

- Supervision of two or three three-phase power sources
- Emergency demand supervision for standby generating set
- Tie-breaker management
- Control of contactors, motorised circuit breakers and motorised changeover switches
- Closed transition
- Automatic non-priority load management
- Event logging
- Remote control and supervision
- Front optical port
- Built-in NFC technology
- Expandable with EXP modules
- Communication protocols Modbus-ASCII, RTU and TCP
- Real time clock
- Enclosed automatic transfer switches ATS.

**Automatic transfer switch controllers for 2 power sources**

	<b>SEC. - PAGE</b>
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**Automatic transfer switch controllers for 3 power sources**

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**Enclosed automatic transfer switches ATS**

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**Accessories**

Dual power supply module .....	26 - 10
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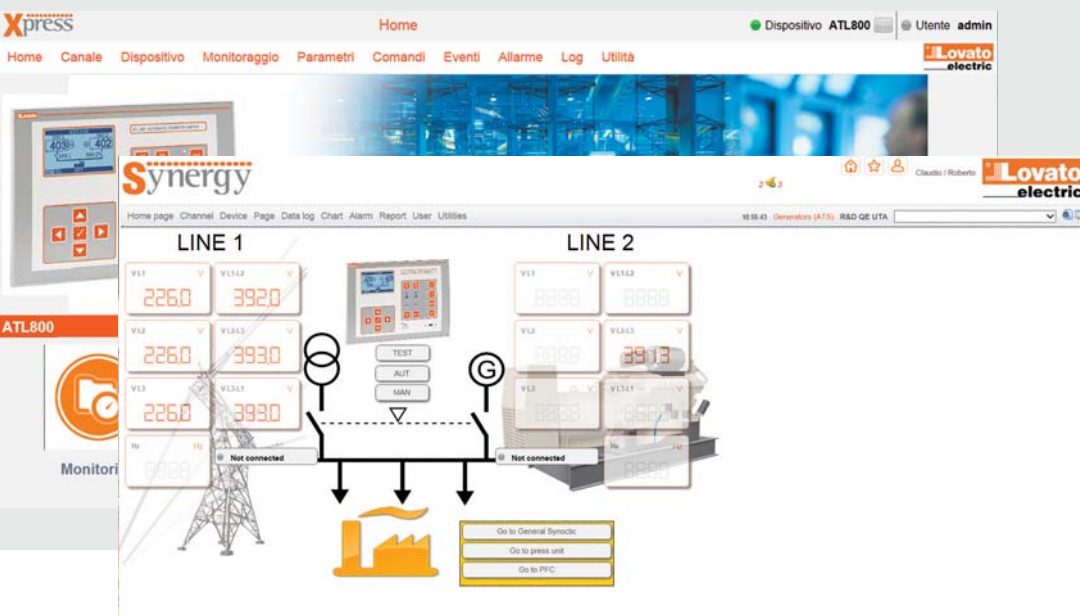
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**Wiring diagrams .....**

**26 - 13**

**Technical characteristics .....**

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### ATL 100

- Modular housing
- Management of two power sources
- Single phase control.



Page 26-6

### ATL 600

- Management of two power sources
- AC power supply
- 6 programmable digital inputs
- 7 programmable relay outputs.



Page 26-6

### ATL 610

- Management of two power sources
- AC and DC power supply
- 6 programmable digital inputs
- 7 programmable relay outputs
- Real time clock (RTC)
- Expandable with EXP series modules (inputs and outputs, communication ports).



Page 26-7

### ATL 800

- Management of 2 power sources and 1 tie breaker
- AC and DC power supply
- 8 programmable digital inputs
- 7 programmable relay outputs
- Built-in NFC technology for parameter settings with APP **NFC**
- Real time clock (RTC)
- Non-priority load management
- Closed transition with brief parallel configuration
- Built-in RS485 communication
- Built-in PLC logic
- Expandable with EXP series modules (inputs and outputs, communication ports).



Page 26-8

### ATL 900

- Management of 3 power sources and 2 tie breakers
- AC and DC power supply
- 12 programmable digital inputs
- 10 programmable relay outputs
- 1 programmable static output
- Built-in NFC technology for parameter settings with APP **NFC**
- Real time clock (RTC)
- Non-priority load management
- Closed transition with brief parallel configuration
- Built-in RS485 communication
- Built-in PLC logic
- 4 current inputs
- Expandable with EXP series modules (inputs and outputs, communication ports).



Pag. 26-9

### ATP

- Enclosed automatic transfer switches from 45 to 160A
- Management of 2 power sources
- Four-pole interlocked contactors
- Automatic transfer switch controller type ATL 600
- Dual power supply module type ATL DPS1 for the measurement and control of voltages present at supply inputs
- Miniature circuit breakers for the protection of the measuring lines
- Metallic enclosure IP65.



Page 26-10

### ATL DPS1

- Module specifically designed to control power supply voltage of motorised circuit breakers and changeover switches
- Continuous monitoring of supply line status
- Management via microcontroller management.



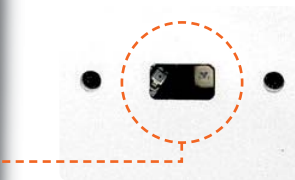
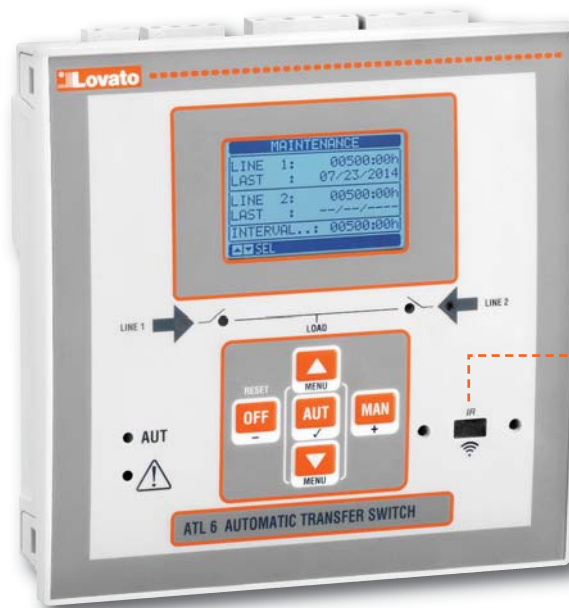
	ATL 100	ATL 600	ATL 610	ATL 800	ATL 900
<b>POWER SUPPLY</b>					
Rated DC supply voltage	—	—	12/24VDC	12/24/48VDC	12/24/48VDC
Rated AC supply voltage	110...230VAC	110...240VAC	110...240VAC	110...240VAC	110...240VAC
Frequency	45...66Hz	45...66Hz	45...66Hz	45...66Hz	45...66Hz
<b>FRONT PANEL / HOUSING</b>					
Backlit display	—	LCD graphic 128x80 pixel	LCD graphic 128x80 pixel	LCD graphic 128x80 pixel	LCD graphic 128x112 pixel
Languages	—	5	5	8	8
Size	Modular housing (3U)	144x144x52.2mm/ 5.67x5.67x2.05"	144x144x52.2mm/ 5.67x5.67x2.05"	240x180x45mm/ 9.45x7.09x1.77"	240x180x45mm/ 9.45x7.09x1.77"
Degree of protection	IP40 on front / IP20 terminals	IP40 / optional IP65	IP40 / optional IP65	IP65	IP65
Expandable with EXP series modules	—	—	2 modules	3 modules	3 modules
<b>VOLTAGE AND CURRENT MEASUREMENT INPUT</b>					
Power sources that can be controlled	—	2	2	2	3
Voltage inputs per line	1 phases + neutral	3 phases + neutral	3 phases + neutral	3 phases + neutral	3 phases + neutral
Rated voltage Ue	110...230VAC	480VAC	480VAC	600VAC	600VAC
Current inputs	—	—	—	—	4 (by 5A or 1A CTs)
Frequency range	45...65Hz	45...65Hz	45...65Hz	45...65Hz	45...65Hz
<b>BUILT-IN DIGITAL INPUTS AND OUTPUTS</b>					
Number of inputs	—	6	6	8	12
Number of outputs	3	7	7	7	11
Contact configuration	3 NO	6 NO + 1 changeover	6 NO + 1 changeover	4 NO + 3 changeover	6 NO + 4 changeover + 1 SSR
<b>INTERFACE</b>					
Programming with NFC technology	—	—	—	●	●
Front optical USB communication port	—	● with CX01	● with CX01	● with CX01	● with CX01
Front optical Wi-Fi communication port	—	● with CX02	● with CX02	● with CX02	● with CX02
USB communication	—	—	● EXP10 10	● EXP10 10	● EXP10 10
RS232 communication	—	—	● EXP10 11	● EXP10 11	● EXP10 11
RS485 communication	—	—	● EXP10 12	● (built in)	● (built in)
Ethernet communication	—	—	● EXP10 13	● EXP10 13	● EXP10 13
Profibus communication	—	—	● EXP10 14	● EXP10 14	● EXP10 14
Communication via Modem	—	—	—	● EXP10 15	● EXP10 15
<b>FUNCTIONS</b>					
Number of tie breakers that can be managed	—	—	—	1	2
Programmable source type (utility or generation)	—	●	●	●	●
Closed transition	—	—	—	●	●
Non-priority load management	—	—	—	●	●
Switching management with power thresholds	—	—	—	—	●
PLC logic	—	—	—	●	●
Timers	—	—	—	●	●
System layout available on display	—	—	—	6	14
Custom system layouts	—	—	—	●	●
User alarms	—	●	●	●	●
Limits	—	●	●	●	●
Event logging	—	100	100	250	250
Real time clock with backup reserve energy	—	—	●	●	●
Acoustic alarms	—	—	—	●	●
Analogue inputs	—	—	—	● EXP10 04	● EXP10 04
Analogue outputs	—	—	—	● EXP10 05	● EXP10 05
Accessory for alarm remoting	—	—	—	—	● RGK RR

## 26 Automatic transfer switch controllers

For 2 power sources  
ATL 600 - ATL 610

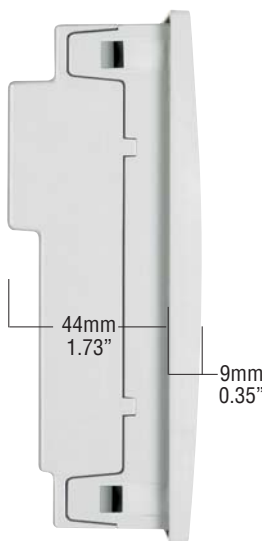
# NON-STOP CONTROL!

