

Contents

1. Outline of facility	2
2. General specifications	3
3. Specifications of equipment	10
4. Scope	31
5. Painting.....	34
6. Shop inspection	34
7. Packing and transportation	34
8. Installation	34
9. Warranty.....	34
10. Applicable equipment and materials	35
11. Applicable equipment and Codes	35
12. Safety regulations	35
13. Resale and Diversion.....	36
14. Documentation	37
15. Governmental procedures.....	37
16. Shop inspection and acceptance inspection.....	38
17. Utility Consumption Data /System.....	39
18. Equipment Mass Data (Estimate)	40
19. Acceptance Criteria	41

1. Outline of facility

This Coating System (hereinafter called "Equipment") shall be used in the sequential double side full width and stripe coating of battery materials onto the Al foils/Cu foils for the production of Lithium-ion batteries.

Equipment is composed of the following units:

	Q'ty/system	Cathode	Anode
(1) Unwinding Unit	One(1) unit	One(1) unit	One(1) unit
(2) 1st web guide controller	One(1) unit	One(1) unit	One(1) unit
(3) 1st Thickness Gauge	One(1) unit	One(1) unit	One(1) unit
(provided by Buyer)			
(4) 1st Coating Unit	One(1) unit	One(1) unit	One(1) unit
Including following units : Side-coating unit (cathode only)			
(5) 2nd Thickness Gauge	One(1) unit	One(1) unit	One(1) unit
(provided by Buyer)			
(6) 1st Drying Unit	One(1) unit	One(1) unit	One(1) unit
(7) 1st Feeding Unit (Including 2nd web guide controller)	One(1) unit	One(1) unit	One(1) unit
(8) 3rd Thickness Gauge	One(1) unit	One(1) unit	One(1) unit
(provided by Buyer)			
(9) 3ed web guide controller	One(1) unit	One(1) unit	One(1) unit
(10) 2nd Coating Unit	One(1) unit	One(1) unit	One(1) unit
Including following units : Side-coating unit (cathode only)			
(11) 1st Pass Roll	One(1) unit	One(1) unit	One(1) unit
(12) 4th Thickness Gauge	One(1) unit	One(1) unit	One(1) unit
(provided by Buyer)			
(13) 2nd Drying Unit	One(1) unit	One(1) unit	One(1) unit
(14) 2nd Feeding Unit (Including 4th web guide controller)	One(1) unit	One(1) unit	One(1) unit
(15) 5th Thickness Gauge	One(1) unit	One(1) unit	One(1) unit
(provided by Buyer)			
(16) 2nd Pass Roll	One(1) unit	One(1) unit	One(1) unit
(17) 5th web guide controller	One(1) unit	One(1) unit	One(1) unit
(18) Half slitting Unit	One(1) unit	One(1) unit	One(1) unit
(19) 1st Rewinding Unit (Option)	One(1) unit	One(1) unit	One(1) unit
(20) 2nd Rewinding Unit(Including 6th web guide controller)	One(1) unit	One(1) unit	One(1) unit
(21) 3rd Rewinding Unit(Including 7th web guide controller)	One(1) unit	One(1) unit	One(1) unit
(22) Electrical Control Device	One(1) set	One(1) set	One(1) set

2. General specifications

2.1 Conditions for operation

(1) Applicable substrates

	Cathode	Anode
Material of Substrate	Aluminum Foil	Electrolytic copper Foil
Width (mm)	650 – 1,300	650 – 1,300
Thickness (μm)	10 – 20	4.5 – 10

Note. AL/Cu foil shall be free from sagging, uneven thickness and weight, oily surface and other factors in feeding and coating processes.

(2) Coating system : Slit Die Coating System

(3) Coating slurries

	Cathode	Anode	Insulator coating
Solid	NCM	Carbon	Al ₂ O ₃ , Boehmite
Solvent	NMP	H ₂ O	NMP
Solid Content (wt%)	70 – 80wt%	45 – 55wt%	25 – 40wt%
Specific gravity of slurry	2.0 – 2.6	1.2 – 1.6	1.2 – 1.6
Binder	PVDF	SBR/CMC/PAA	PVDF
Viscosity (mPa·s at 25°C)	2,000 – 15,000	2,000 – 12,000	1,000 – 8,000

*1: Rheological characteristics (Viscosity-Shear Rate chart) shall be indicated by Buyer before detail design.

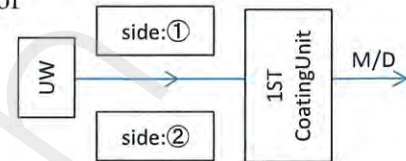
(4) Coating conditions

	Cathode NCM	Anode	Insulator coating
Wet Coat Thickness (μm/Side)			
Dry Coat Thickness (μm/Side) (g/m ² /Side)	200 – 350	110 – 180	-
Dry Side Coat Thickness (μm/Side)			40 – 60
Coating Width (mm)	Max. 1,250 Max. 1,280	Max. 1,250 Max. 1,280	Each 2 – 4
Coating speed (m/min)	20 – 80	20 – 80	20 – 80

Note1. Actual coating speed is depends on coating conditions, drying conditions and quality of products etc.

Note2. The values shown above indicate a settable range, not those for acceptance criteria. For acceptance criteria, see chapter 19.

- (5) Machine speed : 20 – 100 m/min
- (6) Installation site : Normal room
- A. Temperature
- (a) Site of Drying Unit : Not controlled (same temperature of the outdoor)
- (b) Others : $23 \pm 5^{\circ}\text{C}$
- B. Humidity
- (a) Site of Drying Unit : Not controlled (same humidity of the outdoor)
- (b) Others : $30 \pm 15 \% \text{RH}$ (without dewing)
- C. Atmosphere : Partially explosion-proof
- D. Cleanliness : Class 10,000
- (7) Tending side of machine : TBD



- (8) Installation space : Approx. W8.5 x L102 x H6.0 m (1 line Equipment size)
Exclude maintenance-space, ducting Exhaust-fans and other
- (9) Operation rating : 24Hr/day 28days/month *1month:31days

2.2 Utilities (Provided by Buyer)

- (1) Power supply
- A. For power : AC380V $\pm$ 10%, 50 Hz, 5 phases(R,S,T,E,N)
- B. For power(Thickness gauge) : AC220V $\pm$ 10%, 50 Hz, Single phase
- C. For control & instrumentation : (Transformed in the control panel)
- (2) Compressed air : 0.7 MPaG (Oil free, Water free)
Seller recommended value:Dew point:-40°C, Oil 0.1mg/m³
(Same as JIS B 8392 Class2)
- (3) Heat source : Thermo oil (0.3-0.5MPaG, 250°C at battery limit)
- (4) Earth
- A. For power circuit line : 100 Ω (Ohm) or less
- B. For signal circuit line : 10 Ω (Ohm) or less
- C. For intrinsic circuit line : 10 Ω (Ohm) or less
- (5) Cooling water (equivalence tap water) : 0.2MPaG, 10°C(at battery limit)

2.3 Explosion-proof (Officially approved in Japan, Cathode only)

- (1) Range from Coating Unit
 - A. Motor : Air purge
 - B. Solenoid valve : Air-purge
 - C. Sensor : Intrinsically explosion-proof or Air-purge
 - D. Coating Unit operation panel: Air-purge
- (2) ~~Range from Drying Unit~~
 - A. ~~Motor~~ : ~~Pressure-resistant explosion-proof (d₂G₄)~~
 - B. ~~Thermo-resistance~~ : ~~Pressure-resistant explosion-proof (d₂G₄)~~
 - C. ~~Gas density meter~~ : ~~Pressure-resistant explosion-proof (d₂G₄)~~
 - D. ~~Control valve~~ : ~~Not explosion-proof grade~~
- (3) Others : Not explosion-proof grade

2.4 Roll specifications

(1) Precision of a single roll

	Tolerance of outer diameter (mm)	Roundness (mm)	Cylindricity (mm)	Run out (mm)
Metallic roll (Back-up roll)	±0.5	0.002	0.002	0.002
Metallic roll (Other roll)	±0.5	0.02	0.02	0.05
Rubber roll	±0.2	0.15	0.2	0.3

(2) Precision for roll assembly

	Parallelism (mm)		Levelness (mm/m)
Between metallic and metallic roll	0.05	Metallic roll	0.05
Between metallic and metallic roll (In Drying Unit)	0.1	Metallic roll (In Drying Unit)	0.1
Between M/C and M/C roll	0.1	Rubber roll	0.2
Between metal and rubber roll	0.2		

(3) Roll dimension, others

	Roll dimension (mm)	Surface treatment	Surface roughness	Materials
Back-up roll (Metallic roll)	OD300 x L1,400	HCr plating	Ry0.8	SS400 or equivalent
Guide roll (Metallic roll)	OD120 x L1,450 OD110 x L1,000	HCr plating	Ry0.8	SS400 or equivalent
Feed Roll Unit (Metallic roll)	OD200 x L1,450 OD150 x L1,000	HCr plating	Ry0.8	SS400 or equivalent
Feed Roll Unit (Rubber roll)	OD150 x L1,450 OD120 x L1,000	Covered with EPDM rubber (HsA75)	---	SS400 or equivalent
EPC roll	OD120 x L1,500	HCr plating	Ry0.8	SS400 or equivalent

2.5 Painting

(1) Paint material

- A. Machine : Epoxy or Melamine paint
B. Control panel : Melamine paint

(2) Paint color

- A. Machine : TBD
B. Control panel : TBD

2.6 Quantity manufactured

- A. Cathode : One (1) system
B. Anode : One (1) system

2.7 ~~Parameters for calculation of heater's capacity and exhaust volume (Drying Unit)~~

~~This parameters in this table are reference one for calculation of heater's capacity and exhaust volume of Drying unit~~

