BSI Standards Publication

Railway applications — Functional Interface Specification — Door System

bsi.

...making excellence a habit.™

National foreword

This Published Document is the UK implementation of CLC/TR 50623:2014.

The UK participation in its preparation was entrusted to Technical Committee GEL/9, Railway Electrotechnical Applications.

A list of organizations represented on this committee can be obtained on request to its secretary.

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

This Published Document was published under the authority of the Standards Policy and Strategy Committee on 31 July 2014.

Amendments/corrigenda issued since publication

Date	Text affected

TECHNICAL REPORT

RAPPORT TECHNIQUE

TECHNISCHER BERICHT

CLC/TR 50623

June 2014

ICS 35.240.60; 45.060.20

English Version

Railway applications - Functional Interface Specification - Door System

Applications ferroviaires - Spécification d'interface
fonctionnelle - Système de porte

To be completed

This Technical Report was approved by CENELEC on 2014-06-02.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

Contents

Figures

Tables

Foreword

This document (CLC/TR 50623:2014) has been prepared by WG15 of CLC/TC 9X "Electrical and electronic applications for railways".

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC [and/or CEN] shall not be held responsible for identifying any or all such patent rights.

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association.

1 Scope

This Technical Report is covering the whole external door system which includes also movable steps and ramps.

It describes the functional interfaces of door system connected at vehicle level to the TCMS. It includes the direct I/O interface to train-lines.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 61131-3:2013, *Programmable controllers - Part 3: Programming languages (IEC 61131-3:2013)*

UIC 556, *Information transmission in the train (train-bus)*

UIC 558, *Remote control and data cable - Standard technical features for the equipping of RIC coaches*

3 Terms, definitions and abbreviations

For the purposes of this document, the following terms, definitions and abbreviations apply.

3.1 Terms and definitions

3.1.1
configuration
action that affects the system function

3.1.2
conventional train-lines
train lines that are described in the UIC leaflet 558

3.1.3
parameterisation
action that affects the system behaviour

3.1.4
released door
door enabled to act on passenger commands. A door is released by the given release command from driver or train crew and the proper speed condition is achieved (VeryLowSpeed)

3.2 Abbreviations

All the abbreviations used in this document are listed in Table 1, in alphabetic order referenced to their term.

Table 1 - Abbreviation table

Abbreviation	Term
FBS	Functional Breakdown Structure
FIS	Functional Interface Specification
I/O	Input/Output
PBS	Product Breakdown Structure
RAMS	Reliability, Availability, Maintainability, Safety
TCMS	Train Control & Monitoring System
UML	Unified Modelling Language
UTC	Universal Time Coordinated (time scale)

4 Doors reference architecture

The door reference architecture is shown in Figure 1.

The door system has a network interface with the TCMS and is as well connected to the conventional train-lines to transmit safety critical signals. This document describes the interface between TCMS and one single door.

direct I/O interface:

[in] „stand still", „very low speed", „low speed" (option)

External Door System

TCMS PBS

TCMS vehicle bus interface
direct trainline interface :
[in] „release all right doors", „release all left doors"
[out] "Door closed and locked"

conventional train-lines
(acc. to [558])
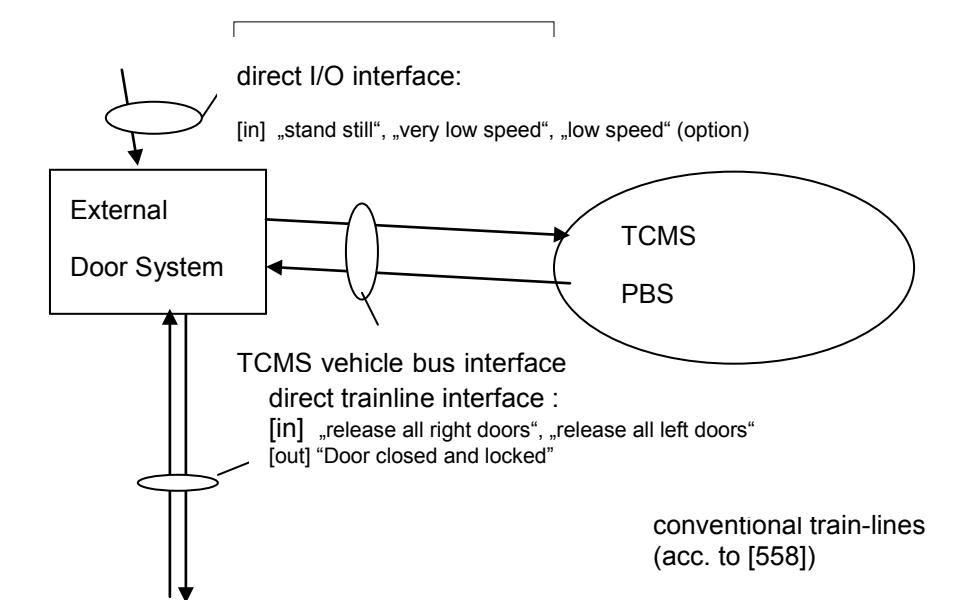
Figure 1 - Door reference architecture

5 Functional description

5.1 General

In this subclause are described the door functions external to the TCMS, which exchange information with the TCMS over the interface.

The here described interface is a basic standard interface with possibilities of extension (parameters and services can be added).

If not especially mentioned for each parameter a Set and a Get service is provided.

The function types which are considered are the following:

- Functions for parameterisation;

- Functions for control;

- Functions for monitoring;

- Functions for diagnostics;

- Functions for service.

5.2 Specific requirements on functional interfaces

If deemed useful, the static description of data are completed by:

- Dynamic description, with sequence diagrams, possibly using several interfaces identified in the reference architecture, for normal and degraded modes. These diagrams may contains timing requirements (such as time between the command set to TCMS and notification to remote actuators);

- RAMS requirements to the communication and processing in the TCMS;

- Any other relevant item;

- The physical layer shall be defined later.

5.3 Door

5.3.1 General

Figure 2 shows the UML model of the door control unit and the interface to the TCMS.

Figure 3 shows the UML diagram of the interfaces of the overall door control unit.
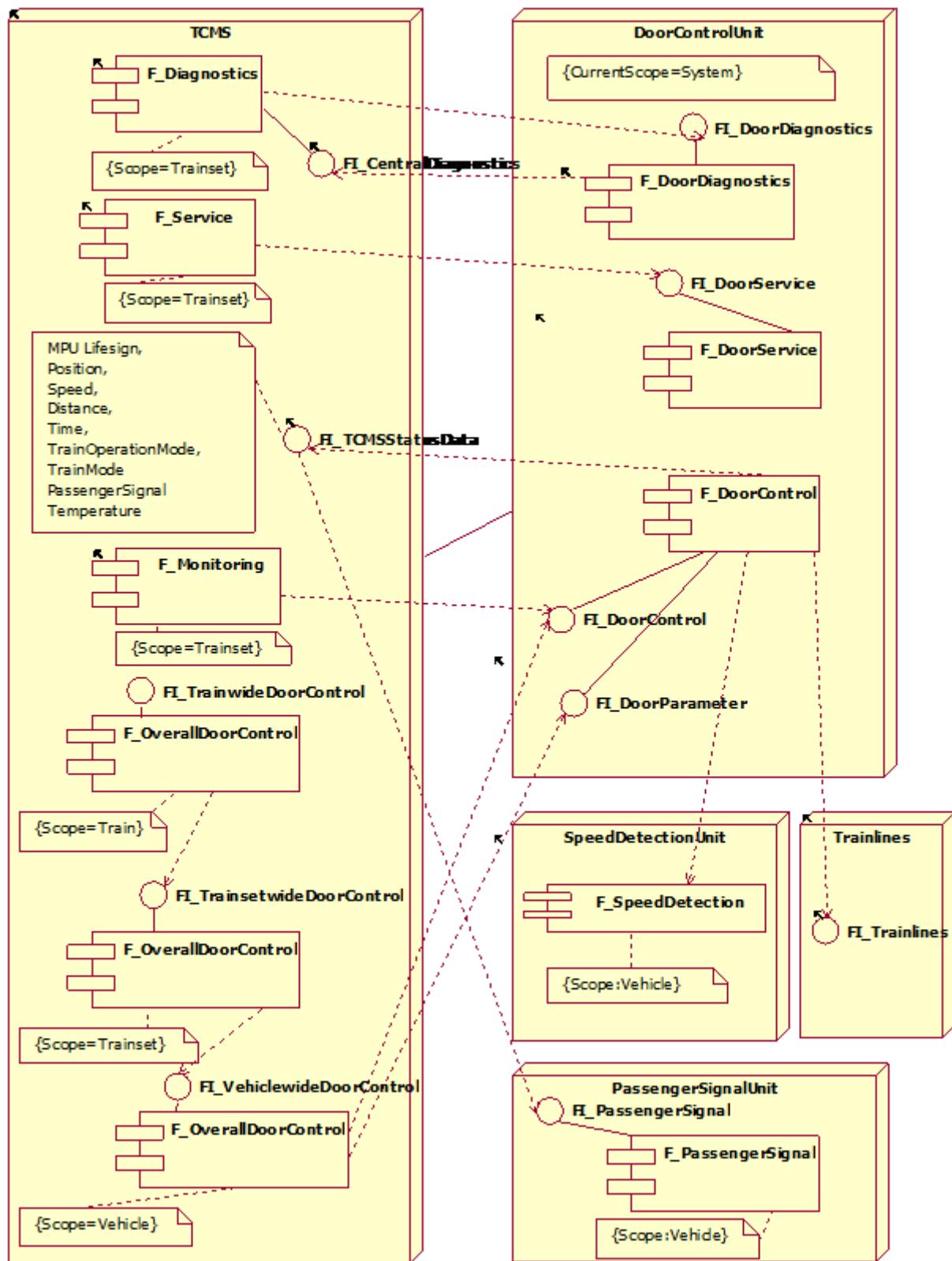
Figure 2 - Door control unit reference model
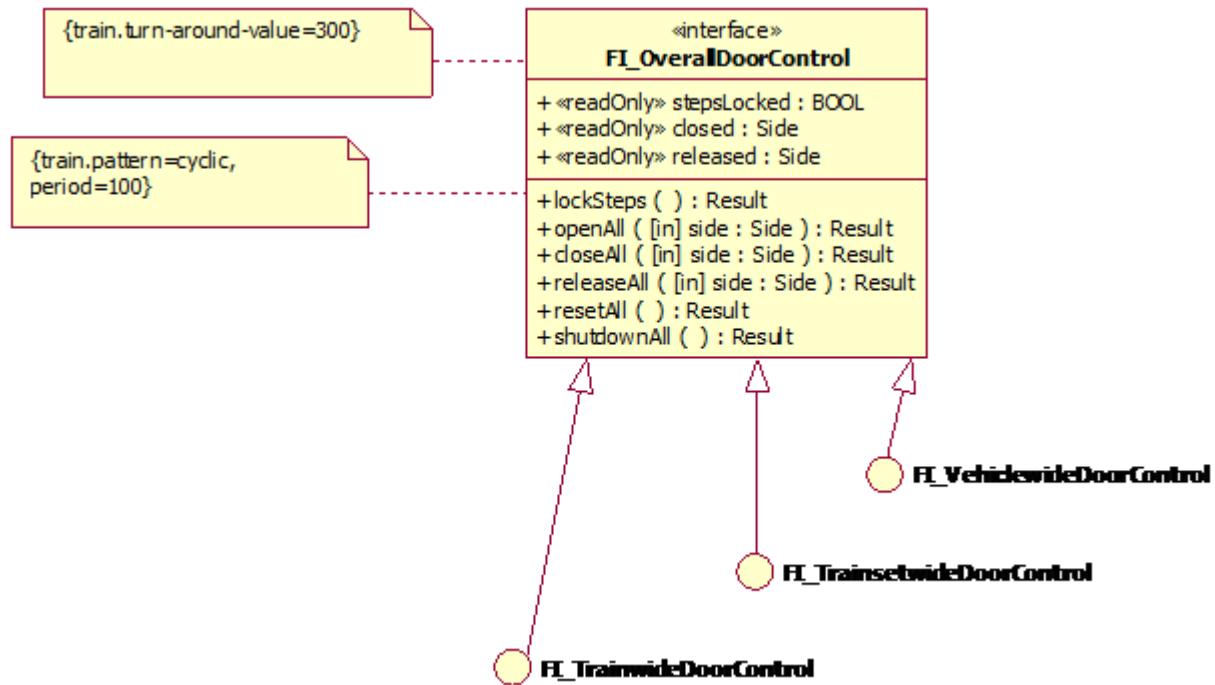
Figure 3 - overall door control unit interfaces

