

# Engine Indicators

## OUTLINE

The engine indicator records the pressure changes in the cylinders of gas combustion engines, reciprocating steam engines, and air and gas compressors. Knowing the pressure changes lets you judge if each cylinder is operating evenly and efficiently and to calculate the output horsepower.

Our mechanical indicators are inexpensive and easy to use. There are widely used in marine internal combustion engines and are extremely reliable. Besides the type which plots a curve on recording chart paper, a pressure indicator which can easily and quickly measure the maximum output of an engine at the site is also available. The MT pressure indicator indicates the maximum pressure at an indicator so it can be easily read directly.



M2 type indicator (MM20)



M3 type indicator (MM30)



W3 type indicator (MW30)



M5 type indicator (MM50)

### M2 type indicator (MM20)

Suitable for low speed internal combustion engines, reciprocating steam engines, and air and gas compressors with a maximum speed of up to 350r.p.m. The maximum pressure is high and the model of the range corresponding to the application can be selected.

### M3 type indicator (MM30)

Suitable for medium speed internal combustion engines, reciprocating steam engines, and air and gas compressors with a maximum speed of up to 600r.p.m. The maximum pressure range is high and the model of the range corresponding to the application can be selected.

### W3 type indicator (MW30)

Suitable for diesel engines, gasoline engines, and other high-speed internal combustion engines with a maximum speed of up to 1000r.p.m. The piston area is large and measurements are made using a compressed coil spring. It is a compact indicator with a high natural frequency.

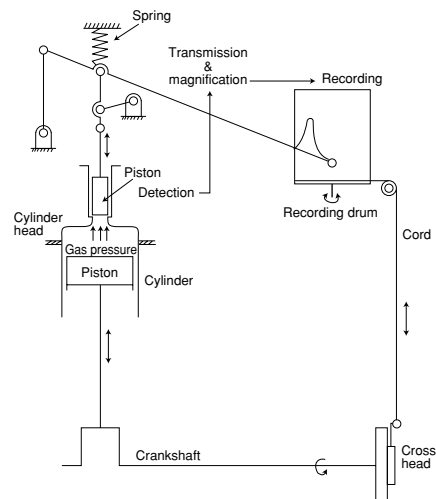
### M5 type indicator (MM50)

Suitable for diesel engines, gasoline engines, and other high-speed internal combustion engines with a maximum speed of up to 1200r.p.m. Measurements are made by using a cantilever spring instead of a coil spring and is suitable for measurement of high-speed engines.

## PRINCIPLE OF OPERATION

MM20, MM30, MW30, MM50

Pressure changes inside the cylinder are detected by a piston and this is balanced by a spring at the top through the piston rod. A precision link mechanism transmits and magnified this displacement and a metal pen with lever tip plots an indicator curve on record chart paper wrapped around a drum. Movement of the drum is linked with movement of the engine piston and is extracted and transmitted by cord. The spring corresponds to the maximum pressure of the engine and can be easily replaced.



## M2 type indicator

### SPECIFICATIONS & MODEL NUMBER CONFIGURATION

For ordering, please specify the model number, each specs and the range.

Model name

**M M 2 0** — **M 0 1** — [X] [X] [X] [X] [X] [X] [X] [X] [X] [X]

M2 type indicator      ①   ②   ③      ④   ⑤   ⑥   ⑦   ⑧   ⑨   ⑩   ⑪   ⑫   ⑬   ⑭   ⑮

Model number	Selective spec.	Additional spec. (Option)
(When ordering, please specify the range and units separately.)	④ Pressure range (MPa)	1 0~4, 5, 6, 7, 8
		2 0~10, 12, 14, 16
		3 0~20, 25, 30

