WICHITA CLUTCH

Tension Control Systems

Tension Control Systems

Wichita offers the most complete product line dedicated to the TENSION CONTROL MARKET. Our extensive experience has enabled us to develop high performance controls able to operate in open and closed loop with brakes and motors.

ABOUT THIS CATALOGUE

This master catalogue groups all the solutions / products that Wichita offer. An important part is dedicated to design solutions with particular consideration to the type of machine and the tension control installed. This should help you choose the right solution, taking into consideration the results you want to achieve. All the product characteristics and dimensions are included for every product.

Applying the appropriate Tension Control will help you

- save material
- improve quality of the operation
- increase production
- lower your production cost

For any further assistance, call your local Wichita company listed on the back cover

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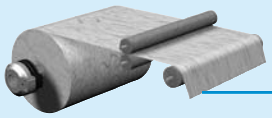


MARKET / SOLUTION

Tension control definition

*Before going through the various products and solutions **Wichita** can offer, it is important to make a correct analysis of the need. What we call “need” is the tension control accuracy you need to operate a good material transfer through the machine and to maintain perfect operation with the material.*

WHAT’S TENSION CONTROL ?

Tension control is the ability to permanently control the mechanical tension in any material (mainly the raw material available in roll size). This control has to be operated dynamically and statically. On every machine the operator should be only concerned by the speed and operation. The line speed is considered as master function. The tension control must be efficient at any machine speed phase, including machine acceleration, steady speed and speed deceleration. Emergency stop case does not require accurate tension control but should act in the way to avoid the web breakage. It is then very important to consider all machine speed phases for the system determination.

WHY A TENSION CONTROL ?

When web material has to be treated in a specific machine (printer, slitter, coater….) it is very important to transport the web with a controlled tension for two main reasons :

❒ **Correct web transport in the machine**

❒ **Correct operation on the transported material**

On the other hand, this kind of machine works very often with an “edge guiding system”. Loosing the tension in material will affect the correct edge guiding system.

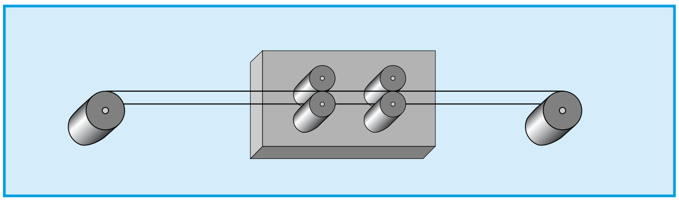
WHERE DOES IT APPLY ?

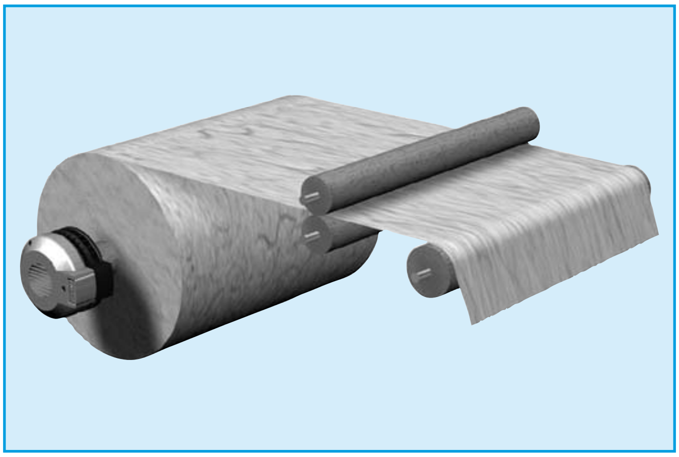
In any roll fed web processing machine. Typically :

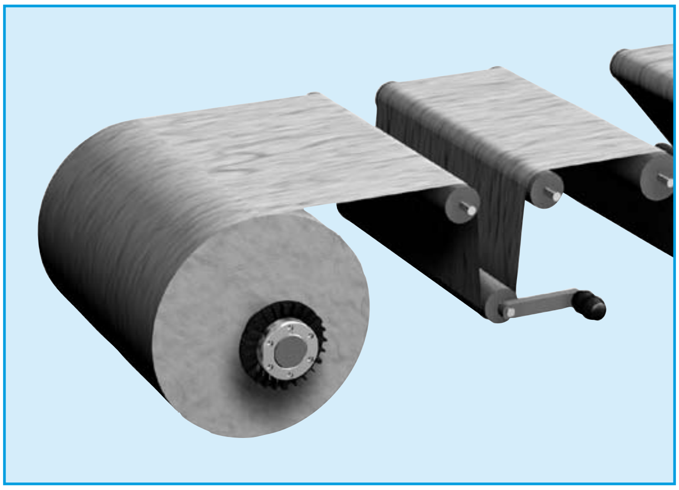
❒ **PRINTING machine**
❒ **LAMINATING machine**
❒ **SLITTING machine**
❒ **SHEETING machine**
❒ **COATING machine**
❒ **EXTRUDERS**
❒ **Stand alone UNWINDER / REWINDER**
❒ **In general all CONVERTING equipment**

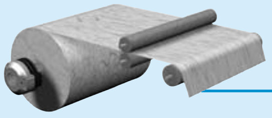
Treating material such as:
❒ **Paper**
❒ **Plastic film**
❒ **Textile**
❒ **Aluminium foil**
❒ **Wires / cables**

In general in all machines whose block diagram can be represented as follow:







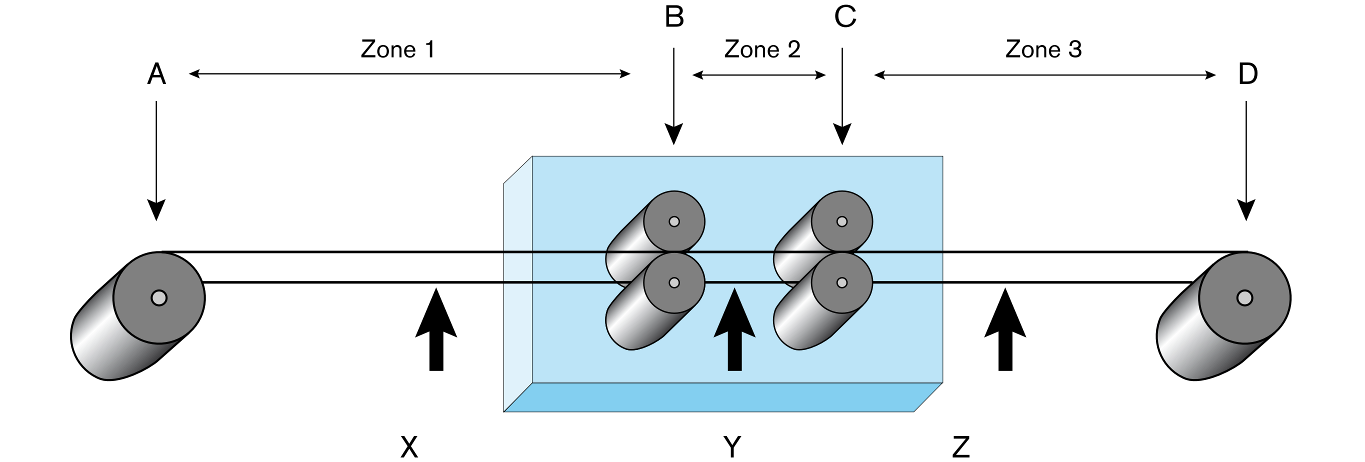


MARKET / SOLUTION

Tension control application

Preparing a project in tension control requires good analysis and support. The block diagram below is a general representation of any machine supporting tension control. We recommend using this diagram -or a part of it- in any discussion and correspondence in order to avoid possible misunderstandings:

GENERAL BLOCK DIAGRAM



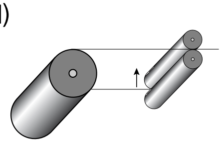
IMPORTANT CONSIDERATION

In every machine the speed point location must be clearly identified. In general one of the machine nip rolls is driven, setting the linear velocity of the machine. The machine speed is considered as **MASTER** function. The tension control, whatever the chosen solution, works in **SLAVE** mode. Practically, the operator sets the machine speed with a simple potentiometer and all tension control system existing on the machine have to follow, keeping the desired tension at any speed and during all transitory speed phases.

REFERING TO THE GENERAL BLOCK DIAGRAM

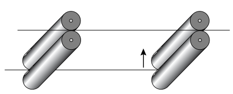
Three zones are clearly identified :

ZONE 1, Typical characteristics (unwind)



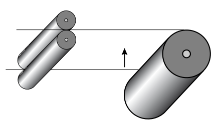
- ❒ Tension zone definition : A-B
- ❒ Speed point in B
- ❒ Variable roll rotation speed
- ❒ Variable inertia
- ❒ In general constant tension X
- ❒ Brake system applicable
- ❒ Motor system applicable

ZONE 2, Typical characteristics



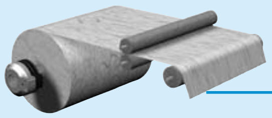
- ❒ Tension zone definition B-C
- ❒ Speed point in C or B
- ❒ Constant roll rotation speed
- ❒ Constant inertia
- ❒ In general constant tension Y
- ❒ Brake system applicable
- ❒ Motor system applicable

Zone 3, Typical characteristics (rewind)



- ❒ Tension zone definition C-D
- ❒ Speed point in C
- ❒ Variable roll rotation speed
- ❒ Variable inertia
- ❒ Constant or Taper tension Z
- ❒ Brake not applicable
- ❒ Motor system required

NOTE : Each zone is individually controlled. Tension may be different in each zone. It is assumed that there is no slipping on the nip roll.



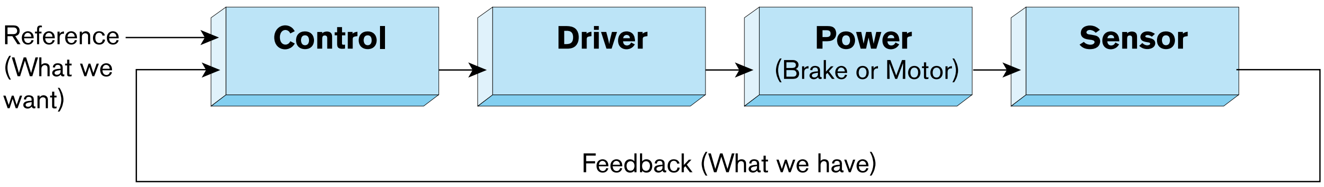
MARKET / SOLUTION

Tension control in closed loop

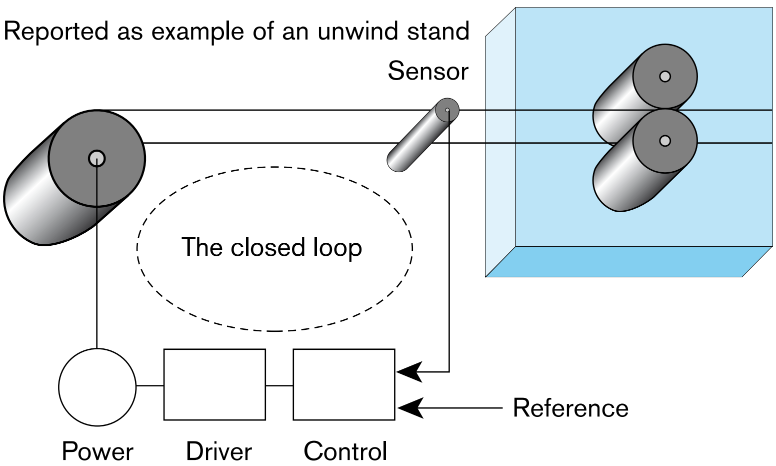
To create tension it is necessary to apply a force -or more precisely a torque- when applied to a turning part. ***Wichita*** *manufacture a wide range of brakes with torque ranges from fractional Nm to thousands of Nm. Two main solutions exist in terms of system configuration to apply the right torque:*
- ❒ *Closed loop control.*
- ❒ *Open loop control (or more precisely open loop setting).*

CLOSED LOOP SOLUTION

The tension control, as any electronic control, is working basically in closed loop according the electrical block diagram below. In closed loop **we sense the result we want to achieve** and compare it with a reference in order to ensure permanent balance between what we want and what we have.



Reported as example of an unwind stand



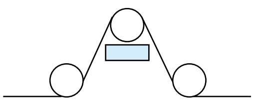
The closed loop is an electrical/mechanical loop. In such a loop all parts are important in terms of quality.

- ❒ The control – has to have high performance to manage all parameter changes correctly during the operation.
- ❒ The driver – has to be as fast as possible in terms of response.
- ❒ The power part – has to be sized correctly according the need and as fast as possible in terms of response.
- ❒ The sensor – has to be accurate, stable over time and to have a good repeatability.

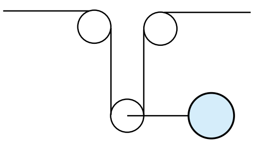
The quality of the mechanical construction is important. The control loop is closed through the mechanical transmission between the power element and the sensor roll. The web itself is a part of the loop. In the case of webs with high elasticity, special consideration should be given in control setting.

THREE WAYS TO SENSE THE TENSION

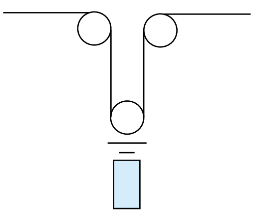
❒ **Direct tension** measurement with **LOAD CELL.**

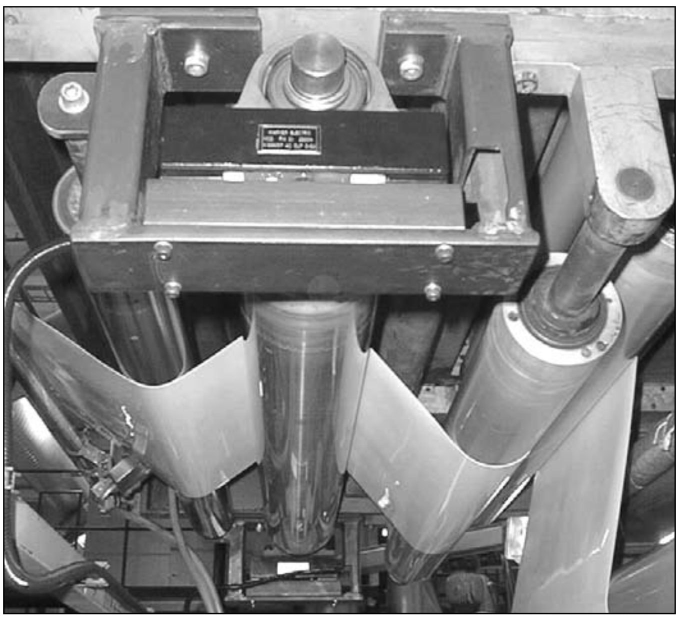


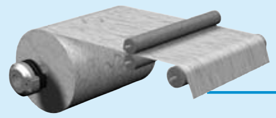
❒ **Indirect tension** measurement with **DANCER ARM.**



❒ **Indirect tension** measurement with **FREE LOOP.**







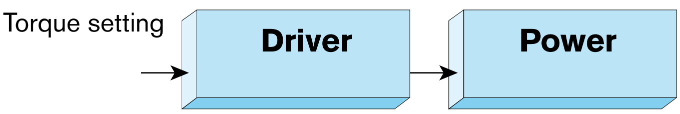
MARKET / SOLUTION

Tension control in open loop

Working in open loop requires an external reference setting applied to the driver. The torque applied to the unwind roll has to vary according to the diameter of the roll. Open loop solution is generally a low cost solution but with limited accuracy.

OPEN LOOP SOLUTION

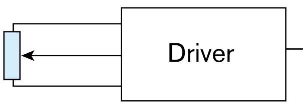
The open loop configuration does not require any control or sensor. It is composed only with a power element (brake or motor) and an associated driver. In this case the torque is **not controlled.** We have **to set the torque** on the driver according to the diameter of the roll. The electrical block schematic drawn from the closed loop system becomes as follows:



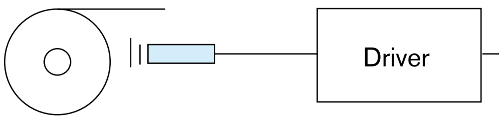
The power part is transmitting the necessary torque to the roll. Since the result is not measured, all the effect due to the inertia of the roll influence the tension in the web. Some compensations are possible but the system stays an open loop with limited accuracy.

