

Title

# Digital Radio Receiver Classes

Scope

This document defines 3 classes for digital radio receivers driven by general use cases. These classes shall apply to all market segments including without limitation home receivers, car radios, portable devices and docking stations. The classes are based on the DAB family of standards. For all classes detailed minimum receiver requirements are defined for products conforming to any of the classes.

The three classes are:

**Class A** Radio receivers with basic audio oriented functionality, **(Audio)** that have a display of at least 8 characters.

**Class M** Multi-function products with a color screen and **(Multimedia)** enhanced audio and multimedia features.

**Class H** Products with integrated broadcast & broadband **(Hybrid)** connectivity for hybrid functionality.

Version History

Ver.	Date	Description
1.0	2014-06-13	Edition 1
2.0	2019-05-10	Edition 2

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Preamble

This document intends to provide a common basis for development of the digital radio market. It builds entirely on existing public standards, defining where applicable subsets of standard technology.

This document represents a common understanding of the market partners in Germany and the UK that services and receivers alike require a stable environment for a rapid market development. It is expected that a clear definition of receiver requirements based on the experiences from key markets will also contribute to harmonisation of digital radio markets with an increase of services available in Europe and beyond.

The requirements address the DAB-family of standards as the base technology. This choice reflects the state-of-the-art at the time of creating this document and shall be amended when needed. This document does not represent any normative or regulatory requirements.

Source

This document is available for download at <https://www.dabplus.de/haendler/>. Please check for its latest version.

## Digital Radio Receiver Classes

Function		Class A Audio	Class M Multimedia	Class H Hybrid
Analogue Front-end	FM Band 2 (87.5-108MHz)	Required*	Required*	Required*
	RDS	Required for in-car receivers Optional for other receivers		
Digital Front-end	Spectrum VHF Band 3 (174-240MHz; blocks 5A-13F)	Required	Required	Required
	Channel decoding	1 sub-channel minimum of 280CU for DAB-audio minimum of 144CU for DAB+ audio	Minimum of 4 subchannels, minimum of 288CU (total)	Minimum of 4 subchannels, minimum of 288CU (total)
Service Selection	Dynamic reconfiguration	Required	Required	Required
	Service List <small>Receiver selects best quality alternative, if a service is receivable in several variants</small>			
	Service following	Required for in-car receivers Optional for other receivers	Required for in-car receivers Optional for other receivers	Required for in-car receivers Optional for other receivers
	Service linking			
Service Info	Service Label <small>long form Required if display has more than 16 characters</small>	Required	Required	Required
Announcements	Traffic Announcement <small>Road traffic flash</small>	Required for in-car receivers Optional for other receivers	Required for in-car receivers Optional for other receivers	Required for in-car receivers Optional for other receivers
	Alarm Announcement	Required	Required	Required
	Emergency Warning Functionality (EWF)	Optional	Optional	Optional
Audio	Audio DAB (MPEG layer 2) DAB+ (MPEG-4, HE AACv2)	Required	Required	Required
Text	Dynamic Label Segment (DLS) <small>when an entire text message cannot be shown, the text shall be scrolled in the display</small>	Required <small>[for receivers which support simultaneous display of 16 or more characters]</small>	/	/
	Dynamic Label Plus (DL+) <small>supported Object types according to DL+ subset</small>	Optional	Required <small>[includes DLS functionality]</small>	Required <small>[includes DLS functionality]</small>
	Journaline		Required for other receivers Optional for in-car receivers	Required for other receivers Optional for in-car receivers
MOT	MOT Transport	Optional	Required	Required
	EPG Transport			
	EPG Programme information		Required for other receivers Optional for in-car receivers	Required for other receivers Optional for in-car receivers
	EPG Service Information			
	Station logo		Required	Required
	Slideshow / cat. Slideshow			
Hybrid broadcast broadband	Return channel / Interactivity <small>(wired or wireless local area network connectivity)</small>	Optional	Optional	Required
	RadioDNS <small>(RadioTAG)</small>			
Display	Alphanumeric display <small>(support of extended RDS character set)</small>	Required	/	/
	Colour screen display	Optional	Required	Required
	Interface to external display		Optional <small>Required if no built-in display</small>	Optional <small>Required if no built-in display</small>
Mobility	TPEG <small>if product supports navigation system</small>	Optional	Required for in-car receivers Optional for other receivers	Required for in-car receivers Optional for other receivers

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**Please note:** \* see details for specific conditions  
 - The table and its content above is subject to change, depending on the development of the overall market  
 - For all functional descriptions reference information to the applicable standard is given. This standard shall be consulted for details.

