

Reasoned Document for Draft Specification of Oil Free Compressor having Capacity 1750 lpm RDSOP/2008/EL/SPEC/0076, Rev. '2'-3. The comments are received from M/s FTRTIL & SCR.

| CL no. | Description in Specification | Comments from Manufacturers & Railways | | RDSO Comments |
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| | | Firms | Comments | |
| | FOREWORD | | | |
| 0.1 | This is a general technical specification for motor driven oil free compressor of 1750 LPM (FAD) capacity for three phase & WAP-4 class of electric locomotive application fitted with 180 KVA SIV. There is additional load on the locomotive air supply circuit (FP circuit) with introduction of LHB rakes, hence it felt necessary to enhance the air capacity of WAP-4 locomotives hauling/Duranto Trains. | M/s ELGI | No Comments received | No change |
| | | M/s KBIL | No Comments received | |
| | | M/s FTRTIL | No comments | |
| | | RLY/LGD | No comments | |
| 0.2 | The compressor shall be mounted in the under frame of the existing three phase electric locomotives WAP-5, WAP-7, WAG-9 & as under slung/on-board in WAP-4 class of electric locomotives fitted with 180 KVA SIV. The mounting arrangement in 3-phase locomotives shall be as per CLW drawing no.1209.02.127.084.The overall dimensions for mounting of high capacity oil free compressor are different for three phase locomotives & WAP-4 locomotive due to space constraints in WAP-4 locomotives for fitment of high capacity oil free compressor. The overall dimensions for mounting of high capacity oil free compressor in three phase locomotive & WAP-4 locomotive have been specified separately in | M/s ELGI | No Comments received | <i>The CLW drawing call for 3 point mounting for 3-phase electric locomotives . 4-point mounting is for WAP-4 locomotive. The compressor dimensions shall be able to be accommodated in the envelop size as specified in clause no. 7.2. The same dimensions cannot be accommodated in WAP-4 locos due to space constraints. Interchangeable may be possible in WAP-4 to WAG-9.</i> |
| | | M/s KBIL | No Comments received | |
| | | M/s FTRTIL | No comments | |

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| | clause 7.3. The purchaser shall specify the requirement of high capacity oil free compressor for three phase electric locomotives or WAP-4 class of electric locomotives clearly in the Tender documents. | RLY/SCR | Paragraph wording to be modified as : The overall dimensions for mounting of high capacity oil free compressors are to be standardized for both conventional and three phase locomotive applications in order to reduce inventory. There should be a provision for interchanging of compressor and motor unit complete between the 3 phase and Conventional electric locomotives. Also the spare parts of sub equipment should be interchangeable between WAP-4 and WAP-7. | <i>Firm requested to submit comments on SCR.</i> |
| 0.3 | The inlet air for the compressor shall be unfiltered atmospheric air at ambient temperature and pressure. | M/s ELGI | No Comments received | No Comments received |
| | | M/s KBIL | No Comments received | |
| | | M/s FTRTIL | No comments | |
| | | RLY/SCR | Paragraph wording to be modified as : The inlet air for both the under- slung and on-Board compressor shall be fitted atmospheric air at ambient temperature and pressure to avoid damages of linear and cylinder heads due to entry of fine dust in to the oil free compressor. For this purpose, existing filter is not suitable and provision of suitable filter is required. | Presently the firms are using two stage filters. And no reports have been received from Railways regarding filters. <i>Firm/Rlys requested to submit comments on RLY /SCR.</i> |
| 0.4 | The suppliers are required to familiarize themselves with the layout of the equipment of the locomotives, including the pneumatic circuit and pipe layout before | M/s ELGI | No Comments received | No Comments received |
| | | M/s KBIL | No Comments received | |

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| | quoting for their products. Adequate clearance from adjacent equipment of locomotive shall be maintained. | RLY/LGD | No comments | |
| | | M/s FTRTIL | No comments | |
| 0.5 | This specification covers clauses which call for agreements between the Indian Railway and the supplier and supply of certain technical information by the Manufacturer / Supplier at the time of submitting tenders for the equipment. | M/s ELGI | No comments received | No Comments received |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |
| | | RLY/LG | No comments | |
| 0.6 | Any deviations from this specification, with a view to improving the performance may be given due consideration, provided, full particulars with justification, thereof are furnished. It may however be noted that due to limited availability of space in locomotive and the necessary to ensure inter changeability with existing equipment increase in the overall size and mounting dimensions shall not be allowed normally. | M/s ELGI | No Comments received | No Comments received |
| | | M/s KBIL | No Comments received | |
| | | M/s FTRTIL | No comments | |
| | | RLY/LGD | No comments | |
| 1.0 | Scope | | | |
| | This specification covers motor driven oil free 1750 LPM under slung air compressors for use on three phase & WAP-4 class of electric locomotives fitted with 180 KVA SIV as on-board/under-slung mounting. This is a general technical specification does not cover all the necessary provision of a contract. | M/s ELGI | No comments received | No Comments received |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |
| | | RLY/LGD | No comments | |
| 2.0 | TERMINOLOGY | | | |
| 2.1 | For the purpose of this standard, the following definitions in addition to these given in Indian Standard "Glossary of Terms Relating to Compressors and Exhausters" IS 5727:1981, Reaffirmed 2001 shall apply. | M/s ELGI | No comments received | No Comments received |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |
| | | RLY/LGD | No comments | |
| 2.2 | Manufacturer: The party manufacturing the machine. | M/s ELGI | No comments received | No Comments received |

