

**AIRMAN**

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**SERVICE MANUAL**

**ENGINE COMPRESSOR**

**PDS185S-6E1**

**HOKUETSU INDUSTRIES CO., LTD.**

# Preface

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This service manual explains about the cautions for maintenance jobs and is to serve a guide for the electric system, and troubleshooting for service personnel. Fundamental matters and other things already mentioned in the “Instruction Manual” and the “Parts Catalogue” are omitted to avoid duplication. Therefore, for the operation and handling of this unit, we request you to refer to the instruction manual and caution plates, and further for the structure and components of the unit, please refer to the “Parts Catalogue” separately to be supplied with the unit.

If you should find any description which does not coincide with the instruction manual and parts catalog, we request you to make sure to start the job after clarifying it.

Service personnel is required to safely take quick and proper countermeasures as well as to use correct technology of maintenance in case of field services and periodical maintenance. It is important that service personnel should have proper and sufficient knowledge about the structure and function of the unit and should be well familiar with such technique mentioned in them.

Regarding the part numbers mentioned in this manual, we request you to refer to the Parts catalogue separately supplied together with the unit, because the parts numbers in this manual are sometimes changed.

Copies of this service manual are intended to be distributed to limited numbers of our customers. The unauthorized reproduction or distribution of this service manual is prohibited.

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# 1. Specification

## 1.1 Specifications

Item	unit	
<b>●Weight · Mass</b>		
Overall length	in.(mm)	128.7(3,270)
Overall length (Bonnet only)	in.(mm)	75.2(1,910)
Overall width	in.(mm)	66.3(1,685)
Overall height	in.(mm)	61.0(1,550)
Net dry mass	lb(kg)	2,050( 930)
Operating mass	lb(kg)	2,271(1,030)
<b>●Compressor</b>		
Free air delivery	cfm(m <sup>3</sup> /min)	185(5.2)
Working pressure	psi(MPa)[bar]	100(0.69)[ 6.9]
Pressure of pressure control valve	psi(MPa)[bar]	58(0.40)[ 4.0]
Burst pressure of safety valve	psi(MPa)[bar]	150(1.03)[10.3]
Ambient conditions: temperature	°F(°C)	5 to 104(-15 to +40)
Ambient conditions: altitude	yd(m)	Less than 1,640(1,500)
<b>●Engine</b>		
Type		YANMAR 4TNV88C-DHKS
Rated output (Gross)	hp/min <sup>-1</sup> (kW/min <sup>-1</sup> )	47.6/3,000(35.5/3,000)
Rated output (Net)	hp/min <sup>-1</sup> (kW/min <sup>-1</sup> )	45.6/3,000(34.0/3,000)
Fuel consumption	g/kW·h	248
Rated RPM	min <sup>-1</sup>	3,000
RPM at unload conditions	min <sup>-1</sup>	1,350
Net dry mass	lb(kg)	441(200)
<b>●Lubricating oils</b>		
Engine oil capacity (H/L level)	gal.(L)	1.95/0.90(7.4/3.4)
Compressor oil capacity (including receiver tank and oil cooler etc.)	gal.(L)	3.59(13.6)
Compressor oil capacity to be filled		Ambient temperature : 5°F to 104°F (-15°C to +40°C)
		HULS : ANDEROL 3032 MOBIL : RARUS SHC 1024 TEXACO: SYN-STAR DE32
Coolant capacity	gal.(L)	1.80(6.8)
Fuel tank capacity	gal.(L)	23.8(90)
<b>●Fuel consumption ratio (for reference only)</b>		
At purge operation	gal./Hr(L/Hr)	0.40(1.5)
At no load	gal./Hr(L/Hr)	0.74(2.8)
At 50%	gal./Hr(L/Hr)	1.29(4.9)
At 70%	gal./Hr(L/Hr)	1.64(6.2)
At full load	gal./Hr(L/Hr)	2.38(9.0)

