

- ANNEX - 1. Training Plan of Managers and  
Instructors
- ANNEX - 2. Training Equipment List with Short  
Specifications
- ANNEX - 3. Sepecification Sheets for Special  
Training Equipment

ANNEX - 1.

### Training Plan of Managers and Instructors

To foster the center's staffs such as managers, instructors and assistant instructors is the most important matter for the successful operation of the center, therefore a plan of the training must be made carefully in detail to meet conditions surrounding setting-up of the center in Saudi Arabia.

A tentative plan for the training prior to the commencement of the center is shown as follows:

- 1) Selection of engineers as candidates of managers or instructors, who should have enough knowledge and experience of operation or maintenance for desalination or power plants.
- 2) Implementation of training, How to Teach or How to Manage, in Japan.
- 3) Selection of technicians as candidates of assistant instructors, who should have practical knowledge and skills for operation or maintenance of desalination or power plants.
- 4) Preparation of the center operation plan, training plan and teaching materials in Saudi Arabia, assisted by JICA-despatched experts.  
Process of these preparation is good opportunity as on-the-job training.
- 5) Learning of how to handle training equipment at the commissioning period of the equipment.

A tentative training program of the above 2) is as follows:

1. Lecture (3.5 weeks)

- 1) General orientation
- 2) Introduction to industrial and labour situation, and vocational training administration in Japan with the comparison with supervisory training programme
- 3) Introduction to management training in Japan
  - Outline of management training (Introduction)
  - Management training
  - Foreman training and supervisory training
  - On the Job Training (OJT)
  - Quality Control Circle (QC Circle)
  - Methods of supervisory training
  - Trainers training
  - Objective management
  - Human relations at the workshop

2. Exercise (0.5 week)

Target shooting game, Test for promoting active listening, Cooperation game, and Work motivation inventory test.

Each exercise is reviewed by the evaluation and feedback of the process and result of game exercise.

3. Discussion (2 weeks)

Discussion between participants and Japanese staffs on present situation and various problems of supervisory training, based upon the oral presentation and comparative study of country reports prepared by participants.

#### 4. Observation and study tours (2 weeks)

Observation and study tours offer the opportunity to take a close look at the actual situation of Japanese industries and institutions specialized in supervisory training and in its closely related domains. Some of institutions and enterprises and enterprises are selected as samples of case studies for further comprehension.

This programme consists of followings:

- 1) Facilities and institutions for supervisory and vocational training
- 2) Research and Development institutions for human resource and business management
- 3) Small and intermediate scale enterprises and typical Japanese industries

The managers, instructors and assistant instructors trained in the above plan may not be self-supporting for the center operation. During the operation by them, assisted by JICA-dispatched experts, they will be able to operate the center by themselves within short period of time.

ANNEX - 2.

Training Equipment List with Short Specifications

	<Classification>	<Sheet No.>
1.	Mechanical Course .....	(1/6 - 6/6)
2.	Piping Course .....	(1/5 - 5/5)
3.	Electrical Course .....	(1/7 - 7/7)
4.	Instrumentation Course .....	(1/9 - 9/9)
5.	Operation Course .....	(1/5 - 5/5)
6.	Audio Visual Aids .....	(1/1 )

Note:

- (1) The ref. No. in the (right side column of this) list corresponds to the No. in the table of each course in Article 4. LIST OF TRAINING EQUIPMENT
- (2) For the Items marked with "\*" in the Remarks column of the Training Equipment List, Specification Sheets are attached in Annex 3. for reference.

Classification: 1. Mechanical Course (1/6)

Item No.	Item	Quantity	Description	Dimension (W x D x H mm)	Weight (Kg)	Utility	Remarks	ref No.
SW-1-001	Single open ended wrench set	16 sets	M6 x to M41, 14 kinds/set				"M" means the size of opening in mm.	1
-002	Double open ended wrench set	16 sets	M6 x 8 to M36 x 41, 9 kinds/set					1
-003	45° double offset wrench set	16 sets	M10 x 12 to M41 x 46, 9 kinds/set					1
-004	15° double offset wrench set	16 sets	M12 x 14 to M36 x 41, 7 kinds/set					1
-005	Socket wrench set	16 sets	M8 to M27, 13 kinds/set					1
-006	Hexagonal bar wrench set	16 sets	M1.27 to M14, 12 kinds/set					1
-007	Adjustable angle wrench set	16 sets	Overall length 200mm, 300mm, 2 kinds/set					1
-008	Adjustable pipe wrench set	16 sets	overall length 200mm, 300mm, 2 kinds/set					1
-009	Combination pliers	16 sets	Overall length 200mm					1
-010	Water pump pliers	16 sets	Overall length 250mm					1
-011	Side cutting pliers	16 sets	Overall length 175mm					1
-012	Stop ring pliers	16 sets	Internal, External type, 2 kinds/set					1
-013	Phillip's screw driver	16 sets	No. 1 x 75mm, No. 2 x 100mm, No. 3 x 150mm, 3 kinds/set					1
-014	Slotted screw driver	16 sets	Nominal size 75mm, 100mm, 150mm, 3 kinds/set					1
-015	Machinist hammer	16 sets	Nominal weight 330g					1
-016	Copper hammer	16 sets	Nominal weight 750g					1
-017	Plastic hammer	16 sets	Nominal weight 500g					1
-018	Hack-saw frame and blade set	16 sets	Saw blade 300mm, Fixed frame type					1
-019	Center punch	16pcs	Length 125mm					1
-020	Compass	16pcs	Overall length 200mm					1
-021	Scraper	16 sets	250mm, Flat type, Bearing scraper, 2 kinds/sets					1
-022	Engineer's files set	16 sets	Flat type, Half-round type, Round type, Square type, Bevel type, Second-cut, 2 kinds, Length 150mm, 300mm (24 kinds/set)					1
-023	File brush	16 pcs	Hard steel wire made brush					1
-024	Oil stone	4 pcs	Grit. No. 320, 150mmL x 50mmW x 25mmT					1
-025	Scissors	1 sets	Round type, straight type for plate, for cloth					1
-026	Chisel set	16 sets	Flat type, edge 15mm, Copie type edge 7mm,					1
-027	Steel tool box	16 pcs	3 layer type					1
-028	Vise for working label	16 sets	Jaw opening 150mm					1
-029	Oil syringe	2 pcs	2 lit.					1
-030	Oil pan	5 pcs	600mmW x 450mmL x 150mmH					1

Classification: 1. Mechanical Course (2/6)

Item No.	Item	Quantity	Description	Dimension ( W x D x H mm)	Weight (Kg)	Utility	Remarks	ref No.
SW -1-031	Hand tap set (Metric)	5 sets	H3 x 0.5P to H20 x 2.5P					1
-032	Stock & round dies set(Metric)	5 sets	H3 x 0.5P to H20 x 2.5P					1

Classification: 1. Mechanical Course (3/6)

Item No.	Item	Quantity	Description	Dimension (W x D x H mm)	Weight (Kg)	Utility	Remarks	ref No.
SW -1-201	Chain block	1 set	Capacity 1 ton					
-202	Sling belt	4 pcs	Capacity 1.5 tons, size 60mmW x 2500mmL					2
-203	Wire rope	18 pcs (9 pairs)	Rope size (6mmφ, 9mmφ, 12mmφ) x (2m, 4m, 6m)					2
-204	Shackle and bolt set	10 sets each	10mmφ					2
-205	Hydraulic oil jack	2 pcs	1 ton, 2 tons					2
-206	Gasket cutting punch set	2 sets	Size 8mmφ to 25mmφ, 18 kinds/set					2
-207	Crowbar	5 pcs	Overall length 950mm					2
-208	Screw clamp	8 sets	Opening 50mm, 150mm, 2 kinds/set					2
-209	Hand lifter	1 set	Capacity 300kg, lift 1500mm	650 x 940 x 1820				2
-210	Hand truck	2 sets	Capacity 300kg					2
-211	Electric portable drill set	2 sets	Capacity 10mmφ, 400W, 133V, with drills 3mmφ to 10mmφ					2
-212	Electric portable grinder	2 sets	Grinding stone Dia. 125mmφ, 325W, 133V					2
-213	Electric disc grinder	2 sets	Grinding disc dia. 100mmφ, 500W, 133V					2
-214	Reel consent	5 sets	Current capacity 15A, No. of consent 4, 133V					2
-215	Carbide rotary bur	2 sets	8 burrs/set					2
-216	Abrasive rotary stone	2 sets	9 stones/set					2
-217	Bolt clipper	2 sets	Cutting capacity 19mmφ					2
-218	Torque wrench set	each						2
-219	Ring-type shock spanner set	1 sets	Capacity 60kgf.cm, 1300kgf.cm					2
-220	Bearing puller set	5 sets	M36 to M50 4 kinds/set					2
-221	Gear puller set	2 sets	Capacity dia. Max. 150mmφ					2
-222	Oil gun	each	Load 8 tons, 18 tons					2
-223	Air Gun with hose and joint	2 sets	Capacity 180c.c., steel, polyethylene-type					2
-224	Grease gun	2 sets	Pistol type with hose 20M, air press. 7kg/cm2G					2
-225	Gasoline torch lamp	2 sets	Capacity 200c.c.					2
-226	Machine shop clamp with bolt	2 pcs	Tank capacity 500c.c.					2
-227	Parts box	10 pcs	Body size 115mmL x 26mmW x 16mmH for M10 bolt					2
-228	Blacksmith's hammer	10 pcs	Size 900mmL x 600mmW x 150mmD					2
		3 pcs	Nominal weight 7.2 Kg					2



## Classification: 1. Mechanical Course (4/6)

Item No.	Item	Quantity	Description	Dimension (W x D x H mm)	Weight (Kg)	Utility	Remarks	ref No.
SW -1-301	dial height gauge	3 sets	Range of measurement 300mm					
-302	Dial gauge	5 sets	Graduation 0.01mm, range 10mm					
-303	Dial gauge magnetic base	5 sets	Base dimension 50mm $\times$ 60mm L					
-304	Block gauge	2 sets	Measuring range 1.005mm to 100mm, 103 stops					
-305	Outside micrometer	5 sets	Range 0mm to 300mm Graduation 0.01mm					
-306	Inside micrometer	5 sets	Range 50mm to 200mm Graduation 0.01mm					
-307	Vernier caliper	5 sets	Range 0mm to 300mm Graduation 0.05mm					
-308	Steel rule	5 sets	Length 300mm, 600mm, 1000mm					
-309	Measuring rule	2 pcs	Measuring length 50m					
-310	Convex rule	16 pcs	Length 200mm					
-311	Thickness gauge	5 pcs	Range 0.03mm to 1.00mm, 19 leaves					
-312	Screw pitch gauge	5 pcs	Range 0.25mm to 2.50mm, 28 gauges					
-313	Angle gauge	5 pcs	Range 1° to 45°, 18 gauges					
-314	Square	2 pcs	Dimension 200mm x 115mm					
-315	Level	2 pcs	Dimension 300mm x 24mm					
-316	Straight edge	2 pcs	Overall length 500mm					
-317	Cast iron V block	12 sets	One 90° v-flute blocks (100mm $\times$ 200mm $\times$ , each 2) x 3					
-318	Outside callipers	6 pcs	Capacity 200mm					
-319	Inside callipers	5 pcs	Capacity 200mm					
-320	Surface gauge	3 sets	Height of pole 200mm, base size 55mm $\times$ 35mmH					
-321	Box block/with V groove	3 sets	Size 150mmL x 150mm $\times$ 150mmH					
-322	Levelling jacks	9 pcs	Max. lift 75mm					
-323	Drill point gauge	1 pc.	Angle 120°					
-324	Plumb bob	5 pcs	Weight 250gs. nylon thread 20m					
-325	Surface plate with tabs	3 sets	1000mmL x 1000mm $\times$ 100mmH	1000 x 1000 x 700				

Classification: 1. Mechanical Course (5/6)

Item No.	Item	Quantity	Description	Dimension (W x D x H mm)	Weight (Kg)	Utility	Remarks	ref No.
SW -1-400	Hydraulic pressure test equipment	1 set	Max. press. 200kg/cm2G	400 x 300 x 700	17		*	4
-405	Lathe	1 set	Swing over bed 470mm W/accessories	2250 x 1110 x 1300	2000	5.5KWx230V		5
-410	Drilling machine	1 set	Drilling capacity 25mmφ (in steel) W/accessories	440 x 700 x 1475	140	1.5KWx230V		6
-420	Milling machine	1 set	Working table 950mmW x 210mmL W/accessories	2200 x 1500 x 1560	1100	1.5KWx230V	*	7
-425	Bench drill	1 set	Drilling capacity 13mmφ (in steel) W/accessories	470 x 280 x 1010	75	0.2KWx230V		8
-430	Duplex head grinder	2 sets	Grinding wheel Dia. 255mmφ	470 x 300 x 346	41	1.05KWx230V		9
-435	Shaper	1 set	Stroke 550mm W/accessories	1005 x 1900 x 1570	1600	1.8KWx230V	*	10
-440	Hack-sawing machine	1 set	Cuttin capacity 180mmφ W/accessories	370 x 1000 x 680	170	400Wx133V	*	11
-445	Electric hoist	1 set	Capacity 1 ton		73	1.7KWx230V		12
-450	Reciprocating air compressor	1 set	Capacity 0.5m3/min, Air press. 7kg/cm2G W/accessories	3065 x 1000 x 1705	750	11KWx230V	*	13
-465	Centrifugal pump	1 set	Capacity 1.4m3/min, head 20m	950 x 460 x 460	200	7.5KWx230V		14
-466	Cutaway centrifugal pump	1 set	Capacity 1.4m3/min, head 20m					15
-470	Steam turbine	1 set	Output 0.9KW, steam press. 5kg/cm2G	820 x 520 x 1120	130			16
-475	Turbo blower	1 set	Capacity 20m3/min, 80mmAq	910 x 550 x 550	80	0.75KWx230V	*	17
-480	Heat exchanger	1 set	Design press. 10kg/cm2G, Heating surface area 20m2	500φ x 3200	2200			18
-490	Valve	1 Lot						19
-490-1	Gate valve	3 sets	1B, 3B, 6B					19
-490-2	Ball valve	3 sets	-do.-					19
-490-3	Check valve	3 sets	-do.-					19
-490-4	Cock valve	3 sets	-do.-					19
-490-5	Butterfly valve	3 sets	3B, 6B					19
-490-6	Globe valve	3 sets	1B, 3B, 6B					19
-490-7	Angle valve	3 sets	-do.-					19
-490-8	Three way valve	3 sets	3B, 6B					19
-490-9	Diaphragm	3 sets	1B, 3B, 6B					19
-490-10	Needle valve	3 sets	-do.-					19
-490-11	Safety valve	3 sets	-do.-					19
-1-491	Cutaway valve	1 Lot	Gate, glove, check safety, 3B"					19
-1-520	Bearings	1 Lot	Ball, Rollers, & plain bearing					20
-1-701	Mechanical seal and oil seal	1 Lot	Mechanical seal, labyrinth and oil seal					21

Training Equipment List

Classification: 1. Mechanical Course (C/6)

Item No.	Item	Quantity	Description	Dimension (W x D x H mm)	Weight (Kg)	Utility	Remarks	Ref No.
SW -1-780	Coupling for shaft	1 lot	Flange, flexible gear, diaphragm, steel flex type					22
-1-785	Drafting machine	8 sets	Size 900mmW x 600mmH A-1 type	1500 x 1120 x 840	33			23
-1-790	Working table	9 sets	2 drawers type	1800 x 900 x 700	60			24
-1-900	Steam trap	1 lot	Float type Max. press 16Kg/cm <sup>2</sup> G, Max. temp 300°C Disk type Max. press 10Kg/cm <sup>2</sup> G, Max. temp 300°C.					25
-1-901	Steam ejector	3 sets	Bi-metal type Max. press. 45Kg/cm <sup>2</sup> G, Max. temp 450°C					
-1-902	Material for field works	1 lot	Motive steam 3.5Kg/cm <sup>2</sup> G x 41Kg/h Pipes, pipe fittings, steel plates, packings, lub-ol. etc.	473 x 620	16			26
-1-911	A.C. arc welder	1	Rated input 41KVA, rated current 500A	460 x 660 x 760				30
-1-912	Punching machine	1	Punching : 26 <sup>ø</sup> x 6 t, Press capacity 20 ton	600 x 1200 x 1600	700	230V x 1.5KV		28
-1-913	Puncher	1	Portable hydraulic type Max. 18 <sup>ø</sup> x 3.2 t		10.5			29

Classification: 2.Piping Course (1/5)

Item No.	Item	Quantity	Description	Dimension ( W x D x H mm)	Weight (Kg)	Utility	Remarks	ref No.
SW -2-001	Single open ended wrench set	16 sets	M6 to M41 14 kinds/set					1
-002	Double open ended wrench set	16 sets	M6 x 8 to M36 x 41 9 kinds/set					1
-003	45° double offset wrench set	16 sets	M10 x 12 to M41 x 46 9 kinds/set					1
-004	15° double offset wrench set	16 sets	M12 x 14 to M36 x 41 7 kinds/set					1
-005	Socket wrench set	16 sets	M8 to M27 13 kinds/set					1
-006	Hexagonal bar wrench set	16 sets	M1.27 to M14 12 kinds/se					1
-007	Adjustable angle wrench set	16 sets	200mm, 300mm 2 kinds/set					1
-008	Adjustable pipe wrench set	16 sets	200mm, 300mm 2 kinds/set					1
-009	Combination pliers	16 sets	Overall length 200mm					1
-010	Water pump pliers	16 sets	Overall length 250mm					1
-011	Side cutting pliers	16 sets	Overall length 175mm					1
-012	Phillips screw drivers	16 sets	No. 1 x 75mm, No.2 x 100mm, No.3 x 150mm 3kinds/set					1
-013	Slotted screw driver	16 sets	Nominal size 75mm, 100mm, 150mm, 3 kinds/set					1
-014	Machinist hammer	16 sets	Nominal weight 330g					1
-015	Copper hammer	16 sets	Nominal weight 750g					1
-016	Plastic hammer	16 sets	Nominal weight 500g					1
-017	Hack-saw frame and blade set	16 sets	Saw blade 300mm, fixed frame type					1
-018	Center punch	16 pcs	Length 125mm					1
-019	Compass	16 pcs	Overall length 200mm					1
-020	Engineer's files set	16 sets	Flat type, Half-round type, Round type, square type Bastard, second-cut, smooth, 2 kinds/length 250mm, 300mm(24 kinds/set)					1
-021	File brush	16 sets	Hard steel wire made brush					1
-022	Oil stone	4 pcs	Grit No. 320, 150mmLx 50mmW x 25mmT					1
-023	Seissors	3 sets	Round type, straight type, for cloth					1
-024	Chisel set	16 sets	Flat type edge 16mm cope type edge 7mm,					1
-025	Steel tool box	16 pcs	Box type for piping tool					1
-026	Vise for working table	16 sets	Jaw opening 150mm					1
-027	Oil syringe	2 pcs	2 Lit.					1
-028	Copper pipe cutter	16 pcs	Cutting capacity 3mmφ to 30mmφ					1

