

Reasoned document of 2x130 KVA SIV

Spec. clause no.	Specification statement	Comments/ suggestions from Firms		RDSO Comments
		M/s.HIND	M/s.MEDHA	
1.0	<p>Introduction: During 38th MSG meeting it was decided to develop 2x130 kVA Variable Voltage Variable Frequency (VVVF) Static Converter (SIV) with redundancy feature. This Static Converter shall be termed as SIV as defined in Clause 2.1 of this specification. This SIV shall be accommodated in the dimensional envelop of 1520 mm X 800 mm X 1700 mm. Control connections should be taken from side of the converter. In addition to this the size of the Choke shall not be more than 600 mm X 800 mm X 1700 mm. The choke may be provided separately. The cabinets shall be of stainless steel of grade SS-304</p>	<p>Mounting Dimensions to be specified.</p>	<p>This SIV shall be accommodated in the dimensional envelop of 1520 mm X 800 mm X 1700 mm. Control connections should be taken from side of the converter. In addition to this the size of the Choke shall not be more than 600mm X 800 mm X 1700 mm. The choke may be provided separately. However it shall be preferred to accommodate SIV along with choke in single cubicle of 1740mm (W) X 720 mm (D) X 1650 mm (H)(without louvers, handles, and eye bolt). Firm's remark With this dimension, 2x130kva retrofitment can be done for 180kva SIV fitted in WAP4/WAG5/WAG7 Locomotives without any modifications.</p>	<p>Hind's query :Mounting dimensions are specified taking the reference of Siemens make 2x130 KVA SIV prototype. Medha's query:The following comments have been added in clause 1.0 :- "The manufacturer may also design SIV in the envelope same as that of existing 180 kVA SIV including Choke Cubicle. The additional cable requirement shall be borne by supplier."</p>
1.1	The rating of 5400 KVA transformer is appended in		The rating of 5400 KVA transformer accepted. However firm requested	Input supply of two windings of

	specification.	OK	<p>the amendment in the specification as below: Note: Two windings of 415V each are available in auxiliary winding which may be used independently for each 130 KVA SIV or by connecting in parallel also, if so required.</p> <p>Firm's remark 2 x 130 KVA is replacement of 180 KVA SIV by using existing transformer. So transformer specification is taken ELRS/SPEC/SI / 0018 from Annexure-B of 180 KVA Spec.</p>	415V has also been included.
1.5	<p>Documentation: The Manufacturer shall submit the following information after completion of their design in printed form and neatly compiled in a booklet form:-</p> <p>f) Mechanical interface diagram: The converters are to be fitted in existing foot print. SIV should not infringe with the adjacent equipment of locomotive and have adequate clearance. Mechanical drawings of complete</p>	“The converters are to be fitted in existing foot print.” is to be removed	<p>Mechanical interface diagram: The converters are to be fitted in existing foot print of 180kVA SIV.</p> <p>Firm's remark For more clarity.</p>	Included in para 1.0

	cubicles as well as Major sub-assemblies/Rack with details of dimensions, mounting arrangement, details of mounting accessories, drawings.			
1.7	<p>Field Trial: After successful type testing of prototype, the SIV unit(s) will be put to Field trial for minimum six months period in actual service condition in a locomotive. However, the number of units to be put for the field for trials may vary which is under discretion of RDSO. Prototype approval will be provided after such successful field trials.</p>	Minimum Field trial period to be reduced to Three months from Six Months.	No comment	The field trial shall be carried out for which quantity and period shall be as per extant ISO guide line. The performance format is also included in draft specification. Annexure-D.
2.2	<p>GENERAL DESCRIPTION: SIV shall be IGBT based on out-put side</p> <p>The manufacturer shall design the scheme such that automatic changeover takes place within 20 seconds.....</p> <p>fan shall be provided for both the SIV unit</p>	Along with changeover time, The initialization time for SIV shall be specified as “The initialization time for SIV shall be within 20sec.”	No comment	Para modified as :- “The manufacturer shall design the scheme such that automatic changeover takes place within 20 seconds including

