

# Loss-in-Weight Feeders

for precise feeding of  
bulk materials in a process



# Modular Product Lines for Flexible Solutions



## Twin & Single Screw Feeders

Modular screw feeders offer numerous exchangeable components and various types of screws for feeding bulk solids.

Feed rates:

0.2 - 45,300 dm<sup>3</sup>/hr  
0.007 - 1,600 ft<sup>3</sup>/hr



## Loss-in-Weight Belt Feeders

The use of a belt as the feeding device of a loss-in-weight system ensures gentle handling of difficult products with low melting points.

Feed rates:

1 - 1,200 dm<sup>3</sup>/hr  
0.04 - 40 ft<sup>3</sup>/hr



## Vibratory Feeders

Vibratory trays in three sizes can be combined with various hopper sizes to feed difficult materials like glass fiber.

Feed rates:

2 - 5,000 dm<sup>3</sup>/hr  
0.07 - 180 ft<sup>3</sup>/hr



## Liquid Feeders

A wide range of pumps and tanks can be combined with a suspension scale or platform scale using SFT II technology for gravimetric feeding of liquids.



## Bulk Solids Pump™ Feeders

The new BSP feeders provide gentle, precise feeding of free flowing materials. Four models can be combined with a suspension scale or platform scale to cover a wide range of feed rates.

Feed rates:

2 - 9,000 dm<sup>3</sup>/hr  
0.07 - 320 ft<sup>3</sup>/hr



## Compact Feeders

Available in single or twin screw configurations or with vibratory tray for feeding materials with high accuracy at low feed rates.

Feed rates:

0.07 - 313 dm<sup>3</sup>/hr  
0.003 - 10 ft<sup>3</sup>/hr



## Quick Change Feeders

Twin and single screw feed modules can be interchanged to provide for quick cleaning and increased production flexibility.

Feed rates:

0.2 - 4,050 dm<sup>3</sup>/hr  
0.007 - 140 ft<sup>3</sup>/hr



## Pharmaceutical Feeders

Designs include sanitary construction with two levels of surface finish and quick disassembly capability for easy cleaning. Drive motor and gearbox can also be enclosed in a sealed stainless steel housing.

Feed rates:

0.1 - 4,000 dm<sup>3</sup>/hr  
0.004 - 140 ft<sup>3</sup>/hr



### K4G Gravimetric Blender

Designed for the plastics compounding and extrusion market, systems can be arranged in compact groups of up to six feeders.

Feed rates:

0.4- 3,125 dm<sup>3</sup>/hr

0.014 - 110 ft<sup>3</sup>/hr

### Feed Rates

*The feed rate range is determined by the equipment configuration and the selected scale capacity. Each feeder type is available in modular configurations that provide for an overlap of feed rate capacities. The stated feed rates are for the smallest equipment configuration to the largest equipment configuration within that type. Typical feed rate turndown capacity within any single configuration is 20:1.*



Loss-in-weight screw and vibratory feeders on a high performance extruder

## Feeding Principles

### Volumetric feeding principle

The bulk material is discharged from a hopper with a constant volume per unit of time by regulating the speed of a feeding device. The actual volume of material fed is determined through calibration. The feeding accuracy is dependent on the uniformity of the material flow characteristics and the bulk density.

**Application:** Simple, economical solutions where a high degree of feed rate accuracy is not required.

### Gravimetric feeding principle

The bulk material or liquid is discharged from a hopper by weighing the material being fed and regulating the speed of the feeding device. The weighing system with control compensates for non-uniform material flow characteristics and variations in bulk density, and therefore provides for a high degree of feeding accuracy.

**Application:** Monitored feeding. Material control. Set point input manually or by host computer or in master/slave operation.

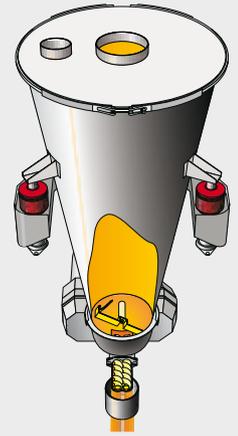
### Gravimetric application principles

K-Tron employs the following principles:

Continuous feeding

Batch feeding

Flow metering



### Loss-in-weight feeding principle

A feeding device with a hopper containing the material to be fed is placed upon a platform scale or suspension scale weighing system. The weight of the feeding device and hopper is electronically tared. The bulk material or liquid is discharged from the hopper by the feeding device and the resultant weight loss per unit of time is determined by the weighing and control system. This actual weight loss per unit of time is compared to a desired weight loss per unit of time based upon a desired continuous feed rate setpoint. Any difference between the actual and desired weight loss per unit of time results in a correction to the speed of the feeding device.

