MF 1/BW 30/V 3

Circulating Lubrication Unit

VOGEL®
Centralized
Lubrication

Vogel Lubrication Inc.
1008 Jefferson Ave.
Newport News, VA 23607
Ph. (757) 380-8585
Fax. (757) 380-0709

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Contents

Operating Instructions

Technical Drawings

Pump Specifications

Component Specifications

Certificates of Conformance/Compliance

Area of application

These pumps are exclusively designed for the supply of lubricant in centralized lubrication systems and hydrostatic bearings. Any other or additional use shall be deemed to be contrary to the designated use. VOGEL will accept no liability for any resulting damage.

For trouble-free operation, the following must be taken into account:

⚠ **Only lubricants permitted for the pump type may be used (see table). Unsuitable lubricants can lead to a failure of the pump unit , and thus the lubrication system. This can cause extensive damage to the machine.**

Safety instructions

These pumps have been constructed in accordance with the generally accepted rules of technology and the work protection and accident prevention regulations. However. dangers may arise from their use which may cause physical injury to the operator, third parties or damage to the machine and other property. The pumps must therefore only be used when in technically immaculate condition, only in accordance with the designated use, with due regard to considerations of safety and danger prevention and in accordance with the operating instructions.

In particular, any defects which may affect safety must be corrected immediately.

⚠ **Electrical connection of the pumps must only be carried out by properly trained personnel. Incorrectly connected machines may cause extensive damage to property and injury to persons.**

⚠ **Repair work must only be carried out after the machines have been disconnected from the power supplies by the proper specialist personnel. Work carried out on machines that have not been disconnected can cause serious injury.**

⚠ **The lubrication system may be under pressure. Therefore it must be depressurized before any extension, alteration or repair work is begun.**

⚠ **When repairing piston distributors, remember that the pistons are under spring pressure. Appropriate safety measures must be adopted.**

Function

1. Pumps for piston distributor systems

The gear pump pumps the lubricant from a separate container or a container mounted to the pump, via a built-in pressure and pressure relief valve to the piston distributors of the system.

Under the pressure of the lubricant, the lubricant measured separately in the distributors for each lubrication point is pumped to the lubrication points ; in pre-lubricating distributors this occurs simultaneously with the working stroke of the pump, in post-lubricating distributors after the pressure relief process.

After the pump is switched off, the pressure in the system, and thus in the distributors, is reduced to approx. 0.5 bar via the pressure relief valve. This enables the lubricant in the dosage areas of the distributors to be transported to the appropriate pumping chambers. The distributors are then ready for operation.

The operating cycle time of the pump must be such that all distributors in the system are supplied with lubricant. In large systems it is therefore advisable to insert a pressure switch at the end of the main line to ensure that lubricant has been supplied to all distributors.

In smaller systems, the pressure switch can be mounted directly after the pump, although a running time for the pump should then be set to ensure that the system is reliably filled.

2. Pumps for oil circulation systems

All gear and cog ring pumps without an integrated pressure relief valve can be used as pumps for oil circulation systems. They pump lubricant from a separate container or a container mounted to the pump into the system. Here the lubricant is distributed to the individual lubrication points by throttle pipes, throttle distributors or progressive distributors.

3. Multi-circuit gear pump units for hydrostatic bearings

Four, five and up to twenty circuit pumps can be used for the oil supply to hydrostatic bearings. A separate circuit is included for each pocket.

Assembly

The pump should be mounted where it is protected from moisture and vibrations but easily accessible.

To mount M and ME series pumps separately from the oil container, 3 pipes must be laid out:

1.) Suction pipe from the container to connection S. (This connection is directly at the pump)

2.) Relief or back-flow pipe from connection R1 to the container.

3.) Pressure pipe to the system from connection P

For MF and MFE series pumps, which are mounted directly to the container, only the pressure pipe to connection P must be connected.

The pumps should preferably be mounted vertically, but horizontal mounting is also possible. If the pump is flange mounted to the reservoir horizontally below the oil level, a special sealed pump must be used.

Gear pumps of the 143 012 ... series and the ZM series must not be flanged horizontally below the oil level, as the intermediate flange is not sealed. In these cases, the pump must be assembled separately from the oil container, and a pipe must be used from the container to the pump suction nozzle. The height difference between the container and the pump must not exceed 2000 mm.

In ZM series multi-circuit pumps, any pressure connections not needed must not be sealed off. The pumped oil from these circuits must be routed back to the container.

All relevant electrical regulations (VDE, DIN) must be observed. Electrical connections should only be made by properly trained and qualified personnel.

When connecting the pump, take care to ensure the correct direction of rotation - marked by an arrow on the pump.

⚠ **The available mains voltage must conform to the details on the rating plate. Check the fuse protection of the power circuit. Only use original fuses with the prescribed current strength. Any deviation can lead to damage and/or injury.**

The main pipe should be of a size appropriate for the maximum pressure and the pumping capacity. It must be fitted with an upward gradient (for venting).

When mounting pumps and accessories, the assembly instructions of the manufacturers must be observed. All auxiliary parts must have sufficient capacity for the maximum pressure in the system.

Distributors at the end of the system should be mounted so that the lubrication point pipes point upwards.

Pumps that do not have a built-in over-pressure valve must be protected by a corresponding valve in the system.

For the maximum permissible pressure, see the rating plate of the pump.

If distributors must be positioned below the main pipe, they must never be at the end of the main pipe!

Initial operation of a system

The container is filled with filtered lubricant (<10 um) without any bubbles, and the pump is operated until lubricant comes out at all lubrication points.

The venting process is facilitated by:

Opening the ends of the main pipes until lubricant without bubbles comes out.

Filling up longer lubrication point pipes, especially for small dosage distributor sections, before connecting the lubrication point.

Maintenance

Monitor the lubricant level in the container, and top it up in good time.

Only use clean, filtered (<10um) brand lubricants.

Always add oil through the built-in filter basket.

After longer operation, check all pipes, hoses and screw connections regularly for leakage and externally visible damage. Repair any damage immediately.

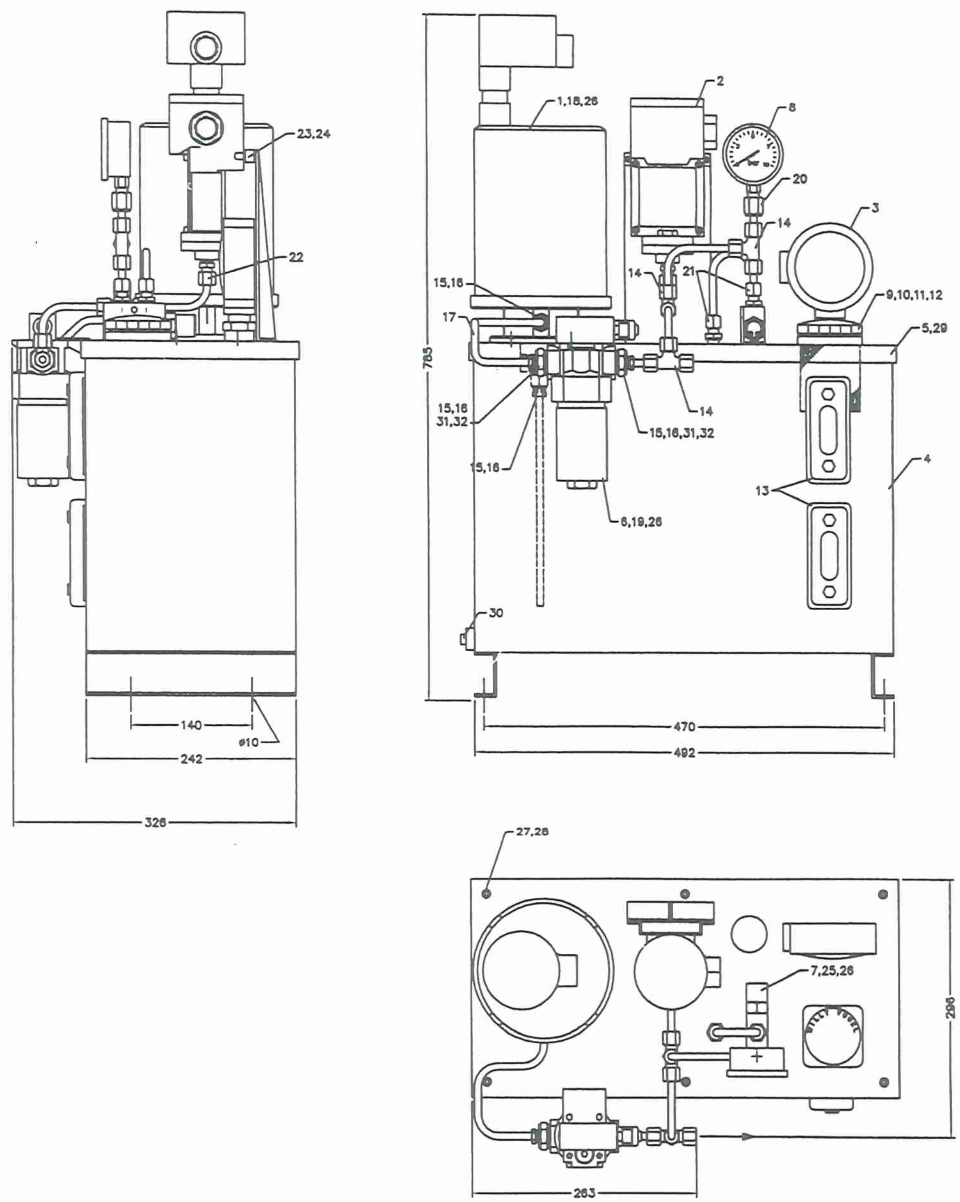
Faults, causes, corrections

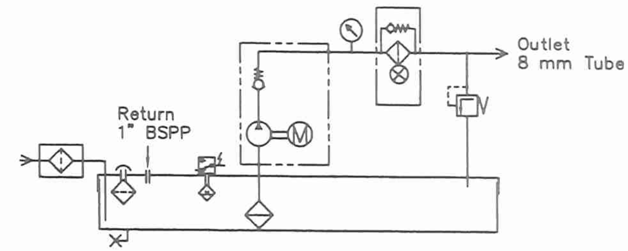
Defects	Possible causes	Corrections
Pump motor does not start-up	Operating voltage not present at pump, Pump blocked	Have the following work carried out by a qualified electrician: • Check mains connection • Check operating voltage at the motor • Check fuse for all further work the machine must be disconnected from the power supply! Dismantle the pump, turn it by hand, replace pump if resistance is high.
Pump does not pump, no pressure build-up	Insufficient lubricant quantity	Top up container, check level switch if necessary.
	Incorrect lubricant (see technical data)	change the lubricant in the whole system, first remove the old lubricant and dispose of it in the correct way
	Air in system	Vent the system, check suction pipe for air-tightness if appropriate. Lubricant must come out of outlet nozzle of pipe without bubbles.
	For all dismantling work, depressurized the system and disconnect it from the power supply!	
	Pressure limiting valve does not close	Check pressure limiting valve for correct opening pressure and for dirt or damage. If pressure is incorrect for fixed setting valves, replace the valve. Replace damaged valves Only use original VOGEL replacement parts Clean valve if dirty.
	Pressure relief valve is open (only for distribution systems)	check pressure relief valve. Replace damage valves. Only use original VOGEL replacement parts. Clean valve if dirty.
	Leakage at passage of the pump drive shaft	Shaft seal ring defective: Replace shaft seal ring, check correct position of lip [generally facing outwards]