# 1. Specification

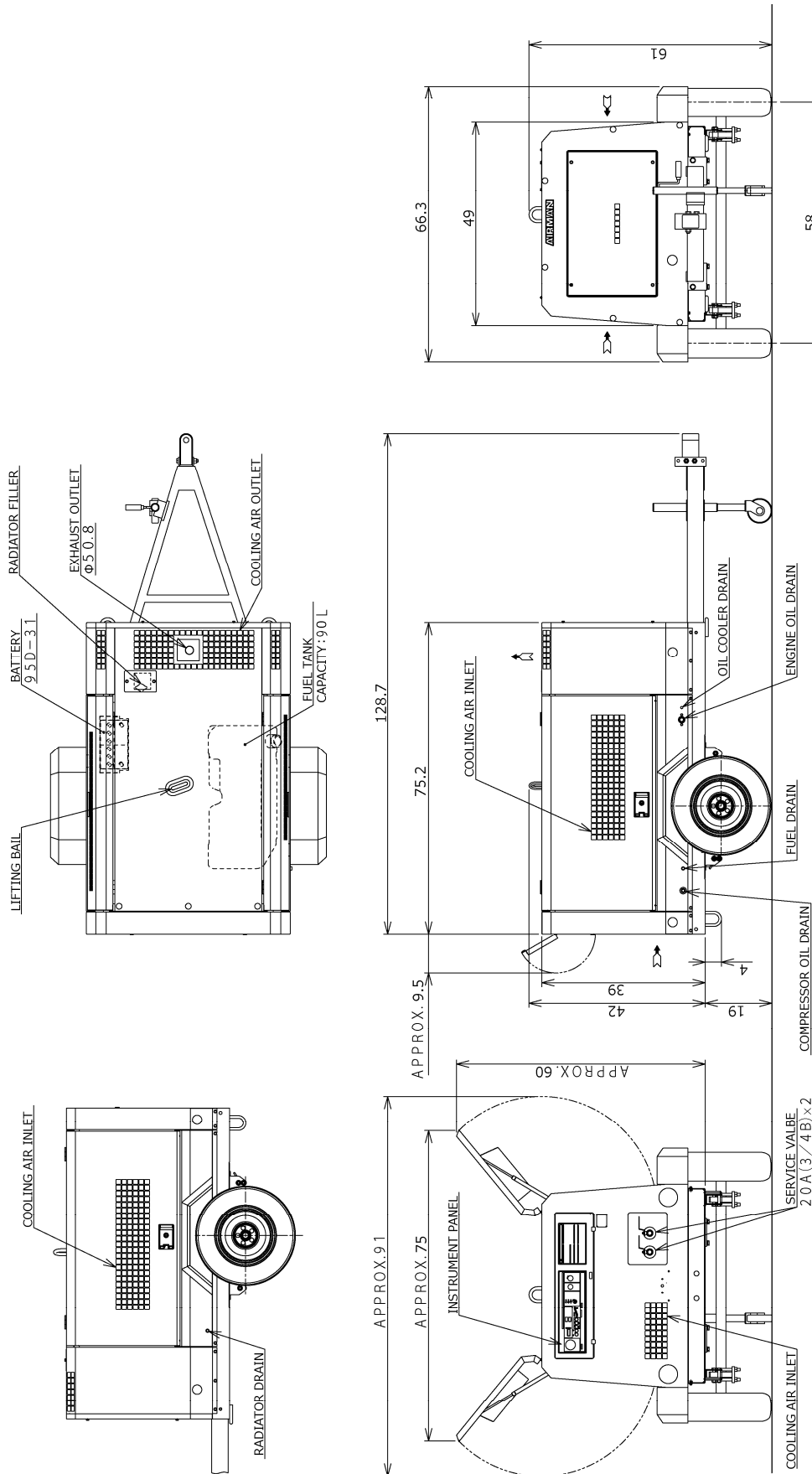
## 1.2 Set Value

Item	unit	
<b>●Emergency stop devices</b>		
Actuating temperature of discharge temperature switch	°F(°C)	248(120)
Actuating temperature of water temperature switch	°F(°C)	230(110)
Actuating pressure of oil pressure switch	psi(MPa)[bar]	7.1(0.049)[0.49]
<b>●Warning devices</b>		
Actuating temperature of discharge temperature switch	°F(°C)	239(115)
Actuating temperature of water temperature switch	°F(°C)	221(105)
Battery failure		When not charged
Actuating pressure of air filter indicator	psi(kPa)[bar]	0.9(6.23)[0.0623]
<b>●Set value</b>		
Pressure control valve	psi(MPa)[bar]	58(0.40)[ 4.0]
Actuating pressure of safety valve	psi(MPa)[bar]	150(1.03)[10.3]
Unload starting pressure	psi(MPa)[bar]	100(0.69)[ 6.9]
Time for starting purge mode operation (At AUTO IDLE operation mode)	sec	5 to 60 (Set at 10 sec. ex. works)
<b>●Engine RPM</b>		
Rated RPM	min <sup>-1</sup>	3,000
RPM at unload	min <sup>-1</sup>	1,350
<b>●Indications of gauges or instruments during operation</b>		
Discharge pressure gauge (at full load)	psi(MPa)[bar]	58 to 100(0.40 to 0.69)[4.0 to 6.9]
Discharge pressure gauge (at no load)	psi(MPa)[bar]	104 to 131(0.72 to 0.90)[7.2 to 9.0]
Discharge pressure gauge (at purge operation)	psi(MPa)[bar]	39 to 73(0.27 to 0.50)[2.7 to 5.0]

# 1. Specification

## 1.3 Outline Drawing

Unit : in.

