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Conformance test for communication protocols between off-board conductive charger and battery management system for electric vehicle

电动汽车非车载传导式充电机与

电池管理系统之间的通信协议一致性测试

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Foreword

This Standard is drafted in accordance with the rules given in GB/T 1.1-2009.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. The issuing organizations of this document shall not be held responsible for identifying any or all such patent rights.

This Standard is proposed by and shall be under the jurisdiction of China Electricity Council.

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Introduction

Protocol conformance testing is a kind of functional testing, which is to test the protocol implementation under test in a certain network environment by using a series of test sequences. By comparing the similarities and differences between actual output and expected output, to determine the extent to which the implementation under test is consistent with the description standard. By protocol conformance testing, it will reduce the risk of errors when the product is running in the field.

In the realization process of the protocol, due to 1) the ambiguity of the protocol standard description and the ambiguity of understanding, 2) the programming mode and implementation method of the protocol are different, and 3) the protocol implementation has different device selection and configuration and other reasons, there are some differences between different protocol implementations, therefore, it is necessary to carry out protocol conformance testing.

Protocol conformance testing is to detect the existence of errors rather than verify that it is error-free. Relying solely on conformance testing cannot absolutely guarantee the interoperability of the application, so it shall carry out the interoperability testing on the basis of conformance testing.

Protocol conformance testing is the basis for interoperability testing. Only for products that pass the protocol conformance testing indicating that they meet the requirements of the relevant protocol standards, carrying out interoperability testing is meaningful.

Protocol conformance testing does not include evaluation of the design of the protocol standard itself, nor the performance, redundancy, robustness and reliability assessment of the particular protocol implementation body.

Conformance test for communication protocols between off-board conductive charger and battery management system for electric vehicle

1 Scope

This Standard specifies the conformance testing requirements, conformance testing system and conformance testing content for communication protocols between off-board conductive charger (hereinafter referred to as charger) and battery management system (hereinafter referred to as BMS) for electric vehicle.

This Standard applies to the conformance testing carried out for products that are stated to comply with GB/T 27930-2015.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the dated edition cited applies. For undated references, the latest edition of the referenced document (including all amendments) applies.

GB/T 17178.1-1997 Information technology - Open systems interconnection - Conformance testing methodology and framework - Part 1: General concepts

GB/T 27930-2015 Communication protocols between off-board conductive charger and battery management system for electric vehicle

3 Terms and definitions

For the purpose of this document, the following terms and definitions and those defined in GB/T 17178.1-1997 apply.

3.1

abstract test case

A complete and independent specification of the actions required to achieve a specific teat purpose defined at the level of abstraction of a particular abstract test method. It starts and ends in a stable testing state.

[GB/T 17178.1-1997, definition 3.3.39]

3.8

implementation conformance statement [ICS] proforma

A document, in the form of a questionnaire, which becomes an ICS when completed for an implementation or system.

[GB/T 17178.1-1997, definition 3.3.40]

3.9

implementation extra information for testing; IXIT

A statement made by a supplier or implementer of an IUT which contains or references all of the information (in addition to information given in the ICS) related to the IUT and its testing environment, which will enable the test laboratory to run an appropriate test suite against the IUT.

[GB/T 17178.1-1997, Definition 3.3.41]

3.10

implementation extra information for testing [IXIT] proforma

A document, in the form of a questionnaire, which becomes an IXIT when completed for an IUT.

[GB/T 17178.1-1997, definition 3.3.42]

3.11

protocol implementation conformance statement; PICS

An ICS for an implementation or system claimed to conform to a given protocol specification.

[GB/T 17178.1-1997, definition 3.3.80]

3.12

protocol implementation extra information for testing; PIXIT

An IXIT related to testing for conformance to a given protocol specification.

[GB/T 17178.1-1997, definition 3.3.81]

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CCS: charger charging status message

CEM: charger error message

CHM: charger handshake message

CML: charger maximum/minimum output parameter message

CRM: charger recognition message

CRO: charger readiness status message

CSD: charger statistical data message

CST: charger stopping charging message

CTS: charger time synchronization message

ETS: executable test suite

ICS: implementation conformance statement

IUT: implementation under test

IXIT: implementation extra information for testing

PICS: protocol implementation conformance statement

PIXIT: protocol implementation extra information for testing

5 Conformance testing requirements

5.1 General

This Standard is to verify whether IUT meets the requirements of GB/T 27930-2015, that is to verify the conformance between IUT and the standard in terms of protocol implementation.

