Low voltage switchboard
Solution guide | 2013

Okken

High dependability

http: / / www.panelbuilders.schneider-electric.com

Schneider Electric

Contents

Fields of applications
Requirements and solutions

	Petroleum, gas, petrochemical	Mines, metallurgy, cement works	Food-processing
			
Requirements	Continuity of supply and safety	Environment and safety	Avaibility and performance
Solutions	> Intelligence in the motor control and the electrical distribution. > Dependability. > Rapid restarting after an incident. > Internal arc protection. > DEP Shell certification.	> Specific “anti-corrosion” treatment on conductive parts. > Tightness ensured by IP54 guaranteed parts for the dusty and / or damp environment.	> Tightness ensured by IP54 guaranteed parts for the dusty and / or damp environment. > Fault prevention by intelligent motor control centers (iMCC).

	Nuclear	Water treatment	Marine and off-shore
			
Requirements	Continuity of supply and safety	Continuity of supply and environment	Robustness and safety
Solutions	> Robustness to vibrations 5G. > Internal arc protection. > Withdrawable solutions	> Feeders on dsconnectable and withdrawable systems. > Specific “anti-corrosion” treatment on conductive parts.	> Robustness to vibrations. > Marine certification (DNV). > Salty environment.

Fields of applications
Functions

High power incomings | **Electrical distribution** | **Power factor compensation and harmonic filtering**

Motor control | **Variable speed drive and soft starters**

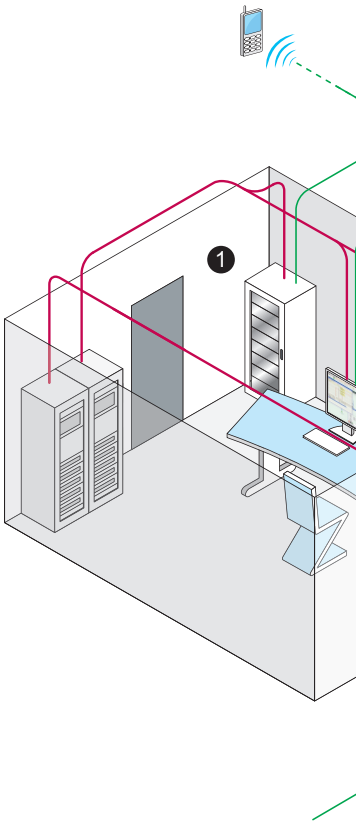
Okken solution
Motor Sys™ intelligent Power & Motor Control Center (iPMCC)

Intelligent solutions for fast and easy access to information from anywhere, around the clock

Our MotorSys™ iPMCC solutions for continuous and critical processes were developed through our specific expertise in energy and industrial process control management.
Forming the keystone of the energy efficiency of your process units, they incorporate a range of functions to supply power (intelligent Power Control Centre - iPCC), start up, control, protect and monitor your LV network electric motors and loads (intelligent Motor Control Centre - iMCC). The breadth of the range ensures that all types of continuous and critical process as well as specific requirements are covered.

Our Motor*Sys*™ iPMCC solutions help your teams optimise the energy efficiency of your assets, offering the following benefits:

- Dependability, even in severe industrial environments,
- Safety of personnel and assets, maintainability and upgradability,
- Lead time management and risk as well as cost reduction throughout your installation's entire lifecycle.



❶ Remote control and monitoring of your installation

A continuous, real-time communication interface with your control and monitoring systems for energy management and process control.

> Motor*Sys*™ iPMCC solutions communicate with the major industrial local area networks on the market (Ethernet TCP / IP, Profibus-DP, DeviceNet, Modbus, etc.).
> With data delivered in real time, your operational and maintenance staff will have immediate access to the relevant information to control your motors and electrical distribution locally or remotely.
> Warning messages can be sent automatically to a mobile phone in the event of an alarm or group of alarms.

❷ Information for local operation, maintenance and upgrading of your installation

Information on electrical distribution, motor operation and power consumption can be accessed.

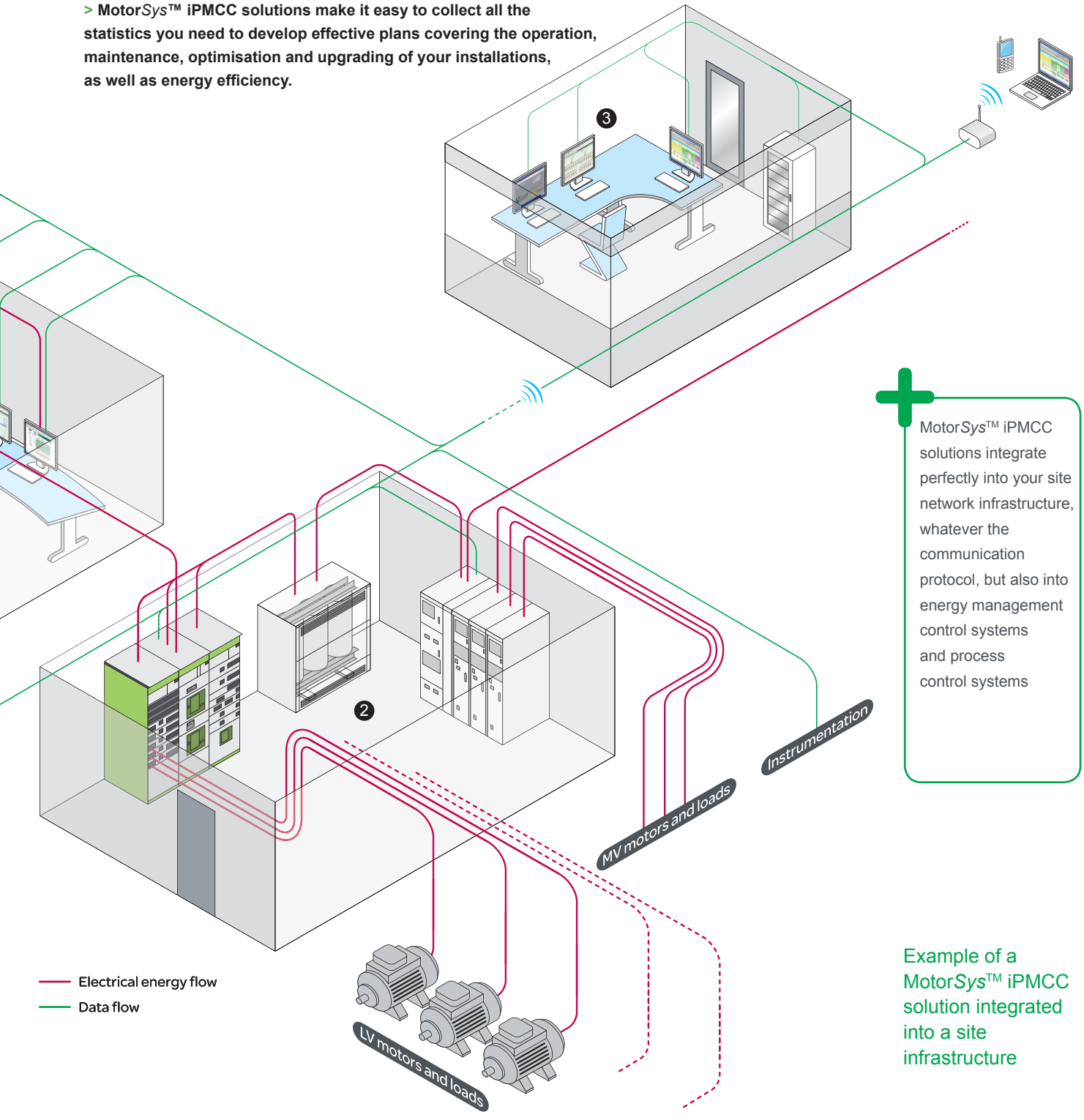
> Motor*Sys*™ iPMCC solutions can integrate a dedicated human-machine interface (HMI) or communicate via a personal computer directly on the motor starters.

Okken solution
Motor Sys™ intelligent Power & Motor Control Center (iPMCC)

❸ Information for site engineering

With information delivered to ensure the traceability of electrical distribution, motor operation and power consumption data, installations are constantly improved.

> Motor*Sys*™ iPMCC solutions make it easy to collect all the statistics you need to develop effective plans covering the operation, maintenance, optimisation and upgrading of your installations, as well as energy efficiency.



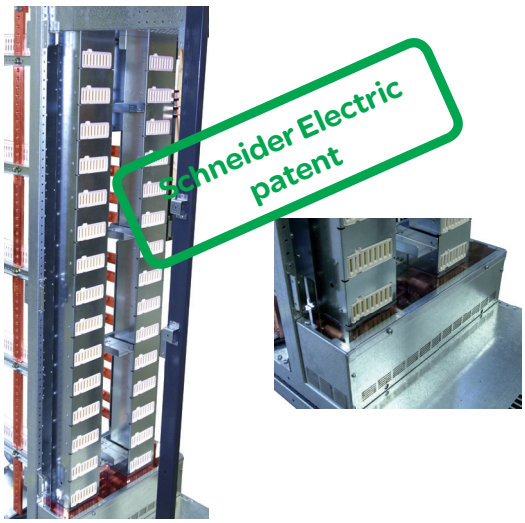
Motor*Sys*™ iPMCC solutions integrate perfectly into your site network infrastructure, whatever the communication protocol, but also into energy management control systems and process control systems

Example of a Motor*Sys*™ iPMCC solution integrated into a site infrastructure

Okken solution
Innovation

70-M cubicles

Distribution busbar



Installed in a partitioned compartment at the rear of the drawers area, it consists of 8 mm thick bars whose cross-section depend upon the current to be distributed in the cubicle.

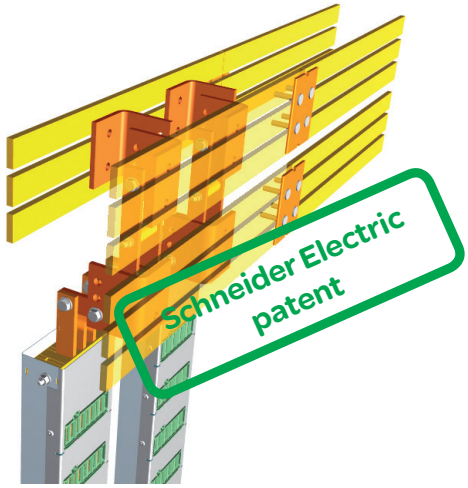
The distribution busbar system can be single or double. The architecture depends on the electrical performance and on the functional unit size (full width or half width).

The distribution busbar is extremely safe: the tap-off outlets make the busbar unaccessible to operators. Tap-off outlets open and close when the functional unit moves between connected and test position.

Up to 630 A, functional units are directly connected to the vertical busbar.

In double busbar architecture, the current flow is balanced in both vertical busbars thanks to the link system.

Horizontal / vertical busbar association principle

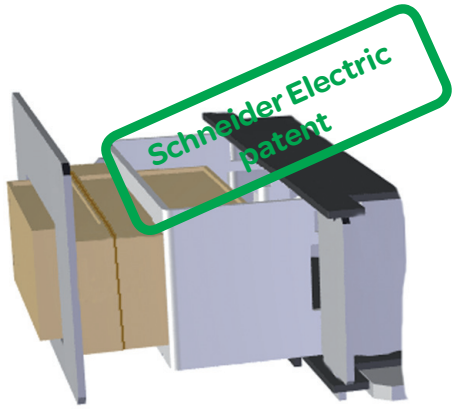


Connections to the distribution busbars and fishplating are made without drilling.

Sliding fishplates ensures the link between 2 horizontal busbars.
Angle brackets secure the connection between the horizontal and the vertical busbar.

The tightening screw devices used to secure the connection go through the gap between the horizontal bars.

Auxiliaries connection

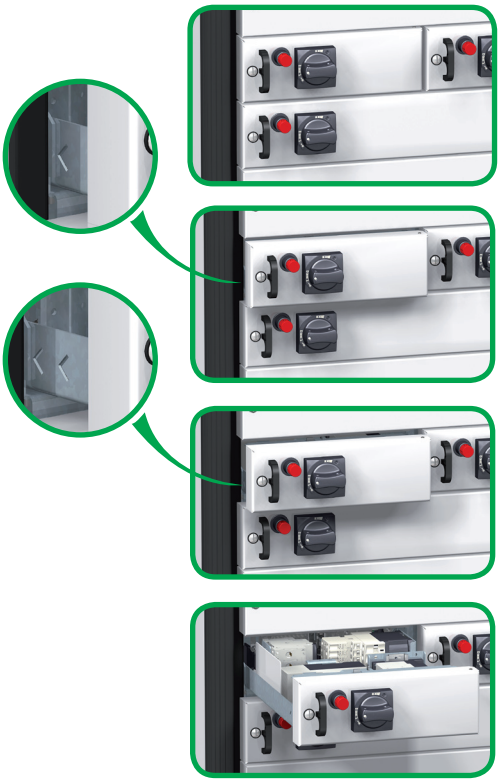


The innovative mechanism guarantees that the control contacts are connected when the drawer is in service or test position.

Okken solution
Innovation

Drawer positions

Drawers operation is very simple. Using the indexing pushbutton, the operator can simply move the drawer in the draw-in, test, draw-out positions. Each position are mechanically marked with a mechanical indicator on the drawer sides.



Draw-in
- The functional unit is operational.
- Power and auxiliaries are connected.

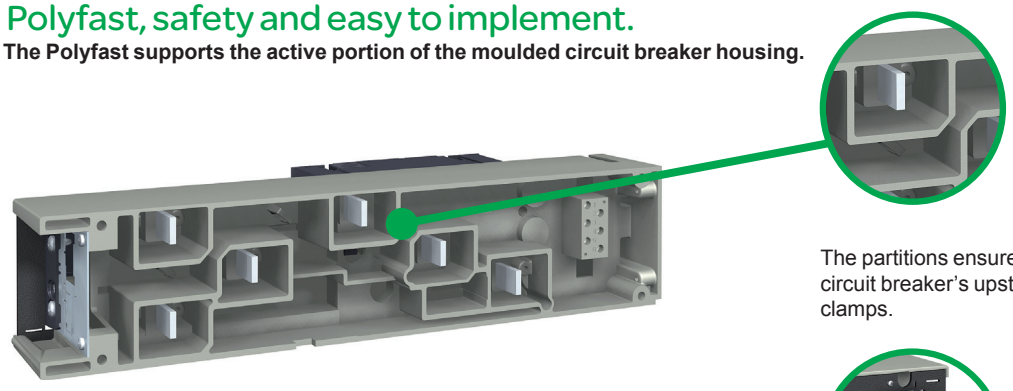
Test
- The functional unit is not operational.
- Only auxiliaries are connected.
- Allow padlocking.
- It allows the functional unit verification.
- Allow maintenance on the process.

Draw out
- The functional unit is not operational.
- Power and auxiliaries are disconnected.
- Allow maintenance on the process.

Withdrawn
- The drawer can be fully extracted.
- Allow quick replacement.
- Allow switchboard live change.

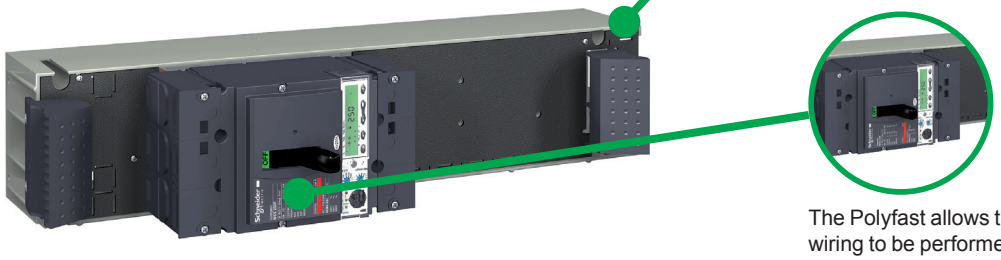
Polyfast, safety and easy to implement.

The Polyfast supports the active portion of the moulded circuit breaker housing.



The partitions ensure electrical insulation between the circuit breaker's upstream connections and the plug-in clamps.