When the hopper content reaches a predetermined minimum weight level, the control by weight loss is briefly interrupted and the hopper is refilled. During the refill period, weight is increasing and the controller regulates the speed of the feeding device based upon the historical weight and speed information that was determined during the previous weight loss cycle. The loss-in-weight feeder principle is most accurate when using a high resolution, fast responding, vibration immune weighing system combined with self tuning controls.



# Anatomy of a Loss-in-Weight Feeder

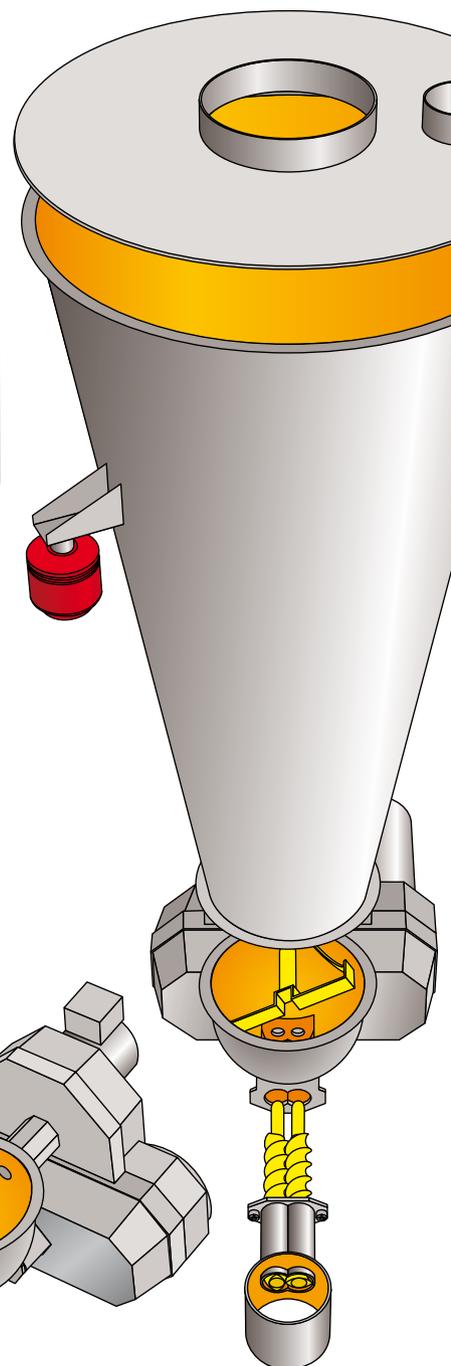
## Features and Benefits

The K-Tron Control Module (KCM) combines the feeder control function together with the motor drive or vibratory tray drive and mounts directly on the feeder frame in an IP65 / Nema 4 enclosure. This eliminates the need to mount these components in remote control panels and eliminates expensive cabling between the feeder and the operator interface in the control room. All wiring between the weighing system, motor and KCM is done at the factory thus reducing installation time and expense. Connecting all feeders in a process line to the operator interface in the control room is accomplished using a single cable with standard serial communications protocol. For hazardous or hostile environments, the KCM can be remote mounted and replaced with a connection box.

Hoppers are available in a variety of configurations. Symmetrical and asymmetrical hoppers with and without vertical agitation are available depending on the flow characteristics of the material to be fed.

The feeding module is supported on a swing out structure that allows for quick cleaning or changing to a variety of units. Screw feeding units with horizontal agitators as well as vibratory trays, belts, Bulk Solids Pumps and other feeding devices can be supplied.

K-Tron Control Module or Connection Box



Hoppers

Modular Feeding Devices

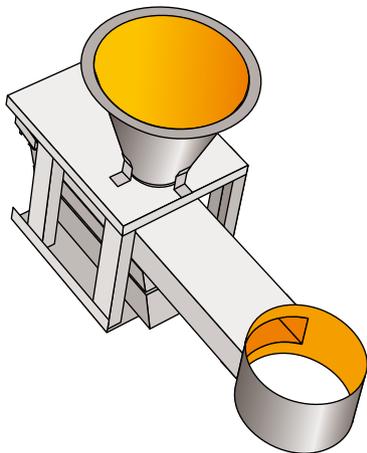


**Inlet/Refill** Hopper lids can accommodate manual or automatic refills, depending on feed rates. When automatic, the inlet and vent size is determined based upon refill rate, material flow characteristics and hopper size. Connection to the upstream refill device is made via a flexible bellows. Pressure compensation systems are available upon request.

