

ROGHAN ROAD GAS EXTRACTION PLANT START UP AND SHUT DOWN PROCEDURE

P. TRANTER
18/6/92

(REFER TO ENGINE START PROCEDURE
FOR ENGINE OPERATION)

START UP

1. Observe external alarm panel.
2. Take appropriate action per indicated alarm.
3. Drain bag filters. V1 & V2
4. Close engine coalescing filter. V3
5. Open main inlet valve from gas field. V4
6. Open both bag filter inlet valves. V5 & V6
7. Open both bag filter outlet valves. V7 & V8
8. Open both bag filter, bleed valves. V22 & V23
9. Close Nitrogen purge/bleed valves. V9 & V10
10. Open oxygen detect manifold valves inlet and outlet. V11 & V12
11. Open pressure gauge and manifold low pressure supply valve. V13
12. Open manifold high pressure supply valve. V14
13. Close blower bypass valve. V15
14. Open blower inlet valve. V24
15. Drain blower from drain valve. V16
16. Check blower isolator is on in acoustic enclosure.
17. Open blower outlet valve. V17
18. Open low pressure and high pressure valves of differential pressure transmitter. V18 & V19
19. Close equalizing valve of differential pressure transmitter. V20
20. Open flare delivery valve. Partially throttle to provide required back pressure. V21
21. Close main isolator on blower switchboard.
22. Check for alarms.

.../2

- 2 -

23. Wait for gas analyser to become operational - approx 2 mins i.e. fault light is extinguished.
If required, accept oxygen alarm (alarm 1) via the accept key.
Do not attempt to reset alarm as yet. If methane alarms 2, 3 or 4 are active, attempt 1 reset if alarms return isolate all valves, vacate building and follow safety procedures.
24. Switch variable speed drive to remote.
25. Check set point of P.I.D. loop controller is at the required m³/hour.
26. Log start up and hours run in to the log book.
27. Warn personnel of intention to start plant.
28. Press start button (plant begins start sequence).
29. Select oxygen sensor on gas analyser via the select key (alarm 1).
Observe oxygen content of gas, when the oxygen level approaches zero, reset panel via the reset key.
30. Complete check list and log.

SHUT DOWN

Short Term

- Press stop button.
- Wait for plant to wind down approx 5 mins.
- Close main inlet valve from gas field. V4
- Close flare delivery valve. V21
- Open blower main switch and TAG off with caution tag.

Long Term

- Reverse Start Up procedure.

EQUIPMENT: Fuji PID Loop Controller
PYZ type

SUPPLIER

Emsby
38 Achievement Cres
ACACIA RIDGE 4077
274 2566

Address	Parameter
P	115
I	32
D	6
HYS	.3
Pdf	30
PSU	500
PSL	0
SP	Variable

EQUIPMENT: Fuji Variable Speed Drive FVR-P5, 22Kw

Emsby
38 Achievement Cres
ACACIA RIDGE 4077
274 2566

Address	Parameter	Address	Parameter
0	00	14	00
1	10	15	00
2	20	16	00
3	30	17	00
4	05	18	00
5	25	19	00
6	25	20	00
7	21	21	00
8	02	22	00
9	01	23	00
10	00	24	00
11	05	25	01
12	00	26	01
13	00	27	50
		28	00
			04

EQUIPMENT: Rosemount Differential Transmitter D.P.
3051CD1A22A1AB1
Oriface Plate 4" 150lb
A = 500m³/hour
202kPa = 1000m³/hour. Extended range for future)

SUPPLIER
Rosemount Instruments
4/139 Sandgate Rd
ALBION 4010
262 8577

EQUIPMENT: Delivery Line mercury pressure switch
Delivery Flare line pressure 15Kpa

ROGHAN ROAD BLOWER OPERATIONAL PARAMETERS AND SUPPLIER

EQUIPMENT: MICRO 2000 Gas Detector

SUPPLIER: Control Equipment
105 Commercial Rd
FORTITUDE VALLEY 4006

LOCATION	CHANNEL	GAS TYPE	RANGE	ALARM SETTINGS		
				WARN ALARM 1	ALARM ALARM 2	HIGH ALARM 3
INLET MANIFOLD	1	OXYGEN	0-20.9%OXY	10%	12%	15%
ABOVE BLOWER ENCLOSURE	2	METHANE COMBUSTIBLE	0-100%LEL	20%	35%	50%
INSIDE BLOWER ENCLOSURE	3	METHANE COMBUSTIBLE	0-100%LEL	20%	35%	50%
ABOVE ENGINE	4	METHANE COMBUSTIBLE	0-100%LEL	20%	35%	50%

* LEL - LOWER EXPLOSIVE LEVEL

Sail Switches S637A & S688A Honeywell

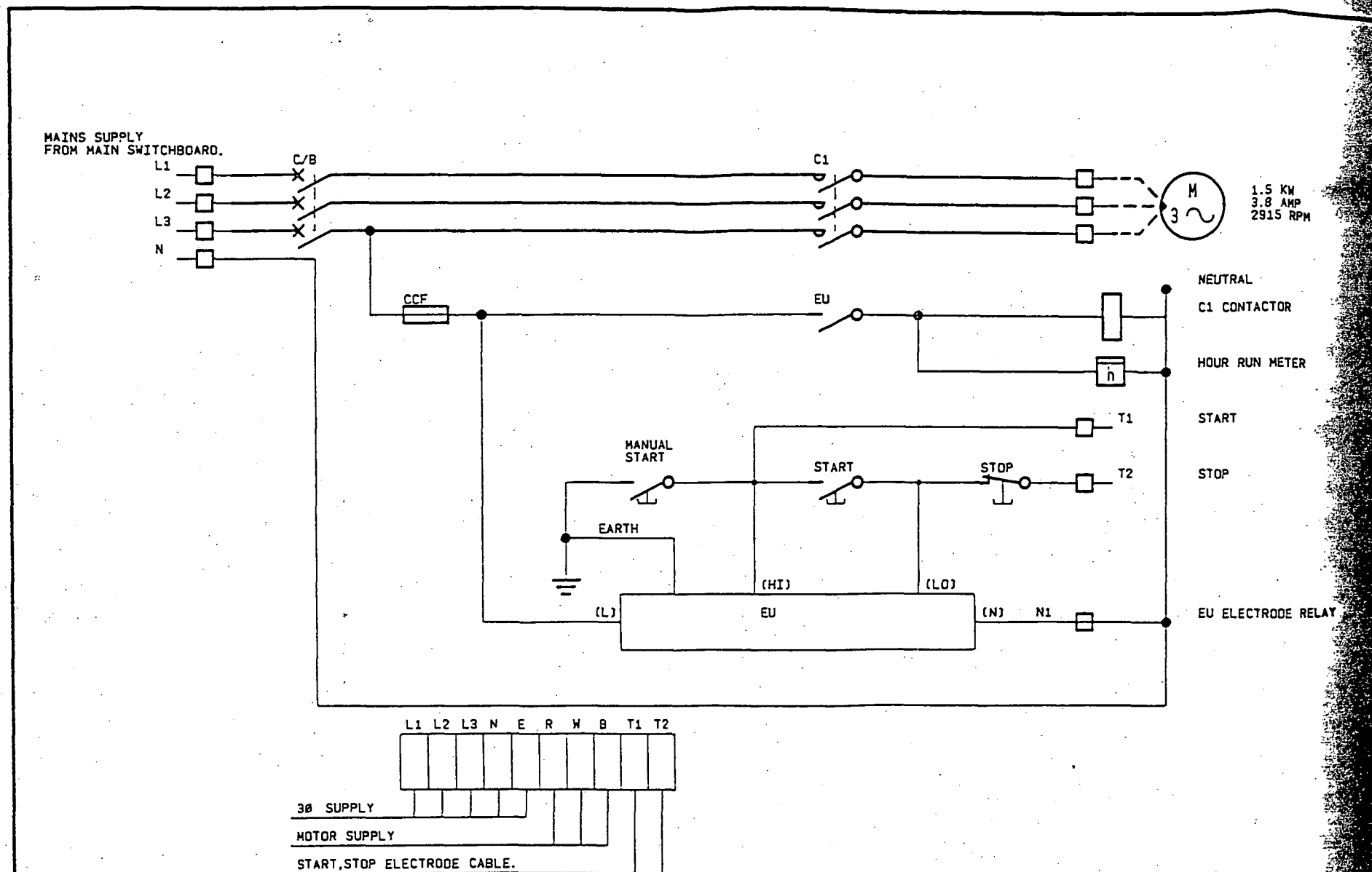
SUPPLIER: Auslec
Commercial Road
FORTITUDE VALLEY 4006
854 1661

EQUIPMENT: Vibration Monitor
Dual Channel Vibration VM2C
Alarm level 5.5mm/sec
Danger level 9.5mm/sec
Accelerometer: VIBRA-metrics
Hamden CT, USA
SIN 2055

SUPPLIER: Howden Sirroco
97-103 Pacific Hwy
NORTH SYDNEY 2060
(02) 929 4566

EQUIPMENT: Electrically operated actuator
Body SKP10 VRH 10.915
Flame detector & rod
Igniter, transformer LFE10
µ amp meter

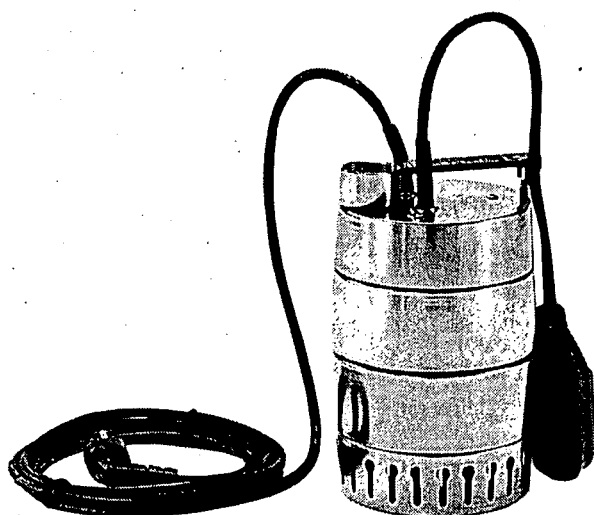
SUPPLIER: F.M. Franklins P/L
65 Ipswich Rd
WOOLLOONGABBA 4102
391 4865



No. DATE		MANAGER		DIRECTOR OF PLANNING & DESIGN		DESIGN		PROJECT: REFUGE TIP REHABILITATION.	
11/91		ORIGINAL		PWT		DRAWN PWT 13.11.91		TITLE: ROGHAN RD LEACHATE RECIRCULATION SCHEMATIC DIAGRAM	
AMENDMENT		INITIALS		DATE:		DATE:		CADD FILE No. 7450002A	
No. DATE		DIRECTOR OF CONSTRUCTION		DIRECTOR OF M & E SERVICES		DIRECTOR OF SEW. OPERATIONS / W.S. DISTRIBUTION		ENGINEER IN CHARGE	
AMENDMENT		INITIALS		DATE:		DATE:		SUPERVISING ENGINEER	

KP 350 & KP 550

- Ⓒ GB Installation and Operating Instructions
- Ⓒ D Montage- und Betriebsanleitung
- Ⓒ F Notice d'installation et d'entretien
- Ⓒ I Istruzioni di montaggio e di funzionamento
- Ⓒ E Instrucciones de instalación y funcionamiento
- Ⓒ P Instruções de instalação e funcionamento
- Ⓒ NL Montage- en bedrijfsinstructies
- Ⓒ S Monterings- och driftsinstruktion
- Ⓒ SF Asennus- ja käyttöohjeet
- Ⓒ DK Monterings- og driftsinstruktion



GRUNDFOS®



Input (0-157)

+ 0	start	start button	26
+ 1	stop	stop button	27
+ 2	press h	high pressure switch	30
+ 3	gas/alm	micro 2000 gas alarm	31
+ 4	SAIL 4	vent fan sail switch PRES	32
+ 5	o/l vfd	blower vfd o/l	33
+ 6	flm/out	flame out detected	34
+ 7	VIB	sirocco vibration detect.	35
+ 10	smoke	smoke detector	36
+ 11	SAIL11	ACOUSTIC SAIL SWITCH	37
+ 12	SAIL12	ACOUSTIC SAIL SWITCH	40
13			41
14			42
15			43
16			44
17			45
20			46
21			47
22			50
23			51
24			52
25			53

arrows, Pg Up/Dn, Ins/Del key to edit PRT SC print-dump F10 to quit

Output (200-357)

+200	BLOWER	BLOWER & FLAME DETECTOR.	226
+201	SAILALM	FAN SAIL SWITCH	227
+202	FANS/AC	FANS IN ACOUSTIC ENCLOSE	230
+203	VFD-O/L	OVERLOAD VAR FREQ. DRIVE	231
+204	flm/on	flame ignition start	232
+205	flm/alm	flame alarm detected	233
+206	SMOKE	SMOKE ALARM	234
+207	prs/alm	high pressure ind alarm	235
+210	GAS/ALM	HIGH GAS ALARM OXY & CH4	236
+211	VIB/ALM	VIBRATION ALARM BLOWER	237
+212	Siren	Start warning siren	240
+213	Strobe	Common external ind.	241
214			242
215			243
216			244
+217	ENG/STR	ENGINE START SIGNAL	245
220			246
221			247
222			250
223			251
224			252
225			253

arrows, Pg Up/Dn, Ins/Del key to edit PRT SC print-dump F10 to quit

Internal relay group 1 (400-557)

+400	Ir/strt	internal relay start	426
+401	Ir/del	Internal relay startdelay	427
+402	IR SAIL	INTERNAL RELAY SAIL SW'S	430
+403	SIRENIR	INTERNAL RELAY ENG SIREN	431
404			432
405			433
406			434
407			435
410			436
411			437
412			440

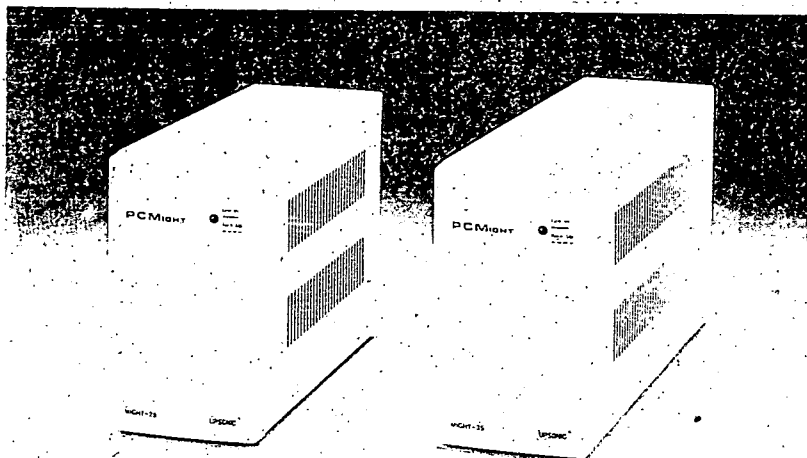
ROGHAN RD REFUSE TIP GAS EXTRACTION CHECK LIST/LOG

P. FRANTER 17-6-92

[illegible]

*Peter Martin Series
Mount Pellier Rd Newstead.*

UPSONIC[®]



PC MIGHT-25 ✓

PC MIGHT-35

UNINTERRUPTIBLE POWER SYSTEM INSTRUCTION MANUAL

NOTE

The UPS has been shipped with the battery bank disconnected to prevent accidental turn-on and potentially hazardous discharge. Please make the final battery connection on the back panel of the unit as stated in this manual.

Operating Location

Your UPS should always rest on its rubber feet. Install the UPS in a well ventilated area. Make sure that the ventilation holes on both sides of the unit and the exhaust fan outlet (if any) is not obstructed by the wall or other object.

Caution

Keep your UPS away from direct heat (maximum 35°C), water, or inflammable liquids or gases.

Safety Precaution



WARNING


Potentially lethal voltages may exist at the output receptacles even when the AC input power cord is disconnected. Do not remove the cover. The unit should be serviced by qualified service personnel only.

CAUTION

Use only the properly rated wire, plug and wall outlet receptacle for UPS power connection. The wiring of the wall outlet must comply with the relevant standards.

General Remarks

Your UPS is designed primarily for computer applications (CPU, terminals, printers and any other kind of peripherals), telecommunication equipment or other similar kind of sensitive equipment. Do not use it for pure inductive load or capacitive load.

 **CAUTION** : Never plug the input power cord into the output receptacles of the same UPS as this may seriously damage the unit.

Initial check before starting-up

Check the following items when the UPS is unpacked from the box:

1. **Shipping damage** : If damage is visually observed, please contact the dealer from whom you purchased the unit.
2. **ON-OFF Switch** : The switch should be at the "OFF" ("0") position.

Activation of Battery Link

Your UPS is shipped with the battery power disconnected from the inverter inside of the unit to prevent accidental discharge of the battery or turn-on of the unit.

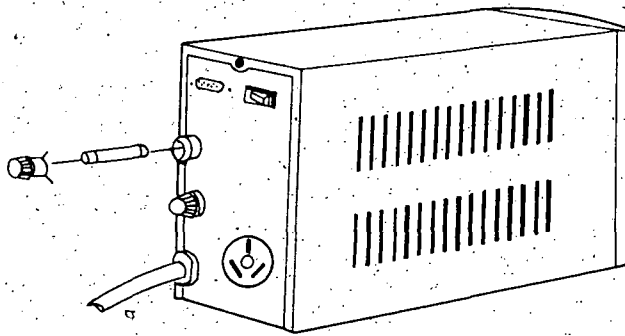
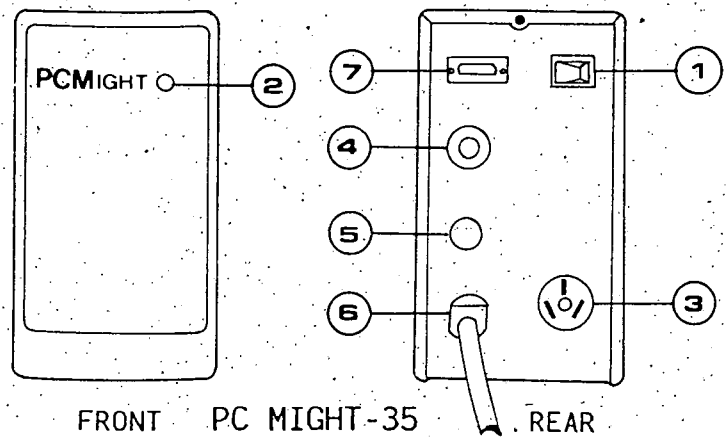
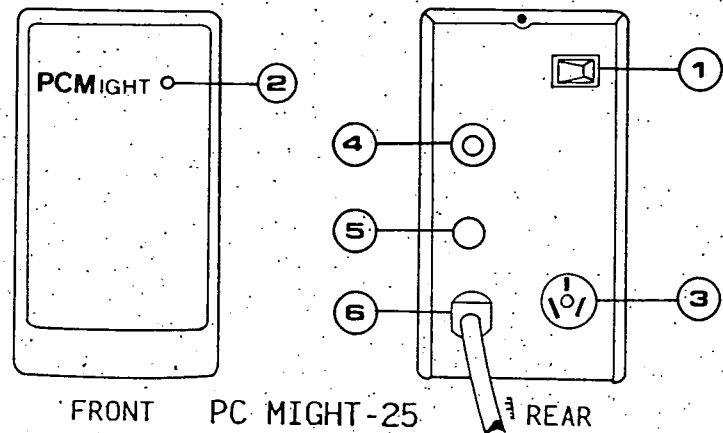


FIGURE 1.

Please refer to figure 1 and activate the battery link at the rear of the unit.

- Make sure the unit is switched OFF and unplugged from AC mains.
- Fit the DC Fuse into the DC Fuse holder as shown.



1. Power On/Power Off switch.
2. Line In/Back Up Indicator – the green light is on during normal operation of the UPS when AC mains power from the utility is at normal level. It flashes during back-up mode when the UPS provides back-up power from its batteries.
3. Output receptacles
4. DC Battery Fuse
5. Input Fuse
6. Power cord
7. Option: Remote Connector (only for PC MIGHT 35)– provides indication of back-up operation and low battery.

Starting-up

Check that the indications on the identification prints of the UPS at its rear correspond to your AC power mains specifications.

Check that the mains supply is grounded (earthed) and complies with relevant standards.

Check that the power ON/OFF switch is at the "off" position.

Plug the power cord into an AC mains wall outlet, and then turn on the power switch.

Warning : AC voltage is now present at the receptacles.

Once turned on, the green "Line In/Back Up" light may flash briefly, then the green "Line In/Back Up" light will illuminate and remain so during normal AC power state. (Line In).

Note : After the connection, leave the UPS switched on for at least 12 hours to ensure that the batteries are in a properly charged state.

Battery back-up mode (load on battery)

When AC power fails or falls too low, the UPS will transfer to back-up mode. The "Line In/Back Up" light will flash with the beeper sounding in the mean time.

The flashing and beeping rate is around once every three seconds in a typical load state.

Note : SAVE files at once as a safe-precaution.

Back-up Function Check

Plug an uncritical load of around 50 Watts (such as a terminal) into one of the UPS output receptacles.

Disconnect the UPS power cord from the AC wall outlet.

The load should be unaffected by this power interruption.

After this check is done, your UPS is now ready for use with your equipment.

Low Battery Shut-down

The UPS automatically stops when battery autonomy is exhausted. When AC mains power returns, it will automatically restart and the green light will come back on.

Caution

Do Not leave the UPS unattended for more than one day after it shuts down due to exhausted battery. Make sure the UPS receives AC power recharge promptly.

Extended Storage of Un-use UPS

Carry out the "Activation of Battery Link" procedure in reverse order. Disconnect the battery from the UPS inverter for prolonged storage.

Note : Batteries have to be re-charged for 24 hours every 2 months even in storage.

Replacement of Batteries

The battery manufacturer recommends replacement of batteries 3 years after first installment of the unit to maintain full-rate performance. The suggested maximum period that the user must replace batteries is 5 years.

Note : Battery replacement should be carried out by qualified personnel only.

Troubleshooting

Problem

UPS does not provide power in normal AC mode. (Line in mode)

-Check AC wall outlets for proper power supply.

-Check the power cord for proper connection.

-Check the AC fuse/breaker. Replace blown fuse or reset breaker if needed.

UPS does not provide power in back-up mode.

-Battery charge may be low due to the consistently inadequate mains power.

Consult your local electricity supply company.

-The batteries may be exhausted. Charge them up for another 24 hours and try again. If the problem persists, take to an authorized service personnel to have them replaced.

UPS transfers to back-up when the mains power seems adequate

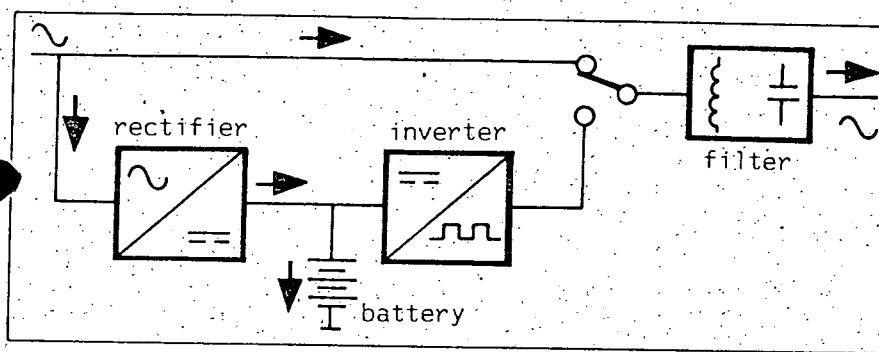
-Make sure that the mains power voltage is at proper level.

UPS SPECIFICATIONS

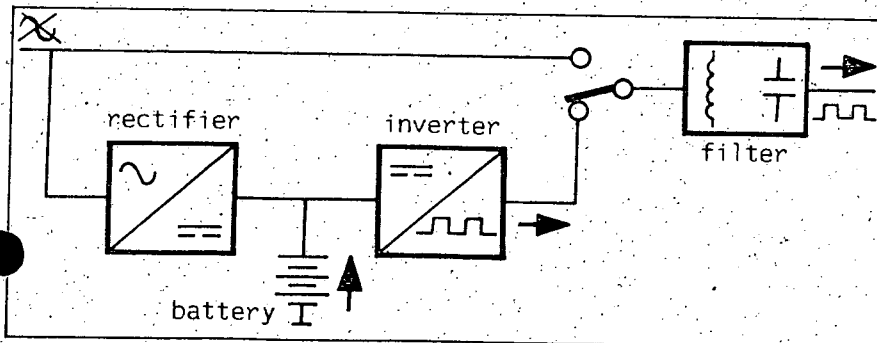
SPECIFICATION	PC MIGHT-25	PC MIGHT-35
PERFORMANCE		
Output		
VA	250VA	350VA
Watts	150W	210W
Voltage	240V	240V
Frequency	50Hz	50Hz
Waveform	SQUARE	SQUARE
Input		
Voltage	240V	240V
Frequency	50Hz	50Hz
Ampere	3A	3A
Back-up Operation		
Back-up Power Time		
Full load	3-4 min	3-4 min
Half load	8-10 min	8-10 min
Transfer Time (in phase typical)	4 msec	4 msec
Transfer Points ($\pm 2VAC$)		
AC line to back-up	204V	204V
Back-up to AC line	216V	216V
Recharge Time	10-12 hrs.	10-12 Hrs.
No. of Batteries	1	1
Battery Type	12V, 4AH	12V, 7AH
SURGE, NOISE & OVERLOAD PROTECTION		
Power Dissipation (20microsec)	7,500,000W	7,500,000W
Energy Dissipation	150 Joules	150 Joules
RFI Attenuation Frequency	100KHz-100MHz	100KHz-100MHz
Attenuation	20dB	20dB
Clamping Voltage level (peak)	370V	370V
Output-SHORT CKT	Current Limiting	Current limiting
Overload input	3A Fuse	3A Fuse
SYSTEM		
Noise Level (1 Meter)		
Normal Operation (w/background)	55dB	55dB
Back-up Operation	60dB	60dB
Heat Dissipation	nominal	nominal
Size (cm) W×H×D	8.5×15×24	8.5×15×30.8
Weight (kg)	5	6.2

Functional Block diagram

mains on line



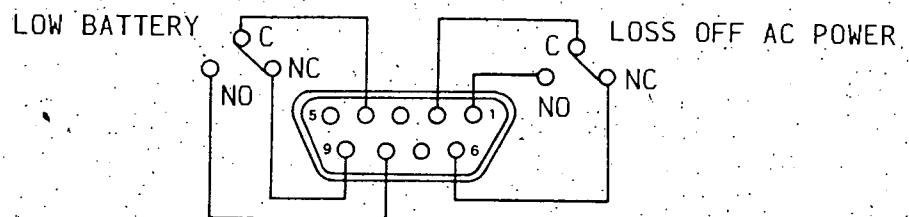
mains off line



OPTION: (ONLY FOR PC MIGHT-35)**Remote Connector**

Located on the rear panel of the UPS is a connector which provides status information through dry relay contacts on UPS operation. These contacts enable the UPS to notify an unattended computer being supported by the UPS of a power outage and a low battery condition. The computer can then initiate a software routine to save its data, close its files and, in the case of an extended outage, prepare for shutdown.

Following is the connector pin configuration during normal UPS operation when AC input power is present.

**TRUTH TABLE**

STATE \ PIN	PIN 2,1	PIN 4,8	PIN 2,6	PIN 4,9
NORMAL	OPEN	OPEN	CLOSE	CLOSE
BACK-UP	CLOSE	OPEN	OPEN	CLOSE
BATTERY LOW	XXXXX	CLOSE	XXXXX	OPEN

Appendix B

MICRO 2000 PARTS LIST

MICRO 2000 SYSTEM

PARTS LIST

PART NUMBER	DESCRIPTION
MICRO 2000 CABINET :	
23-2100L	MICRO 2000 CABINET complete with Front Panel Artwork Key Lock / Keys 20mm Conduit Entry Adaptors Mother Board Supports
23-2000L	MICRO 2000 CABINET
28-2000L	MICRO 2000 FRONT PANEL ARTWORK
28-2010L	CHANNEL LABEL - GAS TYPE
43-0001L	KEY LOCK + KEYS
43-0000L	KEY ONLY [PAIR]
47-9020L	20mm DIA. CONDUIT ENTRY ADAPTOR
MICRO 2000 MOTHER BOARD :	
75-2000LB	MICRO 2000 MOTHER BOARD [Specify A.C. input voltage]
44-1211L	RELAY SPDT 12V [611D012]
55-8600L	RAM 256K BYTE [D446C-3]
55-8000L	MICRO 2000 CPU : Z80
55-9000LP	MICRO 2000 ROM [Specify system requirements,] [previous ROM version, and] [serial number(s).]
43-5212L	FUSE 1 : 2 AMP M205
43-5213L	FUSE 2 : 3 AMP M205
45-8200L	LOGIC PLUG / MINI LINK

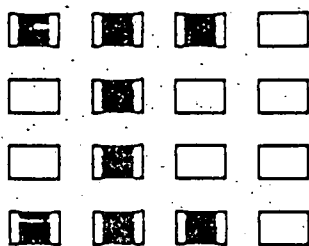
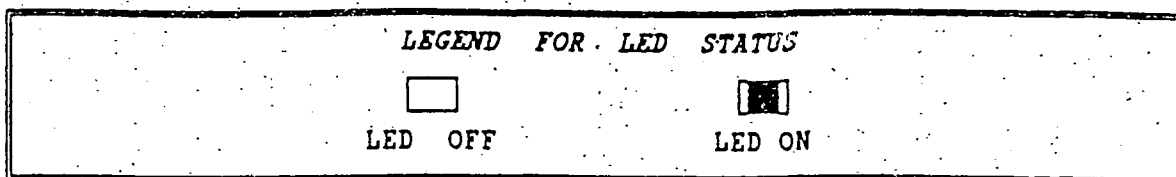
MICRO 2000 SYSTEM

PARTS LIST

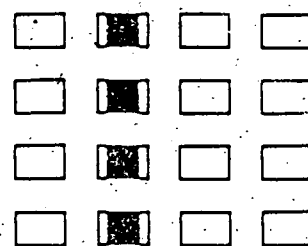
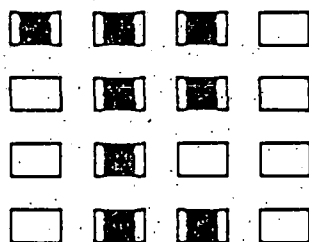
CONTINUED

PART NUMBER	DESCRIPTION
MICRO 2000 DISPLAY BOARD :	
75-2010LB	MICRO 2000 DISPLAY BOARD complete with Meter ; Loom Connector ; Buzzer
50-2000L	MICRO 2000 METER : 1mA FSD [Specify Scale i.e. 0 - 100%]
45-8500L	CONNECTOR LOOM 36" 26 WAY complete with plugs.
45-1005	BUZZER 6 Volt.
43-0101L	PUSH BUTTON SWITCHES : TM101
51-0630L	LED RED
51-0640L	LED YELLOW
51-0650L	LED GREEN
MICRO 2000 INPUT CARD :	
72-2400L	MICRO 2000 INPUT CARD - PROGRAMMED complete with Logic Plugs [Specify input type / sensor]
45-8200L	LOGIC PLUG / MINI LINK

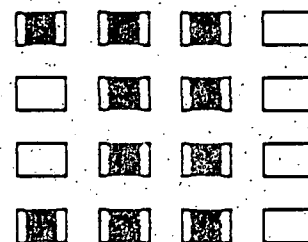
MICRO 2000 FAULT DISPLAYS.



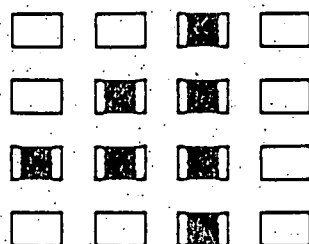
DATA FAULT



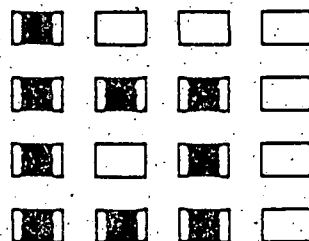
A TO D FAILURE



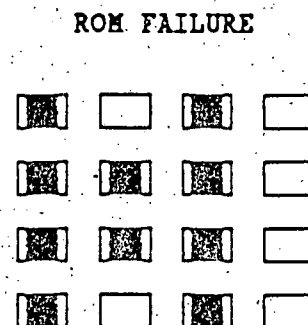
RAM FAILURE



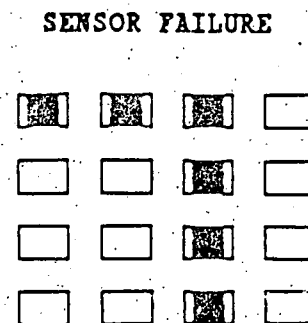
SWITCH FAILURE



WATCH DOG FAILURE



ROM FAILURE



SENSOR FAILURE

MEMORY BACKUP FAILURE



**FAULT LED
ILLUMINATED ALL CONDITIONS**

Drawing Number : SA-87-0079

Figure 10

Appendix E
HAZARDOUS AREA CERTIFICATES

STANDARDS ASSOCIATION OF AUSTRALIA

Incorporated by Royal Charter

STANDARDS HOUSE, 80 ARTHUR STREET, NORTH SYDNEY, N.S.W.

CERTIFICATE FOR EXPLOSION PROTECTED ELECTRICAL EQUIPMENT

No. Ex 228

This certifies that the equipment described hereunder has been examined and tested in accordance with the requirements of the Australian standard(s) specified herein, and such equipment has been found to comply with these requirements.

This certificate may be withdrawn at any time if in the opinion of SAA Committee EL/29, Certification of Electrical Equipment for Hazardous Locations, the relevant standard has been altered or revised to a degree that the equipment is no longer considered suitable for installation in the hazardous location stated, or if the certificate holder has breached any of the terms or conditions under which this certificate was issued.

Description of Equipment

"Gastech" Gas Detector Head

Cat. No. 61-0101

Drawing No(s)

1008-A21(1.8.73); 1007-A1 Rev. A (6.71)
and 1007-A2 (21.6.71)

Certification Conditions

The circuit conductors of the detector head must be terminated in a certified Group IIC flameproof enclosure. The detector head and associated equipment must be installed strictly in compliance with AS 3000

Remarks

Hazardous Location

Class I Zone 1

Type of Protection

Ex s d IIC T5

Certificate Holder

Gas Tech Australia Pty Ltd
P O Box 374
DEE WHY N S W 2099

Manufacturer

Gas Tech Inc.
331 Fairchild Drive
Mountain View
CALIFORNIA 94043 U S A

Test Report No(s)

Londonderry Centre TR No.
LMT 53

Australian Standard(s)

AS 2275 Part 1-1979

SAA File Reference

EL/29: 80107/M95

Effective Date

1981-09-15

Date of Issue

1981-09-29

This document shall not be reproduced, except in full.

This certificate is not transferable and remains the property of the Standards Association of Australia and must be returned to the Association in the event of it being revoked.

STANDARDS ASSOCIATION OF AUSTRALIA

Incorporated by Royal Charter

STANDARDS HOUSE, 80 ARTHUR STREET, NORTH SYDNEY, N.S.W.

SUPPLEMENTARY CERTIFICATE FOR EXPLOSION PROTECTED
ELECTRICAL EQUIPMENT

No. Ex 228-1

This certifies that the equipment described hereunder has been examined and tested in accordance with the requirements of the Australian standard(s) specified herein, and such equipment has been found to comply with these requirements.

This certificate may be withdrawn at any time if in the opinion of SAA Committee EL/29, Certification of Electrical Equipment for Hazardous Locations, the relevant standard has been altered or revised to a degree that the equipment is no longer considered suitable for installation in the hazardous location stated, or if the certificate holder has breached any of the terms or conditions under which this certificate was issued.

Description of Modification

"Gastech" Gas Detector Head

This supplementary certificate is issued to acknowledge the addition of an assembly screw in the detector head shown on drawing number 1007-A35

Drawing No(s)

1007-A35

Hazardous Location

Class I Zone 1

Type of Protection

Ex s d IIC T5

Certificate Holder

Gas Tech Australia Pty Ltd
PO Box 374
DEE WHY NSW 2099

Manufacturer

Gas Tech Inc
331 Fairchild Drive
Mountain View 94043
CALIFORNIA USA

Test Report No(s)

SCC Letter of 1981.12.08

Australian Standard(s)

N/A

SAA File Reference

EL/29:81231/M101

Effective Date

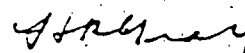
1981.12.16

Date of Issue

1982.02.09

This document shall not be reproduced except in full.

This certificate is not transferable and remains the property of the Standards Association of Australia and must be returned to the Association in the event of it being revoked.



STANDARDS ASSOCIATION OF AUSTRALIA

Incorporated by Royal Charter

STANDARDS HOUSE, 80 ARTHUR STREET, NORTH SYDNEY, N.S.W.

SUPPLEMENTARY CERTIFICATE FOR EXPLOSION PROTECTED
ELECTRICAL EQUIPMENT

No. Ex 228-2

This certifies that the equipment described hereunder has been examined and tested in accordance with the requirements of the Australian standard(s) specified herein, and such equipment has been found to comply with these requirements.

This certificate may be withdrawn at any time if in the opinion of SAA Committee EL/29, Certification of Electrical Equipment for Hazardous Locations, the relevant standard has been altered or revised to a degree that the equipment is no longer considered suitable for installation in the hazardous location stated, or if the certificate holder has breached any of the terms or conditions under which this certificate was issued.

Description of Modification

"Gastech" Gas Detector Head

This supplementary certificate relates to the following items:

- (a) Change of enclosure material from Aluminium Alloy 356 to 316 Stainless Steel.
- (b) Certification marking to be cast on the enclosure in lieu of a separate nameplate.
- (c) Change of Manufacturer.

Hazardous Location

Class I Zone 1

Type of Protection

Ex s d IIC T5

Certificate Holder

Gas Tech Australia Pty Ltd
158 South Creek Road
DEE WHY N S W 2099

Manufacturer

Gas Tech Australia Pty Ltd
158 South Creek Road
DEE WHY N S W 2099

Test Report No(s)

SCC Letter of 1983.10.06

Australian Standard(s)

N/A

SAA File Reference

P/3: 83211/M113

Effective Date

1983.10.07

Date of Issue

1983.10.18

This document shall not be reproduced except in full.

This certificate is not transferable and remains the property of the Standards Association of Australia and must be returned to the Association in the event of it being revoked.

STANDARDS ASSOCIATION OF AUSTRALIA

Incorporated by Royal Charter

STANDARDS HOUSE, 80 ARTHUR STREET, NORTH SYDNEY, N.S.W.

SUPPLEMENTARY CERTIFICATE FOR EXPLOSION PROTECTED
ELECTRICAL EQUIPMENT

No. Ex 228-3

This certifies that the equipment described hereunder has been examined and tested in accordance with the requirements of the Australian standard(s) specified herein, and such equipment has been found to comply with these requirements.

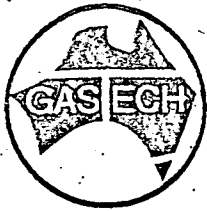
This certificate may be withdrawn at any time if in the opinion of SAA Committee P/3, Certification of Electrical Equipment for Hazardous Locations, the relevant standard has been altered or revised to a degree that the equipment is no longer considered suitable for installation in the hazardous location stated, or if the certificate holder has breached any of the terms or conditions under which this certificate was issued.

Description of Modification	Hazardous Location
<u>'Gastech' Gas Detector Head</u>	Class I Zone 1
This supplementary certificate relates to the change of Cat No from 61-0101 to 61-0103	Type of Protection
	Ex s d IIC T5
	Certificate Holder
	Gas Tech Australia Pty Ltd 158 South Creek Road DEE WHY NSW 2099
	Manufacturer
	Gas Tech Australia Pty Ltd 158 South Creek Road DEE WHY NSW 2099
	Test Report No(s)
	N/A
	Australian Standard(s)
	N/A
	SAA File Reference
	P/3:81231/M127 (Item 5.8)
	Effective Date
	1983-10-07
	Date of Issue
	1985-12-18

This document shall not be reproduced except in full.

This certificate is not transferable and remains the property of the Standards Association of Australia and must be returned to the Association in the event of it being revoked.

J. L. Gray
Director—Administration & Approvals
Standards Association of Australia



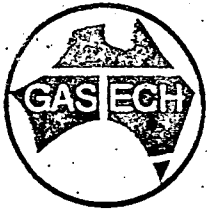
Gas Tech Australia Pty. Ltd.

Standard Warranty

Gas Detection Equipment

1. Consumers have the benefit of conditions and warranties implied by the Trade Practices Act 1974 ("TPA") and similar provisions of State or Territory enactments and nothing in these conditions is intended to exclude restrict or modify any statutory obligation of Gas Tech Australia Pty. Ltd. ("Company") if that cannot lawfully be effected.
2. This warranty relates only to Equipment manufactured and services supplied by the Company, its related corporations and subsidiaries. Equipment or any part thereof which is returned to the Company, transportation prepaid, within 15 months from the date of despatch from the Company's premises or 12 months from the date of shipment to the ultimate user (whichever occurs first) and is found by the Company, after examination, to be defective in workmanship or materials, will be either repaired or replaced as determined by the Company, free of charge.
3. This warranty does not apply to:
 - a) replacement or repairs which are required as a results of improper installation, misuse, maladjustment, modification or lack of routine maintenance by others;
 - b) items subject to deterioration or consumption in normal service, that is, those which must be cleaned, repaired or replaced routinely, such as (but not limited to) lamp, bulbs and fuses, pump diaphragms and valves, absorbent cartridges, filter elements and batteries; or
 - c) goods, materials or parts supplied or manufactured by unrelated third parties and provided to the Purchaser at the specific request of the Purchaser and such goods, materials or parts will be repaired or replaced only to the extent of the original supplier's warranty.
4. Should the Company be liable for breach of a condition or warranty (other than that pursuant to section 69 of the TPA) implied by Division 2 of Part V of the Act (other than that implied by section 69 of the TPA) the liability of the Company for such breach shall, subject to section 68A(2) of the PTA, be limited to one of the following as determined by the Company:
 - a) the replacement of the Equipment or the supply of equivalent Equipment;
 - b) the payment of the cost of replacing the Equipment or of acquiring equivalent Equipment.
5. Subject to Clauses 2 and 4 and any legislation to the contrary:
 - a) representations and agreements not expressly contained herein shall not be binding upon the Company as conditions, warranties or representations; all such conditions, warranties and representations on the part of the Company, whether express or implied, statutory or otherwise, whether collateral or antecedent or otherwise are hereby expressly negated and excluded;
 - b) the Company shall be under no liability to the Purchaser for any loss (including but not limited to loss of profits and consequential loss) or for damage to persons or property or for death or injury caused by any act or omission (including negligent acts or omissions) of the Company or the Company's agents, wherever occurring, arising from the subject matter of this agreement;
 - c) the Purchaser shall indemnify the Company against any claims made against the Company by any third party in respect of any such loss, damage, death or injury as is set out in sub-paragraph (b) hereof; the Purchaser further agrees to indemnify the Company against all losses and expenses which the Company may suffer or incur due to the failure of the Purchaser fully to observe its obligations under this contract; and
 - d) no warranty is given and no responsibility is accepted by the Company to ensure that Equipment supplied complies with any statutory requirements relating to the marketing of goods. Compliance with such legislation shall be the sole responsibility of the Purchaser.
 - e) the Company specifically denies any liability for the overall performance of any plant or the results of any process with which the Equipment is integrated.

Rev. 051291



Gas Tech Australia Pty. Ltd.

Standard Service Policy

Gas Tech Australia Pty. Ltd., ("Company") maintains an Equipment service facility at the Company's factory. Some Company distributors also have repair facilities, however, the Company assumes no liability for service performed by other than Company personnel. Should your instrument require non-warranty repair, you may contact the distributor from which it was purchased, or you may contact the Company directly.

If the Company is to do the repair work for you, you may send the Equipment, pre-paid, to Gas Tech Australia Pty. Ltd., 8 Ponderosa Parade, Warriewood, N.S.W. 2102, Attention Service Department. Always include your address, purchase order number, shipping and invoicing information and a description of the defect as you perceive it. If you wish to set a limit to the authorized repair cost, state a "not to exceed" figure. If you must have a price quotation before you can authorize the repair cost, so state, but understand that this involves extra cost and extra handling delay. The Company policy is to perform all needed repairs to restore the Equipment to full operating condition, including replacement of sensors which are nearing the end of their effective life.

To expedite the repairs operation, it is preferable to call in advance to the Company Customer Service (61-2-979 6979), describe the nature of the problem and provide a purchase order number.

If this is the first time you are dealing directly with the factory, you will be asked to provide credit references or prepay, or authorize COD shipment.

HOWDEN SIROCCO.**ADVICE NOTE
RECEIVERS COPY**

Howden Sirocco Pty. Limited

97-103 Pacific Highway, North Sydney, 2060, P.O. Box 84
Telephone: (02) 929 4566, Telex: 121478, Fax No.: (02) 954 4821

A Howden Group Company Incorporated in N.S.W.

ATTN: PETER TRAINER
% BRISBANE CITY COUNCIL
BUNYA ST
EAGLE FARM.

ADVICE No.

PBR 008

YOUR REF.

529758/EF

OUR REF.

CS1963.

DATE

27. 7. 92

CASE OR PIECE No.	QUANTITY	DESCRIPTION	GROUP ITEM	WEIGHT
	1	VIBRA. METRIC ACCELEROMETER S/N 2039.		

MODEL 1136

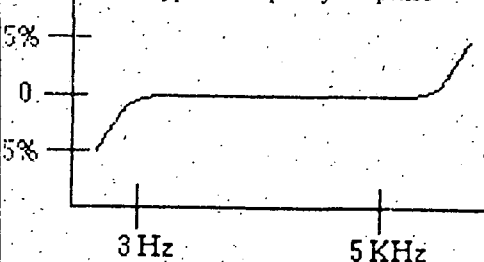
N 9356378

SN 2039

Specifications

Measured Sensitivity 103.6 mv/g @ 100 Hz
Frequency Response 3 Hz to 5 KHz
Maximum Accel. w/o damage 5000 g
Dynamic Range $\pm 50g$
Temperature Range 0 - 200°F
Mounting Stud 1/4-28
Connector Pigtail
Power Requirements 2 - 4 ma, 15 - 30 VDC
Mounting Isolated
Mounting Torque 25 inch lbs.

Typical Frequency Response



I have checked the delivery of goods against this advice note.

For and on behalf of

Received by

Capacity

Date Received

DAMAGE OR SHORTAGES IN DELIVERY MUST BE NOTIFIED WITHIN 14 DAYS

Mobile Phone
018 408155

Chris
KENBESSOS
02-9294566.

Please receive VMC and accelerometers


With our Compliments

Regards

Peter Rolis

Peter Rolis
BSC PG Dip, (Control) AMIEE
Electrical Engineer
Instrumentation and Control Services

97-103 Pacific Highway
North Sydney 2060 NSW
Telephone: (02) 929 4566
Tele: AA1212478
Fax: (02) 954 4821
Telephone Home: (02) 457 9537

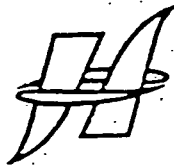
HOWDEN SIROCCO


Howden, 2060, P.O. Box 84
1478, Fax No.: (02) 957 5201
located in N.S.W.

SIROCCO



ISO 9001:2015



HOWDEN SIROCCO

INSTRUCTION MANUAL
FOR THE
OPERATION AND MAINTENANCE
OF THE
HOWDEN SIROCCO VM2C
DUAL CHANNEL VIBRATION
MONITOR

HOWDEN SIROCCO PTY LTD
97-103 PACIFIC HIGHWAY
NORTH SYDNEY
N.S.W. 2060

AUSTRALIA

SPECIFICATION OF VM2C

DUAL CHANNEL VIBRATION MONITOR

<u>Transducer Types:</u>	Velocity transducers, Accelerometers with built-in amplifier. Optionally: accelerometers requiring external charge amplifier.
<u>Number of Inputs:</u>	Two
<u>Frequency Range:</u>	5-1500 Hz (-3db). The range can be changed to suit requirements. (Please specify when ordering).
<u>Detectors:</u>	RMS and Peak velocity
<u>Output:</u>	Large LED display per channel
<u>Range:</u>	15mm RMS on 25mm/s peak velocity
<u>Current Loop:</u>	4-20mA, one per channel
<u>Alarm Indication:</u>	One alarm point and danger point per channel indicated by a LED at front panel.
<u>Relays:</u>	One alarm and one danger relay per channel
<u>Contact Rating:</u>	24V-4A d.c. 120V-4.8A a.c. cos phi = 1 120V- 3A a.c. cos phi = 0.35 240V-4A a.c. cos phi = 1 240V-2A a.c. cos phi = 0.35
<u>Housing:</u>	Polycarbonate Wall Mountable Enclosure
<u>Dimensions:</u>	280 x 280 x 130mm
<u>Feature:</u>	Adjustable built-in signal source for testing and adjusting of relay trip points.

HS-VM2C DUAL CHANNEL VIBRATION CONDITION MONITOR

Description

The HS-VM2C monitors in 2 channels the rotational vibration of machines and bearings to provide early indication and warning of changing plant conditions.

Each channel converts the vibration into an RMS Level expressed in mm/s velocity in accordance with international standards and the indication of "vibration severity". A peak velocity level can be indicated as well by an internal modification.

The frequency range encompasses all vibrational components, e.g. fans, motors and bearings. The maximum full scale indication of the vibration level is adjusted at 15mm/s. Both frequency range and full scale value can be modified when the equipment is ordered from the manufacturer.

Each channel can be connected to a velocity transducer or an accelerometer. The vibration signal is amplified, filtered in a band pass filter to reduce unwanted vibrational components such as rattle and bounce and then connected to either an RMS or a Peak Velocity converter to obtain a d.c. voltage proportional to the RMS or Peak velocity value of the vibration signal. This d.c. voltage is passed on to the digital indicator at the front panel, to the alarm and danger level detectors and to the 4-20 mA current converter.

The 4-20 mA converter gives an output of 4 mA if there is no vibration level and 20 mA if there is a maximum vibration level of the full scale value (15 mm/s).

- 2 -

Adjustments

Each level detector can be adjusted to trip a relay. The alarm detector is set at the factory at 5.5 mm/s. The danger detector is set at 9.5 mm/s. When the detector trips, a set of relay contacts switches over and a LED at the front panel lights up. External devices such as an alarm or a motor cut-out relay can be connected to these contacts.

Testing can be performed by using the switch inside the HSV2C as indicated. A level, adjustable by the turning knob next to the switch is connected to the input and the result can be seen at the digital meter, indicating the level. When the level is adjusted to 5.5mm/s, the alarm relay trips after a delay of 2 seconds. Similarly, when the level is adjusted to 9.5 mm/s, the danger relay trips.

A new alarm or danger level can be adjusted as follows. Turn the test level up to the desired level. Adjust "P11 AL" for the alarm level detector or "P12 DL" for the danger level. Adjust until the warning LED at the front panel illuminates followed by the click of the relay. Confirm the adjustment by slowly increasing the test level to the new value again.

The 4 mA output can be adjusted as follows:

- Short circuit Terminals 2 and 3 for the input.
- Measure the current with a mA-meter between terminals 6 and 7
- Adjust trimpotmeter P22 until the meter indicates a current of 4.00 mA.

The 20 mA output can be adjusted as follows.

- Switch the test level on and adjust the level to 15mm/S, the full scale value.
- Adjust trimpotmeter P23 until the mA meter indicates a current of 20.00 mA.

Calibration

The sensitivity of the two channels is calibrated and adjusted to the value matching the specified input transducer. If a new input transducer is to replace the old one, contact Howden Sirocco, Department of Electrical Services and Instrumentation for details.

Terminals and Trimpotmeters

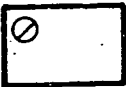
The service manual contains an illustration of the p.c. board where all terminals and trimpots are located.

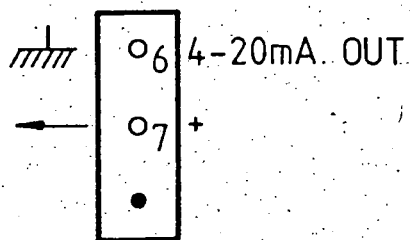
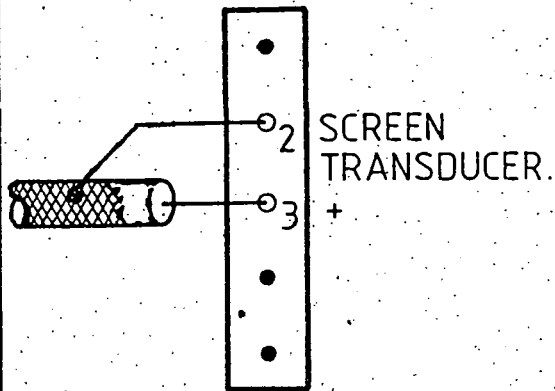
<u>Item</u>	<u>TL Terminal</u>	<u>P Trimpot</u>
<u>Transducers</u>		
Shield, neutral	2	
core, positive	3	
Sensitivity adjustment		P2 Cal
<u>4-20mA Output</u>		
Neutral	6	
Positive	7	
4 mA		P22 4 mA
20 mA		P23 20 mA
<u>240V Mains</u>		
Live	13	
Return	14	
Earth	15	
<u>Alarm Level Detector, Relays not Energised</u>		
Relay common	18 CO	
Normally open	19 NO	
Normally closed	20 NC	
Level adjustment		P11 AL
<u>Danger Level Detector Relays not Energised</u>		
Relay common	21 CO	
Normally open	22 NO	
Normally closed	23 NC	
Level adjustment		P12 DL


HOWDEN-SIROCCO

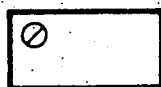
V.M.C VIBRATION PC. BOARD

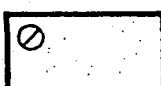
FEBR. 1991

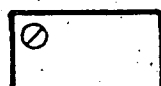
P2  TO CALIBRATE
INPUT SENSITIVITY.