THREE POSSIBILITIES TO APPLY THE SETTING

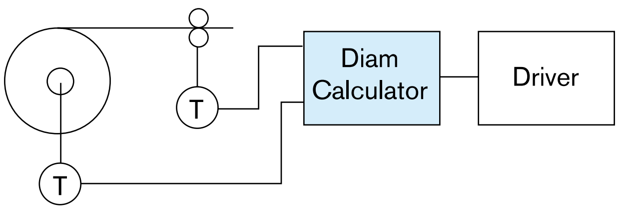
❒ **MANUAL** by **potentiometer**

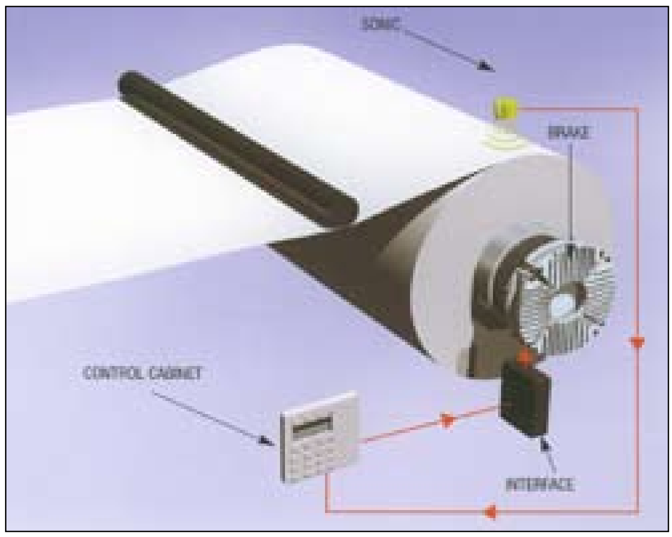


❒ **AUTOMATIC** with the **diameter reading**



❒ **AUTOMATIC** with the **diameter calculation**





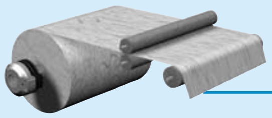
The diameter calculation is based on line and rotation speed information.

This solution requires to have both information available.

To summarise, web tension control can be operated in two system configurations: **OPEN** and **CLOSED** loop. For each configuration, three main possibilities for SETTING and SENSING are possible. The solution choice depends on :

❒ **The accuracy you need in your web tension**
❒ **The mechanical construction of the machine**
❒ **The degree of automation you need**
❒ **The acceleration/deceleration imposed on the system**

In the next section **Wichita** lists some criteria to help facilitate your choice. It's not our intention to impose a solution, but to offer a guide drawn from **Wichita** experience. We put the emphasis on the limits of the various possibilities in order to achieve the results you are expecting.



MARKET / SOLUTION

Torque and power determination

Let's take, as an example, a slitter-rewinder machine in order to establish a complete "power balance" sheet concerning the torque. The power we need in the three machine zones is the following:
- ❒ *Unwind part (zone 2)*
- ❒ *Machine process part (zone 2)*
- ❒ *Rewind part (zone 3)*

"POWER" FROM MOTOR OR BRAKE ?

Based on two parameters :

- ❒ Do I need a positive torque or is a negative torque sufficient ?
- ❒ Which technology is on the machine ?

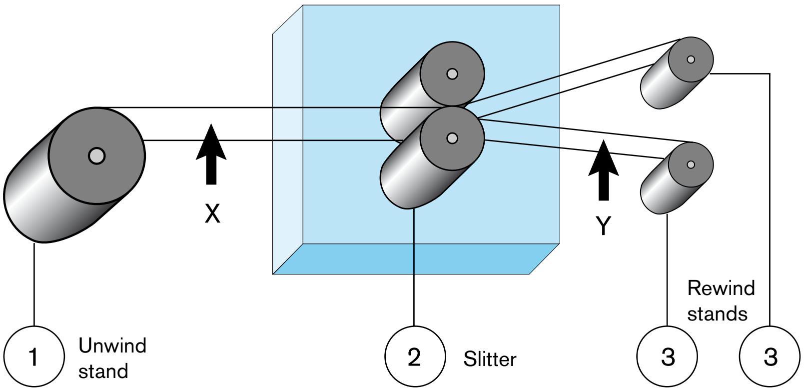
In the case where the "torque need" calculation shows positive results we are forced to use a motor. Only a motor is able to provide positive torque. It's typically the case on the rewind stand; on the other hand, the brake solution very often suits the requirements for an unwind stand.

The technology parameter is purely a customer decision. The tension control with motor is today operated with AC motor and flux vector control drive with full power regeneration in the line.

WICHITA offer both solutions with a wide range of products.

TORQUE NEED EVALUATION

Example of calculation on a typical machine (slitter / rewinder).

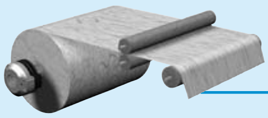


Parameters given	
Unwind tension zone X	250 N
Rewind tension zone Y	100 N, all rolls
Taper tension zone Y	40%
Max unwind roll diam.	1 m
Max rewind roll diam.	0,5 m
Min unwind roll diam.	0,09 m
Min rewind roll diam.	0,06 m
Max line speed	400 (m/min)
Accel	50 m / min / sec
Decel	150 m / min / sec
Max unwind roll weight	500 Kg
Max rewind roll weight	80 Kg, all rolls

Unwind stand

Max torque to provide the tension	- 1 m * 250 N / 2	-125 Nm
Min torque to provide the tension	-0,09 m * 250 N / 2	-11,25 Nm
Inertia of the full roll	0,5 * 500 Kg * 0,5 m * 0,5 m	62,5 Kgm^2
Max rotation speed (at full line speed)	+ (400 m/min / 0,09m / 3.14)	+1415 rpm
Min rotation speed (at full line speed)	+ (400 m/min / 1m / 3,14)	+127 rpm
Torque to accelerate the full roll	+ (62,5 Kgm^2 * 127 rpm / 9,55 / 8 sec)	+104 Nm
Torque to decelerate the full roll	- (62,5 Kgm^2 * 127 rpm / 9,55 / 2,66 sec	- 312 Nm
Torque need on the roll to insure correct tension		
- In acceleration	**- 125 Nm + 104 Nm**	**-21 Nm**
- During steady speed for D to d	**-125 Nm to -11,25 Nm**	**-125 to -11,25 Nm**
- In deceleration	**-125 Nm - 312 Nm**	**-437 Nm**
- Max continuous power dissipated	**- 125 Nm * 127 rpm / 9550**	**-1,66 kW**

The torque need for each machine phase shows a negative result. Brake and motor can comply with all parameters. **Whatever the choice the selection must be based on the max requirements of heat, torque and speed.**



MARKET / SOLUTION

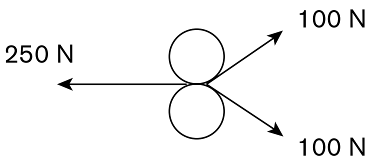
Torque and power determination

Rewind stand (zone 3)

Both shafts are similar in terms of mechanical parameters. It's practically always the case for slitting machines.

Max torque to ensure the tension (biggest diameter, all rolls)	+(0,5 m * 100N * 60% / 2)	+15 Nm
Max torque to ensure the tension (smallest diameter, all rolls)	+(0,06 m * 100N / 2)	+3 Nm
Max shaft rotation speed - In reality the max speed in never reached on the core diameter. For the max speed on the core we can assume a practical reduction of 25%	+(400 m/min / 0,06 m / 3,14)	+2123 rpm
Then max rotation speed	+(2123 rpm * 75%)	+1592 rpm
Min shaft rotation speed - In reality the full roll is never reached at full speed For the min speed at full roll we can assume a practical reduction of 25%	+(400 m/min / 0,5 m / 3,14)	+255 rpm
Then min rotation speed	+(255 rpm * 75%)	+ 191 rpm
Inertia of the full roll, all rolls	0,5 * 80 Kg * 0,25 m * 0,25 m	2,5 Kgm^2
Torque to accelerate the full roll, all rolls	+(2,5 Kgm^2 * 191 rpm / 9,55 / 8sec)	+6,25 Nm
Torque to decelerate the full roll, all rolls	-(2,5 Kgm^2 * 191 rpm / 9,55 / 2,66 sec)	- 18,8 Nm
Final torque need on the roll to ensure correct tension		
- In acceleration	**+ 15 Nm + 6,25 Nm**	**+ 21,25 Nm**
- In steady speed for d to D	**+ 3 to + 15 Nm**	**+ 15 Nm**
- In deceleration	**+ 15 Nm – 18,8 Nm**	**- 3,8 Nm**
- Max power continuous dissipated per shaft	**+ 15 Nm * 255 rpm / 9550**	**+ 0,4 kW**

MAIN DRIVE NIP ROLL (zone 2)



Necessary theoretical power :

Worst tension balance = 250 N – (2 * 100 N * 60%) = 130 N

Max power need = 130 N * 400 m/min/60 = 867 W

Max roll rotation speed : depends of nip roll diameter

MACHINE POWER BALANCE

Unwind stand	- 1,66 kW
Main drive	+ 0,87 kW
Rewind shaft (2)	+ 0,80 kW
TOTAL POWER	+ 0,01 kW
(due rounded number)	0,00 kW

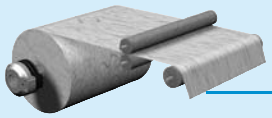
Please note it is a theoretical calculation. We did not take all the initial friction into account. Looking at the torque need for each zone we can say:

❒ Tension function on unwind stand can be achieved by motor or brake.

❒ Nip roll system has to be motor driven.

❒ Tension function on rewind shaft must be provided by motor.

Wichita can offer you the appropriate engineered solution whatever your choice, from our wide range of controls, hydraulic and and pneumatic clutches and brakes.



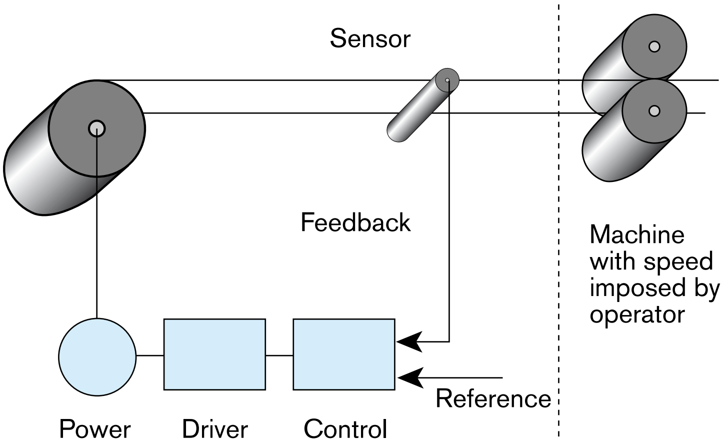
MARKET / SOLUTION

Configuration - selection

The power part selection is the same whatever the configuration. As soon as the power element and its associated drive are defined we have to determine how the system will be driven: in open or closed loop ?

*As previously stated, one important factor is the **tension accuracy** you need.*

CLOSED LOOP - ADVANTAGES / DISADVANTADGES



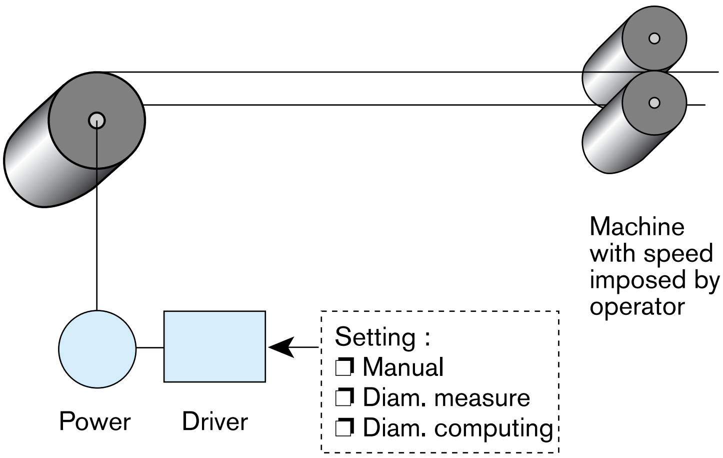
Advantage

- ❒ High accuracy.
- ❒ All initial friction in mechanical parts, even if they are changing over time are overcome.
- ❒ Tension is controlled during all the machine speed phase (accel, decel, steady speed).
- ❒ System can work in slave without any electrical connections to the machine.

Disadvantage

- ❒ Risk of instability.
- ❒ Can be more complex to set-up.
- ❒ More expensive compared to open loop.

OPEN LOOP - ADVANTAGE / DISADVANTAGE



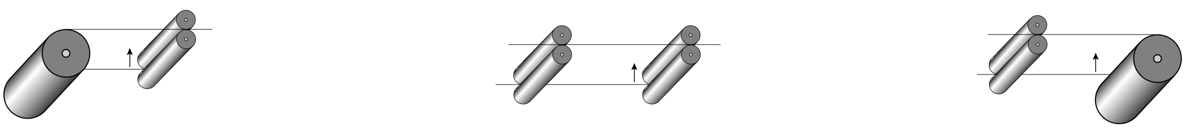
Advantage

- ❒ Very stable.
- ❒ Easy to start-up.
- ❒ Low cost compared to closed loop (sensor and control units not required).

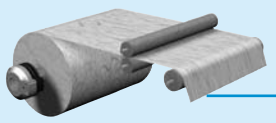
Disadvantage

- ❒ Poor accuracy
- ❒ Strongly dependent on quality of mechanical parts.
- ❒ Accel, decel phase reflected on tension.

DO NOT FORGET : all above considerations - even if example is unwind stand - are applicable to the three various machine zones we have defined on page 5.



Every zone of the complete machine can be controlled with its own appropriate tension system configuration. A typical example is the tension in a printing machine. It is very often controlled on an unwind stand in closed loop where the accuracy is important for good printing and on a rewind stand in open loop where the tension precision is not so important after the print operation. Finally it's the customer's decision. **Wichita** can offer advice in solution and product choice.

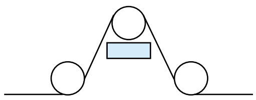
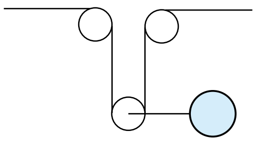
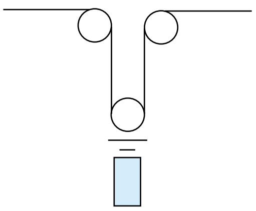


MARKET / SOLUTION

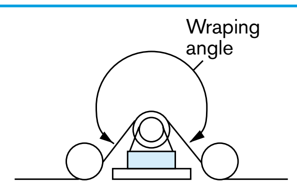
Closed loop - Sensor selection

If your machine requires a very accurate web tension control, then you need to work in closed loop. An important unit in the loop is the sensor. Three main possibilities are offered. The choice is now depending on the kind of machine you are building, the mechanical construction and the max tension value you desire to control.
Wichita *bring you their experience for selection according to various criteria.*

MAIN APPLICATIONS - ADVANTAGE - DISADVANTAGE FOR THE THREE POSSIBILITIES

Type of sensor	Where, When, Why ?	Advantage	Disadvantage
Load cell 	❐ Slitter, Sheeter, Coater ❐ For heavy material ❐ Limited room ❐ No fast accel/decel ❐ Tension peak accepted	Direct tension measure Mechanically well integrated No moving part	No tension peak absorption Accel/decel machine not easy to manage
Dancer arm 	❐ Printing ❐ Intermittent function ❐ Flying splice need	Absorb tension peak Can act as store Easy flying splice Accel / decel machine phase well absorbed Flexibility	Need more space Moving parts
Free loop 	❐ Textile machine ❐ Very low tension	Same as Dancer arm	Same as dancer arm Reliable position reading not easy

❐ In any cases the machine speed profile is important. The accel/decel machine ramps have to be electrically managed.
❐ In any mechanical construction (dancer arm), all the inertia has to be minimized.