# Terms & Definitions

Term	Definition
Class A (audio) receiver	radio receiver with basic audio oriented functionality and a display of at least 8 characters
Class M (Multimedia) receiver	multi-function product with a color screen and enhanced audio and multimedia features
Class H (Hybrid) receiver	product with integrated broadcast & broadband connectivity for hybrid functionality
amplifier	product dedicated to the amplification of audio signals
in-car receiver	device for radio broadcast reception, decoding and reproduction in vehicles
portable radio	portable product dedicated to the reception of radio broadcast which includes a built-in loudspeaker for sound reproduction and the option to be battery powered
receiver	product combining a tuner and an amplifier
tuner	product dedicated to the reception and decoding of radio broadcast signals

# Reference Standards & Specifications

Standard (latest version)	Title / Description
ETS 300 384:1995 +A1:1997	Radio broadcasting systems; Very High Frequency (VHF), frequency modulated, sound broadcasting transmitters
ETSI EN 300 401	Radio Broadcasting Systems; Digital Audio Broadcasting (DAB) to mobile, portable and fixed receivers
ETSI EN 301 234	Digital Audio Broadcasting (DAB); Multimedia Object Transfer (MOT) protocol
ETSI TS 101 499	Hybrid Digital Radio (DAB, DRM, RadioDNS); SlideShow; User Application Specification
ETSI TS 101 756	Digital Audio Broadcasting (DAB); Registered Tables
ETSI TS 101 759	Digital Audio Broadcasting (DAB); Data Broadcasting - Transparent Data Channel
ETSI TS 102 371	Digital Audio Broadcasting (DAB); Digital Radio Mondiale (DRM); Transportation and Binary Encoding Specification for Service and Programme Information (SPI)
ETSI TS 102 563	Digital Audio Broadcasting (DAB); Transport of Advanced Audio Coding (AAC) audio
ETSI TS 102 818	Hybrid Digital Radio (DAB, DRM, RadioDNS); XML Specification for Service and Programme Information (SPI)
ETSI TS 102 979	Digital Audio Broadcasting (DAB); Journaline; User application specification
ETSI TS 102 980	Digital Audio Broadcasting (DAB); Dynamic Label Plus (DL Plus); Application specification
ETSI TS 103 176	Digital Audio Broadcasting (DAB); Rules of implementation; Service information features
ETSI TS 103 270	RadioDNS Hybrid Radio; Hybrid lookup for radio services
ETSI TS 103 461	Digital Audio Broadcasting (DAB); Domestic and in-vehicle digital radio receivers; Minimum requirements and Test specifications for technologies and products
ETSI TS 103 466	Digital Audio Broadcasting (DAB); DAB audio coding (MPEG Layer II)
ETSI TS 103 551	Digital Audio Broadcasting (DAB); Transport of TPEG services
IEC EN 62104	Characteristics of DAB receivers
IEC EN 62105	Digital audio broadcasting system — Specification of the receiver data interface (RDI)
IEC EN 62106	Specification of the Radio Data System (RDS) for VHF/FM sound broadcasting in the frequency range from 87,5 MHz to 108,0 MHz
ISO TS 21219 series	Intelligent transport systems - Traffic and travel information via transport protocol experts group, generation 2 (TPEG2)

Other reference documents	Title / Description
RTAG01 V1.0.0 DRAFT 7 (2015-06)	RadioTAG Technical Specification [ <a href="http://radiodns.wpengine.com/wp-content/uploads/2014/02/rtag01_v100_draft_7.pdf">http://radiodns.wpengine.com/wp-content/uploads/2014/02/rtag01_v100_draft_7.pdf</a> ] [ <a href="https://radiodns.org/developers/documentation/">https://radiodns.org/developers/documentation/</a> ]
DAB-EWF Spec., v9 (2018-10-04)	EWF project specification document provided by Fraunhofer IIS, Erlangen

Please also refer to [[www.worlddab.org/technology-rollout/standards/technical-specifications-list](http://www.worlddab.org/technology-rollout/standards/technical-specifications-list)] for an overview on digital radio related standards and specifications.

## Digital Radio Receiver Classes (Analogue Front-end)

Function		Class A Audio	Class M Multimedia	Class H Hybrid
Analogue Front-end	FM Band 2 (87,5-108MHz)	Required*	Required*	Required*
	<i>Details</i>	FM functionality as specified by ETS 300 384:1995 + A1:1997		
	RDS	Required* for in-car receivers Optional for other receivers	Required*	Required*
	<i>Details</i>	RDS radio text (RT) & program service name (PS) functionality as specified by IEC EN 62106.		
NOTE: *The analogue front-end requirement becomes optional for a country/region as soon as an FM migration/shut-off date was formally announced. Requirement not applicable for adaptors adding digital radio functionality to analogue receivers				