Technical Information

›e series	Construction type	With pressure relief	For separate container	For flanging to container	Number of circuits	Suction pipe length	Requires pre-pressure pump	Lubricant (cSt)	
- M 5*	Gear	-	yes	-	1	500	-	20-2000 (1000)	If units are operated with single-phase alternating current, only 60% of the indicated pressure are permissible
1 - MF 5*	Gear	-	-	yes	1	500	-	20-2000 (1000)	
1 - ME 5*	Gear	yes	yes	-	1	500	-	20-2000 (1000)	
E 1 - MFE 5*	Gear	yes	-	yes	1	500	-	20-2000 (1000)	
MF	Vane	-	-	yes	1	3,000	-	20 - 850	
201	Gear	-	yes	-	2	500	-	20 - 1010	
202	Gear	-	yes	-	2	500	-	20- 1500	
205	Gear	-	yes	-	2	500	-	20 - 500	
201	Gear	-	-	yes	2	500	-	20 - 1000	
202	Gear	-	-	yes	2	500	-	20 - 1500	
205	Gear	-	-	yes	2	500	-	20 - 500	
12 - ZM 25	Gear	-	yes	-	1	500	-	20 - 500	
012 1..	Gerotor	-	yes	-	1	1,000	-	20 - 1000	
012 2..	Gerotor	-	-	yes	1	1,000	-	20 - 1000	
212-21	Gear	-	yes	-	2	500	-	20 - 2000	Counter-presssure, see tech.. data in document 1204
212-31	Gear	-	-	yes	2	500	-	20 - 2000	
502	Gear	-	yes	-	5	500	-	20 - 1000	
502-3	Gear	-	-	yes	5	500	-	20 - 1000	
505	Gear	-	yes		5	500	-	20 - 500	
505-3	Gear	-	-	yes	5	500	-	20 - 500	
1002	Gear	-	yes	-	10	500	-	20 - 1000	
1002-3	Gear	-	-	yes	10	500	-	20 - 1000	
1005	Gear	-	yes	-	10	500	-	20 - 250	
1005-3	Gear	-	-	yes	10	500	-	20 - 250	
1025	Gear	-	yes	-	10	500	-	20 - 500	
1025-3	Gear	-	-	yes	10	500	-	20 - 500	
402 - ZM 405	Gear	-	yes	-	4	-	yes	20 - 500	
502 - ZM 505	Gear	-	yes	-	5	-	yes	20 - 500	
802 - ZM 805	Gear	-	yes	-	8	-	yes	20 - 500	
1002 - ZM 1005	Gear	-	yes	-	10	-	yes	20 - 500	
2101 - ZM 2104	Gear	-	yes	-	20	-	yes	20 - 1000	
1035	Gear	-	yes	-	10	500	-	20 - 500	
2201 - ZM 2203	Gear	-	yes	-	20	500	-	20 - 500	

r all 0.5 l units, viscosity is limited 20 - 1000 cSt (mm²/s)





Item	Qty	Part#	Description
32	2	DIN 7603-A 21x26-CU	Washer
31	2	267 001.13	Adapter
30	1	9592 600 001	Plug
29	1.5m	950 620 000	Gasket
28	6	9432 400 003	Washer
27	6	9492 042 102	Bolt
26	7	650 060	Washer
25	1	DIN 912-M6x35-8.8	Bolt
24	2	650 040	Washer
23	2	DIN 912-M4x10-8.8	Bolt
22	1	408 403N	Tube Connector
21	3	408 403W	Tube Connector
20	1	9523 421 101	Gauge Adapter
19	2	DIN 912-M6x10-8.8	Washer
18	4	DIN 912-M6x25-8.8	Bolt
17		WV-RO 8x1	Steel Tubing
16	4	408 202	Male Fitting
15	4	408 001	Ferrule
14	3	408 407	Tee
13	2	9632 000 002	Sight Glass
12	4	9452 021 005	Bolt
11	1	888 160 003	Gasket
10	1	996 000 199	Strainer
9	1	B 7.08	Fill Muff
8	1	9632 201 010	Gauge
7	1	WVN 200-10-E-8	Pressure Regulator
6	1	169 480 131	Filter
5	1	9813 030 022	Lid
4	1	B 30/V 1	Reservoir
3	1	9652 000 009	Level Switch
2	1	9653 000 005	Pressure Switch
1	1	MF 1/V 11	Gear Pump

PART# MF 1/BW 30/V 3
DRAWING# N1002566
DATE 07/16/01
CUST Rhodia BSP Process
SHEET 1 OF 1
SCALE 1 : 3
BY D L [illegible]
SIZE D
Projection: First Angle
European Projection

VOGEL LUBRICATION, INC.
NEWPORT NEWS, VA

DESCRIPTION
Pump Unit, Explosion Proof

VOGEL
Centralized Lubrication

REVISION HISTORY
NUM.
DATE
NAME

Type M For mounting separately from oil reservoir

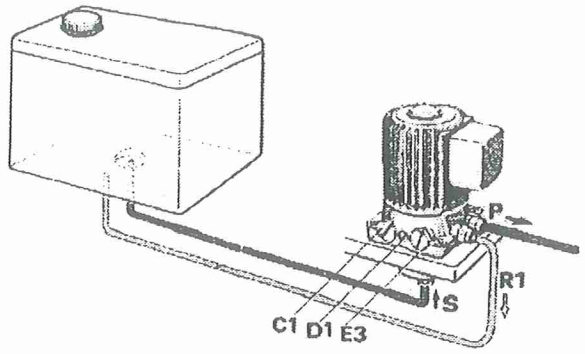


fig. 1

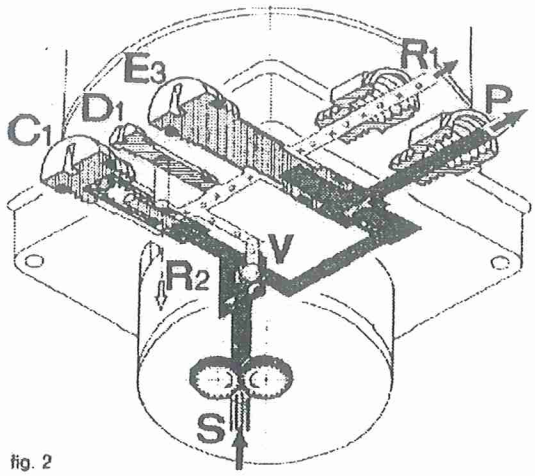


fig. 2

Type MF For flange-mounting into oil reservoir

For horizontal flange-mounting of the unit **underneath the oil level** use a sealed special pump.

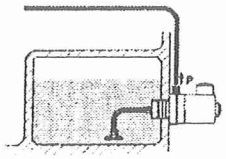


fig. 3

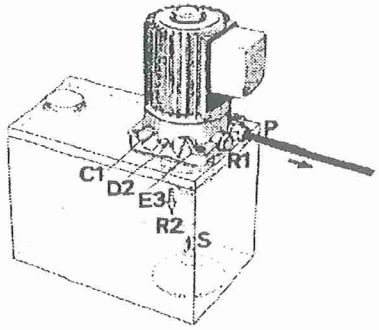


fig. 4

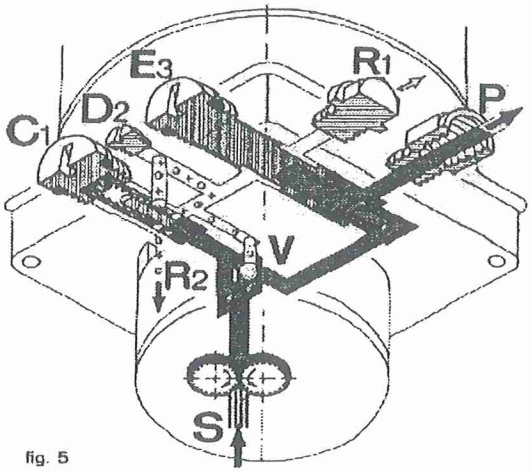
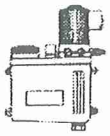


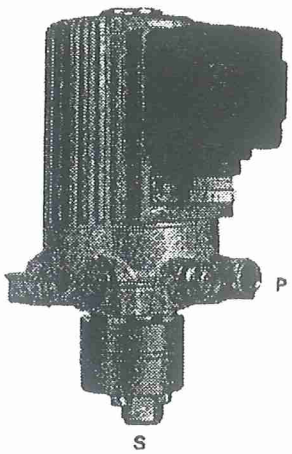
fig. 5



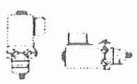
For units type MF complete with reservoir (2.7, 6, and 15 *l*) see pages C 37, C 38

For the units FLM 12-3 and FLMF 12-3, the feed pump is -contrary to the above illustrations - a **vane pump.**

With the exception of V, the valve function is the same as described on page C 25.



Mounting positions



Type of enclosure IP 54, DIN 40 050

Principle of operation of a vane pump: Unchanging direction of delivery with changing direction of rotation.

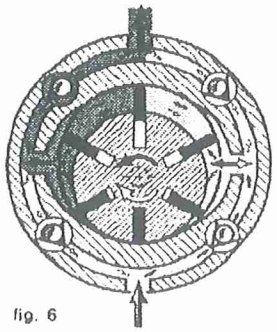
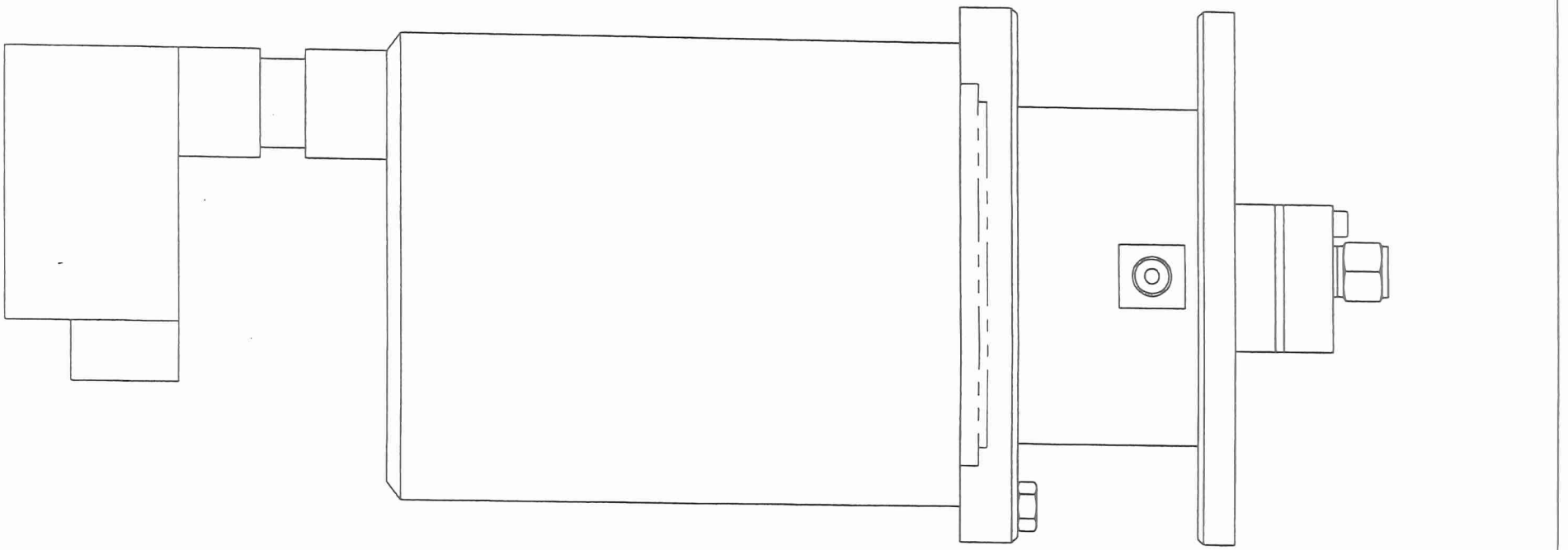
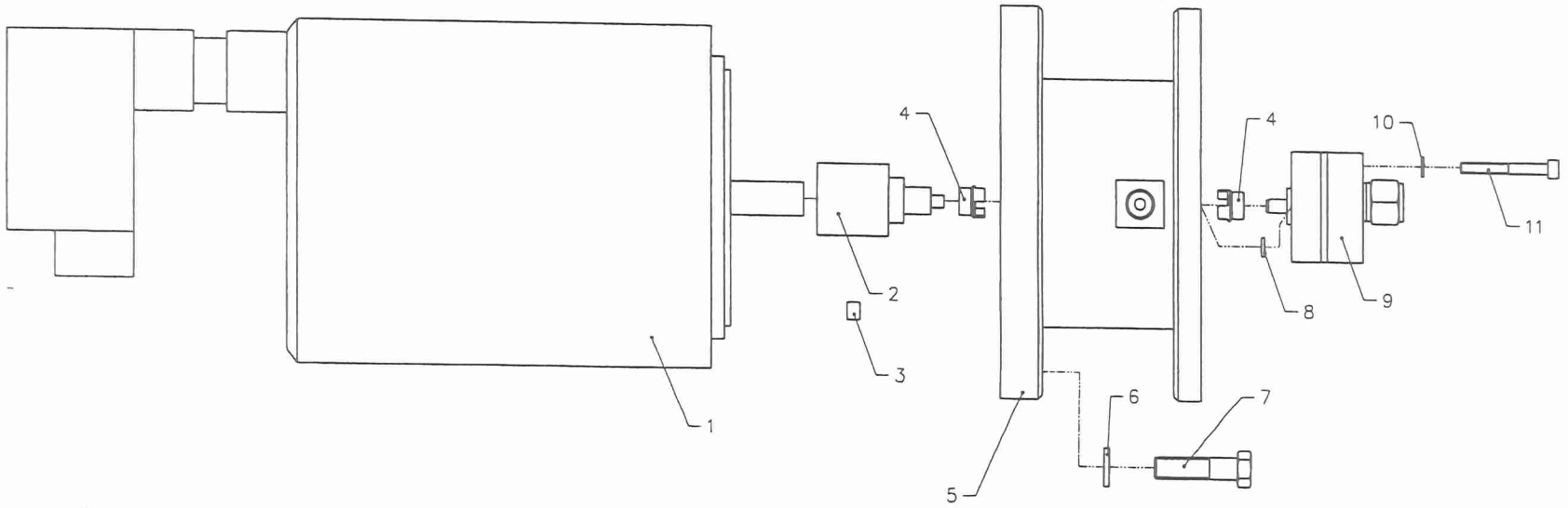


