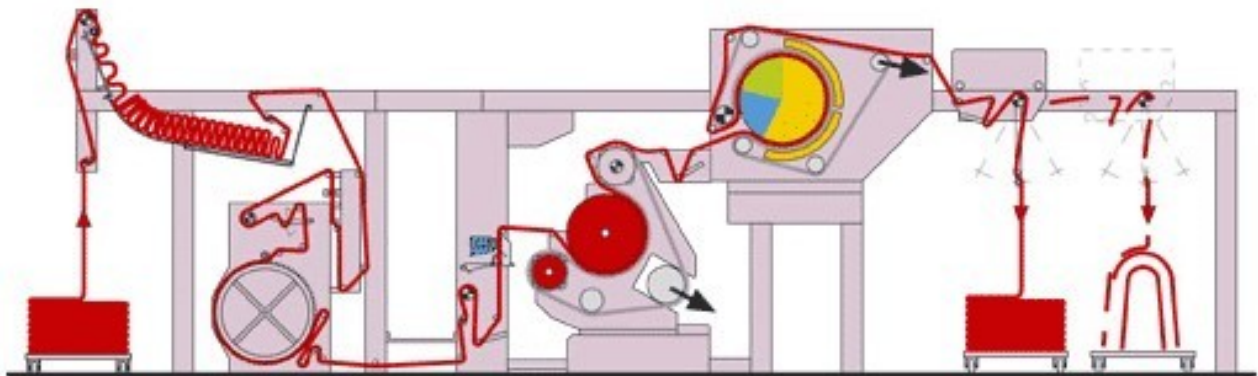# SUPERFINISH GFP 800/900

FUNCTIONAL DESIGN SPECIFICATION (FDS)

PRJ-TK-1709-0-015-DOC-002

Rev.	Date	Prepared	Reviewed	Approved

Index

Chapter	Contents	Page no

1. Introduction

1.1 Purpose of this Document

The main objective of this document is to outline the detailed functionality of the Control system upgradation of the superfinish machine. Hardware updated from S5 to S7 with Simanics drives.

1.2 General

1.2.1 Abbreviations

- HMI-Human Machine Interface

- PLC -Programmable Logic controller

- TRIAC - Triode for Alternating Current

1.2.2 References

- E070163 Dated:18/08/1996, Electrical Schematic diagram of the Original Machine

- E050813.DOC Dated:01/06/2017, Operating instructions Superfinish GFP 800/900

1.3 Technical Data of the machine

Output data of machine/range – parameters

Fabric speed	Nominal		4-40 m/min	
	Normal operations		15-25 m/min	
Pressure belt tension				
Electric		Min.	12	%
		Max.	100	%
Surface pressure on Fabric		Max.	24	N/cm2
Tension of felt band				
Pneumatic		Min.	20	%
		Max.	100	%
		Pe	2/10	bar
Surface pressure on fabric		Max.	0.7	bar
Temperature				
Effect cylinder		Max.	160	C
Setting/normal operation			130-145	C
Heating cylinder		Max.	160	C
Setting/normal operation			140-150	C
Steaming boxes heating		Max.	150	C
Setting/normal operation			140	C
Water tank of Weko humidifier		Max	50	C
Steam throughput of steaming boxes			0-100	%
Setting normal operation			30-70	%
Suction /Post decatizing unit				
Possibility of throttle at suction socket			8-9	A
Depending on state of cylinder wrapping				

1.4 Description of machine
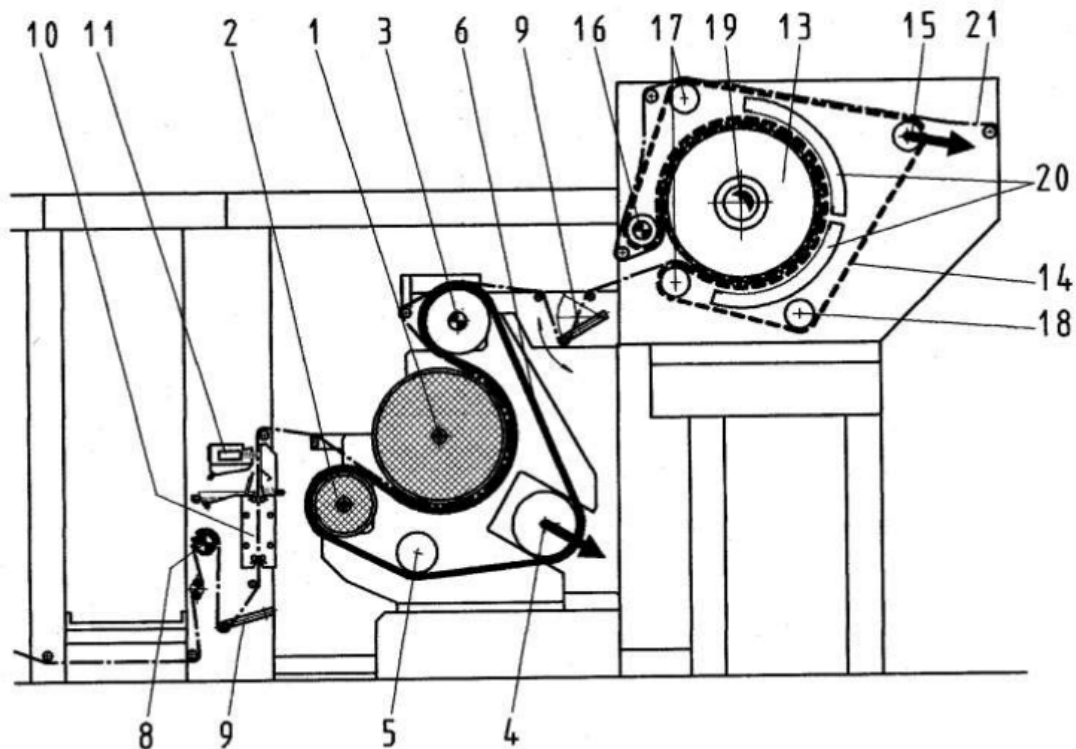
1	Effect cylinder	13	Post-decatizing cylinder with wrapping
2	Heating cylinder		
3	Drive roller for pressure belt	14	Pressure belt
4	Tensioning roller	15	Tensioning roller
5	Belt control roller	16	Drive roller for pressure belt
6	Pressure belt	17	Deflection roller
8	Draw roller	18	Belt control roller
9	Dancer roller	19	Suction
10	Steam lock	20	Steaming box
11	Weko	21	Fabric