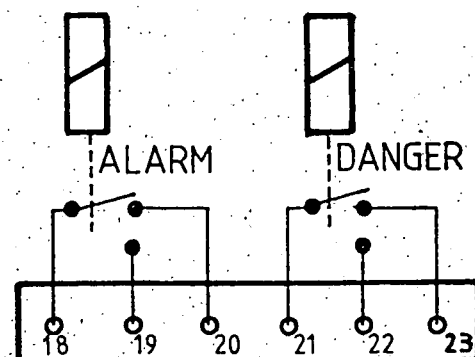
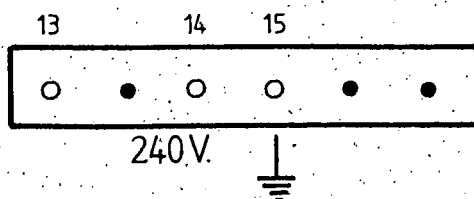


P22  4 mA.

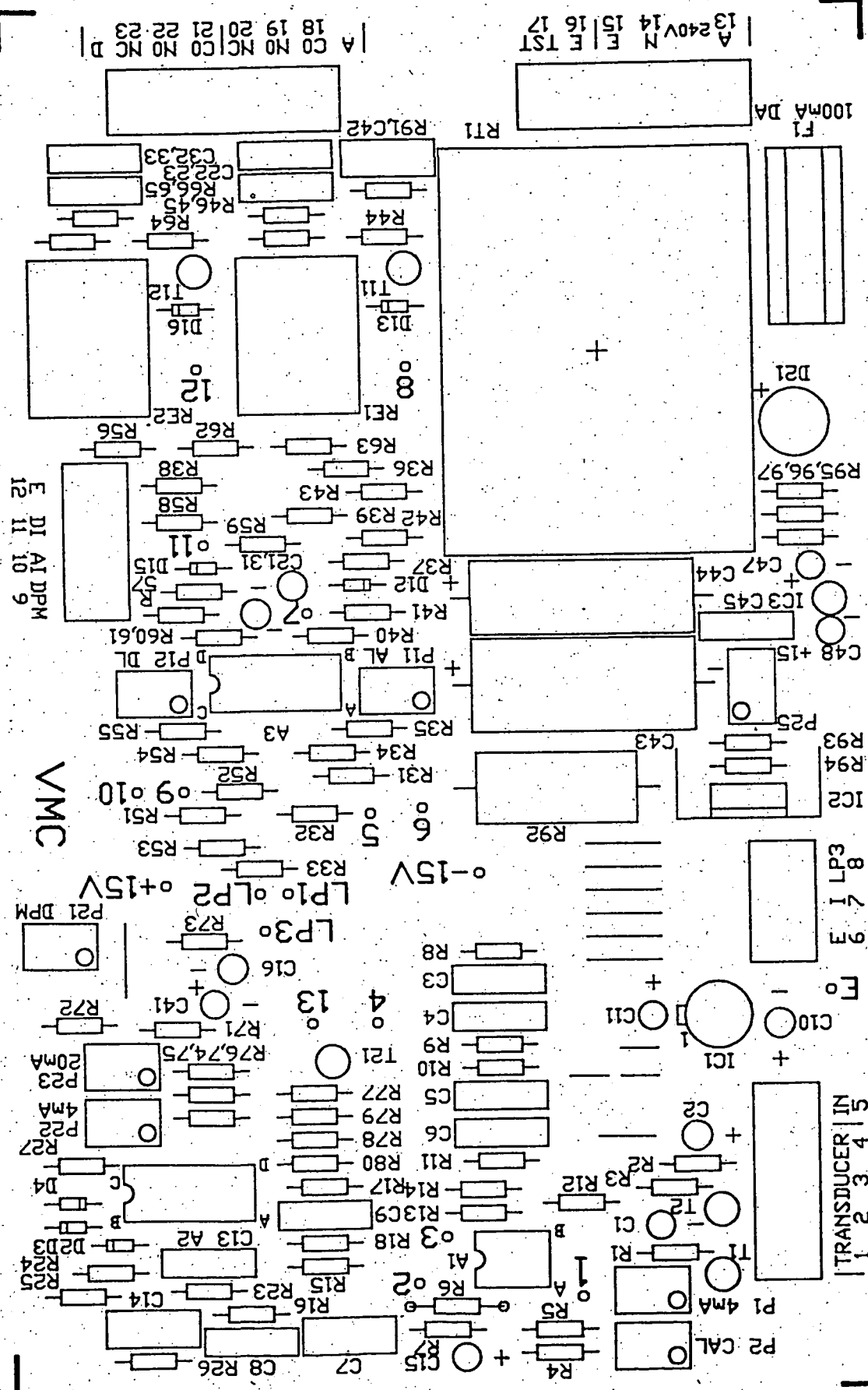
P23  20mA.

P11  ALARM LEVEL
ANNUNCIATION.

P12  DANGER LEVEL
SHUT DOWN.



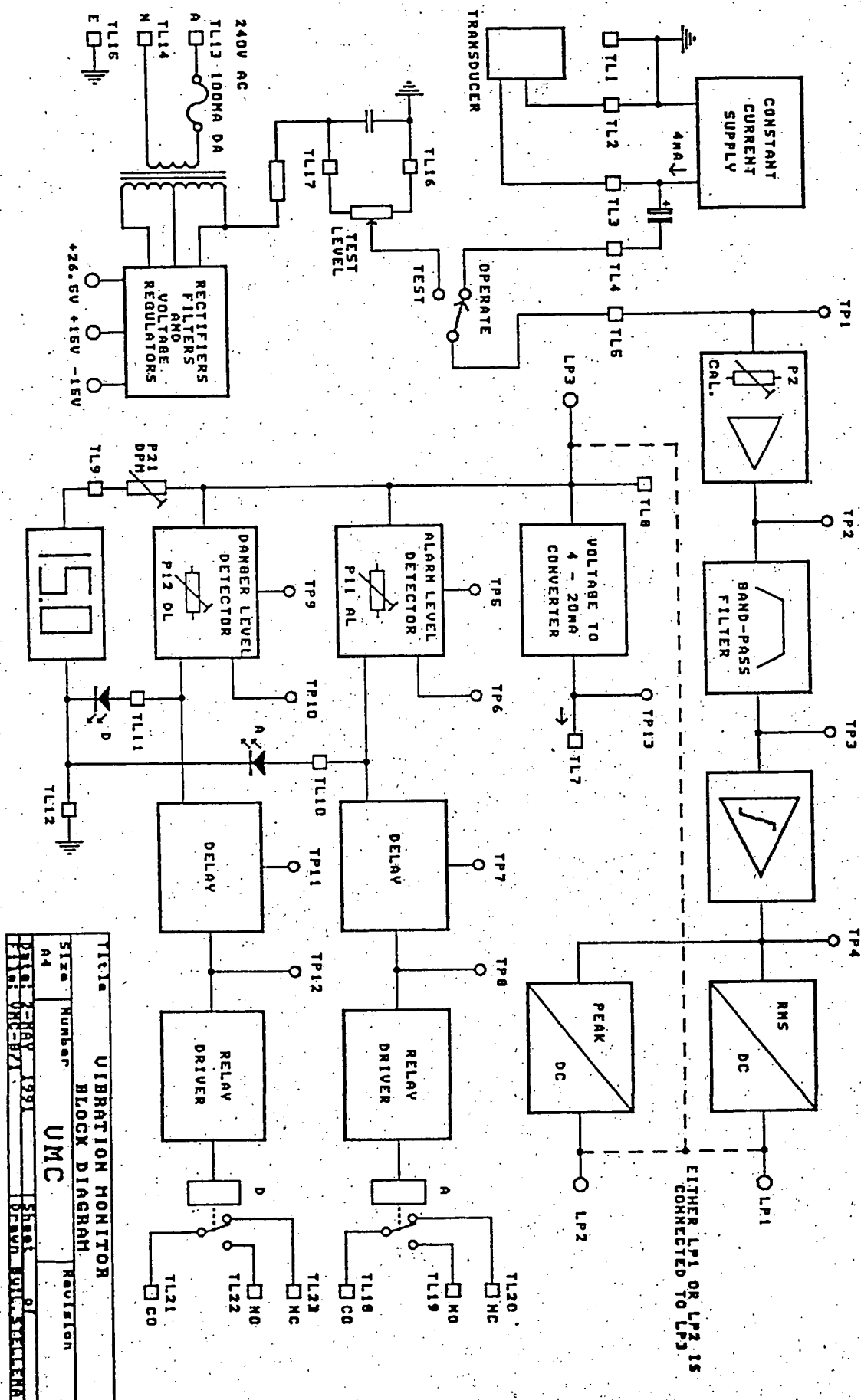
THESE CONTACTS CAN HANDLE AC
UP TO 5A. RESISTIVE,
3A. INDUCTIVE LOAD.



SIZE : 7.460 x 4.660 Inch

Holes : 401 OVERLAY PLOT

VMCPCB 15126 30-APR-1991



VIBRATION MONITOR			
BLOCK DIAGRAM			
Size	Number	Revision	
A4	UMC		
Drawn	Sheet	of	
PLM: OMC-B71	DRWN	PLM: STELENA	

TRANSDUCERS

Technical Manual

© Copyright 1989, Scientific-Atlanta, Inc.

PROPRIETARY RIGHTS OF SCIENTIFIC-ATLANTA, INC. are involved in the subject matter of this material and all manufacturing, reproduction, use and sales rights pertaining to such subject matter are expressly reserved. It is submitted in confidence for a specified purpose, and the recipient, by accepting this material, agrees that this material will not be used, copied or reproduced in whole or in part, nor its contents revealed in any manner, or to any person, except for the purpose delivered.

P/N 31046700
02-89-07-0000

Spectral Dynamics
A Scientific-Atlanta Division

SECTION II

INSTALLATION

2-1 INTRODUCTION

The effectiveness and accuracy of a transducer is critically dependent upon proper installation. This section discusses transducer installation techniques and specific difficulties that may be encountered during mounting/installation.

2-1.1 Frequency Considerations

The expected frequency range of the vibrations to be monitored is of prime consideration when selecting a transducer. Determine the highest frequency that will be monitored and select a transducer that has a resonant frequency at least three times that amount. This ensures that the transducer linear range will include the highest frequency anticipated.

2-1.2 Mounting Area Considerations

The first consideration with respect to the mounting area is the availability of space. First determine if there is sufficient space available to create a smooth flat surface and if there is sufficient vertical clearance above the desired surface. Also consider if the transducer is to be mounted permanently or temporarily. This will effect the necessary surface preparations and hardware. It could also effect the frequency response of the selected transducer. If insufficient space is available to provide a smooth flat surface it may be necessary to make a mounting adapter block. Refer to paragraph 2-2 for information on mounting surface requirements, mounting surface preparation and alternative mounting methods.

2-1.3 Environmental Considerations

There are several aspects of the environment to be considered. In addition to the Environmental Specifications listed in Section VI, you should determine the moisture or humidity of the intended environment. Even though the unit is sealed, excessive moisture can cause damage to the unit. As a hedge against moisture intrusion at the connector, the connector can be filled with silicon grease at the time the

interconnect is made. Silicon grease will prevent moisture intrusion, will not adversely affect the conductance of the connector, and will act as an insulator.

The action of acids or strong bases in the environment can adversely affect the transducer. Acids and strong bases will establish the necessary conditions for corrosion that can attack the housing and connector, ultimately damaging the unit. To help prevent this type of damage Scientific-Atlanta constructs most housings from stainless steel and welds all joints.

2-1.4 Monitoring Requirements

Specific job requirements will strongly affect such considerations as mounting, accuracy, and readout device selection. Determine if the monitoring will be constant, or occasional. This may affect the mounting requirements. Occasional monitoring, in many cases, does not require the transducer to be permanently mounted to the vibrating surface. Certain types of occasional monitoring instruments can be used with a hand-held transducer.

The vibration parameter to be monitored may affect transducer selection. If velocity data is required, then a transducer that senses velocity should be coupled with a readout device that outputs velocity information.

The input impedance of the readout device the transducer is to be connected to may have an affect on transducer selection. The impedance match of the two devices will determine the frequency response characteristics of the system.

2-1.5 Test Area Loading

The load the mounted transducer places on its mounting surface may affect the vibrations being generated and subsequently monitored. Factors such as the mass of the transducer, and effects on surface strain resulting from mounting surface preparation, may adversely affect the performance of the mounted transducer. Evaluation of the surface to be monitored should be conducted to establish the possible effects of transducer mounting on the surface. These and other adverse affects can sometimes be compensated for in the processing and evaluation of the data obtained from the monitoring system.

2-2 TRANSDUCER MOUNTING

2-2.1 Mounting Surface Preparation

The mounting surface must be smooth, flat and large enough to accommodate the entire base of the transducer. For optimum response Scientific-Atlanta recommends a flatness of approximately .0003 TIR and a smoothness of approximately $\frac{3}{4}$ /. Curvature, waviness, or excessive roughness can cause a decrease in the frequency response, vibration level readings lower than the actual vibration, or rocking of the transducer resulting in false vibration readings. The possibility also exists of internally damaging the transducer due to over-torquing.

2-2.2 Mounting Stud Hole Preparation

For most permanent installations a hole must be provided on the mounting surface to accommodate the transducer mounting stud. This hole must be perpendicular to the mounting surface. It is recommended that this hole be ± 6 minutes of 90° . The hole must be deep enough to prevent the stud from bottoming out, thereby permitting flush mounting of the stud. The hole must be free of any burrs or flashing to allow the stud/transducer assembly to seat uniformly against the mounting surface. Figure 2-1 shows four of the most common mounting techniques.

2-2.3 Mounting Stud - Removable Version

Scientific-Atlanta builds most transducers in both the Removable Stud version and the NPT Integral Stud version which is recommended for permanent installation on large machinery. The mounting stud provided with the removable stud versions should always be used to install the transducer. This is a shouldered stud that provides proper seating of the transducer base and vibrating surface. Never use a machine screw to mount the transducer. A screw that is too long or overtightened may cause internal damage to the transducer.

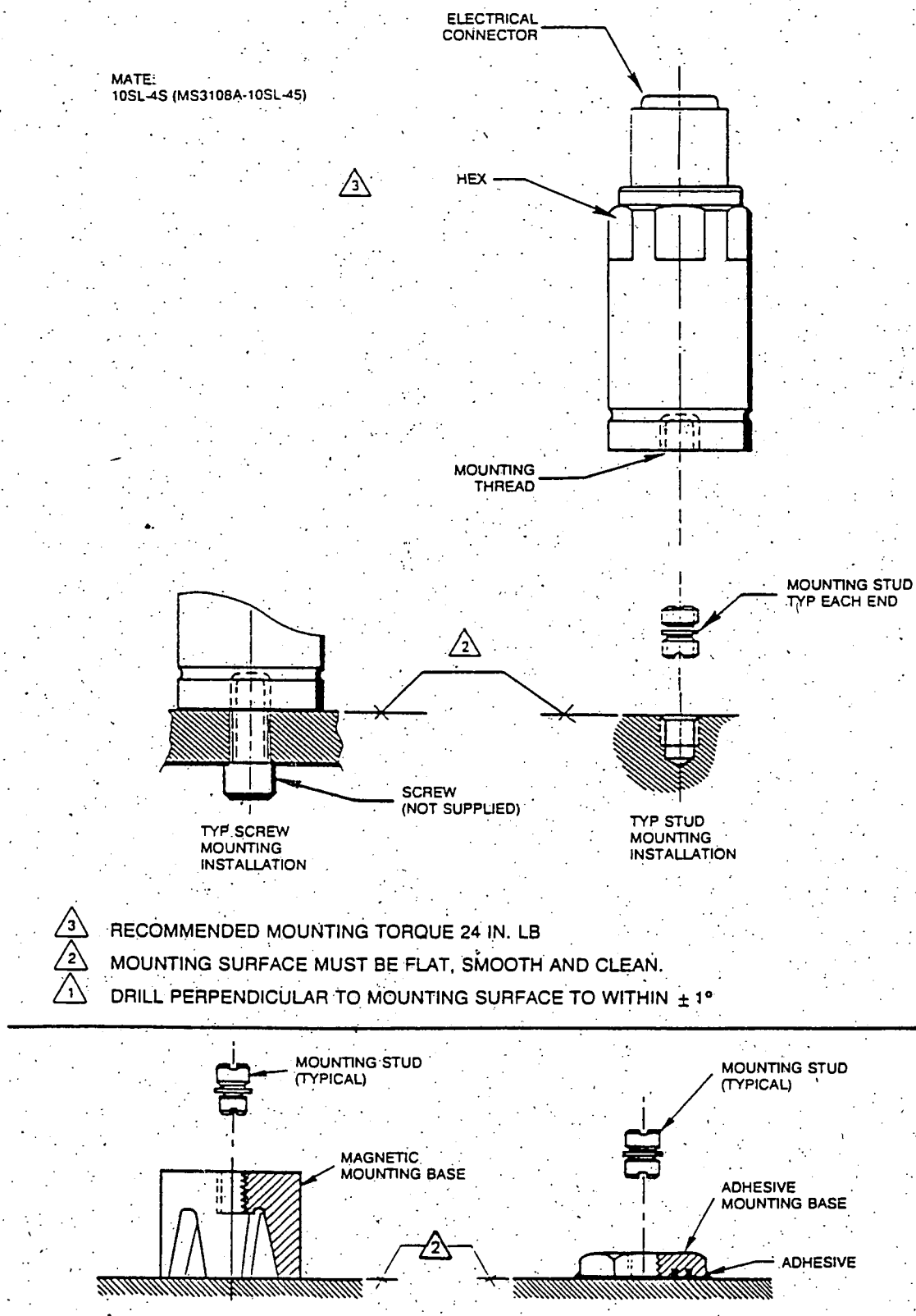


Figure 2-1. Installation Drawing

2-2.5 Special Surfaces

On curved or irregular surfaces it is sometimes not feasible to prepare a smooth flat area directly on the surface to be measured. In these instances transducer mounting can be accomplished by making and installing a mounting block. When designing the mounting block consider the direction of the vibration to be measured and design the block so that, with the block mounted, the transducer's sensitive axis will be perpendicular to the direction of the vibration. To make a mounting block (refer to Figure 2-3), machine an aluminum block to match the irregularity of the mounting surface. Also prepare a transducer mounting surface on the block complete with threaded mounting stud hole. The mounting block can then be epoxyed to the irregular surface and the transducer mounted on the block.

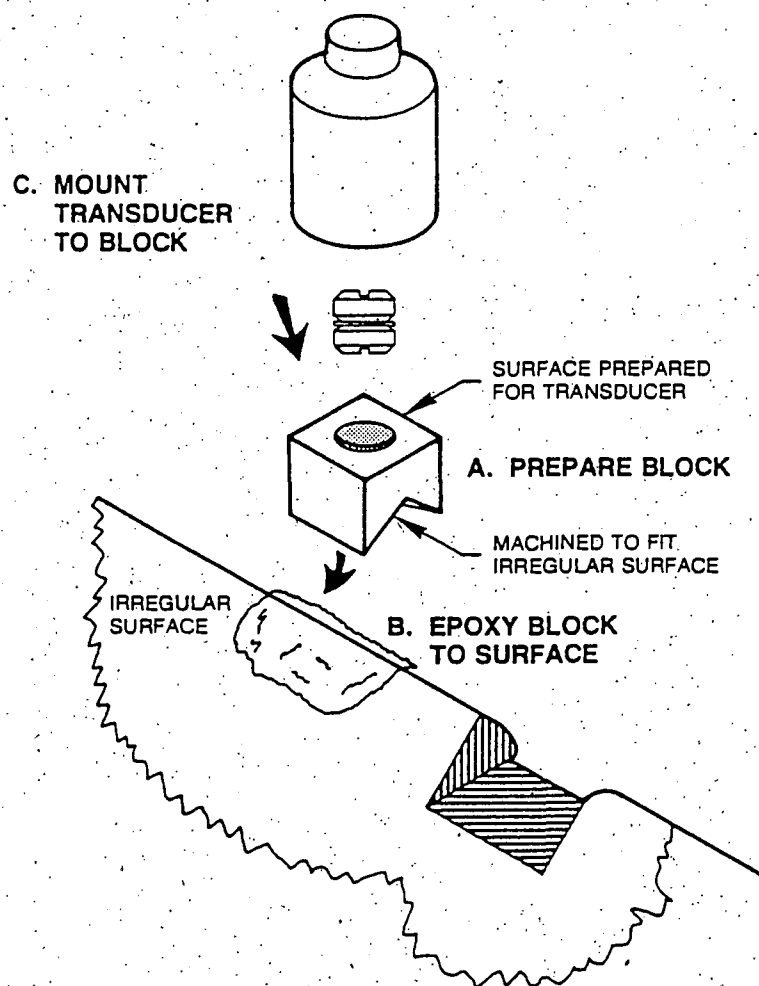


Figure 2-3. Mounting the Transducer on an Irregular Surface

2-2.6 Mounting the Transducer

The prepared mounting surface must be free from dirt, dust, paint and oils before mounting the unit. First, screw the mounting stud into the transducer finger tight. For high frequency applications, apply some silicon grease to the stud threads and transducer base. Thread the transducer/stud into the previously prepared hole, again finger tight only. All tightening should be done with a torque wrench. Typically, transducers are torqued to about 24 inch-pounds. Do not over-torque! Excessive torque can result in degraded performance, internal damage and inaccurate readings. Once mounted, the electrical connections can be made using either locally made cables or those available from Scientific-Atlanta. Care must be taken to ensure that locally manufactured cables meet application requirements.

2-2.7 Cable

Either coaxial cable or shielded twisted-pair cable (AWG 20 min.) may be used to connect the transducer to other equipment such as power supplies, amplifiers, monitors, and other readout devices. Interconnecting cable length should be considered when installing transducers. Excessive length may limit the system's frequency response by acting as a low pass filter. For this reason, it is recommended that low capacitance cable be used. In general, the cable should not exceed 1000 feet in length without an in-line amplifier. Amplifiers may be used to accommodate cable lengths in excess of 1000 feet.

Avoid tight bends (any bend that exceeds the natural bending radius of the cable) in the installed interconnect cable (refer to Figure 2-4). Tight bends can induce noise and cause undue cable wear. Cabling should be tied down about 6" from the transducer to prevent undesired movement of the cable which is also a source of noise and wear.

Piezoelectric charge-output transducers (such as the M98) are used mainly for high-temperature applications. Most piezoelectric transducers have built-in amplifiers. However, the built-in amplifier can suffer permanent damage and/or failure when subjected to temperatures above 250°F (121°C). Therefore, instead of a built-in amplifier, the M98 uses an external charge amplifier (such as the M628 Charge Amplifier, a part of the M98/M628 High Temperature System) to isolate the amplifier from the high temperature environment. Because of the high temperature applications, this type of system

requires a low noise cable between the transducer and the charge amplifier. In addition, this cable must be capable of withstanding temperatures in excess of 250°F (121°C).

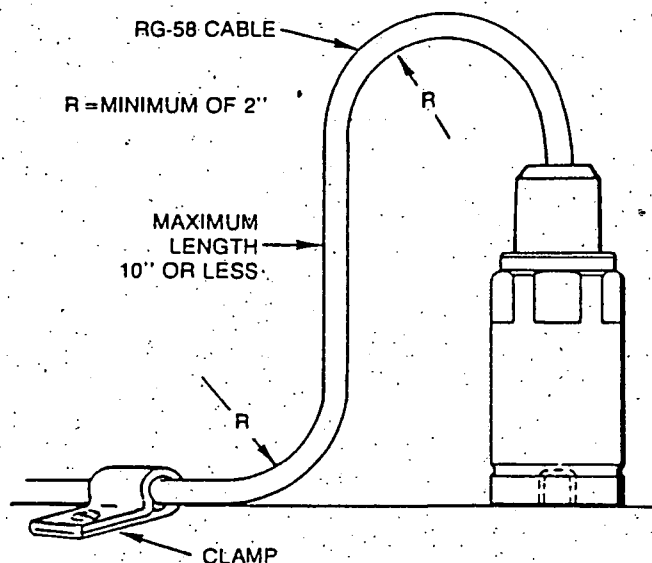


Figure 2-4. Transducer Cable Tie-Down Requirements

2-2.8 Temporary Mounting

When periodic or temporary measurements are being made, it is sometimes undesirable to use a permanently mounted transducer. In these cases it may be desirable to use the M92B Hand-Held Transducer or one of the available temporary mounting adapters that can be used with standard units. Scientific-Atlanta has magnetic mounts, hand-held adapters and mechanical quick disconnects to facilitate these applications. It is important to note that temporary mounting methods typically cause a reduction of the useable frequency range.

2-3 POWER REQUIREMENTS

2-3.1 Suspended-Mass Transducers

Velocity transducers of the suspended-mass type are self-generating and require no external power supply or bias to provide an output. These units can be connected directly to a monitor or other ancillary devices.

2-5 PRE-INSTALLATION CHECK LIST

2-5.1 Instrument Selection

TRANSDUCER

To make sure the transducer will operate satisfactorily in the measurement environment, check the following:

Temperature Range	Magnetic and RF Fields
Maximum Shock and Vibration	Nuclear Radiation
Humidity	Salt Spray
Pressure	Transient Temperatures
Acoustic level	Size of Mounting Surface
Corrosive Gases	

To make sure the transducer will provide the desired data accuracy, check the following:

Sensitivity	Amplitude Linearity
Frequency Response	Temperature Linearity
Resonant Frequency	Weight
Internal Capacitance	Calibration Accuracy
Transverse Sensitivity	Base Strain Sensitivity

To make sure the transducer is in good shape and ready to use, check the following:

Physical Condition	Mounting Threads
Case	Mounting Stud damage
Mounting Surface	Up-to-Date Calibration
Connector	Inspect for Clean Connector

CABLES

To make sure the cable will operate satisfactorily in the measurement environment, check the following:

Temperature Range
Corrosive Gases (some gases cause deterioration of the cable insulation)

To make sure the cable characteristics will provide the desired data accuracy, check the following:

Low Noise	Flexibility
Size and Weight	Seal Connection Requirement
Length	

To make sure the cable is in good condition and ready to use, check the following:

Physical Condition
Cable Kinked or Crushed
Connector Threads
Center Pins

Inspect for Clean Connectors
Continuity
Insulation Resistance
Capacitance

AMPLIFIER - Used with High Temperature Units Only

To make sure the amplifier will operate satisfactorily in the measurement environment, check the following:

Temperature Range
Maximum Shock and Vibration
Humidity

Corrosive Gases
Nuclear Radiation
Transient Temperatures

To make sure the Amplifier characteristics will provide the desired data accuracy, check the following:

Output Sensitivity
Frequency Response
Linearity
Stability
Phase Shift

Output Current and Voltage
Residual Noise
Input Impedance
Transient Response
Overload Capability

To make sure that the amplifier is in good condition and ready for use, check the following:

Physical Condition
Connectors
Case
Output Cables

Up-to-Date Calibration
Inspect for Clean Connectors

READOUT

Make sure that no other part of the system, including additional amplifiers, filters and readout devices establishes any limitations that will tend to degrade the transducer-amplifier characteristics.

2-5.2 Installation

TRANSDUCER - Stud Mounting

Check:

Mounting Surface is clean and flat
 Transducer Base Surface is clean
 Hole is drilled and tapped deep enough
 Correct Tap size
 Hole is properly aligned perpendicular to surface
 Stud Threads Lubricated
 Transducer is mounted with recommended torque
 Silicon Grease is applied for High Frequency Measurements
 (above 5 KHz)

TRANSDUCER - Cement Mounting

Check:

Mounting Surface is clean and flat
 Cement has cured properly
 Transducer mounted to cemented stud base with recommended torque

CABLE

Check:

Cable connected securely to transducer
 Cable tied down at least 6" from transducer
 Excess Cable is coiled and tied down
 Drip Loop is provided
 Cable is connected securely to amplifier

AMPLIFIER

Check:

Mounted securely
 All cable connections secure
 Recommended grounding is in use

SECTION IV**MAINTENANCE****4-1 INTRODUCTION**

All Scientific-Atlanta Transducers are sealed units and contain no user-serviceable parts. Maintenance performed by the user consists of cleaning, visual inspection and only limited troubleshooting. This section will discuss the periodic maintenance requirements, The factory calibration procedures, and troubleshooting techniques associated with suspected transducer failures.

4-2 PERIODIC/PREVENTATIVE MAINTENANCE

Scientific-Atlanta transducers are designed to give many years of maintenance-free service if used within the parameters specified in the Transducer Specification Data Sheets. To help prevent premature failure, make sure the unit is kept clean and free of dirt, dust and oil. Care should also be taken to ensure that the unit does not sustain shock forces in excess of the specified maximum value. Typically, a drop from a height of only three feet to a wood or asphalt floor will induce a shock amplitude of 3000 to 5000 g's. This is sufficient to permanently damage several models of Scientific-Atlanta transducers.

4-3 CALIBRATION

At 6 to 12 month intervals, depending upon usage, transducers should be checked for calibration of sensitivity and frequency response. If it is known that a transducer has always been operated within the specified parameters, a 12 month interval is sufficient. If the unit has operated in a sustained harsh environment, it should be checked at 6 months.

It may also be desirable to check transducers just prior to extensive equipment testing. This will insure the accuracy of test information, optimizing very costly test time. Field calibration of Scientific-Atlanta transducers is not possible. Recalibration can be performed at the factory for a nominal fee.

4-4 TROUBLESHOOTING NOTES

If a fault is suspected in the Scientific-Atlanta transducer, the following items may be checked to verify its failure:

1. Make sure the transducer and connection cable are properly mounted and secured.
2. Check the output of the transducer using an oscilloscope or other similar general purpose test equipment. (Remember to provide current limiting protection to all piezoelectric transducers.)
3. If installed, check the performance of Power Supplies, Charge Amplifiers, or other in-line accessories.
4. Check the continuity and insulation ability of any interconnecting cables. This may be done with a megohmmeter. Insulation resistance should be greater than 10 Megohms.
5. Check the performance of any readout devices used in conjunction with the transducer.

If the output of the transducer is incorrect, it should be replaced and returned to the factory for repair. If any other device used in conjunction with the transducer is not performing appropriately, it should be replaced at the same time.

Erratic output of the transducer may be caused by loose cable connections. Make sure the cable connections are secure.

Poor low frequency response may be caused by low resistance leakage of the interconnecting cable, known as an impedance bridge, this should be checked as stated in item 4.

4-5 REPAIRS

All transducers produced by Scientific-Atlanta are repairable, although this cannot be accomplished in the field. Transducer repairs are done at the factory only. To arrange repairs, contact the nearest Scientific-Atlanta Sales/Service Office.



INSTRUCTIONS

S437A, B & S637A

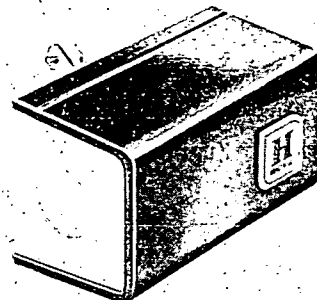
SAIL SWITCH

APPLICATION

The S437 and S637 are safety switches which respond to the air velocity in heating or warm air ducts, such as used in farm crop dryers. The switch completes a 24-volt or line voltage burner control circuit only when the blower or fan has produced a predetermined air velocity.

FEATURES

Each device has a MICRO SWITCH snap switch operated by a metal sail inserted in an air stream. The normally open contacts close at a preset velocity. The S637, in addition, has a set of normally closed contacts which can be used to energize a signal or warning circuit when the velocity drops off.



SPECIFICATIONS

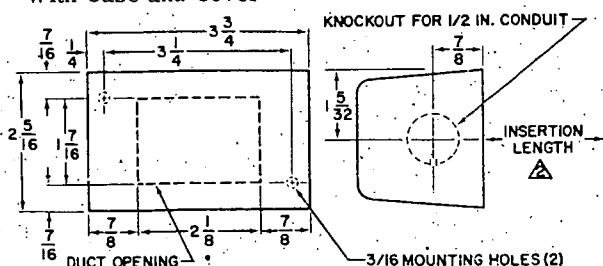
Model	Includes Case and Cover	Switching Action on Increasing Velocity	Switching Action on Decreasing Velocity	Switch Differential
S437A	Yes	Spst. Normally open contacts close at 1900-2250 fpm. Varies directly with differential setting.	Switch de-energizes at 1350 fpm. Not adjustable.	Adjustable, 550-900 fpm.
S437B	No			
S637A	Yes	Spdt. One set of contacts opens, one set closes at 1900-2250 fpm. Varies directly with differential setting.	One set of contacts opens to de-energize blower, one set closes to energize warning circuit at 1350 fpm. Not adjustable.	

MOUNTING POSITION: Velocity characteristics listed apply when standard size sail is inserted in a horizontal air stream with the sail pivot in a vertical position. Vertical mounting with air movement upward is satisfactory; however, characteristics will change. Vertical mounting with downward air movement is not permissible.

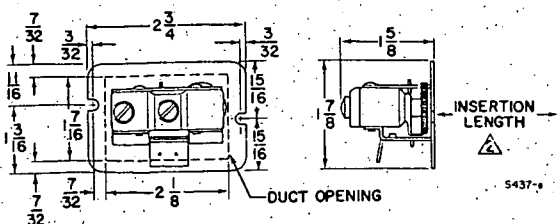
MOUNTING MEANS: Case screw-mounts to duct wall with sail inserted through wall into air stream.

MOUNTING DIMENSIONS (inches):

With Case and Cover —



Without Case and Cover —



SAIL SIZE: Standard—1 x 3 inches.
Large—1 1/2 x 4 inches.

INSERTION LENGTH: Standard—3 1/2 inches.
Large—4 1/2 inches.

COVER FINISH: Red enamel.

MAXIMUM AMBIENT TEMPERATURE: 150 F.

SWITCH CONTACT RATING (amperes):

	120 v ac	240 v ac
Full Load	8	5.1
Locked Rotor	48	30.6

2 amp at 24 v ac
15 amp at 6 v dc
7.5 amp at 12 v dc

ORDERING INFORMATION:

Specify —

1. Model number.
2. Sail size.

Order from —

1. Your usual source, or
2. Honeywell
1885 Douglas Drive North
Minneapolis, Minnesota 55422
(In Canada — Honeywell Controls Limited
Vanderhoof Avenue, Leaside
Toronto 17, Ontario).

Rev. 11-67 J.W.

Form Number **95-2777**
Apparatus Controls Div.

INSTALLATION

MOUNTING: Plan the location so that the sail will be in the direct path of an unrestricted air stream. A horizontal duct run is best because the sail will then move horizontally. In a vertical duct, the effect of gravity on the linkage changes the operating characteristics somewhat.

1. At the desired location, cut a rectangular hole $1\frac{1}{2} \times 2$ inches (see dotted lines in dimension drawing).
2. Note direction of air stream and position chassis so that the flow will operate the switch. Use the chassis as a template to mark the two mounting hole locations.
3. Center punch and drill mounting holes. Secure device with sheet metal screws.

WIRING: All wiring must conform with local codes and ordinances regarding wire size, type of insulation, enclosure, etc.

Wire the sail switch in series with the load to act as an air velocity limit switch.

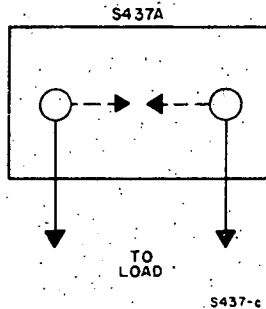


Fig. 1—S437 Schematic and Typical Connections.

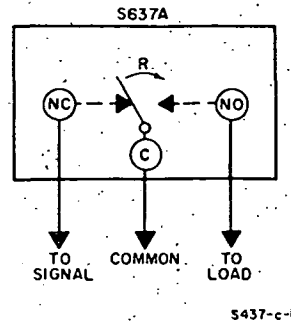


Fig. 2—S637 Schematic and Typical Connections.

SET DIFFERENTIAL:

The knurled wheel at the base of the switch is marked with the letters A, B, C, D to indicate relative differentials from minimum to maximum. Follow instructions of system manufacturer, if available, or adjust to suit actual operation.

A minimum differential setting (position A) of approximately 550 fpm results in a "make" velocity of approximately 1900 fpm. The "break" velocity is 1350 fpm for any setting of the differential.

SAIL SIZE: All velocities given above are for a standard size sail. The large sail operates the switch at reduced velocities.

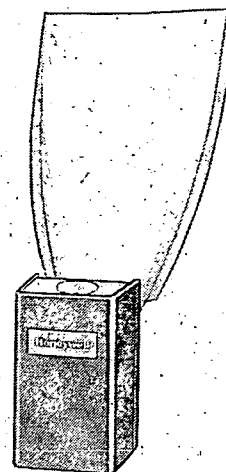
To control at higher velocities, the size of the sail must be reduced in inverse proportion.

Example: $2 \times \text{velocity} = \frac{1}{2} \text{ sail size}$.

Honeywell

S688A Sail Switch

The Sail Switch activates an electronic air cleaner, a humidifier, or other equipment in response to air flow from the system fan. The S688A is mounted in the return air duct where the sail will be in the direct path of an unrestricted air stream.



- Simplified installations with multispeed fans, inaccessible air handlers, fan motors with voltage or phase different from controlled equipment; eliminated wiring to system fan.
- Polyester film sail mounted on a micro switch snap switch.
- Removable spring counterbalances sail to allow mounting in either vertical (up or down) or horizontal air flow.
- Top and bottom conduit knockouts for wiring convenience.
- Low air velocity switch operation—makes at 250 fpm and breaks at 75 fpm.

CONTENTS

Specifications	2
Ordering Information	2
Installation	2
Operation and Checkout	5

S688A

SPECIFICATIONS • INSTALLATION • ORDERING INFORMATION

Specifications

MODEL: S688A Sail Switch.

ELECTRICAL RATINGS (Amperes):

	N.O. Contacts			N.C. Contacts		
	24 Vac	120 Vac	240 Vac	24 Vac	120 Vac	240 Vac
Full Load	2.0	2.0	1.0	1.0	1.0	0.5
Locked Rotor	12.0	12.0	6.0	6.0	6.0	3.0
Resistive	5.0	5.0	2.5	2.5	2.5	2.5

SWITCHING ACTION: Spdt snap-acting switch.

SAIL DATA:

Insertion length—10 in. [254 mm].

Maximum width—5 in. [127 mm].

Approximate area—26.2 in.² [1690 mm²].

Material—polyester film sealed on music wire frame.

MINIMUM AIR FLOW:

N.O. Contacts:

Makes—250 fpm.

Breaks—75 fpm.

N.C. Contacts:

Makes—75 fpm.

Breaks—250 fpm.

MAXIMUM AMBIENT TEMPERATURES:

125° F [52° C] at switches.

170° F [77° C] at sail.

CASE DIMENSIONS: 2-5/16 in. [59 mm] high, 3-3/4 in. [95 mm] wide, 2-1/8 in. [54 mm] deep.

DUCT MOUNTING HOLE DIMENSIONS: 1-1/2 in. [38 mm] by 2-1/4 in. [57 mm].

MOUNTING MEANS: Switch mounts on return air duct with two sheet metal screws. An adhesive backed mounting template is provided. Sail is inserted into duct through 1-1/2 in. [38 mm] by 2-1/4 in. [57 mm] hole.

MOUNTING POSITION: Mounts in vertical (up or down) or horizontal air flow.

WIRING KNOCKOUTS: 1/2 in. conduit knockout in either end of case.

FINISH: Zinc plated case and cover.

REPLACEMENT PARTS: Part no. 123773A Replacement Sail.

UNDERWRITERS' LABORATORIES, INCL LISTED:

File No. E4436, Guide No. XAPX. For use in ambient temperatures normally prevailing in occupiable spaces, which usually are not higher than 77° F [25° C] but occasionally may be as high as 104° F [40° C] for brief periods.

Installation

WHEN INSTALLING THIS PRODUCT...

1. Read these instructions carefully. Failure to follow them could damage the product or cause a hazardous condition.
2. Check the ratings given in the instructions and on the product to make sure the product is suitable for your application.
3. Installer must be a trained, experienced service technician.
4. After installation is complete, check out product operation as provided in these instructions.



CAUTION

Disconnect power supply before beginning installation to prevent electrical shock or equipment damage.

LOCATION

Locate the sail switch in the return air duct where the sail will be in the direct path of an unrestricted air stream. Maximum ambient temperature at the switch is 125° F [52° C] and at the sail is 170° F [77° C]. The air duct at the

Ordering Information

When purchasing replacement and modernization products from your TRADELINE® wholesaler or your distributor, refer to the TRADELINE Catalog or price sheets for complete ordering number, or specify—

1. Order number, TRADELINE, if desired.

If you have additional questions, need further information, or would like to comment on our products or services, please write or phone:

1. Your local Honeywell Residential Sales Office (check white pages of phone directory).
2. Residential Division Customer Satisfaction
Honeywell Inc., 1885 Douglas Drive North
Minneapolis, Minnesota 55422-4386 (612) 542-7500

In Canada—Honeywell Limited/Honeywell Limitee, 740 Ellesmere Road, Scarborough, Ontario M1P 2V9. International Sales and Service Offices in all principal cities of the world. Manufacturing in Australia, Canada, Finland, France, Germany, Japan, Mexico, Netherlands, Spain, Taiwan, United Kingdom, U.S.A.

Fig. 1—Mount sail switch in one of positions shown for elbow turning vanes or sweep radius is recommended.

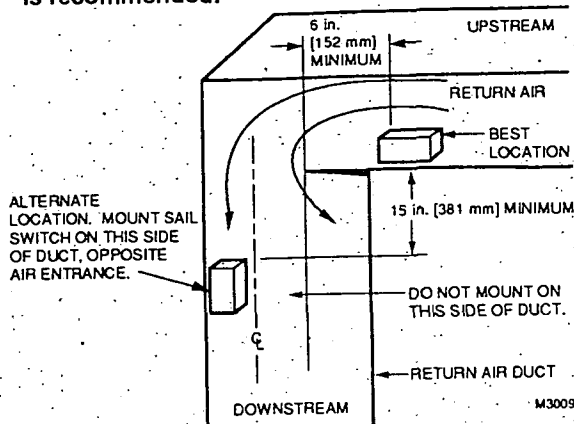


Fig. 2—Mount sail switch on center line of duct in one of angle-T positions shown for junction duct work.

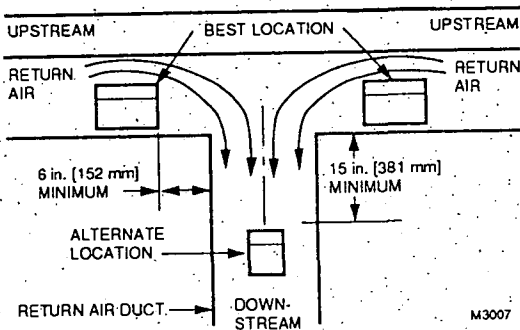
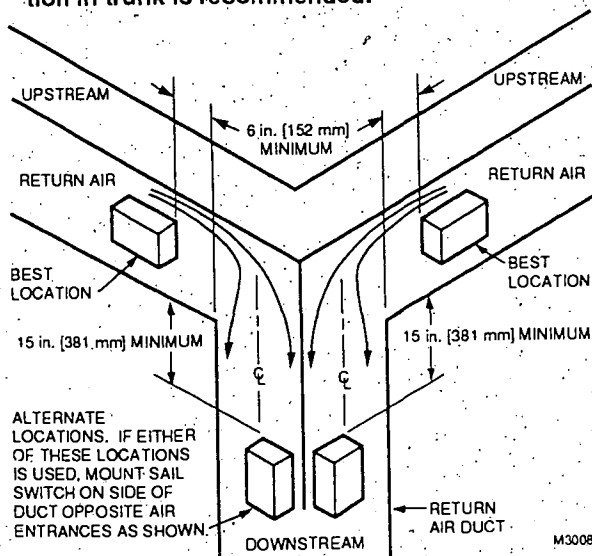


Fig. 3—Mount sail switch in one of positions shown for angle-T junction duct work. Transition in trunk is recommended.



must be at least 12 in. [305 mm] deep and 8 in. [203 mm] wide to allow operation of the sail without affecting the smooth flow of air in the duct. Air flow at the location may be vertical (up or down) or horizontal.

NOTE: When S688 is mounted in warm air, the sail life may be reduced.

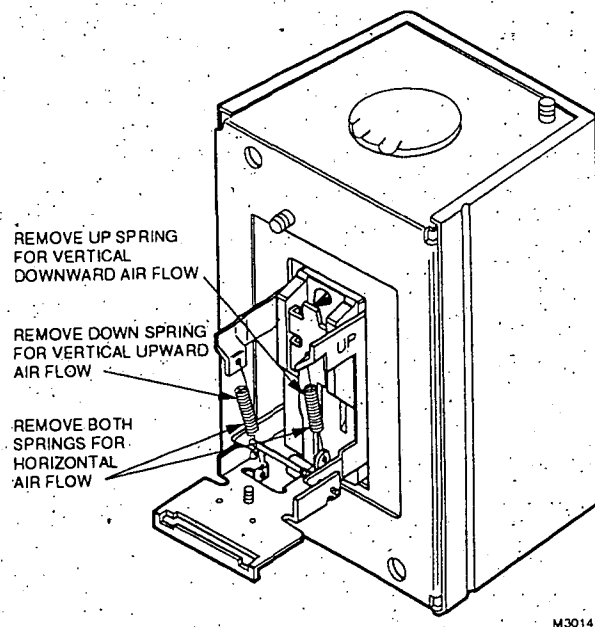
Refer to Figs. 1-3 for the best duct mounting location. Mount the switch at least 6 in. [152 mm] upstream from an elbow or junction, and at least 15 in. [381 mm] downstream from an elbow or junction. The switch must be located on the opposite side of the duct from the air entrance.

ADAPT SWITCH TO AIR FLOW DIRECTION

The S688A Sail Switch is provided with two counterbalancing springs in place as shown in Fig. 4. These springs offset the effect of gravity for air flow direction.

IMPORTANT: *Never use the sail switch with both springs attached.*

Fig. 4—Adapting sail switch to air flow direction.



Adapt the sail switch to mounting position. (F52 requires special instructions; see separate instructions.)

Standard Application

Horizontal air flow—remove both springs.

Vertical upward air flow—leave in place the spring that is attached to the bracket marked *up*. Remove the spring that is attached to the bracket marked *down*.

Vertical downward air flow—leave in place the spring that is attached to the bracket marked *down*. Remove the spring that is attached to the bracket marked *up*.

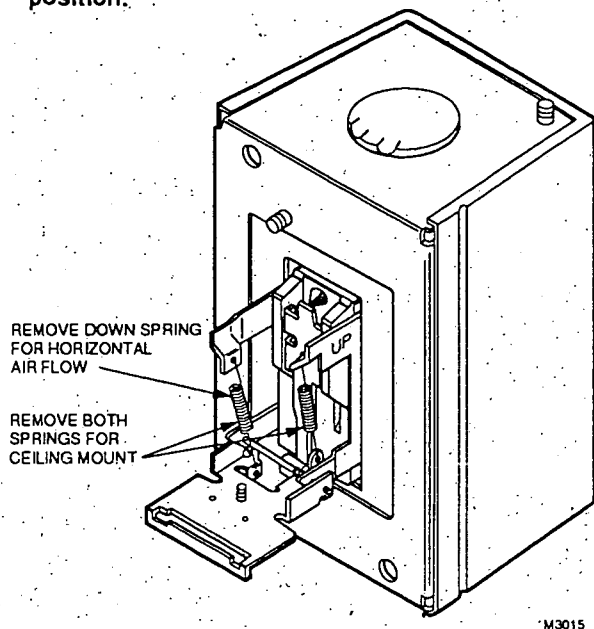
S688A INSTALLATION

F52 Application

Ceiling—remove both springs.

All other positions—leave in place the spring that is attached to the bracket marked *up*. Remove the spring that is attached to the bracket marked *down*.

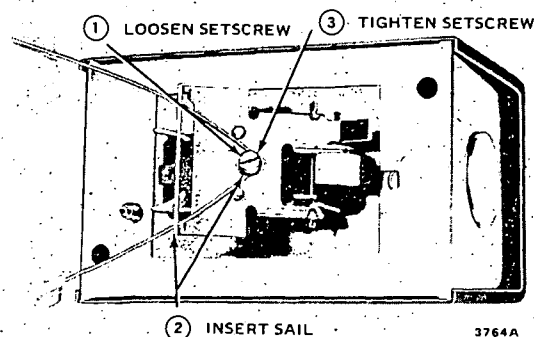
Fig. 5—Adapting sail switch to F52 mounting position.



MOUNT THE SWITCH (See special instructions for F52)
The sail switch counterbalancing springs are calibrated for proper operation when the sail switch case is mounted at true level for horizontal air flow applications, or plumb for vertical air flow applications. Proceed as follows, using the mounting template provided.

1. Mount the template at desired location. **BE SURE THAT THE ARROW INDICATING AIR FLOW POINTS IN THE PROPER DIRECTION.** Level the long dimension shown on the template for horizontal mounting. Plumb this dimension for vertical mounting.
2. Cut the hole indicated on the template in the ductwork.
3. Center punch the screw holes indicated and drill out with a 1/8 inch drill.

Fig. 6—Attaching sail to switch.



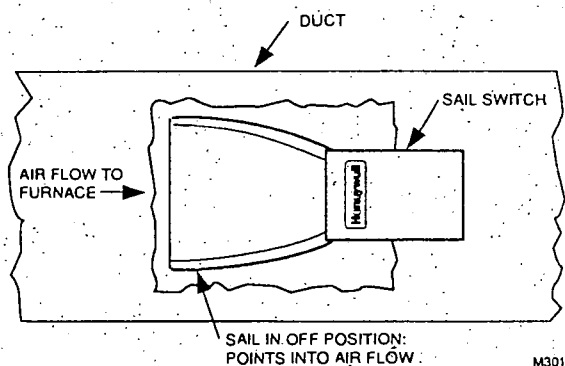
4. Attach the sail to the switch as shown in Fig. 6.

NOTE: The sail switch makes at about 250 fpm and breaks at 75 fpm. In an average residential system that produces 500 fpm in the return air duct, the switch will make at approximately 50% and break at 15% of the maximum air flow rate. In a system where air flow may be as high as 1000 fpm the switch will not break until the air flow drops to about 7.5% of maximum. To retain the original on-off ratios of air flow, trim the sail. Trim about 1-1/2 in. [38 mm] from the sail for 1000 fpm air velocity and proportionally more or less for higher or lower velocity. Correct trimming is important. If sail is too long, it will flutter and the wire frame may break prematurely; if it is too short, the switch may not operate.

5. Press the sides of the wire loop together. Insert the sail into the duct.

6. Before fastening the switch in position, check to make certain air movement will operate the switch. In the off position, the sail should point into the direction of airflow as shown in Fig. 7.

Fig. 7—Position sail so it points into the direction of airflow when switch is off.



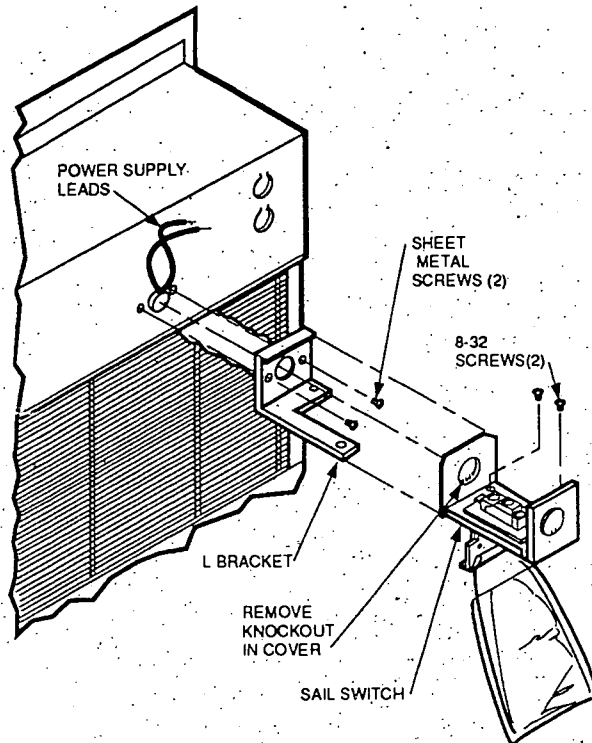
7. Secure the switch by using the sheet metal screws provided. After wiring, snap on the cover. The Honeywell trademark tab can be snapped out and rotated 180 degrees so it will be upright for any vertical mounting position.

