



AIRCRAFT GROUNDING SERVICES POWER UNITS

estel

EXPERIENCE SCIENCE QUALITY



Tallinn Electrical Engineering Factory «Estel» was founded in 1870.

Today, Company develops, manufactures and supplies a broad range of power converter equipment and power semiconductors, focusing on complex technological solutions and production “turnkey” delivery.

Already in 1974 TET Estel developed and launched their first conversion devices for aviation ground handling servicing equipment.

The company portfolio of aviation products includes frequency converters, airfield rectifiers, combined power units that are compatible with all available types of airplanes and helicopters, including Airbus, Bombardier, Boeing etc.

Over the years of operation the company has supplied over 6500 aircraft ground servicing units that are successfully operated in many airports around the world.



TET Estel deliveries

GROUND POWER UNITS OF DIFFERENT TYPES

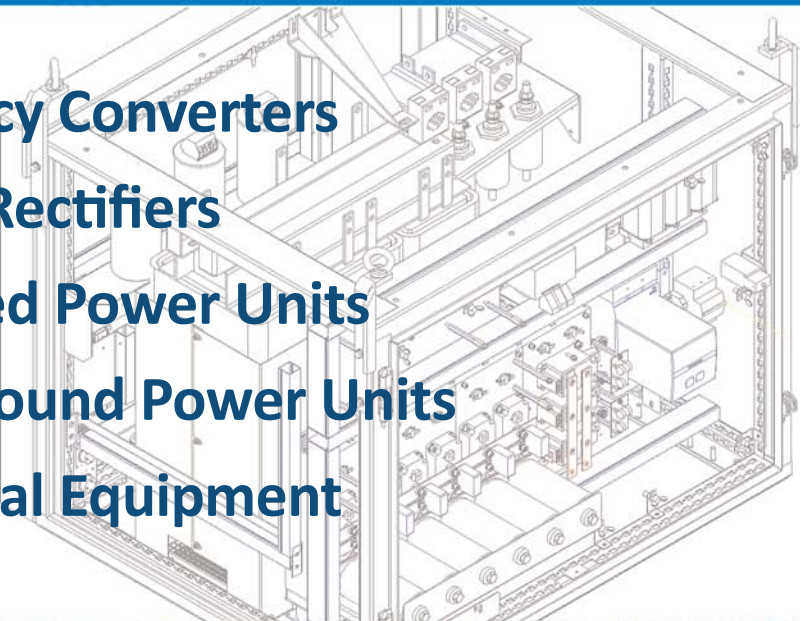
Frequency Converters

Aircraft Rectifiers

Combined Power Units

Small Ground Power Units

Additional Equipment



We offer high quality custom made production, designed and manufactured in our premises. The very first converters for aircraft ground maintenance ESTEL has developed and released yet in 1974. Since then the Company's products for aviation include frequency converters, aircraft rectifiers, combined power supplies and other equipment which for many years successfully working with all types of aircraft and helicopters, including Airbus, Bombardier, Boeing and others.

Converters power range: 5-250 kVA
Rectifiers current range: 100-1200 A

Main characteristics:

- Low power consumption
- 12-pulse system configuration
- New innovative technical solutions
- Adaptable under any type of aircraft
- High level of reliability
- Low noise level
- Possibility of modification/adjustment in accordance with Client's needs
- Heavy duty design

FCA type frequency converters provide:

- High quality of output three-phase sinusoidal voltage with frequency of 400 Hz
- Overall efficiency coefficient over 0.94
- Total harmonic content does not exceed 2%

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General information

FCA series frequency converters are designed to supply aircrafts during preflight maintenance at the airport. They can also be used as a power supply in test benches, hangars and aircraft manufacturing plants.

FCA-90 is intended to supply all types of aircrafts with 115/200 VAC voltage and 400 Hz frequency during preflight preparation and technical maintenance.

Besides standard, converter may be designed or equipped with additional options upon special client's requirements and adjustments.

FCA converters provide:

- high quality of output three-phase sinusoidal voltage with frequency 400 Hz;
- high efficiency;
- low power consumption.



