KOBELCO

SERVICE MANUAL

HYDRAULIC EXCAVATOR

SK013
SK015

Applicable:SK013 PN00001~
Applicable: SK015 PU02001 ~

S5RO0003E-03 04/04

HYDRAULIC EXCAVATOR

SHOP MANUAL

model SK013 SK015

FOREWORD

This is the shop manual for KOBELCO hydraulic excavator. Contained is the necessary technical data concerning the maintenance and repair of this model.

When checking or repairing the machine we suggest that you refer to this manual carefully. We hope that reference to this manual will help to maintain a high level of working efficiency and reliability. For further details on maintenance and checks refer to the "OPERATORS MANUAL" which has been supplied with the machine.

Although all data was correct at the time of printing, due to continual design changes and improvements, some contents may not conform to the actual machine. Take special care to order parts only after confirming the validity of the parts number in the "PARTS MANUAL".

If you notice any explanatory discrepancies, after consulting one of our representatives, please update your manual according to the latest data. However, in the event of any specification changes, we will issue revised edition.

KOBELCO

Book Code No. S5RO0003E ③

HYDRAULIC EXCAVATOR

SHOP MANUAL

model **SK013**
SK015

This is the shop manual for KOBELCO hydraulic excavator. Contained is the necessary technical data concerning the maintenance and repair of this model.

When checking or repairing the machine we suggest that you refer to this manual carefully. We hope that reference to this manual will help to maintain a high level of working efficiency and reliability. For further details on maintenance and checks refer to the "OPERATORS MANUAL" which has been supplied with the machine.

Although all data was correct at the time of printing, due to continual design changes and improvements, some contents may not conform to the actual machine. Take special care to order parts only after confirming the validity of the parts number in the "PARTS MANUAL".

If you notice any explanatory discrepancies, after consulting one of our representatives, please update your manual according to the latest data. However, in the event of any specification changes, we will issue revised edition.

FOREWORD

KOBELCO

Book Code No. S5RO0003E

235

MANUAL OVERVIEW

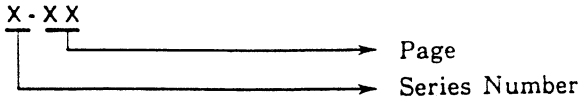
This manual is classified in the following series, and issued for each machine model.

I . GENERAL
II . SYSTEMS
III . COMPONENTS
IV . TROUBLESHOOTING

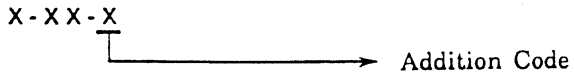
Sheet Numbers

The following sheet numbers are assigned to each respective page. And if there are additional sheets, revisions, etc., an addition code or a revision code is supplied. Please file the sheets in the order of the sheet numbers.

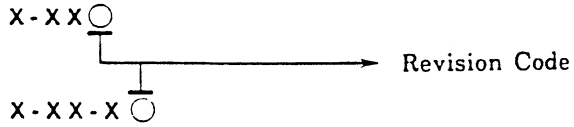
Sheet No.



Sheet Addition



Sheet Revision



Example:

II – 08
II – 09
II – 09 - 1 ····· A page is added between page 09 and page 10.
II – 10
II – 11 ① ····· Page 11 has been revised for the first time.

If a sheet has been revised, it is to be used in place of the sheet used before revision and it is not necessary to keep the old sheet.

⚠ WARNING

SAFETY

⚠ WARNING

The proper and safe lubrication and maintenance for this machine, recommended by KOBELCO are outlined in the OPERATION & MAINTENANCE GUIDE for this machine.

Improper performance of lubrication or maintenance procedures is dangerous and could result in injury or death. Read and understand the OPERATION & MAINTENANCE GUIDE before performing any lubrication or maintenance.

The serviceman or mechanic may be unfamiliar with many of the systems on this machine. This makes it important to use caution when performing service work. A knowledge of the system and or components is important before the removal or disassembly of any component.

Because of the size of some of the machine components, the serviceman or mechanic should check the weights noted in this Manual. Use proper lifting procedures when removing any components.

Following is a list of basic precautions that should always be observed.