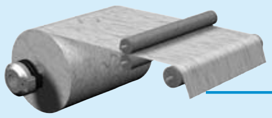


LOAD CELLS SIZING - MOUNTING RECOMMENDATIONS

Please keep this principle in mind: **The load cell installed is destined to measure the WEB TENSION and not other constraints applied to it.**

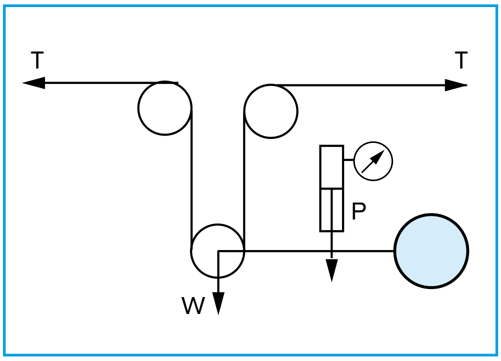
Take the following points into consideration before selecting, sizing and installing material components.

❐ Load cells location should be vibration free. Vibrations will decrease quality measurement.
❐ The sensing shaft fitted on or in has to be very well balanced. Unbalanced shaft will create measurement oscillation, causing variations in control quality.
❐ Adapted ball bearing have to be used to avoid original stress on load cell (self-aligning ball bearing).
❐ Respect a reasonable sensing shaft weight/web tension measure ratio. **Less than 1.**
❐ Do not oversize the load cell respect to your calculation. **Max admitted factor 1.5, recommended 1.25.**
❐ Respect a minimum wrapping angle on load cell. **Min = 240°.**
❐ So far as it is possible, use load cell in compression, with web tension effect in same direction as the weight of shaft.



MARKET /
SOLUTION

Closed loop - Sensor selection



DANCER ARM BUILDING AND OPERATIONAL RECOMMENDATIONS

Dancer arm system is used for indirect tension measurement. It is in fact a position control. The desired tension in web is provided with an external component. As general principle keep this concept in mind :

We have to create tension with force and not with a weight.

Take the following points into consideration before manufacturing, sizing and installing the components.

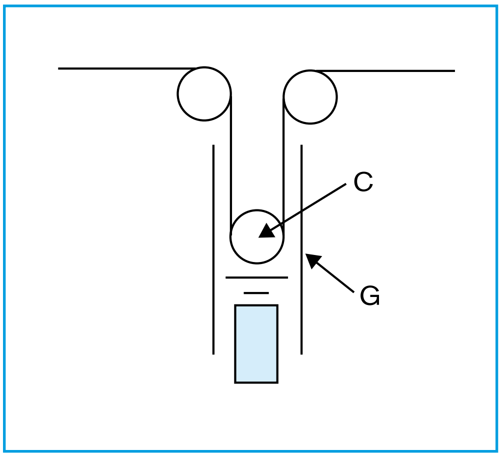
❒ Moving part of dancer has to be as light as possible.

❒ The dancer can act as both position control and web accumulator.

❒ The larger the quantity of material stored in dancer, the easier will be the position control, and hence the tension control.

❒ To set tension you need to use a pneumatic actuator “P” acting on arm of the swinging roll.

❒ In case of light tension do not add balance weights to compensate for excessively heavy dancer arms, but choose free loop.



FREE LOOP INSTALLING RECOMMENDATIONS

This is an indirect tension measure. It is in fact a position control similar to the dancer arm. The loop position is read with ultrasonic sensor. Free loop is applied especially in textile market where tension required are generally low. The free loop system suits to the requirement expressed as “zero tension”. Main difficulty is to obtain reliable position reading.

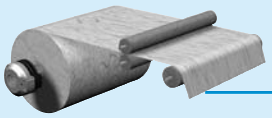
For free loop operation the following points should be taken into consideration:

❒ The tension in material is the own weight of material in the loop.

❒ A light core “C” often is placed in the loop to immobilise the loop, making easier the position reading.

❒ As the system is very light it is very sensible to the “wind”. Some guards “G” are installed to prevent accidental loop moving.

❒ As the system is dedicated to very low tension it often requires a motor as power system.

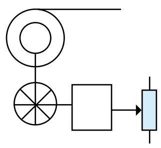
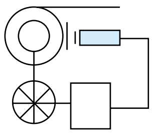
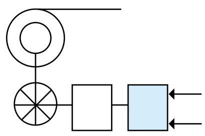


MARKET / SOLUTION

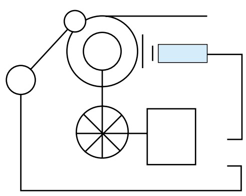
Open loop - Setting selection

Working in open loop requires that a torque setting is defined. As seen on page 7, three possibilities exist. The choice depends on the machine complexity and the automation required. One important factor that remains is the tension precision. For unwind and rewind systems the diameter ratio will play an important role. Working in open loop also requires special considerations regarding system inertia.

MAIN APPLICATIONS - ADVANTAGES AND DISADVANTAGES

Setting type	Where, When, Why ?	Advantage	Disadvantage
Manual setting by pot. 	❒ Cable machine ❒ No fast accel/deccel ❒ Low roll diameter ratio ❒ Operator intervention admitted	❒ Low cost solution ❒ Easy to start-up	❒ Tension precision depends on operation
Diameter reading 	❒ The most commonly used solution in open loop ❒ No operator intervention admitted ❒ Large roll diam ratio	❒ Physical reading, no reset ❒ Easy to start-up	❒ Poor reading accuracy on core
Diameter computing 	❒ In rewind station ❒ In sophisticated machine ❒ Large roll diam ratio	❒ Electrically integrated ❒ Easy compensation for transitory phases	❒ Need line speed signal ❒ Need roll rotation speed signal ❒ Can be complex to set-up ❒ Need reset

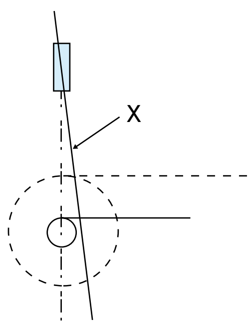
❒ All solutions remain an open loop solution with limited precision.
❒ As we do not measure the result we want to achieve, all initial friction and inertia influence the precision of the system.



SOME PRECAUTIONS WHEN USING READING SOLUTION

Reading solution is generally with **ultrasonic sensor.** Another type of reading is **the roll arm follower.** Both use the same principle. The roll diameter measure is applied as torque setting on the power part driver. The sonic reading offers the advantage of not touching the roll. The reading reliability is the weak point of the system. Ultrasonic sensor location is important and should respect the recommendations below.

The block diagram used in all ultrasonic open loop application shows the sonic in any position. The position shown in explanation is not necessarily the ideal position to get good reading reliability. The problem when using sonic reading is to get signal reliability at the end of the roll when approaching the core. The best position when applicable is the position shown on this diagram where the sensor position axis is voluntarily offset from the theoretical vertical axis. Placing the sensor axis in X position will ensure a good and stable reading even at the end of the roll. The small error provided is not important and the reading stability is guaranteed.

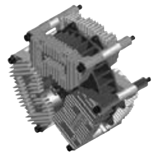


TENSION BRAKE LINE

Tension brake overview

The selection of the power part element (brake or motor) is determined by the max torque needed to ensure the tension for the max machine speed. The basic principle is to calculate the torque we need to obtain the desired max tension needed during all machine speed phases.

WICHITA BRAKE RANGE

WICHITA-MODEVO 	❒ Pneumatic brake ❒ Modular ❒ Up to 7 Bar ❒ 5 sizes	❒ Up to 4400 Nm ❒ Higher Torques available to special design	
WICHITA-MISTRAL 	❒ Pneumatic brake ❒ Modular ❒ 5,5 Bar supply ❒ 2 sizes ❒ fan cooled	❒ Up to 1800Nm	
WICHITA-CAB 	❒ Pneumatic brake ❒ Modular ❒ 5,5 Bar air supply ❒ 3 sizes ❒ Water cooled	❒ Up to 6600 Nm	

WHICH TYPE FOR WHICH APPLICATION ?

Analysing the following considerations will lead you to select the right brake for your application :

- ❒ The max calculated torque you need.
- ❒ The eventual technological choice between electric and air brake in the overlapping zone.
- ❒ The pneumatic brake has higher heat capability
- ❒ The modularity need.
- ❒ The mechanical size (square or round size, dimensions).
- ❒ The own customer technological preferences (air or water cooled).

NOTE: The sizing of brake or motor is absolutely independent of the control system you have chosen (open or closed loop).

TENSION BRAKE LINE

Tension brake sizing

Two important parameters are used in brake selection:

- ❒ *Max torque requirement*
- ❒ *Max thermal power to be dissipated*

These two values are determined by the application (see calculation example on pages 8-9).

PNEUMATIC BRAKE TYPE SELECTION: MISTRAL / MODEVO / CAB

Example: unwind brake selection

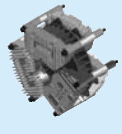
Max reel diam.	= D	= 1.200 m	Min reel diam.	= d	= 0.100 m
Max width	= W	= 1000 mm	Min width	= w	= 600 mm
Max tension	= T	= 0.4 N/mm	Min tension	= t	= 0.3 N/mm
Max line speed	= V	= 300 m/min	Brake mounted directly on reel shaft		

Max Torque	= T*W*D / 2 = 0.4*1000*1.200 / 2	= 240 Nm	
Min torque	= t*w*d / 2	= 0.3*600*0.100 / 2	= 9 Nm
Max heat	= T*W*V / 60000	= 0.4*1000*300 / 60000	= 2.0 kW
Max rotational speed	= V / (d * π) = 300 / (0.100 * π)	= 955 rpm	
Effective cooling speed	= (2*V) / [(D + d) * π]	= (2*300*) / [(1.2 + 0.1) * π] = 147 rpm	

The effective cooling speed compensates for the fact that the reel rotates at slow speed longer than it does at high speed.

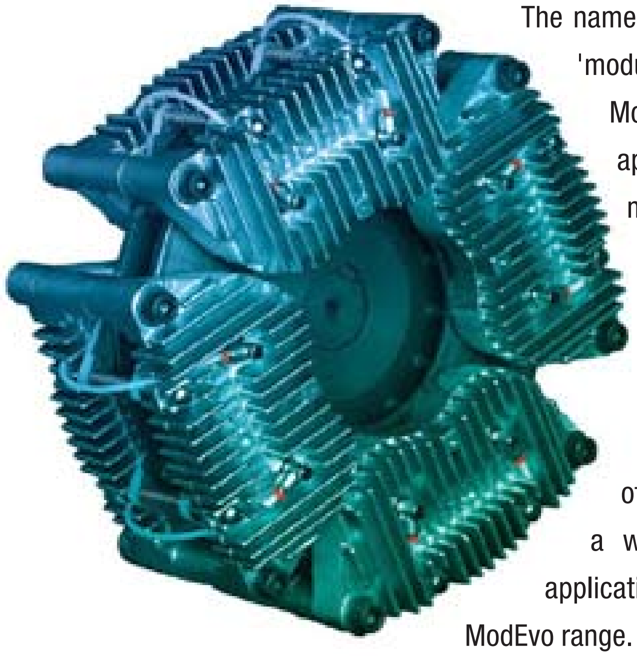
Selection is based on:
a) Heat transfer capability at Effective Cooling Speed
b) Max & Min torque requirements
c) Max speed capability

A Wichita Mistral 200/2 brake with an integral cooling fan (shown on page 24) would suit all the parameters. The choice depends on the customer preference with regard to the overall size of the brake and the best shape to suit the machine aesthetics.



“ModEvo” Tension Control Brake

Versatile, cost-effective performance

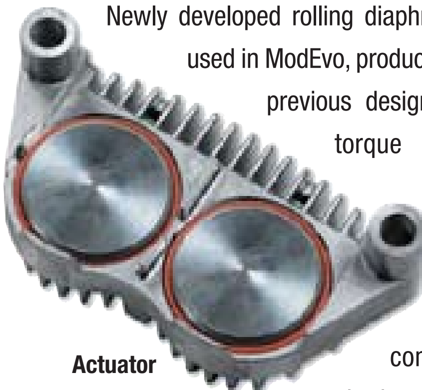


The name for Wichita’s ModEvo tension control brake is derived from 'modular' and 'evolutionary', terms that describe it perfectly. Modular – because braking systems to suit diverse tensioning applications can be assembled from a minimal number of modules common to the entire ModEvo range. Evolutionary – because continuous development of new materials, improved design and manufacturing techniques have enabled Wichita to develop ModEvo to match all customers’ tension needs at affordable cost.

The advantages of the new ModEvo brake lie in the versatility of the modular system, ensuring that the requirements of a wide range of printing and converting unwind tension applications can be met from just a handful of parts common to the ModEvo range. This in turn brings cost benefits, as users can choose just the options they require and add to or upgrade these as their needs change, whilst carrying a minimum of spare parts.

Actuator options

More force, no loss of torque precision


Actuator

Newly developed rolling diaphragm actuators are used in ModEvo, producing more force than previous designs to allow higher torque ratings. However, the sensitivity for which rolling diaphragms are favoured is not compromised. Three actuator options are available, offering clamping forces of 100%, 60% or 25%.


25%


60%

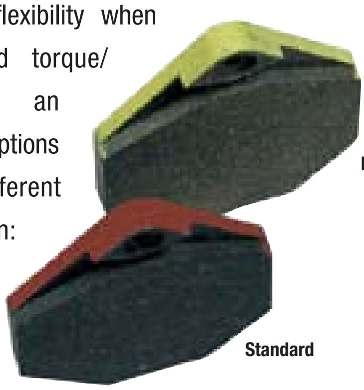

100%

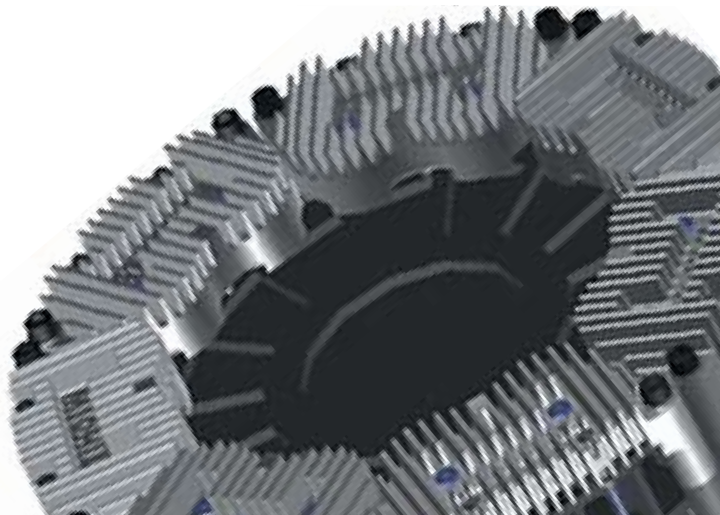
The finned, die-cast aluminium brake module is common to all brake disc diameters. Each module houses two pairs of actuators and allows friction pads to be changed quickly without dismantling the module.

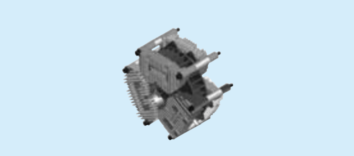
Friction Pad options

Match machine requirements exactly

To provide maximum flexibility when selecting the required torque/tension range for an application, two pad options are available with different coefficients of friction: Low (μ=0.20); colour coded Orange and Standard (μ=0.35); colour coded Grey. Pad types may be mixed within a single brake assembly to provide an exact match to machine requirements.


Low
Standard





Single actuator ModEvo tension brake

For lighter tension duties

The name "ModEvo" comes from Wichita's 'modular' – 'evolutionary' design of tension brake. The original ModEvo tension brake was launched in 2000 and has been highly successful in the global tension market.

Wichita is now happy to extend the successful ModEvo range to include the single actuator ModEvo. Designed for lighter tension duties, the single actuator unit is available with all of the same options as the dual acting unit. We believe it offers our customers even greater flexibility in their applications.

With the added benefit of lower cost, we expect this unit to be a great success in the tension market, whilst maintaining the high Wichita quality standards.

