Voltage Sag Protector

Automotive

ENTi Pte LTD

2017

David Nam : +65 8282 1004 davidnam@entsgp.com

Daniel Cho : +6585718717 Daniel@entsgp.com

Andrew Ng : +65 9766-1793 andrew@entsgp.com

Company Overview

1. Company overview

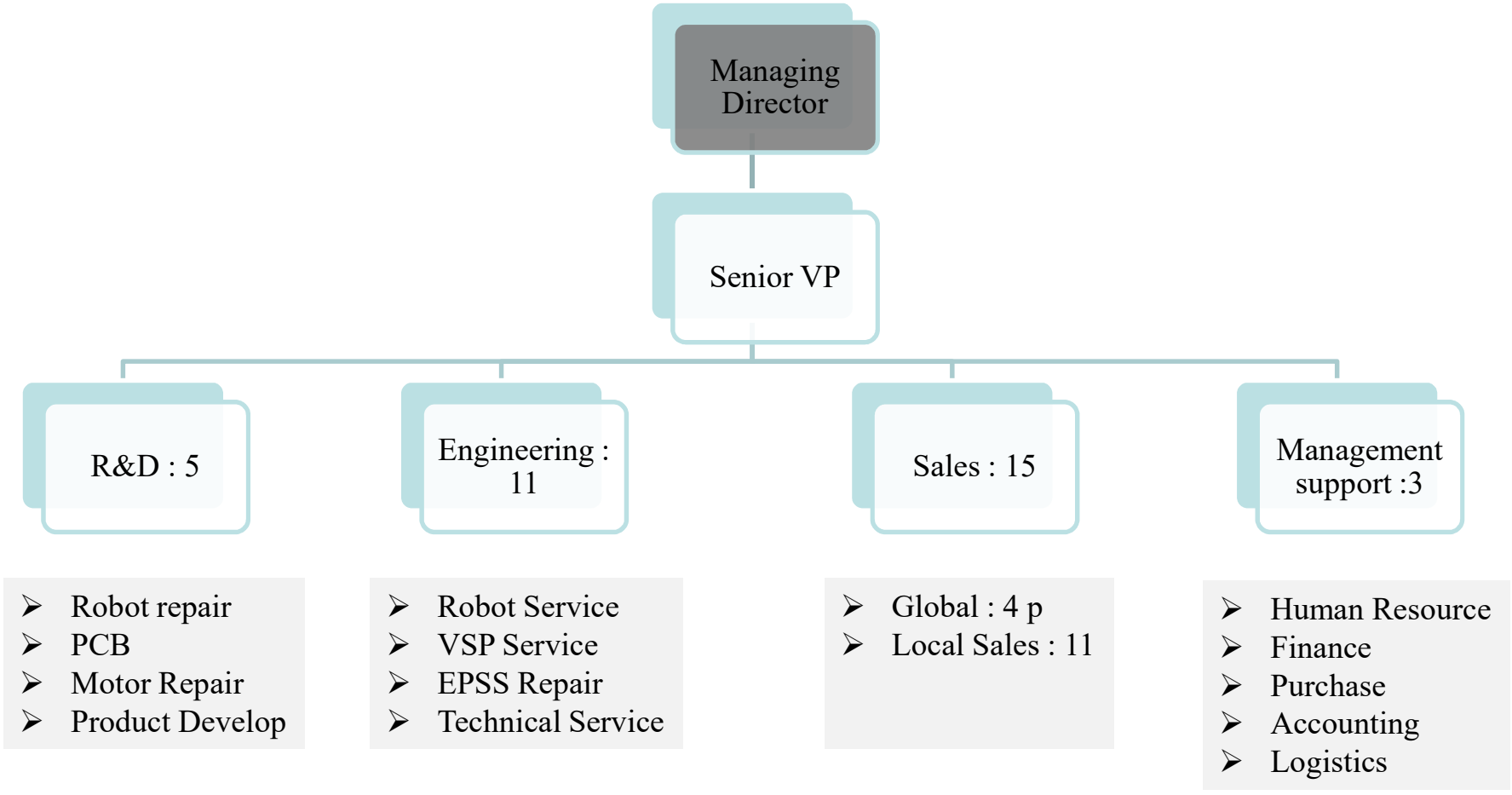
Company Name	ENTi Pte Ltd
Establish	Jan 2006
Representative	Kim Jeong Ho
Address	11 Woodlands Close,#05-07,Woodlands 11, Singapore 737853
Capital	SGD 100,000
Staff	36
Business Area	Manufactoring, Trading and Technical Service
World Location	Singapore, Taiwan, Korea

