



# Operation Manual

## PRODUCT NAME

Load sensor (Cylinder bore size ø63, ø80, ø100)

## MODEL / Series / Product Number

X T 4 7 7 - 4 - X 1

X T 4 7 7 - 5 - X 1

X T 4 7 7 - 6 - X 1

**SMC Corporation**

# Contents

Safety Instructions	2~3
1. Specifications	4~5
2. Construction and Operation Principles	6
3. Dimensions	7
4. Applications and Installation	8~9
5. Handling Precautions	10



# Safety Instructions

These safety instructions are intended to prevent hazardous situations and/or equipment damage. These instructions indicate the level of potential hazard with the labels of “Caution,” “Warning” or “Danger.” They are all important notes for safety and must be followed in addition to International Standards (ISO/IEC)<sup>\*1)</sup>, and other safety regulations.

\*1) ISO 4414: Pneumatic fluid power -- General rules relating to systems.

ISO 4413: Hydraulic fluid power -- General rules relating to systems.

IEC 60204-1: Safety of machinery -- Electrical equipment of machines .(Part 1: General requirements)

ISO 10218-1992: Manipulating industrial robots -Safety.

etc.



## Caution

**Caution** indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.



## Warning

**Warning** indicates a hazard with a medium level of risk which, if not avoided, could result in death or serious injury.



## Danger

**Danger** indicates a hazard with a high level of risk which, if not avoided, will result in death or serious injury.

## Warning

### **1. The compatibility of the product is the responsibility of the person who designs the equipment or decides its specifications.**

Since the product specified here is used under various operating conditions, its compatibility with specific equipment must be decided by the person who designs the equipment or decides its specifications based on necessary analysis and test results.

The expected performance and safety assurance of the equipment will be the responsibility of the person who has determined its compatibility with the product.

This person should also continuously review all specifications of the product referring to its latest catalog information, with a view to giving due consideration to any possibility of equipment failure when configuring the equipment.

### **2. Only personnel with appropriate training should operate machinery and equipment.**

The product specified here may become unsafe if handled incorrectly.

The assembly, operation and maintenance of machines or equipment including our products must be performed by an operator who is appropriately trained and experienced.

### **3. Do not service or attempt to remove product and machinery/equipment until safety is confirmed.**

1. The inspection and maintenance of machinery/equipment should only be performed after measures to prevent falling or runaway of the driven objects have been confirmed.

2. When the product is to be removed, confirm that the safety measures as mentioned above are implemented and the power from any appropriate source is cut, and read and understand the specific product precautions of all relevant products carefully.

3. Before machinery/equipment is restarted, take measures to prevent unexpected operation and malfunction.

### **4. Contact SMC beforehand and take special consideration of safety measures if the product is to be used in any of the following conditions.**

1. Conditions and environments outside of the given specifications, or use outdoors or in a place exposed to direct sunlight.

2. Installation on equipment in conjunction with atomic energy, railways, air navigation, space, shipping, vehicles, military, medical treatment, combustion and recreation, or equipment in contact with food and beverages, emergency stop circuits, clutch and brake circuits in press applications, safety equipment or other applications unsuitable for the standard specifications described in the product catalog.

3. An application which could have negative effects on people, property, or animals requiring special safety analysis.

4. Use in an interlock circuit, which requires the provision of double interlock for possible failure by using a mechanical protective function, and periodical checks to confirm proper operation.



# Safety Instructions

## Caution

### **1. The product is provided for use in manufacturing industries.**

The product herein described is basically provided for peaceful use in manufacturing industries. If considering using the product in other industries, consult SMC beforehand and exchange specifications or a contract if necessary.  
If anything is unclear, contact your nearest sales branch.

## **Limited warranty and Disclaimer/Compliance Requirements**

The product used is subject to the following “Limited warranty and Disclaimer” and “Compliance Requirements”.

Read and accept them before using the product.

### **Limited warranty and Disclaimer**

#### **1. The warranty period of the product is 1 year in service or 1.5 years after the product is delivered, whichever is first.\*2)**

Also, the product may have specified durability, running distance or replacement parts. Please consult your nearest sales branch.