Performance

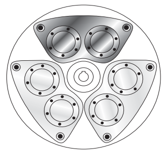
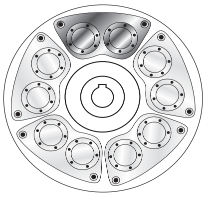
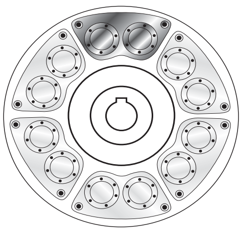
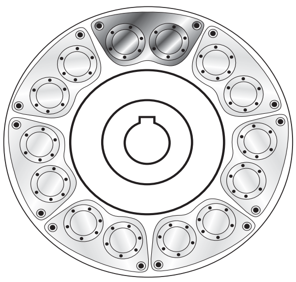
MODEL	Torque Nm			Heat capacity for effective cooling speeds: kW							Max Speed	Inertia (J) kgm^2	Weight kg	
	Min[1]	Max @ 6 bar												
ModEvo	0.2 bar	LC[2]	Std[3]	50rpm	100rpm	200rpm	300rpm	400rpm	500rpm	600rpm	rpm(5)	rotating parts	total	rotating
250/1	5	85	149				No Fan				2750	0.060	12.0	10.0
				0.5	0.6	0.8	1	1.2	1.3	1.4				
							With Electric cooling fan (150 mm)							
				1.6	1.75	2.0	2.25	2.4	2.5	3.0				
300/1	6	108	189				No Fan				2250	0.128	16.3	14.3
				0.9	1.0	1.3	1.5	1.7	1.9	2.1				
With Electric cooling fan (150 mm) [5]				2.3	2.5	2.9	3.2	3.5	3.8	4.2				
350/1	8	130	228				No Fan				2000	0.226	23.3	21.3
				1.2	1.3	1.8	2.0	2.3	2.7	3.0				
With Electric cooling fan (150 mm) [5]				2.6	2.8	3.1	3.5	4.0	4.5	5.0				
400/1	10	152	267				No Fan				1750	0.383	30.0	27.9
				1.4	1.6	2.3	2.5	2.9	3.3	3.5				
With Electric cooling fan (200 mm) [5]				4.3	4.4	4.7	5.0	5.4	5.9	6.3				
450/1	11	176	308				No Fan				1500	0.587	36.6	34.6
				1.5	1.8	2.6	3.0	3.3	3.9	4.2				
With Electric cooling fan (250 mm)				4.3	4.6	5.0	5.5	5.9	6.3	6.6				

(1) Min torque listed is with standard friction coefficient with a single actuator.
For LC Low Coefficient multiply Min torque by 0.6
(2) LC - Low Coefficient based on 0.2 Coefficient of friction
(3) Std - Standard based on 0.35 Coefficient of friction
(5) Max speed is with standard brake disc. A high speed disc capable of 50% higher speed is available (derate heat by 10%)

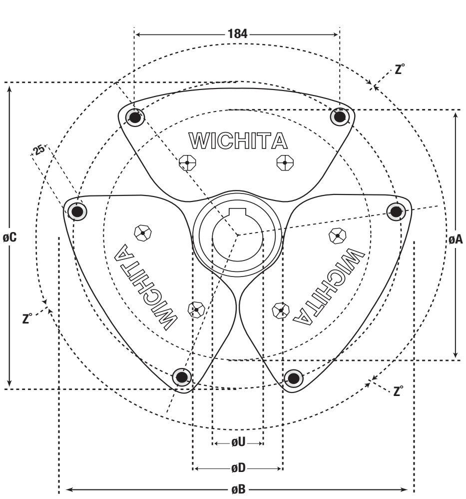
All torque values are obtained based on Wichita's new ModEvo Rolling Diaphragm Actuators
Smaller area (60% and 25%) Rolling Diaphragm actuators are also available for lower torque requirements

Limit to 2.5kw /actuator (normal or 2.8kw /actuator (fan cooled)

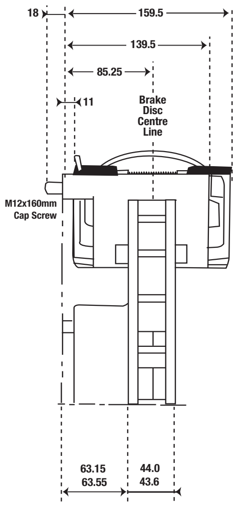
Performance Charts

	MODEL	Torque Nm				
		Min (1)	Max @ 6 bar			
	ModEvo	0.2 bar	LC (2)	Std(3)	50rpm	100rpm
	250/1	5	85	149		
	250/2	10 (5)	170	298	1.2	1.4
	250/4	20 (5)	340	596		
	250/6	30 (5)	510	894	3.4	3.5
	300/1	6	108	189		
	300/2	14 (7)	216	378		
	300/4	28 (7)	432	756	2.1	2.4
	300/6	42 (7)	648	1134		
	300/8	56 (7)	864	1512	5.0	5.0
	350/2	16 (8)	260	456		
	350/4	32 (8)	520	912		
	350/6	48 (8)	780	1368	2.8	3.1
	350/8	64 (8)	1040	1824		
	350/10	80 (8)	1300	2280	5.8	6.3
	400/2	20 (10)	305	534		
	400/4	40 (10)	610	1068		
	400/6	60 (10)	915	1602	3.2	3.8
	400/8	80 (10)	1220	2136		
	400/10	100 (10)	1525	2670	7.5	8.3
	400/12	120 (10)	1830	3204		
	450/2	21 (11)	352	616		
	450/4	42 (11)	704	1232		
	450/6	63 (11)	1056	1848	3.4	4.3
	450/8	84 (11)	1408	2464		
	450/10	105 (11)	1760	3080		
	450/12	126 (11)	2112	3696	8.5	9.5
	450/14	147 (11)	2464	4312		

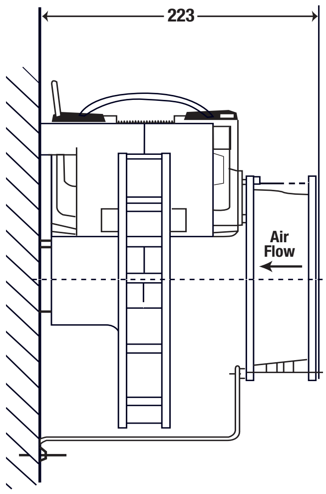
Dimensions



ModEvo Front View



ModEvo Side View



ModEvo Side View With Fan

øA - Disc Size
øB - Overall
øC - Bolt P.C.D
øD - Clearance D
U - As cast bore Max. Bore
Z" - Angular Posi
Maximum No. of Brake Modules
Wichita. Generic Drawing No.

	Heat capacity for effective cooling speeds: kW					Max Speed rpm [4]	Inertia (J) kgm^2 rotating parts	Weight kg	
	200rpm	300rpm	400rpm	500 rpm	600 rpm			total	rotating
	No Fan					2250	0.060	12.4	8.7
	1.9	2.4	2.7	3.0	3.2			13.2	
	With Electric cooling fan							17.6	
	3.8	4.0	4.0	4.0	4.0			22.1	
						1900	0.125	17.3	13.6
	No Fan							18.1	
	3.0	3.5	4.0	4.5	5.0			22.5	
	With Electric cooling fan							27.0	
	5.0	5.0	5.5	6.0	6.0			31.5	
						1650	0.23	24.8	20.3
	No Fan							29.2	
	4.2	4.8	5.5	6.6	7.2			33.7	
	With Electric cooling fan							38.2	
	6.5	6.5	6.5	6.5	6.5			42.7	
						1450	0.4	31.3	26.8
	No Fan							35.7	
	5.4	6.0	6.8	7.8	8.4			40.2	
	With Electric cooling fan							44.7	
	8.7	9.3	10.0	10.0	10.0			49.2	
								53.6	
						1250	0.61	37.5	33
	No Fan							41.9	
	6.1	7.0	7.8	9.2	10.0			46.4	
								50.9	
	With Electric cooling fan							55.4	
	10.0	10.8	11.6	12.5	13.3			59.8	
								64.3	

	ModEvo Dimensions Table				
	250	300	350	400	450
	324	369	415	461	508
	298.5	343.5	389	435.5	482.5
ia.	90	140	190	240	290
	SOLID 55	SOLID 79	25 117	25 136	25 154
tion	120˚	90˚	72˚	60˚	51.4˚
s	3	4	5	6	7
	73125-000	73130-000	73135-000	73141-000	73145-000

[1] Min torque listed is with standard friction coefficient. Values in (brackets) are with a single actuator.

For LC Low Coefficient multiply Min torque by 0.6.

[2] LC - Low Coefficient based on 0.2 Coefficient of friction

[3] Std - Standard based on 0.35 Coefficient of friction

[4] Max speed is with standard brake disc. A high speed brake disc capable of 50% higher speed is also available(reduce heat by 10%)

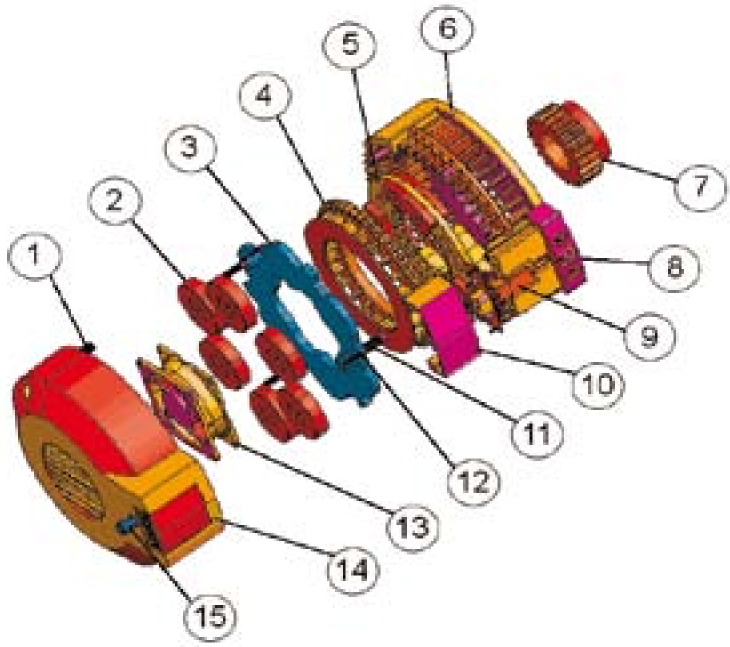
All torque values are obtained based on Wichita's new ModEvo Rolling Diaphragm Actuators. Smaller area (60% and 25%) Rolling Diaphragm actuators are also available for lower torque requirements.

Limit to 2.5kw /actuator (normal or 2.8kw /actuator (fan cooled)

BRAKES

Wichita Mistral brakes

A high performance range of brakes, especially designed for modern corrugating machines to allowing high line speeds within a compact design of brake. An integrated fan is housed within the brake to give high heat dissipation and multi-range actuators allow precise selection of brake torque capacity for optimum tension control.



Component Parts

1	**Short bolts**	**14**	Front Casing
2	Actuator	**9**	Electrical Connector
3	Pressure plate	**10**	**Electrical Cover**
5	Floating Plate	**11**	Return Bolts
6	Centre Plate	**12**	**Release** Spring
7	Hub	**13**	Cooling Fan
8	Conn. Block	**15**	Long Bolt

CHARACTERISTICS

- ❒ Pneumatically applied – spring release.
- ❒ Single disc design.
- ❒ Integrated cooling fan for increased heat dissipation.
- ❒ Fully guarded – needs no additional guard.
- ❒ End of shaft mounting.
- ❒ Maximum air pressure 5.5 bar.
- ❒ Easy maintenance – automatic air and electrical supply disconnection on front cover removal.
- ❒ For dry use only.

MOUNTING PRECAUTIONS

- ❒ Back casing of brake must be supported by machine frame.
- ❒ Inner hub of brake must be supported by machine shaft.
- ❒ Designed for horizontal shaft axis. Consult Wichita if vertical mounting is required.

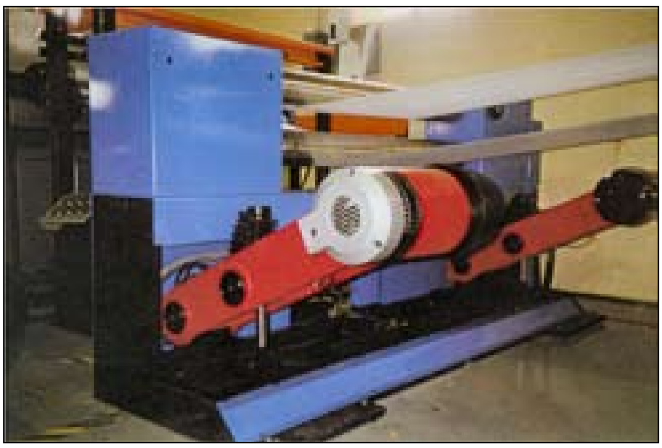
TORQUE

- ❒ Torque is directly proportional to air pressure applied.
- ❒ Standard or Low coefficient (LC) friction pads for various torque requirements.
- ❒ Multi-range actuators for optimum torque selections.

OPTIONS

- ❒ Larger hub bores may be possible with special designs.
- ❒ Speed detection sensors.
- ❒ Infra red positional sensors.
- ❒ Mini actuators for lower torque requirements.
- ❒ 24V DC or 110V and 220V AC fans.

TYPICAL APPLICATION



BRAKES

Wichita Mistral brakes

PERFORMANCE - SELECTION TABLE

Model	Dynamic Slipping Torque Capacity		Heat Transfer Capacity			Max Speed	Inertia of Rotating Parts	Weight	
								Total Brake	Rotating Parts
			No fan	With fan					
	@ 0.2 BAR *	@ 5.5 BAR		Cont	30 Min On/Off				
Mistral	[Nm]	[Nm]	[kW]	[kW]	[kW]	[min^{-1}]	[kgm^2]	[kg]	[kg]
200/2/LC	4	200							
200/2	5	300							
200/4/LC	8 (4)	400	1,1	2,4	2,8	2860	0,032	35	4,5
200/4	10 (5)	600							
200/6/LC	12 (4)	600							
200/6	15 (5)	900							
280/3/LC	5	400							
280/3	6	600							
280/6/LC	10 (5)	800	1,4	4,8	5,2	2090	0,076	50	9,4
280/6	12 (6)	1200							
280/9/LC	15 (5)	1200							
280/9	18 (6)	1800							

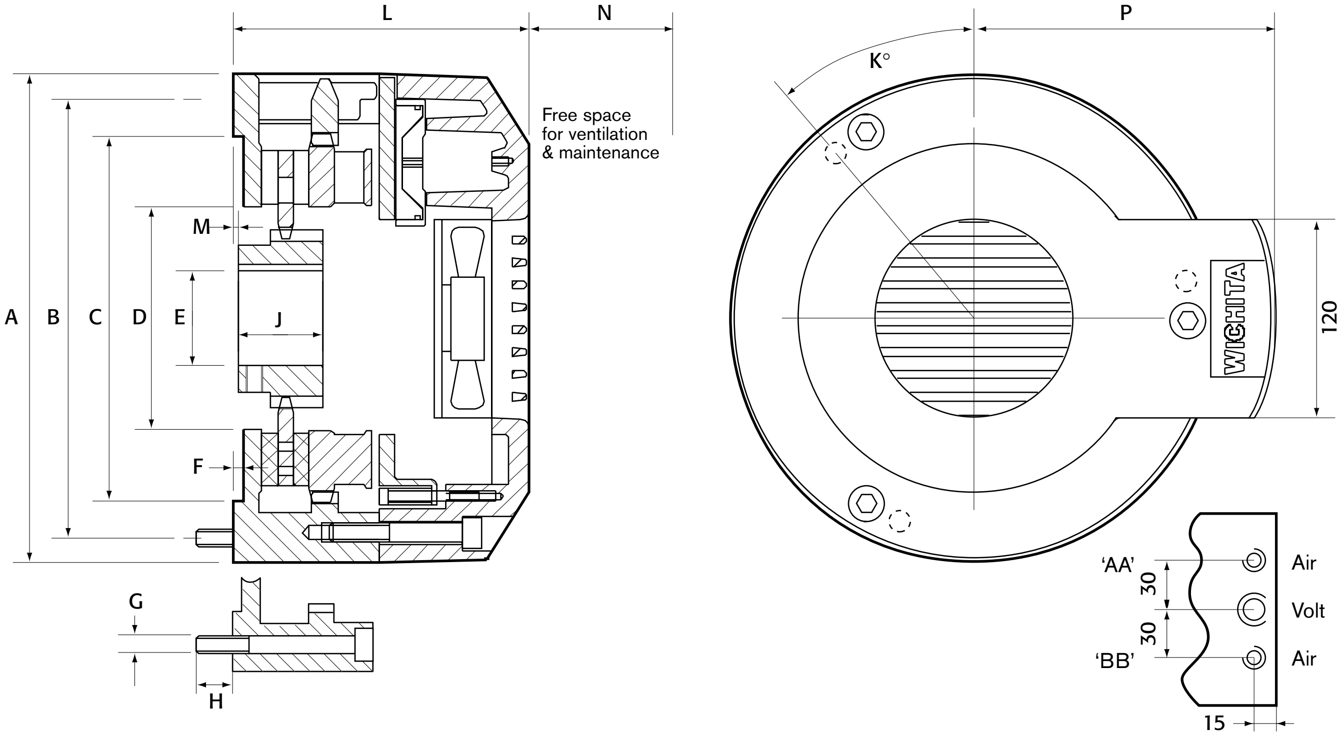
NOTES

* Torque value at 0.2 bar is for full quantity of actuators.
Torque at minimum quantity of actuators is shown in (parenthesis).
Torque at zero air pressure = zero Nm.

