



上海傲瀚机电设备有限公司
SHANGHAI AOHAN MARINE COMPANY

Aohan High Pressure Water Mist System

Final Drawing

Subject : Jiangnan H2390
5100TEU Container Vessel



上海傲瀚机电设备有限公司
SHANGHAI AOHAN MARINE COMPANY

1. System Description

2. Components Description

3. Control System Drawings

4. Drawings

5. Water Pressure Drop

6. Certificate

AOHAN-SAFE Local Application

Fixed Fire-fighting System

The system is a high-pressure water mist system, protecting high-risk objects/areas in engine rooms, as specified in the guidelines/requirements stressed in the Draft New Paragraph 7 of SOLAS Regulation II -2/7, as set out in annex 9 to FP 43/WP.8. And IMO MSC/Circ.913 on guidelines for the approval of fixed water-based local application fire-fighting systems for use in category A machinery spaces.

Plant Description

The AOHAN-SAFE water mist Local Application fire-fighting system is supplied for automatic and manual operation.

Dimensioning of the Local Application system is based on protection of the largest single object, in this case the main. Engine.

The Local Application plant covers the following objects in the engine room:

- Main Engine (5 Aohan-safe/L212 high pressure nozzles)
- Aux. Engine 1+2 (4 Aohan-safe/L212 high pressure nozzles)
- Aux. Engine 3+4 (4 Aohan-safe/L212 high pressure nozzles)
- Boiler (2 Aohan-safe/L212 high pressure nozzles)
- Incinerator (2 Aohan-safe/L212 high pressure nozzles)
- F.O. Purifiers (3 Aohan-safe/L212 high pressure nozzles)

Each of the above 6 sections, having its own section valve and is therefore protected individually.

System Activation

The system is designed for automatic, remote and local activation.

Automatic operation is initiated by the fire detection system.

By remote activation the system is operated from Valve Operation Panel located in the fire control station.

Local operation of the system takes place by operating one of the dedicated Push buttons located close to the protected object.

Emergency Operation

In case of error in the operation system, the section valves can be operated by opening the by-pass valve located at each section valve, and the high-pressure pump can be started by operating the pump start switch located on the front of the motor start panel.

Function Description

1. Reservoir Tank (approx. 350L)

The reservoir tank is stainless steel tank.

The tank is equipped with, water level control, filter, suction socket for high-pressure pump, drain valve, and by-pass sockets from relief valve.

Fresh water is supplied through feeding water pump, a filter, into the reservoir tank, which operates as a buffer tank for the high-pressure pump.

The water level in the tank is controlled by means of a water level control mounted in the tank. The fresh water feeding water pump starts at low level and closes at high level in the reservoir tank.

If the water supply to the reservoir tank fails during release of the system, and the water level in the reservoir tank subsequently drops below low-low level, the high-pressure pump will be stopped the water level control.

The water level control has the following functions:

L1: Closing of fresh water feeding water pump.

L2: Opening of fresh water feeding water pump.

L3: Alarm at low level.

L4: Shut down of high-pressure pump at low-low level.

Sufficient fresh water supply, and transfer of fresh water from the fresh water tank system at a pressure minimum 3 Bar, max.6 Bar to the reservoir tank, should be arranged.

2. Pump Unit

The pump is an electrically driven high-pressure pump, motor and pump are connected via a steel clutch and a clutch housing.

The high-pressure pump takes suction from the reservoir tank, and presses the water via a pressure relief valve, to a high-pressure manifold and via the main closing valve to the respective normally closed valves.

The pressure relief valve sets to the pump pressure, and is dimensioned to be able to return the full pump capacity to the reservoir tank, when the high-pressure pump is started without and section valve open.

The pump unit is supplied wired, and the motor starter control panel can be made ready with cable glands for external cables.

The pump unit is tested before shipment.

Pump data (preliminary, to be adjusted as per final design)

Design pressure:	105 Bar
High-pressure pump:	112 l/Min MAX. Pressure 180Bar
Fresh feeding pump:	WB120/185
Power supply:	3×440V, 60Hz
Protection class:	IP56
Insulation class:	F



3. Section valves

The section valves are supplied loose, ready for installation into the pipe system as a section valve arrangement, and suggested to be located outside the rooms being protected.

A section valve arrangement consists of a high-pressure electrically operated solenoid valve with a manually operated high-pressure by-pass valve.

The section valves can be operated locally at or near the section valve arrangement, or eventually at the objects protected, by pressing a “Release Water mist System” push-button.

The section valves can also be operated from the Valve Operating Panel.



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COMPONENTS DESCRIPTION

FOR

HIGH PRESSURE WATER MIST SYSTEM



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Position NO.	Description	Pieces	Type	Data sheet NO.	Dimensions/ Connections
1	Water Feeding Pump	1	YUEHUA WB120/185	1	INPUT G5/4" OUT G1"
2	High-pressure Pump	1	DANFOSS PAH 80	2	1 ^{1/2}
3	Filter	1	GS-NAI-3	6	DN40
4	Stainless Steel Reservoir Tank	1	304 Stainless steel		350L
5	Level Control System in Tank	1	TIAN MIN UHK		
6	Drain Valve for Tank	1			DN25
7	Relief Valve	1	Stainless steel	3	3/4" 3/4"
8	Pressures Indicator	1		5	
9	Test Valve	1	High-pressure Stainless steel valve	7	1 ^{1/2}
10	Section Valve	1	ZCPY	8	ZG1/2
11	Piping System		φ 34×3 304 stainless steel		
12	Piping System		φ 18×1.5 304 stainless steel		
13	Main closing valve	1	High-pressure stainless steel	7	1 ^{1/2}
14	Motor	1	XIANFENG Y-H	4	
15	Solenoid valve	1	Stainless valve		
16	Push button	6			
17	Alarm	6			
18	Flame detectors	12			
19	VOP	1	Including the fire alarm panel and remote panel		
20	Pump start panel	1			

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Position NO.	Description	Pieces	Type	Data sheet NO.	Dimensions/ Connections
21	Instruction label; including caution labels, name plates	1set			
22	Fitting	1set			
23	Repeater panel on bridge	1			

Type: YUEHUA WB120/185
Power: 1.85KW
Operating point flow: 120L/min

**Materials:**

Casing, back-cover, impeller and pump shaft: SUS304 or SUS316L stainless steel.
Bracket and motor casing: Aluminum-alloy.
Standard mechanical seal: NBR/ceramic/carbon

Technical data:

Suction size: G 5/4"
Discharge size: G 1"
Liquid temperature: -15°C~+80°C

Motor:

Insulation class: F
Protection class: IP55
Three-phase version: 440V-60HZ

DANFOSS PAH PUMP--- PAH80


Generally

PAH 2/4/6/3, 10/12/5, 25/32 and 50/63/70/80 are pumps designed to supply water flow under high pressure. The pumps are based on the axial piston principle enabling a very light and compact design.

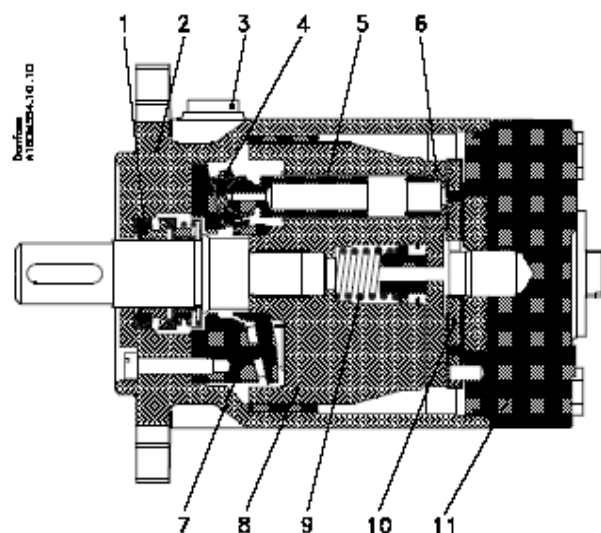
The pumps are designed so that lubrication of the moving parts in the pumps is provided by the water itself. No oil lubrication is thus required.

All parts included in the pumps are designed to provide long service life, i.e. long service life with a constantly high efficiency and minimum of service required.

The pumps are fixed displacement pumps where the flow is proportional to the number of revolutions of the input shaft and the pump displacement.

PAH 25/32 cross-section

- 1: Shaft sealing
- 2: Mounting flange/
housing with bearing
- 3: Bleeding plugs
- 4: Retaining ring
- 5: Piston/shoe
- 6: Valve/thrust plate
- 7: Swash plate
- 8: Cylinder barrel
- 9: Spring
- 10: Port plate
- 11: Connecting flange



Benefits

- Very compact and light pump (can be installed with direct coupling to an electric motor/combustion engine.)
- Generates insignificant pulsations in the pressure line.
- No preventive maintenance required (no periodic service like e.g. change of lubricant and wear parts).
- Long service life
- All parts of the pump are made of non-corrosive material and the surface is easy to clean
- Few wearing parts

Application examples

- Stationary and mobile hydraulic systems
- High pressure systems
- Fire fighting
- Flushing and cleaning processes
- Humidification systems

Code numbers

	Standard pumps ¹⁾ pumps	Stainless steel
PAH 2	180B0024	Standard
PAH 4	180B0022	Standard
PAH 6.3	180B0023	Standard
PAH 10	180B0008	Standard
PAH 12.5	180B0007	Standard
PAH 25 ²⁾	180B0015	180B0036
PAH 32 ²⁾	180B0016	180B0037
PAH 50 ²⁾		180B0047
PAH 63 ²⁾	180B0017	180B0040
PAH 70 ²⁾		180B0042
PAH 80 ²⁾	180B0018	180B0041

1) Please contact Danfoss sales organization for special version.

2) Please contact Danfoss sales organization for technical data.

3) Standard pumps are with aluminium housing.

Technical data

PAH pumps, standard version		2	4	6.3	10	12.5	25	32	63	70	80
Geometric displacement	cm ³ /min ⁻¹	2	4	6.3	10	12.5	25	32	63	70	80
Max. pressure. cont. ¹⁾	bar	100	140	140	160	160	160	160	160	160	160
Max. pressure. intermittent ²⁾	bar	120	160	160	180	180	180	180	180	180	180
Max. pressure. peak ³⁾	bar	160	200	200	220	220	220	220	220	220	220
Max. speed cont. ⁴⁾	min ⁻¹	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Min. speed cont. ⁴⁾	min ⁻¹	700	700	700	700	700	700	700	700	700	700
Max. flow. cont. at 1500 min ⁻¹ ⁵⁾	l/min	2.2	5	8	13.5	17	34	44	86	97	112
Max. power requirement at 1500 min ⁻¹	kW	0.6	1.6	2.5	4.2	5.3	10.5	13.5	26	29	33
Weight	kg	4.4	4.4	4.4	7.7	7.7	9.7	9.7	20.5	20.5	20.5

1) For higher pressure, please contact Danfoss Sales Organization.

2) Intermittent pressure is <10 % every minute.

3) Peak pressure is <1 % every minute.

4) For higher or lower speed, please contact Danfoss Sales Organization.

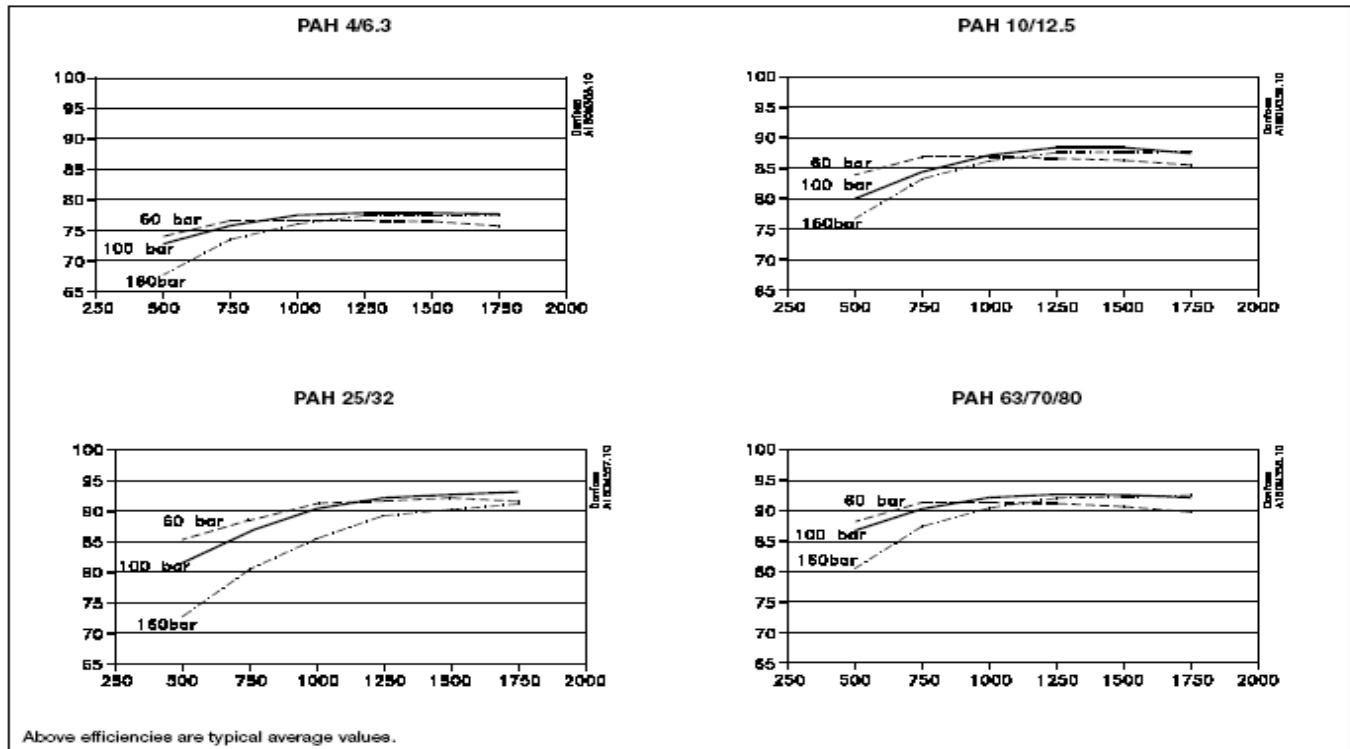
5) Flow at max. pressure continuously.

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Total efficiencies, standard pumps

Suction pressure

Water supply to the pump is either made from a tank placed over the pump or directly from the mains. The pressure at the pump inlet (T) must be in the range: 0 bar - 4 bar (atm).

If higher boost pressure is required, please contact Danfoss Sales Organization for Water Hydraulics.

Temperature

Fluid temperature:

- Min. +3°C to max. +50°C at max. cont. pressure
- Min. +3°C to max. +60°C at max. 100 bar.

Ambient temperature:

- Min. +0°C to max. +50°C.

Storage temperature:

- Min. -40°C to max. +70°C.

For operation at lower temperatures than +3°C, please see the paragraph on antifreeze protection and contact Danfoss Sales Organization for Water Hydraulics.

For operation at higher temperatures please contact Danfoss Sales Organization for Water Hydraulics.

Shaft load

The pump is neither to be exposed to axial nor radial loads. We therefore recommend to use a flexible coupling for connection to the electric motor or the combustion engine.

Noise level

The chart indicates the noise level in dB(A) measured at a distance of 1 m from the pump in a reverberation room. The anechoic noise level is calculated by subtracting 3 dB(A) from the values stated.

Standard pumps	40 bar	140 bar
PAH 2	58	72
PAH 4	58	72
PAH 6,5	61	72
PAH 10	73	71
PAH 12,5	73	71
PAH 25	68	71
PAH 32	68	72
PAH 63	74	78
PAH 70	74	78
PAH 80	74	78

*) Please contact Danfoss Sales Organization if pumps with further noise reduction are required.

Filtration

The applied water must be filtered through a 10 μm abs., β_{10} -value > 5000 filter.

In closed systems (hydraulic systems), where the water is led back to tank for recirculation, the filter must be placed in the return line.

In open-ended systems (continuous supply of "fresh" water) the filter must be placed before the pump or the tank to ensure continuous filtration.

For further filter details, please contact the Danfoss Sales Organization.

RELIEF VALVE

Design and function

The relief valve is used for protecting the components of a system against overload as a result of a pressure peak. Further, the valve is designed for controlling / limiting the system pressure by draining off the surplus water from the pressure side.

The valve is designed for tap water, i.e. without additives of any kind to the medium.

Features

- Excellent functional characteristics.
- Surface easy to clean.
- Corrosion-proof parts (stainless steel)

Filtration

The Water must be clean and must be free from sediments.

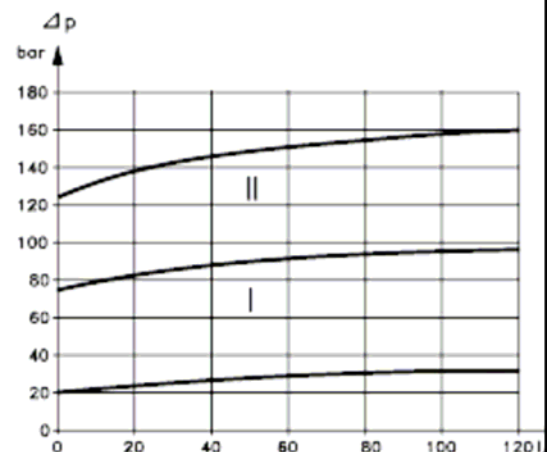
Technical data

Max. flow: 120 l/min

Pressure setting range:

25 - 80 bar (I), alt.

→ 80 - 140 bar (II)

P/Q characteristic:


Y-H is a design of the brand-new Y series developed recently and noted for its high efficiency and starting torque.

The motor are designed in according to the National Standard GB 755-87 “the Fundamental Technical Requirements of the Electrical Machines” and the “Rules of register of Shipping of the PRC and Regulations for the construction of Sea-going Steel Ships”.

The motors also comply with the relevant requirements of the following standards and specifications:

IEC34	Rotating electrical machines
IEC72.1972	Dimensions and output ratings for rotating electrical machines
IEC92	Electrical installation in ships
IEC68	Basic environmental testing procedures

Operating Conditions:

Temperature of the ambient	not exceeding 80°C
Relative humidity	≅95%
Dew	exists
Salt mist	exists
Oil mist	exists
Fungus	exists
Shock	exists
Vibration	exists
Inclination	22.30°
Sway	exists

Rated Voltage and Frequency	380V/50Hz or 440/60Hz
Duty	Continuous (S1)
Insulation	F
Protection class	IP56



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Data sheet No. 4

XIANFENG Y-H

Page 2 of 2

Type	Rated output		Rated Current		Rated Speed		Booked-rotor Torque Rated Torque		Maximum torque rated torque		Locked rotor apparent power Rated output		Efficiency (%)		Power Factor	
	Kw	HP	50Hz, 380V	60Hz, 440V	50Hz, 380V	60Hz, 440V	50Hz, 380V	60Hz, 440V	50Hz, 380V	60Hz, 440V	50Hz, 380V	60Hz, 440V	50Hz,380V	60Hz, 440V	50Hz, 380V	60Hz, 440V
Y160M-4-H	11	15	22.6	19.5	1460	1760	1.8		2		12		88.5	89	0.83	0.83
Y160L-4-H	15	25	30.3	26	1460	1760	1.8		2		12		89	91	0.86	0.86
Y180M-4-H	18.5	25	35.9	31	1470	1770	1.8		2		12		91	91.5	0.86	0.86
Y180L-4-H	22	30	42.5	36.7	1470	1770	1.8		2		12		91	90	0.87	0.86
Y200L-4-H	30	40	56.9	49.8	1476	1779	1.7		1.9		11		91.5	92	0.87	0.86
Y225S-4-H	37	50	70.4	60.9	1481	1783	1.7		1.9		11		92	92.5	0.87	0.87

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Measurement range: 0-25MPA

Size: 60mm

Operating temperature:

Ambient: -20°C to +60°C

Medium: +100°C maximum.

Temperature error:

Additional error when temperature of the pressure element deviates from +20°C a

Rising temperature: +0.4°C%/10K of true scale value

Falling temperature: -0.4°C%/10K of true scale value

Protection class: IP56

Movement: stainless steel

Window:

Laminated safety glass

Bezel ring:

Cam ring (bayonet type), natural finish stainless steel

Liquid filling:

Glycerine 99.7%

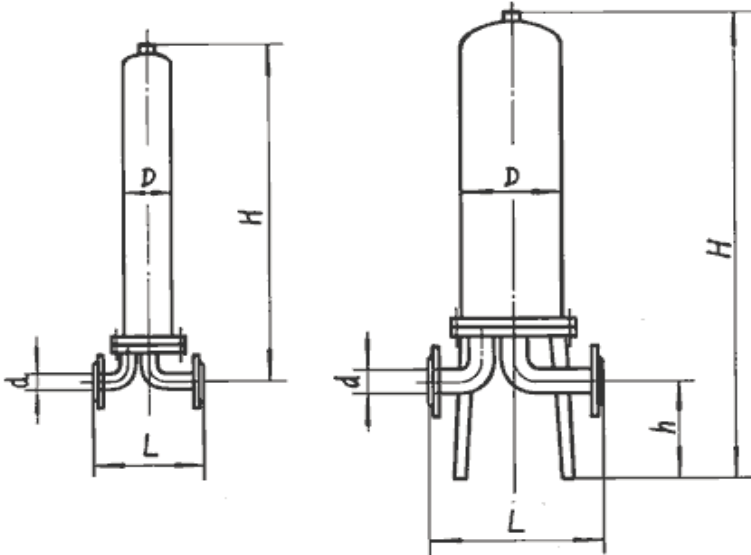
Specification: Type: GS-NAI-3 20" × 3 10 μ m

Capacity: 6m³/h

Construction: stainless steel housing/polypropylene filter

MAX. Temperature: +80°C

Dimensions: DN40



GS-NAI (0.22 μ m)

Type	Filter		Capacity (Per filter)	Size(mm)				
	Amount	Length (mm)		Dimension	D	L	H	h
GS-NAI-0.5	1	250	0.5	22	91	200	470	
GS-NAI-1	1	500	1	25	91	200	850	
GS-NAI-3	3	500	3	40	186	306	880	220
GS-NAI-5	5	500	5	57	256	400	920	230
GS-NAI-10	9	500	10	76	306	450	960	240
GS-NAI-15	13	500	15	76	356	510	1200	240
GS-NAI-20	19	500	20	89	408	560	990	250
GS-NAI-30	24	500	30	108	508	720	1395	265
GS-NAI-50	24	750	50	133	508	720	1700	280



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Data sheet No. 7

High-pressure valves

Page 1 of 1

Technical data:

Material: 304 stainless steel

Seal and seat material: Teflon

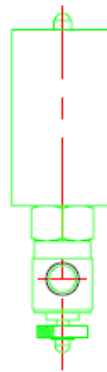
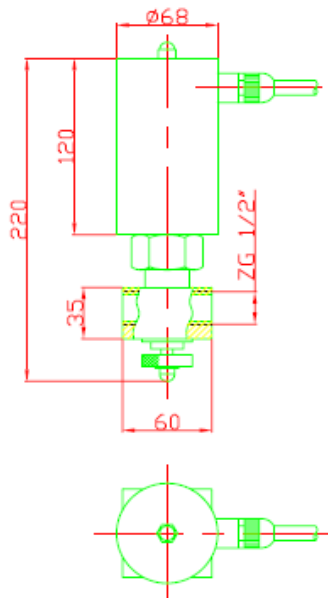
Working pressure: 0-180 Bar

Dimension: 1 ^{1/2}

The section valve arrangement consists of a high-pressure electrically operated solenoid valve with manually emergent operation function.

The section valves can be operated locally at or near the section valve arrangement, or eventually at the objects protected, by pressing a “Release Water mist System” push-button.

The section valves can also be operated from the Valve Operating Panel.