A striker system causes the circuit breaker to open when extracted and placement of the Polyfast with power on.



The Polyfast allows the power and auxiliary circuits wiring to be performed outside the switchboard.

Okken solution
Implementation

Reliability and flexibility

> 7 service index to adapt to the requirements of each application.
> The switchboards are type tested assemblies. They have a complete electrical and mechanical inspection before shipping.
> The addition or the removal of equipment is made with power “ON”, without pre-equiping the switchboard.

Continuity of supply

> Withdrawable feeders (in rack) for rapid workings.
> The switchboards must be reconfigured live.
> Rapid restart after an incident.

Safety of people and equipments

> Internal arc protection, in compliance with the requirements of the strictest international regulations (technical reports IEC61641 Ed.2 and AS / NZS 3439.1 (appendix ZC-ZD)).
> Continuity of supply guaranteed by limitation of harmful effects of the internal arc in the switchboard.
> Quick repair of the area where the arc was confined.
> Safety of people and equipment guaranteed during the occurrence of the fault.
> The busbar epoxy paint on the busbars prevents flashover and propagation of the arc.

Withstand to the most demanding environements

> The conductive parts treated for “anti-corrosion” (according to IEC 721-3-3 standard).
> Marine version for a saline environments withstand.
> IP54 tightness for the dusty and / or damp environments.
> 2G and 5 G earthquake safety versions.
> Forced ventilation for environments with ambient temperatures hotter than 45° C or for devices with considerable heat loss.
> DEP Shell certification for petrochemical industries.

Type tested

Okken is totally type-tested in accordance with IEC 61439-2
■ Certified by independant labs: LOVAG, ASEFA, CESI and VIRLAB.
■ As well as by a permanent control in Schneider Electric test laboratories.
■ Type-tests are carried out:
□ temperature-rise limit,
□ dielectric properties,
□ short-circuit withstand,
□ effectiveness of the protective circuit,
□ conformity of the clearance and creepage distances,
□ mechanical operation,
□ degree of protection.

Okken solution
Implementation

4 specific compliances

Standard
For all applications.

2G & 5G
For seismic zones.

Marine
For boats and offshore platforms.

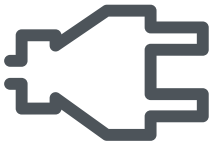
DEP shell
For oil and gas plants.

1 option

Forced ventilation
For busbar derating optimisation (15%)

2 levels of protection against internal arc

Cubicle partitioning
Protective screens (side partition + horizontal busbar screen) prevent tracking of an arc in the cubicle.



Connection accessories
At functional unit level, the Polyfast prevents the propagation of an arc in the cubicle.

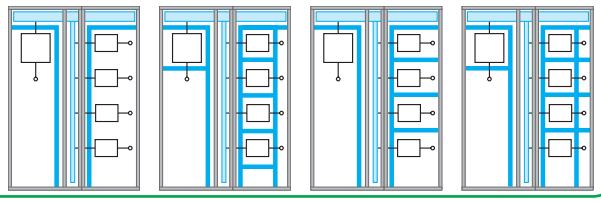
5 levels of service

Service Index	211	212	223	233	333
Operation	Shutting down only the concerned functional unit.				Shutting down only the concerned functional unit, but test of the control system possible before the resumed operation.
Maintenance	Shutting down the whole switchboard.		Shutting down only the concerned functional unit with connections handlings.		Shutting down only the concerned functional unit without connections handlings.
Evolution	Shutting down the whole switchboard.	Addition of a functional unit in pre-equiped spare slots.	Addition of a functional unit without shutting down the switchboard, free addition in non-equiped spare slots.		

4 levels of functional unit partitioning

Available forms	2b	3b	4a	4b
Busbars / functional units separation	■	■	■	■
Busbars / terminal blocks(1) separation for external conductors	■	■	■	■
Separation between functional units	-	■	■	■
Separation between terminal blocks(1) for external conductors	-	-	■	■
Terminal blocks separation for external conductors / functional units	-	-	-	■

(1) They are integral part of the functional unit.



PCC device cubicles

Type of cubicle		230	115	115 / 70-2
In distribution busbar		4500 / 7300 A	1750 / 4000 A	1750 / 3200 A
Incomers		NW40b / 63b	NT08-16 / NS800-1600 NW08-40	NT08-16 / NS800-1600 NW08-32
Feeders	Distribution > 630A	NW40b / 63b	NT08-16 / NS800-1600 NW08-40	NT08-16 / NS800-1600 NW08-32
	Distribution ≤ 630A	-	-	■ disconnectable mounting plate ■ disconnectable Polyfast ■ plug-in Polyfast ■ drawer

PCC device cubicles

Optimized high power incomers / feeders cubicle

Optimized high power incomers / feeders cubicle

Compensation & harmonic filtering

Fuse-switch feeders cubicle

Single NW
1600 / 3200 A
NW08-32
NW08-32
-

Single NT/NS
800 / 1600 A
NT08-16 / NS800-1600
NT08-16 / NS800-1600
-

PFC
-
-
Power factor compensation
-

185
630 / 1500 A
-
Jean Müller
-

PCC device cubicles

Electrical distribution drawers

Electrical distribution feeders cubicle

		70-2	70-F
Type of cubicle		70-2	70-F
In distribution busbar		1000 / 2100 A	2100 A
Incomers		NT08-16 / NS800-1600	NT08-16
Feeders	> 630A	NT08-16 / NS800-1600	NT08-16
Distribution	⩽ 630A	■ disconnectable mounting plate ■ disconnectable Polyfast ■ plug-in Polyfast ■ drawer	■ fixed mounting plate for 1 NSX or NS100-630 ■ fixed mounting plate for 2 NSX100-250
MCC		-	-

Okken 70-2

For electrical distribution, 70-2 is an innovative solution, robust, reliable and secure.
Schneider Electric Polyfast® provide a high level of people safety in the most difficult conditions.

MCC device cubicles

Optimized for MCC drawers

Incomers / feeders cubicle

Variable speed drive & soft starter cubicle

70-M	70-2	VSD - SS
2000 A	1000 / 2100 A	-
-	-	-
-	-	-
-	-	-
■ drawer ≤ 250 kW	■ disconnectable mounting plate ≤ 37 kW ■ drawer ≤ 250 kW	■ fixed mounting plate ≤ 400 kW ■ drawer ≤ 55 kW

Okken 70-M

For MCC application drawers, 70-M is an optimized solution, robust, reliable and secure.
The 70-M back to back configuration is a huge space saving.
The 70-M satisfy the motor control needs ot the most demanding processes.

Feeder's Service Index

What does your installation need?

Because not all your applications have the same needs, Okken allows you to choose the solution appropriate to the expected level of service in terms of operation, maintenance and upgrading.

Making the right choice

The switchboard must permit	Operation Setting Locking Padlocking	Maintenance Checking Cleaning Repairing	Evolution Addition Modifications Expansion
The application's continuity of service is:			
1 Not required	Shutting down the whole switchboard	Shutting down the whole switchboard	Shutting down the whole switchboard
2 Wanted	Shutting down only the concerned functional unit	Shutting down only the concerned functional unit with connections handling	Addition of a functional unit in pre-equiped spare slots
3 Essential	Shutting down only the concerned functional unit Allows "test" position	Shutting down only the concerned functional unit without connections handling	Addition of a functional unit without shutting down the swwitchboard, free addition in non-equiped spare slots

Examples

I want to determine the consequences of mechanical padlocking or electrical locking on my switchboard:

I want to determine whether my switchboard can satisfy a maintenance requirement:

I want to determine whether my switchboard can be upgraded in the future:

OPERATION

I would like this operation to shut down only the functional unit concerned

2

MAINTENANCE

I would like the maintenance operation to be limited to the functional unit concerned. It should be replaced without disturbing with the connections.

3

EVOLUTION

I would like to be able to add any type of functional unit (protection) without powering down the switchboard. This should be done in a location without equipment, within the limits stipulated by the manufacturer.

3

plug-in feeder

I would like this operation to shut down only the functional unit concerned

2

I would like the maintenance operation to be limited to the functional unit concerned. The connections will have to be disconnected and reconnected when it is replaced.

2

I would like to be able to add any type of functional unit (protection) without powering down the switchboard. This should be done in a location without equipment, within the limits stipulated by the manufacturer.

3

disconnectable feeder

I would like this operation to shut down only the power to the functional unit concerned, but allow the automated control system tests, which make it possible to test the installation in its entirety before putting it back into service, to be performed.

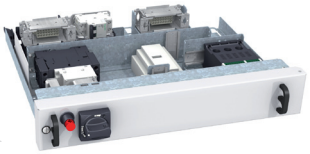
3

I would like the maintenance operation to be limited to the functional unit concerned. It should be replaced without disturbing with the connections.

3

I would like to be able to add any type of functional unit (motor control or protection) without powering down the switchboard.
This should be done in a location without equipment, within the limits stipulated by the manufacturer.

3

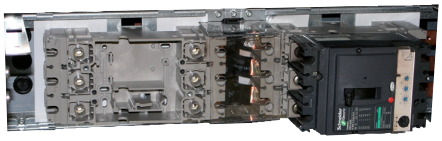


withdrawable drawer

Functional units overview

Compact NSX
fixed on mounting plate

fixed device: SI=211



device on base: SI=232

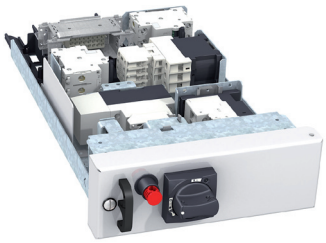
Compact NSX
disconnectable

on Polyfast: SI=223

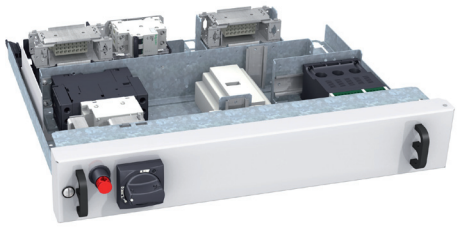
Compact NSX
withdrawable

in drawer SI=233

Compact NSX and iC60
in drawer



70-M half width drawer SI=333



70-M full width drawer SI=333

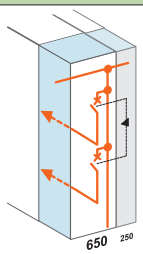
Electrical distribution
In > 630 A

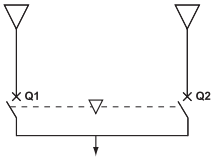
Source changeover switches

■ Source changeover in Okken, can be mounted in one 115 cubicle.
■ An additional 250 mm compartment at the right of the device cubicle is compulsory for the interlocking access.
■ Hereunder are the possibilities with Masterpact NW08-32, Masterpact NT08-16 and Compact NS800-1600:

Type of mechanical interlocking	Combinations

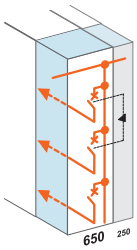
2 devices, 1 device closed

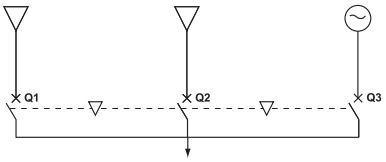




Q1	Q2
0	0
0	1
1	0

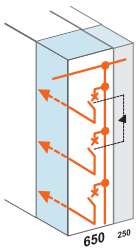
3 sources, 1 device closed

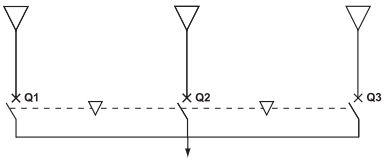




Q1	Q2	Q3
0	0	0
1	0	0
0	1	0
0	0	1

2 "normal" + 1 replacement sources



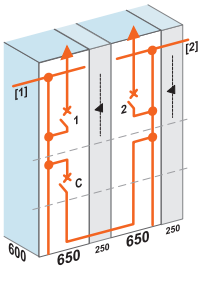
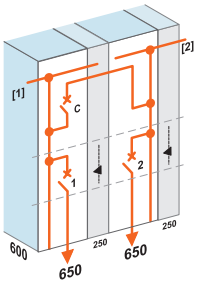
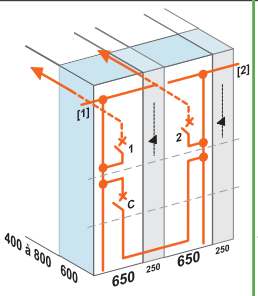
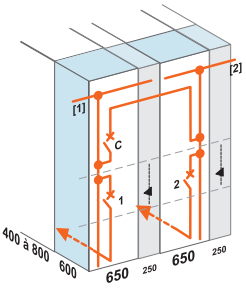
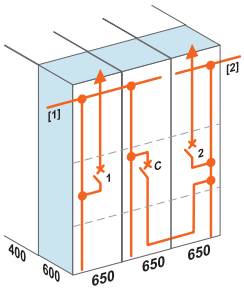
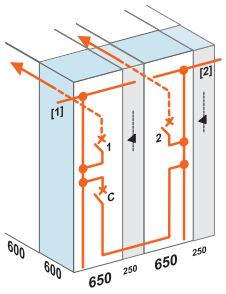
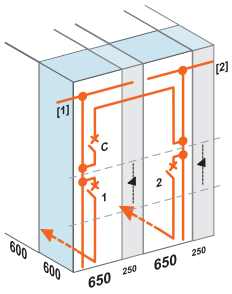
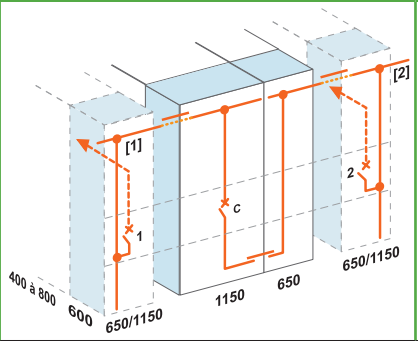


Q1	Q2	Q3
0	0	0
1	0	0
0	0	1
1	1	0
0	1	0

Electrical distribution
In > 630 A

Coupling

■ Coupling in Okken has many possibilities, regarding the devices used and the type of connection.