Classification: 2.Piping Course (2/5)

Item No.	Item	Quantity	Description	Dimension ( W x D x H mm)	Weight (Kg)	Utility	Remarks	ref No.
SW -2-201	Chain block	1 set	Capacity 1 ton					2
-202	Sling belt	4 pcs	Capacity 1.5tons Size 60mm x 2500mmL					2
-203	Wire rope	18 pcs ( 9pairs)	Rope size (6mm, 9mm, 12mm) x(2m, 4m, 6m)					2
-204	Shackle and bolt set	10 sets	10mm					2
-205	Hydraulic oil jack	each 2 pcs	1 ton, 2 tons					2
-206	Gasket cutting punch set	2 sets	Size 8mm to 25mm 16 kinds/set					2
-207	Crowbar	5 pcs	Overall length 950mm					2
-208	Screw clamp	8 sets	Opening 50mm, 150mm 2 kinds/set					2
-209	Hand lifter	1 set	Capacity 300kg, lift 1500mm	650 x 940 x 1820				2
-210	Hand truck	2 sets	Capacity 300kg					2
-211	Electric portable drill set	2 sets	Capacity 10mm, 400W, 133V with drill 3mm to 10mm					2
-212	Electric portable grinder	2 sets	Grinding stone dia. 125mm, 325W, 133V					2
-213	Electric disc grinder	2 sets	Grinding disc dia. 100mm, 500W, 133V					2
-214	Reel consent	5 sets	Current capacity 15A, No. of consent 4, 133V					2
-215	Carbide rotary bur	2 sets	8 burs/set					2
-216	Abrasive rotary stone	2 sets	9 stones/set					2
-217	Bolt clipper	2 sets	Cutting capacity 19mm					2
-218	Torque wrench set	each 3 sets	Capacity 60kgf.cm, 1300kgf.cm					2
-219	Cast iron anvil	2 pcs	30kg type					2
-220	Pipe vise with tripod	3 sets	Chucking capacity 10mm to 102mm					2
-221	Pipe dies set	3 sets	Thread size F1/4" x 19 to F1-1/4 x 11 6 kinds/set					2
-222	Hole saw cutter	2 sets	Saw capacity 16mm to 30mm 3 kinds/set					2
-223	Pipe bender (Manual)	5 pcs	Applied dimension 1-1/2"					2
-224	Blacksmith's hammer	3 pcs	Nominal weight 7.2 Kg					2

Classification: 2. Piping Course (3/5)

Item No.	Item	Quantity	Description	Dimension (W x D x H mm)	Weight (Kg)	Utility	Remarks	Ref No.
SW-2-301	Dial height gauge	3 sets	Range of measurement 300mm					3
-302	Dial gauge	5 sets	Graduation 0.01mm range 10mm					3
-303	Dial gauge magnetic base	5 sets	Base dimension 50mmW x 60mmH					3
-305	Outside micrometer	5 sets	Range 0mm to 300mm Graduation 0.01mm					3
-306	Inside micrometer	5 sets	Range 50mm to 200mm Graduation 0.01mm					3
-307	Vernier caliper	5 sets	Range 0mm to 300mm Graduation 0.05mm					3
-308	Steel rule	5 sets	Length 300mm, 600mm, 1000mm					3
-309	Measuring rule	2 pcs	Measuring length 50m					3
-310	Convex rule	16 pcs	Length 2000mm					3
-311	Thickness gauge	5 pcs	Range 0.01mm to 1.00mm, 19 leaves					3
-312	Screw pitch gauge	5 pcs	Range 0.25mm to 2.50mm 28 gauges					3
-313	Angle gauge	5 pcs	Range 1° to 45° 18 gauges					3
-314	Square	2 sets	Dimension 200mm x 115mm					3
-315	Level	2 pcs	Dimension 300mm x 24mm					3
-316	Straight edge	2 pcs	Overall length 500mm					3
-317	Cast iron V block	6 sets	One 90°-V-flute block (100mmW, 200mmH each 2) x 3					3
-318	Outside calipers	5 pcs	Capacity 200mm					3
-319	Inside calipers	5 pcs	Capacity 200mm					3
-320	Surface gauge	3 sets	Height of pole 200mm, base size 55mmW x 35mmH					3
-321	Levelling jacks	9 pcs	Max. lift 25mm					3
-322	Drill point gauge	1 pcs	Angle 120°					3
-323	Plumb bob	5 pcs	Weight 250gs nylon thread 20m					3
-324	Surface plate	3 sets	1000mmL x 1000mmW x 100mmH	1000 x 1000 x 700	240			3

Classification: 2.Piping Course (4/5)

Item No.	Item	Quantity	Description	Dimension ( W x D x H mm)	Weight (Kg)	Utility	Remarks	ref No.
SW -2-390	Transit	1 set	Scope x 27, Angle 1°8', Min. measuring distance 2m					4
-395	Tube cleaner	2 sets	Air driven tube I.D. 19mm, air consumption 6kg/cm2G	x 0.24m3 W/accessories	10	6kg/cm2G 0.24m3/min.	*	5
-396	Hydraulic pipe bender	1 set	Bending capacity 114.3mmø x 4.5mt W/accessories	1300 x 1150 x 360	170		*	6
-400	A.C. Arc welder	5 sets	Rated input 41KVA, rated current 500A, W/accessories	460 x 680 x 760	172	230Vx41x5KVA *		-
-405	Inert-gas arc welding machine	1 set	Rated input 41KVA, Rated current 500A W/accessories	550 x 780 x 1260	344	230Vx41KVA		8
-410	Oxy-acetylene welding & cutting equipment	5 sets	Gas welding torch 5 tips, Gas cutting torch 3 tips. Regulator, carts, hose each 10m, W/accessories					9
-415	Welding rod driver	1 set	Operating temp. Max. 300°C	400 x 680 x 685				11C
-420	Plastic welder	2 sets	Air press. & Volume 0.37kg/cm2G x 80L./Min. W/accessories	350 x 210 x 240	16	60MMx133V		11
-421	Hydraulic pressure test equipment	1 set	Max. test pressure 200kg/cm2G, W/accessories	344 x 284 x 80	17			-
-422	Valve test rig	1 set	Rating 150psi to 1500 psi W/accessories	1500 x 500 x 800	235	N2 1500kg/cm2G		12
	Equipment for inspection							
-425-1	Sound level meter	1 set	Level range 35dB(A) to 130dB(A)					15
-425-2	Gas detector	3 sets	Range 0% to 20%, 0% to 100% LEL. for inflammable gas					15
-425-3	Stroboscope	1 set	Range 100 r.p.m. to 12000 r.p.m.					15
-425-4	Tachometer	2 sets	Range 100 r.p.m. to 19,999 r.p.m.					15
-425-5	Vibrometer	3 sets	Range 10u mmp-p, 30u mmp-p, 100u mmp-p, 300u mmp-p, 1000u mmp-p					15
-425-6	Surface thermometer	1 set	Range -200°C to 1200°C					15
	Non-destructive inspection							
-450-1	Penetrant check	5 Doz.	Penetrant, developer, remover					15
-450-2	Magnetic flaw detector	1 set	Yoke-type, power source 133V W/accessories					16
-450-3	Digital thickness meter	2 sets	Measuring range 1.2mm to 200mm W/accessories					16
-450-4	Ultrasonic flaw detector	1 set	Testing range 10mm to 10m (in steel) W/accessories				*	16
-500	Shore hardness tester	1 set	Dial indicating, W/accessories	150 x 162 x 360	16		*	17
-505	Universal testing machine	1 set	6 stages (0.5t f, 1t f, 2t f, 5t f, 10t f, 20t f) W/accessories	2200 x 700 x 2100	1400	0.75KWx230V		13
-510	Sharp's impact tester	1 set	Capacity 30kgf-m W/accessories	2100 x 640 x 2050	300			15
-515	Swamp set	1 set	For corrosion examination					20
-530	Standard file for scratch hardness test	1 set	General use, for rockwell "C"					21
-550	Test piece for spark test	1 set	Group "D". 15 kinds/set					2-
-600	Lighting equipment for X-ray film	1 set	Film size 14" x 17"		7			23

Classification: 2.Piping Course (5/5)

Item No.	Item	Quantity	Description	Dimension ( W x D x H mm)	Weight (Kg)	Utility	Remarks	ref No.
SU -2-610	Bench drill	1 set	Drilling capacity 13mm Dia. (in steel) W/accessories	410 x 260 x 955	75	0.2KWx230V		24
-620	Duplex head grinder	2 sets	Grinding wheel Dia. 255mmφ	470 x 300 x 346	41	1.05KWx230V		25
-630	Drilling machine	1 set	Drilling capacity 25mmφ (in steel) W/accessories	440 x 700 x 1475	140	1.5KWx230V		26
-635	Shaper	1 set	Stroke 550mm W/accessories	1005 x 1900 x 1570	1600	1.8KWx230V		27
-636	High speed cut-off machine	1 set	Vice stroke 216mm W/accessories		16	1.45KWx230V		28
-640	Pipe threading machine	1 set	Threading capacity 1/4" to 1-1/2", W/accessories	410 x 280 x 310	28	400Wx133V		29
-641	Electric holst	1 set	Capacity 1 ton		73	1.7KWx230V		30
-645	Working table	8 sets	2 drawer type	1800 x 900 x 700	60			31
-650	Piping material	1 Lot	Pipes, pipe fittings, steel plates, packings, etc.					32
-701	Expansion joint	1 Lot	Flexible tube 6B x 1500mmL, Expansion joint 12B x 40mmL					33
-750	Steam trap	1 Lot	Float type, Max. Press. 16kg/cm <sup>2</sup> G Max. temp. 300°C Disk type, Max. Press. 10kg/cm <sup>2</sup> G Max. temp. 300°C					34
-755	Steam ejector	3 sets	Bi-metal type, Max. Press. 45kg/cm <sup>2</sup> G Max. temp. 450°C Motive steam 3.5kg/cm <sup>2</sup> G x 41kg/h					35
-761	Punching machine	1 set	Punching : 26φ x 6t, Press Capacity 20ton	600 x 1200 x 1600	700	1.5KWx230V		36
-762	Puncher	1 set	Portable hydraulic Max 18φ x 3.2t		10.5			37



Classification: Electrical course (1/7)

Item No.	Item	Quantity	Description	Dimension (W x D x H mm)	Weight (Kg)	Utility	Remarks	ref No.
SW -3-001	Exercise switchboard (High tension)	1 set	6KV, 25MVA incoming	1200 x 2300 x 2300	1200			1
-002	Exercise switchboard (Low tension)	2 sets	Power lighting	1500 x 400 x 2000	300			2
-003	Induction regulator	12 sets	Box type slide type	400 x 300 x 800	30		*	3
-004	Rectifier	1 set	Silicon charger	500 x 300 x 600	50	133Vx3KVA	*	4
-005	Motor for assembling practice	10 sets	Induction type 400W	240 x 380 x 230	15			5
-006	Motor	20 sets	Various 200W-2.2KW	200 x 300 x 200	31 x 4	230Vx6.6KW		6
-007	Transformer	14 sets	Pole TR., insulation TR.	500 x 400 x 620	60			7
-008	Star-delta experiment circuit	3 sets	For 230V 37KW motor	600 x 190 x 600	30			8
-009	Loading resistor	2 sets	Starting controller	500 x 300 x 900	60			9
-010	Lighting fixture	6 sets	For 133V fixture	200 x 1000 x 500	100 x 1	133Vx0.4KVA		10
-011	Relay	11 sets	Protection relay	200 x 200 x 300				11
-012	Sequence circuit panel	3 sets	Noncontact circuit	600 x 190 x 600	30			12
-013	Testing generator	1 set	AC.M-DC.G 2KW	500 x 1000 x 500	100	230Vx3.7KW		13
-014	Experiment motor generator	1 set	DC.M-DC.G 2KW	500 x 1000 x 500	100	133Vx2.2KW	*	14
-015	Control circuit board	3 sets	Reversible circuit	600 x 200 x 600	30			15
-016	Control instrument board	1 set	Fixed equipment	1000 x 300 x 600	30			16



## Training Equipment List

Classification: Electrical course (3/7)

Item No.	Item	Quantity	Description	Dimension ( W x D x H mm)	Weight (Kg)	Utility	Remarks	ref No.
SW -3-501	Insulation test equipment	1 set	0-50KV Manual type	650 x 1000 x 1500	500	230Vx5KVA	*	21
-502	Relay tester	1 set	Universal type	800 x 600 x 400	50		*	22
-503	Insulation tester (Low voltage)	3 sets	Transistor type					23
-504	Insulation tester (High voltage)	3 set	Hand-driven type					23
-505	Earth tester	2 sets	Portable convenient set					23
-506	Clip-on ammeter	3 sets	AC.DC. 50ma-20A					23
-507	Circuit tester	16 sets	Portable DC.AC.-V, $\Omega$ , DC.-A					23
-508	Leakage current tester	3 sets	Portable DC. AC-mA					23
-509	Luxmeter	2 sets	Portable 0-3000 Lux.					23
-510	Cycle counter	2 sets	Portable 20-80 Hz					23
-511	Pocket tacometer (Contact rubber )	3 sets	Touchless type 19,999rpm					23
-512	Pocket tacometer(phot probe)	3 sets	Touchless type 19,999rpm					23
-513	Line current tester	2 sets	Moving iron 0.5-5A					23
-514	Portable AC. Voltmeter	10 sets	Moving iron 150-750V					23
-515	Portable AC. volt-ammeter	5 sets	Moving iron 800V, 30A					23
-516	Portable AC. ammeter	8 sets	Moving iron 100ma-50A					23
-517	Portable watt meter	3 sets	1 & 3 phase 1-25A					23
-518	Portable power factor meter	2 sets	1 & 3 phase 400V					23
-519	Portable frequency meter	2 sets	45-65Hz 200/400V					23
-520	Electrostatic voltmeter	1 set	AC.DC. 15/30KV					23
-521	Galvanometer	2 sets	0.9/VA 540/4V					23
-522	Portable wheatstone bridge	2 sets	0.01 $\Omega$ -10M $\Omega$					23
-523	Portable double bridge	2 sets	0.1m $\Omega$ -110 $\Omega$					23
-524	Decade resistance box	2 sets	0.1-1,111.21 $\Omega$					23
-525	Slide resistor	7 sets	4.7 $\Omega$ /6 $\Omega$ -4,800 $\Omega$ / 0.18A					23
-526	Pocket thermometer	2 sets	(-)-50-150 $^{\circ}$ c Digital					23
-527	Voltage detector	20 sets	Neone grove 600V/7000V					23
-528	Oscilloscope	1 set	20MHz 2Ch. 1mV				*	23
-529	Universal tester	2 sets	Transistorized					23
-530	Phase rotation detector	3 sets	AC. 450V 3phase 60HZ					23

Training Equipment List

Classification: Electrical course (4/7)

Item No.	Item	Quantity	Description	Dimension (W x D x H mm)	Weight (Kg)	Utility	Remarks	ref NO.
SV -3-531	Stop watch	3 sets	0.2 sec./60sec./60min.					23

## Classification: Electrical course (5/7)

Item No.	Item	Quantity	Description	Dimension ( W x D x H mm)	Weight (Kg)	Utility	Remarks	ref No.
SW-3-701	Knife	16 sets	Heavy-duty					24
-702	Screw driver for electrician	40 pcs	75mm-290mm					24
-703	Pipe cutter	2 pcs	Bandy type cap. 1/8-1-1/4 inch					24
-704	Wire stripper	5 pcs	1.3 - 3.2mm wire					24
-705	Joint plier	5 pcs	1.25 - 8mm <sup>2</sup>					24
-706	Knife switch	10 pcs	600V 2p, 3p 100A					24
-707	Combination screw driver sets	16 sets	Exchange screw drive set					24
-708	Electrician's tool bag	5 sets	Band & sack					24
-709	Safety step	2 sets	Collapsible 900/1800mm					24
-710	Portable tool sets	16 sets	Consist of 13 pcs.					24
-711	Side cutting plier	16 sets	Overall length 175mm					24
-712	Screw driver	16 pcs	Phillips & Slotted					24
-713	Water pump plier	16 pcs	Overall length 250mm					24
-714	Gasoline torch	2 pcs	Tank capacity 500cc					24
-715	Cable cutter	3 sets	Cable size max. 50mm					24
-716	45° double offset wrench set	4 sets	M10 x 12 - M41 x 46					24
-717	Double open ended wrench set	4 sets	M6 - M41					24
-718	Adjustable pipe wrench set	4 sets	250mm, 450mm					24
-719	Hydraulic cable joint tool	3 sets	8-36mm <sup>2</sup>					24
-720	Ring type shock spanner set	4 sets	M36-M50					24
-721	Vernier caliper	4 sets	Range 0-300mm graduation 0.01mm					24
-722	Inside & outside micrometer	4 sets	Range 50-200mm/0-300mm					24
-723	Wire gauge	4 pcs	Size No. 0-36					24
-724	Engineer's files set	1 set	24 kinds					24
-725	Machinist hammer	5 pcs	Max. weight 300g					24
-726	Stock & round dies set	3 sets	M3 x 0.5 - M20 x 2.5					24
-727	Back saw frame & blade set	3 sets	Saw blade 300mm					24
-728	Hand tap set	3 sets	M3 x 0.5 - M20 x 2.5					24
-729	Washing pen	3 pcs	Steel 300W x 400L x 60mm					24
-730	Bearing puller set	1 sets	Dim. Max. 150mm					24

Classification: Electrical course (6/7)