1. Read and understand all Warning plates and decals on the machine before operating, lubricating or repairing this product.

2. Always wear protective glasses and protective shoes when working around machines. In particular, wear protective glasses when pounding on any part of the machine or its attachments with a hammer or sledge. Use welders gloves, hood/goggles, apron and other protective clothing appropriate to the welding job being performed. Do not wear loose-fitting or torn clothing. Remove all rings from fingers when working on machinery.

3. Disconnect battery and discharge any capacitors before starting to work on machine. Hang "Do Not Operate" tag in the Operator's Compartment.

4. If possible, make all repairs with the machine parked on a level, hard surface. Block machine so it does not roll while working on or under machine.

5. Do not work on any machine that is supported only by lift jacks or a hoist. Always use blocks or jack stands to support the machine before performing any disassembly.

⚠ WARNING

Do not operate this machine unless you have read and understand the instructions in the OPERATOR'S MANUAL. Improper machine operation is dangerous and could result in injury or death.

---

6. Relieve all pressure in air, oil or water systems before any lines, fittings or related items are disconnected or removed. Always make sure all raised components are blocked correctly and be alert for possible pressure when disconnecting any device from a system that utilizes pressure.

7. Lower the bucket, blade, ripper or other implements to the ground before performing any work on the machine. If this cannot be done, make sure the bucket, blade, ripper or other implement is blocked correctly to prevent it from dropping unexpectedly.

8. Use steps and grab handles when mounting or dismounting a machine. Clean any mud or debris from steps, walkways or work platforms before using. Always face machine when using steps, ladders and walkways. When it is not possible to use the designed access system, provide ladders, scaffolds, or work platforms to perform safe repair operations.

9. To avoid back injury, use a hoist when lifting components which weigh 23 kg (50 lbs) or more. Make sure all chains, hooks, slings, etc., are in good condition and are in the correct capacity. Be sure hooks are positioned correctly. Lifting eyes are not to be side loaded during a lifting operation.

10. To avoid burns, be alert for hot parts on machines which have just been stopped and hot fluids in lines, tubes and compartments.

11. Be careful when removing cover plates. Gradually back off the last two bolts or nuts located at opposite ends of the cover or device and pry cover loose to relieve any spring or other pressure, before removing the last two bolts or nuts completely.

12. Be careful when removing filler caps, breathers and plugs on the machine. Hold a rag over the cap or plug to prevent being sprayed or splashed by liquids under pressure. The danger is even greater if the machine has just been stopped because fluids can be hot.

⚠ WARNING

13. Always use tools that are in good condition and be sure you understand how to use them before performing any service work.

14. Reinstall all fasteners with same part number. Do not use a lesser quality fastener if replacements are necessary.

15. Repairs which require welding should be performed only with the benefit of the appropriate reference information and by personnel adequately trained and knowledgeable in welding procedures. Make reference to "Techniques of Structural Repair Course". Determine type of metal being welded and select correct welding procedure and electrodes, rods or wire to provide a weld metal strength equivalent at least to that of parent metal.

16. Do not damage wiring during removal operations. Reinstall the wiring so it is not damaged nor will it be damaged in operation by contacting sharp corners, or by rubbing against some object or hot surface. Do not connect wiring to a line containing fluid.

17. Be sure all protective devices including guards and shields are properly installed and functioning correctly before starting a repair. If a guard or shield must be removed to perform the repair work, use extra caution.

18. Always use lift arm supports to keep bucket arms raised and bucket tilted down when maintenance or repair work is performed which requires the bucket in the raised position.

19. Loose or damaged fuel, lubricant and hydraulic lines, tubes and hoses can cause fires. Do not bend or strike high pressure lines or install ones which have been bent or damaged. Inspect lines, tubes and hoses carefully. Do not check for leaks with your hands. Pin hole (very small) leaks can result in a high velocity oil stream that will be invisible close to the hose. This oil can penetrate the skin and cause personal injury. Use cardboard or paper to locate pin hole leaks.

20. Tighten connections to the correct torque. Make sure that all heat shields, clamps and guards are installed correctly to avoid excessive heat, vibration or rubbing against other parts during operation. Shields that protect against oil spray onto hot exhaust components in event of a line, tube or seal failure must be installed correctly.