Varnish Item	Cathode NCM Metal oxide	Anode Carbon
	Al foil	Electrolytic Cu foil
Substrate	Al foil	Electrolytic Cu foil
Substrate thickness (μm)	10-12	10-6
Substrate width (mm)	1,300	1,300
Coating width (mm)	1,250	1,250
Viscosity (mPa·s)		
Solid content (wt%)	70	45
Binder	PVDF	SBR
Solvent	NMP	H ₂ O
Coating amount Dry (g/m ² , per side)	350	180
Varnish temperature (°C)	RT	RT
Coating speed (m/min)	80	80
Dryer temperature (°C)		
Zone 1	160	160
Zone 2	160	160
Zone 3	160	160
Zone 4	160	160
Zone 5	160	160
Zone 6	160	160
Zone 7	160	160
Zone 8	160	160
Zone 9	160	160
Zone 10	130	130
Zone 11	100	100
Zone 12	100	100
Nozzle Air Speed (m/sec)		
Zone 1 through 6 -(Roll Support zone)	Upper 15 Lower 15	Upper 15 Lower 15
Zone 7 through 12 -(Floating zone)	Upper 18 Lower 18	Upper 18 Lower 18
Max. exhaust capacity (%)		
Zone 1	4	4
Zone 2	10	10
Zone 3	10	10
Zone 4	12	12
Zone 5	12	12
Zone 6	12	12
Zone 7	12	12
Zone 8	12	12
Zone 9	12	12
Zone 10	10	10
Zone 11	8	8
Zone 12	4	4
Dryer length (m/zone)		
Zone 1 through 12	Each 6	Each 6
Gas density (LEL%)	30 or less	
Intake air temperature (°C)	40	40

~~Note: The coating speed stated above are reference parameters used for calculation of heater's capacity and exhaust volume of the Drying Unit.
Seller shall guarantee a drying process only stated in chapter 19.~~

2.8 The scope of work

No.	Item		Seller	Buyer
1	Transportation of Equipment	Seller's factory → Shanghai port , China	☐	
2	CIF works (Incoterms 2020, Shanghai port , China)		☐	
3	Installation work	Floor marking Unpacking , lifting, carry in Transfer to installation position Centering and fine adjustment		☐ ☐ ☐ ☐
4	Safety management			☐
5	Piping works and materials of Thermo oil	From factory's Boiler to Drying Unit (Each zone). In Drying Unit	☐	☐
6	Piping works and materials of water	From factory's chiller unit to Feeding Unit. In Feeding Unit	☐	☐
7	Piping works and materials of compressed air	From factory's compressor to Equipment (Each unit). In Equipment	☐	☐
8	Wiring works and materials	From factory's panel boards to Control panel (Equipment). From Control panel to Equipment. The drawing of wiring diagram and wiring specification (From Control panel to Equipment) In Equipment	☐ ☐ ☐	☐ ☐
9	Ducting works and materials	From out of the factory to supply fan From exhaust fan to out of the factory or solvent recovery system From supply fan to Drying Unit (Each zone) From exhaust fan to Drying Unit (Each zone) From outlets of circulation fan to Drying Unit (Box) Works Materials From inlets of circulation fan to Drying Unit (Box) Works Materials	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
10	Insulation works and materials	All ducts (Include Drying Unit's ducts) All thermo oil pipes (Include Drying Unit's thermo oil piping) Drying Unit (Box)	☐	☐ ☐

No.	Item		Seller	Buyer
11	Utilities	Electric source, thermo oil, compressed air, water		☐
12	Frame	For Equipment (Item stipulated in this specification document)	☐	
		For Equipment (Item not stipulated in this specification document)		☐
		For operator (Item stipulated in this specification document)	☐	
		For operator (Item not stipulated in this specification document)		☐
13	The materials of test run	The core of unwinding and rewinding shaft (Seller's and Buyer's factory)		☐
		Foil (Seller's and Buyer's factory)		☐
		Slurry (Buyer's factory)		☐
14	Measuring instrument	Micro gauge, Electronic balance, Punching unit etc.		☐
15	Thickness gauge	β -ray source provide by Buyer		☐
16	Inspection unit			☐
17	Solvent recovery system			☐
18	PC for data logging			☐
19	Fire extinguishing system, fire protecting equipment			☐
20	Spare parts	Refer to chapter 3.23 Spare parts	☐	
21	Items not stipulated in this specification document			☐

3. Specifications of equipment

3.1 Unwinding Unit

- (1) Type : 2-axis turret automatic splice type
- (2) Unwinding direction : Upward and downward unwinding
Automatic splice is applied only in the downward unwinding direction.
- (3) Substrate diameter : Max. 850 mm
- (4) Substrate mass : Max. 1,000 kg/Roll
- (5) Core (Provided by Buyer)
 - A. Material : Carboard, steel, plastic
 - B. Size
 - (a) 6 inch core : ID 152.4 ± 0.5 mm x OD 172 ± 0.5 mm x L $1,700 \pm 3$ mm
- (6) Core chucking : Air Chuck
 - A. Type : Pneumatic cylinder type
 - B. 6 inch adapter : Not installed
 - C. Core support : Fixed type installed
- (7) Side lay : Installed
 - A. Type : ~~Manual~~ Automatically
 - B. Stroke : ± 20 mm
- (8) Unwinding tension : 50 – 350 N/full width (Target Less than ± 5 N)
- (9) Tension control : Constant-tension controlled by dancer roll (with monitoring by tension detector)*

* The detecting values of tension (OS/DS) are indicated separately on a HMI.

- (10) Turret Unit : Installed
 - A. Turret speed : 1 r/min
- (11) Splice equipment
 - A. Type : Automatic overlapping splice

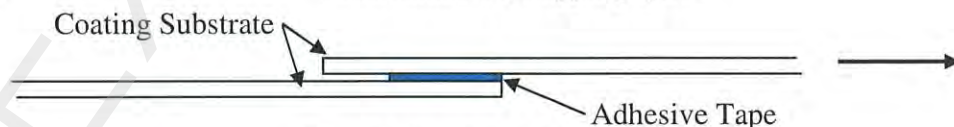


Fig.-1 Joint construction

- B. Applicable substrate diameter: Min. 200 mm
 - C. Splice method : Nip-roll + adhesive tape
Adhesive tape should be affixed beforehand of the substrate loading by hand.
- (12) Cutter : Equipped with tooth blade cutter to cut remained substrate.
- (13) Tray with vacuum blower : Installed under the brade.
 - A. Vacuum blower : Provided by Buyer
- (14) Unwind length display : Indicated on Unwinding Unit Operation Panel and Coating Unit Operation Panel

Remaining foil length ≤ 15 m *

*Enter a correct amount of core-diameter

- (15) Electrostatic eliminator : Not installed
- (16) Drive motor (Not explosion-proof type)
 - A. For unwinding shaft : AC motor..... 2 units
 - B. For turret drive : AC motor..... 1 unit
 - C. For side lay : AC motor..... 2 units
- (17) Load/Unload of substrate/core : Buyer's scope
- (18) Clean air system : Not installed
- (19) Manually splice unit : Installed
- (20) Enclosure
 - A. Substrate passage part : Not installed
 - B. Drive part : Installed
- (21) Safety parts for AGV : Buyer's scope
- (22) Magnetic bar : Not Installed

3.2 1st Web guide controller

- (1) Type : Center pivot CPC type
- (2) Edge sensor : Ultrasonic type
 - A. Type : Ultrasonic
 - B. Edge sensing accuracy : ± 0.3 mm
- (3) Stroke : ± 30 mm
- (4) Drive motor (Not explosion-proof type)
 - A. For guide roll Unit : DC motor..... 1 unit
 - B. For sensor positioning : AC motor..... 2 units

3.3 1st Thickness Gauge (Provided by Buyer)

- (1) Thickness Gauge : Provided by Buyer
- (2) Stand for installation : Provided by Buyer

3.4 1st Coating Unit(Including “Smart Coater”)

- (1) Type : Automated coating control system by using Slit Die (hereinafter called “Smart Coater”)

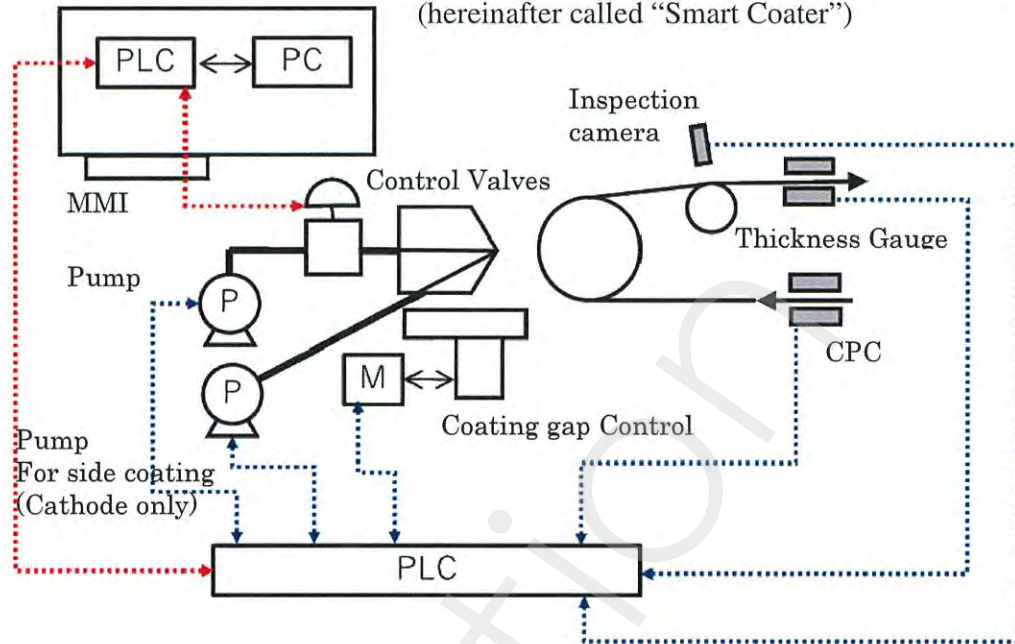


Fig. – 2 “Smart Coater” Automated coating system

- (2) Coating mode (single side continuous full width and stripe coating system)
- A. Continuous full width coating : Installed
 - B. Continuous stripe coating (6 lanes coating) : Installed
 - C. Intermittent full width coating : Not installed

