

SAVE THESE INSTRUCTIONS

Accu-Flow
Meter Service Ltd.

1-800-921-ACCU

IM SERIES BI-DIRECTIONAL INSERTION FLOWMETER

Instruction Manual

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To the owner...

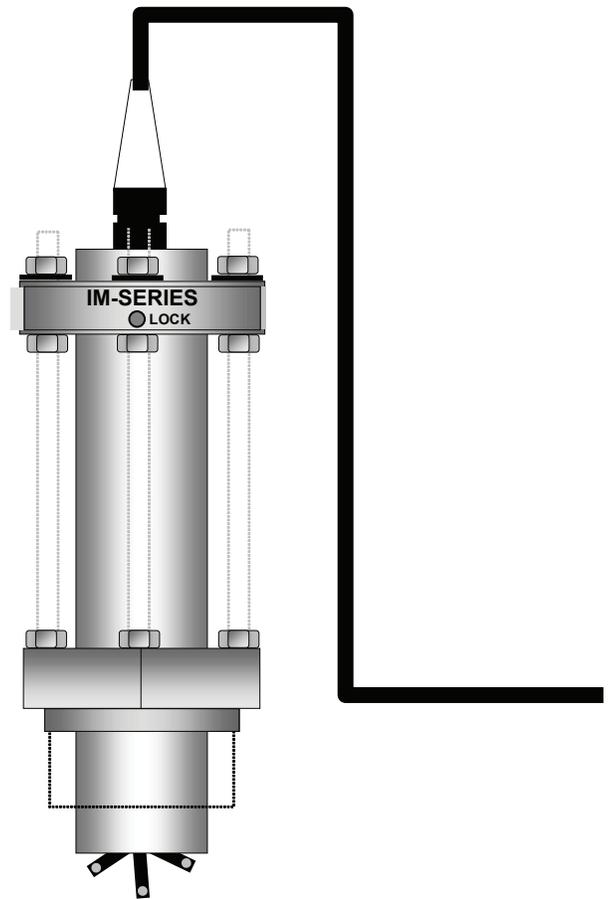
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Our business is the design, manufacture, and marketing of liquid handling, agricultural, and recreational products. We succeed because we provide customers with innovative, reliable, safe, timely, and competitively-priced products. We pride ourselves in conducting our business with integrity and professionalism.

We are proud to provide you with a quality product and the support you need to obtain years of safe, dependable service.



Grant Nutter
President, Great Plains Industries, Inc.



GENERAL INFORMATION

Thank you for purchasing a IM Series Flowmeter. It is important that you read this manual to gain a full understanding of the capability and operational aspects of the equipment you are about to install.

This information is provided only to assist in the installation of the product and does not diminish your obligation to read the manual.

1. Select a location that meets the requirements found in the Installation Section. An ideal installation would provide for 25 diameters of straight pipe upstream from the meter and 10 diameters downstream.

You will also need to know the pipe internal diameter (NB) and pipe wall thickness for calculation of the insertion depth (chart provided). Non ideal installations may require in-situ calibration (refer to the factory for details).

2. After screwing the flowmeter **in place ensure the flow alignment mark located on the top** positioning collar of the meter aligns with the flow in the pipe (See Figure 3). This ensures the paddle is correctly aligned to the flow.

NOTE: The meter is bi-directional so a flow direction arrow is not provided.

3. Calculate and adjust the height of the flowmeter (Figure 3).
4. Electrical Installation depends on the model and/or accessories you have purchased. If the flowmeter is supplied with receiving equipment such as GG500/510 or GX500/510 please refer to the appropriate manual and the Electrical Connections Section of this manual. For pulse output meters, select the appropriate output and wire to your receiving device. (See Pulse Output Section).
5. Calculate the flowmeter K factor to suit the installation. For ideal installations refer to the K Factor charts. For non ideal installations the K-factor may be calculated by performing an in-situ calibration. Enter the appropriate K-factor into your receiving equipment.

Overview

Insertion flowmeters provide a cost effective and simple means of measuring the flow of a wide range of low viscosity liquids. Installation is quick and inexpensive for pipe diameters ranging from 40 mm to 900 mm (1.5-36 in.).

Flowmeter has a linear measuring range of 0.3~10.0 meter/sec. (1~33 ft/sec.). Minimum detectable flow velocity is 0.15 m/sec. (0.5 ft/sec.).

The flowmeter is constructed from 316 L stainless steel enabling use in many applications for metering water and low viscosity chemicals.

