Intercomplex Ltd.®
4002 Пловдив, бул. "Пещерско шосе" № 201, тел. (032) 241 415, тел./факс: (032) 241 414, e-mail: office@intercomplex.bg
1113 София, ул. "Акад. Г. Бончев" № 20, тел. (02) 971 70 41, факс: (02) 971 71 41, e-mail: office.sf@intercomplex.bg

ТЕХНИЧЕСКО ПРЕДЛОЖЕНИЕ

за открита процедура за възлагане на обществена поръчка с наименование:
„Доставка на прекъсвачи ниско напрежение" и реф. № PPD 15-033.

Обособена позиция 1:

Доставка на автоматични прекъсвачи НН с лят корпус

ДО: „ЧЕЗ РАЗПРЕДЕЛЕНИЕ БЪЛГАРИЯ" АД, гр. София, бул. „Цариградско шосе" № 159
ОТ: "ИНТЕРКОМПЛЕКС" ООД – гр. Пловдив
Адрес на управление: гр *Пловдив, бул. Пещерско шосе, №. 201*
тел.: *032 / 241 414*; факс: *032 / 241 415*; e-mail: *sales@intercomplex.bg*
Единен идентификационен код: *115096057*
Представляван от *Ехиязар Узунян – управител*
Упълномощен представител за тази процедура (*ако е предвидено*) .....,
с приложено пълномощно № ....., дата .....Тел.: ..... / .....; факс: .....; e-mail: .....

УВАЖАЕМИ ГОСПОДА,

1. Запознат съм и приемам изискванията на Възложителя, като представям техническите спецификации от раздел IV на документацията с попълнени всички изисквани стойности за всички позиции от стоката по предмета на поръчката за обособена позиция 1.
2. Представям всички изисквани данни и документи, посочени в Приложение 2 от настоящото техническо предложение. Запознат съм с изискването, че представените документи трябва да бъдат на български език или с превод на български език, придружени с оригиналните документи, с изключение на каталозите и протоколите от типовите изпитвания, които могат да се представят и само на английски език.
3. Запознат съм, че представените от нас технически документи (протоколи от изпитания, каталози и др) са доказателство за декларираните от мен технически данни и параметри в техническите спецификации на стоката.
4. Потвърждавам, че представяните от нас стоки, описани в Техническото ни предложение ще отговарят на посочените от възложителя стандарти или на еквивалентни. В случай, че даден материал отговаря на стандарт, еквивалентен на посочения се задължаваме да го отразим в отделен документ и да представим доказателства за еквивалентността на двата стандарта.
5. Всички стойности, попълнени в колона „Гарантирано предложение" на приложените таблици от Технически спецификации от раздел IV от документацията за участие са точни и истински.
6. Предлагам гаранционен срок за предлаганите стоки – *24 (двадесет и четири)* месеца / *не по-малко от 24 месеца/*, от датата на приемо – предавателен протокол за получаване на стоката от Възложителя.
7. Запознат съм, че видовете стоки и ориентировъчни количества за доставка ще бъдат посочени от Възложителя при провеждане на процедура на договаряне без обявление.
8. ~~Приемем, че в срок до ..... (*не повече от 10 дни*) от датата на подписване на договор с възложителя, ще сключа договор с посоченият/те в офертата подизпълнител/и~~ (*попълва се, ако участникът е декларирал, че ще използва подизпълнител/и*).
9. Запознат съм, че в процедурата на договаряне без обявление, изборът на изпълнител ще бъде направен по критерий "най-ниска цена".
10. Запознат съм, че максималният срок за изпълнение на конкретен договор ще бъде определен от Възложителя в поканата за договаряне.

Приложения:

1. *Технически изисквания и спецификации за изпълнение на поръчката – раздел IV от документацията за участие – попълнени на съответните места;*
2. *Изисквани документи от Технически изисквания и спецификации.*

07.08.2015 г.

Участник: ИНТЕРКОМПЛЕКС ООД

.....

Ехиязар Узунян - управител

Intercomplex Ltd.®
4002 Пловдив, бул. "Пещерско шосе" № 201, тел. (032) 241 415, тел./факс: (032) 241 414, e-mail: office@intercomplex.bg
1113 София, ул. "Акад. Г. Бончев" № 20, тел. (02) 971 70 41, факс: (02) 971 71 41, e-mail: office.sf@intercomplex.bg

Приложение 1
към техническо предложение
по процедура PPD 15-033

ТЕХНИЧЕСКИ ИЗИСКВАНИЯ И СПЕЦИФИКАЦИИ ЗА ИЗПЪЛНЕНИЕ НА ПОРЪЧКАТА

ОБОСОБЕНА ПОЗИЦИЯ 1 – Доставка на автоматични прекъсвачи НН с лят корпус

Наименование на материала: Триполюсни автоматични прекъсвачи НН с лят корпус, от 100 А до 400 А, с термомагнитна защита, категория А

Съкратено наименование на материала: Трип. авт. прек. НН, с ТМ защита, 100-400 А, кат. А

Област: Н – Електрически уредби СрН/НН

Категория: 17– Комутационни апарати НН за защита

Мерна единица: Брой

Аварийни запаси: Да

Характеристика на материала:

Триполюсните автоматични прекъсвачи НН с лят корпус представляват механични комутационни апарати от фиксиран тип с предно свързване на шинната система. Автоматичните прекъсвачи са способни да провеждат и да включват/изключват ръчно електрически токове във вериги при нормални условия и да включват, да провеждат за определено време и да изключват автоматично посредством електромеханична защита от термомагнитен тип токове във вериги при условията на претоварване и късо съединение.
Тялото (корпусът) на автоматичните прекъсвачи НН е изработено чрез формоване на устойчив на нагряване, на огън и на механични удари изолационен материал. Използваните в конструкцията изолационни материали съответстват на изискванията на т. 7.1. от БДС EN 60947-2:2006.
Управлението се осъществява ръчно посредством лост. Включването/изключването на контактите на трите полюса се осъществява едновременно с висока скорост, която не зависи от действията на оператора. Автоматичният прекъсвач изпълнява разединяваща функция, която е обозначена със съответния символ. На челния панел на прекъсвача е разположен тест-бутон за проверка на изключвателния механизъм. Лостът за управление при вертикално монтиране на автоматичните прекъсвачи се движи в направление „нагоре – надолу", при което контактите се затварят при движение „нагоре". Лостът има три ясно индицирани положения, съответстващи на позицията на контактната система: „Включено", „Изключено" и „Автоматично изключено от свръхтокове /Тест". Конструкцията осигурява защита срещу проникване на твърди тела и вода до степен най-малко IP20 за клемните съединения и IP40 за челната повърхност на прекъсвача, съгласно БДС EN 60529+A1:2004.
Стойностите на прегряването на частите на триполюсните автоматични прекъсвачи НН с лят корпус при нормален работен режим при температура до 40°С не трябва да надвишават посочените в таблица 7 от БДС EN 60947-2:2006 стойности. Прекъсвачите са маркирани с информацията съгласно т. 5.2 от БДС EN 60947-2:2006 и CE маркировка за съответствие.
Прекъсвачите се доставят с предпазни клемови капаци, изолиращи фазови сепаратори и разширители и удължители на входа и на изхода, които са подходящи за свързване към шинна система, която е изработена с алуминиеви шини с правоъгълно сечение.
По искане на възложителя прекъсвачите трябва да бъдат доставени с адаптерни планки, които са съобразени с присъединителните и габаритните размери на автоматичните прекъсвачи от сериите: A100, A1, A250, A2 и A2-400 съгласно табл. 1 и фиг. 1 по-долу, произвеждани от бившия ЕАЗ гр. Пловдив.
Триполюсните автоматични прекъсвачи са пакетирани в картонени кутии, на които е залепен етикет с наименование на материала „Автоматичен прекъсвач", техническите данни, годината на производство, партидните номера и стандарта, в съответствие с който са произведени и изпитани - БДС EN 60947-2:2006.

