Test Report issued under the responsibility of:

DEKRA

TEST REPORT
IEC 62841-1
Electric Motor-Operated Hand-Held Tools, Transportable Tools and Lawn and Garden Machinery – Safety

Report Number. ..... :	**6137199.51QS**
Date of issue ..... :	**2022.08.29**
Total number of pages ..... :	**15**
Name of Testing Laboratory preparing the Report ..... :	DEKRA Testing and Certification (Shanghai) Ltd. 3F #250 Jiangchangsan Road Building 16, Headquarter Economy Park Shibei Hi-Tech Park, Jing,an District Shanghai 200436 CHINA
Applicant's name ..... :	LEE YEONG INDUSTRIAL CO., LTD.
Address ..... :	No.2, Kejia Rd., Douliu City, Yunlin County 64057, Taiwan
Test specification:	
Standard ..... :	Sub-clause 18.8 of IEC 62841-1: 2014; EN 62841-1:2015+A11:2022 IEC 62841-3-13:2017; EN 62841-3-13:2017
Test procedure ..... :	SCF assessment
Non-standard test method ..... :	N/A
TRF template used ..... :	IECEE OD-2020-F1:2020, Ed.1.3
Test Report Form No. ..... :	IEC 62841_SCF_Assessment_1A
Test Report Form(s) Originator .... :	DEKRA Testing and Certification (Shanghai) Ltd.
Master TRF ..... :	2022-02-23

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This Test Report contains the test results related to the sample(s) test and document(s).

The tests results cannot be used for any statement related to the quality of the equipment from running production.

Test item description ..... :	Hole cutting Drill
Trade Mark ..... :	AGP
Manufacturer ..... :	LEE YEONG INDUSTRIAL CO., LTD. No.2, Kejia Rd., Douliu City, Yunlin County 64057, Taiwan
Model/Type reference ..... :	HC127; CRW12700; LSBM127; KW1500992; RB127; LB120CV; HC600; HC24; HCD24; HCD600; HCD127; HD127; HD24; HD600
Ratings ..... :	110-120 V or 220-240 V; 50-60 Hz; 1100 W;
Software version ..... :	N/A
Hardware version ..... :	PMD3530_V01

Responsible EMC Testing Laboratory (as applicable), testing procedure and testing location(s):		
CB Testing Laboratory:		
Testing location/ address.....:	DEKRA Testing and Certification (Shanghai) Ltd. 3F #250 Jiangchangsan Road Building 16, Headquarter Economy Park Shibei Hi-Tech Park, Jing,an District Shanghai 200436 CHINA	
Tested by (name, function, signature).....:	Xueyan Zhao	
Approved by (name, function, signature)...:	Chris Feng	

Test item particulars.....:	-
Possible test case verdicts:	
- test case does not apply to the test object.....:	N/A
- test object does meet the requirement.....:	P (Pass)
- test object does not meet the requirement.....:	F (Fail)
Testing.....:	
Date of receipt of test item .....:	2022.07.29
Date (s) of performance of tests.....:	2022.07.29-2022.08.29

General remarks:

"(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.

Required performance levels for applicable safety critical functions are specified by the relevant part of IEC 62841-2, IEC 62841-3 or IEC 62841-4. Typical safety critical functions are indicated in table 18.8.1A.

Software used in circuits of programmable devices whose failure would create loss of safety critical function, complied with requirements as in table 18.8.1B according to IEC 60730-1:2010.

If safety critical functions are evaluated by using the fault conditions of 18.6.1 and will not result in a loss of any safety critical function or shall place and maintain the tool into a safe state, Software assessment is not applicable. See table 18.6.1 while the fault condition is present.

Electronic circuits that provide safety critical functions shall be not susceptible to loss of safety critical function due to exposure to electromagnetic environmental stresses encountered in anticipated environments.

Manufacturer's Declaration per sub-clause 4.2.5 of IECEE 02:

The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided ..... :	☐ **Yes** ☒ **Not applicable**

When differences exist, they shall be identified in the General product information section.

