

International Specification for Orienteering Maps

709 Out-of-bounds area
 An out-of-bounds area, see also symbol 528, is shown with vertical stripes.
 A bounding line may be drawn if there is no natural boundary, as follows:
 - a solid line indicates that the boundary is marked continuously (tapes, etc.) on the ground,
 - a dashed line indicates intermittent marking on the ground,
 - no line indicates no marking on the ground.
 Colour: purple.

710 Dangerous area
 An area presenting danger to the competitor is shown with cross-hatched diagonal lines.
 Colour: purple.

711 Forbidden route
 A route which is out-of-bounds is shown with crosses.
 Colour: purple.

712 First aid post
 The location of a first aid post.
 Colour: purple.

713 Refreshment point
 The location of a refreshment point which is not at a control.
 Colour: purple.



INTERNATIONAL ORIENTEERING FEDERATION 2000

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MAP COMMITTEE

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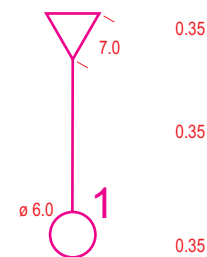
László Zentai

4.7 Overprinting symbols

Note: dimensions are specified in mm at the printed scale of 1:15 000. **Drawings in this section are at 1:15 000 also.**

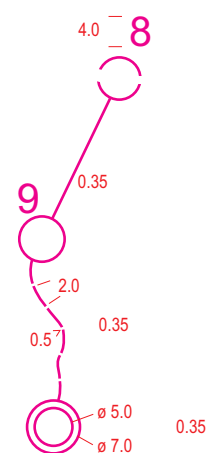
Courses should be overprinted at least for elite classes. For other classes they can be drawn by hand.

The size of overprinting symbols is given for 1:15 000 maps. The size of these symbols for 1:10 000 maps should be the same as for 1:15 000 maps. However, for multi-age competitions in which both 1:10 000 and 1:15 000 maps are used, the size of the symbols on the 1:10 000 maps may be 150% greater than on the 1:15 000 maps.



701 Start

The start or map issue point (if not at the start) is shown by an equilateral triangle which points in the direction of the first control. The centre of the triangle shows the precise position of the start point.
Colour: purple.

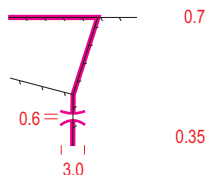


702 Control point

The control points are shown with circles. The centre of the circle shows the precise position of the feature. Sections of circles should be omitted to leave important detail showing.
Colour: purple.

703 Control number

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.
Colour: purple.



704 Line

Where controls are to be visited in order, the start, control points and finish are joined together by straight lines. Sections of lines should be omitted to leave important detail showing.
Colour: purple.

705 Marked route

A marked route is shown on the map with a dashed line.
Colour: purple.

706 Finish

The finish is shown by two concentric circles.
Colour: purple.

707 Uncrossable boundary

A boundary which it is not permitted to cross.
Colour: purple.

708 Crossing point

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.
Colour: purple.

International Specification for Orienteering Maps

1 INTRODUCTION

Orienteering is a worldwide 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.

It is the aim of the International Specification for Orienteering Maps (ISOM) to provide a map specification which can accommodate the many different types of terrain around the world and the many ways of doing orienteering. These specifications should be read in conjunction with the rules for International Orienteering Federation (IOF) orienteering events. For IOF events deviations are permissible only with the sanction of the IOF Map Committee (IOF MC). For other events such sanction must be given by the national federation. In addition, there are supplementary specifications for other orienteering disciplines on the basis of the specification for foot orienteering maps.

2 GENERAL REQUIREMENTS

2.1 Orienteering and the map

Orienteering is a sport in which the orienteer completes a course of control points in the shortest possible time, aided only by map and compass. As in all forms of sport, it is necessary to ensure that the conditions of competition are the same for all competitors. The more accurate the map, the better this can be done, and the greater the opportunity for the course planner to set a good and fair course.

From the competitors' point of view, an accurate and legible map is a reliable guide for choice of route, and it enables them to navigate along a route chosen to suit their navigational skill and physical ability. However, skill in route choice loses all meaning if the map is not a true picture of the ground—if it is inaccurate, out-of-date or of poor legibility.

Anything which bars progress is essential information: cliffs, water, dense thickets. The path and track network shows where the going and navigation is easiest. A detailed classification of the degrees of hindrance or good going helps the competitor to make the right decisions. Orienteering is first of all to navigate by map reading. An accurate map is therefore necessary for a good and effective route choice. In the ideal case no competitor should gain an advantage or suffer a disadvantage because of faults on the map.

The aim of the course planner is a course where the deciding factor in the results will be navigational skill. This can be achieved only if the map is sufficiently accurate, complete and reliable, and is also clear and legible under competition conditions. The better the map the course planner has, the greater the chance he has of setting good, fair courses, whether for the elite or for the novice.

Controls are the most important building blocks of a course. Choice of sites, placing of the markers, checking their positions, and locating controls in competition, all put definite demands on the map. The map must give a complete, accurate and detailed picture of the terrain. For an international event, it must be up-to-date in all parts which could affect the end result of the competition. If it is not up-to-date it must be improved.

