ARC SPEC100A

and

ARC SPEC 100W

TECHNICAL SPECIFICATIONS

VERSION 1 / 2012
UPDATED FEBRUARY 3rd, 2012

ARC SPEC 100A / ARC SPEC 100W ENGINES
TECHNICAL SPECIFICATIONS
DOCUMENT UPDATE SCHEDULE

It is certified that the updates listed below have been approved by the Australian Karting Association and have been incorporated into the document under the relevant rule numbers.

VERSION NUMBER	DESCRIPTION	UPDATED BY	DATE
1	Extracted from the 'Formula Australia' chapter of the 2010 AKA Manual	Brian Sparrow	2-2-2012

ARC SPEC 100A / ARC SPEC 100W ENGINES
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Preamble:

The following are the Technical Specifications for the ARC SPEC 100A, ARC SPEC 100W and ARC SPEC 100W / YAMAHA KT100S Hybrid - Watercooled engines, as approved by the Australian Karting Association.

These engines are approved for use in the following classes.

- Junior Performance
- Open Performance
- Sportsman (when noted in Supplementary Regulations)

Unless otherwise specified, the engines must be original in all their components according to the manufacturers drawings.

Any removal, addition or polishing of material is strictly forbidden.

Sandblasting, glass bead blasting, peening, acid etching, spark eroding and/or any other method of metal removal or displacement is not allowed.

ANY ALTERATIONS / MODIFICATIONS ARE STRICTLY PROHIBITED EXCEPT AS SPECIFICALLY AUTHORISED WITHIN THESE SPECIFICATIONS.

IF THESE SPECIFICATIONS DO NOT SAY YOU CAN MAKE A MODIFICATION, THEN YOU CANNOT.

ARC 1.01 Hybrid Engines:

The ARC SPEC 100W / YAMAHA KT100S Hybrid - Watercooled engines are based on a Yamaha KT100S below the cylinder base gasket and a ARC SPEC 100W water-cooled top end above the cylinder base gasket.

ARC 1.02 Engine Displacement:

The maximum piston diameter and stroke length are:

Piston	Stroke
53.00mm	46.13mm

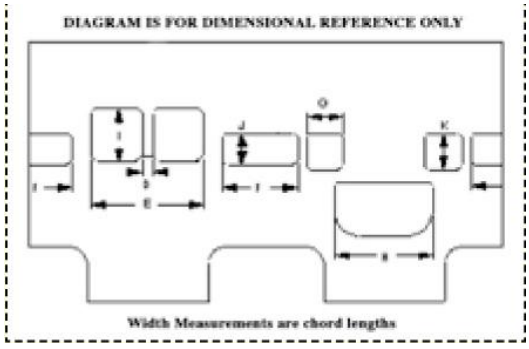
ARC 1.03 Cylinder Machining:

All machined surfaces may be re-machined as long as engine is within any other specifications within these rules.

ARC 1.04 Cylinder Ports:

Cylinder and liner

1. All ports in the liner to be “as machined” condition NO grinding is permitted.
2. All passages must remain in as cast condition; sandblasting, glass beading, peening, etc. are NOT a substitute for “as cast” condition.
3. Port map.



CODE	DIMENSION	CODE	DIMENSION
D	3.7mm min	H	34.10mm maximum
E	39.10mm maximum	I	21.65mm maximum
F	23.60mm maximum	J	11.80mm maximum
G	12.95mm maximum	K	13.80mm maximum
Port Split 9.80mm minimum, exhaust to transfer			

ARC 1.05 Cylinder Head:

1. Must be an original ARC casting.
   The welding and re-machining of the combustion area, gasket face and spark plug surface is allowable. Any additions/repairs must be permanent and non-adjustable.
2. The combustion chamber style is required to have a squish band and chamber, which are visually concentric to the spark plug.
3. The combustion chamber volume shall be a minimum of 11cc. (Ref rule 26.01)
4. The combustion chamber/squish area shall not protrude beyond the combustion gasket sealing face of the cylinder head.
   The spark plug thread may be repaired and shall retain its original position in relation to crankshaft axis. Helicoils and similar are permitted.
5. OEM combustion chamber insert is permitted.
6. Repairs to the spark plug sealing face must be by addition of weld material only and re-machining to a flat surface.

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ARC 1.06 **Head Gasket/s:** Must be retained.