5.2 Testing process

The entire testing process is shown in Figure 1. Preparation for testing includes filling in static documents, building test system, etc. PICS document and PIXIT document are done by IUT provider and test laboratory. After confirming that all devices are normally started, it may turn on PC test software and conduct subsequent test operations. After the test is completed, a test report is generated to draw the test conclusion.

No. of test case	BN.1001	
	1) The CAN communication speed	of the test system and the BMS is
	set to 250 kbit/s;	
Preconditions	2) The physical connection betweer	n the test system and the BMS is
Preconditions	completed and to ensure lock;	
	3) The low-voltage auxiliary power o	circuit contactor K3K4 of the test
	system is closed	
	Test procedure	Expected result
	The test system does not send	1) The BMS does not send any
	messages, and does not start the	message within 60 s from the BMS
	insulation monitoring	startup;
		2) After 60 s, the BMS sends the
		BEM message with SPN3901 =
		01. The message format, content
		and period meet the requirements
		of 9.5 and 10.5.1 in GB/T 27930-
		2015
No. of test case	BN.1002	
	1) The CAN communication speed	of the test system and the BMS is
	set to 250 kbit/s;	
Preconditions	2) The physical connection of the te	st system and the BMS is
Freconditions	completed and to ensure lock;	
	3) The low-voltage auxiliary power o	circuit contactor K3K4 of the test
	system is closed	
	Test procedure	Expected result
	The test system sends a message	1) The BMS does not send any
	that does not match the definition	message within 60 s from the BMS
	of CHM message type and does	startup;
	not start the insulation monitoring	2) After 60 s, the BMS sends a
		BEM message with SPN3901 =
		01, and the message format,
		content and period meet the
		requirements of 9.5 and 10.5.1 in
		GB/T 27930-2015
No. of test case	BN.1003	
Preconditions	1) The test system and the BMS co	mplete handshake confirmation;
1 1000110110110	2) The test system completes insula	ation monitoring
	Test procedure	Expected result
	The test system stops sending	1) Within 30 s since the CHM
	messages	message was first sent, the BMS
		sends a BRM message in a period
		of 250 ms;
		2) After 30 s, the BMS sends a

		01, and the message format,
		content and period meet the
		requirements of 9.5 and 10.5.1 in
		GB/T 27930-2015
No. of test case	BN.1007	
Preconditions	The test system's reception of BRM	message is completed
	Test procedure	Expected result
	The test system stops sending	1) Within 5 s since the BRM
	messages	message was first sent, the BMS
		sends a BRM message in a period
		of 250 ms;
		2) After 5 s, the BMS sends a BEM
		message with SPN3901 = 01, and
		the message format, content and
		period meet the requirements of
		9.5 and 10.5.1 in GB/T 27930-
		2015
No. of test case	BN.1008	
Preconditions	The test system's reception of BRM	message is completed
	Test procedure	Expected result
	The test system sends a message	1) Within 5 s since the BRM
	that does not match the definition	message was first sent, the BMS
	of CRM message type in a period	sends a BRM message in a period
	of 250 ms	of 250 ms;
		2) After 5 s, the BMS sends a BEM
		message with SPN3901 = 01, and
		the message format, content and
		period meet the requirements of
		9.5 and 10.5.1 in GB/T 27930-
		2015
No. of test case	BN.1009	
Preconditions	The test system's reception of BRM	message is completed
	Test procedure	Expected result
	The test system sends a CRM	1) Within 5 s since the BRM
	message with SPN2560 ≠ 0xAA	message was first sent, the BMS
	and SPN2560 ≠ 0x00 in a period	sends a BRM message in a period
	of 250 ms	of 250 ms;
		2) After 5 s, the BMS sends a BEM
		message with SPN3901 = 01, and
		the message format, content and
		period meet the requirements of
		9.5 and 10.5.1 in GB/T 27930-
1		2015

