



ISMTBOM 2022

International Specification for Mountain Bike Orienteering Maps

This International Specification for Mountain Bike Orienteering Maps (ISMTBOM2022) has been compiled and edited by the IOF Map Commission (November 2021) in cooperation with the IOF MTBO Commission and the Czech MTBO Commission.

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INTERNATIONAL ORIENTEERING FEDERATION

Drottninggatan 47 3½ tr, SE-65225 KARLSTAD, SWEDEN

Website: www.orienteering.sport

E-mail: iof@orienteering.sport

IOF INTERNATIONAL SPECIFICATION FOR MOUNTAIN BIKE ORIENTEERING MAPS

1. INTRODUCTION

Orienteering is a world-wide sport. A common approach to the interpretation and drawing of orienteering maps is essential for fair competition and for the future growth of the sport.

These specifications should be read in conjunction with the Competition Rules for IOF Mountain Bike Orienteering Events. For IOF events, deviations are permissible only with the approval of IOF Council (in consultation with Map Commission, MTBO Commission and Event Adviser).

Map specifications for mountain bike orienteering are based on the specifications for foot orienteering maps. However, in order to meet the specific requirements of mountain bike orienteering, a complete and separate set of specifications is described in this set of rules.

1.1 Conventions

Several words are used to signify the requirements in this specification.

- *Must / Shall / Required* mean that the definition is an absolute requirement.
- *Must not / Shall not* mean that the definition is an absolute prohibition.
- *Should / Recommended* mean that there may exist valid reasons in particular circumstances to ignore a particular item, but the full implications must be understood and carefully weighed before choosing a different course.
- *Should not / Not recommended* mean that there may exist valid reasons in particular circumstances when the particular behaviour is acceptable or even useful, but the full implications should be understood, and the case carefully weighed before implementing any behaviour/action described with this label.
- *May / Optional* mean that an item is truly optional.

2. PRINCIPLES

2.1 Specific requirements for mountain bike orienteering maps

Map reading while cycling is particularly demanding. The emphasis is usually on path and track navigation and speeds can be high. Indeed at most MTBO events cutting through the terrain is forbidden. This means that we can and should restrict the amount of detail which is included on the map to improve legibility. Only the features that are strictly necessary for route choice and navigation should be included.

Cycling speeds on the slowest paths can differ considerably when compared to speeds on the fastest paths. The map must clearly show this by classifying the paths and tracks according to relative cycling speed. Gradient also greatly affects speed so the contours must provide a clear overall picture of the topography rather than showing small details in the terrain.

Any barriers and other hindrances to cycling must also be clearly shown on the map to ensure fair route choice and the safety of the competitors.

To ensure a fair race the map shall:

- follow the specifications in this document
- give a clear picture of the path, track and road network, classified according to relative cycling speeds
- give a clear picture of the topography of the area
- only include features that are necessary for navigation and route choice
- be generalized to optimise legibility
- indicate clearly where it is allowed to cycle, and where passage is forbidden

2.2 More on generalization and legibility

Those features which are most essential for the competitor must be selected and presented on the map. To achieve this *cartographic generalization* must be employed. There are two types of generalization – *selective generalization* and *graphic generalization*.

Selective generalization is the process of deciding which details and features should be presented on the map, and which should be left off. This should be based on the importance of the feature from the competitors' point of view and its influence on the legibility of the map. These two considerations will sometimes be incompatible, but the demand for legibility must never be relaxed in order to present an excess of small details and features on the map. Therefore, it will be necessary at the survey stage to adopt minimum sizes for many types of detail. However, consistency is one of the most important qualities of the orienteering map.

Graphic generalization can greatly affect the clarity of the map. Simplification, displacement and exaggeration are used to this end.

2.3 Georeferencing

To georeference a map means to locate it using a geographical reference system. Georeferencing is useful when geographical data from different sources (e.g. orienteering map, digital elevation model, aerial photos, GNSS positions) need to be combined, and it is useful when tracking competitors during a race. It is therefore strongly recommended to produce georeferenced orienteering maps.

3 BASIC ELEMENTS

3.1 Scale and symbol sizes

The base scale for a mountain bike orienteering map is 1:15 000. Generalisation shall follow the requirements for the scale 1:15 000.

The base scale for a mountain bike sprint orienteering map for a competition in urban areas is 1:5 000. Generalisation shall follow the requirements for the scale 1:5 000.

The size of symbols in different scales:

Format	Scales	Map symbols enlargement	Course planning symbols
Long	1:15 000	No enlargement	No enlargement
	1:12 500	1.2×	1.2×
	1:10 000	1.5×	1.5×
Mass start, Middle and Relay	1:10 000	1.5×	1.5×
	1:7 500	1.5×	1.5×
Sprint	1:5 000	1.5×	1.5×
	1:7 500		

For older age groups where reading fine lines and small symbols may cause problems due to deteriorating vision, enlarged maps are recommended for all formats. For the youngest age groups where the capacity of reading complex maps is not fully developed, enlargement is always recommended.

If the map is enlarged to 1:7 500 to improve readability for older and/or younger riders the map symbols may be enlarged 2.0× instead of 1.5× as is stated in above table.

Large maps are difficult to handle particularly on a bike. Maps larger than A3 should be avoided. A map should not be larger than is necessary for the orienteering competition.

See also *MTBO Map – Scales and symbol sizes*.

3.2 Contour interval

The ability to easily assess gradient is vital in MTBO. It is therefore very important that the contour interval for orienteering maps is standardised.

The contour interval for MTBO maps is 5 m. In very hilly terrain an interval of 10 m may be used. In flat terrain where the slope all over the area is less than 5% or the contours would be more than 7 mm apart on the map, 2.5 m may be used. Different contour intervals shall not be used on the same map.

3.3 Dimensions of map symbols

All line widths and symbol dimensions must be kept strictly to their specified value. For line and area symbols certain minimum dimensions must be observed. These are based on both printing technology and the need for legibility. Dimensions in this specification are given at the printed scale of 1:15 000.

All symbols for mountain bike orienteering maps of scale 1:10 000 or larger (e.g. 1:7 500, 1:5 000) are enlarged to 150% including course planning symbols.

3.3.1 On the ground (real world) minimum dimensions

Features that are represented on a mountain bike orienteering map shall be prominent and easily identifiable by the competitor whilst cycling. Minimum on the ground dimensions is provided for many of the symbols in this specification and these must be respected. Minimum dimensions do not mean that all features larger than that need to be represented on the map. For complex terrain, it will often be necessary to operate with larger minimum dimensions to achieve a legible map.

All features smaller than the dimensions above must be either exaggerated or omitted, depending on whether or not they are of significance to the competitor.

Prominent features with small terrain footprints are exaggerated on the map (for instance by using a point symbol) to make them identifiable. When a feature is exaggerated on the map, neighbouring features may need to be displaced to ensure readability and correct relative positions.

3.3.2 Footprint of symbols

There has to be minimum dimensions for line and area symbols on a map. These are termed graphical minimum dimensions. The footprint of a symbol is the area the symbol would cover if it was projected onto the terrain.

For a line symbol, the graphical minimum dimension defines its length on the map. If a line is too short on the map, it ceases to look like a line, and can be mistaken for a point symbol. Also, styled line symbols must not be made so short that the symbol becomes unrecognisable. If there is room on the map and the line feature is prominent and significant, it could be mapped even if it is shorter than the footprint of the minimum size line. However, it must always be exaggerated in size on the map to meet the graphical minimum length. A bent line may have to be drawn longer than the minimum length in order to make it recognisable.