Name and address of factory (ies).....:	LEE YEONG INDUSTRIAL CO., LTD. No.2, Kejia Rd., Douliu City, Yunlin County 64057, Taiwan

General product information and other remarks:

Hole cutting Drill:
Model: HC127

Description of Safety Critical Functions (SCF), if any:
1.Prevent self-resetting as required in 23.3
2.Prevent exceeding thermal limits as in Clause 18

18.8	**Electronic circuits providing safety critical functions (SCF)**		—
18.8.1	Electronic circuits providing SCF are reliable and not susceptible to loss of SCF due to electro-magnetic environmental stresses	Refer to below documents: HC127-2_CS_20220707 HC127-2_Dips_20220707 HC127-2_EFT_20220707 HC127-2_ESD_20220707 HC127-2_Surge_20220707	P
	No SCF lost after tests of 18.8.2 to 18.8.6 for circuits with no internal clock frequency or oscillator frequency > 15 MHz		P
	No SCF lost after tests of 18.8.2 to 18.8.7 for other electronic circuits		N/A
	Test voltage was rated voltage or the mean value of the rated voltage range.....:		P
	Difference between upper and lower limit of rated voltage range > 20 % of its mean value, test at both upper and lower limits of the rated voltage range ..:		N/A
	After evaluation using 18.6.1, no loss of any SCF or tool in a safe state under any present fault condition.		N/A
	Concept of 18.6.1 not appropriate, reliability evaluated using ISO 13849-1.	1.Prevent self-resetting as required in 23.3 2.Prevent exceeding thermal limits as in Clause 18	P
	Required performance levels .....:	See Table 18.8.1A	P
	If only $MTTF_d$ is applied to achieve the required PL: $MTTF_d$ is 5/20/50 years for PL = a/b/c		P
	Software used in circuits of programmable devices whose failure would create loss of safety critical function, complied with software class B requirements as in H.11.12.3 of IEC 60730-1:2010	See Table 18.8.1B	N/A
	In the case where software class B is realized by single channel with periodic self-test, an acceptable period is regarded as either after each activation of the power switch or a maximum of 5 min.		N/A
	Class B realized by single channel, periodic self-test either after each activation of the power switch or at least every maximum 5 min		N/A
	H.11.12.3.4.1 applicable for SCF with a PL ≥ c		N/A
18.8.2	Electrostatic discharges as in IEC 61000-4-2:2008 applied to tool, test level 4 used for air discharge and test level 3 for contact discharge, ten / ten discharges having a positive / negative polarity applied		P
18.8.3	Fast transient bursts as in IEC 61000-4-4:2012 applied to tool, test level 3 used. Repetition frequency 5 kHz for 2 min / 2 min with a positive / negative polarity		P

18.8.4	Voltage surges as in IEC 61000-4-5:2005 applied to power supply terminals, five positive impulses and five negative impulses applied at the selected points		P
	Test level 3 applied for line-to-line coupling mode, a generator with 2 Ω source impedance being		P
	Test level 4 applied for line-to-earth coupling mode, a generator with 12 Ω source impedance being		P
	Tools has surge arresters incorporating spark gaps, test was repeated at 95 % of the flashover voltage		P
18.8.5	Injected currents as in IEC 61000-4-6:2008 applied to tool, test level 3 applicable, all frequencies between 0,15 MHz to 230 MHz covered		P
18.8.6	Class 3 voltage dips and interruptions in accordance with IEC 61000-4-11:2004 applied to tool		P
	Values of Tables 1 and 2 of IEC 61000-4-11:2004 were applied at zero crossing of the supply voltage		P
18.8.7	Radiated fields in accordance with IEC 61000-4-3:2010 applied to tool, test level 3 applicable		N/A
	Frequency ranges 80 MHz to 1 000 MHz tested		N/A

18.6.1	**TABLE: Fault Condition Tests**		
	Ambient temperature (°C) .....:	20 °C	—
	Fuse-link Current (A)	—	—
The test method is to open or short circuit the safety critical functional related electronic components, the test results all passed (normal operation with no loss of SCF or no operation/ safe state).			

