DUCATI energia

HISTORY DRIVES THE FUTURE

Since 1926

Low voltage power factor correction: capacitors, components, fixed & automatic equipment and active harmonic filters

INDEX

New series of power factor controllers “rEvolution” R5 e R8

CONTROLLERS REVOLUTION R5 AND R8 WERE DESIGNED BY DUCATI IN ORDER TO INTRODUCE A NEW VISION OF THE POWER FACTOR CORRECTION.

The new Power Factor Controllers **rEvolution R5** and **R8** were designed by DUCATI in order to introduce a new vision of the Power Factor Correction.
These innovative controllers combine the reliability of the previous series of DUCATI controllers to the most recent data communication technologies, both near field and remote.

TECHNICAL ASPECTS

Among the main technical features:

- 96x96mm size, with a depth of only 57mm
- Easy to setup
- Self-sensing of direction and phase of CT, to reduce errors during installation
- Smart step turn on of the steps for a more uniform usage
- Measurement of the harmonic spectrum up to 60th order

SMART FEATURES

Among the main “Smart” features:

- NFC on all controllers to exchange data to/from DUCATI App on Smartphone
- Various connectivity options (radio, RS485, Ethernet, Bluetooth, USB)
- Optional integration with cloud data sharing DUCNET, for the remote management and analysis of operation and alarms

DUCATI R5

DUCATI R8

The rEvolution series will be installed on DUCATI PFC units in these different versions:

- DUCATI **200-M → R5**
- DUCATI **400-M → R5** with radio 868MHz module and RS485 connection
- DUCATI **170-ML → R5** with radio 868MHz module and RS485 connection
- DUCATI **1600-R → R8** with radio 868MHz module and RS485 and Bluetooth connection
- DUCATI **1000-RL** and **1000-RL/HP → R8** with radio 868MHz module and RS485 and Bluetooth connection

“DUCATI Smart Energy” App

The dedicated app “**DUCATI Smart Energy**” is designed to simplify the setup operations and the control of all equipment with the new **R5** and **R8** power factor controllers. The communication to the smartphone can be established with the NFC (standard for all the models) or via Bluetooth (optional on R8).

DOWNLOAD APP

Functionality:

- Easy and intuitive setting of the configuration parameters
- Firmware updates available in real time
- At glance device status check (battery power, contactors maneuvers, etc.)
- Configuration files shared by e-mail

New DUCATI 50-M with START&GO power factor controller

DUCATI energia introduces the new 50-M series dedicated to the small powers, equipping it with the new power factor controller **START&GO**, designed to ease the installation of the equipment.
The new controller is able to automatically detect all the parameters that are used to start the unit and the correct turn on of the steps.

DUCATI 50-M
WITH START&GO
POWER FACTOR CONTROLLER

Among the main features:

- No setup required (CT autosensing)
- Green/red led for instant status check
- Check table with most common failures/alarms on front and suggestions for solving the issues
- 4 quadrant operation
- "Saving Contactors" logic for a more uniform and optimized usage of capacitors' batteries.

Check out the advantages of the START&GO: https://www.youtube.com/watch?v=ELVw80750wI.

MODULO XD: The only Original and Inimitable

MODULO XD

DUCATI energia has always been synonymous of Quality and High Performance. For this reason our products, especially three-phase capacitors, are subjected to poor counterfeiting.
Only on original **MODULO XD** there's a last generation anti-counterfeiting hologram, which guarantees the purchase and therefore the quality of the capacitors made by DUCATI.
The special structure of the hologram is easily recognizable and impossible to duplicate.
Available Q2 2017.

DUCATI ENERGIA
About us, quality, services

DUCATI, founded in 1926 by Ducati brothers, has been among the first in the world to start industrial production of capacitors, and has been a market leader ever since.
Since its foundation, DUCATI Energia has always been in the forefront of technical and industrial development, leading the research shaping today's technology and cooperating to the upgrades and improvements leading to the current IEC and EN Standards for Capacitors.
DUCATI energia firstly introduced the Metallised Polypropylene Film technology and its innovative PPM and PPMh film set the reference for this technology, outclassing the obsolete paper/oil and gas technology in terms of superior performance and reduced dimensions.

DUCATI energia Group main fields of activities are:
- Motor Lighting Capacitors
- Power Electronics Capacitors
- Power Factor Correction Capacitors and Systems (LV and MV)
- Alternators and Ignition Systems
- Electrical Vehicles and Charging Stations for Electrical Vehicles
- Energy Analysers
- Control Systems for energy grids
- Railways Signalling systems
- Ticketing and Transport Automation systems

Quality

Utmost attention to product quality and customer service are constants in DUCATI's history and the main factors contributing to its success worldwide. DUCATI has always been one of the first companies in its field, in Italy and in Europe, to adopt the most modern standards and procedures in order to assure the highest level of product quality and reliability.
The QUALITY SYSTEM of DUCATI Energia SpA, capacitor division, as described in the Quality Manual, was one of the first in Italy to be approved by the BSI in accordance with ISO 9002 (EN 29002) procedures: Certificate of Registration N. FM22004. DUCATI Energia is fully certified following ISO 9001:2008, ISO 14001:2004 and OHSAS 18001:2007.
All this has been achieved thanks to fully automated and integrated production processes, completely new and innovative machines, production process control methods based on accurate specifications and the assigning of responsibility to operators at all levels.
Capacitors, systems and relays comply with the requirements set forth in EC Directives 73/23 and 93/68 ("Low Voltage Directive"), 89/336 and 92/31 ("Electromagnetic Compatibility Directive").
The harmonized European standards of reference are EN 60831- 1 and EN 60831-2.
Nearly all models are certified by international institutes and all are manufactured in full compliance with the requirements of said standards. The failure rate (for capacitors only) is 300 per 109 components x hours (reliability according to DIN 40040).

Services

In the design and choosing of a PFC equipment , the experience and expertise are the main characteristics that can make a difference. DUCATI Energia guides you all along the process, from the choice of the most suitable PFC system to the commissioning, maintenance and management of the same unit.
A team of experts is dedicated to the design: any prerogative of the equipment is analyzed to obtain the most efficient solution based on the operating condition and the needs of the overall system.
The analysis of the field conditions sometime is essential for the choice of the best equipment to be installed; DUCATI offers the service of analysis measurement by using the most advanced tools on the market.
The after sales service is essential to help the customer in the proper installation of various units. A dedicated number that provides service that will guide the customer in the setting of the various parameters and help you solve small problems that normally can occur when starting the equipment.
The best results are obtained by combining the experience gained over the years with deep knowledge of the technologies used. In one word, DUCATI.


IQNet
CERTIFICATE
ISO 9001:2008

Certification of Quality Management System ISO 9001:2008


IQNet
CERTIFICATE
ISO 14001:2004

Certification of Environmental Management System ISO 14001:2004


IQNet
CERTIFICATE
BS OHSAS 18001:2007

Certification of Occupational Health and Safety Management System BS OHSAS 18001:2007

CAPACITORS

TECHNOLOGY

Capacitors' technology

DUCATI was the first company in Italy, and among the first in the world, to introduce capacitors for the radiobroadcasting equipment designed by Guglielmo Marconi.
Building upon this tradition, which has always seen DUCATI in the forefront of capacitor technology, the company has developed the innovative PPM and PPMh film with 4In capacitor.
Superior performance and reduced dimensions compared to the by now obsolete paper and oil and gas solutions make PPM/PPMh capacitors the new standard of reference for industrial power factor correction systems.
All the capacitors manufactured by DUCATI Energia feature a protection device conforming to standards EN 60831-1/2. This protection has been achieved by means of a special engineering technology: if a fault occurs the connections will be broken due to overpressure, leaving the insulation of the case intact and preventing the capacitor from exploding or burning.

Technology Long Life $4I_N$

The Continuousus research conducted in DUCATI Energia laboratories has led to the development of a polypropylene film with a special metallization, whose purpose is to favour the self-healing process and reduce dielectric losses.
Thanks to this innovative metallization treatment, the polypropylene is subjected to less stress during operation. Therefore it maintains its dielectric properties for a significantly longer time while delivering significantly better performance in terms of both 4In current and voltage.
The above-described characteristics make these capacitors especially suitable for Continuousus duty under highly demanding conditions in harmonic rich environments.

The **Long Life $4I_N$** series of single phase capacitors for industrial PFC, with winded elements made of PPMh film, is the top notch in terms of reliability, performances and reduced size.

The **MONO Long Life $4I_N$** series, equipped in every DUCATI PFC units, use this kind of technology.

EXTRA DUTY (XD) and STANDARD LIFE series

Metallized polypropylene technology (PPM / MKP) utilizes a vacuum evaporation technique to deposit an extremely thin layer of metal on one side of the polypropylene film.
The capacitor elements built using this technology are obtained by winding two polypropylene films. The capacitor plates consist in the metallized surface of the two films and the dielectric is the propylene film itself.
The main advantage of capacitors with metallized plates is their self-healing capacity. This means that they are capable of restoring their electrical properties following the occurrence of a short circuit between the plates.
In these capacitors the impregnating agent is a special type of resin. DUCATI Energia has developed an ecofriendly resin composition displaying high dielectric stability, which completely eliminates every possible risk of air and water molecules being present inside the capacitor.

The capacitors which use this kind of technlogy are:

- Three phases capacitors EXTRA DUTY **MODULO XD** series
- Three phases capacitors EXTRA DUTY **MODULO XD MINI** series
- Mono phase capacitors STANDARD LIFE **FLOPPY CAP** series

For further information about the usage of the capacitors, please check the **reference notes** and the **installation notes** at page 36.

Single phase capacitors

	Technology	Power Range (kVAr)	Voltage Range (V)
MONO	4 I_N	1.67 - 8.33	400 - 525
FLOPPY CAP	Standard Life	1.67 - 4.17	400 - 550

Three phase capacitors

	Technology	Power Range (kVAr)	Voltage Range (V)
MODULO XD	Extra Duty	1.5 - 50	240 - 800
MODULO XD Mini	Extra Duty	0.5 - 10	400 - 550
F50	4 I_N	5 - 60	415 - 525

MONO Long Life 4I$_N$

Single phase capacitors

The capacitors making up the series **MONO Long Life 4I$_N$** are manufactured using elements wound with the PPMh film and housed in metal cases with metal lids. The parts are assembled by crimping to ensure perfect airtightness of the system and efficient operation of the overpressure safety device. The use of resin impregnation technology greatly enhances the capacitor's performance in terms of heat dissipation as well as ensuring a long life and excellent ground insulation.
These characteristics make these capacitors especially suitable for Continuousus duty under highly demanding condition in harmonic rich environments.

General Characteristics

Power Range	1.67 – 8.33 kVAr
Voltage range	400 ÷ 525 V
Rated frequency	50 Hz/60 Hz
Capacitance tolerance	-5 +10%
Duty	Continuousus
Dielectric losses	≤ 0.2 W/kVAr
Life expectancya	≥ 110000h – 25/D ≥ 130000h – 25/C
Max dV/dt	≤ 100 V /µs
Temperature class	-25/D
Max overload In	4 x In
Max inrush current	200 I_n
Terminals	Double faston M5 bolt for Q= 8.33 kVAr
Protection rating	IP 00
Discharge resistance	NO. Option discharge resistance 68kΩ 4W 315.99.0116
Impregnating material	Eco-friendly resin
Altitude	≤ 2000 m s.l.m.
Test voltage (AC) between terminals	2.15 U_n x 2 s
Test voltage (AC) between terminals and case	3kV x 10 s
Standards	IEC 831 - 1/2
Approvals	c UL us * with modified PN 416.84.

Un (V)	Qn (kVAr)	In (A)	C (µF)	DxH (mm)	Pcs x box	Part n. 416.53
400	1.67	4.2	33.2	45x115	40	**1100**
	2.5	6.3	49.8	50x115	28	**1150**
	3.33	8.3	66.3	50x150	28	**1200**
	4.17	10.4	83	55x150	28	**1250**
	5	12.5	99.5	60x150	25	**1300**
	6.66	16.7	132.6	60x165	18	**1350**
	8.33	20.8	165.8	65x165	16	**1400**
415	1.67	4	30.9	45x115	40	**2100**
	2.5	6	46.2	50x115	28	**2150**
	3.33	8	61.6	50x150	28	**2200**
	4.17	10	77.1	55x150	28	**2250**
	5	12	92.5	60x150	25	**2300**
	6.66	16	123.2	60x165	18	**2350**
	8.33	20	154	65x165	16	**2400**
450	1.67	3.7	26.3	45x115	40	**3100**
	2.5	5.6	39.3	50x115	28	**3150**
	3.33	7.4	52.4	50x150	28	**3200**
	4.17	9.3	65.6	55x150	28	**3250**
	5	11.1	78.6	60x150	25	**3300**
	6.66	18.8	104.7	60x165	18	**3350**
	8.33	18.5	131	65x165	16	**3400**
525	1.67	3.2	19.3	45x115	40	**4100**
	2.5	4.8	28.9	50x115	28	**4150**
	3.33	6.3	38.5	50x150	28	**4200**
	4.17	7.9	48.2	55x150	28	**4250**
	5	9.5	57.8	60x150	25	**4300**
	6.66	12.7	77	60x165	18	**4350**
	8.33	15.9	96.2	65x165	16	**4400**

Standard box dimensions: 195x390x255 mm
Weight: 9 Kg.

Terminal cover IP54

Code 316.	Diam. (mm)	Packages n. pz. per box
23.0860	45	100
23.1070	50	200
52.3350	55	72
52.3355	60	60
52.3360	65	60

To enable the overpressure protection device to operate efficiently, it is necessary to leave a gap of at least 30 mm. above the element and use flexible leads for the connection.

FLOPPY CAP

Single phase capacitors

The capacitors making up the **FLOPPY CAP - STANDARD LIFE** series are housed in metal cases. The lids are made of self-extinguishing plastic (Class V2 under the inflammability classification of standard UL 94). The capacitor is sealed closed by reading the case over the lid, a solution that guarantees perfect airtightness, which is necessary to ensure the efficiency of the over-pressure safety device.
The placement of an insulating container between the capacitor element and the metal case, combined with the embedding of the capacitor element in resin, makes the capacitor extremely safe from an electrical point of view (ground insulation) and insensitive to vibrations.

General Characteristics

Power Range	1.67 – 4.17 kVAr
Voltage range	230 ÷ 550 V
Rated frequency	50 Hz /60 Hz
Capacitance tolerance	-5 +10%
Duty	Continuous
Dielectric losses	≤ 0.3 W/kVAr
Life expectancya	≥ 50000h – 25/D ≥ 80000h – 25/C
Max dV/dt	≤ 25 V /µs
Temperature class	-25/D
Max overload In	2 x In
Max inrush current	100 I_n
Terminals	Double faston
Protection rating	IP 00
Discharge resistance	NO
Impregnating material	Eco-friendly resin
Altitude	≤ 2000 m s.l.m.
Test voltage (AC) between terminals	2.15 U_n x 2 s
Test voltage (AC) between terminals and case	3kV x 10 s
Standards	IEC 831 - 1/2
Approvals	(excluding 500-550 V models) c UL us (excluding Un >440 V models)

Un (V)	Qn (kVAr)	In (A)	Cn (µF)	DxH (mm)	Pcs x box	Part n. 416.30	Dim. Box
230	0.83	3.6	50.2	45x122	25	**0764**	A
	1.67	7.2	100	60x137	25	**0564**	A
400	1.67	4.2	33.2	50x122	25	**3964**	B
	2.5	6.3	50	55x132	25	**4064**	A
	3.33	8.3	66.3	60x137	25	**3764**	A
	4.17	10.4	83	60x137	25	**5064**	A
415	1.67	4	30.9	50x122	25	**3264**	A
	2.5	6	46.2	55x132	25	**3464**	A
	3.33	8	61.6	60x137	25	**3664**	A
	4.17	10	77	60x137	25	**5264**	A
450	1.67	3.7	26.3	50x132	25	**6464**	A
	2.5	5.6	39.3	55x132	25	**6164**	A
	3.33	7.4	52.4	60x137	25	**6264**	A
	4.17	9.3	65.5	60x137	25	**5364**	A
500	1.67	3.3	21.3	50x132	25	**8664**	A
	2.5	5	31.8	55x132	25	**7664**	A
	3.33	6.6	42.4	60x137	25	**7964**	A
	4.17	8.3	53.1	60x137	25	**5664**	A
550	1.67	3	17.6	45x132	25	**8164**	B
	2.5	4.5	26.3	55x132	25	**7464**	A
	3.33	6.1	35.1	60x137	25	**7764**	A
	4.17	7.6	43.4	60x137	25	**8064**	A

Standard box dimensions: A= 195x390x255 mm. B= 195x390x200 mm.
Weight: 9 Kg.

Terminal cover IP54		
Code 316.	**Diam. (mm)**	**Packages n. pz. per box**
23.0860	45	100
23.1070	50	200
52.3350	55	72
52.3355	60	60

To enable the overpressure protection device to operate efficiently, it is necessary to leave a gap of at least 20 mm. above the element and use flexible leads for the connection.

MODULO XD

Three phase capacitors

MODULO XD capacitors are used for the fixed and automatic PFC systems in a wide range of industrial applications.
The three elements are housed in a plastic container which, together with the impregnating agents, assures dual insulation between the wound cores and metal enclosure.
To guarantee perfect filling during the resin impregnation process, the process itself is carried out prior to the elements being placed in the enclosure; in this way the distribution and uniformity of the impregnation can be subjected to a complete visual and dimensional inspection.
The overpressure protection system is specifically dimensioned so as to constantly ensure maximum safety in terms of ground protection and protection against the risk of arcing, even in conditions where there is a high energy density.
The characteristics of these capacitors are especially suitable for continuousus duty under highly demanding conditions in harmonic rich environments.

General Characteristics

Power Range	1.5 ÷ 50 kVAr
Voltage range	230 ÷ 800 V
Rated frequency	50 Hz/60 Hz
Capacitance tolerance	-5 +10%
Duty	Continuous
Dielectric losses	≤ 0.2 W/kVAr
Life expectancya	≥110000h –25/D ≥130000h –25/C
Max dV/dt	100 V /µs
Temperature class	-25/D
Max overload In	4 x I_n
Max inrush current	200 I_n
Terminals	Screw clamps
Protection rating	IP20 (IP54 on request)
Internal connection	Delta
Discharge resistance	External (50 V after 60")
Impregnating material	Eco-friendly resin
Altitude	≤ 4000 m s.l.m.
Storage Temperature	–40 +80 °C
Test voltage (AC) between terminals	2.15 Un x 2"
Test voltage between terminals and case	3kV x 10" (UN≤660 V)
Standards	IEC 831 - 1/2
Approvals	c UL us Excluding Ø 125 mm

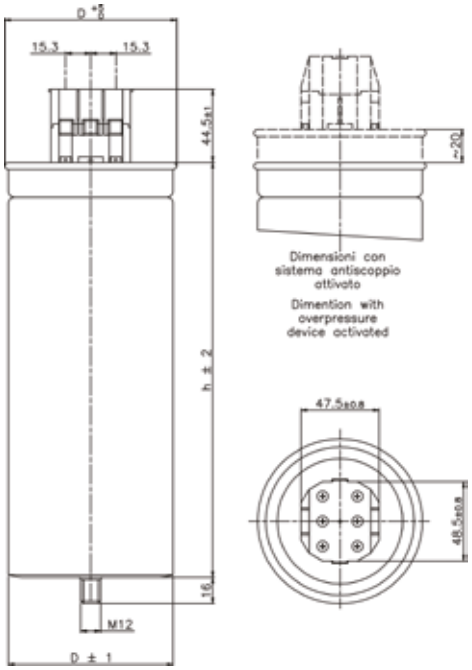
Un (V)	Qn (kVAr)	In (A)	C (µF)	DxH (mm)	Type	Pcs x box	Part n. 41646.	Dim. Box
240 (60Hz)	1.5	3.6	3x23	65x165	A	14	**0020**	E
	2.5	6	3x28	65x165	A	14	**0030**	E
	5	12	3x77	75x255	A	6	**0050**	F
	7.5	18	3x115	85x255	A	6	**0080**	F
	10	24	3x154	100x255	A	6	**0100**	G
	12.5	30	3x192	100x255	A	6	**0150**	H
	15	36	3x230	116x255	A	6	**0200**	H
400	1.5	2.2	3x9.9	65x165	A	14	**1020**	E
	2.5	3.6	3x17	65x165	A	14	**1030**	E
	5	7.2	3x33	75x165	A	6	**1050**	C
	7.5	10.8	3x50	75x255	A	6	**1080**	F
	10	14.4	3x66	75x255	A	6	**1100**	F
	12.5	18.0	3x83	85x255	A	6	**1150**	F
	15	21.7	3x99	90x255	A	6	**1200**	F
	20	28.9	3x133	100x255	A	6	**1260**	G
	25	36.1	3x166	116x255	A	4	**1310**	H
	30	43.3	3x199	116x290	A	4	**1360**	H
	40	57.7	3x265	116x370	A	4	**1370**	I
	45	65	3x298	125x370	B	4	**1375**	I
	50	72.2	3x332	125x370	B	4	**1380**	I
415	1.5	2.1	3x9.2	65x165	A	14	**2020**	E
	2.5	3.5	3x15	65x165	A	14	**2030**	E
	5	7.0	3x31	75x165	A	6	**2050**	C
	7.5	10.4	3x46	75x255	A	6	**2080**	F
	10	13.9	3x62	75x255	A	6	**2100**	F
	12	17.4	3x77	85x255	A	6	**2150**	F
	15	20.9	3x92	90x255	A	6	**2200**	F
	20	27.8	3x123	100x255	A	6	**2260**	G
	25	34.8	3x154	116x255	A	4	**2310**	H
	30	41.7	3x185	116x290	A	4	**2360**	H
	40	55.6	3x246	116x370	A	4	**2370**	I
	45	62.6	3x277	116x370	A	4	**2375**	I
	50	69.6	3X308	125x370	B	4	**2380**	I

Standard box dimensions: C= 190x285x325 mm G= 225x340x270 mm
E= 195x390x255 mm H= 330x340x225 mm F= 185x290x270 mm
I= 270x270x450 mm
Weight: 10÷12 kg

MODULO XD

Three phase capacitors

TECHNICAL DRAWING TYPE A



Terminals and stud	Fixing torque
Screw terminals	1.5 Nm
M10**	6 Nm
M12	10 Nm

(**) Complete the tightening using two wrenches.