Използване:

• Триполюсните автоматични прекъсвачи НН с лят корпус се монтират в разпределителни табла в трансформаторните постове и се използват за защита на електропроводните линии.

Съответствие на предлаганото изпълнение с нормативно-техническите документи:
Триполюсните автоматични прекъсвачи НН с лят корпус трябва да отговарят на посочените по-долу стандарт, или еквиваленти, включително на техните валидни изменения и допълнения:

- БДС EN 60947-1:2007 "Комутационни апарати за ниско напрежение. Част 1: Общи правила (IEC 60947-1:2007)"; и
- БДС EN 60947-2:2006 „Комутационни апарати за ниско напрежение. Част 2: Автоматични прекъсвачи (IEC 60947-2:2006)" и техните валидни изменения и допълнения и
- БДС EN 60529+A1:2004 Степени на защита, осигурени от обвивката (IP код) (IEC 60529:1989+A1:1999)

да бъдат оценени положително по реда и при условията на Наредбата за съществените изисквания и оценяване на съответствието на електрически съоръжения, предназначени за използване в определени граници на напрежението (приета с ПМС № 182 от 6.07.2001 г., обн., ДВ, бр. 62 от 13.07.2001 г., в сила от 14.01.2003 г., изм. и доп., бр. 74 от 22.08.2003 г., бр. 24 от 21.03.2006 г., в сила от 21.03.2006 г., изм., бр. 40 от 16.05.2006 г., в сила от 5.05.2006 г., изм. и доп., бр. 37 от 8.05.2007 г., изм., бр. 50 от 17.06.2014 г.).

Изисквания към документацията и изпитванията:

№ по ред	Документ	Приложение № (или текст)
1.	Точно означение на типа, производителя и страната на производство (произход) и последно издание на каталога на производителя	*Приложение ТС 1-1*
2.	Техническо описание и чертежи с нанесени на тях размери	*Приложение ТС 2-1*
3.	ЕО декларация за съответствие	*Приложение ТС 3*
4.	Протоколи от типови изпитвания на английски или български език, проведени от независима изпитвателна лаборатория – заверени копия, с приложен списък на отделните изпитвания на български език	*Приложение ТС 4-1*
5.	Сертификат/акредитация на независимата изпитвателна лаборатория, провела типовите изпитвания по т. 4 – заверено копие	*Приложение ТС 5*
6.	Техническо описание и чертежи с нанесени размери на монтажни планки, единичната цена на които не се включва в цената на прекъсвачите	*Отговор на въпрос CB-DOC-3861/31.07.2015*
7.	Инструкции за транспортиране, складиране, монтиране, вкл. въртящия момент на затягане на клемовите съединения, обслужване и поддържане	*Приложение ТС 7*

Забележка: Всички оригинални документи трябва да бъдат на български език или с превод на български език. (Каталозите и протоколите от проверките и изпитванията могат да бъдат и само на английски.)

Технически данни

1. Характеристики на работната среда

№ по ред	Характеристика	Стойност
1.1	Място на монтиране	На закрито
1.2	Максимална околна температура	+ 40 °C
1.3	Минимална околна температура	Минус 5 °C
1.4	Максимална средна околна температура за период от 24 ч.	+ 35 °C
1.5	Относителна влажност (при 20°C)	До 90 %
1.6	Степен на замърсяване	3
1.7	Надморска височина	До 2000 m

2. Параметри на електроразпределителната мрежа

№ по ред	Параметър	Стойност
2.1	Номинално напрежение	400 / 230 V
2.2	Максимално напрежение	440 / 253 V
2.3	Номинална честота	50 Hz
2.4	Брой проводници в разпределителната мрежа	4 проводна мрежа (L_1, L_2, L_3, PEN)
2.5	Схема на разпределителната мрежа	TN-C

3. Общи технически параметри и други данни

№ по ред	Технически параметър	Изискване	Гарантирано предложение
3.1	Брой на полюсите	3	*3*
3.2	Обявено работно напрежение (U_e)	min 690 V AC	*690 V AC*
3.3	Обявена честота	50 Hz	*50 Hz*
3.4	Обявено импулсно напрежение (U_{imp})	min 6 kV	*8 kV*
3.5	Обявено изолационно напрежение (U_i)	min 690 V	*800 V*
3.6	Категория на приложение	A	*A*
3.7	Работна изключвателна възможност при късо съединение (I_{cs})	min 50% от I_{cu}	*100%*
3.8	Защита от свръхтокове	-	-
3.8.1	Тип на защитата	Защитата от свръхтокове трябва да бъде от термомагнитен тип. (Допускат се изпълнения със защита от електронен тип.)	*Защитата от свръхтокове е от термомагнитен тип - TMD / TMA*
3.8.2	Защита от претоварване	а) Диапазон на настройване на тока на изключване I_R=(min 0,8÷1)xI_n	*(0.7-1)In*
		б) Условен ток на неизключване I_{nd}=1,05xI_R във времеви интервал от 120 минути	*1,05Ir*
		в) Условен ток на изключване I_d = 1,30xI_R във времеви интервал до 120 минути	*1,3Ir/120 минути*
3.8.3	Защита от къси съединения	Токът на изключване I_i трябва да бъде фиксиран на една от стойностите или регулируем в диапазона препоръчително от min 4x I_n до 10x I_n	*(1-10)xIn*
3.9	Степен на защита от проникване на твърди тела и вода съгласно БДС EN 60529+A1:2004	-	-
3.9.1	Клемни съединения	IP 20	*IP 20*
3.9.2	Челна повърхност	IP 40	*IP 40*
3.10	Аксесоари	а) Два комплекта разширители и удължител за свързване към шинна система от алуминиева шина с правоъгълно сечение	*Два комплекта разширители и удължител за свързване към шинна система от алуминиева шина с правоъгълно сечение*

4. Триполюсни автоматични прекъсвачи НН с лят корпус, 100 А ÷ 400 А, с термомагнитна защита, категория А

