# TEST REPORT

## EN 61131-2

### Programmable controllers - Part 2: Equipment requirements and tests

| | |
|---|---|
| Report Reference No ..... : | P2203023-LVD |
| Date of issue ..... : | 2022-09-01 |
| Total number of pages ..... : | 42 |
| Project handler (name + signature) ..... : | Kai Chou |
| Reviewer (name + signature) : | Kent Fang |
| Testing Laboratory ..... : | i-Tek Electronics Corp |
| Address ..... : | 16F., No.671, Bannan Rd., Zhonghe Dist., New Taipei City 235, Taiwan (R.O.C.) |
| Testing location/ address..... : | 16F., No.671, Bannan Rd., Zhonghe Dist., New Taipei City 235, Taiwan (R.O.C.) |
| Applicant's name..... : | FATEK AUTOMATION CORPORATION |
| Address..... : | 26 F., No. 29, Sec. 2, Zhongzheng E. Rd., Tamsui Dist., New Taipei City 25170, TAIWAN (R.O.C.) |
| Manufacturer's name..... : | FATEK AUTOMATION CORPORATION |
| Address..... : | 26 F., No. 29, Sec. 2, Zhongzheng E. Rd., Tamsui Dist., New Taipei City 25170, TAIWAN (R.O.C.) |
| Test specification: | |
| Standard ..... : | EN 61131-2:2007 |
| Test procedure ..... : | LVD report |
| Non-standard test method..... : | N/A |
| Test Report Form No..... : | ITEK_EN61131-2-2007-S |
| Test Report Form(s) Originator : | ITEK |
| Test item description ..... : | PLC (Programmable Logic Controller) |
| Trade Mark..... : | FATEK |

| | |
|---|---|
| Manufacturer ..... : | FATEK AUTOMATION CORPORATION |
| Model No..... : | MR5C9-1616T+MPA048-24+MHCM25+MHCM55 +M16X+M16YT+M16YJ+M16YR+M1616XYT+ M1616XYJ+M04ADR+M04AD+M04TCR+M04TC+ M04DA+MRE |
| Serial No ..... : | M☆◎-□△+MP◇-＊△+M☆□◎△ |
| **Technical data:** | |
| Rated Voltage ..... : | 100-240 Vac |
| Rated Current..... : | 1 A |
| Rated Power ..... : | -- |
| Frequency ..... : | 50/60 Hz |

| | |
|---|---|
| Mass & Dimensions ..... : | Mass: 2.21 kg<br>Dimension: 515 x 90 x 90 mm |
| Language manual ..... : | English |
| Further information..... : | |

- All information was provided by the applicant or detected at the sample -

Please see also appendix.

**Copy of marking plate:**


<Only the power supply module label is provided as a representative>

**Particulars: test item vs. test requirements**

| | |
|---|---|
| Type of equipment ..... : | ~~Enclosed equipment /~~ Open equipment |
| Connection to mains ..... : | ~~pluggable equipment/~~<br>permanent connection/<br>~~not directly connected to the mains~~ |
| Over voltage category..... : | ~~I/~~ II~~/ III/ IV~~ |
| Pollution degree.....: | ~~1/~~ 2~~/ 3~~ |
| Power connection.....: | TN~~/TT/IT~~ Power distribution systems |
| Tested for IT power systems ..... : | ~~Yes /~~ No |
| IT testing, phase-phase voltage (V)..... : | N.A. |
| Class of equipment ..... : | CLASS I ~~/CLASS II /CLASS III~~ |
| Protection against ingress of water ..... : | IPX0 |

| **Test case verdicts:** | |
|---|---|
| Test case does not apply to the test object . : | N/A |
| Test object does meet the requirement ..... : | P |
| Test object does not meet the requirement . : | F |
| **Testing** .....: | |
| Date of receipt of test item..... : | 2022-04-25 |
| Date (s) of performance of tests ..... : | 2022-04-25 – 2022-05-09 |

**General remarks:**

This test report refers exclusively to the main item tested, model no. MR5C9-1616T+MPA048-24+MHCM25+MHCM55+M16X+M16YT+M16YJ+M16YR+M1616XYT+M1616XYJ+M04ADR+M04AD+M04TCR+M04TC+M04DA+MRE.

The test results presented in this report relate only to the main item tested, we followed manufacturer's declaration and listed the serial no. in the test report.

This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.

"(see Enclosure #)" refers to additional information appended to the report.

"(see appended table)" refers to a table appended to the report.

Throughout this report a comma (point) is used as the decimal separator.

Comments:

Remark1: The following contents are included in this test report.

- Test Report page 1 to 38
- Appendix page 39 to 42

**General product information:**

Products under testing are programmable controllers, industrial-process measurement and control.

All models are identical except for type designation for marketing purposes.

This is a built in type component and regarded as hazards live parts. The protection against electric shock, fire and Mechanical strength must be provided and evaluated in final system installed.

The USB type C port is only for signal transmission, not for power delivery.

＊＊＊＊＊＊＊＊IT IS BLANK OF THIS PAGE BELOW＊＊＊＊＊＊＊＊

| EN 61131-2 | | | |
|---|---|---|---|
| **Clause** | **Requirement - Test** | **Result-Remark** | **Verdict** |
| 4. | **Normal service conditions and requirements** | | P |
| | —PLC is used in an industrial environment. | | P |
| | —User ensure the installation conditions. | | P |
| 4.1 | **Climatic conditions and requirements.** | | P |
| 4.1.1 | Operating ambient air temperature | | P |
| | —Enclosed equipment | | N/A |
| | Permanent Installation Max 40 /Min 5℃ | | N/A |
| | Non-permanent Installation Max 40/Min 5 ℃ | | N/A |
| | —Open equipment | | P |
| | Permanent Installation Max 55 /Min 5℃ | | P |
| | —For enclosed non-ventilated equipment | | N/A |
| | —For enclosed ventilated equipment, the equipment ambient temperature is the temperature of the incoming air. | | N/A |
| | —For open equipment, | | P |
| | —requirements are verified in accordance with 6.1.1 and 6.1.2 | | P |
| 4.1.2 | Relative humidity<br>—The equipment shall be suitable for a relative humidity level from 10% to 95%, | 5-95% RH | P |
| | —Requirements are verified in accordance with 6.1.3. | | P |
| 4.1.3 | Altitude suitable for operation up to 2000m. | ≤ 2000m | P |
| 4.1.4 | Pollution degree Unless specificed,the equipment is used in pollution degree 2 | Pollution degree 2 | P |
| 4.2 | **Mechanical service conditions and requirements** | | P |
| | —Vibration, shock and free-fall conditions are very difficult to specify. | | P |
| | —Fixed equipment | | N/A |
| 4.2.1 | Vibrations<br>—Vibration is applicable to each 3 mutually perpendicular axes. | | P |
| | —Requirements are verified in accordance with6.2.1. | | P |
| 4.2.2 | Shock | | P |
| | —Immunity requirements are occasional excursions to 15g, 11 ms, half-sine, in each of 3 mutually perpendicular axes. | | P |

| EN 61131-2 | | | |
|---|---|---|---|
| **Clause** | **Requirement - Test** | **Result-Remark** | **Verdict** |
| | —Devices containing CRTs are excluded. | No CRTs | N/A |
| | —Relays may temporarily respond to 15 g shocks.<br>Temporary malfunctioning is allowed equipment should be fully functional after the test. | | P |
| | —Requirements are verified in accordance with 6.2.2. | | P |
| 4.2.3 | Free falls (portable and hand-held equipment) | Not portable or hand-held equipment. | N/A |
| 4.3 | **Transport and storage conditions and requirements** | | P |
| | Unpack portable equipment, others per 4.3 | Not portable equipment | N/A |
| 4.3.1 | Temperature —The allowable temperature range is -40°C to +70° C. | | P |
| | —Requirements are verified in accordance with 6.1.1. | | P |
| | —The relative humidity range is 10% to 95%. | 5-95% RH | P |
| | —Requirements are verified in accordance with 6.1.3. | | P |
| 4.3.2 | Altitude<br>The design atmospheric pressure for transportation shall be equivalent to 0-3 000 m altitude (minimum 70 kPa). | | P |
| 4.3.3 | Free Falls (PLC units in manufacturer's original packaging) | | P |
| | —Unit＜10kg with shipping package 5falls of 1000mm | No damage found after the test | P |
| | —Requirements are verified in 6.2.4 | | P |
| 4.3.4 | Other conditions<br>This may include extra-low temperature storage, higher altitude transportation, tec. | | N/A |
| 4.4 | **Electrical service conditions and requirements.** | | P |
| 4.4.1 | AC and d.c. mains power supply<br>Refer to 5.1.1. | AC mains power supply | P |
| 4.4.2 | Overvoltage category, control of transient overvoltages. | | P |
| | —The installation shall be overvoltage category II. | Overvoltage category II | P |
| | —The transient suppression means shall be capable of absorbing the energy in the transient. | | N/A |
| 4.4.3 | Non-periodic overvoltages | Shall be evaluated in final system | N/A |

| EN 61131-2 | | | |
|---|---|---|---|
| **Clause** | **Requirement - Test** | **Result-Remark** | **Verdict** |
| | —Non-periodic overvoltage peaks may appear as a result of power interruptions to high-energy equipment (for example, blown fuse on 1 branch in a 3 phase system). | | N/A |
| | —The user shall take the necessary steps to prevent damage to the PLC system (For examples, by interposing a transformer). | | N/A |
| 4.5 | **Special conditions and requirements** When the service conditions are more severe | | N/A |
| 5. | **Functional requirements** | | P |
| | A typical PLC-system and its interfaces/ ports are shown in Figure 2. | Basic PLC | P |
| 5.1 | **Functional power supply and memory back-up requirements.** | | P |
| 5.1.1 | AC and d.c. power supply<br>Requirements are verified in 6.3.1.<br>Requirements are verified in accordance with 6.3.1. 6.3.2 and 6.3.3. | | P |
| 5.1.1.1 | Rated values and operating ranges Incoming power supplies to the<br>PLC-system and to the externally powered I/O modules shall be: | | P |
| | —DC 24 V:Toleratnce-15%/+20% | | P |
| | —AC100~240V: tolerance -15%/+20%,50 Hz or 60Hz | | P |
| | —Requirements are verified in 6.3.1. | | P |
| 5.1.1.2 | Voltage harmonics<br>—Total r.m.s content of true harmonics less than 10% of the total voltage. | | P |
| | —Harmonic for higher frequencies may reach 2% of the total voltage. | | P |
| | —The equipment shall be tested at the third harmonic only. | | P |
| | —Requirements are verified with 6.3.1.2 | | P |
| 5.1.2 | Memory back-up<br>—Power back-up for volatile memories shall be capable of maintaining stored information for at least 300 h under normal use, and 1000h at a temperature not greater than 25°C. | >1000h | P |
| | —If a memory back-up battery is provided, a warning of " low battery voltage" shall be provided. | Show on display | P |
| | —Requirements are verified in 6.3.4. | | P |

