

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400070			
		Revision	A			
		Page	1/43			

TS400070

TECHNICAL SPECIFICATION OF MASTER CONTROLLER AND AUTOMATIC SPEED CONTROLLER (ASC) FOR DIESEL ELECTRIC COCO LOCOMOTIVE

Research and Development Center Coordinator	Serkan ÇÖKMEZ			
Electrical Machines Factory Manager	Necati Coşkun OTAŞ			
Locomotive Factory Manager	Oğuzhan HOŞGÖR			
Quality Control Coordinator	Tuba Neslihan EROĞLU			
Prepared by	Asuman TONGUL	Güzin TUTAR		
				
Date of Prep.	30.03.2026			

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400070			
		Revision	A			
		Page	3/43			

I. CONTENT

1. SUBJECT AND SCOPE.....	6
2. DEFINITIONS & REFERENCE DOCUMENTS.....	7
2.1. INTRODUCTION.....	7
2.2. ACRONYMS AND DEFINITIONS.....	7
2.3. REFERENCE DOCUMENTS.....	9
2.4. SCOPE OF SUPPLY.....	9
2.4.1. HARDWARE.....	9
2.4.2. SOFTWARE.....	10
2.4.3. SPECIAL TOOLS.....	10
3. STANDARDS TO BE COMPLIED.....	11
4. TSI REQUIREMENTS AND DOCUMENTATION.....	13
4.1. TSI CERTIFICATION.....	13
4.2. EC CERTIFICATION OF CONFORMITY AS INTEROPERABILITY CONSTITUENCE.....	13
5. TECHNICAL SPECIFICATION.....	14
5.1. INTRODUCTION.....	14
5.2. MASTER CONTROLLER AND AUTOMATIC SPEED CONTROLLER REQUIREMENTS.....	14
5.2.1. Automatic Speed Control (ASC) Lever.....	14
5.2.2. Traction/Brake Master Controller with Integrated Driver Activity Control (DAC)..	16
5.2.3. Auxiliary Switches, Encoder and Touch Sensor Characteristics.....	18
5.3. WEIGHT.....	19
5.4. MANUFACTURING.....	19
5.5. PAINTING.....	19
5.6. INTERFACE SPECIFICATION.....	19
5.6.1. Mechanical Interface.....	19
5.6.2. Electrical Interface.....	21
5.7. EARTHING.....	21
5.8. ENVIRONMENTAL CONDITIONS.....	22
5.8.1. CLIMATIC CONDITION.....	22
5.8.2. VIBRATION AND SHOCK.....	22
5.8.3. PROTECTION (IP).....	23
5.8.4. ELECTROMAGNETIC COMPATIBILITY (EMC).....	23
5.9. SYSTEM AND COMPONENTS LIFE.....	23
5.10. MATERIAL REQUIREMENT.....	23
5.10.1. GENERAL REQUIREMENTS.....	23
5.10.2. FIRE RESISTANCE BEHAVIOUR.....	23
5.10.3. SMOKE OPACITY AND TOXICITY.....	24
5.11. LABELS/MARKING.....	24
6. RELIABILITY, AVAILABILITY, MAINTAINABILITY AND SAFETY (RAMS) REQUIREMENTS.....	26
7. TRAINING AND MANUAL.....	27
7.1. TRAINING.....	27

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400070			
		Revision	A			
		Page	4/43			

7.2.	MAINTENANCE MANUAL	27
7.2.1.	MAIN FEATURES OF THE MANUAL.....	27
7.2.2.	CONTENTS OF THE MANUAL.....	27
7.2.3.	FORMAT OF THE MANUAL.....	29
8.	TESTING, INSPECTION AND ACCEPTANCE	30
8.1.	INTRODUCTION TO TEST AND INSPECTION	30
8.2.	TYPE TESTS	30
8.3.	ROUTINE TESTS.....	31
8.4.	FIRST ARTICLE INSPECTION	31
8.5.	CONTRACTOR TECHNICAL ASSISTANCE	32
8.6.	COMMISSIONING.....	32
8.6.1.	TYPE COMMISSIONING TEST.....	32
8.6.2.	ROUTINE COMMISSIONING TEST	33
9.	AUTHORIZATION TO START PRODUCTION	33
9.1.	DESIGN FREEZING	33
9.2.	AUTHORIZATION TO START PRODUCTION.....	33
9.3.	AUTHORIZATION TO START MASS PRODUCTION.....	33
10.	ACCEPTANCE.....	34
11.	PACKAGING AND STORAGE CONDITIONS.....	35
11.1.	PACKAGING	35
11.2.	STORAGE CONDITIONS.....	36
11.3.	MOUNTING AND HANDLING	36
12.	DOCUMENTS TO BE DELIVERED TO THE ADMINISTRATION ALONG WITH THE PRODUCT/EQUIPMENT.....	37
13.	INTELLECTUAL AND INDUSTRIAL PROPERTY ISSUES.....	40
14.	WARRANTY	40
14.1.	WARRANTY CONDITION	40
14.2.	SYSTEMATIC FAULT / EPIDEMIC FAILURE.....	41
15.	OTHER ISSUES	42
16.	ANNEXES AND NOTES.....	43

II. LIST OF TABLES

Table 1 – Acronyms and Definitions	8
Table 2 – Reference Documents	9
Table 3 – Material Quantity	9
Table 4 – Applicable Standards	12
Table 5 – Material Fire Behaviours.....	24
Table 6 – Stage 1 Offer Phase: List of Requested Documents and Due Date	37
Table 7 – Stage 2 List of Requested Documents and Due Date	38
Table 8 – Stage 3 List of Requested Documents and Due Date	38

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400070			
		Revision	A			
		Page	5/43			

III. LIST OF FIGURES

Figure 1 – ASC Lever Positions Marking	14
Figure 2 – ASC Lever Electrical Functional Scheme, Option A	15
Figure 3 – ASC Lever Electrical Functional Scheme, Option B	15
Figure 4 – Master Controller Marking	16
Figure 5 – Enable Key Marking	17
Figure 6 – Master Controller, DAC, Enable Key Electrical Functional Scheme, Option A.....	17
Figure 7 – Master Controller, DAC, Enable Key Electrical Functional Scheme, Option B.....	17
Figure 8 – Max Dimensions of the Master Controller	20
Figure 9 – Max Dimensions of the ASC Lever.....	20

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400070			
		Revision	A			
		Page	6/43			

1. SUBJECT AND SCOPE

This document describes the technical requirements for the procurement of the master controller and automatic speed controller (ASC) to be installed on the driver desks of diesel COCO LOCO (hereafter called LOCO) produced by Turkish Railway Vehicles Industry Inc. (hereafter called ADMINISTRATION).

The Bidders shall offer a solution totally compliant with the requirements of this specification.

After signing the contract, possible deviations from this specification or from other specifications and norms mentioned in this document, shall be validated by written agreements between ADMINISTRATION and the Contractor.

The Bidders shall make clause by clause comment into present technical specification together with their offer.

This Technical Specification and its annexes have been prepared in Turkish and English. In the event of any inconsistency between the two, the Turkish language shall prevail.

IMPORTANT NOTE:

The present document shall be examined by the Bidder, together with the following documents:
TS400049 – DIESEL LOCO General Technical Specification
in order to know general applicable requirements established at LOCO level.

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400070			
		Revision	A			
		Page	7/43			

2. DEFINITIONS & REFERENCE DOCUMENTS

2.1. INTRODUCTION

In this Technical Specification, the following definitions apply:

- “The End Client” means the legal entities or private persons operating on the national railway lines of the Republic of Türkiye with using the LOCO.
- “Final User” means the End Client or its staff who is in charge of use, maintenance, repair etc. the LOCO.
- “The Administration” means the Turkish Railway Vehicles Industry Inc. (TÜRASAS).
- “The Contractor” means the company who wins the tender to supply the good object of this specification.
- “Documentation” means all or any specifications, drawings, reports, networks, operating and maintenance manuals and all other information whether on paper or on magnetic or other format which is prepared by the Contractor in the course of the contract.
- “The Bidder” means the company who want to join to the tender to supply the good object of this specification.