## Digital Radio Receiver Classes (Digital Front-end)

Function	Class A Audio	Class M Multimedia	Class H Hybrid
Spectrum VHF Band 3 (174-240MHz; blocks 5A-13F)	Required	Required	Required
<i>Details</i>	VHF Band III is the allocated spectrum for digital radio broadcast (DAB family of standards). Receivers shall adhere to the sensitivity requirements as defined in ETSI TS 103 461.		
Channel decoding	1 sub-channel	Minimum of 4 subchannels	
<i>Capacity units</i>	minimum of 280CU for DAB-audio minimum of 144CU for DAB+ audio	minimum of 288CU (combined)	
Digital Front-end <i>Data services support</i>	In case a receiver supports an optional TDC and MOT data service, the receiver shall support all transport mechanisms: PAD and packet mode data service. Support for packet mode data services shall include signalling as a stand-alone data service and as a secondary service component.  As the support for only one subchannel is mandated, the use of a packet mode data service might force the receiver to mute the audio service.	Receiver shall support all transport mechanisms for TDC and MOT data services: PAD and packet mode data service. Support for packet mode data services shall include signalling as a stand-alone data service and as a secondary service component.	
<i>Protection level</i>	All protection levels to be supported (ETSI EN 300401 clause 6.2.1, 11.3): For DAB: 280CU e.g. 256kbps@UEP1, For DAB+: 144CU e.g. 256kbps@EEP3B, 192 kbps@EEP3A, 96 kbps@EEP1A) Receivers shall support enhanced packet mode with the forward error correction method (ETSI EN 300401, clause 5.3.5), to improve the robustness of the reception.		
<i>References</i>	IEC EN 62104, clause 4.3.1 <b>ETSI TS 103 461</b> ETSI TS 102 563, clause 5.1	IEC EN 62104, clause 4.3.1 ETSI TS 103 461 ETSI TS 102 563, clause 5.1	

TDC = Transparent data channel (see ETSI TS 101 759)  
MOT = Multimedia Object Transfer (see ETSI EN 301 234)

## Digital Radio Receiver Classes (Service Info)

Function	Class A Audio	Class M Multimedia	Class H Hybrid
<b>Service Label</b> long form Required if display has more than 16 characters	Required	Required	Required
<i>Details</i>	A receiver shall show the service label of the currently selected service as default. At a minimum the short form of the service label shall be used. If the receiver display supports at least 16 characters, the long form of the service label shall be used. The service label is the primary means of service identification, it should be visible whenever possible and shall be available for display at least upon user interaction. In case a service component label is provided, it shall take precedence in display over the service label. The receiver shall meet all requirements for Text labels as defined in ETSI TS 102 176, Clause 8. Support the applicable regional profile relevant for the intended market of the receiver is mandatory, as defined in ETSI TS 103 176, Annex I. Receivers supporting the 'EBU Latin profile', with limited display capabilities shall use the limited character representation as defined in ETSI TS 101 756, table C.3.		
<i>References</i>	ETSI EN 300401 clause 8.1.14, 8.1.14.3; ETSI TS 103 176, Clause 8, Annex I; ETSI TS 101 756 Annex C.		
<b>Programme Type</b> long form Required if display has more than 16 characters	Optional	Optional	Optional
<i>Details</i>	A receiver shall be able to show the programme type of the currently selected service. The programme type is an important means to classify the content of a service, if it is not displayed permanently, it shall be displayed upon user action. At a minimum the short form of the programme type shall be displayed. If the receiver display supports at least 16 characters, the long form of the programme shall be displayed. If the receiver supports a language selection on the user interface or display, the programme type should be shown in the most appropriate language variant, as listed in ETSI TS 101 756 clause 5.8.		
<i>References</i>	ETSI TS 101 756 clause 5.8.		

## Digital Radio Receiver Classes (Service Selection/Following/Linking)

Function	Class A Audio	Class M Multimedia	Class H Hybrid
Dynamic reconfiguration	Required	Required	Required
<i>Details</i>	<p>If a selected primary or secondary service changes its audio configuration audible artifacts shall be kept to a minimum (e.g. by muting if necessary). A receiver shall detect and handle changes of sub-channel allocation, sub-channel identifier of the ongoing audio service and audio bit-rate as seamless as possible if the reconfiguration occurs with correct signalling of 'current/next' configuration as defined in ETSI EN 300 401, clause 6.5 and ETSI TS 102 563 clause 7, IEC 62104 clause 4.5. If services appear during a reconfiguration that are not in the service list, the receiver shall add the new services.</p> <p>If services appear during a reconfiguration that are not in the service list, the receiver shall add the new services. Where secondary service components are used and later stop transmitting, the radio shall fall back to the primary component of this service.</p> <p>A receiver shall follow a service even during multiplex or service reconfigurations or changes to the audio parameters.</p> <p>NOTES: 1) Audio parameters can also be changed without a multiplex or service reconfiguration! 2) It is important to refer to the latest version of ETSI 300 401. Relating to a dynamic reconfiguration, EN 300 401, clauses 5.2.2, 5.3, 6.4.2 and Annex D should be taken into account.</p>		
<i>References</i>	ETSI EN 300 401, clauses 5.22, 5.3, 6.4.2, 6.5, Annex D and ETSI TS 102 563 clause 7, IEC 62104 clause 4.5		