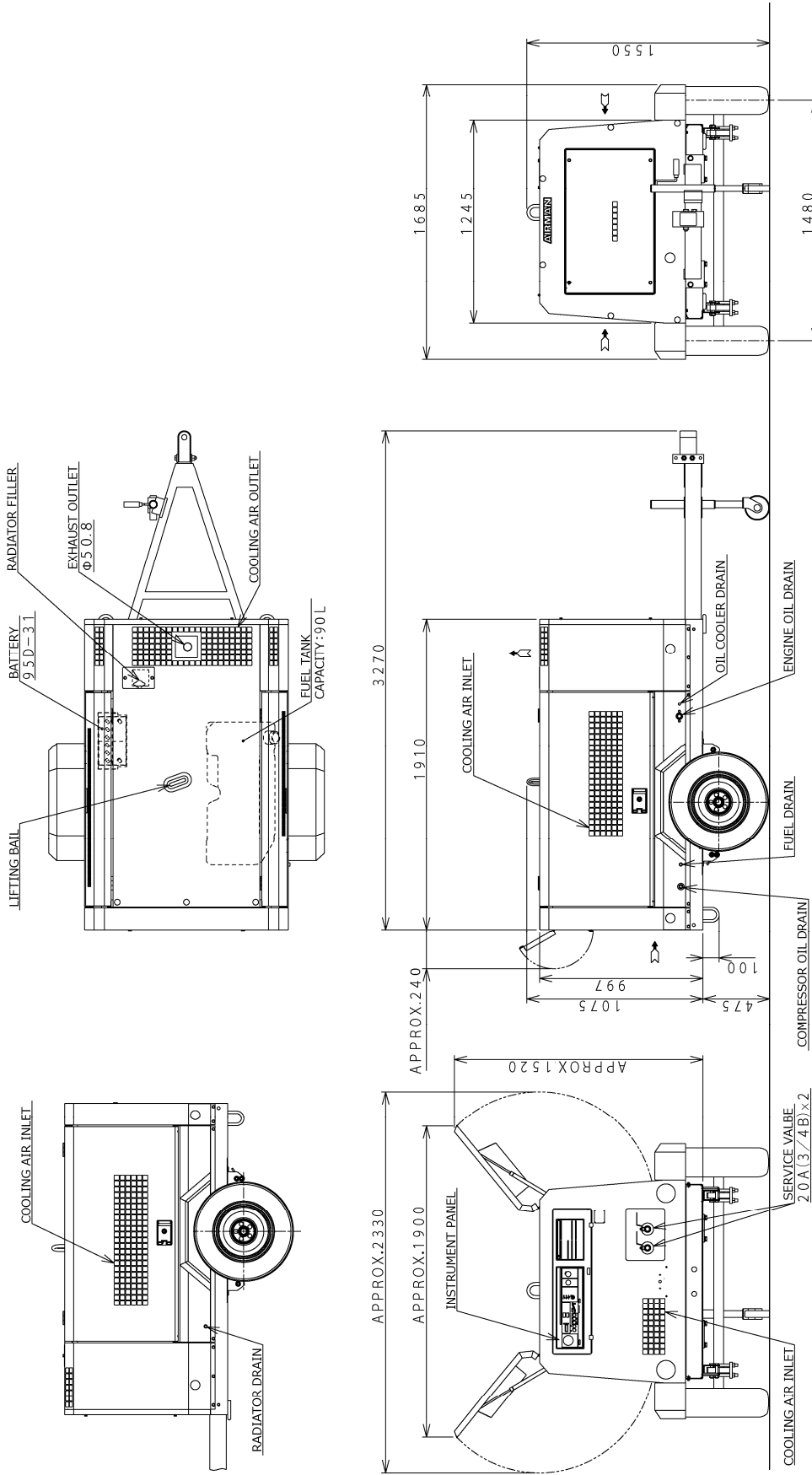


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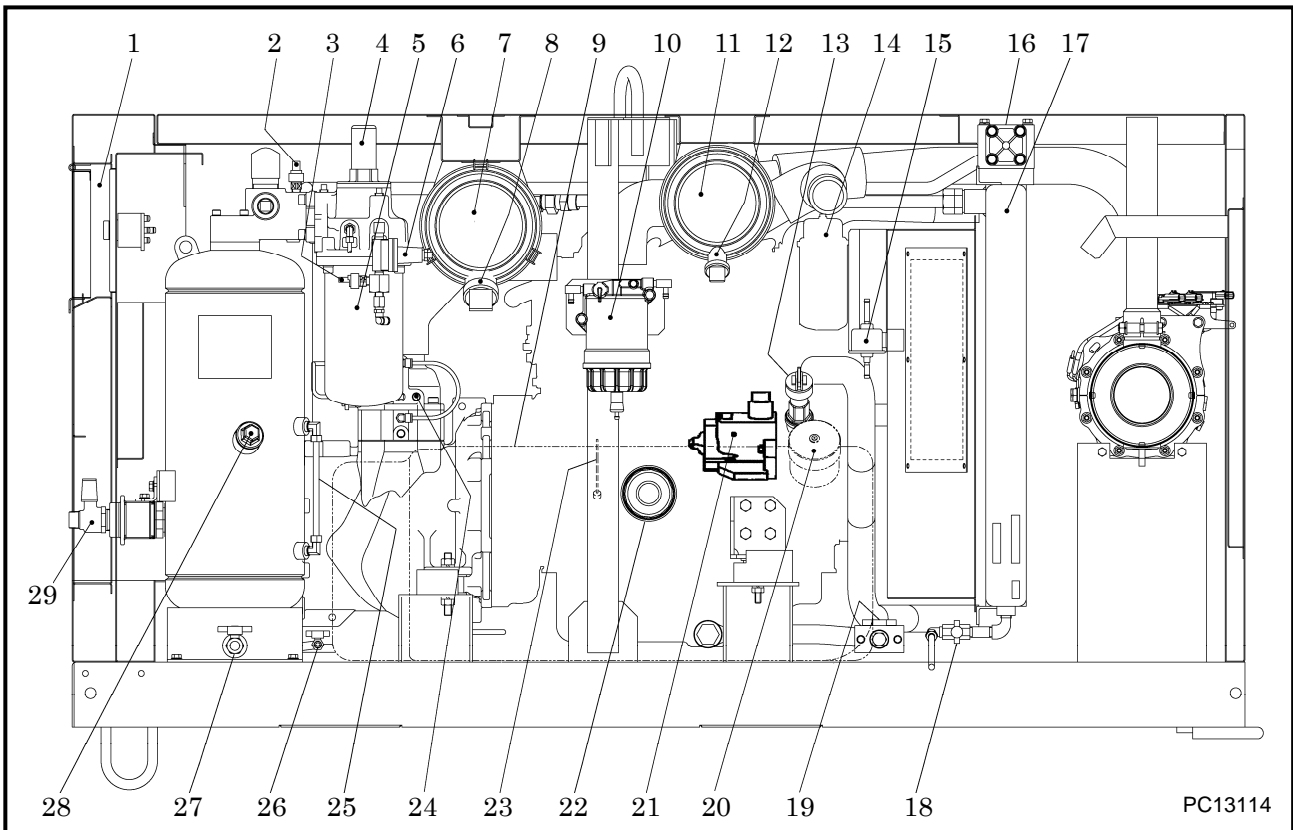
Unit : mm