	Coupling devices	Type of connection			
		TDC	BDC	RC top	RC bottom
115 cubicle	Masterpact NW08-32 Masterpact NT08-16 Compact NS800-1600				
	Masterpact NW40				
230 cubicle	Masterpact NW40b-63				

Electrical distribution
In > 630 A

Selection of the functional unit - rated 415 V - 50 / 60 Hz - IP31 / 35°C

In (A)	Icw max (kA)	Max. qty of circuit breakers per cubicle	Type of circuit breaker	Cubicle	In vertical busbar (A)
4000 < In < 6300	150	1	NW40b-63b	 230	7300
3200 < In < 4000	100	1	NW40	 115-3	4000
		3	NW20-32	 115-2	4000
1600 < In < 3200	100	3	NW08-16	 115-1	3200
		1	NW08-32	 Single NW	3200
800 < In < 1600	100	4	NT08-16 NS 800-1600 A	  70-2 70-F	2100
	80	1	NT08-16 NS 800-1600 A	 Single NT / NS	2100

Electrical distribution
In ⩽ 630 A

Selection of the functional unit - rated 415 V - 50 / 60 Hz - IP31 / 35°C

Withdrawability	In (A)	Device	Max. qty of devices	Max. modularity (1 module = 25 mm)		Cubicle
Drawer **SI = 333**	In < 63	iC60	1	4 modules half width		 70-M
	In < 63	iC60	1	4 modules half width		 70 - M 70-2
	63 < In < 125	NG125	1	8 modules half or full width(1)		
	16< In < 100	NSX100	1	8 modules half or full width		
	125 < In < 160	NSX160	1	8 modules full width		
	200 < In < 400	NSX 250-400	1	12 modules full width		
	400 < In < 630	NSX630	1	16 modules full width		
Disconnectable mounting plate **SI = 223**	In < 63	iC60		6 modules		 70-2
Disconnectable Polyfast **SI = 223**	In < 400	NSX100-250	1	7 modules		 70-2
	400 < In < 630	NSX400-630	1	9 modules		
Plug-in on Polyfast **SI = 233**	In < 400	NSX100-250	1	7 modules		 70-2
	400 < In < 630	NSX400-630	1	9 modules		
Fixed **SI = 211 - 212**	In < 400	NSX100-250	2	8 modules		 70-F
	400 < In < 630	NSX400-630	1	10 modules		

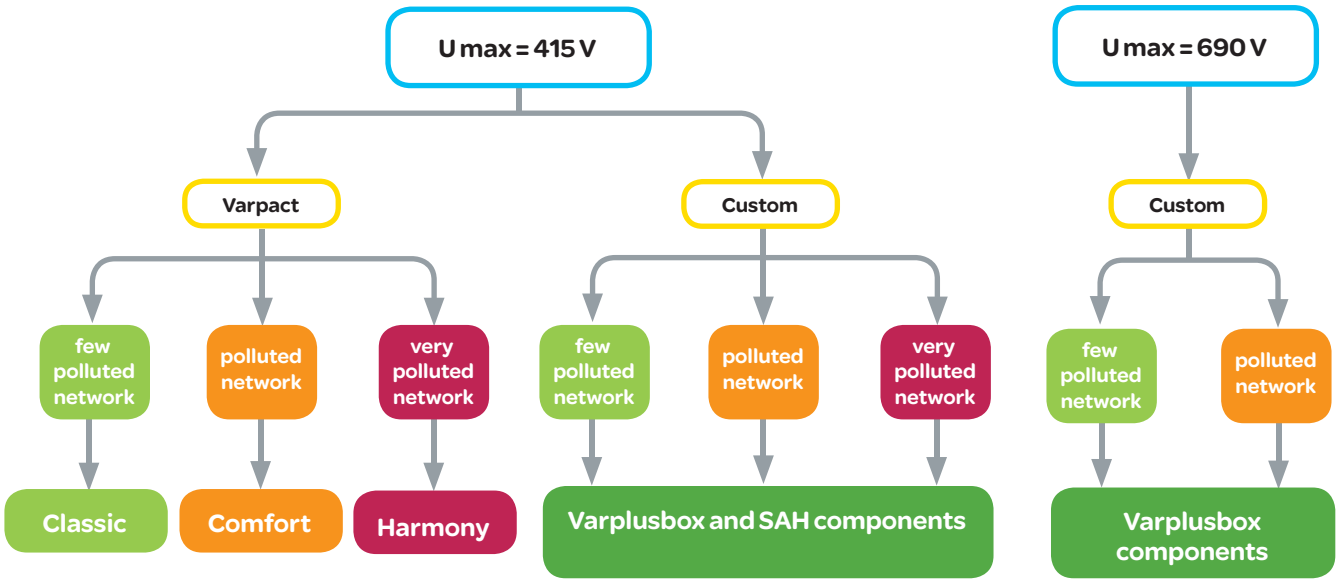
(1) depending on Iq

Selection of the functional unit - rated 690 V - 50 / 60 Hz - IP31 / 35°C

Withdrawability	In (A)	Device	Max. qty of devices	Max. modularity (1 module = 25 mm)		Cubicle
Drawer **SI = 333**	In < 100	NS100L	1	8 modules		 70 - M 70-2
	100 < In < 400	NS400L	1	12 modules		

Power factor compensation and harmonic filtering

Selection



A wide selection for sensitive applications

very frequently
usually
occasionally

Statistical studies determine the frequency of the solutions used, according to the applications.

	Classic	Comfort	Harmony
Pollution rate	**Gh/Sn ≤ 15 %**	**15% < Gh/Sn ≤ 25%**	**25% < Gh/Sn ≤ 50%**
Oil & Gas			
Automotive			
Water treatment			
Mines & Minerals			
Infrastructures			
Tertiary			
Marine & Off-shore			
Agri-food			

Sn: apparent power of the transformer.
Gh: apparent power of harmonics-generating loads (variable speed motors, static converters, power electronics, etc.).

It is however recommended that measurements be carried out on site to check that the correct solution is adopted.

A source of energy savings

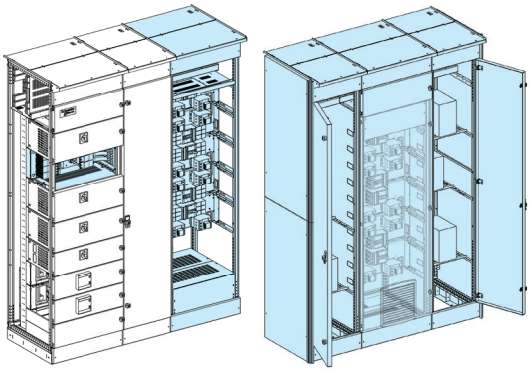
Energy Efficiency

Power factor correction means using your transformer and your facility at maximum efficiency by reducing losses (iron, heat, etc.).

	Power output by your transformer (kVA)				
Cos φ	**250**	**400**	**630**	**1000**	**1600**
0.5	**125**	**200**	**315**	**500**	**800**
0.7	**175**	**280**	**441**	**700**	**1120**
0.9	**225**	**360**	**567**	**900**	**1440**
0.95	**238**	**380**	**598**	**950**	**1520**

Power factor compensation and harmonic filtering

Many configuration possibilities



- As is the case with the other products in the Okken range, the power factor correction and filtering column has been designed to integrate perfectly with a full switchboard, 2350 or 2200 mm high.
- The power factor correction and filtering elements can be protected as follows:
  - externally, by an NS630 circuit breaker in an adjacent cubicle,
  - internally, by an NS100 separate circuit breaker on each mounting plate.
- The choice affects the number of mounting plates per column.

Selection of cubicle

Rated voltage (Ue)	Type	Power (kVAR)	Cubicles			Qty of mounting plates
			qty	height (mm)	width (mm)	
415 V	without self	up to 500	1	2200	650	4
			1	2350	650	5
	with integrated self	up to 250	1	2200	650	4
			1	2350	650	5
	separated self	up to 125	2	2200	650	4
			2	2350	650	5
690 V	without self	up to 500	1	2200	650	4
			1	2350	650	5
	separated self	up to 250	3	2200	650	4
			3	2350	650	5

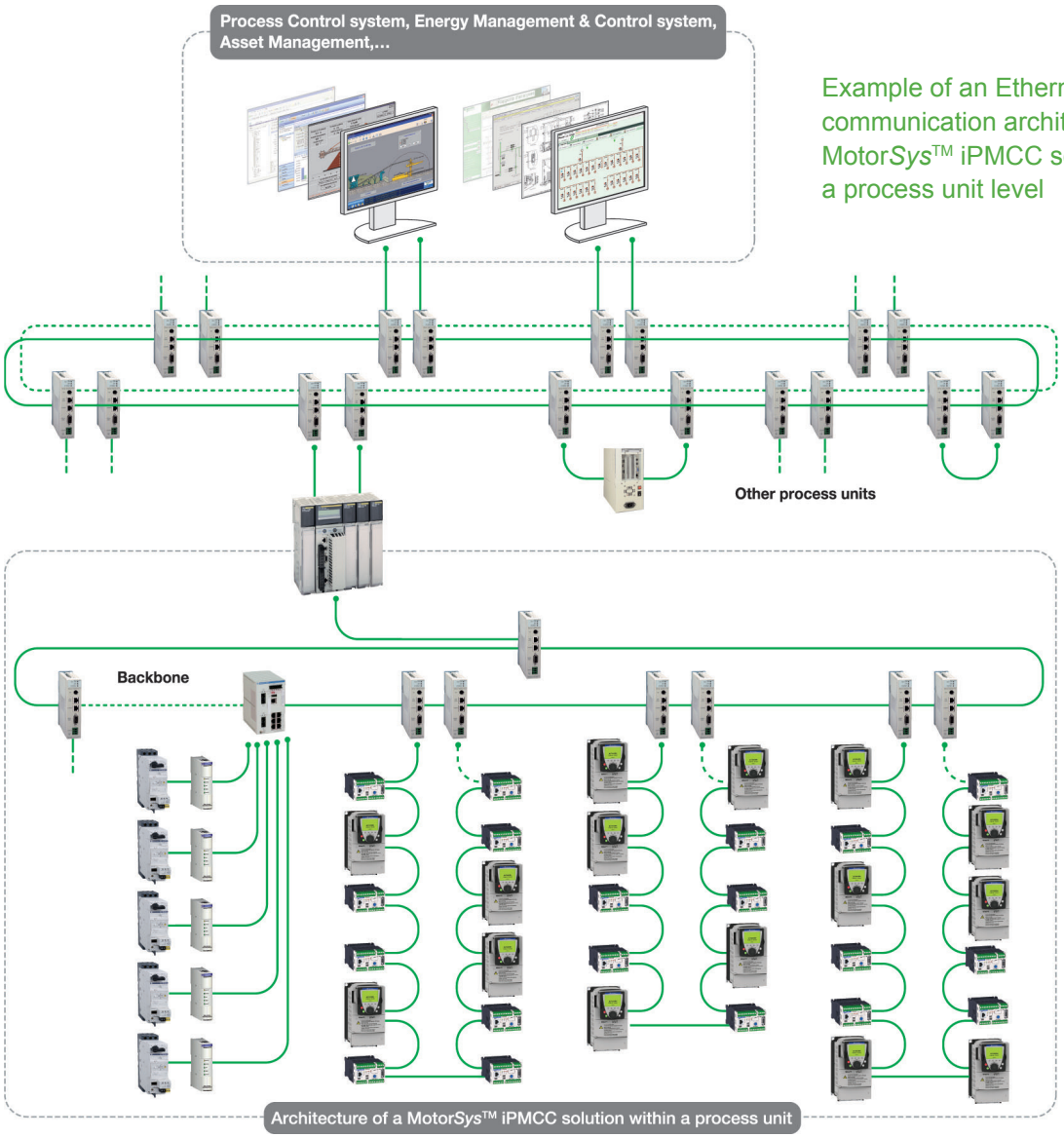
Motor control

Solutions that integrate into your installation, simply

Our MotorSys™ iPMCC solutions integrate perfectly into your site network infrastructure, whatever the communication protocol, but also into all energy management control systems and process control systems.

> Given the complexity of data flows and communication network infrastructures, from instrumentation to corporate management systems, simple to integrate and scalable solutions are the natural choice.

> Based on architectures that have been pre-tested and pre-validated for an integration in the leading communication protocols used in process industry and infrastructures, our solutions help you rapidly and efficiently optimise the energy efficiency of your assets.



Architecture of a MotorSys™ iPMCC solution within a process unit

Example of an Ethernet communication architecture of a MotorSys™ iPMCC solution, at a process unit level

Innovation
Bypass switch in a Daisy Chain Loop for an optimum dependability

Overview of the MotorSys™ iPMCC solutions

We design with you the solution which meets your needs as well as your process requirements.

MotorSys™ iPMCC Solutions Range	iPMCC	MCC
Protection		
Short-circuit, Thermal overload, Overcurrent, Ground current	■	■
Current phase imbalance & phase loss	■	■
Current phase reversal	■	
Undercurrent	■	
Long start (stall) & Jam (locked rotor)	■	
Motor temperature sensor	■	
Rapid cycle lockout	■	
Load shedding	■	
Voltage phase imbalance, phase loss, & phase reversal	□	
Undervoltage & Overvoltage, Underpower & Overpower, Under & Over power factor	□	
Measurements		
Line currents, Ground current, Average current, Current phase imbalance, Thermal capacity level	■	
Motor temperature sensor	■	
Frequency	■	
Line-to-line voltage, Line voltage imbalance, Average voltage	□	
Active & Reactive power, Power factor, Active & Reactive power consumption	□	
High level functions		
Custom logic at starter level	■	
Advanced motor starting modes	■	
Automatic restarting of motors	□	
Fast Device Replacement	□	
Connectivity & Communication architectures		
Schneider Electric Process Control System, Energy Management and Control System, PLCs (1)	interop. tested	interop. tested
Third-party Process Control System, Energy Management and Control System, PLCs (1)	□	□
Native Ethernet Modbus/TCP in Daisy Chain Loop, Star, Proxy	■	■
Native Profibus-DP, Native DeviceNet, Native Modbus-SL	■	
Other protocols	□	
Operational modes		
Consignment	■	■
Starters test position	■	■
Maintenance & Upgrade live	■	□
Control at motor level	□	□
PC set-up	□	
Remote management	■	
Local HMI	■	□
"Nominal current only" set-up (screwdriver)	■	■

(1) PLC: Programmable Logic Controller

■ ■ Standard

□ □ Optional

Motor control

1 component motor feeder

Circuit breaker-contactor combination TeSys U

■ **Advantages**
- □ easy installation:
  - easy to order: 1 power base + 1 protection (control unit)
  - easy to install: only one device must be wired, reduced installation times
  - easy to set: locally via the LCD and keypad built into the control unit or remotely
- □ continuity of service:
  - total coordination between protection devices
  - protection functions modified by simply changing the control unit
  - manual or automatic reset following a thermal fault
- □ upgradeability: modular design. Functional modules (communication and protection) can be easily changed at any time without having to rewire the entire assembly.

■ **Applications**
- □ manufacturing and continuous and semi-continuous processes.

2 components motor feeder

Thermomagnetic circuit-breaker + contactor

■ **Advantages**
- □ very economic solutions
- □ suitable for all types of diagrams
- □ manual reset following a thermal fault
- □ type 2 coordination

■ **Applications**
- □ manufacturing and continuous and semi-continuous processes.

3 components motor feeder

■ **Advantages**
- □ Wide choice of solutions.
- □ Suitable for all types of diagrams.
- □ Manual or automatic reset following a thermal fault.
- □ 2 starting classes (10 and 20).
- □ Type 2 coordination.
- □ Segregation of thermal and magnetic faults.

Magnetic circuit-breaker + contactor + thermal protection

■ For manufacturing and continuous and semi-continuous processes.

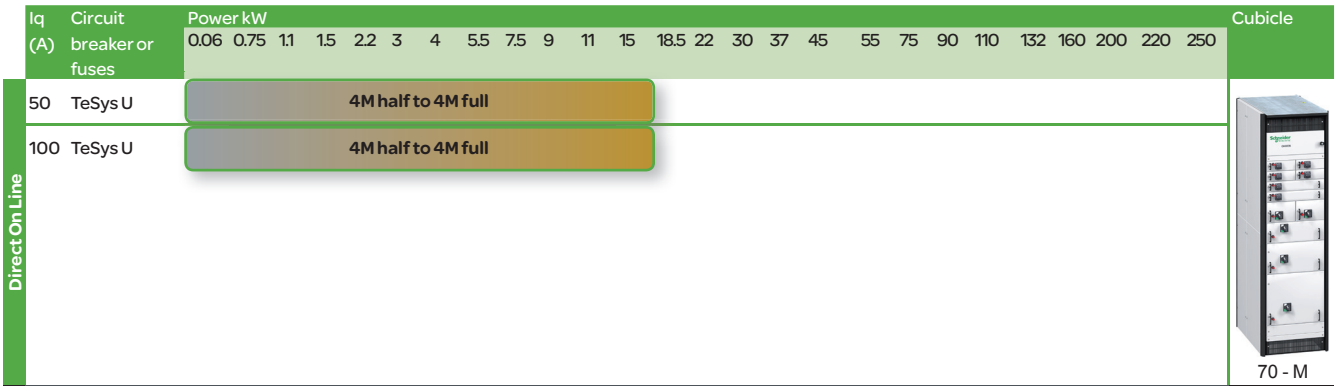
Switch-disconnector fuse + contactor + thermal protection

■ For all types of machines.