## Digital Radio Receiver Classes (Service Selection/Following/Linking)

Function	Class A Audio	Class M Multimedia	Class H Hybrid
<b>Service List</b> Receiver selects best quality alternative, if a service is receivable in several variants	Required	Required	Required
<i>Band Scan</i>	A receiver shall perform a full band scan to create a list of all available services at least upon user action. All receivers shall perform a full band scan at first use of broadcast mode. The service list shall be updated when a dynamic reconfiguration is being performed on a tuned ensemble, at a minimum all newly added services shall show up on the list and previously stored service list entries that are not found during the band scan shall be suitably marked or removed.		
<i>Multiplex handling</i>	When the receiver tunes an ensemble which was not available at the time the service list was created, it shall add all services to the service list.		
<i>Service handling</i>	When the user selects a service from the service list, the receiver shall present the selected audio programme regardless of any changes in the service configuration such as changes of bit-rate, service label, sub-channel configuration or protection level that may have occurred since the service was added to the list. If the user selects a service from the service list and the signal of the ensemble where the service was originally detected is too weak or the frequency changes due to movement of location, the receiver shall present the service using an alternative ensemble according to service list  Note: For in-car receivers the mechanisms of service following and service linking shall additionally be applied.		
<b>Service Selection</b>			
<i>Duplicates handling</i>	When a receiver detects <u>at the point of scanning</u> a service on more than one ensemble, either on different ensembles or on the same ensemble on different frequencies, the receiver shall present the <u>best quality alternative</u> for the capabilities of the receiver. Programs detected at the time of band scanning as having too weak signal according to the manufacturer's threshold for good reception shall be indicated as such or not listed.		
<i>References</i>	IEC 62104 clause 6.2 ETSI TS 103 176, section 6		

## Digital Radio Receiver Classes (Service Selection/Following/Linking)

Function	Class A Audio	Class M Multimedia	Class H Hybrid
Service following	Required for in-car receivers Optional for other receivers	Required for in-car receivers Optional for other receivers	Required for in-car receivers Optional for other receivers
<i>Signal monitoring</i>	The receiver shall continuously monitor signal level and reception quality of the selected service and multiplex.		
<i>DAB - DAB</i>	If the receiver detects a signal lost or degradation it shall attempt to identify the selected service on the same ensemble at a different frequency. If this fails, the receiver shall attempt to identify the selected service on other ensembles.		
<i>DAB - FM/RDS</i>	If the receiver cannot find the same service by service following DAB, it may try to find the selected service on FM/RDS.		
<i>References</i>	ETSI TS 103 176, section 5.		
Service linking	Required for in-car receivers Optional for other receivers	Required for in-car receivers Optional for other receivers	Required for in-car receivers Optional for other receivers
<i>Hard linkage</i>	If service following DAB-DAB fails, the receiver shall evaluate service linkage information. If a hard-link is provided for the selected service the receiver shall attempt to select the linked service as an alternative for the user selected service.		
<i>Soft linkage</i>	If service following DAB-DAB fails and no hard-link is provided for the selected service the receiver must search for a suitable softlink and use it if available. For soft links the specifications of ETSI TS 103 176, especially clause 5.6.3 and Annex A.5 and ETSI TS 103 461 (Spec and related tests, particularly test 9.2.4) shall be followed.		
<i>Dynamic links</i>	While the receiver performs service following, it shall monitor the service linking information on the tuned ensemble. The receiver shall only use service links that are signalled in an active linkage set. If a service link is de-activated, the receiver must not use it for service following after that point. After switching to the alternative service on a different ensemble, the receiver uses service linking information received from the new ensemble for further linking. [ETSI TS 103 176, A3.4]		
<i>References</i>	ETSI TS 103 176, section 5.2, ETSI EN 300 401 clause 8.1, ETSI TS 103 461		

## Digital Radio Receiver Classes (Announcements)

Function	Class A Audio	Class M Multimedia	Class H Hybrid
<b>Traffic Announcement</b> Road traffic flash	Required for in-car receivers Optional for other receivers	Required for in-car receivers Optional for other receivers	Required for in-car receivers Optional for other receivers
<i>Details</i>	When the announcement type 'Road Traffic flash' is detected, the receiver switches to the selected sub-channel from all services that belong to the signalled cluster. If a DAB or DAB+ audio service is decoded, the announcement must be derived from the corresponding FIG. The response to a signalled announcement may be subject to a user setting. Support for announcement types other than "Road Traffic Flash" and Other Ensemble Announcements is optional. ETSI EN 300 401, ETSI TS 103 176, Clause 7.		
<b>Alarm Announcements</b> Tuned Ensemble Alarms	Required	Required	Required
<i>Details</i>	Receivers shall support Tuned Ensemble Alarm Announcements. Receivers must evaluate the Alarm Flag in FIG 0/0. Signalling for Alarm Announcements shall be ignored, when the Alarm Flag is not set. Switching to the target sub-channel shall perform synchronisation between signalling and audio. An Alarm Announcement takes precedence over any regular announcement. Only one Alarm Announcement shall be active at any time. Receiver response to Alarm Announcements shall not be subject to a user setting. Receivers shall meet all requirements in ETSI TS 103 176, clause 7.6.		
<i>References</i>	ETSI EN 300 401 clause 8.1.6, ETSI TS 103 176 clause 7.6		

