ModWeigh

FEATURES
- Flowrate measurement and control for loss-in-weight (or gain-in-weight) systems
- Motor Speed Control Output Signal
- Flowrate Output
- Material Totaliser
- Modbus communications (independent RS232 and RS485 ports)
- Field software upgrades
- 12-24Vdc power supply
- Overall accuracy better than 0.01%

MT1 TRANSMITTER
- Size 136 x 66 x 50mm
- Optional removable P-Module holds calibration settings

MD1, MP1 INDICATOR
- IP65 Facia
- 4.3" (109mm) colour LCD
- 480 x 272 pixels
- Silicone tactile keypad

MD2, MP2 INDICATOR
- IP54 Facia
- 2.8" (70mm) colour LCD
- 320 x 240 pixels
- Polyester film tactile keypad
- 4-20mA output, 1 digital input & 2 digital outputs

MR1 I/O
- Size 136 x 66 x 30mm
- 8 Digital inputs
- 8 Digital outputs
- 4-20mA input (or 0-10V)
- 4-20mA output x 2
- Pulse output

MO3 I/O for MP2
- 4 Digital inputs
- 4 Digital outputs
- 4-20mA input (or 0-10V)
- 4-20mA output

Application
A ModWeigh MW93 Weight Change System is used to control the flowrate of material passing through a weigh hopper and flow regulator. Common flow regulators used for these systems are augers or rotary valves.

The processor is suitable for systems where the flow regulator removes material from a weigh hopper (weight loss system) and systems where the flow regulator adds material to the weigh hopper (weight gain system).

ModWeigh Display
A ModWeigh Flowrate Indicator is used to calibrate the system and provide a status display of the operating system. It has a graphics display with easy to use menu selection of settings.
Features

Basic

Units & Resolution
The units for each variable type (weight etc.) can be selected from a list of metric and imperial units. The resolution of each variable type can be adjusted, this alters the count by e.g. 100kg displayed in 0.2kg increments.

OIML Design
The instrument is designed to OIML standards.

Language Support
Support is available for the following languages: English, Chinese, Korean, German, Spanish, French, Italian and Polish.

Inputs

Digital Inputs INx
The digital inputs are programmable to a range of function including ‘acquire zero’, ‘print’ etc.

Direct Calibration
Direct calibration uses the loadcell capacity and loadcell sensitivity to calibrate the weight signal. Large capacity weighing systems can be quickly and accurately calibrated without the need for large test weights.

Corner Adjustment
The input sensitivity can be individually adjusted for up to 4 loadcells, allowing differences in loadcell sensitivities to be corrected.

Four Loadcell Inputs
Separate inputs are available for 4 loadcells allowing the signal of each to be monitored separately. This provide an aid for load balancing across loadcells and also for fault finding.

Flowrate Setpoint
The setpoint is the flowrate of material the operator wants the flow regulator to convey. The MW93 can control to the local setpoint, which is set using the keypad, or it can control to the optional remote analog setpoint signal. The second analog input AI2 is required for a remote analog setpoint.

Signal Filtering
Filtering for the weight can be adjusted to get the optimum compromise between reduction of plant vibration and response speed.

Internal Signals

Limits
The high and low limits have adjustable setpoints which may be programmed to operate on any internal signal.

Batching
The system can be used to batch out a desired weight by stopping the feeder when the batch weight has been totalised. A pre-act is available to compensate for overrun.

Event Collection
Process events are collected for operation with external equipment (PLCs etc.)

Loop Control
The processor compares the flowrate with the setpoint. A proportional/integral (PI) control technique with feed forward alters the motor speed demand signal to maintain the flowrate at setpoint. Feed forward allows the system to reach the desired set flowrate very quickly and also to respond to changes in setpoint rapidly.

Volumetric Mode
Normally the controller operates gravimetrically and automatically adjusts the speed demand signal to reach the required flowrate setpoint.

Advanced Control Settings
Feed forward settings can be adjusted and corrections for plant delays (transport delay) can be made. A ratio setting is available to multiply the setpoint signal by a percentage for ratio control applications.