| EN 61131-2 | | | |
|---|---|---|---|
| **Clause** | **Requirement - Test** | **Result-Remark** | **Verdict** |
| 5.2 | **Digital I/Os** | | P |
| | —The PLC-system shall be provided with at least 1 type of input interface and 1 type of output interface. | | P |
| | —Digital inputs shall comply with 5.2.1. | | P |
| | —Non-standard voltage digital inputs | | N/A |
| | —Digital outputs shall comply with 5.2.2.1 for a.c. or 5.2.3.1 for d.c. | Only DC output. | P |
| | —It shall be possible to interconnect inputs and outputs | | P |
| | —a.c. multi-phase shall comply | | N/A |
| 5.2.1 | Digital Inputs (current sinking) Requirements are verified in 6.4.2. | | P |
| 5.2.2 | Terminology (U/I) operation regions) —It is necessary to exceed both UT min. and IT min. | | P |
| | —The region below zero volts is a valid part of the “off region” for d.c. inputs only. | | P |
| 5.2.3 | Standard operating ranges for digital inputs (current sinking) Current-sinking digital inputs shall operate within the limits presented in: For Type 1 limits, DC 24V State 1: | | P |
| | a. IH 2~15mA | | P |
| | b. UH 15~30V | | P |
| 5.2.4 | Additional requirement Each input channel shall be indicated for state 1 | By LED | P |
| 5.2.5 | Digital outputs for alternating currents (current sourcing) Requirements are verified in 6.4.3 | | P |
| 5.2.5.1 | Rated Values and operating ranges (a.c.) Digital a.c. outputs shall comply with : | | P |
| | a.Current range for state 1:100mA~2A | | P |
| | b.Voltage drop, *Ud*for state 1:MAX.3V | | P |
| 5.2.5.2 | Additional requirements | | P |
| 5.2.5.2.1 | Output indicators Each output channel shall be provided with a lamp to indicate the output state 1 condition. | LED | P |
| 5.2.5.2.2 | Protected Outputs | | N/A |
| 5.2.5.2.3 | Short-Circuit-proof outputs | | P |

| EN 61131-2 | | | |
|---|---|---|---|
| **Clause** | **Requirement - Test** | **Result-Remark** | **Verdict** |
| 5.2.5.2.4 | Non-protected outputs<br>—For outputs stated by the manufacturer to be non- protected. | | P |
| | —If an external protective device recommended | | P |
| 5.2.5.2.5 | Electromechanical relay outputs | | P |
| 5.2.6 | Digital outputs for direct current(current sourcing)<br>Requirements are verified in 6.4.3 | | P |
| 5.2.6.1 | Rated Values and operating ranges (d.c.)<br>Digital outputs shall comply with: | | P |
| | —Current range for state 1:MAX.1.2A for 1A | | P |
| | —Voltage drop, *U*d for state 1:MAX.3V | | P |
| 5.2.6.2 | Additional requirements<br>—protected outputs: the limit is 1 | | N/A |
| | —relay outputs: AC-15 is replaced by DC-13. | | N/A |
| 5.3 | **Analogue I/OS** | | N/A |
| | Requirements are verified in 6.4.4. | | N/A |
| 5.3.1 | 5.3.1 Analogue inputs —Analogue inputs shall be specified in: | | N/A |
| | a. signal vange +10V | | N/A |
| | b. input impedance >= 10KΩ | | N/A |
| | c. signal vange 0~30mA | | N/A |
| | d. input impedance <= 300KΩ | | N/A |
| | —Analogue inputs may be designed to be compatible with standard thermocouples or (RTDs) | | N/A |
| 5.3.2 | Analogue outputs | | N/A |
| | Analogue outputs shall be specified in : | | N/A |
| | a. signal vange +10V | | N/A |
| | b. load impedance >= 1MΩ | | N/A |
| | c. signal:4~20mA | | N/A |
| | d. load impedance <= 600Ω | | N/A |
| 5.4 | **Communication interface requirements Requirements are verified in 6.5** | | P |
| 5.5 | **Main processing unit (s) and memory(ies) of the PLC-system requirements.** | | P |
| | —This subclause should be read in conjunction with IEC 61131-1. | | P |
| | —Requirements are verified in 6.6. | | P |

| EN 61131-2 | | | |
|---|---|---|---|
| **Clause** | **Requirement - Test** | **Result-Remark** | **Verdict** |
| 5.6 | **Remote input/ output stations (RIOSs) requirements** | Not in scope | N/A |
| 5.7 | **Peripherals (PADTS, TEs, HMIs) requirements** | | P |
| | —Requirements are verified in 6.2.5. | | P |
| | —Connectors for the peripherals shall be polarized, or no malfunction. | RS 485 & RS232 | P |
| | —If on-line modification by a peripheral is possible, then | | P |
| | a.The peripheral shall give warnings | | P |
| | b.The peripheral shall ask the operator | | P |
| | —It shall be possible to upload and verify. | | P |
| | —Requirements are verified in 6.8. | | P |
| 5.8 | **PLC-system self-tests and diagnostics requirements** | | P |
| | —means for self-tests and diagnostics shall be built-in services. | Diagnostics | P |
| | —a means for monitoring the user's application programme. | LED | P |
| | —means to check the memory integrity. | | P |
| | —means to check the validity | | P |
| | —means to check that the power supply not exceed limits | | P |
| | —means to monitor the status of MPU | | P |
| | —The permanently installed PLC-system shall be capable of operating an alarm signal on an alarm output. | ERR signal | P |
| | —RIOSs operating an alarm signal. | | N/A |
| | —Requirements are verified in 6.9. | | P |
| 5.9 | **Functional earthing No constructional requirements for functional earthing terminals.** | | P |
| 5.10 | **Mounting requirements** | | P |
| | Provisions shall be made for securely mounting equipment. | See instructions | P |
| 5.11 | **General marking requirements** | | P |
| | — manufacturer's identification | FATEK | P |
| | — model/ catalogue number | See page 2 for the details. | P |
| | —software serial number revision level ,if applicable. | Not indicated | N/A |
| | —hardware serial number, revision level, and date code | | P |
| | Requirements are verified in 6.10. | | P |

| EN 61131-2 | | | |
|---|---|---|---|
| **Clause** | **Requirement - Test** | **Result-Remark** | **Verdict** |
| 5.11.1 | Functional identifications<br>—The function of each I/O module shall be identifiable. | LED | P |
| | —All operator's switches, indicator lamps, and connectors shall be identified. | By word and symbol | P |
| 5.11.2 | Module location and module identifications Space shall be provided for identification of each module and I/O channel. | | P |
| 5.11.3 | Functional earth terminals marking Functional earth terminals shall be marked with symbol. | | N/A |
| 5.12 | **Requirements for normal service and functional type tests and verifications.** | | P |
| | Test and verifications for normal service and function shall be performed by the manufacturer, in accordance with Clause 6. | | P |
| 5.13 | **Requirements for information on normal service and function.** | | P |
| | Information on normal service and function shall be provided by the manufacturer, in accordance with Clause 7 | | P |
| 6. | **Normal service and functional type tests and verifications** | | P |
| 6.1 | **Climatic tests** | | N/A |
| | Tests are performed on unpackaged equipment. | Built in type, shall be evaluated in final system installed. | N/A |
| 6.1.1 | Dry heat and cold withstand tests<br>—Dry heat+70°C±2°C，16h+1h | | N/A |
| | —Cold withstand:-40°C±3°C ，16h+1h | | N/A |
| 6.1.2 | Variation of temperature | | N/A |
| | —Withstand test ： -40°C±3°C，+70℃ +2°C 3h±30min. | | N/A |
| | —Immunity Test：+5°C±2°C， +55°C±2°C， 3h±30min. | | N/A |
| 6.1.3 | Cyclic damp heat withstand test: | | N/A |
| | —Temperature: +55°C，95％ RH | | N/A |
| | —Number of cycle: 2 | | N/A |
| | —PFVP after test | | N/A |
| 6.2 | **Mechanical tests** | | N/A |
| 6.2.1 | Vibration (type test associated with normal service conditions)<br>—5 Hz < *f*<9 Hz: 3,5mm amplitude | | N/A |
| | —9 Hz < *f* <150 Hz:: 1,0g | | N/A |

| EN 61131-2 | | | | |
|---|---|---|---|---|
| **Clause** | **Requirement - Test** | | **Result-Remark** | **Verdict** |
| | —Vibration type: Sweeping, at a rate of 1 octave/min (± 10%) | | | N/A |
| | —Vibration duration: 10 sweep cycles per axis on each of 3 mutually perpendicular axes | | | N/A |
| | —Verification after tests: According to PFVP (2.5) | | | N/A |
| 6.2.2 | Shock (Type test associated with normal service conditions) | | | N/A |
| | —Type of shock: Half-sine | | | N/A |
| | —Shock severity: 15g peak, 11 ms duration | | | N/A |
| | —Application: Three shocks in each direction per axis | | | N/A |
| | —Verification after tests: According to PFVP (2.5) | | | N/A |
| 6.2.3 | Free fall (portable and hand-held equipment) | | | N/A |
| 6.2.4 | Free fall (type test associated with transport and storage conditions.) (units within manufacturer's original packaging) | | | N/A |
| 6.2.5 | Plugging / unplugging of removable units Insertion/ withdrawal of removable units | | | N/A |
| 6.3 | **Verification of special functional requirements for power ports and memory back-up-Special immunity limits for power ports** | | | P |
| | Perform the proper functional verification procedure. | | | P |
| 6.3.1 | Verification of functional mains power input port (a.c or d.c) | | ac | P |
| 6.3.1.1 | Voltage range, voltage ripple and frequency range test. | | 100-240V | P |
| | —AC voltage | K=0.85/K=1,10 | 85-264V | P |
| | —AC frequency | K=0.94/K=1,04 | 47-63Hz | P |
| | —Ripple continuous | K=0,05/K=0,05 | | P |
| | —Test Duration | 30min/30min | | P |
| | —Verification after tests | According to PFVP | Operative | P |
| | —Performance criteria | A | | P |

| EN 61131-2 | | | |
|---|---|---|---|
| **Clause** | **Requirement - Test** | **Result-Remark** | **Verdict** |
| 6.3.1.2 | Third harmonic immunity test.<br>A third harmonic voltage (150Hz or 180 Hz) adjusted to 10% of the mains rated voltage is added to the a.c. Mains power supply with 0° and 180°,check per PFVP | Operative | P |
| 6.3.1.3 | Shut-down test (suddenly supply interruption) | | P |
| | —During shut-down due to the supply interruption, the system behaviour shall be observed. | | P |
| | －The test is repeated twice. | | P |
| | —Performance criteria:<br>There shall be no change and no erratic or unintended condition of any kind. | No distinct change | P |
| 6.3.1.4 | Start-up test | | P |
| | —The PLC system shall start again according to the specifications of the manufacturer. | | P |
| | —During the start-up, there shall be no erratic or unintended condition. | No distinct change | P |
| 6.3.2 | External energy supply variation tests (immunity tests) | | P |
| | —At voltages below the minimum normal service conditions limits, the PLC-system shall “either maintain normal operation or go to a predefined state.” | Shut down | P |
| | —Performance criteria: no erratic or unintended conditions of any kind. | No damage | P |
| 6.3.2.1 | Gradual shut-down/ start-up test | | P |
| | —Lowest voltage (V): 0 (zero) | | P |
| | —Waiting time at lowest voltage (s): 10 s ± 20% | | P |
| | —Performance Criteria: According to 6.3.2 | No damage | P |
| 6.3.2.2 | Supply voltage variation tests | | P |
| | - Lowest voltage (U)：0 | | P |
| | - Waiting time at lowest voltage：0 | | P |
| | - Pass/ Fail criteria: According to 6.3.2 | No damage | P |
| 6.3.3 | Improper power supply connection tests | | P |
| 6.3.3.1 | Reversal of d.c. power supply polarity test (withstand test) | | N/A |
| 6.3.3.2 | Improper voltage level and/ or frequency test<br>For voltage level above the maximum normal service conditions limit *U*e max, the test shall be agreed between the user and the manufacturer. | | N/A |