	Test Alarm Announcements	Optional	Optional	Optional
	<i>Details</i>	<p>Test Alarms provide confirmation of the entire Alarm infrastructure. When a listener can receive a Test Alarm, it is confirmed that Alarm signalling in emergency situations can be received.</p> <p>Receivers are recommended to support Test Alarm Announcements. If supported all aspects of ETSI TS 103 176, Annex G must be supported.</p> <p>The response to Test Alarms must be a user setting. Response to Test Alarms must be disabled by default (factory setting). Receivers that do not provide a user setting for Test Alarms, must not respond to Test Alarm signalling.</p> <p>Receivers supporting Other Ensemble Test Alarms must support all requirements for Other Ensemble Alarms.</p>		
	<i>References</i>	ETSI EN 300 401 clause 8.1.6, ETSI TS 103 176, Annex G.		
	Alarm Announcements Other Ensemble Alarms	Optional	Optional	Optional
Announcements	<i>General</i>	Other Ensemble Alarms (OE Alarm) provide a signalling to another ensemble for an Alarm Announcement. If the receiver supports Other Ensemble Alarms, the following provisions shall apply. See also ETSI TS 103 176, Annex H.		
	<i>Requirements</i>	<p>Receivers must evaluate the Alarm Flag in FIG 0/0. Signalling for Alarm Announcements shall be ignored, when the Alarm Flag is not set. Switching to the target sub-channel shall perform synchronisation between signalling and audio.</p> <p>An OE Alarm Announcement takes precedence over any regular announcement. Only one Alarm Announcement (Tuned Ensemble or Other Ensemble) shall be active at any time.</p> <p>Receiver response to OE Alarm Announcements shall not be subject to a user setting.</p> <p>Receivers shall meet all requirements in ETSI TS 103 176, clause 7.7.</p>		
	<i>Re-tuning precautions</i>	The receiver needs to change the tuned ensemble to present an Other Ensemble Alarm, in order to avoid undue interruptions of the selected service, specific conditions must be met. Receivers with one tuner shall not support OE Alarms, unless intended for stationary use. An OE Alarm shall only be presented, if the target service component is found in pre-tuning memory. A multi-tuner receiver can verify successful reception of the alarm service before switching to the audio. If the alarm service cannot be received, no switching and no interruption to the audio occurs.		
	<i>References</i>	ETSI EN 300 401 clause 8.1.6, ETSI TS 103 176 clause 7.6, Annex H.		

<p>EWF Emergency Warning Functionality</p>	<p>Optional</p>	<p>Optional</p>	<p>Optional</p>
<p><i>Details</i></p>	<p>EWF is based on AlarmAnnouncements as described above and contains additional mandatory service components (DynamicLabel and Journaline) as well as an optional Wakeup Function.</p> <p>Receivers supporting EWF (EmergencyWarningFunctionality), shall implement Audio, DynamicLabel and Journaline, to support a combination of short information via audio and dynamic label plus detailed multilingual text information via Journaline.</p> <p>The EWF Wakeup Function (wakeup from Standby upon an Alarm) is optional. If available, a receiver shall wakeup latest within one minute.</p> <p>It is recommended, that receivers supporting geolocation detection decode the geo fencing information contained in the EWF Journaline entry menu. If the receiver is located outside of the EWF Journaline geo fencing information, the alarm shall be ignored. The geolocation detection is a receiver internal filter function, that does not share position information to any instance outside of the receiver.</p> <p>Receivers without EWF Journaline geofencing support shall always react on AlarmAnnouncements.</p> <p>The German BBK (Bundesamt für Bevölkerungsschutz und Katastrophenhilfe), the Bavarian Ministry of Internal Affairs and other authorities in Germany are working on EWF based High Priority Emergency Warnings (BBK Priority Class 1) via DAB+ Networks. The purpose of Priority Class 1 messages is immediate transmission of the BBK warning content without any delay and without any modification of the content.</p> <p>EWF is also part of the Radiotechnikum DAB Ensemble in Vienna/Austria. Other countries are evaluating EWF for DAB+.</p>		
<p><i>References</i></p>	<p>DAB-EWF-Spec_v9_20181004.pdf (EWF project specification document provided by Fraunhofer IIS, Erlangen)</p>		

