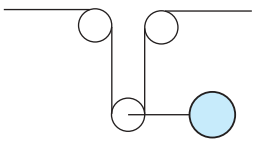
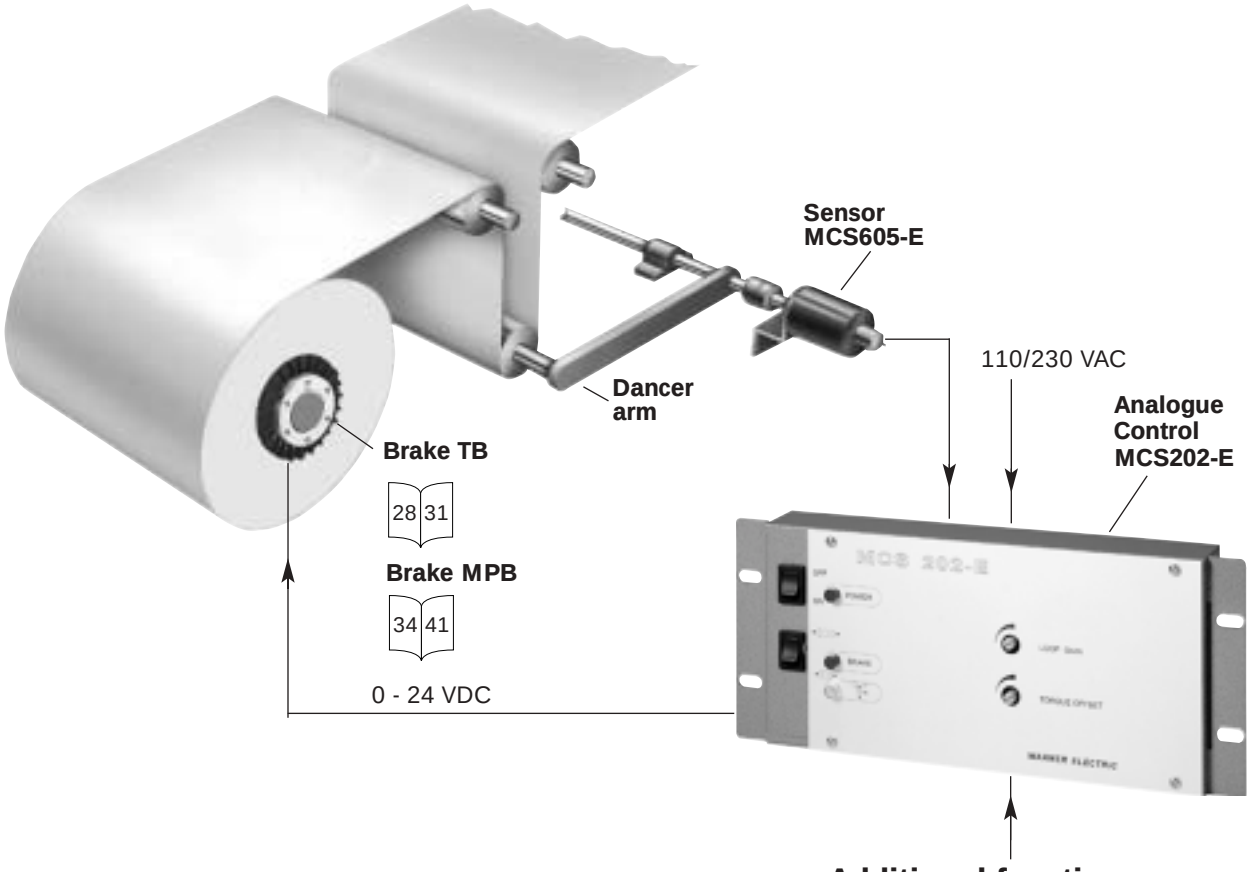
I - Simple tension control in closed loop

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. Several possibilities are offered. The choice now depends on the kind of machine you are building, the mechanical construction and the max tension value you desire to control.

MAIN APPLICATIONS - ADVANTAGE – DISADVANTAGE

Setting type	Where, When, Why ?	Advantage	Disadvantage
Dancer arm 	❒ Printing machines ❒ 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

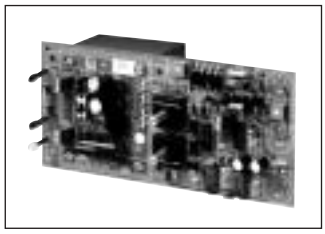


Additional functions

- ❒ Brake open
- ❒ Emergency stop
- ❒ Drift stop(stop integral term of PID)
- ❒ Gain change

ROTARY SENSOR MCS605-E (see pages 16 and 17)

ANALOGUE CONTROL MCS202-E



- ❒ MCS202-E1 Standard execution
- ❒ MCS202-E54 Standard IP54 protected
- ❒ MCS202-EC1 Open frame execution

