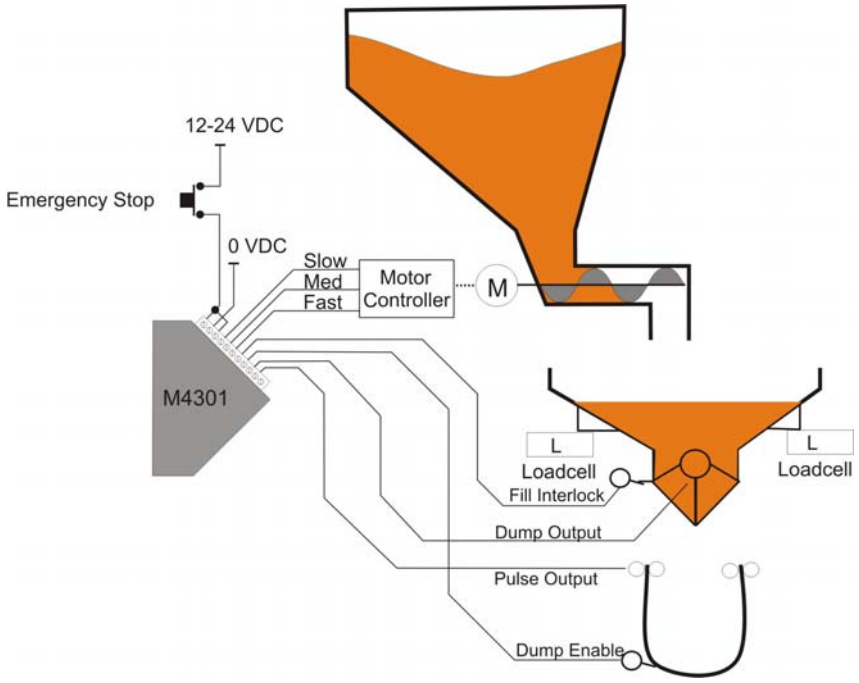
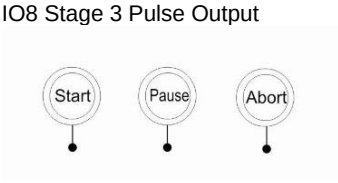
Application Note: R42x-K410 Single Material Filling

Application:



IO1 All Stages Batch Interlock
IO2 Stage 1 Slow Fill
IO3 Stage 1 Medium Fill
IO4 Stage 1 Fast Fill
IO5 Stage 1 Fill Interlock
IO6 Stage 2 Dump Enable
IO7 Stage 2 Dump Output
IO8 Stage 3 Pulse Output

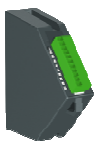


A 12kg bag is to be filled from a hopper that is accurately filled from a larger hopper. The material flow is controlled using a screw feed that is driven with a three (3) speed controller. The K410 uses three (3) set stages a FILL, followed by a DUMP then a PULSE. The FILL stage is used to fill the small hopper. The DUMP is used to control the emptying of the hopper contents into the bag by weight. The PULSE stage is then used to release the bag. The inputs and outputs on the K410 are set according to the table above.

- A multi-speed filling stage is used to ensure fast accurate filling.
- Auto-inflight correction is used to ensure filling accuracy is maintained
- Dump-to-weight is used to ensure all product leaves hopper before the end of the batch
- A fill interlock (IO5) is used on the small hopper and must be active for the duration of the fill to indicate the gate is closed and ready for filling.
- A dump enable (IO6) must occur for the dump stage to commence, this is triggered by the bag being put in place
- The three indicator function keys default to F1 Start, F2 Pause and F3 Abort.
- Emergency Stop: An emergency stop is connected to the batch interlock (IO1). Should the batch interlock be removed the batch process will halt. When used the emergency stop in the example cuts power to the IO module - shutting down the power to all outputs. By wiring it into the interlock the software can pause to coincide. When the emergency stop is released, the operator can restart the batch with the Start key to safely resume batching.
- The K410 features up to 100 recipes, allowing varying bag sizes to be supported in this example.
- The FINISH stage is a pulse for the duration set by the operator – it drives the Pulse Output IO8. It can effectively be used as a wait for the duration set.