| EN 61131-2 | | | |
|---|---|---|---|
| **Clause** | **Requirement - Test** | **Result-Remark** | **Verdict** |
| 6.3.4 | Verification of memory back-up requirements | | P |
| 6.3.4.1 | Back-up duration withstand test | | P |
| | －Temperature: Enclosed equipment 40℃ | | P |
| | －Duration: 300h | | P |
| | Verification: According to PFVP (2.5) | Operative | P |
| 6.3.4.2 | Verification of manufacturer's method of changing the energy source.<br>Replacement of energy source. | | N/A |
| 6.3.4.3 | Verification of other requirements.<br>Check the required warning of" low battery voltage." | LED display | P |
| 6.4 | **Verification of input/output requirements** | | P |
| 6.4.1 | General<br>—Test procedures are not defined in detail. | | P |
| | —All tests shall be carried out twice on the same I/O channels(s): | | P |
| | －First test: at minimum service temperature (*T*min) | | P |
| | －S test: at maximum service temperature( *T*max) | | P |
| | —It is not required to test more than 1 analogue input channel and 1 digital input channel. | | P |
| | —All channels of multi-channel output modules shall be tested. | | P |
| 6.4.2 | Verification of digital inputs | | P |
| 6.4.2.1 | Operating range test<br>Verify all requirements are met. | | P |
| 6.4.2.2 | Reversal of signal polarity test (withstand test) | | P |
| | —A signal of reverse polarity for digital inputs shall be applied for 10 s. | No change | P |
| | —The device shall pass the PFVP. | | P |
| 6.4.2.3 | Verification of other requirements<br>Verify for digital I/Os under 5.2 and 5.2.1.3 are met | | P |
| 6.4.3 | Verification of digital outputs | | P |
| 6.4.3.1 | Operating range test | | P |
| | —Verify that all requirements are met. | | P |
| | —Temporary overload: For short-circuit proof | | N/A |

| EN 61131-2 | | | |
|---|---|---|---|
| **Clause** | **Requirement - Test** | **Result-Remark** | **Verdict** |
| 6.4.3.2 | Test of protected, not protected, and short-circuit proof outputs.<br>Table 26-Overload and short circuit tests for digital outputs. | | P |
| 6.4.3.3 | Reversal of signal polarity test (withstand test) | | P |
| | —A signal of reverse polarity for digital d.c. outputs shall be applied for 10s. | No change | P |
| | —The device shall pass the PFVP. | Operative | P |
| 6.4.4 | Verification of analogue I/Os. | | N/A |
| 6.4.4.1 | Operating range tests<br>Verify that all requirements are met. | | N/A |
| 6.4.4.2 | Analogue input overload withstand test<br>Test procedure | | N/A |
| 6.4.4.3 | Short-circuit test (voltage output) and open-circuit test (current output)<br>Short-circuit or the open circuit is realized, no Physical damage shall be detected. | | N/A |
| 6.4.4.4 | Voltage supply variation test<br>The power supply is replaced by a variable power source. | | N/A |
| 6.4.4.5 | Reversal operational polarity test (withstand test)<br>A signal of reverse polarity for unipolar analogue<br>Inputs shall be applied for 10 s | | N/A |
| 6.4.4.6 | Verification of other requirements All requirements non-tested shall be verifiable<br>Agreed upon by the manufacturer. | | N/A |
| 6.5 | **Verification of communication interface requirements**<br>All requirements non-tested shall be verifiable agreed upon by the<br>manufacturer. | | P |
| 6.6 | **Verification of MPU requirements**<br>All requirements non-tested shall be verifiable agreed upon by the<br>manufacture. | | P |
| 6.7 | **Verification of remote I/O stations** | | N/A |
| 6.7.1 | Response time test | | N/A |
| 6.7.2 | Loss of communication test | | N/A |
| 6.8 | **Verification of peripheral (PADTs, Tes, HMIs)** requirements. All requirements non-tested shall be verifiable agree upon<br>by the manufacturer. | | P |

| EN 61131-2 | | | |
|---|---|---|---|
| **Clause** | **Requirement - Test** | **Result-Remark** | **Verdict** |
| 6.9 | **Verification or PLC-system self-tests and diagnostics.** | Diagnostics | P |
| 6.10 | **Verification of markings and manufacturer's documentation.**<br>Verify the requirements of 5.11 by visual inspection. | | P |
| 7. | **General information to be provided by the manufacturer.** | | P |
| | The manufacturer shall provide application, design, installation, commission, operation and maintenance<br>of the PLC-system | | P |
| 7.1 | Information on type and content of documentation. | User's manual | P |
| | — catalogues and datasheets, | | P |
| | — user's manuals and | | P |
| | —technical documentation. | | P |
| 7.1.1 | NOTE For the preparation of the instructions, see IEC62079 and IEC 61506. Information on catalogues and datasheets.<br>These documents shall contain the description and the specifications of the PLC-system and its associated<br>peripherals. | | P |
| 7.1.2 | Information on user's manuals These documents shall include proper installation, wiring, troubleshooting, user programming and commissioning of the<br>PLC-system. | | P |
| 7.1.3 | Information on technical documentation The manufacturer optionally may provide schematic diagrams, internal or external data protocols, bus assignments, or repair<br>procedures, etc. | | P |
| 7.2 | **Information on compliance with this standard** | | P |
| | The manufacturer shall provide: full compliance with all of the<br>requirements to IEC61131-2.<br>Compliance with a portion. | | P |
| 7.3 | **Information on reliability** | | N/A |
| 7.4 | **Information on other conditions**<br>The user should reach agreement with the manufacturer for not specified conditions. | | P |

| EN 61131-2 | | | |
|---|---|---|---|
| **Clause** | **Requirement - Test** | **Result-Remark** | **Verdict** |
| 7.5 | **Information on shipping and storage**<br>The manufacturer shall provide shipping and storing instructions. | | P |
| 7.6 | **Information on a.c. and d.c power supply** | | P |
| | The manufacturer shall provide: | | P |
| | — data to allow selection of a suitable power distribution network. | AC 100-240V<br>DC 24V | P |
| | — external terminal identification. | | P |
| | — typical examples(s) for power supply system(s); | Single phase | P |
| | — special supply installation requirements, if any. | | N/A |
| | — the effect of the following incorrect connections. | | P |
| | ● reverse polarity | | P |
| | ● improper voltage level and /or frequency and | | P |
| | ● improper lead connection; | | P |
| | — complete information for typical power up sequences. | | P |
| | — data to allow evaluation of interruption time. | | P |
| | — memory back-up time with respect to temperature. | | P |
| | — recommended time interval between replacement of energy sources. | | N/A |
| | —Peak inrush current. | | N/A |
| 7.7 | **Information on digital inputs(current sinking)** | | P |
| | The manufacturer shall provide: | | P |
| | — volt-ampere curve. | | P |
| | — digital input delay time. | | P |
| | — existence of common points. | | P |
| | — effect of incorrect input terminal connection; | | N/A |
| | — isolation potentials between channel and other circuits. | | P |
| | — type of input (Type 1 or) | | P |
| | — monitoring point. | LED | P |
| | — effects when withdrawing/inserting input module under power; | | N/A |
| | — additional external load. | | N/A |
| | — explanation of signal evaluation. | | P |
| | — Recommended cable. | | P |
| | — terminal arrangements; | | P |

| EN 61131-2 | | | |
|---|---|---|---|
| **Clause** | **Requirement - Test** | **Result-Remark** | **Verdict** |
| | —typical example(s) of external connections. | | P |
| 7.8 | **Information on digital outputs for alternating currents(current sourcing)** | | P |
| | The manufacturer shall provide: | | P |
| | — type of protection | | P |
| | — for protected outputs; operating characteristics. | | N/A |
| | — for short-circuit-proof outputs. | | N/A |
| | － for non-protected outputs. | | P |
| | — output delay time. | | P |
| | — commutation characteristics. | | N/A |
| | — existence of common points. | | P |
| | — terminal arrangements. | | P |
| | — typical example(s) if external connections; | | P |
| | — number and type of outputs | | P |
| | — for electromechanical relays. | | P |
| | －output ratings for the other loads | | P |
| | －total out put current | | P |
| | — characteristics of suppresser networks, if required. | | N/A |
| | — effects of incorrect output terminal connection. | | N/A |
| | — isolation potentials between channel and other circuits. | 500V | P |
| | — monitoring points | LED | P |
| | — recommended procedures for changing output modules; | | N/A |
| | — output behaviour during interruptions of MPU control. | | N/A |
| | －Effects of multiple overloads. | | N/A |
| 7.9 | **Information on digital outputs for direct current (current sourcing)**<br>Information for digital outputs for d.c. shall be the same as for digital outputs for a.c.,<br>as 7.8 | Transistor output | P |
| 7.10 | **Information on analogue inputs** | | N/A |
| 7.10.1 | Information on analogue input static characteristics. | | N/A |
| 7.10.2 | Information on analogue input dynamic characteristics. | | N/A |
| 7.10.3 | Information on analogue input general characteristics | | N/A |
| 7.10.4 | Information on analogue input miscellaneous characteristics. | | N/A |

| EN 61131-2 | | | |
|---|---|---|---|
| **Clause** | **Requirement - Test** | **Result-Remark** | **Verdict** |
| 7.11 | **Information on analogue outputs** | | N/A |
| 7.11.1 | Information on analogue output static characteristics | | N/A |
| 7.11.2 | Information on analogue output dynamic characteristics. | | N/A |
| 7.11.3 | Information on analogue output general characteristics | | N/A |
| 7.11.4 | Information on analogue output miscellaneous characteristics. | | N/A |
| 7.12 | **Information on communication interfaces**<br>If the manufacturer provides communication interfaces to other than his own equipment. | RS 485 & RS 232 | P |
| 7.13 | **Information on main processing unit(s) and memory(ies) of the PLC-system** | | P |
| | Information for main processing unit(s) and memory(ies) | | P |
| | —organization, capacity of programme memory; | 128K | P |
| | —organization, capacity of data memory and number of bits per word; | 8 bits | P |
| | —memory type(s)(i.e. CMOS-EPROM, etc.) available; | | P |
| | —memory back-up functionality if any; | | P |
| | —data, and procedures to determine a desired configuration. | | P |
| | —description of the programming languages. | | P |
| | —languages defined in IEC 61131-3. | | P |
| | —calculation methods. | | P |
| | —mechanisms in which I/Os are processed. | | P |
| | System response time | | P |
| | Restart capabilities | | P |
| | Detailed times for inputs, outputs. | | P |
| | Effect of non-permanently installed peripherals. | | P |
| | PLC-system status information. | | P |
| | Self-test and diagnostic functions. | | P |
| 7.14 | **Information on remote input/output stations(RIOSs)** | | N/A |
| 7.15 | **Information on peripherals(PADTs, Tes, HMIs)**<br>The manufacturer shall provide: | | P |
| | —clear warnings and precautions. | | P |