MOUNT SAIL SWITCH ON THE F52

1. Remove the sail switch, L-shaped mounting bracket and small parts envelope from the air cleaner wiring compartment.
2. Remove sail switch cover and remove knockout opposite of the arrow stamped on the inside of the case.
3. Turn the air cleaner over and rest it on the carton.
4. Mount the sail on the sail switch.
5. Locate the two black wires extending from the back of the power supply. Pull wires through L-shaped bracket and case knockout. Using two tapered sheetmetal screws from the envelope, mount the L-shaped bracket to the air cleaner. Next, remove the ground screw on the sail switch to prevent interference with the L-shaped bracket. Mount the sail switch to the L-shaped bracket with two 8-32 screws. Airflow should be in opposite direction of airflow arrow.

NOTE: Although it is not recommended, if the two-cell air cleaner must be mounted horizontally with the power supply on the bottom, the sail switch must be installed at a 45 degree angle from vertical, see Fig. 8.

Fig. 8—Mount sail switch on back of power supply.



NOTE: IF AIR CLEANER IS MOUNTED HORIZONTALLY WITH THE POWER SUPPLY ON BOTTOM, THE SAIL SWITCH MUST BE MOUNTED AT A 45 DEGREE ANGLE FROM VERTICAL.

M3011

6. Make wiring connections to the N.C. (normally closed) and COM. (common) screw terminals in the sail switch.
7. Replace sail switch cover.

WIRING



CAUTION

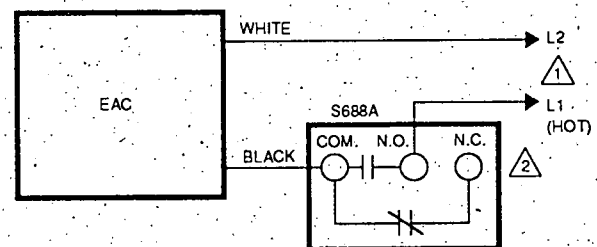
**ELECTRIC SHOCK HAZARD.
CAN CAUSE ELECTRICAL SHOCK OR
EQUIPMENT DAMAGE.**

Disconnect power supply before wiring.

All wiring must comply with local electrical codes and ordinances. When controlling more than one device, make certain that the total electrical load does not exceed the switch rating (see Specifications).

Typical wiring hookups that have the switching action at the sail switch are shown in Fig. 9. Normally open and normally closed refer to the contacts when the switch is in the de-energized position.

Fig. 9—Typical wiring hookups using sail switch to energize electronic air cleaner.



1 POWER SUPPLY. PROVIDE OVERLOAD PROTECTION AND DISCONNECT MEANS AS REQUIRED.

2 TERMINAL DESIGNATIONS ARE FOR POWER OFF:
N.O. - NORMALLY OPEN, N.C. - NORMALLY CLOSED, COM. - COMMON.

M3013

Operation and Checkout

OPERATION

The sail switch has a spdt switch, which permits different hookups for controlling auxiliary equipment in a heating-cooling system. The hookups in Figs. 9 and 10, show systems where the controlled equipment operates only when the system fan operates. When the fan produces 250 fpm air velocity, the normally open contacts make, turning on the auxiliary equipment. When the air velocity decreases to 75

fpm, the normally open contacts break, turning off the auxiliary equipment. The hookup in Fig. 10 shows a system where auxiliary equipment operates when the system fan is off. When the fan produces 250 fpm air velocity, the normally closed contacts break, turning off the auxiliary equipment. When the air velocity decreases to 75 fpm, the normally closed contacts make, turning on the auxiliary equipment.

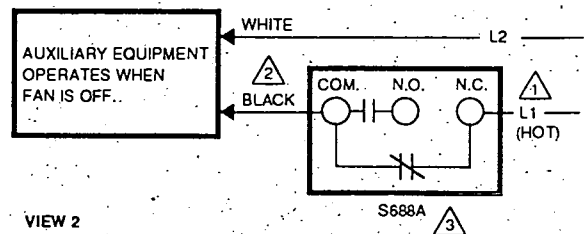
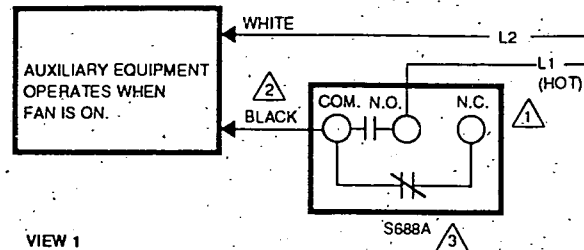
S688A

OPERATION AND CHECKOUT

CHECKOUT

When installation is complete, operate equipment through one complete cycle to make sure sail switch functions as described in OPERATION section.

Fig. 10—Typical wiring hookups using sail switch to energize two-wire auxiliary equipment.



- ① POWER SUPPLY. PROVIDE OVERLOAD PROTECTION AND DISCONNECT MEANS AS REQUIRED.
- ② WHEN CONTROLLING EQUIPMENT WITH TWO LEADWIRES, WIRE SWITCH IN HOT (BLACK) LINE.
- ③ TERMINAL DESIGNATIONS ARE FOR POWER OFF: N.O. - NORMALLY OPEN, N.C. - NORMALLY CLOSED, COM. - COMMON.

M3012

Honeywell

Residential and
Building Controls Division
Honeywell Inc.
1985 Douglas Drive North
Golden Valley, Minnesota 55422

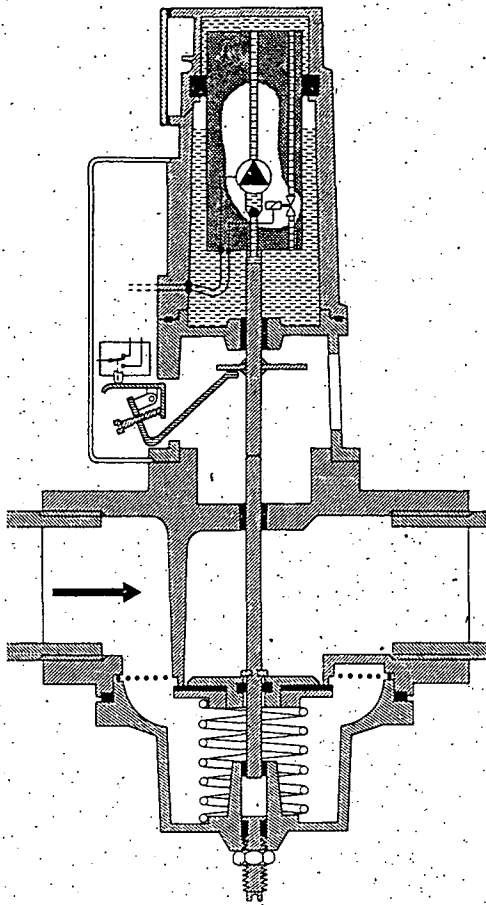
Residential and
Building Controls Division
Honeywell Limited—Honeywell Limitée
740 Ellesmere Road
Scarborough, Ontario
M1P 2V9

Helping You Control Your World

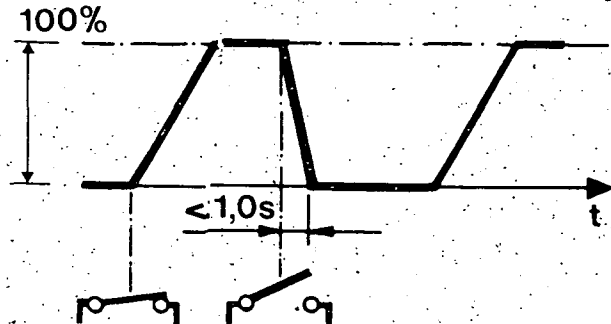


BODY = VRH10.915

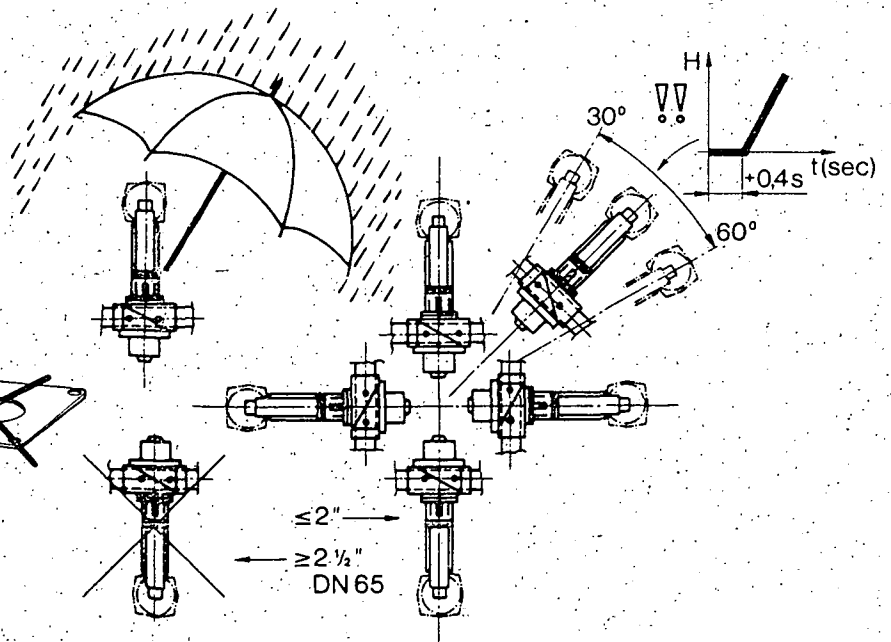
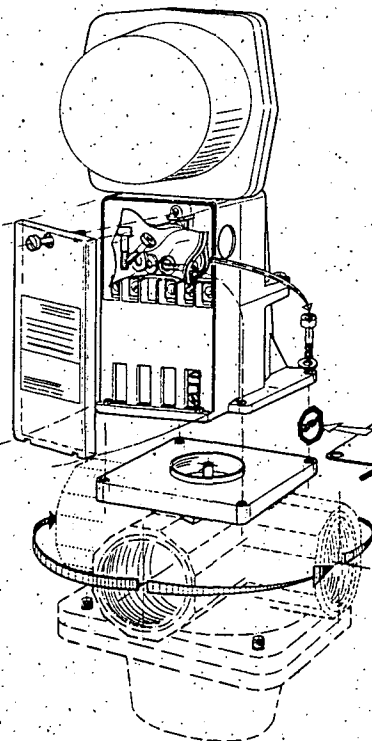
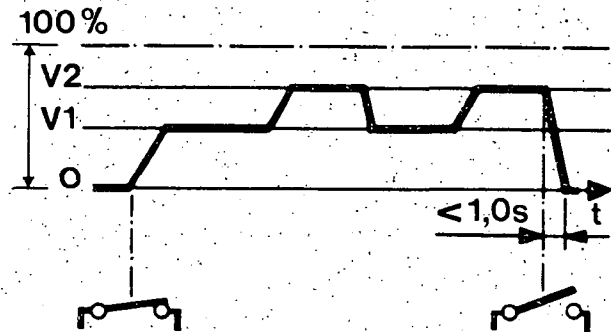
ACTUATOR = **SKP10**

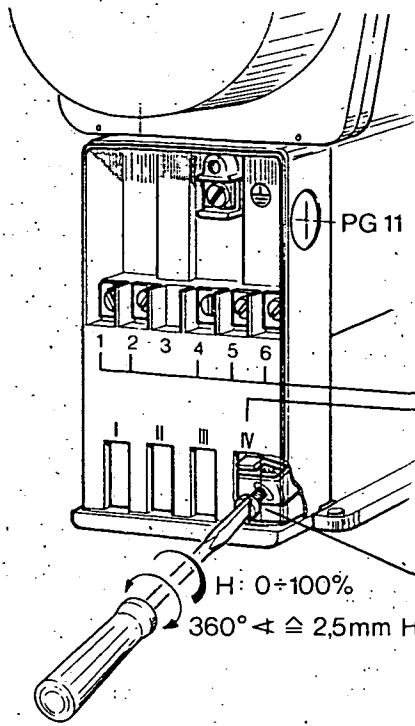


SKP10.111 . . .



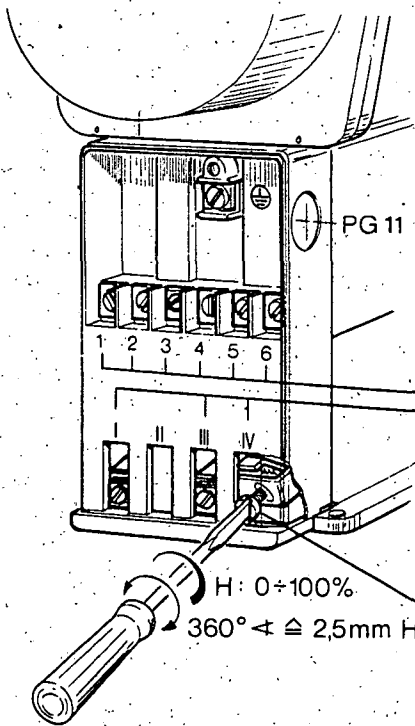
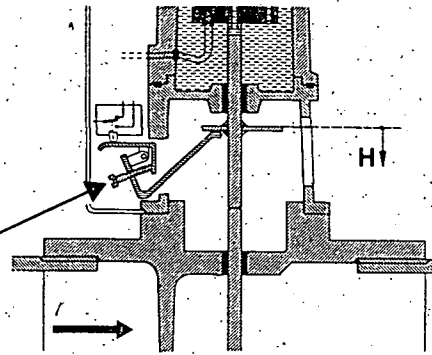
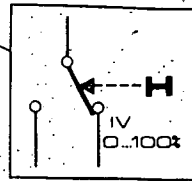
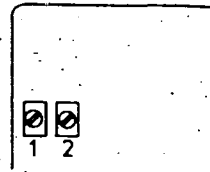
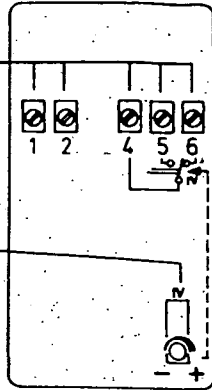
SKP10.1223 . . .



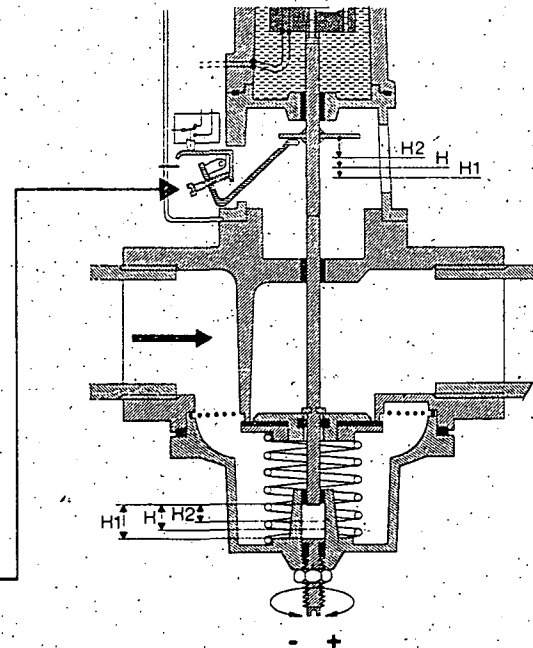
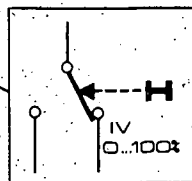
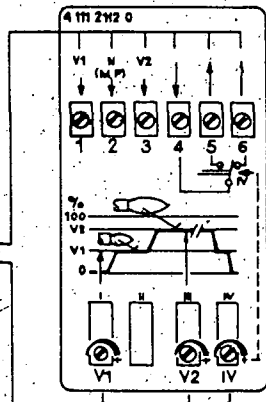


SKP10.1111

SKP10.1110



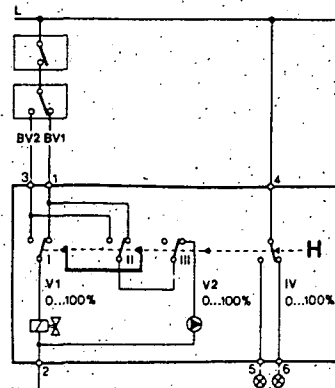
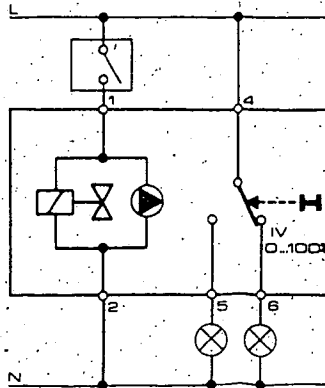
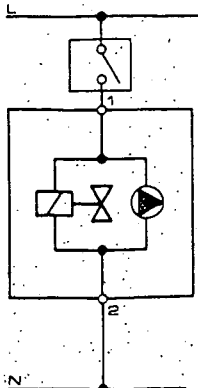
SKP10.1223



SKP10.1110

SKP10.1111

SKP10.1223



Übersicht DIN DVGW Reg. Nr. DVGW Reg. Nr.

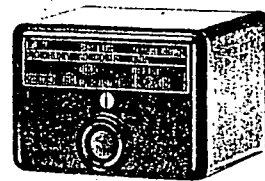
	<u>DIN</u> DVGW	<u>DIN</u> DVGW	<u>DIN</u> DVGW	DVGW	DVGW
	SKP10	SKP20	SKP27/SQS27	SKP50	SKP70
VGG3/4	85.08 e LG	85.01 e 361	85.09 e 361	G 85 e 135	G 85 e 066
VGG1	85.09 e LG	85.02 e 361	85.10 e 361	G 85 e 136	G 85 e 067
VGG1 ¹ / ₂	85.10 e LG	85.03 e 361	85.11 e 361	G 85 e 137	G 85 e 068
VGG2	85.12 e LG	85.05 e 361	85.13 e 361	G 85 e 138	G 85 e 070
VGf40	85.11 e LG	85.04 e 361	85.12 e 361	G85 e 139	G 85 e 069
VGf50	85.13 e LG	85.06 e 361	85.14 e 361	G85 e 140	G 85 e 071
VGf65	85.14 e LG	85.07 e 361	85.15 e 361	G85 e 141	G 85 e 072
VGf80	85.15 e LG	85.08 e 361	85.16 e 361	G85 e 142	G 85 e 073
VGH80	83.01 e LG	83.01 e 361	83.04 e 361	G 83 e 170	G 83 e 165
VGH100	83.02 e LG	83.02 e 361	83.05 e 361	G 83 e 171	G 83 e 166
VGH125	83.03 e LG	83.03 e 361	83.06 e 361	G 83 e 172	G 83 e 167
VGD40 } SKP10 VGD50 }	DIN DVGW 89.01 e 361	DIN DVGW 89.02 e 361	DIN DVGW 89.03 e 361	DIN DVGW 89.04 e 361	DIN DVGW 89.05 e 361

Flame detector relays

LAE10 for the supervision and indication of oil flames
LFE10 for gas and oil flames

LAE10
LFE10

leave On Site



Application range

The flame detector relay type LAE10, series 02, used in conjunction with selenium photocell RAR..., is designed for the supervision of oil flames.

The type LFE10, series 02, can be used for the supervision of gas flames and of luminous or blue-burning oil flames. Supervision is achieved using either an UV-detector QRA..., or a flame rectification detector. The LFE10 is also able to provide supervision of the ignition spark, using the UV-detector QRA... or the ignition spark detector QRE1, series 02.

Both types of flame detector relay are used primarily in conjunction with the burner control type LEC1 for the following applications:

- Dual-supervision of burners (supervision of the main flame, or of the pilot and main flames, by means of two identical or different flame detectors).
- Supervision of dual-fuel burners (supervision of the flame with different types of detector according to the selected fuel).
- Multi-flame supervision (i. e. central and simultaneous control of the start-up and supervision programme for several burners, the flames of which must be individually supervised by one or two flame detectors).
- The flame detector relays can also be used in conjunction with other types of burner controls, providing the given combination and selected circuitry does not impair the safety functions of the burner control.
- The design of the flame detector relays also allows them to be used as flame indicator units in manually operated burner plants.

Both units comply with the relevant European standards for oil and gas burners with intermittent operation (at least one controlled shut-down must be provided every 24 hours). Flame safeguards for permanently operating burners see DETACTOGRYR®, data sheet 7783.

Construction of the flame detector relays

The flame detector relays are of plug-in design and comprise a power pack, the flame signal amplifier, the flame relay, an auxiliary relay to operate the UV-detector test (LFE10) or the flame simulation test (LAE10), and the flame-present indicator lamp visible through a transparent viewing window in the unit cover. The circuitry is intrinsically safe within the terms of the relevant regulations and — when used with the burner control LEC1 — is continuously tested in respect of serviceability.

The flame detector relays may be mounted in any orientation direct on the burner, on a control panel or in a control cabinet. Two types of baseplate are available to suit the form of connection to be employed; both types are designed for cable entry from the front, the sides and below. 2 Earth terminals provide looping facilities for the Earth connections of other burner components, e. g. ignition transformer, etc., (the flame detector relay itself is double insulated!). The baseplates and the unit cover are manufactured in impact proof and heat resistant plastic. Dimensions and further details of the baseplates and accessories are given on Page 4.

Special features

- Small dimensions
- Mounting location and orientation optional

- Built-in signal lamp for «flame-present» indication
- With LAE10: Automatic flame simulation test by means of increasing the response sensitivity of the flame signal amplifier during the purge periods and when the burner is at rest; test programme given by the burner control LEC1.
- With LFE10: Automatic testing of the UV-detector by increasing the operating voltage of the UV-tube during purge periods and when the burner is at rest; test programme given by the burner control LEC1.

Flame detectors and ignition spark detector

— UV-detector QRA...

The UV-detector can be used for the supervision of gas and oil burners, as well as for the supervision of ignition sparks. As the UV-tube of the detector reacts only when illuminated with UV-light from the 190...270 nm band of the spectrum, neither infra-red radiation (glowing fire-brick) nor daylight can simulate a flame. The service life of the tube is approx. 10 000 hours with an ambient temperature of max. 50°C. In conjunction with the burner control LEC1, the tube is tested automatically during the purge times and when the burner is at rest by means of a higher operating voltage. — Variants:

- QRA2** Detector housing in plastic. Delivered complete with mounting flange and clamp.
- QRA10** Die-cast metal housing, gas tight up to 50 mbars, with connection facility for cooling air, for industrial burners. Protection standard IP54.

Types available:

- QRA2** Detectors with normal sensitivity. Part number of the UV-replacement cell: 4 502 1131 0 (P607.2)
- QRA2M** Detectors with increased sensitivity. QRA2M can be recognized by a green terminal cover, QRA10M by a green dot. Part number of the UV-replacement cell: 4 502 4065 0 (P607.20).

— Photocell detectors RAR7 and RAR8

The light sensitive element is a selenium photocell (active sensing element); it is mounted below a protective glass and is hermetically sealed within the detector housing, which is manufactured in black duroplast. The photocell generates an emission current, of a strength sufficient to allow flame supervision, only when it is subjected to light from the visual range of the spectrum (insensitive to infra-red radiation!). Delivered complete with mounting flange and clamp.

— Flame rectification detector

Flame supervision using the electrical conductivity of the flame, in conjunction with rectification, is only possible with gas and blue-flame burners. As the flame signal amplifier reacts exclusively to the d.c. component of the flame signal (ionisation current), a short circuit between the flame electrodes cannot simulate flame.

— Ignition spark detector QRE1, series 02

The QRE1 is used for ignition spark supervision when the flame supervision itself is achieved by means of a flame rectification detector. As the QRE1 reacts exclusively to the high frequency waves in the ignition circuit (100 kHz and above), a short circuit of the ignition electrodes cannot simulate a flame signal. Construction: Black plastic housing with connection cable; the electronic components are encapsulated in dust and oil proof material.

Operation and Connection Examples

Principle operation of a flame detector relay in conjunction with the burner control LEC1

With this combination the flame signal generated by the flame detector relay is added to the LEC1's burner firing sequence programme to achieve the same control and supervision function as that given by a gas or oil burner control with built-in flame signal amplifier.

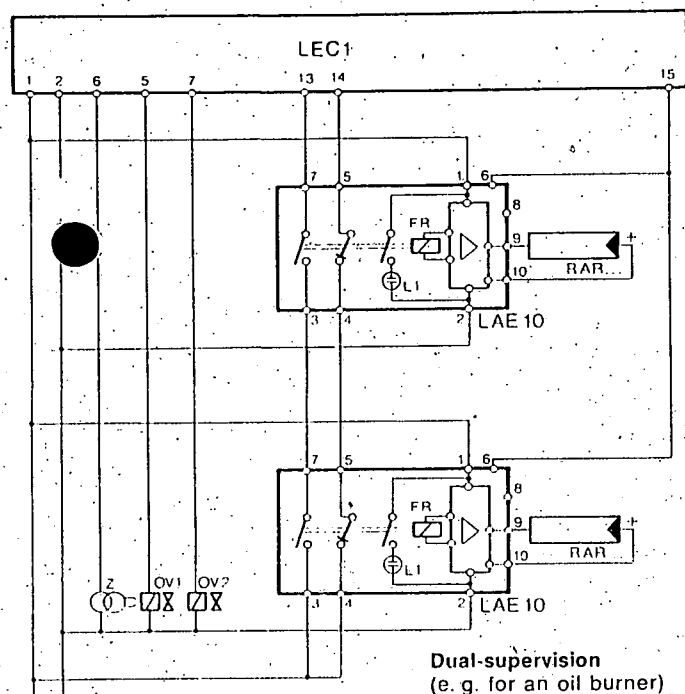
In the event of failure to establish flame on completion of the burner firing sequence, or flame is lost during burner operation, or the detection of a flame signal during burner off and purge periods, the burner is shut down and the LEC1 goes to lockout. The switching functions needed to add the flame signal to the control circuit of the burner control are provided by the flame relay FR of the flame detector relay LAE10 or LFE10 and the two auxiliary relays HR1 and HR2 in the LEC1.

The burner control LEC1 also provides the programme for the flame simulation test (in conjunction with the flame detector relay LAE10) as well as the UV-detector test (with LFE10). The control command for the tests is given via the connection

between terminal 15 of the burner control and terminal 6 of the flame detector relay being used. Both forms of test commence about 7 s after a controlled shut-down, are continued throughout the burner-off period and during the ensuing pre-purge time, and are ended 3 s prior to the start of the safety time. Any flame signal detected during this test time, whether caused by extraneous light, excess ageing of the UV-detector or any other defect in the flame supervision circuit, will lead automatically to the burner control LEC1 locking out the burner. In the flame detector relay, the switching functions needed for the test are executed by the auxiliary relay HR3.

As a test is not necessary in the case of flame supervision using a flame rectification detector, the connection between terminal 15 of the burner control and terminal 6 of the flame detector relay is not needed. Instead, terminal 6 should be connected direct to Phase, e.g. by means of connection to terminal 1, 5 or 7 of the flame detector relay.

Any flame signal — whether normal (during burner run) or a fault signal — is signalled by the indicator lamp in the housing of the flame detector relay.



Operation of the flame detector relays used for dual-supervision

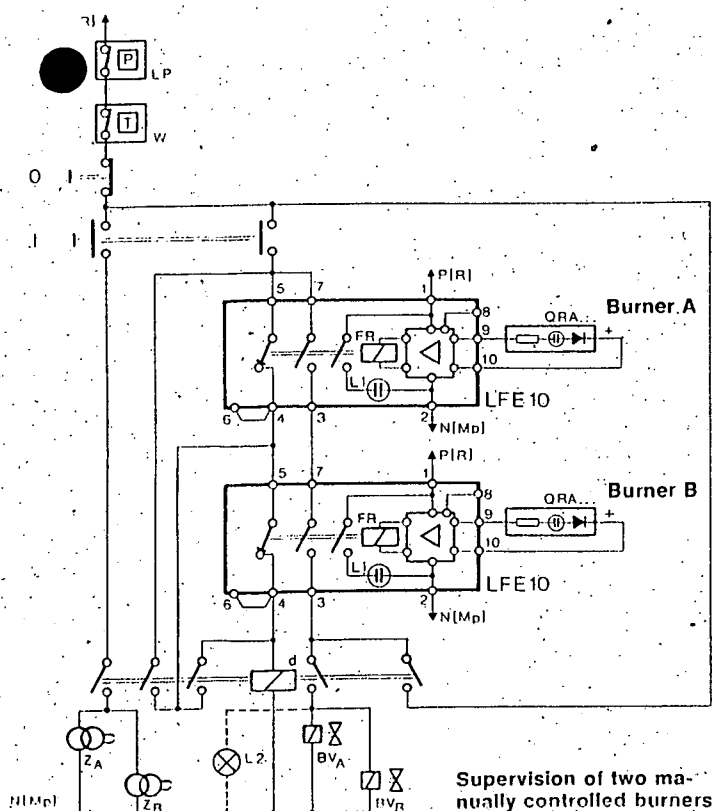
With this form of supervision one flame is supervised by two independently operating flame detector relays, with the aim of reducing the possibility of a flame failure occurring at the same time as the failure of both flame detector relays to an «improbable coincidence».

With dual supervision the control contacts of the flame relays of both flame detector relays are connected in series in such a manner that the loss of the flame signal of **either of the flame detector relays is sufficient** to cause lockout of the burner. Also during burner-off periods or during purge times, the detection of a flame (fault) signal by only **one** of the flame detector relays will result in lockout.

Attention: If flame supervision is made using UV-detectors, it must be ensured that the two detectors are so placed that there is no direct sighting between them as an Ignited UV-tube is itself a generator of UV-radiation!

If any adjustment on the controls are necessary, or any wiring change have to be made, the electrical supply to the control unit must be isolated before this work is undertaken!

The detector cable should not be laid in the same conduit with other conductors, as the line capacity can reduce the value of the flame signal.



Operation of the flame detector relays by the supervision of two manually operated burners

Also with this application, a burner start is only possible after a successful UV-detector or flame simulation test i. e. **neither** of the flame detector relays may register a flame signal when the burners are at rest. At the burner start, the detector test is interrupted automatically.

When push-button 1 is actuated, relay «d» is energized via the closed current path 4-5 of the flame relays. This switches on the ignition for both burners and simultaneously releases the fuel. The duration of the «start» pulse given by push-button 1 should — in the sense of a **safety time** — be limited by means of a time relay, e. g. type KOD1 (SAIA).

Providing flame is established with both burners — indicated by the signal lamps in the housings of the flame detector relays — the relay «d» is maintained in its energized state via the current path 3-7 of the two flame relays. When the push-button is released, the ignition is switched off and the burner firing sequence completed.

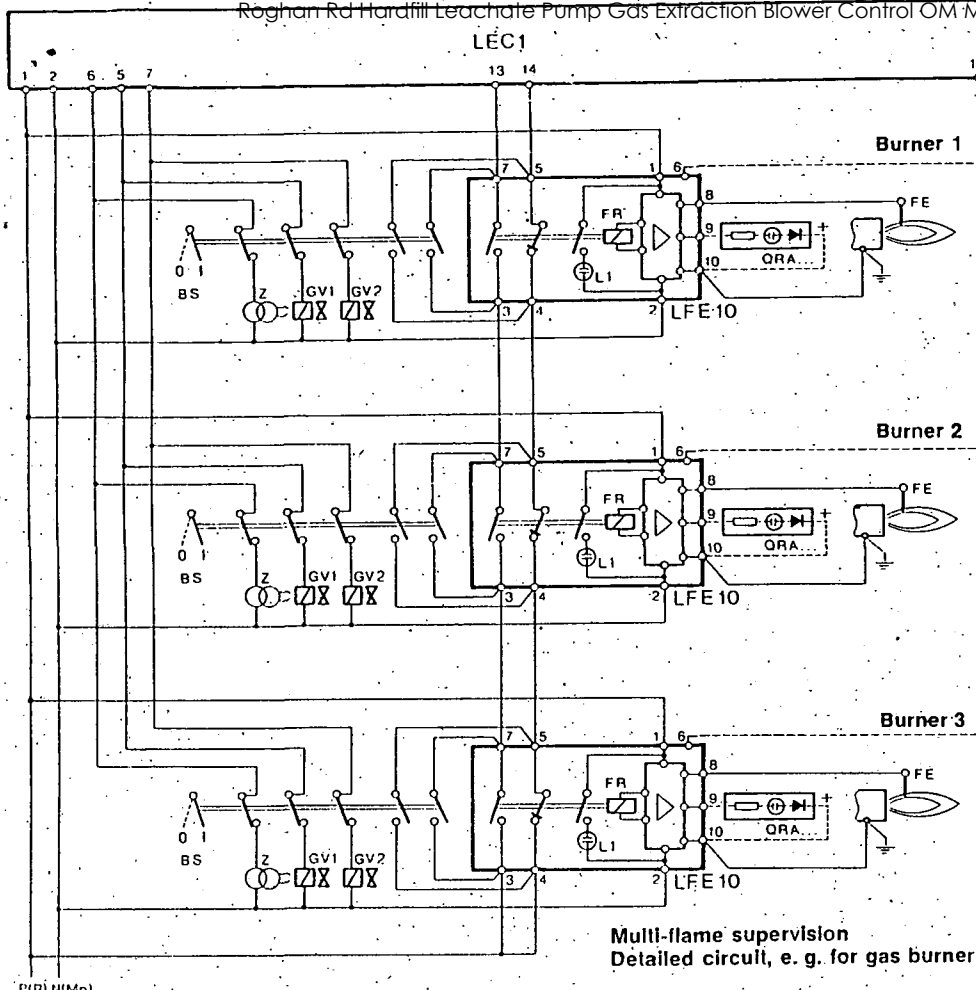
In the event of flame failure with **one** of the burners, the affected flame relay de-energizes and breaks the holding circuit for relay «d». This results in the fuel valves of **both** burners being closed immediately.

The burners are switched off manually by actuation of the «0» push-button or — automatically — by the thermostat or pressurestat (limiter) in the Phase connection.

In the case of flame supervision using flame rectification detectors, terminals 6 of the flame detector relays should be connected direct to Phase (e. g. by connecting to terminal 1), the detector test being unnecessary in this instance.

Note:

Note:
When using the UV-detector QRA..., terminal 10 must be connected to earth!



Operation of the flame detector relays with multi-flame supervision

In the same manner as with dual-supervision, the control contacts of the flame relays of all flame detector relays must be connected in series, so that failure to establish flame during the safety time, or flame failure during operation, with one of the burners will result in all the burners being locked out.

The correctly operating burners can only then be re-started (after the burner control has been reset) when the faulty burner has been switched off. In this respect, it is not only necessary to bridge the control contacts of the flame detector relay involved (thus closing the control circuit again), it is also necessary to interrupt the Phase connection to the ignition transformer and fuel valves.

In the same context, the affected burner can only be re-started (once the fault has been corrected) in conjunction with the remaining burners, i. e. only following the shut-down of all the burners.

Note:
When using the UV-detector QRA... terminal 10 must be connected to earth!

Legend for the basic circuit diagram and the connection examples

- BS Operating switch ON/OFF (per burner)
- BVA/BVB Fuel valves of the burners A and B
- d Auxiliary relay
- FE Detector electrode for flame rectification
- FR Flame relay
- GV1, GV2 Gas valves for the 1st and 2nd stages
- H Mains isolator
- HR3 Auxiliary relay for the UV-detector/Flame simulation test
- L1 Built-in signal lamp (flame present)
- L2 External signal lamp (burner running)
- LP Air pressure switch
- OV1, OV2 Oil valves for the 1st and 2nd stages
- W Limit thermostat
- Z Ignition transformer
- ZA, ZB Ignition transformers for burners A and B

Technical data

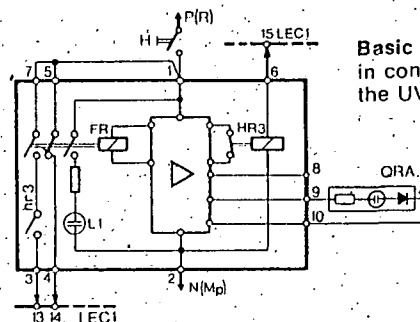
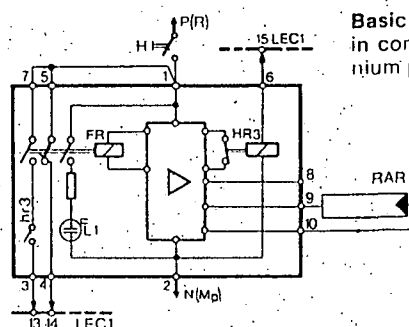
Flame detector relays LAE10 and LFE10

Mains voltage	220 V ~ -15%...240 V +10%
Frequency	50...60 Hz
Fuse (external)	max. 10 A, slow
Consumption	5 VA
Max. perm. contact loading	2 A
Protection standard	IP40
Permissible ambient temp.	-10...+60 °C
Mounting position	optional
Weight without baseplate	LAE10: 305 g LFE10: 390 g
with standard baseplate	: 380 g : 470 g
with special baseplate	415 g 505 g

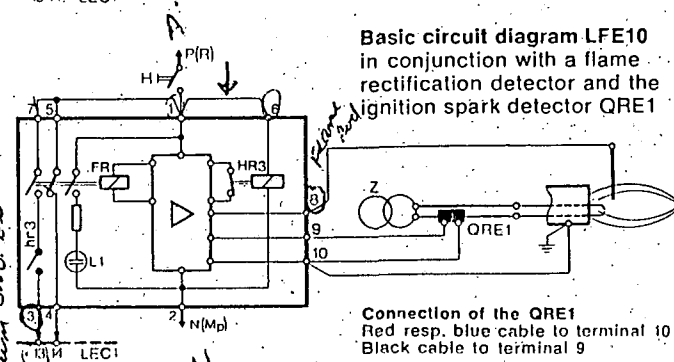
	LFE10 Series 02 Flame rectif. detector	LFE10 Series 02 UV- detector	LAE10 Series 02 Selenium photocell
Min. required detector current in μ A at nominal voltage	220 V 240 V 8 9	220 V 240 V 150 200	220...240 V 8
Max. possible detector current in μ A	approx. 100	approx. 650	appr. 25
Detectors			
Permissible cable run	20 m ¹⁾	20 m ¹⁾	20 m ¹⁾
Permissible ambient temp.	—	60 °C	60 °C

¹⁾ For longer cable run, use insulated screened single-core cable (low capacitance!); screen to terminal 10.
²⁾ For longer cable run, use Type RAR8 and low capacitance cable as mentioned above.

Basic circuit diagrams



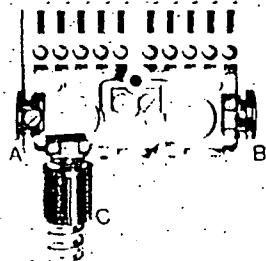
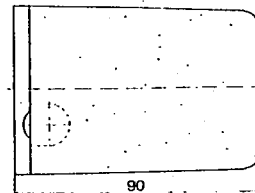
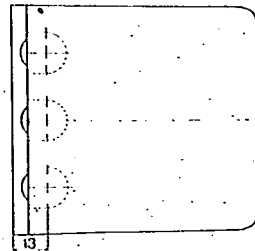
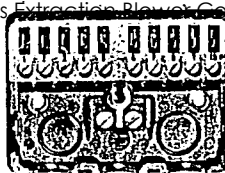
When using the UV detector QRA terminal 10 must be connected to earth!



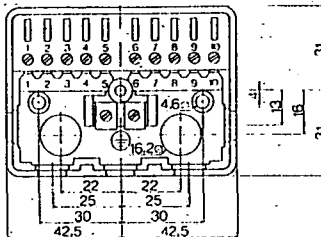
Baseplate variants

Normal baseplate, ref. 4 104 1345 0

This baseplate is equipped with 2 additional terminals for the looping of Earth wires of other burner components. The following cable entry accessories are available:



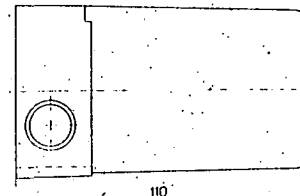
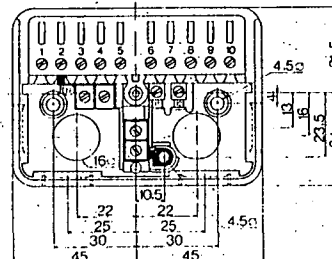
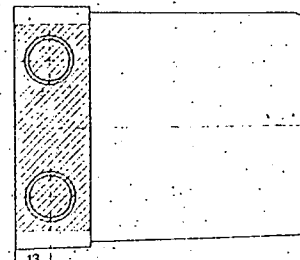
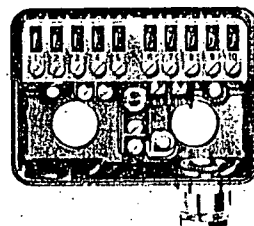
- A** Auxiliary terminals, which can be inserted into any of the cable entries
4 484 8916 0
- B** Cable-strain relief bushing for multi-core cable up to 9.4 mm ϕ
4 482 1768 0
- C** As 'B', but for flexible conduit with 15 mm external diameter
4 482 1649 0



Special baseplate, ref. 4 104 9025 0

This baseplate is equipped with

- 2 auxiliary terminals with terminal numbering 11 and 12.
 - 2 Neutral terminals, permanently connected to Neutral-input, terminal 2.
 - 2 earth terminals with earthing lug for the burner
- and the following cable entry facilities:
- 2 unthreaded entries from below
 - 2 knock-out entries threaded for Pg11 or 3/4" UNP (2 at the front and 1 each side).



Special baseplate, ref. 4 104 9113 0

Execution as above, but with removable front (shaded area in dimension diagram).

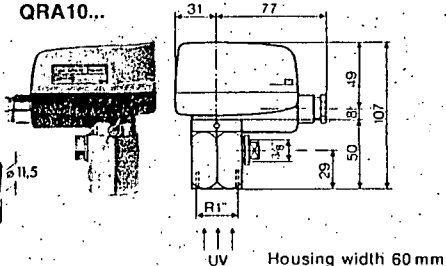
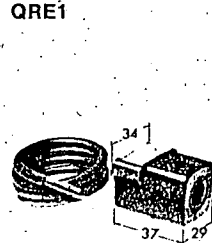
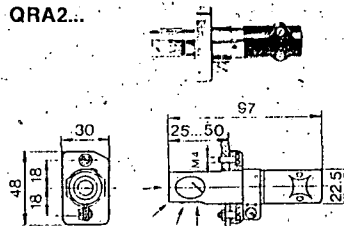
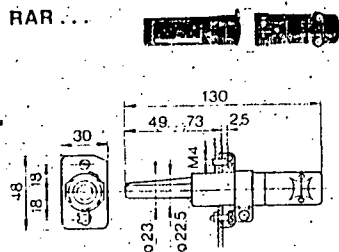
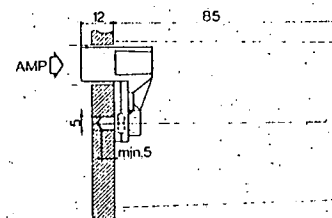
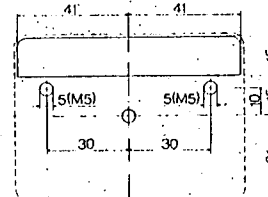
Special baseplate, ref. 4 104 9087 0

Execution as ref. 4 104 9025 0 but with 2 knock-out entries from below (instead of the 2 unthreaded open entries).

Special socket, ref. 4 408 2582 0

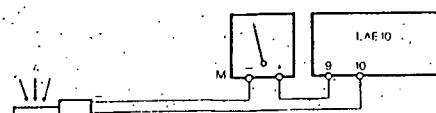
for the connection of the burner control by means of non insulated AMP-connectors.

The used AMP-connectors have to be of the click-into-place type which remain in the socket even when the burner control is removed (e.g. AMP Fastin-Faston type 42 281-1 or 42 238-2 resp. similar types complying with draft standard DIN 46 340). The adjacent drawing shows the necessary cutout and drilling holes for mounting the socket.

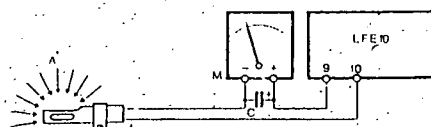


Measurement circuits

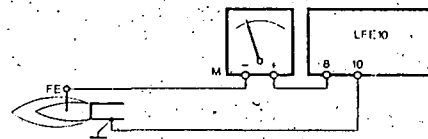
- A Illumination from the flame
M Microamperemeter
C Electrolytic capacitor 100 μ F, 10 V=



Note: When using the UV-detector QRA..., terminal 10 must be connected to earth!



Note: The ignition can affect the ionisation current! Possible aid: reverse the primary connections to the ignition transformer.



ORIFICE DESIGN ISO 5167 - 1980.

PRIMARY DEVICE - CONCENTRIC ORIFICE PLATE. - RADIUS TAPS.
 A ROSEMOUNT CALCULATION PROGRAM

CUSTOMER : BRISBANE CITY COUNCIL
 ORDER No : 190285EF
 TAG No :
 REG No. : 81723
 CALC No. : 91-021
 RANGE RATING : ANSI 150
 PLATE MATERIAL : 316 SS
 LINE INTERNAL DIAMETER : 100 mm
 PROCESS FLUID : gas

TRANSMITTER 6.22 KPA
 - MAX RANGE

APPLICATION DATA

MAX FLOW RATE : 0.132 kg/s
 NORM FLOW RATE : 0.100 kg/s
 FLOWING PRESSURE : 104.000 kPa. (abs)
 FLOWING TEMPERATURE : 33.000 Deg C
 DENSITY AT FLOW : 0.950 kg/m³
 VISCOSITY AT FLOW CONDITIONS : 0.010 cP
 SPECIFIC HEAT RATIO : 1.000
 DIFF. PRESS AT MAX FLOW : 1.000 kPa.

$\frac{132}{.95} = \text{cm}^3/\text{sec}$
 $= 500 \text{ m}^3/\text{hour}$

1 KPA = 500 m³/hr

1 KPA = 101.97 mmHg

RESULTS

REYNOLDS No AT NORM FLOW : 1.2732E+05
 COEFFICIENT C : 0.61267
 EXPANSIBILITY FACTOR Y : 0.99719
 THERMAL CORRECTION FACTOR : 1.00000
 DRAIN/VENT CORRECTION FACTOR : 1.00143
 FINAL BETA RATIO : 0.73018
 ORIFICE BORE (CALC AT NORM FLOW) : 73.018 mm *
 NETT PRESSURE LOSS : 0.443 kPa.
 DRAIN/VENT HOLE : 3.000 mm

4.202 KPA
 = 1000 cm³/HR

SIGNED

[Signature]

DATE:

2.12.91

ORIFICE DESIGN ISO 5167 - 1980.

PRIMARY DEVICE - CONCENTRIC ORIFICE PLATE. - RADIUS TAPS.
A ROSEMOUNT CALCULATION PROGRAM

CUSTOMER : BRISBANE CITY COUNCIL
ORDER No. : 190285EF
TAG No. :
REG No. : 81723
CALC No. : 91-021
FLANGE RATING ANSI 150
PLATE MATERIAL 316 SS
LINE INTERNAL DIAMETER 100 mm
PROCESS FLUID gas

TRANSMITTER 6.22 KPA
- MAX RANGE

APPLICATION DATA

MAX FLOW RATE 0.132 kg/s
NORM FLOW RATE 0.100 kg/s
FLOWING PRESSURE 104.000 kPa. (abs.)
FLOWING TEMPERATURE 33.000 Deg C
DENSITY AT FLOW 0.950 kg/m³
VISCOSITY AT FLOW CONDITIONS 0.010 cP
SPECIFIC HEAT RATIO 1.000
DIFF. PRESS AT MAX FLOW 1.000 kPa.

 $\frac{0.132}{0.95} = \frac{\text{m}^3}{\text{sec}}$
 $= 500 \text{ m}^3/\text{hour}$

1 KPA = 101.97 mmHg

RESULTS

REYNOLDS No AT NORM FLOW 1.2732E+05
COEFFICIENT C 0.61267
EXPANSIBILITY FACTOR Y 0.99719
THERMAL CORRECTION FACTOR 1.00000
DRAIN/VENT CORRECTION FACTOR 1.00143
FINAL BETA RATIO 0.73018
ORIFICE BORE (CALC AT NORM FLOW) 73.018 mm *
NETT PRESSURE LOSS 0.443 kPa.
DRAIN/VENT HOLE 3.000 mm

SIGNED



DATE: 2-12-91

ROSEMOUNT

Measurement
Control
Analytical
Valves

Rosemount Instruments
Pty. Limited
471 Mountain Highway
Bayswater, Vic. 3153,
Australia
Tel (61) (3) 721 0200 Telex AA34744

Facsimile Lead Sheet

DATE 5.12.91 PAGE 1 OF 2
COMPANY BRISBANE CITY COUNCIL SENDER DAVID SEXTON
ATTENTION PETER TRANTER FAX NUMBER (61) (3) 720.4215
LOCATION EAGLE FARM REF. NUMBER _____
FAX NUMBER 07 268 0847 CC _____

SUBJECT FLOW ELEMENT CALCULATION FOLLOW-UP DATE _____

YOUR P.O. 190285EF
OUR REFERENCE B1723

ATTACHED IS CALCULATION N° 91-021 WHICH
SHOWS APPLICATION DATA WHICH HAS BEEN USED
TO CALCULATE THE ELEMENT BORE AND THE
RESULTS OF THE CALCULATION.

THIS DOCUMENT CAN FORM PART OF YOUR
PERMANENT PLANT RECORD FOR THE FLOW
METER.

IF APPLICATION DATA USED IS NOT CORRECT
PLEASE ADVISE.

REGRADS
DAVID

ROSEMOUNTApproved:
Valves

Rosemount (Australia)
Pty. Limited
471 Mordiallo Highway
Bayswater, Vic 3153
Tel: (03) 721 9200
Fax: (03) 720 4215

ORIFICE DESIGN ISO 5167 - 1980.

PRIMARY DEVICE - CONCENTRIC ORIFICE PLATE. - RADIUS TAPS.
A ROSEMOUNT CALCULATION PROGRAM

CUSTOMER : BRISBANE CITY COUNCIL
ORDER No : 190285EF
TAG No :
REG No. : 81723
CALC No. : 91-021
FLANGE RATING ANSI 150
PLATE MATERIAL 316 SS
LINE INTERNAL DIAMETER 100 mm
PROCESS FLUID gas

TRANSMITTER 6.22 KPA
MAX RANGE

APPLICATION DATA

MAX FLOW RATE 0.132 kg/s
NORM FLOW RATE 0.100 kg/s
FLOWING PRESSURE 104.000 kPa. (abs)
FLOWING TEMPERATURE 33.000 Deg C
DENSITY AT FLOW 0.950 kg/m³
VISCOSITY AT FLOW CONDITIONS 0.010 cP
SPECIFIC HEAT RATIO 1.000
DIFF. PRESS AT MAX FLOW 1.000 kPa.