4.1 Триполюсен автоматичен прекъсвач НН с лят корпус, 100 А, с термомагнитна защита, кат. А

Номер на стандарта		Тип/референтен номер съгласно каталога на производителя	
20 17 5001		*1SDA067397R1 XT1C 160 TMD 100-1000 3p F F*	
Наименование на материала		Триполюсен автоматичен прекъсвач НН с лят корпус, 100 А, с термомагнитна защита, кат. А	
Съкратено наименование на материала		Трип. авт. прек. НН, с ТМ защита, 100 А, кат. А	
№ по ред	Технически параметър	Изискване	Гарантирано предложение
4.1.1	Обявен ток (I_n)	100 А	*100A*
4.1.2	Обявена максимална изключвателна възможност при к.с. (I_{cu})	min 12 kA / 500 V	*18kA/500V*

Номер на стандарта		Тип/референтен номер съгласно каталога на производителя	
20 17 5001		*1SDA067397R1 XT1C 160 TMD 100-1000 3p F F*	
Наименование на материала		Триполюсен автоматичен прекъсвач НН с лят корпус, 100 А, с термомагнитна защита, кат. А	
Съкратено наименование на материала		Трип. авт. прек. НН, с ТМ защита, 100 А, кат. А	
№ по ред	Технически параметър	Изискване	Гарантирано предложение
4.1.3	Работна изключвателна възможност при късо съединение (I_{cs})	Съгласно т. 3.7 и т. 4.1.2 Да се посочи	*50%xIcu*
4.1.4	Ток на изключване на защитата от къси съединения (I_i)	Съгласно т. 3.8.3 Да се посочи	*10xIn*
4.1.5	Време за изключване при I_{cu}	max 0,010 s	*5ms*
4.1.6	Износоустойчивост	-	-
4.1.6a	Електрическа (брой к.ц.)	min 1500 бр.	*8 000*
4.1.6b	Механична (брой к.ц.)	min 8500 бр.	*25 000*
4.1.7	Максимални размери ВхШхД (Дълбочината „Д" не включва лоста за управление)	165x110x125 mm	*130/76/70*
4.1.8	Тегло, kg	Да се посочи	*0.9*

4.2 Триполюсен автоматичен прекъсвач НН с лят корпус, 160 А, с термомагнитна защита, кат. А

Номер на стандарта		Тип/референтен номер съгласно каталога на производителя	
20 17 5002		1SDA067399R1 XT1C 160 TMD 160-1600 3p F F	
Наименование на материала		Триполюсен автоматичен прекъсвач НН с лят корпус, 160 А, с термомагнитна защита, кат. А	
Съкратено наименование на материала		Трип. авт. прек. НН, с ТМ защита, 160 А, кат. А	
№ по ред	Технически параметър	Изискване	Гарантирано предложение
4.2.1	Обявен ток (I_n)	160 А	*160A*
4.2.2	Обявена максимална изключвателна възможност при к.с. (I_{cu})	min 12 kA / 500 V	*18kA/500V*
4.2.3	Работна изключвателна възможност при късо съединение (I_{cs})	Съгласно т. 3.7 и т. 4.2.2 Да се посочи	*50%xIcu*
4.1.4	Ток на изключване на защитата от къси съединения (I_i)	Съгласно т. 3.8.3 Да се посочи	*10xIn*
4.2.5	Време за изключване при I_{cu}	max 0,010 s	*5ms*
4.2.6	Износоустойчивост	-	-
4.2.6a	Електрическа (брой к.ц.)	min 1000 бр.	*8 000*
4.2.6b	Механична (брой к.ц.)	min 7000 бр.	*25 000*
4.2.7	Максимални размери ВхШхД (Дълбочината „Д" не включва лоста за управление)	185x140x100 mm	*130/76/70*
4.2.8	Тегло, kg	Да се посочи	*0.9*

4.3 Триполюсен автоматичен прекъсвач НН с лят корпус, 250 А, с термомагнитна защита, кат. А

Номер на стандарта	Тип/референтен номер съгласно каталога на производителя
20 17 5003	*1SDA068059R1 XT3N250 TMD250-2500 3p F F*
Наименование на материала	Триполюсен автоматичен прекъсвач НН с лят корпус, 250 А, с термомагнитна защита, кат. А
Съкратено наименование на материала	Трип. авт. прек. НН, с ТМ защита, 250 А, кат. А

№ по ред	Технически параметър	Изискване	Гарантирано предложение
4.3.1	Обявен ток (I_n)	250 A	*250A*
4.3.2	Обявена максимална изключвателна възможност при к.с. (I_{cu})	min 16 kA / 500 V	*20kA/500V*
4.3.3	Работна изключвателна възможност при късо съединение (I_{cs})	Съгласно т. 3.7 и т. 4.3.2 Да се посочи	*75%xIcu*
4.3.4	Ток на изключване на защитата от къси съединения (I_i)	Съгласно т. 3.8.3 Да се посочи	*10xIn*
4.3.5	Време за изключване при I_{cu}	max 0,010 s	*7ms*
4.3.6	Износоустойчивост	-	-
4.3.6a	Електрическа (брой к.ц.)	min 1000 бр.	*8 000*
4.3.6b	Механична (брой к.ц.)	min 7000 бр.	*25 000*
4.3.7	Максимални размери ВхШхД (Дълбочината „Д" не включва лоста за управление)	225x140x130 mm	*150/105/70*
4.3.8	Тегло, kg	Да се посочи	*1.5*

4.4 Триполюсен автоматичен прекъсвач НН с лят корпус, 400 А, с термомагнитна защита, кат. А

Номер на стандарта		Тип/референтен номер съгласно каталога на производителя	
20 17 5005		*1SDA054437R1 T5N400 TMA 400A 3P FF*	
Наименование на материала		Триполюсен автоматичен прекъсвач НН с лят корпус, 400 А, с термомагнитна защита, кат. А	
Съкратено наименование на материала		Трип. авт. прек. НН, с ТМ защита, 400 А, кат. А	
№ по ред	Технически параметър	Изискване	Гарантирано предложение
4.5.1	Обявен ток (I_n)	400 A	*400A*
4.5.2	Обявена максимална изключвателна възможност при к.с. (I_{cu})	min 20 kA / 500 V	*25kA/500V*
4.5.3	Работна изключвателна възможност при късо съединение (I_{cs})	Съгласно т. 3.7 и т. 4.4.2 Да се посочи	*100%xIcu*
4.5.4	Ток на изключване на защитата от къси съединения (I_i)	Съгласно т. 3.8.3 Да се посочи	*(5-10)xIn*
4.5.5	Време за изключване при I_{cu}	max 0,010 s	*6ms*
4.5.6	Износоустойчивост	-	-
4.5.6a	Електрическа (брой к.ц.)	min 1000 бр.	*7 000*
4.5.6b	Механична (брой к.ц.)	min 4000 бр.	*20 000*
4.5.7	Максимални размери ВхШхД (Дълбочината „Д" не включва лоста за управление)	300x195x160 mm	*205/140/103.5*
4.5.8	Тегло, kg	Да се посочи	*3.25*