1.5 Technological Process

Just before the treatment, controlled moisture is applied to the fabric to be processed. This is followed by pressing and compacting by the pressure belt, pretensioned by a tensioning device, which presses the fabric against the effect cylinder.

By heating the pressure belt and the effect cylinder, controlled heat is applied to both sides of the fabric. The heated pressure belt is absolutely impermeable and seals the fabric completely against the atmosphere so that the moisture fed to the fabric is converted into steam reaching temperatures of up to 140°C. In this process the machine produces the necessary steam itself and this is constantly adjusted to the degree of moisture in the incoming fabric. So, the effective temperature inside the fabric core can be altered immediately by adjusting the pressuring force.

This is of special advantage in the continuous operation when changing the type of article to be treated, because normally temperature values can be altered only very slowly. After steaming and setting treatment the fabric is post-decatizing.

This post-decatizing process is carried out on a permeable treatment cylinder with a circulating, also permeable pressure belt of felt. A suction fan provides negative pressure inside the cylinder, so that first steam and then cooling air passes through the fabric running between the cylinder and the felt band at a preset surface pressure.

By means of this procedure - i.e., continuous steaming and setting treatment and post-decatizing at an adjustable surface pressure - classical roll-decatizing effects, press lustre and finish effects can be achieved. The system ensures reproducibility of the desired effects, i.e., touch, lustre, volume and intensity

2. Control System Development Overview

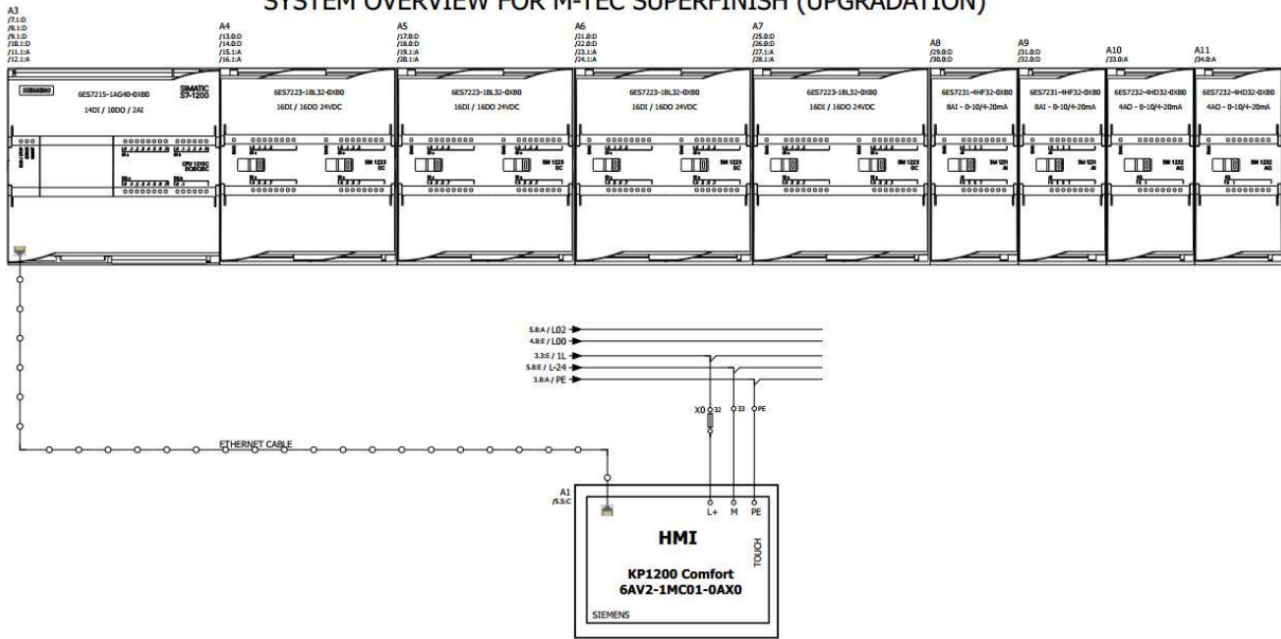The Delivery of the Control System runs through a set of Project Phases with a schedule as outlined below