		2)
		2) After 5 s, the BMS sends the
		BEM message with SPN3904 =
		01. The message format, content
		and period meet the requirements
		of 9.5 and 10.5.1 in GB/T 27930-
		2015
No. of test case	BN.2006	
Preconditions	The test system receives the BRO r	message with SPN2829 = 0xAA
	Test procedure	Expected result
	The test system sends the CRO	1) Within 60 s since the BRO
	message with SPN2830 ≠ 0xAA in	message with SPN2829 = 0xAA is
	a period of 250 ms	first sent, the BMS sends the
		message in a period of 250 ms.
		The message format, content and
		period meet the requirements of
		9.2 and 10.2.4 in GB/T 27930-
		2015;
		2) After 60 s, the BMS sends the
		BEM message with SPN3904 =
		01. The message format, content
		and period meet the requirements
		of 9.5 and 10.5.1 in GB/T 27930-
		2015
No. of test case	BN.2007	
Preconditions	The test system receives the BRO r	message with SPN2829 = 0xAA
	Test procedure	Expected result
	The test system continues to send	1) Within 5 s since the BRO
	the CML message in a period of	message with SPN2829 = 0xAA is
	250 ms and sends the CTS	first sent, the BMS sends the
	message (optional) in a period of	message in a period of 250 ms.
	500 ms. The message format,	The message format, content and
	content and period meet the	period meet the requirements of
	requirements of 9.2, 10.2.2 and	9.2 and 10.2.4 in GB/T 27930-
	10.2.3 in GB/T 27930-2015	2015;
		2) After 5 s, the BMS sends the
		BEM message with SPN3904 =
		01. The message format, content
		and period meet the requirements
		of 9.5 and 10.5.1 in GB/T 27930-
		2015
		2010

7.4.3 Charging stage

Test cases of the charging stage are shown in Table 4. The test is mainly for

Γ		
		length is 9 bytes;
		3) The BMS sends the BSM
		message in a period of 250 ms.
		The message format, content and
		period meet the requirements of
		9.3 and 10.3.4 in GB/T 27930-
		2015. The message length is 7
		bytes;
		4) The BMS sends the BMV
		message, the BMT message, the
		BSP message in a period of 10 s.
		The message format, content and
		period meet the requirements of
		9.3 and 10.3.5, 10.3.6 and 10.3.7
		in GB/T 27930-2015 (optional)
No. of test case	BP.3003	
Preconditions	The test system voluntarily suspend	ds charging
	Test procedure	Expected result
	The test system sends the CST	1) MS stops sending BCL, BCS,
	message in a period of 10 ms.	BSM, BMV (optional), BMT
	The message format, content and	(optional) and BSP (optional)
	period meet the requirements of	messages;
	9.3 and 10.3.9 in GB/T 27930-	2) The BMS send the BST
	2015. The reason for the	message in a period of 10 ms. The
	suspension may be:	message format, content and
	a) Reach the condition set by the	period meet the requirements of
	charger.	9.3 and 10.3.8 in GB/T 27930-
	b) Manual suspension.	2015. The message length is 4
	c) Failure suspension: charger	bytes;
	over-temperature failure; charge	3) It enters into the charge
	connector failure; charger internal	completion communication
	over-temperature failure; required	process
	power cannot be transmitted;	
	charger emergency stop failure;	
	mismatch current; abnormal	
	voltage; other failures	
	NOTE: The "manual suspension"	
	includes suspension by swiping	
	the card, pressing the stop button,	
	etc.	
No. of test case	BP.3004	
Preconditions	The BMS voluntarily suspends char	ging
	Test procedure	Expected result
	•	1