Main characteristics

- Smart operational TFT display
- Full diagnostic turn-up test
- Energy consumption measuring system
- Modularity
- Maximum individual protection
- Innovative design
- Easy operation and maintenance
- A380, B787 compatible

Upon request converters could be equipped with 2 years and 5 years spare parts set .



Output parameters

Rated output power, kVA	90 and up
Rated output voltage phase/line, V	3 x 115/200
Output voltage frequency, Hz	400
Output voltage regulation accuracy, %:	
– for balanced load	±0.5
– for 30 % unbalanced load	±0.5
Total harmonic content, %	≤2
Frequency stabilization accuracy, %	±0, 001
Voltage modulation, %	≤1
Phase symmetry, electrical degree:	
– for the balanced load	120±1
– for 30 % unbalanced load	120±1
Load power factor	from 0.8 to 1
Range of load change, %	0-100
Voltage value change at 100 % load connection, %	≤8
Permissible overload, %:	
– During 600 seconds	150
– During 30 seconds	200
– During 10 seconds	250
– During 2 second	400
Starting current	No, soft start

Input parameters

Supply main rated voltage, V	3×400 (380)
Supply main permitted deviation, %	% ±15
Supply main rated frequency, Hz	50/60
Supply main permitted frequency deviation, %	±10
Power factor at 100% load	≥0.97
Power consumption at no-load mode, kW	≤1
Overall efficiency, at load 35-90 kVA, %	≥96
Ingress protection (electronic part)	IP55
Dimensions (WxHxD), mm	600x1200x600
Weight, no more, kg	≤365
Outside temperature conditions	+56 / -40 C
Aqstic noise level (1 m)	60 dB
Humidity	0 – 100%

FREQUENCY CONVERTERS, RECTIFIERS and COMBINED VERSIONS

Stationary Unit **FCA-90S**

Dimensions (WxHxD), mm
600 x 1200 x 600
Weight, no more
kg ≤ 365



Mobile version **FCA-90M**

Dimensions (WxHxD), mm
1635 x 1135 x 930
Weight, no more
kg ≤ 500



Aerobridge version **FCA-90H**

Dimensions (WxHxD), mm
1200 x 600 x 600
Weight, no more
kg ≤ 365



Aerobridge version with cable winder **FCA-90HC (FCA 90H + ACW - 02)**

Dimensions (WxHxD), mm
1600 x 800 x 1000
Weight, no more
kg ≤ 680 (without cable)



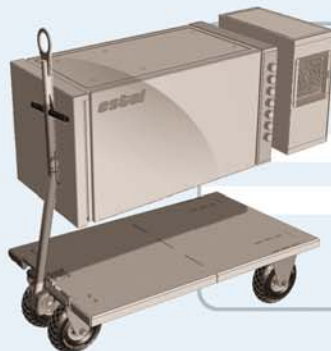
FCA-90/AR-600S

Dimensions (WxHxD), mm
FCA 600 x 1200 x 600
AR 600 x 300 x 600
Weight, no more
kg ≤ 450



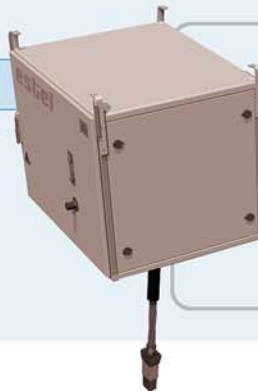
FCA-90/AR-600M

Dimensions (WxHxD), mm
1935 x 1135 x 950
Weight, no more
kg ≤ 600



Cable winder ACW-02

Dimensions (WxHxD), mm
1000 x 800 x 800
Weight, no more
kg ≤ 260 (without cable)



The new combined ESTEL GPU is the safe and the most reliable choice for supply of modern aircraft.

Combined GPU is perfect solution to have two or more power options in one device.

Could be manufactured in mobile, stationary and aerobridge versions.

