

1. GENERAL

1.1. Scope

These regulations are mandatory and binding in all FEMA member countries.

1.2. Application

These regulations are to be used for all questions that may arise during FEMA sanctioned events. They are to be interpreted in such a manner that the original purpose is always maintained.

Should the regulations not cover a certain topic the FEMA board, the race jury and the race director must always decide in favor of the highest safety.

1.3. Comradeship

Every competitor is obligated to adhere to the regulations and to behave fairly among other competitors.

1.4. Safety

Model car – Every competitor is responsible for the technical safety of his or her model car. A yearly technical inspection and constant personal inspection of the model car are mandatory. Model cars that do not meet the technical regulations are not allowed to take part in FEMA races.

Tracks - Each race track is to be inspected every 3 years by FEMA according to form 8.4. Identified deficiencies must be resolved prior to the next FEMA race. Tracks that do not comply with safety standards must not host a FEMA race and will not be included in the official race calendar. Please also see section 3.4.

1.5. Offenses / Sanctions

In the case of an offense against the technical regulations the FEMA board, in the presence of a country representative of the relevant member country, will autonomously decide on the penalty.

Depending on the severity of the offense, the penalty will typically range from a censure up to a one year race ban. In the worst case, a model car driver may receive a lifelong ban for all FEMA races.

2. MODEL CARS

2.1. General

A model car must have four wheels and be powered by a combustion engine (piston engine). The transmission of power must occur directly or via a gearbox from the motor to one or more wheels.

The wheels must be arranged so that at the point of contact with the ground either a rectangle or a trapezium is formed.

The two front wheels and the two rear wheels must have the same nominal diameter. It is however not required that the two wheels be rotated against each other. In a disassembled state, there must be two independent wheels.

The FEMA registration number must be easily visible on the chassis. Allowable methods for applying the number are: burning-in, stamping and engraving.

2.2. Classes

Regulation of the classes: racing classes that show less than 10 competitors (not model cars) at 2 consecutive European Championships are no longer recognized as a racing class.

The following are the prescribed race-classes:

| Class | From (min.) | To (max.) Capacity |
|-----------|----------------------|----------------------|
| 1 | 0.01 cm ³ | 1.5 cm ³ |
| 2 | 1.51 cm ³ | 2.5 cm ³ |
| 3 | 2.51 cm ³ | 3.5 cm ³ |
| 3b (FEMA) | 0.01 cm ³ | 3.5 cm ³ |
| 4 | 3.51 cm ³ | 5.0 cm ³ |
| 5 | 5.01 cm ³ | 10.0 cm ³ |

Table: Overview of Race-Classes

The maximum allowable deviation for all classes is an engine displacement of +0.009 cm³.

Four stroke motors are allowable in all classes with double the engine displacement.

The relevant measuring points are the maximum diameter of the cylinder in TDC (1/100 mm) and the stroke (1/100 mm). The race director is responsible for having the required measuring devices and gauges at hand.

2.3. Weight

A car with all its components including fuel and batteries may not exceed the following weight in a ready state (including fuel, battery and electronics) at the start of a race:

| Class | Maximum Weight |
|--------|----------------|
| 1 | 1.050 kg |
| 2 | 1.570 kg |
| 3 + 3b | 2.000 kg |
| 4 | 2.300 kg |
| 5 | 3.130 kg |

Table: Overview of Maximum Weight / Class

2.4. Stability

Intrinsic load bearing and power transmitting components like the pan, bridle, motor and wheel mountings, axles etc., must be calculated in such a way that they safely meet the demands placed on them during operation.

2.5. Body

Every car must have a body that together with the pan encloses all parts with the following exceptions: Cylinder head (allowed up to 12 mm out of the body, Exhaust pipe including fixing bracket, fuel shut off lever, vent connections for the fuel tank, valve pin, bridle, tail skid, wheels. If a class III car uses a true copy body of a certain make of car (Ferrari, Bugatti, Mercedes-Benz, etc.) the cylinder may be visible.

The body must be designed in such a way that the car can be turned off anytime without any risk of damage.

Cars racing in international FEMA races must have their body marked with a nationality mark and national identification number (see 5.3.3). The letters and numbers used must be at least 10 mm high.

2.6. Bridle

Every car must be equipped with a Bridle of material having a nominal tensile strength of 500 N/mm², for fastening the retaining cable. The minimum measurements must be adhered to. The safety factor $S=2$ has to be applied for the strength calculation for the bridle and for the fixing screws of the bridle. The competitor must ensure that the correct material has been used for the construction of the bridle.

Supplementary connectors between the bridle and the cable connector as well as between the cable and the centre arm are not allowed.

All bridles must be marked on the outside at the screw hole for the correct cable colour with a colour mark of approximately 2 cm (either painted, or with colour tape).

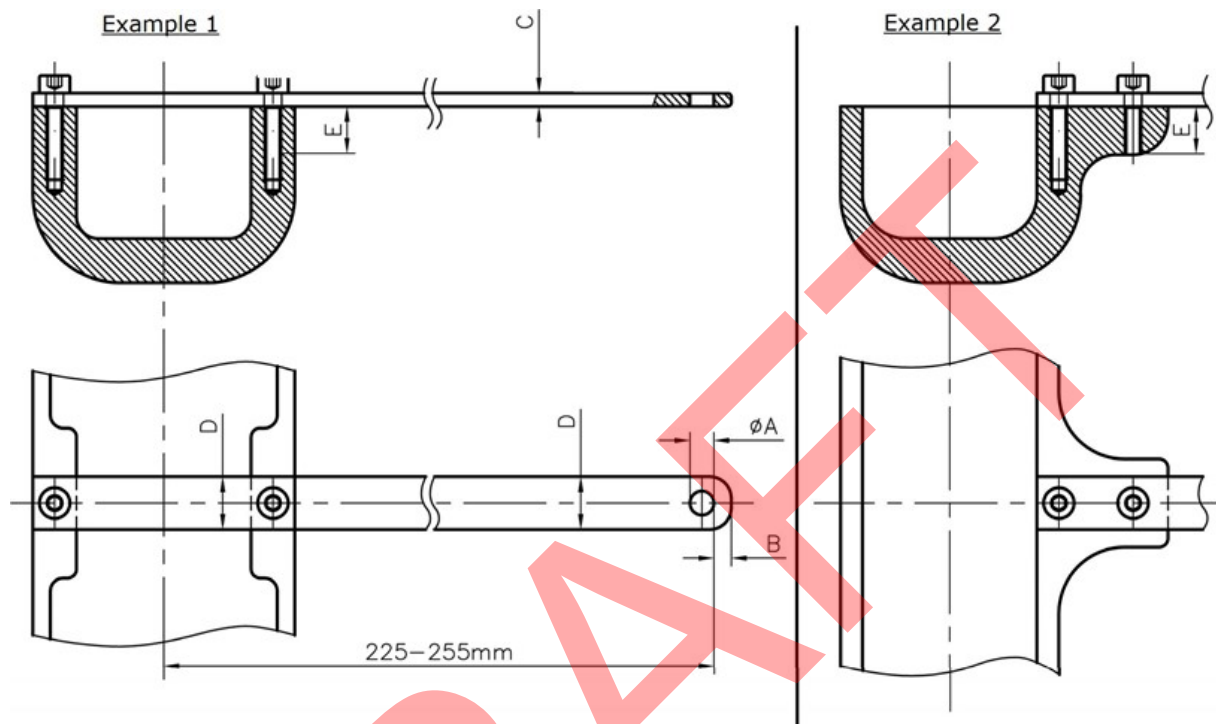
| Classes | Colour |
|---------|--------|
| 1 | white |
| 2 + 3b | green |
| 3 | yellow |
| 4 | red |
| 5 | black |

Table: Overview of the Colour markings for the bridle / class

All powered wheels must be symmetrically aligned with the centre of the car. The dimensioning of the bridle begins at this centre line. The minimum measurement of C and D must be clearly measurable in the area of the hanging and fastening holes. Otherwise the bridle may be profiled lenticular or wing-shaped as long as the minimum dimensions are respected. Here too, the

rectangular CxD must be measurable. The crossover from profiled to right angled cross-section should have a radius of at least 3 mm. Countersunk screws are not be used for fastening the bridle.

Bridles that are curved in the region of the flywheel must be checked for cracks. (Resources like under point 9.1). The bridle must be thermally treated in accordance with the material (risk of breakage).