Type: ZCPY 24V

Working pressure: 12MPA

MAX. Flow: 120L/min

Dimension: ZG1/2"

Max. Working temperature: +80°C

Protection class: IP56

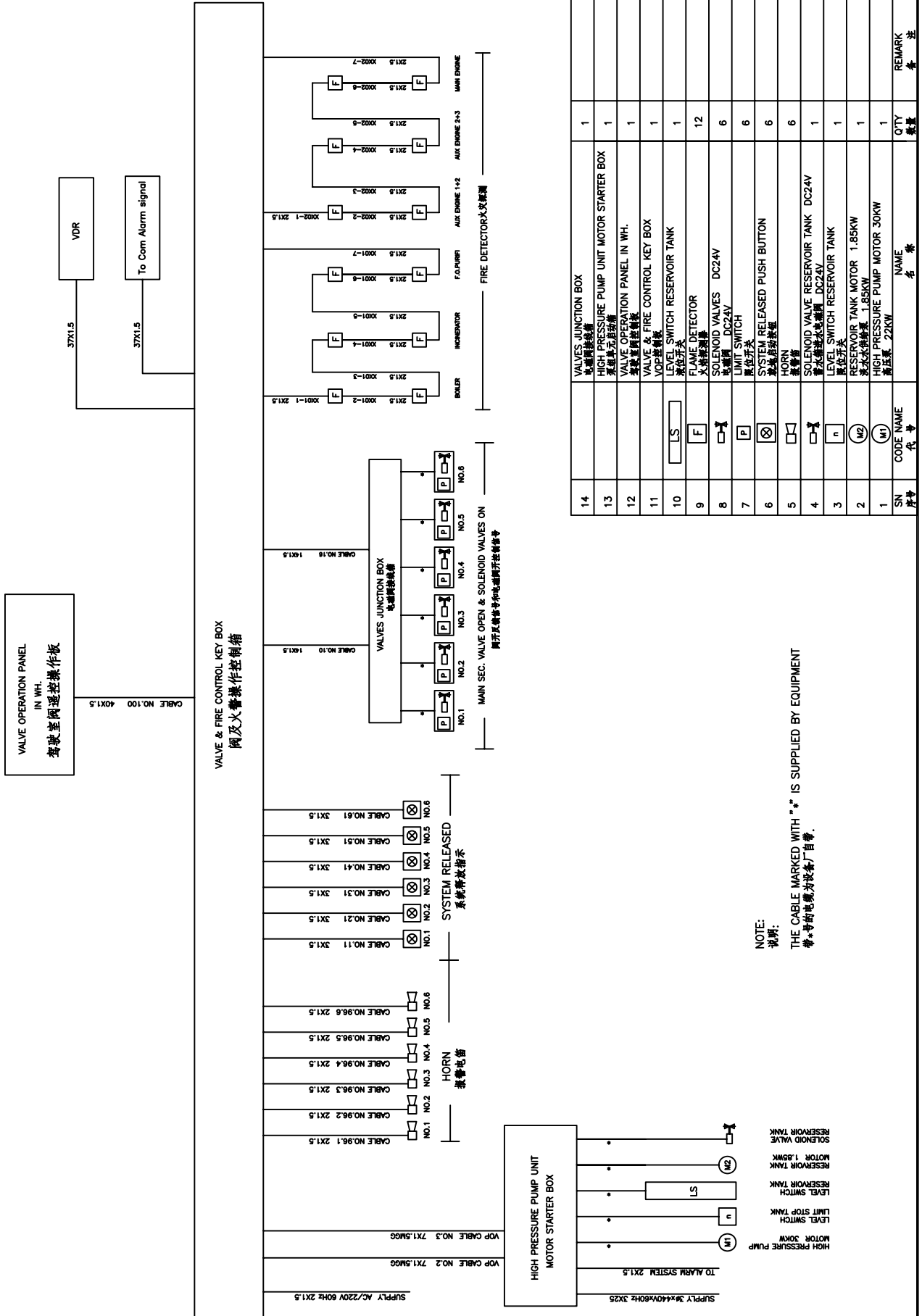


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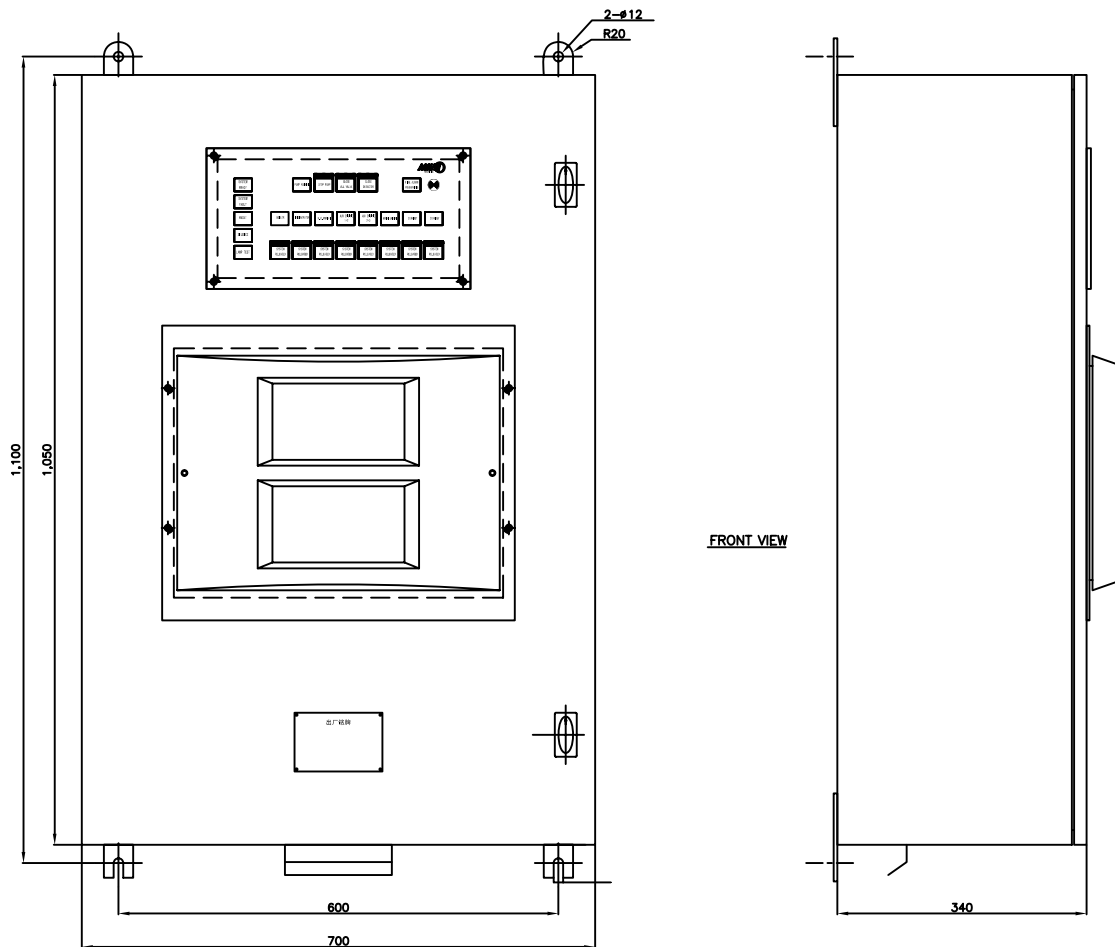
Drawing List

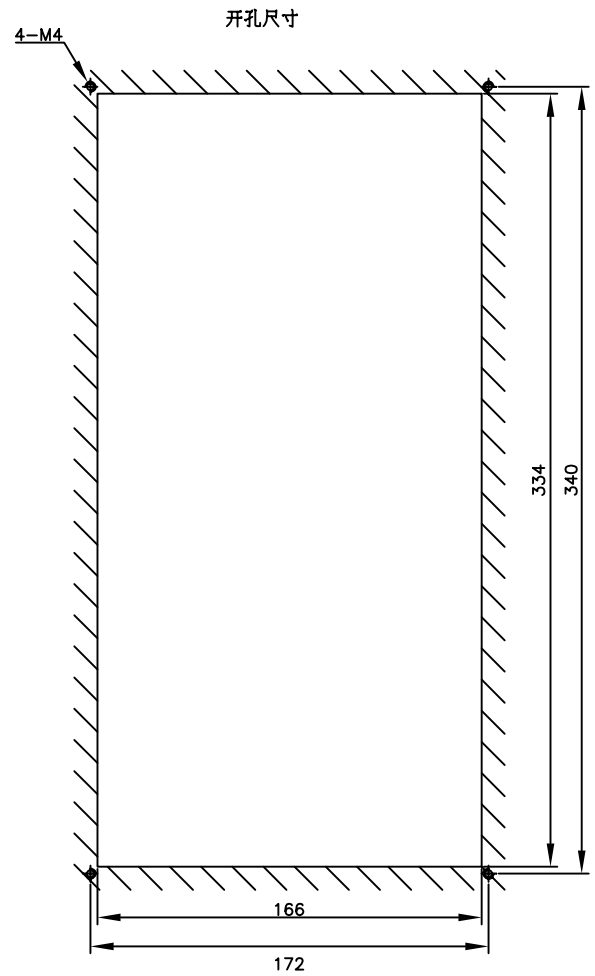
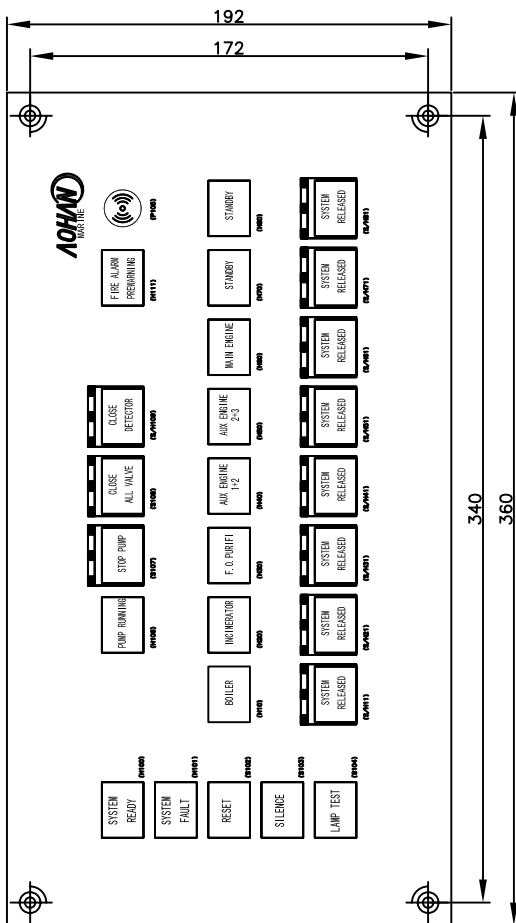
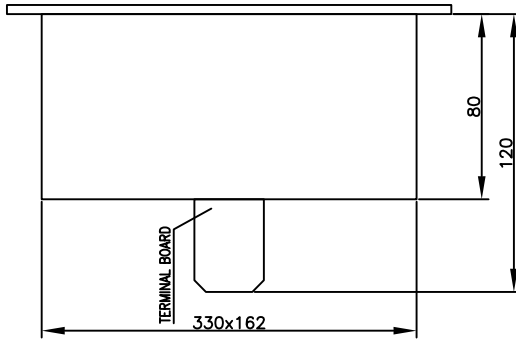
No.	Name	Count
1	Control system	23
2	Fire detect system	
3	High pressure water mist system	1
4	High pressure nozzle	1
5	Pump unit	1
6	Engine room arrangement	2
7		

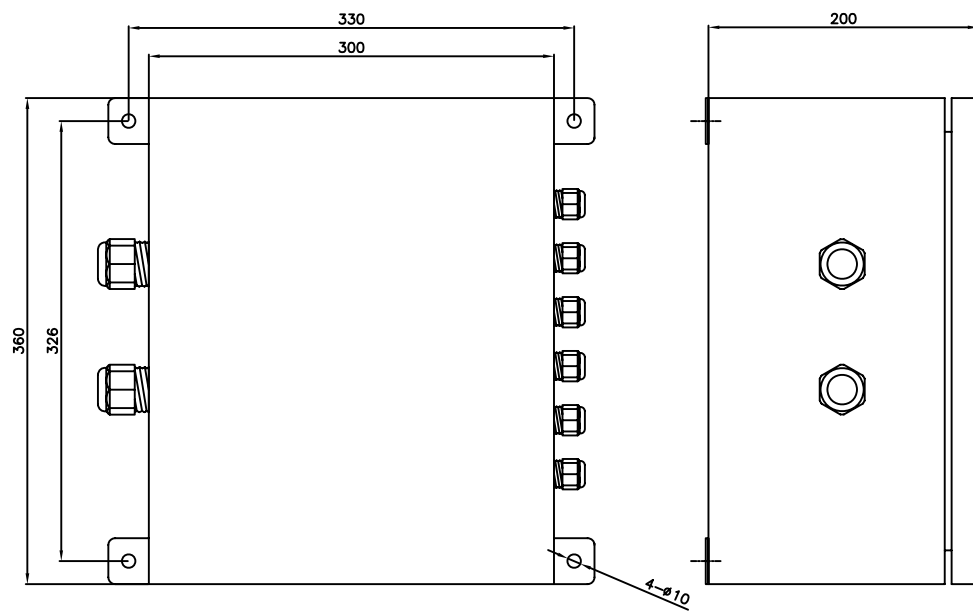


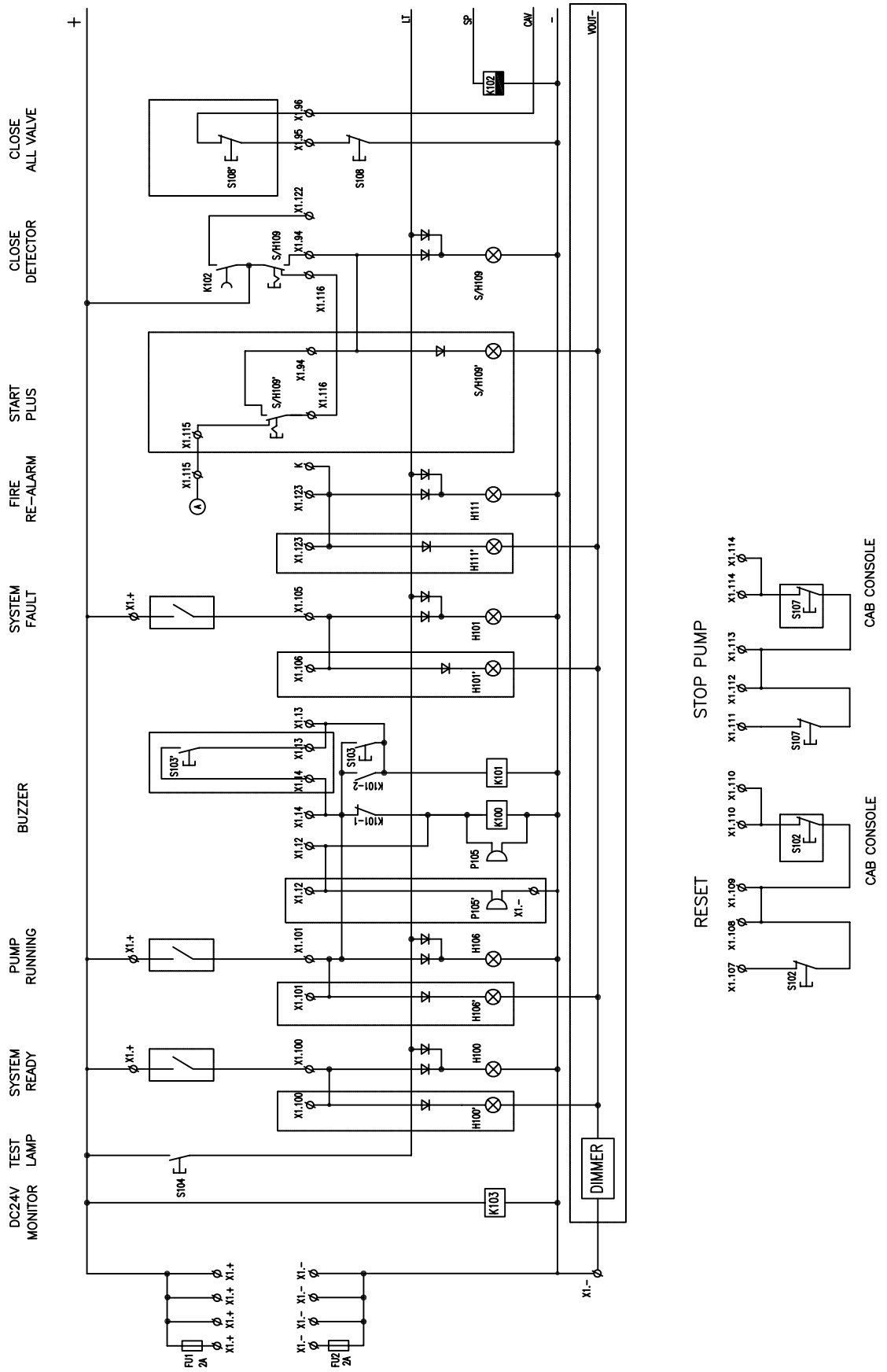
NOTE:
说明:
THE CABLE MARKED WITH "*" IS SUPPLIED BY EQUIPMENT
带*号的电缆为设备厂自带。

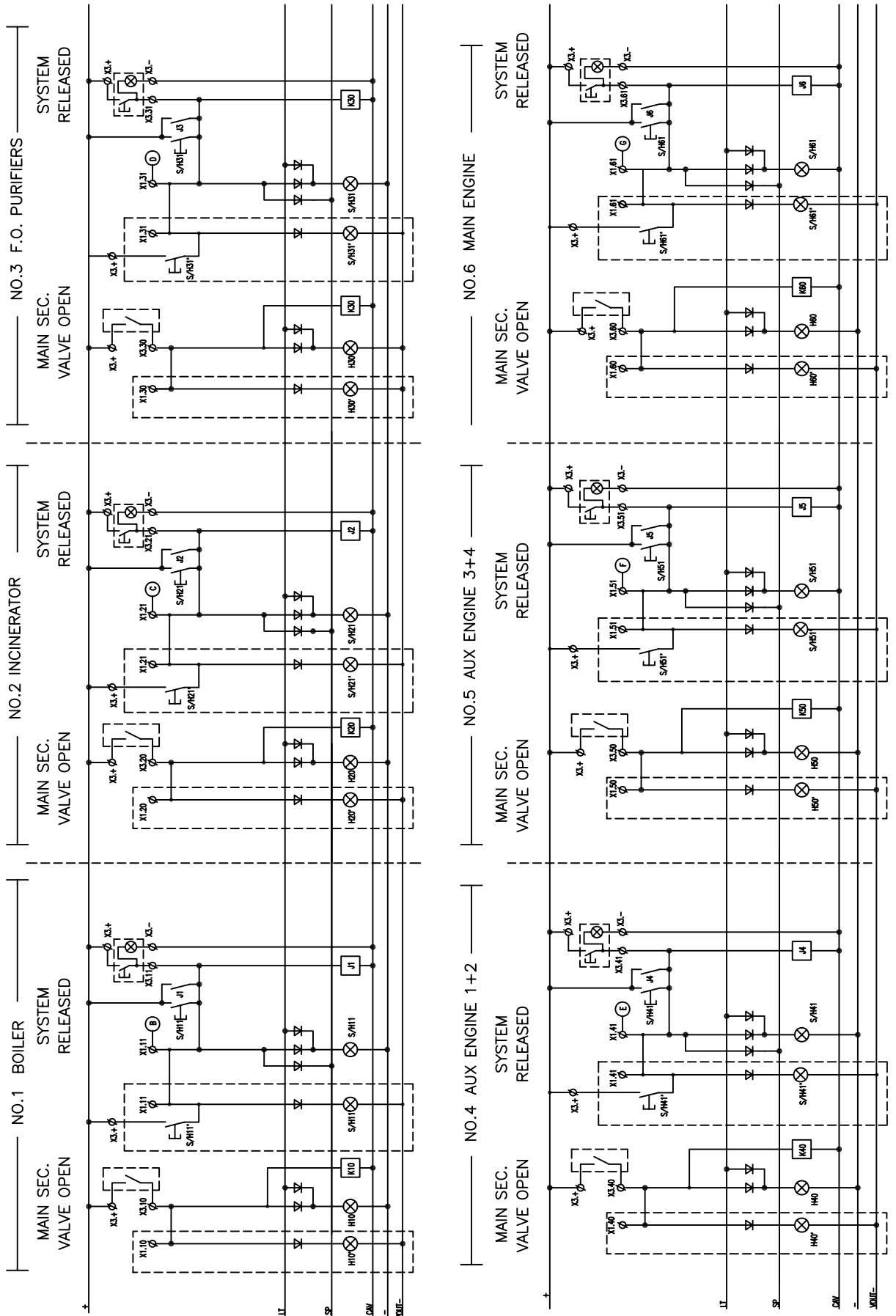
序号	代号	名称	数量	备注
14		VALVES JUNCTION BOX 电磁阀接线箱	1	
13		HIGH PRESSURE PUMP UNIT MOTOR STARTER BOX 高压泵单元启动箱	1	
12		VALVE OPERATION PANEL IN WH. 驾驶室阀遥控操作板	1	
11		VALVE & FIRE CONTROL KEY BOX VOP控制箱	1	
10	LS	LEVEL SWITCH RESERVOIR TANK 液位开关	1	
9	F	FLAME DETECTOR 火焰探测器	12	
8	DC24V	SOLENOID VALVES DC24V 电磁阀 DC24V	6	
7	LS	LIMIT SWITCH 限位开关	6	
6	DC24V	SYSTEM RELEASED PUSH BUTTON 系统释放按钮	6	
5	DC24V	HORN 报警电笛	6	
4	DC24V	SOLENOID VALVE RESERVOIR TANK DC24V 潜水阀电磁阀 DC24V	1	
3	n	LEVEL SWITCH RESERVOIR TANK 液位开关	1	
2	M2	RESERVOIR TANK MOTOR 1.85KW 潜水阀电泵 1.85KW	1	
1	M1	HIGH PRESSURE PUMP MOTOR 30KW 高压泵 22KW	1	