2.2. ACRONYMS AND DEFINITIONS

The acronyms used in this document are reported in the following table:

Acronyms	Description
ASC	Automatic Speed Control
BCU	Brake Control Unit
CAD	Computer Aided Design
CBM	Condition Based Maintenance
COCO LOCO	Diesel or Electrical Mainline Locomotive
CSM	Document 402/2013/EU of the European Commission (General security method for Risk Assessment)
EC	European Community
DAC	Driver Activity Control
EN	European Standard
I/F	Interfaces
ISO	International Standard Organization
LCC	Life Cycle Cost
LOCO	Diesel Mainline Locomotive
LRU	Line Replaceable Unit
LV	Low Voltage
MC	Master Controller
NoBo	Notified Body
RAMS	Reliability - Availability- Maintainability- Safety
PPCU	Power Pack Control Unit

ÜRA F.005	<i>This Technical Specification cannot be REPRODUCED OR USED for any purposes without the written consent of TÜRASAS</i>	07.04.2016 Rev:02
-----------	--	-------------------

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400070			
		Revision	A			
		Page	8/43			

SW	Software
TCDD	Turkish State Railways General Management
TCDDT	Turkish State Railways Transportation Inc.
TCMS	Train Control Management System
TCU	Traction Control Unit
TSE	Turkish Standards Institute
TSI CCS	Document 2023/1695/EU of the European (the technical specification for interoperability relating to the control-command and signalling subsystems of the rail system in the European Union)
TSI	Technical Specification for Interoperability
TSI LOC&PAS	Document 1302/2014/EU of the European Commission Amended by: ► M1 Commission Regulation (EU) 2016/919 ► M2 Commission Implementing Regulation (EU) 2018/868 ► M3 Commission Implementing Regulation (EU) 2019/776 ► M4 Commission Implementing Regulation (EU) 2020/387 ► M5 Commission Implementing Regulation (EU) 2023/1694 ► C1 Corrigendum, OJ L 10, 16.1.2015
TSI NOI	Document 1304/2014/EU of the European Commission (Railway vehicles - technical specification for mutual operability related to 'noise')
TSI SRT	Document 1303/2014/EU of the European Commission (technical specifications for the mutual operability of the Trans-European Conventional and High-Speed railway system concerning 'security in railway tunnels')
UIC	International Railway Association
UNI	National Standards Unit
IEC	International Electrotechnical Commission
IRIS	International Railway Industry Standard
EMC	Electromagnetic Compatibility
TBC	To be confirmed
TBD	To be defined
N/A	Not applicable
IP	Ingress Protection
FAI	First Article Inspection
EB	Emergency Brake

Table 1 – Acronyms and Definitions

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400070		
		Revision	A		
		Page	9/43		

2.3. REFERENCE DOCUMENTS

In the following table the documents used for

Ref.	Document	Title
1	TS400049	Diesel Electric Loco General Technical Specification
2	TB50160	Standard List
3	TB50165	RAMS Target Allocation
4	012FX0000003-000	Driver desk layout – Diesel loco type

Table 2 – Reference Documents

2.4. SCOPE OF SUPPLY

2.4.1. HARDWARE

The Bidder/Contractor shall provide all relevant components related to the equipment, installed in the driver desks of the LOCOs:

- ASC Lever
- Main Master Controller with driver enable key
- Installation materials (screw, bolt, etc.)
- All cables and connectors/connections relevant to the ASC Lever and Main Master Controller as male and female with pins shall be provided by Contractor.
- If any, all other equipment and material which are necessary for functionality and installation of ASC Lever and Main Master Controller.

The quantity of equipment is given as in the following table

Part Name	Per LOCO			
	CAB1	OTHER	CAB2	Total
Main Master Controller	1		1	2
Main Master Controller Connector Kit	1		1	2
ASC Lever	1		1	2
ASC Lever Connector Kit	1		1	2
Spare Driver Key	1	-	1	2
If any, all other equipment and material which is necessary for functionality and installation	-	-	-	1 complete set for each product

Table 3 – Material Quantity

ÜRA F.005	<i>This Technical Specification cannot be REPRODUCED OR USED for any purposes without the written consent of TÜRASAS</i>	07.04.2016 Rev:02
-----------	--	-------------------

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400070			
		Revision	A			
		Page	10/43			

2.4.2. SOFTWARE

N/A

2.4.3. SPECIAL TOOLS

Generally, the usage of special tools shall be avoided to perform preventive and corrective maintenance.

If this is not possible, the Bidder/Contractor shall provide a list of tools and 2 complete sets of special tools free of charge.

Nevertheless, if they are essential for maintenance (upon Contractor and ADMINISTRATION agreement), following information shall be supplied in a dedicated section of the Maintenance Manual:

- Descriptions and technical data (including SW if present)
- Drawings (2D/3D)
- Use instructions
- List of tasks where the tools usage is mandatory (Maintenance Cards shall refer to the relevant special tools when is needed)
- All the information for purchasing it correctly (technical data, builder, price, and so on) if the special tool is available on the market

The Contractor shall provide the software tools necessary to manage the life cycle of the system (monitoring and troubleshooting SW, special connection cables and adaptors, diagnostics and CBM data cloud access and analysis, etc.).

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400070			
		Revision	A			
		Page	11/43			

3. STANDARDS TO BE COMPLIED

The LOCO shall be designed, assembled and tested according to the following international reference standards:

-European Standards: TSI, EN

-International Standards: UIC, ISO, IEC

-Other International Standards: DIN, NF F, UNI, CEI, etc.

-National Standards: Technical documents published in accordance with TSE directives and related annexes

-Unit System: SI (International System of Units)

The complete standards list is indicated in the TB50160.

In conformity assessments to be carried out by the Bidder/Contractor, and in respect of other requirements to be fulfilled by the product subject to this Technical Specification and its constituent equipment and sub-components, where such requirements are not explicitly defined herein, the directives, standards and requirements listed above shall be applied in the order of priority specified.

Where compliance with these directives, standards and requirements is not possible, other relevant international standards, European national standards, national standards, TCDD guidelines, and requirements stipulated by national legislation may be applied.

If a gap exists in the standards with the defined order of priority, such a gap shall be filled by the subsequent standard.

In case of any amendments to the standards/norms referred to under this clause during the execution of the Contract:

- The Contractor shall notify the Administration in writing within twenty (20) working days following the date of entry into force of such amendment.
- Within one (1) calendar month after providing such notification, the Contractor shall prepare the necessary processes to comply with the new requirements and submit them to the Administration for approval. However, the approval process shall not exceed two (2) months (60 calendar days) from the date the amendment enters into force.
- The Administration shall review the process and notify the Contractor of its decision within fifteen (15) working days.

Amendments to directives, standards, or norms shall not prevent completion of certification.

By reviewing this Technical Specification and its annexes, the Bidder/Contractor shall confirm that the product, its constituent equipment and sub-components comply with the latest applicable versions of the relevant standards. The Bidder/Contractor shall be obliged to notify the Employer in writing, together with proposals, in case of:

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400070			
		Revision	A			
		Page	12/43			

- any inconsistency, contradiction, or violation with international standards,
- problems that may arise in implementation,
- matters that are deemed technically beneficial to amend,
- issues not specified in this Technical Specification or its annexes but necessary/mandatory for the manufacture of the system/equipment.

The Bidder/Contractor shall satisfy the specific standards indicated in Table 4.

Standard	Title
EN 17050	Conformity assessment - Contractor's declaration of conformity
EN 45545 series	Railway applications - Fire protection on railway vehicles
EN 50121-3-2	Railway applications - Electromagnetic compatibility
EN 50124-1	Railway applications - Insulation coordination
EN 50126	Railway applications - The specification and demonstration of reliability, availability, maintainability and safety (RAMS)
EN 50153	Railway applications - Rolling stock - Protective provisions relating to electrical hazards
EN 50155	Railway applications - Electronic equipment used on rolling stock
EN 61373	Railway applications - Rolling stock equipment - Shock and vibration tests
EN ISO 14040	Environmental management - Life cycle assessment - Principles and framework
IEC 60529	Degrees of protection provided by enclosures (IP Code)
EN 60077-1	Railway applications - Electric equipment for rolling stock - Part 1: General service conditions and general rules
TSI CCS 2016/796 Amended 2023/1695	Technical Specification of Interoperability: Control Command and Signalling TSI
TSI LOC&PAS 1302/2014 Amended 2023/1694	Technical Specification of Interoperability: Rolling Stock - locomotives and passenger rolling stock subsystem of the rail system in the European Union
TSI Noise 1304-2014 Amended 2023/1694	Technical Specification of Interoperability: Noise
TSI SRT 1303/2014 Amended 2019/776	Technical Specification of Interoperability: Safety in Railway Tunnels
UIC 612-0	Driver Machine Interfaces for EMU/DMU, Locomotives and driving coaches - Functional and system requirements associated with harmonised Driver Machine Interfaces
IEC 60947-5-1	Low-voltage switchgear and controlgear - Part 5-1: Control circuit devices and switching elements - Electromechanical control circuit devices
IEC 60947-1	Low-voltage switchgear and controlgear - Part 1: General rules

Table 4 – Applicable Standards

ÜRA F.005	<i>This Technical Specification cannot be REPRODUCED OR USED for any purposes without the written consent of TÜRASAS</i>	07.04.2016 Rev:02
-----------	--	-------------------

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400070		
		Revision	A		
		Page	13/43		

The Bidder shall review and confirm compliancy to the above list of applicable norms; any deviation shall be submitted to ADMINISTRATION for approval.