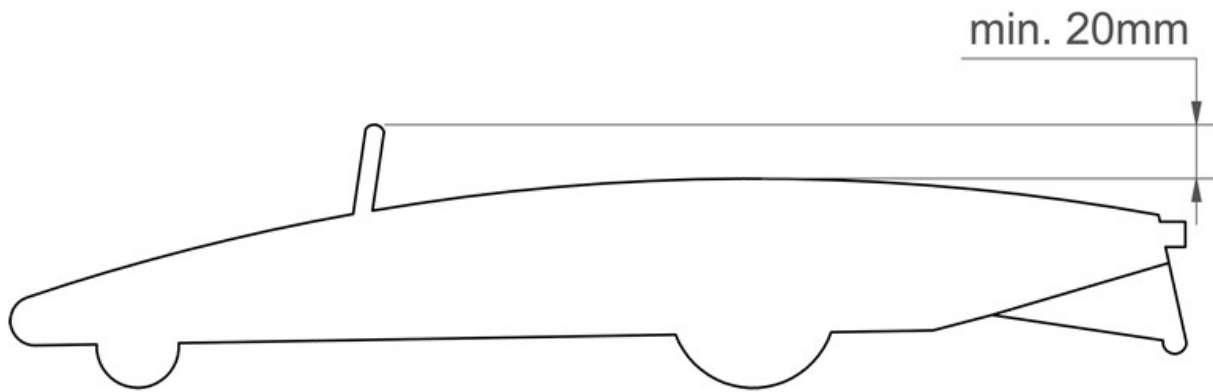
Example Illustration: Construction of the Bridle and Fasteners

| Class | A | B min. | B max. | C min. | C max. | D min. | E minimum screw length | min. 2 screws |
|--|-----|--------|--------|--------|--------|--------|------------------------|---------------|
| 1 | 4.5 | 2.0 | 4.0 | 2.0 | 3.5 | 8.5 | 9 | M 3 |
| 2 + 3b | 4.5 | 2.5 | 4.0 | 2.0 | 3.5 | 9.5 | 9 | M 3 |
| 3 | 5.5 | 3.0 | 4.0 | 2.5 | 4.5 | 11.5 | 12 | M 4 |
| 4 | 5.5 | 3.0 | 4.0 | 2.5 | 4.5 | 11.5 | 12 | M 4 |
| 5 | 5.5 | 3.0 | 4.0 | 3.0 | 4.5 | 12.5 | 15 | M 5 |
| Screw qualities: 8.8 No counter sinking screws | | | | | | | | |
| Free size tolerance according to DIN 7168 middle (all sizes in mm) | | | | | | | | |

Table: Dimensions for Bridle Illustration

2.7. Shutoff Device

Every car must be equipped with a shutoff device, whose stop lever must project at least 20 mm in height above the highest point of the model in the on mode, so that the model can be stopped at any time and without difficulty. The spark plug does not count as the highest point.

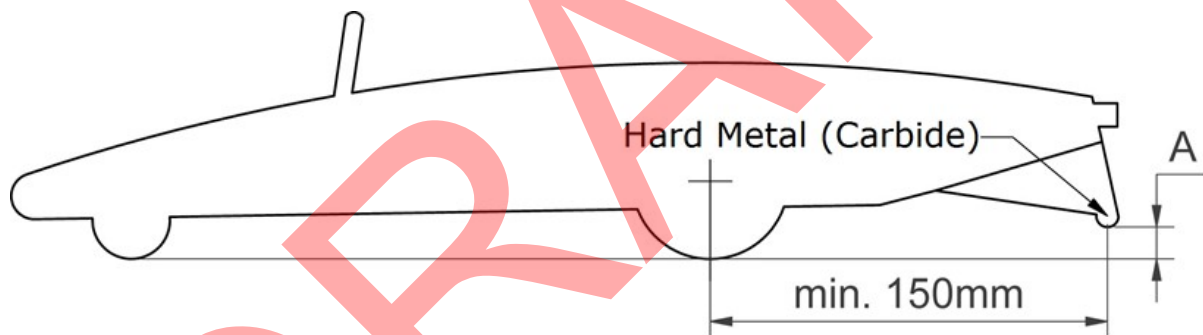


Example Illustration: Shutoff Device

2.8. Skid

Cars with rear wheel drive must be equipped with a spur that prevents the car from flipping. The end of the tail skid must be hardened or made of hard metal (danger of injury). The skid may not be shorter than 150 mm.

The tail skid must be firmly integrated into the chassis or bodywork. (No wire / No round steel). The maximum tail skid height (A) above the ground must be maintained according to the classes: Class 1 = 20mm / Class 2, 3 + 3b = 25mm / Class 4 + 5 = 30mm.



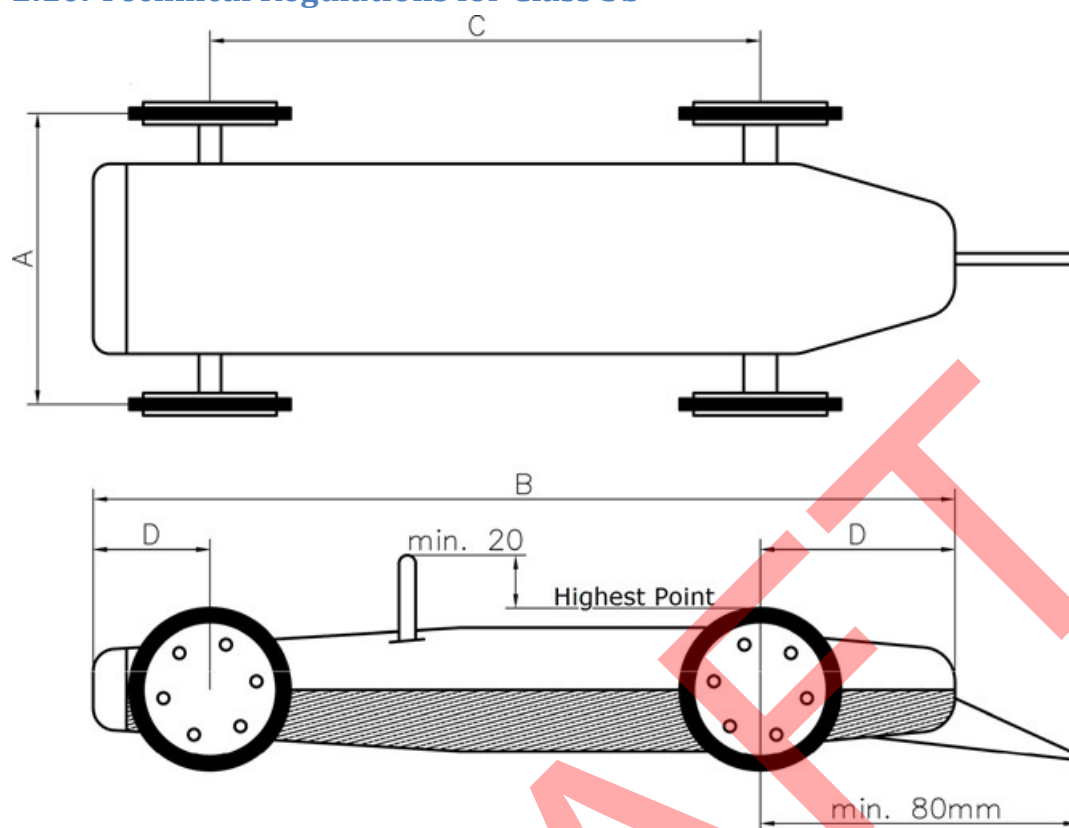
Example Illustration: Spur Integrated

2.9. Electronics and Remote Control

Electronics inside the vehicle for controlling, regulating and measuring are allowed without restrictions.

An electronic remote control of the model from the outside is permitted within the 3 minutes of starting time. During the measurement period (8 laps) the model must not be influenced by remote control. After the measurement time, the model may be placed on a remote control.

2.10. Technical Regulations for Class 3b



Example Illustration: Racing Class 3b.

Measurements for cars of Class 3b

| Description | Measurements |
|---------------------------------------|------------------------------|
| Track Width | A= min. 90 mm max. 130 mm |
| Overall length without skid | B= max. 500 mm |
| Wheelbase | C= max. 400 mm |
| Car overhang over the axle centreline | D= max. 100 mm |

The model car must have four wheels and an internal combustion engine (piston engine) that powers the rear wheels.

Motor: Single cylinder two-stroke engine with glow ignition. The brand of motor is not regulated. The engine capacity must not exceed 3.50 cm³.

The car must have a spur tipped with a carbide end. The minimum length (see example illustration) must be a minimum of 80mm and should be integrated into the chassis or bodywork.

All wheels must be situated outside of the cars body and may not be covered. They must all be visible both in plan view, and in side view in full size.

It is not permitted to have suspension on the driving axle.

The power transmission from the engine to the drive wheels must be done either directly with the crankshaft or by means of a spur gear. Bevel gears and driving belts may not be used.

A tuned pipe or muffler must be installed inside the car body. The tail pipe must not be directed to the track and it may only protrude a maximum of 20 mm from the cars body.

The car must be equipped with a shutoff. In a turned on state the shutoff device must project at least 20 mm over the highest point of the car. The wheels may be counted as the highest point of the car, however the spark plug as stated under point (2.7.1) does not apply.

The Class 3b cars are driven with a Class 2 cable (green). Should the car exceed a speed of 272 km/h a Class 3 cable (yellow) must be used (see table in section 4.5.1). The clamp must be highlighted in yellow, the weight surcharge adjusted to 0.075 kg and it must be driven with the fastening elements of Class 3.

The race car must pass a technical approval test as carried out by the sports commission (see 5.6 regulation).

A FEMA number must be well visible on the outside of the chassis. It may be engraved or stamped into the chassis (see 2.1.4).

For the model racing car Class 3b a vehicle registration certificate is required (see 5.3).

In addition to the above regulations, all terms of the technical FEMA regulations and the subsequent amendments to the newest version also apply.