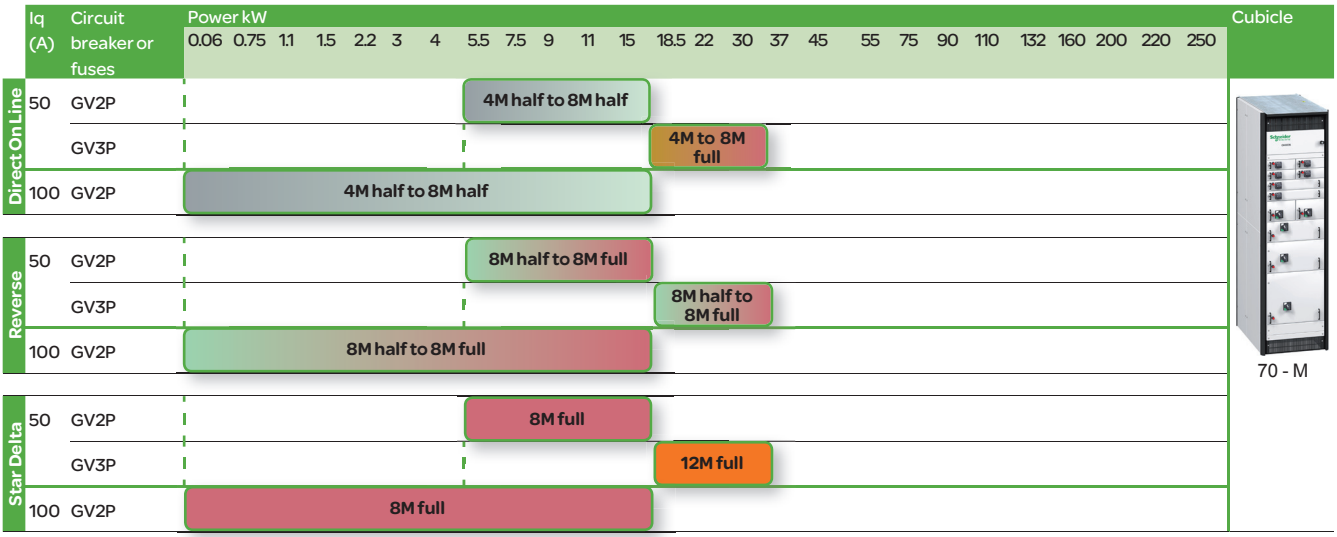
■ For manufacturing and continuous and semi-continuous processes.

Motor control

Selection of the functional unit -MotorSys iMCC 1 component - Ue = 415 V - 50 / 60 Hz - IP31 / 35°C

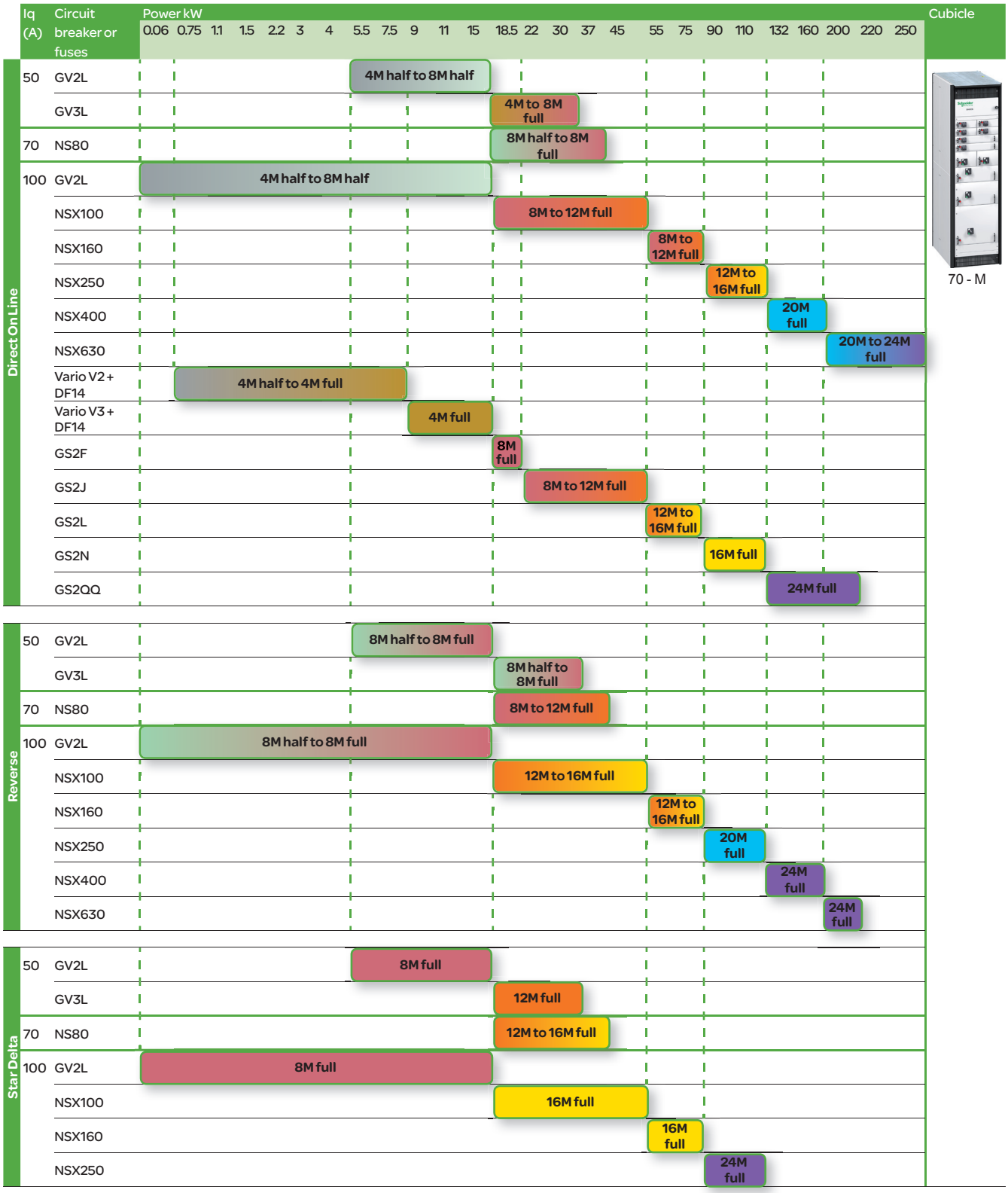


Selection of the functional unit -MotorSys MCC 2 components - rated 415 V - 50 / 60Hz - IP31 / 35°C



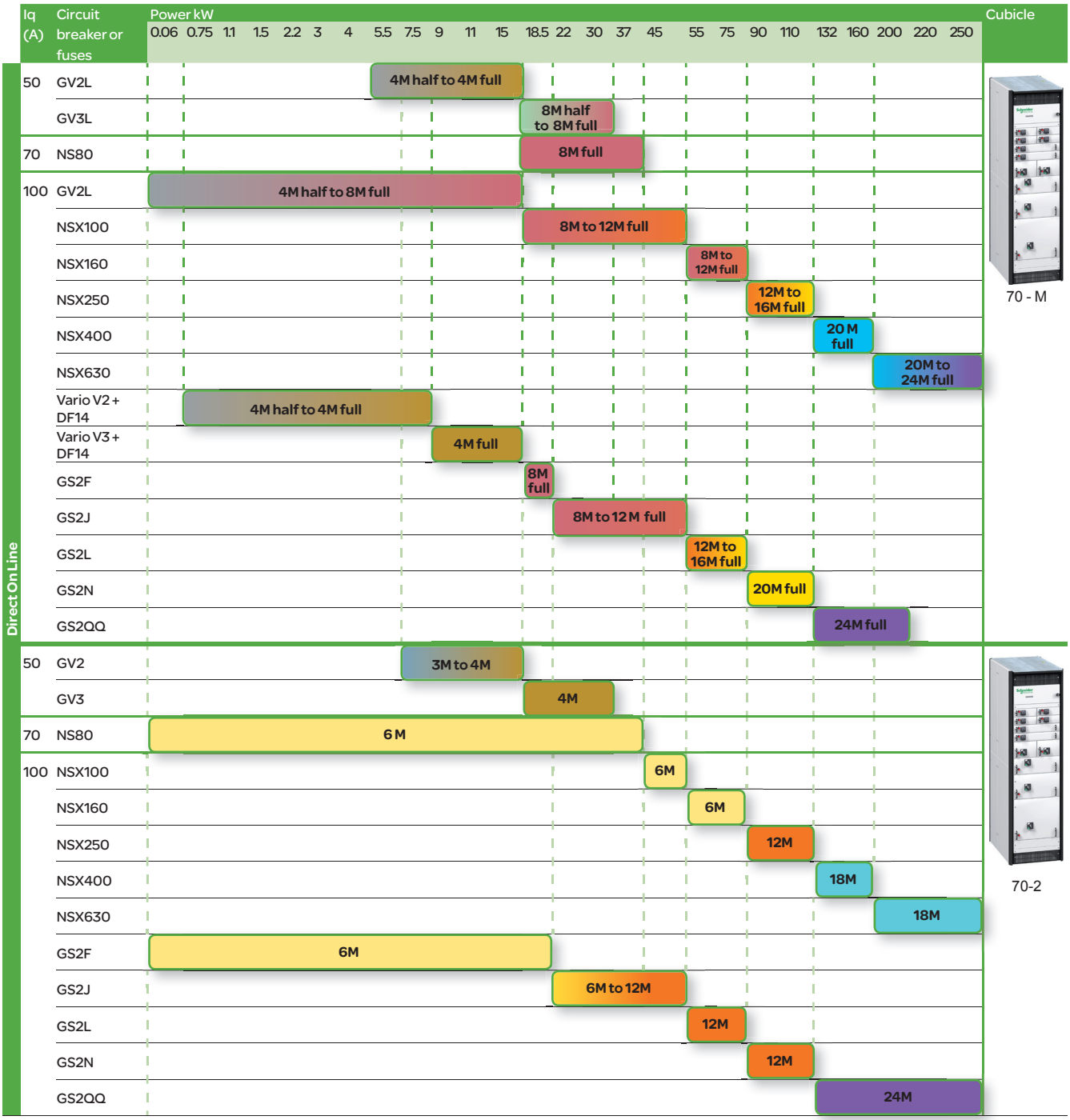
Motor control

Selection of the functional unit - MotorSys MCC 3 components - rated 415 V - 50 / 60 Hz - IP31 / 35°C



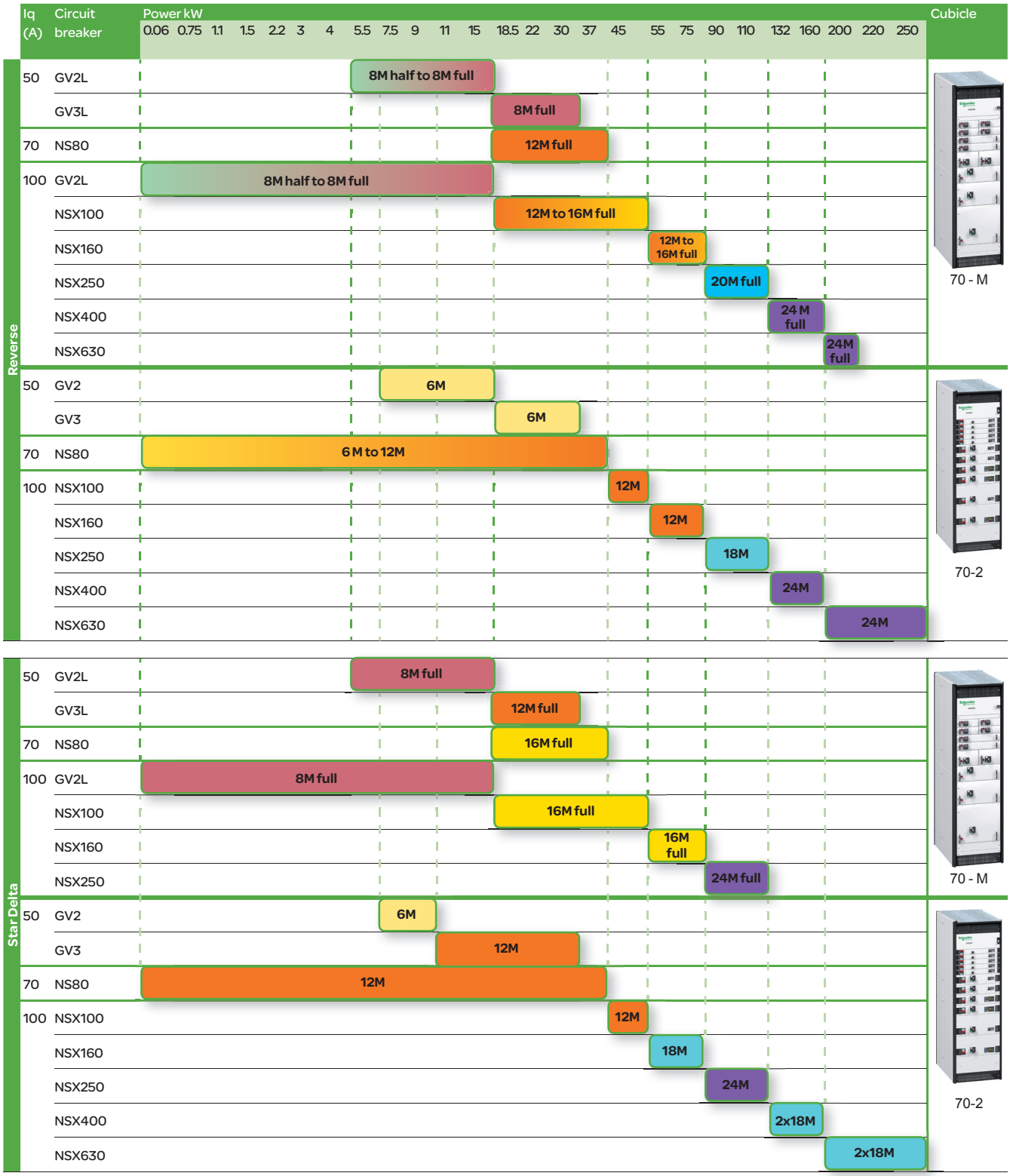
70 - M

Selection of the functional unit - MotorSys iMCC 3 components - rated 415 V - 50 / 60 Hz - IP31 / 35°C



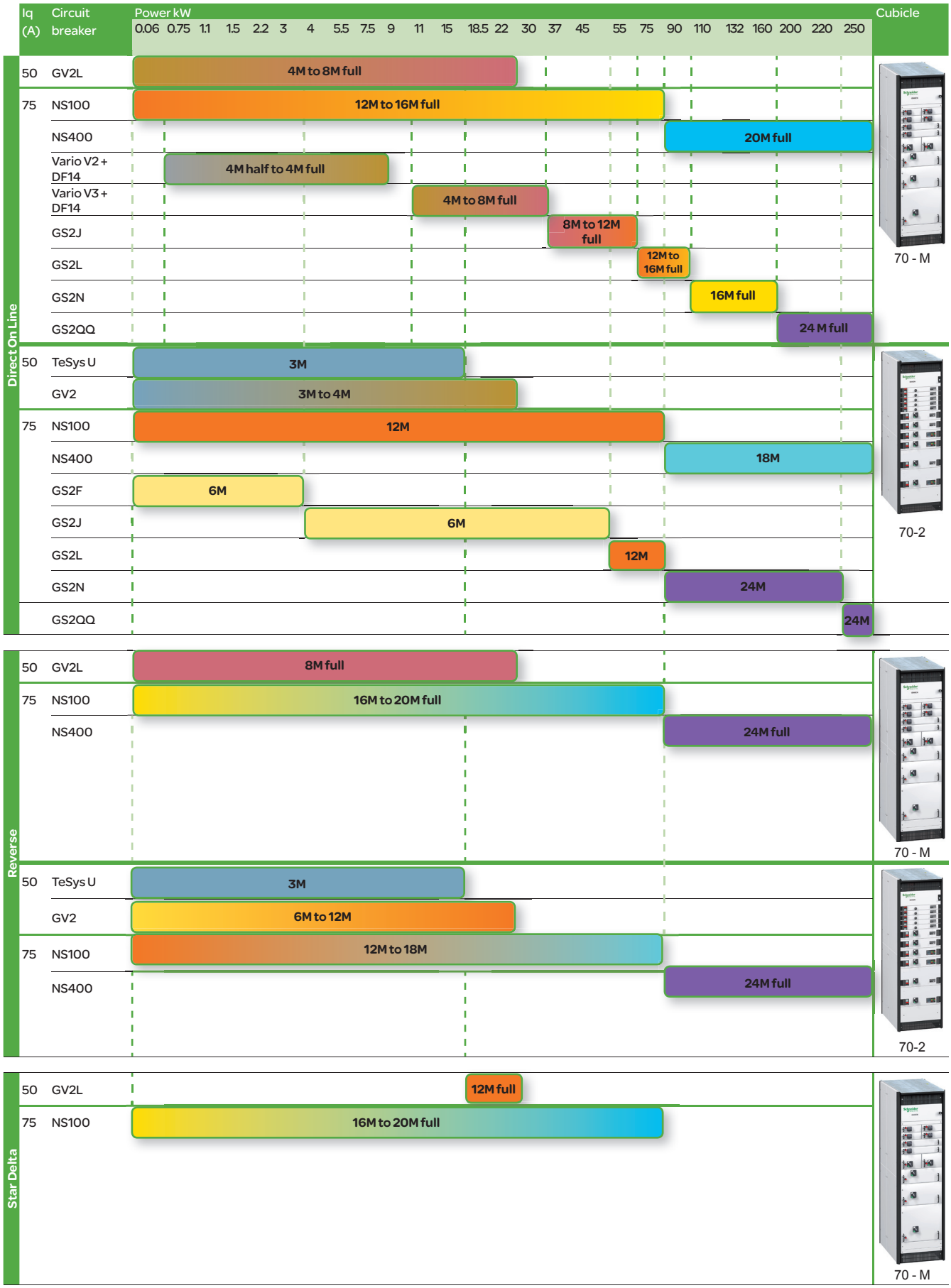
Motor control

Selection of the functional unit - MotorSys iMCC 3 components - rated 415 V - 50 / 60 Hz - IP31 / 35°C



Motor control

Motor control - MotorSys MCC and iMCC 1 & 3 components - rated 690 V - 50 Hz - IP31 / 35°C



Variable speed drive and soft starter

Altistart ATS U01

Altistart ATSU 01

■ When combined with a TeSys U controller by means of a connector, the Altistart U01 is a power option, including by-pass, which provides the «soft start / soft stop» function.
■ Its choice criteria is the power of the motor to supply.
■ The Altistart ATS U01 limits the starting torque and current peaks on starting, on machines which do not require a high starting torque.