2.1 Project Phases

Flow chart
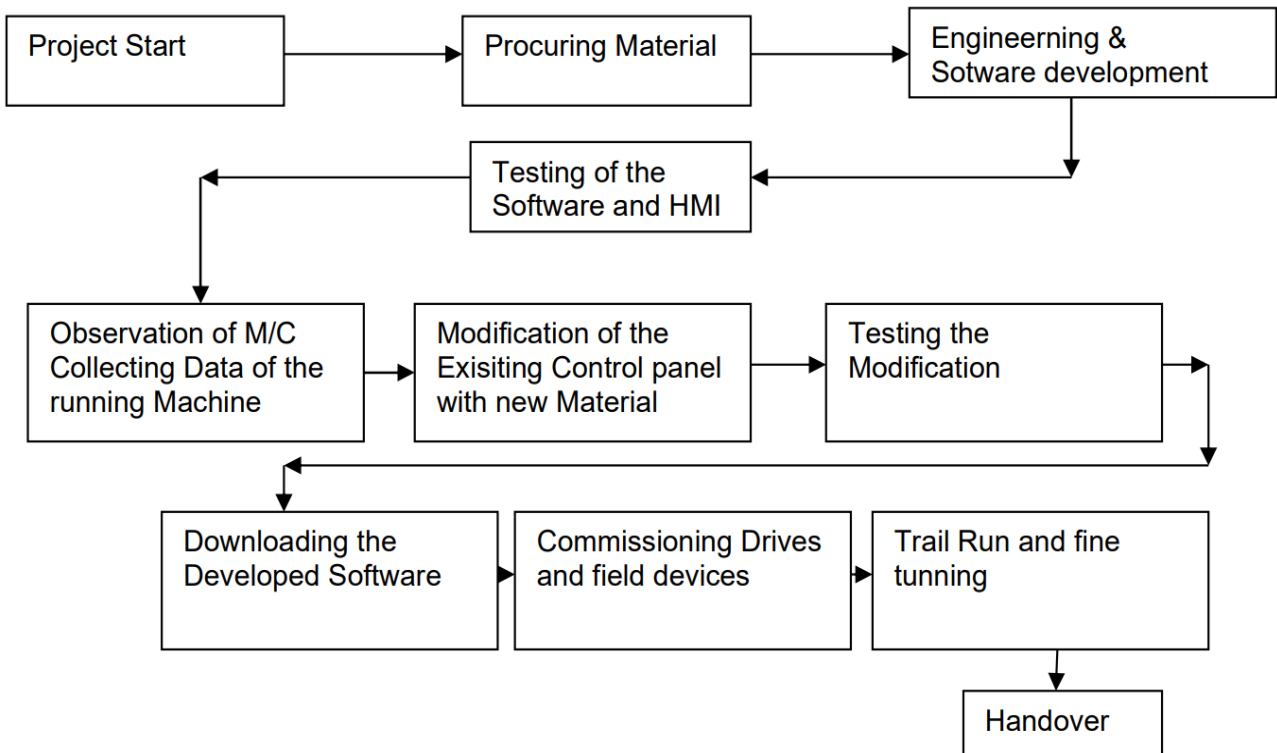
2.2 System Architecture

SYSTEM OVERVIEW FOR M-TEC SUPERFINISH (UPGRADATION)

3. Operation of Machine

3.1 Modes of Control

This machine can be operated either in AUTO or MANUAL Mode depending on the selection by the operator.

3.1.1 Manual Mode

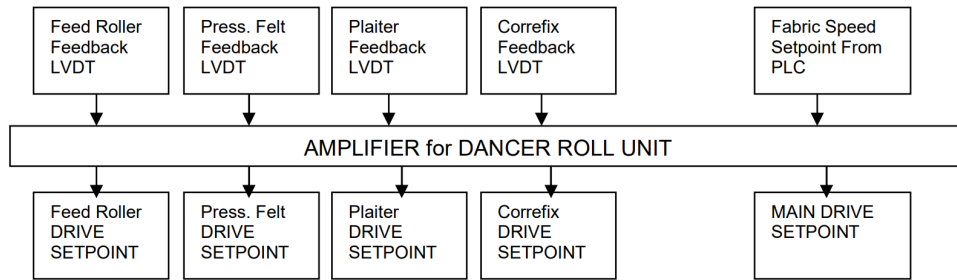Individual devices can be operated with basic interlock from the HMI.

If the individual device has indication, those will be blinking if it is operated in manual operation

3.1.2 Auto Mode

On press of start all devices will start working in a synchronized manner depending on the Parameters selected from the Recipe.

3.2 Individual Functions

3.2.1 DANCER ROLL UNIT

Feed Roller Feedback LVDT	Press. Felt Feedback LVDT	Plaiter Feedback LVDT	Correfix Feedback LVDT	Fabric Speed Setpoint From PLC

AMPLIFIER for DANCER ROLL UNIT

Feed Roller DRIVE SETPOINT	Press. Felt DRIVE SETPOINT	Plaiter DRIVE SETPOINT	Correfix DRIVE SETPOINT	MAIN DRIVE SETPOINT

Dancer Roll unit drives the machine at the set speed defined through the HMI. Main Roller and all the other rollers are synchronized by this unit.

3.2.2 SCRAY

Scray is a trough where fabric is collected in folds so that it passes through the machine easily. When scray is selected as Manual it can be operated by the Manual forward and reverse command.

Scray Drive runs in a synchronized ratio with the Machine actual speed. Scray Overcharged signal increases the speed when it is activated and decreases the speed when it is deactivated.

3.2.3 CORREFIX

Straightening is carried out on two wheels equipped with pins at their circumference pinning up the fabric selvedges. The pin wheels are not driven and thus individually free-running. During rotation of the pin wheels the slanted position of the wheels affects stretching of the distorted weft.

Needle wheel movement is based on the Needle Limit switch in Manual operation, in auto along with Limit switch photo sensor signals are also interlocked.