#### **2. For any failure or damage reported within the warranty period which is clearly our responsibility, a replacement product or necessary parts will be provided.**

This limited warranty applies only to our product independently, and not to any other damage incurred due to the failure of the product.

#### **3. Prior to using SMC products, please read and understand the warranty terms and disclaimers noted in the specified catalog for the particular products.**

#### **\*2) Vacuum pads are excluded from this 1 year warranty.**

A vacuum pad is a consumable part, so it is warranted for a year after it is delivered.

Also, even within the warranty period, the wear of a product due to the use of the vacuum pad or failure due to the deterioration of rubber material are not covered by the limited warranty.

### **Compliance Requirements**

#### **1. The use of SMC products with production equipment for the manufacture of weapons of mass destruction (WMD) or any other weapon is strictly prohibited.**

#### **2. The exports of SMC products or technology from one country to another are governed by the relevant security laws and regulations of the countries involved in the transaction. Prior to the shipment of a SMC product to another country, assure that all local rules governing that export are known and followed.**

# Foreword

The outlet pressure of the XT477 has a linear relationship with the applied load to the load sensor”  
 The XT477 can be combined with air operated devices in a feedback loop to create a balanced pneumatic circuit. For e.g.: combining the XT477 with an air cylinder and an air-operated precision regulator.

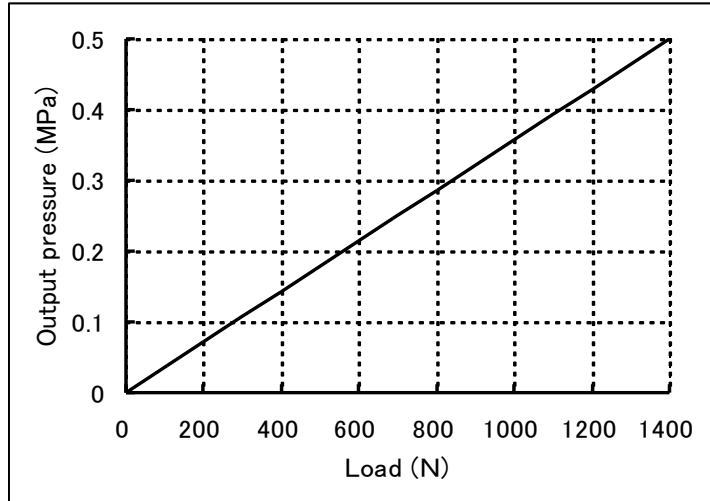
## 1. Specifications

Model	XT477-4-X1	XT477-5-X1	XT477-6-X1
Max. operating pressure	0.6 MPa		
Output pressure	0.05 ~ 0.5MPa		
Load/Output pressure characteristics	Refer to Load/Output pressure characteristics Table 1	Refer to Load/Output pressure characteristics Table 2	Refer to Load/Output pressure characteristics Table 3
Applicable cylinder bore size	63mm	80mm	100mm
Recommended weight for workload <sup>(Note 1)</sup>	100kg or less	150kg or less	240kg or less
Ambient and fluid temperature	-5 to 60 °C (No freezing)		
Fluid	Air		
Port size	Rc 1/8		
Construction	Relieving type		
Weight	Approx. 0.57kg	Approx. 0.88kg	Approx. 1.15kg

