MANUAL NO:H950

DAIHEN Corporation

OWNER'S MANUAL

FOR

TIG WELDING TORCH

MODEL: AW-18 (4m) H950
AW-18 (8m) H951

DO NOT DESTROY

IMPORTANT: Read and understand the entire contents of this manual, with special emphasis on the safety material throughout the manual, before installing, operating, or maintaining this equipment. This equipment and this manual are for use only by persons trained and experienced in the safety operation of welding equipment. Do not allow untrained persons to install, operate or maintain this equipment. Contact your distributor if you do not fully understand this manual.

DAIHEN Corporation WELDING & MECHTRONICS DIVISION

September 26, 2000

Upon contact, advise MODEL and MANUAL NO.

12-2-030-4

CONTENTS

1. SAFETY INFORMATION

The following safety alert symbols and signal words are used throughout this manual to identify various hazards and special instructions.

⚠ WARNING	WARNING gives information regarding possible personal injury or loss of life.

⚠ CAUTION	CAUTION refers to minor personal injury or possible equipment damage.

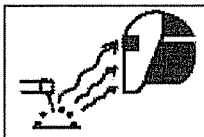
2. ARC WELDING SAFETY PRECAUTIONS

⚠ WARNING
ARC WELDING can be hazardous.
◆ PROTECT YOURSELF AND OTHERS FROM POSSIBLE SERIOUS INJURY OR DEATH. Be sure to: ・Keep children away. ・Keep pacemaker wearers away until consulting a doctor. ◆ Read and understand the summarized safety information given below and the original principal information that will be found in the PRINCIPAL SAFETY STANDARDS. ◆ Have only trained and experienced persons perform installation, operation, and maintenance of this equipment. ◆ Use only well maintained equipment. Repair or replace damaged parts at once.
ARC WELDING is safe when precautions are taken.

ELECTRIC SHOCK can kill.

Touching live electrical parts can cause fatal shocks or severe burns. The electrode and work circuits are electrically live whenever the output is on. The power line and internal circuits of this equipment are also live when the line disconnect switch is on. When arc welding all metal components in the torch and work circuits are electrically live.

1. Do not touch live electrical parts.
2. Wear dry insulating gloves and other body protection that are free of holes.
3. Insulate yourself from work and ground using dry insulating mats or covers.
4. Be sure to turn off the line disconnect switch before installing, changing torch parts or maintaining this equipment.
5. Properly install and ground this equipment according to its Owner's Manual and national, state, and local codes.
6. Keep all panels and covers of this equipment securely in place.
7. Do not use worn, damaged, undersized, or poorly spliced cables.
8. Do not touch electrode and any metal object if POWER switch is ON.
9. Do not wrap cables around your body.
10. Turn off POWER switch when not in use.



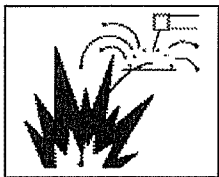
ARC RAYS can burn eyes and skin: FLYING SPARKS AND HOT METAL can cause injury. NOISE can damage hearing.

Arc rays from the welding process produce intense heat and strong ultraviolet rays that can burn eyes and skin.
Noise from some arc welding can damage hearing.

1. Wear face shield with a proper shade of filter (See ANSI Z 49.1 listed in PRINCIPAL SAFETY STANDARDS) to protect your face and eyes when welding or watching a welder work.
2. Wear approved safety goggles. Side shields recommended.
3. Use protective screens or barriers to protect others from flash and glare: warn others not to look at the arc.
4. Wear protective clothing made from durable, flame-resistant material (wool and leather) and foot protection.
5. Use approved earplugs or earmuffs if noise level is high.

Chipping and grinding can cause flying metal. As welds cool, they can throw off slag.

6. Wear approved face shield or safety goggles. Side shields recommended.
7. Wear proper body protection to protect skin.



WELDING can cause fire and explosion.

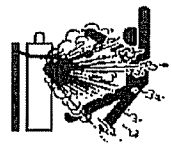
Sparks and spatter fly off from the welding arc. The flying sparks and hot metal, spatter, hot base metal, and hot equipment can cause fire and explosion. Accidental contact of electrode or welding wire to metal object can cause sparks, overheating, or fire.

