NAKAKITA

NAKAKITA
AUTOMATIC CONTROLLERS

CAT. No. 322-2E

1982Ⓓ

PRESSURE · DIFFERENTIAL PRESSURE · LEVEL · TEMPERATURE · FLOW RATE · VISCOSITY

- The technological trend in the industrial world is toward extra-large and fully-automated plants with emphasis placed on safety. **NAKAKITA**, a comprehensive manufacturer creating valves and their systems, has been constantly striving to develop new technologies, and at the same time, to maintain high and stable quality of the products with our total quality control system (TQC) monitoring the whole procedures of design and production. We are producing rich selections of valves, instruments, and their systems, so as to meet all the requirements of the customers.

- This catalogue summarily explains **NAKAKITA's** "pneumatic type automatic controllers" widely used in almost every type of industrial facilities, in combination with **NAKAKITA** diaphragm type control valves, one of our main products. The fields of application of our controllers are diverse, including ships, utilities' thermal and nuclear power generation, iron making, and chemical plants. Especially, in the field of ships, we have a glorious history and have accumulated much experience.

- As for the automaton on board ships, **NAKAKITA** has been working, as a pathfinder, together with the shipbuilding world and contributing much by energetically developing various control devices and their systems. As the full automation (unmanned machinery space) has been realized for labor saving on board ships, the highest reliability is naturally required of the control devices bearing the central roles in the automation. And the classification society of each country has established an environmental test system and made it obligatory to meet certain requirements or conditions.

  In view of this situation, we acquired the NV/EO type approval, the first one given to a Japanese instrument, for our Model NS732 indicating controller, one of our main products, in 1970. We have then obtained the type approval of each classification society for all of the relevant instruments.

- Further, **NAKAKITA** is positively promoting systematization of instrumentation systems, with the objective of furthering the reliability of the processes as a whole on land and sea, and of rationalizing the facilities and their maintenance. One notable example is our modules of instrumentation devices for certain processes, and we have a record of many past performances.

- **NAKAKITA** is prepared to meet various needs in the present and future domestic market as well as in the expanding international market, with our comprehensive total system engineering. By applying our field know-how, which has been acquired through many years of our work as a manufacturer of control systems including control valves and various valves, to the existing systems so as to achieve a comprehensive systematization, we are in a constant pursuit of higher reliability and economy in a wide range of applications.

- We have prepared this catalogue for the process instrumentation engineers, which concisely summarizes our instruments as a system. We hope these control devices will be adopted for your "automation scheme".

  NAKAKITA is waiting for your enquiry. Please remember our experienced engineers are ready to assist you in your planning.

PNEUMATIC TYPE AUTOMATIC CONTROLLERS

Sensers and auxiliary devices | Transmitters | Indicators and monitor switches | Indicating controllers

Pressure

① Instrument source valve with capilary tube

② Oil separate chamber (sealing pot)

③ Drain Pot

⑤⑥ Gauge savers

⑦ Noise damper

⑮ Pressure/temperature transmitter [Model NS790N]

⑯ Pressure transmitter [Model NS778AN]

D

B

⑲ Ribbon type level indicator [Model NS960RA]

⑳㉑ Dial type indicator (receiver gauges)

㉒ Monitor switch [Model NS9-3]

㉔ Automatic indicating controller [Model NS732]

㉕ Pneumatic pressure setting type indicating controller [Model NS732]

F

㉖ Program setting indicating controller [Model NS734]

D E

Differential pressure-level-flow rate (viscosity)

④ Reservoir tank (standard head)

⑰ Differential pressure transmitter [Models NS778BN and NS778CN]

⑱ 3-valve set

A

G

C

A

㊵ High sensitivity type differential pressure switch

A

㉗ Differential pressure controller [Model NS712]

㉘ Differential pressure type level controller [Model NS754A]

Temperature

⑩ Mercury expansion type thermal element
Gas-filled thermal element

D

Level

⑪ Air purge type level detecting element

B

C

NS967A air purge unit

E

⑫ Displacement type level detecting element

㉙ Level controller [Model NS755N]

㉛ Float type level controller [Model NS721]

⑬ Float type level detecting element

㉜ Float type level switch

Viscosity

㉚ Viscosity-transmitter unit [NS777C]

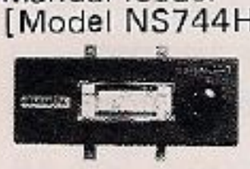
G

SYSTEM DIAGRAM

Manual controllers | **Adder and select relays** | **Accessories of operators** | **Accessories for pneumatic circuit**

㉝ Auto/manual changeover selector [Model NS743]

㉞ Manual loader [Model NS744H]



㉞ Manual loader [Model NS744V]

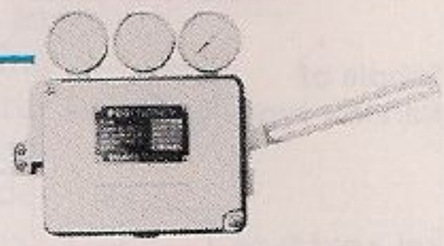
F

㉟ Pressure converter [Models NS767N and NS736N]

㊱ Differentiation adder [Model NS753D]

㊲ Select relay [Model NS774A]

㊳ Positioner [Model NS737]



㊴ Positioner [Model NS727]

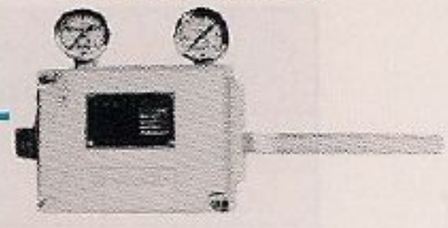
㊴ Booster relay [Model NS766C]

㊶ Lock valve for single action [Model NS772S]

㊷ Lock valve for double action type [Model NS722D]

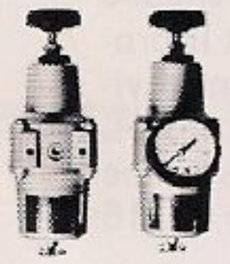
㊸ Three-way lock valve [Model NS772T]

㊹ Pneumatic type valve travel transmitter [Model NS737T]



㊺ Limit switch for valve open/close position

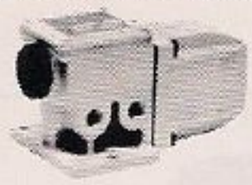
㊻ Filter regulator [Models NS770C and NS770CG]



㊼ Regulator

㊽ Bore 1/4 in. needle valve

㊾ 3-Port solenoid valve [Model NS642-70]



㊿ Air chamber

Pressure detecting line

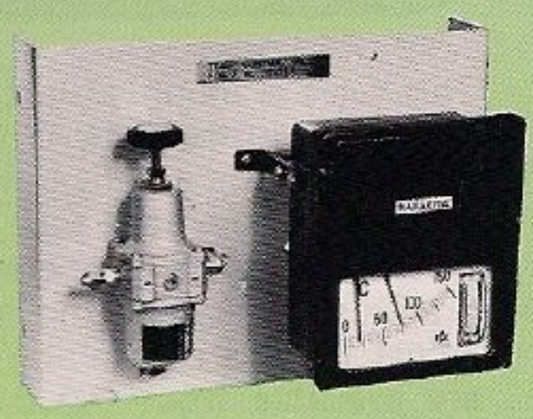
Temperature detection

Level detection

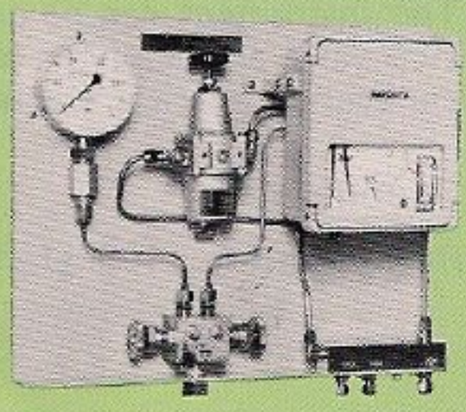
Signal & control air line

■ Unit & Unit Panels

• Simple type fitting panel

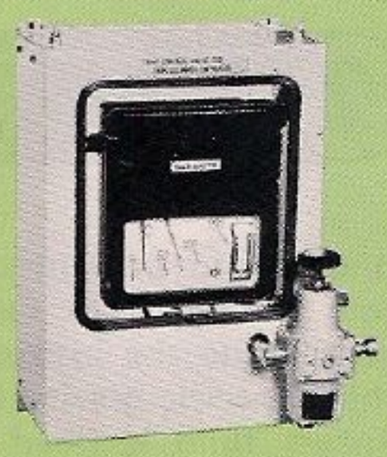


• Unit panel

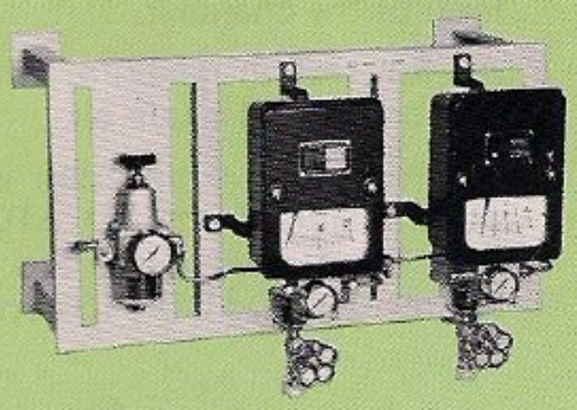


• Gland packing steam pressure control unit for main engine and generator turbine

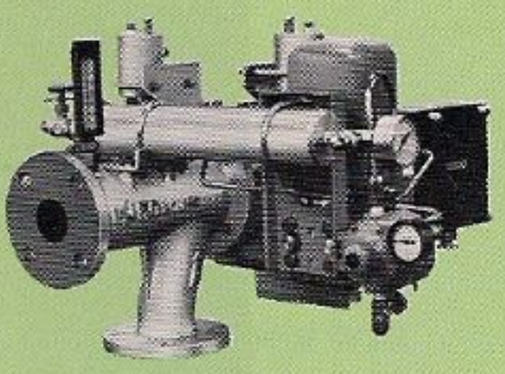
• Vibration-proof panel



• Transmitter-unit



• Viscosity-transmitter unit



Some specifications may be altered without prior notice for improvement of the products.

1 Instrument Source Valve with Capillary Tube

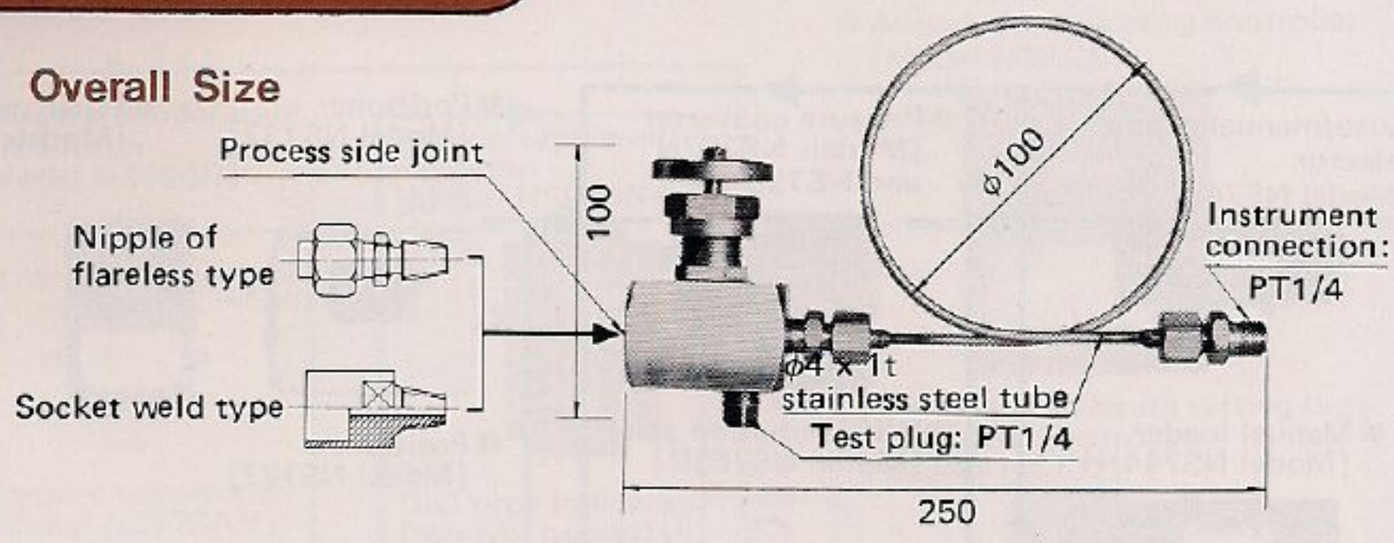
This valve is mounted just upstream the pressure measuring instrument. With the use of the heat radiating effect and flexibility of the loop-shaped ϕ4 x 1t stainless steel tube, the instrument is protected from high temperature fluid, harmful vibrations of the detecting line, and piping stresses. Joints for the connection with the process line are avaialble from OD ϕ10 copper tube to 15 (JIS bore) steel pipe.

The instrument can be calibrated by closing the stop valve and applying test pressure through the connection port for testing.

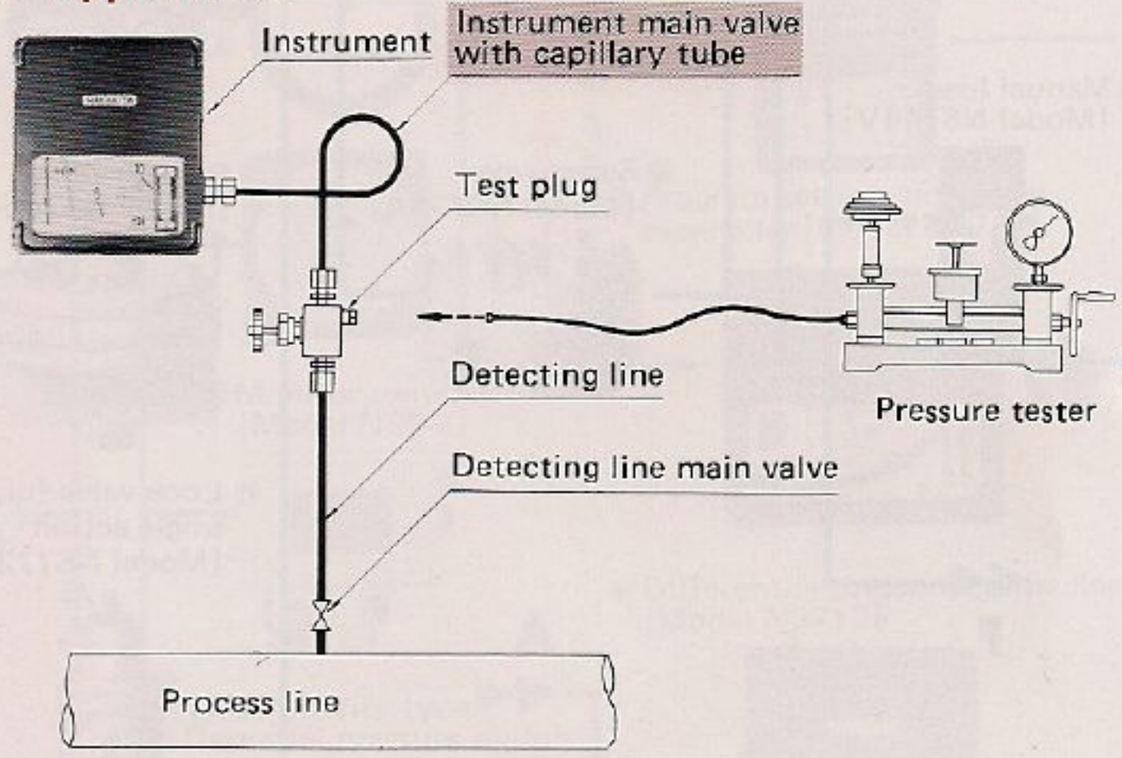
Specification

Rated pressure: 100kgf/cm²

Overall Size



Example of Application



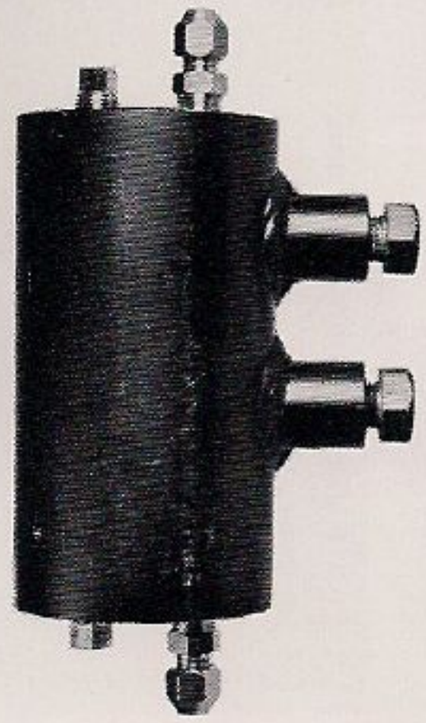
2 Oil Separate Chamber

(Sealing Pot)

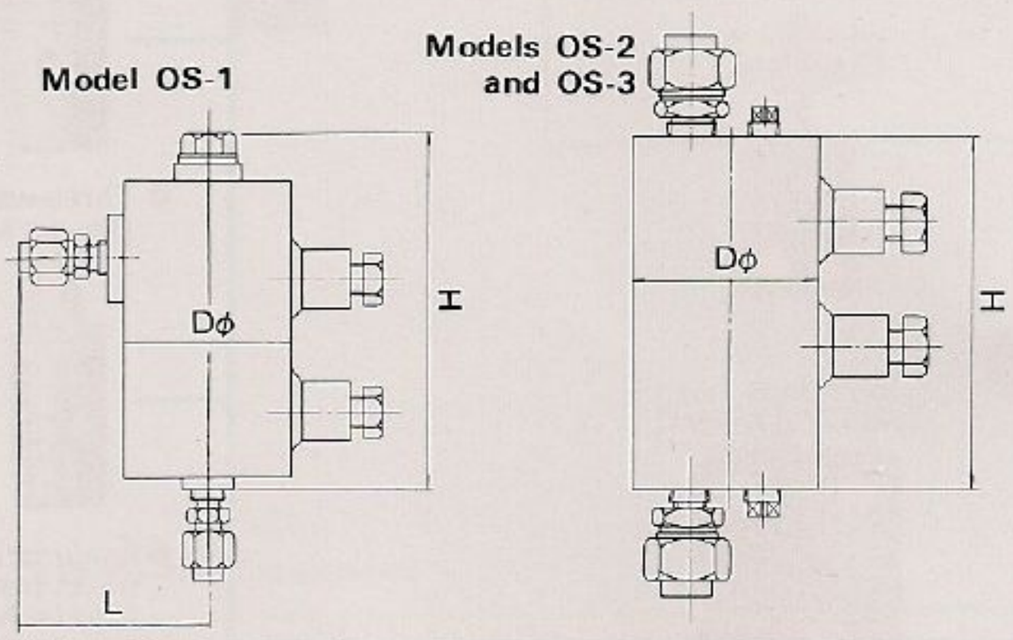
In order to prevent viscous or corrosive fluid from flowing into the pressure measuring element inside the instrument, an inactive fluid of which specific gravity is greater than that of the process fluid is filled from the instrument installed below this device up to an intermediate level of the chamber.

As for sealing medium, ethylene glycol is used for fuel oil and crude oil.

Joints for the connection with the process line are available from OD ϕ10 copper tube to 15 (JIS bore) steel pipe. The standard for the instrument side is OD ϕ10 copper tube.

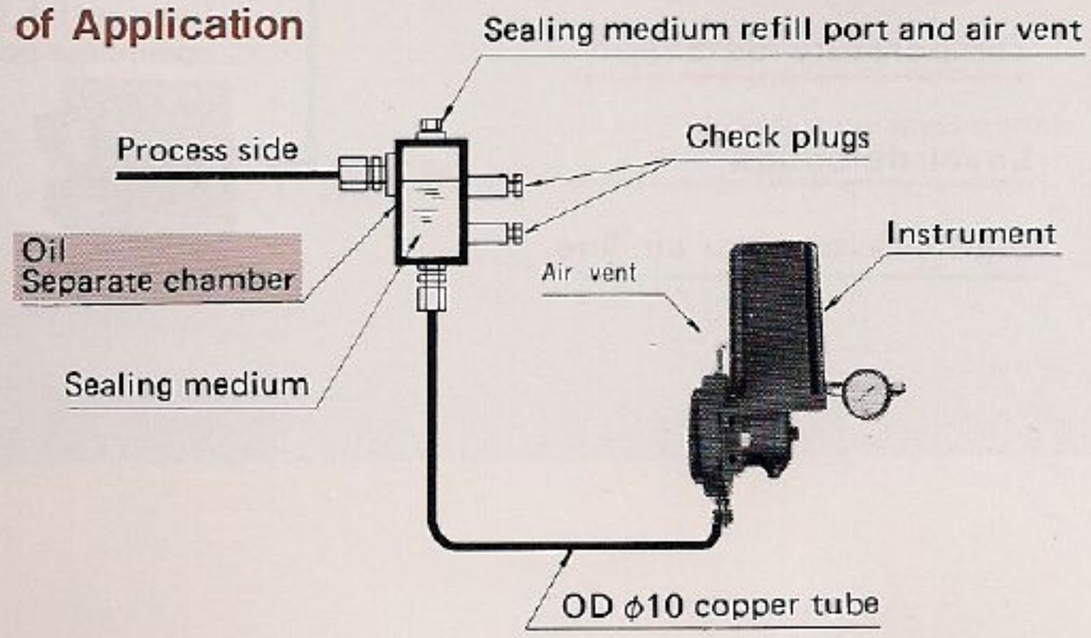


Overall Size



Model	Rated pressure kgf/cm²	Capacity ℓ	Overall sizes		
			D	H	L
OS–1	90	0.4	76.3	161	110
OS–2	10	0.115	48.6	97	—
OS–3	50	0.4	76.3	145	—

Example of Application



3 Drain Pot

This device is used for measuring minute pressure of fluids which condense at normal temperature such as steam. Drain condensed in the pot due to heat radiation overflows through the detecting line to the process side. Accordingly, the instrument is loaded with a constant head all the time. Measuring error due to the drain pot in the detecting line can be prevented by making a correction of this head.

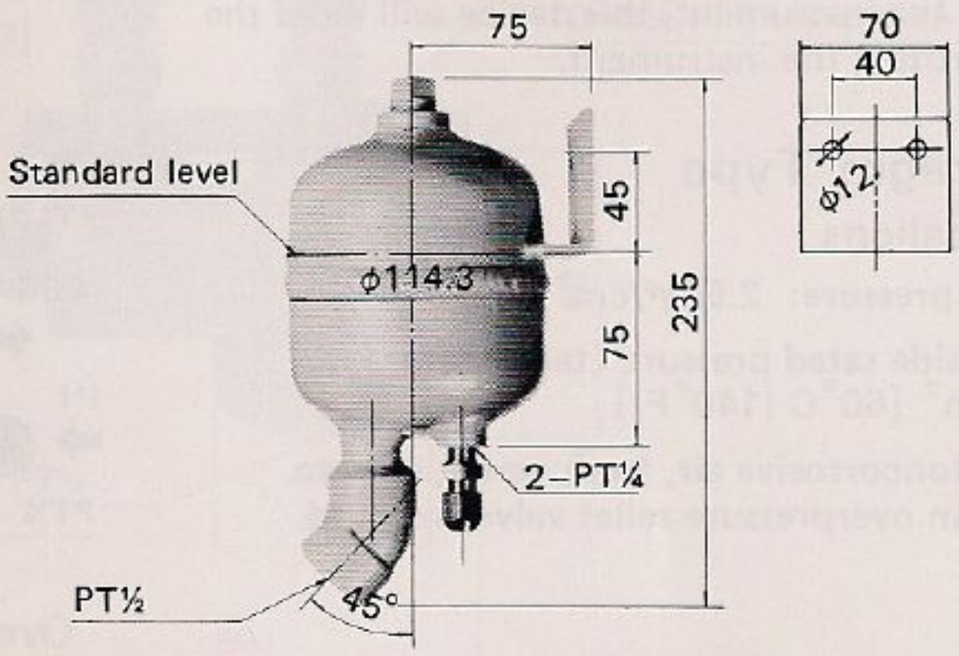
In addition, high temperature steam can be prevented from directly flowing into the instrument.

As the process detecting line handles the drain condensed in the pot, its appropriate size is 15 (JIS:bore) and a proper joint is provided. The standard for the instrument side is OD ϕ10 copper tube.

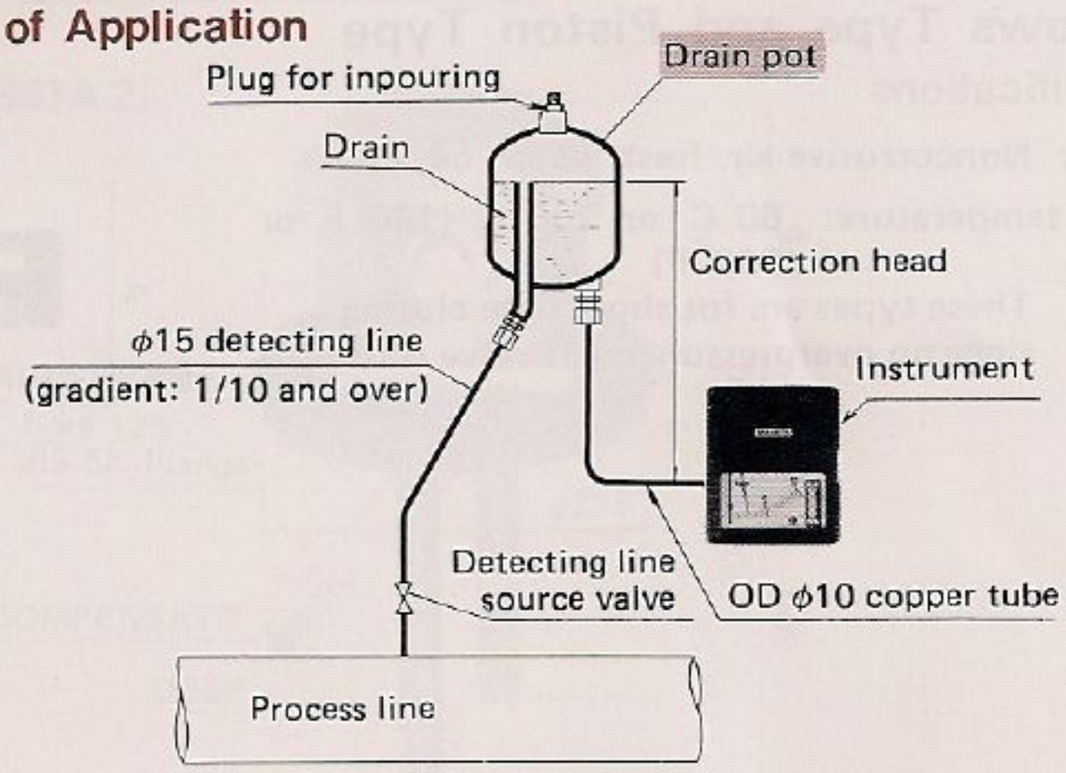
Specification

Rated pressure: 30kgf/cm²

Overall Size



Example of Application

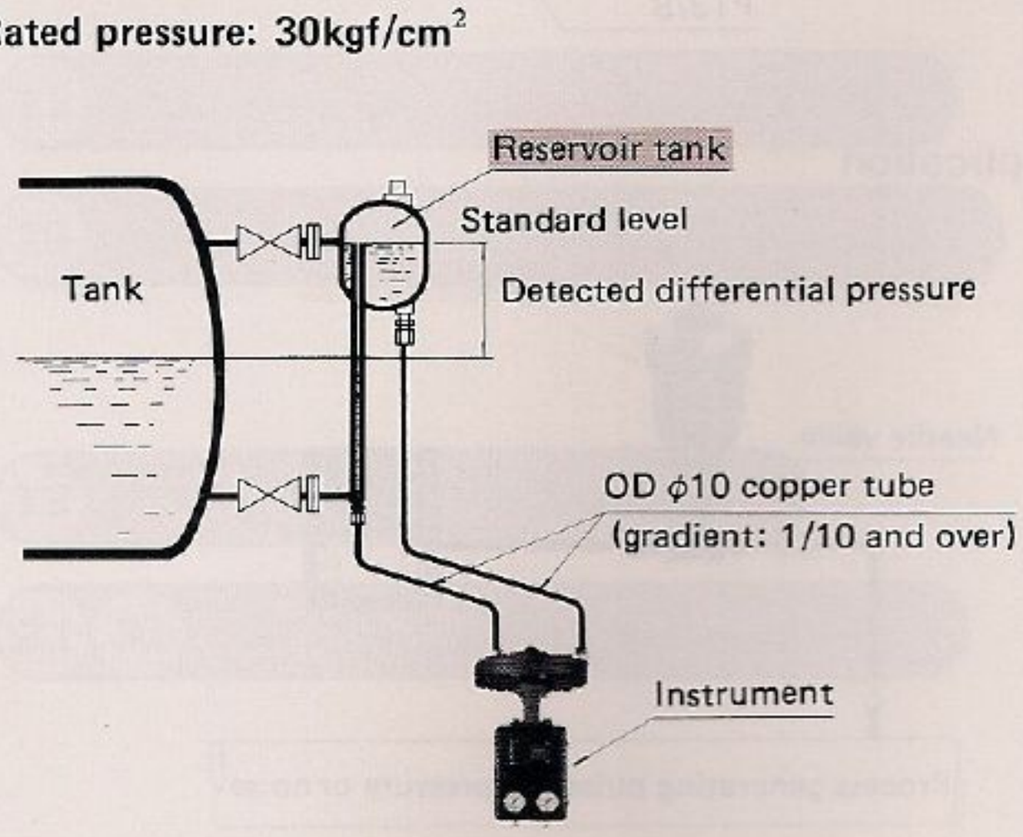


4 Reservoir Tank

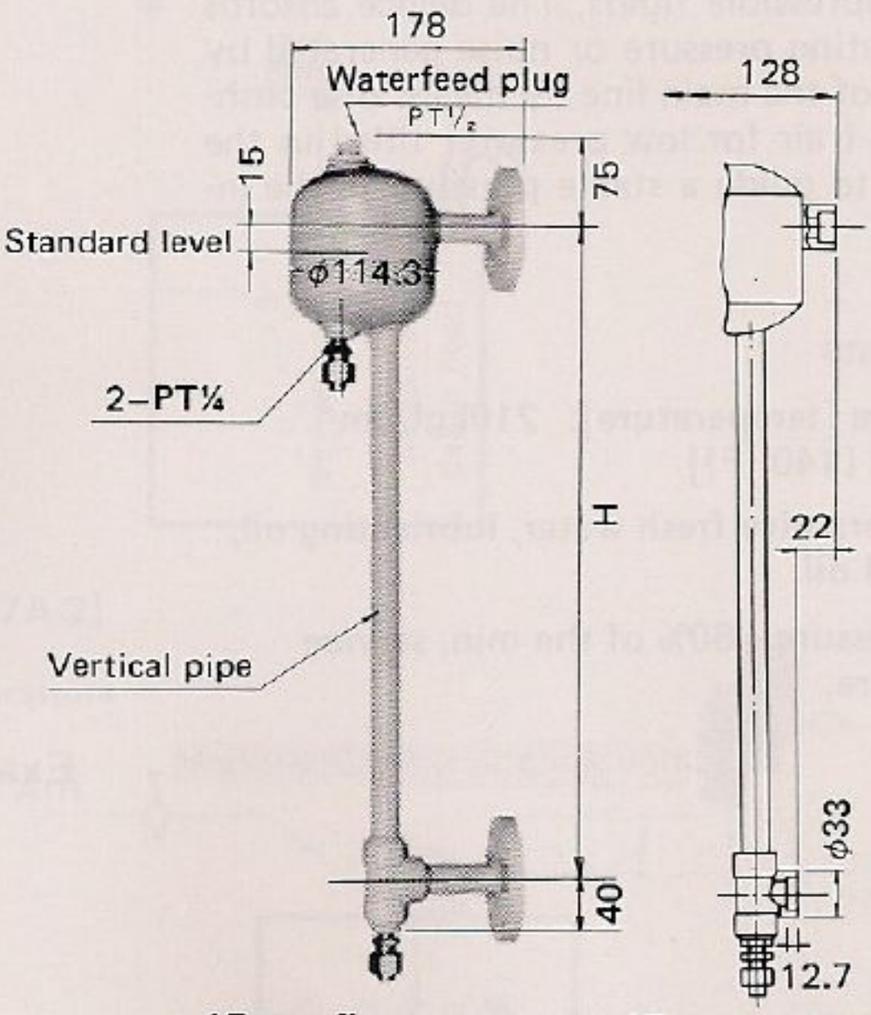
This device is used when the level of a pressure tank of fluids which condense at normal temperature such as steam is measured with a differental pressure type detector. Drain condensed due to heat radiation in the upper chamber constantly overflows the standard level through the vertical pipe to the lower detecting element. The tank level is between the upper and lower detecting elements, and the level is measured as a differential pressure in comparison with the abovementioned standard level.

Specification

Rated pressure: 30kgf/cm²



Overall Size



15mm flange type　　15mm socket weld type

mm

H (flange center) standard dimensions										
400	450	500	600	700	800	900	1000	1200	1400	1600
bore 15mm flange type										
JIS 5K, 10K, 20K				ANSI 150lb 300lb						

5 6 Gauge Savers

When the detected pressure exceeds the mesuring range of the instrument, this device will close the line to protect the instrument.

Diaphragm Type

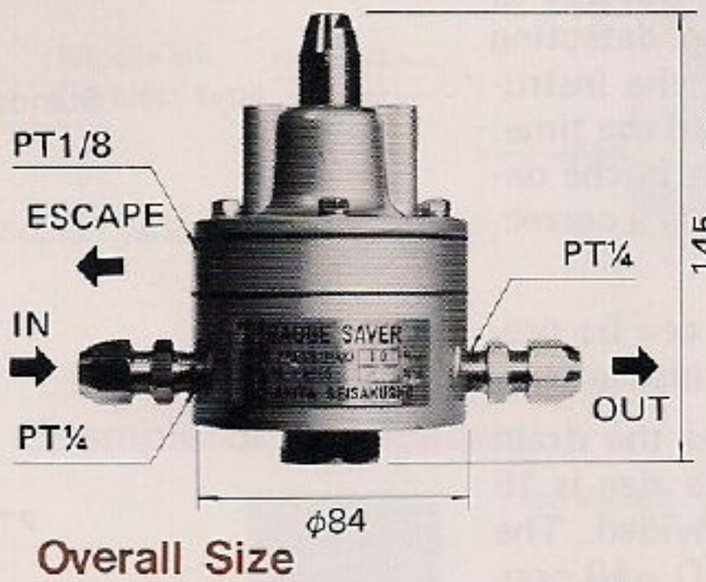
Specifications

Max. set pressure: 2.5kgf/cm²

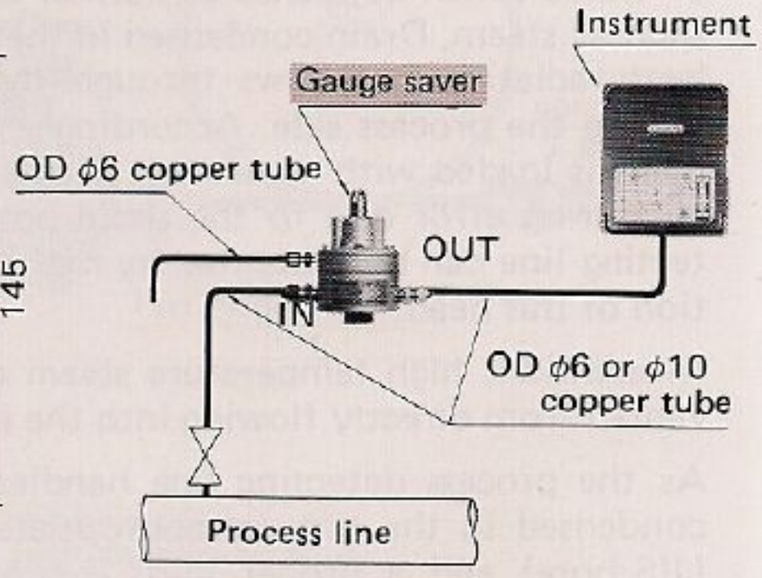
Primary side rated pressure [temperature] : 10kgf/cm² [60°C (140°F)]

Fluid: Noncorrosive air, fresh water, oil, etc.
An overpressure relief valve is stored.