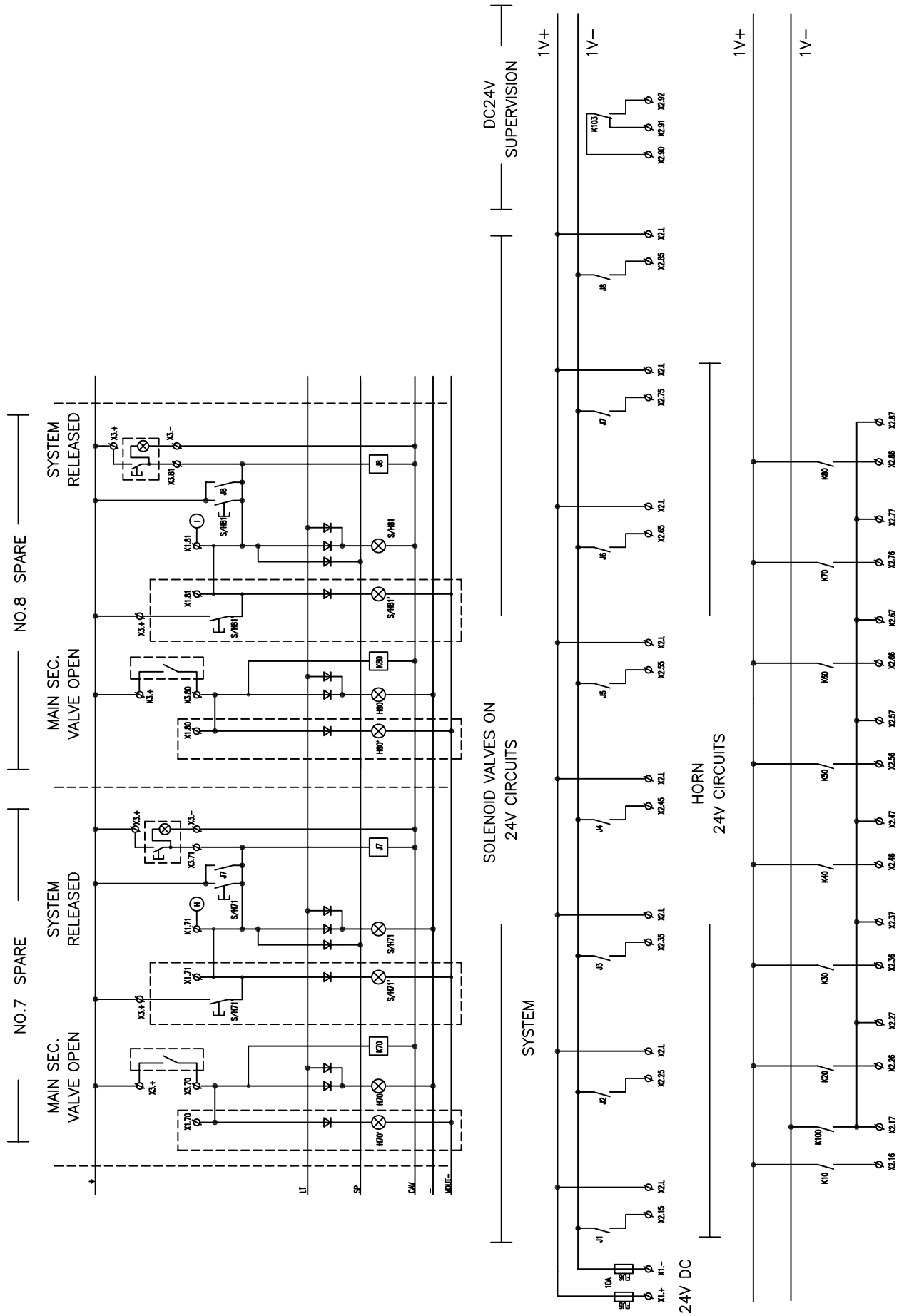


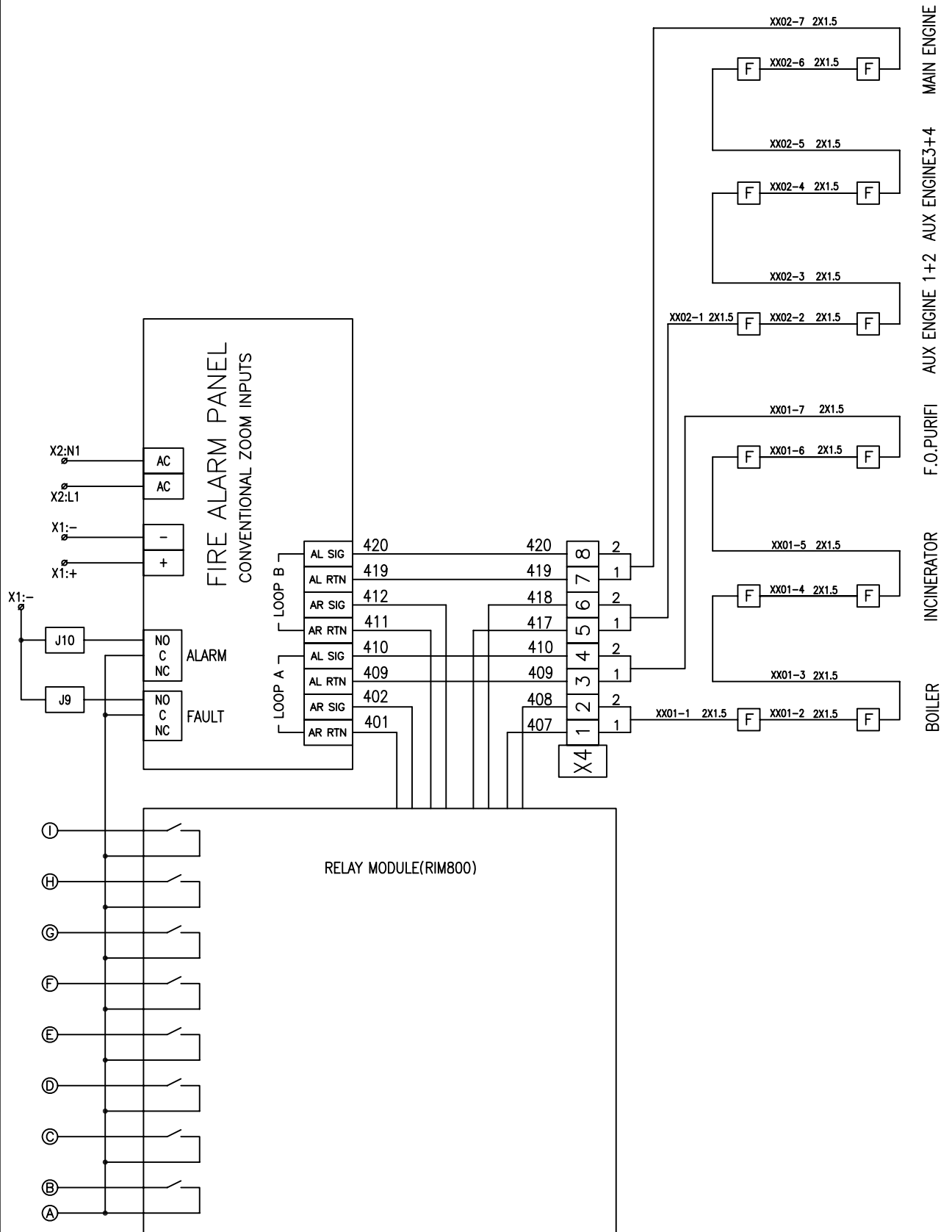


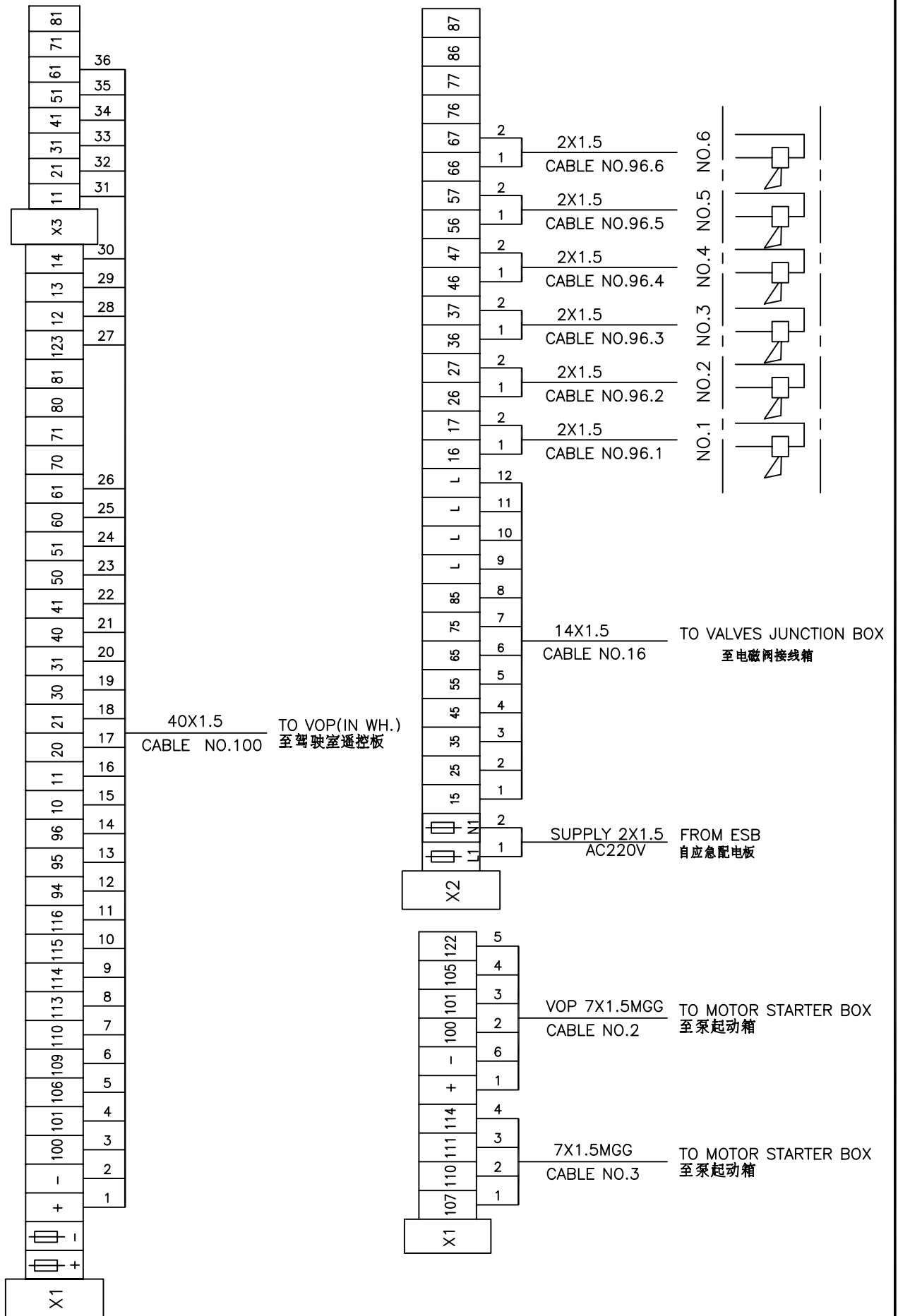


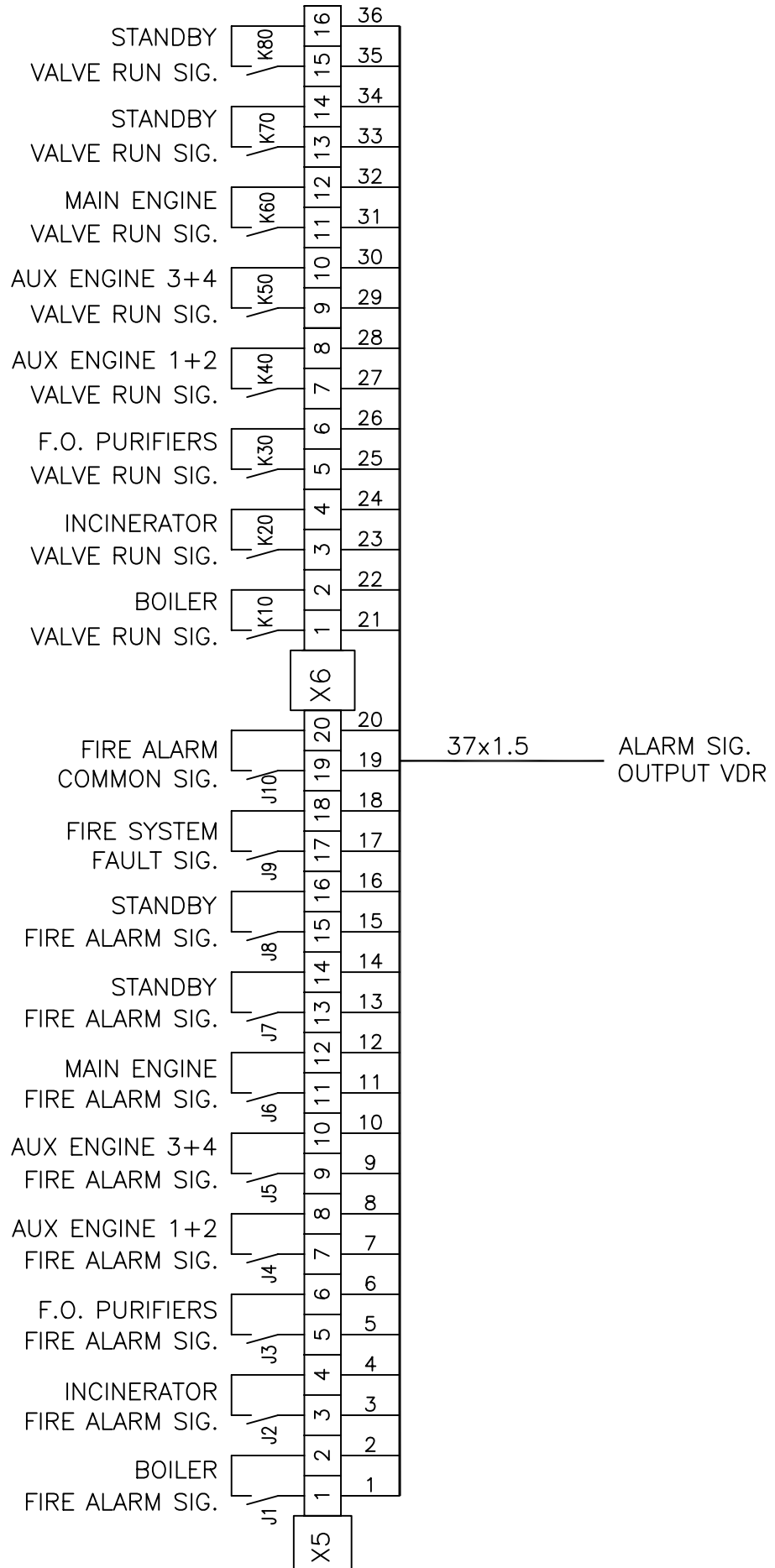


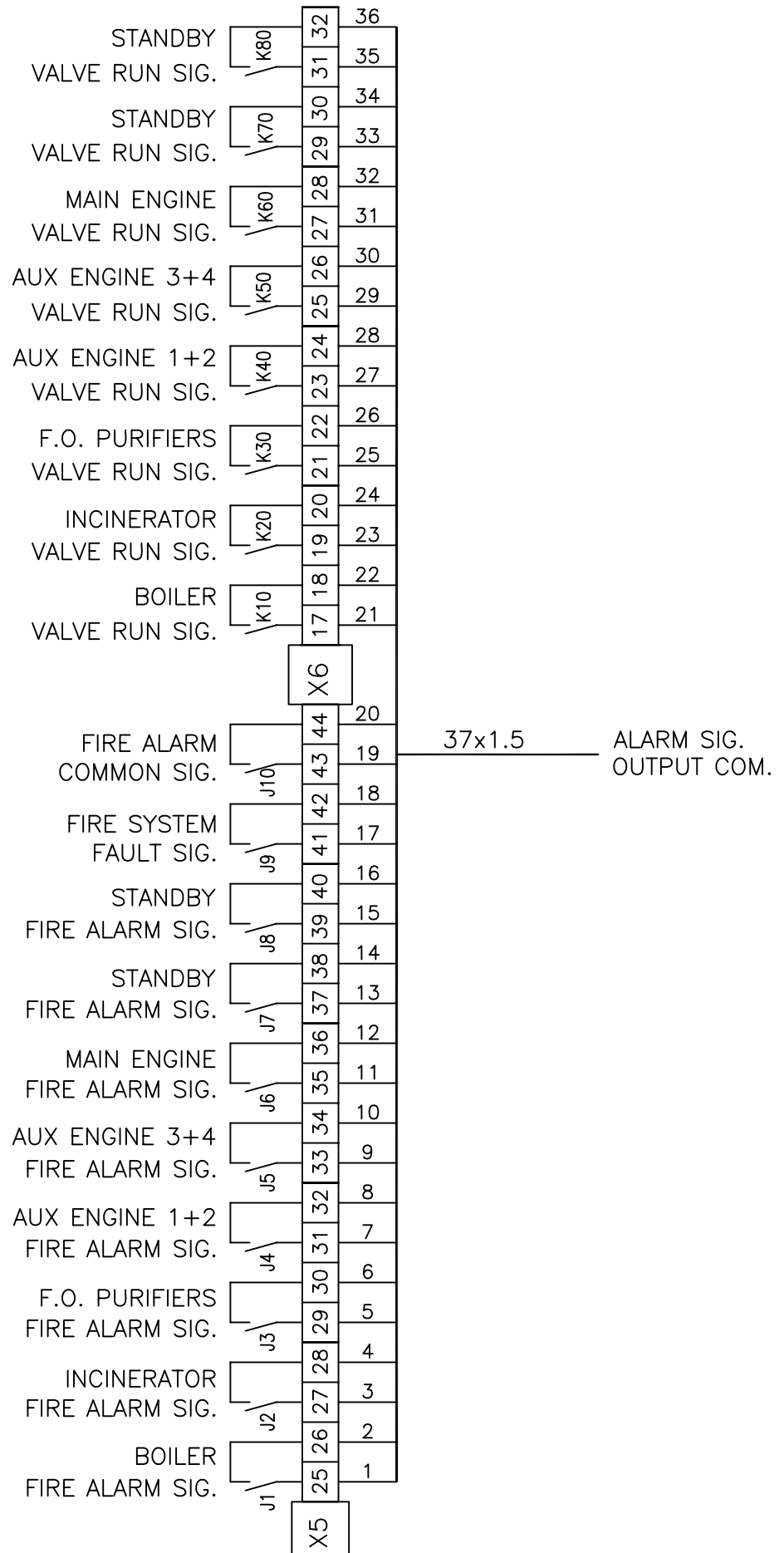




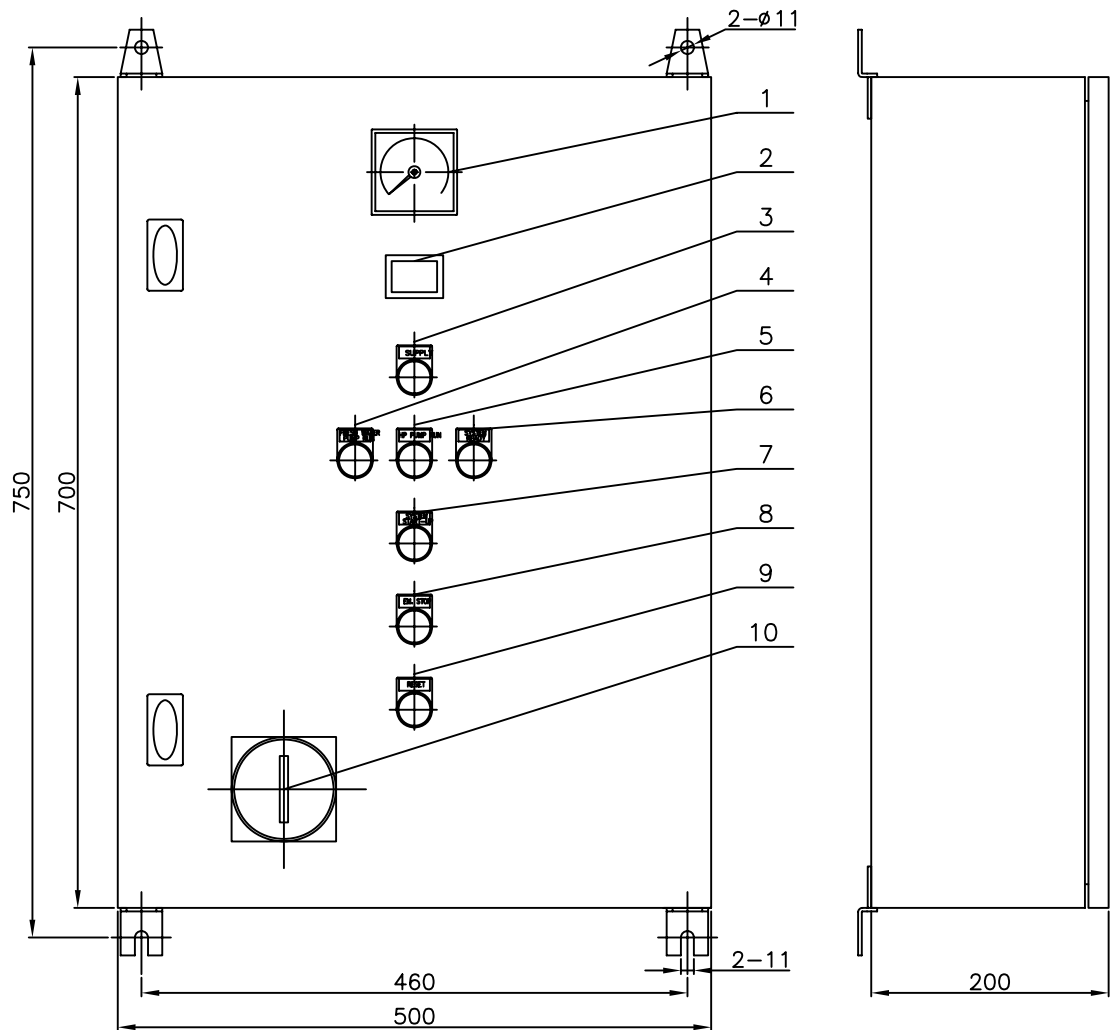






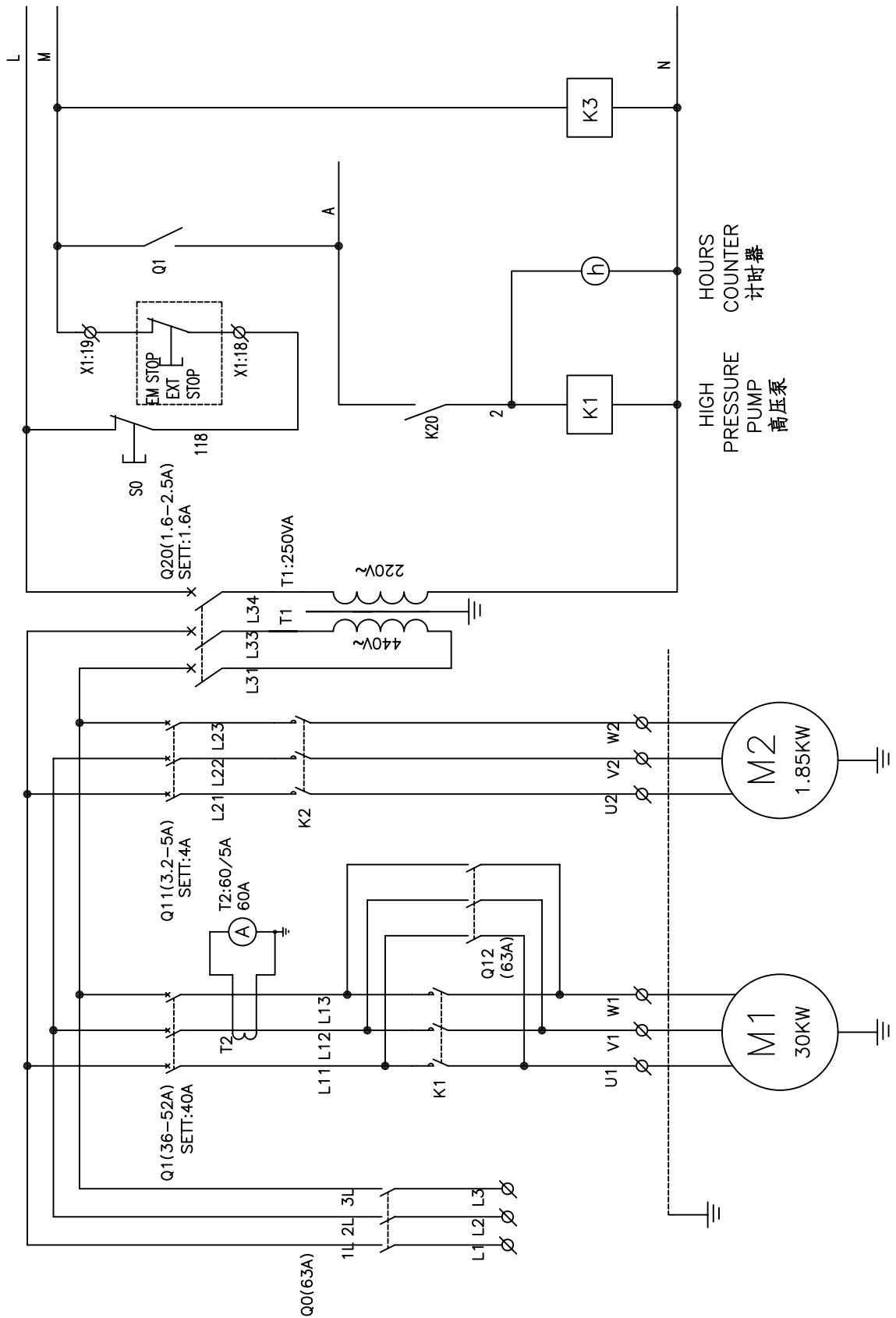


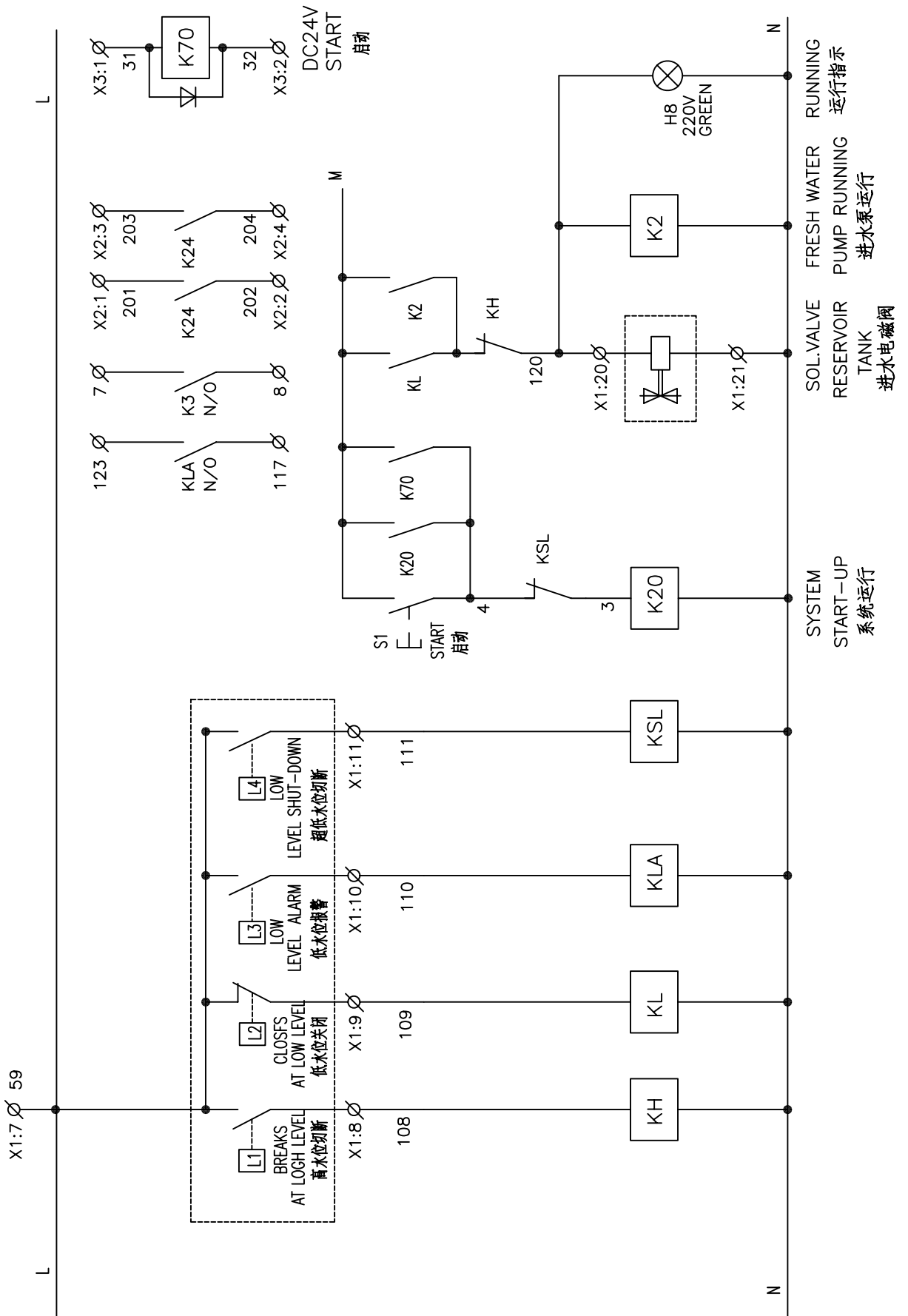
17		CIRCUIT BOARD	4	PCB-1 DC24V	SHENGFA
16	X6	TERMINAL	30	SAKD-2.5N	WEIDMULLER
15	X5	TERMINAL	60	SAKD-2.5N	WEIDMULLER
14	X4	TERMINAL	16	SAKD-2.5N	WEIDMULLER
13	X3	TERMINAL	42	SAKD-2.5N	WEIDMULLER
12	X2	TERMINAL	37	SAKD-2.5N	WEIDMULLER
11	X1	TERMINAL	46	SAKD-2.5N	WEIDMULLER
10	FU1-FU4	FUSE TERMINAL	4	ASK-1EN/(5x20)	WEIDMULLER
9	P105	BUZZER	1	AD16-16MJ-DC24V	ERGONG
8	H10-80,H101,H111	INDICATOR LIGHT	10	AD16-16CJ/R-DC24V	ERGONG
7	H100,H106	INDICATOR LIGHT	2	AD16-16CJ/G-DC24V	ERGONG
6	S/H109	BUTTON(INDICATOR)	1	LA39-E22TDJ/R-DC24V	ERGONG
5	S/H11-81	BUTTON(INDICATOR)	8	LA39-E22DJ/R-DC24V	ERGONG
4	S107-108	BUTTON	2	LA39-E22J/G	ERGONG
3	S102-104	BUTTON	3	LA39-E22J/Y	ERGONG
2	K102	TIME RELAY	1	MR3Y-A8 DC24V	OMRON
	K100,101,103,K10-80	RELAY	11	MY4NJ-DC24V	OMRON
SN	NO.	NAME	Q'TY	TYPE	REMARK