Un (V)	Qn (kVAr)	In (A)	Cn (µF)	DxH (mm)	Type	Pcs x box	Part n. 41646.	Dim. Box
440	1.5	2	3x8.2	65x165	A	14	**3023**	E
	2.5	3.3	3x14	65x165	A	14	**3033**	E
	5	6.6	3x27	75x165	A	6	**3053**	C
	7.5	9.8	3x41	75x255	A	6	**3083**	F
	10	13.1	3x55	75x255	A	6	**3103**	F
	12.5	16.4	3x69	85x255	A	6	**3153**	F
	15	19.7	3x82	90x255	A	6	**3203**	F
	20	26.2	3x110	100x255	A	6	**3263**	G
	25	32.8	3x137	116x255	A	4	**3313**	H
	30	39.4	3x164	116x290	A	4	**3363**	H
	40	52.5	3x219	116x370	A	4	**3373**	I
	45	59.0	3x247	116x370	A	4	**3378**	I
	50	65.6	3x274	125x370	A	4	**3383**	I
450	1.5	1.9	3x7.9	65x165	A	14	**3020**	E
	2.5	3.2	3x13	65x165	A	14	**3030**	E
	5	6.4	3x26	75x165	A	6	**3050**	C
	7.5	9.6	3x39	75x255	A	6	**3080**	F
	10	12.8	3x52	75x255	A	6	**3100**	F
	12.5	16.0	3x65	85x255	A	6	**3150**	F
	15	19.2	3x79	90x255	A	6	**3200**	F
	20	25.7	3x105	100x255	A	6	**3260**	G
	25	32.1	3x131	116x255	A	4	**3310**	H
	30	38.5	3x157	116x290	A	4	**3360**	H
	40	51.3	3x210	116x370	A	4	**3370**	I
	45	57.7	3x236	116x370	A	4	**3375**	I
	50	64.2	3x262	125x370	A	4	**3380**	I
500	1.5	1.7	3x6.4	65x165	A	14	**4020**	E
	2.5	2.9	3x11	65x165	A	14	**4030**	E
	5	5.8	3x21	75x165	A	6	**4050**	C
	7.5	8.7	3x32	75x255	A	6	**4080**	F
	10	11.5	3x42	75x255	A	6	**4100**	F
	12.5	14.4	3x53	85x255	A	6	**4150**	F
	15	17.3	3x64	90x255	A	6	**4200**	F
	20	23.1	3x85	100x255	A	6	**4260**	G
	25	28.9	3x106	116x255	A	4	**4310**	H
	30	34.6	3x127	116x290	A	4	**4360**	H
	40	46.2	3x170	116x370	A	4	**4370**	I
	45	52.0	3x191	116x370	A	4	**4375**	I
	50	57.7	3x212	125x370	A	4	**4380**	I

Standard box dimensions:
C= 190x285x325 mm G= 225x340x270 mm E= 195x390x255 mm H= 330x340x225 mm
F= 185x290x270 mm I= 270x270x450 mm

Weight: 10÷12 kg

Un (V)	Qn (kVAr)	In (A)	Cn (µF)	DxH (mm)	Type	Pcs x box	Part n. 41646.	Dim. Box
	10	11	3x38	85x255	A	6	**5130**	F
	12.5	13.7	3x48	85x255	A	6	**5170**	F
	15	16.5	3x58	100x255	A	6	**5230**	G
	20	22	3x77	116x255	A	4	**5270**	H
525	25	27.5	3x96	116x255	A	4	**5330**	H
	30	33	3x115	116x290	A	4	**5370**	H
	40	44	3x154	116x370	A	4	**5373**	I
	45	49.5	3x173	116x370	A	4	**5377**	I
	50	55	3x192	125x370	A	4	**5385**	I
	1.5	1.6	3x5.3	65x165	A	14	**5020**	E
	2.5	2.6	3x8.8	65x165	A	14	**5030**	E
	5	5.2	3x18	75x165	A	6	**5050**	C
	7.5	7.9	3x26	75x255	A	6	**5080**	F
	10	10.5	3x35	75x255	A	6	**5100**	F
	12.5	13.1	3x44	85x255	A	6	**5150**	F
550	15	15.7	3x53	90x255	A	6	**5200**	F
	20	21	3x70	100x255	A	6	**5260**	G
	25	26.2	3x88	116x255	A	4	**5310**	H
	30	31.5	3x105	116x290	A	4	**5360**	H
	40	42	3x140	116x370	A	4	**5372**	I
	45	47.2	3x158	116x370	A	4	**5375**	I
	50	52.5	3x175	125x370	A	4	**5380**	I
	10	8.4	3x22	75x255	A	6	**6100**	F
	12.5	10.5	3x28	85x255	A	6	**6150**	F
	15	12.6	3x33	90x255	A	6	**6200**	F
	20	16.7	3x45	100x255	A	6	**6260**	G
690 (*)	25	20.9	3x56	116x255	A	4	**6310**	H
	30	25.1	3x67	116x290	A	4	**6360**	H
	40	33.5	3x89	116x370	A	4	**6370**	I
	45	37.7	3x100	116x370	A	4	**6375**	I
	50	41.8	3x111	125x370	A	4	**6380**	I
	10	7.2	3x17	75x255	A	6	**8100**	F
	12.5	9.0	3x21	85x255	A	6	**8150**	F
	15	10.8	3x25	90x255	A	6	**8200**	F
	20	14.4	3x33	100x255	A	6	**8260**	G
800 (*)	25	18.0	3x41	116x255	A	4	**8310**	H
	30	21.7	3x50	116x290	A	4	**8360**	H
	40	28.9	3x66	116x370	A	4	**8370**	I
	45	32.5	3x75	116x370	A	4	**8375**	I
	50	36.1	3x83	125x370	A	4	**8380**	I

(*) Without discharge resistance.
Standard box dimensions:
C= 190x285x325 mm G= 225x340x270 mm E= 195x390x255 mm H= 330x340x225 mm
F= 185x290x270 mm I= 270x270x450 mm
Weight: 10 ÷ 12 kg

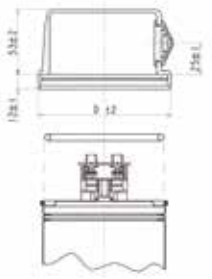
To enable the overpressure protection device to operate efficiently, it is necessary to leave a gap of at least 30 mm. above the element and use flexible leads for the connection.

TECHNICAL DRAWING TYPE B

Terminals and stud	Fixing torque
Screw terminals	1.5 Nm
M10**	6 Nm**
M12 stud	10 Nm

(**) Complete the tightening using two wrenches.

Terminal cover IP54



Code 316.52	Diam. (mm)	Packages n. pz. per box
.3338	85	30
.3339	90	30
.3340	100	30
.3341	116	30

MODULO XD MINI

Three phase capacitors

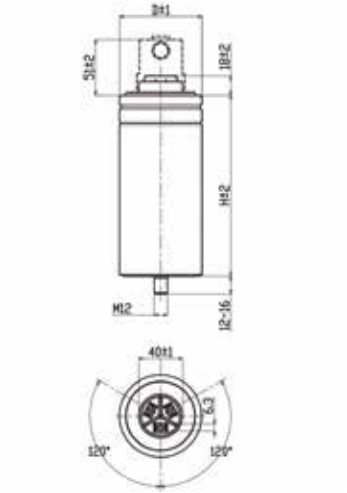
MODULO XD Mini – COMPACT PERFORMANCE capacitors integrate the excellent MODULO XD technology with an innovative mechanical construction, which has been optimized for the 0,5 ÷ 10 kVAr/400 ÷ 550 V power/voltage ranges. Thanks to their mechanical construction and a particularly effective dry-resin impregnation process, **MODULO XD mini** capacitors deliver excellent performance in a very compact package. The faston connections, integrated discharge resistors and IP20 protection cap simplify their installation and maintenance in every type of application.

General Characteristics

Power Range	0.5 ÷10 kVAr
Voltage range	400 ÷ 550 V
Rated frequency	50 Hz/60 Hz
Capacitance tolerance	-5 +10%
Duty	Continuous
Dielectric losses	≤ 0.2 W/kVAr
Life expectancya	≥110000h –25/D ≥130000h –25/C
Max dV/dt	100 V /µs
Temperature class	-25/D
Max overload In	3 x I_n
Max inrush current	200 I_n
Terminals	Faston 6.3x0.8 mm
Protection rating	IP20 (with included protection cap)
Internal connection	Delta
Discharge resistance	Internal (50 V after 60")
Impregnating material	Eco-friendly resin
Altitude	≤ 4000 m s.l.m.
Storage Temperature	–40 +80 °C
Test voltage (AC) between terminals	2.15 Un x 2"
Test voltage between terminals and case	3 kV x 10"
Standards	IEC 831 - 1/2

Un (V)	Qn (kVAr) 50 Hz	In (A)	Cn (µF)	DxH (mm)	Pcs x box	Part n. 416.12.	Dim. Box
	0.5	0.7	3x3.32	50x150	21	**1010**	E
	1	1.4	3x6.63	50x150	21	**1020**	E
400	1.5	2.2	3x9.95	50x150	21	**1040**	E
	2.5	3.6	3x16.6	60x150	18	**1060**	E
	5	7.2	3x33.2	75x175	6	**1130**	C
	7.5	10.8	3x49.7	75x265	12	**1150**	D
	10	14.4	3x66.3	75x265	12	**1170**	D
	0.5	0.7	3x3.08	50x150	21	**2010**	E
	1	1.4	3x6.16	50x150	21	**2020**	E
	1.5	2.1	3x9.24	50x150	21	**2040**	E
415	2.5	3.5	3x15.4	60x150	18	**2060**	E
	5	7.0	3x30.8	75x175	6	**2130**	C
	7.5	10.4	3x46.2	75x265	12	**2150**	D
	10	13.9	3x61.6	75x265	12	**2170**	D
	0.5	0.7	3x2.74	50x150	21	**3010**	E
	1	1.3	3x5.48	50x150	21	**3020**	E
	1.5	2.0	3x8.22	50x150	21	**3040**	E
440	2.5	3.3	3x13.7	60x150	18	**3060**	E
	5	6.6	3x27.4	75x175	6	**3130**	C
	7.5	9.8	3x41.1	75x265	12	**3150**	D
	10	13.1	3x54.8	75x265	12	**3170**	D
	0.5	0.6	3x2.62	50x150	21	**4010**	E
	1	1.3	3x5.24	50x150	21	**4020**	E
	1.5	1.9	3x7.86	50x150	21	**4040**	E
450	2.5	3.2	3x13.1	60x150	18	**4060**	E
	5	6.4	3x26.2	75x175	6	**4130**	C
	7.5	9.6	3x39.3	75x265	12	**4150**	D
	10	12.8	3x52.4	75x265	12	**4170**	D
	0.5	0.6	3x1.92	50x150	21	**5010**	E
	1	1.3	3x3.85	50x150	21	**5020**	E
	1.5	1.9	3x5.77	50x150	21	**5040**	E
525	2.5	3.2	3x9.62	60x150	18	**5060**	E
	5	6.4	3x19.2	75x175	6	**5130**	C
	7.5	9.6	3x28.9	75x265	12	**5150**	D
	10	12.8	3x38.5	75x265	12	**5170**	D
	0.5	0.6	3x1.75	50x150	21	**6010**	E
	1	1.3	3x3.51	50x150	21	**6020**	E
	1.5	1.9	3x5.26	50x150	21	**6040**	E
550	2.5	3.2	3x8.77	60x150	18	**6060**	E
	5	6.4	3x17.5	75x175	6	**6130**	C
	7.5	9.6	3x26.3	75x265	12	**6150**	D
	10	12.8	3x35.1	75x265	12	**6170**	D

TECHNICAL DRAWING



Terminals and stud	Fixing torque
Screw terminals	1.5 Nm
M12	11 Nm

Standard box dimensions: C= 190x285x325 mm D= 250x360x345 mm E= 195x390x255 mm.

To enable the overpressure protection device to operate efficiently, it is necessary to leave a gap of at least 30 mm. above the element and use flexible leads for the connection.

DUCATI F50 MONO Long Life 4I$_N$

Three phase capacitors

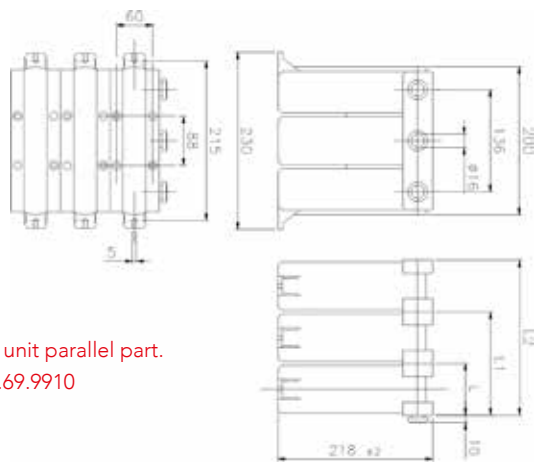
The modular design of **DUCATI F50** units makes them especially suitable for fixed transformer power factor correction systems and local power factor correction of motors. The **DUCATI F50** three-phase capacitor consists of 3 delta connected single-phase capacitors of the **MONO Long Life 4I$_N$** series.

General Characteristics

Power Range	5 ÷ 60 kVAr
Voltage range	415 ÷ 525 V
Rated frequency	50 Hz/60 Hz
Capacitance tolerance	-5 +10%
Duty	Continuous
Dielectric losses	≤ 0.2 W/kVAr
Life expectancya	≥110000h –25/D ≥130000h –25/C
Max dV/dt	≤ 100 V /µs
Temperature class	-25/D
Max overload In	4 x In
Max inrush current	≤ 200 I_n
Terminals	Pins 3 x M8
Protection rating	IP40
Connection	Delta
Discharge resistance	Internal (50 V after 60")
External case material	Insulating V2 class
Altitude	≤ 2000 m s.l.m.
Test voltage (AC) between terminals	2.15 U_n x 2"
Test voltage between terminals and case	3 kV x 10"
Standards	EN 60831 – 1/2

Un (V)	Qn (kVAr)	Q (400 V) (kVAr)	In (A)	Cn (µF)	L (mm)	Part n. 415.04.
415	5	4.7	7.0	3x31	79 (1)	**7010**
	10	9.3	13.9	3x62	79 (1)	**7015**
	12.5	11.6	17.4	3x77	79 (1)	**7018**
	15	13.9	20.9	3x92	79 (1)	**7020**
	20	18.6	27.9	3x123	79 (1)	**7025**
	25	23.2	34.8	3x154	148 (2)	**7030**
	30	27.9	41.8	3x185	148 (2)	**7035**
	40	37.2	55.7	3x247	148 (2)	**7040**
	50	46.7	69.6	3x308	217 (3)	**7045**
450	5	4.0	6.4	3x26	79 (1)	**7110**
	10	7.9	12.8	3x52	79 (1)	**7115**
	12.5	9.9	16.1	3x66	79 (1)	**7118**
	15	11.9	19.3	3x79	79 (1)	**7120**
	20	15.8	25.7	3x105	79 (1)	**7125**
	25	19.8	32.1	3x131	148 (2)	**7130**
	30	23.7	38.5	3x157	148 (2)	**7135**
	40	31.6	51.4	3x210	148 (2)	**7140**
	50	39.5	64.2	3x262	217 (3)	**7145**
525	5	2.9	5.5	3x19	79 (1)	**7210**
	10	5.8	11.0	3x39	79 (1)	**7215**
	12.5	7.3	13.8	3x48	79 (1)	**7218**
	15	8.7	16.5	3x58	79 (1)	**7220**
	20	11.6	22.0	3x77	79 (1)	**7225**
	25	14.5	27.5	3x96	148 (2)	**7230**
	30	17.4	33.0	3x116	148 (2)	**7235**
	40	23.2	44.0	3x154	148 (2)	**7240**
	50	29.0	50.1	3x193	217 (3)	**7245**
	60	34.8	66.1	3x231	217 (3)	**7250**

TECHNICAL DRAWING F50



Kit for unit parallel part.
n. 415.69.9910

ACCESSORIES AND COMPONENTS

rEvolution R5, R8

rEvolution SERIES (R5, R8)

The reactive power controllers are efficient systems that automatically manage capacitor banks to compensate the reactive power absorbed by the loads in order to avoid the penalties imposed by the electric providers.
DUCATI energia, thanks to the experience and the know-how gained from years of designing and manufacturing energy and power analyzers, has developed an innovative series of reactive power regulators: **rEvolution**.
The compact size, the latest generation technology and the full range of features and data communication options make rEvolution controllers extremely adaptable to any application context for power factor correction systems, for both single-phase and three-phase, low and medium voltage networks, with or without the presence of energy generation systems (eg PV, cogeneration).
The various models are equipped with all most common connectivity options (Wireless-radio, NFC, Ethernet, RS485, Bluetooth, USB), both for local data exchange with the new App "**Ducati Smart Energy**", and for remote monitoring of equipment performance, status of capacitor banks and events related to electrical parameters.
rEvolution do away with additional expansion modules that increase the size of the controller; the reduced depth of only 57mm includes all communication options and additional relays.
The 96x96 panel format is IEC 61554 compliant.

App DUCATI Smart Energy

The dedicated smartphone app "**Ducati Smart Energy**" is designed to simplify the setup and maintenance operations of all PFC Equipment using the **rEvolution R5** and **R8** power factor controllers. The communication with the smartphone can be made via NFC (standard for all the models) or via Bluetooth (optional on rEvolution R8).

Features and functions:

- Easy and intuitive setup of configuration parameters
- Firmware updates available in real time
- At a glance device status check (battery power, contactor operations, etc.)
- Configuration and log files shared by mail

Model	Part. N.	Connectivity	Relays
R5	**415984050 NNNN**	NFC	5
R5 485 radio	**415984050 QNDN**	NFC, radio, RS-485	5
R8 radio	**415986080 NNDN**	NFC, radio	8
R8 485 radio	**415986080 QNDN**	NFC, radio, RS-485	8
R8 ETH radio	**415986080 ENDN**	NFC, radio, Ethernet	8
R8 USB radio	**415986080 NSDN**	NFC, radio, USB	11
R8 BLT radio	**415986080 NBDN**	NFC, radio, Bluetooth	11
R8 485 BLT radio	**415986080 QBDN**	NFC, radio, RS-485, Bluetooth	11

DOWNLOAD APP

rEvolution R5

Reactive power controller

The new **rEvolution R5** Power Factor Controller has been designed to allow simplify installation and allow a quick and easy startup of the PFC unit. The R5 models are equipped with connection technology allowing the exchange of performance and system status data both locally to the **Ducati Smart Energy** Smartphone App (via NFC) and remotely for monitoring purposes (RS485 / radio) through the new **ENERGY GEAR** and **ENERGY BRIDGE** dataloggers.
The big display with bright, red LEDs is easily readable in every lighting condition and from great distance.
The 5 button keypad simplifies the navigation of the menus and allows a more intuitive the setup of the configuration parameters. One keys is dedicated to the quick change from manual to automatic mode and vice versa.
The advanced detection algorithms can sense on which phase the CT is installed and in which direction, automatically setting the relevant parameters to avoid common installation errors.
The dual power input, 400VAC and 230VAC, allows to use the controller in single-phase networks with neutral or three-phase networks with or without neutral.
Thanks to a powerful microprocessor, R5 calculates the real power factor from the voltage-current displacement of the fundamental harmonic at the nominal voltage, and in addition it measures the total harmonic distortion of voltage (THDV%) and current (THDI%) with a global spectrum up to 60th harmonic order.

Smart communications

The NFC connection (available on all models) provides fast data exchange with the **Ducati Smart Energy Smartphone App**, whereas the optional radio and RS485 interfaces allow permanent communication either wirelessly (868MHz) to the **ENERGY BRIDGE** gateway or to the **ENERGY GEAR** datalogger/gateway, respectively.
It's also possible to download all the Event logs stored in the local memory to perform a local diagnostic on the Smartphone (useful for on-site maintenance) or remotely in real-time.

Technical features

Power supply:
- Rated voltage: 400 or 230 VAC
- Frequency range: 45 ÷ 66 Hz
- Power consumption: 2.5 W – 3 VA

Current input:
- Current rating: 5 A (1 A programmable)
- Input consumption: < 1.8 VA

Relays outputs:
- Number of relays outputs: 5 + 1 common terminal
- Contact type: NO (Normally Open)
- Maximum operating voltage: 440 VAC
- Nominal Capacity: AC1 6 A – 250 V~, AC15 1.5 A - 440 V~

Alarms:
- Over-Voltage and Over-Current
- Low Voltage and Low Current
- THD_V and THD_I threshold
- Max Temperature with double threshold (optional): forced ventilation/ Temperature Alarm & Standby
- Insufficient power factor correction (low cosφ)

Environment conditions:
- Operating temperature: -20 ÷ 70 °C
- Storage temperature: -30 ÷ 80 °C
- Insulation voltage: 600 V~
- Relative humidity: < 80%
- Condensation: not allowed

Enclosure:
- Format: 96x96 recessed
- Protection degree: IP51 on the front – IP20 rear / terminals
- Weight: 350g

RS485 interface:
- Modbus-RTU
- Ascii-Ducbus

radio interface:
- Carrier frequency: 868 MHz
- Protocol: Modbus-RTU

NFC interface:
- Data exchange with smartphone app via antenna (behind display)

Compliance with standards:
- IEC/EN 61010-1
- IEC/EN 61000-6-2
- IEC/ EN 61000-6-4

rEvolution R8

Power factor controller

The new **rEvolution** is an innovative Power Factor Controller providing advanced functions, a wide range of measurements and various data communication solutions, all concentrated in a compact 96x96mm design. These characteristics make it ideal for PFC solutions in every type of environment and application.
The various **R8** models are equipped with all most common connectivity options (Bluetooth, USB, wireless radio, NFC, Ethernet, RS485), for local data exchange (setup, maintenance) and for the remote monitoring of the status / performance of the PFC unit.
A clear on-screen user guide, translated into 9 languages, makes **rEvolution R8** easy to use both during commissioning and during normal operation of the PFC system, with helpful tips for solving problems related to the controller's input connections, the setting of configuration parameters and in general to the voltage and current quality events detected by **R8**.
The large, high contrast LCD display of 128x128 pixel with white backlight has graphical capabilities in order to show data, waveforms, histograms and icons.
The advanced detection algorithms can sense on which phase the CT is installed and in which direction, automatically setting the relevant parameters to avoid common installation errors.
Thanks to a powerful microprocessor, **R8** calculates the real power factor from the voltage-current displacement of the fundamental harmonic at the nominal voltage, and in addition it measures the total harmonic distortion of voltage (THDV%) and current (THDI%) with a global spectrum up to 60th harmonic order.

Smart communications

Every rEvolution R8 model, even the basic version, is equipped with following standard communication and data management features:

- NFC connection, for the download/upload of the configuration files, event logs and status via the DUCATI Smart Energy Smartphone App, **"DUCAT Smart Energy"**
- Integrated memory with up to 1 year storage of historical data RTC battery powered sensor
- Radio Wireless communication interface at 868 MHz for connection to the **ENERGY BRIDGE Gateway**

Optional models "485" feature an opto-isolated RS485 interface with integrated termination resistor. RS485 interface supports Modbus-RTU communication protocol for easy connection to the DUCATI Energia ENERGY GEAR Datalogger and Gateway or other devices such as PCs or SCADA systems.Optional models "ETH" have an integrated Ethernet card and opto-isolated RJ45 connector with auto-crossover MDI/MDX function; they feature both an integrated Webserver (for quick data visualization via any browser) and Modbus-TCP protocol support for remote connection.
The "USB" models feature a USB Host interface for downloading data from the integrated memory and / or upload firmware updates and configuration files. They are also equipped with 3 additional relay outputs.Optional models "BT" are characterized by Bluetooth interface for configuration and management control from the App Smartphone dedicated and 3 additional relay outputs.Firmware upgrades can be applied locally with a USB memory stick or via Bluetooth through the DUCATI Smart Energy Smartphone App, or remotely for the models with remote communication interfaces (wireless-radio, Ethernet, RS485).