For the mapper, the task is knowing which features to map and how to represent them. A continuing involvement in the sport is important for a basic understanding of the requirements for the orienteering map: its content, the need for accuracy, the level of detail and above all the need for legibility.

537 Cairn

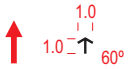
Cairn, memorial stone or boundary stone (or a trigonometric point in some countries) more than 0.5 m high.
Colour: black.



0.16

538 Fodder rack

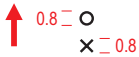
A fodder rack which is free standing or built on to a tree. Location is at the centre of gravity of the symbol. For land access reasons these may be omitted.
Colour: black.



0.16

539, 540 Special man-made features

Special man-made features are shown with these symbols. The definition of the symbols must be given in each case in the map legend.
Colour: black.



0.16

4.6 Technical symbols

Note: dimensions are specified in mm at the scale of 1:15 000.
All drawings are at 1:7 500 for clarity only.

Technical symbols are such symbols which are essential on all kinds of topographic maps and not only on orienteering maps.

601 Magnetic north line

Magnetic north lines are lines placed on the map pointing to magnetic north. Their spacing on the map should be 33.33 mm which represents 500 m on the ground at the scale of 1:15 000. For maps with other scales lines placing should be at intervals which represents a round number of meters (e.g. 50 m, 100 m, 250 m, 500 m) and the spacing should be between 20 mm and 40 mm on the map. North lines may be broken where they obscure small features such as boulders, knolls, cliffs, stream junctions, path ends, etc. In areas with very few water features, blue lines may be used.
Colour: black (blue).



602 Registration marks

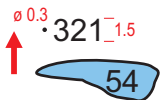
At least three registration marks must be placed within the frame of a map in a non-symmetrical position. In addition, a colour check should also be possible.
Colour: all printed colours.



0.1

603 Spot height

Spot heights are used for the rough assessment of height differences. The height is given to the nearest metre. The figures are orientated to the north. Water levels are given without the dot.
Colour: black.



2.2 Content

An orienteering map is a detailed topographic map. The map must contain the features which are obvious on the ground to a competitor at speed. It must show every feature which could influence map reading or route choice: land forms, rock features, ground surface, rate of progress through the vegetation (known in foot-o as runnability), main land uses, hydrography, settlements and individual buildings, the path and track network, other lines of communication and features useful from the point of view of navigation.

The shape of the ground is one of the most important aspects of an orienteering map. The correct use of contours to show a three dimensional picture of the ground—shape and height difference—cannot be overemphasized.

The degree to which a feature is recognizable, the openness of the forest and runnability of the terrain should be taken into consideration at the survey stage.

Boundaries between different types of ground surface provide valuable reference points for the map reader. It is important that the map shows these.

An orienteer's speed and choice of route through the terrain is affected by many factors. Information on all of these factors must therefore be shown on the map by classifying paths and tracks, by indicating whether marshes, water features, rock faces and vegetation are passable, and by showing the characteristics of the ground surface and the presence of open areas. Clearly visible vegetation boundaries should also appear since they are useful for map reading.

The map must show the features which are obvious on the ground and which are of value from the point of view of map reading. An attempt must be made when surveying to maintain the clarity and legibility of the map, i.e. the minimum dimensions designed for normal sight must not be forgotten when choosing the degree of generalization.

The map must contain magnetic north lines and may additionally contain some place names and peripheral text to help the competitor to orientate the map to north. This text should be written from west to east. Text within the map should be placed to avoid obscuring important features and the style of lettering should be simple.

The sides of the map should be parallel to the magnetic north lines. Arrowheads may be used to show magnetic north.

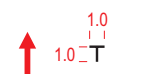
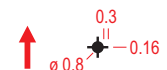
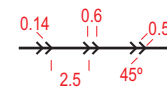
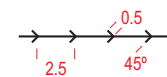
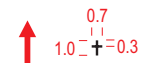
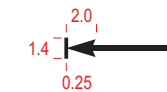
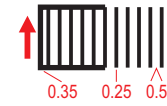
2.3 Accuracy

The general rule should be that competitors shall not perceive any inaccuracy in the map. The accuracy of the map as a whole depends upon the accuracy of measurement (position, height and shape) and the accuracy of drawing. Accuracy of position on an orienteering map must be consistent with that obtained by compass and pacing. A feature must be positioned with sufficient accuracy to ensure that a competitor using compass and pacing will perceive no discrepancy between map and ground. In general if the distance between neighbouring features deviates less than 5% this will satisfy accuracy requirements.

Absolute height accuracy is of little significance on an orienteering map. On the other hand, it is important that the map shows as correctly as possible the relative height difference between neighbouring features.

Accurate representation of shape is of great importance for the orienteer, because a correct, detailed and sometimes exaggerated picture of the land form is an essential precondition for map reading. However, the inclusion of a lot of small detail must not disguise the overall shapes. Drawing accuracy is of primary importance to any map user because it is closely connected with the reliability of the final map.

Absolute accuracy is important if an orienteering map is to be used with a positioning system or together with geographical data sets from other sources. In such cases it must also be possible to transform the map to a well known geographical reference system.



