Ballard Power Systems Europe A/S
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| Revision history | | |
|---|---|---|
| **Rev.** | **Date.** | **Description** |
| 001 | 2/3/2023 | First Issue |
| 002 | 2/17/2023 | Modified according to comments |
| 003 | 3/24/2023 | Further detailed and expanded |
| 004 | 9/18/2023 | Updated and expanded |
| 005 | 3/8/2024 | Updated according to comments |
| 006 | 4/9/2024 | Exp. to include fan contactors |
| 007 | 10/15/2024 | Updated with changed water separator |
| 008 | 9/9/2025 | Updated. As build |
| | | |
| | | |

| | |
|---|---|
| **Document Title:** | **BLPH Project - Electrical Single Line Diagrams** |
| **Document Number:** | BPSE-ELE-BPH-DWG-00005 |
| **Legacy Number:** | K559-2254-CWIWP4202202-C06-001 |
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| **File Name:** | K559-2254-CWIWP4202202-C06-001Rev008 |
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| **Purchase Order:** | CWIWP4202202 |
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| **Requsition Number:** | n/a |
| **Customer:** | CrossWind C.V., Rotterdam, The Netherlands |

# Single Line Diagrams

## Crosswind/Shell Baseload Power Hub, Fuel Cell Container 1MW, no BESS

## K559-2254-CWIWP4202202-C06-001

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| | |
|---|---|
| Reference Item Number | Ballard Part # TBD |
| EPLAN Project Name | 601456B - Shell Baseload Power Hub |
| EPLAN Revision | 11 |
| EPLAN Project Pages | 628 |
| = ++ + & C01 | |

| REVISION INFORMATION |
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| 09-Sep-25 |

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| DRAWING | K559-2254-CWIWP4202202-C06-001 | REVISION | 11 |
| DRAWING TITLE | Crosswind/Shell Baseload Power Hub, Fuel Cell Container 1MW, no BESS | | |
| SHEET TYPE/DESC | Single Line Diagram Introduction | | |
| ALL SHEETS ARE THE SAME REVISION STATUS | SIZE A3 | LANGUAGE EN | SHEET/TOTAL 1 / 7 |

# AC Distribution - 40ft Container

## Crosswind Scope

## Ballard Scope

=HKN70-XB01
3p+N+PE 400Vac
20kW

=BA20+UC50
AC Power Distribution

-XB01
AUX Supply Terminals

-SG01
63 A
Switch Disconnector

-FA01
Uc:277V
Iimp: 25 kA
Surge Arrester

-FC06
2A, B curve
MCB

AUX Customer Supply
Voltage Meas
3ph 400V
-BA01

-BC02
+UC508C03/10.1
+UC508C03/10.1
+UC508C03/10.1
3ph 75A
AUX Customer Supply
Current Trafo

-FC02
50A, C curve
MCCB

-FC12
63A, C Curve
MCCB

-QA02
55A
Isolation Contactor, 4 pole

-FC10
2A, C-curve
MCCB

-FC01
250A, 3p+N
MCCB

Nanogrid Internal
Voltage Meas
3ph 400V
-BA02

-QA01
55A
Isolation Contactor, 4 pole

-FC05
32A, B-curve
MCCB

3p+N 400-480V 50/60Hz

-FC04
63A, B Curve
MCCB

=BA20+DA01

Transformer, dry-type
-TA03

0,46/0,4-0,48
Dyn11 160kVA

=AA01+WZ10
Container Interconnect, Between Containers

BP1 AC Supply from Transformer 250A / 4.3:B

BP2 AC Supply to Container #2 - 32A / 4.3:C

-FC04
160A, 3p+N
MCCB Cooling Skid
+UC30

=LA01+UC20
Control System, Container #1 Inside

-QB01
63A, 3ph+N
Switch Disconnector

3p+N 400-480V 50/60Hz

-FC01A
6A, B-curve
MCCB

-FC01B
6A, B-curve
MCCB

-FC01C
6A, B-curve
MCCB

-FC02
4A, B-curve
MCCB

-FC06
10A, B-curve
MCCB

-FC07
10A, B-curve
MCCB

-FC03A
6A, B-curve
MCCB

-FC03B
6A, B-curve
MCCB

-FC04
10A, C-curve
RCD/MCB

-FC08
20A, B-curve
MCCB

-FC09
20A, B-curve
MCCB

-FC10
20A, B-curve
MCCB

-FC11
10A, B-curve
MCCB

-TB01A
24-28V/40ADC
FCwave PSU
with UPS

-TB01B
24-28V/40ADC
FCwave PSU
with UPS

-TB01C
24-28V/40ADC
FCwave PSU
with UPS

-TB02
24-28V/10ADC
Control PSU
with UPS

-QB02
50A, 24V coil
Contactor

-QB03
50A, 24V coil
Contactor

-QA08
25A
Solidstate
Contactor

-QA09
25A
Solidstate
contactor

-QA10
25A
Solidstate
contactor

-GB01A
UPS Battery
24V, XY Ah

-GB01B
UPS Battery
24V, XY Ah

-GB01C
UPS Battery
24V, XY Ah

-GB02
UPS Battery
24V, XY Ah

1/N/PE

-XD04
1P+N+PE, 1kW
Service

=HE01+UC30
Coolant Skid Cabinet, Container #1 Outside

3p+N 400-480V 50/60Hz

-FC01
6A, B-curve
MCCB

-FC02
2A, B-curve
MCCB

-FC19
25A, B-curve
MCCB

-FC11
6A, B-curve
MCCB

-FC12
6A, B-curve
MCCB

-FC13
6A, B-curve
MCCB

-FC14
6A, B-curve
MCCB

-FC15
6A, B-curve
MCCB

-FC16
6A, B-curve
MCCB

-FC40
13A, B-curve
MCCB

-TB01
24-28V/10ADC
PSU with UPS

-BT02
5°C
Temperature Switch

-GB01
24V Backup Battery
24V, XY Ah

-EA02
0,4W
Cabinet Heater

-TA19
15kW
3x 380-500 VAC
HT Pump Drive

=HE01+UC41
HT + LT VFD Cabinet

-TA11
4.0kW
VFD

-TA12
4.0kW
VFD

-TA13
4.0kW
VFD

-TA14
4.0kW
VFD

-TA15
4.0kW
VFD

-TA16
4.0kW
VFD

-EC40
VFD Cabinet Chiller

=HE01+DA02
HT Cooling System #1, Container #1 Outside

-GP19
15kW
HT1
Coolant Pump

-GQ11
4kW
Ventilation Fan

-GQ12
4kW
Ventilation Fan

-GQ13
4kW
Ventilation Fan

-GQ14
4kW
Ventilation Fan

-GQ15
4kW
Ventilation Fan

-GQ16
4kW
Ventilation Fan

=HE01+UC30
Coolant Skid Cabinet, Container #1 Outside

3p+N 400-480V 50/60Hz

-FC41
20A, B-curve
MCCB

-FC42
20A, B-curve
MCCB

-FC03
2A, B-curve
MCCB

-FC29
25A, B-curve
MCCB

-FC21
6A, B-curve
MCCB

-FC22
6A, B-curve
MCCB

-FC23
6A, B-curve
MCCB

-FC24
6A, B-curve
MCCB

-FC25
6A, B-curve
MCCB

-FC26
6A, B-curve
MCCB

-FC31
6A, B-curve
MCCB

-QA41
25A
Solidstate
contactor

-QA42
25A
Solidstate
contactor

-EA03
Container
Lighting

-TA29
15kW
3x 380-500 VAC
HT Pump Drive

=HE01+UC41
HT + LT VFD Cabinet

-TA21
4.0kW
VFD

-TA22
4.0kW
VFD

-TA23
4.0kW
VFD

-TA24
4.0kW
VFD

-TA25
4.0kW
VFD

-TA26
4.0kW
VFD

-TA31
4.0kW
VFD

-EB01
3x480V, 3x15kW
H2 Heater

9kW
Heating Element

9kW
Heating Element

=HE02+DA02
HT Cooling System #2, Container #1 Outside

-GP29
15kW
HT2
Coolant Pump

-GQ21
4kW
Ventilation Fan

-GQ22
4kW
Ventilation Fan

-GQ23
4kW
Ventilation Fan

-GQ24
4kW
Ventilation Fan

-GQ25
4kW
Ventilation Fan

-GQ26
4kW
Ventilation Fan

=HE03+DA02
LT Coolant System Cooler, Container #1 Outside

-GQ31
4kW
Ventilation Fan

=JA01+DA01
Container Ventilation, Inside Container #1

-EA01
Container
Lighting

-GQ06
4,3 kW
Ventilation Fan

-GQ07
4,3 kW
Ventilation Fan

=JA01+UC07
Container Ventilation, Fan/Heater Assembly

-GQ08
1kW
Ventilation Fan

-GQ09
1kW
Ventilation Fan

-EB01
3x480V, 3x15kW
Container Heater

15kW
Heating Element

15kW
Heating Element

15kW
Heating Element

=HE03+DA01
LT Cooling System, Container #1 Inside

-TA11
4kW
3x380-500VAC
LT Pump Drive

-GP11
4kW
LT Circuit Pump

| | |
|---|---|
| Reference Item Number | Ballard Part # TBD |
| EPLAN Project Name | 601456B - Shell Baseload Power Hub |
| EPLAN Revision | 11 |
| EPLAN Project Pages | 628 |
| = | ++ \| + \| & C01 |

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| REVISION | 11 |
| DRAWING TITLE | Crosswind/Shell Baseload Power Hub, Fuel Cell Container 1MW, no BESS |
| SHEET TYPE/DESC | Single Line Diagram - 40ft Container AC |
| ALL SHEETS ARE THE SAME REVISION STATUS | SIZE A1 \| LANGUAGE EN \| SHEET/TOTAL 2 / 7 |

FRM510365 3/0B

# DC Distribution - 40ft Container

=AA01+WZ10
Container Interconnect, Between Containers

DC1 DC Bus to Container #2 / 4.3:G
DC2 DC Bus to Container #2 / 4.3:G
DC3 DC Bus to Container #2 / 4.3:G
DC4 DC Bus to Container #2 / 4.3:G
DC5 DC Bus to Container #2 / 4.3:G
DC6 DC Bus to Container #2 / 4.3:G

=BA01
Power Conversion Block #1, Container #1 Inside

+UC01
DCDC Cabinet #1, Inside Container #1

-QB01
Switch Disconnector

-FC03
215A

-TA01
DCDC Drive

-TA02
DCDC Drive

-RB01
Converter Inductor

-RB02
Converter Inductor

-FC01
315A

-FC02
315A

+UC02
DCDC Cabinet #2, Inside Container #1

-QB01
Switch Disconnector

-FC03
215A

-TA03
DCDC Drive

-TA04
DCDC Drive

-RB03
Converter Inductor

-RB04
Converter Inductor

-FC01
315A

-FC02
315A

+UC03
DCDC Cabinet #3, Inside Container #1

-QB01
Switch Disconnector

-FC03
215A

-TA05
DCDC Drive

-TA06
DCDC Drive

-RB05
Converter Inductor

-RB06
Converter Inductor

-FC01
315A

-FC02
315A

=BA02
Power Conversion Block #2, Container #1 Inside

+UC04
DCDC Cabinet #4, Inside Container #1

-QB01
Switch Disconnector

-FC03
215A

-TA07
DCDC Drive

-TA08
DCDC Drive

-RB07
Converter Inductor

-RB08
Converter Inductor

-FC01
315A

-FC02
315A

+UC05
DCDC Cabinet #5, Inside Container #1

-QB01
Switch Disconnector

-FC03
215A

-TA09
DCDC Drive

-TA10
DCDC Drive

-RB09
Converter Inductor

-RB10
Converter Inductor

-FC01
315A

-FC02
315A

+UC06
DCDC Cabinet #6, Inside Container #1

-QB01
Switch Disconnector

-FC03
215A

-TA11
DCDC Drive

-TA12
DCDC Drive

-RB11
Converter Inductor

-RB12
Converter Inductor

-FC01
315A

-FC02
315A

=RE01
Fuel Cell Block 1

+GB01
Fuel Cell Module 1

-GB01
720-350V, 0-300A
Fuel Cell Stacks

-GB02
720-350V, 0-300A
Fuel Cell Stacks

+GB02
Fuel Cell Module 2

-GB01
720-350V, 0-300A
Fuel Cell Stacks

-GB02
720-350V, 0-300A
Fuel Cell Stacks

+GB03
Fuel Cell Module 3

-GB01
720-350V, 0-300A
Fuel Cell Stacks

-GB02
720-350V, 0-300A
Fuel Cell Stacks

=RE02
Fuel Cell Block 2

+GB04
Fuel Cell Module 4

-GB01
720-350V, 0-300A
Fuel Cell Stacks

-GB02
720-350V, 0-300A
Fuel Cell Stacks

+GB05
Fuel Cell Module 5

-GB01
720-350V, 0-300A
Fuel Cell Stacks

-GB02
720-350V, 0-300A
Fuel Cell Stacks

+GB06
Fuel Cell Module 6

-GB01
720-350V, 0-300A
Fuel Cell Stacks

-GB02
720-350V, 0-300A
Fuel Cell Stacks

| | |
|---|---|
| Reference Item Number | Ballard Part # TBD |
| EPLAN Project Name | 6014568 - Shell Baseload Power Hub |
| EPLAN Revision | 11 |
| EPLAN Project Pages | 628 |
| = | ++ \| + \| & C01 |

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| SHEET TYPE/DESC | Single Line Diagram - 40ft Container DC |
| ALL SHEETS ARE THE SAME REVISION STATUS | SIZE A1 \| LANGUAGE EN \| SHEET/TOTAL 3 / 7 |

FRMS103653/0B

# AC/DC Distribution - 10ft Container

## Crosswind Scope

## Ballard Scope

=AA01+WZ10
Container Interconnect, Between Containers

=BA30+DA03
Power Conversion Output, Inside Container #2

=HKN70-XB02
3ph 6,6 kV

=HKN70-FC01
MV Latched Contactor

=HKN70-FC02
400A
Fuse

-TA30
1250kVA
400/6600V Transformer
Dry-type

-FC31
250A
250A Breaker

-FC30
2000A
2000A Breaker

-FC40
2.5..4A
Circuit Breaker
for Primary Transformer Protection

-RB30
500V, 840A
0,084mH, 203uF
LC Filter

-RB31
500V, 840A
0,084mH, 203uF
LC Filter

-TA40
0,4/0,4 kV, 2kVA
Isolation Transformer

-TB30
1640 A, 3x 400-500 VAC
Active Front End

-QA40
Precharge Contactor

-TB40
60A
Rectifier, 3ph doide bridge

-RA40
4 pcs 3,3Ω, 1000W
Resistor

-FC29
800A
Fuse

-FC32
800A
Fuse

-FC41
20A

DC Busbar System

Busbar system: Cubic S2000
Short circuit withstand: 120kA, 1s
Peak withstand: 264kA

3ph 400-480V, 50-60Hz

2.15:B / 3ph AC Supply to Container #1 - 250A BP1

2.15:B / 3ph+N AC Supply from Container #1 - 32A BP2

=LA01+UC31
Control System, Container #2 Inside

-QB01
32A, 3p+N
Switch Disconnector

3ph+N 400-480V, 50-60Hz

-FC01
4A, B-curve
MCCB

-FC03
13A, B-curve
MCCB

-FC04
10A, B-curve
MCCB

-FC07
4A, B-curve
MCCB

-FC08
10A, C-curve
RCB/MCB

-TB33
24-28V/10ADC
PSU with UPS

-GB01
UPS Battery
24V, XY Ah

-QA03
4...32 V DC/48...600 V AC
Solidstate contactor
Container Heating

-EA07
Room Lighting

-XD08
1kW
Service Outlet

=JA01+DA03
Container Ventilation System, Inside Container #2

-EB03
10kW
Container Heating

-GQ10
5,7kW
Ventilation Fan

3.15:B / DC Bus from Fuel Cells DC1

3.15:B / DC Bus from Fuel Cells DC2

3.15:B / DC Bus from Fuel Cells DC3

3.15:B / DC Bus from Fuel Cells DC4

3.15:B / DC Bus from Fuel Cells DC5

3.15:B / DC Bus from Fuel Cells DC6

6x (2x120 mm2)

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| = \| ++ | + \| & C01 |

FRMS103653/08

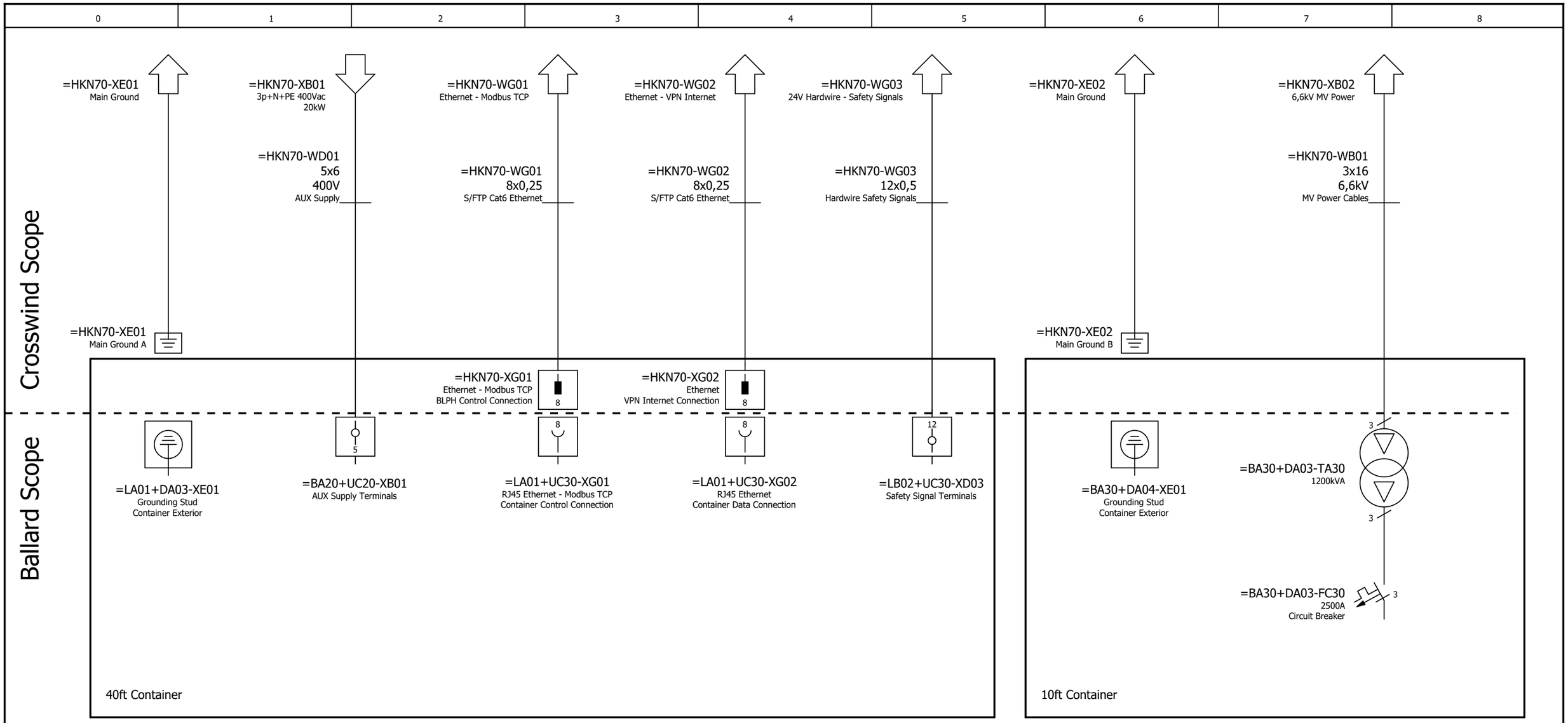
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| = | ++ | + | & C01 |

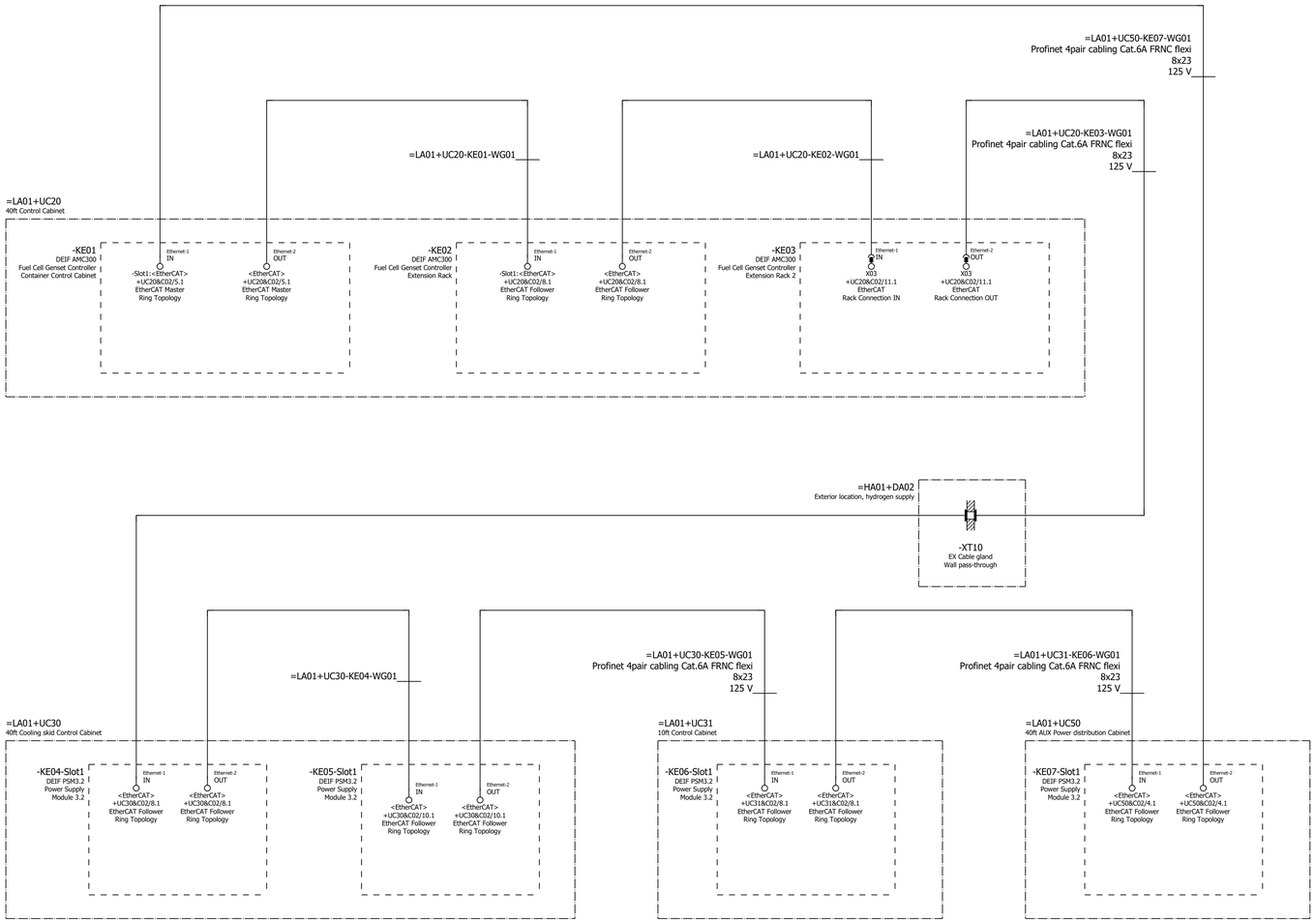
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| SHEET TYPE/DESC | Interconnection Diagram - External Use | | |
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=HE01+UC41