Based on long positive experience, we always looking for the best solutions and the most effective and easy set-up and operation of our equipment. Our GPU guarantee the very easy complex operational and maintenance. Its design also provides easy access for cable connections and vital parts.

estel combined power



HEAVY-DUTY FREQUENCY CONVERTERS OVER 90 kVA

Output parameters

Rated output power, kVA	120 - 180
Rated output voltage phase/line, V	3 x 115/200
Output voltage frequency, Hz	400
Output voltage regulation accuracy, %:	
– for balanced load	± 0,5
– for 30 % unbalanced load	± 0,5
Total harmonic content THDU, %	
– linear load	≤2
– nonlinear load	≤2
Frequency stabilization accuracy, %	± 0,001
Voltage modulation, %	≤1
Phase symmetry, electrical degree:	
– for balanced load	120 ± 1
– for 30 % unbalanced load	120 ± 1
Load power factor	0,8 - 1
Range of load change, %	0 – 100
Crest factor	1,414 ± 0,05
Permissible overload, %:	
– during 600 s	125
– during 30 s	200
– during 10 s	250
– during 2 s	400



Input parameters

Supply main rated voltage, V	3×380 (400)
Supply main voltage permitted deviation, %	± 15
Supply nominal frequency, Hz	50/60
Supply frequency permitted deviation, %	± 10
Power factor at 100 % load	≥0,97
Line Current Distortion at nominal load THDI, %	≤7
Starting current	No, soft start



General Information

Frequency converters of FCA series are designed to supply aircrafts during preflight maintenance at the airport. They can also be used as a power supply in test benches, hangars and aircraft manufacturing plants.

FCA-180 converter is intended to supply simultaneously two commercial jets with 3×115/200 VAC voltage and 400 Hz frequency. To provide it the Converter has two independent outputs with 90 kVA each. Both outputs can be paralleled to supply one load with ×115/200 VAC voltage, 400 Hz frequency and 180 kVA power.

FCA converters provide:

- High quality of output three-phase sinusoidal voltage with frequency 400 Hz
- High efficiency coefficient
- Low power consumption



Main characteristics

- Smart operational TFT display
- Full diagnostic turn-up test
- Energy consumption measuring system
- Modularity
- Maximum individual protection
- Innovative design
- Easy operation and maintenance
- High quality outgoing 400 Hz 3 phase sinusoidal voltage
- High efficiency
- Possibility of modification/adjustment in accordance to the Customer's needs
- Low level power consumption

RECTIFIER AR-1X400/600/800X28,0

General Information

AR series rectifiers are designed to supply aircrafts and helicopters during preflight maintenance at the airport. They can also be used as a power unit of test benches, hangars and aircraft manufacturing plants.

AR is intended to supply all types of aircrafts and helicopters with 28,0 V DC voltage. Could be manufactured in a mobile and stationary versions.

AR series rectifiers provide:

- high efficiency coefficient;
- low power consumption;
- high quality of output DC voltage

Output parameters

Rated output voltage, V	28 (24...32)
Output voltage stabilization accuracy, V	± 0,85
Pulsation coefficient of output voltage, %	≤ 7,4
Rated output current, A	400, 600, 800
Current overload, 50 s, A	≤ 2400
Overall efficiency, %	≥ 92

Input parameters

Supply main rated voltage, V	3 x 400 (380)
Supply main voltage permitted deviation, %	± 10
Supply nominal frequency, Hz	50/60
Supply main rated frequency, Hz	± 10
Ingress protection	IP ≤ 55
Dimensions (WxHxD), mm	600x600x600
Weight, no more, kg	130
Maximum ambient temperature, °C	+ 45
Minimal ambient temperature, °C	- 40

Main characteristics

- TFT display
- Brand new schematics and technical solutions
- Adaptable under any type of aircraft
- High level of reliability
- Low noise level
- Possibility of modification/adjustment in accordance with the Client's needs
- Heavy duty design.



RECTIFIER AR-2X600X28,0/48

General Information

The AR-2x600x28/48 rectifier is intended for supplying on board electrical equipment of aircrafts and helicopters with 28 V DC voltage during pre-flight preparation, and also starting engines in a 24/48 V system.

