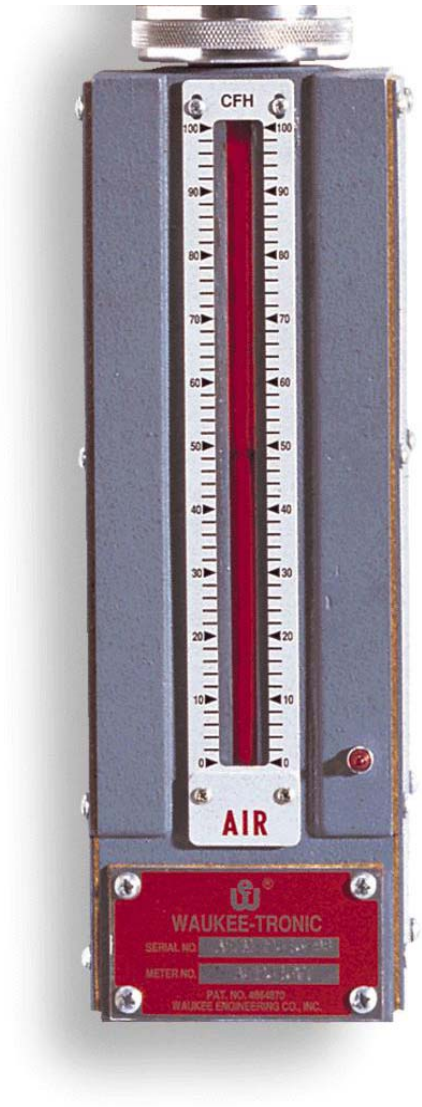
WAUKEE ENGINEERING

Waukee-Tronic
Installation and Operation Manual

a member of United PROCESS CONTROLS



NOTICE

This manual contains important safety information and should be read and understood by all installation personnel and all users of this equipment. This Manual only applies to models AEFSI, AEFMI and AEFLI. If your unit does not have an "I" use the previous revision of this manual "2004".

2004-R1

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INTRODUCTION

The Purpose of this Manual

Thank you for purchasing a Waukee-Tronic Flow Sensor. This Manual shows you how to install, wire and maintain all Waukee-Tronic Models. It also helps you understand how to interface them to other devices in a control system. This manual contains important information and should be read and understood by all individuals who install, use or service this equipment.

Supplemental Manuals

The 904 "Installation and Operation of Waukee Flo-Meters" manual contains technical information as well as precautions about Waukee Flo-Meter's

Technical Support

We strive to make our manuals the best in the industry. We rely on your feedback to let us know if we are reaching our goal. If you cannot find the solution to your particular application, or, if for any reason you need technical assistance, please call us at:

414-462-8200

Our technical support group will work with you to answer your questions. They are available Monday through Friday from 8:00 A.M. to 4:30 P.M. Central Standard Time. We also encourage you to visit our web site where you can find technical and non-technical information about our products and company.

http://www.waukeemeters.com
http://www.group-upc.com

If you have a comment, question or suggestion about any of our products, services, or manuals, please e-mail us or contact us by phone.

Conventions Used

When you see the "exclamation point" icon in the left-hand margin, the paragraph to its immediate right will be a warning. This information could prevent injury, loss of property, or even death in extreme cases. Any warning in this manual should be regarded as critical information that should be read in its entirety. The word WARNING or CAUTION in boldface will mark the beginning of the text

Field Device

Refers to any device the Waukee-Tronic connects to that accepts a 4-20mA signal. (Ex. PLC, Chart Recorder, Controller, etc.)

SENSOR OVERVIEW

The Waukee-Tronic Flow Sensor is an electronic package for use with Waukee Flo-Meters. It provides visual flow rate indication at the Flo-Meter as well as a current output (4-20 mA) linearly proportional to the flow rate to connect to a Field Device like a PLC or Recorder.

Principle of operation

The Waukee-Tronic Flow Sensor operates on the photo electric principle. The left side of the sensor contains a vertical series of LEDs; the right side of the sensor contains a vertical series of phototransistors. When the light beam to a phototransistor is broken, the phototransistor is turned "off". At zero flow, the light beam to all the phototransistors is obstructed by the float rod assembly resulting in a 4 mA output. When there is flow, the float rod rises and the phototransistors are exposed to the light, the current output is based on the light level they are exposed to. The phototransistors are all connected in parallel and as the float rod rises because of an increased flow rate, the current generated by each phototransistor exposed to the light is continuously and linearly added to the zero flow value of 4 mA until at the 100 percent (100%) level of full scale of the Flo-Meter the output is 20 mA.

CAUTION: This unit contains ESD (Electrostatic Discharge) sensitive parts and assemblies. Static control precautions are required when installing, testing, servicing or repairing this assembly. Component damage may result if ESD control procedures are not followed. If you are not familiar with static control procedures refer to an applicable ESD protection handbook.

WARNING: If Flo-Meter is equipped with a flow control valve <u>DO NOT</u> use it as a means for positive shut-off. Valves may leak gas into equipment and cause asphyxiation, poisoning or in extreme cases death. If positive shut-off is desired install a manual shut-off valve before the inlet of the Flo-Meter.

WARNING: Flo-Meter must be earth grounded. Ungrounded Flo-Meters may become a source of ignition.

PRODUCT IDENTIFICATION

AEFSI	Flow Sensor for "S", (3" scale) Waukee Flo-Meters 4-20 mA output, Does not have Change Oil / Zero Flow Indicator.
AEFMI	Flow Sensor for "M", (6" scale) Waukee Flo-Meters 4-20 mA output, Has Change Oil / Zero Flow Indicator
AEFLI	Flow Sensor for "L", (9" scale) Waukee Flo-Meters. 4-20 mA output, Has Change Oil / Zero Flow Indicator

SENSOR SPECIFICATIONS

The Waukee-Tronic Sensor offers the following features:

- Isolated 4-20mA output.
- The removable quick disconnect plug makes it possible to remove the unit without disconnecting field wiring.
- Most importantly not only is the flow outputted electrically as a 4-20mA signal, but it also provides visual indication of flow. This fulfills the requirements as outline in NFPA86.
- Zero Flow/ Dirty Oil Light – indicates zero flow or dirty oil.*
- Can be used will all of Waukee's current Flo-Meter's as well as retrofit able to most Waukee Flo-Meter's in the field.