A131025

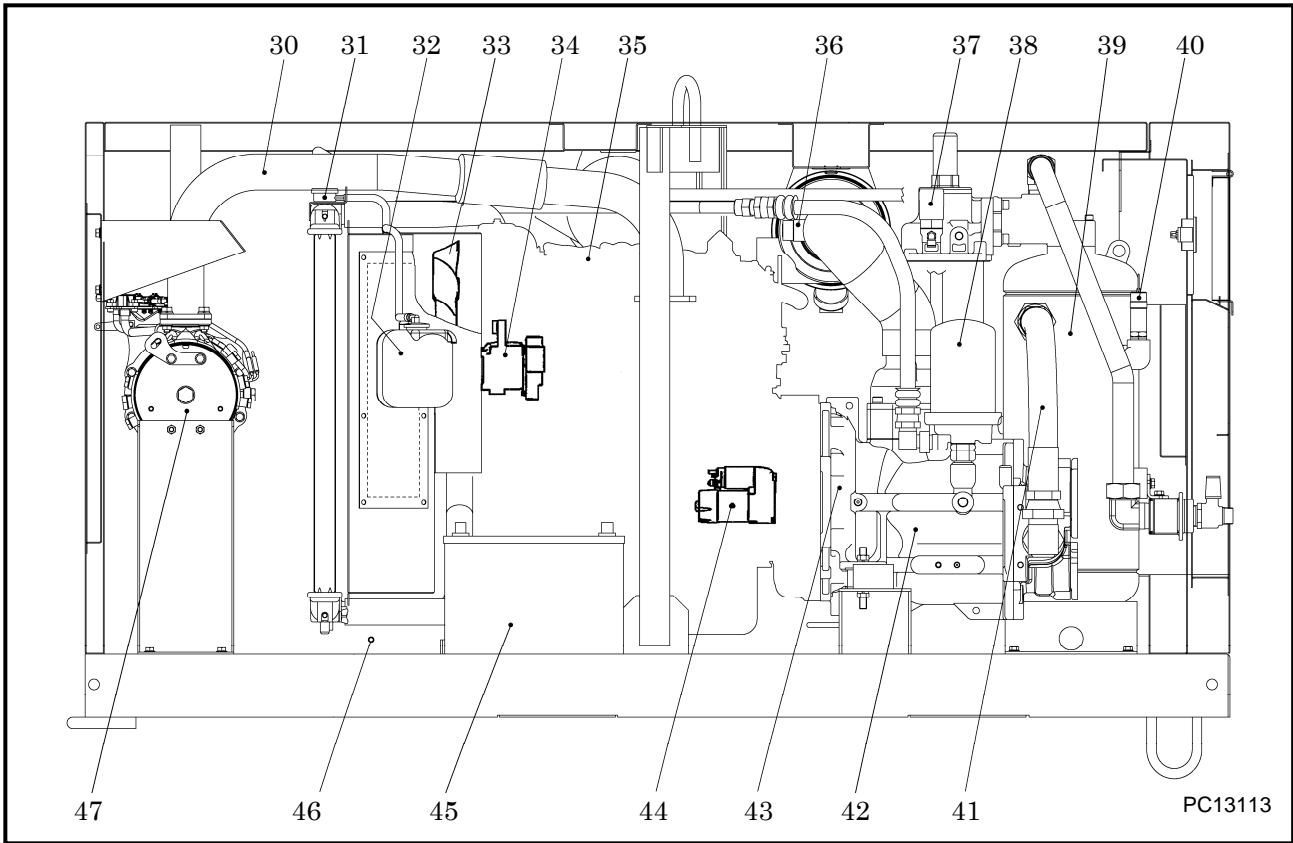
# 1. Specification

## 1.4 Internal Components and Part Names



No.	Description	No.	Description
1	Instrument panel	16	By-pass valve
2	Service pressure sensor	17	Oil cooler
3	Regulator secondary pressure	18	Oil cooler drain valve
4	Pressure control valve	19	Engine oil drain valve
5	Oil separator	20	Fuel cap
6	Pressure regulator	21	Supply pump
7	Air filter (For compressor air-end)	22	Engine oil filter
8	Vacuator valve (For compressor air-end)	23	Engine oil level gauge
9	Fuel tank	24	Intake negative pressure sensor
10	Sedimenter and pre-filter	25	Compressor oil level gauge
11	Air filter (For engine)	26	Fuel tank drain valve
12	Vacuator valve (For engine)	27	Separator receiver tank drain valve
13	Engine oil filler port	28	Compressor oil filler port
14	Fuel filter	29	Service valve
15	Air-bleeding electromagnetic pump		