18.8.1A	**TABLE: Performance levels of Safety Critical Functions**		P
Type and purpose of SCF	Min. PL determined based on:[1,2]	Min. PL	Actual PL
Prevent self-resetting as required in 23.3	IEC 62841-3-13	b	c
Prevent exceeding thermal limits as in Clause 18	IEC 62841-1	a	c

Supplementary Information:
[1] Relevant part of IEC 62841-2, IEC 62841-3 or IEC 62841-4 or; if no such part existent, ISO 13849-1 using Annex E as a guide

[2] For safety critical functions not listed in Table 4 of IEC 62841-1 and provided by electronic circuits, PL values were determined using the methods of ISO 13849-1.

18.8.1B	**TABLE: Software in Safety Critical Functions**		**—**
H.11.12.3 from IEC 60730-1:2010			
H.11.12.3	Measures to avoid errors		**—**
H.11.12.3.1	For controls with software Class B or C the V-model for the software life cycle was applied		N/A
	Measures used for software class C are inherently acceptable for software class B		N/A
	Other methods applied if they incorporate disciplined and structured processes including design and test phases ..... :		N/A
H.11.12.3.2	Specification		**—**
H.11.12.3.2.1	Software safety requirements		**—**
H.11.12.3.2.1.1	The specification of the software safety requirements includes:		**—**

	• A description of each safety related function to be implemented, including its response time(s):
	  ○ functions related to the application including their related software classes
	  ○ functions related to the detection, annunciation and management of software or hardware faults
			N/A

	• A description of interfaces between software and hardware		N/A
	• A description of interfaces between any safety and non-safety related functions		N/A
H.11.12.3.2.2	Software architecture		**—**
H.11.12.3.2.2.1	The description of software architecture shall include the following aspects:		**—**
	• Techniques and measures to control software faults/errors (refer to H.11.12.2)		N/A
	• Interactions between hardware and software		N/A
	• Partitioning into modules and their allocation to the specified safety functions		N/A
	• Hierarchy and call structure of the modules (control flow)		N/A
	• Interrupt handling		N/A
	• Data flow and restrictions on data access		N/A
	• Architecture and storage of data		N/A
	• Time based dependencies of sequences and data		N/A

H.11.12.3.2.2.2	The architecture specification was verified against the specification of the software safety requirements by static analysis. Acceptable methods are:		—
	• Control flow analysis		N/A
	• Data flow analysis		N/A
	• Walk-throughs / design reviews		N/A
H.11.12.3.2.3.1	Based on the architecture design, software is suitably refined into modules. Software module design and coding are implemented in a way that is traceable to the software architecture and requirements		N/A
H.11.12.3.2.3.2	Software code is structured		N/A
H.11.12.3.2.3.3	Coded software is verified against the module specification, and the module specification is verified against the architecture specification by static analysis		N/A
H.11.12.3.2.4	Design and coding standards		—
	Program design and coding standards is consequently used during software design and maintenance		N/A
	Coding standards specify programming practice, proscribe unsafe language features, and specify procedures for source code documentation as well as for data naming conventions		N/A
H.11.12.3.3	Testing		—
H.11.12.3.3.1	Module design (software system design, software module design and coding)		—
H.11.12.3.3.1.1	A test concept with suitable test cases is defined based on the module design specification.		N/A
H.11.12.3.3.1.2	Each software module is tested as specified within the test concept		N/A
H.11.12.3.3.1.3	Test cases, test data and test results are documented		N/A
H.11.12.3.3.1.4	Code verification of a software module by static means includes such techniques as software inspections, walk-throughs, static analysis and formal proof		N/A
	Code verification of a software module by dynamic means includes functional testing, white-box testing and statistical testing		N/A
H.11.12.3.3.2	Software integration testing		N/A
H.11.12.3.3.2.1	A test concept with suitable test cases is defined based on the architecture design specification		N/A