2. CEO profile

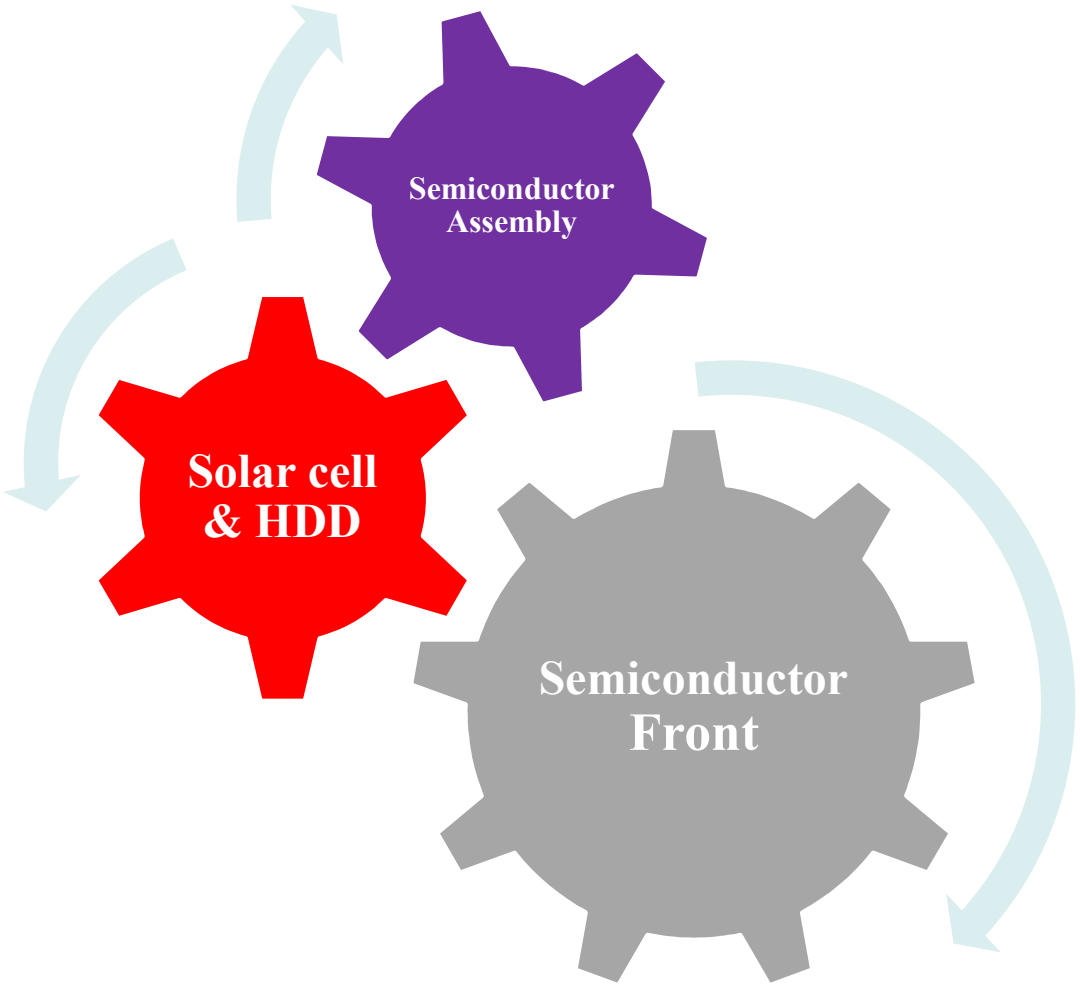
Kim Jeong Ho

Seoul national university
Hynix
Chattered

3. Company Organization



4. Business Area



5. Global Co-work

- Manufacturing
- R&D
- Sales
- Customer service

- Parts Sourcing
- Material Sourcing

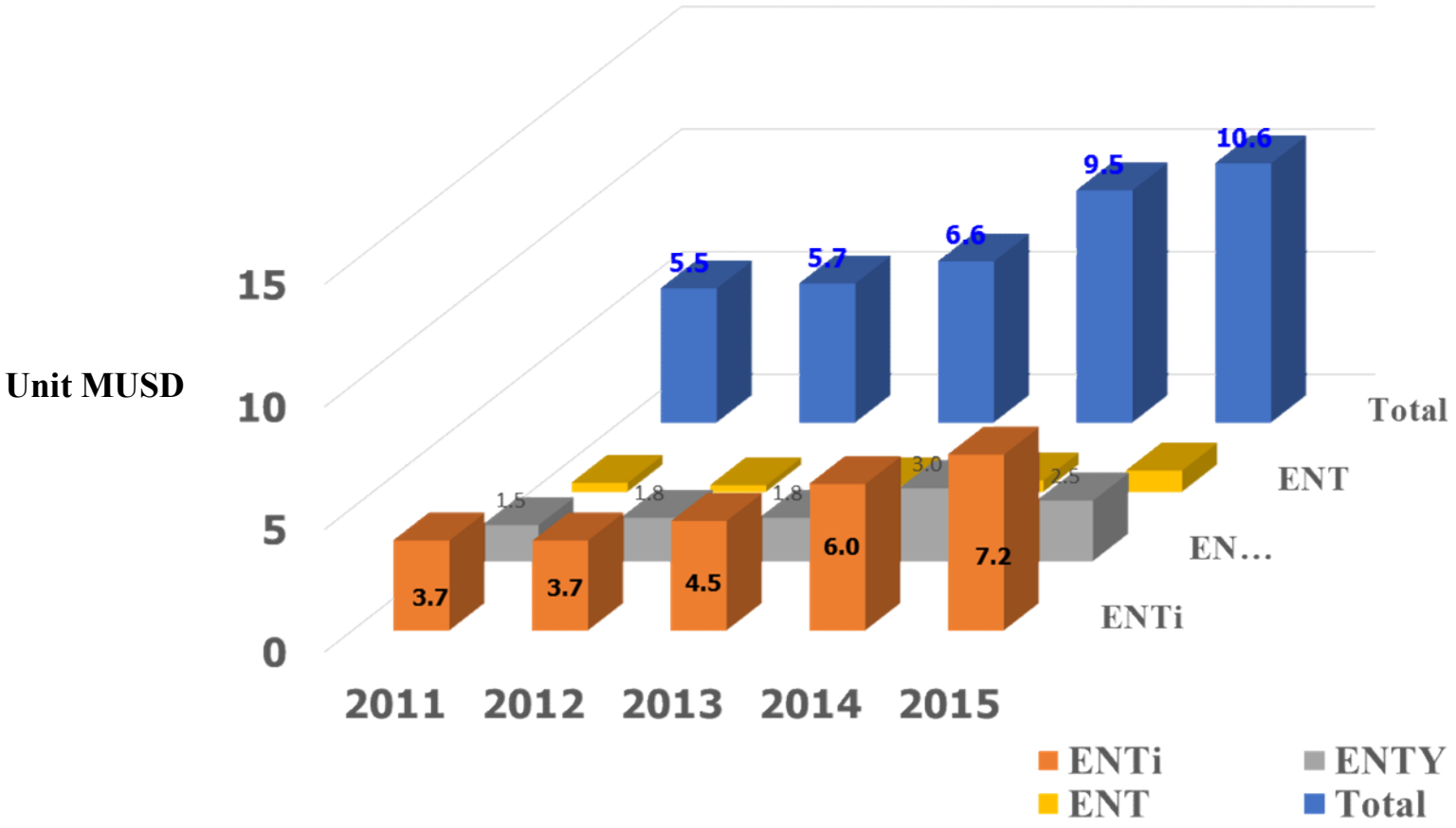
KHJ Taiwan

ENT Korea

ENTi Singapore

- R&D Center
- Robot Repair
- Sales
- Customer service

6. Sales


Unit MUSD
15
10
5
0
2011
2012
2013
2014
2015
5.5
5.7
6.6
9.5
10.6
Total
3.7
3.7
4.5
6.0
7.2
ENTi
1.5
1.8
1.8
3.0
2.5
ENTY
ENT
EN…
ENTi
ENTY
ENT
Total

7. Customers - Singapore Taiwan Malaysia Philippine

SAMSUNG
SK hynix
UMC
Micron
ST
Amkor Technology
JCET STATSChipPAC A JCET Company
Infineon
winbond
UTAC
ASE GROUP
NXP
RENESAS
inotera memories is now Micron
AMD
tsmc
MXIC
nuvoTon 新唐科技
Maxchip 矽晶電子 Maxchip Electronics Corp.
SILTERRA
XFAB MIXED-SIGNAL FOUNDRY EXPERTS
ON Semiconductor
GLOBAL FOUNDRIES
Powerchip
maxim integrated
Texas Instruments
Deca Technologies
ssmc

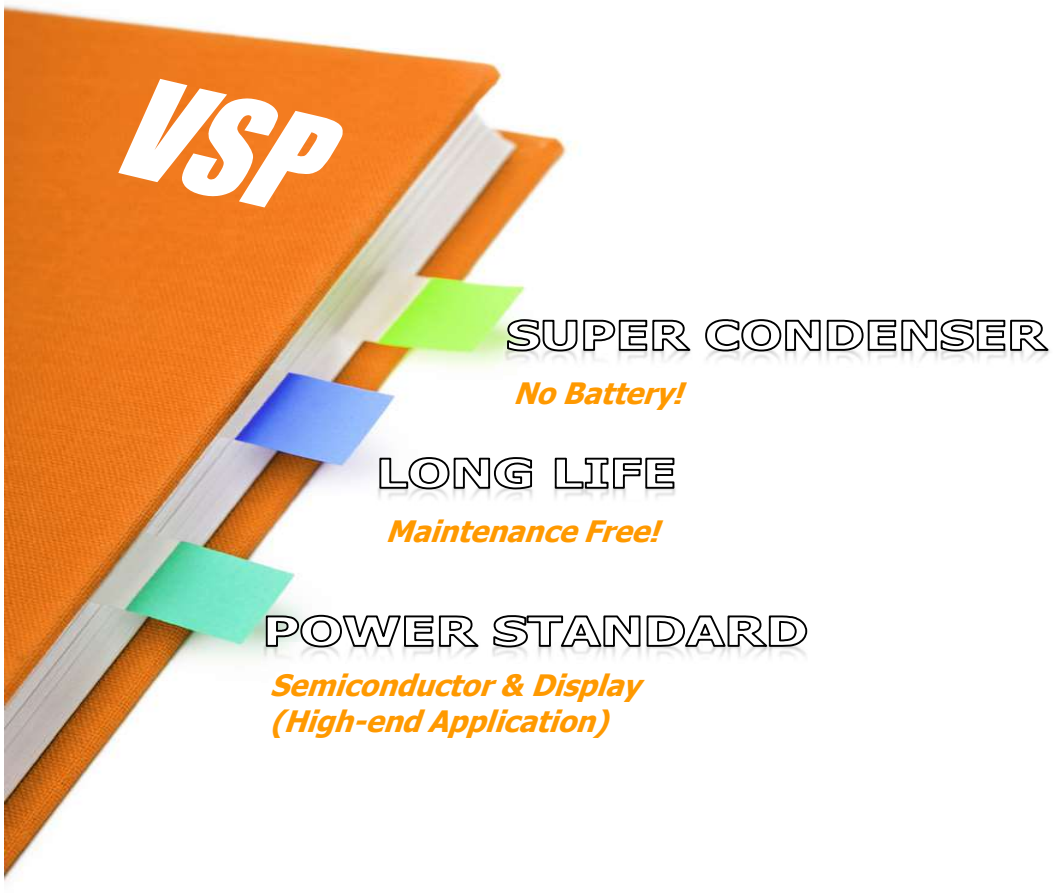
VSP INTRODUCTION

Index

1. What and why is VSP?
2. Voltage Sag Influence in Car assembly factory
3. General power supply to Car Factory
4. VSP backup plan and method
5. VSP Specification and Products Lineup
6. Sales record