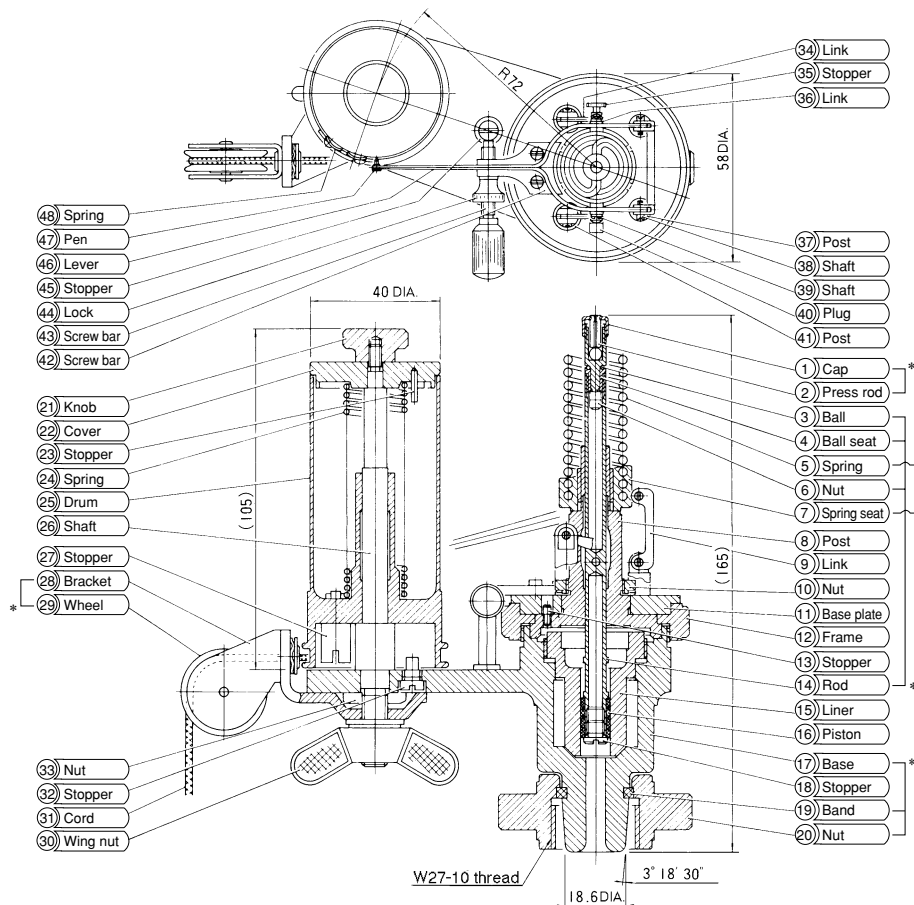
⑮ Documents	0	Nil
	1	Required (Please specify the desired documents separately.) Submission drawings, instruction manual, inspection procedure, mill sheet, test report (1 pc 1 copy), traceability certificate, attended inspection

Max. pressure MPa	Spring, scale symbol mm/MPa	Piston		Indicator curve		Drum dia. mm
		Size	Diameter mm	Max. height mm	Max. length mm	
1	4	1/5	9.06	50	90	40
	5					
	6					
	7					
	8					
2	10	1/10	6.41	50	90	40
	12					
	14					
	16					
3	20	1/20	4.53	50	90	40
	25					
	30					

Specify "X" if there is no specification item.

### CONSTRUCTION

- The part numbers connected by a line are an assembly and are sold as a unit. The name of the unit shall be the part name indicated by the asterisk.
- Liner ⑮ and piston ⑯ are sold as a set.
- Rod ⑭ and piston ⑯ with piston sizes of 1/10 and 1/20 are a set.



## M3 type indicator

### SPECIFICATIONS & MODEL NUMBER CONFIGURATION

For ordering, please specify the model number, each specs and the range.

