

# For Construction

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Rev.	DATE	REASON FOR REVISION	DRAWN	CHECKED	APPROVED
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DRAWN BY	DATE	<b>PROJECT</b>  OLKARIA I ADDITIONAL UNITS GEOTHERMAL POWER PLANT			
DESIGN BY	DATE				
CHECK BY	DATE	<b>TITLE &amp; DESCRIPTION</b>  <b>Technical Specification and Data Sheet</b> <b>for DC &amp; UPS-OKB-1-IAU</b>			
APPROVED BY	DATE				
DRAWING SCALE	DRAWING No.				
	ZP00700-B1CE-VED-DSC-0001	0			

## DATASHEET

22/3/2013

**Project:** **Olkaria IAU GTPP (Offer: 120192)**

**APODYS CHARGER - DC UPS**

**ITEM 1 :** **110VDC system (OKB1)**

### Item description

<b>1 x system of:</b>	<b>110 V</b>	-	<b>80 A</b>	-	<b>120 min</b>	<b>- APODYS DC UPS system</b>
System configuration:	Charger dual parallel, Battery Dual 100 %					
Each system includes:						
2 x Stationary battery with for each battery :	100 %		Valve regulated lead acid AGM			
	1 x string of	54	Cells, ref :	T-1440 HP	total capacity :	1,440 Ah
	Battery installation*:			On rack within battery room within UPS cubicle		
2 x Battery protection	MCCB					
2 x Charger, 6 pulses	100 %	Nominal DC voltage:		110 V		
			Current limitation:		320 A	
1 x DC Distribution board			In Separate Distribution Cubicle		47 feeders	

*\* installation is not part of Chloride scope of supply*

### System general data

#### Configuration

Rated output current / rated output power	320 A	/	35,200 W
Nominal output voltage		110 V	
Max DC output voltage tolerance / Max DC output voltage	10 %	/	121.0 V
Min DC output voltage tolerance / Min DC output voltage	10 %	/	99.0 V
Autonomy / Backup period		120 min	

#### Environment

Protection degree of cubicle / cubicle painting colour	(RAL)	IP 41	/ 7035
Maximum system heat losses (tolerances ± 10 %)			4,720 W
Maximum altitude with full rating / with derating of 2,5% per additional 500m		1,000 m	ASL 4,000 m
Charger minimum / maximum ambient operating temperature		0 °C	/ 40 °C

#### Control and Monitoring

##### Local (System front panel)

Rectifier / charger control	on / off push button
System front panel display	64 x 128 pixels graphical LCD
LED System 'Normal' status	green
LED System 'Warning' status	orange
LED System 'Fault' status	red
Battery test launch	Automatic / manual via display
Event log (memorisation of last 100 events)	on display
Analogue meters on front door	72 x 72 mm 3
<b>Remote</b>	
Volt-free contacts	6
4-20mA Transducers	1
Modbus on Ethernet	None

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**APODYS CHARGER - DC UPS**

**ITEM 1 :** **110VDC system (OKB1)**

### Isolators and protections

Auxiliaires protection device	Fuse
Charger input isolator	MCCB

### System detailed technical data

#### Charger

##### Charger features

Double wound input isolation step-down transformer with earth screen	included
Rectifier type	solid-state SCR
Blocking diode for Parallel operation of 2 chargers	1 for each charger
Continuous DC earth fault detection	fault status via dry contact

##### Charger input

Nominal input voltage / tolerance ( $\pm$ ) (o/p regul at $\pm 1\%$ ) / number of phases	415 V	+10 % ; -10 %	3 ph
Nominal frequency / frequency tolerance ( $\pm$ )	50 Hz	/	$\pm 5\%$
Recommended size for input protection (D curve or gl) <span style="float: right; font-size: small;">(to be confirmed at engineering stage)</span>		125 A	
Maximum conductor size on input terminals		35 mm <sup>2</sup>	

##### Charger output

Output nominal voltage	110 V		
Customer standing load current	80 A		
Charger output current limitation	320 A		
Battery floating voltage / tolerance ( $\pm$ )	120.42 V	/	$\pm 1\%$
Battery automatic recharge voltage / tolerance ( $\pm$ )	120.42 V	/	$\pm 1\%$
Battery initial charge voltage / tolerance ( $\pm$ )	120.42 V	/	$\pm 1\%$
Max charger voltage ripple (with connected batteries)	Less than	1 %	
Maximum conductor size on output terminals	DC System incoming: 4C x 1-25sqmm Charger~ Battery Bank: 1C x 2-240sqmm Charger~ Distribution Board: 1C x 2-240sqmm		

#### Battery

##### Battery features

*Please refer to battery manufacturer's technical specification for full details.*