H.11.12.3.3.2.2	The software is tested as specified within the test concept		N/A
H.11.12.3.3.2.3	Test cases, test data and test results are documented		N/A
H.11.12.3.3.3	Software validation		—
H.11.12.3.3.3.1	A validation concept with suitable test cases is defined based on the software safety requirements specification		N/A
H.11.12.3.3.3.2	The software is validated with reference to the requirements of the software safety requirements specification as specified within the validation concept.		N/A
	The software is exercised by simulation or stimulation of:		N/A
	• input signals present during normal operation		N/A
	• anticipated occurrences		N/A
	• undesired conditions requiring system action		N/A
H.11.12.3.3.3.4	Test cases, test data and test results are documented		N/A
H.11.12.3.4	Other Items		—
H.11.12.3.4.1	Tools, programming languages are assumed to be suitable if they comply with "increased confidence from use" according to IEC 61508-7, C.4.4	Only applicable for SCF with PL ≥ c	N/A
H.11.12.3.4.2	Management of software versions: All versions are uniquely identified for traceability		N/A
H.11.12.3.4.3	Software modification		—
H.11.12.3.4.3.1	Software modifications are based on a modification request which details the following:		—
	• the hazards which may be affected		N/A
	• the proposed change		N/A
	• the reasons for change		N/A
H.11.12.3.4.3.2	An analysis is carried out to determine the impact of the proposed modification on functional safety.		N/A
H.11.12.3.4.3.3	A detailed specification for the modification is generated including the necessary activities for verification and validation, such as a definition of suitable test cases		N/A
H.11.12.3.4.3.4	The modification are carried out as planned		N/A
H.11.12.3.4.3.5	The assessment of the modification is carried out based on the specified verification and validation activities. This may include:		N/A

	• a reverification of changed software modules		N/A
	• a reverification of affected software modules		N/A
	• a revalidation of the complete system		N/A
H.11.12.3.4.3.6	All details of modification activities are documented		N/A
H.11.12.3.5	For class C control functions: One of the combinations (a–p) of analytical measures given in the columns of table H.9 is used during hardware development .....:	Measures to avoid errors for class C not required	N/A

Annex 1 Description of Test Object

The product under evaluation is the safety critical function s of model: HC127; CRW12700; LSBM127; KW1500992; RB127; LB120CV; HC600; HC24; HCD24; HCD600; HCD127; HD127; HD24; HD600 manufactured by LEE YEONG INDUSTRIAL CO., LTD.

Only the following safety critical functions are evaluated in this report.

SCF1: Prevent self-resetting as required in 23.3
The prevent self-resetting protection function is realized by hardware circuit. According to table 4 of IEC 62841-3-13, PLr = b.