Item No	Item	Quantity	Description	Dimension (W x D x H mm)	Weight (Kg)	Utility	Remarks	ref No
SW -J-731	Vise for working table	3 pcs	Jaw opening 150mm					24
-732	Hexagonal bar wrench set	3 sets	1.2 - 14mm					24
-733	Socket wrench set	3 sets	M8-M27					24
-734	Center punch set	3 sets	Max. size 10mm					24
-735	Scissor	1 set	3 kinds					24
-736	Torque wrench set	1 set	60kgf. cm 1300kgf.cm					24
-737	Chisel set	3 sets	Flat & cope type					24
-738	Measuring tape	3 sets	Steel 50m					24
-739	Thickness gauge	4 sets	Range 0.03-1.00mm					24
-740	Cleaner	2 sets	AC 133V 1phase 800W					24
-741	Dial gauge	4 sets	Graduation 0.01mm range 10mm				133Vx1.6KW	24
-742	Level	2 sets	Dimension 300 x 24mm					24
-743	Reel concent	3 sets	133V 20A contents					24
-744	Grease gun	3 sets	Cap. 200cc					24
-745	Steel tool box	4 sets	3 layer type					24
-746	Parts box	4 sets	500W x 900L x 150D mm					24
-747	Band lifter	1 set	Cap. 300Kg lift 1500mm					24
-748	Electric drill set	3 sets	133V 400W capacity 10mm					24
-749	Charger	2 sets	Power AC-133V Out.pnt.DC. 0-10V				133Vx1.2KW	24
-750	Chain block	2 sets	Capacity 1 ton	500 x 500 x 700	30		133Vx0.2KVA	24
-751	Band truck	2 sets	Cart load capacity 300Kg					24
								24
								24
								24
								24
								24
								24
								24
								24
								24
								24
								24
								24
								24
								24
								24
								24
								24
								24
								24
								24
								24
								24
								24
								24
								24

Classification : Electrical course (7/7)

Item No.	Item	Quantity	Description	Dimension (W x D x H mm)	Weight (kg)	Utility	Remarks	Ref. No.
SW-3-901	Work bench	5 Sets	Wooden load weight 1000Kg	1800x900x800				25
-903	Toolcabinet	4 Sets	Steel cabinet	500 x 500 x 900				26
-905	Drafting set	6 Sets	Desk & Machine	1500x1500x1500				26
-906	Materials for Practice	1 lot						27
-911	Engine generator	3 Sets	Portable gasoline engine generator 60HZ, 230V x 22A, single phase	628 x 413 x 535	61			28

Training Equipment List

Classification : Instrumentation Course (1/9)

Item No.	Item	Quantity	Description	Dimension (V x D x H mm)	Weight (kg)	Utility	Remarks	Ref. No.
SW-4-100	Instrument Calibration Desk	Each 2 sets	(1) For Pneumatic Inst.(YEM6923) with Pressure gauge, circuit breaker & etc. (2) For Electric Inst., with Voltage meter, Universal tester Transformer, DC Power Supply	1525x760x1040	70kg x2	133Vx0.8KVA Air 2kg/cm <sup>2</sup> 0.2Nm <sup>3</sup> /h		1
-101	Tool Set	Each 5 sets	For Mechanical Inst.(6925-1000) For Electrical Inst.(6925-2000) For Instrument Adjustment(6925-6000) Auxiliaries for Soldering Iron	250x250x30 250x250x30 130x100x18 300x300x100	2 x 5 2 x 5 1 x 5 2 x 5			2
-102	Air Connection Set	2 sets	For Receivers, controllers & etc.	170x200x55	4 x 2			2
-103	Measuring Tool	Each 2	Dial gage, Micrometer screw gage vernior caliper, tape measure	300x300x100 10x100x20 200x70x20 50g	1kg x2 0.5kg x2 0.5kg x2 0.3kg x2			3
-104	Balance	1 set	Graduated cylinder 500 milliliter & Table balance 100g	50x50x300 270x180x105	0.4x2 0.6			4
-105	Wet and Dry Bulb Thermometer	1 set	Classelers type -10° - 50°C	210 x 60 x 330	1.3			5
-106	Thermometers	1 set	Mercury 0-360°C, Alcohol -5-105°C Standard thermometers 0-100°C	6x6x300 6x6x350 6x6x350	10			5
-107	Optical Pyrometer	1 set	Graduation;Low 700-1,500°C, High 1,200-2,000°C	152x234x280	1.7			5
-108	Aneroid Altimeter	1 set	930-1,070 mb	180x70x180	0.9			6



Classification : Instrumentation Course (2/9)

Item No.	Item	Quantity	Description	Dimension (W x D x H mm)	Weight (kg)	Utility	Remarks	Ref. No.
SW-4-113	Dead Weight Tester	1 set	Bench type 100 kg / cm <sup>2</sup>	350x420x266	30		*	9
-114	Liquid Column Manometer	Each ?	Water: 0-2,000 mm Hg: 0-1,000 mmHg Single tube, Double scale	2310x280x240 1310x280x240	138			7
-115	Digital Manometer	2 sets	Portable 4 range, 5 digit, Measuring 11,900 (YEW 2654-23)	149x233x414	9.3kg <sup>x</sup>			7
-116	Manual Pressure Test Pump	2 sets	0-1,000 mmHg (YEW6919)	300x200x200	5kg x2			10
-117	Portable Pressure Standard	1 set	0-2,000 kg/cm <sup>2</sup> (YEW2656-23)	149x233x414	9.3kg			8
-118	Spring Balance and Stopwatch	Each 1	Spring Balance 80N, 10 kg Stopwatch: Analogue, digital each 1	250 x 300 100x100x100	2 kg			4
-119	Orifice Calculation Scale	1 set	Calculation: B.Re, JIS, ISO, DIN, ASME	200x100x30	1 kg			31
-130	DC Voltage/Current Standard	3 sets	Portable type 10mV/100V, 1mA/100mA (YEW2224)	210x230x100	4kg x3			11
-131	Electric Instrument	3 sets	Portable type AC, DC Ammeter, Voltmeter Pointer Galvanometer, Universal Circuit Tester	200x200x250 180x180x100 100x150x35	36 1.8 1			12
-133	Digital Voltmeter	3 sets	Hybrid Multimeter (YEW2441)	197x87x25	0.37kg <sup>x3</sup>			13
-135	Variable Register	1 set	Plug type resistor 0-1,111.0	200x200x125	1.5			14
-136	Wheatstone Bridge	2 sets	1-10 Mohm, Built-in Galvanometer	200x240x130	2 x2			15

Classification : Instrumentation Course (3/9)

Item No.	Item	Quantity	Description	Dimension (H x D x H mm)	Weight (kg)	Utility	Remarks	Ref. No.
SW-4-137	Decade Resistance Box	2 sets	Range: 0 - 111.1110 Mohm	491x110x140	5 x 2			14
-139	Insulation Tester	Each 1	Battery type 500V/100Mohm, Hand Drive type 500V/1,000Mohm, Insulation polyester.	174x100x88 184x112x105 120x185x125	0.8kg 1.3kg 5			16
-140	Oscilloscope	3 sets	DC -250kHz Braun tube 130B.E	750x410x220H	6.2kg			17
-141	Synchroscope	3 sets	Multi-function type 6" 500kHz	218x308x460	18 x2			18
-161	Auto-Transformer	1 set	Input 133V 60Hz 1φ output 0-160V 30A	250x230x250	6.5	AC133V 3KVA		19
-162	DC Power Supply Unit	2 set	0-30V, 0-7A, Indicate: 0-32V, 0-7.5A	200x363x200	13.6kg			20
-171	Cold Junction Bottle	4 pcs.	Ice-bottle type with 4 kind thermocouples	200x200x250	2.5 x4			21
-173	Refrigerator	1 set	Defroster switched on & off	438x501x775	21kg	AC133V 33W		22
-174	Standard Water Bath	1 set	Room Control 10-80°C on-off control	700x450x490	32	AC133V 2KW Water 100 liter		23
-175	Furnace for Thermocouple Calibration	1 set	Tube furnace 50φ x 300L Max. 1,000°C Resistance bulb: pt 100 ohm R.K. Thermocouple: CA, IC, CC, CFC	350x300x560	15kg	AC133V 16KW		24

Classification : Instrumentation Course (4/9)

Item No.	Item	Quantity	Description	Dimension (H x D x H mm)	Weight (kg)	Utility	Remarks	Ref. No.
SN-4-20)	Pressure Gauge	Each 2 sets	Bourdon tube, Diaphragm seal, Bellow type	A, B 120φx53x160H C 110φx200H D 110x150 E 130x100	42 x2 x2			25
-211	Temperature Measuring Element	Each 1 set	(1) Thermowell: 300L x 22φ PT 3/4" (2) Resistance bulb Pt 100ohm (3) Thermocouple CA, IC, CC & CRC	130x130x300 700x100x100 500x100x100	5kg 3kg 4kg			26
-212	Temp., Press. & Level Switch	Each 1 set	Temp. switch 0-300°C, Pressure switch 0-10kg/cm <sup>2</sup> , Level switch 0-1m	200x200x350 164x59x129 155x153x1280	3kg 2kg 6kg			27
-213	pH Meter	Each 1 set	(1) pH Transmitter 0-14pH inline (YEW PH6H) (2) Glass Electrode pH meter desk type	289x190x302 160x140x65	5 1.2			28
-214	Conductivity Meter	1 set	Immersion type transmitter 0-100 μS/cm	560x500x1,000	20			29
-215	Explosive Gas Detector	1 set	Range 0-20/0-100% (LEL)	150x125x85	5			30
-216	Orifice Flow Meter	Each 1 set	Orifice Assembly, Edge & Quadrant	125x100x300 125x100x300	8kg 10kg			31
-217	Area Flowmeter	Each 1 set	Variable area type 4m <sup>3</sup> /h x 1", Flapper type 5m <sup>3</sup> /h x 1"	250x250x250	4kg			31
-218	Positive Displacement Type Flowmeter	1 set	Cut model(oval type)2"	250x155x310	7kg			31
-219	Turbine Flowmeter	1 set	Cut model(Nitto KA75)3"	250x200x300	10kg			31
-220	Salt Density Meter	1 set	Range 0-30% Portable type	110x170x65	0.55kg			32

Classification : Instrumentation Course (5/9)

Item No.	Item	Quantity	Description	Dimension (W x D x H mm)	Weight (kg)	Utility	Remarks	Ref. No.
SW-4-251	Pneumatic Transmitter	Each 2 sets	(1) Temp. Transmitter: 0-100°C (2) Pressure Transmitter: 0-10 kg/cm <sup>2</sup> (3) Pneumatic Differential Transmitter: 0-125/0-635 mmAq (4) Pneumatic Differential Transmitter Flange type 0-1,000 mmAq (5) Displacement type level: 0-1 m	500x300x300 260x130x110	5 x 2 5.3 x 2			33
-252	Electronic Transmitter	Each 2 sets	(1) Press. Transmitter: 0-10kg/cm <sup>2</sup> out 4-20mA (2) Differential Transmitter: 0-500/0-3,500 mmH <sub>2</sub> O out 4-20mA	260x130x380	15 x 2			33
-253	Recorder	Each 1 set	(1) Pneumatic 2 pen (2) Electronic 6 point dot printing (3) Electric trend recorder	160x660x210 190x350x190 240x650x200	6 16 10			34
-254	Analogue Controller and Kit	Each 2 sets	(1) Pneumatic Panel Mounted, Cascade type (2) Electronic Panel Mounted, Cascade type (3) Pneumatic Filled Mounted 0.2-1K(0-100%)	90x660x210 90x660x210 400x150x340	11 x 2 10 x 2 10 x 2			35
-255	Auxiliary Panel Inst.	Each 1 set	(1) Pneumatic Manual Control Station (2) Electric Manual Control Station (3) Pneumatic to Electronic Converter (4) Electronic to Pneumatic Converter (5) Alarm Set Station (Pneumatic) (6) Alarm Set Station (Electronic) (7) Ratio Station (8) Pneumatic Analogue Computer	90x660x210 90x660x210 50x140x130 215x163x178 90x660x210 50x360x180 90x660x210 90x124x213	11 10 1 5 11 2 11 2			36

Classification : Instrumentation Course(6/9)

Item No.	Item	Quantity	Description	Dimension (W x D x H mm)	Weight (kg)	Utility	Remarks	Ref. No.
SW-4-271	Nozzle & Flapper	3 sets	Nozzle 2pcs. Flapper displacement Ind. 0-2mm, 1/1,000mm	270x300x160	5kg x3		*	37
-272	Process Simulator	2 sets	Pneumatic type: Chamber & Restriction	300x300x200	5 x2			38
-273	Circuit Tester Kit	15 sets	Multi-purpose training kit, disassembly	90x135x37	0.4 x15			39
-274	Synchroscope Trainer	1 set	IWATSU ITF-04 or equivalent	440x280x350	13kg			40
-275	Electronic Circuit Training Kit	4 sets	National AVCC DT-III or equivalent	500x400x200	3kg x3		*	41
-276	Relay Sequencer Training Kit	2 sets	Portable type with AV software	500x300x120	9.6kgx3		*	42
-278	DC Source Circuit Exp. APP.	1 set	Shimazu Rika KPD-5 or equivalent	465x350x140	10kg			43
-279	Motor Training Kit	Each 1	(1) Assembling kit 200W 1φ (2) Cut model 200W 3φ with transformer on the base plate	250x200x200 400x250x250	8 10			44
-280	Electronic Element Basic Training Kit	2 sets	Speaker, DC ammeter, DC voltmeter	410x295x105 198x190x103	5kg x2			43
-281	Transistor Amp. Trainer	2 sets	Work of transistor and diodes, etc.	600x500x200	4kg			43

Classification :- Instrumentation Course (I/II)

Item No.	Item	Quantity	Description	Dimension (W x D x H mm)	Weight (kg)	Utility	Remarks	Ref. No.
SW-4-301	Air Compressor System	1 set	Air compressor (oil-free, 400 liter/min. 8.5kw) Air cooled Defumidifier: 70°C-40°C Air dryer	1,420x420x980 396x300x545 396x253x545	185 18 30	3φ 230V 4kW		45
-311	Process Feedback Control Unit	each 1	(1) Pneumatic process control model equipment (Model: C-FLPT-1002M) (2) Electric process control model equipment (Model: P-FLPT-11 32N)	900x800x1,750 900x800x1,750	670 670	3φ 230V 4kW	*	46
-313	Comparative Flow Measurement Apparatus	1	Venturi meter 26x16mm Orifice meter 16.4x26mm Ro ta meter 2,000 liter/h Manometer 800 mm	1,800x500x1,700	200	Air 2k 10 liter/h Water 2m <sup>3</sup> /h		47
-401	Electric Power Distribution Board	1	230 V 3P 60A 4 circuits 133 V 2P 60A 10 circuits	500x800x200	50			48
-402	Cable Winder	2	1φ133 V, 2.0mm <sup>2</sup> x 2c, 30m x 15A	400x200	10			49
-403	Hand Drill	1	1φ133 V, 400W 1,250rpm Drill 13φ	300x100x60	4			50
-404	Drilling Machine	1	Capacity 13mm, 670, 1,250, 2,120 rpm	290x450x940	70	133V, 0.2kW		50
-405	Bench Grinder	1	Dia. 150 <sup>OD</sup> x 12.7 <sup>P</sup> 3,000rpm	350x200x250	15	0.2kW, 133V		51
-406	Welding Machine	1	Primary 230V, Second 2 (36)V, 110A	190x200x280	17	230V, 4kVA		52
-407	Tools for Wiring Work	Each 2	Round nose chain plier, cable joint plier, electronic soldering iron, gasoline torch lump cable cutter, wire stripper, cable stripper,	470x230x160	10			53

Classification : Instrumentation Course (8/9)

Item No.	Item	Quantity	Description	Dimension (W x D x H mm)	Weight (kg)	Utility	Remarks	Ref. No.
SW-4-407	(Cont.)		oil pressure calbe joint plier, conduit tube bender, diagonal cutting plier, driver set, knife, tool box					
-408	Tools for Copper Tube Work	Each 2	Tube cutter, tube bender	300x300x100	4			53
-411	Tool Set for Instrument	1	Wrenches, socket wrench set, pliers, drivers hammer, total 78 pcs.	1,100x106x602	43			53
-412	Tap & Round Dies Sets	Each 1	5 sets, each 8-9 pcs.	Each 430x200x30	27			53
-413	Surface Plates	Each 1	Precision surface plate Granite surface plate	500x500x145 500x500x100	110 68			54
-414	Bench Vise	4 2	(1) Bench vise jaw: 130 x 99mm (2) Adjustable bench vise jaw: 40mm	130x100 350x100x100	22 1.7			55
-415	Pipe Vise	1	For conduit & gas pipes 10-77φ	300φx1,100H	14.5			55
-416	Pipe Cutter & Screw Cutting Lathe	Each 1	Pipe cutter 1/8"-2" Screw cutting lathe 1/2"-2"	300x100x150 1,000x200x150	2 5			53
-417	Tool Box	5	Steel type with 2 trays & handles Fax	530x215x190	3			53
-431	Control Valve Test Stand	2	Valve 1-3B, JIS 10K, ANSI 150LB, 300LB, 600LB 700x500x1,500		30 x2	Alf 2Nm3/h 0-6kg/cm2 0-2kg/cm2		56
-432	Control Valves	Each 1	(1) Glove type 1 1/2B, 10K (2) Angle type 2B, 10K	300φx750mm 330φx800mm	45 50			57

Classification : Instrumentation Course (9/9)

Item No.	Item	Quantity	Description	Dimension (W x D x H mm)	Weight (kg)	Utility	Remarks	Ref. No.
SW-4-432	(Cont.)		(3) Butterfly type 3B, 10K (4) Ball type 2B, 10K with positioner	460x330x680mm 178x150x300	40 17			57
-433	Valve Positioner	Each 2	(1) P/P positioner, input 0.2-1.0kg/cm <sup>2</sup> G (2) E/P positioner, input 10-50mA DC	170x160x170 250x160x180	3 5			58
-434	Cut Model of Control Valve	Each 1	(1) Diaphragm motor, grove type 1 1/2B, 10K (2) Electric motor, grove type 1 1/2B, 10K	300øx750mm 330øx780mm	45 60			59
-435	3 Valve Manifold	4	Materials for pneumatic & electric piping, tubing & wiring; each 30 items		100			60
-441	Precision Pressure Gauge	2	0-2 kg/cm <sup>2</sup> , 300ø	360x250x460	3x2			61
-442	Hydraulic Pressure Test Pump	1	Max. pressure 70K, tank capacity 22 liter	800x250x500	36			10
-443	Chain Block	1	Capacity 1t, lift 2.5m	300x300x300	23kg			62
-444	Cart	1	Loading area 1,200x750mm, capacity 50kg	1,200x750x850	20			63
-445	Electric Cleaner	1	Vacuum 1,600mmHg, Air 3.6m <sup>3</sup> /min.	352x416x475	14	133V 1kW		64
-446	Transportable Working Table	1	Capacity 1t (NZ330)	1,000x600x700	60			65
-447	Materials for Practice	1 lot						66



Classification : OPERATION COURSE (1/5)