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| | The manufacturer may or may not be the Supplier. | | | M/s KBIL | No comments received | |
| | | | | M/s FTRTIL | No comments | |
| | | | | RLY/LGD | No comments | |
| 2.3 | Engineers: The term 'Engineers' shall apply to the Director General, Research Designs and Standards Organization, Ministry of Railways, Lucknow – 226011, Dy. Chief Electrical Engineer (D),CLW / Chittaranjan and person to persons authorized by them. | | | M/s ELGI | No comments received | No Comments received |
| | | | | M/s KBIL | No comments received | |
| | | | | M/s FTRTIL | No comments | |
| | | | | RLY/LGD | No comments | |
| 2.4 | Sub-Contractors: Sub-Contractor means person to persons from whom the manufacturer buys parts / assembles for fitment to the equipment to be supplied. | | | M/s ELGI | No comments received | No Comments received |
| | | | | M/s KBI | No comments receive | |
| | | | | M/s FTRTIL | No comments | |
| | | | | RLY/LGD | No comments | |
| 2.5 | Supplier: The party supplying the machine. | | | M/s ELGI | No comments received | |
| | | | | M/s KBIL | No comments received | |
| | | | | M/s FTRTIL | No comments | |
| | | | | RLY/LGD | No comments | |
| 3.0 | Sl.No. | Specification no | Description | M/s ELGI | No comments received | No comments received |
| | 1. | IS 5456 : 1985 Reaffirmed 2001 2006 | Code of practice for testing of positive displacement type air compressors and exhausters. | M/s KBIL | No comments received | |
| | | | | M/s FTRTIL | No comments | |
| | | | | RLY/LGD | No comments | |
| | 2. | IS 10431 : 1994 Reaffirmed 1999 2008 | Measurement of air flow of compressors and exhausters by nozzles | | | |
| | 3. | IS 5727:1970 Reaffirmed 2001 Superseding IS | Glossary of terms relating to compressors and exhausters. | | | |
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| | | 5727:1981(Reaffirmed 2019) | Compressors, Pneumatic Tools and Machines- Vocabulary | | | |
| | 4. | BS 1571 (Part II) :1975 (1984) Superseded with ISO 1217:1996 | Methods for simplified acceptance testing for air compressors and exhausters Displacement compressors- Acceptance tests | | | |
| | 5. | SPEC.NO.SPEC/E-10/3/09(Motor) August 1997 With Amendment 1,2,3 & 4 or latest | Technical specification and test schedule for single phase / three phase Induction motors for driving blowers, compressors and pumps for three phase drive electric locomotives. | | | |
| 3.1 | Other relevant IEC, IS and BS specifications quoted in the appropriate clause of the specification will also apply except where modified/ amended by the provisions of this specification. | | | M/s ELGI | No comments received | No Comments received |
| | | | | M/s KBIL | No comments received | |
| | | | | M/s FTRTIL | No comments | |
| | | | | RLY/LGD | No comments | |
| 3.2 | Latest version/revision of the standards and specifications etc shall be followed, unless specifically mentioned otherwise. | | | M/s ELGI | No comments received | No Comments received |
| | | | | M/s KBIL | No comments received | |
| | | | | M/s FTRTIL | No comments | |
| | | | | RLY/LGD | No comments | |

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| 4.0 | DESIGN FEATURES AND SERVICE CONDITIONS | | | |
| 4.1 | The equipment offered shall preferably be of – <ul style="list-style-type: none"> - Simple in design - Good workmanship - Easy for maintenance and operation - Robust and rugged in construction, suitable for traction duty application. | M/s ELGI | No comments received | No Comments received |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |
| | | RLY/LGD | No comments | |
| 4.2 | Inter cooling and after cooling arrangement of air shall be provided with the compressor so as to limit the final delivery temperature of air shall not be more than 20°C above ambient when working at a pressure of 10.5 kg/cm ² . | M/s ELGI | No comments received | No Comments received |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |
| | | RLY/LGD | No comments | |
| 4.3 | The FAD of the compressor should not be less than 1750 LPM at 1000 meters altitude above sea level at 20°C with relative humidity of 95% at 10.5 kg/cm ² . | M/s ELGI | No comments received | This is the part of motor specification. So, this comments has been shared to motor group. |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |
| | | RLY/LGD | To be included newly: 4.4 Failures of oil free compressor motors on account of winding defects were experienced. To avoid above failures the motor inductance and resistance variation between phase winding should not be more than 10%. To adhere to above criteria necessary changes may be done in the RDSO specification No. E-10/3/09 motor Part-2 (Technical specification and test schedule for single phase /Three phase induction motors for driving blowers , | |