5.3.2   Types

5.3.2.1   General

Figure 4 shows the UML diagram of the door system data types.
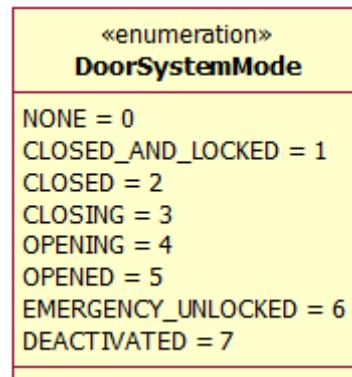
Figure 4 - door system data types

5.3.2.2 <Enumeration> DoorSystemMode

Table 2 lists the door system modes reporting the assigned value and the description.

Table 2 - Door system modes

Literal	Value	Description
NONE	0	Initial state
CLOSED_AND_LOCKED	1	door closed and mechanically locked
CLOSED	2	door completely closed, ramps and steps moved in
CLOSING	3	door in closing procedure and/or steps moving in
OPENING	4	door in opening procedure and/or steps moving out
OPENED	5	door completely opened and steps moved out
EMERGENCY_UNLOCKED	6	door unlocked to be opened manually
DEACTIVATED	7	door closed and locked by square key

5.3.3 Control and Parametrisation

5.3.3.1 General

Figure 5 shows the control and parametrisation interfaces of the door system.

The control is supported by services and parameters to influence the behaviour of the system in a wanted way. The door control and parametrisation functionality uses the TCMS interface to get the relevant train information (e.g. train mode, time, position).

«interface»
FI_PassengerSignal

+ «readOnly» alarm : BOOL
+ «readOnly» stopRequest : BOOL

{train.turn-around-value=300}

«interface»
FI_DoorParameter

- timeDelayAfterReversing : USINT
- numberOfReversings : USINT
- automaticDoorClosing : BOOL
- holdOpenTime : USINT

+ IsAutomaticDoorClosing ( )
+ GetTimeDelayAfterReversing ( )
+ GetNumberOfReversings ( )
+ GetHoldOpenTime ( )
+ SetHoldOpenTime ( )
+ SetNumberOfReversings ( )
+ SetTimeDelayAfterReversing ( )
+ SetAutomaticDoorClosing ( )

{trainset.turn-around-value : 1000}

«enumeration»
Result

OK = 0
NOT_VALID = 1
NOT_SUPPORTED = 2
ERROR = -1

«interface»
FI_DoorControl

+ «readOnly» systemLifesign : UINT
+ «readOnly» specificSystemMode : DoorSystemMode
+ «readOnly» closed : BOOL
+ «readOnly» released : BOOL
+ «readOnly» stepsLocked : BOOL
+ «readOnly» openingDisabled : BOOL
+ «readOnly» obstacleDetected : BOOL

+ Close ( )
+ Open ( )
+ Release ( )
+ SetLockSteps ( )
+ SetDisableOpening ( )

{trainset.pattern = periodic, trainset.period = 100}

{trainset.turn-around-value=300}

«enumeration»
DoorSystemMode

NONE = 0
CLOSED_AND_LOCKED = 1
CLOSED = 2
CLOSING = 3
OPENING = 4
OPENED = 5
EMERGENCY_UNLOCKED = 6
DEACTIVATED = 7

«enumeration»
GeneralSystemMode

OFF = 0
NORMAL = 1
DEGRADED = 2
OUT_OF_ORDER = 3
INITIALISATION = 4
READY_FOR_SHUTDOWN = 5
SHUTDOWN = 6
ISOLATED = 7
STANDBY = 8
PASSIVE = 9
TEST = 10
APPLICATION_SUSPENDED = 11
RESET = 12

{trainset.pattern = periodic, trainset.period = 300}

{turn-around-value=300}

«interface»
FI_GeneralSystemMode

+ «readOnly» generalSystemMode : GeneralSystemMode

+ SetGeneralSystemMode ([in] mode : GeneralSystemMode) : Result

Figure 5 - Door control and parametrisation interfaces

5.3.3.2 <Interface> FI_DoorControl

Table 3 lists the door control system interface attributes.

Table 3 - Door control system interface attributes

Attribute	Visibility	Type	Description
systemLifesign	0 - PUBLIC	UINT	<<readOnly>> Lifesign of the door system, set to 0 after reset and incremented each application cycle. Operational read only parameter provided for other systems.
specificSystemMode	0 - PUBLIC	DoorSystemMode	<<readOnly>> Specific system operation mode – typically as an additional specific mode inside the general system modes. Read only parameter provided to other systems
closed	0 - PUBLIC	BOOL	<<readOnly>> Door closed information to influence the respective trainline.
released	0 - PUBLIC	BOOL	<<readOnly>> Door is able to react on passenger commands
stepsLocked	0 - PUBLIC	BOOL	<<readOnly>> Steps are locked and not operated together with the door.
openingDisabled	0 - PUBLIC	BOOL	<<readOnly>> To prevent door opening for selected doors.
obstacleDetected	0 - PUBLIC	BOOL	<<readOnly>> Status information This signal may happen while closing the door and when the door is closed and locked. Operational read only parameter provided for other systems.

Table 4 lists the door control system interface operation commands.

Table 4 - Door control system interface operation commands

Operation	Visibility	Parameter	Description
Close	0 - PUBLIC	(3 - RETURN) : Result	Service for central door closing
Open	0 - PUBLIC	(3 - RETURN) : Result	Service for central door opening
Release	0 - PUBLIC	(3 - RETURN) : Result	Service for central door and steps releasing, that makes the door ready to react on local open and close commands given via the passenger HMI
SetLockSteps	0 - PUBLIC	(0 - IN) lock: BOOL (3 - RETURN) : Result	Leading signal by trainline.
SetDisableOpening	0 - PUBLIC	(0 - IN) disabled: BOOL (3 - RETURN) : Result	To prevent door opening for selected doors .

5.3.3.3 <Interface> FI_DoorParameter

Table 5 lists the door control system interface functional parameters.

Table 5 - Door control system interface functional parameters

Parameters	Visibility	Type	Description
timeDelayAfterReversing	2 - PRIVATE	USINT	Time delay in seconds between before a door closing after a previous reversing.
numberOfReversings	2 - PRIVATE	USINT	Maximum number of door reversing.
automaticDoorClosing	2 - PRIVATE	BOOL	Enabling/Disabeling the automatic door closing after DoorHoldOpenTime.
holdOpenTime	2 - PRIVATE	USINT	Time in seconds until automatic door closing. 255 = Automatic door closing disabled.

Table 6 lists the door control system interface operation relevant to the functional parameters.

Table 6 - Door control system interface operation

Operation	Visibility	Parameter	Description
IsAutomaticDoorClosing	0 - PUBLIC	(3 - RETURN) result: BOOL	Get automatic door closing parameter.
GetTimeDelayAfterReversing	0 - PUBLIC	(3 - RETURN) delay: USINT	
GetNumberOfReversings	0 - PUBLIC	(3 - RETURN) numReversings: USINT	
GetHoldOpenTime	0 - PUBLIC	(3 - RETURN) holdOpenTime: USINT	
SetHoldOpenTime	0 - PUBLIC	(0 - IN) time: USINT (3 - RETURN) : Result	Time in seconds until automatic door closing. 255 = Automatic door closing disabled.
SetNumberOfReversings	0 - PUBLIC	(0 - IN) reversings: USINT (3 - RETURN) :	Time in seconds until automatic door closing. 255 = Automatic door closing disabled.

