

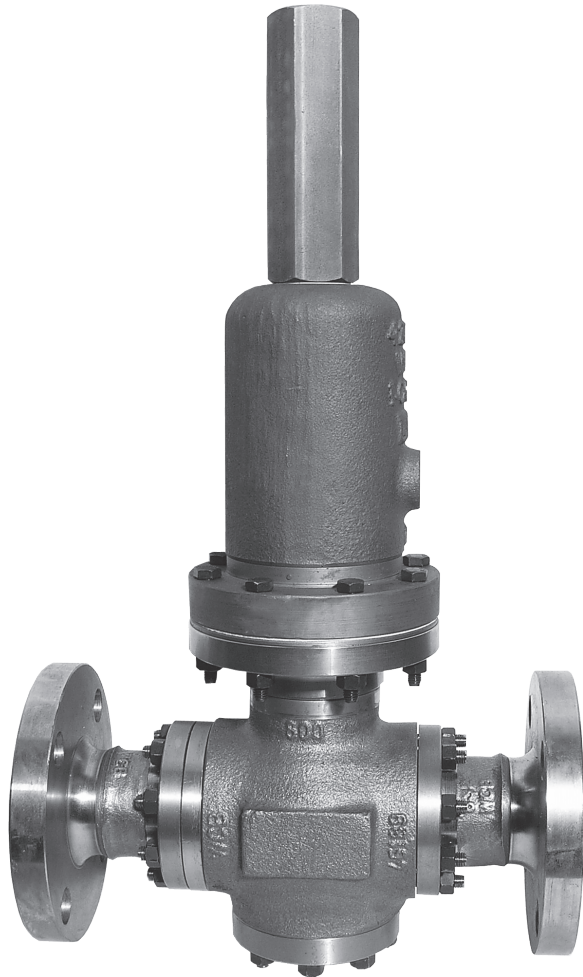
# Masoneilan

a Baker Hughes business

# 171/172 Series

## Self Operating Pressure Regulators

Instruction Manual (Rev.E)



**THESE INSTRUCTIONS PROVIDE THE CUSTOMER/OPERATOR WITH IMPORTANT PROJECT-SPECIFIC REFERENCE INFORMATION IN ADDITION TO THE CUSTOMER/OPERATOR'S NORMAL OPERATION AND MAINTENANCE PROCEDURES. SINCE OPERATION AND MAINTENANCE PHILOSOPHIES VARY, BAKER HUGHES COMPANY (AND ITS SUBSIDIARIES AND AFFILIATES) DOES NOT ATTEMPT TO DICTATE SPECIFIC PROCEDURES, BUT TO PROVIDE BASIC LIMITATIONS AND REQUIREMENTS CREATED BY THE TYPE OF EQUIPMENT PROVIDED.**

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# Safety Information

## Important - Please read before installation

These instructions contain **DANGER**, **WARNING**, and **CAUTION** labels, where necessary, to alert you to safety related or other important information. Read the instructions carefully **before** installing and maintaining your control valve. **DANGER** and **WARNING** hazards are related to personal injury. **CAUTION** hazards involve equipment or property damage. Operation of damaged **equipment can, under certain operational conditions, result in degraded process system performance that can lead to injury or death. Total compliance with all DANGER, WARNING, and CAUTION notices is required for safe operation.**



This is the safety alert symbol. It alerts you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.



Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.



Indicates a potentially hazardous situation which, if not avoided, could result in serious injury.



Indicates a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.



When used without the safety alert symbol, indicates a potentially hazardous situation which, if not avoided, could result in property damage.

**Note: Indicates important facts and conditions.**

# About this Manual

- The information in this manual is subject to change without prior notice.
- The information contained in this manual, in whole or part, shall not be transcribed or copied without Baker Hughes's written permission.
- Please report any errors or questions about the information in this manual to your local supplier.
- These instructions are written specifically for the 171 and 172 Series pressure reducing regulators, and do not apply for other valves outside of this product line.

## Useful Life Period

The current estimated useful life period for the 171 and 172 Series pressure reducing regulators is 25+ years. To maximize the useful life of the product, it is essential to conduct annual inspections, routine maintenance and ensure proper installation to avoid any unintended stresses on the product. The specific operating conditions will also impact the useful life of the product. Consult the factory for guidance on specific applications if required prior to installation.

## Warranty

Items sold by Baker Hughes are warranted to be free from defects in materials and workmanship for a period of one year from the date of shipment provided said items are used according to Baker Hughes recommended usages. Baker Hughes reserves the right to discontinue manufacture of any product or change product materials, design or specifications without notice.

### **Note: Prior to installation:**

- The valve must be installed, put into service and maintained by qualified and competent professionals who have undergone suitable training.
- All surrounding pipe lines must be thoroughly flushed to ensure all entrained debris has been removed from the system.
- Under certain operating conditions, the use of damaged equipment could cause a degradation of the performance of the system which may lead to personal injury or death.
- Changes to specifications, structure, and components used may not lead to the revision of this manual unless such changes affect the function and performance of the product.

# 1. General Information

The following instructions are designed to assist maintenance personnel in performing most of the maintenance required on the 171 and 172 Series regulators and if followed carefully will reduce maintenance time.