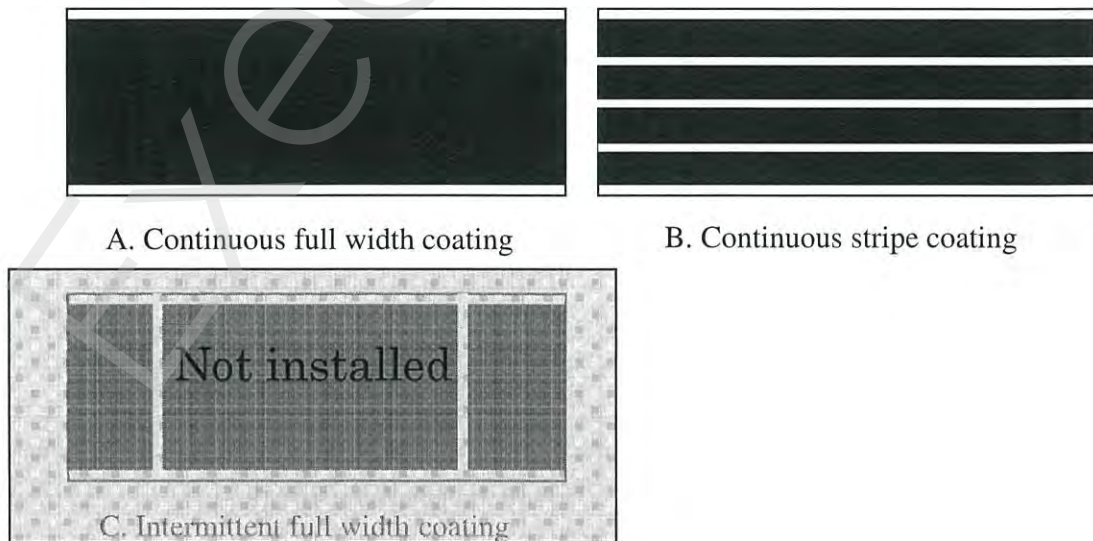
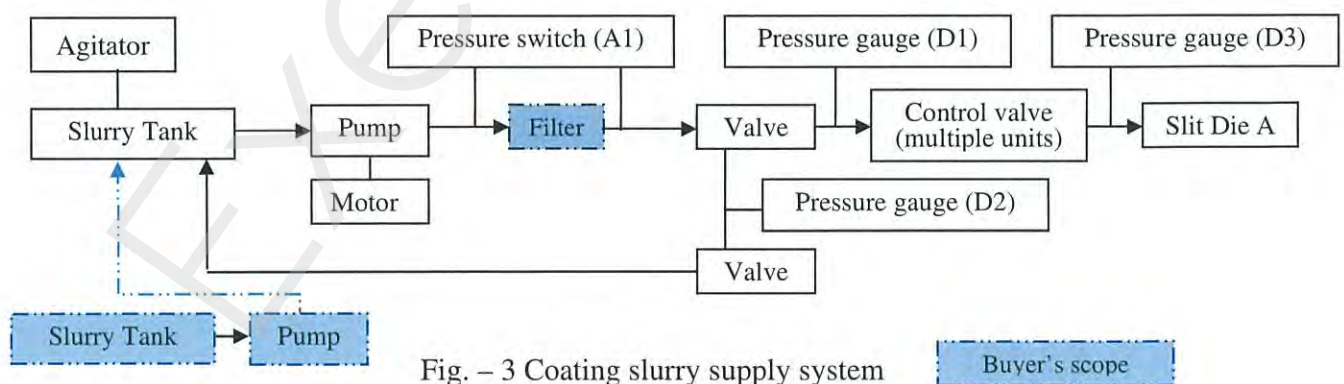


Fig. – 3 Coating pattern

- (3) Coating width : Max. 1,250 mm
- (4) Coating width adjustment
- A. Main coating width : By change the shim plate
 - B. Side coating width : By change the Slit Die or the shim plate
- (5) Intermittent coating method : Not installed

- (6) Slit Die for cathode (including side coat)
- A. Type : “Smart Coater” automated control type
 - B. Slit gap adjust mechanism : Installed, choke bar type
 - C. Suction chamber : Not installed
 - D. Quantity
 - (a) Slit Die : 1 set / system
 - (b) Shim plate : 1 piece / Slit Die
- (7) Slit Die for anode
- A. Type : ~~Double layers coating at once~~
“Smart Coater” automated control type,
~~for upper layer only~~
 - B. Slit gap adjust mechanism : ~~Not installed~~ Installed, choke bar type
 - C. Suction chamber : Not installed
 - D. Quantity
 - (a) Slit Die : 1 set / system
 - (b) Shim plate : 1 piece / Slit Die
- (8) Slit Die installation
- A. Gap adjustment
 - (a) Fine adjustment : Ball screw and AC servo motor with digital display
 - (b) Setback of Die : 65 mm stroke
 - B. Angle adjustment : Not installed
 - C. TD direction adjustment : Installed
 - (a) Settable stroke : ± 5 mm
- (9) TD direction coating profile adjustment : Valve control system
- A. Control valve
 - (a) Type : Globe valve
 - (b) Actuator : Pneumatic cylinder
 - (c) Position sensor : Installed
 - (d) Quantity : 10 units
 - (e) Spare : Not installed
- (10) Safeguard for hand pinch : Photo sensor
- (11) Coating slurry supply (for main coating, this unit compatibility to 2nd coating unit)
- A. Type : Installed on carrier cart type
Slurry storage tank and slurry feed pump system are individually movable.
 - B. Slurry storage tank
 - (a) Capacity : ~~400~~ 150 liter
 - (b) Temperature sensor : Installed (Resistance type)
 - (c) Agitator : Installed (AC servo motor driven)
 - (d) Level gauge : Static capacity type

- (e) Sampling port : 1 port (Manual valve)
- (f) Air purge port : 2 ports (Rc1/4,Max 100PaG)
- (g) Inlet port for slurry : 1 port 1.5S, sanitary flange)
- (h) Cooling jacket : Installed
- C. Slurry feed pump
 - (a) Type : Precision snake pump (HEISIN MOHNO Pump)
 - (b) Flow rate
 - (i) Cathode : ~~Max.25,000~~ 26,000 ml/min
 - (ii) Anode : ~~Max.17,000~~ 35,000 ml/min
- D. Filter : Not installed (Buyer's scope)
- E. Magnetic filter : Installed
- F. Flow meter : Not installed
- G. Pressure gauge
 - (a) For filter pressure switch : Installed (Digital type, 1 set/side)
(Alarm shall be sounded at setting vale)
 - (b) For continuous coating : Installed (Digital type, 3 sets/side)
- H. Valve : Air operate valve
- I. Piping : Sanitary type + PE tube
- J. Catch pan : Installed
- K. Quantity : (Slurry storage tank is installed each one (1) set /system)
 - (a) Cathode : ~~2~~ 1 sets/system
 - (b) Anode : ~~2~~ 1 sets/system



(12) Coating slurry supply (for side coating, Cathode only)

- A. Slurry storage tank
 - (a) Capacity : 50 liter
 - (b) Temperature sensor : Installed (Resistance type)
 - (c) Agitator : Installed (AC servo motor driven)
 - (d) Level gauge : Static capacity type
 - (e) Sampling port : 1port(Manual valve)
 - (f) Air purge port : 2 port(Max 100PaG)

- (g) Inlet port for slurry : 1 port(1.5S, sanitary flange)
 (h) Quantity : One(1) unit
- B. Slurry feed pump
 (a) Type : Precision snake pump (HEISIN MOHNO Pump)
 (b) Flow rate : Max.150 ml/min
 (c) Quantity : Six(6) units
- C. Filter : Installed
- D. Magnetic filter : Not installed (Buyer's scope)
- E. Flow meter : Not Installed
- F. Pressure gauge
 (a) For filter pressure monitor : Installed (Digital type, 1 set / pump)
 (b) For slurry : Installed (Digital type, 2 sets / pump)
- G. Valve : Air operated valve
- H. Piping : Sanitary type + PE tube

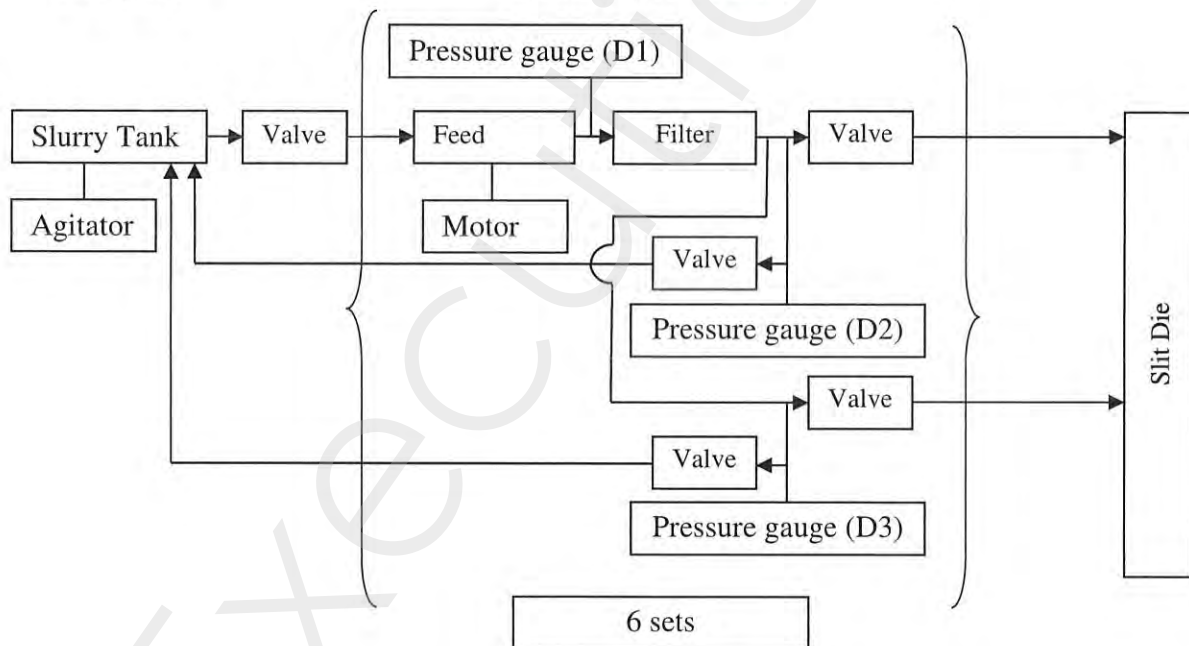


Fig.-5 Coating liquid supply system(insulator)

- (13) Spare slurry feed unit : Refer to Chapter 3.23
- (14) Spare Slit Die : Refer to Chapter 3.23
- (15) Slit Die change unit : Installed
- (16) Seam skip : Automatically skipped by splice signal
- (17) Electrostatic eliminator : Not installed
- (18) Nip roll unit
 A. Type : Nip roll type with metallic feed roll and rubber roll
 B. Press Unit : Pneumatic cylinder
 C. Rubber material : EPDM
 D. Gap adjustment : ~~Taper wedge type~~ Differential screw type
 E. Safeguard for hand pinch : Photo sensor