Overall Size



Example of Application



Bellows Type and Piston Type

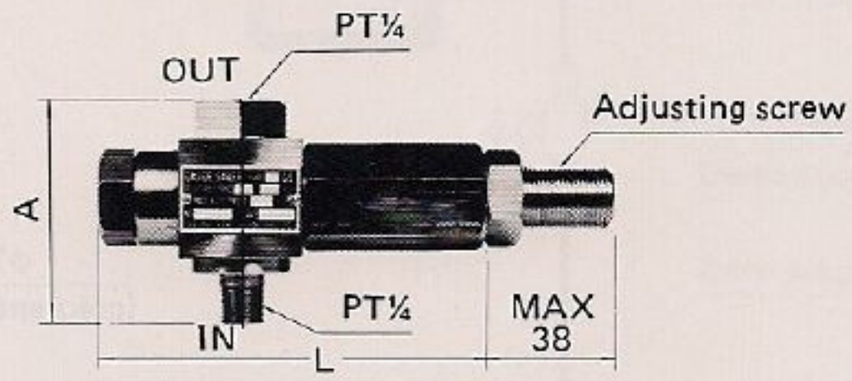
Specifications

Fluid: Noncorrosive air, fresh water, oil, etc.

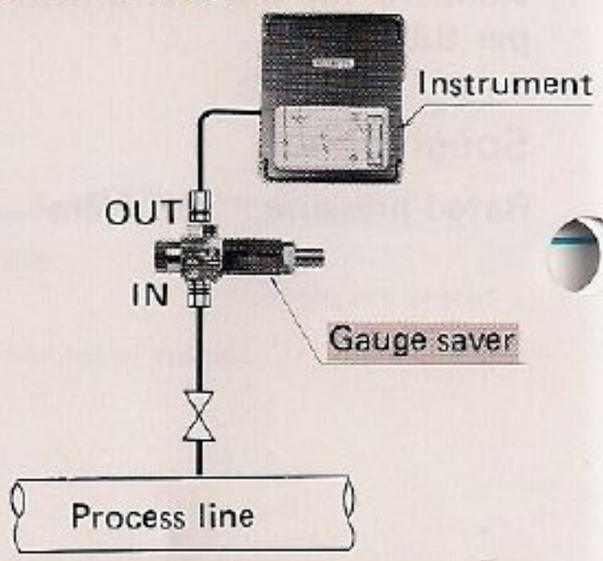
Fluid temperature: 60°C or 200°C (140°F or 392°F)

These types are for short time closing since no overpressure relief valve is stored.

Overall Size



Example of Application



Type	Max. set pressure kgf/cm²	Primary side rated pressure kgf/cm²	Overall sizes	
			L mm	A mm
Piston type	200	300	115	73
Bellows type	10	15	92	105

7 Noise Damper

This device is installed on a pressure detecting line of incompressible fluids. The device absorbs harmful pulsating pressure or noise generated by a pump, etc. of the main line by means of a cushion of N_2 gas (air for low pressure) filled in the device, so as to guide a stable pressure to the instrument.

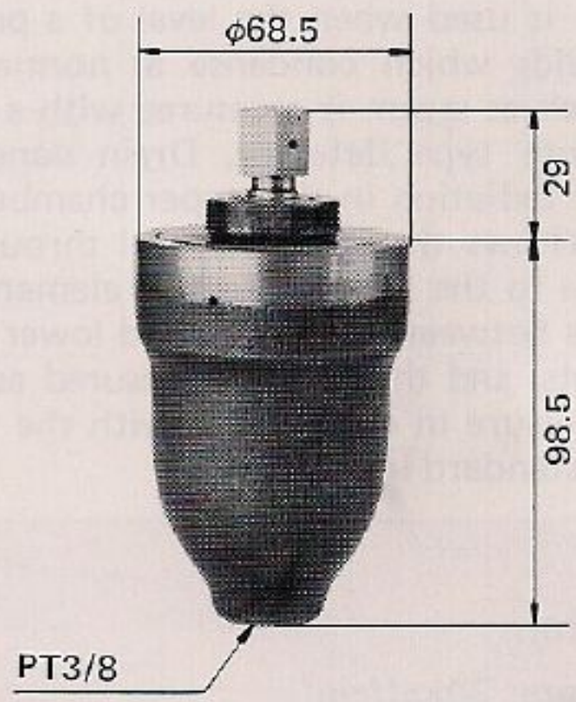
Specifications

Rated pressure [temperature]: 210kgf/cm² [60°C (140°F)]

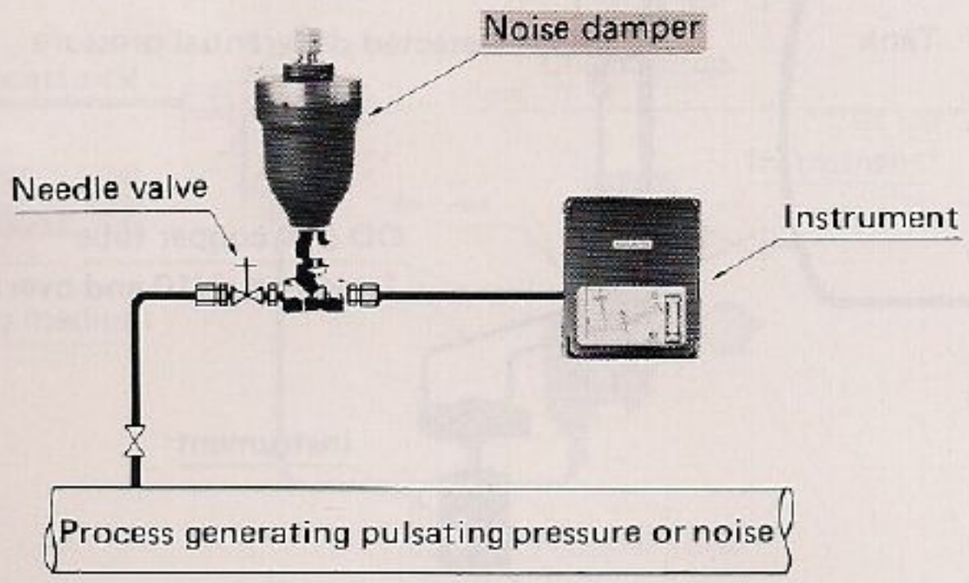
Fluid: Noncorrosive fresh water, lubricating oil, or fuel oil.

Sealed gas pressure: 60% of the min. service pressure.

Overall Size



Example of Application



11 Air Purge Unit for Level Detection

[Model NS967] 1-element simple type

[Model NS967A-2] 2-element surge-proof type with automatic shutoff valve

Air supplied at a very low rate through the orifice on the upper end of the purge pipe inserted in the tank overflows from the end of the purge pipe to move up in the fluid in bubbles. At this instant, the air pressure inside the pipe is equal to the measured depth head. This pressure is guided into an indicator or a transmitter as a signal.

AS no floating components are used in the wetting parts, it is possible to measure viscous or corrosive fluids, and the maintenance is easy.

For details, see Catalogue No. 325-1.

Specifications

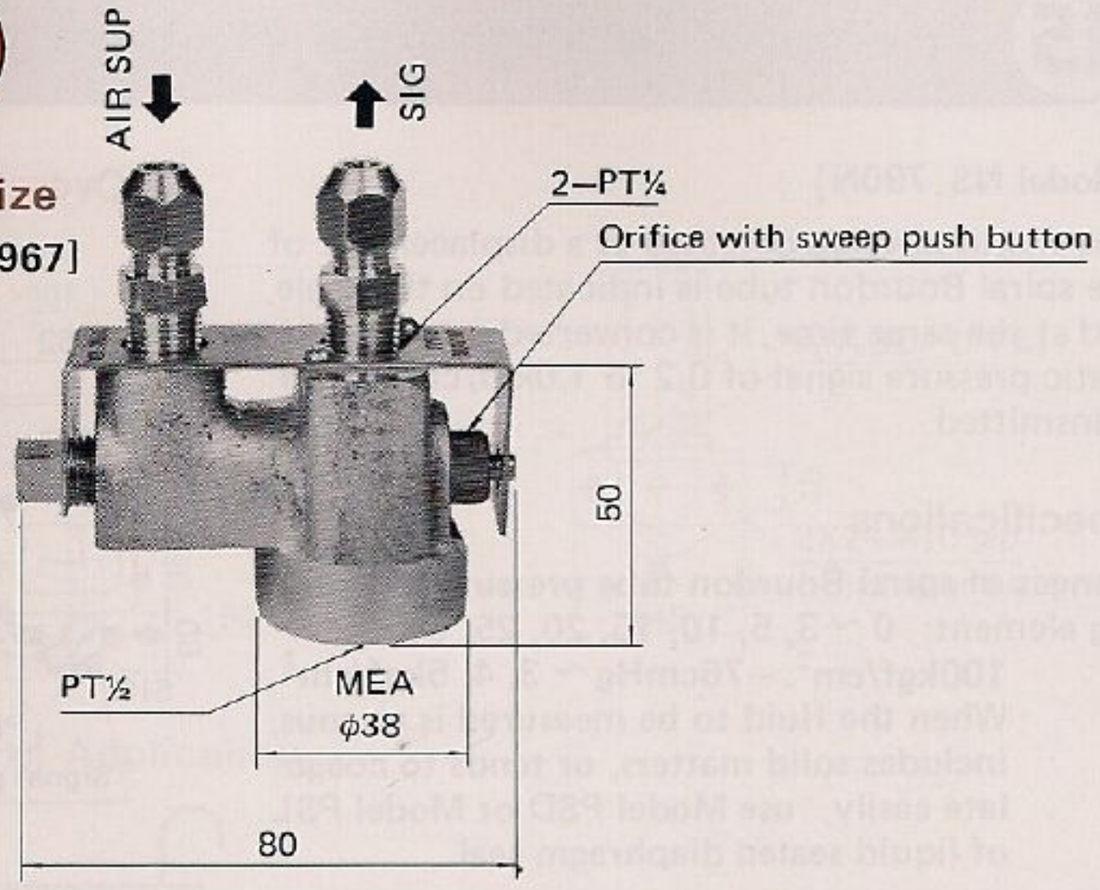
Measuring range: In practical use, max. 40m

Supply air pressure: Max. measured depth head + 0.5kgf/cm^2

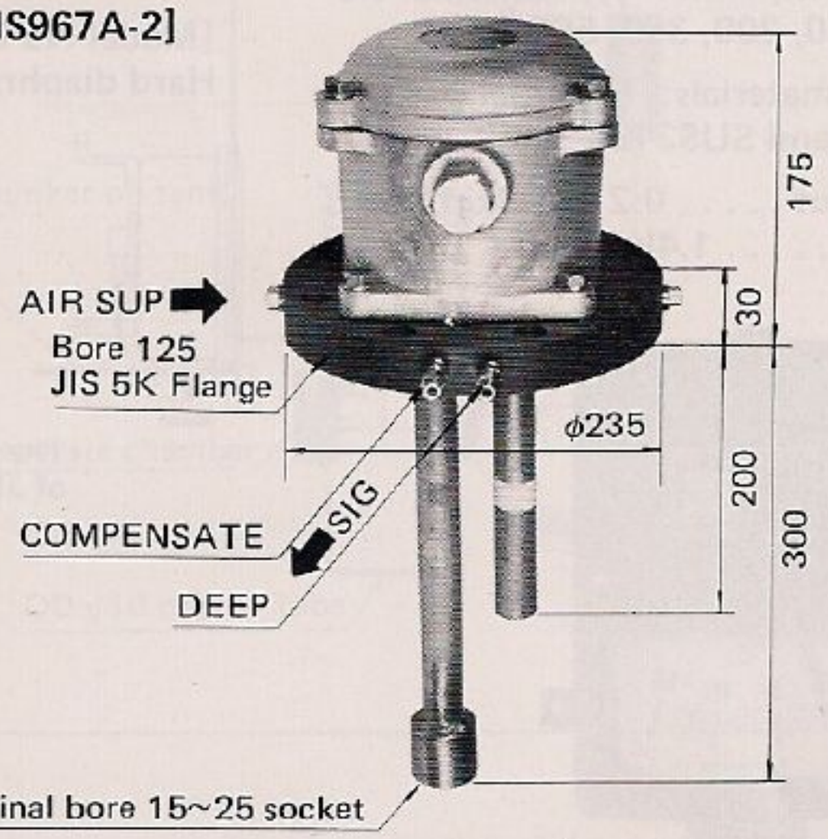
Air consumption: When supply air pressure is 2kgf/cm^2, 2.4Nℓ/min/1-element.

Overall Size

[Model NS967]



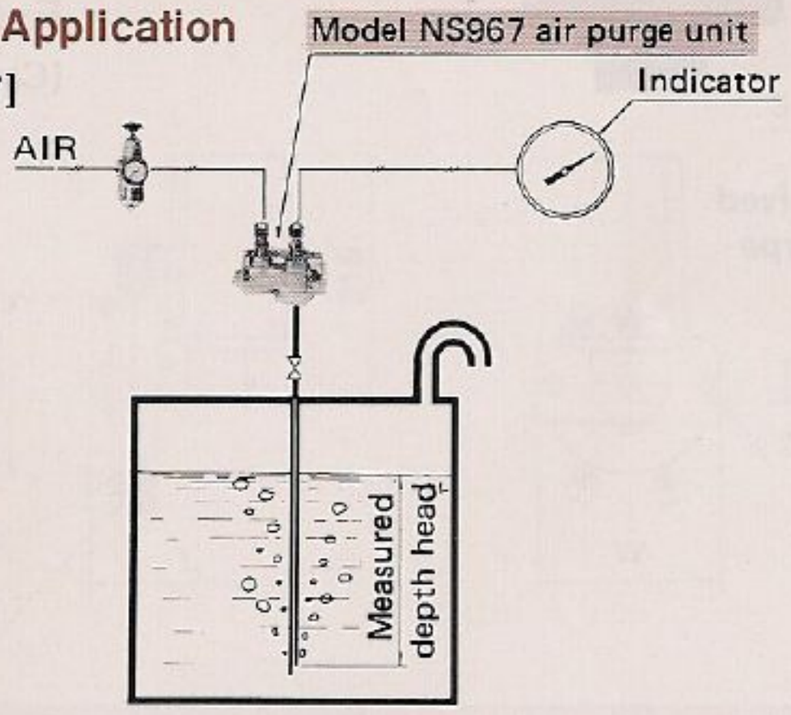
[Model NS967A-2]



Example of Application

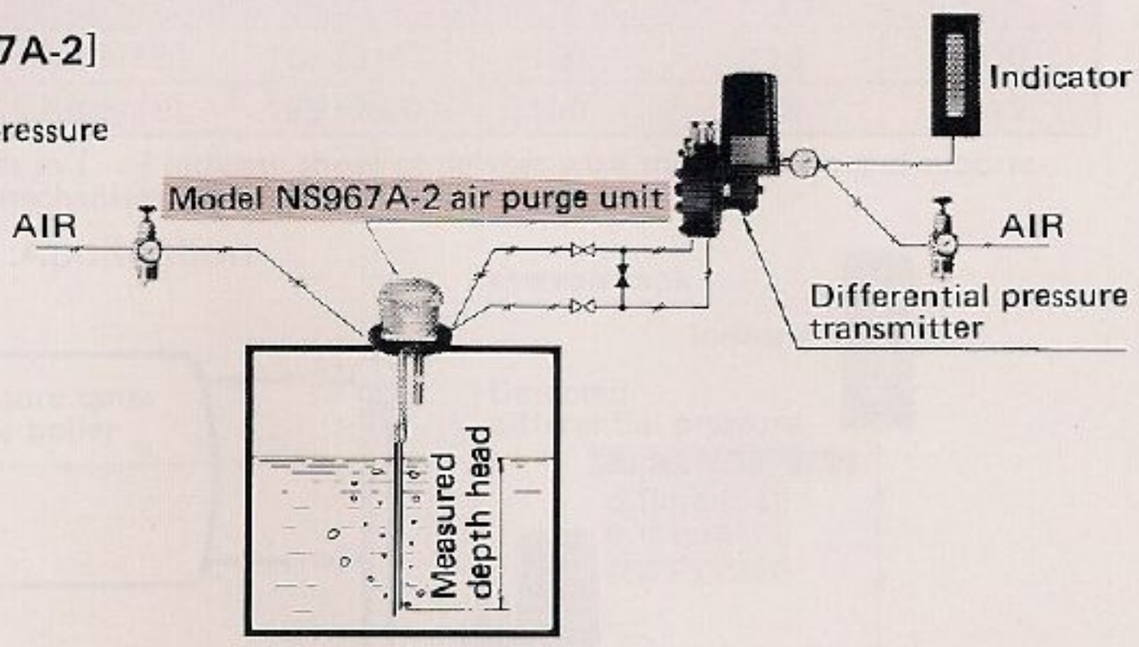
[Model NS967]

Open top tank



[Model NS967A-2]

Closed tank
Tank internal pressure is corrected



For 12 Displacement Type Level Detecting Element,

see 29 Displacement Type Level Indicating Controller.

Fog 13 Float Type Level Detecting Element,

see 31 32 Float Type Level Controller and Switch.

15 Pressure/Temperature Transmitter

[Model NS 790N]

The mesured value detected as a displacement of the spiral Bourdon tube is indicated on the scale, and at the same time, it is converted into a pneumatic pressure signal of 0.2 to 1.0kgf/cm^2 to be transmitted.

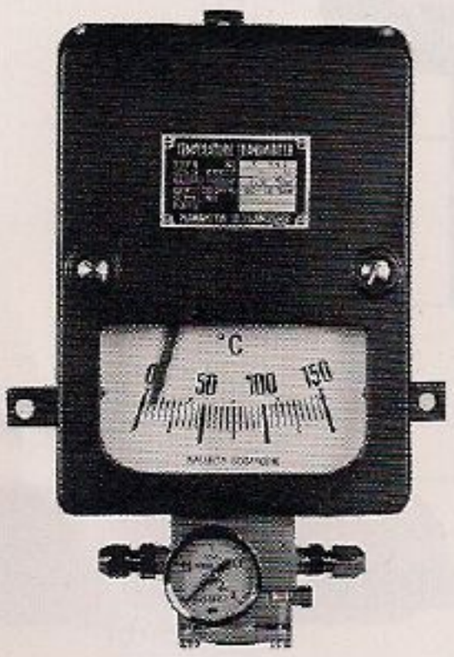
Specifications

Ranges of spiral Bourdon tube pressure measuring element: 0 ~ 3, 5, 10, 15, 20, 25, 30, 50, 100kgf/cm^2. −76cmHg ~ 3, 4, 5kgf/cm^2
When the fluid to be measured is viscous, includes solid matters, or tends to coagulate easily, use Model PSD or Model PSL of liquid sealed diaphragm seal.

Ranges of mercury expansion type thermal element: 0 ~ 100, 150, 200, 300, 500 °C

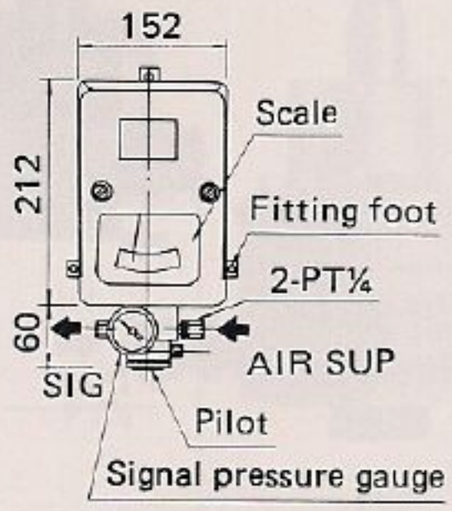
Detecting element materials: Essential parts are of SUS304 and SUS316.

Transmitter: Output . . . . . 0.2 ~ 1.0kgf/cm^2
Suppy air pressure . . . . . 1.4kgf/cm^2

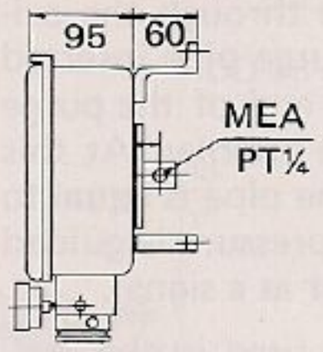


Pressure received diaphragm type

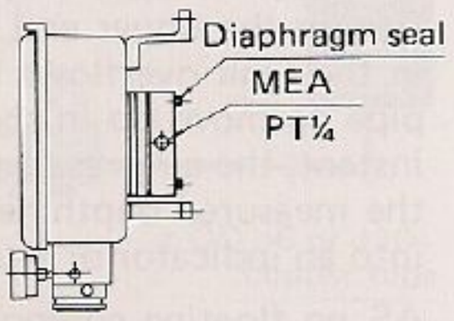
Overall Size



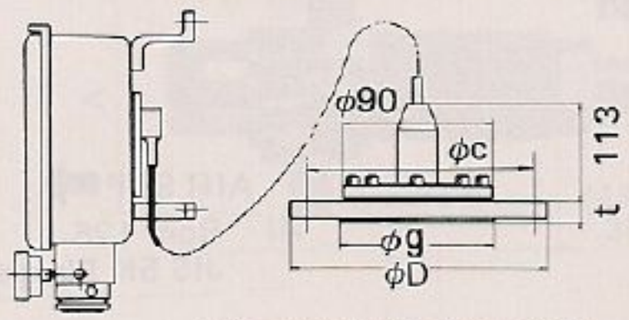
[Model NS PS790N]
For ordinary pressure



[Model NS PSD790N]
Diaphragm seal · For pressure

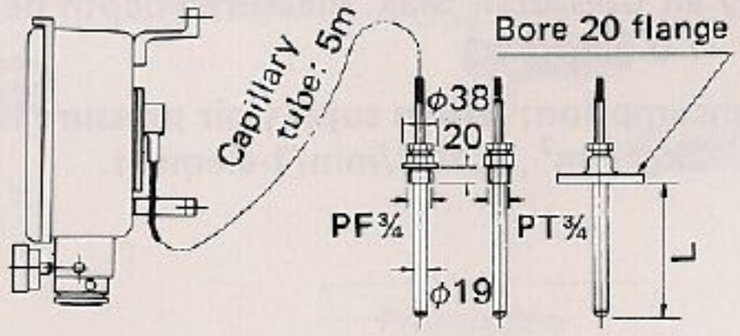


[Model NS PSL790N]
Hard diaphragm seal · For pressure



The standard dimension of JIS or ANSI

[Model NS TM790N]
For temperature



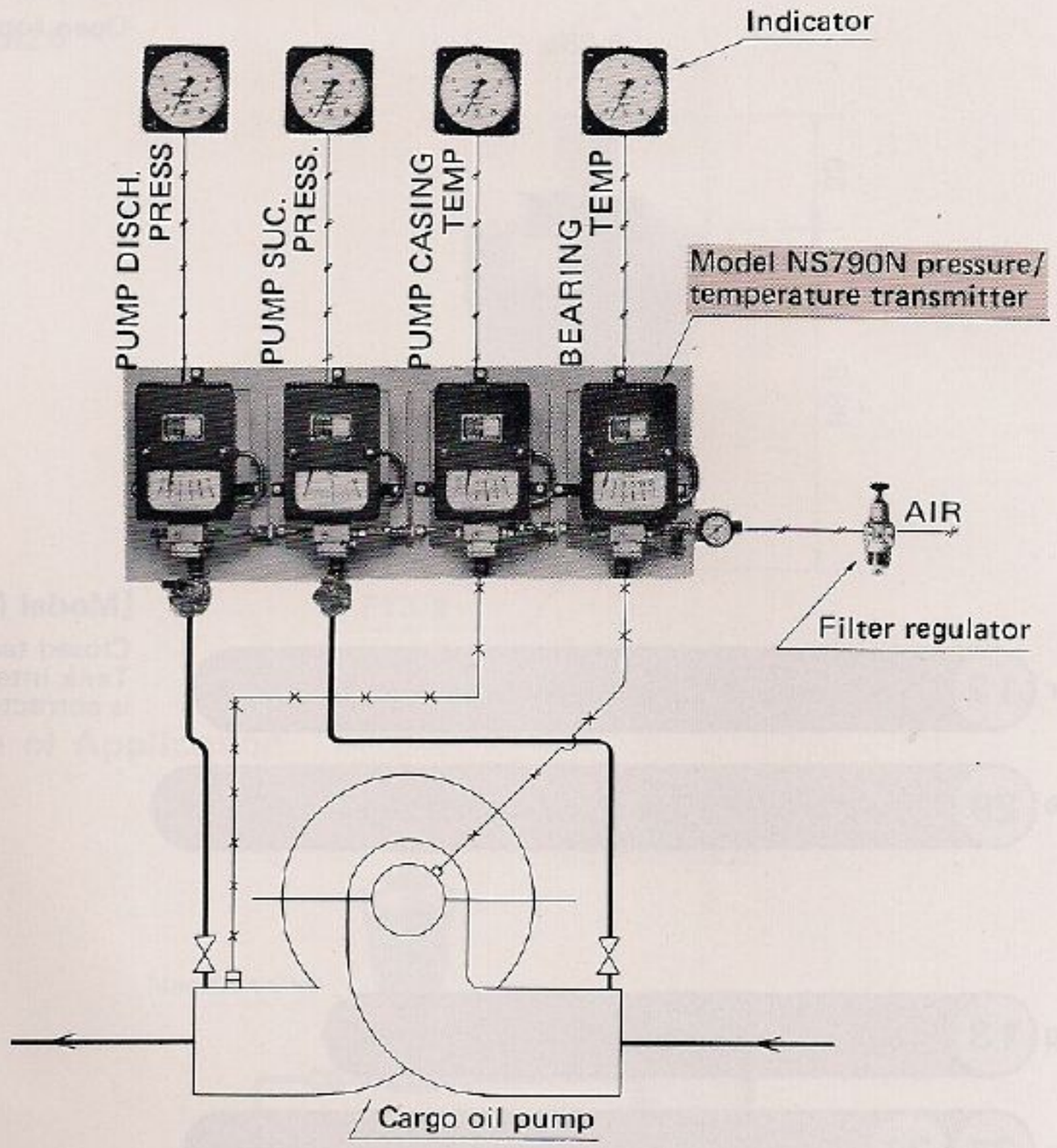
Thermobulb and well

Thermowell length:	L mm
For 0 ~ 100°C	200
For 0 — 150 ~ 500°C	150

Note: Effective length of insertion into the flow is more than 70% of L.

Example of Application

(Cargo oil pump remote control system)



16 Pressure Transmitter

[Model NS778AN]

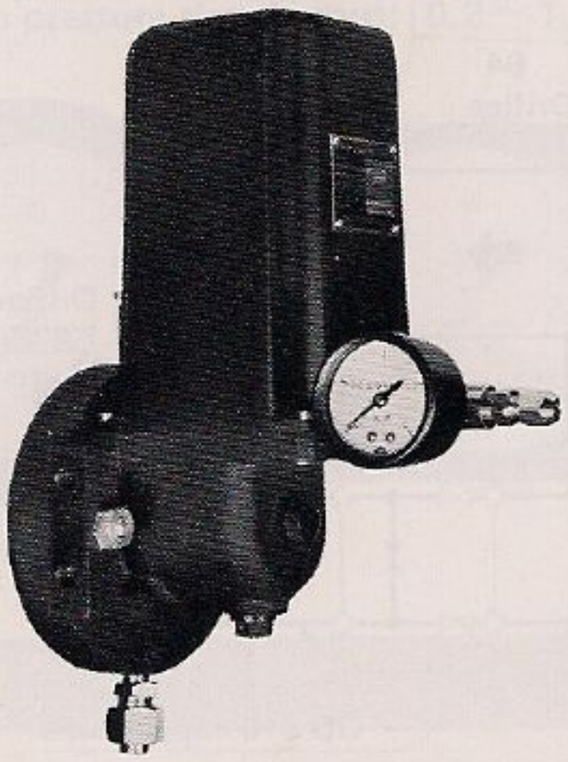
This device uses a diaphragm for detection and is used for low pressure applications. It is frequently used in level measurement usig the measured depth head in various tanks. The measured pressure is converted into a pneumatic pressure signal of 0.2 to 1.0kgf/cm^2 to be transmitted.

Specifications

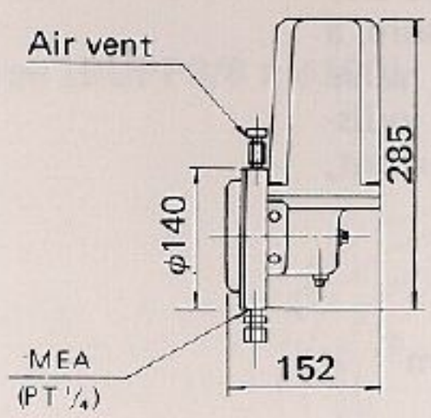
Range of measurement: 0—0.5 ~ 20mAq

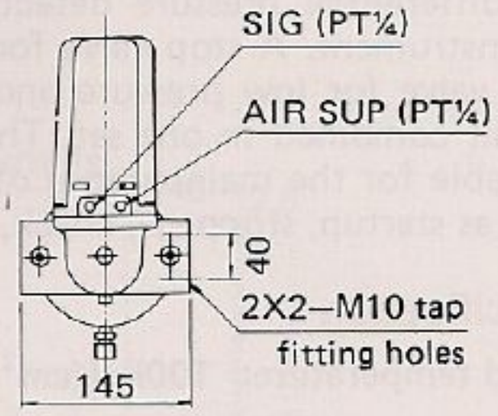
Fluid measured: Noncorrosive air, fresh water, lubricating oil, fuel oil, etc.

Transmitter: Output . . . . . 0.2 ~ 1.0kgf/cm^2
Supply air pressure . . . . . 1.4kgf/cm^2

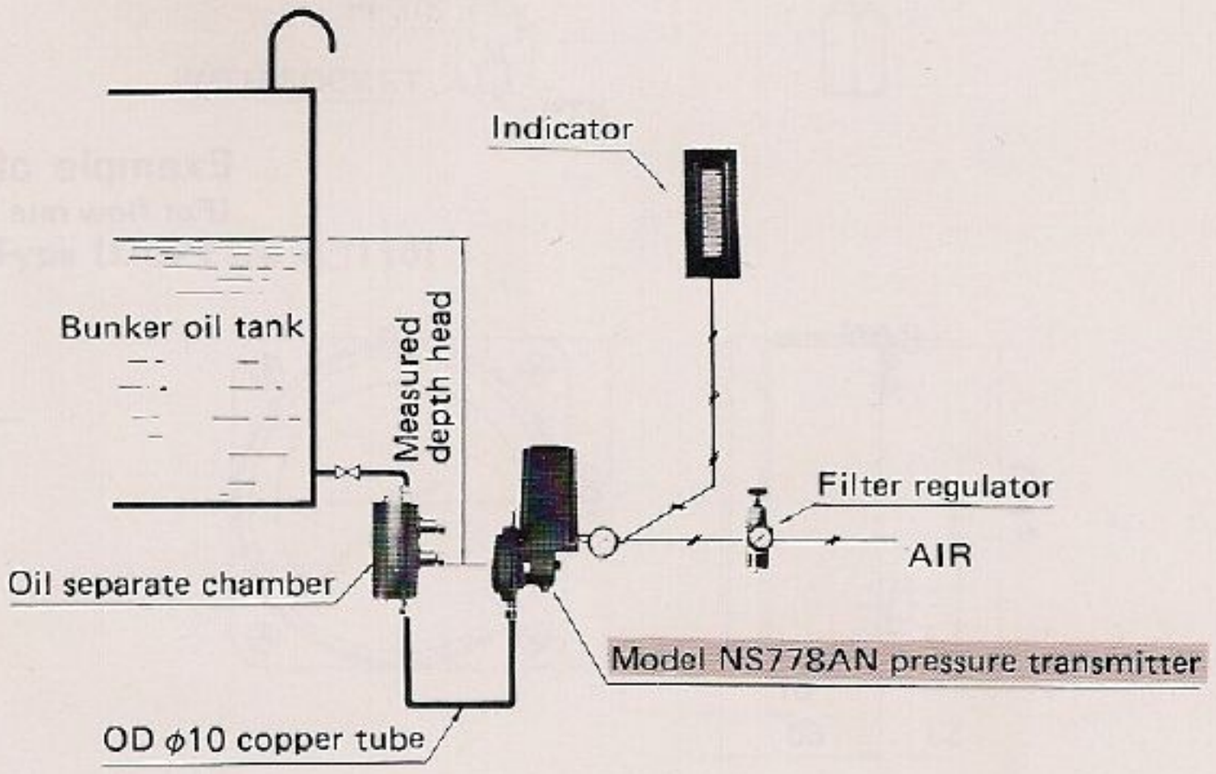


Overall Size





Example of Application



17 Differential Pressure Transmitter

[Models NS778BN and NS778CN]

This device uses a diaphragm for detection. It converts the differential pressure working across the diaphragm into a pneumatic pressure signal of 0.2 to 1.0kgf/cm^2. Its applications are the measurement of the level of pressure tank or boiler, of the capillary tube differential pressure for viscosity measurement, of the orifice differential pressure for flow rate measurement, etc.