*Excludes AEFSI Series

Operating Voltage:	24 VDC (±10%)	
Power Consumption:	AEFSI	125mA
	AEFMI	250mA
	AEFLI	250mA
Output:	4-20mA Isolated Current Loop	
Maximum Load:	AEFSI	600Ω
	AEFMI	1000Ω
	AEFLI	1000Ω
Maximum Operating Temperature:	150˚F (32℃)	
Minimum Operating Temperature:	32˚F (0˚C)	
Accuracy:	±2% of full scale	
Resolution:	±2% of full scale	
Repeatability:	±2% of full scale	

INSTALLATION

Flo-Meter Installation

The 904 "Installation and Operation of Waukee Flo-Meters" manual contains instructions on the proper installation of the Flo-Meter. Refer to Figure 1 for reference and read all CAUTIONS and WARNIGS before proceeding.

The Waukee-Tronic Flo-Meter is shipped as a complete unit shown in Figure 1. Before Installing the Flo-Meter carefully remove the Waukee-Tronic, to achieve this lay the unit on its side on a work space. Then hold the Waukee-Tronic unit with one hand, while unscrewing the union nut counterclockwise with the other hand to loosen it.

CAUTION: Once the Waukee-Tronic is loose from the Flo-Meter make sure to pull the Waukee-Tronic from the Flo-Meter straight back off the float rod assembly. Moving the Waukee-Tronic to one side or another during removal may result in damage to the float rod assembly.

Once the Waukee-Tronic is free from the Flo-Meter, THE FLOAT ROD MUST NOT BE BENT OR DAMAGED IN ANY WAY. INACCURATE READING MAY RESULT IF FLOAT ROD IS BENT. Remove the Float Rod Assembly and store it in a safe location until Flo-Meter body is mounted. Remove the red tape from the float rod and insert the float rod assembly into the Flo-Meter body. Remove the sight glass tube from the Waukee-Tronic and fill the tube with Waukee Flo-Meter Oil so that the level of oil is approximately one (1) inch from the top. **Note:** Do not put oil in the sight glass tube of meters used for **oxygen** or **methanol** service. Oxygen Flo-Meters should be run dry, or with distilled water. Flo-Meters for Methanol service will automatically fill the sight glass tube with Methanol when in service. Place the sight glass tube back into the Waukee-Tronic, making sure the sight glass tube o-ring is properly seated, then carefully install the Waukee-Tronic on to the Flo-Meter.

WARNING: Do not fill the sight glass tube with Flo-Meter oil on meters used for Oxygen service. Use of oil may cause fire or explosion. Serious personal injury may result from fire or explosion.

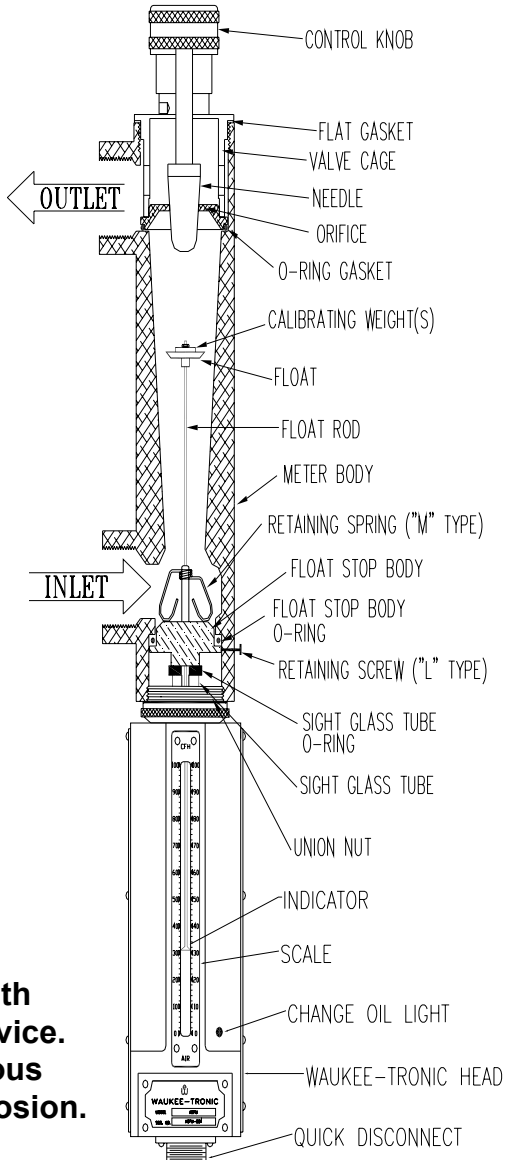


Figure 1

Wiring Guidelines

Your company may have guidelines for wiring installation. If so, you should check those before you begin the installation. Here are some general things to consider:

- Use the shortest wiring route whenever possible
- Use shielded wiring and ground the shield at the Field Device End. **DO NOT** ground the shield at both the Waukee-Tronic and Field Device.
- Do not run the signal wiring next to large motors, high current switches, or transformers. This may cause noise problems.
- Route the wiring through an approved cable housing to minimize the risk of accidental damage. Check local and national codes to choose the correct method for your application.

Connecting the Waukee-Tronic

The Waukee-Tronic is supplied with an electrical quick disconnect plug. The wiring side of the male connector for the AEFMI and AEFL is show in Figure 2. The connector diagram for model AEFS is shown in Figure 3. A four conductor 18-20AWG Shielded Cable is recommended and a suitable source of 24 VDC power is required which Waukee can supply as an extra cost option if needed.

NOTE: Be sure to leave enough slack in the cable to allow easy removal of the Waukee-Tronic from the Flo-Meter for maintenance. If seal tight or similar conduit is used, be sure to provide an adequate loop of conduit for maintenance access.

CAUTION: To reduce the risk of electrical shock and also to prevent damage to the Waukee-Tronic and the Field Device the Waukee-Tronic is connecting to. It is advised to turn off the supply power to the Waukee-Tronic and Field Device before connecting or disconnecting any wires.