- **BACKLIT GRAPHIC LCD DISPLAY**  
128x80 pixel, with excellent legibility with adjustable brightness and display of events, alarms and measurements in 5 languages: English, Italian, French, Spanish and German.



- **OPTICAL COMMUNICATION PORT**  
The optical port on the front, using a standard USB or Wi-Fi point, permits to communication with a PC, smartphone and tablet, to carry out programming, diagnostics and data download without removing power to the electric panel.

### ● COMPACT SIZE



**Slim frame profile** and reduced total depth simplify installation of the transfer switch controller also in very compact electric panels.

- **HIGH PROTECTION DEGREE**  
The controller front and the optional frame seal have been designed to warrant an **IP65** protection degree.
- **MAINTENANCE COUNTERS**  
ATL features two counters used for maintenance; the first monitors the operating time and the second counts the number of switching operations. Exceeding the limit set on the counters activates the corresponding alarm.

### ● FIXING SYSTEM



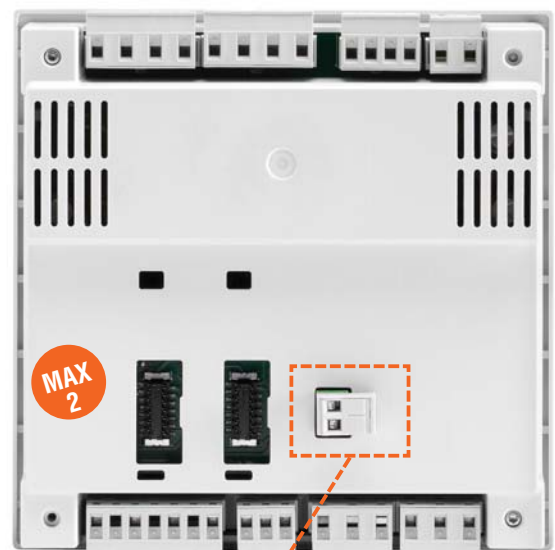
The fixing system with **metal screws** guarantees excellent, lasting hold over time.

- **STATISTICS AND EVENTS**  
The recorded statistical data is available to the user for understanding how the system operates. A cyclical internal memory records up to 100 events.
- **EMERGENCY DEMAND SUPERVISION FOR STANDBY GENERATING SET**  
In applications where one of the two supply sources is a generating set, the transfer switch controller has specific functions to supervise the generator starting and stopping operations.

### ● INPUTS, OUTPUTS, INTERNAL VARIABLES, COUNTERS

The inputs and outputs can be configured by the user to manage the various application requirements. Also available to the user are limit thresholds, counters, user alarms and remote control variables (ATL 610 only) to customise the control functions. The limit and counter statuses, if enabled, are shown in the appropriate pages on the display.

- **CALENDAR CLOCK (ATL 610)**  
Built-in calendar-clock with backup reserve power.
- **DUAL POWER SUPPLY (ATL 610)**  
110...240VAC and 12/24VDC supply.
- **EXPANDABILITY (ATL 610)**  
Basic functions of the transfer switch controllers can be easily extended using EXP series expansion modules:
  - Relay outputs
  - Digital and analogue inputs and outputs
  - Opto-isolated RS232 interface
  - Opto-isolated RS485 interface
  - Opto-isolated Ethernet interface.
 Using modules dedicated to communications the device can be controlled and supervised by the **Synergy** and **Synergy** softwares and controlled remotely and configured with the **Xpress** software.



12/24VDC battery supply input

## VERSATILE CONFIGURATION



### ATL 800

- Management of 2 energy sources and 1 tie breaker.
- 6 preconfigured system layouts.
- Non-priority load management.
- Management of transition with brief parallel configuration.
- RS485 built in.
- Built-in NFC technology for parameter settings with APP **NFC**.
- App and software: **Synergy**, **Synergy Vision**, **Xpress**, **Sam1**, **NFC**.



#### ● GRAPHIC LCD AND 8-LANGUAGE TEXT

The backlit graphic display simplifies the user interface and permits good visibility in environments with poor lighting. For ATL 800 and ATL 900 the texts are available in 8 languages: English, Italian, French, Spanish, German, Portuguese, Polish and Russian.

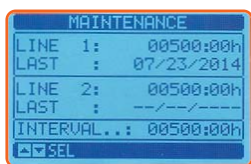
The new interface allows the user to see, clearly and simply:

- System status
- Measurements
- Statistical data
- Threshold control
- Alarm pop-up windows.



#### ● MAINTENANCE COUNTERS

Two counters can be used for scheduling maintenance on the transfer systems installed: the first for recording the operating time and the second for monitoring the number of switching operations. Exceeding the limit set on the counters activates the corresponding alarm.

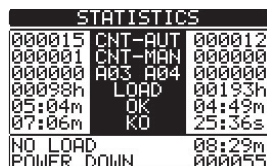
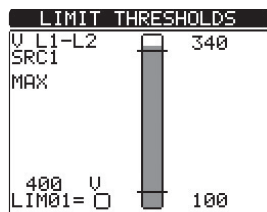


#### ● INPUTS, OUTPUTS, INTERNAL VARIABLES, COUNTERS

The input and output functions are preconfigured with the most frequently used settings; the user can easily modify the predefined configuration and adapt the switch to their application requirements. All the inputs and outputs can be configured. There are various types of programmable internal variables:

- Limit thresholds
- Remote control variables
- User alarms
- Programmable counters
- Timer.

The limit, counter and enabled timer statuses are available for display on dedicated pages.



#### ● HIGH PROTECTION RATING

The controller front and the frame seal have been designed to warrant an **IP65** protection degree.

#### ● STATISTICS AND EVENTS

The statistical data recorded by the transfer switch controller is available to the user for analysing the performance of the switching system. A cyclical internal memory records up to 250 events, providing useful information on the history of the system controlled.

#### ● BUILT-IN CALENDAR CLOCK

A built-in calendar clock with backup reserve energy permits each event to be identified using the time and date on which it occurred.

#### ● BUILT-IN RS485 COMMUNICATION

Thanks to the built-in RS485 communication port, ATL 800 and ATL 900 are already set up for remote supervision and control. In addition to this communication port, the user can install two further types of communication from those available in the EXP... expansion modules.

#### ● DUAL AC/DC SUPPLY

ATL switches can deal with all supply solutions demanded by the market. The best and safest solution is the simultaneous use of AC and DC supply. The switches can then be supplied by the AC line available and, during switching, in the absence of the AC line, the switch will be supplied by the battery via the DC inputs. Non-stop control! AC supply ensures supply during system monitoring and DC supply guarantees constant supply during switching.

#### ● PROGRAMMABLE PLC LOGIC

With the built-in PLC functions, new switching logic can be defined through appropriate combinations of input, output and internal variable signals.

#### ● TIMER

8 timer variables are available for use in the system's PLC logic, in combination with the outputs or user alarms. Each timer variable has an input variable that controls it. When this variable changes state, so does the timer variable, but it remains in the new state only for the time specified then returns automatically to the starting condition.

#### ● NFC CONNECTION

Programming the parameters via tablet and smartphone is now possible also through NFC wireless technology. Bringing a smartphone or tablet with NFC connection enabled close to the display of the ATL 800-900 activates the **NFC** APP and the switch connected is recognised automatically. It will then be possible to modify the parameters and program the ATL.

#### ● USB AND WI-FI COMMUNICATION INTERFACES

ATL 800 and ATL 900 feature a front optical port for programming via optional USB (CX 01) or Wi-Fi (CX 02) communication interface. Advantages:

- Not necessary to disconnect the supply from the panel to connect to the switch
- Electrical safety (no physical connection)
- Convenience of operating on the front.

## 26 Automatic transfer switch controllers

For 2 and 3 power sources  
ATL 800 - ATL 900

# FULL OPTIONAL, FOR EVERY REQUIREMENT



### ATL 900

- Management of 3 energy power sources and 2 tie breakers.
- 4 current inputs for the three phases and neutral.
- 14 preconfigured system layouts.
- Non-priority load management.
- Management of transition with brief parallel configuration.
- RS485 built in.
- Built-in NFC technology for parameter settings with APP **NFC**.
- App and software: **Synergy**, **Synergy Xpress**, **Sam1, NFC**.



#### ● WI-FI COMMUNICATION INTERFACE (VIA CX 02)

This connection can be used to:  
- Copy the parameters  
All the parameters of the ATL can be saved in the CX 02 memory and if necessary loaded back into the same device (backup function) or a new switch (replication of the configuration).  
- Clone the device settings  
In addition to copying the parameters, the current values of the statistical data, counters and events can be saved in the memory in order to completely replicate an ATL on another device of the same type or restore the ATL to a previously saved state.