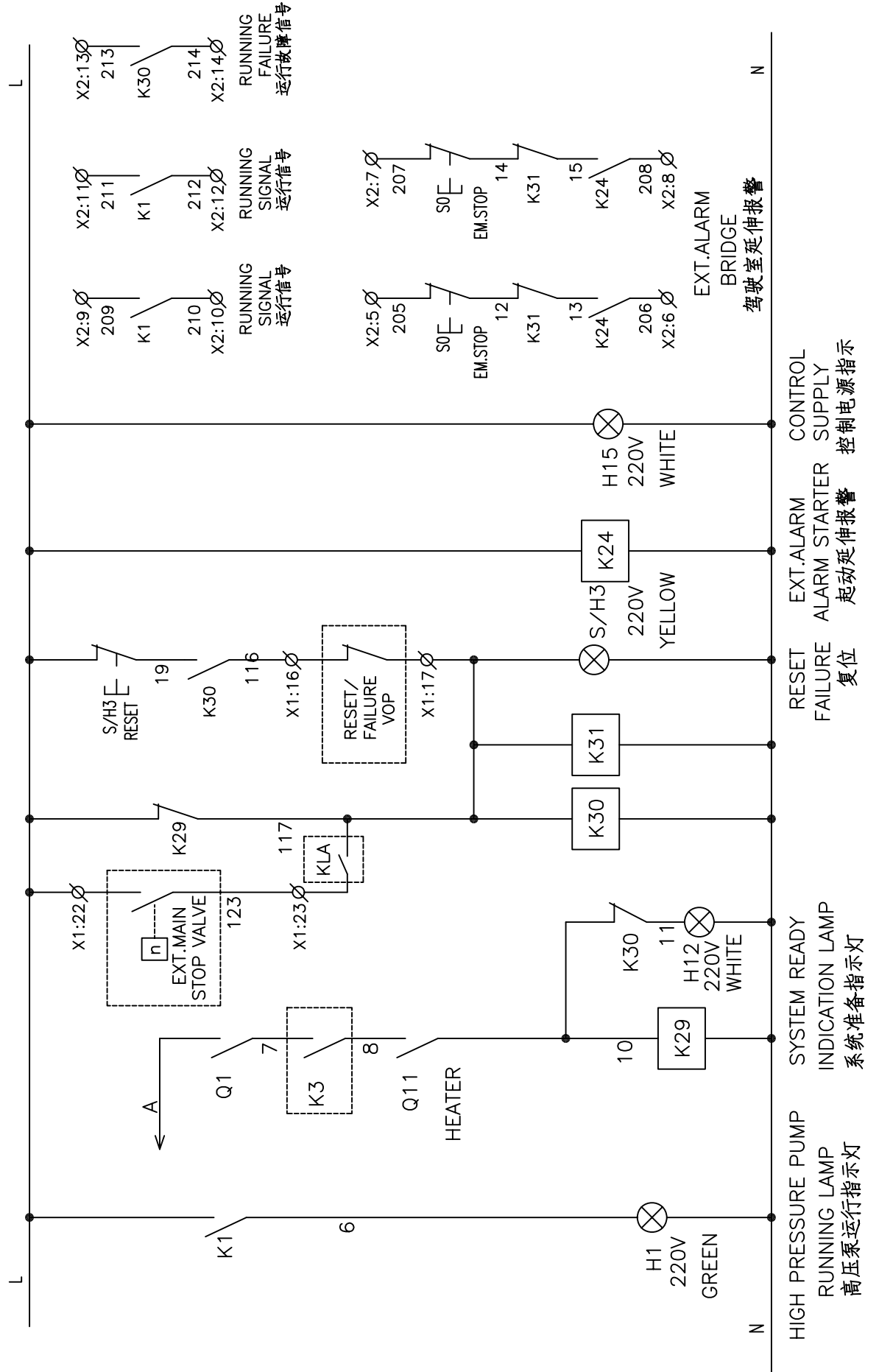


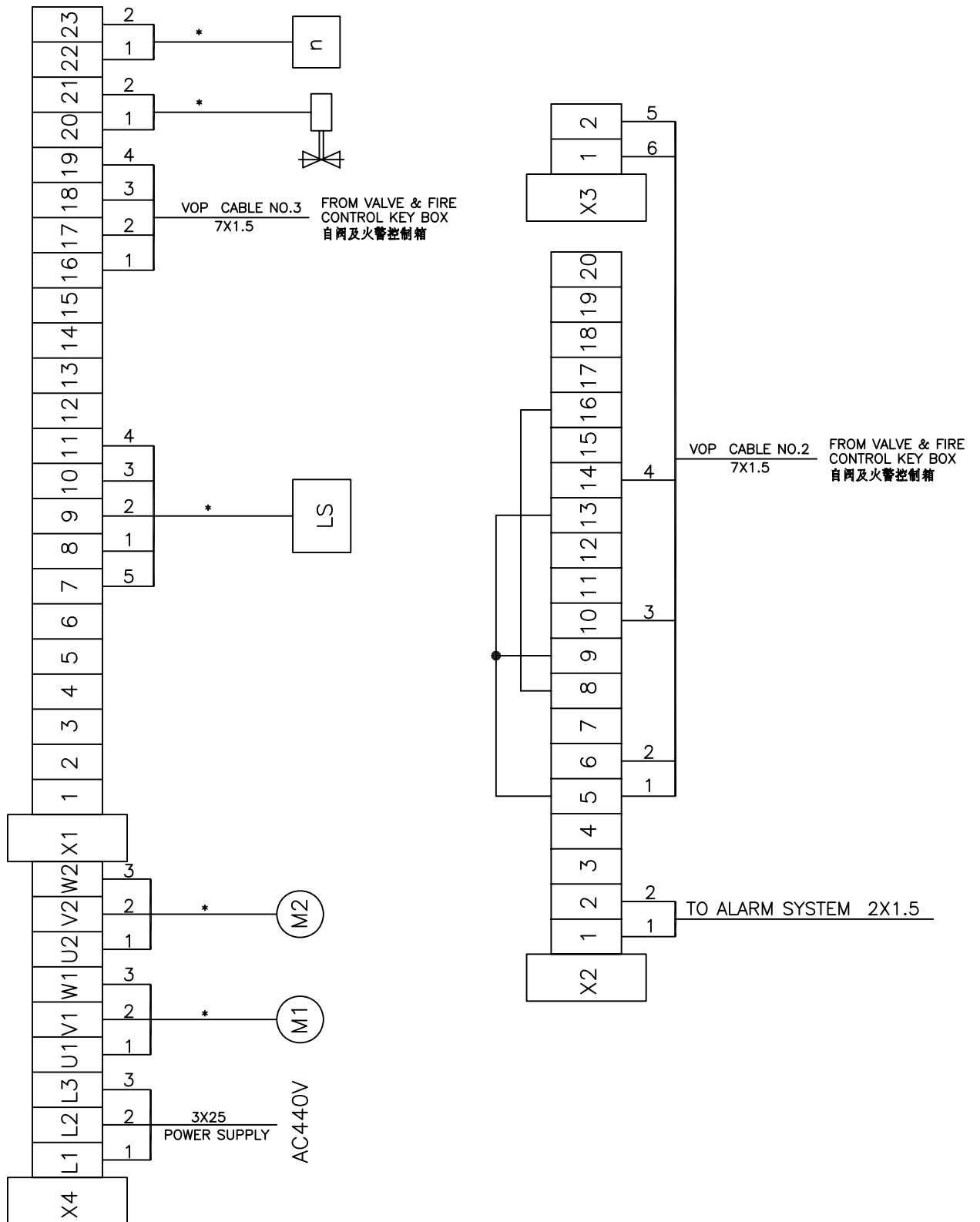
10	Q0	CONTROL SWITCH	1		
9	S/H3	RESET	1		
8	S0	EM. STOP	1		
7	S1	SYSTEM START-UP	1		
6	H12	SYSTEM READY	1		
5	H1	HP PUMP RUN	1		
4	H8	FRESH WATER PUMP RUN	1		
3	H15	SUPPLY	1		
2	h	OPERATING TIME METER	1		
1	A	AMMETER	1		
Order	Code	Name	Name	Q'TY	Remarks

AREA: 0.0625m²





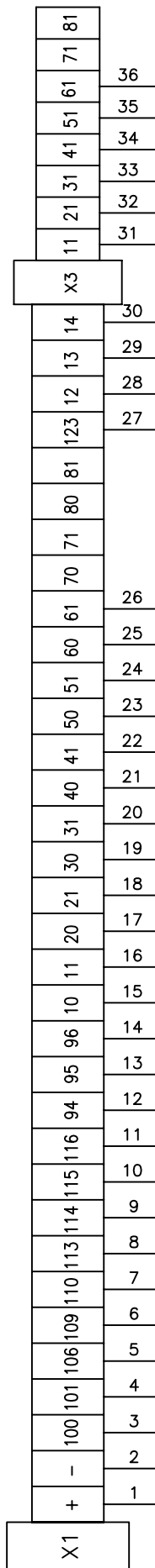




NOTE:
说明:

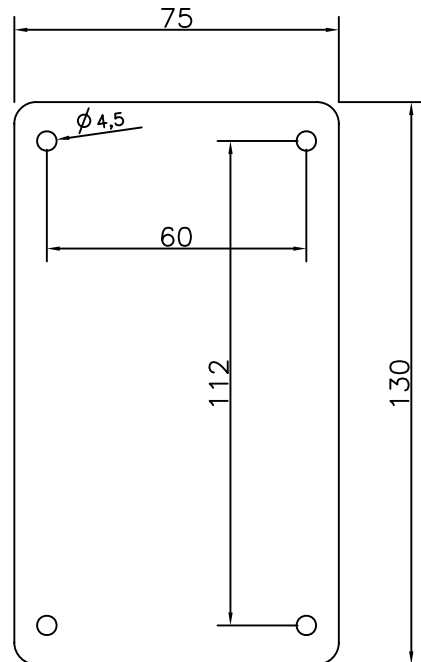
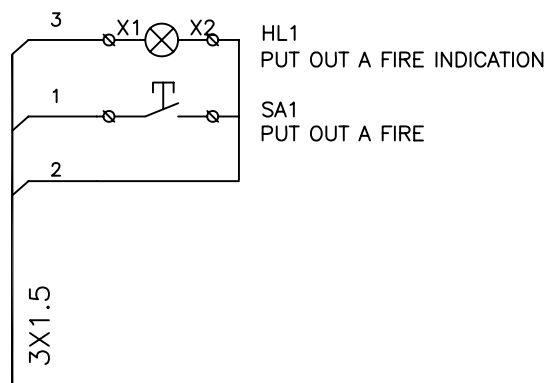
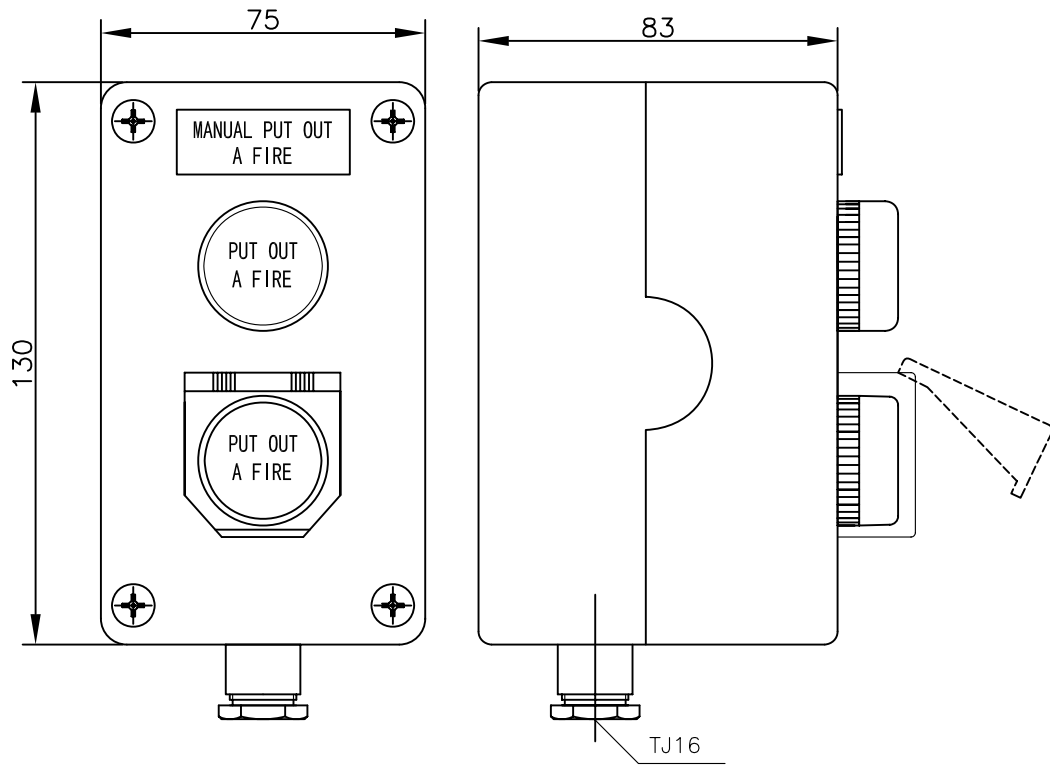
THE CABLE MARKED WITH "*" IS SUPPLIED BY EQUIPMENT
带*号的电缆为设备厂自带.

HIGH PRESSURE PUMP UNIT MOTOR STARTER PARTS LIST			JIANGNAN SHIPYARD H2390/91		共 23 页 第 19 页
21					
20					
19	X1,X2,X3	TERMINAL	45	SAKD-2.5N	WEIDMULLER
18	X4	TERMINAL	9	SAK-35EN	WEIDMULLER
17	S0	BUTTON	1	LA39B-04/R	ERGONG
16	S/H3	BUTTON(INDICATOR)	1	LA39(B)-22D/Y-AC220V	ERGONG
15	H12,H15	INDICATOR LIGHT	2	AD16-22B/W-AC220V	ERGONG
14	H1,H8	INDICATOR LIGHT	2	AD16-22B/G-AC220V	ERGONG
13	K2	CONTACTOR	1	LC1-D0910M7C/AC220V	SCHNEIDER
12	K1	CONTACTOR	1	LC1-D6511M7C+LA8DN40/AC220V	SCHNEIDER
11	K24,K30	RELAY	2	MY4NJ-AC220V	OMRON
10	K3,K20,K29,k31	RELAY	4	MY4NJ-AC220V	OMRON
9	K70	RELAY	1	MY4NJ-DC24V	OMRON
8	h	TIME ACCUMULATOR	1	HC32/24 AC220V 60Hz	DEIF
7	Q20	BREAKER	1	3VU1340-2MH00 (1.6-2.4A)	整定1.6A
6	Q11	BREAKER	1	3VU1340-2NJ00 (3.2-5A)	整定4A
5	Q1	BREAKER	1	3VU1640-2MR00 (36-52A)	整定40A
4	Q0,Q12	SWITCH	2	LW42/63A	ERGONG
3	A	CURRENT METER	1	F72-A1 0-60A(跟电流互感器配套)	YITAI
2	T2	CURRENT TRANSFORMER	1	ALH-0.66TH 60/5A	ERGONG
1	T1	TRANSFORMER	1	JBK3-250TH[AC440V/220V-60HZ]	红旗变压器厂
序号	代 号	名 称	数量	型 号 规 格	备 注

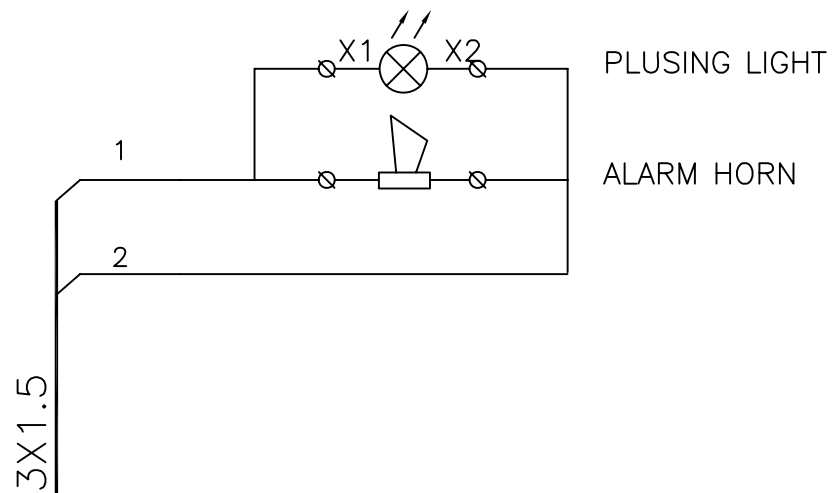
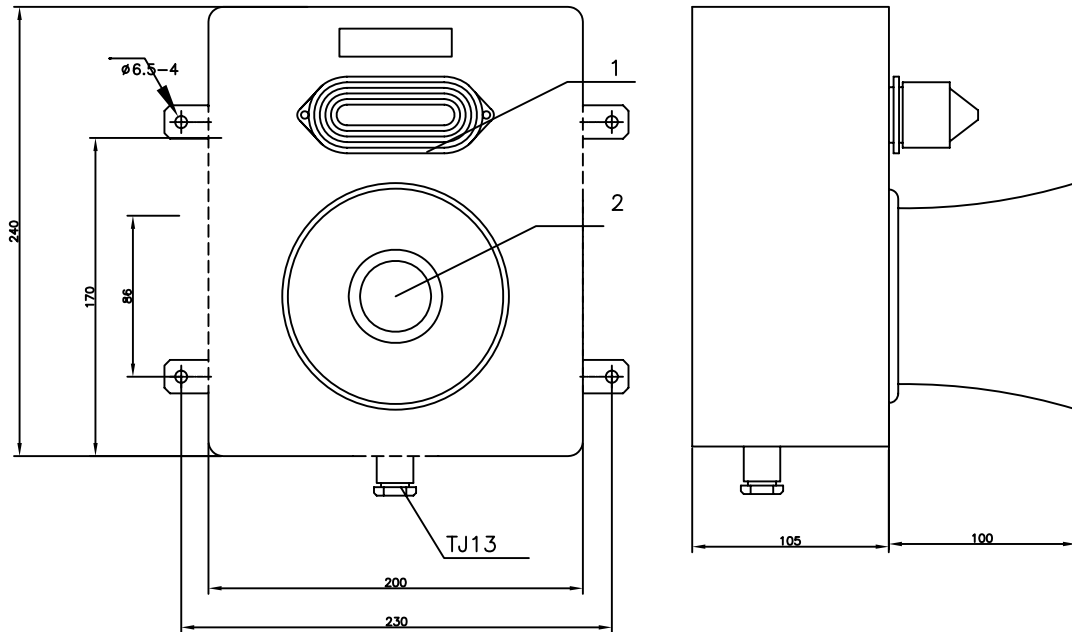


40X1.5
CABLE NO.100

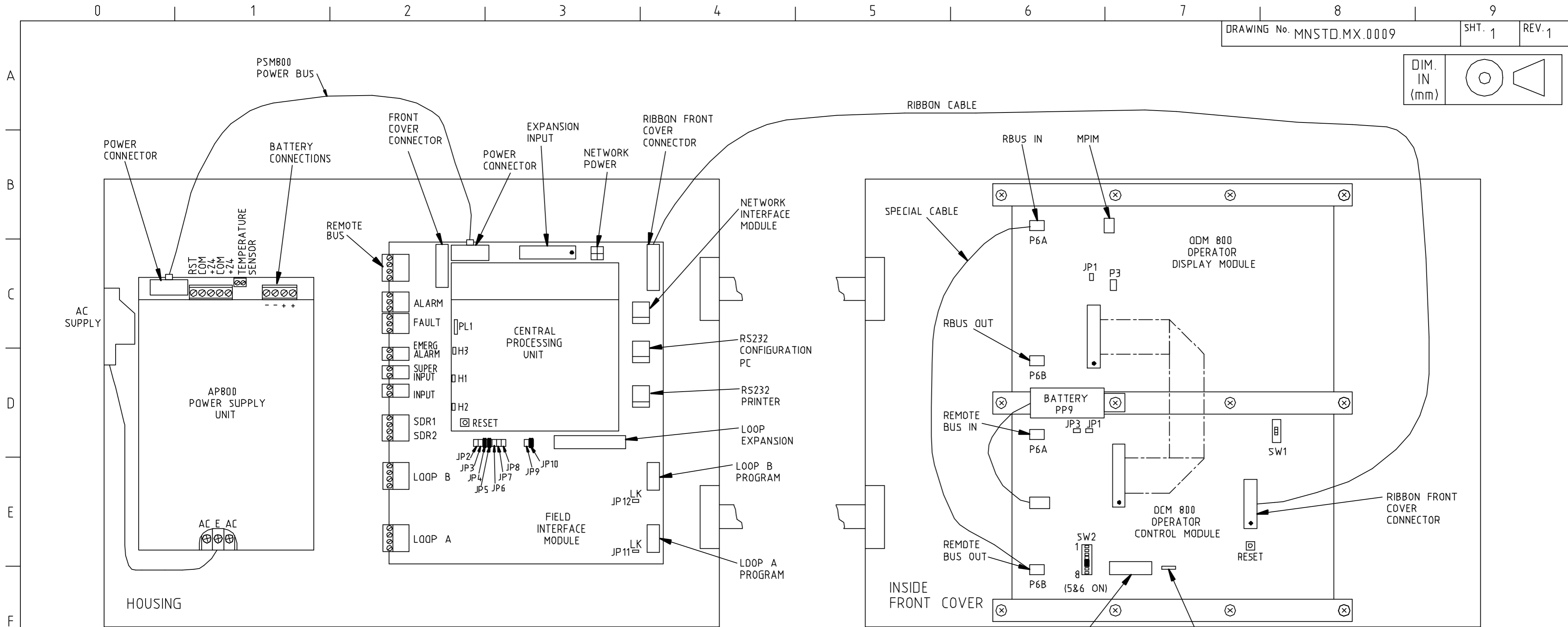
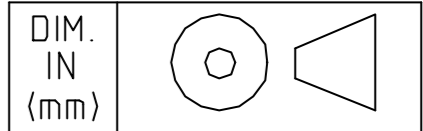
FROM VALVE & FIRE
CONTROL KEY BOX
来自阀及火警控制箱



4					
3		STUFFING	TJ16	1	
2	HL1	INDICATOR LIGHT	AD16-22/R/DC24V	1	RED
1	SA1	BUTTON	LA39-10/R+SAFETY COVER	1	RED
SN	NO.	NAME	TYPE	Q'TY	REMARK



4					
3		STUFFING	TJ13	1	
2		HORN		1	RED
1		PLUSING LIGHT		1	RED
SN	NO.	NAME	TYPE	Q'TY	REMARK



ELECTRICAL DATA

T2000 SIGNAL CABLES SHOULD BE SEGREGATED FROM P.A. LINES.

EARTHING : ALL EXPOSED METALWORK & CABLING CONDUITS MUST BE RETURNED TO EARTH VIA A SUITABLE COPPER CONDUCTOR. ALL CABLE SCREENS ARE TO BE TERMINATED & CONNECTED TO THE GLAND PLATE EARTHNG STUD.

NOTE: EARTHING SHOULD BE TO I.E.E. REGULATIONS.

REMOTE BUS : CONFORMING TO RS485 SPEC. HALF DUPLEX & 19200 BAUD (CONFIGURABLE)

PRINTER CONFIGURATION PC PORTS : CONFORMING TO RS232 SPEC. FULL DUPLEX & 9600 BAUD

AC SUPPLY : 120 TO 230AC RATIO (LIMITS MAY BE EXCEEDED BY UP TO 15% IN ACCORDANCE WITH EN54 PART 5D-60 AUTO RANGING CURRENT DRAWN 1.5A MAX)

SDR OUTPUT : 2 CIRCUITS RATED 30VDC NOMINAL @ 3A 2K7 END OF LINE RESISTOR
COMMON ALARM RELAY 1 C/O CONTACT 1A @ 30VDC
FAULT ALARM RELAY 1 C/O CONTACT 1A @ 30VDC
 SUPERVISED I/P = 10K

TECHNICAL DATA

WEIGHT : CONTROLLER HOUSING: 3kg
 BULKHEAD MOUNTING KIT: 5kg

COLOUR : CASING: DAWN GREY (B.S. 4800 10A-03)
 FRONT PANEL: DAWN GREY (B.S. 4800 10A-03)

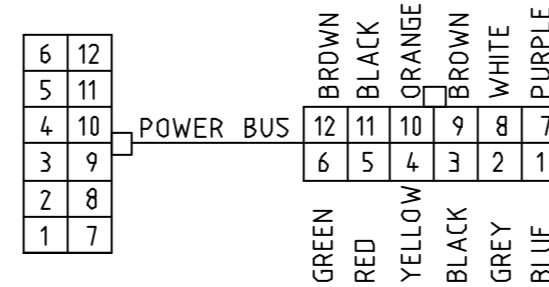
ENVIRONMENTAL : STORAGE TEMPERATURE: -20°C TO +70°C
 OPERATING TEMPERATURE: -8°C TO +55°C
 RELATIVE HUMIDITY: UP TO 95% RH (NON-CONDENSING)

OVERALL DIMENSIONS ARE THE SAME FOR THE REPEATER, POWER BOX & TERMINAL CHAMBER.
 HEIGHT: 320mm
 WIDTH: 440mm
 DEPTH: SHALLOW -120mm
 DEEP - 210mm

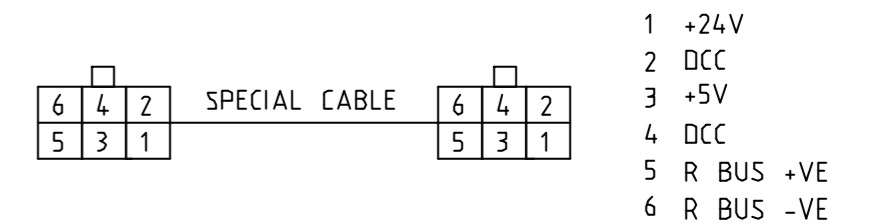
CONTROL UNIT CAN BE BULKHEAD MOUNTED USING 'H' FRAME OR RACK MOUNTED USING RACK MOUNTING BRACKETS. SEE ORDERING DETAILS.