Technical features

Power supply:
- Rated voltage: 400 or 230 or 110 VAC
- Frequency range: DC or 45 ÷ 66 Hz
- Power consumption: 2.5 W
- Max power consumption 10 W (for the "USB ETH" model)

Voltage input:
- Measuring range: 50 ÷ 525 VAC
- Accuracy: 1% ± 0.5 digit

Current input:
- Current rating: 5 A (1 A programmable)
- Input consumption: <1,8 VA
- Accuracy: 1% ± 0,5 digit

Relays outputs:
- Number of outputs: 8 (11 for "USB" and "BT" models)
- Maximum operating voltage NO contacts: 440 VAC
- Nominal contact rating NO/NC: AC1 6A – 250 V~, AC15 1,5A - 440 V~

Contact type for "USB" and "BT" models:
- 6 NO (common C1)
- 1 NO (common C2)
- 1 NO/NC (common C3)
- 2 NO (common C4)
- 1 NO (common C5)

Alarms:
- Over-Voltage and Over-Current
- Low Voltage and Low Current
- THD_V and THD_I threshold
- Max Temperature with double threshold (optional): forced ventilation / Temperature Alarm & Standby
- Insufficient power factor correction (low cosφ)

Environment conditions:
- Operating temperature: -20 ÷ 70 °C
- Storage temperature: -30 ÷ 80 °C
- Relative humidity: < 80%
- Condensation: not allowed

Enclosure:
- Format: 96x96 recessed
- Protection degree: IP51 on the front – IP20 rear / terminals
- Weight: 350 g.

radio interface:
- Carrier frequency: 868 MHz
- Protocol: Modbus-RTU

NFC interface:
- Data exchange with smartphone app via antenna (behind display)

RS485 interface:
- Protocols: Modbus-RTU, Ascii-Ducbus

Ethernet interface:
- Opto-isolated RJ45 connector with auto MDI/MDX crossover function
- Integrated Webserver
- Modbus-TCP protocol

USB interface:
- USB 2.0 Host-type

Bluetooth interface:
- Bloetooth Low Energy (BLE)

Compliance with standards:
- IEC/EN 61010-1
- IEC/EN 61000-6-2
- IEC/ EN 61000-6-4

REGO12

Power factor controller

The **REGO12** is a power factor controller with 12 output relays in 144x144 mm size.
Thanks to the RS-485 connection the **REGO12** can exchange data with other network-connected DUCATI energia instruments, and it also perform measurement and acquisition of data, to be transmitted and stored in a PC.
The programming algorithms allow the completely automatic recognition of the CT direction and the phase on which is installed the TC, to avoid any possible installation errors.

Model	Part. N.	Connectivity	Relays
REGO12	**415989040**	RS-485	12

Technical features

Power supply:
- Nominal voltage: 220/240 V - 380/415 V
- Frequency range: 50/60 Hz
- Power consumption: 15 VA max

Current input:
- Current rating: 5A

Relays outputs:
- Number of outputs: 12
- Switching contacts: 1500 VA - 250 VAC
- Contact for remote alarm indication: NC (6 A - 250 Vac)

Alarms:
- Overvoltage
- Overtemperature
- Harmonc overload
- No power factor correction (low cosφ)
- No voltage protection

Environment conditions:
- Operating temperature: – 40/+60 °C
- Storage temperature: -30/+80 °C
- Relative humidity: < 80%

Enclosure:
- Format: 144x144 recessed
- Protection rating frontale: IP 40
- Weight: 875 g

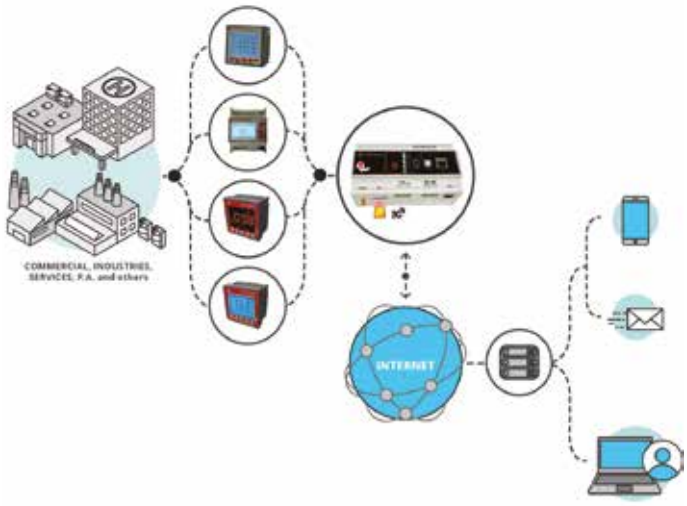
RS485 interface:
- Ascii-Ducbus protocol

Compliance with standards:
- IEC/EN 61010 – 1
- IEC/EN 50081 – 1

DUCNET ENERGY CLOUD

Introduction

DUCNET Energy Monitor System is Ducati's cloud solution providing Energy Monitoring and Energy Management solutions compliant with ISO50001, ISO14001, ISO 50001 and Directive 2012/27 / EU. **DUCNET** is the ideal tool for all Energy Managers, who can thus access, in an easy and automatic way, all the energy data of the monitored plants, in order to take effective strategic decisions, reduce immediately energy wastage and check the results in real time.

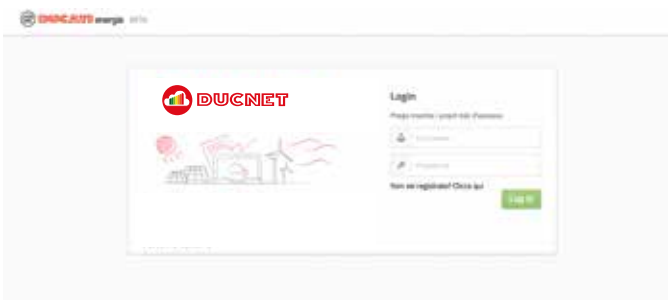


Main characteristics

The **DUCNET** system provides an accurate overview of energy consumption data and numerous real-time data related to the proper functioning of the electrical network and the loads it supplies. **DUCNET** can also send alarms via email and SMS in order to immediately alert Facility Managers to any anomaly such as electrical faults, interruptions, excessive energy / power consumption, low power factor , excessive harmonic distortion, etc.
DUCNET can integrate the new Reactive Power Controllers **rEvolution R5** and **R8** to share not only network information/data but also the status of the related Power Factor Correction Equipment.
Configuration of the **DUCNET** system, the optional **ENERGY GEAR** dataloggers & gateways and the R5 or R8 Reactive Power Controllers can be done remotely through a web interface (accessed via any browser), without any need of onsite operations.
Diagnostic information is also available for immediate control of the health status of remote monitoring and data collection points.
With **DUCNET Cloud system** it is possible to check all energy and electrical data client connected to the Internet, such as PCs, smartphones, tablets, SmartTVs, etc., without any need to manage multiple, annoying software installations.
All data will be stored on **DUCATI energia** servers, without any need to install and maintain local software or provide safe, local data storage space. The service autonomously collects all the data and stores it on the **DUCNET** cloud; no action is required by the customer.

Main intended users

INDUSTRY: large plants and high energy demand users, compelled by the law to use power/energy management systems.
PUBLIC BUILDINGS & ADMINISTRATION: hospitals, schools, municipalities, ministries, military facilities, etc.
SERVICE COMPANIES: buildings and structures of post offices, banks, insurance companies, telephone companies, couriers, etc.
RETAIL: department stores, malls, superstores, store chains.
TOURISM: hotels, airports, ports, camping sites.
RESIDENTIAL: partition of energy costs among multiple users connected to a single utility point.



ENERGY GEAR AND ENERGY BRIDGE

Within the **DUCNET** monitoring system DUCATI Energia presents the **ENERGY GEAR** Datalogger & Gateway and the **ENERGY BRIDGE** Gateway, designed respectively for the Energy Management and for monitoring of Power Factor Correction Units located in distributed industrial plants, branches of organizations, isolated production facilities or service sites.
ENERGY GEAR's main functions are dedicated to reading, storing and communicating data from energy/power analyzers, **rEvolution R5** and **R8** Power Factor Controllers, Pulse Counters and Flow Meter and Sensors.
ENERGY GEAR stores the data in its internal memory and shares it with could services, servers or local LAN-connected PCs.
ENERGY BRIDGE is designed to establish a connection through 868MHz radio interface used by the **rEvolution R5** and **R8** Power Factor Controllers to read and archive data from these. The data is then sent to the DUCATI Servers via LAN / GPRS / UMTS connections.

ENERGY GEAR

ENERGY GEAR means flexibility, ease of use, high reliability and availability
ENERGY GEAR can read and store data from:

- DUCATI energia Energy & Power Analyzers and Controllers, for electric energy consumption and system control
- DUCATI energia Indoor/Outdoor Temperature and / or Humidity Sensors
- DUCATI energia Modules for the acquisition and storage of digital signals from devices with pulse emission: water meters, gas meters, steam / compressed air / fluids meters, parts counters, etc.
- Any other measurement device with RS485 or Ethernet port and MODBUS-RTU or MODBUS TCP communication protocols

ENERGY GEAR as a large internal memory capable of storing up to several years worth of data. The overall storage capacity can be extended by connecting a USB memory stick on the front of the device. Data is stored in .xml or .csv format for easy successive analysis but with Modbus-TCP it's also possible do real-time monitoring. A web server allows quick configuration from any browser.
ENERGY GEAR provides different communication modes:

- Automatic remote transmission to the LAN Server or Internet Cloud through Ethernet port
- Automatic remote transmission or manual download via GPRS modem with a M2M data SIM
- Local Download on a USB memory stick connected to the front port of the device
- Local Download on PC through the USB or Ethernet ports on the front of the device

ENERGY GEAR allows you to program an address book with emails and phone numbers to which communications about alerts or alarms should be sent. Excessive consumption, anomalies or black outs, failures and other similar events can be recognized and the relevant alert sent to registered phones or smartphones through the **DUCNET** Cloud Service.

Part number	Description
468001313GSPL	ENERGY GEAR Europe/Asia inc. power-supply, GPRS Modem Europe/Asia and Antenna
468001313ASPL	ENERGY GEAR America inc. power-supply, UMTS Modem America and Antenna

ENERGY BRIDGE

The main features of **ENERGY BRIDGE** are ease of installation, flexibility of use, high reliability.
ENERGY BRIDGE is designed for installers and users who, after the complete activation of Power Factor Correction Units equipped with **rEvolution R5** and **R8** Controllers, want to remotely connect the Power Factor Correction Controllers/Units.
Thanks to the wireless radio communication interface, the main features of **ENERGY BRIDGE** are ease/speed of installation, flexibility and high reliability.
ENERGY BRIDGE connect to one or more **R5** and **R8** controllers via a 868 MHz radio channel (where available).
ENERGY BRIDGE has an internal memory that can store up to 2 years of data. The memory can be further extended by plugging a common USB memory stick into the USB port located on the front of the device.
ENERGY BRIDGE can share this data to the DUCATI servers in various ways:

- With Ethernet (port located on the front of the device) to the local network, that must allow an internet connection
- Through GPRS / UMTS port with a data SIM card
- Through an external memory via USB HOST port (located on the front of the device) and subsequent upload to the Server Ducati through integrated import process in the **DUCNET** web interface

Once the data of **R5**, **R8** is on the Ducati Servers, the user can check them by logging into the **DUCNET** web portal.
ENERGY BRIDGE enables easy configuration via web server through a common browser locally or remotely connected to the device.

Part number	Description
468001342GWNF	ENERGY BRIDGE Europe/Asia inc. power-supply and GPRS Modem Europe/Asia, WiFi
468001342AWNF	ENERGY BRIDGE America inc. power-supply and, UMTS Modem America, WiFi

RACKS/TRAYS

The current range of DUCATI energia racks includes these series:

- **C160** power range 20÷160 kVAr
- **C160–MINI** power range 20÷160 kVAr
- **C50–L–MINI** power range 25÷50 kVAr equipped with harmonic blocking reactors
- **C100–L** power range 25÷100 kVAr equipped with harmonic blocking reactors

These can be used to create automatic power factor correction systems with existing or special structures. Each chassis holds up to 4 capacitor banks.

Technical details

- Single-phase capacitors **MONO Long Life 4I$_N$** series in PPMh, for a continuous duty under highly demanding condition in harmonic rich environments
- Rated voltage 415 - 450 - 525 V for **C160** e **C160-MINI** series and 480 V for **C50-L-MINI** e **C100-L** series
- Harmonic filter reactors with tuning frequency 189 Hz (only for **C50–L-Mini** and **C100–L**)
- Structure made of galvanized sheet steel
- Contactors designed for controlling capacitive loads, equipped with an inrush current limiting device with 230 V 50-60 Hz power supply

General Characteristics

Rated voltage	400 V
Rated frequency	50 Hz
Insulating voltage	690 V
Usage	Indoor
Protection degree	IP00
Duty	Continuous
Temperature range	-5 +40 °C
Power supply	3F + PE
Internal connection	FS17
Discharge devices	On each capacitor according EN 60831
Fuse	NH-00 GL
Standards	EN 61921

DUCATI C160 Un - Cond = 415 V

$THD_{I\ MAX-C}$ % ≤ 50% THD_I% ≤ 12% Un 400V - 50Hz

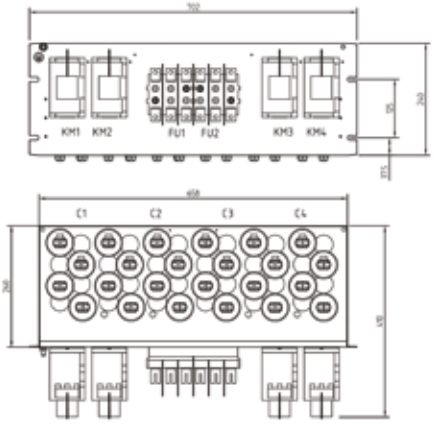
Part n. 415.04.	Qn (kVAr)	Q (400 V) (kVAr)	Bank Power (kVAr)	In (A)	Dissipated Power (W)	Weight (kg)
9010	20	18	2 x 10	27	24	20
9015	40	37	4 x 10	54	47	22
9020	60	55	2 x 10 + 2 x 20	80	72	22
9025	80	74	4 x 20	107	102	23
9030	100	92	3 x 20 + 40	134	127	23
9035	120	111	2 x 20 + 2 x 40	161	157	23
9040	140	130	20 + 3 x 40	188	190	24
9045	160	148	4 x 40	215	226	24

DUCATI C160 Un - Cond = 450 V

$THD_{I\ MAX-C}$ % ≤ 70% THD_I% ≤ 20% Un 400 V - 50 Hz

Part n. 415.04.	Qn (kVAr)	Q (400 V) (kVAr)	Bank Power (kVAr)	In (A)	Dissipated Power (W)	Weight (kg)
9110	20	15	2 x 10	23	20	20
9115	40	31	4 x 10	46	41	22
9120	60	47	2 x 10 + 2 x 20	68	60	22
9125	80	63	4 x 20	91	84	23
9130	100	79	3 x 20 + 40	114	107	23
9135	120	94	2 x 20 + 2 x 40	137	130	23
9140	140	110	20 + 3 x 40	160	155	24
9145	160	126	4 x 40	182	183	24

TECHNICAL DRAWING DUCATI C160

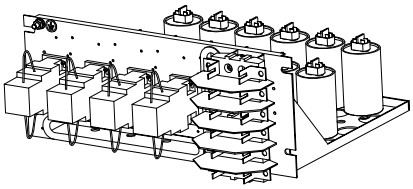


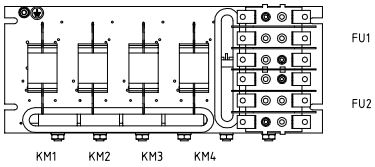
DUCATI C160 Un - Cond = 525 V

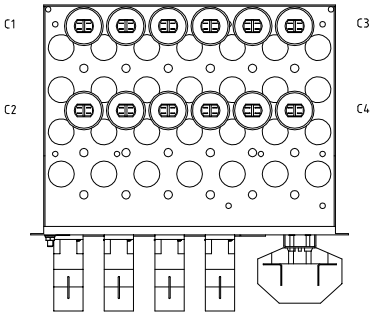
$THD_{I\ MAX-C}$ % ≤ 85% THD_I% ≤ 27% Un 400 V - 50 Hz

Part n. 415.04.	Qn (kVAr)	Q (400 V) (kVAr)	Bank Power (kVAr)	In (A)	Dissipated Power (W)	Weight (kg)
9210	20	11	2 x 10	17	16	20
9215	40	23	4 x 10	34	32	22
9220	60	34	2 x 10 + 2 x 20	50	44	22
9225	80	46	4 x 20	67	59	23
9230	100	58	3 x 20 + 40	84	79	23
9235	120	69	2 x 20 + 2 x 40	101	94	23
9240	140	81	20 + 3 x 40	117	110	24
9245	160	92	4 x 40	134	127	24

TECHNICAL DRAWING DUCATI C160-MINI







DUCATI C160-MINI Un - Cond = 415 V

$THD_{I\ MAX\text{-}C}$ % ≤ 35% THD_I% ≤ 10% Un 400 V - 50 Hz

Part n. 415.04.	Qn (kVAr)	Q (400 V) (kVAr)	Bank Power (kVAr)	In (A)	Dissipated Power (W)	Weight (kg)
3010	20	18	2 x 10	27	24	19
3015	40	37	4 x 10	54	47	21
3020	60	55	2 x 10 + 2 x 20	80	72	21
3025	80	74	4 x 20	107	102	22
3030	100	92	3 x 20 + 40	134	127	22
3035	120	111	2 x 20 + 2 x 40	161	157	22
3040	140	130	20 + 3 x 40	188	190	23
3045	160	148	4 x 40	215	226	23

DUCATI C160-MINI Un - Cond = 450 V

$THD_{I\ MAX\text{-}C}$ % ≤ 65% THD_I% ≤ 18% Un 400 V - 50 Hz

Part n. 415.04.	Qn (kVAr)	Q (400 V) (kVAr)	Bank Power (kVAr)	In (A)	Dissipated Power (W)	Weight (kg)
3110	20	15	2 x 10	23	20	19
3115	40	31	4 x 10	46	41	21
3120	60	47	2 x 10 + 2 x 20	68	60	21
3125	80	63	4 x 20	91	84	22
3130	100	79	3 x 20 + 40	114	107	22
3135	120	94	2 x 20 + 2 x 40	137	130	22
3140	140	110	20 + 3 x 40	160	155	23
3145	160	126	4 x 40	182	183	23

DUCATI C160-MINI Un - Cond = 525 V

$THD_{I\ MAX\text{-}C}$ % ≤ 80 THD_I% ≤ 25% Un 400 V - 50 Hz

Part n. 415.04.	Qn (kVAr)	Q (400 V) (kVAr)	Bank Power (kVAr)	In (A)	Dissipated Power (W)	Weight (kg)
3210	20	11	2 x 10	17	16	19
3215	40	23	4 x 10	34	32	21
3220	60	34	2 x 10 + 2 x 20	50	44	21
3225	80	46	4 x 20	67	59	22
3230	100	58	3 x 20 + 40	84	79	22
3235	120	69	2 x 20 + 2 x 40	101	94	22
3240	140	81	20 + 3 x 40	117	110	23
3245	160	92	4 x 40	134	127	23

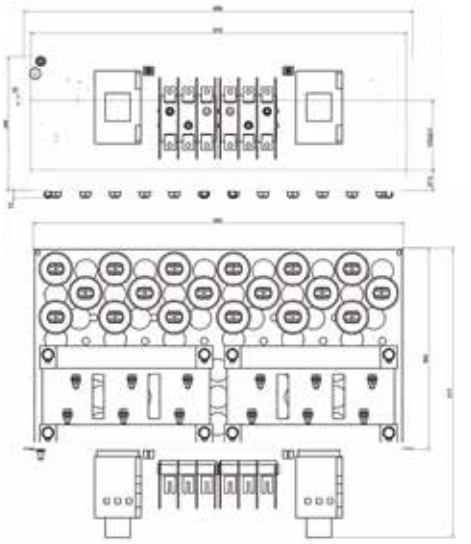
DUCATI C100-L Un - Cond = 480 V FILTER 189 Hz(*)

$THD_{I\ MAX-C}$ % ≤ 80%(*) THD_I% ≤ 6%(*) Un 400 V - 50 Hz

Part n. 415.04.	Qn (kVAr)	Q (400 V) (kVAr)	Bank Power (kVAr)	In (A)	Dissipated Power (W)	Weight (kg)
9310	25	25	2 x 12.5	36	244	30
9315	37.5	37.5	12.5 + 25	54	293	32
9320	50	50	2 x 25	72	342	44
9325	75	75	50 + 25	108	412	60
9330	100	100	2 x 50	144	452	74

* Other operating voltages and tuning frequencies available upon request.

TECHNICAL DRAWING
DUCATI C100-L



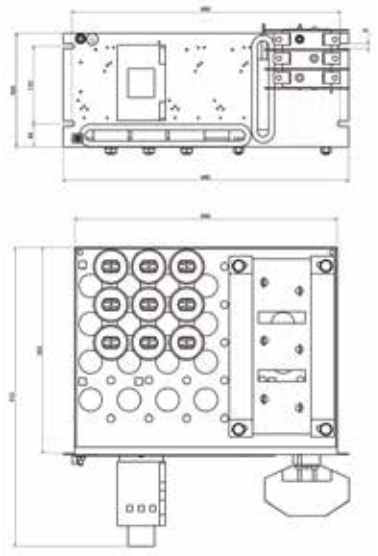
DUCATI C50-L-MINI Un - Cond = 480 V FILTER 189 Hz(*)

THD_I% ≤ 80%(*) THD_V% ≤ 6%(*) Un 400 V - 50 Hz

Part n. 415.04.	Qn (kVAr)	Q (400 V) (kVAr)	Bank Power (kVAr)	In (A)	Dissipated Power (W)	Weight (kg)
3310	25	25	2 x 12.5	36	244	29
3315	37.5	37.5	12.5 + 25	54	293	31
3320	50	50	2 x 25	72	342	43
3325	50	50	50	72	337	38

* Other operating voltages and tuning frequencies available upon request.

TECHNICAL DRAWING DUCATI
C50-L-MINI



BLOCKING REACTORS

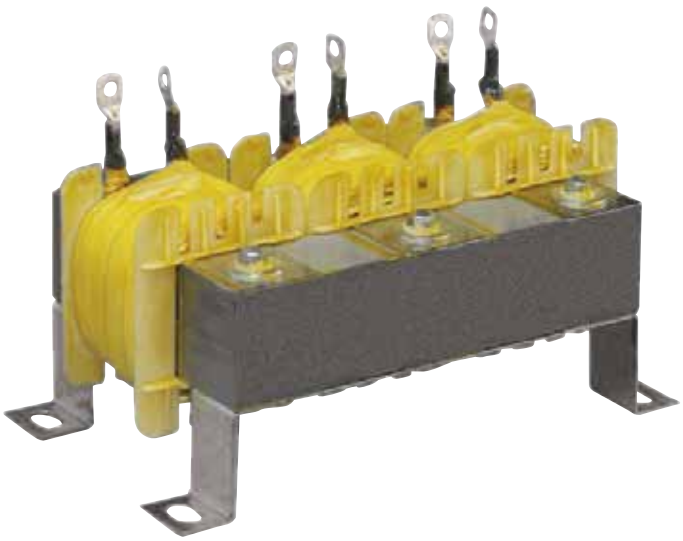
When choosing a power factor correction system for industrial networks characterized by the presence of harmonics (typically generated by use of non-linear loads such as rectifiers, welders, etc.), you should pay particular attention to the fact that resonance effects may be produced. To avoid such dangerous phenomena, suitable inductances must be placed in series with the capacitors.
The result is a partial absorption of the critical harmonic component and a blocking effect vis-à-vis the upstream supply network containing harmonics.
The parameter that defines inductance is the degree of inductance p where:

$p = X_L/X_C$

Where X_L is the inductive reactance and X_C the capacitive inductance
The presence of the reactor creates other effects, for example the voltage at the capacitor terminals will increase to a value of:

$U_C = U/(1 - p)$

Where:
U_C = voltage on the capacitors
U = mains voltage
P = degree of inductance
The reactive power delivered by the combination of reactors + capacitors is different from that delivered by capacitors on their own.
When choosing the components to be used in power factor correction equipment with blocking reactors, you must thus know the characteristics of the power network in which the equipment will be installed and the impact that the reactor used will have on the capacitors.
The capacitors must possess appropriate characteristics in order to operate reliably in the system.
DUCATI energia can supply reactors and capacitors to suit the most frequent conditions of use.