		and paried most the requirements
		and period meet the requirements
		of 9.5 and 10.5.1 in GB/T 27930-
		2015
No. of test case	BN.3007	
Preconditions	• •	ging and sends the BST message in
	a period of 10 ms	
	Test procedure	Expected result
	The test system sends the	1) Within 5 s since the BST
	message that does not match the	message is first sent, the BMS
	CST message type definition in a	sends the BST message in a
	period of 10 ms	period of 10 ms. The message
		format, content and period meet
		the requirements of 9.3 and 10.3.8
		in GB/T 27930-2015;
		2) After 5 s, the BMS sends the
		BEM message with SPN3906 =
		01. The message format, content
		and period meet the requirements
		of 9.5 and 10.5.1 in GB/T 27930-
		2015
		2013
No. of test case	BN.3008	2013
		ging and sends the BST message in
No. of test case Preconditions		
	The BMS voluntarily suspends char	
	The BMS voluntarily suspends char a period of 10 ms	ging and sends the BST message in
	The BMS voluntarily suspends char a period of 10 ms Test procedure	ging and sends the BST message in Expected result
	The BMS voluntarily suspends char a period of 10 ms Test procedure The test system continues to send	ging and sends the BST message in Expected result 1) Within 5 s since the BST
	The BMS voluntarily suspends char a period of 10 ms Test procedure The test system continues to send the CCS message in a period of	ging and sends the BST message in Expected result 1) Within 5 s since the BST message is first sent, the BMS
	The BMS voluntarily suspends char a period of 10 ms Test procedure The test system continues to send the CCS message in a period of 50 ms. The message format,	ging and sends the BST message in Expected result 1) Within 5 s since the BST message is first sent, the BMS sends the BST message in a
	The BMS voluntarily suspends char a period of 10 ms Test procedure The test system continues to send the CCS message in a period of 50 ms. The message format, content and period meet the	ging and sends the BST message in Expected result 1) Within 5 s since the BST message is first sent, the BMS sends the BST message in a period of 10 ms. The message
	The BMS voluntarily suspends char a period of 10 ms Test procedure The test system continues to send the CCS message in a period of 50 ms. The message format, content and period meet the requirements of 9.3 and 10.3.3 in	Expected result 1) Within 5 s since the BST message is first sent, the BMS sends the BST message in a period of 10 ms. The message format, content and period meet
	The BMS voluntarily suspends char a period of 10 ms Test procedure The test system continues to send the CCS message in a period of 50 ms. The message format, content and period meet the requirements of 9.3 and 10.3.3 in	ging and sends the BST message in Expected result 1) Within 5 s since the BST message is first sent, the BMS sends the BST message in a period of 10 ms. The message format, content and period meet the requirements of 9.3 and 10.3.8
	The BMS voluntarily suspends char a period of 10 ms Test procedure The test system continues to send the CCS message in a period of 50 ms. The message format, content and period meet the requirements of 9.3 and 10.3.3 in	Expected result 1) Within 5 s since the BST message is first sent, the BMS sends the BST message in a period of 10 ms. The message format, content and period meet the requirements of 9.3 and 10.3.8 in GB/T 27930-2015;
	The BMS voluntarily suspends char a period of 10 ms Test procedure The test system continues to send the CCS message in a period of 50 ms. The message format, content and period meet the requirements of 9.3 and 10.3.3 in	ging and sends the BST message in Expected result 1) Within 5 s since the BST message is first sent, the BMS sends the BST message in a period of 10 ms. The message format, content and period meet the requirements of 9.3 and 10.3.8 in GB/T 27930-2015; 2) After 5 s, the BMS sends the
	The BMS voluntarily suspends char a period of 10 ms Test procedure The test system continues to send the CCS message in a period of 50 ms. The message format, content and period meet the requirements of 9.3 and 10.3.3 in	Expected result 1) Within 5 s since the BST message is first sent, the BMS sends the BST message in a period of 10 ms. The message format, content and period meet the requirements of 9.3 and 10.3.8 in GB/T 27930-2015; 2) After 5 s, the BMS sends the BEM message with SPN3906 =
	The BMS voluntarily suspends char a period of 10 ms Test procedure The test system continues to send the CCS message in a period of 50 ms. The message format, content and period meet the requirements of 9.3 and 10.3.3 in	ging and sends the BST message in Expected result 1) Within 5 s since the BST message is first sent, the BMS sends the BST message in a period of 10 ms. The message format, content and period meet the requirements of 9.3 and 10.3.8 in GB/T 27930-2015; 2) After 5 s, the BMS sends the BEM message with SPN3906 = 01. The message format, content
	The BMS voluntarily suspends char a period of 10 ms Test procedure The test system continues to send the CCS message in a period of 50 ms. The message format, content and period meet the requirements of 9.3 and 10.3.3 in	Expected result 1) Within 5 s since the BST message is first sent, the BMS sends the BST message in a period of 10 ms. The message format, content and period meet the requirements of 9.3 and 10.3.8 in GB/T 27930-2015; 2) After 5 s, the BMS sends the BEM message with SPN3906 = 01. The message format, content and period meet the requirements

7.4.4 End of charging stage

Test cases of the end of charging stage are shown in Table 5. The test is mainly for communication logic and BSD messages in this stage.