Наименование на материала: Триполюсни автоматични прекъсвачи НН с лят корпус, от 160 А до 1250 А, с електронна защита, категория А

Съкратено наименование на материала: Трип. авт. прек. НН, с ел. защита, 160-1250 А, кат. А

Област: Н – Електрически уредби СрН/НН

Категория: 17–Комутационни апарати НН за защита

Мерна единица: Брой

Аварийни запаси: Да

Характеристика на материала:

Триполюсните автоматични прекъсвачи НН с лят корпус представляват механични комутационни апарати от фиксиран тип с предно свързване на шинната система. Автоматичните прекъсвачи са способни да провеждат

и да включват/изключват ръчно електрически токове във вериги при нормални условия и да включват, да провеждат за определено време и да изключват автоматично посредством защита от електронен тип токове във вериги при условията на претоварване и късо съединение.
Тялото (корпусът) на автоматичните прекъсвачи НН е изработено чрез формоване на устойчив на нагряване, на огън и на механични удари изолационен материал. Използваните в конструкцията изолационни материали съответстват на изискванията на т. 7.1. от БДС EN 60947-2:2006.
Управлението се осъществява ръчно посредством лост. Включването/изключването на контактите на трите полюса се осъществява едновременно с висока скорост, която не зависи от действията на оператора. Автоматичният прекъсвач изпълнява разединяваща функция, която е обозначена с предвидения от стандарта символ. На челния панел на прекъсвача е разположен тест-бутон за проверка на изключвателния механизъм. Лостът за управление при вертикално монтиране на автоматичните прекъсвачи се движи в направление „нагоре – надолу", при което контактите се затварят при движение „нагоре". Лостът има три ясно индицирани положения, съответстващи на позицията на контактната система: „Включено", „Изключено" и „Автоматично изключено от свръхтокове /Тест". Конструкцията осигурява защита срещу проникване на твърди тела и вода до степен най-малко IP20 за клемните съединения и IP40 за челната повърхност на прекъсвача, съгласно БДС EN 60529+A1:2004.
Стойностите на прегряването на частите на триполюсните автоматични прекъсвачи НН с лят корпус при нормален работен режим при температура до 40°C не трябва да надвишават посочените в таблица 7 от БДС EN 60947-2:2006 стойности. Прекъсвачите са маркирани с информацията съгласно т. 5.2 от БДС EN 60947-2:2006 и CE маркировка за съответствие.
Прекъсвачите се доставят с предпазни клемови капаци, изолиращи фазови сепаратори и разширители и удължители на входа и на изхода, които са подходящи за свързване към шинна система, която е изработена с алуминиеви шини с правоъгълно сечение.
По искане на възложителя прекъсвачите трябва да бъдат доставени с адапторни планки, които са съобразени с присъединителните и габаритните размери на автоматичните прекъсвачи от сериите: A100, A1, A250, A2, A2-400, A3, A4 и A5 съгласно табл. 1 и фиг. 1 по-долу, произвеждани от бившия ЕАЗ гр. Пловдив.
Триполюсните автоматични прекъсвачи са пакетирани в картонени кутии, на които е залепен етикет с наименование на материала „Автоматичен прекъсвач", техническите данни, годината на производство, партидните номера и стандарта, в съответствие с който са произведени и изпитани - БДС EN 60947-2:2006.

Използване:

- Триполюсните автоматични прекъсвачи НН с лят корпус се монтират в главните разпределителни табла в трансформаторните постове и се използват за защита на силови трансформатори СрН/0,4 kV с мощност до 800 kVA.

Съответствие на предлаганото изпълнение с нормативно-техническите документи:
Триполюсните автоматични прекъсвачи НН с лят корпус трябва да отговарят на посочените по-долу стандарти или еквиваленти, включително на техните валидни изменения и допълнения:
- БДС EN 60947-1:2007 "Комутационни апарати за ниско напрежение. Част 1: Общи правила (IEC 60947-1:2007)"; и
- БДС EN 60947-2:2006 „Комутационни апарати за ниско напрежение. Част 2: Автоматични прекъсвачи (IEC 60947-2:2006)" и техните валидни изменения и допълнения
- БДС EN 60529+A1:2004 Степени на защита, осигурени от обвивката (IP код) (IEC 60529:1989+A1:1999) и

да бъдат оценени положително по реда и при условията на Наредбата за съществените изисквания и оценяване на съответствието на електрически съоръжения, предназначени за използване в определени граници на напрежението (Приета с ПМС № 182 от 6.07.2001 г., обн., ДВ, бр. 62 от 13.07.2001 г., в сила от 14.01.2003 г., изм. и доп., бр. 74 от 22.08.2003 г., бр. 24 от 21.03.2006 г., в сила от 21.03.2006 г., изм., бр. 40 от 16.05.2006 г., в сила от 5.05.2006 г., изм. и доп., бр. 37 от 8.05.2007 г., изм., бр. 50 от 17.06.2014 г.).

Изисквания към документацията и изпитванията:

№ по ред	Документ	Приложение № или текст
1.	Точно означение на типа, производителя и страната на производство (произход) и последно издание на каталога на производителя	*Приложение ТС 1-2*
2.	Техническо описание и чертежи с нанесени на тях размери	*Приложение ТС 2-2*
3.	ЕО декларация за съответствие	*Приложение ТС 3*

№ по ред	Документ	Приложение № или текст
4.	Протоколи от типови изпитвания на английски или български език, проведени от независима изпитвателна лаборатория – заверени копия, с приложен списък на отделните изпитвания на български език	*Приложение ТС 4-2*
5.	Сертификат/акредитация на независимата изпитвателна лаборатория, провела типовите изпитвания по т. 4 – заверено копие	*Приложение ТС 5*
6.	Техническо описание и чертежи с нанесени размери на монтажни планки, единичната цена на които не се включва в цената на прекъсвачите	*Отговор на въпрос CB-DOC-3861/31.07.2015*
7.	Инструкции за транспортиране, складиране, монтиране, вкл. въртящия момент на затягане на клемовите съединения, обслужване и поддържане	*Приложение ТС 7*

Забележка: Всички оригинални документи трябва да бъдат на български език или с превод на български език. (Каталозите и протоколите от проверките и изпитванията могат да бъдат и само на английски.)