Item No.	Item	Quantity	Description	Dimension ( W x D x H mm )	Weight (Kg)	Utility	Remarks	Ref. No.
SW-5-100	Mini Plant-A (Vacuum Evaporation Unit)	1	Evaporator, Receiver, Condenser, Reboiler, Steam ejector, Package boiler, Air compressor, Cooling tower, Pump, Control panel, Instrumentation	Main Unit 4,500 x 2,200 Boiler & Compressor 2,000 x 1,500		230V 38.6k	*	1
-200	Mini Plant-B (Air Scrubbing Unit)	1	Packed tower, Receivers, Coolers, Air compressor, Prefilter, Air tank, Cooling tower, Pumps, Silencer, Control panel, Instrumentation	5,000 x 4,500		230V 38.97k	*	2
SW-6-100	Process Control Model	1	Control panel with instrument (Flow, Temperature, Pressure, and Level), Water tank, Pump, Control valve, Air compressor	1,000x3,000x2,200	Empty: 750	133V1ø 5KVA	*	3
SW-7-100	Steam Turbine Generator Experiment Unit	1	Steam boiler, Steam turbine, Generator, Load resister, Atomspheric condenser, Softener, Fuel tank, and Others	min. 7,000 x 4,000 x 2,500	Empty 3,000	230V 4KVA	*	4

Training Equipment List

Page : 29

Classification : OPERATION COURSE ( 2/5 )

Item No.	Item	Quantity	Description	Dimension ( W x D x H mm )	Weight (kg)	Utility	Remarks	Ref. No.
SM-7-200	Hydraulics Bench	1 unit		1600 x 800 x 1300	550 (5M3)	230Vx0.75KW	*	5
	(1) Weigh Tank		85 liter					
	(2) Circulation Water Pump		80kg/min, 12mAQ					
	(3) Drive Motor for (2)		750W					
	(4) Sump Tank		Weigh balance (max): 100kg					
			Pressure guage: 0-2kg/cm2G					
			Thermometer: 0-100°C					
	ACTUAL EQUIPMENT FOR PRACTICE AND HAND TOOLS							
-310	Centrifugal Pump	1	Horizontal, 1.4 M <sup>3</sup> /Min..20M	.950 x 460 x 460				6
-320	Reciprocating Pump	1	Metering Pump					6
-330	Valves	each 1	GATE, Glove, Cock, Check, Ball (3B)					6
-340	Hand Tools	3 set	Spanner, Wrench, Plier, Screw driver and others					6

Classification : OPERATION COURSE (3/5 )

Item No.	Item	Quantity	Description	Dimension (W x D x H mm)	Weight (kg)	Utility	Remarks	Ref. No.
	EXPERIMENT APPARATUS FOR FUNDAMENTAL CHEMISTRY AND PHYSICS							
SW-7401	Metal Cubes and Cylinders Set	2	Fe, Cu, Al each 4 piece	70 x 300 x 300	5			7
-402	Apparatus to Demonstrate Law of Gas	2	Type: BC-10, 0-650mm graduated	700 x 10 x 10	4			7
-403	Pressure Gauge	2	Type: CT-1, Bourdon's tube	300 x 60 x 80	2			7
-404	Heat Expansion Demonstrator	2	Type: MO-10, Metal ball and holes	40 x 100 x 400	2			7
-405	Bimetal Demonstration	2	Electric contacts	90 x 80 x 80	1			7
-406	Thermometer without Scale	10		10 x 40 x 300	0.5			7
-407	Thermometer	each 20	Alcohol and Hg					
-408	Metal Acid Reaction Apparatus	3	Type: W-1, W-shaped tube	600 x 200 x 200	7			7
-409	Electrolysis and Iron Experiment Apparatus	2	Type: DB-10, Electrode and test tube	200 x 120 x 100	5			7
-410	Metal Erosion Experiment Kit	1	Polarizing microscope	400 x 500 x 500	15			7
-411	Pensky & Martin's Flash Point Tester	1	For high temperature experiment	400 x 300 x 400	5			7
-412	Evacuation Experiment Set	1	Rotary vacuum pump, Evacuation plate, Manometer	600 x 600 x 900	30			7
-413	Glass Apparatus and Others	1	Glass apparatus, Stand, Burner					

Classification : OPERATION COURSE ( 4/5 )

Item No.	Item	Quantity	Description	Dimension ( W x D x H mm )	Weight (Kg)	Utility	Remarks	Ref. No.
	EXPERIMENT APPARATUS FOR FUNDAMENTAL ELECTRICITY							
-501	Electrical Network Experiment Apparatus	2	Type: ESC-10, Various blocks	100 x 500 x 600	6			8
-502	Ohm's Law Demonstration Apparatus	2	Type: OF-3, Resistors and power source	150 x 800 x 900	10			8
-503	Electromagnetic Phenomena Demonstration Apparatus	2	Type: EF-4, Transformer and coils	200 x 600 x 600	15			8
-504	Electromagnetic Force Demonstrator	2	Type: DI-1, Maximum current: DC5A	150 x 200 x 200	3			8
-505	Electrostatics Experiment Kit	2	Leaf Electroscope	250 x 500 x 500	5			8
-506	Single Phase Induction Motor	1	Type: IH-50N					
	MEASURING INSTRUMENT							
-601	Conductivity Meter	3	Type: AOC-10					9
-602	Handy pH Meter	3	Type: HS-20					9
-603	Glass Electrode pH Meter	3						9
	EQUIPMENT FOR SAFETY PRACTICE							
-701	Safety Equipment	1 set	Dust protection mask, Dust protection glasses, Face shield, Ear muffs, Anti-solvent rubber gloves					10

Classification : OPERATION COURSE ( 5/5 )

Item No.	Item	Quantity	Description	Dimension ( W x D x H mm )	Weight (kg)	Utility	Remarks	Ref. No.
SW-7-702	Combustible Gas & Oxygen Detector	1 set	O <sub>2</sub> , CH <sub>4</sub> , CO					10
-703	Multi-Gas Detector	1 set	Drager type, Detecting type					10
-704	Portable Oxygen Indicator	2 set						10
	CUT MODEL FOR DEMONSTRATION							
-801	Valve	each 1	Gate, Glove, Check, Ball, and Relief valve	1-1/2"				11
-802	Steam Devices	each 1	Below, Disc, and Thermodynamic steam trap	3/4"				11
-803	Pump	each 1	Centrifugal (Nozzle 1-1/2"), Recipro (Nozzle 1")					11
-901	Experiment Table for Students	4				113Vx1.6KVA		12
-902	Experiment Table for Instructor	1				113Vx0.2KVA		12
-903	Sink	1	with drying oven					12
-904	Cabinet	4	for apparatus and reagents					12
-905	Spare Parts and Others	1 lot						12

Training Equipment List

Classification :- AUDIO VISUAL AIDS (1/1)

Item No.	Item	Quantity	Description	Dimension (W x D x H mm)	Weight (kg)	Utility	Remarks	Ref. No.
SW-8-010	Movie Projector	2	16m/m with O & M talkie with Portable Box Type	220 x 354 x 265	14			1
011	Screen	2	1,500 x 1,500 Portable Stand Type	600 x 400 x 1,020	16			
020	Slide Projector	2 sets	AUTOMATIC Remo-Con. Type, with Portable Type Stand	700 x 700 x 755 700 x 700 x 87	33 18			2
021	Slide Corder	1	Model B01 Voice & Signal Record	300 x 275 x 115	5			2
030	Over Head Projector	8 sets	HR-2,450, with Portable Box Type Stand	352 x 332 x 766 500 x 510 x 765	11 20			4
031	Screen	8	1,500 x 1,500 Spring Roller Type	1,500 x 1,500	15			4
032	T/P Producing Equipment with Materials	1 2 x 2 8 8 40	Color Fax Model 45 TP Film TP Air Kit 100 Sheets A-4 Tp Sheet 6 Colors TP Pen	495 x 394 x 200	16			5
040	TV Monitor	8 sets	26" CRT PAL SECAM NTSC	83 x 52 x 62	44			6
041	Video Cassette Recorder	8 sets	3/4" U-Vision PAL SECAM NTSC with VTRC-100E Stand	621 x 472 x 238 855 x 640 x 995	34 57			7
050	Language Laboratory System	1 set	1 Teacher console with CRT display & 9 Booth consoles for 18 students					8
090	Spare Parts and Others	1 lot						

ANNEX-3.

Specification Sheets for Special Training Equipment

<Classification>	< Sheet No.>
1. Mechanical.....	SW-1-400/420/435/440/460/475
2. Piping.....	SW-2-395/396/400/450-(4)/500
3. Electrical .....	SW-3-003/004/014/301/501/502/528
4. Instrumentation .....	SW-4--113/253-(3)/271/275/276/ 311-(7)
5. Operation.....	SW-5-100/200 SW-6-100 SW-7-100/200

SPECIFICATION		SPEC. SHEET NO.
Item No.	Description	Quantity
SW-1-40C	HYDRAULIC PRESSURE TEST EQUIPMENT	1 set

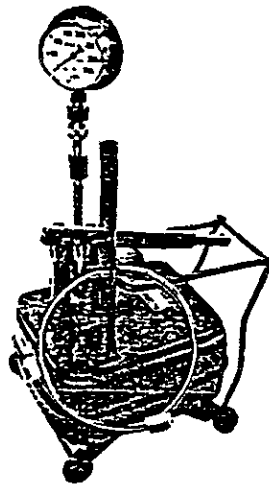
HYDRAULIC PRESSURE TEST EQUIPMENT shall have the same or equivalent specification as mentioned below;

1. Specification

- 1) Working pressure : Max. press. 200kg/cm<sup>2</sup>G
- 2) Discharge : 8cc/stroke
- 3) Plunger Dia. : 16mm $\phi$
- 4) Stroke : 40mm
- 5) Dimension : 344mmL x 284mmW x 680mmH
- 6) Weight : 17Kg

2. Accessories

- 1) High pressure connecting rubber hose with coupling : 1 pc
- 2) Auxiliary handle bar : 1 pc



4									
3									JOB NO.
2									DOC. NO.
1									DATE MADE CHKD APPR
REV	DESCRIPTION	DATE	BY	CHKD	APPR				

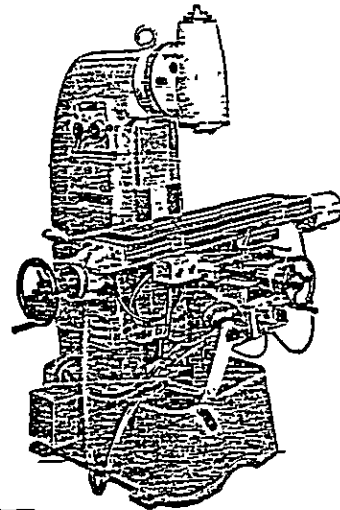


SPECIFICATION		SPEC. SHEET NO.
Item No.	Description	Quantity
SW-1-420	MILLING MACHINE	1 set

MILLING MACHINE shall have the same or equivalent specification as mentioned below;

1 Specification

- 1) Type : Vertical milling
- 2) Table size : 950mmW x 210mmD
- 3) Distance from table to spindle center : 0mm to 400mm
- 4) Cutting speed : 29mm to 1587mm (3 x 6 steps)
- 5) Spindle speed : 150 r.p.m. to 2000 r.p.m.
- 6) Main motor : 1.5KW x 4P  
Rated voltage of motor : AC 230 V x 3ph x 60Hz
- 7) Floor space : 1500mm x 2200mm
- 8) Weight : 1100Kg



4									
3									JOB NO.
2									DOC. NO.
1									DATE MADE CHKO APPR
REV	DESCRIPTION	DATE	BY	CHKO	APPR				

SPECIFICATION		SPEC. SHEET NO.
Item No.	Description	Quantity
SW-1-435	SHAPER	1 set

SHAPER \_\_\_\_\_ shall have the same or equivalent specification as mentioned below;

### 1. Specification

- |  |                            |
|--|----------------------------|
| 1) Max. stroke                               | : 550mm                    |
| 2) Rated voltage                             | : 230 V x 3ph x 60Hz       |
| 3) No. of strokes                            | : 6 steps 15 to 85         |
| 4) Motor                                     | : 1.8KW x 4p x 3ph x 60Hz  |
| 5) Max. work width                           | : 600mm                    |
| 6) Feed speed                                | : 7steps 0.15 to 1.05      |
| 7) Vertical travel distance of the table     | : 240mm                    |
| 8) Vertical travel distance of the test past | : 170mm                    |
| 9) Max. distance between the table and ram   | : 350mm                    |
| 10) Dimension of the table                   | : 420mmL x 355mmW x 370mmH |
| 11) Weight                                   | : Approx. 1600Kg           |

### 2. Accessories

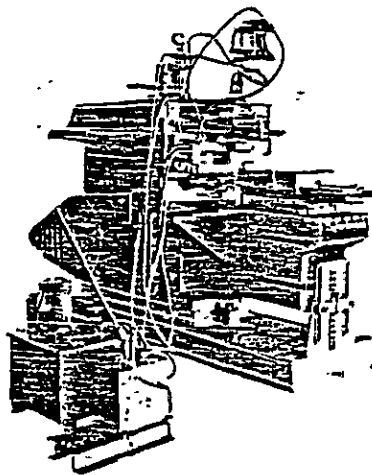
- |                      |         |
|----------------------|---------|
| 1) Tool and tool box | : 1 set |
| 2) Cutting tool      | : 5 pcs |

4									
3									JOB NO.
2									DOC. NO.
1									DATE MADE CHKD APPR
REV	DESCRIPTION	DATE	BY	CHKD	APPR				

SPECIFICATION

SPEC. SHEET NO.

SW-1-435



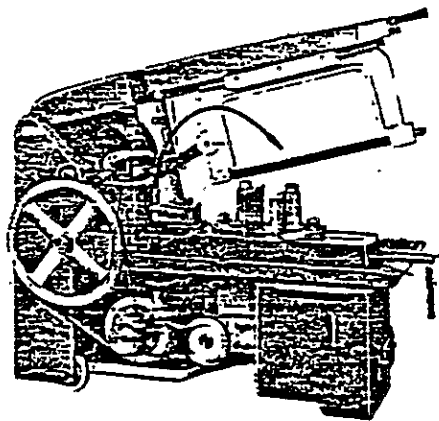
JOB NO.
DOC. NO.

SPECIFICATION		SPEC. SHEET NO.
Item No.	Description	Quantity
SW-1-440	HACK-SAWING MACHINE	1 set

HACK-SAWING MACHINE \_\_\_\_\_ shall have the same  
or equivalent specification as mentioned below;

1 Specification

- 1) Cutting capacity : 180mm $\phi$
- 2) Angle cutting : 45°
- 3) Stroke : 110mm~160mm
- 4) Power required : 400W x 133V x 1 $\phi$
- 5) Floor space : 1000mm x 370mm
- 6) Height of machine : 680mm
- 7) Weight : 170Kg



4								
3								JOB NO.
2								DOC. NO.
1								DATE MADE CHKD APPR
REV	DESCRIPTION	DATE	BY	CHKD	APPR			

SPECIFICATION		SPEC. SHEET NO.
Item No.	Description	Quantity
SW-1 - 460	RECIPROCATING AIR COMPRESSOR	1 set

RECIPROCATING AIR COMPRESSOR shall have the same or equivalent specification as mentioned below;

1. Specification

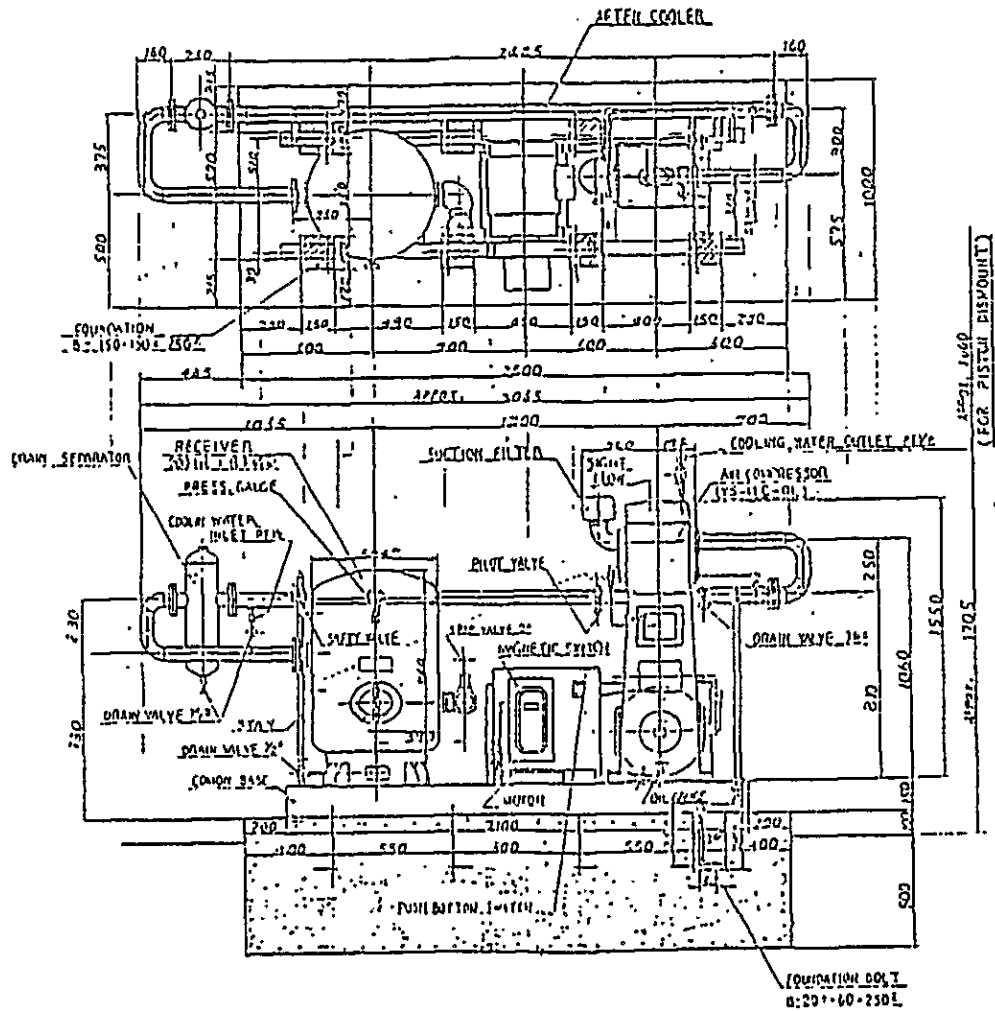
- 1) Type : Water cooled oil free air compressor
- 2) Capacity : 0.9m<sup>3</sup>/min.
- 3) Pressure : 7Kg/cm<sup>2</sup>G
- 4) Motor : 11KW x 4P x 230 V x 3φ x 60Hz  
Totally-enclosed-fan cooled indoor type

2. Accessories

- 1) Air filter
- 2) Unloader
- 3) Aftercooler & drain separator
- 4) Receiver
- 5) Control panel

4									
3									JOB NO.
2									DCC. NO.
1									DATE MADE CHKD APPR
REV	DESCRIPTION	DATE	BY	CHKD	APPR				

SPECIFICATION	SPEC. SHEET NO.
	SW-1-460



3. Net weight : 750Kg

JOB NO.
DOC. NO.