| EN 61131-2 | | | |
|---|---|---|---|
| **Clause** | **Requirement - Test** | **Result-Remark** | **Verdict** |
| | —service conditions for peripherals selection of adequate cables. | | P |
| | —installation. | | P |
| | —type of communication network | | P |
| | —principles, procedures and transmission speeds. | | P |
| | —terminating devices if required. | | P |
| | —physical characteristics | | P |
| | —RS232, RS485, etc. | | P |
| | —Earthing specifications. | | P |
| 7.16 | **Information on self-tests and diagnostics.** | | P |
| | The manufacturer shall provide: | | P |
| | —description of tests and diagnostics. | | P |
| | —correct functioning of the alarm output(s) | | P |
| 8. | **Electromagnetic compatibility (EMC) requirements** | Evidenced by EMC report | P |
| 9. | **Electromagnetic compatibility (EMC)type test and verifications** | See clause 8. | P |
| 10. | **Electromagnetic compatibility (EMC)information to be provided by the manufacturer** | See clause 8. | P |
| 11. | **Safety requirement** | | P |
| | Components connected to the mains power supply are subject to the applicable provisions of this clause | | P |
| 11.1 | Protection against electric shock | This is a built in type component and regarded as hazards live parts. The protection against electric shock must be provided and evaluated in final system installed. | N/A |
| | —Protection against electric shock shall be maintained in normal and single fault condition. | | N/A |
| | —Accessible parts shall not be in the case of a single fault hazardous live. | It shall be evaluated during final installation. | N/A |
| | —When applied to open equipment. | | N/A |
| | —Protection shall be by compliance with requirements in 11.1.4, 11.1.5, 11.1.6, 11.1.7, and 11.4. | | N/A |

| EN 61131-2 | | | |
|---|---|---|---|
| **Clause** | **Requirement - Test** | **Result-Remark** | **Verdict** |
| 11.1.1 | Permissible limits for accessible parts<br>—The voltage, current, charge or energy between an accessible part and reference test earth, or between any 2 accessible parts shall not exceed the values of<br>11.1.1.1 in normal condition nor of 11.1.1.2 in single-fault condition. | | N/A |
| | —If the voltage is below the limit of<br>11.1.1.1 or 11.1.1.2 accessible current and capacitance need not be measured. | | N/A |
| 11.1.1.1 | Values in normal condition<br>Above the level of a),b) or c) in normal condition are hazardous live. | | N/A |
| | a) a.c. 30V r.m.s. and 42, 4V peak or d.c. 60V. | | N/A |
| | b) If the voltage exceeds the current levels are | | N/A |
| | c) If the voltage exceeds, the charge or energy of capacitance levels. | | N/A |
| 11.1.1.2 | Values in single –fault condition | | N/A |
| | a) The voltage r.m.s. and 70 V peak or<br>d.c. 120V | | N/A |
| | b) If the volatage exceeds, the current levels are | | N/A |
| | c) If the voltage exceeds, the capacitance levels | | N/A |
| 11.1.2 | Open PLC-system equipment. | | P |
| 11.1.3 | Enclosed PLC-system equipment | | N/A |
| | —Enclosed PLC-system equipment is enclosed on all sides | | N/A |
| | —The protection degree must be ≧IP20 | | N/A |
| | —Each entity of an enclosed PLC-system shall comply with the requirements of class I, class II, class III. | | N/A |
| | —Protection against electric shock shall be provided for operator access. | | N/A |
| 11.1.3.1 | Class I equipment | | P |
| 11.1.3.2 | Class II equipment | | N/A |
| | —Class II equipment does not rely on basic insulation or , such as double insulation or reinforced insulation. | | N/A |
| | 1) insulation-encased class II equipment. | | N/A |
| | 2) metal-encased class II equipment: | | N/A |
| | 3)combination of types 1) and 2). | | N/A |
| | —Protective impedance may be used. | | N/A |

| EN 61131-2 | | | |
|---|---|---|---|
| **Clause** | **Requirement - Test** | **Result-Remark** | **Verdict** |
| | —Class II equipment may be provided with conductive surfaces. | | N/A |
| | —Class II equipment may be provided with the earthing terminals for functional purposes. | | N/A |
| 11.1.3.3 | Class III equipment —Class III equipment is supplied by safety extra-low voltage (SELV). | | N/A |
| | —Class III equipment may be provided with earthing terminals for functional purposes. | | N/A |
| | —The insulation of all conductors shall be rated for the higher voltage. | | N/A |
| 11.1.4 | Dielectric strength | | P |
| | —The dielectric withstand type test of 12.2.1 shall be performed between all parts and circuit. | 3250Vdc between Line/Neutral and output circuit.<br>1900Vdc between Line/Neutral and earth. | P |
| | —between SELV/PELV circuits and operator-accessible conductor parts,not tested. | | P |
| 11.1.5 | Operator accessibility | | P |
| | —Table 44 defines operator accessible ports of a PLC-system. | | P |
| | —F (mains power interface/port) Open equipment/ No enclosed equipment /Yes | Open equipment/yes | P |
| | —J (I/O power interface/port) Open equipment/ No enclosed equipment /Yes | Open equipment/yes | P |
| 11.1.6 | Protection in normal condition | | P |
| | —Protection for operator-accessible parts shall be | | - |
| | a) basic insulation | | P |
| | b) enclosures or barriers | | P |
| | c) protective impedance | | N/A |
| | —Enclosures and barriers shall meet 11.7.2.2 | | P |
| | —compliance of clearance and creepage distance shall be | | - |
| | a) by the determination of 12.1.2, | | P |
| | b) by the requirements of 11.1.4 for dielectric strength of basic insulation | | P |
| | c) by the tests of 12.1.7 for rigidity of enclosures. | | P |
| 11.1.7 | Protection in single-fault condition | | P |

| EN 61131-2 | | | |
|---|---|---|---|
| **Clause** | **Requirement - Test** | **Result-Remark** | **Verdict** |
| | —Operator-accessible conductive parts are prevented from becoming hazardous live when a single fault occurs. | | P |
| | —Protection shall be provided by one or more of the following means: | | - |
| | a)Protective earthing and bonding(see 11.1.7.1), | | N/A |
| | b)Supplemental insulation (see 11.1.7.2), or | | P |
| | c)Protective impedance (see 11.1.7.3) | | N/A |
| | —Requirements are verified in 12.3. | | P |
| 11.1.7.1 | Protective earthing and bonding | | N/A |
| 11.1.7.2 | Supplemental insulation | | P |
| | —Clearances shall be in accordance with 11.4.1 and 11.4.2. | | P |
| | —Creepage distances shall be in accordance with 11.4.3. | | P |
| | —Requirements are verified in 12.3.2. | | P |
| 11.2 | **Protection against the spread of fire.** | This is a built in type component and regarded as hazards live parts. The protection against the spread of fire must be provided and evaluated in final system installed. | N/A |
| | —There are no requirements for protection against the spread of fire within limited power circuits | | N/A |
| | —Protection shall be evaluated between limited power circuits and other circuits | | N/A |
| | —Breakdown of components is verified according to 12.3.1 | | N/A |
| 11.3 | **Limited power circuits** | | P |
| | —A limited power ciurcuit is a circuit supplied by potential not more than a.c. 30 V r.m.s. and 42,4 V peak or d.c. 60V. and | | P |
| | — the maximum output current and power not more than Table 45; | | P |
| | — the maximum output current are limited Table 45; | | P |
| | — an over-current protective device more than Table 46; | | N/A |
| | — a regulating network limits the maximum output current Table 45; | | N/A |

| EN 61131-2 | | | |
|---|---|---|---|
| **Clause** | **Requirement - Test** | **Result-Remark** | **Verdict** |
| | — a regulating network limits the maximum output current Table 45, and an over-current protective device limits Table 46. | | P |
| | —Over-current protective device shall be a fuse or a non-adjustable non-self-resetting device. | | N/A |
| | 1) Output voltage is measured in no-load condition. | | P |
| | 2) Output current measured after 60 s , with a resistive load which produces the highest current | | P |
| | —Fuses and circuit-breakers break the current within 120 s at a current value of 210%. | | N/A |
| 11.4 | **Clearance and creepage distances requirements** | This is a built in type component and regarded as hazards live parts, it must be evaluated in final system installed. | N/A |
| | —Clearance and creepage shall meet the requirements with the higher voltages. | | N/A |
| | —There are no requirements for multi-layer printed-circuit boards. | | N/A |
| | —Linear interpolation of creepage distance is permissible. | | N/A |
| | —Determination shall be made in accordance with the requirements in Table 50, Table 51, Table 52, Table 53, and Table 54. | | N/A |
| | —For SELV/PELV circuits and ungrounded accessible parts, the requirements for double insulation shall apply. | | N/A |
| | —In all cases the values given shall be met or exceeded. | | N/A |
| | —Requirements are verified in 12.1.8. | | N/A |
| 11.4.1 | Clearances relating to overvoltage category II | This is a built in type component and regarded as hazards live parts, it must be evaluated in final system installed. | N/A |
| 11.4.1.1 | Clearances for other than filed-wiring terminals | | N/A |
| | —Clearances associated with basic and supplementary insulation are given in Table 47 and | | N/A |

| EN 61131-2 | | | |
|---|---|---|---|
| **Clause** | **Requirement - Test** | **Result-Remark** | **Verdict** |
| | —Clearances associated with double and reinforced insulation are given in Table 48. | | N/A |
| | —Clearances shall be verified by mechanical measurement or by dielectric withstand tests according to 12.2.1. | | N/A |
| | —Clearances to metal enclosures, which may be deflected, shall not be less than 12mm. | No metal enclosure. | N/A |
| | —The above clearances do not apply to printed circuit boards with protective coating of 12.1.6. | | N/A |
| | —The above clearances do not apply where overvoltages are known and controlled. Table 50. | | N/A |
| 11.4.1.2 | Field-Wiring terminal clearances Clearances at field-wiring terminals shall comply with Table 49. | | N/A |
| 11.4.2 | Clearances for micro-environment where voltages are known and controlled. | | N/A |
| 11.4.3 | Creepage distances for basic and supplementary insulation. | | N/A |
| | —A creepage distance cannot be less than clearance. | | N/A |
| | —Creepage distances less than the clearances. | | N/A |
| | —A homogeneous field configuration can achieve a greater impulse withstand voltage than an inhomogeneous field design. | | N/A |
| | —The creepage distances are dependent on the CTI in Table 51 | IIIa | N/A |
| 11.4.3.1 | Minimum creepage distances (basic and supplementary insulation) | | N/A |
| 11.4.3.1 .1 | Minimum creepage distances for other than printed circuit boards | | N/A |
| | —Creepage distances shall be not less than values given in Table 52. | IIIa | N/A |
| | —Basic and supplementary insulation : 250V,Pollution degree 2, 2,5mm | | N/A |
| 11.4.3.1 .2 | Minimum creepage distances for printed circuit boards, | | N/A |
| | —For protective coated and uncoated areas of printed circuit boards shall be not less than given in Table 53. | | N/A |
| | —250V :With coating 0,56mm/Uncoated 1,0mm | | N/A |