For an area symbol, the graphical minimum dimension defines the area covered by the symbol on the map. If the area is too small, it will be difficult to differentiate it from point symbols, it becomes 'noise' to the map user, or the structure of the symbol will become unrecognisable. If the area is too narrow, it will be difficult to differentiate it from line symbols, and a structured area symbol will become unrecognisable. If there is room on the map and the area feature is prominent and significant it can be mapped even if it is smaller than the footprint of the minimum size area or narrower than the footprint of the minimum width. However, it must always be exaggerated to meet the minimum graphical dimensions.

3.3.3 Graphical minimum dimensions

The graphical minimum dimensions apply to the base scale of 1:15 000. This means that for enlarged maps, the graphical minimum dimensions will be proportionally larger (1.5 times larger for the 1:10 000 map scale).

Where graphical minimum dimensions are given for individual symbols, these take precedence. For other symbols the following graphical minimum dimensions apply.

Minimum gaps

- Minimum edge to edge gap between parallel paths that do not connect: 0.5 mm.
- Minimum gap between buildings where it is allowed to pass: 1 mm.

Minimum line length

Line symbols need to be long enough to differentiate them from other symbols. Closed lines must have sufficient white space within to allow the line symbol to be recognized. For closed styled lines such as fences, walls and cliffs, there must be enough room for the styling (e.g. tags), so that the type of symbol can be recognized.

On the map for mountain bike orienteering in general:

- Shortest dashed and dotted path/track symbol: at least two dots/dashes
- Very short sections of paths can be drawn with only 1 dash for clarity in junctions etc. Use either symbol *Track: fast riding* (815) or symbol *Path: fast riding* (816).

Minimum dimensions for areas

Providing minimum dimensions for areas is difficult as the shape varies. The minimum width is as important as the minimum area. Very thin parts of areas must be exaggerated.

Minimum widths for area symbols (if not specified for the symbol):

- Blue, green, grey, orange or yellow full colour: 1 mm
- Black, blue, brown, green or yellow dot screen: 1,4 mm

Minimum area of colour (if not specified for the symbol):

- Blue, green, grey, orange or yellow full colour: 1 mm²
- Black, blue, brown, green or yellow dot screen: 2 mm²

3.3.4 Screens

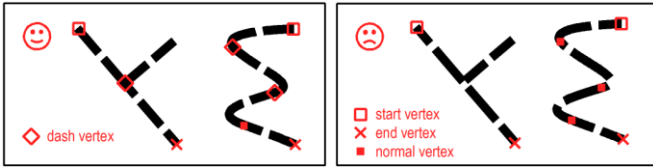
Vegetation, open areas, marshes, etc. are shown with dot or line screens. The following table lists the permissible combinations of screens.

210 Stony ground				210 Stony ground
307 Uncrossable marsh				307 Uncrossable marsh
308 Marsh	○			308 Marsh
401 Open land	○		○	401 Open land
824 Open land, permitted to ride	○		○	824 Open land, permitted to ride
825 Forested area, permitted to ride			○	825 Forested area, permitted to ride
826 Rough open land, permitted to ride	○		○	826 Rough open land, permitted to ride
402 Open land with scattered trees	○		○	402 Open land with scattered trees
403 Rough open land	○	○	○	403 Rough open land
404 Rough open land with scatt. trees	○	○	○	404 Rough open land with ...
407 Vegetation: reduced off-track ...	○		○	407 Vegetation: ...

Other symbols (as 413, 414, 501) cannot be combined with other symbols.

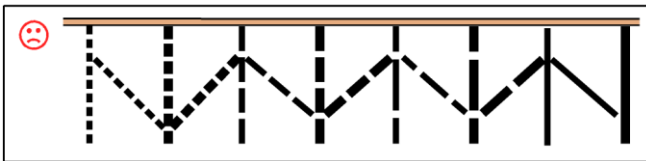
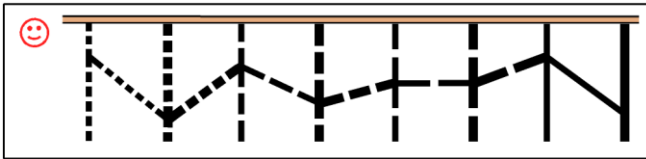
3.4 Examples of graphical implementation of path network

The correct drawing of all junctions and sharp turns makes the map easier to read and understand the situation. This can be achieved by using dash vertices, which are additionally inserted points in the drawn line. A function for placing dash vertices is a common part of cartographic software for orienteering and influence how dashed lines are rendered – the middle of dash is placed at the dash vertex. The following part contains graphical demonstration of good and poor implementation.



Connected path

Connected paths should always be clearly drawn and there should be no gap at the junction. This is especially important in relation to indistinct junctions (see below).

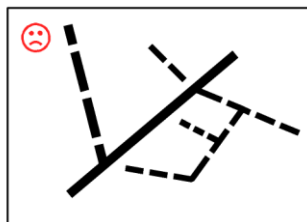
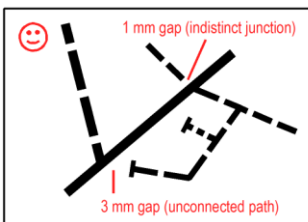


Unconnected path

If the paths are unconnected, this must be clearly identifiable. The gap must be at least 3 mm. **This is especially important when off-track riding is restricted.**

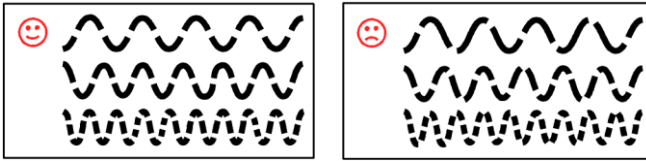
Indistinct junction and unconnected path

Sometimes the junction is indistinct and in such cases a gap of 1 mm is used. The optional *Track end point* (823) symbol can help identify unconnected paths and distinguish them from indistinct junctions.



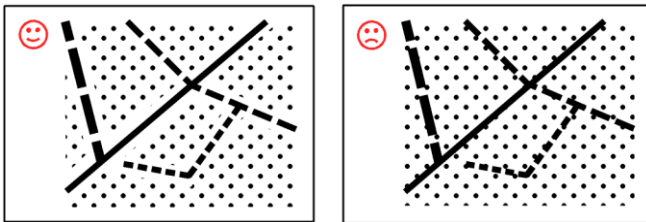
Serpentines

Applying dash vertices to the bends improves the readability of serpentines.



Forested area-permitted to ride and track network

Cutting out a dot raster around tracks will greatly improve the readability of the track network. This is also suitable for other objects used for navigation in these areas.



3.5 Colour concept

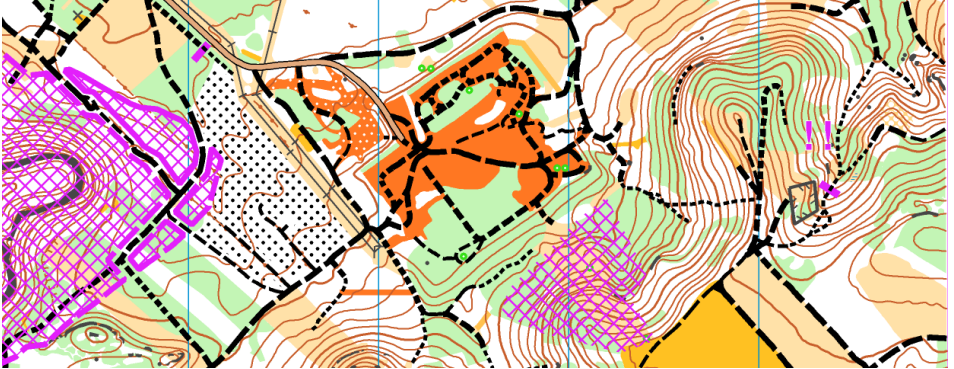
The latest version document “IOF Map specifications - printing and colour definitions” applies. See [page with document](#).

