شرکت مبنا تجهیز تابلو (سهامی خاص)

Mabna Tajhiz Tableau Co. (MTT Co.)

TEM GROUP

نماینده رسمی و انحصاری Lovato در ایران

Lovato electric

ENERGY AND AUTOMATION

www.MTTIran.com

info@Mttiran.com

021-88366081-2 & 88583128

021-88583154

تهران، شهرک غرب، انتهای بلوار دادمان، روبروی پژوهشگاه نیرو، خیابان گل افشان شمالی، کوچه یکم، پلاک ۱، واحد ۷

Automatic power factor controllers and thyristor modules

- Microprocessor supervision and control
- Accurate TRMS measurement circuit
- Automatic intelligent adjustment system
- Versions from 2 to 24 steps and up to 32 with Master-Slave function
- Versions with static outputs
- Versions for capacitive reactive power factor correction
- Use in cogeneration and medium-voltage systems
- Basic controller functionalities can be extended using the EXP series of expansion modules
- USB, serial, Ethernet communication interfaces
- Modbus-RTU and ASCII communication protocols
- Thyristor modules for dynamic correction.

Page 26-8

DCRM SERIES

- Reactive current control relay
- Modular housing
- 2 steps
- Settings by front potentiometers
- 3 LED indications.

Page 26-9

DCRL SERIES (EXPANDABLE)

- Flush-mount housing:
  DCRL3 - DCRL5 (96x96mm/3.78x3.78")
  DCRL8 (144x144mm/5.67x5.67")
- 3/5/8 steps, expandable with EXP series modules (step increment, digital outputs, communication ports, etc.)
- Backlit icon LCD
- Ethernet communication interface (only for DCRL8)
- Alarm codes with scrolling texts, programmable in 6 languages (Italian, English, Spanish, French, German and Portuguese)
- Independent voltage measurement input
- Suitable for low and medium voltage systems
- Capacitor overload protection
- Internal panel temperature sensor
- Voltage and current harmonic-content measurement up to 15th order
- Front optical USB and Wi-Fi communication port for PC, smartphone and tablet connection
- Programmable alarms
- Protection via 2-level password to prevent all undesired access
- Compatible with Synergy and Synergy cloud, supervision and energy management software, Xpress configuration and remote control software and with the Sam1 application for Android/iOS.

Page 26-10

DCRG SERIES (EXPANDABLE)

- Flush-mount housing: DCRG8 - DCRG8F - DCRG8IND (144x144mm/5.67x5.67")
- 8 steps, expandable with EXP series modules (step increment, inputs and outputs, communication ports, GPRS/GSM modem, data memory, etc.) and with Master-Slave function
- 128x80 backlit graphic LCD, facilitating data reading even in poor lighting conditions and the display of system information clearly and intuitively
- Ethernet communication interface
- Texts in 10 languages: Italian, English, Spanish, French, German, Czech, Polish, Russian, Portuguese and one customisable
- Voltage measurement input independent from the supply input
- Suitable for low and medium voltage systems
- Capacitor overload protection
- Internal panel temperature sensor
- Voltage and current harmonic-content measurement up to 31st order
- Dynamic power factor correction (DCRG8F version).
- Power factor correction by single phase (SPPFC)
- Capacitive reactive power factor correction (DCRG8IND version)
- Front optical USB and Wi-Fi communication port for PC, smartphone and tablet connection
- Programmable alarms
- Protection via 2-level password to prevent any undesired access
- Calendar-clock with backup reserve energy
- Logging of up to 250 events
- Compatible with Synergy and Synergy cloud, supervision and energy management software, Xpress configuration and remote control software and with the Sam1 application for Android/iOS.

Page 26-13

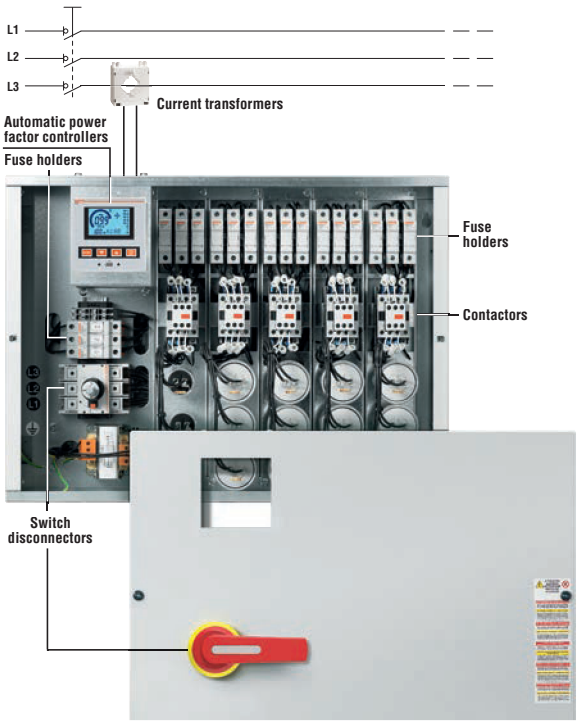
THYRISTOR MODULES DCTL SERIES

- Version for steps from 7.5kvar to 120kvar
- Version with rated voltage from 400 to 690VAC
- Suitable for dynamic power factor correction
- Zero-crossing controlled connection-disconnection
- Over-temperature protection
- Monitoring and protection of current, power and current harmonics of the capacitor bank
- NFC connectivity for parameter settings and programming of protection thresholds with APP NFC
- Optical port for programming and diagnostic with software Xpress and APP Sam1
- Optional RS485 port for the command and monitoring by DCRG8F controller.

Lovato electric

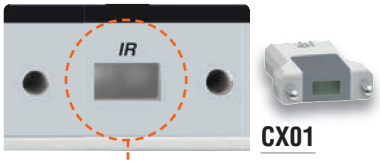
	 DCRL3	 DCRL5	 DCRL8	 DCRG8 / DCRG8IND	DCRG8F
Steps	3 relay steps (up to 6 with EXP1007)	5 relay steps (up to 8 with EXP1007)	8 relay steps (up to 14 with EXP1007)	8 relay steps (up to 18 relay outputs with EXP1006 and EXP1007) (up to 24 mixed relay and static outputs with EXP1001)	8 static steps (up to 24 static outputs with EXP1001) (up to 23 mixed relays and static outputs with EXP1006, EXP1007 and EXP1001)
ON FRONT/HOUSING					
Display	Backlit icon LCD			128x80 pixel backlit graphic LCD	
Languages	6 (scrolling text of alarm codes only) Italian, English, Spanish, French, German, Portuguese			10 Italian, English, Spanish, French, German, Czech, Polish, Russian, Portuguese and 1 customisable	
Dimensions	96x96mm/ 3.78x3.78”	96x96mm/ 3.78x3.78”	144x144mm/ 5.67x5.67”	144x144mm/ 5.67x5.67”	
Protection rating	IP54	IP54	IP65	IP65	
Expandable with EXP... modules	●			●	
CONTROL/FUNCTIONS					
Automatic recognition of current flow direction	●			●	
4-quadrant operation	●			●	
Master-Slave function				● (DCRG8 / DCRG8IND)	
Independent auxiliary supply input	●			●	
Three-phase voltage control				●	
Current inputs	1 (by 5A or 1A CTs)			3 (by 5A or 1A CTs)	
Dynamic (FAST) power factor correction				● with EXP1001 (maximum 16 static outputs)	●
Power factor correction by single phase				●	
Possibility of connecting inductive steps				● (DCRG8IND)	
Possibility of use in medium voltage	●			●	
Possibility of phase-neutral insertion on a three-phase system	●			●	
Analog inputs				● with EXP1 04	
Analog outputs				● with EXP1005	
Input programmable as function or external temperature sensor				● with EXP1004	
USB communication interface	● with EXP1010			● with EXP1010	
RS232 communication interface	● with EXP1011			● with EXP1011	
Opto-isolated RS485 communication interface	● with EXP1012			● with EXP1012	
Ethernet communication interface	● with EXP1013 (only for DCRL8)			● with EXP1013	
Opto-isolated Profibus-DP interface				● with EXP1014	
GPRS/GSM modem				● with EXP1015	
Optical USB communication port on front	● with CX01			● with CX01	
Optical Wi-Fi communication port on front	● with CX02			● with CX02	
Fast setting of current transformer	●			●	
Compatible with Xpress configuration and remote control software	●			●	
Compatible with Synergy and Synergy Cloud, supervision and energy management software	●			●	
Compatible with Sam1 App	●			●	
Calendar-clock with backup reserve power				●	
Data logging memory				● with EXP1030	
Event logging: alarms, setup changes, etc.				●	
Customisable internal counters				●	

	 DCRL3	 DCRL5	 DCRL8	 DCRG8 / DCRG8IND	DCRG8F
MEASUREMENTS					
Rated measurement voltage	600VAC max			600VAC max	
Measurement voltage range	50...720VAC			50...720VAC	
Instantaneous cosφ	●			●	
Instantaneous and average weekly power factor values	●			●	
Voltage and current	●			●	
Reactive power to reach set-point and total values	●			●	
Capacitor overload	●			●	
Electrical panel temperature	●			●	
Maximum voltage and current value	●			●	
Maximum capacitor overload value	●			●	
Maximum panel temperature value	●			●	
Maximum capacitor temperature value				● with EXP1004 and EXP1015	
Active and apparent power value				●	
Active, reactive, apparent energy				●	
Current and voltage harmonic analysis	● up to 15th			● up to 31st	
Var-measured value for each step	●			●	
Number of switches for each step	●			●	
PROTECTIONS					
Voltage too high and too low	●			●	
Current too high and too low	●			●	
Over compensation (capacitors disconnected and cosφ higher than set-point)	●			●	
Under compensation (capacitors connected and cosφ lower than set-point)	●			●	
Capacitor overload	●			●	
Capacitor overload on all 3 phases				●	
Over temperature	●			●	
Mains micro-breaking	●			●	
Capacitor bank failure	●			●	
Exceeding switching limits	●			●	
Exceeding of maximum harmonic distortion level limit	●			●	
Programmable alarm property (enable, trip delay, relay energising, etc.)	●			●	
Capacitor protection				● with EXP1016	



ESSENTIAL AND PERFORMANCE TOO!
DCRL3 - DCRL5

OPTICAL COMMUNICATION PORT
The optical port on the front permits communication with PCs, smartphones and tablets through the USB and Wi-Fi standards for carrying out programming, diagnostics and data download without disconnecting power to the electrical panel.