fig. 6



Performance Data
Output: 1liters per min.
Watts: 180
Speed: 1750 rpm
Voltage: 460V 60 Hz.
MaxBackPress. 27 Bar

PART# MF 1/V 11	VOGEL LUBRICATION, INC. NEWPORT NEWS, VA	VOGEL® Centralized Lubrication
DRAWING#		
DATE 01-05-99	DESCRIPTION Explosion Proof Gear Pump Unit	REVISION HISTORY
CUST RHM (B&P Process)		NUM.
CHK'D	SCALE 1 : 2	DATE
SHEET 1 OF 1		NAME
Projection First Angle	DONE BY / SIZE B	
European Projection	NOTE: This Drawing Is The Property Of Vogel Lubrication Inc. Including The Principles Of The Design And Is Submitted With Agreement That It Is Not To Be Reproduced, Copied Or Loaned In Whole or In Part	



Item	Qty	Part#	Description
11	4	DIN 912-M 5x40-8.8	Bolt
10	4	650 050	Lock Washer
9	1	ZP 21-2	Gear Pump
8	1	WVN 501-6x1.5	O-ring
7	4	9402 062 001	Bolt
6	4	9432 600 002	Lock Washer
5	1	M 2.03/V 2	Flange
4	2	M 2.28	Coupling
3	1	DIN 916-M 5x6 45H	Set Screw
2	1	9391 000 021	Coupling
1	1	9392 000 030	Explosion Proof Motor

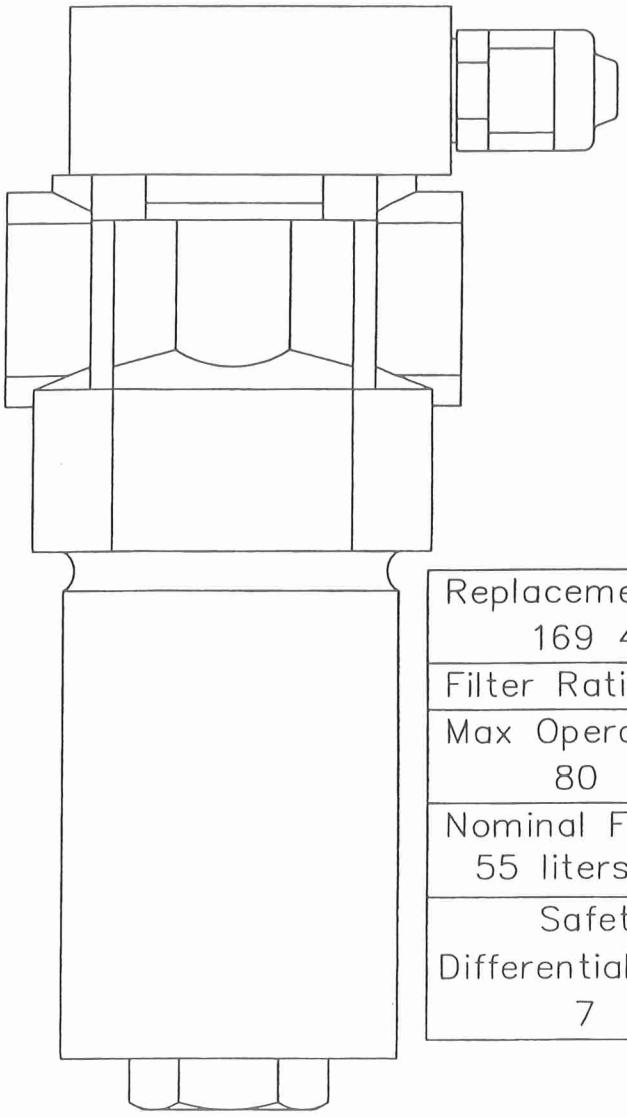
PART# MF 1/V 11
DRAWING# F1000094
DATE 11-19-98
CUST RHM (B&P Process)
CHK'D
SCALE 1 : 2
SHEET 1 OF 1
DONE BY B L Zirkle
SIZE B
Projection: First Angle
European Projection

VOGEL LUBRICATION, INC. NEWPORT NEWS, VA

DESCRIPTION
Explosion Proof Gear Pump Unit

VOGEL®
Centralized Lubrication

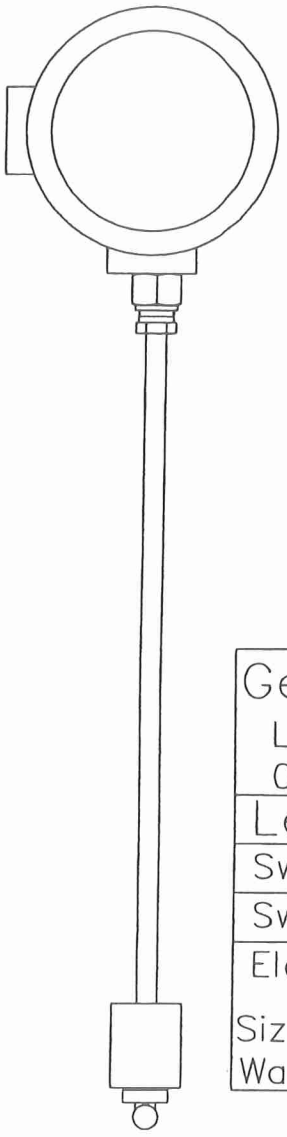
REVISION HISTORY
NUM.
DATE
NAME



Replacement Element: 169 400 038
Filter Rating: 25 microns
Max Operating Pressure 80 Bars
Nominal Flow Rate: 55 liters per minute
Safety Valve Differential Opening Pressure 7 Bars

Projection First Angle

PART# 169 460 131	VOGEL LUBRICATION, INC. NEWPORT NEWS, VA	VOGEL® Centralized Lubrication
DRAWING#		
DATE 01-10-99	DESCRIPTION Filter Unit	
CUST		
CHK'D	SCALE 1 : 1	REVISION HISTORY
SHEET 1 OF 1		NUM. / DATE / NAME
DONE BY	SIZE A	
European Projection	NOTE: This Drawing Is The Property Of Vogel Lubrication Inc. Including The Principles Of The Design And Is Submitted With Agreement That It Is Not To Be Reproduced, Copied Or Loaned In Whole or In Part	



Gems Part Number:
LS-700EP-BR-SS-SPST-020-GR1-1-12.4-JB
Length: 12.4 in.
Switch Type: SPST N.O.
Switch Rating: 20 VA
Electrical Termination:
Size 50 J-Box, ExplosionProof Watertight, with terminal strip

Projection
First Angle

PART# 9852 000 009	VOGEL LUBRICATION, INC. NEWPORT NEWS, VA	VOGEL® Centralized Lubrication
DRAWING# XXXXXXXX		
DATE 01-10-99	DESCRIPTION: Gems Level Switch Explosion Proof	REVISION HISTORY
CUST		NUM. / DATE / NAME
CHK'D / SCALE 1 : 1		
SHEET 1 OF 1		
DONE BY / SIZE A	NOTE: This Drawing Is The Property Of Vogel Lubrication Inc. Including The Principles Of The Design And Is Submitted With Agreement That It Is Not To Be Reproduced, Copied Or Loaned In Whole or In Part	
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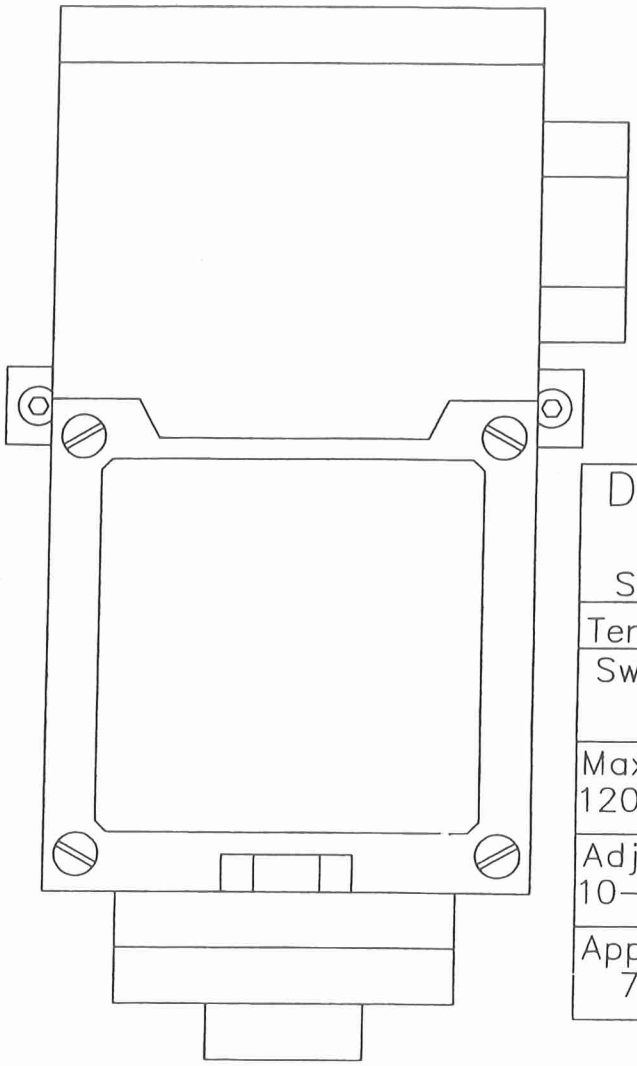