#### THREE TYPES OF TRANSITION AVAILABLE

##### Open transition

The switch transfers the load between the two sources, interrupting the supply for a period of time that can be programmed by the user.

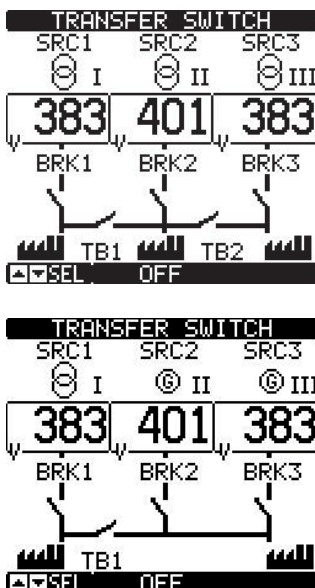
##### In-phase transition

The switch transfers the load between the two sources, interrupting the supply for a period of time that can be programmed. In this case the load is passed to a new source if spontaneous synchronisation is found; the amplitude, phase and frequency of the two sources must not differ from the maximum value set.

##### Closed transition

With switches and external protections, configured appropriately, the two sources will be synchronised (where possible) or spontaneous synchronisation will be expected within a limit time. In presence of all synchronisation conditions the load will be transferred with closed transition and instantaneous parallel without interrupting supply.

#### ATL 900: Management of three sources and two tie breakers



A single transfer switch controller can be used to manage applications which in the past required several transfer switch controllers in a cascade connection.  
24 system layouts are available.

##### 4 current inputs

The current inputs permit the monitoring of the demand load and defining of the correct switching strategy. Knowing the power demanded by the system and the rated power of the sources, ATL900 can select the best source available that can supply the loads correctly.

#### ● EXPANDABILITY

ATL 800 and ATL 900 functionality can be extended thanks to the EXP... series expansion modules. Three expansion slots are available, and while the switch is restarting the modules are recognised and configured entirely automatically. The following EXP... modules are available:  
- Digital I/O modules  
- Analogue I/O modules  
- USB, RS232, RS485, Ethernet and Profibus communication modules  
- GPRS/GSM modem  
Since the additional modules are shared with other LOVATO Electric products, it is possible to save in management costs, guaranteeing flexibility and ease of installation, above all when the system has already been commissioned.



EXP10...



MAX  
3

### Non expandable



ATL 100



ATL 600

### Expandable with EXP... modules



ATL 610



EXP10...

**new**

Order code	Description	Qty per pkg	Wt
		n°	[kg]
ATL 100	Automatic transfer switch controller for 2 power sources with single phase control, modular housing, 110...230VAC supply	1	0.300
ATL 600	Automatic transfer switch controller with LCD display and optical port for 2 power sources with three phase control (144x144mm/5.7x5.7"), 110...240VAC supply	1	0.600

Order code	Description	Qty per pkg	Wt
		n°	[kg]
ATL 610	Automatic transfer switch controller with LCD display and optical port for 2 power sources with three phase control (144x144mm/5.7x5.7"), 110...240VAC supply and 12/24VDC, expandable with EXP... series modules	1	0.680

Order code	Description
------------	-------------

EXPANSION MODULES FOR ATL610  
Snap on fixing of two modules on ATL 610 rear.  
Inputs and outputs.

EXP10 00	4 opto-isolated digital inputs
EXP10 01	4 opto-isolated static outputs
EXP10 02	2 digital inputs and 2 static outputs, opto-isolated
EXP10 03	2 relay outputs 5A 250VAC
EXP10 06	2 relay outputs, normally open contact 5A 250VAC
EXP10 07	3 relay outputs, normally open contact 5A 250VAC
EXP10 08	2 opto-isolated digital inputs and 2 5A relay outputs 250VAC
Communication ports.	
EXP10 10	Opto-isolated USB interface
EXP10 11	Opto-isolated RS232 interface
EXP10 12	Opto-isolated RS485 interface
EXP10 13	Opto-isolated Ethernet interface
EXP10 14	Opto-isolated Profibus-DP interface

#### EXP... expansion modules fixing on ATL 610



MAX 2

#### General characteristics ATL 100

ATL100 is a single phase automatic transfer switch controller in modular housing. It monitors 2 single phase voltage inputs and it connects to the output the line that is within the limits. The priority line is the line 1. The 2 outputs can control contactors or motorized changeover switches to perform the transfer between the lines.

#### Operational characteristics ATL 100

- Self-powered
- Input voltage range: 80...300VAC
- Frequency range: 45...66Hz
- 2 relay outputs with 1 NO contact 4A 250VAC
- 1 relay output with 1 NO contact 3A 250VAC

#### General characteristics ATL 600 - ATL 610

The automatic transfer switch controllers ATL 600 / ATL 610 are used for the automatic or manual switching of the load from the MAIN LINE to a stand-by or emergency SECONDARY LINE and vice versa. They have two outputs for the "automatic" and/or "manual" control of contactors or motorised circuit breakers and switches. The main features are:

- Supply input
  - Single in AC for ATL 600
  - Dual in AC and DC for ATL 610
- Measurement inputs for three phase + neutral voltage values; also suitable for 1 and 2 phase lines
- 128x80 backlit graphic LCD to view measurements, events and alarms in 5 languages (English, Italian, French, Spanish and German)
- 2 status indication LEDs
- 6 programmable digital inputs
- 7 programmable relay outputs
- Viewing of L-L and L-N voltage values of the controlled lines
- Status viewing of contactor or motorised circuit breakers and switches
- Configuration programming of lines, control and supervision parameters for emergency demand of generating set
- Event logging
- Microprocessor supervision of functions; including virtual real time clock for ATL 610
- Communication interface by front optical port with CX01 or CX02 dongle using USB or Wi-Fi
- Compatible with Synergy and Synergy<sup>2</sup>, supervision and energy management software, Xpress remote control and configuration software and with the Sam1 application for Android/iOS
- Modbus-RTU, ASCII and TCP communication protocol

#### CONTROL FUNCTIONS OF THE LINES

- Phase sequence and phase loss
- Minimum and maximum voltage
- Voltage asymmetry
- Minimum and maximum frequency.

#### Operational characteristics ATL 600 - ATL 610

- Power supply
  - Power supply voltage: 110...240VAC ; 12/24VDC only for ATL 610
  - Voltage range: 90...264VAC; 9...36VDC only for ATL 610
- Voltage measurement inputs
  - Rated voltage Ue: 100...480VAC (L-L)
  - Measuring range: 50...576VAC (L-L)
  - Frequency range: 45...65Hz.
- Programmable digital inputs
  - Negative inputs
- Programmable relay outputs
  - 5 each with 1 normally open contact (NO - SPST) rated 8A 250VAC
  - 2 each with 1 changeover contact (NO/NC - SPDT) rated 8A 250VAC
- Enclosure
  - Flush-mount housing: 144x144mm/5.7x5.7"
  - IEC degree of protection: IP40 on front; IP65 with optional seal EXP80 01; IP20 at rear.

#### Certifications and compliance

Certifications obtained: cULus (only for ATL 600 - ATL 610), EAC, RCM.

Compliant with standards: IEC/EN 60947-1, IEC/EN 60947-6-1, IEC/EN 61000-6-2, IEC/EN 61000-6-3, UL508, CSA C22.2 n°14.

### Expandable with EXP... modules



ATL 800



EXP10...

Order code	Description	Qty per pkg	Wt
		n°	[kg]
ATL 800	Automatic transfer switch controller (240x180mm/9.45"-7.09") with LCD display, optical port and NFC for 2 lines control and 1 tie breaker, 110...240VAC supply and 12/24/48VDC, expandable with EXP... series modules	1	1.000

Order code	Description
EXPANSION MODULES. Snap on fixing of three modules on rear of ATL 800. Digital inputs and outputs.	
EXP10 00	4 opto-isolated digital inputs
EXP10 01	4 opto-isolated static outputs
EXP10 02	2 digital inputs and 2 static outputs, opto-isolated
EXP10 03	2 relay outputs 5A 250VAC
EXP10 06	2 relay outputs, normally open contact 5A 250VAC
EXP10 07	3 relay outputs, normally open contact 5A 250VAC
EXP10 08	2 opto-isolated digital inputs and 2 5A relay outputs 250VAC
Analogue inputs and outputs.	
EXP10 04	2 opto-isolated analogue inputs 0/4...20mA or PT100 or 0...10V or 0...+5V
EXP10 05	2 opto-isolated analogue outputs 0/4...20mA or 0...10V or 0...+5V
Communication ports.	
EXP10 10	Opto-isolated USB interface
EXP10 11	Opto-isolated RS232 interface
EXP10 12	Opto-isolated RS485 interface
EXP10 13	Opto-isolated Ethernet interface
EXP10 14	Opto-isolated Profibus-DP interface

### EXP... expansion module fixing on ATL 800



MAX 3

### General characteristics

The automatic transfer switch controller ATL 800 is used for the automatic or manual switching of the load between two lines in accordance with the selected switching logic. It has outputs for the "automatic" and/or "manual" control of contactors or motorised circuit breakers and switches. It can also manage a third control device as tie breaker or non-priority load management. The layout and system status are displayed directly on the graphic LCD.