- (19) Drive motor
- A. For back-up roll : AC motor (Air purge)..... 1 unit
 - B. Slurry feed pump(for main coating) : AC motor (Air purge) 2 units
 - C. Slurry feed pump(for side coating) : AC motor (Air purge)..... 6 units
 - D. For gap adjustment of Slit Die : AC motor (Air purge)..... 2 units
 - E. Agitator(for main coating) : AC motor 2 units
 - F. Agitator pump(for side coating) : AC smotor 1 units
- (20) Speed stability
- A. Back-up roll : Less than $\pm 0.5\%$ at 100 m/min
(1st Coating unit only)
- (21) Gas density meter : Not installed
- (22) Lighting : Not installed
- (23) Clean air system : Not installed
- (24) Web cleaning unit : Not installed
- A. Type : Blow and vacuum type
 - B. Applicable width : 1,300 mm
 - C. Compressed air : Provided by Buyer
 - D. Vacuum blower : Provided by Buyer
 - E. Piping : Provided by Buyer
 - F. Conection
 - (a) Blowing chamber : TBD
 - (b) Vacuum chanber : ϕ 75
- (25) Magnetic bar : Installed (Total 2 sets per Coating Unit)
- A. Magnetic force : 12,000 G
- (26) Enclosure
- A. Substrate passage part : Not installed
 - B. Drive part : Installed
- (27) Clean booth : Not installed
- (28) Hygrometer : ~~Installed (Alarm shall be sounded at setting vale)~~ Not installed
- (29) Thermometer : ~~Installed (Alarm shall be sounded at setting vale)~~ Not installed
- (30) Camera unit (for coating width measurement) : Not installed (Buyer's scope)

3.5 2nd Thickness Gauge

- (1) Distance between Slit die and Thickness Gauge : Less than 1.5 m
- (2) Others : Same as 3.3 1st Thickness Gauge

3.6 1st Drying Unit

- (1) Type : Hot-air dryer of air floating type
- (2) Working temperature range : (60) 160 °C
- (3) Temperature Uniformity

Note

1. The temperature, pressure of oil ($\leq \pm 5^\circ\text{C}$) and fresh air temperature shall not be varied.
(temperature change rate : Within range $3^\circ\text{C}/30\text{minutes}$)
 2. Only three (3) zones randomly selected shall be inspected shall not be inspected.
- A. The difference between the measuring temp. and the actual temp. : Actual measured value $\leq \pm 1^\circ\text{C}$
~~✱Submitting the Inspection Report of Resistance Temperature Detector~~
 The difference between the displayed temp. and set values : Actual measured value $\leq \pm 2^\circ\text{C}$
 The difference in temperatures in the work object flow direction in Zone : Temperatures measured $\leq \pm 2^\circ\text{C}$
~~✱The temperatures measured at one point in the center of each of the upper, middle and lower nozzles shall be within the values stated in the left column~~
- B. The difference in temperatures in the nozzle width direction : Temperatures measured $\leq \pm 1^\circ\text{C}$
~~✱The temperatures measured at either end and the center of any randomly selected nozzle shall be within the values stated in the left column.~~
- C. Surface temperature $\leq$ Ambient temperature + 30°C
~~✱The temperatures measured 3 points .~~
 (any randomly selected. Exclude structure division)

(4) Drying-zone division

Zone No.	Operation temperature (°C)	Type of air nozzle	Nozzle air speed (m/sec)	Zone length (m)
1-7	(80) 160	Upper: Standard floating nozzle	5-15	Each 6
		Lower: Special floating nozzle	5-15	
8-9	(60) 160	Upper: Standard floating nozzle	10-18	Each 6
		Lower: Standard floating nozzle	10-18	
10	(60) 130	Upper: Standard floating nozzle	10-18	Each 6
		Lower: Standard floating nozzle	10-18	
11	(60) 100	Upper: Standard floating nozzle	10-18	Each 6
		Lower: Standard floating nozzle	10-18	
12	100 or (Fresh air temp.)	Upper: Standard floating nozzle	10-18	6
		Lower: Standard floating nozzle	10-18	

- (5) Temperature control system : PID control at 1-12 zone

- (6) ~~Gas concentration control system~~ : ~~Monitor with gas density meter (Explosion-proof type)~~
~~(Cathode only)~~
- A. ~~Over LEL 30%~~ : ~~Alarm shall be sounded.~~
- B. ~~Over LEL 50%~~ : ~~The line shall be stopped, and the exhaust fan shall be run at the max revolution.~~
- (7) ~~Blow-out nozzle air speed~~ : ~~Air speed adjustment with inverter control~~
~~Set value $\pm 1.5\text{m/sec}$~~
- (8) ~~Blow-out nozzle height adjustment~~ : ~~Adjustable 0-10 mm (manual)~~
- (9) ~~Gas density meter~~
- A. ~~Cathode~~ : ~~Installed at 1-12 zone (Total 12 sets/system)~~
- B. ~~Anode~~ : ~~Not installed (Setting ports is included)~~
- (10) ~~Manometer gauge (Indicated in display panel)~~
- A. ~~For blow-out nozzle~~ : ~~2 sets / zone (Total 24 sets / system)~~
- B. ~~For heating room~~ : ~~1 set / zone (Total 12 sets / system)~~
~~*In normal use control to negative pressure~~
- (11) ~~Manometer gauge (Not indicated in display panel)~~
- A. ~~For HEPA filter~~ : ~~1 set / zone (Total 12 sets / system)~~
- (12) ~~Support roller unit (For 8-12 zone)~~
~~: Installed (3 units per zone)~~
- (13) ~~Supply Fan~~ : ~~Not installed (Buyer's scope)~~
- (14) ~~Exhaust Fan~~ : ~~Not installed (Buyer's scope)~~
- (15) ~~Materials of construction~~
- A. ~~Area in contact with gas~~
- (a) ~~Air supply line~~ : ~~SUS304~~
- (b) ~~Air circulation line~~ : ~~SUS304~~
- (c) ~~Air exhaust line~~ : ~~SUS304 (Range from circulation duct to exhaust fan)~~
- B. ~~Outer panel of oven~~ : ~~SS400~~
- C. ~~Other structure parts~~ : ~~SS400~~
- D. ~~Insulation materials~~ : ~~Glass wool~~
- (16) ~~Filter~~
- A. ~~For air intake~~ : ~~Non-woven Pre-filter~~
- B. ~~For circulation~~ : ~~HEPA filter (Installed differential pressure gauge)~~
- (17) ~~Explosion port~~ : ~~To be installed at 1 points in each zone,~~
~~except zone 12. (Cathode only)~~
~~(Explosion release area (m^2) / inner volume (m^3) = 1/24)~~
- (18) ~~Maintenance window & door~~ : ~~Installed on side of oven~~
- (19) ~~Substrate tension in the machine~~ : ~~50-350 N/full width (Less than $\pm 5\text{N}$)~~
- (20) ~~Air seal box for inlet and outlet of oven~~ : ~~Installed~~

- (21) ~~Drive motor~~
- A. ~~For fresh air supply fan~~ : AC inverter motor 2 units
 - B. ~~For circulation fan~~ : AC inverter motor 12 units
 - C. ~~For exhaust fan~~ : AC inverter motor 2 units
 - D. ~~For guide roll~~ : AC inverter motor 28 units
- (22) ~~Duct(pipe) and Heat insulation~~
- A. ~~For fresh air supply~~
 - (a) ~~Duct manufacturing~~ : **By Buyer**
 - (b) ~~Installation~~ : **By Buyer**
 - (c) ~~Heat insulation~~ : **By Buyer**
 - B. ~~For exhaust~~
 - (a) ~~Duct manufacturing~~ : **By Buyer**
 - (b) ~~Installation~~ : **By Buyer**
 - (c) ~~Heat insulation~~ : **By Buyer**
 - C. ~~For circulation~~
 - (a) ~~Duct manufacturing~~ : **By Seller**
 - (b) ~~Installation~~ : **By Buyer**
 - (c) ~~Heat insulation~~ : **By Buyer**
 - D. ~~Thermo oil Piping~~
 - (a) ~~Pipe manufacturing~~ : **By Seller(seller scope only)**
 - (b) ~~Installation~~ : **By Buyer**
 - (c) ~~Heat insulation~~ : **By Buyer**
- (23) ~~Threading unit~~ : ~~Not installed~~ Installed
~~The leading pet film could be reused.~~
- (24) ~~Surface temperature of the electrode measurement sensor~~
: Installed (1 unit per zone , Total 12 units / system)
- (25) ~~Lighting~~ : ~~Installed~~
- (26) ~~Enclosure~~
- A. ~~Substrate passage part~~ : ~~Installed (Dryer oven has the same function)~~
 - B. ~~Drive part~~ : ~~Installed~~

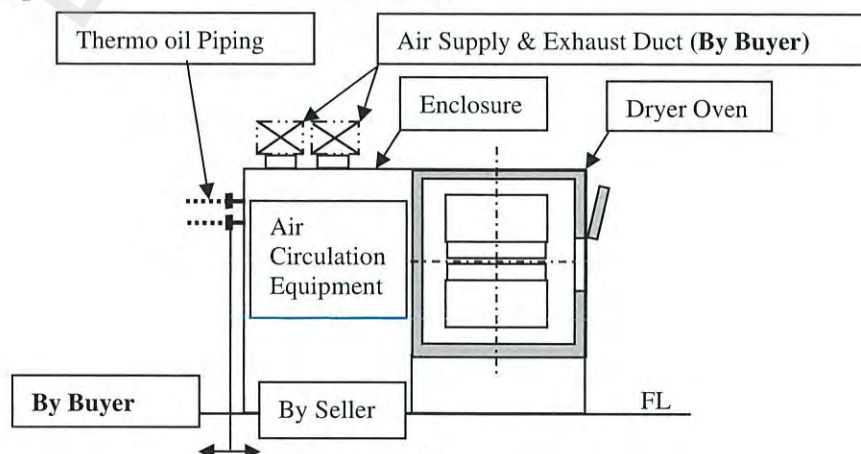


Fig. 4 Dryer oven structure

- (27) ~~Operating stage & Stairs (Seller Scope : Basic design)~~
- A. ~~Stea~~ : ~~Installed at tending side (SS400, with handrail)~~
 - B. ~~Fixed Stairs~~ : ~~Installed at tending side (SS400, 2 places)~~
 - C. ~~Division of work~~
 - (a) ~~Basic design~~ : ~~By Seller~~
 - (b) ~~Detail design~~ : ~~By Buyer~~
 - (c) ~~Manufacturing~~ : ~~By Buyer~~
 - (d) ~~Installation work~~ : ~~By Buyer~~
 - (e) ~~Technical adviser~~ : ~~By Seller (at site)~~
- (28) ~~IR heater (Anode only) : Installed~~
- (a) ~~Type~~ : ~~Electrical lamp type (BSG3250/1300 Heraeus)~~
~~3250W, 440V~~
 - (b) ~~Effective length~~ : ~~1,300 mm~~
 - (c) ~~Installation zone~~ : ~~Zone 1 to 2 4~~
 - (d) ~~Quantity~~ : ~~33 pieces per zone (total 66 132 pieces)~~