Could be manufactured in a mobile and stationary versions

Environmental parameters

Air temperature, maximum +50 °
Air temperature, minimum -50 °



Operation mode: 2x28.5 V

Nominal output voltage	28 V
Accuracy of output voltage stabilization	± 0.85 V
Nominal current with simultaneous working of both outputs	600 A
Short-time overloading of any output for two seconds	2400 A
Ripple factor of output voltage	max 7.4 %
Efficiency	≥ 92 %

Operation mode: 24/48 V

Nominal output voltage with series connection of output	48 V
Output voltage range with series connection of outputs	48-69 V
Nominal output current in serial con.	600 A

HYBRID DIESEL POWER UNIT



Combine Diesel Ground Power Unit has two operational modes:

- **Self-powered mode:**
supply from internal diesel generator set
- **Hybrid (static) mode:**
supply from an external power source 3x400V, 50Hz



Combine Diesel Ground Power Unit (hereand after as DGPU) is designed to supply all type of aircraft and helicopter during preflight maintenance at the airport.

DGPU consists of a 50 Hz diesel generator set, 400 Hz frequency converter and 28 VDC rectifier. DGPU supplies any type of loads with alternating voltage 3x400 / 230 V with a frequency of 50 Hz, alternating voltage 3x200 / 115 V with a frequency of 400 Hz and a constant voltage of 28 VDC.



Output parameters (AC)

Rated output power, kVA	30-180
Rated output voltage phase/line, V	3 x 115/200
Output voltage frequency, Hz	400 ± 0.01 %
Output voltage regulation accuracy, %:	
- for balanced load	± 0.5
- for 30% unbalanced load	± 0.5
Total harmonic content THDU, %	
- linear load	≤ 2
- nonlinear load	≤ 2
Phase symmetry, electrical degree:	
- for balanced load	120 ± 1 %
- for 30% unbalanced load	120 ± 1 %
Crest factor	1.414 ± 0.04
Permissible overload, %:	
- within 600 s	150
- within 2 s	400

Output parameters (DC)

Rated output voltage, V	28.0
Rated output current, A	400-1200
Current overload, 2s, A	≤ 2500
Quantity of outputs	1

Input parameters for static work mode

Supply main rated voltage, V	3 × 400 (380)
Supply main voltage permitted deviation, %	± 15
Supply nominal frequency, Hz	50 / 60
Supply main rated frequency deviation, Hz	± 10
Power factor at 100 % load	1
Line Current Distortion at nominal load THDI, %	≤ 5
Overall efficiency at nominal conditions, %	≥ 96
Power interruption	up to 25 ms
Starting current	no, soft start

Main characteristics:

- Brand new schematics and technical solutions
- Adaptable under any type of aircraft
- High level of reliability
- Low noise level
- Comply with all aviation standards
- Possibility of modification/adjustment in accordance to the Customer's needs

Options:

- As many outputs as needed
- double AC / double DC outputs
- 24/48 V
- 27/54 V
- 36 V

Engine technical data

Manufacturer	DEUTZ/Cummins
Cycle	4 Stroke
Induction	Turbocharged
Governing Class	ISO8528 G2
Engine Speed: RPM	1500
Fuel Tank, L	350
Operation time	10 hours

Generator

Number of Bearings	1
Insulation Class	H
Wires	3P+N
Radio Interference	Supression is in line with European Standard EN61000-6

Miscellaneous

Overall dimensions A - W x H x D, mm	3300 x 1760 x 1800
Weight, kg	≤ 3000
Ingress protection (converter module)	IP55
Maximum ambient temperature, °C	plus 56
Minimal ambient temperature, °C	minus 50
Audible noise, 1m, static mode	55dB(A (typically 50 dB)
Relative humidity, %	30 to 80

BATTERY-PERFORMANCE GROUND POWER UNIT

General Information

Our battery-powered GPU FCA-B Series is ideally designed to supply all types of aircraft with AC and DC voltage for flight preparation and maintenance.

Mobility, zero emissions and a low noise level allow it to be used in multiple locations with stable output parameters - from hangars to gates and aprons.

Battery-powered GPU has two operational modes:

- **Self-powered mode:**
supply from internal battery packs
- **Static mode:**
supply from external power source

Static mode can be operated while GPU is under charge.