Operation	Visibility	Parameter	Description
		Result	Used for parameterisation, set by TCMS.
SetTimeDelayAfterReversing	0 - PUBLIC	(0 - IN) delay: USINT (3 - RETURN) : Result	Time delay in seconds between before a door closing after a previous reversing Used for parameterisation, set by TCMS.
SetAutomaticDoorClosing	0 - PUBLIC	(0 - IN) automaticClosing : BOOL (3 - RETURN) : Result	Enabling/Disabeling the automatic door closing after DoorHoldOpenTime. Used for parameterisation, set by TCMS.

5.3.3.4 <Interface> FI_PassengerSignal

Table 7 lists the passenger signal functional interface relevant to the door control system.

Table 7 - Passenger signal functional interface

Attribute	Visibility	Type	Description
alarm	0 - PUBLIC	BOOL	<<readOnly>> Passenger alarm: depending on the train position and speed it will lead to an emergency brake. Operational read only parameter provided for other systems.
stopRequest	0 - PUBLIC	BOOL	<<readOnly>> Stop at next station requested Operational read only parameter provided for other systems
helpRequest	0 - PUBLIC	BOOL	<<readOnly>> Passenger alarm: depending on the train position and speed it will lead to an emergency brake. Operational read only parameter provided for other systems.

5.3.4   Diagnostics

5.3.4.1 General

Diagnostics functionality is supported by functions that identifying a malfunction of the system by the result of different diagnostic procedures. In Figure 6 are just mentioned functionalities that are additional to those treated in the FIS Diagnostic.

Further services needed for TCMS diagnostics support are defined in the train diagnostics system specification.
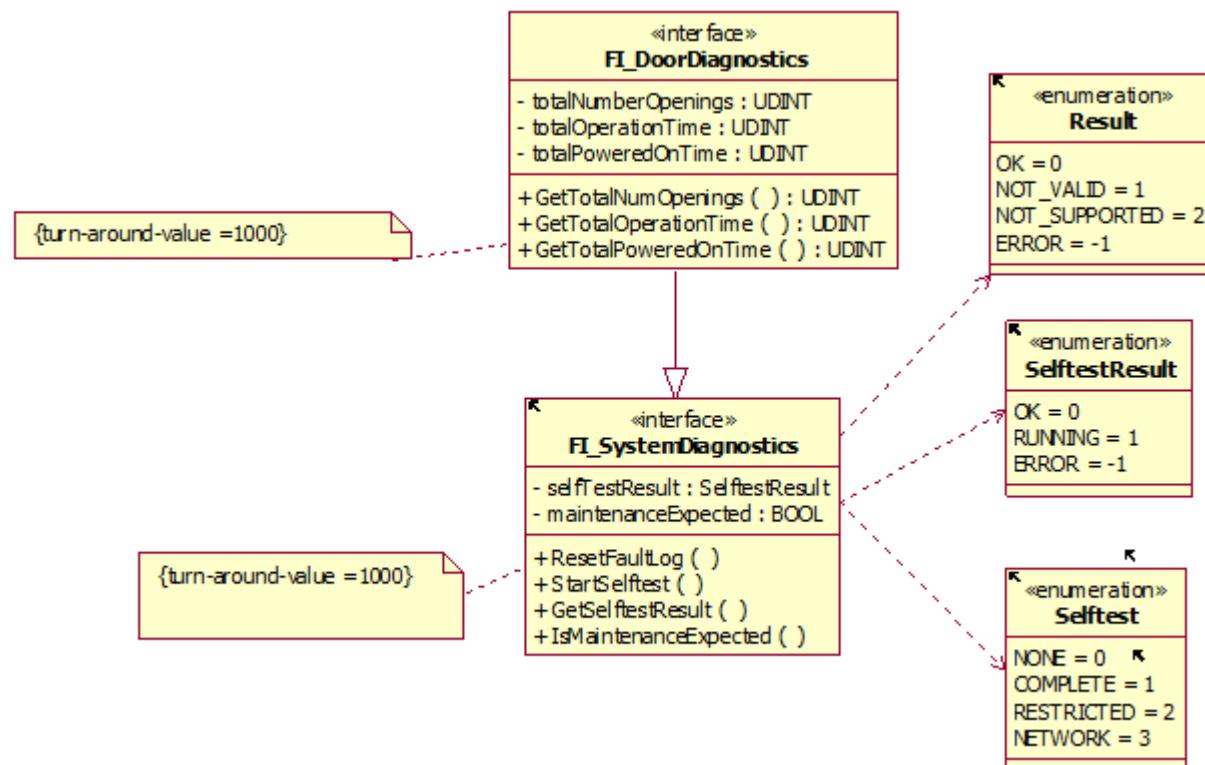
Figure 6 - Door diagnostics interfaces

5.3.4.2 <Interface>   FI_DoorDiagnostics

Table 8 lists the diagnostic attributes of the door control system functional interface.

Table 8 - Door control system diagnostic attributes

Attribute	Visibility	Type	Description
totalNumberOpenings	2 - PRIVATE	UDINT	
totalOperationTime	2 - PRIVATE	UDINT	Counter to specify the total operation time in seconds.
totalPoweredOnTime	2 - PRIVATE	UDINT	Counter to specify the total powered on time in seconds.

Table 9 lists the diagnostic operation of the door control system functional interface.
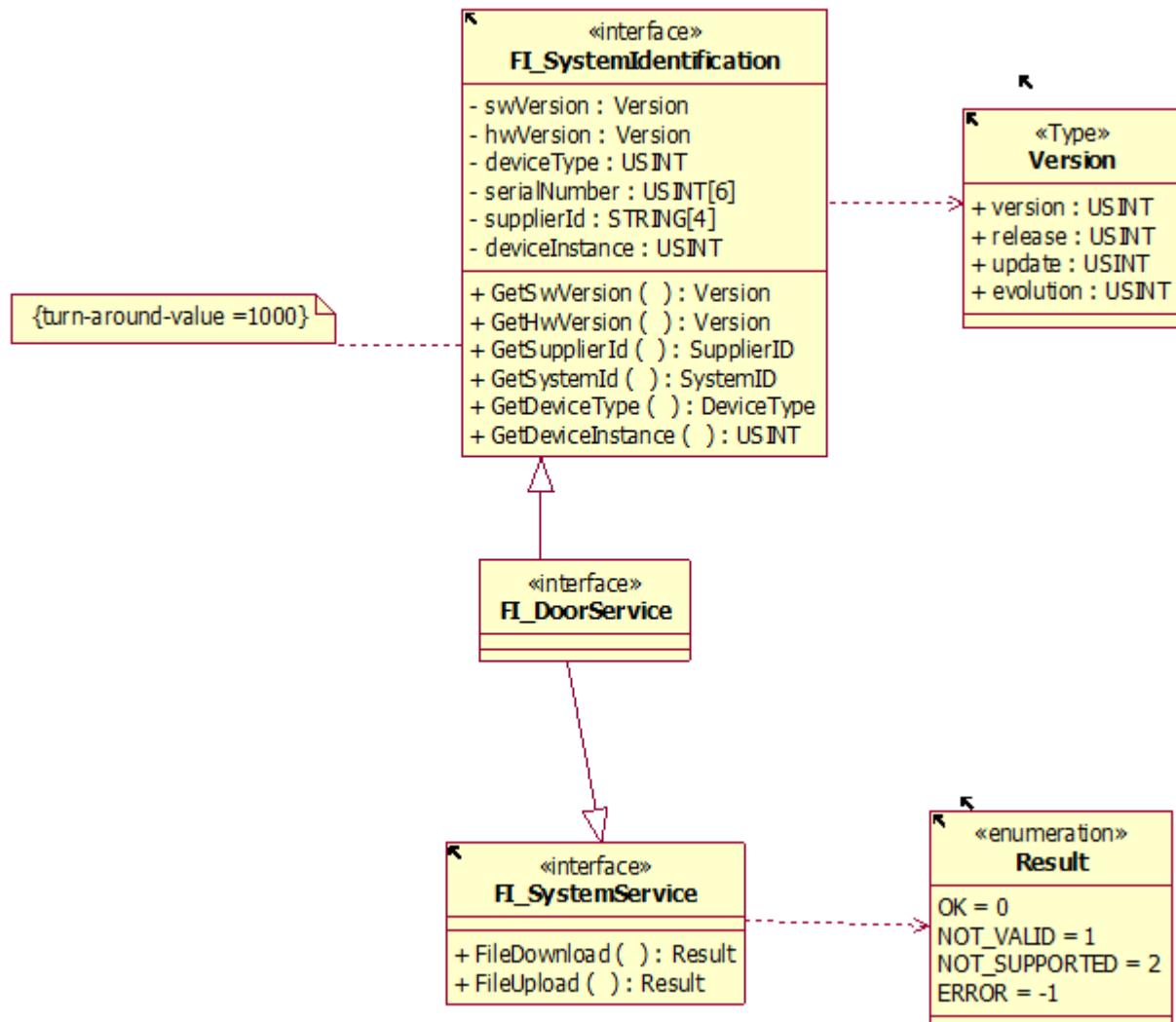
Table 9 - Door control system diagnostic operation of the functional interface

Operation	Visibility	Parameter	Description
GetTotalNumOpenings	0 - PUBLIC	(3 - RETURN) result: UDINT	Counter to specify the total number of door openings Diagnostics read only parameter provided for other systems.
GetTotalOperationTime	0 - PUBLIC	(3 - RETURN) result: UDINT	Counter to specify the total operation time of the door in seconds. Diagnostics read only parameter provided for other systems.
GetTotalPoweredOnTime	0 - PUBLIC	(3 - RETURN) result: UDINT	Counter to specify the total powered on time of the door in seconds. Diagnostics read only parameter provided for other systems.

5.3.5 Service

5.3.5.1 General

Service functionality, shown in Figure 7, includes services for commissioning and maintenance of the system such as e.g. software download, system diagnostics access, system configuration.