Hopper Refilling
The processor uses weight setpoints and delays to produce a material feed control signal. In a weight loss system, the feed is opened to refill the weigh hopper from bulk storage when it nears empty. In a weight gain system, the feed is opened to empty the weigh hopper when it nears full. During the filling process, the processor is put into hold during which the flowrate reading and the motor speed demand...
signal are held constant. This keeps the flow regulator speed constant during refilling when the flowrate can not be measured.

**Automatic Hold**
The hopper weight is continuously monitored to automatically detect that filling is occurring or that the hopper has been accidentally knocked. If this is detected, the flowrate signal and speed demand signal are held constant until the weight returns to normal. This feature ensures that a constant output flowrate is always maintained during a disturbance to the hopper.

**Auto Setup**
To make setting up easier, the auto setup facility allows many settings for the processor to be calculated and set automatically.

**Memory Storage**
Allows a group of settings to be stored or recalled from memory. This can be used for example to store settings for different products. There are 20 memory locations with up to 4 settings in each.

**Material Total**
The processor incorporates a totaliser which totalises the weight of material through the system. The totaliser can be reset to zero. A pulse output is available to operate external counters. A low flow cutout ensures that low flows do not cause false counts. The total is retained after a power failure. The totaliser can be set to operate with 5, 6, 7 or 8 digits.

**Outputs**

**Speed Demand**
An analog speed demand output signal is used to drive an externally connected motor controller to vary the flow regulator speed.

**Material Flowrate**
An analog flowrate output signal is available for connection to other instruments.

**Analog I/O Scaling**
The analog output range can be adjusted over the full 0 to 20mA range. The output will drive to a slight negative mA, allowing a live zero to be achieved when using a 0 to 20mA range. A voltage output is easily produced by connecting a resistor to the output.

In addition the analog output signal is selectable to come from any internal signal in the instrument e.g. weight, flowrate etc.

**Digital Outputs OUTx**
The digital outputs are programmable to operate from any internal signal. These signals include the digital input states, status conditions (running, paused etc) and any fault conditions that are detected. This makes it easy connect into other systems.

**Communications & Display**

**Comms**
RS232 and RS485 ports are available. These are used to connect ModWeigh units together and also to connect to other systems. The protocol is either ASCII output for example to drive a printer or Modbus for interactive communications. Baud rates and node addresses are programmable.

**Printouts & Macros**
Printouts can be triggered by a key press or set up to occur at set times during the day or week. Data may also be output continuously for data collection purposes. Data is output on the COM1 RS232 port. The content of the printouts is fully programmable using Macros.

Macros are programs used to customise printouts, but can also be used to perform arithmetic calculations. The Macro language also contains conditional terms for more advanced programming.

**Display Customisation**
Locks may be set to prevent unauthorised use of the operator keys and restrict entry to the operator menu. The keys are individually lockable and optionally a passcode can be used to allow authorised operators to use the keys. Alternatively a confirmation of the key action can be requested. The operator MENU can be customised to make additional settings or signals available to the operator.

The contents of the main display can be set to suit any condition, from a comprehensive display showing all operating parameters to a simple display showing the basic signals.

**Computer Connectivity**
An ActiveX control is available to allow programmers to easily communicate with a ModWeigh instrument. Typically this can be used with a Visual Basic programme to collect and write data to the controller.
Feature Summary

<table>
<thead>
<tr>
<th>Feature</th>
<th>Digital Inputs (includes pulse input)</th>
<th>Digital Outputs (includes pulse output)</th>
<th>Isolated Pulse Output</th>
<th>Isolated +20mA Outputs</th>
<th>Corner adjustment and balancing for 4 load-cells</th>
<th>Trade approvals (planned)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MT1, MR1, MD1</td>
<td>2+8</td>
<td>1+9</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>MT1, MR1, MD2</td>
<td>2+8</td>
<td>1+9</td>
<td>✓</td>
<td>✓</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>MP1, MR1</td>
<td>1+8</td>
<td>9</td>
<td>✓</td>
<td>✓</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>MP2, MO3</td>
<td>1+4</td>
<td>2+4</td>
<td>✓</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>MP2</td>
<td>1</td>
<td>2</td>
<td>✓</td>
<td>0</td>
<td>×</td>
<td>×</td>
</tr>
</tbody>
</table>

Configurations

There are three principle configurations for gravimetric flow measurement and control systems. These are Weight Loss, Modified Weight Loss and Weight Gain.