BRAKES

Wichita Mistral brakes

DIMENSIONS



Model(I)	A	B	C	D	E	F	G	H	J	K	L	M	N	P
200	295	260	220 H7	N/A	60	6	3 x M12	25	50	40	178	0	70	182.5
280	410	355	N/A	175 H7	65	0	3 x M16	30	60	20	192	9.5	80	240.5

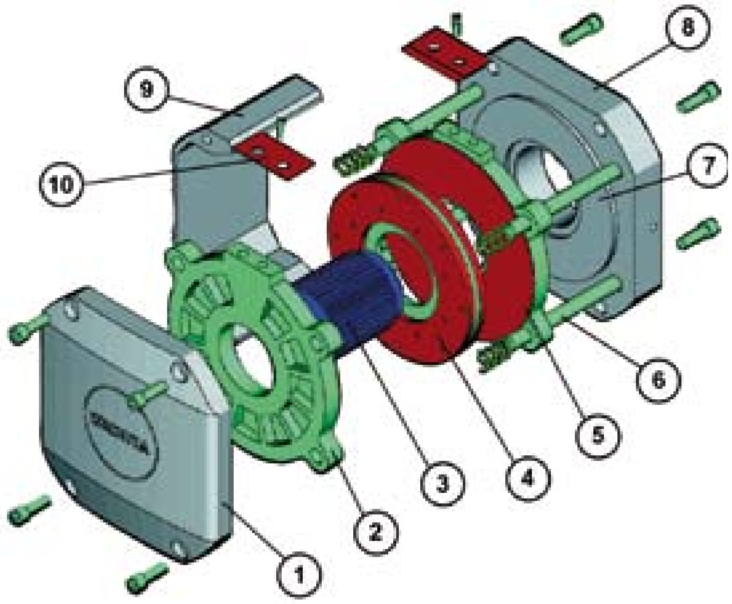
Model	Fan Voltages	Fan Power	Electric	Pneum.
200	110VAC or	20 W	PG9	1/8 BSP
	24VDC		3/8 NPT	1/8 NPT
	220VAC or		M16	1/8 BSP
280	110VAC or	25 W	PG9	1/8 BSP
	24VDC		3/8 NPT	1/8 NPT

Actuator/Inlet	'AA'	'BB'
200/2	2	0
200/4	2	2
200/6	2	4
280/3	3	0
280/6	3	3
280/9	3	6

BRAKES

Wichita CAB - Copper Alloy Brakes

Pneumatically actuated, water cooled brakes designed for use in constantly slipping applications. Utilising copper alloy wear plates, the brake has a high power rating within a reduced envelope size. Optimum torque selection is achieved by utilising either a single annular piston or multiple piston actuators for finer torque control. Visual wear indicator is incorporated in standard.



Component Parts			
1	Front Casing	6	**Torque Pins**
2	Water Jacket Assembly	7	Piston
3	**Hub**	8	Back Casing
4	Drive plate assembly	9	Side casing
5	Water jacket assembly	10	Top Guard

CHARACTERISTICS

- ❒ Pneumatically applied – spring released.
- ❒ 1 or 2 disc design.
- ❒ Water cooled incorporating copper alloy plates for high heat dissipation.
- ❒ For dry use only on friction surfaces.
- ❒ Fully incorporated guard.
- ❒ Easy maintenance.
- ❒ End-of-shaft or through shaft mounting.

MOUNTING PRECAUTIONS

- ❒ Outer ring of brake must be supported by machine frame.
- ❒ Inner hub of brake must be supported by machine shaft.
- ❒ Designed for horizontal shaft axis. Consult Wichita if vertical mounting is required.
- ❒ Through-shaft models require centre guard of brake removed.

SAFETY

- ❒ Maximum air pressure 5.5 bar.
- ❒ Maximum water inlet pressure is 2.7 bar.

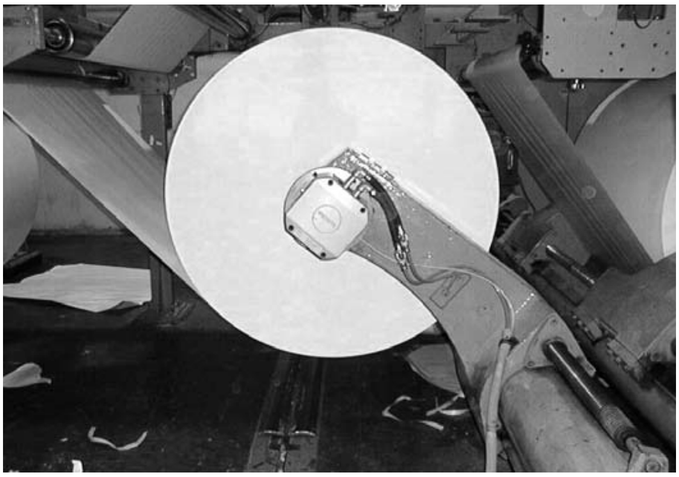
TORQUE

- ❒ Torque is directly proportional to air pressure applied.

OPTIONS

- ❒ High speed – high performance materials available for increased rotational speeds.
- ❒ Larger hub bores may be possible with special designs.
- ❒ MR - Multi-range actuators for optimum torque selection available on all sizes.

TYPICAL APPLICATION



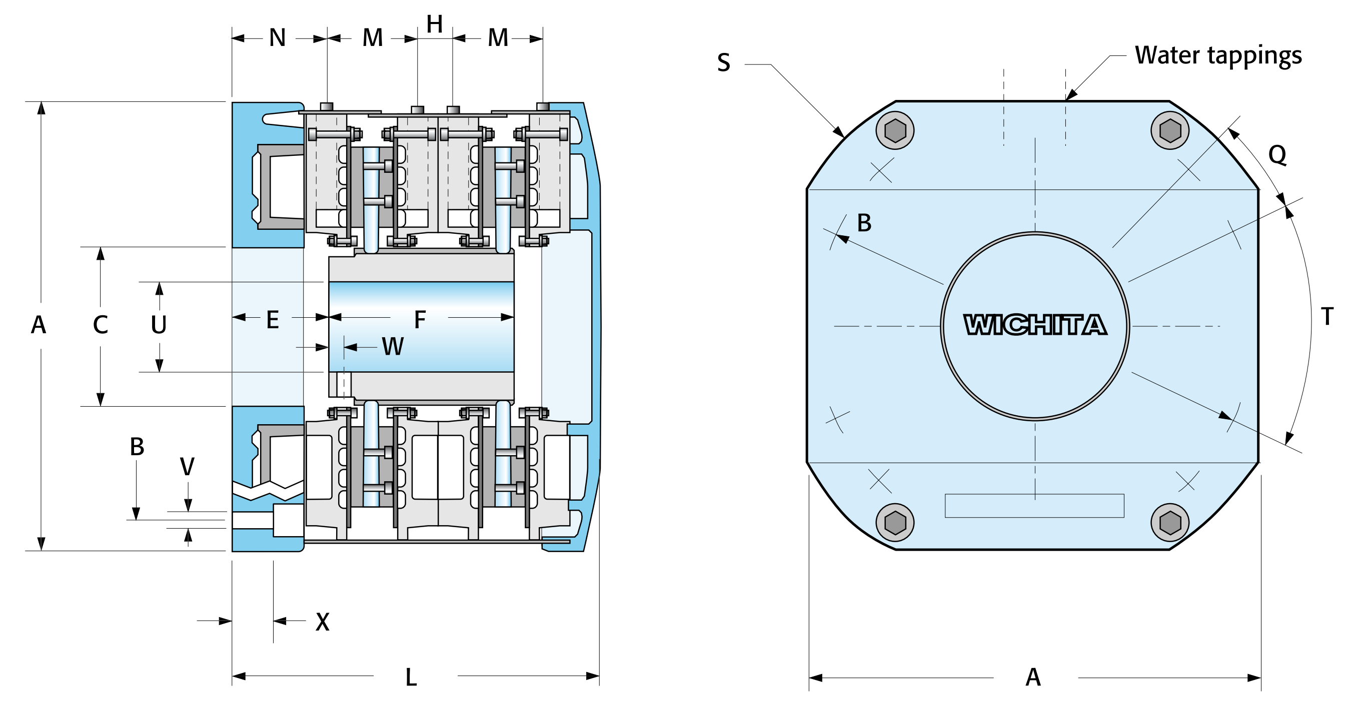
BRAKES

Wichita CAB - Copper Alloy Brakes

PERFORMANCE - SELECTION TABLE

Model	Dynamic slip torque @ 0.2 bar Nm	Dynamic slip torque @ 5.5 bar Nm	Heat transfer capacity kW	Max speed rpm	Inertia mr^2 Hub & drive plate kgm^2	Weight Total brake kg	Weight Hub & drive plate kg	Water flow L/min	Piston displacement volume new cm^3	Piston displacement volume worn cm^3
CAB 123	20	380	12.5	3150		32	7	7	67	405
CAB 223	40	760	25	3150		50	17	13	67	405
CAB 131	40	1050	25	2250	0.065	38	9	13	134	810
CAB 231/MR 5	20	525	50	2250	0.135	59	21	26		
CAB 231/MR 10	40	1050	50	2250	0.135	59	21	26		
CAB 231	80	2100	50	2250	0.135	59	21	26	134	810
CAB 145	125	3300	50	1590	0.3	123	22.5	26	297	2385
CAB 245/MR 5	62	1650	100	1590	0.62	210	52	52		
CAB 245/MR 10	125	3300	100	1590	0.62	210	52	52		
CAB 245	250	6600	100	1590	0.62	210	52	52	297	2385

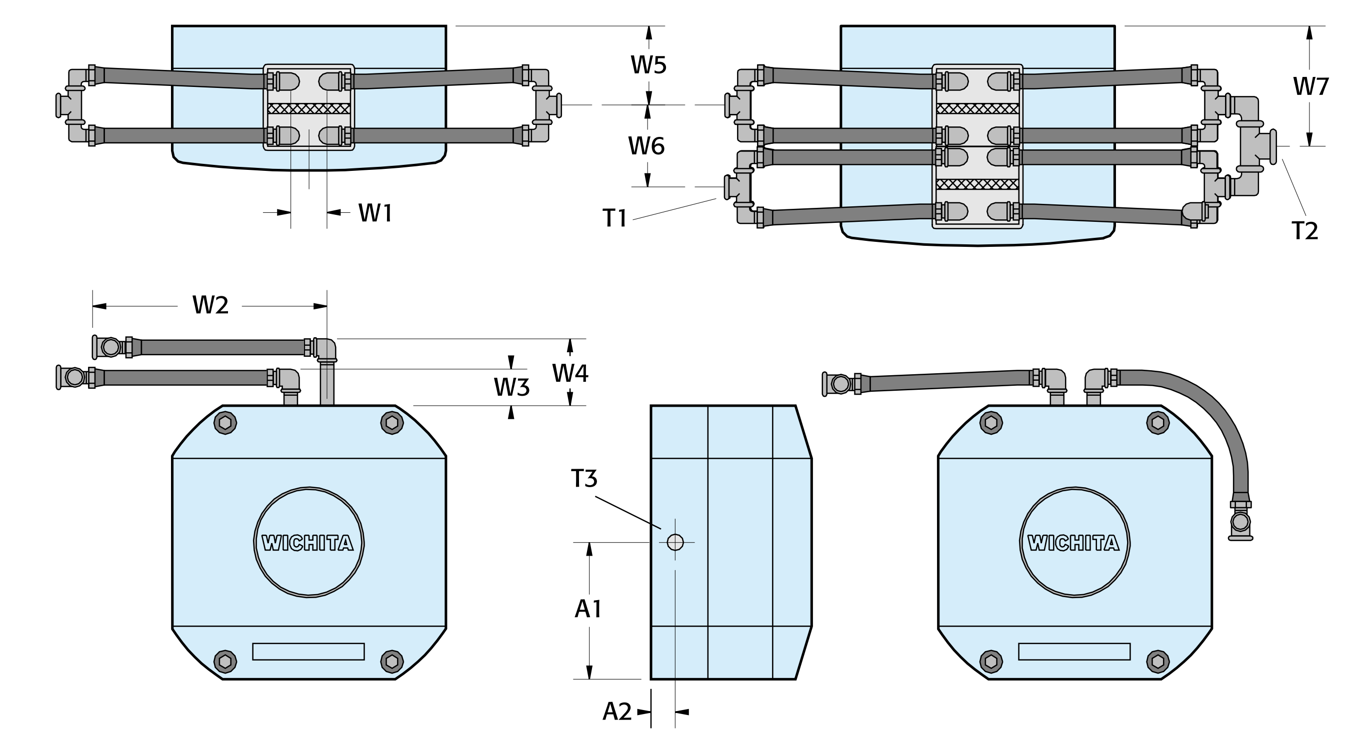
DIMENSIONS



Water inlet temperature 10° C min. - 50° C max.
Max temperature rise across brake = 25° C.
If a lower minimum torque is required please consult Wichita.

Wichita CAB - Copper Alloy Brakes

WATER HOSE CONNECTIONS



Model	A	B	C	E	F	H	L	M	N	Q	S	T	U1	U2	V		W	X
	mm	mm	mm*	mm	mm	mm	mm	mm	mm	deg	mm	deg	min	max	mm	qty	mm	mm
CAB 123	230	225	85	78	51	–	193	71	73.5		276	60	15	40	9	4	6	50
CAB 223	230	225	85	78	150	27	291	71	73.5		276	60	15	40	9	4	6	50
CAB 131	310	280	120	76	55	–	200	73	74	30	370	60	25	75	14	8	12	48
CAB 231	310	280	120	76	152	27	300	73	74	30	370	60	25	75	14	8	12	48
CAB 145	450	445	162	80	72	–	238	89	92	20	528	50	35	100	18	8	16	50
CAB 245	450	445	162	90	180	35	362	89	92	20	528	50	35	100	18	8	16	50

Model	W1	W2	W3	W4	W5	W6	W7	A1	A2	T1	T2	T3
	mm	mm	mm	mm	mm	mm	mm	mm	mm	BSPT	BSPT	BSP
CAB 123	44	325	60	110	130	140	200	115	20	1/2	3/4	3/8
CAB 223	44	325	60	110	130	140	200	115	20	1/2	3/4	3/8
CAB 131	44	445	50	100	110	–	–	155	20	1/2	3/4	3/8
CAB 231	44	445	50	100	110	100	160	155	20	1/2	3/4	3/8
CAB 145	60	445	60	110	130	–	–	225	20	3/4	1	3/8
CAB 245	60	445	60	110	130	135	198	225	20	3/4	1	3/8

* −0.0/+0.1 mm

DIMENSIONS: Certified drawings showing exact dimensions are sent with every order acknowledgement and these should always be obtained before finalising any design details.

