

SUBSTITUTION BOARD

TECHNICAL SPECIFICATION

1. Scope and Purpose

This specification defines the functional, mechanical, electrical, optical, and environmental requirements, as well as delivery and acceptance conditions, for a **double-sided substitution board** to be used in football matches.

2. Definitions

- **Board:** A portable indicator used during substitutions to display the shirt numbers of the incoming/outgoing players and the additional time.
- **SMD LED:** Surface-mounted LED.
- **Time Display:** Display of minutes and seconds in the format **mm:ss**—two digits for minutes + two digits for seconds with a “:” separator (5 characters total).

3. System Components

- Double-sided LED display surfaces
- Membrane keypad (numeric 0–9)
- On/Off button
- Control screen (small display for information monitoring)
- Built-in rechargeable power source and charge indicator
- Connectors and internal wiring (grouped data cables)

4. Functional Requirements

- 4.1. The board shall be **double-sided**.
- 4.2. During the match, the shirt numbers of the **incoming** and **outgoing** players shall be displayed **simultaneously**.
- 4.3. The displayable number range shall be **00–99**.
- 4.4. The **incoming player** shall be shown in **green** digits; the **outgoing player** in **red** digits.
- 4.5. The **added time** shall be displayed; time format **mm:ss** (5 characters).
- 4.6. Match information shall be viewable on the **control screen** (small display).
- 4.7. An **On/Off** button shall activate the LED display.
- 4.8. Shirt numbers shall be entered via the **0–9 numeric keys** on the keypad.

5. Optical / Display Requirements

- 5.1. **Digit height** shall be **at least 24 cm**.
- 5.2. LEDs shall be **SMD type** with **luminous intensity 5,000–8,000 mcd**.
- 5.3. **Viewing angles** shall be **≥ 140° (H)** and **≥ 120° (V)**.
- 5.4. Display digits shall be of **7-segment** construction.
- 5.5. In the event of one or more LED failures, the corresponding **segment shall not go completely dark** (segment continuity).
- 5.6. The display **front panel** shall be covered with **anti-glare Lexan**.

6. Mechanical Requirements

- 6.1. The board housing shall be manufactured from **ABS** material.
- 6.2. **Enclosure dimensions** shall be at least **70 cm (W) × 35 cm (H) × 1.5 cm (D)**.
- 6.3. The housing shall be **lightweight** and **black** in colour.
- 6.4. The front area shall be covered with **anti-glare Lexan**.
- 6.5. **Product weight** shall be in the range **1.5–3.0 kg**.
- 6.6. The board shall include a **sponsor advertising area**, internal or add-on.
- 6.7. It shall be supplied with a **carrying case**.
- 6.8. **Connectors** shall be easy to plug/unplug and **resistant to moisture**.
- 6.9. **Internal wiring** shall be neat with **grouped data cables** to facilitate service and maintenance. There shall be **no cut, spliced, or connector-less** cable joints.

7. Electrical / Electronic Requirements

- 7.1. **Maximum power consumption** shall be **≤ 45 W**.
- 7.2. **Operating voltage** shall be **14.8 V**.
- 7.3. **Driver boards** shall be protected against **short circuits**.
- 7.4. IC/microcontroller families used shall be **ST, Toshiba, Texas Instruments, NXP, or Green Micro**.
- 7.5. **Charging time** shall be **≤ 1.5 hours**; a **battery charger** shall be supplied with the product.
- 7.6. The board shall include a **charge status indicator**.

8. Environmental Conditions and Robustness

- 8.1. **Operating temperature** shall be **–25 °C to +50 °C**.
- 8.2. **Protection rating: IP65**.
- 8.3. Suitable protection shall be provided against **humidity, dust, and splashing water** for outdoor use.

9. Compliance and Standards

- 9.1. The product shall comply with **RoHS**.
- 9.2. The product shall bear **CE** marking.
- 9.3. The device shall meet **UEFA-level manufacturing quality** appropriate to relevant football organisations' requirements.
- 9.4. The manufacturer shall hold **ISO 9001 Quality Management System** certification.

10. Delivery and Documentation

10.1. A **user manual** and **warranty certificate** shall be delivered.

10.2. The **battery charger** and **carrying case** shall be included in the delivery.

11. Warranty and Service

11.1. The product shall have a warranty of **at least 2 (two) years**.

11.2. **Technical support** shall be provided by the manufacturer for service and maintenance processes.

12. Testing, Inspection, and Acceptance Criteria

12.1. Functional Tests:

- Simultaneous display of incoming/outgoing player numbers
- Colour verification (green/red)
- Time display verification (mm:ss, 5 characters)

12.2. Optical Tests:

- Digit height measurement (≥ 24 cm)
- Verification of luminous intensity (5,000–8,000 mcd) and viewing angles ($\geq 140^\circ/120^\circ$)
- Verification of anti-glare front panel

12.3. Electrical Tests:

- Maximum power consumption (≤ 45 W)
- Operating voltage (14.8 V)
- Charging time (≤ 1.5 hours) and charge indicator operation

12.4. Environmental & Protection Tests:

- Functional tests across the operating temperature range
- Verification of IP65 protection level

12.5. Mechanical & Structural Checks:

- Enclosure dimensions and material conformity (ABS)
- Weight range (1.5–3.0 kg)
- Internal wiring layout and connector configuration

12.6. Documentation:

- User manual, warranty certificate, declarations of conformity

SUMMARY TABLE – System-Wide (Key Mandatory Items)

Feature	Requirement
Display Surface	Double-sided
Number Range	00–99
Colour Codes	Incoming: Green ; Outgoing: Red
Time Format	mm:ss (5 characters; two-digit minutes + two-digit seconds; “:”)
Digit Height	≥ 24 cm
LED Type / Intensity	SMD / 5,000–8,000 mcd
Viewing Angle	≥ 140° (H) / ≥ 120° (V)
Protection Rating	IP65
Operating Temperature	–25 °C ... +50 °C
Max. Power / Voltage	≤ 45 W / 14.8 V
Charging Time	≤ 1.5 h (with charge indicator)
Weight	1.5–3.0 kg
Front Panel	Anti-glare Lexan
Housing	ABS
Control	Membrane keypad + On/Off button + small control display
Manufacturing/Compliance	ISO 9001, CE, RoHS; compliant with football organisation standards