3.6 Off-track riding

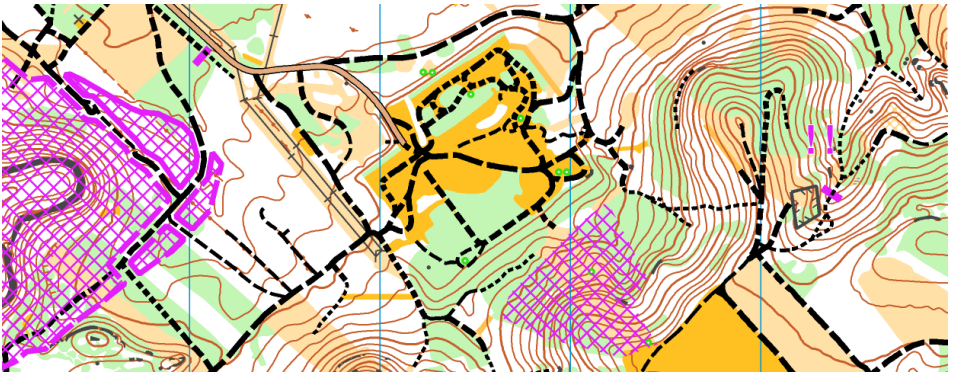
Due to national and local laws and regulations, off-track riding may be restricted. When off-track riding is not allowed this means the athlete is not allowed to pass through the terrain, either by riding or on foot. In all cases the organizer must inform the competitors (in bulletins, Team Officials meeting etc.) of the prevailing regulations.

All symbols showing riding forbidden e.g. *Out of bounds area* (709) or forbidden to cross e.g. *Forbidden route* (716) will always be forbidden, regardless of whether off-track riding is permitted or not.

If off-track riding is generally forbidden in the terrain, symbol *Open land, permitted to ride* (824), *Rough open land, permitted to ride* (826) and *Forested area, permitted to ride* (825) may be used to show areas where this off-track riding is allowed.



If off-track riding is allowed in most of the terrain, *Out of bounds area* (709) must be used to indicate areas where it is not allowed.



4 DEFINITION OF SYMBOLS

Definitions of map features and specifications for the drawing of symbols are given in the following sections.

Symbols are classified into 10 categories:


Paths, track and roads	(black)
Other features, where riding is permitted	
Landforms	(brown)
Rock and Boulders	(black 60% + grey)
Water and Marsh	(blue)
Vegetation	(green + yellow)
Man-made features	(black 60%)
Technical symbols	(black 60% + blue)
Course planning symbols	(purple)
Optional symbols for navigation	

Note: dimensions are specified in mm at the scale 1:15 000 except sections 4.10.

All drawings are in 1:7500 scale for clarity only except sections 4.9 and 4.10.

Type of symbols:

P ... Point
L ... Line
A ... Area
T ... Text

<	gap or infill between two lines
-	line thickness
=	distance
∅	diameter
	symbol oriented to north

(OM) Outside measure
(IM) Inside measure
(CC) Centre to centre

4.1 Paths, tracks and roads

It is always allowed to cycle on roads, tracks and paths unless indicated otherwise by for instance out of bounds or forbidden route symbols.

Curves, corners and junctions

Paths (or roads and tracks) between which it is not allowed to ride must be clearly separated on the map.

For distinct junctions the lines or dashes of the symbols are joined at the junction. For indistinct rideable junctions the dashes of the symbols are not joined. The gap must be 1 mm for indistinct junction (footprint 15 m) and 2 mm for unconnected path (footprint 30 m).

Sharp curves and corners on paths (or tracks) must be shown clearly by ensuring that a dash (and not space between dashes) coincides with the curve.

Width categories

There are two width categories for unpaved roads, tracks and paths:

1. Track or wide path, greater than 1.5 m in width, where it is generally possible for cyclists to pass or meet each other.
2. Narrow path, less than 1.5 m in width, where it is generally difficult for cyclists to pass or meet each other.

The width of the symbol on the map is used to indicate the width of the path.

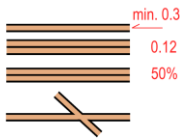
Speed categories

Tracks and paths must be classified into four speed bands: fast, medium, slow and very slow. As a guide the following ratios may be used:

- Fast, 75–100 % (relative to possible riding speed on a hard smooth surface)
- Medium, 50–75 %
- Slow, 25–50 %
- Very slow, 0–25 %

Note that these ratios are only a rough guide as the actual speed achievable is dependent on the skill and fitness of the individual cyclist as well as the prevailing conditions.

It is however important to be consistent in the speed classification over the whole mapped area.



502 Paved road (L)

A road with asphalt, concrete or other paved surface. The width should be drawn to scale, but not smaller than the minimum width. The space between the black lines is filled with brown (50%). The outer boundary lines may be replaced with other black line symbols, such as symbol *Fence* (516), *Impassable fence* (518), *Wall* (513) or *Impassable wall* (515) if the feature is so close to the road edge that it cannot practically be shown as a separate symbol.

A road with two carriageways can be represented using two wide road symbols side by side, keeping only one of the road edges in the middle.

Minimum width: $0.3 + 2 \times 0.12$ mm - footprint 8.1 m.

Colour: black, brown 50%.



815 Track: fast riding (L)

Road, track or wide path, fast riding.

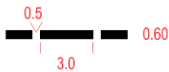
Colour: black.



816 Path: fast riding (L)

Narrow path, fast riding.

Colour: black.

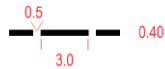


817 Track: medium riding (L)

Gravel road, track or wide path, medium speed riding.

Minimum length (isolated): 2 dashes (6.5 mm – footprint 97.5 m).

Colour: black.



818 Path: medium riding (L)

A narrow path, medium speed riding.

Minimum length (isolated): 2 dashes (6.5 mm – footprint 97.5 m).

Colour: black.

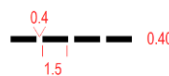


819 Track: slow riding (L)

Gravel road, track or wide path, slow riding.

Minimum length (isolated): 2 dashes (3.4 mm – footprint 51 m).

Colour: black.

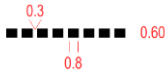


820 Path: slow riding (L)

Narrow path, slow riding.

Minimum length (isolated): 2 dashes (3.4 mm – footprint 51 m).

Colour: black.

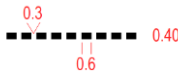


821 Track: very slow riding (L)

Gravel road, track or wide path, very slow riding.

Minimum length (isolated): 2 dashes (1.9 mm – footprint 28.5 m).

Colour: black.



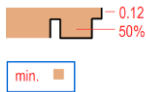
822 Path: very slow riding (L)

Narrow path, very slow riding.

Minimum length (isolated): 2 dashes (1.5 mm – footprint 22.5 m).

Colour: black.

4.2 Other features where riding is permitted



501 Paved area (A)

An area with a firm surface such as asphalt, hard gravel, paving stones, concrete or similar. The paved area should be bordered (or framed) by a thin black line where it has a distinct boundary.

Minimum width: 0.9 mm (footprint 13.5 m).

Minimum area: 2 mm².

Colour: brown 50%, black.



824 Open land, permitted to ride (A)

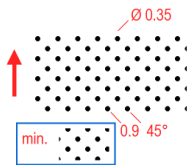
An area of open land that is permitted to ride, when off-track riding is otherwise forbidden. The permitted area should have obvious borders or be marked in the terrain.

Minimum width: 0.9 mm (footprint 13.5 m).

Minimum area: 2 mm².

Colour: orange (60% magenta, 100% yellow).

On the printed map a clear colour differentiation must exist between this colour and yellow 100%.



825 Forested area, permitted to ride (A)

An area of terrain with a dense track network or little ground vegetation where riding everywhere is allowed. Predominant track/paths going through this area shall be shown to aid navigation. The permitted area should have obvious borders or be marked in the terrain. Black dots shall not interfere with other black elements and other optional point and line symbols which serve for navigation or as features for control points.