Photo sensor	Limit Switch	Output
Photocell left pinwheel to outside corefix	Limit switch left pin wheel outside correfix	Left Pin Wheel to outside
Photocell left pin wheel to inside corefix	Limit switch left pin wheel inside correfix	Left Pin Wheel to inside
Photocell right pinwheel to outside corefix	Limit switch right pin wheel outside correfix	Right Pin Wheel to Outside
Photocell left pinwheel to inside corefix	Limit switch right pin wheel inside correfix	Right Pin Wheel to Inside

3.2.4 FABRIC GUIDE

Based on the Analog input s (Actual Value Fabric guide left and Right) Fabric guide left and right Valves are operated.

3.2.5 FEED ROLLER

Feed roller is enabled when the Main roller starts rotating; synchronized speed reference from Main roller is feed to Feed Roller to enable smooth operation.

3.2.6 STEAM LOCK

Steam Lock is enabled from HMI by the operator.

3.2.7 WEKO

The value of the water flow meter (7) represents the actual value which works in closed loop with the desired values (setpoints). The quantity regulation of the water feed by the rotor humidifier (Weko) is affected via speed regulation of the water pump's (4) drive motor (3). The flow quantity is preset at the operating panel. The setpoint values are first found out empirically for each fabric quality. Any deviations from the desired values are re-adjusted fully automatically. The water heating (2) is set to a temperature of 40°C.
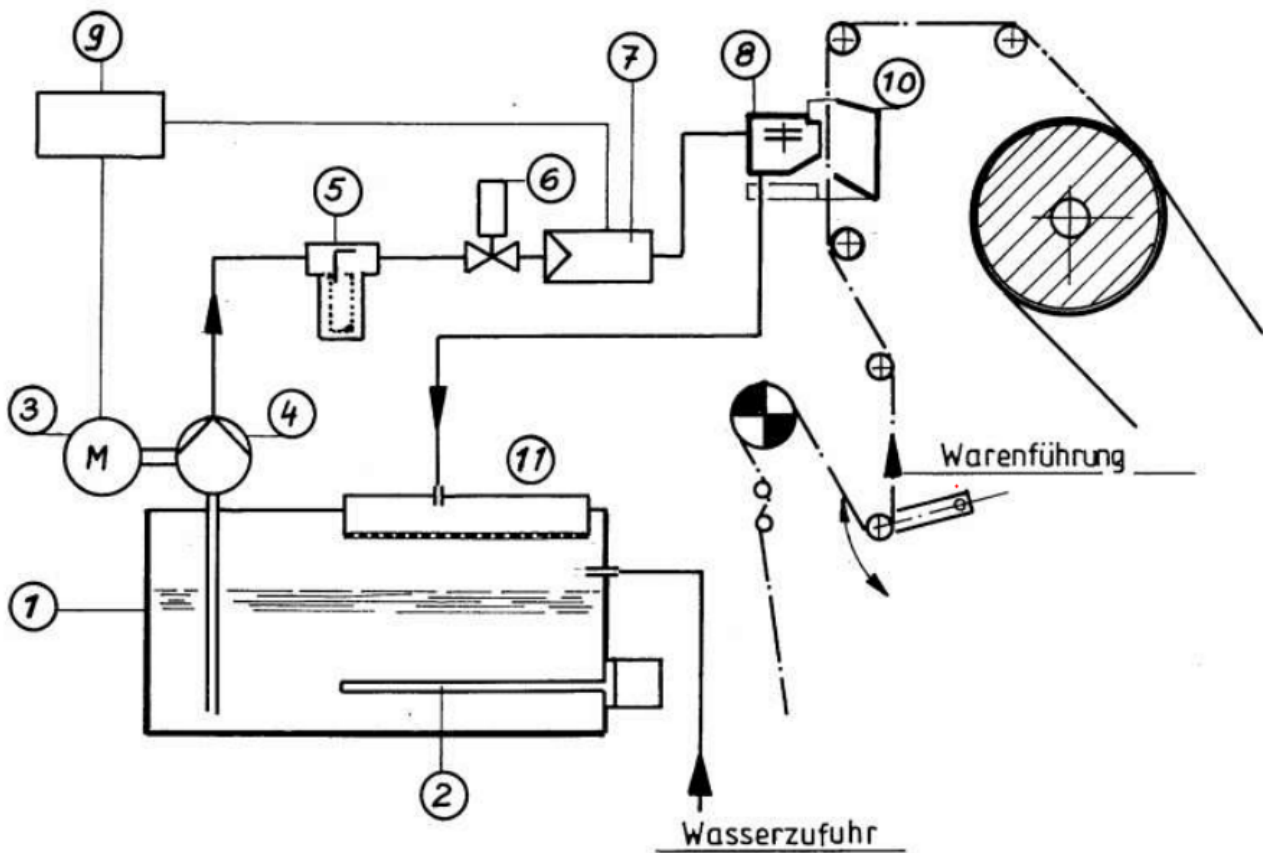
1	Feed unit - water	7	Flow meter
2	Heating - water	8	Rotor humidifier - Weko
3	Motor - frequency controlled	9	Control unit (SPS)
4	Pump for water	10	Collector sheet
5	Water filter in feed line	11	Cap with sieve in reflux
6	Magnetic valve		

3.2.8 HEATING CYLINDER

Heating Cylinder Heat control using thermistor and TRIAC circuit, Actual temperature of the Heating cylinder is feed to PLC using a temperature sensor connected to Analog input, based on the Setpoint from the HMI Heating and cooling outputs are triggered by the PLC which is connected to a TRIAC

3.2.9 EFFECT CYLINDER

Effect Cylinder Heat control using thermistor and TRIAC circuit, Actual temperature of the Heating cylinder is feed to PLC using a temperature sensor connected to Analog input, based on the Setpoint from the HMI Heating and cooling outputs are triggered by the PLC which is connected to a TRIAC

3.2.10 BELT CONTROL

Belt control starts with machine start in auto mode and in manual mode it can be operated from HMI. In auto mode Band Limit switch will control in opposite direction.