The Bidder/Contractor shall comply with the specific standards indicated; all norms shall be considered with the version indicated in the relevant TSI list. If a norm is not listed in the TSI list, the latest version available at the time of contract signature shall apply.

4. TSI REQUIREMENTS AND DOCUMENTATION

4.1. TSI CERTIFICATION

The LOCO shall be certified according to current version TSI LOC/PAS, TSI NOI, TSI PRM, TSI SRT and TSI CCS by Notified Body (NoBo) / Designated Body (DeBo). The Contractor shall provide whole calculations, drawings, analysis, test reports and other kind of documentation which is requested by TSIs for the present Scope of Supply. Within the scope of Supply, Contractor provide the documentation required for the compliance matrix to be created by NoBo.

The Contractor/Bidder shall provide the declaration of conformity of its Scope of Supply to the relevant technical specifications and applicable norms.

The declaration of conformity shall be in accordance with the EN17050 Norm and shall include also the following documents:

- Conformity declaration (The Bidder shall submit it at Stage 1, see §12 Table 6)
- Conformity report with all conformity evidence (The Contractor shall submit it at Stage 3, see §12 Table 8)
- Type test reports (The Contractor shall submit them at Stage 3, see §12 Table 8)

The documentation presented by the Contractor/Bidder relevant to the Conformity report with all conformity evidence and test reports will be examined for approval by the NoBo/DeBo in charge of certification of the LOCO.

If there is a need for corrections to the documents or new documents are required depending on the examinations made by the NoBo/DeBo, the relevant documents will be provided by the Contractor.

The Contractor is obliged to meet the documents that are not foreseen at the tender stage but are requested by NoBo later.

4.2. EC CERTIFICATION OF CONFORMITY AS INTEROPERABILITY CONSTITUTE

N/A

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400070		
		Revision	A		
		Page	14/43		

5. TECHNICAL SPECIFICATION

5.1. INTRODUCTION

Each Loco has 2 driver cabins, which includes driver desks.

The Contractor shall cooperate with the supplier of the driver desk for the correct implementation of the master controller and ASC lever in the driver desk.

A reference list will be given by Bidder, showing that the proposed equipment/ system manufacturer's products are operated in minimum three projects and in commercial operations with minimum 120 km/h speed.

The Contractor shall cooperate with the other equipment suppliers for the correct functional, mechanical and electrical integration with other subsystems.

5.2. MASTER CONTROLLER AND AUTOMATIC SPEED CONTROLLER REQUIREMENTS

The master controller and the automatic speed controller must comply with all the requirements defined by the UIC612-0.

The identifier numbers in the UIC612-0 are 019 for the Automatic Speed Controller and 020 for the Master Controller.

Moreover, the Master Controller shall include also the Driver Desk Enable key.

5.2.1. Automatic Speed Control (ASC) Lever

The functionality and the mechanical arrangement of the ASC lever must comply with all the requirements of the UIC612-0, Appendix A and Appendix K.



Figure 1 – ASC Lever Positions Marking

TÜRASAŞ Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400070		
		Revision	A		
		Page	15/43		

Above lever shall be connected to relevant I/O modules (analogue and digital) using adequate connector, to be included into scope of supply.

Above lever shall include encoder to share the lever position with the TCMS I/O modules; position of the lever shall be stable; the encoder shall convert the angle of the lever into a current (4-20mA) to let TCMS convert it into the cruise control speed set point.

The accuracy of the encoder mechanical positioning and output current shall allow the TCMS to define 24 stable steps of speed between 0 and Vmax.

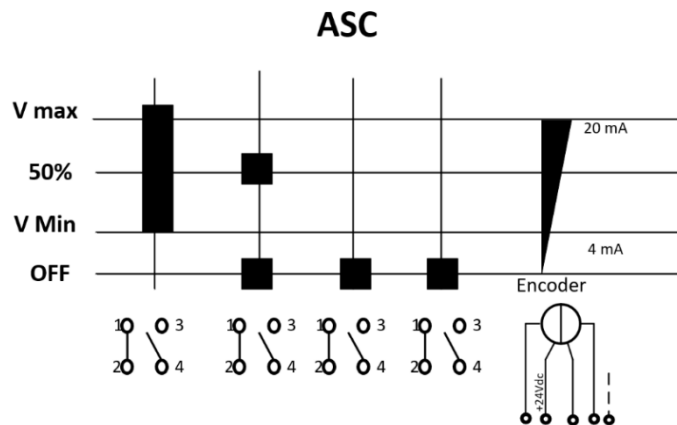


Figure 2 – ASC Lever Electrical Functional Scheme, Option A

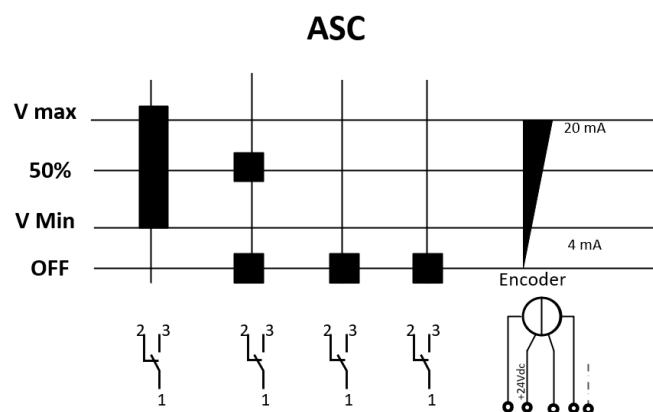


Figure 3 – ASC Lever Electrical Functional Scheme, Option B

The Figure 2 and Figure 3 above shows the number, the type and the function of the auxiliary switches connected to the lever rotation, together with the angular position encoder.

The power supply of the encoder should be 24 Vdc.

ÜRA F.005	This Technical Specification cannot be REPRODUCED OR USED for any purposes without the written consent of TÜRASAŞ	07.04.2016 Rev:02
-----------	---	-------------------

TÜRASAŞ Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400070		
		Revision	A		
		Page	16/43		

5.2.2. Traction/Brake Master Controller with Integrated Driver Activity Control (DAC)

The functionality and the mechanical arrangement of the Master Controller lever must comply with all the requirements of the UIC612-0, in particular Appendix A and Appendix K. It integrates also Driver Activity Control by means of the sensitivity area on the top of the lever knob.

Moreover, the subassembly must include the lock which can be operated by a removable white key, placed on the Master Controller panel. The key and lock rotation has a mechanical action on the master controller lever and on a group of auxiliary switches. If the white key is not inserted in the lock and rotated, the master controller lever shall be blocked in the OFF position. Vice versa, if the master controller lever is not in the OFF position, it shall not be possible to counter rotate the key and remove it from the lock.

The Master Controller lever has also the function to control the driver activity (DAC) by means of a touch sensitive sensor placed on the top of the knob.

The Figure 4 below shows the panel upper part marking.

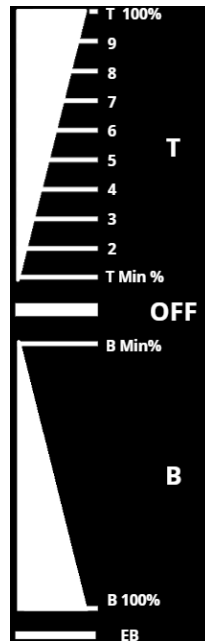


Figure 4 – Master Controller Marking

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400070		
		Revision	A		
		Page	17/43		

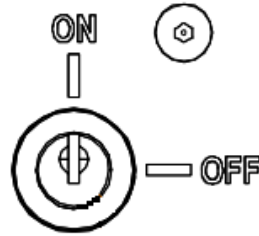


Figure 5 – Enable Key Marking

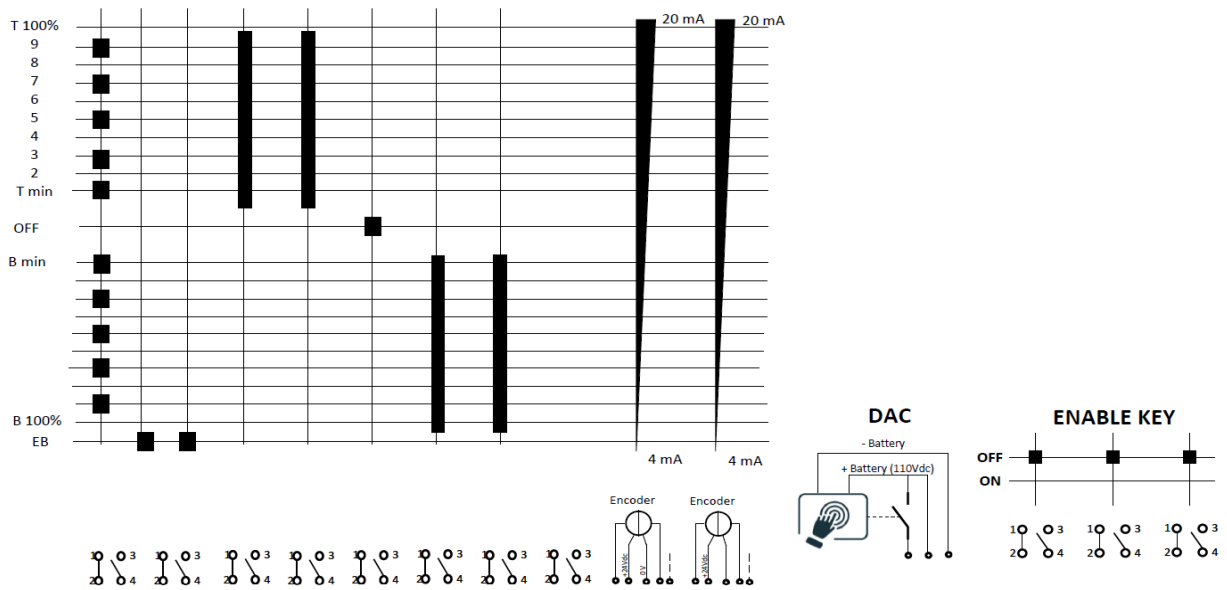


Figure 6 – Master Controller, DAC, Enable Key Electrical Functional Scheme, Option A

