CHAPTER- 5

BOILER WATER GAUGES SERIES

REFLEX TYPE LEVEL GAUGES
TRANSPARENT TYPE LEVEL GAUGES
TWO-COLOR TYPE LEVEL GAUGES

IN THIS CHAPTER-5

Here is introduce the reflex and transparent type level gauges for boiler water service. You can also find our two-color type level gauges. All series of this chapter may be a little changed in order to improve a quality and on customer's special requirements.



TYPES AND MODELS FOR BOILER WATER & STEAM SERVICE

Below tabulated level gauge models are to use on the boiler drums and other steam services those are used under high pressure and high temperature. To cover a wide range of applications from low pressure and temperature to super high pressure under saturated temperature, SAM IL will offer various types of the level gauge suitable of the best on each service conditions of the various industrial requirements.

The general principles and features of SRG-1B and STG-1,2,3 & 4B described here are the same with that our SRG and STG series.

MODEL	TYPE	GLASS NO.	SERVICE CONDITIONS	
SRG-1B	REFLEX	NO. 5 ~ 9	500 psi[35 kg/cm^2]	AT 470 °F
STG-1B	TRANSPARENT	NO. 5 ~ 9	285 psi[20 kg/cm^2]	AT SAT. TEMP.
STG-2B		NO. 5 ~ 9	569 psi[40 kg/cm^2]	AT SAT. TEMP.
STG-3B		NO. 1 ~ 8	1422 psi[100 kg/cm^2]	AT SAT. TEMP.
STG-4B		NO. 1 ~ 7	3555 psi[250 kg/cm^2]	AT SAT. TEMP.
SGC-1B	TRANSPARENT TWO - COLOR	NO. 6 ~ 9	569 psi[40 kg/cm^2]	AT SAT. TEMP.
SGC-20B		NO. 5 ~ 8	853 psi[60 kg/cm^2]	AT SAT. TEMP.
SGCZ-20B		NO. 7 ~ 9	853 psi[60 kg/cm^2]	AT SAT. TEMP.
SGC-300B	MULTI - PORT TYPE TWO - COLOR	Port Glass	4978 psi[350 kg/cm^2]	AT SAT. TEMP.

DESCRIPTION

The above models are used for industrial boiler drums and **SRG-2,3 & 4** of SAM IL basic reflex types are not designed and manufactured for boiler water service because those are not suitable for high pressure under saturated temperature.

PRESSURE - TEMPERATURE CHARTS FOR REFLEX GLASS

INTRODUCTION :

Gauge Glasses in liquid level gauge on steam boilers are exposed to very high mechanical and chemical stresses. The interface between steam and water is continuously in motion like as water evaporates, condensate forms. In this an event, the glass is wear rapidly.
As the reflex glass is not protected with mica shield, an operating conditions is important in the boiler water service. with unprotected gauge glasses, steam pressure should not exceed 35 bar nor the pH-value 10. and the gauges used on steam services must be more frequently replaced than gauge glasses used with other media.



REFLEX GLASS

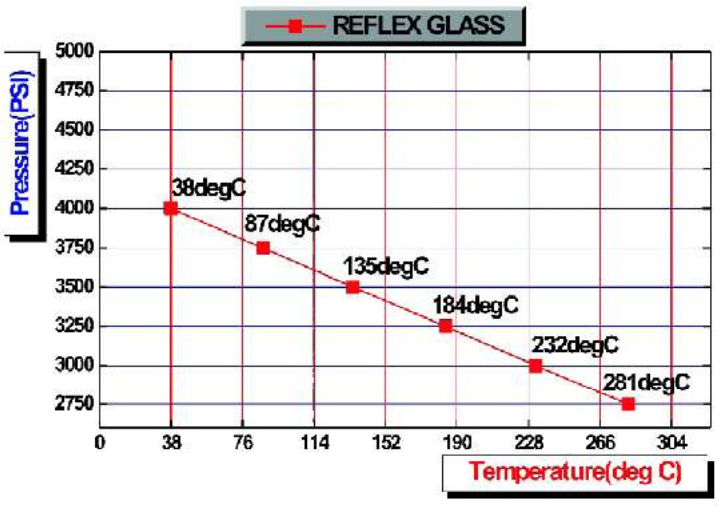
Reflex Glass Application Conditions

Saturated steam or hot water in direct contact with reflex sight glass is :

- **Maximum Permissible Pressure : 500 psi[35bar] at 243 °C [470 °F]**
  [If Pressure is not exceed 35 bar, the best and most economical solution].

■ The chart shown on the right is range of application with no technically significant glass attack.

■ Reflex Glasses can be used with all media except steam at service conditions up to 5800 psi[400bar] or temperature up to 750 °F [400 °C].



GENERAL DESCRIPTION

Reflex Type Gauge Glasses have a several groove on the glass surface that is in contact with the liquid for reflection. Liquid Level shows conspicuously dark hard color similar with black for liquid space and light white for empty or steam space.

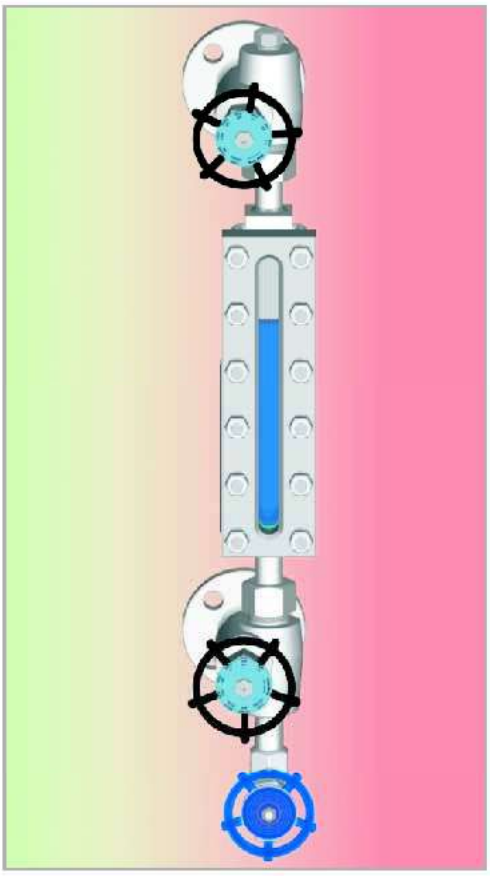
For details, See **SAM IL** Basic Reflex Series.