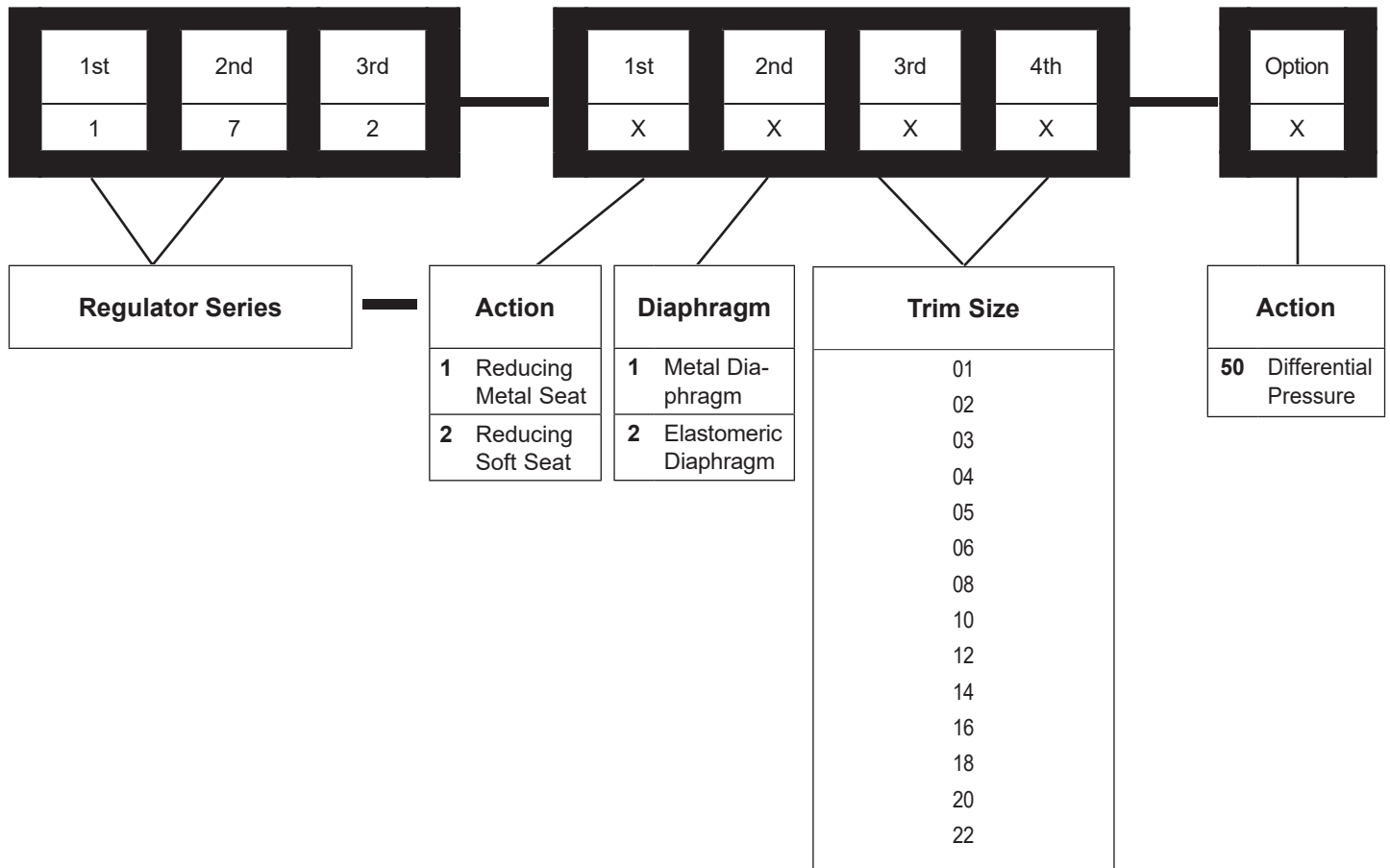
Baker Hughes has highly skilled Service Engineers available for start-up, maintenance and repair of our regulators and component parts. In addition, regularly scheduled training programs are conducted to train customer service and instrumentation personnel in the operation, maintenance and application of our control valves, regulators and instruments. Arrangements for these services can be made through your Baker Hughes Representative or District Office. When performing maintenance use only **Masoneilan™** replacement parts. Parts are obtainable through your local Baker Hughes Representative or District Office. When ordering parts always include MODEL and SERIAL NUMBER of the unit being repaired.

# 2. Transport, Storage and Handling

## Transport

Depending on their size, regulators can be transported loose, packed in cardboard boxes or in wooden crates.

All the regulator ends are fitted with covers to prevent dirt from entering. Packs can be placed on pallets if required. Follow all and any indications written on the packaging.



## CAUTION

Operators moving loads must take all necessary precautions to prevent accidents.

## Storage

Regulators must be kept in a dry place to protect them from atmospheric conditions. They may only be removed from their crates or packing immediately prior to installation.

The end protections and covers must be kept on until the last moment. Regulators, whether packed or not, must not be subject to violent knocks. Regulators, whether packed or not, must always be kept upright, that is, never lying on one side, in order to prevent distortion and damage to internal parts.

## Handling

When unpacking the regulators and removing the end protectors immediately prior to installation, take great care to make sure that foreign bodies do not enter the regulator inlet and outlet holes while it is being connected.

## CAUTION

When handling the regulator, make sure the work area is kept clear in order to prevent injury to people and damage to property.