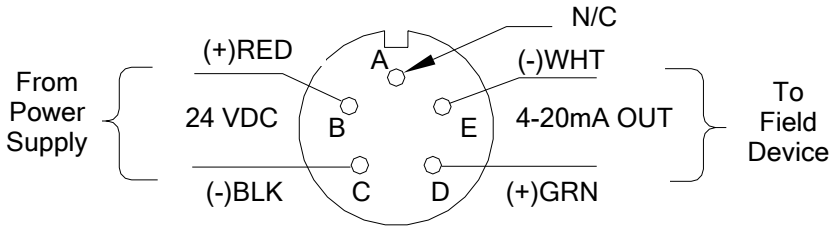
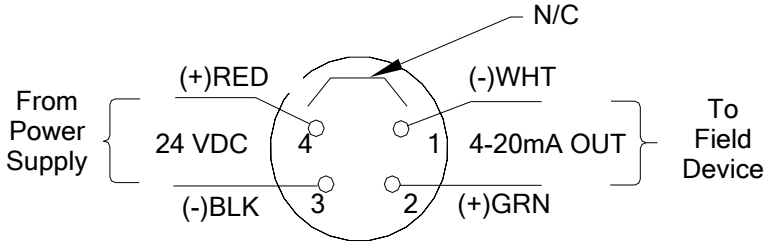


Figure 2
AEFM, AEFL Model
Quick Disconnect
Wire Side View

Figure 3
AEFS Model
Quick Disconnect
Wire Side View



WIRING DIAGRAMS

Use the following diagrams to connect the Waukee-Tronic to a PLC, Recorder, or any Field Device that accepts a 4-20mA input signal. Figure 4 shows connection to a field device with differential inputs (separate + and -) Figure 5 shows connections to a field device with single ended inputs (common -).

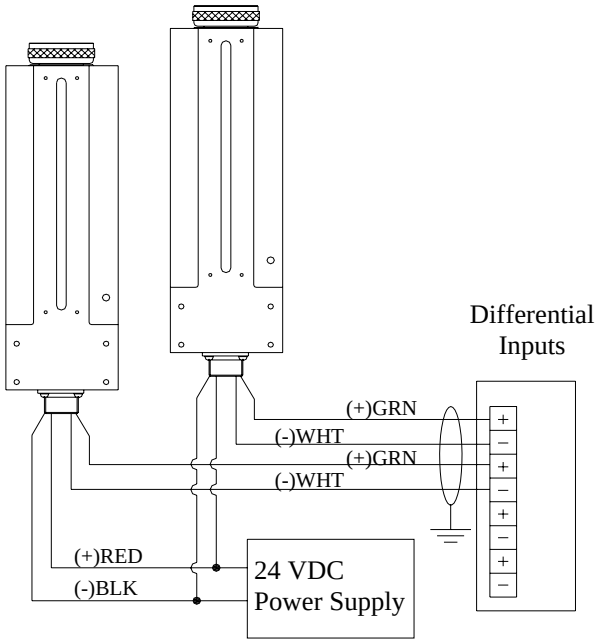


Figure 4

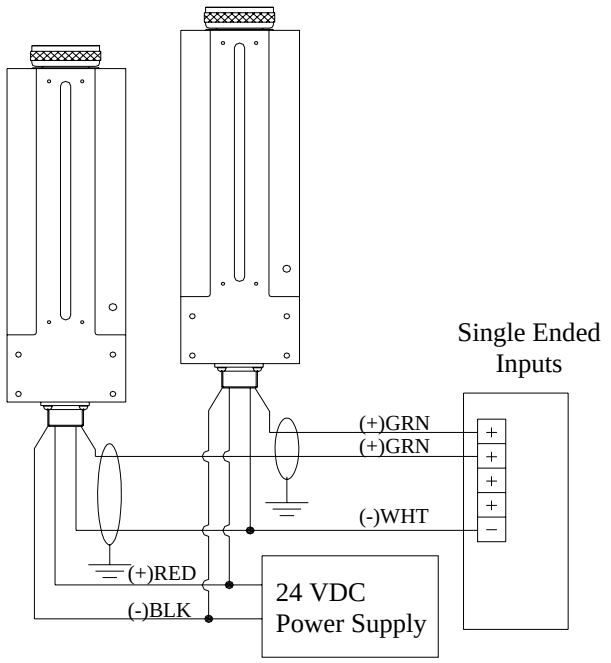


Figure 5

FUSE PROTECTION

The Waukee-Tronic circuitry is protected by two fuses. The power protection fuse is located on the Input board located under the Serial/Model number plate. Refer to Figure 16. The 4-20mA output protection fuse is located on the pick-up board assembly located on the right side of the Waukee-Tronic. See Figure 7 & 8.

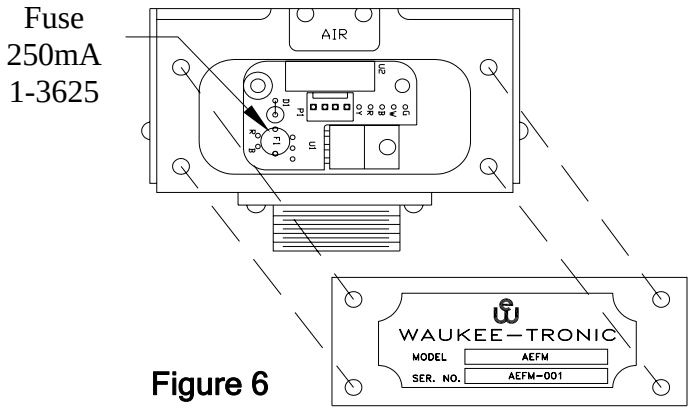


Figure 6

CLIBRATION AND FIELD SERVICE

The Waukee-Tronic current output signal is calibrated at the factory and should be received calibrated, but in some cases the calibration may be off. If the readings are off by more than 2.5%, you can recalibrate the current output by the adjustment of small potentiometers inside the Waukee-Tronic. When looking at the front of the Waukee-Tronic, remove the right hand side cover by removing the #2 Phillips head screws holding the cover in place, see Figure 7. Once the right hand side cover is removed, refer to Figure 8 for the AEFS models and Figure 9 for the AEFM, AEFL models for the location of potentiometers.