Output parameters (400Hz AC power)

Rated output power, kVA	90
Rated output voltage phase/line, V	3 x 115/200
Output voltage frequency, Hz	400 ± 0.01 %
Total harmonic content THDU, %	≤ 2.0
Crest factor	1.414 ± 0.04
Load power factor	from 0.8 lagging to 0.95 leading
Load variation range, %	0...100
Voltage regulation range, %	<0.5 up to 30 for unbalanced (single phase) load
Voltage modulation, %	<1.0
Permissible overload, %	
- within 2h, at cosφ = 1	100
- within 600 s	150
- within 30 s	200
- within 10 s	250*
- within 5 s	300*
- within 2 s	400*

*Overloads are applicable only in Static mode

Features

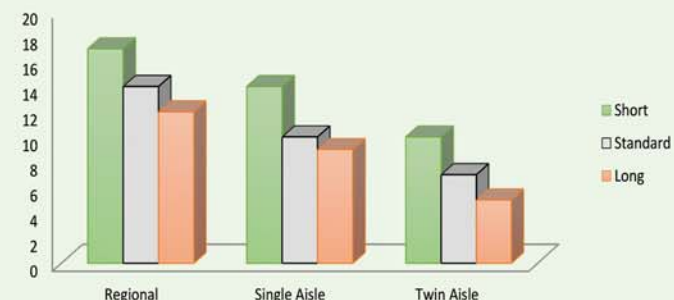
- Zero emission during operations.
- 100% output power under any temperature conditions with no battery efficiency loss.
- Up to 12 hours of operation on one charge.
- Continuous 400Hz and 28VDC output even while charging.
- Recharge from standard 50/60Hz mains socket.
- Adjustable maximum charging current from remote control for optimum charging.
- Turbo-Charge option with 1 hour to full capacity.



Output parameters (28VDC power)

Nominal output voltage, V	28
Output voltage stabilization accuracy, %	0.85
Voltage ripple, %	<1
Rated output current, A	600
Voltage compensation, V	0 - 5
Output voltage adjustment range, V	19 - 33
Permissible output current overload, A:	
- within 30 s	1200
- within 10 s	1800
- within 5 s	2100
- within 2 s	2400

GPU FCA-B average number of aircraft services on one charge based on aircraft type and service length.



Charging time in hours based on current (A) regulations.

Amperes	16	32	63	125	216
Hours	<10	<5	<3	<2	1

GPU remote control is equipped with current regulation controls to control charging speeds.

Input parameters

Rated supply voltage, V	3x400, PE
Supply voltage permitted deviation, V	
- Static mode	340...460
- Charging mode	285...475
Rated supply frequency, Hz	45...65
Overall efficiency at nominal condition, %	≥ 95
Starting current	No, soft start

Miscellaneous

Overall dimensions A - W x H x D, mm	3300 x 1760 x 1800
Weight, kg	≤ 2500
Ingress protection (converter module)	IP55
Maximum ambient temperature, °C	+ 50
Minimal ambient temperature, °C	- 40
Relative humidity, %	10...100
Audible noise at 1m distance, dB	≤ 65

SMALL GROUND POWER UNITS 5 - 20 kVA

General Information

Small ground power units are used for supplying loads with three-phase alternating current with a frequency of 400 Hz and a voltage of 3×200/115 V. Small ground units are used for centralized supply of aviation industry workshops and test facilities.

Can be manufactured both in standard complete set and also in accordance to Customer's special requirements and adjustments.



Small converters provide:

- high quality of output three-phase sinusoidal voltage with frequency 400 Hz
- high efficiency coefficient
- low power consumption
- designed in 2 versions: desktop and rack 19"
- compact design version

Main characteristics:

- High level of reliability
- Low energy consumption
- Manufactured in two versions: desktop and as an installation component for 19" telecommunication units
- Multifunctional remote control panel
- Brand new schematics and technical solutions
- Low noise level
- Possibility of modification/adjustment in accordance to the Customer's needs
- Heavy duty design
- High quality of outgoing 400 Hz 3 phase sinusoidal voltage



Output parameters

Rated output power, kVA	5-20
Rated output voltage phase/line, V	3 x 115/200
Output voltage frequency, Hz	400
Output voltage regulation accuracy, %:	± 1
Total harmonic content THDU, %	≤3
Frequency stabilization accuracy, %	± 0,01
Voltage modulation, %	≤1
Phase symmetry, electrical degree:	120 ± 1%
Range of load change, %	0 – 100
Permissible overload, %:	
– during 600 s	125
– during 30 s	150
– during 1 s	200
Starting current no, soft start	