# 3. Installation and Assembly Instructions – 171 and 172 Series

## 3.1 Cross-Section Drawing

Fig.1

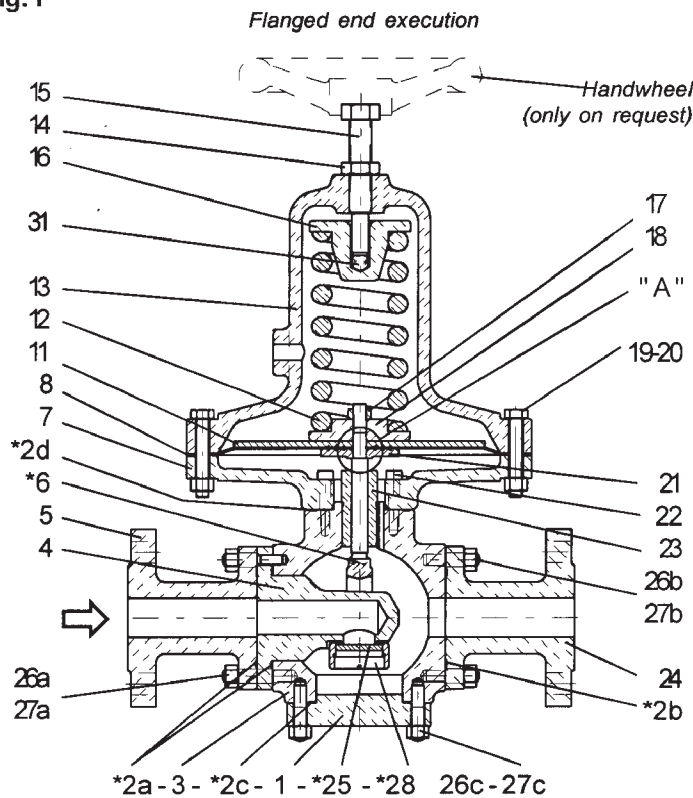


Fig.2

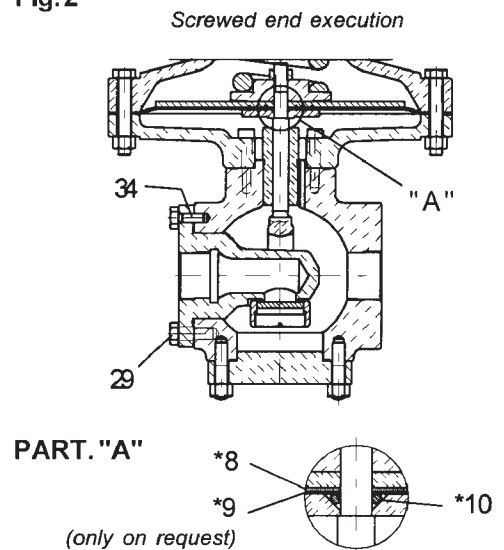


Fig.5  
Equalizer  
execution

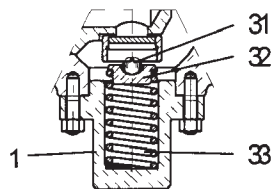


Fig.3

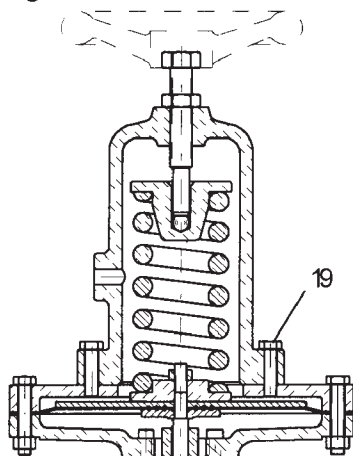
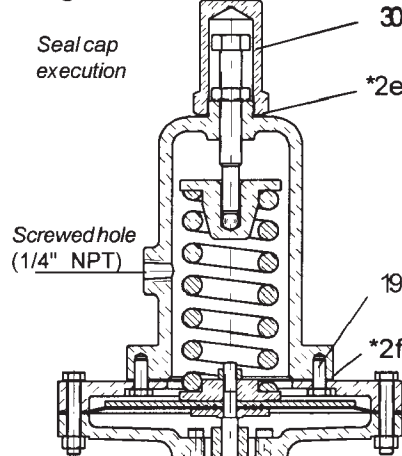


Fig.4



Figs.1-2-3-4-5 show the cross-sectional view of the Model 172 regulators along part names and versions.

Ref.	Part Name
1	Blindhead
*2	Gasket Set
3	Body
4	H.P. Insert
5	Inlet Flange
*6	Plug
7	Diaphragm Case
*8	Diaphragm
*9	Protector - optional
*10	O-Ring
11	Diaphragm Plate
12	Spring
13	Spring Case
14	Lock Nut
15	Adjusting Screw
16	Spring Button
17	Nut
18	Spring Guide
19	Screw
20	Nut
21	Diaphragm Plate - Lower
22	Screw
23	Guide
24	Outlet Flange
*25	Disc
26	Stud
27	Nut
*28	Plug Screw
29	Screw
30	Cap
31	Ball
32	Ball Seat
33	Spring
34	Pin

\*Recommended spare parts.

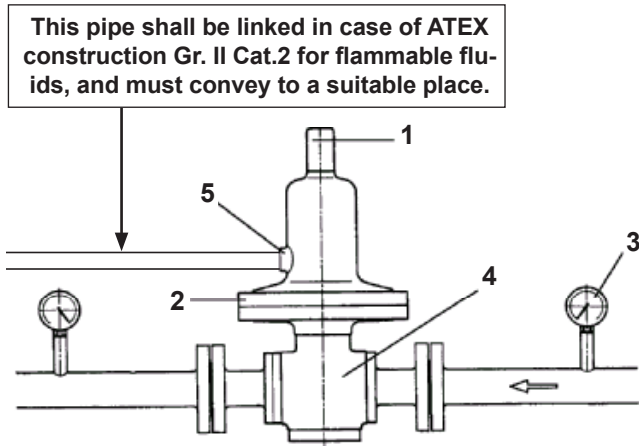
## 3.2 Installation

**3.2.1** 171 and 172 Series regulators must be installed with the actuator facing upwards and the diaphragm perfectly horizontal as shown in Fig. 6.

In pressure reducing applications regulating very low downstream pressures (normally lower than 100 mm water column); the regulator must be installed with the actuator facing downwards and perfectly horizontal (below pipeline) as indicated by the nameplate orientation as shown in Fig. 7.