MODEL IN THE SRG-1B



OPTIONS

- **Scale Plate**
  - units : Cm, Liter
- **Vent**
  - Needle Valve
  - Gate Valve
  - Globe Valve
  - Nipple & Cap
- **Drain**
  - Needle Valve
  - Gate Valve
  - Globe Valve
  - Nipple & Cap
- **Bracket**
  - Longer than 3000 mm of C to C
- **Gauge Valve**
  - Hand Wheel with Chain
  - Arm Lever



SPECIFICATIONS

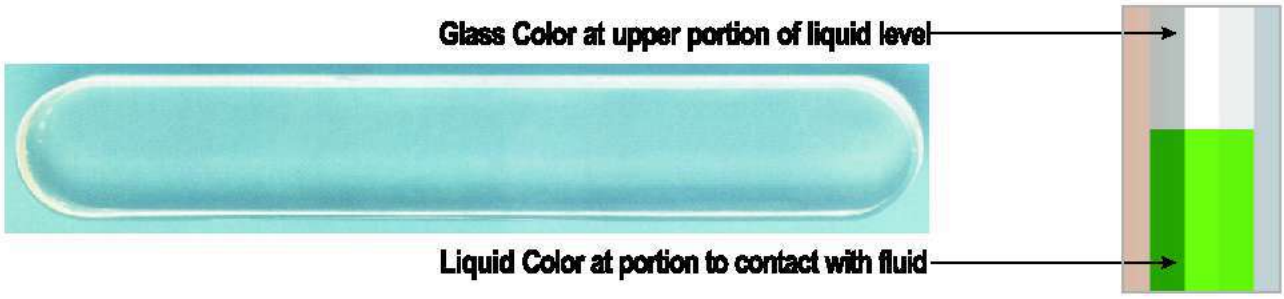
- **MATERIAL** : Carbon Steel & Stainless Steel.
- **VISIBLE LENGTH** : 225 to 3510 mm.
- **MAX. NO. OF SECTION** : 8 Sections.
- **VESSEL CONNECTION** : 3/4" or 1" Flanged ANSI 150# ~300# or Socket Welds[S.W].
- **GAUGE BODY & GAUGE VALVE CON'N** : Not Rotatable & 360° Rotatable [turn to page G-9].
- **SHELL TEST PRESSURE** : 1.5 Times at the Max. Working Pressure.

Others, except the above specification are available on request by customer.

PRESSURE - TEMPERATURE CHARTS FOR TRANSPARENT GLASS

INTRODUCTION :

Gauge Glasses in liquid level gauges on steam boilers are exposed to very high mechanical and chemical stresses. The interface between steam and water is continuously in motion like as water evaporates, condensate forms. in this an event, the glass is wear rapidly.
For the above problem, Transparent Glasses could be protected with mica shield and if the medium is dirty, viscous on aggressive, flat transparent glasses guarantee better indication since the glass surface can be protected by mica shield against serious attack from media.



TRANSPARENT GLASS

Transparent Glass Application Conditions

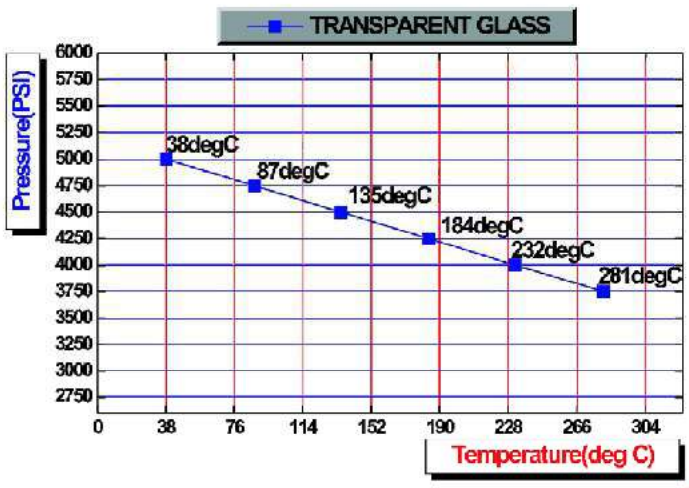
- Saturated steam or hot water in direct contact with transparent sight glass is :

  - Maximum Permissible Pressure : 500 psi[35bar] at 243 °C [470 °F]

- Saturated steam or hot water in contact with transparent sight glass protected with Mica is :

  - Maximum Permissible Pressure : 1500 psi[103bar] at 320°C [608°F]

- The chart shown on the right is range of application with no technically significant glass attack.
- Transparent Glasses can be used with all media except steam at service conditions up to 4930 psi or temperature up to 400°C.



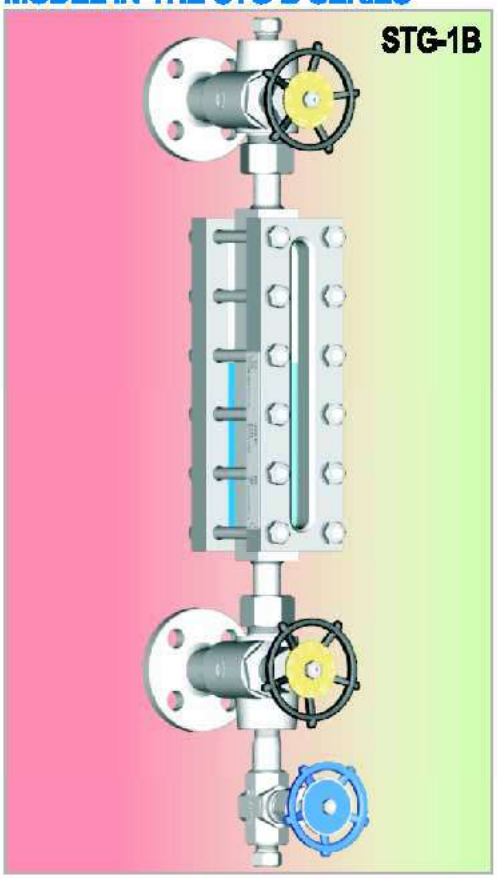
SAM IL TRANSPARENT GAUGE FOR BOILER SERVICES STG-B

GENERAL DESCRIPTION

These Types are the most commonly used for high pressure and temperature applications to a wide various of boiler services in the power plants, industrial boilers, steam generators, etc. Transparent Types are classified into four[4] models according to operating conditions. especially, our models, **STG-3B & 4B** capable of withstanding the pressure up to 1422 ~ 3555 psi and for protecting the thermal expansion in the event of over 250 degC or above, There is connected between gauge body and gauge valve with bended loop type[U-Formed].

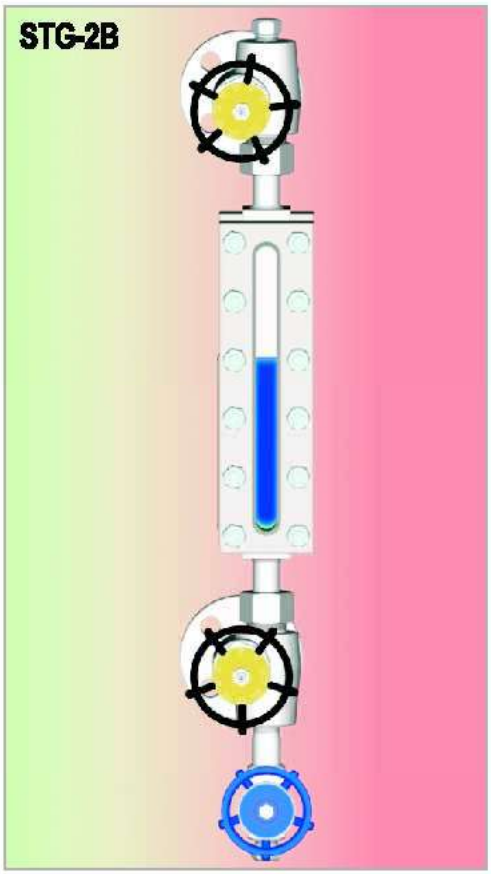
For Details, See SAM IL Basic Transparent Series.