527 Settlement

Houses and gardens and other built up areas. Roads, buildings and other significant features within a settlement must be shown. If all buildings cannot be shown, an alternative symbol (black line screen) may be used. Colour: green 50% (60 l/cm) and yellow 100% or alternatively black 32.5% (27 l/cm).

528 Permanently out of bounds

Areas which are permanently forbidden to the runner are shown as out of bounds. The screen is superimposed on the normal map detail. A bounding line may be drawn if there is no natural boundary (see 709). Colour: black or purple 33.3% (13.3 lines/cm).

529 Paved area

An area of hard standing used for parking or other purposes. Colour: black and brown 50% (60 lines/cm).

530 Ruin

The ground plan of a ruin is shown to scale, down to the minimum size shown opposite. Very small ruins may be drawn with a solid line. Colour: black.

531 Firing range

A firing range is shown with a special symbol to indicate the need for caution. Associated buildings are individually marked. Colour: black.

532 Grave

A distinct grave marked by a stone or shrine. Location is at the centre of gravity of the symbol, which is orientated to north. A cemetery is shown by using grave symbols as space permits. Colour: black.

533 Crossable pipeline

A pipeline (gas, water, oil, etc.) above ground level which can be crossed over or under. Colour: black.

534 Uncrossable pipeline

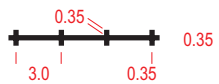
A pipeline which cannot be crossed. Colour: black.

535 High tower

A high tower or large pylon, standing above the level of the surrounding forest. Location is at the centre of gravity of the symbol. Colour: black.

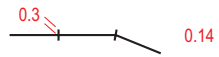
536 Small tower

An obvious shooting platform or seat, or small tower. Location is at the centre of gravity of the symbol. Colour: black.



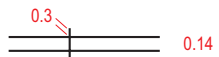
515 Railway

A railway or other kind of railed track (tramway, truckway, etc.).
Colour: black.



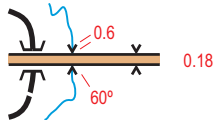
516 Power line

Power line, cableway or skilift. The bars indicate the exact location of the pylons.
Colour: black.



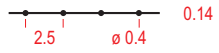
517 Major power line

Major power lines should be drawn with a double line. The gap between the lines may indicate the extent of the powerline.
Colour: black.



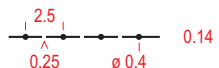
518 Tunnel

A way under roads, railways, etc. which may be used by the runner. This symbol is used whether or not the tunnel has a track leading to it.
Colour: black.



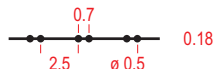
519 Stone wall

A stone wall or stone-faced bank.
Colour: black.



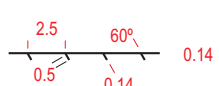
520 Ruined stone wall

A ruined stone wall may be shown by a dashed line.
Colour: black.



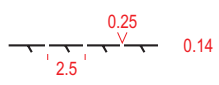
521 High stone wall

A stone wall higher than ca 1.5 m, not crossable to the average orienteer.
Colour: black.



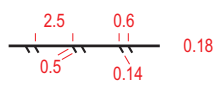
522 Fence

A wooden or wire fence less than ca. 1.5 m high.
Colour: black.



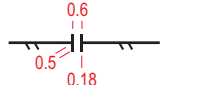
523 Ruined fence

A ruined fence may be shown with a dashed line.
Colour: black.



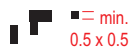
524 High fence

A boarded or wire fence higher than ca 1.5 m, not crossable to the average orienteer, eg. deer fence.
Colour: black.



525 Crossing point

All ways through or over high fences or walls must be indicated. The symbol may also be used for a gate through or stile over a stone wall (519) or a fence (522) or a pipeline (534).
Colour: black.



526 Building

A building is shown with its ground plan so far as the scale permits.
Colour: black.

2.4 Generalization and legibility

Good orienteering terrain contains a large number and a great variety of features. Those which are most essential for the runner in competition must be selected and presented on the orienteering map. To achieve this, in such a way that the map is legible and easy to interpret, cartographic generalization must be employed. There are two phases of generalization—selective generalization and graphic generalization.

Selective generalization is the decision as to which details and features should be presented on the map. Two important considerations contribute to this decision—the importance of the feature from the runners' 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. These minimum sizes may vary somewhat from one map to another according to the amount of detail in question. 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.

Legibility requires that the size of symbols, line thicknesses and spacing between lines be based on the perception of normal sight in daylight. In devising symbols, all factors except the distance between neighbouring symbols are considered.

The size of the smallest feature which will appear on the map depends partly on the graphic qualities of the symbol (shape, format and colour) and partly on the position of neighbouring symbols. With immediately neighbouring features, which take up more space on the map than on the ground, it is essential that the correct relationships between these and other nearby features are also maintained.

3 MAP SPECIFICATION FOR FOOT-ORIENTEERING

3.1 Scale

The scale for an orienteering map is 1:15 000. Terrain that cannot be fieldworked at a scale of 1:7500 and legibly presented at a scale of 1:15 000, is not suitable for international foot-orienteering.