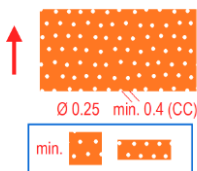
When riding in the terrain is generally allowed use this symbol to show networks of tracks which are too dense to map individually.

The symbol is orientated to north.

Minimum width: 2 mm (footprint 30 m).

Minimum area: 25 mm².

Colour: black.



826 Rough open land, permitted to ride (A)

Heath, moorland, felled areas, newly planted areas (trees lower than ca. 1 m) or other generally open land with rough ground vegetation, heather or tall grass that is permitted to ride, when off-track riding is otherwise forbidden. The permitted area should have obvious borders or be marked in the terrain.

Smaller areas must either be left out, exaggerated or shown using symbol *Open land, permitted to ride* (824).

The symbol is orientated to north.
Minimum width: 1.5 mm (footprint 22.5 m).
Minimum area: 4 mm².
Colour: orange (60% magenta, 100% yellow).

On the printed map a clear colour differentiation must exist between this colour and yellow 100%.

827 Narrow ride or linear trace through the terrain, permitted to ride: fast riding (L)

A forest ride or a prominent trace (forestry extraction track, sandy track, ski track) through the terrain which does not have a distinct rideable path along it, fast riding.

Minimum width: 0.9 mm (footprint 13.5 m).
Colour: orange (60% magenta, 100% yellow).

On the printed map a clear colour differentiation must exist between this colour and yellow 100%.



828 Narrow ride or linear trace through the terrain, permitted to ride: medium riding (L)

A forest ride or a prominent trace (forestry extraction track, sandy track, ski track) through the terrain which does not have a distinct rideable path along it, medium riding.

Minimum width: 0.9 mm (footprint 13.5 m).
Minimum length (isolated): 2 dashes (6.5 mm – footprint 97.5 m).
Colour: orange (60% magenta, 100% yellow).

On the printed map a clear colour differentiation must exist between this colour and yellow 100%.



829 Narrow ride or linear trace through the terrain, permitted to ride: slow riding (L)

A forest ride or a prominent trace (forestry extraction track, sandy track, ski track) through the terrain which does not have a distinct rideable path along it, slow riding.

Minimum width: 0.9 mm (footprint 13.5 m).
Minimum length (isolated): 2 dashes (3.4 mm – footprint 51 m).
Colour: orange (60% magenta, 100% yellow).

On the printed map a clear colour differentiation must exist between this colour and yellow 100%.



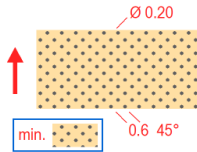
830 Narrow ride or linear trace through the terrain, permitted to ride: very slow riding (L)

A forest ride or a prominent trace (forestry extraction track, sandy track, ski track) through the terrain which does not have a distinct rideable path along it, very slow riding.

Minimum width: 0.9 mm (footprint 13.5 m).
Minimum length (isolated): 2 dashes (1.9 mm – footprint 28.5 m).
Colour: orange (60% magenta, 100% yellow).

On the printed map a clear colour differentiation must exist between this colour and yellow 100%.





213 Open sandy ground (A)

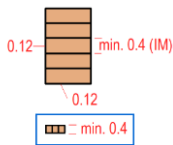
An area of soft sandy or soft gravelled ground where cycling is difficult or impossible, but it is permitted to ride.

The symbol is orientated to north.

Minimum width: 1.4 mm (footprint 21 m).

Minimum area: 16 mm².

Colour: black 60% and yellow 50%.



532 Stairs (L)

Steps or stairways which present a challenge to riding. A stairway going through rock passages or between impassable objects may be drawn without border lines.

An easily rideable stairway or indistinct stairway should be drawn as a footpath. Steps of a stairway shall be represented in a generalized manner.

Minimum length: 3 (graphical) steps (1.2 mm – footprint 18 m).

Minimum width: 0.4 mm (IM).

Colour: black, brown 50% background.

A note on forest rides

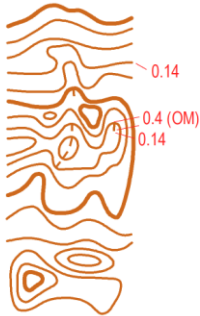
A forest ride or extraction lane where there is no distinct path or track can be shown using the following symbols:

- On maps where off-track riding is generally allowed linear versions of *Open land (401)* or *Rough open land (403)* should be used for rides.
- On maps where off-track riding is generally forbidden *Narrow ride, permitted to ride: fast riding (827)*, *Narrow ride, permitted to ride: medium riding (828)*, *Narrow ride, permitted to ride: slow riding (829)* or *Narrow ride, permitted to ride: very slow riding (830)* should be used for rides where riding is permitted. Linear versions of *Open land (401)* or *Rough open land (403)* should be used for rides where riding is not permitted.

4.3 Landforms

The shape of the terrain is shown by means of contours. This is complemented in black 60% by symbols for rocks and cliffs.

Contour lines in mountain bike orienteering map may be more generalised in comparison to foot orienteering maps. It is essential that an abundance of small features do not hide the main features of the terrain, such as hills, valleys and major fault lines.



min.	0.25 (CC)
	0.5 (CC)
	0.6 (OM)
	0.9 (OM)
	0.7 (OM)
	1.1 (OM)

101 Contour (L)

A line joining points of equal height. The standard vertical interval between contours is 5 m. A contour interval of 10 m may be used in steep terrain and 2.5 m may be used for sprint terrain.

Slope lines may be drawn on the lower side of a contour line to clarify the direction of slope. When used, they should be placed in re-entrants.

A closed contour represents a knoll or a depression. A depression has to have at least one slope line. Minimum height/depth should be 1 m.

Relationships between adjacent contour lines are important. Adjacent contour lines show form and structure. Small details on contours should be avoided because they tend to hide the main features of the terrain.

Absolute height accuracy is of little importance, but the relative height difference between neighbouring features should be represented on the map as accurately as possible. It is permissible to alter the height of a contour slightly if this improves the representation of a feature. This deviation should not exceed 25% of the contour interval, and attention must be paid to neighbouring features.

Smaller prominent knolls and depressions must be exaggerated on the map to satisfy the minimum dimension.

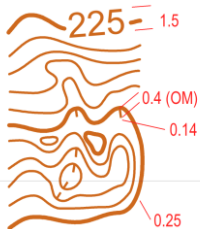
Colour: brown.

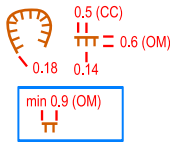
102 Index contour (L, T)

Every fifth contour shall be drawn with a thicker line. This is an aid to the quick assessment of height difference and the overall shape of the terrain surface. An index contour may be represented as an ordinary contour line in an area with much detail. Small contour knolls and depressions are normally not represented using index contours.

The index contour level must be carefully selected in flat terrain. The ideal level for the index contour is the central contour in the most prominent slopes. An index contour may have a height value assigned. A height value should only be inserted in an index contour in places where other detail is not obscured. It shall be orientated so that the top of the label is on the higher side of the contour. The index value (label) shall be 1.5 mm high and represented in a sans-serif font.

Colour: brown.





104 Earth bank (L)

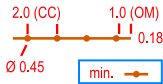
An earth bank is an abrupt change in ground level which is clearly distinct from its surroundings, e.g. gravel or sand pits, road and railway cuttings or embankments.

An earth bank may impact rideability. The tags represent the full extent of the earth bank.

For long earth banks it is allowed to use tags shorter than the minimum length at the ends. If two earth banks are close together, tags may be omitted. Impassable earth banks shall be represented using symbol *Impassable cliff* (201).

Minimum length: 0.9 mm (footprint 13.5 m).

Colour: brown.