MODEL IN THE STG-B SERIES



OPTIONS

- **Scale Plate**
  - units : Cm, Liter
- **Vent**
  - Needle Valve
  - Gate Valve
  - Globe Valve
  - Nipple & Cap
- **Drain**
  - Needle Valve
  - Gate Valve
  - Globe Valve
  - Nipple & Cap
- **Bracket**
  - Longer than 2000 mm of C to C
- **Gauge Valve**
  - Hand Wheel with Chain
  - Arm Lever



SPECIFICATIONS

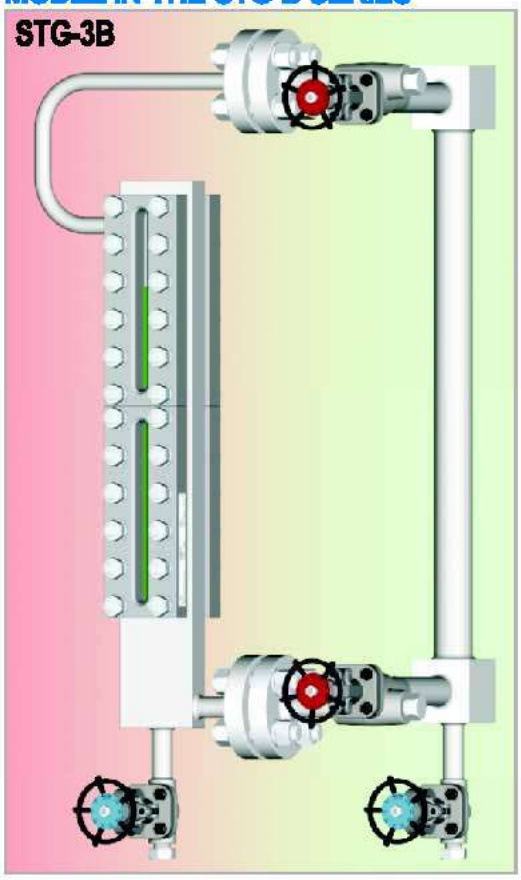
- **MATERIAL** : Carbon Steel & Stainless Steel
- **VISIBLE LENGTH** : 225 to 3510 mm.
- **MAX. NO. OF SECTION** : 8 Sections.
- **VESSEL CONNECTION** : 3/4" or 1" Flanged ANSI 150# ~ 600# or Socket Welds[S.W].
- **GAUGE BODY & GAUGE VALVE CON'N** : Not Rotatable & 360° Rotatable [turn to page G-9].
- **SHELL TEST PRESSURE** : 1.5 Times at the Max. Working Pressure.

Others, except the above specification are available on request by customer.

STG-B SAM IL TRANSPARENT GAUGE FOR BOILER SERVICE

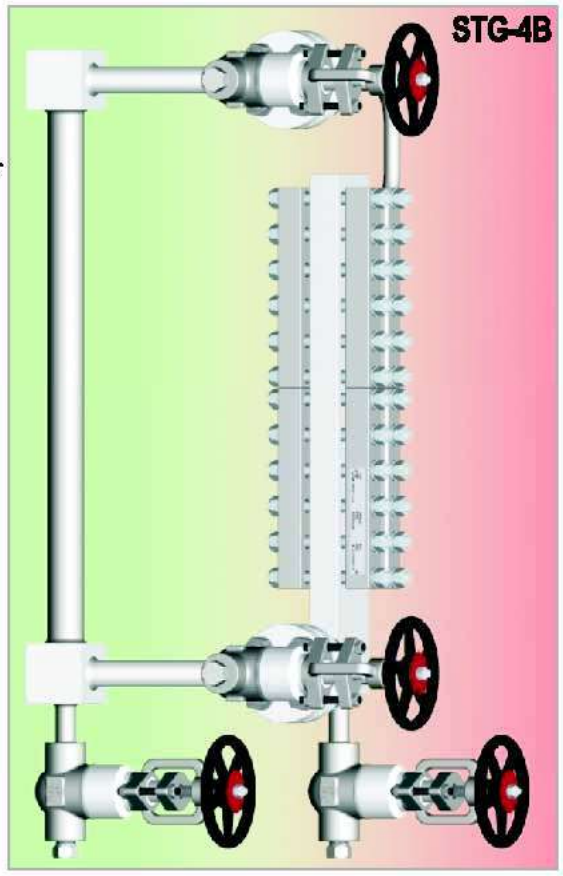
For General information of SAM IL's conventional transparent level gauge, See transparent series and this type is protected the glass from erosion in steam service with mica shield where the gauge is used for such high pressure and temperature as to cause the erosion.

MODEL IN THE STG-B SERIES



OPTIONS

- **Scale Plate**
  - units : Cm, Liter
- **Vent**
  - Gate Valve
  - Globe Valve
  - Nipple & Cap
- **Drain**
  - Gate Valve
  - Globe Valve
  - Nipple & Cap
- **Gauge Valve**
  - Hand Wheel with Chain
  - Arm Lever



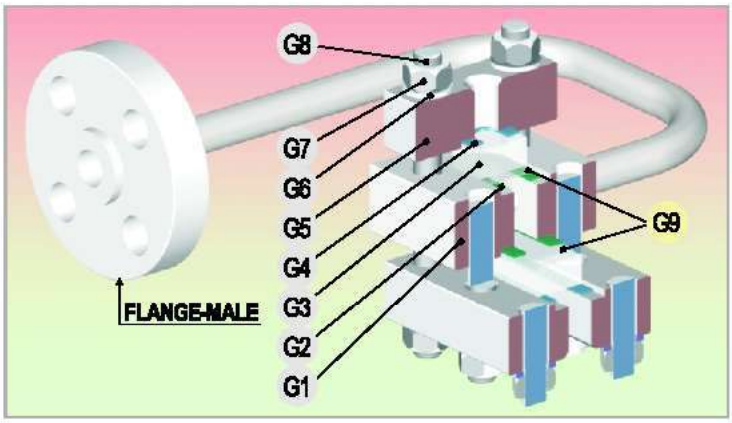
SPECIFICATIONS

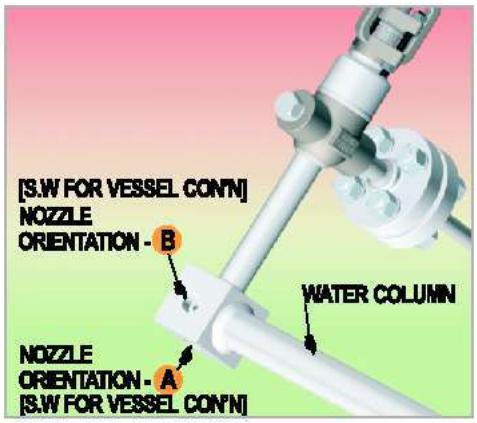
- **MATERIAL** : Carbon Steel & Stainless Steel, A182-F11, F22, F5, F9, F91, etc.
- **VISIBLE LENGTH** : 225 to 3510 mm.
- **MAX. NO. OF SECTION** : 8 Sections.
- **VESSEL CONNECTION** : Socket Welds or Flanged[on request].
- **GAUGE BODY & GAUGE VALVE CON'N** : Not Rotatable[turn to page G-9].
- **SHELL TEST PRESSURE** : 1.5 Times at the Max. Working Pressure.

