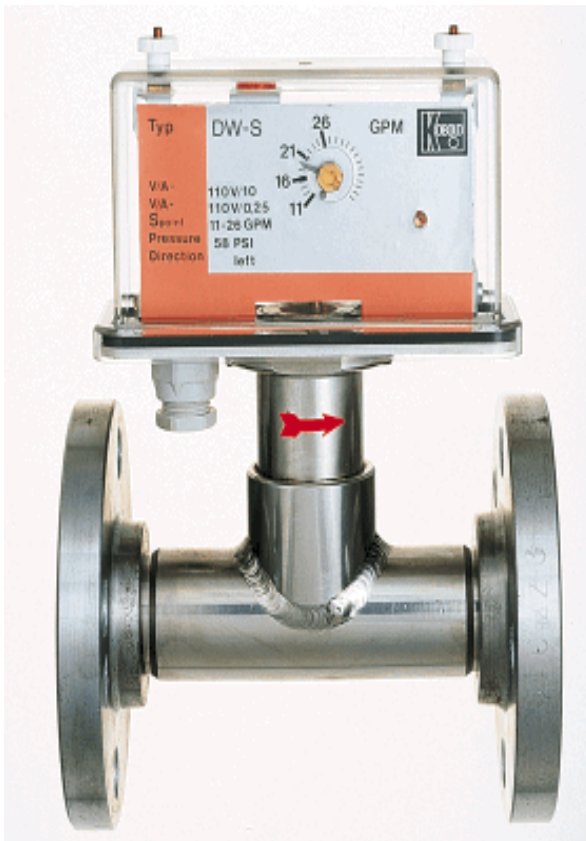


# KOBOLD DW SERIES FLOWMETER

## User Instructions



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### User Instructions

**CAUTION:** For safety reasons, please read the cautionary information located at the end of the manual, before attempting installation.

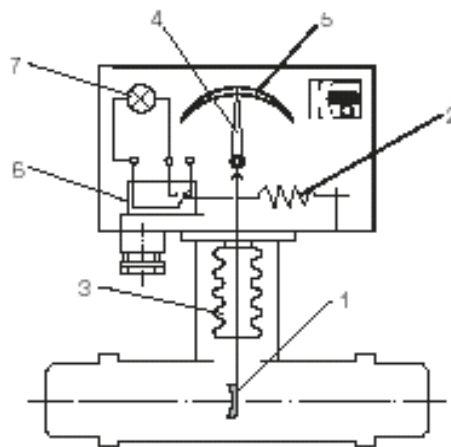
#### 1.0 General

The KOBOLD DW flowmeters and switches are intended for use in monitoring and measuring (DWU only) control applications involving high flow rates and/or dirty media. The DWS and DWP versions monitor flow rate through a setpoint feature. At setpoint, an internal microswitch is activated, allowing control of other equipment. The DWU has the same setpoint triggering capability as well as a meter scale for displaying flow rate.

The devices operates as follows:

1. Flowing medium impacts upon a paddle attached to a lever which has its pivot point in the instrument housing (see diagram 1.5). This causes the paddle and lever arrangement to pivot about its hinge point.
2. The motion of the paddle is opposed by a spring whose strength determines the range of the instrument. The motion of the paddle is coupled to an indicator dial, in the DWU, calibrated for the flow rate of the device.
3. Positioned in the path of the paddle/lever is a microswitch contact. When the lever pivots through a preset angle, the microswitch is activated.

Diagram 1.5: Function Diagram



**Operation:**

- a. Flowing medium exerts force on paddle (1).
- b. Motion of paddle is opposed by spring (2).
- c. Bellows (3) isolates the paddle from the rest of the system. It also opposes paddle motion due to its own spring constant.
- d. Motion of paddle operates pointer (4) which indicates flow on scale (5).
- e. If the paddle pivots further than a preset angle, a microswitch (6) is activated. This causes a lamp (7) to change state.
- f. Screw (on face of DWS, or rear of DWU) is used to position the microswitch at the desired setpoint. DWP versions have a factory preset switchpoint and are not field adjustable.