3. RACE TRACKS

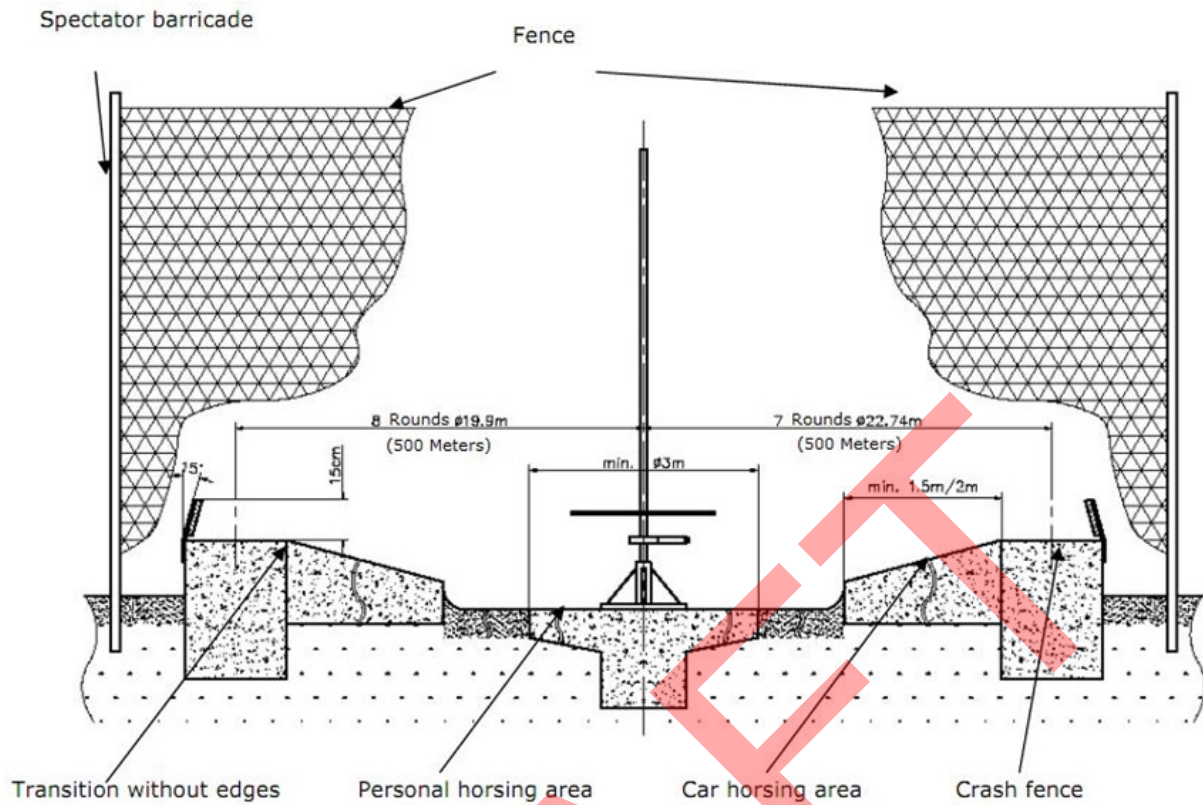
3.1. Track Size

FEMA races must take place on even horizontal round tracks. The cars must be attached to a cable coming from a post (centre post) in the centre of the track.

The prescribed track size is: 19.90m diameter = 8 laps - round track (500 m)

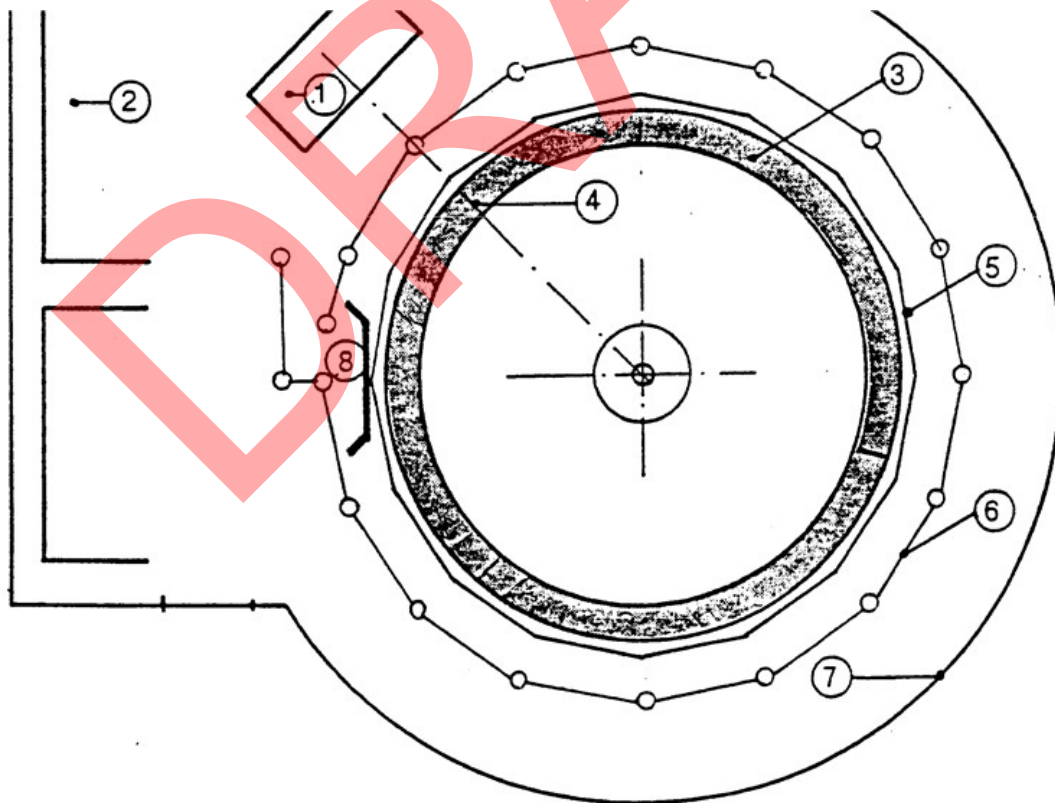
The race track must have a minimum width of 0.35m. Inside of this must be an apron with a recommended width of 1m. For tracks constructed after 1985 the following minimum size for the apron must be maintained: 8 - round track a 1.5m width.

In the centre of the track (at the centre post) there must be a flat concrete horsing area with a minimum diameter of 3m.



Example Illustration: Model Race Car Track (Sectional Drawing)

3.2. Infrastructure



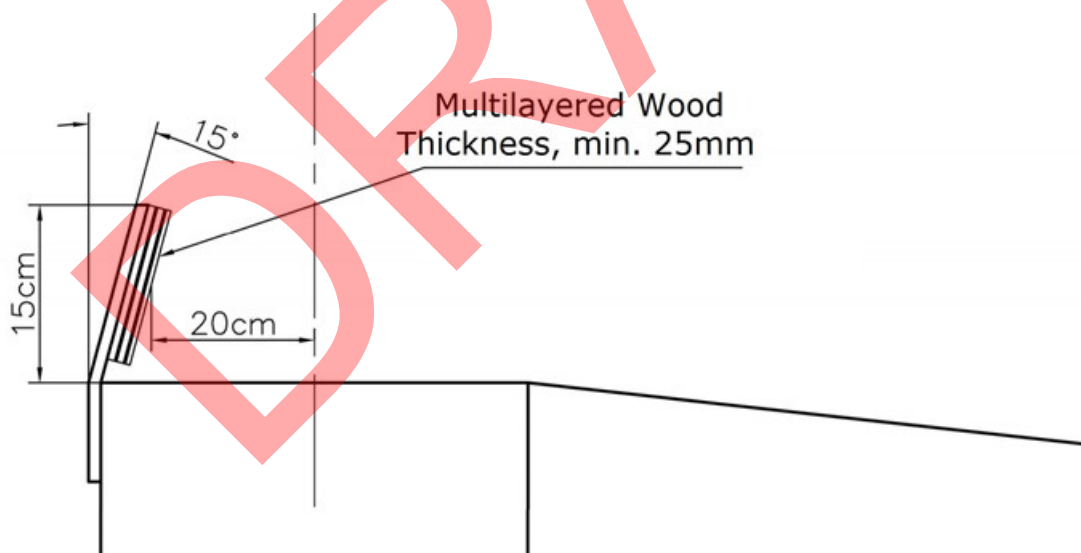
Sample drawing of a racetrack

Legend:

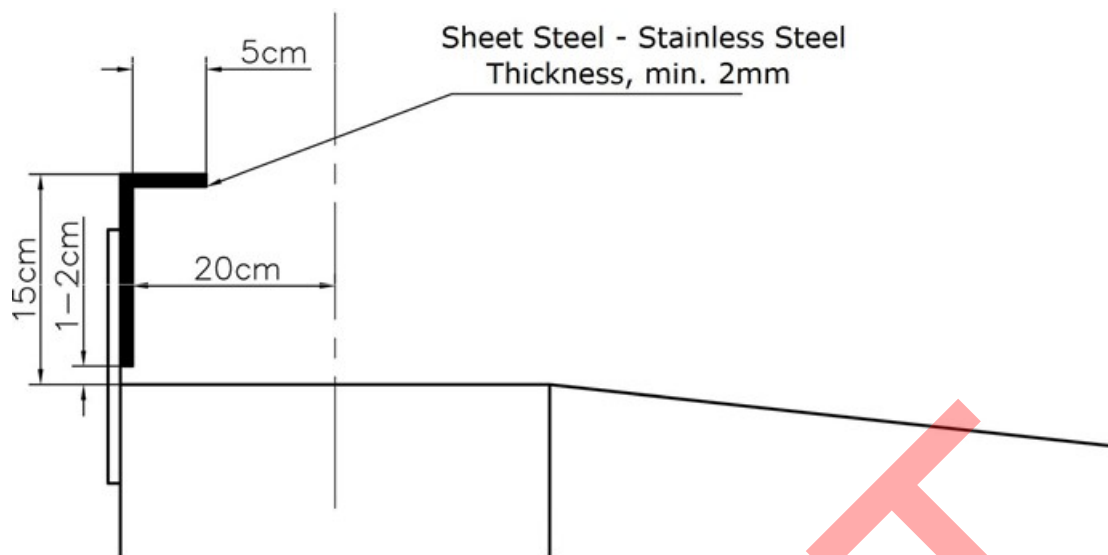
1. Timekeeper's house
2. Participant's area
3. Track
4. Timing mark
5. Safety barrier
6. Safety fence
7. Spectator barricade
8. Driver's station

3.3. Safety devices

In order to protect against model cars flying off the track, the track must be equipped with a solid safety barrier. The barrier must be made of layered wood with a minimum thickness of 25 mm or of stainless steel plate with a minimum thickness of 2 mm. The inside of the wall should be smooth and have no protruding screws or supports. The barrier cannot be more than 20 cm away from the model. The gap between the barrier and the track surface should be no less than 1 cm and no more than 2 cm. Wooden safety barriers must be replaced every 10 years.