The main features are:

- AC and DC supply inputs
- Measurement inputs for three phase + neutral voltage values; also suitable for 1 and 2 phase lines
- 128x80 backlit graphic LCD to view measurements, events and alarms in 8 languages (English, Italian, French, Spanish, German, Portuguese, Polish and Russian)
- Active operating mode indicator LED
- Viewing of L-L and L-N voltage values of the controlled lines
- Viewing the status of contactors or motorised circuit breakers both via display and LED
- 6 system layouts available
- Management of a tie breaker
- 8 programmable digital inputs
- 7 programmable relay outputs
- Viewing of L-L and L-N voltage values of the controlled lines
- Configuration programming of lines, type of source (line/generator), control and supervision parameters for emergency demand of generating set
- Possibility of transferring load with closed transition and spontaneous or controlled genset synchronisation
- Non-priority load management
- Built-in programmable PLC logic
- Built-in RS485 communication
- Event logging
- Virtual calendar clock (RTC)
- Communication interface by front optical port with CX01 or CX02 dongle using USB or Wi-Fi
- Parameter programming via NFC technology and the App **NFC**
- Compatible with **Synergy** and **Synergy**, supervision and energy management software, **Xpress** remote control and configuration software and with the **Sam1** application for Android/iOS
- Modbus-RTU, ASCII and TCP communication protocol

### CONTROL FUNCTIONS OF THE LINES

- Phase sequence and phase loss
- Minimum and maximum voltage
- Voltage asymmetry
- Minimum and maximum frequency.

### Operational characteristics

- Power supply
  - Power supply voltage: 100...240VAC; 12/24/48VDC
- Voltage measurement inputs
  - Rated voltage Ue: 100...600VAC (L-L)
  - Frequency range: 45...65Hz.
- Programmable digital inputs
  - Negative inputs
- Programmable relay outputs
  - 2 each with 1 normally open contact (NO - SPST) rated 12A 250VAC
  - 2 each with 1 normally open contact (NO - SPST) rated 8A 250VAC
  - 3 each with 1 changeover contact (NO/NC - SPDT) 8A 250VAC
- Enclosure
  - Flush-mount housing: 180x240mm/5.7x5.7"
  - IEC degree of protection: IP65 on front; IP20 at back.

### Certifications and compliance

Certifications obtained: cULus, EAC, RCM.  
Compliant with standards: IEC/EN 61010-1, IEC/EN 61010-2, IEC/EN 61000-6-2, IEC/EN 61000-6-4, IEC/EN 60947-1, IEC/EN 60947-6-1, UL508 and CSA C22.2 n° 14.



### Expandable with EXP... modules



ATL 900



Order code	Description	Qty per pkg	Wt
		n°	[kg]
ATL 900	Automatic transfer switch controller (240x180mm/ 9.45"-7.09") with LCD display, optical port and NFC for 3 lines control and 2 tie breakers, 110...240VAC supply and 12/24/48VDC, expandable with EXP... series modules	1	1.800



EXP10...

Order code	Description
EXPANSION MODULES. Snap on fixing of three modules on rear of ATL 900. Digital inputs and outputs.	
EXP10 00	4 opto-isolated digital inputs
EXP10 01	4 opto-isolated static outputs
EXP10 02	2 digital inputs and 2 static outputs, opto-isolated
EXP10 03	2 relay outputs 5A 250VAC
EXP10 06	2 relay outputs, normally open contact 5A 250VAC
EXP10 07	3 relay outputs, normally open contact 5A 250VAC
EXP10 08	2 opto-isolated digital inputs and 2 5A relay outputs 250VAC
Analogue inputs and outputs.	
EXP10 04	2 opto-isolated analogue inputs 0/4...20mA or PT100 or 0...10V or 0...+5V
EXP10 05	2 opto-isolated analogue outputs 0/4...20mA or 0...10V or 0...+5V
Communication ports.	
EXP10 10	Opto-isolated USB interface
EXP10 11	Opto-isolated RS232 interface
EXP10 12	Opto-isolated RS485 interface
EXP10 13	Opto-isolated Ethernet interface
EXP10 14	Opto-isolated Profibus-DP interface
EXP10 15	GPRS/GSM modem

### EXP... expansion module fixing on ATL 900



MAX 3

### General characteristics

The automatic transfer switch controller ATL 900 is used for the automatic or manual switching of the load between three lines in accordance with the selected switching logic. It has outputs for the "automatic" and/or "manual" control of contactors or motorised circuit breakers and switches. It can also manage two more control devices as tie breakers or non-priority load management. It has four current inputs for managing switching with power thresholds. The layout and system status are displayed directly on the graphic LCD. The main features are:

- AC and DC supply inputs
- Measurement inputs for three phase + neutral voltage values; also suitable for 1 and 2 phase lines
- 4 current measurement inputs
- 128x112 backlit graphic LCD to view measurements, events and alarms in 8 languages (English, Italian, French, Spanish, German, Portuguese, Polish and Russian)
- Active operating mode indicator LED
- Viewing of L-L and L-N voltage values of the controlled lines
- Viewing the status of contactors or motorised circuit breakers both via display and LED
- 6 system layouts available
- Management of a tie breaker
- 12 programmable digital inputs
- 10 programmable relay outputs
- 1 static output
- Viewing of L-L and L-N voltage values of the controlled lines
- Configuration programming of lines, type of source (line/generator), control and supervision parameters for emergency demand of generating set
- Possibility of transferring load with closed transition and spontaneous or controlled genset synchronisation
- Non-priority load management
- Built-in programmable PLC logic
- Built-in RS485 communication
- Event logging
- Virtual calendar clock (RTC)
- Communication interface by front optical port using USB CX01 or Wi-Fi CX02 dongle
- Parameter programming via NFC technology and the App **NFC**
- Compatible with **Synergy** and **Synergy**, supervision and energy management software, **Xpress** remote control and configuration software and with the **Sam1** application for Android/iOS
- Modbus-RTU ASCII and TCP communication protocol.

### CONTROL FUNCTIONS OF THE LINES

- Phase sequence and phase loss
- Minimum and maximum voltage
- Voltage asymmetry
- Minimum and maximum frequency.

### Operational characteristics

- Power supply
  - Power supply voltage: 100...240VAC; 12/24/48VDC
- Voltage measurement inputs
  - Rated voltage Ue: 100...600VAC (L-L)
  - Frequency range: 45...65Hz.
- Programmable digital inputs
  - Negative inputs
- Programmable relay outputs
  - 3 each with 1 normally open contact (NO - SPST) rated 12A 250VAC
  - 3 each with 1 normally open contact (NO - SPST) rated 8A 250VAC
  - 4 each with 1 changeover contact (NO/NC - SPDT) 8A 250VAC
  - 1 30VDC 50mA static output
- Enclosure
  - Flush-mount housing: 180x240mm/5.7x5.7"
  - IEC degree of protection: IP65 on front; IP20 on back.

**Synergy**, **Synergy**, **Xpress**, **Sam1** and **NFC** software and APP

See section 29.

### EXP expansion modules

See page 30-2.

### Certifications and compliance

Certifications obtained: cULus, EAC, RCM.  
Compliant with standards: IEC/EN 61010-1, IEC/EN 61010-2, IEC/EN 61000-6-2, IEC/EN 61000-6-4, IEC/EN 60947-1, IEC/EN 60947-6-1, UL508 and CSA C22.2 n° 14.

**new**



ATP...

Order code	Operating current AC1	Power (400V)	Dimensions (HxWxD)
	[A]	[kVA]	[mm (in)]
Auxiliary supply 230VAC, with four-pole contactors versions.			
<b>ATP 0045 T4 A230 C 600 A</b>	45	31	500x400x200 (19.68x15.75x7.87")
<b>ATP 0060 T4 A230 C 600 A</b>	60	42	500x400x200 (19.68x15.75x7.87")
<b>ATP 0080 T4 A230 C 600 A</b>	80	55	500x400x200 (19.68x15.75x7.87")
<b>ATP 0100 T4 A230 C 600 A</b>	100	69	500x400x200 (19.68x15.75x7.87")
<b>ATP 0125 T4 A230 C 600 A</b>	125	87	600x400x250 (23.62x15.75x9.84")
<b>ATP 0160 T4 A230 C 600 A</b>	160	111	600x400x250 (23.62x15.75x9.84")

### General characteristics

The enclosed automatic transfer switches ATP series are provided in metallic enclosure IP65, complete with automatic transfer switch controller type ATL 600, four-pole contactors BF series, dual power supply module type ATL DPS1 and miniature circuit breakers (MCB) type P1 MB for the protection of the measuring lines.

They are used for the automatic or manual switching of the load between two lines ("MAIN LINE" and "SECONDARY LINE").

They are available in versions from 45 to 160A in four-pole configuration.