The mechanical/electronic portion of the DW is isolated from the medium through use of a bellows. Since the bellows is elastic, a pressure difference between atmosphere (one surface of the bellows) and the medium (the other side), will result in a change of the bellows' spring constant. It is important, therefore, that the DW series be used only at their intended operating pressure if accurate flow readings are desired.

## 2.0 Specifications

Table 2.1; Technical Data

Operating Principle:	Paddle/bellows arrangement
Dimensions:	See Diagram 2.6
Range:	4:1 or 5:1 (depending on pipe size)

Table 2.2: Material Combination & Operating Limits

Component	Material Combination	
	0200	0300
T-Piece	Brass	316-Ti SS
Paddle	Brass	303 SS
Bellows	316-Ti SS	316-Ti SS
Housing: Measuring Section	Matte Aluminum	
Housing: Cover	Clear Polycarbonate	
Flanges (on Flanged Units)	Galvanized Steel	316 SS
Maximum Operating Pressure	145 PSIG	
Maximum Operating Temperature	210° F	
Maximum Ambient Temperature	160° F	

Diagram 2.3: Electrical Connections

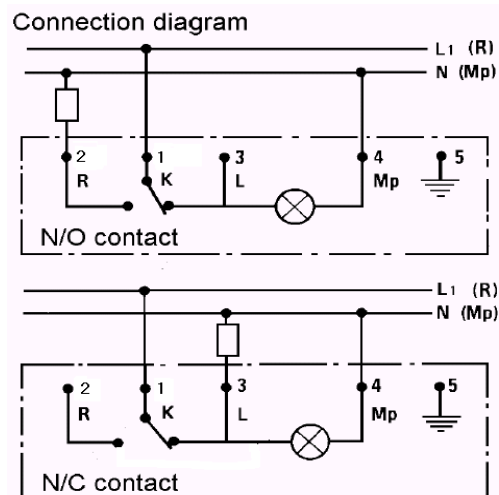
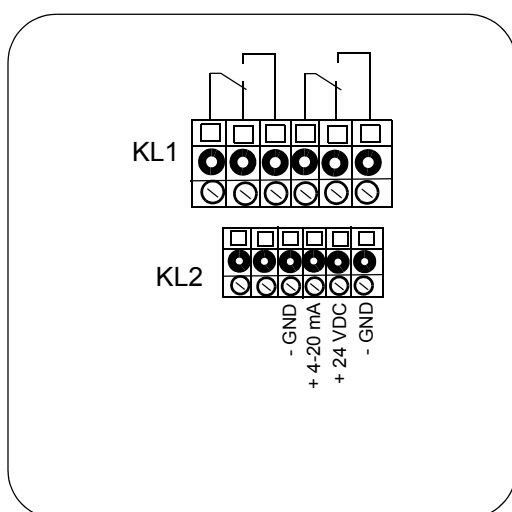


Table 2.4: Microswitch Data

Quantity:	1 or 2 SPDT
Switch Hysteresis:	+/- 10%
Maximum Load:	10 A/250 V, 2500 VA maximum
Status Lamp Power Supply:	220 VAC, or 110 VAC, or 24 VDC

Diagram 2.5 Wiring Diagram for DWU Series with 4-Wire 4-20 mA Transmitter/  
LCD Display