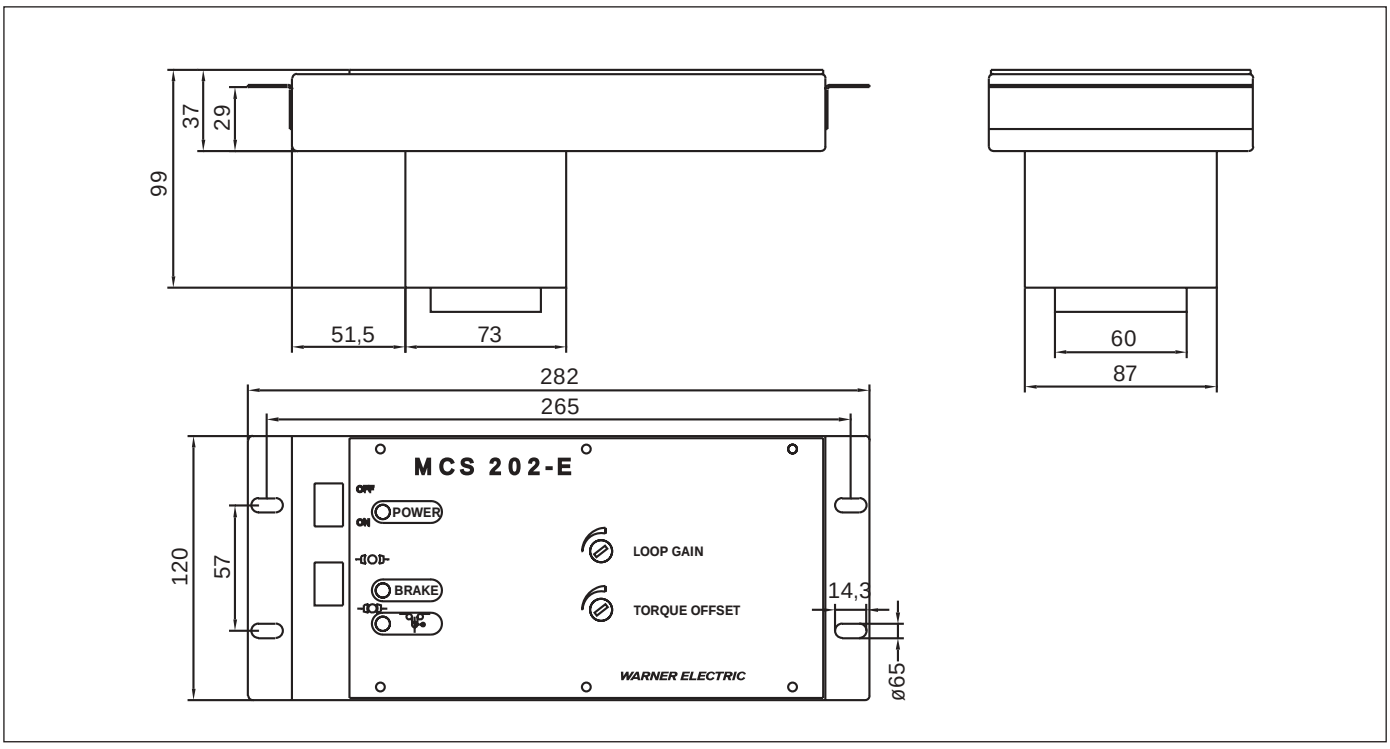
Technical characteristics – valid for 3 executions

	Range - Values	Comments
Power supply	110-220 VAC selectable	Open front face to access
Output current capability	Max 2, 5 Amps, short circuit protected	Able to power 2 TB in parallel
User settings	Loop gain	Front face potentiometer
	Offset torque	Front face potentiometer
Output voltage brakes	0-24 VDC	Compatible all elec. Warner Electric
Housing	Metal rugged housing	Only MCS202-E1 and –E54
Loop gain	2 adjustable range selection	Can be change during operation
Accessories	MCS-KIT1, 2, 3, 5 and 6	See details on page 17
Sensor compatible	Dancer arm with MCS605-E	See details on pages 16 and 17
Service manual	MC403	

Technical information

MCS202 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 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 (mm)



ROTARY SENSOR MCS605-E

A position sensor is used in 2 possible ways:

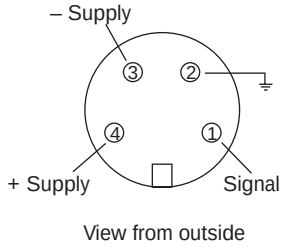
❒ *- To detect dancer moving in the closed loop installation working on dancer principle.*

❒ *To sense the diameter of the roll to operate open loop control or make PID compensation in closed loop installation.*