3.2.11 DECATIZING FELT

Decatizing Felt Stays in the Band using the Band limit, when it moves to limit opposite direction valves are operated.

3.2.12 SUCTION COOLING BELT

Suction Cooling Belt is operated directly from the HMI

3.2.13 PLAITER

Fabric can be folded in two patterns using the Plaiter arrangement, desired pattern is achieved using the clutch and the brake arrangement.

3.2.13.1 Movable Plaiter

By operating the Forward and Reverse inputs Plaiter can be moved forward and reverse.

3.2.13.2 Flat fold

To form Flat fold pattern, Brake is released and Clutch is engaged

3.2.13.3 Sanford

To form Sanford pattern, Brake is applied and clutch is released when it reaches the end and hold for some time and Brake is released and clutch is engaged to create a Pendulum action which stops when it reaches the right and left ends.

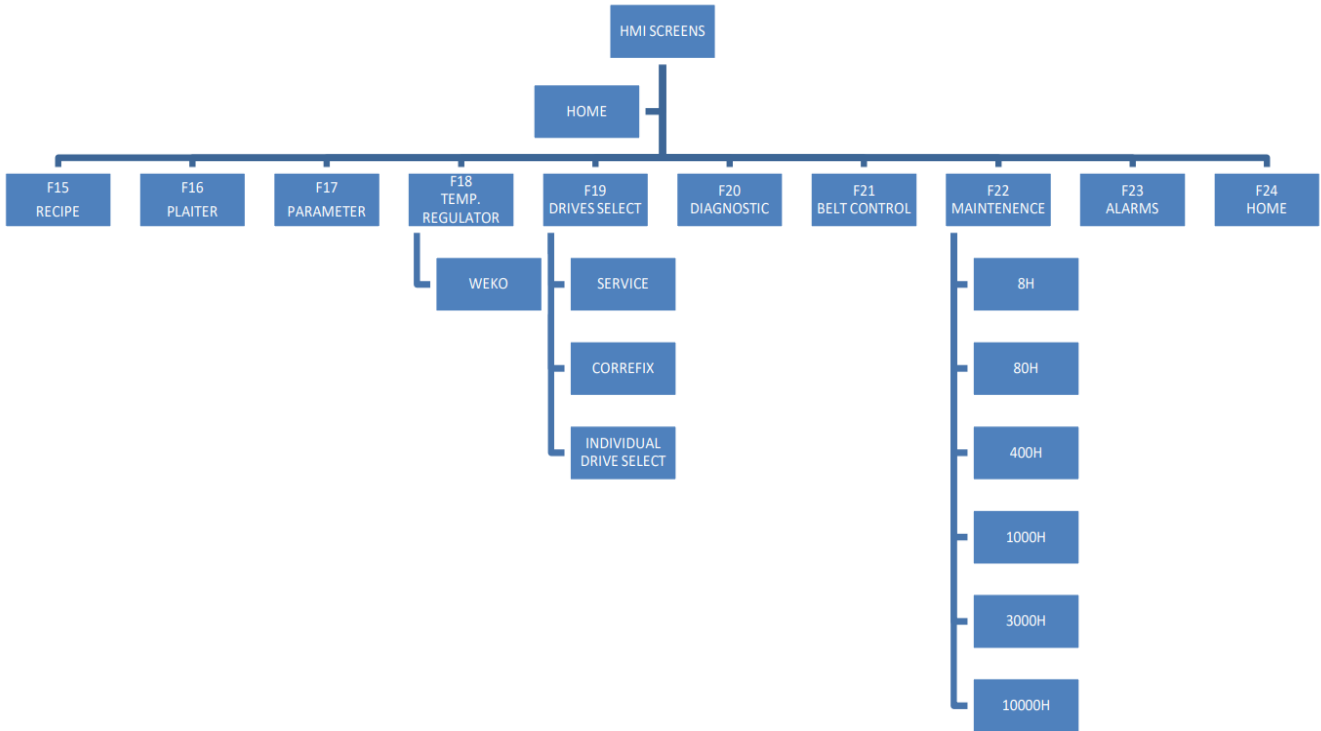# 4. Safety

4.1 List of Safety Devices

- Emergency /Off Switches
- Stop from Door limit Switches
- Safety hood
- Pull cord Switches
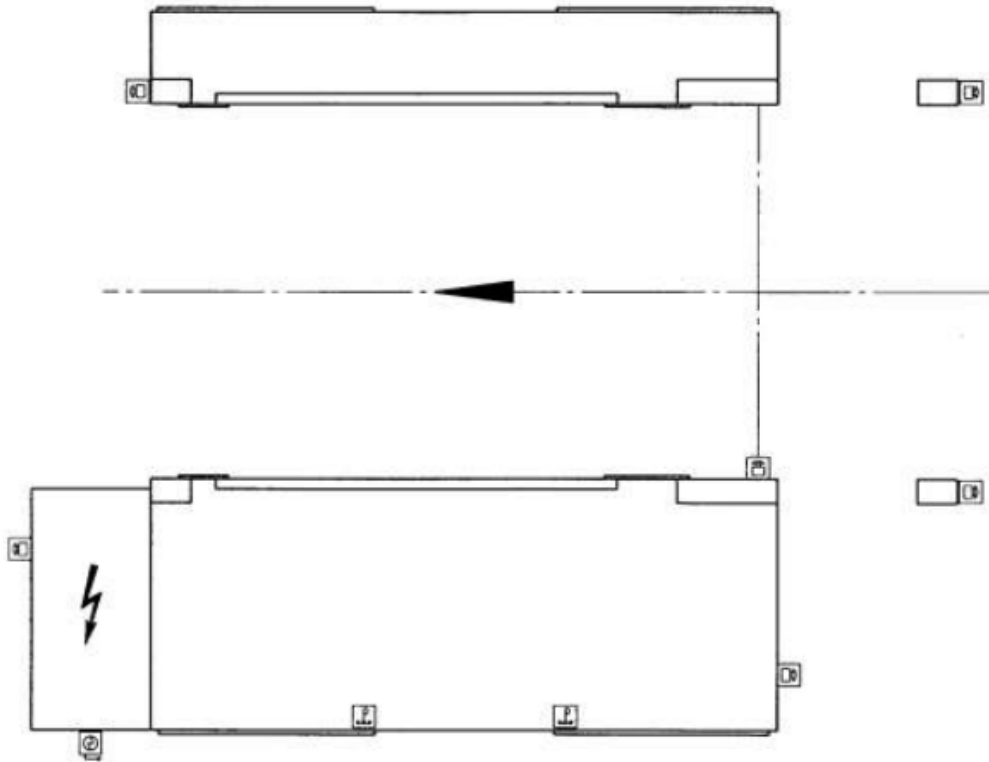
⊕	Electric main switch
🔒	Emergency off switch
⊢	Door switch
🔒	Emergency off - Pull cord

5. HMI

5.1 HMI HIERARCHY

5.2 USER ADMINISTRATION

Three levels of users are used
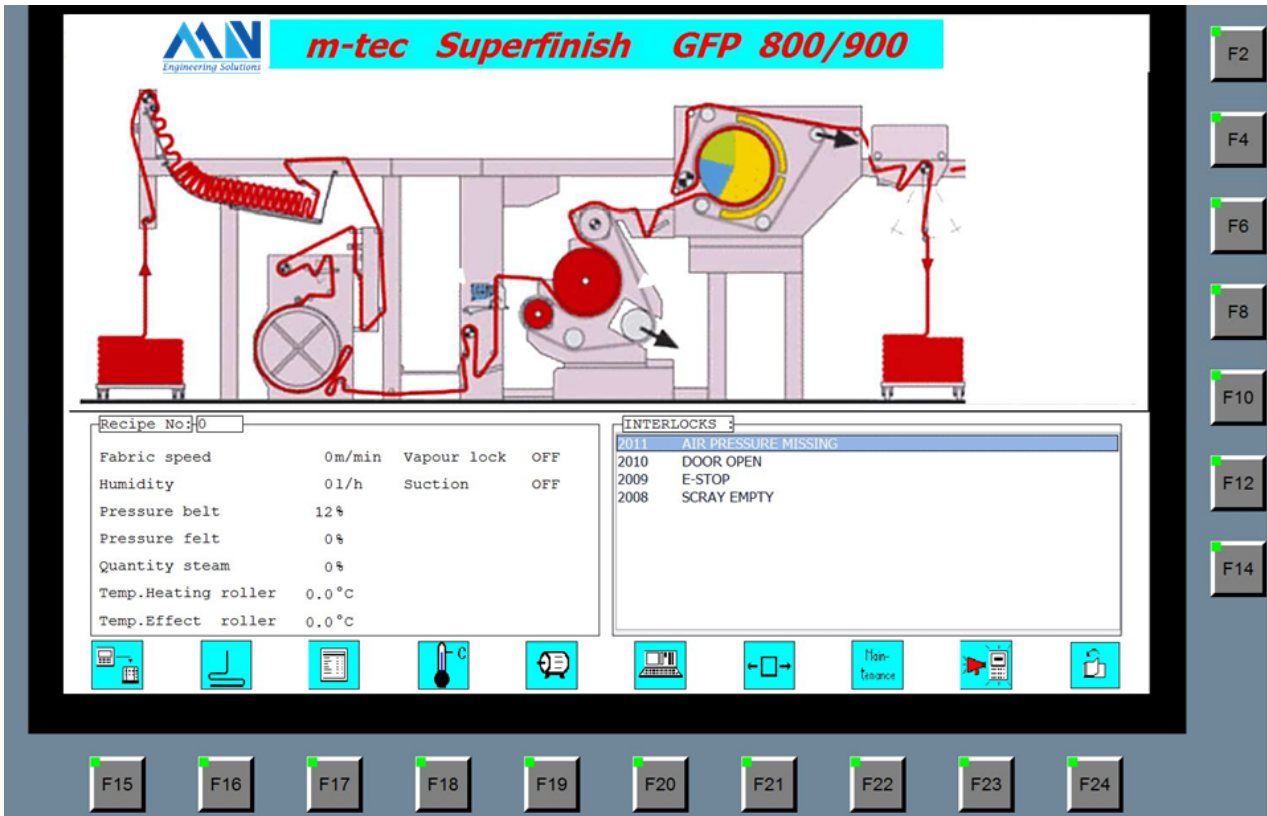
- Operator
- Engineer
- Admin