Manufacturer	HBL
Type	Valve regulated lead acid AGM
Cell reference	T-1440 HP
Battery design life at normal conditions defined by the manufacturer	20 Years
Nominal capacity <span style="float: right; font-size: small;">C 10</span>	1,440 Ah
For a back up time of	120 min
Floating voltage per cell / per battery	2.23 V / 120.42 V
Recharge voltage per cell / per battery	2.23 V / 120.42 V
Initial charge voltage per cell / per battery	2.23 V / 120.42 V
End of discharge voltage per cell / per battery	1.83 V / 98.82 V
Battery protection by	MCCB
Rating of battery protection (to be confirmed after engineering)	400 A
Battery protection location	within UPS cubicle
Recommended air exchange flow in battery room (per battery)	19.44 m <sup>3</sup> /h
Cell installation (installation not in Chloride's scope of supply)	On rack within battery room

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**Project:** **Olkaria IAU GTPP (Offer: 120192)**

**APODYS CHARGER - DC UPS**

**ITEM 1 :** **110VDC system (OKB1)**

### Distribution

#### DC distribution board

Distribution installation	Distribution Form:	Form 1	in DC Regulator cubicle		
Short circuit capacity (Isc) of bus bar (or of wires)			36 kA		

#### Distribution main isolator:

Type	On/Off contact	Trip contact	Shunt trip device		
MCCB	No	No	No	2 x	400 A 2 pole(s)

#### Distribution Feeders:

Type	On/Off contact	Trip contact	Shunt trip device		
MCCB	No	No	No	45 x	50 A 2 pole(s)
MCCB	No	No	No	2 x	250 A 2 pole(s)

### Mechanical, manufacturing and installation data

#### Charger cabinet features:

Structure thickness	2	mm
Panels thickness	1.2	mm
Door thickness	2	mm
Door secured by lock with key, number:	G9233	
Anticondensation heater with autocontrol via positive temperature compensation (PTC)	included	
Cable entry	Bottom	

#### System dimensions - per system (to be confirmed at engineering stage)

	Qty	Unitary Height(mm)	Unitary Length(mm)	Unitary Depth(mm)	Unitary Weight(kg)
Charger cubicle	2 x	1982	1200	808	435
foot print					1.94 m2
floor loading					449 kg/m2
Distribution (in DC Regulator cubicle)	1 x	1900	2200	400	320
foot print					0.88 m2
floor loading					364 kg/m2
Dropping diode (in floor-standing cubicle)	0 x	1982	0	808	150
foot print					0 m2
floor loading					kg/m2
<b>Overall footprint per unitary system</b>			<b>4600</b>	<b>808</b>	<b>1190</b>
<b>(battery installation footprint excluded, if offered)</b>					<b>3.7168</b>
					<b>320 kg/m2</b>

## DATASHEET

22/3/2013

**Project:** Olkaria IAU GTPP (Offer: 120192)

**APODYS AC UPS**

**ITEM 3 :** AC UPS 60KVA (OKB1)

### Item description

<b>1 x system of:</b>	<b>60.0 kVA</b>	<b>- Three phase output -</b>	<b>240 min</b>	<b>- APODYS AC UPS system</b>
System configuration: Charger dual isolated, Battery Dual 100 %, Inverter Dual Distributed 2 bypass lines				
Each system includes:				
2 x Stationary battery	100 %	Valve regulated lead acid AGM		
with for each battery:	1 x string of	118 Cells, ref :	T-1500 HP	total capacity: 1,500 Ah
	Battery installation*:		On rack within battery room	
2 x Battery protection	MCCB		within UPS cubicle	
2 x Charger, 6 pulses	100 %	Nominal DC voltage	240 V	
		Current limitation	380 A	
2 x On line inverter	100 %	Nominal power rating	60.0 kVA	
		DC input	240 V	
		AC output	3 x 415 V	- 50 Hz
2 x Static by-pass switch		Anti parallel SCRs - Make before break		
2 x Manual by-pass switch		Make before break		
2 x Reserve transformer	100 %	Dry, isolating & step down	60.0 kVA	
2 x Voltage regulator	100 %	Solid state	60.0 kVA	
1 x AC Distribution board		in floor-standing cubicle		50 feeder(s)

*\* installation is not part of Chloride scope of supply*

### System general data

#### Configuration

Rated output power / Rated output power factor	60.0 kVA	/	0.80
Nominal output voltage (Ph - Ph)		415 V	
Number of phases / Rated output frequency	3 ph	/	50 Hz
Autonomy period		240 min	
Inverter configuration	Dual Distributed 2 bypass lines		