Model name

<b>M</b>	<b>M</b>	<b>3</b>	<b>0</b>	—	<b>M</b>	<b>0</b>	<b>1</b>	—	×	×	×	×	×	×	×	×	×	×	×	
M3 type indicator					①	②	③		④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮

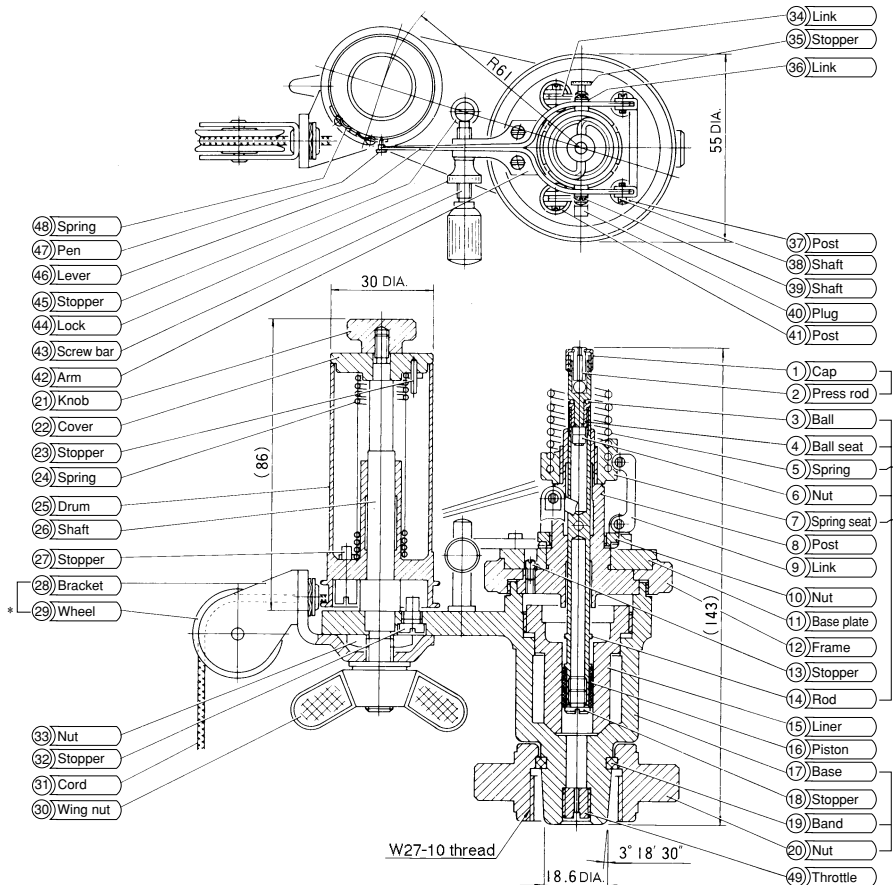
Model number	Selective spec.	Additional spec. (Option)						
(When ordering, please specify the range and units separately.)	④ Pressure range (MPa)	<table border="1" style="border-collapse: collapse; width: 100%;"> <tr> <td style="width: 10%; padding: 2px;">1</td> <td style="padding: 2px;">0~4, 5, 6, 7</td> </tr> <tr> <td style="padding: 2px;">2</td> <td style="padding: 2px;">0~8.5, 10, 13, 15</td> </tr> <tr> <td style="padding: 2px;">3</td> <td style="padding: 2px;">0~20, 30</td> </tr> </table>	1	0~4, 5, 6, 7	2	0~8.5, 10, 13, 15	3	0~20, 30
1	0~4, 5, 6, 7							
2	0~8.5, 10, 13, 15							
3	0~20, 30							
	⑮ Documents	<table border="1" style="border-collapse: collapse; width: 100%;"> <tr> <td style="width: 10%; padding: 2px;">0</td> <td style="padding: 2px;">Nil</td> </tr> <tr> <td style="padding: 2px;">1</td> <td style="padding: 2px;">Required (Please specify the desired documents separately.) Submission drawings, instruction manual, inspection procedure, mill sheet, test report (1 pc 1 copy), traceability certificate, attended inspection</td> </tr> </table>	0	Nil	1	Required (Please specify the desired documents separately.) Submission drawings, instruction manual, inspection procedure, mill sheet, test report (1 pc 1 copy), traceability certificate, attended inspection		
0	Nil							
1	Required (Please specify the desired documents separately.) Submission drawings, instruction manual, inspection procedure, mill sheet, test report (1 pc 1 copy), traceability certificate, attended inspection							