ORDERING DETAILS

ITEM	STOCK CODE No.
T2000	557-200-600
BULKHEAD MOUNTING BRACKET	557-180-454
RACK MOUNTING KIT	557-180-452
BATTERY BOX	557-200-602
12V 17Ah BATTERY	3072



- | | |
|------------------------|---------------------------|
| 1 CHARGER CURRENT | 7 EARTH FAULT |
| 2 RESET | 8 DC COM |
| 3 DC COM | 9 BATT. MDN |
| 4 AC FAULT | 10 +5V RESISTANCE |
| 5 24V DC NON RESETABLE | 11 24V DC RESETABLE |
| 6 BATT. FAULT | 12 CHARGE FAULT/BATT TEST |



REFERENCE DRAWINGS

MNSTD.MX.0008	T2000MX MINERVA CONTROL/REPEATER FRONT PANEL LAYOUT
MNSTD.MX.0009	T2000MX MINERVA CONTROL UNIT CONNECTION DIAGRAM
MNSTD.MX.0010	T2000MX MINERVA CONTROL/REPEATER MOUNTING DETAILS OUTLINE DRAWING

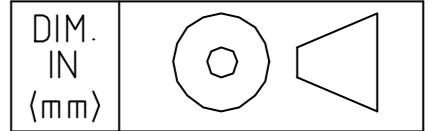


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DRN. JCS	CLIENT STANDARD DRAWING
DATE 27/01/00	PROJECT STANDARD DRAWING
CHKD. SW	TITLE FIRE DETECTION
DATE 11/06/01	T2000MX MINERVA CONTROL UNIT
APPR. DWJ	CONNECTION DIAGRAM
DATE 11/06/01	SIZE A2
	SCALE 1:2
	DRAWING No. MNSTD.MX.0009
	SHT. 1 OF 1
	REV. 1



1	REVISED DRAWING	4564	09/05/01	JCS
0	NEW DRAWING	4264	27/01/00	JCS
REV.	DESCRIPTION	TASK	DATE	DRAWN



TECHNICAL DATA

WEIGHT : CONTROLLER HOUSING: 13.62kg

COLOUR : CASING: DAWN GREY (B.S. 4800 10A-03)
FRONT PANEL: DAWN GREY (B.S. 4800 10A-03)

ENVIRONMENTAL : STORAGE TEMPERATURE: -20°C TO +70°C
OPERATING TEMPERATURE: -8°C TO +55°C
RELATIVE HUMIDITY: UP TO 95% RH (NON-CONDENSING)

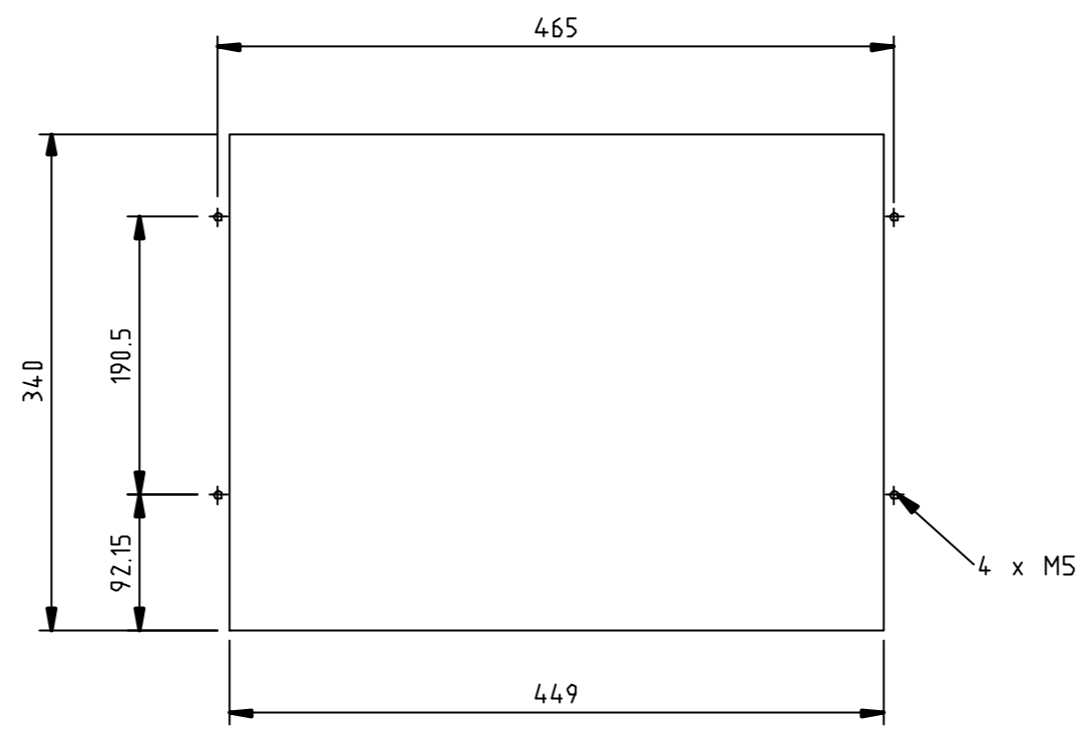
OVERALL DIMENSIONS ARE THE SAME FOR THE CONTROLLER, REPEATER, & TERMINAL CHAMBER.

HEIGHT: 320mm
WIDTH: 440mm
DEPTH: 120mm

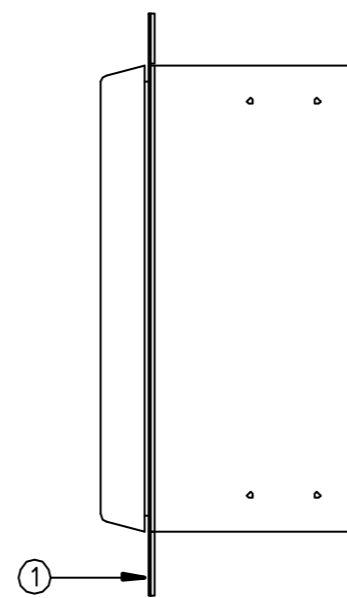
ORDERING DETAILS

ITEM	STOCK CODE No.
T2000	557-200-600
T2000 REPEATER	557-200-601
RACK MOUNTING KIT	401-011-003
BATTERY BOX	557-200-602
12V 15Ah BATTERY	660-001-005

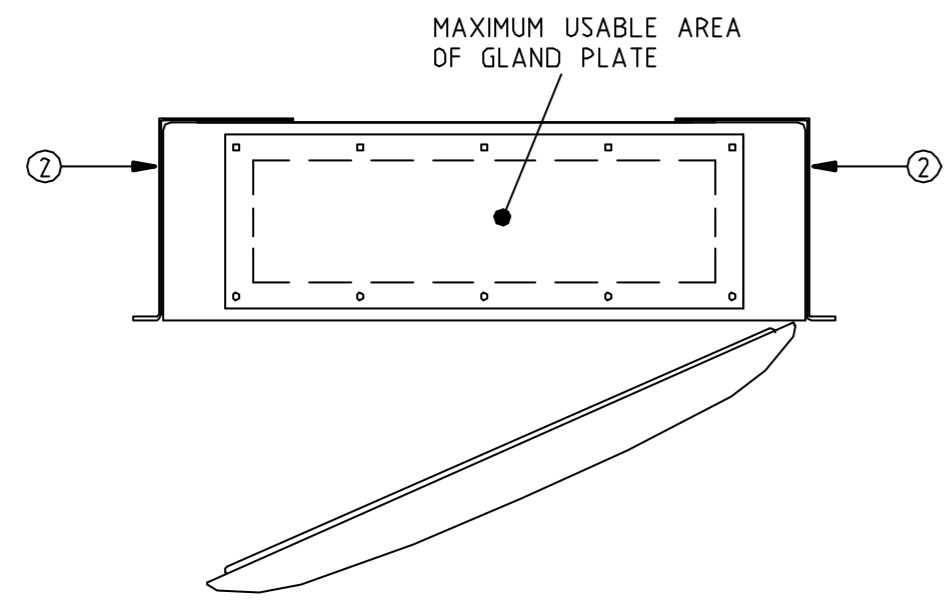
ITEM	DESCRIPTION	DRAWING No.
1	MOUNTING BEZEL	MNSTD-0206
2	MOUNTING BRACKET	MNSTD-0207



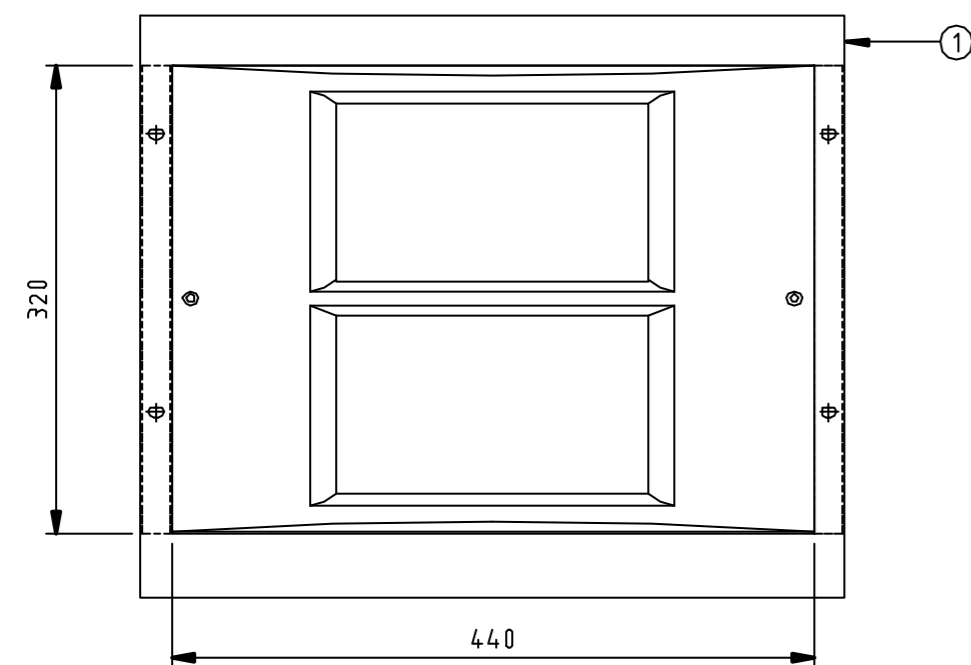
CUT OUT FOR PANEL IN CONSOLE



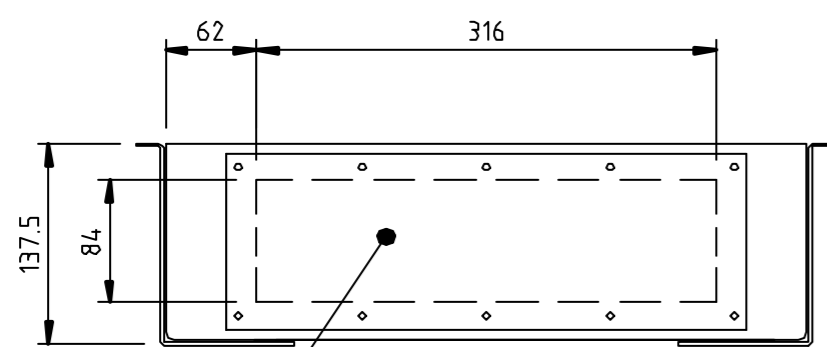
SIDE VIEW



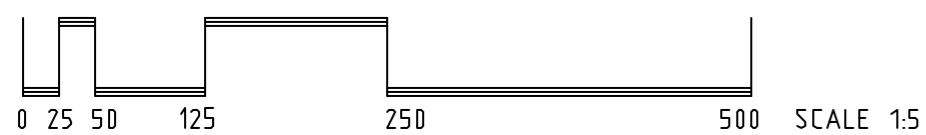
TOP VIEW



FRONT VIEW WITH MOUNTING BEZEL



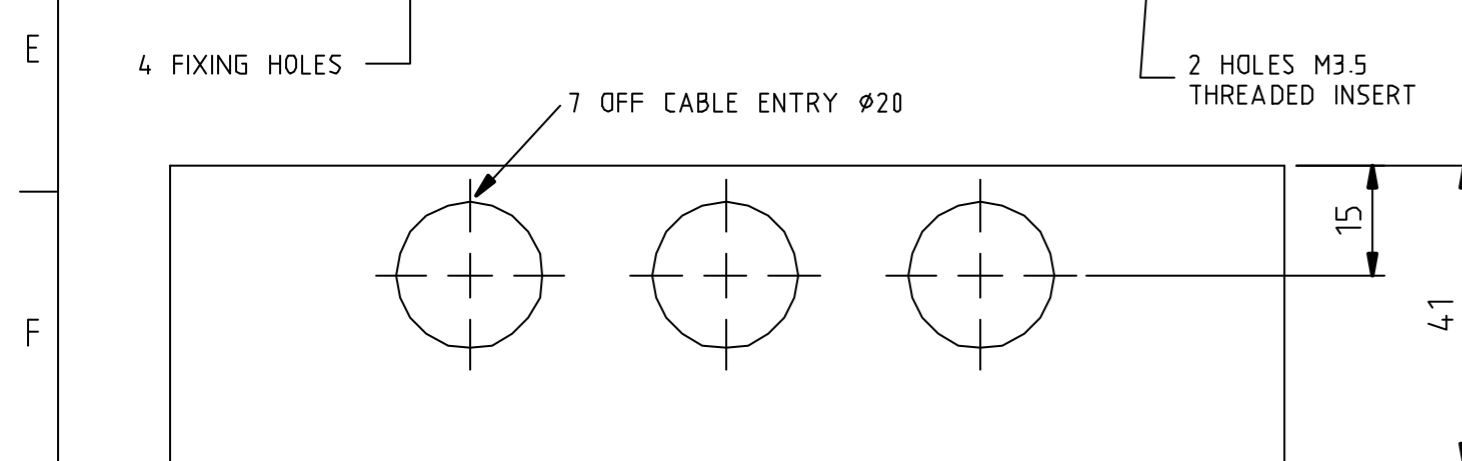
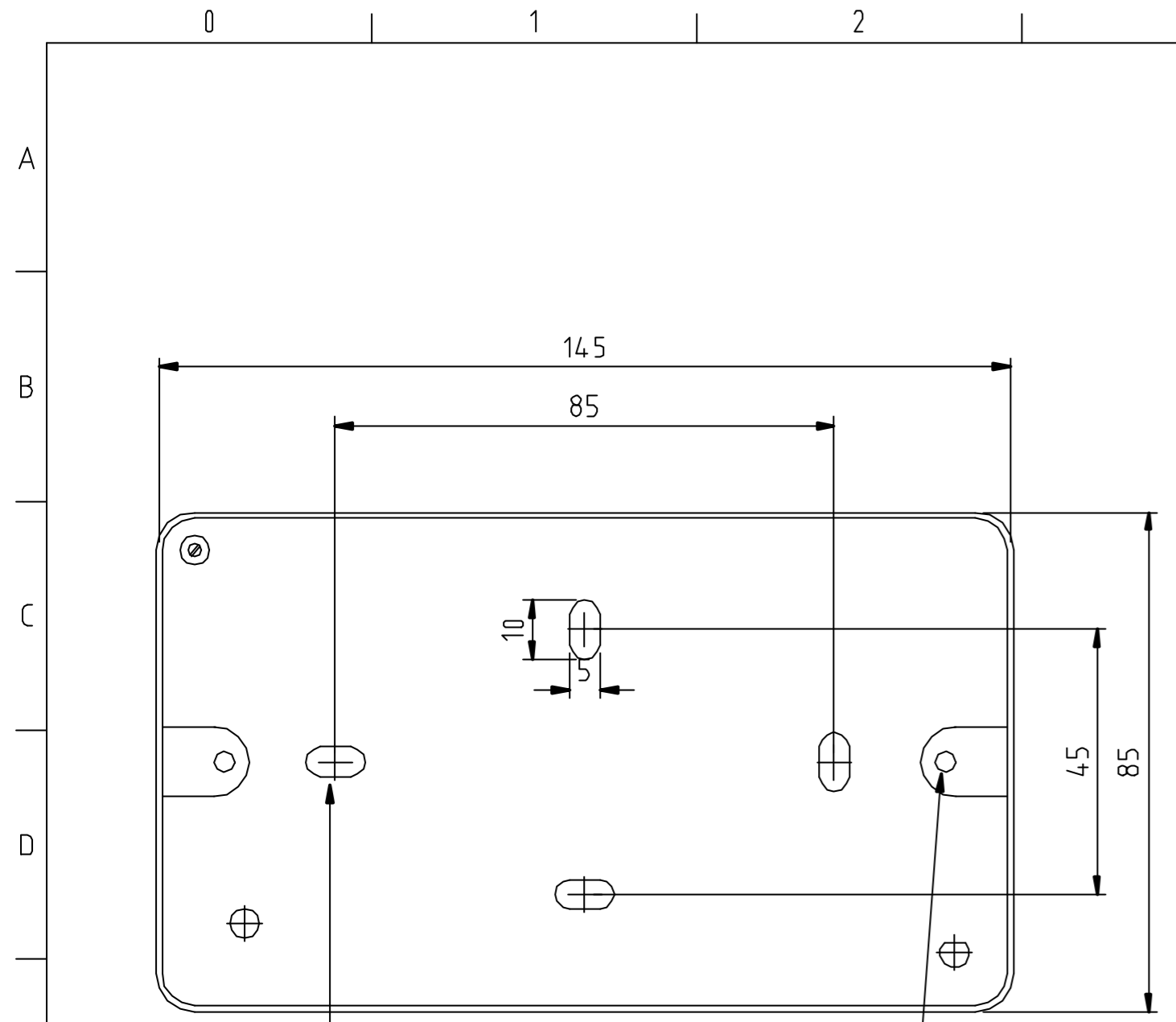
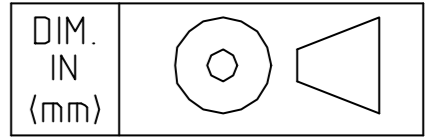
BOTTOM VIEW WITH DOOR REMOVED



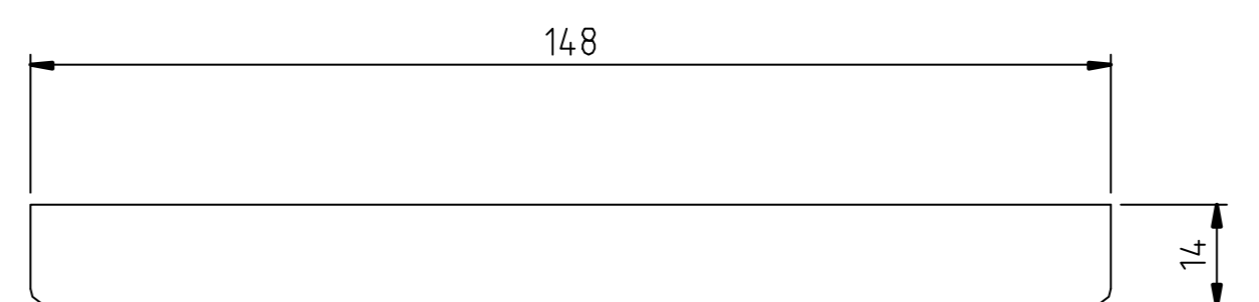
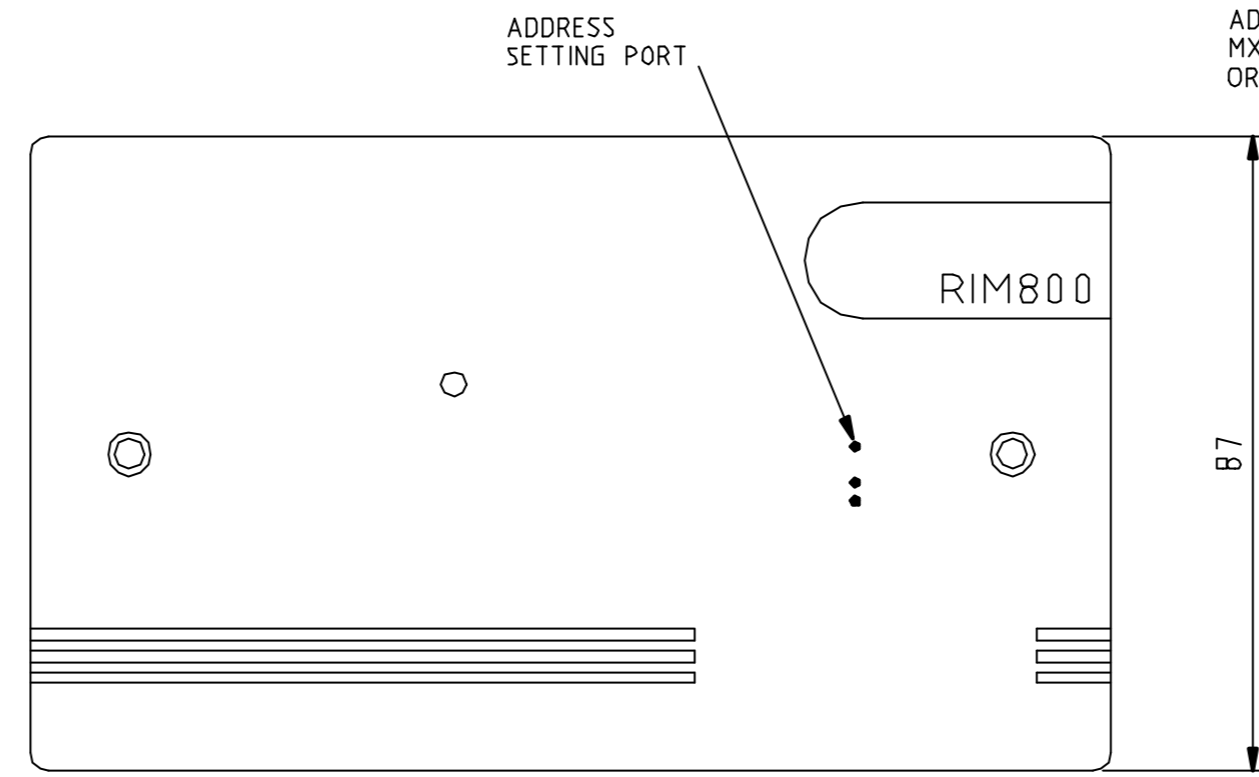
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DRN. CAW	CLIENT	STANDARD DRAWING		
DATE 05/12/00	PRDJECT	STANDARD DRAWING		
CHKD. RDS	TITLE	FIRE DETECTION		
DATE 12/12/00		T2000 MINERVA MARINE CONTROL UNIT		
APPR. PH		CONSOLE MOUNTING DETAILS		
DATE 12/12/00	SIZE A2	SCALE 1:5	DRAWING No. MNSTD.MX.0016	SHT. 1 OF 1
				REV. 0

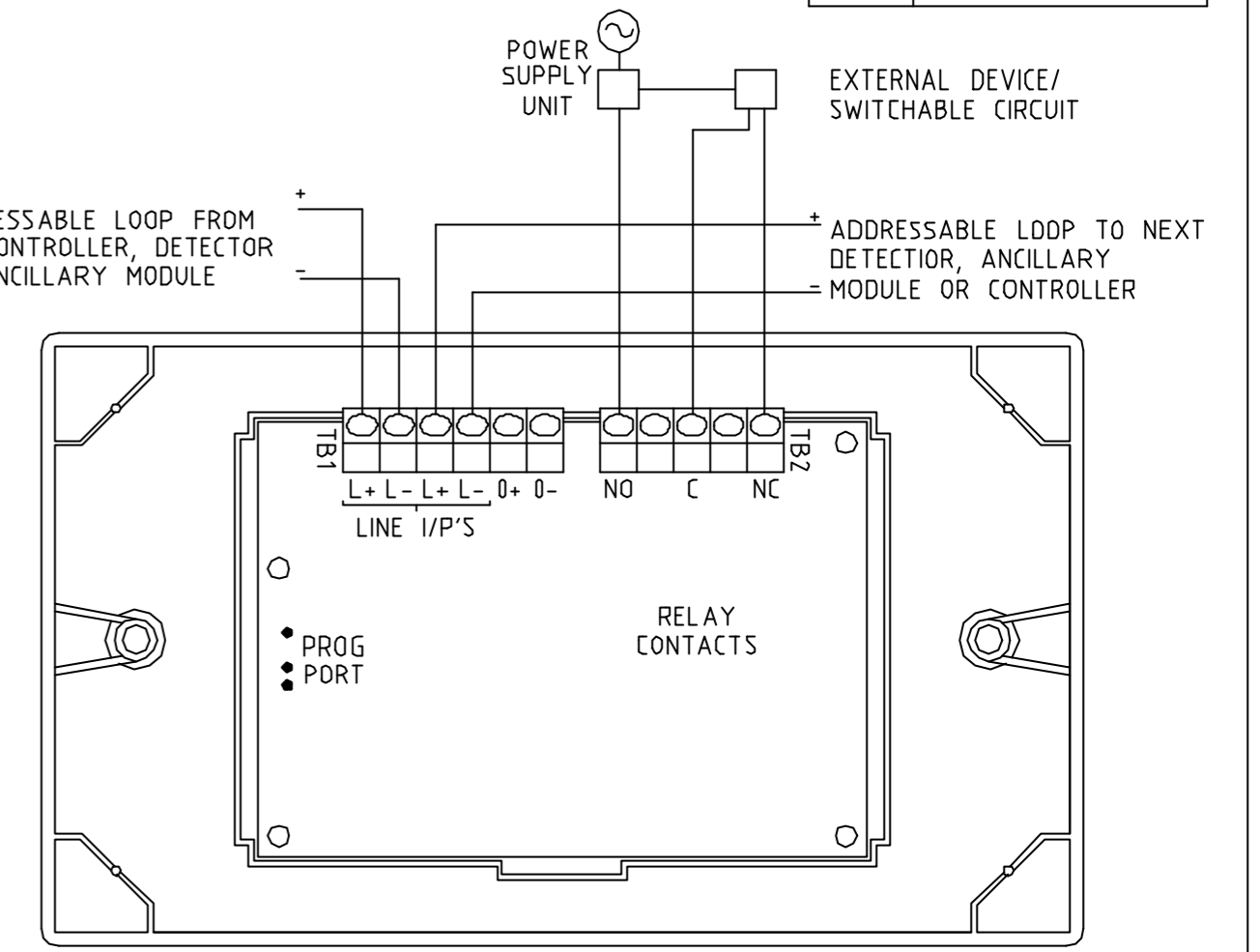
0	NEW DRAWING	4476	05/12/00	CAW
REV.	DESCRIPTION	TASK	DATE	DRAWN



BACK BOX



FACIA PLATE



FACIA PLATE (BACK VIEW) SHOWING POSITION OF P.C.B.

RELAY MODULE (RIM800) TO SWITCH EXTERNAL DEVICES WHICH REQUIRE A SEPERATE POWER SUPPLY.

ELECTRICAL DATA

ADDRESSABLE CIRCUIT VOLTAGE: 37.5± 1.5 VOLTS DC
 CURRENT RATING: 40mA MAX (WHEN OPERATED)
 CONTACT RATING: 2A @ 24V D.C.
 STANDBY CURRENT 0.2mA
 ALARM CURRENT 3mA

CAUTION

THE 0+ & 0- TERMINALS MUST ONLY BE USED WITH THE HVR800 HIGH VOLTAGE RELAY MODULE. FOR CONNECTION TO THE HVR800, REFER TO PUBLICATION 17A-02-HVR.