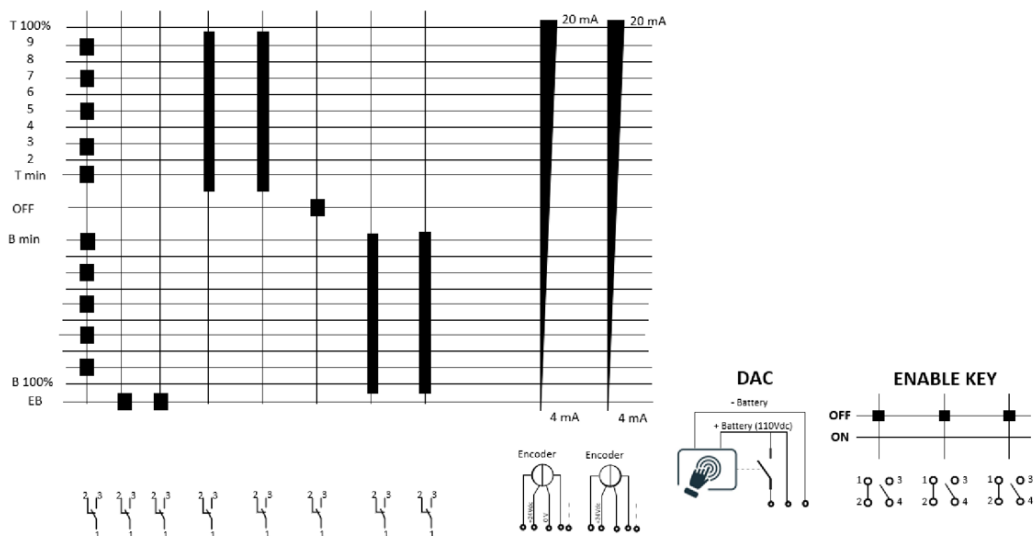


Figure 7 – Master Controller, DAC, Enable Key Electrical Functional Scheme, Option B

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400070		
		Revision	A		
		Page	18/43		

5.2.3. Auxiliary Switches, Encoder and Touch Sensor Characteristics

The auxiliary switches must be of the type snap-action switches with positive opening operation and self-cleaning contacts, designed for high reliability at low current operation (24V/2mA) and compliant with the requirements of the IEC 60947-1 and IEC60947-5-1.

The utilisation category shall be DC-13: 110V DC / 0.5 A.

The expected mechanical durability must be at least 30 million operations.

The encoder must be compliant with all the requirements of the EN 50155 standard, and the accuracy of the mechanical assembly shall allow the full utilisation of the 4-20 mA output current span.

The power supply of the encoder should be 24 Vdc.

The touch sensor for the DAC function shall be fully compliant to the EN50155 standard and shall have the following characteristics:

Nominal power supply voltage:	110 Vdc (battery voltage)
Power supply inrush current:	< 2 A
Output: relay contact polarised at Battery Voltage	
- Thermal current	300 mA
- Maximum switching current	100 mA @ $\tau=30$ ms
- Minimum current	10 mA

When the driver touches the touch-sensitive sensors, the touch-sensitive sensor system shall detect the driver's presence. The driver's actions shall be filtered as per the following:

- When releasing or maintaining press for a period shorter than 50 ms, this period of time shall not be counted.
- A press lasting between 50 ms and 120 ms shall cause the deadman output to be activated after 120 ms.
- A press lasting more than 120 ms shall cause the deadman output to be activated for such period of time.
- A release of the pressing lasting between 50 ms and 120 ms shall cause the deadman output to be deactivated after 120 ms.
- A release of the pressing lasting more than 120 ms shall cause the deadman output to be deactivated for such period of time.
- The system shall be active within 500 ms after the network is switched on.

The short-circuit current (in case of short circuit between the relay output and the negative pole of the battery) shall be limited automatically at a current value coordinated with the locomotive protection circuit breaker.

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400070		
		Revision	A		
		Page	19/43		

5.3. WEIGHT

The maximum weight of the complete sub-assembly, including the cabling and the electrical and fixation screws must be lower than 13 kg.

5.4. MANUFACTURING

As stated in the reference document 012FX0000003-000, the ASC lever and master controller installed in the driver's desk of the locomotive are identified as signs 19, 20, and 999 (key switch).

The top plate of the ASC and of the Master Controller shall be black anodized with writings/markings laser engraved colour white. A chamfer must be provided on the plate edges.

The master controller subassembly shall be shipped with one key inside the lock. Removable key such as CISA Astral, KABA, etc. will be used.

One additionally spare key shall be shipped.

5.5. PAINTING

The Bidder can propose its own painting specification to ADMINISTRATION. The usage of this painting specification is dependent on ADMINISTRATION approval.

Concerning resistance to corrosion, design and processes shall take in account the effect of potential galvanic corrosion.

5.6. INTERFACE SPECIFICATION

5.6.1. Mechanical Interface

The master controller and the ASC shall be mounted on the driver desk from above and it is fixed to it by using countersunk screws M5.

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400070		
		Revision	A		
		Page	20/43		

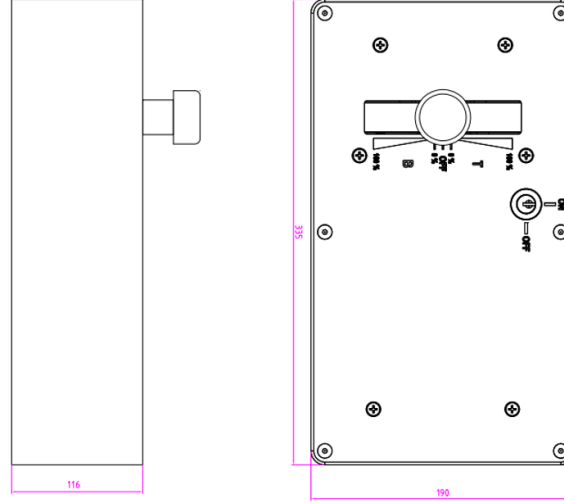


Figure 8 – Max Dimensions of the Master Controller

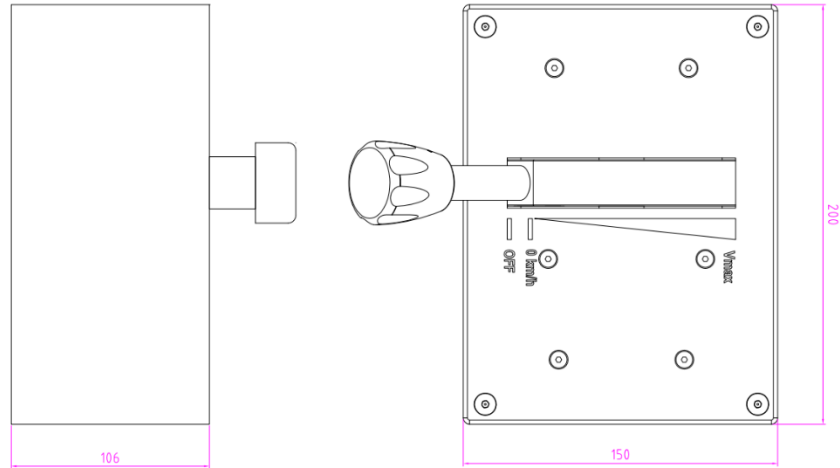


Figure 9 – Max Dimensions of the ASC Lever

It is necessary to avoid using constraints that obstruct material dilatation in operative conditions from -25°C to +70°C.

The dilatation effect and the dimensional tolerances (of components to be fixed) must be considered in choosing the fixing holes diameters.