«interface»
FI_SystemIdentification

- swVersion : Version
- hwVersion : Version
- deviceType : USINT
- serialNumber : USINT[6]
- supplierId : STRING[4]
- deviceInstance : USINT

+ GetSwVersion ( ) : Version
+ GetHwVersion ( ) : Version
+ GetSupplierId ( ) : SupplierID
+ GetSystemId ( ) : SystemID
+ GetDeviceType ( ) : DeviceType
+ GetDeviceInstance ( ) : USINT

«Type»
Version

+ version : USINT
+ release : USINT
+ update : USINT
+ evolution : USINT

{turn-around-value =1000}

«interface»
FI_DoorService

«interface»
FI_SystemService

+ FileDownload ( ) : Result
+ FileUpload ( ) : Result

«enumeration»
Result

OK = 0
NOT_VALID = 1
NOT_SUPPORTED = 2
ERROR = -1

Figure 7 - Door service model

5.3.5.2 <Interface> FI_DoorService

The door service interface does not contain any door specific generic functions.

Annex A
(informative)
UML common definitions
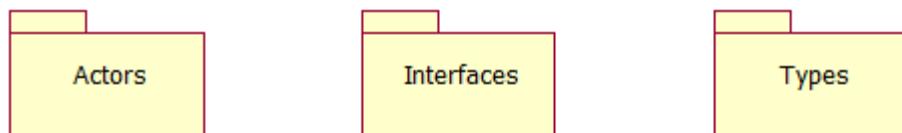
A.1   Common Definitions

This annex describes common types and interfaces used by the different systems (e.g. Door, HVAC, Battery).

The following functions are considered:
- Functions for parameterisation
- Functions for control
- Functions for monitoring
- Functions for diagnostics
- Functions for service

The rules for UML modelling are listed in Figure A.1

RULES:
1. How cyclic parameters/commands will be shown ? - readonly parameters at source using arrivalPattern for QoS (Quality of Service) constraints
2. How noncyclic transmitted parameters will be shown ? - get method to set at source using turn-around pattern for QoS constraints
3. How noncyclic transmitted commands will be shown ? - set method to set at sink using turn-around pattern for QoS constraint
4. How name types, functions, enumerations, variables shall be written ?
- primitive types, constants: only capital letters with underscore to seperate the words
- types, enumeration types: first letter of each word starts with capital letter, no underscores to separate words
- variables: start with a small letter, each further word of the variable starts with a capital letter, no underscores to separate words (ModControl naming rules)
- functions: start with a verb, each word starts with a capital letter, no underscores to separate words
5. A overall function name (component) in the UML shall start with "F_" followed by the name starting each word with a capital letter, without using underscores
6. A functional interface shall start with "FI_" followed by the name starting each word with a capital letter, without using underscores

Figure A.1 - rules for UML modelling

A.2   UML description

A.2.1   UML component diagram

The Figure A.2 shows the structure of a generic UML component diagram
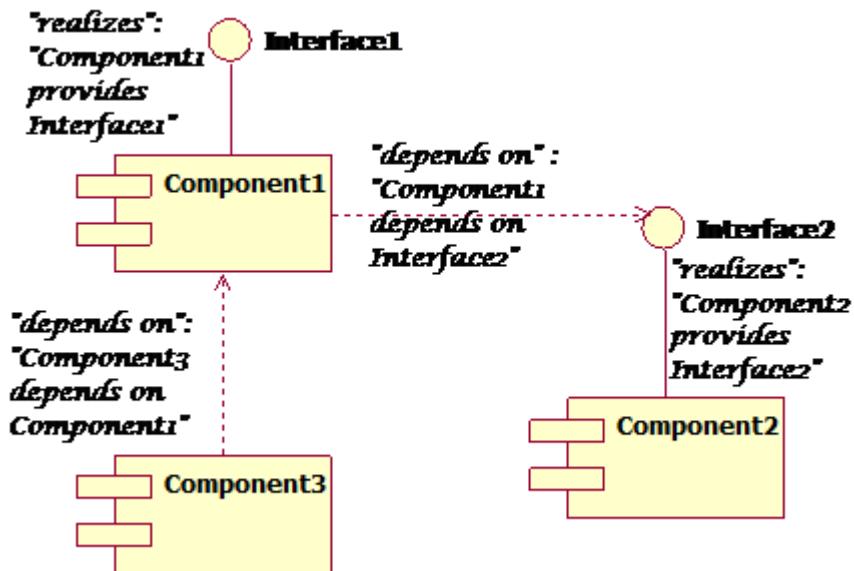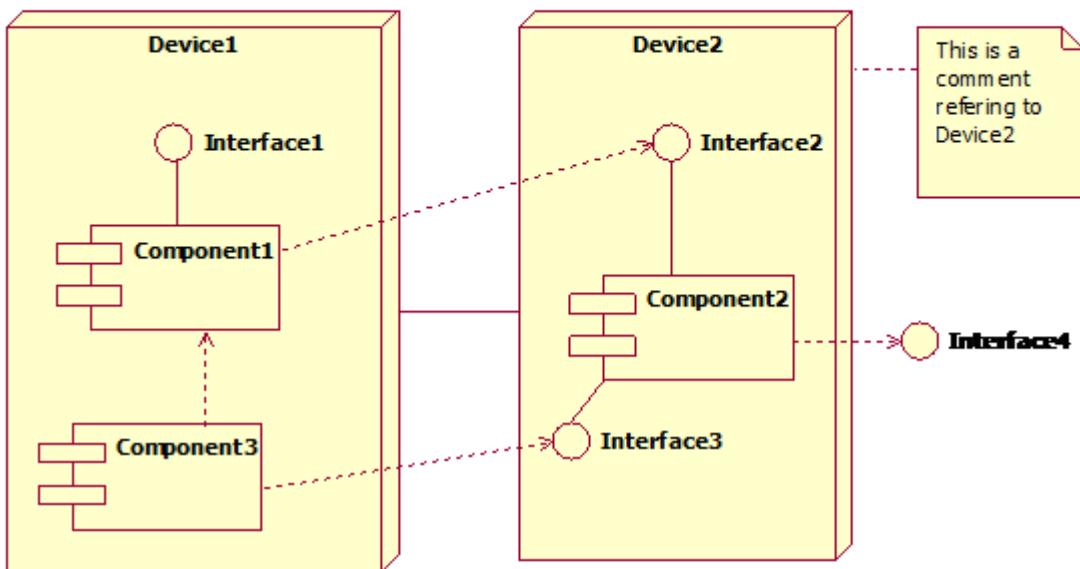
Figure A.2 - UML component diagram structure

A.2.2   UML deployment diagram

The Figure A.3 shows the structure of a generic UML deployment diagram

UML Diagrams for Components and Deployment

Device1

Interface1

Component1

Component3

Device2

This is a comment refering to Device2

Interface2

Component2

Interface4

Interface3

Verbal description of the contents of this diagram:
The physical devices Device1 and Device2 are connected by some communication link (solid line between the cubes)
Component1 and Component3 are executed on Device1.
Component2 is executed on Device2.
Component3 depends on Component1.
Component1 provides ("realizes") Interface1.
Component2 provides ("realizes") Interface2 and Interface3.
Component1 depends on ("uses") Interface2.
Component3 depends on ("uses") Interface3.
Component2 depends on ("uses") Interface4 (and the one who provides this is not drawn in this diagram).

Figure A.3 - UML deployment diagram structure

A.2.3   UML class diagram

A.2.3.1   General

Figure A.4 shows the structure of a generic UML class diagram
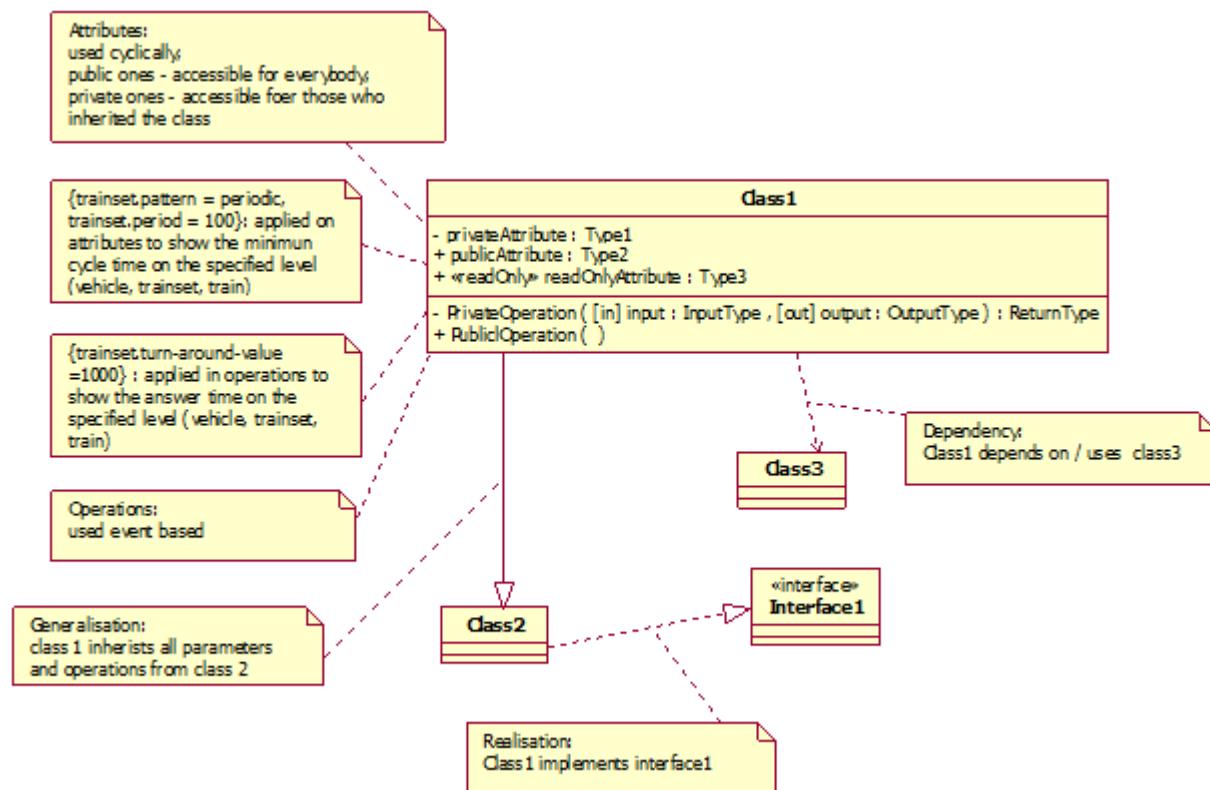
Figure A.4 - UML class diagram description

A.2.3.2   <Class> Class1

Table A.1 lists the attribute of Class1.