| EN 61131-2 | | | |
|---|---|---|---|
| **Clause** | **Requirement - Test** | **Result-Remark** | **Verdict** |
| 11.4.3.2 | Creepage distance requirements for recurring peak voltages | | N/A |
| 11.4.3.2 .1 | Rational<br>The values given in Table 54 will prevent any partial discharge from occurring. | | N/A |
| 11.4.3.2 .2 | Creepage distance requirements for recurring peak voltages | | N/A |
| | —In addition to the clearance and creepage distance requirements when recurring peak voltages are present the creepage distance given in Table 54 shall<br>also be met. | | N/A |
| | —recurring peak 400 V : 0,2 mm | | N/A |
| 11.4.4 | Creepage distances for double /reinforced insulation Creepage distances shall be<br>double the value for basic insulation. | | N/A |
| 11.4.5 | Creepage for field-wiring terminals Creepage distances for field wiring terminals shall be in accordance with Table<br>52, but not less than Table 50. | | N/A |
| 11.5 | **Flame-retardant requirements for non-metallic materials** | | P |
| 11.5.1 | Non-metallic enclosure material | | P |
| | —Non-metallic enclosure shall comply with<br>a flame spread rating of 5VA, FV2, FV1, or FV0. | V-1 | P |
| | —Flame spread ratings are given in Clause 9 of IEC 60707. | | P |
| | —Non-metallic enclosure materials used for decorative purposes or for functional<br>purposes require no flame rating. | | P |
| 11.5.2 | Non-metallic material supporting live parts | | P |
| | —Non-metallic materials used to support live parts include: | | P |
| | a flame rating of FV0, FV1, or FV2 | Approved terminal blocks | P |
| | a glow-wire test at 750°C with a 30S | | P |
| | a comparative tracking index greater than, or equal to, 175. | | P |
| | — No test are required if the PLC manufacturer provides evidence of compliance. | Approved type | P |
| | —Non-metallic components shall be used in accordance with their specified ratings. | | P |
| 11.5.3.2 | Decorative and labeling materials<br>Decorative materials and labeling materials need not comply with 11.5. | | P |

| EN 61131-2 | | | |
|---|---|---|---|
| **Clause** | **Requirement - Test** | **Result-Remark** | **Verdict** |
| 11.5.3.3 | Internal wiring or interconnection cables | | P |
| | —Insulated wire used in unlimited circuits shall have a flammability classification of FV-1or better. | VW-1 | P |
| | —Wiring within limited power circuits has no flame-retardant requirements. | VW-1 | P |
| 11.6 | **Temperature limits** | | P |
| | —Components shall not be operated beyond their rated temperature limits or rated temperature rises. | Inductor and transformer are class B | P |
| | —Parts likely to be touched shall not exceed the temperature limits of Table 55. | | P |
| | —Field wiring terminals shall be monitored to determine the field-wiring insulation temperature rating. | | P |
| | —Operator parts normally touched in operation: Momentary70°C/85°C | Open equipment, the enclosure shall be evaluated in final system installed | N/A |
| | —Parts accessible during servicing, normally touched in operation: Momentary70°C/85°C | Open equipment, the enclosure shall be evaluated in final system installed | N/A |
| 11.7 | **Enclosures** | | N/A |
| | Enclosure shall provide protection against the hazards of moving parts and live parts | See below | N/A |
| 11.7.1 | open equipment | Open equipment, the enclosure shall be evaluated in final system installed | N/A |
| 11.7.2 | Enclosed equipment<br>Enclosed equipment shall meet IP20 requirements as a minimum. | | N/A |
| 11.7.2.1 | Shafts and knobs<br>Conductive keypads, shafts and knobs shall not be in contact with hazardous live parts. | | N/A |
| 11.7.2.2 | Mechanical strength | | N/A |
| | —The mechanical strength of the enclosure shall withstand rough handling. | | N/A |
| | —The protection shall be verified after the impact withstand test in 12.1.1. and the rigidity test in 12.1.7. | | N/A |
| 11.8 | **Field-wiring terminals constructional requirements** | | P |
| | —Loose strands of wire shall not reduce the required clearance/creepage. | | P |
| | —Terminals shall be of metal of adequate | Approved type | P |

| EN 61131-2 | | | |
|---|---|---|---|
| **Clause** | **Requirement - Test** | **Result-Remark** | **Verdict** |
| | mechanical strength. | | |
| | —Terminals shall ensure necessary contact pressure. | | P |
| | —Terminals shall not allow the conductors displaced. | | P |
| | —No individual conductor is subjected to bending of a radius less than 6 times its diameter. | | P |
| | —Clearances between terminals are given in 11.4.1.2. | | P |
| 11.9 | **Provisions for protective earthing** | | P |
| 11.10 | **Wiring** | | P |
| | The following requirements shall apply to internal and/or external wiring. | | P |
| 11.10.1 | Internal writing | | P |
| | —The insulation shall be rated for the voltage and the temperature. | | P |
| | —All splices and connections shall be mechanically secure. | | P |
| | —Internal wiring shall be so routed to stress or mechanical damage.. | | P |
| | —Internal wiring that is subject to flexing shall be tested in 12.1.4 | | N/A |
| | —Electrical connections shall be soldered, crimped, or otherwise securely connected. | | P |
| | —Soldered connections shall be mechanically secured. | | P |
| | —Screw connections shall be secured against loosening. | | P |
| | —This requirement does not apply to SELV/PELV circuits, earthing conductors. | | N/A |
| 11.11 | **Switching devices** | | N/A |
| 11.12 | **Components** | | P |
| | — Components shall comply with relevant IEC product standard(s). | | P |
| | — Where no relevant IEC component standard exists, or not specified ratings, the components shall be tested under the worst-case conditions. | | P |
| 11.13 | **Battery requirements** | | P |
| | — Battery compartments shall protect against accumulation of flammable gases or | | P |
| | — Rechargeable and non-rechargeable batteries, shall be provided with protection. | | P |

| EN 61131-2 | | | |
|---|---|---|---|
| **Clause** | **Requirement - Test** | **Result-Remark** | **Verdict** |
| | —Means shall be provided to prevent charging and to limit the discharge current of non-rechargeable batteries in both normal and single-fault. | | P |
| | —Compliance shall be verified in 12.3.1. | | P |
| 11.14 | **Maximum voltage and minimum voltage** | | P |
| | —The equipment shall operate as intended when subjected to maximum voltage or minimum voltage conditions. | | P |
| | —This requirement shall be verified by 12.1.5. | | P |
| 11.15 | **Markings and identification** | | P |
| | —Markings shall be visible. | | P |
| | —For open equipment, markings are permitted to be on any surface that becomes visible. | | P |
| | —For all equipment, shall identify the manufacturer and the device. | FATEK | P |
| | —The remaining information shall be provided in the data sheet. | | P |
| | — manufacturer's identification, | FATEK | P |
| | — type designation, | | P |
| | — hardware serial number revision, and date code | | P |
| | — information on replaceable fuses | | N/A |
| | — live parts and protective earth terminals markings | | P |
| 11.15.1 | External wiring terminals identification | | P |
| | —External wiring terminals shall be marked or a wiring diagram coded to the terminal marking shall be provided. | L, N and ⏚ | P |
| | — Installation instructions shall identify the temperature rating of field wiring. | | P |
| 11.15.2 | Live part<br>A live part likely to be mistaken as dead metal and exposed to service personnel shall be marked with "dangerous voltage" symbol: | | N/A |
| 11.15.3 | Protective earth terminals markings | | P |
| 11.15.4 | Equipment protected by double/reinforced insulation | | P |
| | —Equipment (Class II) shall be marked with symbol. | | N/A |
| | —Equipment which is only partially double | | N/A |

| EN 61131-2 | | | |
|---|---|---|---|
| **Clause** | **Requirement - Test** | **Result-Remark** | **Verdict** |
| 11.15.5 | Equipment supplied by SELV/PELV Equipment energized by a SELV or PELV shall be marked on equipment or literature. | I/O modules | P |
| 11.15.6 | Rating information Equipment shall be marked | | P |
| | — rated voltage(s) or range (V) | 100-240 | P |
| | — rated frequency (Hz) | 50/60 | P |
| | — kind of supply system (a.c., d.c.) | AC | P |
| | — number of phase conductors if more than one; | Single phase | N/A |
| | — rated current (A); | 1 | P |
| | — rated input and/ or volt-amperes(VA). | | N/A |
| | — For open-type equipment be marked in the manual. | Marked on product label | P |
| 11.16 | **Requirements safety type tests and verifications.** Test verifications for safety shall be in accordance with Clause 12. | | P |
| 11.17 | **Requirements for safety routine tests and verifications** | | N/A |
| | Safety routine tests shall be accordance with 13.1 and 13.3. | | N/A |
| 11.17.1 | Requirement for dielectric strength verification | | N/A |
| 11.17.2 | Requirement for protective earthing verification | | P |
| 11.18 | **Requirements for information on safety** Information on safety shall be in accordance with Clause 13. | | P |
| 12 | **Safety type tests and verification** | | P |
| 12.1 | **Safety-related mechanical tests and verifications** | | N/A |
| 12.1.1 | Impact withstand test | Open equipment, the enclosure shall be evaluated in final system installed | N/A |
| | —Reference Test : IEC60950 | | N/A |
| | —Description of the test : See Figure 13 | | N/A |
| | —Number of trials : One per surface | | N/A |
| | —Verification after the test : Accessibility test Dielectric withstand test | | N/A |
| | —a solid, steel sphere 50 mm in diameter and with a mass of 500g.Fall from distance of 1300m. | | N/A |
| 12.1.2 | Operator accessibility tests | | P |

| EN 61131-2 | | | |
|---|---|---|---|
| **Clause** | **Requirement - Test** | **Result-Remark** | **Verdict** |
| | —The jointed test finger (IP2X) and, the test pin shall not make contact with any hazardous live part or any moving part. | Open equipment | N/A |
| | —For open equipment, no test is required. | | P |
| | —Parts are considered to be accessible if they can be touched with a jointed test finger or test pin. | | N/A |
| | —For equipment accepting plug-in modules. | | N/A |
| | —If any actions will increase the accessibility. | | N/A |
| 12.1.3 | General examination of openings | Open equipment, it shall be evaluated during installation. | N/A |
| | —The jointed test finger, shall be applied with a force of 10N. | | N/A |
| | —The test shall be applied to all outer surfaces, including the bottom. | | N/A |
| | —The test pin (Figure C.3) shall be inserted in any openings to penetrate up to 100m. | | N/A |
| | — The test pin (Figure C.4) shall be inserted to pre-set controls. | | N/A |
| | —Penetration shall not exceed 3 times the distance or 100mm, whichever is smaller. | | N/A |
| 12.1.4 | Wire flexing test | Flat cable | P |
| | — The flexing test consists of flexing the wire between the 2 extreme points of travel. | | P |
| | —Number of flexing cycles:500,or | | N/A |
| | — 25, if flexing occurs only during maintenance operations; | 25 cycles | P |
| | —Pass/fail criteria:<br>The insulation passes the dielectric withstand test (12.2.1) and insulation breakdown test method | 1900Vdc | P |
| | —The portion of the cable having been flexed is wrapped with a conductive foil. | Flat cable with metal foil | P |
| | — Test voltage is then applied between each conductor and this conducting foil. | | P |
| 12.1.5 | Temperature test | | P |
| | — Temperatures shall be measured its maximum dissipation. | | P |
| | —The test ambient shall be monitored either at a point not more than 50 mm or at<br>1 point not more than 25 mm. . | | P |