### CONTROL FUNCTIONS OF THE LINES

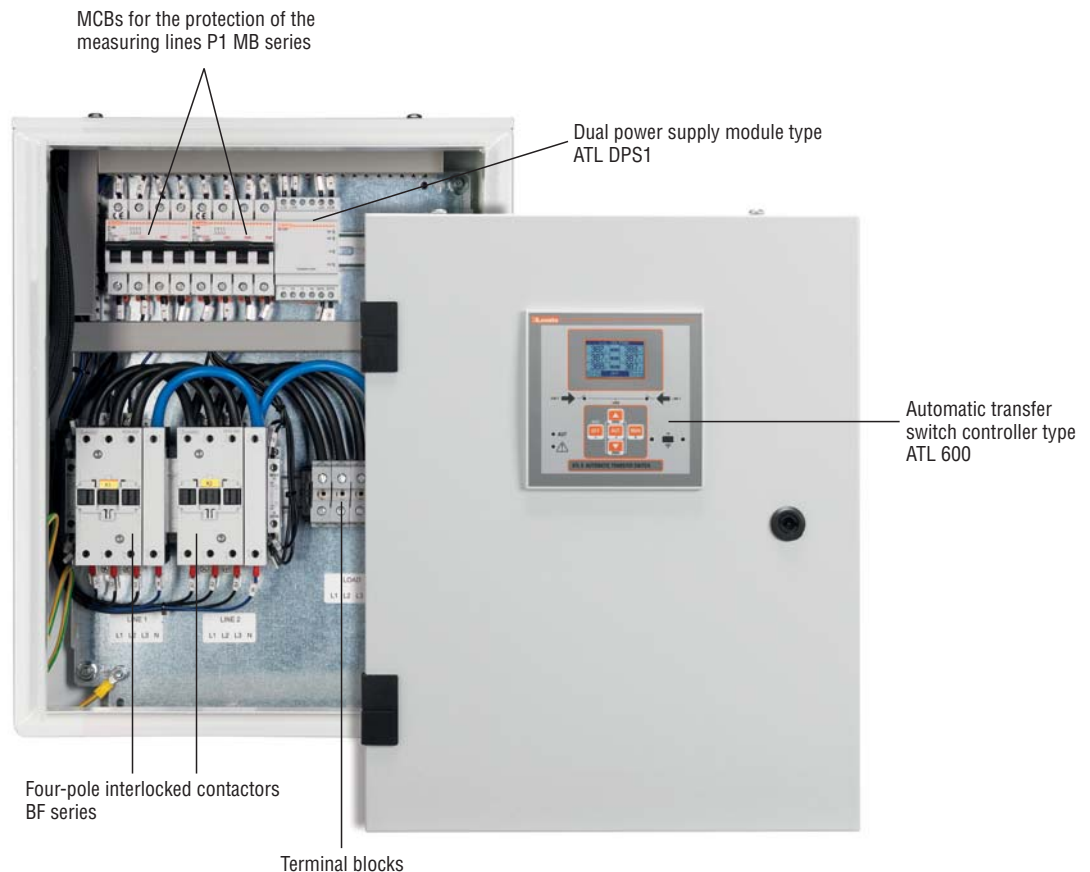
- Phase sequence and phase loss
- Minimum and maximum voltage
- Voltage asymmetry
- Minimum and maximum frequency

### Operational characteristics

- Power supply
  - Auxiliary supply voltage: 230VAC (taken from the input lines)
- Voltage measurement inputs
  - Rated voltage  $U_e$ : 100...480VAC (L-L)
  - Measuring range: 50...576VAC (L-L)
  - Frequency range: 45...65Hz
- 6 programmable digital inputs
- 7 programmable relay outputs:
  - 6 each with 1 normally open contact (NO-SPST) rated 8A 250VAC
  - 1 with 1 changeover contact (NO/NC - SPDT) rated 8A 250VAC
- Enclosure:
  - Metallic enclosure
  - Flanges for cable entries in the top and bottom sides
  - PVC locking system with double-comb tool insert
  - Opening with left hinges
  - IEC degree of protection: IP65.

### Compliance

Compliant with standards: IEC 60947-6-1, IEC 60947-4-1.



MCBs for the protection of the measuring lines P1 MB series

Dual power supply module type ATL DPS1

Automatic transfer switch controller type ATL 600

Four-pole interlocked contactors BF series

Terminal blocks

### Dual power supply module



ATL DPS1

Order code	Description	Qty per pkg	Wt
		n°	[kg]
ATL DPS1	For controlling and selecting supply for contactors 110...230VAC configurable	1	0.300

	110VAC		230VAC	
	MIN	MAX	MIN	MAX
Line absent	< 88V	> 152V	< 176V	> 288V
Line present	< 92V	> 144V	< 185V	> 273V

Using the thresholds above ATL DPS1 outputs one of the power supplies available according to the logic shown in the table:

Status Line 1	LED Line 1	Status Line 2	LED Line 2	Output	LED Output	ATL DPS1	Alarm contact	LED Fault
OK	ON	<MIN OR >MAX	OFF	ON - from line 1	ON	ON - OK	Closed	OFF
OK	ON	OK	ON	ON - from line 1	ON	ON - OK	Closed	OFF
<MIN OR >MAX	OFF	OK	ON	ON - from line 2	ON	ON - OK	Closed	OFF
<MIN	OFF	<MIN	OFF	OFF	OFF	OFF	Open	OFF
>MAX	OFF	<MIN OR >MAX	OFF	OFF	OFF	ON	Open	ON
<MIN OR >MAX	OFF	>MAX	OFF	OFF	OFF	ON	Open	ON
>MIN	ON	OK	ON	OFF	OFF	ON - Fault Internal relays	Open	ON
OK	ON	<MIN OR >MAX	OFF	OFF	OFF	OFF	Open Internal relays	ON
	<MIN OR >MAX	OFF	>MIN	ON	OFF	OFF	Open Internal relays	ON

### General characteristics

ATL DPS1 is capable of measuring and controlling voltages at its inputs selecting the most ideal to connect to the output. It is suitable to supply motorised circuit breakers and changeover switches in automatic switching systems of 2 three phase supply lines.

The two voltage inputs of the module are independent and insulated; each is capable of supplying the internal measuring circuit managed by the microcontroller. It reduces the number of components and improves installation safety.

Main ATL DPS1 features include:

- Voltage value selectable via bypass terminals
- Minimum and maximum voltage tripping thresholds
- 2 single phase L+N inputs
- 1 single phase L+N output
- L1 priority line
- Use with motorised control units powered at 110VAC or 230VAC
- Output voltage monitoring
- Internal relay self-diagnosis
- Indicating LEDs for abnormal conditions and status of inputs and outputs.

### Operational characteristics

- Rated supply voltage: 110...230VAC configurable
- Frequency: 50/60Hz
- Input voltage range: 80...300VAC
- Voltage tripping thresholds min / max: 80% and 120% of preset value
- 2 line inputs L1-L2: Single phase, between phase and neutral
- Current output: 4A max.
- Priority line: L1 when both input values are within limits
- Fixed delay time between line switching: 0.5s
- 4 status indication LEDs for voltage of each line within limits, voltage present at output, relay output anomaly
- Mounting: 35mm DIN rail (IEC/EN 60715) or screw-type by means of removable clips
- Modular housing, 3 module
- IEC degree of protection: IP40 on front; IP20 at rear.

### Certifications and compliance

Certifications obtained: cULus, EAC, RCM.  
Compliant with standards: IEC/EN 61010-1, IEC/EN 61010-2, IEC/EN 61000-6-2, IEC/EN 61000-6-4, IEC/EN 60947-1, IEC/EN 60947-6-1, UL508 and C22.2 n° 14.

### Communication devices



CX 01



CX 02



CX 03

Order code	Description	Qty per pkg	Wt
		n°	[kg]
<b>CX 01</b>	USB/optical dongle with PC ↔ ATL 600/610/800/900 with optical port for programming data download, diagnostics and firmware upgrade	1	0.090
<b>CX 02</b>	Wi-Fi device for connecting PC ↔ ATL 600/610/800/900 with optical port for programming, data download, diagnostics and cloning	1	0.090
<b>CX 03</b>	GSM penta-band antenna (850/900/1800/1900/2100MHz) for EXP10 15 expansion module	1	0.090

### General characteristics

Communication devices for connection of LOVATO Electric products to personal computers, smartphones and tablets.

#### CX 01

The USB/optical dongle, complete with cable, allows the connection of products compatible with PCs without having to disconnect the power supply from the electric panel. The PC identifies the connection as a standard USB.

#### CX 02

By Wi-Fi connection, compatible LOVATO Electric products can be viewed on PCs, smartphones and tablets with no need for cabling.

#### CX 03

Antenna compatible with major part of worldwide mobile networks thanks to the use of 850/900/1800/1900/2100MHz frequencies. Protection rating IP67. Fixing hole Ø10mm/3.94". Cable length 2.5mm/0.10".

For dimensions, wiring schemes and technical characteristics, refer to technical instructions in Downloads of local or global websites or consult Customer Service.

[www.LovatoElectric.com](http://www.LovatoElectric.com)

### Software and accessories



51 C4



EXC CON 01



EXC M3G 01



RGK RR

Order code	Description	Qty per pkg	Wt
		n°	[kg]
<b>EXP80 01</b>	Protective seal IP65 for ATL 600 and ATL 610	1	0.150
For ATL 610 - ATL 800 - ATL 900.			
<b>51 C2</b>	Connection cable PC ↔ ATL 610/800/900 with EXP10 11, length 1.8m	1	0.090
<b>51 C4</b>	Connection cable PC ↔ product RS232/RS485, length 1.8m	1	0.147
<b>EXC CON 01</b>	RS485/Ethernet converter, 12...48VDC, including kit for DIN rail fixing	1	0.400
<b>EXC M3G 01</b>	RS485 gateway/3G modem, 9.5...27VAC/9.5...35VDC, including antenna and cable for programming	1	0.340
For ATL 900.			
<b>RGK RR</b>	Remote unit for status and alarms, 12/24 VDC, 12 relay outputs, pulse input.	1	0.420

### Software

By using the **Xpress** software, the quick setup of the switch controllers can be carried out via PC, avoiding parameter programming errors.

The parameter programming of ATL 600/610/800/900 controllers can also be PC saved and quickly uploaded into another device requiring the same programming. It permits the correct operation of the system to be checked through graphic and numerical display of the measurements and controller status.

**Synergy** and **Synergy** softwares provide for the supervision of the ATL 600/610/800/900 transfer switch controllers. This software has structures and applications based on MS SQL relational databases, and the data can be consulted using the most popular browsers.

It is a highly versatile system, simultaneously accessible to a large number of users/workstations via intranets, VPN or Internet.

See section 29 for details.