Технически данни:

1. Характеристики на работната среда

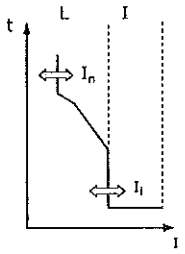
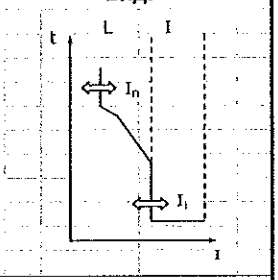
№ по ред	Характеристика	Стойност
1.1	Място на монтиране	На закрито
1.2	Максимална околна температура	+ 40°C
1.3	Минимална околна температура	Минус 5°C
1.4	Максимална средна околна температура за период от 24 ч.	+ 35°C
1.5	Относителна влажност (при 20°C)	До 90 %
1.6	Степен на замърсяване	3
1.7	Надморска височина	До 2000 m

2. Параметри на електроразпределителната мрежа

№ по ред	Параметър	Стойност
2.1	Номинално напрежение	400 / 230 V
2.2	Максимално напрежение	440 / 253 V
2.3	Номинална честота	50 Hz
2.4	Брой проводници в разпределителната мрежа	4 проводна мрежа (L_1, L_2, L_3, PEN)
2.5	Схема на разпределителната мрежа	TN-C

3. Общи технически параметри и други данни

№ по ред	Технически параметър	Изискване	Гарантирано предложение
3.1	Брой на полюсите	3	*3*
3.2	Обявено работно напрежение (U_e)	min 690 V AC	*690 V AC*
3.3	Обявена честота	50 Hz	*50 Hz*
3.4	Обявено импулсно напрежение (U_{imp})	min 6 kV	*8 kV*
3.5	Обявено изолационно напрежение (U_i)	min 690 V	*1000 V*
3.6	Категория на приложение	A	*A*
3.7	Работна изключвателна възможност при късо съединение (I_{cs})	min 50% от I_{cu}	*100% от I_{cu}*
3.8	Защита от свръхтокове	-	-

№ по ред	Технически параметър	Изискване	Гарантирано предложение
3.8.1	Тип и времетокова характеристика	Защитата от свръхтокове трябва да бъде от електронен тип с времетокова характеристика от показания по-долу вид: 	*Защитата от свръхтокове е от електронен тип (PR221DS) с времетокова характеристика от показания по-долу вид:* 
3.8.2	Защита от претоварване	а) Диапазон на настройване I_R=(min 0,5÷1)xI_n	*I_R=(0,4÷1)xI_n*
		б) Условен ток на неизключване I_{nd}=1,05xI_R във времеви интервал от 120 минути	*I_{nd}=1,05xI_R във времеви интервал от 120 минути*
		в) Условен ток на изключване I_d = 1,30xI_R във времеви интервал до 120 минути	*I_d = 1,30xI_R във времеви интервал до 120 минути*
3.8.3	Защита от къси съединения	Токът на изключване I_i трябва да бъде фиксиран на една от стойностите или регулируем в диапазона препоръчително от min 4x I_n до 10x I_n	*(1-10)xIn*
3.9	Степен на защита от проникване на твърди тела и вода съгласно БДС EN 60529+A1:2004	-	-
3.9.1	Клемни съединения	IP 20	*IP 20*
3.9.2	Челна повърхност	IP 40	*IP 40*
3.10	Аксесоари	а) Два комплекта разширители и удължител за свързване към шинна система от алуминиева шина с правоъгълно сечение	*а) Два комплекта разширители и удължител за свързване към шинна система от алуминиева шина с правоъгълно сечение*
		б) Два комплекта предпазни клемови капаци и изолиращи фазови сепаратори.	*б) Два комплекта предпазни клемови капаци и изолиращи фазови сепаратори.*

4. Триполюсни автоматични прекъсвачи НН с лят корпус, от 160 А ÷ 1250 А, с електронна защита, категория А

4.1 Триполюсен автоматичен прекъсвач НН с лят корпус, 630 А, с електронна защита, кат. А

Номер на стандарта	**Тип/референтен номер съгласно каталога на производителя**
20 17 6002	*1SDA054396R1 T5N630 PR221DS-LS/I 3p FF*
Наименование на материала	Триполюсен автоматичен прекъсвач НН с лят корпус, 630 А, с електронна защита, кат. А
Съкратено наименование на материала	Трип. авт. прек. НН, с ел. защита, 630 А, кат. А

№ по ред	Технически параметър	Изискване	Гарантирано предложение
4.3.1	Обявен ток (I_n)	630 A	*630A*
4.3.2	Обявена максимална изключвателна възможност при к.с. (I_{cu})	min 20 kA / 500 V	*25kA / 500V*
4.3.3	Работна изключвателна възможност при късо съединение (I_{cs})	Съгласно т. 3.7 и т. 4.3.2 Да се посочи	*100%xIcu*
4.3.4	Ток на изключване на защитата от къси съединения (I_i)	Съгласно т. 3.8.3 Да се посочи	*(1-10)xIn*
4.3.5	Време за изключване при I_{cu}	max 0,010 s	*6ms*
4.3.6	Износоустойчивост	-	-
4.3.6a	Електрическа (брой к.ц.)	min 1000 бр.	*5 000*
4.3.6b	Механична (брой к.ц.)	min 4000 бр.	*20 000*
4.3.7	Максимални размери ВхШхД (Дълбочината „Д" не включва лоста за управление)	290x215x160 mm	*205/140/103.5*
4.3.8	Тегло, kg	Да се посочи	*3.25*

4.2 Триполюсен автоматичен прекъсвач НН с лят корпус, 1000 А, с електронна защита, кат. А

Номер на стандарта		Тип/референтен номер съгласно каталога на производителя	
20 17 6003		*1SDA060561R1 T6H 1000 PR221DS-LS/I 3p FF*	
Наименование на материала		Триполюсен автоматичен прекъсвач НН с лят корпус, 1000 А, с електронна защита, кат. А	
Съкратено наименование на материала		Трип. авт. прек. НН, с ел. защита, 1000 А, кат. А	
№ по ред	Технически параметър	Изискване	Гарантирано предложение
4.4.1	Обявен ток (I_n)	1000 A	*1000A*
4.4.2	Обявена максимална изключвателна възможност при к.с. (I_{cu})	min 45 kA / 500 V	*50kA / 500V*
4.4.3	Работна изключвателна възможност при късо съединение (I_{cs})	Съгласно т. 3.7 и т. 4.4.2 Да се посочи	*100%xIcu*
4.4.4	Ток на изключване на защитата от къси съединения (I_i)	Съгласно т. 3.8.3 Да се посочи	*(1-10)xIn*
4.4.5	Време за изключване при I_{cu}	max 0,030 s	*8ms*
4.4.6	Износоустойчивост	-	-
4.4.6a	Електрическа (брой к.ц.)	min 500 бр.	*4 000*
4.4.6b	Механична (брой к.ц.)	min 2500 бр.	*20 000*
4.4.7	Максимални размери ВхШхД (Дълбочината „Д" не включва лоста за управление)	375x210x160 mm	*268/210/103.5mm*
4.4.8	Тегло, kg	Да се посочи	*9.5*

4.3 Триполюсен автоматичен прекъсвач НН с лят корпус, 1250 А, с електронна защита, кат. А