SPDT Relays (optional) are connected at KL1

Power and Analog output are connected at KL2

Power: Connected at +24 VDC and GND

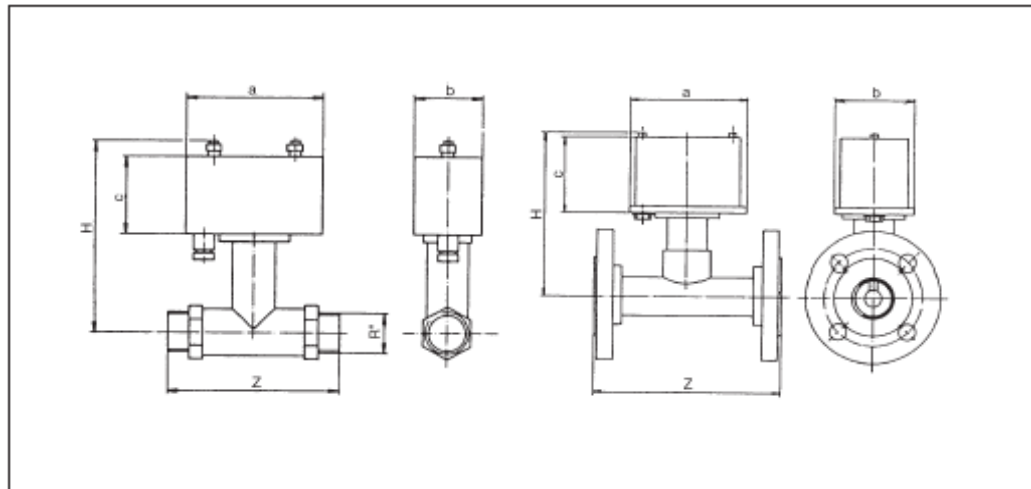
Output: 4-20 mA active, connected at  
+ 4-20 mA and GND.

Specifications for DWU with LCD and Analog Output

Output:	4 - 20mA, 4-wire
Load:	0-500 Ohms
Power Requirement:	24 VDC +/- 10%
Display:	8- Digit LCD with option AN1
Adjustments:	Zero: +/- 4% Span: +/- 10%
Optional Relays:	0, 1 or 2 SPDT
Maximum Load:	1A @ 230 VAC
Protection:	NEMA 4



Diagram 2.6: Dimensions



DWP Series Dimensions (mm)

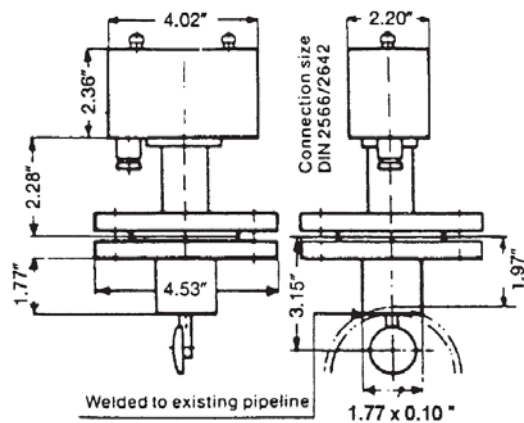
Pipe Size, R (Nominal)	3/4"	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"
Dimension Z (Length) with NPT Fittings	110 ± 1	130 ± 1	135 ± 1	135 ± 1	170 ± 2	170 ± 2	170 ± 2
Dimension Z (Length) with ANSI Flange	130 ± 2	155 ± 2	160 ± 2	160 ± 2	190 ± 2	190 ± 2	190 ± 2
Dimension H (Height)	145 ± 1	145 ± 1	145 ± 1	145 ± 1	145 ± 2	150 ± 2	155 ± 2
Housing: a×b×c	100×70×70						

DWS Series Dimensions (mm)

Pipe Size, R (Nominal)	3/4"	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"
Dimension Z (Length) with NPT Fittings	135 ± 1	135 ± 1	135 ± 1	135 ± 1	170 ± 2	170 ± 2	170 ± 2
Dimension Z (Length) with ANSI Flange	155 ± 2	155 ± 2	160 ± 2	160 ± 2	190 ± 2	190 ± 2	190 ± 2
Dimension H (Height)	155 ± 1	155 ± 1	155 ± 1	155 ± 1	160 ± 2	165 ± 2	170 ± 2
Housing: a×b×c	100×50×80						

DWU Series Dimensions (mm)

Pipe Size, R (Nominal)	3/4"	1/2"	3/4"	1"	1 1/4"	1 1/2"	2"
Dimension Z (Length) with NPT Fittings	135 ± 1	135 ± 1	135 ± 1	135 ± 1	170 ± 2	170 ± 2	170 ± 2
Dimension Z (Length) with ANSI Flange	155 ± 2	155 ± 2	160 ± 2	160 ± 2	190 ± 2	190 ± 2	190 ± 2
Dimension H (Height)	145 ± 1	145 ± 1	145 ± 1	145 ± 1	150 ± 2	155 ± 2	160 ± 2
Housing: a×b×c	100×70×70						









### 3.0 Installation Instructions

**CAUTION:** For safety reasons, please read the cautionary information located at the end of the manual, before attempting installation.