**Air/Ventilation** During the feeding process, air must enter and leave the hopper as the process material is being discharged or refilled. The vent connection is provided for this purpose and can be connected to: plantwide dust collection systems, the refill container, the atmosphere through an attached fabric filter, the atmosphere through a self-cleaning jet filter mounted on the hopper. Connection to upstream hoppers or central collection systems is made with a flexible bellows.

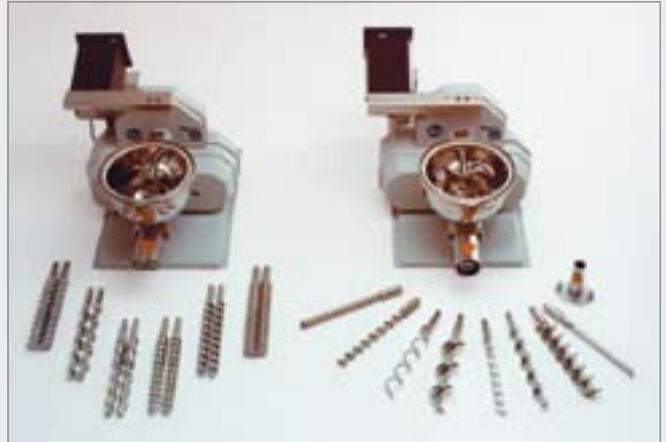
**Smart Force Transducer Weighing Technology** High resolution (4 parts / million), zero deflection, vibration and temperature immune weighing system provides for the fastest most accurate weight information to be available to the control system. Available as a platform scale or three-point suspension scale system as shown here.

**Gear Box/Motor Drives** A variety of gear box types and sizes is available to accommodate a broad range of feed rate ranges. Motors are available as DC drives with 100:1 turndown capability, AC drives with 20:1 turndown capability and stepper drives. A variety of drives are available to meet hazardous location requirements.



**Discharge** Discharge configurations can be supplied as open horizontal, closed vertical, and closed vertical with pressure compensation designs. Separate sampling valves are available to divert materials for calibration checks.

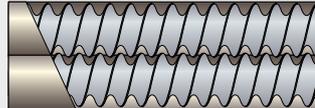
## The Right Feed Screw for Every Application



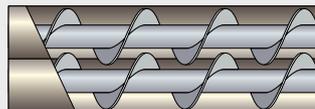
Screw feeding units use K-Tron's unique Powersphere design with horizontal agitation to provide the most uniform fill of material into the discharge screw thus improving feeding accuracy over a greater turndown range. Single and twin screw configurations are available with a variety of screw designs to accommodate the broad range of materials that have to be fed.

Years of experience feeding all kinds of materials can be accessed in our test lab databases. Fully equipped testing facilities around the world can help in making the optimal equipment selection.

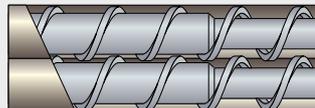
### Twin Feed Screws



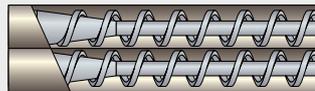
**Twin concave-profile screws** for free-flowing and sticky powders



**Twin auger screws** for pellets or pellet-powder mixtures



**Twin spiral screws** for difficult pellet-powder mixtures

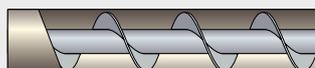


**Double spiral screws** for pellets

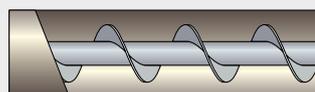
### Single Feed Screws



**Single spiral screws** for pellets



**Single auger screws** for poorly flowing powders



**Single auger screws with wider tube** for large pellets



# Loss-in-Weight Feeders in the Field

## Fiber-reinforced Thermoplastics

### Typical application

Precise feeding and blending of materials is a critical part of the process when manufacturing reinforced thermoplastics. Typical applications require the blending of several granular materials with one or two powder materials within a compact area at the throat of an extruder. Maintaining a steady and precise level of blended material above the throat of the extruder is also a requirement.