$\frac{132}{.95} = \text{cm}^3/\text{sec}$
 $= 500 \text{ m}^3/\text{hour}$

1 KPA = 101.97 mmHg

RESULTS

REYNOLDS No AT NORM FLOW 1.2732E+05
CORRECTION COEFFICIENT C 0.61267
CORRECTION FACTOR Y 0.99719
THERMAL CORRECTION FACTOR 1.00000
DRAIN/VENT CORRECTION FACTOR 1.00143
FINAL LETA RATIO 0.73018
ORIFICE BORE (CALC AT NORM FLOW) 73.018 mm *
NETT PRESSURE LOSS 0.443 kPa.
DRAIN/VENT HOLE 3.000 mm

SIGNED 

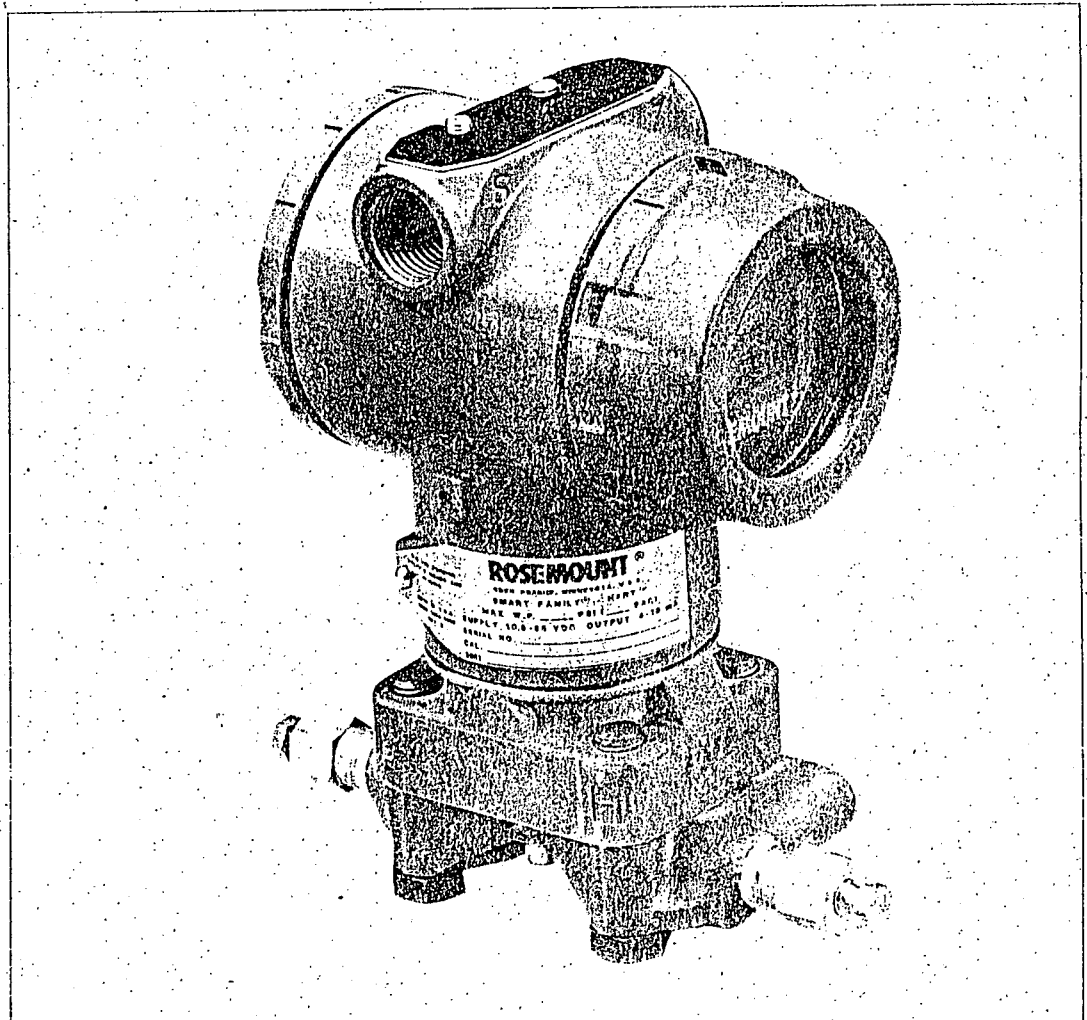
DATE: 1.9.91

3051CD1A22A1AB1

C/N 316 S/S Flanges 0-0.2 to

0-602249.1

Model 3051C Differential Pressure Transmitter



ROSEMOUNT

Measurement
Control
Analytical
Valves

PERFORMANCE

- New! → • High performance: $\pm 0.075\%$ accuracy
 • 30:1 rangeability
 • Microprocessor-based electronics

FLEXIBILITY

- Small, lightweight Coplanar™ design for easy installation
- Member of Rosemount SMART FAMILY* line
- HART* communication with Model 268 SMART FAMILY Interface and Rosemount System 3™ and RMV9000™ control systems—without interrupting output signal
- Software-selectable linear or square root output
- Stainless steel and aluminum electronics housings

MAINTAINABILITY

- Continuous self-diagnostics for maximum reliability
- Modular design for easy maintenance
- Local zero and span adjustments standard
- Nonvolatile memory needs no batteries
- Sensor module memory allows easy repair

INTRODUCTION

The Model 3051C Coplanar Smart Pressure Transmitter* is a high-performance extension of the Rosemount* pressure instrument line. The Model 3051C joins the distinguished Rosemount SMART FAMILY line of microprocessor-based field instruments.

The Model 3051C benefits from the proven capacitance cell technology pioneered by the Rosemount Model 1151. Digital technology used in the Model 3051C ensures maximum accuracy and rangeability, as well as an easy interface between the field and the control room. In addition, the output is software-selectable for linear or square root.

The extensive use of application-specific integrated circuits (ASICs) and surface-mount electronic technology significantly reduces the size and weight of the transmitter. This, coupled with the Coplanar process connection, ensures easy installation.

All SMART FAMILY instruments communicate using the HART

(Highway Addressable Remote Transducer) protocol with the handheld Model 268 SMART FAMILY Interface and Rosemount System 3 and RMV9000 process control systems. Figure 1 shows the Model 3051C and the Model 268.

In addition to remote communications, the Model 3051C allows you to adjust the analog output span and zero locally through the use of integral adjustments. An optional digital meter adds diagnostic capabilities and allows you to read the digital process variable at the transmitter.

TRANSMITTER DESCRIPTION

Figure 2 shows a functional block diagram of the Model 3051C.

The Sensor Module

The Model 3051C incorporates a high-accuracy capacitance sensor. With this sensor, process pressure is transmitted through the isolating

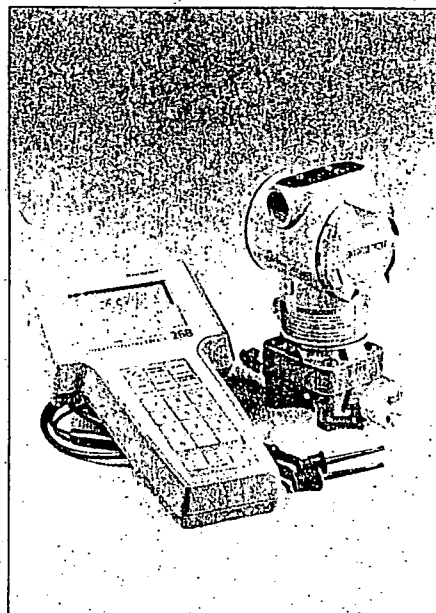


FIGURE 1: Model 3051C Coplanar Pressure Transmitter shown with Model 268 SMART FAMILY Interface

diaphragm and fill fluid to the sensing diaphragm in the center of the capacitance cell. Capacitor plates on both sides of the sensing diaphragm detect its position. The differential capacitance between the sensing diaphragm and the capacitor plates is directly proportional to process pressure.

The patented capacitance cell is laser-welded, and isolated mechanically, electrically, and thermally from the process medium and the external environment. Mechanical and thermal isolation is achieved by moving the capacitance cell away from the process flange to a position in the neck of the electronics housing. This design relieves mechanical stress on the cell, thereby improving static pressure performance and removes the sensor from direct process heat.

Glass-sealed pressure transport tubes and insulated cell mountings provide electrical isolation, and thus improve the electronic circuitry's flexibility, performance, and transient protection.

* Rosemount Inc., 1988, 1989, 1990, 1991.

May be protected by one or more of the following U.S. Pat. Nos. 4,370,890; 4,612,812; 4,791,352; 4,798,089; 4,818,994; 4,833,922; 4,866,435; 4,926,340; 4,988,990; 5,028,746. MEXICO PATENTADO NO. 154,961. May Depend on Model. Other U.S. and Foreign Patents Issued and Pending.

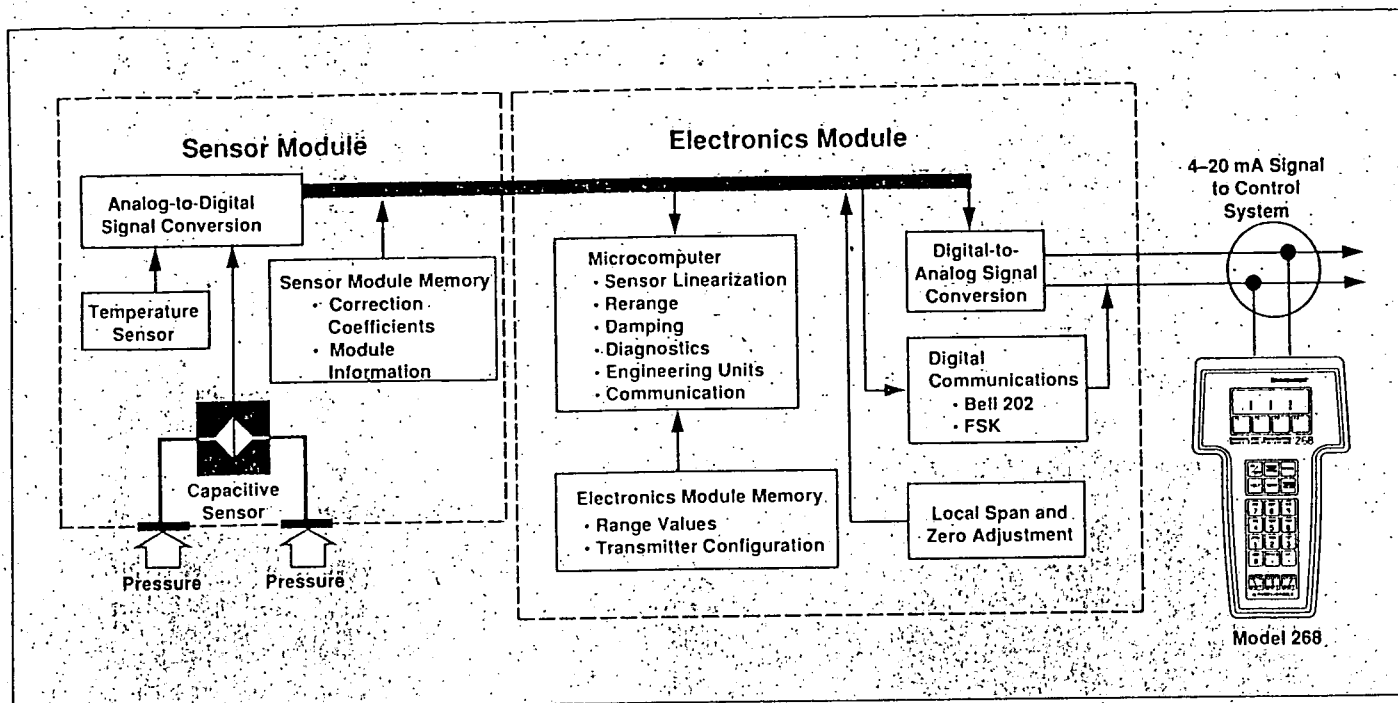


FIGURE 2. Model 3051C Differential Pressure Transmitter Block Diagram

The Model 3051C sensor module also incorporates a temperature measurement to compensate for thermal effects.

During the characterization process at the factory, all sensors are run through pressure and temperature cycles over the entire operating range. Data from those cycles is used to generate correction coefficients that are stored in the sensor module memory to ensure precise signal correction during operation.

This sensor module memory also speeds repair. Because all of the module characteristics are stored with the module, the electronics can be replaced without having to recalibrate or remove separate correction PROMs.

Also located in the sensor module are electronics that convert the capacitance and temperature input signal directly into a digital format for further processing by the electronics module.

Electronics Module

The electronics module consists of a single board incorporating ASIC and surface-mount technology. This module accepts the digital input signal from the sensor module, along with the correction coefficients, then corrects and linearizes the signal. The output section of the electronics module converts the digital signal to a 4–20 mA output and handles communication with the Model 268 or Rosemount control systems.

An optional LCD meter, shown in Figure 12, plugs into the electronics board and displays the digital output in pressure engineering units or percent of analog range values.

Data Storage

Configuration data is stored in nonvolatile EEPROM memory in the electronics module of the transmitter. This data is retained in the transmitter when power is interrupted, so the transmitter is functional immediately upon power-up.

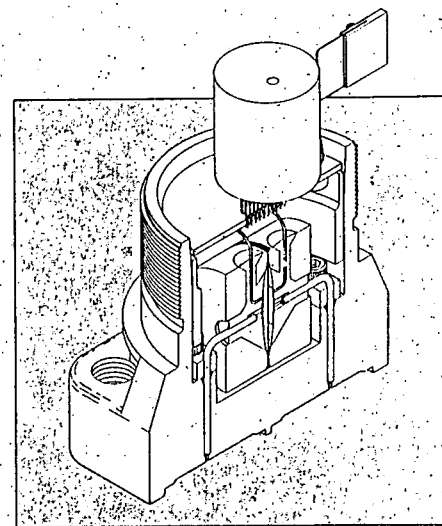


FIGURE 3. Sensor Module Cross Section

D/A Conversion and Signal Transmission

The process variable is stored as digital data, enabling precise corrections and engineering unit conversion. The corrected data is then converted to a standard 4–20 mA current applied to the output loop. The Model 268, the LCD meter, and Rosemount control systems can access the sensor reading directly as a digital signal, bypassing the D/A conversion process for higher accuracy.

Model 3051C Differential Pressure Transmitter

Communication Format

The Model 3051C communicates via the HART protocol, which uses an industry standard Bell 202 Frequency Shift Keying (FSK) technique. Remote communication is accomplished by superimposing a high-frequency signal on top of the 4–20 mA output signal. The Rosemount implementation of this technique allows simultaneous communications and output without compromising loop integrity. The Model 3051C will communicate with any host that incorporates the HART protocol.

transmitter operational parameters are set, which include:

- 4 and 20 mA points
- Linear or square root output
- Damping
- Engineering unit selection

Second, informational data can be entered into the transmitter to allow identification and physical description of the transmitter. This data includes:

- Tag: 8 alphanumeric characters
- Descriptor: 16 alphanumeric characters
- Message: 32 alphanumeric characters
- Date
- Integral Meter Installation
- Flange Type
- Flange Material
- Drain/Vent Material
- O-ring Material
- Remote Seal Information

In addition to the configurable parameters discussed here, the Model 3051C software contains several kinds of information that are not user-changeable: transmitter type, sensor limits, minimum span,

fill fluid, isolator material, module serial number, and transmitter software revision level.

Test

The Model 3051C performs continuous self-tests. In the event of a problem, the transmitter activates the user-selected analog output warning. A Model 268 or Rosemount control system can then interrogate the transmitter to determine the problem. The transmitter outputs specific information to the Model 268 or control system identifying the problem for fast and easy corrective action. If an operator believes there is a loop problem, the transmitter can be directed to give specific outputs for loop testing.

Format

The format function is used during the initial setup of a transmitter and for maintenance of the digital electronics. It allows the sensor and the 4–20 mA output to be trimmed to meet plant pressure standards. In addition, a characterize function allows the user to prevent accidental or deliberate adjustment of the 4 and 20 mA setpoints.

SOFTWARE FUNCTIONALITY

The HART protocol allows the user easy access to the Configuration, Test, and Format capabilities of the Model 3051C.

Configuration

The Model 3051C can be configured easily from the Model 268 hand-held interface or a Rosemount control system. Configuration consists of two parts. First, the

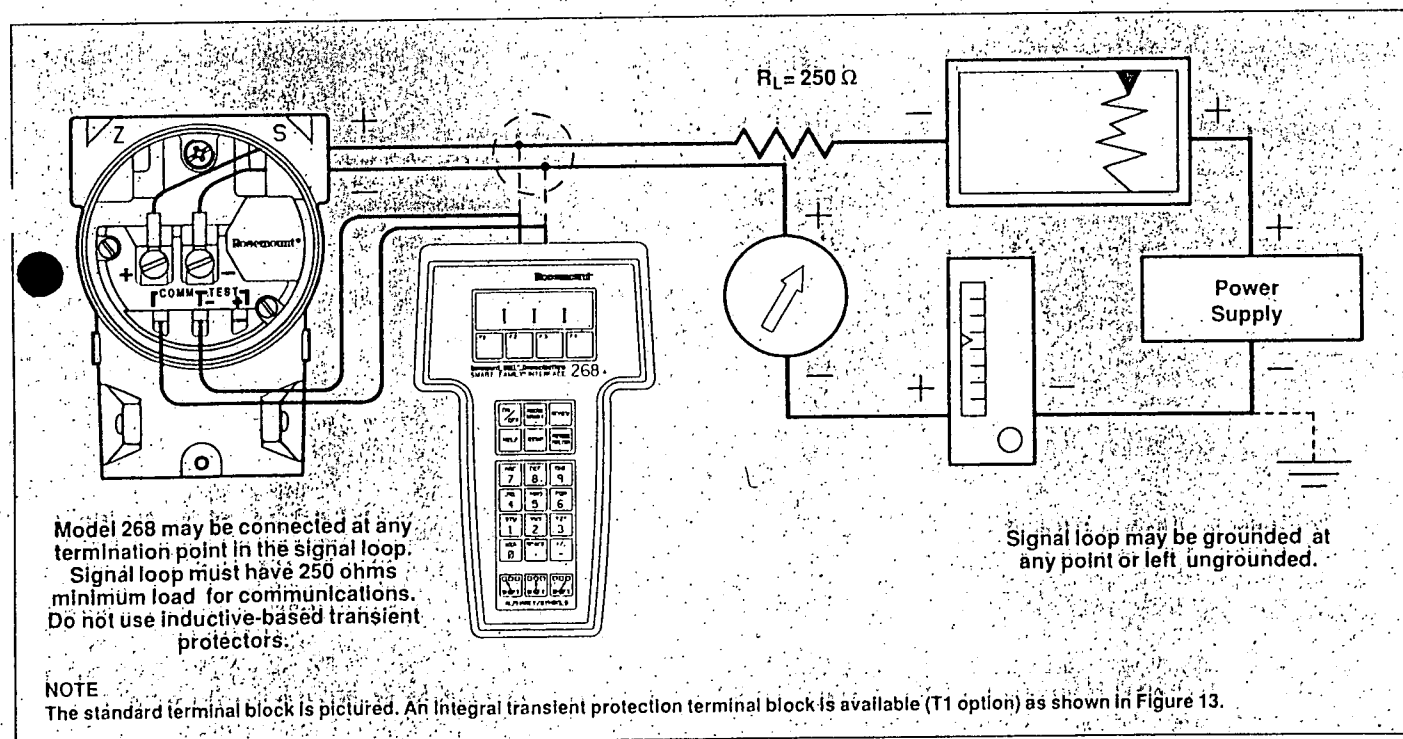


FIGURE 4. Model 3051C Pressure Transmitter Field Wiring Connections

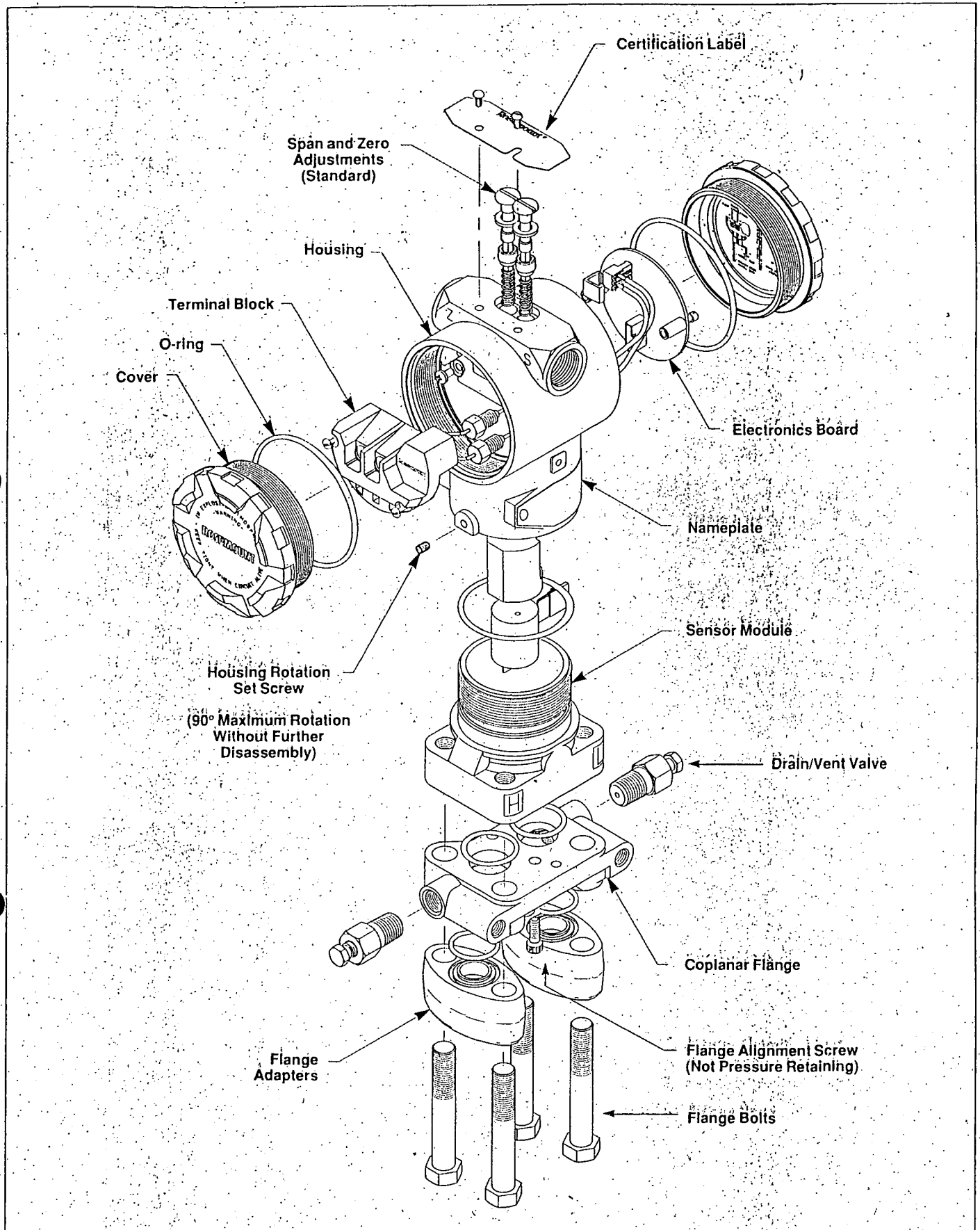


FIGURE 5. Model 3051C Differential Pressure Transmitter Exploded View

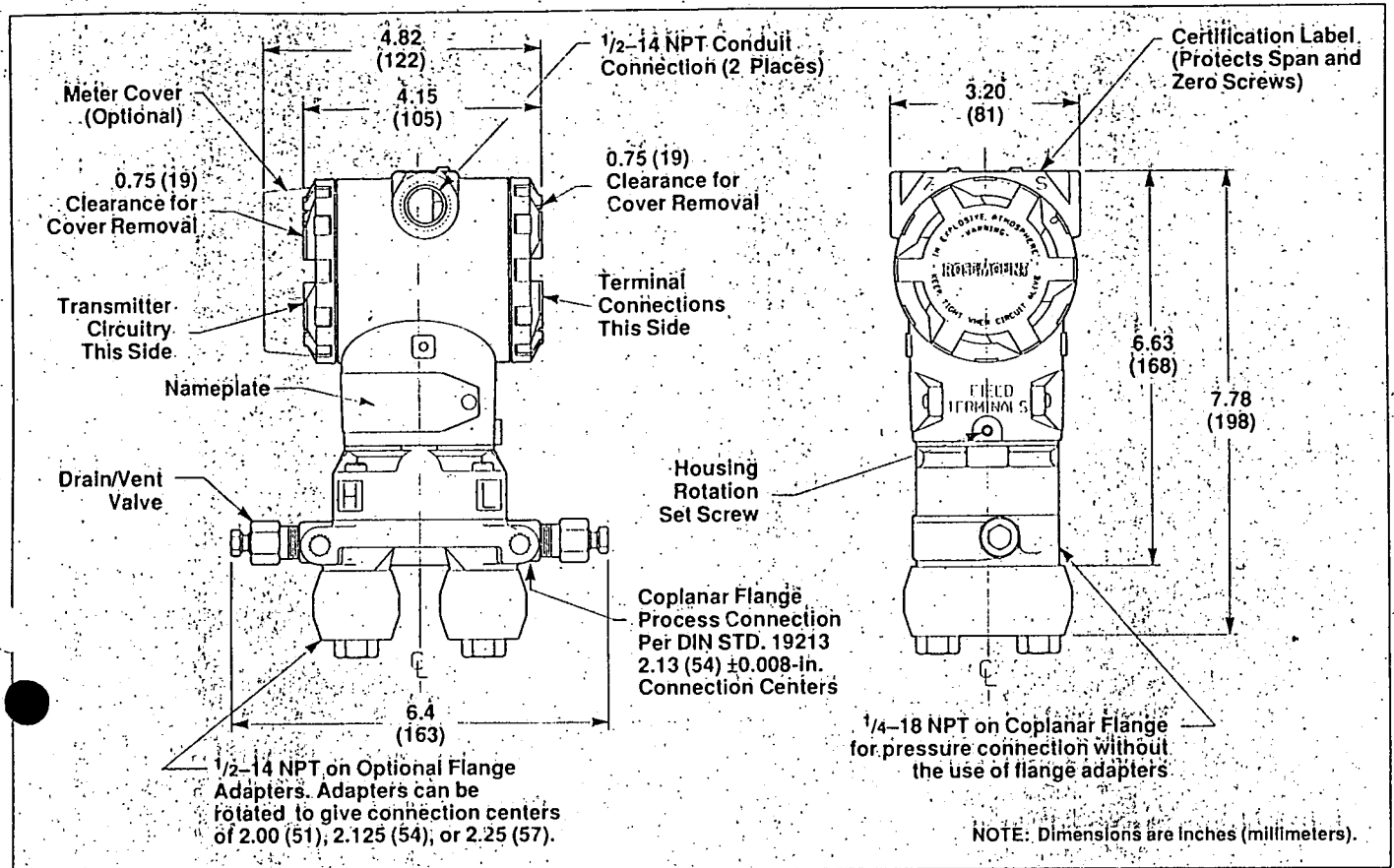


FIGURE 6. Model 3051C Differential Pressure Transmitter Dimensional Drawing

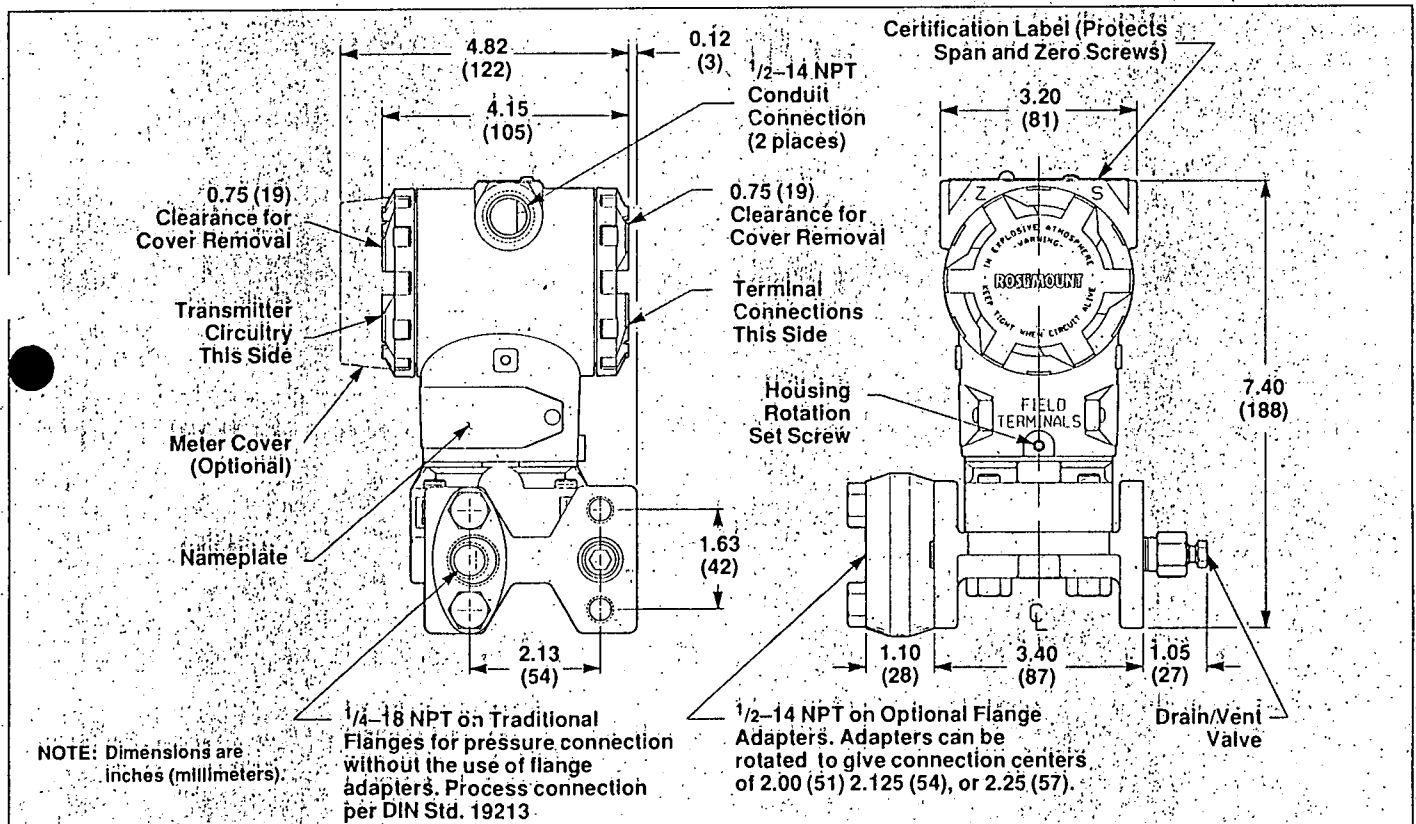


FIGURE 7. Traditional Flange Option Dimensional Drawing

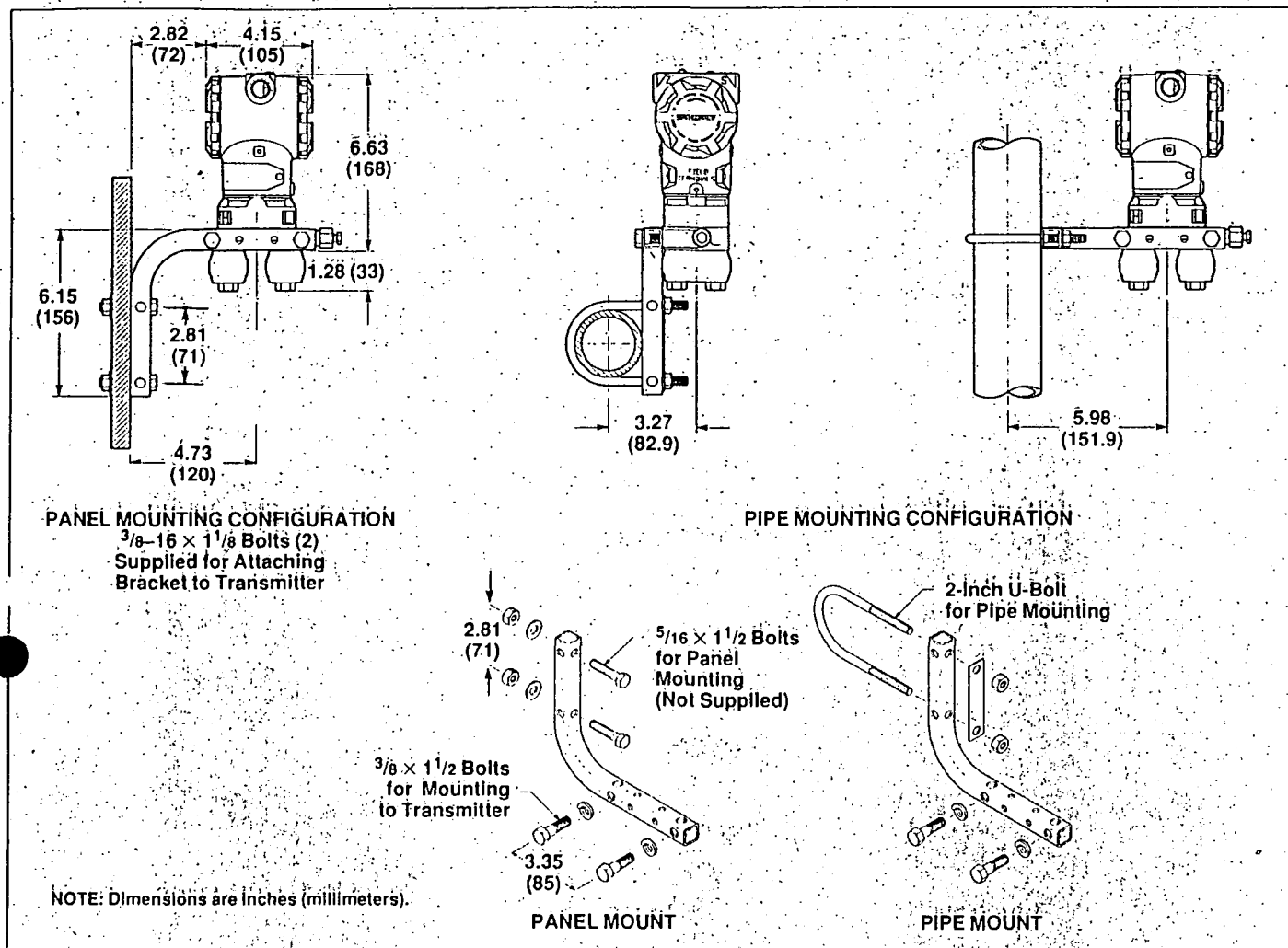


FIGURE 8. Transmitter with Coplanar Flange Shown in Typical Mounting Configuration with Optional Bracket (Option Code B4) for 2-inch Pipe or Panel Mounting

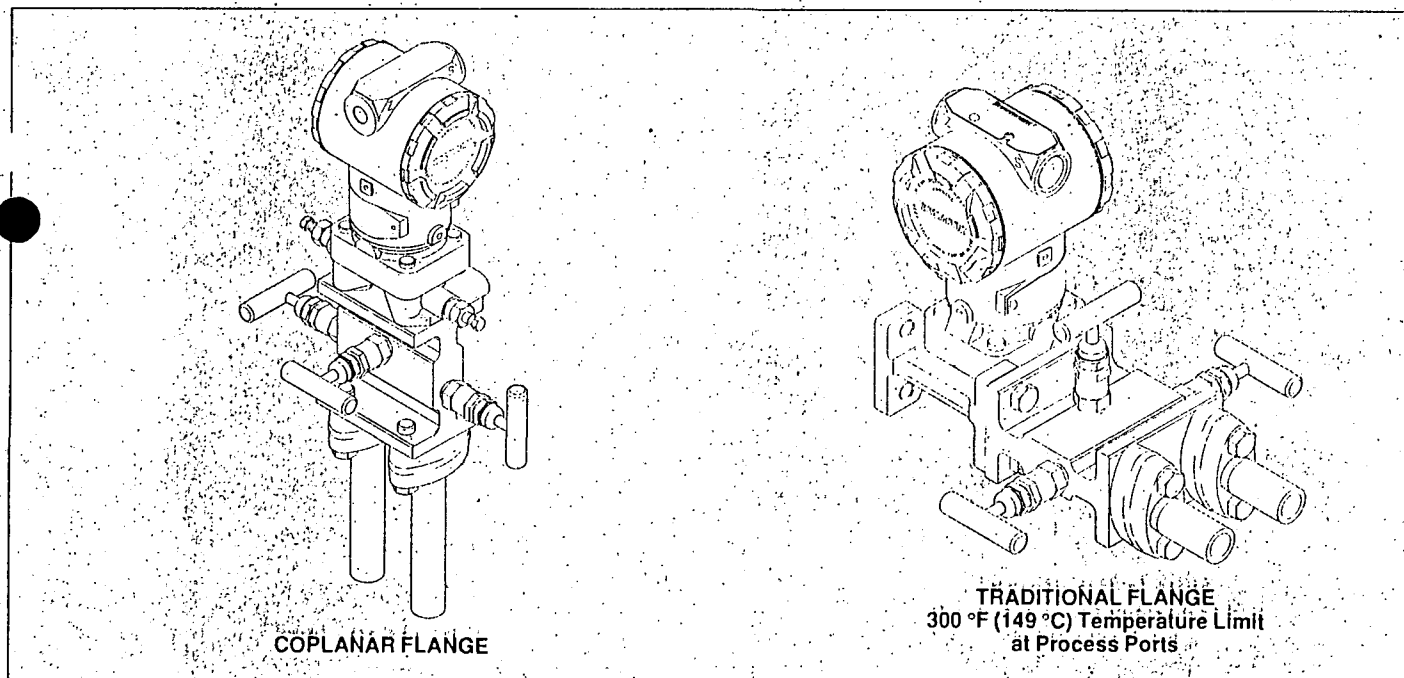


FIGURE 9. Coplanar and Traditional Flange Options Connected to a Three-Valve Manifold

5/16 x 7/8 Bolts
for Panel Mounting
(Not Supplied)

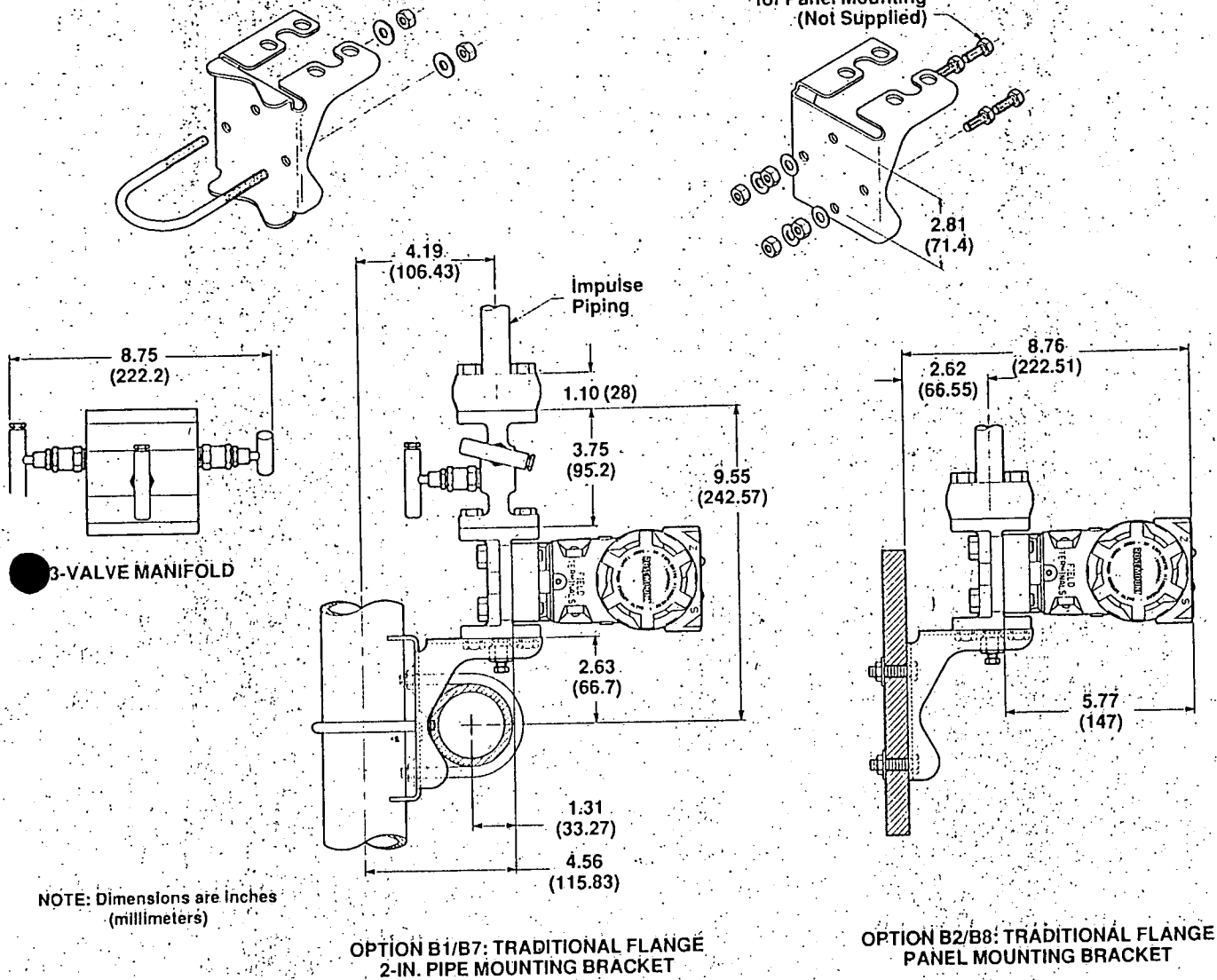


FIGURE 10. Optional Mounting Brackets for Traditional Flange Options H2, H3, H4, and H7

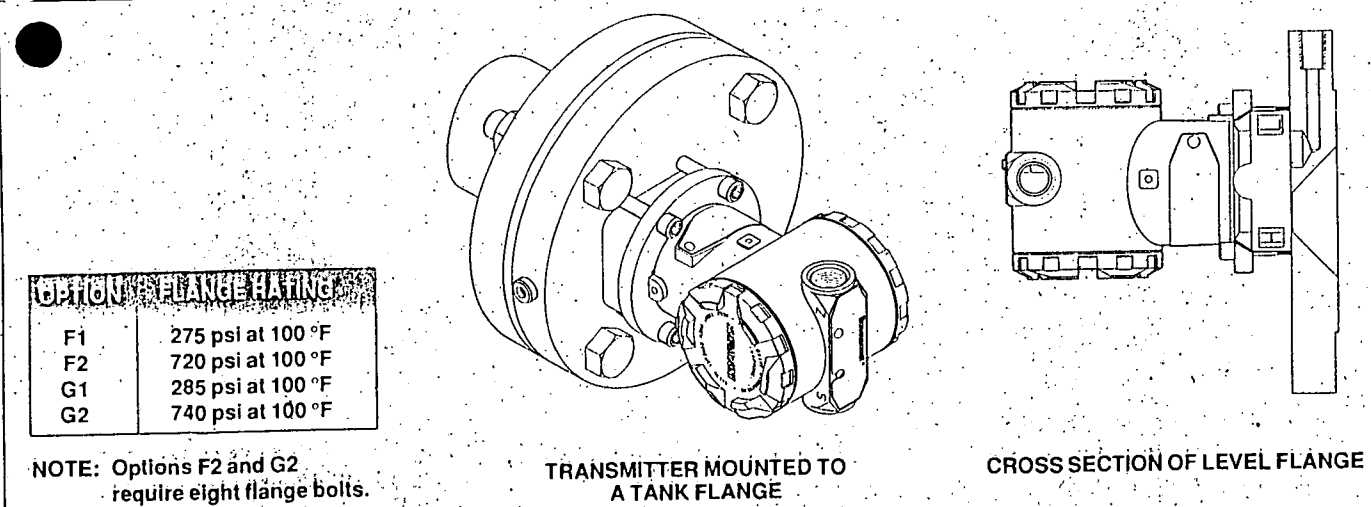


FIGURE 11. Level Flange Option

SPECIFICATIONS

Functional Specifications

Service

Liquid, gas, and vapor applications.

Ranges

- Code 1: 0 to 0.83/25 inH₂O
(0 to 0.20/6.22 kPa)
- Code 2: 0 to 8.3/250 inH₂O
(0 to 2.07/62.2 kPa)
- Code 3: 0 to 33.3/1,000 inH₂O
(0 to 8.28/248 kPa)

Sensor Limits

- Range 1: -25 to 25 inH₂O
- Range 2: -250 to 250 inH₂O
- Range 3: -1,000 to 1,000 inH₂O

Output

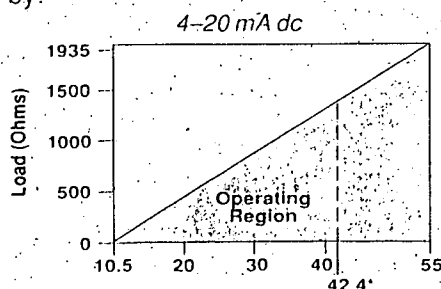
Two-wire 4–20 mA, user-selectable for linear or square root output. Digital process variable superimposed on 4–20 mA signal, available to any host that conforms to the HART protocol.

Power Supply

External power supply required. Transmitter operates on 10.5–55 V dc with no load.

Load Limitations

Maximum loop resistance is determined by the voltage level of the external power supply, as described by:



$$R = 43.5 (V_{ps} - 10.5)$$

V_{ps} = power supply voltage

Communication requires a minimum loop resistance of 250 ohms.

* For CSA approval, power supply must not exceed 42.4 V.

Indication

Optional 4-digit LCD meter.

Hazardous Location Certifications

Factory Mutual (FM) Approvals

- E5: Explosion Proof for Class I, Division 1, Groups B, C, and D. Dust Ignition Proof for Class II, Division 1, Groups E, F, and G. Suitable for Class III, indoor and outdoor (NEMA 4X) hazardous (classified) locations.
- I5: Intrinsically Safe for use in Class I, Division 1, Groups A, B, C, and D, Class II, Division 1, Groups E, F, and G when connected in accordance with Rosemount drawings 03031-1019 and 00268-0031. Temp. Code T4. Suitable for Class I, Division 2, Groups A, B, C, and D.

Canadian Standards Association (CSA) Approvals

- C6: Explosion Proof for Class I, Division 1, Groups B, C, and D. Dust Ignition Proof for Class II, Division 1, Groups E, F, and G. Suitable for Class I, Division 2, Groups A, B, C, and D. Suitable for Class III, indoor and outdoor hazardous locations, CSA enclosure 4; factory sealed.
- Intrinsically Safe for Class I, Division 1, Groups A, B, C, and D. Temp. Code T3C. (Intrinsically safe when connected with approved barriers. See Rosemount drawing 03031-1024.)

BASEEFA/CENELEC Intrinsic Safety Certification

- I1: EEx ia IIC T5.
EEx ia IIC T4 ($T_{amb} = 70^\circ\text{C}$).

BASEEFA Type N Certification

- N1: Ex N IIC T5 ($T_{amb} = 70^\circ\text{C}$).

Zero Elevation and Suppression

Can be set anywhere within the sensor limits as long as the span is greater than or equal to the minimum span, the lower range value does not exceed the lower range limit, and the upper range value does not exceed the upper range limit.

Overpressure Limit

0 psia to 3,626 psig (25 MPa) on either side without damage to the transmitter for Ranges 2 and 3. 0 psia to 2,000 psig (13.8 MPa) for Range 1. Proof pressure on Coplanar or Traditional Flange is 10,000 psig (69 MPa).

For Options F1, F2, G1, and G2, limit is 0 psia to the flange rating.

Static Pressure Limit

Operates within specifications between static line pressures of 0.5 psia and 3,626 psig (2,000 psig for Range 1).

For Options F1, F2, G1, and G2, limit is 0.5 psia to the flange rating.

Temperature Limits

• Process*

Silicone fill sensor:
-40 to 250 °F (-40 to 121 °C).**

Inert fill sensor:
0 to 185 °F (-18 to 85 °C).***

• Ambient

-40 to 185 °F (-40 to 85 °C).

With integral meter:
-4 to 175 °F (-20 to 80 °C).

• Storage

-50 to 230 °F (-46 to 110 °C).

With integral meter:
-40 to 185 °F (-40 to 85 °C).

* Process temperatures above 185 °F (85 °C) require derating the ambient limits by a 1.5:1 ratio.

** 220 °F (104 °C) limit in vacuum service.

*** 160 °F (71 °C) limit in vacuum service.

Failure Mode Alarm

If self-diagnostics detect a gross transmitter failure, the analog signal will be driven either below 4 mA or above 20 mA to alert the user. High or low alarm signal is user-selectable by internal jumper.

Humidity Limits

0–100% relative humidity.

Turn-on Time

Performance within specifications less than 2.0 seconds after power is applied to transmitter.

Volumetric Displacement

Less than 0.005 in³ (0.08 cm³).

Damping

Analog output response to a step input change will be from 0 to 36 seconds for one time constant. This is in addition to sensor response time of 0.2 second (0.4 second for inert fill).

Performance Specifications

(Zero-based spans, reference conditions, silicone oil fill, 316 SST isolating diaphragms, and digital trim values equal to the 4-20 mA span setpoints)

Accuracy

±0.075% of span for spans from 1:1 to 10:1 of URL.
For Range 1, accuracy equals ±0.1% of span for spans from 1:1 to 15:1 of URL.

For spans less than 10:1 (15:1 for Range 1) rangedown, accuracy =

± [0.025 + 0.005 ($\frac{URL}{Span}$)] % of Span

(Reference accuracy includes hysteresis, terminal-based linearity, and repeatability of the pressure sensor.)

Stability

±0.1% of URL for 12 months (±0.2% for Range 1).

Static Pressure Effect

- Zero Error (can be calibrated out at line pressure)
±0.1% of URL/1,000 psi (6.9 MPa) for line pressures from 0 to 2,000 psi (0 to 13.7 MPa), ±0.2% of URL/1,000 psi (6.9 MPa) for line pressures above 2,000 psi (13.7 MPa) for Ranges 2 & 3.
±0.25% of URL/1,000 psi (6.9 MPa) for Range 1.

- Span Error
±0.2% of reading/1,000 psi (6.9 MPa), ±0.4% for Range 1.

Ambient Temperature Effect

±(0.025% URL + 0.125% span) per 50 °F. for Ranges 2 and 3.
±(0.1% URL + 0.25% span) per 50 °F for Range 1.

Vibration Effect

Less than ±0.1% of URL per g when tested from 15 to 2,000 Hz in any axis relative to pipe-mounted process conditions.

Power Supply Effect

Less than 0.005% of calibrated span per volt.

Mounting Position Effect

Zero shifts up to 1.25 inH₂O (0.31 kPa), which can be calibrated out.
No span effect.

RFI Effects

±0.1% of span when tested with shielded conduit and grounding from 20 to 1,000 MHz, and for field strength up to 30 V/m.

Physical Specifications

Electrical Connections

1/2-14 NPT, PG 13.5, and CM 20 conduit. Model 268 SMART FAMILY Interface connections permanently fixed to terminal block.

Process Connections

1/4-18 NPT on 2 1/8-in. centers;
1/2-14 NPT on 2-, 2 1/8-, or 2 1/4-in. centers.

Process-Wetted Parts

- Isolating Diaphragms
316 SST, Hastelloy C-276[®], or Monel[®] material.
- Drain/Vent Valves
316 SST, Hastelloy C[®], or Monel material.
- Flanges
Plated carbon steel, 316 SST, Hastelloy C, or Monel.
- Wetted O-rings
Glass-filled TFE.

Non-Wetted Parts

- Electronics Housing
Low-copper aluminum or 316 SST, NEMA 4X, IP 65.
- Bolts
Plated carbon steel per ASTM A449, Grade 5; or Austenitic 316 SST.
- Fill Fluid
Silicone or inert oil.
- Paint
Epoxy-polyester.
- Cover O-rings
Buna-N.

Weight

Transmitter approximately 5.5 lb (2.5 kg) without options. See Table 1 for option weights.

CODE	OPTION	ADD lb (kg)
J, K, L	Stainless Steel Housing	3.1 (1.4)
M5	LCD Meter for Aluminum Housing	0.5 (0.2)
M6	LCD Meter for SST Housing	1.25 (0.6)
B4	SST Mounting Bracket for Coplanar Flange	1.0 (0.5)
B1, B7	Mounting Bracket for Traditional Flange	2.3 (1.0)
B2, B8	Mounting Bracket for Traditional Flange	2.3 (1.0)
H2	Traditional Flange	2.4 (1.1)
H3	Traditional Flange	2.7 (1.2)
H4	Traditional Flange	2.6 (1.2)
H7	Traditional Flange	2.5 (1.1)
F1	Level Flange - 3 in., ANSI 150 Class, SST	10.8 (4.9)
F2	Level Flange - 3 in., ANSI 300 Class, SST	14.3 (6.5)
G1	Level Flange - 3 in., ANSI 150 Class, CS	10.7 (4.8)
G2	Level Flange - 3 in., ANSI 300 Class, CS	14.0 (6.3)

TABLE 1. Transmitter Option Weights

Rosemount, the Rosemount logotype, HART, and SMART FAMILY are registered trademarks of Rosemount Inc.
Rosemount System 3, RMV9000, and Coplanar are trademarks of Rosemount Inc.
Hastelloy C-76 and Hastelloy C are registered trademarks of Cabot Corp.

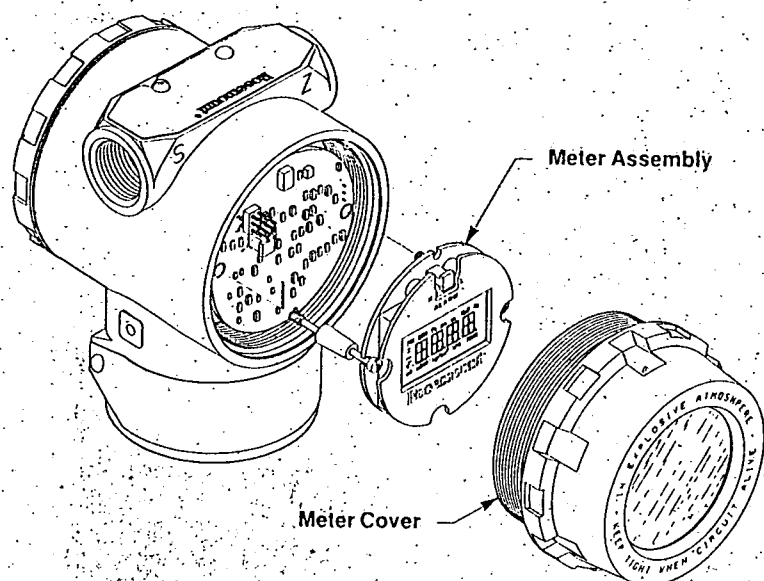


FIGURE 12. Optional LCD Meter Exploded View.