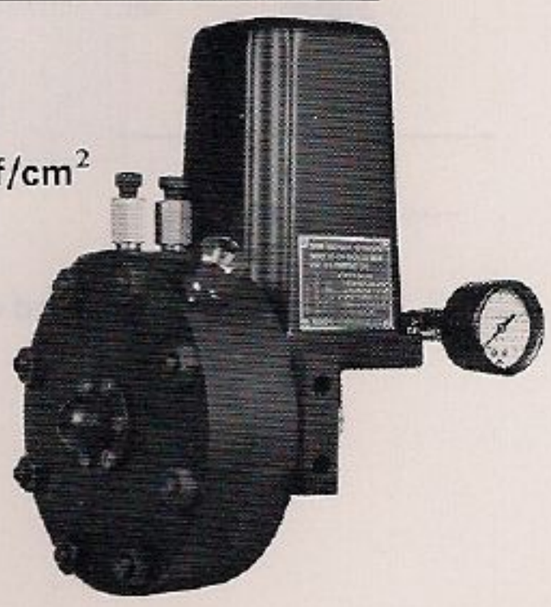
Specifications

Model	Range of measurement	Rated pressure kgf/cm^2
NS 778BN	0 — 0.1 ~ 1.5kgf/cm^2	10
NS 778CN	0 — 200 ~ 3000mm Aq	20

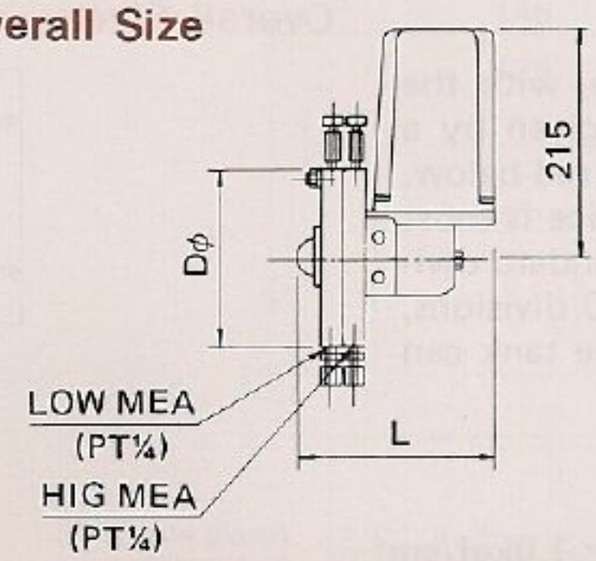
Model (B is added to the end.)	Elevation and suppression adjustment range
NS 778BN · B	MAX. 0.8kgf/cm^2
NS 778CN · B	MAX. 1800 mm Aq

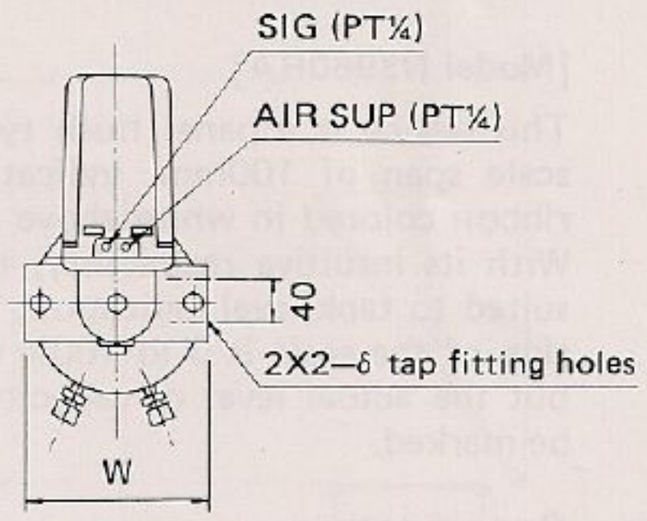
Transmitter:

Output . . . . . 0.2 ~ 1.0kgf/cm^2
Supply air pressure . . . . . 1.4kgf/cm^2



Overall Size

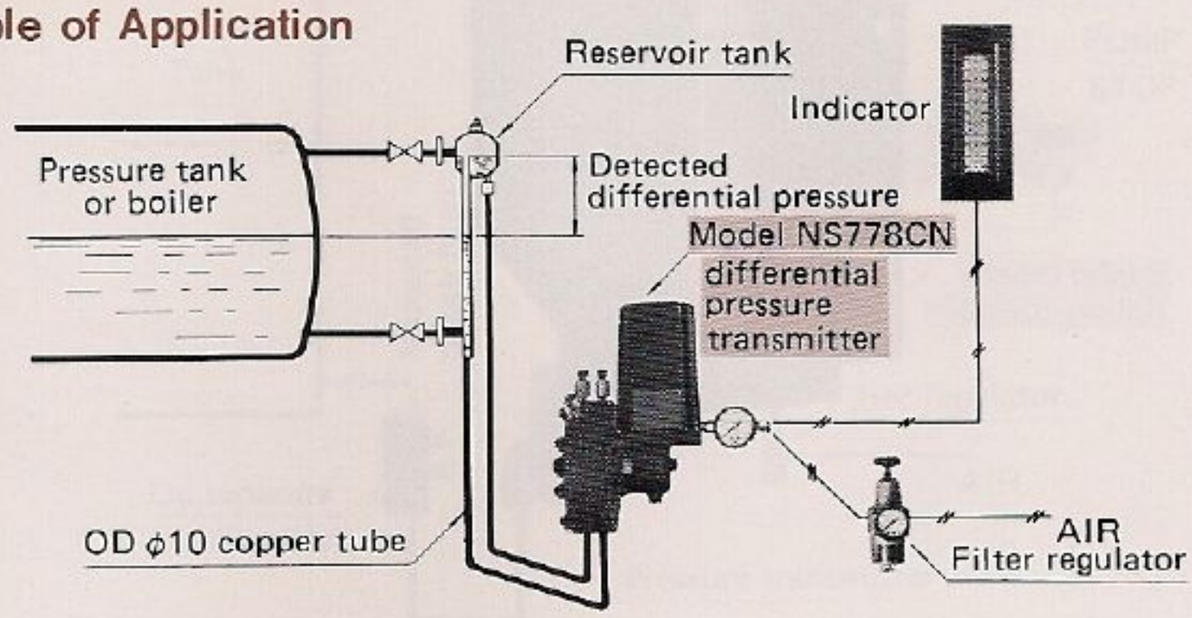




Model	L	W	D	δ
NS 778BN (B)	183 (216)	120	110	M10
NS 778CN (B)	195 (228)	190	180	M12

Figures in ( ) indicate those of devices with the elevation and suppression mechanism.

Example of Application



18 3-Valve Set

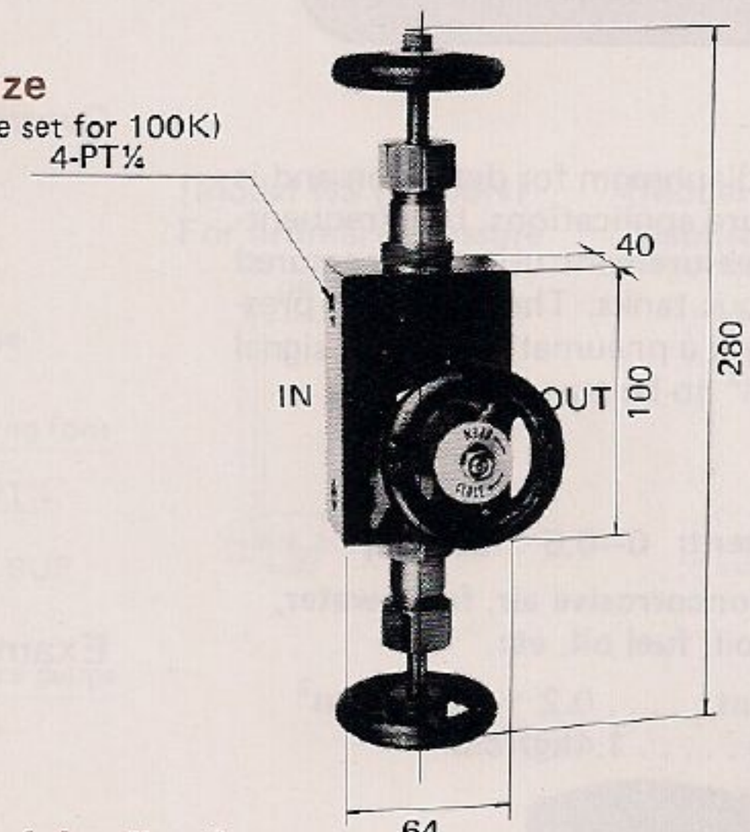
This device is installed on the detecting lines of the differential pressure detecting element and the instrument. A stop valve for high pressure, a stop valve for low pressure and a valance valve are all combined in one set. The device is indispensable for the maintenance of the instrument, such as startup, stoppage, check, etc.

Specification

Rated temperature: 100kgf/cm^2, 200kgf/cm^2

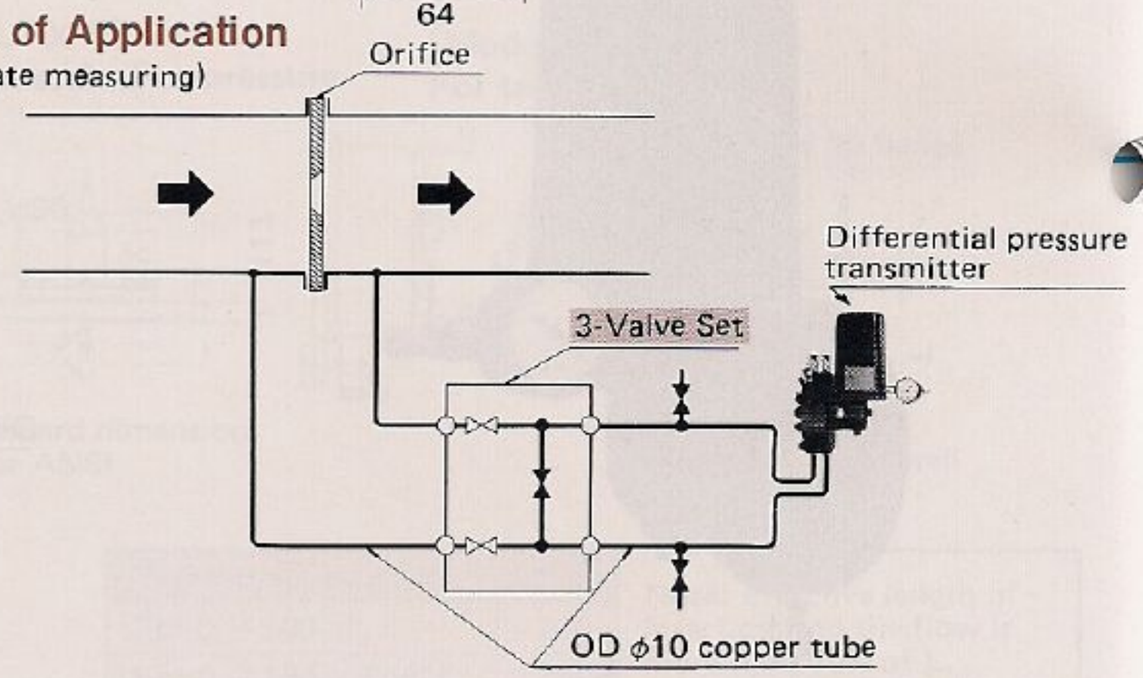
Overall Size

(Indicates the set for 100K)



Example of Application

(For flow rate measuring)



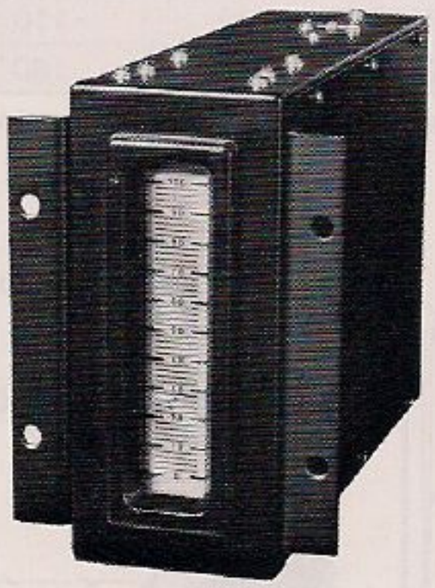
19 Ribbon Type Level Indicator

[Model NS960RA]

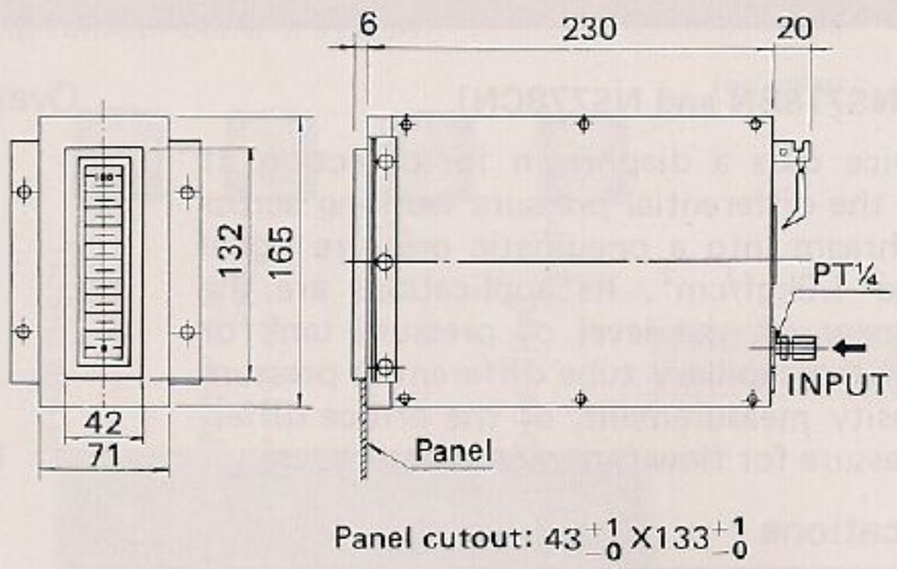
This device is a panel flush type one, with the scale span of 100mm. Indication is given by a ribbon colored in white above and in red below. With its intuitive readability, the device is most suited to tank level indication. The standard division of the scale is 0 to 100% with 50 divisions, but the actual level or capacity of the tank can be marked.

Specification

Pneumatic pressure signal input: 0.2 ~ 1.0kgf/cm^2

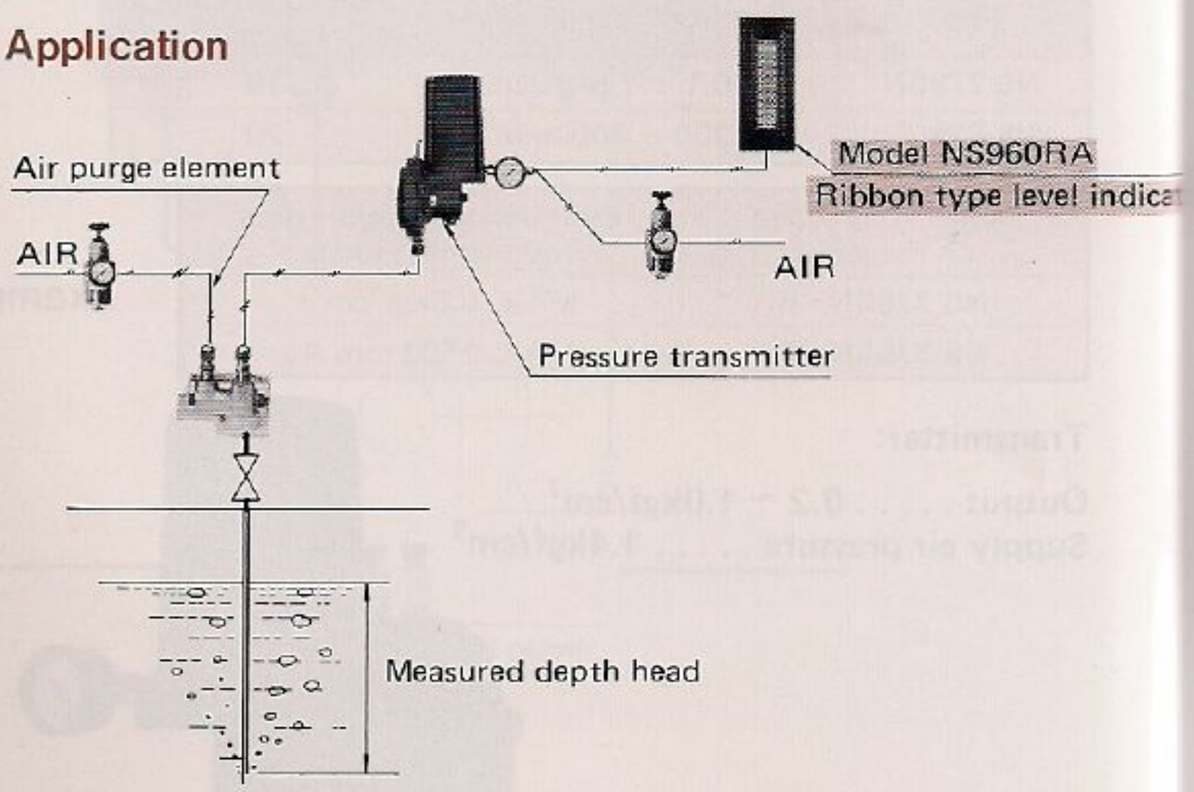


Overall Size

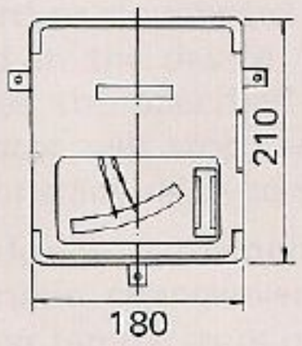


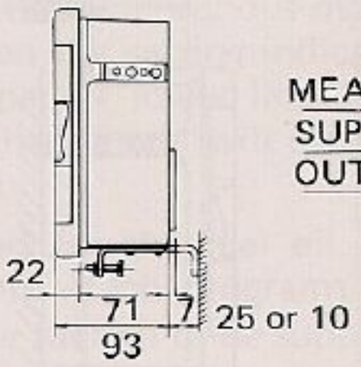
Panel cutout: 43^{+1}_{0} X 133^{+1}_{0}

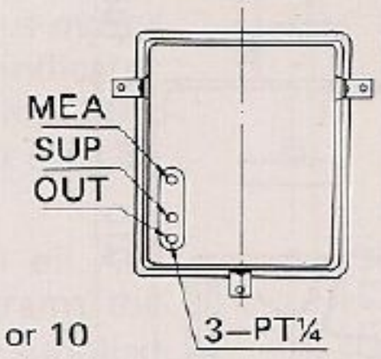
Example of Application



Overall Size

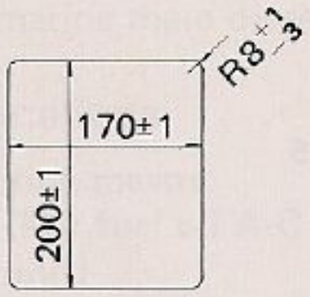




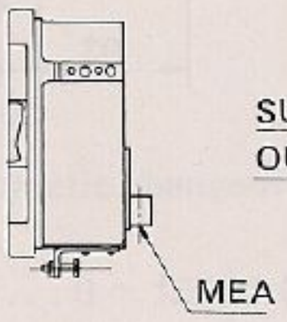


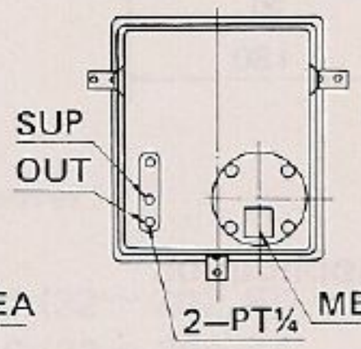
[Model NS□BT732]
[Model NS PB732]
Bellows unit

[Model NS PS732]
Spiral Bourdon tube unit
(standard model)

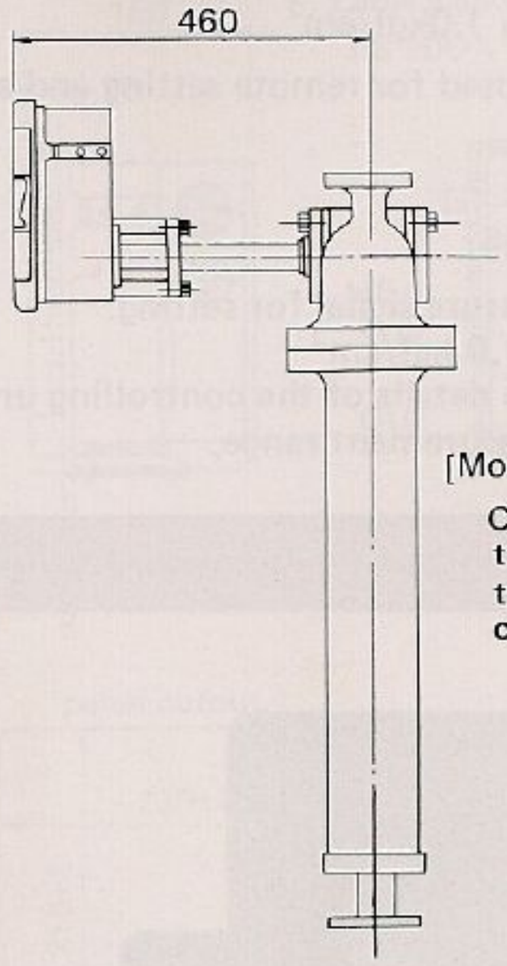


Panel cutout

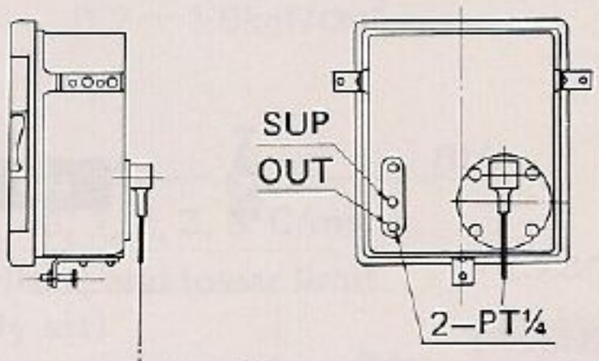




[Model NS PS/K732]
Spiral Bourdon tube unit
for chemical plant

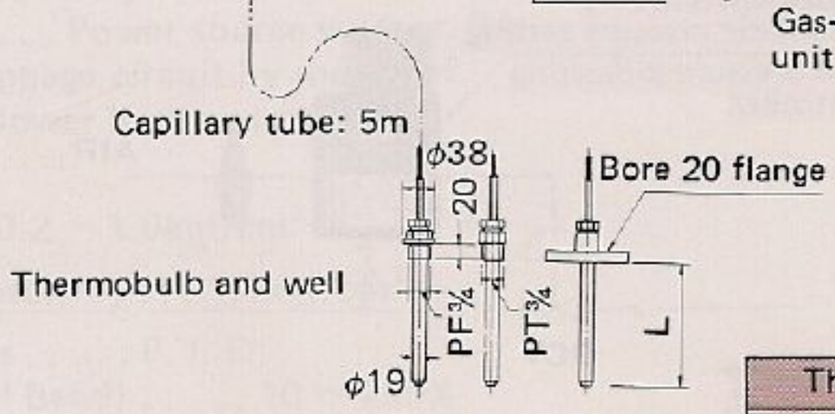


[Model NS LT732]
Combination with the displacement type level indicating controller



[Model NS TM732]
Mercury expansion type thermal unit

[Model NS TG732]
Gas-filled thermal unit

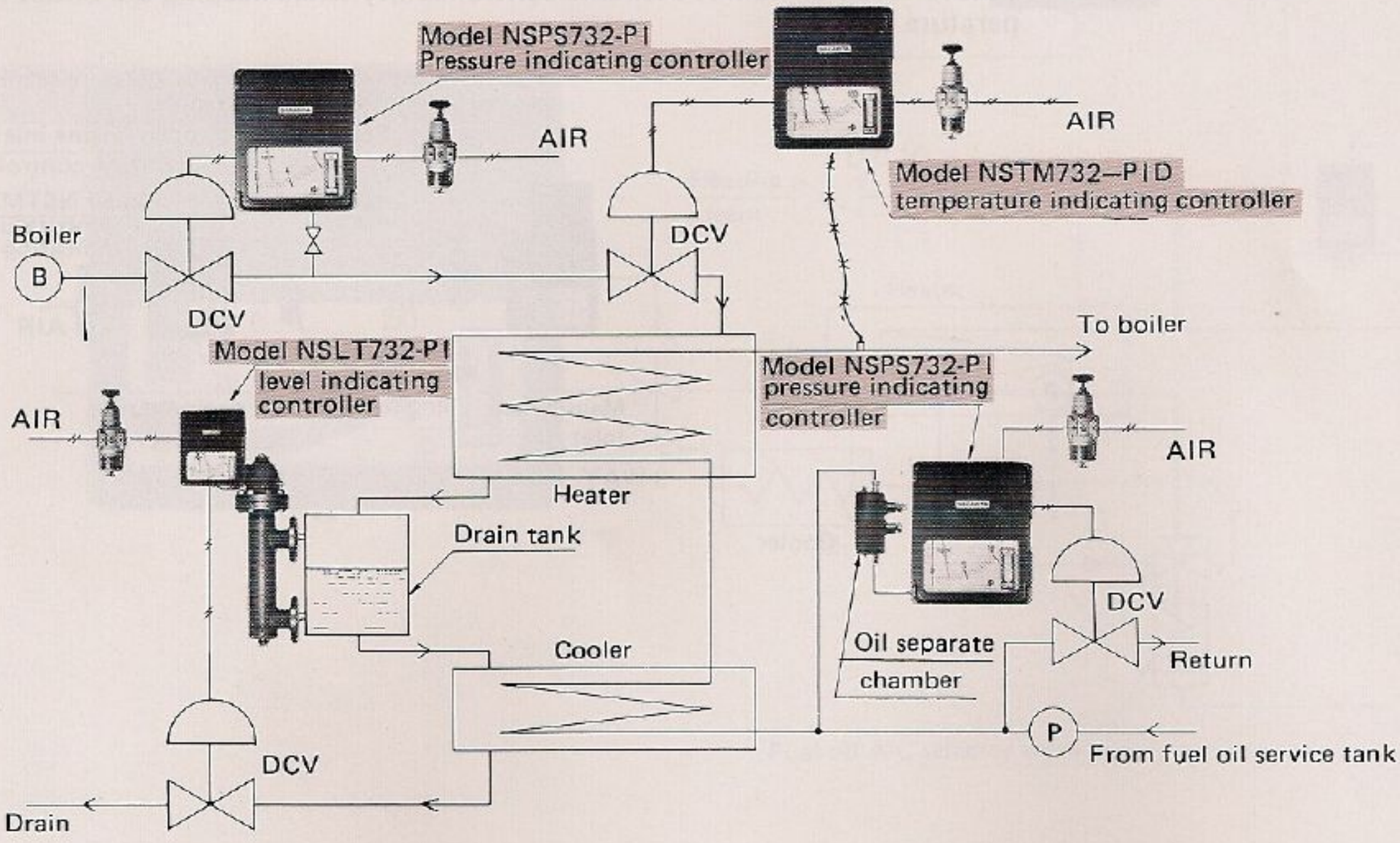


For details, see
29 Displacement Type Level Indicating Controller

Thermowell length: L mm	
For 0 ~ 100°C	200
For 0 – 150 ~ 500°C	150

Note: The effective length of insertion into the fluid is over 70% of L.

Example of Application (Fuel oil heating equipment for boiler)



25 Pressure Setting Type Indicating Controller

A bellows pressure measuring element is added to Model NS732 indicating controller. The setting indicator is controlled by a pneumatic pressure signal of 0.2 to 1.0kgf/cm^2.

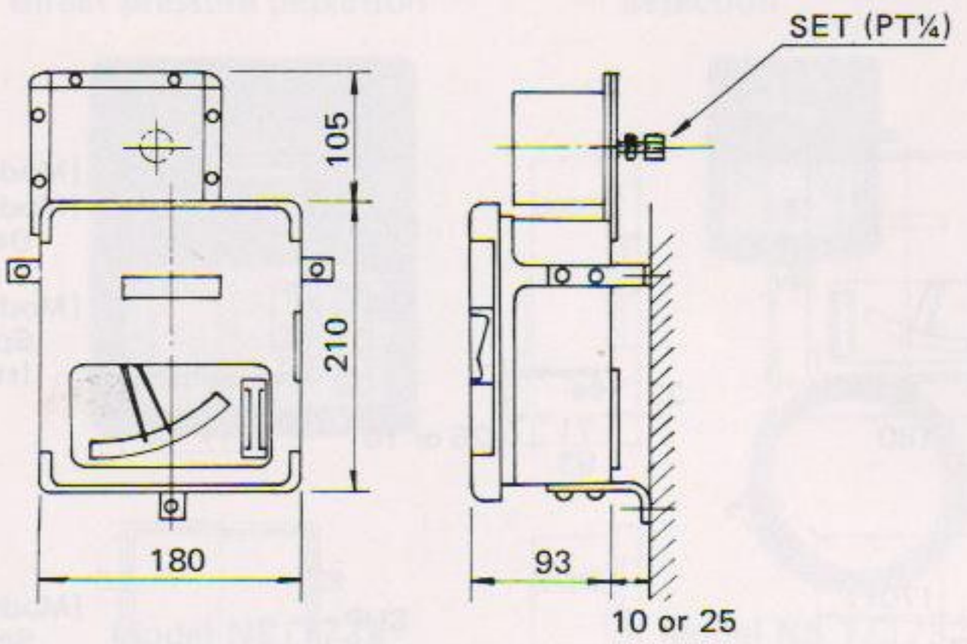
The device is used for remote setting and cascade control.

Specifications

Pneumatic pressure signal for setting:
0.2 ~ 1.0 kgf/cm^2
For the details of the controlling unit and the measurement range,

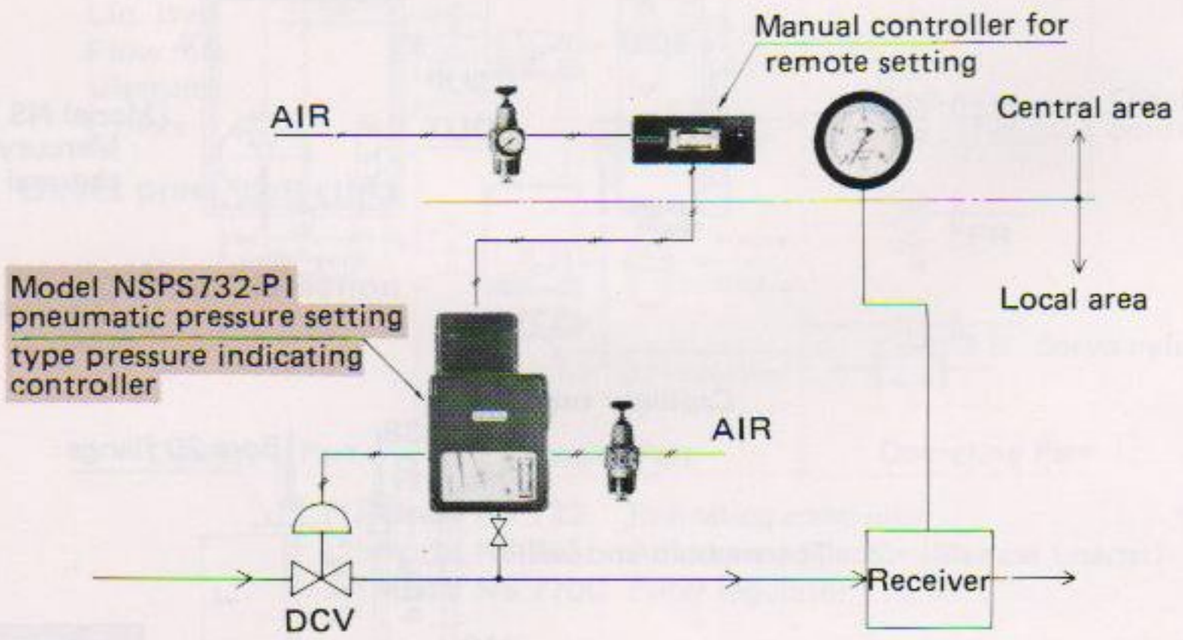
See 24 Automatic Indicating Controller

Overall Size



Example of Application

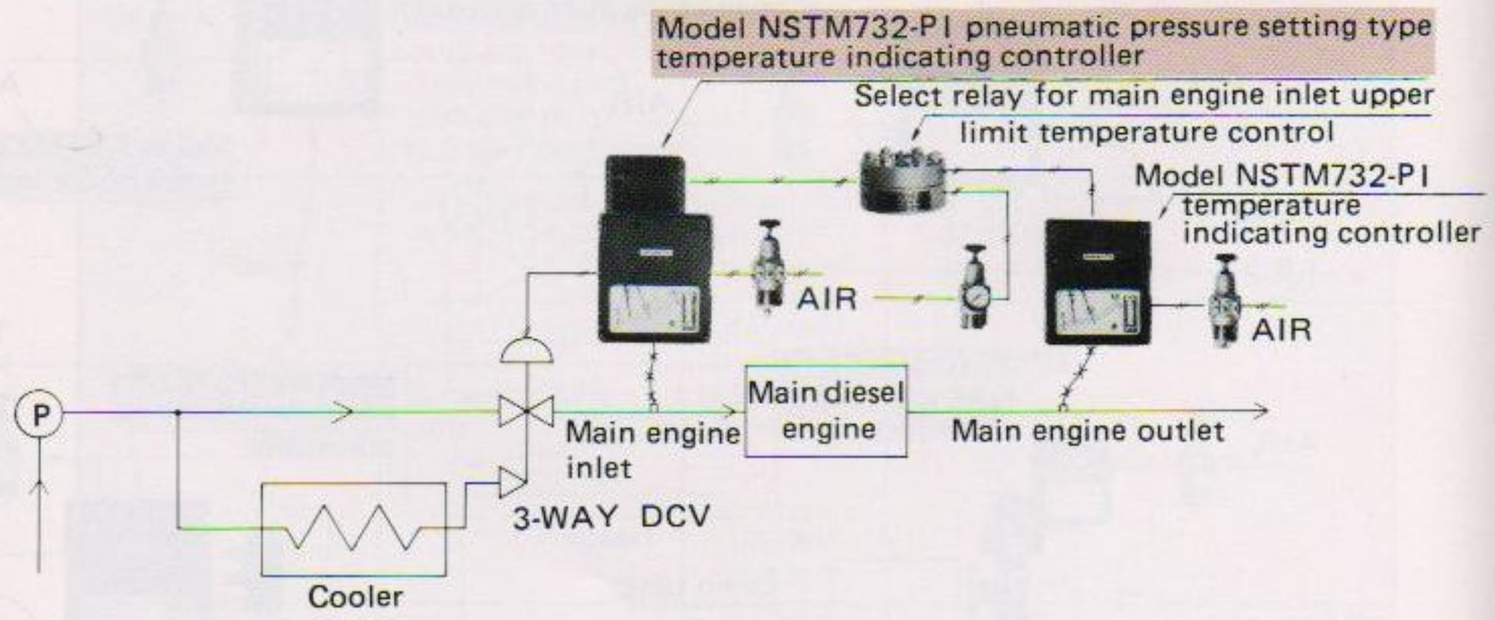
① Remote setting of receiver pressure



② Cascade control of main diesel engine cooling fresh water temperature

For maintaining the performance of the main engine, it is desirable to keep the outlet temperature constant. However, at present, as the dead time gets too long and the controllability is deteriorated excessively, the inlet temperature is controlled inevitably.

Cascade control secures desirable controllability while keeping the outlet temperature constant.



26 Program Setting Indicating Controller

[Model NS734]

This device mainly consists of the inner mechanism of Model NS732 indicating controller. The setting indicator is driven at a specified speed upward or downward by the synchronous motor stored in the device. When the setting indicator reaches the specified upper or lower limit, the indicator will stop, and the control will shift to the constant-value control.

The device is mainly used for the fuel oil A-C automatic changeover unit which programs the heating temperature of the fuel oil to be supplied to the marine main diesel engine.

Specifications

■ Detecting means:

(For fuel oil A-C automatic changeover unit)

Masurement range . . . . . 0 ~ 150°C (32 ~ 302°F)
0 ~ 200°C (32 ~ 392°F)

Signal air pressure . . . . . 0.2 ~ 1.0kgf/cm²

■ Controlling unit:

Upward or downward speed . . . . .
0, 1, 2, 3, 5°C/min

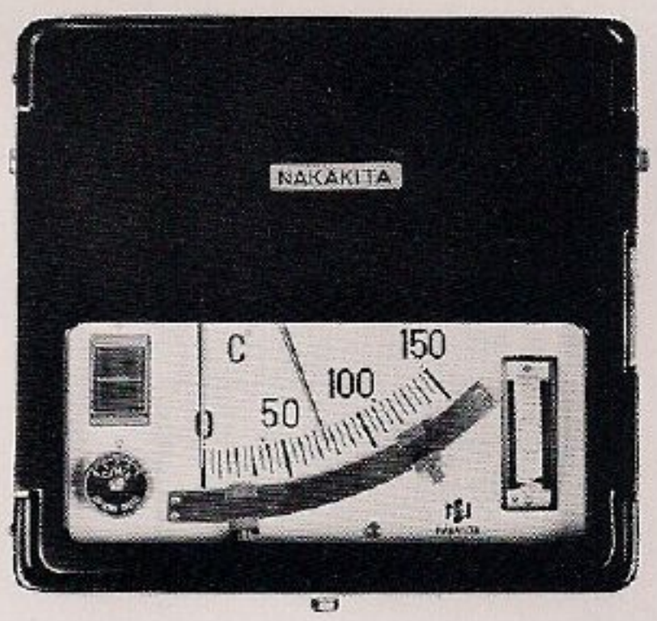
Upper limit, intermediate, and lower limit switches (can be freely set)
Voltage signal . . . Power source voltage. 5A
Automatic stoppage circuit by means of the upper and lower limit switches is stored.