1. Protect yourself and others from flying sparks and hot metals.
2. Do not weld where flying sparks can strike flammable material.
3. Remove all flammables within 10m (35ft.) of the welding arc. If this is not possible, tightly, cover them with approved covers.
4. Be alert that welding sparks and hot metals from welding can easily pass through cracks and openings into adjacent areas.
5. Watch for fire, and keep a fire extinguisher nearby.
6. Be aware that welding on a ceiling, floor, bulkhead, or partition can ignite a hidden fire.
7. Do not weld on closed containers such as tanks or drums.
8. Connect base metal side cable as close to the welding area as possible to prevent the welding current from traveling along unknown paths and causing electric shock and fire hazards.
9. Remove stick electrode from holder or cut off welding wire at contact tip when not in use.
10. Do not use the welding power source for other than arc welding.
11. Wear oil-free protective garments such as leather gloves, a heavy shirt, cuffless trousers, boots, and a cap.
12. A loose cable connection can cause sparks and excessive heating.
13. Tighten all cable connections.

FUMES AND GASES can be hazardous to your health.

Arc welding produce fumes and gases. Breathing these fumes and gases can be hazardous to your health.

1. Keep your head out of the fumes. Do not breathe the fumes.
2. Ventilate the area and / or use exhaust at the arc to remove welding fumes and gases.
3. If ventilation is poor, use an approved air-supplied respirator.
4. Read the Material Safety Data Sheets (MSDS) and the manufacturer's instructions on metals, consumables, coatings, and cleaners.
5. Do not weld or cut in locations near degreasing, cleaning, or spraying operations. The heat and rays of the arc can react with vapors to form highly toxic and irritating gases.
6. Work in a confined space only if it is well ventilated, or while wearing an air-supplied respirator. Shielding gases used for welding can displace air causing injury or death. Be sure the breathing air is safe.

	CYLINDER can explode if damaged.

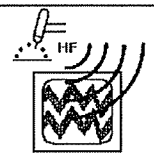
A shielding gas cylinder contains high-pressure gas. If damaged, a cylinder can explode.
Since gas cylinders are normally part of the welding process, be sure to treat them carefully.

1. Use only correct shielding gas cylinders, regulators, hoses, and fittings designed for the specific application; maintain them in good condition.
2. Protect compressed gas cylinders from excessive heat, mechanical shock, and arcs.
3. Keep the cylinder upright and securely chained to a stationary support or a rack to prevent falling or tipping.
4. Keep cylinders away from any welding or other electrical circuit.
5. Never touch cylinder with welding electrode.
6. Read and follow instructions on compressed gas cylinders, associated equipment, and the CGA publication P-1 listed in PRINCIPAL SAFETY STANDARDS.
7. Turn face away from valve outlet when opening cylinder valve.
8. Keep protective cap in place over valve except when gas cylinder is in use or connected for use.

	Rotating parts may cause injuries. Be sure to observe the following.

If hands, fingers, hair or clothes are put near the fan's rotating parts or wire feeder's feed roll, injuries may occur.

1. Do not use this equipment if the case and the cover are removed.
2. When the case is removed for maintenance/inspection and repair, certified or experienced operators must perform the work. Erect a fence, etc. around this equipment to keep others away from it.
3. Do not put hands, fingers, hair or clothes near the rotating fans or wire feed roll.

	This equipment uses high frequency for arc starting.

High-frequency may enter nearby units as shown below, causing electromagnetic trouble.

* Input cables, signal cables, telephone cables
* Radio sets, TV sets
* Computers and other control equipment
* Industrial detectors and safety units
* Pacemakers, hearing-aid sets

For preventing electromagnetic trouble;

1. Make the cable as shortest as possible.
2. Install cables along the floor or the ground as close as possible.
3. Put the base metal side cable together with the torch side cable.
4. Do not use a common base metal ground with other machines.
5. Tightly close all of the doors and covers of this equipment, and secure them.
6. Do not press the torch switch other than when ready to start the arc.
7. When electromagnetic trouble occurs, take the measures shown in this instruction manual until trouble is corrected.
   Please contact OTC-DAIHEN , when necessary.
8. Pacemaker wearers must not come near this equipment during operation until consulting a doctor.
   Operation of the pacemakers will be affected badly by high frequency.