Two independent pulse outputs are standard and can directly input to a wide range of ancillary instruments, PLC's and computers. Both pulse outputs have a high level of immunity to electrical interference.

Operating principle

Flow passes through a pipe causing the rotor to spin. Magnets installed in the rotor pass by pulse sensors within the transducer body and in turn this produces frequency outputs proportional to flow rate.

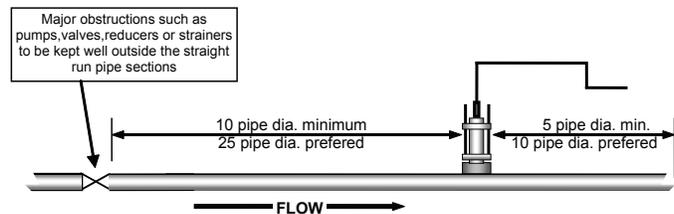
INSTALLATION

Meter location

Choose an appropriate section of horizontal or vertical pipe as per the guidelines below. With vertical pipe installations the media should be pumped up through the pipe past the flow sensor so that any entrained air will pass freely.

The IM Series Flowmeter requires a fully developed turbulent flow profile to ensure maximum measurement accuracy and repeatability. This can be achieved by installing the flowmeter in a straight run of pipe. We recommend at least 10 but ideally 25 straight pipe diameters upstream and at least 5 but ideally 10 pipe diameters downstream of the flowmeter. Major obstructions such as pumps, valves or strainers will require longer straight runs before and after the flowmeter.

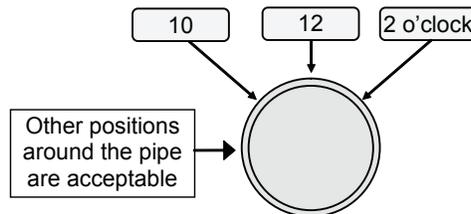
Figure 1



Meter installation and orientation

Cut a 40 mm diameter hole (1.6 in.) on either the 2, 10 or 12 o'clock positions of the pipe. If there is any likelihood of air entrainment in a horizontal pipe do not locate the flowmeter in the 12 o'clock position.

Figure 2



Install a female threaded weld on fitting (threadolet) or service saddle. Wrap the threads of the flowmeter with PTFE tape or sealing compound and screw the unit into the installed fitting.

Height adjustment calculation

Calculate the adjustment height A

$$A = 6.9 \text{ in. (175 mm)} - (B + C + D)$$

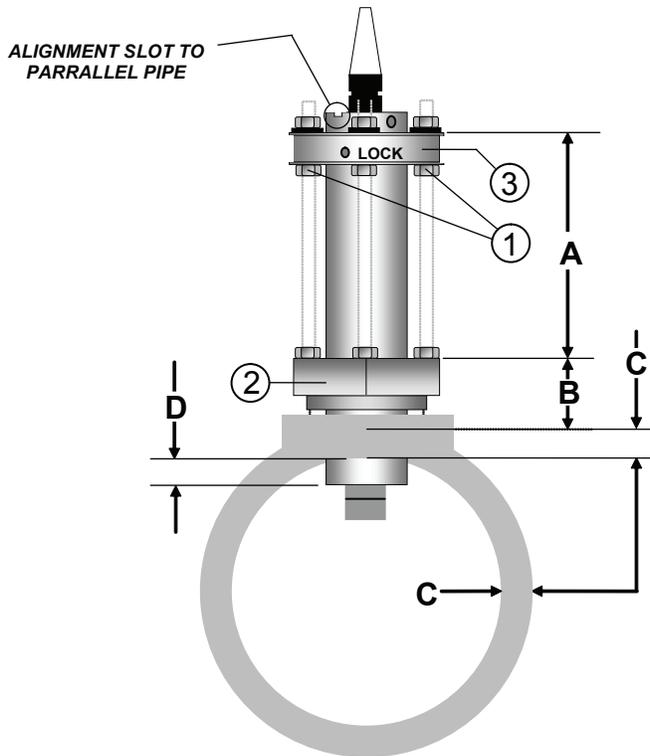
Where :

B = Distance between the top of the pipe and the top of the hex adaptor.

C = Pipe wall thickness

D = Insertion depth (pipe ID ÷ 8)

Figure 3



Examples of insertion depth D :

- For 1.5 pipe ID (D = .188 in)
- For 2.0 pipe ID (D = .25 in)
- For 4.0 pipe ID (D = .50 in)
- For 16.0 pipe ID (D = 2 in)

Turn the height adjustment nuts (1) as required so that the distance between the top of the hex adaptor (2) and the top of the positioning collar (3) equals your calculated distance A. Retighten the height adjustment nuts (1).