ARC 1.07 **Piston:**

1. Piston must be AKA approved ARC (forged or cast) and stock in appearance.
2. AKA approved/registered aftermarket pistons are YAMAHA, KSI, KSI MK 11, JDP/Vertex, ARC (forged and cast) and Strike with cast piston crowns or Strike evolution 1 with machined piston crown.
3. All piston crowns to be as manufactured with 100mm radius.
4. Chamfer on skirt of piston to be not more than 1.0mm maximum.
5. It is permissible to notch the piston to accept earless circlips.
6. The piston skirt length may be machined, providing it conforms with the current specifications as laid down in these rules.

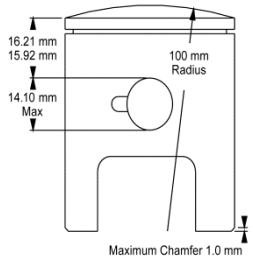

DIAGRAM IS FOR DIMENSIONAL REFERENCE ONLY.

Note: Skirt length must be equal distance on both sides

ARC 1.08 **Connecting Rod:**

(a) Connecting rod must have either ARC or 213 or Yamaha forged into the side of the rod.
(b) Minimum/Maximum rod length, centre to centre 99.87mm – 100.13mm.
(c) Conrod alignment may be either top or bottom.
Bearings and spacers are non-tech items.

ARC 1.09 **Crankshaft**:

Must be of original engine manufacturer.

(a) Crank Pin to be hollow pin 18mm or 20mm (Crank Pin plugs Optional)
(b) Crank Pin length 44.80mm min, 45.00mm max
(c) Crank Pin bore diameter measurement: 10.25 mm min, 10.45 mm max.
(d) It is permissible to recondition the crankshaft main shaft by plating
(e) Crank Shaft outside diameter measurement: 86.60mm min., 87.25mm max.

Note: If the crank assembly is outside the min/max dimensions, then disassemble engine to inspect further. Crankshaft width (measured across shoulder for the main bearings) to be 45.59 mm min.

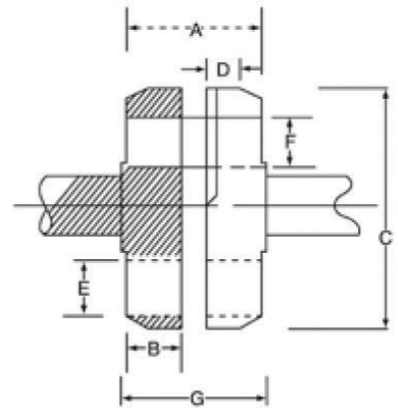

DIAGRAM IS FOR DIMENSIONAL REFERENCE ONLY

CODE	DIMENSION	CODE	DIMENSION
A	44.5mm	E	22.0mm +/- .15mm
B	17.5mm +/- .1mm	F	Crank pin 18.00 or 20.00mm
C	88.60mm minimum	G	45.59mm minimum
D	10.8mm minimum		

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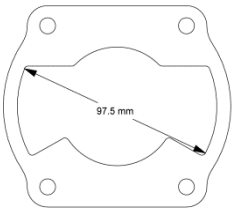
ARC 1.10 Crankcase:



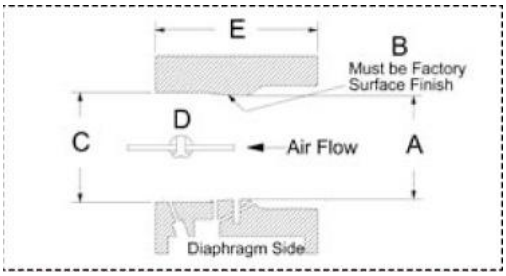
The crankcase ports will remain as cast. The minimum chordal distance measured with a vernier caliper across the widest section of the transfer ports shall be 97.5mm minimum. (Refer diagram). All machined surfaces may be re-machined as long as engine is within any other specifications within the rules. It is permissible to repair crankcase main bearing recesses by welding or with metal inserts.
NOTE: Existing crankcases that are narrow may be spaced with a thicker gasket.
(DIAGRAM IS FOR DIMENSIONAL REFERENCE ONLY)

ARC 1.11 Ignition:

a) Ignition must be that supplied by the original engine manufacturer which is approved by the AKA. Any optional unit must be approved and registered with the AKA for this class.
The use of the following AKA approved TCI module is permissible: YAMAHA, VICTA, ATOM, DELTA/WEI SHIEH, PRD, PRD with coil.
No modifications or repairs to any of the listed AKA approved modules is permitted.
The fitting of a PRD ignition coil and a PRD ignition rotor (flywheel) is permissible (this includes the Oppama ignition system).
b) Ignition timing may be adjusted by the removal of the locating key or part thereof and/or by the ignition plate.
c) All engines must rotate in a clockwise direction when viewed from the drive side.
d) Ignition/rotor cover is optional.
e) It is permissible to repair/replace the connector on the TCI module and mating wiring.

ARC 1.12 Carburettor:

Must be Walbro WB series conforming to dimensions as per diagram. (Note – WB 24 is not eligible)



Measurement code:
A As cast MAX Venturi diameter 24.13mm
B As cast (area will extend from the front of the carburetor to the progression discharge jet which must have all or portion of this jet in the cast area.)
C MAX downstream diameter 25.7mm
D Butterfly shaft must be located at the bore centre.
E MIN carburettor body length of 37.5mm
DIAGRAM IS FOR DIMENSIONAL REFERENCE ONLY

(a) It is permissible to machine the Walbro carburettor body to
(i) conform to dimension E
(ii) conform to dimension C
(iii) accept an O ring for the low speed jet and throttle shaft.
b) A threaded butterfly screw must be retained, countersunk screws are not permitted.
Butterfly and shaft must be as manufactured.
c) It is permissible to repair the inlet seat and throttle shaft bore in the Walbro carburettor. Carburettor bore may not be sleeved.
d) It is permissible to enlarge only existing fuel / air holes, but they may not be deleted or relocated. The holes must be the same shape as originals when viewed externally.
e) All air must pass through the carburettor throat.
f) Adjustment of carburetor jet needles must be done by manually turning the jet needle (or its extension) only.
g) Carburettor throttle cannot be actuated by electro mechanical means.
h) It is permissible to fit a mechanical stop to limit the range of carburetor jet needle movement, however no modifications to the carburetor are permitted to mount such a stop.

No internal inspection required, ie covers will not be removed and only external measurements and visual inspection taken.

ARC 1.13 Pressurised Fuel Systems:

Fuel pump or pressurised fuel systems are forbidden. Squeeze type pump between fuel tank and carburettor is permitted.

ARC 1.14 Insulating Spacer:

Hole size 26.42mm max.

ARC 1.15 Aluminium Carburettor Mount Plate:

Hole size 26.29mm max.

ARC 1.16 Inlet Tract Length:

69mm minimum (measured along the port floor from the aluminium carburettor adaptor outer face to piston skirt).

ARC 1.17 Internal Additions:

No additional material may be added except in the case of engine repairs and shall only restore engine or components to original specifications. The cylinder may NOT be repaired in any of the port or passage as cast areas.

(a) The use of thermal barrier coatings / ceramic coatings on or in the engine / engine components and on or in exhaust components is prohibited.

(b) The use of anti friction coatings on or in the engine / engine components is prohibited.

ARC 1.18 External Modifications:

External modifications, which do not in any way affect a performance gain, are legal.

ARC 1.19 External Identification

The ARC Spec 100 water-cooled must have “Mod 2” cast into the rectangular boss on the cylinder barrel above the drive side of the engine.

ARC 1.20 Legal Additions:

Legal additions shall be limited to the following: Chain guard, motor mount, direct drive gear, extension of carburettor jet needles, carburettor return springs, third bearing and adapter (for ARC clutch only), temperature gauge and tachometer.

ARC 1.21 Non-tech Items:

(a) Non-tech items are gaskets, seals, big end roller/cage, little end spacers, rings, washers, cages, fasteners, fulcrum spring (carburetor meter levering spring), spark plug and spark plug lead and cap, gudgeon pins, main bearings, coolant sealing “O” rings, engine sprocket and key.

1. Unless specified, non-tech items are to be of the same type and style as the original. No alteration from the original manufacturer's specifications is permitted to fit a non-tech item
2. Head gasket/s must be retained
3. Cylinder base baskets are dimensionally free
4. Carburettor base and phenolic spacer gaskets are dimensionally free
5. Only crankcase half gasket may be formed from liquid gasket compounds
6. Cylinder base adjusting shims/spacers may be of any material and must be of uniform thickness.
7. Spark plugs must have a maximum engagement length of 20mm without the washer.
8. A direct drive sprocket (complete) cannot weigh more than 100 gms.
9. A direct drive sprocket retaining nut cannot be made from a hex material greater than 19mm AF.
10. Pull start and electric start systems are non-tech.

ARC 1.22 Waterpump.

Drive, type and mounting is optional

ARC 1.23 Exhaust Header Pipe:

This item is not restricted to the original Manufacturer but must conform to the type (style) and of the original header pipe. Inside diameter must be parallel.

Minimum Length permitted 120mm (as per diagram below)

Maximum inside diameter of 36mm.

Minimum diameter 34mm. Refer diagram

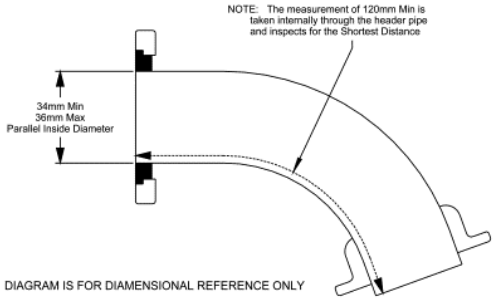
It is permissible to stiffen the exhaust flange to the extent shown in the drawing.

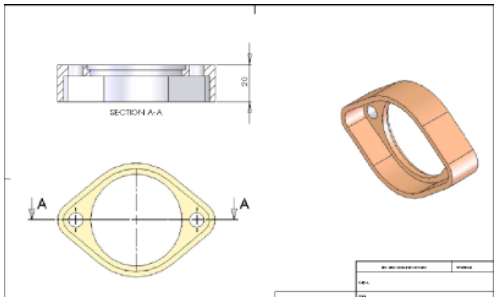
The maximum length from the engine side face of the flange to the end of any stiffening is 20mm

Any stiffening must not interfere with the fitting of exhaust seals.

Modifications to fit an exhaust probe are permissible. A maximum of one (1) Exhaust probe/fitting is permitted. The maximum diameter of the probe is 6mm. Maximum length of exhaust probe is 25mm

Exhaust header studs must remain in their original position.





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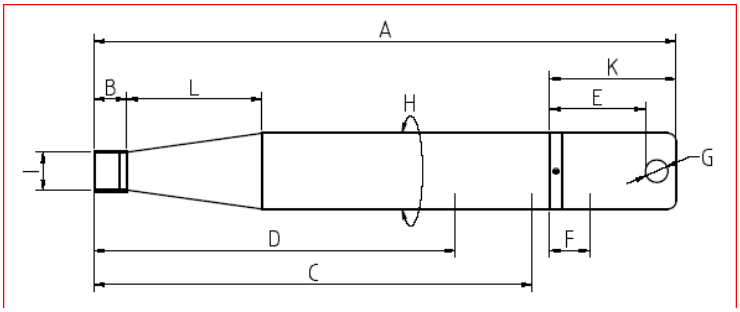
ARC 1.24 Exhaust System:

1. Must be such as to carry the exhaust gases away from and to the rear of the driver.
2. Exhaust gases must all pass through the exhaust header pipe and the muffler and silencer (if mandatory) at all times.
3. Mufflers must conform to Rule 24.2 of the AKA manual with respect to noise level. (Supplementary Regulations may allow for a lesser noise level.)
4. The open end must point in such a way so that it does not present a hazard to other drivers.
5. Muffler must be securely fastened with springs to a mounting bracket cradle and to the header pipe of the engine. A secondary fastening system, comprising a multi-strand wire (as used in throttle cables) to be secured through a fixing lug or a similar attachment (e.g. hose clamp) on the muffler and fixed to the chassis, excluding rear bumper bar to prevent the exhaust system detaching from the kart.
6. It is permissible to use, externally, heat proof wrapping between the springs and exhaust cradle and the springs and flex.

ARC 1.25 Exhaust Muffler: AKA 39 CONTROLLED EXHAUST MUFFLER



Reference	Description	AKA 39
A	overall length	680mm
B	internal tail pipe length	38mm
C	tail pipe to baffle length	508mm
D	tail pipe to deflector length	422mm
E	exhaust outlet hole position	112mm
F	end cap to baffle	47mm
G	maximum diameter outlet hole	26.3mm max
H	circumference	280mm
I	“internal diameter” tail pipe inlet	46.0 +/- 1mm
J (not shown)	maximum diameter of internal baffle plate hole	N/A
K	end cap length	148mm
L	inlet pipe to first weld (cone length)	158mm

Dimensional References:

Unless specified as a maximum measurement, the following dimensions are subject to Rule 26.02 General Tolerances, in the AKA Manual.

(a) No device capable of being moved whilst racing is permissible in or on the exhaust.

(b) The only permissible exhaust muffler for classes using the KT100S Series Engine is the control pipe AKA 39 manufactured by Powermac. The AKA 39 exhaust pipe carries precise dimension specifications that allow confidence in equality of performance for all competitors using the KT100S series engine.

(c) Any measurement related to weld at either end of the cone will be taken to the centre line of the weld.

(d) All other dimensions not specified carry stringent technical specifications. Any attempt to alter these dimensions will deem the unit illegal.

(e) Any accidental damage (when all gasses still pass through the exhaust system as per rule 25.09.2) will not incur a technical breach of these rules.