Output . . . . . 0.2 ~ 1.0kgf/cm²

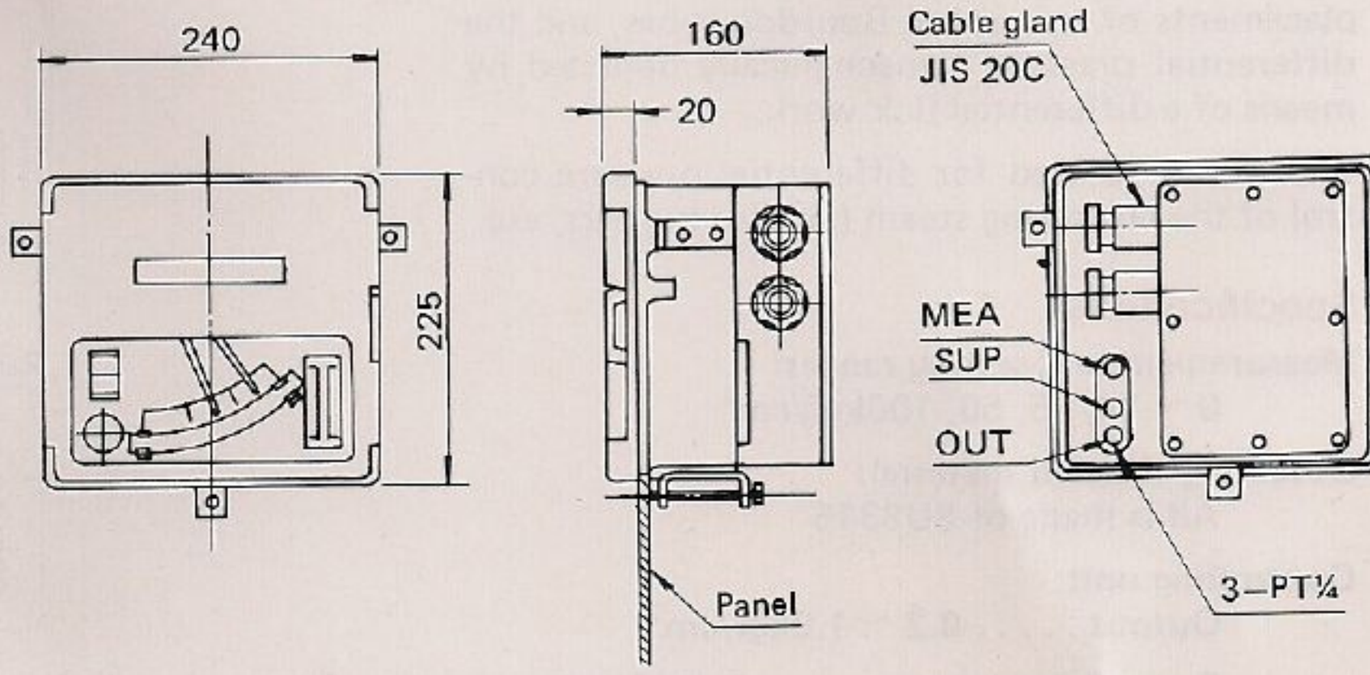
Supply air pressure 1.4kgf/cm²

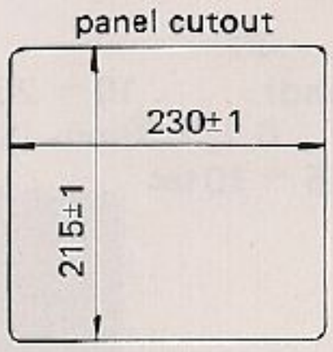
Control actions . . . . . P. I. D.
P (Proportional band) . . . . . 10 ~ 250%
I (Reset time) . . . . . 0.1 ~ 20min
D (Rate time) . . . . . 0.05 ~ 10min

Power source . . . . . AC 100/110V. 60Hz

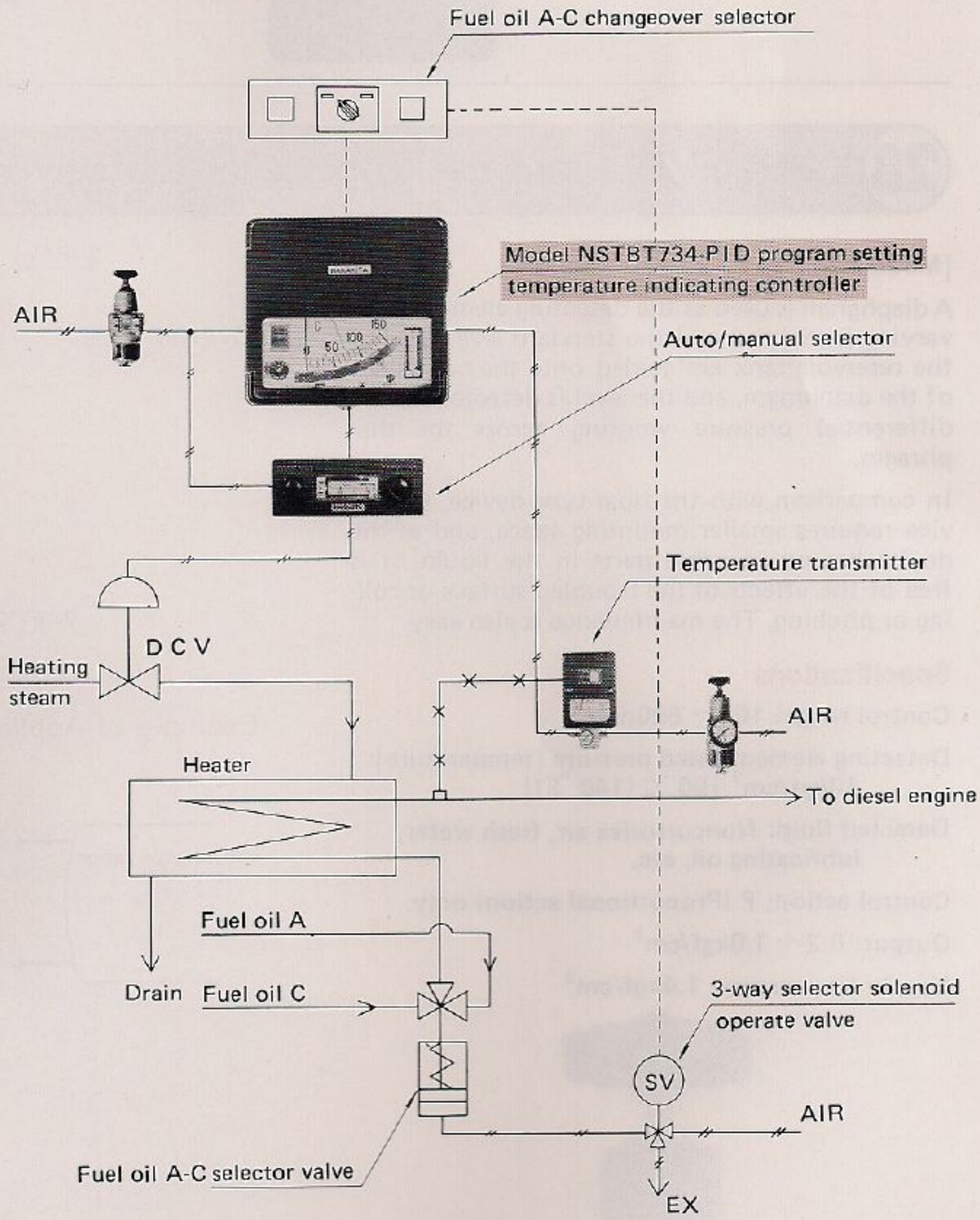


Overall Size





Example of Application



27 Differential Pressure Controller

[Model NS712]

Two detected pressures are converted into displacements of two spiral Bourdon tubes, and the differential pressure is mechanically detected by means of a differential link work.

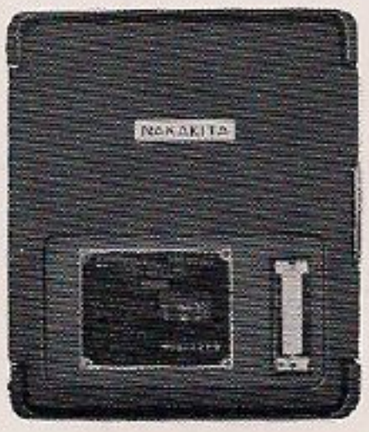
The device is used for differential pressure control of the atomizing steam (air) for burners, etc.

Specifications

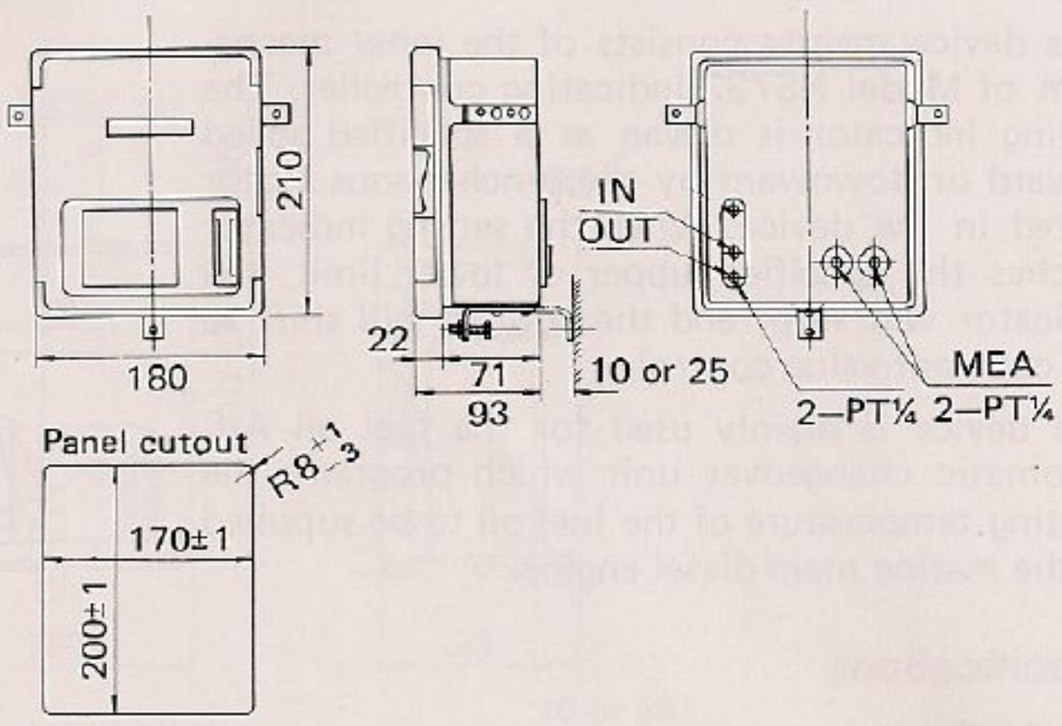
Measurement and setting ranges:
0 ~ 10, 25, 50, 100kgf/cm^2

Detecting element material:
All is made of SUS316

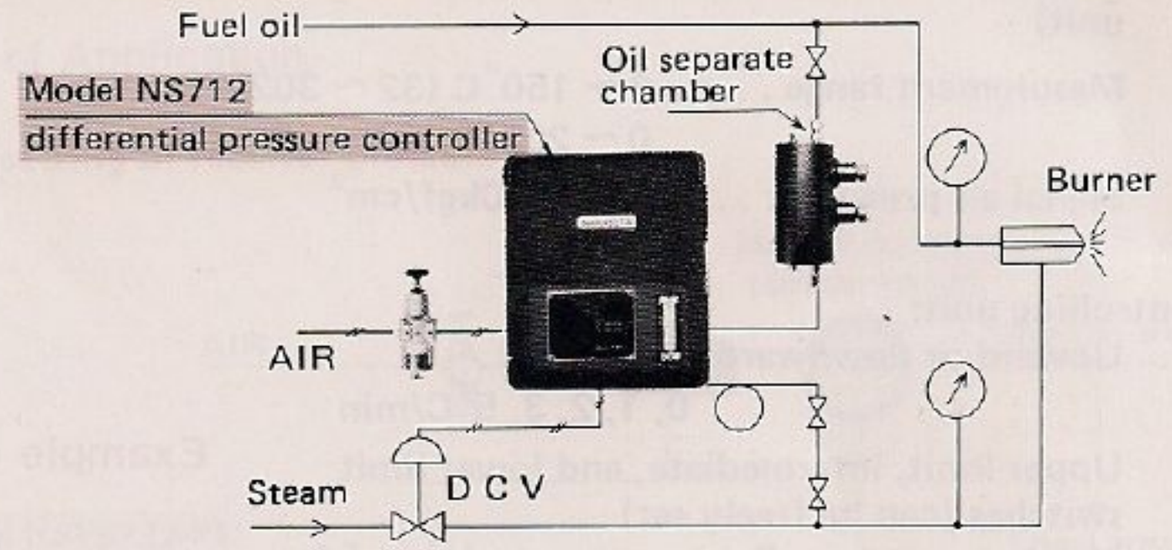
Controlling unit:
Output . . . . . 0.2 ~ 1.0kgf/cm^2
Supply air pressure . . . . . 1.4kgf/cm^2
Control action . . . . . PI
P (Proportional band) . . . . . 10 ~ 250%
I (Reset time) . . . . . 0.1 ~ 20min (Standard)
2 ~ 40sec, 0.5 ~ 10sec



Overall Size



Example of Application Atomizing steam pressure control unit for burners



28 Differential Pressure Type Level Controller

[Model NS754A]

A diaphgram is used as the detecting element. The varying level head and the standard level head of the reservoir tank are guided onto the both sides of the diaphragm, and the level is detected by the differential pressure working across the diaphragm.

In comparison with the float type device, the device requires smaller mounting space, and as the device has no movable parts in the liquid, it is free of the effects of the troubled surface or rolling or pitching. The maintenance is also easy.

Specifications

Control range: 100 ~ 600mm

Detecting element rated pressure [temperature]:
10kgf/cm^2 [60 °C (140 °F)]

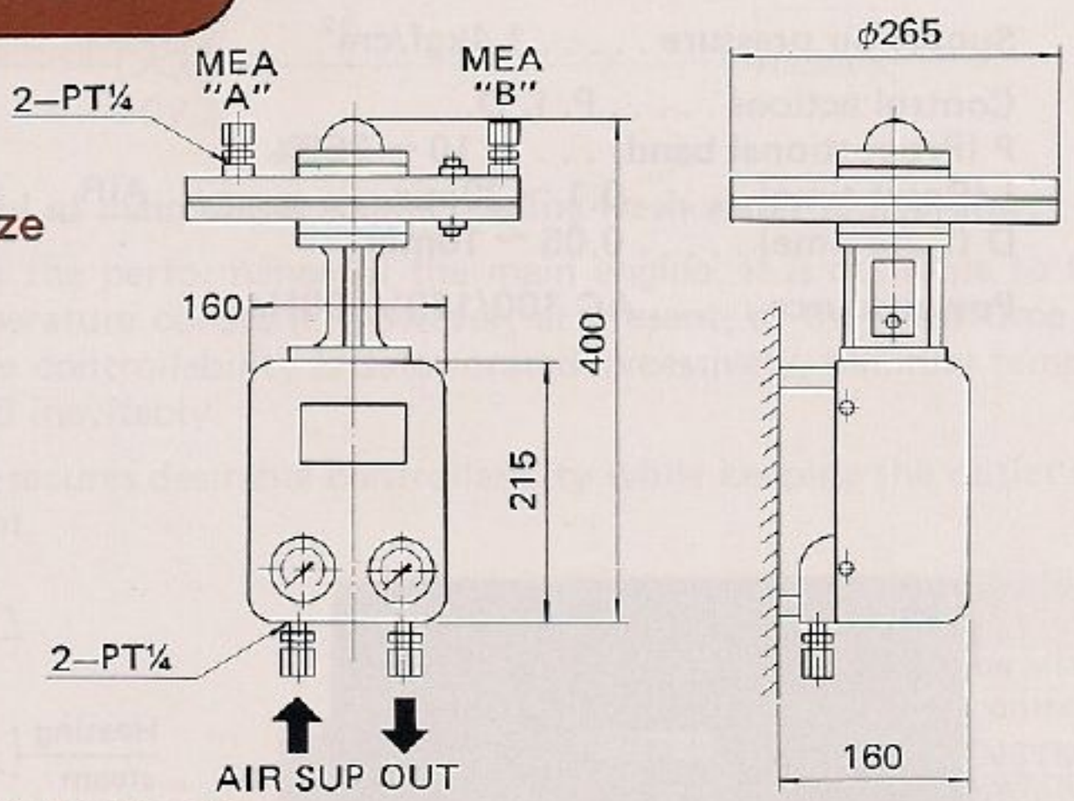
Detected fluid: Noncorrosive air, fresh water, lubricating oil, etc.

Control action: P (Proportional action) only.

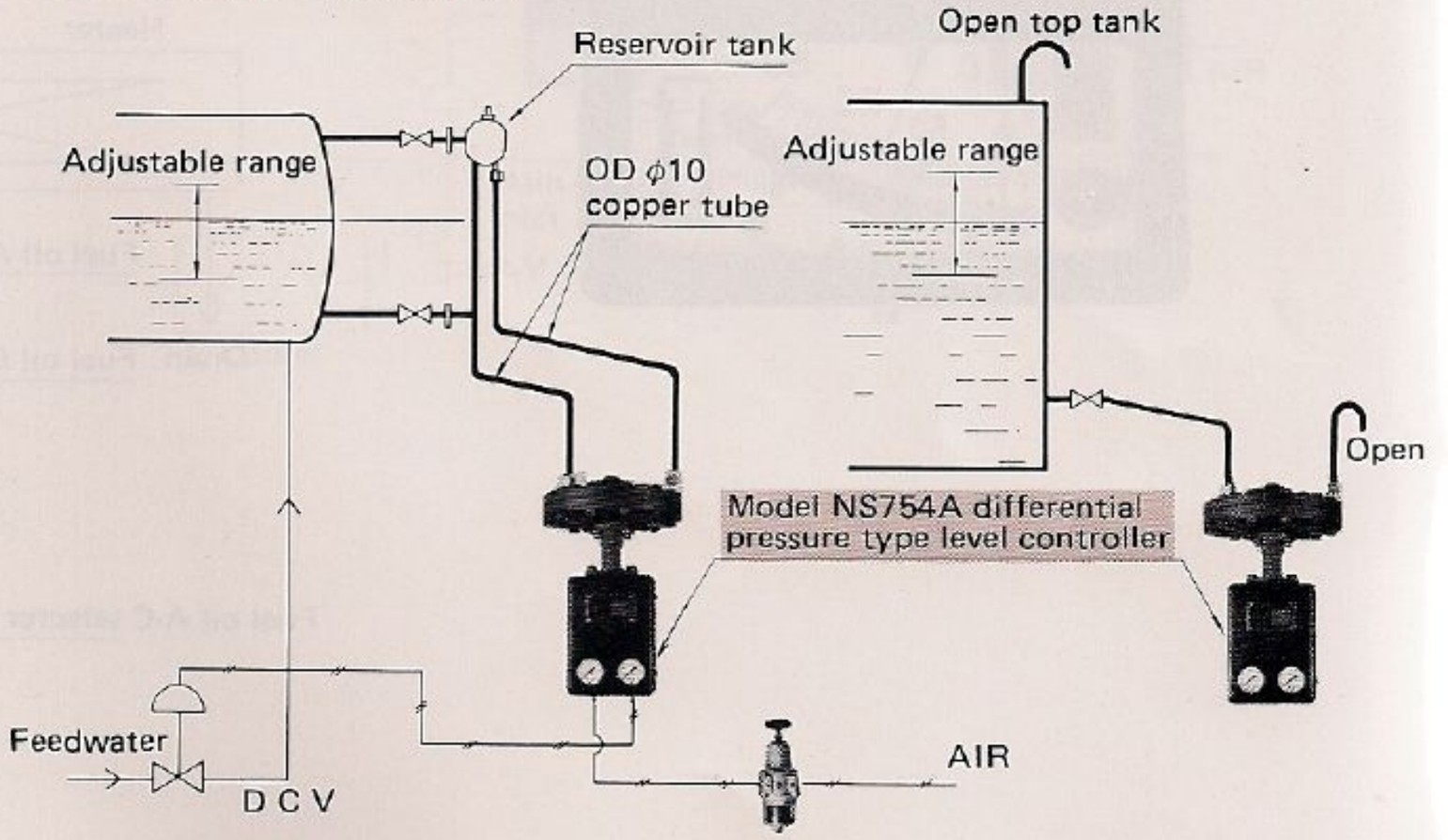
Output: 0.2 ~ 1.0kgf/cm^2

Supply air pressure: 1.4kgf/cm^2

Overall Size



Example of Application



29 Displacement Type Level Indicating Controller

Models NS LT732 and NS755N]

he cylindrical displacer is suspended from the nd of the lever connected to the torque tube nto the liquid. A change in the level will change he buoyant force on the displacer, and in turn, hange the torsion angle of the torque tube. This orsion angle is transmitted to the controlling nit as the detected level.

pecifications

Rated pressure [temperature]:
16, 20, 30, 40, 63kgf/cm² [saturated steam temperature]

Measurement range: 250 ~ 2,000mm

Detecting element materials:
FC, SC, steel tube.
Important parts are of SUS304, SUS316.

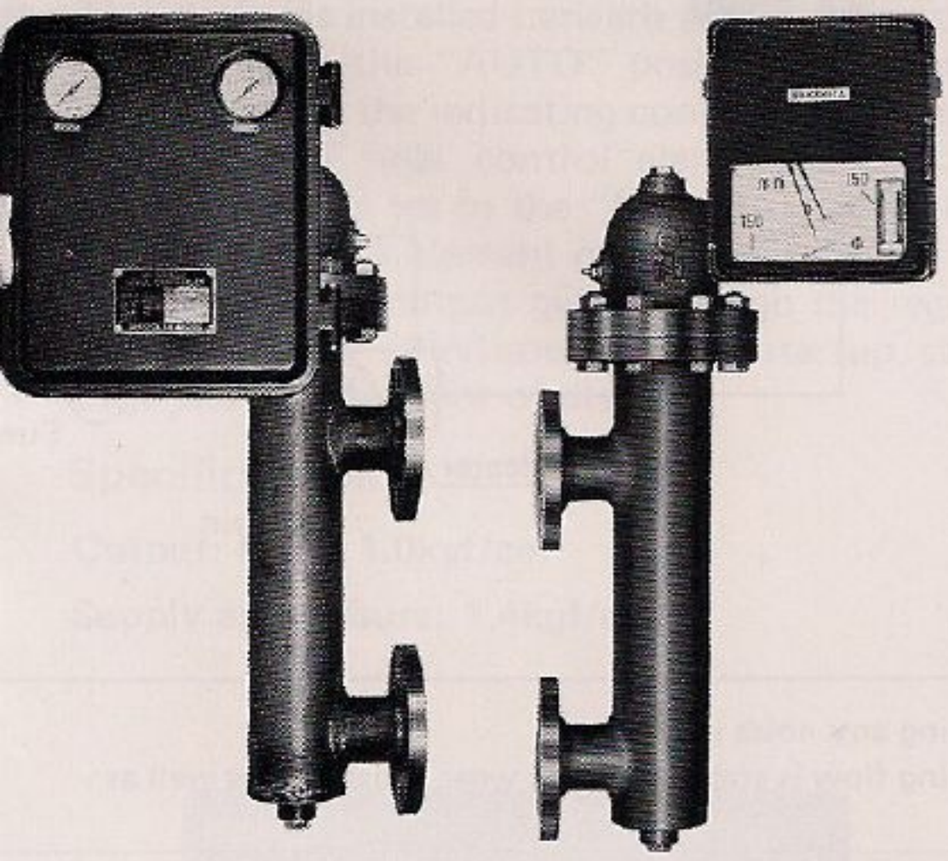
Mounting method:
Inner cage type . . Side flange model and top flange model
External cage type . . . Mounting orientation of the detecting flanges
(T: top, S: side, B: bottom)
TB, TS, SB, SS

Controlling unit

Model NS LT 732 level indicating controller
For the details,

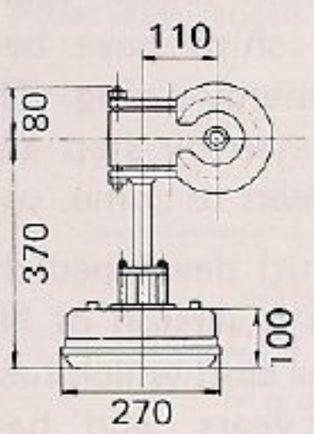
see 24 Automatic Indicating Controller

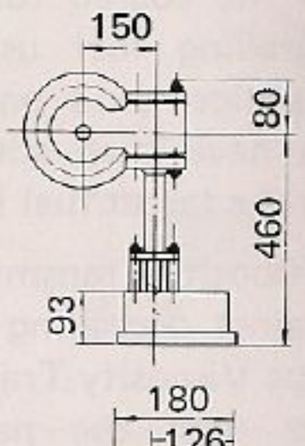
Model NS755N level controller
Output: 0.2 ~ 1.0kgf/cm²
Supply air pressure: 1.4kgf/cm²
Control actions: P, PI
P (Proportional band) . . . . 25 ~ 100%, (Standard)
25 ~ 200%, 50 ~ 300%
I (Reset time) . . . . . 0.1 ~ 20min
When P action is used, the device can be used as a transmitter.

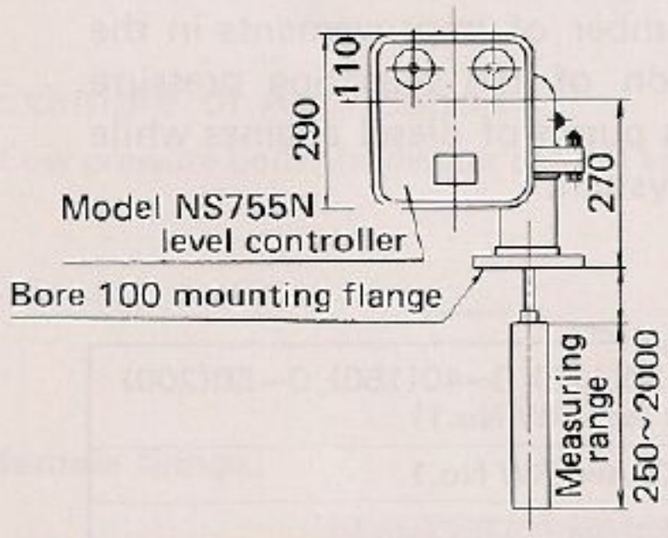


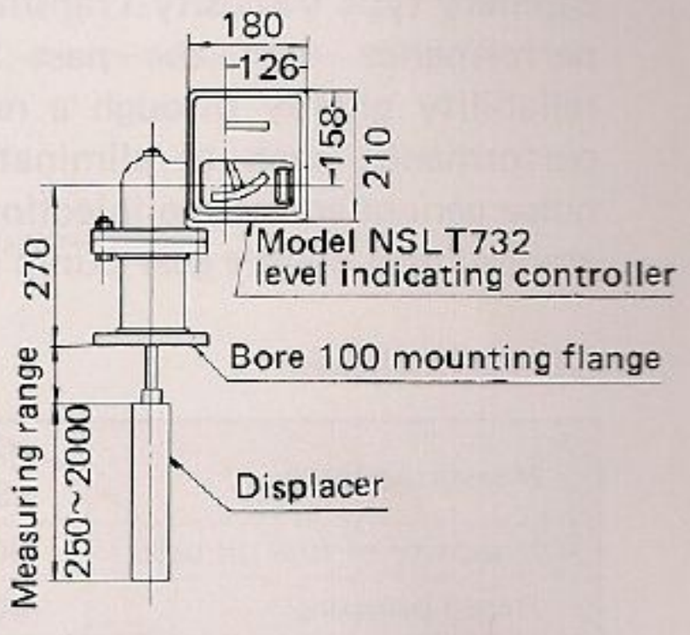
Overall Size

①Inner cage type top flange model
Mounting flange dimensions: Bore 100. JIS 5k – 20k



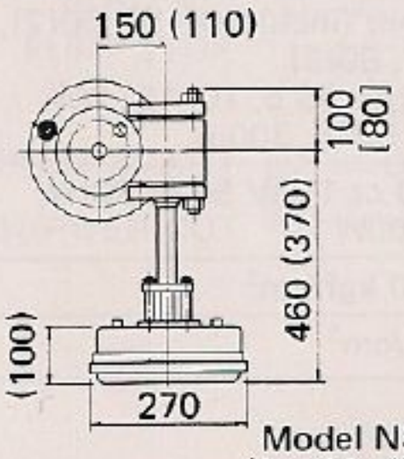


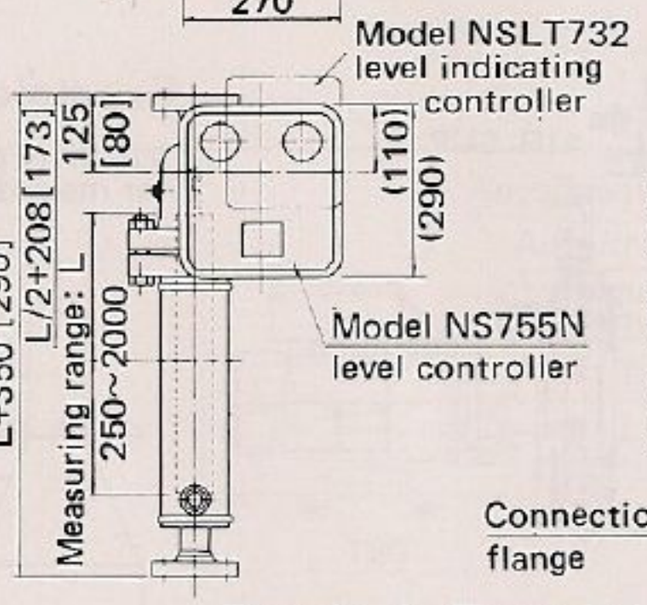




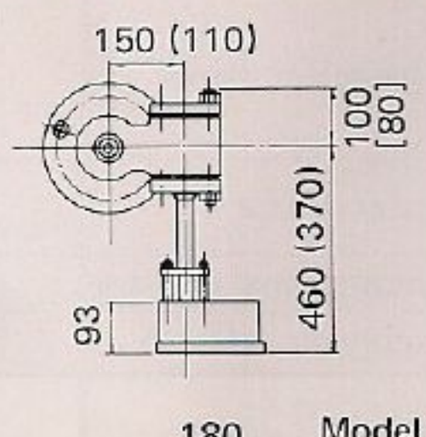
②External cage type

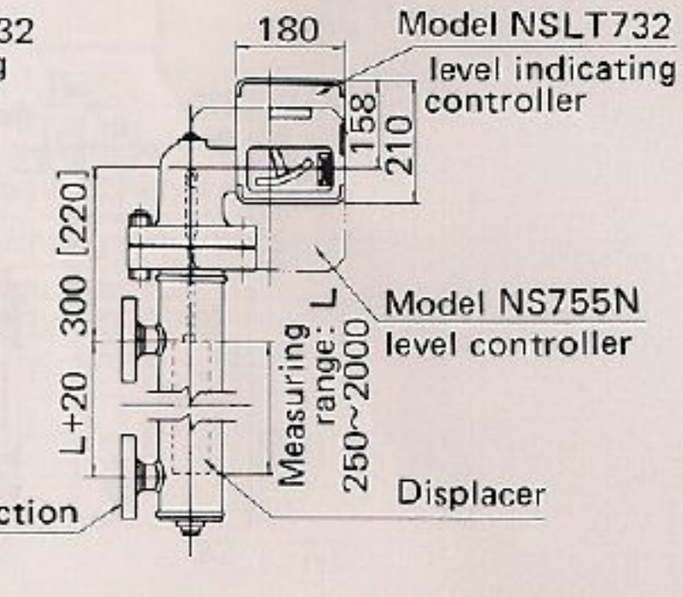
Models TB 16, 20, 30, 40, 63





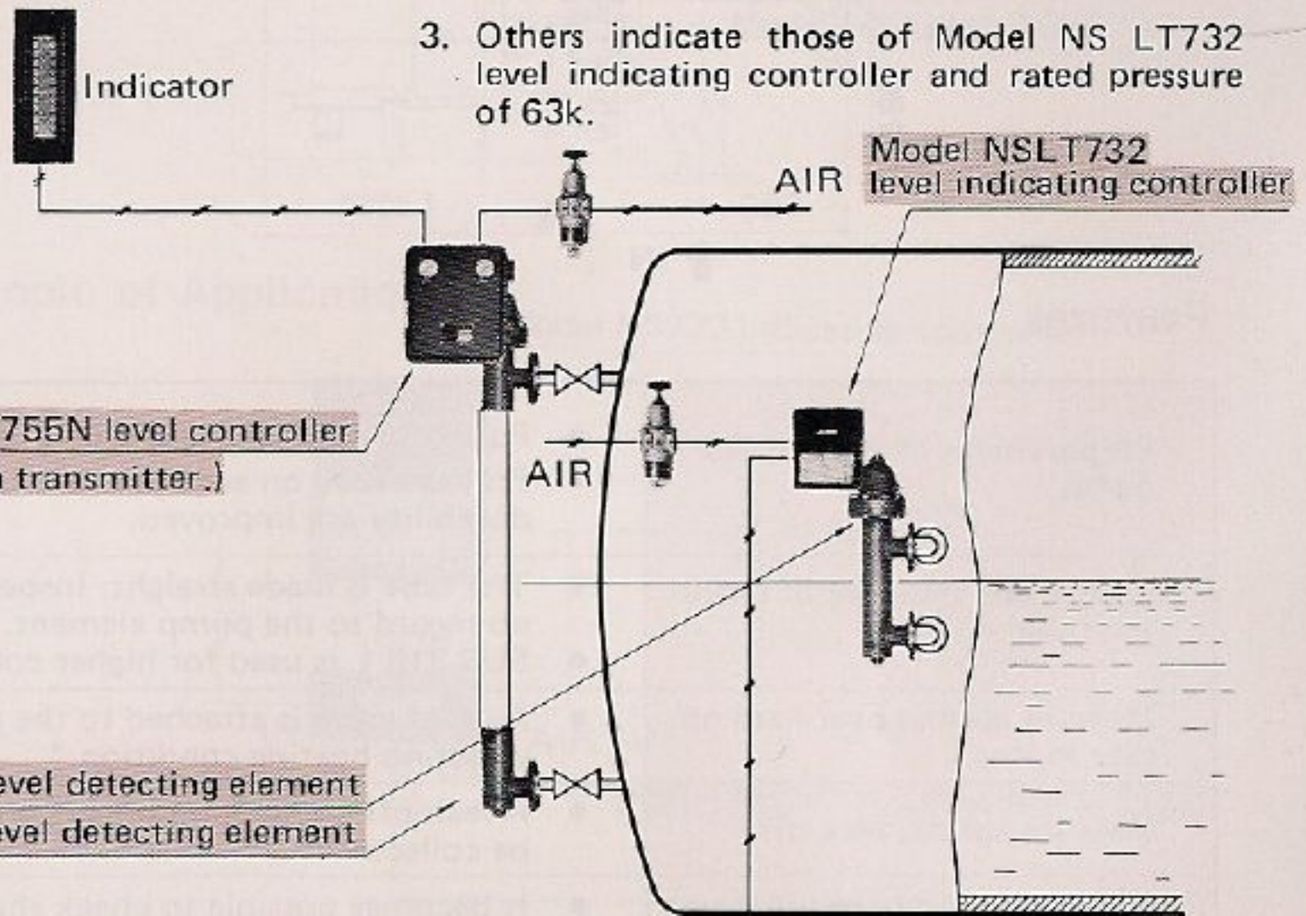
Models SS 16, 20, 30, 40, 63





Remarks
1. Figures in [ ] indicate those of rated pressure of 16k or 20k.
2. Figures in ( ) indicate those of Model NS-755N level controller.
3. Others indicate those of Model NS LT732 level indicating controller and rated pressure of 63k.