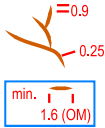


105 Earth wall (L)

Distinct earth wall. Minimum height: 1 m.

Minimum length: 1.6 mm (footprint 24 m).

Colour: brown.



107 Erosion gully (L)

An erosion gully which is too small to be shown using symbol *Earth bank* (104) is shown by a single line.

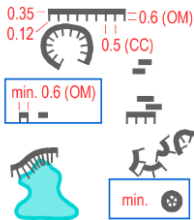
Minimum length: 1.15 mm (footprint 17.25 m).

Contour lines should not be broken around this symbol.

Colour: brown.

4.4 Rock features

Rock is a special category of landform. The inclusion of rock gives useful information about danger and rideability as well as providing features for map reading. Rock is shown in black 60% to distinguish it from other landform features. Care must be taken to make sure that rock features such as cliffs fit with the shape and fall of the ground as shown by contours.



201 Impassable cliff (L)

A cliff, quarry or earth bank that is so high and steep that it is impossible to pass/climb or is dangerous.

For vertical rock faces the tags may be omitted if space is short. Ends of the top line may be rounded or square. Shorter tags may be used at the ends.

The gap between two impassable cliffs or between impassable cliffs and other impassable feature symbols must exceed 0.25 mm on the map.

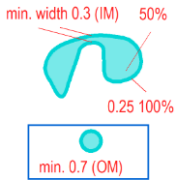
When an impassable cliff drops straight into water, making it impossible to pass under the cliff along the water's edge, the bank line is omitted, or the tags shall clearly extend over the bank line. An impassable cliff should interplay with the contour lines.

Minimum length: 0.6 mm (footprint 9 m).

Colour: black 60%.

4.5 Water and marshes

This group includes both open water and special types of vegetation caused by the presence of water (marsh). A blue line around a water feature indicates that it is uncrossable. The features listed in this section may only contain water in some seasons. Marsh symbols are combined with area symbols for openness (yellow and orange) and rideability (green and yellow).



301 Uncrossable body of water (A)

The blue bank line emphasises that the feature is uncrossable. Dominant areas of water may be shown with 50% colour. Small areas of water and bodies of water that have narrow parts shall always be shown with full colour.

Minimum width (inside): 0.3 mm (footprint 4,5 m).

Minimum area (inside): 2 mm².

Colour: blue, blue 50%.



304 Crossable watercourse (L)

Should be at least 2 m wide.

Minimum length (isolated): 1 mm (footprint 15 m).

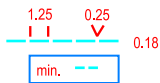
Colour: blue.



305 Crossable small watercourse (L)

Minimum length (isolated): 1 mm (footprint 15 m)

Colour: blue.

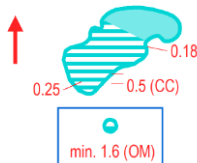


306 Minor/seasonal water channel (L)

A natural or man-made minor water channel which may contain water only intermittently.

Minimum length (isolated): two dashes (2.75 mm - footprint 41.25 m).

Colour: blue.



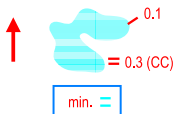
307 Uncrossable marsh (A)

A marsh which is uncrossable or dangerous for the competitor. The blue outline emphasises that the feature is uncrossable. The blue outline is omitted for boundaries between uncrossable marsh and symbol *Uncrossable body of water* (301). The symbol may be combined with a *Rough open land* symbol (403, 404) to show openness. The symbol is orientated to north.

Minimum width: 0.3 mm (inside) (footprint 4,5 m).

Minimum area: 2 mm² (inside).

Colour: blue (outline), blue.



308 Marsh (A)

A crossable marsh, usually with a distinct edge. The symbol shall be combined with other symbols to show rideability and openness.

The symbol is orientated to north.

Minimum width: 0.3 mm (inside) (footprint 4,5 m).

Minimum area: 0.5 mm × 0.4 mm (footprint 7.5 m × 6 m).

Colour: blue.

4.6 Vegetation

The representation of vegetation is important to the competitor because it affects visibility and it also provides features for map reading.

Colour

The basic principle is as follows:

- **white** represents typical open forest
- **yellow** represents open areas divided into several categories
- **green** represents the density of the forest and undergrowth

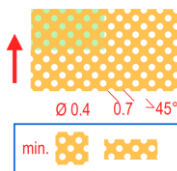
In terrain where off-track riding is allowed the representation of vegetation both has a navigational purpose and for deciding route choices. If off-track riding is forbidden the representation of vegetation is of importance to the competitor only for navigational purposes, not for route choices. This is important to have in mind when surveying the map. For example, if the forest is dense on one side of the path and sparse on the other, this presents navigation and positioning information.

It should also be noted that the foot orienteering symbols 414 and 416 (cultivation boundaries) should be omitted since they may cause confusion with some of the symbols used for tracks and paths.



401 Open land (A)

Open land that has a ground cover (grass, moss or similar). If yellow coloured areas become dominant, a screen (75% instead of full yellow) may be used. Shall not be combined with area symbols other than *Stony ground* (210) and *Marsh* (308).
Minimum width: 0.6 mm (footprint 9 m).
Minimum area: 2 mm².
Colour: yellow (or yellow 75%).



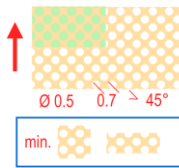
402 Open land with scattered trees (A)

Areas with scattered trees or bushes in open land may be generalised by using a regular pattern of large dots in the yellow screen. The dots may be white (scattered trees) or green (scattered bushes / thickets). Prominent individual trees may be added using symbol *Prominent large tree* (417).
Smaller areas must either be left out, exaggerated or shown using symbol *Open land* (401).
The symbol is orientated to north.
Minimum width: 1.5 mm (footprint 22.5 m).
Minimum area: 4 mm².
Colour: yellow with holes of white or green 60%.



403 Rough open land (A)

Heath, moorland, felled areas, newly planted areas (trees lower than ca. 1 m) or other generally open land with rough ground vegetation, heather or tall grass.
Smaller areas must either be left out, exaggerated or shown using symbol *Open land* (401).
Minimum width: 0.6 mm (footprint 9 m).
Minimum area: 2 mm².
Colour: yellow 50%.



404 Rough open land with scattered trees (A)

Scattered trees in rough open land, typically long grass areas. It is not recommended to add individual *Prominent large tree* (417) or *Special vegetation feature* (419), unless they are exceptionally distinct from surroundings and provide a navigation feature or control point, when shortcutting is permitted.

Smaller areas must either be left out, exaggerated or shown using symbol *Open land* (401).

The symbol is orientated to north.

Minimum width: 0.6 mm (footprint 9 m).

Minimum area: 6 mm².

Colour: yellow 50% with holes of white or green 60%.



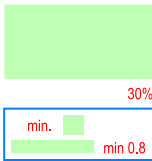
405 Forest (A)

Typically open forest for the terrain.

Minimum width: 0.8 mm (footprint 12 m).

Minimum area: 2 mm².

Colour: white.



406 Forest: reduced rideability and visibility (A)

Dense forest with low visibility.

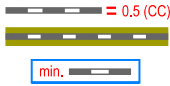
Minimum width: 0.8 mm (footprint 12 m).

Minimum area: 2 mm².

Colour: green 30%.

4.7 Man-made features

Some man-made features constitute obstacles or barriers to the competitor and must be easily identifiable on the map. Important examples are fences, walls, buildings and forbidden areas. Other man-made features are important both for map reading and for control points.



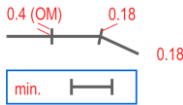
509 Railway (L)

A railway or other kind of railed track.

If it is forbidden to cycle across or along the railway, it should be combined with symbol *Area that shall not be entered* (520).

Minimum length (isolated): two black dashes (4 mm - footprint 60 m).

Colour: black 60%, white.