SPECIFICATION		SPEC. SHEET NO.
		S W-1-475
Item No.	Description	Quantity
SW-1-475	TURBO BLOWER	1 set

TURBO BLOWER \_\_\_\_\_ shall have the same  
or equivalent specification as mentioned below;

1. Specification

- 1) Capacity : 20m<sup>3</sup>/min, 80mm Aq
- 2) Revolution : 2600 r.p.m.
- 3) Material : Mild steel
- 4) Motor : 0.75KW x 4P x 230 V x 3φ x 60Hz

2. Accessories

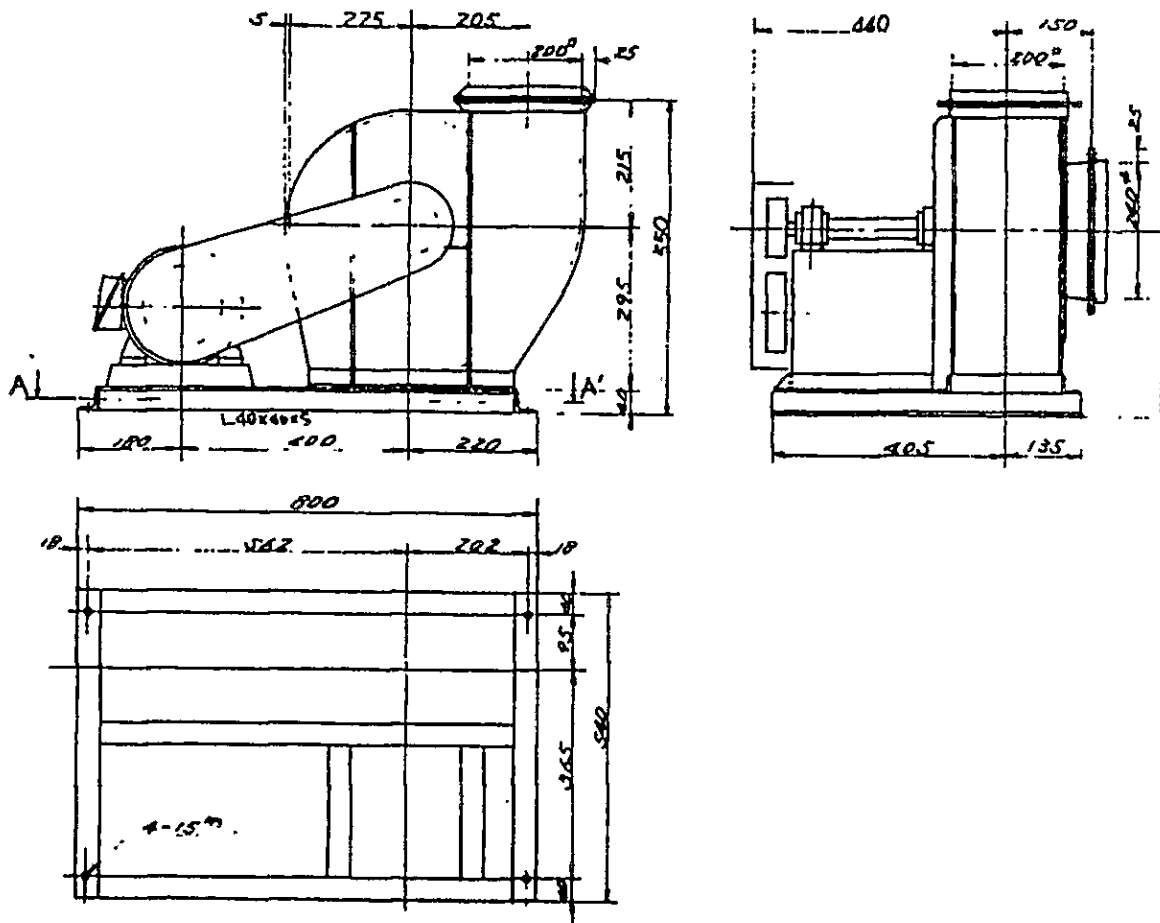
- 1) Spare parts : V-belt & Bearing (each 1 set)

4									
3								JOB NO.	
2								DCC. NO.	
1						DATE	MADE	CHKD	APPR
REV	DESCRIPTION	DATE	BY	CHKD	APPR				

SPECIFICATION

SPEC. SHEET NO.

S W-1-475



JOB NO.
DOC. NO.



SPECIFICATION		SPEC. SHEET NO.
Item No.	Description	Quantity
SW-2-395	TUBE CLEANER	2 sets

TUBE CLEANER

\_\_\_\_\_ shall have the same  
or equivalent specification as mentioned below;

1. Specification

- 1) Type : Air driven tube cleaner
- 2) Tube I.D. : 19mm
- 3) Min. Curve radius : 230mm
- 4) Air consumption :  $6\text{Kg/cm}^2\text{G} \times 0.24\text{m}^3/\text{min.}$
- 5) Hose size : 1/4"

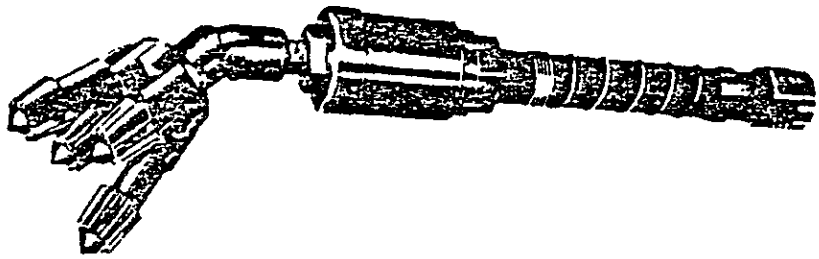
1 set Tube Cleaner consists of

Cleaner motor	1 pc.
Spare blade	1 set
Universal joint	1 pc.
Dill head	1 pc.
Cutter head	3 pcs
Air valve	1 pc.
Hose shank	1 pc.
Hose socket nut	1 pc.
Rotor wrench	1 pc.
Adjustable wrench	1 pc.
Tool box	1 set
Air hose 20M	1 pc.

- 6) Approx. weight : 10Kg

4								
3								JOB NO.
2								DCC NO.
1								DATE MADE CHKD APPR
REV	DESCRIPTION	DATE	BY	CHKD	APPR			

SPECIFICATION	SPEC. SHEET NO.
	SW-2-395



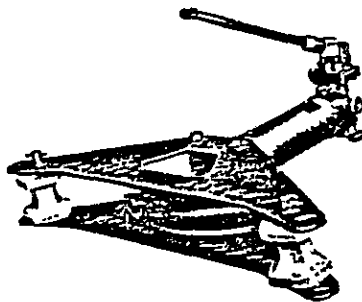
JOB NO.
DCC. NO.

SPECIFICATION		SPEC. SHEET NO.
Item No.	Description	Quantity
SW-2-396	HYDRAULIC PIPE BENDER	1 set

HYDRAULIC PIPE BENDER shall have the same or equivalent specification as mentioned below;

1. Specification

- 1) Type : Hydraulic manual operation, portable
- 2) Capacity : Max. 114.3mm $\phi$  x 4.5mmt
- 3) Bending angle : 0-90° (One shot)
- 4) Pump type : Plunger pump
- 5) Dimensions : 1,150mmL x 1,300mmW x 360mmH
- 6) Weight : 170Kg



4									
3								JOB NO.	
2								DOC. NO.	
1								DATE	MADE
REV	DESCRIPTION	DATE	BY	CHKD	APPR			CHKD	APPR

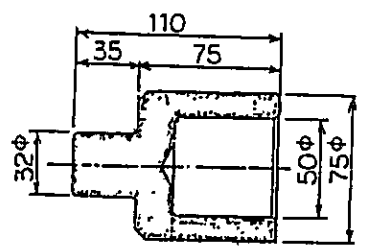
SPECIFICATION	SPEC. SHEET NO.
	SW-2-396

2. Accessories

- 1) Center former : 10 pcs. ( each 1 pc. )  
 For SGP 1/2, 3/4, 1, 1-1/4, 1-1/2,  
 2, 2-1/2, 3, 3-1/2 & 4"



- 2) Distance piece : 1 pc.



- 3) Tool and tool bag
  - Single open ended wrench, 41 mm : 1 pc
  - Tool bag : 1 pc
  - Materials : Vinyl
  - Size : 450 x 200 x 10 mm

JOB NO.
DOC. NO.

SPECIFICATION		SPEC. SHEET NO.
Item No.	Description	Quantity
SW-2-400	AC ARC WELDER SET	5 sets

**AC ARC WELDER SET**

\_\_\_\_\_ shall have the same  
or equivalent specification as mentioned below;

**1. Specification**

- Model : AD-STX
- Rated secondary current : 500A
- Rated primary KVA : 41KVA
- Input KW : 22.2KW
- Secondary current adj. scope : 35A to 500A
- Rated duty : 60%
- Secondary max. No load voltage : 95V
- Rated load voltage : 30V
- Diameter of Electlode : 2.0mm $\phi$  to 8.0mm $\phi$
- Dimension : 550mmW x 780mmL x 1260mmH
- Weight : 344Kg

**2. Standard Accessory**

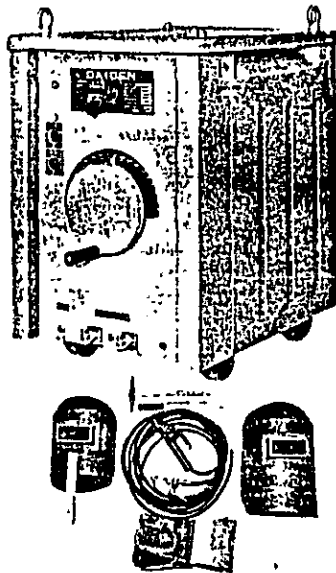
- 1) 5m cords with safety holder .....1
- 2) 3m earth cords with .....1
- 3) Hand shield .....1
- 4) Helmet .....1
- 5) Glove .....1

4								
3								JOB NO.
2								DCC NO.
1								DATE MADE CHKO APPR.
REV	DESCRIPTION	DATE	BY	CHKD	APPR			

SPECIFICATION	SPEC. SHEET NO.
	SW-2-400

- 6) Chipping hammer..... 1
- 7) Wire brush ..... 1

Std. Power Source : Single phase 230V,50Hz or 60Hz



JOB NO.
JOC. NO.

SPECIFICATION		SPEC. SHEET NO.
Item No.	Description	Quantity
SW-2-45C-4	ULTRASONIC FLAW DETECTOR	1 set

ULTRASONIC FLAW DETECTOR shall have the same  
or equivalent specification as mentioned below;

1. Specification

- 1) Type : Portable ultrasonic flaw detector
- 2) Model : SM90
- 3) Frequency range : 0.4-10MHZ
- 4) Testing range : 10mm - 10m (for steel)
- 5) Gain control : 90dB in steps by switching;  
20dB x 2, 2dB x 20, 0.5dB x 20  
Continuous fine control for  
0-1.5dB by variable adjuster
- 6) Ambient temp : -10-+45°C
- 7) Power supply for charger : AC 133 v x 60Hz
- 8) Dimension : 160H x 235W x 335D mm
- 9) Weight : 5.8Kg

2. Accessories

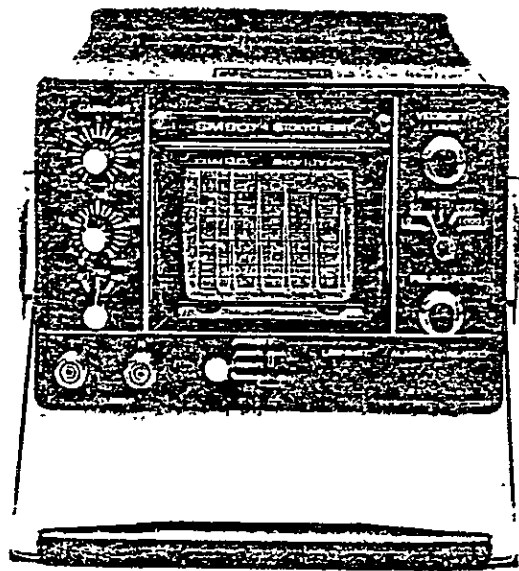
- 1) Standard accessories
- 2) Probe : 2Z10N-H W/holder 1 pc.
- 3) Probe : 2Z20N-H W/holder 1 pc.
- 4) Probe : 2Z10 x 10A45
- 5) Probe : 2Z10 x 10A60

4									
3									JOB NO.
2									DCC. NO.
1									DATE MADE CHKD APPR
REV	DESCRIPTION	DATE	BY	CHKD	APPR				

SPECIFICATION

SPEC. SHEET NO.

SW-2-450-4



JOB NO.
DCC. NO.



SPECIFICATION		SPEC. SHEET NO.
		..
Item No.	Description	Quantity
SW-2-500	SHORE HARDNESS TESTER	1 set

SHORE HARDNESS TESTER \_\_\_\_\_ shall have the same  
or equivalent specification as mentioned below;

1. Specification

- 1) Type : Dial indicating Shore hardness tester
- 2) Model : SH-D
- 3) Height : 360mm
- 4) Base space : 150 x 162mm
- 5) Vertical gap : 80mm
- 6) Weight : 16Kg

2. Accessories

- 1) Standard test piece : 2 pcs
- 2) Vanvil : 1 pc.
- 3) Batt gauge : 1 pc.
- 4) Cleaning bar : 1 pc.
- 5) Conversion table : 1 pc.
- 6) Strage case : 1 pc.



Type SH-D

4									
3						JOB NO.			
2						DOC. NO.			
1						DATE	MADE	CHKD	APPR
REV	DESCRIPTION	DATE	BY	CHKD	APPR				

SPECIFICATION		SPEC. SHEET NO.
Item No.	Description	Quantity
SW-3-003	INDUCTION REGULATOR	12sets

INDUCTION REGULATOR shall have the same or equivalent specification as mentioned below;

1. Specification

1) Induction regulator (A)

- (1) Type : Manual operation, Box type
- (2) Input : AC 230V 1phase 60HZ
- (3) Output : AC 0-260V
- (4) Capacity : 5KVA
- (5) Q'ty : 2 sets
- (6) Other : Maker standard

2) Induction regulator (B)

- (1) Type : Manual operation Box type
- (2) Input : AC 230V 3phase 60HZ
- (3) Output : AC 0-460V 3phase
- (4) Capacity : 10KVA
- (5) Q'ty : 2 sets
- (6) Other : Maker standard

3) Slide voltage regulator (A)

- (1) Type : Portable
- (2) Input : AC 230V 1 phase 60HZ
- (3) Output : AC 0-260V
- (4) Capacity : 3KVA
- (5) Q'ty : 5sets
- (6) Other : Maker standard

4									
3								JOB NO.	
2								DCC NO.	
1						DATE	MADE	CHKD	APPR
REV	DESCRIPTION	DATE	BY	CHKD	APPR				

SPECIFICATION	SPEC. SHEET NO.
	SW -3-003

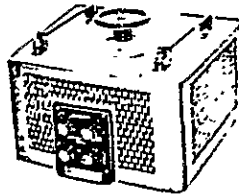
- 4) Slide voltage regulator (B)
- (1) Type : Portable
  - (2) Input : AC 230V 1phase 60HZ
  - (3) Output : AC 0-460V
  - (4) Capacity : 5KVA
  - (5) Q'ty : 3 sets
  - (6) Other : Maker standard

2. Accessory

Maker standard

SAMPLE

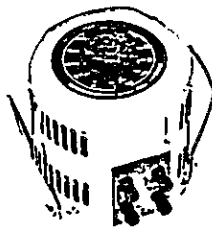
1)



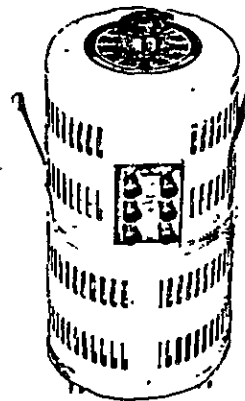
2)



3)



4)



JOB NO.

DCC. NO.

SPECIFICATION		SPEC. SHEET NO.
Item No.	Description	Quantity
SW -3-004	RECTIFIER	1set

RECTIFIER shall have the same or equivalent specification as mentioned below;

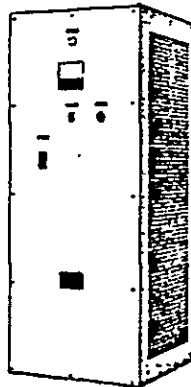
1. Specification

- 1) Type : Self standing type, silicon charger
- 2) Power supply : AC 230V 1phase 60HZ
- 3) Output : DC 0-110V/DC 0-20A
- 4) Instrument : Ammeter  
Voltmeter  
Setting and control nobe
- 5) Other : Maker standard

2. Accessory

- 1) Charging cable with clip
- 2) Maker standard

SAMPLE



4									
3									JOB NO.
2									DCC. NO.
1									DATE
REV	DESCRIPTION	DATE	BY	CHKD	APPR				

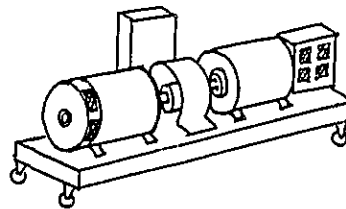
SPECIFICATION		SPEC. SHEET NO.
Item No.	Description	Quantity
SW-3-014	EXPERIMENT MOTOR GENERATOR	1 set

EXPERIMENT MOTOR GENERATOR shall have the same or equivalent specification as mentioned below;

1. Specification

- 1) Type : DC. Motor-DC. Generator package type  
Commonbed with caster
- 2) DC. Motor
  - (1) Type : Shunt type
  - (2) Power supply : DC. 100V
  - (3) Capacity : 2.2KW
  - (4) Other : Maker standard
- 3) DC. Generator
  - (1) Type : Shunt generator
  - (2) Output : DC. 100V
  - (3) Capacity : 2KW
  - (4) Other : Maker standard
- 4) DC. Power supply panel for DC. motor  
Apply to No. 2) DC. motor
- 5) Control panel for DC. generator  
Apply to No. 3) DC. Generator

SAMPLE



2. Accessory

- 1) Maker's recommended spare parts
- 2) Maker standard

4							
3						JOB NO.	
2						DOC. NO.	
1						DATE	PAGE
REV	DESCRIPTION	DATE	BY	CHKD	APPR		

SPECIFICATION		SPEC. SHEET NO.
Item No.	Description	Quantity
SW - 3-301	CUTAWAY MOTOR	3 sets

CUTAWAY MOTOR shall have the same or equivalent specification as mentioned below;

1. Specification

1) Split-phase starting motor

- (1) Power source : AC 230V 1phase 60HZ
- (2) Output : 200W
- (3) Poles : 4P
- (4) Q'ty : 1 set
- (5) Other : Maker standard

2) Commutator type motor

- (1) Power source : AC 230V 1phase 60HZ
- (2) Output : 35W
- (3) Poles : 4P
- (4) Q'ty : 1 set
- (5) Other : Maker standard

3) Squirrel-cage motor

- (1) Power : AC 230V 3phase 60HZ
- (2) Output : 750W
- (3) Poles : 4P
- (4) Q'ty : 1 set
- (5) Other : Maker standard

4									
3									JOB NO.
2									DCC NO.
1									DATE MADE CHKC APPR
REV	DESCRIPTION	DATE	BY	CHKC	APPR				

## SPECIFICATION

SPEC. SHEET NO.