Example of Application

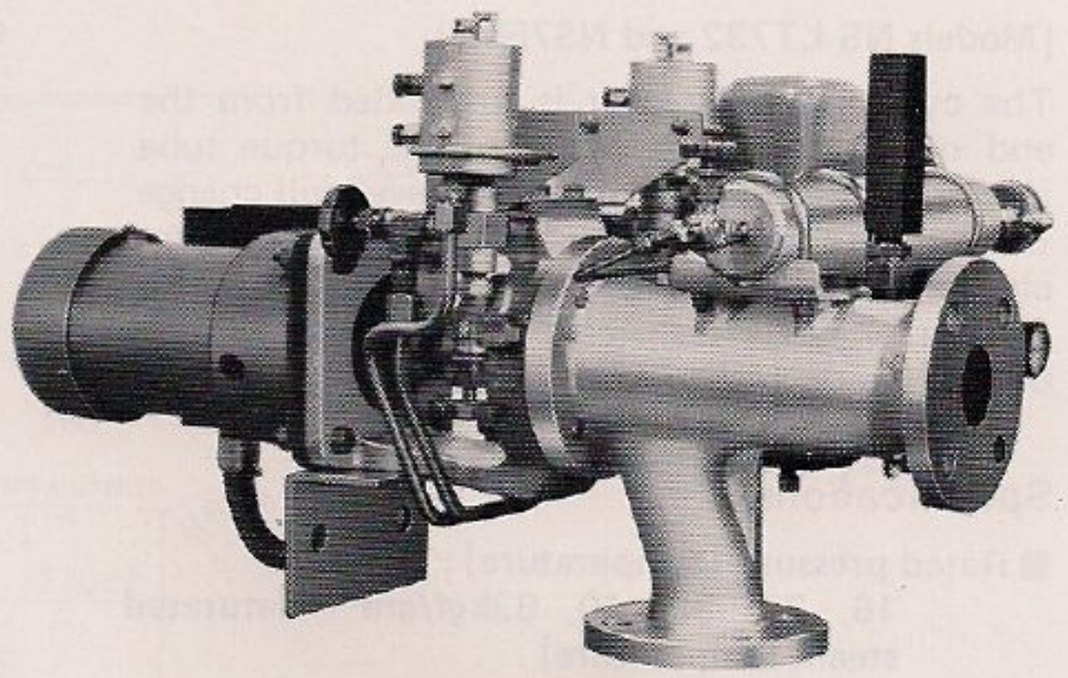


30 Viscocity Transmitter Unit

[Model 777C]

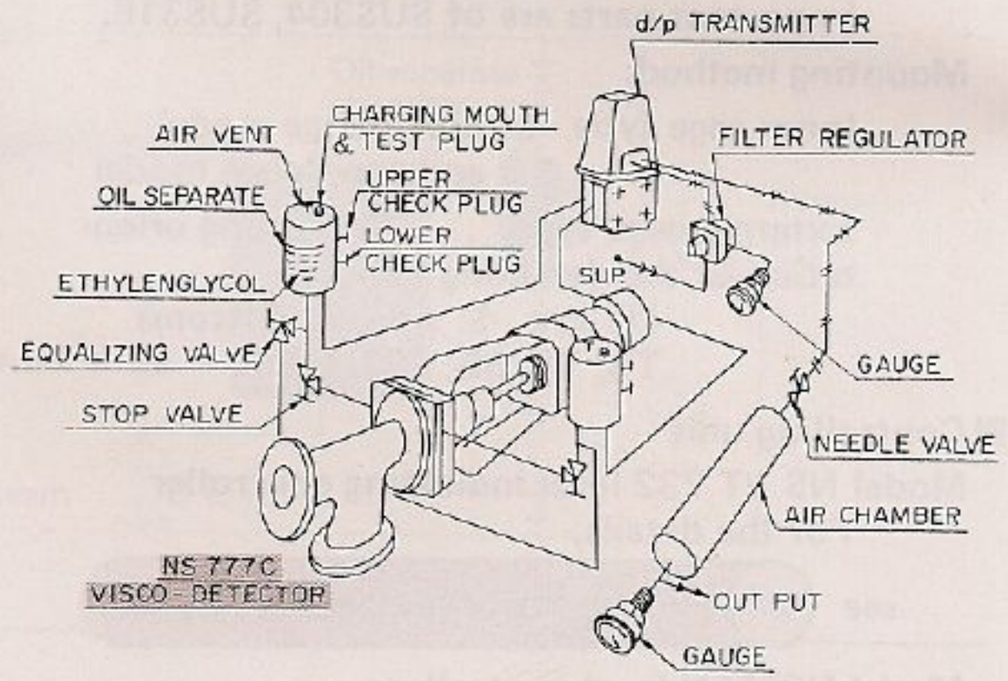
Along with the soared fuel price in recent years, measures against degrading fuel used for ships have been drawing world's attention as a part of energy-saving. The practical applications have been advanced step by step and 6000 sec RW No.1 as the target fuel in the years to come.

NS777C (Viscosity-Transmitter Unit) developed this time as a measure against degrading fuel is a version of NS777 series capillary type Viscosity-Transmitter Unit which has the proved performance over the past 20 years, and has improved reliability qreatly through a number of improvements in the performance such as elimination of the pulsating pressure noise generated by the injection pump of diesel engines while employing a double gear pump system.

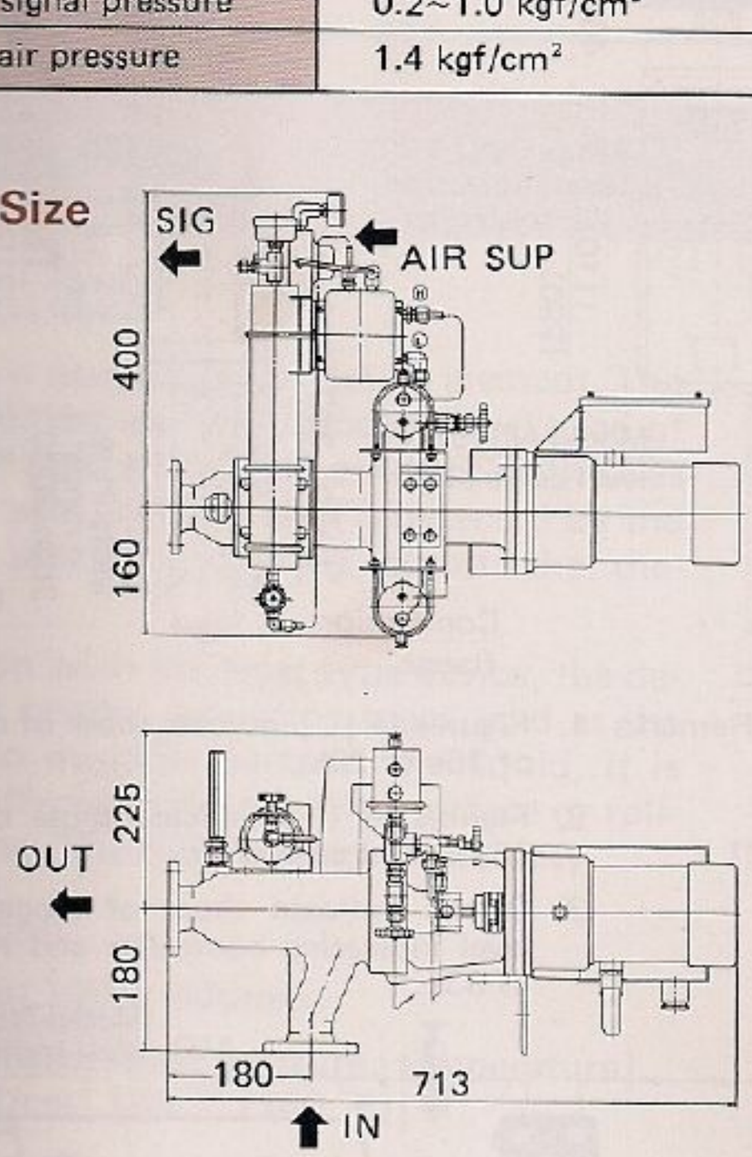


Specifications

Measuring range	0~30(125), 0~40(150), 0~50(200) cSt (sec RW No.1)
Viscosity of fuel oil used	6000 sec RW No.1
Rated pressure	20kgf/cm²
Fluid temperature	Max. 200° C
Connection flange	Size: mm (inch) 40(1½), 50(2), 65(2½), 80(3) Standard: JIS 5, 10, 16, 20K ANSI 150 lb, 300lb
Power source	AC 100 or 115V 50 or 60Hz, φ—1, 100W
Output signal pressure	0.2~1.0 kgf/cm²
Supply air pressure	1.4 kgf/cm²

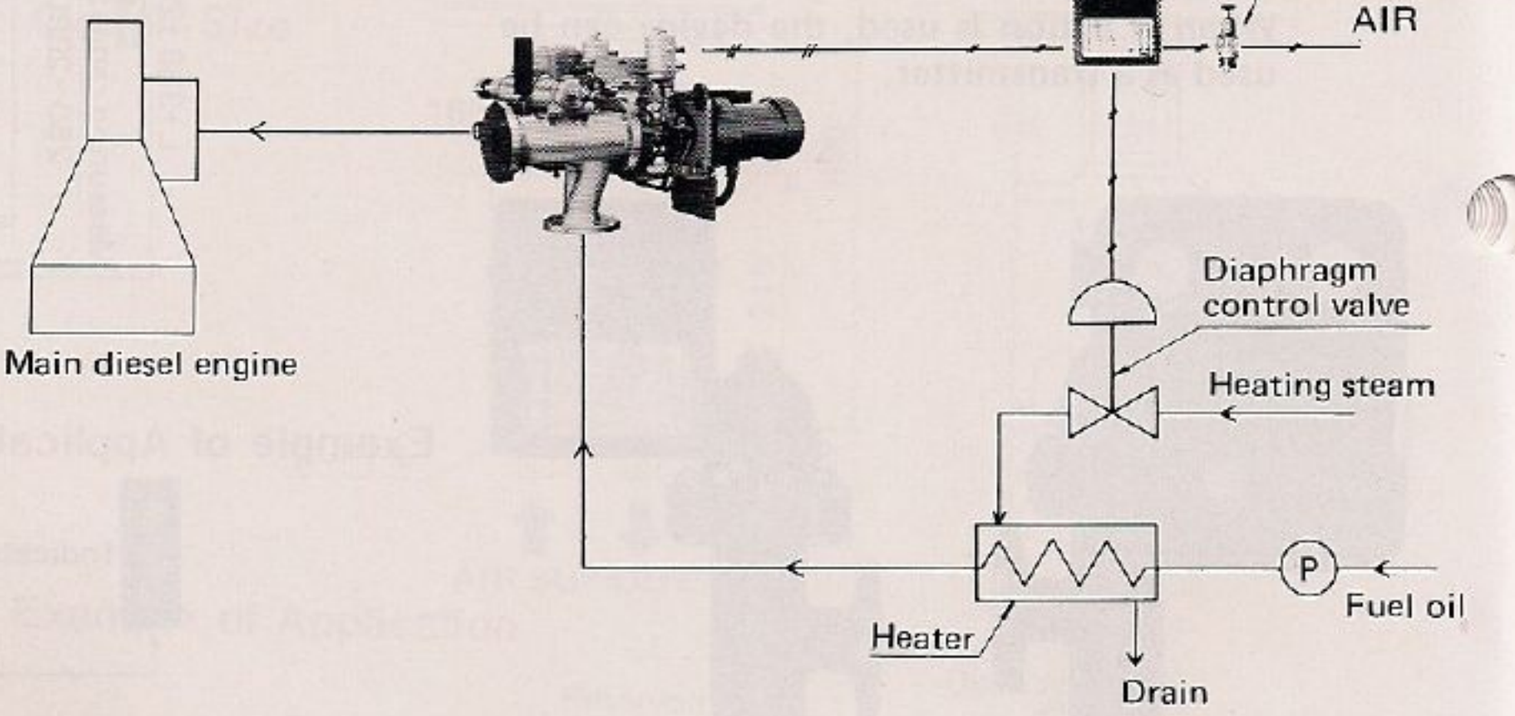


Overall Size



Example of Application

Viscosity control equipment for main diesel engine



Features

Employment of double gear pump	• Pulsating pressure noise can be cut off without using any noise damper. • Pressure load on each pump is lowered, the sampling flow is stabilized, and wear resistance as well as durability are improved.
Sharpe and material of capillary tube	• The tube is made straight. Inspection and cleaning of the tube can be made easily and independently with no regard to the pump element. • SUS 316 L is used for higher corrosion resistance.
Measure against over-load on gear motor	• A relief valve is attached to the gear pump unit improving the safety at extra high viscosity operation under no heating condition.*
Measure against leak-off	• A leak-off connection port is provided so that the fuel oil which may possibly ooze out of the gland can be collected.
Additional temperature gauge on the Unit	• It becomes possible to check the relationship between actual temperature and viscosity at the same position.

31 32 Float Type Level Controller and Swich

[Model NS721]

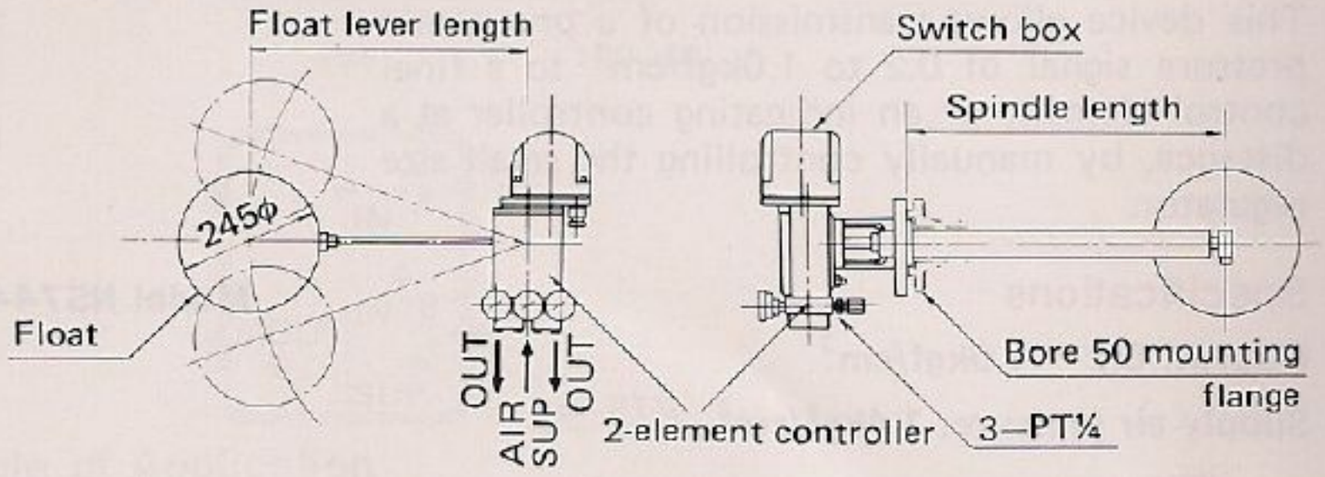
The device is used for simple control such as feedwater control of low pressure boilers where high accuracy is not essential and the set value can be fixed.

The detecting element is a float tap type one where a float is set afloat in the center of the tank, and the float gives a large controlling force. The device has a rigid float lever and a spindle. Since the pneumatic type controller can be installed with two elements, signal transmission and control can be made. In addition, a 5P level switch can be installed on the device. Thus, level transmission, control, alarm actuating, startup or stoppage of the pump, and burner cutting can be made with one unit of this device.

Specifications

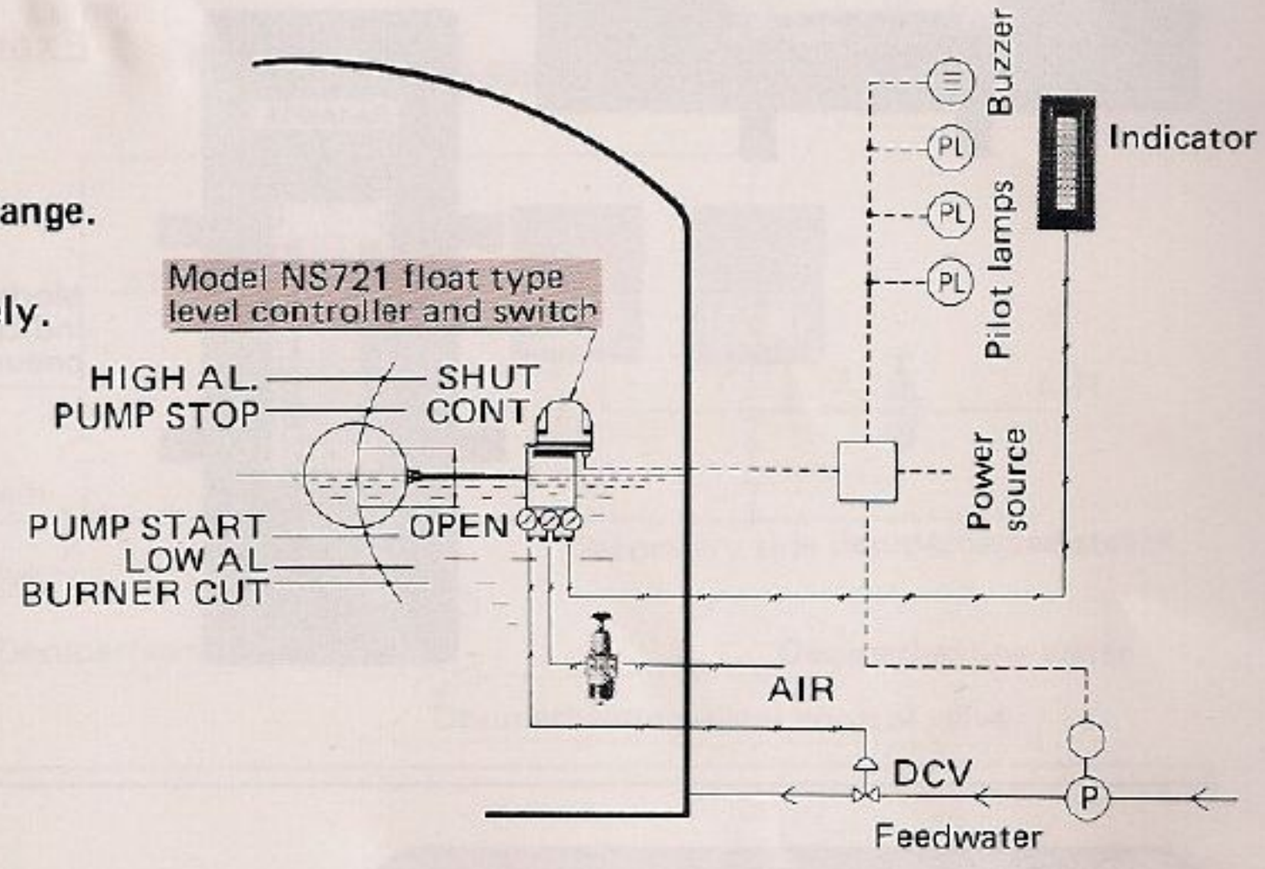
- **Detecting element: Rated pressure [temperature]**
  10kgf/cm² [saturated steam temperature]
  Mounting flange . . . Bore 50. JIS 5 ~ 20k. Male and female flange.
  Float diameter ϕ245
  The length of the float lever and the spindle can be set freely.
- **Controlling unit:**
  Turning input of the float lever . . . . . 10 ~ 40°
  Control action . . . . . P (Proportional action)
  Output . . . . . 0.2 ~ 1.0kgf/cm²
  Supply air pressure 1.4kgf/cm²
- **Level switch:**
  Number of contacts . . . . . 5P (each can be set freely)
  Switch . . . . . Single-pole double-throw.
  AC 125V. 250V-10A
  DC 125V-0.5A, 250V-0.25A

Overall Size



Example of Application

(Low pressure boiler feedwater control equipment)



33 Automatic/Manual Selector

[Model NS743]

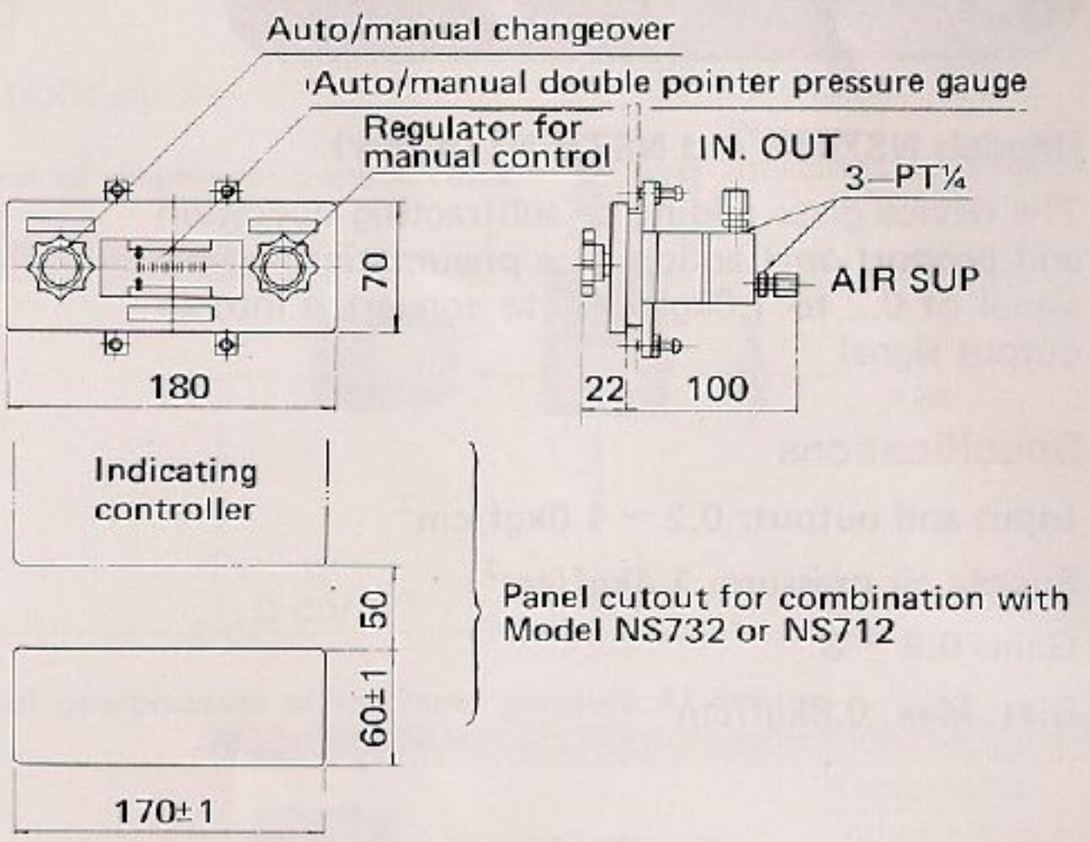
This device is installed beneath an indicating controller. When the "AUTO" position is selected, the output of the indicating controller is directly given to the final control element. When the switch cock is set in the "MANUAL" position, the final control element can be operated by the manual control output given through the regulator. The device is indispensable for startup, stoppage and maintenance of plants.

Specifications

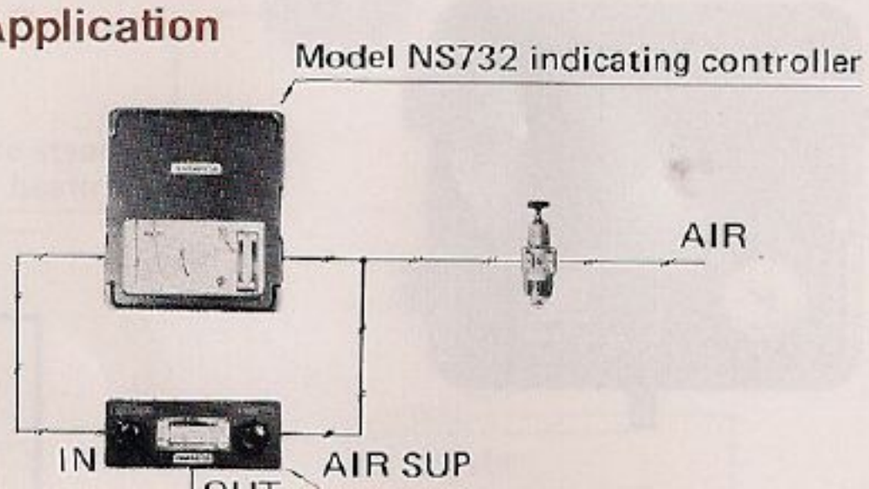
Output: 0.2 ~ 1.0kgf/cm²

Supply air pressure: 1.4kgf/cm²

Overall Size



Example of Application



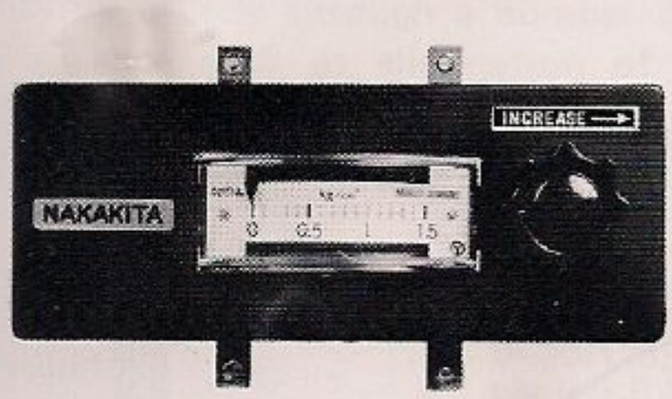
[Models NS744H and NS744V]

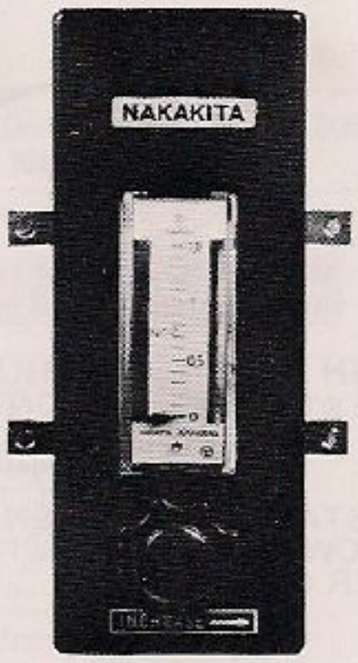
This device allows transmission of a pneumatic pressure signal of 0.2 to 1.0kgf/cm^2 to a final control element or an indicating controller at a distance, by manually controlling the small size regulator.

Specifications

Output: 0.2 ~ 1.0kgf/cm^2

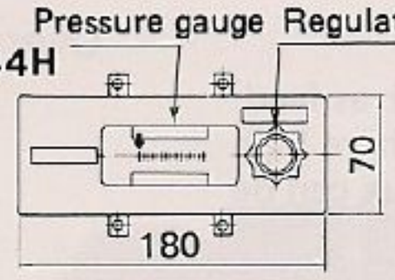
Supply air pressure: 1.4kgf/cm^2

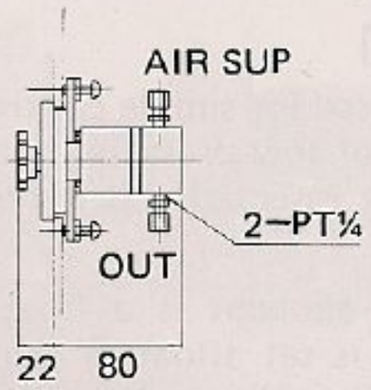




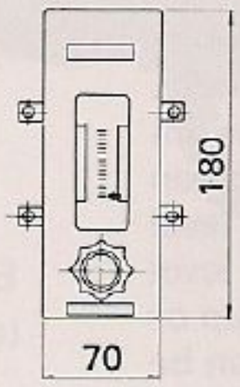
Overall Size

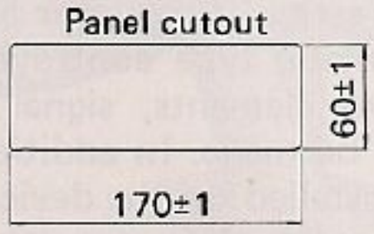
Model NS744H



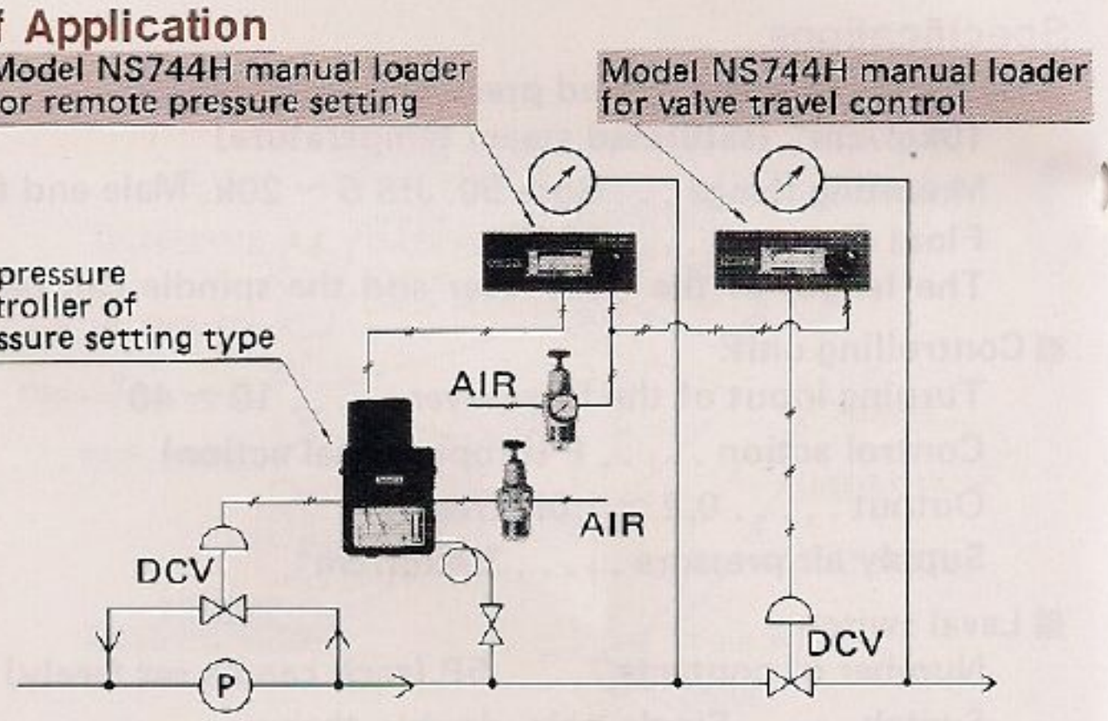


Model NS744V





Example of Application



35 Pressure Converter

[Models NS767N and NS736N] (Adder)

The device gives adding or subtracting operation and proportional action to a pneumatic pressure signal of 0.2 to 1.0kgf/cm^2 to convert it into an output signal.

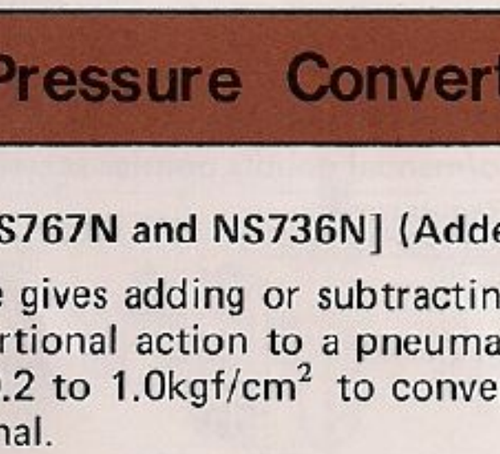
Specifications

Input and output: 0.2 ~ 1.0kgf/cm^2

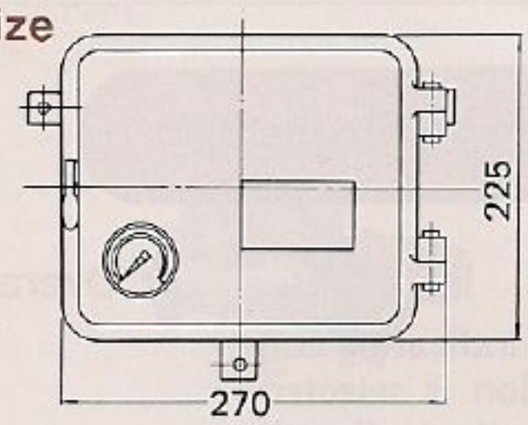
Supply air pressure: 1.4kgf/cm^2

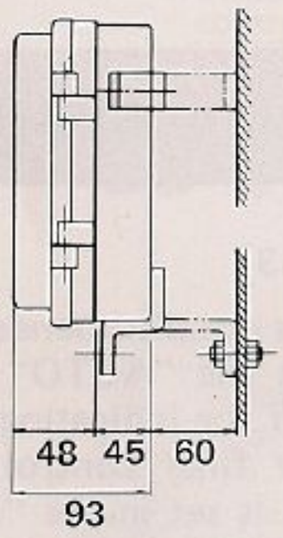
Gain: 0.8 ~ 8

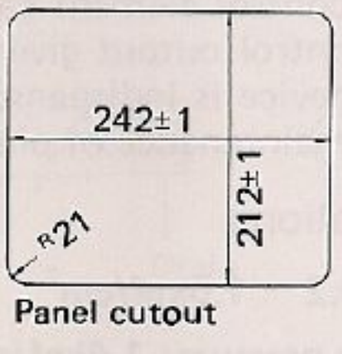
Bias: Max. 0.8kgf/cm^2



Overall Size

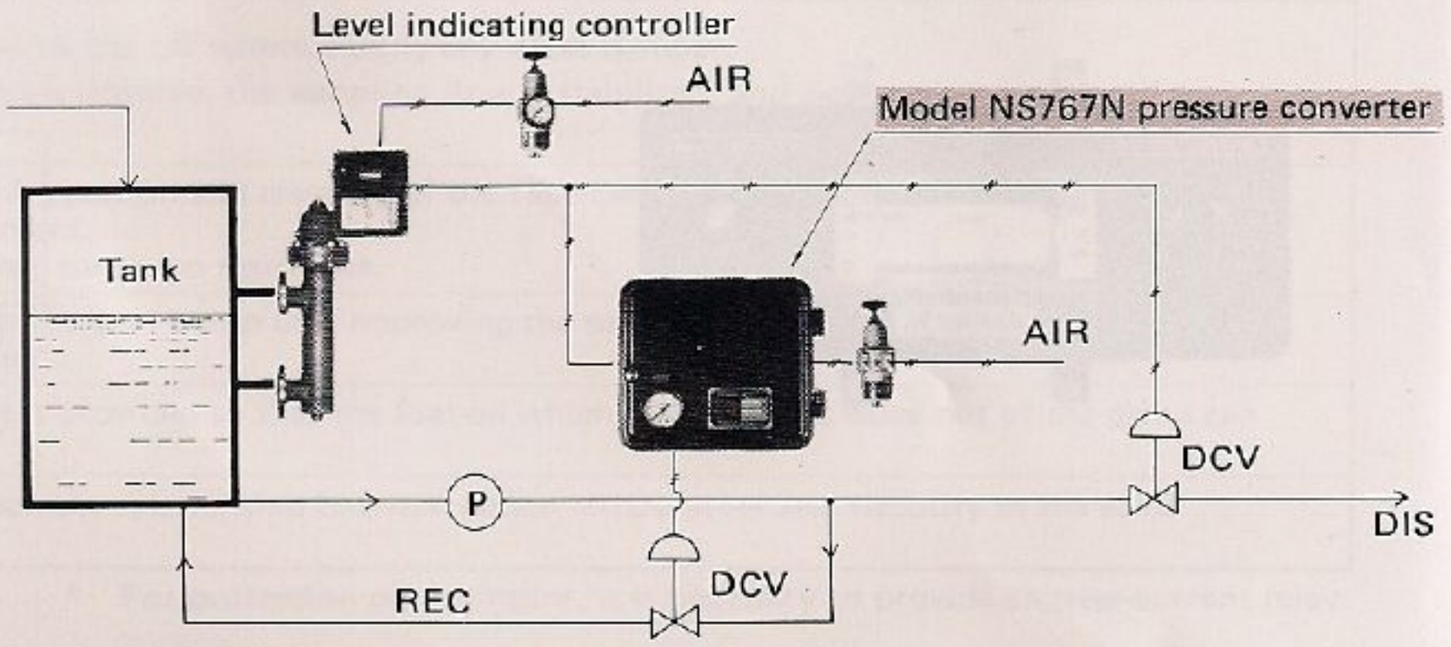






Panel cutout

Example of Application



Differentiation Adder

NS753D]

evice adds two pneumatic pressure signal ranging from 0.2 to 1.0kfg/cm^2 with each One of the input signal's change is differ-d, and the derivative is used in the addi-For example, in the case of temperature l, in order to cover the dead time, a pre-action is given by the derivative of the hange (flow rate or pressure).