Input parameters

Supply main rated voltage, V	3 × 400/230 (3×380/220)
Supply main voltage permitted deviation, %	± 15
Supply nominal frequency, Hz	50
Power factor at 100 % load	0,8
Power consumption:	
– at no-load mode with running converter, kW	≤0,35
Overall efficiency at nominal rated, %	≥95



Miscellaneous

Overall dimensions A - W x H x D, mm	600 x 410 x 630
Overall dimensions B - W x H x D, mm	440 x 410 x 650 (19")
Weight, kg	≤60
Ingress protection (converter module)	IP21
Maximum ambient temperature, °C	plus 40
Minimal ambient temperature, °C	minus 10
Audible noise, 1m	55dBA



AIRFIELD DISTRIBUTION COLUMNS DPA-SERIES



Airfield electric distribution column of DPA series is intended for the distribution and supply of stationary and mobile ground power units with electric power during operational forms of aircraft technical maintenance.

Technical characteristics:

Main technical parameters:

Input type of 3-phase mains	cable
Normal operating mode	24/7
Operation time at 1,5 overload	not less than 2 min
Grounding type	TN-S
General incoming switch	630 A
Protection level	IP55

Operational characteristics:

Load connectors upon customer request	
within total current	600A
Unit load current connection	250A
Dimensional characteristics:	
WxHxL, mm	600* x 1720 x 600*
Weight, kg	160

* Dimensions are variable and depend on output socket type.



PIT SYSTEMS

Hatch PIT-system



Pop-up PIT-system



TET Estel offers a wide range of products in the field of underground distribution systems. A PIT-system is a device for storing cables and other networks for supplying power, water and compressed air.

Our hatch PIT-systems and pop-up PIT systems provide long-term storage and stable operation of all electrical and electronic equipment.

Technical characteristics:

	Hatch PIT-system	Pop-up PIT-system
Height above ground when open:	610 mm	950mm
Protection:	-Rain & surface water -Sand -Ice -Thread protection module	-Rain & surface water -Sand -Ice -Pit-bunker is closed
Lifting mechanism:	Counterweight / manually	Automatic
Lock mechanism open/close:	Self lock / manually	Automatic
Movement:	Balanced smooth	Powerful, constant,
Open/close force:	Up to 10 kg / up to 15 kg	0 kg / 0 kg
Warning signals (optional):	Flash light, siren	Siren
PCA hose & aircraft adapter:	Available	Available

AUTOMATIC CABLE WINDING DEVICE ACW-04



Automatic cable winding device is operated using remote control panel or from the diagnostics panel.

Automatic cable winding device can be installed for the convenient storage and operation of cables.

ACW-04 allows for safekeeping of cables under any weather conditions, ensuring their extended longevity and protection. It can also be equipped with a heating system for low operational temperatures.

Technical characteristics:

Power supply	3x400/230 (3 x 380/220)
Coiling speed, m/min	40
Cable length, m	22 (30, 40 – optional)
Motor rating of winding device, kW	1,0

Additional data:

Overall dimensions (basic model), WxLxH, mm	800x1000x800
Cable diameter, mm	42

MANUAL CABLE WINDING DEVICES



Technical characteristics CW

Weight, kg	150
Overall dimensions, mm	1800 x 1600 x 1150
Drum diameter, mm	1000
Wheels diameter, mm	420
Cable diameter, mm	52
Voltage, V	208
Cable length, m	10 – 50
Number of wheels	3

Service conditions ZIG-ZAG

Ambient temperature °C :	from -40 to + 52
Relative humidity at 20 °C:	95%
Zig-zag weight with 30 meters cable:	
service unit with ladder:	900kg
service unit with cable box:	810kg
service unit with cable holder:	750kg
service unit with cable racks:	700kg



TET ESTEL AS

www.tet-estel.com
Tel. : +372 6228300
Fax : +372 6228301
E-mail : estel@tet-estel.com
Kuuli 6
13619 Tallinn
ESTONIA