AISG Standard
Antenna Port Colour Coding
V3.2.1

Revision History

DATE	ISSUE	NOTES
28. June 2012	1.0	First issue
9. July 2012	1.1	Chapter 1 FOREWORD, amended as agreed
31 January 2013	2.0	Chapter 8.1 wording, Chapter 10 Array ID, introduced
12th March 2014	3.0	Introduction of Coding Reference Point for port and array numbering
7th May 2015	3.1	Editorial corrections and extension to lower frequency ranges
12th March 2018	3.2	Two new bands and band colours added. The upper limit of the yellow band reduced from 4GHz to 3GHZ. Band colour table modified to make it more readable even when printed with black and white printer. New coding examples of the new bands added to Annex A.
7th May 2018	3.2.1	Only editorial changes: Corrected version on 2..n page header. Corrected wrong font style in the annex part of the table of contents. Unified 1st page texts with the v3.0 standards.

CONTENT

1. FOREWORD

The Antenna Interface Standards Group (AISG) published the AISG standard to facilitate the introduction of antenna line products with remote control and monitoring facilities. The purpose of this standard is to introduce a colour and print-pattern coding scheme as well as a text marking scheme for the Antenna RF and AISG Control Ports. Using this specified colour/pattern coding and text marking should help an installer/rigger to minimize cabling errors by identifying the RF ports of an antenna array and the associated AISG Control Ports.

For purposes of compliance, users should note that this entire Standard is *optional*. However, once this standard is referred to in a device, the entire specification becomes mandatory.

This document does not apply to ALDs external to the antenna.

2. SCOPE

This document is a stand-alone specification (independent to other AISG antenna or ALD related specifications).

3. REFERENCES

This AISG Standard incorporates references to other publications. These are cited in the text and the referenced publications are listed below. Where references are listed with a specific version or release, subsequent amendments or revisions of these publications apply only when specifically incorporated by amendment or revision of this AISG specification. For references listed without a version or release, the latest edition of the publication referred to applies.

1 [Not used]
2 Colour list RAL-840-HR (matt finish)

4. ABBREVIATIONS

Where abbreviations or acronyms are used in this document they have the following meaning:

ALD	Antenna Line Device
RET	Remote Electrical Tilting

5. TERMINOLOGY AND DEFINITIONS

Where the following terms are used in this document, they have the meaning listed below.

Antenna Line	A group of logical devices associated with one or more antenna systems, which may include antenna control actuator, amplifiers and other equipment.
Antenna Line Device	A generic term for an addressable physical device, such as an antenna drive or amplifier.
RF Port	The port which is carrying the radio frequency signal.

Array	An Array is a logical group of single or dual polarized radiators inside the antenna radome supporting a common frequency band and a common beam shape and tilt.
Array Position	The relative position of an antenna array for a specific frequency band inside the antenna radome.
AISG Control Port	The antenna interface carrying AISG control functionality related to RF Ports (e.g. mechanical RET interface or electrical control port like RS485)
RAL Colour List	Defined set of colours specified by the RAL institute
Coding Reference Point	If an antenna contains more than one array having the same colour group, then the arrays shall be numbered beginning from the coding reference point. The coding reference point is defined as the lower left corner of the antenna looking at the front of the antenna, oriented as mounted.

6. GENERAL COLOUR AND PATTERN CODING AND TEXT MARKING RULES

To assign a colour and/or pattern coding to an antenna RF Port and AISG Control Port, the following general rules shall apply:

(1) The assigned colour shall be defined by the highest frequency of the frequency band supported by the antenna RF Port, i.e. the upper band edge.

(2) If the antenna has only one AISG IN Control Port, and if there is no ambiguity, then the AISG Control Port shall not require a colour/pattern code.

(3) It shall be possible to identify all ports before and after port connections are made.

7. COLOUR CODING DEFINITIONS

7.1. Frequency range and colour codes

Colour coding is used to identify antenna RF Ports and the associated AISG Control Ports. The applied colours shall be part of the RAL Colour List defined in [2]. Table 7.1.1 shows the definition of the frequency range and the associated colour code.

To assign a colour to an AISG control port and/or an RF port the following rule shall apply:

"Use the upper edge of the frequency range to select the colour code."

Table 7.1.1 Definition of RF frequency range and associated RAL code

Upper Band Edge Range	RAL Code of the Colour	Band Colour	Band Character
380 MHz - 1000 MHz	RAL 3020	Red	R
1001 MHz - 1700 MHz	RAL 6029	Green	G
1701 MHz - 2300 MHz	RAL 5015	Blue	B
2301 MHz - 3000 MHz	RAL 1023	Yellow	Y
3001 MHz - 5000 MHz	RAL 4006	Purple	P
5001 MHz - 6000 MHz	RAL 2009	Orange	O

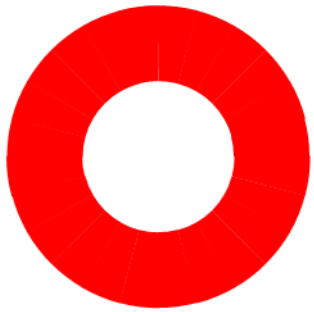
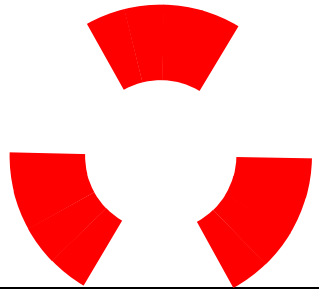
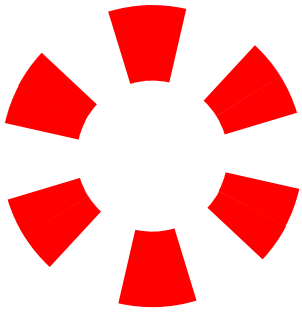
7.2. Pattern coding

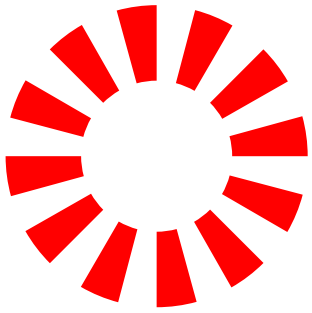
The following chapter introduces a pattern coding that is required for differentiation of array ports carrying the same colour coding.

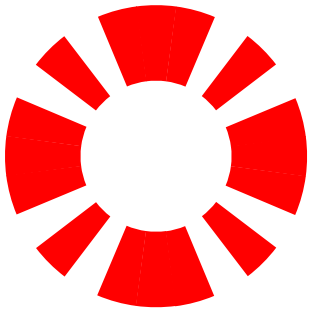
If more than one array uses the same colour coding, additional differentiation with clearly distinguishable pattern coding is mandatory. The used pattern shall remain visible and distinguishable after all connectors are attached.

Recommended patterns are shown in table 7.2.1 – 7.2.3.