Max. pressure MPa	Spring, scale symbol mm/MPa	Piston		Indicator curve		Drum dia. mm	
		Size	Diameter mm	Max. height mm	Max. length mm		
1	4	8.16	1/5	9.06	35	60	30
	5	7.14					
	6	5.10					
	7	4.08					
2	8.5	3.57	1/10	6.41	35	60	30
	10	3.06					
	13	2.55					
3	15	2.04	1/20	4.53	35	60	30
	20	1.53					
	30	1.02					

Specify "X" if there is no specification item.

### CONSTRUCTION

- The part numbers connected by a line are an assembly and are sold as a unit. The name of the unit shall be the part name indicated by the asterisk.
- Liner ⑮ and piston ⑯ are sold as a set.
- Rod ⑭ and piston ⑯ with piston sizes of 1/10 and 1/20 are a set.



## W3 type indicator

### SPECIFICATIONS & MODEL NUMBER CONFIGURATION

For ordering, please specify the model number, each specs and the range.

Model name

<b>M</b>	<b>W</b>	<b>3</b>	<b>0</b>	—	<b>M</b>	<b>0</b>	<b>1</b>	—	×	×	×	×	×	×	×	×	×	×	×	
W3 type indicator					①	②	③		④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮

Model number

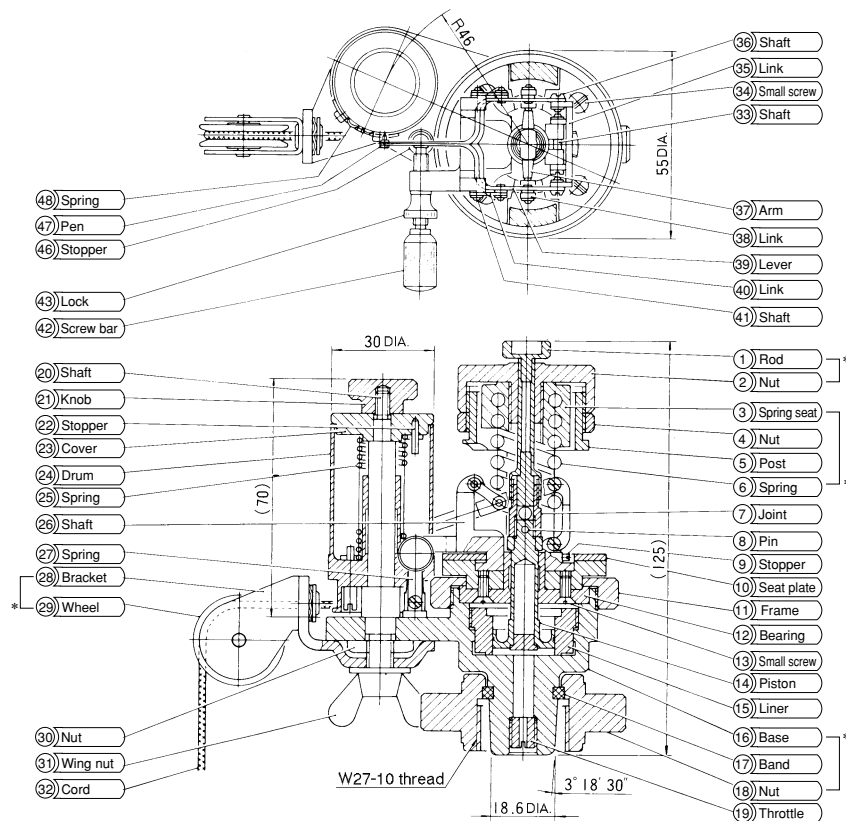
(When ordering, please specify the range and units separately.)	④ Pressure range (MPa)	1	0~5, 6, 7, 8, 10
		2	0~12, 13, 14, 15
⑮ Documents		0	Nil
		1	Required (Please specify the desired documents separately.) Submission drawings, instruction manual, inspection procedure, mill sheet, test report (1 pc 1 copy), traceability certificate, attended inspection