				initialization time of SIV.”
2.3.1.1	<p>Input Voltage: Input voltage available for 2 X 130 kVA SIV shall be 830 V at 22.5 KV supply of OHE voltage. Input voltage to SIV may vary according to OHE voltage.</p>	OK	<p>Thyristors or IGBTs may be employed at A.C.Input. Input voltage available for 2 X 130 kVA SIV shall be 830V (for series winding) or 415V (for parallel or independent winding) at 22.5kV supply of OHE voltage.</p>	Included.
2.3.1.4	<p>Input power arrangement: (i) R-C circuit is placed across the auxiliary winding of transformer 5400 KVA. A combination of four capacitors of 0.47 µf/2 KV(Two in parallel) are placed across auxiliary winding of Transformer with center point earth. Alternatively in some of the transformers two nos. of 1 µf/ 2 KV in series may be placed across auxiliary winding with center point earth. (ii) Panto bouncing duration up to 45 ms (loss of contact with OHE) shall not affect SIV performance.</p>	OK	<p>R-C Circuit is placed across the auxiliary winding of four capacitors of 0.47uf/2 KV (Two in parallel) are placed across auxiliary winding of Transformer with center point earth. Alternatively in some of the transformers two nos. of 1uf/2 KV in series may be placed across auxiliary winding with center point earth. It can be left unused if not required. SIV manufacture should specify whether it will require for his SIV or not. Firm’s remark Requirement of R-C filter is dependent on SIV design.</p>	Centre point earth capacitor design cannot be withdrawn or kept at isolate as it is designed to overcome the surge voltage if any generated from transformer.
2.3.2 e	DC output of battery charger: The output of fully charged Battery shall be	OK	DC output of battery charger: The output of fully charged Battery shall be 110V± 5%, 20A with current	As per spec. SMPS type battery charger

	110V± 5%, 20A with current ripple less than 5%. The battery charger characteristics shall be suitable for charging 75 Ah batteries for Electric Loco as well as power supply electrical loads operating at 110 V. The charging cycle shall be such that after charging of battery, the charger shall go to trickle mode. The battery charger shall have over current protection to limit battery charging current between 8A -10 Amps. There should be a provision of isolation of Battery using HBA switch.		ripple less than 5%. The battery charger characteristics shall be suitable for charging 75 Ah batteries for Electric Loco as well as power supply electrical loads operating at 110V. The charging cycle shall be such that after charging of battery, the charger shall go to trickle mode. The battery charger shall have over current protection to limit battery charging current between 8A - 10Amps. There should be a suitable protection at input of the battery charger to isolate the battery charger automatically in case of battery charger failure. HBA switch is placed at locomotive to isolate battery from the battery charger. Firm's remark It is better to have battery charger protection at input side also. Battery HBA Switch is mounted at Locomotive. It is not in scope of SIV.	are being used and protection of input side of the charger may be taken care by manufacturer itself.
2.3.2 f	Efficiency at rated output: Minimum 92% at rated load (130 kVA) at 0.8 ± 0.02 pf (lag) at 830 volts.	OK	Efficiency at rated output: Minimum 92% at rated load (130 kVA) at 0.8 ± 0.02 pf (lag) at input voltage of (2 x 415) volts Firm's remark For more clarity of input voltage	Included.
2.3.3	Load distribution on SIV Distribution of load in SIV.	Shift one no. Compressor motor to SIV-1 and one no. of	No comment	Distribution of load in both SIV as per spec. is correct. Redistri

		Traction motor blower (MVMT) to SIV-2 for better balancing of Load on SIV-1 & SIV-2 during MVMT & MVRH Load in ON Condition as well as in OFF condition.		bution of loading may create problem in synchronization as compressors & blower having timer relay.
2.3.4	Working of motor/auxiliaries connected to SIV: SIV shall be capable of achieving the rated output with auxiliary motors in group (a), (b) & (d) in table -1 above connected to it within 15 seconds.	“SIV shall be capable of achieving the rated output with auxiliary motors in group (a), (b) & (d) in table -1 above connected to it within 15 seconds and Battery charger output voltage within 25 sec”	No comment	Loco is having MPCS .It’s tripping time is 30 seconds (as per TC no. RDSO/2010/EL/TC/0106, Rev. ‘0’ dtd. 11.10.2010)
2.5 ii	Input /output earth fault: Both the converter shall have provision to work with output earth fault. Converter should be suitably protected for earth fault at the input side.	O.K.	Input /output earth fault Both the converter shall have provision to work with output earth fault. Converter should be suitably protected for earth fault at the input side. Firm’s remarks: If any body have done earth bypass	Earth fault bypass mode cycle is kept for 45 minutes circulated vide RDSO letter no. EL/1.2.9.1 dtd. 23.07.2009.

			and forgot then earth fault will automatically enable after 30 min.	The para is modified accordingly.
2.5 iii	New clause suggested by Medha	---	<p>SIV should have below interface with locomotive MPCS and driver desk-</p> <ol style="list-style-type: none"> 1. SIV enable command hard wired signal from driver desk to SIV-1 & SIV-2. 2. Hard wired signal from SIV-1 to driver desk for SIV-1 ON indication. 3. Hard wired signal from SIV-2 to driver desk for SIV-2 ON indication. 4. Hard wired signal from Battery Charger to driver desk for Battery Charger ON indication. 5. Hard wired signal from SIV1 & SIV2 to MCS for both SIV failed signal. If one SIV failed then SIV change-over should take place automatically and fail signal should not go to MCS. If both SIV is failed then SIV fail signal should go to MCS. <p>Firm's remarks: By adding the interface related information in spec, interface related issues with MCS and Driver desk will be standardized.</p>	Not accepted.
2.7	Cable: The use of wires / cables shall be as per RDSO	Cable: The use of wires / cables shall be		Included.