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| | | | compressors and pumps for three phase drive electric locomotives). 4.5 To be included newly: The amount of shocks and vibrations to which the equipment shall be exposed is to be mentioned clearly in view of mail/express trains being operated at more than 160 kmph speeds. | 4.5 In IEC 61373 all parameters are covered |
| 5.0 | NORMAL DUTY: | | | |
| 5.1 | The compressor motor set shall be suitable for continuous operation at pressure of 10.5 kg/cm ² without causing higher temperature, damage and unusual wear to the components. | M/s KBIL | No comments received | Comments of M/s FTRTIL is not relevant. |
| | | M/s FTRTIL | The compressor motor set shall be suitable for continuous operation at pressure of 10.5 kg/cm ² without causing higher temperature, damage and unusual wear to the components. However, the Compressor shall be operated to a maximum of three (3) times in a day under forced mode operation. | |
| | | M/s ELGI | No comments received | |
| | | RLY/LGD | No comments | |
| 5.2 | The compressor will work continuously but after building up a pressure of 10.5 kg/cm ² in the main reservoir. Compressor motor supply cut off by the pressure governor setting and restarts at 8.0 Kg/cm ² . | M/s KBIL | No comments received | Comments of M/s FTRTIL is not relevant. |
| | | M/s FTRTIL | The compressor will work continuously but after building up a pressure of 10.5 kg/cm ² in the main reservoir. Compressor motor supply cut off by the pressure governor setting and restarts at | |

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| | | | 8.0 Kg/cm ² . The ODD / EVEN Compressor management shall be done by VCU (Vehicle Control Unit) | |
| | | M/s ELGI | No comments received | |
| | | RLY/LGD | No comments | |
| 6.0 | Drive | | | |
| 6.1 | The compressor shall be driven by 3- phase induction motors controlled by a 3- phase contactor will be started direct on line start. | M/s ELGI | | Comments of M/s FTRTIL is not relevant. |
| | | M/s FTRTIL | The compressor shall be driven by 3- phase induction motors controlled by a 3- phase contactor will be started direct online start. The 3-phase contactor and DOL starter are provided by Car builder. | |
| | | M/s KBIL | No comments received | |
| | | RLY/LGD | No comments | |
| 6.2 | The drive to the compressor shall be either direct or through a suitable flexible coupling. | M/s ELGI | No comments received | No comments received |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |
| | | RLY/LGD | No comments | |
| 6.3 | Flexible coupling shall be of proven design. It shall be selected to suit the arduous duty encountered in normal service without the necessity of renewing any wearing part within three years of its operation. It shall be of simple design and shall require minimum attention during maintenance. It shall be possible to replace the wearing components of the coupling in situ without disturbing the machine alignment. | M/s ELGI | No comments received | No comments received |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |
| | | RLY/LGD | No comments | |
| 6.4 | The limits of angular, radial and axial misalignments, | M/s ELGI | No comments received | No comments received |

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| | which the coupling is capable of withstanding, shall be intimated to 'Engineers' and their approval be obtained. | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |
| | | RLY/LGD | No comments | |
| 6.5 | The coupling shall be designed suitable to withstand shocks due to frequent starting and stopping and variation of load on compressor motor set. Manufacturer shall advise technical details including breakaway torque of the coupling. | M/s ELGI | No comments received | No comments received |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |
| | | RLY/LGD | No comments | |
| 6.6 | The drive arrangement of the compressor shall be subject to the approval of the "Engineers". | M/s ELGI | No comments received | No comments received |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |
| | | RLY/LGD | No comments | |
| 7.0 | MOUNTING AND LIFTING ARRANGEMENTS: | | | |
| 7.1 | Three point mounting arrangement with proven design damping preferably of metallic helical coil type in 3-phase locomotives and four point mounting arrangement in WAP-4 locomotives fitted with 180 KVA SIV. The resilient mounts shall be suitable for absorbing the vibration level up to 90% of the level generated on the motor and compressor side. | M/s ELGI | No comments | This may be considered after comments. |
| | | M/s KBIL | No comments | |
| | | M/s FTRTIL | Three / Four point mounting arrangement with proven design damping and suitable vibration absorption characteristics preferably of metallic helical coil type in 3-phase locomotives and four point mounting arrangement in WAP-4 locomotives fitted with 180 KVA SIV. The resilient mounts shall be suitable for absorbing the vibration level up to 90% of the level generated on the motor and compressor side | |

