



Good to Great 2008

Tesys D 09 to 38A contactors for Railway applications (passengers coache / Rolling stock)

Didier Scheer , March 2007



Schneider
 **Electric**





Power

Railway applications : electric equipment for rolling stock

■ Main standard required by Railway market



□ IEC 60- 077 : Railway applications : Electric equipment for rolling stock

- operating from 0,7 to 1,25 times the nominal voltage , from -25°C to $+70^{\circ}\text{C}$
- chock and vibration withstand , according to IEC 61-373 , category 1 class B

□ NF 16 101–102 : Railway applications – Fire & smoke withsand

□ in addition to usual standard as IEC 947 series





Power

Railway applications : electric equipment for rolling stock



	Converters	Auxiliaries	Control & Communication	Motors & Gears
LV protection	●	●		
Detection			●	●
Safety			●	
Power Control & Protection	●	●	●	
Push Buttons			●	
Enclosures	●	●	●	
Beacons			●	
Human Machine Interface			●	
Programmable Logic Controllers			●	●

- Traction Control
- Brake Control
- Slip and Skid Control
- Door control
- Heating / air conditioning
- Lighting
- Speed monitoring
- Simple I/O
- Diesel engine control and diagnostics
- Battery control
- Cockpit Automation
- Driver Display
- Electric train tilt control
- etc.



Power



Schneider & Railway applications

- **Schneider is working for a long time for these applications**
- **as partner with main train/subway manufacturers : Bombardier , Alstom , Ansaldo , CAF, Rotem, ...**
- **to switch motors and loads :** contactors & protection for
 - brakes compressor ,
 - heating&ventilation compressor,
 - lighting /door / signaling /communication / propulsion monitoring,....
- **to monitor & control different systems:**
 - Electromechanical, Electronic pressure switch for brake system, fire alarm system, pressure generation system and HVAC.
 - Limit switches for gate control.
 - Photo-electric sensors for the passage of the passengers (counting, gates opening...)
 - Control system for traction monitoring , service brake, vehicle speed, power supply ...
- **to protect electrical installation**



Power

TesysD evolution

■ Up to now Tesys D offer answer to Railway applications requirements :

- general characteristics (CEI 60-077 or NF F 62-000)
- fire & smoke (NF 16-101 & 16-102) : **severity level 1**
- shock & vibration withstand (CEI 61-373)

■ In order to answer to fire & smoke severity level 3

- mainly required for products installed within the coaches, for subways (A1 category : material which are working frequently underground)
- and also cover severity level 2 required for inside installation whatever the category

➤ Schneider has developed a specific range for Railway applications

**S207 TeSys D specification
for LC1D 09 to 38 & CAD**



Power

Fire & smoke : NF16-101&16-102 requirement

Classification of rolling stock

The NF F 16-101 standard identifies 3 categories of rolling stock.

Category A1: equipment frequently running in tunnels.

Category A2: equipment seldom running in tunnels, motor coaches and trailers, main line trains with sleeper cars.

Category B: main line train equipment for seated passengers seldom running in tunnels, locomotive driver cabs.

requirements according to rolling stock categories

Installation situation, location		Requirements for		
		category A1	category A2	category B
Outside	$m \leq 300 \text{ g}$	0	0	0
	$m > 300 \text{ g}$	2	1	1
Inside	technical premises			
	$m \leq 300 \text{ g}$	0	0	0
	$m > 300 \text{ g}$	2	2	2
	passenger premises, driver's cab			
	$m < 10 \text{ g}$	0	0	0
	$10 \text{ g} \leq m \leq 100 \text{ g}$	2	2 ⁽¹⁾	2 ⁽¹⁾
	$m > 100 \text{ g}$	3	3	3
Inside or outside				
- part subjected to electric arc		4	3	3
- on special specification, other part exposed				
In closed enclosure	$v \leq 0.5 \text{ m}^3$	0	0	0
	$v > 0.5 \text{ m}^3$	(2)	(2)	(2)
(1) : no smoke classification is required		(2) : requirement depends on the location		
m = part weight ; v =inside volume				