Others, except the above specification are available on request by customer.

SECTIONAL VIEW

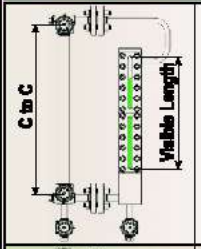
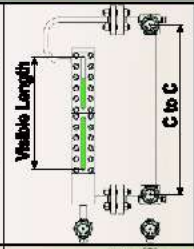
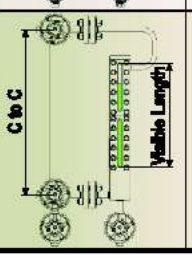
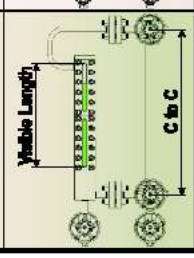
Nozzle Orientation - **A** is **SAM IL** Standard and Nozzle - **B** is only available on request by Customer.





NO.	PARTS	MATERIAL	NO.	PART	MATERIAL
G1	Gauge Body	C.S, Stainless Steel	G5	Gauge Cover	Carbon Steel
G2	Sealing Gasket	Graphite	G6	Washer	SWRH-62B
G3	Transparent Glass	Borosilicate	G7	Nuts	A194 Gr.2H
G4	Cushion Gasket	Non-Asbestos	G8	Stud-Bolts	A193 Gr.B7
			G9	Shield	Mica

DIMENSIONAL VIEW

MODEL	INSTALLATION DIRECTION		DIRECTION OF GAUGE FACING	DIMENSIONS		
	RIGHT-HAND	LEFT-HAND		GLASS NO.	C to C	V.L
STG-3B			FRONT ONLY	5	340	195
				6	370	225
				7	400	255
				8	440	295
STG-4B			FRONT ONLY	4	320	165
				5	350	195
				6	380	225
				7	410	255

※Others, except the above materials of part are available on request by customer.

INTRODUCTION :

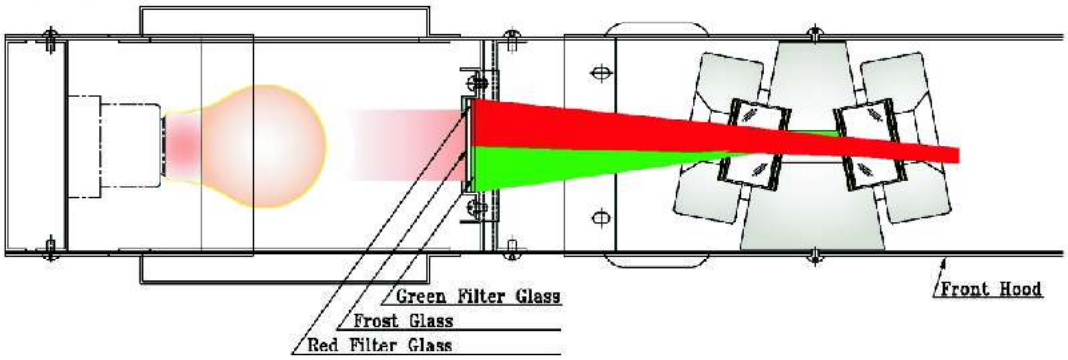
Two-Color Level Gauge is apply the principle of a difference between refractive indices of light at liquid such as water in the boiler and that of steam. In this former reason, we can observe obviously the level through the two-color level gauge series because of display the level as reliable chromatic indication in which is **GREEN** Color for water portion and **RED** Color for steam portion. With distinguishing a light into red and green color through the colored filter and its distinguished colors enter into visible window of level gauge after traveling angle is changed a little by the wedge shaped body. in the above principle, when the gauge is filled with water, The red light beam is disappear after deflected side-wards and absorbed and is filled with steam, it pass through the steam space. Therefore, only the red light beam appears in the steam space and the green light beam is vice versa against the above.
Two-Color Gauge Series is designed and manufactured based on the above principles.

HOW IT COMPRISED

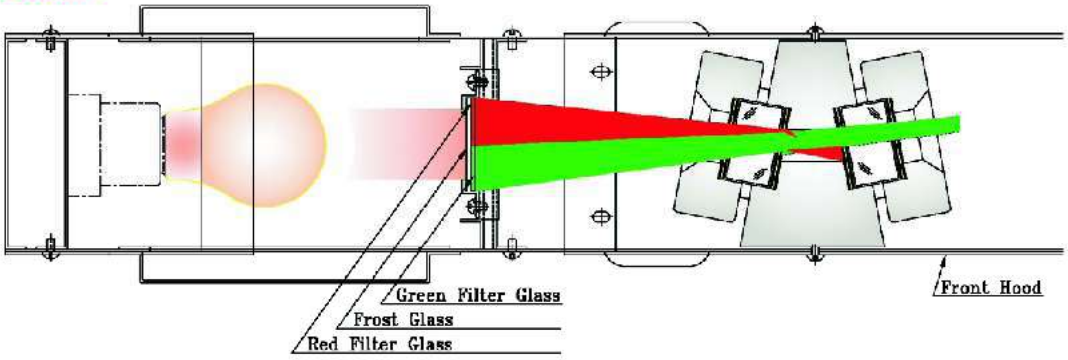
The Two-Color Illuminator is mounted the illuminator box equipped with a special filter glasses [Red and Green Colored], lamps and a frost glass for fixing color glasses at the rear of observing window of the body in the SGC-B Gauge Series. The body of SGC-B Series has wedge-shaped as shown in the sectional view on the pages after next and next.