#### Environment

Protection degree of cubicle / Cubicle painting colour (RAL)	IP 41	/	7035
Single system UPS heat losses at full load in floating mode (tolerances $\pm 10$ %)		9,670 W	
Maximum altitude with full rating / with derating of 2,5 % per additional 500 m	1,000 m	ASL	4,000 m
UPS minimum / maximum ambient operating temperature	0 °C	/	40 °C

#### Control and Monitoring

##### Local (System front panel)

Rectifier / charger control	on / off push button
Inverter control	on / off push button
System front panel display	64 x 128 pixels graphical LCD
LED System 'Normal' status	green
LED System 'Warning' status	orange
LED System 'Fault' status	red
Battery test launch	Automatic / manual via display
Event log (memorisation of last 100 events)	on display

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**Project:** **Olkaria IAU GTPP (Offer: 120192)**

**APODYS AC UPS**

**ITEM 3 :** **AC UPS 60KVA (OKB1)**

Analogue meters on front door	72 x 72 mm	4
<b>Remote</b>		
Volt-free contacts		9
4-20mA Transducers		2
Modbus on Ethernet		None
<b>Isolators and protections</b>		
Auxiliaires protection device		Fuse
Charger input isolator		MCCB
Reserve input isolator		MCCB
Reserve output isolator		MCCB
Manual by-pass switch		Rotary switch

### System detailed technical data

#### Charger

##### Charger features

Double wound input isolation step-down transformer with earth screen	included
Rectifier type	solid-state SCR
Continuous DC earth fault detection	fault status via dry contact

##### Charger input

Nominal input voltage / tolerance ( $\pm$ ) (o/p regul at $\pm 1\%$ ) / number of phases	415 V	+10 % ; -10 %	3 ph
Nominal frequency / frequency tolerances ( $\pm$ )	50 Hz	/	5 %
Recommended size for input protection (D curve or gl) <small>(to be confirmed at engineering stage)</small>	320 A		
Conductor size on input terminals	UPS incoming : 3C > 70 or 95sqmm (190A input)		

##### Charger output

Output nominal voltage	240 V		
Charger output current limitation	380 A		
Battery current limitation in initial charge mode	150 A		
Battery floating voltage / tolerance ( $\pm$ )	263.14 V	/	$\pm 1\%$
Battery automatic recharge voltage / tolerance ( $\pm$ )	263.14 V	/	$\pm 1\%$
Battery initial charge voltage / tolerance ( $\pm$ )	263.14 V	/	$\pm 1\%$
DC voltage ripple, battery in charge mode	1 %		
Conductor size on battery / charger output terminals	UPS ~ Battery Bank : 2C 185sqmm (356A)		

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**Project:** **Olkaria IAU GTPP (Offer: 120192)**

**APODYS AC UPS**

**ITEM 3 :** **AC UPS 60KVA (OKB1)**

### Battery

**Battery features** *Please refer to battery manufacturer's technical specification for full details.*

Manufacturer	HBL		
Type	Valve regulated lead acid AGM		
Cell reference	T-1500 HP		
Battery design life at normal conditions defined by the manufacturer	20 Years		
Nominal capacity C 10	1,500 Ah		
For a back up time of	240 min		
Floating voltage per cell / per battery	2.23 V	/	263.14 V
Automatic recharge voltage per cell / per battery	2.23 V	/	263.14 V
Initial charge voltage per cell / per battery	2.23 V	/	263.14 V
End of discharge voltage per cell / per battery	1.83 V	/	215.94 V
Battery protection by	MCCB		
Rating of battery protection (to be confirmed after engineering)	250 A		
Battery protection location	within UPS cubicle		
Recommended air exchange flow in battery room (per battery)	44.25 m3/h		
Cell installation (installation not in Chloride's scope of supply)	0.0025 NI	On rack within battery room	

### Inverter, static switch & manual bypass

#### Inverter, static switch & bypass features

Double wound inverter output isolation transformer	included		
Inverter type	IGBT		
PWM sine wave (Pulse Width Modulation) frequency control	3.2kHz		
Static by-pass switches	anti-parallel solid-state SCR		
Manual by-pass switches	Rotary switch		
Parallel operation of inverters	one Parallel Operation Board (POB) per inverter		

#### Inverter input

Nominal input DC voltage / Min / Max (with o/p regul. at $\pm 1\%$ )	240 V	216 V	264 V
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#### Inverter output