(f) It is permissible to weld a fixing lug to the external surface of the AKA 39 body.

(g) With the exception of repair to fixing points, any attempt to repair damage by cutting, welding or fabrication will automatically remove eligibility of the exhaust unit.

(h) The exhaust header pipe and muffler can be joined by a pipe or flexible tube with a constant wall thickness, ends must be within 5 degrees of perpendicular to the centreline of the tube, min 36mm ID max 46.5mm OD these being an absolute size all TOLERANCES included. Exhaust spacers are allowed and must be of material equal to the permitted size of the joining exhaust flex or pipe, be of parallel bore, and within 5 degrees of perpendicular.

(i) An “R” end-cap for the AKA39 control pipe is not permitted to be fitted to an AKA14 “J” body and an “R” end-cap for the AKA14 control pipe cannot be fitted to an AKA39 “S” body.

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For information and clarification of Exhaust Bodies and End Caps:

- An AKA39 complete exhaust unit is identified by an alphanumerical stamp on the main body at the inlet end, and on the end-cap. (Eg: S00123456)
- An AKA39 end-cap replacement is identified by an alphanumerical beginning with R on the end-cap (: Eg R123456)
- An AKA14 complete exhaust unit is also identified by an alphanumerical stamp on the main body at the inlet end, and on the end-cap. (Eg: S00123456)
- An AKA14 end-cap replacement is identified by an alphanumerical beginning with R on the end-cap (: Eg R123456)
- A pre alpha numerical AKA14 complete exhaust pipe is identified by the AKA14 stamp on the main body of the pipe and the end-cap and is eligible for competition.

Competitors are requested to check their exhaust pipes for compliance with the new regulation.

ARC 1.26 Clutch:

The only permissible clutches to be used with these engines are the following AKA registered clutches, as per rule 25.17 of the AKA Manual.

- Freeline SL AKA # 44 (short shaft) only
- Strike SSS AKA # 45 (short shaft) only
- Ital Red AKA # 55 (short shaft) only
- TomarTD22 AKA # 56 (long shaft) only
- ARC (ARC electric start bottom end) only
- Drive belt pulley AKA # 52 (SSS clutch) only
- Ital Red "S" Taperlock AKA #.55A (Short shaft) only
- Zedtec ZD1 Long shaft and short shaft

THE FOLLOWING SECTION COVERS HYBRID ENGINES WHERE ALTERNATE CONNECTING ROD, CRANKSHAFT AND CRANKCASE MAY BE USED AS PER RULE ARC 1.01

ARC 1.27 Connecting Rod:

Can be either of the following and must be stock:

(a) Yamaha or KSI.
(b) Minimum/Maximum rod length, centre to centre 99.87mm – 100.13mm.
(c) Conrod alignment may be either top or bottom
(d) 50W-11651-00 Yamaha "J" rod is not eligible
(e) Bearings and spacers are non-tech items.

ARC 1.28 Crankshaft:

Legal crankshafts are Yamaha, or KSI

(a) Outside diameter measurement: 86.60mm min., 87.25mm max.
(b) Crank Pin to be standard hollow pin.

Note: If the crank assembly is outside the min/max dimensions, then disassemble engine to inspect further. Crankshaft width (measured across shoulder for the main bearings) to be 45.59mm min.

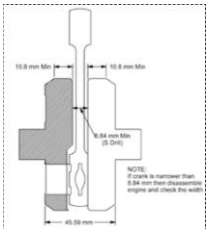


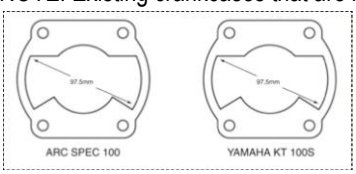
DIAGRAM IS FOR DIMENSIONAL REFERENCE ONLY

ARC 1.29 Crankcase:

The crankcase ports will remain as cast. The minimum chordal distance measured with a vernier caliper across the widest section of the transfer ports shall be 97.5mm minimum. (Refer diagram below). All machined surfaces may be re-machined as long as engine is within any other specifications within the rules. It is permissible to repair crankcase main bearing recesses by welding or with metal inserts.

It is permissible to use ARC electric start crankcase on Yamaha KT100S if clutch and starter motor is fitted.

NOTE: Existing crankcases that are narrow may be spaced with a thicker gasket.



DIAGRAMS ARE FOR DIMENSIONAL REFERENCE ONLY

ARC 1.30 ARC Spec100 A, ARCSpec100 W and Hybrid Engine Compliance

Refer to rule 26.04 for procedure