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400070		
		Revision	A		
		Page	21/43		

The Contractor shall provide all the information on the mounting points of the system (dimensions, tolerances, type, etc.).

The products shall be supplied with complete cabling and the cable jumper to match the locomotive side connectors.

The length of the cable jumpers will be defined by the Administration during the detail design phase.

5.6.2. Electrical Interface

The nominal voltage from the battery DC-system is 110Vdc.

The system shall perform its function to the specification under all conditions of EN 60077-1 and EN50155.

Type tests shall prove the compatibility, especially the variations of the voltage supply (-30% and + 25%), and fluctuations of the supply.

Voltage supply interruption test shall be as per EN 50155.

No part of the system shall be damaged by low voltage below to zero volts.

The products shall be connected with the vehicle lines via suitable Harting connectors, to be included in the scope of supply (fixed and mating). Connectors shall be completed with all pins.

All elements regarding grounding connections shall be included in the scope of supply (screws, nuts, washers,...).

5.7. EARTHING

For protective provisions relating to electrical hazards on railway vehicles EN 50153 standard is valid and shall be obeyed.

All equipment causing an electric shock shall be protected against direct contact.

All conductive surfaces of electrical equipment on the vehicle shall be connected to an earthing point for equalization of the electrical potential.

This includes conductive surfaces of cubicles, doors and covers.

Exceptions are small items of interior trim in an environment otherwise protected by bonding to car body and/or insulation (e.g. grips, coat hooks, etc.).

All equipment operating at AC-voltage >25V or at DC-voltage >60V shall be earthed for safety.

Each earthing point of the equipment shall be designed as follows:

ÜRA F.005	<i>This Technical Specification cannot be REPRODUCED OR USED for any purposes without the written consent of TÜRASAS</i>	07.04.2016 Rev:02
-----------	--	-------------------

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400070			
		Revision	A			
		Page	22/43			

The earthing points shall be of good electrical conduction to ensure low touch voltage; the earthing points shall have large contact surface and shall be able to carry a possible short circuit current.

Each earthing point shall be easily accessible for assembly.

The Contractor shall provide an earthing diagram of its equipment including earthing bonds and shields.

The Contractor shall indicate which cables of his system will be shielded.

Cable shielding may only be used for shielding purposes and NOT as signal, ground or reference wires.

If Contractor does not request different connection, cable shields shall be grounded on both ends in order to obtain high shielding efficiency against electric and magnetic fields.

This requires potential equalisation between both grounding points, e.g. through chassis or appropriate structural components.

Grounding of cable shields shall be made with low impedance (large contact surface, preferably over 360 deg. circumference).

Grounding by means of sheath wires (pig tails) or connector pins is NOT permitted.

The Low Voltage 0V level in the cars is floating, so shall be avoided an internal connection in the equipment between metallic chassis and the 0V connection; grounding connections in the equipment shall not be connected to car Low Voltage DC power supply.

5.8. ENVIRONMENTAL CONDITIONS

5.8.1. CLIMATIC CONDITION

The systems and equipments of the present document specification shall work properly in the specified climatic conditions (temperature, rain, snow, ice, dust, wind and so on) in particular, ice, sand and snow shall not be cause of malfunction.

General climatic conditions, following the EN 50125-1, are reported in the mentioned General Technical Specification.

5.8.2. VIBRATION AND SHOCK

For shock and vibration, the Contractor shall be able to demonstrate that the equipment is tested and validated according to IEC 61373.

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400070		
		Revision	A		
		Page	23/43		

5.8.3. PROTECTION (IP)

The IP rating of the outer part shall be at least IP30, and the internal part of the component shall be IP00.

5.8.4. ELECTROMAGNETIC COMPATIBILITY (EMC)

The electronic components such as the encoder and the touch sensor, shall comply with the EMC requirements defined in EN 50121-3-2.

5.9. SYSTEM AND COMPONENTS LIFE

The required life shall be equal or greater than 30 years considering the periodical maintenance. In case of any component obsolescence happening during the 30 years lifetime, the upper level LRU may be replaced with an equivalent LRU with identical functionality, dimensions, interfaces and aspect. The Contractor shall detail the obsolescence management plan able to prevent possible service life interruption of the TCMS due to spare parts unavailability.

5.10. MATERIAL REQUIREMENT

5.10.1. GENERAL REQUIREMENTS

Materials shall be suitable to allow the normal maintenance activities without need to adopt special operations including welding, cuts and so one. They shall be suitable for the waste disposal without need of particular care.

Material Safety Data Sheets (MSDS) and all information about safety and health shall be provided, even for consumables like glue and cleaning agents.

The choice of materials shall be done to prevent corrosion in every usage condition.

The Bidder/Contractor shall give the list of every material used together with their offer.

5.10.2. FIRE RESISTANCE BEHAVIOUR

According to TSI LOC&PAS materials requirements for fire resistance behaviour are expressed through the index R(n) described in the standard EN 45545-2, "Table 5". To correctly define the requirement, it is necessary to know the hazard level of the train that, in this case, is HL2.

These requirements for materials depend not only on the component intrinsic nature, but also on the position, shape and layout, surface exposure, relative mass and thickness of the material considered.

To identify the relevant R (n) requirements, in "Table 2" of the standard EN 45545-2 several products and their position on the train are listed.

In the table below the material requirements for the components of the cars are reported.

ÜRA F.005	<i>This Technical Specification cannot be REPRODUCED OR USED for any purposes without the written consent of TÜRASAS</i>	07.04.2016 Rev:02
-----------	--	-------------------

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400070		
		Revision	A		
		Page	24/43		

According to EN45545-1 and EN45545-2 standards, the locomotive hazard level will be HL2 and operation category will be 2N (freight locomotive).

Name	Applicable Product Type (No)	Definition	Details	Requirement
Master controller and ASC lever	EL9	Printed circuit boards	Printed circuit boards without any attached technical equipment	R24 or R25

Table 5 – Material Fire Behaviours

Any material used, even if not included in table above, must meet the requirements specified in Chapter 4 of the EN 45545-2 standard.

The Bidder/Contractor shall adopt materials with required characteristic and identify other materials not mentioned above. The above R(x) list is not definitive; the Bidder/Contractor shall complete it according to the materials used in the scope of supply.

The Bidder/Supplier shall give the list of the inflammable materials used with material type, quantity and fire resistance behaviour tests.

The documentation presented by the Bidder or the Contractor relevant fire performance will be examined for approval by the Notified Body/Designated Body in charge of certification of the Project nominated by the ADMINISTRATION. The Contractor/Bidder shall be responsible to perform all necessary activities which are required by Notified Body/Designated Body.

5.10.3. SMOKE OPACITY AND TOXICITY

All the materials used do not emit toxic gases in such quantities as to be harmful.

The parameters taken as reference for the selection of materials, and the requirements they must meet, are described in "Table 5" of the EN 45545-2 standard with reference to the classification of the hazard level of the LOCO and the set of requirements R(n) to which the material is associated.

5.11. LABELS/MARKING

The system/equipment/components supplied shall be provided with technical markings, in order to fulfil requirements of electrical safety, and provide information to maintenance personnel.

Wherever required for health and safety purposes, including where necessary to comply with legislation, parts shall be fitted with suitable safety and warning signs.

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400070			
		Revision	A			
		Page	25/43			

In particular the parts supplied, including all replaceable parts, shall be identified by a label showing:

- Serial number
- Data of manufacturer
- Date of manufacture
- Contractor's part number (if any)
- Revision level
- Company's part number (if any)

Format and positioning of all labels/markings shall be subject to approval by ADMINISTRATION. Wherever possible, the position shall be such that any company information (Logo and brand etc) cannot be viewed when the relevant part is installed within the vehicle.

All labels shall be permanent and indelible.

TÜRASAŞ Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400070			
		Revision	A			
		Page	26/43			

6. RELIABILITY, AVAILABILITY, MAINTAINABILITY AND SAFETY (RAMS) REQUIREMENTS

The Contractor shall make RAMS analysis according to TB50165.

TÜRASAŞ Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400070		
		Revision	A		
		Page	27/43		

7. TRAINING AND MANUAL

7.1. TRAINING

N/A

7.2. MAINTENANCE MANUAL

7.2.1. MAIN FEATURES OF THE MANUAL

The Contractor shall prepare integrated manual for the operation and maintenance of its scope of supply equipment.

The manual shall contain:

- Supplied system/equipment description
- Preventive maintenance tasks description
- Corrective maintenance tasks description (repair instructions included)
- Information in order to carry out the overhaul of the system/equipment and the heavy repair (if it is repairable and off Loco).

The manual will be used as the basis for LOCO operation and maintenance by Final User staff.

The manual shall be prepared in electronic editable format and the language UK English and Turkish.