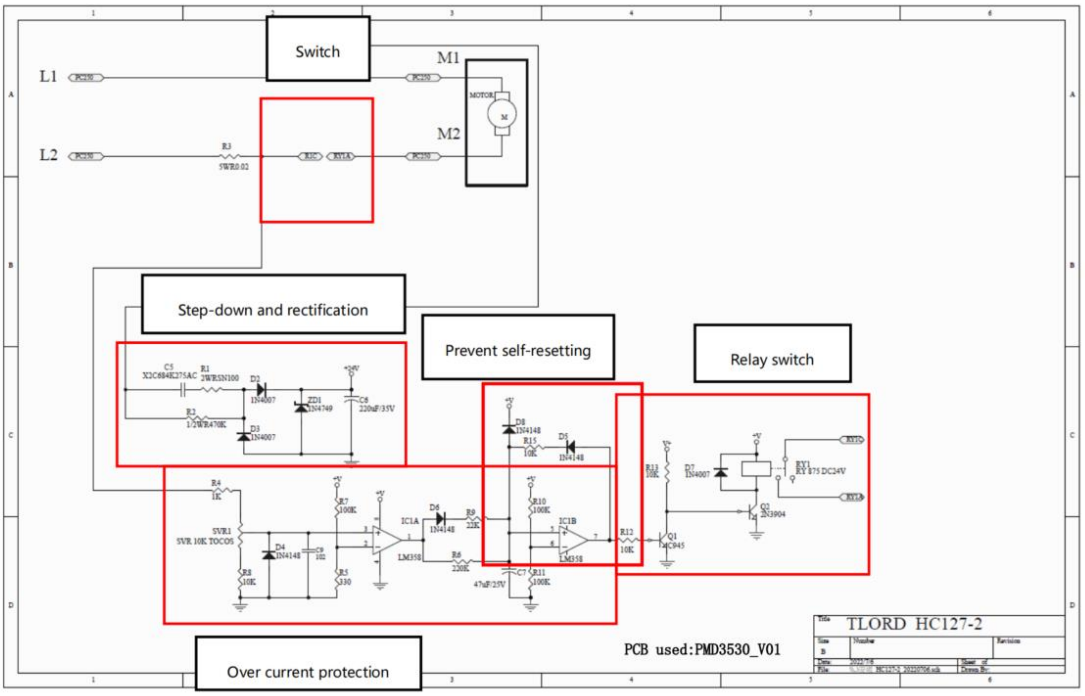
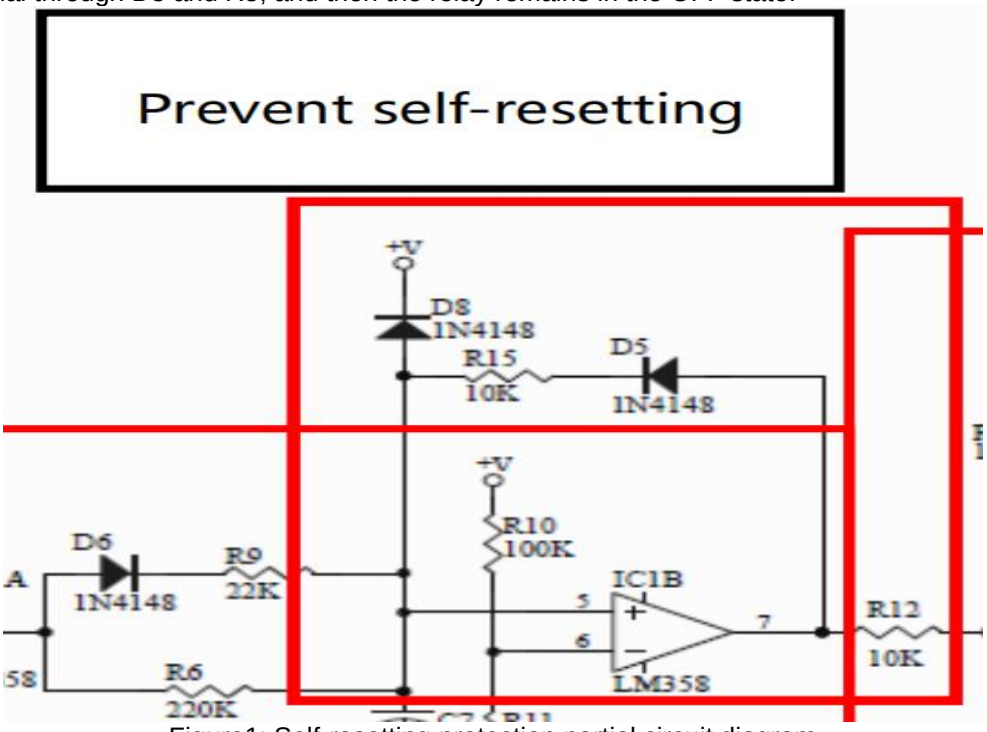
SCF2: Prevent exceeding thermal limits as in Clause 18
Over current protective function is provided to meet this requirement. The protective electronic circuit that provides this function is relied upon to pass the test of Clause b) “The terminals of each motor are shorted one at a time.” and c) “The rotor of each motor is locked one at a time.” of clause 18.8 of IEC/EN 62841-1. According to table 4 of IEC 62841-3-13, PLr = a.