21. Do not operate a machine if any rotating part is damaged or contacts any other part during operation. Any high speed rotating component that has been damaged or altered should be checked for balance before reusing.

22. On track-type machines, be careful when servicing or separating tracks. Chips can fly when removing or installing a track pin. Wear safety glasses. Track can unroll very quickly when separated. Keep away from front and rear of machine. The machine can move unexpectedly when both tracks are disengaged from the sprockets. Block the machine to prevent it from moving.

23. Caution should be used to avoid breathing dust that may be generated when handling components containing asbestos fibers. If this dust is inhaled, it can be hazardous to your health. Components in Caterpillar products that may contain asbestos fibers are brake pads, brake band and lining assemblies, clutch plates and some gaskets. The asbestos used in these components is usually bound in a resin or sealed in some way. Normal handling is not hazardous as long as airborne dust which contains asbestos is not generated.

If dust which may contain asbestos is present, there are several common sense guidelines that should be followed.

a. Never use compressed air for cleaning.
b. Avoid brushing or grinding of asbestos containing materials.
c. For clean up, use wet methods or a vacuum equipped with a high efficiency particulate air (HEPA) filter.
d. Use exhaust ventilation on permanent machining jobs.
e. Wear an approved respirator if there is no other way to control the dust.
f. Comply with applicable rules and regulations for the work place.
g. Follow environmental rules and regulations for disposal of asbestos.
h. Avoid areas where asbestos particles may be in the air.



I . GENERAL



II . SYSTEMS



III . COMPONENTS



IV . TROUBLESHOOTING



I . GENERAL

PREFACE

This Chapter, General, first of all describes concerning service operations, then covers specifications. Service operations consist of basic precautions which must be taken when conducting service operations and include those items which are required to assure safe and accurate operations. The specifications which follow include vehicle outline specifications and service standards, and are centered on the data required for service operations. Use these specifications for vehicle pre-service checks, post-service checks and when replacing component parts.
As a manual continually undergoes revisions to enhance its effectiveness, any useful opinions or suggestions are welcomed and can be addressed to the section in charge.

In regard to Standard Values and Allowable Values
The terms used in the items "Servicing Standards" and "Standatrds for Judging Performance" have the following meanings.

Standard Value ..... This indicates the standard value for the machine at the time of shipping from the factory.
It should be used as the target value for maintenance work after operation etc.

Allowable Value ..... The dimensions of parts change during use because of wear and deformation. Also, the performance of pumps, motors, and other hydraulic equipment drops, and this is the estimated value indicating the use limit for the respective part. It is decided under reference to the standard at the time of shipping, the results of various tests, etc. As the use conditions, the degree of repairs, etc. differ for each machine, these should be combined and used as reference for servicing standards and standards for judging performance.
* Do not use the standard values and the allowable values as standards for customer claims.