All configurations have the same basic components of a flow regulator and weigh hopper.

**Weight Loss**

- BULK HOPPER
- control valve
- loadcells
- WEIGH HOPPER
- FLOW REGULATOR

**Features**
- continuous flow
- weigh hopper & flow regulator combined

**Modified Weight Loss**

- BULK HOPPER
- control valve
- loadcells
- WEIGH HOPPER
- FLOW REGULATOR

**Features**
- continuous flow
- weigh hopper isolated from flow regulator combined e.g. plastic extruders
Weight Gain

Flow Regulators

<table>
<thead>
<tr>
<th>SCREW FEEDER</th>
<th>DRUM FEEDER</th>
</tr>
</thead>
<tbody>
<tr>
<td>BELT FEEDER</td>
<td>TABLE FEEDER</td>
</tr>
<tr>
<td>ROTARY VALVE</td>
<td>PUMP</td>
</tr>
<tr>
<td>VIBRATOR FEEDER</td>
<td>RESTRIC</td>
</tr>
</tbody>
</table>

Performance

One factor which determines the performance of a system is the capacity of the loadcell weighing system used to weight the hopper. The following graph gives an indication of the useful operating range that may be used. The Loadcell Capacity is the sum of the capacity of all loadcells, and should take into account any lever system if one exists.

The performance is very dependent on the weighing system repeatability. It is desirable to aim for as high a repeatability as possible. With care, it is possible to achieve weighing repeatability of 1 part in 10,000 to 1 part in 100,000.

Note that other factors may also limit the performance.

Watch flexible couplings to the weigh hopper, as these can easily reduce the achievable performance.

Good accuracy also requires repeatable results from the flow regulator system. Some materials can be difficult to control (for example powders that fluidise).
Specifications

Loadcell Input AI1

- Input Range: ±4 mV/V (0-20mV)
- Excitation: 5 Vdc ±20 %, 250 mA maximum current
- Signal processing rate: 100 Hz (response time setting≤ 0.5 s)
- Input sensitivity: 0.5 µV/division maximum
- Zero range: ±3 mV/V (±15 mV)
- Zero drift: ±0.02 µV+0.0005 % of deadload/°C typical
- Span drift: ±0.0005 %/°C typical
- Non-linearity: <0.002 % of FS
- Input noise: 0.15 µVp-p typical
- Filtering: 0.04 s to 32.0 s response time adjustable
- Sense voltage range: 1-5 V

Analog Input AI2

- 4-20mA input resistance: <60 Ω
- 0-10V input resistance: >100 kΩ
- Isolation: galvanically isolated to 50Vac

Analog Outputs AO1 & AO2

- Output range: 0 to 20 mA (-0.2 mA to 21 mA, includes standard 4-20mA)
- Maximum load: 1000Ω
- Resolution: 0.4 µA
- Response time: Loadcell response time setting + 20 ms
- Voltage output: Use an external resistor to convert mA to volts. For example 500Ω gives 10 V at 20 mA.
- Non-linearity: <0.01 %
- Drift: <2 µA/°C.
- Isolation: independently galvanically isolated to 50Vac
- High voltage: > 8 V
- Low voltage: < 4 V
- Maximum voltage: 32 V
- Input load: 4 kΩ approximate

Digital Inputs INx

- High voltage: > 8 V
- Low voltage: < 4 V
- Maximum voltage: 32 V
- Input load: 6 kΩapproximate
- Input type: PNP output sensors

Digital Outputs OUTx

- Max output current: Σ I_OX < 0.25 A
- Output voltage: same as supply voltage

Communications COM1, COM2 & COM3

- COM1 Interface: RS232
- COM1 Handshake: CTS can be enabled
- COM2/COM3 Interface: RS485
- Baud rates: 9600, 19200, 38400, 57600, 115200 (230400 on COM2)
- Settings: 8 data bits, no parity, 2 stop bits (8-N-2)
- Protocol: Modbus RTU (MWBUS on COM2)

General

- IP Rating: IP20 (MD1,MP1 facia IP65) (MD2,MP2 facia IP54)
- Operating temperature: -10 to 45 °C
- Supply voltage: 10 to 32 Vdc
- Power MT1: 1.0 to 2.2 W + P_Tacho Excitation
- Power MR1: 1.5 to 2.5 W + P_OUTx
- Power MD1: 1.8 W
- Power MP1: 1.8 to 3.0 W
- Power MD2: 1.4 W
Dimensions

Following are the dimensions of the hardware items that make up the system. The displays/processors are designed for panel mounting.