Maps at 1:10 000 may be produced for relay and short distance competitions. The scale 1:10 000 is recommended for older age groups (45 and above) where reading fine lines and small symbols may cause problems or for younger age groups (age classes 16 and below) where the capacity of reading complex maps is not fully developed.

Maps at 1:10 000 must be drawn with lines, line screens and symbol dimensions 50% greater than those used for 1:15 000 maps.

Where practical the same dot screens as used at 1:15 000 will give the most legible map and are therefore to be preferred.

In education there is usually a progression of scales from 1:2 500 to 1:5 000 to 1:10 000. Maps at very large scales such as 1:2 500 will clearly contain additional detail such as playground equipment. Line dimensions for these maps should also be enlarged by 50%.

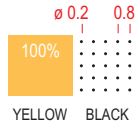
Other scales may be produced for other forms of orienteering.

For practical reasons a map should not be larger than is necessary for the orienteering competition. Maps larger than A3 should be avoided.

414 Distinct cultivation boundary

The boundary of cultivated land when not shown with other symbols (fence, wall, path, etc.) is shown with a black line. A permanent boundary between different types of cultivated land is also shown with this symbol.
Colour: black.

0.12



415 Cultivated land

Cultivated land which is seasonally out-of-bounds due to growing crops may be shown with a black dot screen.
Colour: yellow 100%, black 5% (12.5 lines/cm).

416 Distinct vegetation boundary

A distinct forest edge or very distinct vegetation boundary within the forest.
Colour: black.

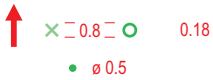


417 Indistinct vegetation boundary

Indistinct boundaries between areas of green, yellow or white are shown without a line. The edge of the area is shown only by the change in colour or dot screen.

418, 419, 420 Special vegetation features

Symbols 418, 419 and 420 can be used for special small vegetation features. The definition of the symbol must be given in each case in the map legend.
Colour: green.



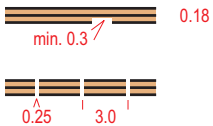
4.5 Man-made features

Note: dimensions are specified in mm at the scale of 1:15 000.
All drawings are at 1:7 500 for clarity only.

The track network provides important information for the runner and the classification must be clearly recognisable on the map. Particularly important for the competitor is the classification of smaller paths. Account must be taken not only of the width, but also of how obvious the path is to the runner.
Other man-made features are also important both for map reading and as control points.

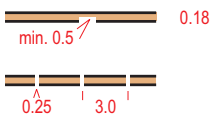
501 Motorway

A road with two carriageways. The width of the symbol should be drawn to scale but not smaller than the minimum width. The outer boundary lines may be replaced with symbols 519, 521, 522 or 524 if a fence or wall is so close to the motorway edge that it cannot practically be shown as a separate symbol. The space between the black lines must be filled with brown (50%). A road under construction may be shown with broken lines.
Colour: black and brown 50% (60 lines/cm).



502 Major road

Road wider than 5m. The width of the symbol should be drawn to scale but not smaller than the minimum width. The outer boundary lines may be replaced with symbols 519, 521, 522 or 524 if a fence or wall is so close to the motorway edge that it cannot practically be shown as a separate symbol. The space between the black lines must be filled with brown (50%). A road under construction may be shown with broken lines.
Colour: black and brown 50% (60 lines/cm).



3.4 Enlargement of maps

Where a map is enlarged to a scale of 1:10000 or greater, all lines and symbols must be enlarged by 150%. Area screens made with fine dot percentage tints should not be enlarged wherever possible, i.e. screens at 60 l/cm.

3.5 Printing

An orienteering map must be printed on good, possibly water resistant, paper (weight 80 - 120 g/m²).

Spot colour printing is recommended for IOF events. Other printing methods may be used, if colours and line width have the same quality as printing with spot colours.

Legibility depends on the correct choice of colours.

3.5.1 Spot colour printing

Spot colour printing uses pure colour inks. Each spot colour ink is made by mixing a number of stock inks in specific proportions to produce the desired colour. The colours specified for use for orienteering maps are defined by the Pantone Matching System (PMS).

The map may be in up to 6 colours (excluding overprinting).

The following recommendations for spot colours are intended to standardize maps as much as possible:

Colour	PMS number
Black	Process black
Brown	471
Yellow	136
Blue	299
Green	361
Grey	428
Violet	Purple

The appearance of colours is dependent on the printing order.

In spot colour printing, order should always be:

1. yellow
2. green
3. grey
4. brown
5. blue
6. black
7. purple

3.5.2 Four colour offset printing

Four-colour printing is the traditional way of printing most colour work, maps have been one of the main exceptions due to the fine line requirements.

The four colour printing method uses the three basic colours of the additive colour model: cyan, magenta and yellow. In theory a mix of 100% of cyan, magenta and yellow produces black colour, but in reality it will be more of a dark brown. Therefore black is normally printed as a separate colour. After these four colours the model is often referred to as CMYK.

Although four-colour printing requires fewer and standardized inks, the main advantage of using this process is that it allows the inclusion of colour photographs and full colour advertisements at no extra cost.