ARC WELDING work areas are potentially hazardous.

FALLING or MOVING machine can cause serious injury.

- Use both eyebolts, if installed, to lift the welding power source.
- Put this equipment solidly on a flat surface.
- Do not pull this equipment across a floor laid with cables and hoses.

PRINCIPAL SAFETY STANDARDS

Arc welding equipment – Installation and use, Technical Specification
IEC 62081, from International Electrotechnical Commission

Safety in Welding and Cutting, ANSI Standard Z49.1, from American Welding Society.

Safety and Health Standards, OSHA 29 CFR 1910, from Superintendent of Documents, U.S. Government Printing Office.

Recommended Practices for Plasma Arc Cutting, American Welding Society Standard AWS C5.2, from American Welding Society.

Recommended Safe Practices for the Preparation for Welding and Cutting of Containers That Have Held Hazardous Substances, American Welding Society Standard AWS F4.1, from American Welding Society.

National Electrical Code, NFPA Standard 70, from National Fire Protection Association.

Safe Handling of Compressed Gases in Cylinders, CGA Pamphlet P-1, from Compressed Gas Association.

Code for Safety in Welding and Cutting, CSA Standard W117.2, from Canadian Standards Association, Standards Sales.

Safe Practices For Occupation And Educational Eye And Face Protection, ANSI Standard Z87.1, from American National Standards Institute.

Cutting And Welding Processes, NFPA Standard 51B, from National Fire Protection Association.

3. NOTICE AT OPERATION

3.1 Cooling water

⚠ CAUTION
●Be sure to flow cooling water more than 0.6 ℓ / min. (The water pressure at inlet torch should 0.1～0.3MPa.) If cooling water is not enough, it can be a cause of burning.

●Do not use this at air-cooling.

●Do not use a welding torch which has a water leak, it can be a cause of electrical shock.

3.2 Cable hose

⚠ CAUTION
●Do not bent cable hose excessively, touch high temperature parts, or put heavy stuff, or welding torch might be burned out.

3.3 Replacement of parts

⚠ CAUTION
●Be sure to observe the followings for preventing burning.

●At welding, never touch the high temperature parts of nozzle and electrode directly.

●At welding, use the protection goods.

●The replacing of parts of welding torch should be done after cooling down.

⚠ CAUTION
●In case of parts are damaged, replace them with new parts for safety and quality.

●Be sure to use the OTC's genuine parts.

⚠ CAUTION
●When polishing of electrode, wear protection glasses to protect your eyes.

●For safety polishing operation, follow the safety instructions for grinder and electrode polishing machine.

4. WELDING PREPARATION

4.1 Connection to welding power source

⚠ CAUTION
● Securely tight the adapter nut of welding torch. If loosen it, it can be cause of a water and gas leakage. They will be the cause of fire, burning and breakdown.

●Refer to owner's manual of each welding power source, and connect rightly.

4.2 Selection of electrode

Pure tungsten electrode (with white mark), ceriated tungsten electrode (contained 2% cerium, with gray mark) and thoriated tungsten electrode(contained 2% thorium, with red mark) are usually used.

Welding method	Electrode material	Work material
DC TIG arc welding	Ceriated tungsten Thoriated tungsten	Stainless steel, Mild steel, Brass, High carbon steel, Cast iron, Copper, Titanium, Silver
AC TIG arc welding	Ceriated tungsten Pure tungsten Thoriated tungsten	Aluminum, Aluminum casting, Magnesium, Magnesium casting

Note: The table above shows only typical work materials and electrode materials.

4.3 Selection of electrode diameter

Electrode diameter (mm ϕ)	Welding current (A)				
	DC TIG welding (Negative electrode)		AC TIG welding		
	Ceriated tungsten	Thoriated tungsten	Ceriated tungsten	Pure tungsten	Thoriated tungsten
0.5	—	1～20	—	30	50
1.0	—	1～80	—	10～60	20～80
1.6	5～150	5～150	40～130	20～100	40～130
2.0	—	10～200	—	30～130	50～180
2.4	20～250	20～250	70～220	50～160	70～220
3.0	—	40～350	—	80～190	90～260
3.2	50～400	50～400	110～290	100～210	110～290
4.0	—	80～500	—	150～270	170～360

Note: Above current range shows that usable current limit for wire diameter.