CONTENTS

Service Operations

General Precautions 03

Precautions for Disassembly and Assembly 05

Precautions for Removing and Installing Hydraulic Units 06

Precautions for Removing and Installing Piping 07

When Handling Seals 08

Tightening Torques 09

Specifications

Names of Components 12

Specification Diagrams 13

Lifting Capacities 15

Specification Tables 18

Weight Tables 22

Fluid Capacitiy Table 26

Types of Crawler Shoes 27

Types of Attachments and Their Combinations 28

Servicing Standards 30

Standards for Judging Performance 39

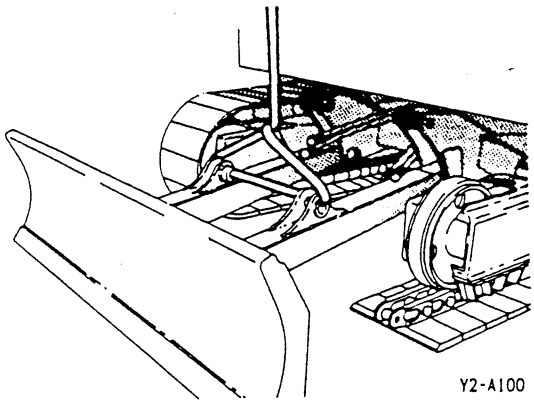
Reference Value Table 39

Method for Inspecting Performance 41

Engine Performance Curve 50

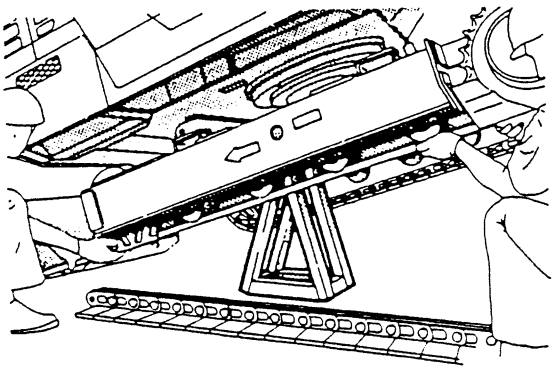
GENERAL PRECAUTIONS

1. Make sure to use helmets, safety boots and the work clothes.
2. And always inspect equipment and tools, particularly equipment used for slinging work.
3. Procedures and call signs should be worked out beforehand and good communication maintained when two or more personnel work together.
4. The operation of cranes and slinging must be carried out by qualified personnel.
5. Never allow anyone to get underneath suspended loads.
6. Especially heavy components should be temporarily suspended using a crane before their securing bolts are loosened.



Y2-A100

7. Be sure to support the machine with stands, when going underneath a machine that has been lifted up using devices such as hoe attachments.



Y2-A101

8. Disconnect any cables connected to batteries when repairing electrical systems.
9. Disconnect and remove battery when doing welding work on a machine.

10. Make sure that torque values are adhered to when tightening piping and bolts.

11. Upon completing repairs, run the machine's engine at low speed and when hydraulic oil has reached all parts of the system, conduct trial operation.

PRECAUTIONS FOR DISASSEMBLY AND ASSEMBLY

1. Clean the machines before disassembling them.

2. Inspect the machine and record the following information before disassembling it.
   - Model, machine serial number and hourmeter
   - Reason for servicing, and servicing history
   - Dirtiness of filters
   - Fuel level and condition of hydraulic and other fluids
   - Damage or wear to various parts, others items

3. Make position matching marks where necessary to make assembling quicker and easier.

4. Be sure to clean and handle, in proper order, both the disassembled old parts and the assembled new ones.

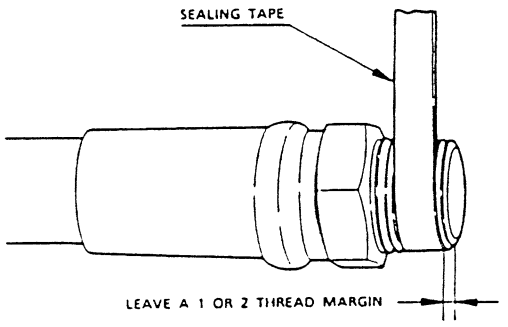
5. All seals and cotter pins must be replaced with new ones.

6. Keep parts that are sensitive to water or oil separate from the others.
   - Includes electrical parts, rubber parts, V belts

7. A press is normally used when installing bearings, bushings and oil seals. If utilizing a hammer, be sure to use a driving block.

8. Wipe all parts clean to ensure that no foreign matter adheres to the mating faces surfaces of parts.

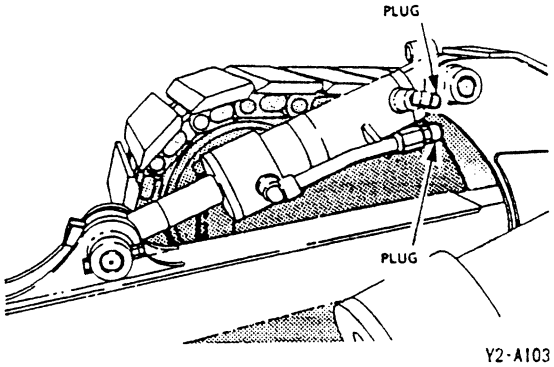
9. Winding tightly, build up a 10mm layer of sealing tape on the threaded part, positioned one or two threads from the outside end.