The Contractor shall be responsible for ensuring that the maintenance manuals remain up-to-date, accurate, and applicable until the end of the general warranty period of the final delivered product. During this process, the opinions, requirements, and requests communicated by the ADMINISTRATION and/or the End User shall be taken into consideration. The ADMINISTRATION reserves the right to request modifications, corrections, or additions in case the submitted maintenance manuals are found insufficient during its review. The Contractor shall be responsible for carrying out the necessary revisions in a timely and complete manner in line with such requests.

7.2.2. CONTENTS OF THE MANUAL

The manual shall contain as minimum the following information/instructions:

- Description and Operation
 - General description and operation of system/equipment
 - Functional description and operation of all LRU's and components
 - Mechanical and electrical data sheets for all LRU's and components
- Maintenance Activities
 - Preventive Maintenance Plan including the maintenance periodicity (frequency) table for system/equipment.

TÜRASAF Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400070		
		Revision	A		
		Page	28/43		

- Reported information shall be the same of those described by the Preventive Maintenance analysis and be linked with detailed Maintenance Instructions.
- Preventive Maintenance Plan shall report reference to specific/special tools needed for the maintenance works (if used).
- Maintenance Instructions shall report step by step detailed description of each task of the maintenance plan in order to include all information necessary for carrying out the relevant work.
- The Preventive Maintenance Plan shall include all activities foreseen for the system/equipment from daily inspection up to major repair/overhaul.
- Preventive Maintenance Card/Instruction
Each maintenance instruction shall include:
 - Task periodicity
 - Safety warnings
 - Cleaning materials
 - Recommended lubricants
 - Torque values
 - Special tools (if any): as special tool is intended either a tool (hardware and/or software) that is exclusively produced by the Contractor and is essential for system/equipment maintenance, either a tool available on market but expensive, sophisticated, with long lead time and so on
 - Step by step activity description with necessary schemes, drawings and illustrations, including:
 - Scheduled activities (greasing, topping up, visual check, etc)
 - Removal and refitting
 - off- LOCO overhaul
 - Final functional check

The Contractor is responsible to update the maintenance instructions until the end of the general warranty period of the last supplied equipment.

- Corrective Maintenance Card/Instruction
Each maintenance instruction shall include:
 - Trouble shooting
 - Safety warnings
 - Torque values
 - Special tools (if any)
 - Step by step activity description with necessary schemes, drawings and illustrations, including:
 - Removal and refitting
 - off- LOCO repair
 - Failure diagnosis
 - Final functional check

The Contractor is responsible to update the maintenance instructions until the end of the general warranty period of the last supplied equipment.

ÜRA F.005	<i>This Technical Specification cannot be REPRODUCED OR USED for any purposes without the written consent of TÜRASAF</i>	07.04.2016 Rev:02
-----------	--	-------------------

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400070			
		Revision	A			
		Page	29/43			

7.2.3. FORMAT OF THE MANUAL

The format of the Maintenance Manual can vary according to the ADMINISTRATION and the End Client requirements, therefore here following are reported some rules generally applicable.

Specific requests shall be communicated when available.

- The Manual shall report/contain the same references, drawings, schemes, component codes, part numbers, definitions, descriptions, terminology and so on used in the system/equipment configuration and design documentation to guarantee a perfect correspondence and to avoid mismatching during tasks performance.
- In the manual, the parts should be shown by numbering on the exploded picture. Within the scope of this picture, there should be a list consisting of Part No, Stock or Part Code No, Part Name and Quantities.
- It is important to properly identify the LRUs/components by utilizing the same identification name reported by the technical drawings.
- All maintenance manuals shall be prepared electronically and submitted to the ADMINISTRATION via encrypted sharing areas using cloud-based storage. The Contractor is responsible for submitting each new version/revision electronically and retaining revision records for previous versions. No printed copies will be delivered. The Contractor shall deliver two copies of the manuals with two USB flash drives.
- The documentation in electronic format shall be in a completely editable form (Office Word version TBD).
- The PDF format can be used as formal delivery of the documentation (in order to be used as official delivery towards End Client).
- Pictures and photos shall be inserted and not simply linked.
- Photos should be only JPEG format.
- Pictures should be only TIFF format.

Derogations from above listed issues can be discussed and agreed between ADMINISTRATION and the Contractor pending the respect of End Client requirements.

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400070			
		Revision	A			
		Page	30/43			

8. TESTING, INSPECTION AND ACCEPTANCE

The LOCO will be certified in accordance with the latest version of the TSI regulations. If all products and services (including hardware, software, system main and subcomponents) to be procured under the tender are evaluated within the scope of TSI requirements, the Contractor will be responsible for all relevant certifications for the equipment to be provided to NoBo.

8.1. INTRODUCTION TO TEST AND INSPECTION

The Contractor shall perform the tests and the inspection in accordance with the Approved Test Procedure and the Approved Inspection Specification.

ADMINISTRATION and/or End Client have the right to witness any of these tests and inspections at any stage of test and inspection procedure.

All test and inspection documents, as well as final reports—including the verification of design activities and the assessment of any improvements to the checklists, if applicable—shall be submitted to the ADMINISTRATION and shall only become valid upon approval by the ADMINISTRATION.

If the test to be performed is defined as a “type test” within the scope of the TSI, the following principles shall be followed:

- The procedure under the responsibility of the Contractor shall be shared with and approved by the Notified Body (NoBo).
- The test, and relative documentation, shall be done in either an accredited lab, or with the NoBo attendance.
- The test, that will be done on the vehicle, shall be planned in coordination with NoBo (attendance required), Contractor and Administration.

8.2. TYPE TESTS

Type tests are required to verify that the components of the system object of the scope of supply, operate in accordance with the Approved Design Data.

The Contractor shall perform type tests, in accordance with a test procedure approved by ADMINISTRATION.

During testing, the criteria shall be observed and recorded. All alterations, adjustments and maintenance works required by ADMINISTRATION shall be carried out by the Contractor.

The Contractor has the responsibility for the success of mentioned type tests.

At least the following type tests shall be executed:

- Electronic components (encoder and touch sensor)
 - All tests defined by the EN50155 including the EMC tests

ÜRA F.005	<i>This Technical Specification cannot be REPRODUCED OR USED for any purposes without the written consent of TÜRASAS</i>	07.04.2016 Rev:02
-----------	--	-------------------

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400070		
		Revision	A		
		Page	31/43		

- Complete subassembly
 - Visual and dimensional inspection
 - Shock and vibration as per EN61373
 - Functional, mechanical and electrical tests including efforts measurement
 - Dielectric tests as per EN60077-1
 - Climatic tests (including salt mist as per ISO 9227 and thermal shock)

8.3. ROUTINE TESTS

Routine tests are required to verify that the components of the scope of supply have been built in such a way that it satisfies the requirements of the Approved Design Data as verified by the type test.

The Contractor shall perform routine tests in accordance with a test procedure approved by ADMINISTRATION under his responsibility, and, if necessary, with ADMINISTRATION participation.

During tests, the criteria shall be observed and recorded and necessary alterations, adjustments and maintenance works shall be carried out.

Records from routine tests shall be kept by the Contractor and made available timely for ADMINISTRATION and/or End Client's inspection.

All copies of the approved routine test results shall be submitted. Additional copies of records of all tests/inspection results shall also be kept at the Contractor's work to be made available to ADMINISTRATION or their representative on demand.

This test shall include functional test, visual inspection and dimensional inspection, as a minimum. The test details shall be approved.

8.4. FIRST ARTICLE INSPECTION

The Contractor shall perform a First Article Inspection (FAI) of the components of the scope of supply at the Contractor's factory with ADMINISTRATION and/or End Client participation in accordance with an inspection specification issued by ADMINISTRATION and/or End Client, prior to serial production in order to confirm that the hardware & software fully complies with the Contractor's scope of supply design and manufacturing process.

Contractor shall submit FAI test procedure to ADMINISTRATION at least 4 weeks before FAI. If any changes are requested by ADMINISTRATION, Contractor shall comply with these requests.

During the First Article Inspection (FAI), the Contractor shall have available all pertinent documents related to the design and production process, test records, material certifications, etc. Any nonconformities identified during the FAI shall be considered a critical quality defect. If all requirements are not met, a Hardware Review shall be requested. The Contractor shall initiate a System Review process covering the hardware and associated software components, and shall

ÜRA F.005	<i>This Technical Specification cannot be REPRODUCED OR USED for any purposes without the written consent of TÜRASAS</i>	07.04.2016 Rev:02
-----------	--	-------------------

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400070			
		Revision	A			
		Page	32/43			

implement the necessary corrective actions. Upon completion of the System Review, the FAI shall be repeated to verify that the nonconformities have been resolved. The System Review and the repeated FAI shall be carried out in such a manner as not to affect the project delivery schedule.

Upon acceptance of the FAI by ADMINISTRATION and/or End Client, the Contractor is then free to proceed to manufacture all pertinent hardware. The hardware shall meet or exceed the quality standards set at the FAI and must incorporate any comments made by ADMINISTRATION and/or End Client at the FAI.