Max. pressure MPa	Spring, scale symbol mm/MPa	Piston		Indicator curve		Drum dia. mm
		Size	Diameter mm	Max. height mm	Max. length mm	
1	5	4/5	18.23	21	38	30
	6					
	7					
	8					
	10					
2	12	1/2	14.33	21	38	30
	13					
	14					
	15					
	15					

Specify "X" if there is no specification item.

### CONSTRUCTION

- The part numbers connected by a line are an assembly and are sold as a unit. The name of the unit shall be the part name indicated by the asterisk.
- Piston ⑭ is integrated with joint ⑦ and arm ⑳ and the parts cannot be replaced by parts order. Therefore, piston ⑭ is replaced as a set with liner ⑮ at the factory.



## M5 type indicator

### SPECIFICATIONS & MODEL NUMBER CONFIGURATION

For ordering, please specify the model number, each specs and the range.

Model name

**M M 5 0** — **M 0 1** — **1** × × × × × × × × × × × × ×

M5 type indicator      ①   ②   ③      ④   ⑤   ⑥   ⑦   ⑧   ⑨   ⑩   ⑪   ⑫   ⑬   ⑭   ⑮

Model number

Selective spec.      Additional spec. (Option)

④ Pressure range (MPa)      1      0~4.5, 5, 6, 7, 8, 10, 12

(When ordering, please specify the range and units separately.)

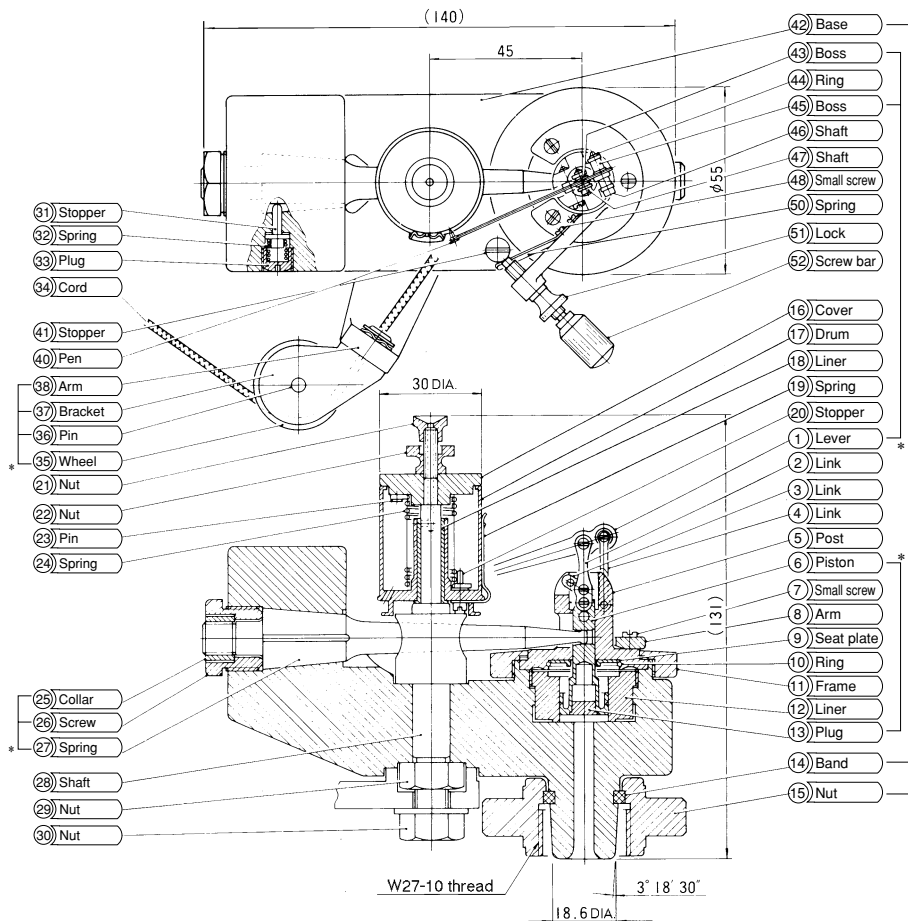
⑮ Documents      0 Nil  
1 Required (Please specify the desired documents separately.)  
Submission drawings, instruction manual, inspection procedure, mill sheet, test report (1 pc 1 copy), traceability certificate, attended inspection