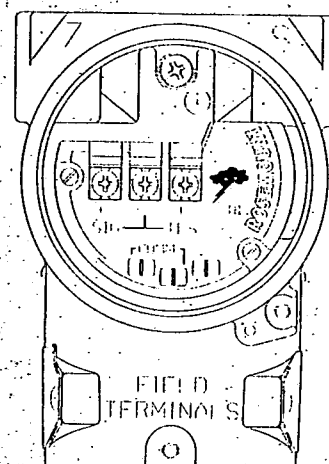


FIGURE 13. Optional Transient Protection Terminal Block (T1 Option Code)

ORDERING INFORMATION (SEE BACK PAGE)

STANDARD CONFIGURATION

Unless otherwise specified, transmitter will be shipped as follows:

Engineering units: inH₂O
 4 mA: 0
 20 mA: Upper Range Limit
 Output: Linear
 Flange Type: Specified model code option
 Flange Material: Specified model code option
 O-ring Material: Specified model code option
 Drain/Vent: Specified model code option
 Integral Meter: Installed or None
 Alarm: Upscale
 Software Tag: (Blank)

Customer may specify the above items at no charge. Software tag (8 characters) is left blank unless specified.

CUSTOM CONFIGURATION (C1 OPTION)

If code C1 is ordered, the customer may specify the following data in addition to the standard configuration parameters. Refer to Configuration Data Sheet CDS 4622/4623.

Descriptor: 16 alphanumeric characters
 Message: 32 alphanumeric characters
 Date: Day, Month, Year
 Damping: Seconds

OUTPUT INFORMATION

4 and 20 mA points must be the same unit of measure.

Available units of measure:
 inH₂O mbar
 inHg g/cm²
 ftH₂O kg/cm²
 mmH₂O Pa
 mmHg kPa
 psi torr
 bar atm

OPTIONAL THREE-VALVE MANIFOLDS

(Packaged Separately)

Part No. 01151-0150-0001: 3-Valve Manifold, Carbon Steel (Anderson, Greenwood & Co., M4AVC)

Part No. 01151-0150-0002: 3-Valve Manifold, 316 SST (Anderson, Greenwood & Co., M4AVS)

HARDWARE TAGGING

Transmitter will be tagged in accordance with customer requirements. All tags are stainless steel. Wire-on tag is standard; customer may specify permanent tag.

SMART FAMILY PRODUCT DATA SHEETS

Model 268	SMART FAMILY Interface	PDS 2560
Model 1151	Smart Pressure Transmitter	PDS 4593
Model 1151	Smart Retrofit Kit	PDS 4594
Model 3051C	Gage Pressure Transmitter	PDS 4623
Model 3051L	Flange Mounted Liquid Level Transmitter	PDS 4673
Model 3051C	Absolute Pressure Transmitter	PDS 4694
Model 3051C with Model 1199 Remote Seals		PDS 4672
Model 3044C	Temperature Transmitter	PDS 4659
Model 8712C	Magnetic Flowmeter Transmitter	PDS 4668

ORDERING INFORMATION

MODEL 3051CD DIFFERENTIAL PRESSURE TRANSMITTER

CODE RANGES

1	0-0.83 to 0-25 inH ₂ O (0-0.21 to 0-6.22 kPa)
2	0-8.3 to 0-250 inH ₂ O (0-2.07 to 0-62.2 kPa)
3	0-33.3 to 0-1,000 inH ₂ O (0-8.28 to 0-248 kPa)

CODE OUTPUT

A	4-20 mA with digital signal based on HART protocol
---	--

MATERIALS OF CONSTRUCTION

CODE	PROCESS FLANGE TYPE	FLANGE MATERIAL	DRAIN/VENT	FLANGE ADAPTERS
5	Coplanar	Plated CS	SST	Plated CS
2	Coplanar	SST	SST	SST
3*	Coplanar	Hastelloy C	Hastelloy C	Hastelloy C
4	Coplanar	Monel	Monel	Monel
8*	Coplanar	Plated CS	Hastelloy C	Plated CS
7*	Coplanar	SST	Hastelloy C	SST
0	Alternate Flange—See Options H2, H3, H4, H7, F1, G1, F2, or G2			

CODE ISOLATING DIAPHRAGM

2	316L SST
3*	Hastelloy C-276
4	Monel

CODE O-RING

A	Glass filled TFE
---	------------------

CODE FILL FLUID

1	Silicone
2	Inert fill

CODE HOUSING MATERIAL AND CONDUIT ENTRY SIZE

A	Epoxy-polyester-covered aluminum	1/2-14 NPT
B	Epoxy-polyester-covered aluminum	CM 20
C	Epoxy-polyester-covered aluminum	PG 13.5
J	316 SST	1/2-14 NPT
K	316 SST	CM 20
L	316 SST	PG 13.5

CODE OPTIONS

ALTERNATE FLANGE OPTIONS (Requires Materials of Construction Code 0)	
H2	Traditional Flange, 316 SST, SST Drain/Vent, SST Flange Adapters
H3*	Traditional Flange, Hastelloy C, Hastelloy C Drain/Vent, Hastelloy C Flange Adapters
H4	Traditional Flange, Monel, Monel Drain/Vent, Monel Flange Adapters
H7*	Traditional Flange, 316 SST, Hastelloy C Drain/Vent, 316 SST Flange Adapters
F1	Level Flange, SST, 3 in., ANSI Class 150
F2	Level Flange, SST, 3 in., ANSI Class 300
G1	Level Flange, CS, 3 in., ANSI Class 150
G2	Level Flange, CS, 3 in., ANSI Class 300
MOUNTING BRACKETS:	
B4	SST Mounting Bracket for 2-in. Pipe and Panel Mount, SST Bolts (for use with Coplanar Flange)
B1*	Mounting Bracket for 2-in. Pipe Mount, CS Bolts (for use with Traditional Flange)
B2	Mounting Bracket for Panel Mount, CS Bolts (for use with Traditional Flange)
B7	Mounting Bracket for 2-in. Pipe Mount, SST Bolts (for use with Traditional Flange)
B8	Mounting Bracket for Panel Mount, SST Bolts (for use with Traditional Flange)
HAZARDOUS LOCATION CERTIFICATIONS	
E5	Factory Mutual (FM) Explosion-Proof Approval
I5	Factory Mutual (FM) Intrinsic Safety Approval
C6	Canadian Standards Association (CSA) Explosion-Proof, Intrinsic Safety, and Nonincendive Approval (Requires 42.4 V dc max. power supply)
I1	BASEEFA/CENELEC Intrinsic Safety Certification
N1	BASEEFA Type N Certification
OTHER OPTIONS	
L4	Austenitic 316 SST bolts
J1	Local zero adjustment only
J3	No local zero or span adjustment
M5	LCD Meter for aluminum housing (Codes A, B, and C)
M6	LCD Meter for SST housing (Codes J, K, and L)
T1	Transient Protection Terminal Block
C1	Custom configuration

NOTE: Local zero and span adjustments are standard unless J1 or J3 options are specified

3051CD 2 A 2 2 A 1 A B4 TYPICAL MODEL NUMBER

*Meets NACE material recommendations per MR 01-75.

**T1 Option available with E5, I5, and C6 hazardous approval certifications

Rosemount Inc.
Measurement Division
12001 Technology Drive
Eden Prairie, MN 55344 USA
Tel (612) 941-5560
Telex 4310012
Fax (612) 828-3088



10/91

ROSEMOUNT®

Measurement
Control
Analytical
Valves

FUJI Inverters FVR-P5S

200-400V Series 7.5 to 22 kW

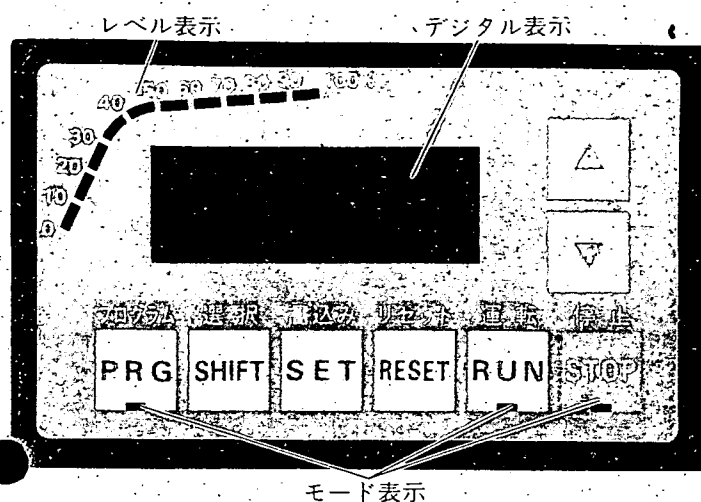
Instruction Manual

Contents

1. Introduction
2. Visual inspection of the inverter upon receipt
3. Construction
 - 1) Names
 - 2) Removing the front cover
4. Installation
 - 1) Environment
 - 2) Mounting direction and space
 - 3) Mounting in the control cubicle
5. Wiring
 - 1) FUJI factory wiring
 - 2) Wiring the main circuit terminal
 - 3) Wiring the control terminal
 - 4) Wiring the external DB braking resistor unit (option)
6. Operating panel
 - 1) Names and functions
 - 2) Setting the function and data codes
7. Description of functions
 - 1) Changing functions
 - 2) General-purpose functions
 - 3) Special functions
8. Operation
 - 1) Keypad operation
 - 2) External RUN/STOP operation
 - 3) Multistep speed operation
 - 4) Jogging operation
 - 5) 2nd acceleration time operation
9. Maintenance and inspection
 - 1) Inspection before operation
 - 2) Maintenance and inspection, and periodic replacement of parts
 - 3) Measuring points and meters
10. Failure diagnosis
 - 1) Remedy for displayed protective function to be operated
 - 2) Remedy to be taken against abnormality
 - 3) Noise interference suppression
11. Specifications
 - 1) Standard specifications
 - 2) Description of the input/output terminals
 - 3) Selecting the distribution and control equipment
 - 4) Outline dimensions, mm

Fuji Electric Co., Ltd.

Using the operating panel



(1) Operating panel operation

- Frequency setting: To change the setting frequency, use the Δ ∇ up/down keys. **SET** key is used to write to the EEPROM.
- Operating: To operate, use the **RUN** key. Actual frequency is displayed.
- Stopping: To stop the operation, use the **STOP** key. Setting frequency flashes.

(2) Changing the function/data codes

- STOP mode: Check that the **STOP** lamp lights up when the STOP key is pressed.
- Accessing of the PROGRAM mode: Check that the lamp lights up when the **PRG** key is pressed.
- Accessing of the function code: Press the **SHIFT** key.
- Accessing of the data code: Press the Δ ∇ up/down keys.
- Storing of the code setting: Press the **SET** key.
- Exiting of the PROGRAM mode: Check the **PRG** lamp goes out and **STOP** lamp lights up.

Mode, display and operating key functions

The display section and the function of the operating keys vary depending on mode.

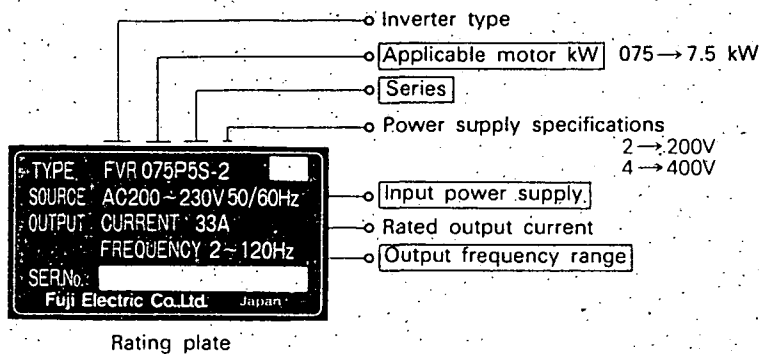
Mode	PROGRAM mode	RUN mode	STOP mode	TRIP mode
Mode indicator	PRG RUN STOP	PRG RUN STOP	PRG RUN STOP	PRG RUN STOP
Digital display example	Function code and Data code 1018	Output Hz or Amps 60.00 (Hz) 123A (A)	Setting Hz (flashing) 60.00	Cause of trip 001
Frequency Level indicator	—	Output Hz display	Setting Hz display	—
Operating key	Δ / ∇ PRG SHIFT SET RESET RUN STOP	Hz setting — Hz-Amp display selecting Storing the Hz setting value — — Stopping	Hz setting Accessing the PROGRAM mode — Storing the Hz-setting value — Starting —	— — — — Resetting the TRIP mode — —

1. Introduction

Before installing or operating the inverter, read this manual carefully to ensure maximum performance.

2. Visual inspection of the inverter upon receipt

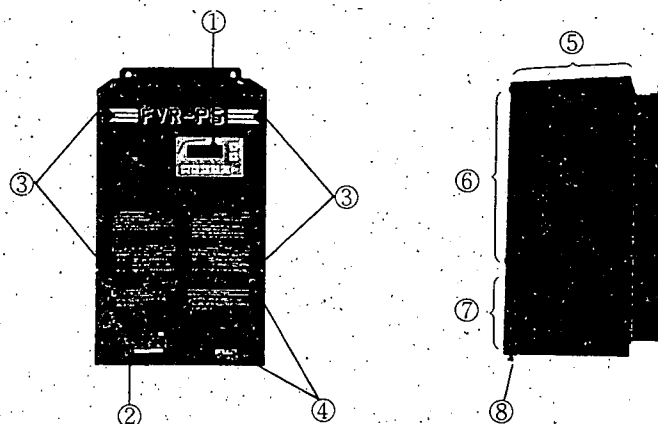
Upon receipt of the inverter, carefully inspect that it is as specified when ordering, referring to the rating plate on the front cover.



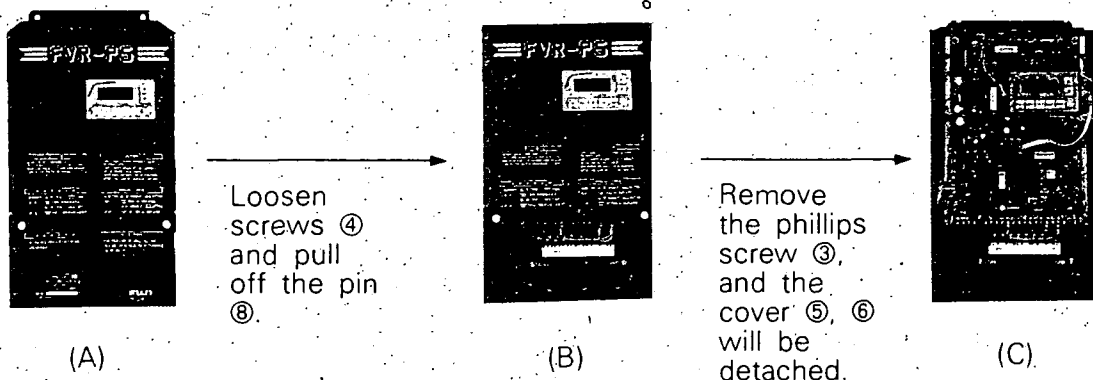
If, by any chance, depression in the cover, damage to the parts, missing parts are found, please contact FUJI.

3. Construction

1) Name



2) Removing the front cover



4. Installation

1) Environment

Install the inverter in a place where temperature and humidity are below 40°C and 90% respectively. Avoid a location where the inverter is exposed to the direct sun light and subjected to dust, corrosive fumes or excessive vibration.

2) Mounting direction and space

i) Direction

Mount the unit vertically so that "FVR-P5" can be seen in its front.

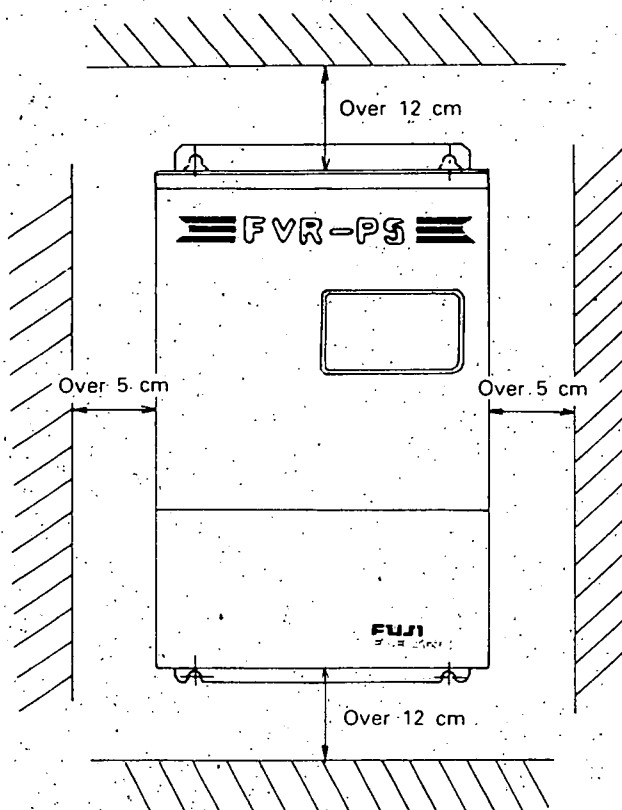
ii) Space

The inverter generates heat during operation. Allow a sufficient space around the unit as shown in the illustration on the right.

3) Mounting in the control cubicle

The dimensions differ depending on cooling method. For further information please refer to the technical data for panel design.

Note: FVR-P5S comprises a variety of electronic parts including CPU and ROM. Install the unit so that it is far away from the noise source.



5. Wiring

1) FUJI factory wiring

Remove the terminal cover and you will see the main and control circuit terminals. When shipped from the FUJI factory they are connected as shown in the drawing on the right. This permits an operating panel operation.

2) Wiring the main circuit terminal

i) Power supply connections (R.S.T.)

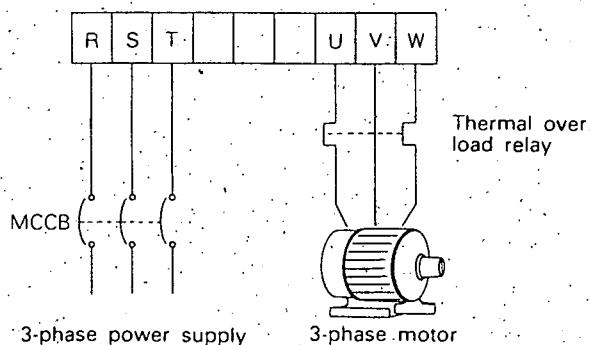
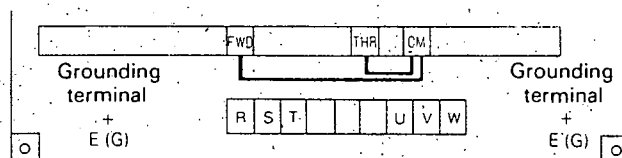
The phase sequence does not matter for rotative direction of motor.

ii) Motor connections (U.V.W.)

When connected normally, the motor rotates counterclockwise when seen from the load side. When the rotation is reversed, interchange any 2 motor connections at the U, V and W terminals.

iii) Ground terminal connections

Be sure to ground the inverter so as to prevent the malfunctions due to external noise pick up.



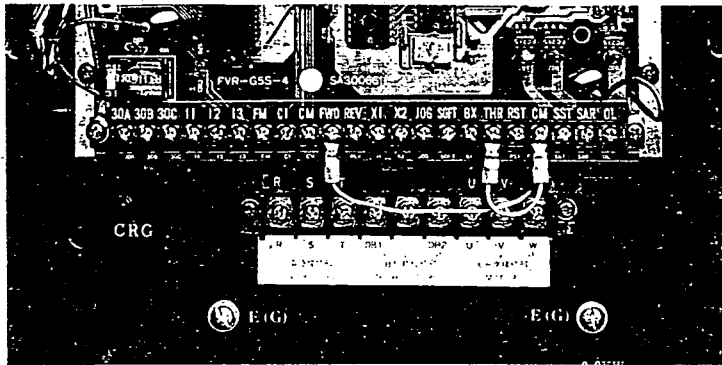
[Warning]

Misconnection of the power supply to the motor terminals U, V and W will damage the inverter.

3) Wiring the Control terminal

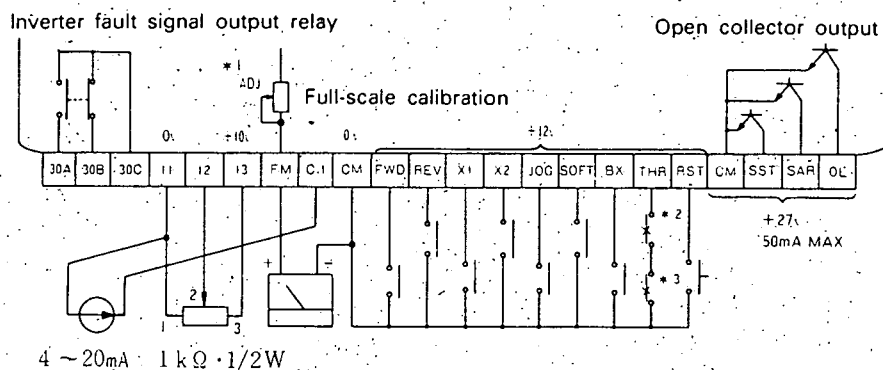
i) Keypad operation (Panel operation)

It is unnecessary to modify the wiring after shipment from the FUJI factory. When connecting an external braking unit, please refer to the Paragraph 4).



ii) Control terminal operation (external operation)

Carry out the wiring referring to the drawing below. For explanation of the terminals refer to the Paragraph 11-2).



(Current setting) (Voltage setting)

When the current and voltage are inputted simultaneously, they are added and the resulted value will be set.

- *1: When using a voltmeter of full-scale, 7 V or less.
- *2: External DB resistor unit thermostat (Normally closed contact)
- *3: Motor protective thermal overload relay (Normally closed contact)
- *4: This switch is used when the voltage input is from 0 to -10 V.

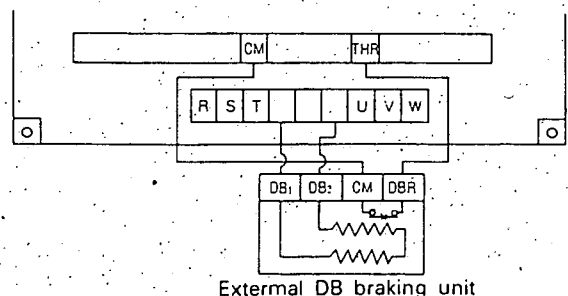
[Warning]

1. Separate the control wiring from the main circuit wiring as far as possible to prevent malfunction due to noise interference. Never run them in the same conduit. When they are intersecting each other, arrange so that they meet at right angles.
2. When wiring, use twisted or shielded wire. Avoid excessive wire lengths of wiring. (Grounding of shielded wires must be carried out on the inverter side.)

4) Wiring the external DB braking resistor unit (Option)

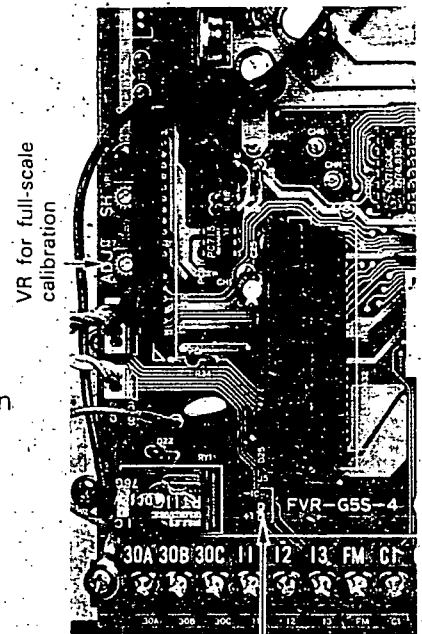
When requiring frequent braking or a high torque braking, connect an option external DB braking unit as shown in the drawing on the right.

* Remove jumpers across CM-THR connected when shipped from the FUJI factory.



[Warning]

1. Standard type inverter equipped no DB transistor can't apply the external DB braking resistor unit.



*4 Voltage setting input switching pin Set at 0 to +10 V when shipped from the FUJI factory.

-10 V } 0 ~ -10 V
+10 V } 0 ~ +10 V

2) Setting the function and data codes

The function of the display and operating keys varies depending on mode.

Mode	PROGRAM mode	RUN mode	STOP mode	TRIP mode
Mode indicator				
Digital display example	Function code and Data code 	Output Hz or Amps 	Setting Hz (flashing) 	Cause of trip
Frequency Level indicator	—	Output Hz display	Setting Hz display	—
Operating key	/ : Accessing the data code : Exiting the PROGRAM mode : Accessing the function code : Storing the code : Resetting the data code : — : —	Hz setting — Hz-Amp display selecting Storing the Hz setting value — — Stopping	Hz setting Accessing the PROGRAM mode — Storing the Hz setting value — Starting —	— — — — Resetting the TRIP mode — —

Set to the PROGRAM mode (lights up.) and operate the following keys.

: This key is used to select the function code. When this key is pressed, the left hand two digits increments from to one at a time and when is reached, they return to .

: To select the data code, use this key. When the key is pressed, the right hand 2 digits increments one at a time and when the key is pressed, the right hand 2 digits decrement one at a time.

: This key is used to store the function code and data code. When requiring to store two or more function and data codes, press this key every time the function or data code is stored. Stored data will not be volatile even when the power supply is removed.

[Example] When setting

- ① Press the key. (PROGRAM mode selection)
- ② Press the key. Select 10 for the left hand 2 digits. (Function code selection)
- ③ Press the and keys so as to set the right hand 2 digits at 18. (Data code setting)
- ④ Press the key. (Function and data code storing)
- ⑤ Press the key. (PROGRAM mode resetting)

(Flashes)

7. Description of functions

1) Changing function

- i) Display changing

This is used to select the display of the digital display between output frequency and output current.

: Frequency display

Factory setting

: Current display

* The changing of the display content can also be carried out by using the key, during operation.

- ii) Overspeed limiter 1500
 This function is used to limit the output frequency to 150 Hz or less so as to prevent the motor overspeed due to incorrect setting of the V/F pattern.
1500 : Operation can not be carried out when 150 Hz is exceeded.
1501 : Operation can be carried out Factory setting 1500
 even when 150 Hz is exceeded.
 * Maximum frequency of the inverter FVR-P5S is 120 Hz, so the overspeed limiter does not function in respect of the inverter FVR-P5S.
- iii) Keypad panel operation-external operation selection 1900
RUN / STOP command can be inputted via terminals FWD and REV (external operation) or keypad operation. The external operation permits the addition of either the automatic V/F operation (automatic accelerating operation) or automatic torque boost (automatic energy-saving operation):
1900 : External operation
1901 : External Automatic V/F (automatic accelerating operation)
1902 : External automatic torque boost (automatic energy-saving operation)
1903 : Keypad panel operation Factory setting 1903
- iv) Brake torque selection 2300
 When requiring a high braking torque as in the case of abrupt deceleration of a load with large GD^2 , a high torque brake is selected. However, in the standard type of inverter it is necessary that a option brake unit (transistor switch) is installed internally and a option DB resistor is installed externally.
 When an DC brake is selected, the DC brake operates for a period of 0.1 sec at 2.0 Hz or less and the motor will come to a complete standstill.
2300 : Normal brake
2301 : High torque brake.
2302 : DC brake Factory setting 2300
 * Even when a DC brake is selected, the normal brake operates up to 2.0 Hz.
- v) Frequency setting method selection (analog/digital) 2500
 When the frequency setting is carried out from outside, the input method can be selected as required.
2500 : Operating panel input (Digital setting)
2501 : Control terminal input (Analog setting)
2502 : Binary code input } Use the OPC-4 option card.
2503 : BCD code input } (Digital setting) Factory setting 2500
 * When using 2503, it is necessary to change for a special ROM.
- vi) Operating panel selection 2700
 The input selection is carried out between the inverter front operating panel and the option OPC-09 remote control panel.
 When the option OPC-09 is not used, no change is necessary from what is set when shipped from the FUJI factory.
2700 : Front operating panel
2701 : Remote control panel (OPC-09) Factory setting 2700
 * In case of removing the front operating panel for using the remote operating panel, don't change the date code of function code 27 to 00. (It makes uncontrollable to operate the inverter.)

[Example]

When requiring a 4-pole motor to be accelerated up to 3600 rpm in 5 sec from its standstill state,

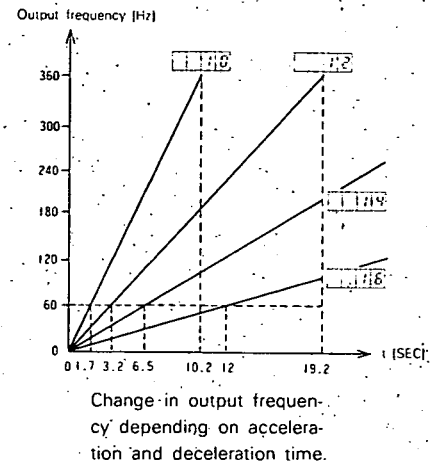
- 1) Obtain the inverter output frequency at 3600 rpm. (The slip is zero.)

$$\frac{3600 \times 4}{120} = 120 \text{ [Hz]}$$

- 2) Obtain the time elapsed until the output frequency changes by 60 Hz.

$$\frac{60}{120 - 0} \times 5 = 2.5 \text{ [sec]}$$

- 3) Set the data code referring to the acceleration deceleration time code table so that it has an acceleration time that approaches the value obtained from paragraph 2). It is 11 (2.3 sec) in this case.



[Warning]

1. Set the acceleration or deceleration time somewhat longer with due attention given to the power supply voltage and load fluctuation.
2. When the acceleration time is too short for the load condition, the overcurrent protection function (OC1 display) will operate and the motor will coast to a stop.
3. When the deceleration time is too short for the load condition the overcurrent protection function (OC2 display) or overvoltage protection function (OU display) will operate trip and the motor will coast to a stop.

iii) Electronic thermal overload

0800

FUJI inverters can provide an overload protection of standard 3-phase 4-pole induction motor without an external thermal overload relay. This electronic thermal overload relay can provide protection in the area exceeding 10 Hz. Obtain the continuous allowable current I_{100} (ratio against the inverter rated current) [%] using the following formula and set the data code to match the value referring to the thermal overload level code table.

$$I_{100} = \frac{K \times (\text{Motor rated current})}{(\text{Inverter rated current})} \times 100 \text{ [%]}$$

K = 1.0 (Rated frequency 50 [Hz])

K = 1.1 (Rated frequency 60 [Hz])

Electronic thermal overload level code table

Data code	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
I_{100}	No operation	96	91	86	81	76	71	66	61	56	51	46	41	36	31	26
[%]		100	95	90	85	80	75	70	65	60	55	50	45	40	35	30

Example 1)

Factory setting

0800

When driving a standard motor of 22 kW, 50 Hz by using a FVR220P5S-2, the inverter rated current is 86 [A] and the motor rated current 82 [A] (FUJI data).

Therefore,

$$I_{100} = \frac{1.0 \times 82}{86} \times 100 = 95 \text{ [%]}$$

Set the program code 0802 referring to the thermal overload level code table.

[Example 2]

When driving a standard motor of 11 kW, 60 Hz by using a FVR150P5S-4, the inverter rated current is 29 [A] and the motor rated current 20.5 [A] (FUJI data).

Therefore,

$$I_{100} = \frac{1.1 \times 20.5}{29} \times 100 = 78 \text{ [%]}$$

Set the program code 0805 referring to the thermal overload level code table.

[Warning]

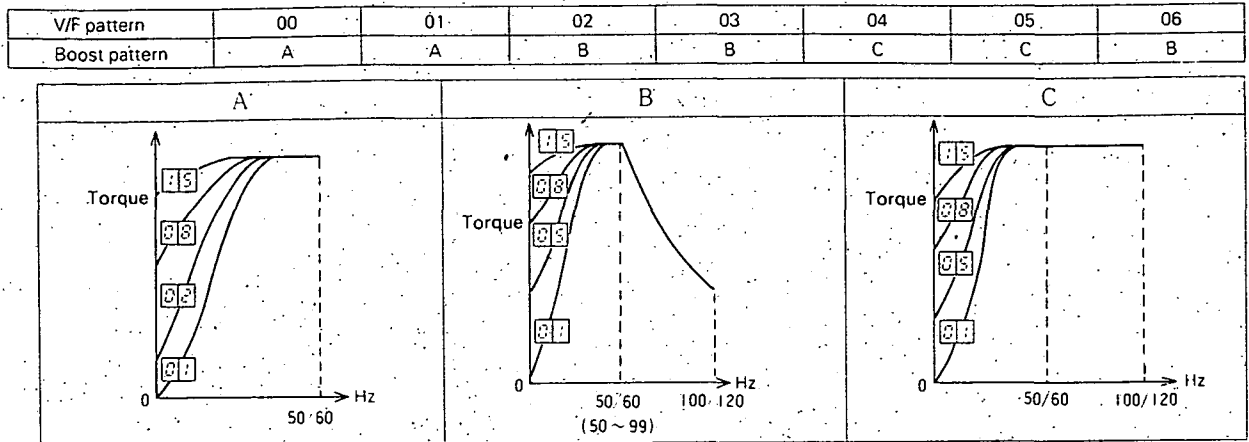
1. When the electronic thermal overload relay is not used, set to 0800 so as to prevent fault.
2. The electronic thermal overload relay can not provide protection for loads in which frequent start-up can be expected or press loads.

iv) Torque boost

09

16 selectable torque boosts are available for selection depending on constant torque load and variable torque load. Obtain a boost pattern (A, B or C) from the preset V/F pattern. Then, obtain optimum torque boost from the A (B or C) curve and set the data code (00 to 15) referring to the boost pattern code table.

V/F pattern Table



Torque Boost Pattern Code Table

Data code	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
Starting torque	Low ← → High															

Factory setting

0908

* When the torque boost is too high, high motor sound can be expected, overcurrent trip may result at low speeds or the electronic thermal overload relay may operate.

v) V/F pattern

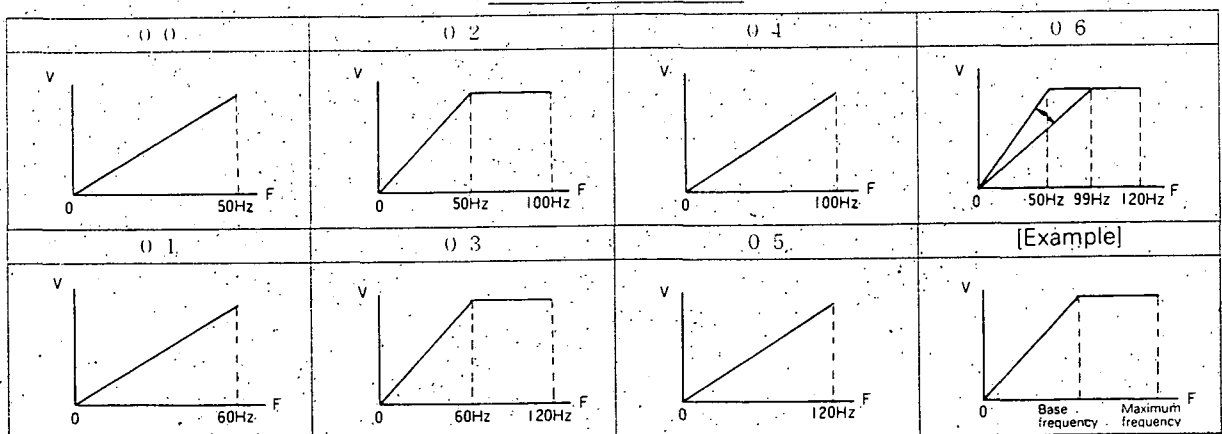
10

Select one out of 7 V/F patterns depending on the base frequency (rated frequency) and the maximum frequency of the motor.

Factory setting

1001

V/F Pattern Table



1. When a V/F pattern to be set does not match the base frequency, motor overheat or start up failure due to torque shortage may occur.
2. When requiring to set the V/F pattern code to 06, please refer to the optional V/F pattern in the paragraph vii).

- vi) Motor operating sound 1105
 The motor operating sound is influenced by the inverter PWM control. The noise can be reduced by changing the data code. It is unnecessary to change the data code if the sound is not a nuisance.

Operating Sound Code Table

Data code	00	01	02	03	04	05	06	07	08	09
Sound	Low sound ←					Normal	→ High sound			

Factory setting 1105

- vii) Optional V/F pattern 26

The base frequency of the V/F pattern code "06" can be set to any value between 50 Hz and 99 Hz as required. In this case, the base frequency is used for the data code.

1005 : Setting the optional V/F pattern
26 : Setting the base frequency } Be sure to set both.
 50 ~ 90 [Hz]

Factory setting 2650

2) Special functions

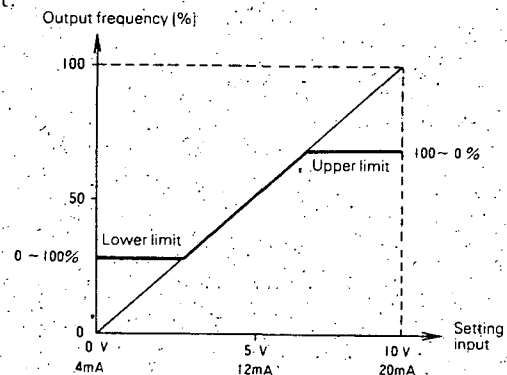
The following functions do not operate with the factory setting. Change only the setting for the required function.

- i) Upper limit, Lower limit 12 13

This function provides 16 pattern for setting of the Upper or Lower limit of the output frequency for the external frequency setting input.

Upper limit 12 } % code
 Lower limit 13 } +
 00 ~ 15

Factory setting

1200 1300**Upper limit % code**

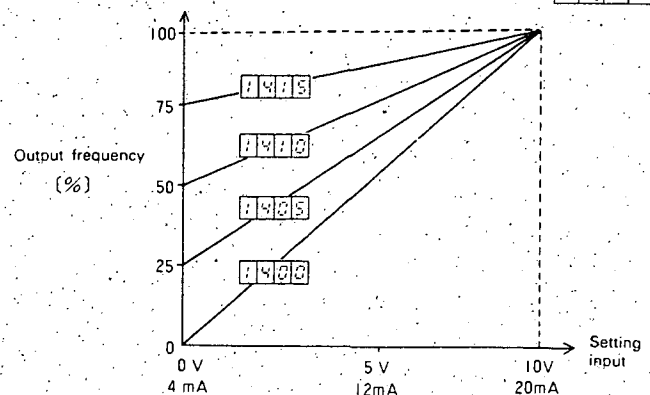
Data code	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
Upper limit frequency [%]	100	87.5	81.3	75.0	68.8	62.5	56.3	50.0	43.8	37.5	31.3	25.0	18.8	12.5	6.3	0.

Lower limit % code

Data code	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
Lower limit frequency [%]	0	6.3	12.5	18.8	25.0	31.3	37.5	43.8	50.0	56.3	62.5	68.8	75.0	81.3	87.5	100

- ii) Bias 14

This function can be used with the external frequency setting input. It is used when requiring that the setting frequency and motor speed are of linearity as in the case of spindle for machine tool drive.



Bias % Code

Data code	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
Bias quantity [%]	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75

Factory setting **1400**

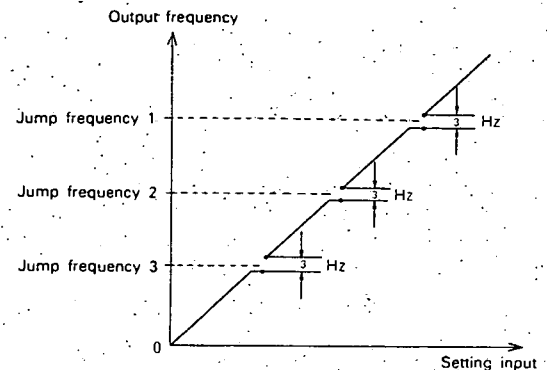
iii) Jump Frequency 1, 2, 3

1600 1700 1800

This function allows the inverter to jump ± 1.5 Hz of a selected frequency so as to prevent resonance of machines or structures. The jump frequency can be set at three positions. To set, select the function code No. 16 (17, 18) and data code No. (Refer to the frequency code table page 7)

Jump frequency 1 **16** } Frequency code
 Jump frequency 2 **17** } + **00**
 Jump frequency 3 **18** } 00~50
 00~60

Factory setting

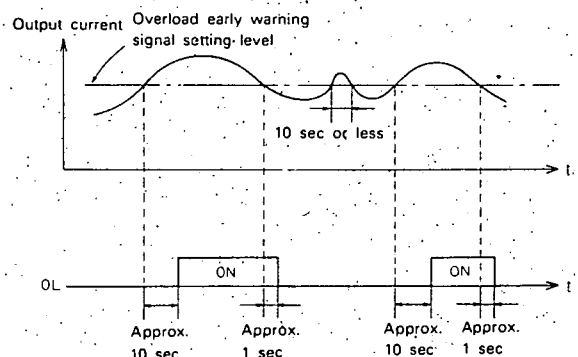
1600 1700 1800**[Warning]**

1. There is a case that the inverter's protective function is operated to set the jump frequency by 1 Hz or 2 Hz.
2. When the multistep speed or jogging speed is equal to the jump frequency, a frequency of 1.5 Hz higher than the set value will be outputted.
3. The jump frequency does not function during the period of acceleration and deceleration.

iv) Inverter overload early warning signal

2000

When the inverter output current exceeds the setting overload level for the period of over 10 sec, the open collector OL to CM is ON, and then, OFF one second after it has decreased below the setting overload level. The overload level can be set at 10 % interval between 110 % and 150 % of the inverter rated current.

**Over load % Code Table**

Data code	00	01	02
Overload level [%]	No operation	110	120

Factory setting

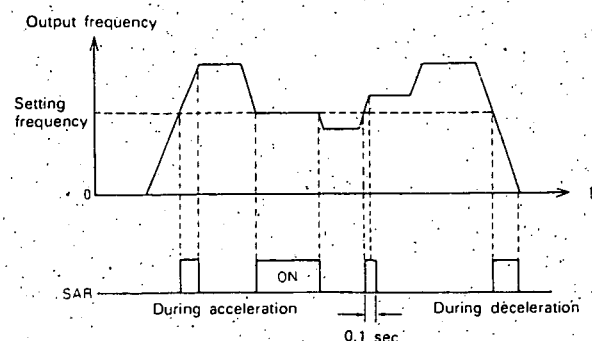
2000

v) Frequency agreement signal

2100

When the inverter output frequency agrees with the setting frequency, the open collector SAR-CM is ON for a period of time exceeding 0.1 sec. When the output frequency exceeds the setting frequency during the acceleration or deceleration period, it is continuously ON until the acceleration or deceleration has been completed. (Obtain the data code referring to the frequency code table, page 7.)

Factory setting

2100

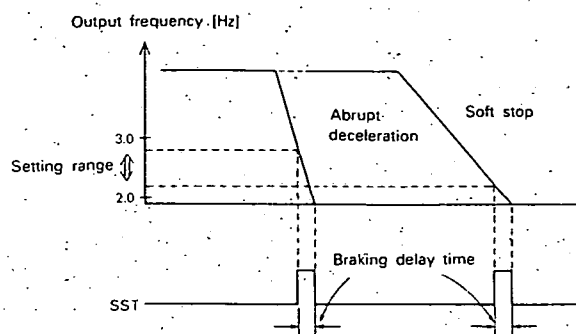
iv) Inverter stop signal

221

When the inverter output frequency reaches the setting stop signal frequency, the open collector SST-CM is ON. When the output frequency exceeds the setting frequency during deceleration, it is continuously ON until the deceleration has been completed. In this case, it is not ON even when the setting frequency is exceeded during acceleration. The stop signal frequency can be set to any value between 2.0 Hz and 3.0 Hz

Stop Frequency Code Table

Data code	00	01	02	03	04	05
Stop signal frequency [Hz]	2.0	2.0	2.0	2.0	2.5	3.0



Set the stop frequency so as to match the braking delay time

Factory setting

2200

vii) Stall prevention level control

241

This function is used to control so that the inverter output current does not exceed the limiting value, thus preventing the motor slip current from increasing. The current limiting value can be set to any value between 25 % and 95 % of 1.2 times the inverter rated current.

$$\text{Current limiting value (\%)} = \frac{[\text{Limiting current}]}{[\text{Inverter rated current}] \times 1.2} \times 100$$

Current % Code Table

Data code	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
Current limiting value (%)	No operation	95	90	85	80	75	70	65	60	55	50	45	40	35	30	25

[Warning]

Factory setting

2400

The stall prevention level control does not function during deceleration and constant speed.

viii) Automatic restart after instantaneous power failure/

commercial line ↔ inverter operation

281

When an instantaneous power failure occurs for a period exceeding 15 ms, the protective function operates and the motor will coast to a stop. However, when this function is used, motor automatic restart will be carried out during the setting time instantaneous power failure protection period even when the motor rotates.

(Automatic restart after instantaneous power failure) (Commercial line ↔ inverter operation)

2800 : No operation

No operation

2801 : Operation

Change with setting frequency

2802 : Operation

Change with 50 Hz

2803 : Operation

Change with 60 Hz

2804 : Operation

No operation

Use the OPC-07

Factory setting

2800

Instantaneous Power Failure Protection Time (Reference)

Inverter type	FVR	075P5S-2	110P5S-2	150P5S-2	185P5S-2	220P5S-2	075P5S-4	110P5S-4	150P5S-4	185P5S-4	220P5S-4
Instantaneous power failure protection time (sec)		5	6	11	18	19	3.5	4.5	7.5	8	9.5

[Warning]

- The automatic restart after instantaneous power failure/commercial line ↔ inverter operation function does not operate unless the function 19 (internal RUN/STOP operation, external RUN/STOP operation) is set so that the code is 1900
- The commercial line ↔ inverter operation can not be carried out unless the option OPC-07 is installed in the inverter.

Function and data code list

Function	Description	Application	Factory setting
00 Display changing	00 Frequency display 01 Current display	Output Frequency [Hz]/Output current [A] 	00
01 Multistep speed 1	00-60 frequency data code No.	Multistep speed operation (Control terminals X1 and X2 are used to select.)	10
02 Multistep speed 2			20
03 Multistep speed 3			30
04 Jogging speed		Jogging operation	05
05 Acceleration time (ACCEL 1)	00-31 Accel/Decel time data code No.	Set so as to match load GD. Shockless acceleration/deceleration Heavy load-light load selection	16 (12)
06 Deceleration time (DECEL 1)			
07 Accel/Decel time (ACCEL/DECEL 2)			
08 Electronic thermal overload	00-15 Thermal level code No.	Motor overload protection	00
09 Torque boost	00-15 Torque boost data code No.	Starting torque adjustment for use with fans, pumps	08
10 V/F pattern (V/F ratio)	00-18 V/F pattern data code No.	Can meet the requirements of high-speed motors and special motors.	01
11 Motor operating sound	00-09 Operating sound data code No.	High-low adjustment of motor sound	05
12 Upper limit	00-15 Upper limit ratio data code No.	Overspeed prevention due to excessive setting input	00
13 Lower limit	00-15 Lower limit ratio data code No.	Secures a fixed flow rate in a pumping system	00
14 Bias	00-15 Bias ratio data code No.	Motor slip speed compensation	00
15 Overspeed limiter	00: Over 150Hz operation is not available 01: Over 150Hz operation is available	Prevents overspeed due to improper setting of V/F pattern	00
16 Jump frequency 1	00-60 Frequency data code No.		
17 Jump frequency 2	Prevents resonance between motor and coupled machines.	00	
18 Jump frequency 3		00	
19 Keypad panel operation external operation selection	00 External operation ✓	Operation using relay or Programmable Controller.	03
	01 External Automatic V/F	External operation with automatic acceleration of function	
	02 External automatic torque boost	External operation with automatic energy-saving function	
	03 Keypad panel operation	Operation via operating panel (keypad operation)	
20 Overload early warning signal	00-05 Overload setting value data code No.	Provides overload protection for inverter	00
21 Frequency agreement signal	00-60 frequency data code No.	Detects target frequency	00
22 Inverter stop signal	00-05 Stop signal frequency data code No.	Motor with brake	00
23 Brake torque selection	00 Normal torque brake	20% of motor rated torque	00
	01 High torque brake	Ensures 20 to 30% higher torque compared with normal brakes.	
	02 Normal torque brake + DC dynamic brake	When requiring a brake until motor comes to a standstill.	
24 Stall prevention level control	00-15 Current limiting value setting data code No.	For load requiring warm-up operation	00
25 Frequency setting method selection (analog/digital)	00 Digital setting from operating panel	Individual operation	00
	01 ✓ Analog setting through terminal input	Process control operation	
	02 Digital setting through binary code	Computer link (FA system, centralized control system)	
	03 Digital setting through BCD code		
26 Optional V/F pattern	50-99 Base frequency [Hz]	When program code  is set	50
27 Operating panel selection	00 Front operating panel	When remote control using option OPC-09 is carried out	00
	01 Remote control panel		
28 Automatic restart after instantaneous power failure. Commercial line — inverter operation selection.	00 No operation	Prevents troubles due to instantaneous power failure.	00
	01 Change with setting frequency		
	02 Change with 50 [Hz]	Use the OPC-07 option card.	
	03 Change with 60 [Hz]		
	04 ✓ Only automatic restart function	For operation using commercial power.	

8. Operation

1) Keypad operation

1903

i) Operating frequency

a) Operating panel digital setting

2500

It can be varied from 0.5 Hz up to the maximum frequency using the Δ/∇ keys. It is also possible to store the running frequency by using **SET** key. (This is possible even during running or stop).

b) Control terminal analog output frequency setting

2501

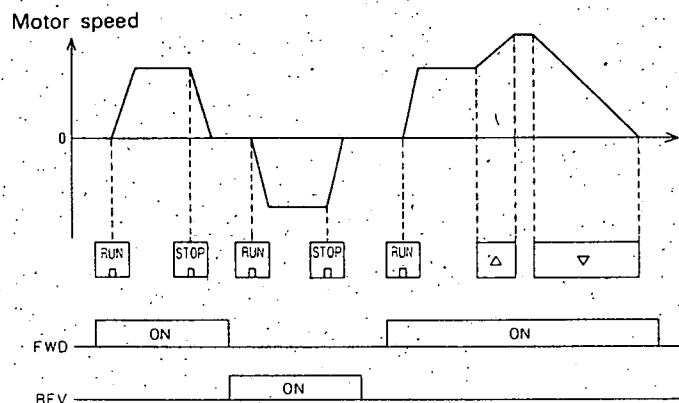
There are two ways, i.e. voltage setting and current setting. The output frequency varies from 2.0 Hz up to the maximum frequency within the input range from 0 V to +10 V, 4mA to 20 mA. (When inputted simultaneously, they are added and the resulted value is set.)

* The setting input range can be changed from 0 V to -10 V by changing the voltage setting input switching pin (J4 or J5) to the -10 side.

ii) Operating method

When the **RUN** key on the operating panel is pressed, the motor starts. It decelerates and comes to a complete standstill when the **STOP** key is pressed. (The rotating direction is determined depending on control terminals FWD and REV.)

* The inverter does not operate without FWD or REV signal.



2) External RUN/STOP operation

1900 1901 1902

i) Operating frequency

a) Operating panel digital setting

2500

To set, follow the description in paragraph 8: 1), i), a).

b) Control terminal analog setting

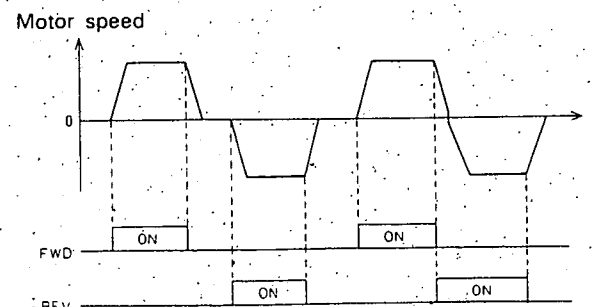
2501

To set, follow the description in paragraph 8: 1), i), b).

ii) Operating method

When the control terminal FWD or REV is ON, the motor starts, and then, it stops when the terminal is OFF. (The RUN/STOP key on the operating panel will be ignored.)

* When the FWD and REV signals are overlapped, the motor will decelerate and come to a complete standstill.



3) Multistep speed operation 1900 1901 1902

i) Operating frequency

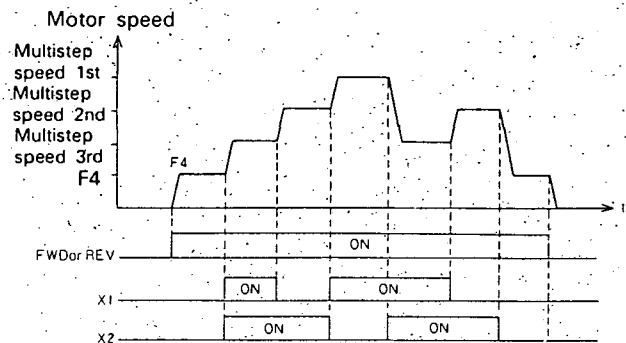
To set, use the multistep speed (1st, 2nd and 3rd) 01 02 03

ii) Operating method

When the control terminal FWD or REV is closed (ON), the motor starts and it stops when these terminals are open (OFF). (The RUN/STOP key is ignored.) To select, use the control terminals X1 and X2.