Example Illustration: Wooden safety barrier



Example Illustration: Stainless safety barrier

For the safety of competitors and spectators, the track must have double safety fencing to provide protection against parts of a car coming off during a run. For this purpose protective textile, polycarbonate foil, PVC foil of at least 0.5mm thickness or a comparable material has to protect the whole circumference of the track area from ground up to 1m in height, and $\frac{1}{4}$ of the track after the shutoff device up to head height. FEMA race organisers must ensure that competitors and spectators stay at least 1m away from the fence. Exemptions for race tracks with deviating, but at least similar effective safety features (e.g. brick-built walls) have to be examined on a case-by-case basis and require documentation in form 8.4 during safety inspection.

There must be a safe and secure competitor's station. It must offer protection from the front and both sides (safety wall, safety glass, doors). The competitor's station must offer adequate protection when cars are racing both clockwise and counter clockwise.

Cars that crash into the safety barrier or fence after a break in the cable will cause damage to the wall or fence. The damage is dangerous to both the spectators and the competitors. Organizers are responsible for replacing or fixing dented and damaged fences and barriers before each heat.

3.4. Testing of Protective Devices

As described in section 1.4.2, FEMA requires all race tracks to be inspected every 3 years according to form 8.4. All safety features mentioned in form 8.4 have to be documented with corresponding pictures. The timely inspection shall be the duty of the track owner and race organiser.

It is an obligation of the race organiser to check all safety features prior to a FEMA race, and to repair any defects immediately. FEMA has to be informed about any alteration to the installed safety features immediately and prior to the next race.

Form 8.4, corresponding pictures or a report on alterations have to be sent to the General Secretary and Technical Secretary. Race tracks that do not comply with safety standards or for which a documentation with pictures according to form 8.4 is not available must not host a FEMA race and will not be included in the official race calendar.

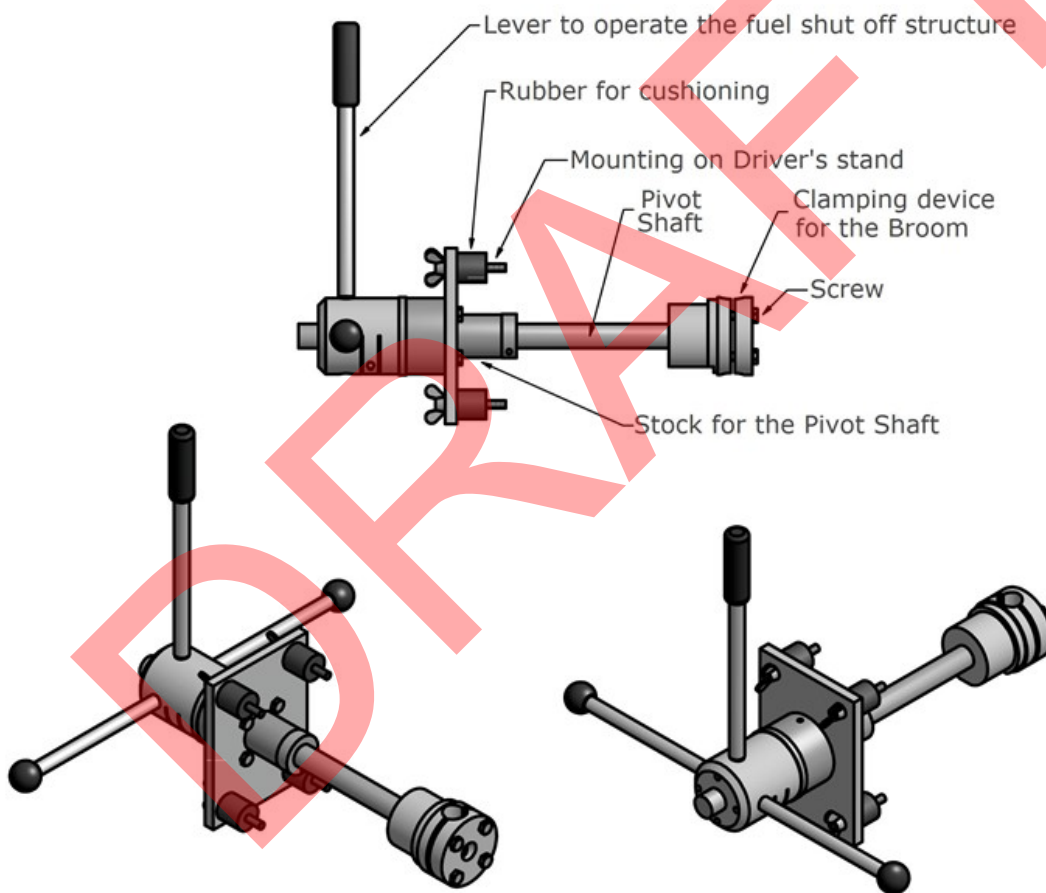
3.5. Shut-Off Device

Each race track has to be equipped with a fixed shutoff device, which is used for all training and timed runs. The broom used as shutoff device has to be installed pivoting. The pivot should be 80cm or higher above the track surface. The shutoff device must be operated via a lever outside the track area within the driver's stand. A shutoff device lowering the broom

The broom must be set to a minimum height of 20 mm above the bridle at every racing class. The bristles of the broom should be equal in length. The setting and condition should be checked after each run of a model by the cable marshal and the competitor.

Instead of a broom, a mop with viscose/cellulose strips is also recommended.

Only in an emergency situation small hand brooms may be used to turn off the model manually. Brooms with long handles are not allowed, if a hand broom is used for stopping the model car, the run is invalid.



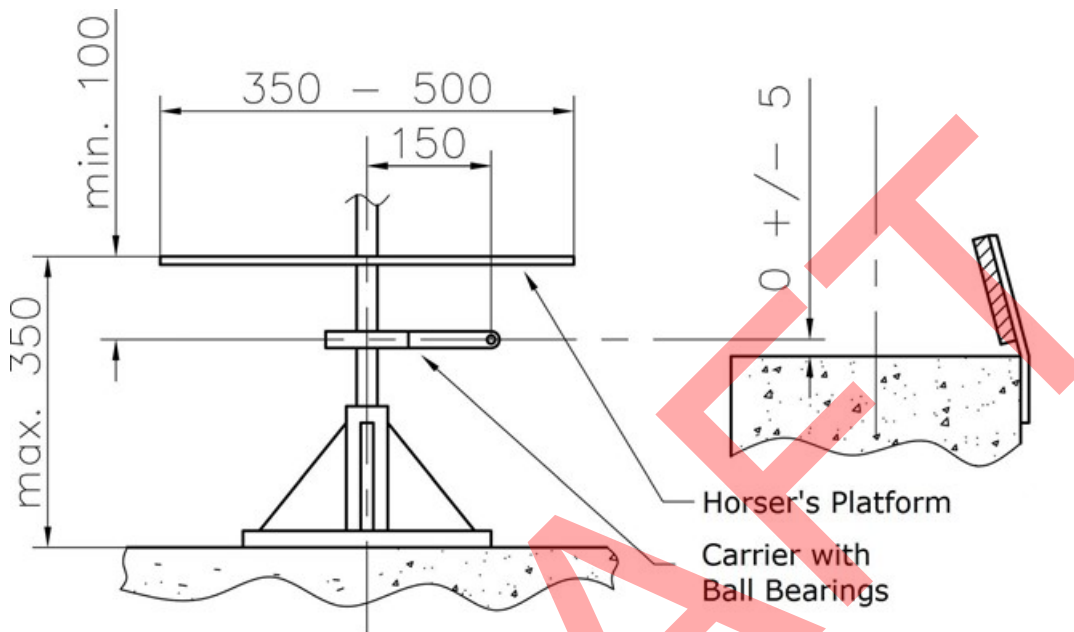
Example Illustration: Mechanism of the Shut-Off Device

3.6. Centre Post

The centre post must be solid, securely anchored and be equipped with a ball race mounted connector for the cable attachment. The dimension of the centre of the centre post to the middle hole for the cable attachment to the carrier must be 150mm, 0/+2.