All domestic and international accommodation and travel expenses (including round-trip international airfare, accommodation, and transportation between workplaces) for all Administration personnel traveling to the Contractor's facilities for First Article Inspections (FAI) will be covered by the Contractor. Administration personnel will participate in First Article Inspections for a maximum of 3 personnel/day.

8.5. CONTRACTOR TECHNICAL ASSISTANCE

The Contractor shall provide all necessary technical support and engineering services for the product covered by the technical specifications and the equipment and sub-components (hardware and software) that constitute this product during the initial installation and commissioning to be carried out at the ADMINISTRATION's facilities. The installation and commissioning procedures, instructions, and step-by-step checklists shall be available for verification and approval during this process, and details shall be finalized during the project process.

The Contractor's support shall cover, at a minimum, installation, connections, configuration, system verification, and commissioning/homologation activities.

If deemed necessary, the Contractor shall actively participate in the installation of the products and sub-components (hardware and software) within the scope of supply on the first locomotive, in the initial system commissioning processes to be carried out at the ADMINISTRATION's facilities, as well as in track tests conducted on the national railway network, test tracks, and/or at the End Client's site. The Contractor shall monitor the performance of the supplied products and sub-components under field conditions and carry out verification/testing activities in coordination with the ADMINISTRATION.

8.6. COMMISSIONING

8.6.1. TYPE COMMISSIONING TEST

If deemed necessary, for the first prototype LOCO, the Contractor shall perform static (factory test on ADMINISTRATION workshop) and dynamic commissioning (on track) tests for the system to adequately demonstrate the requirements of this technical specification, in accordance with a test procedure to be prepared by the Contractor and approved by ADMINISTRATION, under ADMINISTRATION participation.

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400070		
		Revision	A		
		Page	33/43		

8.6.2. ROUTINE COMMISSIONING TEST

On the serial LOCOs, routine commissioning test for the system will be performed by ADMINISTRATION in workshop and service track under the Contractor's responsibility.

9. AUTHORIZATION TO START PRODUCTION

The Administration will authorize the Contractor to start production according to the following stages.

9.1. DESIGN FREEZING

At the design freeze stage, the design data, interface definitions, technical drawings, and engineering calculations of all systems, subsystems, and components developed under the scope of this contract shall be finalized in compliance with the relevant specification clauses and the referenced national and international standards.

The design freeze process shall be carried out in accordance with the project schedule. The Contractor shall be responsible for submitting to the Administration, in a complete and timely manner, all documents required for the Design Freeze, including but not limited to the final design data, technical drawings, and interface definitions.

9.2. AUTHORIZATION TO START PRODUCTION

According to the final design criteria mutually agreed upon as a result of the design freeze meetings, the Contracting Authority will authorize the Contractor to manufacture the first product(s) within the scope of supply.

9.3. AUTHORIZATION TO START MASS PRODUCTION

The Contractor will be authorized by the Administration to start mass production after the FAI (First Product Inspection) is performed on the first product(s) produced.

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400070			
		Revision	A			
		Page	34/43			

10. ACCEPTANCE

The acceptance report will be issued by the ADMINISTRATION after the following conditions have been met:

- ✓ Complete delivery of the products and sub-components (hardware/software) within the scope of supply
- ✓ Demonstration of compliance with all standards and technical requirements defined in this technical specification and its annexes, supported by conformity declarations, inspection, and test reports
- ✓ Complete submission of documentation to the ADMINISTRATION by the Contractor
- ✓ Successful execution of the locomotive system's on-track tests (commissioning type tests)
- ✓ Successful completion of the approval process by the NoBo/DeBo

Acceptance of the first product shall not be construed as acceptance of the entire quantity requested. Each item of the contract shall be evaluated individually, and acceptance shall be carried out separately for each item.

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400070		
		Revision	A		
		Page	35/43		

11. PACKAGING AND STORAGE CONDITIONS

11.1. PACKAGING

The products and all their sub-components (hardware/software) shall be delivered in suitable packaging with sufficient strength to withstand impacts and transport damage, including effects from climatic conditions such as dust, rain, snow, sun, wind, etc.

Packaging boxes shall be stackable and suitable for lifting by forklift (where reasonably applicable) or overhead crane.

Even if the products cannot be mounted on the locomotive promptly and are stored for long periods (e.g., up to three years) without use, they shall be delivered in packaging that fully protects them from any damage.

All packaging and crates shall carry the following information in a clear, legible, and weather-resistant manner:

- Manufacturer's name, address, and registered logo
- Product name, part number, and technical specification number
- Serial number and manufacturing date (if applicable)
- Contract number and date
- Quantity of products in the package and serial numbers of components
- Batch number (if applicable)
- "Project No: XXXXXX" statement

If a box contains multiple components:

- Each component shall be labeled separately.
- A component list shall be included inside and outside the box/create.
- Lists shall be finalized with the ADMINISTRATION's approval.

Systems/equipment/components:

- Shall be packaged in sets required to produce one locomotive.
- Packages shall be arranged separately for mechanical and electrical production lines.
- Package lists shall be finalized upon the ADMINISTRATION's approval, and a copy shall be provided to the ADMINISTRATION prior to shipment.

Products and all their sub-components (hardware/software) shall be wrapped in appropriately thick bubble wrap, secured to wooden crates, and delivered on pallets. Crate weights shall not exceed 400–500 kg. Deliveries shall be made, at the Contractor's own expense, to TÜRASAS Eskişehir Regional Directorate.

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400070			
		Revision	A			
		Page	36/43			

If packaging or delivery documents are missing or non-compliant, the situation shall be recorded in a report, and the products shall be returned to the Contractor without acceptance. If the returned materials are reshipped after the contractual delivery date, delay penalties shall apply. The Contractor shall not be entitled to any claims due to delays caused by packaging.

11.2. STORAGE CONDITIONS

The Contractor shall provide any useful information it is deemed necessary for the correct storage of the goods delivered.

In addition, the necessary conditions and procedures to be applied in order to prevent damage to the products stored in warehouses without being used for a long time will be delivered by the Contractor in detail.

11.3. MOUNTING AND HANDLING

All the components shall be supplied ready for installation and possibly already mounted and pre-regulated. Special care is requested to the Contractor to list all the necessary tools for mounting and maintenance.

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400070		
		Revision	A		
		Page	37/43		

12. DOCUMENTS TO BE DELIVERED TO THE ADMINISTRATION ALONG WITH THE PRODUCT/EQUIPMENT

The following tables report the list of requested documents (with schedule) to be supplied to ADMINISTRATION.

Table 6 shows the documentation which shall be given by the Bidders in the offer phase.

Table 7 and Table 8 show the documentation which shall be provided by the Contractor for the Preliminary Technical Review and the Detail Technical Review respectively.

Id.	Stage 1 -OFFER Phase	Time Schedule	Language
1.1	Clause by Clause commentary of present Technical Specification	With offer	Turkish and English
1.2	Scope of supply list		Turkish and English
1.3	General description of the proposed system, including all the characteristics and functionalities and technical documentation and information requested in this specification as preliminary		Turkish and English
1.4	Preliminary 3D models or installation drawings showing the main external space envelope		English
1.5	Preliminary applicable schemes		Turkish and English
1.6	Preliminary definition of main I/F characteristics with the other LOCO systems		Turkish and English
1.7	List of tests (FAI, routine, type, commissioning and homologation) that shall be performed on components and systems		English
1.8	Declaration of Conformity to applicable standards according to EN17050		English
1.9	EC Declaration of Conformity according to the TSI LOC&PAS 1302 if the scope of Supply is considered “Interoperability Constituent”		English
1.10	IRIS or ISO9001 Certification of the Bidder (If the Bidder is an agency of the manufacturer, the Bidder shall show the manufacturer’s certificate)		English
1.11	List of special tools and test equipment		Turkish and English
1.12	Project schedule, in line with project milestones		Turkish and English
1.13	Sub Contractor List		English
1.14	Detailed part list with price information of each part		Turkish and English
1.15	Delivery time from order		English
1.16	Escalation formula for spare parts		English
1.17	Explanation on how to pack in pieces		Turkish and English

Table 6 – Stage 1 Offer Phase: List of Requested Documents and Due Date

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400070		
		Revision	A		
		Page	38/43		

Id.	Stage 2 - PRELIMINARY Review	Time Schedule	Language
2.1	First level drawings with weight and centre of gravity indications in 3D and 2D formats	Within one month after signing the contract	English
2.2	Technical description of the system, with system characteristics and performance		English
2.3	Functional description (normal and degraded mode) of the system, included diagnostic description		English
2.4	Design justification analysis reports		English
2.5	Definition and specification of applicable I/F's characteristic (mechanical, pneumatics, electrical, signals, I/O data, etc.)		English
2.6	Certificates of the fire smoke behaviour of non-metal materials and electric cables		English
2.7	Certificates of behaviour versus applicable emissions requirements		English
2.8	Preliminary applicable analysis reports (performance, consumptions, structural strength, etc.)		English