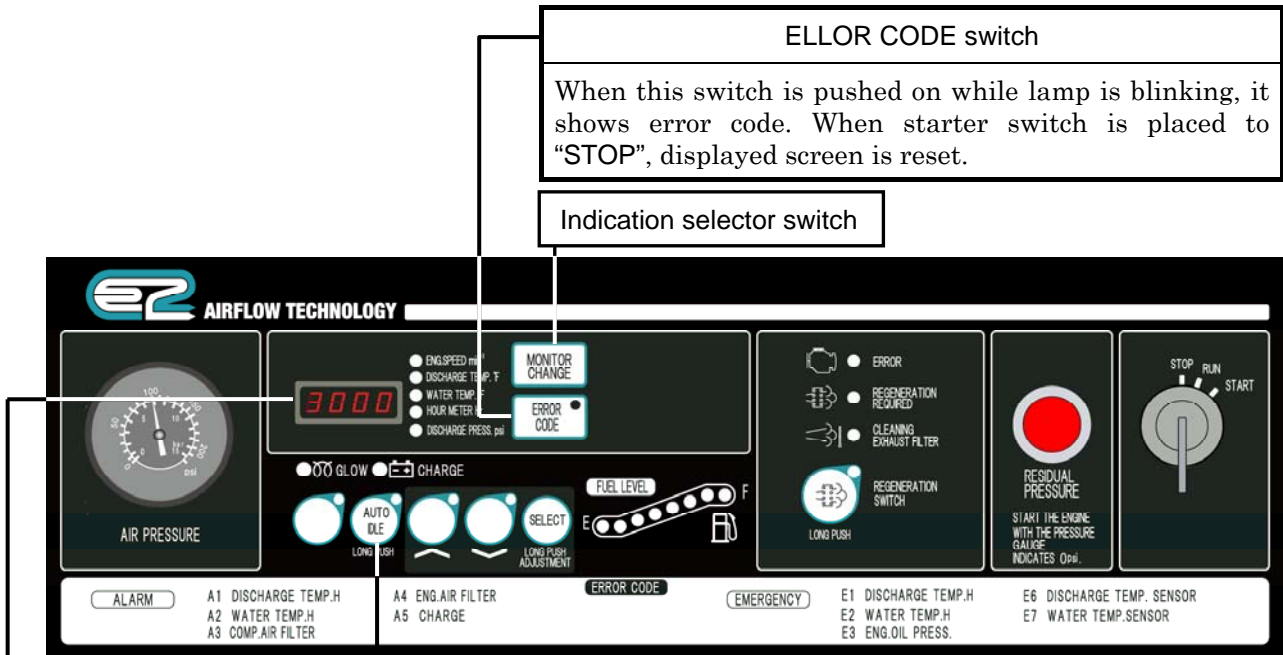
# 1. Specification



No.	Description	No.	Description
30	Exhaust pipe	39	Separator receiver tank
31	Radiator	40	Safety valve
32	Reserve tank	41	Discharge pipe
33	Cooling fan	42	Air-end
34	Alternator	43	Coupling
35	Engine	44	Starter
36	Air filter differential pressure indicator (For compressor air-end)	45	Battery
37	Solenoid valve for starting unloader (purge)	46	Radiator drain valve
38	Compressor oil filter	47	Diesel particulate filter (DPF)

# 1. Specification

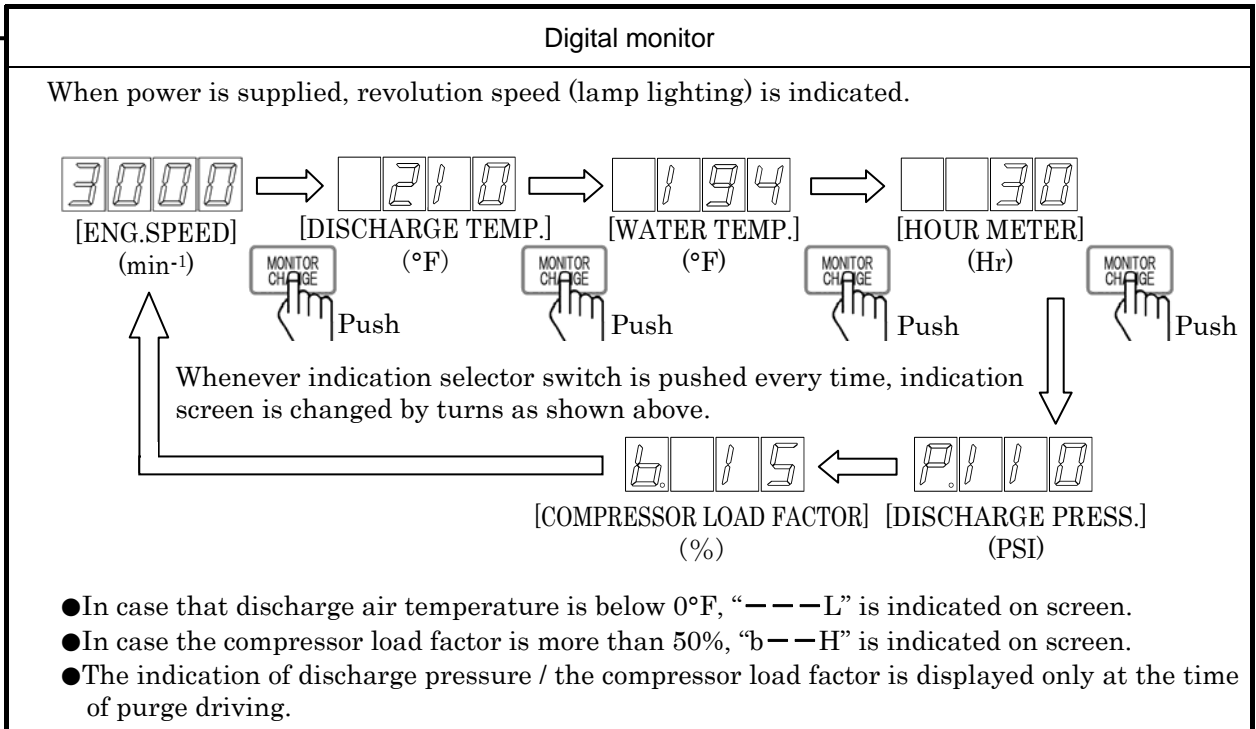
## 1.5 Instrument Panel



A130957

**AUTO IDLE switch**



This switch is used when fuel consumption is minimized at no load operation. (It functions when the lamp goes on.)



# 1. Specification

## 1.5.1 Indicator lamp

**[Indicator lamp]** Turn the starter switch to “RUN” position. Then the lamp goes on.

Item	Contents	Measures	Monitor
GLOW	When starter switch is placed to “RUN”, the lamp goes on and after preheating is finished, the lamp will be off.	—	
CHARGE	Lamp goes on when alternator is not charging.	Check wiring Check alternator	

**[Warning display]** This displays such trouble of less importance when it occurs during operation, but the unit continues operating.

When any abnormality happens, a ERROR CODE lamp flickers. In this time when ERROR CODE switch is pressed, a error code will be displayed.

Item	Error code	Contents
DISCHARGE TEMP. H	A1	Lamp flickers when the air temperature at the outlet of the air-end reaches 239°F (115°C).
WATER TEMP. H	A2	Lamp flickers when coolant temperature reaches 221°F (105°C).
COMP. AIR FILTER	A3	It is displays when air filter gets clogged and suction resistance increases. [Operating resistance: More than 0.062bar(6.23kPa)]
ENG. AIR FILTER	A4	
CHARGE	A5	Belt loosened and/or cut Faulty generation of alternator