Flow direction orientation

The unit is bi-directional however the paddle must be aligned with the direction of flow.

Using a 2 mm hex key (Allen key), unlock the locking screw located on the positioning collar (3) then insert the hex key (as a lever) in the body rotating hole located above the collar, turn the body until the alignment slot is parallel with the direction of pipe. Retighten the locking screw.

ELECTRICAL CONNECTIONS

Instrument cable installation requirements

Use twisted multi-core low capacitance shielded instrument cable (22 AWG stranded) for electrical connection between the flowmeter and the remote instrumentation. The screen should be earthed at the readout instrument end only to protect the transmitted signal from mutual inductive interference.

The cable should not be run in a common conduit or

parallel with power and high inductive load carrying cables as power surges may induce erroneous noise transients onto the transmitted pulse signal. Run the cable in separate conduit or with other low energy instrument cables.

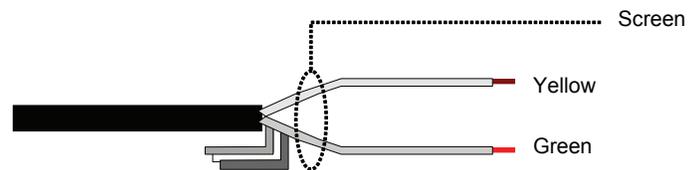
Pulse output selection (standard outputs)

The standard flowmeter has two independent pulse output signals that are linearly proportional to volumetric flow rate. Pulse transmission can be up to 1000 meters (3300 ft).

Reed Switch output

The Reed Switch has a fast response capable of frequencies in excess of 80hz. Receiving instruments should have the ability to suppress reed switch bounce (0.01µf capacitor) and a 1 meg pull up resistor would be typical.

Figure 4



HAZARDOUS AREAS

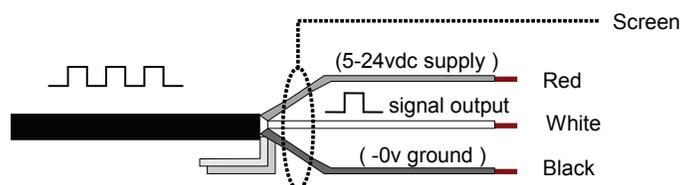
The REED SWITCH output is classed as a "simple apparatus" as defined in the CENELEC standard EN50020 and recognized IEC and ATEX directive. It can be connected to an approved I.S. secondary instrument with both being located in the hazardous area. The Reed Switch may also be connected through an approved I.S. barrier.

Note: The Reed switch produces 1/3rd the normal pulse output value (eg. 1/3 the standard K-factor)

Square Wave Pulse (Hall sensor)

An NPN open collector transistor pulse output produced by a solid state Hall Effect device. This three wire device requires 5~24vdc and produces an NPN square wave output (20mA max. sink), pulse width is 2~75 mSec. The Hall output requires a pull up resistor, these are generally incorporated in most receiving instruments.

Figure 5



K – FACTORS (Calibration Factors for Meter)

The K-factor (pulses / litre, gallon etc.) will vary in relation to the bore size of the pipe in which the flowmeter is installed.

The K-factors and formula shown are a result of factory testing using smooth bore piping under ideal conditions. Variations to the given K-factors may occur when using rough bore piping or inadequate flow conditioning on either side of the flow transducer (Meter Location Section). In these instances on site calibration may be used to determine the K-factor.