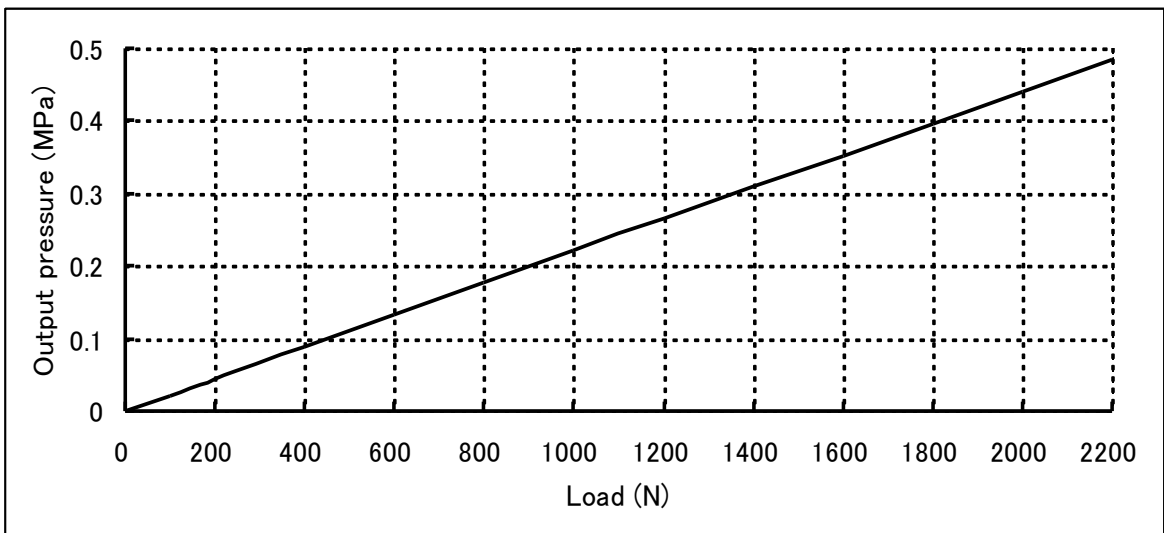
(Note 1) Inertia effects are accounted for.

Note : Eccentric loads should be kept as small as possible.