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| | | RLY/LGD | Since the compressor and motor unit is common for both Conventional WAP-4 and 3-phase locomotives, suitable single mounting envelop should be provided by OEM for both under –slung and on-board mounting in WAP-4 which can be flipped 180 ⁰ depending upon the type of arrangement . | RDSO remarks has given para 0.2 |
| 7.2 | The compressor and its mounting arrangement shall be of robust design for traction duty and shall withstand satisfactorily the vibrations and shocks normally encountered in service. | M/s ELGI | No comments received | No comments received |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |
| | | RLY/LGD | The amount of shocks and vibrations faced by the compressor and motor unit during service should be specified clearly keeping in view cooperation of mail/express trains at speeds above 140kmph. Accordingly, design of compressor mountings lugs has to be re-designed specifically for passenger service locomotives. | In IEC 61373 all parameters are covered. |
| 7.3 | The overall dimensions for mounting in three phase locomotives shall be preferably fall within the limits of Length= 1460 mm Width = 740 mm Height = 825 mm The overall dimension of compressor-motor unit in WAP-4 locomotive shall be preferably fall within the limit of Length = 1400 mm Width = 640 mm Height = 600 mm | M/s ELGI | No comments received | RDSO remarks has given para 0.2 |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |
| | | RLY/LGD | There is a vast difference in the overall dimensions for mounting of compressor and motor unit in 3-pahse and conventional locomotives. Same requires to be standardized for all types | |

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| | The weight of the complete set of compressor and Motor shall be taken. | | of electric locomotives to reduce inventory on this account and also to reduce maintenance costs. | |
| 7.4 | The compressor shall be provided with suitable safety slings to prevent it from falling down in case of failure/breakage of the under-slung mounting arrangement. | M/s ELGI | No comments received | No comments received |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |
| | | RLY/LGD | No comments | |
| 7.5 | Adequate numbers of lifting hooks shall be provided to facilitate lifting of the compressor motor set. | M/s ELGI | No comments received | No comments received |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |
| | | RLY/LGD | No comments | |
| 7.6 | For On board mounting of compressor in WAP-4 loco fitted with 180 KVA SIV, mounting holes of compressor motor unit shall be in accordance with mounting holes provided in machine room of locomotive for fitment of compressor. | M/s ELGI | No comments received | No comments received |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |
| | | RLY/LGD | No comments | |
| 8.0 | COOLING : | | | |
| 8.1 | The compressor shall be air cooled. A cooling fan of adequate capacity, of simple and rugged design and light weight shall be provided. | M/s ELGI | No comments received | No comments received |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |
| | | RLY/LGD | No comments | |
| 8.2 | The fan shall be mounted on the shaft and shall be dynamically balanced, suitable protection guard also to be provided, to prevent the hitting of foreign object during run of the locomotive. | M/s ELGI | No comments received | No comments received |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |
| | | RLY/LGD | No comments | |

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| 9.0 | Intercooler Intercooler of adequate cooling capacity / shall be provided as an integral part of the compressors unit. The Intercooler shall not interface with free access to other equipment of the compressor. | M/s ELGI | No comments received | Noted |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | Intercooler of adequate cooling capacity / shall be provided as an integral part of the compressor's unit. The Intercooler shall not interface interfere with free access to other equipment of the compressor. | |
| | | RLY/LGD | No comments | No comments received |
| 10.0 | After cooler of radiator type or superior design shall be provided compressor. | M/s ELGI | No comments received | No comments received |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |
| | | RLY/LGD | No comments | |
| 11.0 | Miscellaneous | | | |
| 11.1 | For securing protective hoods, pipe brackets etc. foundation and cylinder head bolts shall not be utilized. If aluminum alloy is used, threaded connections in aluminum portion for fastening of components shall not be used. | M/s ELGI | No comments received | No comments received |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |
| | | RLY/LGD | No comments | |
| 11.2 | Wherever bearings are grease lubricated, easy accessible grease nipples to IS 4971:1968 "Recommendations for selection of industrial floor finishes" shall be provided. Suitable vent for overflow of excess grease shall also be provided. Type of indigenously available grease to be used, shall be specified. | M/s ELGI | No comments received | No comments received |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |
| | | RLY/LGD | No comments | |
| 11.3 | Direction plate with 50 mm arrow shall be fitted on the compressor and motor, separately to indicate the normal direction of rotation. | M/s ELGI | No comments received | No comments received |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |

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| | | RLY/LGD | No comments | |
| 12.0 | Name Plate The compressor shall have indelibly marked on a nameplate at least the following information. <ul style="list-style-type: none"> a. Manufacturer's name and also brand name monogram if any. b. Type and serial no. c. Capacity (FAD) in liters / minute. d. Effective pressure. e. Month & year of manufacture | M/s ELGI | No comments received | No comments received |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |
| | | RLY/LGD | No comments | |
| 13.0 | LUBRICATION CHART: Periodical lubricating instructions shall be affixed at a convenient location indicating the type, quantity and the frequency of lubrication required for the compressor's Bearings if required. | M/s ELGI | No comments received | Comments is not relevant |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | Periodical lubricating instructions shall be affixed at a convenient location indicating the type, quantity and the frequency of lubrication required for the compressor's Bearings if required. Self-Lubricated Bearings shall be used between rotating elements in Compressor to avoid any need for Lubrication during service until overhaul of Compressor. | |
| | | RLY/LGD | No comments | |
| 14.0 | Service Conditions | | | |
| 14.1 | The compressor shall be capable of working satisfactorily under the following conditions: | M/s ELGI | No comments received | No comments received |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |

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| | <ul style="list-style-type: none"> Ambient temperature - 5° to 55 °C. Maximum temperature of air at inlet port – Up to 60°C. Relative humidity – Up to 100%. Altitude – Sea level to 1776 m. The equipment shall be capable of operating satisfactorily in spite of dust, dirt, mist, rain and heavy dust storm to which rolling stock is normally exposed in service. The equipment shall also be capable of withstanding continuous contact of prolonged exposure to petroleum products without any effect on its efficiency. | RLY/LGD | No comments received | |
| 14.2 | The equipment shall withstand satisfactorily the vibration and shock normally encountered in service as per IEC 61373 Category-1 Class - A | M/s ELGI | No comments received | No comments |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |
| | | RLY/LGD | No comments | |
| 15.0 | Accessories: | | | |
| 15.1 | The compressor unit shall be fitted with the following accessories: | M/s ELGI | No comments received | |
| | | M/s KBIL | No comments received | |
| | i. Dry type air filter for suction and an indication to | M/s FTRTIL | No comments | |

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| | <p>indicate the level of carbonization/ blockage of filter element.</p> <p>ii. Intercooler Safety valve and drain cock.</p> <p>iii. After cooler, fitted with auto drain valve.</p> <p>iv. Flexible pipe for use on the delivery side, which shall be capable of withstanding the delivery of hot air temperature.</p> <p>v. Suitable resilient mount of proven design.</p> <p>vi. Suitable safety sling / safety arrangement to prevent the compressor from falling in case of failure/breakage of the mounting arrangement.</p> | RLY/LGD | <p>To be modified as :</p> <p>(iv) Flexible hose pipe for use on delivery side should be of Reinforced Rubber Hose to SAE 100 R1/R2 standard as per RDSO Lr. No. EL/3.2.15/3-phase dated 01.04.2019 and shall be capable of withstanding the delivery of hot air temperature.</p> <p>The accessories such as safety valve /drain cock /cooling fan etc should be properly covered /protected to with stand foreign material hit since CPs are under slung in three phase locomotives.</p> | <p>(iv) Agreed</p> <p>Discussed with M/s KBIL they told that cooling fan protection has been provided in oil free compressor. Such type of failures have not received till yet. <i>Firm advised to give comments on this para.</i></p> |
| 16.0 | TESTING & INSPECTION : | | | |
| 16.1 | Type Tests: | | | |
| 16.1.1 | The testing shall be conducted on the compressor unit and testing shall generally conform to IS 5456: 1969 or relevant BS specification. The motor for compressor shall be procured from RDSO approved sources only. If, however, the motor is procured from any other sources, it shall also be subjected to type tests separately and shall be witnessed by RDSO. | M/s ELGI | No comments received | No comments |
| | | M/s KBIL | No comments received | |
| | | M/s FRTLIL | No comments | |
| | | RLY/LGD | No comments | |

| 17.0 | MECHANICAL TESTS : | | M/s ELGI | No comments received | No comments received | | | | | | | | |
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| | <p>The mechanical tests are intended to ascertain the reliability of the machine and its accessories. Prior to the starting of this test, essential working parts of compressor and its accessories shall be checked for accuracy with the manufacturer's drawings. All mechanical parts shall also be checked for proper functioning when assembled and in operation. The duration of the separate stages of type tests shall be as given in the table below:</p> <table border="1"> <thead> <tr> <th>Tests</th> <th>Duration</th> </tr> </thead> <tbody> <tr> <td>Running of compressor on discharge pressure of i. 8 kg/cm²</td> <td>5 Hours</td> </tr> <tr> <td>ii. 9 kg/cm²</td> <td>7 Hours</td> </tr> <tr> <td>iii. 10.5 kg/cm²</td> <td>10 Hours</td> </tr> </tbody> </table> <p>The supply shall be from a source of 415 V, unbalanced 3- phases at 50 C/s. During these tests measure individual line voltage, phase currents, power input, frequency, speed, time to come up to full speed and ambient temperature. Measure the temperature by thermometer/ Temperature sensor / Laser gun of Inlet and Outlet air of Inter Cooler & After Cooler, bearings, LP, HP cylinder heads & the</p> | | Tests | Duration | | Running of compressor on discharge pressure of i. 8 kg/cm ² | 5 Hours | ii. 9 kg/cm ² | 7 Hours | iii. 10.5 kg/cm ² | 10 Hours | M/s KBIL | No comments received |
| | | | Tests | Duration | | | | | | | | | |
| | | | Running of compressor on discharge pressure of i. 8 kg/cm ² | 5 Hours | | | | | | | | | |
| | | | ii. 9 kg/cm ² | 7 Hours | | | | | | | | | |
| iii. 10.5 kg/cm ² | 10 Hours | | | | | | | | | | | | |
| M/s FTRTIL | No comments | | | | | | | | | | | | |
| RLY/LGD | No comments | | | | | | | | | | | | |