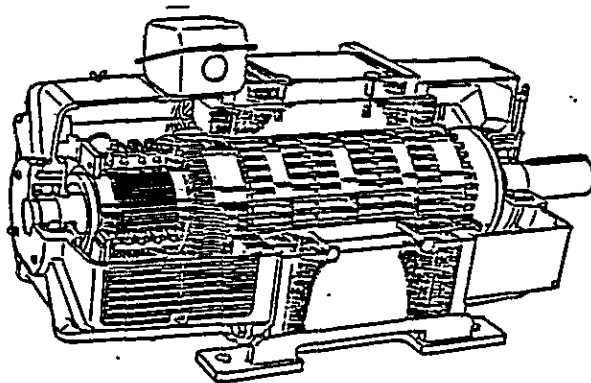
SW -3-301

2. Requirement

A quarter part of these motors shall be cutted enable to see the internal structure and parts.

3. Accessory

- 1) Training manual and related documents shall be attached.
- 2) Set base
- 3) Maker's recommendation

SAMPLE

JOB NO.

DOC. NO.

SPECIFICATION		SPEC. SHEET NO.
Item No.	Description	Quantity
SW - 3-501	INSULATION TEST EQUIPMENT	1 set

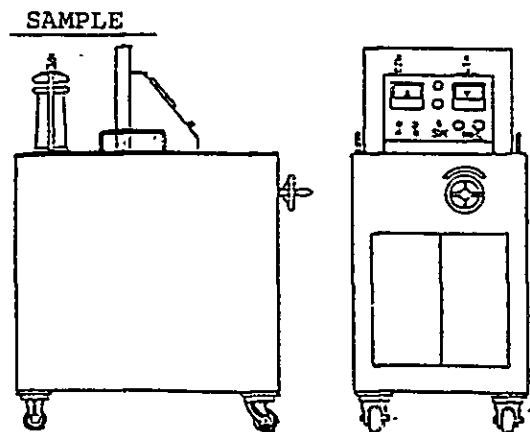
INSULATION TEST EQUIPMENT shall have the same or equivalent specification as mentioned below;

**1. Specification**

- 1) Type : Manual type, Box with caster
- 2) Power supply : AC 230V 1phase 60HZ
- 3) Output : 0-50KV
- 4) Capacity : 5KVA
- 5) Protective device : Circuit breaker, lamp, Buzer
- 6) Instrument : AC voltmeter 240V/60KV  
: AC ammeter 5A/30A
- 7) Dimension : 600(W) x 1000(D) x 1500(H) mm
- 8) Weight : 500Kg
- 9) Other : Maker standard

**2. Accessory**

- 1) Oil cup with electrode
- 2) Pointed electrode
- 3) Spherical electrode
- 4) Power supply cable and earth wire
- 5) Maker standard



4						
3					LOG NO.	
2					DOC. NO.	
1					DATE	MADE
REV	DESCRIPTION	DATE	BY	CHKD	APPR.	



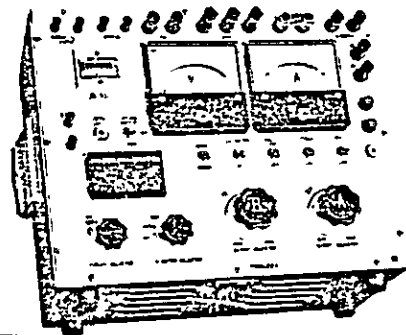
SPECIFICATION		SPEC. SHEET NO.
Item No.	Description	Quantity
SW-3-502	RELAY TESTER	1 set

RELAY TESTER \_\_\_\_\_ shall have the same  
or equivalent specification as mentioned below;

1. Specification

- 1) type : Universal type
- 2) Power source : AC 133V 1phase 60HZ  
As the other power source voltage, the power transformer is supplied as optional accessory.
- 3) Output (low-voltage/large-current)
  - (1) Current Range : 0-50 A
  - (2) Current/voltage : 50A\*, 15A, 5A/20V, 1.5A, 0.5A/40V  
\*30min. duty
- 4) Output (high-voltage/small-current)
  - (1) Voltage adjusting circuit : 0-300V/0.5A  
0-150V/1A  
0- 75V/2A
  - (2) Current adjusting circuit : 0-0.5A  
0-5A  
0-10A
- 5) Other : Maker standard

SAMPLE



4						
3					JCS NO.	
2					JCC NO.	
1					DATE	MADE
RS-1	DESCRIPTION	DATE	BY	CHECK	APPROV	

SPECIFICATION		SPEC. SHEET NO.
Item No.	Description	Quantity
SW-3-528	OSCILLOSCOPE	1 set

OSCILLOSCOPE \_\_\_\_\_ shall have the same  
or equivalent specification as mentioned below;

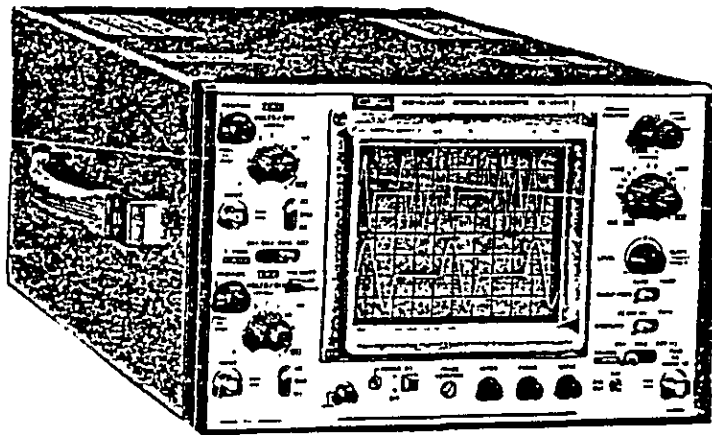
1. Specification

- 1) Type : Cathod Ray type instrument
- 2) Supply power : AC 133V 60HZ
- 3) Model : CH1, CH2, DUAL. X-Y
- 4) Bandwidth : DC (AC 2HZ)-20MHZ
- 5) Magnifier : 1mV/DIV
- 6) Other : Maker standard

2. Accessory

- 1) Lead wire
- 2) Probe
- 3) Maker standard

SAMPLE



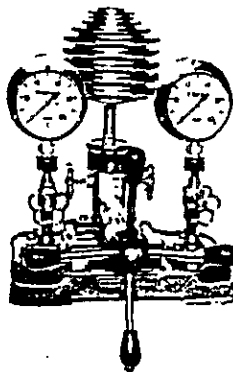
4							
3						JOS NO.	
2						ACC. NO.	
1						DATE MADE	CHKO 1962
RE-	DESCRIPTION	DATE	BY	CHKO	1962		

SPECIFICATION		SPEC. SHEET NO.
Item No.	Description	Quantity
SW-4-113	DEAD WEIGHT TESTER	EACH 1 Set

DEAD WEIGHT TESTER \_\_\_\_\_ shall have the same  
or equivalent specification as mentioned below;

Specification

1. Manufacturer : Nagano KeikiCo., Japan
2. Model No. : PD12-100
3. Technical data
  - Type : Bench type
  - Range : min. 1 kg/cm<sup>2</sup>  
          max. 100 kg/cm<sup>2</sup>
  - Ram : Sectional area 1/4 cm<sup>2</sup>  
          Diameter 5.642 mm
  - Lubricant : Machine oil (equivalent to JISK2238, ISOVG7)
  - Dimensions : 350(W) x 420(D) x 266(H) mm



4									
3									JOB NO.
2									DCC. NO.
1									DATE MADE CKD APPR.
REV	DESCRIPTION	DATE	BY	CHKD	APPR.				

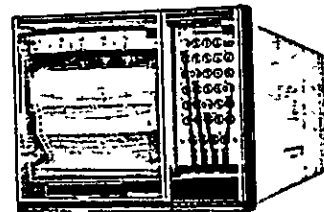
SPECIFICATION		SPEC. SHEET NO.
		S W-4-253(3)
Item No.	Description	Quantity
SW-4-253(3)	ELECTRONIC TREND RECORDER	1 set

Technical data

- 1) Type : Electronic, 3 pens of 20 points trend record.
- 2) Model : YEW-4230/4251 or equivalent
- 3) Specification :
  - . Input signal : No. 1 point 0~100 mV  
No. 2, 3 point 4~20 mA or 1~5 V DC
  - . Graduation : 0~100 Linear
  - . Power Supply : AC 133 V 60 Hz (or DC 24V)
  - . Others : Manufacturer's standard
- 4) System components
  - (1) Recorder
  - (2) Jack panel
  - (3) Mounting Kit
  - (4) Pulse Generator (if req'd)
  - (5) Power Distributer ( " )
  - (6) Standard Accessories

Scope of purchase

- 1) Original items each 1 set
- 2) Spare parts
- 3) Technical documents



4									
3						JOB NO.			
2						DCC. NO.			
1						DATE	MADE	CHKD	APPR
REV	DESCRIPTION	DATE	BY	CHKD	APPR				

SPECIFICATION		SPEC. SHEET NO.
		SW-4-271
Item No.	Description	Quantity
SW-4-271	NOZZLE & FLAPPER ASSEMBLY	3 sets

**■ FEATURES**

- To obtain the various gains and linearity on the curves plotted air pressure (Output) and flapper-displacement (Input)
- Rapid change-over of nozzles and fixed restrictors for comparative test.
- Compact and free standing apparatus
- Only requires an air supply

**■ SPECIFICATIONS**

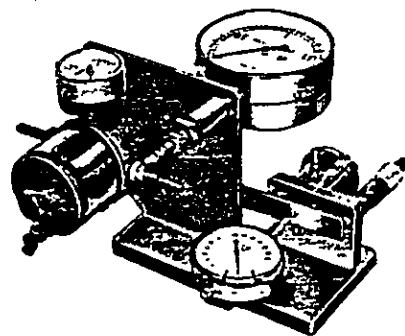
1. Nozzle & Flapper assembly
  - Nozzle (2 pcs) (D)
  - Fixed restrictor (2 pcs) (d)
  - Flapper moving setter (Input)
  - Flapper displacement indicator, 0~2mm,  $\frac{1}{1000}$  mm
  - Pressure gage (Output), 0~2kg/cm<sup>2</sup>G
2. Supply pressure reducing valve with filter and gage

**■ SERVICES REQUIRED**

Clean, dry air supply of at least 3kg/cm<sup>2</sup>G

**■ DIMENSIONS and WEIGHT**

NETT (approx.)	GROSS (approx.) Packed for export
Width 270mm	Volume 0.02m <sup>3</sup>
Depth 300mm	Weight 20kg
Height 160mm	



MODEL : NFST-1B

4									
3								JOB NO.	
2								DCC. NO.	
1						DATE	MADE	CHKD	APPR
REV	DESCRIPTION	DATE	BY	CHKD	APPR				

SPECIFICATION		SPEC. SHEET NO.
		SW-4-275
Item No.	Description	Quantity
SW-4-275	ELECTRONIC CIRCUIT TRAINING KITS	3 sets

#### Technical Data

This Training Kit shall satisfy following requirements, Vendor is requested to quote the same or equivalent equipment and attach his detail specification to the proposal.

#### 1) Specification

.Type : Portable with a attache case

.Power Supply : AC 133 V 60 Hz

.Built-in circuit element:

(following circuits or units are built-in for practices mentioned below)

- (1) Power Source ; +12 V, +5 V, -12 V
- (2) Input signal ; 0~20 VAC (1 terminal)  
Source 0~5.5 V DC (2 terminal)
- (3) Logic circuit; 3 boards with horizontal 30 holes (5 by 6) by 2 rows, four boards with vertical 5 holes by 35 rows, 1 DC relay and pulse transformer.
- (4) Electronic amplification circuit;  
1 half-wave rectifier and 1 full-wave rectifier in thyristor format, 1 solid-state relay and 2 power transistors
- (5) Load and indication ; 1 DC motor and 100 V incandescent lamp
- (6) Others ; 1 microvoltmeter and 1 minitester

#### 2) Contents of Practice (programmed study)

This kit shall help the trainee with a basic knowledge of electricity, e.g., Ohm's law, learn both basic and complex electronically controlled circuitry as following contents;

- (1) Electronic control and detector
- (2) Composition of electronic control and transistor
- (3) Voltage amplification
- (4) Power control
- (5) ON/OFF control and Schmidt trigger circuit
- (6) Thyristor and ON/OFF control
- (7) Phase control
- (8) Operational amplifier and comparing function
- (9) Operational amplifier and application
- (10) Applied circuit

4								
3								JOB NO.
2								DGC NO.
1								DATE MADE CKD APPR
REV	DESCRIPTION	DATE	BY	CHKD	APPR			

SPECIFICATION

SPEC. SHEET NO.

S W-4-275

3) Sample



JOB NO.

DOC. NO.

SPECIFICATION		SPEC. SHEET NO.	
		S W-4-276	
Item No.	Description	Quantity	
SW-4-276	RELAY SEQUENCE TRAINING KIT	3 sets	

\_\_\_\_\_ shall have the same or equivalent specification as mentioned below;

Specification

**FEATURES**

This kit consists of a video tape recorder system and some learning materials. The video tapes have two courses: course A and course B, each of them containing step 1 up to step 10. The problems are the easiest at the step 1 of the course A, then gradually increasing the difficulties consummate at the step 10 of the course B. Each course is provided with a subtext and circuit graphs, which serve themselves to students as submaterials for learning.

**SPECIFICATIONS**

1. Construction: carrying box of sheet metal
2. Dimension: 300mm x 500mm x 120mm
3. Weight: 9.6 kgs
4. Paint: baking finished paint of yellow
5. Accessory:
  - Pres-on terminal : 100 pcs
  - Ring mark : 50 sets
  - Wiring cord : 10 m
  - Fuse : 5A, 5 pcs
  - Video tape : 1 each of A & B course
  - Down transformer : 1 pc
6. Constituting parts
  - Braker : 1 pc
  - Fuse holder : 1 pc
  - Glass fuse : 1 pc
  - Relay : 4 pcs

4									
3									JOB NO.
2									DOC. NO.
1									DATE MADE CHKD APPR
REV	DESCRIPTION	DATE	BY	CHKD	APPR				



## SPECIFICATION

SPEC. SHEET NO.

S W-4-276

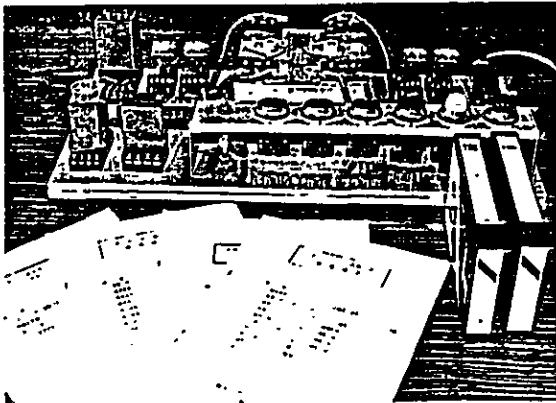
Relay socket : 4 pcs  
 Terminal base : 2 pcs  
 Terminal base : 2 pcs  
 Terminal base : 1 pc  
 Micro switch : 4 pcs  
 Pilot lamp : 1 pc  
 Pilot lamp : 1 pc  
 Select switch : 1 pc  
 Push button switch : 3 pcs  
 Snap switch : 1 pc  
 Timer socket : 1 pc  
 Counter socket : 1 pc  
 Counter socket : 1 pc  
 Pulse motor : 2 pcs  
 Timer : 1 pc  
 Counter : 1 pc  
 Shock absorption rubber : 8 pcs  
 Carrying case : 1 pc  
 Counter : 1 pc

## 7. Electricity requirement

3 phase 380V, 1 phase 133V, 60Hz, AC

## 8. MEASUREMENTS

550(W) x 85(D) x 300(H) mm



JOB NO.

DOC. NO.

SPECIFICATION		SPEC. SHEET NO.
		S W-5-100/200
Item No.	Description	Quantity
SW-5-100 SW-5-200	MINI PLANT - A & B	each 1 unit

Mini Plant - A & B shall have the same or equivalent specification as mentioned below;

Specification

I. Purpose of Use

To train fresh operators for Desalination Plant, Power Plant, and Steam Turbine Generator Plant.

II. Features

Both Mini Plant A&B, although of small scale, are completely functioning plants where the typical process equipment of the above plants such as valves, pumps, heat exchangers, drums and instrumentation for automatic control are arranged exactly the same way as in a commercial plant.

Mini Plants enable trainees to be trained on various aspects of operation ranging from basic operating procedures such as valve opening/closing and the starting/stopping of pumps, to the automatic control of the plant and also maintenance work of the plant.

Mini Plant A is designed to train the above basic skills through Vacuum Evaporation Unit, while Mini Plant B is through Air Scrubbing Unit.

As for Process flow, Equipment layout, and Equipment specification, refer to Training Equipment List (SW-5), and the following spec. sheets.

4								
3								JOB NO.
2								DOC. NO.
1								DATE MADE CHKD APPR
REV	DESCRIPTION	DATE	BY	CHKD	APPR.			

SPECIFICATION		SPEC. SHEET NO.	
		S 4-5-100	
Item No.	Description	Quantity	
SW-5-100	Mini Plant-A (Vacuum Evaporation Unit)	1 unit	

Mini Plant-A \_\_\_\_\_ shall have the same  
or equivalent specification as mentioned below;

1. Outline of the Plant

Mini Plant-A consists of an evaporator with a steam reboiler, a condenser, a overhead receiver, and a steam ejector as main equipment. In addition to the above, an air compressor system for instrument air and a package steam boiler, a cooling tower, and penumatic based instrument are provided. By utilizing this Plant, trainees will be able to acquire basic skills and knowledge on fundamental operation of vacuum evaporation. Simplified process flow sheet and equipment layout are shown on the following pages.

2. Equipment List

- SW-5-100-101 Evaporator:
  - Vertical, Cylindrical (with Demister), Full vacuum
  - 102 Receiver
  - 103 Condenser:
    - Stationary tube sheet
    - 104
    - Stationary tube sheet
    - 105 Steam Ejector (1)
  - 180mmHg
    - 106 Condensate Pump & Motor
    - 201 Local Instrument (1 set)
  - Flow indicator (Steam & water), Temperature indicator, Temperature guage, Pressure guage
    - 202 Control Panel (1 set)
    - 203 FRC Loop (1 set)
  - Dp transmitter, Controller recorder, Control valve
    - 204 LR Loop (1 set)
  - Dp transmitter, Recorder
    - 205 PIC Loop (1 set)
  - Pressure transmitter, Indicator controller, Control valve
    - 206 LIC Loop (1 set)
  - Pressure transmitter, Indicator controller, Control valve
    - 207 FR Loop (1 set)
  - Dp transmitter, Recorder

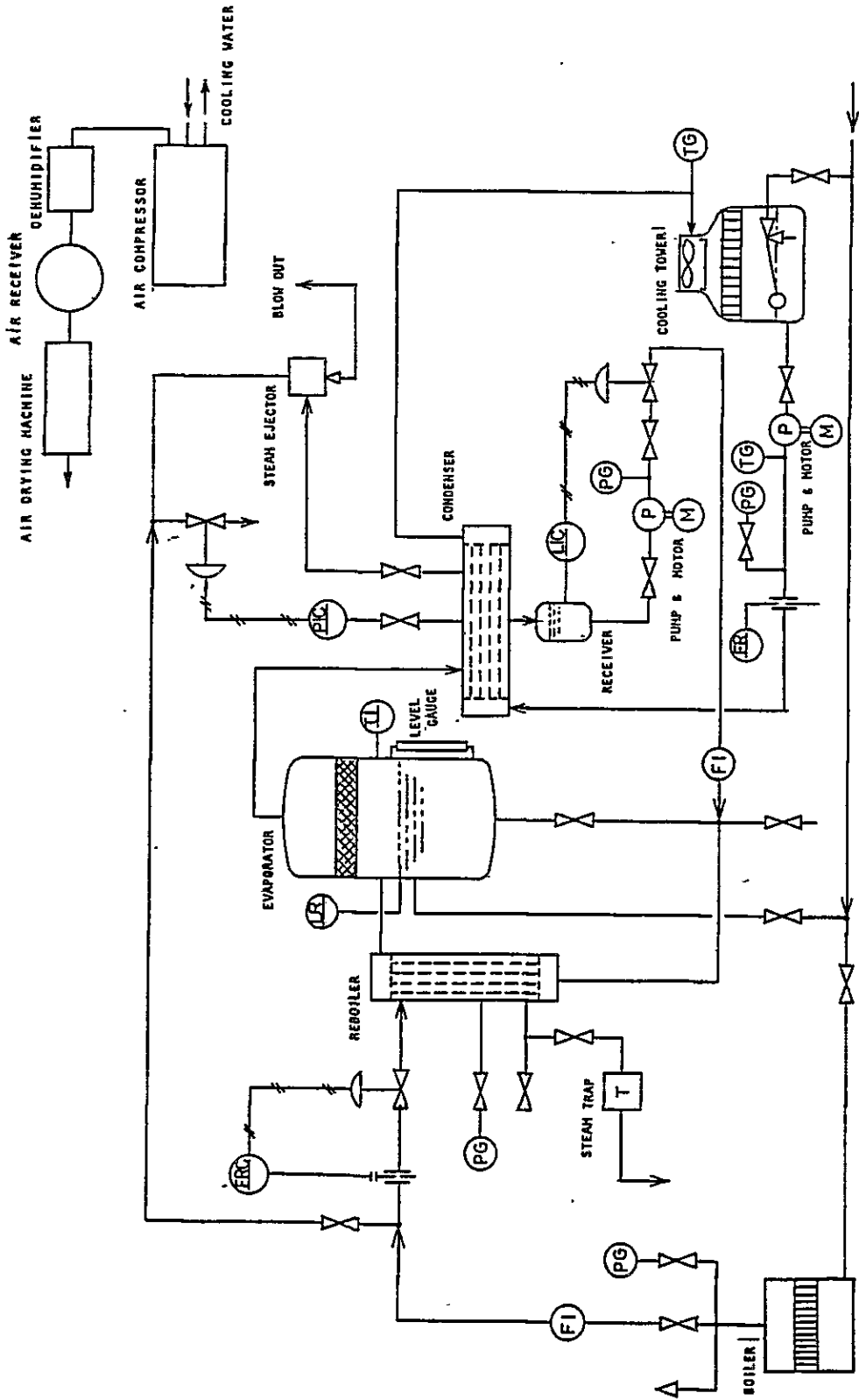
4									
3									JOB NO.
2									DOC. NO.
1									DATE MADE CKD APPR
REV	DESCRIPTION	DATE	BY	CHKD	APPR				

SPECIFICATION	SPEC. SHEET NO.
	S W-5-100
<p><u>TW-5-100-300</u> Boiler Unit (1 unit) Boiler (210kg/h, 10kg/cm<sup>2</sup>G), Fuel tank, Hi-drainser Water softner, metering pump -400 Air Compressor Unit (1 unit) Air compressor, Dehumidifier, Air receiver, Air drying equipment, -500 Cooling Tower Unit (1 unit) Cooling tower, pump &amp; motor</p> <p data-bbox="992 1895 1368 1984">JOB NO. DOC. NO.</p>	

SPECIFICATION

SPEC. SHEET NO.

S W-5-100



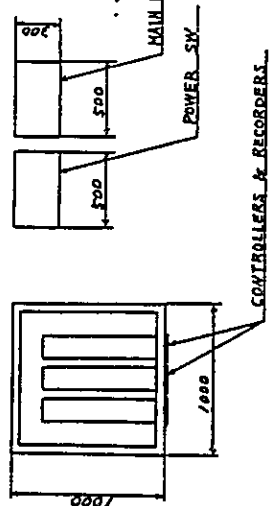
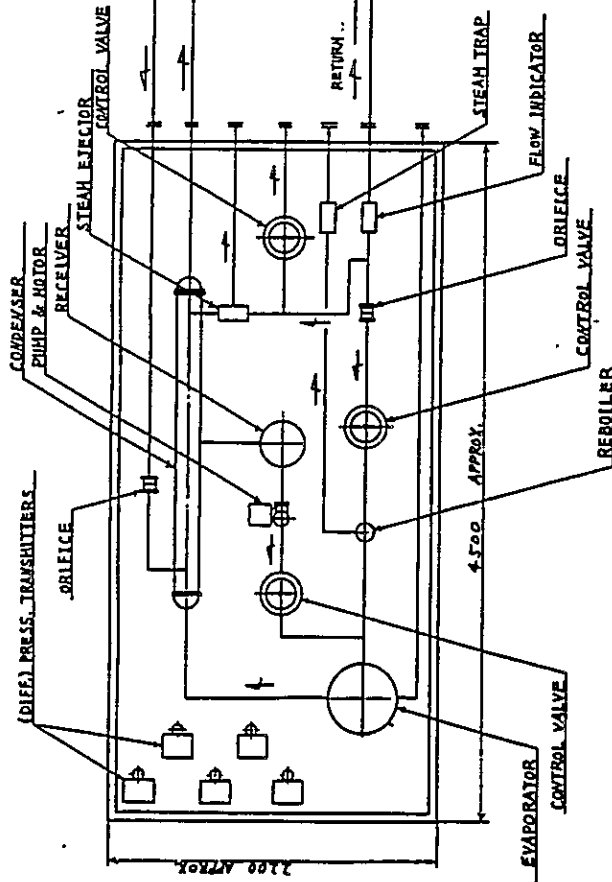
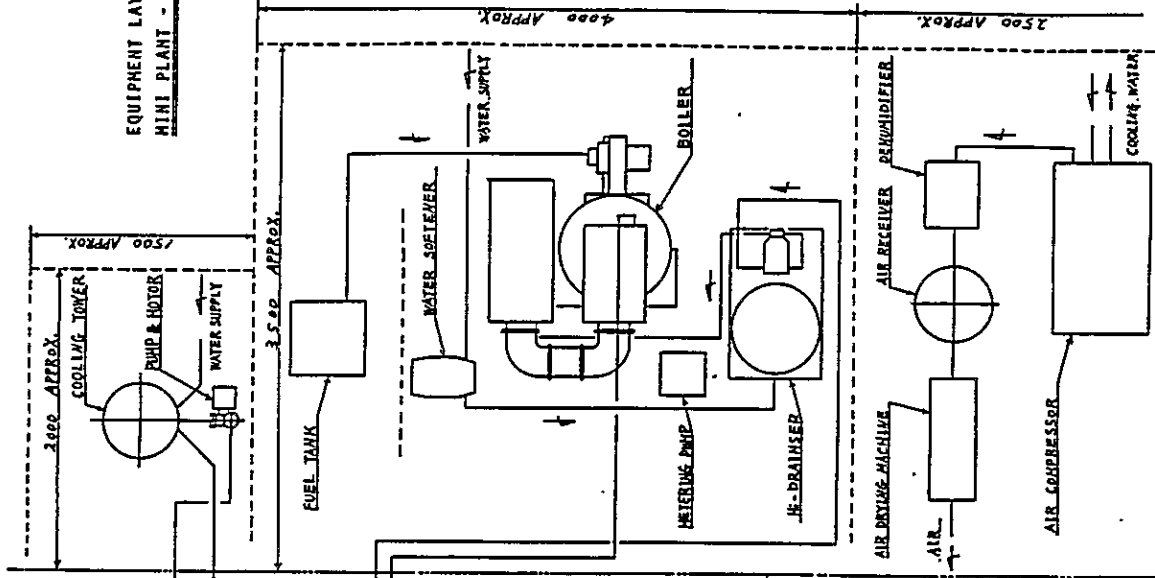
TW-5-100 MINI PLANT A

SPECIFICATION

SPEC. SHEET NO.

S W-5-700

EQUIPMENT LAYOUT  
MINI PLANT - A



SPECIFICATION		SPEC. SHEET NO.	
		S W-5-200	
Item No.	Description	Quantity	
SW -5-200	Mini Plant-B (Air Scrubbing Unit)	1 unit	

Mini Plant-B shall have the same or equivalent specification as mentioned below;

1. Outline of the Plant

Mini Plant-B consists of a packed tower with an external water circulation, an air compressor system for scrubbing air and instrument air source, and a cooling tower for supplying coolant. The electrical instrumentation is provided with this plant.

By utilizing this plant, trainees will be able to acquire basic skills and knowledge on fundamental operation through air scrubbing unit.

2. Equipment List

- SW -5-200-101 Packed Tower (1)  
 Vertical Cylindrical, sus 304 rachig ring packed  
 -102 Drain Separater (2: Air reciver & Overhead receiver)  
 Vertical Cylindrical, 9kg/cm<sup>2</sup>G  
 -103 Cooler A (Air cooler) (1)  
 Horizontal Multi-tube  
 -104 Cooler B (Circulation water cooler) (1)  
 Horizontal Multi-tube  
 -105 Air Compressor (1 unit)  
 V-shape water cooling type, 2 stage (oilless)  
 4.8m<sup>3</sup>/min., 7kg/cm<sup>2</sup>G  
 -106 Prefilter (1 unit)  
 Air dryer, Self-regenerative no-heating type  
 -107 Air Tank (1)  
 Vertical Cylindrical  
 -108 Cooling Tower (1 unit)  
 -109 Cooling Tower Pump (1)  
 -110 Circulation Water pump (1)  
 -111 Silencer (1)  
 -112 Base (1)  
 -201 Local Instrument  
 Temperature guage (6), Pressure guage (6), Pressure safety valve (1), Flow indicator (1)  
 -202 Control Panel (1 set)  
 Indoor self standing type  
 -203 LICA Loop (1 set)  
 DP transmitter, Indicator, Alarm setter, Solenoid valve

4									
3						JOB NO.			
2						DOC. NO.			
1						DATE	MADE	CHKD	APPR
REV	DESCRIPTION	DATE	BY	CHKD	APPR				

## SPECIFICATION

SPEC. SHEET NO.

S W-5-200

SW -5-200-204 FIC Loop (1 set)  
Flow transmitter, Indicator controller, Diaphragm valve  
-205 PICRA Loop (1 set)  
DP transmitter, Indicator controller, Recorder,  
Diaphragm valve  
-206 TI Loop (1 set)  
Thermoresistance, Temperature indicator  
-207 PIA Loop (1 set)  
Pressure guage (with limit switch)  
-208 PI Loop (1 set)  
Pressure guage  
-209 Instructor Panel

JOB NO.

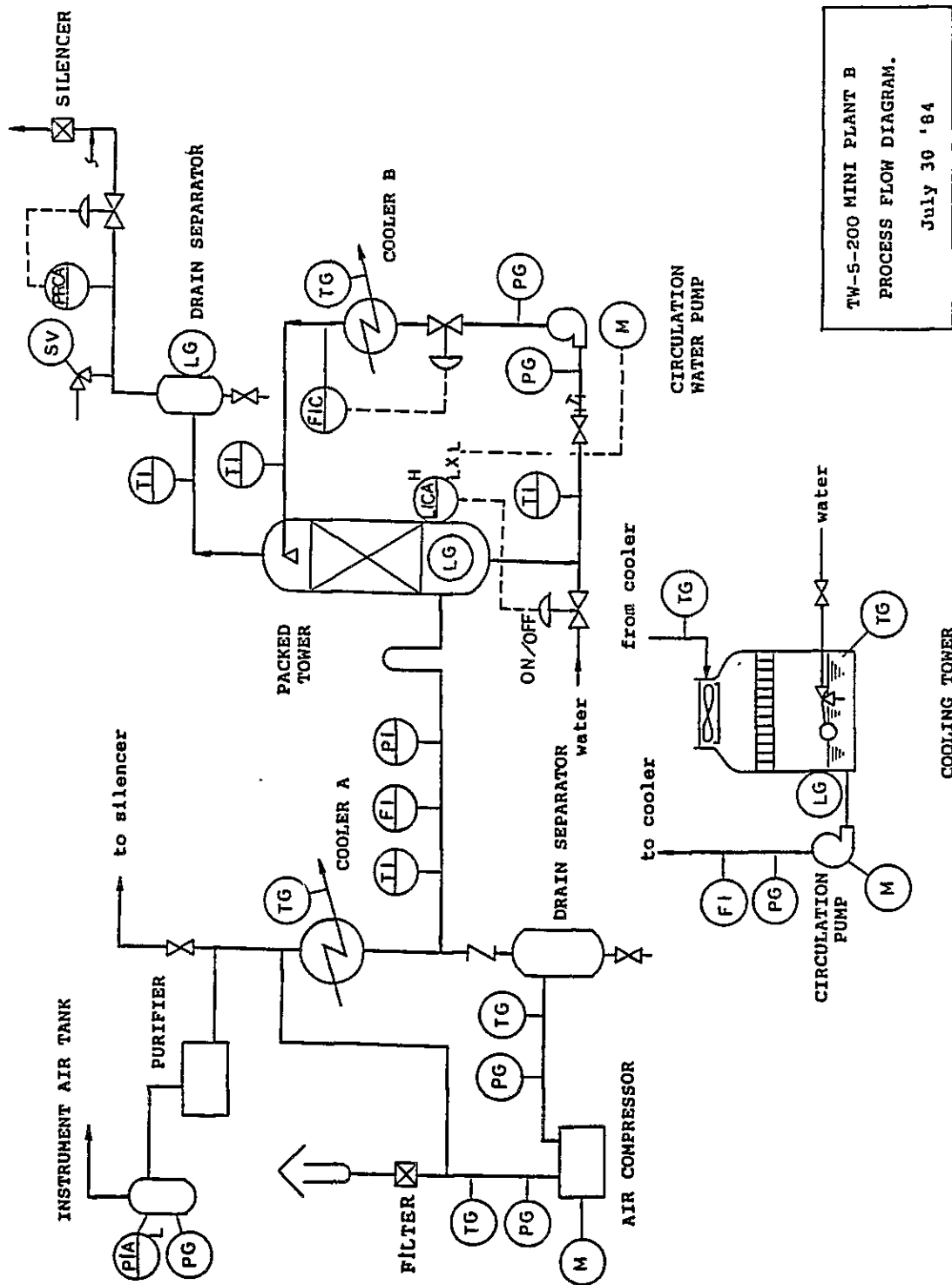
DGC. NO.