| EN 61131-2 | | | |
|---|---|---|---|
| **Clause** | **Requirement - Test** | **Result-Remark** | **Verdict** |
| | — The environment surrounding the equipment under test shall not be subject to air movement. | | P |
| | —Wiring should be the smallest size suitable rating. | | P |
| | — The temperature test shall be followed by the dielectric withstand test (12.2.1). | | P |
| 12.1.6 | Protective coating test | | N/A |
| 12.1.7 | Rigidity Test | Open equipment, it shall be evaluated during installation. | N/A |
| | —The test equipment shall be subjected to a force of 30N applied by a hard rod of 12mm diameter. | | N/A |
| | —For non-metallic enclosure, the test is performed at an ambient temperature of 40°C. | | N/A |
| | —Verification shall be in accordance with criteria 12.1.2. | | N/A |
| 12.1.8 | Clearance and creepage verification Clearance and creepage requirements of 11.4 shall be verified by measurement. | | N/A |
| 12.1.9 | Field-wiring terminals constructional verification. | | N/A |
| | —Terminals shall be designed to the requirements of 11.8. | | N/A |
| | — This shall be verified by an 8 mm length of the strands free. | | N/A |
| | －The strand shall not touch accessible conductive parts, when bent. | | N/A |
| 12.2 | **Safety-related electrical test** | | P |
| 12.2.1 | Dielectric withstand verification test. | | P |
| | —Sample preconditioned for 48h at 40°± 2 °C and 92,5%RH± 2,5%RH. | 48h, 40℃, 95% RH | P |
| | —The test voltage is based on the highest working voltage, | 240Vac | P |
| | —Selection of Table 58 or Table 59 is based on the insulation specified in 11.1. | B/R | P |
| | —Impulse test, according to IEC 60060-1. | | N/A |
| | —AC voltage test. | | N/A |
| | —DC voltage test. | | P |
| | —The dielectric test voltage is applied between | | P |
| | a) isolated non-SELV circuits, | | N/A |
| | b) isolated non-SELV circuits and SELV circuits, and | | N/A |

| EN 61131-2 | | | |
|---|---|---|---|
| **Clause** | **Requirement - Test** | **Result-Remark** | **Verdict** |
| | c) isolated non-SELV circuits and accessible conductive parts. | Primary to enclosure with metal foil | P |
| | —All mechanical switches shall be in the “on” closed position. | | N/A |
| | —Accessible insulating part of an enclosure shall be covered with metal foil | | P |
| | — There shall be no unintentional flashover or breakdown. | | P |
| | —operation of protecting devices. | | P |
| | —Dielectric withstand testing need not be performed between SELV/PELV circuits and accessible parts. | | P |
| | —These tests need not be done on units tested separately. | | P |
| | —For basic and supplementary insulation 150< *U*e < 300 Impulse 2500/ AC1350/DC 1900 | 1900Vdc | P |
| | —For double insulation Impulse 150< *U*e < 300 Impulse 4250/AC2300/DC 3250 | 3250Vdc | P |
| 12.2.2 | Protective earthing continuity test | Measured between earthing terminal of TB1 and CY1 FG pin : 7 m ohm | P |
| 12.2.3 | Stored energy injury risk test | | P |
| | — External point of disconnection of the mains supply, there is no risk of electric shock. | | P |
| | —Equipment comply if capacitance exceeding 0,1μ F has a means of discharge | See below | P |
| | a. 1s for pluggable equipment, | | N/A |
| | b.10 s for permanently connected equipment. | 0 V | P |
| | — Time constant is the product capacitance in microfarads and discharge resistance in megohms. | | P |
| | —In 1 time constant the voltage will have decayed to 37% of its original value. | | P |
| 12.2.4 | Overload test<br>—Switching devices shall close and open a test circuit given in Table 61. | No such component used. | N/A |
| 12.2.5 | Endurance test<br>—The switching device is to close and open a test circuit given in Table 62. A total of 6000 cycles shall be completed. | See above. | N/A |
| 12.3 | **Single-fault condition test-General** | | P |

| EN 61131-2 | | | |
|---|---|---|---|
| **Clause** | **Requirement - Test** | **Result-Remark** | **Verdict** |
| | — Determine fault conditions liable to result in hazards. | | P |
| | —This is normally limited to 1 h. or for a maximum period of 4 h. | | P |
| | —For open equipment, wire mesh cage are to be connected through a 3 A fast-acting fuse. | | P |
| | —The fault conditions shall be applied only 1 at a time. | | P |
| | —After application of each fault condition, there shall be | | - |
| | a) no emission of flame or molten material nor ignition of cotton loosely placed around the item under test, | | P |
| | b) no accessible hazardous live parts, and | | P |
| | c) no opening of the 3 A fuse. | | P |
| 12.3.1 | Single –fault condition-Breakdown of components test capacitor ,diodes etc shall open/short | | P |
| 12.3.2 | Single-fault condition-Protective impedance test | | N/A |
| 12.3.3 | Single-fault condition-Mains transformers test —The secondary windings of mains transformers shall be short-circuited. | | P |
| | Over current protection devices, which are directly connected to any secondary winding, shall be connected during this test. | No such device. | N/A |
| 12.4 | Limited power source | USB type C port and output port (TB2) comply with the requirement. | P |
| 13. | **Safety routine tests** | It shall be carry out by the manufacture. | N/A |
| 13.1 | **Dielectric withstand test** | | N/A |
| | —Routine dielectric withstand testing in accordance with | | N/A |
| 13.2 | **Dielectric withstand verification test** | | N/A |
| 13.3 | **Protective earthing test** | | N/A |
| 14. | **Safety information to be provided by the manufacturer** | | P |
| | —The manufacturer's data shall include the following information as a minimum. | | P |
| | —Protective earthing requirements and | | P |
| | —recommendations concerning personnel safety circuits. | | P |

| EN 61131-2 | | | |
|---|---|---|---|
| **Clause** | **Requirement - Test** | **Result-Remark** | **Verdict** |
| | —“ Open Equipment”, a suitable enclosure is required to provide protection. | | P |
| | —Precautionary instructions, if removal of any module while the equipment is in operation. | | P |
| | —A statement relative to overvoltage category in 3.43. | Overvoltage category II | P |
| | —Isolation potentials between channel and other circuits. | | P |
| | —Information can be in other than printed form. | | P |
| 14.1 | **Information on evaluation of enclosures for open equipment (power dissipation)** | | P |
| 14.2 | **Information on mechanical terminal connection** | | P |
| | —The manufacturer shall provide type, cross-sectional area and material of the conductors connected to the PLC-system. | | P |
| | —Recommendations for use of shielded cables, and how they are to be connected. | | N/A |

＊＊＊＊＊＊＊IT IS BLANK OF THIS PAGE BELOW＊＊＊＊＊＊＊＊

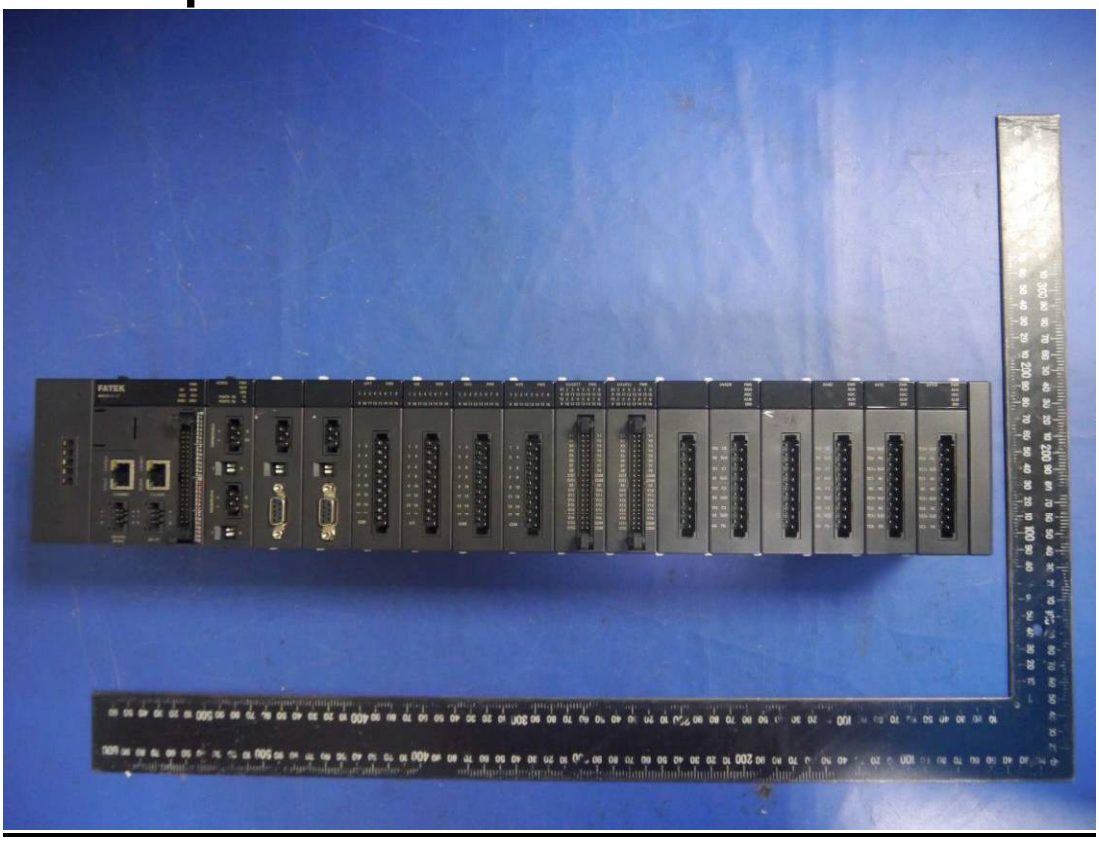
| EN 61131-2 | | | |
|---|---|---|---|
| **Clause** | **Requirement - Test** | **Result-Remark** | **Verdict** |