CX01

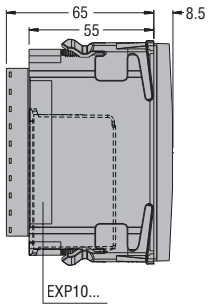
CX02

USER INTERFACE
The backlit icon LCD ensures excellent legibility as well as the texts for the display of measurements and description of alarms. The 4 navigation buttons are for settings and functions.

AN EXPANSION SLOT FOR EXP... SERIES MODULES

EXPANDABLE UP TO 8 STEPS

COMPACT SIZE
The space taken by the housing does not increase (96x96x73mm / 3.78x3.78x2.87") even with the expansion module fitted.



FIXING SYSTEM
The fixing system with clips is simple, with a press to click into place and push to ensure retention over time.
Correct application of the standard seal and clips in the panel ensures a front **IP54** protection degree.

EXPANDABILITY
Basic controller functionality can be extended easily using the EXP series expansion modules:
– digital outputs
– relay outputs to increase number of steps
– opto-isolated USB interface
– opto-isolated RS232 interface
– opto-isolated RS485 interface.

MAX 1

SOFTWARE COMPATIBILITY
- Sam1 Application for Android and iOS
- Xpress for configuration and remote control
- Synergy and Synergy Cloud for supervision and energy management.

CHARACTERISTICS OF THE DCRL SERIES

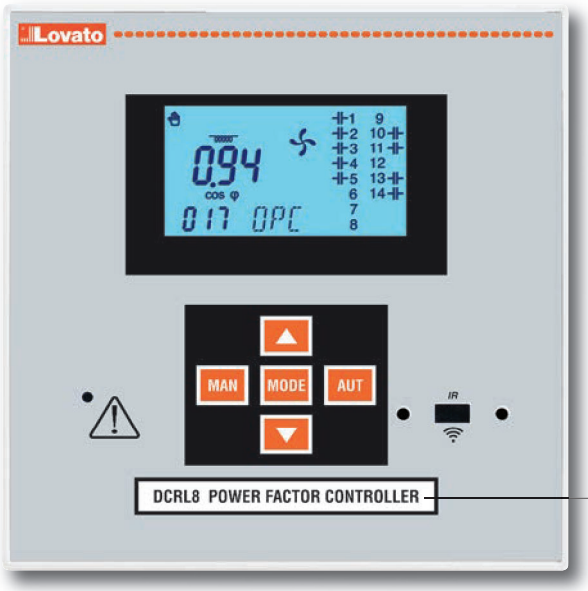
– **WIDE RANGE OF VOLTAGE MEASUREMENTS**
The wide measurement range between 50...720VAC L-L and between 50...415VAC L-N allows the controllers to be used in most applications.

– **SUITABLE FOR LOW- AND MEDIUM-VOLTAGE SYSTEMS**
The controllers can be used in medium-voltage systems thanks to the ability to set a voltage transformer ratio, obtaining measurements regarding the transformer primary value both for adjustment and for the display.

– **ALARM MESSAGES IN 6 LANGUAGES**
The alarm texts can be displayed in Italian, English, French, German, Portuguese and Spanish.

– **DEFECTIVE STEP**
The DCRL measures the percentage of residual power for each step, comparing it with the value set in the main menu.
The defective step alarm is generated if this value is below the set limit.

DCRL8



USER INTERFACE
The backlit icon LCD ensures excellent legibility as well as the texts for the display of measurements and description of alarms. The 5 navigation buttons are for settings and functions, while an LED indicates the alarms and the optical port for communication via USB and Wi-Fi.

EXPANDABLE UP TO 14 STEPS

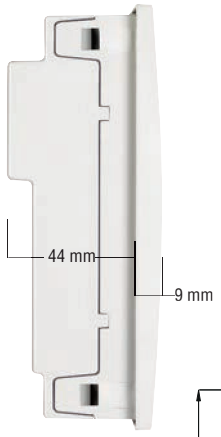
OPTICAL COMMUNICATION PORT
The optical port on the front permits communication with PCs, smartphones and tablets through the USB and Wi-Fi standards for carrying out programming, diagnostics and data download without disconnecting power to the electrical panel.

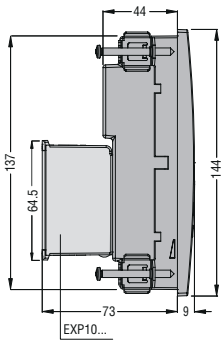
TWO EXPANSION SLOTS FOR EXP... SERIES MODULES

ETHERNET COMMUNICATION INTERFACE
By using the expansion module EXP1013.

CUSTOMISATION
An insert for labels customised with text, logos, codes, etc. is available, to be fixed onto the controller frames.

COMPACT SIZE
Reduced profile and depth simplify installation of the power factor controller even in very compact electrical panels.
The total depth of the controller is 73mm (2.87") inside the panel with the expansion modules installed.

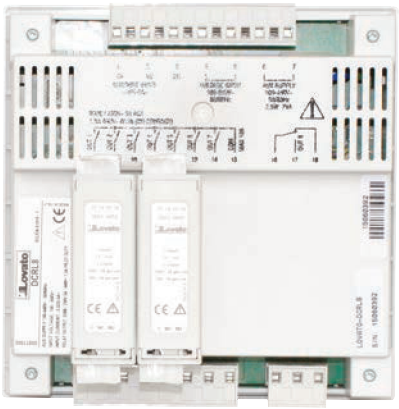




FIXING SYSTEM
The fixing system **with metal screws** guarantees excellent, lasting retention over time.

HIGH PROTECTION RATING
The front of the controller and seal have been designed to ensure a front protection rating of **IP65**.

EXPANDABILITY
Basic controller functionality can be extended easily using the EXP series expansion modules:
– relay outputs to increase number of steps
– digital outputs
– opto-isolated RS232 interface
– opto-isolated RS485 interface
– opto-isolated ETHERNET interface.



MAX 2

SOFTWARE COMPATIBILITY
- Sam1 Application for Android and iOS
- Xpress for configuration and remote control
- Synergy and Synergy Cloud for supervision and energy management.

CHARACTERISTICS OF THE DCRL SERIES

– **5A OR 1A IN THE SAME CONTROLLER**
A parameter setting can easily allow to use 5A or 1A secondary current transformers.

– **WHITE BACKLIT DISPLAY**
It can be programmed to flash during alarm conditions.

– **HARMONIC ANALYSIS**
It includes voltage and current THD measurements and single harmonic measurement up to the 15th order and they can be shown on the display.

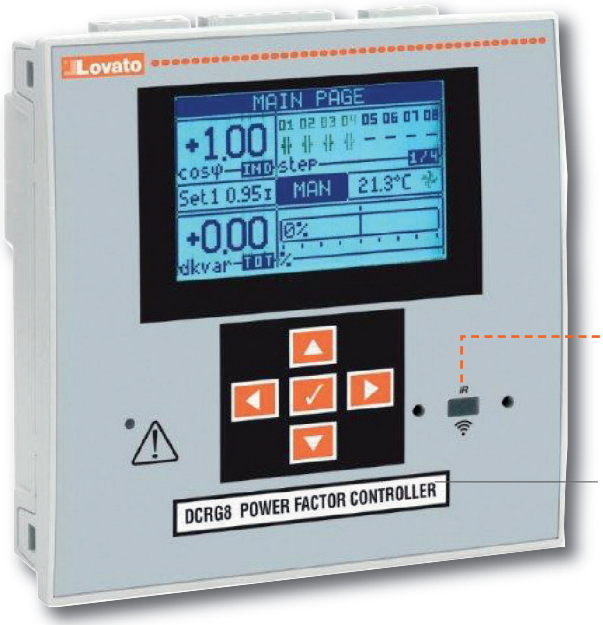
– **MAINTENANCE INTERVALS**
There are 2 counters: one to count the operating hours of the steps and the other for the number of interventions of each step. An alarm threshold can be set for both counters.

– **BUILT-IN TEMPERATURE SENSOR**
The internal temperature of the controller is monitored constantly by the built-in sensor.
The user can program the thresholds to activate and stop the cooling fan and/or generate the temperature alarm.

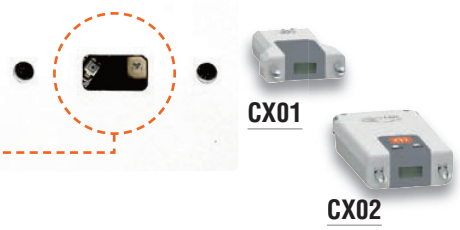
THE SOLUTION FOR ALL APPLICATIONS!
DCRG8

BACKLIT GRAPHIC LCD
High-legibility 128x80 pixels, with adjustable brightness.

3 VERSIONS AVAILABLE:
– DCRG8: for traditional power factor correction with contactors or dynamic (fast) power factor correction with EXP1001
– DCRG8F: for dynamic (fast) power factor correction
– DCRG8IND: for capacitive reactive power factor correction.

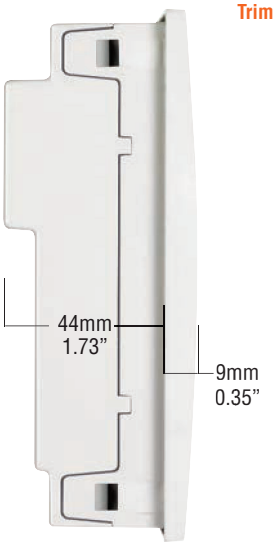


OPTICAL COMMUNICATION PORT
The optical port on the front permits communication with PCs, smartphones and tablets through the USB and Wi-Fi standards for carrying out programming, diagnostics and data download without disconnecting power to the electrical panel.

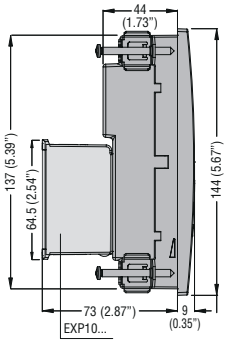


CUSTOMISATION
There is a customisation slot available on the front panel for the description of the controller by adding texts, logos, codes, etc.