	MCS605-E
Power supply	10 to 30 VDC / 30 mA (or ± 5 to 15 VDC)
Max. detection angle	200° or ± 100°
Sensitivity	2,5 mV / V / °
Service manual	MC483

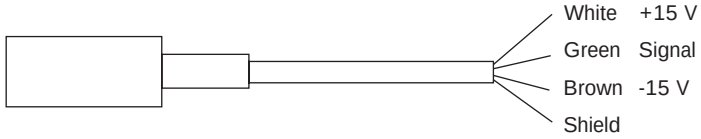
ELECTRICAL CONNECTIONS

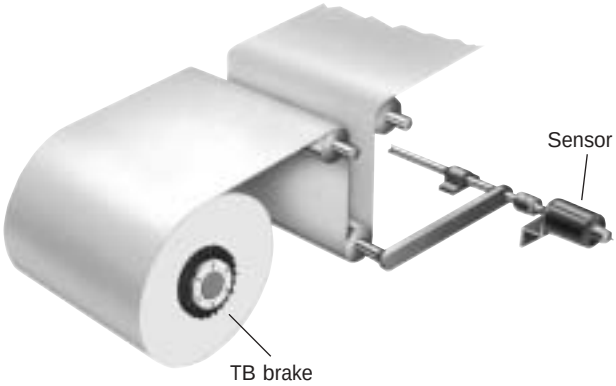
CONNECTOR



View from outside

CABLE





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

MCS605-E is ideal for easy mounting. It is encapsulated in rugged metal housing preventing mechanical shocks. Furthermore it is provided with built in switch in order to change the signal output polarity.

MCS605-E ACCESSORIES

The **MCS202-Exx** is designed to work with dancer arm principle. Usually the sensor is a rotary type.

Warner Electric sensor **MCS605-E** are delivered with complete mounting kit.

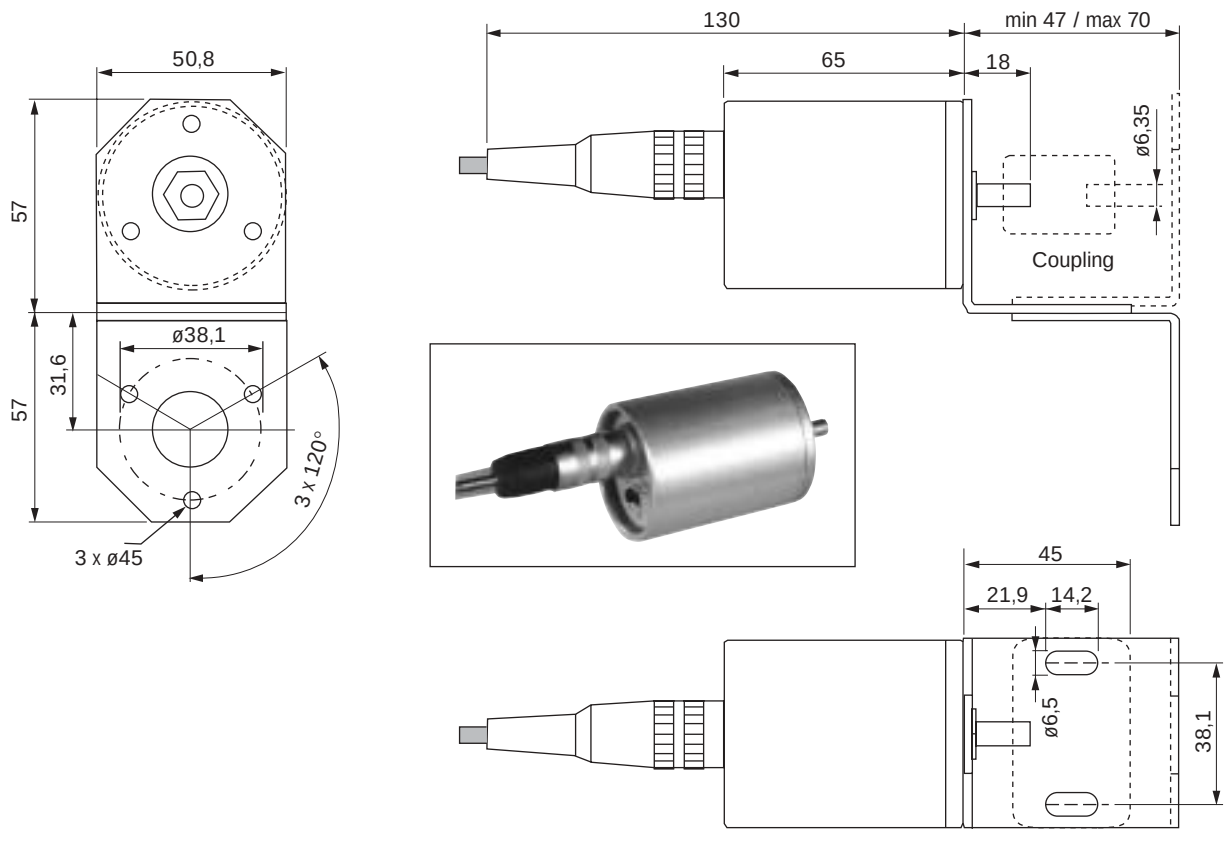
Mounting kit comprises of **CABLE, COUPLING, BRAKETS** and all necessary **SCREWS**. Various KITS have various lengths of cable and cable with or without connector at control end side.