The KOBOLD DW series meters and switches are to be installed in the orientation described by the symbol on the identification tag. (See Symbol Key, Diagram 3.1). In general, the DW series may be installed in any desired position. The user, however, must specify the installation orientation so that the flow scale is calibrated for this position DURING MANUFACTURE. Installation in other positions will lead to inaccurate flow rate indication.

Table 3.1: Flow Symbol Key

	= To the left of line
	= To the right of line
	= Horizontal flow, left to right
	= Horizontal flow, right to left
	= Vertical flow, down
	= Vertical flow, up

The DW is connected to your system in one of three fashions:

1. Pipe Fittings: Connect in direction indicated using appropriate tools.
2. Flange Connection: Connect in direction indicated using the flanges and the gasket provided.
3. Weld Connection: The weld-on DW's come with two flanges; one is connected to the DW and the other to the joint to be welded to your pipe. Cut a hole in the pipe into which the flange pipe will fit cleanly. This will guarantee that travel of the paddle will not be hindered.

In welding the flange pipe to your system, it is important to keep the distance between flange face and top of your system pipe at 50mm (See Diagram 2.6, Dimensions). If this distance is not observed, flow rate measurement errors will occur.

Observe also that when the flowmeter is re-installed on the flange, it positioned so that the flow direction in the pipe and that indicated on the instrument, match after installation.

After welding, make sure that the interior of the weld joint is clean and no metal protrudes. This will ensure that the paddle can move freely after mounting. A tight flange to flange seal is obtained through the use of the supplied rubber gasket.

To obtain accurate flow readings, it is necessary to establish reproducible flow conditions in front of and behind the DW installation point. To do this, straight lengths of pipe are needed on either side of the flow switch. The needed lengths are:

Upstream:  $10 \times d$

Downstream:  $5 \times d$

( $d$  = Inner Pipe Diameter)

4. If you wish to use the setpoint switch, then connect as follows: Remove the plastic housing cover by first removing the two hold down nuts on the bottom of the housing and then lifting the housing off the electrical assembly. Feed your wiring through the watertight strain relief fixture at the bottom of the electrical housing. Connect your wiring according to Diagram 2.3. Tighten the strain relief nut around your cabling to insure a watertight seal. Replace the plastic housing cover and refasten using the hold down nuts.

#### 4.0 Operation

The DWU version indicates flow rate on its large circular scale through use of a pointer indicator. The DWS has no indication, only an adjustable switchpoint.

Both devices have a single set point that is user adjustable within the range of the instrument.

DWP versions have a factory preset switchpoint that is not field adjustable.

#### 4.1 - Adjusting the Setpoint

Proceed as follows:

1. Remove the clear plastic cover from the instrument.
2. On the face of the DWS body (or the rear for DWU) is a screw with a pointer and dial face graduated to the instrument's flow rate. Adjust this screw so that the pointer indicates the flow amount desired for setpoint.
3. Replace the plastic cover.

## 5.0 Maintenance

Due to its construction, a paddle type flowmeter, such as the DW series, is nearly maintenance-free. There are only two areas that could (potentially) be a source of concern if the medium contains minerals which could precipitate out onto the instrument.

1. If enough material deposits on the paddle, its area may be enlarged. This will lead to high flow rate readings.
2. In extremely severe cases, it may be possible that sufficient materials will deposit inside the bellows to alter the bellows' spring constant. This will lead to low flow rate reading (stiffening of the bellows).

If you find it necessary to clean your instrument, do not use any sharp metal instruments to scrape away deposits. Use only solvents not aggressive to the instrument to remove deposits.