MT1 Transmitter

MR1 Remote IO

MD1 Display

MP1 Processor

MD2 Display

MP2 Processor

Connections

Connection Principles

ModWeigh instruments can be configured in many different ways to suit any given application.

The display is normally located to suit an operator. The transmitter can be located in the field to reduce field wiring or can be located with the display for a more conventional approach.

The I/O can conveniently be situated on a DIN rail in a cabinet.
Connection Diagram – MT1

Keep all wiring separated from mains wiring.

Use shielded cable where indicated.

Either the RUN input or the RUN MOTOR output should be used.

For individual loadcell sensitivity adjustment, use terminals P, Q, R and S.

Display and transmitter can alternatively be connected COM1 to COM1 using an MAC cable.

Several system can be connected onto the same bus. Use bus termination for cable runs over 100m.

MT1 bus address set with ADS pin or a setting.

MR1 bus address set with ADS pin and must be same as MT1.

Fit an MAT terminator to each end of COM2 cable if length exceeds 50m.

For individual loadcell sensitivity adjustment, use terminals P, Q, R and S.

Display and transmitter can alternatively be connected COM1 to COM1 using an MAC cable.

Several system can be connected onto the same bus. Use bus termination for cable runs over 100m.

MT1 bus address set with ADS pin or a setting.

MR1 bus address set with ADS pin and must be same as MT1.

Fit an MAT terminator to each end of COM2 cable if length exceeds 50m.
Connection Diagram – MP1

Keep all wiring separated from mains wiring. Use shielded cable where indicated.

Several system can be connected onto the same bus. Use bus termination for cable runs over 100m.

Either the RUN input or the RUN MOTOR output should be used.

Fit an MAT terminator to each end of COM2 cable if length exceeds 50m.

Ensure all wiring is kept separate from mains wiring.

Address Select (Q2522) for MP1 bus address set with ADS pin and must be same as MP1.

Address Select (Q2522) for MR1 bus address set with ADS pin and must be same as MP1.

Loadcell (s) optional sense for 6 wire connection.

Keep wiring separated from mains wiring.

Either the RUN input or the RUN MOTOR output should be used.

Several system can be connected onto the same bus. Use bus termination for cable runs over 100m.

Fit an MAT terminator to each end of COM2 cable if length exceeds 50m.

Ensure all wiring is kept separate from mains wiring.
Connection Diagram – MP2

Keep all wiring separated from mains wiring.

Use shielded cable where indicated.

Either the RUN input or the RUN MOTOR output should be used.

- AX2 (+) and AX2 (−)
- VAI1 (+) and VAI1 (−)
- mAII1 (+) and mAII1 (−)
- INO (+) and INO (−)
- ON (+) and ON (−)
- RPO (+) and RPO (−)
- RAII (+) and RAII (−)
- RT (+) and RT (−)
- CTS (+) and CTS (−)
- DSR (+) and DSR (−)
- DTR (+) and DTR (−)
- TXD (+) and TXD (−)
- RXD (+) and RXD (−)
- RJ11 connector
- 24V output

Loadcell(s) - optional area for 6 wire connection

- speed demand
- run motor
- acquire zero

TOTALISER - input
- 24V

Digital I/O:
- OUT1
- OUT2
- OUT3
- OUT4
- IN1
- IN2
- IN3
- IN4
- 24V

Analog:
- AD1
- AD2
- VAI2
- mAII2
- mAII1
- A12

DC power supply, 24V DC output

- pulse output
- material feed
- run motor
- healthy
- hold control
- acquire zero
- run
- reset total

Keep all wiring separated from mains wiring.

Use shielded cable where indicated.