Do not turn potentiometers excessively as these adjustments are sensitive. The bottom potentiometer marked 4 is the adjustment for the 4 mA (Zero) at zero flow. The potentiometer marked 20 is the adjustment for 20 mA (Span) at full flow.

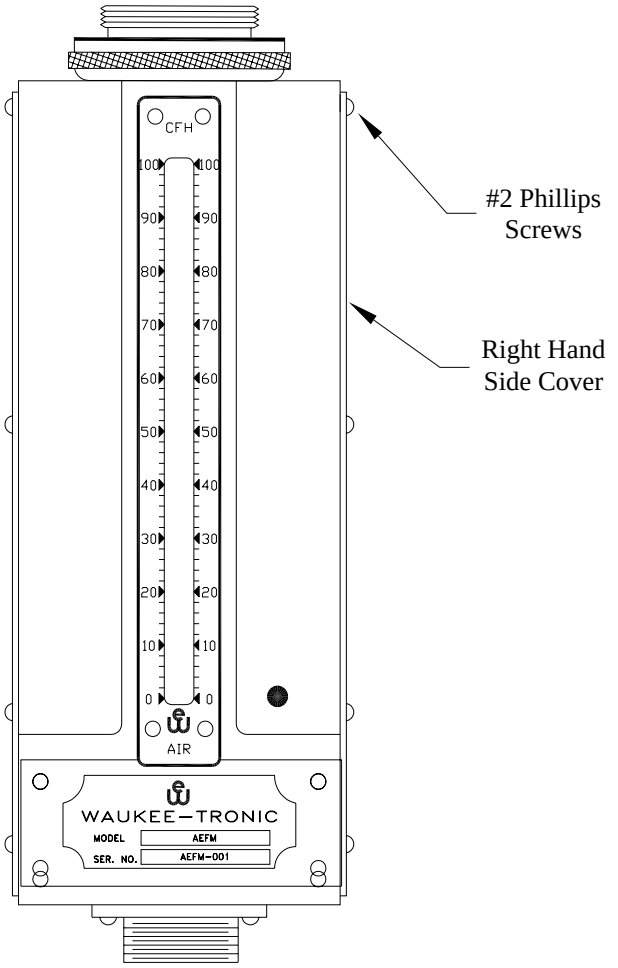


Figure 7

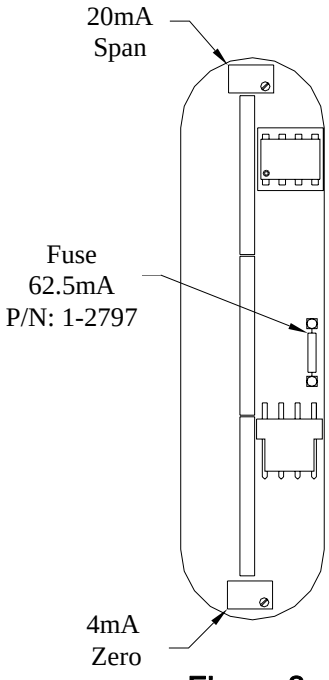


Figure 8
AEFSI

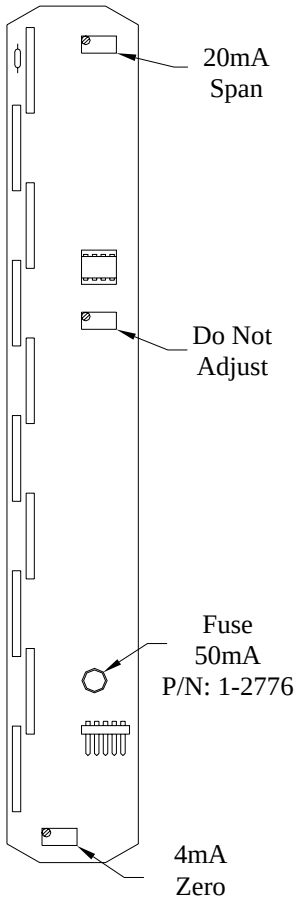


Figure 9
AEFMI, AEFLI

Measurement of 4-20mA output

CAUTION: Before proceeding power to the Waukee-Tronic should be shut-off while making connections. Failure to follow this advisory may result in damage to the Waukee-Tronic and/or Field device the Waukee-Tronic is connected to.

There are a few methods to measure the 4-20mA output of the Waukee-Tronic. These methods are detailed below.

Method 1

Purchase a Waukee-Tronic "Quick Read" harness from Waukee. This is the preferred method of measurement since it avoids the possibility of shorting wires or connecting to the wrong wires. The part number for the "Quick Read" harness is 2-1717 for the AEFSI Models and 2-1682 for the AEFMI and AEFLI Models. This harness connects in series with the Quick Disconnect plug located on the bottom of the Waukee-Tronic and provides leads to go to an Ammeter for measurement.

Method 2

If you do not have a "Quick Read" harness you can measure the 4-20mA output by connecting an Ammeter in series. Locate the wire termination point and remove either the white or green wire and connect one lead of the Ammeter to one end of the wire and the other lead to the other end. Refer to Figure 10. (NOTE: You will want to be as close to the Waukee-Tronic as possible to be able to calibrate it.)

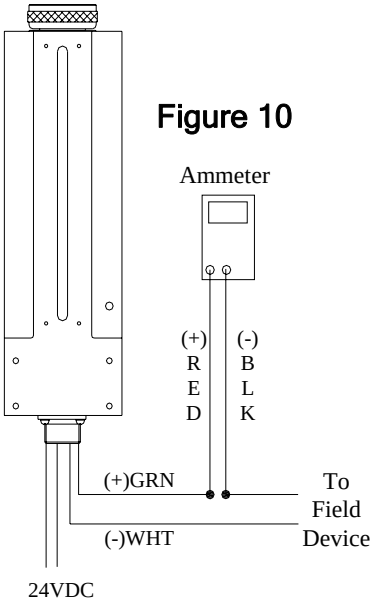


Figure 10

Method 3

Connect an Ammeter across the output. Refer to Figure 11. This method is great for troubleshooting because it eliminates any other field devices it is connected too. Locate the wire termination point and disconnect the Green and White wires, then connect you Ammeter across these wires. Use this method when the Waukee-Tronic appears to not be providing a 4-20mA output. (NOTE: You will want to be as close to the Waukee-Tronic as possible to be able to calibrate it.)