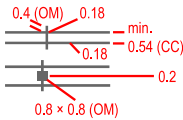
510 Power line, cableway or ski lift (L)

Power line, cableway or ski lift. The bars show the exact location of the pylons. The line may be broken to improve legibility.

If a section of a power line, cableway or ski lift goes along a road or path (and does not offer significant additional navigational value) it should be omitted.

Minimum length (isolated): 5 mm (footprint: 75 m).

Colour: black 60%.

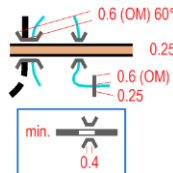


511 Major power line (L)

Major power lines should be drawn with a double line. The gap between the lines may indicate the extent of the power line. The bars show the exact location of the pylons. The lines may be broken to improve legibility.

Very large carrying masts shall be represented in plan shape using outline of symbol *Building* (521) or with symbol *High tower* (524).

Colour: black 60%.



512 Bridge / tunnel (L, P)

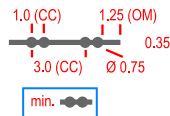
Bridges and tunnels are represented using the same basic symbols.

If it is not possible to get through a tunnel (or under a bridge), it shall be omitted.

Minimum length (of baseline): 0.4 mm (footprint 6 m).

Small bridges connected to a track/path are shown by centring a track dash on the crossing. Tracks/paths are broken for water course crossings without bridges. A small footbridge with no path leading to it is represented with a single dash.

Colour: black 60%.

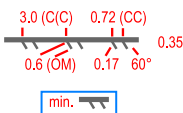


515 Impassable wall (L)

A significant wall of brick, stone, concrete, wood or other materials that is impossible to cross.

Minimum length (isolated): 2 mm (footprint 30 m).

Colour: black 60%.



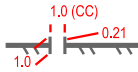
518 Impassable fence or railing (L)

A fence that is impossible to cross. If the fence forms an enclosed area, tags should be placed inside.

Minimum length (isolated): 2 mm (footprint 30 m).

Colour: black 60%.

519 Crossing point (P)

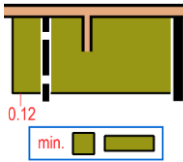


A way through or over a wall, fence or other linear feature, including a gate or stile.

For impassable features, the line shall be broken at the crossing point. For passable features, the line shall not be broken if passing involves a degree of climb. *Crossing point* (710) can be used to emphasise crossing points.

Colour: black 60%.

520 Area that shall not be entered (A)



An area that shall not be entered such as private area, a flower bed, a railway area etc. No feature shall be represented in this area, except very prominent features such as railways and large buildings. Road entrances shall be represented clearly. The area shall be discontinued where a path or track goes through and white colour is used as background with overlap 0.15 mm on both sides.

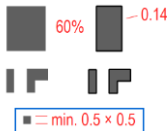
The area may be delineated by a bounding line (0.12 mm).

Minimum width: 1 mm (footprint 15 m).

Minimum area: 2 mm².

Colour: yellow 100% + green 50%, black (outline).

521 Building (A)



A building is a relatively permanent construction having a roof. Buildings within symbol *Area that shall not be entered* (520) may just be represented in a simplified manner. Areas totally contained within a building shall be mapped as being a part of the building. A building shall not be entered.

Minimum gap between buildings and other impassable features should be 1 mm. Boundaries in touching buildings shall not be represented.

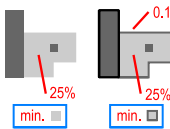
Minimum width: 1 mm (footprint 15 m).

Minimum area: 1 mm².

Colour: black (or black (outline), black 60%).

Outline shall only apply in 1:5000 or 1:7500.

522 Canopy (A)



A canopy is a building construction (with a roof), normally supported by pillars, poles or walls, such as passages, gangways, courts, bus stops, gas stations or garages. Canopies may be shown if significant. Small passable parts of buildings, which cannot easily be crossed by competitors, shall not be represented on the map and shall be closed during the competition.

Minimum width: 1 mm (footprint 15 m).

Minimum area: 2 mm².

Colour: black 60% (outline), black 25%.

Outline shall only apply in 1:5000 or 1:7500.

522.1 Pillar (P)



A pillar is an upright shaft or structure of stone, brick or other material, relatively slender in proportion to its height and any shape in section, used as a building support. Pillars may be shown if significant. Pillars smaller than 1 m × 1 m are generally not represented.

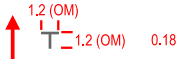
Colour: black 60%.



524 High tower (P)

A high tower or large pylon. If it is in a forest, it must be visible above the level of the surrounding forest. Towers with a larger footprint must be represented using symbol *Building* (521).
The symbol is orientated to north.

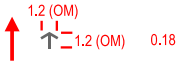
Footprint: 25.2 m in diameter.
Colour: black 60%.



525 Small tower (P)

An obvious small tower, platform or seat.
The symbol is orientated to north.

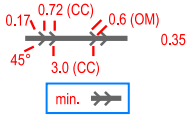
Footprint: 18 m × 18 m.
Colour: black 60%.



527 Fodder rack (P)

A fodder rack, which is free standing or attached to a tree.
The symbol is orientated to north.

Footprint: 18 m × 18 m.
Colour: black 60%.



529 Uncrossable line feature (L)

A man-made line feature that is impassable to cross. For example, a high pipeline (gas, water, oil, heat, etc.) or a bobsleigh / skeleton track. The definition of the symbol must be given on the map.

Minimum length: 2 mm (footprint 30 m).
Colour: black 60%.

4.8 Technical symbols



601 Magnetic north line (L)

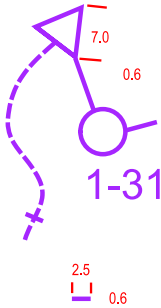
Magnetic north lines are placed on the map pointing to magnetic north, parallel to the sides of the paper and with magnetic north being at the top of the map. Their spacing shall be 20 mm on the map which represents 300 m on the ground at the scale of 1:15 000. If the map scale is 1:5 000 (sprint), the spacing of the lines will be 30 mm on the map which represents 150 m on the ground.

North lines shall be broken to improve the legibility of the map, for instance where they would obscure small features.

The symbol is orientated to north.
Colour: blue.

4.9 Course planning symbols

The dimensions of the course planning symbols are specified in mm at the printed scale of 1:15 000.



701 Start (P)

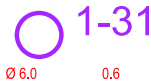
The place where the orienteering starts. The centre of the triangle shows the precise position where the orienteering course starts. The start must be on a clearly identifiable point on the map. The triangle points in the direction of the first control.

Colour: lower purple (under black).

702 Map issue point (P)

If there is a marked route to the start point, the map issue point is marked using this symbol.

Colour: upper purple (over black).



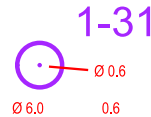
703 Control point (P)

For point features, the centre of the circle shall be the centre of the symbol.

For line and area features, the centre of the circle shows the precise position of the control marker. Sections of the circle should be omitted to leave important detail showing.

Footprint 90 m.

Colour: lower purple (under black).

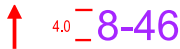


703.1 Control point with focus point (P)

The focus point (i.e. the point in the centre of a control circle) can be used when it is necessary to clarify the exact position of a control for instance in a dense track network. The focus point shall be used in case of necessity when the exact position of a control is not clear.

Footprint 90 m.

Colour: circle lower purple (under black) - focus point upper purple (over black).



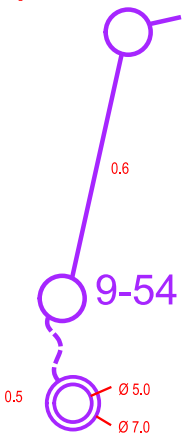
704 Control number with control code (T)

The number of the control is placed close to the control point circle in such a way that it does not obscure important detail.