## Digital Radio Receiver Classes (Audio)

Function	Class A Audio	Class M Multimedia	Class H Hybrid
<b>Audio</b> DAB (MPEG layer 2) DAB+ (MPEG-4, HE AACv2)	Required	Required	Required
<b>Audio</b> <i>DAB MPEG layer 2</i>	The audio decoder shall conform to the subset of ISO/IEC 11172-3 as defined in ETSI TS 103 466. The conformity is described in ETSI TS 101 757. The audio decoder should include an error concealment method which may be based on the scale factor-cyclic redundancy check (ScF-CRC) as defined within ETSI EN 300 401. If, for any reason, the data stream cannot be decoded, the receiver shall mute.  The audio part shall be able to decode DAB bitstreams corresponding to both 24 kHz and 48 kHz sampling frequencies. It shall comply with ISO/IEC 11172-3 and ISO/IEC 13818-3 (bit-rates above 256 kbit/s are optional).		
<i>DAB MPEG-4 HE AACv2</i>	The audio decoder shall conform to the subset of ISO/IEC 14496-3 as defined in ETSI TS 102 563 including the error concealment function in normative annex A. If, for any reason, the data stream cannot be decoded, the receiver shall mute.  The audio part shall be able to decode MPEG-4 HE AACv2 bitstreams corresponding to all sampling frequencies and bitrates defined in ETSI TS 102 563. Audio testing procedures are described in ETSI TS 103 461, section 7.3. .		
<i>Stereosignal handling on mono receivers</i>	Receivers with only one speaker shall play the combined L+R audio		

## Digital Radio Receiver Classes (Text)

Function	Class A Audio	Class M Multimedia	Class H Hybrid
<b>Dynamic Label Segment</b> when an entire text message cannot be shown, the text shall be scrolled in the display	Required [for receivers which support simultaneous display of 16 or more characters]	/	/
<i>Supported character set and coding</i>	The receiver shall meet all requirements for Text labels as defined in ETSI TS 103 176, Clause 8. Support the applicable regional profile relevant for the intended market of the receiver is mandatory, as defined in ETSI TS 103 176, Annex I. Receivers supporting the 'EBU Latin profile', with limited display capabilities shall use the limited character representation as defined in ETSI TS 101 756, table C.3.		
<i>Message presentation</i>	A receiver shall support DLS messages of full (128char) length. If the display does not support the presentation of the entire DLS text message on the display at once, the text shall be scrolled on the display. Messages shall not be displayed until they have been received completely.		
<i>References</i>	ETSI EN 300401 section 7.4.5.2; ETSI TS 101 756 Annex C; ETSI TS 103 176 Clause 8 & Annex I		
<b>Dynamic Label Plus (DL+)</b> supported Object types according to DL+ subset	Optional	Required [includes DLS functionality]	Required [includes DLS functionality]
<i>Supported tags</i>	The receiver shall support at a minimum the decoding and presentation of the following DL+ tags: Item category: item.title, item.artist, item.conductor, item.band Info category: info.news Programme category: stationname.long, programme.host, programme.homepage Interactivity category: phone.studio, email.studio The toggling of DL+ messages shall be supported by DL+ capable receivers.		
Text <i>References</i>	ETSI TS 102 980 Annex A		

## Digital Radio Receiver Classes (Text)

Function	Class A Audio	Class M Multimedia	Class H Hybrid
Journaline	Optional	Required for other receivers Optional for in-car receivers	Required for other receivers Optional for in-car receivers
<i>Supported character set</i>	The receiver shall support the applicable regional profile relevant for the intended market of the receiver, as defined in ETSI TS 103 176, Annex I. Receivers supporting the 'EBU Latin profile', with limited display capabilities shall use the limited character representation as defined in ETSI TS 101 756, table C.3.		
<i>Receiver behaviour</i>	The mandatory receiver functionality as detailed in the Journaline specification shall be implemented according to the specification. (ETSI TS 102979, clause 7.1, "Expected receiver behaviour / Mandatory functionality"). Recommended receiver functions, if supported by the receiver, shall be implemented as described in the specification (ETSI TS 102979, clause 7.2, "Expected receiver behaviour / Recommended functionality"). All receivers shall support objects of maximum size (ETSI TS 102979, clause 5.1, "JML object - format specification / Overview").		
<i>Text-to-Speech support</i>	Text-to-Speech functionality is recommended for mobile devices like Smartphones, Automotive Receivers or Receivers designed for impaired users. If a receiver supports text-to-speech output, it shall be implemented according to the specification. (ETSI TS 102979, chapter 7.2.6, "Support for text to speech engines").		
<i>Caching</i>	Data caching for at least 2 objects (4 kB each) shall be supported by the receiver. In addition, persistent storage (optional for all classes) can be used to improve access times after tuning back to previously received Journaline services.		
<i>References</i>	IEC EN 62104, clause 6.5.1 ETSI TS 102 979, ETSI TS 103 176 Annex C; ETSI TS 101 756		