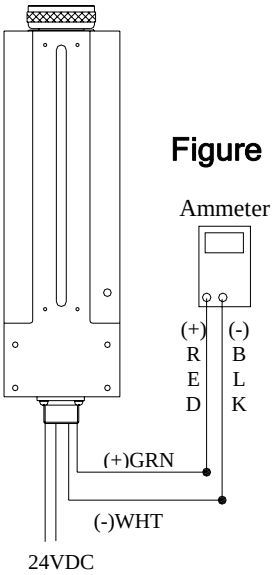


Figure 11

CAUTION: When Using Methods 2 or 3 make sure you are connecting to the proper wires and ensure none of the connections are shorted to ground or to each other before applying power. Failure to do so may result in damage to the Waukee-Tronic or Field Device.

Adjustment of 4-20mA Output

NOTE: Before proceeding check to make sure the Flo-Meter oil and sight glass tube is clean. Usually this is the first cause of the 4-20mA output not reading correctly.

This procedure requires the ability to move the float rod from 0 “Zero” flow to 100% “Full Flow” there are two methods to achieve this

Method 1

Remove the Waukee-Tronic and float rod assembly from the Flo-Meter and manually move the float rod assembly to the required position for calibration. Refer to page 6 of this manual for removal and installation. This is the preferred method of Calibration of the Waukee-Tronic.

CAUTION: Make sure supply fluid to Flo-meter has been SHUT-OFF before removing the Waukee-Tronic from the Flo-Meter. Failure to do so may result in accidental death or explosion.

Method 2

If the equipment and process allows this, the float rod assembly can be moved to the required position for calibration by shutting off the fluid valve for zero flow and opening the fluid valve to full open for full flow.

WARNING: Depleting or over gassing of equipment that the Flo-Meter is connected to may produce a hazardous condition, check with all personnel before attempting this method of calibration. Waukee is not responsible for any damages that may occur using this method.

To adjust the 4 mA (Zero) for zero flow output, the float rod should be at the bottom or zero flow position. Current output should be between 3.9 mA and 4.1 mA. If not adjust the 4 mA (Zero) potentiometer until the current output is between 3.9 and 4.1 mA. Refer to Figure 7 and 8 for location of potentiometers. To adjust the 20mA (Span) The float rod will now need to be adjusted to read 100% of scale. The current output should be between 19.5 and 20 mA. Adjust the 20 mA potentiometer until the current output is 19.5-20 mA. The 4 mA output must be rechecked after every 20 mA adjustment and the 20 mA output should be re-checked after each 4 mA adjustment. It will take several sets of adjustments to obtain the correct readings on both the 4 and 20 mA outputs.

MAINTENANCE

For optimum performance the Waukee-Tronic must have the oil changed regularly to maintain accuracy. The frequency of maintenance intervals will vary depending on the cleanliness of the gas being used. To replace the oil will require the removal of the Waukee-Tronic, refer to the Installation section of this manual for instructions. Also during these maintenance intervals it is recommended that all gaskets and O-rings are inspected for signs of wear or damage. Replace worn or damaged seals. Gasket kit sets are available from Waukee if needed.

CALCULATIONS

Determine output in mA for a given flow rate

1. First determine the % of scale represented by:

$$\% \text{ of Scale} = \frac{\text{Actual Flow (cfh)}}{\text{Full Scale Flow (cfh)}}$$

2. Then the mA Output is calculated by:

$$mA = (\% \text{ of Scale} \times 16) + 4$$

Example 1:

Scale Plate is 750CFH
Indicated Flow is 500CFH

$$\frac{500}{750} = .6666$$

$(.6666 \times 16)+4 = 14.65mA$

Determine the flow rate from the mA output

1. First determine % of Full Scale:

$$\% \text{ of Full Scale} = \frac{mA - 4}{16}$$

2. Then Actual Flow is calculated by:

$$\text{Actual Flow} = \% \text{ of Full Scale} \times \text{Full Scale Flow}$$

Example 2:

Find the flow rate for a mA signal of 12.00mA and a Flow Meter Scale of 1000CFH

$$\frac{12 - 4}{16} = .5 \text{ or } 50\%$$

$.5 \times 1000 = 500CFH$

RELATIONSHIP OF CURRENT AND VOLTAGE OUTPUT FROM WAUKEE- TRONIC

%	mA	VOLT	%	mA	VOLT	%	mA	VOLT
0	4.00	.200	35	9.60	.480	70	15.20	.760
1	4.16	.208	36	9.76	.488	71	15.36	.768
2	4.32	.216	37	9.92	.496	72	15.52	.776
3	4.48	.224	38	10.08	.504	73	15.68	.784
4	4.64	.232	39	10.24	.512	74	15.84	.792
5	4.80	.240	40	10.40	.520	75	16.00	.800
6	4.96	.248	41	10.56	.528	76	16.16	.808
7	5.12	.256	42	10.72	.536	77	16.32	.816
8	5.28	.264	43	10.88	.544	78	16.48	.824
9	5.44	.272	44	11.04	.552	79	16.64	.832
10	5.60	.280	45	11.20	.560	80	16.80	.840
11	5.76	.288	46	11.36	.568	81	16.96	.848
12	5.92	.296	47	11.52	.576	82	17.12	.856
13	6.08	.304	48	11.68	.584	83	17.28	.864
14	6.24	.312	49	11.84	.592	84	17.44	.872
15	6.40	.320	50	12.00	.600	85	17.60	.880
16	6.56	.328	51	12.16	.608	86	17.76	.888
17	6.72	.336	52	12.32	.616	87	17.92	.896
18	6.88	.344	53	12.48	.624	88	18.08	.904
19	7.04	.352	54	12.64	.632	89	18.24	.912
20	7.20	.360	55	12.80	.640	90	18.40	.920
21	7.36	.368	56	12.96	.648	91	18.56	.928
22	7.52	.376	57	13.12	.656	92	18.72	.936
23	7.68	.384	58	13.28	.664	93	18.88	.944
24	7.84	.392	59	13.44	.672	94	19.04	.952
25	8.00	.400	60	13.60	.680	95	19.20	.960
26	8.16	.408	61	13.76	.688	96	19.36	.968
27	8.32	.416	62	13.92	.696	97	19.52	.976
28	8.48	.424	63	14.08	.704	98	19.68	.984
29	8.64	.432	64	14.24	.712	99	19.84	.992
30	8.80	.440	65	14.40	.720	100	20.00	1.000
31	8.96	.448	66	14.56	.728			
32	9.12	.456	67	14.72	.736			
33	9.28	.464	68	14.88	.744			
34	9.44	.472	69	15.04	.752			