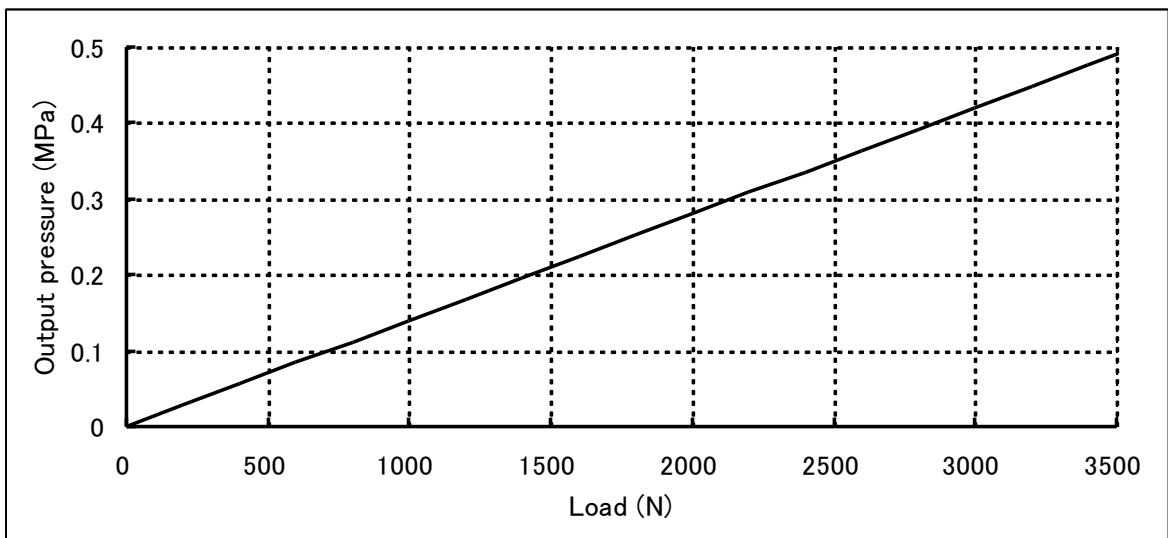
# Load/Output pressure characteristics



**Table 1 XT477-4-X1**



**Table 2 XT477-5-X1**



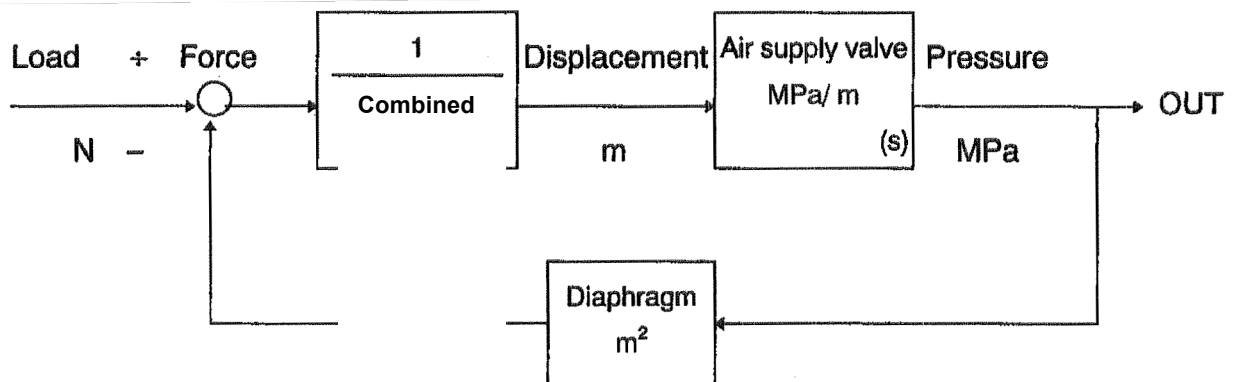
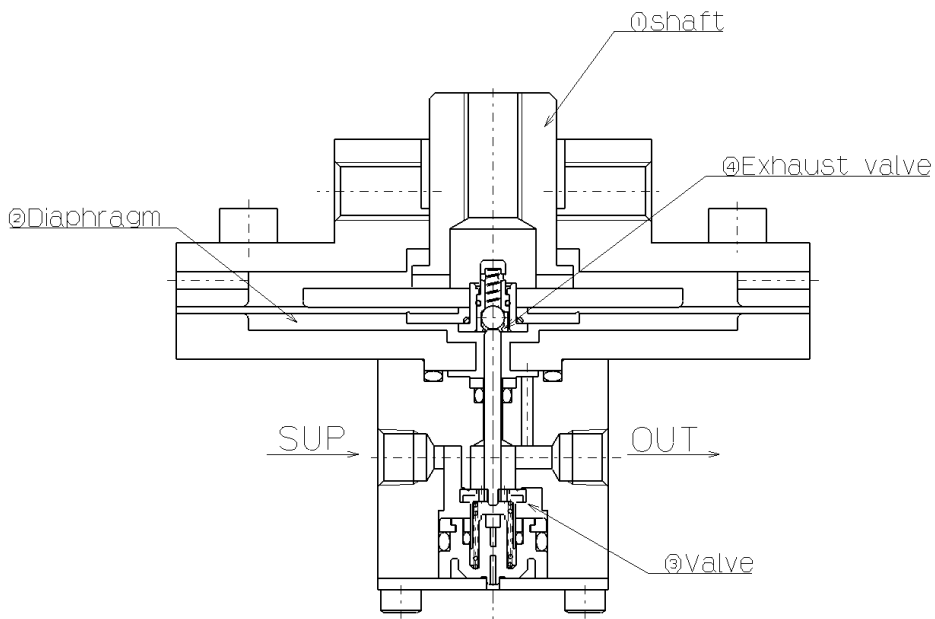
**Table 3 XT477-6-X1**

## 2. Construction and Operation Principles

When a load is applied to the shaft (1), the diaphragm (2) and valve (3) are pushed downwards. As a result, part of the supply pressure will flow to the OUT port. Air pressure from the OUT port acts upwards on the lower side of the diaphragm (2) and counteracts the force created by the load acting downwards on the diaphragm (2). This balances the applied load with the outlet pressure and is the set pressure.