Components:

R420-K410-A
R42x Filling Indicator VDC



M4301
8 I/O Module

M4901
8 voltage free relay outputs rated to 250VAC 8A

M4902
Cable, M4901 to Module

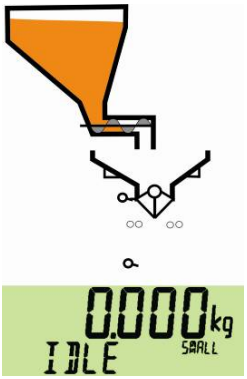
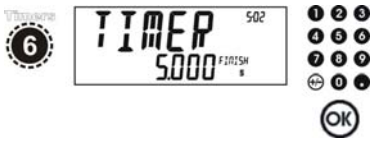
A10010
Power Supply, 12VDC, 2A DIN Rail

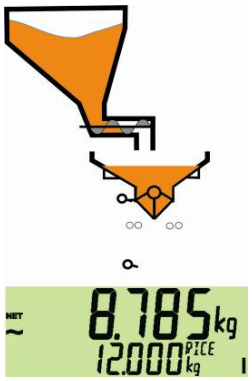
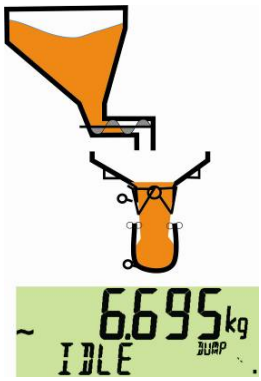
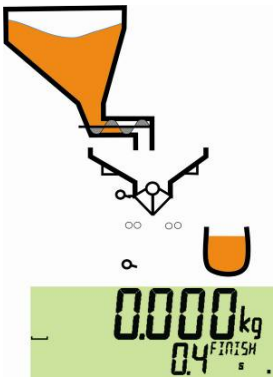
For stand a alone batching system

*Note1 Either R420s ABS or R423s flush stainless steel housing could be used.
*Note2 Suitable external power supply required for M4301 and M4901

Operation:

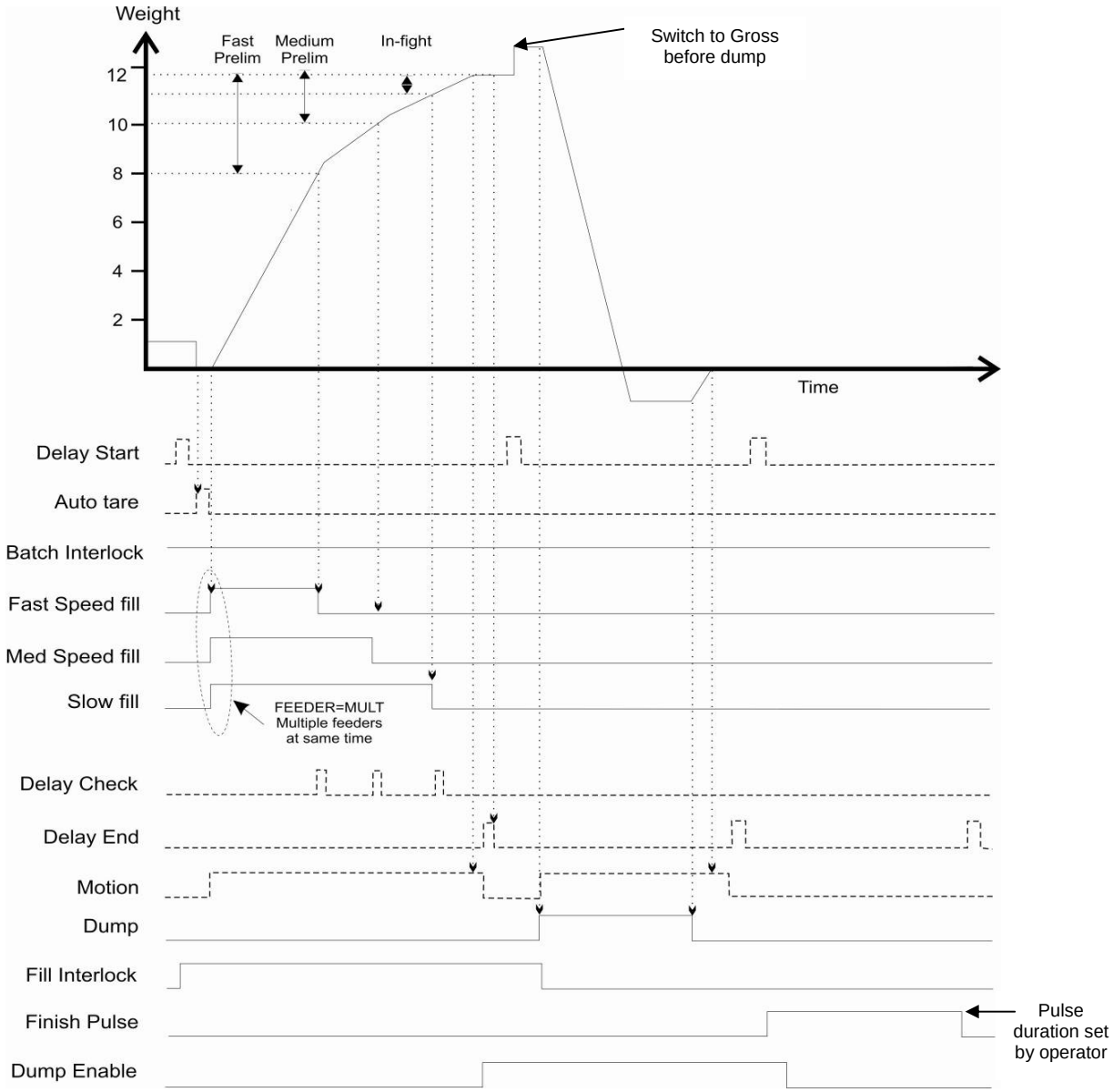
Set Up

Using the Recipe Key, the Operator enters target as required – 12kg in this example		
Operator can adjust flight settings as required using the Flight (8 key) – in-flight and preliminary targets FLIGHT is the expected weight of material in flight and is initially set by the operator; auto in-flight can then make fine adjustments. It applies to the slow fill output. M.PRE and F.PRE apply to the medium and fast outputs respectively and are set by the operator. Preliminary target values are specified for the medium and fast feeders in terms of the 'weight before target'.	 FLIGHT, F.PRE, M.PRE	
Operator to set pulse duration of Finish stage as required using the Timer (6 key). Note that the default duration is 0s and if no duration is set the Finish stage is effectively skipped.		

Stage 1 – Fill to Target	Stage 2 – Dump to Weight	Stage 3 – Finish (Pulse)
		
Stage 1 fill commences with the operator pressing the Start key. The fill in this application is multi-speed where all three speeds at once. The Fill Interlock (I/O 5) must be active for the duration of the fill indicating the hopper gate is closed.	The DUMP stage has a fixed dump enable set to IO6. This input is both edge and level sensitive and must be detected for the dump stage to proceed to indicate a bag is in position. The signal may be detected anytime after the batch has started and in this application is operator initiated with the loading of the bag. Stage 2 dump commences automatically after a period of no motion and the dump enable has been detected (ie the bag is in place and the hopper fill has finished). Dump-to-weight is used to ensure all product leaves hopper before end of batch.	The FINISH stage is a pulse for the duration set by the operator that drives the Pulse Output IO8. In this example it is likely that the bag is held in place with either a latching electrical clamp or an air powered one. The pulse would be used to release the bag clamp. **Manual Sealing System** Note that if the bag sealing system is manual the pulse output could drive a buzzer to alert the operator to manually release the bag and seal it.

Delays: For each of the three stages it is possible to define a delay either at the start (DLY.ST) or the end (DLY.END) of the stage, of up to 5 hours.