Altistart ATS 48

Altistart ATS 48

■ The Altistart ATS 48 soft start - soft stop unit is a controller with 6 thyristors, which is used for the torque-controlled soft starting and stopping of three-phase squirrel cage asynchronous motors.
■ The Altistart ATS 48 must be selected on the basis of 3 main criteria:
  □ the power supply voltage range (this catalogue deals only whith the devices connected to a 415V or 690V network),
  □ the power and the nominal current of the motor,
  □ the type of application and the operating cycle.

Altivar ATV61 and 71

Altivar ATV 61

Altivar ATV 71

They have been designed for the following main applications:

ATV61	ATV71
ventilation, air conditioning, pumping, …	hoisting, handling, packing, process machines, lifts, ...

This catalogue deals only with 415V and 690V voltage.

Circuit breaker and variable speed drive combination

From 1.5 to 75kW, the protection and the variable speed drive are in one functional unit (drawer or fixed, fig.1).

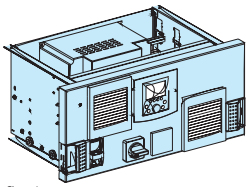


fig.1

From 75 kW, the equipment is composed of:
■ the protecion functional unit (drawer or cubicle),
■ the variable speed drive functional unit.

Speed drive is powered, either through a drawer located in the 70-2 adjoining cubicle (fig. 2 and 3), or through a dedicated 450 mm cubicle (fig. 4).

The speed drive cubicle can be either 650 mm (fig. 2) or 1150 mm wide (fig. 3 and 4).

Installation can be performed only in IP31 maximum.

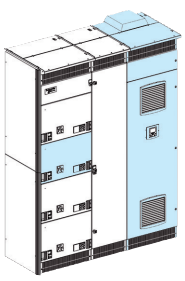


fig.2

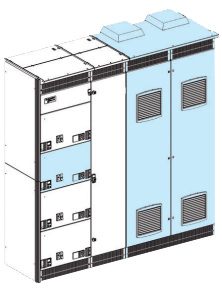


fig.3

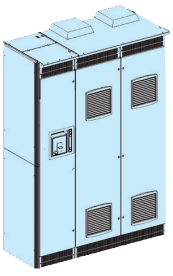


fig.4

Variable speed drive and soft starter

Variable speed drive and soft starter - 415V

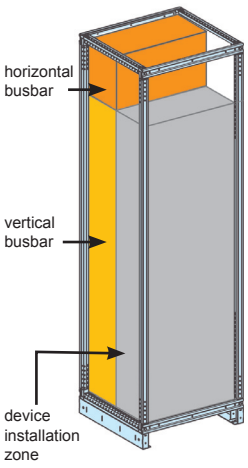
Withdrawability	Switchgears	Power (kW)	Circuit breaker	Modularity (1 module = 25 mm)		Cubicle
				Protection	Switchgears	
Drawer **SI = 333**	**ATSU01** 	1.5 to 15	Tesys U	-	4	 70-2
	ATS48 	5.5 to 15	GV2	-	18	
		5.5 to 37	NS80	-	18	
		45 to 55	NSX100-160	-	18	
	ATV61 	0.75 to 5.5	GV2	-	12	
		7.5 to 18.5	GV3	-	18	
		0.75 to 18.5	NS80	-	18	
	ATV71 	0.75 to 5.5	GV2	-	12	
		7.5	GV3	-	12	
		11 to 15	GV3	-	18	
		0.75 to 18.5	NS80	-	18	
Fixed mounting plate **SI = 211**	**ATS 48** 	5.5 to 11	GV2	-	18	 VSD - SS
		5.5 to 18.5	NS80	-	18	
		22 t o 30	NS80	-	24	
		30 to 55	NSX 100-250	-	36	
		75 to 90	NSX 100-250	-	48	
		75 to 90	NSX 250-630	12	column - 650mm	
		110 to 220	NSX 250-630	18	column - 650mm	
	ATV 61 	0.75 to 5.5	GV2	-	18	
		5.5 to 7.5	GV3	-	18	
		11 t o 18.5	GV3	-	24	
		22	GV3	-	36	
		5.5 to 11	NS80	-	18	
		15 to 18.5	NS80	-	24	
		22	NS80	-	36	
		30 to 37	NS80	-	48	
		30 to 75	NSX100-160	-	48	
		75 to 110	NSX250-400	12	column - 650mm	
		132 to 220	NSX250-400	18	column - 650mm	
		250	NSX250-400	18	column - 1150mm	
		280 to 400	NS800	column - 450mm	column - 1150mm	
	ATV71 	0.37 to 5.5	GV2	-	18	
		5.5 to 11	GV3	-	18	
		15 to 18.5	GV3	-	24	
		22	GV3	-	36	
		5.5 to 11	NS80	-	18	
		15 to 18.5	NS80	-	24	
		22	NS80	-	36	
		30	NS80	-	48	
		30 to 75	NSX100-250	-	48	
		75 to 110	NSX250	12	column - 650mm	
		132 to 160	NSX400	18	column - 650mm	
		200 to 315	NSX400-630	18	column - 1150mm	
		355 to 400	NS800	column - 450mm	column - 1150 mm	

Variable speed drive and soft starter - 690V

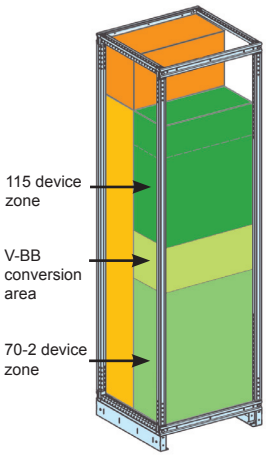
Withdrawability	Switchgears	Power (kW)	Circuit breaker or fuse	Modularity (1 module = 25 mm)		Cubicle
				Protection	Switchgears	
Fixed mounting plate **SI = 211**	**ATS48** 	11 to 18.5	GV2	-	48	 VSD - SS
		11 to 160	NS100-400	-	48	
		75 to 200	NS400	18	column - 650mm	
	ATV61 	2.2 to 11	GV2	-	36	
		11 to 30	NS100-400	-	36	
		37 to 90	NS100-400	-	48	
		75 to 200	NS400	18	column - 650mm	
		250 to 315	NS630b	column - 450mm	column - 1150mm	
	ATV71 	1.5 to 15	GV2	-	36	
		11 to 30	NS100	-	36	
		37 to 90	NS100-400	-	48	
		75 to 160	NS400	18	column - 650mm	
		200	NS400	18	column - 1150mm	
		250 to 400	NS630b	column - 450mm	column - 1150mm	

Cubicles available modularities

Device cubicles architecture



Cellule 230, 115, 70-2, 70-F et 185

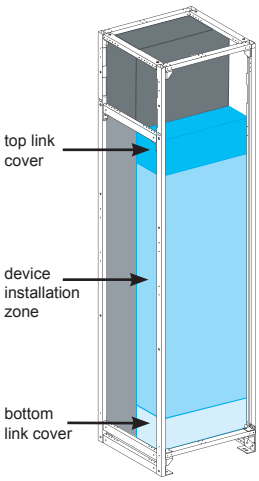


Cellule 115 / 70-2

Cubicles 230, 115, 115 / 70-2, 70-2, 70-F, 185:

Device installation zone				
Cubicle height	**2200 mm**		**2350 mm**	
No. of poles	3P	3P+N	3P	3P+N
Available modularity	66 modules		72 modules	
115 device zone	9 + 19 modules (700 mm)			
70-2 device zone	30 modules (750 mm)		36 modules (900 mm)	
V-BB conversion area	8 modules (200 mm)			

Note: 1 module = 25 mm.



Cellule 70-M

Cubicle 70-M:

Double vertical busbar							
Cubicle height		**2200 mm**			**2350 mm**		
No. of poles	**H-BB**	3P	4P		3P	4P	
	V-BB	3P	3P	4P	3P	3P	4P
Available modularity		64 modules	60 modules	56 modules	68 modules	68 modules	60 modules
Top link cover dimension		-	4 modules (100 mm)	4 modules (100 mm)	2 modules (50 mm)	2 modules (50 mm)	6 modules (150 mm)
Bottom link cover dimension		2 modules (50 mm)	2 modules (50 mm)	6 modules (150 mm)	2 modules (50 mm)	2 modules (50 mm)	6 modules (150 mm)

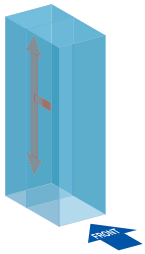
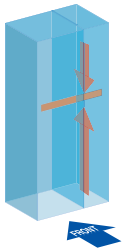
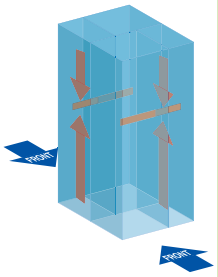
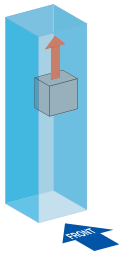
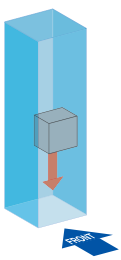
Single vertical busbar							
Cubicle height		**2200 mm**			**2350 mm**		
No. of poles	**H-BB**	3P	4P		3P	4P	
	V-BB	3P	3P	4P	3P	3P	4P
Available modularity		64 modules	60 modules	60 modules	68 modules	68 modules	64 modules
Top link cover dimension		-	4 modules (100 mm)	4 modules (100 mm)	2 modules (50 mm)	2 modules (50 mm)	6 modules (150 mm)
Bottom link cover dimension		2 modules (50 mm)	2 modules (50 mm)	2 modules (50 mm)	2 modules (50 mm)	2 modules (50 mm)	2 modules (50 mm)

Note: 1 module = 25 mm.

Cubicles available modularities

Type of connection

Okken has 5 types of connection:
- rear connection and side connection, done in a specific compartment at the rear or at the side of the device cubicle,
- back to back connection, done in a specific compartment at the side of the front or back cubicle,
- top direct connection and bottom direct connection, directly done in the device cubicle.

Connection	230	115	115/70	Single NW	Single NT/NS	70-2	70-F	VSD(1)	185	PFC	70-M
Rear connection 		C B 400/600 C A 600 250 650			C B 400 C A 600 250 1150						B 400/600 A 600 600
Side connection 		C A B 600 250 650 350/450/650				C A B 600 250 650 350/450/650					A B 600 600 200/300/400
Back to back 											300/400 600 B A 600 A B 600 600 300/400
Top direct 				A 600 650							
Bottom direct 				A 600 650							

(1) except for P > 75 kW

A device cubicle **B** cable compartment **C** auxiliaries (option)

Presentation

Cubicle

The Okken switchboards consist of a framework and busbar assembly designed to combine in the same cubicle functional units of varying technologies, grouping both distribution and motor control applications.

A complete range of configurations to satisfy the requirements of each site:
- ■ cubicles available in 2 heights, 5 widths and 2 depths, to allow integration in all environments and optimize installation modularity,
- ■ switchboard supplied by busbar trunking and / or cables,
- ■ front or rear, top and / or bottom connections,
- ■ choice of functional unit output partitioning:
- □ incomers: forms 3b, 4b,
- □ feeders: forms 2b, 3b, 4a, 4b,
- ■ possible customisation of panels, whose components may be delivered unpainted.

Busbars

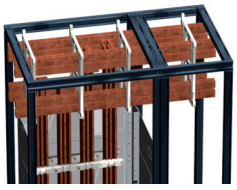
Busbar coating

Busbar coating	none	silver	tin	nickel	epoxy
Horizontal busbar	■	■	■		■
Vertical busbar 115	■	■	■		■
Vertical busbar 70	■			■	■
Vertical busbar 115 - 70	■			■	■
protection against ...			corrosive environment	corrosive environment	internal arc

Optimization

- ■ The busbar epoxy coating increase heating up to 10%.
- ■ To increase busbar In in hot environments and with an IP 41 or 54, cubicle ventilation is strongly recommended.

Horizontal busbar



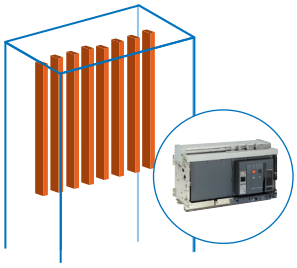
Selection table

Allowable intensity (A) - IP31 / 35 °C	(kA eff.)	Qty of bars Bars section 40 x 10 mm
Single busbars		
from 0 to 1900	50	2
from 1900 to 2500	80	3
from 2500 to 3200	100	4
from 3200 to 4000	100	6
Double busbars		
from 4000 to 5000	100	2 x 3
from 5000 to 6300	100	2 x 4
from 6300 to 7300	150	2 x 6

Functional unit

Busbar for 230 cubicle

- very high power,
- dedicated to NW40b-63 devices,
- height-reduced busbar.



Rated current In (A) IP31 / 35°C	No. of bars / phase	Icw max (kA)
4530	2 x 3 x 40x10	100
5810	2 x 4 x 40x10	100
7320	2 x 6 x 40x10	150

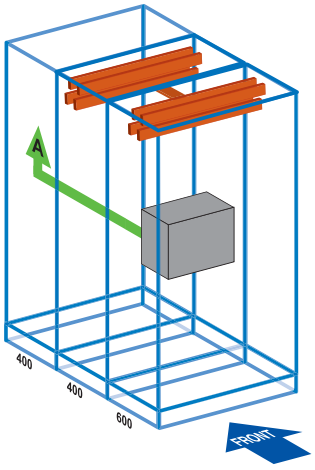
Type of connection

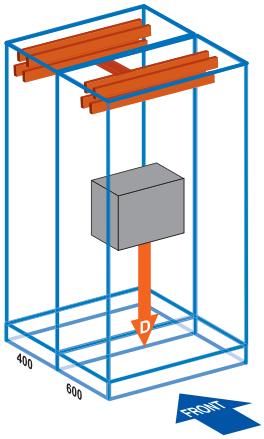
Type of distribution	Type of connection	Qty of cubicle
1 incomer or 1 distribution feeder	■ direct connection from the bottom ■ rear connection	1
2 incomers + 1 coupling	■ rear connection	3

The dimensions of the functional units, PCC > 630A, are in the choice pages, page 18.