4.4 Selection of nozzle

●Refer to the table below to get enough shield by argon gas and use a right nozzle according to welding current

Welding current (A)	DC welding		AC welding	
	Nozzle No.	Gas flow rate (ℓ / min.)	Nozzle No.	Gas flow rate (ℓ / min.)
10～100	4, 5, 6	4～5	5, 6	6～8
101～150	4, 5, 6	5～7	6, 7	7～10
151～200	4, 5, 6, 7, 8	6～8	7, 8	7～10
201～300	5, 6, 7, 8	8～9	8, 10, 12	8～15

Notes:

(1) Relation between nozzle number and inside diameter.

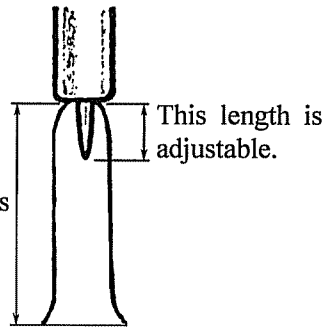
Nozzle No.	4	5	6	7	8	10	12	5L	7L
Inside diameter (mm)	6.5	8	9.5	11	12.7	16	19	8	11

(2) Nozzle for gas lens

Gas lens controls the flow of shield gas at a uniform pace.
Gas lens has following advantages.

●Even few gas flow rate gets perfect shield effect.

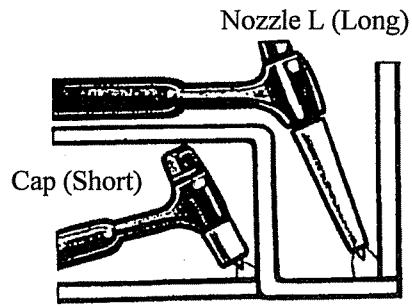
●The tip of tungsten is adjustable and it makes welding operation possible at narrow place and reduce damages of nozzle. Gas nozzle is very useful for high quality welding and complicated welding.



4.5 Selection of collet and collet body

●Collet and collet body are for feed and electrode holding. Select according to wire diameter.

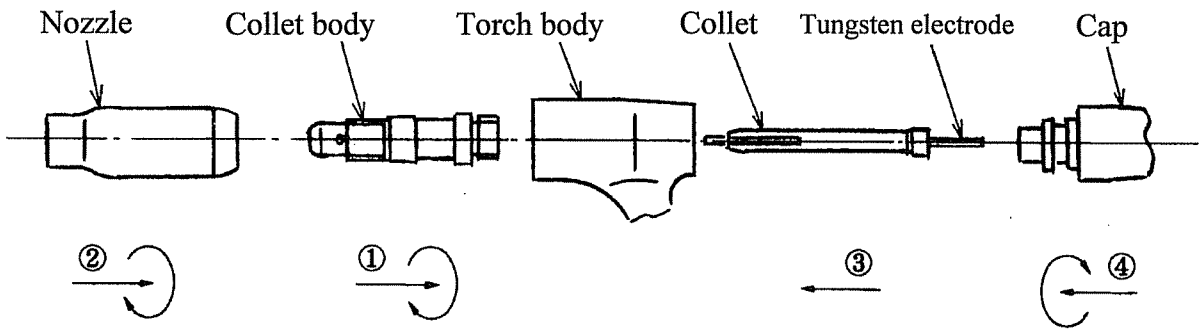
4.6 How to use a cap (short) and nozzle L (Long) (Optional accessory)



●Select according to the welding place and the shape of base metal. By using them, larger limit welding is possible.
For ordering, refer to "5.2 Optional accessories."