Power

Fire & smoke : NF16-101&16-102 requirement

Definition of the requirements

Based on the I and F classifications the NF F 16-102 standard defines a variety of authorised and forbidden combinations for the "fire" classification (classes I0 to I4) and for the "smoke" classification (classes F0 to F5) for each requirement from 1 to 4 read in table

authorised classifications (white boxes), forbidden classifications (grey boxes) for each level of requirement

Exigence																															
0		1						2						3						4											
No prescription		I0	I1	I2	I3	I4	NC			I0	I1	I2	I3	I4	NC			I0	I1	I2	I3	I4	NC			I0	I1	I2	I3	I4	NC
	F0																														
	F1																														
	F2																														
	F3																														
	F4																														
	F5																														



Power

Fire & smoke : NF16-101&16-102 requirement

■ Severity 3 allow the following installation :

TeSys D S207 products can be installed on rolling stock equipments without any constraints, even if the products are close together (rail mounting).

Outside



Inside





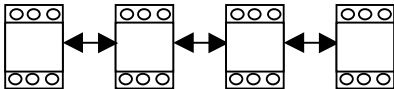
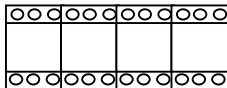
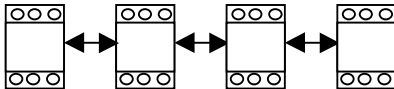
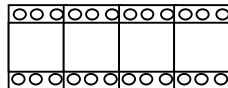
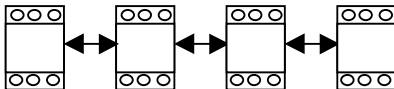
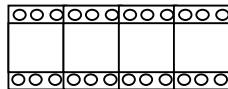
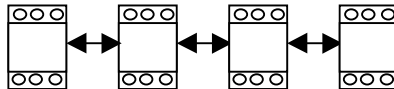
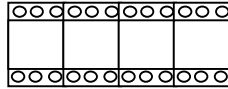
Power

Fire & smoke : NF16-101&16-102 requirement

Outside

Inside



Category B (Main line train) or Category A2 (City train)	 100g for one product, with 100mm spacing → $m < 300g$ → Severity 0  100g for one product, without spacing → $m > 300g$ → Severity 1	 100g for one product, with 100mm spacing → $m < 100g$ → Severity 2  100g for one product, without spacing → $m > 100g$ → Severity 3
Category A1 (Metro/Subway)	 100g for one product, with 100mm spacing → $m < 300g$ → Severity 0  100g for one product, without spacing → $m > 300g$ → Severity 2	 100g for one product, with 100mm spacing → $m < 100g$ → Severity 2  100g for one product, without spacing → $m > 100g$ → Severity 3



Power

Fire & smoke : NF16-101&16-102 requirement

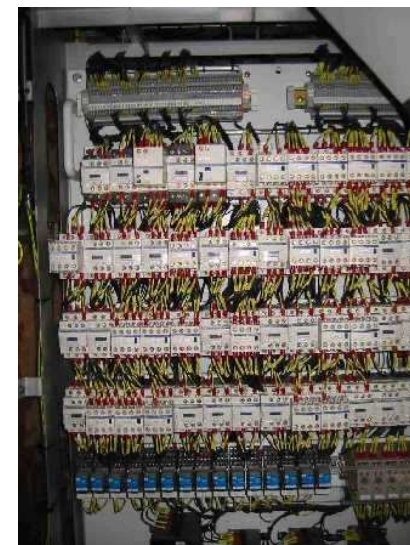
■ NF 16-101 & 16-102 : Category A1 (material which are working frequently underground)

- installed in passengers or driver cabins
- weight >100g (side by side products installation)

➤ Severity level 3 (material rating I2F3)

- parts close to Electrical Arc

➤ Severity level 4 (material rating I2F1)