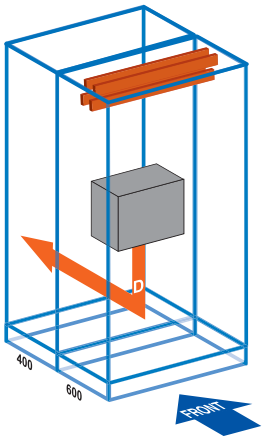
Masterpact NW40b-63

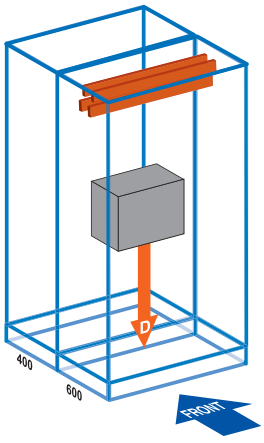
Double horizontal busbar





Single horizontal busbar





D direct connection

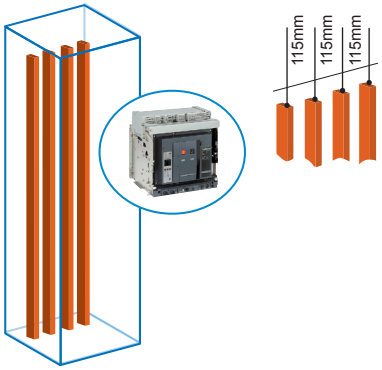
Rear connection from the top or the bottom

A A: Additionnal= 800 mm

Functional unit

Vertical 115 busbar

- high power,
- designed for NW08-40, NT08-16 / NS800-1600 devices,
- full height busbar.



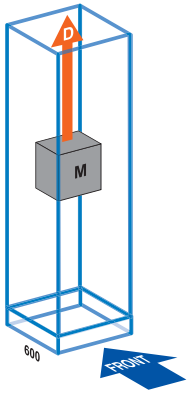
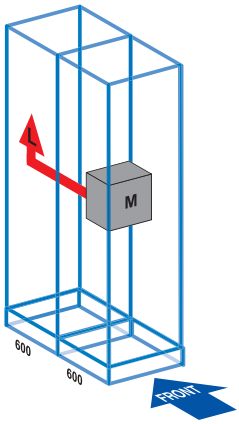
Rated current In (A) IP31 / 35°C	No. of bars / phase	Icw max (kA)
1750	1 x 80x10	50
2780	2 x 80x10	100
3200	3 x 80x10	100
4090	3 x 120x10	100

Type of connection

Type of distribution	Circuit breaker	Type of connection	Qty of cubicle
1 incomer or 1 distribution feeder	Masterpact NW40	■ direct connection from the bottom ■ rear connection	1
	Masterpact NW08-32	■ side connection from the front ■ direct connection from the top ■ direct connection from the bottom ■ rear connection	1
	Masterpact NT08-16	■ side connection from the front ■ direct connection from the top ■ direct connection from the bottom ■ rear connection	1
2 incomers + 1 coupling	Masterpact NW40	■ direct connection from the bottom	2
		■ rear connection	3
	Masterpact NW08-32	■ direct connection from the top ■ direct connection from the bottom ■ rear connection	2
	Masterpact NT08-16	■ direct connection from the top ■ direct connection from the bottom ■ rear connection	2

The dimensions of the functional units, PCC > 630A, are in the choice pages, page 18.

Masterpact NW40

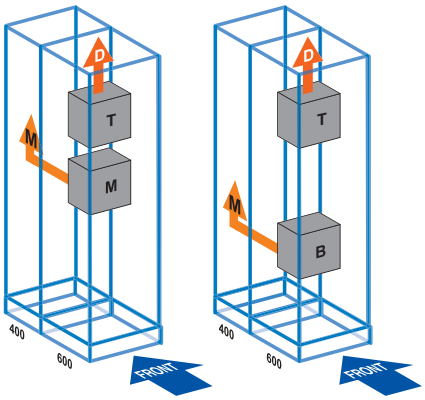
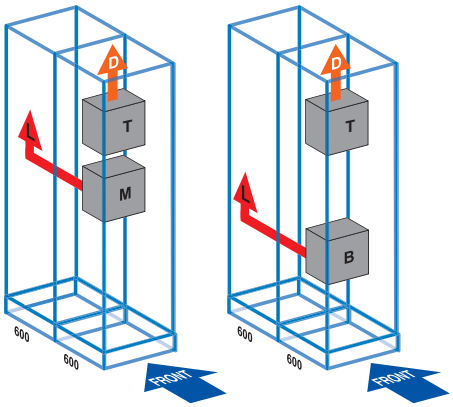
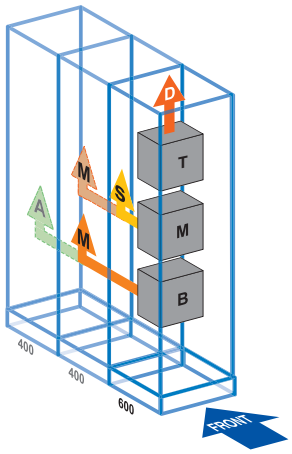
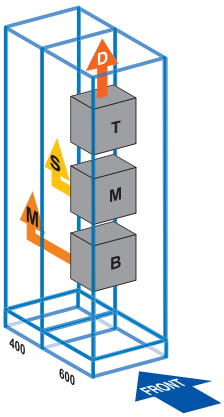
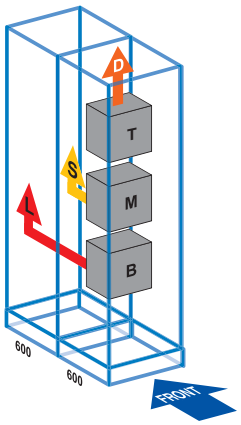
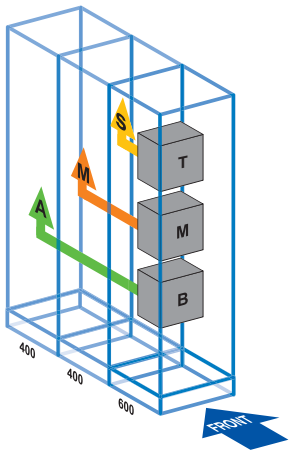
column depth 600 mm	column depth 1200 mm
	

D direct connection

Rear connection from the top or the bottom

L: long = 600 mm

Rear connection

	column depth 1000 mm	column depth 1200 mm	column depth 1400 mm
Masterpact NW20-32			
Compact NS800-1600 Masterpact NW / NT08-16			

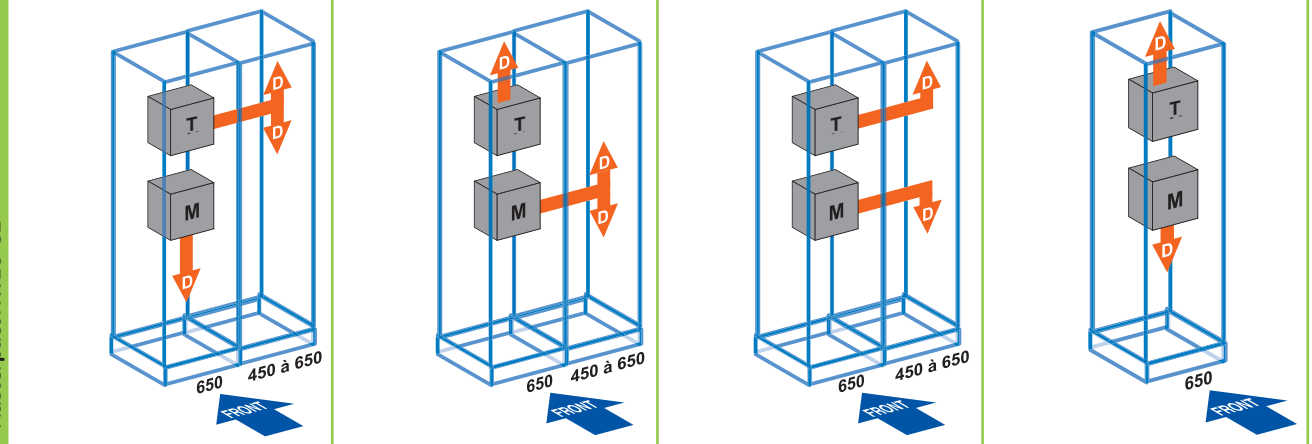
Rear connections from the top or the bottom

- D: direct connection
- S: short= 250 mm
- M: medium= 400 mm
- L: long = 600 mm
- A: additionnal = 800 mm

Side connection

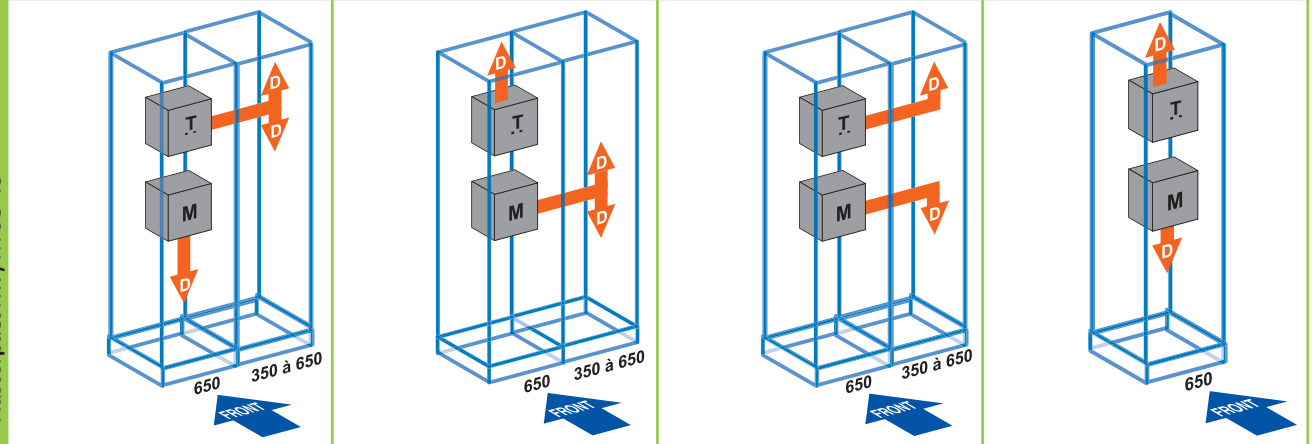
Masterpact NW20-32

column width 650 + 450 / 650 mm



Masterpact NW / NT08-16

column width 650+350 / 650 mm



D direct connection

Single NW

Functional unit

Vertical 115 busbar

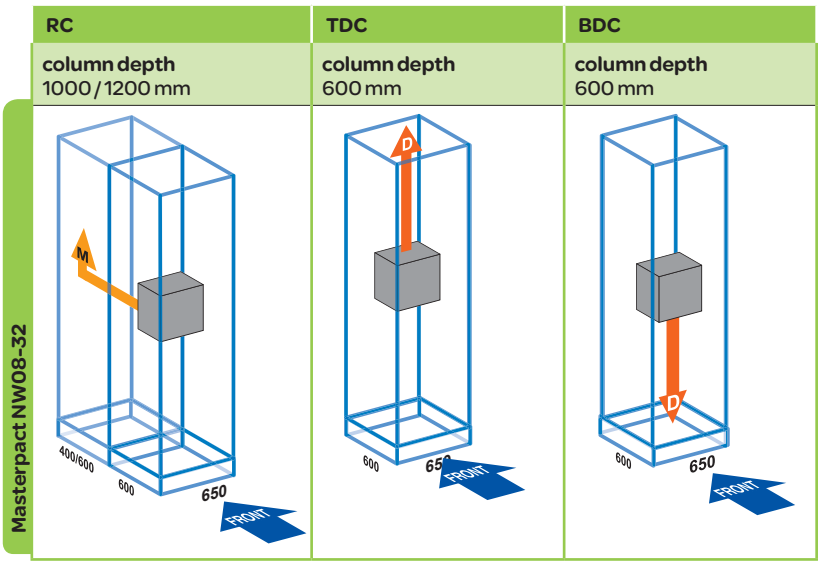
- high power,
- designed forNW08-32 devices,
- height-reduced busbar.

Rated current In (A) IP31 / 35°C	No. of bars / phase	Icw max (kA)
1750	1 x 100x10	50
2780	2 x 100x10	100
3200	3 x 100x10	100

Type of connection

Type of distribution	Circuit breaker	Type of connection	Qty of cubicle
1 incomer or 1 distribution feeder	Masterpact NW40	■ direct connection from the bottom ■ rear connection	1
	Masterpact NW08-32	■ side connection from the front ■ direct connection from the top ■ direct connection from the bottom ■ rear connection	1
	Masterpact NT08-16	■ side connection from the front ■ direct connection from the top ■ direct connection from the bottom ■ rear connection	1

The dimensions of the functional units, PCC > 630A, are in the choice pages, page 18.



D direct connection

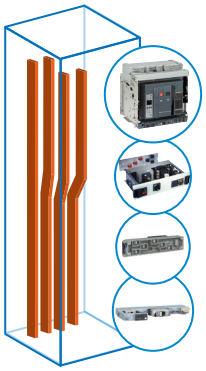
Rear connections from the top or the bottom:

M: medium = 400 mm

Functional unit

Vertical 115 / 70-2 busbar

- Mixing high power incomers and feeders,
- designed for NW08-32 devices and functional units up to 630 A,
- full height busbar.



Rated current In (A) IP31 / 35°C	No. of bars / phase	Icw max (kA)
zone 115		
1750	1 x 80x10	50
2780	2 x 80x10	80
3200	3 x 80x10	80
zone 70-2		
1750	1 x 80x10	80

Type of connection for electrical distribution > 630 A

Type of distribution	Circuit breaker	Type of connection	Qty of cubicle
1 incomer or 1 distribution feeder	Masterpact NW40	■ direct connection from the bottom ■ rear connection	1
	Masterpact NW08-32	■ side connection from the front ■ direct connection from the top ■ direct connection from the bottom ■ rear connection	1
	Masterpact NT08-16	■ side connection from the front ■ direct connection from the top ■ direct connection from the bottom ■ rear connection	1

Type of connection for electrical distribution ≤ 630 A

Compact NS / NSX

Type of functional unit	Type of connection
Disconnectable on Polyfast	■ side connection from the front ■ rear connection
Removable on Polyfast	■ side connection from the front ■ rear connection
Drawer	■ side connection from the front ■ rear connection

Small distribution (iC60)

Type of functional unit	Type of connection
Drawer	■ side connection from the front ■ rear connection
Disconnectable on mounting plate	■ side connection from the front

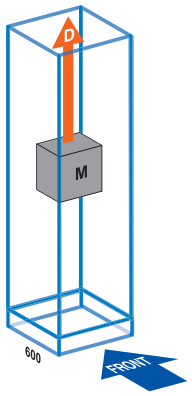
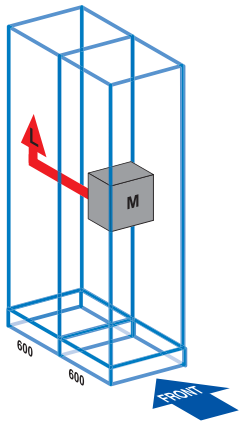
The dimensions of the functional units, PCC ≤ 630A, are in the choice pages, page 19.