Table 7.2.1 Pattern coding for non-multiplexed ports

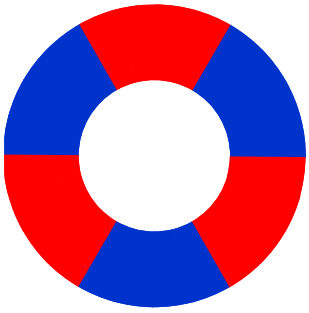
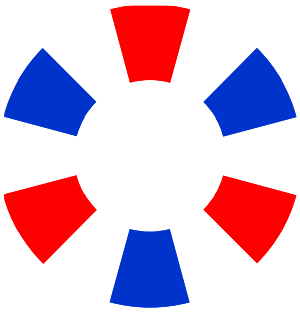
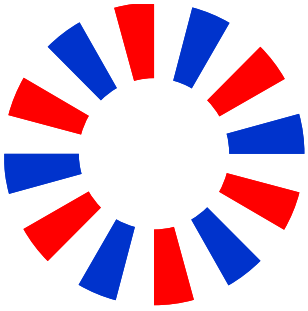
Pattern	Description	Comment
	**Ports of array 1**	**Solid pattern**
	**Ports of array 2**	**Segmented pattern 1 (3 + 3 segments of colour and gaps)**
	**Ports of array 3**	**Segmented pattern 2 (6 + 6 segments of colour and gaps)**

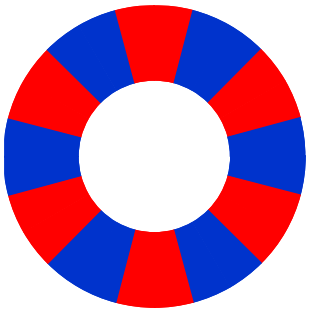
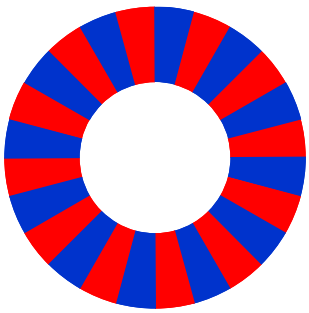
	**Ports of array 4**	**Segmented pattern 3 (12 + 12 segments of colour and gaps)**

	**Ports of array 5**	**Segmented pattern 4 (4 small and 4 large segments of colour separated by 8 gaps)**

NOTE: Gaps between coloured segments may be white or antenna background colour.

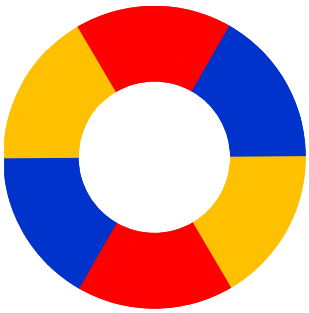
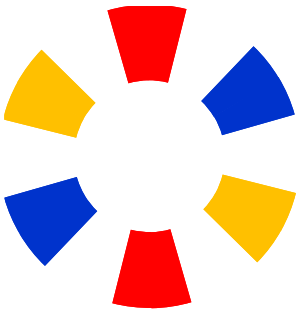
Table 7.2.2 Pattern coding for diplexed ports

Pattern	Description	Comment
	**Ports of array 1 and 2**	**Segmented pattern 1 (6 segments of the colours of the two diplexed frequency bands, colours of diplexed frequency bands alternate)**
	**Ports of array 3 and 4**	**Segmented pattern 2 (6 + 6 segments of colours and gaps, colours of diplexed frequency bands alternate)**
	**Ports of array 5 and 6**	**Segmented pattern 3 (12 + 12 segments of colours and gaps, colours of diplexed frequency bands alternate)**

	**Ports of array 7 and 8**	**Segmented pattern 4 (12 segments of colours of the diplexed frequency bands, colours of diplexed frequency bands alternate)**
	**Ports of array 9 and 10**	**Segmented pattern 5 (24 segments of colours of the diplexed frequency bands, colours of diplexed frequency bands alternate)**

NOTE: Gaps between coloured segments can be white or antenna background colour.

Table 7.2.3 Pattern coding for triplexed ports

Pattern	Description	Comment
	**Ports of array 1, 2 and 3**	**Segmented pattern 1 (6 segments of the colours of the three triplexed frequency bands, colours of triplexed frequency bands alternate)**
	**Ports of array 4, 5 and 6**	**Segmented pattern 2 (6 + 6 segments of colours and gaps, colours of triplexed frequency bands alternate)**

	**Ports of array 7, 8 and 9**	**Segmented pattern 3 (12 + 12 segments of colours and gaps, colours of triplexed frequency bands alternate)**

NOTE: Gaps between coloured segments can be white or antenna background colour.

8. TEXT MARKING REQUIREMENTS OF RF PORTS

Text markings shall be located close to the related ports.

8.1. Port Number

The RF ports shall be marked with unique port numbers. RF port numbering shall start with 1 and increment by 1 for each following RF port without resetting the number to 1.

To assign the RF port numbers start with non-multiplexed ports, continue with diplexed ports and then continue with triplexed ports.

The following rules shall be used to assign RF port numbers for non-multiplexed ports:

(1) Start RF port numbering for the colour representing the lowest frequency band supported in the antenna and continue in the order red to green to blue to yellow.

(2) Within the same colour, RF port numbering begins from nearest array position to the Coding Reference Point at solid pattern and then continues bottom-up as first direction and left-to-right as second direction to segmented colour pattern 1 up to segmented colour pattern 4.

(3) Within the same colour pattern, port numbering is in the order +45° to -45°, RHC to LHC, or V to H.

The following rules shall be used for diplexed RF ports

(1) Start at the last incremented number of non-multiplexed ports and increment by 1 for segmented pattern 1 up to segmented pattern 5.

(2) Start with colour combinations with red as the first colour and the second colour in the order red to green to blue to yellow. Continue accordingly for combinations containing green, blue, and yellow as the first colour.

(3) Within the same colour combination, port numbering begins from the nearest array position to the Coding Reference Point bottom up as first direction and left-to-right as second direction in the order +45° to -45°, RHC to LHC, or V to H.

The following rules shall be used for triplexed RF ports

(1) Start at the last incremented number of diplexed ports and increment plus 1 for segmented pattern 1 up to segmented pattern 3.

(2) Start with colour combinations with red as the first colour, red as the second colour, and the third colour in the order red to green to blue to yellow. Continue accordingly for combinations containing green, blue, and yellow as the second colour and finally with the first colour in the order green to blue to yellow.

(3) Within the same colour combination, port numbering begins from the nearest array position to the Coding Reference Point bottom up as first direction and left-to-right as second direction in the order +45° to -45°, RHC to LHC, or V to H.

In the case of more than one array having the same colour and occupying the same position relative to the Coding Reference Point, RF port numbering begins with the array having the lowest operating frequency and proceeds in the order of increasing lowest frequency.

8.2. Array Position

If the antenna includes two or more arrays supporting the same frequency range, then the relative position of the arrays shall be marked by using the abbreviation or full text format given in table 8.2.1. The use of upper and/or lower case is acceptable.

In addition to the left/right port marking, the left/right orientation of the array position shall be marked on the antenna (see Annex D).

Table 8.2.1 Definition of array position

Vertical definition	
Abbreviation format	**Full text format**
T	Top
MT	Mid Top
M	Mid
MB	Mid Bottom
B	Bottom

Horizontal definition	
Abbreviation format	**Full text format**
L	Left
CL	Centre Left
C	Centre
CR	Centre Right
R	Right

For two-dimensional arrangements combinations of the definitions shall be used (see Annex C).

NOTE: If there is a need for marking more than 5 positions in horizontal and/or vertical line the marking can be vendor specific.

8.3. Frequency Range

The supported frequency band of the RF Port shall be marked as defined in table 8.3.1.