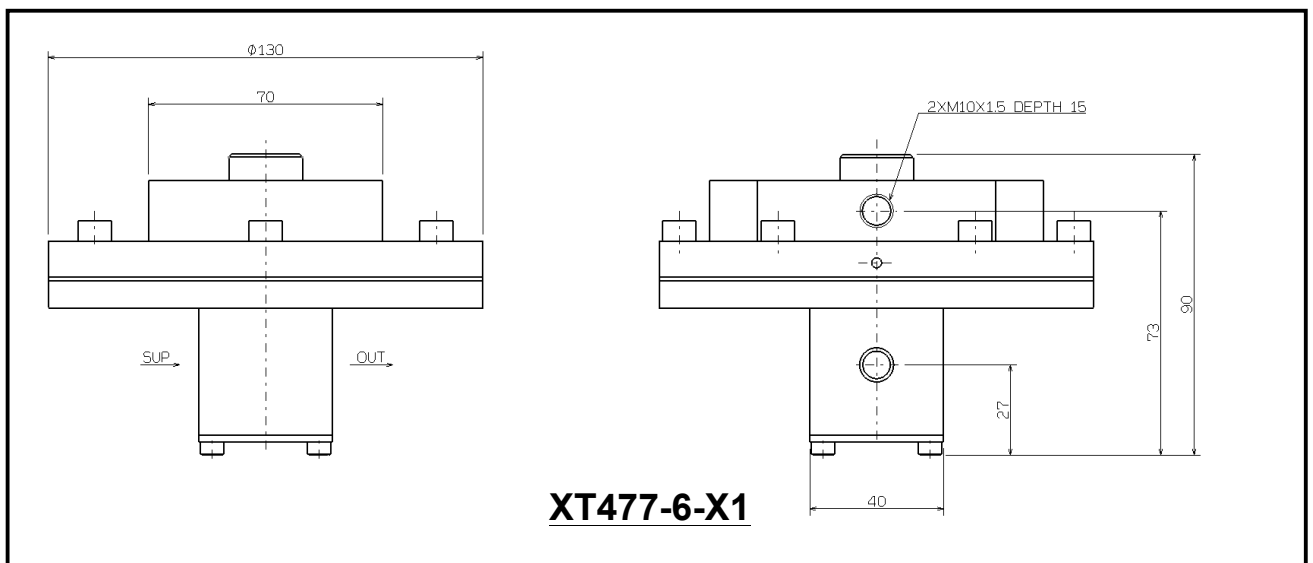
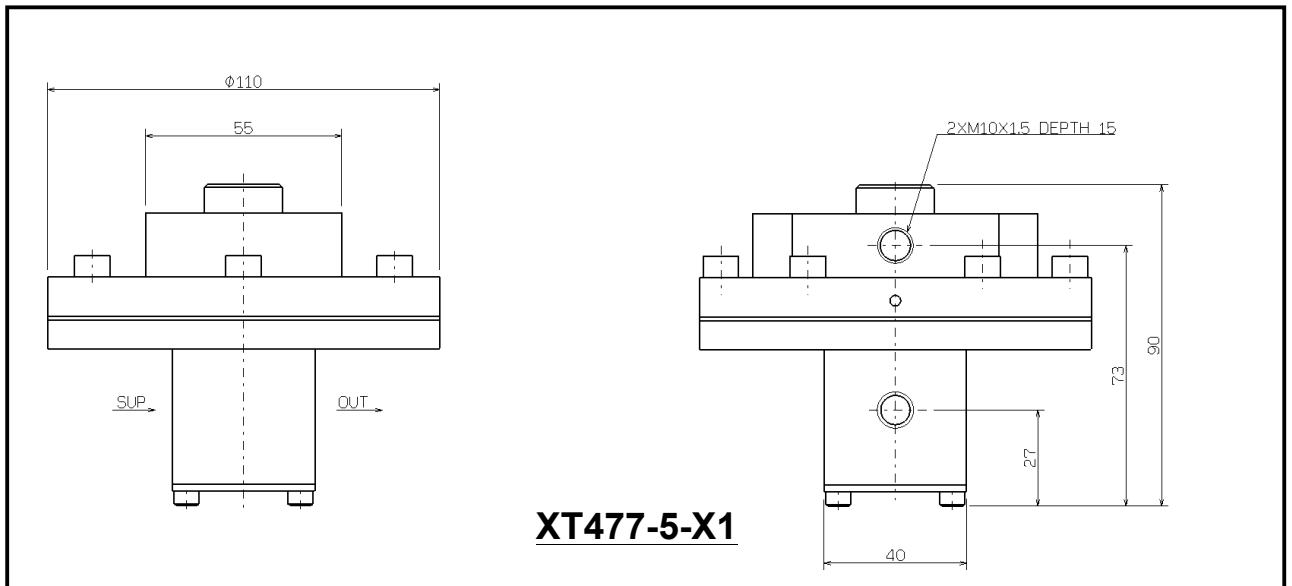
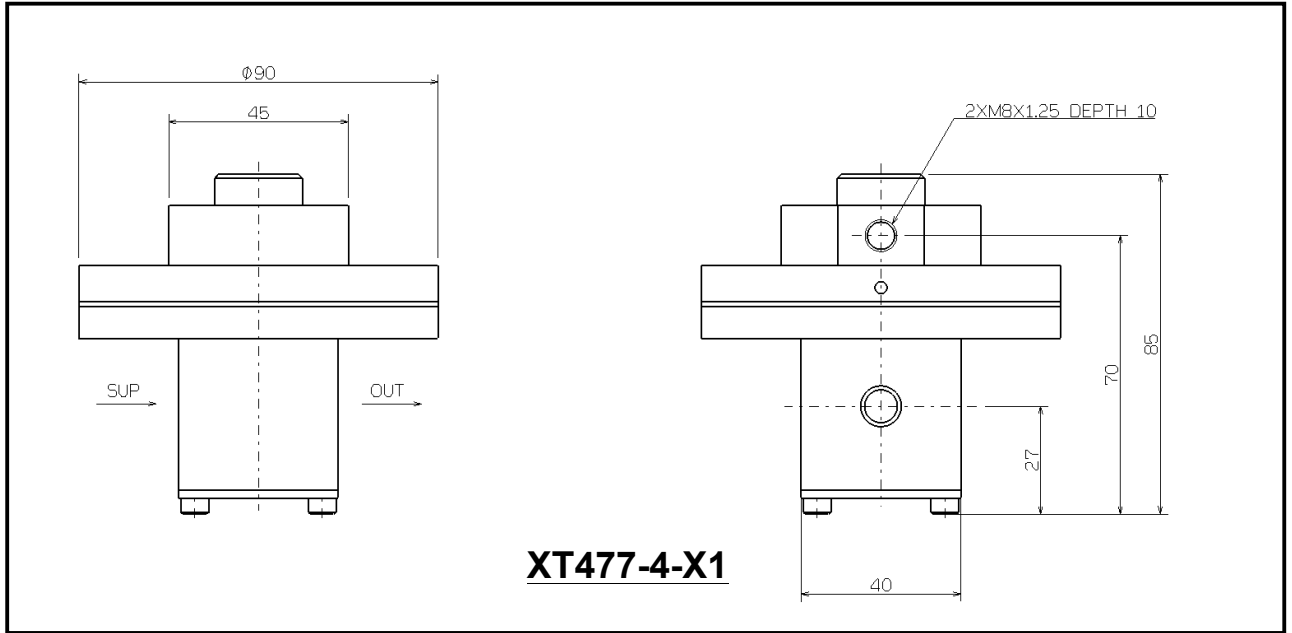
If the load is reduced, output pressure pushed upwards on the diaphragm (2) which closes the valve (3) and opens the exhaust valve (4), thus exhausting the excessive pressure from the OUT port to atmosphere.