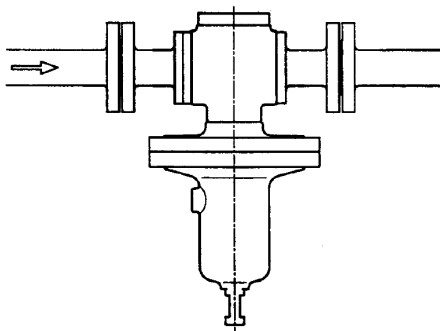
**3.2.2** Before installation, ensure piping is clean, free of any debris (machining chips, weld slag, etc). Contaminants remaining in the piping system can damage internal components of the regulator.

Fig. 6



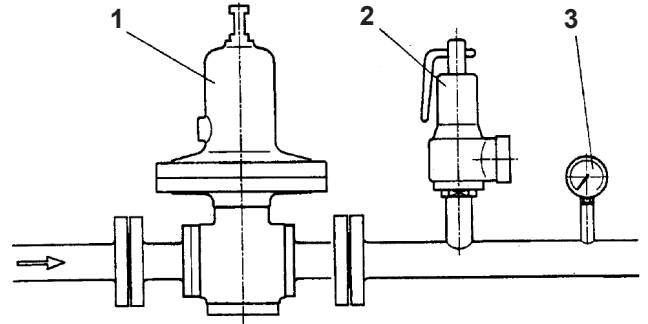
- 1) Adjustment screw
- 2) Actuator
- 3) Pressure gauge
- 4) Regulator body
- 5) Drain hole

Fig. 7



**3.2.3 WARNING/CAUTION ON ATEX USAGE:** When handling/working on harmless fluids (e.g. inert gases, like nitrogen, carbon dioxide and noble gases) the spring case is not normally airtight (ATEX construction, Group II- Cat.2), and has a hole (5) in Fig.6 and 7 which prevents it from pressurizing if the diaphragm breaks. If the spring case is airtight (Fig.4), made from carbon steel and stainless steel, the hole (5) in Fig.6 and 7 is always threaded 1/4" NPT and must be connected to pipe conveying the discharge to a suitable place (safely and constantly at atmospheric pressure).

Fig. 8



Pressure reduction system:

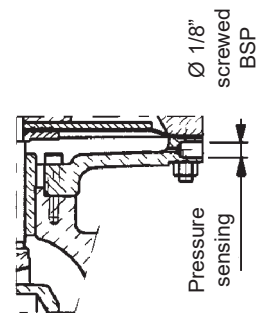
- 1) Reducing regulator
- 2) Safety relief valve
- 3) Pressure gauge

**3.2.4** Please keep in mind that the regulated pressure sensing port is located inside the regulator, therefore the pressure drops in the interconnecting piping between the regulator and the point of use will affect the accuracy of the maintained set pressure. This pressure drop must be considered when calculating the size of the connection piping.

**3.2.5** When it is essential to avoid pressure variations at the point of use, the regulators are fitted with an external sensing line connection, as shown in Fig. 9. The 1/8" female threaded port must be connected to a nipple as near as possible to the point of use.

**3.2.6** If you are not sure that the regulated fluid is clean, install a filter before the regulator.

Fig. 9



External sensing line nipple (only on request).

## 3.3 Start-Up and Calibration

The 171 and 172 series pressure regulators are shipped with a pressure setting at the low end of the adjustable range unless otherwise specified by the customer. The pressure setting can be changed to any value within the adjustable range by loosening the adjusting screw locknut (14) and turning the adjusting screw (15) in Fig.1 clockwise to increase the pressure setting or counterclockwise to decrease the pressure setting.



## 3.4 Maintenance

The required maintenance interval will vary depending on application. The user must establish a suitable maintenance depending on the operating conditions. Prior to disassembly remove all system pressure from the regulator.

### 3.4.2 Disassembly (Figs.1-2-3-4-5).

#### 3.4.2.1 Actuator

Remove spring compression by unscrewing the adjustment screw (counter-clockwise) after loosening the lock nut. The position of the locknut should be noted to allow closer preliminary adjustment when reassembling. If the regulator is equipped with a sealed cap (Fig.4), first remove the cap (30) and gasket.

Remove the spring case (13) by loosening the nuts (20).

**Note:** it is not necessary to remove the housings on actuator sizes 220 and 360.

Remove the spring. Unscrew the nut (17).

Remove the diaphragm and washers.

#### 3.4.2.2 Body Removal

Unscrew the nuts (27c) and remove the blindhead (1). Unscrew the nuts (27a) Fig.1 (flanged regulator) or the screws (29) Fig. 2 (threaded regulators). Remove the high pressure insert (4) keeping the plug in position; remove the plug.

#### 3.4.2.3 Parts Inspection

All the components are now ready to be inspected. Replace any worn items. Clean all parts.

Pay particular attention to the condition of the disc and plug, both elastomeric and metal, and the seat area of the high-pressure body.

If the seat is worn, it may be able to restore it by lapping using a metal disk and abrasive paste.

If preferred, the regulator may be returned to a Masoneilan Authorized Repair Center (*MARC*<sup>™</sup>) to be reconditioned.

The diaphragm should be replaced if it shows any damage. The same applies to Teflon diaphragm protector (if equipped).

Gaskets should not be re-used.

#### 3.4.2.4 Reassembly

Carry out the disassembly operations in reverse order.