### APP for smartphone and tablet

The **Sam1** (Setup And Maintenance 1) application allows the user to program the controller, view alarm conditions, send commands, read measurements, download statistical data and events and send retrieved data by email. The connection is made by Wi-Fi with a smartphone or tablet using the CX02 dongle.

It is iOS and Android compatible.

For more details consult our Technical support.

For ATL 800 and ATL 900, featuring built-in NFC technology, the LOVATO **NFC** application is available for parameter programming.

Available only for Android devices.

See section 29 for details.

### EXC CON 01

The EXC CON 01 converter allows "Slave" devices connected on an RS485 network to interface with a "Master" featuring Ethernet port:

- Kit comprising MOXA NPORT5230 converter and DIN rail mounting accessory DK35
- Programming via web interface
- Power supply not included.

See section 30 for details.

### EXC M3G 01

The EXC M3G 01 gateway allows "Slave" devices connected on an RS485 network to interface with a "Master" via 3G network.

See section 30 for details.

### RGK RR

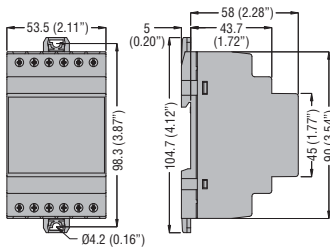
It is an expansion unit for remoting statuses and alarms.

RGK RR can be connected at a maximum distance of 1000m/39.37" using the static output of the ATL 900.

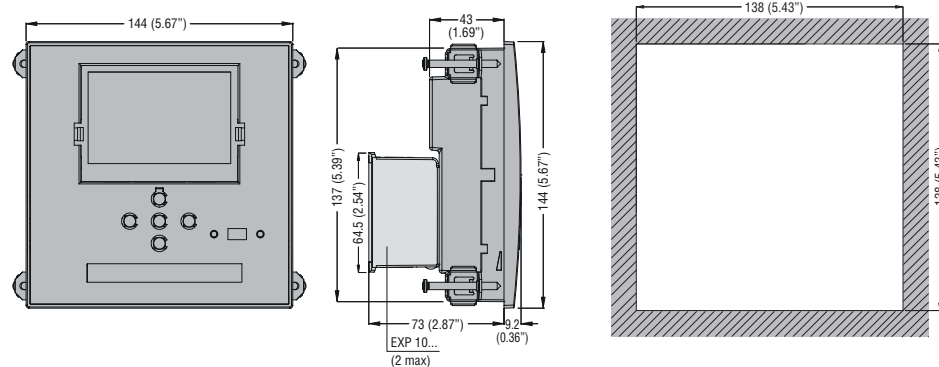
RGK RR has 12 output relays, 7 normally open (2.5A 250VAC/C38) and 5 changeover contacts (5A 250VAC/B300).

## AUTOMATIC TRANSFER SWITCH CONTROLLERS

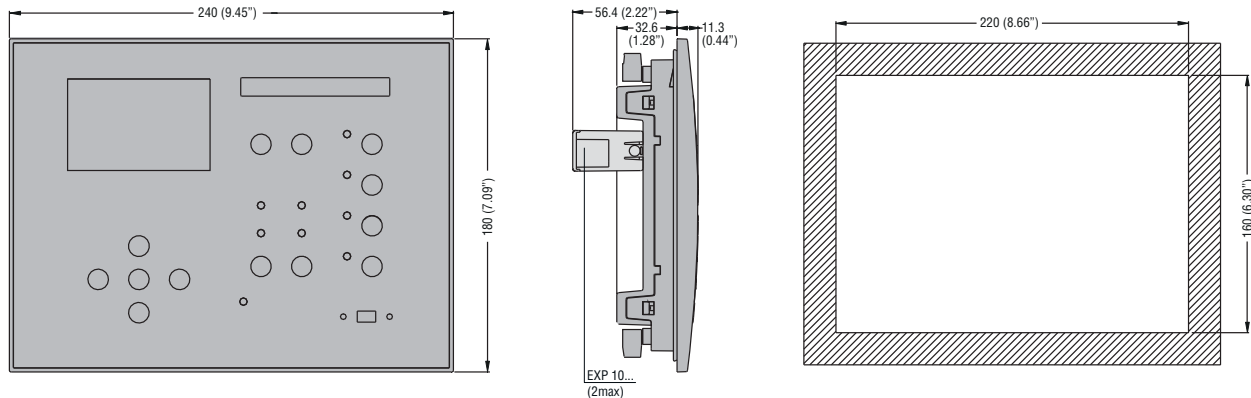
### ATL 100



### ATL 600 - ATL 610

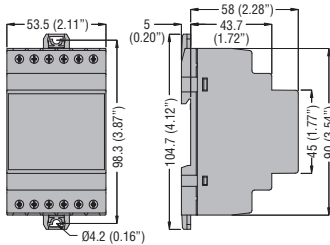


### ATL 800 - ATL 900



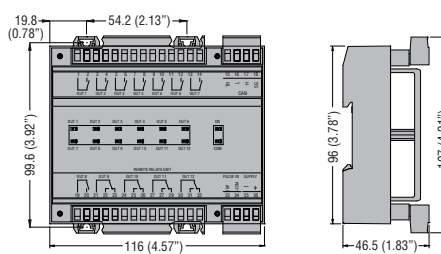
## DUAL POWER SUPPLY MODULE

### ATL DPS1



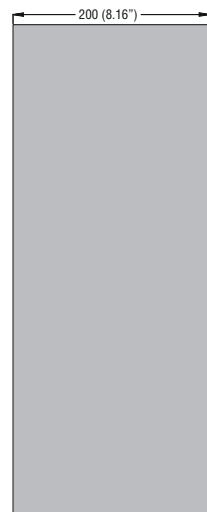
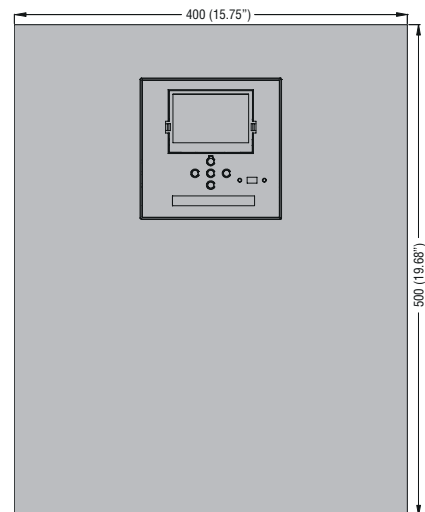
## EXPANSION UNIT

### RGK RR



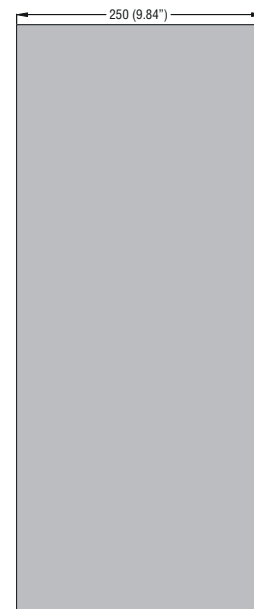
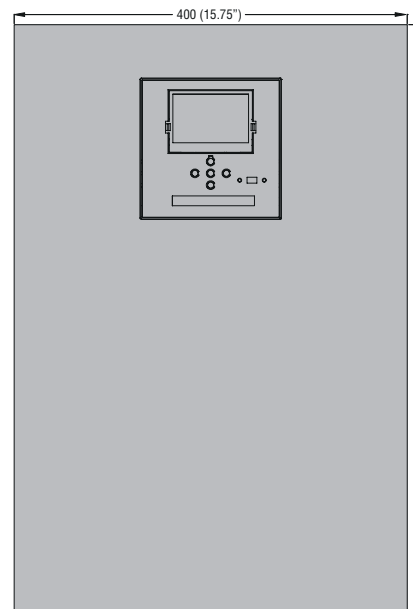
## ENCLOSED AUTOMATIC TRANSFER SWITCHES ATS

ATP 0045... - ATP 0060... - ATP 0080... - ATP 0100...



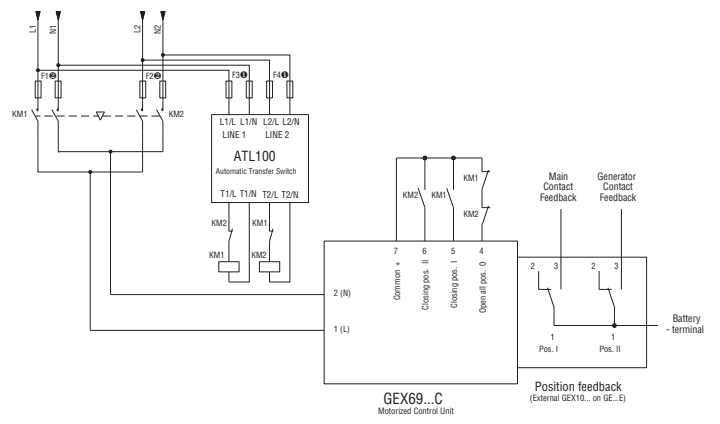
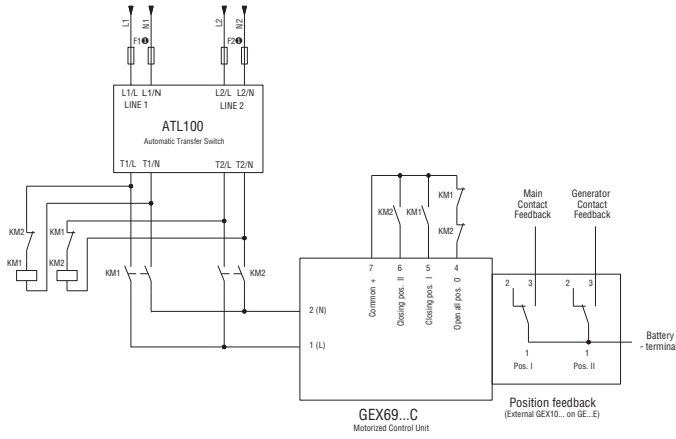
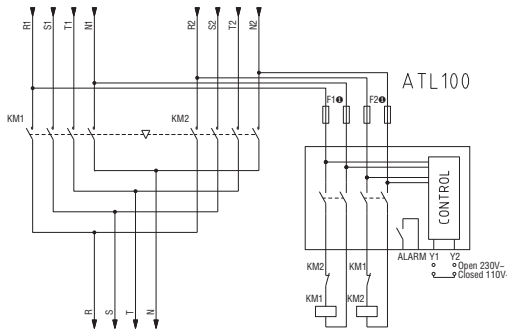
## ENCLOSED AUTOMATIC TRANSFER SWITCHES ATS

ATP 0125... - ATP 0160...