The numbers are orientated to north.

Font: Arial, 4.0 mm, non-bold, non-italic. Both control number and code may be bordered with a small white borderline (0.15 mm) to improve legibility if necessary.

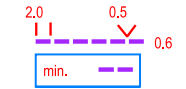
Colour: upper purple (over black).



705 Course line (L)

Where controls are to be visited in order, the sequence is shown using straight lines from the start to the first control and then from each control to the next one. Sections of lines should be omitted to leave important detail showing. The line should be drawn via mandatory crossing points. There may be gaps between the line and the control circle in order to increase the readability of the underlying detail close to the control.

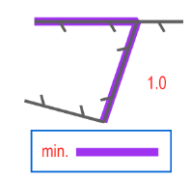
Colour: lower purple (under black).



706 Finish (P)

The end of the course.

Colour: lower purple (under black).

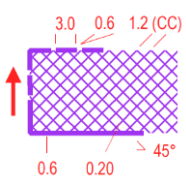


707 Marked route (L)

A marked route that is a part of the course. It is mandatory to follow the marked route.

Minimum length: 2 dashes (4.5 mm – footprint: 67.5 m).

Colour: upper purple (over black).

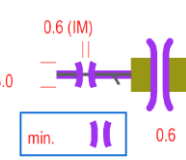


708 Out of bounds boundary (L)

A boundary which is not permitted to cross. Use as an overprint for a symbol that otherwise indicates that the boundary is passable e.g. *Passable fence* (513). If a section of track must not be used by competitors, symbol *Forbidden to cross* (718) or *Forbidden route* (716) should be used.

Minimum length: 5 mm – footprint: 75 m.

Colour: lower purple (under black).



709 Out of bounds area (A)

An out of bounds area. A bounding line may be drawn if there is no natural boundary as follows: a solid line indicates that the boundary is marked continuously in the terrain, a dashed line indicates intermittent marking in terrain, no line indicates no marking in terrain. The symbol is orientated to north.

Minimum width: 2 mm (footprint 30 m).

Minimum area: 4 mm².

Colour: upper purple (over black).

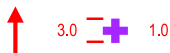


710 Crossing point (P, L)

A crossing point through or over a wall or fence, or across a road or railway, or through a tunnel or an out of bounds area is drawn on the map with two lines curving outwards.

Minimum width: 0.6 mm inside measure (footprint 9 m).

Colour: upper purple (over black).



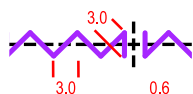
712 First aid post (P)

The location of a first aid post.
The symbol is orientated to north.
Footprint: 45 m.
Colour: upper purple (over black).



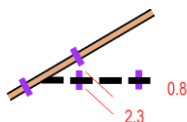
713 Refreshment point (P)

The location of a refreshment point which is not at a control.
The symbol is orientated to north.
Footprint: 45 m.
Colour: upper purple (over black).



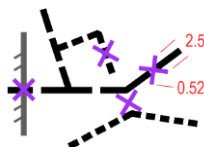
716 Forbidden route (L)

A route which is out of bounds and forbidden to cross and follow is shown with a zigzag. The zigzag line should be as continuous as possible. If there is a crossing point over the forbidden route, it shall be presented like a gate by two perpendicular lines over the forbidden route. A longer crossing section shall be presented clearly on the map by using the perpendicular lines at the end of the zigzag lines.
Colour: upper purple (over black).



717 Obstacle across track, path or road (P)

These barriers must be highly visible on the map and should be over-printed in purple. The symbol should be used for all obstacles that are difficult to cross. For uncrossable barrier, symbol *Forbidden to cross* (718) shall be used. This symbol can be used for stairs, if it is important to accent stairs as dangerous object.
Colour: lower purple (under black) or upper purple (over black) if this symbol is used across the road.



718 Forbidden to pass (P)

This symbol can be used for all locations that are forbidden or impossible to pass. In locations where two tracks or paths almost meet, but the situation is not obvious on the map, this symbol can be used to indicate that crossing is forbidden.
Footprint: 37.5 m.
Colour: upper purple (over black).



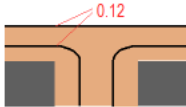
719 Dangerous section (P)

Two exclamation marks with a white outline to represent a dangerous section.
The symbol is orientated to north.
Font: Arial, 4.0 mm, non-bold, non-italic. Symbol shall be bordered with a small white borderline (0.15 mm) to improve legibility if necessary.
Footprint: 90 m.
Colour: upper purple (over black).

4.10 Optional symbols

These symbols should not generally be used but may be used in certain circumstances such as:

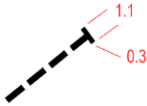
- When off-track riding is allowed, additional symbols may be required for navigation off-track.
- In areas with very few features, additional symbols may be helpful for navigation.
- To improve safety



501.1 Step or edge of paved area (L)

An edge of a paved area. Edges within paved areas are generally not represented unless they serve navigation.

Colour: black.

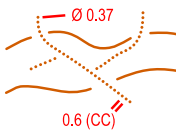


823 Track end point (P)

The end of the track or path, it is no longer possible to continue in its direction.

Footprint: 16.5 m.

Colour: black.



108 Small erosion gully (L)

A small erosion gully or trench which is a significant aid to navigation, where riders should not need to dismount. Contour lines should be broken around this symbol.

Minimum depth is 0.5 m.

Minimum length (isolated): three dots (1.6 mm – footprint 24 m).

Colour: brown.



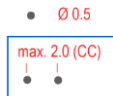
109 Small knoll (P)

A small obvious mound or rocky knoll which cannot be drawn to scale with a *Contour* (101), *Index contour* (102). The symbol shall not touch or overlap contours.

Minimum height: 1 m.

Footprint: 11.25 m in diameter.

Colour: brown.

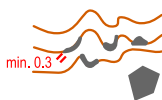


204 Boulder (P)

A distinct boulder (should be higher than 1 m), which is immediately identifiable on the ground. Boulders should be omitted from maps where they are abundant and can obscure the path network.

Footprint: 7.5 m diameter.

Colour: black 60%.



206 Gigantic boulder or rock pillar (A)

A gigantic boulder, rock pillar or massive cliff shall be represented in plan shape. The objects can vary in shape and width.

The gap between gigantic boulders or between gigantic boulders and other impassable feature symbols must exceed 0.15 mm on the map.

Minimum width: 0.3 mm (footprint 4.5 m).

Minimum area: 0.3 mm².

Colour: black 60%.

210 Stony ground (A)

Stony or rocky ground which reduces rideability to about 60-80% of normal speed.

The dots should be randomly distributed but not interfere with the representation of important terrain features and objects. Point symbol (single dots) can be used to draw stony ground.

The minimum number of dots is three (footprint 12 m × 12 m).

The maximum centre to centre distance between neighbouring dots is 0.6 mm.

The minimum centre to centre distance between neighbouring dots is 0.45 mm.

Density: 3-4 dots / mm².

Colour: black 60%.



214 Bare rock (A)

An area of rock without earth or vegetation should be shown as bare rock. An area of rock covered with grass, moss or other low vegetation, shall not be shown using the bare rock symbol.

An area of less rideable bare rock should be shown using a *Stony ground symbol* (210).

Minimum width: 0.3 mm (footprint 4.5 m).

Minimum area: 4 mm².

Colour: black 30%.



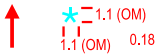
313 Prominent water feature (P)

The definition of the symbol must be given on the map.

The symbol is orientated to north.

Footprint: 16.5 m × 16.5 m.

Colour: blue.



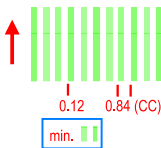
407 Vegetation: reduced off-track rideability, good visibility (A)

An area of good visibility but undergrowth (brambles, heather, low bushes, cut branches). Speed is reduced to difficult or impossible requiring the competitor to dismount. Symbol should only be used when off-track riding is allowed.