Push the plug stem into the guide, replace gaskets (2a) and put the high pressure insert into position. Tighten the nuts or screws. Replace the small retention ring (10) after thoroughly cleaning its seat. Install the diaphragm, taking care to install the Teflon diaphragm protector (if equipped), towards the regulator body, lying on the lower diaphragm plate (21). Replace the diaphragm and spring guide. Tighten the nut (17), positioning the diaphragm so that when the diaphragm-bracket assembly is fully rotated to the right and left, each hole rotates by the same angle as the matching hole on the actuator flange. This means that the bracket is at right-angles to the high pressure insert. Match the holes of the diaphragm with the holes in the actuator flange and install the spring, spring button and spring case. Install the blindhead (1). Return the screw (15) to the position marked by the nut (14) or the position you noted down (see paragraph 3.4.2.1). Exact calibration must then be checked when the regulator starts working again.

### 3.4.3 Replacing the Diaphragm

The diaphragm may require replacement without having to make other repairs. If the regulator is easy to access and isolate, it can be replaced while leaving the regulator installed in the piping provided it can be isolated. In this case, isolate the regulator and vent all pressure. Ensure isolation valves are locked to prevent accidental pressurization will working on the regulator. Remove the actuator following the instructions in section 3.4.2.1.

Replace and install the diaphragm and reassemble the actuator as shown in section 3.4.2.4. Check calibration once more when the regulator starts working again.

## 3.5 171 and 172 Versions with Balancing Spring (Fig.5)

Some versions of the 171 and 172 Series regulators are equipped with a balancing spring which is mounted on the blindhead (1) in Fig.1. Note the existence of this spring during operations involving disassembly and reassembly of the blindhead (1) (see paragraph 3.4.2.2 and 3.4.2.4).

# CAUTION

**When welding piping, do not attach the ground to the regulator as this may damage important sliding parts.**

### 3.5.1 Model 171 with Cast Iron Body

Model 171 is identical to the 172 model in the versions with threaded ends (Fig.2), except that the body is made from cast iron.

The body is closed by means of a threaded disc screwed onto the body, instead of being attached with screws and nuts. The inlet and outlet connections are always threaded. There are therefore no substantial differences with respect to installation, start-up and calibration, and maintenance.

It should only be remembered that the blindhead is threaded and screwed to the body. The instructions for the Model 172 in the previous sections also apply to these versions. Remove the blindhead (1) with a 46 mm hex wrench.



# 4. Installation and Assembly Instructions – 172-50 Differential Pressure

## 4.1 Cross-Section Drawing – 172-50 Single Diaphragm

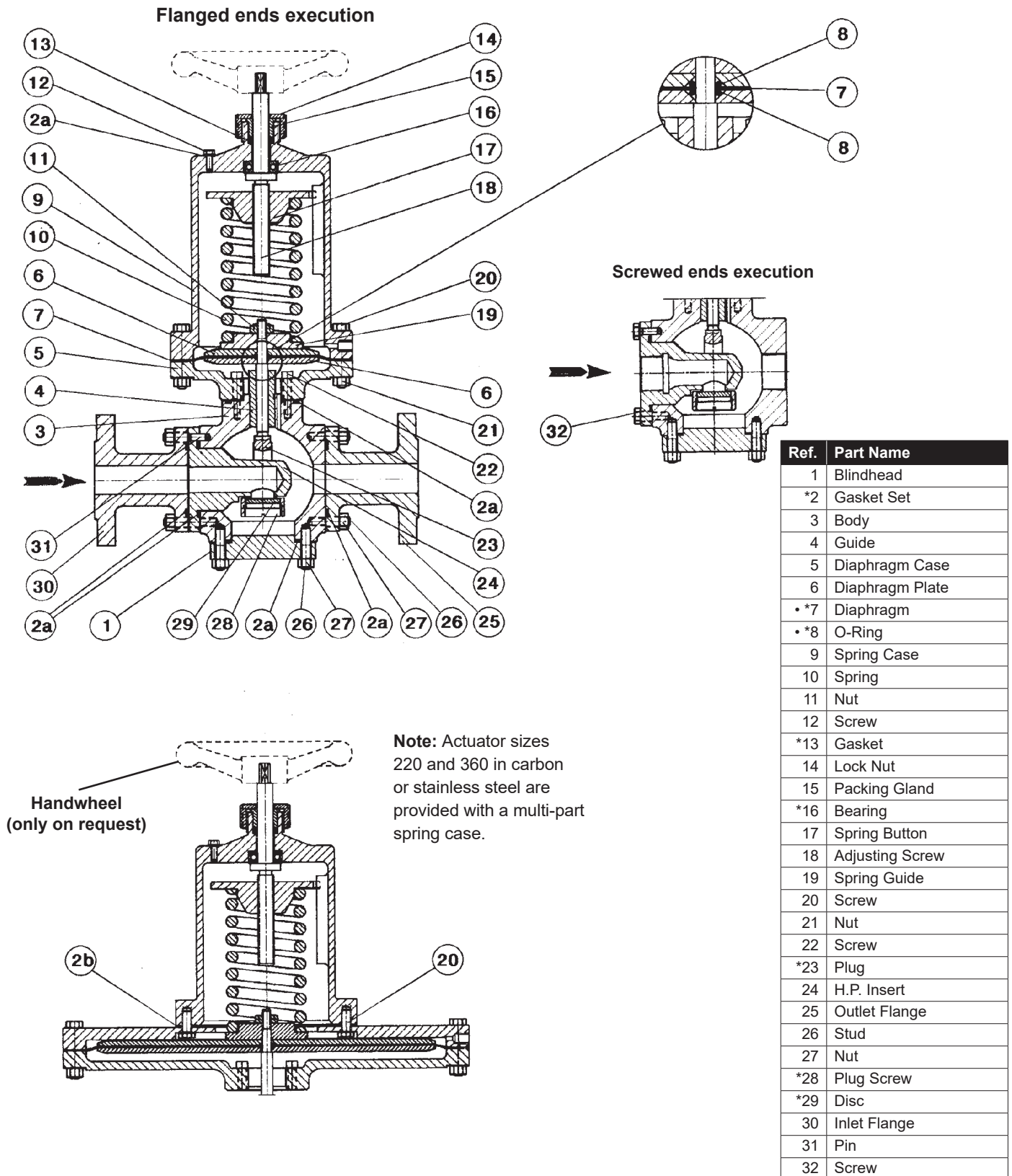


Fig. 10

\*Recommended spare parts.