COMPRISAL DIAGRAM

STEAM VIEW

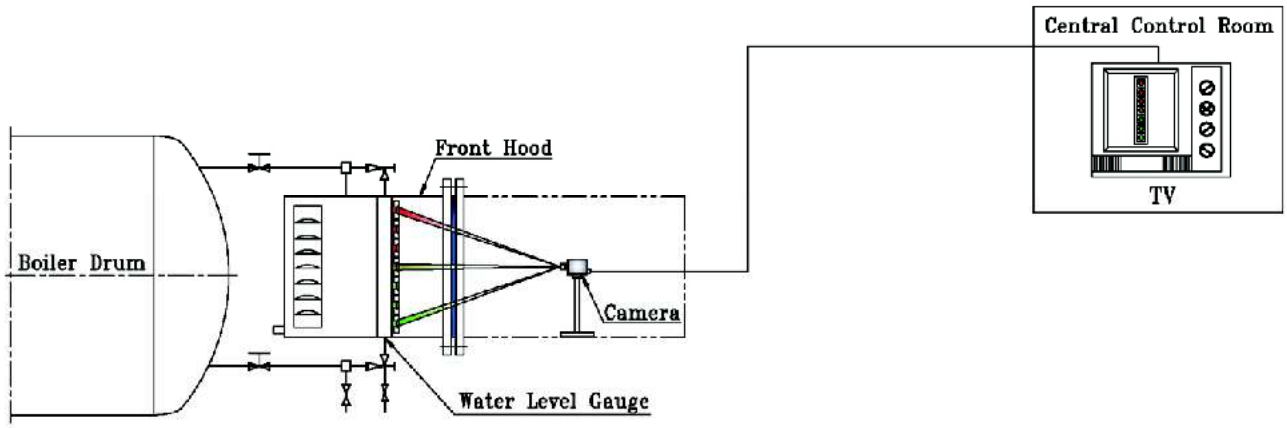


LIQUID VIEW



OBSERVATION BY REMOTE SYSTEM

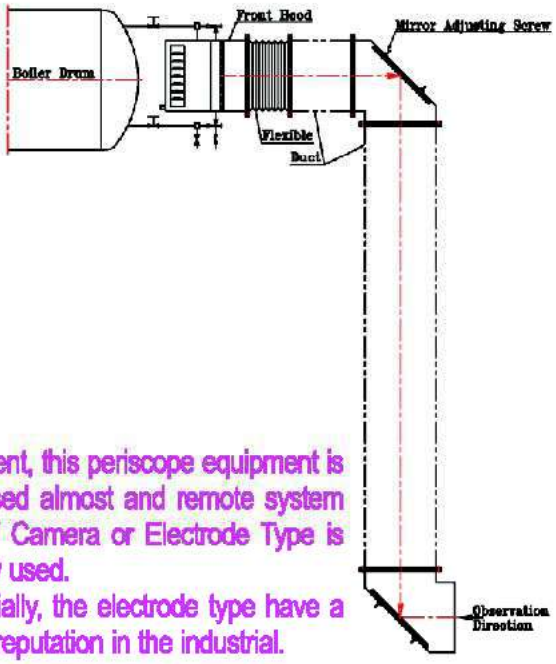
With installation the TV Camera, you can observe the liquid level in the central control place apart long distance from the SGC-B Type level gauge. Liquid level will be transmitted into TV as a **GREEN** Color for liquid space and a **RED** Color for steam space.



OBSERVATION BY PERISCOPE

The Periscope is comprised of several hoods with reflex mirror and observation is performed at the most convenient place to an observer.





In recent, this periscope equipment is not used almost and remote system by TV Camera or Electrode Type is mostly used.
especially, the electrode type have a great reputation in the industrial.

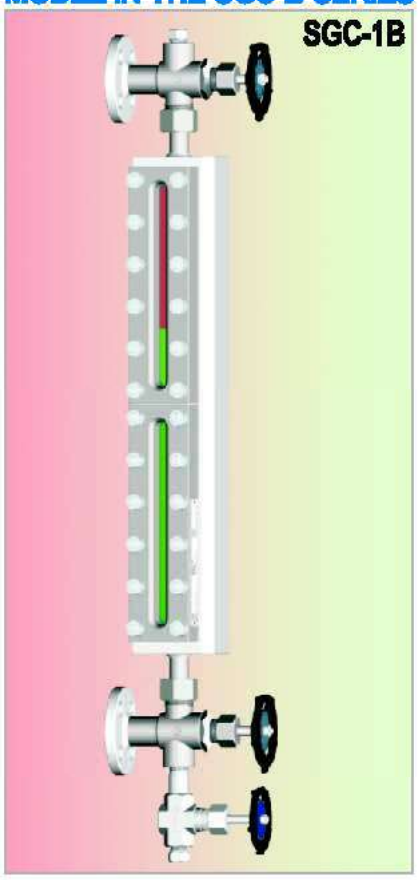
SGC-B SAM IL TRANSPARENT TYPE TWO-COLOR FOR BOILER

GENERAL DESCRIPTION

This Types are of the most excellent construction as function of the transparent type two-color gauges, especially has wide-spread out a great reputation for the installed ones on the boilers at the independent power generation plant or industrial.

MODEL IN THE SGC-B SERIES

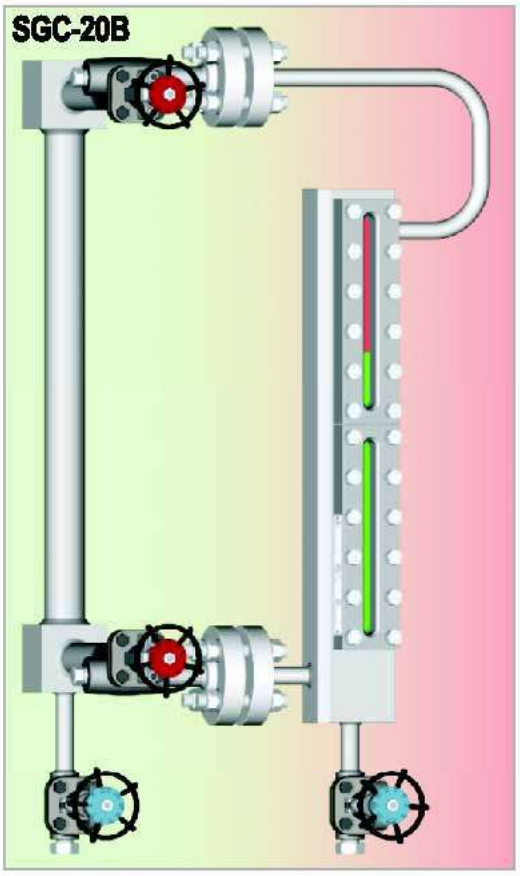
SGC-1B



OPTIONS

- **Scale Plate**
  - units : Cm, Liter
- **Vent**
  - Gate Valve
  - Globe Valve
  - Nipple & Cap
  - Needle Valve
- **Drain**
  - Gate Valve
  - Globe Valve
  - Nipple & Cap
  - Needle Valve
- **Bracket[SGC-1B]**
  - Longer than 3000 mm of C to C
- **Gauge Valve**
  - Hand Wheel with Chain
  - Arm Lever