## Digital Radio Receiver Classes (MOT)

Function	Class A Audio	Class M Multimedia	Class H Hybrid
MOT Transport	Optional	Required	Required
<i>Details</i>	Receivers that support any of the MOT services in this sheet shall be able to reassemble at least object after object. Therefore the receiver shall be able to skip MOT segments for objects that it does not intend to reassemble. Note that the content provider will usually interleave segments from various objects. All occurrences of the MOT directory (DgTy=6) shall be received.		
<i>References</i>	ETSI TS 102 371		
EPG Transport	Optional	Required	Required
<i>Profile</i>	EPG Basic Profile mandatory if EPG is supported (Advanced Profile optional)		
<i>Supported objects</i>	At a minimum support for objects up to 16kB is required. Support for compressed objects or directories is required if the receiver supports the Advanced Profile.		
<i>Token table</i>	All receiver shall support the token table mechanism. Token bytes in the token table shall be discarded.		
<i>References</i>	ETSI TS 102 371 clause 4.9		

## Digital Radio Receiver Classes (MOT)

Function	Class A Audio	Class M Multimedia	Class H Hybrid
EPG Programme information	Optional	Required for other receivers Optional for in-car receivers	Required for other receivers Optional for in-car receivers
<i>Supported objects</i>	Support for 'Programme information' objects is required according to the 'basic profile'. One MOT object within an EPG service holds programme information for one service for one day. All receivers shall support at a minimum the parsing of the programme information object for the present day and the selected service.		
<i>Supported tags</i>	<p>If supported, at a minimum, all receivers shall decode the following programme information elements and their associated attributes:</p> <p><i>Schedule</i>  <i>Schedule.scope</i>  <i>Schedule.scope.startTime</i>  <i>Schedule.scope.stopTime</i>  <i>Schedule.scope.serviceScope</i>  <i>Schedule.programme</i>  <i>Schedule.programme.shortID</i>  <i>Schedule.programme.mediumName</i>  <i>Schedule.programme.location</i>  <i>Schedule.programme.location.time</i>  <i>Schedule.programme.location.time.startTime</i>  <i>Schedule.programme.location.time.duration</i>  <i>Schedule.programme.mediaDescription.shortDescription</i>  <i>Schedule.programme.genre</i>  <i>Schedule.programme.genre.name</i></p>		<p>Additionally support for the following programme information tags and associated attributes is required:</p> <p><i>Schedule.programme.link</i>  <i>Schedule.programme.url</i>  <i>Schedule.programme.description</i></p>
<i>String sizes</i>	A support for string sizes of 16 characters is required.		
<i>References</i>	ETSI TS 102 371 ETSI TS 102 818 See 'Proposed usage of text services'		

## Digital Radio Receiver Classes (MOT)

Function	Class A Audio	Class M Multimedia	Class H Hybrid
MOT (Multimedia Object Transfer) EPG Service Information	Optional	Required	Required
<i>Supported objects</i>	Support for 'service information' objects is required according to the 'basic profile'. One MOT object within an EPG service holds service information for all services in the ensemble that the EPG service addresses. All receivers shall support the parsing of the service information object.		
<i>Supported tags</i>	If supported, at a minimum, all receivers shall decode the following service information elements and the associated attributes:  ensemble ensemble.shortName ensemble.mediumName ensemble.frequency ensemble.service ensemble.service.serviceID ensemble.service.shortName ensemble.service.mediumName ensemble.service.mediaDescription ensemble.service.mediaDescription.shortDescription		Additionally support for the following programme information tags and associated attributes is required:  <i>ensemble.link</i>
<i>References</i>	ETSI TS 102 371 clause 5 & Annex A 'Profiling Tables'		

## Digital Radio Receiver Classes (MOT)

Function	Class A Audio	Class M Multimedia	Class H Hybrid
Station logo	Optional	Required	Required
<i>Details</i>	<p>A receiver that include a display with graphics capability (also referred as color dot matrix), the station logo shall be shown for the selected service and in the service list. At a minimum the station logo shall be shown as the 32x32 pixel (logo_colour_square) size. For support of station logos the receiver shall extract the logo (image) files from the EPG object carousel. The association of an image file name and a service ID is given in the relevant EPG service information object. If supported, at a minimum, a receiver shall be able to extract the following elements (and associated attributes) from the service information object:</p> <p>ensemble ensemble.service ensemble.service.serviceID ensemble.service.mediaDescription ensemble.service.mediaDescription.multimedia</p>		
<i>References</i>	ETSI TS 102 818 annex I (guideline for logo usage)		
Slideshow / cat. Slideshow	Optional	Required	Required
<i>Slide objects</i>	<p>All receivers shall support image files of type JPG and PNG, at sizes up to 50kB. Support for image dimensions of at least 320x240 pixels is required. Images shall be presented at their original aspect ratio and shall not be cropped when displayed large. If cat. SLS is supported the device shall provide a holding buffer of at least 450 kB and shall be able to cache <b>at least 20 slides</b> up to a maximum of 64 slides. Receivers with internet browser shall support click-through and alternative-location URLs.</p>		
<i>Slide categories</i>	<p>Support for at least 7 slide categories is required. Support for category name with a minimum of 16 characters is required. The receiver shall provide a navigation menu to allow to access the received slides per category in interactive mode. This requires for example:</p> <ul style="list-style-type: none"> <li>- Category view (which displays the names of the received categories so far)</li> <li>- Slide view (which displays the received slides in a certain category)</li> </ul>		
<i>References</i>	<p>ETSI TS 101 499 V2.3.1 (section 5.2.2, 6.2, 8.1) See 'Proposed usage of visual services'</p>		