### Solution discussion

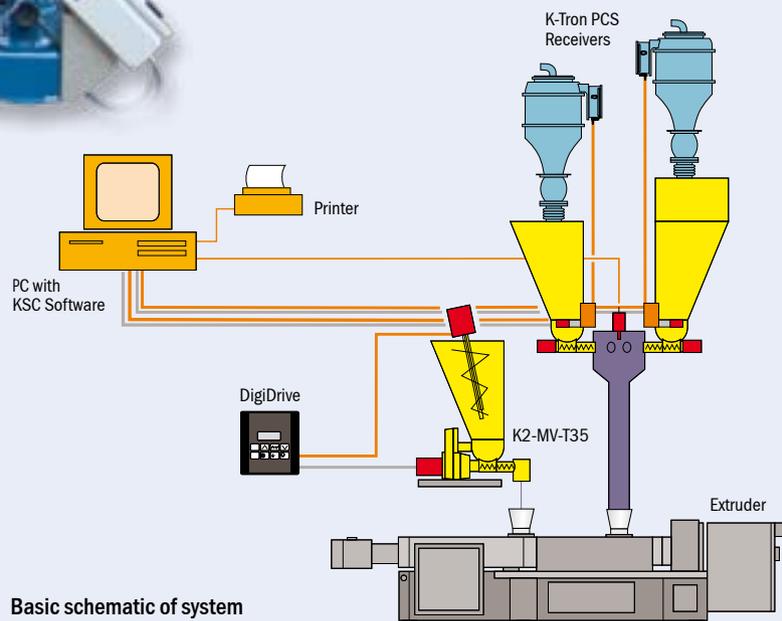
The requirements of this application are ideally suited to the gravimetric blending system. The photograph shows a multiple feeder system within a very compact area. Each feeder is accessible for maintenance and cleaning by a swing out construction that allows access to all sides. All ingredient feed rates are controlled simultaneously and continuously blended in the collection hopper. A level sensor is provided within the collection hopper to maintain a fixed level of blended materials above the throat of the extruder. Feeders can be single or twin screw depending on the materials to be processed. K-Tron PCS pneumatic conveying units are supplied to transfer materials from storage to the process area above the feeding system. Operator interface to determine line rates and blend ratios as well as the control for each feeder is provided through the SmartConnex system.

### Economic aspects

A feeding and conveying system that provides precise control of individual ingredients that allows for the most accurate blend of products to be achieved, has good accessibility for cleaning and maintenance, is easy for operators to use and is compact in its installation provides the most economical solution to the application. End product quality is improved, thus reduced scrap. Change-over time is reduced, thus faster production runs. Easy operator interface and recording of process information improves historical records.



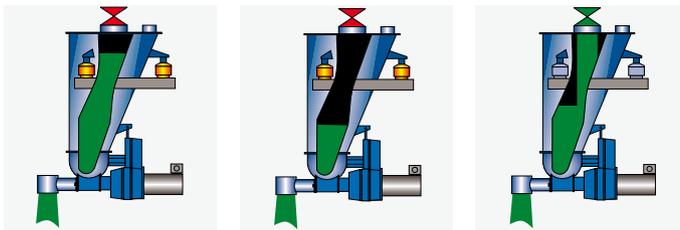
The K4G gravimetric blender is designed to group up to six feeders in a compact configuration



# Refill rules

## Quick Rules of Thumb:

- Refill rate = 8 - 10 times the feed rate
- Number of refills per hour = 20 - 40 (max. 60)
- Maximum refill level= 70-80% of the hopper volume
- Number of refills = feed rate divided by the refill volume