	specification for cable No-ELRS/SPEC/ELC/0019 Rev'4' of Feb 2018.	as per RDSO specification and/or as per CLWspecification, CLW/ES/3/0458 for single core cable and CLW/ES/3/0459 for Multi core cable.		
4.1.18	Tests for withstanding Vibration and shock. IEC 61373 Clause 4.5.3.18	OK	Tests for withstanding Vibration and shock IEC 61287 clause 4.5.3.18. Firm's remarks: Text correction.	IEC 61373 is O.K as specified in the spec.
4.2	Field trials shall be carried out by the manufacturer on priority. The number of SIV units for field trial may vary as decided by RDSO. Prototype approval shall be given after successful field trials.	Minimum Field trial period to be reduced to Three months from Six Months.	No comments	The Field Trail is mentioned in specification clause no 1.7. However, the field trial shall be carried out for which quantity and period shall be as per extant ISO guide line. The performance format is included in

draft specification. Para is modified accordingly.

Not accepted.

4.14

Leakage current test: -
The followings are the voltage and corresponding leakage current limits:

OK

Leakage current test : -
The followings are the voltage and corresponding leakage current limits:

Location	Voltage (rms)	Duration (sec)	Leakage current should be less than (mA)
Input Circuit	3.3 KV	60	50
110 V control side	1.5 KV	60	10
24 V electronics side	500 V	60	10

Circuit	Voltage (V _{RMS}) *	Duration (sec.)	Leakage current (should be less than)(mA)
Input circuit (if 830 V used)	3.3 KV	60	50
Input circuit (if 415 V used)	2.5 KV	60	50
415 VAC output circuit	2.5 kv	60	20
Battery Charger 415 V	2.5 KV	60	10

	Battery Charger (415V side)	2 KV	60	10		side					
						110 V _{dc} Power circuit	1.5 KV	60	10		
						110 V _{dc} Control circuit	1 KV	60	10		
						<24 V circuit	500 V	60	10		
						Note (*): If test to be repeated then test voltage to be taken 80% of specified value.					
4.18	Cooling arrangement of electronics shall be made in such a way that temperature of electronics is maintained 20° C lower than the maximum temperature allowed for the electronic card.				OK	Cooling arrangement of electronics shall be made in such a way that temperature of electronics is maintained 10° C lower than the maximum temperature allowed for the electronic card.					Not accepted.

M/s. SIEMENS vide letter no. MO/RS/LM/2X130KVA/16 dated 17.07.2020 has requested that the commissioning of the prototype has started at Bhusawal shed and before going through some rigorous trials, it will be too early to comment on the draft specification. Further firm has requested to let the product do service for next few years and add/delete the clauses/requirements based on the feedback from the field can be done. It is also to inform that a change in the specification at this nascent level, without any field

performance report/feedback will attract huge financial implication which will demoralize the firm to continue the business of this product.

RDSO Comment on Siemens' remarks: No major changes are done in final draft of specification and will not alter the status of vendors who have got clearance for their prototypes for field trials.

Electrical Directorate

No. EL/1.2.9.1

Date: 16.11.2020

Sub: Specification & STRs being uploaded on RDSO website for comment/suggestion.

Ref: Vigilance Cell-RDSO note no CVO/RDSO/Confdl/2020/dated 21.08.2020.

Compliance of Vigilance Dte. Note No. CVO/RDSO/Confdl/2020 dated 23.06.2020. With respect to revision of specification & STR.

S.N. of vigilance letter dtd. 23.06.20	Para of Vigilance Dte. Note no. CVO/RDSO /Confdl / 2020 dated 23.06.2020. With respect to revision of specification & STR.	Draft Specification no. RDSO/2018 /EL / Spec/ 0140 Rev '1' for Single phase to three phase 2 x 130 KVA Static Converter (SIV) for conventional locomotive.
1. (a)	Some of draft/ provisional specifications are in use even after a lapse of many years. Such specifications to be identified by each dte. head and finalized specification be issued as per ISO procedures on priority.	The Rev '0' specification was finalized & issued in July 2018 following the ISO procedure. Now, as per instruction the draft specification are being issued again.
b)	Some of the specifications uploaded on RDSO website are not fully legible /readable. Legible/readable copy to be uploaded on priority.	Being ensured.
(c)	All drawings/ Specifications of sub-systems /sub-assemblies not uploaded with some of the specifications. It compels vendor to obtain these from RDSO separately which is against the spirit of ease of doing business	Sub-systems /sub-assemblies not uploaded. It is not possible as designs are different and depends on vendor to vendor. Envelop size are stipulated in the draft specification in clause no 1.0 . Again it has been included in draft specification.