Table 8.3.1 Definition of RF frequency marking format for RF port

<StartFrequency><dash><StopFrequency>[<space><MHz>]1)

1) The use of <MHz> in the marking is optional.

The used resolution of start and stop frequency shall be 1MHz (e.g., 880-960 MHz).

NOTE: If there are multiple supported frequency bands, concatenated strings with a slash "/" in between are recommended.(e.g. 880-960/1710-2170 MHz)

8.4. AISG/DC port

RF ports that are used to receive and transmit AISG OOK signalling and DC power supply to integrated devices shall be marked with the letters "AISG IN".

8.5. Polarization

The polarization of the array connected to the RF port shall be marked as defined in table 8.5.1.

Table 8.5.1. Definition of polarization marking

cross polar antennas	Vertical	Horizontal	Right Hand Circular	Left Hand Circular
+[45°] [1)] or -[45°][1)]	**V**	**H**	**RHC**	**LHC**

[1)] The use of <45°> in the marking is optional.

9. TEXT MARKING REQUIREMENTS OF AISG CONTROL PORTS

Text markings shall be located close to the related ports.

9.1. AISG Control Port

Any port that is used to receive and transmit AISG control signalling shall be marked with the letters “AISG IN” or “AISG OUT”.

If an AISG Control Port is implemented as a proprietary interface (e.g. mechanical RET interface) the text marking “AISG IN” or “AISG OUT” may be replaced by a vendor-specific term.

9.2. Array Position

If the antenna includes two or more arrays supporting the same frequency range, the AISG Control Port shall be marked with the same relative position of the arrays as used to mark the RF port by using either the abbreviation or full text format given in table 8.2.1. This shall only apply if more than one AISG control interface is used for the given frequency range.

9.3. Frequency Range

The marking of the frequency range is optional as defined in table 9.3.1.

Table 9.3.1 Definition of RF frequency marking format for AISG control port

<StartFrequency><dash><StopFrequency>[<space><MHz>][1)]

[1)] The use of <MHz> in the marking is optional.

The used resolution of start and stop frequency shall be 1MHz (e.g. “880-960 MHz”).

NOTE: If there are multiple supported frequency ranges, concatenated strings with a slash “/” in between are recommended.(e.g. “880-960/1710-2170 MHz”)

10. ARRAY ID

An antenna includes one or more arrays which shall have an assigned unique array identifier called array ID. This array ID shall be built as a concatenated string which consists of the first letter of the appropriate colour (R, Y, G, B) and a unique number within each colour.

To assign the array ID number, start with non-multiplexed ports, continue with diplexed ports and then continue with triplexed ports.

The following rule shall be used to assign the array ID number for non-multiplexed ports:

- Within each colour, start numbering with 1 beginning from nearest array position to the Coding Reference Point at solid pattern and increment by 1. Continue bottom-up as first direction and left-to-right as second direction for segmented pattern 1 up to segmented pattern 4 (see table 7.2.1)

The following rules shall be used to assign the array ID number for diplexed ports:

(1) Start with the last incremented array number of non- multiplexed ports from nearest array position to the Coding Reference Point of the same colour code and increment by 1 continue bottom-up as first direction and left-to-right as second direction for segmented pattern 1 up to segmented pattern 5 (see table 7.2.2).

(2) Concatenate the array ID string of the two colour strings separated by slash for diplexed ports (e.g. R1/B1, …)

The following rules shall be used to assign the array ID number for triplexed ports:

(1) Start with the last incremented array number of diplexed ports from nearest array position to the Coding Reference Point of the same colour code and increment plus 1 continue bottom-up as first direction and left-to-right as second direction for segmented pattern 1 up to segmented pattern 3 (see table 7.2.3).

(2) Concatenate the array ID string of the three colour strings separated by slash for triplexed ports (e.g. R1/B1/Y1 …)

In the case of more than one array having the same colour and occupying the same position relative to the Coding Reference Point s, numbering begins with the array having the lowest operating frequency and proceeds in the order of increasing lowest frequency.

The array ID number shall be marked on the antenna closed to the RF ports and control ports. If there is no ambiguity one text marking position may be sufficient.

Annex A: Examples of colour coding (informative)

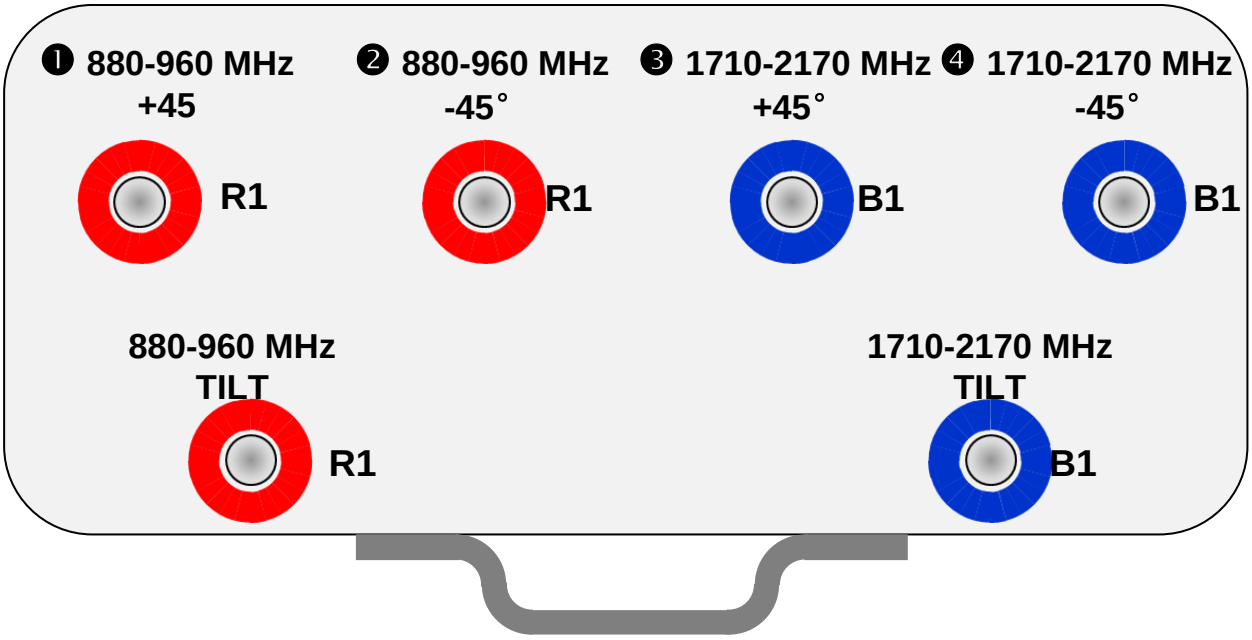
Table A.1 shows the colour coding for typical frequency examples.