Max. pressure MPa	Spring, scale symbol mm/MPa	Piston		Indicator curve		Drum dia. mm
		Size	Diameter mm	Max. height mm	Max. length mm	
1	4.5	1/2	14.33	25	40	30
	5					
	6					
	7					
	8					
	10					
12	2.04					

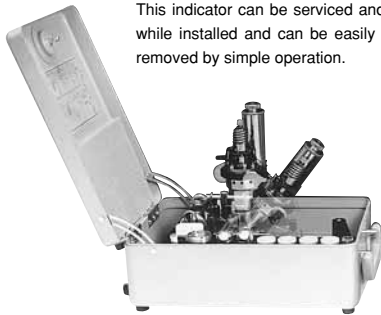
Specify "X" if there is no specification item.

### CONSTRUCTION

- The part numbers connected by a line are an assembly and are sold as a unit. The name of the unit shall be the part name indicated by the asterisk.
- Piston ⑥ is replaced as a set with liner ⑫ at the factory.



## Type M2, M3, W3, and M5 indicator standard accessories

Part name	Type		M2	M3	W3	M5	Remarks
	Model number	Qty*					
Indicator	1		●	●	●	●	<ul style="list-style-type: none"> <li>• • Specified size (Built-in)</li> <li>• • Specified size</li> <li>• • Same size as spring.</li> <li>• • Same size as piston with liner.</li> </ul> <p>This indicator can be serviced and inspected while installed and can be easily stored and removed by simple operation.</p>  <p>Stored in a metal case.</p> <p>* Quantity cannot be increased or decreased.</p>
Piston with liner	1		●	●	●	●	
Spring	2		●	●	●	●	
Scale	1		●	●	●	●	
Cleaning rod	1		●	●	●	●	
Drum spring	1		●	●	●	●	
Pen	10		●	●	●	●	
Cord	2m		●	●	●	●	
Recording chart paper	2 (50 sheets)		●	●	●	●	
Hook	1		●	●	●	●	
Oil	2		●	●	●	●	
Screwdriver	L	1	●	●	—	●	
	S	1	●	●	●	●	
Union nut spanner	1		●	●	●	●	
Liner turning tool	1		●	●	●	●	
Liner pulling tool	1		●	●	●	—	
Cutting pliers	1		●	●	—	●	
Pin remover	1		—	—	—	●	
Spanner wrench	17 (head)	1	●	●	●	●	
	19 (head)	1	—	—	—	●	
Weight (Approx. kg)	1		5.7	5.4	5.2	7.0	

- Piston with liner (Type M2, M3 only) and spring other than standard parts are available as options upon request. In this case, one scale and cleaning bar are supplied for each size. However, they are not supplied when the optional piston with liner and spring size are the same as standard parts.
- A valve and cock for the indicator are available upon request.

### SPRING MARKING

It is necessary to choose the spring corresponding to the pressure of the engine to be measured. The piston with liner and the scale having the same marking as the spring should be used.

This marking indicates the height of the indicator curve in mm. The maximum pressure is expressed in MPa.

For example, a spring marking of

5.10mm=1MPa 6MPa piston 9.06mm on the side of the spring seat means that this spring measures up to 6MPa maximum pressure using a piston with liner of 9.06mm diameter (size 1/5), and that the 5.10mm height of the indicator curve corresponds to 1MPa pressure; therefore, the indicator curve pressure should be read using the scale with the scale marking 5.10mm=1MPa.