## 6.0 Arrival of Damaged Equipment

Your instrument was inspected prior to shipment and found to be defect-free. If damage is visible on the unit, we advise that you carefully inspect the packing in which it was delivered. If damage is visible, notify your local carrier at once, since the carrier is liable for a replacement under these circumstances. If your claim is refused, please contact KOBOLD Instruments for further advisement.

## 7.0 Need help with your DW Series?

Call one of our friendly engineers at 412-788-2830.

## **Caution**

PLEASE READ THE FOLLOWING GENERAL FLOW METER/ MONITOR WARNINGS BEFORE ATTEMPTING INSTALLATION OF YOUR NEW DEVICE. FAILURE TO HEED THE INFORMATION HEREIN MAY RESULT IN EQUIPMENT FAILURE AND POSSIBLE SUBSEQUENT PERSONAL INJURY.

- Inspect instrument for damage upon arrival. Cracked, fractured, bent or otherwise damaged instruments must not be put into use, since the device is weakened to an unknown extent. (The operations and installation guide will explain how to make a claim on damaged instruments.)
- Under NO circumstances must the maximum tolerances (temperature and pressure) be exceeded.
- Diagrams 2.3, 2.5 and Table 2.4 provide the voltage and current limitations and the wiring for the various sensor types. The sensor electrical ratings should never be exceeded. Electrical wiring of the sensor should be performed in accordance with all applicable national, state and local codes
- The maximum tolerances of the device have been determined using water, air and/or oil. If using other media, especially corrosive ones, it is critically important that the user determine chemical compatibility with our instruments. A list, detailing material composition of our instruments, is available from KOBOLD Instruments Inc. upon request. KOBOLD Instruments Inc. cannot accept responsibility for failure and consequences resulting from use of media other than water, mineral oil, air, and nitrogen.
- Install the device in a fully supported position within your flow system. This avoids excessive stresses which may damage the instrument. In particular:
  - a. Ensure that the plumbing leading to and from the instrument is fully supported and that the instrument does not perform the physical function of a joint.
  - b. When calculating stress on the device caused by plumbing, the weight of the medium in the pipes must be considered as well.
  - c. Misaligned runs of rigid piping can cause large stresses when connected to the instrument. Do not connect in such a fashion.
- During installation, avoid stresses on the instrument by following guidelines given below:
  - a. When connecting fittings, hold the instrument fittings rigid with a correctly sized wrench. Do not install by twisting the instrument into the pipe fittings.
  - b. Do NOT install by holding the device housing to provide counter-torque to the pipe fitting.
  - c. Use an appropriate amount of teflon tape on male threads of fitting. This reduces the twisting stresses produced by tightening the fittings into each other.
  - d. Do not use pliers or wrenches on the housing, as this may damage it.
  - e. Do not overtighten, as this may fracture the fittings.

- During operation, there are a number of situations to avoid:
  - a. The sudden cessation of fluid flow causes what is typically referred to as "water hammer". Most people are familiar with this phenomenon from their home experience - it is the cause behind the loud clank of water pipes which occurs when faucets are turned off too suddenly. The cause behind this "water hammer" is quite easy to visualize. Water is fairly massive. The amount of water in long runs of pipe is quite substantial. When the faucets are turned off suddenly, especially from a full on condition, the water has considerable momentum and does not want to stop flowing. The situation is similar to stopping a car by running into a wall, rather than by applying brakes. Both are sudden rather than gradual. The damage to the wall can be substantial (not to mention the car).

The "water hammer" causes surges in fluid pressure which could cause the measurement instrument's pressure limit to be exceeded, resulting in failure and possible personal injury.

- b. Fluid surges, as well as the water hammer, can be particularly damaging to empty flowmeters since there is no back pressure in the device. The damage is caused, once again, by momentary excess pressure. To avoid these surges, fluid lines should remain full (if possible) and water flow should be introduced to the device slowly.
  - c. If the instrument is isolated with inlet and outlet valves, the flowmeter must be completely drained when said valves are both closed. Failure to do so could result in damage to the device caused by thermal expansion of fluid.
  - d. Freezing of water in the instrument must be avoided since the resultant expansion will damage the flowmeter and make it unsafe for use.