fications

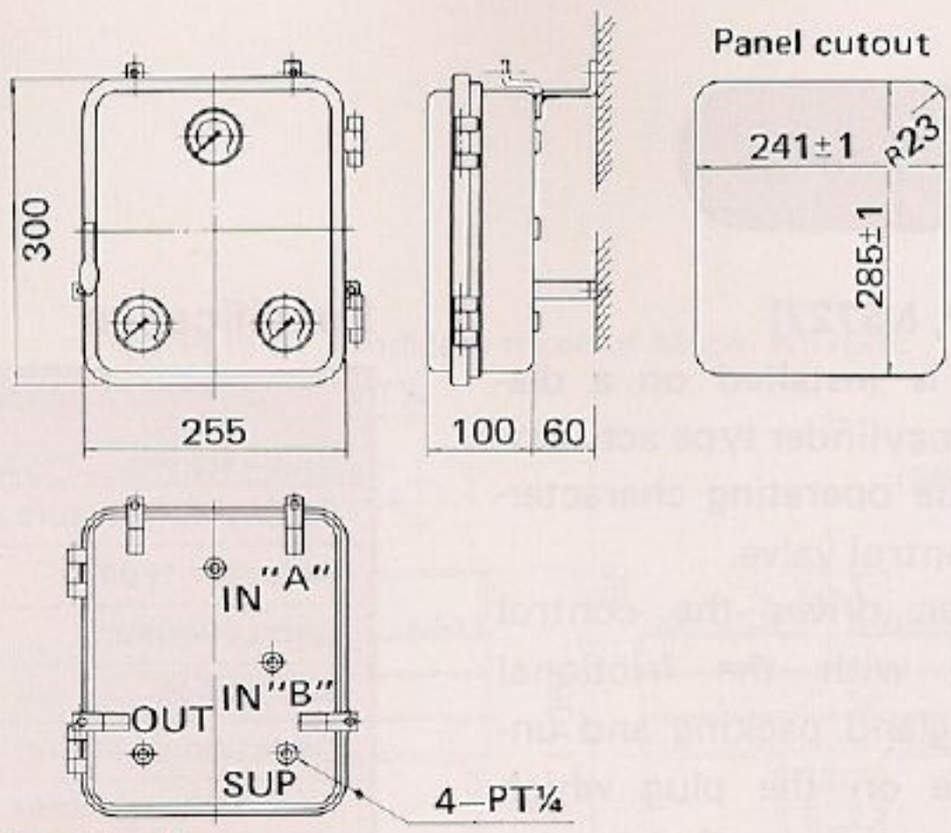
nd output: 0.2 ~ 1.0kgf/cm^2

air pressure: 1.4kgf/cm^2

0.5 ~ 2

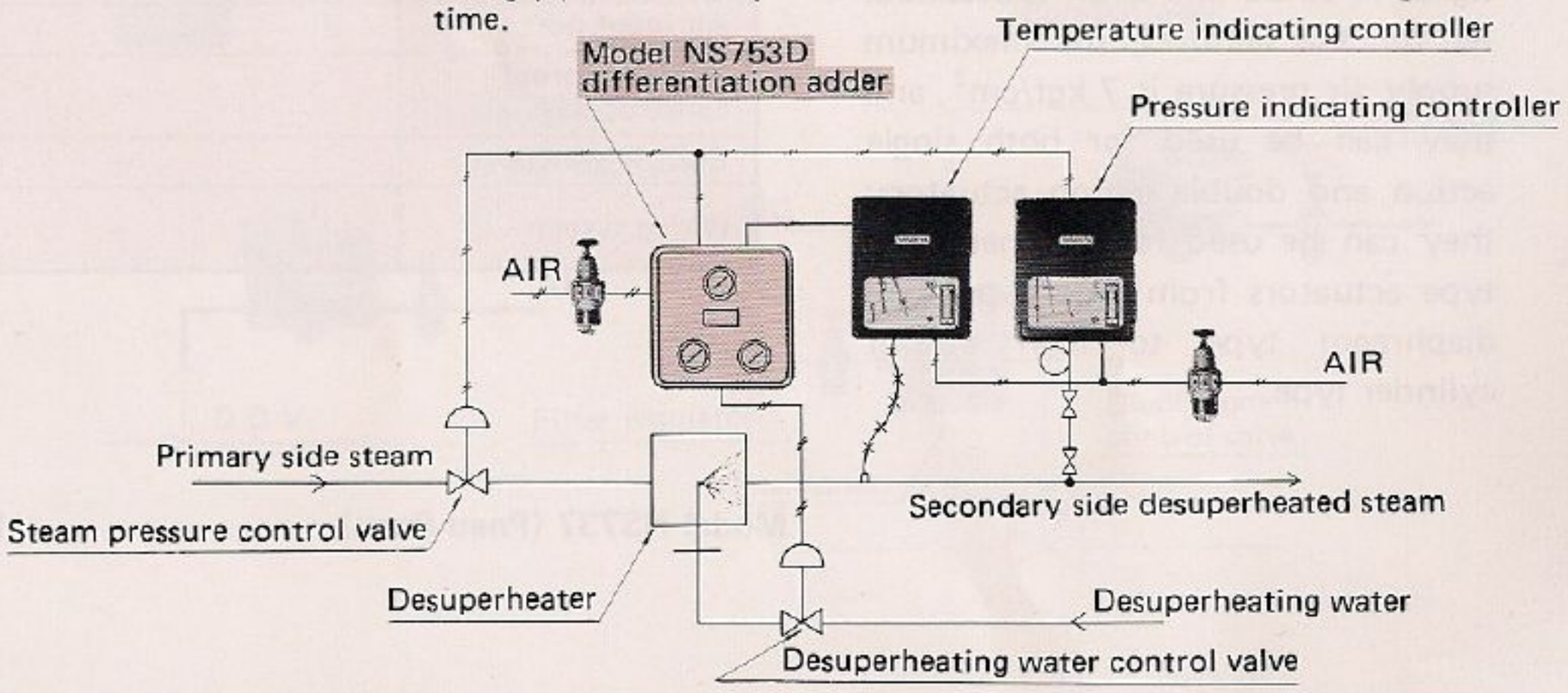
e time): 0.05 ~ 10min

Overall Size



Example of Application

The stability of the secondary side steam temperature is secured by controlling the desuperheating water control valve in proportion with the derivative of the change of the control signal (valve travel) of the steam pressure control valve or the speed of the desuperheating load change, prior to temperature measurement which entails a long dead time.



Select Relay

I NS774A]

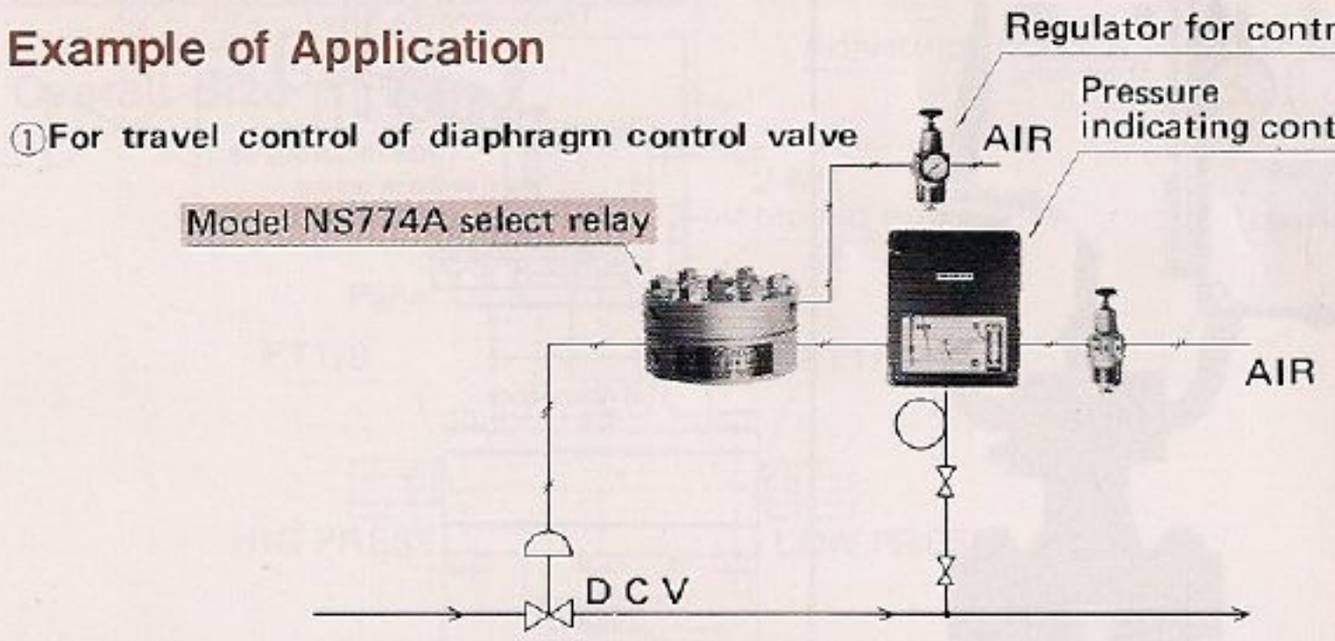
evice is a highly sensitive relay which se-nd outputs the higher or lower pressure according to the order of priority speci-eforehand, from two pneumatic pressure inputs. There are two types: HIGH select-e and LOW selecting one.

fication

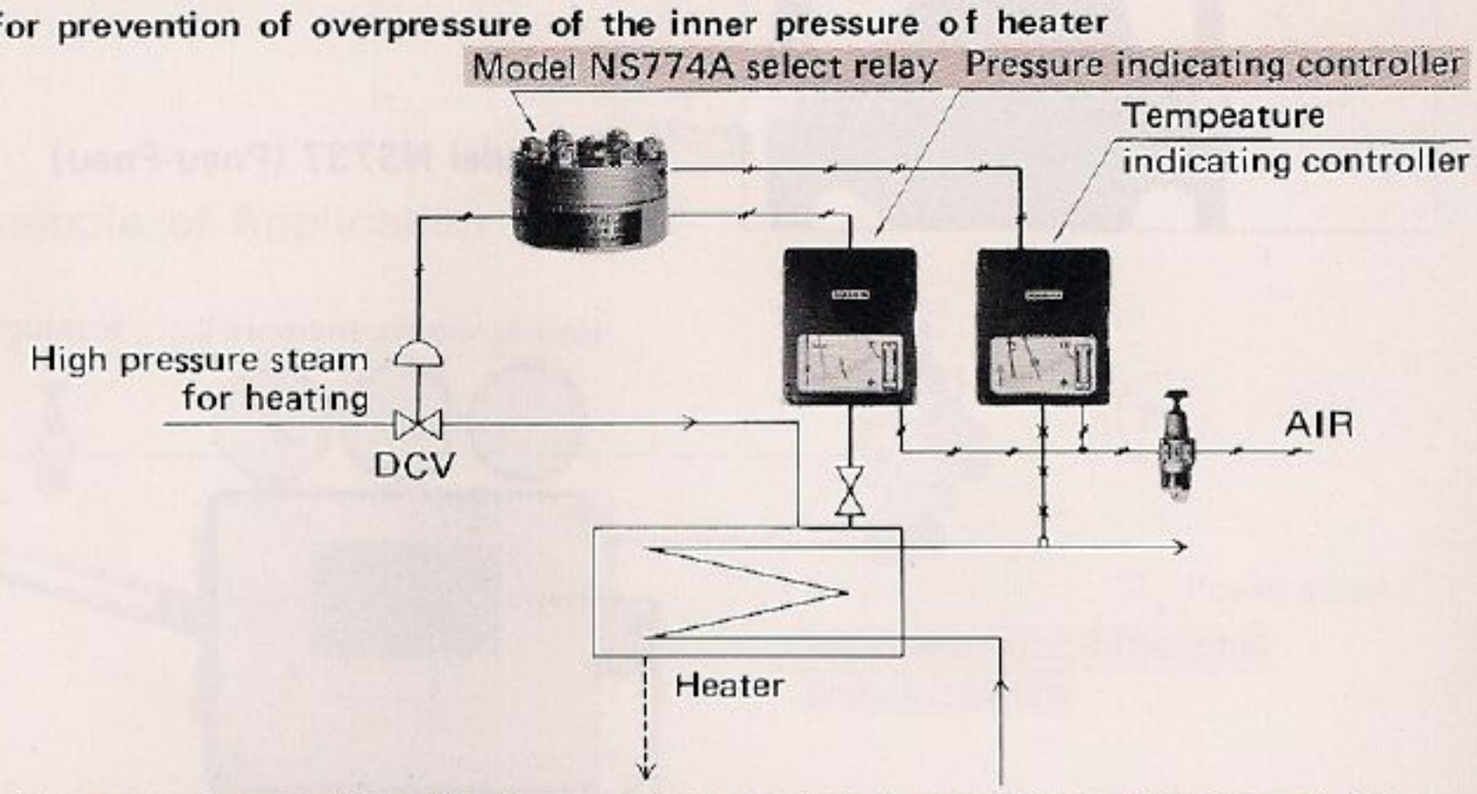
pneumatic pressure: 2.4kgf/cm^2

Example of Application

①For travel control of diaphragm control valve

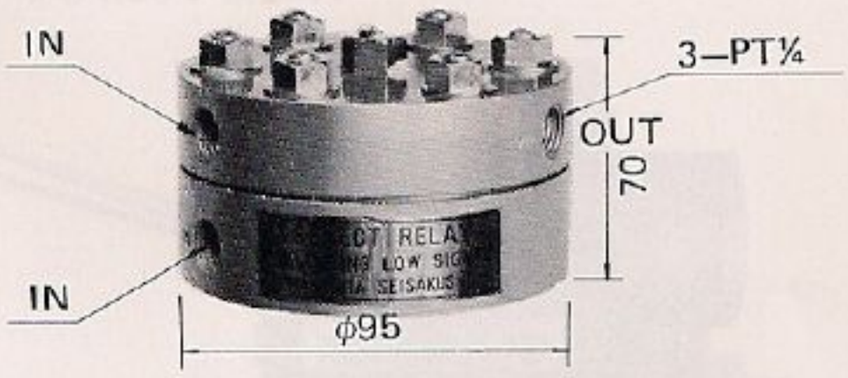


②For prevention of overpressure of the inner pressure of heater



During the normal operation, the temperature control is prevailing. However, at the startup or stoppage, the dead time of temperature measuring becomes long and proper control can not be achieved. At this instant, the inner pressure of the heater will rise transiently. When the set value of the pressure indicating controller is reached to, the output preferring valve closing will be selected, and the control will shift to the pressure control

ll Size



38 Positioner

[Type: NS737, NS727]

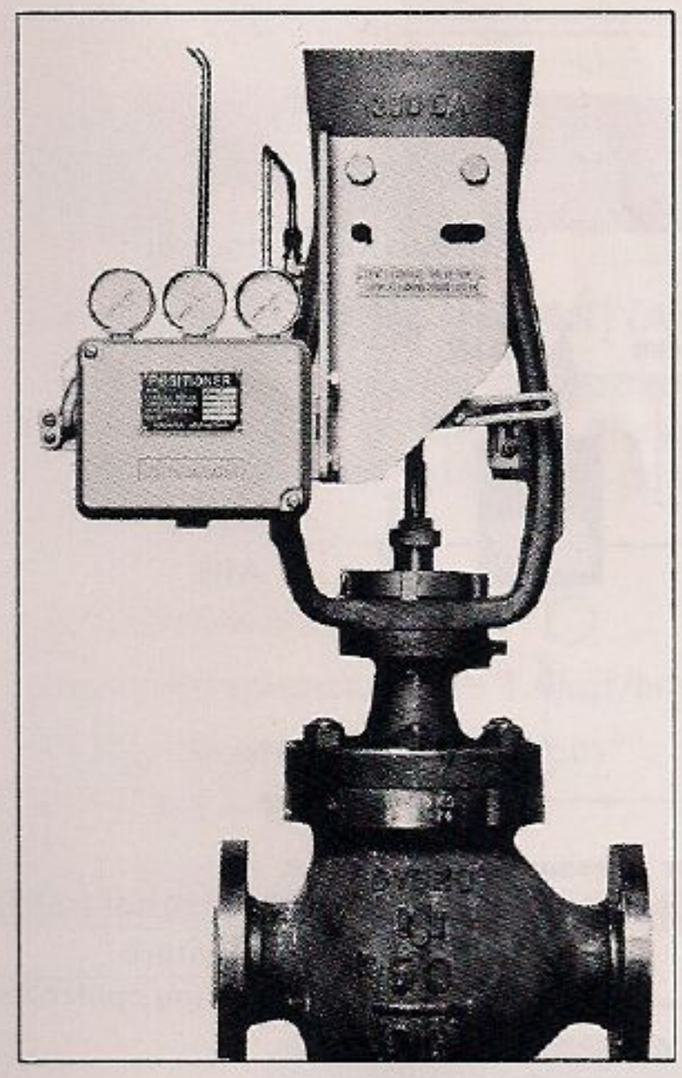
A positioner is installed on a diaphragm type or cylinder type actuator to improve the operating characteristics of the control valve.

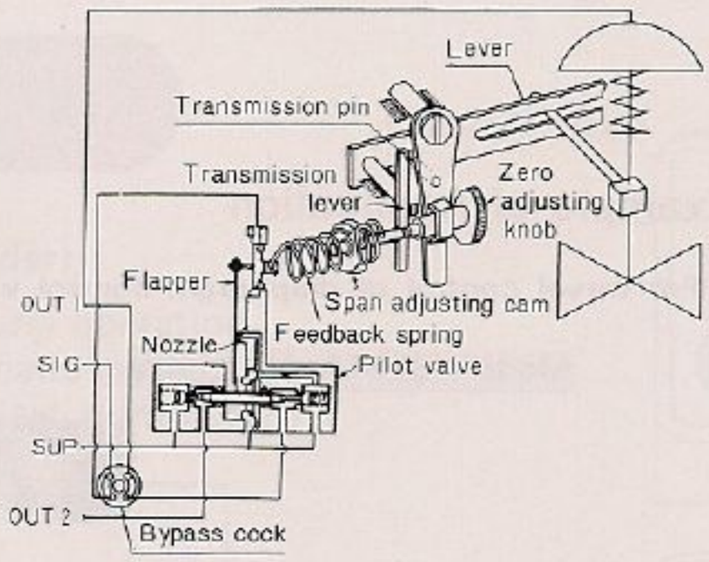
The positioner drives the control valve, coping with the frictional resistance of gland packing and unbalanced force on the plug which prevent the movement of the valve stem, till the valve travel corresponding to the input pneumatic signal (0.2 to 1.0 kgf/cm^2) or input current signal (4 to 20 mA D C) is attained. As for the features, the maximum supply air pressure is 7 kgf/cm^2, and they can be used for both single action and double action actuators; they can be used for all pneumatic type actuators from general purpose diaphragm type to high output cylinder type.

Specification

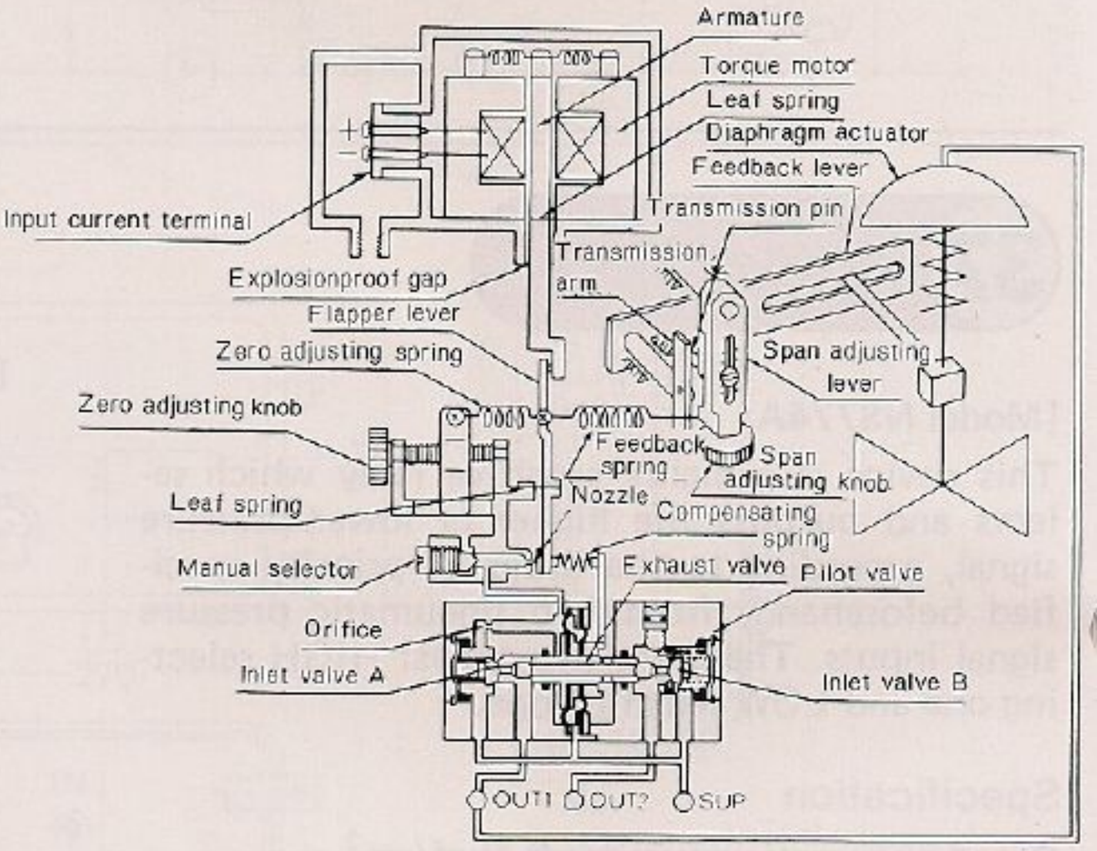
Model / Input signal		NS737 (Pneu-Pneu)	NS727 (Elec-Pneu)
		0.2 ~ 1.0 kgf/cm^2	4 ~ 20 mA DC (standard)
Supply air pressure		1.4 ~ 7 kgf/cm^2	
Actuator type		Suitable to both single action (spring return) and double action types.	
Charactieristic		Linear, or free choice with cam.	
Split range		30 ~ 100%	50 ~ 100%
Direction of action		Direct action and reverse action. Direction of action can be reversed.	
Input angle	Lever type	5 ~ 30°	10 ~ 30°
	Cam type	60 ~ 120°	
Air consumption		7 Nℓ/min (when supply pressure is 1.4 kgf/cm^2)	
Outlet flow rate		70 Nℓ/min (when supply pressure is 1.4 kgf/cm^2)	
Air input port		PT 1/4 female	
Explosionproof construction		–	Explosionproof construction $d_2 G_4$
Electric wire port		–	PT 1/2 female
Wiring system		–	Conduit tube system, Pressure tight packing.

Model NS737 (Pneu-Pneu)

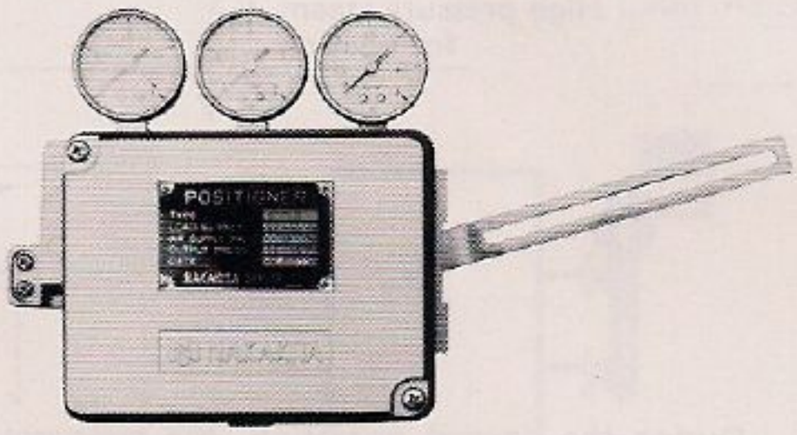




Model NS727 (Elec-Pneu)



Model NS737 (Pneu-Pneu)



Model NS727 (Elec-Pneu)

39 Booster Relay

[Model NS766C and NS766E]

This device is added to a pneumatic actuator to amplify the output of the controller or the positioner to a high capacity and substantially increase the driving speed.

In case the amplification results in overshooting or hunting, adjust the needle valve stored. Stable response can be obtained.

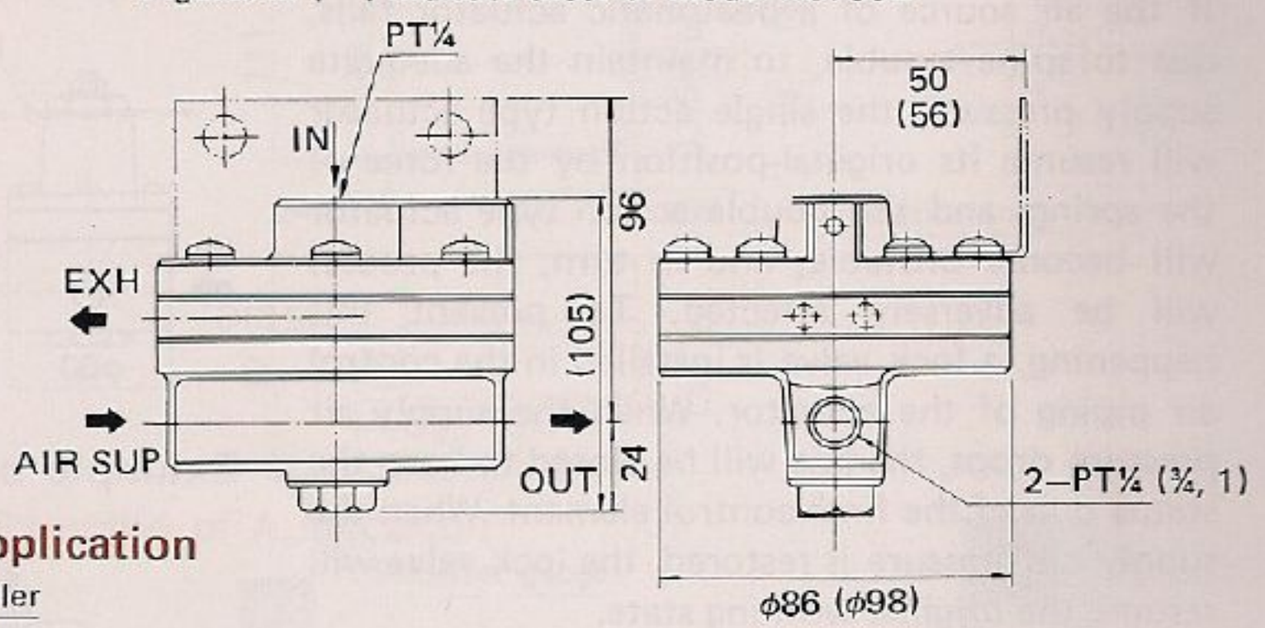
Specification

Input & output	Max. 6 kgf/cm²
Supply air pressure	Less than 10 kgf/cm²
Input/output ratio	1 : 1

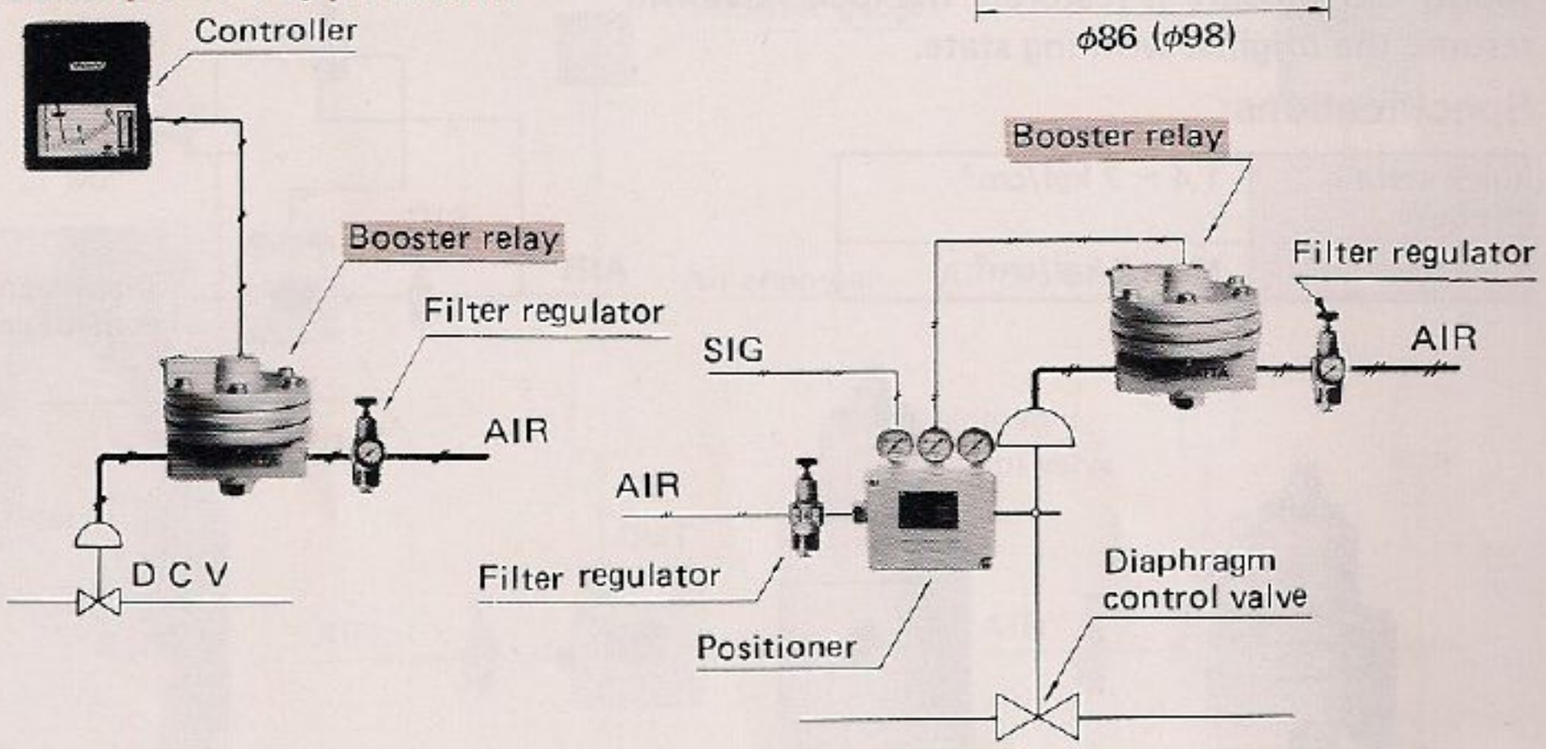
Overall Size

Model NS766C

Figures in ( ) indicate those of Model NS766E



Example of Application



40 High Sensitivity Type Differential Pressure Switch

This device is used only for receiving instrument air pressure signal. A microswitch is operated by a differential pressure working across the diaphragm of the pressure receiving part. It is highly sensitive with response differential pressure of 150mmAq. The device is most suited for detecting the differential pressure between two signals and for level detection of air purge type.

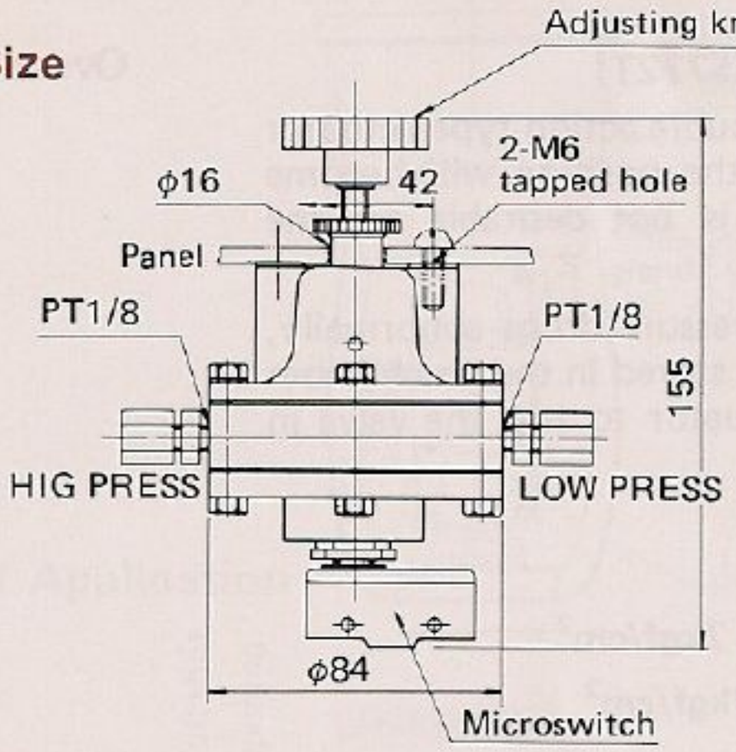
Specifications

Rated pressure: 4kgf/cm²

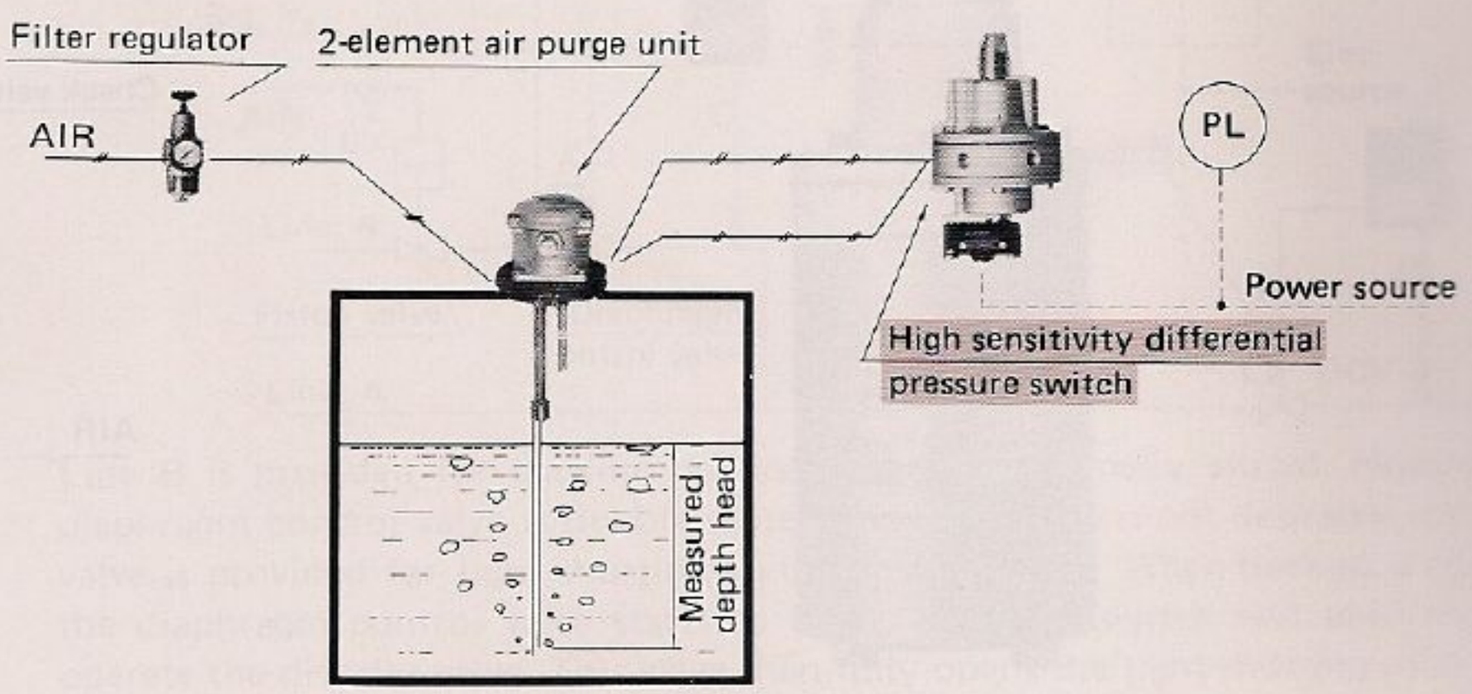
Set differential pressure: Max. 2.5kgf/cm²

Switch: Single pole, double throw.
AC 125V, 250V, 480V-20A
DC 125V-0.5A
DC 250V-0.25A

Overall Size



Example of Application



41 42 Lock Valve

[Models NS772S and D]

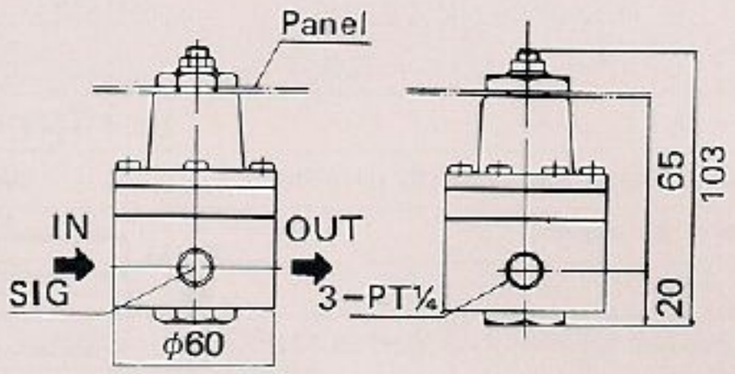
If the air source of a pneumatic actuator fails, due to some trouble, to maintain the adequate supply pressure, the single action type actuator will resume its original-position by the force of the spring, and the double action type actuator will become unstable, and in turn, the process will be adversely affected. To prevent this happening, a lock valve is installed in the control air piping of the actuator. When the supply air pressure drops, the line will be closed to keep the status quo of the final control element. When the supply air pressure is restored, the lock valve will resume the original working state.