Table A.1 - Class 1 attribute

Attribute	Visibility	Type	Description
privateAttribute	2 - PRIVATE	Type1	Private attribute of type "Type1".
publicAttribute	0 - PUBLIC	Type2	Public attribute of type "Type2".
readOnlyAttribute	0 - PUBLIC	Type3	<<readOnly>> Readonly public attribute of type "Type3".

Table A.2 lists the attribute of Class1.

Table A.2 - Class 1 operation

Operation	Visibility	Parameter	Description
PrivateOperation	2 - PRIVATE	(0 - IN) input: InputType (1 - OUT) output: OutputType (3 - RETURN) : ReturnType	input: Input parameter of type "InputType". output: Output parameter of type "OutputType". : Return value of type "ReturnType".
PubliclOperation	0 - PUBLIC		

A.2.3.3 Types

A.2.3.3.1 General

Figure A.5 lists common primitive types and constants.
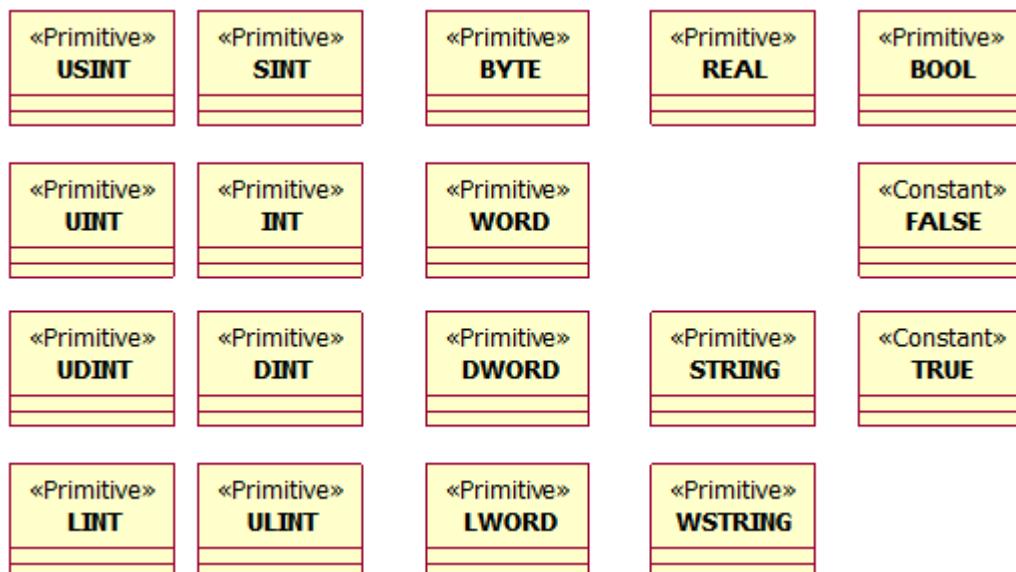
Figure A.5 - Common primitive types and constants

Figure A.6 lists common enumeration types.

«enumeration» GeneralSystemMode	«enumeration» TrainMode	«enumeration» TrainOperationMode
OFF = 0 NORMAL = 1 DEGRADED = 2 OUT_OF_ORDER = 3 INITIALISATION = 4 READY_FOR_SHUTDOWN = 5 SHUTDOWN = 6 ISOLATED = 7 STANDBY = 8 PASSIVE = 9 TEST = 10 APPLICATION_SUSPENDED ... RESET = 12	NONE = 0 BATTERY_PROTECTION = 10 SHUTDOWN = 20 PARKING = 21 PULLED = 22 SWITCHED_ON = 30 ENERGY_SAVING = 40 IN_SERVICE = 50 SERVICE_RETENTION = 60 DRIVING = 70 NORMAL = 71 SHUNTING = 72 COUPLING = 73 TRANSITION = 74 WASHING = 75 EMERGENCY = 76	NONE = 0 NORMAL_OPERATION = 1 MAINTENANCE = 2 COMMISSIONING = 3

«enumeration» Result
OK = 0 NOT_VALID = 1 NOT_SUPPORTED = 2 ERROR = -1

«enumeration» Side	«enumeration» Selftest	«enumeration» SelftestResult
NONE = 0 RIGHT = 1 LEFT = 2 BOTH = 3	NONE = 0 COMPLETE = 1 RESTRICTED = 2 NETWORK = 3	OK = 0 RUNNING = 1 ERROR = -1

Figure A.6 - Common enumeration types

Figure A.7 lists common data types.

«Type» Position
+ valid : BOOL
+ latitude : REAL
+ longitude : REAL
+ altitude : REAL

«Type» Distance
+ meter : UDINT

«Type» Speed
+ valid : BOOL
+ value : INT
+ low : BOOL
+ veryLow : BOOL
+ standStill : BOOL

«Primitive» Temperature

«Type» Time
+ seconds : UDINT
+ milliseconds : UINT
+ timeZone : SINT
+ dailightSavingTime : BOOL

«Type» Version
+ version : USINT
+ release : USINT
+ update : USINT
+ evolution : USINT

«Type» PassengerSignal
+ alarm : BOOL
+ stopRequest : BOOL
+ helpRequest : BOOL

«Type» UICGlobalData
+ confPos : USINT[8]
+ trnVhclCnt : USINT
+ topoCnt : USINT
+ inaugState : USINT
+ inaugFrameVersion : USINT
+ confPosAvail : BOOL
+ operatAvail : BOOL
+ natApplAvail : BOOL
+ cstPropAvail : BOOL
+ vhclPropAvail : BOOL
+ identAvail : BOOL
+ seatResNumAvail : BOOL
+ rDataVer : USINT
+ orient : BOOL
+ notAllConf : BOOL
+ confCancelled : BOOL

| «Type» UICVhclData |
|---|
| + cstProperties : USINT[22] |
| + vhclProperties : USINT[6] |
| + uicIdent : USINT[5] |
| + cstSeqNum : USINT |
| + seatResNum : UINT |
| + contrVhdCnt : SINT |
| + operator : USINT |
| + owner : USINT |
| + natAppl : USINT |
| + natVer : USINT |
| + trnOrient : USINT |
| + cstOrient : USINT |
| + isLeading : BOOL |
| + isLeadRequ : BOOL |
| + trnSwInVhclCnt : USINT |

Figure A.7 - Common data types

A.2.3.3.2   <<Type>> <Class> UICGlobalData

Table A.3 lists the UIC556 global data.

Table A.3 - UIC global data

Attribute	Visibility	Type	Description
confPos	0 - PUBLIC	USINT[8]	Confirmed position of unreachable vehicles (UIC556, Appendix 3.3 byte 13...20).
trnVhclCnt	0 - PUBLIC	USINT	Vehicles in train (UIC556, Appendix 3.1 Composition of NADI, global part)
topoCnt	0 - PUBLIC	USINT	Topology counter (UIC556, Appendix 3.1 Composition of NADI, global part).
inaugState	0 - PUBLIC	USINT	Inauguration state.
inaugFrameVersion	0 - PUBLIC	USINT	Inauguration frame version.
confPosAvail	0 - PUBLIC	BOOL	0 if data for confirmed position of unreachable vehicles not available.
operatAvail	0 - PUBLIC	BOOL	0 if operator identification not available.
natApplAvail	0 - PUBLIC	BOOL	0 if no national application available.
cstPropAvail	0 - PUBLIC	BOOL	0 if consist properties are not available.
vhclPropAvail	0 - PUBLIC	BOOL	0 if vehicle properties not available.
identAvail	0 - PUBLIC	BOOL	0 if UIC identification is not available.
seatResNumAvail	0 - PUBLIC	BOOL	0 - seat reservation numbers not available
rDataVer	0 - PUBLIC	USINT	R telegram version number (UIC556, Appendix 3.3 byte 21).
orient	0 - PUBLIC	BOOL	0 - if UIC orientation is opposite to train bus (UIC556, Appendix 3.1 Composition of NADI, global part)
notAllConf	0 - PUBLIC	BOOL	0 if train configuration is not confirmed (UIC556, Appendix 3.1 Composition of NADI, global part).
confCancelled	0 - PUBLIC	BOOL	0 if confirmation of train configuration by driver not cancelled.

A.2.3.3.3   **<<Type>> <Class> UICVhclData**

Table A.4 lists the UIC556 vehicle data.