COMPACT SIZE



Frame profile and reduced total depth simplify installation of the controller also in very compact electric panels.



FIXING SYSTEM

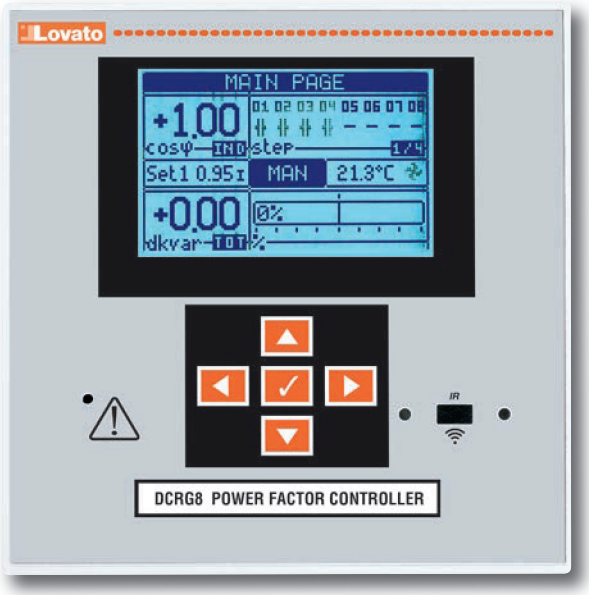
The fixing system with **metal screws** guarantees excellent retention over time.

HIGH PROTECTION DEGREE
The controller front and the rear seal have been designed to warrant an **IP54** protection degree.

EXPANDABILITY

Basic controller functionality can be extended easily using the EXP series expansion modules:
- Relay outputs to increase the number of steps
- Opto-isolated static outputs (also for dynamic correction)
- Capacitor protection
- Digital and analog inputs and outputs
- Expandable up to 24 mixed outputs
- Opto-isolated RS232 interface
- Opto-isolated RS485 interface
- Opto-isolated ETHERNET interface
- Opto-isolated Profibus-DP interface
- GPRS/GSM modem
- Data memory, calendar-clock with backup reserve power for data logging.

SOFTWARE COMPATIBILITY
- Sam1 Application for Android and iOS
- Xpress for configuration and remote control
- Synergy and Synergy Cloud for supervision and energy management.

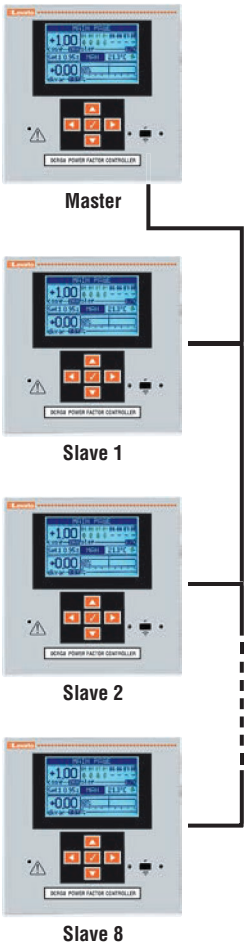


- SUITABLE FOR POWER FACTOR CORRECTION USING CONTACTORS AND THYRISTOR MODULES (WITH DCRG8F MODEL OR DCRG8 + EXP1001)
- INDEPENDENT POWER FACTOR CORRECTION FOR EACH SINGLE PHASE
- CAPACITIVE REACTIVE POWER FACTOR CORRECTION VIA INDUCTIVE STEP MANAGEMENT (WITH DCRG8IND MODEL)
- SMS SENDING FOR ALARM TRIGGERING
- DATA SENDING BY EMAIL OR FTP SERVER
- STREAMLINE DESIGN

  The DCRG controller has an ergonomic design and, at the same time, particular care has been given to details.

MASTER-SLAVE FUNCTION

The DCRG controller can control the outputs of other compatible controllers in addition to its own steps. In this way, it offers a **Master-Slave** architecture.
Up to 8 slaves can be controlled to create a system with a maximum of 32 steps.



CAPACITOR PROTECTION

By adding the dedicated EXP1016 expansion module, the DCRG controller can be equipped with additional capacitor protection functions. The module can measure the harmonic current values and the capacitor temperature on-site as well as detecting malfunction on any phase.

3 CURRENT INPUTS

- **Independent power factor correction** for each single phase
- Analysis of all electrical measurements in the system (multimeter).

WIDE RANGE OF RATED VOLTAGE MEASUREMENTS

The wide measurement range between 100...600VAC allows the controller to be used in most applications.

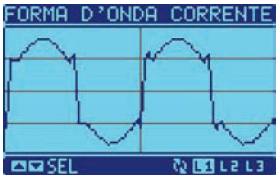
GSM/GPRS MODEM

With the EXP1015 expansion module, the controller is equipped with a GSM/GPRS modem, which it is automatically configured. This simplifies installation and wiring. Once a data-enabled SIM card is inserted, the controller can send alarm or event SMS and **e-mails** and data files can be transmitted to FTP servers.

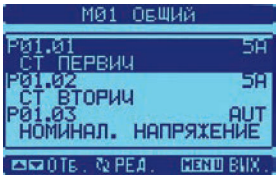
5A AND 1A BOTH IN THE SAME CONTROLLER

By configuring a specific parameter, the controller can be enabled for use with either a 5A or 1A secondary current transformer.

GRAPHS AND TEXTS IN 10 LANGUAGES



Display of waveforms, graphs and texts in 10 languages: Italian, English, Spanish, French, German, Czech, Polish, Russian, Portuguese and one customisable.



SUITABLE FOR MEDIUM-VOLTAGE SYSTEMS

The controller can be used in medium-voltage systems thanks to the ability to set a voltage transformer ratio, obtaining measurements regarding the transformer primary value both for adjustment and for the display.

DYNAMIC (FAST) POWER FACTOR CORRECTION

Thyristor-based dynamic power factor correction systems are necessary where the reactive load varies rapidly over time. DCRG8F has 8 built-in static outputs, while DCRG8 + EXP1001, by taking advantage of the built-in relay outputs as well, realizes a mixed traditional (relay) and dynamic system.

INDEPENDENT POWER FACTOR CORRECTION FOR EACH SINGLE PHASE (SPPFC)

In highly unbalanced three-phase systems, power factor correction by single phase can be implemented. The DCRG controller can monitor the cosφ of each single phase and correct through the joint use of single- and three-phase capacitor banks.

CAPACITIVE REACTIVE POWER FACTOR CORRECTION (DCRG 8IND).

The DCRG8IND version can connect both capacitors and inductors to achieve the desired cosφ should it be necessary to correct the capacitive reactive power factor as well.

DCRM series

DCRM2

Order code	Steps	Auxiliary supply voltage	Qty per pkg	Wt
	no.	[V]	n°	[kg]
Single and three-phase low-voltage systems.				
DCRM2	2	380...415VAC	1	0.284

General characteristics
The DCRM allows the reactive current of a system to be controlled.
It allows to reach the best cosφ value possible, reducing the request for reactive current from the mains.
It can control the connection of two capacitor banks. Each one can be individually enabled and its power can be set through a dedicated trimmer.
It is also possible to adjust the time for connection and disconnection of the capacitors, thereby modifying the reaction speed of the system.
The controller can be used both in single-phase and three-phase wiring.

Operational characteristics
- Auxiliary supply voltage:
  - 380...415VAC standard
  - 220...240VAC and 440...480VAC on request
- Rated frequency: 50/60Hz
- 80...528VAC voltage measurement input
- Current measurement input:
  - By CT /5A
  - Measuring range: 0.1...6A
  - Measurement type: true root mean square (TRMS)
  - Automatic identification of CT connection polarity (straight / inverted)
- Relay outputs:
  - 2 relays (steps), each with 1 changeover contact
  - Rated current: 8A 250VAC (AC1)
  - Individual enablement of control of the two relays
- Modular DIN 43880 housing (3 modules)
- IEC degree of protection: IP40 on front (if placed in IP40 housing and/or electrical panel), IP20 terminals.

ADJUSTMENTS

“C/K Step 1”	C/K ratio step 1 (0.15...2)
“C/K Step 2”	C/K ratio step 2 (0.15...2)
“Connection delay”	Step connection delay 1...60s
“Disconnection delay”	Step disconnection delay 0.1...60s
“System configuration”	Single- or three-phase wiring selection.

INDICATIONS
- 1 green LED for power on and inhibition time
- 2 red LEDs for relay connection.

Certifications and compliance
Certifications obained: UL Listed, for USA and Canada (File E93601), as Auxiliary Devices-Modular ampere monitoring relays (with 415VAC maximum only); EAC.
Compliant with standards: IEC/EN/BS 60255-5, IEC/EN/BS 61010-1, IEC/EN/BS 61000-6-2, IEC/EN/BS 61000-6-3, UL508, CSA C22.2 n°14.

