: 55 mm; Total: 105 mm
Body	<ul style="list-style-type: none"> ➤ Body and cover of 0.8 mm thick cold rolled steel ➤ Ventilation louvers for heat dissipation ➤ Cross bracing for rigidity ➤ Secure cover with steel screws to threaded inserts on the cross bracings ➤ Three die-formed fixing centres (65 mm diameter and 4 mm high) with punched 20 mm diameter conduit entries and four "C" slots in circular formation for fixing to 60 mm diameter round conduit boxes ➤ One 20 mm diameter knock-out at each end ➤ Welded earth stud ➤ Manufacturers label fixed inside the body
Control gear	<ul style="list-style-type: none"> ➤ Fix control gear with welded studs, nuts and washers or threaded brackets, screws and washers. ➤ Starters must be on the sides of the body and accessible without removing the lamps or cover ➤ Switch start circuit ➤ Three way 15 A terminal block, independently secured ➤ Internal wiring must have 105 °C, 600 V grade insulation
Finish	Hot-dip bonderised with epoxy powder coating
Colour	White
Lamp	2 x 58 W, 26 mm diameter fluorescent lamps
Lamp holder	Telescopic 2-pin lamp holders
Ingress protection rating	IP20
SABS Mark	Safety mark for luminaire Safety and/or approved performance mark for control gear components

FLOODLIGHT LUMINAIRE (B15)



Identification symbol	B15
Application	Exterior: Sport field and area lighting
Type	Flood light
Mounting	Adjustable bracket
Shape	Square (lens)
Approximate dimensions	Width: 400 mm (lens) Height: 400 mm (lens) Depth: 360 mm (total)
Options available	<p>Provide these options if specified:</p> <ul style="list-style-type: none"> ➤ Symmetrical narrow, medium wide and extra wide beam distribution ➤ Asymmetrical beam distributions as specified ➤ An integrally mounted thermal circuit breaker 10 A, 5 kA with the circuit breaker lever accessible from the outside ➤ A pug-in type daylight switch installed via Nema socket located above the gear compartment of the luminaire housing
Body	<ul style="list-style-type: none"> ➤ The luminaire must consist of a separate lamp compartment and control gear housing that are attached to each other ➤ The lamp compartment must be manufactured of high pressure die-cast aluminium and stainless steel and consist of two side plates that control the shape of the pre-formed back reflectors by 4 extruded aluminium stay-bars ➤ The control gear compartment must be manufactured of high pressure die-cast aluminium and consist of a body and lid sealed together with a silicone sponge rubber gasket ➤ The control gear housing lid must be held captive by a removable wish-bone spring when it is unscrewed and opened ➤ The reflector system must be made of super pure anodised aluminium and consist of a back reflector and two side reflectors ➤ The angle adjustable mounting bracket must be made of 5 x 40 mm hot dipped galvanised steel with pre-drilled mounting holes

Identification symbol	B15
Control gear	<ul style="list-style-type: none"> ➤ Control gear must be suited for the lamp specified and must be mounted on a removable gear tray ➤ The gear tray must be manufactured of sheet steel at least 0.7 mm thick ➤ All components must be individually removable and must bear the relevant SABS mark ➤ All internal wiring must be Teflon coated with protective sleeving ➤ All screws, bolts and metals must be stainless steel or of non-corrosive material ➤ Mains connection must be through a suitable screw terminal block ➤ Ignitors where applicable must be of the superposed pulse type ➤ The luminaire must be power factor corrected to at least 0.85 ➤ The luminaire must be able to withstand ambient temperatures of 45°C without mechanical or electrical failure or damage ➤ The luminaire must be completely wired internally
Finish	Natural
Colour	Aluminium/Stainless steel
Lens	<ul style="list-style-type: none"> ➤ The lens must be heat and impact resistant glass ➤ The lens must be secured by at least four stainless steel screw-down clamps ➤ The lens must be sealed with a moulded, heat resistant, silicone sponge rubber gasket
Lamp options	Provide the lamp options as specified: <ul style="list-style-type: none"> ➤ 250/400 W MV/Metal Halide ➤ 150/250/400 W HPS
Lamp holder	<ul style="list-style-type: none"> ➤ Lamp holder must be suitable for the lamp specified ➤ Lamp replacement must be facilitated from the side with a high pressure die-cast aluminium lamp holder housing sealed with a one-piece silicone gasket and secured with two stainless steel screws ➤ The housing must support an E40 porcelain lamp holder suitable for 5 kV superposed ignitor pulses ➤ The design must prevent loosening of the lamp caused by vibrations
Ingress protection rating	Lamp compartment: IP65 Control gear compartment: IP65
SABS mark	Safety and approved performance mark for luminaire Safety and/or approved performance mark for control gear components