The symbol is orientated to north.

Minimum area: two lines.

Colour: green.



410 Impassable vegetation (L)

A hedge of any height, which is distinct in the terrain and provides an important navigational feature.

Minimum length (isolated): 1 mm (footprint 15 m).

Colour: green.



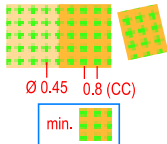
413 Orchard (A)

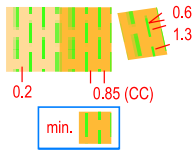
Land planted with trees or bushes, normally in a regular pattern. The dot lines may be orientated to show the direction of planting.

Must be combined with either symbol *Open land* (401) or *Rough open land* (403).

Minimum area: 4 mm².

Colour: green, yellow or yellow 50%.





414 Vineyard (A)

A vineyard or similar cultivated land containing dense rows of plants offering good or normal runnability in the direction of planting. The lines shall be orientated to show the direction of planting. At least three lines shall be clearly visible.

Must be combined with either symbol *Open land* (401) or *Rough open land* (403).

Minimum area: 4 mm².

Colour: green, yellow or yellow 50%.

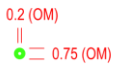


417 Prominent large tree (P)

White mask is used under the green circle, to improve readability in yellow and green (OM 1.1 mm).

Footprint: 16.5 m × 16.5 m.

Colour: green.

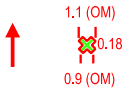


418 Prominent bush or small tree (P)

A prominent bush or a small single tree. Small white dot inside is used to aid the colour vision impaired.

Footprint: 11.25 m in diameter.

Colour: green.



419 Special vegetation feature (P)

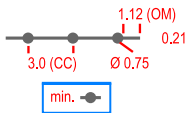
White mask is used under the green cross, to improve readability in yellow and green (line width of white mask 0.36 mm, and the total length of mask line is to be 0.18 mm longer).

The definition of the symbol must be given on the map.

The symbol is orientated to north.

Footprint: 16.5 m × 16.5 m.

Colour: green.

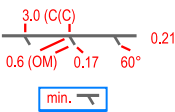


513 Passable wall (L)

A significant wall of brick, stone, concrete, wood or other materials that is possible to cross.

Minimum length (isolated): 1.5 mm (footprint 22.5 m).

Colour: black 60%.

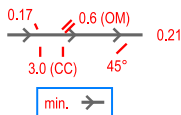


516 Passable fence or railing (L)

A fence that is possible to cross. If the fence forms an enclosed area, tags should be placed inside.

Minimum length (isolated): 1.5 mm (footprint 22.5 m).

Colour: black 60%.



528 Passable line feature (L)

A man-made line feature that is allowed to cross. For example, a low pipeline (gas, water, oil, heat, etc.) or a bobsleigh / skeleton track that is clearly visible.

The definition of the symbol must be given on the map.

Minimum length: 1.5 mm (footprint 22.5 m).

Colour: black 60%.



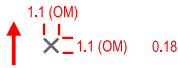
530 Prominent man-made feature – ring (P)

Location is at the centre of gravity of the symbol.

The definition of the symbol must be given on the map.

Footprint: 16.5 m in diameter.

Colour: black 60%.



531 Prominent man-made feature – x (P)

Location is at the centre of gravity of the symbol.
The definition of the symbol must be given on the map.
The symbol is orientated to north.
Footprint: 16.5 m × 16.5 m.
Colour: black 60%.



603 Spot height (P, T)

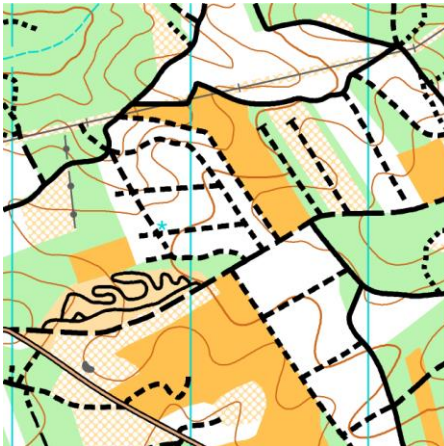
Spot heights are used for the rough assessment of height differences.
The height is given to the nearest metre. Water levels are given without the dot. Spot heights must only be used where they do not conflict with other symbols.
Font: sans-serif, 1.5 mm, non-bold, non-italic.
Colour: black – point, black 60% value.



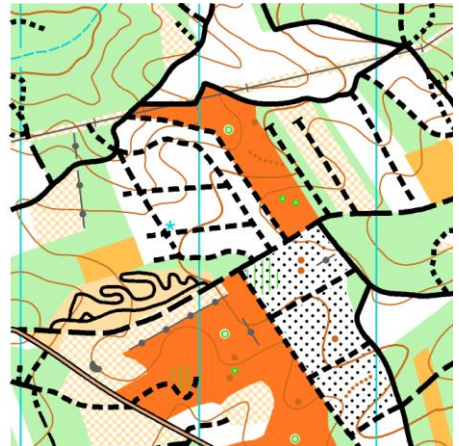
841 One-way compulsory (P)

For use on tracks and paths where it is only allowed to ride in one direction, for example on mountain bike single tracks. The frequency of chevron arrows depends on the overall length of track/path in question. At minimum, there should be one at the start, after each adjoining junction, and at the end.
Footprint 15 m × 21 m.
Colour: lower purple (under black).

Example of application of optional symbols



Example of map where selected optional symbols for navigation are used; see here *Gigantic boulder or rock pillar* (206), *Prominent water feature* (313), *Passable wall* (513).



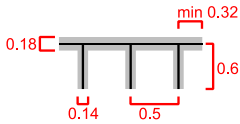
Example of map with areas permitted to ride where selected optional symbols for navigation are used. Note that the dotted pattern *Forested area, permitted to ride* (825) is cut out in place of the optional symbols for better readability.

4.11 Precise definition of symbols

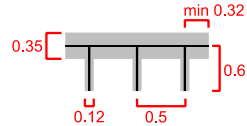
Note: Dimension are specified in mm.

All drawings are magnified (10×) for clarity only. The centre of gravity is marked (×) when it is not unambiguous.

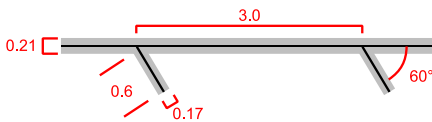
104



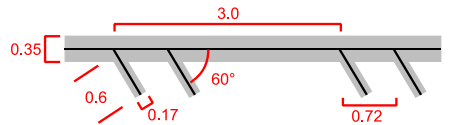
201



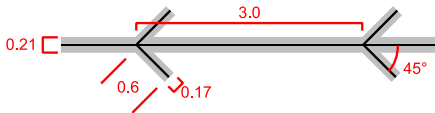
516



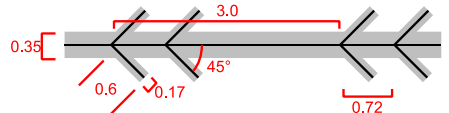
518



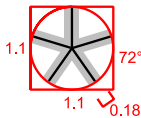
528



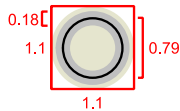
529



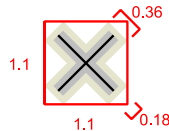
313



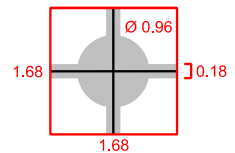
417



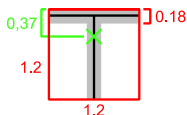
419



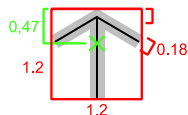
524



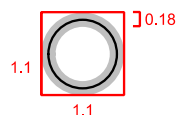
525



527



530



531