2) The test system disconnects K1K2, K3K4 No. of test case BN.4001 Preconditions The test system first receives the BSD message Test procedure Expected result The test system stops sending messages 1) Within 10 s since the BSD message is first sent, the BI sends the BSD message ir period of 250 ms. The mess format, content and period in the requirements of 9.4 and 1 in GB/T 27930-2015. 2) After 10 s, the BMS sends BEM message with SPN390 01. The message format, contents of the period of 250 ms.	MS age neet 0.4.1 s the
No. of test case BN.4001 Preconditions The test system first receives the BSD message Test procedure Expected result The test system stops sending messages message is first sent, the B sends the BSD message ir period of 250 ms. The mess format, content and period in the requirements of 9.4 and 1 in GB/T 27930-2015. 2) After 10 s, the BMS sends BEM message with SPN390	MS age neet 0.4.1 s the
Preconditions The test system first receives the BSD message Expected result The test system stops sending message is first sent, the Bisends the BSD message ir period of 250 ms. The mess format, content and period in the requirements of 9.4 and 1 in GB/T 27930-2015. 2) After 10 s, the BMS sends BEM message with SPN390.	MS age neet 0.4.1 s the
Test procedure Expected result The test system stops sending messages message is first sent, the Bisends the BSD message ir period of 250 ms. The messing format, content and period in the requirements of 9.4 and 1 in GB/T 27930-2015. 2) After 10 s, the BMS sends BEM message with SPN390.	MS age neet 0.4.1 s the
The test system stops sending messages 1) Within 10 s since the BS message is first sent, the BI sends the BSD message ir period of 250 ms. The mess format, content and period n the requirements of 9.4 and 1 in GB/T 27930-2015. 2) After 10 s, the BMS sends BEM message with SPN390	MS age neet 0.4.1 s the
messages message is first sent, the Bi sends the BSD message ir period of 250 ms. The mess format, content and period in the requirements of 9.4 and 1 in GB/T 27930-2015. 2) After 10 s, the BMS sends BEM message with SPN390	MS age neet 0.4.1 s the
sends the BSD message in period of 250 ms. The mess format, content and period in the requirements of 9.4 and 1 in GB/T 27930-2015. 2) After 10 s, the BMS sends BEM message with SPN390	age neet 0.4.1 s the
period of 250 ms. The mess format, content and period not the requirements of 9.4 and 1 in GB/T 27930-2015. 2) After 10 s, the BMS sends BEM message with SPN390	age neet 0.4.1 s the 07 =
format, content and period n the requirements of 9.4 and 1 in GB/T 27930-2015. 2) After 10 s, the BMS sends BEM message with SPN390	neet 0.4.1 s the 07 =
the requirements of 9.4 and 1 in GB/T 27930-2015. 2) After 10 s, the BMS sends BEM message with SPN390	0.4.1 s the 07 =
in GB/T 27930-2015. 2) After 10 s, the BMS sends BEM message with SPN390	s the)7 =
2) After 10 s, the BMS sends BEM message with SPN390)7 =
BEM message with SPN390)7 =
01. The message format, cor	ntent
l	itorit
and period meet the requirem	nents
of 9.5 and 10.5.1 in GB/T 27	930-
2015	
No. of test case BN.4002	
Preconditions The test system first receives the BSD message	
Test procedure Expected result	
The test system sends the 1) Within 10 s since the BS	3T
message that does not match the message is first sent, the B	MS
CSD message type definition in a sends the BSD message in	١a
period of 250 ms period of 250 ms. The mess	age
format, content and period n	neet
the requirements of 9.4 and 1 in GB/T 27930-2015.	0.4.1
2) After 10 s, the BMS sends	the
BEM message with SPN390	
01. The message format, cor	
and period meet the requirem	
of 9.5 and 10.5.1 in GB/T 27	930-
2015	
No. of test case BN.4003	
Preconditions The test system receives the BSD message	
Test procedure Expected result	
The test system continues to send 1) Within 10 s since the BS	 3T
the CST message in a period of message is first sent, the B	MS
10 ms. The message format, sends the BSD message in	۱a
contents and period meet the period of 250 ms. The mess	age
requirements of 9.3 and 10.3.9 in format, content and period n	neet
GB/T 27930-2015 the requirements of 9.4 and 1	0.4.1