TROUBLE SHOOTING GUIDE

PROBLEM	SYMPTOMS	PROBABLE CAUSE	RECOMMENDED ACTION
Waukee-Tronic does not illuminate.	• No red glow in sight glass tube.	• 24V DC power supply is connected reverse polarity or less than 24V DC. • Power Fuse on Input board is blown • Open Circuit	• Check wire connections. • Check voltage across Red and Black Wires. • Check Power Polarity. • Check Power Fuse and replace if needed.
Waukee-Tronic does not produce 4 mA at zero float rod position "Zero Flow" or 20 mA at 100% float rod position "Full Flow".	• Incorrect mA reading. • Change oil light is on.	• Oil and/or Sight Glass Tube is Dirty. • Wires to Green and White wires are reversed (negative reading). • Loose Connection on Green and White wires	• Replace Flo-Meter oil and Clean Sight Glass Tube. • Check wiring to Green and White wires • Remove Green and White wires and place an ammeter across these terminals. Check for 4 and 20 mA readings. Adjust if required.
No 4-20mA Output	• "0" Zero mA reading regardless of float rod position.	• Blown 4-20mA Current Loop Fuse • Broken current loop	• Check Wiring • Replace 4-20mA Current loop Fuse
No 20mA Output when float rod is at 100% position "Full Flow"	• Cannot obtain a 20mA output	• Too much resistance in the 4-20mA current loop • Power supply is not at 24VDC • Dirty oil and/or Sight Glass Tube • Boards out of alignment	• Look up the Field Devices Input Impedance. Input Impedance must be less then 900Ω of AEFMI and AEFLI Models and less then 550Ω for AEFSI Models. • Check Power Supply voltage across Red and Black wires. Voltage should be 24VDC ±10% • Replace Flo-Meter oil and clean Sight Glass Tube. • Send Unit Back to Waukee for Repair.

EXPRESS WARRANTY ON WAUKEE EQUIPMENT.

WAUKEE warrants its products for a period of one (1) year from date of shipment from WAUKEE to the original purchaser to be free from defects in material and workmanship under normal recommended use, service, inspection and maintenance. Normal recommended use, service inspection and maintenance mean:

1. Not to be used in excess of nor below the rated capacity, pressures and temperature ranges specified in the applicable quotation, purchase order, acknowledgment, marketing literature, nameplate(s), specification sheet or the Installation, Operation, Inspection and Maintenance Manual (THE MANUAL);

2. Using only clean liquids or gases (only liquids in liquid Flo-Meters and only gases in gas Flo-Meters); air and fuel gases used in mixing equipment to be clean and free of solids all as further explained in THE MANUAL; and

3. Installation, operation, inspection and maintenance in compliance with THE MANUAL; and

4. The WAUKEE products being used only in:

a. Ambient environments lower than 132° Fahrenheit (54° Celsius) unless specifically designed and so labeled by WAUKEE for higher temperatures; and

b. Non-corrosive environments; and

c. Completely protected from moisture, rain, snow or other outside environments; and

d. Not to be used below 32° Fahrenheit (0° Celsius) unless special precautions are taken for low temperature conditions as shown in THE MANUAL.

5. Being used only for applications permitted by THE MANUAL or other WAUKEE literature or special applications approved in a separate written authorization by WAUKEE.

WARRANTY EXCEPTIONS

This Warranty does not apply to damage caused by any or all of the following circumstances or conditions:

1. Freight damage;

2. Parts, accessories, materials or components not obtained from nor approved in writing by WAUKEE;

3. Any consequential or incidental damages including but not limited to loss of use, loss of profits, loss of sales, increased costs, arising from the use of any product, system or other goods or services manufactured, sold or provided by WAUKEE;

4. Misapplication, misuse and failure to follow THE MANUAL or other literature, instructions or bulletins (including drawings) published or distributed prior to THE MANUAL.

The exclusive remedy under this Warranty or any other express warranty is the repair or replacement without charge for labor and materials of any WAUKEE parts found upon examination by WAUKEE to have been defective. Since certain WAUKEE equipment is heavy, bulky and not deliverable by U.S. mail or other parcel service, WAUKEE equipment may be returned only upon written consent of WAUKEE and then only to the location designated by WAUKEE. Generally such consent will be given only upon the condition that the customer assume and prepay all carrier charges and responsibility for damage in transit.
Purchasers of WAUKEE products, equipment, goods or services waive subrogation on all items covered under their own or any other insurance.

DISCLAIMER

THIS WARRANTY IS EXCLUSIVE. WAUKEE EXPRESSLY DISCLAIMS ANY AND ALL OTHER WARRANTIES WHETHER EXPRESS OR IMPLIED INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR ANY PURPOSE.

No person, including any dealer, seller or other representative of WAUKEE is authorized to make, on behalf of WAUKEE, any representations beyond those contained in WAUKEE literature and documents or to assume for WAUKEE any obligations or duties not contained in this Warranty and Warranty Policy.

WAUKEE reserves the right to make design and other changes, modifications or improvements to its products, services, literature or systems, without any obligation, to furnish or install same on any previously sold or delivered products or systems.