5.3 DIAGNOSTIC INFORMATION

Basic PLC Diagnostic information can be viewed from the HMI without connecting Programmer to the PLC.
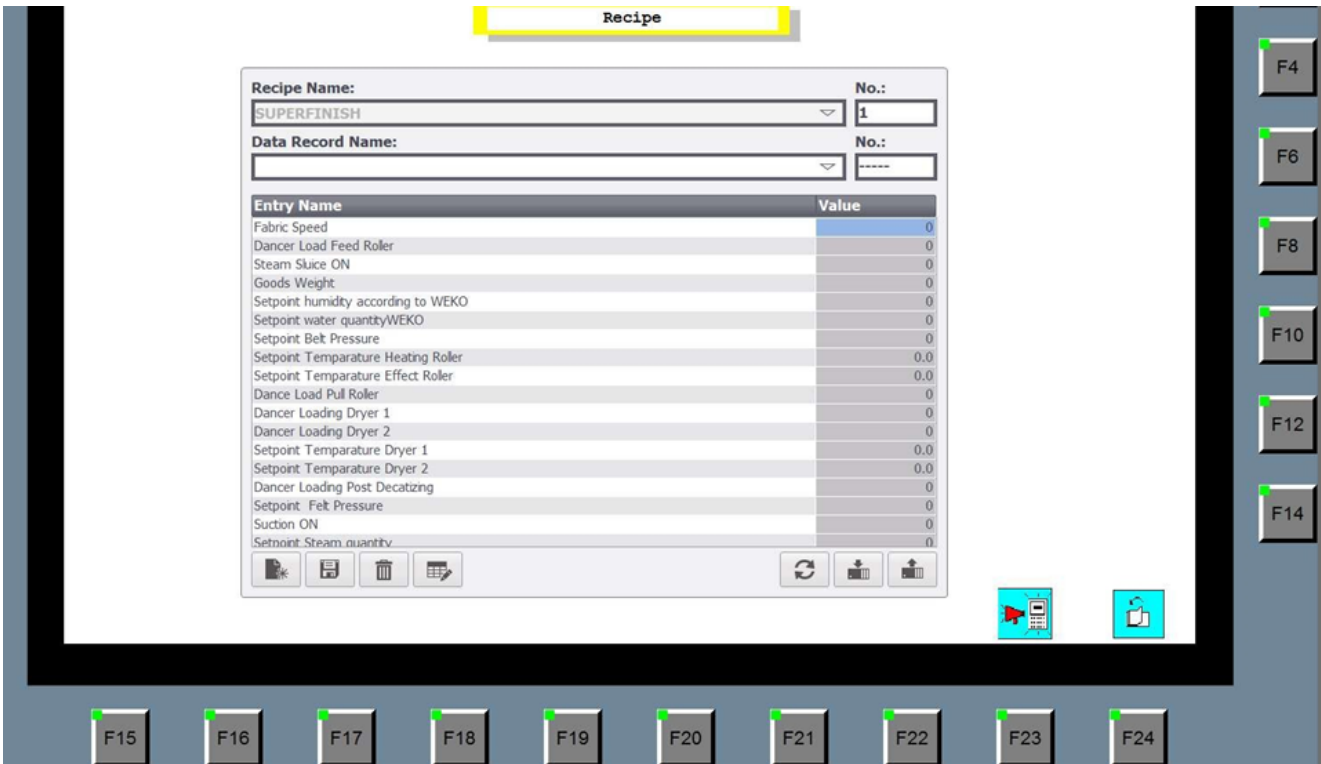
5.4 SCREENS

Below are the HMI Screens Developed for the Revamp.
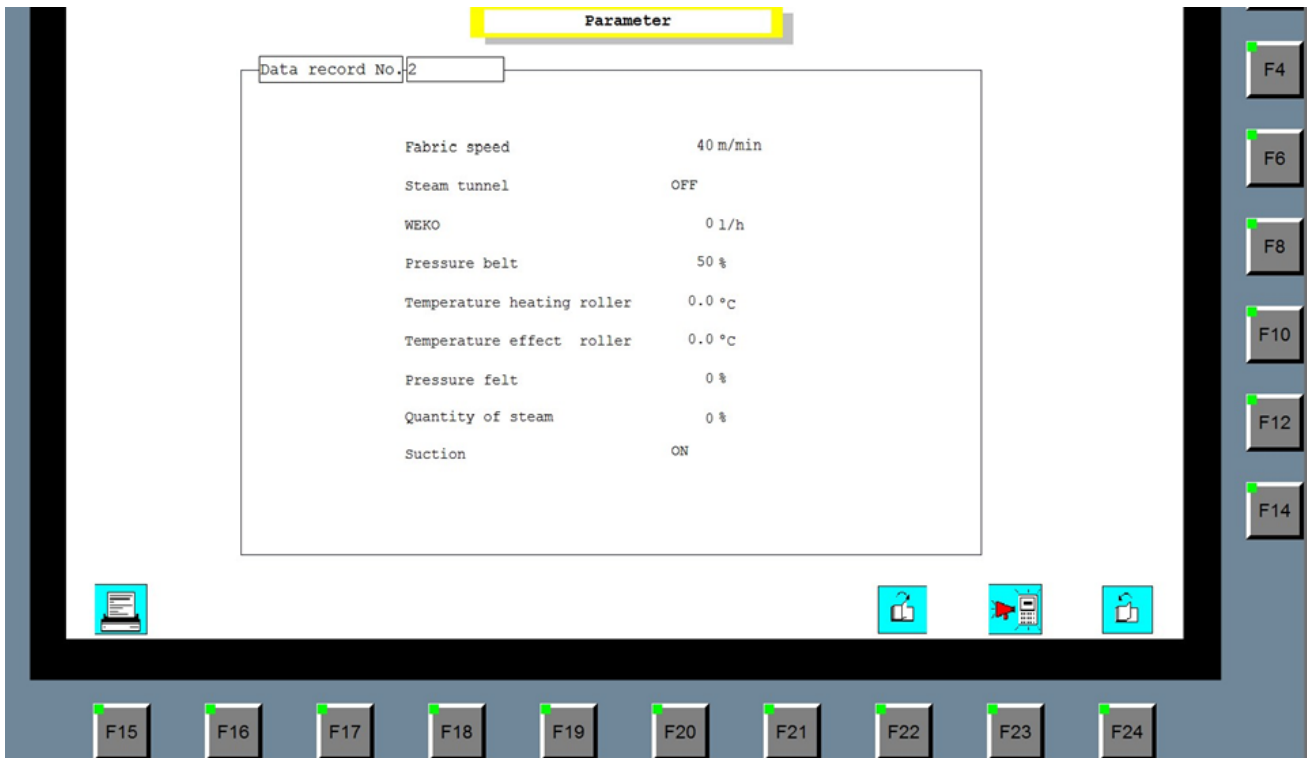
Home Screen