	1) The charger and the test system	enter the handshake identification
Preconditions	stage;	
	2) The test system receives the CR	M message with SPN2560 = 0x00
	Test procedure	Expected result
	The test system continues to use	1) Within 5 s since the CRM
	the transmission protocol function	message with SPN2560 = 0xAA
	to send the BRM message in a	message is sent, the charger uses
	period of 250 ms. The message	the transmission protocol function
	format, contents and period meet	to receive the BRM message and
	the requirements of 9.1 and	sends the CRM message with
	10.1.4 in GB/T 27930-2015	SPN2560 = 0xAA in a period of
		250 ms. The message format,
		content and period meet the
		requirements of 9.1 and 10.1.3 in
		GB/T 27930-2015;
		2) After 5 s, the charger sends the
		CEM message with SPN3922 =
		01. The message format, content
		and period meet the requirements
		of 9.5 and 10.5.2 in GB/T 27930-
		2015

7.5.2 Charging parameters configuration stage

Test cases of the charging parameters configuration stage are shown in Table 7. The test is mainly for communication logic, CTS messages, CML messages and CRO messages in this stage.

Table 7 -- Charger test cases - Charging parameters configuration stage

No. of test case	DP.2001	
Preconditions	The charger and the test system en	ter the charging parameter
Preconditions	configuration stage	
	Test procedure	Expected result
	The test system uses the	1) The charger uses the
	transmission protocol function to	transmission protocol function to
	send the BCP message in a	receive the BCP message;
	period of 500 ms. The message	2) The charger stops sending the
	format, content and period meet	CRM message with SPN2560 =
	the requirements of 9.2 and	0xAA;
	10.2.1 in GB/T 27930-2015	3) The charger sends the CML
		message in a period of 250 ms;
		and sends the CTS message in a
		period of 500 ms (optional). The
		message format, content and

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		byte
No. of test case	DN.2001	· · · · · · · · · · · · · · · · · · ·
	The charger and the test system en	ter the charging parameter
Preconditions	configuration stage	
	Test procedure	Expected result
	The test system stops sending	1) Within 5 s since the CRM
	messages	message with SPN2560 = 0xAA is
		first sent, the charger sends the
		CRM message with SPN2560 =
		0xAA in a period of 250 ms;
		2) After 5 s, the charger sends the
		CEM message with SPN3922 =
		01. The message format, content
		and period meet the requirements
		of 9.5 and 10.5.2 in GB/T 27930-
		2015
No. of test case	DN.2002	
Preconditions	The charger and the test system en	ter the charging parameter
Preconditions	configuration stage	
	Test procedure	Expected result
	The test system does not use	1) Within 5 s since the CRM
	transmission protocol function to	message with SPN2560 = 0xAA is
	send the BCP message	first sent, the charger sends the
		CRM message with SPN2560 =
		0xAA in a period of 250 ms;
		2) After 5 s, the charger sends the
		CEM message with SPN3922 =
		01. The message format, content
		and period meet the requirements
		of 9.5 and 10.5.2 in GB/T 27930-
		2015
No. of test case	DN.2003	
Preconditions	The test system receives the CML r	nessage and the CTS message
Freconditions	(optional)	
	Test procedure	Expected result
	The test system stops sending	1) Within 5 s since the CRM
	messages	message and the CTS message
		(optional) are first sent, the charger
		sends the CML message in a
		period of 250 ms and sends the
		CTS message in a period of 500
		ms (optional);
		2) After 5 s, the charger sends the