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| | delivery air temperature. Record the above measurements with supply voltage of 415V when the compressor is working at 10.5 kg/cm ² pressure. | | | |
| 17.1 | CAPACITY (OUTPUT) MEASUREMENTS During the above tests arrange to measure Air flow when the compressor is working against pressure of 8 kg/cm ² , 9 kg/cm ² & 10.5 kg/cm ² , after all parts have attained the maximum temperature the FAD should not be less then 1750 LPM. | M/s ELGI | No comments received | No comments received |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments received | |
| | | RLY/LGD | No comments | |
| 17.2 | STARTING TESTS (COMBINED UNIT TEST) Immediately after completion of the tests under clause 17.1 above always operating against the same pressure (10.5 kg/cm ²) compressor motor unit shall be run successfully as follows. <ul style="list-style-type: none"> • 10 minutes under 90% rated voltage. 1 minute stop • 5 minutes under 110% rated voltage. 1 minute stop • 10 minutes under 90% rated voltage. 1 minute stop • 10 minutes under 110% rated voltage. 1 minute stop | M/s ELGI | No comments received | <i>It is the part of motor specification. The comments has been sheared to Motor group.</i> |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |
| | | RLY/LGD | Starting current of oil free compressors is more compared to oil lubricated compressors leading to tripping of MCB in three phase locomotives .Therefore , the starting current of oil free Compressor is to be specified clearly taking MCB rating in to consideration in three phase locomotives . Such problems experienced with M/s Knorr Bremse make oil free compressors. | |

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| 17.3 | <p>ENDURANCE TESTS</p> <p>Run the compressor on load at 10.5 kg/cm² pressure. The compressor shall run of full load for a minimum period of 8 hours at a stretch. At least for half and hour in the 8 hours running, the compressor shall be loaded and unloaded at frequent intervals to check the performance of the unloading mechanism. In addition, the compressor shall be run at 10% over load for 10% of the time disturbed over the entire run of endurance tests.</p> <p>Following measurement shall be made during the endurance tests at intervals of one hour.</p> <ul style="list-style-type: none"> i. Ambient temperature ii. Speed (r.p.m.) iii. Discharge air pressure L.P. Cylinder iv. Discharge air pressure H.P. Cylinder v. Temperature of air at Suction. vi. Temperature of air at LP discharge vii. Temperature of air at HP discharge / Delivery air temp. viii. Intercooler and after cooler Inlet & Outlet temperature. ix. Temperature of Cylinder heads LP & HP. x. Temperature of crank case body. xi Temperature of Motor body. | M/s ELGI | No comments received | |
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| | | M/s KBIL | No comments received | M/s FTRTIL comments are not relevant. |
| | | M/s FTRTIL | Run the compressor on load at 10.5 kg/cm ² pressure. The compressor shall run of full load for a minimum period of 8 hours at a stretch. At least for half an hour in the 8 hours running, the compressor shall be loaded and unloaded at frequent intervals to check the performance of the unloading mechanism. In addition, the compressor shall be run at 10% overload for 10% of the time disturbed over the entire run of endurance tests. <u>If endurance test already performed for similar applications, it is not required to be repeated. The relevant Endurance report (or copy of certificate) shall be submitted to RDSO.</u> | |
| | | RLY/LGD | No comments received | |
| 17.4 | Before and after completion of the endurance tests, the compressor shall be opened and dimensions of all the wearing parts shall be recorded. | M/s ELGI | No comments received | No comments received |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |
| | | RLY/LGD | No comments | |
| 17.5 | The endurance tests of 400 hours shall also be applicable to the existing design of compressors, in case of change in operating requirements such as increase in speed of operation, working pressure etc. | M/s ELGI | No comments received | No comments received |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |
| | | RLY/LGD | No comments received | |

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| 18.0 | TESTS AT HIGHER ENVIRONMENTAL TEMPERATURE: A test run of 48 hours shall be conducted at inlet temperature of 60°C. The compressor shall run at 10.5 kg/cm ² pressure for 8.00 hours and will be stopped for half and hour for cooling under prevailing atmospheric conditions. Six such cycles shall be performed. During these tests measurements as for endurance tests (17.3) shall be made. | M/s ELGI | No comments received | No comments received |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |
| | | RLY/LGD | No comments | |
| 19.0 | WEIGHT: The weight of the complete set and bare compressor and Motor shall be taken separately. Design should ensure minimum weight of the compressor motor set. | M/s ELGI | No comments received | No comments received |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |
| | | RLY/LGD | No comments | |
| 20.0 | ROUTINE TESTS: These tests shall be carried out on all the compressors before acceptance by the Engineer. The supplier shall also supply a copy of the test report with every machine. Following tests shall be conducted. | M/s ELGI | No comments received | No comments received |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments received | |
| | | RLY/LGD | No comments received | |
| 20.1 | Run the compressor at maximum rated speed at 10.5 kg/cm ² pressure for two hours and check the general mechanical and electrical test results and with values recorded during type tests with 415 V supply at 50 c/s. The discharge air temperature shall be recorded at half an hours interval. | M/s ELGI | No comments received | No comments received |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |
| | | RLY/LGD | No comments | |
| 20.2 | Assure the capacity (output) of the compressors at the rated maximum speed and 10.5 kg/cm ² pressure. This will be done in one compressor unit of a batch of fifteen. | M/s ELGI | No comments received | No comments received |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |
| | | RLY/LGD | No comments received | |
| 20.3 | At least 10% of the total lot of compressor on order, | M/s ELGI | No comments received | |