Either the RUN input or the RUN MOTOR output should be used.
System Ordering

A ModWeigh system is a group of ModWeigh parts that together form the system. Many possible systems can be created, but most applications will use one of the systems listed below. When ordering, just specify the system order code. To create a custom system, specify the individual components required.

<table>
<thead>
<tr>
<th>Weight Change Instrument</th>
<th>System Order Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-Module, transmitter, display, IO</td>
<td>MW93A, MT1, MD2, MR1</td>
</tr>
<tr>
<td>Product Key, Processor, IO</td>
<td>MK93A, MP1, MR1</td>
</tr>
<tr>
<td>Product Key, Processor, IO</td>
<td>MK93A, MP2, MO3</td>
</tr>
</tbody>
</table>

Parts Ordering

Following is a list of order codes for the individual parts of a ModWeigh system. The order code (and options) are shown below.

<table>
<thead>
<tr>
<th>Product</th>
<th>Product Order Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>P-Module (for transmitter only)</td>
<td>MW93A</td>
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<tr>
<td>Unactivated P-Module (requires a product key)</td>
<td>MX93A</td>
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<tr>
<td>Product Key</td>
<td>MK93A</td>
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**Special Options**

<table>
<thead>
<tr>
<th>Select any (or none) of the following</th>
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<tbody>
<tr>
<td>Chinese manuals</td>
</tr>
<tr>
<td>Korean manuals</td>
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<tr>
<td>German manuals</td>
</tr>
<tr>
<td>Spanish manuals</td>
</tr>
<tr>
<td>French manuals</td>
</tr>
<tr>
<td>Italian manuals</td>
</tr>
<tr>
<td>Polish manuals</td>
</tr>
<tr>
<td>No manuals</td>
</tr>
<tr>
<td>Manufacturing certificate</td>
</tr>
</tbody>
</table>

**Transmitter**

<table>
<thead>
<tr>
<th>Select one (or none) of the following</th>
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</thead>
<tbody>
<tr>
<td>Loadcell transmitter</td>
</tr>
<tr>
<td>Loadcell processor</td>
</tr>
<tr>
<td>Loadcell processor</td>
</tr>
</tbody>
</table>

**Processor**

<table>
<thead>
<tr>
<th>Select one (or none) of the following</th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital IO - 4In 4Out, 1 x 4-20mA input &amp; output</td>
</tr>
</tbody>
</table>

**IO Option**

<table>
<thead>
<tr>
<th>Select one (or none) of the following (only for MP2)</th>
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</thead>
<tbody>
<tr>
<td>Digital IO</td>
</tr>
</tbody>
</table>

**Display**

<table>
<thead>
<tr>
<th>Select one (or none) of the following</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.3&quot; Colour display</td>
</tr>
<tr>
<td>2.8&quot; Colour display</td>
</tr>
</tbody>
</table>

**Remote IO**

<table>
<thead>
<tr>
<th>Select one (or none) of the following</th>
</tr>
</thead>
<tbody>
<tr>
<td>Remote IO unit</td>
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</tbody>
</table>

**Accessories**

<table>
<thead>
<tr>
<th>Select one (or none) of the following</th>
</tr>
</thead>
<tbody>
<tr>
<td>RJ12 Cable 2m (COM1 cable)</td>
</tr>
<tr>
<td>RJ12 to 9 pin D-connector adaptor (ModWeigh to PC)</td>
</tr>
<tr>
<td>RJ12 to 25 pin D-connector adaptor (ModWeigh to printer)</td>
</tr>
<tr>
<td>DIN Rail mount kit for MT1 or MR1</td>
</tr>
<tr>
<td>Stack mount kit for MT1 or MR1</td>
</tr>
<tr>
<td>RS485 Line Terminator</td>
</tr>
</tbody>
</table>

**Other ModWeigh Products**

- **MW61** Weigher Systems – loadcells indicators. Suitable for scales, vessel weighing and most general weighing applications.
- **MW94** Impact Weigher Systems – impact weigher processor for continuous flowrate measurement.
- **MW95** Belt Weigher Systems – belt weigher processor for continuous flowrate measurement.
Weighfeeder Systems – weighfeeder processor for continuous flowrate control application of a weighing conveyor.

Contact Details

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As we are continuously improving our products, changes to this specification may occur without notice.