Multistep speed 1st CM ... X1 X2
 Multistep speed 2nd CM ... X1 X2
 Multistep speed 3rd CM ... X1 X2

- * F4 is a digital setting frequency on the operating panel (in case of 2500) or a control terminal analog setting frequency (in case of 2501).



4) Jogging operation 1900 1901 1902

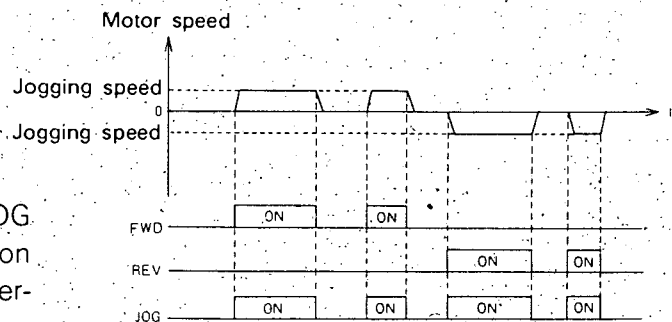
i) Operating frequency

To set, use the jogging speed 04

ii) Operating method

When the control terminal FWD or REV and JOG are ON simultaneously, the jogging starts and it stops when these terminals are OFF simultaneously.

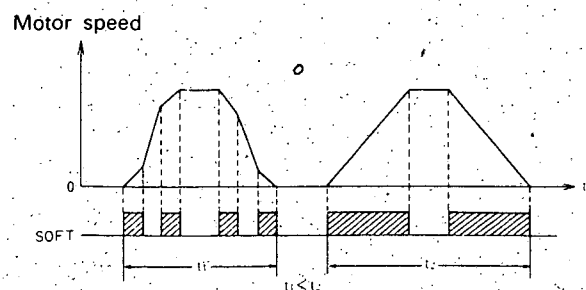
- * When the control terminal X1 or X2 and JOG are ON simultaneously, Jogging operation takes precedence over Multistep speed operation.



5) 2nd acceleration time operation

A soft acceleration (deceleration) is carried out when the acceleration (deceleration) is started and completed. This ensures shockless short-time acceleration (deceleration).

1st accel/decel time CM ... SOFT
 2nd accel/decel time CM ... SOFT



9. Maintenance and inspection

1) Inspection before operation

When the installation and wiring has been completed, carry out the inspection regarding the following matters before applying the power.

- Check for miswiring. (Refer to Section 5.)
- Check for wire chips left.
- Check screws and terminals for tightness.
- Check that the barbed wire of the crimp terminal is not in contact with other terminal.

2) Maintenance and inspection, and periodic replacement of parts

i) Maintenance and inspection

The inverter is a stationary equipment. However, a periodic inspection should be carried out so as to prevent troubles due to the aged deterioration or the life.

[Warning]

- When carrying out an inspection, be sure to remove the power supply and wait until the CRG lamp goes out a few minute later.
- To attach or detach the connector, be sure to hold the housing. Take a note of the correct position.

Maintenance and inspection points

Inspection point	Inspection item	Inspection subject	Remedy
General	Environment	• Ambient temperature.(- 10 to + 40°C), Humidity (90% or less), Installation-area vibration (0.5G or less)	Inspect the trouble and remove the cause.
	Power supply	• Input voltage (within $\pm 10\%$ of the rating)	Voltage adjustment
Main circuit	Tr, D module	• Discoloring, malodor • Loosened terminal screw	Replace the transistor module, tightening
	Smoothing capacitor	• Liquid leakage, swelling of casing • Electrostatic capacity (over 85% of the rating)	Replace.
	Resistor	• Discoloring, crack • Resistance value (within $\pm 10\%$ of displayed value)	Replace.
	Cable and wire	• Discoloring and crack of casing • Discontinuity	Replace.
	Others	• Deposit of dust • Looseness in tightened portion	Cleaning, tighten.
Printed circuit board	Hybrid IC	• Looseness in mounting	Vibration proofing
	Capacitor	• Swelling of casing	Replace.
	Resistor	• Discoloring, crack	Replace.
	Connector	• Loosening, loss	Prevent loosening.
Cooling system	Cooling fan	• Deposit of dust at the ventilating portion • Bearing noise	Cleaning Replace
	Cooling fin	• Deposit of dust on surfaces	Cleaning

ii) Periodic replacement of parts

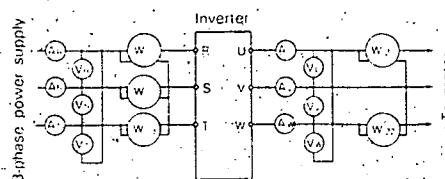
The life of an inverter varies depending on the environment of installation and operating time. The life expectancy of the smoothing capacitor and the cooling fan are 5 years and 3 years respectively, when it is continuously operated within the allowable temperature range. It is recommendable for them to be replaced before troubles are experienced.

3) Measuring points and the meters

The inverter input/output voltage and current include a high frequency. Therefore, the measuring instruments must be selected properly. Otherwise, large error can be expected. When measuring the current using a CT, the error increases as the frequency decreases. Be sure to use ones whose capacity is as large as possible.

Measuring Point and meters

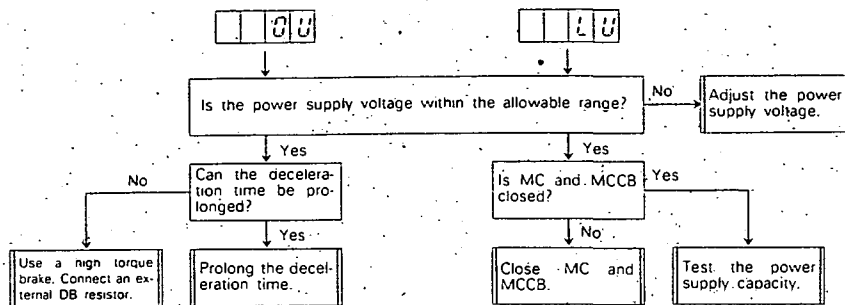
Measuring point		Rough measurement	Precision measurement
Input	Voltage	V-ohmmeter	Moving-iron type voltmeter
	Current	Clamp meter	Moving-iron type ammeter
	Power	—	Electrodynamometer-type wattmeter
Output	Voltage	V-ohmmeter	Rectifier type voltmeter
	Current	Clamp meter	Moving-iron type ammeter
	Power	—	Electrodynamometer-type wattmeter



10. Failure Diagnosis

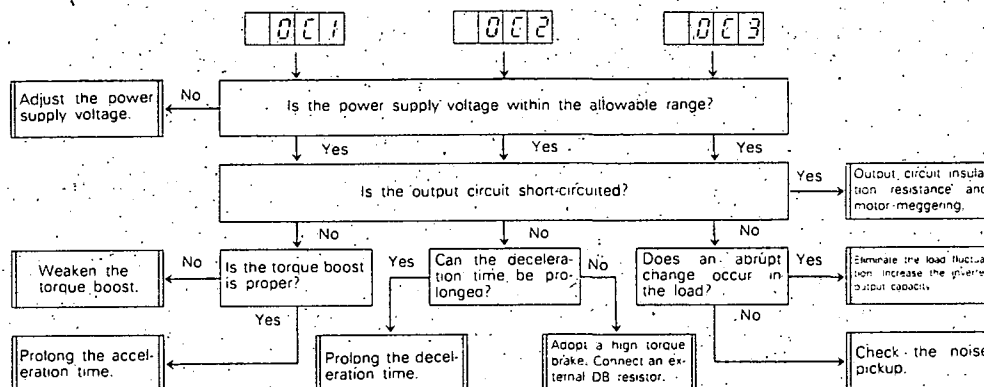
1). Remedy for displayed protective function to be operated

i) DC intermediate circuit abnormal voltage (OU: Overvoltage, LU: Undervoltage)

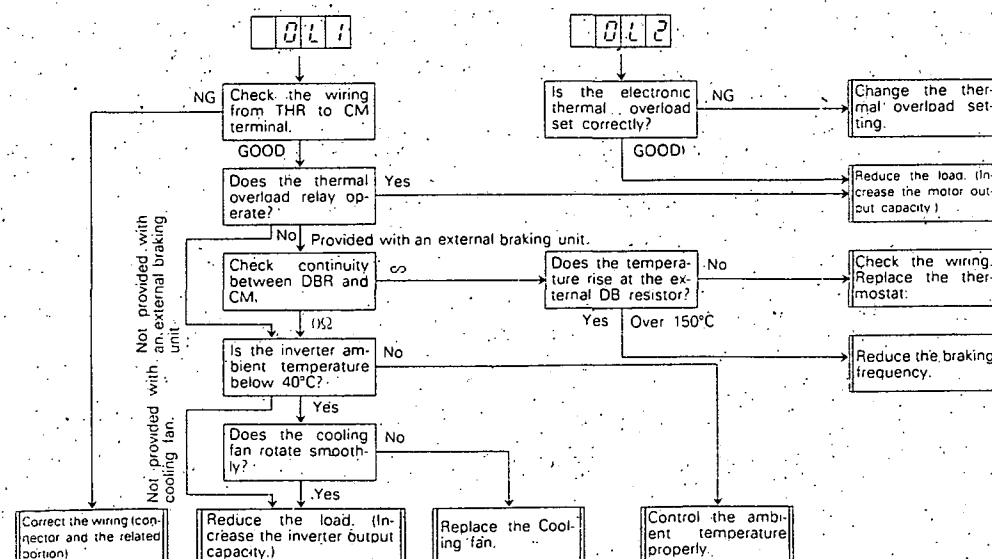


* When the power supply is ON or OFF, the LU will be displayed. However, this does not mean the abnormality.

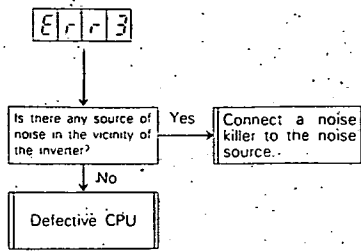
ii) Inverter output overcurrent (OC1: during acceleration, OC2: during deceleration, OC3: during constant speed operation)



iii) Overheating (OL1: Inverter, external DB resistor, thermal overload relay, OL2: Electronic thermal overload)



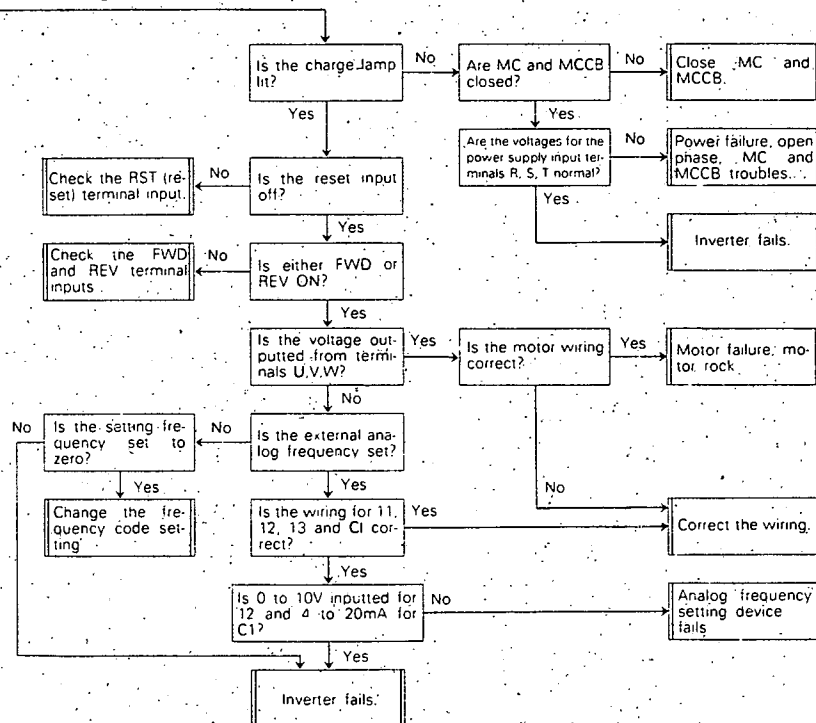
iv) CPU error



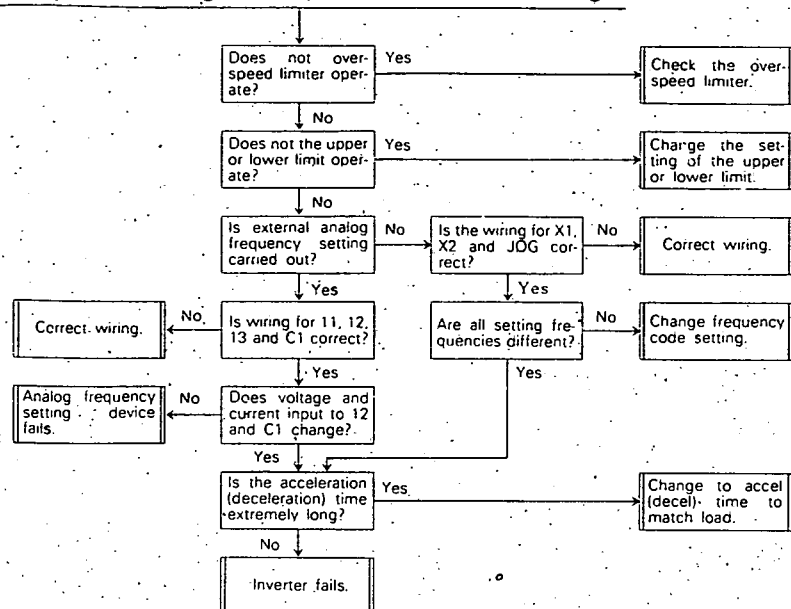
When the protection is displayed, the motor coasts to a stop. To clear, press the **RESET** key on the operating panel after having removed the cause referring to the flow chart as shown in the illustration above. (When pressing the **RESET** key, be sure to wait that the motor has come to a complete standstill.)

2) Remedy to be taken against abnormalities.

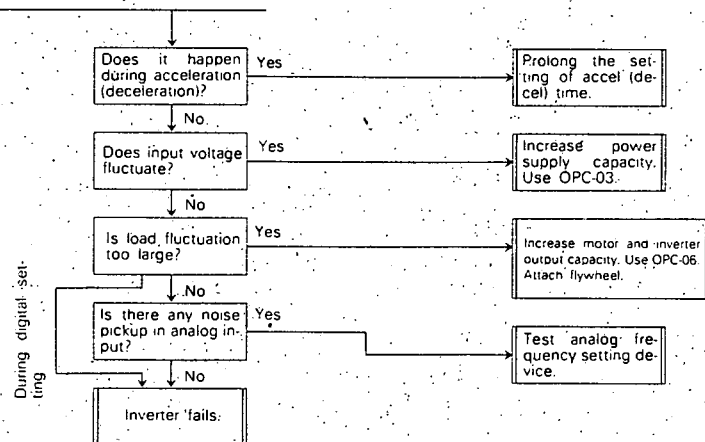
i) Motor is not running.



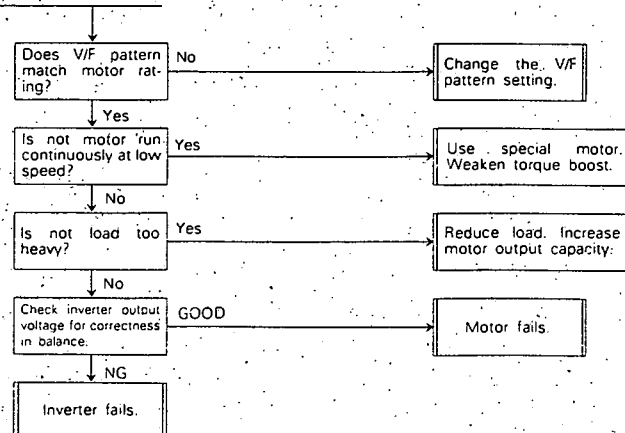
ii) Motor is running but speed does not change.



iii) Motor rotation is not smooth.



iv) Motor is abnormally heated.

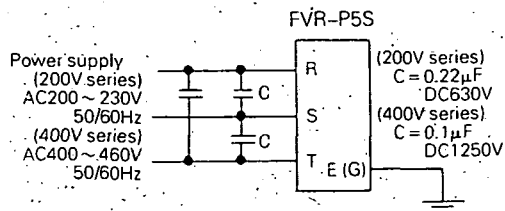


3) Noise interference suppression

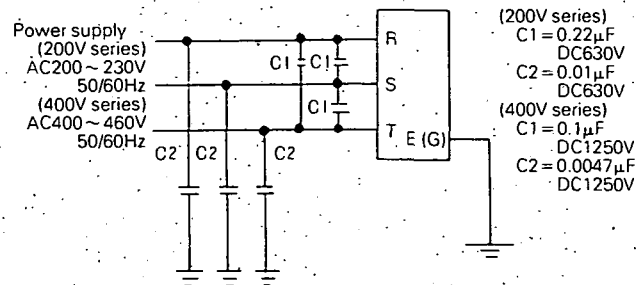
i) External noise interference suppression

Attach following noise suppressor to the power supply input terminals. This ensures enhanced suppression against external noise interference.

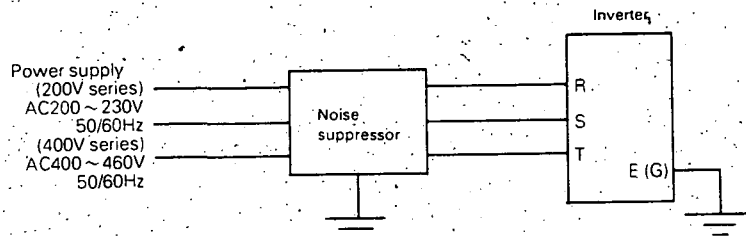
Example 1



Example 2



- * When connecting C2, the malfunction of ELCB due to leakage current may be expected. Use a special noise suppressor so as to ensure enhanced effectiveness.



- * When a noise suppressor is installed in the inverter output circuit, an inverter failure may be expected.

ii) Precautions for Noise source

Connect a CR filter (for AC circuit) or a diode (for DC circuit) in parallel with the coil of the magnetic contactors or relays so as to prevent noise interference.

a) Applying the CR filters and diodes (circuit voltage 250 V or less)

① CR filter capacity

S2-A-O C: 0.2 μ F 500VDC, R: 500 Ω
(OKAYA DENKI SANGYO)

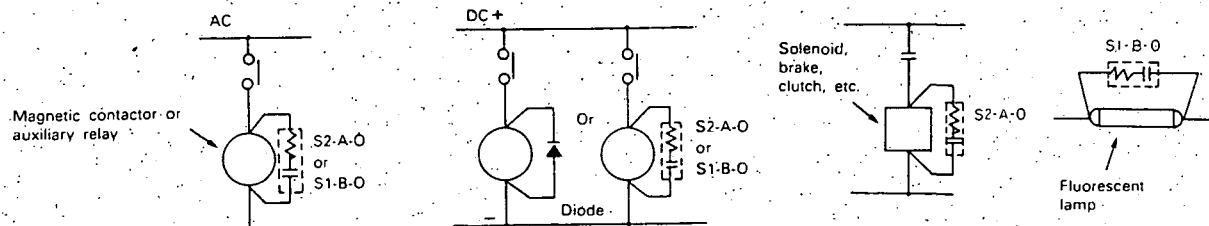
S1-B-O C: 0.1 μ F 500VDC, R: 200 Ω
(OKAYA DENKI SANGYO)

② Diode capacity (in case operating coil current 1 A or less)

ERB240-06C 600 V 1 A (surge 45 A/10 mS)

Equipment	CR filter or diode
Magnetic contactor (Main circuit)	AC S2-A-O or its equivalent DC Diode or S2-A-O
Auxiliary relay	AC S1-B-O or its equivalent DC Diode or S1-B-O
Fluorescent lamp	S1-B-O
Solenoid Brake Clutch	AC S2-A-O DC Diode

b) Wiring example



11. Specifications

1) Standard specifications

Inverter type	FVR075 P5S-2	FVR110 P5S-2	FVR150 P5S-2	FVR185 P5S-2	FVR220 P5S-2	FVR075 P5S-4	FVR110 P5S-4	FVR150 P5S-4	FVR185 P5S-4	FVR220 P5S-4
Applicable motor output [kW]	7.5	11	15	18.5	22	7.5	11	15	18.5	22
Inverter output [kVA]	13	17	22	28	33	13	17	22	28	33
Output current [A]	33	45	58	73	86	18	23	29	37	43
Weight [kg]	12.1	13.1	17	18	21.5	10.5	11	16	18.5	20.5

Input ratings	Power supply	3-phase 200 to 230V 50/60Hz (P5S-2), 3-phase 400 to 460V 50/60Hz (P5S-4)
	Allowable variation	<ul style="list-style-type: none"> Voltage: 180 to 253V (P5S-2), 360 to 506V (P5S-4) Frequency: $\pm 5\%$
Output ratings	Output voltage	3-phase 200, 220, 230V (P5S-2), 3-phase 400, 440, 460V (P5S-4) (same as input voltage)
	Output frequency	<ul style="list-style-type: none"> 50Hz, 60Hz, 100Hz, 120Hz
	Frequency stability	<ul style="list-style-type: none"> Digital setting: $\pm 0.02\%$ of maximum frequency (at $25^{\circ}\text{C} \pm 10^{\circ}\text{C}$) Analog setting: 0.5% of maximum frequency (at $25^{\circ}\text{C} \pm 10^{\circ}\text{C}$)
	Overload capacity	120 % for 1 minute (Inverse time characteristics) Provided with current limiter
Control specifications	Control system	Sinusoidal wave PWM control
	Frequency control range	<ul style="list-style-type: none"> 2 to 120 Hz
	Analog frequency setting inputs	0 to - 10V DC, 0 to + 10V DC, 4 to 20mA DC
	Frequency resolution	<ul style="list-style-type: none"> Digital setting: 0.01Hz step (at 2 to 60Hz) Analog setting: 0.02Hz step (at 2 to 60Hz)
	V/F ratio and torque boost	<ul style="list-style-type: none"> V/F ratio: 7-pattern, selectable modes with 50 to 99Hz V/F adjustment, Automatic V/F, Jump frequency control Torque boost: 16 selectable modes with Automatic torque boost
	Acceleration/deceleration time	0.06 to 1800 sec. (independently adjustable acceleration and deceleration.)
	Braking torque	<ul style="list-style-type: none"> Regenerative braking: 20% DC dynamic braking (at 2Hz or less)
	Jogging operation	Fine adjustment
	Operating sound selection	10-pattern selectable modes (Carrier frequency control)
Protection	Stall prevention	When the motor current reaches the maximum limit on acceleration or deceleration the frequency change is suppressed, so preventing overcurrent or overvoltage trip.
	Instantaneous power failure	<ul style="list-style-type: none"> The inverter operates through a power interruption of 15 msec or less. If the failure is longer than 15 msec, the inverter restarts automatically.
	External output signal	Fault alarm signal (1 Form C, 250V AC 2A), Inverter stop signal, Frequency agreement signal, Overload early warning signal.
	Inverter trip and error message	Overvoltage (OU), Undervoltage (LU), Overcurrent while acceleration (OC1), Overcurrent while deceleration (OC2), Overcurrent while running (OC3) Inverter heat sink overheating, External thermal GL relay trip (OL1) Electronic thermal OL trip (OL2), Operating error (Err1), CPU error (Err3) Short circuit for output terminal (P5S-2 only) Grounding for output terminal (P5S-2 only)
Indication	7-segment digital display	<ul style="list-style-type: none"> Actual frequency, Load current Error message Setting data (Function code and data code No.)
	Frequency level indicator	0 to 100% (10% steps): Actual frequency or setting frequency is indicated.
Condition	Installation location	Indoor not more than 1000m above sea level. Do not install in a dusty location or expose to corrosive gases or direct rays of the sun.
	Ambient temperature, humidity	<ul style="list-style-type: none"> -10°C to $+40^{\circ}\text{C}$ (-10°C to 50°C: When mounted inside the switchboard) 90% RH or less (non-condensing)
	Cooling system	<ul style="list-style-type: none"> Forced air-cooling type
Plug-in type option PC boards		<ul style="list-style-type: none"> Relay output Backup operation Remote operation panel 8 bit digital input interface Remote digital display
Application		Fans, Blowers, Pumps (Variable torque loads)

2) Description of the input/output terminals

	Symbol	Terminal names	Description
Main circuit	R.S.T.	Commercial power input terminal	Commercial power supply is connected
	U.V.W.	Inverter output terminal	3-phase induction motor terminal
	(DB1, DB2)	External DB resistor terminals *1	External DB resistor is connected between DB1 and DB2.
Control circuit	11	Frequency control common terminal	Common terminal for voltage and current setting (Do not ground, since this is not isolated from CM)
	12	Frequency control input terminal *2	When any value from 0V DC to $\pm 10V$ DC is inputted, the maximum frequency is reached at $\pm 10V$ and in proportion until 0V is reached. Input impedance is 22k Ω .
	13	Frequency control power supply terminal	Stabilized power supply + 10V DC, 10mA or less (for terminal 11)
	C1	Frequency control auxiliary terminal	When any value from 4 to 20mA is inputted, the maximum frequency is reached at 20mA and in proportion until 4mA is reached.
	CM	Control circuit common terminal	Common terminal for control input/output signal (Do not ground, since terminal 11 is not isolated.)
	FWD REV	Forward command signal terminal Reverse command signal terminal	Forward command signal via CM, FWD and reverse command signal via CM, REV. (Inverter decelerates and comes to a complete standstill via CM, FWD, REV.)
	BX	Coast-to-stop input terminal	Coast-to-stop via BX, CM (Used to apply mechanical brake during inverter operation)
	JOG	Jogging command input terminal	Operation at jogging speed via CM, JOG (JOG has priority to X1, X2)
	X1 X2	Multistep speed operation command input terminal 1 Multistep speed operation command input terminal 2	Multistep speed 1 via CM, X1, multistep speed 2 via CM, X2, multistep speed 3 via CM, X1, X2 (When no input is made to X1 or X2, operation is carried out with external setting frequency.)
	SOFT	2nd accel/decel time command input terminal	Change to 2nd accel/decel time via CM, SOFT (When input is not made to SOFT, operation is carried out with normal 1st accel/decel time.)
	THR	External thermal overload relay, external DB resistor thermostat terminal	Motor coasts to a stop, when CM, THR is open. (When neither external thermal overload nor external DB resistor is available, inverter can not be operated unless the THR and CM is short-circuited.)
	RST	Reset signal input terminal	Protective function is reset when CM and RST is short-circuited for over 0.1sec. (If input is made to FWD and REV, restart is made the moment reset is made.)
	FM	Frequency meter terminal Digital counter terminal	+ 10 is outputted when the maximum frequency is reached and in proportion until 0V is reached. DC voltmeter (7 to 10V) ... internal resistor over 10k Ω DC ammeter (1mA) ... 10k Ω 1/2 is connected in series. Outputted as a pulse train via FM terminal. Pulse frequency = Output frequency $\times n$

Maximum frequency [Hz]	50	60	100	120	150	180	200	240	300	360
n	24	24	12	12	8	8	6	6	4	4


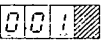

*1. Not provided for FVR-P5S.

*2. When inputting any one from 0 to $\pm 10V$, change the pin (J4 or J5) to ± 10 side. 11 is for 0V and 12 for 0 to $\pm 10V$. Do not connect any to 13.


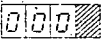

Program protection

Program protection can be provided so as to prevent the selecting function and data codes from being changed due to the user's misoperation causing troubles.

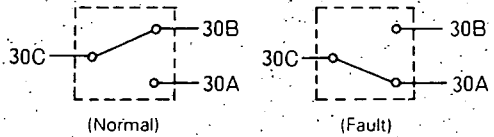
i) PROGRAM protection procedure

- ① Press the PRG key 
(PROGRAM mode selection)
- ② Press the STOP key and hold it while pressing the SET key 
(PROGRAM protection)
- ③ Press the PRG key 
(PROGRAM mode resetting)

ii) PROGRAM protection clearing procedure

- ① Press the PRG key 
(PROGRAM mode selecting)
- ② Press the STOP key and hold it while pressing the RESET key 
(PROGRAM protection clearing)
- ③ Press the PRG key 
(PROGRAM mode resetting)

* When changing the function and data codes, clear the PROGRAM protection.

Control circuit	SST	Inverter stopping signal output terminal	When the frequency set with function code "22" is reached during deceleration, SST and CM are ON. (Open collector output, 27V, 50mA max.)
	SAR	Frequency agreement signal output terminal	When the frequency set with function code "21" is reached, SAR and CM are ON. (Open collector output, 27V, 50mA max.)
	OL	Inverter overload early warning signal output terminal	When the output current set with function code "20" is exceeded for over 10sec, OL and CM are ON. (Open-collector output, 27V, 50mA max.)
	30A 30B 30C	Inverter fault signal output terminal	Output is made via 1 Form contacts to indicate that inverter protective function operates. (Contact capacity for resistance load 230VAC, 2A, 30VDC, 2A) 

3) Selecting the distribution and control equipment

i) D & C equipment

Motor output [kW]		7.5	11	15	18.5	22	7.5	11	15	18.5	22
Inverter type		FVR075 P5S-2	FVR110 P5S-2	FVR150 P5S-2	FVR185 P5S-2	FVR220 P5S-2	FVR075 P5S-4	FVR110 P5S-4	FVR150 P5S-4	FVR185 P5S-4	FVR220 P5S-4
Inverter output [kVA]		13	17	22	28	33	13	17	22	28	33
Applicable wire size [mm²]	Main circuit	5.5 (14)	5.5 (14)	14 (22)	14 (30)	22 (38)	3.5 (5.5)	5.5 (8)	5.5 (14)	5.5 (14)	14 (22)
	Control circuit	0.5 (1.25)									
FAB		SA53/50	SA63/60	SA103/75	SA103/100	SA103/125	SA33/30	SA33/30	SA53/40	SA53/50	SA53/50
Fuse [A]		40	60	75	100	100	30	30	40	60	60
Magnetic contactor		SC-2N	SC-2SN	SC-3N	SC-4N	SC-5N	SRC3631-5-1	SC-1N	SC-2N	SC-3N	SC-4N
Thermal overload relay		TR-3N (24 ~ 36)	TR-3 (34 ~ 50)	TR-3 (45 ~ 67)	TR-6 (54 ~ 80)	TR-6 (65 ~ 95)	TR-3N (12 ~ 18)	TR-3N (18 ~ 26)	TR-3N (24 ~ 36)	TR-3N (28 ~ 40)	TR-3N (34 ~ 50)
Spark killer		S2-A (for magnetic contactors), S1-B (for control relay and timer)									

ii) External braking unit

Type		DB075-2		DB150-2		DB185-2		DB220-2		DB075-4		DB150-4		DB185-4		DB220-4	
Resistor	Capacity [kW]	1.2		2.0		2.4		2.8		1.2		2.0		2.4		2.8	
	Resistance [Ω]	15		12		10		8.6		66.7		40		33		28.6	
Applicable inverter		FVR075P5S-2DB		FVR110P5S-2DB FVR150P5S-2DB		FVR185P5S-2DB		FVR220P5S-2DB		FVR075P5S-4DB		FVR110P5S-4DB FVR150P5S-4DB		FVR185P5S-4DB		FVR220P5S-4DB	
Outline drawing		B		C		C		D		B		C		C		D	
Motor output [kW]		7.5		11 15		18.5		22		7.5		11 15		18.5		22	
Average braking torque [%]		100		100 100		100		100		100		100 100		100		100	
Allowable braking characteristics	Allowable braking frequency [%]	10		10 10		10		10		10		10 10		10		10	
	Continuous allowable braking time [sec]	20		20 20		20		20		20		20 20		20		20	
Inverter [kVA]		13		17 22		28		33		13		17 22		28		33	

4) Outline dimensions, mm

i) Inverter unit

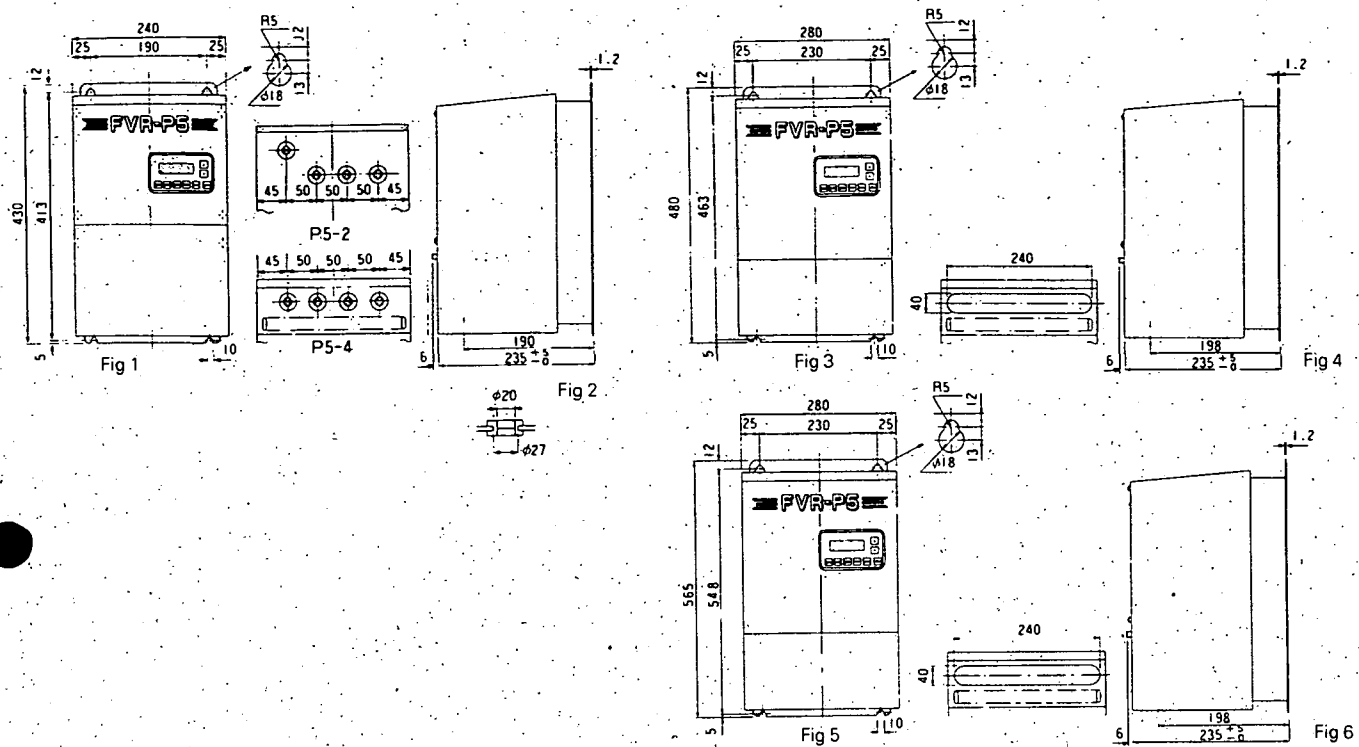
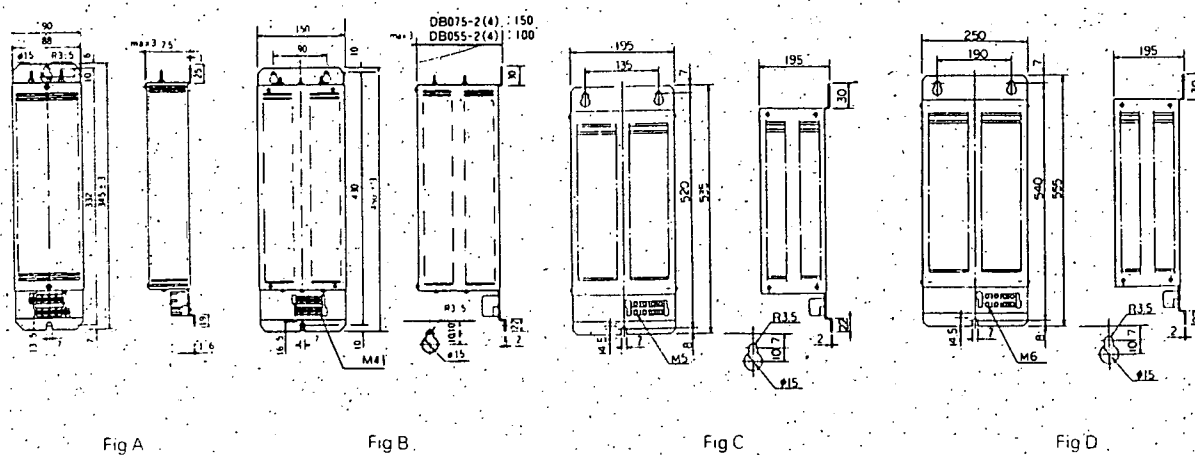
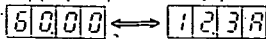
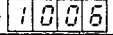


Fig No. \ Type	FVR075 P5S-2, 4	FVR110 P5S-2, 4	FVR150 P5S-2, 4	FVR185 P5S-2, 4	FVR220 P5S-2, 4
Front view	Fig 1	Fig 1	Fig 3	Fig 3	Fig 5
Side view	Fig 2	Fig 2	Fig 4	Fig 4	Fig 6

ii) Braking resistor



Function and data code list

Function	Description	Application	Factory setting
00 Display changing	00 Frequency display	Output Frequency [Hz]/Output current [A] 	00
	01 Current display		
01 Multistep speed 1	00-60 frequency data code No.	Multistep speed operation (Control terminals X1 and X2 are used to select.)	10
02 Multistep speed 2			20
03 Multistep speed 3			30
04 Jogging speed		Jogging operation	05
05 Acceleration time (ACCEL 1)	00-31 Accel/Decel time data code No.	Set so as to match load GD². Shockless acceleration/deceleration Heavy load-light load selection	16 (12)
06 Deceleration time (DECEL 1)			
07 Accel/Decel time (ACCEL/DECEL 2)			
08 Electronic thermal overload	00-15 Thermal level code No.	Motor overload protection	00
09 Torque boost	00-15 Torque boost data code No.	Starting torque adjustment for use with fans, pumps	08
10 V/F pattern (V/F ratio)	00-18 V/F pattern data code No.	Can meet the requirements of high-speed motors and special motors.	01
11 Motor operating sound	00-09 Operating sound data code No.	High-low adjustment of motor sound	05
12 Upper limit	00-15 Upper limit ratio data code No.	Overspeed prevention due to excessive setting input	00
13 Lower limit	00-15 Lower limit ratio data code No.	Secures a fixed flow rate in a pumping system	00
14 Bias	00-15 Bias ratio data code No.	Motor slip speed compensation	00
15 Overspeed limiter	00 Over 150Hz operation is not available	Prevents overspeed due to improper setting of V/F pattern	00
	01 Over 150Hz operation is available		
16 Jump frequency 1	00-60 Frequency data code No.	Prevents resonance between motor and coupled machines.	00
17 Jump frequency 2			00
18 Jump frequency 3			00
19 Keypad panel operation external operation selection	00 External operation	Operation using relay or Programmable Controller.	03
	01 External Automatic V/F	External operation with automatic acceleration of function	
	02 External automatic torque boost	External operation with automatic energy-saving function	
	03 Keypad panel operation	Operation via operating panel (keypad operation)	
20 Overload early warning signal	00-05 Overload setting value data code No.	Provides overload protection for inverter	00
21 Frequency agreement signal	00-60 frequency data code No.	Detects target frequency	00
22 Inverter stop signal	00-05 Stop signal frequency data code No.	Motor with brake	00
23 Brake torque selection	00 Normal torque brake	20% of motor rated torque	00
	01 High torque brake	Ensures 20 to 30% higher torque compared with normal brakes.	
	02 Normal torque brake + DC dynamic brake	When requiring a brake until motor comes to a standstill.	
24 Stall prevention level control	00-15 Current limiting value setting data code No.	For load requiring warm-up operation	00
25 Frequency setting method selection (analog/digital)	00 Digital setting from operating panel	Individual operation	00
	01 Analog setting through terminal input	Process control operation	
	02 Digital setting through binary code	Computer link (FA system, centralized control system)	
	03 Digital setting through BCD code		
26 Optional V/F pattern	50-99 Base frequency [Hz]	When program code  is set	50
27 Operating panel selection	00 Front operating panel	When remote control using option OPC-09 is carried out	00
	01 Remote control panel		
28 Automatic restart after instantaneous power failure. Commercial line — inverter operation selection.	00 No operation	Prevents troubles due to instantaneous power failure.	00
	01 Change with setting frequency		
	02 Change with 50 [Hz]	Use the OPC-07 option card.	
	03 Change with 60 [Hz]		
	04 Only automatic restart function	For operation using commercial power.	

FUJI
ELECTRIC

Instruction Manual

MICRO CONTROLLER E

Z-SERIES

TYPE: PYZ 4

5

7

9

INTRODUCTION

You are now the owner of Fuji's Digital Temperature Controller.

Before using, be sure to check the instrument for correct specifications.

This instruction manual has been prepared for final users.

CONTENTS

	Page
Introduction	i
1. Functions of their keys and displays	1-1
2. Operation	2-1
2.1 Preparation for operation	2-1
3. Fault indication	3-1
4. Use of dual output type (option)	4-1
5. Use of heater break alarm (option)	5-1
6. Change of functions	6-1
6.1 Kinds of second parameter and meanings	6-1
6.2 Function setting	6-1
7. Outline dimensions and panel cutout	7-1
8. Terminal connection diagram	8-1
9. Control/alarm output and indicating lamp	9-1
10. Cautions for installation and wiring	10-1
11. Specifications	11-1
12. Ordering code	12-1

1. FUNCTIONS OF THEIR KEYS AND DISPLAYS

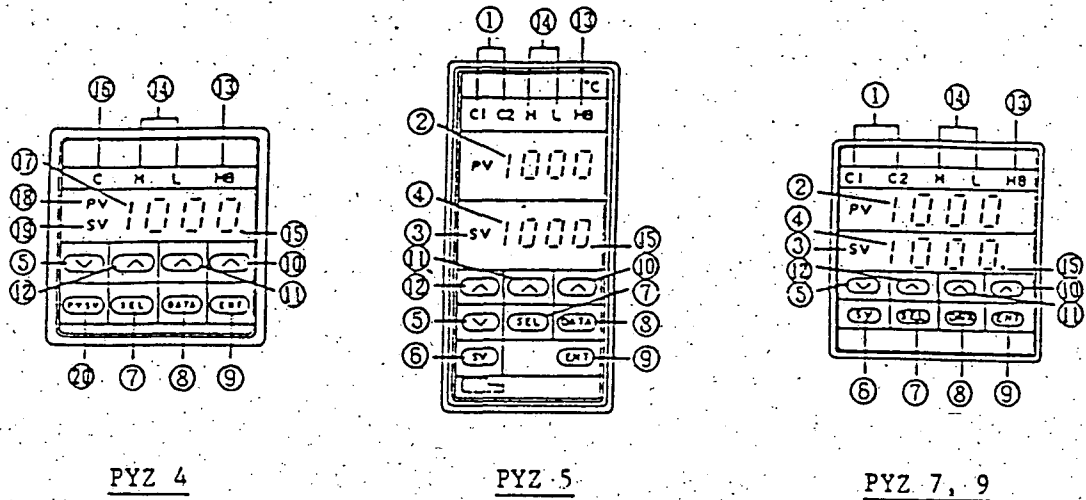


Fig. 1

Table-1

Item	Function
① Control output lamp (green)	C1: Control output "1" indication (lamp is lit at ON) C2: Control output "2" indication (lamp is lit at ON) (option)
② Measured value (PV) lamp (red)	Indication of measured value.
③ Set value (SV) lamp (green)	Lamp is lit while indicating set value (SV).
④ Parameter lamp (green)	Indication of set value (SV) and various parameters (PID, high/low alarm, heater break alarm, etc.)
⑤ Down-key (common to all digits)	Numeric value of digit selected by up-key goes down. When parameters do not flicker, press the key. Parameters are indicated sequentially. SEL key indication and Down-key indication are reverse.
⑥ Direct SV select key	Set value (SV) is indicated by pressing this key.
⑦ Parameter select key	Parameters are indicated in order at each press of this key.
⑧ Data key	Indication of parameter data selected by parameter select key.
⑨ Data entry key	Data are registered after they have been changed. (Changed data cannot be registered unless this key is pressed.)
⑩ 1-digit up-key	Numerical value of digit flickers at a press. It goes up while repeating to press this key.
⑪ 10-digit up-key	Numeric value of 10-digit flickers at a press. It goes up while repeating to press this key.
⑫ 100-digit up-key	Numeric value of 100-digit flickers at a press. It goes up while repeating to press this key. It returns to "0" after it reaches "9" and, at the same time, the 1000th digit goes up by "1".
⑬ Heater break alarm lamp (red)	Lamp is lit at ON of heater break alarm output (option)
⑭ Alarm lamp (red)	H: Lamp is ON at high alarm (option) L: Lamp is ON at low alarm (option)
⑮ Auto tuning lamp	Lamp flickers during PID auto tuning.
⑯ Control output lamp (green)	Lamp is lit at ON of control output.
⑰ Parameter indication	Indication of measured value (PV), set value (SV) and various parameters
⑱ Measured value (PV) lamp (red)	Lamp is lit at indication of measured value (PV)
⑲ Set value (SV) lamp (red)	Lamp is lit at indication of set value (SV).
⑳ PV/SV select key	Selection of measured value (PV) or set value (SV) at each press of this key

PY24 {

2. OPERATION

Turn ON the power and the measured value (PV) and set value (SV) indicators show, then a measured value and set value are indicated a few seconds later.

2.1 Preparation for operation

To ensure correct operation of the controller, it is necessary to set parameters fitted to the controlled system before operating, according to the procedures shown in the setting method. While setting parameters, be sure to turn OFF the system for the sake of safety.

For changing the ordered specifications after purchase, refer to "Setting method of second block parameters" shown on Page 6-2.

(1) Kinds of parameters and meaning

Table 2.1 shows a list of parameters. Note that some parameters are not indicated depending on code symbols.

Parameters are indicated in the order of SV → P → I LoC → SV. To return indicating SV, with another parameter indicated, press the SV key.

Press the V key, and parameters are indicated in the order of SV → LoC P → SV.

(2) Setting method of parameters

See the Table 2.2, 2.3.

When the PID value has not been determined at the operation with PID action, the auto tuning function should be used.

When altering plus sign to minus, press the V key after setting all digits to "0".

When altering minus sign to plus, press the ^ key after setting all digits to "0".

(3) Auto tuning operation

The PID parameters can be automatically set by the controller using auto tuning function.

- (a) The auto tuning function should be used after the set value (SV), alarm setting (AL, AH) and control cycle (TC) [Reference: SSR drive output; TC=2 sec, contact output; TC=30 sec] are set up.

- (b) Auto tuning startup operation

o Press the parameter

R	7		
---	---	--	--

select key to indicate R7.

o Press the Data key to

0			
---	--	--	--

indicated data.

Auto tuning disable code

"0" is indicated.

o Press the 1-digit up-key

0			
---	--	--	--

for setting the code of

auto turning.

(Standard type: 1, low

PV type: 2)

o Press the 1-digit up-key

1			
---	--	--	--

to set "1". In this

example, the auto tuning

of the standard type is

executed.

ENTER

o Press the Data entry key

1	0	1	.
---	---	---	---

to start auto tuning.

The decimal point on the

1st digit flickers during

auto tuning.

o Press the direct SV select

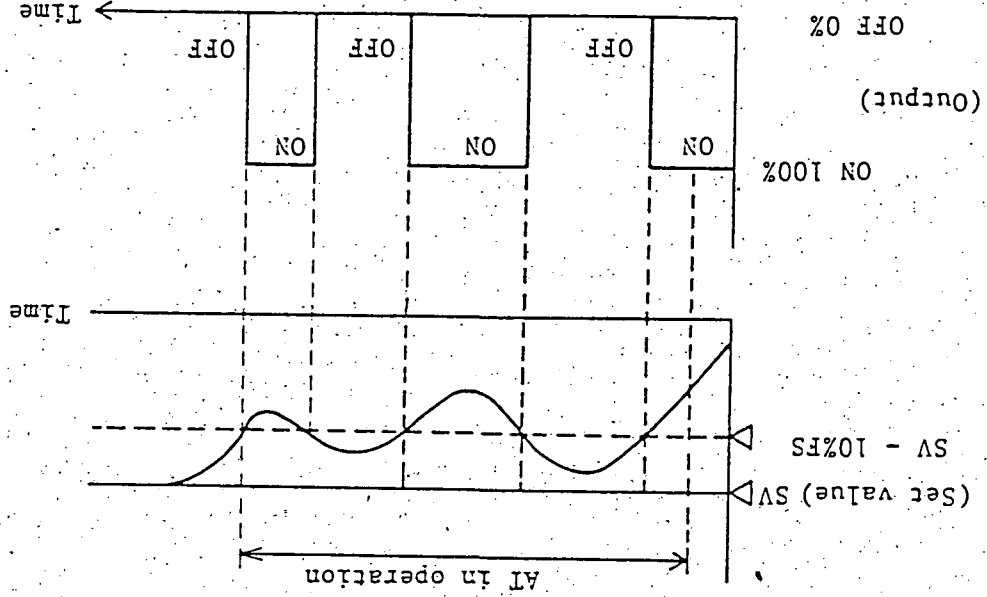
key or PV/SV select key to

indicate SV.

- o At the end of auto tuning, flashing goes off and the auto tuning code is automatically reset to "0".
- (c) Meaning of auto tuning data
 - 0: Autotuning is disable
 - 1: Standard type auto tuning
PV is compared with SV during auto tuning.
 - 2: Low PV type
PV is compared with (SV-10%FS) during auto tuning.
- (d) When the auto tuning is completed, the PID parameter is saved even if the power is turned OFF.
- (e) During auto tuning, PV may be oscillated greatly depending on process. If it is not desirable, do not use the auto tuning function.
- (f) When auto tuning is not completed within 4 hours, it means that the auto tuning function is abnormal. In such a case, check the control system and then repeat the auto tuning once again.
- (g) When the process operating condition has changed, carry out the auto tuning again.
- (h) During auto tuning, PV and output vary as shown in Figs. 2-1 and 2-2.
- (4) With the PYZ left for 30 seconds after key operation, the parameter indication is reset to SV indication automatically.
(In case of PYZ4, the parameter is reset to PV indication.)