TECHNICAL DATA

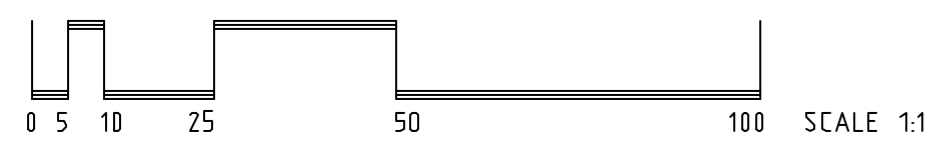
MATERIAL "BAYBLEND" (POLYCARBONATE/ABS ALLOY)
 FACIA PLATE:
 BACK BOX: MILD STEEL 1.2mm (18 SWG).
ENVIRONMENTAL
 OPERATING TEMPERATURE: -20°C TO +70°C
 RELATIVE HUMIDITY: UP TO 95% RH (NON-CONDENSING)
 WEIGHT: 100gm (LESS MK BOX) 340gm (BOX)
 COLOUR BOX: GREY METAL CLAD
 EMC: EN50130-4 B.S. EN 50082-1

ITEM	STOCK CODE No.
RIM800	568-800-003
BACK BOX	400-002-006
M820 FRONT COVER	557-201-400

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DRN. JCS	CLIENT STANDARD DRAWING
DATE 01/02/00	PRDJECT STANDARD DRAWING
CHKD. FL	TITLE FIRE ALARM RIM800 RELAY MODULE OUTLINE/CONNECTION DRAWING
DATE 30/10/01	APPR. KB
DATE 19/11/01	SIZE A2 SCALE 1:1 DRAWING No. MNSTD.MX.0007
REV. 1	SHT. 1 OF 1
REV. 1	REV. 1

REV.	DESCRIPTION	TASK	DATE	DRAWN
1	REVISED DRAWING	4702	30/10/01	CAS
0	NEW DRAWING	4266	01/02/00	JCS



DOCUMENT CONTROL NUMBER /

801F/811F INFRA-RED FLAME DETECTORS

PRODUCT APPLICATION AND DESIGN INFORMATION

1. INTRODUCTION

The 801F Infra-Red Flame detector forms part of the 800 Series Addressable Fire detectors. The 811F is the Marine version of the 801F.

The detector is intended to plug into the following:

- MUB
- 801IB Isolator Base
- 5B 5" Base
- 5BI 5" Isolator Base
- 801IB Isolator Base
- 801RB Relay Base
- 801SB Sounder Base
- 802SB Sounder Base

The detector is designed to transmit, to a remote MX/MX2/T2000 fire controller, digital signals which represent status of the flame sensing elements. The flame detector also has a self-test facility.

Software within the controller is used to interpret the returned flame sensor values to raise alarm or other appropriate response according to the type of detector configured in 'MX CONSYS' (refer to Publication 17A-06-X1).

2. OPERATING PRINCIPLE

2.1 OPTICAL CHARACTERISTICS

The 801F is designed to detect the infra-red radiation produced by flaming fires involving carbonaceous materials.

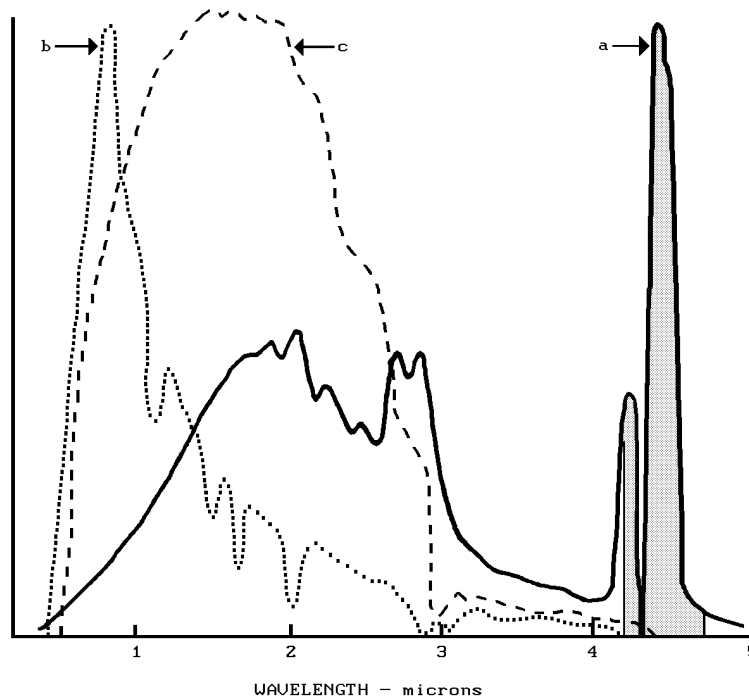
Fig. 1(a) shows the spectrum of a typical fire of this type

Fig. 1(b) the spectrum of the radiation of the sun and

Fig. 1(c), that of a tungsten filament lamp.

It can be seen that there is a large peak in the flame output at wavelengths in the region of $4.45\mu\text{m}$. This peak is a characteristic of carbonaceous flames and results from the formation of carbon dioxide in the flame. It will be seen also that the radiation from the sun and from the filament lamp is relatively low in this region.

In order to exploit these spectral characteristics, the 801F uses an optical filter which transmits infra-red between $4.38\mu\text{m}$ and $4.56\mu\text{m}$ (shown shaded in fig. 1(a)). This bandwidth allows high sensitivity to flames with low sensitivity to other interfering sources.



**Fig. 1 Spectrums of: a) Typical Carbonaceous Fire b) Solar Radiation at Ground Level
c) Tungsten Filament Lamp**

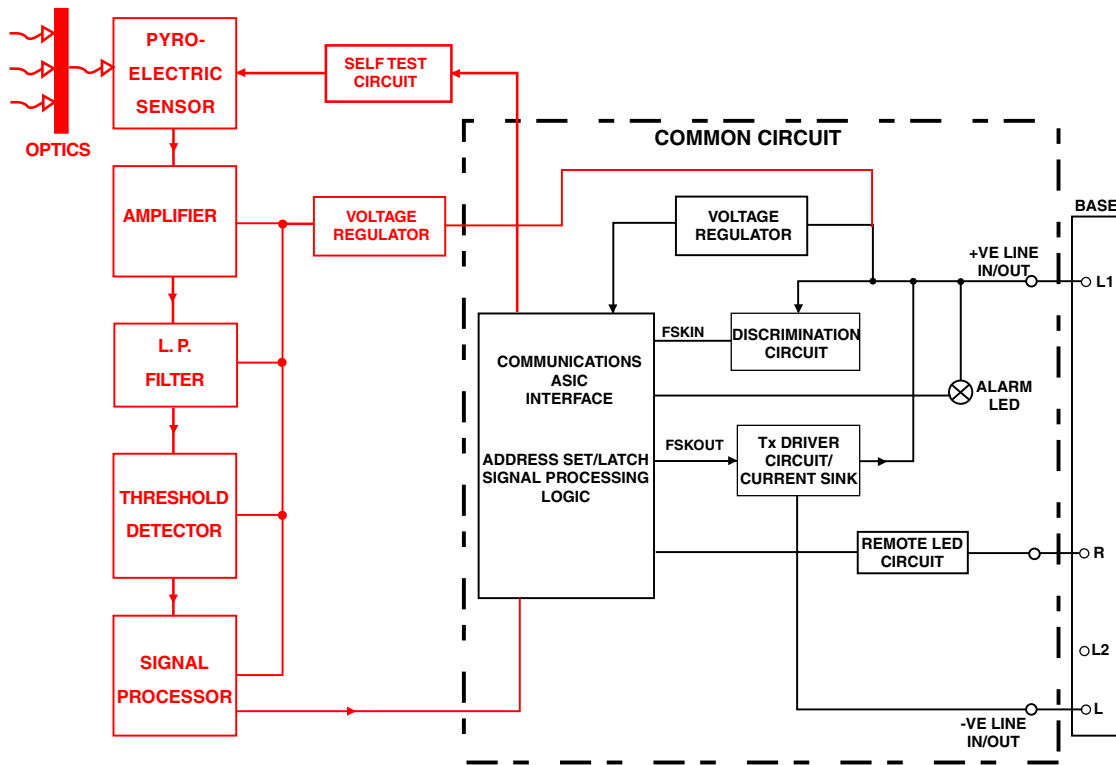


Fig. 2 Simplified Block Schematic Diagram of Detector

2.2 FLICKER CHARACTERISTICS

It is observed that the radiation from a flame is not constant but varies with time. This flicker is present in all flames to a greater or lesser degree (including those resulting from high pressure gas jets) and can be used to give improved discrimination between flames and other sources of infra-red.

The 801F responds to flicker frequencies in the range 1-10Hz which provides high sensitivity to almost all types of accidental fire.

2.3 CIRCUIT OPERATION

2.3.1 FLAME SENSOR

A simplified block schematic of the circuit is given in Fig. 2.

The infra-red radiation passing through the narrow-band filters falls on a pyroelectric sensor which responds to the flickering component of the radiation. The electrical signal produced is amplified and filtered, to remove frequencies outside the required flicker region.

The threshold detector and signal processor evaluate the amplitude and frequency characteristics of the flicker and pass the results to the signal processing logic in the common circuit.

All critical parts of the circuit are fed by an internal voltage regulator to make the sensitivity independent of supply over a wide range.

2.3.2 COMMON CIRCUIT

Refer to Fig. 2.

Communications between the controller and detector uses the Frequency Shift Keying (FSK) method.

The 'Discrimination Circuit' filters the FSK signal from the +ve line voltage and converts it to a digital square wave input for the 'Communications ASIC'.

The 'Communications ASIC' decodes the signal and when its own address is decoded, the analogue inputs received from the flame sensor circuit are converted to corresponding digital values. These digital values are then passed to the 'Tx Driver Circuit/Current Sink' which applies them to the +ve line for transmission to the controller.

The Common Circuit is also used to:

- Control the operation of the Remote LED via the 'Remote LED Circuit' from controller commands.

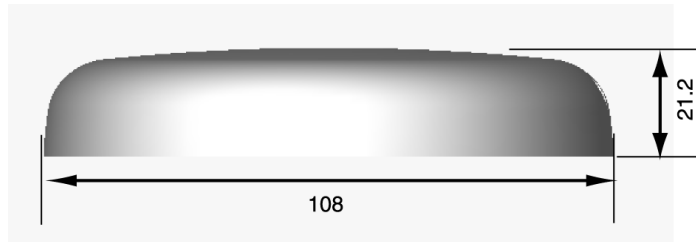


Fig. 3 Overall Dimensions of 801F Detector

2.4 WIRING

Loop cabling is connected to base terminals L (-ve) and L1 (+ve). A drive is provided for a remote indicator connected between loop positive and terminal R. Terminal L2 is for use with functional sounder and relay bases.

3. MECHANICAL CONSTRUCTION

The major components of the detector are:

- Body Assembly
- Printed Circuit
- Outer Cover
- Sapphire lens

3.1 BODY ASSEMBLY

The body assembly consists of a plastic moulding to which are secured the four detector contacts which align with contacts in the MUB/5B bases. The moulding incorporates securing features to retain the detector in the base.

The PCB is clipped to the body by four spring contacts. These contacts both hold the assembly together mechanically and provide electrical contact between the base contacts and the PCB.

4. TECHNICAL SPECIFICATION

4.1 MECHANICAL

Dimensions

The overall dimensions are shown in Fig. 3.

Materials

Body, cover, and closure: FR110 'BAYBLEND' flame retardant.

Weight

Detector: 74g

4.2 ENVIRONMENTAL

Operating Temperature: -20°C to +70°C

Storage Temperature: -40°C to +80°C

Relative Humidity

Operational: 90% RH continuous (non-condensing) and up to 99% RH intermittent (non-condensing)

Storage: >40% RH and <70% RH

Shock:

Vibration:

Impact:

Corrosion:



To EN54 Part 10

4.3 ELECTROMAGNETIC COMPATIBILITY

The detector complies with the following:

Product family standard EN50130-4 in respect of Conducted Disturbances, Radiated Immunity, Electrostatic Discharge, Fast Transients and Slow High Energy

EN50081-1 for Emissions

Note: The EMC standards fulfil the requirements of the European Directive for EMC (89/336/EEC).

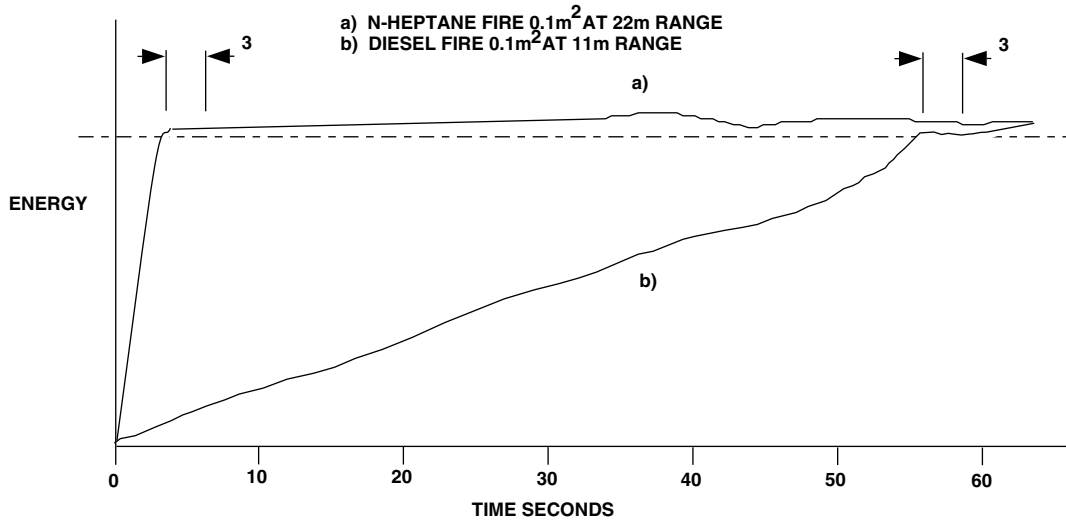


Fig. 4 Typical Response to Fires

4.4 ELECTRICAL CHARACTERISTICS

The following characteristics (Table 1) apply at 25°C and detector nominal supply voltage of 37.5V unless otherwise specified.

Characteristic	Min.	Typ.	Max.	Unit
Loop Voltage	20	-	40	V
Quiescent Current	-	300	350	µA
Alarm Current*		3	3.3	mA

Table 1: Electrical Characteristics

* No remote indicator fitted

5. PERFORMANCE CHARACTERISTICS

5.1 MODE OF OPERATION-BEHAVIOUR IN FIRE TESTS

The operating principles of the detector have been described in Section 2 and the information given below is intended to supplement this basic description.

It has already been noted that the detector analyses the signal flicker frequency and produces an alarm if the level is above a preset threshold for three seconds. It is worth stressing that if the signal is below this threshold the detector will not respond even after a long time.

The level of the signal received depends on the size of the flame and its distance from the detector. For liquid fuels the level is almost proportional to the surface area of the burning liquid. For any type of fire, the signal level varies inversely with the square of the distance.

Fire tests are normally carried out using liquid fuels, burning in pans of known area. The sensitivity of a detector is then

expressed as the distance at which a particular fire size can be detected.

It is important to think in terms of distance rather than time because of the burning characteristics of different fuels. Fig. 4 shows the typical response of two different fuels which ultimately produce the same signal level. The signal level given by n-heptane quickly reaches its maximum, and produces an alarm in approximately six (6) seconds after ignition. Diesel, being less volatile, takes approximately sixty (60) seconds to reach equilibrium burning state and an alarm is given approximately fifty-five (55) seconds after ignition.

The time taken by the fire to reach equilibrium depends on the initial temperature of the fuel. If diesel is pre-heated to a temperature above its flash point, then it behaves the same as n-heptane at 25°C.

The fire test data presented in Section 5.2 refers to fires which have reached their equilibrium condition. The range specified is that obtained with the detector axis horizontal and with the fire on the detector axis.

5.2 FIRE TEST DATA

5.2.1 N-HEPTANE

The most convenient fuel for fire tests is n-heptane since it is readily available and quickly reaches its equilibrium burning rate. The range figures specified in Section 5.2.2 relate to a n-heptane fire in a 0.1m² pan on the main axis of the detector field of view.

The graph in Fig. 5 shows the typical detection ranges as a function of pan area for n-heptane fires. It will be seen that this curve is approximately a square law; that is to say that to obtain detection at twice the distance the pan area must be multiplied by four.

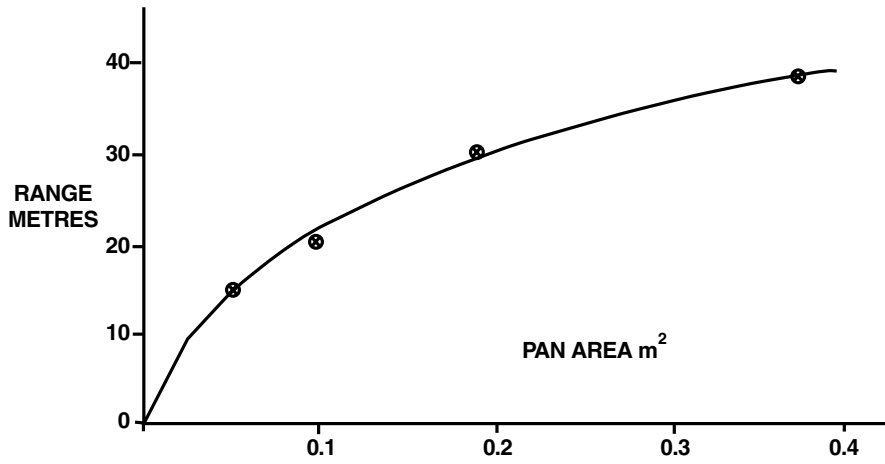


Fig. 5 Typical Detector Range vs Pan Area - n-heptane

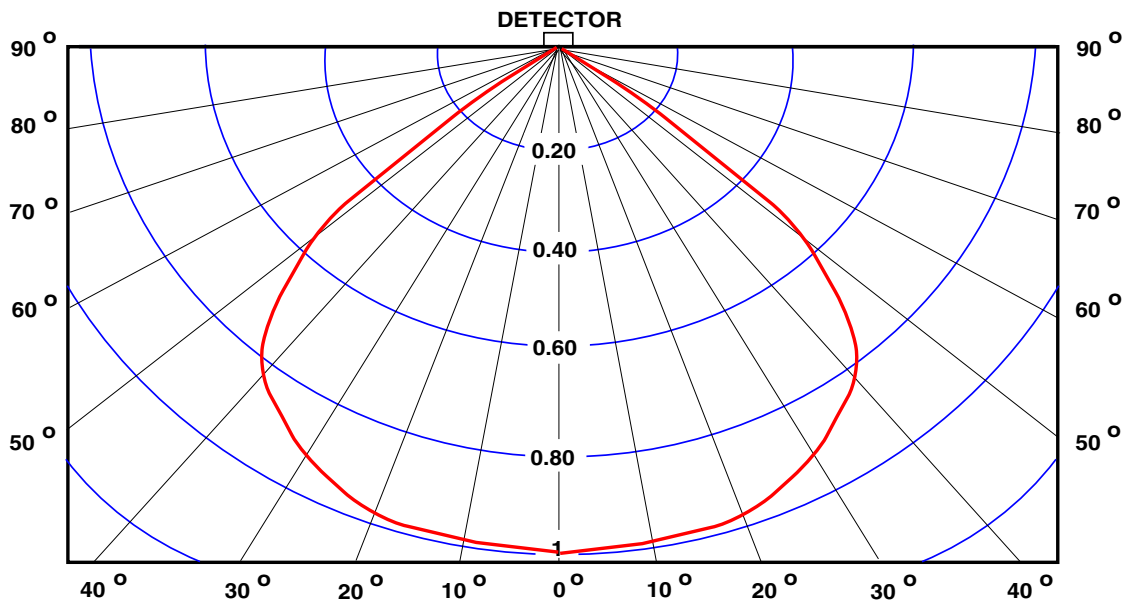


Fig. 6 Relative Range vs Angle of Incidence

800 SERIES

17A-02-F

2 2/04

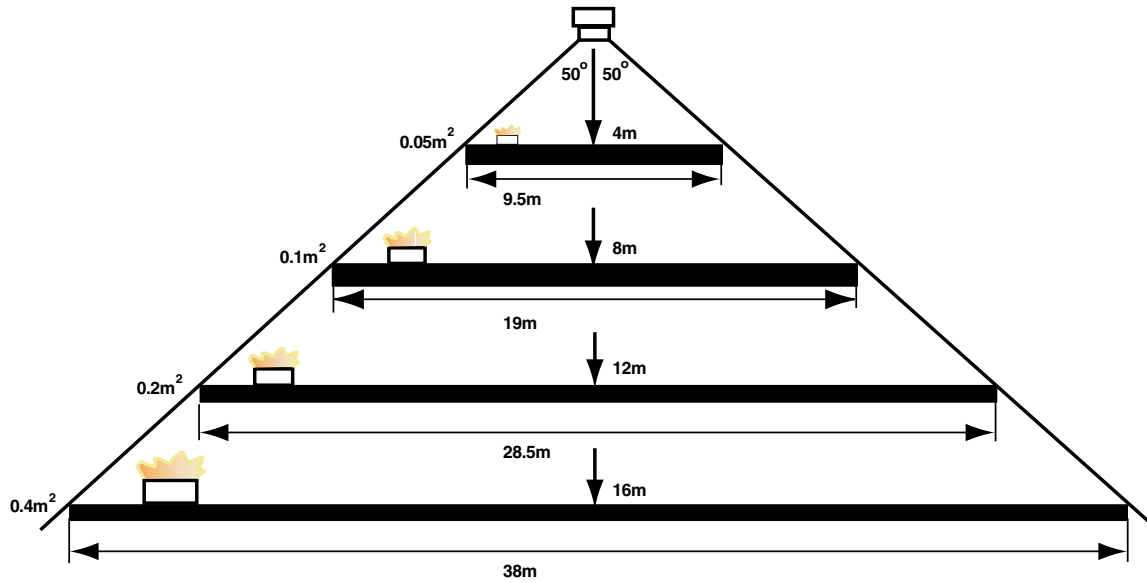


Fig. 7 Field of View

5.2.2 OTHER LIQUID HYDROCARBONS

Ranges achieved with other fuels burning in 0.1m² pans are as follows:

Kerosene	15.5m
Alcohol (I.M.S.)	13m
Diesel oil	13m
Ethylene glycol	15.5m

The typical detection range for other pan areas may be calculated using the square law relationship give in Para 5.2.1.

5.2.3 DIRECTIONAL SENSITIVITY

The sensitivity of the 801F is at a maximum on the detector axis. The variation of range with angle of incidence is shown in Fig. 6.

6. DESIGN OF SYSTEM

6.1 GENERAL

Using the information given in Sections 2 to 5, it is possible to design a flame detection system having a predictable performance. Guidance on the application of the above data and on siting of detectors is given on the following page.

6.2 USE OF FIRE TEST DATA

It has been explained in Section 5 that the sensitivity of the detector is specified in terms of its response to well-defined test fires. Tests are carried out using a 0.1m² pan. Sensitivity to other pan areas is calculated from the square law relationship. That is to obtain detection at twice the distance, the pan area must be multiplied by four.

Accidental fires are rarely of a well-defined size. It is still possible, however, to calculate the response to a 'real' fire using the fire test data.

For example, a spillage fire involving a highly volatile liquid, eg, n-heptane: will spread quickly from the point of ignition to cover the complete surface of the pool. Such a spillage would normally cover approximately 2m². Using the data for n-heptane fires and extrapolating to an area of 2m², the 801F should respond at a distance of about 120m within ten (15) seconds. It WILL NOT respond in less than three (8) seconds, even at short range.

If the spillage is of a less volatile material (eg, diesel), the spread of the flame from the ignition point will be much slower. The detector will then respond in a time dependent on the distance from the fire.

6.3 DETERMINING THE NUMBER OF DETECTORS

The number of detectors required for a particular risk will depend on the area involved and the fire size at which detection is required. Large areas or small fires require large numbers of detectors.

As there are no agreed 'rules' for the application of flame detectors, the overall system sensitivity must be agreed between the designer and the end user. When agreement has been reached the system designer can determine the area to be covered by each detector using the fire test data.

The detector is designed primarily for ceiling mounting with its axis vertically downwards. When used in this way it will cover a circular area at ground level, the diameters of the circle being proportional to the height. Under these conditions the effective sensitivity is that which is achieved at the edge of this circular area taking into account the slant range and the angle of incidence.

Fig. 5 shows the effective sensitivity for n-heptane fires when used in this configuration. Sensitivity to other fuels can be determined from the data given in Section 5.2.2.

Note: Any object within the detector's field of view will cause a 'shadow' in the protected area. Small objects close to the detector can cause large shadows.

7. DETECTOR ADDRESS

The loop address of the detector is held in internal E²PROM which is programmed either from the controller, or by the 801AP MX Service Tool.

8. ADDRESS FLAG

Refer to Fig. 8. The address flag is used to identify the address and zone of the detector. The address flags are supplied in one of two packs (address 1 - 127 or 128 - 255, with a different colour for each loop) and are ordered separately from the detector. The address flag is fitted to the bottom of the detector. When the detector is fitted to the base and turned until fully located, the address flag is then transferred to the base. If the detector is removed from the base, the address flag remains with the base.

9. CONFIGURATION

The detector may be configured as Immediate (interrupt) or Verified (5 second delay).