### ATL 100

#### Connection diagrams

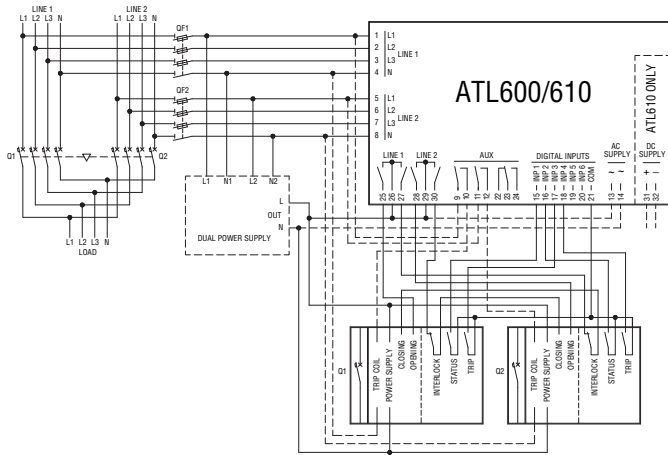


- ① 4A maximum fuses
- ② 1A maximum fuses

### ATL 600 - ATL 610 ①

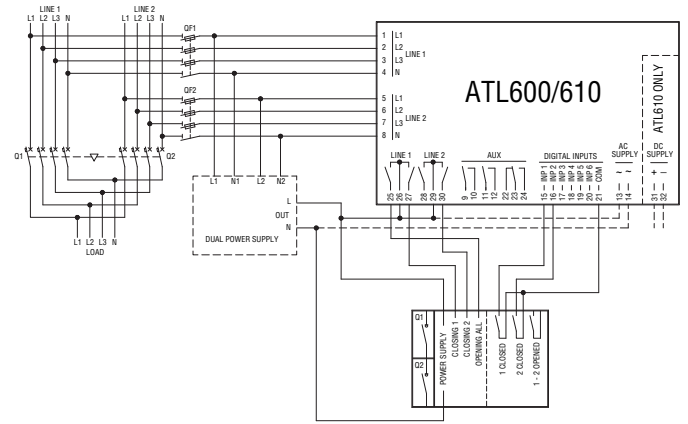
#### Connection diagrams

#### Motorised breaker control



#### Connection diagrams

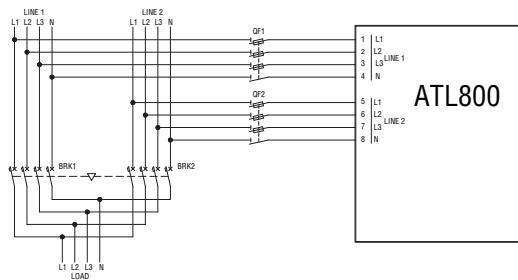
#### Motorised changeover switches control



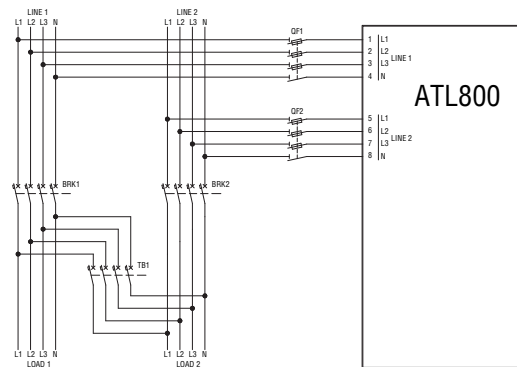
① For the correct programming of inputs and outputs, consult the installation manuals available at [www.LovatoElectric.com](http://www.LovatoElectric.com).

### ATL 800 ①

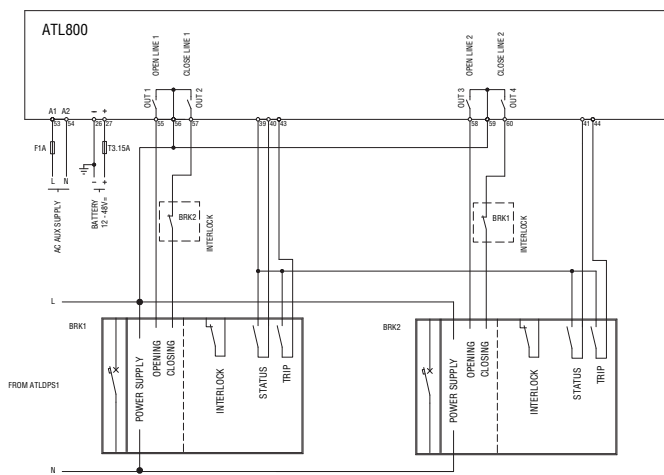
Power connection diagrams  
Two breakers



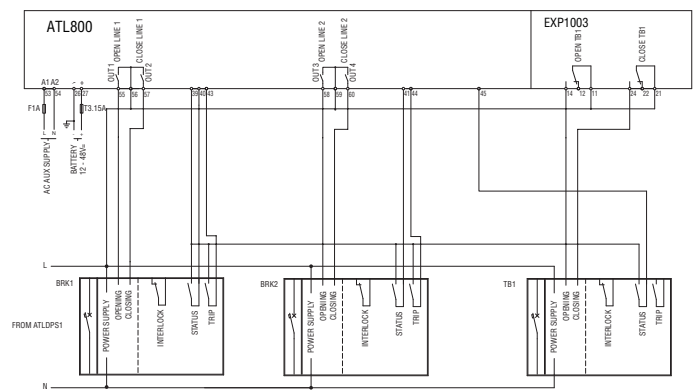
Power connection diagrams  
Two breakers and a tie breaker



Control connection diagrams  
Two breakers



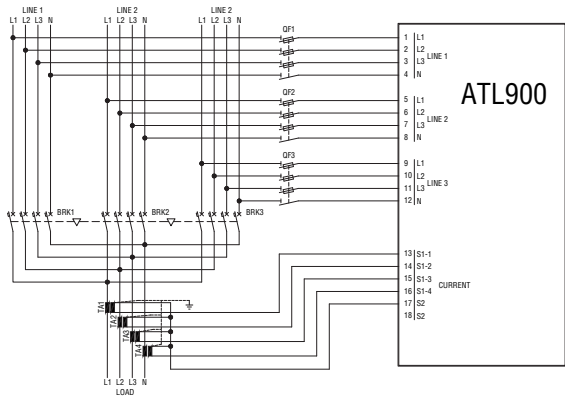
Control connection diagrams  
Two breakers and a tie breaker



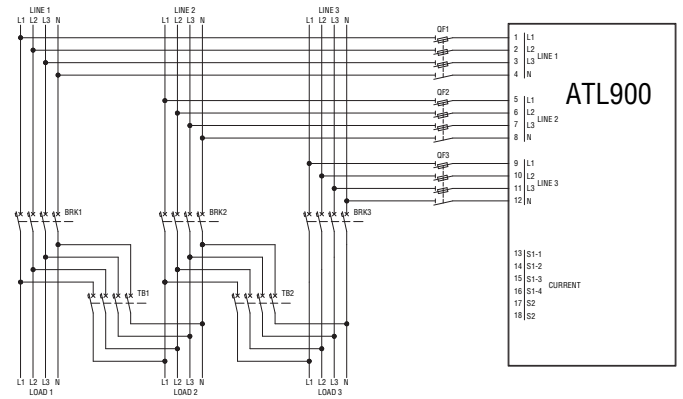
① For the correct programming of inputs and outputs, consult the installation manuals available at [www.LovatoElectric.com](http://www.LovatoElectric.com).