### PISTON SIZE & PISTON

For convenience, piston area 322.7mm<sup>2</sup> (1/2 in<sup>2</sup>) is designated as size 1/1.

One half of this is designated 1/2 and one fifth is designated 1/5.

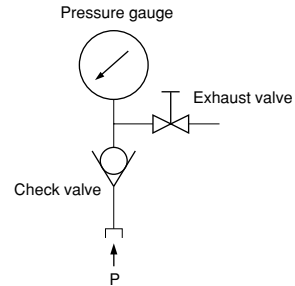
Piston size	Piston dia. mm
1/1	20.27
4/5	18.23
1/2	14.33
1/5	9.06
1/10	6.41
1/20	4.53

## Maximum pressure indicator



### Construction:

This indicator is made up of the three elements check valve, pressure gauge, and exhaust valve. The measured pressure P flows into the indicator through the check valve. The check valve prevents this pressure from escaping. Since the measured pressure flows in until it reaches the maximum pressure of the fixed pressure of the side at which the internal pressure fluctuates. Therefore, the maximum pressure is measured by reading the display when the needle of the pressure gauge becomes steady. After measurement, the exhaust valve opens and the pressure returns to zero. Since the indicator uses an oil-filled pressure gauge, it is extremely vibration and heat resistant.



### SPECIFICATIONS & MODEL NUMBER CONFIGURATION

For ordering, please specify the model number and each specs.

Model name

<b>M T 3 1</b>	①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪	⑫	⑬	⑭	⑮
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Maximum pressure indicator

Model number

Selective spec.

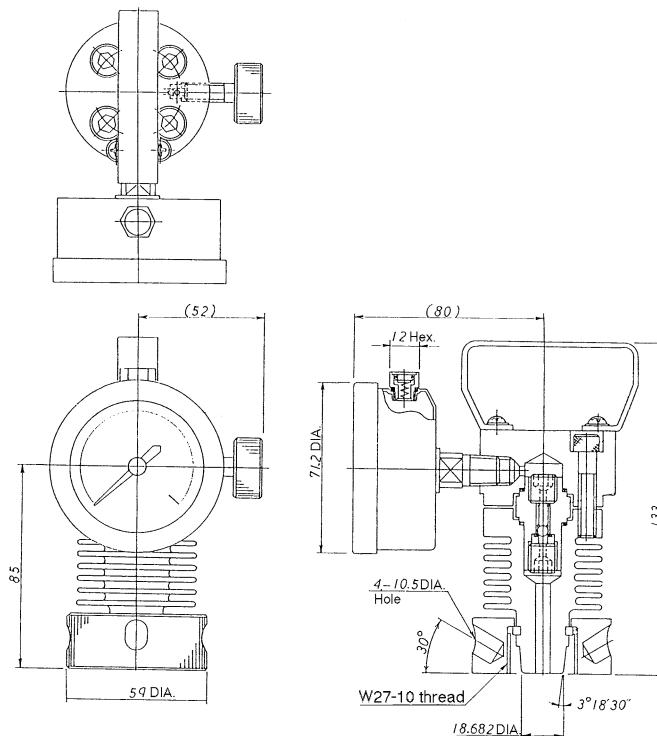
Additional spec. (Option)

⑮ Documents	0	Nil
	1	Required (Please specify the desired documents separately.) Submission drawings, instruction manual, inspection procedure, mill sheet, test report (1 pc 1 copy), traceability certificate, attended inspection

Model number	Indicator				Material
	Pressure range MPa	Min. graduation MPa	Accuracy	Size	
MT31-150	0~15	0.5	±1.5%F.S.	60	Bourdon tube SUS316
-200	0~20	1			Socket C3604BD

Specify "X" if there is no specification item.

### DIMENSIONS





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- OVERSEAS PLANT
- OVERSEAS SALES NETWORK

Gets ISO 9001, ISO 14001, ISO/TS 16949 Certification

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