Dwyer/Mercoid Part Number: SA 1111E–A4–K1
Temp.Range –30 to 140F
Switch Type: 1 or 2 SPDT Snap Acting
Maximum Operating Pressure 1200 PSIG (82.6 Bar)
Adjustable Operating Range 10–150 PSIG .7 – 10 Bar
Appx. Maximum Deadband 75 PSIG 5.2 Bar

PART# 9853 000 005	VOGEL LUBRICATION, INC. NEWPORT NEWS, VA	VOGEL® Centralized Lubrication
DRAWING#		
DATE 01–05–98	DESCRIPTION	REVISION HISTORY
CUST B & P	Dwyer / Mercoid Explosion Proof Pressure Switch	NUM.
CHK'D / SCALE		DATE
SHEET 1ST OF OF		NAME
DONE BY OPERATOR / SIZE A	NOTE: This Drawing Is The Property Of Vogel Lubrication Inc. Including The Principles Of The Design And Is Submitted With Agreement That It Is Not To Be Reproduced, Copied Or Loaned In Whole or In Part	
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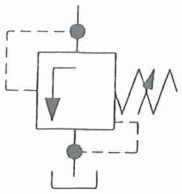
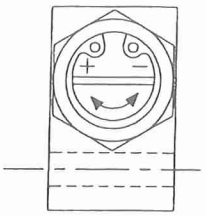
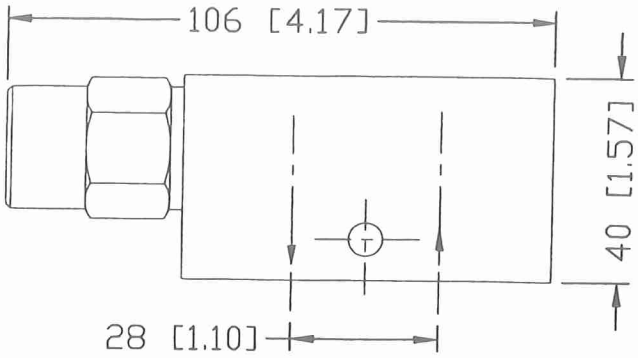
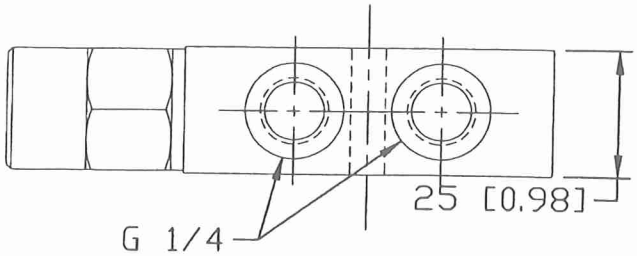
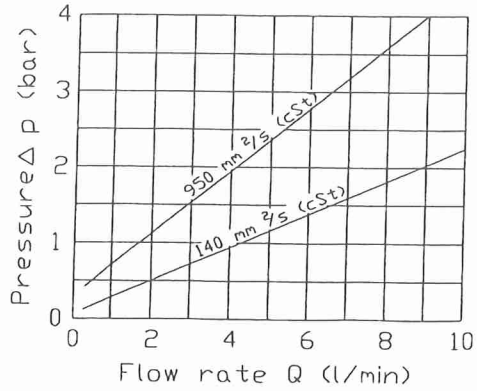








Pressure Loss Parameter



Oil Temperature max	80 °C [176 °F]
Operating Viscosity	2 to 1000 cSt
Rated flow rate	see Pressure Loss Parameter

Vogel Part #		Adjustable range bar / [psi]	Max Operating Pressure
WVN200-10E6		0.1 to 6 ±1 [1.5 to 87 ±14.5]	40 bar [580 psi]

PART# WVN200-10E-6	VOGEL LUBRICATION, INC. NEWPORT NEWS, VA		VOGEL® Centralized Lubrication
DRAWING#			
DATE 01-06-99	DESCRIPTION Adjustable Pressure Regulating Valve for Oil		REVISION HISTORY
CUST B & P			NUM.
CHK'D	SCALE NTS		DATE
			NAME
DONE BY	SIZE A	NOTE: This Drawing Is The Property Of Vogel Lubrication Inc. Including The Principles Of The Design And Is Submitted With Agreement That It Is Not To Be Reproduced, Copied Or Loaned In Whole or In Part	
SHEET 1	OF 1		

Gems Sensors

[redacted]

VOGEL LUBRICATION SYSTEMS
1008 JEFFERSON AVE.

NEWPORT NEWS, VA
23607

VOG236

BILL TO CUSTOMER

[redacted]

Gems Sensors

TEL: 860-747-3000
FAX: 860-747-4244

VOGEL LUBRICATION SYSTEMS
1008 JEFFERSON

NEWPORT NEWS, VA
23607

P.O.

SVOG236

SHIP TO CUSTOMER

SALES ORDER NO.	REVSN	DATE	PAGE
L83285	0	08/31/01	

CUSTOMER ORDER NO.: 808758

BILL OF LADING NO.	DATE SHIPPED
037013717O	09/20/01

SHIP VIA	F.O.B.	P.P.D.
UPS COLL	1	

S.A.				
5876				

TERMS: 2% 10 NET 30

SHIPMENT I.D. NUMBER: 1693225

1	195940	LS700EP-3-BR-SS-SPST-20-GR1-1 SALES ORDER SPECIAL INSTRUCTIONS: (MARK) DOROTHY UPS ACCT# 276-635 SSSSSSSSSSSSSSSSSSSSSSSSSSSSS SEE JACKIE-ACCTG B/4 SHIPPING. SSSSSSSSSSSSSSSSSSSSSSSSSSSSS	[redacted]	0.

PACKING LIST

FREIGHT TERMS: FOB FACTORY, FRT COL

CUSTOMER COPY

CERTIFICATION

All parts supplied on this order are in full compliance with [illegible] instructions, specifications, and/or drawings.

[illegible]

[redacted]

C. ARTHUR WEAVER Company, Inc.

2430 ALABAMA AVENUE • NORFOLK, VIRGINIA 23513

Phone (804) 857-8700

CERTIFICATE OF COMPLIANCE

CUSTOMER NAME: VOGEL LUBRICATIONS

CUSTOMER P.O. NUMBER: 808837

SUPPLIER OR MANUFACTURER: RELIANCE

DESCRIPTION: A.C. MOTOR 1/4 HP

QUANTITY: 1 PART NUMBER: P56H5039

EXCEPTION OR DEVIATION:

THE SELLER HEREBY CERTIFIES THAT THE ITEM SUPPLIED ON THIS ORDER COMPLIES WITH THE ABOVE LISTED PURCHASE ORDER. THE SELLER CERTIFIES THAT ANY DEVIATION FROM PURCHASE ORDER REQUIREMENTS ARE LISTED ABOVE.

SIGNATURE

QUALITY ASSURANCE MANAGER OR EQUIVALENT

10/8/2001

DATE

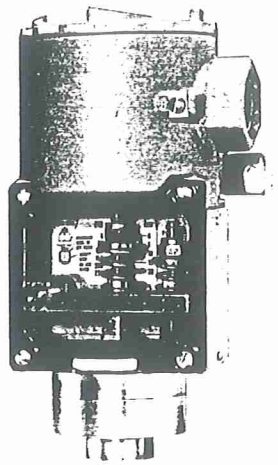
Mercoid®

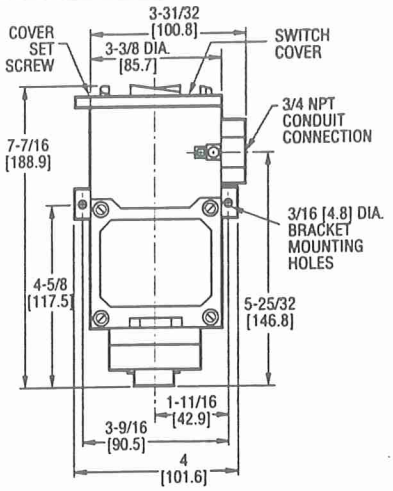
A Division of DWYER INSTRUMENTS, INC.

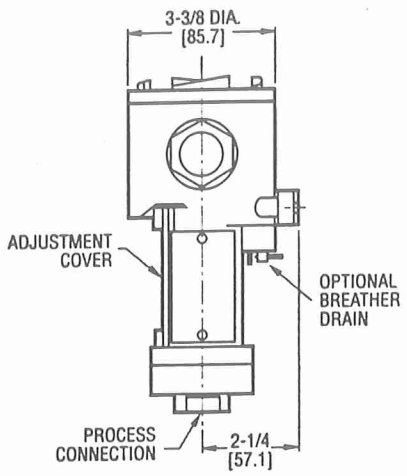
SERIES SA1100

Diaphragm Operated Pressure Switches

Visible setpoint, adjustable deadband, Weather-proof, Explosion-proof. Optional hermetically sealed snap switch.







Weatherproof and Explosion-Proof in One Economical Enclosure

Extremely rugged construction assures excellent reliability in chemical, petroleum and industrial plants. New design also provides burst pressure protection to 3000 PSI (206 bar). The rolling diaphragm design maintains a constant effective area to minimize friction. This results in a minimum deadband as low as 5% of full scale. Since many applications require higher deadbands, the SA1100 includes a separate adjustment of this when necessary. A pump being used to control liquid level in a tank would be a typical situation where this feature would be important. Both setpoint and deadband adjustments are protected, yet clearly visible behind a clear polycarbonate window and are fully isolated from the electrical components for additional safety. A 7/16" open-end wrench is the only tool required to change settings. Terminal blocks are provided for switch wiring connections and both internal and external ground screws are included. Standard housing is weatherproof to NEMA standards 1 through 4X and 13; explosion-proof to NEMA 7, Class I, Groups B, C & D; NEMA 9, Class II, Groups E, F & G or Cenelec Eexd IIC T6 (T amb. = 75°C); is UL/CSA listed and Cenelec certified to IP56. Optional construction adds drain to meet IP54. Diaphragm elements are available in either Buna-N or fluorocarbon for compatibility in many liquid or gas applications.

APPLICATIONS

Chemical, petroleum, food and drug processing industries. Used indoor, outdoor or in explosion-proof areas. Machine tools, high vibration locations.

SERIES SA1100 STOCKED MODELS

Aluminum pressure port,* 1/4" NPTF process connection, Buna-N diaphragm and o-ring	316SS pressure port, 1/2" NPTF process connection, fluorocarbon diaphragm and o-ring
MODEL NUMBER	**MODEL NUMBER**
SA1111E-A4-K1	SA1111E-S5-K2
SA1112E-A4-K1	SA1112E-S5-K2
SA1113E-A4-K1	SA1113E-S5-K2

*Brass pressure port available for water service.

Note: The fifth and sixth characters designate the range of adjustment.