1.1 What is VSP?

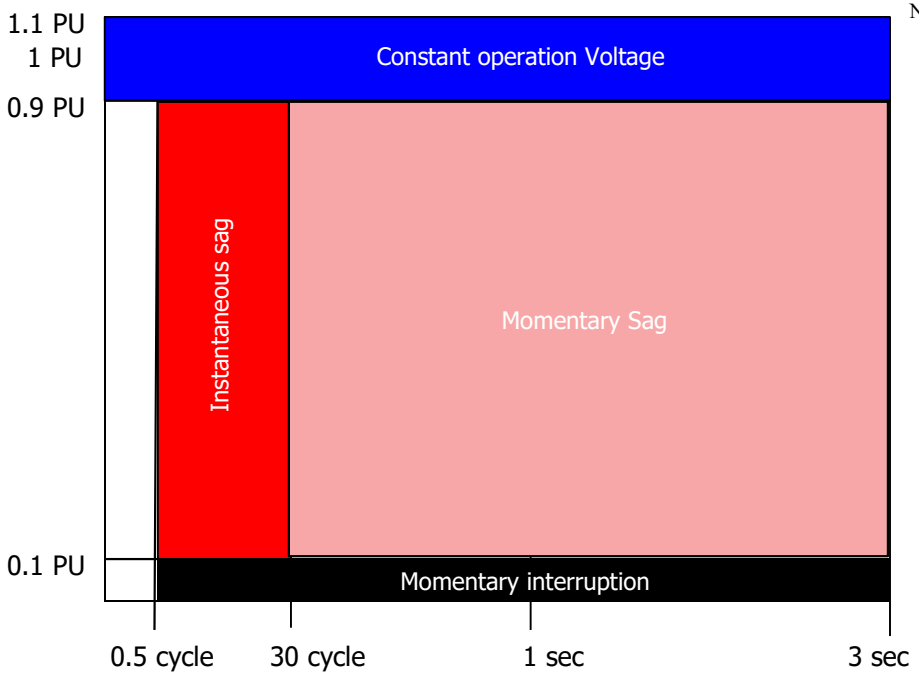
Voltage **S**ag **P**rotector



1.2 Criteria specification for Voltage Sag

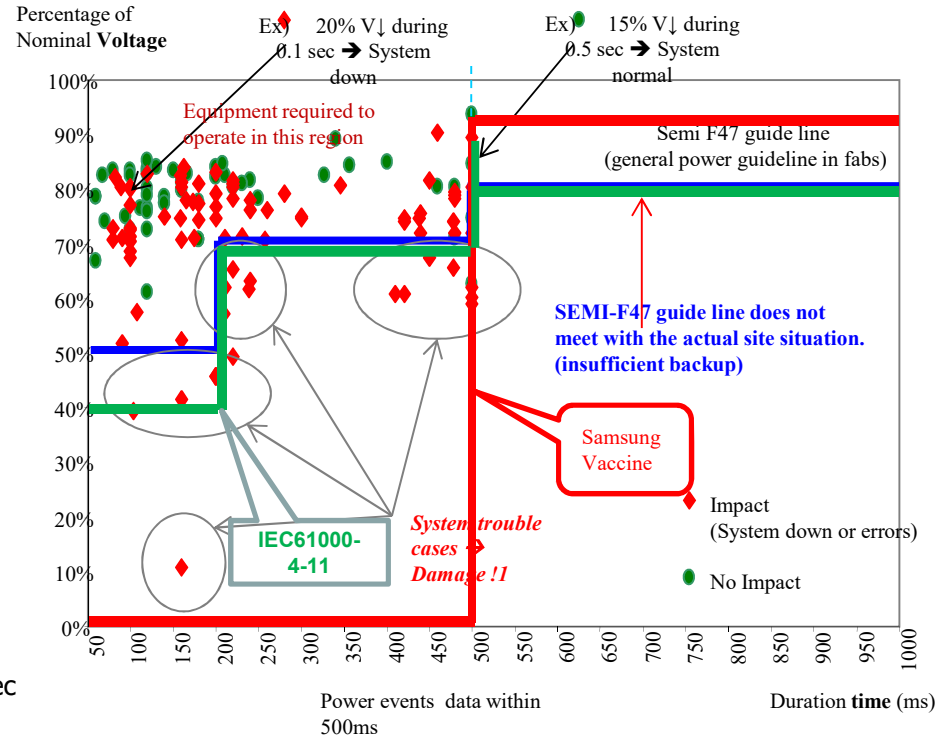
IEEE 1159

Industrial



SEMI F47, IEC6100, Samsung Vaccine

Semiconductor



1.3 Trouble Makers(Parts) & Backup Structure by VSP

General parts' immunity
(between 1.5~20 cycle)
Relay, PLC, Inverter,
Magnetic contactors,,,…

Sag & Response

Normal Power

Sag or Interruption

VSP backup mode → Perfect sync.

0

1 cycle

VSP Switching time
(VSP Response time)

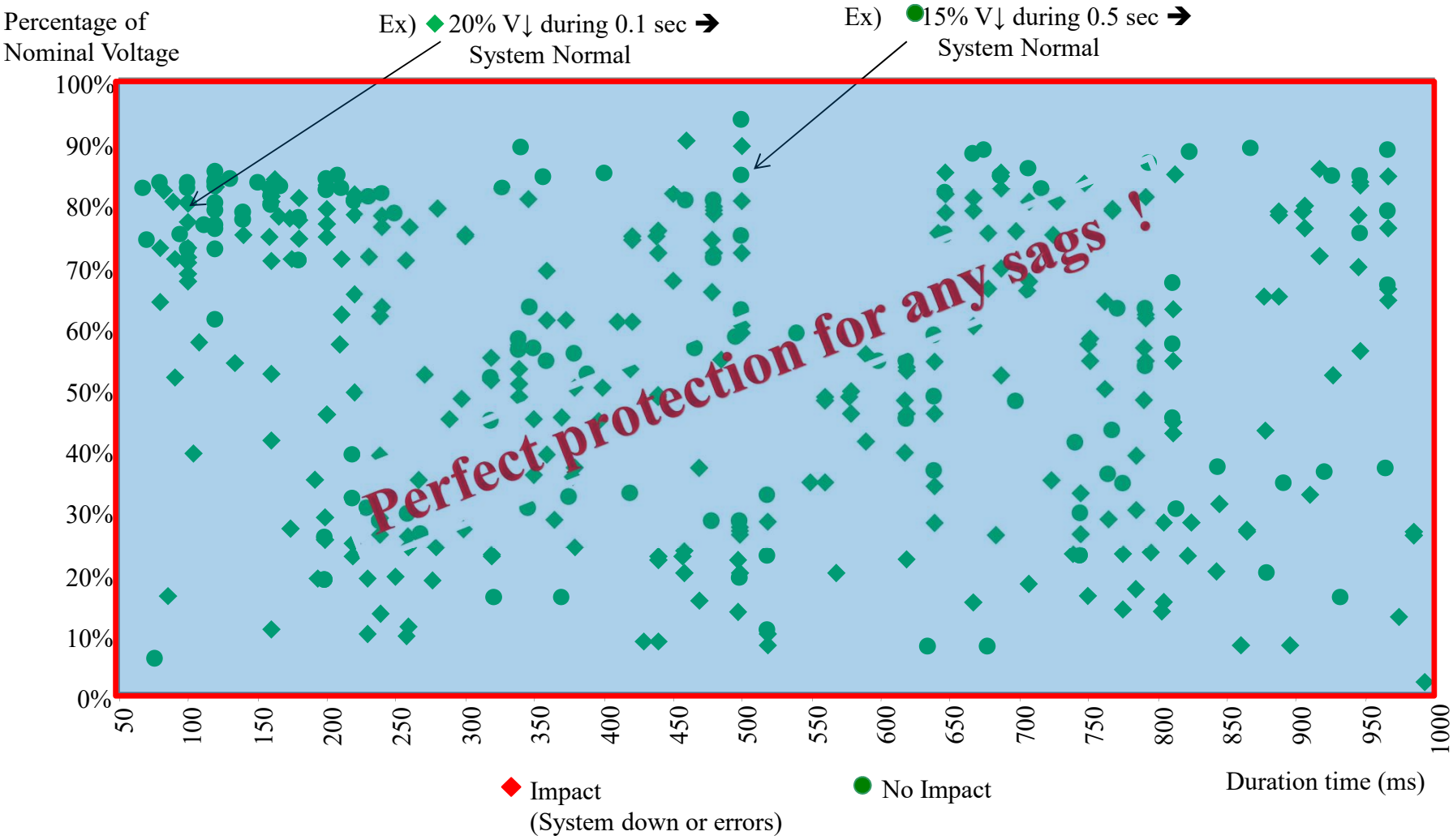
Most Critical Parts Immunity
(between 1/2~1/4 cycle)

Conventional
system's switching time

1/16 1/8 1/4 1/2 1 cycle

Cycle	-	1/16	1/8	1/4	1/2	1
50Hz	msec	1.25	2.50	5.00	10.00	20.00
60 Hz	msec	1.04	2.08	4.00	8.00	16.60

1.4 Backup window for power sag (ENTi VSP)



1.5.a Comparison with VSP and UPS

Item	UPS	VSP
Charging type	Battery 2 – 3 years	Super Condenser more than 8 years
Efficiency	75 – 85%	97 – 98%
Maintenance	Yes	No
Function Method	On line (consume power) (Always Charging – recharging)	Off line (No consume power)
Spoil	Equipment down	No effect equipment (By pass)
Size	Big Size / capacity	Small size / capacity
	Separate battery bank	No need installation space Install with equipment
Power Tolerance	1.2 – 1.5 times	Actual power

1.5.b Comparison with VSP and UPS

Backup Type	Description	VSP (condenser)	Small Local UPS	Big House UPS
Initial Cost (Investment)	Backup system purchase	Cost-effective (100% sag protection/1sec)	Low cost, low performance	High cost (specially for user)
	Foot print(Big space)	No need	No need	Yes
	Hook-up engineering	No need	No need	Yes.
	Process tool engineering	Need (compact backup)	Not available.	Available, but limited.
Process Troubles & Damage (power trouble influence)	System Error or Shutdown → Downtime loss → Repair cost	**Not happen**	Happen	Not happen
Maintenance	Battery change budget 	**No need**	Need	Need
	Battery maintenance 	**No need**	Need	Need
Total Reliability		Stable /Confident Process	Not stable	Stable

1.6.Why is VSP?

- Equipment does not stop during power voltage sag
- Yield improvement
- Productivity going up
- Reduce maintenance time
- Reduce recovery time
- Save material cost

2.1 If Voltage Sag occur, then

1. Occur Voltage Sag

2. Stop : Factory,
   Robot, CNC, Oven for painting, Compressor….

3. Loss : Operation loss/min, Long recovery time, labor cost, stop component line, Spoil material scrap cost, Expensive price machine stop, Defect spare part loss

2.2 Detail process damage during Voltage Sag

Assembly line	• Robot system, Oven for painting, Chemical process before painting, assembly tire and wheel, Air pressure system.
Electric part	• Assembly automatic electric circuit board, Test and minor adjustment system, Glass tint.
Interior	• Plastic injection, Air transfer system, Oven, Molding, Glass product line
Stamping	• Press and transfer module, Material transfer system, Robot system, Welding system Air pressure system
Painting	• Painting robot, Curing oven.
PowerTrain	• CNC, Heat treatment oven, Casting, Engine line, Transmission line

3. General power Distribution (Assembly factory)

Power St.
22.9 KV

Power supply line

1st Sub-St.
154/345/765KV

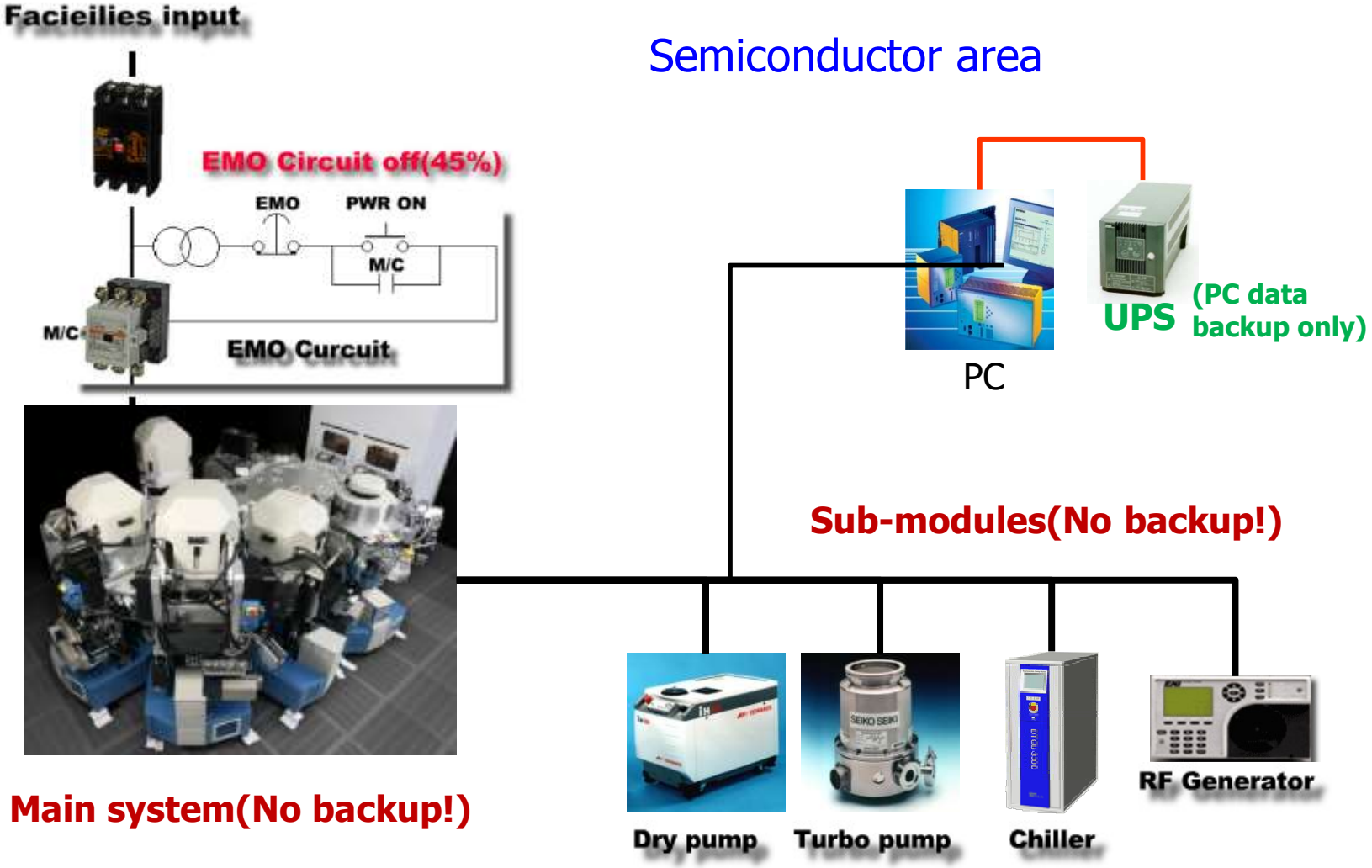
2nd Sub-St. of Fab
(6.9/22.9/154KV)

Battery Storage

Emergency Power Backup Connection

Stamping | Interior | Assembly | Electric Part | PowerTrain

4.1 General Backup Solution(**Before Improvement**)



4.2 VSP total backup solution

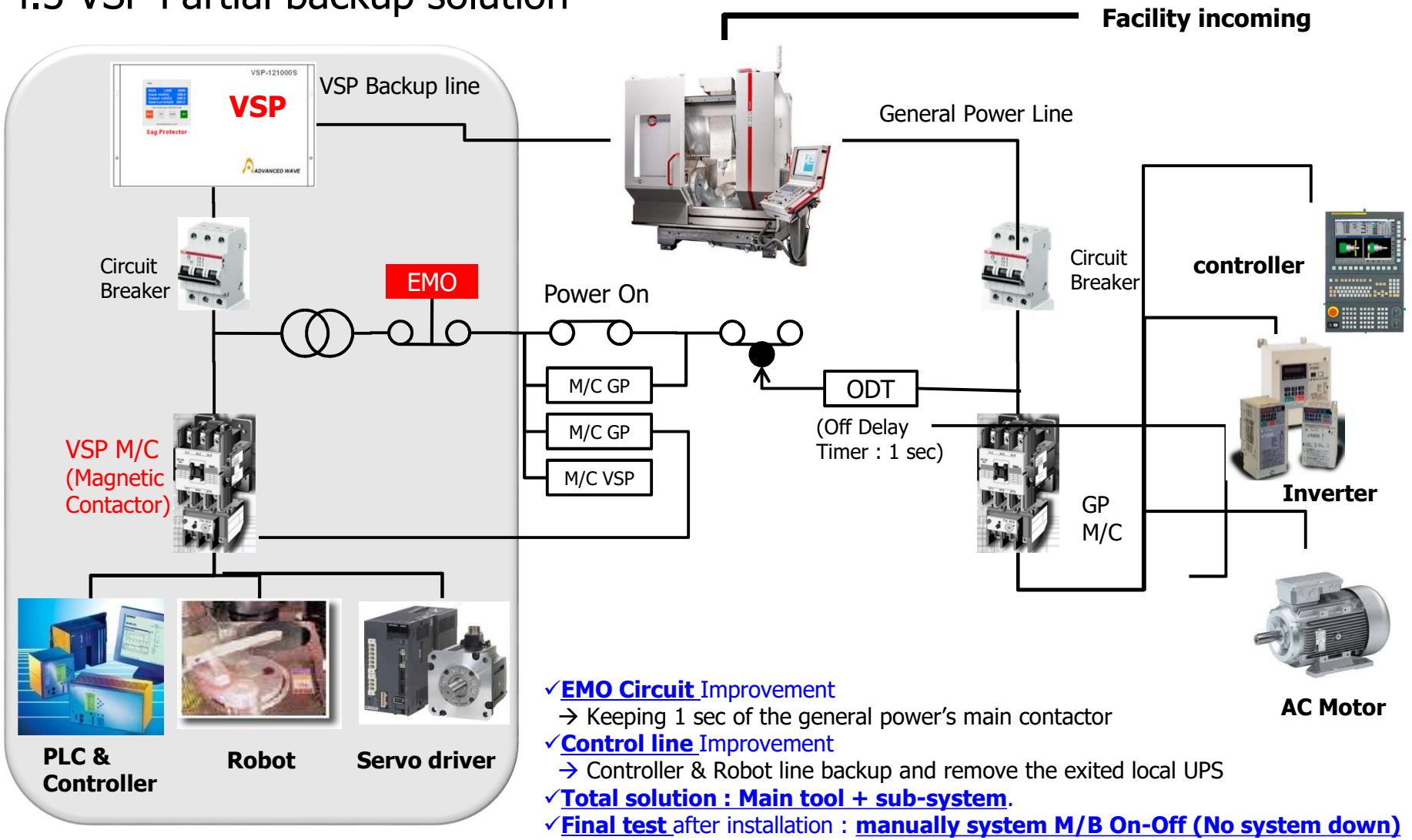
Factory main power line

Equipment

Equipment power and control panel

3상 VSP

4.3 VSP Partial backup solution

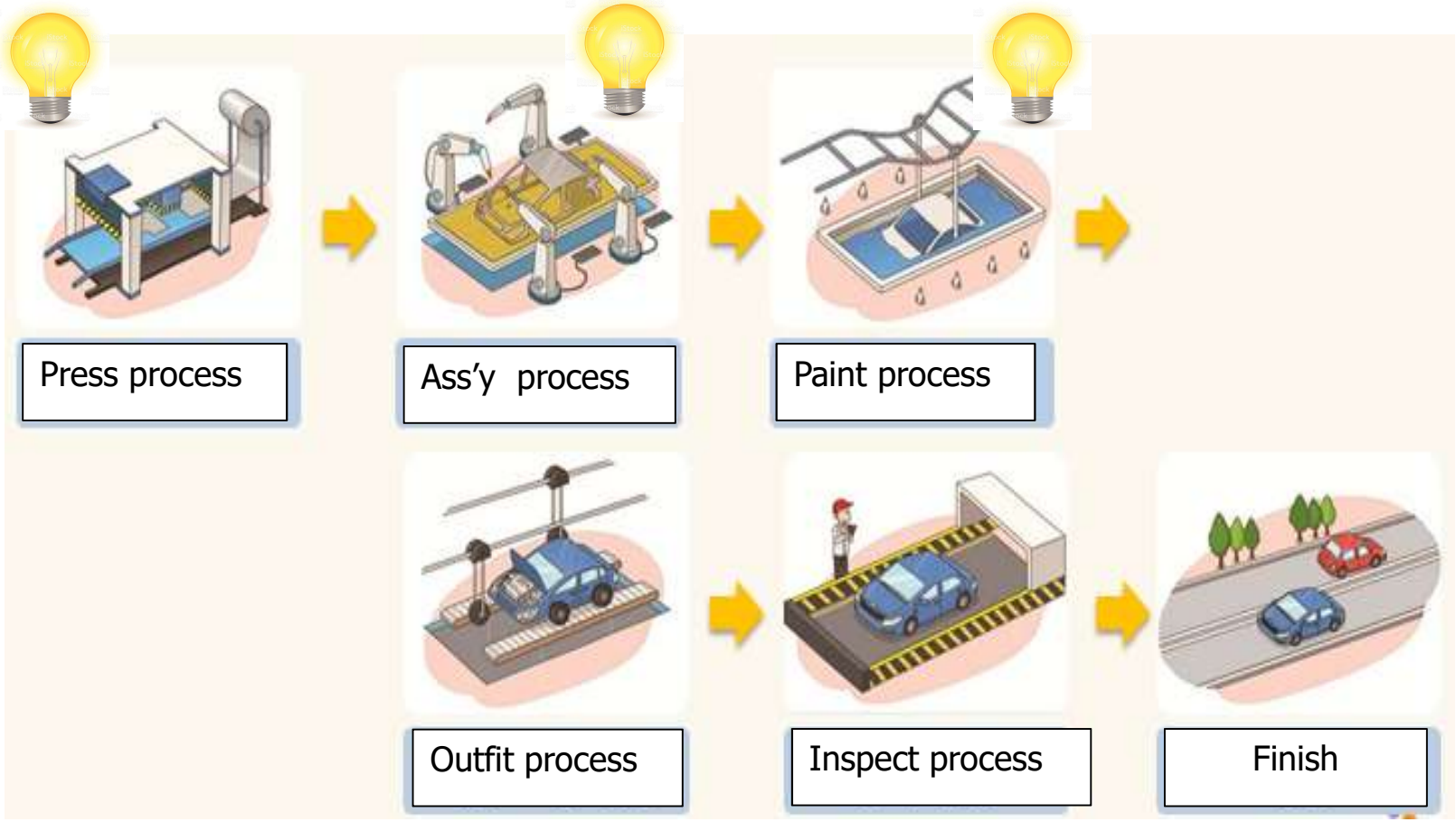


✓**EMO Circuit** Improvement
→ Keeping 1 sec of the general power's main contactor
✓**Control line** Improvement
→ Controller & Robot line backup and remove the exited local UPS
✓**Total solution : Main tool + sub-system**.
✓**Final test** after installation : **manually system M/B On-Off (No system down)**

4.4 VSP Backup Points in detail

Backup	Loads	Application Examples	Sag Immunity Std
VSP Backup (Capacitor)	**Data backup system**	ECS, CIM, PC(general, tool), PLC, Touch, Controller(for data saving), APC valve, etc.	**1 second under 100% voltage drop**
	Safety & Interlock	Safety circuit, interlock circuit (EMO)	
	General control	SMPS(DC power supply), Sensors, On/Off circuit, Flow meters, MFC, etc.	
	Drive control	Motor controller, Temp controller, Robot Controller, Servo driver, etc.	
	Servo power	Servo motor drive power	
	Robot power	Robot power(ATM robot, inline robot, etc)	
General Power(GP) → No Backup	Heaters	HPCP, Oven, Heater, etc.	Rewiring(Alarm. ODT)
	Sub-modules(VSP)	Pump, TMP, Scrubber, Chiller etc	
	Inverter control	USC, Wing fan, blower, etc	

4.5 VSP installed good process



4.6 VSP connection method with paint assembly robot

One to multi

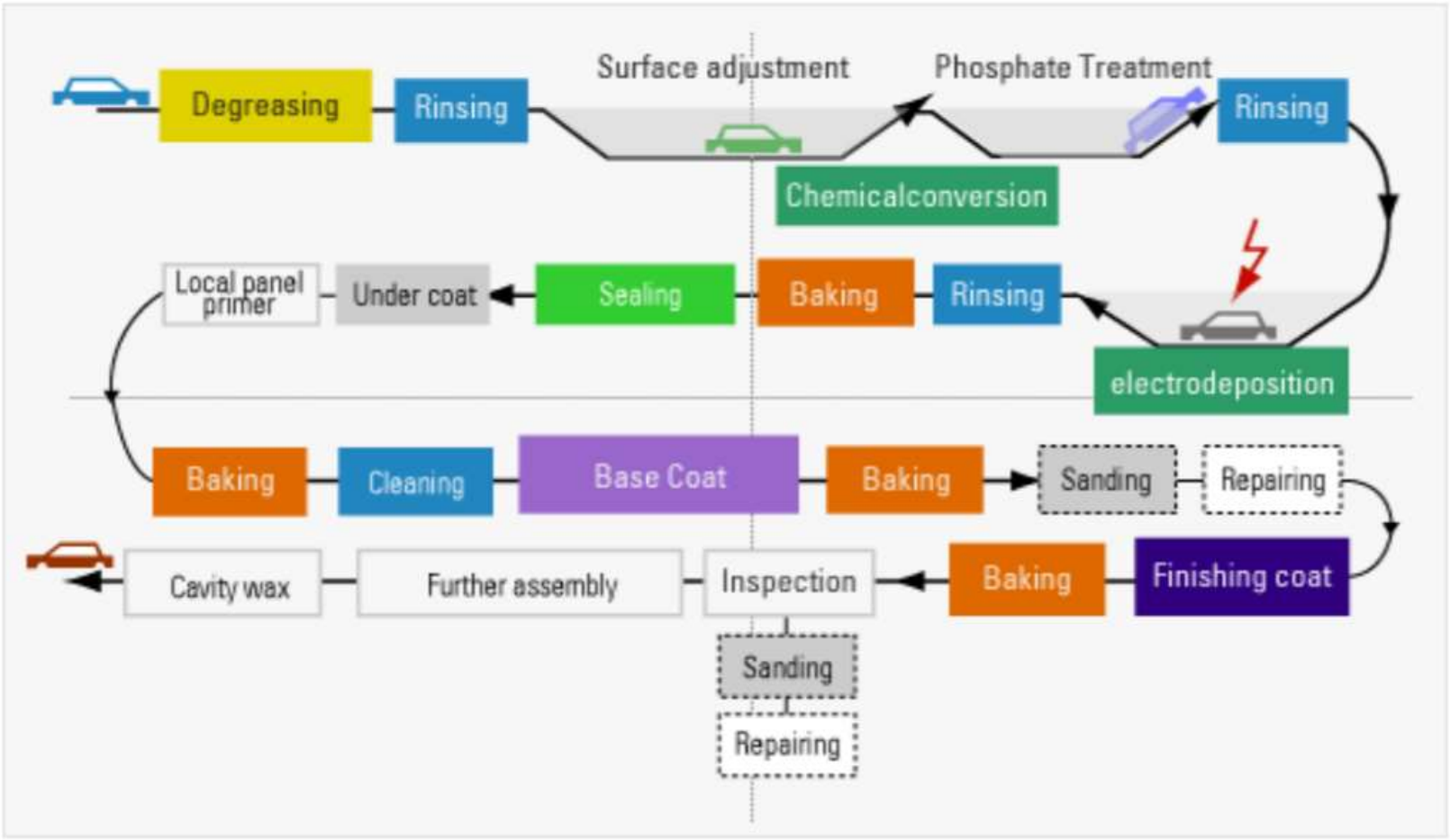
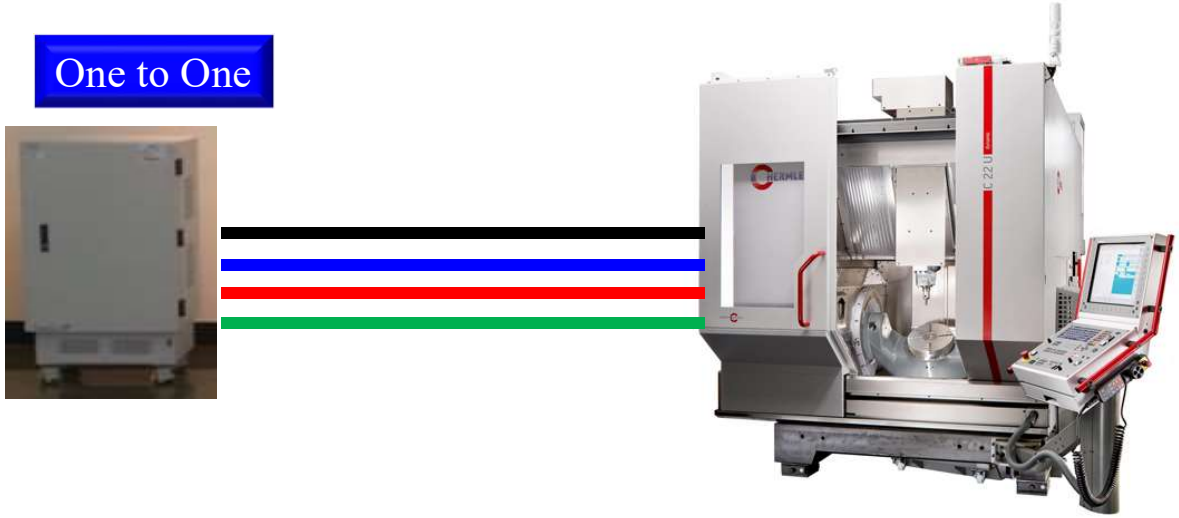


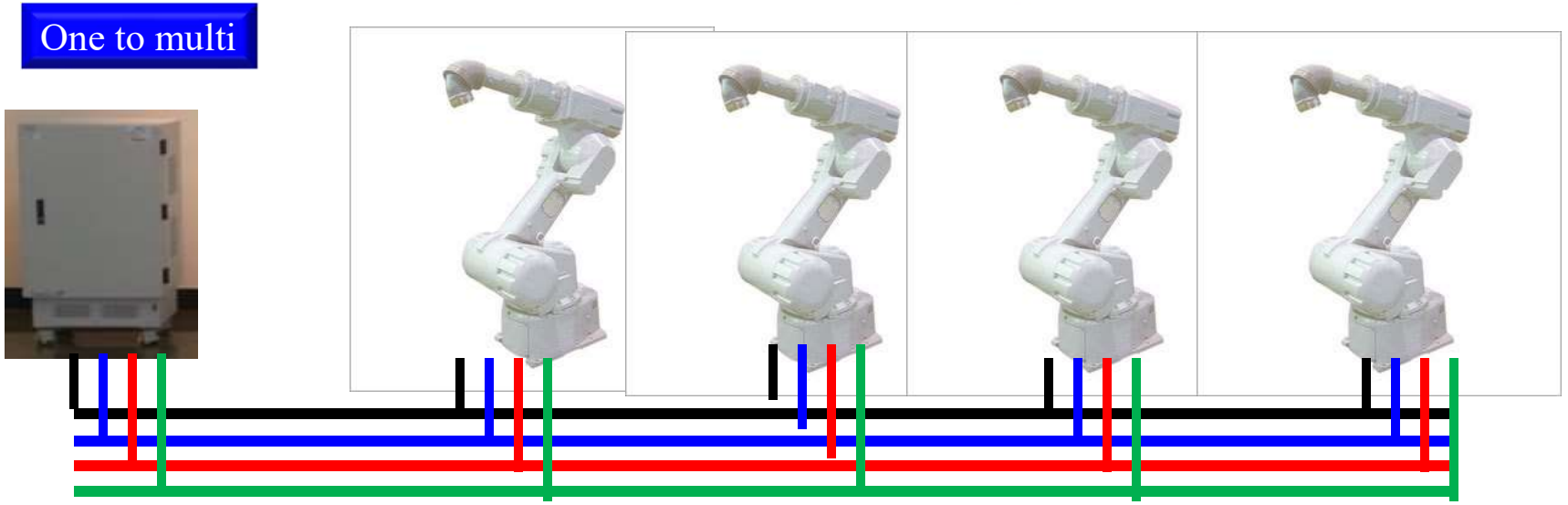
Figure 2.2 Overview Painting Process

4.7 VSP connection method with equipment

One to One



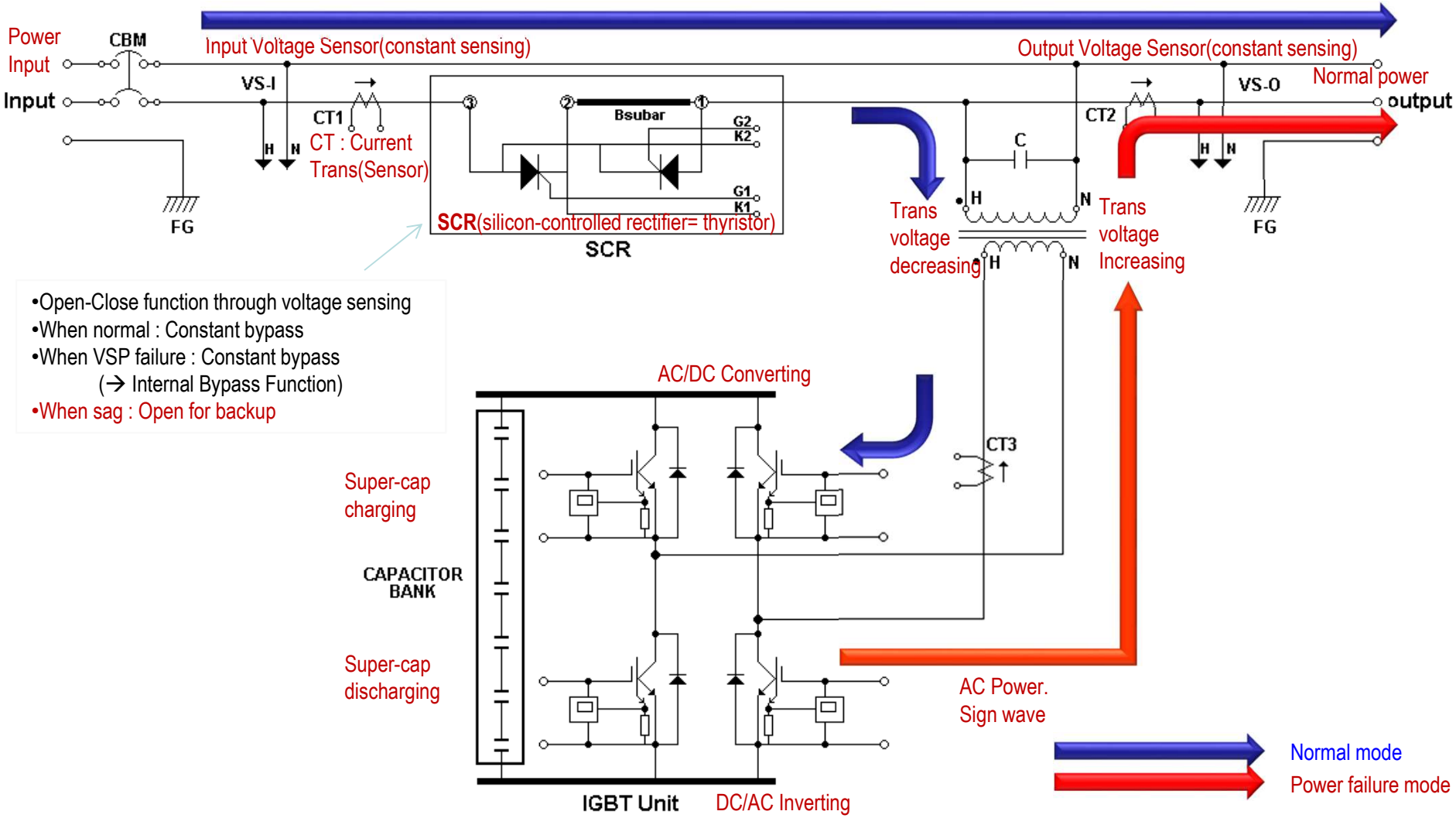
One to multi



5.1 VSP General Specification

Item		Specification	Remarks
Sag Protection Method		Stand by off-line	
Storage Type		Electric Double Layer Super Condenser Life cycle : 12~15 years	Cf. UPS : Battery type Life cycle : 3~5 years
Switch detection voltage		(-15% of peak of voltage)	
Response Time for Sag		0.8ms or less 2ms	Switching time
Duration time (Backup)		1.0 second or more at 100% Electrical load	UPS : Long time(minute base)
Indicator (LCD)		Output voltage-current, Input voltage-current, Power failure count, Frequency, Charge voltage, etc.	
Operation signal		Relay contact output	
Ambient temperature		0℃ ~ +40℃	
Relative humidity		30% to 90% (Free from condensation and vapor)	
AC output (by backup)	Voltage waveform	Sine waveform	
	Voltage distortion	3% (linear load)	
	Transition voltage change	±10%	
	Load power factor	Pf=1.0	
General		Battery free, Cooling Fan free Maintenance free, Low Running cost No noise, No vibration	Cf. UPS : Need battery change. Required the Maintenance Waste cost

5.2 Basic System Block Diagram of VSP



5.3 VSP Products line up

1. VSP 1Ø AC 100~1Ø AC 120 V

VSP 1Ø AC 100~1Ø AC 120V		Unit	VSP-1103S	VSP-1105S	VSP-1110S	VSP-1120S	VSP-1130S	VSP-1150S	VSP-11100S
Rated Voltage	Alternating input voltage range	V	1Ø AC 100 - 1Ø AC 120V (Commercial input voltage)						
	Norminal alternating output capacity (v: 100-120 case)	KVA	0.3	0.5	1.0	2.0	3.0	5.0	10.0
		A	3.0 – 2.5	5.0 – 4.1	10.0 – 8.3	20.0 – 16.6	30.0 – 25.0	50.0 – 41.6	100.0 – 83.3
	Dimension(WxHxL)	mm	180x450x117	300x132x400	300x150x400	400x180x450	400x200x450	430x250x500	430250x500

Option : Bypass Switch(EBS)

2. VSP 1Ø AC 200~1Ø AC 240 V

VSP 1Ø AC 100~1Ø AC 120V		Unit	VSP-1203S	VSP-1205S	VSP-1210S	VSP-1220S	VSP-1230S	VSP-1250S	VSP-12100S
Rated Voltage	Alternating input voltage range	V	1Ø AC 200 - 1Ø AC 240V (Commercial input voltage)						
	Norminal alternating output capacity (v: 200- 240 case)	KVA	0.3	0.5	1.0	2.0	3.0	5.0	10.0
		A	1.50 – 1.25	2.5 – 2.0	5.0 – 4.2	10.0 – 8.3	15.0 – 12.5	25.0 – 20.8	50.0 – 41.6
	Dimension(WxHxL)	mm	180x450x117	300x132x400	300x150x400	400x180x450	400x200x450	430x250x500	430250x500

3. VSP 3Ø AC 200~3Ø AC 240 V

VSP 3Ø AC 200~3Ø AC 240V		Unit	VSP-3205S	VSP-3210S	VSP-3220S	VSP-3230S	VSP-3250S	VSP-3210KS
Rated Voltage	Alternating input voltage range	V	3Ø AC 100 - 3Ø AC 120V (Commercial input voltage)					
	Norminal alternating output capacity (v: 200-240 case)	KVA	5	10	20.0	30.0	50.0	100.0
		A	14.4 – 12.1	28.8 – 24.0	57.7 – 48.1	86.6 – 72.2	144.3 – 120.2	289.0 – 241.0
	Dimension(WxHxL)	mm	600x1045x425	600x1045x425	650x1205x380	650x1205x460	800x1400x500	1000x1700x550

Option : Bypass Switch(EBS)

4. VSP 3Ø AC 380~3Ø AC 440 V

VSP 3Ø AC 380~3Ø AC 440V		Unit	VSP-3405S	VSP-3410S	VSP-3420S	VSP-3430S	VSP-3450S	VSP-3410KS
Rated Voltage	Alternating input voltage range	V	3Ø AC 380 - 3Ø AC 440V (Commercial input voltage)					
	Norminal alternating output capacity (v: 380-440 case)	KVA	5	10	20.0	30.0	50.0	100.0
		A	7.6 – 6.6	15.2 – 13.12	30.4 – 26.24	45.58 – 39.3	75.96 – 65.6	152.0 – 132.0
	Dimension(WxHxL)	mm	600x1045x425	600x1045x425	650x1205x380	650x1205x460	800x1400x500	1000x1700x550

5.4 Double Emergency Bypass System

EBS(Emergency Bypass Switch)

Internal Bypass → Built-in

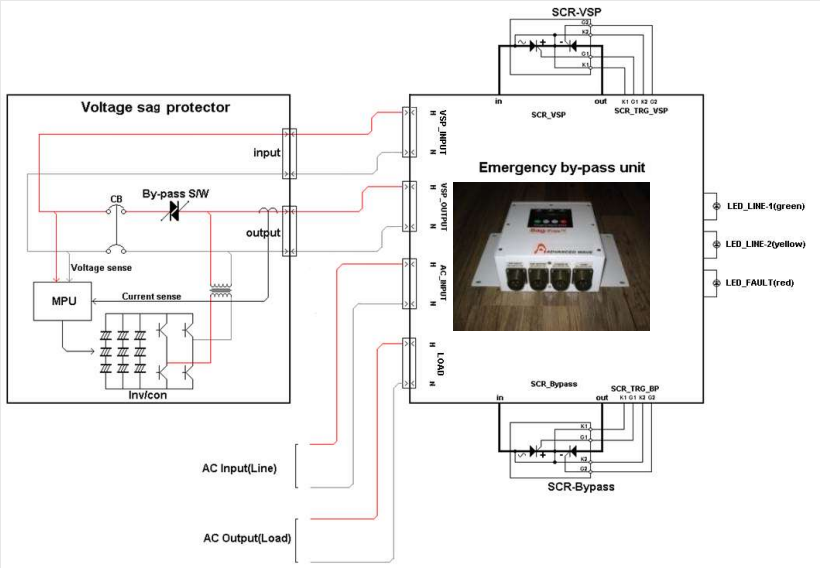
1. Emergency BYPASS when VSP's malfunction or overloads
   → System FREE-RUNNING without shut down
2. Bypass mode : Power is normal, but no more protection for sag
3 Need system shutdown when VSP change

External Bypass → Option

No need system shutdown when VSP change.

Front side view

Back side view



5.5 Display

VSP™	Remarks
1. Display & monitoring ① Setting : Available to check for all power situation ② Event log : Available to record all power events : 0~999 times 	➢ VSP monitoring factors : input voltage, output voltage, output current, frequency, condenser, event log, charging voltage, sag count, run status(Run/stop, Line/backup). ➢ Parameter input : Rated voltage(VAC), Sag level(%), Hysterisis(%), Rated power(KW), Charge voltage(VDC), Discharge voltage(VDC), Frequency(Hz), Inverter output Adj(%), Input voltage gain(%), Output voltage gain(%), Current gain, DC voltage gain(%), Calender(yy,mm,dd,hh,mm,ss), etc.
2. Condenser type & life cycle ① Electric Double Layer Super Condenser (EDLS Condenser) ② Durable 500,000 sags → Maintenance FREE!!	

Items	EDLS
Discharge capacity per electrode weight (/gram)	**100~120F**
Using voltage per cell unit	0.8~3.0V
Energy Density (Wh/kg) Energy	2~10

6.1 Sales Records

(Over 60K sets in worldwide)

Korea

- Car Maker : Hyundai, Kia, Ssangyoung, Samsung Renault

- Semiconductor
  - Samsung Group
    - Samsung Semiconductor line : Memory, System LSI, B/E(Onyang)
    - Samsung Display/LED
    - Samsung Electro-Machanics
  - Hynix(Semiconductor) : Ichon, Chungju, Wuxi
  - LG Display(Turn-key) : P1~P8. TFT ARRY,C/F, CELL, Module line
  - Dongbu HiTek (Semiconductor line · Umsung)
  - Package Line : Amkor Korea, Signetics
  - Others : Process Tool Makers(F/E, B/E, FPD,…), Auto-Mobile,…

- Other area
  - Taiwan : TSMC, CMO*, Innolux* (* : via tool makers)
  - Japan : Toshiba, Renesas, Sony
  - Singapore : Global Foundries, SSMC
  - Malaysia : Infineon, X-fab

6.2 VSP Installation Samples(F/E)

Thank you !!