Specifications

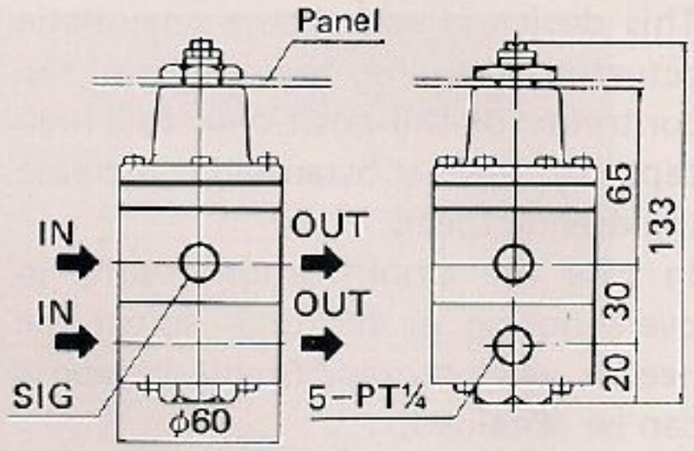
Lock setting pressure	1.4 ~ 7 kgf/cm²
Line pressure	Max. 7 kgf/cm²

Overall Size

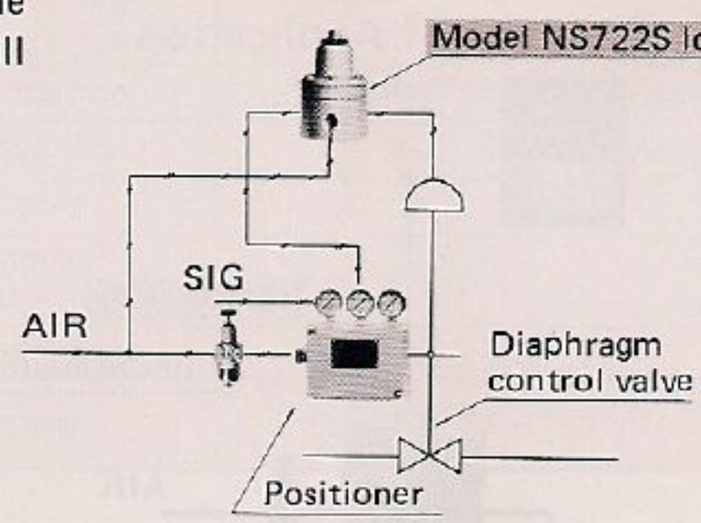
Model NS772S(SINGLE ACTION)

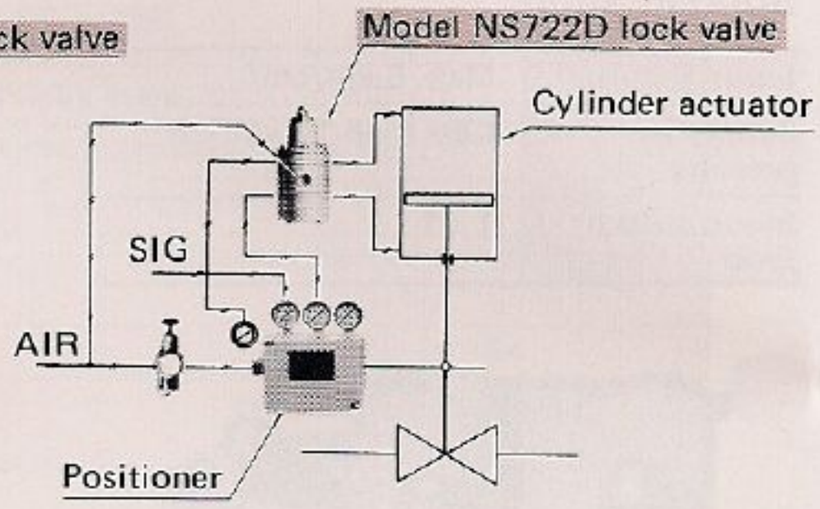


Model NS772D(DOUBLE ACTION)



Example of Application





43 Three-Way Lock Valve

[Models NS772C and NS772T]

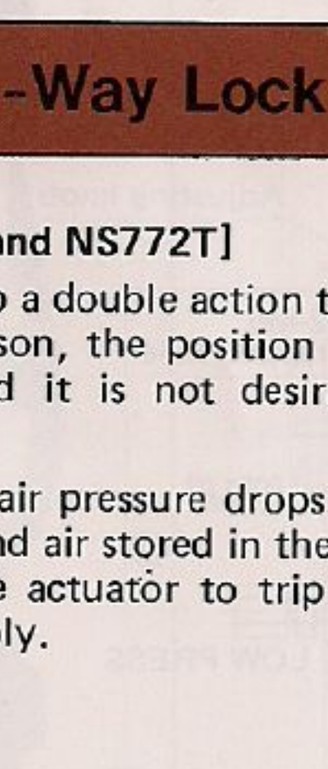
If the supply air to a double action type actuator fails by some reason, the position will become indeterminate, and it is not desirable for the process.

When the supply air pressure drops abnormally, this device will send air stored in the air chamber to one side of the actuator to trip the valve in one position forcibly.

Specifications

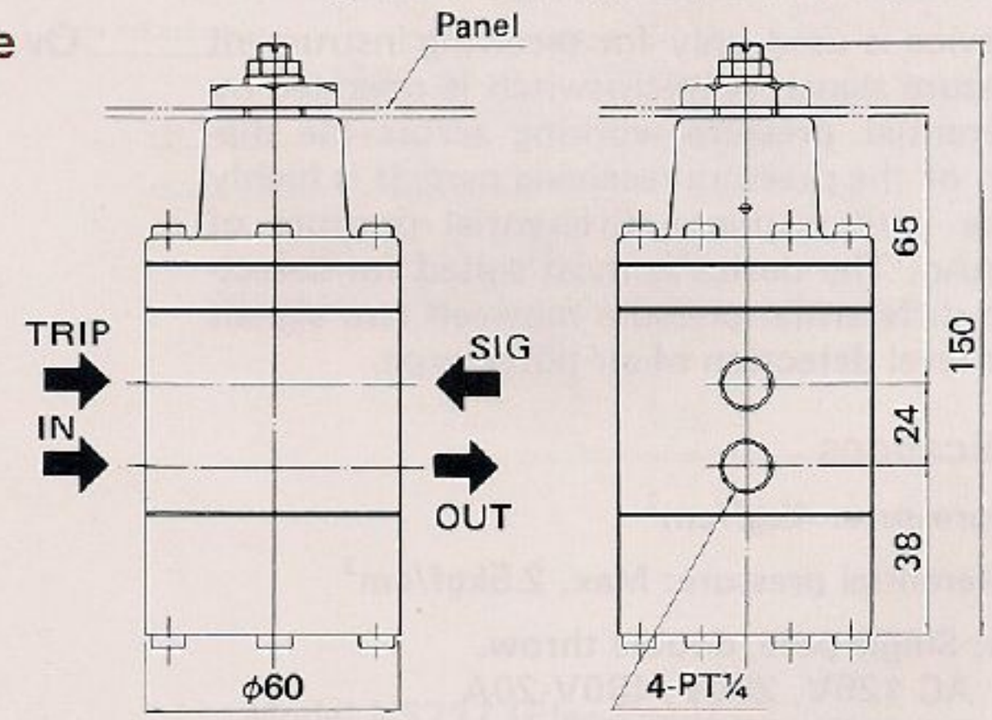
Trip set pressure: 1.4 ~ 7kgf/cm²

Circuit pressure: Max. 7kgf/cm²

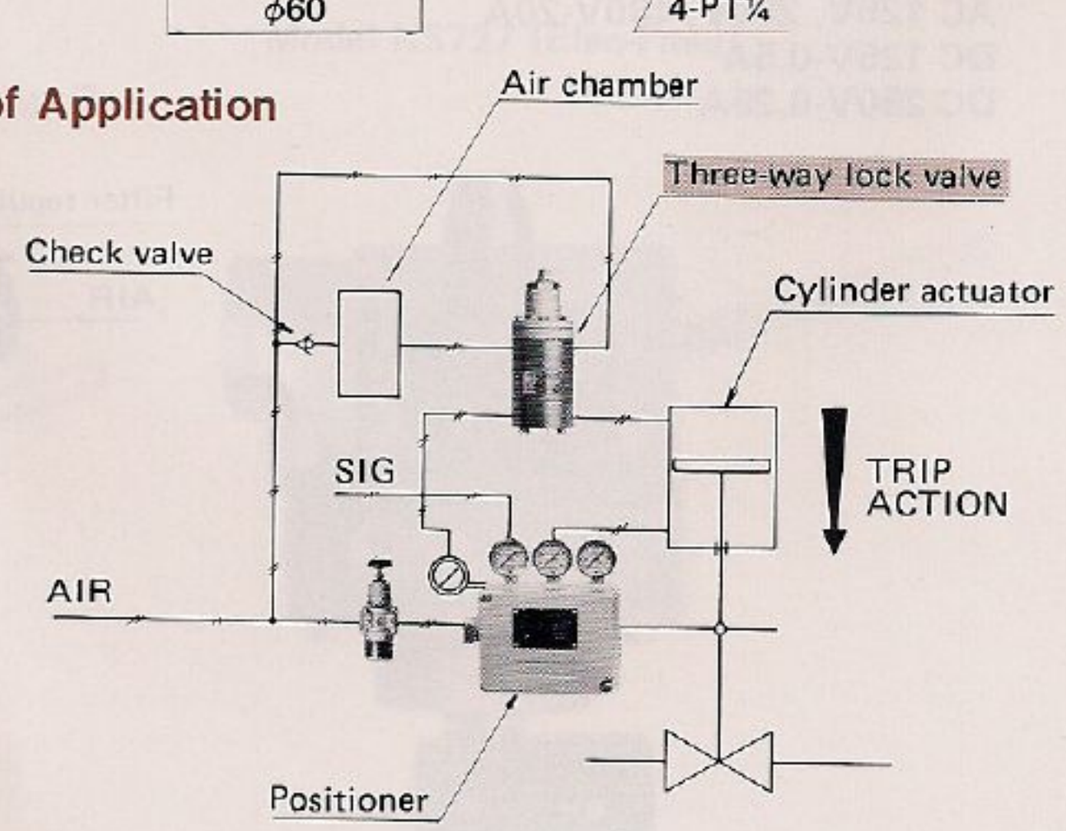


Overall Size

(Dimensions shown are those of Model NS772T.)



Example of Application



44 Pneumatic Type Valve Travel Transmitter

[Model NS737T]

This device converts the travel of a cotrol valve into a pneumatic pressure signal of 0.2 to 1.0kgf/cm^2 and transmits it to an indicator at a distance. The signal is also used as a feedback signal for a monitor switch or a servo unit.

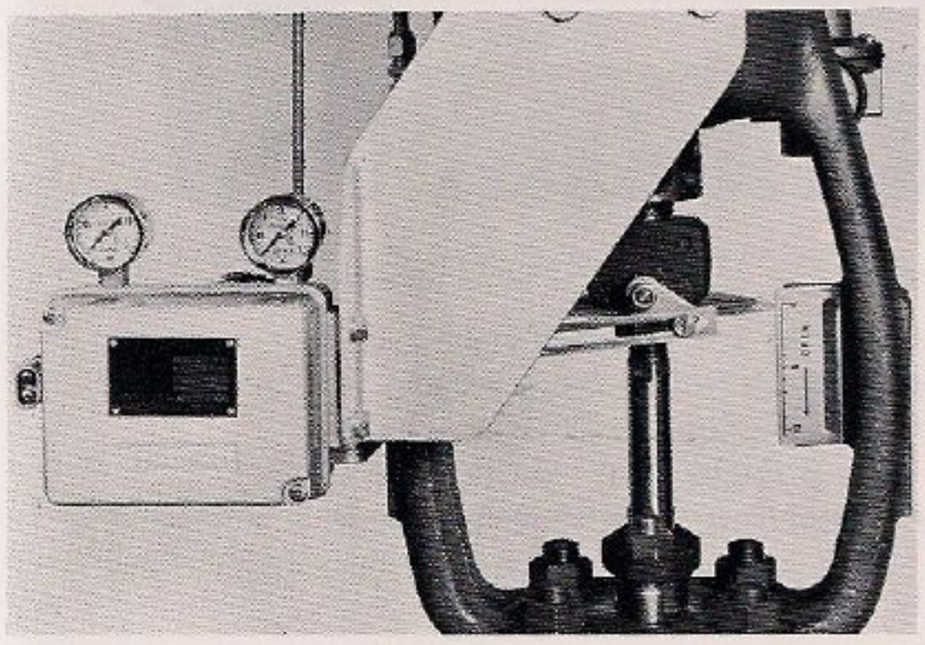
As this device uses Model NS737 positioner intact, handling and maitenance are the same with the positioner. The device provides high reliability and accuracy.

Specifications

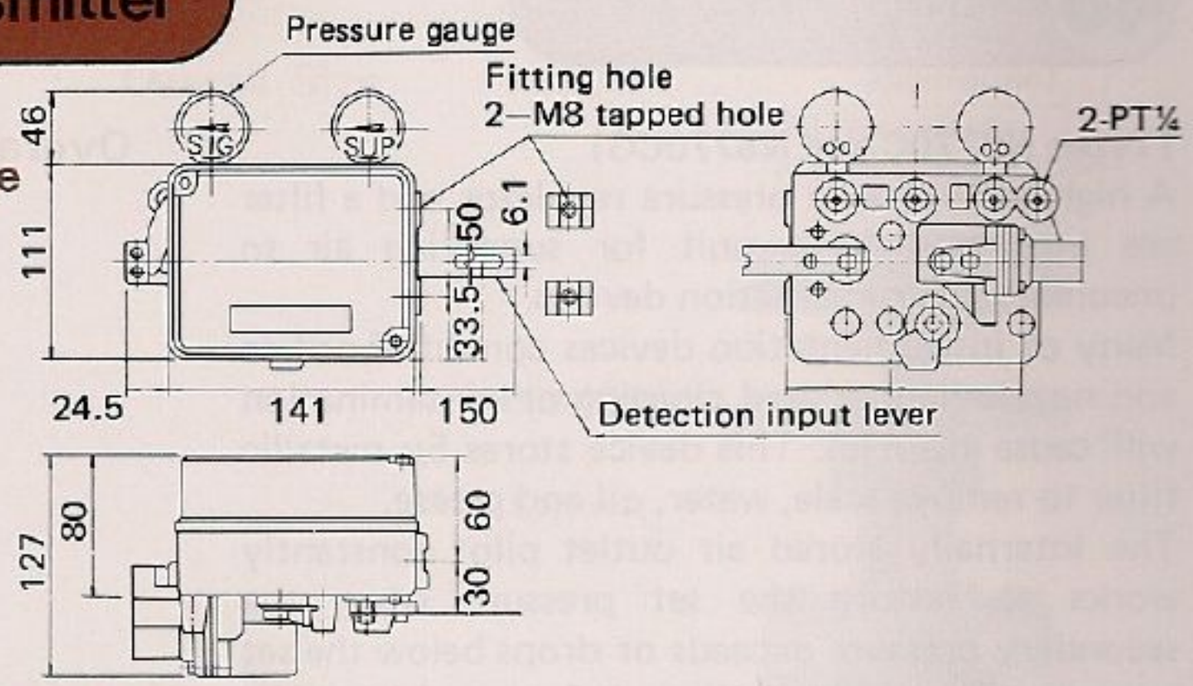
Output: 0.2 ~ 1.0kgf/cm^2

Supply air pressure: 1.4kgf/cm^2

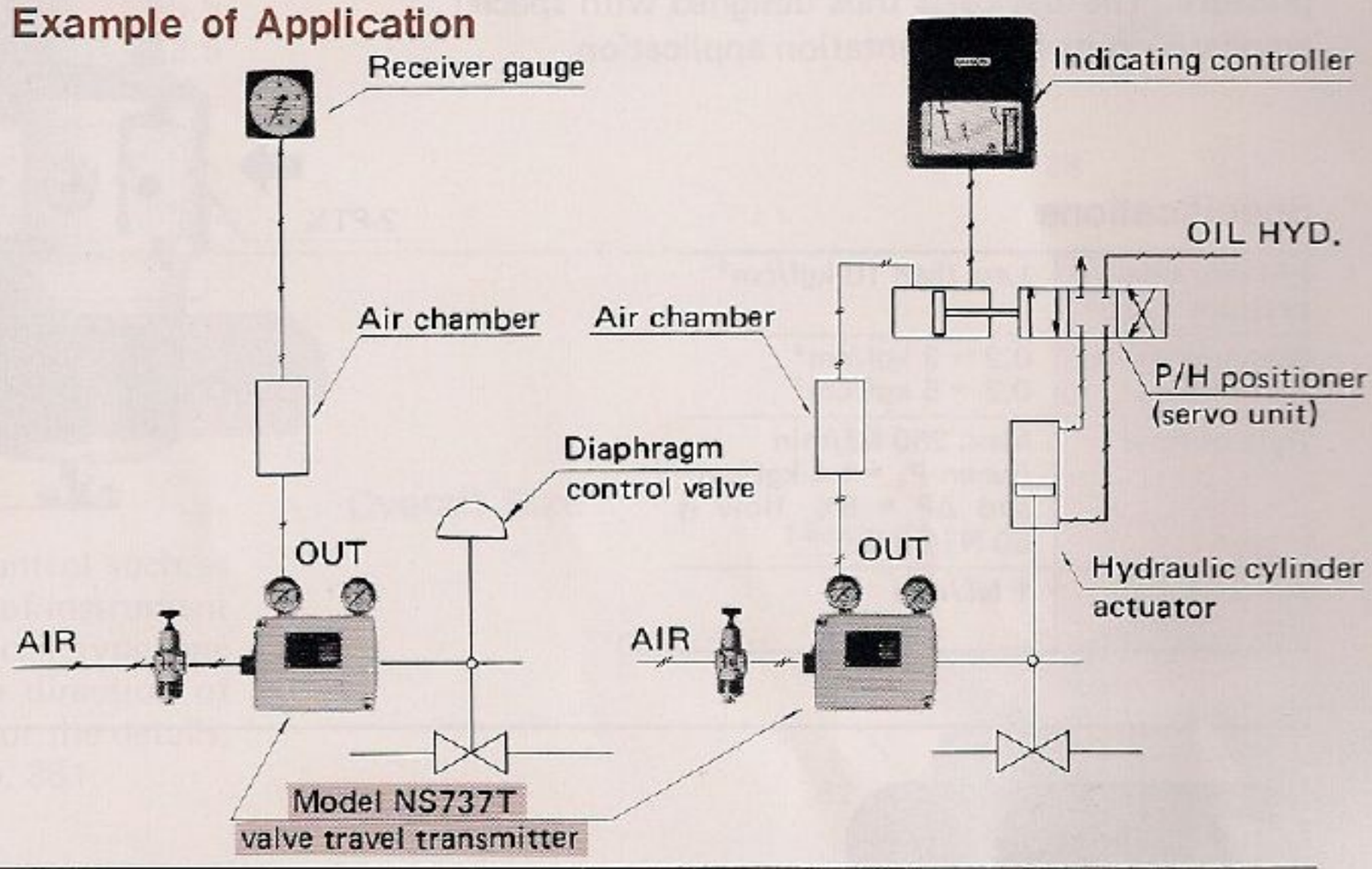
Detection input angle: Lever type . . . . . 5 ~ 30°
Cam type . . . . . 90°



Overall Size



Example of Application

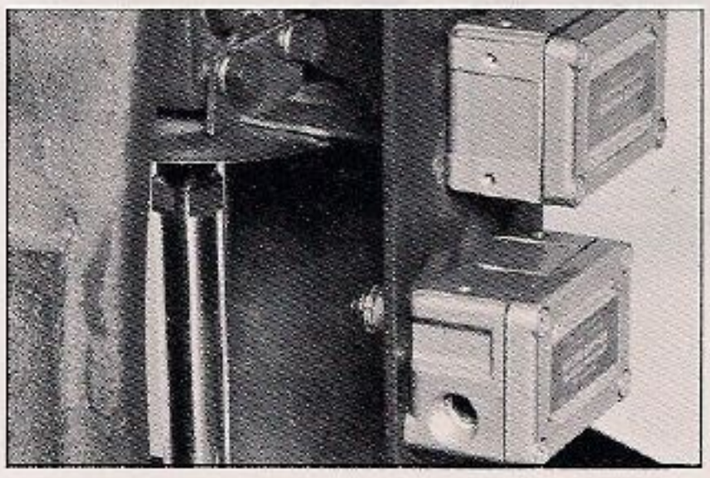


45 Limit Switch For Valve Open/Close Position

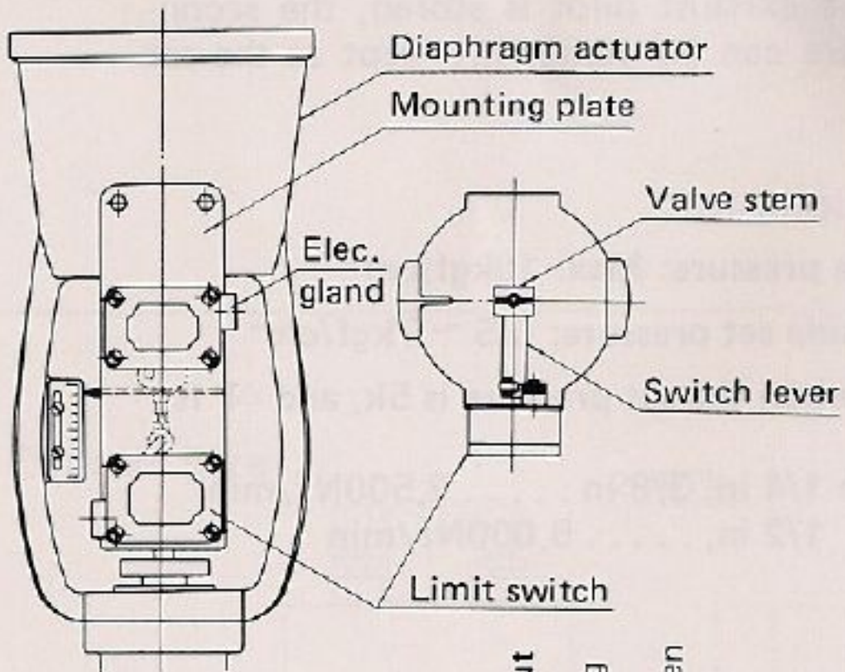
The limit switch is solidly designed for the use on a diaphragm control valve. A lever fixed on the valve stem actuates the switch at the full open or full shut position. A variety of switch constructions is available, from oiltight type to explosionproof one. They are used for operation displays and sequence control.

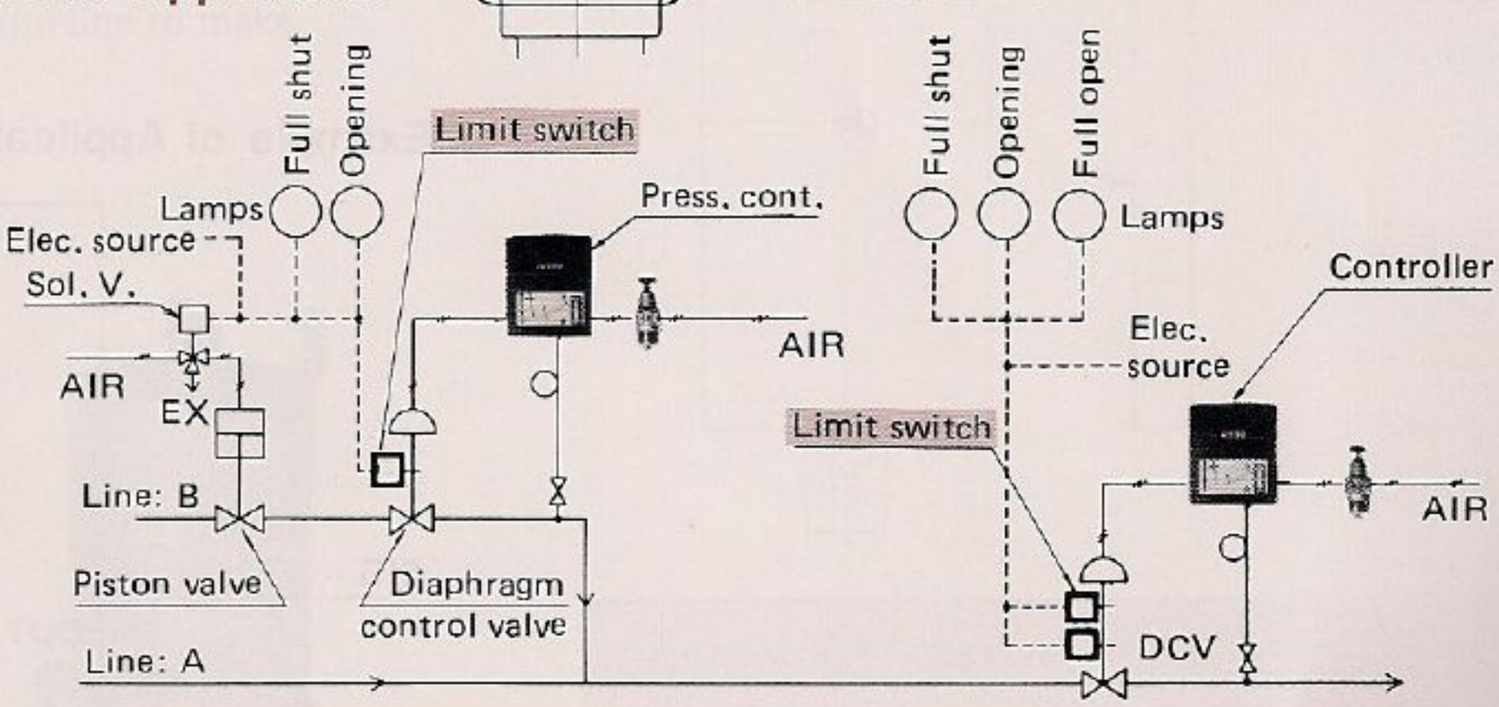
Specifications

Switch construction (Service temp.)	Switch type	Electric rating	Circuit
Standard type	Y Ltd.: #BZE6-2RN-J	AC 125V 250V 15A 480V DC 125V 0.5A 250V 0.25A	Single pole double throw COM NC NO
Drip proof type (outdoor)	Y Ltd.: #DP-A8J		
Outdoor explosion-proof type (d, G,) Outdoor dust explosion proof type (SDP)	Y Ltd.: #EXZ-5000	AC 125V 250V 5A DC 125V 0.8A 250V 0.4A	Double pole double throw NO NC



Example of Application





Line B is provided for backing up line A, and is normally closed. However, as the diaphragm control valve is double seated and its leakage is not desirable, a piston type valve is provided for tight shutting on the upstream side. When backup is required and the diaphragm control valve starts to open, the limit switch will send the signal to operate the diverter valve. This valve then fully opens the tight-shutting valve.

46 Filter Regulator

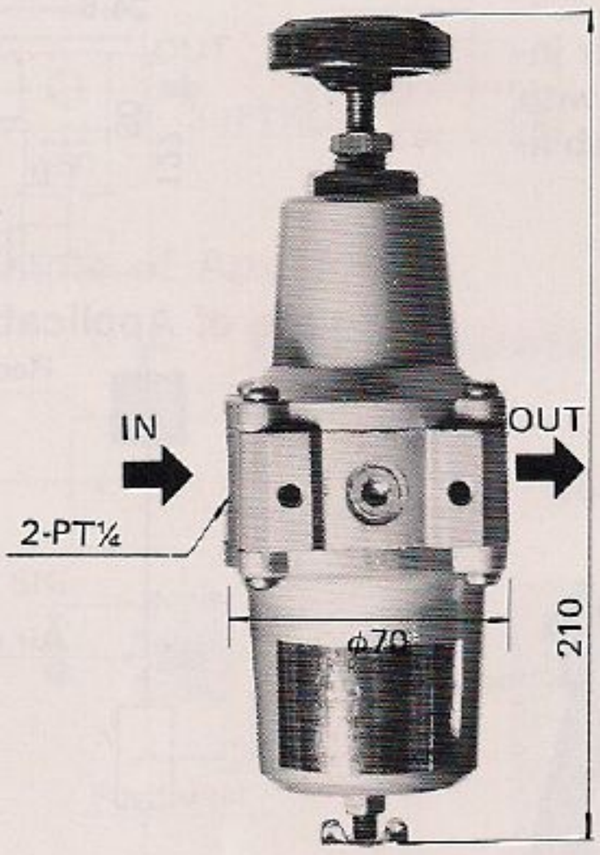
[Types NS770C and NS770CG]
A high-performance pressure regulator and a filter are integrated in a unit for supplying air to pneumatic instrumentation devices.
Many of instrumentation devices consist of orifice and nozzle-flapper, and clogging or contamination will cause troubles. This device stores 5μ metallic filter to remove scale, water, oil and grease.
The internally stored air outlet pilot constantly works to restore the set pressure when the secondary pressure exceeds or drops below the set pressure. The device is thus designed with special emphasis on its instrumentation application.

Specifications

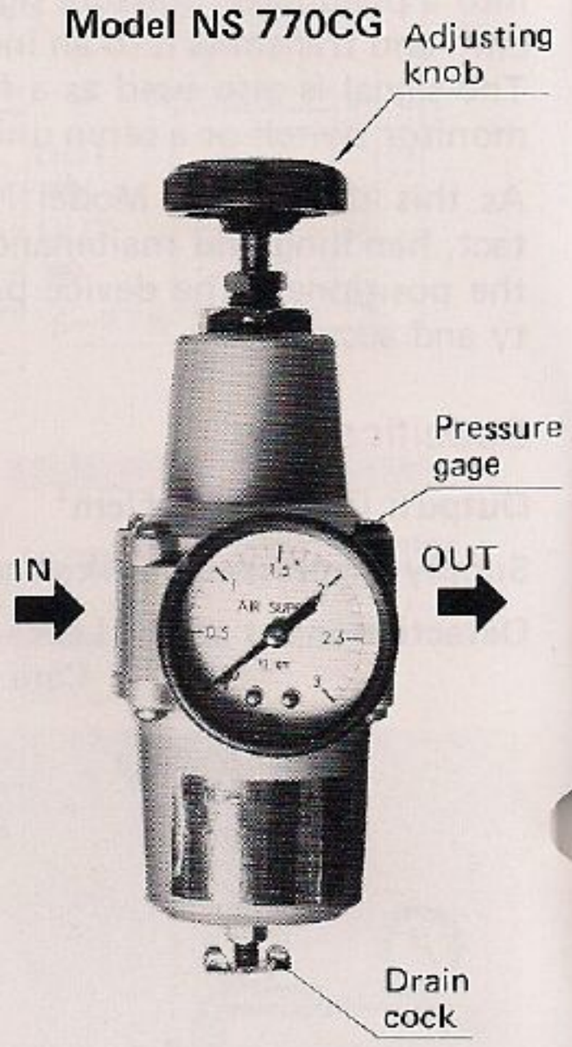
Primary side pressure	Less than 10 kgf/cm^2
Secondary side set pressure	0.2 ~ 3 kgf/cm^2 0.2 ~ 5 kgf/cm^2
Rate of flow	Max. 250 Nℓ/min (when P_2 = 1.4 kgf/cm^2 and ΔP = 5%, flow is 60 Nℓ/min)
Air consumption	1 Nℓ/min

Overall Size

Model NS 770C



Model NS 770CG



47 Regulator

This device reduces the pressure of the bulk supply air of booster relays, etc. to a specified pressure. As the exhaust pilot is stored, the secondary pressure can be constantly kept at the set pressure.