This is how the linear relationship between output pressure and applied load is created.



**Block diagram**

### 3. Dimensions

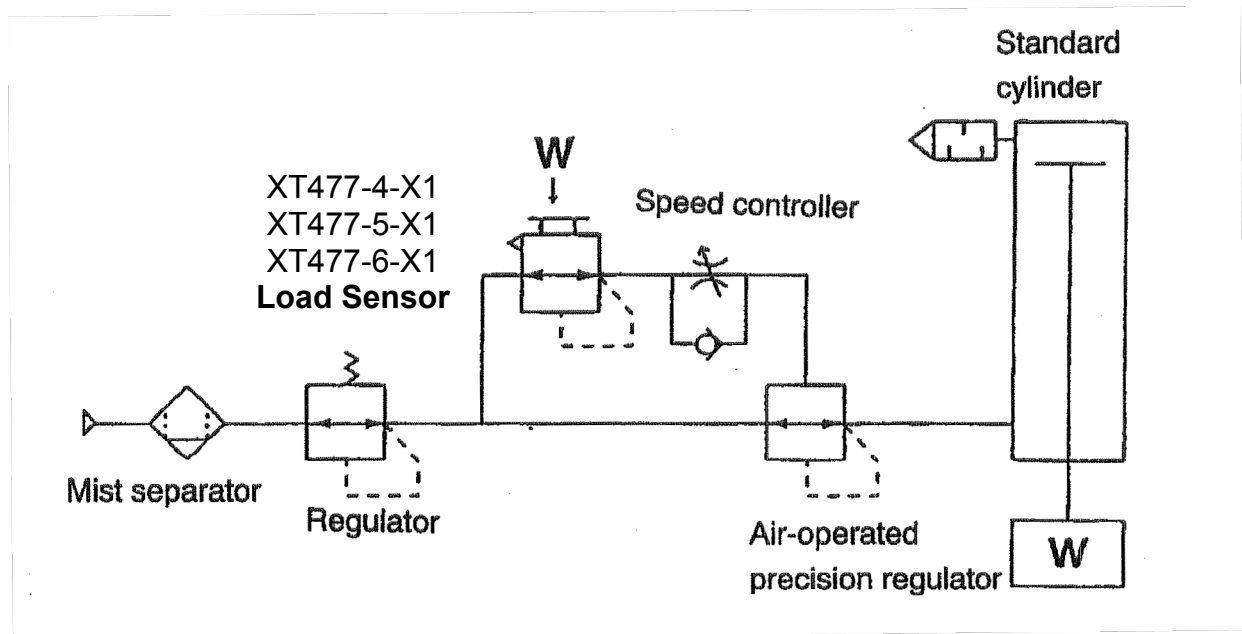




## 4. Application and Installation

Load sensor, XT477-4,5,6-X1, can be used as a balancer by combining an air cylinder [bore size : 63mm(XT477-4-X1), bore size : 80mm(XT477-5-X1), bore size : 100mm(XT477-6-X1)], air operated precision regulator and speed controller.

### 4-1. Circuit Example



Note)

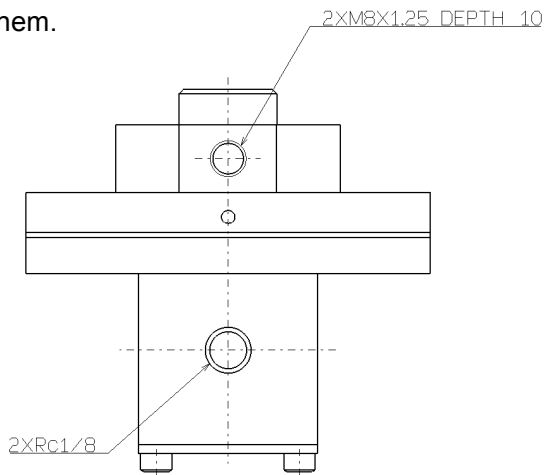
XT477-4,5,6-X1 can only be used with a cylinder with bore size of 63mm,80mm and 100mm.

When the load and pressure are not completely balanced, perform fine adjustment of the pressure by the air operate precision regulator.

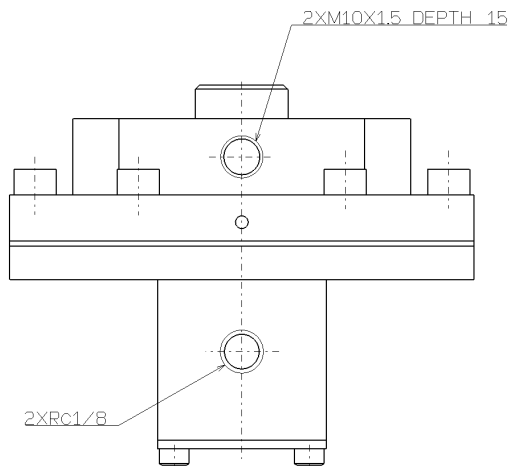
If there is a noise in the circuit, install a speed controller or air tank on the output side of the XT477-4,5,6-X1.