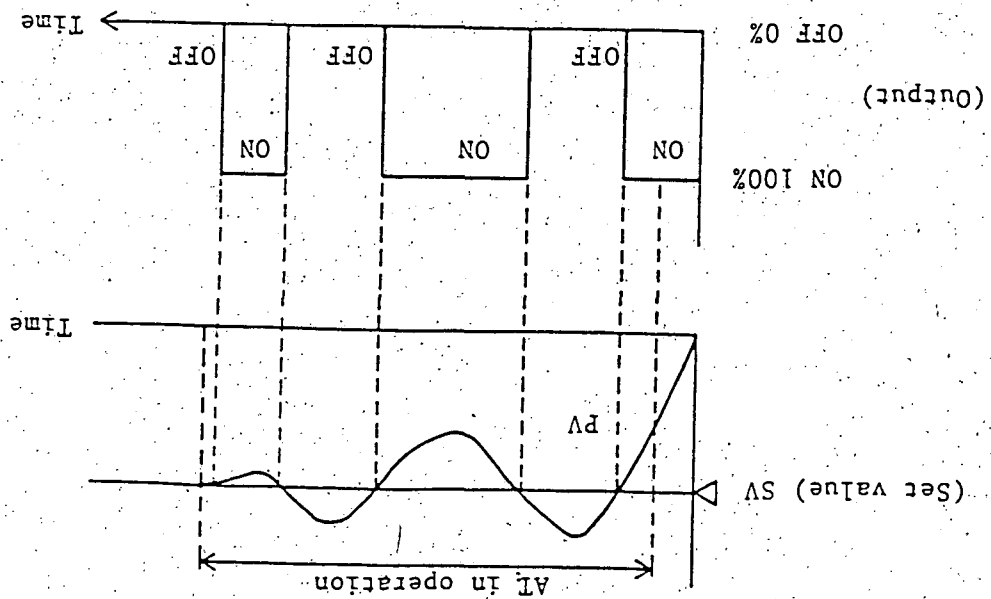
2-4

Fig. 2-2



Low PV type

Fig. 2-1



Standard type

List of parameters

Table 2-1

Parameter symbol	Item	Meaning	Description	Initial value prior to delivery
SV	SV	Set value	Settable within the input range	Ordering specification
P	P	Proportional band	Setting range: 0.0 to 999.9% 2-position action* at "0" setting (TC should also be set to "0").	3
I	I	Integral time	Setting range: 0 to 9999 sec. Integral action is OFF at "0".	0
D	D	Derivative time	Setting range: 0 to 3600 sec. Derivative action* is OFF at "0".	0
AL	AL	Low	Settable within the input range. Not indicated without alarm function.	10
AH	AH	High	Settable within the input range. Not indicated without alarm function.	10
TC	TC	Control cycle of control output 1	Setting range: 0 to 150 sec. "0" means 0.5 sec. Set to "0" at P = 0. Not indicated at current output.	Contact output : 30 SSR drive output: 2
HYS	HYS	Hysteresis width of control output 1	Setting range: 0.0 to 20.0%	0.3
Hb	Hb	Heater break alarm	Setting range: 0 to 50.0A. See Page 5-1 for setting. Alarm function is OFF at "0.0" Not indicated without heater break alarm function.	0.0
AT	AT	Auto tuning	Used for automatic setting PID parameters. 0: Disable 1: Standard type autotuning 2: Lower PV type autotuning	0
TC2	TC2	Control cycle of control output 2	Setting range: 0 to 150 sec. "0" means 0.5 sec. Not indicated without function of control output 2 and at current output.	Contact output : 30 SSR drive output: 2
Cool	Cool	Proportional band coefficient for cooling output	Setting range: 0.1 to 100.0 Not indicated without function of control output 2	1.0
db	db	Proportional band shift for cooling output	Setting range: -50.0 to +50.0 Not indicated without function of control output 2	0.0
LoC	LoC	Key lock	Data setting inhibit 0: Release (all data settable) 1: Inhibit changing the all data 2: Inhibit changing the all data other than set value (SV)	0

* 2-position action (ON-OFF action): Control output turns ON or OFF by comparing PV with SV






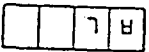

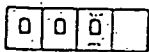
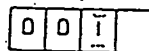
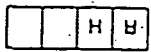
Contents of operation	Key operation	Description	Indication
Setting of low alarm to 100	<div>    </div>	<ul style="list-style-type: none">o Press the SEL key to indicate RL.o Press the DATA key to indicate data. Initial value "0" is displayed.o Press the V key of any digit to be set. In this example, the indication of 100-digit flickers.o Press the V key (once) to indicate "1". (0-1)o Press the ENT key. Indication stops flickering and the alarm set value "100" is indicated. The indication is shifted automatically to the next parameter.	<div>    </div>

Table 2-3

Setting of low alarm (AL)

Contents of operation	Key operation	Description	Indication
Setting of SV to 250	<p>o Press the SV key to indicate set value.</p> <p>(This operation can be omitted when a set value is indicated.)</p> <p>o Press V key of any digit to be set. In this example, the V key of 10-digit is pressed. The 10-digit indication flickers.</p> <p>o Press the V key (5 times) to indicate "5". (0-1-2-3-4-5)</p> <p>o Press V key of 100-digit. The 100-digit indication flickers.</p> <p>o Press the V key (2 times) to indicate "2". (0-1-2)</p> <p>o Press the ENT key. The indication stops flickering and the set value 250°C is indicated. - Operation is completed.</p>		<p>SV 0 0 5 0</p> <p>SV 0 0 5 0</p> <p>SV 0 0 5 0</p> <p>SV 0 0 5 0</p> <p>SV 0 0 5 0</p> <p>SV 0 0 5 0</p>

Table 2-2

Setting of set value (SV)

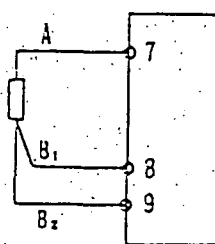
3. FAULT INDICATION

The controller has a fault indicating function so that the cause of fault can be removed quickly. After the cause has been removed, be sure to turn off and then turn on the power switch.

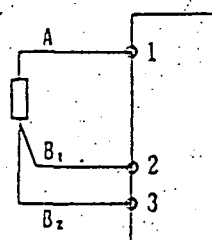
Table 3-1

Indication	Cause	Control output
UUUU	① Burnout of thermocouple sensor (upscale burnout) ② Burnout of resistance bulb sensor (upscale burnout) ③ J thermocouple input temperature is more than 1115°C ④ E thermocouple input temperature is more than 850°C	① In case of upscale burnout OFF or less than 4 mA in reverse action ON or more than 20 mA in normal action ② In case of downscale burnout ON or more than 20 mA in reverse action OFF or less than 4 mA in normal action
LLLL	① Burnout of thermocouple sensor (downscale burnout) ② Burnout of resistance bulb sensor (downscale burnout)	
UUUU	① PV reading is more than 130% FS	Goes on control
LLLL	① Short-circuit of resistance bulb sensor (between A and B) Note) ② PV reading is less than -30% FS Note)	
HB lamp ON	Heater burnout	Normal control

Note)



PYZ7


 PYZ4
 PYZ5
 PYZ9

4. USE OF DUAL OUTPUT TYPE (OPTION)

(1) Function description

The dual output type has 2 control outputs for one input signal and set value (SV). Control output 1 is used for heating, while control output 2 is used for cooling, respectively. Output signal is any combination with contact output, SSR drive output and DC 4-20mA output which are available according to the code symbols. The dual output type has the parameters TC2, cool, db in addition to those of the standard type.

In the dual type, the proportional band of control output 1 is $P/2$. The proportional band of control output 2 is described below. However, the max. value should be limited to $P/2$.

By setting the parameter cool to 0.0, cooling control is set to ON-OFF control (Note that hysteresis is not attached.)

Example: In case of $P = 20(\%)$ and $\text{cool} = 0.5$
 proportional band of control output 2
 $= 20 \times 0.5 = 10(\%)$

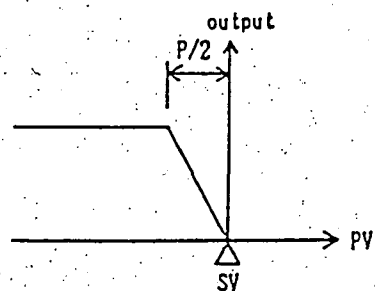


Fig. 4-1

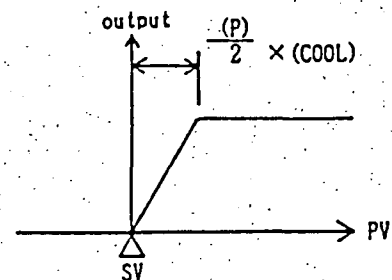


Fig. 4-2

4. USE OF DUAL OUTPUT TYPE (OPTION)

(1) Function description

The dual output type has 2 control outputs for one input signal and set value (SV). Control output 1 is used for heating, while control output 2 is used for cooling, respectively. Output signal is any combination with contact output, SSR drive output and DC 4-20mA output which are available according to the code symbols. The dual output type has the parameters TC2, cool, db in addition to those of the standard type.

In the dual type, the proportional band of control output 1 is $P/2$. The proportional band of control output 2 is described below. However, the max. value should be limited to $P/2$.

By setting the parameter cool to 0.0, cooling control is set to ON-OFF control (Note that hysteresis is not attached.)

Example: In case of $P = 20(\%)$ and $\text{cool} = 0.5$
 proportional band of control output 2
 $= 20 \times 0.5 = 10(\%)$

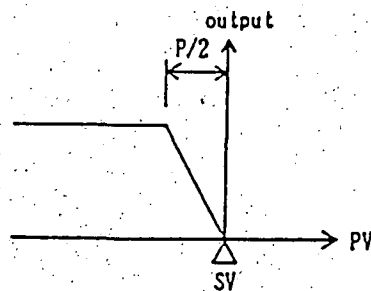


Fig. 4-1

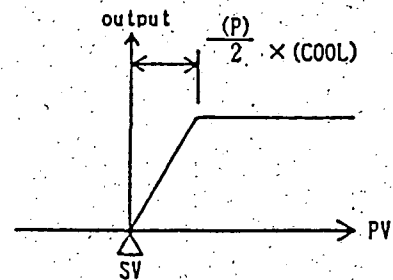


Fig. 4-2

The control output 2 value corresponding to deviation can be changed. This can be changed according to setting of parameter dB.

(When dB is plus)

(When dB is minus)

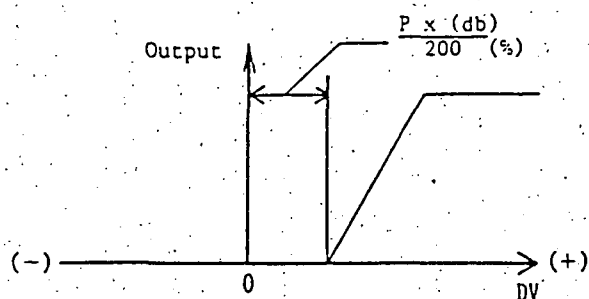


Fig. 4-3

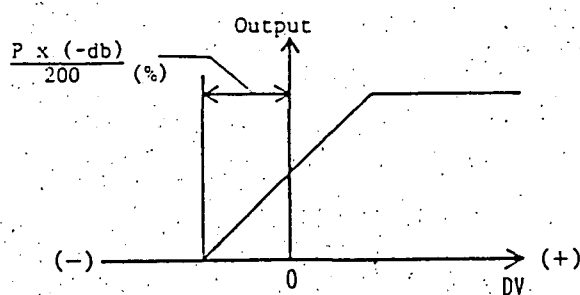


Fig. 4-4

(2) The tuning of dual output type

In the dual output type controller, the PID autotuning is not effective.

Then set PID parameters, parameter cool and parameter dB with front panel keys.

5. USE OF HEATER BREAK ALARM (OPTION)

- o The current detector (CT) comes in 2 types, 0-30A type (CTL-6-SF) and 20-50A type (CTL-12-S36-8F). It should be set to the heater current being used.
- o For setting alarm point, the parameter Hb is used.
- o Setting of alarm set point
 - ① With the controller output set to ON, apply a current to the heater.
 - ② While changing the alarm set point, locate the value at which the alarm operates (when changing the set point, be sure to wait for 3 seconds or more).
 - ③ When the operating point has been set, the final set point should be 70 to 80% of the operating point.
- o By using a power common to the heater and this controller, the variation of the alarm operating point due to power fluctuation can be minimized.
Set the parameter Tc for 6 sec. or more.
- o To use heater alarm functions properly, set the second parameter P-CT to heater power voltage value.
- o When heater is controlled with an actuator controlling phase angle, the heater break alarm can not be used.
- o Connection of heater burnout detecting CT

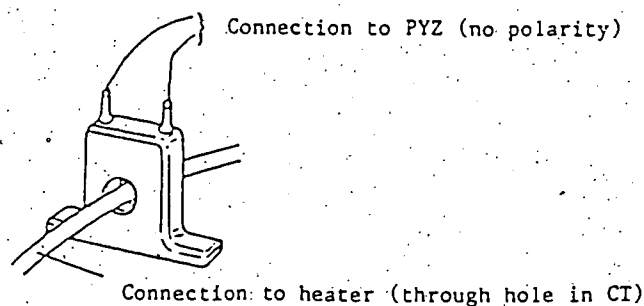
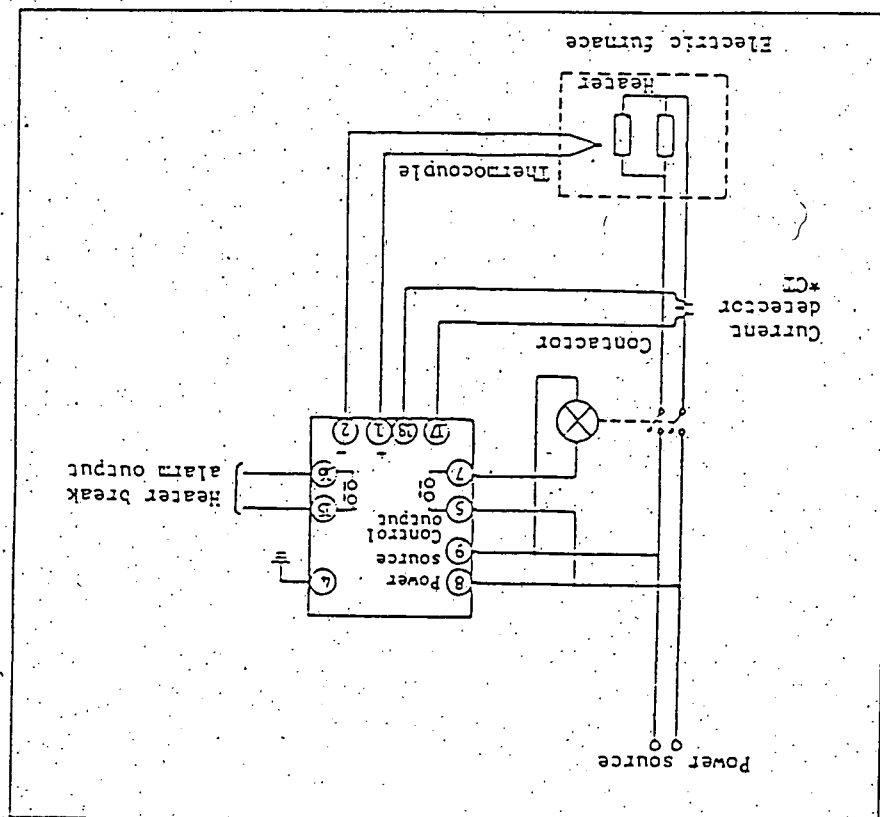


Fig. 5-1

5-2

Read the following when changing the functions of this controller.

Fig. 5-2



o Connection example of heater break alarm (Type PYZ5, 9)

6. CHANGE OF FUNCTIONS

The functions of this controller can be changed by the user, if desired. To change the functions, the second parameter should be called out.

6.1 Kinds of second parameter and meanings

Table 6-1 shows a list of second parameters and their meanings.

To call out of second parameter, operate the keys in the following order.

After the parameter "P" has been selected, press the SEL key for about 5 seconds. In this way, the indicator shows "P-n1" and the controller is set in the second parameter mode. To return to the first parameter mode, display "P-n1" and then press the SEL key for about 5 seconds.

When the key is not operated for 30 sec. or more, the parameter indication is reset to SV of the first block parameter (Note that it is reset to PV in case of PYZ 4.)

6.2 Function setting

(1) Method of changing input specifications

Input can be changed shown below.

(a) Change of thermocouple type

Select the parameter P-n2. Set the code of desired thermocouple.

(b) Change from the thermocouple to resistance bulb.

Select the parameter P-n2. Set the code of resistance bulb. Change the position of internal switch to RTD position.

(c) Change from resistance bulb to thermocouple

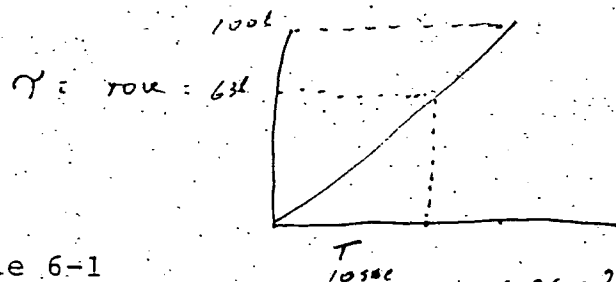
Select the parameter P-n2

Set the code of desired thermocouple.

Change the position of internal switch to TC position.

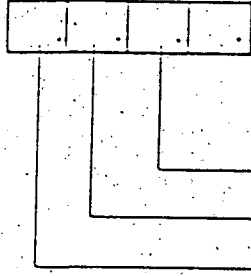
- (d) Change from DC 1-5V DC input to DC 4-20 mA DC input
Connect a resistor (250Ω) to input terminal. The resistor should be purchased by user.
- (e) Change from 4-20 mA DC to 1-5V DC
Remove the resistor (250Ω) connected at input terminals.
- (f) Change from thermocouple or resistance bulb to 1 - 5 V DC or 4 -20 mA DC.
In this case, changing is not usable.

For input type code, refer to table 6-2. For changeover of internal switch, refer to Fig. 6-1 through 6-4.



Second parameter list

Table 6-1

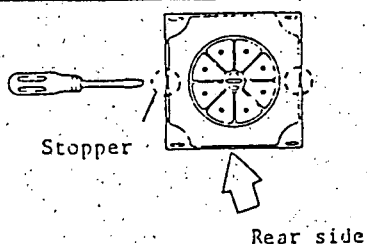
Parameter symbol	Item	Meaning	Description	Initial value
P-n1	P-n1	Control action	Setting of direct/reverse action, and setting of input direction at input burnout	Ordering specification
P-n2	P-n2	Input type		Ordering specification
P-dF	P-dF	Input filter response time	Half of data value is 63% response time (code 0 to 201) <i>Dampens the input signal</i>	Code 20 (10 Sec)
P-SL	P-SL	Lower limit of input range		Ordering specification
P-SU	P-SU	Upper limit of input range	<i>Engineering units (CM³/H)</i>	Ordering specification
P-Ab	P-Ab	Alarm type	Shown on page 6-8	Function code 79
P-An	P-An	Hysteresis of alarm	Setting range: 0-255°C/°F	1
P-dP	P-dP	Decimal point position	Selection of the position of decimal point indicated by seven segment LED 	Ordering specification
P-48	P-48		Setting need not be changed.	PYZ4 ... 3 PYZ5, 7, 9 ... 2
P-CT	P-CT	Setting of heater rated voltage		100
PVOF	PVOF	PV offset	PV indicated value is changed, however PV is unchanged. (Setting range: -1999 to +2000)	0
SVOF	SVOF	SV offset	SV value is changed, however SV indicated value is unchanged. (Setting range: -1999 to +2000)	0
P-F	P-F	°C/°F selection	°C: 0 °F: 1 $PV(°F) = \frac{9}{5}PV(°C) + 32$	Ordering specification
PLC2	PLC2		Setting need not be changed	Specified by manufacturer
PHC2	PHC2		Same as above	Ditto
DSP1	DSP1		Same as above	Ditto
DSP2	DSP2		Same as above	Ditto
DSP3	DSP3		Same as above	Ditto

Input type and code

Table 6-2

Input type		Code
PT100/IEC		1
TC	J	2
	K	3
	R	4
	T	7
	N	12
	PL-II	13
1 to 5V DC		31
4 to 20mA DC		31

RYZ4
(socket type)



Attach a flat blade screwdriver to the hooks on the rear at the left and right sides to open the case, then push the "inside of the main unit with finger tip.

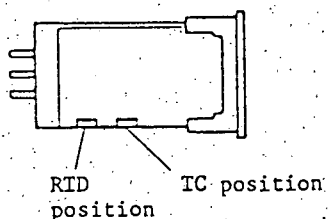
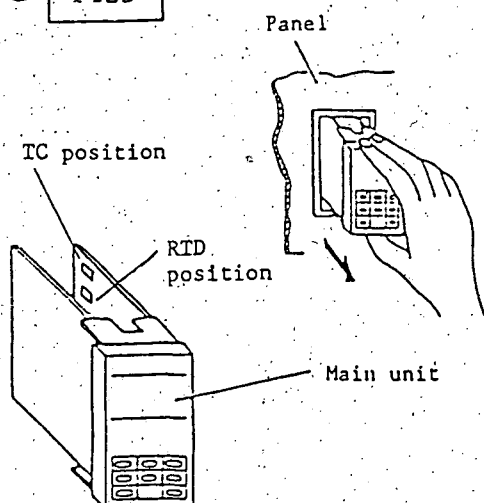


Fig. 6-1

Set the small socket to RTD position or TC position.

PYZ5

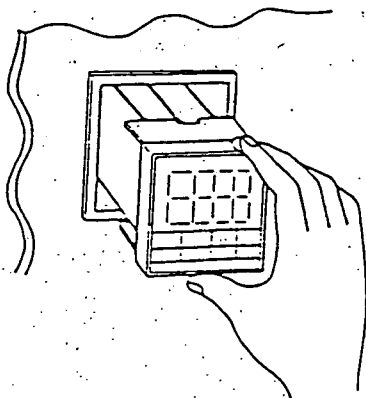


Push down until the lock is released.

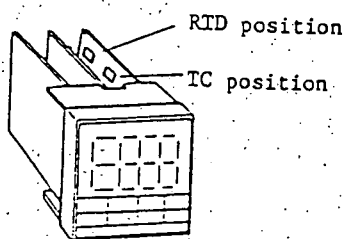
Set the small socket to RTD position or TC position.

Fig. 6-2

PYZ7



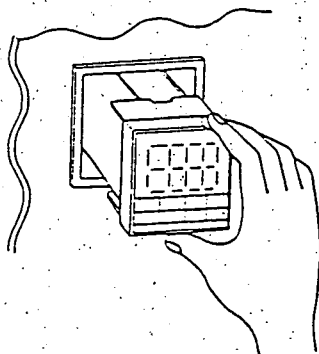
Push down until the lock is released.



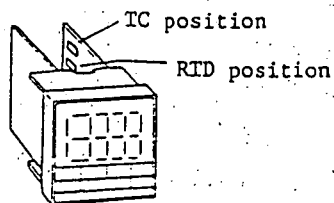
Set the small socket to RTD position or TC position.

Fig. 6-3

PYZ9



Push down until the lock is released.



Set the small socket to RTD position or TC position.

Fig. 6-4

(2) Change of control action

Select the second parameter "P-n1" and set the function code as shown in Tables 6-3 and 6-4.

Definition of reverse action and direct action

o Reverse action

This is used to control temperature by heating. When the temperature is higher than the set value, the controller output decreases.

o Direct action

This is used to control temperature by cooling. When the temperature is higher than the set value, the controller output increases.

For wire-break of thermocouple input and RTD input, the input value becomes the value specified by burnout direction.

As a result, when wire-break direction is set to upper limit and control output is set to reverse action, for example, the control output goes to lower limit in wire-break of input..

Table 6-3

Standard type					
Function code	Burnout direction	Control output 1	Function code	Burnout direction	Control output 1
0	Upper limit	Reverse action	1	Lower limit	Reverse action
16	Upper limit	Direct action	17	Lower limit	Direct action

Table 6-4

Dual output type							
Function code	Burnout direction	Control output 1	Control output 2	Function code	Burnout direction	Control output 1	Control output 2
2	Upper limit	Reverse action	Direct action	3	Lower limit	Reverse action	Direct action
18	Upper limit	Direct action	Direct action	19	Lower limit	Direct action	Direct action
34	Upper limit	Reverse action	Reverse action	35	Lower limit	Reverse action	Reverse action
50	Upper limit	Direct action	Reverse action	51	Lower limit	Direct action	Reverse action

(3) Change of alarm operation (option)

Alarm operation has 18 types of functions.

Select the second parameter "P-Ab" and set the function code as shown in Table 6-5. Then the alarm type can be changed.

The low alarm hold function inhibits the low alarm output when the power of the controller is turned on.

By setting the upper/lower alarm in case of PYZ4, the alarm output is obtained by OR of upper and lower alarms.

In this case, their alarms can be displayed independently on the front panel.

Table 6-5

	Function		Action	Function code	Description
Deviation alarm	High/low alarm Without low alarm hold			15	Upper limit (H) and lower limit (L) for set value (SV). Alarm output is ON in the hatched area.
	High alarm			10	
	Low alarm Without low alarm hold			5	
	High/low alarm With low alarm hold			79	
	Low alarm With hold			69	
Absolute value alarm	High/low alarm Without low alarm hold			3	Upper limit (H) and lower limit (L) within the range (0-100%). Alarm output is ON in the hatched area.
	High alarm			2	
	Low alarm Without low limit hold			1	
	High/low alarm With low alarm hold			67	
	Low alarm With low alarm hold			65	
Absolute value + Deviation alarm	Absolute value	Deviation		7	Alarm output is ON in the hatched area.
	High alarm	Low alarm		11	
	Low alarm	High alarm		75	
	Low alarm With low alarm hold	High alarm		71	
	High alarm	Low alarm With low alarm hold		71	
Zone alarm	Low alarm	High alarm		179	Alarm output is ON within the range between low alarm set value and high alarm set value. Alarm is output to Alarm 2 terminal (PY25, PY27, PY29)
	Absolute value	Absolute value		183	
	Deviation	Absolute value		187	
	Absolute value	Deviation		191	
	Deviation	Deviation		191	

7. OUTLINE DIMENSIONS AND PANEL CUTOUT

(Unit: mm)

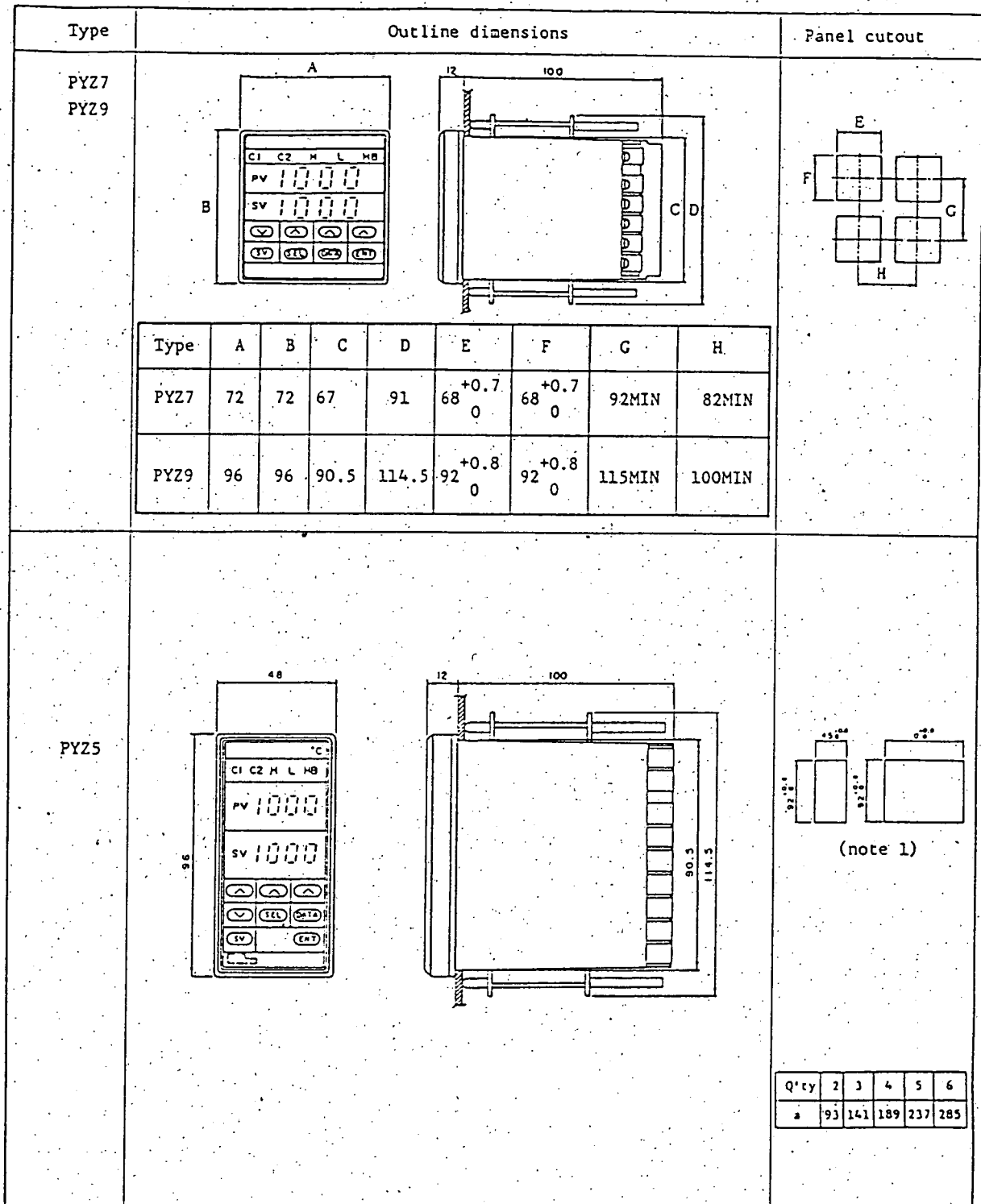


Fig. 7-1

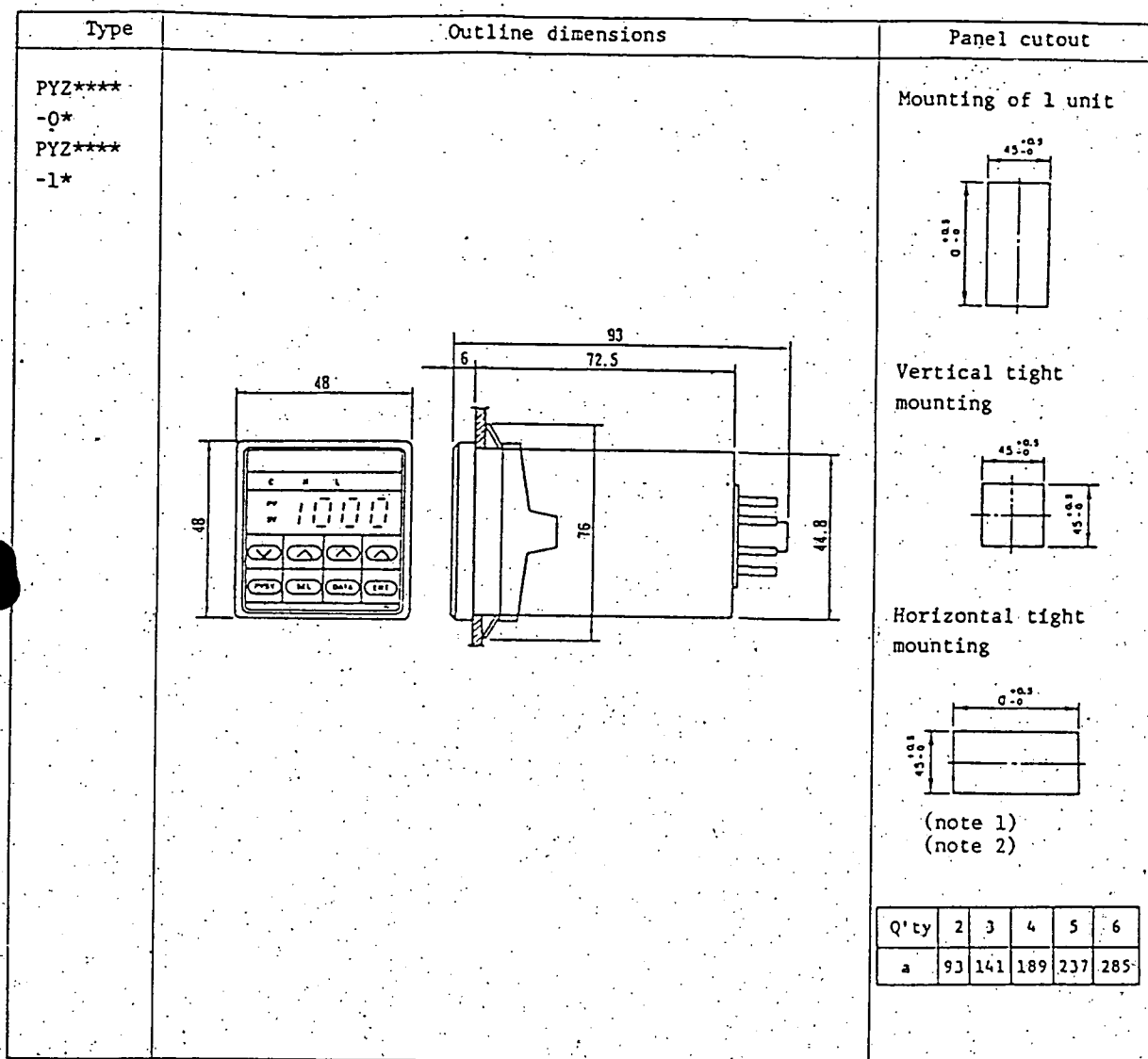


Fig. 7-2

Note 1) When the power source voltage is more than 200V, it is recommended to use a ventilating fan.

Note 2) The socket IP311SB cannot be used.

8. TERMINAL CONNECTION DIAGRAM

PYZ4****-0*

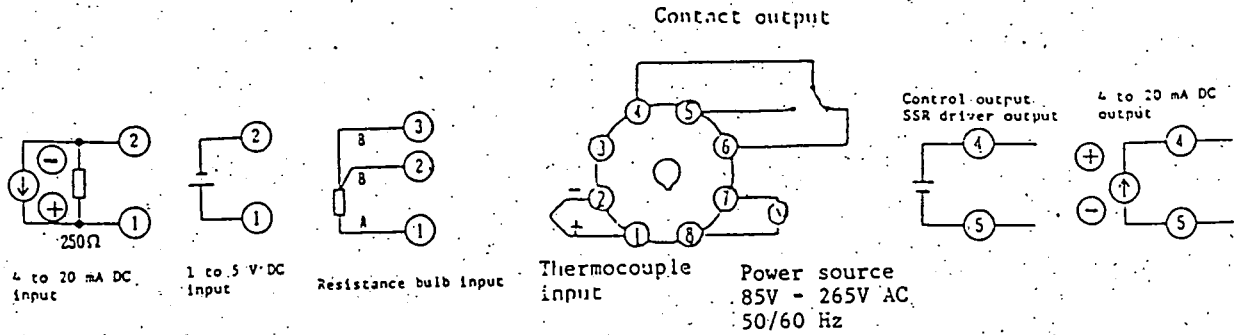


Fig. 8-1

PYZ4****-1*

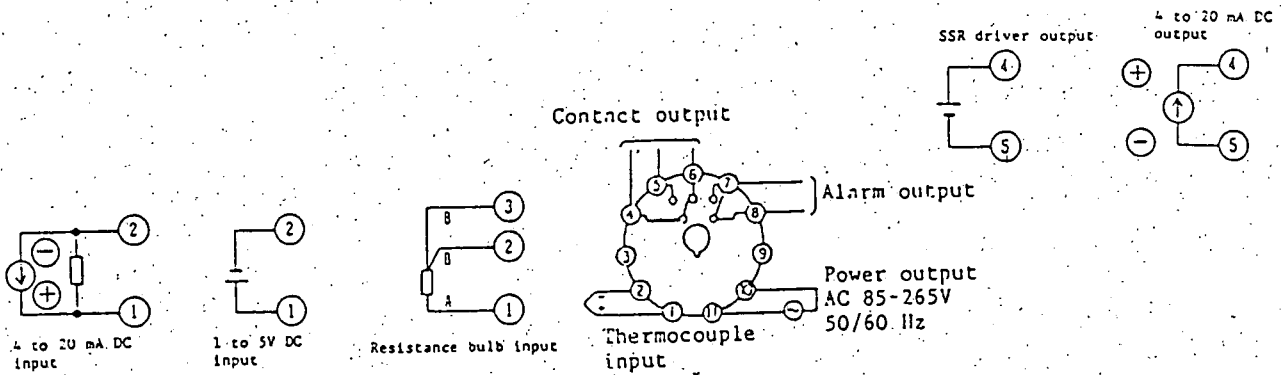


Fig. 8-2

PYZ5, 9

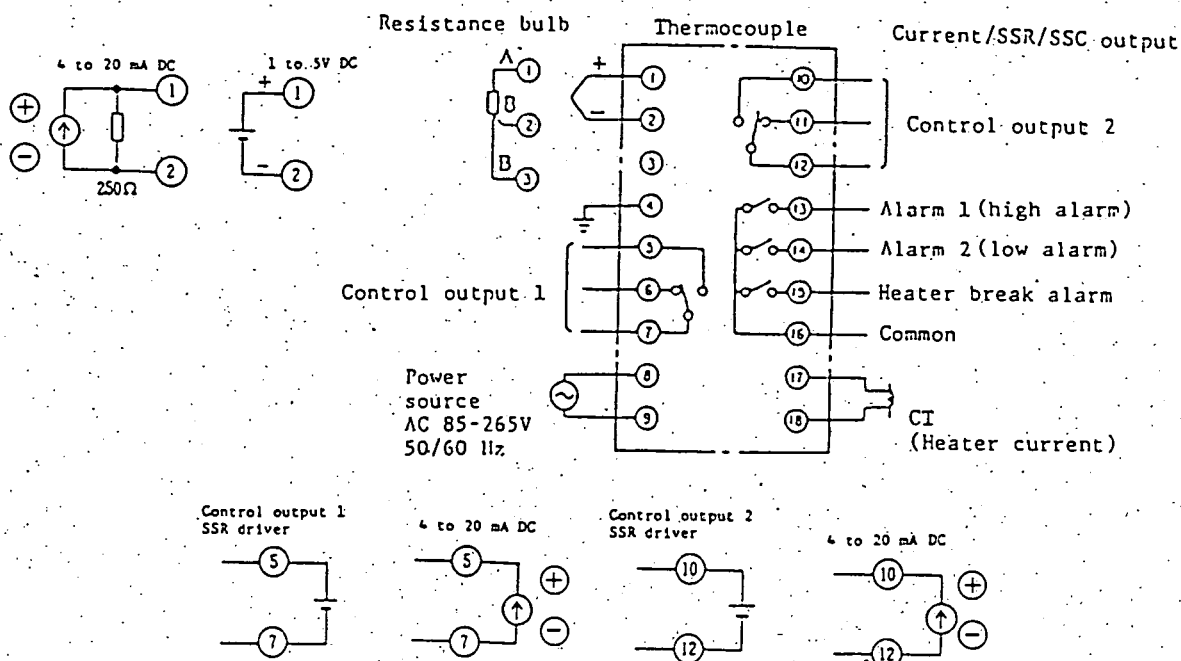


Fig. 8-4

PYZ7

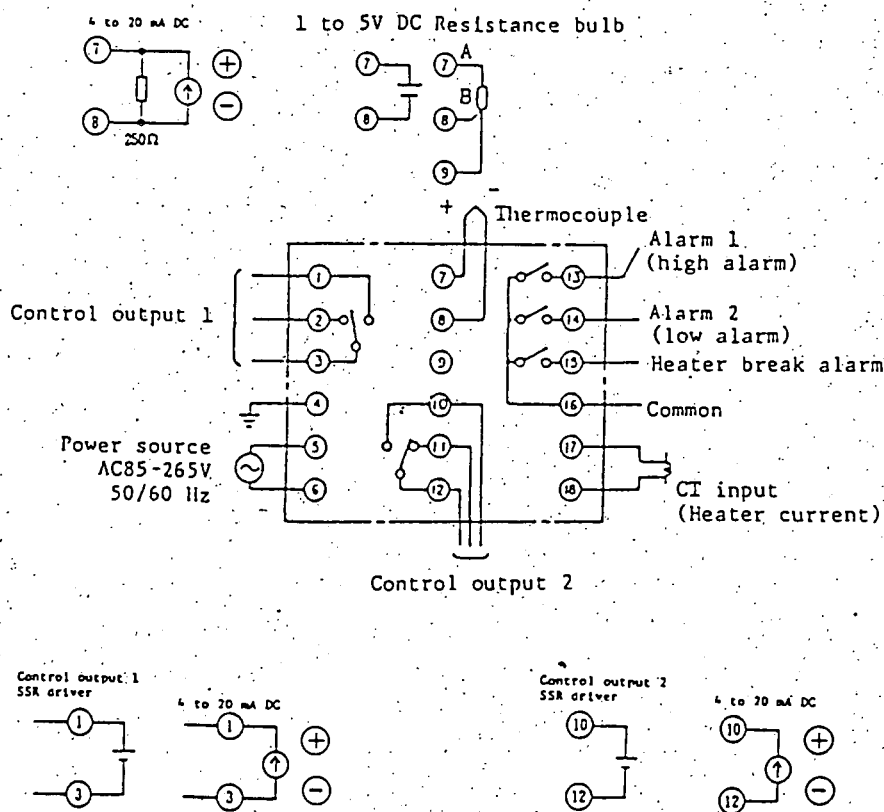


Fig. 8-5

9. CONTROL/ALARM OUTPUT AND INDICATING LAMP

o Output and indication during operation

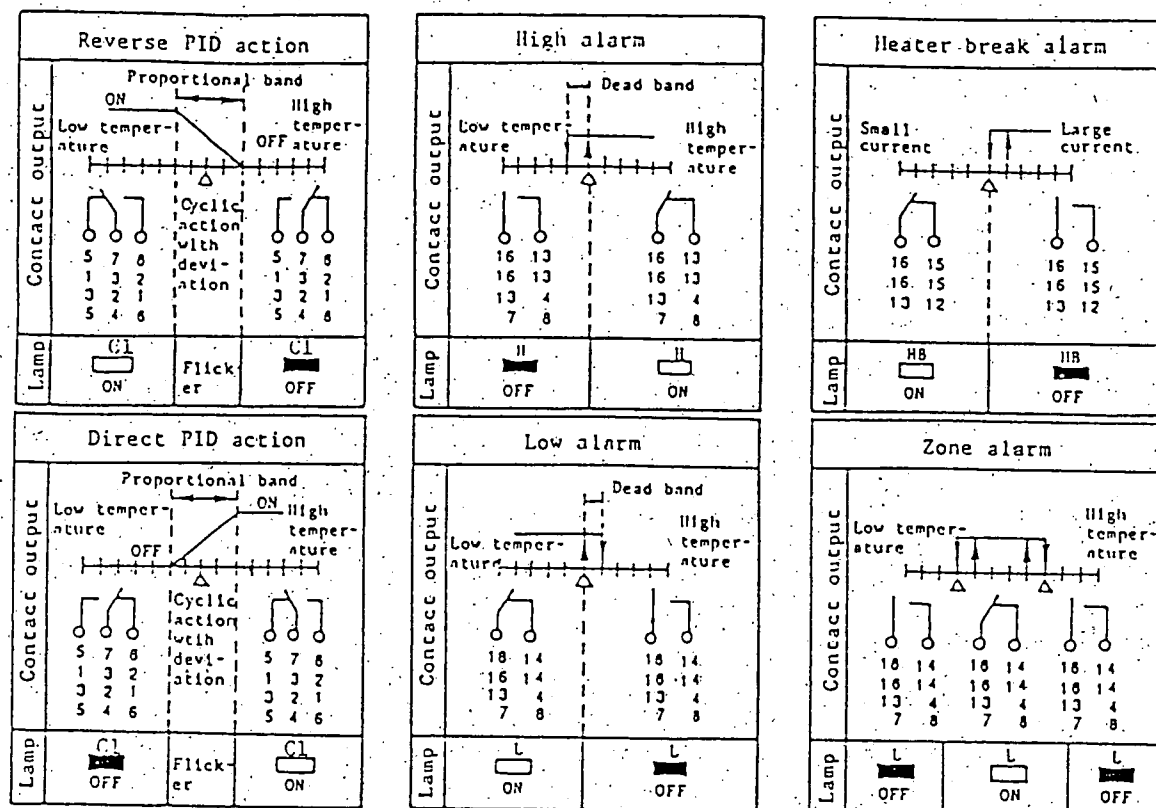


Fig. 9-1

o Output and indication at power OFF

(Note) Terminal No. varies with type of instrument.

Terminal No.:

Uppermost ... PYZ5, 9

Upper PYZ7

Lowermost ... PYZ4****-0*

PYZ4****-1*

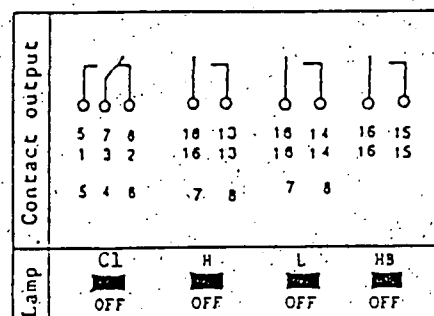
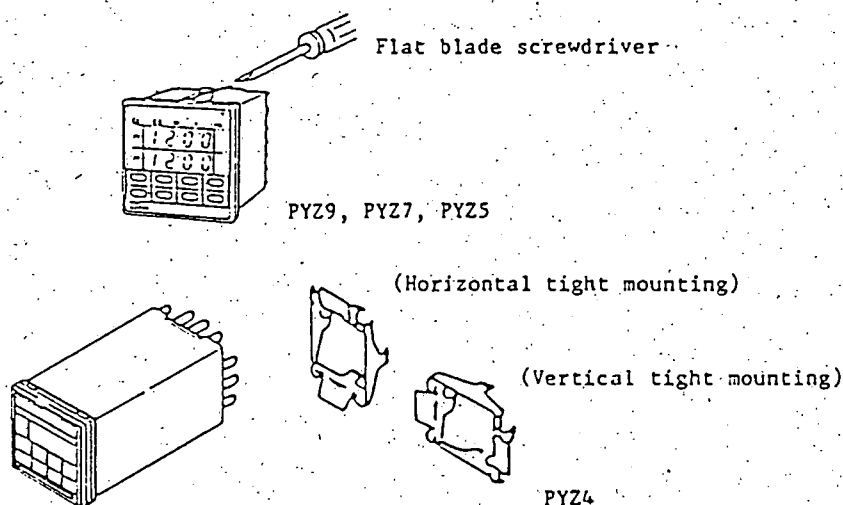


Fig. 9-2

10. CAUTIONS FOR INSTALLATION AND WIRING

o Installation

- . The front panel size of the instrument and the panel mounting size conform to DIN43700 Standards.
- . Recommended panel of PYZ9, PYZ7 and PYZ5 is 1-8 mm thick and the recommended panel of PYZ4 is 1-3.2 mm thick.
- . For installation of PYZ9, PYZ7 and PYZ5, attach the mounting brackets (two) on the top and bottom and tighten with a flat blade screwdriver to the torque of about 1.5 kgcm.
(Plastic case is used. Do not tighten excessively.)

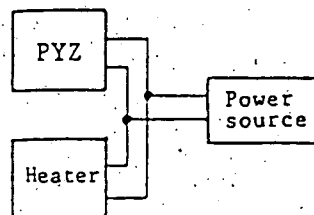


o Environment of installation location

- . Do not install in a place with corrosive gases (sulfuric gas, ammonia, etc.)
- . Do not install in a place subject to vibration, impact, water or high temperature.
- . Do not install in a place where ambient temperature changes suddenly or radiation from furnace is present. Ambient temperature of installation location should be -10 to +50°C.

o Wiring

- . For thermocouple input, connect the specified compensating lead wire.
- . For resistance bulb input, use a lead wire having a small resistance.
- . For instrument with heater break alarm, use the same power source for the heater and the controller to minimize the variation of alarm operating point due to power voltage.



o Use of controller output for sequence circuit

- . When power is ON, it takes about 4-5 seconds until the internal relay starts operating. This should be taken into account when using the controller contact output for the sequence circuit.

o Wiring of load circuit

- . A load connected to the control output should be used within the rating. If it exceeds the rating, it should be connected through a contactor having a larger rating.

The contact output type has its own operating life so the control cycle (TC and TC2) should be extended so as not to affect the control function. In the case of the 2-position control, the hysteresis width should be increased making sure that it does not affect the control function. Also, care should be taken with regard to the alarm output and heater break alarm output when using.

Contact output life:

Mechanical ... More than 10^7 cycles
(at no load)

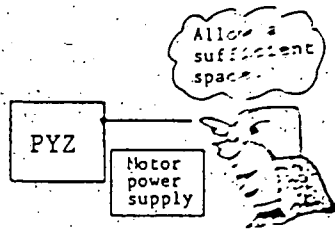
Electrical ... More than 10^5 cycles
(at AC 220V/3A, resistive load)

o Current output ripple

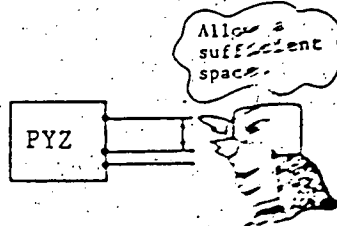
- . Current output (4-20 mA DC) contains about 1.5%FS/2 Hz of ripples.

o Removal of noise

- . The instrument should be installed as far as away possible from a device generating high frequency noise.



- . Input signal and power cables connected to the instrument should be wired away from power line and load line to minimize inductive noise.



- . Instrument power cable should preferably be twisted to avoid noise.



- . Use of noise filter or insulating transformer for the instrument power supply is recommended.

o Wiring for DC 4-20 mA input

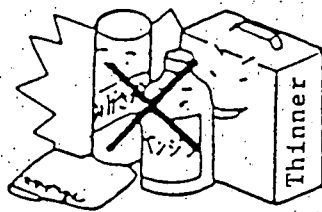
- . When ordering instrument of DC 4-20 mA input specifications, a resistor (250 Ω) will be supplied as an accessory for connection to the input terminal.
- . When using the final control element in the non-insulated type, use the temperature sensor in non-grounding type

o Connection of PYZ9, PYZ7 and PYZ5

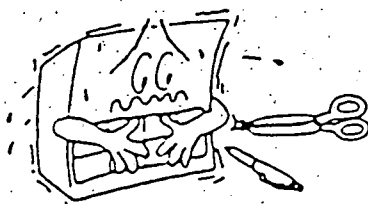
For connection, use round type or fork type M3.5 clamping terminal. The maximum outside diameter of the terminal should be less than 8 mm.

o Caution prior to use

- . To clean the front panel of the instrument, do not use benzine, thinner, etc., as it damages the panel. It should be washed with water or soapy water until the dirt and dust are removed. (The front panel of the instrument is water/dust-proof type based on IEC IP65 standards.)



- . Do not use any tool having a sharp tip when operating the keys on the front panel.



11. SPECIFICATIONS

Table 11-1

Input signal	Thermocouple/resistance bulb, 1 to 5V DC, 4 to 20 mA DC.
Control output signal	Contact (220V AC, 3A, 1c contact), 4 to 20 mA DC (load resistance: less than 600 Ω) SSR drive (24V DC typ./60mA at ON, 0.3V DC max at OFF)
Control action	PID action (2-position action, proportional action possible)
Indicator accuracy	$\pm 0.5\%$ full scale ± 1 digit (better than 400°C with R thermocouple)
Operating cycle	0.5 sec
Indication system	7-segment LED, 4 digits
Effect of external resistance	About 0.5 μ V/ Ω (Thermocouple input) Reading 0.015%/ Ω (per wire), resistance bulb
Attachment	High/low alarm (PYZ4: high or low alarm) Alarm output: 220V AC, 1A, 1a, 2 contact (PYZ4: 1 contact) Heater break alarm (Connected to separately installed Fuji's CT) Alarm output: 220V AC, 1A, 1a contact
Power supply	85-265V AC, 50/60 Hz
Power consumption	About 10 VA/100V AC 18VA/220V AC
Enclosure case	Plastic housing
Ambient temperature	-10 to +50°C
Ambient humidity	90% RH or less

Table 11-2 Input specification

Figures in () include those with decimal point.

Input	Range (°C)	Range (°F)	Remarks
Jpt100 (Old JIS) Pt100 (New JIS)	0 ~ 50 400 (0.0 ~ 100.0, ... 300.0) -150, ... -100 ~ 50, ... 200 (-150.0, ... -100.0 ~ 50.0, ... 200.0)	32 ~ 122, ... 752 -238, ... -148 ~ 122, ... 392	Accuracy is not guaranteed when the range setting is below the minimum.
J	0 ~ 200, ... 1000 (0.0 ~ 200.0, ... 300.0)	32 ~ 392, ... 1832	Accuracy is not guaranteed when the reading is out of range.
K	0 ~ 200, ... 1200 (0.0 ~ 200.0, ... 300.0)	32 ~ 392, ... 2192	
R	0 ~ 1000, ... 1600	32 ~ 1832, ... 2192	$^{\circ}\text{F} = \frac{9}{5} ^{\circ}\text{C} + 32$
T	-0 ~ 200, ... 400 (0.0 ~ 200.0, ... 300.0) -200, ... -100 ~ 200, ... 400 (-199.9, ... -100.0 ~ 200.0, ... 300.0)	32 ~ 392, ... 752 -328, ... -148 ~ 392, ... 752	(NBC standards)
N	0 ~ 200, ... 1300 (0.0 ~ 200.0, ... 300.0)	32 ~ 392, ... 2372	
PL-II	0 ~ 200, ... 1300 (0.0 ~ 200.0, ... 300.0)	32 ~ 392, ... 2372	
DC4~20 mA	-1999 ~ 3000 (Industrial value setting)		Setting of decimal point is possible.
DC1~5V			

Note) When the span of input range is large, the indication may be limited to 3276°F or 327.6°C in the over-range zone. Avoid a wide range setting unnecessarily.

12. ORDERING CODE

Table 12-1

1 2 3 4 5 6 7 8 9 10 digit												Description
P	Y	Z						2	-		V	
4												Front panel size 48 x 48 mm
5												48 x 96 mm
7												72 x 72 mm
9												96 x 96 mm
T												Input signal Thermocouple (°C)
R												Thermocouple (°F)
N												Resistance bulb, Pt 100, 3-wire, (IEC) (°C)
S												Resistance bulb, Pt 100, 3-wire, (IEC) (°F)
A												DC 1 - 5V
B												DC 4 - 20 mA (I/V converter (250 Ω) mounted outside)
A												Control output 1 Contact reverse PID output
B												Contact direct PID output
C												SSR drive reverse PID output
D												SSR drive direct PID output
E												DC 4-20 mA reverse PID output
F												DC 4-20 mA direct PID output
Y												Control output 2 (Not for PYZ4) None
A												Contact reverse PID output
B												Contact direct PID output
C												SSR drive reverse PID output
D												SSR drive direct PID output
E												DC 4-20 mA reverse PID output
F												DC 4-20 mA direct PID output
0												Attachment None
1												With high/low alarm
2												With heater break alarm
3												With high/low alarm + heater break alarm

Mounting socket ordering (PYZ4)

Type	Mounting	Application
ATX2PSB	Panel flush mounting	For non alarm type
ATX1NS (US SOCKET)	Panel flush mounting	
TP28S	Wall mounting	
TP28X	Rail mounting	
TP311SB	Panel flush mounting	For alarm type
HGB	Panel flush mounting	
TP311S	Wall mounting	
TK7A5807P9	Rail mounting	

TOPTec CONTROLS PTY. LTD.