Table 8 -- Charger test cases - Charging stage

No. of test case	DP.3001	Charging stage
Preconditions	The test system receives the CRO	mossago with SDN2920 - 0v4 4
Preconditions	•	
	Test procedure	Expected result
	The test system uses the	1) The charger uses the
	transmission protocol function to	transmission protocol function to
	send the BCS message in a	receive the BCS message;
	period of 250 ms and the BCL	2) The charger stops sending the
	message in a period of 50 ms.	CRO message with SPN2830 =
	The message format, content and	0xAA;
	period meet the requirements of	3) The charger sends the CCS
	9.3 and 10.3.1 and 10.3.2 in GB/T	message in a period of 50 ms. The
	27930-2015	message format, content and
		period meet the requirements of
		9.3 and 10.3.3 in GB/T 27930-
		2015. The message length is 7
		bytes
No. of test case	DP.3002	
Preconditions	1) The charger and the test system	are at the charging stage;
1 1000Haldons	2) The charger and the test system	are normally charged
	Test procedure	Expected result
	The test system sends the BMV	The charger uses the transmission
	message, the BMT message, the	protocol function to receive the
	BSP message in a period of 10 s.	BMV message, the BMT message,
	The message format, content and	the BSP message or to drop the
	period meet the requirements of	connection
	9.3 and 10.3.5, 10.3.6 and 10.3.7	
	in GB/T 27930-2015	
No. of test case	DP.3003	
	1) The charger and the test system	are at the charging stage;
Preconditions	2) The test system appears anomal	y when simulating the traction
	battery and sends the correspor	nding message
	Test procedure	Expected result
	The test system sends the BSM	The charger stops sending the
	message according to the reason	CCS message and stops the
	of the anomaly. The message	power output at the same time;
	format, content and period meet	and sends the CST messages in a
	the requirements of 9.3 and	period of 10 ms. The message
	10.3.4 in GB/T 27930-2015. The	format, content and period meet
	possible conditions and message	the requirements of 9.3 and 10.3.9
	definitions include:	in GB/T 27930-2015. The message
	a) Cell voltage anomaly:	length is 4 bytes
	SPN3090 = 01 or SPN3090 = 10;	

	content and period meet the requirements of 9.3 and 10.3.4 in GB/T 27930-2015. SPN3090 ~ SPN3095 are all set to 00 (normal battery state) and SPN3096 is set to 00 (charging is forbidden)	and charger communicate normally according to the charging process; 2) Within 10-min waiting time, if SPN3090 ~ SPN3095 of the messages received by the test system are all 00 (normal battery state) and SPN3096 is 01 (charging is allowed), the charger will resume charging and the surge current shall meet the requirements of 9.7 in GB/T 18487.1 -2015; 3) When the waiting time exceeds 10 min, the charger stops charging and sends the CST message in a period of 10 ms. The message format, content and period meet the requirements of 9.3 and 10.3.9 in GB/T 27930-2015. The message length is 4 bytes. At the same time
		stop the power output
No. of test case	DP.3006	
	1) The charger and the test evetors	
Dreconditions	1) The charger and the test system	are at the charging stage;
Preconditions	The charger and the test system The test system voluntarily suspense.	• • •
Preconditions	, ,	• • •

Preconditions	The charger and the test system are at the normal charging state					
	Test procedure Expected result					
	The test system sends the BCL	1) Within 5 s since the last				
	message in a period of 50 ms.	reception of the BCS message, the				
	The message format, content and	charger sends the CCS message.				
	period meet the requirements of	The message format, content and				
	9.3 and 10.3.1 in GB/T 27930-	period meet the requirements of				
	2015. And send the BCS	9.3 and 10.3.3 in GB/T 27930-				
	message without using the	2015;				
	transmission protocol function	2) After 5 s, the charger sends the				
	·	CEM message with SPN3924 =				
		01. The message format, content				
		and period meet the requirements				
		of 9.5 and 10.5.2 in GB/T 27930-				
		2015				
No. of test case	DN.3008					
Preconditions	The charger and the test system are at the normal charging state					
	Test procedure Expected re					
	The test system uses the	1) The charger uses the				
	transmission protocol function to	transmission protocol function to				
	send the BCS message in a	receive the BCS message;				
	period of 250 ms. The message	2) Within 1 s since the last				
	format, content and period meet	reception of the BCL message, the				
	the requirements of 9.3 and	charger sends the CCS message.				
	10.3.2 in GB/T 27930-2015. Sent	The message format, content and				
	the message that does not match	period meet the requirements of				
	the BCL message type definition	9.3 and 10.3.3 in GB/T 27930-				
		2015;				
		3) After 1 s, the charger sends the				
		CEM message with SPN3924 =				
		01. The message format, content				
		and period meet the requirements				
		of 9.5 and 10.5.2 in GB/T 27930-				
No of test	DN 2000	2015				
No. of test case	DN.3009 The charging voluntarily suspends of	pharaina, and conda the CST				
Preconditions	The charging voluntarily suspends charging, and sends the CST					
	message in a period of 10 ms					
	Test procedure The test system stops sending	Expected result 1) Within 5 s since the CST				
	The test system stops sending	message is first sent, the charger				
	messages	sends the CST message in a				
		period of 10 ms. The message				
		format, content and period meet				
		iormat, content and pendu meet				