## 4-2. Mounting

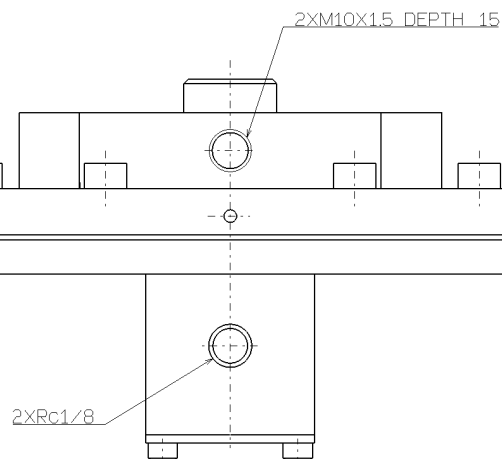
Use the two [M8 x 1.25] (XT477-4-X1), [M10X1.5](XT477-5-X1,XT477-6-X1) threaded holes to mount the workload to mount the sensor to the cylinder. Apply locking adhesive to the mounting screws before securing them.



**XT477-4-X1**

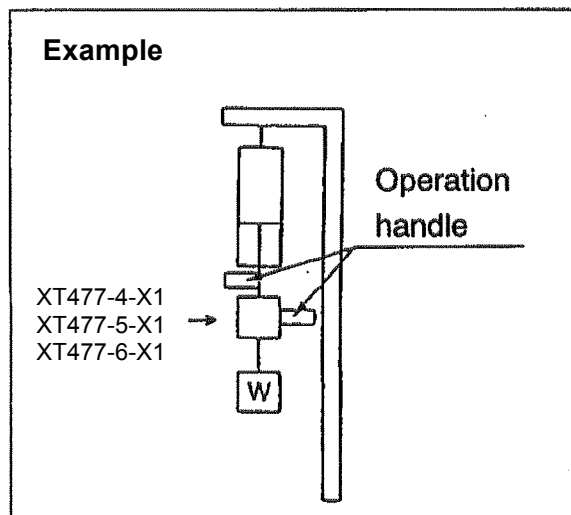


**XT477-5-X1**



**XT477-6-X1**

## Mounting Example



## 5. Handling Precautions

### **Warning**

#### Handling

- (1) Mount and remove the workload while the supply pressure is applied.
- (2) If a failure of the load sensor will be a danger to the system, install a safety circuit and configure the system so that danger can be avoided

### **Caution**

#### Air Supply

- (1) Install an air filter upstream near the product. A filtration degree of 5 micron millimeter or less should be selected.
- (2) Compressed air that contains excessive foreign material may cause malfunction of the product and other air compression equipment. Take measures to ensure air quality, such as by installing an aftercooler, air dryer, or water separator.
- (3) If excessive carbon dust is generated by the compressor, it may adhere to the inside of the product and cause it to malfunction.

### **Caution**

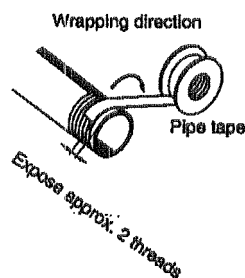
#### Environment

- (1) Do not use in an atmosphere containing corrosive gases, chemicals, sea water, water, steam, or where there is direct contact with any of these.
- (2) Do not use in a place subject to excessive heavy vibration and/or shock.

### **Caution**

#### Piping

- (1) Before piping is connected, it should be thoroughly blown out with air (flushing) or washed to remove chips, cutting oil and other debris from inside the pipe.
- (2) When screwing piping or fittings into ports, ensure that metal chips from the pipe threads or sealing material do not enter the piping. If sealant tape is used, leave approx. 2 thread ridges exposed at the end of the threads.



### **Caution**

#### Operation

- (1) Do not operate the load sensor outside of the specified ranges, as this can cause a failure. (See 1. Specifications)


Revision history

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Note: Specifications are subject to change without prior notice and any obligation on the part of the manufacturer.  
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