Table A.1 Examples of RF frequency marking

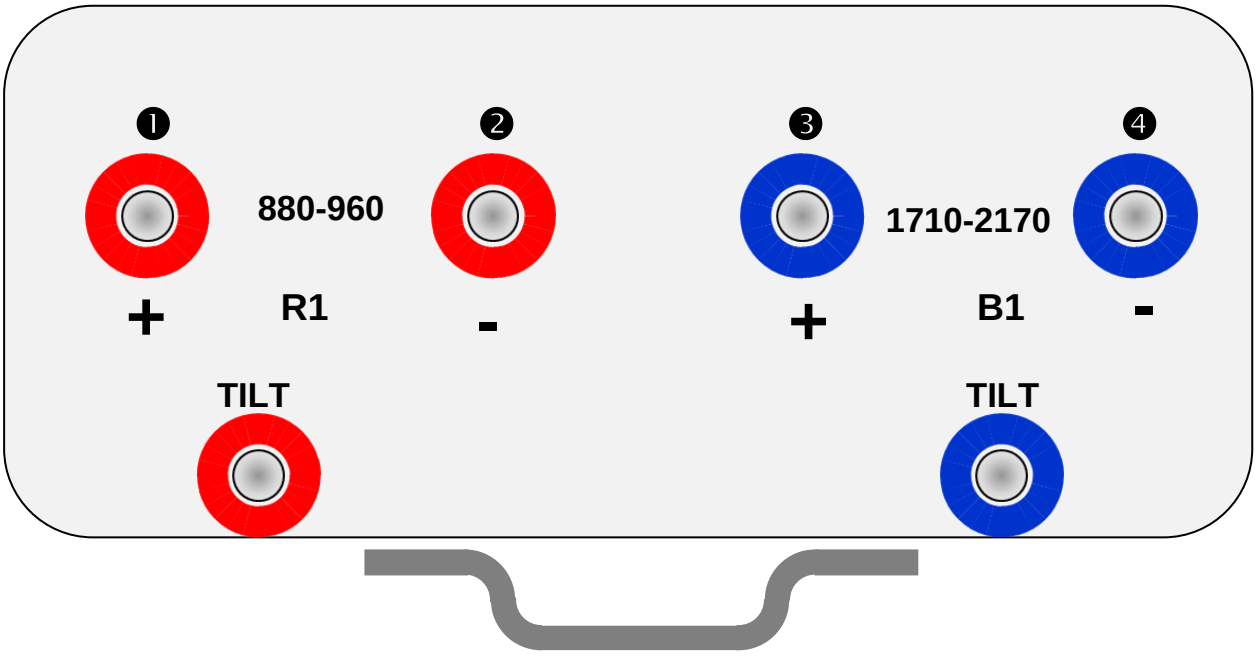
Typical frequency bands and the applicable antenna port colour coding	f_low [MHz]	f_high [MHz]	Colour Code
400 MHz	380	500	RAL 3020
500+600 MHz	500	698	RAL 3020
700 MHz	698	806	RAL 3020
800 MHz	791	862	RAL 3020
850 MHz	824	894	RAL 3020
700+850 MHz	698	894	RAL 3020
900 MHz	880	960	RAL 3020
850+900 MHz	824	960	RAL 3020
800+900 MHz	791	960	RAL 3020
700+800+900 MHz	698	960	RAL 3020
1400 MHz	1428	1496	RAL 6029
1500 MHz	1525	1661	RAL 6029
1800 MHz	1710	1880	RAL 5015
1900 MHz	1850	1990	RAL 5015
2100 MHz	1920	2170	RAL 5015
1800+2100 MHz	1710	2170	RAL 5015
2300 MHz	2300	2400	RAL 1023
2600 MHz	2496	2690	RAL 1023
1800+2100+2600 MHz	1710	2690	RAL 1023
3500 MHz	3400	3600	RAL 4006
3700 MHz	3600	3800	RAL 4006
4200 MHz	4100	4300	RAL 4006
4900 MHz	4800	5000	RAL 4006
3500+3700 MHz	3400	3800	RAL 4006
4200+4900 MHz	4100	5000	RAL 4006
5000 MHz WiFi	4910	5875	RAL 2009
5200 MHz	5150	5350	RAL 2009
5900 MHz	5855	5925	RAL 2009

Annex B: Examples of colour and pattern coding (informative)

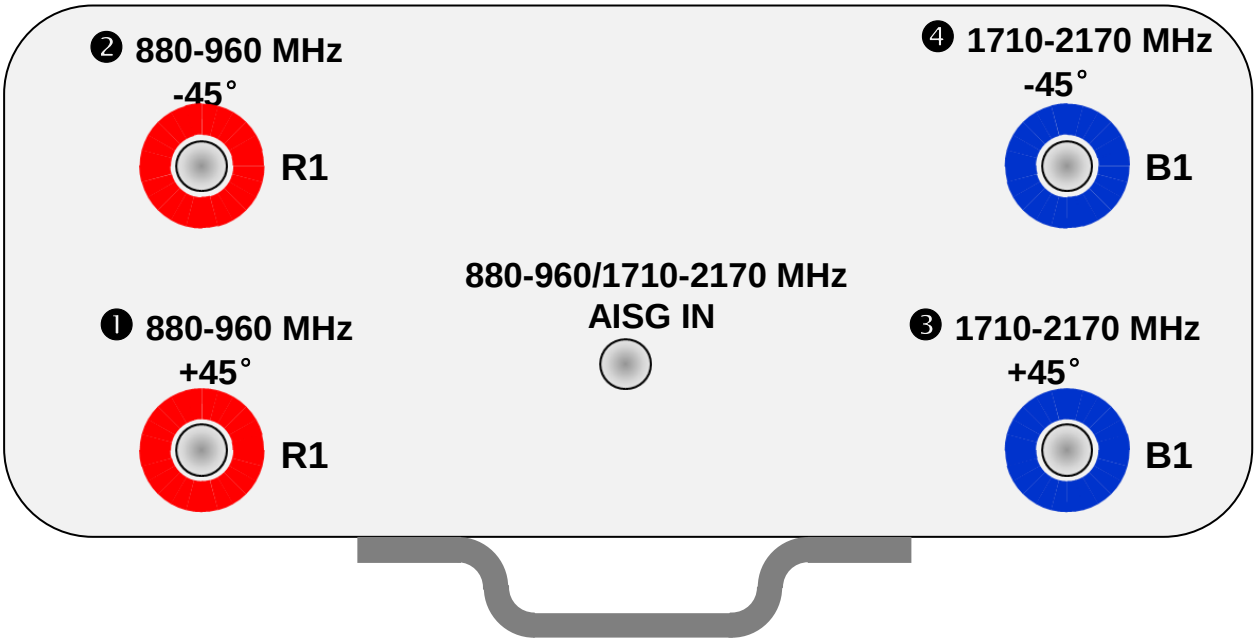
(1) Dual Band Antenna 880-960/1710-2170 MHz