Номер на стандарта		Тип/референтен номер съгласно каталога на производителя	
20 17 6004		*1SDA062898R1 T7H 1250 PR231/P LS/I 3p FF*	
Наименование на материала		Триполюсен автоматичен прекъсвач НН с лят корпус, 1250 А, с електронна защита, кат. А	
Съкратено наименование на материала		Трип. авт. прек. НН, с ел. защита, 1250 А, кат. А	
№ по ред	Технически параметър	Изискване	Гарантирано предложение
4.5.1	Обявен ток (I_n)	1250 A	*1250A*
4.5.2	Обявена максимална изключвателна възможност при к.с. (I_{cu})	min 45 kA / 500 V	*50kA / 500V*

4.5.3	Работна изключвателна възможност при късо съединение (I_{cs})	Съгласно т. 3.7 и т. 4.5.2 Да се посочи	*100%xIcu*
4.5.4	Ток на изключване на защитата от къси съединения (I_i)	Съгласно т. 3.8.3 Да се посочи	*(1-10)xIn*
4.5.5	Време за изключване при I_{cu}	max 0,030 s	*10ms*
4.5.6	Износоустойчивост	-	-
4.5.6a	Електрическа (брой к.ц.)	min 500 бр.	*4 000*
4.5.6b	Механична (брой к.ц.)	min 2500 бр.	*20 000*
4.5.7	Максимални размери ВхШхД (Дълбочината „Д" не включва лоста за управление)	375x210x160 mm	*268/210/154mm*
4.5.8	Тегло, kg	Да се посочи	*9.5*

07.08.2015 г.

Участник: ИНТЕРКОМПЛЕКС ООД

.....

Бинязар Узунян - управител

intercomplex Ltd.®
4002 Пловдив, бул. "Пещерско шосе" № 201, тел. (032) 241 415, тел./факс: (032) 241 414, e-mail: office@intercomplex.bg
1113 София, ул. "Акад. Г. Бончев" № 20, тел. (02) 971 70 41, факс: (02) 971 71 41, e-mail: office.sf@intercomplex.bg

Приложение ТС 1-1
към Технически спецификации
за обособена позиция 1
от процедура PPD 15-033

Точно означение на типа, производителя и страната на производство на триполюсни товарови прекъсвач-разединители НН с лят корпус

№	НАИМЕНОВАНИЕ	ТИП	ПРОИЗВОДИТЕЛ И СТРАНА НА ПРОИЗХОД
1	Триполюсен автоматичен прекъсвач НН с лят корпус, 100 А, с термомагнитна защита, кат.А;	*XT1C 160 TMD 100-1000 3p F F*	*ABB SACE, Италия*
2	Триполюсен автоматичен прекъсвач НН с лят корпус, 160 А, с термомагнитна защита, кат.А;	*XT1C 160 TMD 160-1600 3p F F*	
3	Триполюсен автоматичен прекъсвач НН с лят корпус, 250 А, с термомагнитна защита, кат.А;	*XT3N250 TMD 250-2500 3p F F*	
4	Триполюсен автоматичен прекъсвач НН с лят корпус, 400 А, с термомагнитна защита, кат.А;	*T5N400 TMA 400A 3P FF*	

07.08.2015 г.

Кандидат: ИНТЕРКОМПЛЕКС ООД

.....

Ехиязар Узунян - управител

intercomplex Ltd.®
4002 Пловдив, бул. "Пещерско шосе" № 201, тел. (032) 241 415, тел./факс: (032) 241 414, e-mail: office@intercomplex.bg
1113 София, ул. "Акад. Г. Бончев" № 20, тел. (02) 971 70 41, факс: (02) 971 71 41, e-mail: office.sf@intercomplex.bg

Приложение ТС 1-2
към Технически спецификации
за обособена позиция 1
от процедура PPD 15-033

Точно означение на типа, производителя и страната на производство на триполюсни товарови прекъсвач-разединители НН с лят корпус

№	НАИМЕНОВАНИЕ	ТИП	ПРОИЗВОДИТЕЛ И СТРАНА НА ПРОИЗХОД
1	Триполюсен автоматичен прекъсвач НН с лят корпус, 630 А, с електронна защита, кат.А;	*T5N630 PR221DS-LS/I 3p FF*	*ABB SACE, Италия*
2	Триполюсен автоматичен прекъсвач НН с лят корпус, 1000 А, с електронна защита, кат.А;	*T6H 1000 PR221DS-LS/I 3p FF*	
3	Триполюсен автоматичен прекъсвач НН с лят корпус, 1200 А, с електронна защита, кат.А;	*T7H 1250 PR231/P LS/I 3p FF*	

07.08.2015 г.

Кандидат: ИНТЕРКОМПЛЕКС ООД

.....

Ехиязар Узунян - управител

intercomplex Ltd.®
4002 Пловдив, бул. "Пещерско шосе" № 201, тел. (032) 241 415, тел./факс: (032) 241 414, e-mail: office@intercomplex.bg
1113 София, ул. "Акад. Г. Бончев" № 20, тел. (02) 971 70 41, факс: (02) 971 71 41, e-mail: office.sf@intercomplex.bg

Приложение ТС 2-1
към Технически спецификации
за обособена позиция 1
от процедура PPD 15-033

Техническо описание и чертежи с нанесени на тях размери на триполюсни автоматични прекъсвачи НН с лят корпус, с термомагнитна защита, кат.А

Триполюсните автоматични прекъсвачи НН с лят корпус представляват механични комутационни апарати от фиксиран тип с предно свързване на шинната система.

Автоматичните прекъсвачи са способни да провеждат и да включват/изключват ръчно електрически токове във вериги при нормални условия и да включват, да провеждат за определено време и да изключват автоматично посредством електромеханична защита от термомагнитен тип токове във вериги при условията на претоварване и късо съединение.

Тялото (корпусът) на автоматичните прекъсвачи НН е изработено чрез формоване на устойчив на нагряване, на огън и на механични удари изолационен материал. Използваните в конструкцията изолационни материали съответстват на изискванията на т. 7.1. от БДС EN 60947-2:2006.

Управлението се осъществява ръчно посредством лост. Включването/изключването на контактите на трите полюса се осъществява едновременно с висока скорост, която не зависи от действията на оператора. Автоматичният прекъсвач изпълнява разединяваща функция, която е обозначена със съответния символ. На челния панел на прекъсвача е разположен тест-бутон за проверка на изключвателния механизъм.

Лостът за управление при вертикално монтиране на автоматичните прекъсвачи се движи в направление „нагоре – надолу", при което контактите се затварят при движение „нагоре". Лостът има три ясно индицирани положения, съответстващи на позицията на контактната система: „Включено", „Изключено" и „Автоматично изключено от свръхтокове /Тест". Конструкцията осигурява защита срещу проникване на твърди тела и вода до степен най-малко IP20 за клемните съединения и IP40 за челната повърхност на прекъсвача, съгласно БДС EN 60529+A1:2004.

Стойностите на прегряването на частите на триполюсните автоматични прекъсвачи НН с лят корпус при нормален работен режим при температура до 40°C не трябва да надвишават посочените в таблица 7 от БДС EN 60947-2:2006 стойности. Прекъсвачите са маркирани с информацията съгласно т. 5.2 от БДС EN 60947-2:2006 и CE маркировка за съответствие.