## Digital Radio Receiver Classes (Hybrid Broadcast Broadband)

Function	Class A Audio	Class M Multimedia	Class H Hybrid
Return channel / Interactivity <small>(wired or wireless local area network connectivity)</small>	Optional	Optional	Required
<i>General</i>	Receivers without return channel shall disregard information for interactive use provided on the broadcast channel If supported, see for requirement description at Class H.		Receivers with active return channel (i.e. Ethernet, WiFi, EDGE/3/4G) connection shall support the following interactive functionality offered by data provided on the broadcast channel upon user interaction:
<i>DL+</i>			Open URLs in webbrowser if device has a built-in browser Forward e-mail address to an email-application if device has such an application and open application
<i>EPG</i>			Open URLs in webbrowser if device has a built-in browser
<i>Journaline</i>			All link type definitions listed in the Journaline specification (ETSI TS 102979, clause 5.3.2.3 "Data section "general link target" structure and content") and supported by the receiver device, such as e-mail, URL, SMS, phone number, other DAB services, etc.
<i>cat. Slideshow</i>			Open URLs in webbrowser if device has built-in browser
RadioDNS	Optional	Optional	Required
<i>References</i>	ETSI TS 101 499 ETSI TS 102 371 ETSI TS 102 818 ETSI TS 103 270 RTAG01 V1.0.0 DRAFT 7 (2015-06)		

## Digital Radio Receiver Classes (Display)

Function	Class A Audio	Class M Multimedia	Class H Hybrid
Alphanumeric display (support of EBU Latin profile)	Required		
<i>Character set for text display</i>	The receiver shall meet all requirements for Text labels as defined in ETSI TS 103 176, Clause 8. Receivers shall support the 'EBU Latin profile', and support limited character representation as defined in ETSI TS 101 756, table C.3.		
<i>Display size</i>	At least 8 characters shall be displayed		
Colour screen display	Optional	Required	Required
<i>Colour display characteristics</i>	The display shall support at least the minimum display requirements of 320 x 240 pixels at a colour/grey scale depth of 8 bits per pixel (Simple profile) for a 4:3 slide format as recommended by the SLS specification ETSI TS 101 499 (section 8.1)	The display shall support at least the minimum display requirements of 320 x 240 pixels at a colour depth of at least 15 bits per pixel (enhanced profile) for a 4:3 slide format as recommended by the SLS specification. ETSI TS 101 499 (section 8.1)	
<i>Character set for text display</i>	The receiver shall meet all requirements for Text labels as defined in ETSI TS 103 176, Clause 8. Support the applicable regional profile relevant for the intended market of the receiver is mandatory, as defined in ETSI TS 103 176, Annex I.		
Interface to external display	Optional	Optional, Required if no built-in display	Optional, Required if no built-in display
<i>Details</i>	Systems consisting of multiple components have to meet the requirements in combination. The device containing the digital radio receiver may claim the respective class, but shall state the need of additional devices for the overall system functionality. System components needed for a specific function have to be listed.		

## Digital Radio Receiver Classes (Mobility)

Function	Class A Audio	Class M Multimedia	Class H Hybrid
TPEG if product supports navigation system	Optional	Required for in-car receivers Optional for other receivers	Required for in-car receivers Optional for other receivers
<i>General</i>	A receiver shall either pass on the complete TPEG transport stream to a separate TPEG decoding system or shall support TPEG services on its own.		
<i>Transport</i>	Receivers shall support the transport of TPEG services as defined in ETSI TS 103 551.		
<i>Supported services in case of TPEG receiver implementation</i>	All receivers shall support TPEG services providing safety traffic information using the following TPEG applications: TPEG-TEC, TPEG2-TFP. For location referencing method(s) the specifications of TISA shall be followed.		
<i>Service access</i>	All FTA services shall be decoded and available for use.		
<i>Details</i>	Systems consisting of multiple components have to meet the requirements in combination. The device containing the digital radio receiver may claim the respective class, but shall state the need of additional devices for the overall system functionality. System components needed for a specific function have to be listed.		
<i>References</i>	ISO/TS 21219-9: TPEG-SNI ISO/TS 21219-15: TPEG-TEC, version 3.0/001 ISO/TS 21219-18: TPEG2-TFP, version 1.0/003 ISO/TS 17572 - 2: Pre-coded profile ETSI TS 103 551: Digital Audio Broadcasting (DAB); Transport of TPEG services.		