4.7 Assembling of torch body

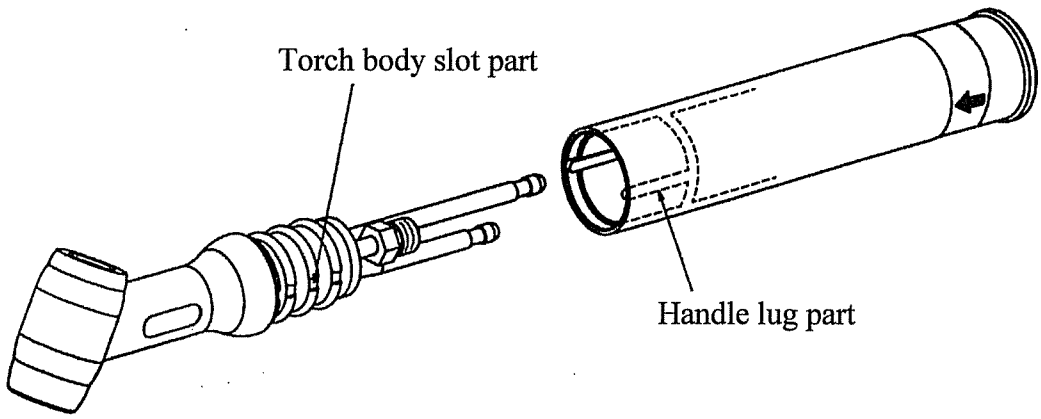
●For assembling, follow the numbers below.



⚠ CAUTION
●Securely tight the collet body and cap. If loosen it, it can be cause of burning and over heating.

⚠ CAUTION
●Use electrode stick 5～10mm out from tip of nozzle. If the tip of electrode is inside nozzle, nozzle might be damaged by heat of arc.

4.8 Assembling and disassembling of handle



⚠ CAUTION
●For assembling of handle, set the handle lug part to torch body slot part, and insert. ●Do not screw handle when assembling and disassembling. If screw handle, torch body might be damaged.

5. PARTS LIST

If parts are required for replacement, direct order involving Description and Part No. to our sales agent or OTC's office directly. For optional accessories, refer to 5.2.