**Fire
& smoke**
NF F 16-101
NF F 16-102
EN 60 695
EN ISO 4589

Tesys D S207



80% of plastic materials have been changed :

- * Power & Control terminal blocks , Base : severity 3
- * Arc shield : severity 4



Power

IEC 60 077-2 : Railway applications : electric equipment for rolling stock

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Power



Shock and Vibration tests

- Category 1 class B : body mounted, inside an equipment case

- Fonctional random vibration tests :

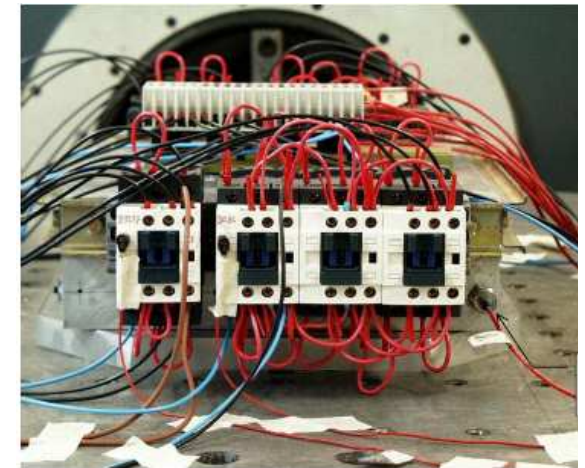
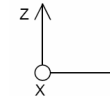
5 - 150Hz ==> 1 ms⁻² eff axe OX / 10 min
5 - 150Hz ==> 1 ms⁻² eff axe OY / 10 min
5 - 150Hz ==> 1 ms⁻² eff axe OZ / 10 min

- Accelerated random vibration tests :

5 - 150Hz ==> 5,50ms⁻² eff axe OX / 5 hours
5 - 150Hz ==> 3,50ms⁻² eff axe OY / 5 hours
5 - 150Hz ==> 7,90ms⁻² eff axe OZ / 5 hours

- Shock tests :

5g / 30ms / 3 shocks per sens , OX
3g / 30ms / 3 shocks per sens , OY & OZ



Tesys D S207

Specific test done in our Labs
“COFRAC accreditation”



Power



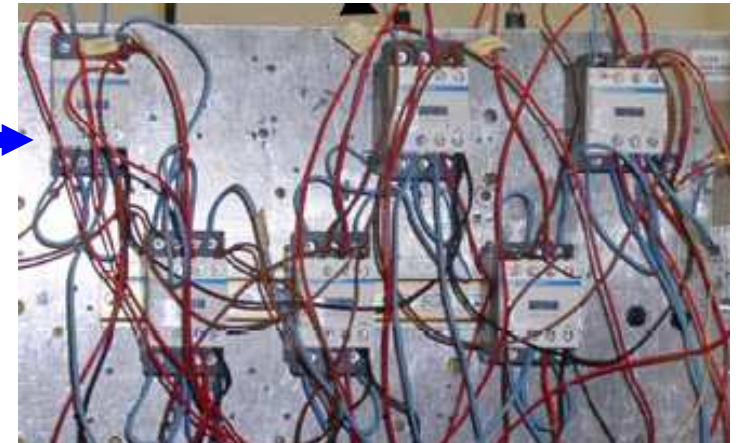
Shock and Vibration tests

- Category 1 class B : body mounted, inside an equipment case

- Test done for both type of installation

- fixed by screw on a solid plate →

- mounted on rail →

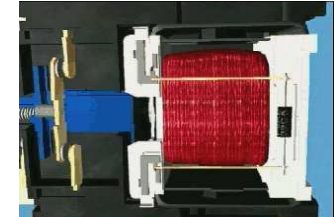


Tesys D S207

Specific test done in our Labs
“COFRAC accreditation”

Large coil operating range

- To support voltage fluctuation : 0,7 ... 1,25 Uc
- from -25°C to 70°C
- low consumption (4w)
- Even if side by side mounting