Recipe Screen

Plaiter Screen

```
                        SANFOR-STOP-PLAITER



                Extention off the loop after

                     0  plaits by one cm each.

                Lenght after RESET is        15 cm.
```

F4 F6 F8 F10 F12 F14

F15 F16 F17 F18 F19 F20 F21 F22 F23 F24

Parameter Screen

```
                              Parameter

        Data record No. 2

                Fabric speed                40 m/min

                Steam tunnel              OFF

                WEKO                         0 l/h

                Pressure belt               50 %

                Temperature heating roller  0.0 °C

                Temperature effect  roller  0.0 °C

                Pressure felt                0 %

                Quantity of steam            0 %

                Suction                   ON
```

F4 F6 F8 F10 F12 F14

F15 F16 F17 F18 F19 F20 F21 F22 F23 F24

Temperature Regulator Screen

TEMPARATURE REGULATOR

Heating Roller

Set point:	0.0 °C
Actual Value:	0.0 °C
Range:	5.0 °C
Hysteresis:	0.0 °C
Offset:	0.0 °C

Effect Roller

Set point:	0.0 °C
Actual Value:	0.0 °C
Range:	8.0 °C
Hysteresis:	0.0 °C
Offset:	0.0 °C

WEKO

F4 F6 F8 F10 F12 F14

F15 F16 F17 F18 F19 F20 F21 F22 F23 F24

Drive Select Screen

Drive Select

Drive Correfix

Drive Scray

Drive Infeed Roller

Drive Main Drive

SERVICE   CORREFIX

F4 F6 F8 F10 F12 F14

F15 F16 F17 F18 F19 F20 F21 F22 F23 F24

Diagnostic

Belt control Screen

Maintenance Table Screen

Maintenance tables

3h	1000h
80h	3000h
400h	10000h

F4
F6
F8
F10
F12
F14

F15 F16 F17 F18 F19 F20 F21 F22 F23 F24

Alarms Screen

Alarms

No.	Time	Date	Status	Text	Acknowledge group
2011	2:56:56 PM	10/31/2017	IA	AIR PRESSURE MISSING	0
2010	2:56:56 PM	10/31/2017	IA	DOOR OPEN	0
2009	2:56:56 PM	10/31/2017	IA	E-STOP	0
2008	2:56:56 PM	10/31/2017	IA	SCRAY EMPTY	0
2061	3:14:23 PM	10/31/2017	I	10000H SERVICE EXCEEDED NO RESTART POSIBLE	0
2060	3:08:08 PM	10/31/2017	I	3000H SERVICE EXCEEDED NO RESTART POSIBLE	0
2052	3:06:02 PM	10/31/2017	I	1000H SERVICE REQUIRED	0
2051	3:04:47 PM	10/31/2017	I	400H SERVICE REQUIRED	0
2059	3:04:42 PM	10/31/2017	I	1000H SERVICE EXCEEDED NO RESTART POSIBLE	0
2050	3:04:02 PM	10/31/2017	I	80H SERVICE REQUIRED	0
2049	2:58:02 PM	10/31/2017	I	8H SERVICE REQUIRED	0
2029	2:56:56 PM	10/31/2017	I	DRIVE BELT CONTROL FAILED	0
2028	2:56:56 PM	10/31/2017	I	HEATING WEKO FAILED	0
2027	2:56:56 PM	10/31/2017	I	DRIVE WEKO FAILED	0
2002	2:56:56 PM	10/31/2017	I	DRIVE PRESSURE BELT	0

F4
F6
F8
F10
F12
F14

F15 F16 F17 F18 F19 F20 F21 F22 F23 F24

Correfix Screen

Bypass Screen

Weko Regulator Screen

WEKO-Regulator

Trend	Tag connection	Value	Date/time
Actual	IstwWEKO	0	10/31/2017 3:09:14:838 PM
Setpoint	SollWEKO___1	0	10/31/2017 3:09:14:838 PM

Reinforcement	K =	0	
Proportional coefficient	P =	0	
Integration Time	TI =	0	
Actual Value	=	0	l/h
Set point	=	0	l/h
Setvalue	=	0	