PHYSICAL DATA

Temperature Limits: –30 to 180°F (–35 to 82°C)
Maximum Operating Pressure: 1200 psig (82.6 bar)
Maximum Pressure Without Bursting: 3000 psig (206 bar)
Process Connection: 1/4" (K1) or 1/2" (K2) NPTF
Conduit Opening: 3/4" NPTF
Switch Type: 1 or 2 SPDT snap acting
Wiring Connections: 3 screw terminals
Electrical Ratings: 15 A @ 125/250/480 VAC, 1/8 HP @ 125 VAC, 1/4 HP @ 250 VAC, 1/2A @ 125 VDC resistive, 1/4 A @ 250 VDC resistive. Hermetically sealed contacts: Rated 3 A @ 125/250 VAC, 3 A resistive @ 30 VDC. Hermetically sealed gold contacts: Rated 1 A @ 125 VAC, 1 A resistive @ 30 VDC.
Setpoint Adjustment: 7/16" hex nut
Housing Material: Copper free, die cast aluminum
Finish: Textured gray polyurethane
Connection Material: Aluminum, brass or 316 stainless steel
Wetted Materials: Buna-N, fluorocarbon, aluminum, brass or 316 SS
Weight: 3½ lbs. (1.59 kg)
Position: Within 20° of vertical

RANGE NUMBER	ADJUSTABLE OPERATING RANGE		APPROXIMATE MINIMUM DEADBAND				APPROXIMATE MAXIMUM DEADBAND	
			LOW		HIGH			
	PSIG	BAR	PSIG	BAR	PSIG	BAR	PSIG	BAR
11	10-150	0.7-10	4.0	0.28	7.5	0.52	75	5.2
12	20-250	1.4-17.2	5.0	0.35	12.5	0.86	150	10
13	30-500	2.0-34	12	0.83	45	3.1	300	21

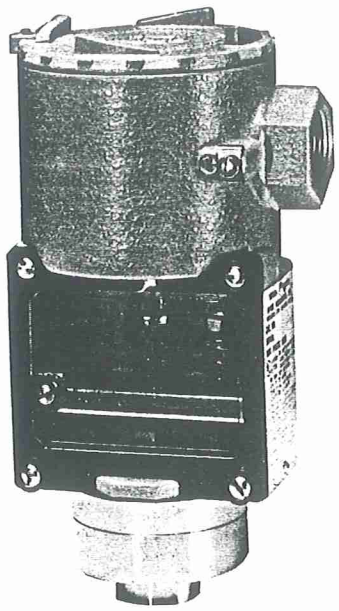
OPTIONS – Hermetically sealed snap switch: (UL approved only) Replace seventh character E with HS. Example, SA1111HS-A4-K1.
Hermetically sealed gold contact snap switch: (UL approved only) Replace seventh character E with HG. Example, SA1111HG-A4-K1.
DPDT contacts: Change tenth character to L. Example, SA1111E-A4-L1. Multiply approximate minimum deadband by 1.5.
Housing with drain: Add suffix DR. Example, SA1111E-A4-K1-DR.
CENELEC certified construction: Add suffix CN. Example, SA1111E-A4-K1-CN

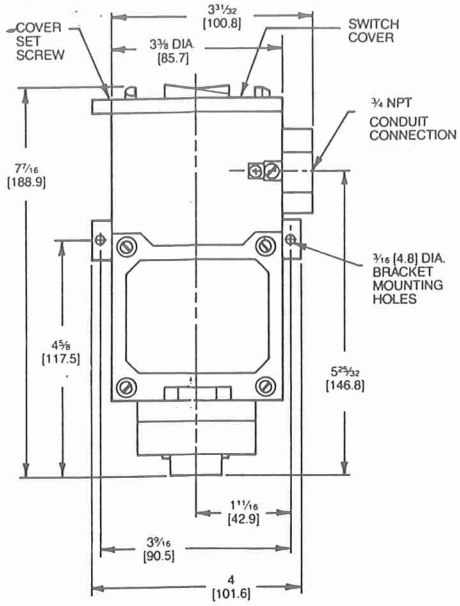
Suggested Specification

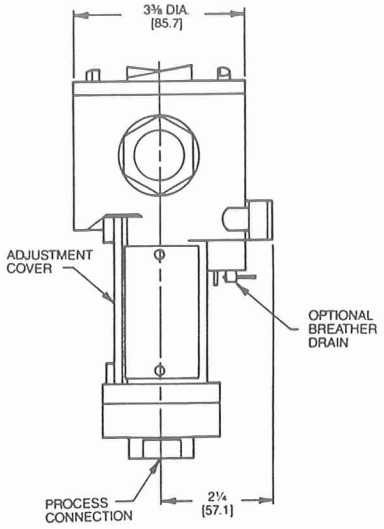
Pressure switches shall be (UL/CSA) (Cenelec) listed and be diaphragm operated with fully adjustable setpoint. Switch shall have visible setpoint indicator and adjustable deadband protected by clear polycarbonate window. Electrical terminals shall be isolated from setpoint adjustment. Housing shall be weatherproof and explosion-proof, Cl I, Groups B, C & D; Cl II, Groups E, F & G, Cenelec Eexd IIC T6 (T amb. = 75°C). Switches shall be Mercoid Model SA11(__)E-(__)-(__)-(__).

SA1100 PRESSURE SWITCHES
WEATHERPROOF, EXPLOSION-PROOF

Specifications – Installation and Operating Instructions







SA1100 Pressure Switches actuate one or two single pole, double throw (SPDT) snap switches in response to increasing or decreasing pressure of compatible gases or liquids. Three field adjustable operating ranges are available allowing setpoints up to 500 PSIG (35 kg/cm²). All models are weather-proof and suitable for hazardous locations as detailed in the chart at lower right. Read and understand these instructions completely before proceeding with installation or operation.

MODEL NUMBER DEFINITIONS

SA11 _① _ E ②③ – ④⑤ – _⑥_

① **Operating Range** / **Deadband Range**
- 11) 10-150 PSIG (0.7-10 kg/cm²) — 3-75 PSIG (0.21-5.2 kg/cm²)
- 12) 20-250 PSIG (1.4-17.5 kg/cm²) — 4-150 PSIG (0.28-10 kg/cm²)
- 13) 30-500 PSIG (2-35 kg/cm²) — 6-300 PSIG (0.42-21 kg/cm²)

② Process Connection Material
- A – Aluminum
- B – Brass
- S – 316 Stainless Steel

③ Diaphragm and O-Ring Materials
- 4 – Buna-N
- 5 – Fluorocarbon

④ Circuit
- K – SPDT
- L – DPDT

⑤ Process Connection Size
- 1 – 1/4" NPT, female
- 2 – 1/2" NPT, female

⑥ Options
- DR – Explosion-proof Drain

PHYSICAL DATA

Temperature Limits:	–30 to 180°F (–35° to 82°C)
Maximum Pressure Without Bursting:	3000 PSIG (210 kg/cm²)
Process Connection:	1/4" or 1/2" NPT female
Electrical Ratings:	SPDT or DPDT contacts rated 15A @ 125/250/480 VAC, 1/8 HP @ 125 VAC, 1/4 HP @ 250 VAC, 1/2A @ 125 VDC resistive, 1/4A @ 250 VDC resistive.
Wiring Connections:	3 screw type
Conduit Connection:	3/4" NPT
Setpoint Adjustment:	7/16" hex nut, field adjustable
Housing Material:	Die cast aluminum
Finish:	Textured gray polyurethane
Connection Material:	Aluminum, brass or 316SS
Diaphragm:	Buna-N or fluorocarbon
Weight:	3½ lbs. (1.59 kg)

HAZARDOUS LOCATION/WEATHERPROOF RATINGS

MODEL	UL		
SA11_ E–_–_	Cl.I, Gr.B, C & D Cl.II, Gr.E, F & G NEMA-4X		
SA11_ E–_–_ DR	Cl.I, Gr.B, C & D Cl.II, Gr.E, F & G NEMA-3		

MERCOID DIVISION
DWYER INSTRUMENTS, INC.
P.O. BOX 258 • MICHIGAN CITY, INDIANA 46360 (USA)

Telephone 219/879-8000
Fax 219/872-9057

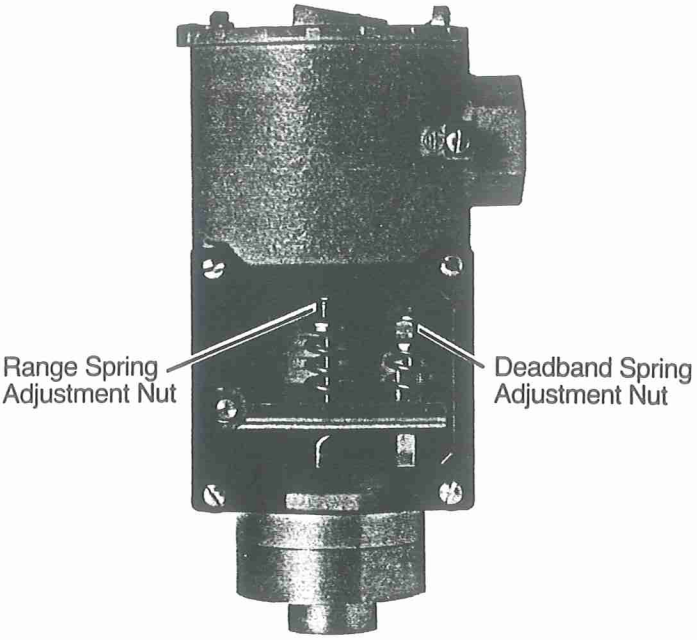
INSTALLATION

1. **Location:** Select a location where the temperature limits of −30° to 180°F (−35° to 82°C) will not be exceeded. Locate the switch as close as possible to the pressure source for best response. Long lengths of piping will not affect the accuracy of the actuation point but will increase response time.
2. **Mounting:** Avoid mounting surfaces with excess vibration which could cause false actuation when pressure is near setpoint. Attach switch with two 3/16″ screws or bolts (not included) through mounting bracket. The switch must be mounted within 20° of vertical for proper operation.
3. **Pressure Connection:** The pressure connection is standard 1/4″ or 1/2″ NPT female. Pipe joint sealing material should be used to insure a pressure tight joint.
4. **Electrical Connections:** One or two SPDT snap switches are provided, each with normally open contacts closing and normally closed contacts opening when pressure increases beyond the high setpoint. The contacts reverse, returning to their "normal" condition when pressure decreases below the low setpoint. Wire in accordance with local electrical codes.

   For convenience, two ground screws are provided. One is located inside the housing and the other on the exterior, adjacent to the 3/4″ NPT conduit connection. Replace cover after wiring connections are complete.

ADJUSTMENT

1. Determine the low and high setpoint pressures.
2. Connect tubing or piping from the pressure port on bottom to one leg of tee. Connect the second leg to a pressure gage of known accuracy and in an appropriate range. The third leg should be connected to a controllable source of pressure.
3. Connect a volt/ohm meter or other circuit tester to the snap switch terminals to indicate when switching occurs.
4. Slowly apply pressure to the system and note the pressure at which switch actuates. If adjustment is necessary, remove the clear plastic cover over the lower half of the switch. It is held in place by four machine screws.



5. Adjust the low setpoint first by using a 7/16″ open end wrench on the left, range spring adjustment nut. As viewed from above, turn nut clockwise to increase, counter-clockwise to decrease the low setpoint (deactuation point).
6. Adjust the high setpoint by turning the deadband spring adjustment nut, on right, clockwise to increase, counter-clockwise to decrease, the high setpoint (actuation point).
7. Operate the switch through several pressure cycles to confirm proper setpoint adjustment. Replace plastic cover.

MAINTENANCE

The moving parts of these switches need no maintenance or lubrication. The setpoint is the only user adjustment. On models with optional drain fitting, periodically rotate the small captive screw from side to side several times to keep drain path clear. Units in need of repair should be returned to the following address, freight prepaid. Be sure to include a brief explanation of the problem and any relevant application information.

Dwyer Instruments, Inc.
Attn: Repair Department
55 Ward Street
Wakarusa, IN 46503

Mercoid®

MERCOID DIV., DWYER INSTRUMENTS, INC.
P.O. Box 258
Michigan City, IN 46360
Phone: 219/879-8000 Fax: 219/872-9057

Litho in U.S.A. 10/92
FR 89-442112-00

GEMS® LIQUID LEVEL SWITCHE

MULTI-STATION

Miniaturized for small tanks . . . restricted spaces . . .