Annex 2 Achieved Performance Level--Calculation of MTTFd

MTTFd					
Component	**Reliability Reference**	No.	**Units n**	**MTTFd Typical years**	**n/MTTFd Typical 1/year**
Resistor-Carbon Film	ISO 13849	R1, R2	1	114155	0.0000088
Resistor-Variable	ISO 13849	SVR	1	7618	0.0001313
Capacitor-Ceramics	ISO 13849	C9	1	45662	0.0000219
Aluminium electrolytic	ISO 13849	C7, C6, C9	3	45662	0.0000657
Rectifier diodes	ISO 13849	D2, D3, D4, D5, D6, D7, D8	7	228311	0.0000307
Zener diode Ptot < 1 W	ISO 13849	ZD1	1	228311	0.0000044
Transistor-Bipolar, universal	ISO 13849	Q1, Q2	2	76104	0.0000263
$1/MTTF_d$ (1/years)					0.000288948
MTTFd (years)Total:					3460.830172

The calculated overall $MTTF_d$ value is **3460 years (> 50 years)**. According to Cl. 4.6 of EN ISO 13849-1, the circuitry design can meet this requirement.

Annex 3 Description of Safety Hardware

System Description	
System diagram of Hole cutting Drill	 Figure1: Hardware Structure Diagram
Description of SCF-Prevent self-resetting as required in 23.3:	Overcurrent monitoring self-locking mode: When the current is too high, the voltage of ICIB PIN5 is higher than that of PIN6. PIN7 outputs a high voltage to make the relay OFF. At the same time, the voltage of PIN5 is locked at a high potential through D5 and R5, and then the relay remains in the OFF state.  Figure1: Self-resetting protection partial circuit diagram If the motor stop while trigger switch is operated. The tool is mechanically overloaded by forcing tool during using, and the motor comes to a stop, the tool shall not restart, power button needs to be repressed to start tool again.

Description of SCF-Prevent exceeding thermal limits as in Clause 18:	When the device is in the unprotected state, if the operating current of the device exceeds the set overcurrent protection value and the corresponding time, the device will turn off the output and enter the overcurrent protection state.