DRIVERS

Brake driver

*Considering the power element, we need to "drive" this with a **DRIVER.** The driver is the element providing the necessary power to the "power element". The driver can be considered as power interface between **CONTROL** and **POWER ELEMENT.** The driver has to be "power" compatible with the power element (pneumatic brake) and the "signal" compatible with the control or the setting.*

PNEUMATIC BRAKE DRIVER

The pneumatic driver - an electro-pneumatic transducer - has to have a fast response in order to avoid difficulties when used in closed loop system.

All the pneumatic brakes are rated for the max air pressure 5,5 Bar.

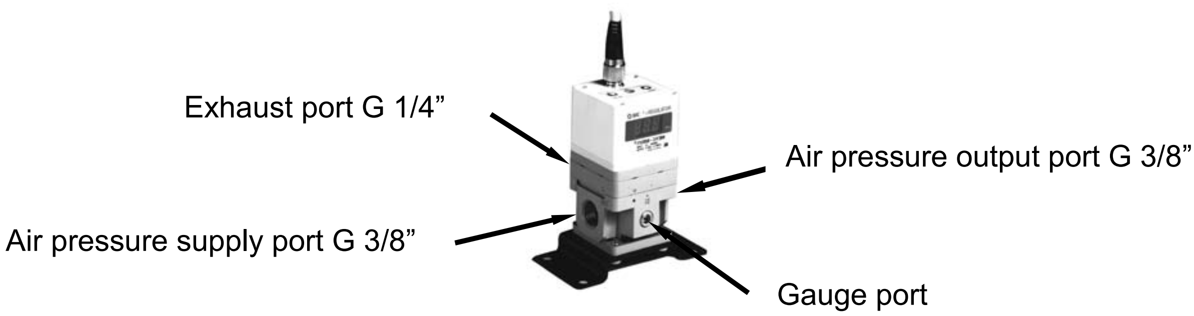
Model	Electrical input	Air pressure supply range	Air pressure output range
EPC-V	0 – 10 VDC	1 - 10 bar	0 - 9 bar
Piping gauge		G 3/8	
Filter required	5 µ, dry air		
Mounting position	Vibrations free, preferably vertical		
Power Supply	24 VDC / 100 mA		

The electro-pneumatic transducer has to be placed as close as possible to the brake. Excessive air piping length will penalise the controllability of the system.

WIRING with ALTRAEASY CONTROLLER

EPC-V (EPC-I) connections		ALTRAEASY CONNECTIONS Output 1	Output 2
White	(signal EPC-V)	C3-9	C3-11
Brown	(+24 VDC)	C7-1	C7-1
Blue	(0 VDC)	C3-10	C3-12
Black	(display output)*	NOT USED	NOT USED

EPC-V (EPC-I)

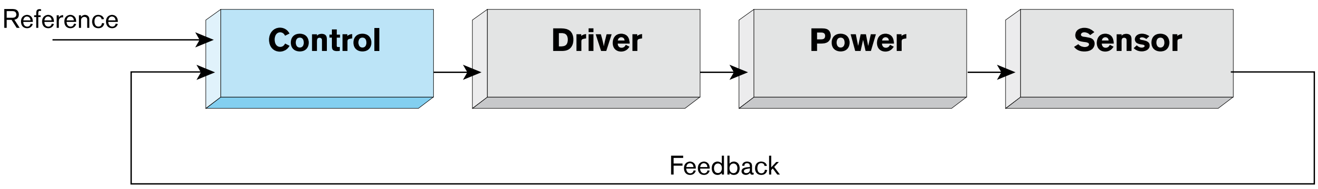


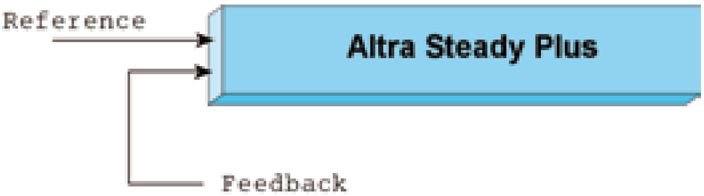
CONTROLS

Closed loop control overview

Most tension controls work in closed loop configuration. In this case the ***CONTROLLER*** *is indispensable. This element is the heart of the system. The control is continuously comparing the web tension information coming from the* ***SENSOR*** *with the tension reference we give to the controller. As soon as the controller detects a difference between the two values a correction is applied to the power element through the driver.*

WICHITA CONTROL LINE OVERVIEW

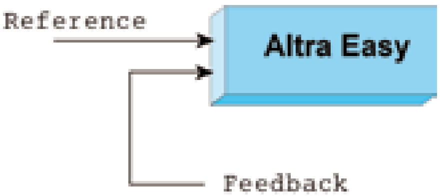




Low cost analogue control **including driver** in 2 versions:

❒ Altra Steady Plus With P.I.D

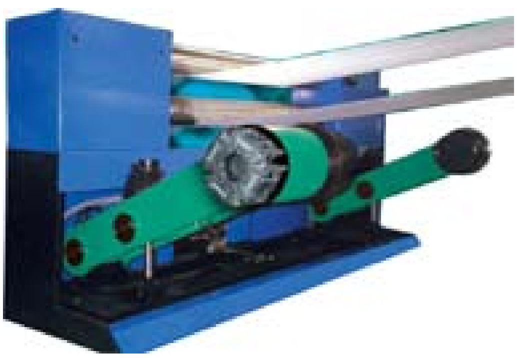
❒ Altra Steady Standard Version



Digital control

❒ Altra Easy (with flying splice capability)

Typical applications

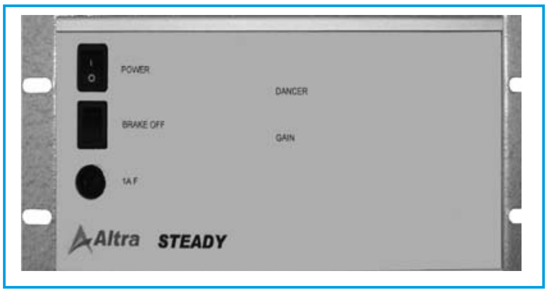


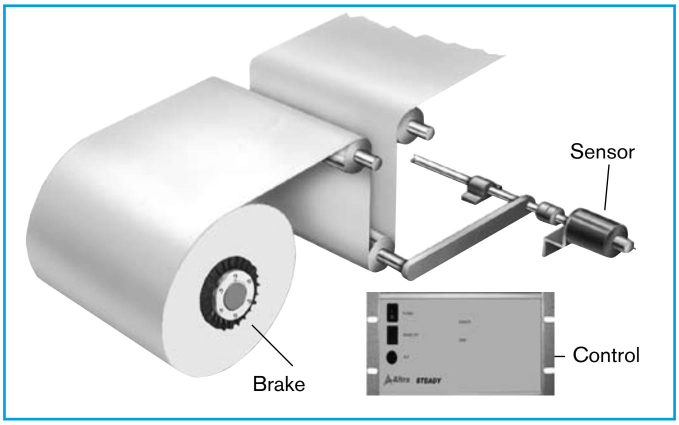
CONTROLS

Altra Steady / Altra Steady Plus

Altra Steady control is based on adjustable P, I, and D terms. The loop gain can be set on front face potentiometers. Switcheable gain for large roll diameter ratio change. To ensure proper operation it is important to wire the function "Drift Stop". This function releases the Integral term as soon as the machine runs. The Altra Steady is dedicated to Dancer Control and electric brakes only.

ANALOGUE CONTROL





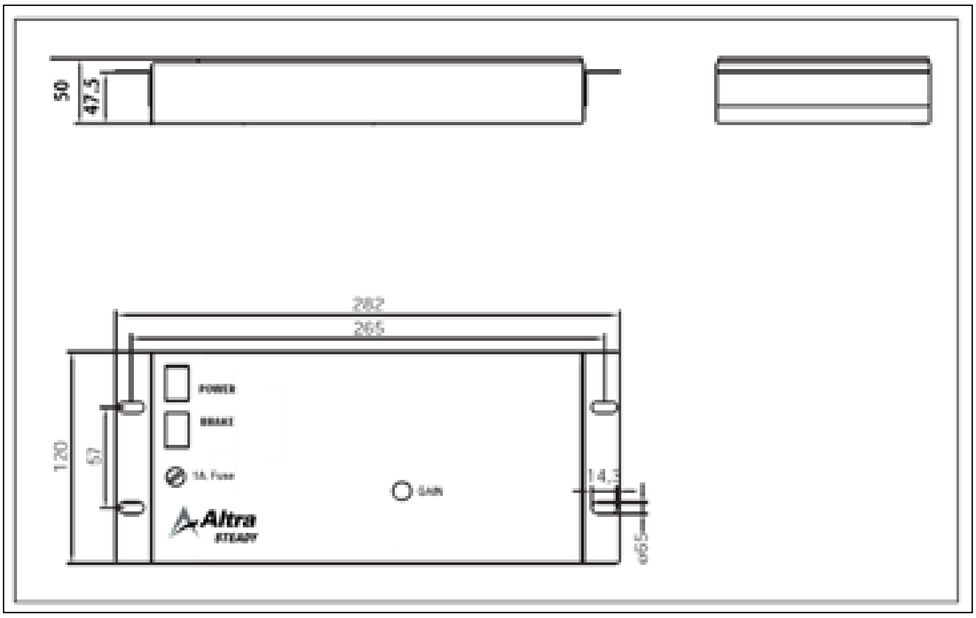
Technical Characteristics – valid for 3 executions

	Range - Values	Comments
Power supply	110-220 VAC selectable	Open front face to access
Output current capability	Max 2, 5 Amps, shortcircuit protected	
User settings	Loop gain	Front face potentiometer
	Offset torque	Front face potentiometer
Output voltage	0-24 VDC (0-10 VDC Steady Plus)	Compatible all Wichita electric brakes
Housing	Metal rugged housing	
Loop gain	2 adjustable range selection	Can be changed during operation
Accessories		
Sensor compatible	Dancer arm (Loadcell Steady Plus)	

Technical information

Altra Steady control is based on classical and fixed PID terms. The loop gain can be set on front face potentiometer. Due to the fixed PID terms, its use is limited in terms of roll diameter ratio. One input is provided to change the loop gain and has to be used when diameter ratio exceeds 8 to 10. To ensure proper operation it is important to wire the function "Drift Stop". This function releases the Integral term as soon as the machine runs.

Dimensions



CONTROLS

Altra Easy

The Altra Easy high performance tension controller offers probably the most versatile web tension control system on the market today.

Whether your interest is as system integrator, maintenance, production or quality control manager, the powerful tools will be of benefit to all.

The intuitive Windows based software suite provides powerful diagnostic, management and data logging tools. Graphical PID tuning makes light work of commissioning.

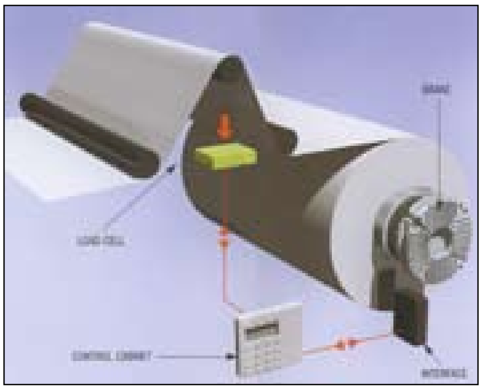
Designed in association with TTS, this controller may be configured to control tension on unwind stands or winders working with any electric or pneumatic brakes via appropriate drivers. The one unit interfaces with load cells, dancers and diameters measurement devices as well as handling splicing.

Features and Benefits:

- Data logging and diagnostic software tools included
- No complicated menus
- For use with load cells or dancers
- MODBUS communication
- Diameter functions
- Graphical PID tuning and configuration
- No internal adjustments required
- 24V Supply

A range of support products is available

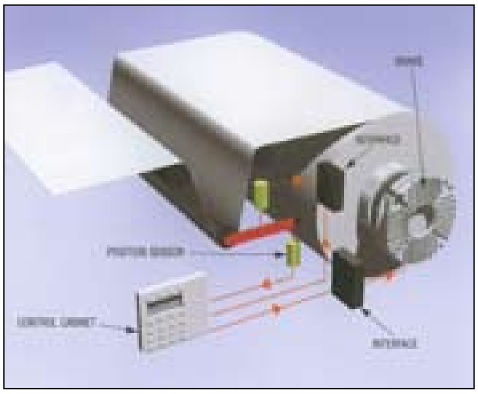
Altra Easy configuration options



Load Cell Control

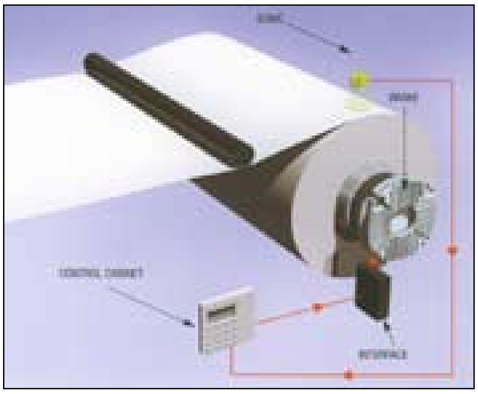
Load Cells measure the force in the web and compare that force to the set point tension in the controller.

If there is any variation, the controller automatically increases or decreases the output, thus maintaining constant tension.



Dancer Control

The Dancer indicates a position error which is proportional to the web tension, and the controller compares that position to the set point within the controller. If there is any variation the controller automatically increases or decreases the output, thus maintaining constant tension.



Ultrasonics

Can be used in open or closed loop mode with the controller.

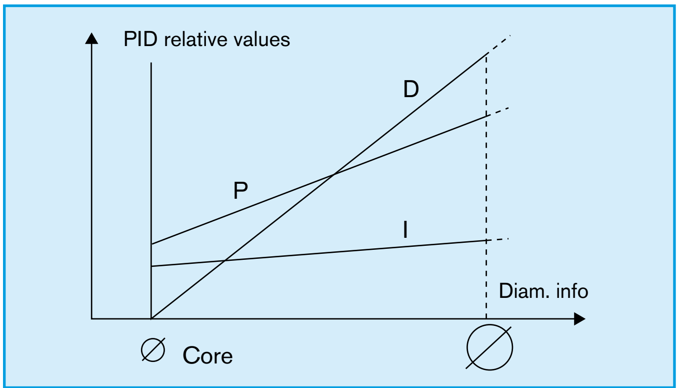
The signal from the ultrasonic device is used to measure the diameter of the reel.

CONTROLS

Altra Easy - Important features

The Altra Easy *is provided with very interesting and useful features. Below is a brief description of the most interesting ones.*

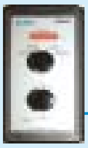
As already stated, the main problem in tension control is the roll inertia change during operation. The PID function is optimal for one inertia value. The Altra Easy is provided with an important PID correction feature. Based on the available diameter information you can apply continuous PID correction; when no information is available, an internal PID change can be programmed.



Each parameter P, I and D can be set individually for the smallest (core) and biggest diameter. As soon as the correct parameters are found for the extreme diameter value, they are stored. The diameter information provided will fix the PID values for the present diameter value. This will allow the system to keep an excellent stability during the whole diameter evolution. In the case where the diameter information is not available we can provide this signal by installing a sonic sensor or by working with internal correction. The external diameter information supplied to the controller will ensure a better precision compensation compared to an internal correction.

WHATEVER YOU NEED, THE ALTRA EASY IS CAPABLE ...

You need the tension control connected to PC.	**Use** RS232 communication.
You need an adaptive PID due to big diameter ratio.	**Use** internal or external PID correction. **Use** RS232 communication to operate the correction.
You already have your own load cell.	**Altra Easy** can accept any signal.
You have flying splice on the machine.	**Altra Easy** can manage it.
You need to control a brake and a motor.	**Altra Easy** can control both.
You have a multi-material machine range.	**Operator** selectable programs. **Use** RS232 communication to change the parameters. **Use** Window software to load the correct programme.
You need taper function.	**Altra Easy** can manage it.
Your feedback is a 0-10 V.	**Altra Easy** can accept any signal range.
You need to work in open + closed loop.	**Altra Easy** is provided with both function.
You finally found a perfect setting.	**Save it** to a laptop computer.
You need to display the tension in Newton, kilo…	**Altra Easy** can be programmed for any unit.
You have a very special application.	**We can** assist you in control definition. **Ask a Wichita** representative, we can propose any customised solution / software.