SGC-20B



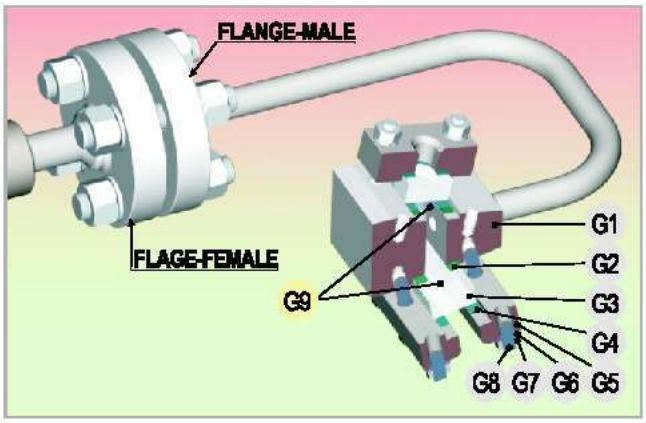
SPECIFICATIONS

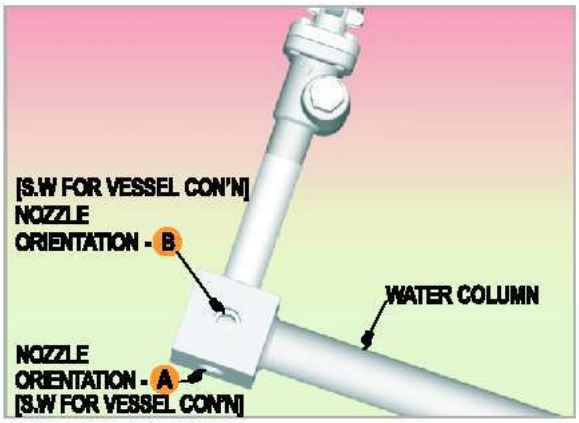
- **MATERIAL** : Carbon Steel & Stainless Steel, etc.
- **VISIBLE LENGTH** : 225 to 3510 mm.
- **MAX. NO. OF SECTION** : 8 Sections for SGC-20B and 9 Sections for SGC-1B.
- **VESSEL CONNECTION** : 3/4" or 1" Flanged ANSI 150# ~ 900# or Socket Welds[S.W].
- **GAUGE BODY & GAUGE VALVE CON'N** : Not Rotatable [SGC-20B] & 360° Rotatable [turn to page G-9].
- **SHELL TEST PRESSURE** : 1.5 Times at the Max. Working Pressure.

Others, except the above specification are available on request by customer.

SECTIONAL VIEW

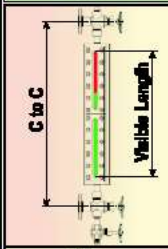
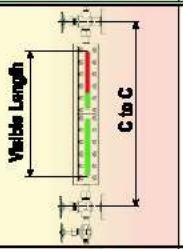
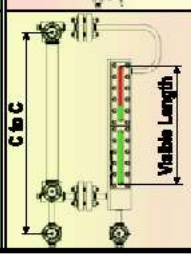
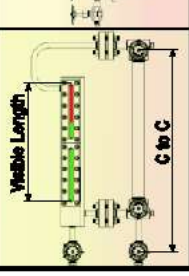
Nozzle Orientation - **A** is **SAM IL** Standard and Nozzle - **B** is only available on request by Customer.





NO.	PARTS	MATERIAL	NO.	PART	MATERIAL
G1	Gauge Body	C.S, Stainless Steel	G5	Gauge Cover	Carbon Steel
G2	Sealing Gasket	Graphite	G6	Washer	SWRH-62B
G3	Transparent Glass	Borosilicate	G7	Nuts	A194 Gr.2H
G4	Cushion Gasket	Non-Asbestos	G8	Stud-Bolts	A193 Gr.B7
			G9	Shield	Mica

DIMENSIONAL VIEW

MODEL	INSTALLATION DIRECTION		DIRECTION OF GAUGE FACING	DIMENSIONS		
	RIGHT-HAND	LEFT-HAND		GLASS NO.	C to C	V.L
SGC-1B			NOT ROTATABLE & 360° ROTATABLE	6	500	225
				7	530	255
				8	570	295
				9	590	315
SGC-20B			FRONT ONLY	5	350	195
				6	380	225
				7	410	255
				8	450	295

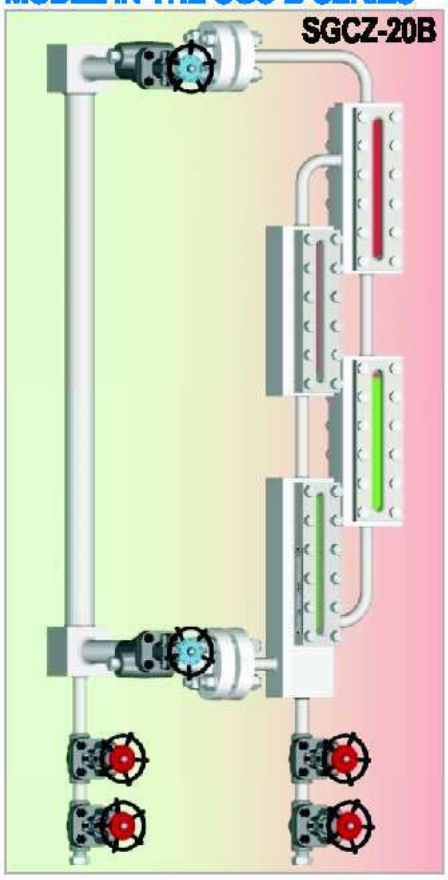
Others, except the above materials of part are available on request by customer.

SGC-B SAM IL TRANSPARENT TYPE TWO-COLOR FOR BOILER

GENERAL DESCRIPTION

For General Information of **SAM IL**'s conventional transparent level gauges, See the transparent series and this type protects the glass from erosion in steam service with mica shield where the gauge is used under such high temperature and pressure as to cause the erosion.

MODEL IN THE SGC-B SERIES



OPTIONS

■ **Scale Plate**
- units : Cm, Liter

■ **Drain**
- Gate Valve
- Globe Valve
- Nipple & Cap
- Double Drain

■ **Gauge Valve**
- Hand Wheel with Chain
- Arm Lever

ILLUMINATOR FOR SGC-B SERIES



▣ CONSTRUCTION OF LAMP

- SGC-1B, 20B & SGCZ-20B : 2 Lamps per Gauge Glass.
- SGC-300B : 1 Lamp per Port Glass.