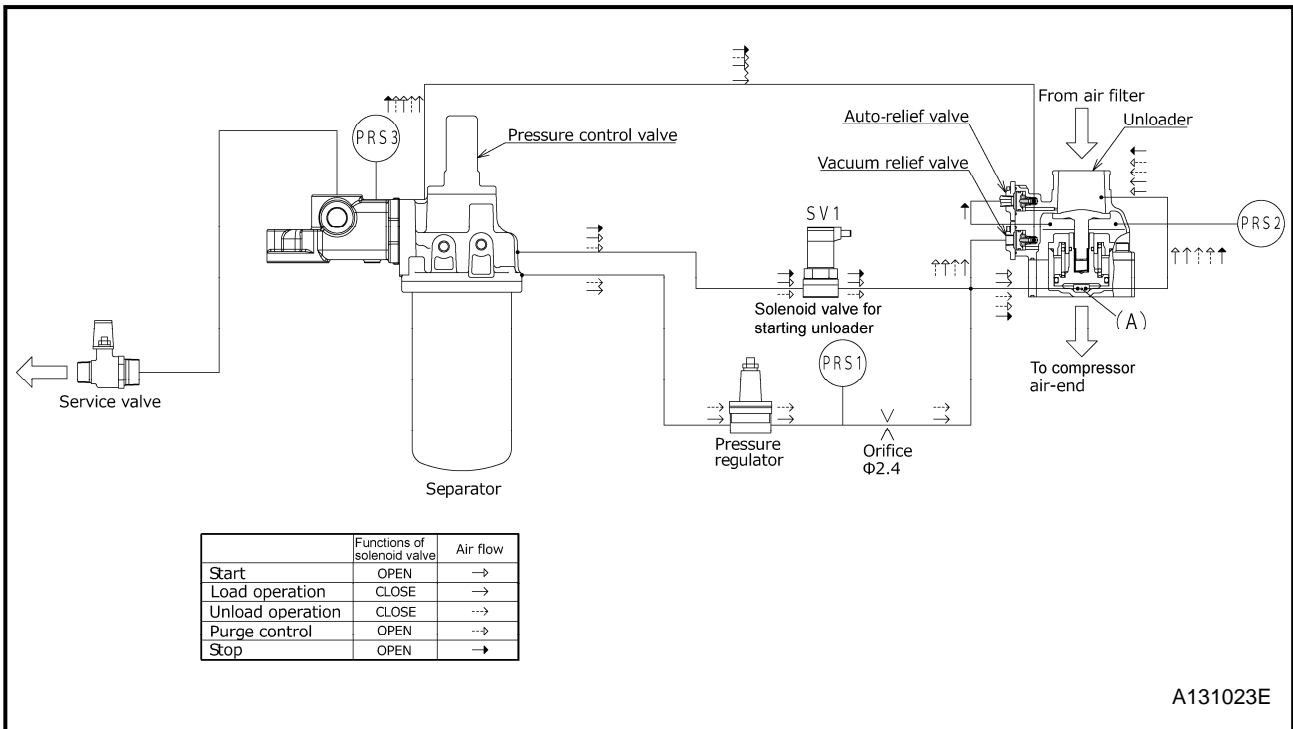
**[Emergency display]** When any trouble takes place during operation, this displays and it stops as an emergency stop.

When any abnormality happens, a ERROR CODE lamp flickers. In this time when ERROR CODE switch is pressed, a error code will be displayed.

Item	Error code	Contents
DISCHARGE TEMP. H	E1	It is displays when the air temperature at the outlet of the air-end reaches 248°F (120°C).
WATER TEMP. H	E2	It is displays when coolant temperature reaches 230°F (110°C).
ENG. OIL PRESS.	E3	It is displays when engine oil pressure drops. 【Function pressure: 7.1psi(0.049MPa)[0.49bar]】
DISCHARGE TEMP. SENSOR	E6	It is displayed when air temperature sensor at the outlet port of compressor air-end is disconnected.
WATER TEMP. SENSOR	E7	It is displayed when engine water temperature sensor is disconnected.

# 1. Specification

## 1.6 Capacity Control Device



Step	Response
Start	Compressed air flows into unloader chamber (A) because solenoid valve for purge control SV1 is opened at start-up. The pressure in chamber (A) rises soon to close unloader valve fully and accordingly it can reduce the load at start-up.
Load operation	After starting, SV1 is closed after automatic unloaded operation, and the air volume which is sent to chamber (A) increases and decreases according to the rise and drop of the discharge air pressure and consequently the opening width of the unloader valve is changed. Further, engine speed (RPM) is changed by the pressure which PRS1 detects, and it steplessly controls the air volume in the range from 0 to 100%.
Suction port closing unload operation	When compressed air pressure exceeds the rated pressure with reduction of air consumption, PRS1 detects the pressure and it reduces engine speed (RPM) in proportion to the pressure rise, and it closes unloader valve at the same time. When compressor air-end becomes vacuum during unload operation, vacuum noise is caused. To prevent this noise, it opens vacuum relief valve by detection of secondary pressure of pressure regulator. Thus high vacuum condition of compressor air-end is prevented.
Purge control unload operation	When the certain set time (it can be changed.) has passed at lower pressure than the set negative pressure, detecting the negative pressure inside the compressor air-end with a pressure sensor PRS2, solenoid valve SV1 opens and it closes unloader valve. At the same time, it functions to relieve the compressed air from separator receiver tank to the atmosphere and thus it lowers the pressure. Thus the compressor power is saved. When air consumption increases, and the pressure used for load drops below the set pressure, pressure sensor PRS3 detects it and it disengages the purge control (SV1 closes) to start full load operation.
Stop	When stopping operation, it opens auto-relief valve to relieve the compressed air in separator receiver tank to atmosphere, detecting the pressure inside compressor air-end.