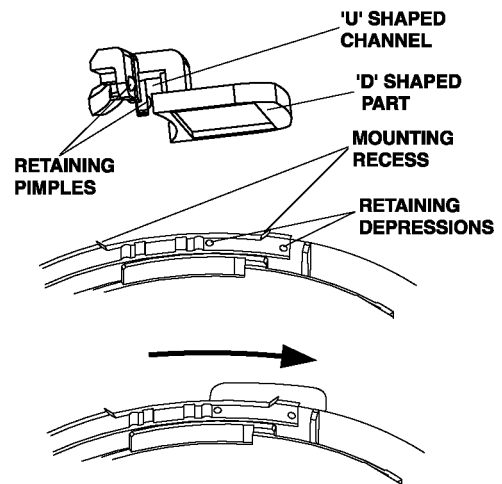


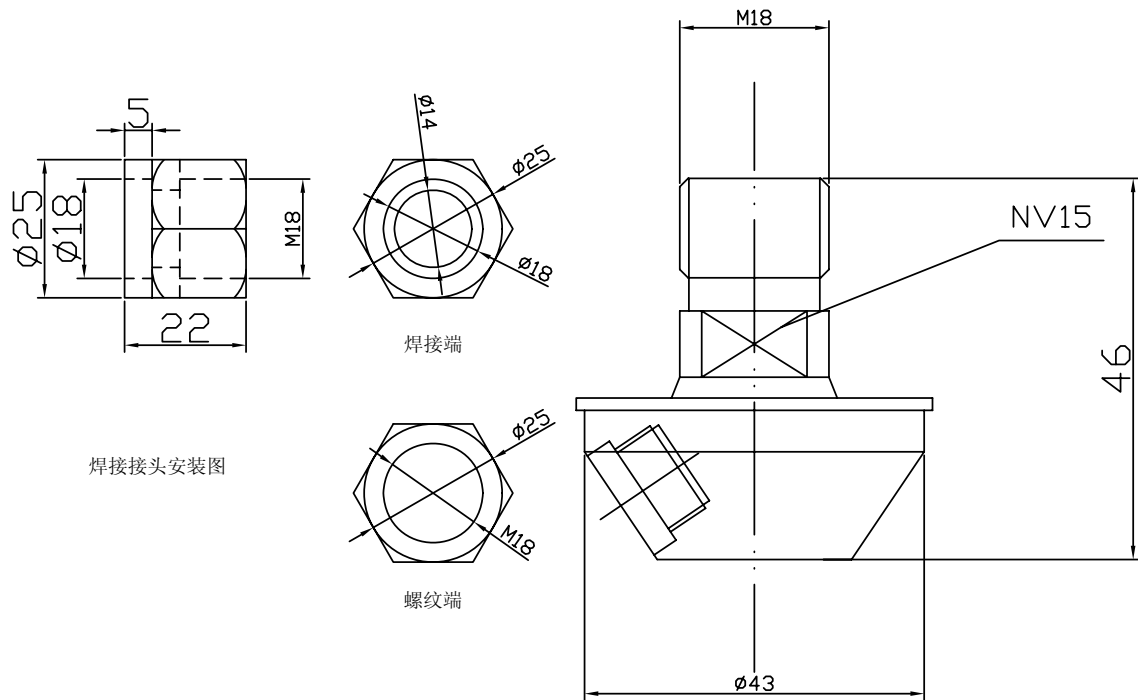
Fig. 8 Fitting Address Flag

10. ORDERING INFORMATION

801F Infra-red Flame Detector:	516.800.006
811F Infra-red Flame Detector (Marine):	516.800.007
MUB Base:	517.050.001
801IB Isolator Base:	516.800.903
5B 5" Universal Base:	517.050.017
5BI 5" Isolator base:	517.050.018
Address Flag Labels - Loop A (White):	516.800.931
Address Flag Labels - Loop B (Yellow):	516.800.932
Address Flag Labels - Loop C (Purple):	516.800.933
Address Flag Labels - Loop D (Green):	516.800.934

JM/jm

18th February 2004



焊接接头安装图

焊接端

螺纹端

ADHAN-SAFE/L212

Min./Max.pressure:
94Bar/114Bar

Working pressure:
100Bar

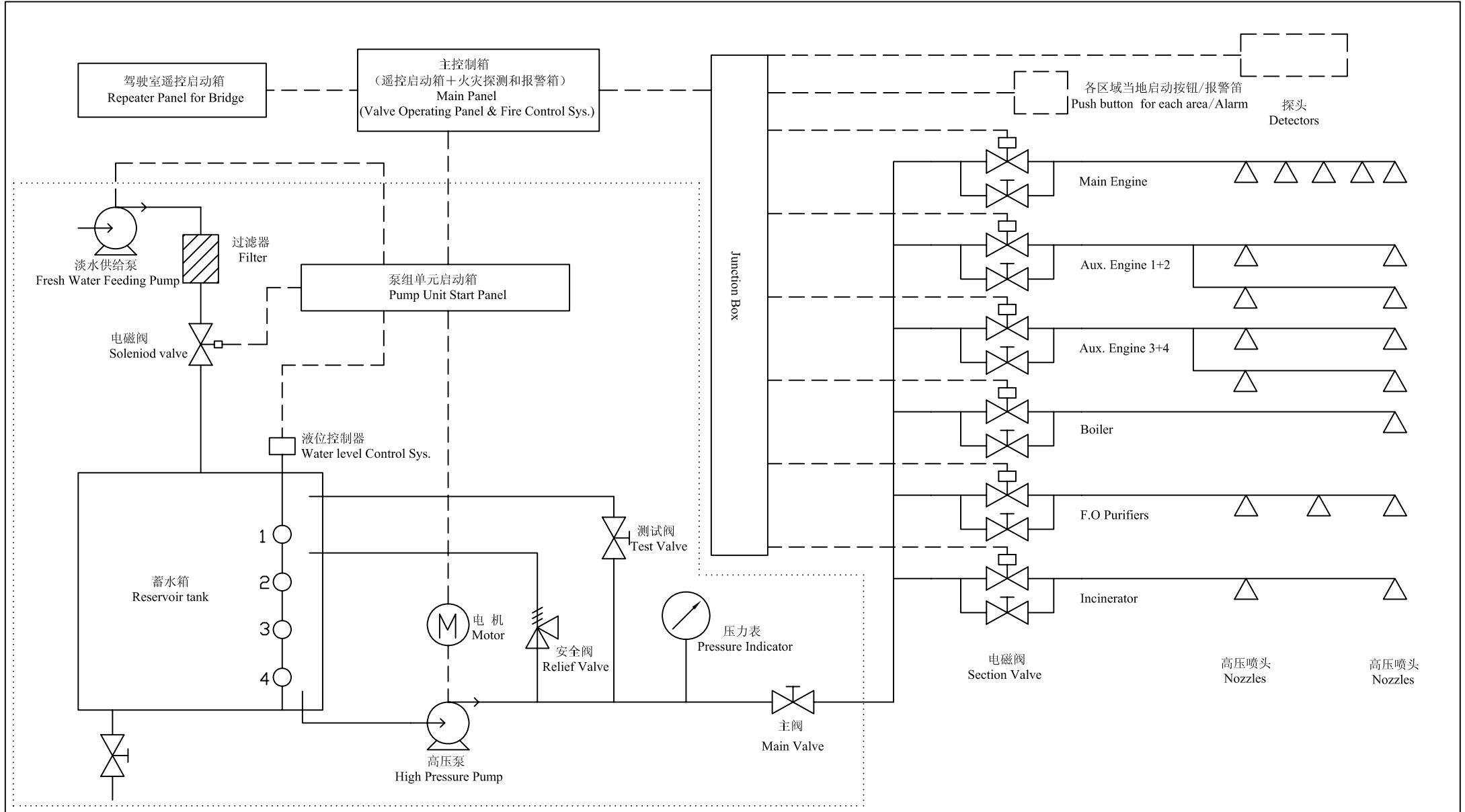
K-factor:
2.01

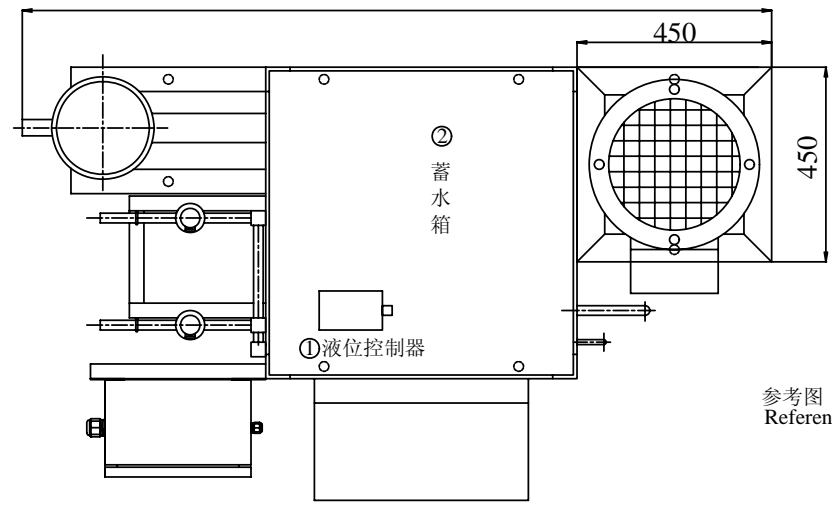
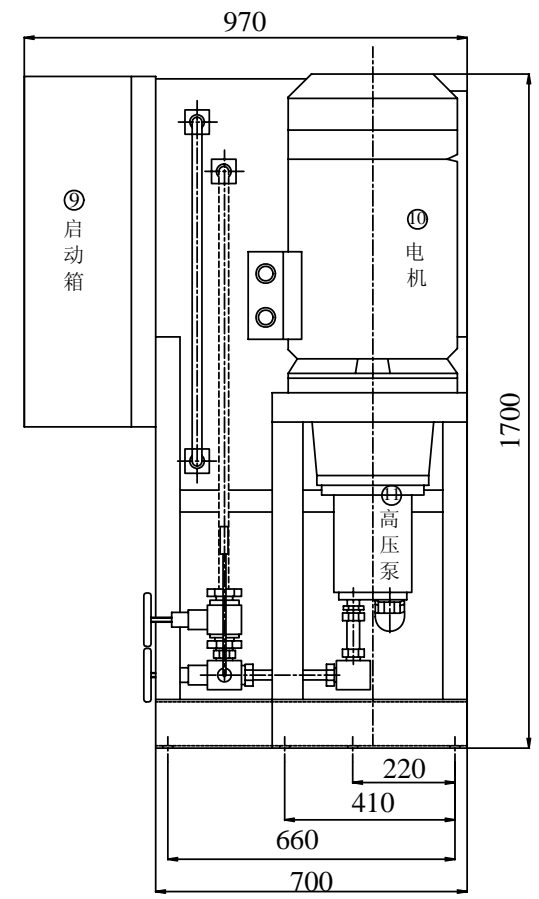
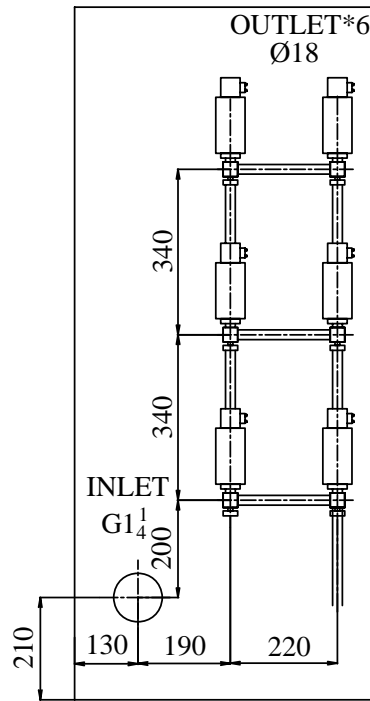
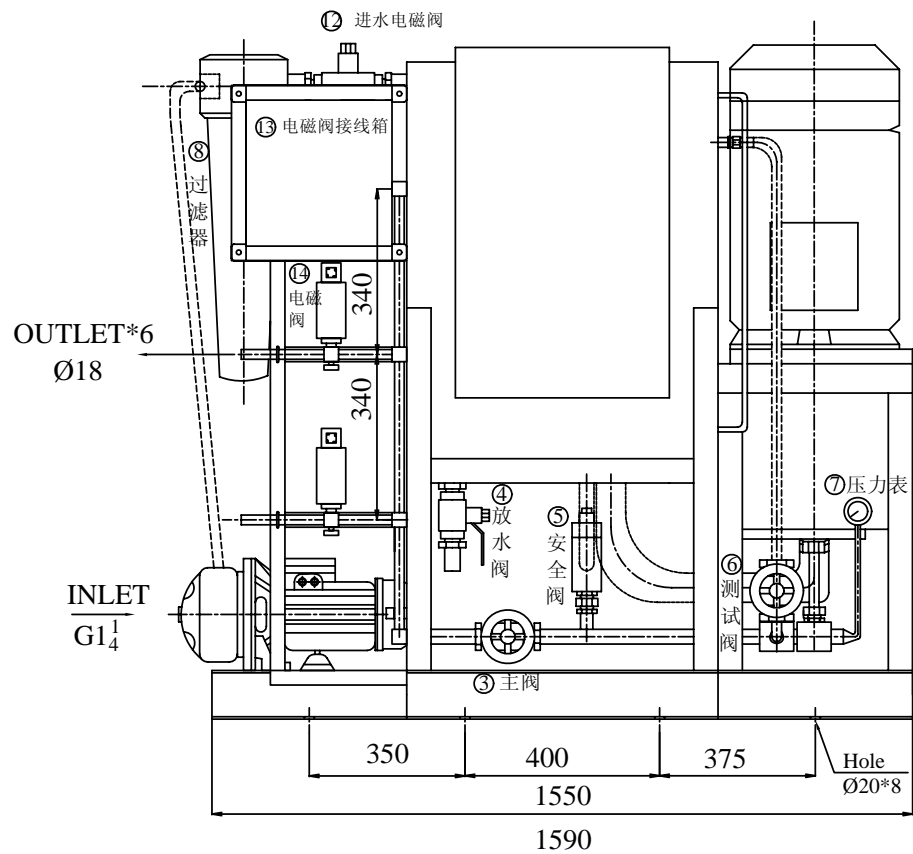
Material:
304 stainless steel

Pipe connection:
screw thread



上海傲瀚机电设备有限公司
Shanghai Aohan Marine Company





参考图
Reference

14	Section valve	
13	Valve junction box	
12	Solenoid valve	
11	High pressure pump	
10	Motor	
9	Pump unit start panel	
8	Filter	
7	Pressure indicator	
6	Test valve	
5	Relief valve	
4	Release valve	
3	Main valve	
2	Reservoir tank	
1	Water level control	



上海傲瀚机电设备有限公司
Shanghai Aohan Marine Company

Pressure drop calculation

Project: Jiangnan shipyard

Section: Main engine

Nozzle: L212, 20L/min

Temperature: 20°C

Fr	To	D	t	d _{hy}	A	Q	V	v	ρ	Re	k	k/d _{hy}	λ	L	ΔP _{pipe}	h	ΔP _{height}	ζ ₉₀	n	ζ ^T	n	ζ ^V	n	Σ ζ	ΔP _{fit}
0	1	34	3	28	615	60	1.626	1.004	998.2	4.5E+04	0.002	7.1E-05	2.14E-02	2	0.020	0	0.000	0.15	5	1.3	1	1	1	3.05	0.040
1	2	34	3	28	615			1.004	998.2	0.0E+00	0.002	7.1E-05		0.0	0	0	0.000	0.15						0	0
2	3	34	3	28	615			1.004	998.2	0.0E+00	0.002	7.1E-05		0.0	0	0	0.000	0.15						0	0
3	4	34	3	28	615			1.004	998.2	0.0E+00	0.002	7.1E-05		0.0	0	0	0.000	0.15						0	0
4	5	18	1.5	15	177	60	5.65	1.004	998.2	8.4E+04	0.002	1.3E-04	2.01E-02	15	3.202	8	0.783	0.15	9			2.2	1	3.55	0.565
5	6	18	1.5	15	177	40	3.766	1.004	998.2	5.6E+04	0.002	1.3E-04	2.12E-02	3.5	0.350	0	0.000	0.15		0.9	1			0.9	0.064
6	7	18	1.5	15	177	20	1.883	1.004	998.2	2.8E+04	0.002	1.3E-04	2.23E-02	3.5	0.092	0	0.000	0.15		0.9	1			0.9	0.016
7	8	18	1.5	15	177			1.004	998.2	0.0E+00	0.002	1.3E-04		0.0	0.00	0	0.000	0.15		0.9	1			0.9	0
8	9	18	1.5	15	177			1.004	998.2	0.0E+00	0.002	1.3E-04		0.0	0.00	0	0.000	0.15						0	0
																3.664	0.783	0.685							
Total pressure drop: 5.132																									

D	mm	Pipe diameter	h	M	Height of water column		
t	mm	Wall thickness	L	M	Pipe length	For bending	ζ ⁹⁰ = 0.15 Smooth pipe
d _{hy}	mm	Inter diameter	g	m/s ²	Gravitation		N = < ↓ ≠ ⁰⁰
Q	L/min	Volume flow	ζ		Specific resistance	For T-side flow	ζ ^T = 1.3 Q _{side} /Q = 1.0
A	mm ²	Cross-sectional area	n		Number		ζ ^T = 1.0 Q _{side} /Q = 0.5
V	m/s	Flow velocity	Σ ζ		Total specific resistance		ζ ^T = 0.9 Q _{side} /Q = 0.2
v	mm ² /s	Kinematical viscosity				For t-thought and concentric reducer	ζ ≈ 0
ρ	Kg/m ³	Density	d _{hy}	=	D - 2t	Ball valve, reduced area	ζ = 1.0
Re		Reynold number	A	=	π * D _{hy} ² / 4	Non-return, seated valve	ζ = 1.2
k	mm	Roughness	V	=	1000 * Q / (A * 60)	Section and main valve	ζ = 2.2
λ		Specific resistance, pipe	Re	=	1000 * v * d _{hy} / v		
ΔP _{fit}	Bar	Pressure drop, fitting	ΔP _{fit}	=	Σ ζ * ρ * g / 200000	v	= 1.004 mm ² /s at 20 °C
ΔP _{pipe}	Bar	Pressure drop, pipe	ΔP _{pipe}	=	λ * L * ρ * V ² / (200 * d _{hy})	ρ	= 998.2 kg/m ³ at 20 °C
ΔP _{height}	Bar	Pressure drop, water colum	ΔP _{height}	=	H * g * ρ / 100000	g	= 9.81 m / s ²
			Σ ζ	=	ζ ⁹⁰ * n + ζ ^T * n + ζ ^V * n	k	= 0.002 for stainless pipe

Pressure drop calculation

Project: Jiangnan shipyard

Section: Aux. Engine 1+2

Nozzle: L212, 20L/min

Temperature: 20°C

Fr	To	D	t	d _{hy}	A	Q	V	v	ρ	Re	k	k/d _{hy}	λ	L	ΔP _{pipe}	h	Δ P _{height}	ζ ₉₀	n	ζ ^T	n	ζ ^V	n	Σ ζ	ΔP _{fit}		
0	1	34	3	28	615	80	2.168	1.004	998.2	6.0E+04	0.002	7.1E-05	2.01E-02	2	0.037	0	0.000	0.15	5	1.3	1	1	1	3.05	0.072		
1	2	34	3	28	615			1.004	998.2	0.0E+00	0.002	7.1E-05		0.0	0	0	0.000	0.15						0	0		
2	3	34	3	28	615			1.004	998.2	0.0E+00	0.002	7.1E-05		0.0	0	0	0.000	0.15						0	0		
3	4	34	3	28	615			1.004	998.2	0.0E+00	0.002	7.1E-05		0.0	0	0	0.000	0.15						0	0		
4	5	18	1.5	15	177	80	7.533	1.004	998.2	1.2E+05	0.002	1.3E-04	1.96E-02	10	3.701	4	0.000	0.15	9			2.2	1	3.55	0.864		
5	6	18	1.5	15	177	40	3.766	1.004	998.2	5.6E+04	0.002	1.3E-04	2.12E-02	2	0.200	0	0.000	0.15		0.9	1			0.9	0.064		
6	7	18	1.5	15	177	20	1.883	1.004	998.2	2.8E+04	0.002	1.3E-04	2.23E-02	2	0.051	0	0.000	0.15		0.9	1			0.9	0.016		
7	8	18	1.5	15	177			1.004	998.2	0.0E+00	0.002	1.3E-04		0.0	0.00	0	0.000	0.15		0.9	1			0.9	0		
8	9	18	1.5	15	177			1.004	998.2	0.0E+00	0.002	1.3E-04		0.0	0.00	0	0.000	0.15						0	0		
																3.989	0.391	1.016									
																Total pressure drop: 5.396											

D	mm	Pipe diameter	h	M	Height of water column		
t	mm	Wall thickness	L	M	Pipe length	For bending	ζ ⁹⁰ = 0.15 Smooth pipe
d _{hy}	mm	Inter diameter	g	m/s ²	Gravitation		N = < ↓ ≠ ⁰⁰
Q	L/min	Volume flow	ζ		Specific resistance	For T-side flow	ζ ^T = 1.3 Q _{side} /Q = 1.0
A	mm ²	Cross-sectional area	n		Number		ζ ^T = 1.0 Q _{side} /Q = 0.5
V	m/s	Flow velocity	Σ ζ		Total specific resistance		ζ ^T = 0.9 Q _{side} /Q = 0.2
v	mm ² /s	Kinematical viscosity				For t-thought and concentric reducer	ζ ≈ 0
ρ	Kg/m ³	Density	d _{hy}	=	D - 2t	Ball valve, reduced area	ζ = 1.0
Re		Reynold number	A	=	π * D _{hy} ² / 4	Non-return, seated valve	ζ = 1.2
k	mm	Roughness	V	=	1000 * Q / (A * 60)	Section and main valve	ζ = 2.2
λ		Specific resistance, pipe	Re	=	1000 * v * d _{hy} / v		
ΔP _{fit}	Bar	Pressure drop, fitting	ΔP _{fit}	=	Σ ζ * ρ * g / 200000	v	= 1.004 mm ² /s at 20 °C
ΔP _{pipe}	Bar	Pressure drop, pipe	ΔP _{pipe}	=	λ * L * ρ * V ² / (200*d _{hy})	ρ	= 998.2 kg/m ³ at 20 °C
ΔP _{height}	Bar	Pressure drop, water colum	ΔP _{height}	=	H * g * ρ / 100000	g	= 9.81 m / s ²
			Σ ζ	=	ζ ⁹⁰ * n + ζ ^T * n + ζ ^V * n	k	= 0.002 for stainless pipe

Pressure drop calculation

Project: Jiangnan shipyard

Section: Aux. Engine 3+4

Nozzle: L212, 20L/min

Temperature: 20°C

Fr	To	D	t	d _{hy}	A	Q	V	v	ρ	Re	k	k/d _{hy}	λ	L	ΔP _{pipe}	h	Δ P _{height}	ζ ₉₀	n	ζ ^T	n	ζ ^V	n	Σ ζ	ΔP _{fit}		
0	1	34	3	28	615	80	2.168	1.004	998.2	6.0E+04	0.002	7.1E-05	2.01E-02	2	0.037	0	0.000	0.15	5	1.3	1	1	1	3.05	0.072		
1	2	34	3	28	615			1.004	998.2	0.0E+00	0.002	7.1E-05		0.0	0	0	0.000	0.15						0	0		
2	3	34	3	28	615			1.004	998.2	0.0E+00	0.002	7.1E-05		0.0	0	0	0.000	0.15						0	0		
3	4	34	3	28	615			1.004	998.2	0.0E+00	0.002	7.1E-05		0.0	0	0	0.000	0.15						0	0		
4	5	18	1.5	15	177	80	7.533	1.004	998.2	1.2E+05	0.002	1.3E-04	1.96E-02	10	3.701	4	0.000	0.15	9			2.2	1	3.55	0.864		
5	6	18	1.5	15	177	40	3.766	1.004	998.2	5.6E+04	0.002	1.3E-04	2.12E-02	2	0.200	0	0.000	0.15		0.9	1			0.9	0.064		
6	7	18	1.5	15	177	20	1.883	1.004	998.2	2.8E+04	0.002	1.3E-04	2.23E-02	2	0.051	0	0.000	0.15		0.9	1			0.9	0.016		
7	8	18	1.5	15	177			1.004	998.2	0.0E+00	0.002	1.3E-04		0.0	0.00	0	0.000	0.15		0.9	1			0.9	0		
8	9	18	1.5	15	177			1.004	998.2	0.0E+00	0.002	1.3E-04		0.0	0.00	0	0.000	0.15						0	0		
																3.989	0.391	1.016									
																Total pressure drop: 5.396											

D	mm	Pipe diameter	h	M	Height of water column		
t	mm	Wall thickness	L	M	Pipe length	For bending	ζ ⁹⁰ = 0.15 Smooth pipe
d _{hy}	mm	Inter diameter	g	m/s ²	Gravitation		N = < ↓ ≠ ⁰⁰
Q	L/min	Volume flow	ζ		Specific resistance	For T-side flow	ζ ^T = 1.3 Q _{side} /Q = 1.0
A	mm ²	Cross-sectional area	n		Number		ζ ^T = 1.0 Q _{side} /Q = 0.5
V	m/s	Flow velocity	Σ ζ		Total specific resistance		ζ ^T = 0.9 Q _{side} /Q = 0.2
v	mm ² /s	Kinematical viscosity				For t-thought and concentric reducer	ζ ≈ 0
ρ	Kg/m ³	Density	d _{hy}	=	D - 2t	Ball valve, reduced area	ζ = 1.0
Re		Reynold number	A	=	π * D _{hy} ² / 4	Non-return, seated valve	ζ = 1.2
k	mm	Roughness	V	=	1000 * Q / (A * 60)	Section and main valve	ζ = 2.2
λ		Specific resistance, pipe	Re	=	1000 * v * d _{hy} / v		
ΔP _{fit}	Bar	Pressure drop, fitting	ΔP _{fit}	=	Σ ζ * ρ * g / 200000	v	= 1.004 mm ² /s at 20 °C
ΔP _{pipe}	Bar	Pressure drop, pipe	ΔP _{pipe}	=	λ * L * ρ * V ² / (200 * d _{hy})	ρ	= 998.2 kg/m ³ at 20 °C
ΔP _{height}	Bar	Pressure drop, water colum	ΔP _{height}	=	H * g * ρ / 100000	g	= 9.81 m / s ²
			Σ ζ	=	ζ ⁹⁰ * n + ζ ^T * n + ζ ^V * n	k	= 0.002 for stainless pipe

Pressure drop calculation

Project: Jiangnan shipyard

Section: Boiler

Nozzle: L212, 20L/min

Temperature: 20°C

Fr	To	D	t	d _{hy}	A	Q	V	v	ρ	Re	k	k/d _{hy}	λ	L	ΔP _{pipe}	h	ΔP _{hei} ght	ζ ₉₀	n	ζ ^T	n	ζ ^v	n	Σ ζ	ΔP _{fit}
0	1	34	3	28	615	40	1.084	1.004	998.2	3.0E+04	0.002	7.1E-05	2.21E-02	2	0.009	0	0.00	0.15	5	1.3	1	1	1	3.05	0.018
1	2	34	3	28	615			1.004	998.2	0.0E+00	0.002	7.1E-05		0.0	0.000	0	0.00	0.15						0	0
2	3	34	3	28	615			1.004	998.2	0.0E+00	0.002	7.1E-05		0.0	0.000	0	0.00	0.15						0	0
3	4	34	3	28	615			1.004	998.2	0.0E+00	0.002	7.1E-05		0.0	0.000	0	0.00	0.15						0	0
4	5	18	1.5	15	177	40	3.766	1.004	998.2	5.6E+04	0.002	1.3E-04	2.12E-02	15.0	1.501	10	0.98	0.15	9			2.2	1	3.55	0.251
5	6	18	1.5	15	177	20	1.883	1.004	998.2	2.8E+04	0.002	1.3E-04	2.23E-02	3	0.079	0	0.00	0.15		0.9	1			0.9	0.064
6	7	18	1.5	15	177			1.004	998.2	0.0E+00	0.002	1.3E-04		0.0	0.000	0	0.00	0.15		0.9	1			0.9	0
7	8	18	1.5	15	177			1.004	998.2	0.0E+00	0.002	1.3E-04		0.0	0.000	0	0.00	0.15		0.9	1			0.9	0
8	9	18	1.5	15	177			1.004	998.2	0.0E+00	0.002	1.3E-04		0.0	0.000	0	0.00	0.15						0	0