Y2-A102

PRECAUTIONS FOR REMOVING AND INSTALLING HYDRAULIC UNITS

1. Confirm that the temperature of the hydraulic oil has dropped.
2. Make sure to release any residual pressure in the lines and depressurize the hydraulic tank, otherwise oil will flow out.
3. Be sure to install caps or plugs on the openings to the hydraulic systems to prevent dirt from entering.

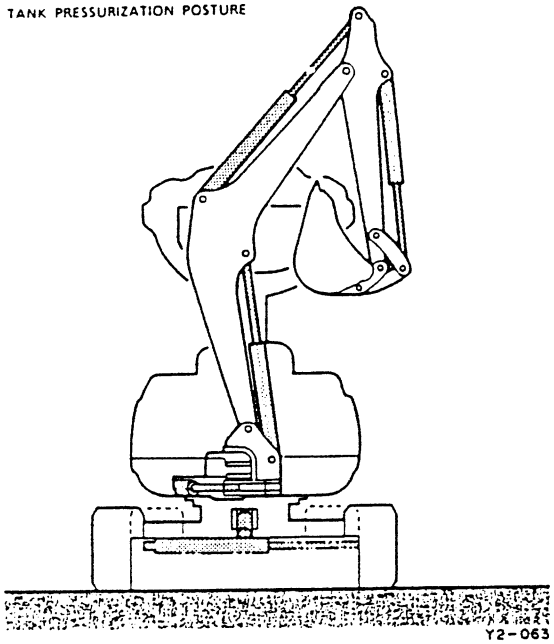


Y2-A103

4. Any hydraulic oil showing on equipment is easily mistaken for leakage so be sure to thoroughly wipe hydraulic units.
5. Be careful not to damage the plating on the rods of hydraulic cylinders.
6. Removing or installing hydraulic cylinders is normally done with their rods fully retracted.
7. Bleeding must always be done after hydraulic cylinders have been installed. (See section III. Components.)
8. Make sure to always pressurize the hydraulic tank after installing hydraulic equipment. Failing to do so may cause cavitation in the hydraulic pump and seriously shorten its life.

   • Procedures for pressurizing hydraulic tank:
   Ground the dozer blade and fully extend all hydraulic cylinders except the dozer blade cylinder. Then install all bleeding plugs and seal the tank.

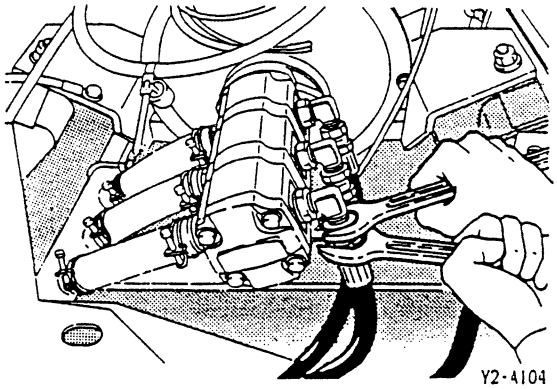
TANK PRESSURIZATION POSTURE


Y2-063

PRECAUTIONS FOR REMOVING AND INSTALLING PIPING

1. Hydraulic hoses are installed by first tightening them to the specified torque, then loosening slightly and tightening back to torque.
   - Allow the connecting fittings to set before tightening them completely.
   - This is not necessary if fittings are wrapped with sealing tape.

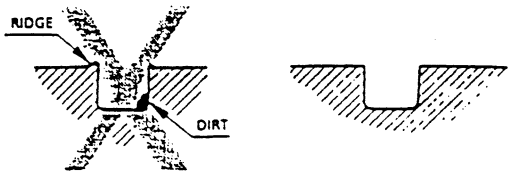
2. Use two wrenches, one to secure the connector nut and one to turn the piping nut when disconnecting hoses or pipes. This keeps the piping from being twisted by wrench force.