LIMITATION OF LIABILITY

It is expressly agreed that the liability of WAUKEE is limited and WAUKEE does not function as an insurer. The purchaser and/or user agree that WAUKEE is not liable for loss, harm or damage due directly or indirectly to any occurrence or consequences therefrom. If WAUKEE should be found liable to anyone on any theory (except any express warranty where the remedy is set forth in Section 2 of this Warranty and Warranty Policy) for loss, harm or damage, the liability of WAUKEE shall be limited to the lesser of the actual loss, harm or damage or the purchase price of the involved WAUKEE equipment or service when sold (or when service performed) by WAUKEE to its customer. This liability is exclusive and regardless of cause or origin resulting directly or indirectly to any person or property from:

1. The performance or nonperformance of any obligations set forth in this Warranty and Warranty Policy:

2 Any agreement including specifications between WAUKEE and the customer;

3 Negligence, active, passive or otherwise of WAUKEE or any of its agents or employees;

4. Breach of any judicially imposed warranty or convenant of workmanship, durability or performance; and

5. Misrepresentation (under the Restatement, common law or otherwise) and/or strict liability involvement.

6. Liability for fraud-in-the-inducement.

INFORMATION NECESSARY TO OBTAIN TECHNICAL ASSISTANCE.

For WAUKEE to appropriately respond to a request for assistance or evaluation of customer or user operating difficulty. Please provide at a minimum the following information:

1. Serial number and type or model of meter, compressor or other equipment and all other data shown on the nameplate and on the specific component which appears to be involved in the difficulty;

2. The date and from whom you purchased your WAUKEE equipment and your purchase order number.

3. State your difficulty, being sure to mention at least the following:

4. Application.

5. Input pressure where Flo-Meters or compressors are involved.

6. Condition of filters, strainers or screens, upstream or downstream of the WAUKEE equipment.

7. Gas or liquid temperatures and other ambient conditions at the time of the difficulty.

8. Type of lubrication being used (if any) - give specifics.

9. Any other relevant pressures including gauge readings both upstream and downstream of the WAUKEE equipment.

10. All electrical information available.

11. Performance activity.

12. Any other pertinent information. If a sketch would help explain the difficulty, please include one.

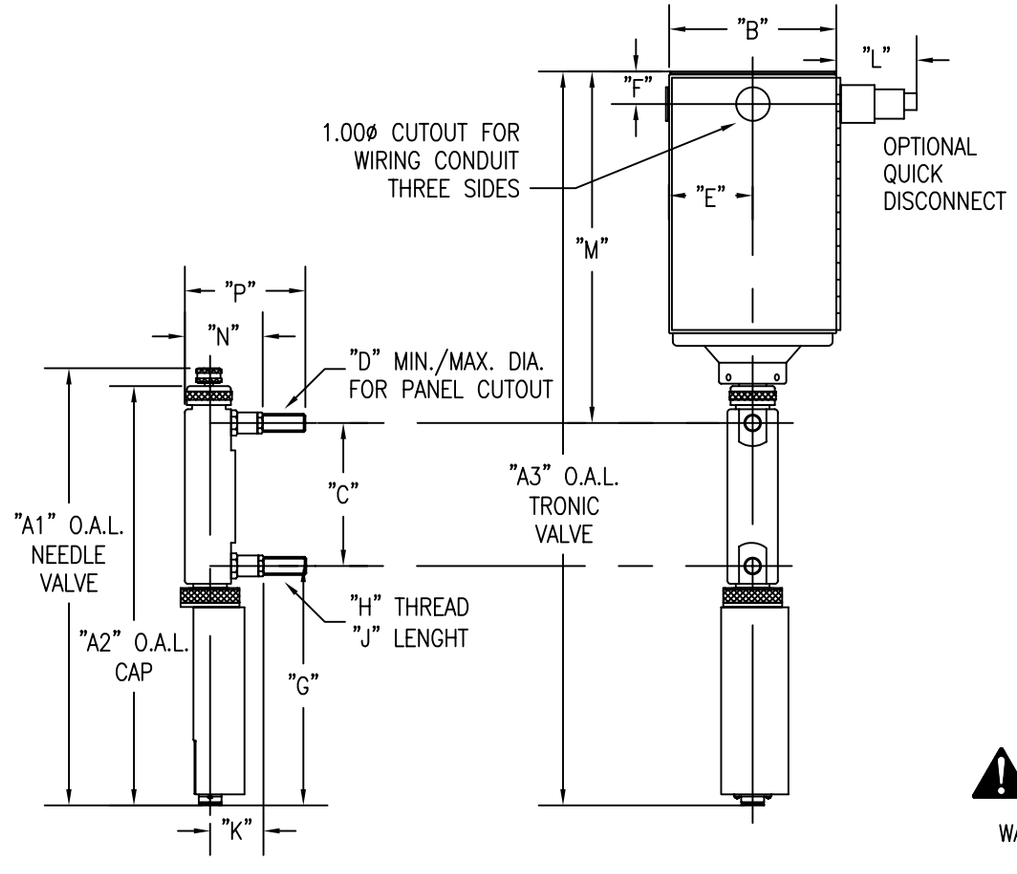
WARRANTY FIELD SERVICE

If warranty Field Service at the request of the purchaser or user is rendered and the difficulty is found not to be with WAUKEE's product, the purchaser shall pay the time and expense (at the prevailing rate at the time of the service) of WAUKEE's field representative(s). Charges for service, labor and other expenses that have been incurred by the purchaser, its customer or agent without written approval of WAUKEE will not be accepted. The OEM or other reseller is responsible for transmitting installation and operating instructions, THE MANUAL or other service literature supplied by WAUKEE with the equipment.

APPENDIX "A" - DRAWINGS

DIMENSION SHEET FOR S01–S07
WAUKEE–TRONIC FLO–METER'S

DIM.	S01 – S07
A1	13.5
A2	12.5
A3	21.82
B	5.00
C	4.25
D	.63/.75
E	2.50
F	.88
G	7.12
H	1/4" NPT
J	1.00
K	1.60
L	5.00
M	10.45
N	2.32
P	3.60



CAUTION

WAUKEE VALVES ARE FOR FLOW CONTROL ONLY, NOT FOR TIGHT SHUT OFF.
INSTALL A GAS COCK, SOLENOID VALVE OR MANUAL VALVE AHEAD OF
FLO–METER FOR TIGHT SHUT–OFF OR MAINTENANCE PURPOSES.
DO NOT EXCEED PRESSURE SHOWN ON METER NAMEPLATE.