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| | selected at random, shall be subjected to a run of 48 hours with 30 minutes shut off at 8 hours interval, at the maximum rated speed and 10.5 kg/cm ² pressure. Readings as for endurance tests shall also be recorded. | M/s KBIL | No comments received | |
| | | M/s FTRTIL | <p>At least 10% of the total lot of compressor on order, selected at random, shall be subjected to a run of 48 hours with 30 minutes shut off at 8 hours interval, at the maximum rated speed and 10.5 kg/cm² pressure. Readings as for endurance tests shall also be recorded.</p> <p>This Clause to be removed:</p> <p>FT explanation:</p> <p>During prototype test, all the requirements are tested. After completion of type test requirements, Compressor released for Serial production. However, if any major design changes, Type test will be recommended.</p> | M/s FTRTIL comment is not relevant. |
| | | RLY/LGD | No comments received | |
| 21.0 | TESTING OF ACCESSORIES : | | | |
| 21.1 | 21.1 The supplier shall indicate the test specification for the following accessories components. | M/s ELGI | No comments received | No comments received |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |
| | | RLY/LGD | No comments | |
| | <ul style="list-style-type: none"> i. Inter cooler & after cooler. ii. Filter – Air suction. iii. Inter cooler safety valve. iv. Resilient mountings. | | | |
| 21.2 | The test specification of the accessories shall have RDSO's approval prior to the commencement of the type tests. | M/s ELGI | No comments received | No comments received |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |

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| | | RLY/LGD | No comments | |
| 22.0 | GENERAL CONDITIONS FOR INSPECTION & TESTS | | | |
| 22.1 | All tests shall be conducted at Manufacturer's premises. Any shortcoming or defect noticed during the type test shall be pointed out to the manufacturer by the Engineer or his representative to enable him to incorporate the necessary improvements before bulk manufacture is commenced, without affecting the guaranteed deliveries or guaranteed performance characteristics. | M/s ELGI | No comments received | No comments received |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |
| | | RLY/LGD | No comments | |
| 22.2 | Any additional tests trials, if considered necessary by the Engineers, shall also be arranged the suppliers free of cost. | M/s ELGI | No comments received | No comments received |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |
| | | RLY/LGD | No comments | |
| 22.3 | The Engineer or their representative shall have access for stage inspection, to those portions of the manufacturer's works in which production is being carried out and where the testing is taking place. This also applies to the items procured from sub suppliers. | M/s ELGI | No comments received | No comments received |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |
| | | RLY/LGD | No comments | |
| 22.4 | The Engineer, at the time of inspection, shall have the power to ask for additional information and/or tests he may consider necessary to satisfy him that proper materials and parts specified are actually used during the manufacture of the compressor. | M/s ELGI | No comments received | No comments received |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |
| | | RLY/LGD | No comments | |
| 22.5 | The manufacturer shall provide labour or appliances required by the Engineer, free of charge, for inspection | M/s ELGI | No comments received | No comments received |
| | | M/s KBIL | No comments received | |

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| | and testing of the compressor and its components, as required. | M/s FTRTIL | No comments received | |
| | | RLY/LGD | | |
| 22.6 | If any part of the compressor unit requires alteration or any defect appear during the tests or trials, the supplier shall, without any extra charge, make such alterations or rectify the defects to the satisfaction of the engineer or his representative. | M/s ELGI | No comments received | No comments received |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |
| | | RLY/LGD | No comments | |
| 22.7 | Any modification or alteration to the components during the supply of the order shall be made only after the approval of the Engineer. The unit after such modifications / alterations shall be subjected to such tests as considered necessary by the engineer. | M/s ELGI | No comments received | No comments received |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |
| | | RLY/LGD | No comments | |
| 22.8 | Zinc yellow passivation /Blackening shall be done on all hardware. | M/s ELGI | No comments received | No comments received |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |
| | | RLY/LGD | No comments | |
| 23.0 | SPARES : | | | |
| 23.1 | Along with the quotation for supply of air compressor the tenderer shall also furnish a recommended list of spares for two years and quotations thereof. The tenderer shall also agree to hold the price of spares for a period of one year from the date of supply of the compressor. | M/s ELGI | No comments received | |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |
| | | RLY/LGD | Before proliferation of the equipment life cycle cost analysis to be carried out . The cost of spares is high when compared to oil lubricated Compressor. This is increasing the maintenance cost of equipment. | AS per Railway Board letter no. 2006/Elect(G)/150/9/pt. dated 16.11.2010. "Technical specification should not include eligibility criteria ,approval of sources and other |