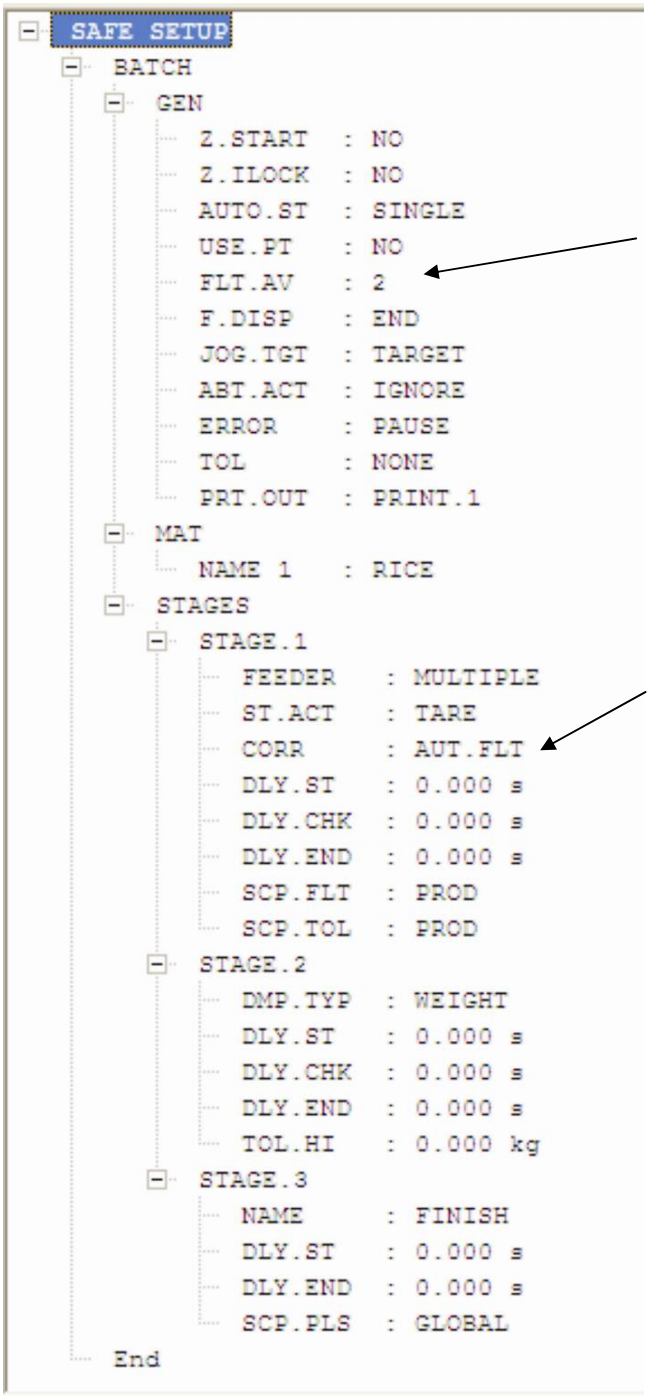
Timing Diagram:



The instrument has three (3) stages, FILL, DUMP and PULSE. These stages have fixed inputs and outputs, unused interlock or enable inputs should be shorted to the COM+ of the module. The table below shows the fixed IO used in the batch.

IO	Stage	Use
IO1	All Stages	Batch Interlock
IO2	Stage 1	Slow Fill
IO3	Stage 1	Medium Fill
IO4	Stage 1	Fast Fill
IO5	Stage 1	Fill Interlock
IO6	Stage 2	Dump Enable
IO7	Stage 2	Dump Output
IO8	Stage 3	Pulse Output

Indicator Configuration:

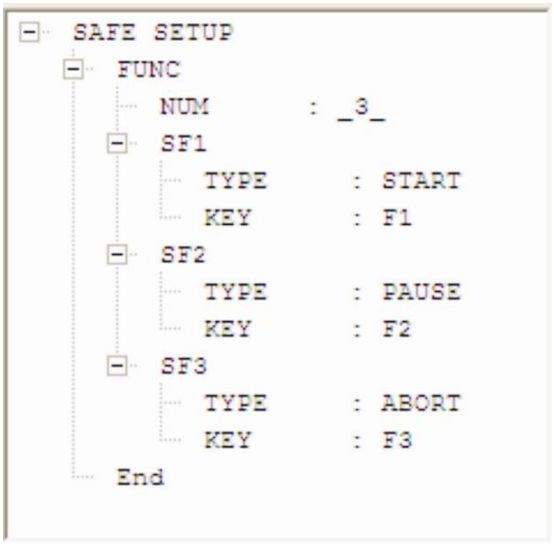


In-flight averaging (FLT.AV): The number of in-flight results to be averaged. If it is greater than five (5) then extreme results are ignored. This averaged in-flight result is used with auto jog and auto flight FILL correction.

Stage 1: FILL In-flight setting

The slow fill is switched OFF when the weight left to fill equals the in-flight. The in-flight can be set manually or automatically adjusted using past fill results.

Auto Flight (AUT.FLT): Uses the average fill error to calculate a corrected in-flight. The amount of averaging is determined by FLT.AV. The operator can set a starting in-flight value.



For more information refer to the Reference Manual for this product