Formerly Hawk Measurement Systems Australia Inc. in Victoria

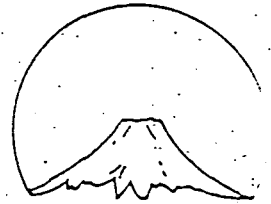
Victoria

3/122 Railway Avenue

Ringwood East Vic 3135

Telephone: (03) 879 5241

Facsimile: (03) 879 5270



TOMORROW'S TECHNOLOGY TODAY

(VERSION 1.2)

Operating Instructions for Fuji Temperature**Controllers Type PYZ**

The following instructions refer to the programming parameters of the PYZ range of controllers. As the instrument is supplied it contains two levels of programming, the first of which is intended for the use of operations personnel, the second is designed to be used by engineering staff in designing the controller to suit the process. Naturally the instrument is supplied with some of the parameters entered at the factory, however these figures will not suit every application, and consequently the instrument must have the flexibility to cope with the particular application. The two displays of the facia refer to the SET POINT (SV) and the PROCESS VARIABLE (PV). While the upper display is dedicated to the function of PROCESS VARIABLE the lower display is utilised as the means of accessing and altering the operating parameters. If at any time you wish to revert to displaying the SV (SET POINT), merely press the SV button. Parameters are accessed by use of the SEL button and the current contents of that parameter are then accessed by pressing the DATA button. Should you wish to change the value of the data, you must press the appropriate \wedge button under the digit which you wish to change. The relevant digit will then flash to confirm that this is the digit which is to be changed. To change the value now press the \wedge button or alternately the \vee button until the required value is reached. To change the existing data you must now press the ENTER button.

Information on the operating parameters is as follows:

P This parameter is known as proportional band and is indicated in percentage. Note! The lower the proportional band the tighter the control - a typical value would be about 10% (factory setting 3)

I Integration in units of seconds. Integration refers to rate of change and the longer the period over which the integration is performed the slower is the response. A typical value for this parameter is 5 seconds. (factory setting is 0)

D Differential in units of seconds (factory setting is 0)

AL Where fitted this refers to the low temperature alarm setting. The value is set in degrees celsius (factory setting 0)

AH Where fitted this refers to the high temperature alarm setting and is in degrees celsius (factory setting 0)

7C Reset rate or proportional cycle time in seconds. This refers to the minimum oscillation interval of the output device which should not be less than 30 seconds for a relay and not less than 1 second for a solid state output. In the case of 4-20 Ma output, this parameter must be set to 0. (Factory setting 30 for Contact output type and 1 for SSR/SSC Output type).

Hys Dead band in percentage. Maximum setting is 20.0%. (factory setting 0.3).

Hb The instrument is capable of monitoring the heating element and this parameter sets the current of the comparator. The setting of this parameter is in amperes and the maximum possible is 50. Optional Current Transformer is necessary (factory setting 0.0)

A7 Auto tuning start parameter. If a 0 is entered auto tuning is disabled and enabled when a 1 is entered. If the auto tuning function is enabled, the controller places the optimum values of P,I and D into these registers. When auto tune is operating a small LED flashes in the bottom right hand corner of the display, and normally the loop should be optimised within two oscillations around set point, after which the auto tune function is disabled and the LED ceases to flash. If auto tune is engaged, (ie this parameter contains 1) then the auto tune function will be instigated on application of power to the instrument. It is suggested that following installation the instrument is run on auto tune to establish the optimum values for P,I and D, and further fine tuning can then be carried out if the customer so desires. If a 2 is placed in this parameter, the auto-tuning function is carried out to 90% of the set point. This function is intended to eliminate possible overshoot during the tuning procedure. (Factory setting 0).

7C2 Cooling side reset rate (measured in seconds) Cool Cooling side proportional band gain (in percentage units) Normally only used if the process has a self generating heat source so as this energy can be used to raise the temperature thereby saving on input temperature. Normally this parameter contains 1, however if the function is required enter 2.0. Available only for dual output type (Factory setting 30 for contact output type and 1 for SSR/SSC output type).

dB Cooling side dead band/overlap band. Inverse function of the heating dead band function and the value is in percent.

Loc This function is intended to limit access to the front panel to eliminate erroneous parameter value changing. If a 0 is entered unlimited access is gained, however a 1 prevents the changing of any other parameters on the instrument. Should a 2 be entered, then the SET POINT (SV) only can be changed. (Factory setting 0)

This concludes the function of the primary menu. Access to the secondary menu is gained by selecting the P parameter and thereafter holding the SEL button down for a period in excess of 10 seconds. After this time has elapsed the first parameter P-n1 will appear. An explanation of the second menu is as follows:

P-n1 For a standard unit the following applies;

- 0 Burnout HI, Controller output reverse
- 16 Burnout HI, Controller output normal
- 1 Burnout LO, Controller output reverse
- 17 Burnout LO, Controller output normal

For a dual output type the following applies;

	Burnout	Controller Output 1	Controller Output 2
2	HI	Reverse	Normal
18	HI	Normal	Normal
34	HI	Reverse	Reverse

	Burnout	Controller Output 1	Controller Output 2
50	HI	Normal	Reverse
3	LO	Reverse	Normal
19	LO	Normal	Normal
35	LO	Reverse	Reverse
31	LO	Normal	Reverse

P-n2 This parameter refers to the selection of the Process Variable input medium and the following numbers represent the appropriate device:

- 1 and 14 Pt (IEC) type RTD (Select switch for TC to RTD is inside the controller)
- 2 J type thermocouple
- 3 K type thermocouple
- 4 R type thermocouple
- * 12 N type thermocouple
- * 13 PL-II type thermocouple
- 7 T type thermocouple
- 9 FR40/20
- 10 Thermistor 1 (-50 to 100 degrees C)
- 11 Thermistor 2 (0 to 150 degrees C)
- 31 1 to 5 Volts DC
- * 31 4 to 20 mA.

P-df Digital filter time constant (set at the factory to 4)

P-SL Lower limit of input scale, ie the minimum value which you require the PV display to read.

P-SU Upper limit of input scale, ie the maximum value which you require the PV display to read.

P-Ab Alarm configuration (factory setting 79)

Differential alarm

- 15 Upper and lower limit
- 10 Upper limit only
- 5 Lower limit only
- 79 Upper & lower with lower limit hold
- 69 lower limit with lower limit hold

Absolute Value Plus Differential

- 7 Upper absolute value plus lower differential
- 11 Lower absolute value plus upper differential
- 75 Lower limit absolute with lower limit hold & upper limit differential
- 71 Upper limit absolute plus lower limit differential with lower limit hold.

Absolute Value Alarm

- 3 Upper and lower limit
- 2 Upper limit
- 1 Lower limit
- 67 Upper and lower limit with lower limit hold
- 65 Lower limit with lower limit hold
- 179 Upper absolute value and lower absolute value
- 183 Upper absolute and lower differential value
- 187 Upper differential and lower absolute value
- 191 Upper differential and lower differential value

P-An Dead band for alarm. (set to 1 at factory)

P-dP Setting of decimal point.

P-48 Function selection compensation for ambient temperature

- 0: PYZ5, 7 & 9 compensation OFF
- 1: PYZ4 compensation OFF
- 2: PYZ5, 7 & 9 compensation ON (Factory set)
- 3: PYZ4 compensation ON (Factory set)

P-C7 Selection of heater rated voltage.

PUOF Zero shift of input value. This is used to enter a constant to offset error in the process variable signal and can be entered as either a positive or negative number.

SUOF Zero shift of set value as referred to in PUOF.

P-F Selection of Fahrenheit (F) and Celsius (C). 0 for C, and 1 for F.

P 150
 I 32
 D 6
 HYS .3
 Ref 6030
 PSU 500
 PSL 0
 SP 250

Diffused acts like a brake
 as you come down to power



GENERAL INSTRUCTION MANUAL

Total head 15m

1.5 kW

3-8 Amps

2915 RPM

TSURUMI MANUFACTURING CO., LTD.

INTRODUCTION

Thank you for selecting the Tsurumi submersible pump.

Our products have been developed with special attention by the technical background and knowhows cultivated for many years.

In order to ensure that you receive the maximum benefit of this equipment, it is recommended that this instruction manual be thoroughly read prior to use, and that all instructions be carefully followed.

Please fill in the information below and retain. These informations will be necessary when requesting parts or service.

Pump Model	
Serial Number	
Date of Purchase	

Contents

Prior to operation.....p.1

Operation

connection to power source.....p.1

direction of pump rotation.....p.2

grounding.....p.3

motor protection device.....p.3

Periodical inspection

electricity.....p.4

pump.....p.5

Trouble-shooting guide.....p.6

Specifications.....p.7

1. Prior to operation

- 1) Check the name plate attached to the pump to confirm that the pump is correct model, and that the discharge dia., output, frequency, voltage, etc. confirm to the valve specified in the leaflet.
- 2) Check to be certain that no damage to the pump has been occurred during the transportation.
- 3) Keep the pump as vertical as possible. If pump is operated in a inclined position, this will cause the abnormal wear of limited part.
- 4) Don't submerge the end of the cabtyre cable. Don't lift the pump by the cable. This will cause the inferior of insulation or the motor burn-out.
- 5) If the length of the cabtyre cable must be extended, handle the joint portion carefully. Don't submerge the joint portion. To do so might result in an electrical short circuit. If the cable is extended too far, a drop in voltage may occurs, which will prevent the motor from starting. Select the proper size of the cable in accordance with extention length.

2. Operation

1) Connection to power source

*Pump with single phase.

Plug in to the power source of single phase.

*Pump with three phase.

Connect the wire U-red, V-white, W-black, X-white, Y-black, Z-red and ground-green with the respective terminals correctly

as shown in Fig.NO.1.

In case of D.O.L.starting, connect the wire, U-red, V-white, W-black and ground-green with the respective terminal correctly as shown in Fig.NO.2.

If the pump is equipped with the miniature protector and leak sensor(electrode), connect the wire, protector-yellow and leak sensor-thin white wire with the respective terminal.

Fig. 1

Star-Delta (11 15 22)

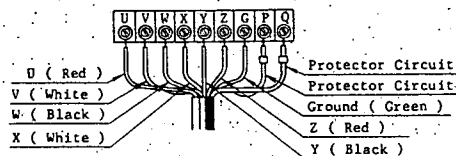
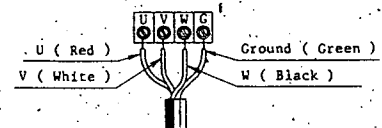


Fig. 2

Direct on line (1.5 2.2 3.7 5.5 7.5)



2) Direction of Pump Rotation

If the wires are connected in accordance with connection method explained in the section NO.2(Operation), the pump rotates correctly. All pumps rotate in the same direction.

That is counterclockwise when viewed from the suction side.

If the direction is reverse, correct the direction as stated below. (The pumps with single phase always rotate in the same direction.)

*D.O.L starting

Change any two of the "U", "V", or "W" phase cores in order to correct.

*Star-Delta starting

Change any two of the "R", "S", or "T" phase cores from the mains.

3) Grounding

It is vital that the unit be properly grounded. The grounding wire on all Tsurumi products is designated by the green color.

4) Motor protection device

The pump has a built-in overload protection device, which has two kinds of the motor protection device, circle thermal protector and miniature protector.

(a) Circle Thermal Protector

The pump automatically stops in case of detecting overcurrent, overheat or any other overheating condition by the circle thermal protector. When the motor cooling takes place, the protector is automatically reset and the pump resumes operation. (Circle thermal protector is built in the pump for the output of less than 22kw. Some of the pumps of less than 22kw have exceptionally built-in miniature protector.)

(b) Miniature Protector

They are built in the stator windings. When the temperature of the motor rises unusually, the contactor on bimetal opens to switch off magnetic contactor in startor or control panel. The miniature protectors should be accompanied with the control panel exclusive for it. Therefore, you are requested to use our standard stator or control panel.

Against the overcurrent the thermal relay built in the panel responds to the overcurrent and shuts off the circuit.

(The thermal relay is built in the pump with the output of over 22kw, but there may have possible cases that it is built in the pump with the output of over 11kw.)

Before the pump restarts after automatic stoppage by the protector, eliminate the cause of the trouble without fail.

Be certain that the power source is switched off before fixed up.

3. Periodical Inspection

1) Electricity

- a. Check the power source regularly to make sure that the specified voltage and current are being supplied.
- b. Check to be certain that the capacity of breaker switch is of proper capacity and also that spare fuses are to be provided.
- c. Check to be certain that the control setting of all equipment indicates the proper value (Thermal Relay, 3-E Relay, etc.).
- d. Use a 500V megger tester to measure the electrical insulation of the motor regularly. Measure the insulation value between the conductors designated U.V.W. and earth by a megger tester, and make sure that the value is more than 1M Ω . If the reading is less than 1M Ω , the motor or the cable should be fixed up.

2) Pump

a. Inspection of lubricating oil

Inspection Cycle : Every 3,000 hours of the operation

Replacement : Every 6,000 hours of the operation

Remove the oil plug and drain the oil completely. If water is found to be mixed with the oil (which may be indicated by a milky condition), the shaft seal of the pump must be replaced. If the drained oil is found to be in normal condition, replace it with the specified amount of fresh oil (ISO SG 32 Turbine Oil), and tighten the oil plug securely.

Note : Replace the O-Ring of the oil plug, if it is found to be defective.

b. Replacement of impeller

If the pump performance noticeably decreases, it may be an indication that the impeller has got worn out due to the clogging of miscellaneous matters or pumping up abrasive materials. If this is true, the impeller must be replaced as soon as possible. It is advised that the suction cover may be replaced as well in order to get continuous maximum performance.

c. In case that the pump is not on duty it is advisable that the pump is stored in the dried indoor location after pump inside and outside are washed by clean water.

4. Trouble-shooting guide

Faults	Possible Cause	Correction
Pump will not start	1.No electric power 2.Cable cut/broken or poor electric connection 3.Low voltage 4.Impeller obstructed by something 5.Fuse melted	1.Turn power on 2.Change cable or clean connection 3.Check power source 4.Remove obstruction 5.Replace with proper size
Stops during operation	1.Impeller obstructed 2.Overload protector actuated	1.Remove obstruction 2.Solve the causes that have it overloaded
Reduction in pumping capacity	1.Voltage drop 2.Reverse rotation 3.Piping is blocked 4.Impeller worn	1.Increase the voltage 2.Interchange with 2 of 3 wires for the pump with 3-phase (*) 3.Remove the blockade 4.Replace with new one

* (The pumps with single phase always rotate in the same direction)


TSURUMI PUMP

 No. **A-00553E-1**

性能曲線図

CHARACTERISTIC CURVES

TITLE 名称	SUBMERSIBLE STAINLESS-STEEL PUMP 水中ケミカルポンプ	TYPE 型式	15-CL2	FREQUENCY 周波数	50 Hz
-------------	---	------------	--------	------------------	-------

CUSTOMER'S NAME

御注文先

殿

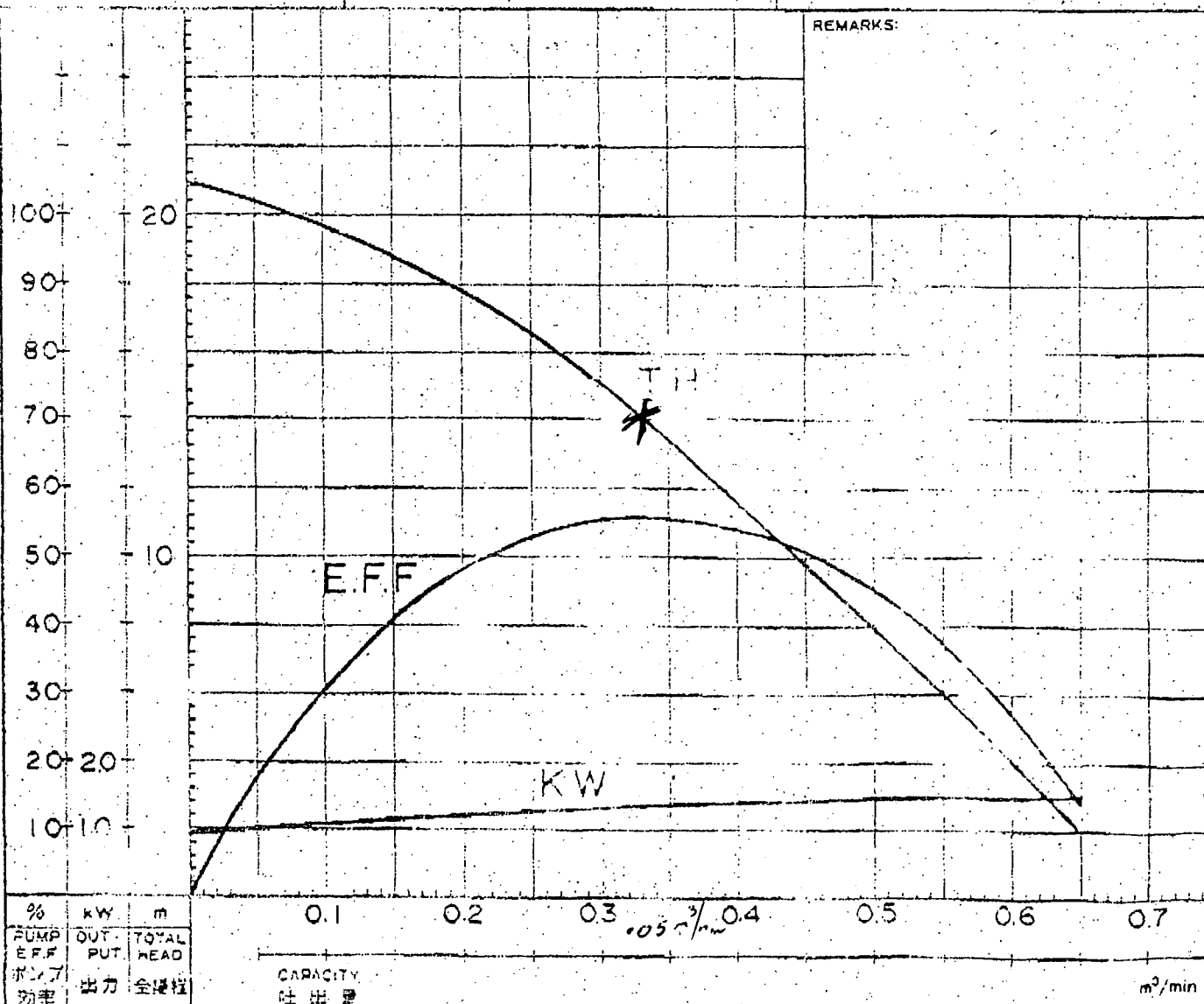
EQUIPMENT TITLE

機器名称

No.

	標準仕様	STANDARD SPECIFICATIONS	御注文仕様	REQUIRED SPECIFICATIONS
口 径 : DISCHARGE	80	mm		
全 揚 程 : TOTAL HEAD	15	m		
吐 出 量 : CAPACITY	0.3	m ³ /min		m ³ /min
出 力 : OUTPUT	1.5	kW		
相×電圧 : PHASE×VOLTAGE	3 φ×	V	φ×	V
電 流 : CURRENT		A		A
極数 : POLES/回転数 : REVOLUTION	2 P/ 3000	r.p.m.		
起動方式 : STARTING METHOD	直入起動	DIRECT ON LINE		
絶 縁 : INSULATION CLASS	E			

REMARKS:



%	kW	m			
PUMP	OUT.	TOTAL			
E.F.F.	PUT.	HEAD			
ポンプ	出力	全揚程			
効率			CAPACITY		
			吐出量		m ³ /min

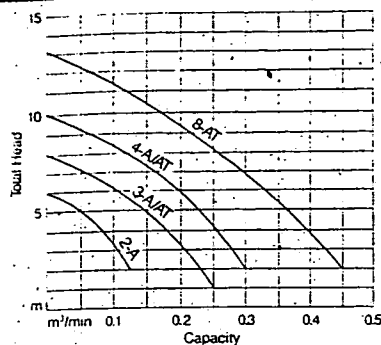
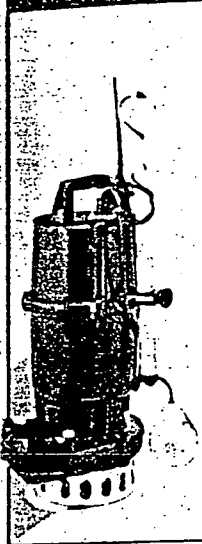
株式会社 鶴見製作所

TSURUMI MANUFACTURING CO.

CHECKED BY

A SERIES AUTO PUMP

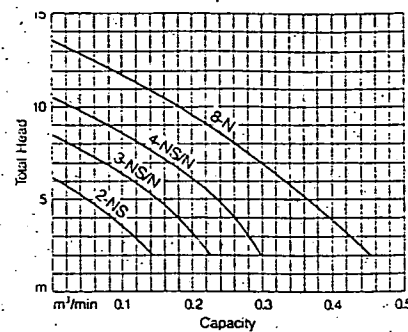
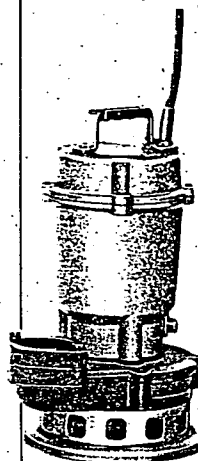
0.15kW to 0.75kW
φ32mm to 50mm



MODEL	DISCHARGE BORE	MOTOR OUTPUT
2-A	32mm (1 1/4")	0.15kW (1/5HP)
3-A	40mm (1 1/2")	0.25kW (1/3HP)
3-AT	40mm (1 1/2")	0.25kW (1/3HP)
4-A	50mm (2")	0.4kW (1/2HP)
4-AT	50mm (2")	0.4kW (1/2HP)
8-AT	50mm (2")	0.75kW (1HP)

N SERIES DRAINAGE PUMP

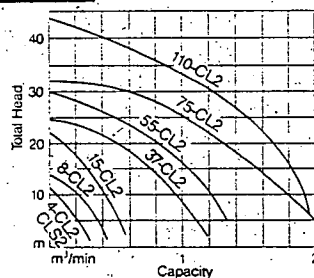
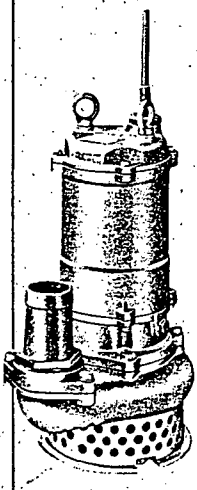
0.15kW to 0.75kW
φ32mm to 50mm



MODEL	DISCHARGE BORE	MOTOR OUTPUT
2-NS	32mm (1 1/4")	0.15kW (1/5HP)
3-NS	40mm (1 1/2")	0.25kW (1/3HP)
3-N	40mm (1 1/2")	0.25kW (1/3HP)
4-NS	50mm (2")	0.4kW (1/2HP)
4-N	50mm (2")	0.4kW (1/2HP)
8-N	50mm (2")	0.75kW (1HP)

CL2 SERIES STAINLESS STEEL PUMP AISI 316

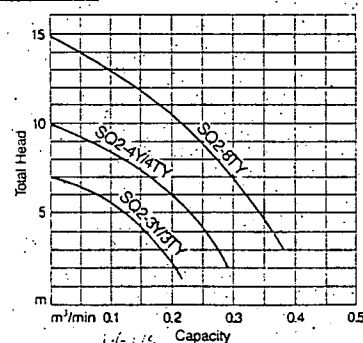
0.4kW to 11kW
φ50mm to 100mm



MODEL	DISCHARGE BORE	MOTOR OUTPUT
4-CL2	50mm (2")	0.4kW (1/2HP)
8-CL2	50mm (2")	0.4kW (1/2HP)
15-CL2	80mm (3")	0.75kW (1HP)
37-CL2	80mm (3")	1.5kW (2HP)
55-CL2	100mm (4")	3.7kW (5HP)
75-CL2	100mm (4")	5.5kW (7 1/2HP)
110-CL2	100mm (4")	7.5kW (10HP)

SQ SERIES STAINLESS STEEL PUMP AISI 304

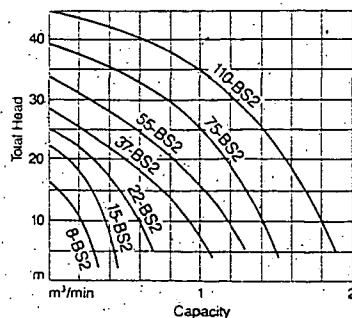
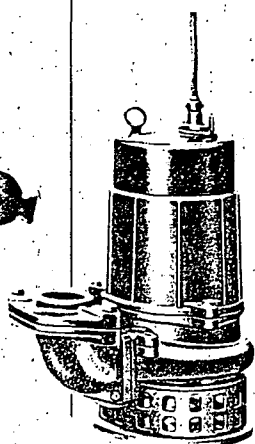
0.25kW to 0.75kW
φ40mm to 50mm



MODEL	DISCHARGE BORE	MOTOR OUTPUT
SQ2-3Y	40mm (1 1/2")	0.25kW (1/3HP)
SQ2-3TY	40mm (1 1/2")	0.25kW (1/3HP)
SQ2-4Y	50mm (2")	0.4kW (1/2HP)
SQ2-4TY	50mm (2")	0.4kW (1/2HP)
SQ2-8TY	50mm (2")	0.75kW (1HP)

BS SERIES DRAINAGE PUMP

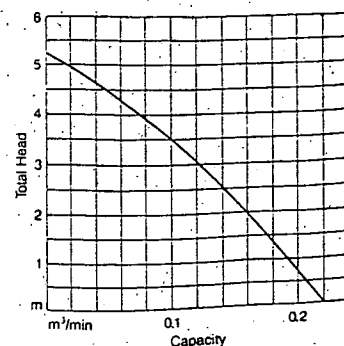
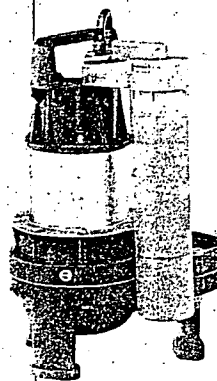
0.75kW to 11kW
φ50mm to 100mm



MODEL	DISCHARGE BORE	MOTOR OUTPUT
8-BS2	50mm (2")	0.75kW (1HP)
15-BS2	50mm (2")	1.5kW (2HP)
22-BS2	80mm (3")	2.2kW (3HP)
37-BS2	80mm (3")	3.7kW (5HP)
55-BS2	100mm (4")	5.5kW (7 1/2HP)
75-BS2	100mm (4")	7.5kW (10HP)
110-BS2	100mm (4")	11kW (15HP)

OMU SERIES CELLER DRAINAGE PUMP

0.15kW
φ50mm



MODEL	DISCHARGE BORE	MOTOR OUTPUT
OMU-2	50mm (2")	0.15kW (1/5HP)
OMU-2	50mm (2")	0.15kW (1/5HP)

WOLF MANUFACTURING PTY LTD

295 CULLEN AVENUE

EAGLE FARM QLD 4009

PHONE: (07) 268 1933

FAX: (07) 268 1408



TO: B.C.C.
FROM: KEN WALSH
ATTENTION: BARRY DIENIEN

DATE: 30.9.91
DESPATCH NO: 0705
NO. OF PAGES: 3
(INCLUDING THIS ONE)

FAX NO: 860 46 87.
(PLEASE NOTIFY OUR OFFICE ON (07) 268 1933 IF ANY PART OF
THIS MESSAGE FAILS TO TRANSMIT)

M E S S A G E :

- *Centrifugal Fans
- *Industrial Blowers ...
- *Axial Fans
- *Forward Curve Fans ...
- *In-line Centrifugals ...
- *Roof Units
- *Cyclones
- *General Fabrication ..
- *Air Filters
- *Manometers
- *Magnahelic Gauges
- *Air Diffusers
- *Industrial Radiators ...
- *Activated Carbon Prods ...
- *On-site Balancing
- *Gulliotining 6 x 3000 ...
- *Fuel Tank Bases
- *Pump Base & Assemblies ...
- *Stainless Steel Welding ...
- *Aluminium Welding

RE: WOLF 2 STAGE H.P. BLOWER FAN
AND ACOUSTIC ENCLOSURE FOR
LAND FILL GAS.

PLEASE FIND ATTACHED OUR LAYOUT
OF THIS FAN AND THE ENCLOSURE.
ALSO PLEASE FIND PERFORMANCE
CHARACTERISTIC CURVES.

WE TRUST THAT THIS IS SUFFICIENT
FOR YOUR IMMEDIATE REQUIREMENTS
HOWEVER IF YOU HAVE ANY OVERIES
PLEASE DO NOT HESITATE TO
CALL ME.

REGARDS

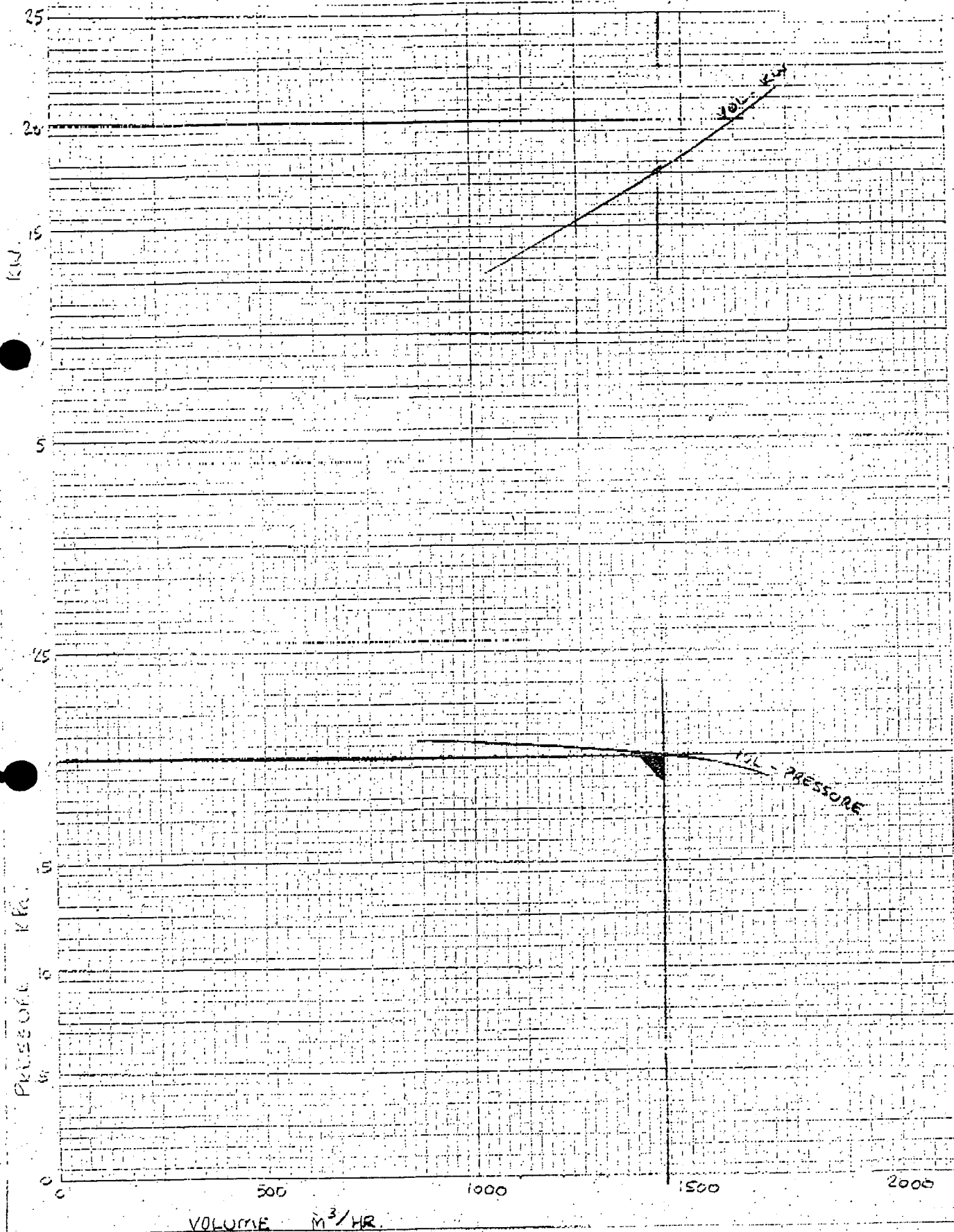
Ken Walsh
SALES ENGINEER

WOLF FAN CHARACTERISTIC CURVES

SIZE: 12/WT-11-10

TYPE: 2 STAGE TURBO

SPEED: 2900 R.P.M.

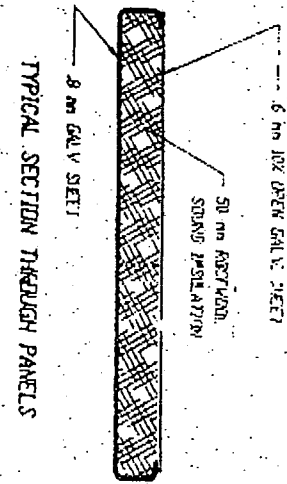


DESIGN NO. F5551001

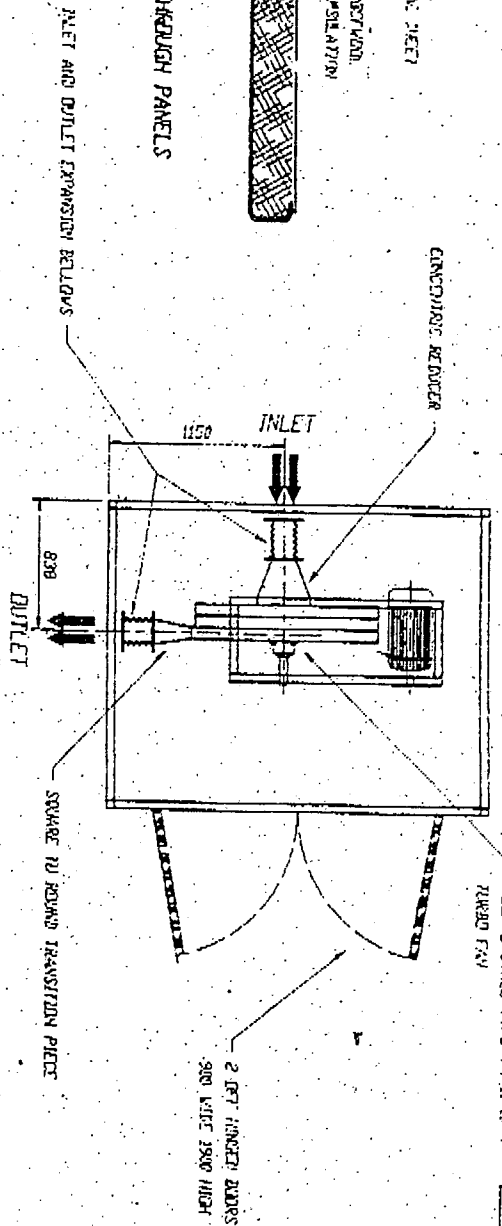
SCALE

10

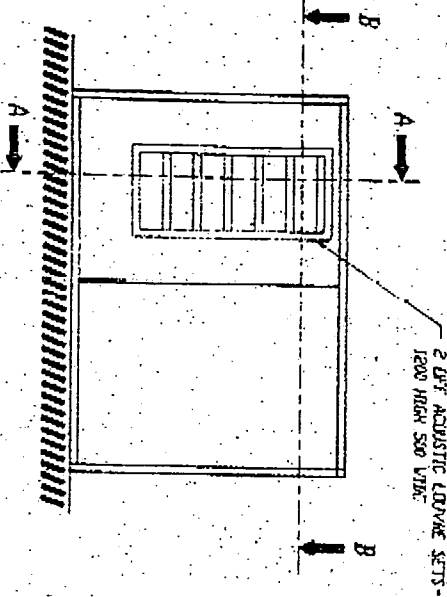
REVISION IDENTIFIER	DATE	DESCRIPTION
A	25/9/9	ORIGINAL



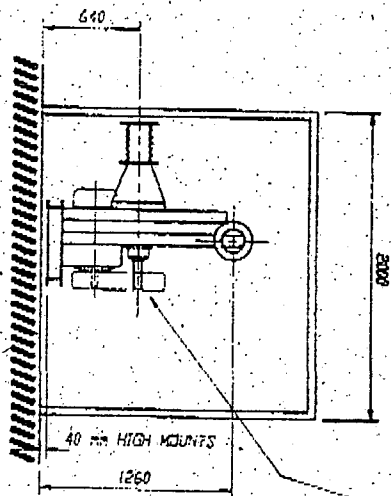
TYPICAL SECTION THROUGH PANELS



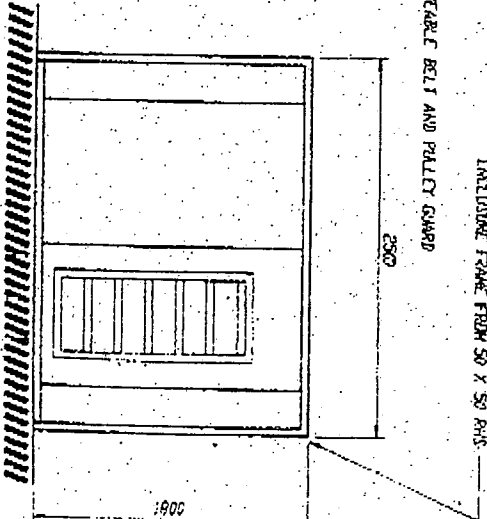
SECTIONAL TOP VIEW DN BB



LEFT HAND SIDE VIEW



SECTIONAL FRONT VIEW DN AA



RIGHT HAND SIDE VIEW

ALL DIMENSIONS IN mm TOLERANCE ± 0.5 mm UNLESS STATED		WOLF MANUFACTURING PTY. LTD. 250 QUEEN AVE. (PO BOX 4000) MILBURN VIC. 3113	
DESIGNER	ENGINEERS	2 STAGE TURBO FAN AND ENCLOSURE LAYOUT DRAWING	
CHECKED	DESIGNED BY	F5551001	SHEET 1 OF 1
APPROVED	DATE	25/9/9	A2

BACTON AND NUDGE ROAD BLOWER OPERATIONAL PARAMETERS AND SUPPLIERS

EQUIPMENT: Fuji PID Loop Controller
PYZ Type

Supplier: Emsby
38 Achievement Cres
ACACIA RIDGE 4077
274 2566

<u>Address</u>	<u>Parameter</u>	
	<u>Bacton</u>	<u>Nudgee</u>
P	36	86
I	27	12
D	1	1
HYS	.3	.3
Pdf	1	1
PSU	3 500	2 000
PSL	0	0
SP	Variable	Variable

EQUIPMENT: Variable Speed Drive

Bacton FRN 075 P7-4 75kW 150amp Fuji
Nudgee FRN 055 P7-4 55kW 110amp Fuji

Emsby
38 Achievement Cres
ACACIA RIDGE 4077
274 2566

<u>Address</u>	<u>Parameter</u>	<u>Address</u>	<u>Parameter</u>	
			<u>Bacton</u>	<u>Nudgee</u>
10	50	14	50	
11	50	15	00	
12	415	16	210	
13	0	17	220	
		18	105	
		19	C-5	
		1A	00	
		1B	66	63
		20	0.7	
		21	10	
		22	0.5	

EQUIPMENT: Rosemount Differential Transmitter D.P.

Bacton - Oriface - Flow Rate Diff Press
137.514mm - 3500m³/hr 5.33KPa

Nudgee - 126.936mm - 2000m³/hr 2.492KPa

SUPPLIER

Rosemount Instruments
4/139 Sandgate Rd
ALBION 4010
262 8577

EQUIPMENT: Delivery Line pressure switch

SUPPLIER

BACTON & NUDGE ROAD BLOWER

OPERATIONAL PARAMETERS AND SUPPLIER

EQUIPMENT: MICRO 2000 Gas Detector

SUPPLIER

Control Equipment
105 Commercial Rd
FORTITUDE VALLEY 4006

LOCATION	CHANNEL	GAS TYPE	RANGE	ALARM SETTINGS		
				WARN ALARM 1	ALARM ALARM 2	HIGH ALARM 3
INLET MANIFOLD	1	OXYGEN	0-20.9% OXY where 20% = 100% F.S.D.	10%	12%	15%
ABOVE BLOWER ENCLOSURE	2	METHANE COMBUSTIBLE	0-100%LEL	20%	35%	50%
INSIDE BLOWER ENCLOSURE	3	METHANE COMBUSTIBLE	0-100%LEL	20%	35%	50%
ABOVE ENGINE	4	METHANE COMBUSTIBLE	0-100%LEL	20%	35%	50%

LEL - LOWER EXPLOSIVE LEVEL

Sail Switches S688A Honeywell

SUPPLIER

Auslec
Commercial Rd
FORTITUDE VALLEY 4006
854 1661

EQUIPMENT: Vibration Monitor
Dual Channel Vibration VM2C
Alarm level 5.5mm/sec
Danger level 9.5mm/sec

SUPPLIER

Howden Sirroco
97-103 Pacific Hwy
NORTH SYDNEY 2060
(02) 929 4566

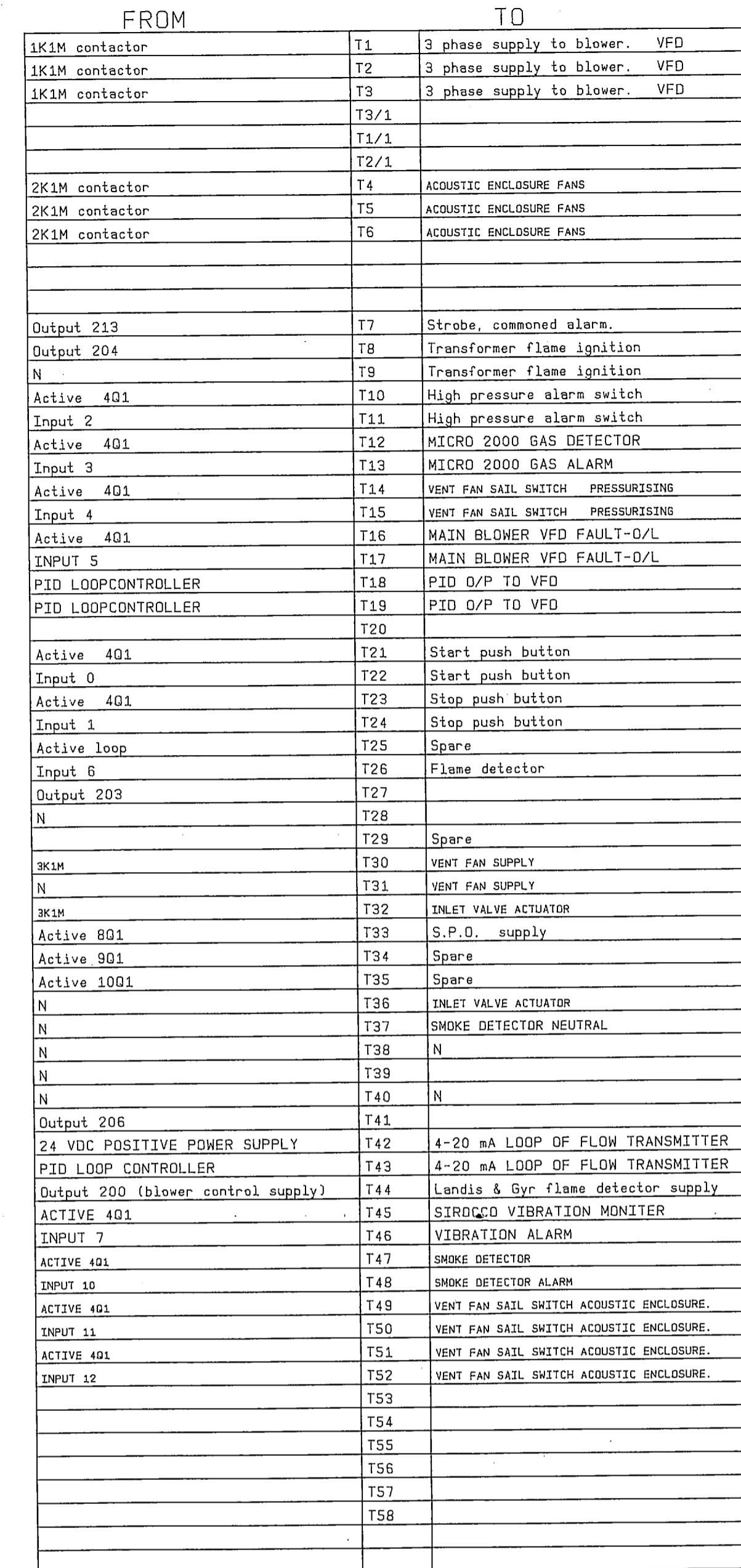
Acceluometer: VIBRA-metrics
Hamden CT, USA
SIN 2055


EQUIPMENT: Pneumatic operated actuator

SUPPLIER

Keystone
2 Jenner St
NUNDAH 4012
266 5766

P. Tranter
8-5-93



C	7/92	AS WIRED	PWT
A	2.91	ORIGINAL	PWT
No	DATE	AMENDMENT / ISSUE TO / ISSUE FOR	INITIALS
AMENDMENT & ISSUE REGISTER			
MANAGER		DIRECTOR OF PLANNING & DESIGN	
DATE:		DATE:	
DIRECTOR OF CONSTRUCTION		DIRECTOR OF M & E SERVICES	
DATE:		DATE:	
DIRECTOR OF CONSTRUCTION		DIRECTOR OF SEW. OPERATIONS / W.S. DISTRIBUTION	
DATE:		DATE:	
DESIGN	P. T.	12.2.91	ENGINEER IN CHARGE
DRAWN	P. T.	12.2.91	SUPERVISING ENGINEER
TRACED			LEVEL BOOK
CHECKED	P. T.	12.2.91	FIELD BOOK
A.H.DATUM			SURVEYED
CADD FILE No.			REFERENCES
7450001C			
 BRISBANE CITY COUNCIL DEPARTMENT OF WATER SUPPLY & SEWERAGE MECHANICAL & ELECTRICAL SERVICES			
PROJECT:			
REFUSE TIP REHABILITATION.			
TITLE:			
ROGHAN RD, GAS EXTRACTION & INCINERATION.			
SCALE: NTS		No. 1 OF 1	SHEETS
DRAWING No.			AMEND.
486/7/45-MV1E0001E			C

413
414
415
416
417
420
421
422
423
424
425

441
442
443
444
445
446
447
450
451
452
453

arrows, Pg Up/Dn, Ins/Del key to edit PRT SC print-dump F10 to quit

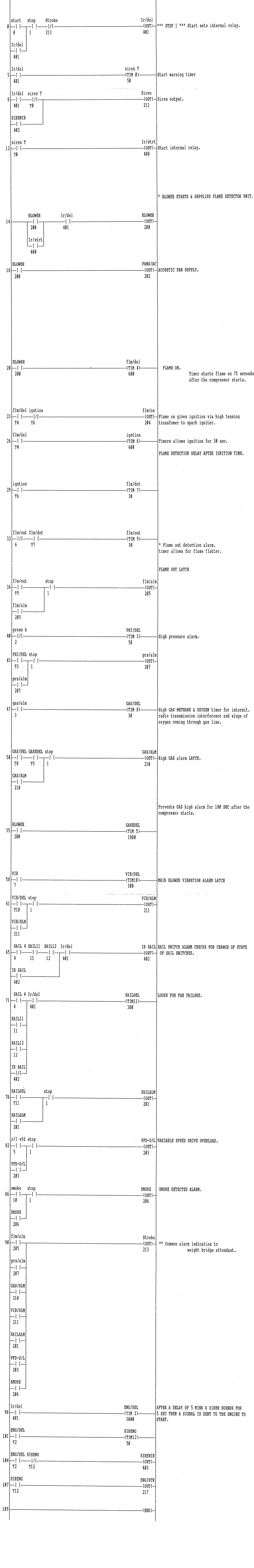
Timer (0-79)

```
+ 0 siren T Start warning timer.      22
  1                                     23
+ 2 ENG/DEL ENGINE START DELAY        24
+ 3 PHI/DEL PRESSURE HIGH DELAY       25
+ 4 flm/del flame start up delay      26
+ 5 GASHDEL oxygen high delay .       27
+ 6  ignition Ignition duration.      28
+ 7 flm/det Flame detection allowed.  29
+ 8 GAS/DEL Radio & oxy slugs delay.   30
+ 9 flm/out Allows for flame flutter. 31
+ 10 VIB/DEL VIBRATION ALARM DELAY    32
+ 11 SAILDEL SAIL SWITCH ALARM DELAY  33
+ 12 SIRENG                           34
  13                                  35
  14                                  36
  15                                  37
  16                                  38
  17                                  39
  18                                  40
  19                                  41
  20                                  42
  21                                  43
```

arrows, Pg Up/Dn, Ins/Del key to edit PRT SC print-dump F10 to quit

Roghan Rd Dump Site

* Waste Bio-gas Extraction and Incineration.
* VERSION 13 27-4-92
* WATER SUPPLY AND SEWERAGE M&E TECHNICAL SUPPORT
* FILE NAME:ROGHELOW



Input (8-157)

+ 0	start start button	26
+ 1	stop stop button	27
+ 2	press h high pressure switch	30
+ 3	gas/alm micro 2000-gas alarm	31
+ 4	SAIL 4 vent fan sail switch PRRS	32
+ 5	o/l vfd blower vfd o/l	33
+ 6	flm/out flame out detected	34
+ 7	VIB sirocco vibration detect.	35
+ 10	smoke smoke detector	36
+ 11	SAIL11 ACOUSTIC SAIL SWITCH	37
+ 12	SAIL12 ACOUSTIC SAIL SWITCH	40
13		41
14		42
15		43
16		44
17		45
20		46
21		47
22		50
23		51
24		52
25		53

arrows, Pg Up/Dn, Ins/Del key to edit PRT SC print-dump F10 to quit

Output (200-357)

+200	BLOWER BLOWER & FLAME DETECTOR.	226
+201	SAIL11M PAN SAIL SWITCH	227
+202	PANS/AC PANS IN ACOUSTIC ENCLOSURE	230
+203	VFD-O/L OVERLOAD VAR FREQ. DRIVE	231
+204	flm/on flame ignition start	232
+205	flm/alm flame alarm detected	233
+206	SMOKE SMOKE ALARM	234
+207	prs/alm high pressure ind alarm	235
+210	GAS/ALM HIGH GAS ALARM OXY & CH4	236
+211	VIB/ALM VIBRATION ALARM BLOWER	237
+212	Siren Start warning siren	240
+213	Strobe Common external ind.	241
214		242
215		243
216		244
+217	ENG/STR ENGINE START SIGNAL	245
220		246
221		247
222		250
223		251
224		252
225		253

arrows, Pg Up/Dn, Ins/Del key to edit PRT SC print-dump F10 to quit

Internal relay group 1 (400-557)

+400	Ir/strt internal relay start	426
+401	Ir/del internal relay startdelay	427
+402	IR SAIL INTERNAL RELAY SAIL SW'S	430
+403	SIRENIR INTERNAL RELAY ENG SIREN	431
404		432
405		433
406		434
407		435
410		436
411		437
412		440
413		441
414		442
415		443
416		444
417		445
420		446
421		447
422		450
423		451
424		452
425		453

arrows, Pg Up/Dn, Ins/Del key to edit PRT SC print-dump F10 to quit

Timer (0-79)

+ 0	siren T Start warning timer.	22
1		23
+ 2	ENG/DEL ENGINE START DELAY	24
+ 3	PHI/DEL PRESSURE HIGH DELAY	25
+ 4	flm/del flame start up delay	26
+ 5	GASHDEL oxygen high delay	27
+ 6	ignition Ignition duration.	28
+ 7	flm/det Flame detection allowed.	29
+ 8	GAS/DEL Radio & oxy slugs delay.	30
+ 9	flm/out Allows for flame flutter.	31
+ 10	VIB/DEL VIBRATION ALARM DELAY	32
+ 11	SAILDEL SAIL SWITCH ALARM DELAY	33
+ 12	SIRENG	34
13		35
14		36
15		37
16		38
17		39
18		40
19		41
20		42
21		43

arrows, Pg Up/Dn, Ins/Del key to edit PRT SC print-dump F10 to quit

* Roghan Rd Dump Site
* Waste Bio-gas Extraction and Incineration.
* VERSION 13 27-4-92
* WATER SUPPLY AND SEWERAGE M&E TECHNICAL SUPPORT
* FILE NAME ROGBLOW.*