LS-300 Series Low-cost...all Polysulfone ...designed for the OEM. Limited use in oils... chemicals*.

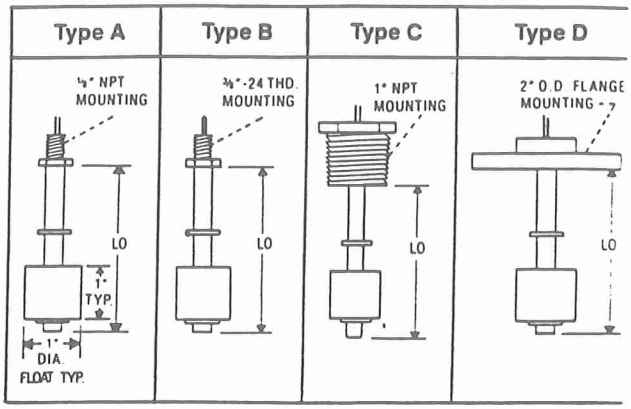
Four Standard Models...wired as in Groups I or II only (see "Wiring Data" on page 18). From one to four level stations per unit wired as in Group I...one or two level stations per unit may be wired as in Group II. May be mounted with up to ±30° inclination.

LS-68500 Series Extremely compact...of Polysulfone with Polypropylene floats. Excellent stability in higher sp. gr. liquids. Limited usage in oils or chemicals.

Four Standard Models...wired as in Groups I and II only (see "Wiring Data" on page 18). From one to four level stations per unit wired as in Group I...from one or two level stations per unit wired as in Group II. May be mounted with up to ± 30° inclination.

Standard Model Types . . .

See "Actuation Levels, Dimensional Data" on page 18.

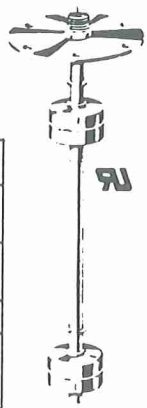


Specifications . . .

	LS-300				LS-68500			
	Type A	Type B	Type C	Type D	Type A	Type B	Type C	Type D
Mounting	⅛" NPT	⅜"-24 Thd.	1" NPT	2" O.D. FLANGE	⅛" NPT	⅜"-24 Thd.	1" NPT	2" O.D. FLANGE
Stem. Float. Mtg. & Collar Material	Polysulfone				Polysulfone w/Polypropylene float			
Operating Temp.	−40° to +225°F.				−40° to +150°F.			
Pressure Rating	50 psi. max. — types A,B and C only				150 psi. max. — types, A, B and C only			
Overall Length LO	15" Max.				15" Max.			
Switch	SPST, 10/20/50/100 VA* (N.O. or N.C.) See Elec. Data, P. 2				SPST, 20 VA, (N.O. or N.C.) See Elec. Data. P. 2			
Lead Wires	#22 awg. 24" L.				#22 awg. 24"L.			

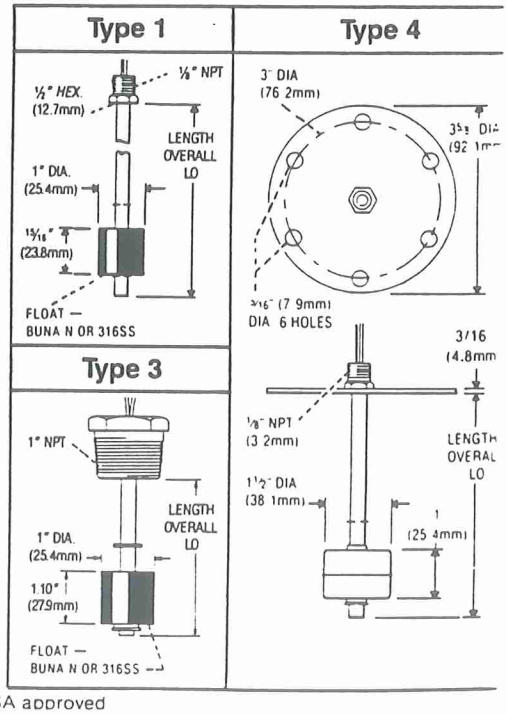
LS-700 Series Includes many standard multi-station features. For use in oils, water (Brass/Buna N models)...oils, water, chemicals (all-SS models).

Three Standard Models...1 through 5 level stations per unit with wiring group I and 1 through 3 levels with wiring group II only (see "Wiring Data" on page 18). Can be mounted with up to ± 30° inclination . Maximum overall length (LO) - 48".



Standard Model Types . . .

See "Actuation Levels, Dimensional Data" on page 18



Specifications . . .

	Type 1		Types 3 & 4	
Mounting	1/8" NPT		Type 3 — 1" NPT Type 4 — Flange	
Stem & Mtg. Mat.	Brass	316 SS	Brass	316 SS
Float Mat.	Buna N	316 SS	Buna N	316 SS
Other Wetted Mat.	Hysol, Beryl. Copper	SS. ARMCO PH-15-7 MO	Hysol, Beryl. Copper	SS. ARMCO PH-15-7 MO
Operating Temp.	−40°-+230°F. Water-+180°F.	−40°-+300°F.	−40°-+230°F. Water-+180°F.	−40°-+300°F.
Pressure Rating	150 psi	100 psi	100 psi Type 3	50 psi Type 4
Switch	SPST, 20/100 VA* (N.O. or N.C.). See Elec. Data, Pg. 2			
Lead Wires	#22 awg. 24" L.			

Note 1: LS-300 and LS-700 Series Level Switches are **UL Recognized—File No. E45168,** and **CSA Approved—File No. 30200.**

*Level switch units with 50 VA and/or 100 VA switches are not UL recognized or CSA approved

ACCESSORIES

GEMS Accessory Junction Boxes

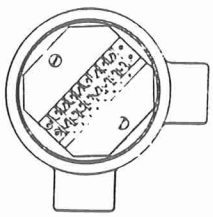
A variety of electrical junction boxes with built-in terminal blocks or relays are available to simplify wiring . . . amplify load-handling capabilities of GEMS level (or flow) switches. ½" NPT ports assemble directly to the following GEMS level switch units:

LS-800 Series
LS-850 Series
LS-2050 Series
LS-35565 and LS-56060 Series

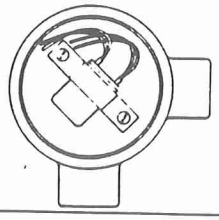
Feraloy Junction Boxes . . .

GEMS Feraloy junction boxes are explosion-proof, watertight and comply with NEC requirements: Class I, Groups C and D; Class II, Groups E, F and G; Class III. FM-approved.

P/N 55633 with 3-pin terminal block.*



P/N 75975 with 8-pin terminal block.*

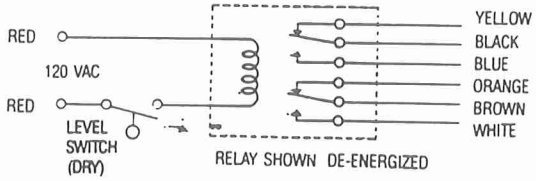


P/N 76270 with DPDT relay for controlling high current loads and/or multiple loads.

Relay Specifications . . .

Configuration	DPDT
Input Voltage	120 VAC, 50/60 Hz
Contact Ratings	10 amp, 277 VAC
	½ HP, 250 VAC
	⅓ HP, 120 VAC
	10 amp, 30 VDC, resistive

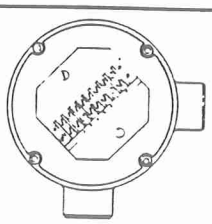
Relay Wiring Diagram . . .



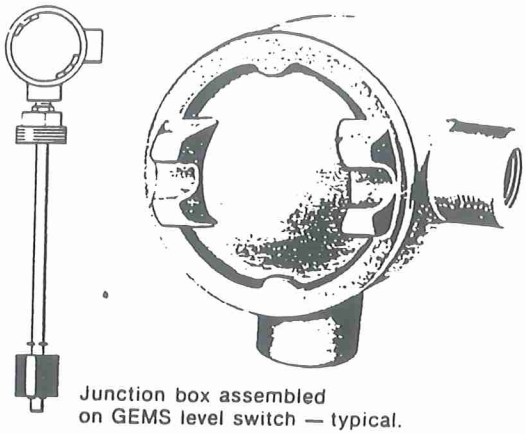
Molded ABS Plastic Junction Boxes . . .

Low-cost, corrosion-resistant.

P/N 75970 with 8-pin terminal block.*



*Terminals are screw-type with terminal lugs supplied for wire connections.



Junction box assembled on GEMS level switch — typical.

GEMS Sensors can supply the level switches listed below **FM-approved, explosion-proof** for Class I, Division 1 Group D hazardous areas:

LS-800 Series * *
LS-850 Series * *
LS-30290 Series
LS-52100 Series

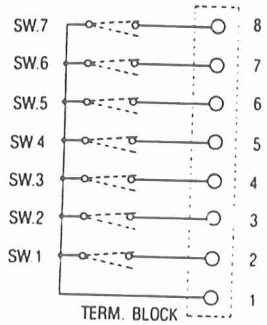
* * Consult Gems Sensors Division for specific data.

Consult Gems Sensors Division for ordering information.

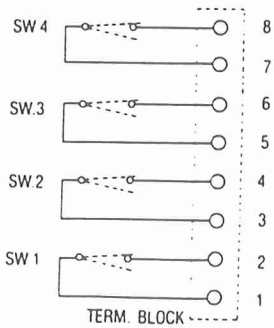
Typical Wiring Diagrams . . .

Junction boxes equipped with 8-pin terminal blocks and assembled on GEMS multi-station level switch (or flow switch units.

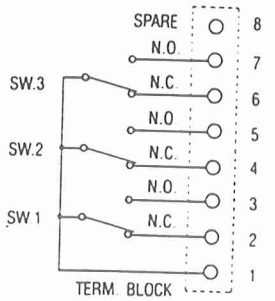
Group I Wiring



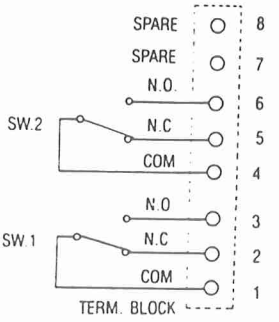
Group II Wiring



Group III Wiring



Group IV Wiring



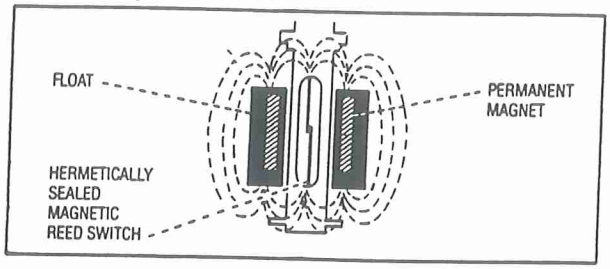
Ordering Information . . .

Specify GEMS Level Switch Accessories by P/N with quantities required.

GEMS Liquid Level Switches . . .

Simple in design, and of instrument quality throughout, GEMS level switches are ruggedly built for long service dependability. Single-and multi-station units provide high, low and intermediate point level sensing in all types of storage tanks and reservoirs...for automatic pump control... alarms and safety interlocks. Applications are practically limitless.

How They Work . . .



The simple, direct operating principle of all GEMS level switches is primary to their consistent accuracy... ⅛" when vertically mounted. A magnetic float moves with liquid level to actuate a hermetically sealed, magnetic reed switch within the unit stem.

GEMS liquid level indicating components are rendered intrinsically safe when properly connected with a GEMS SAFE-PAK® or Zener Barrier.