WAUKEE ENGINEERING CO., INC.
5600 West Florist Avenue, Milwaukee, Wisconsin 53218 U.S.A.
Phone: (414) 462–8200 Fax: (414) 462 7022

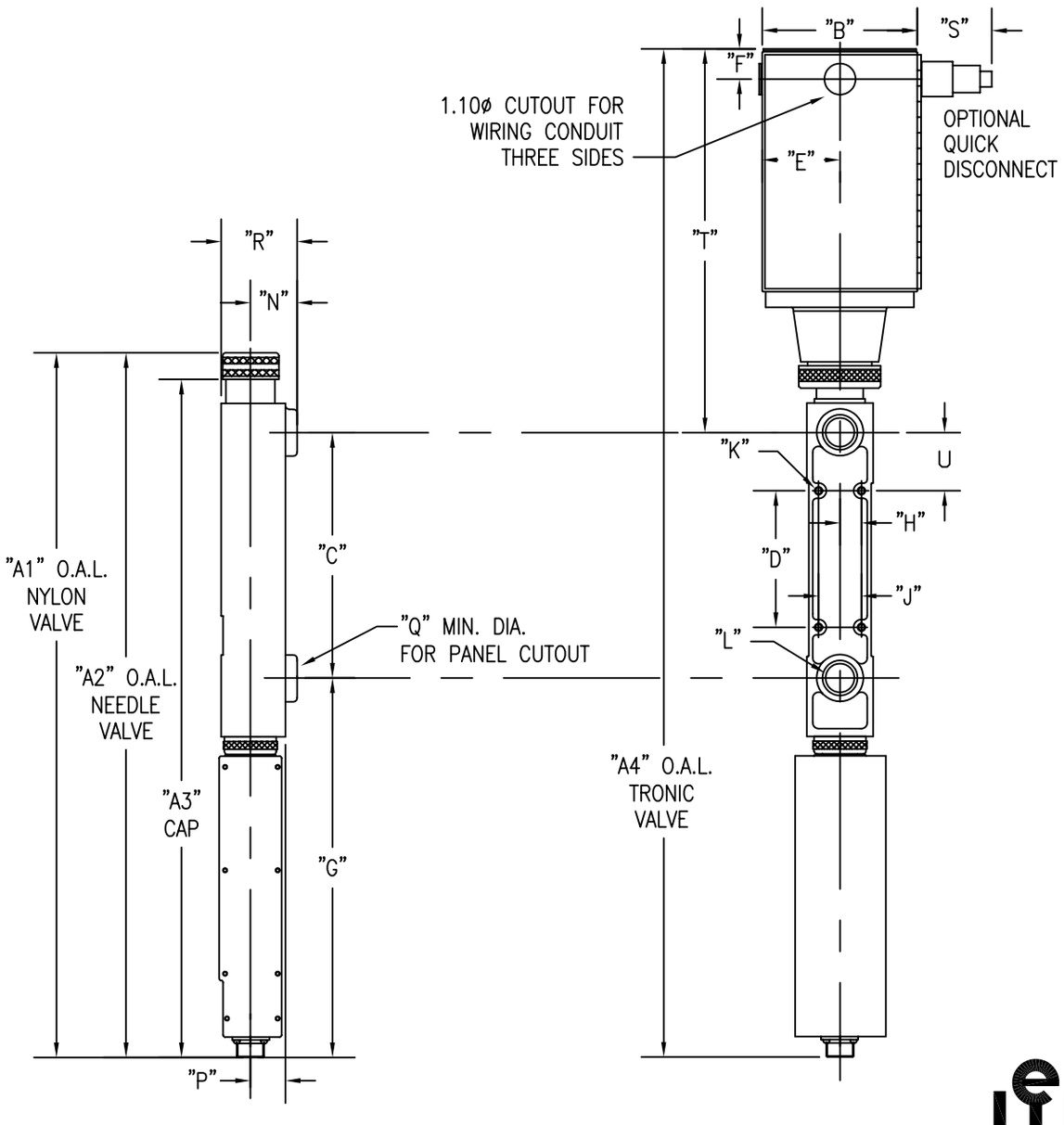
REF. NO.:

DIRECTORY: WT

NOTE: DWG. NOTES FROZEN IN "INFO" LAYER

BULLETIN NO.:
2–2130

DIMENSION SHEET FOR M01–M11 & L01–L09 WAUKEE–TRONIC FLO–METER'S



DIM.	M01 – M07	M08 – M11	L01 – L03	L04 – L06	L07	L08 – L09
A1	22.58	23.52	31.96	33.53	37.20	40.41
A2	24.02	24.72	32.60	34.03	N/A	N/A
A3	21.52	22.40	30.40	31.71	34.91	37.97
A4	32.31	32.44	41.19	42.37	45.49	48.92
B	5.00	5.00	5.00	5.00	5.00	5.00
C	7.88	8.38	12.00	12.62	14.63	16.13
D	4.38	4.38	6.50	6.50	6.50	4.31
E	2.50	2.50	2.50	2.50	2.50	2.50
F	.88	.88	.88	.88	.88	.88
G	12.15	12.03	16.40	16.53	16.63	17.16
H	.69	1.00	1.00	1.12	1.12	1.12
J	1.38	2.00	2.00	2.25	2.25	2.25
K	1/4–20	1/4–20	1/4–20	1/4–20	5/16–18	3/8–16
L	3/4" NPT	1 1/4" NPT	1 1/4" NPT	2" NPT	3" NPT	4" NPT
M	1.75	2.25	3.00	3.81	5.25	6.50
N	1.50	2.00	2.56	2.49	3.31	4.00
O	2.00	2.00	2.00	2.00	2.00	2.00
P	1.12	1.15	1.28	1.62	2.31	3.00
Q	1.75	2.50	2.25	3.12	4.75	6.00
R	2.44	3.06	3.84	4.19	5.72	7.09
S	5.00	5.00	5.00	5.00	5.00	5.00
T	12.30	12.79	12.79	13.22	14.35	15.17
U	1.81	2.31	2.69	3.31	5.36	7.75

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BULLETIN NO.: 2–2128

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2004-R1