Flow transducer K- factors for common pipe sizes

Chart 1

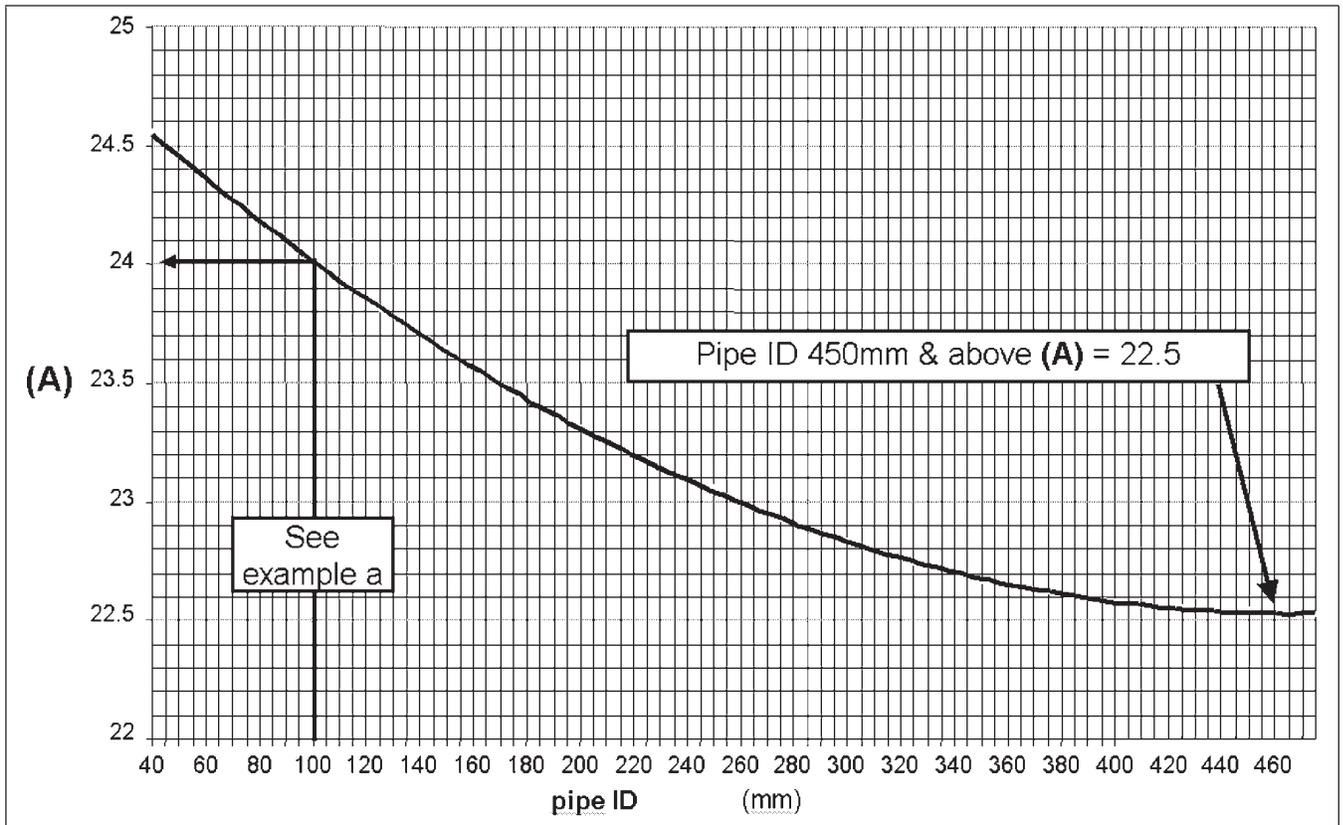
Pipe detail		K-factors (standard K-factors for square wave output only)					
NB	pipe ID	Schedule 40 pipe			Schedule 80 pipe		
inches	mm	p / litre	p / m3	p / USgal	p / litre	p / m3	p / USgal
1.5	40.9	18.678	18678	70.695	21.524	21524	81.468
2	52.6	11.238	11238	42.534	12.818	12818	48.517
2.5	62.7	7.880	7880	29.824	8.899	8899	33.682
3	78.0	5.062	5062	19.161	5.676	5676	21.485
3.5	90.2	3.768	3768	14.263	4.200	4200	15.896
4	102.4	2.912	2912	11.021	3.233	3233	12.237
5	128.3	1.839	1839	6.959	2.025	2025	7.665
6	153.9	1.268	1268	4.798	1.402	1402	5.307
8	203	0.719	719.0	2.721	0.787	787.2	2.980
10	255	0.450	450.3	1.705	0.496	495.9	1.877
12	303	0.316	316.0	1.196	0.347	347.4	1.315
14	333	0.261	260.5	0.986	0.286	285.7	1.081
16	381	0.198	198.0	0.750	0.217	217.0	0.821
18	429	0.156	155.8	0.590	0.171	170.6	0.646
20	478	0.125	125.4	0.475	0.138	137.8	0.521
24	575	0.087	86.64	0.328	0.095	95.39	0.361

For other pipe sizes below 610 mm (24 in.) not listed above, use the graphs and apply the formula on the following pages.