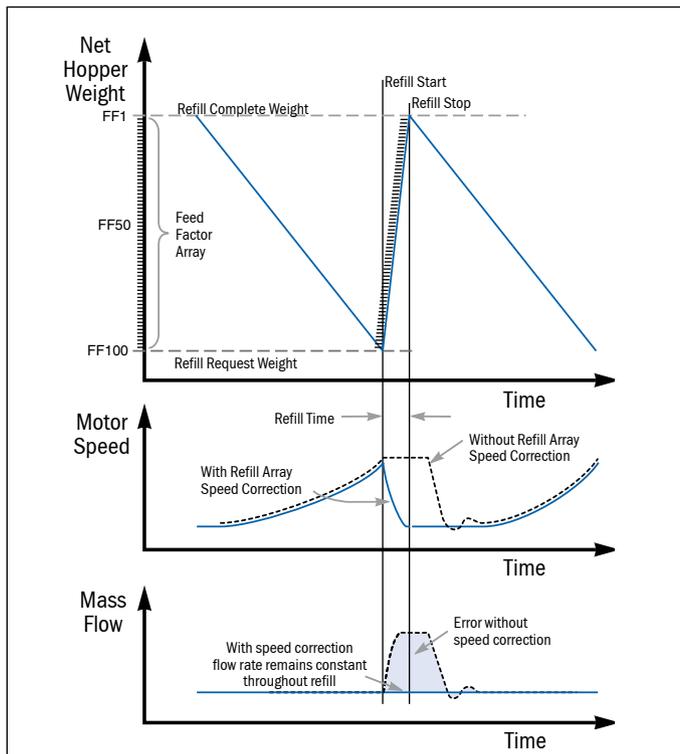
Maximum level

Minimum level

Refilling started

## Refill Array

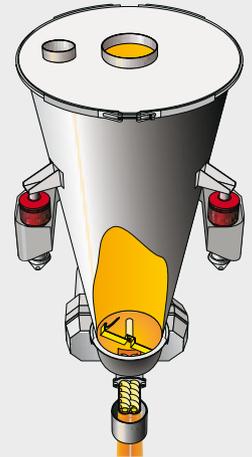
Unlike conventional loss-in-weight systems that lock onto a fixed screw speed during the refill cycle, the K-Tron patented refill array technique automatically adjusts the screw speed during refill as the weight is increasing. The speed of the screw during refill will correspond to the known screw speed at correlated weights of material in the hopper during the last loss-in-weight cycle. The result is continuous feed accuracy within specification even during the refill cycle.



# Core technologies

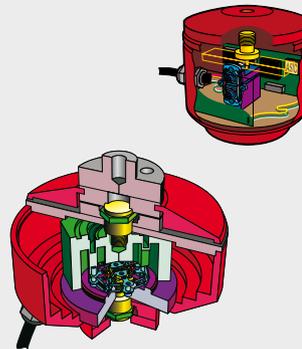
## Material Handling

No two process applications are the same, and K-Tron offers the widest range of material handling solutions in the industry. All volumetric feeders, loss-in-weight feeders, weigh belts, flow meters and conveying systems are offered in a variety of configurations, which can be combined to create an optimal solution for any application.



## Precision Weighing

K-Tron's unique vibrating wire weighing technology is based on the fact that the resonance frequency of an oscillating wire depends on the wire tension produced when a load is applied. The force of an applied weight is transferred mechanically to the wire. The resonant frequency of the wire is then measured to determine the weight with a resolution exceeding 4 parts in 1 million.



## Advanced Controls

K-Tron's SmartConnex™ concept represents a new control environment that tightly integrates the core technologies of a feeder system. This greatly reduces the cost of installation and daily operation, makes the system easier to use and maintain, and provides an optimum level of performance. In multi-feeder applications, SmartConnex can be used to form a network of feeders using simple field wiring techniques with superior performance.



# Smart Solutions for Material Handling

Since its creation in 1964, K-Tron has defined the leading edge of technology for material handling applications in the process industries. K-Tron designs, produces, sells and supports its equipment under the product names K-Tron Feeders, K-Tron PCS and K-Tron Colormax.

## K-Tron Feeders

Volumetric and gravimetric feeding systems for plastics, foods, chemicals, detergents and pharmaceuticals

## K-Tron PCS

Central and self-contained vacuum receivers and systems for conveying bulk materials in industrial processes

## K-Tron Colormax

Auxiliary and blending equipment for the plastics industry

## K-Tron Test Labs

Fully equipped testing facilities help in making the optimal equipment selection

## Systems Engineering Support

Single station or multi-station systems designed to meet all your material handling needs

## Worldwide Service Personnel

Trained service engineers located around the world to provide on-site solutions at your facility

## Service Support

Twenty-four hour technical support to solve your problem any time, any day

## Custom Service Programs

Start-up and preventive maintenance programs designed for your specific installation

## Spare Parts

Quick delivery so you can safely limit your inventory to the most critical parts

## Professional Training

The K-Tron Institute provides hands-on maintenance, mechanical and operator training for all of your K-Tron equipment, either on-site or at a K-Tron facility



Modular volumetric and loss-in-weight feeders integrated with a gravimetric blending system and K-Tron PCS loaders in a plastics extrusion process

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