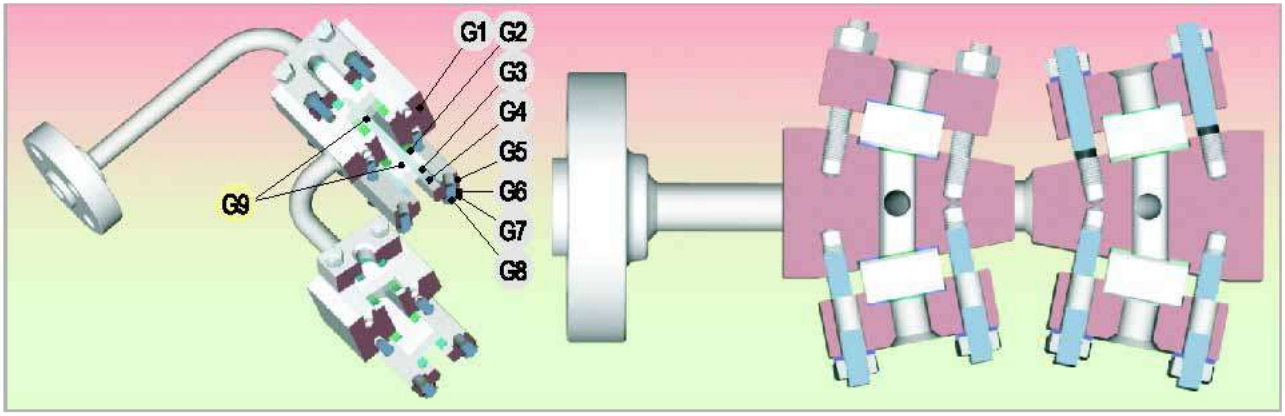
SPECIFICATIONS

■ **MATERIAL** : Carbon Steel & Stainless Steel, etc.
■ **VISIBLE LENGTH** : 225 to 3510 mm.
■ **MAX. NO. OF SECTION** : 8 Sections.
■ **VESSEL CONNECTION** : 3/4" or 1" Flanged ANSI 150# ~ 900# or Socket Welds[S.W].
■ **GAUGE BODY & GAUGE VALVE CON'N** : Not Rotatab[turn to page G-9].
■ **SHELL TEST PRESSURE** : 1.5 Times at the Max. Working Pressure.

Others, except the above specification are available on request by customer.

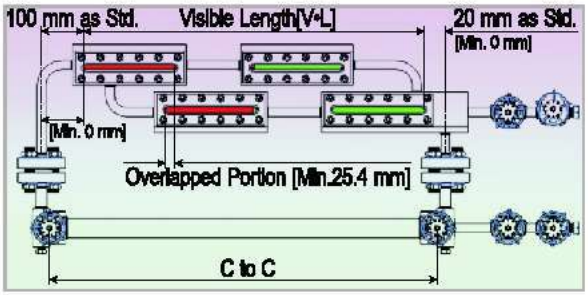
SAM IL TRANSPARENT TYPE TWO-COLOR FOR BOILER SGC-B

SECTIONAL VIEW



NO.	PARTS	MATERIAL	NO.	PART	MATERIAL
G1	Gauge Body	C.S, Stainless Steel	G5	Gauge Cover	Carbon Steel
G2	Sealing Gasket	Graphite	G6	Washer	SWRH-62B
G3	Transparent Glass	Borosilicate	G7	Nuts	A194 Gr.2H
G4	Cushion Gasket	Non-Asbestos	G8	Stud-Bolts	A193 Gr.B7
			G9	Shield	Mica

☐ Construction of this level gauge for boiler is in full accordance with ASME Boiler & Pressure Vessel Code.



DIMENSIONAL VIEW

NO. OF GAUGE SECTIONS	GLASS NO. -7		GLASS NO. -8		GLASS NO. -9	
	C TO C [mm]	V - L [mm]	C TO C [mm]	V - L [mm]	C TO C [mm]	V - L [mm]
3 GAUGES	830	710	950	830	1010	890
4 GAUGES	1060	940	1220	1100	1300	1180
5 GAUGES	1290	1170	1490	1370	1590	1470
6 GAUGES	1520	1400	1760	1640	1880	1760
7 GAUGES	1750	1630	2030	1910	2170	2050
8 GAUGES	1980	1860	2300	2180	2460	2340
9 GAUGES	2210	2090	2570	2450	2750	2630
10 GAUGES	2410	2290	2840	2720	3040	2920

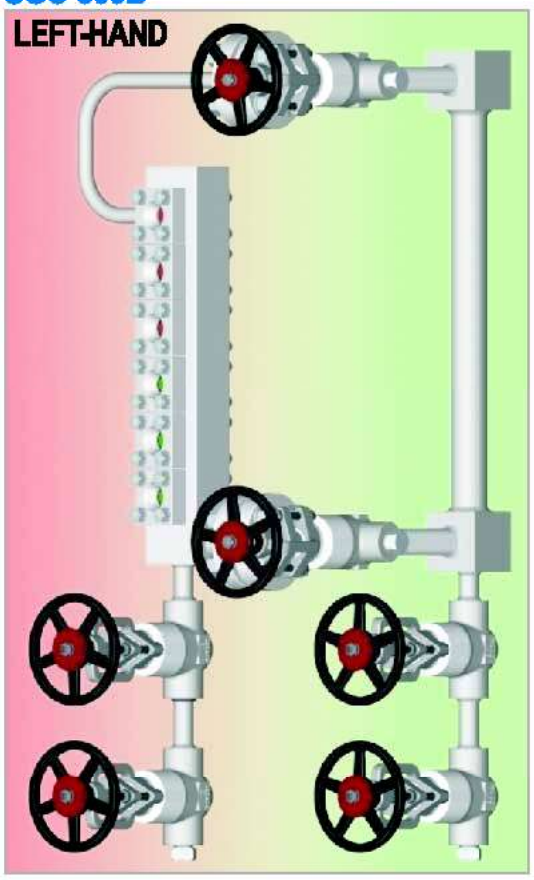
Visible + 120 [=Minimum] = C to C, as standard.

Others, except the above materials of part are available on request by customer.

GENERAL DESCRIPTION

This Multi-Port type Two-Color Level Gauges are designed and manufactured to use under its services of higher pressure and temperature than conventional Reflex and Transparent type gauges. The impacts or shocks from internal pressure and thermal [=heat] are distributed uniformly to each ports. Thereby, this type is usually used on the steam boiler under the service of high pressure and temperature because of avoiding or minimizing the glass breakage / damage and increasing the structural durability.