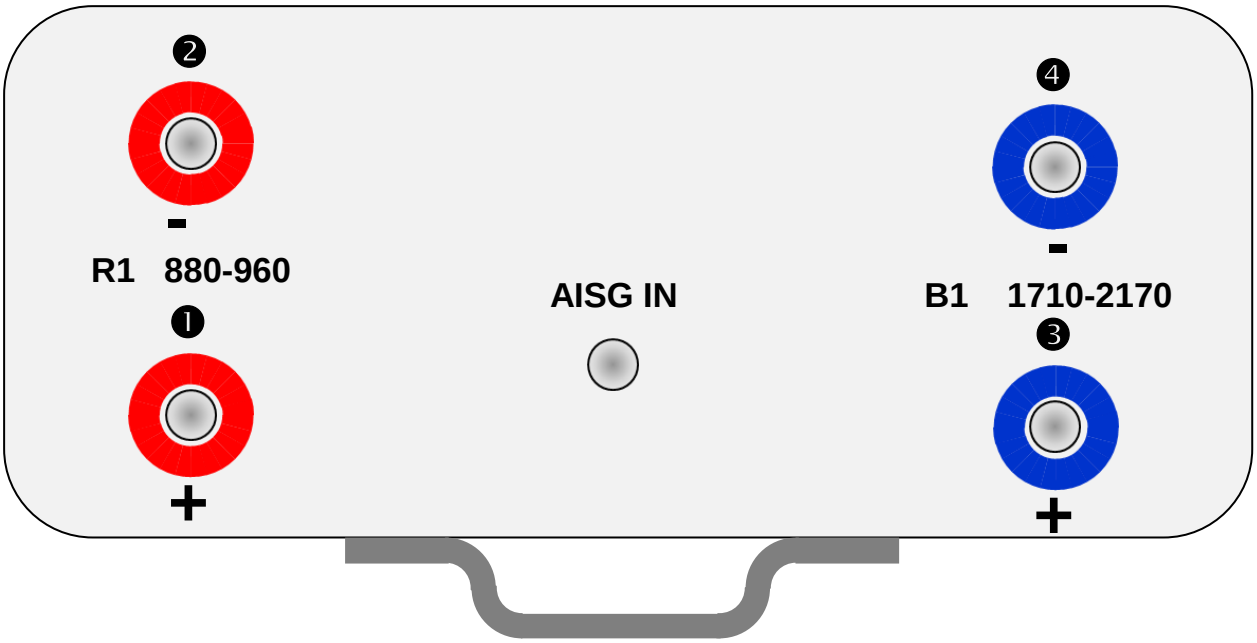
Minimum marking required:



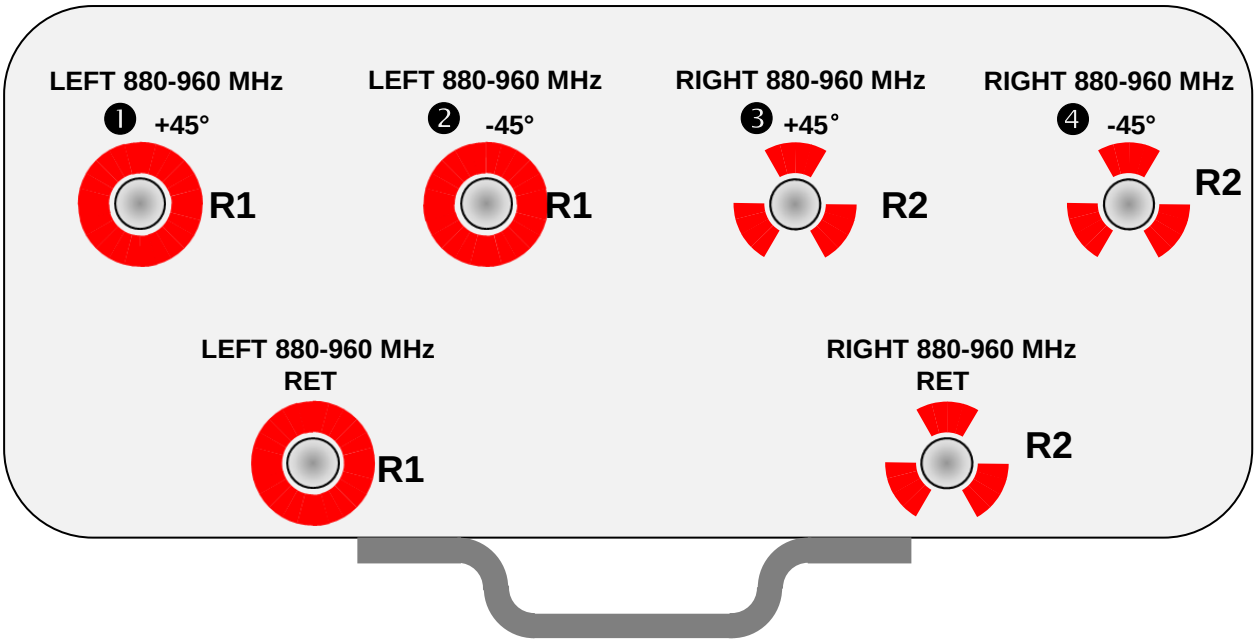
(2) Dual Band Antenna 880-960/1710-2170 MHz with an integrated multi RET interface for both bands



Minimum marking required:



(3) Side-by-Side low band antenna 880-960/880-960 MHz



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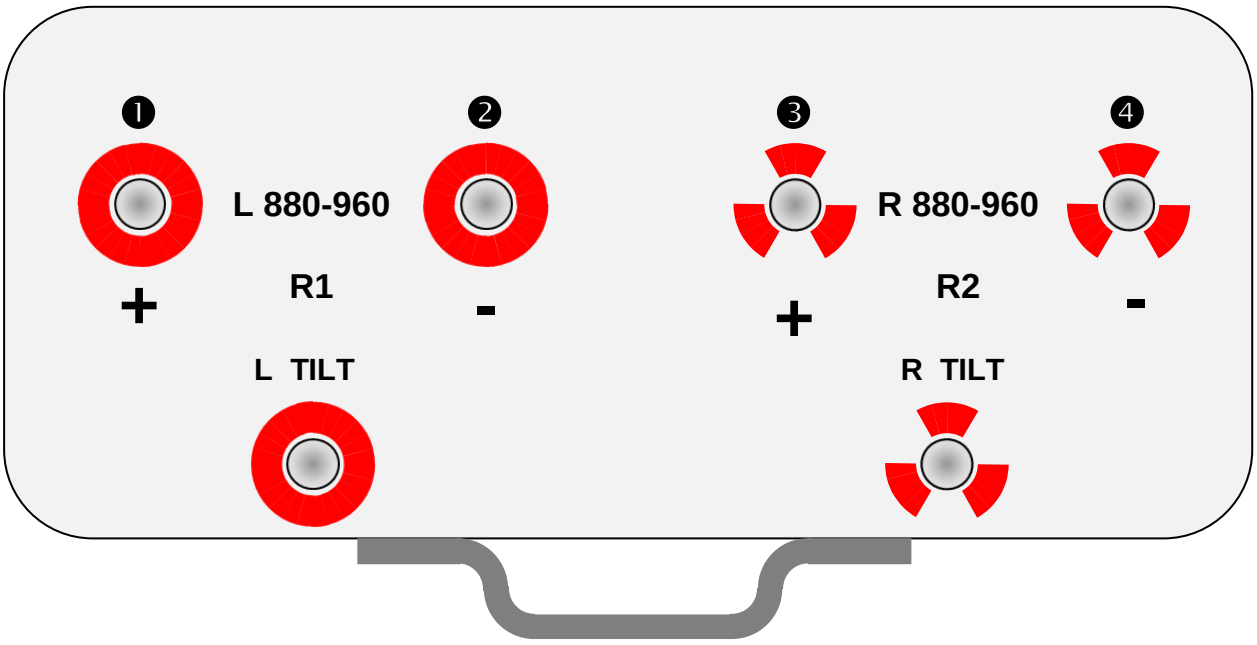
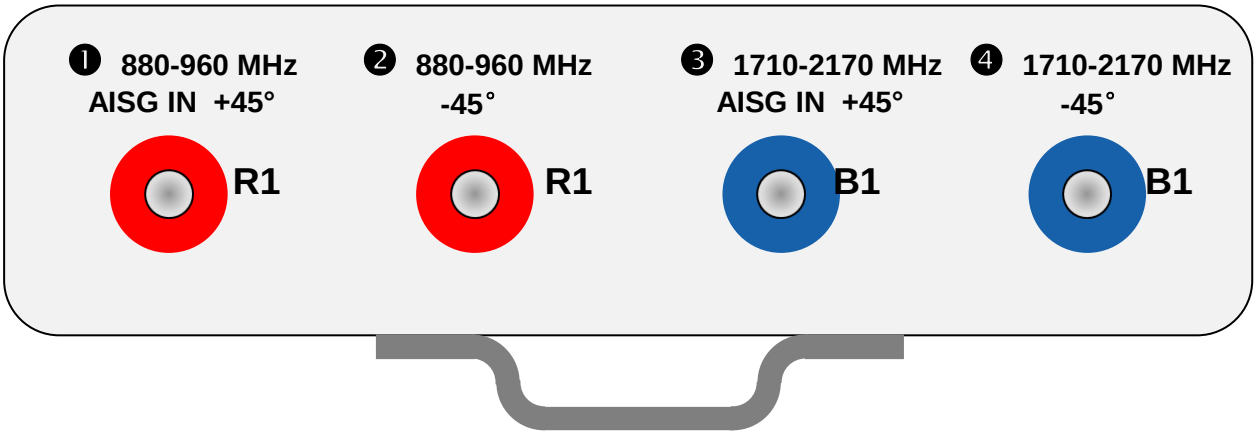
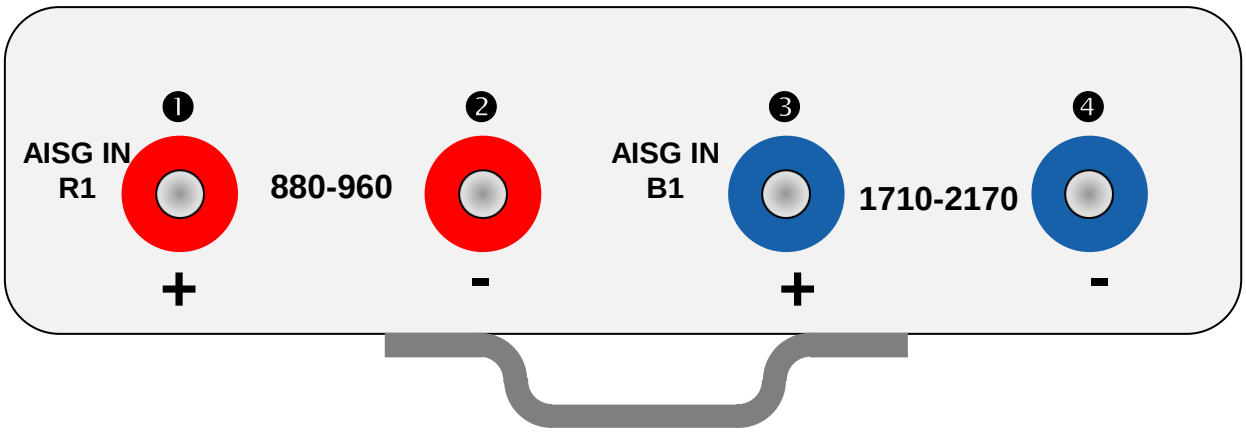


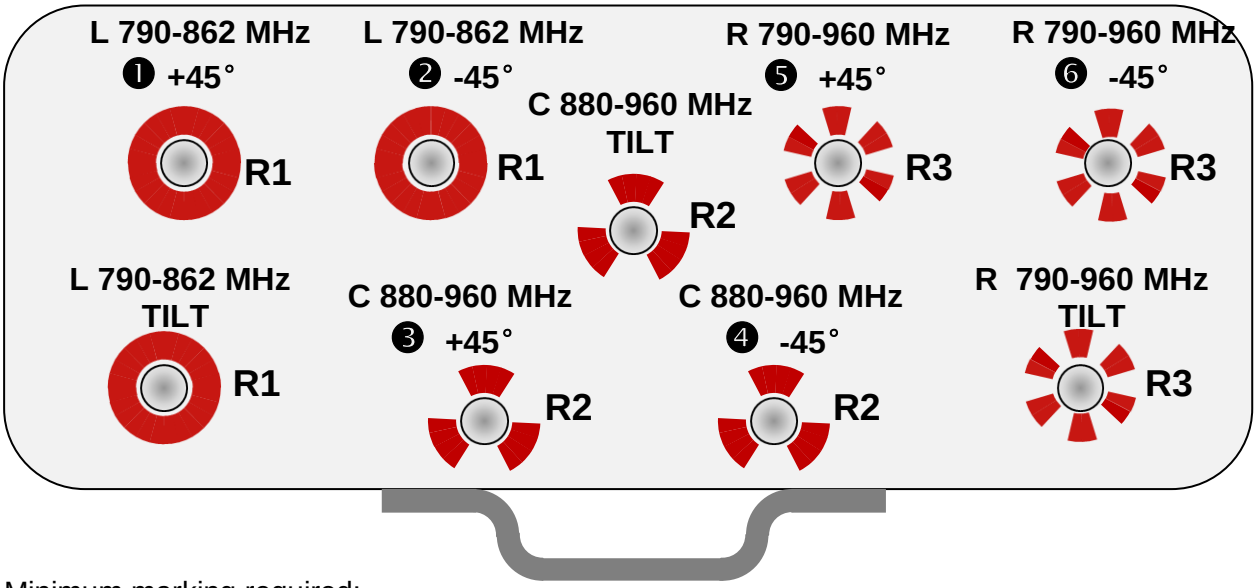
(4) Dual Band Antenna 880-960/1710-2170 MHz with integrated BIAS-T and integrated RETs



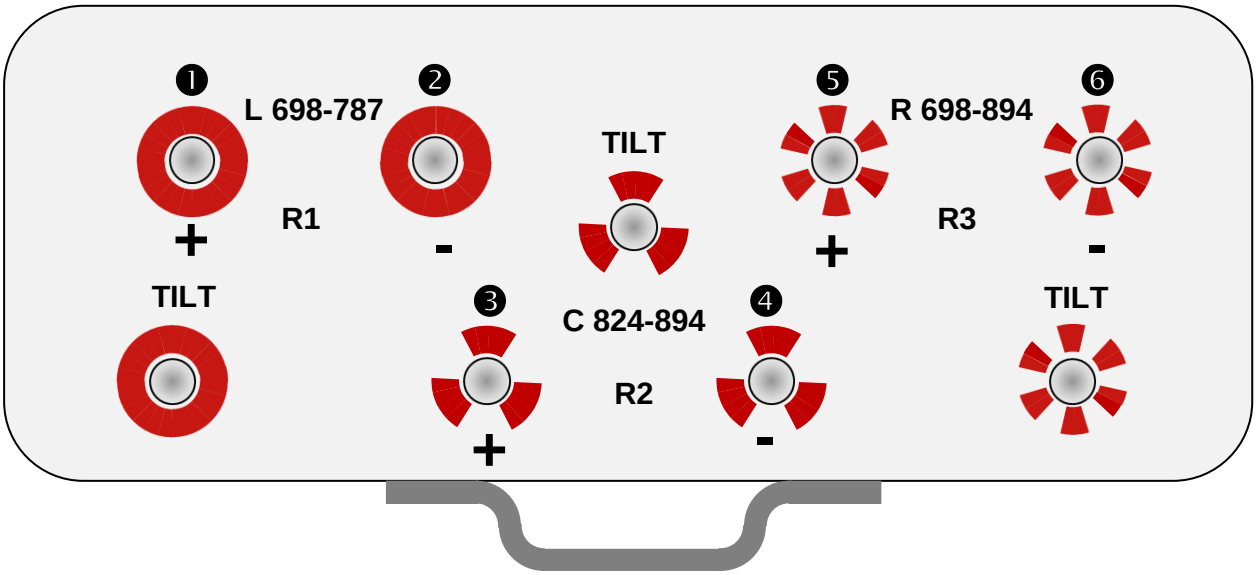
Minimum marking required:



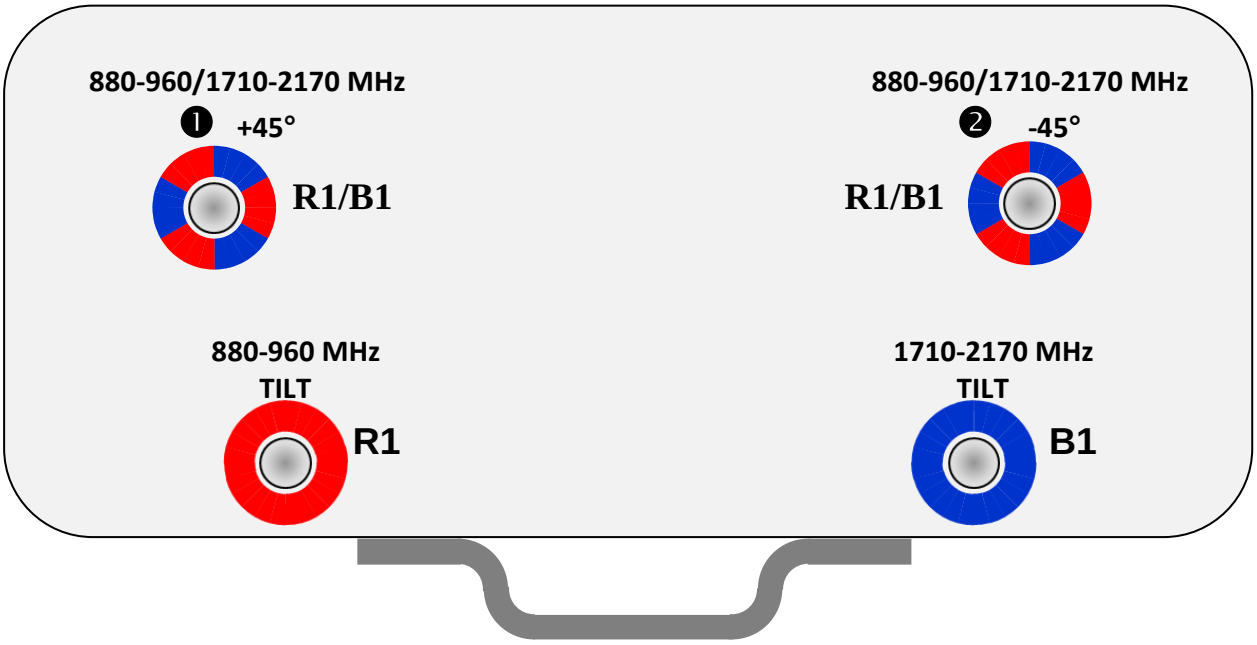
(5) Triple Band Antenna 800 MHz / 900 MHz / 800+900 MHz



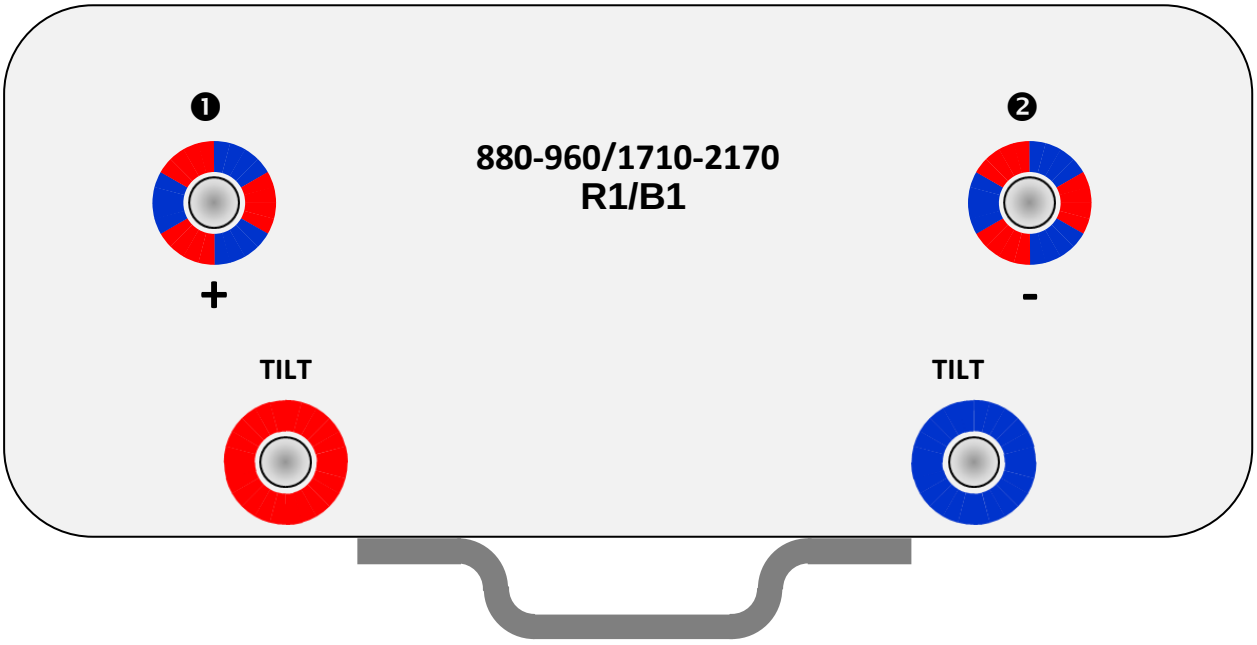
Minimum marking required:



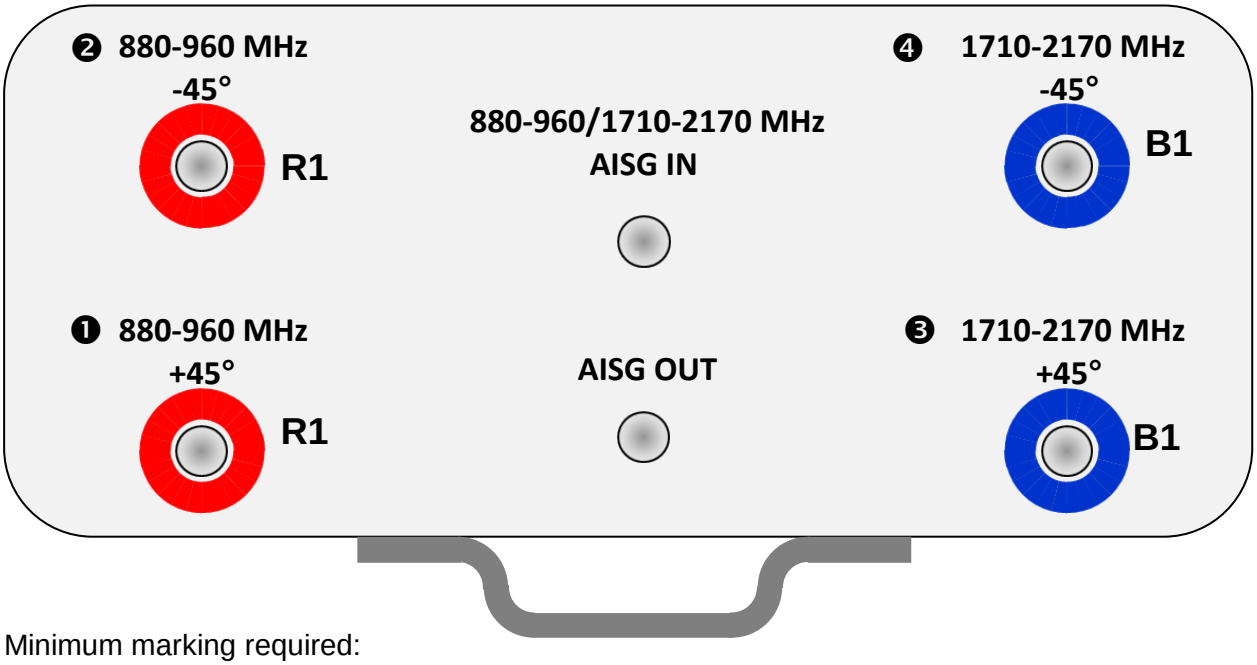
(6) Dual Band Antenna 880-960/1710-2170 MHz with diplexed ports



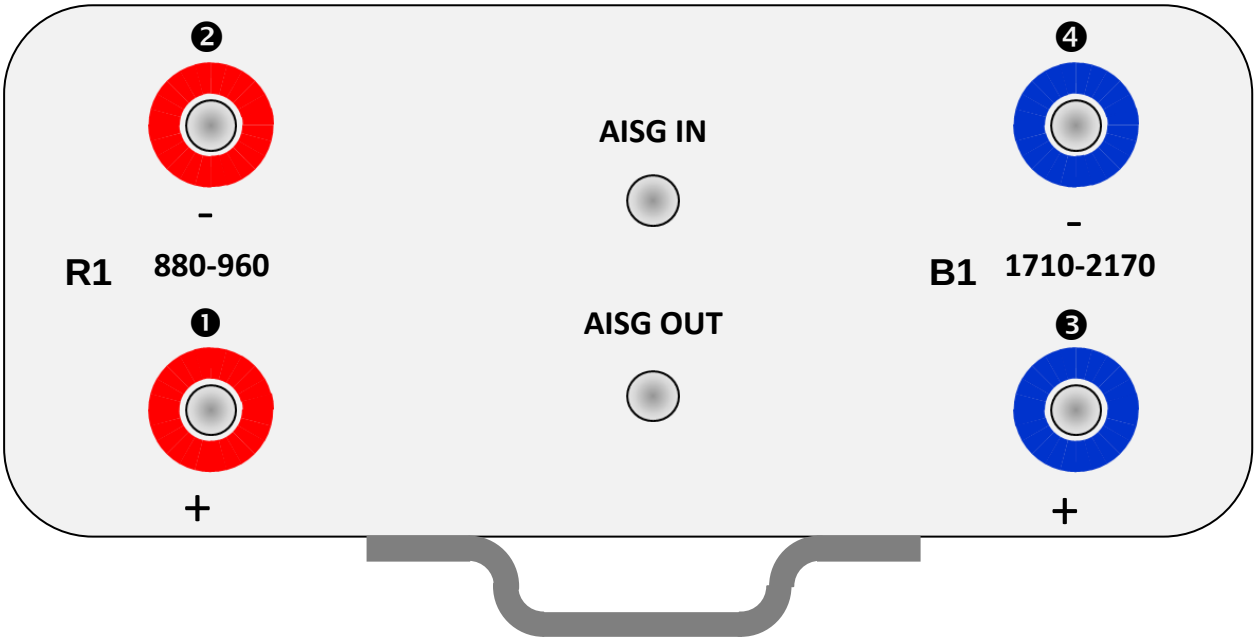
Minimum marking required:



(7) Dual Band Antenna 880-960/1710-2170 MHz with an integrated multi RET interface for both bands and AISG OUT port for ALD cascading



Minimum marking required:



Annex C: Examples of text marking for array positions (informative)

Annex C shows which descriptors to select in one-dimensional arrays of a given size. For two-dimensional arrangements, combinations of the definitions shall be used, i.e. Top Left, Mid Bottom Right, etc.

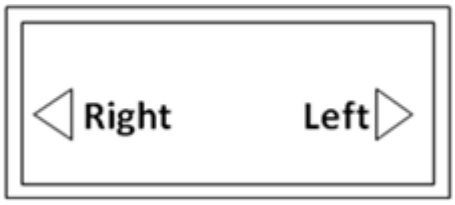
Table C.1 Text marking examples

Number of vertical arrays	Abbreviation format	Full text format
1	*-------no array position marking-------*	
2	T, B	Top, Bottom
3	T, M, B	Top, Mid, Bottom
4	T, MT, MB, B	Top, Mid Top, Mid Bottom, Bottom
5	T, MT, M, MB, B	Top, Mid Top, Mid, Mid Bottom, Bottom
Number of horizontal arrays	**Abbreviation format**	**Full text format**
1	*-------no array position marking-------*	
2	R, L	Right, Left
3	R, C, L	Right, Centre, Left
4	R, CR, CL, L	Right, Centre Right, Centre Left, Left
5	R, CR, C, CL, L	Right, Centre Right, Centre, Centre Left, Left

Annex D: Example of left/right marking for array positions (informative)

The following picture shows a typical left/right marking on the antenna.

Figure D.1: Left/Right marking example

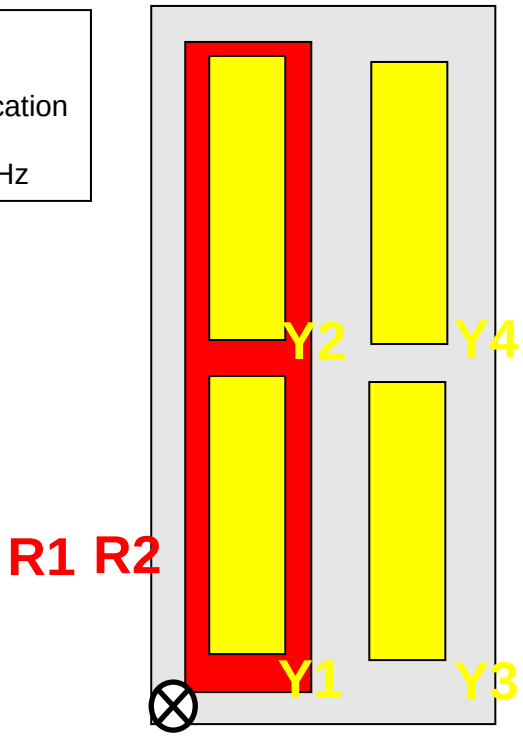


Annex E: Example of port and array numbering (informative)

The following picture shows array numbering for a hexa-band antenna.

R1: 698 – 862 MHz
R2: 880 – 960 MHz
R1 and R2 occupy the same location

Y1, Y2, Y3, Y4: 1710 – 2690 MHz



Coding Reference Point