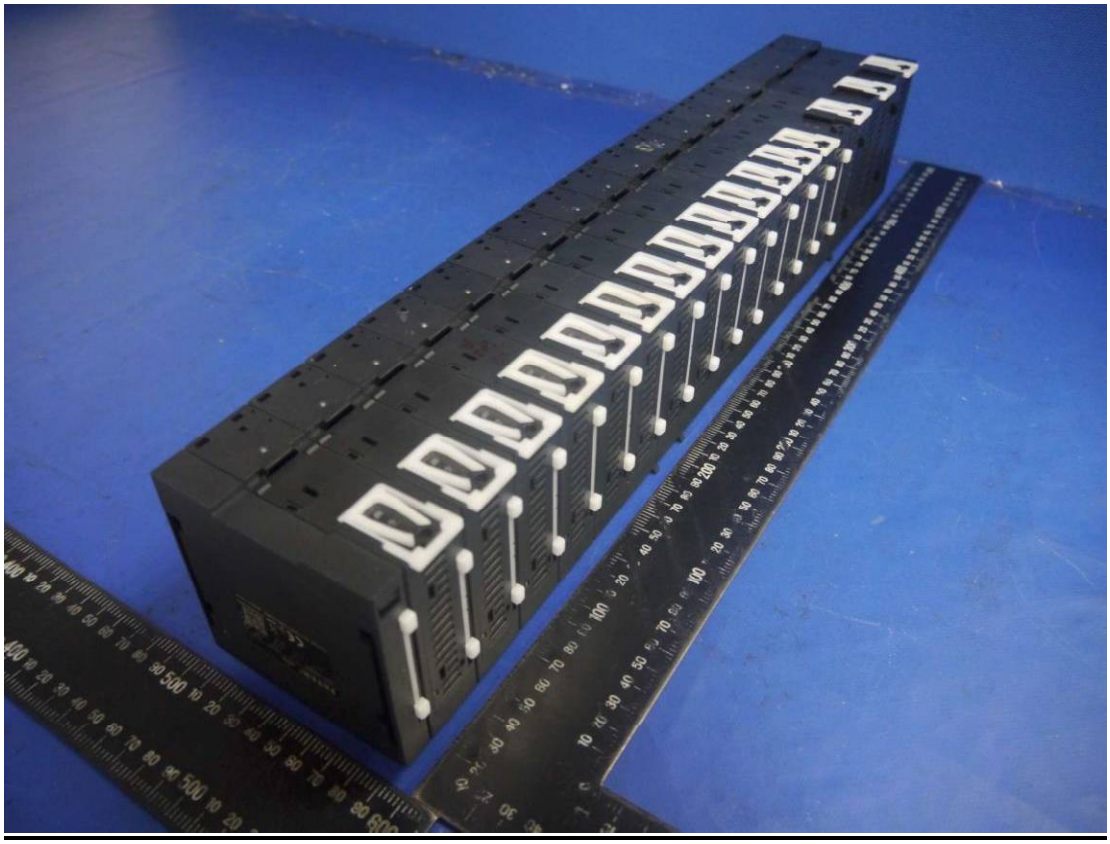
| Item | Component | Identification/Type | Rating | Approval |
|---|---|---|---|---|
| **1.** | **Enclosure** | Plastic enclosure, ventilation openings provided on sides<br>MFR : CHI MEI<br>Type : PA-765A | V-1, 85℃ | UL |
| **2.** | **Enclosure** | Plastic enclosure, ventilation openings provided on sides<br>MFR : CHI MEI<br>Type : PA-765A | V-1, 85℃ | UL |
| **3.** | **PCB** | MFR : LM PCB CO LTD<br>Type : 020 | V-0, 130℃ | UL |
| 4. | **Terminal block (TB1)** | MFR : Dinkle Electric Machinery (China) Co., Ltd.<br>Type : 0177-5105 | 250V, 1A | CE |
| 5. | **Fuse (F1)** | MFR : CONQUER<br>Type : MST | 250V, 2A | VDE |
| 6. | **Thermistor (TH1)** | MFR : Thinking Electronic Industrial Co., Ltd<br>Type : SCK-502 | 50 Ω, 2A | TUV, UL |
| 7. | **X-Capacitor (C14)** | X2 capacitor<br>MFR : Carli Electronics Co., Ltd.<br>Type : MXP | 250V, 0.33uF | VDE |
| 8. | **Bleeder Resistor (R12, R19)** | Interchangeable | Max. 750 Ω | -- |
| 9. | **Choke (LF1)** | MFR : LI TAI ELECTRONIC ENTERPRISE CO.,LTD<br>Type : LF-025106<br>Ferrite Core<br>Phenolic Base | 130 °C | -- |
| 10. | **Bridge Rectifier (DB1)** | Interchangeable | Min. 1 A, min. 800 V | -- |
| 11. | **Storage Capacitor (C3, C4)** | Interchangeable | 56 µF, min. 450 V, min. 105 °C | -- |
| **12.** | **Transistor (Q1)** | Interchangeable | Min. 6 A, min. 650 V | -- |
| **13.** | **Transformer (T1)** | MFR : Big Elephant Electroic Components CO., LTD.<br>Type : 2LT018000010<br>Ferrite core<br>Phenolic bobbin | Class B insulation | -- |

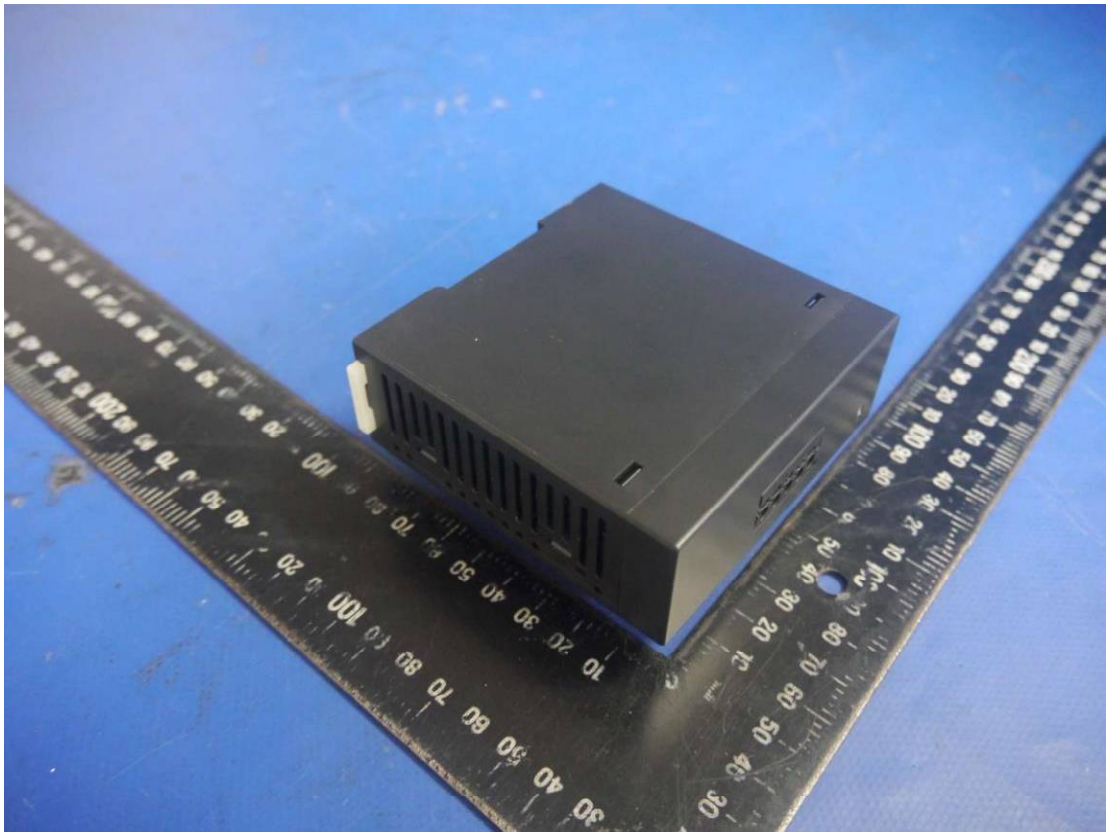
| EN 61131-2 | | | | |
|---|---|---|---|---|
| **Clause** | **Requirement - Test** | | **Result-Remark** | **Verdict** |
| 14. | **- Triple Insulated Wire in T1** | MFR : F TA YA ELECTRIC WIRE & CABLE CO.,LTD.<br>Type : TILW-B | 130℃ | VDE |
| 15. | **- Triple Insulated Wire in T1** | MFR : COSMOLINK CO.,LTD.<br>Type : TIW-MB | 130℃ | VDE |
| 16. | **Photo Coupler (U2)** | MFR : Lite-On Technology Corporation<br>Type : LTV-817 | Dti >= 0.4 mm, Ext. dcr = 7.0 mm, min. 115 °C | VDE |
| 17. | **Y-Capacitor (CY1)** | MFR : TDK Corporation<br>Type : CD | Max.220 pF, min. 250 V, 125 °C | VDE |
| **18.** | **Bridge Capacitor (CY2)** | MFR : TDK Corporation<br>Type : CD | Max. 2200 pF, min. 250 V, 125 °C | VDE |
| **19.** | **Inductor (L2)** | MFR : 3L Electronic Corp<br>Type : 100M<br>Ferrite core | Class B insulation | -- |
| **20.** | **RTC Battery (BAT1)** | MFR : Interchangeable<br>Type : CR2032 | 3.0V, Max. abnormal charging current >10 mA | UL |
| **21.** | **Capacitor (C9, C10, C11, C12)** | Interchangeable | 470 µF, min. 35 V, min. 105 °C | -- |
| | **Alteration** | Not applicable. | | |

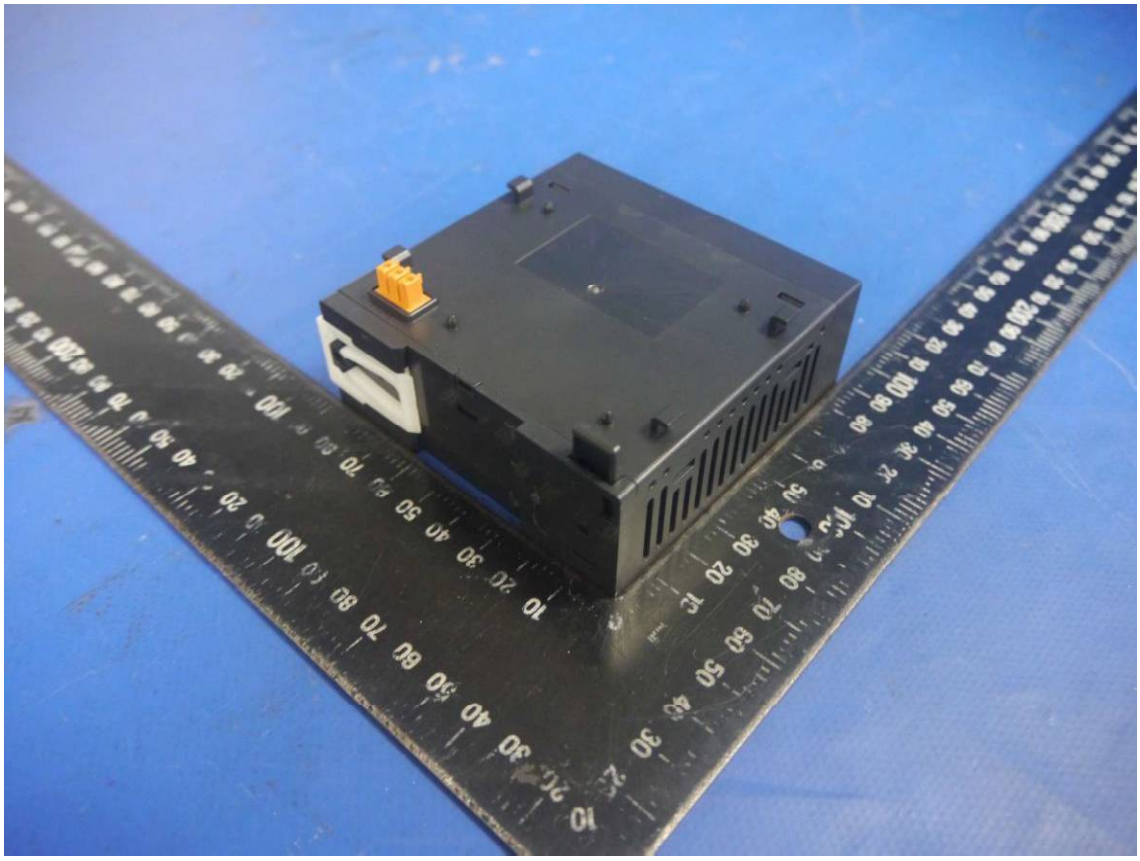
＊＊＊＊＊＊＊＊IT IS BLANK OF THIS PAGE BELOW＊＊＊＊＊＊＊＊