3.7 1st Feeding Unit

- (1) Type : Web guide controller and Feed roll
- (2) Web guide Unit
 - A. Type : End pivot CPC type
 - B. Edge sensor : Ultra-sonic type
 - C. Edge sensing accuracy : ± 0.3 mm
 - D. Stroke : ± 60 mm
- (3) Pinch roll unit
 - A. Type : Pinch roll type with metallic feed roll and rubber roll
 - B. Press Unit : Pneumatic cylinder
 - C. Rubber material : EPDM
 - D. Gap adjustment : ~~Taper wedge type~~ Differential screw type
 - E. Safeguard for hand pinch : Photo sensor
- (4) Feed roll : Chill roll type
 - A. Cooling water : Provided by Buyer
 - B. Rotary joint : Installed
- (5) Substrate tension : 50 – 350 N/full width (Less than ± 5 N)
- (6) Tension control : Constant-tension control (Tension feed-back type)
- (7) Drive motor
 - A. For feed roll : AC motor 1 unit
 - B. For web guide Unit : DC motor..... 1 unit
 - C. For sensor positioning : AC motor..... 2 units
- (8) Electrostatic eliminator : Not installed
- (9) Clean air system : Not installed

- (10) Web cleaning unit : Not installed
 - A. Type : Blow and vacuum type
 - B. Applicable width : 1,300 mm
 - C. Compressed air : Provided by Buyer
 - D. Vacuum blower : Provided by Buyer
 - E. Piping : Provided by Buyer
 - F. Connection
 - (a) Blowing chamber : TBD
 - (b) Vacuum chamber : ϕ 75
- (11) Enclosure
 - A. Substrate passage part : Not installed
 - B. Drive part : Installed
- (12) Installation space for PET : Not Installed

3.8 3rd Thickness Gauge

Same as 3.3 1st Thickness Gauge

3.9 3rd web guide controller

Same as “3.2 1st web guide controller”

3.10 2nd Coating Unit

- (1) Back up roll
 - A. Type : Chill roll type
 - B. Cooling water : Provided by Buyer
 - C. Rotary joint : Installed
- (2) Others : Same as “3.4 1st Coating Unit”

3.11 4th Thickness Gauge Provided by Buyer

Same as 3.5 2nd Thickness Gauge

3.12 ~~2nd Drying Unit~~

~~Same as 3.6 1st Drying Unit”~~

3.13 2nd Feeding Unit

- (1) Vacuum nozzle for cleaning on electrode surface
 - A. Nozzle : Installed (Total 2 sets per 2nd Feeding Unit)
 - B. Blower : Not installed (Provided by Buyer)
 - C. Piping : Not installed (Provided by Buyer)
- (2) Feed roll : Normal type
- (3) **Tension control** : **Constant-tension controlled by dancer roll (with monitoring by tension detector)***
- (4) Others : Same as 3.7 1st Feeding Unit

3.14 5th Thickness Gauge Provided by Buyer

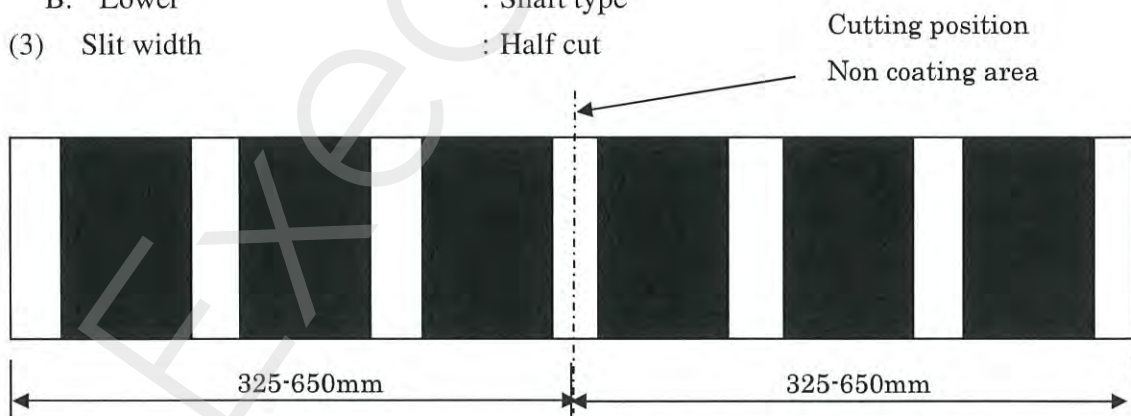
Same as 3.3 1st Thickness Gauge

3.15 5th Web guide controller

Same as “3.2 1st Web guide controller”

3.16 Half Slitting Unit

- (1) Type : Shear cutter
- (2) Cutter unit type : 1 axis type
 - A. Upper : Individual type
 - B. Lower : Shaft type
- (3) Slit width : Half cut



- (4) Cutter material
 - A. Upper : Carbon tool steel
 - B. Lower : Carbon tool steel
- (5) Drive
 - A. Upper : AC servo motor
 - B. Lower : AC servo motor
- (6) Pass adjustment roll : Installed near the cutter part of upstream and downstream.
- (7) Cutter cleaner
 - A. Type : Wet felt cleaning (Only upper knife)

- B. Oil supply : Prepare alcohol supply hole on felt holder.
The alcohol shall be provided to holes by pump.
- C. Vacuum cleaner : Installed
 - (a) Blower : Provided by Buyer (1 unit)
 - (b) Piping : Provided by Buyer (2 sets)
- (8) Splice table : Installed (Manual magnet type)
- (9) Web cleaner : Not installed
 - A. Type : Vacuum nozzle type (2 sets)
 - B. Blower : Provided by Buyer (1 unit)
 - C. Piping : Provided by Buyer (2 sets)
- (10) Lighting : Installed (LED Type, 1 set)
- (11) Threading unit : **Not installed**
 - A. For Cutter upstream side : ~~Installed (bottom of step – upstream side adjust roll unit)~~
 - B. For Cutter downstream side : ~~Installed~~
~~(downstream side adjust roll unit – end of Half Slitting Unit)~~
 - C. Type : plastics chain type
- (12) Drive motor
 - A. For Cutter drive : AC motor..... 2 units
- (13) Cutter unit change unit : Not installed (Buyer's scope)

3.17 1st Rewinding Unit (for wasted foil winding, Option)

: Not installed

3.18 2nd & 3rd Feeding Unit

Same as “3.13 2nd Feeding Unit”

3.19 2nd Rewinding Unit

- (1) Type : 2-axis turret automatic splice type
- (2) Rewinding direction : Upward and downward rewinding
Automatic splice is applied only in the downward rewinding direction.
- (3) Substrate diameter : ~~Max. 4,000~~ 1,350 mm
- (4) Substrate mass : ~~Max. 4,200~~ 2,000 kg/Roll
- (5) Core (Provided by Buyer)
 - A. Material : Carboard, steel, plastic
 - B. Size
 - (a) 6 inch core : ID 152.4±0.5mm x OD 172±0.5mm x ~~L4,300~~ 1,200±3mm
- (6) Core chucking : Air Chuck
 - A. Type : Pneumatic cylinder type
 - B. Core support : Fixed type installed
- (7) 3 inch adapter : Not Installed
- (8) Winding mode : Touch and far winding
 - A. Touch roll : Installed
- (9) Side lay : Not Installed
- (10) Rewinding tension : 50 – 250 N/full width (Less than ±5N)
- (11) Tension control : User can program tension curve to product requirements
(Linear taper 0 to -50%)
- (12) Touch roll control : User can program tension curve to product requirements
(Linear taper 0 to -80%)
- (13) Turret Unit : Installed
 - A. Turret speed : 1 r/minn
- (14) Web guide controller
 - A. Type : Motor-driven screw system with center stopper, edge sensing
 - B. Edge sensor : Ultrasonic type
 - C. Edge sensing accuracy : ±0.3 mm
 - D. Stroke : ±30 mm
- (15) Splice equipment
 - A. Type : Automatic overlapping splice

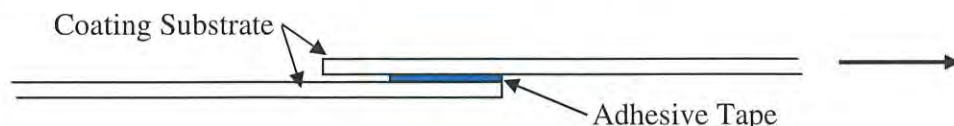


Fig.-5 Joint construction

- B. Splice method : Nip-roll + adhesive tape
Adhesive tape should be affixed beforehand of the substrate loading by hand.