• Supplied in one set only.

## 4.2. Cross-Section Drawing – 172-50 Double Diaphragm Construction

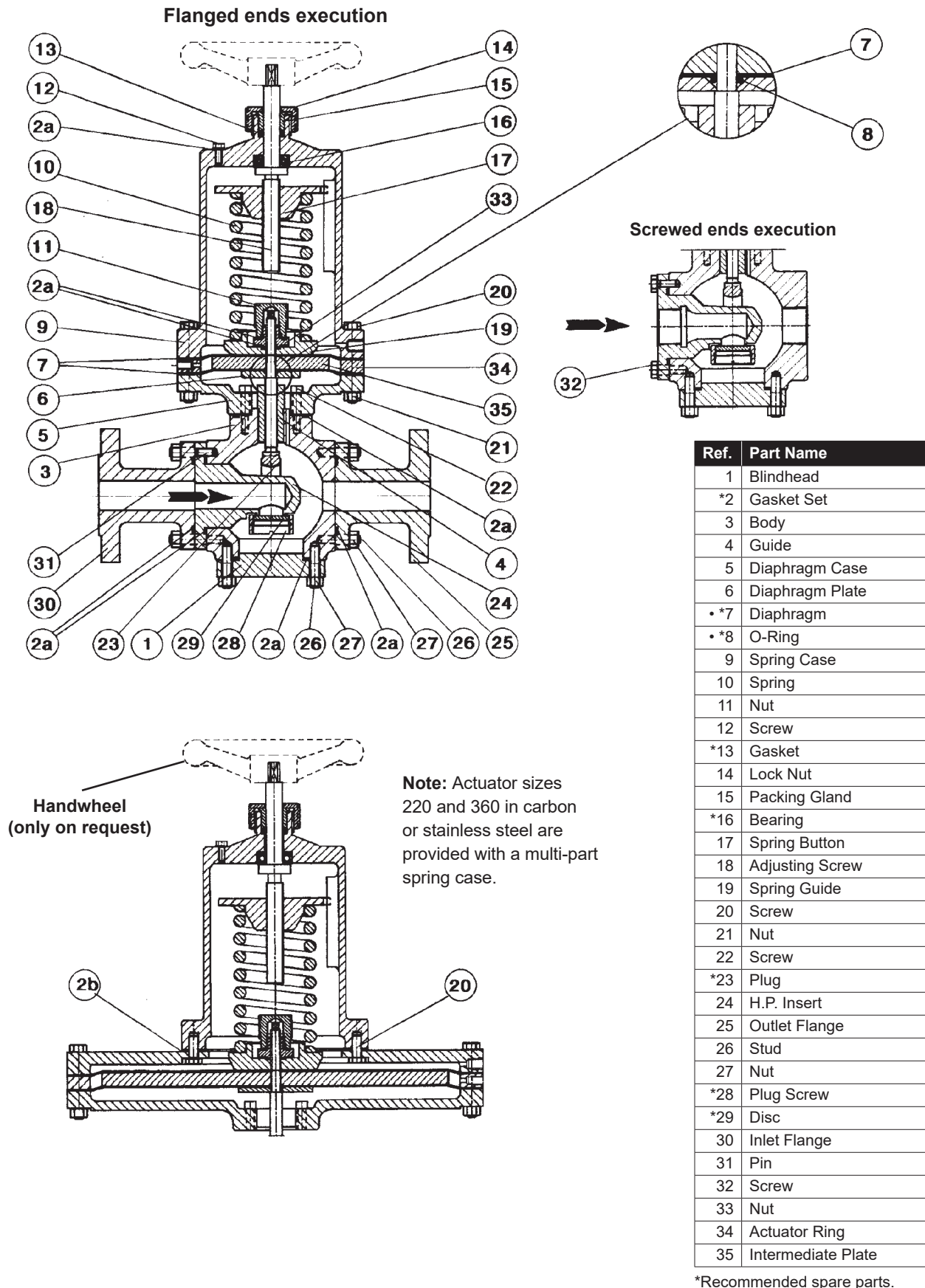


Fig. 11

**The 172-50 regulators comprise two groups of regulators:**

**Group 1: 172-50 Single Diaphragm (Fig.10)**

All the group 1 regulators have just one diaphragm; one of the controlled pressures acts under the diaphragm through an internal sensing line connection while the other acts over the diaphragm through a sensing line connection on the spring housing. The plug is kept open by the spring.

**Group 2: 172-50 Double Diaphragm (Fig.11)**

All the group 2 regulators have two diaphragms separated by a chamber communicating with the outside; the controlled pressures act under the lower diaphragm (through an internal sensing connection) and over the upper diaphragm (through a sensing line connection on the spring housing). The plug is kept open by the spring.

### 4.3 Installation

**4.3.1** All 172-50 regulators must be installed with the actuator facing upwards and the diaphragm horizontal.

### 4.4 Installation Diagrams

In most cases the flow crosses the regulator as shown by the arrow in Figs. 10-11. The installation diagrams are therefore as follows:

**Group 1 Regulators: 172-50 Single Diaphragm (Fig. 12)**

**Group 2 Regulators: 172-50 Double Diaphragm (Fig. 13)**

**4.4.1** Install an isolation valve upstream, downstream and on the sensing and discharge line connecting piping, in order to allow for servicing of the regulator (if necessary) while the plant is operating. Install one filter or pressure gauge downstream from the regulator and another one on the sensing line, as shown in the diagrams, in order to calibrate the differential pressure and keep it constantly under control.