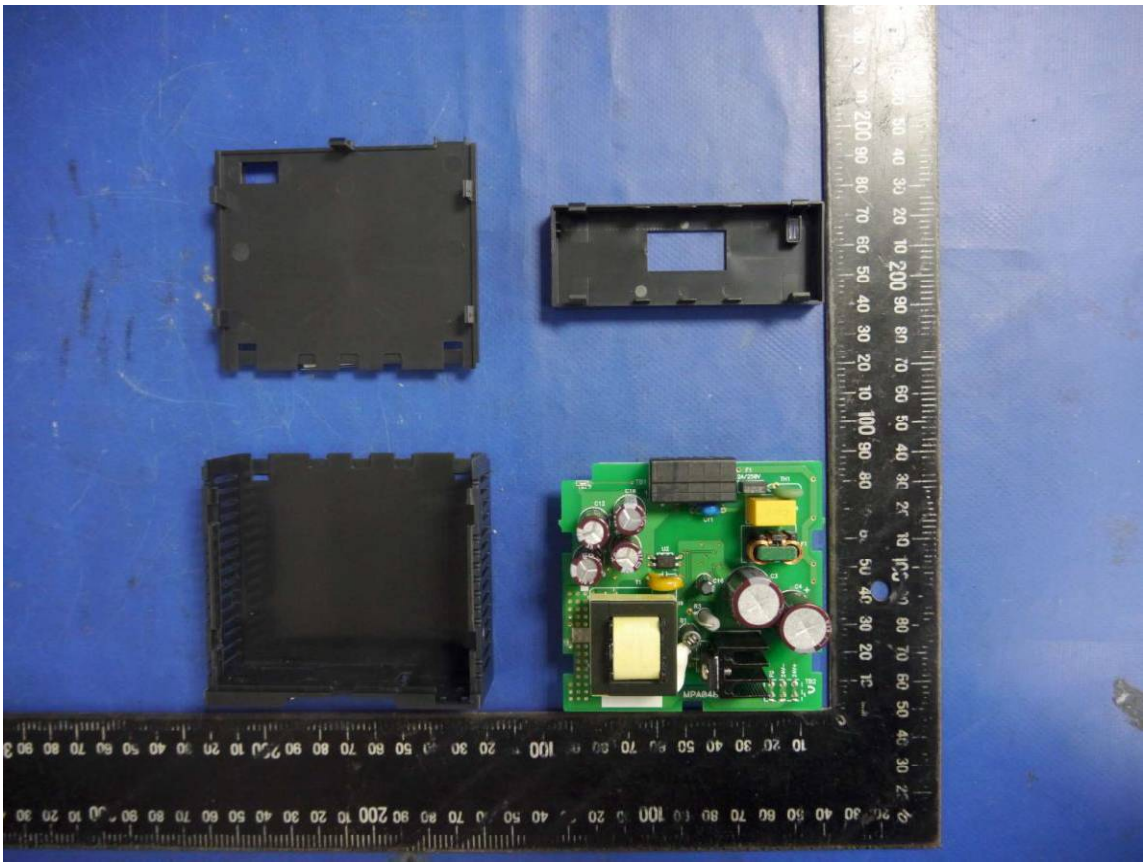
# Appended photos

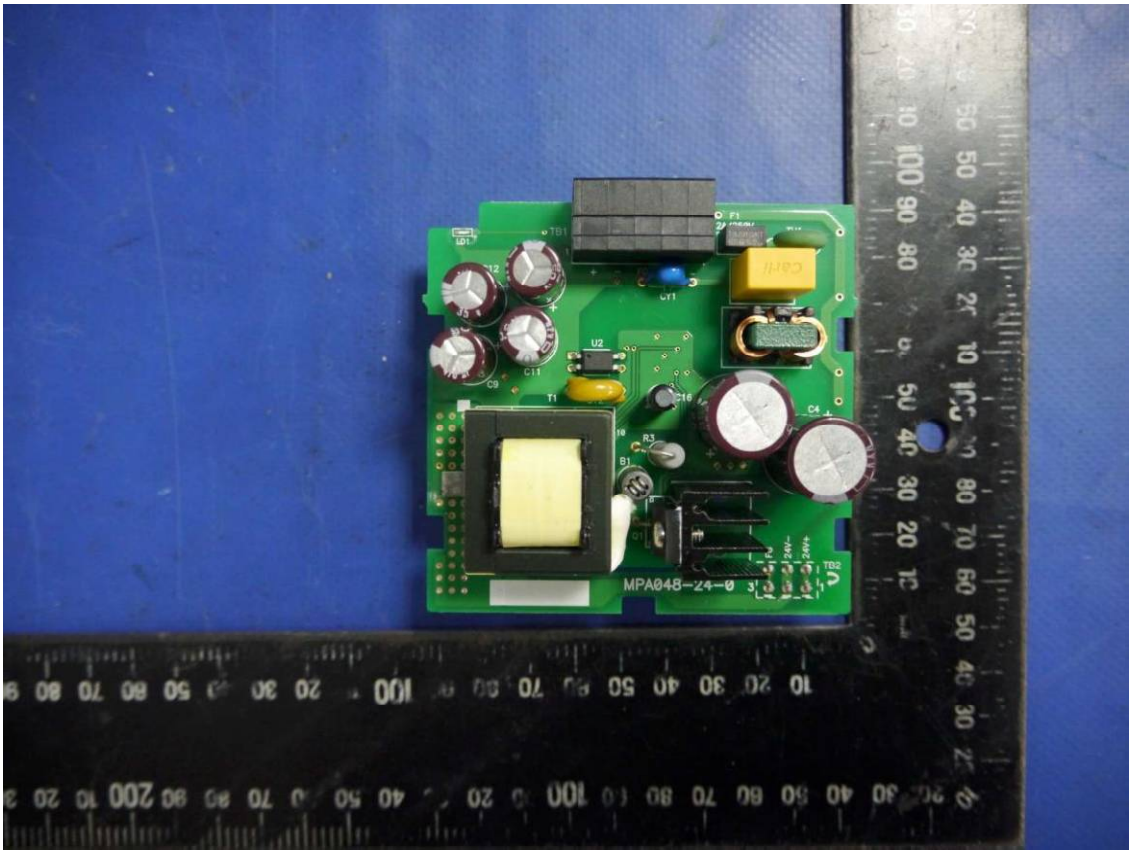


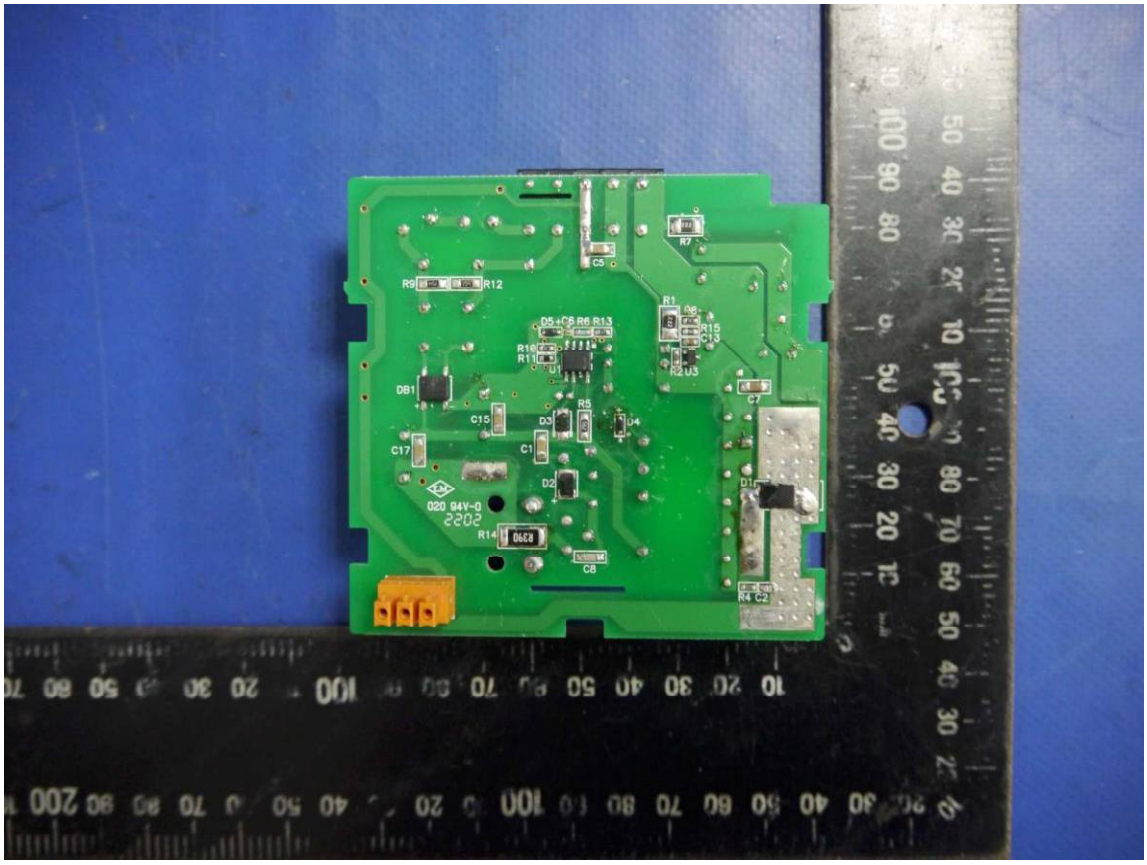










＊＊＊＊＊＊＊＊ END OF THIS REPORT ＊＊＊＊＊＊＊＊