K-factors for large pipes 460mm ID (18 in.) and above use:

Pulses per litre	=	$28647 \div \text{pipe ID}^2 \text{ (mm)}$
Pulses per M ³	=	$28647000 \div \text{pipe ID}^2 \text{ (mm)}$
Pulses per US gallon	=	$168.14 \div \text{pipe ID}^2 \text{ (inches)}$
Pulses per Imp. gallon	=	$201.94 \div \text{pipe ID}^2 \text{ (inches)}$

NOTE : K-factors for Reed Switch output are 1/3 the standard factors of the square wave output.



Calculate K-factor

(pulses / litre) using the above graph and the metric constant of 1273.2 as follows :

$$\text{Pulses / litre} = \frac{1273.2 \times (\text{A}) \text{ from graph}}{\text{pipe ID}^2 \text{ (mm)}}$$

Example 'a':

K-factor for 100mm pipe:

1) from graph 100mm ID (A) = 24.0

2) pulses/litre. = $\frac{1273.2 \times 24.0}{10000} = 3.056 \text{ p/litre}$

K-factor for m³

: multiply by 1000 eg.

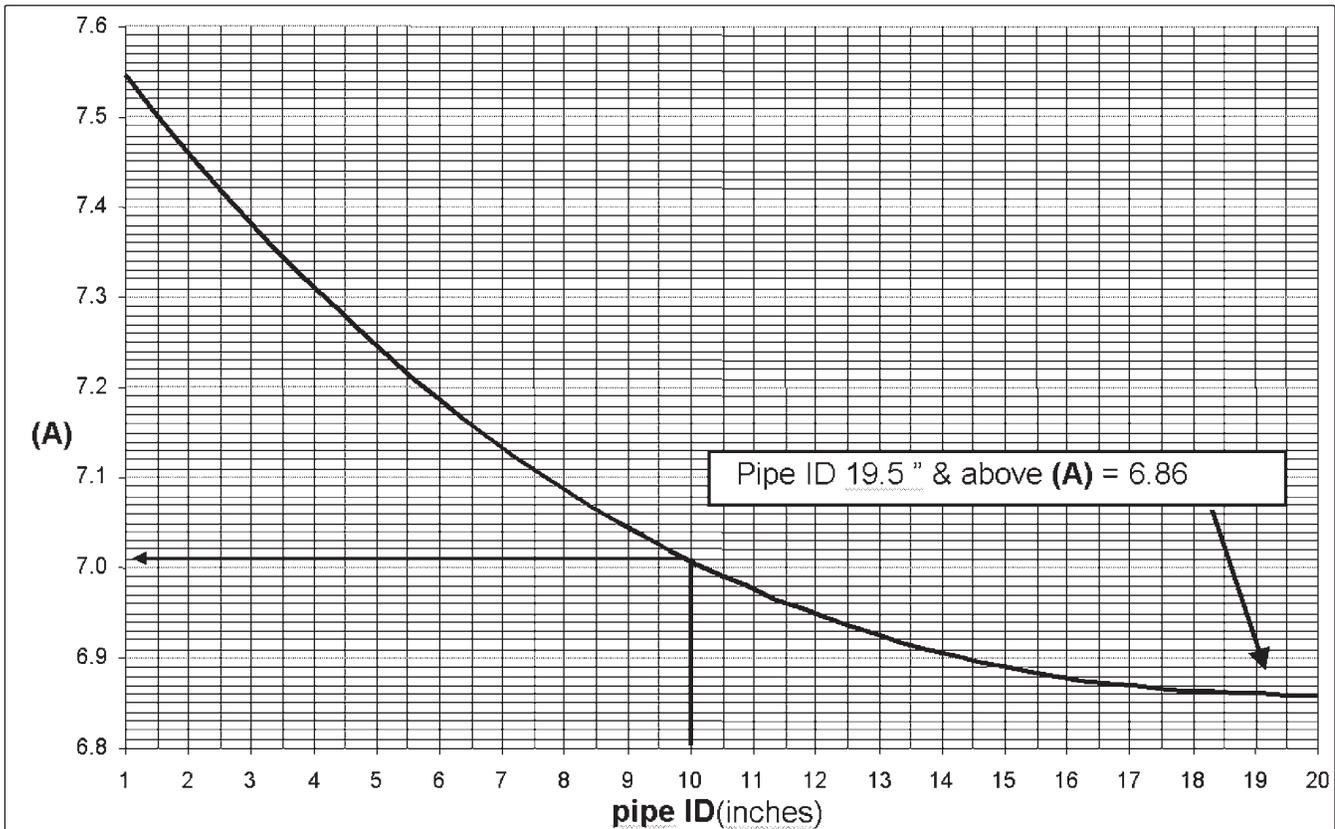
K = 3056 p/m³

K-factor for megalitres

: multiply by 1000000 eg.