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| | | | | commercial conditions. Therefore this Para may be deleted . |
| 24.0 | INFORMATION TO BE FURNISHED BY TENDERER: | | | |
| 24.1 | Data as per Annexure I & II shall be furnished by the tenderer along with their QAP for this item. | M/s ELGI | No comments received | No comments received |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |
| | | RLY/LGD | No comments | |
| 25.0 | TOOL KIT The price for tool kit for the maintenance of the compressor shall be indicated separately, along with the tender. | M/s ELGI | No comments received | No comments received |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |
| | | RLY/LGD | No comments | |
| 26.0 | MAINTENANCE MANUALS The tenderer shall supply copies of exhaustive, fully | M/s ELGI | No comments received | No comments received |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |

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| | <p>illustrated manuals covering among other items, the following vital details, to the “Engineer” with the tender.</p> <ol style="list-style-type: none">1. Description and arrangement.2. Technical data.3. Dismantling and assembly instructions.4.5. Commissioning instructions6. Particulars of indigenously available recommended lubricants.7. Periodical inspection schedules.8. Periodical maintenance instructions along with trouble shooting instructions.9. Testing procedure for the equipment and other auxiliaries like oil pump etc, if applicable. | RLY/LGD | No comments | |
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| | <p>10. Wear limits for vital components.</p> <p>11. Detailed parts catalogue with description of items. The parts shall be detailed by sketches to facilitate ordering.</p> <p>12. Instructions for reclamation of worn out components.</p> <p>13. List of special tools with instruction for use. Two copies of the Maintenance Manual shall be supplied with the quotation. One copy of the manual shall be supplied with every 10 compressor sets or a part thereof.</p> | | | |
| 27.0 | <p>TRAINING:</p> <p>The supplier shall provide facilities for free training of the railway maintenance staff at their works on aspects</p> | M/s ELGI | No comments received | No comments received |
| | | M/s KBIL | No comments received | |

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| | of maintenance, overhaul and testing of the compressor. | M/s FTRTIL | No comments received | |
| | | RLY/LGD | No comments received | |
| 28.0 | SPECIAL CONDITIONS: | | No comments received | |
| 28.1 | At the time of approval of the prototype unit the manufacturer / supplier shall furnish the list of names and addresses of their Sub supplier of the main items of the equipment and important raw materials which they have used in the prototype unit and shall not make any changes in the sources of supply without prior approval of RDSO. | M/s ELGI | No comments received | No comments received |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments received | |
| | | RLY/LGD | No comments received | |
| 28.2 | Field Trial: After successful completion of the type test the compressor shall be subjected to extended field trial for a period of six months before according the prototype approval. However, the period & quantity mentioned in extant ISO guidelines of RDSO shall be followed. Field performance feedback format is attached in Annexure III. | M/s ELGI | No comments received | No comments received |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments received | |
| | | RLY/LGD | No comments received | |
| 28.3 | Consistency test: In case of large scale failures being reported from the zonal railway/CLW and/or in case of major design change, one unit of compressor motor set selected at random to be offered for consistency test to be witnessed by RDSO. Consistency tests shall generally cover those type tests which provide valuable information on the reasons of failures and/or can establish the efficacy of the design changes. The | M/s ELGI | No comments received | No comments received |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments received | |
| | | RLY/LGD | No comments received | |

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| | periodicity and scope of such a test shall be decided by RDSO prior to undertaking such a test. | | | |
| 28.4 | <p>Identification of manufacturer: The compressor manufacturer should clearly emboss the following details :</p> <p>a) Year and month of manufacturing</p> <p>b) Sl. no.</p> <p>c) Name of manufacturer at suitable places on various parts viz. crank-case, cylinder head, crank-shaft etc. to assess the performance of various makes of machines and to determine their codal life for replacement decision.</p> | M/s ELGI | No comments received | |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |
| | | RLY/LGD | No comments | |
| 29.0 | <p>FINISH</p> <p>The compressor motor set shall be suitably treated to remove rust and should be coated with antirust primer and finished with two coats of light grey or black paint as per IS 5:1994.</p> | M/s ELGI | No comments received | No comments received |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |
| | | RLY/LGD | No comments | |
| 30.0 | <p>ISO CERTIFICATION:</p> <p>Indian Railway reserves the right to procure the item from ISO certified manufacturers only.</p> | M/s ELGI | No comments received | No comments received |
| | | M/s KBIL | No comments received | |
| | | M/s FTRTIL | No comments | |
| | | RLY/LGD | No comments received | |
| 31.0 | <p>HARDWARE:</p> <p>All types of high tensile fasteners including spring washer shall be of either from RDSO's or CLW's approved sources only. Prior approval shall be taken from RDSO/CLW if any other makes are proposed to be used.</p> | M/s ELGI | No comments received | M/s FTRTIL comments are not relevant. |
| | | M/s KBIL | | |
| | | M/s FTRTIL | All types of high tensile fasteners including spring washer shall be of either from RDSO's or CLW's approved sources only. Prior approval shall be taken from RDSO/CLW if any other | |

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| | | | <p>makes are proposed to be used. This clause to be removed. FT explanation: Hardware requirements may please be left to supplier to select the type of fasteners requirement-based Compressor performance.</p> | |
| | | RLY/LGD | No comments | |