CONTROLS

Open loop control - Altra Sonic

The cost effective alternative to digital

The Wichita Altra Sonic is an open loop analogue regulated tension controller designed to maintain stable web tension during the steady running phase of unwinding and rewinding operations. Simple to set up and use, the Altra Sonic is an analogue device that enables the tension control user to save a significant percentage of the cost of buying and commissioning one of the more complex digital controllers from the Wichita range

Consistent web tension

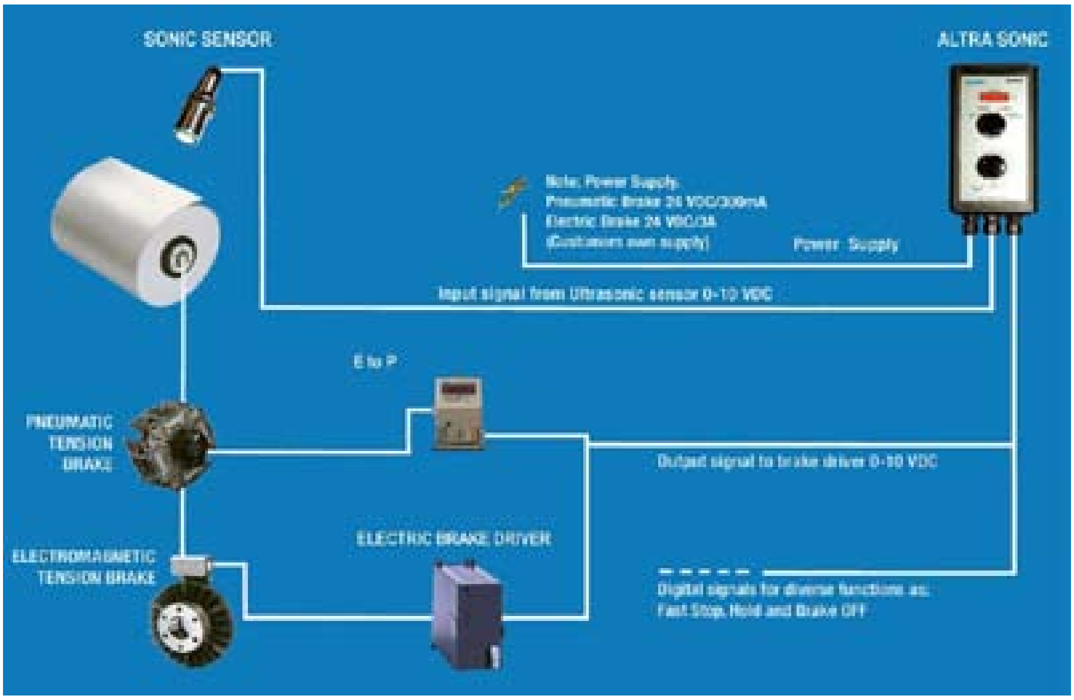
Working in an open-loop configuration the controller receives an input from a scalable ultrasonic sensor, or a reel follower arm monitoring the change in diameter of the unwind or rewind reel on the machine, then adjusts the applied torque proportionately according to the reference settings programmed into the brake driver.

Remote operation and clear display

The brake on the machine can be operated from the Altra Sonic during the unloading and loading of reels and also via an optional external switch which can be positioned by the brake if required. The display on the controller is clear and simple, with a moving bar array indicating the percentage output to the brake. The position of the function rotary switch indicates the status of the ‘Run’, ‘Manual’, ‘Hold’ and ‘Brake Off’ functions.

Easy set-up

Setting up the controller is straightforward. The Altra Sonic receives its input from a scalable ultrasonic sensor. The sensor scaling can be pre-programmed at the factory if the range details are given at the point of order, or they can be manually achieved via the enclosed instructions. The output signal is sent to an EPC-V brake driver, which converts the electrical signal to pneumatic pressure for the brake, or to the MCS2000-DRV driver if an electromagnetic brake is used.



Tension controller Altra Sonic
Potentiometer-regulated analogue input tension controller.

Scalable ultrasonic sensor
The sensor emits an ultrasonic signal towards the surface of the reel. The reflected wave- form serves as a means of measuring the distance to the reel and its changing diameter, thus signalling to the controller to adjust the torque.

Brake driver for pneumatic brake
Wichita’s electrical to pressure transducer is used to convert the electrical output signal from the tension controller to the pneumatic pressure required to operate the brake.

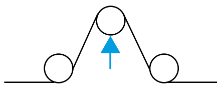
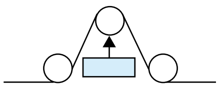
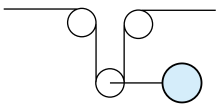
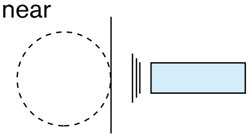
Wichita Pneumatic tension brake
Wichita offers a wide range of air cooled, fan cooled and water cooled tension brakes. The brakes are pneumatically applied via multi-range actuators to provide maximum flexibility with smooth tension control over a wide range of requirements. Torque range from 5 Nm to 200 000 Nm (3.7 lb.ft to 147500 lb.ft).

SENSOR
ACCESSORIES

Sensors overview

Working in closed loop requires a web tension ***SENSOR****. When working with load cell the system is called “Direct Tension Feedback”. When working with dancer arm the system is called “Indirect Tension Sensor”. Position sensors are divided in two categories : linear and rotary.*

SENSOR OVERVIEW

MODEL	TYPE / SYMBOL	RANGE	MAIN CHARACTERISTICS	
ES01	End shaft load cell 	❒ 10 - 500Kg ❒ Resistive bridge	❒ Typical output volltage : 10 mV at full load ❒ 40 mm ball bearing diam.	
TE	Foot mounted load cell 	❒ 10Kg to 10 tonnes ❒ Resistive bridge	❒ Typical output voltage: 10 mV at full load	
RPS	Rotary 	❒ ±30° ❒ Optical conception	❒ Typical output voltage: ± 3.0 VDC for ± 10 VDC power supply and ±30°	
SCUA 2000	Linear 	❒ 0 to 2 m ❒ Ultrasonic measure	❒ Typical output voltage: 0-10 VDC for 0 - 2m	

DO NOT FORGET: The sensor is the most important element when working in closed loop, and has to be accurate, with good repeatability.

- Place load cell in order to measure web tension, minimize the dead load and all other stress interferences on it.
- When using dancer solution create the desired tension with true force (pneumatic cylinder) and not with weight.
- When measuring distance avoid hysteresis in the movement. In general, the sensor must be the exact image of the value we have to measure.

SENSOR ACCESSORIES

End shaft load cell type ES

END SHAFT LOAD CELLS *are normally used in new machines designed with the possibility to place the load cell directly on the sensing roll. The end shaft version offers the advantage of being able to easily place the load cell in any tension resultant direction.*

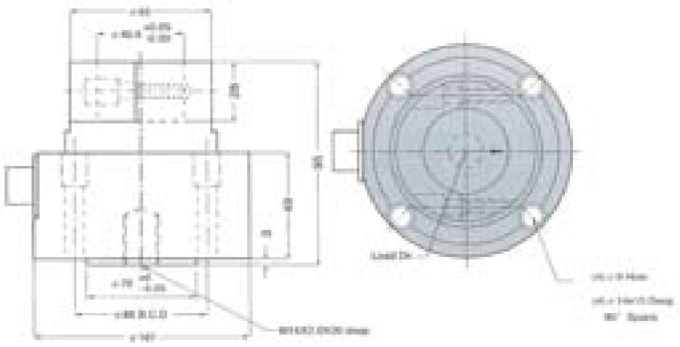
This shaft end tension loadcell uses a high sensitivity beam structure as the sensing element, and tool steel material to increase overload capacity. Endof shaft mounting makes it easy to install; it is accurate and durable for use in tension force measurement.

All end shaft load cells are based on the Wheatstone bridge principle. They have no built in amplifier. They are delivering a signal which is proportional to the voltage supply and tension applied. It is important to respect the measurement direction referenced on the load cell body (normally an arrow indicates the sensitive direction).

Features:

**** Tool Steel Material***
**** Easy Installation***
**** Precision***
**** To 10, 25, 50, 100, 200, 350, 500 KG***

Installed Dimensions:



ALTRA EASY CONNECTIONS		
	CELL1	**CELL2**
RED (+ input)	C10-1	C10-5
Black (- input)	C10-4	C10-8
Green (+ output)	C10- 2	C10-6
White (- output)	C10-3	C10-7
Shield	C9	C9

Specifications:

Rated Output .... 1m V/V
Total Error .... 0.3% R.O.
Repeatability .... 0.2% R.O.
Creep .... 0.1%/20 min
Input Resistance .... 405 ± 25 Ω
Output Resistance .... 350 Ω
Max Excitation Voltage .... 20 v
Recommended Excitation Voltage .... 10 v
Compensated Temperature Range .... 10~50 °C
Safe Temperature Range .... 20~70 °C
Temp. Effect On Zero Balance .... 0.05%/10 °C
Temp. Effect on Rated Output ....0.03%/10 °C
Zero Balance .... ± 3% R.O.
Safe Overload Rating 300%
Cable Length 3m
Cable Connection .... Input: Red (+) Black (-) / Output: Green (+) White (-)

SENSOR ACCESSORIES

Foot Mounted Tension Load cell

This Tension force loadcell uses a highly sensetive shear beam as the sensing element and is hermitically sealed during construction. A specially designed overload protection device greatly increases overload capacity.

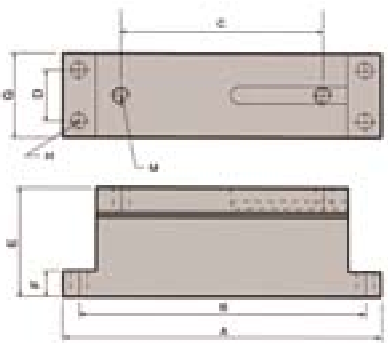
Features

* Overload Protection
* Hermetically Sealed
* Precision
TE-10, 25, 50, 100, 200, 350, 500, 1T, 2T, 3T, 4T, 5T, 10T kg

Specifications

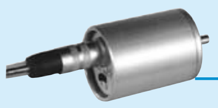
Rated Output	1 mV/
V	
Total Error	0 . 3 %
R.O.	
Repeatability	0 . 2 %
R.O.	
Creep	
0.05%/20min	
Input Resistance	430 or 405 ±
Ω	
Output Resistance	350
Ω	
Max. Excitation Voltage	
20V	
Recommended Excitation Voltage	
10V	

Dimensions



Model(kg)	A	B	C	D	E	F	G	H	M
TE-10 ~ TE-25	124	112	83	30	52	10	51	±7	M6 × 1.0 × 10 Deep
TE-50 ~ TE-200	190	170	120	30	71	15	51	±9	M10 × 1.5 × 12 Deep (T Slot 65 long)
TE-350 ~ TE-3T	250	220	136	45	76	15	75	±13	M12 × 1.75 × 20 Deep
TE-5T ~ TE-10T	290	260	184	50	103	24	80	±13	M16 × 2.0 × 25 Deep (T Slot 85 long)

TE Wire colours	AltraEasy connection Load Cell 1	AltraEasy connection Load Cell 2, (if Fitted).
Red (+ ve Input)	C10-1	C10-5
Black (- ve Input)	C10-4	C10-8
Green (+ ve Output)	C10-2	C10-6
White (- ve Output)	C10-3	C10-7
Shield	C9	C9



SENSOR ACCESSORIES

Rotary sensors

POSITION SENSOR

A position sensor is used in 2 possible ways:

- ❒ *To detect dancer moving in the closed loop installation working on dancer principle.*
- ❒ *To sense the diameter of the roll to operate open loop control or make PID compensation in closed loop installation.*

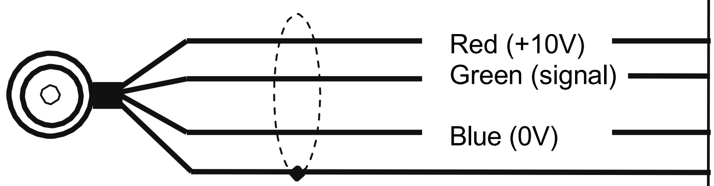
ALTRAEASY ROTARY POSITION SENSOR

Type ALTRAEASY RPS

Power supply	10VDC / 15 mA
Detecting angle	200° (or ± 100°)
Sensitivity*	2.5 mV/V/°
*Example	Detect. angle = ± 30° =>
	Sensitivity = 3.0 VDC

2. WIRING

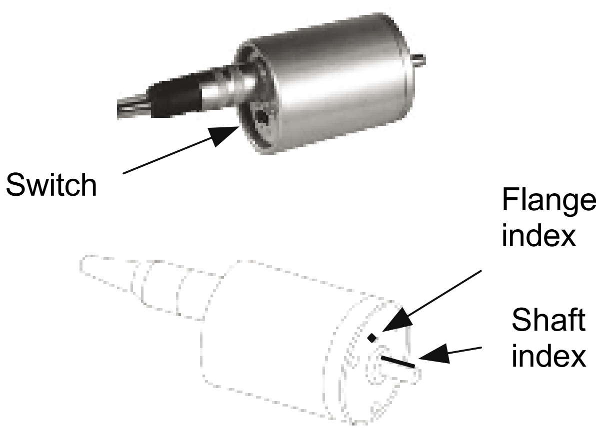
with ALTRAEASY



ROTARY POSITION SENSOR	ALTRAEASY CONNECTIONS
Red (+10V)	C10-1
Green (signal)	C3-3
Blue (0V)	C3-4
	Shield C9

3. SETTING

Signal output polarity can be selected with the switch on the back flange of the sensor.