DCRL series

DCRL3 - DCRL5

DCRL8

EXP8000

EXP10…

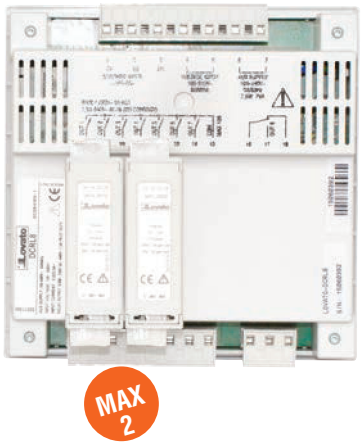
Order code	Description	Qty per pkg	Wt
		n°	[kg]
Single and three-phase low and medium-voltage systems.			
DCRL3	3 steps, expandable up to 6 steps, 100...440VAC	1	0.340
DCRL5	5 steps, expandable up to 8 steps, 100...440VAC	1	0.340
DCRL8	8 steps, expandable up to 14 steps, 100...440VAC	1	0.640
Accessory.			
EXP8000	Plastic insert for customisation label (only for DCRL3 and DCRL5)	10	0.050

Order code	Description
EXPANSION MODULES. Additional steps.	
EXP1006	2 relay outputs to increase number of power factor correction steps
EXP1007	3 relay outputs to increase number of power factor correction steps
Inputs and outputs.	
EXP1003	2 relay outputs 5A 250VAC
Communication ports.	
EXP1010	Opto-isolated USB interface
EXP1011	Opto-isolated RS232 interface
EXP1012	Opto-isolated RS485 interface
EXP1013	Opto-isolated ETHERNET interface (only for DCRL8)

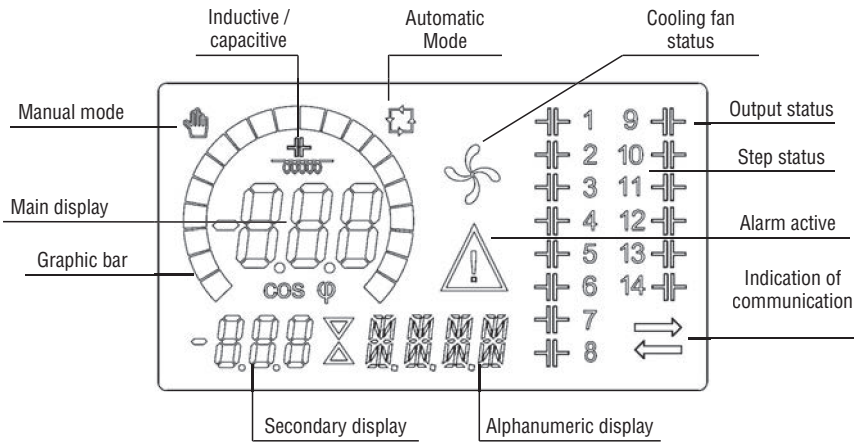
Snap-in fixing of EXP… expansion modules

DCRL3 - DCRL5 with 1 module

DCRL8 with 2 modules



Backlit icon LCD



General characteristics

The DCRL series has been developed with advanced functionality and produced with a dedicated ultra-compact housing. It combines modern front design with practical mounting and expandability (EXP... modules).
Its main features are:
- Backlit icon LCD with excellent information display
- Alarm codes with scrolling texts, programmable in 6 languages (Italian, English, Spanish, French, German and Portuguese)
- Connection in single or three phase lines and co-generation systems with 4-quadrant operation
- Voltage measurement input independent from the supply and which can be used in medium-voltage lines with VTs
- Drastic reduction of the the number of switching operations
- Balanced use of steps with same power rating
- Measurement of reactive power installed for each step
- Capacitor over-current protection
- Panel over-temperature protection via internal sensor
- Accurate micro-breaking protection
- Vast choice of measurements available, including voltage and current THD with single harmonic analysis up to the 15th order
- Wide voltage measurement range
- High accuracy of true root mean square (TRMS) measurements
- Front optical USB (CX01 dongle) and Wi-Fi (CX02 dongle) communication port for PC, smartphone and tablet connection
- Compatible with Ethernet communication modules EXP1013 (only for DCRL8)
- Compatible with Synergy and Synergy Cloud supervision and energy management software, Xpress configuration and remote control software and with the Sam1 application for Android/iOS
- Customisation with label on front (only for DCRL8).

Operational characteristics
- Supply:
  - Auxiliary voltage: 100...440VAC
  - Frequency: 50/60Hz ±10%
- Voltage input:
  - Rated voltage: 600VAC L-L (346VAC L-N)
  - Frequency range: 45...65Hz
- Current input:
  - Single-phase connection
  - Rated current: 1A or 5A, configurable
- Measurements and control:
  - Power factor adjustment: 0.5ind....0.5cap.
  - Voltage measurement range: 50...720VAC L-L; 50...415VAC L-N
  - Current measurement range: 0.025...1.2A for 1A full scale; 0.025...6A for 5A full scale
  - Type of voltage and current measurement: true root mean square (TRMS)
- Relay outputs (steps):
  - DRCL3: 3 outputs
  - DCRL5: 5 outputs
  - DCRL8: 8 outputs
  - Contact arrangement: NO; the last is a changeover
  - Rated current: 5A 250VAC AC1
- Flush-mount housing:
  DCRL3, DCRL 5 (96x96mm / 3.78x3.78”);
  DCRL8 (144x144mm / 5.67x5.67”)
- IEC degree of protection:
  DCRL3, DCRL5 IP54 and DCRL8 IP65 on front;
  IP20 on terminals for all.

Certifications and compliance:
Certifications obtained: UL Listing for USA and Canada (cULus - File E93601), as Auxiliary Devices - Power factor controllers, EAC, RCM.
Compliant with standards: IEC/EN/BS 61010-1, IEC/EN/BS 61000-6-2, IEC/EN/BS 61010-2-030, IEC/EN/BS 61000-6-3 (only for DCRL8), IEC/EN/BS 61000-6-4 (only for DCRL3-5), UL 508, CSA C22.2 n°14.

Contactors for power factor correction
See section 2, page 2-16.

Software Synergy , Synergy Cloud, Xpress and Sam1
See section 30.

EXP expansion modules
See section 31.

DCRG series

DCRG8

EXP10...

Snap-in fixing of 4 EXP... expansion modules
DCRG8 / DCRG8F / DCRG8IND

Order code	Description	Qty per pkg	Wt
		n°	[kg]
DCRG8	8 relay steps, expandable up to 24 steps, 100...415VAC	1	0.980
DCRG8F	8 static steps, expandable up to 24 steps, 100...415VAC	1	0.980
DCRG8IND	8 relay steps, expandable up to 24 steps, 100...415VAC, for capacitive reactive power factor correction	1	0.980
Accessories.			
NTC01	Remote temperature sensor, length 3m/3.3yd	1	0.150

Order code	Description
EXPANSION MODULES Additional steps.	
EXP1006	2 relay outputs to increase number of power factor correction steps
EXP1007	3 relay outputs to increase number of power factor correction steps
Inputs and outputs.	
EXP1000	4 opto-isolated digital inputs
EXP1001	4 opto-isolated static outputs to increase number of static steps
EXP1002	2 digital inputs and 2 opto-isolated static outputs
EXP1003	2 relay outputs 5A 250VAC
EXP1004	2 PT100 opto-isolated analogue inputs, either 0/4...20mA, 0...10V or 0...±5V
EXP1005	2 opto-isolated analogue inputs 0/4...20mA, 0...10V or 0...±5V
EXP1008	2 opto-isolated digital inputs and 2 relay outputs 5A 250VAC
EXP1016	Capacitor protection with 2 inputs for temperature measurement with NTC sensors and 2 three-phase measurement inputs
Communication ports.	
EXP1010	Opto-isolated USB interface
EXP1011	Opto-isolated RS232 interface
EXP1012	Opto-isolated RS485 interface
EXP1013	Opto-isolated ETHERNET interface
EXP1014	Opto-isolated Profibus-DP interface
EXP1015	GPRS/GSM modem❶, without antenna
Other functions.	
EXP1030	Data memory, calendar-clock with backup reserve power for data logging

❶ For configuration via software, contact our Technical support.

Maximum expandability DCRG8 / DCRG8IND / DCRG8F

		EXP1006	EXP1007	EXP1001	TOTAL STEPS	
		Module with 2 relay outputs	Module with 3 relay outputs	Module with 4 static outputs		
Controller	Steps	no. of modules	no. of modules	no. of modules	Relay	Static
DCRG8 / DCRG8IND	8	4 (2 steps)	–	–	16	–
	8	2 (2 steps)	max 2 (3 steps)	–	18	–
	8	–	–	max 4 (4 steps)	8	16
DCRG8F	8	4 (2 steps)	–	–	8	8
	8	2 (2 steps)	max 2 (3 steps)	–	10	8
	8	–	–	max 4 (4 steps)	–	24

General characteristics
The DCRG automatic power factor controller meets the technical requirements of modern electrical systems in industry. It is designed to comply and has the option to extend its functionality by using specific EXP series expansion modules. Mention should also be made of the optical communication port as standard, for programming the controller, diagnostics and data download.
The backlit graphic LCD facilitates data reading even in poor lighting conditions and permits the display of system information clearly and intuitively.
Its main features are:
- 128x80-pixel backlit graphic LCD with texts in 10 languages: Italian, English, Spanish, French, German, Czech, Polish, Russian, Portuguese and one customisable
- Connection in single and three-phase lines as well as three-phase lines with neutral control and cogeneration systems (4 quadrants)
- Capacitive reactive power factor correction (DCRG8IND only)
- Independent power factor correction for each single phase (SPPFC only for DCRG8 / DCRG8IND)
- Suitable for dynamic power factor correction with DCRG8F or DCRG8 + EXP1001
- Control of thyristor modules type DCTL... with static outputs or RS485 connection with DCRG8F controller
- Use with medium-voltage lines with VTs (DCRG8 / DCRG8IND only)
- Capability for correct operation even in systems characterised by high harmonic content
- Drastic reduction in the number of switching operations
- Balanced use of steps with same power rating
- Measurement of reactive power installed for each step
- Recording of the number of connections for each step
- Capacitor over-current protection on all three phases
- Panel over-temperature protection via internal sensor and external sensor
- Accurate micro-breaking protection
- Current and voltage harmonic analysis
- Quick CT programming function
- USB (CX01 dongle) and Wi-Fi (CX02 dongle) communication port for PC, smartphone and tablet connection
- Modbus-RTU TCP and ASCII communication protocol
- Compatible with Synergy and Synergy Cloud supervision and energy management software, Xpress configuration and remote control software and with the Sam1 application for Android/iOS
- Sending and reception of SMS, sending of e-mails with alarm diagnosis and data files, FTP Client function (with EXP1015 module).

Operational characteristics
- Voltage measurement circuit:
  - Auxiliary supply voltage: 100...415VAC
  - Rated frequency: 50/60Hz (±10%)
- Current measurement circuit:
  - Single and three-phase input
  - Rated current: 5A (1A programmable)
- Measurements and control:
  - Power factor adjustment: 0.5ind....0.5cap.
  - Voltage measurement range: 50...720VAC
  - Current measurement range: 0.025...6A
  - Temperature measurement range: -30...+85°C
  - Capacitor overload current measurement range: 0...250%
  - Type of voltage and current measurement: true root mean square (TRMS)
- Relay outputs:
  - 7 each with NO contact and the last as changeover
  - Rated current: 5A 250VAC AC1
- Flush-mount housing (144x144mm / 5.67x5.67")
- IEC degree of protection: IP65 on front; IP20 on terminals.