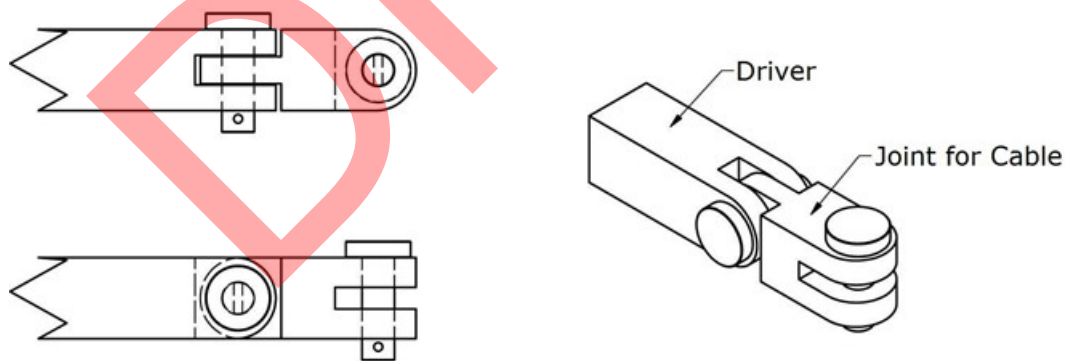
The centre post must be provided with a platform for the horser, which has a diameter of 350 to 500mm.

The vertical distance between the cable fastening on the attachment and the running surface of the track must be 0 +/- 5 mm.



Example Illustration: Driver's Centre Post

Attachment with joint: Pin $d = 5\text{mm}$, Material: Hexagon Socket Screw, grade 12.9.



Example Illustration: Attachment/Driver Joint

Centre posts are subject to wear from the turning of the horser and can break. Before the start of each season the centre post should be inspected in accordance with the Technical Regulations as given in Appendix III, 9.1.

It is recommended for the centre post to be anchored (wired) to three points from above.

3.7. Timekeeper System / Time Measurement

The timing at FEMA races must be performed by two reliable and independently operating systems. Both systems must be electronic and display the lap number and the measured time with 1/1000 second precision.

An additional system may consist of hand-stopping, in which the time can be read with 1/100 second accuracy. This system may only be used for control and safety should the electronic system fail. Times recorded by hand-stopping can never be used for setting records.

4. CABLE

4.1. General

The holding cable for the guidance of the model car on the track (hereafter referred to as, cable) must be produced using non-alloy, round spring steel in accordance with DIN EN 17223 or made of carbon, round spring steel 10270-1 .

Note: The old descriptions "Extra Extra" (DIN 17223, from 1944 - 1964) and Class 2 (DIN 17223, 1964 - 1984) are still allowed by vendor specification. Suitable alternative materials having a tensile strength of $R = 2470 - 2500 \text{ N/mm}^2$ may be used. The wire type "D" must be used for the production of the cable

It is not permitted to use wires with rust or corrosion marks.

The cable and all its fastening elements belong to the race track. The enclosure, change or covering of any part is not permitted.

4.2. Allowable Tension

The following equation is used for determining the maximum allowable tension:

$$\frac{d^2 \times \pi}{4} \times R_m = d^2 \times 0.785 \times R_m \text{ (N)}$$

Legend:

d = Diameter of Wire

Rm = Minimum (according to data sheet 9.4.)

A correction factor for the entanglement is not necessary. The weakest point is clearly the simple cable cross-section.

The following table shows the tensile strength of the finished cable, depending on the wire diameter:

| Wire Diameter (mm) | Tensile Strength (C) [N] | Wire Diameter (mm) | Tensile Strength (C) [N] |
|--------------------|--------------------------|--------------------|--------------------------|
| 0.80 | 1160 | 1.50 | 3691 |
| 0.90 | 1443 | 1.60 | 4139 |
| 1.00 | 1750 | 1.70 | 4628 |
| 1.10 | 2089 | 1.80 | 5137 |
| 1.20 | 2452 | 1.90 | 5667 |
| 1.30 | 2839 | 2.00 | 6217 |
| 1.40 | 3246 | 2.10 | 6819 |

Table: Overview of the tensile strength of cables according to diameter.

To calculate the tensile loads, one must account for the allowed maximum permissible weight of the model car and include the following supplement for the shackle:

| Class | Maximum Car Weight | Supplement | Total Weight (G) |
|-------|--------------------|------------|------------------|
| 1 | 1.050 kg | 0.030 kg | 1.080 kg |
| 2 | 1.570 kg | 0.040 kg | 1.610 kg |
| 3 | 2.000 kg | 0.075 kg | 2.075 kg |
| 3b | 2.000 kg | 0.040 kg | 2.040 kg |
| 4 | 2.300 kg | 0.075 kg | 2.375 kg |
| 5 | 3.130 kg | 0.100 kg | 3.230 kg |

The tensile load (Centrifugal Force) (F) in N is calculated as follows

$$F = \frac{V^2}{R} \times G \text{ (N)}$$

Legend:

V = Speed in m/sec.

R = Track radius in meters (according to 3.1.2 = 9.95 m).

G = Weight of model racing car in kg.

4.3. Safety Factors

A safety factor of $S = 2$ ought to be used to calculate the required cable diameter.

For light damage to the cable, for example, scratches from the concrete of the track. A deduction of 2% of the maximum speed is to be taken into account. This calculated value is rounded down to an integer.

4.4. Maximum Speed

The maximum permissible speed (v) for each class and for each wire diameter is calculated to the tensile strength values found in table 4.2.2. and the formula from 4.2.4.

$$v = 3.6 \times \sqrt{\frac{R \times C}{2 \times G}} \quad (km/h) - 2\% \text{ (see 4.3.2)}$$

R = Track radius in meters (according to 3.1.2. = 9.95 m).

C = Tensile strength according to the table found in 4.2.2

G = Weight of the model car in kg according to the table found in 4.2.3

4.5. Maximum Speed for Class/Cable

The allocation of cables to the different classes as well as the allowed maximum speed for the different cable diameters are shown in the following table.

| Class | Cable Diameter (mm) | Allowed Maximum Speed |
|-------|-----------------------|---------------------------|
| 1 | 0.90 | 287 km/h |
| | 1.00 | 316 km/h |
| 2 | 1.20 | 307 km/h |
| | 1.30 | 330 km/h |
| 3 | 1.40 | 311 km/h |
| | 1.50 | 331 km/h |
| 3b | 1.20 Class 3 Cable | 272 km/h from 272 km/h |
| 4 | 1.60 | 328 km/h |
| | 1.70 | 347 km/h |
| 5 | 2.00 | 345 km/h |
| | 2.10 | 361 km/h |

Table: Overview Class / Cable Diameter / Maximum Speed

If the maximum allowable speed is reached or exceeded during a FEMA race, the next thickest cable is to be used (also see point 5.16.3).

The maximum speed in each case is the average speed of 8 timed rounds.

The graduation of the cable diameters for the next higher speed limit occurs in steps of 0.1 mm for all classes.

4.6. Cable Ends

The cable ends are to be made according to the technical directives from 9.2. The windings must be done carefully so that the cable is not damaged during the procedure. The cable ends must be colour coded as follows:

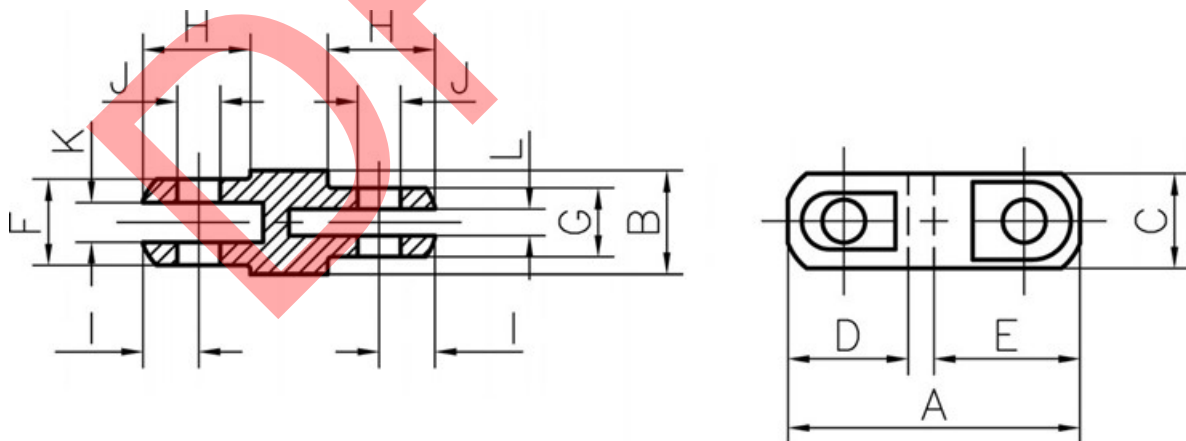
| Class | Colour |
|-------|----------------------|
| 1 | White |
| 2 | Green |
| 3 | Yellow |
| 3b | Green (see 2.10.10.) |
| 4 | Red |
| 5 | Black |

Table: Overview of the cable colour by class.