### ATL 900 ①

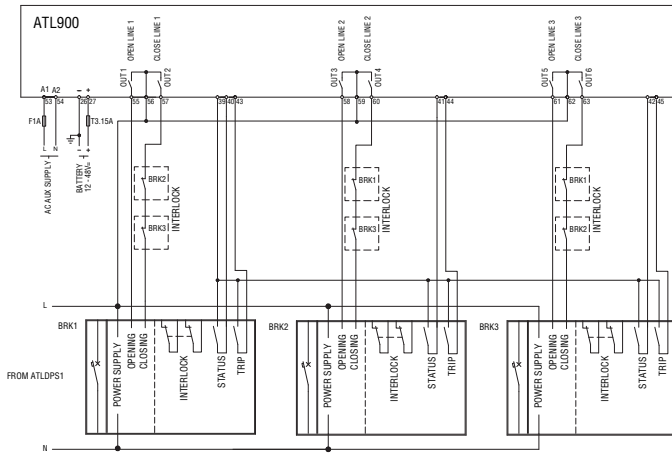
Power connection diagrams  
Three breakers



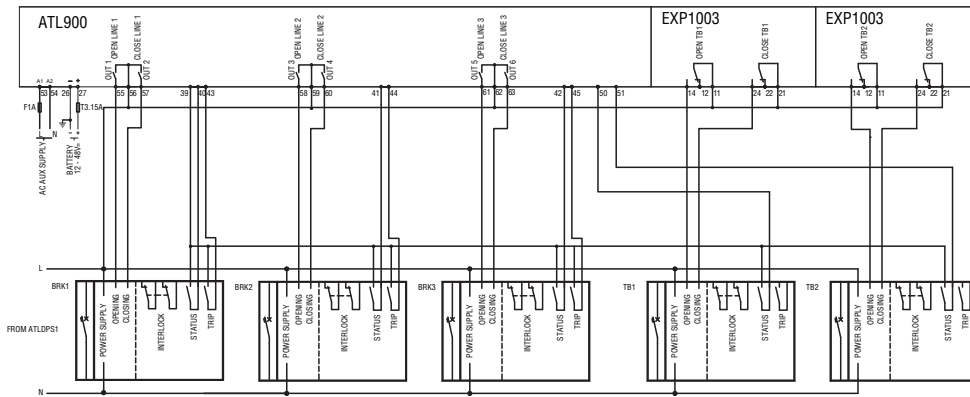
Power connection diagrams  
Three breakers and two tie breakers



Control connection diagrams  
Three breakers

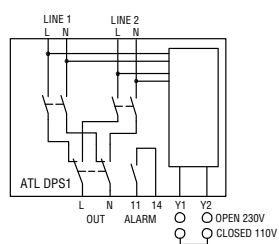


Control connection diagrams  
Three breakers and two tie breakers



### ATL DPS1 ①

Connection diagram



① For the correct programming of inputs and outputs, consult the installation manuals available at [www.LovatoElectric.com](http://www.LovatoElectric.com).



	ATL 100	ATL 600	ATL 610	ATL 800	ATL 900
<b>AC POWER</b>					
IEC rated insulation Us	110...230VAC	100...240VAC	100...240VAC	100...240VAC	100...240VAC
Operating range	80...300VAC	90...264VAC	90...264VAC	90...264VAC	90...264VAC
Frequency	45...66Hz	45...66Hz	45...66Hz	45...66Hz	45...66Hz
Immunity time for micro-breaking	—	≤25ms (110VAC)	≤25ms (110VAC)	≤40ms (110VAC)	≤40ms (110VAC)
	—	≤250ms (220VAC)	≤250ms (220VAC)	≤200ms (220VAC)	≤200ms (220VAC)
Immunity time for micro-breaking (with EXP expansions)	—	—	≤25ms (110VAC)	≤20ms (110VAC)	≤20ms (110VAC)
	—	—	≤120ms (220VAC)	≤100ms (220VAC)	≤100ms (220VAC)
<b>DC POWER</b>					
Rated battery voltage	—	—	12-24VDC	12-24-48VDC	12-24-48VDC
Operating range	—	—	7.5...33VDC	7.5...57.6VDC	7.5...57.6VDC
Maximum power consumption	—	—	230mA at 12VDC and 120mA at 24VDC 100mA at 48VDC	400mA at 12VAC; 220mA at 24VDC; 135mA at 48VDC	510mA at 12VAC; 260mA at 24VDC;
Maximum power consumption/dissipation	—	—	2.9W	4.W	6.5W
<b>VOLTMETER INPUTS</b>					
Max. rated voltage Ue	110...230VAC L-N	480VAC L-L (277VAC L-N)	480VAC L-L (277VAC L-N)	600VAC L-L (346VAC L-N)	600VAC L-L (346VAC L-N)
Measuring range	80...300VAC	50...576VAC L-L (333VAC L-N)	50...576VAC L-L (333VAC L-N)	50...720VAC L-L (415VAC L-N)	50...720VAC L-L (415VAC L-N)
Frequency range	45...65Hz	45...65Hz	45...65Hz	45...65Hz	45...65Hz
Measurement method	True root mean square (TRMS)	True root mean square (TRMS)	True root mean square (TRMS)	True root mean square (TRMS)	True root mean square (TRMS)
Measuring input impedance	>8MΩ L-N	>0.5MΩ L-N, >1.0MΩ L-L	>0.5MΩ L-N, >1.0MΩ L-L	>0.55MΩ L-N, >1.10MW L-L	>0.55MΩ L-N, >1.10MW L-L
Connection method	1 phase and neutral	One-phase, two-phase, three-phase line with or without neutral and balanced three-phase			
<b>AMMETER INPUTS</b>					
Rated current Ie	—	—	—	—	1A- 0 5A~
Measuring range	—	—	—	—	for 5A scale: 0.02 - 6A~ for 1A scale: 0.02 - 1.2A ~
Type of input	—	—	—	—	Shunt supplied by current transformer external (low voltage) 5A max.
Measurement type	—	—	—	—	True root mean square (TRMS)
Overload capacity	—	—	—	—	-20% Ie
Overload peak	—	—	—	—	50A for 1 second
Burden	—	—	—	—	<0.6VA
<b>MEASUREMENT ACCURACY</b>					
Mains and genset voltage	±0.25% f.s. ±1 digit	±0.25% f.s. ±1 digit	±0.25% f.s. ±1 digit	±0.25% f.s. ±1 digit	±0.25% f.s. ±1 digit
<b>DIGITAL INPUTS</b>					
Number of inputs	—	6	6	8	12
Type of input	—	Negative	Negative	Negative	Negative
Input current	—	<8mA	<8mA	<8mA	<8mA
Low input signal	—	≤2.2V	≤2.2V	≤2.2V	≤2.2V
High input signal	—	≥3.4V	≥3.4V	≥3.4V	≥3.4V
Input signal delay	—	≥50ms	≥50ms	≥50ms	≥50ms
<b>CALENDAR CLOCK</b>					
Backup reserve power	—	—	Backup capacitor	Backup capacitor	Backup capacitor
Operation without power voltage	—	—	5 min approx.	14 days approx.	14 days approx.
<b>RELAY OUTPUTS</b>					
Number of outputs	3	7	7	7	10
Configuration	- 2NO: AC1 - 4A 250VAC; 1.5A 250V~ AC15 - 1NO: AC1 - 3A 250VAC; DC1 - 3A 30VDC	- 6NO: AC1 - 8A 250VAC; AC15 -1.5A 250VAC; B300 - 1 changeover: AC1 - 8A 250VAC; DC1 - 8A 30VDC; AC15 - 1.5A 250VAC; B300 30VDC1A Auxiliary service	- 6NO: AC1 - 8A 250VAC; AC15 -1.5A 250VAC; B300 - 1 changeover: AC1 - 8A 250VAC; DC1 - 8A 30VDC; AC15 - 1.5A 250VAC; B300 30VDC1A Auxiliary service	- 2NO: AC1 - 12A 250VAC; AC15 - 1.5A 250VAC; B300 - 2NO: AC1 - 8A 250VAC; AC15 - 1.5A 250VAC; B300 - 3 changeover: AC1 - 8A 250VAC; DC1 - 8A 30VDC; AC15 - 1.5A 250VAC; B300 30VDC 1A Auxiliary service	- 3NO: AC1 - 12A 250VAC; AC15 - 1.5A 250VAC; B300 - 3NO: AC1 - 8A 250VAC; AC15 - 1.5A 250VAC; B300 - 4 changeover: AC1 - 8A 250VAC; DC1 - 8A 30VDC; AC15 - 1.5A 250VAC; B300 30VDC 1A Auxiliary service
Mechanical / electrical endurance	1x10 <sup>7</sup> / 1x10 <sup>5</sup> operations	1x10 <sup>7</sup> / 1x10 <sup>5</sup> operations	1x10 <sup>7</sup> / 1x10 <sup>5</sup> operations	1x10 <sup>7</sup> / 1x10 <sup>5</sup> operations	1x10 <sup>7</sup> / 1x10 <sup>5</sup> operations
<b>STATIC OUTPUT</b>					
Output type	—	—	—	—	NO
Operating voltage	—	—	—	—	10-30V
Maximum current	—	—	—	—	50mA

	ATL 100	ATL 600	ATL 610	ATL 800	ATL 900
<b>AMBIENT CONDITIONS</b>					
Operating temperature	-30...+70°C				
Storage temperature	-30...+80°C				
Relative humidity	<80% (IEC/EN 60068-2-78)				
Maximum pollution degree	2				
Overvoltage category	3				
Measurement category	III				
Climatic sequence	Z/ABDM (IEC/EN 60068-2-61)				
Shock resistance	15g (IEC/EN 60068-2-27)				
Vibration resistance	0.7g (IEC/EN 60058-2-6)				
<b>HOUSING</b>					
Version	Modular housing 3 modules (DIN 43880)	Flush-mount			
Material	Polyamide RAL 7035	Polycarbonate			
IEC degree of protection	IP40 on front IP20 on terminals	IP40 on front IP65 with optional gasket IP20 on terminals		IP65 on front IP20 on terminals	
Weight	300g	600g	680g	1000g	1800g
<b>CERTIFICATIONS AND COMPLIANCE</b>					
Certifications obtained	EAC	cULus, EAC, RCM			
Compliance with standards	IEC/EN 61010-1, IEC/EN 61010-2, IEC/EN 61000-6-2, IEC/EN 61000-6-4, IEC/EN 60947-1, IEC/EN 60947-6-1	IEC/EN 61010-1, IEC/EN 61010-2, IEC/EN 61000-6-2, IEC/EN 61000-6-4, IEC/EN 60947-1, IEC/EN 60947-6-1, UL508 e CSA C22.2 n°14			