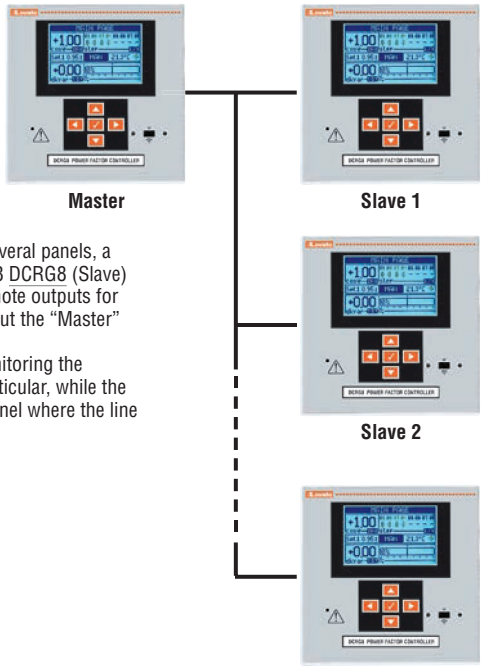
Certifications and compliance
Certifications obtained: UL Listing for USA and Canada (cULus - File E93601), as Auxiliary Devices - Electronic power factor regulator, RCM, EAC.
Compliant with standards: IEC/EN/BS 61010-1, IEC/EN/BS 61000-6-2, IEC/EN/BS 61000-6-4, UL508, CSA C22.2 n°14.

Contactors for power factor correction
See section 2, page 2-16.

Software Synergy , Synergy Cloud, Xpress and Sam1
See section 30.

EXP expansion modules
See section 31.

"Master-Slave" power factor correction system with DCRG8



When the correction system is divided into several panels, a DCRG8 (Master) controller can control up to 8 DCRG8 (Slave) controllers. The "Slave" controllers act as remote outputs for the connection of capacitor banks that carry out the "Master" controller's commands.
The single controllers are responsible for monitoring the electrical panel and the capacitor banks in particular, while the cosφ reading is centralised in the "Master" panel where the line arrives.

Software and APP

Xpress configuration and remote control software

Synergy Supervision and energy management software

Sam1 APP

General characteristics
By using the Xpress software, the quick setup of the controllers can be carried out via PC, avoiding parameter programming errors.
The parameter programming of a DCRL... or DCRG8... controller can also be saved on PC and quickly loaded into another device requiring the same programming.
It permits the following operations:
– System operation monitoring:
  • Graphical and numerical display of measurements
  • Controller status
– Capacitor efficiency control
  • Current kvar measurement for each step
  • Counters for the number of connections for each step
  • Total hour counter for connection time for each individual step
  • Access all setup parameters
  • Saving / loading parameters
  • Highlighting of changed values
  • Resetting to default values.

The Synergy software permits remote control and supervision of the DCRL... and DCRG8... controllers.
See section 30 for details.
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.

APP for smartphone and tablet
The Sam1 application allows the user to program the controller, view alarms, send commands, read measurements, download statistical data and events and send retrieved data by e-mail. The connection is made by Wi-Fi with a smartphone or tablet using the CX02 device.
It is iOS and Android compatible.
For details, consult section 30 or our Technical support; see contact details on inside front cover.

Accessories for DCRL and DCRG

EXCM4G01

new

Order code	Description	Qty per pkg	Wt
		n°	[kg]
51C2	Connection cable PC↔DCRL/DCRG+ EXP10 11 length 1.8m/2yd	1	0.090
EXCCON01	RS485/ Ethernet converter, 12...48VDC, including DIN rail fixing kit❶	1	0.400
EXCM4G01	RS485 gateway/4G modem, 9...36VDC, including cable for programming❶	1	0.340

❶ Consult our Technical support for modem details; see contact details on front cover.

Communication devices

CX01

CX02

CX03

Order code	Description	Qty per pkg	Wt
		n°	[kg]
CX01	USB/optical device PC↔DCRL/DCRG, for programming, data download, diagnostics and updating firmware	1	0.090
CX02	Wi-Fi connection device for PC↔DCRL/DCRG, for downloading data, programming, diagnostics and cloning	1	0.090
For DCRG8... type only.			
CX03	GSM penta-band antenna (850/900/1800/1900/2100MHz)	1	0.090

General characteristics
Communication and connection devices to connect the DCRL and DCRG power factor controllers to personal computers, smartphones and tablets.

CX01
This USB device, complete with cable, permits connection of the power factor controller with a PC without needing to disconnect the electrical panel supply, in order to:
– Program parameters
– Copy the settings to external units
– Download data and events
– Carry out diagnostics
– Update the firmware.
The PC identifies the connection as a standard USB.

CX02
Via Wi-Fi connection, the power factor controllers can be viewed from PCs, smartphones and tablets without having to connect cables, in order to:
– Program parameters
– Download data and events
– Carry out diagnosis and cloning of the device.

CX03
Compatible with major worldwide mobile phone networks, thanks to the use of 850/900/1800/1900/2100MHz frequencies.
IEC degree of protection: IP67.
Fixing hole Ø10mm (0.40”).
Cable length 2.5m/2.73yd.

For dimensions, wiring diagrams and technical characteristics, consult the manuals available online in the Download section of the following website: www.LovatoElectric.com.

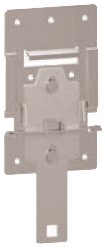
DCTL series

DCTL...

Order code	Step power	Qty per pkg	Wt
	[kvar]	n°	[kg]
Versions with rated voltage 400VAC.			
DCTLA4000075	7.5kvar at 400VAC step module	1	1.74
DCTLA4000150	15kvar at 400VAC step module	1	1.74
DCTLA4000300	30kvar at 400VAC step module	1	1.74
DCTLA4000500	50kvar at 400VAC step module	1	2.84
DCTLA4001000	100kvar at 400VAC step module	1	6.68
Versions with rated voltage 400...480VAC.			
DCTLA4800090	9kvar at 480VAC step module	1	1.74
DCTLA4800180	18kvar at 480VAC step module	1	1.74
DCTLA4800360	36kvar at 480VAC step module	1	1.74
DCTLA4800600	60kvar at 480VAC step module	1	2.84
DCTLA4801200	120kvar at 480VAC step module	1	6.68
Versions with rated voltage 600...690VAC IEC, 600VAC cULus.			
DCTLA6900300	30kvar at 690VAC step module	1	2.84
DCTLA6900500	50kvar at 690VAC step module	1	2.84
DCTLA6901000	100kvar at 690VAC step module	1	6.68

Accessories for DCTL

EXC1042



EXP8003

NTC01

EXA01

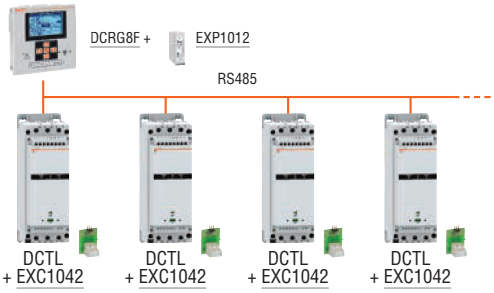
EXA02

Order code	Description	Qty per pkg	Wt
		n°	[kg]
EXC1042	RS485 communication board	1	0.020
EXP8003	DIN rail mount kit for DCTL up to 60kvar max	1	0.200
NTC01	Remote temperature sensor, 3m	1	0.150
CX01	USB connection dongle PC↔DCTL, for programming diagnostics and firmware update	1	0.090
CX02	Wi-Fi connection dongle PC↔DCTL, for programming, diagnostics and cloning	1	0.090
EXA01	Kit of 3 UL terminal lugs for DCTLA4001000, DCTLA4801200 and DCTLA6901000	1	0.141
EXA02	Kit of 3 terminal protection covers for DCTLA4001000, DCTLA4801200 and DCTLA6901000	1	0.125

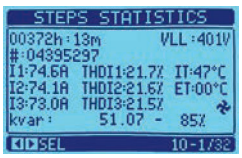
Power connections with double lug clamps

The thyristor modules type DCTL up to 60kvar are provided with power connections with double lug clamps which allows to simplify the wiring, in particular when is necessary to connect more thyristor modules in parallel.

Connection to the automatic power factor controller type DCRG8F via RS485



Alternatively to the standard command from static outputs, the thyristor modules type DCTL can be connected to the automatic power factor controller type DCRG8F with the RS485 optional port (code EXC1042), obtaining a simple and linear wiring.
In this configuration, it is possible to monitor from the display of the DCRG8F controller the status and measures of each DCTL module such as step power, currents, harmonics, temperature, working hours, etc.



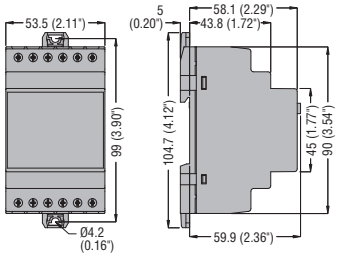
General characteristics
- Suitable for dynamic (fast) power factor correction
- Silent operation
- Zero-crossing switching
- Monitoring and protection of the current, power and current harmonics of the capacitor bank: thanks to the presence of integrated current transformers, it is possible to monitor and protect the capacitor bank against overcurrents caused by events like the distortion of the voltage waveform. It is also possible to monitor electrical measurements of the capacitor bank such as the residual power three-phase voltages and currents, temperatures, THDI, morning hours, etc...
- Over-temperature protection via built-in sensor and input for the optional external temperature sensor NTC01 for the measure of the temperature in the area of installation of the capacitors
- Ready to work without need of any programming when used with standard features
- NFC connectivity for parameter settings and programming of the protection thresholds (overtemperature, overcurrent, overvoltage,...) with the App Lovato NFC freely downloadable from Google Play Store and App Store
- Optical port for programming and diagnostic with software Xpress and App Sam1,connection with USB dongle (CX01) or Wi-Fi dongle (CX02)
- Command circuit made by 8...30VDC signal or dry contact (which allows to save the use of a power supply)
- Optional RS485 communication card (code EXC1042) for the command and monitoring from power factor controller type DCRG8F; from the display of DCRG8F is also possible to monitor the status and the measurements (temperature, power,...) of each DCTL
- 1 programmable relay output with changeover contact for the signalling of alarms or fan command
- Possibility to install the thyristor modules DCTL in both vertical and horizontal position without derating, thanks to the built-in fans
- Monitoring of the functioning of the fans with the analog measure of the current through integrated sensor, which allows to control the status of the fan and recognize automatically any fault like jamming or disconnection
- Power connections with double screw terminals (for sizes up to 60kvar), which simplify the wiring, in particular for the connection of more thyristor modules in parallel; it is also possible to decide to cable or not the central phase according to the layout of the power factor correction panel
- Panel fixing with screw or on DIN guide with the optional accessory EXP8003 (only for sizes up to 60kvar).