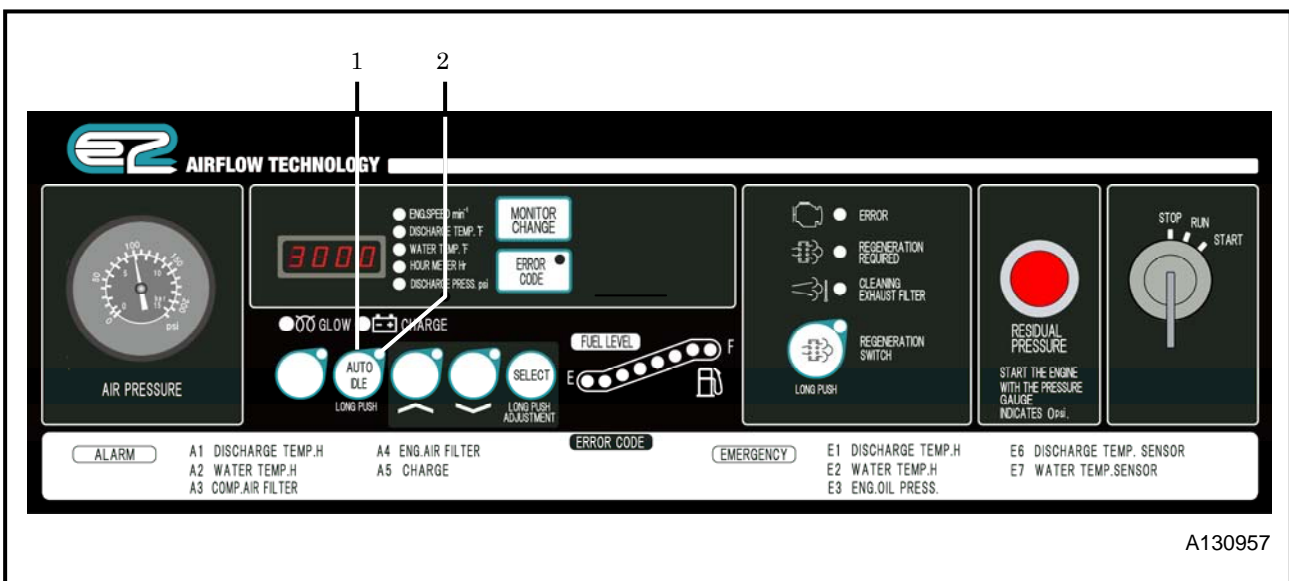
# 1. Specification

## 1.6.1 Auto idle control (purge control)

This model is equipped with auto idle control operation mode. This operation mode is recommendable for such use: not so much air consumption is required and it is used continuously and also power consumption under unloaded operation is required to be saved. Use this mode, depending upon the need and demand. For the selection of this mode, switch on “AUTO IDLE” on the operation panel. Select this operation mode freely, according to required air consumption.

<Procedure>

- ① During operation, long push (2 seconds) on AUTO IDLE switch (purge control) “1”.
- ② Then the AUTO IDLE lamp “2” goes on.
- ③ In order to stop this operation mode, push again AUTO IDLE switch “1” and then the lamp “2” goes out to disengage this purge control.



### Function of auto idle control (purge control)

Function	Conditions of AUTO IDLE lamp
① First engine speed drops to the minimum speed by pressure regulator, owing to reduction of air consumption. Later the air consumption is reduced further, the unloader valve gradually closes and intake negative pressure increases. In this stage, the pressure sensor detects the intake negative pressure. Then when the intake negative pressure becomes higher than the set pressure, the AUTO IDLE lamp flickers at short intervals.	Lamp flickers at short intervals.
② When this condition continues for a certain time, the solenoid valve functions to start purge mode operation. Consequently, the pressure inside separator receiver tank drops and reduces the power of compressor air-end. In this stage, the AUTO IDLE lamp flickers at longer intervals.	Lamp flickers at longer intervals.
③ Next, when the pressure for load down to the purge releasing pressure owing to the increase of air consumption, the solenoid valve operation gets “OFF” and it is transferred to normal operation. In this stage, the AUTO IDLE lamp goes on.	Lamp goes on.