Each cable must be provided with a label on the inner thimble with the date of manufacture, the diameter, and the tested tension load. (In accordance with Technical Instruction 9.2)

4.7. Fastening Elements

The fastener (Centre Post to Cable) must be made in accordance with 3.6.4. The fasteners (Cable to bridle) must be carried out as follows:



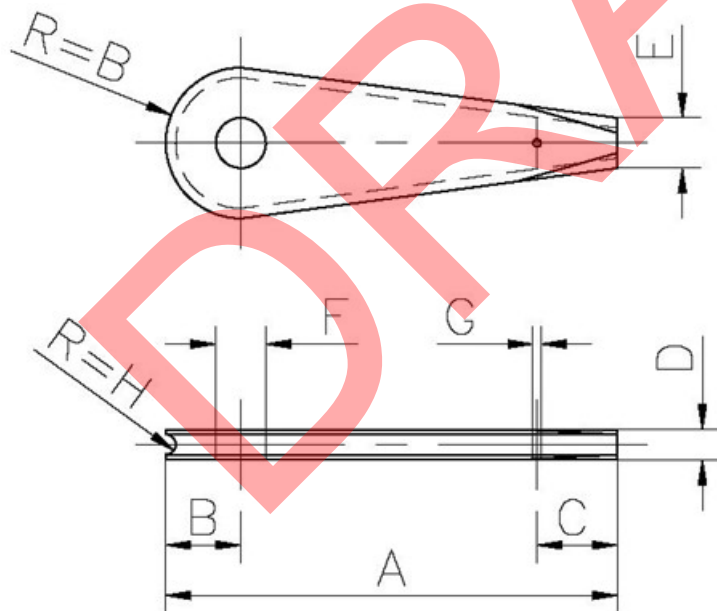
Example Illustration: Fastener, Cable to Bridle.

| Designation | Class | Size |
|-------------|------------|---------|
| A | 1 / 2 / 3b | 25.0 mm |
| | 3 / 4 / 5 | 34.0 mm |
| B | 1 / 2 / 3b | 10.0 mm |

| | | |
|---|------------|---------|
| | 3 / 4 / 5 | 12.0 mm |
| C | 1 / 2 / 3b | 9.0 mm |
| | 3 / 4 / 5 | 11.0 mm |
| D | 1 / 2 / 3b | 11.5 mm |
| | 3 / 4 / 5 | 14.0 mm |
| E | 1 / 2 / 3b | 11.5 mm |
| | 3 / 4 / 5 | 17.0 mm |
| F | 1 / 2 / 3b | 7.6 mm |
| | 3 / 4 / 5 | 10.0 mm |
| G | 1 / 2 / 3b | 6.1 mm |
| | 3 / 4 / 5 | 8.0 mm |
| H | 1 / 2 / 3b | 10.0 mm |
| | 3 / 4 / 5 | 12.5 mm |
| I | 1 / 2 / 3b | 5.0 mm |
| | 3 / 4 / 5 | 6.5 mm |
| J | 1 / 2 / 3b | 4.0 mm |
| | 3 / 4 / 5 | 5.0 mm |
| K | 1 / 2 / 3b | 3.6 mm |
| | 3 / 4 / 5 | 4.6 mm |
| L | 1 / 2 / 3b | 2.1 mm |
| | 3 / 4 / 5 | 3.1 mm |

Table: Measurements on sample drawing of the fastener above

4.8. Cable Termination (Thimble)



Example Illustration: Cable Termination (Thimble)

| Designation | Class | Size |
|-------------|------------|---------|
| A | 1 / 2 / 3b | 33.0 mm |
| | 3 / 4 / 5 | 45.0 mm |
| B | 1 / 2 / 3b | 5.0 mm |

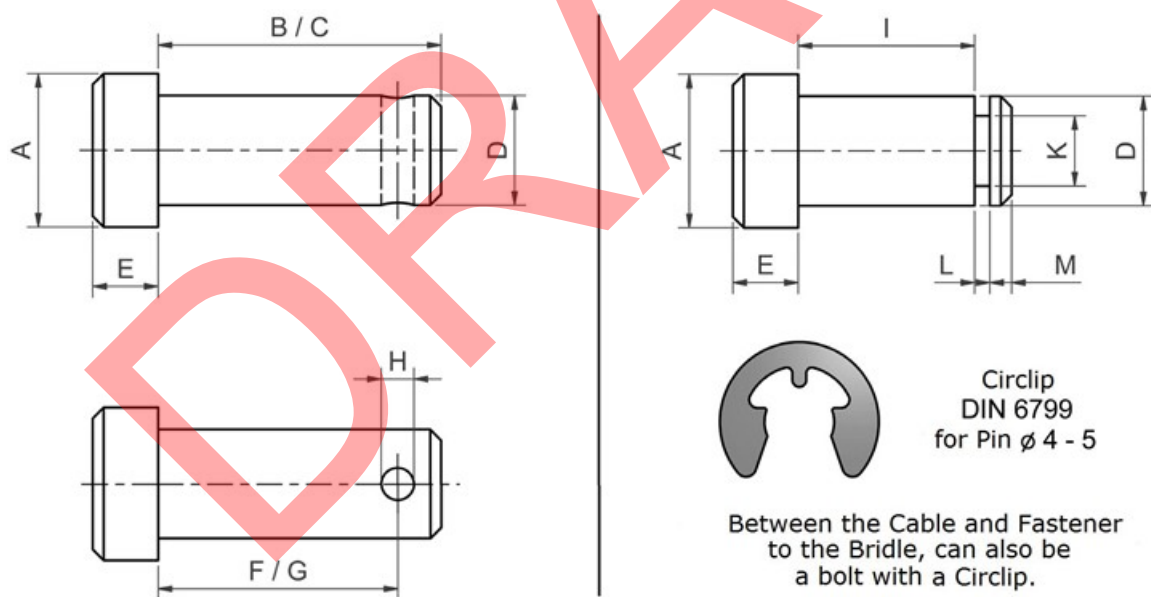
| | | |
|---|------------|---------|
| | 3 / 4 / 5 | 7.5 mm |
| C | 1 / 2 / 3b | 6.0 mm |
| | 3 / 4 / 5 | 8.0 mm |
| D | 1 / 2 / 3b | 2.0 mm |
| | 3 / 4 / 5 | 3.0 mm |
| E | 1 / 2 / 3b | 3.0 mm |
| | 3 / 4 / 5 | 5.0 mm |
| F | 1 / 2 / 3b | 5.0 mm |
| | 3 / 4 / 5 | 5.0 mm |
| G | 1 / 2 / 3b | 0.8 mm |
| | 3 / 4 / 5 | 0.8 mm |
| H | 1 / 2 / 3b | 0.75 mm |
| | 3 / 4 / 5 | 1.0 mm |

Table: Measurements on sample drawing of the thimble above:

Material: Brass MS 58, SIS 5165-4

Safety recommendation: Usage of large thimble on the post side of the cable also for the classes 1, 2 und 3b.

4.9. Pin



Example Illustration: Pin

| Designation | Class | Size |
|-------------|------------|---------|
| A | 1 / 2 / 3b | 7.0 mm |
| | 3 / 4 / 5 | 7.0 mm |
| B | 1 / 2 / 3b | 9.0 mm |
| | 3 / 4 / 5 | 11.0 mm |
| C | 1 / 2 / 3b | 11.0 mm |

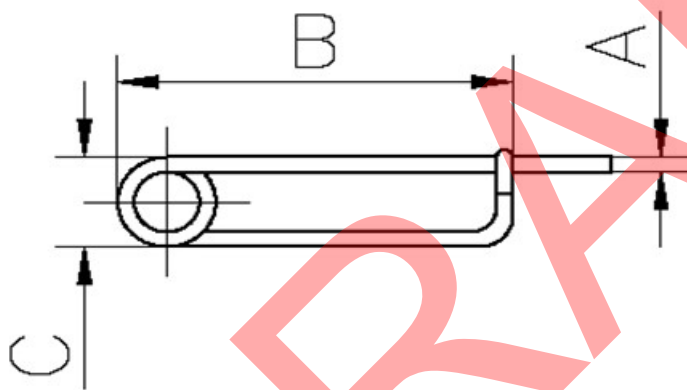
| | | |
|---|------------|---------|
| | 3 / 4 / 5 | 13.0 mm |
| D | 1 / 2 / 3b | 3.9 mm |
| | 3 / 4 / 5 | 4.9 mm |
| E | 1 / 2 / 3b | 2.0 mm |
| | 3 / 4 / 5 | 3.0 mm |
| F | 1 / 2 / 3b | 7.0 mm |
| | 3 / 4 / 5 | 9.0 mm |
| G | 1 / 2 / 3b | 8.5 mm |
| | 3 / 4 / 5 | 11.0 mm |
| H | 1 / 2 / 3b | 1.5 mm |
| | 3 / 4 / 5 | 1.5 mm |

Table: Measurements on sample drawing of the pin above:

Material: Cap Screw with hexagon socket quality 12.9

4.10. Safety Pin

The Pin must be secured with a Safety Pin:



Example Illustration: Safety Pin

| Designation | Class | Size |
|-------------|------------|---------|
| A | 1 / 2 / 3b | 0.6 mm |
| | 3 / 4 / 5 | 0.6 mm |
| B | 1 / 2 / 3b | 20.0 mm |
| | 3 / 4 / 5 | 24.0 mm |
| C | 1 / 2 / 3b | 6.0 mm |
| | 3 / 4 / 5 | 6.0 mm |

Table: Measurements for sample illustration, Safety Pin.

Material: Same material as used for the cable

4.11. Cable Testing

Before international and FEMA sanctioned races all cables must be tested in accordance with the test directives and test loads for every cable strength. The test load = 50% of the minimum tensile stress at break. See the Technical Regulations 9.3.

| D [mm] | Tensile Stress At break [N] | Test Load [N] | Test Load [kg] |
|--------|-----------------------------|---------------|----------------|
| 0.90 | 1443 | 722 | 74 |
| 1.00 | 1750 | 875 | 89 |
| 1.10 | 2089 | 1044 | 107 |
| 1.20 | 2452 | 1226 | 125 |
| 1.30 | 2839 | 1414 | 145 |
| 1.40 | 3246 | 1623 | 166 |
| 1.50 | 3691 | 1845 | 188 |
| 1.60 | 4139 | 2069 | 211 |
| 1.70 | 4628 | 2314 | 236 |
| 1.80 | 5137 | 2568 | 262 |
| 1.90 | 5667 | 2833 | 289 |
| 2.00 | 6217 | 3108 | 317 |
| 2.10 | 6819 | 3409 | 348 |

Table: Summary of Test Load.