Operational characteristics
- Step power:
  - 7.5, 15, 30, 50 and 100kvar at 400VAC
  - 9, 18, 36, 60 and 120kvar at 480VAC
  - 30, 50 and 100kvar at 600...690VAC
- Rated operating voltage:
  - 400VAC (IEC and cULus) for version DCTLA400...
  - 400...480VAC (IEC and cULus) for version DCTLA480...
  - 600...690VAC (IEC), 600VAC (cULus) for version DCTLA690...
- Rated frequency 50/60Hz
- Auxiliary supply voltage: 100...240VAC ± 10%
- Command circuit: 8...30VDC or dry contact or RS485 connection from DCRG8F controller
- Controlled phases: 2
- Forced ventilation monitored from the control logic
- Operating temperature: -20...+45°C (up to 55°C with derating)

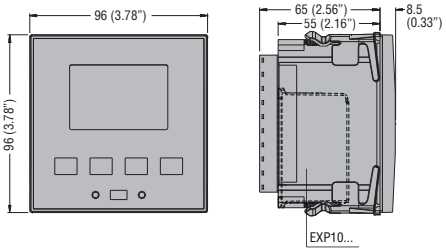
INDICATIONS
- LED POWER: presence of supply
- LED FAULT: alarm active (n° flashes = type of alarm)
- LED ON: command active.

Certifications and compliance:
Certifications obtained: cULus.
Compliant with standards: IEC/EN/BS 60947-4-3, IEC/EN/BS 61000-6-2, IEC/EN/BS 61000-6-4.

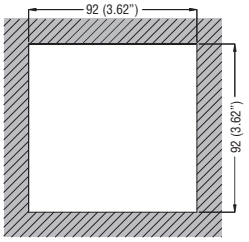
REACTIVE CURRENT CONTROL RELAY
DCRM2



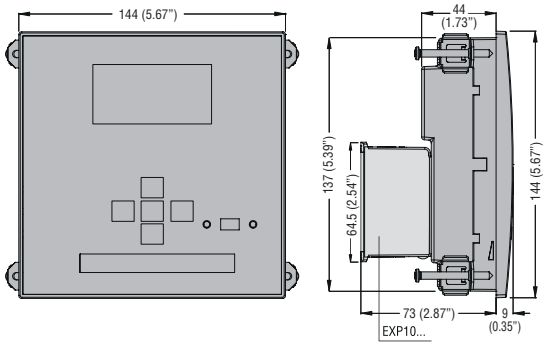
AUTOMATIC POWER FACTOR CONTROLLERS
DCRL3 - DCRL5



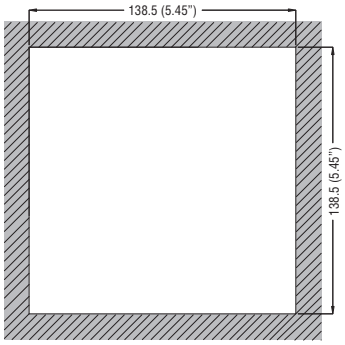
Cutout



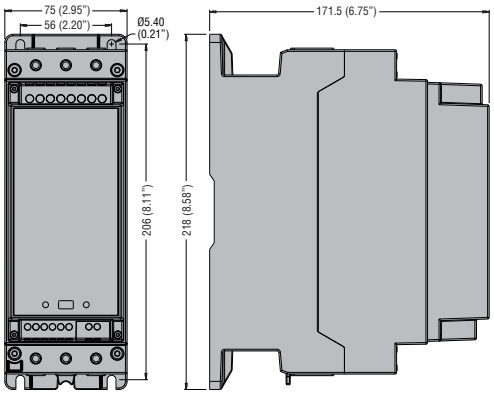
DCRL8 - DCRG8...



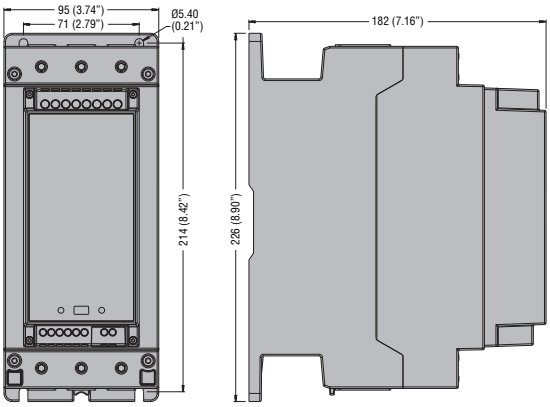
Cutout



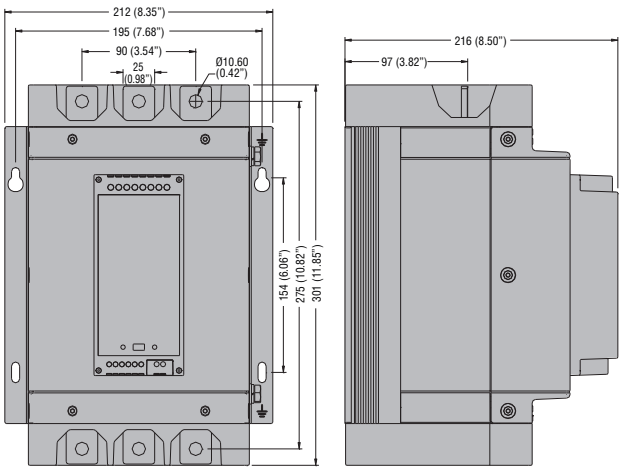
THYRISTOR MODULES
DCTLA4000075 - DCTLA4000150 - DCTLA4000300
DCTLA4800090 - DCTLA4800180 - DCTLA4800360

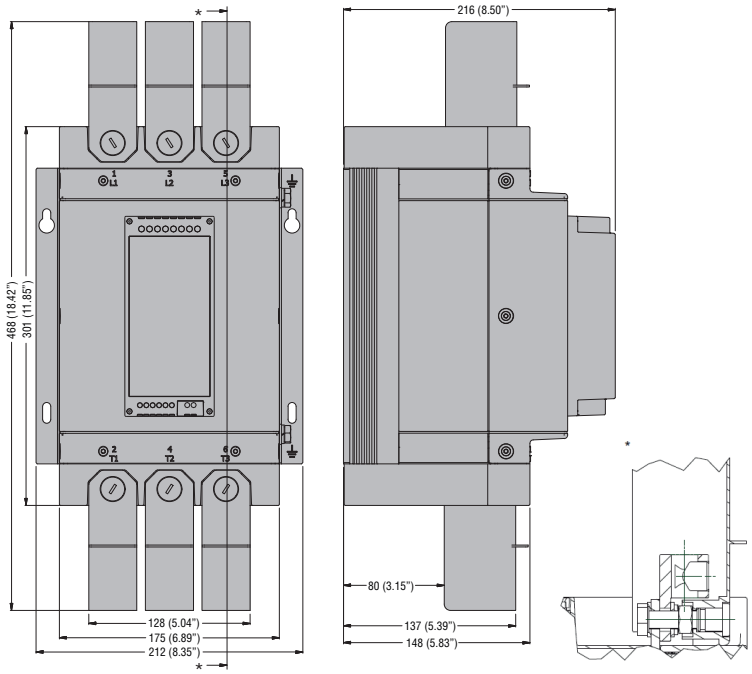


DCTLA4000500 - DCTLA4800600
DCTLA6900300 - DCTLA6900500



DCTLA4001000 - DCTLA4801200
DCTLA6901000

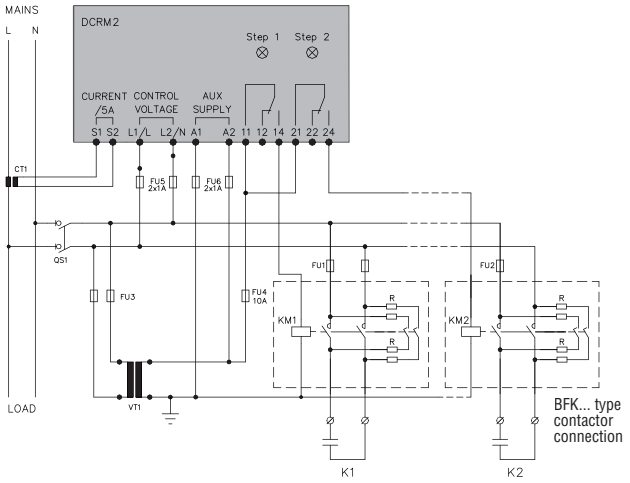




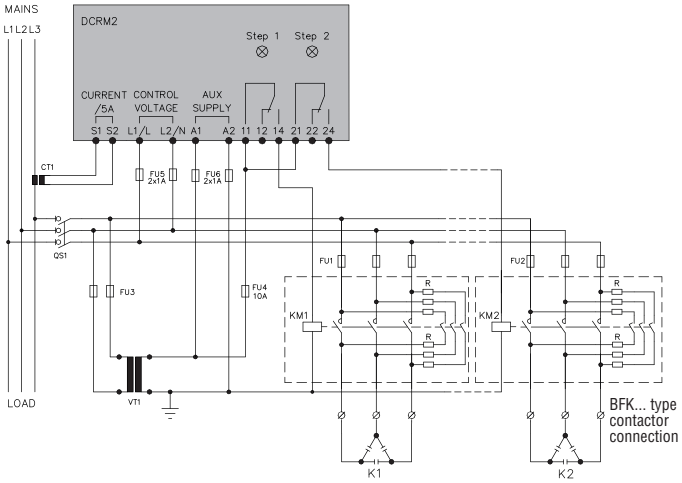
DCTLA4001000, DCTLA4801200, DCTLA6901000 complete with terminal lugs kit EXA01 and terminals protection kit EXA02 (necessary only for cULus compliance).