Table A.4 - UIC vehicle data

Attribute	Visibility	Type	Description
cstProperties	0 - PUBLIC	USINT[22]	Consist properties as defined in UIC 556 (UIC556, Appendix 3.3 byte 22..44).
vhclProperties	0 - PUBLIC	USINT[6]	Vehicle properties as defined in UIC 556 (UIC556, Appendix 3.3 byte 50...55/64...69/78...83/92...97/106...111/120...125).
uicIdent	0 - PUBLIC	USINT[5]	Vhcl unique UIC identification number (UIC556, Appendix 3.3 byte 45...49/59...63/73...77/87...91/101...105/115...119).
cstSeqNum	0 - PUBLIC	USINT	Consist sequence number in UIC train (UIC556, Appendix 3.3 byte 11).
seatResNum	0 - PUBLIC	UINT	Vehicle seat reservation number (UIC556, Appendix 3.3 byte 57,58/71,72/85,85/99,100/113,114/127,128).
contrVhclCnt	0 - PUBLIC	SINT	Number of controlled vehicles in consist (UIC556, Appendix 3.3 byte 9).
operator	0 - PUBLIC	USINT	Consist operator identification as defined in UIC 556 (UIC556, Appendix 3.3 byte 5).
owner	0 - PUBLIC	USINT	Consist owner identification as defined in UIC 556 (UIC556, Appendix 3.3 byte 6).
natAppl	0 - PUBLIC	USINT	National application type, e.g. UIC556 (UIC556, Appendix 3.3 byte 7).
natVer	0 - PUBLIC	USINT	National application version (UIC556, Appendix 3.3 byte 8).
trnOrient	0 - PUBLIC	USINT	Vehicle orientation in relation to train orientation - 0 - opposite(UIC556, Appendix 3.1, vehicle add on information bit 0).
cstOrient	0 - PUBLIC	USINT	Vehicle orientation in relation to consist orientation - 0 - opposite (UIC556, Appendix 3.1, vehicle add

Attribute	Visibility	Type	Description
			on information bit 1).
isLeading	0 - PUBLIC	BOOL	Not leading vehicle - 0 (UIC556, Appendix 3.1, vehicle add on information bit 2).
isLeadRequ	0 - PUBLIC	BOOL	Vehicle not requested lead - 0 (UIC556, Appendix 3.1, vehicle add on information bit 3).
trnSwInVhclCnt	0 - PUBLIC	USINT	Number of train bus gateways in vehicle (UIC556, Appendix 3.3 byte 9).

A.2.3.3.4   <<Primitive>> <Class>   REAL

This class includes REAL32 as defined by EN 61131-3.

A.2.3.3.5   <<Primitive>> <Class>   Temperature

Temperature is expressed in degrees Celsius and temperature difference in Kelvin. Both data are expressed by INT as defined by EN 61131-3.

A.2.3.3.6   <<Type>> <Class>   PassengerSignal

Table A.5 lists the passenger signals.

Table A.5 - Passenger signals

Attribute	Visibility	Type	Description
alarm	0 - PUBLIC	BOOL	Passenger alarm: depending on the train position and speed it will lead to an emergency brake.
stopRequest	0 - PUBLIC	BOOL	Stop at next station requested.
helpRequest	0 - PUBLIC	BOOL	Help request for PRM..

A.2.3.3.7   <<Primitive>> <Class>   BOOL

This class includes 1 bit BOOL as defined by EN 61131-3.

A.2.3.3.8   <<Constant>> <Class>   TRUE

This class includes TRUE as defined by EN 61131-3.

A.2.3.3.9   <<Constant>> <Class>   FALSE

This class includes FALSE as defined by EN 61131-3.

A.2.3.3.10   <<Primitive>> <Class>   BYTE

This class includes BYTE (8 bit) as defined by EN 61131-3.

A.2.3.3.11   <<Primitive>> <Class>   WORD

This class includes WORD (16 bit) as defined by EN 61131-3.

A.2.3.3.12 <<Primitive>> <Class> DWORD

This class includes DWORD (32 bit) as defined by EN 61131-3.

A.2.3.3.13 <<Primitive>> <Class> LWORD

This class includes LWORD (64 bit) as defined by EN 61131-3.

A.2.3.3.14 <<Primitive>> <Class> SINT

This class includes SINT (8 bit integer) as defined by EN 61131-3.

A.2.3.3.15 <<Primitive>> <Class> INT

This class includes INT (16 bit integer) as defined by EN 61131-3.

A.2.3.3.16 <<Primitive>> <Class> DINT

This class includes DINT (32 bit integer) as defined by EN 61131-3.

A.2.3.3.17 <<Primitive>> <Class> LINT

This class includes LINT (64 bit integer) as defined by EN 61131-3.

A.2.3.3.18 <<Primitive>> <Class> USINT

This class includes USINT (8 bit unsigned integer) as defined by EN 61131-3.

A.2.3.3.19 <<Primitive>> <Class> UINT

This class includes UINT (16 bit unsigned integer) as defined by EN 61131-3.

A.2.3.3.20 <<Primitive>> <Class> UDINT

This class includes UDINT (32 bit unsigned integer) as defined by EN 61131-3.

A.2.3.3.21 <<Primitive>> <Class> ULINT

This class includes ULINT (64 bit unsigned integer) as defined by EN 61131-3.

A.2.3.3.22 <<Primitive>> <Class> STRING

This class includes STRING, 8 bit character string as defined by EN 61131-3. NULL terminated 8 bit character string.

A.2.3.3.23 <<Primitive>> <Class> WSTRING

NULL terminated 16 bit character string.

This class includes WSTRING, 16 bit character string as defined by EN 61131-3. NULL terminated 16 bit character string.

A.2.3.3.24 <Enumeration> GeneralSystemMode

Table A.6 lists the Enumeration types for general system mode provided by each system.

Table A.6 - General System mode enumeration types

Literal	Value	Description
OFF	0	system switched off
NORMAL	1	normal operation
DEGRADED	2	system is not fully operational due to a minor fault (not available as a set parameter for external application)
OUT_OF_ORDER	3	system is out of order (with working communication) (not available as a set parameter for external application)
INITIALISATION	4	startup sequence (if applicable)

(not available as a set parameter for external application) |
READY_FOR_SHUTDOWN	5	in case system needs a longer procedure to prepare a shutdown
SHUTDOWN	6	system shut down (if applicable)
ISOLATED	7	no control processing, system is waiting for a command to change mode, change mode command only possible by maintenance personal
STANDBY	8	no control processing, system waiting for a command to change mode
PASSIVE	9	system mode for the non active redundant device (not available as a set parameter for external application)
TEST	10	system tests running
APPLICATION_SUSPENDED	11	Mode for the download of SW
RESET	12	system reset

A.2.3.3.25   <Enumeration> TrainOperationMode

Table A.7 lists the Enumeration types for train operation modes.

Table A.7 - Train operation mode enumeration types

Literal	Value	Description
NONE	0	Undefined, Initialisation
NORMAL_OPERATION	1	normal operational mode
MAINTENANCE	2	maintenance mode with possible special functions like marking of occurred events
COMMISSIONING	3	commissioning mode with possible extended access to parameters

A.2.3.3.26   <Enumeration> TrainMode

Table A.8 lists the Enumeration types for train mode.

Table A.8 - Train mode enumeration types

Literal	Value	Description
NONE	0	Initial state.
BATTERY_PROTECTION	10	
SHUTDOWN	20	
PARKING	21	
PULLED	22	
SWITCHED_ON	30	
ENERGY_SAVING	40	
IN_SERVICE	50	
SERVICE_RETENTION	60	
DRIVING	70	
NORMAL	71	
SHUNTING	72	
COUPLING	73	

Literal	Value	Description
TRANSITION	74	
WASHING	75	
EMERGENCY	76	

A.2.3.3.27   <Enumeration> Selftest

Table A.9 lists the Enumeration types for self test functionality.

Table A.9 - Self test enumeration types

Literal	Value	Description
NONE	0	No option given
COMPLETE	1	Complete selftest including all tests, often only allowed in standstill without passengers.
RESTRICTED	2	Partially selftest e.g. for a train in passenger operation
NETWORK	3	Network connection test.

A.2.3.3.28   <Enumeration> SelftestResult

Table A.10 lists the Enumeration types for self test result.

Table A.10 - Self test result enumeration types

Literal	Value	Description
OK	0	Self test passed without errors
RUNNING	1	Self test still running
ERROR	-1	Self test not passed

A.2.3.3.29   <Enumeration>   Side

Table A.11 lists the Enumeration types for train sides.

Table A.11 - Train side enumeration types

Literal	Value	Description
NONE	0	
RIGHT	1	
LEFT	2	
BOTH	3	

A.2.3.3.30   <Enumeration>   Result

Table A.12 lists the Enumeration types for results given back from functions.

Table A.12 - Result enumeration types

Literal	Value	Description
OK	0	No errors
NOT_VALID	1	Invalid parameters
NOT_SUPPORTED	2	Function not supported
ERROR	-1	Unspecified error

A.2.3.3.31   <<Type>> <Class>   Distance

Table A.13 reports the integrating counter for calculating distance, having a resolution of 1m. The counter is set to 0 with power up

Table A.13 - distance

Attribute	Visibility	Type	Description
meter	0 - PUBLIC	UDINT	integrating 1m pulses

A.2.3.3.32   <<Type>> <Class>   Position

Table A.14 lists the data for coding the geographical position of the train which is sent by TCMS e.g. for optional local diagnostics support.

Table A.14 - train position

Attribute	Visibility	Type	Description
valid	0 - PUBLIC	BOOL	
latitude	0 - PUBLIC	REAL	+/- ddmmss,ss (d - degree, m - minutes, s - seconds, + - north, - south, for seconds and minutes < 10 leading zeros will be added) (ISO 6709)
longitude	0 - PUBLIC	REAL	dddmmss,sss (d - degree, m - minutes, s - seconds, + east, - west, for seconds and minutes < 10 leading zeros will be added) (ISO 6709)
altitude	0 - PUBLIC	REAL	+/- mmmm,mm (m - meter) (ISO 6709), optional parameter

A.2.3.3.33   <<Type>> <Class>   Speed

Table A.15 lists the data for coding the train speed.

Table A.15 - train speed

Attribute	Visibility	Type	Description
valid	0 - PUBLIC	BOOL	
value	0 - PUBLIC	INT	Proposal: speed in +/- 1/10 km/h
low	0 - PUBLIC	BOOL	Optional: Low speed signal if v < vlow (e.g. vlow = 10 kmph, project depending) Signal parallel via network and direct input, leading signal is hard wired to door control Operational parameter provided from TCMS. Used for door emergency unlocking.
veryLow	0 - PUBLIC	BOOL	Very low speed signal if v < vverylow (e.g. vverylow = 5 kmph, project depending) Operational parameter provided from TCMS. Used e.g. for door release handling.
standStill	0 - PUBLIC	BOOL	Stand still signal if v = vstandstill (e.g. vstandstill = 0, project depending) Signal for non movement of the train

Attribute	Visibility	Type	Description
			which may be a signal generated by a device or by the driver itself.
			Operational parameter provided from TCMS. Used e.g for ramp and step control.