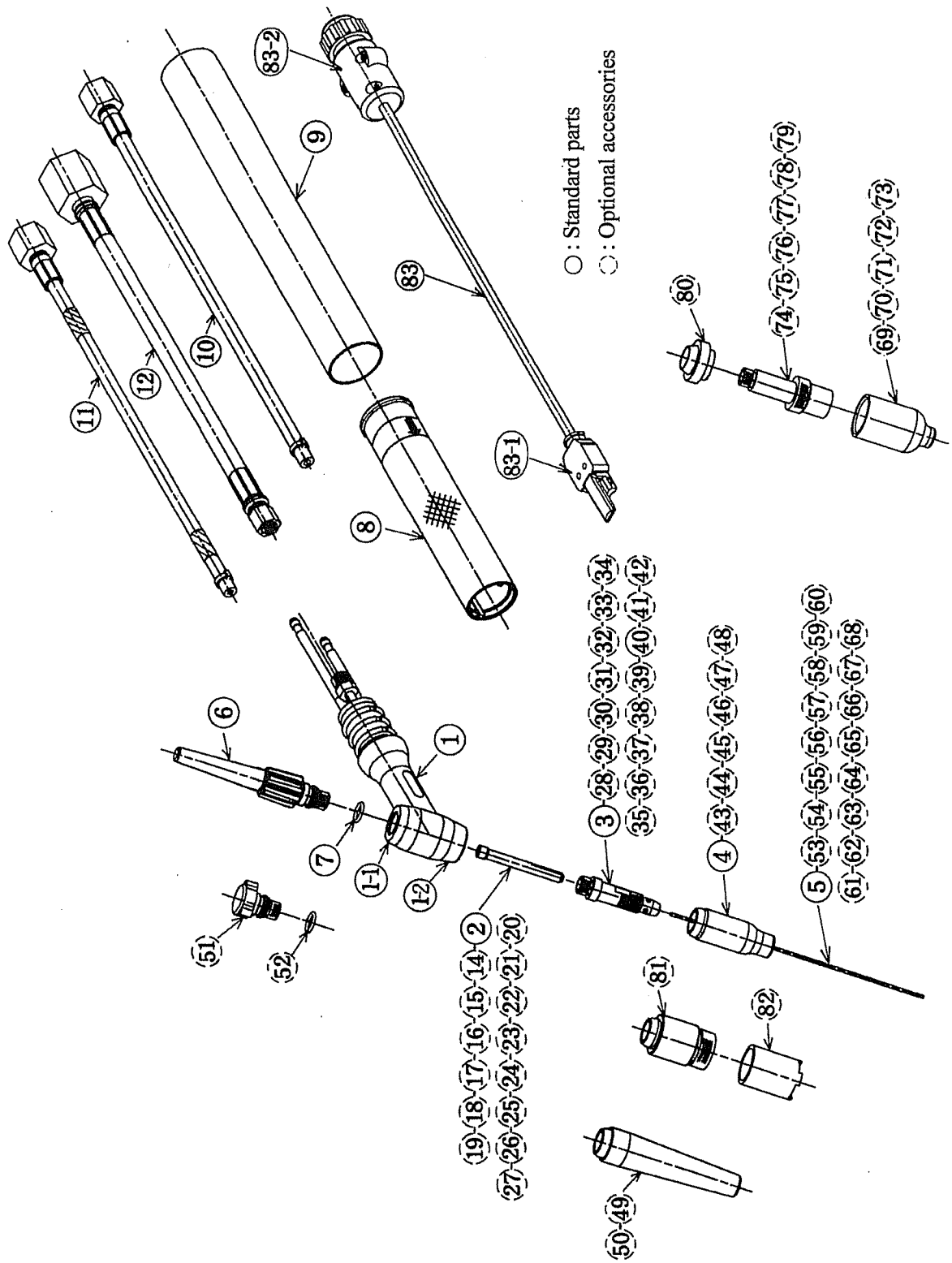
5.1 Standard parts

No.	Part No.	Description	Q'ty	Remarks
1	H950J00	Torch body	1	Include 1-1, 1-2
1-2	H500B04	Insulator	(1)	
1-3	H500B05	Gasket	(1)	
2	H950C07	Collet (3.2)	1	
3	H950C17	Collet body (3.2)	1	
4	H21B22	Nozzle (No.7)	1	Inside diameter ϕ11
5	0870-032	Ceriated tungsten electrode	1	ϕ3.2 × 150mm
6	H83C01	Cap (Long)	1	
7	3570-007	"O" ring	1	JISW1516-7
8	H950E01	Handle	1	
		(Cable length: 4m)		
9	H950E02	Hose sheath	1	
10	H950F00	Gas hose	1	
11	H950G00	Cooling water hose	1	
12	H21E00	Power cable hose	1	
83	K1108A00	Torch switch	1	Include 83-1, 83-2
83-1	K1108C00	Body assembly	(1)	
83-2	4730-001	Plug	(1)	2P
		(Cable length: 8m)		
9	H951E02	Hose sheath	1	
10	H951F00	Gas hose	1	
11	H951G00	Cooling water hose	1	
12	H223E00	Power cable hose	1	
83	K1109A00	Torch switch	1	Include 83-1, 83-2
83-1	K1108C00	Body assembly	(1)	
83-2	4730-001	Plug	(1)	2P