The use of digital techniques to produce four colour separations has now made it possible to make high quality orienteering maps using four colour printing. This is not the suggested method of printing orienteering maps, it is an alternative. This method will only be acceptable when line quality, legibility and colour appearance are of the same quality as the traditional spot colour printed map.

However, the mapmaker has to take into consideration the limitations and potential errors of this method. The reproduction of very thin lines (contours) requires special attention.

Colours

The following table lists the CMYK combinations for the equivalent PMS colours recommended for orienteering maps:

Colour	Cyan	Magenta	Yellow	Black
Black	Process black			100%
Brown	PMS 471	56%	100%	18%
Yellow	PMS 136	27%	79%	
Blue	PMS 299	87%	18%	
Green	PMS 361	76%	91%	
Grey	PMS 428			23%
Violet	Purple	100%		

Screens

The colour mixture can be done either with traditional printing screens or special printing screens with randomly distributed dots called stochastic screens. The latter screens will improve legibility and make fine lines such as contours more readable, and is therefore highly recommended.

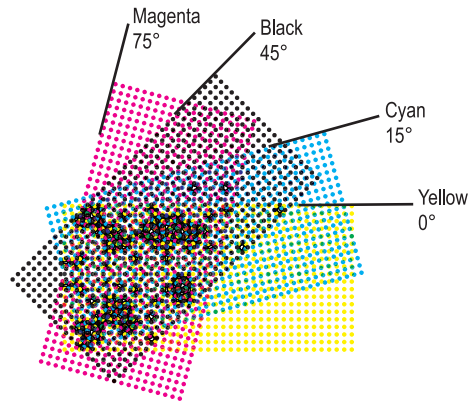
Screen frequency

Traditional screens should have a screen frequency of at least 60 lines /cm. For stochastic screens the frequency will vary randomly.

Angles

To avoid the unwanted moiré effects with traditional printing screens 4-color orienteering maps should always use the conventional angle set. In proper stochastic screens the dots are placed randomly, so angles are irrelevant and unwanted moiré effects will not appear.

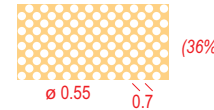
Colour	Angle
Cyan	15°
Magenta	75°
Yellow	0°
Black	45°



Printing order

The appearance of colours is dependent on the printing order. In 4-colour orienteering map offset printing the printing order should always be:

1. Yellow
2. Cyan
3. Magenta
4. Black



404 Rough open land with scattered trees

Where there are scattered trees in rough open land, areas of white (or green) should appear in the tone. Such an area may be generalised by using a regular pattern of large white dots in the yellow screen. Areas smaller than 16 mm² in the maps scale are shown as rough open land (403). Individual trees may be added (418, 419, 420). Colour: yellow 70% (60 lines/cm), white 48.5% (14.3 lines/cm).



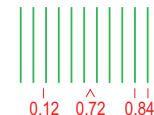
405 Forest: easy running

Typically open runnable forest for the particular type of terrain. If no part of the forest is runnable then no white should appear on the map. Colour: white.



406 Forest: slow running

An area with dense trees (low visibility) which reduces running to ca. 60-80% of normal speed. Colour: green 30% (60 lines/cm).



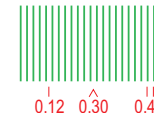
407 Undergrowth: slow running

An area of dense undergrowth but otherwise good visibility (brambles, heather, low bushes, and including cut branches) which reduces running to ca. 60-80% of normal speed. This symbol may not be combined with 406 or 408. Colour: green 14.3% (11.9 lines/cm).



408 Forest: difficult to run

An area with dense trees or thicket (low visibility) which reduce running to ca. 20-60% of normal speed. Colour: green 60% (60 lines/cm).



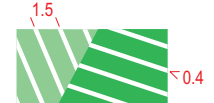
409 Undergrowth: difficult to run

An area of dense undergrowth but otherwise good visibility (brambles, heather, low bushes, and including cut branches) which reduces running to ca. 20-60% of normal speed. This symbol may not be combined with 406 or 408. Colour: green 28.6% (23.8 lines/cm).



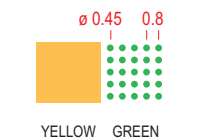
410 Vegetation: very difficult to run, impassable

An area of dense vegetation (trees or undergrowth) which is barely passable. Running reduced to ca. 0 - 20% of normal speed. Colour: green 100%.



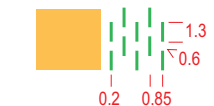
411 Forest runnable in one direction

When an area of forest provides good running in one direction but less good in others, white stripes are left in the screen symbol to show the direction of good running. Colour: green, white.



412 Orchard

Land planted with fruit trees or bushes. The dot lines may be orientated to show the direction of planting. If yellow coloured areas becomes dominant, a screen (75%) instead of full yellow may be used. Colour: yellow and green 25% (12.5 lines/cm).



413 Vineyard

The green lines may be orientated to show the direction of planting. If yellow coloured areas becomes dominant, a screen (75%) instead of full yellow may be used. Colour: yellow and green.