**4.4.2** Before installing the regulator in the piping, make sure the insides of the pipes are clean and free of any debris (machining cuttings, weld slag, etc., especially the upstream section; blow down the piping if possible to eliminate any remaining dirt: small drops of weld slag may seriously damage the regulator.

**4.4.3** In group 2 regulators, the chamber between the two diaphragms must be connected to piping taking the discharge to a suitable place, safely and constantly at atmospheric pressure. This hole can be closed with a plug or pressure gauge with an electrical contact for the remote signaling that the diaphragm has failed, as long as the downstream piping is protected as described in section 4.4.4 below.

**4.4.4** If there is the slightest possibility of the pressure downstream from the regulator exceeding the maximum allowable pressure for the downstream piping or equipment, a safety valve must be installed, without any isolation valve in between, capable of discharging the entire flow.

**4.4.5** Please bear in mind that the regulated pressure sensing port is located inside the regulator, therefore the pressure drops in the inter-connecting piping between the regulator and the point of use will affect the accuracy of the maintained set pressure. This pressure drop must be considered when calculating the size of the connection piping.

**4.4.6** When it is essential to avoid pressure variations at the point of use, the regulators are fitted with an external sensing line connection, as shown in Figure 9. The 1/8" female threaded port must be connected to a nipple as near as possible to the point of use.

### 4.5 Start-Up and Calibration

**4.5.1** This operation is similar for both groups. The sensing line connection regulator and the upstream and downstream isolation valves must be closed. Slightly open the downstream valve and then the upstream valve together with the sensing line connection, making sure that the pressure difference read on the pressure gauges is correct. If necessary, to decrease it, turn the adjustment screw (18) clockwise to increase differential pressure or counterclockwise to decrease it.

When the required value is reached, fully open all the valves. When the downstream system is working at full power, calibrate by adjusting the screw (18).

### 4.6 Maintenance

**4.6.1** The required maintenance interval will vary depending on application. The user must establish a suitable maintenance depending on the operating conditions. Prior to disassembly remove all system pressure from the regulator.

#### 4.6.2 Disassembly

Be sure to consider the different diaphragm configurations while completing the following procedures for disassembly and reassembly of all types of 172-50 regulators. The diaphragm configurations are:

- one (1) single elastomer diaphragm for 172-50 Single Diaphragm
- two (2) elastomer diaphragms (one per side) for 172-50 Double Diaphragm version.

#### 4.6.3 Actuator Disassembly

Remove spring compression by unscrewing the adjustment screw (counterclockwise) after loosening the lock nut. The position of the locknut should be noted to allow closer preliminary adjustment when reassembling. If the regulator is equipped with a sealed cap (Fig.4), first remove the cap (30) and gasket.

Remove the spring housing (9) by loosening the nuts (20).

**Note:** it is not necessary to remove the housings on actuator sizes 220 and 360.

Remove the spring. Unscrew the nut (17).

Remove:

- The diaphragm with the relative washers for regulators 172-50 Single Diaphragm.
- The assembly comprising the two diaphragms, washers, servomotor ring and intermediate plate for regulators 172-50 Double Diaphragm Versions.

#### 4.6.4 Body Removal

Unscrew the nuts (27) and remove the blindhead (1).

Remove the nuts (27a) of the inlet flange (flanged regulators), or the screws (32) of the regulators with threaded ends; remove the high pressure body (24) keeping the plug in a suitable position. Remove the plug.

#### 4.6.5 Parts Inspection

All the components are now ready to be inspected. Replace any worn items. Clean all parts.

Pay particular attention to the condition of the disc and plug, both elastomeric and metal, and the seat area of the high-pressure body.

If the seat is worn, it may be able to restore it by lapping using a metal disc and abrasive paste.

If preferred, the regulator may be returned to Masoneilan Authorized Repair Center (MARC) to be reconditioned.

The diaphragm should be replaced if it shows any damage. The same applies to Teflon diaphragm protector (if equipped).

Gaskets and O-rings (8) should not be re-used.

#### 4.6.6 Reassembly

Carry out the dismantling operations in reverse order.

Push the stem of the plug into the guide and put the high pressure insert into position with the pin (31). For regulators with flanged ends, put the flange into position; tighten the nuts or screws uniformly. Install the Diaphragm(s) (see paragraph 4.6.3.) taking care to properly arrange the Teflon protectors, if equipped. Make sure the seats of the O-rings are perfectly clean before installing them.

Assemble:

- for single diaphragm versions: bracket, diaphragm plates, diaphragm and spring guide disks (with relative gaskets), nut.
- for double diaphragm versions: bracket, diaphragm, diaphragm plate, lower diaphragm, intermediate ring and actuator ring, upper diaphragm, spring guide (with relative gaskets), nut.

Before installing the nut and tightening, position the diaphragm/s so that when the diaphragm-bracket assembly is fully rotated to the right and left, each hole rotates by the same angle as the matching hole on the actuator flange. This means that the bracket is at right-angles to the high pressure body.

Tighten the nut (and the lock nut for double diaphragm). Match the holes of the diaphragm(s) with the holes in the actuator flange and reinstall the spring, spring holder and spring case.

Install the blindhead (1). Turn the adjustment screw the number of turns noted down during disassembly.

Exact calibration must then be checked when the regulator is returned to service.