GEMS Engineering . . .

Their depth of knowledge and technological experience qualifies GEMS engineers in every aspect of liquid level monitoring. If your level detection or control problem involves unique requirements, our engineers are ready to recommend solutions that are both practical and economically feasible.

Electrical Data . . .

Standard reed switches in GEMS liquid level switch units are hermetically sealed, magnetically actuated, make-and-break type. Switches are SPST or SPDT in various ratings, depending on unit model. See chart below.

Switch Ratings-Max. Resistive Load . . .

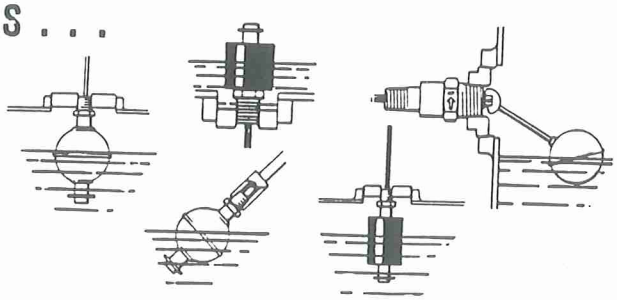
VA	Volts	Amps AC	Amps DC
10	0-50	.2	.13
	120	.08	.05
	240	.04	.02
15	0-50	.3	.2
	120	.12	.08
	240	.06	.04
20	0-30	.4	.3
	120	.17	.13
	240	.08	.06
50*	0-50	0.5	0.5
	120	.4	.4
	240	.2	.2
100*	120	.8**	N.A.
	240	.4	N.A.

*Level switch units with 50 VA or 100 VA switches are not UL recognized.
**Limited to 50,000 operations.
Switch ratings of UL-listed units: 10 VA or 20 VA at 120 through 240 VAC, pilot duty.

Gems Sensors Division would be pleased to run life tests on our level switches with your specific load and issue a report indicating the approximate number of cycles that can be expected.

GEMS Single Station Level Switches . . .

Compact...rugged...simple in design, GEMS Single Station Level Switches bring maximum reliability to high, low or intermediate liquid level detection in almost any tank or vessel. A comprehensive group of standard models in a variety of materials offers compatibility with most liquids. Repeatability is precise...effects of shock, vibration, pressure or vacuum are minimized. Many standard models are UL-recognized.



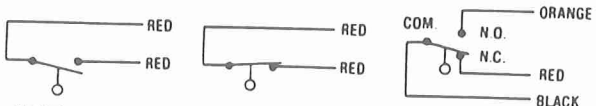
Applications . . .

In storage tanks and reservoirs of all types...in chemical processing systems...for automatic safety interlocks, pump motor control etc. These level switches meet level control requirements in a variety of market areas.

Installation and Maintenance . . .

A standard NPT female boss in tank top or bottom is all that is required for rapid installation. Units operate normally in any attitude from the vertical to a 30° inclination, with lead wires up or down. Standard IPS pipe extends units to any intermediate level in the tank. Wire leads connect to alarm or other remote indicator. Maintenance is minimum...only occasional "wipe-down" cleaning if the liquid is excessively contaminated.

Typical Wiring Diagrams . . . Standard Models



SPST, normally open-dry

SPST, normally closed-dry

SPDT, shown dry

Ordering information . . .

Specify units by P/N (part number) from "Standard Models" charts when ordering GEMS Single Station Level Switches.

Rockwell Automation
Reliance Electric

Model Number	P56H5039	**Environment**	Explosion Proof
Voltage	208-230/460	**Application**	General Duty
Speed(RPM)	1800	**HP**	1/4
Phase	3	**Efficiency**	Standard Efficient
Inverter Duty	N	**Frequency(Hz)**	60
Frame Size	56	**Enclosure**	Totally Enclosed NonVentilated
Features	Class I Group D: Class II Groups F, G	**Prefix Frame**	GA56C
Service Factor	1	**Mounting**	Horizontal C-Face Footless
List Price($)	493	**Approx. Weight (lbs)**	19
Normally Stocked	Y	**Price Symbol**	RSM01
Design	B	**Insulation Class**	B
Page	B1-49	**Parts List (revision)**	
Dimension Sheet	600703-19	**Instr. Manual**	B_3622
Electrical Design	M2706	**Connection Diagram**	416820-35

Rockwell Automation
Reliance Electric

DUTY MASTER ALTERNATING CURRENT MOTORS

SQUIRREL-CAGE INDUCTION

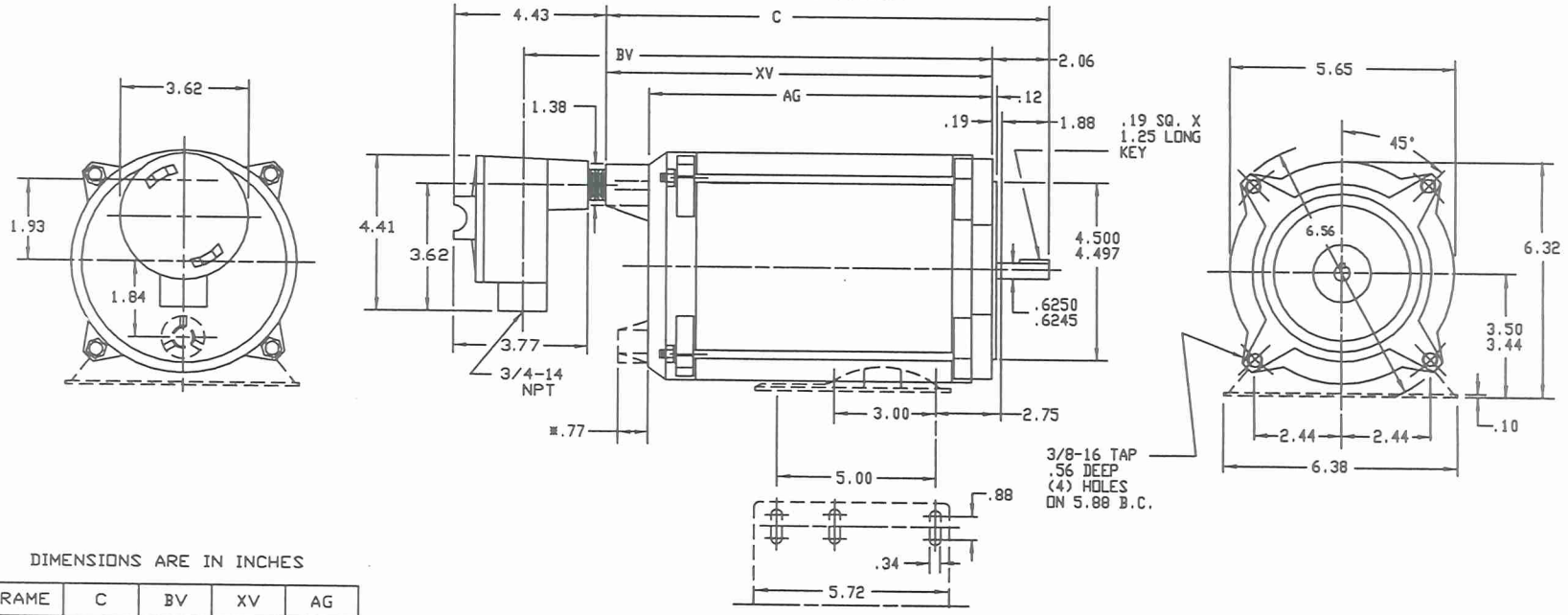
ENCLOSURE: EXPLOSION-PROOF

COOLING: NON-VENTILATED

MOUNTING: RIGID OR ROUND BODY
NEMA "C" FACE

TYPE: P AND CS

5.5 BODY
56C FRAME



DIMENSIONS ARE IN INCHES

FRAME	C	BV	XV	AG
GA56C	10.75	10.90	8.69	7.56
GB56C	11.50	11.65	9.44	8.31
GC56C	11.75	11.90	9.69	8.56
GD56C	12.25	12.40	10.19	9.06
GE56C	12.75	12.90	10.69	9.56
GH65C	13.25	13.40	11.19	10.06
GF56C	13.75	13.90	11.69	10.56

NOTES: FACE RUNOUT AND ECCENTRICTY .004 MAX. T.I.R.
SHAFT RUNOUT .002 MAX. T.I.R.
* DIMENSION APPLIES TO MOTORS WITH MANUAL THERMAL PROTECTOR ONLY.
BASE OPTIONAL-SUPPLIED ONLY WHEN SPECIFIED.

FRAME- _____ TYPE- _____ CERTIFIED FOR- _____

ORDER- _____ ITEM- _____ HP- _____ RPM- _____ PH- _____ HZ- _____ VOLTS _____

RELIANCE SALES ORDER- _____ APPROVED BY- _____ DATE _____

RELIANCE ELECTRIC
CLEVELAND, OHIO 44117 U.S.A.

DR. BY E.GRIMES
CK. BY D.SHAW
APP. BY B.SCHAEFFER
DATE 3-30-77

DIMENSION SHEET 600703-19
ISSUE DATE 11-23-93

C/R 228712-K / 312358-V

FILENAME: E:\DS_AC\600703\019.DWG

DISTRIBUTION: ASD

REL. S.O.	FRAME	HP	TYPE	PHASE/ HERTZ	RPM	VOLTS
–	48/56	1/4	P	3/60	1725	230/460

AMPS	DUTY	AMB°C/ INSUL.	S.F.	NEMA DESIGN	CODE LETTER	ENCL.
1.1/.55	CONT	40/F	1.15	B	M	TENV

E/S	ROTOR	TEST S.O.	TEST DATE	STATOR RES. @25°C OHMS (BETWEEN LINES)
500114-24	602006-23-C	–	–	18/72

PERFORMANCE

LOAD	HP	AMPERES	RPM	% POWER FACTOR	% EFFICIENCY
NO LOAD	0	.95	1799	16.0	0
1/4	.074	.97	1786	30.0	47.0
2/4	.14	1.0	1774	42.0	60.0
3/4	.20	1.1	1762	52.0	66.0
4/4	.26	1.1	1750	61.0	71.0
5/4	.32	1.2	1735	67.0	72.0

SPEED TORQUE

	RPM	TORQUE % FULL LOAD	TORQUE OZ.-FT.	AMPERES
LOCKED ROTOR	0	392	49.0	6.9
PULL UP	300	306	45.0	6.4
BREAKDOWN	1100	457	57.0	5.1
FULL LOAD	1750	100	12.5	1.1

AMPERES SHOWN FOR 230. VOLT CONNECTION. IF OTHER VOLTAGE CONNECTIONS ARE AVAILABLE, THE AMPERES WILL VARY INVERSELY WITH THE RATED VOLTAGE.

REMARKS:

RELIANCE ELECTRIC
CLEVELAND, OHIO 44117 U.S.A.

DR. BY W. A. EWING
CK. BY W. A. EWING
APP. BY W. A. EWING
DATE 7/24/92

AC MOTOR PERFORMANCE DATA

M2706

ISSUE DATE 7/24/92

Installation and Operation Manual

Fractional Horsepower Duty Master® A-C Motors

- Type CS, Capacitor Start
- Type P, Polyphase
- 1/8 Thru 3 hp
- 48–56–140T

Reliance Electric

A-C MOTORS

We're keyed to your need.

Instruction Manual B-3622-13

June, 1988

INSTALLATION AND OPERATION

UNPACKING

Unpack motor carefully. Inspect for possible damage during shipment. Check packing materials. Save any instruction tags or wiring diagrams found in carton. Report any damages or shortages immediately to local transportation agent.

Before connecting motor to electrical supply, inspect for any damage resulting from shipment. Turn shaft by hand to insure free rotation. If the motor has been in storage or subjected to adverse moisture conditions, have it dried thoroughly before operating. After drying, run motor not connected to load for a short time for further drying and as a check on bearings.