-TA11
VFD - HT1 Fan 1
4.0kW / 5.5HP, 3x 380-480 VAC
Net1
ETH01
-KF41
16 port network
VFD Cabinet Network Switch
V2+
Port 2

-TA12
VFD - HT1 Fan 2
4.0kW / 5.5HP, 3x 380-480 VAC
Net1
ETH01
I
Port 3

-TA13
VFD - HT1 Fan 3
4.0kW / 5.5HP, 3x 380-480 VAC
Net1
ETH01
I
Port 4

-TA14
VFD - HT1 Fan 4
4.0kW / 5.5HP, 3x 380-480 VAC
Net1
ETH01
I
Port 5

-TA15
VFD - HT1 Fan 4
4.0kW / 5.5HP, 3x 380-480 VAC
Net1
ETH01
I
Port 6

-TA16
VFD - HT1 Fan 6
4.0kW / 5.5HP, 3x 380-480 VAC
Net1
ETH01
I
Port 7

-TA21
VFD - HT2 Fan 1
4.0kW / 5.5HP, 3x 380-480 VAC
Net1
ETH01
I
Port 8

-TA22
VFD - HT2 Fan 2
4.0kW / 5.5HP, 3x 380-480 VAC
Net1
ETH01
I
Port 9

-TA23
VFD - HT2 Fan 3
4.0kW / 5.5HP, 3x 380-480 VAC
Net1
ETH01
I
Port 10

-TA24
VFD - HT2 Fan 4
4.0kW / 5.5HP, 3x 380-480 VAC
Net1
ETH01
I
Port 11

-TA25
VFD - HT2 Fan 5
4.0kW / 5.5HP, 3x 380-480 VAC
Net1
ETH01
I
Port 12

-TA26
VFD - HT2 Fan 6
4.0kW / 5.5HP, 3x 380-480 VAC
Net1
ETH01
I
Port 13

-TA31
VFD - LT Fan
4.0kW / 5.5HP, 3x 380-480 VAC
Net1
ETH01
I
Port 14

I
Port 15

R1.2
Port 1

=LA01+UC30
Coolant Skid Control Cabinet

-KF110
16 port
Unmanaged Switch
Port 7
7
7 Ethernet
Port 1
1
Ethernet 1
Port 4
4
4 Ethernet
Port 5
5
5 Ethernet
Port 16
16
16 Ethernet

-TA19
VFD, 15kW
HT Pump #1 Drive
1
RJ-45
OPT-E9

-TA29
VFD, 15kW
HT Pump #2 Drive
1
RJ-45
OPT-E9

-KF120
4G/LTE
WLAN Gateway
Firewall
1
DEV1

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |

| | |
|---|---|
| Reference Item Number | Ballard Part # TBD |
| EPLAN Project Name | 601456B - Shell Baseload Power Hub |
| EPLAN Revision | 11 |
| EPLAN Project Pages | 628 |
| = | ++ \| + \| & C01 |

| REVISION INFORMATION |
|---|
| DESCRIPTION |
| |
| DATE |
| 09-Sep-25 |

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| | |
|---|---|
| DRAWING | K559-2254-CWIWP4202202-C06-001 |
| REVISION | 11 |
| DRAWING TITLE | Crosswind/Shell Baseload Power Hub, Fuel Cell Container 1MW, no BESS |
| SHEET TYPE/DESC | Single Line Diagram - Network, Coolant Skid |
| ALL SHEETS ARE THE SAME REVISION STATUS | SIZE A1 \| LANGUAGE EN \| SHEET/TOTAL 7 / 7 |

FRM510365 3/08