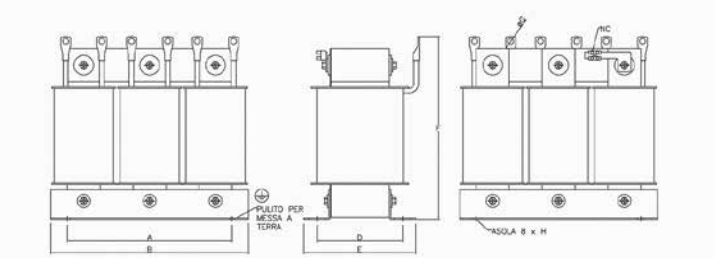
General Characteristics
Three-phase reactors P = 7% (189 Hz) e P = 5,67% (210 Hz)

Mains voltage	400V 50 Hz
Power supply	Three-phase + PE
Continuous current harmonic distortion allowed	2% In at 150 Hz 35% In at 250 Hz 15% In at 350 Hz
Insulation	690 V
Linearity	Up to 1.8 Ip/In
Figure of merit	Q > 20
Induction value at In	< 0.8Tesla
Materials	Class H
Thermal protection	Via thermistor with NC contact

General Characteristics
Three-phase reactors P = 12.5% (141 Hz) e P = 14% (134 Hz)

Mains voltage	400V 50 Hz
Power supply	Three-phase + PE
Continuous current harmonic distortion allowed	2% In at 150 Hz 35% In at 250 Hz 15% In at 350 Hz
Insulation	690 V
Linearity	Up to 1.8 Ip/In
Figure of merit	Q > 20
Induction value at In	< 0.8Tesla
Materials	Class H
Thermal protection	Via thermistor with NC contact

TECHNICAL DRAWING BLOCKING REACTORS



THREE-PHASE REACTORS* P= 7% (189 HZ) | P=5.67%(210HZ)

(*) Colors of Titles and Values change following reactor's kind

Part n. 315.99.	Power output (kVAr)	Inductance (mH)	I RMS (A)	Size (mm)								Weight (kg)	C theorical (µF)	Proposed capacitors 416.46.xxxx (*)
				A	B	C	D	E	F	G	H			
1005	10	3x3.84	16.3	150	180	110	82	110	180	M	20	9.5	3x62	4200
1405	10	3x3.05	17.0	150	180	110	82	110	180	M	20	10	3x62	4200
1010	12.5	3x3.07	20.4	150	180	120	92	120	180	M	20	11	3x77	4080 + 4100
1510	12.5	3x2.45	21.5	150	180	120	92	120	180	M	20	11	3x78	5270
1012	15	3x2.55	26.8	200	240	130	85	118	166	9	20	13	3x94	4100 + 4150
1512	15	3x2.03	26.0	200	240	130	85	118	166	9	20	13	3x94	5330
1015	20	3x1.91	32.7	200	240	130	88	118	165	9	20	13	3x123	4100 + 4260
1515	20	3x1.53	35.0	200	240	130	88	118	165	9	20	14	3x	2x4200
1020	25	3x1.53	40.8	200	240	140	98	128	165	9	20	15	3x154	4200 + 4260
1520	25	3x1.23	42.0	200	240	140	98	128	165	9	20	15	3x	2x5270
1025	40	3x0.96	65.2	200	240	140	98	128	205	9	20	21	3x247	3x4260
1525	40	3x0.76	69.0	200	240	140	98	128	205	9	20	22	3x	3x4260
1030	50	3x0.77	81.6	200	240	150	113	143	220	9	20	25	3x308	3x4310
1530	50	3x0.60	86.0	200	240	150	113	143	220	9	20	26	3x	3x4310
1050	100	3x0.385	164	300	320	200	170	280	360	9	24	60	3x618	3x4380

THREE-PHASE REACTORS* P= 12.5% (141 HZ) | P=14%(134HZ)

(*) Colors of Titles and Values change following reactor's kind

Part n. 315.99.	Power output (kVAr)	Inductance (mH)	I RMS (A)	Size (mm)								Weight (kg)	C theorical (µF)	Proposed capacitors 416.46.xxxx (*)
				A	B	C	D	E	F	G	H			
1105	10	3x7.28	16.7	200	240	130	88	118	165	9	20	13	3x58	5080 + 5100
1505	10	3x8.15	17.5	200	240	130	88	118	165	9	20	14	3x58	5230
1110	12.5	3x5.82	20.9	200	240	140	98	128	165	7	20	15	3x73	5100 + 5150
1510	12.5	3x6.70	21.0	200	240	140	98	128	165	7	20	16	3x73	5260
1112	15	3x4.85	25.1	200	240	140	98	128	205	7	20	20	3x87	5310
1512	15	3x5.40	27.0	200	240	140	98	128	205	7	20	21	3x87	5310
1115	20	3x3.64	33.4	200	240	140	98	128	205	7	20	21	3x116	5150 + 5260
1515	20	3x4.10	35.0	200	240	140	98	128	205	7	20	22	3x	2x5230
1120	25	3x2.91	41.8	200	240	150	113	143	220	9	20	25	3x145	5150 + 5360
1520	25	3x3.35	43.0	200	240	150	113	143	220	9	20	26	3x	2x5260
1125	40	3x1.82	66.8	250	300	165	120	160	285	9	25	39	3x232	(2x5260) + 5310
1525	40	3x2.05	70.0	250	300	165	120	160	285	9	25	40	3x	3x5270
1130	50	3x1.46	83.6	250	300	175	130	170	285	9	25	45	3x290	4x5260
1530	50	3x1.65	87.0	250	300	175	130	170	285	9	25	46	3x	3x5270
1190	100	3x0.73	168	325	360	300	215	270	400	9	24	90	3x580	5x5370

(*) The suggested models refer to generic applications.
DUCATI energia reserves to propose and authorize the use of different capacitor types and ratings for specific applications.

THREE-PHASE REACTORS* P= 7% (189 HZ) | P=5.67%(210HZ)

(*) Colors of Titles and Values change following reactor's kind

Part n. 315.99.	Power output at 415V (kVAr)	Inductance (mH)	I RMS (A)	Size (mm)								Weight (kg)	C theorical (µF)	Proposed capacitors 416.46.xxxx (*)
				A	B	C	D	E	F	G	H			
1805	10	3x4.08	16.5	150	180	110	82	110	180	M	20	10	3x58	5230
1605	10	3x3.30	16.0	150	180	110	82	110	180	M	20	10	3x62	5230
1810	12.5	3x3.28	21.0	150	180	120	92	120	180	M	20	11	3x72	5270
1610	12.5	3x2.64	21.0	150	180	120	92	120	180	M	20	11	3x72	5270
1812	15	3x2.75	24.0	200	240	130	85	118	166	9	20	13	3x86	5310
1612	15	3x2.20	24.0	200	240	130	85	118	166	9	20	13	3x87	5310
1815	20	3x2.06	32.5	200	240	130	88	118	165	9	20	14	3x115	5370
1615	20	3x1.65	32.5	200	240	130	88	118	165	9	20	14	3x116	5370
1820	25	3x1.64	41.0	200	240	140	98	128	165	9	20	15	3x114	3150+3200
1620	25	3x1.32	40.5	200	240	140	98	128	165	9	20	15	3x145	3150+3200
1825	40	3x1.03	65.0	200	240	140	98	128	205	9	20	22	3x230	3260+3310
1625	40	3x0.82	65.0	200	240	140	98	128	205	9	20	22	3x233	3260+3310
1830	50	3x0.82	81.0	200	240	150	113	143	220	9	20	26	3x287	3310+3360
1630	50	3x0.66	81.0	200	240	150	113	143	220	9	20	26	3x291	3310+3360

THREE-PHASE REACTORS* P= 12.5% (141 HZ) | P=14%(134HZ)

(*) Colors of Titles and Values change following reactor's kind

Part n. 315.99.	Power output at 415 (kVAr)	Inductance (mH)	I RMS (A)	Size (mm)								Weight (kg)	C theorical (µF)	Proposed capacitors 416.46.xxxx (*)
				A	B	C	D	E	F	G	H			
1905	10	3x7.88	16.5	200	240	130	88	118	165	9	20	14	3x54	4150
1705	10	3x9.92	16.5	200	240	130	88	118	165	9	20	14	3x53	4150
1910	12.5	3x6.26	20.5	200	240	140	98	128	165	7	20	16	3x68	4200
1710	12.5	3x7.16	20.0	200	240	140	98	128	165	7	20	16	3x66	4200
1912	15	3x5.25	24.5	200	240	140	98	128	205	7	20	21	3x81	4260
1712	15	3x5.91	25.0	200	240	140	98	128	205	7	20	21	3x80	4260
1915	20	3x3.97	32.5	200	240	140	98	128	205	7	20	22	3x106	4310
1715	20	3x4.46	33.0	200	240	140	98	128	205	7	20	22	3x106	4310
1920	25	3x3.15	41.0	200	240	150	113	143	220	9	20	26	3x135	5230+5270
1720	25	3x3.56	41.0	200	240	150	113	143	220	9	20	26	3x133	5230+5270
1925	40	3x1.97	65.0	250	300	165	120	160	285	9	25	40	3x216	2x4310
1725	40	3x2.23	65.0	250	300	165	120	160	285	9	25	40	3x212	3x4310
1930	50	3x1.56	80.0	250	300	175	130	170	285	9	25	46	3x270	3x5310
1730	50	3x1.78	81.5	250	300	175	130	170	285	9	25	46	3x266	3x5310

(*) The suggested models refer to generic applications.
DUCATI energia reserves to propose and authorize the use of different capacitor types and ratings for specific applications.

CONTACTORS

When choosing switching contactors for capacitors used to compensate the reactive power present in the network, you should bear several aspects in mind:

- On being energized the capacitor is connected in parallel to the inductive network and the oscillating circuit produced by connecting the capacitor to the network will result in the passage of a high frequency current (from 3 to 15 kHz), which may be 160 times greater than the In current for 1 or 2 ms
- The presence of harmonic currents and the tolerance with respect to mains voltage determine the continuous passage, within the circuit, of a current whose value is around 1.3 times greater than the rated current In of the capacitor
- Because of the tolerances allowed by the manufacturer, the exact power of a capacitor may be 1.10 times greater than the rated power

The contactor employed must therefore be capable of working with:

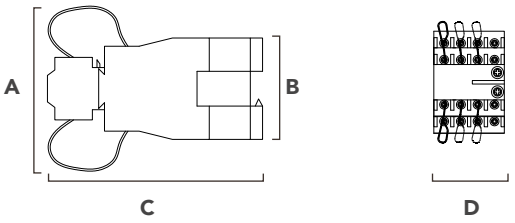
- An elevated, albeit transient, peak current during the closing phase
- A closing current that may be 1.43 times greater than the rated current of the capacitor

The contactors offered by DUCATI Energia are specifically engineered to work in these conditions.
Select the type of contactor based on the working voltage and effective power (in kVAr) of the capacitor bank to be controlled.

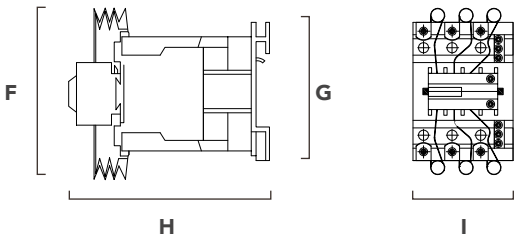
Part n. 315.99.	kVAr 50/60 Hz ∂ ≤ 55°C (*)		Auxiliary contacts		Maximum operating frequency	Electric life with rated load
	200 V 240 V	400 V 440 V	NA	NC	Switching per hour	Switching
1143	6.7	12.5	1	1	240	200000
1142	10	20	1	1	240	100000
1141	15	25	1	1	240	100000
1140	20	40	1	2	100	100000
1139	40	60	1	2	100	100000

(*) Average temperature over 24h as per standards IEC 70 and 851.

230 VAC 50/60 Hz coil for all sizes.
WARNING: The capacitors must be completely discharged before being energized by closing contacts (max voltage at terminals < 50 V).



315.99	A (mm)	B (mm)	C (mm)	D(mm)
1143	130	74	117	45
1142	140	84	130	56
1141	140	84	135	56



315.99	F (mm)	G (mm)	H (mm)	I (mm)
1140	180	127	150	75
1139	200	127	157	35

ISOLATING SWITCHES

DUCATI energia offers a complete series of modular switches for all applications like:

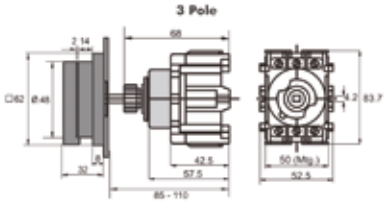
- Main Service Entrance Switch from Transformers & Busbars
- AC or DC Power Distribution System
- Switching & Isolating Motors, capacitors or industrial control equipment

Ducati's switches have compact size and their installation is fast and easy.
The handle in the switch disconnectors has a telescopic shaft. It permits installation of the same switch in installations of different depth, without any modification or addition to the enclosures.
Four hole handle fixing on the door permits last minute rotation of the switch inside the panel by 90 degrees on either side as per convenience, again without any modification to the door.
These time saving features increase the ease and flexibility of installation and also reduce installation cost.
Door interlocking prevents opening in the ON position, guarding the operator against an accidental mishap.

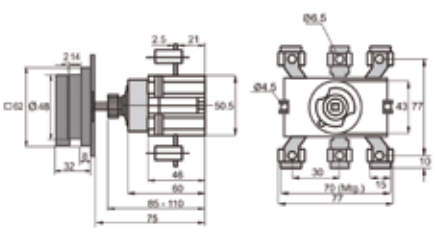
Common Characteristics		
Conformity to Standards	-	IEC 60947 Pt.3 e IS 13947 Pt.3
Rated Operational Voltage (Ue)	V	415
Rated Operational Frequency	Hz	50/60
Pollution Degree as per IEC / IC	-	3
Ambient / Cubicle Service Temp.	°C	55
IP Level after mounting	-	IP 54
Number of Poles (4th Pole always 100% rated in 4 Pole switches)	-	3P/4P

Rated current		**40**	**63**	**80**	**125**	**160**
Number of poles (part. n. 315.99)	**3**	**.0200**	**.0201**	**.0202**	**.0203**	**.0204**
	4	**.0597**	**.0598**	**.0599**	**.0600**	**.0601**
Rated voltage	V	415	415	415	415	415
Max operating voltage	V	690	690	690	690	690
Rated frequency	Hz	50/60	50/60	50/60	50/60	50/60
Insulation voltage	V	750	750	750	750	750
Rated operational current	A	40	63	80	125	160
Rated capacitor power	kVAr	20	35	45	70	80
Rated short time withstand current Icw (1 sec)	kA	1	1	1.5	2.5	5
Mechanical endurance	cycles	25000	25000	25000	25000	25000
Terminals for cable lug size	Sq mm	16	25	25	70	95
Tightening torque	Nm	2	2	4	6	6

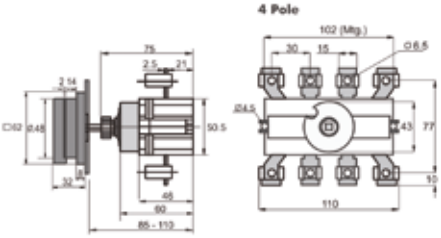
TECHNICAL DRAWING ISOLATING SWITCHES



63A Rotatory Type 3 Pole



100A & 125A Rotatory Type 3 Pole

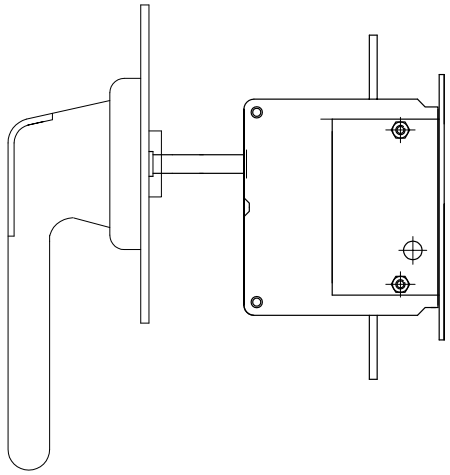


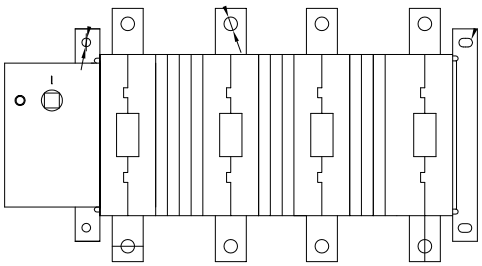
63A - 100A & 125A Rotatory Type 4 Pole

ISOLATING SWITCHES

Rated current		**250**	**400**	**630**	**800**
Number of poles (part. n. 315.99)	**3**	**.0205**	**.0206**	**.0207**	**.0208**
	4	**.0602**	**.0603**	**.0604**	**.0605**
Rated voltage	V	415	415	415	415
Max operating voltage	V	690	690	690	690
Rated frequency	Hz	50/60	50/60	50/60	50/60
Insulation voltage	V	1000	1000	1000	1000
Rated operational current	A	250	400	630	800
Rated capacitor power	kVAr	125	200	315	400
Rated short time withstand current Icw (1 sec)	kA	8	17	17	17
Mechanical endurance	cycles	10000	10000	10000	10000
Terminals for cable lug size	Sq mm	120	300	400	640
Tightening torque	Nm	12	25	45	45

TECHNICAL DRAWING ISOLATING SWITCHES
400A - 800A

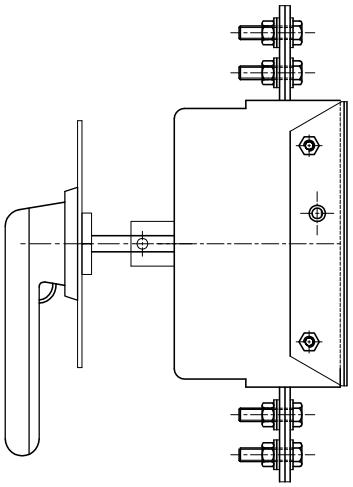


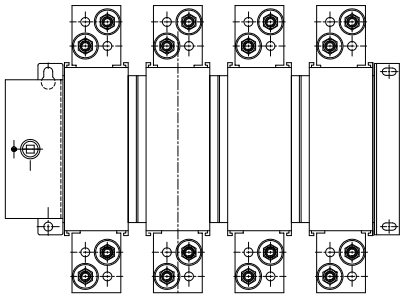


Rating	**A**		**B**	**L**		**P**	**Q**	**S**	**T**
	3P	**4P**		**3P**	**4P**				
400A	211	257	205	151	197	46	25	4	11
603A	244	306	223	183	245	62	40	4	13.5
800A	260	330	223	199	269	70	40	5	13.5

ISOLATING SWITCHES

TECHNICAL DRAWING
ISOLATING SWITCHES
1000A - 1600A





Rated current		1000	1250	1600
Number of poles (part. n. 315.99)	**3**	**.0209**	**.0210**	**.0211**
	4	**.0606**	**.0607**	**.0608**
Rated voltage	V	415	415	415
Max operating voltage	V	690	690	690
Rated frequency	Hz	50/60	50/60	50/60
Insulation voltage	V	1000	1000	1000
Rated operational current	A	1000	1250	1600
Rated capacitor power	kVAr	500	630	800
Rated short time withstand current Icw (1 sec)	kA	50	50	50
Mechanical endurance	cycles	10000	10000	10000
Terminals for cable lug size	Sq mm	-	-	-
Tightening torque	Nm	70	70	70

Rating	A		L		T
	3P	4P	3P	4P	
1000A	383	483	318	418	8
1250A	383	483	318	418	8
1600A	383	483	318	418	10

EQUIPMENT

SELECTION CRITERIA

PFC: why?

There are many objectives to be pursued in the planning of an electrical system. Among the measures that enable electricity use to be optimized, improving the power factor of electrical systems is undoubtedly one of the most important. If we quantify this aspect from the utility company's point of view, raising the average operating power factor of the network from 0.7 to 0.95 means:

- Cutting costs due to ohmic losses in the network by 45%
- Increasing the potential of production and distribution plants by 35%

The user which corrects the power factor in his plants gets these advantages:

- To avoid the fees by the supplier
- It reduces the absorbed current and it optimizes the electrical system
- It reduces the voltage drops and the losses due to Joule effect

How to correct

The most appropriate technical solution is to put on each load its own power factor correction capacitor to be included with the drive switch (distributed PFC).
The most effective power factor correction, however, is the one that involves the installation of an automatic battery on the bars of the distribution panel (Centralized PFC) and, if necessary, the installation of fixed capacitor banks for the correction of transformers, asynchronous motors and any loads that absorb significate amount of reactive power.
For electrical machines such as induction motors and transformers it is often used a fixed power factor correction, most of the time sized on values obtained from tables.

How to compute

The calculation of the capacitor bank to be installed in an installation is simple: given the cosφ of the system without any correction (often obtainable from electric bills) and the cosφ that has to be reached, the reactive power necessary to achieve the wanted Power factor is obtained by few calculations:

$Qc = P \cdot (\tan\varphi_0 - \tan\varphi_1) = P \cdot K$
P = active power of the system
$\cos\varphi_0$ = cosφ of the system without PFC
$\cos\varphi_1$ = cosφ target
Qc = reactive power of PFC system to be installed
K = given $\cos\varphi_0$ and $\cos\varphi_1$ K is derived from the table below

If the system's coφs value should be unknown, the calculation of the reactive power necessary for the compensation can be done starting from the data found on the energy utility's bills or read directly from the utility's energy meter.

Knowing the active power [kW] P and the reactive power [kVAr] Q of the system, or the active energy [kWh] and the reactive energy [kVArh], the following formula can be used:
Q / P = tanφ
The tanφ value thus calculated can be used with the table to calculate the reactive power of the PFC equipment necessary to correct the PF to the desired value.
For the monitoring of the system's electrical parameters we suggest the installation of one or more Network Analysers, providing measurements of all parameters characterising the system and the loads. DUCATI Energia offers a comprehensive range of Energy Analysers and Monitoring Systems.

Reference notes

The capacitors and the automatic power factor correction equipment must be installed in well-ventilated areas.
The air should be able to circulate freely through the air vents. The ambient temperature must comply with EN 60831-1/2 standards.
When the system subject to power factor correction has AC/DC static conversion systems (e.g. for the operation of DC motors, uninterrupted power systems, etc.), harmonic currents are generated and may cause either current or voltage overloads which the capacitors are unable to withstand.
DUCATI energia can provide properly protected equipment suitable for use in such systems as well as filter systems designed to eliminate harmonic components.
When the capacitors are used in automatic equipment, be sure to check that the regulator response time is greater than the capacitor discharge time. If this is not the case, suitable discharge resistors should be installed.
The use of rigid connections should be avoided with cylindrical capacitors in order to avoid blocking the intervention of the overpressure device.
For this reason at least 3 cm should be left between the terminals and any surface above the upper capacitor.
In the automatic equipment the integrity of the pre-charging resistors should be checked every 10.000 operations or at least once a year.
Plan to replace the contactors every 100.000 operations.
The guarantee does not cover problems arising from operation:

- In the presence of excessive harmonic overloads (> 1.3 In, > 1.1 Un.)
- Contactors with worn-out electrical contacts or interrupted precharging resistors

Installation notes

As required by the standards, it is necessary to ensure an appropriate protection against short-circuit and overload (via magnetic/thermic circuit breaker or fuses) for the line supplying the PFC units. The protection must be dimensioned for capacitive currents (approx. 1,45 times the equipment's nominal current) and taking into account the short-time short-circuit current values expected in the point of installation and sustainable by the PFC equipment.

K FACTOR See the full table at page 64.

Existing values		Target cosφ										
tgφ	cosφ	0.90	0.91	0.92	0.93	0.94	0.95	0.96	0.97	0.98	0.99	1.00
0.72	0.81	0.240	0.268	0.298	0.329	0.361	0.395	0.432	0.473	0.521	0.581	0.724
0.70	0.82	0.214	0.242	0.272	0.303	0.335	0.369	0.406	0.447	0.495	0.556	0.698
0.67	0.83	0.188	0.216	0.246	0.277	0.309	0.343	0.380	0.421	0.469	0.530	0.672
0.65	0.84	0.162	0.190	0.220	0.251	0.283	0.317	0.354	0.395	0.443	0.503	0.646

Criteria for choosing equipment according to network conditions

Once the maximum necessary power has been determined as directed in the previous sections, the choice of which type of equipment to adopt must be based on the conditions of the electrical network and the types of loads present.The selection table below, drawn up on the basis of general plant characteristics (and thus not usable for planning purposes), aims to provide an indication of the power factor correction system generally suited to the most frequently encountered conditions; electrical systems with mains voltage of 400V-50Hz, characterized by the presence of distorting loads with a spectrum composed of 5th, 7th, 11th and 13th harmonics.

SERIES	THDi < 12% (THDic <50%)	THDi < 20% (THDic < 70%)	THDi < 27% (THDic < 85%)	THDi < 80% (THDic < 95%)	THDi < 80% (THDic <100%)	PV system
Fixed PFC equipment						
DUCATI F120 (5 - 120 kVAr) 	Un = 415 V	Un = 450 V	Un = 525 V	Un = 525 V	Un = 525 V	
Automatic PFC equipment						
DUCATI 50-M (5 - 50 kVAr) 	Un = 415 V	Un = 450 V	Un = 525 V			Un ⩾ 450 V
DUCATI 200-M (60 - 200 kVAr) 	Un = 415 V	Un = 450 V	Un = 525 V			Un ⩾ 450 V
DUCATI 400-M (220 - 400 kVAr) 	Un = 415 V	Un = 450 V	Un = 525 V			Un ⩾ 450 V
DUCATI 1600-R (240-1600 kVAr) 	Un = 415 V	Un = 450 V	Un = 525 V			Un ⩾ 450 V
Automatic PFC equipment with detuning reactors						
DUCATI 170-ML (25,5-170 kVAr) 	✔	✔	✔	✔		✔
DUCATI 1000-RL (150 -1000 kVAr) 	✔	✔	✔	✔		✔
DUCATI 1000-RL/HP (132 - 1056 kVAr) 	✔	✔	✔	✔	✔	✔
Real time automatic PFC equipment						
DUCATI 1000-RL/S (250 - 600 kVAr) 	✔	✔	✔	✔		✔

DUCATI F120

Fixed power factor correction equipment

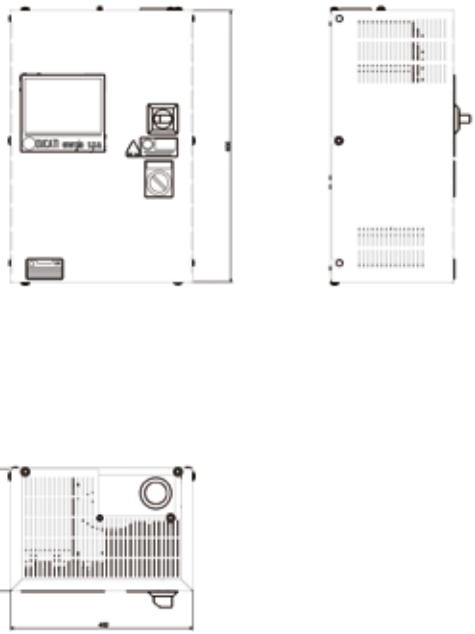
Technical details

- Single-phase capacitors **MONO Long Life 4I$_N$** in PPMh, for a continuous duty under highly demanding condition in harmonic rich environments. Rated voltage 415V, 450V, 525V
- External steel structure painted with epoxy powder color RAL 7035
- Omni pole disconnecting switch, with door lock, and rated current 1.45In according to the CEI EN standard

General Characteristics

Rated voltage	400 V
Rated frequency	50 Hz
Insulating voltage	690 V
Ventilation	Natural
Usage	Indoor
Protection degree	IP 30
Duty	Continuous
Temperature range	-5 +40 °C
Power supply	3F + PE
Cable entry	Top
Internal connection	FS17
Discharge devices	On each capacitor
Fuse	NH-00 GL
Standards	IEC 61439 IEC 61921

TECHNICAL DRAWING DUCATI F120



DUCATI F120 Un cond = 415 V

Part n. 415.04.	Qn (kVAr)	Q (400 V) (kVAr)	In (A)	In sw. (A)	LxPxH (mm)	Weight (kg)
8005	5	4.6	7	40	400x270x400	15
8007	10	9.3	13	40	400x270x400	15
8010	20	18.6	27	63	400x270x400	17
8015	40	37.2	54	80	400x270x400	17
8020	60	55.7	80	125	400x270x400	21
8025	80	74.3	107	125	400x270x600	30
8030	100	92.9	134	250	400x270x1000	32
8035	120	111.5	161	250	400x270x1000	33

DUCATI F120 Un cond = 450V

Part n. 415.04.	Qn (kVAr)	Q (400 V) (kVAr)	In (A)	In sw. (A)	LxPxH (mm)	Weight (kg)
8105	5	4.0	6	40	400x270x400	15
8107	10	7.9	11	40	400x270x400	15
8110	20	15.8	23	63	400x270x400	17
8115	40	31.6	46	80	400x270x400	17
8120	60	47.4	68	125	400x270x400	21
8125	80	63.2	91	125	400x270x600	30
8130	100	79.0	114	250	400x270x1000	32
8135	120	94.8	137	250	400x270x1000	33

DUCATI F120 Un cond = 525 V

Part n. 415.04.	Qn (kVAr)	Q (400 V) (kVAr)	In (A)	In sw. (A)	LxPxH (mm)	Weight (kg)
8205	5	2.9	4	40	400x270x400	15
8207	10	5.8	8	40	400x270x400	15
8210	20	11.6	17	63	400x270x400	17
8215	40	23.2	34	80	400x270x400	17
8220	60	34.8	50	125	400x270x400	21
8225	80	46.4	67	125	400x270x600	30
8230	100	58.0	84	250	400x270x1000	32
8235	120	69.7	101	250	400x270x1000	33

DUCATI 50-M

Automatic power factor correction equipment

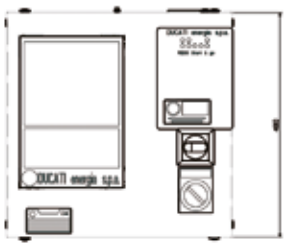
Technical details

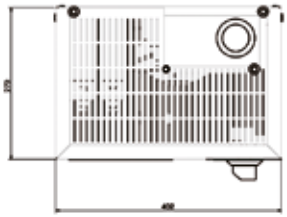
- Single-phase capacitors **MONO Long Life 4I$_N$** in PPMh, for a continuous duty under highly demanding condition in harmonic rich environments. Rated voltage 415 V, 450 V, 525 V
- Power Factor controller series **START&GO**. No setup required (TC autosensing and automatic start), fast and user friendly. Suitable for cogeneration plants as PV
- External steel structure painted with epoxy powder color RAL 7035
- Omni pole disconnecting switch, with door lock, and rated current 1.45In according to the CEI EN standard
- Contactors designed for controlling capacitive loads, equipped with an inrush current limiting device with 230 V 50-60 Hz power supply

General Characteristics

Rated voltage	400 V
Rated frequency	50 Hz
Insulating voltage	690 V
Ventilation	Natural
Usage	Indoor
Protection degree	IP 30
Duty	Continuous
Temperature range	-5 +40 °C
Power supply	3F + PE + N
Cable entry	Top
Internal connection	FS17
Discharge devices	On each capacitor
Fuse	NH-00 GL
Standards	IEC 61439 where applicable IEC 61921
I_{SH}	50 kA (conditioned by the upstream protective device)

TECHNICAL DRAWING DUCATI 50-M





DUCATI 50-M Un - Cond = 415 V

$THD_{I\ MAX-C}$ % ≤ 50% THD_I% ≤ 12% Un 400 V - 50 Hz

Part n. 415.04	Qn (kVAr)	Q (400 V) (kVAr)	Bank Power (kVAr)	Steps	In (A)	In sw. (A)	LxPxH (mm)	Weight (kg)
0010	5	4.7	0.7 + 1.4 + 2.9	7	7	40	400x270x400	15
0015	7.5	7.0	1.1 + 2.1 + 4.3	7	10	40	400x270x400	15
0020	10	9.3	1.4 + 2.9 + 5.7	7	13	40	400x270x400	16
0025	12.5	11.6	2.5 + 2 x 5	5	17	40	400x270x400	16
0030	17.5	16.3	2.5 + 5 + 10	7	23	40	400x270x400	16
0035	20	18	2 x 5 + 10	4	27	63	400x270x400	17
0040	25	23	5 + 2 x 10	5	34	63	400x270x400	17
0045	35	32	5 + 10 + 20	7	47	80	400x270x400	18
0050	40	37	2 x 10 + 20	4	54	80	400x270x400	18
0055	50	46	10 + 2 x 20	5	68	80	400x270x400	19

DUCATI 50-M Un - Cond = 450 V

$THD_{I\ MAX-C}$ % ≤ 70% THD_I% ≤ 20% Un 400 V - 50 Hz

Part n. 415.04	Qn (kVAr)	Q (400 V) (kVAr)	Bank Power (kVAr)	Steps	In (A)	In sw. (A)	LxPxH (mm)	Weight (kg)
0210	20	15	2 x 5 + 10	4	23	63	400x270x400	17
0215	25	19	5 + 2 x 10	5	29	63	400x270x400	17
0220	35	27	5 + 10 + 20	7	40	80	400x270x400	18
0225	40	31	2 x 10 + 20	4	46	80	400x270x400	18
0230	50	39	10 + 2 x 20	5	57	80	400x270x400	19

DUCATI 50-M Un - Cond = 525 V

$THD_{I\ MAX-C}$ % ≤ 85% THD_I% ≤ 27% Un 400 V - 50 Hz

Part n. 415.04	Qn (kVAr)	Q (400 V) (kVAr)	Bank Power (kVAr)	Steps	In (A)	In sw. (A)	LxPxH (mm)	Weight (kg)
0310	20	11	2 x 5 + 10	4	17	63	400x270x400	17
0315	25	14	5 + 2 x 10	5	21	63	400x270x400	17
0320	35	20	5 + 10 + 20	7	29	80	400x270x400	18
0325	40	23	2 x 10 + 20	4	34	80	400x270x400	18
0330	50	29	10 + 2 x 20	5	42	80	400x270x400	19

DUCATI 200-M

Automatic power factor correction equipment

Technical details

- Single-phase capacitors **MONO Long Life 4I$_N$** in PPMh, for a continuous duty under highly demanding condition in harmonic rich environments. Rated voltage 415 V, 450 V, 525 V
- Power Factor Controller series **rEvolution R5**. NFC connection for the exchange of the configuration with **"DUCATI Smart Energy" App.** Auto-sensing of the direction and the position of the TC, to ease the opertaions of the setup. Suitable for cogeneration plants as PV
- External steel structure painted with epoxy powder color RAL 7035
- Omni pole disconnecting switch, with door lock, and rated current 1.45In according to the CEI EN standard
- Contactors designed for controlling capacitive loads, equipped with an inrush current limiting device with 230 V 50 - 60 Hz power supply

General Characteristics

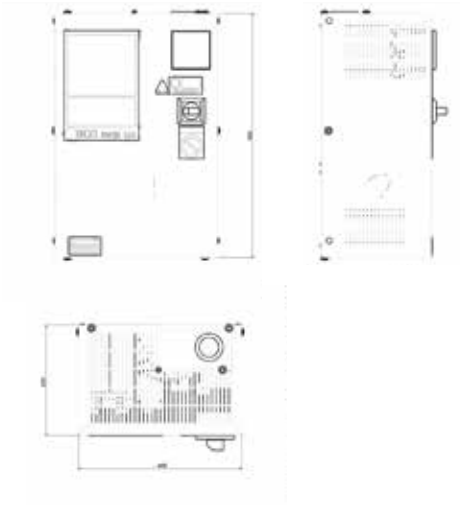
Rated voltage	400 V
Rated frequency	50 Hz
Insulating voltage	690 V
Ventilation	Natural
Usage	Indoor
Protection degree	IP30 - IP54
Duty	Continuous
Temperature range	-5 +40 °C
Power supply	3PH + PE + N (Up to 80 kVAr) 3PH + PE (Q_n > 80 kVAr)
Cable entry	Top
Internal connection	FS17
Discharge devices	On each capacitor
Fuse	NH-00 GL
Standards	IEC 61439 where applicable IEC 61921
I_{SH}	50 kA (conditioned by the upstream protective device)

DUCATI 200-M Un - Cond = 415 V IP30

$THD_{I\ MAX-C}$ % ≤ 50% THD_I% ≤ 12% Un 400 V - 50 Hz

Part n. 415.04	Qn (kVAr)	Q (400 V) (kVAr)	Bank Power (kVAr)	Steps	In (A)	In sw. (A)	LxPxH (mm)	Weight (kg)
0060	60	55	2 x 10 + 2 x 20	6	80	125	400x270x600	30
0065	70	65	10 + 3 x 20	7	94	125	400x270x600	35
0070	80	74	2 x 10 + 20 + 40	8	107	125	400x270x600	35
0075	90	83	10 + 2 x 20 + 40	9	121	250	400x270x1000	40
0080	100	92	2 x 10 + 2 x 20 + 40	10	134	250	400x270x1000	45
0085	120	111	2 x 10 + 20 + 2 x 40	12	161	250	400x270x1200	50
0090	140	130	20 + 3 x 40	7	188	400	400x270x1200	55
0095	160	148	2 x 20 + 3 x 40	8	215	400	400x270x1200	60
0100	180	167	20 + 4 x 40	9	241	400	400x270x1400	65
0105	200	185	2 x 20 + 2 x 40 + 80	10	268	400	400x270x1400	70

TECHNICAL DRAWING DUCATI 200-M IP30
60 ÷ 80 kVAr

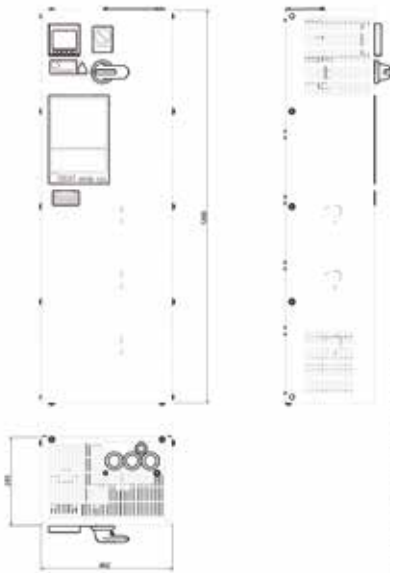


DUCATI 200-M Un - Cond = 450 V IP30

$THD_{I\ MAX-C}$ % ≤ 70% THD_I% ≤ 20% Un 400 V - 50 Hz

Part n. 415.04	Qn (kVAr)	Q (400 V) (kVAr)	Bank Power (kVAr)	Steps	In (A)	In sw. (A)	LxPxH (mm)	Weight (kg)
0235	60	47	2 x 10 + 2 x 20	6	68	125	400x270x600	30
0240	70	55	10 + 3 x 20	7	80	125	400x270x600	35
0245	80	63	2 x 10 + 20 + 40	8	91	125	400x270x600	35
0250	90	71	10 + 2 x 20 + 40	9	103	250	400x270x1000	40
0255	100	79	2 x 10 +2 x 20+40	10	114	250	400x270x1000	45
0260	120	94	2 x 10 + 20 + 2 x 40	12	137	250	400x270x1200	50
0265	140	110	20 + 3 x 40	7	160	400	400x270x1200	55
0270	160	126	2 x 20 + 3 x 40	8	182	400	400x270x1200	60
0275	180	142	20 + 4 x 40	9	205	400	400x270x1400	65
0280	200	158	2 x 20 + 2 x 40 + 80	10	228	400	400x270x1400	70

TECHNICAL DRAWING DUCATI 200-M IP30
90 ÷ 200 kVAr



DUCATI 200-M Un - Cond = 525 V IP30

$THD_{I\ MAX-C}$ % ≤ 85% THD_I% ≤ 27% Un 400 V - 50 Hz

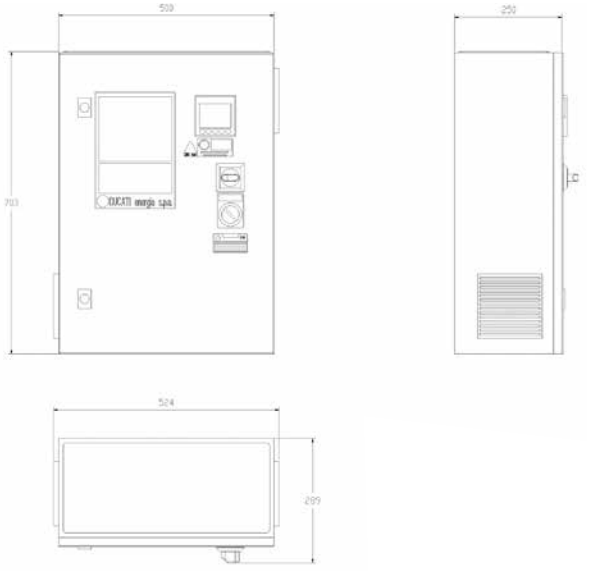
Part n. 415.04	Qn (kVAr)	Q (400 V) (kVAr)	Bank Power (kVAr)	Steps	In (A)	In sw. (A)	LxPxH (mm)	Weight (kg)
0335	60	34	2 x 10 + 2 x 20	6	50	125	400x270x600	30
0340	70	40	10 + 3 x 20	7	59	125	400x270x600	35
0345	80	46	2 x 10 + 20 + 40	8	67	125	400x270x600	35
0350	90	52	10 + 2 x 20 + 40	9	75	250	400x270x1000	40
0355	100	58	2 x 10 + 2 x 20 + 40	10	84	250	400x270x1000	45
0360	120	69	2 x 10 + 20 + 2 x 40	12	101	250	400x270x1200	50
0365	140	81	20 + 3 x 40	7	117	400	400x270x1200	55
0370	160	92	2 x 20 + 3 x 40	8	134	400	400x270x1200	60
0375	180	104	20 + 4 x 40	9	151	400	400x270x1400	65
0380	200	116	2 x 20 + 2 x 40 + 80	10	168	400	400x270x1400	70

DUCATI 200-M Un - Cond = 415 V IP54

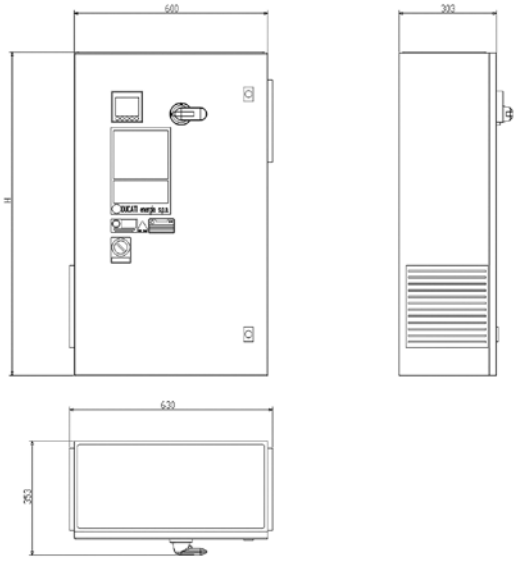
$THD_{I\ MAX-C}$ % ≤ 50% THD_I% ≤ 12% Un 400 V - 50 Hz

Part n. 415.04	Qn (kVAr)	Q (400 V) (kVAr)	Bank Power (kVAr)	Steps	In (A)	In sw. (A)	LxPxH (mm)	Weight (kg)
0011	5	4.7	0.7 + 1.4 + 2.9	7	7	40	500x250x700	39
0016	7.5	7.0	1.1 + 2.1 + 4.3	7	10	40	500x250x700	39
0021	10	9.3	1.4 + 2.9 + 5.7	7	13	40	500x250x700	39
0026	12.5	11.6	2.5 + 2 x 5	5	17	40	500x250x700	40
0031	17.5	16.3	2.5 + 5 +10	7	23	40	500x250x700	40
0036	20	18	2 x 5	4	27	63	500x250x700	41
0041	25	23	5 + 2 x 10	5	34	63	500x250x700	41
0046	35	32	5 + 10 + 20	7	47	80	500x250x700	42
0051	40	37	2 x 10 + 20	4	54	80	500x250x700	42
0056	50	46	10 + 2 x 20	5	67	80	500x250x700	43
0061	60	55	2 x 10 + 2 x 20	6	80	125	500x250x700	54
0067	70	65	10 + 3 x 20	7	94	125	500x250x700	59
0071	80	74	2 x 10 + 20 +40	8	107	125	500x250x700	59
0076	90	83	10 + 2 x 20+40	9	121	250	600x300x1000	77
0081	100	92	2 x 10 + 2 x 20+40	10	134	250	600x300x1000	82
0086	120	111	2 x 10 + 20 + 2 x 40	12	161	250	600x300x1000	93
0091	140	130	20 + 3 x 40	7	188	400	600x300x1000	98
0096	160	148	2 x 20 + 3 x 40	8	215	400	600x300x1200	109
0101	180	167	20 + 4 x 40	9	241	400	600x300x1400	114
0106	200	185	2 x 20 + 2 x 40 + 80	10	268	400	600x300x1400	119

TECHNICAL DRAWING DUCATI 200-M IP54
5-80kVAr



TECHNICAL DRAWING DUCATI 200-M IP54
90-200kVAr



DUCATI 200-M Un - Cond = 450 V IP54

$THD_{I\ MAX-C}$ % ≤ 70% THD_I% ≤ 20% Un 400 V - 50 Hz

Part n. 415.04	Qn (kVAr)	Q (400 V) (kVAr)	Bank Power (kVAr)	Steps	In (A)	In sw. (A)	LxPxH (mm)	Weight (kg)
0211	20	15	2 x 5 + 10	4	23	63	500x250x700	41
0216	25	19	5 + 2 x 10	5	29	63	500x250x700	41
0221	35	27	5 + 10 + 20	7	40	80	500x250x700	42
0226	40	31	2 x 10 + 20	4	46	80	500x250x700	42
0231	50	39	10 + 2 x 20	5	57	80	500x250x700	43
0236	60	47	2 x 10 + 2 x 20	6	68	125	500x250x700	54
0241	70	55	10 + 3 x 20	7	80	125	500x250x700	59
0246	80	63	2 x 10 + 20 + 40	8	91	125	500x250x700	59
0251	90	71	10 + 2 x 20 + 40	9	103	250	600x300x1000	77
0256	100	79	2 x 10 + 2 x 20 + 40	10	114	250	600x300x1000	82
0261	120	94	2 x 10 + 20 + 2 x 40	12	137	250	600x300x1200	93
0266	140	110	20 + 3 x 40	7	160	400	600x300x1200	98
0271	160	126	2 x 20 + 3 x 40	8	182	400	600x300x1200	109
0276	180	142	20 + 4 x 40	9	205	400	600x300x1400	114
0281	200	158	2 x 20 + 2 x 40 + 80	10	228	400	600x300x1400	119

DUCATI 200-M Un - Cond = 525 V IP54

$THD_{I\ MAX-C}$ % ≤ 85% THD_I% ≤ 27% Un 400 V - 50 Hz

Part n. 415.04	Qn (kVAr)	Q (400 V) (kVAr)	Bank Power (kVAr)	Steps	In (A)	In sw. (A)	LxPxH (mm)	Weight (kg)
0311	20	11	2 x 5 + 10	4	17	63	500x250x700	41
0316	25	14	5 + 2 x 10	5	21	63	500x250x700	41
0321	35	20	5 + 10 + 20	7	29	80	500x250x700	42
0326	40	23	2 x 10 + 20	4	34	80	500x250x700	42
0331	50	29	10 + 2 x 20	5	42	80	500x250x700	43
0336	60	34	2 x 10 + 2 x 20	6	50	125	500x250x700	54
0341	70	40	10 + 3 x 20	7	59	125	500x250x700	59
0346	80	46	2 x 10 + 20 + 40	8	67	125	500x250x700	59
0351	90	52	10 + 2 x 20 + 40	9	75	250	500x250x1000	77
0356	100	58	2 x 10 + 2 x 20 + 40	10	84	250	500x250x1000	82
0361	120	69	2 x 10 + 20 + 2 x 40	12	101	250	500x250x1200	93
0366	140	81	20 + 3 x 40	7	117	400	500x250x1200	98
0371	160	92	2 x 20 + 3 x 40	8	134	400	500x250x1200	109
0376	180	104	20 + 4 x 40	9	151	400	500x250x1400	114
0381	200	116	2 x 20 + 2 x 40 + 80	10	168	400	500x250x1400	119

DUCATI 400-M

Automatic power factor correction equipment

Technical details

- Single-phase capacitors **MONO Long Life 4I$_N$** series in PPMh, for a continuous duty under highly demanding condition in harmonic rich environments. Rated voltage 415 V, 450 V, 525 V
- Power Factor Controller series **rEvolution R5 485 radio**. Auto-sensing of the direction and the position of the TC, to ease the opertaions of the setup. Suitable for cogeneration plants as PV. NFC connection for the exchange of the configurations with **"DUCATI Smart Energy" App**. Optional integration with cloud data sharing system **DUCNET**, through RS485 connection or radio 868 MHz transmission
- External steel structure painted with epoxy powder color RAL 7035
- Omni pole disconnecting switch, with door lock, and rated current 1.45 In according to the CEI EN standard
- Contactors designed for controlling capacitive loads, equipped with an inrush current limiting device with 230 V 50 - 60 Hz power supply

General Characteristics

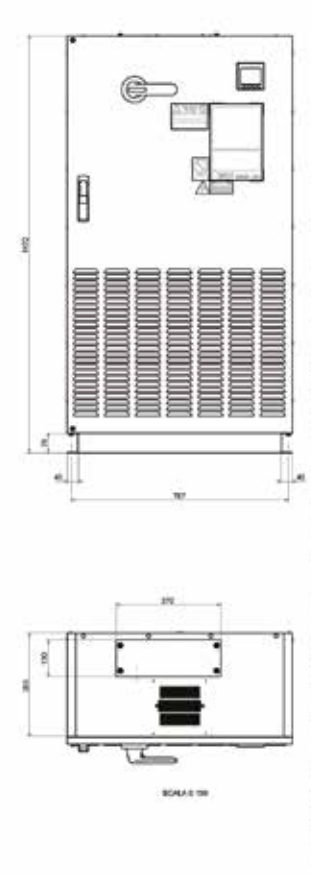
Rated voltage	400 V
Rated frequency	50 Hz
Insulating voltage	690 V
Ventilation	Forced
Usage	Indoor
Protection degree	IP 30
Duty	Continuous
Temperature range	-5 +40 °C
Power supply	3F + PE
Cable entry	Top
Internal connection	FS17
Discharge devices	On each capacitor
Fuse	NH-00 GL
Standards	IEC 61439 where applicable IEC 61921
I_{SH}	50 kA (conditioned by the upstream protective device)

DUCATI 400-M Un - Cond = 415 V

$THD_{I\ MAX-C}$ % ≤ 50% THD_I% ≤ 12% Un 400 V - 50 Hz

Part n. 415.04	Qn (kVAr)	Q (400 V) (kVAr)	Bank Power (kVAr)	Steps	In (A)	In sw. (A)	LxPxH (mm)	Weight (kg)
0510N	220	204	20 + 3 x 40 + 80	11	295	630	800x400x1470	115
0515N	240	223	2 x 20 + 40 + 2 x 80	12	322	630	800x400x1470	120
0520N	260	241	20 + 2 x 40 + 2 x 80	13	349	630	800x400x1470	125
0525N	280	260	3 x 40 + 2 x 80	7	375	630	800x400x1470	130
0527N	300	278	20 + 40 + 3 x 80	15	402	630	800x400x1470	135
0530N	320	297	2 x 40 + 3 x 80	8	429	800	800x400x1470	140
0535N	360	334	40 + 4 x 80	9	483	800	800x400x1470	145
0540N	400	371	5 x 80	5	536	800	800x400x1470	150

TECHNICAL DRAWING DUCATI 400-M



DUCATI 400-M Un - Cond = 450 V

$THD_{I\ MAX-C}$ % ≤ 70% THD^{I}% ≤ 20% Un 400 V - 50 Hz

Part n. 415.04	Qn (kVAr)	Q (400 V) (kVAr)	Bank Power (kVAr)	Steps	In (A)	In sw. (A)	LxPxH (mm)	Weight (kg)
0610N	220	173	20 + 3 x 40 + 80	11	251	630	800x400x1470	115
0615N	240	189	2 x 20 + 40 +2 x 80	12	274	630	800x400x1470	120
0620N	260	205	20 + 2 x 40 + 2 x 80	13	297	630	800x400x1470	125
0625N	280	221	3 x 40 + 2 x 80	7	319	630	800x400x1470	130
0627N	300	237	20 + 40 + 3 x 80	15	342	630	800x400x1470	135
0630N	320	252	2 x 40 + 3 x 80	8	365	800	800x400x1470	140
0635N	360	284	40 + 4 x 80	9	411	800	800x400x1470	145
0640N	400	316	5 x 80	5	456	800	800x400x1470	150

DUCATI 400-M Un - Cond = 525 V

$THD_{I\ MAX-C}$ % ≤ 85% THD_I% ≤ 27% Un 400 V - 50 Hz

Part n. 415.04	Qn (kVAr)	Q (400 V) (kVAr)	Bank Power (kVAr)	Steps	In (A)	In sw. (A)	LxPxH (mm)	Weight (kg)
0710N	220	127	20 + 3 x 40 + 80	11	184	630	800x400x1470	115
0715N	240	139	2 x 20 + 40 + 2 x 80	12	201	630	800x400x1470	120
0720N	260	150	20 + 2 x 40 + 2 x 80	13	218	630	800x400x1470	125
0725N	280	162	3 x 40 + 2 x 80	7	235	630	800x400x1470	130
0727N	300	174	20 + 40 + 3 x 80	15	251	630	800x400x1470	135
0730N	320	185	2 x 40 + 3 x 80	8	268	800	800x400x1470	140
0735N	360	209	40 + 4 x 80	9	302	800	800x400x1470	145
0740N	400	232	5 x 80	5	335	800	800x400x1470	150

DUCATI 1600-R

Automatic power factor correction equipment

Technical details

- Single-phase capacitors **MONO Long Life 4I$_N$** series in PPMh, for a continuous duty under highly demanding condition in harmonic rich environments. Rated voltage 415 V, 450 V, 525 V
- Power Factor Controller series **rEvolution R8** with 868 MHz radio module and RS485 and Bluetooth connection. In addition of the NFC module, there's the BT connection to exchange configuration files and status information with **"DUCATI Smart Energy" App**. Auto-sensing of the direction and the position of the TC, to ease the operations of setup. Suitable for cogeneration plants as PV. NFC connection for the exchange of the configurations with **"DUCATI Smart Energy" App**. Optional integration with cloud data sharing system **DUCNET**, through radio 868 MHz transmission
- External steel structure painted with epoxy powder color RAL 7035
- Omni pole disconnecting switch, with door lock, and rated current 1.45 In according to the CEI EN standard
- Contactors designed for controlling capacitive loads, equipped with an inrush current limiting device with 230 V 50 - 60 Hz power supply

General Characteristics

Rated voltage	450 V - 525 V
Rated frequency	50 Hz
Insulating voltage	690 V
Ventilation	Forced
Usage	Indoor
Protection degree	IP30 - IP54
Duty	Continuous
Temperature range	-5 +40 °C
Power supply	3F + PE
Cable entry	Top or bottom
Internal connection	FS17
Discharge devices	On each capacitor
Fuse	NH-00 GL
Standards	IEC 61439 where applicable IEC 61921
I_{SH}	50 kA (0.5 s)

DUCATI 1600-R Un - Cond = 415 V

$THD_{I\ MAX\text{-}C}$ % ≤ 50% THD_I% ≤ 12% Un 400 V - 50 Hz

Qn (kVAr)	Q (400 V) (kVAr)	Bank Power (kVAr)	Steps	In (A)	In sw. (A)	Top Cable entry			Bottom cable entry		
						Part n. 415.04.	LxPxH (mm)	Weight (kg)	Part n. 415.04.	LxPxH (mm)	Weight (kg)
240	223	6 x 40	6	322	630	**1010**	800x600x2250	265	**1010B**	800x600x2250	265
280	260	7 x 40	7	375	630	**1012**	800x600x2250	270	**1012B**	800x600x2250	270
320	297	6 x 40 + 80	8	429	630	**1015**	800x600x2250	275	**1015B**	800x600x2250	275
360	334	5 x 40 + 2 x 80	9	483	1000	**1017**	800x600x2250	285	**1017B**	800x600x2250	295
400	371	4 x 40 + 3 x 80	10	536	1000	**1020**	800x600x2250	290	**1020B**	800x600x2250	298
440	408	3 x 40 + 4 x 80	11	590	1000	**1022**	800x600x2250	295	**1022B**	800x600x2250	300
480	445	2 x 40 + 5 x 80	12	644	1000	**1025**	800x600x2250	300	**1025B**	800x600x2250	305
520	483	3 x 40 + 5 x 80	13	697	1250	**1027**	800x600x2250	310	**1027B**	800x600x2250	310
560	520	2 x 40 + 6 x 80	14	751	1250	**1030**	800x600x2250	315	**1030B**	800x600x2250	315
600	557	3 x 40 + 6 x 80	15	805	1250	**1032**	800x600x2250	320	**1032B**	800x600x2250	320
640	594	2 x 40 + 7 x 80	16	858	1250	**1035**	800x600x2250	325	**1035B**	800x600x2250	325
680	631	3 x 40 + 7 x 80	17	912	1600	**1037**	800x600x2250	335	**1037B**	1600x600x2250	580
720	668	2 x 40 + 8 x 80	18	965	1600	**1040**	800x600x2250	345	**1040B**	1600x600x2250	582
800	743	2 x 40 + 7 x 80 + 160	20	1073	1600	**1045**	800x600x2250	350	**1045B**	1600x600x2250	585
880	817	2 x 40 + 6 x 80 + 2 x 160	22	1180	1000 + 1000	**1050**	1600x600x2250	580	**1050B**	1600x600x2250	588
960	891	8 x 80 + 2 x 160	12	1287	1000 + 1000	**1055**	1600x600x2250	590	**1055B**	1600x600x2250	590
1040	966	7 x 80 + 3 x 160	13	1395	1000 + 1250	**1060**	1600x600x2250	605	**1060B**	1600x600x2250	605
1120	1040	6 x 80 + 4 x 160	14	1502	1000 + 1250	**1065**	1600x600x2250	615	**1065B**	1600x600x2250	615
1200	1114	5 x 80 + 5 x 160	15	1609	1250 + 1250	**1070**	1600x600x2250	630	**1070B**	1600x600x2250	630
1280	1189	4 x 80 + 6 x 160	16	1716	1250 + 1250	**1075**	1600x600x2250	635	**1075B**	1600x600x2250	635
1360	1263	3 x 80 + 7 x 160	17	1824	1250 + 1600	**1080**	1600x600x2250	650	**1080B**	2400x600x2250	850
1440	1337	2 x 80 + 8 x 160	18	1931	1250 + 1600	**1085**	1600x600x2250	665	**1085B**	2400x600x2250	855
1520	1412	3 x 80 + 6 x 160 + 320	19	2038	1600 + 1600	**1090**	1600x600x2250	680	**1090B**	2400x600x2250	860
1600	1486	2 x 80 + 7 x 160 + 320	20	2145	1600 + 1600	**1095**	1600x600x2250	700	**1095B**	2400x600x2250	865

DUCATI 1600-R Un - Cond = 450 V

$THD_{I\ MAX-C}$ % ≤ 70% THD_I% ≤ 20% Un 400 V - 50 Hz

Qn (kVAr)	Q (400 V) (kVAr)	Bank Power (kVAr)	Steps	In (A)	In sw. (A)	Top cable entry			Bottom cable entry		
						Part n. 415.04.	LxPxH (mm)	Weight (kg)	Part n. 415.04.	LxPxH (mm)	Weight (kg)
240	189	6 x 40	6	274	630	**1110**	800x600x2250	265	**1110B**	800x600x2250	265
280	221	7 x 40	7	319	630	**1112**	800x600x2250	270	**1112B**	800x600x2250	270
320	252	6 x 40 + 80	8	365	630	**1115**	800x600x2250	275	**1115B**	800x600x2250	275
360	284	5 x 40 + 2 x 80	9	411	1000	**1117**	800x600x2250	285	**1117B**	800x600x2250	295
400	316	4 x 40 + 3 x 80	10	456	1000	**1120**	800x600x2250	290	**1120B**	800x600x2250	298
440	347	3 x 40 + 4 x 80	11	502	1000	**1122**	800x600x2250	295	**1122B**	800x600x2250	300
480	379	2 x 40 + 5 x 80	12	547	1000	**1125**	800x600x2250	300	**1125B**	800x600x2250	305
520	410	3 x 40 + 5 x 80	13	593	1250	**1127**	800x600x2250	310	**1127B**	800x600x2250	310
560	442	2 x 40 + 6 x 80	14	639	1250	**1130**	800x600x2250	315	**1130B**	800x600x2250	315
600	474	3 x 40 + 6 x 80	15	684	1250	**1132**	800x600x2250	320	**1132B**	800x600x2250	320
640	505	2 x 40 + 7 x 80	16	730	1250	**1135**	800x600x2250	325	**1135B**	800x600x2250	325
680	537	3 x 40 + 7 x 80	17	776	1600	**1137**	800x600x2250	335	**1137B**	1600x600x2250	580
720	568	2 x 40 + 8 x 80	18	821	1600	**1140**	800x600x2250	345	**1140B**	1600x600x2250	582
800	632	2 x 40+7 x 80+160	20	912	1600	**1145**	800x600x2250	350	**1145B**	1600x600x2250	585
880	695	2 x 40+ 6 x 80 + 2 x 160	22	1004	1000 + 1000	**1150**	1600x600x2250	580	**1150B**	1600x600x2250	588
960	758	8 x 80 + 2 x 160	12	1095	1000 + 1000	**1155**	1600x600x2250	590	**1155B**	1600x600x2250	590
1040	821	7 x 80 + 3 x 160	13	1186	1000 + 1250	**1160**	1600x600x2250	605	**1160B**	1600x600x2250	605
1120	884	6 x 80 + 4 x 160	14	1277	1000 + 1250	**1165**	1600x600x2250	615	**1165B**	1600x600x2250	615
1200	948	5 x 80 + 5 x 160	15	1369	1250 + 1250	**1170**	1600x600x2250	630	**1170B**	1600x600x2250	630
1280	1011	4 x 80 + 6 x 160	16	1460	1250 + 1250	**1175**	1600x600x2250	635	**1175B**	1600x600x2250	635
1360	1074	3 x 80 + 7 x 160	17	1551	1250 + 1600	**1180**	1600x600x2250	650	**1180B**	2400x600x2250	850
1440	1137	2 x 80 + 8 x 160	18	1642	1250 + 1600	**1185**	1600x600x2250	665	**1185B**	2400x600x2250	855
1520	1201	3 x 80 + 6 x 160 + 320	19	1733	1600 + 1600	**1190**	1600x600x2250	680	**1190B**	2400x600x2250	860
1600	1264	2 x 80 + 7 x 160 + 320	20	1825	1600 + 1600	**1195**	1600x600x2250	700	**1195B**	2400x600x2250	865

IP54 on demand (same sizes as the previous table).

DUCATI 1600-R Un - Cond = 525 V

$THD_{I\ MAX\text{-}C}$ % ≤ 85% THD_I% ≤ 27% Un 400 V - 50 Hz

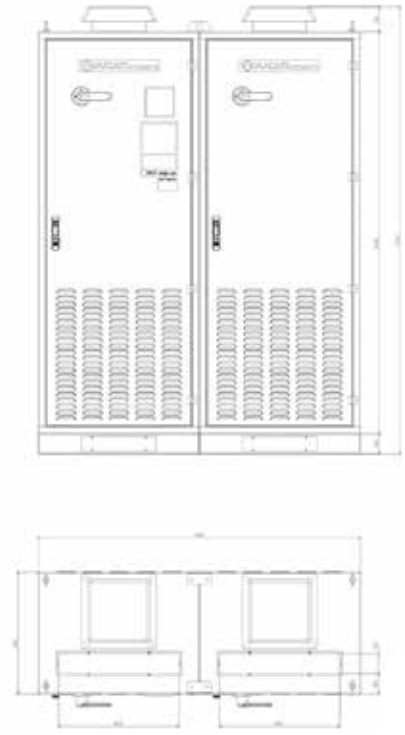
Qn (kVAr)	Q (400 V) (kVAr)	Bank Power (kVAr)	Steps	In (A)	In sw. (A)	Top cable entry			Bottom cable entry		
						Part n. 415.04.	LxPxH (mm)	Weight (kg)	Part n. 415.04.	LxPxH (mm)	Weight (kg)
240	139	6 x 40	6	201	630	**1210**	800x600x2250	265	**1210B**	800x600x2250	265
280	162	7 x 40	7	235	630	**1212**	800x600x2250	270	**1212B**	800x600x2250	270
320	185	6 x 40 + 80	8	268	630	**1215**	800x600x2250	275	**1215B**	800x600x2250	275
360	209	5 x 40 + 2 x 80	9	302	1000	**1217**	800x600x2250	285	**1217B**	800x600x2250	295
400	232	4 x 40 + 3 x 80	10	335	1000	**1220**	800x600x2250	290	**1220B**	800x600x2250	298
440	255	3 x 40 + 4 x 80	11	369	1000	**1222**	800x600x2250	295	**1222B**	800x600x2250	300
480	278	2 x 40 + 5 x 80	12	402	1000	**1225**	800x600x2250	300	**1225B**	800x600x2250	305
520	301	3 x 40 + 5 x 80	13	436	1250	**1227**	800x600x2250	310	**1227B**	800x600x2250	310
560	325	2 x 40 + 6 x 80	14	469	1250	**1230**	800x600x2250	315	**1230B**	800x600x2250	315
600	348	3 x 40 + 6 x 80	15	503	1250	**1232**	800x600x2250	320	**1232B**	800x600x2250	320
640	371	2 x 40 + 7 x 80	16	536	1250	**1235**	800x600x2250	325	**1235B**	800x600x2250	325
680	394	3 x 40 + 7 x 80	17	570	1600	**1237**	800x600x2250	335	**1237B**	1600x600x2250	580
720	418	2 x 40 + 8 x 80	18	603	1600	**1240**	800x600x2250	345	**1240B**	1600x600x2250	582
800	464	2 x 40 + 7 x 80 + 160	20	670	1600	**1245**	800x600x2250	350	**1245B**	1600x600x2250	585
880	510	2 x 40 + 6 x 80 + 2 x 160	22	737	1000 + 1000	**1250**	1600x600x2250	580	**1250B**	1600x600x2250	588
960	557	8 x 80 + 2 x 160	12	804	1000 + 1000	**1255**	1600x600x2250	590	**1255B**	1600x600x2250	590
1040	603	7 x 80 + 3 x 160	13	871	1000 + 1250	**1260**	1600x600x2250	605	**1260B**	1600x600x2250	605
1120	650	6 x 80 + 4 x 160	14	938	1000 + 1250	**1265**	1600x600x2250	615	**1265B**	1600x600x2250	615
1200	696	5 x 80 + 5 x 160	15	1005	1250 + 1250	**1270**	1600x600x2250	630	**1270B**	1600x600x2250	630
1280	743	4 x 80 + 6 x 160	16	1072	1250 + 1250	**1275**	1600x600x2250	635	**1275B**	1600x600x2250	635
1360	789	3 x 80 + 7 x 160	17	1140	1250 + 1600	**1280**	1600x600x2250	650	**1280B**	2400x600x2250	850
1440	835	2 x 80 + 8 x 160	18	1207	1250 + 1600	**1285**	1600x600x2250	665	**1285B**	2400x600x2250	855
1520	882	3 x 80 + 6 x 160 + 320	19	1274	1600 + 1600	**1290**	1600x600x2250	680	**1290B**	2400x600x2250	860
1600	928	2 x 80 + 7 x 160 + 320	20	1341	1600 + 1600	**1295**	1600x600x2250	700	**1295B**	2400x600x2250	865

IP54 on demand (same sizes as the previous table).