WARNING
HIGH VOLTAGE AND ROTATING PARTS CAN CAUSE SERIOUS OR FATAL INJURY. THE USE OF ELECTRIC MACHINERY, LIKE ALL OTHER UTILIZATION OF CONCENTRATED POWER AND ROTATING EQUIPMENT, CAN BE HAZARDOUS. INSTALLATION, OPERATION, AND MAINTENANCE OF ELECTRIC MACHINERY SHOULD BE PERFORMED BY QUALIFIED PERSONNEL. FAMILIARIZATION WITH NEMA SAFETY STANDARDS, NATIONAL ELECTRICAL CODE AND SOUND LOCAL PRACTICES IS RECOMMENDED.

MOUNTING

Mount the motor on a foundation sufficiently rigid to prevent vibration. After careful alignment, bolt motor securely in place.

WIRING

Check nameplate data on motor before installing to insure correct rating and that the available power supply agrees with the motor power supply. If in doubt, check local power company. Fuses, wires, thermal cutouts and other protective devices should be the proper size and rating to safely carry the load and to interrupt the circuit on overloads. Built in thermals, when installed, are of proper size to provide the required protection.

WARNING
GROUND THE MACHINE PROPERLY TO AVOID SERIOUS INJURY TO PERSONNEL. GROUNDING SHOULD BE IN ACCORDANCE WITH THE NATIONAL ELECTRICAL CODE AND CONSISTENT WITH SOUND LOCAL PRACTICES.

All motors contain wiring instructions either as a label on the inside of the conduit box cover or by separate sheet or tag. All motors should be installed in accordance with the National Electric Code and local requirements. Check leads or terminals with connection diagrams or label so the proper connections to the incoming power leads are made.

STARTING

CAUTION: Check direction of motor rotation before coupling motor to load.

The motor should start quickly and run smoothly. If the motor should fail to start it may be that the load is too great, the applied voltage low or the motor improperly connected. In any case, immediately shut motor off, disconnect from power supply, and investigate the cause.

ROTATION

Refer to notation on wiring diagram for method of changing rotation.

AMBIENT TEMPERATURE

Each motor nameplate carries a maximum ambient temperature rating. Motors should not be operated at ambients in excess of this rating.

MAINTENANCE

WARNING
HIGH VOLTAGE. ELECTRIC SHOCK MAY CAUSE SERIOUS OR FATAL INJURY. DISCONNECT POWER BEFORE TOUCHING ANY INTERNAL PART.

The fundamental principle of electrical maintenance is - KEEP THE APPARATUS CLEAN AND DRY. This requires periodic inspection of the motor, the frequency depending upon the type of motor and the service.

The following should be checked at regular intervals.

1. Windings should be dry and free of dust, grease, oil, and dirt. Windings may be cleaned by suction cleaners or by wiping. Nozzles on suction type cleaners should be non-metallic. Gummy deposits of dirt and grease may be removed by using a commercially available mineral solvent. Do not use gasoline or other inflammable solvents.

2. Terminal connections, assembly screws, bolts and nuts should be tight. They may loosen if motor is not securely bolted and tends to vibrate.

3. Insulation resistance of motors in service should be checked periodically at approximately the same

temperature and humidity conditions to determine possible deterioration of the insulation. When such measurements at regular intervals indicate a wide variation, the cause should be determined. Motor should be reconditioned if the motor has been subjected to excessive moisture, or by re-winding or re-insulating if necessary. Enclosed motors require very little attention. Be sure that external air chamber of fan cooled motors does not become clogged with foreign material which will restrict passage of air.

WARNING
MINERAL SOLVENTS ARE FLAMMABLE AND MODERATELY TOXIC. THE USUAL PRECAUTIONS FOR HANDLING CHEMICALS OF THIS TYPE SHOULD BE OBSERVED. THESE INCLUDE:

1. **AVOID EXCESSIVE CONTACT WITH SKIN.**
2. **USE IN WELL VENTILATED AREAS.**
3. **TAKE NECESSARY PRECAUTIONS TO PREVENT FIRE OR EXPLOSION HAZARDS.**

LUBRICATION

BALL BEARINGS

The ball bearing has deep grooved, double shielded bearings with sufficient lubricant packed into the bearings by the manufacturer for "life Lubrication". The initial lubricant is supplemented by a supply packed into larger reservoirs in the end shield at time of assembly. No grease fittings are provided as the initial lubrication is adequate for up to 10 years of operation under normal conditions.

SLEEVE BEARINGS

The bearing sleeve is steel on the outside for strength with a tin base babbit lining on the inside for low friction and long wear. A storage space around the bearing is filled with Permawick, a commercial composition of special cellulose fiber highly saturated with oil. The initial factory lubrication is normally adequate for approximately one year under normal operation. Thereafter, lubricate about every six (6) months. This requires about 3 to 4 squirts from a 4 in. oil can. Use only LIGHT grade mineral oil (similar to SAE 10W) having viscosity of 210 sec. at 100°F. If the motor has been subjected to storage prior to operation it is advisable to lubricate in accordance with the above.

OVERLOAD PROTECTION

Motors supplied with thermal protectors are furnished with either a manual or automatic reset type to protect against destructive overheating. If the protector trips, proceed as follows:

FOR MANUAL RESET TYPE

1. Wait two minutes.
2. Push in reset plunger until it catches.

FOR AUTOMATIC RESET TYPE

This type will reset itself when the motor cools sufficiently.

If the thermal protector continues to trip, some abnormal condition exists. This condition must be corrected before motor will operate normally.

WARNING
MOTORS WITH AUTOMATIC RESET THERMAL PROTECTORS SHOULD BE USED IN APPLICATIONS WHERE AN UNEXPECTED RESTART WOULD NOT BE HAZARDOUS.
IF A MOTOR USING AN AUTOMATIC RESET THERMAL PROTECTOR HAS TRIPPED "OFF" MAKE SURE TO DISCONNECT MOTOR FROM LINE BEFORE WORKING NEAR THE MOTOR OR ANY EQUIPMENT DRIVEN BY IT: SERIOUS INJURIES COULD OCCUR OTHERWISE DUE TO AN UNEXPECTED "RESET" AND MOTOR START UP.

TROUBLE SHOOTING

If trouble develops in operation of motor, be sure that:

(a) The bearings are in normal condition and have been properly lubricated with a high grade, ball bearing lubricant, free of dirt or grit. (If dirt enters bearing, flush and relubricate.)

(b) There is no mechanical misadjustment to prevent free rotation of moving parts of motor and drive.

(c) All bolts and nuts are properly tightened.

(d) Motor instructions have been carefully carried out.

(e) That rated voltage is available in all phases at the motor terminals.

(f) That the line voltage, frequency and phase correspond to the values stamped on the nameplate.

(g) That all connections and contacts are properly made in all circuits between motor and line, and between motor and control.

(h) That overload and low voltage devices in control equipment, fuses or other protective devices are in proper working order.

(i) That no excessive overload exists on the motor. Company line amperes at full load with nameplate stamping.

WARRANTY

Reliance Electric Company warrants workmanship and materials on each Fractional Horsepower Duty Master A-C Motor for one year from date of shipment. This warranty does not extend to failures induced by misuse, abuse or misapplication. For warranty service, contact the nearest Reliance Electric distributor, service shop or sales office.

REPAIR PROCEDURES

NOTE: *Reliance Electric Company cannot be held responsible for expense incurred in any repairs performed by other than the Company's Engineers or Authorized Service Stations unless authorization has been granted by Reliance Field Representatives or the factory at Cleveland, Ohio.*

WARNING
INTERNAL PARTS OF THIS MOTOR MAY BE AT LINE VOLTAGE EVEN WHEN MOTOR IS NOT ROTATING. BEFORE CONTACTING ANY INTERNAL PART: DISCONNECT ALL A-C LINE CONNECTIONS.

DISASSEMBLY

If it becomes necessary to disassemble the motor, care should be taken not to damage the stator windings as the insulation may be injured by improper or rough handling. Precautions to keep bearings clean should be exercised.

Before removing either end shield;

1. Disconnect motor from power source. Tag the leads to insure proper reconnection.
2. Remove motor from mounting base.
3. Mark end shields relative to position on frame so they can be easily replaced.

REMOVING END SHIELDS AND ROTOR

4. Remove any bearing cartridge nuts or screws.
5. Remove end shield through bolts.
6. Pull end shields by tapping lightly on screw driver in slot between end shield and frame with fiber mallet.
7. Remove rotor.

REMOVING AND REPLACING BALL BEARINGS

Should it become necessary to replace bearings, the bearing bore and cavity should be thoroughly cleaned and repacked with approximately 1/2 teaspoonful of recommended grease. (Chevron SRI #2 or equivalent.)

Bearings should be removed with bearing pullers using a center insert in the end of the shaft to protect the shaft center. If a puller is not available, use a fiber hammer and transmit blows through a hard wood block.

To re-install ball bearings, either in a press or on the bench, pressure should be applied to the inner race by using a square faced sleeve or piece of pipe that will fit over the shaft, to avoid damaging the bearing. If a press is not available and a hammer is used, the blows should be transmitted against the sleeve by a block of wood or fiber.

REASSEMBLY

Follow reverse procedure as outlined for Disassembly. Having marked the brackets in the original position, replace as marked.

WARNING
THE USE OF ELECTRICAL EQUIPMENT IN HAZARDOUS LOCATIONS IS RESTRICTED BY THE NATIONAL ELECTRICAL CODE, ARTICLE 500. ORIGINAL EQUIPMENT MANUFACTURERS AND USER CUSTOMERS MUST READ, UNDERSTAND AND APPLY THESE RULES FOR INSTALLATION AND USE OF ALL EQUIPMENT IN SUCH LOCATIONS AND CONSULT LOCAL CODE INSPECTION AND ENFORCEMENT AGENCIES AS NECESSARY TO INSURE COMPLIANCE. MOTORS LISTED BY UNDERWRITERS LABORATORIES, INC., FOR USE IN SPECIFIC LOCATIONS HAVE BEEN DESIGNED, TESTED, AND APPROVED FOR USE IN SUCH LOCATIONS ONLY.

A-C DRIVES
TRAINING AND AUDIO/VISUAL PRODUCTS

Reliance Electric offers a wide variety of Industrial Training courses for electricians, electronic technicians and engineers who are responsible for the installation, repair and maintenance of production equipment and systems.

Professional quality A/V Programs are also available. These programs have been designed to provide years of efficient in-house training. Available for playback at the user's convenience, these videotape programs allow individual or groups to learn or review subjects at any time.

Printed reference materials come with all diagnostic and troubleshooting programs.

Training Courses

No.	Title
	A-C DRIVE COURSES
2-1	Maintenance and Troubleshooting of VVI Style Variable-Speed A-C Drives
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2-4	VVI/PWM A-C Drives Hands-On Troubleshooting Lab
2-7	Maintenance and Troubleshooting VCI A-C Inverters
2-8	Maintenance and Troubleshooting VGI A-C Inverters

Audio/Visual Products

Order No.	Title	Format	Price
	A-C DRIVES PROGRAMS		
TM2241	Introduction to the VVI	Videotape	**$725**
TM2242	Troubleshooting the VVI Regulator	Videotape	**995**
TM2367	Troubleshooting the 6-Transistor Power Module	Videotape	**725**
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For details and prices on these courses, audio/visual products and FREE Training Schedule Brochure, HD-405, contact:

Industrial Training Department
Reliance Electric
35000 Curtis Boulevard
Eastlake, Ohio 44095

Call Toll Free:

800-RELIANCE
(800-735-4262)

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RELIANCE ELECTRIC

798-5674

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