(d)	Outdated/withdrawn BIS/ international standards find mention in many of the specifications.	All standards used are latest and relevant standards are latest. It is ensured
(e)	In many of the specifications, test procedures along with pass/fail criteria not described leaving ample scope for arbitrariness on the part of inspector involved in the testing of the sample of the item during the vendor registration process or during purchase inspection. All specifications must contain test procedures along with pass/fail criteria. No new/revised specification should be released for implementation without test plans/formats.	Being ensured
4.	In spite of chasing at highest level, sincere efforts to review the specification & STR do not appear to have been made. It is very important that specification & STRs of items having less than 3 vendors should be truthfully reviewed & all clauses coming in way of widening vendor base to be critically reviewed within the ambit of ISO laid down procedure. Prime responsibility of review of the specification/STR lie with concerned design/ custodian dte.	Being ensured. Single phase to three phase 2x130 KVA Static Converter (SIV) for conventional locomotive have 04 (Four) development vendors with limited quantity restriction on initial supply.
5.	Implementation / compliance of vigilance cell letter number 18/Vig/Policy dated 04.06.2018 in regard to procedure to be followed for updating status of vendor in the event of revision of specifications/STR is not being ensured in some of the dtes. There is no monitoring of cut-in of revised specification/STR by existing approved vendors. It is a serious matter to be looked. Into personally by respective dte heads	As it is new specification, hence no change in vendor status. After revision of specifications if required the existing vendor status will be reviewed as per the vigilance letter.

6.	In the developmental vendor approval letter, there is no mention of the vendors approved drawing accepted deviation and approved sub vendors for outsourced activities /raw material. It makes comparison of supplied item with approved prototype difficult.	This will be ensured during issuing of prototype clearance letter.
7.	Prototype equipment tested and approved by RDSO is also not preserved in most of the cases giving a room to vendor supplying modified item subsequently.	The cost of one unit of Single phase to three phase 2 x 130 KVA Static Converter (SIV) is nearer to 26 lac + 18 % GST. It requires a store, crane for handling, maintenance staff, security and other logistics. This matter has not been included in draft specification and may be decided by Competent Authority as it has cost implications.
8.	There is no monitoring of up gradation of developmental vendors to regular vendor or delisting of vendor for the committed lapses. Many old developmental vendors are appearing in the vendor directory it needs critical review	Not applicable for draft specification . However , monitoring of RDSO controlled vendors is done through software “ Failure Reporting & Vendor Performance monitoring System” available on RDSO Railnet Website.
10.	As per existing provision in ISO procedure, no opportunity is required to be given to the vendor in case of non-conformities observed during prototype inspection against 1 st time registration. Case is required to be closed straight away in case of observation of nonconformities. Some of the dtes. are however, conveying the noted non-conformities to the vendor and taking final call to reject or approve vendor based on this action/compliance on non-conformities.	Noted. However, decision as taken by directorate head shall be followed.
11.	BOM (Bill of Materials) approved vendors list not put in	Bill of material is the proprietary of firm.

	the public domain. It needs to be done through appropriate mechanism.	It is opined that before put the BOM in public domain the consent of firm should be taken . Hence, this issue may be decided by Competent Authority.
12.	In some of the specifications, requirement of field trials of prototype equipment has been specified without standardization of field performance feedback format. Issue of format for obtaining field performance to be ensured by design dte. Failure data downloaded from equipment/system (if available) should be invariably made use of.	The Field Trail is mentioned in specification clause no 1.7. However, the field trial shall be carried out for which quantity and period shall be as per extant ISO guide line. The performance format is included in draft specification
13	There is a need to generate sample plan for items for which RDSO undertake purchase inspection through PIMS.	Not applicable
14	Correspondence during the registration process should only be at the addresses given in the registration application & important correspondence to be posted on web portal. Prime responsibility for this lies with nominated supervisor & officer signing the letter.	Being Ensured
15	In ordinate delay is noticed in implementation /complying suggested system improvements issued by Vigilance dte with the approval' of the competent authority.	Noted for compliance
16	In spite of clear cut instruction of DG/RDSO new item are getting added to the vendor directory without seeking the approval of DG.	Vide Note No 3, 4, 5 of efile No RDSO-EL/0/PN(HRP)/7/2020-O/o PED/SE/RDSO, permission is taken.
17	Some of the directorates are still seeking the approval of Railway Board on specification before issue which need to be done away with.	Not Applicable for this draft Spec./STR.