4.4 Vegetation

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

COLOUR

The basic principle is as follows:

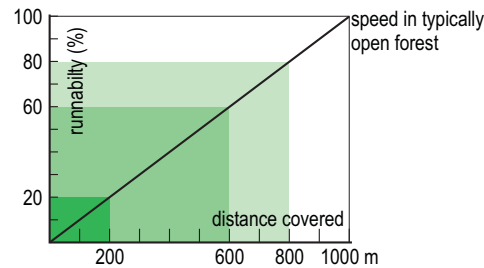
- **white** represents runnable forest,
- **yellow** represents open areas divided into several categories,
- **green** represents the density of the forest and undergrowth according to its runnability and is divided into several categories.

RUNNABILITY.

The runnability depends on the nature of the forest (density of trees/brushwood and undergrowth—bracken, brambles, nettles, etc.) but does not take account of marshes, stony ground etc. which are shown by separate symbols.

Runnability in forest is divided into 4 categories according to running speed. If speed through typically open runnable forest is, for example, 5 min/km, the following ratios apply:

open forest	80-100%	5 - 6:15 min/km
slow running	60-80%	6:15 - 8:20 min/km
difficult to run	20-60%	8:20 - 25:00 min/km
very difficult to run	0-20%	> 25:00 min/km



Note: dimensions are specified in mm at the scale of 1:15 000.
All drawings are at 1:7 500 for clarity only.

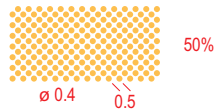
401 Open land

Cultivated land, fields, meadows, grassland, etc. without trees, offering easy running. If yellow coloured areas becomes dominant, a screen (75%) instead of full yellow may be used.
Colour: yellow.



402 Open land with scattered trees

Meadows with scattered trees or bushes, with grass or similar ground cover offering easy running. Areas smaller than 10 mm² at the maps scale are shown as open land (401). Individual trees may be added (418, 419, 420). If yellow coloured areas becomes dominant, a screen (75%) instead of full yellow may be used.
Colour: yellow (20 lines/cm).



403 Rough open land

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. Symbol 403 may be combined with symbols 407 and 409 to show reduced runnability.
Colour: yellow 50% (60 lines/cm).



Overprinting

With traditional spot colour printing inks are physically printed on top of each other. It is possible to simulate the same with four-colour printing technique, and this optimises legibility and gives a colour appearance as close to traditional spot colour printing as possible. To achieve this effect in four-colour offset printing, information underlying (in the spot colour printing order described in 3.5.1) a specific spot colour should not be blocked out (erased / printed white) completely, but should be blended in to produce a new colour for printing.

The use of overprinting effect with 4-color offset printing is recommended for the following solid colors:

- 100 % Violet
- 100 % Black
- 100 % Brown
- 100 % Blue
- 100 % Green

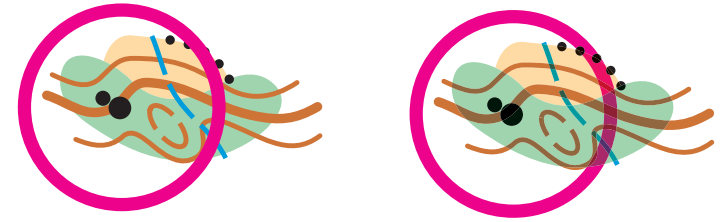


Illustration: Contours in dense vegetation printed in 4-colours. Overprinting effect in the right illustration.

3.5.3 Alternative printing methods

Colour copiers, printers and other digital printing equipment are not yet suitable for printing orienteering maps for high level competitions. It is very difficult to achieve the line quality, legibility and colour appearance of traditional spot colour printed maps using this kind of equipment.

It is expected that the continuing development of computer technology will lead to the possibility of using alternative printing methods with quality suitable for large competitions.

Most printing devices use a 4-color technique (CMYK). For such devices the same colour settings as recommended for 4-color offset printing may be suitable, but the colour appearance will vary slightly from one device to another and from one paper quality to another.

Extensive experimentation with different colour and halftone settings, different paper qualities and other variables will be necessary to achieve a quality as close to offset printing as possible. Such experimentation has to be done for a whole range of devices. This specification can therefore not give any general recommendations for the use of such alternative printing methods.

4 EXPLANATION OF SYMBOLS (FOOT-O)

Definitions of map features and specifications for the drawing of symbols are given in the following sections. Symbols are classified into 7 categories:

Land forms	(brown)
Rock and boulders	(black+grey)
Water and marsh	(blue)
Vegetation	(green+yellow)
Man-made features	(black)
Technical symbols	(black+blue)
Course symbols	(purple)

Note: dimensions are specified in mm at the scale of 1:15 000.
All drawings are at 1:7 500 for clarity only.

<	gap or infill between two lines
-	line thickness
-	distance from centre to centre or length of line
∅	diameter
↑	symbol orientated to north

4.1 Land forms

The shape of land is shown by means of very detailed contours, aided by the special symbols for small knolls, depressions, etc. This is complemented in black by the symbols for rock and cliffs. Orienteering terrain is normally best represented with a 5 m contour interval.

Excessive use of form lines should be avoided as this will complicate the map and give a wrong impression of height differences. If the representation of an area needs a large number of form lines, a smaller contour interval provides a more legible alternative.