MCS2000 line requires free leads (MCS2000 control line is provided with terminal block).

MCS202-Exx requires a connector (MCS202-Exx is provided with the connector).

	Cable length	One / Two connectors	Compatible
MCS-KIT1	3 m	2	MCS202-Exx
MCS-KIT2	3 m	1	MCS2000
MCS-KIT3	4,5 m	2	MCS202-Exx
MCS-KIT4	4,5 m	1	MCS2000
MCS-KIT7	6 m	2	MCS202-Exx
MCS-KIT8	8 m	1	MCS2000

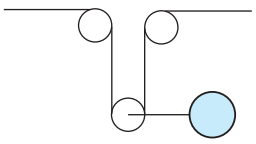
Dimensions (mm) – Mounting

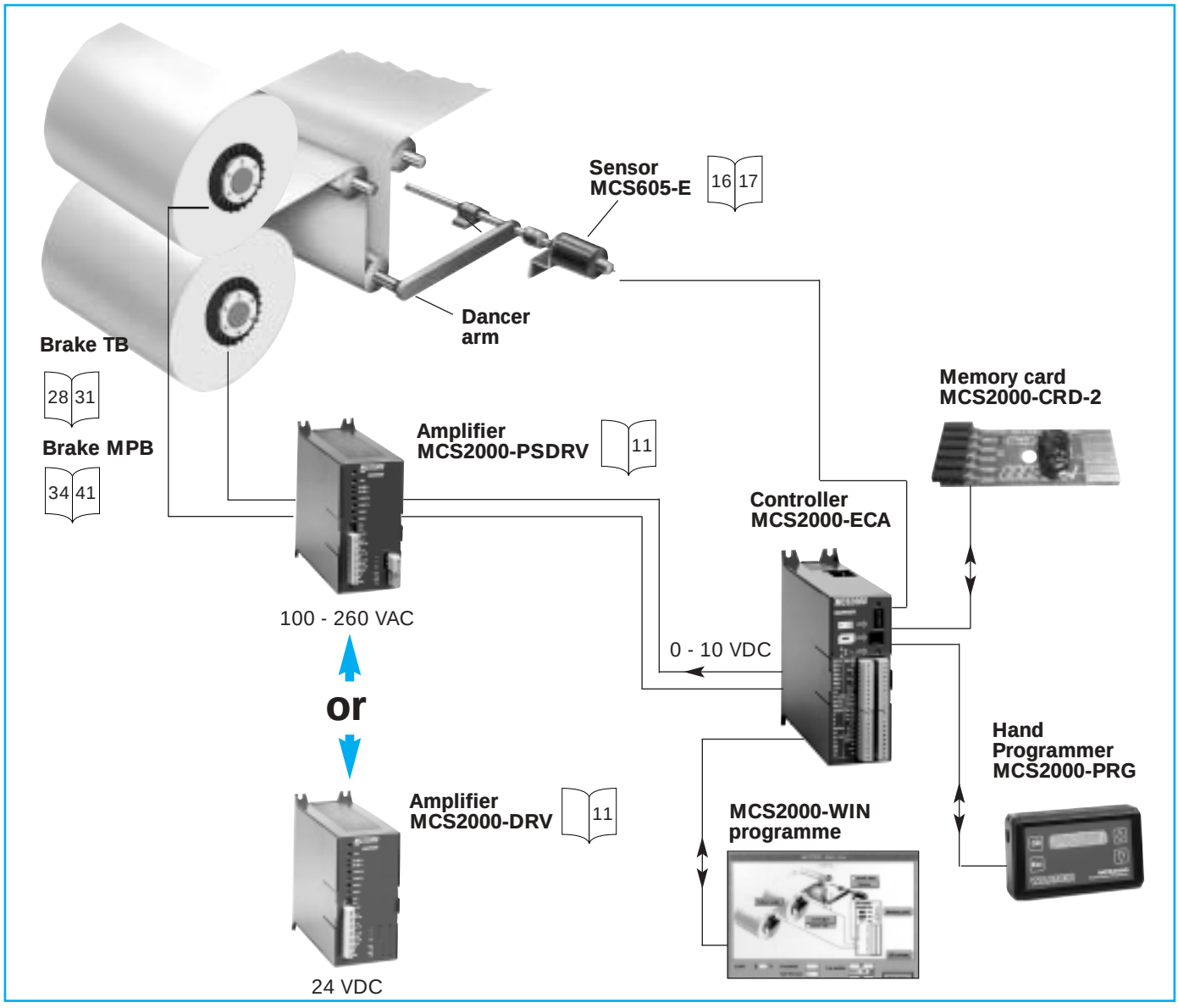


II - Double tension control in closed loop (modular)

MCS2000-ECA *is a digital controller that can be used in both open or closed loop. Operation in open and closed loop is also possible. It is mainly destined for OEM application. The programming tool is detachable. Sensor, sensor mounting kit, display are available as options. The unit has to be powered with 24 VDC.*

MAIN APPLICATIONS - ADVANTAGE – DISADVANTAGE

Setting type	Where, When, Why ?	Advantage	Disadvantage
Dancer arm 	❒ Printing machines ❒ 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



ELECTRICAL AMPLIFIERS MCS2000-PSDRV and MCS2000-DRV (see page 9)

ROTARY SENSOR MCS605-E (see pages 16 et 17)

CONTROLLER MCS2000-ECA

❒ Digital controller - 2 channels

Main Characteristics

❒ 24 VDC power supply unit
❒ PID parameters setting on line
❒ Automatic adaptation for PID parameters, splicing logic included
❒ Opto isolation for input and output
❒ Compatible PLC
❒ Automatic sensor scaling and output sensor information
❒ Programming easy by pocket keyboard or PC(Windows)
❒ Available in open loop as calculator
❒ 2 analogic input, 2 output channels
❒ Plugable memory card
❒ Three language available
❒ Most dedicated for unwinding and rewinding with electromagnetic brakes and clutches.
❒ Service manual : MC514

MCS2000-PRG - HAND PROGRAMMER

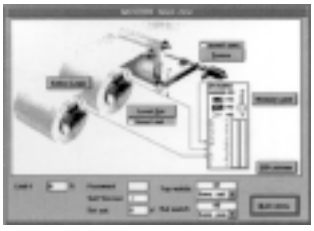
❒ 4 command keys only
❒ 2 x 16 characters display
❒ Menu in 3 languages
❒ Connectable and disconnectable during operation
❒ Supply by control MCS 2000-EC

MCS2000-CRD-2 - MEMORY CARD

All setting data saved. It allows a quick loading operation on new machine or on running machine to optimise.

❒ Memory for 2 different programs
❒ Plugable on line in MCS2000-ECA unit

MCS2000-WIN – PROGRAMME

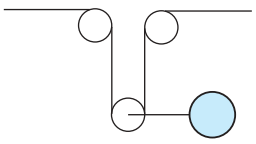


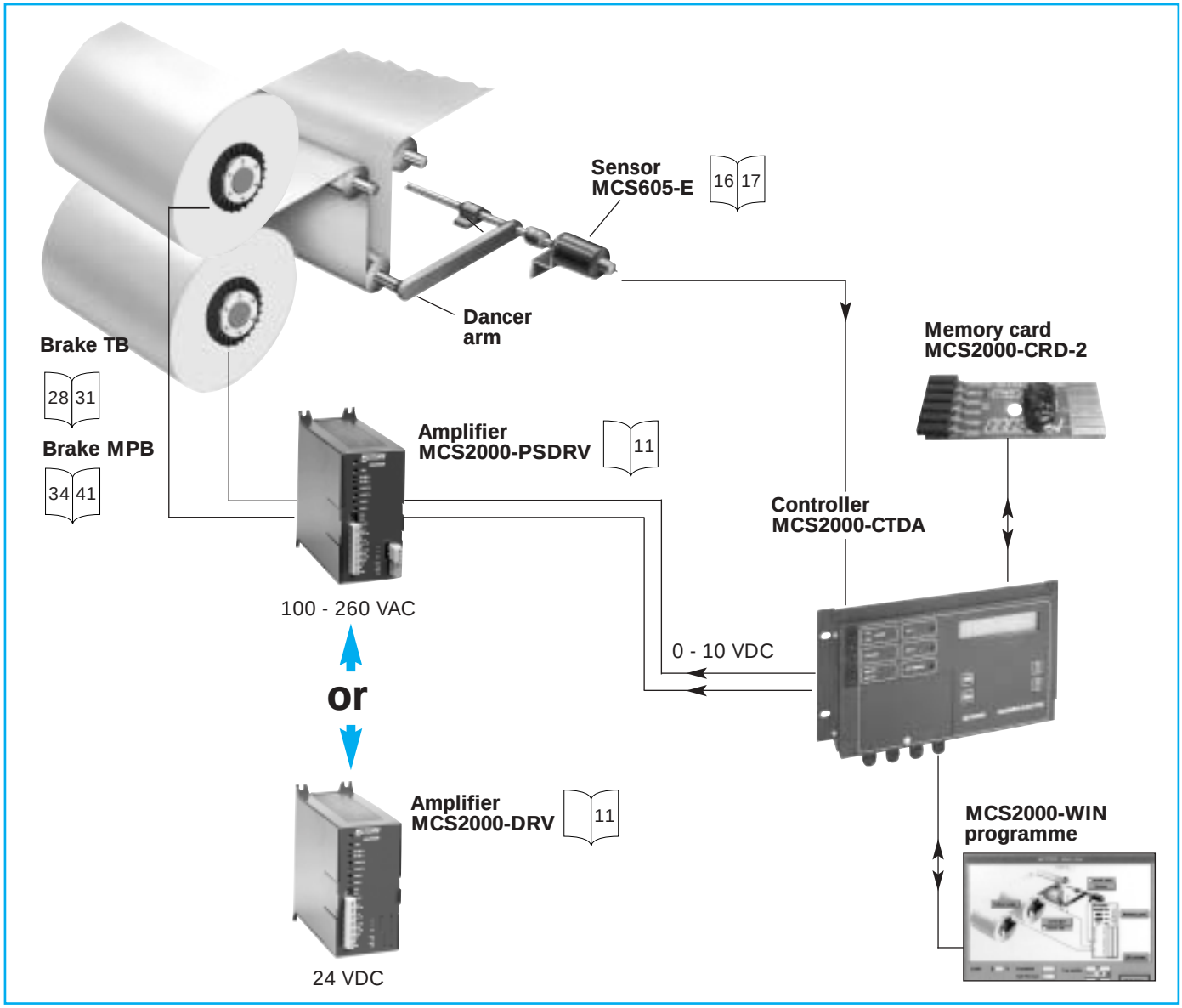
The program can modify the running setting by this software running with: Windows 95/98/XP/2000.

III - Double tension control in closed loop (compact)

The command unit **MCS2000-CTDA** *is a complete solution with power supply and programmer display integrated. There are 2 software version available. See technical data below*

MAIN APPLICATIONS - ADVANTAGE – DISADVANTAGE

Setting type	Where, When, Why ?	Advantage	Disadvantage
Dancer arm 	❒ Printing machines ❒ 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



ELECTRICAL AMPLIFIERS MCS2000-PSDRV and MCS2000-DRV (see page 9)

ROTARY SENSOR MCS605-E (see pages 16 et 17)

CONTROLLER MCS2000-CTDA

Main features

- ❒ Three mounting possibilities
- ❒ Software password protected
- ❒ Scrolling menu program
- ❒ Multipurpose application
- ❒ RS232 communication
- ❒ Two ouput channels
- ❒ Automatic sensor scaling
- ❒ Programmable output configuration
- ❒ Output sensor information
- ❒ External set point change
- ❒ Automatic or imposed PID correction
- ❒ All features requested for tension control
- ❒ Plugable memory card
- ❒ Variable tension value to prevent telescopic effect on unwinding – CTDA-22
- ❒ Service manual : MC525

Specifications

Input power supply	110-240 VAC selectable
Analogue inputs	
Two analogue inputs	0-10 VDC
Analogue outputs	
Two controlled channels	± 10 VDC, 0-20 mA
Open loop signal	0-10 VDC
Digital inputs	
Set point change +	active low
Set point change –	active low
Set point change ±	front face switch
Gain multiplier	active low
Output limitation	active low
ABC binary combination	active low
ABC inputs synchronisation	active low
Stop integral form	active low
Digital outputs	
Sensor level indication	Two binary outputs
Other outputs	
Power supply sensor	± 15 VDC / 100 mA
	± 5 VDC / 100 mA
Power supply	24 VDC
Voltage reference	+ 10 VDC / 10 mA

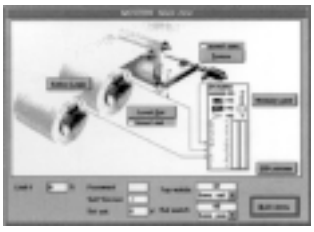
MCS2000-CRD-2 - MEMORY CARD

All setting data saved. It allows a quick loading operation on new machine or on running machine to optimise.

- ❒ Memory for 2 different programs
- ❒ Plugable on line in MCS2000-ECA unit

MCS2000-WIN – PROGRAMME

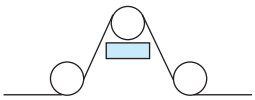
The program can modify the running setting by this software running with: Windows 95/98/XP/2000.

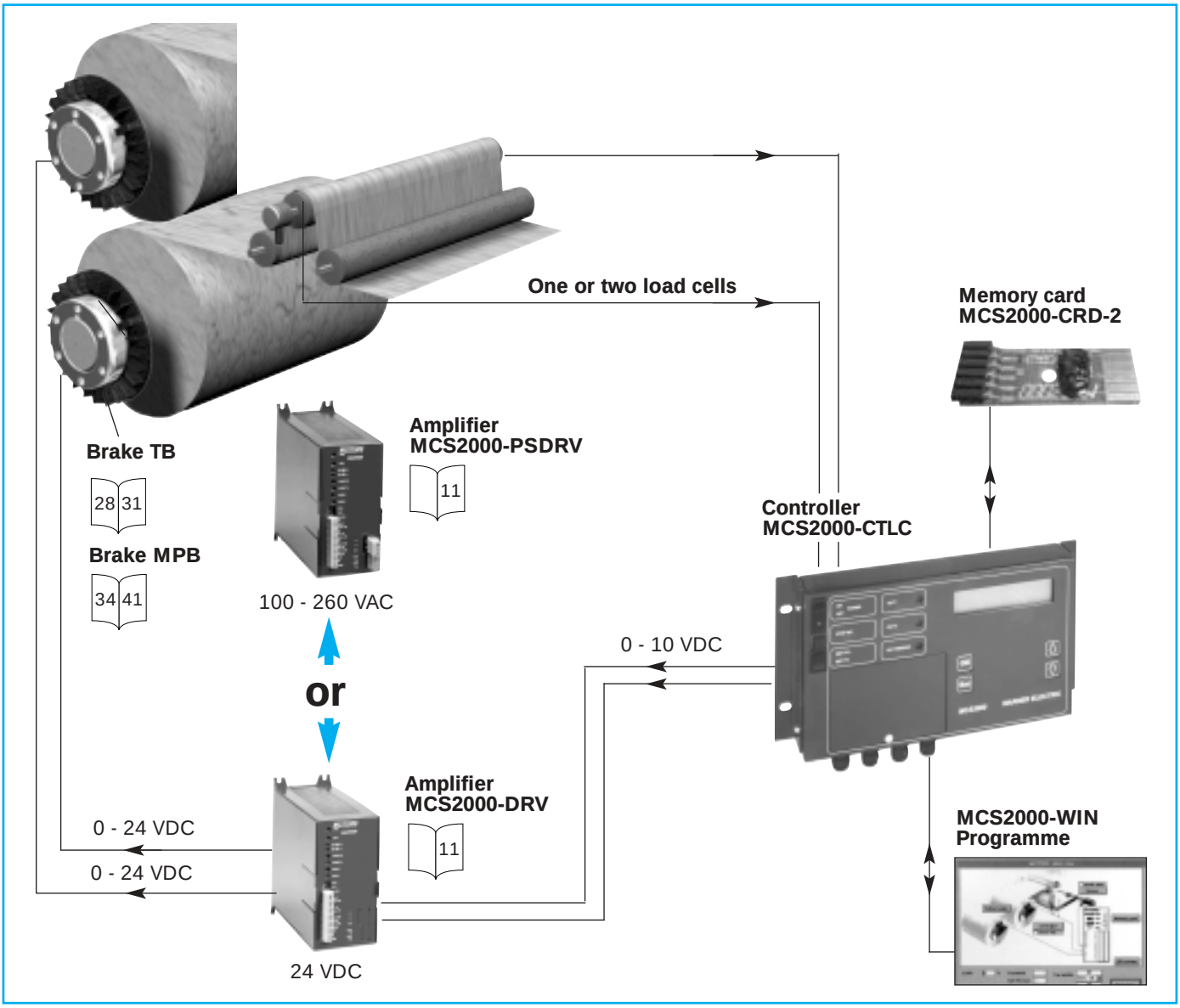


IV - Double tension control in closed loop

The command unit **MCS2000-CTLC** *is a complete solution with power supply and programmer display integrated. There are 2 software version available. See technical data below*

MAIN APPLICATIONS - ADVANTAGE – DISADVANTAGE

Setting type	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 ❒ Flying splice function not easy



ELECTRICAL AMPLIFIERS MCS2000-PSDRV and MCS2000-DRV (see page 9)

CONTROLLER MCS-2000-CTLC

Main features

- ❒ Three mounting possibilities
- ❒ Software password protected
- ❒ Scrolling menu program
- ❒ Multipurpose application
- ❒ RS232 communication
- ❒ Two ouput channels
- ❒ Automatic sensor scaling
- ❒ Programmable output configuration
- ❒ Output sensor information
- ❒ External set point change
- ❒ Automatic or imposed PID correction
- ❒ All features requested for tension control
- ❒ Plugable memory card
- ❒ Service manual : MC525

Specifications

Input power supply	110-240 VAC selectable
Analogue inputs	
Two analogue inputs	0-10 VDC
Analogue outputs	
Two controlled channels	± 10 VDC, 0-20 mA
Open loop signal	0-10 VDC
Digital inputs	
Set point change +	active low
Set point change –	active low
Set point change ±	front face switch
Gain multiplier	active low
Output limitation	active low
ABC binary combination	active low
ABC inputs synchronisation	active low
Stop integral form	active low
Digital outputs	
Sensor level indication	Two binary outputs
Other outputs	
Power supply sensor	± 15 VDC / 100 mA
	± 5 VDC / 100 mA
Power supply	24 VDC
Voltage reference	+ 10 VDC / 10 mA

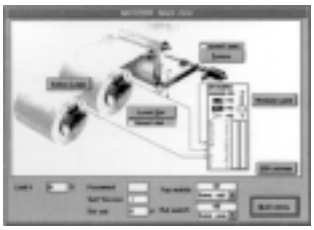
MCS2000-CRD-2 - MEMORY CARD

All setting data saved. It allows a quick loading operation on new machine or on running machine to optimise.

- ❒ Memory for 2 different programs
- ❒ Plugable on line in MCS2000-ECA unit

MCS2000-WIN – PROGRAMME

The program can modify the running setting by this software running with: Windows 95/98/XP/2000.



The **FOOT MOUNTED LOAD CELL** *is the ideal solution to retrofit machines or for heavy tension measurement. The foot mounted model has to be installed with a pillow block type ball bearing supporting the sensing shaft.* **FM01A...** *and* **FM02-...** *are only differenciated by the physical dimensions.*

FOOT MOUNTED TYPE FM01A... and FM02-...

Foot mounted load cells are available in two versions:

With incorporated amplifier : FM……..-AC
AC = amplifier and connector on the load cell body

Without amplifier : FM……..-C
C = connector on load cell body

Specifications (all FM series)

	FM……..-AC	FM……..-C
Power supply	±12 to ±15 VDC	± 5 VCC or +10 VDC
Sensitivity	0-5 VDC, nominal load	10 mV, nominal load
Rating	100 – 250 – 500 – 1000 – 2500 – 5000 – 10000 N	
Connections	Cable supplied	
Permitted overload		
- Compression	150 %	
- Extension	120 %	
Radial permitted force	50%	
Dimensions	See mounting instructions ref. MC480	
Mounting	See recommendations on page 25	
Service manual	MC480	

AVAILABLE MODELS / CAPACITY

Nominal load	100 N	250 N	500 N	1000 N	2500 N	5000 N	10000 N
FM01A-	-100-AC	-250-AC	-500-AC	-1000-AC	-2500-AC	-5000-AC	
FM01A-	-100-C	-250-C	-500-C	-1000-C	-2500-C	-5000-C	
FM02..-						-5000-AC	-10000-AC
FM02..-						-5000-C	-10000-C

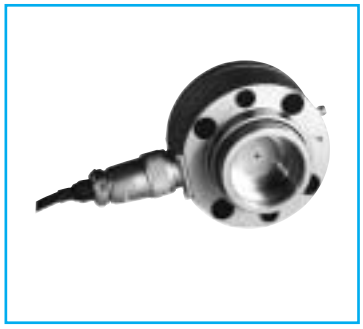
Load cells

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. The* **ES** *model exists in two versions differenciated with the diameter of ball bearing which has to be placed in.*

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 proportionnal 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).

ES..-... LOAD CELL FEATURES

	ES01-40C and ES02-52C
Power supply	10 to 15 VDC / 40 mA (±5 VDC in Warner Electric control)
Sensitivity	2 mV / V supply at nominal load
	1 mV / V supply for 50 and 150 N models
Rating	50-150-250-500-1000-2000 N
Connections	5 m shielded cable supplied
Mechanical overload	Max 150 % in any direction
Dimensions	See mounting instructions ref. MC481 and MC482
Mounting	See recommendations below
Service manual	MC481 and MC482

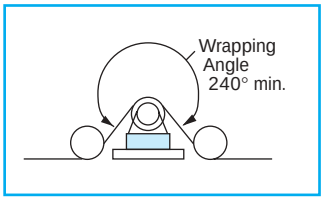


AVAILABLE MODELS / CAPACITY

Nominal load	50 N	150 N	250 N	500 N	1000 N	2000 N
ES01-...	-50-40C	-150-40C	-250-40C	-500-40C	-1000-40C	-2000-40C
ES02-...	-	-	-250-52C	-500-52C	-1000-52C	-2000-52C

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 3, recommended 1,5.**

❒ 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.