Rated output power / power factor	60.0 kVA	0.80	
Load power factor	0,5 lag to 0,9 lead		
Nominal output voltage (Ph - Ph)	415 V		
Number of phases / Rated output frequency	3 ph	/	50 Hz
Overload at PF 0.80 during 10 minutes	125%	/	104.3 A
Overload at PF 0.80 during 1 minute	150%	/	125.2 A
Short circuit capacity between Ph & N (three phase output) for: 100ms	315%	/	262.9 A
Short circuit capacity between Ph & N (three phase output) for: 5s	220%	/	183.6 A
Voltage tolerance in steady state for balanced load ( $\pm$ )	$\pm 1\%$		
Voltage tolerance in steady state for 100 % unbalanced load ( $\pm$ )	$\pm 2\%$		
Dynamic voltage tolerances ( $\pm$ ) / recovery time <small>for 0-100-0 % load step variations</small>	$\pm 3\%$	/	< 2 ms
Frequency stability when crystal driven ( $\pm$ ) / frequency slew rate	0.05 %	0.1 Hz/s	
Voltage distortion for 100 % linear load / for 100 % non linear load	< 3 %	/	IEC62040-1-2
Load crest factor	3		
Conductor size on inverter output terminals	UPS ~ Distribution Board : 4C 25sqmm (84A)		

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**Project:** **Olkaria IAU GTPP (Offer: 120192)**

**APODYS AC UPS**

**ITEM 3 :** **AC UPS 60KVA (OKB1)**

### Reserve

#### Reserve static switch

AC nominal input voltage (Ph - Ph)		415 V	
Input voltage tolerances (±)		± 10 %	
Number of phases / rated output frequency	3 ph	/	50 Hz
Frequency tracking range (±)		3.0 %	
AC nominal current		83.5 A	
Overload for 10 minutes	125%	/	104.3 A
Overload for 1 minute	150%	/	125.2 A
Overload for 1 seconde	600%	/	500.8 A
Overload for 0,1 seconde	750%	/	626.1 A
Inverter reserve transfer time when synchronised		No break	
Inverter reserve transfer time when unsynchronised		< 20 ms	
Reserve / inverter retransfer delay		less than 15 seconds	

#### Reserve transformer

Reserve transformer nominal power		60 kVA	
AC nominal input voltage (Ph - Ph)		415 V	
AC input voltage tolerances (±) / primary taps (±)	10 %	/	5 %
Number of phases (Primary / secondary)	3	/	3 ph
Short circuit capacity		2,087 A	
Reserve transformer efficiency at full load (tolerances ± 1 %)		97.0 %	
Recommended size for input protection (D curve or gl)		160 A	
Conductor size on input terminals		35 mm <sup>2</sup>	

#### Reserve automatic voltage regulator

Automatic voltage regulator nominal power		60 kVA	
AC input voltage tolerances (±) / output voltage tolerances in steady state (±)	10 %	/	1 %
Overload for 2 seconds	1,000 %	/	835 A

### Distribution

#### AC distribution board

Distribution installation	Distribution Form:	Form 1	in floor-standing cubicle		
Short circuit capacity (Isc) of bus bar (or of wires)			6 kA		

#### Distribution main isolator:

Type	On/Off contact	Trip contact	Shunt trip device			
MCCB	No	No	No	2 x	250 A	3 pole(s)

#### Distribution Feeders:

Type	On/Off contact	Trip contact	Shunt trip device			
MCCB	No	No	No	46 x	50 A	2 pole(s)
MCCB	No	No	No	2 x	250 A	2 pole(s)
MCCB	No	No	No	2 x	100 A	2 pole(s)



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**APODYS AC UPS**

**ITEM 3 :** **AC UPS 60KVA (OKB1)**

### Mechanical, manufacturing and installation data

#### UPS cabinet features:

Structure thickness	2	mm
Panels thickness	1.2	mm
Door thickness	2	mm
Door secured by lock with key, number:	G9233	
Anticondensation heater with autocontrol via positive temperature compensation (PTC)	included	
Cable entry	Bottom	

#### System dimensions - per system (to be confirmed at engineering stage)

	Qty	Unitary Height (mm)	Unitary Length (mm)	Unitary Depth (mm)	Unitary Weight (kg)
AC UPS cubicle	2 x	1,982	1,600	808	1,000
foot print					2.59 m2
floor loading					774 kg/m2
Bypass cubicle (with transfo. & stabil.)	2 x	1,982	1,200	808	692
foot print					1.94 m2
floor loading					714 kg/m2
Distribution (in floor-standing cubicle)	1 x	1,900	2,200	400	320
foot print					0.88 m2
floor loading					364 kg/m2
Battery rack	2 x	0	0	0	0
foot print					0.00 m2
floor loading					#DIV/0! kg/m2
<b>Overall footprint per unitary system (battery installation footprint excluded, if offered)</b>			<b>7,800</b>	<b>808</b>	<b>3,704</b>
					<b>6.30 m2</b>
					<b>588 kg/m2</b>