For 8 lap tracks the cable must have a length of 9.725 - 9.745m at 10% of the test load from the centre post to the centre of the outside shackle pin.

For 7 lap tracks the cable must have a length of 11.145 - 11.165m at 10% of the test load from the centre post to the centre of the outside shackle pin.

4.12. Cable Replacement

Cables must be replaced every 4 years.

5. RACE REGULATIONS

5.1. Sanctions - Registrations

Sanctions for international races during the year are obtained through an application to FEMA. FEMA must receive the application by 1st March of the year that the race should be held. All FEMA sanctioned races are recorded in the FEMA race calendar. Late applications will not be entered in the FEMA race calendar.

Only competitors from FEMA affiliated countries may participate in FEMA races. Registration for racing in a FEMA race must be done with the event organizer no later than one week before the race. Drivers who do not register on time must start for both races at the end of their class.

FEMA will sanction a maximum of 2 international races (with the exception of European Championships) and an unlimited number of national races for each race track in each calendar year.

5.2. Race Organization

For FEMA races there should be a national organizing committee (race organizer) responsible for the planning and execution of races. The organizing committee must always have a race organizer and two timekeepers. At the races contained in the FEMA race calendar, the following persons should be on the organizing committee:

- Race Organizer.
- Two Timekeepers.
- Cable Marshal.
- Fuel Marshal.
- Race Jury = Stewards (3 People).

Each country must designate a Technical Delegate, who works together with the FEMA Technical Secretary (see 7.2). The Technical Delegate will be responsible for ensuring that the FEMA regulations are upheld and new regulations implemented in his country. He or she is also responsible for bringing new ideas to the FEMA Technical Secretary.

The Technical Delegate should when possible be appointed to the position of Sports Commissioner at FEMA races.

The Technical Delegate must be registered by name with FEMA.

The Technical Delegate is responsible for the yearly model car approval for his country and is responsible for forwarding the results to the FEMA General Secretary. He or she is responsible for carrying out the inspections without error.

Race Organizers and Race Jury have the following responsibilities:

- ensuring that FEMA regulations are upheld.
- to check, and ensure that the cars meet the safety requirements.
- to deal with any protests and/or appeals and decide on them with a simple majority.
- to ensure the starting line-up for competitors and the order of the different classes.
- to ensure that a copy of the current regulations is available at the race.

At FEMA race the Race Jury is named by the Race Organizer (also see 5.2.3.).

At European Championships however, the three members of the Race Jury are selected by lottery. No two members may come from the same country.

5.3. Vehicle Registration Certificate

Competitors wishing to take part in FEMA races must have a valid FEMA vehicle registration certificate for each model car, and complete the competitor's declaration each year (see Appendix 8.2) and pay the yearly fee.

Every country association is responsible for ensuring that the registered competitors taking part in FEMA races have a valid vehicle registration certificate.

FEMA requires at least 4 weeks for processing vehicle registration certificates.

A written application from the country association to the FEMA General Secretary is required for the issuing of a vehicle registration certificate.

An application can only be made using the official registration form (see Appendix 8.1.). The form must be completed and signed.

In order for a vehicle registration certificate to be issued every country association must provide the driver with an identification number that must also be entered on the registration form. The number must contain the country code and a three digit number (example, CH 009, EN 072, UA 426). This number stays with the driver and can only be issued once.

The FEMA numbers for cars are issued by the FEMA General Secretary. This is a three to four digit serial number.

The issuance of the vehicle registration certificate is free, but every driver has to pay according to the driver's declaration an annual vehicle registration fee. The amount of this fee shall be determined in each case by the General Assembly for the next year.

A vehicle registration certificate will only be issued if the car has passed the car approval.

5.4. Vehicle Registration Certificate - Front Side

Information about the competitor: Name, nationality, registration numbers

Information about the model car: Class, model, FEMA number

Example Illustration: Vehicle Registration Certificate - Front Side (As of January 2013)

5.5. Vehicle Registration Certificate - Back Side

The back side of the Certificate is used for recording notes from the car approval (engraved FEMA Number, Bridle, Bridle Bolt Size, Cover, Skid, Front Wheels, Country No., Dimensions for Class 3b, Name and Signature of the Examiner, Place and Date).

Example Illustration: Vehicle Registration Certificate - Back Side (As of January 2013)

5.6. Car Approval

Car approvals must take place yearly before the race season starts and are to be carried out by the Technical Delegates of the National Associations (see 5.2.5.).

Car approval must occur yearly before the 31st March. Results and the driver declaration are to be reported to the FEMA General Secretary.

A vehicle registration certificate must have a note with the signature of the controller for each car approval. This applies to European Championships as well.

Vehicle registration certificates must be collected and controlled at all FEMA races. If this not done, the race and records set at the race will be considered invalid.

Race organizers have the authority to check the information on the vehicle registration certificate including checking the cylinder capacity during a race.

Should there be a violation of or falsification of information on the vehicle registration certificate, the driver will be automatically disqualified and be banned from partaking in the next five (5) FEMA races.

Should a country association have knowingly submitted false information for the issuing of a vehicle registration certificate, it will be given one warning. Should this occur again the association must pay a 200 EURO penalty

5.7. Race Participants

Every race participant, known as a competitor, must follow the directives of the race organizer and the race jury.

A competitor may start with a maximum of two cars in each class. For the placement in a race and point calculation for the team score only the fastest of the two cars in each class will be counted.

Competitors who start with two cars in one class must provide a clear identification mark for the car (such as colour, number, etc.) at the start registration.

The driver must be present at the FEMA races in which he or she competes and must be at the start.

The driver must personally perform the race. That means he or she must be able to start the model, initiate the time keeping and turn off the car.

These rules do not apply to beginners and those with disabilities. These persons are allowed to be assisted by a helper. They must however be personally present at the racetrack.

A driver may horse his car personally and allow an assistant to take his or her place for the start, commencing of time keeping and turning off of the car.

The minimum age for a participant in model race car sports is 12 years old. Younger participants may only partake in accompaniment of an experienced driver.

5.8. Number of Races

At FEMA races the race organizer determines the number of heats.

At the European Championships three heats are to be driven.

Training between heats is not permitted.

Should a race be limited to one or two heats due to extraordinary circumstances (example: rain etc.), the results from the one or two heats will suffice for the evaluation of the race.

5.9. Starting Order

The race organizer determines the starting order of the classes and drivers. There must be enough time given to drivers with two cars to setup between starts.

The starting order should go from top to bottom in the first race and from bottom to top in the second.

5.10. Start / Start Time

Upon being called a driver must be at the track within a minute. If the track is free the car must be attached to the cable immediately.

Once the car is attached to the cable, the driver has 3 (three) minutes to start the car. During this time period the car may be stopped for correction and started again.

The race organizer and race jury may reduce the start time to 2 (two) minutes in the second heat if this is deemed necessary for reasons of time.

Drivers may have a maximum of two assistants including a horser for the start preparations.

Only completely assembled cars may start.

The direction to start timing is given by the competitor or in extraordinary circumstances by another person during the 3 minute period or as long as the car is self-powered.

Should the car not run on its own power after 3 (three) minutes, the start will be declared invalid and the car must be removed from the track.

The competitor must shut off the engine within 10 laps using the track's turn off device after the stop signal for timing has been given. Should this not be done the race will be deemed invalid (also see 3.3.4. and 3.3.4.1.).

5.11. Horsing

Competitors are responsible for having a horser lead the cable from the centre post in order to prevent damage to the cable during the start and stop.

After the starting procedures the horser may lead the cable and accelerate the model (horse) as long as the three minutes are not exceeded. Once the horser has stepped onto the platform the model may no longer be influenced by the horser until time keeping has begun.

Within the 3 minute start time the competitor may stop the car and restart it under the conditions of 5.11.2.

It is not permitted to use the cable to stop the car after it has been turned off. The cable may only be led.

It is forbidden to horse from the platform.

The horser must always have a hand on the centre post when horsing.

The horser must always wear a glove on the leading hand. The glove must be made available by the event organizer at no cost.

The competitor is responsible for ensuring that his or her horser knows, understands and follows these rules. Noncompliance with these rules will lead to the competitor being disqualified.

5.12. Time Keeping / Time Keeper's Protocol

The speed of a model car is recorded over 500 metres (8 rounds).

Timing is to commence synchronously with two mutually independent timing systems as soon as the competitor gives the signal. Timing may not commence until the car has completed three entire rounds without the assistance or influence of the horser.

The competitor must be given a visible or audible signal to tell him or her that timing is completed.

The timing systems may not be reset to zero until the competitor has left the track.

The measured speed must be recorded in a log. The time measures by the electronic timing systems must be recorded to 1/1000 sec. In exceptional circumstances the time from a hand stop to 1/100 sec. and the corresponding speed to three decimal places must also be recorded.

If a car experiences damage during the time keeping such as losing a wheel, the resonance tube, or top cover (excluding spark plugs and rubber tires), the speed must not be counted.

5.13. Placing / Result Lists

Immediately after each race a list of results must be prepared.

Should multiple competitors have reached the same speed, then the sum of the times from the two races determines the placement. If these results do not yield a different result then an elimination race will be held after the other races. This is only to be done for the evaluation of the first three places. Other drivers with the same results will be given the same position.

After the race the result lists must be promptly sent to the FEMA General Secretary.

5.14. Cancellation of a Race

The cancellation of a race or heat must be done by the race organizer under the use of the existing rules.