A.2.3.3.34   <<Type>> <Class>   Time

Table A.16 lists UTC time coding, including time zone and daylight saving time information sent by TCMS in Unix format for local diagnostics support. Optional for diagnostics

Table A.16 - UTC time

Attribute	Visibility	Type	Description
seconds	0 - PUBLIC	UDINT	32 bit time, see EN 61131-3.
milliseconds	0 - PUBLIC	UINT	optional
timeZone	0 - PUBLIC	SINT	-48 ... +48, in 15 min steps
dailightSavingTime	0 - PUBLIC	BOOL	

A.2.3.3.35   <<Type>> <Class>   Version

Table A.17 lists the coding of the information useful to identify software versions.

Table A.17 - software version

Attribute	Visibility	Type	Description
version	0 - PUBLIC	USINT	incremented after incompatible changes.
release	0 - PUBLIC	USINT	incremented after functional extension.
update	0 - PUBLIC	USINT	incremented after bugfixes.
evolution	0 - PUBLIC	USINT	incremented in developement process.

A.2.3.4   Interfaces

A.2.3.4.1   General

Figure A.8 shows general standard interfaces with their data and functions.
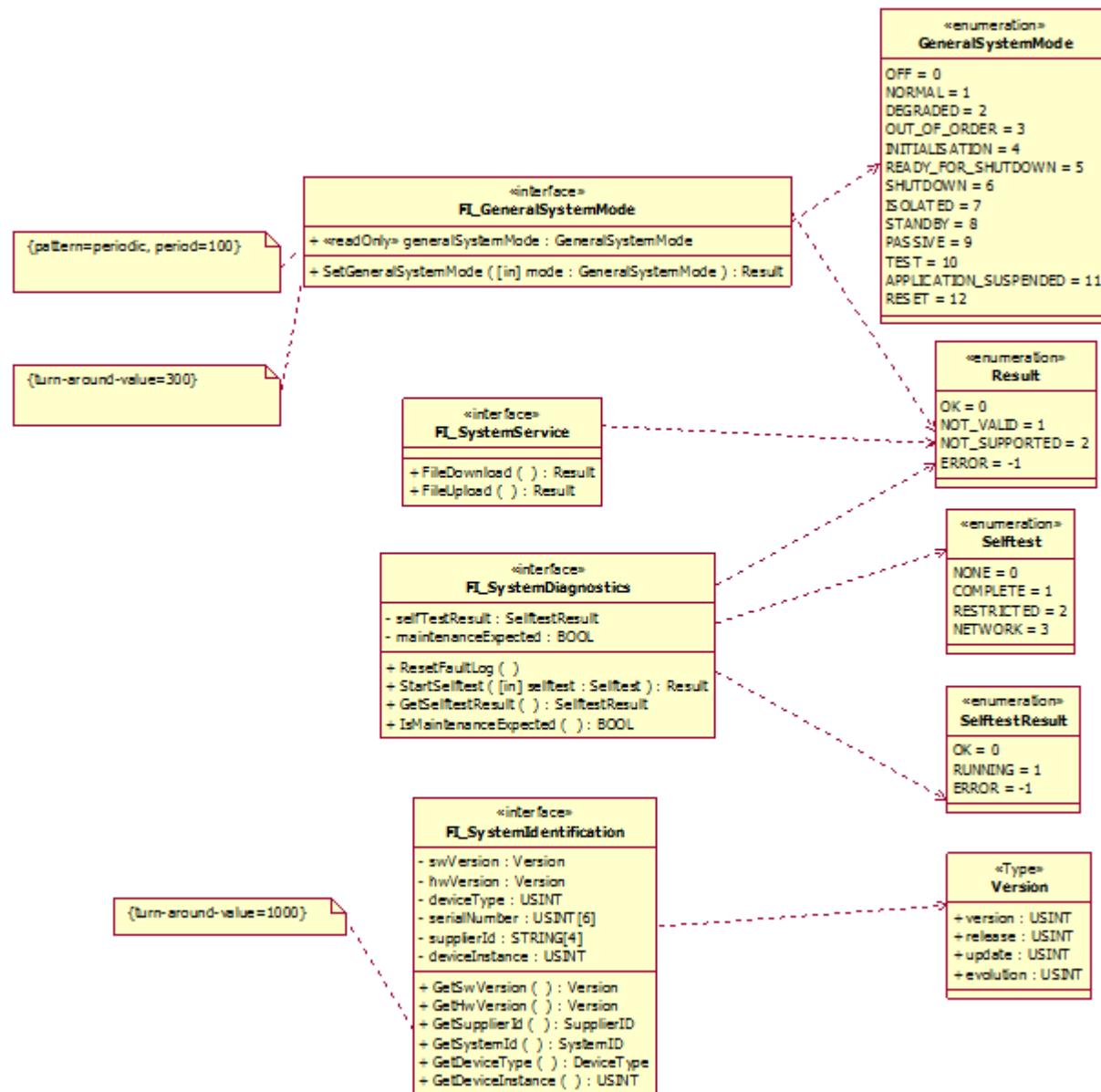
Figure A.8 - Common standard interfaces for all systems

Figure A.9 shows common TCMS interfaces with their data and functions offered to all systems.
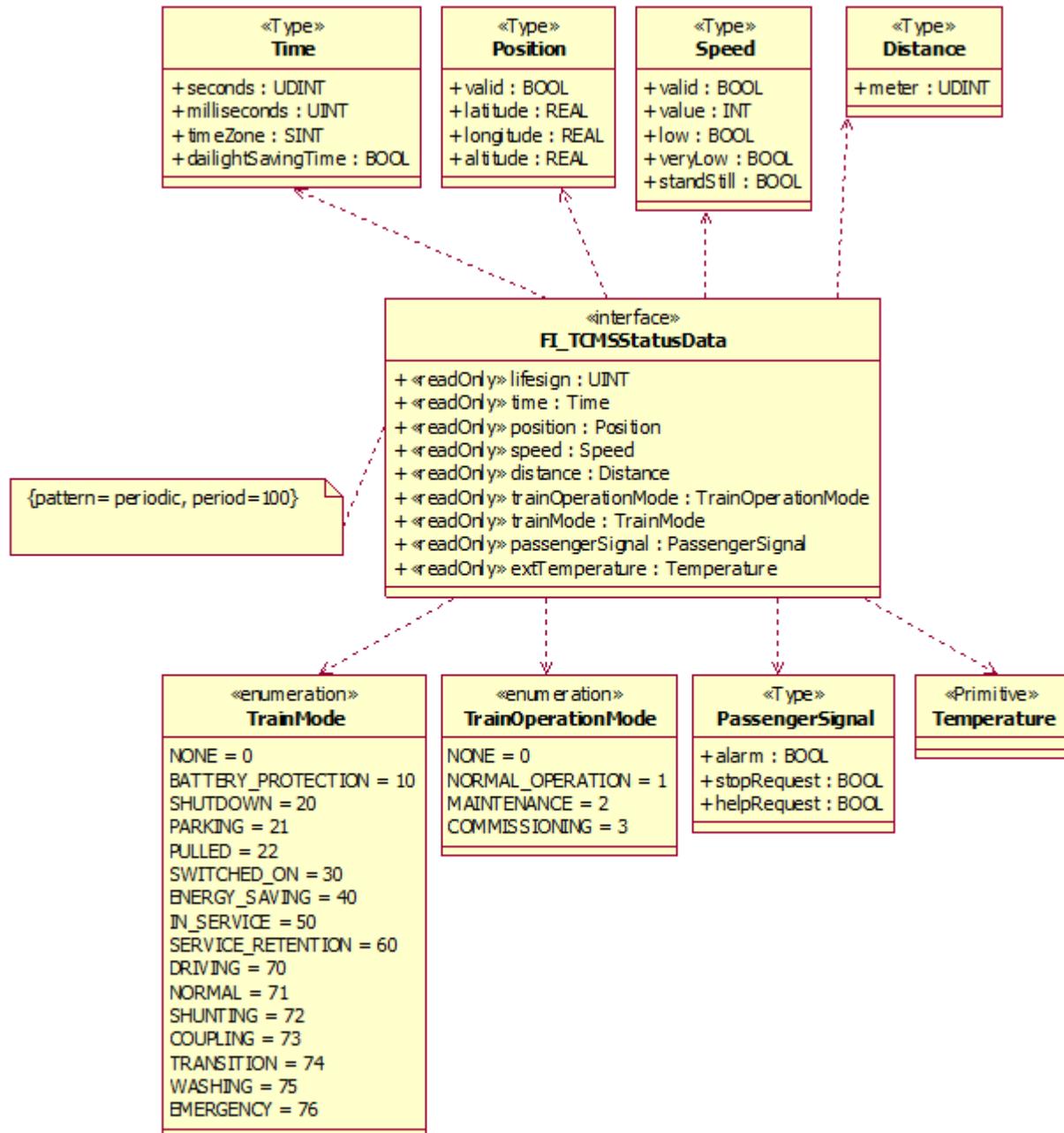

Figure A.9 - Common standard TCMS interface

Figure A.10 shows common train configuration and data interfaces offered to all systems.