3. Apply maximum operational pressure five or six times to test for leaks after the piping has been connected.

WHEN HANDLING OIL SEALS

1. Clean any dirt from the grooves in the O-rings and remove any ridges.



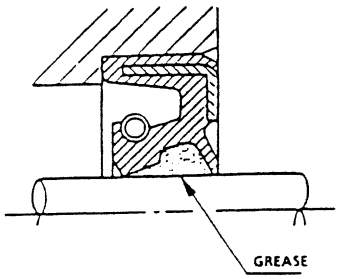
Y2-A105

2. Be careful that twists do not develop in the O-rings and untwist them if they do.

3. Take care not to damage or cut the seals when installing.

4. When Handling Floating Seals;
   - Be sure to wipe all oil from the O-rings and housings when removing floating seals.
   - Apply a thin coating of transmission fluid to the housing's mounting surface when reinstalling.
   - After installing the seal rotate two or three times to allow the seal to set.

5. A coating of grease is applied to the lip portion of oil seals.
   - This prevents any wear or tear during the start up after assembly.

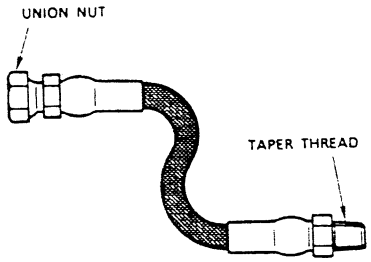


Y2-A106

TIGHTENING TORQUES

Hydraulic Hose Fittings

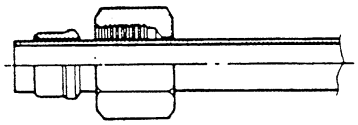
Hose Fitting Size	Torque			
	Union Nut (PF)		Taper Threads (PT)	
	kgf·m	ft-lb	kgf·m	ft-lb
1/8	$1.0^{+0.5}_{0}$	$7.3^{+3.5}_{0}$	$1.2^{\pm 0.12}$	$8.7^{\pm 0.8}$
1/4	$2.5^{+0.5}_{0}$	$18.1^{+3.5}_{0}$	$3.0^{\pm 0.30}$	$21.7^{\pm 2.1}$
3/8	$5.0^{+0.5}_{0}$	$36.2^{+3.5}_{0}$	$5.5^{\pm 0.55}$	$39.8^{\pm 3.9}$
1/2	$6.0^{+0.5}_{0}$	$43.4^{+3.5}_{0}$	$9.0^{\pm 0.90}$	$65.1^{\pm 6.4}$
3/4	$12.0^{+0.5}_{0}$	$86.8^{+3.5}_{0}$	$15.0^{\pm 1.50}$	$108.5^{\pm 10.7}$
1	$14.0^{+0.5}_{0}$	$101.3^{+3.5}_{0}$	$20.0^{\pm 2.00}$	$144.7^{\pm 14.3}$



Y2-A107

Bite Type Tube Fittings For Steel Tube

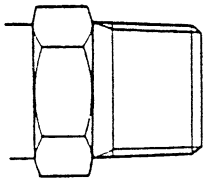
Tube Outer Diameter (mm)	Torque	
	kgf·m	ft-lb
8	$3.5^{\pm 0.5}$	$25.3^{\pm 3.5}$
10	$4.25^{\pm 0.25}$	$30.7^{\pm 1.7}$
12	$6.0^{\pm 0.5}$	$43.4^{\pm 3.5}$
15	$9.0^{\pm 0.5}$	$65.1^{\pm 3.5}$
16	$9.5^{\pm 0.5}$	$68.7^{\pm 3.5}$
18	$13.5^{\pm 0.5}$	$97.6^{\pm 3.5}$
22	$21.0^{\pm 1.0}$	$151.8^{\pm 7.2}$
27.2	$25.0^{\pm 1.0}$	$181.0^{\pm 7.2}$
28	$32.0^{\pm 2.0}$	$231.4^{\pm 14.3}$
32	$32.0^{\pm 2.0}$	$231.4^{\pm 14.3}$
35	$42.0^{\pm 2.0}$	$303.7^{\pm 14.3}$