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

101 Contour
A line joining points of equal height. The standard vertical interval between contours is 5 metres. The smallest bend in a contour is 0.25 mm from centre to centre of the lines.
Colour: brown.

102 Index contour
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. Where an index contour coincides with an area of much detail, it may be shown with a normal contour line.
Colour: brown.

103 Form line
An intermediate contour line. Form lines are used where more information can be given about the shape of the ground. They are used only where representation is not possible with ordinary contours. Only one form line may be used between neighbouring contours.
Colour: brown.

104 Slope line
Slope lines may be drawn on the lower side of a contour line, e.g. along the line of a re-entrant or in a depression. They are used only where it is necessary to clarify the direction of slope.
Colour: brown.

306 Crossable small watercourse

A crossable watercourse (including a major drainage ditch) less than 2 m wide. For better legibility a ditch in a marsh should be drawn as a crossable watercourse (305).
Colour: blue.



307 Minor water channel

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



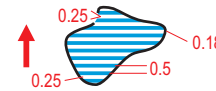
308 Narrow marsh

A marsh or trickle of water which is too narrow to be shown with symbol 310 (less than ca. 5 m wide).
Colour: blue.



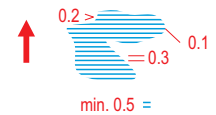
309 Uncrossable marsh

A marsh which is uncrossable or dangerous for the runner. A black line surrounds the symbol.
Colour: blue, black.



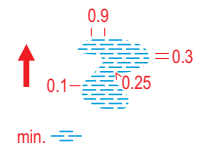
310 Marsh

A crossable marsh, usually with a distinct edge. The symbol should be combined with vegetation symbols to show runnability and openness. Where a small marsh area should be combined with either 403/404 it is permitted to use 401/402 to improve legibility.
Colour: blue.



311 Indistinct marsh

An indistinct or seasonal marsh or area of gradual transition from marsh to firm ground, which is crossable. The edge is generally indistinct and the vegetation similar to that of the surrounding ground. The symbol should be combined with vegetation symbols to show runnability and openness.
Colour: blue.



312 Well

Wells and captive springs, which are clearly visible on the ground.
Colour: blue.



313 Spring

The source of a stream with a distinct outflow. The symbol is orientated to open downstream.
Colour: blue.



314 Special water feature

A special small water feature. The definition of the symbol must always be given in the map legend.
Colour: blue.

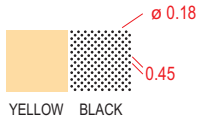




ø 0.16 - 0.2

210 Stony ground

Stony or rocky ground which affects going should be shown on the map. The dots should be randomly distributed with density according to the amount of rock. A minimum of three dots should be used. Colour: black.



ø 0.18

ø 0.45

YELLOW BLACK

211 Open sandy ground

An area of soft sandy ground or gravel with no vegetation and where running is slow. Where an area of sandy ground is open but running is good, it is shown as open land (401/402). Colour: black 12.5% (22 lines/cm) and yellow 50% (see 403).



(30%)

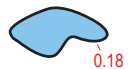
212 Bare rock

A runnable area of rock without earth or vegetation is shown as bare rock. An area of rock covered with grass, moss or other low vegetation is shown as open land (401/402). Colour: black 30% (60 lines/cm) or grey.

4.3 Water and marsh

Note: dimensions are specified in mm at the scale of 1:15 000. All drawings are at 1:7 500 for clarity only.

This group includes both open water and special types of vegetation caused by the presence of water (marsh). The classification is important because it indicates the degree of hindrance to the runner and provide features for map reading and control points. A black line around a water feature indicates that it cannot be crossed under normal weather conditions. In dry areas the features listed in this section may only contain water in some seasons.



0.18

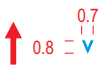
301 Lake

Large areas of water are shown with dot screen. Small areas of water should be shown with full colour. A black bank line indicates that the feature cannot be crossed. Colour: blue 50% (60 lines/cm), black.



302 Pond

Where the lake or pond is smaller than 1mm² on the printed map, the bank line is omitted. Colour: blue.



0.18

303 Waterhole

A water-filled pit or an area of water which is too small to be shown to scale. Location is the centre of gravity of the symbol, which is orientated to north. Colour: blue.



0.18

min. 0.2

304 Uncrossable river

An uncrossable river or canal is drawn with black bank lines. The bank lines are broken at a ford. Colour: blue 50% (60 lines/cm), black.



min. 0.25

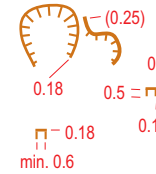
305 Crossable watercourse

A crossable watercourse, minimum 2 m wide. The width of watercourses over 5 m wide should be shown to scale. Colour: blue.



105 Contour value

Contour values may be included to aid assessment of large height differences. They are inserted in the index contours in positions where other detail is not obscured. The figures should be orientated so that the top of the figure is on the higher side of the contour. Colour: brown.



106 Earth bank

A steep earth bank is an abrupt change in ground level which can be clearly distinguished from its surroundings, e.g. gravel or sand pits, road and railway cuttings or embankments. The tags should show the full extent of the slope, but may be omitted if two banks are close together. Impassable banks should be drawn with symbol 201 (impassable cliff). The line width of very high earth banks may be 0.25 mm. Colour: brown.