K = 3056000 p/megalitre

NOTE : K-factors for Reed Switch output option are 1/3 the standard factors of voltage pulse output.



Calculate K-factor

(pulses / gallon) using the above graph and the volumetric constant of 24.51 as follows :

$$\text{Pulses / US gal.} = \frac{24.51 \times (\text{A}) \text{ from graph}}{\text{pipe ID}^2 \text{ (inches)}}$$

Example 'b':

K-factor for 10 in. pipe:

1) from graph 10 in. ID (A) = 7.01

$$2) \text{ pulses/gal.} = \frac{24.51 \times 7.01}{100} = 1.718 \text{ p/gal}$$

NOTE : K-factors for Reed Switch output are 1/3 the factors of the square wave output.

SPECIFICATIONS (subject to change without notice)

Model	IM 36
Suits pipe sizes	1.5 – 36 inches (0mm - 900mm)
Flow range	4-99600 USGPM (0.25 - 6300 litres/sec.)
Process connections	1.5 in. NPT or BSPT
Velocity range	1 - 33 feet/sec. (0.3 - 10 meters/sec.)
Linearity	typically $\pm 1.5\%$
Repeatability	typically $\pm 0.5\%$
Pressure (max)	1200PSI (80 Bar)
Temperature range	-40° F to 212° F (-40° C to 100° C) – refer options
Body material	316L stainless steel
Rotor materials	PVDF (standard) or optional high temperature PEEK rotor with graphite-PTFE impregnated PEEK bearing
O-Ring material	VITON - options available
ELECTRICAL	
(a) Square wave (Hall Effect)	5-24vdc, 3wire NPN open collector (20mA max. current sink)
(b) Reed Switch (to 100° C)	30vdc max. x 20mA max. (output freq. is 1/3 std. K-factor)
Output freq. @ max. velocity	(a) outputs 220~240 Hz (b) output 73~80 Hz
Transmission distance	3300 feet (1000 meters) maximum
Wiring (standard)	5 core, screened cable, length 10 feet (3 meters)
Protection class	Nema 6X (IP68 submersible)
Conduit entry (terminal box)	3/8 in. NPT
Shipping Weight	2.7 lbs. (1.2 kg)

Limited Warranty Policy

Great Plains Industries, Inc. 5252 E. 36th Street North, Wichita, KS USA 67220-3205, hereby provides a limited warranty against defects in material and workmanship on all products manufactured by Great Plains Industries, Inc. This product includes a 1 year warranty. Manufacturer's sole obligation under the foregoing warranties will be limited to either, at Manufacturer's option, replacing or repairing defective Goods (subject to limitations hereinafter provided) or refunding the purchase price for such Goods theretofore paid by the Buyer, and Buyer's exclusive remedy for breach of any such warranties will be enforcement of such obligations of Manufacturer. The warranty shall extend to the purchaser of this product and to any person to whom such product is transferred during the warranty period.

The warranty period shall begin on the date of manufacture or on the date of purchase with an original sales receipt. This warranty shall not apply if:

- A. the product has been altered or modified outside the warrantor's duly appointed representative;
- B. the product has been subjected to neglect, misuse, abuse or damage or has been installed or operated other than in accordance with the manufacturer's operating instructions.

To make a claim against this warranty, contact the GPI Customer Service Department at 316-686-7361 or 888-996-3837. Or by mail at:
Great Plains Industries, Inc.
5252 E. 36th St. North
Wichita, KS, USA 67220-3205

The company shall, notify the customer to either send the product, transportation prepaid, to the company at its office in Wichita, Kansas, or to a duly authorized service center. The company shall perform all obligations imposed on it by the terms of this warranty within 60 days of receipt of the defective product.

GREAT PLAINS INDUSTRIES, INC., EXCLUDES LIABILITY UNDER THIS WARRANTY FOR DIRECT, INDIRECT, INCIDENTAL AND CONSEQUENTIAL DAMAGES INCURRED IN THE USE OR LOSS OF USE OF THE PRODUCT WARRANTED HEREUNDER.

The company herewith expressly disclaims any warranty of merchantability or fitness for any particular purpose other than for which it was designed.

This warranty gives you specific rights and you may also have other rights which vary from U.S. state to U.S. state.

Note: In compliance with MAGNUSON MOSS CONSUMER WARRANTY ACT – Part 702 (governs the resale availability of the warranty terms).

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