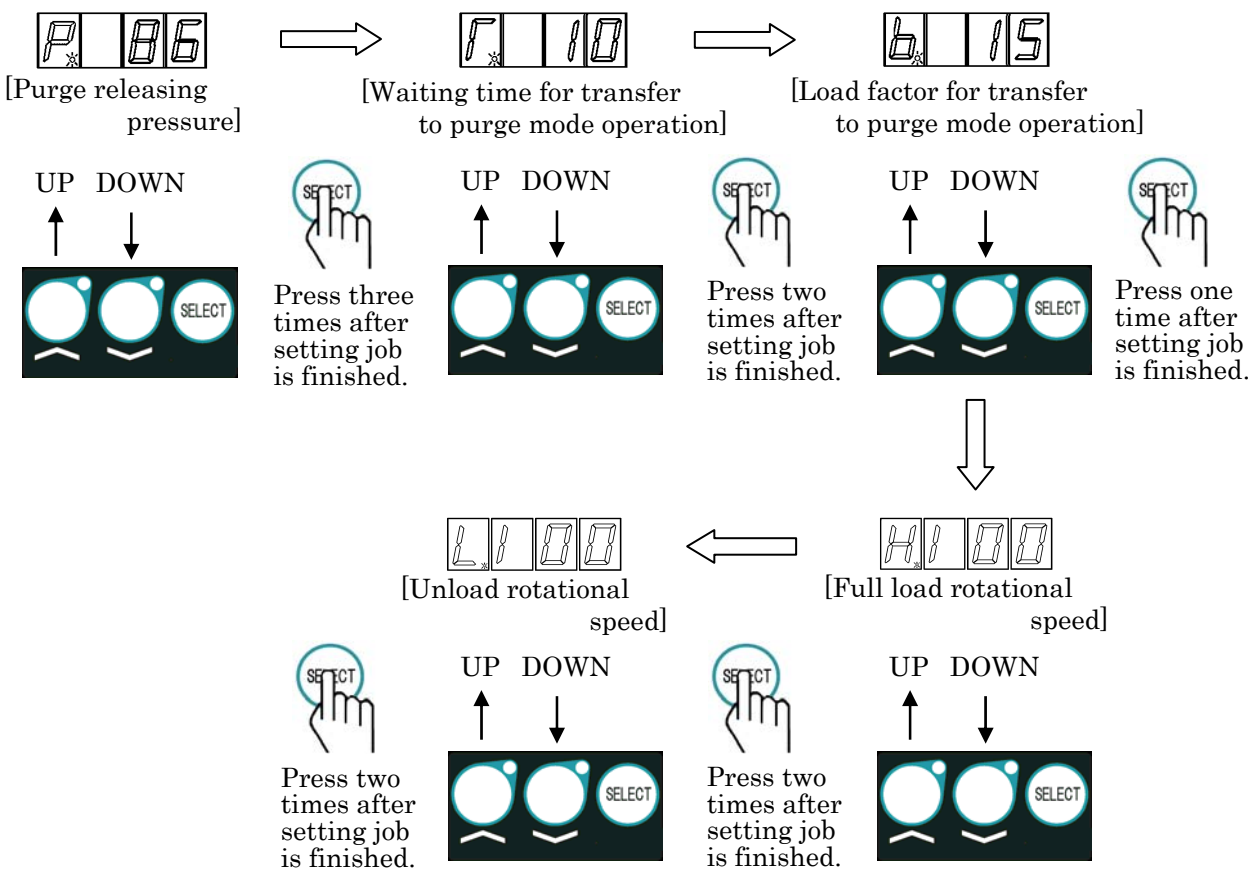
# 1. Specification

## 1.6.2 Adjustment of auto idle control (purge control) and correction of engine speed

No.	Item	Indication	Unit	Primary set value	Range of set values
1	Purge releasing pressure		PSI	86	70 to 100
2	Waiting time for transfer to purge mode operation		sec	10	5 to 60
3	Load factor for transfer to purge mode operation		%	15	5 to 30
4	The high-speed side correction (Full load rotational speed)		min <sup>-1</sup>	100	0 to 200
5	The low-speed side correction (Unload rotational speed)		min <sup>-1</sup>	100	0 to 200

### <Procedures of adjustment>

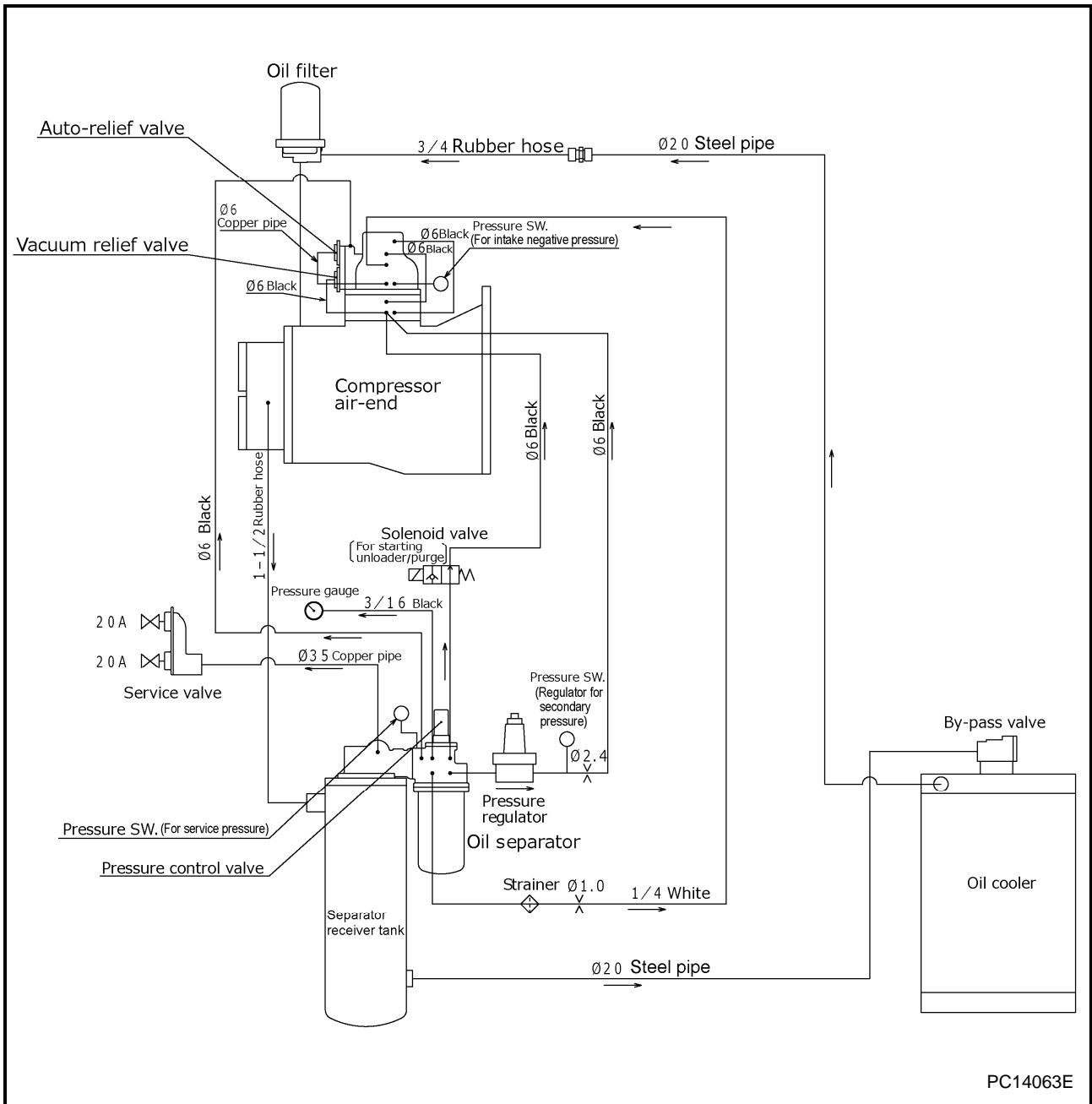
When SELECT switch is pressed longer (than 5 seconds), first P. (Purge releasing pressure) is displayed. Each time SELECT switch is pressed, each indication will be selected. Then each time it is pressed one time, T. (Waiting time for transfer to purge mode operation) is switched to b. (Load factor for transfer to purge mode operation) to H. (Full load rotational speed) to L. (Unload rotational speed), according to the set orders.





# 1. Specification

## 1.7 Piping Diagram



# 1. Specification

## 1.8 Fuel Piping