5.2 Optional accessories

No.	Part No.	Description	Q'ty	Remarks
14	H950C02	Collet (1.0)	1	
15	H950C03	Collet (1.6)	1	
16	H950C04	Collet (2.0)	1	
17	H950C05	Collet (2.4)	1	
18	H950C06	Collet (3.0)	1	
19	H950C08	Collet (4.0)	1	
20	H21B13	Collet (0.5)	1	
21	H21B14	Collet (1.0)	1	
22	H21B15	Collet (1.6)	1	Quartered type
23	H21B64	Collet (2.0)	1	Quartered type
24	H21B16	Collet (2.4)	1	Quartered type
25	H21B65	Collet (3.0)	1	Quartered type
26	H21B17	Collet (3.2)	1	Quartered type
27	H21B63	Collet (4.0)	1	Quartered type
28	H950C11	Collet body (0.5)	1	
29	H950C12	Collet body (1.0)	1	
30	H950C13	Collet body (1.6)	1	
31	H950C14	Collet body (2.0)	1	
32	H950C15	Collet body (2.4)		
33	H950C16	Collet body (3.0)	1	
34	H950C18	Collet body (4.0)	1	
35	H21B08	Collet body (0.5)	1	Stiffness type
36	H21B09	Collet body (1.0)	1	Stiffness type
37	H21B10	Collet body (1.6)	1	Stiffness type
38	H21B66	Collet body (2.0)	1	Stiffness type
39	H21B11	Collet body (2.4)	1	Stiffness type
40	H21B67	Collet body (3.0)	1	Stiffness type
41	H21B12	Collet body (3.2)	1	Stiffness type
42	H21B68	Collet body (4.0)	1	Stiffness type
43	H21B19	Nozzle (No. 4)	1	
44	H21B20	Nozzle (No. 5)	1	
45	H21B21	Nozzle (No. 6)	1	
46	H21B23	Nozzle (No. 8)	1	
47	H21B24	Nozzle (No. 10)	1	
48	H21B25	Nozzle (No. 12)	1	
49	H21B38	Nozzle (No. 5L)	1	Long
50	H21B39	Nozzle (No. 7L)	1	Long
51	H17B19	Cap (short)	1	
52	3570-007	"O" ring	1	JISW1516-7
53	0870-016	Ceriated tungsten electrode	1	1.6 × 150
54	0870-024	Ceriated tungsten electrode	1	2.4 × 150

No.	Part No.	Description	Q'ty	Remarks
55	0831-005	Thoriated tungsten electrode	1	0.5 × 150 Polishing
56	0831-010	Thoriated tungsten electrode	1	1.0 × 150 Polishing
57	0831-016	Thoriated tungsten electrode	1	1.6 × 150 Polishing
58	0831-020	Thoriated tungsten electrode	1	2.0 × 150 Polishing
59	0831-024	Thoriated tungsten electrode	1	2.4 × 150 Polishing
60	0831-030	Thoriated tungsten electrode	1	3.0 × 150 Polishing
61	0831-032	Thoriated tungsten electrode	1	3.2 × 150 Polishing
62	0831-040	Thoriated tungsten electrode	1	4.0 × 150 Polishing
63	0830-005	Pure tungsten electrode	1	0.5 × 150 Polishing
64	0830-010	Pure tungsten electrode	1	1.0 × 150 Polishing
65	0830-016	Pure tungsten electrode	1	1.6 × 150 Polishing
66	0830-024	Pure tungsten electrode	1	2.4 × 150 Polishing
67	0830-032	Pure tungsten electrode	1	3.2 × 150 Polishing
68	0830-040	Pure tungsten electrode	1	4.0 × 150 Polishing
69	H21B40	Nozzle (No. 4)	1	For gas lens
70	H21B41	Nozzle (No. 5)	1	For gas lens
71	H21B42	Nozzle (No. 6)	1	For gas lens
72	H21B43	Nozzle (No. 7)	1	For gas lens
73	H21B44	Nozzle (No. 8)	1	For gas lens
74	H21B50	Collet body (0.5)	1	For gas lens
75	H21B51	Collet body (1.0)	1	For gas lens
76	H21B52	Collet body (1.6)	1	For gas lens
77	H21B53	Collet body (2.4)	1	For gas lens
78	H21B54	Collet body (3.2)	1	For gas lens
79	H21B61	Collet body (4.0)	1	For gas lens
80	H21B60	Insulator	1	For gas lens
81	H21B70	Insulating bush	1	For arc spot
82	H21B71	Nozzle	1	For arc spot



AW-18 TIG welding torch parts layout

6. SPECIFICATIONS

6.1 Specification

Model			AW-18
Torch type			65° Angle type
Max. applicable current		DC	300A
		AC	260A
Rated duty cycle			100%
Usable electrode			(φ0.5), (φ1.0), (φ1.6), (φ2.0), (φ2.4), (φ3.0), φ3.2, (φ4.0)
Electrode material			Ceriated tungsten (Thoriated tungsten , Pure tungsten)
Cooling method			Water cooling
Cable length			4m, 8m
Mass.	Include cable	4m	2.2kg
		8m	4.0kg

Note: In case of using electrode size of "( )", optional accessories are required.

6.2 External view