- (16) Cutter : Equipped with tooth blade cutter to cut remained substrate.
- (17) Tray with vacuum blower : Installed under the blade.
 - A. Vacuum blower : Provided by Buyer
- (18) Rewind length display : Indicated on Rewinding Unit Operation Panel and Coating Unit Operation Panel
- (19) Electrostatic eliminator : Not installed
- (20) Winding position changing unit : Installed
 - A. Type : Manual
 - B. Stroke : 250 mm
- (21) Drive motor (Not explosion-proof type)
 - A. For rewinding shaft : AC motor..... 2 units
 - B. For turret drive : AC motor..... 1 unit
 - C. For Web guide Unit : DC motor..... 1 unit
 - D. For sensor positioning : AC motor..... 1 unit
 - E. For Oscillating : Linear actuator 1 unit
- (22) Load/Unload of substrate/core : Buyer's scope
- (23) Clean air system : Not installed
- (24) Enclosure
 - A. Substrate passage part : Not installed
 - B. Drive part : Installed
- (25) Safety parts for AGV : Buyer's scope
- (26) Oscillation System : Installed Accuracy is not guarantee.
 - A. Type : Web guide Unit (sensor) Oscillation
 - B. Stroke : Max. ± 5 mm
 - C. Adjustment : stroke speed and distance adjustable
- (27) Magnetic bar : Installed (Total 2 sets per Rewinding Unit)
 - A. Magnetic force : 12,000 G

3.20 3rd Rewinding Unit

- (1) Same as 3.18 2nd Rewinding Unit

3.21 Electrical control box

3.21.1 Line and Dryer control panel

- (1) Type : Self-standing & dust-proof type
- (2) Size :
 - A. Line control panel : H 2350 x W3750 x D 600 mm x1 panels
 - B. ~~Dryer control panel(Cathode) : H 2350 x W4000 x D 600 mm x2 panels~~
 - C. ~~Dryer control panel(Anode) : H 2350 x W3500 x D 600 mm x2 panels~~
- (3) Quantity : One (1) set
- (4) Explosion-proof : Not applied
- (5) PLC : MITSUBISHI iQ-R
- (6) Line motor drive : AC motor
- (7) Parts on the panel
 - A. Touch panel : Not installed
 - B. Numerical display : Not installed
(Displayed on Coating Unit operation panel)
 - C. Gas concentration meter : Not installed (Displayed on touch panel of Coating Unit)
 - D. ~~Temperature Controller~~ : ~~Digital indicating type~~
 - E. Recorder : Not installed
 - F. Alarm unit : Buzzer (Voice alarm not installed)
 - G. Printer : Not installed
- (8) Temperature control
 - A. ~~Drying Unit temperature~~ : ~~1 loop/zone, PID control~~
 - B. Roll temperature : Not installed
 - C. Slit Die temperature : Not installed
- (9) Electric heater power regulation
 - A. Drying Unit : Not installed
 - B. Heating roll : Not installed
- (10) Operation mode
 - A. Single mode : Unwinding axis, rewinding axis, coating roll, feed roll, etc.
 - B. Linked mode : The speed of the Coating Unit is used as the reference speed, and the front and rear motors are used for tension control.
 - C. Pass mode : Installed
 - D. Reverse mode : Installed

*web handling problem(wrinkle ,broken ,alignment of edge etc.) is not guarantee.

3.21.2 Coating Unit operation panel (Including Line operation,operation box for “Smart Coater”)

- (1) Type : Mounted on machine type
- (2) Size : H 1800 x W 1000 x D 500 mm
- (3) Quantity : Two(2) set
- (4) Explosion-proof(Cathode only) : Air purge, Pressure monitor (Alarm at low pressure)
Purge air shall be supplied by Buyer.
- (5) Parts on the panel
 - A. Touch panel : ~~12~~ 15 inches color
 - B. Linear-scale display : Digital display for Die installation gap
 - C. Alarm unit : Buzzer (Voice alarm not installed)
 - D. Pressure indicator : Digital display type
- (6) PLC : MITSUBISHI iQ-R
- (7) Function
 - A. Selectable operation mode : Normal or “Smart Coater” mode.
 - B. Operation condition setting : Line Speed, Tension, Drying Unit Temperature, Fan Drive Motor Frequency, Pump Revolution, Coating Length, Non-coating Length
 - C. Operation condition monitor : Tension, Drying Unit temperature, Fan Drive Motor Frequency, Gas density (LEL%), Slit Die Gap
 - D. Coating slurry supply pump drive: Pump constant revolution control by Explosion-proof type servo motor. Line speed link impossible, Flow meter feed back control installed.
 - E. Emergency stop : Installed
 - F. Intermittent Coating : Not installed
 - G. Operation condition management: It is possible to memorized 10 kinds of products.
 - H. “Smart Coater” (Automated Coating Control System)
 - (a) Control parameters setting : Target values of control subjects, Gains of final control elements.
 - (b) Control subject monitor : Each value displayed on the screen of Trend Table
 - (c) Final control element : Each value displayed on the screen of Trend Table
 - I. Barcode reader : Installed (For maintenace management)

3.21.3 “Smart Coater” (Automated coating control) system

This “Smart Coater” is designed to control; coating weight per unit area; coating profile in the web width direction; coating width. In controlling coating weight per unit area, the final control element is the feed pump revolution. To control coating profile in the web width direction, it is the final control element to control the amount of slurry fed at the valves. In coating width control, the final control element is the gap between the web and the lip of the Slit Die. Those control subjects and their corresponding final control elements, however, essentially interfere with each other. For example, although it is possible to adjust the coating width as intended by closing said gap, this may result in thus noticeably decreasing the coating weight. The “Smart Coater” ’s control performance may be affected by Buyer’s Equipment and/or measuring equipment. Therefore, the Seller guarantees coating accuracy only. Each guaranteed value shall be determined through mutual discussions based on the results of the trial runs performed at Seller’s site before shipment.

(1) Final control element and control subject in single-layer coating

- A. Pump (rpm) : Avg. coating weight per unit area (g/25cm²)
 - (a) Communication between Pump and “Smart Coater” : Connection between Equip. PLC and “Smart Coater” PLC (CC-Link IE/Control)
 - (b) Min. commanded value : 0.1 rpm
- B. Coating gap (μm) : Coating width (mm)
 - (a) Communication between coating gap device and “Smart Coater” : Connection between Equip. PLC and “Smart Coater” PLC (CC-Link IE/Control)
 - (b) Min. commanded value : 1 μm
- C. CV to adjust flow rate, multiple units (%) : Web width (transverse) direction (TD) coating profile (g/25cm²)
 - (a) Communication between Several CVs and “Smart Coater” : Connection between each CV and “Smart Coater” PLC
 - (b) Min. commanded value : 0.1 % (0 – 100 %)

(2) Coating state feedback

- A. Thickness gauge
 - (a) Inspection subject : Avg. coating weight, TD coating profile
 - (b) Communication between thickness gauge and “Smart Coater” : Connection between Equip. PLC and “Smart Coater” PLC (CC-Link IE/Control)
- B. Inspection Camera
 - (a) Inspection subject : Coating width
 - (b) Communication between inspection camera and “Smart Coater” : Connection between Equip. PLC and “Smart Coater” PLC (CC-Link IE/Control)

(3) “Smart Coater” controller (PC)

- A. PC OS : Windows10 (English version)
- B. PC Specification : CPU Core i3, Memory 8GB, SSD 256GB

3.21.4 Operation panel on the machine side

- (1) Unwinding Unit : Installed
 - A. Explosion-proof : Not applied
 - B. Parts on the panel : MMI (Touch panel), Signal tower (4 color type)
 - C. Functions : Emergency stop, Web guide operation panel,
Core chuck ON/OFF, Jog switch for unwinding
 - D. Quantity : One(1) set
- (2) ~~1st&2nd Drying Unit : Installed~~
 - A. ~~Explosion-proof : Not applied~~
 - B. ~~Functions : Emergency stop~~
 - C. ~~Quantity : Eight(8) sets/1st&2nd Dryingunit(total 16sets/line)~~
- (3) 1st&2nd Feeding Unit : Installed
 - A. Explosion-proof : Not applied
 - B. Functions : Emergency stop, Web guide operation panel,
Nip roll ON/OFF, Jog switch for substrate feed
 - C. Quantity : One(1) set
- (4) Rewinding Unit : Installed
 - A. Explosion-proof : Not applied
 - B. Parts on the panel : MMI (Touch panel), Signal tower (4 color type)
 - C. Functions : Emergency stop, Web guide operation panel,
Nip roll ON/OFF, Core chuck ON/OFF,
Jog switch for rewinding
 - D. Quantity : One(1) set

3.21.5 Other specification

- (1) Countermeasure for Instantaneous power faultier : Not installed
- (2) Interface to external controller : Contact input/output signal each 16 points
- (3) Communication function between Main Control Panel and Buyer's PC
 - : Installed
 - A. Connection by LAN cable : Buyer's Scope
 - B. Item of communication : discussed separately.
- (4) Programming tool : Not attached
- (5) Wiring inside the machine
 - A. Coating Unit ~~& Dryer~~ : Explosion-proof wiring (for explosion-proof unit)
 - B. Others : Not explosion-proof wiring
- (6) Wiring works and material from control panel to the machine
 - : Buyer's Scope
 - Cable layout should be designed less than 50m from controller to machine.
- (7) Language of "MMI" and "name plate"
 - A. MMI : English and Chinese(Change language of MMI)
 - B. Name plate : Chinese
- (8) UPS : Equipped for "Smart Coater"'s PC

3.22 Correspondence of MES

Only the items stated in the "Specification for Communication between Coating system and Buyer's MES".

3.23 Thickness gauge (Buyer's scope)

- (1) Installation space
 - A. Frame : Approx W2500xL450xH1300mm
 - B. Local box : Approx W600xL300xH1300mm
- (2) Quantity
 - A. Frame : 5 Frames / System
 - B. Local box : 5 PCS / System
 - C. PC(OPS and Stack server) : 2 PCS / System
- (3) Other specification : To be detailed

3.24 Spare Parts list

3.24.1 Recommended spare parts : Not included

- (1) Air chuck : 2 pcs
- (2) Back-up roll : 2 sets
- (3) AC motor for Back-up roll : 1 set
(including controller)
- (4) AC motor for Slitting unit : 1 set per
(including controller)
- (5) Feeding roll : 1 set
- (6) Nip roll : 4 sets
- (7) Guide roll
 - A. Flat : 4 units
 - B. With groove : 4 units
 - C. For web guide unit : 2 units
- (8) Slit die
 - A. For Cathode : 1 unit
 - B. For Anode : 1 unit
- (9) Cutter blade for slitting unit
 - A. Upper blade : 5 pcs
 - B. Lower blade : 5 pcs
- (10) Shim plate for cutter blade
 - A. 0.5 mm : 4 pcs
 - B. 1.0 mm : 4 pcs
 - C. 2.0 mm : 4 pcs
- (11) Cutter unit
 - A. Upper : 1 unit
 - B. Lower (cart included) : 1 unit
- (12) Dryer Roll
 - A. Drive roll : 2 sets
 - B. Free roll : 2 sets
- (13) Touch Roll : 2 sets

3.24.2 Attached spare parts

- (1) Slit Die : 1 pc per system
- (2) Shim plate for slit die : 4 pcs per system
- (3) Guide roller
 - A. With TD groove : 1 pc per system
 - B. Without any groove : 2 pcs per system
- (4) Nip roller
 - A. For feeding : 5 pcs per system
- (5) ~~HEPA filter for Drying Unit : 2 pcs per system~~
- (6) ~~Rubber seal for Drying Nozzle : 30 m per system~~
- (7) Timing belt
 - A. For feeding roll in Drying Unit: 5 pcs per system
 - B. ~~For circulation fan : 5 pcs per system~~
- (8) ~~Gus's density meter for NMP : 2 pcs per system~~
- (9) Safety relay unit : 2 pcs per system
- (10) Edge sensor for web guide : 1 pc per system