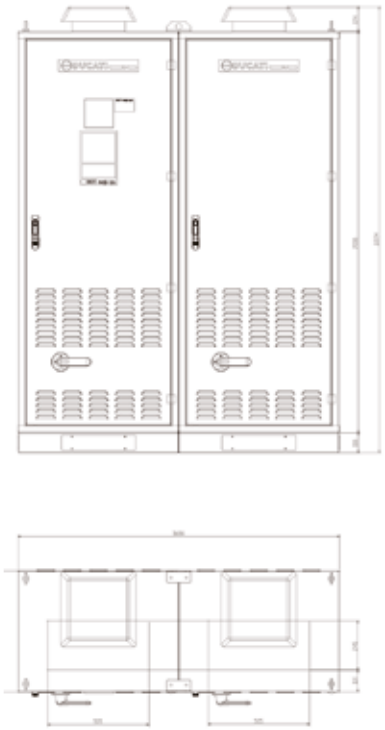
TECHNICAL DRAWING DUCATI 1600-R

1 Door top cable entry

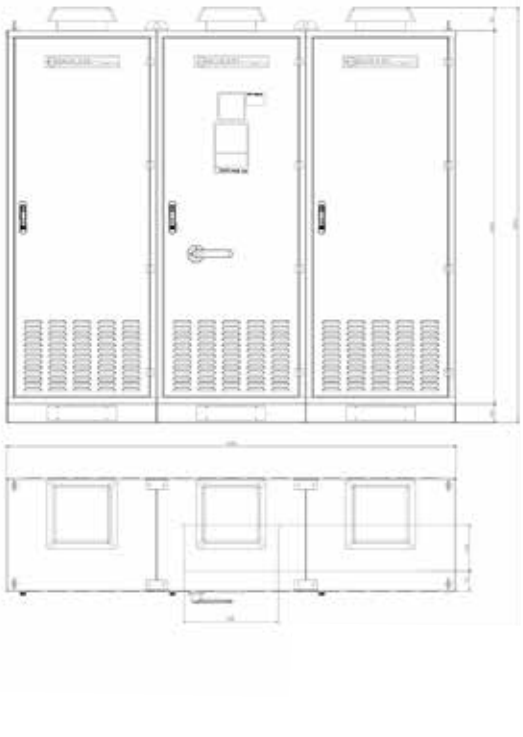
1 Door bottom cable entry



2 Doors top cable entry



2 Doors bottom cable entry



3 Doors bottom cable entry

DUCATI 170-ML

Automatic equipment with detuning reactors

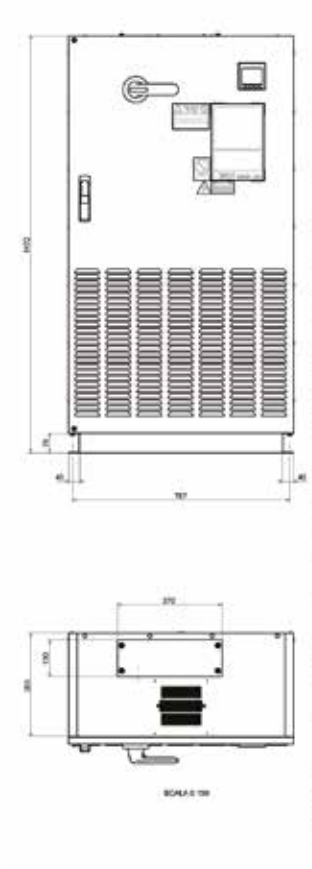
Technical details

- Single-phase capacitors **MONO Long Life 4I$_N$** series in PPMh, for a continuous duty under highly demanding condition in harmonic rich environments. Rated voltage 480 V
- Power Factor Controller series **rEvolution R5** 485 radio. Auto-sensing of the direction and the position of the TC, to ease the operations of setup. Suitable for cogeneration plants as PV. NFC connection for the exchange of the configurations with **"DUCATI Smart Energy" App**. Optional integration with cloud data sharing system **DUCNET**, through RS485 connection or radio 868 MHz transmission
- Harmonic filter reactors with tuning frequency 189 Hz (p= 7%)
- External steel structure painted with epoxy powder color RAL 7035
- Omni pole disconnecting switch, with door lock, and rated current 1.45 In according to the CEI EN standard
- Contactors designed for controlling capacitive loads, equipped with an inrush current limiting device with 230 V 50 - 60 Hz power supply

General Characteristics

Rated voltage	400 V
Rated frequency	50 Hz
Insulating voltage	690 V
Ventilation	Forced
Usage	Indoor
Protection degree	IP30
Duty	Continuous
Temperature range	-5 +40 °C
Power supply	3PH + PE
Cable entry	Top
Internal connection	FS17
Discharge devices	On each capacitor
Fuse	NH-00 GL
Standards	IEC 61439 where applicable IEC 61921
I_{SH}	50 kA (conditioned by the upstream protective device)

TECHNICAL DRAWING DUCATI 170-ML



DUCATI 170-ML
Un - Cond = 480 V FILTER 189 Hz(*)

THD$_I$% ≤ 80%(*) THD$_V$% ≤ 6%(*) Un 400 V - 50 Hz

Part n. 415.04.	Qn (kVAr) (400 V)	Bank Power (kVAr)	Steps	In (A)	In sw. (A)	LxPxH (mm)	Weight (kg)
2110N	25.5	3 x 8.5	3	37	160	800x400x1470	170
2115N	34	2 x 8.5 + 17	4	49	160	800x400x1470	170
2120N	42.5	8.5 + 2 x 17	5	61	160	800x400x1470	175
2125N	59.5	8.5 + 17+34	7	86	160	800x400x1470	185
2130N	68	2 x 17 + 34	4	98	160	800x400x1470	185
2135N	85	17 + 2 x 34	5	123	250	800x400x1470	190
2140N	102	2 x 17 + 2 x 34	6	147	250	800x400x1470	220
2145N	119	17 + 3 x 34	7	172	250	800x400x1470	220
2150N	136	2 x 17 + 3 x 34	8	196	400	800x400x1470	240
2155N	153	17 + 4 x 34	9	221	400	800x400x1470	245
2160N	170	5 x 34	5	245	400	800x400x1470	250

* Other operating voltages and tuning frequencies available upon request.

DUCATI 1000-RL

Automatic equipment with detuning reactors

Technical details

- Single-phase capacitors **MONO Long Life 4$_{IN}$** series in PPMh, for a continuous duty under highly demanding condition in harmonic rich environments. Rated voltage 480 V
- Power Factor Controller series **rEvolution R8** with 868 MHz radio module and RS485 and Bluetooth connection. In addition of the NFC module, there's BT connection to exchange configuration files and status information with **"DUCATI Smart Energy" App**. Auto-sensing of the direction and the position of the TC, to ease the operations of setup. Suitable for cogeneration plants as PV. NFC connection for the exchange of the configurations with **"DUCATI Smart Energy" App**. Optional integration with cloud data sharing system **DUCNET**, through radio 868 MHz transmission
- Harmonic filter reactors with tuning frequency 189 Hz (p= 7%)
- External steel structure painted with epoxy powder color RAL 7035, with modular chassis style internal structure
- Omni pole disconnecting switch, with door lock, and rated current 1.45 In according to the CEI EN standard
- Contactors designed for controlling capacitive loads, equipped with an inrush current limiting device with 230 V 50 - 60 Hz power supply

General Characteristics

Rated voltage	400 V
Rated frequency	50 Hz
Insulating voltage	690 V
Ventilation	Forced
Usage	Indoor
Protection degree	IP30 - IP54
Duty	Continuous
Temperature range	-5 +40 °C
Power supply	3F + PE
Cable entry	Top or bottom
Internal connection	FS17
Discharge devices	On each capacitor
Fuse	NH-00 GL
Standards	IEC 61439 where applicable IEC 61921
I_{SH}	50 kA (0.5 s)

DUCATI 1000-RL Un - Cond = 480 V FILTER 189 Hz(*)

THD_I% ≤ 80%(*) THD_V% ≤ 6%(*) Un 400 V - 50 Hz

Qn (kVAr) (400 V)	Bank Power (kVAr)	Steps	In (A)	In sw. (A)	Top cable entry			Bottom cable entry		
					Part n. 415.04.	LxPxH (mm)	Weight (kg)	Part n. 415.04.	LxPxH (mm)	Weight (kg)
150	2 x 25 + 2 x 50	6	217	630	**2010**	800x600x2250	360	**2010B**	800x600x2250	360
175	25 + 3 x 50	7	253	630	**2015**	800x600x2250	365	**2015B**	800x600x2250	365
200	4 x 50	4	289	630	**2020**	800x600x2250	370	**2020B**	800x600x2250	370
200	2 x 25 + 3 x 50	8	289	630	**2023**	800x600x2250	400	**2023B**	800x600x2250	460
250	5 x 50	5	361	630	**2025**	800x600x2250	410	**2025B**	800x600x2250	465
300	6 x 50	6	433	630	**2030**	800x600x2250	445	**2030B**	800x600x2250	475
350	7 x 50	7	505	1000	**2035**	800x600x2250	485	**2035B**	800x600x2250	485
400	8 x 50	8	577	1000	**2040**	800x600x2250	520	**2040B**	800x600x2250	520
500	10 x 50	10	722	1000	**2045**	800x600x2250	595	**2045B**	1600x600x2250	885
600	6 x 50 + 3 x 100	12	866	630 + 630	**2050**	1600x600x2250	890	**2050B**	1600x600x2250	890
700	6 x 50 + 4 x 100	14	1010	630 + 1000	**2055**	1600x600x2250	965	**2055B**	1600x600x2250	965
800	4 x 50 + 6 x 100	16	1155	1000 + 1000	**2060**	1600x600x2250	1045	**2060B**	1600x600x2250	1045
900	2 x 50 + 8 x 100	18	1299	1000 + 1000	**2065**	1600x600x2250	1110	**2065B**	2400x600x2250	1350
1000	2 x 50 + 7 x 100 + 200	20	1443	1000 + 1000	**2070**	1600x600x2250	1190	**2070B**	2400x600x2250	1430

* Other operating voltages and tuning frequencies available upon request.
IP54 on demand (same sizes as the previous table).

TECHNICAL DRAWING DUCATI 1000-RL

1 Door top cable entry

1 Door bottom cable entry

2 Doors top cable entry

2 Doors bottom cable entry

DUCATI 1000-RL/HP

Automatic equipment with detuning reactors

Technical details

- Single-phase capacitors GP84 series in PPMh for high performance, built exclusively with dual-element series to work in systems characterized by high harmonic currents. Rated voltage 550 V
- Power Factor Controller series **rEvolution R8** with 868 MHz radio module and RS485 and Bluetooth connection. In addition of the NFC module, there's BT connection to exchange configuration files and status information with **"DUCATI Smart Energy" App**. Auto-sensing of the direction and the position of the TC, to ease the operations of setup. Suitable for cogeneration plants as PV. NFC connection for the exchange of the configurations with **"DUCATI Smart Energy" App**. Optional integration with cloud data sharing system DUCNET, through radio 868 MHz transmission
- Harmonic filter reactors with tuning frequency 189 Hz (p= 7%)
- External steel structure painted with epoxy powder color RAL 7035, with modular chassis style internal structure
- Omni pole disconnecting switch, with door lock, and rated current 1.45 In according to the CEI EN standard
- Contactors designed for controlling capacitive loads, equipped with an inrush current limiting device with 230 V 50 - 60 Hz power supply

General Characteristics

Rated voltage	400 V
Rated frequency	50 Hz
Insulating voltage	690 V
Ventilation	Forced
Usage	Indoor
Protection degree	IP30 - IP54
Duty	Continuous
Temperature range	-5 +40 °C
Power supply	3F + PE
Cable entry	Top or bottom
Internal connection	FS17
Discharge devices	On each capacitor
Fuse	NH-00 GL
Standards	IEC 61439 where applicable IEC 61921
I_{SH}	50 kA (0.5 s)

DUCATI 1000-RL/HP Un - Cond = 550 V FILTER 189 Hz (*)

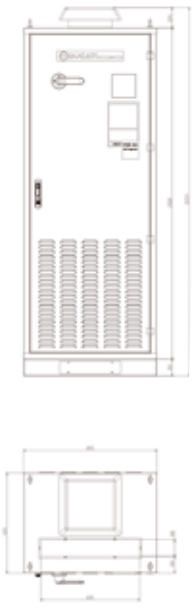
THD_I% ≤ 100%(*) THD_V% ≤ 7%(*) Un 400 V - 50 Hz

Qn (kVAr) (400 V)	Bank Power (kVAr)	Steps	In (A)	In sw. (A)	Top cable entry			Bottom cable entry		
					Part n. 415.04.	LxPxH (mm)	Weight (kg)	Part n. 415.04.	LxPxH (mm)	Weight (kg)
132	2 x 22 + 2 x 44	6	191	630	**2510**	800x600x2250	380	**2510B**	800x600x2250	380
176	4 x 44	4	254	630	**2515**	800x600x2250	400	**2515B**	800x600x2250	400
264	6 x 44	6	381	630	**2520**	800x600x2250	480	**2520B**	800x600x2250	480
352	8 x 44	8	508	1000	**2525**	800x600x2250	600	**2525B**	800x600x2250	600
440	10 x 44	10	635	1000	**2530**	1600x600x2250	850	**2530B**	1600x600x2250	850
528	6 x 44 + 3 x 88	12	762	1250	**2535**	1600x600x2250	930	**2535B**	1600x600x2250	930
616	6 x 44 + 4 x 88	14	889	1600	**2540**	1600x600x2250	1000	**2540B**	1600x600x2250	1000
704	4 x 44 + 6 x 88	16	1016	1600	**2545**	1600x600x2250	1080	**2545B**	1600x600x2250	1080
792	2 x 44 + 8 x 88	18	1143	2500	**2550**	2400x600x2250	1400	**2550B**	2400x600x2250	1400
880	2 x 44 + 7 x 88 + 176	20	1270	2500	**2555**	2400x600x2250	1500	**2555B**	2400x600x2250	1500
968	2 x 44+ 6 x 88 + 2 x 176	22	1397	2500	**2560**	2400x600x2250	1600	**2560B**	2400x600x2250	1600
1056	8 x 88 + 2 x 176	12	1524	2500	**2565**	2400x600x2250	1700	**2565B**	2400x600x2250	1700

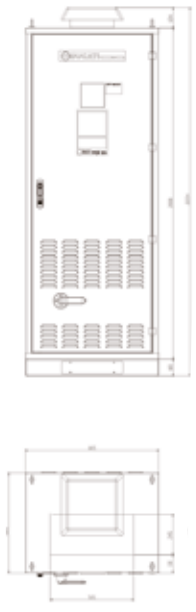
* Other operating voltages and tuning frequencies available upon request.

IP54 on demand (same sizes as the previous table).

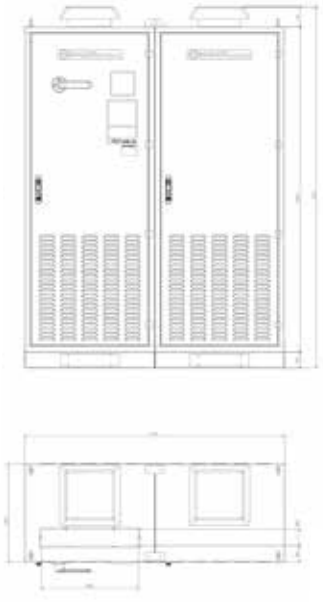
TECHNICAL DRAWING DUCATI 1000-RL/HP



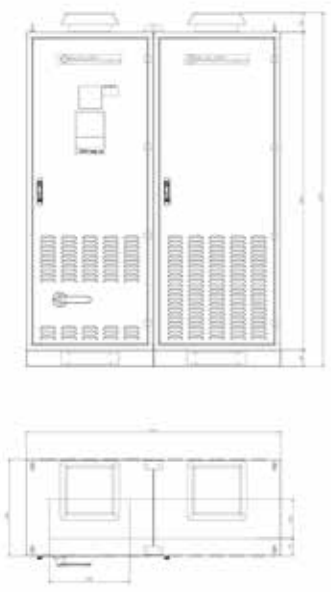
1 Door top cable entry



1 Door bottom cable entry



2 Doors top cable entry



2 Doors bottom cable entry

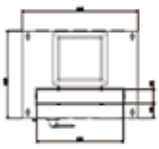
DUCATI 1000-RL/S

Real time automatic PFC equipment

Technical details

- Single-phase capacitors **MONO Long Life 4I$_N$** series in PPMh, for a continuous duty under highly demanding condition in harmonic rich environments. Rated voltage 480 V
- Power factor **controller FCR** with enhanced VLSI and Digital Signal Processor system for FFT measurement. Realtime analysis with duty cycle around 5 millisecond RS-485
- Communication serial port RS-485 and built-in customization help software
- Harmonic filter reactors with tuning frequency 189 Hz (p= 7%)
- External steel structure painted with epoxy powder color RAL 7035, with modular chassis style internal structure
- Omni pole disconnecting switch, with door lock, and rated current 1.45 In according to the CEI EN standard
- **Static Switching Module SCR**, suitable for controlling capacitive loads, inserted outside the delta connection formed by the single-phase capacitive elements

General Characteristics	
Rated voltage	400 V
Rated frequency	50 Hz
Insulating voltage	690 V
Ventilation	Forced
Usage	Indoor
Protection degree	IP30
Duty	Continuous
Temperature range	-5 +40 °C
Power supply	3F + PE
Cable entry	Top
Internal connection	FS17
Discharge devices	On each capacitor according to EN 60831 standard
Fuse	NH-00 GL
Standards	EN 61000-4-2 EN 50081-2 EN 50082-2 IEC 61921 -1/2



TECHNICAL DRAWING DUCATI 1000-RL/S

DUCATI 1000-RL/S
Un - Cond = 480 V FILTER 189 Hz

THD$_I$ % ≤ 80%(*) THD$_V$% ≤ 6%(*) Un 400 V - 50 Hz

Part no. 415.14.	Q (400 V) (kVAr)	Bank Power (kVAr)	Steps	In (A)	In sw. (A)	LxPxH (mm)	Weight (kg)
1360	250	2 x 25 + 4 x 50	10	361	630	800x700x2150	465
1365	300	6 x 50	6	433	630	800x700x2150	505
1370	350	7 x 50	7	505	1000	1600x700x2150	780
1372	400	8 x 50	8	577	1000	1600x700x2150	820
1375	450	9 x 50	9	650	1000	1600x700x2150	860
1380	500	10 x 50	10	722	1000	1600x700x2150	900
1385	550	11 x 50	11	794	1250	1600x700x2150	940
1390	600	12 x 50	12	866	1250	1600x700x2150	980

* Other operating voltages and tuning frequencies available upon request.

DUCATI ACTISINE

Active harmonic filters

ActiSine measures and eliminates harmonic currents in real-time by compensating them with equal and opposed currents.
Active compensation is:

- **EFFECTIVE:** its performance is independent from the network's characteristics and dimensioning is simple and straightforward
- **RELIABLE:** because it automatically and instantaneously adapts to the loads' operation and cannot be overloaded

Technical details

- **ActiSine** active filter technology guarantees excellent results (residual THD < 3%) independently from the network's characteristics. The FULL rated current can be dedicated to harmonic current compensation
- **ActiSine** is equipped with a DSP controller (Digital Signal Processor), assuring a REAL TIME response (< 20 ms, within a cycle of the mains voltage)
- **ActiSine** is dimensioned basing on a simple harmonic measurement and is univocal, because it depends exclusively on the harmonic currents
- **ActiSine** cannot be overloaded. If the harmonic currents should exceed the value for which the filter is dimensioned, the system will limit its action to its nominal current, filtering the maximum possible amount of harmonics
- **ActiSine** combines a modular structure with the possibility of connecting up to 8 units in parallel, in order to obtain very high powers. These characteristics ensure the maximal flexibility during installation and the expandability of the system
- Harmonics of 3rd order (and order 9th, 15th, …, 6n+3) generated by single-phase distorting loads (PCs, copying machines, electronic ballasts) add up in the neutral cables, overloading them. **ActiSine** is available as three-phase + neutral version, capable of effectively canceling these harmonics
- With its default settings **ActiSine** acts on all harmonics up to the 51st. The user can also set up to 12 harmonics on which to concentrate the filtering action. Moreover, **ActiSine** can be set to use part of its current to correct the load's power factor and can be used together with traditional capacitor-based PFC equipment, as long as they are equipped with detuning reactors
- The installation is simple and flexible because **ActiSine** is connected in parallel to the loads to be filtered and the CTs for the current measurement can be mounted up or down-stream (closed or open loop control). The startup is immediate thanks to default and automatic settings. The user interface is simple and straightforward

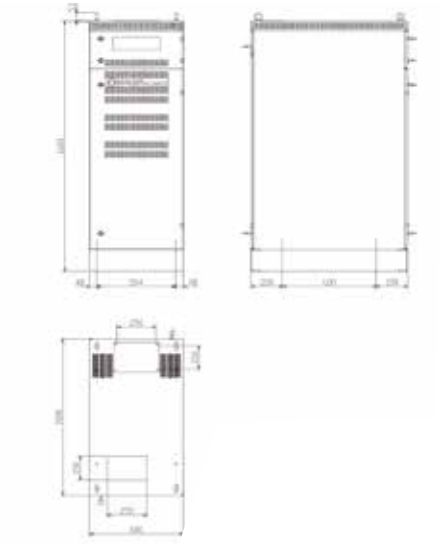
General Characteristics

Rated voltage	400 V /480 V
Voltage tolerance	-20 +15 %
Rated frequency	50 Hz/60 Hz
Insulating voltage	690 V
Ventilation	Forced
Usage	Indoor
Protection degree	IP30
Duty	Continuous
Temperature range	-5 +40 °C
Power supply	3F o 3F + N
Cable entry	Top or bottom
Color	RAL 7035
Harmonic compensations	From 2° to 51°
Response time	< 20 ms
Standards	EN 60146

DUCATI Active Filter Un = 400 V

Power Range: 35 – 120 A - Harmonic orders: 2° - 51°

TECHNICAL DRAWING DUCATI ACTISINE



Part n. 415.14	I - L1/L2/L3 (Arms)	I - neutral (Arms)	LxPxH (mm)	Weight (kg)
		3 phases – 3 wires		
2001 K	35	-	600x1000x1600	75
2002 K	60	-	600x1000x1600	120
2003 K	90	-	600x1000x1600	190
2004 K	120	-	600x1000x1600	235
		3 phases – 4 wires		
2005 K	35	105	600x1000x1600	75
2006 K	60	180	600x1000x1600	120
2007 K	90	270	600x1000x1600	190
2008 K	120	360	600x1000x1600	235

DUCATI Active Filter Un = 480 V

Power Range: 30 – 100 A - Harmonic orders: 2° - 51°

Part n. 415.14	I - L1/L2/L3 (Arms)	I - neutral (Arms)	LxPxH (mm)	Weight (kg)
		3 phases – 3 wires		
2011 K	30	-	600x1000x1600	85
2012 K	50	-	600x1000x1600	130
2013 K	75	-	600x1000x1600	200
2014 K	100	-	600x1000x1600	245
		3 phases – 4 wires		
2015 K	30	90	600x1000x1600	85
2016 K	50	150	600x1000x1600	130
2017 K	75	225	600x1000x1600	200
2018 K	100	300	600x1000x1600	245

APPENDIX

Glossary

Cosφ. In an electrical system the phi (φ) is the phase shift between voltage and current at the fundamental frequency of 50Hz. The cosφ is a dimensionless number between 0 and 1 that represent this shift.

Power Factor. It's a ratio between the active power and the apparent power and as cosφ has value between 0 and 1. In a system without harmonics, cosφi and Power Factor are the same; in a system with harmonic, the power factor is always less than the cosφ.

Nominal Voltage of the capacitor (Un) it's the rated voltage or the capacitor, at which its output rated power is given. This is the maximum effective value of the alternating sinusoidal voltage for which the capacitor was designed.

Nominal Power of the Capacitor (Qn) it's the reactive power delivered by the capacitor at the rated voltage and frequency applied.

Rated capacitance (Cn) This is the value of the capacitance which permits the delivery of the rated power when the rated voltage and frequency are applied to the terminals.

Rated current (In) this is the effective value of the alternating current that circulates through the capacitor when the rated voltage and frequency are applied at the rated capacitance.

Insulation voltage. For a PFC system that complies with IEC 60429-1/2, the insulation voltage is indicative of the maximum voltage that the entire system can withstand.

Short circuit current I_{SH}. As indicated in the IEC 61429-1 it the prospective short circuit current that the cabinet can endure for a specified time. It's a value stated by the manufacturer based on laboratory tests. It can be increased by installing fuses in this case the data must indicate the presence of the fuses.

Steps of an automatic PFC unit. They are the physical units of the bank, each of them controlled by a dedicated switching device.

Combinations it's the number of the different configurations that the PFC unit can made with the combinations of the physical steps For example, a 160 kvar unit with steps 20-20-40-40-40 can use 8 different combinations: 20-40-60-80-100-120-140-160. The more combinations can be used, the better flexibility to use the PFC unit.

THD (Total Harmonic Distorsion). For a periodic non-sinusoidal wave, the THD is the ratio between the rms value of all harmonic components and the rms value of the fundamental 50 Hz.

THD_{IC} it's the maximum THD that a capacitor can bear in terms of current passing through it.

THD_{IR} it' the maximum THD present in the plant without any PFC unit on. It's useful to define the type of the capacitor to install.

THD_{V} it's the voltage THD that a PFC bank with harmonic blocking reactors can bear.

Operating conditions

Unlike most electrical equipment, power factor correction capacitors, each time they are energized, continuously operate at full load or at loads which differ from this value only as a consequence of variations in voltage and frequency. Overstressing and overheating shorten the lifespan of the capacitor. For this reason the operating conditions (temperature, voltage and current) must be carefully controlled in order to obtain optimum results as regards the lifespan of the capacitor.