Specifications

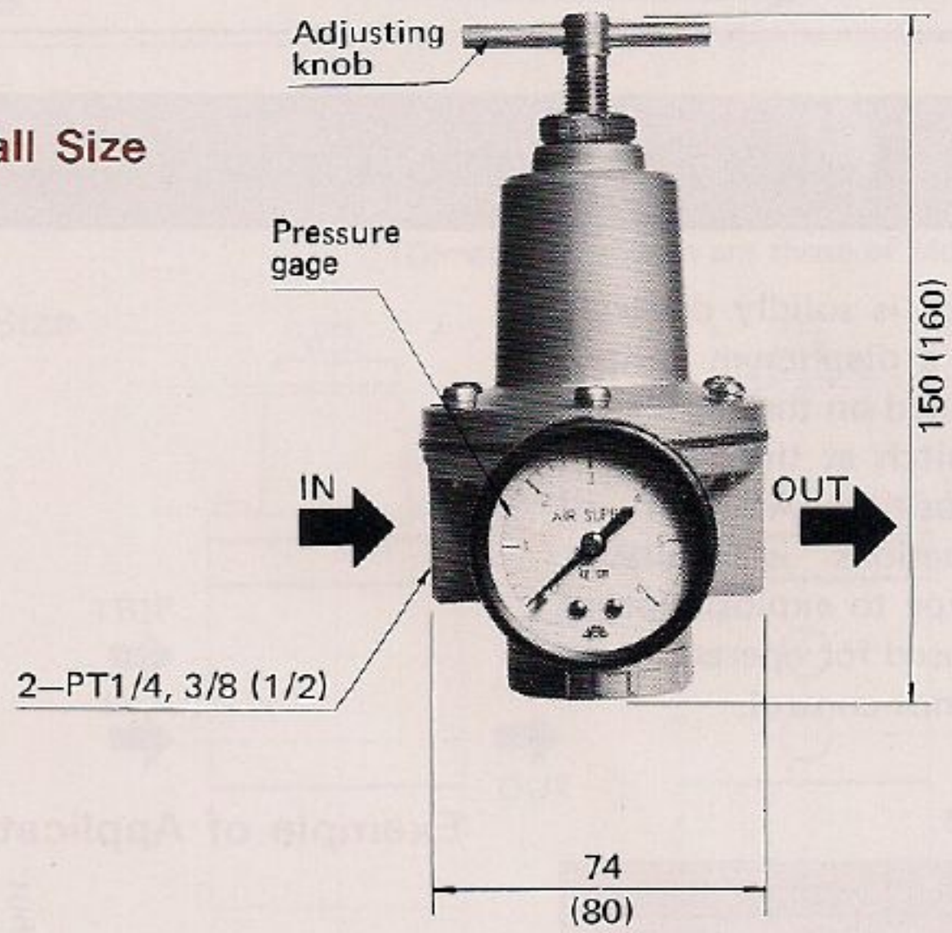
Primary side pressure: Max. 10kgf/cm^2

Secondary side set pressure: 0.5 ~ 7kgf/cm^2

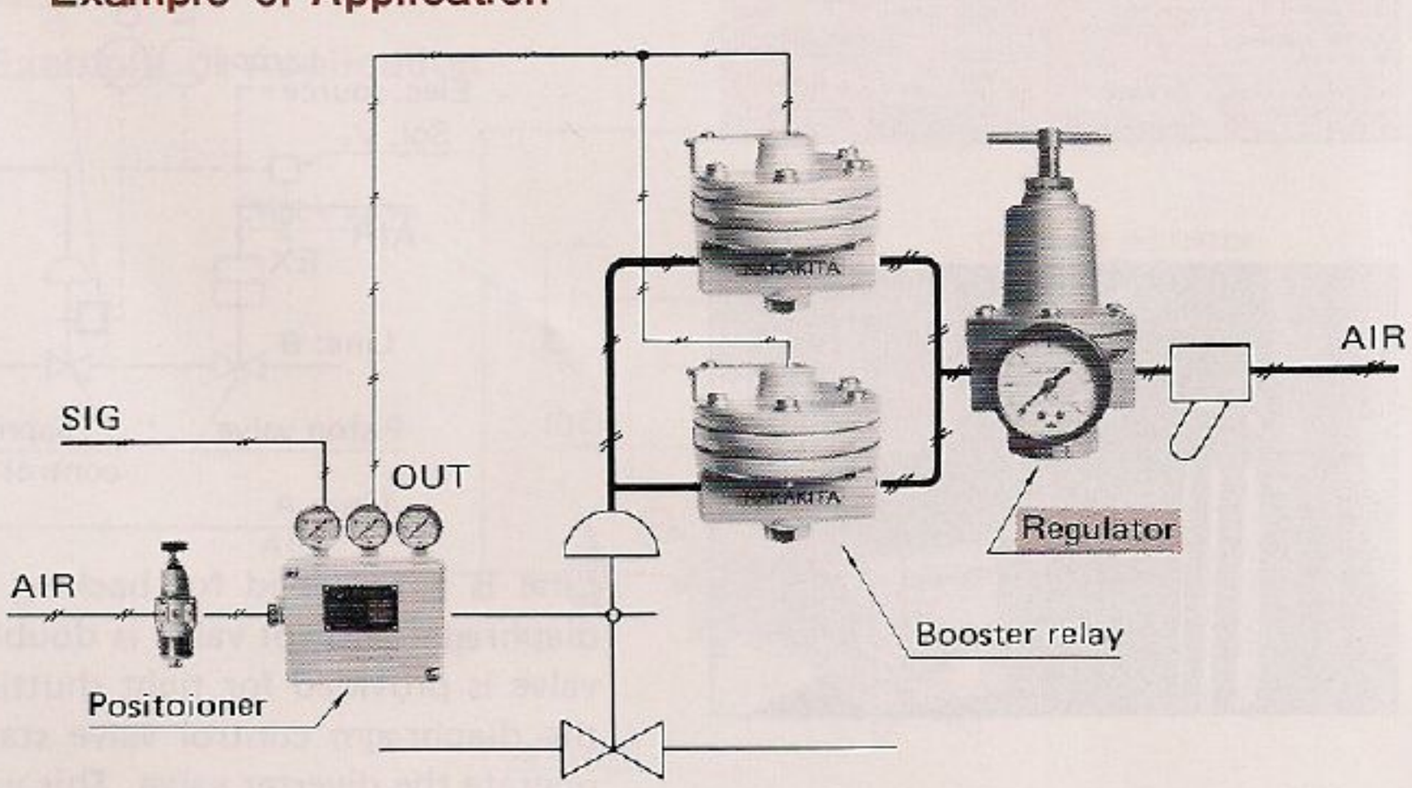
Flow rate (when the set pressure is 5k, and $\triangle$P is 1k)

Bore 1/4 in, 3/8 in 2,500Nℓ/min
1/2 in, ... 5,000Nℓ/min

Overall Size



Example of Application



48 1/4 in. Needle Valve

This device is used in a pressure transmitting line for pressure detection or signal air. With the throttling effect, the device reduces noises or hunting.

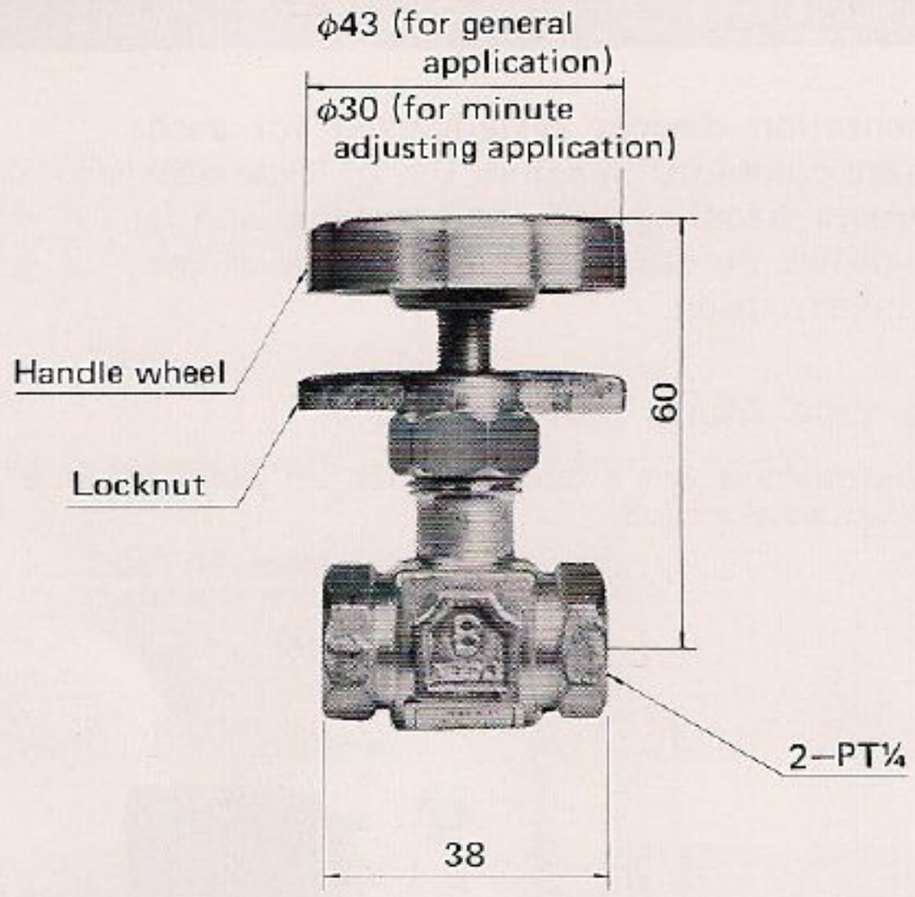
Specifications

Rated pressure: 20kgf/cm^2

Fluid: Noncorrosive air, fresh water, lubricating oil, fuel oil, etc. at 80°C (176°F) and under.

Needle valve seat diameter:
For general application ϕ5.5
For minute adjusting application . . ϕ2.5

Overall Size



49 Three-Port Solenoid Valve

[Model NS642-70]

The device is used for sequence control such as changeover, operation or stoppage of instrument air circuits. The device is a universal type one which allows free selection of the direction of flow and the direction of action. For the details, see the sepatate catalogue, CAT. No. 361.

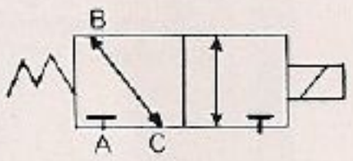
Specifications

Rated pressure: 15kgf/cm^2

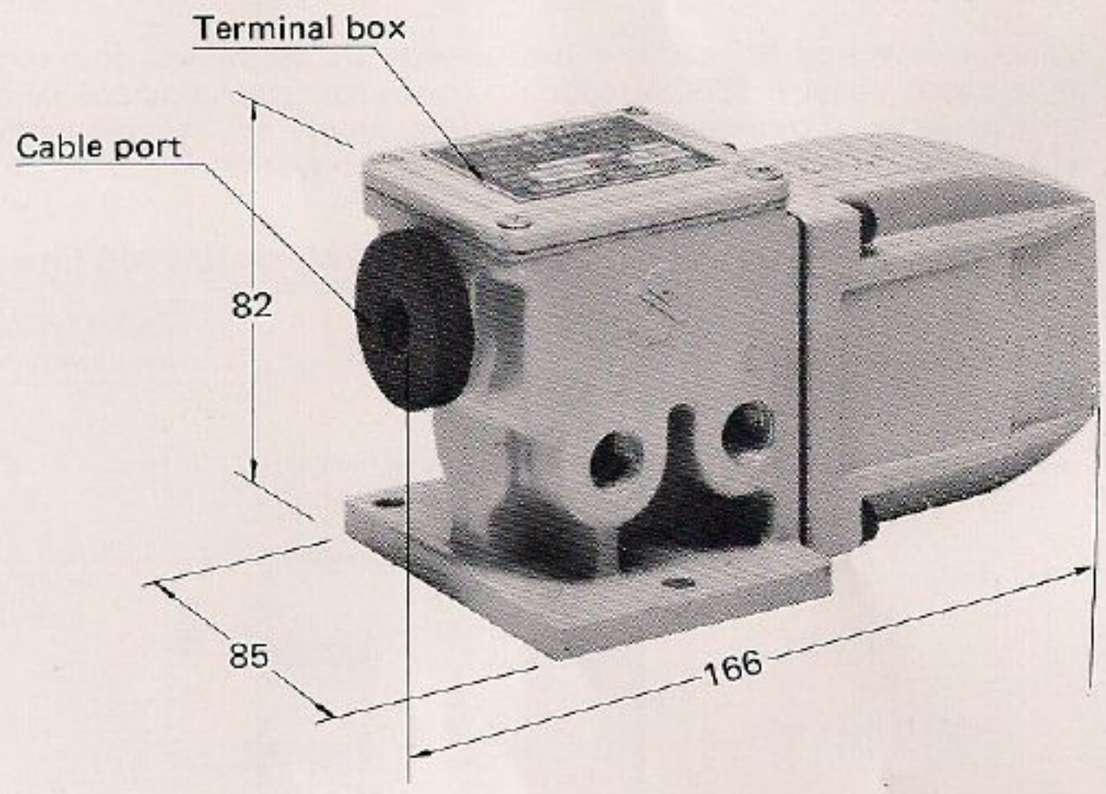
Fluid: Air, water or oil at 70°C(158°F) and under.

Power source: AC100/110V, 200/220V-50/60Hz, DC100V

Graphic symbol:



Overall Size



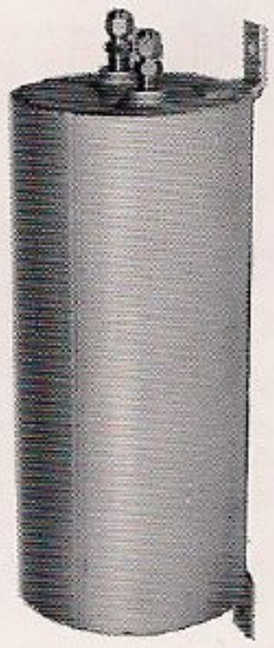
50 Air Chamber

This device is installed together with a needle valve on a signal pneumatic pressure line to make the capacity lag variable.

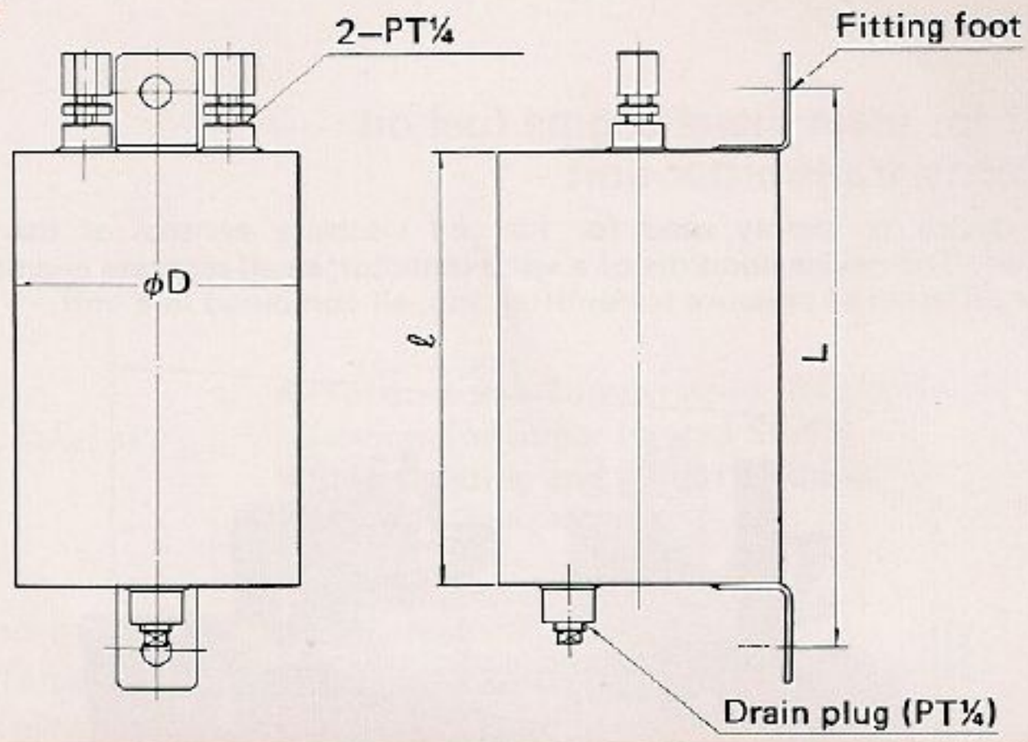
Specifications

Chamber capacity: 0.5, 1, 2, and 4ℓ.

Rated pressure: 10kgf/cm^2



Overall Size



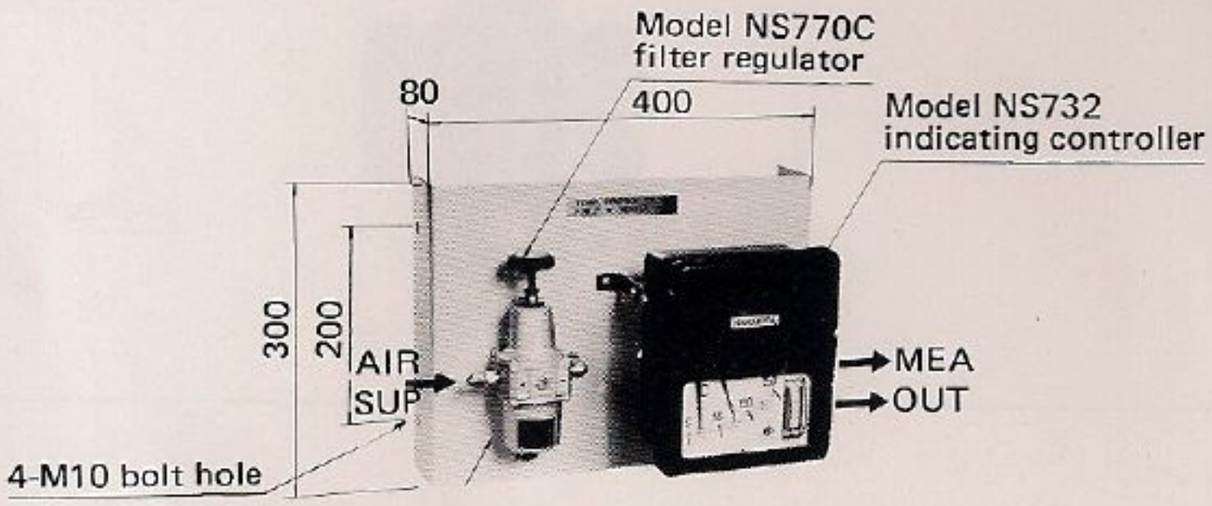
Type number	Capacity ℓ	Overall size		
		D	ℓ	L
C—0.5	0.5	89	110	160
C—1	1	89	205	255
C—2	2	140	170	220
C—4	4	140	315	365

51 Marine Instrumentation Device Unit & Unit Panels

Instrumentation devices systematized for each process are combined in a unit. Use of these panels improves handling and maintenance, and it also simplifies the instrumentation work at the time of construction.

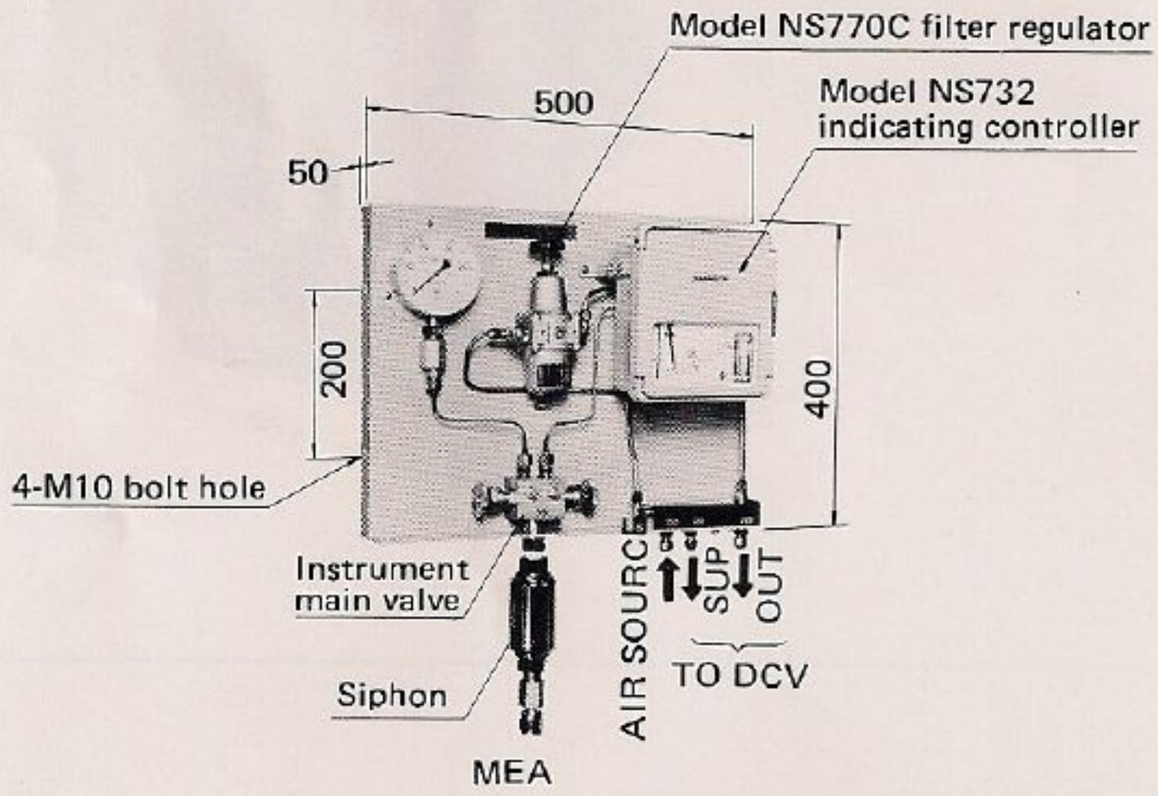
Simple type fitting panel

Various instruments and a filter regulator are assembled on a unified panel with channel section.



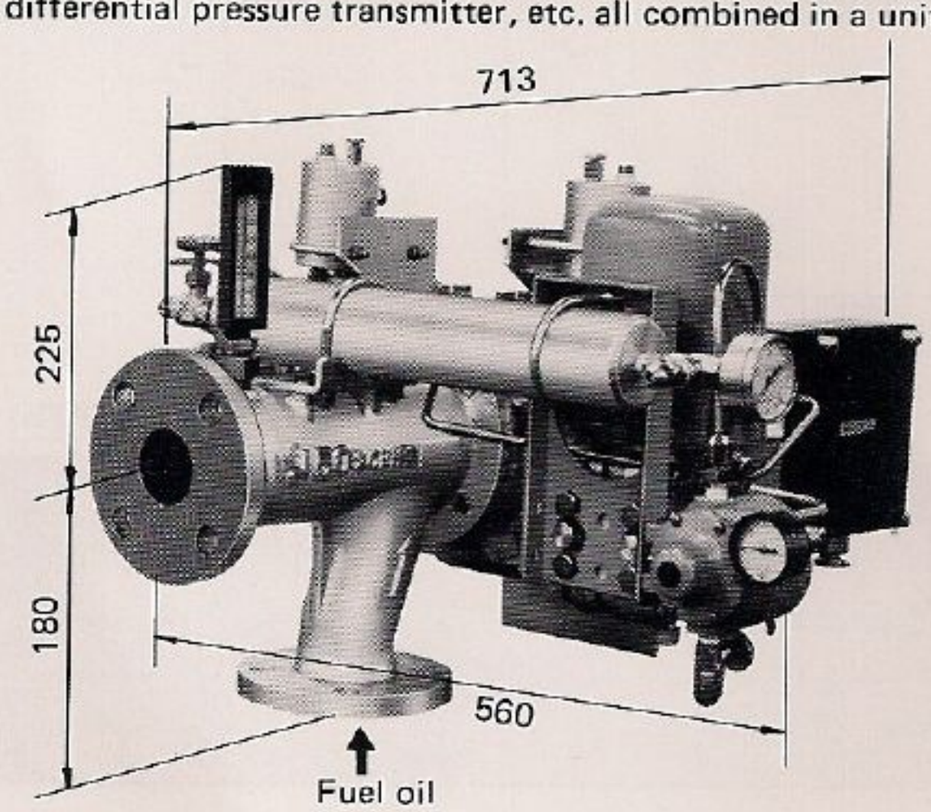
Unit panel

Various detecting devices and instruments are assembled on a unified angle-based panel of 500 x 400mm. Instrumentation line connections such as those of detection, input, output, supply air, etc. are gathered at a panel end to ease the field instrumentation work.



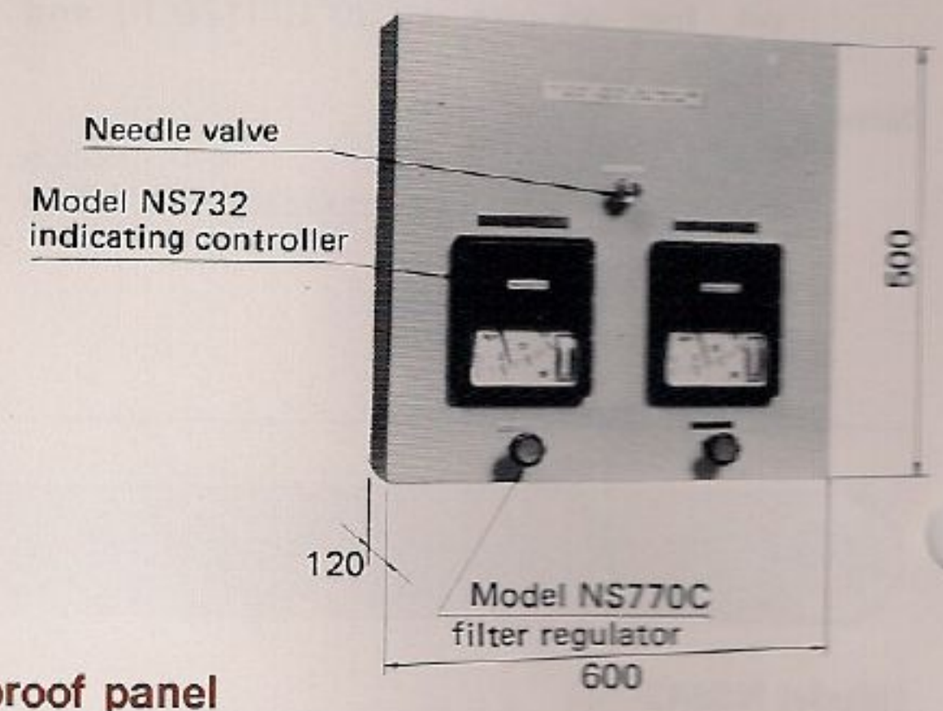
Unit for main diesel engine fuel oil viscosity transmitter unit

The device is mainly used for fuel oil viscosity control of marine engines. The device condidts of a visco-detector, an oil separate chamber, and a differential pressure transmitter, etc. all combined in a unit.



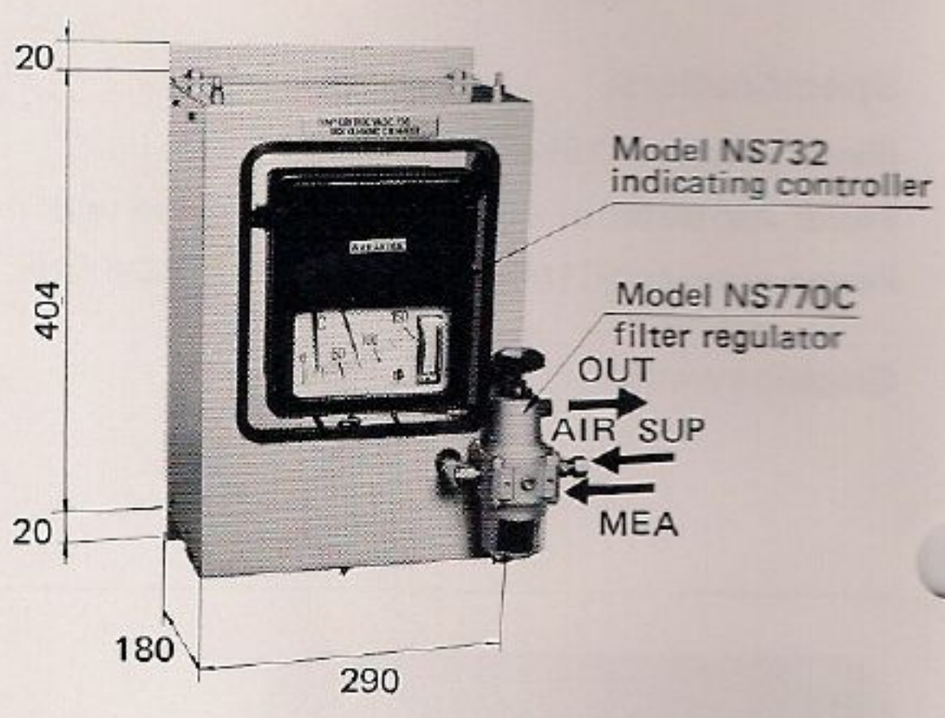
Gland packing steam pressure control unit for main engine and generator turbine

A drain pot and a needle valve are provided for minute pressure detection.



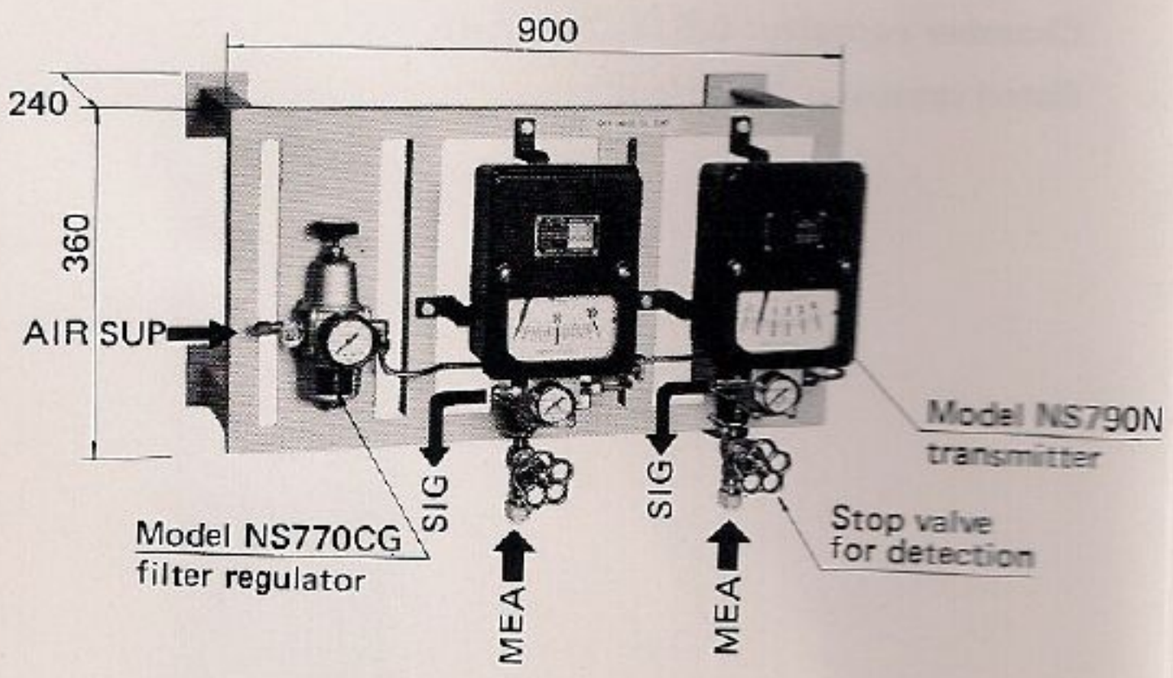
Vibration-proof panel

In instruments with measuring indicators, wears on the linkage or pins of the amplifying mechanism tend to be accelerated by vibration in the installed positions. The effectiveness of hanging an instrument with springs in suppressing vibration has been demonstrated by the use of these panels over many years.



Model NS790N trans mitter unit

Transmitters for suction/discharge pressure of cargo pump for cargo tanker, of ballast pump, bearing temperature, etc. are assembled as a unit. Standardized units are for assembling one, two, three and four transmitters. Surgeproof boxes are also available.



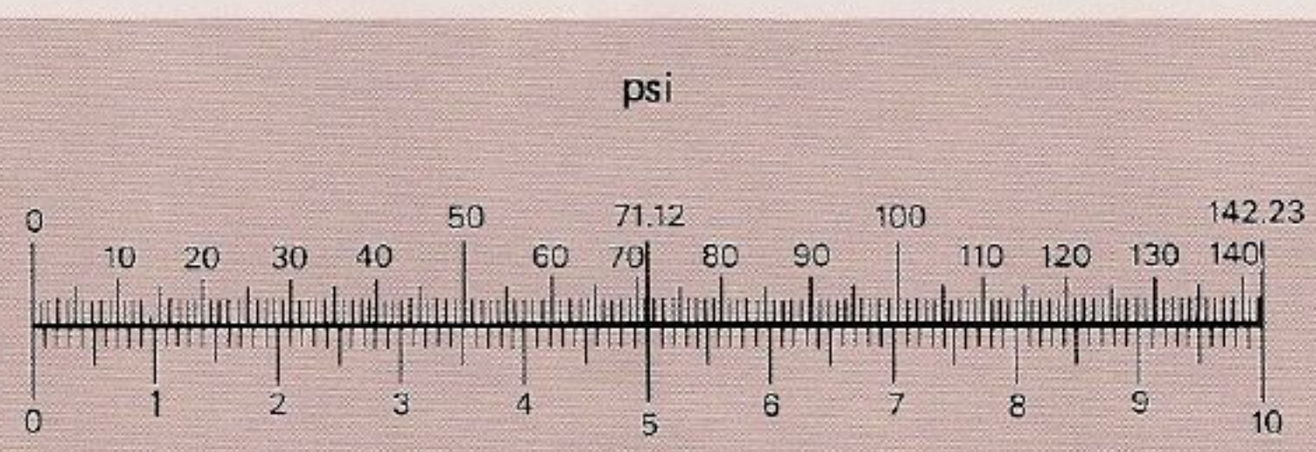
52 Comparisons of Units

■ TEMPERATURE

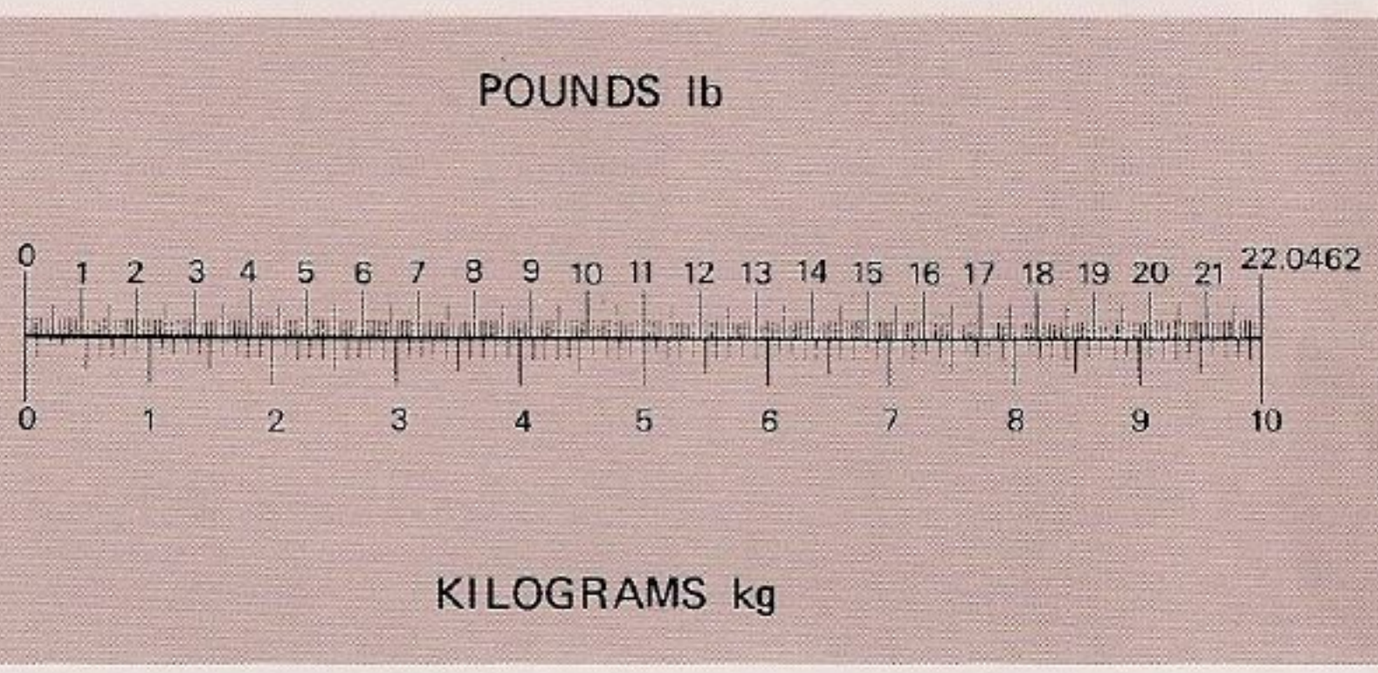
FAHRENHEIT °F $°F = °C \times \frac{9}{5} + 32$

CENTRIGRADE °C

■ PRESSURE



■ WEIGHT



Product List

- **Automatic Control Valves**
  Pneumatic Diaphragm Control Valves
  Hyoraulic and Electric Control Valves
- **Regulating Valves**
  Reducing Valves for High Pressure and Temperature Steam Use.
  Regulating Valves for Furnace
- **Remote Operated Valves**
  Electric Valves
  Pneumatic Cylinder Valves
  Hydraulic Cylinder Valves
- **Solenoid Operated Valves**
  Direct Drive Type Solenoid Operated Valves
  Pilot Type Solenoid Operated Valves
  3-way, 4-way, Change-over Solenoid Operated valves
  Emergency Cut-off Solenoid Operated Valves
  Special Solenoid Operated Valves
- **Safety Valves**
  Safety-Relief Valves for Air, Any Gases or Vapors Service
  Safett Valves for Steam Service
  Relief Valves for Liquid Service
- **Butterfly Valves**
  Hand and Remote Control Method
- **Valves of High Pressure and Temperature**
- **Valves for Cryogenic** (LNG, liquid oxygen)
- **Valves for Nuclear Plant**
- **Pneumatic Automatic Control Equipment**
  Indication Controllers for flow, differential pressure, temperature,
  Transmitters liquid level, flow rate, viscosity, etc.
  Valve Positioners
  Other Instrumentation Accessories.
- **Presssure and Temperature Reducing Devices for Super-Heated Steam**
- **Ship Loading and Ballast Remote Control Devices**
  Control Panels
  Hydraulic Power Units
  Other Hydraulic Equipment.
- **Remote Tank level Gauges and Alarm Devices**
  Air Purge Type Remote Level Gauges
  Electric Float Wind-up Type Remote Level Gauges
- **Float Type Level Switches**
- **Design and Fabrication of Various Automatic Control Special Valves and Adjustment Devices**
- **Twin Power Actuators**
  (Technical Collaboration Product)

Any contents of this catalogue may be altered without notice.

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