If a second heat cannot be carried out, the results from the first heat and the results of the other completed classes of the second heat should provide the basis for a result list.

If a race is disrupted for more than an hour the race organizer and the race jury will decide if the heat of the started class will be held again. Records achieved before the disruption will be counted as records, but will not count towards the race results.

5.15. Protests

Protests, for example, against a car of a competitor, must be given to the race organizer immediately in written form. Protests filed after the results are made known will not be considered.

Protests against a run of a competitor must be made to the race organizer immediately, if possible before the time keeping systems are zeroed.

Every submitted protest carries a 50 EURO fee payable to the race organizer or the race jury. The race jury decides on the submitted protests.

If the protest is upheld, the offending competitor must pay the fee of 50 EURO, this goes in equal shares to the FEMA and the race organizer. The protesting party will receive their protest fee back in full.

If the protest is rejected, the protest fee will be divided equally amongst the FEMA and the race organizer. The protest fee is not a penalty, but a compensation for the race organizer and the FEMA.

The race organizer is obliged in either case to pay 50% of the protest fee to the FEMA treasurer within 10 days.

The sport commissioner must report the protest, decision and reason to the FEMA board in written form within 10 days.

5.16. Cables and Cable Replacement

Cables as described under Section 4 must be used for all FEMA races. The cable dimensions are to be selected according to the current applicable speed limits for each class. Valid cable strengths are determined by FEMA.

Once the record speed of 5 km/h under the allowed maximum speed has been reached in accordance with table 4.5.1, the race organizer is responsible for getting a cable with the next largest dimension ready.

If the speed limit is surpassed during a FEMA race, the next strongest cable is to be used in subsequent races for that class (see 4.5.2.).

Once a race has started it is to be completed with the same cable as long as safety is ensured.

If a cable needs to be replaced during a race due to damage or breakage, the cars that have already raced must not race again.

In case of damage to the cable, the race organizer decides on when the cable is to be replaced.

5.17. Records

FEMA must receive a fully completed record protocol, signed by the race organizer, the race jury, time keepers and the competitor, for claims on an official record (see appendix 8.3).

Records will only be acknowledged if they were set at a FEMA race using electronic timing systems and during a regular heat. Competitors from at least three different countries must have taken part in the race.

As soon as a record speed has been set the race organizer must control the car and the cable and ensure that they meet the provisions of the regulations. Then the official record protocol must be completed.

The inspection of the car and the measurement of the record engine are to be carried out in private by a person chosen by the race organizer and in the presence of the competitor, as well as the race organizer or a member of the race jury.

Records will also be acknowledged if they were achieved on a 1/4 mile track (402 metre) at WMCR races and they used the same cable sizing / strengths.

To measure the cylinder capacity, measuring tools with a resolution of 0.01 mm and a repeat accuracy of 0.02 mm must be used.

If the measurements indicate a value exceeding the specified value, then 0.02 mm is to be subtracted from the cam and the inner diameter and the calculation is to be redone. If the new calculation is still outside the accepted tolerance, then the measurement must be done by another person. If the results are still inconsistent then a third protocol is to be carried out by a third person. All protocols inside and outside the accepted tolerance must be forwarded to the FEMA and the WMCR.

If the results of the calculations show a cylinder capacity that is too large, the driver will be disqualified and the record will not be acknowledged. In this case, written notification must be given to the FEMA board immediately. The penalty for the driver will come from the FEMA board in accordance with section 1.5.

5.18. Fuel

WARNING Methyl alcohol (CH_3OH) is very poisonous. Keep fuel containers out of the reach of children. Young drivers are to be carefully monitored when handling fuel.

Only standard uniform fuel is to be used at FEMA races.

The mixing of fuel may only be done in the following by volume ratio: 20% castor oil (1st pressing) and 80% methanol (water-free quality). Due to the different densities of the components, the fuels must be mixed according to volume and not weight.

The race organizer must provide the fuel for the official training and races.

The race organizer may charge drivers for the fuel they use.

Cars are to be fueled under the supervision of the fuel marshal. The competitor has to show to the fuel marshal that the fuel tank of the car is empty. The car may only leave the fuel station in order to be taken to the track.

The race organizer may take fuel samples for testing from individual cars at his or her discretion, to check that the fuel regulations are being respected.

If a competitor is asked for a fuel test after his race, he or she must follow the directives of the race jury.

Should the competitor not comply with a fuel test or have broken the fuel regulations the punishment is disqualification. In this case the race committee must file a written protocol with the FEMA board immediately.

Penalties for those breaking the fuel regulations must come from the FEMA board as well as a member of the country association of which the driver is a member.

5.19. Control of Starting Weight

The race organizer should control the starting weight of every car, directly before the start of the race in which the car is racing (see 2.3.1.).

A scale that measures a minimum of 5 grams is to be used. The maximum tolerance for weight is +10 grams.

The race organizer must carry out a weight control with FEMA Number and the start weight for every car in the first and second heat.

5.20. Accidents and Damage to Cables

Accidents during races and training must be reported to the technical secretary of FEMA within 30 days for statistical purposes. They are to be reported in the following manner:

- Send in the broken cable or bridle.
- In the case of a breakage of the chassis, a photo must be sent in.
- Description of the course of events (during a free run, defective tire, while turning car off, speed, etc.)
- Description with a photograph of the consequences to the safety devices.

Cables that are expired after four (4) years are to be provided to the FEMA technical secretary for tensile tests.

All of the information will be used exclusively for statistical purposes. The information is intended to identify potential weaknesses and problems.

6. EUROPEAN CHAMPIONSHIPS

6.1. General

The European Championships are held annually by FEMA. It includes the individual European Championships in classes 1, 2, 3, 3b, 4 and 5, as well as the team title and European Cup for the classes 1 to 5 (including 3b).

The FEMA delegates meeting decides on the venue and date for the European Championship. The event is offered to FEMA countries in a rotational order.

The order of the host country and locations for the European Championships has been established from 2002 as follows:

| Year | Country | Location |
|------|-------------|-------------|
| 2002 | Germany | Kapfenhardt |
| 2003 | Russia | Jaroslavl |
| 2004 | Switzerland | Witterswil |
| 2005 | France | Lyon |
| 2006 | Poland | Pila |
| 2007 | Russia | Jaroslavl |
| 2008 | Ukraine | Stryj |
| 2009 | Sweden | Örebro |
| 2010 | Germany | Kapfenhardt |

| | | |
|------|-------------|------------|
| 2011 | Estonia | Tallinn |
| 2012 | Poland | Pila |
| 2013 | Switzerland | Witterswil |
| 2014 | Ukraine | Stryj |
| 2015 | | |

Before the European Championship can take place on a track it must have hosted at least one international FEMA race.

At the European Championships, the rules must be followed in accordance with the Technical Regulations, but with the following exception and additions:

The three (3) heats must take place within three (3) days with one heat per day.

Before the race, a check of the vehicle registration certificate must be done, along with a technical review of the model car.

The race organizer of the European Championships is required to announce the event to member countries at least 4 months in advance of the event. The announcement must contain the following information:

- An accurate description of the location of the track.
- Official training times.
- Time when cars are to be inspected and vehicle registration certificates checked.
- Start times for the races.
- Place and time of the FEMA Delegate Assembly (General Assembly).
- Possible formalities such as Visas etc
- Various accommodation options.
- Catering facilities.
- Time, date and location of the banquette and/or party.
- The names and positions of the organizing committee (race organizer, time keepers, cable marshal, race jury etc.).

6.2. Notifications

The competitor under whose name the car is being raced must be present at the European Championships.

Registration for the European Championships must be received at the address on the announcement of the event at least six (6) weeks before the event. It must be accompanied by the official FEMA registration form. Late registration is not permitted.

Competitors from overseas (non-FEMA countries) may participate in the race with a valid international license and be entered in the rankings. However, they may not race competitively and they will not be recorded in the rankings of the European Championships.

Every country that has met its financial and other obligations to FEMA may, enter a maximum of 24 cars from classes 1 to 5 (including 3b) at the European Championships. The distribution of cars amongst the six classes is optional.

The current European Champions do not count to the contingent of 24 cars. Therefore, a country could enter a maximum of 30 cars, if all European Champions for each class came from the same country.

The current European Champion has the right to start first in the first heat and to start last in the third heat of his class.

Each country must appoint a team captain. The team captain will act as contact person for the race organizers in case of disagreement or similar instances.

6.3. Ranking of Competitors

The competitors finishing in positions 1 through to 3 in each class are awarded with a medal at the European Championships. These medals are paid for by FEMA.

At least the three top placing drivers from each class will be given a certificate from the race organizer at the European Championships.

The national anthem of the winner of each class is to be played at the European Championships.

6.4. Ranking for the Team Title

For the team ranking the 2 fastest competitors of each country and class are counted. The following point system shall be used for the determination of placement/ranking:

| Rank | Points | Rank | Points | Rank | Points | Rank | Points |
|------|--------|------|--------|------|--------|------|--------|
| 1 | 400 | 6 | 95 | 11 | 22 | 16 | 5 |
| 2 | 300 | 7 | 71 | 12 | 17 | 17 | 4 |
| 3 | 225 | 8 | 53 | 13 | 13 | 18 | 3 |
| 4 | 169 | 9 | 40 | 14 | 9 | 19 | 2 |
| 5 | 127 | 10 | 30 | 15 | 7 | 20 | 1 |

6.5. Rankings for the European Cup

A challenge trophy (European Cup) is awarded at the European Championships.

In the evaluation of this European Cup, the speeds of the best competitors in each class, and country are added. The sum is the score for the ranking.