Прекъсвачите се доставят с предпазни клемови капаци, изолиращи фазови сепаратори и разширители и удължители на входа и на изхода, които са подходящи за свързване към шинна система, която е изработена с алуминиеви шини с правоъгълно сечение.

- Триполюсните автоматични прекъсвачи НН с лят корпус се монтират в разпределителни табла в трансформаторните постове и се използват за защита на електропроводните линии.

Триполюсните автоматични прекъсвачи НН с лят корпус отговарят на посочените по-долу стандарти, включително на техните валидни изменения и допълнения:

- EN 60947-1:2007 "Комутационни апарати за ниско напрежение. Част 1: Общи правила (IEC 60947-1:2007)"; и
- EN 60947-2:2006 „Комутационни апарати за ниско напрежение. Част 2: Автоматични прекъсвачи (IEC 60947-2:2006)" и техните валидни изменения и допълнения и
- EN 60529+A1:2004 Степени на защита, осигурени от обвивката (IP код) (IEC 60529:1989+A1:1999)

Подробни чертежи с нанесени размери има в приложения каталог – раздел 6, стр. 1/62÷стр. 62/62.

07.08.2015 г.

Кандидат: ИНТЕРКОМПЛЕКС ООД

.....

Ехиязар Узунян - управител

intercomplex Ltd.®
4002 Пловдив, бул. "Пещерско шосе" № 201, тел. (032) 241 415, тел./факс: (032) 241 414, e-mail: office@intercomplex.bg
1113 София, ул. "Акад. Г. Бончев" № 20, тел. (02) 971 70 41, факс: (02) 971 71 41, e-mail: office.sf@intercomplex.bg

Приложение ТС 2-2
към Технически спецификации
за обособена позиция 1
от процедура PPD 15-033

Техническо описание и чертежи с нанесени на тях размери на триполюсни автоматични прекъсвачи НН с лят корпус, от 160 А до 1250 А, с електронна защита, категория А

Триполюсните автоматични прекъсвачи НН с лят корпус представляват механични комутационни апарати от фиксиран тип с предно свързване на шинната система. Автоматичните прекъсвачи са способни да провеждат и да включват/изключват ръчно електрически токове във вериги при нормални условия и да включват, да провеждат за определено време и да изключват автоматично посредством защита от електронен тип токове във вериги при условията на претоварване и късо съединение.

Тялото (корпусът) на автоматичните прекъсвачи НН е изработено чрез формоване на устойчив на нагряване, на огън и на механични удари изолационен материал. Използваните в конструкцията изолационни материали съответстват на изискванията на т. 7.1. от БДС EN 60947-2:2006.

Управлението се осъществява ръчно посредством лост. Включването/изключването на контактите на трите полюса се осъществява едновременно с висока скорост, която не зависи от действията на оператора. Автоматичният прекъсвач изпълнява разединяваща функция, която е обозначена с предвидения от стандарта символ. На челния панел на прекъсвача е разположен тест-бутон за проверка на изключвателния механизъм. Лостът за управление при вертикално монтиране на автоматичните прекъсвачи се движи в направление „нагоре – надолу", при което контактите се затварят при движение „нагоре". Лостът има три ясно индицирани положения, съответстващи на позицията на контактната система: „Включено", „Изключено" и „Автоматично изключено от свръхтокове /Тест".

Конструкцията осигурява защита срещу проникване на твърди тела и вода до степен най-малко IP20 за клемните съединения и IP40 за челната повърхност на прекъсвача, съгласно БДС EN 60529+A1:2004.

Стойностите на прегряването на частите на триполюсните автоматични прекъсвачи НН с лят корпус при нормален работен режим при температура до 40°C не трябва да надвишават посочените в таблица 7 от БДС EN 60947-2:2006 стойности. Прекъсвачите са маркирани с информацията съгласно т. 5.2 от БДС EN 60947-2:2006 и CE маркировка за съответствие.

Прекъсвачите се доставят с предпазни клемови капаци, изолиращи фазови сепаратори и разширители и удължители на входа и на изхода, които са подходящи за свързване към шинна система, която е изработена с алуминиеви шини с правоъгълно сечение.

Триполюсните автоматични прекъсвачи са пакетирани в картонени кутии, на които е залепен етикет с наименование на материала „Автоматичен прекъсвач", техническите данни, годината на производство, партидните номера и стандарта, в съответствие с който са произведени и изпитани - БДС EN 60947-2:2006.

- Триполюсните автоматични прекъсвачи НН с лят корпус се монтират в главните разпределителни табла в трансформаторните постове и се използват за защита на силови трансформатори СрН/0,4 kV с мощност до 800 kVA.

Триполюсните автоматични прекъсвачи НН с лят корпус отговарят на посочените по-долу стандарти, включително на техните валидни изменения и допълнения:

- EN 60947-1:2007 "Комутационни апарати за ниско напрежение. Част 1: Общи правила (IEC 60947-1:2007)"; и

- EN 60947-2:2006 „Комутационни апарати за ниско напрежение. Част 2: Автоматични прекъсвачи (IEC 60947-2:2006)" и техните валидни изменения и допълнения и

- EN 60529+A1:2004 Степени на защита, осигурени от обвивката (IP код) (IEC 60529:1989+A1:1999)

Подробни чертежи с нанесени размери има в приложения каталог – раздел 6, стр. 1/62÷стр. 62/62.

07.08.2015 г.

Кандидат: ИНТЕРКОМПЛЕКС ООД

.....

Ехиязар Узунян - управител

4002 Пловдив, бул. "Пещерско шосе" № 201, тел. (032) 241 415, тел./факс: (032) 241 414, e-mail: office@intercomplex.bg
1113 София, ул. "Акад. Г. Бончев" № 20, тел. (02) 971 70 41, факс: (02) 971 71 41, e-mail: office.sf@intercomplex.bg

Приложение ТС 3
към Технически спецификации
от процедура PPD 15-033

ЕО ДЕКЛАРАЦИЯ ЗА СЪОТВЕТСТВИЕ

Долуподписаният *Ехиязар Гарабед Узунян*, притежаващ лична карта № *643235253*, издадена на *15.11.2011* от *МВР, гр. Пловдив,* с ЕГН *5105294446*, адрес: *гр. Пловдив, ул Елин Пелин" 26,*в качеството ми на *управител* на *ИНТЕРКОМПЛЕКС ООД*, със седалище и адрес на управление: *гр. Пловдив, бул. Пещерско шосе № 201*, вписано в Търговския регистър към Агенцията по вписванията с ЕИК *115096057*, във връзка с участие в открита процедура за сключване на рамково споразумение за възлагане на обществени поръчки с предмет: *Доставка на прекъсвачи ниско напрежение;* Реф. № *PPD 15-033*

ДЕКЛАРИРАМ:

Предлаганите от ИНТЕРКОМПЛЕКС ООД автоматични прекъсвачи НН с термомагнитна и електронна защита, както и товаровите прекъсвач-разединители НН, производство на ABB SACE – Италия, от сериите Tmax и Tmax XT са в съответствие със следните европейски директиви:

Директива за ниско напрежение 2006/95/ЕС

Директива за електромагнитна съвместимост 2004/108/ЕС

Прекъсвачите са произведени и изпитани за съответствие със стандартите:

EN 60947-1; EN 60947-2; EN 60947-2; EN 60847EN 50081-1; EN 50081-2; EN 50082-1;

DIN EN 60947-2

Правя настоящата декларация на основание предоставените ми документи от производителя и АББ България ЕООД.