1.589	0.98	0.285
Total pressure drop: 2.845		

D	mm	Pipe diameter	h	M	Height of water column		
t	mm	Wall thickness	L	M	Pipe length	For bending	ζ ⁹⁰ = 0.15 Smooth pipe
d _{hy}	mm	Inter diameter	g	m/s ²	Gravitation		N = < ↓ ≠ ⁰⁰
Q	L/min	Volume flow	ζ		Specific resistance	For T-side flow	ζ ^T = 1.3 Q _{side} /Q = 1.0
A	mm ²	Cross-sectional area	n		Number		ζ ^T = 1.0 Q _{side} /Q = 0.5
V	m/s	Flow velocity	Σ ζ		Total specific resistance		ζ ^T = 0.9 Q _{side} /Q = 0.2
v	mm ² /s	Kinematical viscosity				For t-thought and concentric reducer	ζ ≈ 0
ρ	Kg/m ³	Density	d _{hy}	=	D - 2t	Ball valve, reduced area	ζ = 1.0
Re		Reynold number	A	=	π * D _{hy} ² / 4	Non-return, seated valve	ζ = 1.2
k	mm	Roughness	V	=	1000 * Q / (A * 60)	Section and main valve	ζ = 2.2
λ		Specific resistance, pipe	Re	=	1000 * v * d _{hy} / v		
ΔP _{fit}	Bar	Pressure drop, fitting	ΔP _{fit}	=	Σ ζ * ρ * g / 200000	v	= 1.004 mm ² /s at 20 °C
ΔP _{pipe}	Bar	Pressure drop, pipe	ΔP _{pipe}	=	λ * L * ρ * V ² / (200 * d _{hy})	ρ	= 998.2 kg/m ³ at 20 °C
ΔP _{height}	Bar	Pressure drop, water colum	ΔP _{height}	=	H * g * ρ / 100000	g	= 9.81 m / s ²
			Σ ζ	=	ζ ⁹⁰ * n + ζ ^T * n + ζ ^v * n	k	= 0.002 for stainless pipe

Pressure drop calculation

Project: Jiangnan shipyard

Section: FO Purifiers

Nozzle: L212, 20L/min

Temperature: 20°C

Fr	To	D	t	d _{hy}	A	Q	V	v	ρ	Re	k	k/d _{hy}	λ	L	ΔP _{pipe}	h	Δ P _{height}	ζ ₉₀	n	ζ ^T	n	ζ ^v	n	Σ ζ	ΔP _{fit}		
0	1	34	3	28	615	40	1.084	1.004	998.2	3.0E+04	0.002	7.1E-05	2.21E-02	2	0.009	0	0.000	0.15	5	1.3	1	1	1	3.05	0.018		
1	2	34	3	28	615			1.004	998.2	0.0E+00	0.002	7.1E-05		0.0	0.000	0	0.000	0.15						0	0		
2	3	34	3	28	615			1.004	998.2	0.0E+00	0.002	7.1E-05		0.0	0.000	0	0.000	0.15						0	0		
3	4	34	3	28	615			1.004	998.2	0.0E+00	0.002	7.1E-05		0.0	0.000	0	0.000	0.15						0	0		
4	5	18	1.5	15	177	40	3.766	1.004	998.2	5.6E+04	0.002	1.3E-04	2.12E-02	22.0	2.201	4	0.391	0.15	9			2.2	1	3.55	0.251		
5	6	18	1.5	15	177	20	1.883	1.004	998.2	2.8E+04	0.002	1.3E-04	2.23E-02	1.8	0.047	0	0.000	0.15		0.9	1			0.9	0.064		
6	7	18	1.5	15	177			1.004	998.2	0.0E+00	0.002	1.3E-04		0.0	0.000	0	0.000	0.15		0.9	1			0.9	0		
7	8	18	1.5	15	177			1.004	998.2	0.0E+00	0.002	1.3E-04		0.0	0.000	0	0.000	0.15		0.9	1			0.9	0		
8	9	18	1.5	15	177			1.004	998.2	0.0E+00	0.002	1.3E-04		0.0	0.000	0	0.000	0.15						0	0		
																2.257	0.391	0.285									
																Total pressure drop: 2.933											

D	mm	Pipe diameter	h	M	Height of water column		
t	mm	Wall thickness	L	M	Pipe length	For bending	ζ ⁹⁰ = 0.15 Smooth pipe
d _{hy}	mm	Inter diameter	g	m/s ²	Gravitation		N = < ↓ ≠ ⁰⁰
Q	L/min	Volume flow	ζ		Specific resistance	For T-side flow	ζ ^T = 1.3 Q _{side} /Q = 1.0
A	mm ²	Cross-sectional area	n		Number		ζ ^T = 1.0 Q _{side} /Q = 0.5
V	m/s	Flow velocity	Σ ζ		Total specific resistance		ζ ^T = 0.9 Q _{side} /Q = 0.2
v	mm ² /s	Kinematical viscosity				For t-thought and concentric reducer	ζ ≈ 0
ρ	Kg/m ³	Density	d _{hy}	=	D - 2t	Ball valve, reduced area	ζ = 1.0
Re		Reynold number	A	=	π * D _{hy} ² / 4	Non-return, seated valve	ζ = 1.2
k	mm	Roughness	V	=	1000 * Q / (A * 60)	Section and main valve	ζ = 2.2
λ		Specific resistance, pipe	Re	=	1000 * v * d _{hy} / v		
ΔP _{fit}	Bar	Pressure drop, fitting	ΔP _{fit}	=	Σ ζ * ρ * g / 200000	v	= 1.004 mm ² /s at 20 °C
ΔP _{pipe}	Bar	Pressure drop, pipe	ΔP _{pipe}	=	λ * L * ρ * V ² / (200 * d _{hy})	ρ	= 998.2 kg/m ³ at 20 °C
ΔP _{height}	Bar	Pressure drop, water colum	ΔP _{height}	=	H * g * ρ / 100000	g	= 9.81 m / s ²
			Σ ζ	=	ζ ⁹⁰ * n + ζ ^T * n + ζ ^v * n	k	= 0.002 for stainless pipe

Pressure drop calculation

Project: Jiangnan shipyard

Section: Incinerator

Nozzle: L212, 20L/min

Temperature: 20°C

Fr	To	D	t	d _{hy}	A	Q	V	v	ρ	Re	k	k/d _{hy}	λ	L	ΔP _{pipe}	h	ΔP _{hei} ght	ζ ₉₀	n	ζ ^T	n	ζ ^v	n	Σ ζ	ΔP _{fit}
0	1	34	3	28	615	40	1.084	1.004	998.2	3.0E+04	0.002	7.1E-05	2.21E-02	2	0.009	0	0.00	0.15	5	1.3	1	1	1	3.05	0.018
1	2	34	3	28	615			1.004	998.2	0.0E+00	0.002	7.1E-05		0.0	0.000	0	0.00	0.15						0	0
2	3	34	3	28	615			1.004	998.2	0.0E+00	0.002	7.1E-05		0.0	0.000	0	0.00	0.15						0	0
3	4	34	3	28	615			1.004	998.2	0.0E+00	0.002	7.1E-05		0.0	0.000	0	0.00	0.15						0	0
4	5	18	1.5	15	177	40	3.766	1.004	998.2	5.6E+04	0.002	1.3E-04	2.12E-02	22.0	2.201	15	1.47	0.15	9			2.2	1	3.55	0.251
5	6	18	1.5	15	177	20	1.883	1.004	998.2	2.8E+04	0.002	1.3E-04	2.23E-02	1	0.026	0	0.00	0.15		0.9	1			0.9	0.064
6	7	18	1.5	15	177			1.004	998.2	0.0E+00	0.002	1.3E-04		0.0	0.000	0	0.00	0.15		0.9	1			0.9	0
7	8	18	1.5	15	177			1.004	998.2	0.0E+00	0.002	1.3E-04		0.0	0.000	0	0.00	0.15		0.9	1			0.9	0
8	9	18	1.5	15	177			1.004	998.2	0.0E+00	0.002	1.3E-04		0.0	0.000	0	0.00	0.15						0	0

2.236	1.47	0.285
Total pressure drop: 3.991		

D	mm	Pipe diameter	h	M	Height of water column		
t	mm	Wall thickness	L	M	Pipe length	For bending	ζ ⁹⁰ = 0.15 Smooth pipe
d _{hy}	mm	Inter diameter	g	m/s ²	Gravitation		N = < ↓ ≠ ⁰⁰
Q	L/min	Volume flow	ζ		Specific resistance	For T-side flow	ζ ^T = 1.3 Q _{side} /Q = 1.0
A	mm ²	Cross-sectional area	n		Number		ζ ^T = 1.0 Q _{side} /Q = 0.5
V	m/s	Flow velocity	Σ ζ		Total specific resistance		ζ ^T = 0.9 Q _{side} /Q = 0.2
v	mm ² /s	Kinematical viscosity				For t-thought and concentric reducer	ζ ≈ 0
ρ	Kg/m ³	Density	d _{hy}	=	D - 2t	Ball valve, reduced area	ζ = 1.0
Re		Reynold number	A	=	π * D _{hy} ² / 4	Non-return, seated valve	ζ = 1.2
k	mm	Roughness	V	=	1000 * Q / (A * 60)	Section and main valve	ζ = 2.2
λ		Specific resistance, pipe	Re	=	1000 * v * d _{hy} / v		
ΔP _{fit}	Bar	Pressure drop, fitting	ΔP _{fit}	=	Σ ζ * ρ * g / 200000	v	= 1.004 mm ² /s at 20 °C
ΔP _{pipe}	Bar	Pressure drop, pipe	ΔP _{pipe}	=	λ * L * ρ * V ² / (200 * d _{hy})	ρ	= 998.2 kg/m ³ at 20 °C
ΔP _{height}	Bar	Pressure drop, water colum	ΔP _{height}	=	H * g * ρ / 100000	g	= 9.81 m / s ²
			Σ ζ	=	ζ ⁹⁰ * n + ζ ^T * n + ζ ^v * n	k	= 0.002 for stainless pipe



Type Approval Certificate

Germanischer Lloyd

This is to certify that the undernoted product(s) has/have been tested in accordance with the relevant requirements of the GL Type Approval System.

Certificate No. 26 206 - 05 HH

Company Shanghai Aohan Marine Company
IOA, No. 428, Tianmuzhong Road
200070 Shanghai, P.R. China

Product Description Control System for Fixed Water-Based Local Application Fire Fighting System for Category-A Machinery Space

Type AOHAN-SAFE H1

Environmental Category C, EMC2

Technical Data / Range of Application
Main Control Panel:
Fire / release alarms at continuously manned station, Automatic release of the system via two flame detectors, Manual release via local operation panel, Pressure pump start/stop and monitoring, Low level fresh water tank, Monitored outputs for the solenoid valves
Local Operation Panel:
Release section valve, close valve, alarm reset, Outputs of optical and acoustical alarm of each protected area,
Pump Starter Cabinet:
Start/Stop pump, monitoring of system operating pressure, pump starter failure
High pressure pump: PAH 63, 180B0016 *1)
Motor for high pressure pump: Y180L-4-H, 22KW, 380/440VAC, 50/60Hz, IP56 *1)
Solenoid valve: 7GPY, 24VDC, IP56 *1)

Test Standard Guidelines for the Performance of Type Approvals Part 2, Edition 2003
IMO MSC/Circ.913

Documents Test report : NX04200, dated 2004-09-29; NX04235, dated 2004-10-28
Documents: Manual High-pressure water mist system dated 2004-11-15,
Components of Fixed Local Application Fire Fighting System
Drawings: Wiring, connection and circuit diagram according to submitted file

Remarks This certificate is valid together with our type approval certificate No.26190-05HH
*1) = or other types approved by GL

Valid until 2010-06-30

Page 1 of 1

Type Approval Symbol



File No. I.B.11

Hamburg, 2005-08-01

Germanischer Lloyd

J. Wittburg
J. Wittburg

H. Jansen
H. Jansen

This certificate is issued on the basis of "Guidelines for the Performance of Type Approvals Part 1, Procedure".



Germanischer Lloyd

Type Approval Certificate

This is to certify that the undermoted product(s) has/have been tested in accordance with the relevant requirements of the GL Type Approval System.

Certificate No. 26 190 - 05 HH

Company Shanghai Aohan Marine Company
IOA, No. 428, Tianmuzhong Road
200070 Shanghai, P.R. China

Product Description Fixed Water-Based Local Application Fire-Fighting System for Category-A Machinery Spaces

Type AOHAN-SAFE H1

Environmental Category None

Technical Data / Range of Application Main components: High-pressure pump unit, water feeding pump, reservoir tank, electrically operated section valves, pump start / valve operating panels, local push buttons, audible / visual alarm devices, flame detectors, stainless steel piping and spray heads

Operating pressure: min. 95 bar at the nozzles

Spray nozzle details: - type: AOHAN-SAFE/L212
- k-factor: 2.01
- orientation: pendent
- spacing as well as vertical and lateral distances see page 2

Application: Fixed local application fire fighting in category A machinery spaces and similar risks.

Test Standard IMO MSC/Circ. 913

Documents See page 2

Remarks This certificate is valid together with our type approval certificate No. 26206-05 HH.

Valid until 2010-06-30

Page 1 of 2

File No. II.H.01

Hamburg, 2005-07-15

Type Approval Symbol



Germanischer Lloyd

G. Hölzer

M. Kämpf

This certificate is issued on the basis of "Guidelines for the Performance of Type Approvals Part 1, Procedure".



Type Approval Certificate

This is to certify that the undernoted product(s) has/have been tested in accordance with the relevant requirements of the GL Type Approval System.

Certificate No. 26 190 - 05 HH

Spray Nozzle Arrangement:

Max. horizontal spacing [m]	Min. vertical distance from protected object [m]	Max. vertical distance from protected object [m]	Min. lateral distance of the outer nozzles from protected object [m]
3.5	1.5	10.5	0.0

DOCUMENTS

- AOHAN Type Approval Documentation dated 2004-11-15, reviewed with our Ref. No. 05-036373 dated 2005-04-19
- CNAL (China) Test Report on Fire Tests, No. NX04200 dated 2004-09-29
- CNAL (China) Report on Nozzle Testing, No. NX04235 dated 2004-10-28

- CONDITIONS:**
1. Installation of the system and arrangement of nozzles to be in accordance with the type approval documentation and the principal requirements of IMO MSC/Circ. 913. Besides, the GL Rules are to be observed.
 2. Prior to fitting on board, arrangement drawings and calculations are to be submitted to GL Head Office for approval.
 3. Prior to commissioning, each installation is subject to testing in presence of a Surveyor to Germanischer Lloyd in accordance with the manufacturers' specification.

MARKING: The nozzles are to be marked with the name of the manufacturers and type coding.

AUDITING: Germanischer Lloyd is to be given the permission to perform periodical production audits at any time during the validity of this certificate.

Valid until 2010-06-30

Page 2 of 2

Type Approval Symbol



File No. II.H.01

Hamburg, 2005-07-15

Germanischer Lloyd

G. Hölzer

M. Kämpf



中国船级社
CHINA CLASSIFICATION SOCIETY

证书格式号/Form: T01.00-
HQ001931

型式认可证书
CERTIFICATE OF TYPE APPROVAL

证书编号/Certificate No. SH05T00042

兹证明本证书所述制造厂生产的下列产品能够满足下面列明认可标准的要求。

This is to certify that the following products produced by the manufacturer stated in the certificate can meet the requirements of the approval standards listed below.

认可产品/ Product Approved

固定式局部水基灭火系统

Fixed Water-Based Local Application Fire Fighting System

制造厂/ Manufacturer

上海傲瀚机电设备有限公司

Shanghai Aohan Marine Company

中国上海市天目中路428号西楼10A

West Building, 10A 428 Tianmuzhong Road Shanghai, China

认可标准/ Approval Standard

1. 国际海事组织 国际消防安全系统规则
IMO MSC.98(73) FSS Code
2. 国际海事组织 MSC/Circ.913 《适用于A类机器处所的固定式局部水基灭火系统认可导则》
IMO MSC/Circ.913 GUIDELINES FOR THE APPROVAL OF FIXED WATER-BASED LOCAL APPLICATION FIRE-FIGHTING SYSTEM FOR USE IN CATEGORY A MACHINERY SPACES

证书有效期至/ This Certificate is valid until

2009年7月21日 / Jul. 21, 2009

发证机构 中国船级社上海分社
Issued by CCS Shanghai Branch

签发日期 2005年7月22日
Date Jul. 22, 2005

本证书根据中国船级社《产品检验规则》及有关程序规定签发。关于证书的有关规定见本证书背面的说明。当本证书包括多页纸张时，则所有证书页为一个整体，必须同时使用。每一页证书均须由本社盖章方为有效。证书复印件无效。任何单位和个人均不应摘录或节选本证书的部分内容。本认可证书不代表本社对实物产品质量的最终确认。有关各方对所持证书的真实性有疑问时，可以向我社检验机构咨询。
This Certificate is issued pursuant to the Regulations for Survey of Marine Products and related procedures of the Society. Refer to the back of the certificate for detailed requirements of the certificate. When the certificate consists of more than one page, all pages of the certificate are taken as a whole and are used simultaneously. No certificate pages is valid without bearing the stamp of the Society and no copied form of the certificate is regarded as valid. Any part of the certificate is not to be extracted or abridged by any form. This approval certificate does not constitute the final confirmation of the Society about the quality of the actual product. Related parties who are doubted about the authenticity of the certificate may inquire of the Society or its offices.



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本地检验机构/CCS Local Office: 中国船级社上海分社 CCS Shanghai Branch 电话/Tel: +86 (21) 58851234 传真/Fax: +86 (21) 58852626

SH45061532

第1页 共3页 / Page 1 of 3

No. 05047664

产品明细/Product Description

固定式局部水基灭火系统/Fixed water-based local application fire fighting system

产品型号/Model	: AOHAN-SAFE H1
最小工作压力/Min. Operating pressure	: 9.5 MPa
最大工作压力/Max. Operating pressure	: 11.4 MPa
最大水平距离/Max. Horizontal spacing	: 3.5 m
距被保护物最小垂直距离/Min. Vertical distance from object	: 1.5 m
距被保护物最大垂直距离/Max. Vertical distance from object	: 10.5 m
喷头型式/Nozzle Type	: AOHAN-SAFE/L212
流量系数 K/Flow factor K	: 2.01
喷雾锥角度/Angle of the spray taper	: 105°
本体材料/Body material	: 304不锈钢/304 stainless steel

批准的图纸和设计计算书/ Approved Drawings and Design Calculations

图纸批准号/ Drawings Approval No. : SH05A00088
 图纸或技术文件编号/ No. of Drawings and/or Technical Documents :

产品认可试验报告/Approval Test Report

试验报告编号/Test Report No.	:	NX04200
试验报告日期/Test Report Date:	:	2004-09-29
试验单位/ Laboratory:	:	南京消防器材股份有限公司火灾实验中心 Center of fire test of Nanjing Fire Protection Technology Co., Ltd.
试验单位地址/ Test Address:	:	中国江苏南京市白下区石门坎石杨路12号 12 Shiyang Road, Baixia District
试验报告编号/Test Report No.	:	NX04235
试验报告日期/Test Report Date:	:	2004-10-28
试验单位/ Laboratory:	:	南京消防器材股份有限公司火灾实验中心 Center of fire test of Nanjing Fire Protection Technology Co., Ltd.
试验单位地址/ Test Address:	:	中国江苏南京市白下区石门坎石杨路12号 12 Shiyang Road, Baixia District

产品适用范围/Application of the Product

认可保持条件/ Maintenance Requirements of Approval

型式认可后, 如果产品及其重要零部件的设计、所用材料或制造方法有所改变, 且影响到产品的主要特性、特征; 或产品的性能指标有所更改, 且超过认可的范围, 则有关图纸和文件应经检验机构审批。并在检验机构认为必要时, 经本社检验人员见证有关试验和进行检查, 其结果应能证实仍符合认可条件。
 After type approval, if there are changes to the design, materials used or manufacturing method of the product and important components and such changes affect major characteristics and properties of the product, or property indexes of the product are changed and exceed the scope of approval, related drawings and documents are to be examined and approved by the concerned survey office. Where deemed necessary by the survey office, the surveyor to the Society will go to witness relevant tests and conduct inspection and the results should be able to demonstrate compliance with the approval conditions.

认可后的产品检验方式/ Method of product inspection after works approval

认可后检验方式定为: 出厂检验。由本社检验人员在每件或每批产品处于完工阶段或出厂前, 到工厂审查有关产品的质量记录, 并对产品进行逐件或抽样检验, 认为结果满意后在产品上加本社检验标志, 并颁发产品证书或签署等效证明文件。
 The method of inspection before delivery is used for products after works approval. Upon completion or prior to the delivery of each piece or batch of products, the surveyor to the Society will go to the manufacturer to examine the quality records of the given product(s) and inspect them piece by piece or by sampling, brand the Society's inspection marking on the product(s) where the results are satisfactory and issue the product certificate or equivalent document.

其他/ Others

- ※备注: Remark
1. 本证书是基于Lloyd's Register 验船师见证的型式试验报告签发。
This Certificate is Issued on based of the Lloyd's Register Type Test Reports of Surveyor testimony.
 2. 该系统不得以单喷头形式布置。
This system shall not be arranged in single nozzle.
 3. 高压泵/型号/制造商: High-pressure Pump/PAH 63/DANFOSS.

中国船级社上海分社

CCS Shanghai Branch



*****本证书正文完/ End of Text*****



Periodic check program

To make sure that the system will always function satisfactorily, a periodic check program has to be carried out according to the mentioned procedure.

After having executed the program the individual check programs are dated and signed.

Monthly check	Part A	Check of local start and stop of pump unit.
	Part B	Start of pump unit and operation valves from the VOP.
	Part C	Test of start and running signal at different remote control stations

Every six month	Part D	Test of automatic start of pump unit and operation of the section valve
-----------------	--------	---

IMPORTANT NOTICE!

Avoid dry running of the high-pressure pump!

Before start and after any maintenance or service of the pump unit, make sure that the pump is filled with water.

Filling of the pump is carried out in the following way:

With the inlet line connected to the reservoir tank, remove the upper bleeding plug. Make sure that plenty of water is drained from the upper bleeding drain. Hereafter tighten the bleeding plug.



Monthly Check: Part A

Test of local start and stop of pump unit

Precondition:

Close main valve.

System in “System ready” mode.

Test procedure

Check

1. Start high-pressure pump by pressing the start bush button on pump unit start panel

Observe:

The pump running indication “HP PUMP RUN”

Reestablishing the system:

Stop HP pump by pressing the “EM Stop” push button

Open test valve and drain the pipe system between unit and main valve

Close the test valve

Open main valve

Date:

Sign:



Monthly check: Part B

Start of the pump unit and operating the section valves from the VOP.

Precondition:

Close main valve to prevent water mist coming out in the protected area during the release of the section valve.

Test Procedure

Check

1. Activate push button for section valve for Boiler

Observe:

Section valve for boiler is activated.

HP pump starts.

Light in "Pump running" and valve open, are on

2. Close section valve by "Close all valve" and Stop of high pressure pump by activate push button "Stop pump"

Observe:

Section valve for boiler is deactivated

Light in "Pump running" and valve open, are off

3. Open test valve and drain the pipe system between pump unit and main valve.

Date:

Sign:



AOHAN-SAFE

SERIES

Carry out item nos. 1-3 for all sections:

Section tested	Section valve	Valve open	Lamp on	Valve closed	Lamp off
Section No. 1					
Section No. 2					
Section No. 3					
Section No. 4					
Section No. 5					
Section No. 6					
Section No. 7					
Section No. 8					

Reestablishing the system:

Open test valves and drain the pipe system between pump unit and main valve.

Open main close valve

Check

Date:

Sign:



Monthly Check: Part C

Test of pump start and opening of section valves upon activation of remote control "Release System" push button.

Precondition:

- System in "System ready" mode.
- Close main valve.

Test procedure:

Press the individual "Release System" push buttons, and observe fire alarm sounds in the respective area, and observe that the high pressure pump starts up and the corresponding section valve opens.

"Release System" push button	Pump start	Valve open
For section NO. 1		
For section NO. 2		
For section NO. 3		
For section NO. 4		
For section NO. 5		
For section NO. 6		
For section NO. 7		
For section NO. 8		

After every start

Check

Stop the high-pressure pump by pressing push button "Close all valve" and "Stop pump" on the VOP

Reestablishing the system

Open the test valve and drain the pipe system between the pump unit and the main valve

Close test valve

Open main valve

Date:

Sign:



Every six-month check: Part D

Automatic start of the pump unit and operation of the section valves from the fire detect system

Precondition:

Close main valve to prevent water mist coming out in the protected are during the release of the section valve.

Test procedure	Check
1. Active one flame detector for boiler section Observe Pre alarm on repeater panel is activated	_____
2. Activate another flame detector for boiler section Observe Section valve for boiler section is activated High pressure pump starts Light in “pump running” and valve open, are on Audible and visual alarm are activated	_____ _____ _____ _____
3. Close section valve by pressing the push button “Close all valve” and Stop high pressure pump by activate push button “Stop pump” Observe Section valve for boiler is deactivated Light in “pump running” and valve open, are off	_____ _____

Date:

Sign:



AOHAN-SAFE

SERIES

Carry out item 1-3 for all section:

Section tested	Section valve	Valve open	Lamp on	Valve closed	Lamp off
Section No. 1					
Section No. 2					
Section No. 3					
Section No. 4					
Section No. 5					
Section No. 6					
Section No. 7					
Section No. 8					

Reestablishing the system:

Open test valves and drain the pipe system between pump unit
and main valve.

Open main close valve

Check

Date:

Sign: