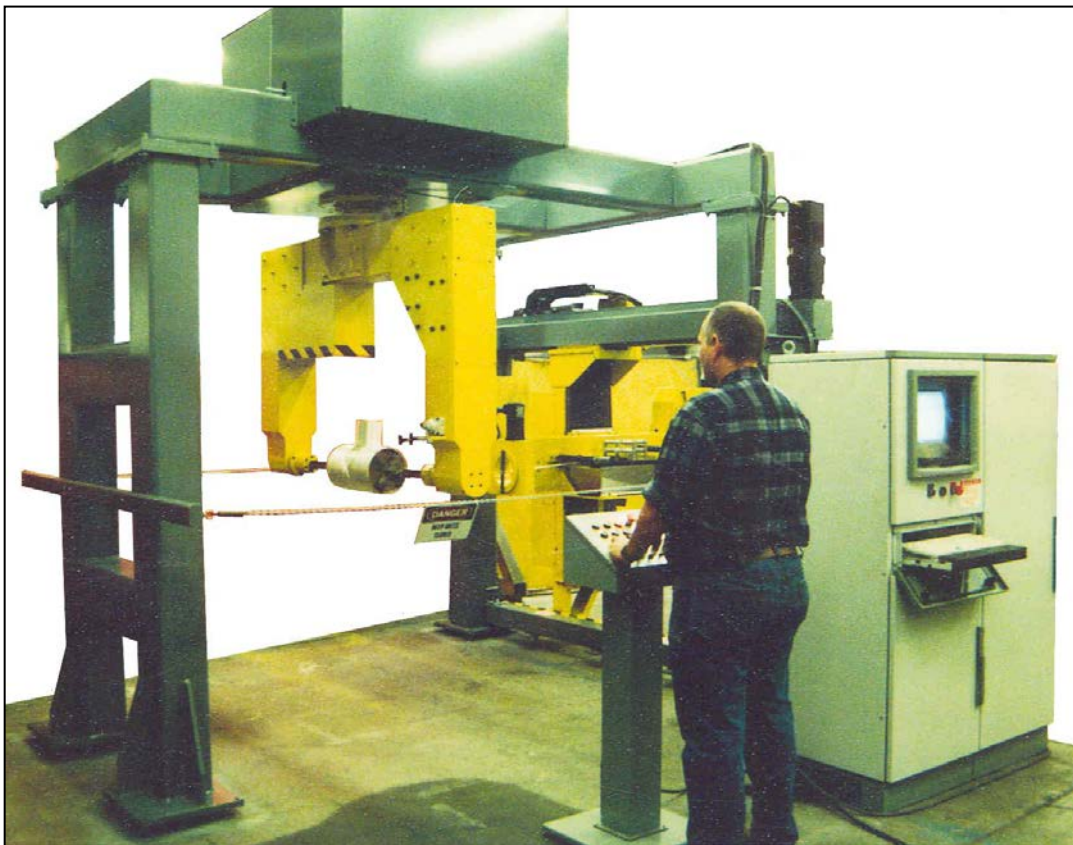


**Specification for  
PULTREX TEEWINDER 1S-6NC-600D-2400L  
Filament Winding Machine**



## 1.0 INTRODUCTION

Specification for **TEEWINDER 1S-6NC-600D-2400L** Filament Winding Machine.

- 1S - One Spindle
- 6NC - 6 Axes numerically controlled:
  - X, Y & Z - Linear
  - A - Main Axis Spindle, rotary
  - B - Feed-eye, rotary
  - C - Tee Axis rotation, rotary
- 600D - Maximum Tee Pipe diameter - 600 mm
- 2400L - Maximum Pipe fitting length - 2,400 mm

## 2.0 CONSTRUCTION

The machine is system is constructed with the following machine elements:

- **MAIN SUPPORT GANTRY**
- **MAIN CROSS BEAM**
- **MANDREL SUPPORT CRADLE**
- **FIBRE DELIVERY CARRIAGE**
- **NUMERICAL CONTROL SYSTEM**

Taking these elements in order:

### 2.1 MAIN SUPPORT GANTRY

This is a ridged support structure comprising of four support legs and cross members manufactured from rectangular hollow steel box section. This is the main support structure for the main cross beam. The main support gantry is also used to support the main fibre delivery carriage.

The gantry also supports the cable handling system for the fibre delivery carriage.

#### 2.1.1 Foundations

No special foundations are required for this machine. The floor should have a minimum of 150 mm thickness of reinforced concrete.

Provision is made for securing the machine to the floor with bolts into the main gantry support legs.

## 2.2 MAIN CROSS BEAM

The main cross beam is constructed from a ridged steel fabrication made from structural steel sections. This is stress relieved and precision machined to give location for the main spindle bearing housing, main spindle drive and the mandrel support cradle drive system.

## 2.3 MANDREL SUPPORT CRADLE

The mandrel support cradle is a light weight ridged fabrication.

It comprises:

- Main rotation beam
- Adjustable mandrel support arms
- Mandrel rotation system

### 2.3.1 Main rotation beam – “A” Axis

The main rotation beam is fitted with the main rotation spindle which couples it to the main cross beam. Drive for the main spindle is via an AC brushless servo motor and belt drive mounted on the main cross beam. This is the ‘A’ axis

Passing through the centre of the rotation spindle is the mandrel rotation drive. Mounted within the main rotation beam is a right angle gearbox which feeds the drive along a splined driveshaft running the length of the beam. The underside of the beam is precision machined and fitted with linear ball slides.

### 2.3.2 Adjustable mandrel support arms

The main rotation beam is fitted with two adjustable mandrel support arms. These are mounted to the linear ball slides mounted on the underside of the main rotation beam.

The arms are adjusted in or out about the centre of rotation via a screw drive system to accommodate varying mandrel sizes. The ends of the arms are fitted with a spindle and mandrel holding device.

The arms can be locked in position on the main rotation beam.

### 2.3.3 Mandrel rotation system – “C” Axis

Drive for the mandrel rotation system is from an AC brushless servo motor mounted on the main cross beam. The drive passes down the centre of the main drive spindle via a right angle gearbox to a splined drive shaft mounted under the main rotation beam. The adjustable mandrel support arms are fitted with splined nuts and the drive passes down the arm via a toothed timing belt to

the mandrel support spindles. The servo CNC system compensates for the rotation induced by the main arm rotation.

## **2.4 FIBRE DELIVERY CARRIAGE**

The carriage is an aluminium fabrication that has recirculating linear bearings that run on linear ways mounted to the main gantry cross beam. This is the 'X' Axis

Maximum carriage stroke	3000mm
Maximum carriage speed	60 metres/min
Maximum carriage acceleration	3 metres/sec <sup>2</sup>

Drive for the carriage is by a brushless AC servomotor, via a precision gearbox and rack and pinion drive.

### **2.4.1 Vertical Axis "Z" - Stroke 1500mm.**

The main ("X") carriage has vertical hardened ways on it to support the vertical axis "Z". This axis comprises a carriage supported on a vertical recirculating ballscrew. The ballscrew is driven from a brushless AC servomotor, which is also fitted with a fail-safe brake. The "Z" carriage carries the drive motor for the horizontal "Y" arm.

Maximum carriage stroke	1500mm
Maximum carriage speed	30 metres/min
Maximum carriage acceleration	3 metres/sec <sup>2</sup>

### **2.4.2 Horizontal axis "Y"**

The horizontal axis "Y" consists of a lightweight arm moving on guides located on the face of the main carriage. This carriage also supports the fibre guidance system.

This "Y" carriage is driven by recirculating ball screw and nut from an AC brushless servomotor.

The carriage carries the rotary ("B") axis head on the spindle centre line together with its drive motor.

Maximum carriage stroke	2000mm
Maximum carriage speed	60 metres/min
Maximum carriage acceleration	3 metres/sec <sup>2</sup>

### 2.4.3 Rotary "B" axis

The rotary axis head is mounted to the horizontal "Y" axis. The head is hollow, and has a face-plate front surface with tapped holes to locate fibre guidance systems.

The heads are driven by an AC brushless servomotor.

Maximum travel	360 degrees continuous
Maximum speed	50 RPM
Maximum acceleration	3,600/sec <sup>2</sup>

## 2.5 NUMERICAL CONTROL SYSTEM

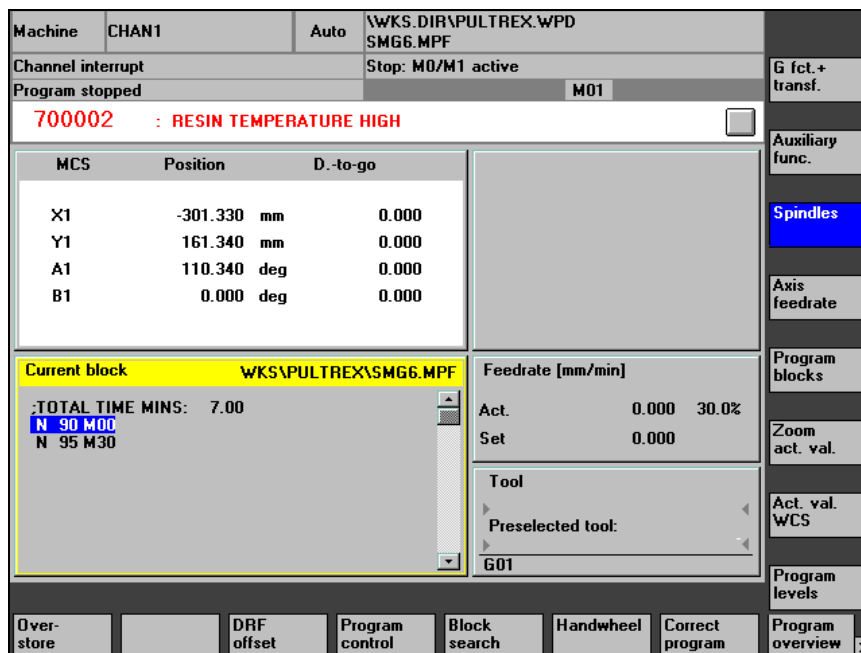
The machine is controlled by a Siemens 840D - 6 axis CNC control system.

This is a free-standing unit located in a sealed NEMA 12 cabinet near the **MODWIND** machine.

The cabinet contains the colour screen, controls and the servo drives for all axes.

The control screen displays many functions. The axes position displays are in large numbers visible from a distance.

Programs are displayed and the control panel buttons enable full editing and background editing whilst the machine is in motion.



Interface is provided for external computer connection.

The control is a standard machine tool type system, which interfaces through **Pultrex** designed magnetics.

#### 2.5.1 Diagnostics.

All interface connections can be looked at for status, using the standard CNC ladder logic.

Any faults or incorrect data occurring during use of the machine are displayed on the screen together with an error message.

#### 2.5.2 Interlocks/Limit switches

The linear axes of the machine are fitted with three limit switches.

Two end (over travel) switches  
One Home (reference) switch.

The CNC control will also be supplied with a set of "software" switches.

**Soft Limit. 1** acts like linear axes over travel switches, which are set up in Parameters.

#### 2.5.3 Optional operator Jog Box

Apart from the operator controls on the CNC system, the machine can be fitted with an option jog control box. When supplied the jog control box is a hand held box on a lead. This has : **Stop : Start : Jog Switches for all axes.**

#### 2.5.4 Safety Interlocks

Provision is made for connecting safety interlocks and duplicate machine **START/STOP** locations. Two levels of **STOP** interface are provided.

1. **STOP** - This stops the machine during running without loss of position or program. Typically this would be connected to an infra-red beam system or any other safety device.
2. **EMERGENCY STOP** - This kills power to the servo drives and should only be used in a true emergency situation.

**2.6 AXES SUMMARY.**

AXIS	TRAVEL MM.	MAX. SPEED MTR./MIN.	RESOLUTION MM.
X	3000	60	0.01 mm
Y	2000	60	0.01 mm
Z	1500	30	0.01 mm
A	Rotary	20 rpm	0.01 Degree
B	Rotary	60 rpm	0.01 Degree
C	Rotary	30 rpm	0.01 Degree

**3.0 POWER REQUIREMENTS**

Electrical power 380/440 volts 3 phase 12 Kva