Table 7 – Stage 2 List of Requested Documents and Due Date

Id.	Stage 3 - DETAIL Review	Time Schedule	Language
3.1	Definitive drawings with weight and centre of gravity indications in 3D and 2D format	Within one month before FAI	English
3.2	Definitive schemes		English
3.3	Installation drawings		English
3.4	Installation instruction		Turkish and English
3.5	Detailed description of the supplied components or systems		Turkish and English
3.6	All the technical documentation and information requested during the project (including final version of documents of previous stages)		Turkish and English
3.7	Procedures of tests (FAI, routine, type, commissioning and homologation) performed on components and systems		Turkish and English
3.8	Available reports of tests (routine, type, commissioning and homologation) performed on components and systems		English
3.9	List of special tools and test equipment		Turkish and English
3.10	LRU list		Turkish and English
3.11	Spare Parts and Equipment List (including order codes)		Turkish and English
3.12	Servicing and lubricating table		Turkish and English
3.13	Final documentation for certification		Turkish and English
3.14	EC Certification according to the TSI LOC&PAS 1302 if the scope of supply is considered "Interoperability Constituent"		English
3.15	RAMS and LCC documentation: see dedicated paragraphs		Turkish and English
3.16	User Manuals		Turkish and English
3.17	Maintenance Manuals (including periodic maintenance schedule, failure repair documentation)		Turkish and English
3.18	Calculations, tests and analysis report requested by TSI		Turkish and English
3.19	3.1 certificates of the product/equipment according to EN 10204		English
3.20	Documents showing compliance to EN 45545-2 (Certificate of Conformity, Test Report etc.)		Turkish and English
3.21	Warranty documentation		Turkish and English

Table 8 – Stage 3 List of Requested Documents and Due Date

ÜRA F.005	<i>This Technical Specification cannot be REPRODUCED OR USED for any purposes without the written consent of TÜRASAS</i>	07.04.2016 Rev:02
-----------	--	-------------------

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400070			
		Revision	A			
		Page	39/43			

The Bidder/Contractor shall review and confirm the above lists of documents for all the phases of the project. Any deviation shall be submitted to ADMINISTRATION for approval.

The documents specified in Stage 3 shall be delivered to the Administration both before the FAI and together with the product/equipment.

The documents to be delivered by the Contractor in Stage 1 and Stage 3 will be provided to the Administration in 2 (two) USBs.

Notes:

- All components, including their sub-elements (cables, connectors, etc.), shall be provided as complete 3D models in “.step” format. Connectors shall be prepared separately from the 3D model to allow their use in harness design.
- 2D drawings shall be provided in “.dwg or .dxf” format (plus PDF).
- Electrical schematics shall preferably be provided in EPLAN Electric P8 format; alternatively, in .dwg/.dxf format (plus PDF).
- All documents shall be provided in editable format as well as in PDF.
- In case both Turkish and English are used in the documents, the Turkish version shall be considered authoritative.
- Documents shall be delivered in a format compatible with the ADMINISTRATION’s PLM system.
- All documents shall be prepared electronically and delivered to the ADMINISTRATION via cloud-based storage with secure access. After each update, relevant parties shall be notified by email in accordance with the communication matrix. Alternatively, the digital documents may be delivered on two copies of portable storage media.
- 3D design of electrical equipment and cables shall be provided in Catia Electric format (plus PDF) and/or in EPLAN Pro Panel or EPLAN Harness format.

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400070		
		Revision	A		
		Page	40/43		

13. INTELLECTUAL AND INDUSTRIAL PROPERTY ISSUES

The following issues should be taken in account:

1. Any projects or documents shared with the Contractor within the scope of the work subject to the tender shall not be used for any other purpose. The Contractor shall share all technical information only with the Administration.
2. Administration shall be authorized, under the administrative contract, to use the products to be supplied by the Contractor (right of usage) – without prejudice to any mandatory legal provisions applicable and without any detriment to the Contractor’s dignity and reputation.
3. In case of proven violation of an intellectual and/or industrial property right by the Contractor, the Contractor shall be liable for any direct, reasonable and properly documented damages resulting directly from such violation. If the Administration faces legal sanctions, it is allowed to recourse such sanctions to the Contractor within the scope of liability of the Contractor mentioned above, limited to the contract price. Upon the request of the Administration, the Contractor is obliged to fully inform and certify to the Administration whether the service to be undertaken is a matter of intellectual and industrial property.
4. This technical specification is a part of the contract between the Contractor and the Administration. The Contractor does not have the authority to distribute this document or any part of it to third parties without the approval of the Administration.
5. If an official document is requested and mutual communication causes any mistake; all possible information requests and their responses shall be made in written format and via e-mail.

14. WARRANTY

14.1. WARRANTY CONDITION

The Contractor shall warrant the quality of the products supplied under this Specification against failures, malfunctions, assembly and workmanship defects, except for cases arising from natural wear and tear and maintenance neglect; for a period of 400,000 km of operation or 24 months from the commissioning date of LOCO, or 36 months from the delivery date of the products to the ADMINISTRATION, whichever expires first.

The responsibility of performing preventive maintenance on the normally used parts and the protective maintenance in cases where it is evidently clear that the root cause is not the own malfunctions of the unit, shall belong to ADMINISTRATION.

Throughout the warranty period, following the notification by ADMINISTRATION of any malfunction, the Contractor shall respond to that malfunction within three (3) working days and replace the malfunctioning parts and equipment or repair and fix the malfunction. The Contractor shall make available in Turkey throughout the warranty period the required service facilities in order

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400070		
		Revision	A		
		Page	41/43		

to respond to the possible malfunctions and a sufficient number of spare parts or fully complete equipment within this time period.

Responsibility for making sure that none of the information, document, certificate, component, system, machine, software, technology and design the Contractor supplies to the Administration violates any brand, patent or third-party ownership rights belongs to the Contractor.

The Contractor company shall provide a 10 (ten) year service and spare parts guarantee, valid from the end of the warranty period.

14.2. SYSTEMATIC FAULT / EPIDEMIC FAILURE

Upon commissioning of the first locomotive, any failures that occur repeatedly and in a non-random manner under specific conditions or inputs during the warranty period shall be considered systematic failures.

Additionally, after the mass-production locomotives have been put into operation and during the warranty period, if a failure within the scope of the warranty occurs in more than 15% of the same part/component in the first 24 locomotives, or in more than 10% of the same part/component in the 25th and subsequent locomotives, due to the same reason, it shall be considered an “epidemic failure”.

Records of systematic failures shall be kept for a period of 24 months following the commissioning of the locomotive.

In addition, if mean time between failures (general average failure time) for the failures occurring in main components/parts used in all locomotives within annual periods during the guarantee term is shorter than guaranteed MDBF or MTBF value, such failure shall be deemed as an epidemic failure.

In case systematic/epidemic failures are confirmed, the necessary investigations shall be carried out in order to define an appropriate technical solution, including spare part replacement or modification, and a new warranty period for the solution defined within this scope shall be agreed with the ADMINISTRATION.

The CONTRACTOR shall perform, within the period specified by ADMINISTRATION, all necessary reinforcement, modification, material replacement, assembly and disassembly works required for the elimination of systematic/epidemic failures, at its own expense.

The expiration of the warranty period shall not relieve the CONTRACTOR of its obligations related to the subject matter of the contract. The CONTRACTOR shall remain responsible for remedying the systematic failures recorded by mutual agreement at the end of the warranty period.

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400070			
		Revision	A			
		Page	42/43			

15. OTHER ISSUES

Following points have to be considered:

1. For matters not specified in the technical specification, the administrative specification shall apply.
2. The Contractor is responsible for all transportation costs.
3. The Contractor is responsible for work accidents that may occur during the work of the Contractor personnel at ADMINISTRATION facilities.
4. The food and accommodation costs of the Contractor personnel belong to the Contractor.
5. The Contractor must comply with T.B. 2348 in its work within the boundaries of ADMINISTRATION facilities.
6. The Contractor must comply with the safety, protective safety, occupational health and safety instructions and provide the protective materials required by the work and follow their use.
7. The Contractor must comply with all kinds of warnings, signs and writings within the boundaries of ADMINISTRATION facilities.
8. All software used by the Contractor (Computer Aided Design Programs (CATIA, AutoCAD etc.), MS Office, FEM Analysis Programs etc.) will be licensed. All responsibility in this regard belongs to the Contractor.
9. The Contractor is responsible for all kinds of damages and losses to ADMINISTRATION or third parties in relation to the obligations fulfilled within the scope of the work subject to the tender.

TÜRASAS Eskişehir Regional Directorate	TECHNICAL SPECIFICATION	Document No	TS400070			
		Revision	A			
		Page	43/43			

16. ANNEXES AND NOTES

N/A