4. Scope

4.1 Seller's Scope

- (1) The contract covers a range of the design and manufacture of the Equipment*¹ including control devices necessary to start and accomplish the functions as the coating system, the factory inspection, export packing, CIF Shanghai port China (Incoterms 2020).
- (2) Lubricants and so on for test operation in the factory 1 set
- (3) Internal wiring and piping works 1 set

4.2 Buyer's Scope

- (1) Foundation and building works
- (2) Fire alarm and illumination works
- (3) On-site installation
- (4) Jointing and materials to the primary side utilities
- (5) Wiring and materials between the Control Box and major equipment
- (6) Design, manufacture and test-operation of the following parts .
 - A. Solvent recovery system
 - B. Air conditioning facility and coater booth
 - C. Compounding facility of coating slurry
 - D. Fire extinguishing facility
 - E. Defect inspection system
 - F. Other auxiliary facilities
- (7) Buyer-supplied parts
 - A. Unwinding and rewinding cores
 - B. Materials necessary for the shop inspection, the onsite dry/wet running and acceptance inspection
- (8) Air intake ducts from out of the factory to intake fan
- (9) Air intake ducts from intake fan to each zone of Drying Unit
- (10) Air exhaust ducts from each zone of Drying Unit to exhaust fan.
- (11) Air exhaust ducts from exhaust fan to solvent recovery system or out of factory.
- (12) Hot air ducts insulation and materials
- (13) Spare parts not stipulated herein
- (14) Items not stipulated herein

NOTE: *¹: All components are have been assembled under normal room conditions
(not in a controlled clean environment.)

5. Painting

After the sufficiently basic treatment, the Equipment will be painted one time for rust-prevention and two times for finish at Seller's factory or its subcontractor's factory. The kinds of the paints are to be decided by Seller while the finish colors are to be specified by Buyer. Seller shall make and submit some color samples before starting the manufacture. For the purchased parts or equipment (motors, reduction gears and the like), they have been painted in their standard colors which shall be regarded as the final colors.

6. Shop inspection

Once the Equipment has been fabricated, it shall be operated in the presence of Buyer without the load of materials for verification at Seller's or its subcontractor's factory.

The inspections shall be conducted according to the inspection manual made and submitted by Seller to Buyer. After the inspection, Seller shall submit the inspection report to Buyer.

Acceptance Inspection

After completion of the on-site installation of the Equipment, Buyer shall conduct its trial run and final inspection ("Acceptance Inspection"). If Buyer confirms that the Equipment conforms to the requirements stated herein, Buyer shall issue the acceptance certificate ("Acceptance Certificate") to Seller, and the Equipment shall be deemed to have been accepted by Buyer as of its issuance date. If Buyer fails to conduct the Acceptance Inspection within four and a half (4.5) months from the date of the bill of lading for reasons attributable to Buyer, Buyer shall unconditionally issue the Acceptance Certificate to Seller.

7. Packing and transportation

The Equipment shall be divided into suitable sizes for convenience during transportation and be provided with the match marks on the necessary areas. Then, they shall be carefully packed to avoid deformation and breakage during transportation. Every part of the Equipment and its case shall be tagged and carefully handled and stored in a manner not to obstruct the onsite installation.

8. Installation

Buyer shall provide all personnel, material handling equipment, tools and jigs necessary to install the Equipment and undertake the full responsibility of the safety management and operational control including safety educations. (Normal circumstance condition)

9. Warranty

If, within eighteen (18) months after the date of the bill of lading or twelve (12) months after the date of the Acceptance Certificate whichever comes first ("Warranty Period"), any malfunction and/or damage to any part(s) of the Equipment resulting from the Seller's design or fabrication occurs, and/or the Equipment does not provide the performance stated herein, Seller will repair or replace the part(s) in question at its own expense. Notwithstanding the foregoing, Seller shall not be held liable to Buyer, for any loss and/or damage arising from or caused by any reason other than those stated above, including but not limited to improper operations. Moreover, Seller shall not be liable to Buyer, even if Seller did foresee or should have foreseen, for any indirect, special or consequential loss and/or damage that may be suffered by Buyer, including but not limited to loss of use of the Equipment and/or any other related facilities, loss of production, loss of profit, and loss of any contract.

10. Applicable equipment and materials

The makers of the equipment and materials to be procured by Seller shall be determined by Seller in its sole discretion.

Unless otherwise specified, any equipment and materials used shall comply with Japanese Industrial Standards (JIS) or other Japanese standards.

11. Applicable equipment and Codes

Unless otherwise specified, any equipment and materials used shall comply with Japanese Industrial Standards (JIS) or other Japanese standards.

12. Safety regulations

If any equipment is under the control of any Japanese labor, safety, or health regulations or other Japanese standards, sufficient care shall be taken during manufacture to comply with the applicable standards. If any special standard is required, Seller will separately submit to Buyer a quotation for it.

13. Resale and Diversion

This Equipment is designed and manufactured based on the Contract with Buyer provided that it is used for the specific purpose mentioned above article 1.1 "Outline of equipment" at the same place with Buyer's designated delivery place within Buyer's country.

Therefore, we ask Buyer to perform the after-mentioned procedures if Buyer performs the following acts.

Export, technical provision and resale without following procedures shall be prohibited.

(1) Act I

A. In case Buyer exports this Equipment (Including domestic relocation, resale, rent and so forth on the premise of export) ; and/or

B. In case Buyer provides the technology related to this Equipment to any third party

(2) Procedure I

After Buyer gives us in advance a full detail of the export of such Equipment, export and provision of such Equipment shall be done with our prior written permission.

A. Buyer shall proceed with the proper classification of such Equipment based on Buyer's own country's export regulations ; and

B. If export license defined by Buyer's country is required based on export classification, export and provision of such Equipment shall be done with prior necessary permission.

(3) Act II

In case Buyer relocates, resells, rents and so forth this Equipment within Buyer's country

(4) Procedure II

Buyer shall give us in advance a full detail of the export of such Equipment and obtain our written permission.

(5) Act III

In case Buyer uses this Equipment for the purpose other than those described above

(6) Procedure III

Buyer shall give us in advance a full detail of such other purpose and obtain our written permission.

14. Documentation

- (1) Delivery specification drawing (English)

After conclusion of the contract, Seller shall submit to Buyer the following drawings:

A. Mechanical drawings

- (a) Equipment layout drawing
- (b) Outline drawing of each unit
(Include air unit)
- (c) Foundation drawing

B. Electrical drawings

- (a) Schematic diagram
- (b) Outline drawing of each unit
- (c) Equipment layout drawing
- (d) Ladder diagram
- (e) Power/control wiring drawing

Note: Seller will not submit any component assembly drawings nor detailed drawings of the Equipment, its electric control specifications, etc.

- (2) Maintenance manuals (English)

The maintenance manuals for the Equipment shall be submitted by the start of the acceptance inspection at the site.

- (3) Instruction and Operation manuals (English)

The instruction manuals for the Equipment shall be submitted by the start of the test operation at the site.

- (4) Inspection reports (English)

The inspection report will be submitted after completion of each stage of inspection.

- (5) Governmental application documents (English)

All of the documents necessary for application for (local) government approval shall be submitted by the legally specified date.

- (6) Minutes(English)

The minutes shall be submitted immediately after each meeting.

The number of copies of each of said documents shall be specified by Buyer.

After confirmation of the submitted drawings, Buyer shall return to Seller one copy each of those drawings signed by Buyer in approval.

15. Governmental procedures

The government application procedures for installation, test and inspection shall be made by Buyer while Seller will assist Buyer to prepare necessary documents or to attend the test and inspection in connection with the Equipment. Moreover, Buyer shall prepare, at its own expense, stamps and other things necessary for said application procedures.

16. Shop inspection and acceptance inspection

16.1 Outline of shop inspection

Once the Equipment has been fabricated, it shall be operated in the presence of Buyer without the load of materials for verification at Seller's or its subcontractor's factory.

The inspections shall be conducted according to the inspection manual made and submitted by Seller to Buyer for approval. After the inspection, Seller shall submit the inspection report to Buyer.

16.2 Items to be assembled at Seller's or its subcontractor's factory.

The following units will be individually assembled at Seller's or its subcontractor's factory.

- (1) Unwinding Unit
- (2) 1st CPC Unit
- (3) 1st Coating Unit
- (4) ~~(1st Drying Unit) (Not complete assemble)~~
- (5) 1st Feed Unit
- (6) 1st Pass Roll (Not complete assemble)
- (7) 2nd CPC Unit
- (8) 2nd Coating Unit
- (9) ~~(2nd Drying Unit) (Not complete assemble)~~
- (10) 2nd Feed Unit
- (11) 2nd Pass Roll (Not complete assemble)
- (12) 3rd CPC Unit
- (13) Half Slitting Unit
- (14) 1st Rewinding Unit (Option)
- (15) 2nd Rewinding Unit
- (16) 3rd Rewinding Unit
- (17) Control Box

16.3 Inspection Items

The items to be inspected at Seller's factory are as follows:

- (1) Appearance check for defects on the surface of the Equipment
- (2) Dimensional check
- (3) Mechanical operation check (pneumatic operation only)
- (4) Dryer nozzle air velocity measurement

16.4 Permission for Shipment

If Buyer confirms that the Equipment conforms to the requirements stated herein, Buyer shall give Seller permission for its shipment.