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		CCD manage Turn off the			
	CSD message. Turn off the				
		auxiliary power, and the charging			
No. of test case	DP.4002 ends				
No. or test case		e to failure (failure type with			
Preconditions	The charger suspends charging due to failure (failure type with				
	treatment method b, c), and the current charging process has ended Test procedure Expected result				
		The charger fails to respond to			
	Restart charging using cards, App, etc.	the charging, and it needs to re-			
	Αρρ, εισ.	plug the charging connection			
		, , ,			
No. of test case	DN 4004	device to continue charging			
No. or test case	DN.4001	do abouting and assist the DCT			
Preconditions	The test system voluntarily suspends charging, and sends the BST				
	message and receives the CST message				
	Test procedure	Expected result			
	The test system stops sending	1) Within 10 s since the CST			
	messages	message is first sent, the charger			
		sends the CST message in a			
		period of 10 ms. The message			
		format, content and period meet			
		the requirements of 9.3 and 10.3.9			
		in GB/T 27930-2015.			
		2) After 10s, the charger sends the			
		CEM message with SPN3927 =			
		01. The message format, content			
		and period meet the requirements			
		of 9.5 and 10.5.2 in GB/T 27930-			
		2015			
No. of test case	DN.4002				
Preconditions	The test system voluntarily suspends charging, and sends the BST				
1 recorditions	message and receives the CST message				
	Test procedure	Expected result			
	The test system sends the	1) Within 5 s since the CST			
	message that do not match the	message is first sent, the charger			
	BSD message type definition in a	sends the CST message in a			
	period of 250 ms	period of 10 ms. The message			
		format, content and period meet			
		the requirements of 9.3 and 10.3.9			
		in GB/T 27930-2015.			
		2) After 10s, the charger sends the			
		CEM message with SPN3927 =			
		01. The message format, content			
		and period meet the requirements			

Annex A

(normative) Static documents of protocol conformance testing

A.1 General

Static documents of conformance testing for communication protocols between charger and BMS are provided, in the form of a template, to the IUT provider, whom fill in the blank fields of the template according to the specific conditions of the IUT and then submit to the test laboratory.

Static documents include PICS and PIXIT.

A.2 Protocol implementation conformance statements PICS

Protocol implementation conformance statements PICS document is shown in Table A.1.

Table A.1 -- PICS template document

Protocol implementation conformance statements PICS						
Manufacturer's name						
Manufacturer's address						
Draduct name		Specifications				
Product name		model				
Software version number		Software check				
Software version number		code				
Applicable technical	GB/T 27930-2015 Communication protocols between off-board					
standard	conductive charger and battery management system for electric					
Standard	vehicle					
Specifically meet the following requirements in the standard						
Mandatory & Optional						
Message name	SPN	Description	Support or not			
CHM	2600	Charger communication protoco	ol □ Support □ Not support			
OT IIVI		version number				
BHM	2601	Maximum allowable charging	□ Support □ Not support			
DI IIVI		total voltage	- Oupport - Not support			
	2560	Identification result	□ Support □ Not support			
CRM	2561	Charger number	□ Support □ Not support			
Ortivi	2562*	Code of region where	□ Support □ Not support			
		charger/charging station is	- Support - Not support			
BRM	2565	BMS communication protocol	□ Support □ Not support			
DIXW		version number	- Support - Not support			

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