Voltage

The capacitors are produced in accordance with standards EN 60831-1/2, which regulate their manufacture, testing, installation and application of capacitors, indicating the following maximum overvoltages:

- +10% for 8 hours every 24 hours
- +15% for 30 minutes every 24 hours
- +20% for 5 minutes
- +30% for 1 minute

Overvoltages in excess of 15% should not occur more than 200 times during the life of a capacitor.
When overload conditions may be assumed to occur during service – in the presence of a moderate harmonic load for example – it is common to use capacitors that are oversized in terms of voltage.
In such cases the output power at the operating voltage will be reduced in comparison with the rated load. It is advisable to evaluate the reduction occurring in the output power on the basis of the ratio between the operating voltage and the rated voltage.

$Q_{resa} = Qn \times (Ue/Un)^2$

Where:
Ue= Operating voltage Q_{resa} = Output power at Ue
The table below shows the power output by a 100 kvar capacitor used on a 400 V network having a rated voltage respectively of 415, 450 and 525 V.

U_n [V]	415	450	525
Q_{resa} [kVAr]	93	79	58

Temperature

The temperature of the capacitor during operation is the parameter that, along with the voltage, has the greatest influence on the lifespan of a capacitor.
It is important that the capacitor always be placed in a position where cooling air can freely circulate and away from the radiant heat of hot surfaces of other components.
When capacitors are placed in closed cabinets it is necessary to have air vents which allow for an easy exchange of air between the interior and exterior of the cabinet. Where the degree of protection of the cabinet does not permit such an exchange to take place, the positioning of the capacitors must be carefully planned so as to provide the necessary channels for the circulation of cooling air. In this case, suitable fans will have to be installed to force cooling air through the cabinet. As a rule, the temperature of the cooling air inside the cabinet should not differ from the outside air temperature by more than 5 °C.

Cooling air temperature
This is the temperature of the cooling air measured at the hottest point of the capacitor bank, under working conditions, halfway between two capacitors or on the surface of one of them.

Ambient temperature class
This represents the range of cooling air temperatures in which the capacitor is designed to operate. There are 4 standard categories represented by a number and a letter or by two numbers as shown in the table.

Category		Category Ambient air temperature		
		Max	Highest mean over any period of:	
			24 h	1 Year
-25/A	-25 +40 °C	40	30	20
-25/B	-25 +45 °C	45	35	25
-25/C	-25 +50 °C	50	40	30
-25/D	-25 +55 °C	55	45	35

The first number represents the minimum cooling air temperature at which the capacitor can be energized (- 25°C; on request -40°C). The letter or second number represents the upper limit of the temperature range and precisely. the max. value indicated in the table.

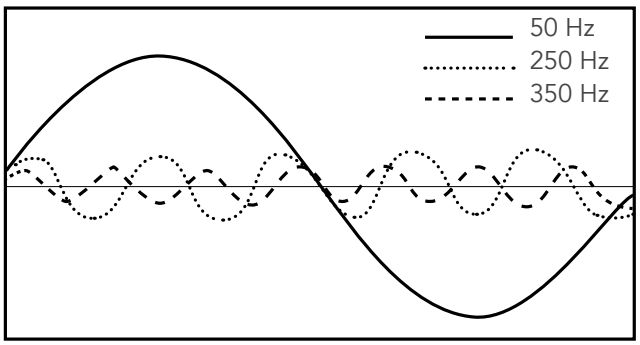
Residual voltage
This is the voltage that remains after the capacitor is disconnected from the network. This voltage must be eliminated in order to avoid exposing the operator to dangerous conditions. All three-phase capacitors are equipped with discharge devices that reduce residual voltage to less than 75 V in 3 minutes.
It is important to bear in mind that the capacitors cannot be energized if there is a residual voltage of more than 10% across them. Particular care must thus be taken to harmonise the capacitor discharge times with the response times of the control devices (Power control relays). In cases where the lag time of the controllers is shorter than the capacitor discharge time, additional discharge devices must be provided so that the connection will occur with a residual voltage not exceeding 10%.

Max current
In accordance with standard EN 60831-1/2, the capacitors are designed to function continuously at an effective current that is 1.3 times the current at the rated voltage and frequency. Bearing in mind the capacitance tolerance, the maximum current may reach 1.5 In, value to which it is necessary to refer in the sizing of the lines of control and protection devices. This overcurrent factor can be determined by the combined effect of harmonics, overvoltages and capacitance tolerance.

Max inrush current
Transient overcurrents having elevated amplitudes and high frequencies occur when the capacitors are switched in to the circuit. This is especially true when a capacitor bank is put in a parallel connection with other already energized banks.
It may therefore be necessary to reduce these transient overcurrents to values acceptable both for the capacitor and the contactor used by connecting the capacitor using suitable devices (resistors or reactors) in the power circuit of the bank.
The crest value of overcurrents caused during switching operations must be limited to a maximum of 100 In (crest value of the 1st cycle).

Protection and safety
To ensure protection, the capacitor elements making up the unit are individually fitted with an overpressure safety device.
The function of this device is to interrupt a short circuit when the capacitor reaches the end of its useful life and is no longer able to regenerate itself. This device breaks the connections of the terminal by exploiting the internal pressure that builds during the film's decomposition, which results from the overheating caused by the short circuit.
It should be noted that an external fuse is not as reliable since the short circuit current, being strongly limited by the metallized surface, may vary widely.
All the capacitors are built with environmentally friendly materials conforming to standards EN 60831-1/2.

The effect of harmonics in electrical systems
A harmonic is defined as one of the components obtained from the breakdown of a periodic wave in the Fourier series. The order of a harmonic is further defined as the ratio between the frequency of the harmonic and the fundamental frequency of the periodic wave considered.
In the case of a perfectly sinusoidal waveform (as should characterize the voltage supplied by the utility) only the fundamental harmonic of the first order will be present, which in Europe has a frequency of 50 Hz.
If a sinusoidal voltage is applied to a load, the circulating current will also have a sinusoidal waveform only in the presence of loads with "linear characteristics".
In the presence of a "non-linear" load the current waveform will deviate from the ideal pattern and breaking down the wave according to the Fourier theorem will show evidence of harmonics whose number and amplitude will increase with the degree of distortion in the current waveform.
The increasingly frequent use of non-linear loads in industrial facilities (inverters, fluorescent lamps, welders, etc.) creates elevated distorsions in the waveform of circulating current.
This is true in the case of ac/dc converters, for which the input current theoretically displays only harmonics of the order:
$h = mp \pm 1$
where m is an integer other than 0 (thus 1, 2, 3, 4, ...) and p is the number of solid-state switches of the bridge. Therefore, a converter with six-phase reaction (p= 6) generates characteristic harmonics of the 5th and 7th order (m= 1), 11th and 13th order (m= 2), 17th and 19th order (m= 3) etc., whereas a converter with twelve-phase reaction (p= 12) generates characteristic harmonics of the 11th and 13th order (m= 1), 23rd and 25th order (m= 2).



The parameter used to determine the level of harmonic distortion presents in an electrical network is THDI% (Total Harmonic Distortion), defined as:

$$TDH_i\%= \frac{\sqrt{\sum_{k=2}^{\infty} I_k^2}}{I_1}$$

Where I_1 is the effective value of the fundamental and Ik represents the effective values of harmonics of order k.

The presence of current harmonics in the system is therefore an indication of a distortion (deviation from a sinusoidal pattern) in the waveform of the current itself.
This results in increased losses due to the Joule effect and the skin effect in the cables and increased losses due to hysteresis and parasite currents in the iron of transformers and motors. In addition, because of the equivalent cable impedances, the mains voltage may also be distorted.

Installing power factor correction capacitors in the network serves to create a condition of parallel resonance between the equivalent capacitance of the capacitors and the equivalent inductance of the system (which may usually be approximated by calculating the equivalent inductance of the transformer) in correspondence to a frequency fr.

$$\int_r = \int_1 \cdot \sqrt{\frac{Scc}{\Omega}}$$

Where S_{cc} indicates the short circuit power of the system (expressed in MVA) at the point where the capacitors are connected and Q is the installed reactive power (expressed in Mvar), the parallel resonance frequency fr is thus determined:

$$S_{cc} = \frac{A}{V_{cc}\%} \cdot 100$$

Where A is the rated power of the transformer (expressed in MVA) and Vcc% is the percentage short circuit voltage of the transformer.
The voltage harmonics present in the system - having a frequency close to the parallel resonance frequency fr - are amplified. For this reason, an extremely high voltage comes to be created at the capacitor terminals, which causes the dielectric to age rapidly and hence significantly shortens the lifespan of the capacitor.

Risk of Explosion and Fire
All capacitors consists mainly of polypropylene. They can rupture and ignite cause of internal faults (malfunction of safety system, if present) or external overload (Overvoltage, overcurrent, high temperature, etc.).
It must be ensured, by appropriate measures, to avoid any risk of explosion, fire and hazard to their environment in the event of malfunction.

Correcting the power factor of MV/LV transformers
It is always a good idea to ensure a power factor correction for MV/LV transformers, since even when they are operating loadless (e.g. during the night) they absorb reactive power, which must be compensated.
The exact capacitor power necessary may be calculated using the formula below:
Q = Io% · Pn/100
Io = loadless current (specified by the transformer manufacturer)
Pn= rated power of the transformer.
Alternatively, if the required data is not available, you can refer to the table below, which differentiates among types of transformers with NORMAL losse

Power transformer	Oil transformer	Resin transformer kVAr
10	1	1.5
20	2	1.7
50	4	2
75	5	2.5
100	5	2.5
160	7	4
200	7.5	5
250	8	7.5
315	10	7.5
400	12.5	8
500	15	10
630	17.5	12.5
800	20	15
1000	25	17.5
1250	30	20
1600	35	22
2000	40	25
2500	50	35
3150	60	50

Power factor correction of three-phase asynchronous motors

One of the most commonly occurring loads is the three-phase asynchronous motor. The table below shows the power factor correction in the case of squirrel-cage motors. An additional 5% is recommended for motors with wound armatures.

The table shows the approximate powers of the capacitor banks to be installed according to motor power.

Reactive power to be installed - Three-phase motor: 230/400 V					
Rated power		Rotation speed (rpm)			
(kW)	(Cv)	3000	15000	1000	750
22	30	6	8	9	10
30	40	7.5	10	11	12.5
37	50	9	11	12.5	16
45	60	11	13	14	17
55	75	13	17	18	21
75	100	17	22	25	28
90	125	20	25	27	30
110	150	24	29	33	37
132	180	31	36	38	43
160	218	35	41	44	52
200	274	43	47	53	61
250	340	52	57	63	71
280	385	57	63	70	79
355	482	67	76	86	98
400	544	78	82	97	106
450	610	87	93	107	117

Minimum cable cross section for equipment power supply

Main voltage 400 V – 50 Hz – 3F		
Qn kVAr	In A	Minimum cablecross-section suggested for phase[1] (mm²)
5	7	2.5
10	14	4
15	22	6
20	29	10
30	43	16
40	58	16
50	72	35
100	144	70
200	288	185 opp./or2x70
300	433	2x150
400	576	2x240
500	722	3x185
600	864	3x240
700	1010	4x240
800	1154	4x240
900	1300	6x185
1000	1443	6x240

(1) = Values reported for single-core PVC cables in free air laid not separated on horizontal shelves. For other types of cables and/or installation refer to IEC 60364-5, CEI 64-8 and table UNEL 35024/1.

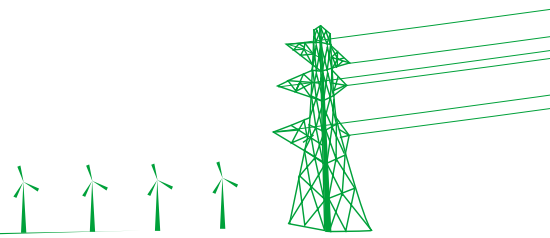
K FACTOR

Existing values		Target cosφ															
tgφ	cosφ	0.85	0.86	0.87	0.88	0.89	0.90	0.91	0.92	0.93	0.94	0.95	0.96	0.97	0.98	0.99	1.00
3.18	0.30	2.560	2.586	2.613	2.640	2.667	2.695	2.724	2.754	2.785	2.817	2.851	2.888	2.929	2.977	3.037	3.180
3.07	0.31	2.447	2.474	2.500	2.527	2.555	2.583	2.611	2.641	2.672	2.704	2.738	2.775	2.816	2.864	2.924	3.067
2.96	0.32	2.341	2.367	2.394	2.421	2.448	2.476	2.505	2.535	2.565	2.598	2.632	2.669	2.710	2.758	2.818	2.961
2.86	0.33	2.241	2.267	2.294	2.321	2.348	2.376	2.405	2.435	2.465	2.498	2.532	2.569	2.610	2.657	2.718	2.861
2.77	0.34	2.146	2.173	2.199	2.226	2.254	2.282	2.310	2.340	2.371	2.403	2.437	2.474	2.515	2.563	2.623	2.766
2.68	0.35	2.057	2.083	2.110	2.137	2.164	2.192	2.221	2.250	2.281	2.313	2.348	2.385	2.426	2.473	2.534	2.676
2.59	0.36	1.972	1.998	2.025	2.052	2.079	2.107	2.136	2.166	2.196	2.229	2.263	2.300	2.341	2.388	2.449	2.592
2.51	0.37	1.891	1.918	1.944	1.971	1.999	2.027	2.055	2.085	2.116	2.148	2.182	2.219	2.260	2.308	2.368	2.511
2.43	0.38	1.814	1.841	1.867	1.894	1.922	1.950	1.979	2.008	2.039	2.071	2.105	2.143	2.184	2.231	2.292	2.434
2.36	0.39	1.741	1.768	1.794	1.821	1.849	1.877	1.905	1.935	1.966	1.998	2.032	2.069	2.110	2.158	2.219	2.361
2.29	0.40	1.672	1.698	1.725	1.752	1.779	1.807	1.836	1.865	1.896	1.928	1.963	2.000	2.041	2.088	2.149	2.291
2.22	0.41	1.605	1.631	1.658	1.685	1.712	1.740	1.769	1.799	1.829	1.862	1.896	1.933	1.974	2.022	2.082	2.225
2.16	0.42	1.541	1.567	1.594	1.621	1.648	1.676	1.705	1.735	1.766	1.798	1.832	1.869	1.910	1.958	2.018	2.161
2.10	0.43	1.480	1.506	1.533	1.560	1.587	1.615	1.644	1.674	1.704	1.737	1.771	1.808	1.849	1.897	1.957	2.100
2.04	0.44	1.421	1.448	1.474	1.501	1.529	1.557	1.585	1.615	1.646	1.678	1.712	1.749	1.790	1.838	1.898	2.041
1.98	0.45	1.365	1.391	1.418	1.445	1.472	1.500	1.529	1.559	1.589	1.622	1.656	1.693	1.734	1.781	1.842	1.985
1.93	0.46	1.311	1.337	1.364	1.391	1.418	1.446	1.475	1.504	1.535	1.567	1.602	1.639	1.680	1.727	1.788	1.930
1.88	0.47	1.258	1.285	1.311	1.338	1.366	1.394	1.422	1.452	1.483	1.515	1.549	1.586	1.627	1.675	1.736	1.878
1.83	0.48	1.208	1.234	1.261	1.288	1.315	1.343	1.372	1.402	1.432	1.465	1.499	1.536	1.577	1.625	1.685	1.828
1.78	0.49	1.159	1.186	1.212	1.239	1.267	1.295	1.323	1.353	1.384	1.416	1.450	1.487	1.528	1.576	1.637	1.779
1.73	0.50	1.112	1.139	1.165	1.192	1.220	1.248	1.276	1.306	1.337	1.369	1.403	1.440	1.481	1.529	1.590	1.732
1.69	0.51	1.067	1.093	1.120	1.147	1.174	1.202	1.231	1.261	1.291	1.324	1.358	1.395	1.436	1.484	1.544	1.687
1.64	0.52	1.023	1.049	1.076	1.103	1.130	1.158	1.187	1.217	1.247	1.280	1.314	1.351	1.392	1.440	1.500	1.643
1.60	0.53	0.980	1.007	1.033	1.060	1.088	1.116	1.144	1.174	1.205	1.237	1.271	1.308	1.349	1.397	1.458	1.600
1.56	0.54	0.939	0.965	0.992	1.019	1.046	1.074	1.103	1.133	1.163	1.196	1.230	1.267	1.308	1.356	1.416	1.559
1.52	0.55	0.899	0.925	0.952	0.979	1.006	1.034	1.063	1.092	1.123	1.156	1.190	1.227	1.268	1.315	1.376	1.518
1.48	0.56	0.860	0.886	0.913	0.940	0.967	0.995	1.024	1.053	1.084	1.116	1.151	1.188	1.229	1.276	1.337	1.479
1.44	0.57	0.822	0.848	0.875	0.902	0.929	0.957	0.986	1.015	1.046	1.079	1.113	1.150	1.191	1.238	1.299	1.441
1.40	0.58	0.785	0.811	0.838	0.865	0.892	0.920	0.949	0.979	1.009	1.042	1.076	1.113	1.154	1.201	1.262	1.405
1.37	0.59	0.749	0.775	0.802	0.829	0.856	0.884	0.913	0.942	0.973	1.006	1.040	1.077	1.118	1.165	1.226	1.368
1.33	0.60	0.714	0.740	0.767	0.794	0.821	0.849	0.878	0.907	0.938	0.970	1.005	1.042	1.083	1.130	1.191	1.333
1.30	0.61	0.679	0.706	0.732	0.759	0.787	0.815	0.843	0.873	0.904	0.936	0.970	1.007	1.048	1.096	1.157	1.299
1.27	0.62	0.646	0.672	0.699	0.726	0.753	0.781	0.810	0.839	0.870	0.903	0.937	0.974	1.015	1.062	1.123	1.265
1.23	0.63	0.613	0.639	0.666	0.693	0.720	0.748	0.777	0.807	0.837	0.870	0.904	0.941	0.982	1.030	1.090	1.233
1.20	0.64	0.581	0.607	0.634	0.661	0.688	0.716	0.745	0.775	0.805	0.838	0.872	0.909	0.950	0.998	1.058	1.201
1.17	0.65	0.549	0.576	0.602	0.629	0.657	0.685	0.714	0.743	0.774	0.806	0.840	0.877	0.919	0.966	1.027	1.169
1.14	0.66	0.519	0.545	0.572	0.599	0.626	0.654	0.683	0.712	0.743	0.775	0.810	0.847	0.888	0.935	0.996	1.138
1.11	0.67	0.488	0.515	0.541	0.568	0.596	0.624	0.652	0.682	0.713	0.745	0.779	0.816	0.857	0.905	0.966	1.108
1.08	0.68	0.459	0.485	0.512	0.539	0.566	0.594	0.623	0.652	0.683	0.715	0.750	0.787	0.828	0.875	0.936	1.078
1.05	0.69	0.429	0.456	0.482	0.509	0.537	0.565	0.593	0.623	0.654	0.686	0.720	0.757	0.798	0.846	0.907	1.049
1.02	0.70	0.400	0.427	0.453	0.480	0.508	0.536	0.565	0.594	0.625	0.657	0.692	0.729	0.770	0.817	0.878	1.020
0.99	0.71	0.372	0.398	0.425	0.452	0.480	0.508	0.536	0.566	0.597	0.629	0.663	0.700	0.741	0.789	0.849	0.992
0.96	0.72	0.344	0.370	0.397	0.424	0.452	0.480	0.508	0.538	0.569	0.601	0.635	0.672	0.713	0.761	0.821	0.964
0.94	0.73	0.316	0.343	0.370	0.396	0.424	0.452	0.481	0.510	0.541	0.573	0.608	0.645	0.686	0.733	0.794	0.936
0.91	0.74	0.289	0.316	0.342	0.369	0.397	0.425	0.453	0.483	0.514	0.546	0.580	0.617	0.658	0.706	0.766	0.909
0.88	0.75	0.262	0.289	0.315	0.342	0.370	0.398	0.426	0.456	0.487	0.519	0.553	0.590	0.631	0.679	0.739	0.882
0.86	0.76	0.235	0.262	0.288	0.315	0.343	0.371	0.400	0.429	0.460	0.492	0.526	0.563	0.605	0.652	0.713	0.855
0.83	0.77	0.209	0.235	0.262	0.289	0.316	0.344	0.373	0.403	0.433	0.466	0.500	0.537	0.578	0.626	0.686	0.829
0.80	0.78	0.183	0.209	0.236	0.263	0.290	0.318	0.347	0.376	0.407	0.439	0.474	0.511	0.552	0.599	0.660	0.802
0.78	0.79	0.156	0.183	0.209	0.236	0.264	0.292	0.320	0.350	0.381	0.413	0.447	0.484	0.525	0.573	0.634	0.776
0.75	0.80	0.130	0.157	0.183	0.210	0.238	0.266	0.294	0.324	0.355	0.387	0.421	0.458	0.499	0.547	0.608	0.750
0.72	0.81	0.104	0.131	0.157	0.184	0.212	0.240	0.268	0.298	0.329	0.361	0.395	0.432	0.473	0.521	0.581	0.724
0.70	0.82	0.078	0.105	0.131	0.158	0.186	0.214	0.242	0.272	0.303	0.335	0.369	0.406	0.447	0.495	0.556	0.698
0.67	0.83	0.052	0.079	0.105	0.132	0.160	0.188	0.216	0.246	0.277	0.309	0.343	0.380	0.421	0.469	0.530	0.672
0.65	0.84	0.026	0.053	0.079	0.106	0.134	0.162	0.190	0.220	0.251	0.283	0.317	0.354	0.395	0.443	0.503	0.646
0.62	0.85		0.026	0.053	0.080	0.107	0.135	0.164	0.194	0.225	0.257	0.291	0.328	0.369	0.417	0.477	0.620
0.59	0.86			0.027	0.054	0.081	0.109	0.138	0.167	0.198	0.230	0.265	0.302	0.343	0.390	0.451	0.593
0.57	0.87				0.027	0.054	0.082	0.111	0.141	0.172	0.204	0.238	0.275	0.316	0.364	0.424	0.567
0.54	0.88					0.027	0.055	0.084	0.114	0.145	0.177	0.211	0.248	0.289	0.337	0.397	0.540
0.51	0.89						0.028	0.057	0.086	0.117	0.149	0.184	0.221	0.262	0.309	0.370	0.512
0.48	0.90							0.029	0.058	0.089	0.121	0.156	0.193	0.234	0.281	0.342	0.484
0.46	0.91								0.030	0.060	0.093	0.127	0.164	0.205	0.253	0.313	0.456
0.43	0.92									0.031	0.063	0.097	0.134	0.175	0.223	0.284	0.426
0.40	0.93										0.032	0.067	0.104	0.145	0.192	0.253	0.395
0.36	0.94											0.034	0.071	0.112	0.160	0.220	0.363
0.33	0.95												0.037	0.078	0.126	0.186	0.329
0.29	0.96													0.041	0.089	0.149	0.292
0.25	0.97														0.048	0.108	0.251
0.20	0.98															0.061	0.203
0.14	0.99																0.142

DUCATI energia
HISTORY DRIVES THE FUTURE

Product range

Instruments and systems for electrical measurements



Power electronics capacitors

Capacitors MV and HV power factor correction systems and filters

Motor capacitors

DUCATI energia

HISTORY DRIVES THE FUTURE

DUCATI energia s.p.a.
Via M.E.Lepido,182
40132 Bologna, Italy

+39 051-6411511
+39 051-402040
info@DUCATIenergia.com

www.ducatienergia.it

Low voltage power factor correction: capacitors, components, fixed & automatic equipment and active harmonic filters