Tesys D xL S207

Specific large operating dc coil
24v (BL) , 72v (SL) , 110v (FL)

Ring lugs terminals

- Limit poor connection , caused by severe vibration



Tesys D S207

Products , version 6 terminals



Power

the Offer : Tesys D S207

■ Complete line - Part number principle :

□ 3P :	LC1D	096	126	186	256	326	386
□ 4P :	LC1DT	206	256	326	406		
□ 2P2R :	LC1D	0986	1286	1886	2586		
□ CAD :	CAD	326	506				

■ 3 low consumption large operating voltage DC coil

- BL 24V
- SL 72V
- FL 110V
- with bidirectional peak limiting diode

■ Standard voltage coil is also available

to be proposed when 4 poles add-on auxiliaries are needed , with some derating when used side by side mounting

- BD , SD , FD

ex : LC1D 09 6 SL S207



Competition

- ABB : TAL ..RT contactors from 9 to 110A & TNL ..RT relays



strong promotion & prescription on railway market
homogeneous range from 9 to 110A



Products larger than TesysD : 45mm up to 16A, 54mm up to 40A
Fire & smoke **severity level 2 only**
TAL contactors is limiting up to 55°C, **not 70°C**
TAL contactors **could not be used side by side mounting**
(5mm spacing is required)

- AL & AE range do not withstand Railway specification
 - coil operating limits 0,85 to 1,1 UC only !!



TAL 16-30-10



TAL 40-30-10



TAE 50-30-00



Power

Tesys D S207 competitive advantages

- Fire & smoke severity level 3

- ➔ enable installation whatever Rolling stock categories ,
and mounting solution (ic side by side)

- xL voltage coil operation from 0,7 to 1,25 Uc, from -25°C to 70°C

- ➔ enable installation whatever Power supply drop
(according to IEC 60 077 standard) & temperature

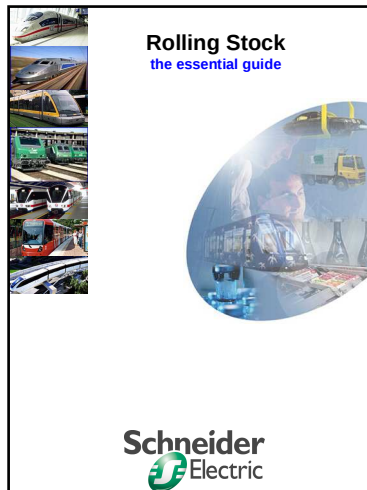
- Shock & Vibration withstand

- ➔ enable installation whatever mounting solution



Tesys D S207 launch planning

- Products availability : Q2 2007
- Communication means availability :
 - Declaration of conformity available
[Decla_conformité_Railways_TesysD S207_DSR 07-02-07.pdf](#)
 - Technical Catalog available
[TesysD S207 Railway Technical Catalog_v01.pdf](#)
 - S207 internal qualification PV available
[PV qualification S207.pdf](#)
 - Fire & smoke certificats available
[Certificats NF16 101&102_TeSys LC1D 9 à 38A s207.xls](#)
 - Shock & vibration test PV available
[TesysD S207 2007-0118-00A.pdf](#)
 - Rolling Stock Schneider Essential Guide Q3 2007





Power

Railway market : Conclusion

- Increase of the specification requirements from the main prescriptors
 - More and more sub contractors on the supply chain
 - More and more requirement for safety and reliability

➔ standardisation of the standard and product requirements on European market

- Opportunities for Schneider to promote our products range dedicated for this market
 - Product adaptation (ex: TesysD S207)
 - Test reports according to Railway application standards
 - Push / Pull Promotion & Prescription through
 - End Users (SNCF,RATP,DB,SNB)
 - Main train manufacturers (BOMBARDIER,ALSTOM,.....)
 - Sub contractors (SI,PB's,OEM)
 - Promote all Schneider offer (ic LVP, MAC, LEC, Selectron ...offers)