17. Utility Consumption Data /System

- (1) Electrical Power.
 - A. Cathode : Approx. Max. 1,550 kVA / system
 - B. Anode : Approx. Max. 2,600kVA / system
- (2) Thermo oil (Supplied by Buyer)
 - A. Cathode : Approx. Max. $4,920,000 \times 2$ kcal / Hr / system
 - B. Anode : Approx. Max. $5,750,000 \times 2$ kcal / Hr / system
- (3) Max. flow rate of exhaust air
 - A. Cathode : Approx. Max. $1,650 \times 2$ Nm³ / min / system
 - B. Anode : Approx. Max. $1,750 \times 2$ Nm³ / min / system
- (4) Compressed Air (Oil free, Water free)
 - A. For air purge : Approx. 40 Nm³/hr/system
 - B. For the others : Approx. 40 Nm³/hr/system
 - C. For automated coating system : Approx. 50 Nm³/hr/system
 - D. ~~For web cleaning unit~~ : ~~Approx. 360 Nm³/hr/system (Blowing air speed : 5 m/s)~~
- (5) Water for 1st Feeding Unit and 2nd Coating Unit (0.2MPa,Equivalence tap water)
 - A. Cathode : Approx. Max. 75L / min/ system
 - B. Anode : Approx. Max. 75L / min /system

18. Equipment Mass Data (Estimate) (Maximum load weight 2ton/m²)

	Approx.
(1) 1st Unwinding Unit	: 9 ton/system
(2) 1st EPC Unit	: 0.5 ton/system
(3) 1st Thickness Gauge	: 0.5 ton/system
(4) 1st Coating Unit	: 9 ton/system
(5) 2nd Thickness Gauge	: 0.5 ton/system
(6) (1st Drying Unit)	: 93 ton/system
(7) 1st Feeding Unit	: 3.5 ton/system
(8) 3rd Thickness Gauge	: 0.5 ton/system
(9) 2nd EPC Unit	: 0.5 ton/system
(10) 2nd Coating Unit	: 9 ton/system
(11) 4th Thickness Gauge	: 0.5 ton/system
(12) (2nd Drying Unit)	: 93 ton/system
(13) 2nd Feeding Unit	: 3.5 ton/system
(14) 5th Thickness Gauge	: 0.5 ton/system
(15) 3rd CPC Unit	: 0.5 ton/system
(16) Half slitting Unit	: 4 ton/system
(17) 1st Rewinding Unit(Optional)	: 6 ton/system
(18) 2nd Rewinding Unit	: 8 ton/system
(19) 3rd Rewinding Unit	: 8 ton/system
(20) <u>Electrical Control Device</u>	<u>: 5 ton/system</u>
Total	: 255 ton/system

19. Acceptance Criteria

19.1 Coating accuracy *4,6

	Accuracy	Criteria Cathode (V=80m/min)	Criteria Anode (V=80m/min)
(1) Accuracy of coating pattern The diagram illustrates the coating pattern accuracy. It shows a cross-section of a coated material with various dimensions labeled. W1, W2, W3, W4, WS, D, WT, T, WL, TG, ETG, and M/D are indicated. The diagram also shows a side view of the coating process with dimensions W1+EW1, W2+EW2, W3, W4+EW4, WL, TG+ETG, and T±ET.	EW1	< ±0.5 mm	< ±0.5 mm
	EW2	< ±0.5 mm	< ±0.5 mm
	WS	7mm (Non thick part)	7mm (Non thick part)
	D	< ±0.5 mm	< ±0.5 mm
	EW4	< ±1 mm	—
	WL	<0.5 mm	—
	ETG	±0.005mm	—
	ET *1,2,5	< ±1.5%	< ±1.5%
		~ φ 850 : ±1mm	~ φ 850 : ±1mm
(2) Accuracy of coating weight			
(3) Winding alignment of edge *7,*8			

*1 The viscosity characteristics of slurry will be determined.

Slurry's rheological characteristics (Viscosity-Shear Rate chart) shall be stable during coating in one batch.

The weight variation of a raw material (foil) shall not be counted in measuring the criteria of accuracy.

Seller reference variation: η (mPa · sec)=PA/ γ^{PB} (1/SEC) PA&PBvariation: ±10%

*2 A + B side coating weight.

*3 Seller shall not guarantee any coating performance values other than those stated in 19.1, 19.2

*4 As for "ET", all 5mm edges shall be excluded.

*5 The following things are needed to achieve these criteria.

Coating-test shall be performed. After completion of the test, both Buyer and Seller will discuss the test results.

*6 It shall not be changed the operating parameters during winding(coating) operation.

*7 It shall no use the function of oscillation.

19.2 Acceptance test conditions

At the Acceptance Inspection, only the values stated in table 19.1 and 19.2 shall be considered as criteria for acceptance.

(1) Slurry condition

A. Cathode : One kind

B. Anode : One kind

Note. Slurry's rheological characteristics (Viscosity-Shear Rate chart) and solid contents for using acceptance test shall be determined an coating test in advance with a demo machine at the seller's factory.

(2) Substrate condition

A. For substrate feeding test

Only AL/Cu foil free from sagging, uneven thickness and weight, oily surface

B. For Coating test

Only AL/Cu foil free from sagging, uneven thickness and weight, oily surface, coated foil and other factors that may adversely affect the coating performance is acceptable for the Acceptance Inspection.

(a) Cathode line : AL foil ($t \leq 10 \mu m$)

(b) Anode line : Cu foil ($t \leq 4.5 \mu m$)

(3) Coating condition

A. Cathode : One kind of continuous stripe coating($w \leq 3mm$ x 6 lanes)

B. Anode : One kind of continuous stripe coating($w \leq 3mm$ x 6 lanes)

(4) Coating weight accuracy

A. Cathode : $280 g/m^2 \pm 1.5 \%$

B. Anode : $150 g/m^2 \pm 1.5 \%$

C. Accuracy : (max-min) / average
(All 5mm edges excluded for accuracy evaluation)

(5) Measuring condition

A. Instrument : Electronic force balance

B. Measuring points : Total (2 lanes:60points)on one coating pattern.
(Approx $25cm^2$ / 1 point) (Exclude surface defects)

(a) Machine direction : 3 points

(b) Traverse direction : (2 lanes:20 points)

C. Statistical criteria : To evaluated in average value of arbitrary
Three patterns in the same batch (3000m,6000m,9000m).
(Not evaluated by 3σ)

< 2 lanes >

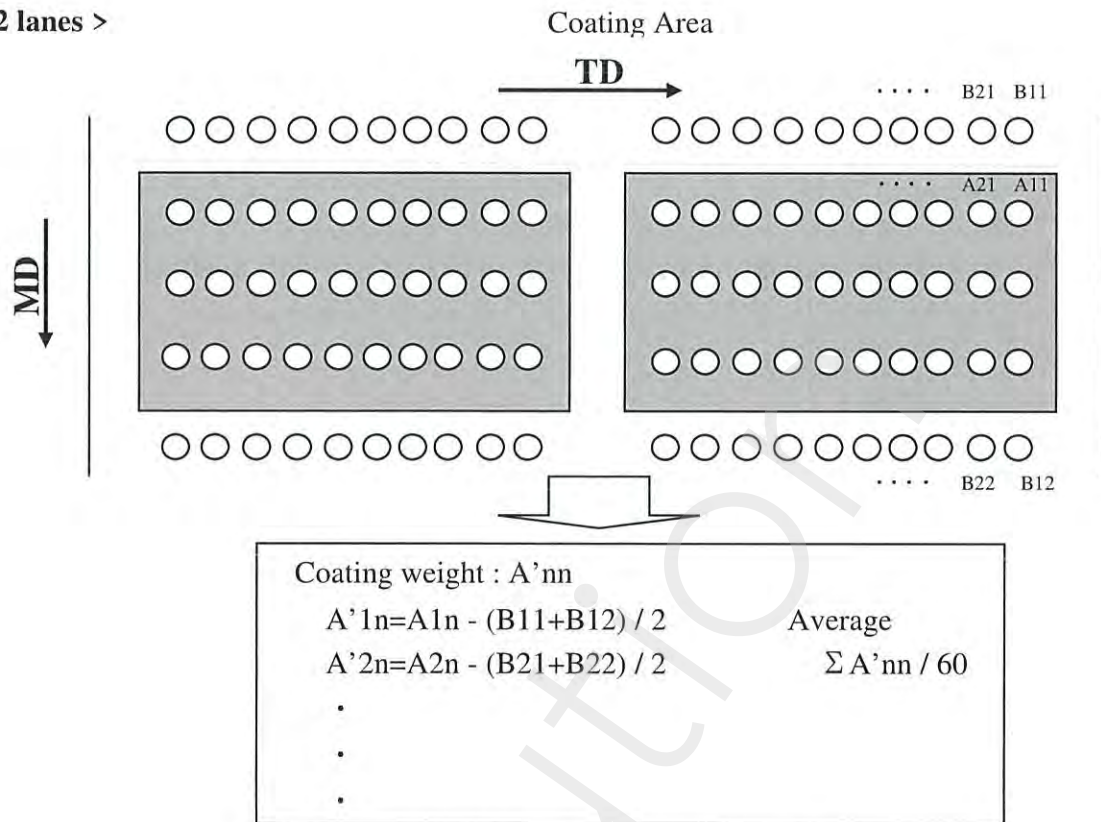


Fig.6 Coating weight measuring points

(6) Requirement

- A. Slurry's rheological characteristics (Viscosity-Shear Rate chart) shall be stable during coating in one batch.
- B. The amount of slurry in a tank shall be controlled to be a same one.

(7) Note

We shall not guarantee product quality and any coating performance values other than those stated in Chapter 19.

19.3 Equipment availability

The operating rate will be tallied after operation of seventy-two (72) hours in total within five (5) days has been achieved. The downtime caused by reasons clearly attributable to TEK's coating machine will be added up. (However, it is different from a non-defective product rate.) Notwithstanding the foregoing, if the operation of seventy-two (72) hours with five (5) days has not been achieved, the operating rate shall be calculated deeming that said seventy-two (72) hours operation has been achieved. If the result is not satisfactory, the Seller will solve the issues affecting such result and then recalculate it.

19.4 Half slitting accuracy

At the time of the on-site adjustment after dry runs, test runs shall be performed using the materials supplied by Buyer.

The prerequisites for such test runs are a running speed of 80 m/min and the use of already-passed materials.

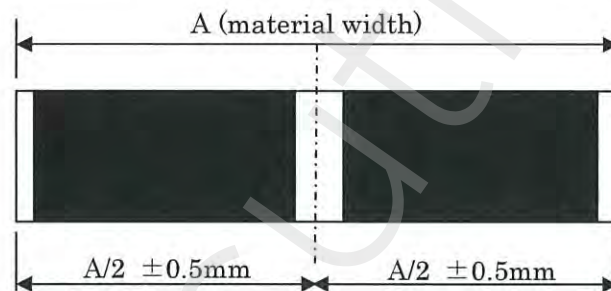
Test runs shall be performed on site during the period specified herein. Should any additional period of time and/or parts be needed, the Seller shall submit to the Buyer quotations separately.

The prerequisites for such test runs are;

- Operational speed : 80 m/min
- Material : Free from wrinkles, misalignment, meandering or slack.

If there is a problem with said material, the following items shall not be guaranteed.

- (1) Slit width (meandering) : Slit width $\leq \pm 0.5 \text{ mm}$



- (2) Slit burr : burr $\leq 20 \mu \text{ m}$