«interface»
FI_Trainlines

+ allDoorsClosedAndLocked
+ releaseAllRightDoors
+ releaseAllLeftDoors
+ lightOn
+ LightOff
+ closeAllDoors
+ controlCabCommunication
+ controlRemoteCommunication
+ loudspeakerSelectedReception
+ applyEpBrake
+ releaseEpBrake
+ emergencyBrakeRequest
+ emergencyBrakeOverwrite
+ emergencyBrakeApplied
+ loudspeakerObligatoryReception

«interface»
FI_TrainConfiguration

- uicGlobalData : UICGlobalData
- uicVhclData : UICVhclData[32]

{tourn-around-value = 100}

+ GetUicVhclData ([out] vhclData : UicVhclData , [inout] topoCnt : USINT , [in] vhclSeqNum : USINT) : Result
+ GetUicState ([out] inaugState : USINT , [out] topoCnt : USINT) : Result
+ GetUicGlobaldata ([out] uicGlobalData : UicGlobalData , [inout] topoCnt : USINT) : Result
+ GetOwnCstSeqNum ( ) : USINT
+ GetOwnVhclSeqNum ( ) : USINT

«Type»
UICVhclData

+ cstProperties : USINT[22]
+ vhclProperties : USINT[6]
+ uicIdent : USINT[5]
+ cstSeqNum : USINT
+ seatResNum : UINT
+ contrVhclCnt : SINT
+ operator : USINT
+ owner : USINT
+ natAppl : USINT
+ natVer : USINT
+ trnOrient : USINT
+ cstOrient : USINT
+ isLeading : BOOL
+ isLeadRequ : BOOL
+ trnSwInVhclCnt : USINT

«Type»
UICGlobalData

+ confPos : USINT[8]
+ trnVhclCnt : USINT
+ topoCnt : USINT
+ inaugState : USINT
+ inaugFrameVersion : USINT
+ confPosAvail : BOOL
+ operatAvail : BOOL
+ natApplAvail : BOOL
+ cstPropAvail : BOOL
+ vhclPropAvail : BOOL
+ identAvail : BOOL
+ seatResNumAvail : BOOL
+ rDataVer : USINT
+ orient : BOOL
+ notAllConf : BOOL
+ confCancelled : BOOL

Figure A.10 - Train configuration and data interfaces offered to all systems

A.2.3.4.2   \<Interface\>   FI_SystemDiagnostics

Table A.18 lists an example of attributes of the standard diagnostics interface.

Table A.18 - System diagnostics

Attribute	Visibility	Type	Description
selfTestResult	2 - PRIVATE	SelftestResult	
maintenanceExpected	2 - PRIVATE	BOOL	Parameter to flag that maintenance has to be planned due to evaluation of the system condition. The system is still working properly.

Operation	Visibility	Parameter	Description
ResetFaultLog	0 - PUBLIC		
StartSelftest	0 - PUBLIC	(0 - IN) selftest: Selftest (3 - RETURN) result: Result	
GetSelftestResult	0 - PUBLIC	(3 - RETURN) result: SelftestResult	
IsMaintenanceExpected	0 - PUBLIC	(3 - RETURN) : BOOL	

A.2.3.4.3   \<Interface\>   FI_SystemIdentification

Table A.19 lists system identification interface attributes.

Table A.19 - System identification attributes

Attribute	Visibility	Type	Description
swVersion	2 - PRIVATE	Version	
hwVersion	2 - PRIVATE	Version	
deviceType	2 - PRIVATE	USINT	unique device type identification (e.g. Door1, Door2 ..)

Attribute	Visibility	Type	Description
serialNumber	2 - PRIVATE	USINT[6]	unique serial number of systems communication board
supplierId	2 - PRIVATE	STRING[4]	unique 4 ASCII char identification of the supplier
deviceInstance	2 - PRIVATE	USINT	Instance of the device

Table A.20 lists system identification interface operations.

Table A.20 - System identification operations

Operation	Visibility	Parameter	Description
GetSwVersion	0 - PUBLIC	(3 - RETURN) result: Version	
GetHwVersion	0 - PUBLIC	(3 - RETURN) result: Version	
GetSupplierId	0 - PUBLIC	(3 - RETURN) result: SupplierID	
GetSystemId	0 - PUBLIC	(3 - RETURN) result: SystemID	
GetDeviceType	0 - PUBLIC	(3 - RETURN) result: DeviceType	
GetDeviceInstance	0 - PUBLIC	(3 - RETURN) : USINT	

A.2.3.4.4   <Interface>   FI_Trainlines

Table A.21 lists the Train lines functional interface according to UIC558.

Table A.21 - Train lines functional interface

Attribute	Visibility	Type	Description
allDoorsClosedAndLocked	0 - PUBLIC		UIC 558 16, 12-
releaseAllRightDoors	0 - PUBLIC		UIC558 15+, 12-
releaseAllLeftDoors	0 - PUBLIC		UIC558 14+, 12-
lightOn	0 - PUBLIC		UIC558 10+, 12-
LightOff	0 - PUBLIC		UIC558 11+, 12-
closeAllDoors	0 - PUBLIC		UIC558 9+, 12-
controlCabCommunication	0 - PUBLIC		UIC558 3-, 4+
controlRemoteCommunication	0 - PUBLIC		UIC558 3+, 4-
loudspeakerSelectedReception	0 - PUBLIC		UIC558 5+, 6-
applyEpBrake	0 - PUBLIC		UIC558 10-, 12+
releaseEpBrake	0 - PUBLIC		UIC558 11-, 12+
emergencyBrakeRequest	0 - PUBLIC		UIC558 9, 10
emergencyBrakeOverwrite	0 - PUBLIC		UIC558 9-, 12+
emergencyBrakeApplied	0 - PUBLIC		UIC558 9, 10
loudspeakerObligatoryReception	0 - PUBLIC		UIC558 7+, 8-

A.2.3.4.5 <Interface> FI_GeneralSystemMode

Table A.22 lists the attributes of the general system mode functional interface

Table A.22 - General system mode functional interface - attributes

Attribute	Visibility	Type	Description
generalSystemMode	0 - PUBLIC	GeneralSystemMode	<<readOnly>>

Table A.23 lists the operations of the general system mode functional interface

Table A.23 - General system mode functional interface - operations

Operation	Visibility	Parameter	Description
SetGeneralSystemMode	0 - PUBLIC	(0 - IN) mode: GeneralSystemMode (3 - RETURN) : Result	

A.2.3.4.6 <Interface> FI_SystemService

Table A.24 lists the operation relevant to the system service functional interface.

Table A.24 - System service functional interface - operations

Operation	Visibility	Parameter	Description
FileDownload	0 - PUBLIC	(3 - RETURN) : Result	
FileUpload	0 - PUBLIC	(3 - RETURN) : Result	

A.2.3.4.7   <Interface>   FI_TCMSStatusData

Table A.25 lists the status data sent by TCMS which are accessible by all systems.

Table A.25 - TCMS status data

Attribute	Visibility	Type	Description
lifesign	0 - PUBLIC	UINT	<<readOnly>> TCMS lifesign
time	0 - PUBLIC	Time	<<readOnly>> current time
position	0 - PUBLIC	Position	<<readOnly>> current position
speed	0 - PUBLIC	Speed	<<readOnly>> current speed
distance	0 - PUBLIC	Distance	<<readOnly>> distance in meters incremented since power-up
trainOperationMode	0 - PUBLIC	TrainOperationMode	<<readOnly>> current train operation mode
trainMode	0 - PUBLIC	TrainMode	<<readOnly>> current train mode
passengerSignal	0 - PUBLIC	PassengerSignal	<<readOnly>> passenger signals
extTemperature	0 - PUBLIC	Temperature	<<readOnly>> current calculated external temperature average (trainwide)

A.2.3.4.8   <Interface>   FI_TrainConfiguration

Table A.26 lists the attributes of the functional interface which provides the access to UIC train inauguration result.

Table A.26 - Train configuration functional interface - attributes

Attribute	Visibility	Type	Description
uicGlobalData	2 - PRIVATE	UICGlobalData	current UIC global data
uicVhclData	2 - PRIVATE	UICVhclData[32]	current UIC vehicle configuration

Table A.27 lists the opearation of the functional interface which provides the access to UIC train inauguration result.

Table A.27 - Train configuration functional interface - operations

Operation	Visibility	Parameter	Description
GetUicVhclData	0 - PUBLIC	(1 - OUT) vhclData: UicVhclData (2 - INOUT) topoCnt: USINT (0 - IN) vhclSeqNum: USINT (3 - RETURN) : Result	Retrieve vehicle UIC inauguration data.
GetUicState	0 - PUBLIC	(1 - OUT) inaugState: USINT (1 - OUT) topoCnt: USINT (3 - RETURN) : Result	Retrieve UIC inauguration state.
GetUicGlobaldata	0 - PUBLIC	(1 - OUT) uicGlobalData: UicGlobalData (2 - INOUT) topoCnt: USINT (3 - RETURN) : Result	Retrieve global UIC inauguration data.
GetOwnCstSeqNum	0 - PUBLIC	(3 - RETURN) : USINT	Retrieve own consist UIC sequence number.
GetOwnVhclSeqNum	0 - PUBLIC	(3 - RETURN) : USINT	Retrieve own vehicle UIC sequence number.

This page deliberately left blank

British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards -based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at bsigroup.com/standards or contacting our Customer Services team or Knowledge Centre.

Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at bsigroup.com/shop, where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to bsigroup.com/subscriptions.

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

PLUS is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit bsigroup.com/shop.

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email bsmusales@bsigroup.com.

Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

Copyright

All the data, software and documentation set out in all British Standards and other BSI publications are the property of and copyrighted by BSI, or some person or entity that owns copyright in the information used (such as the international standardization bodies) and has formally licensed such information to BSI for commercial publication and use. Except as permitted under the Copyright, Designs and Patents Act 1988 no extract may be reproduced, stored in a retrieval system or transmitted in any form or by any means – electronic, photocopying, recording or otherwise – without prior written permission from BSI. Details and advice can be obtained from the Copyright & Licensing Department.

Useful Contacts:

Customer Services
Tel: +44 845 086 9001
Email (orders): orders@bsigroup.com
Email (enquiries): cservices@bsigroup.com

Subscriptions
Tel: +44 845 086 9001
Email: subscriptions@bsigroup.com

Knowledge Centre
Tel: +44 20 8996 7004
Email: knowledgecentre@bsigroup.com

Copyright & Licensing
Tel: +44 20 8996 7070
Email: copyright@bsigroup.com

BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

bsi.

...making excellence a habit.™