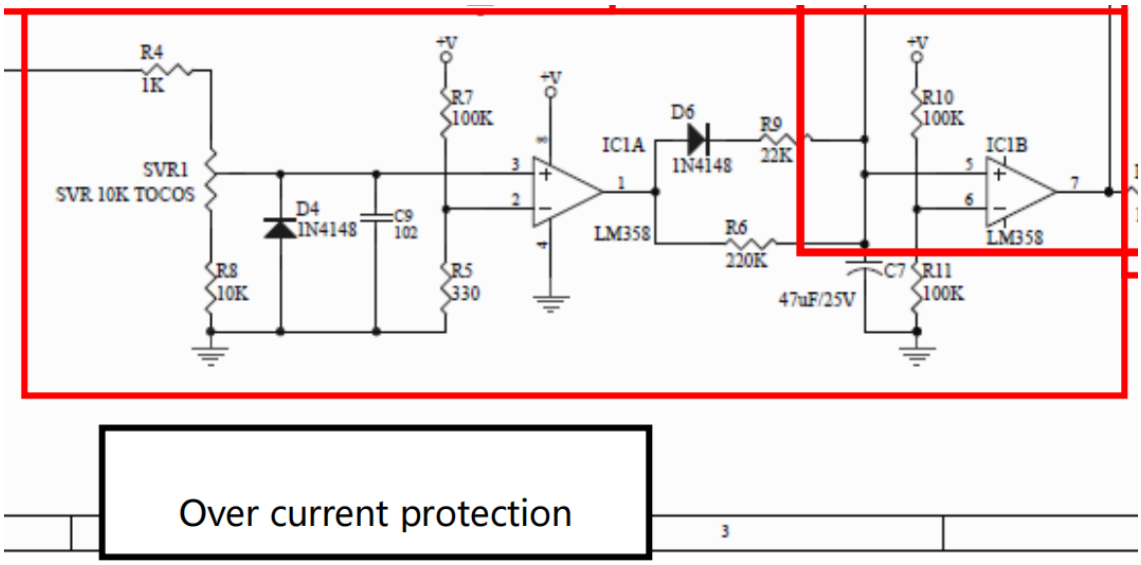


Figure3: Current protection partial circuit diagram

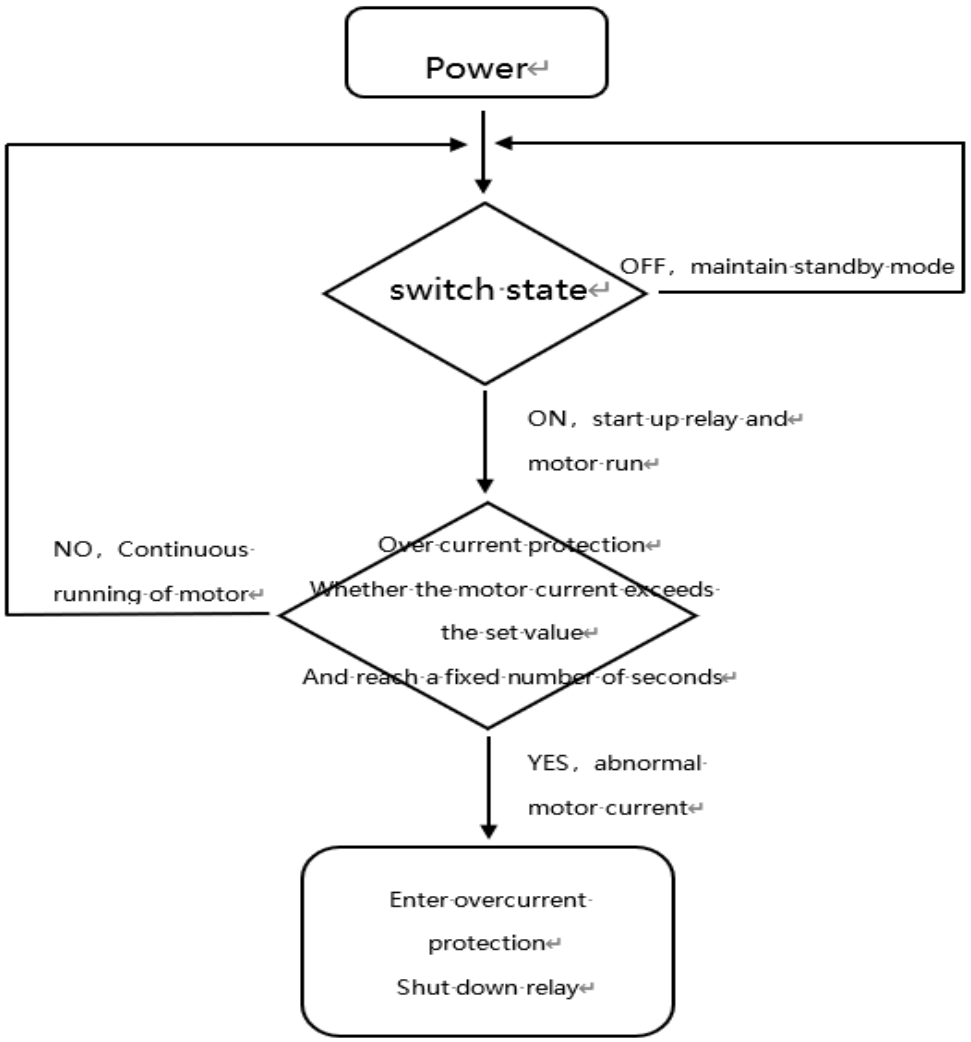


Figure4: Flow chart of current protection

	Protection Mechanism: Turn off the relay and the motor stops running Action: The switch ON/FF: Switch OFF, motor does not run. If the motor is ON and does not reach the current protection point, the motor keeps running. Motor current overload: When the switch is ON and the motor current reaches the judgment point, the relay will be closed and the motor will stop running: Hc127-2 motor current up to 8A for 3~15 seconds.

----------END----------