REACTIVE CURRENT CONTROL RELAY
DCRM2

Single-phase connection



Three-phase connection

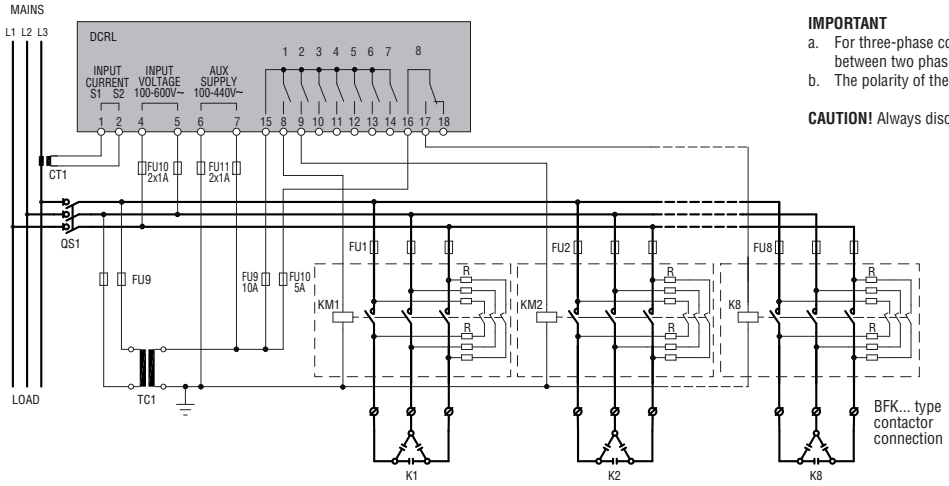


IMPORTANT

a. For three-phase connection, the voltage measurement input must be connected between two phases; the line CT must be connected on the remaining phase.
b. The polarity of the current measurement input is irrelevant.

CAUTION! Always disconnect the power supply when operating on the terminals.

AUTOMATIC POWER FACTOR CONTROLLERS
DCRL... with BFK... type contactors

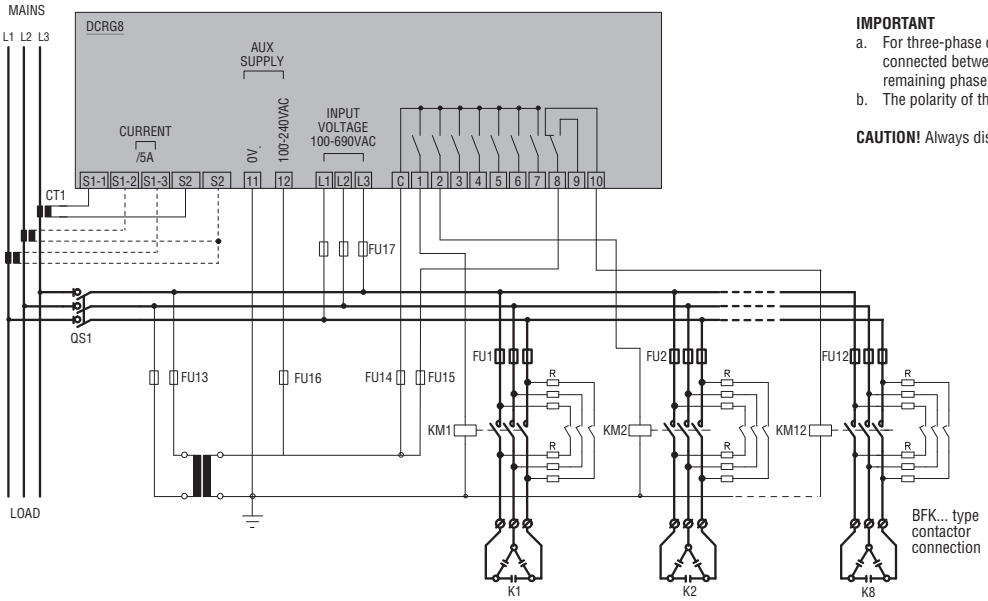


IMPORTANT

a. For three-phase connection, the voltage measurement input must be connected between two phases; the line CT must be connected on the remaining phase.
b. The polarity of the current measurement input is irrelevant.

CAUTION! Always disconnect the power supply when operating on the terminals.

AUTOMATIC POWER FACTOR CONTROLLERS
DCRG8 with BF...K type contactors

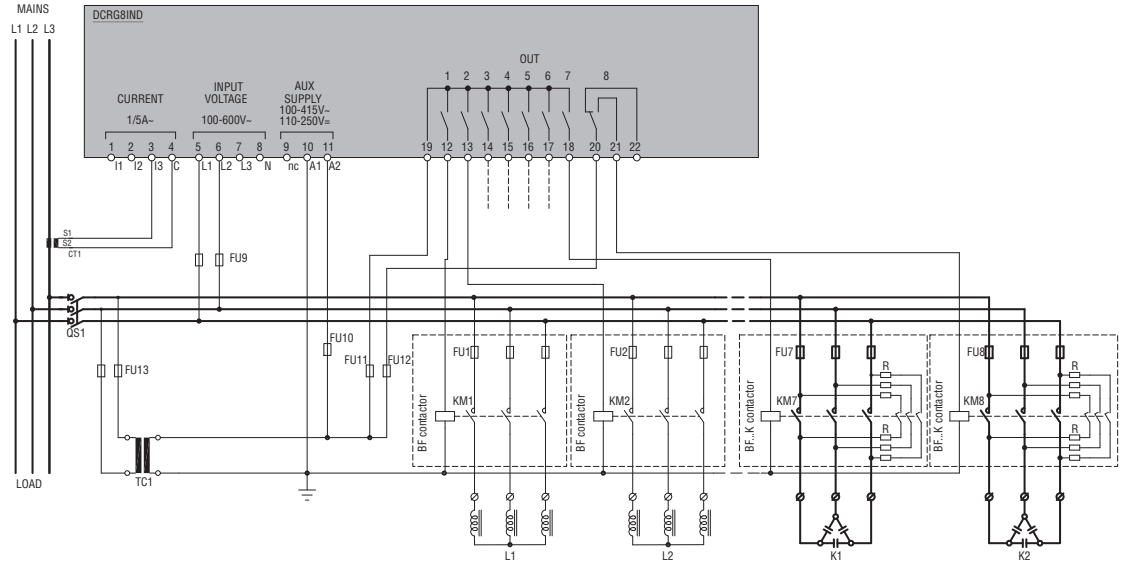


IMPORTANT

a. For three-phase connection, the voltage measurement input must be connected between two phases; the line CT must be connected on the remaining phase.
b. The polarity of the current measurement input is irrelevant.

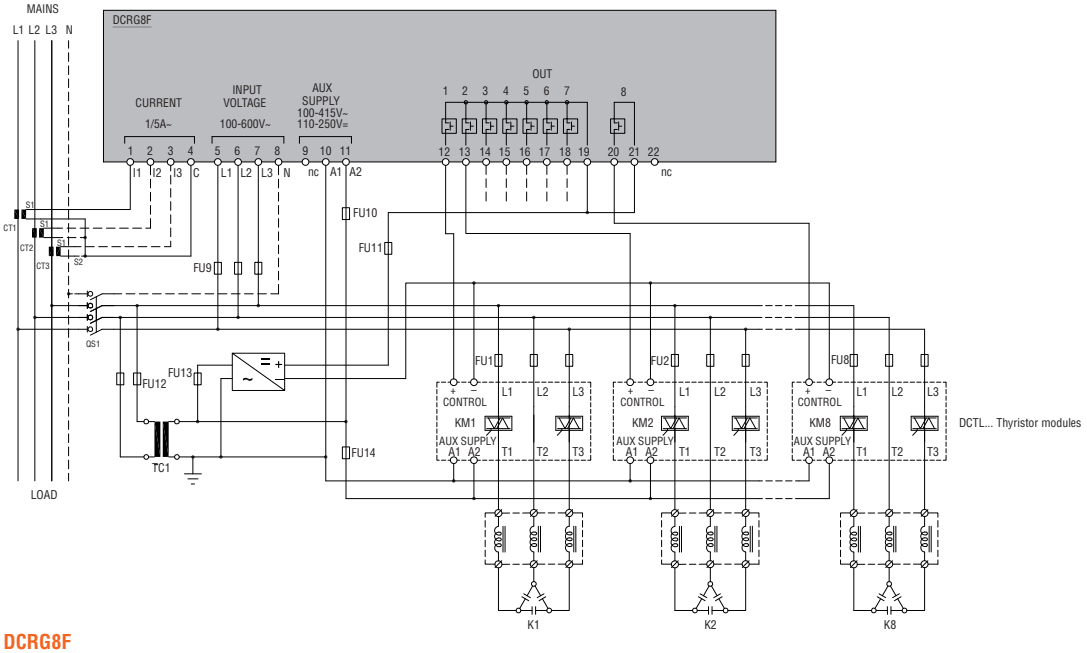
CAUTION! Always disconnect the power supply when operating on the terminals.