107 Earth wall

Distinct earth wall. Minimum height is 1 m. Colour: brown.



108 Small earth wall

A small or partly ruined earth wall shall be shown with a dashed line. Minimum height is 0.5 m. Colour: brown.



109 Erosion gully

An erosion gully or trench which is too small to be shown by symbol 106 is shown by a single line. The line width reflects the size of the gully. Minimum depth 1 m. The end of the line is pointed. Colour: brown.



110 Small erosion gully

A small erosion gully or trench. Minimum depth 0.5 m. Colour: brown.



111 Knoll

Knolls are shown with contour lines. A prominent knoll falling between contour lines may still be represented by a contour line if the deviation from the actual contour level is less than 25%. Smaller or flatter knolls should be shown with form lines. Colour: brown.



112 Small knoll

A small obvious mound or rocky knoll which cannot be drawn to scale with a contour (diameter of mound less than ca. 5 m). The height of the knoll should be a minimum of 1 m from the surrounding ground. The symbol may not touch a contour line. Colour: brown.



113 Elongated knoll

A small obvious elongated knoll which cannot be drawn to scale with a contour (length less than 12 m and width less than 4 m). The height of the knoll should be a minimum of 1 m from the surrounding ground. Knolls larger than this must be shown by contours. The symbol may not be drawn in free form or such that two elongated knoll symbols overlap. The symbol may not touch a contour line. Colour: brown.



114 Depression

Depressions are shown with contours or form lines and slope lines. Prominent depressions falling between contour lines may be represented by a contour line if the deviation from the actual contour level is less than 25%. Smaller or shallower depressions should be shown by form lines.
Colour: brown.



115 Small depression

Small shallow natural depressions and hollows (minimum diameter 2 m) which cannot be shown to scale by contours are represented by a semicircle. Minimum depth from the surrounding ground should be 1 m. Location is the centre of gravity of the symbol, which is orientated to north. Symbol 116 is used for man-made pits.
Colour: brown.



116 Pit

Pits and holes with distinct steep sides which cannot be shown to scale by symbol 106 (minimum diameter 2 m). Minimum depth from the surrounding ground should be 1 m. Location is the centre of gravity of the symbol which is orientated to north.
Colour: brown.



117 Broken ground

An area of pits or knolls which is too intricate to be shown in detail. The density of randomly placed dots may vary according to the detail on the ground.
Colour: brown.



118 Special land form feature

This symbol can be used for a special small land form feature. The definition of the symbol must be given in the map legend.
Colour: brown.

4.2 Rock and boulders

Note: dimensions are specified in mm at the scale of 1:15 000.
All drawings are at 1:7 500 for clarity only.



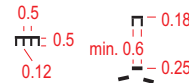
201 Impassable cliff

An impassable cliff, quarry or earth bank (see 106) is shown with a 0.35 mm line and downward tags showing its full extent from the top line to the foot. For vertical rock faces the tags may be omitted if space is short, e.g. narrow passages between cliffs (the passage should be drawn with a width of at least 0.3 mm). The tags may extend over an area symbol representing detail immediately below the rock face. When a rock face 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 should clearly extend over the bank line.
Colour: black.



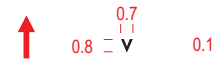
202 Rock pillars/cliffs

In the case of unusual features such as rock pillars or massive cliffs or gigantic boulders, the rocks shall be shown in plan shape without tags.
Colour: black.



203 Passable rock face

A small vertical rock face (minimum height 1 m) may be shown without tags. If the direction of fall of the rock face is not apparent from the contours or to improve legibility, short tags should be drawn in the direction of the fall. For passable rock faces shown without tags the ends of the line may be rounded to improve legibility.
Colour: black.



204 Rocky pit

Rocky pits, holes or mineshafts which may constitute a danger to the runner. Location is the centre of gravity of the symbol, which is orientated to north.
Colour: black.



205 Cave

A cave is represented by the same symbol as a rocky pit. In this case the symbol should be orientated to point up the slope as indicated opposite. The centre of gravity of the symbol marks the opening.
Colour: black.



206 Boulder

A small distinct boulder (minimum height 1 m). Every boulder marked on the map should be immediately identifiable on the ground. To be able to show the distinction between boulders with significant difference in size it is permitted to enlarge this symbol by 20% (diameter 0.5 mm).
Colour: black.



207 Large boulder

A particularly large and distinct boulder. For gigantic boulders symbol 202 should be used.
Colour: black.



208 Boulder field

An area which is covered with so many blocks of stone that they cannot be marked individually is shown with randomly orientated solid triangles with sides of ratio 8:6:5. A minimum of two triangles should be used. The going is indicated by the density of the triangles. To be able to show the distinction between boulder fields with a significant difference in boulder size it is permitted to enlarge the triangles by 20%.
Colour: black.



209 Boulder cluster

A small distinct group of boulders so closely clustered together that they cannot be marked individually. The symbol is an equilateral triangle orientated to the north. To be able to show the distinction between boulder clusters with significant difference in size it is permitted to enlarge this symbol by 25% (1.0 mm).
Colour: black.