D direct connection

Rear connection from the top

L: long = 600 mm

Masterpact NW40

column depth 600 mm	column depth 1200 mm
	

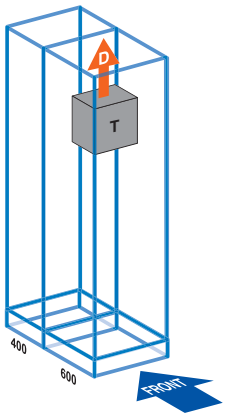
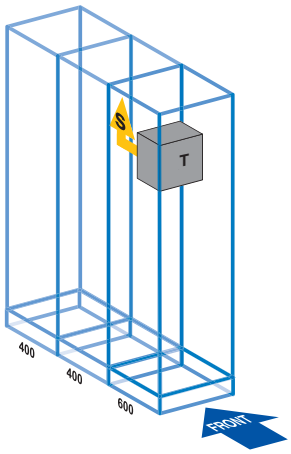
Rear connection

D direct connection

Rear connections from the top or the bottom

S: short= 250 mm

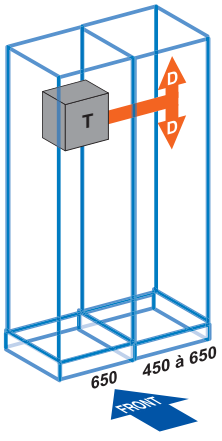
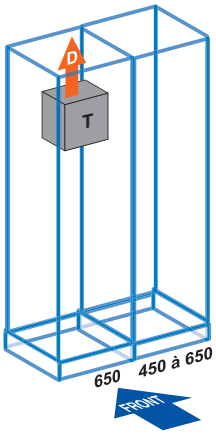
Compact NS800-1600
Masterpact NW/NT08-16

column depth 1000 / 1200 mm	column depth 1400 mm
	

Side connection

D direct connection

Masterpact NW20-32

column width 650 + 450 / 650 mm	
	

Single NT / NS

Functional unit

Vertical 70 busbar

- high power,
- designed for NT08-16 / NS800-1600 devices,
- height-reduced busbar.

Rated current In (A) IP31 / 35°C	No. of bars / phase	Icw max (kA)
1750	1 x 80 x 10	80

Type of connection

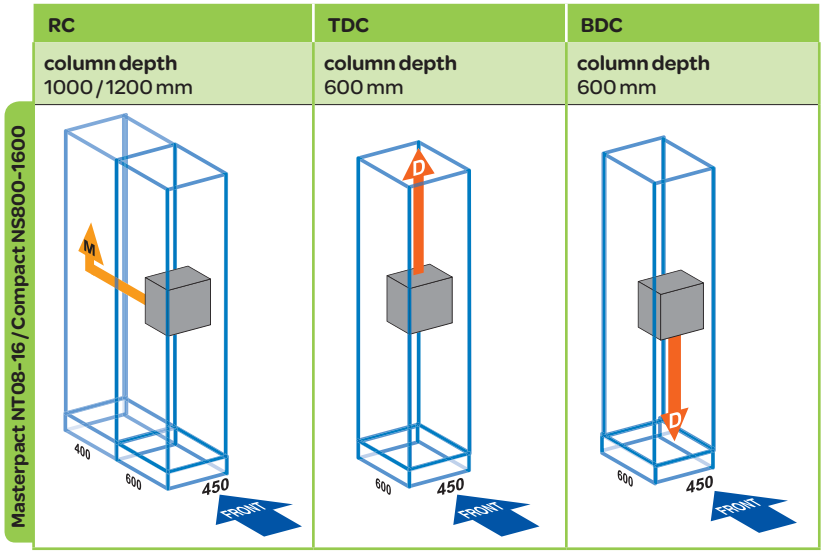
Type of distribution	Type of connection	Qty of cubicle
1 incomer or 1 distribution feeder	■ direct connection from the bottom ■ direct connection from the top ■ rear connection	1

The dimensions of the functional units, PCC > 630A, are in the choice pages, page 18.

D direct connection

Rear connections from the top or the bottom:

M: medium = 400 mm

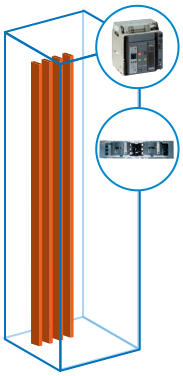


Schneider Electric 42

Functional unit

Vertical 70 busbar

- designed for NT08-16/NS800-1600 and all the distribution feeders,
- full height busbar.



Rated current In (A) IP31 / 35°C	No. of bars / phase	Icw max (kA)
1010	1 x 40x10	50
1200	1 x 50x10	50
1750	1 x 80x10	80
2100	1 x 100x10	100

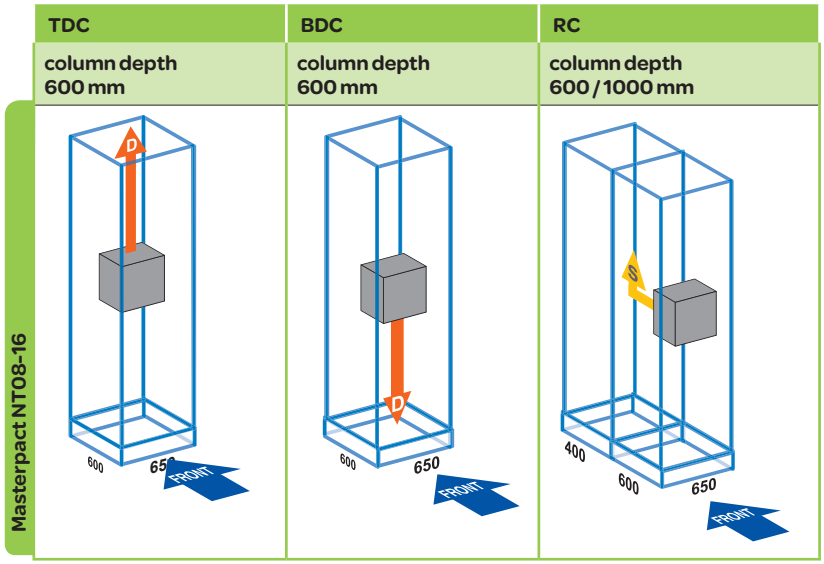
Type of connection for electrical distribution > 630 A

Type of distribution	Circuit breaker	Type of connection	Qty of cubicle
1 incomer or 1 distribution feeder	Masterpact NT08-16	■ side connection from the front	1
		■ direct connection from the bottom	1
		■ direct connection from the top	1
		■ rear connection	1

Type of connection for electrical distribution ⩽ 630 A

Circuit breaker	Type of connection
Compact NSX	■ side connection from the front ■ rear connection
Compact NS	■ side connection from the front ■ rear connection

The dimensions of the functional units, PCC ⩽ 630A, are in the choice pages, page 19.



D direct connection

Rear connections from the top or the bottom:

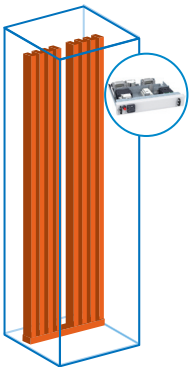
S: short = 250 mm

70-M

Functional unit

Vertical 70-M busbar

- designed for 70-M drawers,
- full height busbar.



Rated current In (A) IP31 / 35°C	No. of bars / phase	Icw max (kA)
800	2 x 20 x 8	50
1250	2 x 30 x 8	75
2000	2 x 50 x 8	100

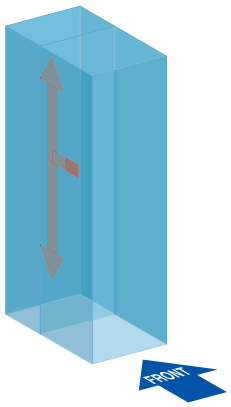
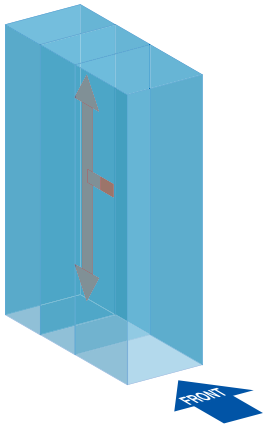
Type of connection

Type of functional unit	Type of connection
Drawer	■ side connection from the front ■ rear connection ■ back to back

The dimensions of the functional units are in the choice pages:
- PCC ⩽ 630A page 19,
- MCC page 25.

Rear connection

TeSys U / GV2-GV3 / Compact NS80
Compact NSX100-630 / GS2 / Vario 2-3

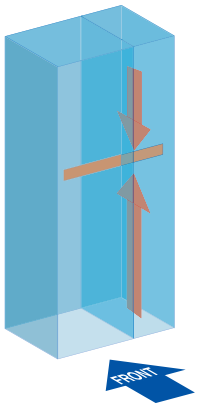
column depth 1000 to 1200 mm	column depth 1400 mm
	

70-M

Side connection

TeSys U / GV2-GV3 / Compact NS80
Compact NSX100-630 / GS2 / Vario 2-3

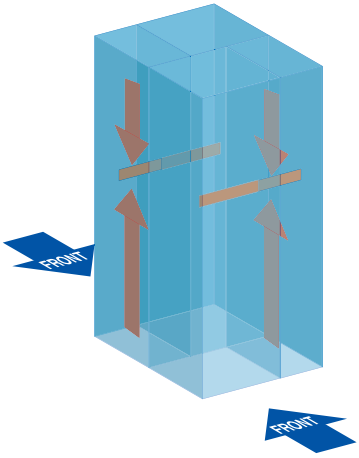
column width 600 + 200 / 300 / 400 mm



Back to back connection

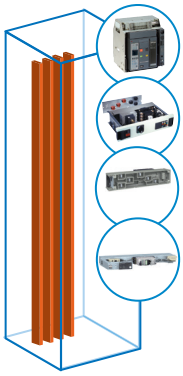
TeSys U / GV2-GV3 / Compact NS80
Compact NSX100-630 / GS2 / Vario 2-3

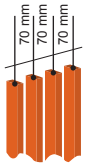
column width 600 + 300 / 400 mm



Functional unit

70-2 cubicle is compliante with specific applications:
- marine,
- seismic,
- DEP Shell,
- nuclear.





Vertical 70 busbar

- designed for NT08-16 / NS800-1600 and all the distribution feeders and motor control feeders,
- full height busbar.

Rated current In (A) IP31 / 35°C	No. of bars / phase	Icw max (kA)
1010	1 x 40x10	50
1200	1 x 50x10	50
1750	1 x 80x10	80
2100	1 x 100x10	100

Type of connection for functional units > 630 A

Type of distribution	Circuit breaker	Type of connection	Qty of cubicle
1 incomer or 1 distribution feeder	Masterpact NT08-16	■ side connection from the front	1
		■ direct connection from the bottom	1
	Compact NS800-1600 A	■ direct connection from the top	1
		■ rear connection	1

Type of connection for functional units ⩽ 630 A

Small distribution (iC60)

Type of functional unit	Type of connection
Drawer	■ side connection from the front ■ rear connection
Disconnectable on mounting plate	■ side connection from the front

Other functional units

Type of functional unit	Type of connection
Disconnectable on Polyfast	■ side connection from the front ■ rear connection
Removable on Polyfast	■ side connection from the front ■ rear connection
Drawer	■ side connection from the front ■ rear connection

The dimensions of the functional units are in the choice pages:
- PCC ⩽ 630A page 19,
- MCC page 27.

Rear connection

D direct connection

Rear connections from the top or the bottom:

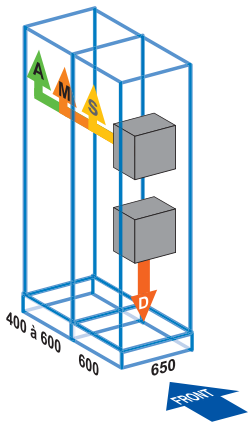
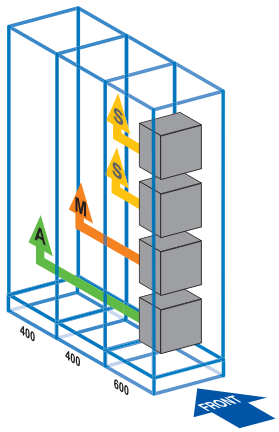
S: short= 250 mm

L: long= 600 mm

M: medium= 400 mm

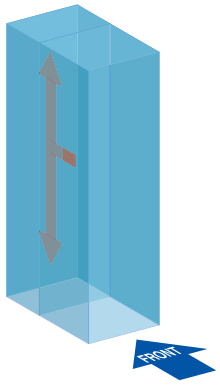
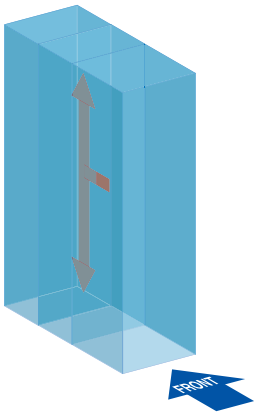
A: additionnal= 800 mm

Masterpact NT08-16 / Compact NS08-16

column depth 1000 to 1200 mm	column depth 1400 mm
	

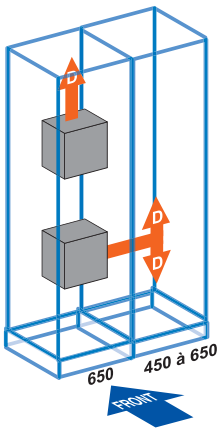
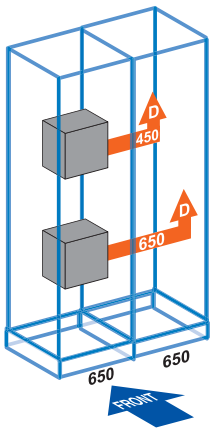
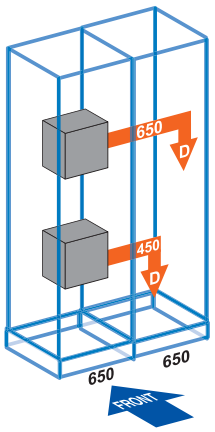
Rear connection (continued)

TeSys U / GV2-GV3 / Compact NS80
Compact NSX100-630 / GS2

column depth 1000 to 1200 mm	column depth 1400 mm
	

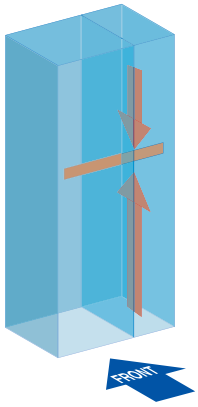
Side connection

Masterpact NT08-16 / Compact NS08-16

column width 650 + 450 / 650 mm	column width 650 + 650 mm	
		

D direct connection

TeSys U / GV2-GV3 / Compact NS80
Compact NSX100-630 / GS2

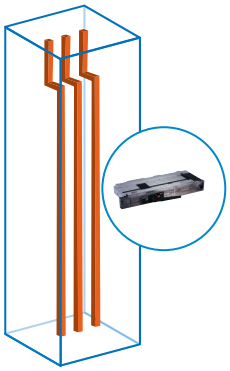
column width 650 + 350 / 450 / 650 mm


185 (Jean Müller)

Functional unit

Vertical 185 busbar

- designed for Jean Müller fuse-switches,
- full height busbar.



Rated current In (A) IP35 / 35°C	No. of bars / phase	Icw max (kA)
630	1 x 40x10	80
800	1 x 50x10	80
1250	1 x 80x10	80
1500	1 x 100x10	80

Type of connection

Type of functional unit		Type of connection
Drawer		■ side connection from the front ■ rear connection

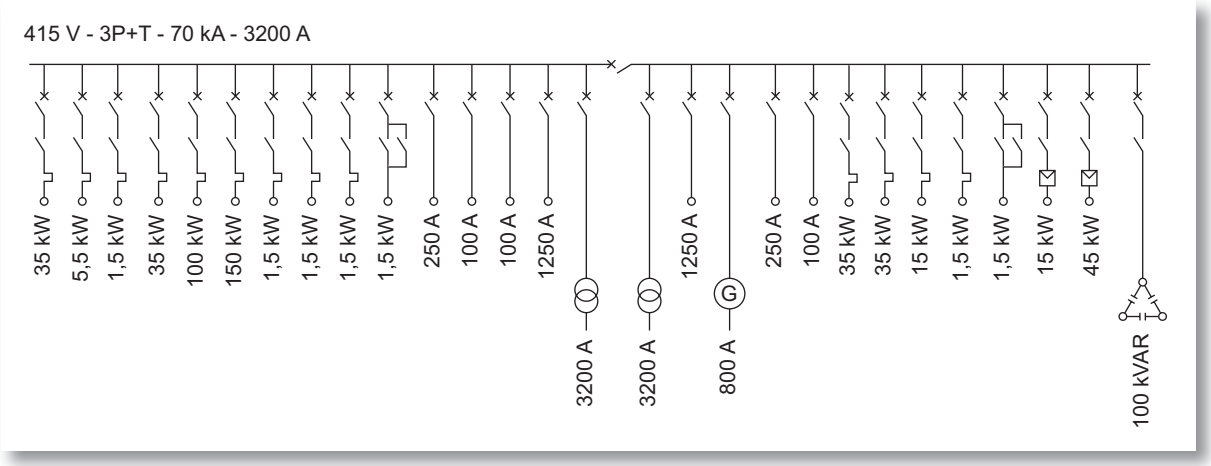
The dimensions of the MCC functional units are in the choice pages, page 25.