DCRG8IND



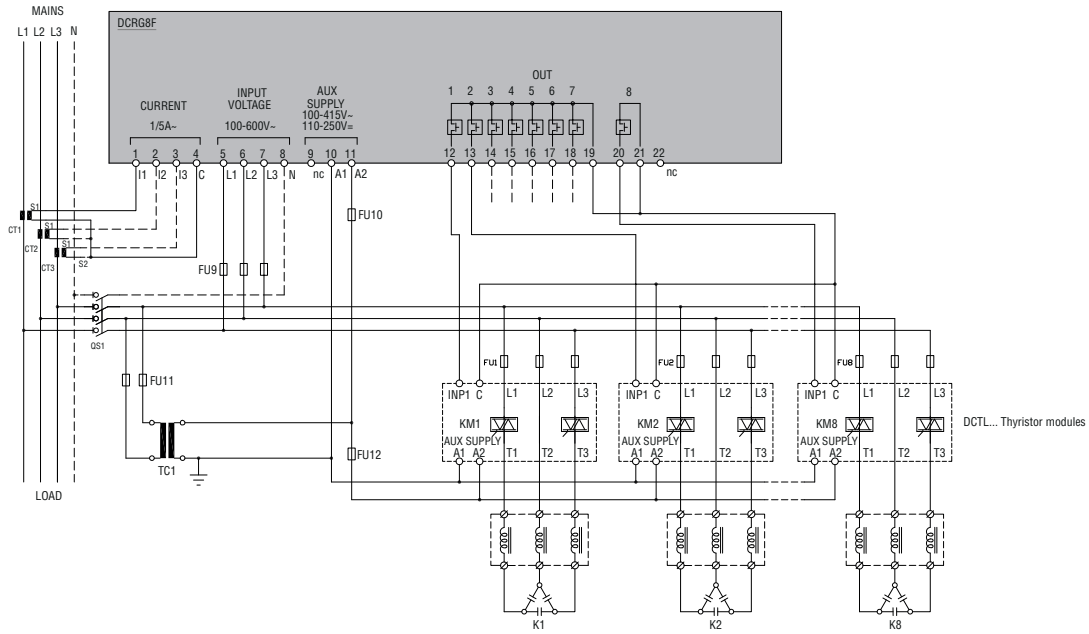
DCRG8F

Thyristor module control via 8 ... 30VDC signal



DCRG8F

Thyristor module control via clean contact (only with DCTL)



TYPE	DCRM2
AUXILIARY SUPPLY CIRCUIT	
Rated auxiliary voltage (Us)	380...415VAC standard 220...240VAC and 440...480VAC on request❶
Operating range	0.85...1.1Us
Rated frequency50/60Hz ±5%	
Maximum power consumption/dissipation	4.4VA / 2.4W
Micro-breaking immunity	≤17ms
No-voltage release	≥8ms
VOLTAGE INPUT	
Maximum rated voltage Ue	480VAC❶
Measuring range	80...528VAC
Frequency range	50 or 60Hz ±1% self configurable
Measurement input impedance	>1MΩ
Type of connection	L1-L2 or -N
CURRENT INPUT	
Type of connection	By current transformer (CT)
Rated current Ie	5A AC
Measurement range	0.1...6A
Type of input	Shunt supplied by external current transformer (low voltage). Max. 5A
Measurement method	True RMS value
Overload capacity	+20% Ie
Overload peak	10In for 1s
Dynamic limit	160A for 10ms
Burden	≤0.6W
ADJUSTMENTS	
C/K step 1 and 2	OFF / 0.15...2
Connection / disconnection	1...60s
System configuration	3-phase - 1-phase
RELAY OUTPUTS	
Number of relays	2 (each with 1 changeover)
Rated operational voltage	250VAC
Maximum switching voltage	400VAC
IEC conventional free air thermal current (Ith)	8A
IEC/EN/BS 60947-5-1 and UL/CSA designation	B300
Electrical life with rated load	10^5 cycles
Mechanical life	$30x10^6$ cycles
INSULATION (input-output)	
Rated insulation voltage	480VAC
CONNECTIONS	
Maximum tightening torque	0.8Nm (7lb.in; 7-9lb.in according to UL/CSA)
Conductor section min....max.	0.2...4.0mm² (24...12AWG; 18...12AWG according to UL/CSA)
AMBIENT CONDITIONS	
Operating temperature	–20...+60°C
Storage temperature	–30...+80°C
HOUSING	
Material	Self-extinguishing polyamide

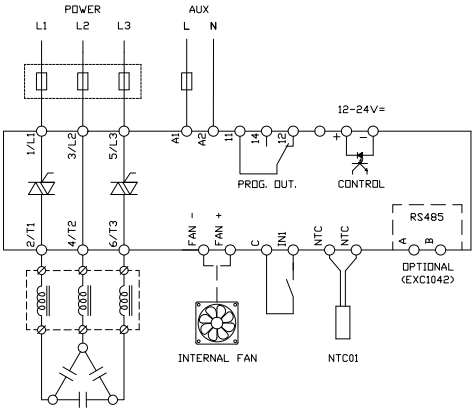
❶ UL/CSA certification obtained with 415VAC maximum.

TYPE	DCRL3	DCRL5	DCRL8	DCRG8 / DCRG8IND	DCRG8F
AUXILIARY SUPPLY CIRCUIT					
Rated supply voltage (Us)	100...440VAC			100...415VAC	
Operating range	90...484VAC			90...456VAC	
Rated frequency	50Hz; 60Hz			50Hz; 60Hz	
Maximum power consumption	9.5VA		7VA	27VA	
Maximum power dissipation (excluding power dissipation from the output contacts)	3.5W		2.5W	10.5W	
VOLTAGE CIRCUIT					
Control voltage	100...600VAC L-L; 100...346VAC L-N			100...600VAC L-L; 100...346VAC L-N	
Operating range	50...720VAC L-L; 50...415VAC L-N			50...720VAC L-L; 50...415VAC L-N	
Frequency range	45...66Hz			45...66Hz; 360...440Hz	
Immunity time for microbreaking	<25ms			35ms (110VAC) - 80ms (220...415VAC)	
No-voltage relay release	≥8ms			≥8ms	
CURRENT CIRCUIT					
Rated current Ie	Programmable 5A or 1A				
Operating range	0.025...6A for 5A full scale; 0.025...1.2A for 1A full scale				
Constant overload	1.2Ie				
Overload peak	50A for 1 second				
Power consumption	0.6VA				
MEASUREMENT DATA					
Type of voltage and current measurement	True RMS value				
Power factor adjustment	0.5ind....0.5cap.				
Type of temperature sensor type	Internal			Internal + PT100 with EXP1004 + NTC with EXP1016 (DCRG8 / DCRG8IND)	
Temperature measurement range	0...+212°C			0...+212°C	
RELAY OUTPUTS					
Number of outputs	3 (up to 6 with EXP1006 - EXP1007)	5 (up to 8 with EXP1006 - EXP1007)	8 (up to 14 with EXP1006 - EXP1007)	8 (up to 18 with EXP1006 - EXP1007)	0 (up to 10 with EXP1006 - EXP1007)
Contact arrangement	2 NO contacts + 1 changeover	4 NO contacts + 1 changeover	7 NO contacts + 1 changeover	7 NO contacts + 1 changeover	–
IEC rated current	5A 250V AC1			5A 250V AC1	
Maximum current at common contact terminal	10A				
Maximum switching voltage	415VAC				
IEC/EN/BS 60947-5-1 and UL/CSA designation	B300				
Electrical life with rated load	10^5 cycles				
Mechanical life	$30x10^6$ cycles				
STATIC OUTPUTS					
Number of outputs	—			4 or 8 with EXP1001 (55mA)	8 (120mA) (up to 24 with EXP1001)
INSULATION					
Rated insulation voltage Ui	600VAC				
Rated impulse withstand voltage Uimp	9.5kV				
Power frequency withstand voltage	5.2kV				
CONNECTIONS					
Type of terminal	Removable				
Conductor section min....max	0.2...2.5mm² (24...12AWG; 18...12AWG according to UL)				
AMBIENT CONDITIONS					
Operating temperature	-20...+60°C			-20...+70°C	
Storage temperature	-30...+80°C			-30...+80°C	
HOUSING					
Version	Flush-mount 96x96mm (3.78x3.78")		Flush-mount 144x144mm (5.67x5.67")		
Material	Polycarbonate		Polycarbonate		
IEC degree of protection	IP54		IP65		

TYPE		DCTLA 4000075	DCTLA 4000150	DCTLA 4000300	DCTLA 4000500	DCTLA 4001000	DCTLA 4800090	DCTLA 4800180	DCTLA 4800360	DCTLA 4800600	DCTLA 4801200	DCTLA 6900300	DCTLA 6900500	DCTLA 6901000
Rated operating voltage Us		400VAC					400...480VAC					600...690VAC		
Rated frequency		50/60Hz												
Rated current Ie		11A	22A	43A	72A	144A	11A	22A	43A	72A	144A	29A	48A	96A
Step power	400VAC	7.5kvar	15kvar	30kvar	50kvar	100kvar	7.5kvar	15kvar	30kvar	50kvar	100kvar	20kvar	33kvar	67kvar
	440VAC	–	–	–	–	–	8kvar	16.5kvar	33kvar	55kvar	110kvar	22kvar	37kvar	73kvar
	480VAC	–	–	–	–	–	9kvar	18kvar	36kvar	60kvar	120kvar	24kvar	40kvar	80kvar
	525VAC	–	–	–	–	–	–	–	–	–	–	26kvar	44kvar	87kvar
	600VAC	–	–	–	–	–	–	–	–	–	–	30kvar	50kvar	100kvar
	690VAC	–	–	–	–	–	–	–	–	–	–	30kvar	50kvar	100kvar
Peak Inverse Voltage (PIV)		1800VAC					2200VAC					3600VAC		
Number of controlled phases		2												
Auxiliary supply		100...240VAC												
Control circuit		8...30VDC or dry contact or via RS485 serial port (with optional card EXC1042 in combination with controller DCRG8F + EXP1012												
Over-temperature protection		Yes, via integrated probe or optional external probe NTC01												
Cooling		Forced ventilation												
Operating temperature		-20...+45°C without derating (up to 55°C with derating)❶												

❶ Consult our Technical support for more information; see contact details on front cover.

THYRISTOR MODULES
DCTL



شرکت مبنا تجهیز تابلو (سهامی خاص)

Mabna Tajhiz Tableau Co. (MTT Co.)

TEM GROUP

نماینده رسمی و انحصاری Lovato در ایران

Lovato electric

ENERGY AND AUTOMATION

www.MTTIran.com

info@Mttiran.com

021-88366081-2 & 88583128

021-88583154

تهران، شهرک غرب، انتهای بلوار دادمان، روبروی پژوهشگاه نیرو، خیابان گل افشان شمالی، کوچه یکم، پلاک ۱، واحد ۷