#### 4.6.7 Diaphragm Replacement

The diaphragm may require replacement without having to make other repairs. If the regulator is easy to access and isolate, it can be replaced while leaving the regulator installed in the piping provided it can be isolated. In this case, isolate the regulator and vent all pressure. Ensure isolation valves are locked to prevent accidental pressurization while working on the regulator. Remove the actuator following the instructions in section 4.6.3

Replace and install the diaphragm and reassemble the actuator as shown in section 4.6.2 – 4.6.6. Check calibration once more when the regulator is returned to service.

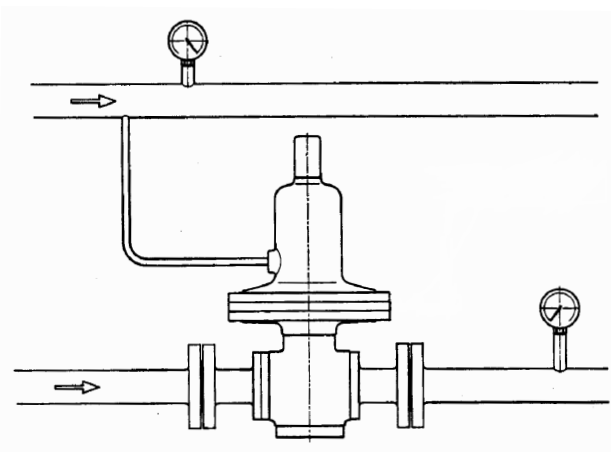


Fig. 12 Example of installation layout – Group 1 regulators: 172-50 Single Diaphragm

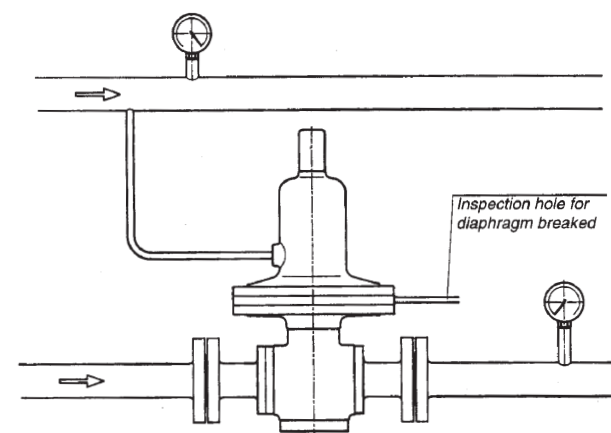


Fig. 13 Example of installation layout – Group 2 regulators: 172-50 Double Diaphragm

## Notes

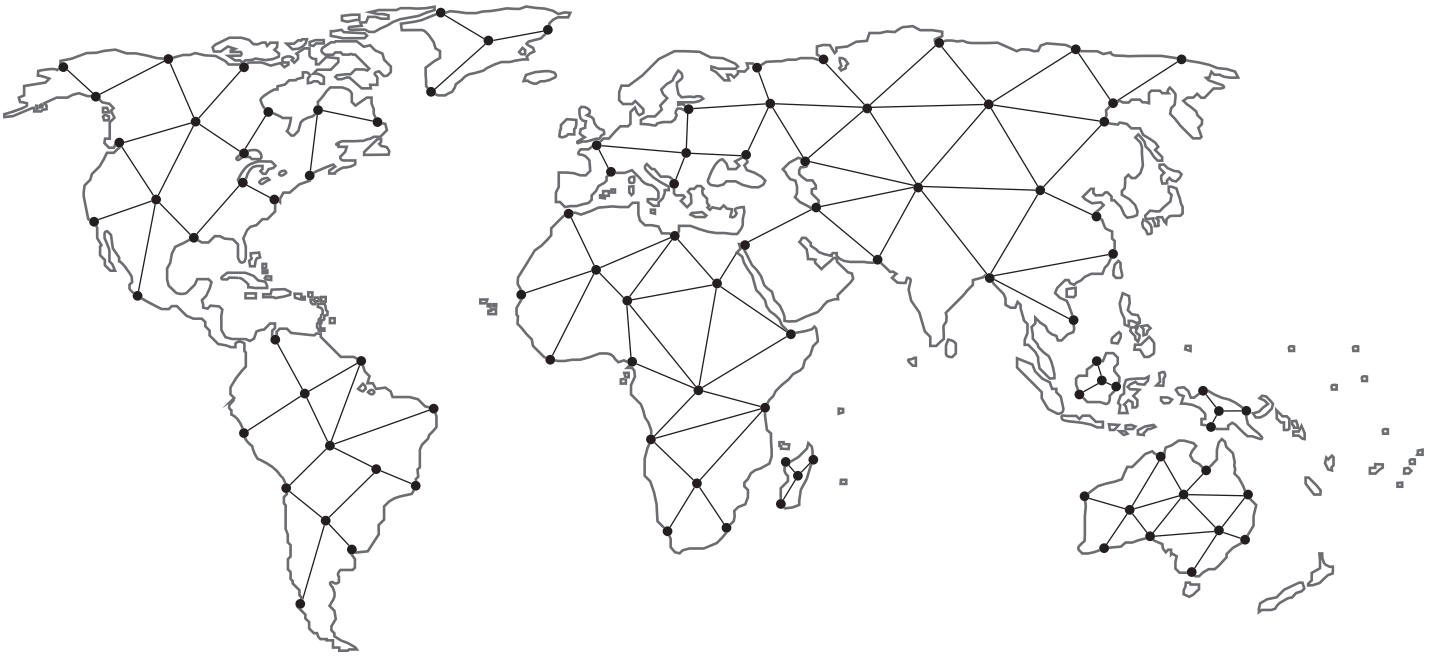
# Notes

## Notes



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