SGC-300B

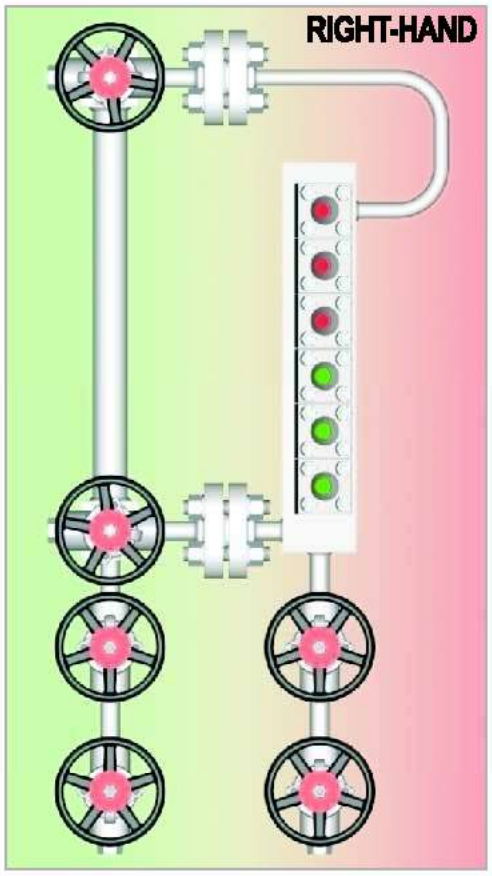


OPTIONS

■ **Scale Plate**
- units : Cm, Liter

■ **Drain**
- Gate Valve
- Globe Valve
- Nipple & Cap
- Double Drain

■ **Gauge Valve**
- Hand Wheel with Chain
- Arm Lever



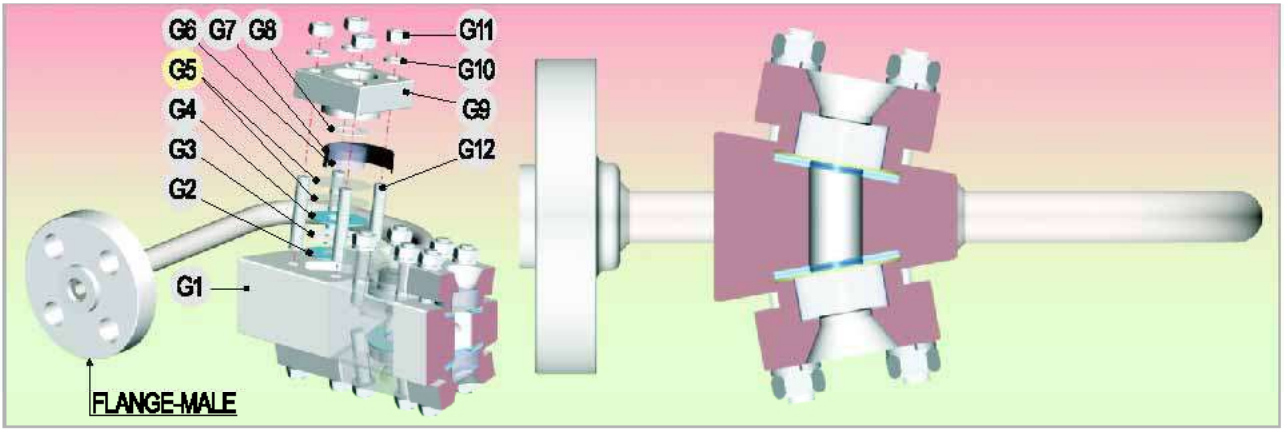
SPECIFICATIONS

- ■ **MATERIAL** : Carbon Steel & Stainless Steel, A182-F11, F22, F5, F9, F91, etc.
- ■ **VISIBLE LENGTH** : Max. 1597 mm.
- ■ **MAX. NO. OF SECTION** : 22 Ports.
- ■ **VESSEL CONNECTION** : 3/4" or 1" Flanged ANSI 900# ~ 2500# or Socket Welds[S.W].
- ■ **GAUGE BODY & GAUGE VALVE CON'N** : Not Rotatab[turn to page G-9].
- ■ **SHELL TEST PRESSURE** : 1.5 Times at the Max. Working Pressure.

Others, except the above specification are available on request by customer.

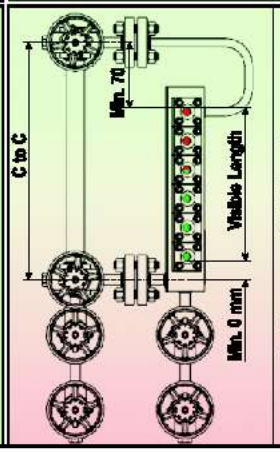
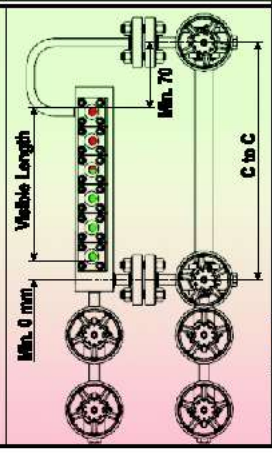
SAM IL MULTI-PORTT TYPE TWO-COLOR FOR BOILER SGC-B

SECTIONAL VIEW



NO.	PARTS	MATERIAL	NO.	PART	MATERIAL
G1	Gauge Body	A105, Stainless Steel	G7	Packing Strip	Non-Asbestos
G2	1st Sealing Gasket	Graphite	G8	Gasket	Aluminum
G3	Metal Sheet	304SS	G9	Gauge Cover	A105
G4	2nd Sealing Gasket	Graphite	G10	Washer	SWRH-62B
G5	Shield	Ruby Mica	G11	Nuts	A194 Gr.2H
G6	Port Glass	Alumina-Silicate	G12	Stud-Bolts	A193 Gr.B7

DIMENSIONAL VIEW

MODEL	INSTALLATION DIRECTION		DIRECTION OF GAUGE FACING	DIMENSIONS		
	RIGHT-HAND	LEFT-HAND		NO. OF PORTS	C to C	V.L
SGC-300B			FRONT ONLY	6	467	397
				7	542	472
				8	617	547
				9	692	622
				10	767	697

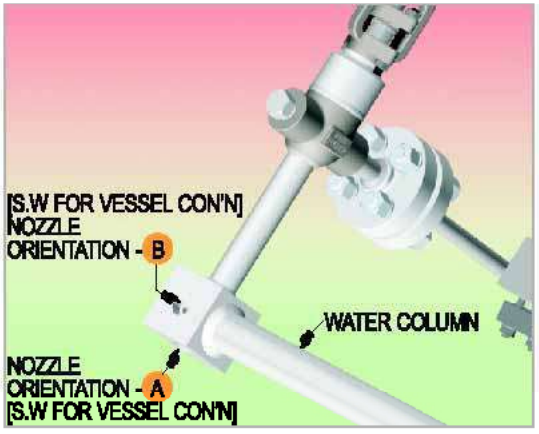
V-L is possible to manufacture as min. 70 mm for top side and 0 mm for bottom side base on C to C.

Others, C to C & V-L are available on required spec.

75 x No. of Ports - 53 = Visible Length.

Others, except the above materials of part are available on request by customer.

Nozzle Orientation - **A** is **SAM IL** Standard and Nozzle - **B** is only available on request by Customer.



STELLITE as an option :
The stem and renewable seat with stellite reinforcement is hard and resistant to abrasion and corrosion. It prevents scorching and withstand high pressure and temperature.

INSTALLATION : In recent boiler installations, at least a set of this type gauge is used to a boiler which normally installs two sets of level observation system in order to prevent an occurrence of sudden and abnormal change of the water level.

EASY AND ECONOMICAL MAINTENANCE : Multi-Port Type Gauge have several ports for visible. It offers a feature of economical maintenance since replacement of the gauge glass can be carried out for a port only to replace independently.

EASY LEVEL READING : Multi-Port Type Gauge is easy to read the exact level of boiler drum far away at any frontal angle because of providing the wide visible window and an incandescent bulb beam.

NO.	PARTS
1	Water Column Block
2	Retainer
3	Pipe
4	Check Ball
5	Re-Newable Seat
6	Gauge Valve Body
7	Plug
8	Stem
9	Bonnet
10	Gland Packing
11	Gland Bolt
12	Gland Nut
13	Yoke
14	Gland
15	Gland Flange
16	Sleeve
17	Hand Wheel
18	Name Plate
19	Washer
20	Nut