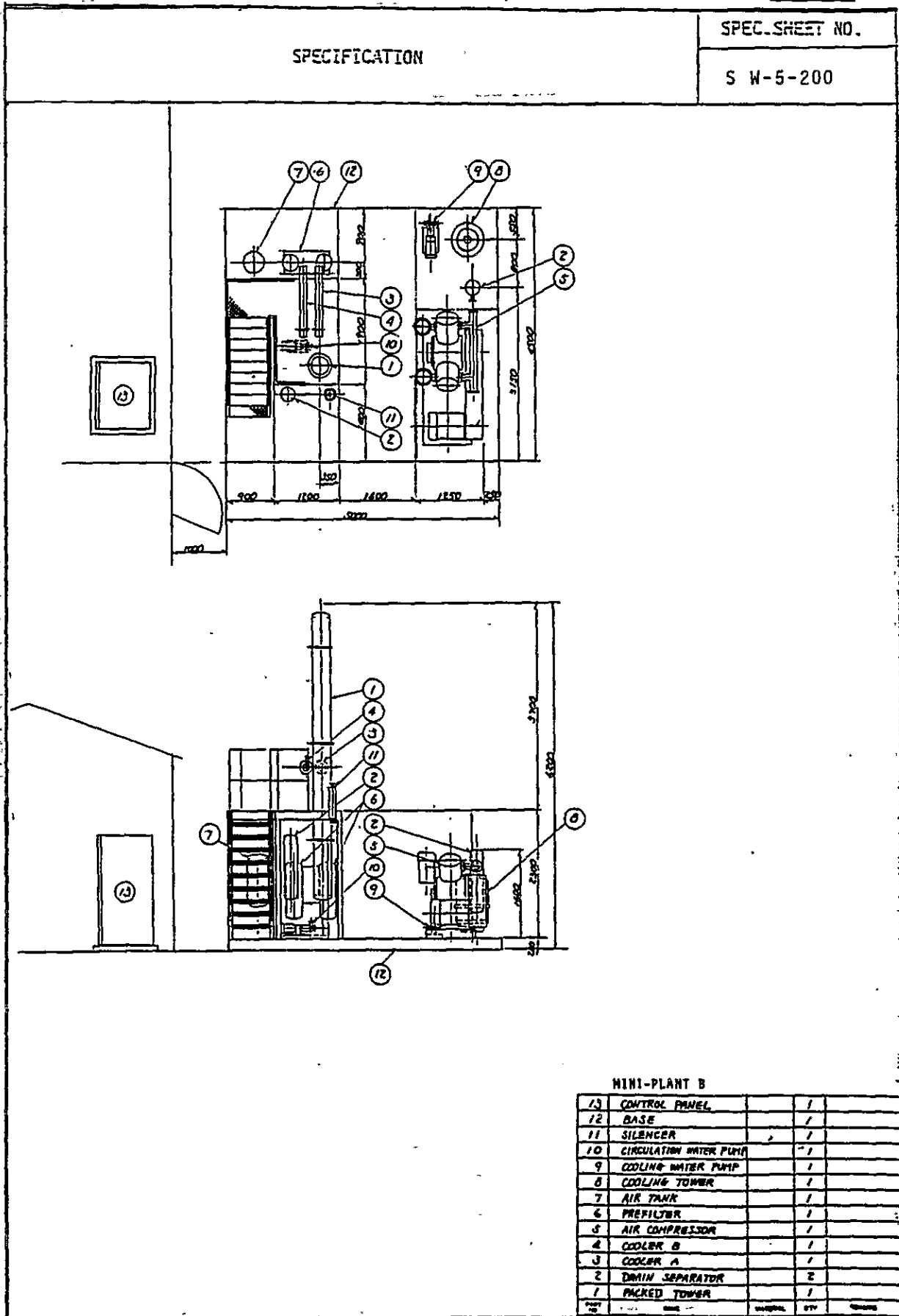


SPECIFICATION

SPEC. SHEET NO.

S W-5-200





SPECIFICATION		SPEC. SHEET NO.
		S W-6-100
ITEM NO.	DESCRIPTION	QUANTITY
TW-6-100	Process Control Model	1 Unit

PROCESS CONTROL MODEL shall have the same or equivalent specifications as mentioned below;

Specification

1. Outline of the Equipment

Process Control Model consists of 3(three) tanks, one pump, piping connecting these equipment and several kind of instruments as shown in the attached sheet.

Each tank can be fed water directly and circulated separately, or cascade by switching pass from one tank to another by using pump. One of the tanks is equipped with electric heater.

As shown on the attached sheet, all components except for air compressor shall be assembled in one block.

Air compressor shall be installed outside the room.

4								
3								JOB NO.
2								DOC. NO.
1								DATE MADE CHKD APPR
REV	DESCRIPTION	DATE	BY	CHKD	APPR.			

SPECIFICATION		SPEC. SHEET NO.	
		S W-6-100	
ITEM NO.	DESCRIPTION -	QUANTITY	

2. Training Items to be performed

MODEL EQUIPMENT shall contain components shown on the ATTACHED SHEET, or equivalent.

Detail design should be done by seller, taking effective performance of following training items into consideration.

- (1.) To measure process variables such as flow rate, Level, Temperature, and Pressure by using more than two kinds of instruments for each process variable.
- (2.) Automatic control of circulating water flowrate.
- (3.) Automatic control of water Level, Pressure, and Temperature of Tanks.
- (4.) How to use limit switches (sensors of Temperature, Pressure and Level), and annu
- (5.) Program control of startup and stop sequence of water circulation system.
- (6.) Others.

3. Design Basis

- (1.) Location ; Indoor (Process Control Model Room)
- (2.) Utility ; Potable water  
Compressed air (4 Kg/cm<sup>2</sup>) F.A.S.  
Power supply ; AC 230 V, 1 $\phi$ ; 60Hz (5 KVA)
- (3.) Dimensions ; Approx. 1,000 (D) x 3,000 (W) x 2,200 (H) mm

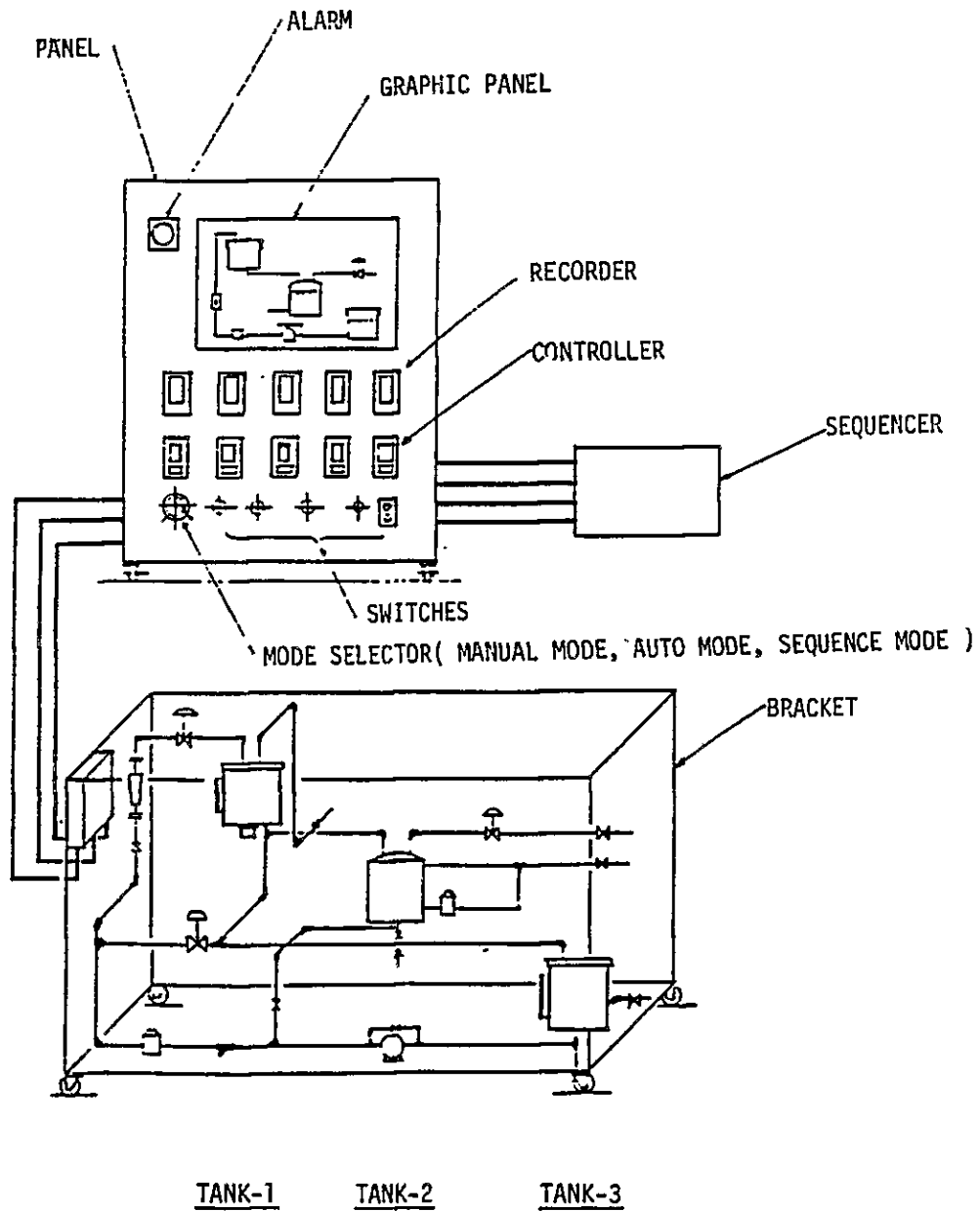
4									
3									JOB NO.
2									DOC. NO.
1									DATE
REV	DESCRIPTION	DATE	BY	CHKD	APPR		MADE	CHKD	APPR

SPECIFICATION

SPEC. SHEET NO.

S W-6-100

PROCESS CONTROL MODEL LAYOUT



JOB NO.
OGC. NO.

SPECIFICATION		SPEC. SHEET NO.
		S W-7-100
Item No.	Description	Quantity
SW-7-100	Steam Turbine Generator Experiment Unit	1 unit

Steam Turbine Generator Experiment Unit shall have the same or equivalent specification as mentioned below;

Specification

1. Outline of the Unit

This Experiment Unit is composed of Boiler, Steam Turbine, and Power Generator as main parts, and other equipment such as superheater, condenser, water treating units, and instrumentation.

This unit is designed to carry out the following experiment items.

Boiler	: Actural evaporating quantity Actual evaporating rate Equivalent evaporating quantity Equivalent evaporating rate Boiler efficiency Exhaust gas Analysis Excess air rate
Superheater	: Superheater efficiency
Steam Turbine	: Turbine output Steam consumption Steam velocity from nozzle Turbine efficiency Total efficiency of turbine-generator
Condenser	: Exchange heat value Logarithmic mean temperature difference
Calorimeter	: Dryness degree of saturated steam Calorimetry of saturated steam Practice on h-s chart

4									
3									JOB NO.
2									DOC. NO.
1									DATE MADE CHKO APPR
REV	DESCRIPTION	DATE	BY	CHKO	APPR				

## SPECIFICATION

SPEC. SHEET NO.

S W-7-100

## 2. Specification

- (1) Steam Boiler (1 set)  
 Type: GK-S1 Vertical water tube type  
 Usual pressure : 6kg/cm<sup>2</sup>G  
 Max. Pressure : 7kg/cm<sup>2</sup>G  
 Steam capacity : 200kg/H
- (2) Steam Turbine (1 set)  
 Type: GK-D220 Horizontal impulse type  
 Output : 0.9KW  
 Steam pressure : 5kg/cm<sup>2</sup>G  
 Revolution : 3,000 rpm
- (3) Generator (1 set)  
 Type: GK-DES95 Self-excited,  
 drip proof, single phase, AC  
 Output : 0.5 KVA  
 Revolution : 3,000 rpm
- (4) Load Resistor (1 set)  
 Type: GK-L2 Electric turn off type  
 Capacity : 0.5KW
- (5) Super Heater (1 set)  
 Type: GK-V2 Vertical burner heating type  
 Super heating temp.:  
 230°-250°c  
 Normal flow : 200kg/H approx.
- (6) Steam Flow Measuring Device (1 set)  
 Type: GK-N2 Nozzle and Manometer type
- (7) Calorimeter (1 set)  
 Type: GK-C Vertical throttle type
- (8) Atmosphere Condensor (1 set)  
 Type: GK-AV2 Vertical, surface cooling type  
 Condensate temp.: 10°-40°c

JOB NO.

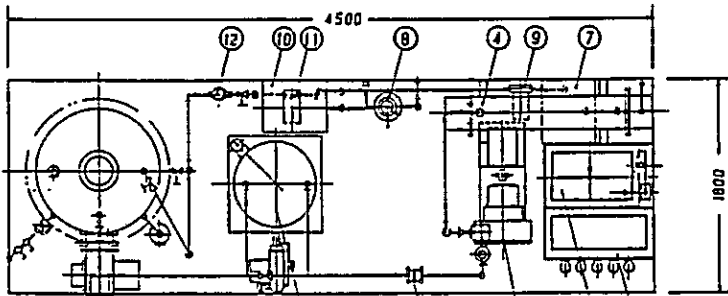
OGC. NO.

SPECIFICATION	SPEC. SHEET NO.			
	S W-7-T00			
(9) Accessories				
1) for Steam boiler	1 set			
Oil service tank	1 ea			
Oil gauge	1 ea			
Injector	1 ea			
Water supply flowmeter	1 ea			
Thermometer	1 ea			
Pressure gauge	1 ea			
Safty gauge	1 ea			
Water gauge	2 ea			
Main steam valve	1 ea			
Chimny(Stainless steel Made)	1 set			
Water supply automatic control system				
Hard water softening equipment	1 set			
Soft water tank	1 set			
Feed water pump	1 set			
Automatic water supply equipment	1 set			
Float switch	1 ea			
Combustion automatic control system				
Pressure switch	1 ea			
Oil burner automatic system	1 set			
2) for Steam turbine				
Governor	1 set			
Measuring panel board	1 set			
Thermometer	1 ea			
Pressure gauge	1 ea			
Safty gauge	1 ea			
3) for Generator				
Power board	1 set			
Ampere meter	1 ea			
Voltage meter	1 ea			
Cycle meter(rpm meter)	1 ea			
4) for Super heater	1 unit			
Oil service tank	1 ea			
Oil gauge	1 set			
Oil burner	1 ea			
Thermometer				
5) for Steam flow measuring resistor				
Water tank	2 sets			
Measuring panel board	1 set			
6) for Calorimeter				
Thermometer	1 ea			
Pressure gauge	2 ea			
7) for Atmosphere Condensor				
Condensate measuring tank	1 unit			
Flow meter	1 ea			
Thermometer	4 ea			
<table border="1" style="margin-left: auto;"> <tr> <td>JOB NO.</td> </tr> <tr> <td>DGC.NO.</td> </tr> </table>			JOB NO.	DGC.NO.
JOB NO.				
DGC.NO.				

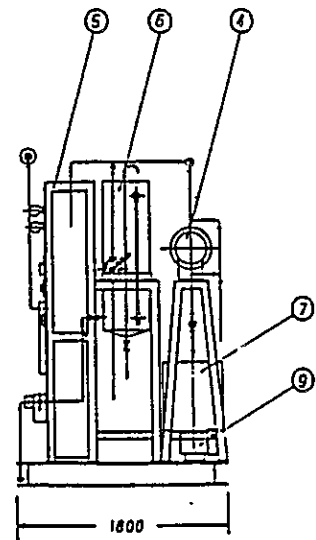
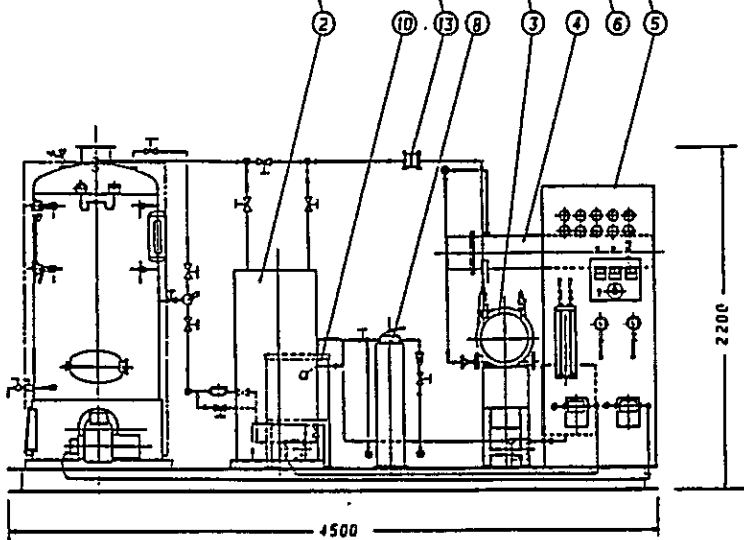


S P E C I F I C A T I O N	NO. S W - 7 - 100
TRAINING EQUIPMENT	REQ. NO.

Steam Turbine Experiment Unit  
(Atomosphere Condensate Type)



NO.	PART NAME
1	STEAM BOILER
2	SUPERHEATER
3	STEAM TURBINE
4	ATMOSPHERE CONDENSER
5	MEASURING PANEL BOARD
6	OIL SERVICE TANK
7	MEASURING TANK
8	WATER SOFTENER
9	CONDENSATE WATER PUMP
10	SOFT WATER TANK
11	FEED WATER PUMP
12	WATER FLOW METER
13	STEAM FLOW METER



JOB NO.
DOC. NO.

SPECIFICATION		SPEC. SHEET NO.
		S W-7-200
Item No.	Description	Quantity
SW - 7-200	HYDRAULICS BENCH	1

HYDRAULICS BENCH shall have the same or equivalent specification as mentioned below;

Specification

FEATURES

- \* Supply and accurate gravimetric measurement of water to a wide variety of experimental equipment possible
- \* Self contained water recirculating unit
- \* All round visibility
- \* Supplied on castors

SPECIFICATIONS

Weigh tank

Capacity : 85 liters

Circular Water pump

Delivery flow rate (max) : 80 kg/min

Delivery head (max) : 12 mH<sub>2</sub>O

Drive motor

output : 750 Watt

Sump tank

Capacity : 200 liters

Weigh balance (max) : 100 kg

Pressure gauge : 0 - 6 kg/cm<sup>2</sup>G

Thermometer : 0 - 100°C

SERVICES REQUIRED

Earthed, a.c. 200/230<sup>V</sup>, 50/60Hz, 3 phase electrical supply as standard, or as specified by the customer

4										
3							JOB NO.			
2							DOC. NO.			
1							DATE	MADE	CHKD	APPR
REV	DESCRIPTION	DATE	BY	CHKD	APPR					

SPECIFICATION

SPEC.SHEET NO.

S W-7-200

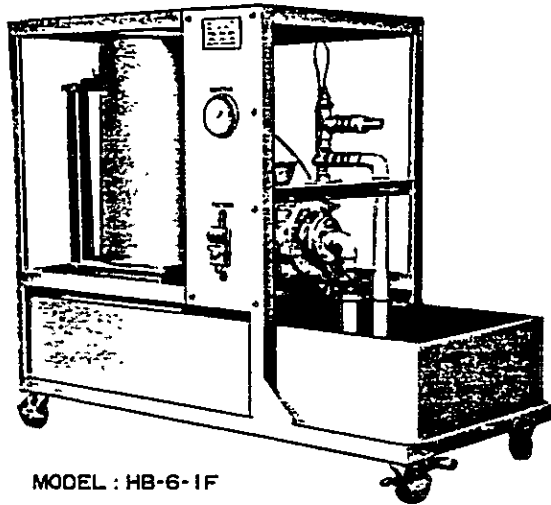
DIMENSIONS and WEIGHT

NETT(approx)

Width 1600 mm  
Depth 800 mm  
Height 1300 mm

GROSS(approx) Packed for export

Volume 5 m<sup>3</sup>  
Weight 550 kg



MODEL : HB-6-1F

JOB NO.
DOC. NO.