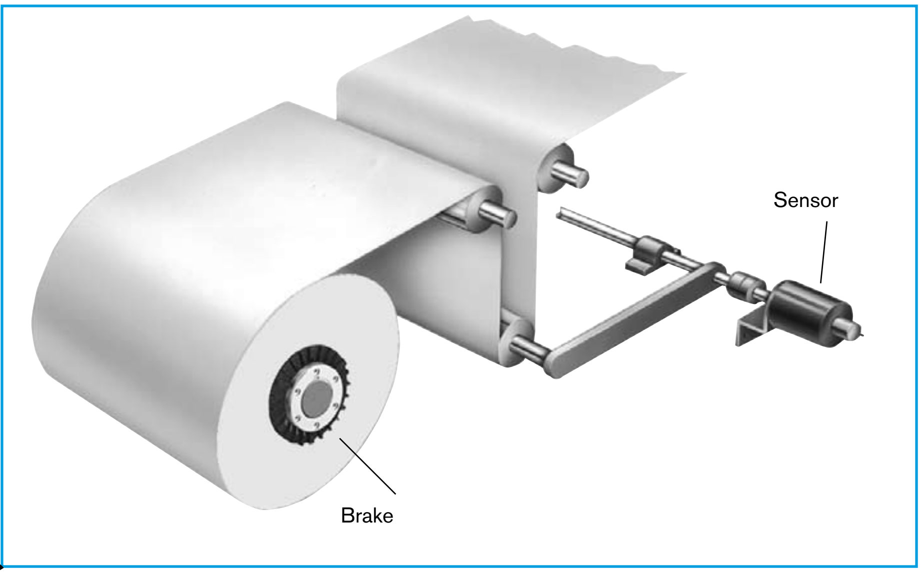


4. NOTES

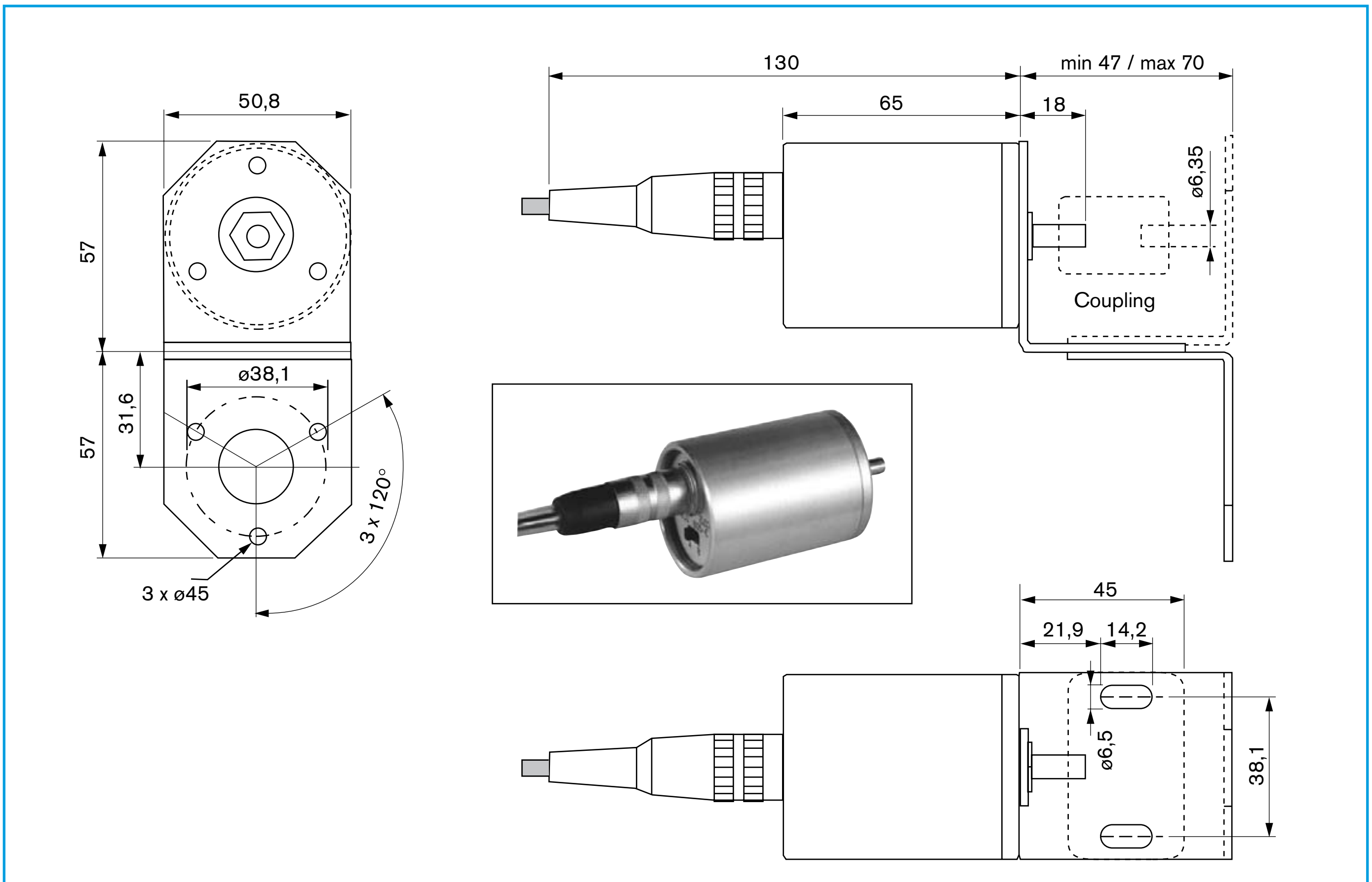
Align both black index (flange + shaft) to nominal dancer arm position.
No axial or radial effort admitted on the shaft.
The coupling used should accept any alignment error between the sensor shaft and the pivot point of the dancer arm.

Rotary sensors

Working in closed loop with the arm dancer principle is very popular, especially in the printing market where a flexibility of the system is required to absorb the eventual “tension peaks”. The rotary sensor is necessary to read the dancing roll movement.



DIMENSIONS - MOUNTING



In the tension control market ultrasonic sensors have two primary uses:
- *For roll diameter reading when the system operates in open loop.*
- *For loop position reading when the system operates in closed loop with dancer arm principle.*

SCALABLE ULTRASONIC SENSOR

1. FEATURES

Type SCUA-2000:

Power supply	15 to 30 V DC/ 900mW
Analogue output	See 'TEACH-IN'
Min distance	120 mm
Max distance	2000 mm
Accuracy	≤0.1%
Housing	IP 65
Accessory available	5 m cable
Default settings:	400 mm = output 0V 2500 mm = output 10V +ve slope

'TEACH-IN' SETTING:

The output is 0-10 V or 10V to 0V for a measured distance between 120 and 2000 mm.

Sensor Functions: The sensor features a four pole Temperature/ Teach-In plug that can be connected in four different positions as follows:

Plug Position	Effect
A1	To TEACH-IN Distance A1
A2	To TEACH-IN Distance A2
E2/E3	To Set the +ve or –ve Slope of Voltage or Current Output from the 0 point
T	Temperature Compensation

TO SET THE SLOPE:

Switch off the sensor supply.
Remove the TEACH-IN plug.
Restore the sensor supply (Reset).
Plug-in the TEACH-IN plug into position E2/E3. Repeat the unplugging then plugging action in this position, and three different ramp modes can be selected in the following sequence:

LED A2 Flashes – Rising +ve Slope
LED A1 Flashes – Falling –ve Slope
LED A1 & A2 Flashes – 0 Slope

Plug in the TEACH-IN plug in T to complete and save the Slope.

Note: *If the TEACH-IN plug has not been inserted into the T position within 5 minutes the unit will revert to the normal mode with the last stored values and without temperature compensation.*

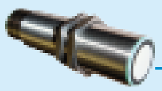
2. TEACH-IN PROCEDURE

TO SET LIMITS 1 & 2:

Switch off the sensor supply.
Remove the TEACH-IN plug.
Restore the sensor supply (Reset).
Set the target to the required minimum distance (Switch Point)
Plug-in and then remove the TEACH-IN plug in position A1 and then in A2 with the second maximum distance required. This programs the device for min and max range.

Caution: *Removing the TEACH-IN plug enters and saves the current value of A1 or A2 into the program.*

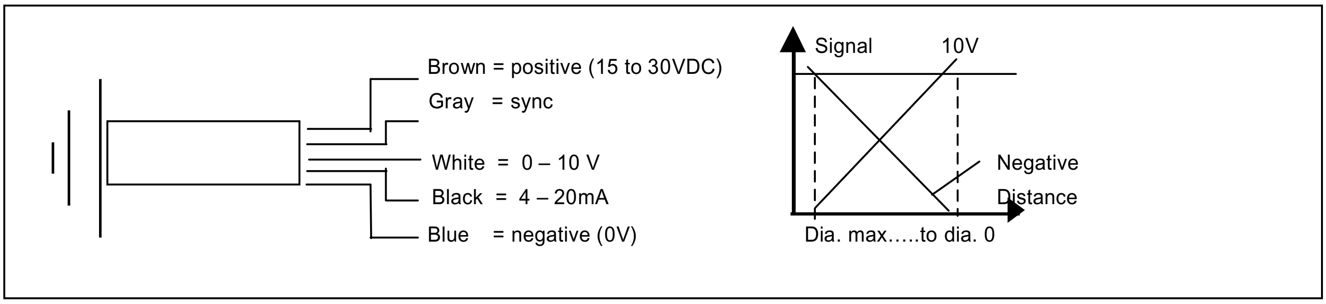
The LED-Window provides a status indication. The Green LED flashes when an object is detected, and a Red LED flashes when an object is not detected.
Plug in the TEACH-IN plug in T to complete and save the values.



SENSOR ACCESSORIES

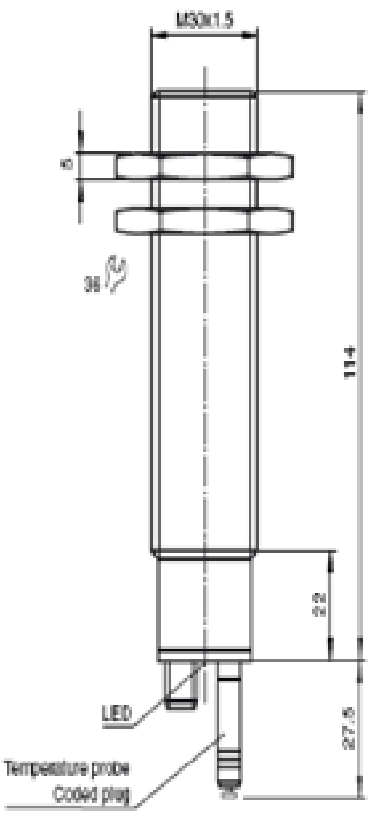
Ultrasonic sensors

3. WIRING:

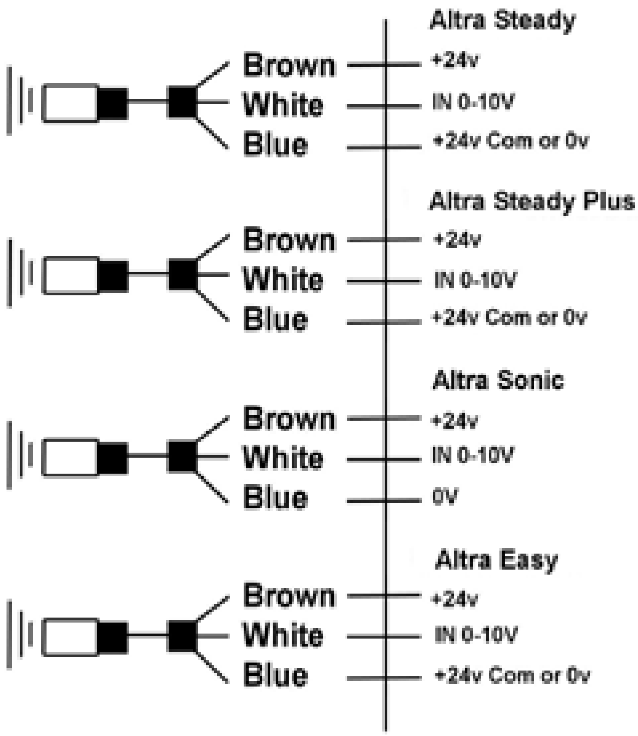


The signal is compatible with any 0-10V input

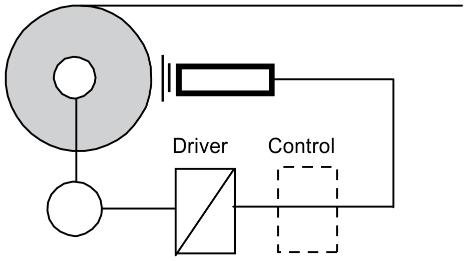
4. DIMENSIONS:



5. MAIN WIRING:



6. TYPICAL APPLICATION:



To read roll diameter in a Open Loop Web Tension Control application, to exploit diameter information as a torque reference or as a PID compensation in a Closed Loop application. In these cases the settings should be:

Max roll diameter (min distance) = output 10V
Diameter zero (max distance) = output 0V

(These are typical cases where we need a negative curve)

7. REMARKS AND RECOMMENDATIONS:

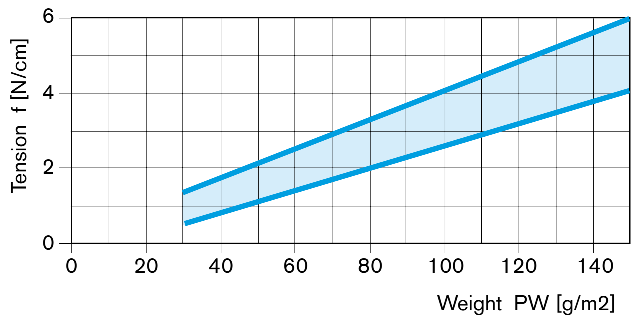
In scaling phase, always start with minimum distance registration. This distance should be scaled to the centre line of the roll shaft.
For typical application where we need to sense the diameter of the roll we need negative curve in order to get zero dia.=0V and max. dia.=10V
After 5 minutes operating for scaling the process is blocked. Switch off the power supply and ON again to release another 5 minutes scaling time.
It is not recommended to use the sonic sensor on reflecting material such as moss, carpet etc…..

Tension selection

Wichita *experience enables us to offer a tension guide as shown below. For any special material not included in the chart below, please consult* ***Wichita.***

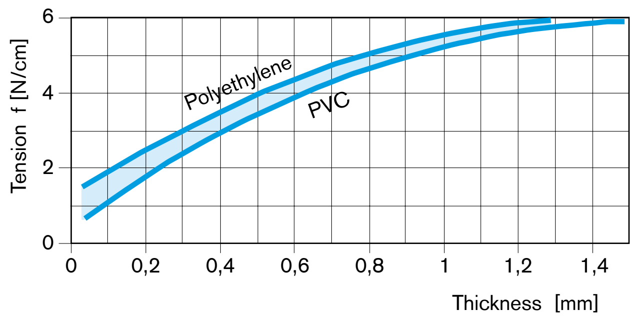
PAPER WEIGHT

F = f x width [cm]

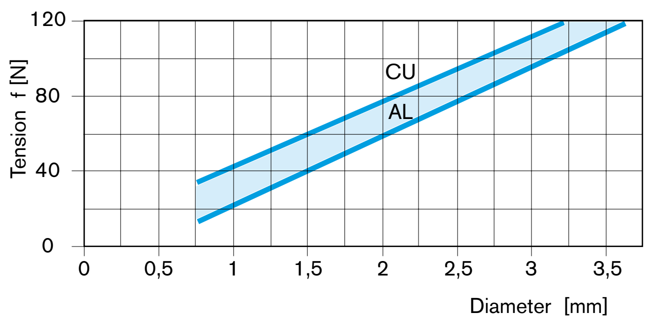


FOIL

F = f x width [cm]



WIRE



MATERIAL DENSITY

	kg/m^3
Paper	920
Paper board	1420
Alu foil	2720
Alu wire	2750
Cu wire	8550
PVC	400-1050

Data application Form

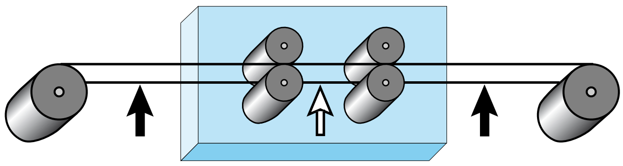
*To enable us to assist you in selecting the best product type and specification to ensure reliable and accurate tension control, please submit this **APPLICATION FORM.***

Company name: ____________________

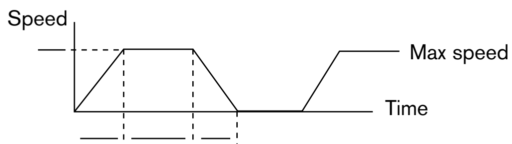
Adresse: ____________________

City: __________ Country: __________

Contact name: __________ Phone / fax: __________



		Unwider stand	Nip roll	Rewind stand
Which type of machine is it ?				
♦ Printer, Slitter, Sheeter, Coater, Laminator, …or other ?				
Which machine part concerned				
Which web material is it ?				
Max / min tension (if known)				
Characteristics of the material				
♦ Paper weight	Gr / m^2			
♦ Plastic film thickness	mm			
♦ Wire diameter, matter	mm			
♦ Other (short description)				
Characteristics machine				
♦ Auto flying splice	Yes / No			
♦ Zero speed splice	Yes / No			
♦ Max linear speed	M / min			
♦ Min linear speed	M / min			
♦ Max acceleration time	M / min / sec			
♦ Normal deceleration time	M / min / sec			
♦ Emergency stop time	M / min / sec			
♦ Taper tension requested	+ or - %			
Roll characteristics				
♦ Weight	Kg			
♦ Max diameter	mm			
♦ Min diameter	mm			
♦ Max width	mm			
♦ Min width	mm			
General information				
♦ Is it a new project or a retrofit ?				
♦ Loosing tension permitted in emergency stop case	Yes / No			
♦ If machine working in cycle, what's the cycle rate ? Speed in m/min	Time in sec.			
♦ Is the brake or motor direct on shaft or gear mounted ?	Roll/ brake (rpm)			
♦ Which control configuration ?	Open loop / Closed loop			



Please complete this form as much as possible. Please also include any other information of interest.

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Worldwide support and distribution

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