Y2-A108

Tube Fittings

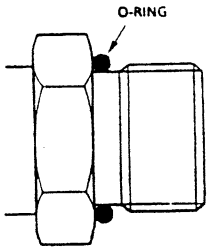
Nominal Thread Diameter (PT)	Torque			
	Steel		Cast Steel	
	kgf·m	ft-lb	kgf·m	ft-lb
1/8	$1.2^{\pm 0.12}$	$8.7^{\pm 0.8}$	$1.1^{\pm 0.11}$	$8.0^{\pm 0.7}$
1/4	$3.0^{\pm 0.30}$	$21.7^{\pm 2.1}$	$2.5^{\pm 0.25}$	$18.1^{\pm 1.7}$
3/8	$5.5^{\pm 0.55}$	$39.8^{\pm 3.9}$	$5.0^{\pm 0.50}$	$36.2^{\pm 3.5}$
1/2	$9.0^{\pm 0.90}$	$65.1^{\pm 6.4}$	$7.5^{\pm 0.75}$	$54.3^{\pm 5.3}$
3/4	$15.0^{\pm 1.50}$	$108.5^{\pm 10.7}$	$13.0^{\pm 1.30}$	$94.1^{\pm 9.3}$
1	$20.0^{\pm 2.00}$	$144.7^{\pm 14.3}$	$17.5^{\pm 1.75}$	$126.6^{\pm 2.5}$



Y2-A109

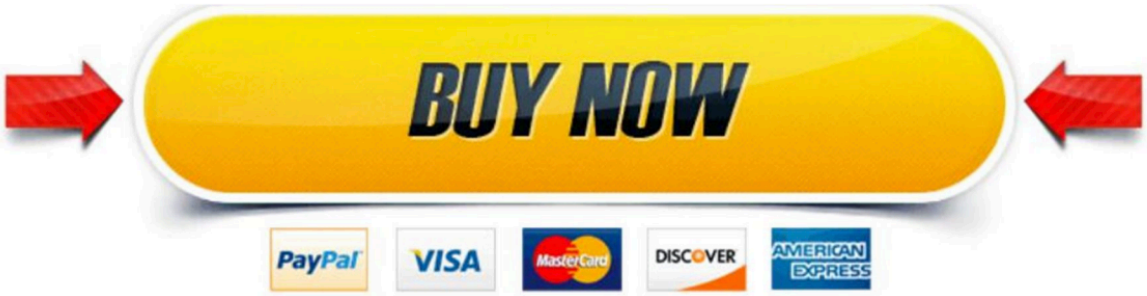
Tube Fittings (O-Ring Seal Type)

Nominal Thread Size (PF)	Torque	
	kgf·m	ft-lb
1/8	$2.0^{\pm 0.2}$	$14.5^{\pm 1.4}$
1/4	$3.5^{\pm 0.5}$	$25.3^{\pm 3.5}$
3/8	$5.5^{\pm 0.5}$	$39.8^{\pm 3.5}$
1/2	$6.5^{\pm 0.5}$	$47.0^{\pm 3.5}$
3/4	$9.5^{\pm 0.5}$	$68.7^{\pm 3.5}$
1	$11.0^{\pm 01.0}$	$79.5^{\pm 7.2}$
1-1/4	$12.0^{\pm 1.0}$	$86.8^{\pm 7.2}$
1-1/2	$14.0^{\pm 1.0}$	$101.2^{\pm 7.2}$



Y2-A110

Nominal Thread Size (UNF)	Torque	
	kgf·m	ft-lb
7/16-20	$1.7^{\pm 0.2}$	$12.3^{\pm 1.4}$
1/2-20	$2.3^{\pm 0.2}$	$16.6^{\pm 1.4}$
9/16-18	$3.2^{\pm 0.3}$	$23.1^{\pm 2.1}$
3/4-16	$6.1^{\pm 0.5}$	$44.1^{\pm 3.5}$
1-1/16-12	$10.4^{\pm 0.6}$	$75.2^{\pm 4.4}$
1-5/16-12	$13.8^{\pm 0.8}$	$99.8^{\pm 5.8}$
1-5/8-12	$18.5^{\pm 1.0}$	$133.8^{\pm 7.2}$


BUY NOW
PayPal
VISA
MasterCard
DISCOVER
AMERICAN EXPRESS