Notes

Example of configuration

1 Customer's needs

Single line diagram



Main characteristics of the switchboard

Reference standards		IEC 61439-2
Rated insulation voltage		1000 V
Rated operation voltage		380 / 415 V
Vertical busbar rating		3200 A
Rated short-circuit current		70 kA
Rated peak current		154 kA
Rated frequency		50 / 60 Hz
Busbar	number of phases	3
	material	copper
	insulation	air
Form		3b
Degree of pollution	external	IP 31
	internal	IP 20
Rated auxiliary circuit voltage		230 V
Energy compensation		100 kVAR
Cable entry		top / bottom
Access		front / rear
Temperature		35 °C
Altitude		≤ 2000 m
Panelling color		RAL 9003

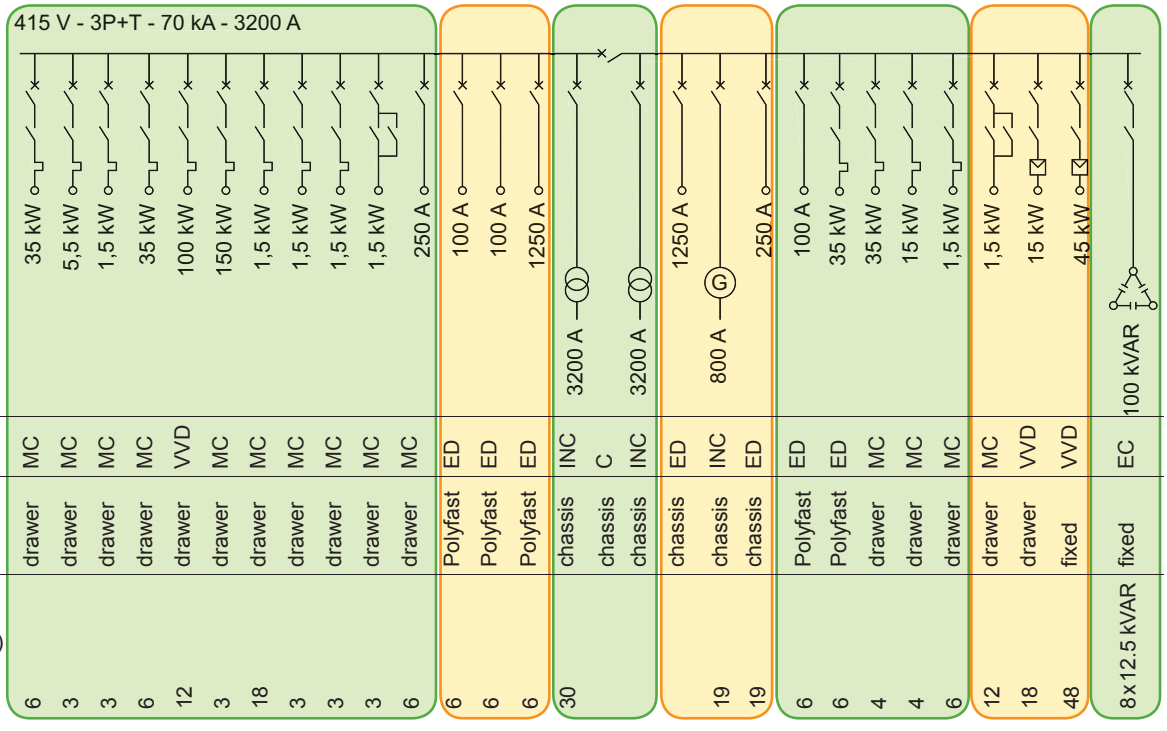
Example of configuration

2 Determine the functional units

according to the following parameters:

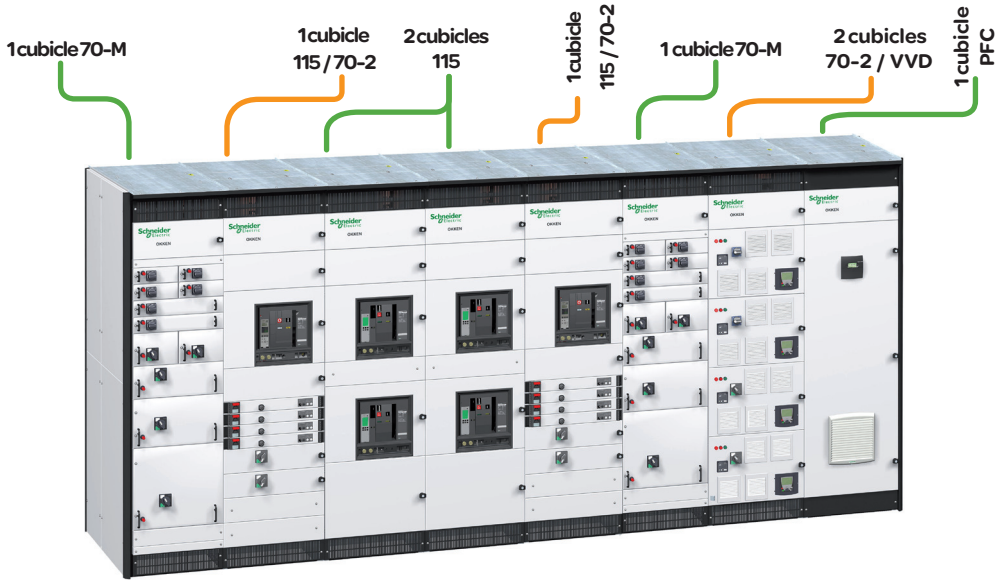
- In current,
- voltage,
- short-circuit current,
- number of pole
- type and technology of the functional units.

3 Deduce the number and the type of necessary cubicles



Type of functional units	MC	MC	MC	MC	VVD	MC	MC	MC	MC	MC	MC	ED	ED	ED	INC	C	INC	ED	INC	ED	ED	ED	MC	MC	MC	MC	VVD	VVD	EC
Technology	drawer	drawer	drawer	drawer	drawer	drawer	drawer	drawer	drawer	drawer	drawer	Polyfast	Polyfast	Polyfast	chassis	chassis	chassis	chassis	chassis	chassis	Polyfast	Polyfast	drawer	drawer	drawer	drawer	drawer	fixed	fixed
No. of vertical modules (1 module = 25 mm)	6	3	3	6	12	3	18	3	3	3	6	6	6	6	30			19	19	6	6	4	4	6	12	18	48	8x12.5 kVAR				

Cubicles, height = 2350 mm, rear connection with around 10 % of reserve



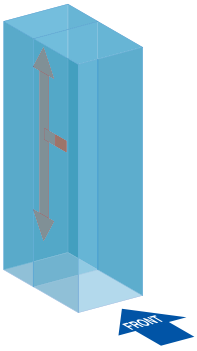
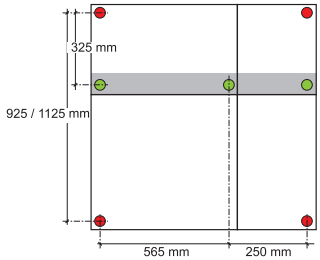
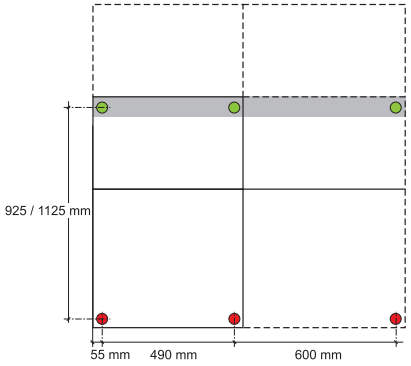
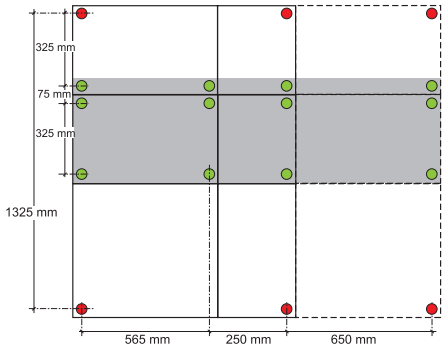
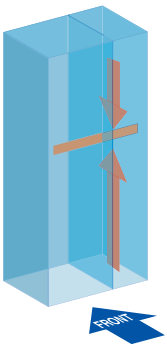
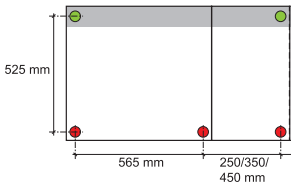
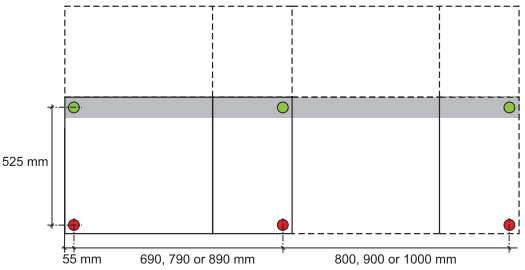
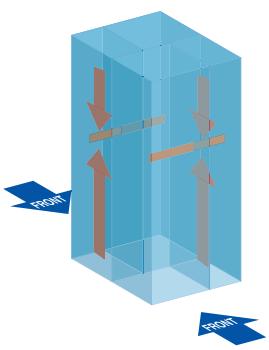
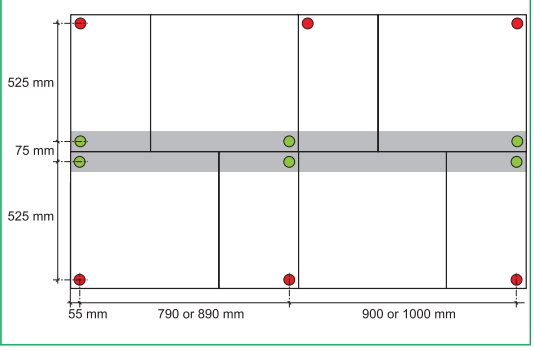
To determine the dimensions of each functional unit, see the selection table.
***INC:** high power circuit-breaker incoming.*
***C:** coupling.*
***EC:** Power factor compensation and harmonic filtering.*
***ED:** electrical distribution.*
***MC:** motor control.*
***VVD** = Variable speed drive and soft starter.*

Design your installation
Civil works

Ground fastening

● compulsory fastening point
● optional fastening point

■ class 8.8 screws: M10 TH screws + washers
(∅ 25 mm external, thickness 3 mm) +
CS ∅ 10 mm contact washers

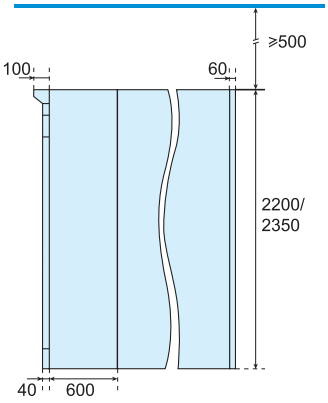
Connection	230, 115, 115-70, 70-F, 70-2 and 185 cubicles	70-M cubicle
Rear connection 		
		
Side connection 		
Back to back 		

Design your installation
Civil works

Minimum clearances around switchboard

- For connection by cables and fishplating of the horizontal busbar, provide 500 mm above the switchboard.
- When ceiling clearance is limited, provide a horizontal busbar of 3200 A maximum (4 bars / phase) for fishplating and connection from the front of the switchboard.

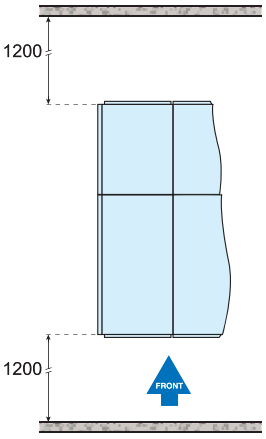
Side view



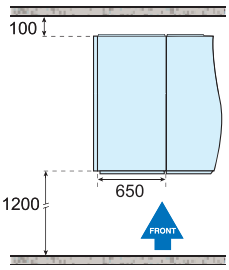
Clearance above the switchboard.

Top view

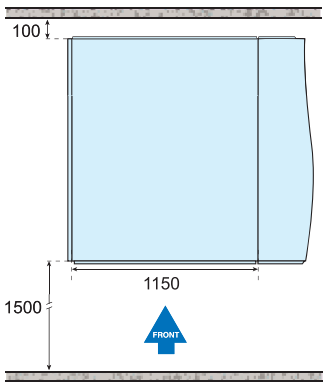
Rear connection



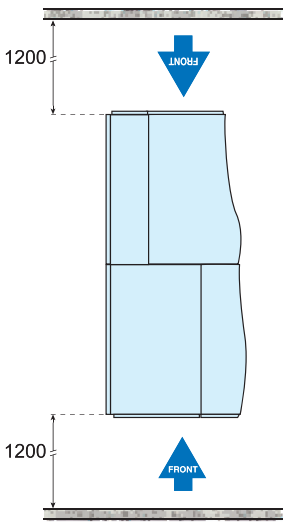
Side connection



All cubicle except 230 cubicle



230 cubicle.



70-M back to back connection.

Futher technical information

General data

Standard environment

reference standards		IEC 61439-2
		IEC 60529
climatic resistance	damp heat withstand	IEC 60068-2-30
	dry heat withstand	IEC 60068-2-2
	low temperature withstand	IEC 60068-21
	salt spray withstand	IEC 60068-2-11
installation		indoor
earthquake withstand		IEC68-3-3 and IRC60721-3-6 according to IBC 2000
		CRT91
environment (CEM)		type 2

Mechanical data

cable entry		top / bottom
access		front / rear
degree of protection (IP)		22 / 31 / 41 / 54
impact withstand index (IK)		10
form		2b / 3b / 4a / 4b
withdrawability		FFD / WFD / WFW / WWW
dimensions (mm)	height	2200 / 2350
	width	600 / 650 / 800 / 900 1000 / 1100 / 1150 / 1300
	depth	600 / 1000 / 1200 / 1400
installation modularity in a cubicle	height 2200 mm	66 modules of 25 mm
	height 2350 mm	72 modules of 25 mm
average weight	cubicle 115 (2500A)	~ 850 kg
	cubicle 70-M	~ 400 kg
	cubicle 70-2 PCC	~ 700 kg
	cubicle 70-2 MCC	~ 600 kg
	cubicle 230 (6300A)	~ 1300 kg
panel coating		epoxy / polyester powder (SP03) polymerised, > 50 µ
framework		galvanised
panelling colour		RAL 9003

Electrical data

rated insulation voltage (Ui)		1000 V
rated operational voltage (Ue)		415 / 690 V CA
rated frequency (F)		50 / 60 Hz
rated impulse voltage (Uimp)		12 kV
rated auxiliary circuit voltage		230 V AC max.
overvoltage category		IV
degree of pollution		3
rated current (In)		6300 A
horizontal busbar rating		7300 A
vertical busbar rating		4000 and 2000 A
horizontal busbar	rated short-time current (Icw) 1s	50 / 80 / 100 / 150 kA rms
	rated peak current	110 / 176 / 220 / 330 kA peak
vertical busbar	rated short-time current (Icw) 1s	50 / 80 / 100 kA rms
	rated peak current	110 / 176 / 220 kA peak
rated conditional short-circuit current (Isc)		up to 150 kA
internal arcing protection according to IEC 61641 V2		100 kA eff 0.4 s
earthing diagram		TT-IT-TNS-TNC
current limit of power incoming and outgoing feeders		up to 6300 A
power limit of motor control feeders		up to 250 kW 690 V

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