Известно ми е, че за за посочване на неверни данни нося наказателна отговорност по чл. 313 от Наказателния кодекс.

07.08.2015 г.

Декларатор: .....

Ехиязар Гарабед Узунян

Power and productivity
for a better world

ДЕКЛАРАЦИЯ ЗА СЪОТВЕТСТВИЕ

Ние АББ България ЕООД
София 1592, бул. Хр. Колумб N:9

Декларираме че продуктите:
Прекъсвачите с лят корпус и разединители на SACE Tmax и Tmax XT
Тип: XT1C 160 TMD, XT3N 250 TMD, T5N 400 TMA, T5N 630 PR221DS-LS/I, T6H 1000 PR221DS-LS/I, T7H 1250 PR231/P LS/I, XT1D 160 3p F F, XT3D 250 3p F, T5D 400 3p F F, T6D 630 3p F F

аксесоари и устройства към тях
изпълняват следните ЕС – Директиви:
Директива за ниско напрежение 2006/95,
Директива за електромагнитна съвместимост 2004/108/CE

Проверени за съответствие с посочените по-долу стандарти:
EN 60947-1, EN 60947-2, EN 50081-1, EN 50081-2, EN 50082-1, EN60947-3
DIN EN 60947-2 (стандарт, обхващащ A, B, C, N, S характеристики на изключване),

София,
06.08.2015

Иво Глушков
/Продуктов Мениджър/

Васил Такев
/Старши Мениджър Продажби/

ТЕРКОМПЛЕКС ООД * ПЛОВДИВ *

АББ България ЕООД
Адрес на управление:
бул. „Христофор Колумб" № 9, ет. 3
София 1592, България
тел.: (+359 2)8075500, 8075600, 8075700
факс: (+359 2)8075599 (8,7,6)
уеб страница: www.abb.bg
ел. поща: office@bg.abb.com

ЕИК: 831133152
Ид. номер по ЗДДС: BG 831133152
Банкови данни:
ИНГ Банк, клон София
IBAN: BG13INGB91451000027317 (BGN)
IBAN: BG60INGB91451400027311 (EUR)
BIC: INGBBGSF

Производство и офис:
ул. „Варна" № 1,
Петрич 2850, България
тел.: (+359 745) 69212/ 14
факс: (+359 745) 69228/ 29/ 39
Банкови данни:
Уникредит Булбанк, клон Петрич
IBAN: BG91UNCR96601058227914 (BGN)
IBAN: BG22UNCR96601258227927 (EUR)
BIC: UNCRBGSF

Type Approval Certificate

This is to certify that the undernoted products have been tested with satisfactory results in accordance with the relevant requirements of the Lloyd's Register Type Approval System.

This certificate is issued to:

PRODUCER	ABB Sace S.p.A Via Biaoni 35 24123 Bergamo Italy
PLACE OF PRODUCTION	Via Enrico Fermi 14 03100 Frosinone Italy
DESCRIPTION	Moulded case circuit breakers
TYPE	Tmax XT1, XT3, equipped with thermal-magnetic release TMD/TMA Tmax XT2, XT4, equipped with thermal-magnetic release or Ekip microprocessor based electronic releases: software version 1.20 (Ekip LSI and LSIG), 2.07 (Ekip LS/I, Ekip I, Ekip M-LIU).
APPLICATION	Marine, Offshore and Industrial applications for use in environmental categories ENV1, ENV2 and ENV3 as detailed in LR Type Approval Test Specification No. 1: 2002.
SPECIFIED STANDARD	IEC 60947-1: 2011 IEC 60947-2: 2006
ADDITIONAL TESTS	Low Temperature, -25°C ±2.5°C for 16 hours

Certificate No.	12/00065
Issue Date	10 October 2012
Expiry Date	9 October 2017
Sheet	1 of 3

P. Sciaba
London Design Support Office
Lloyd's Register EMEA

Lloyd's Register EMEA
71 Fenchurch Street, London EC3M 4BS

Lloyd's Register

RATINGS

Tmax Type	Rated Current In at 45°C (A)	Voltage 50-60Hz (V)	Power factor	Peak Making Icm (kA)	Short Circuit	
					Ultimate S/C Breaking Capacity Icu (kA)	Service S/C Breaking Capacity Ics (kA)
XT1B	160	240	0,19	52,5	25	25
XT1C	160	240	0,19	84	40	40
XT1N	160	240	0,19	143	65	50
XT1S	160	240	0,19	187	85	64
XT1H	160	240	0,19	220	100	75
XT2N	160	240	0,14	143	65	65
XT2S	160	240	0,14	187	85	85
XT2H	160	240	0,14	220	100	100
XT2L	160	240	0,14	330	150	150
XT2V	160	240	0,14	440	200	200
XT2N	160	440	0,19	75,6	36	36
XT2S	160	440	0,19	105	50	50
XT2H	160	440	0,19	143	65	65
XT2L	160	440	0,19	220	100	100
XT2V	160	440	0,19	330	150	150
XT2N	160	690	0,29	17	10	10
XT2S	160	690	0,29	24	12	12
XT2H	160	690	0,29	30	15	15
XT2L	160	690	0,29	36	18	18
XT2V	160	690	0,29	40	20	15
XT3N	250	440	0,21	52,5	25	19

Certificate No. 12/00065

Issue Date 10 October 2012

Expiry Date 9 October 2017

Sheet 2 of 3

P. Scialla
London Design Support Office
Lloyd's Register EMEA

Lloyd's Register EMEA
71 Fenchurch Street, London EC3M 4BS

Tmax Type	Rated Current In at 45°C (A)	Voltage 50-60Hz (V)	Power factor	Peak Making Icm (kA)	Short Circuit	
					Ultimate S/C Breaking Capacity Icu (kA)	Service S/C Breaking Capacity Ics (kA)
XT3S	250	440	0,23	84	40	20
XT3N	250	690	0,7	7,85	5	4
XT4N	250	240	0,14	143	65	65
XT4S	250	240	0,14	187	85	85
XT4H	250	240	0,14	220	100	100
XT4L	250	240	0,14	330	150	150
XT4V	250	240	0,14	440	200	200
XT4N	250	440	0,19	75,6	36	36
XT4S	250	440	0,19	105	50	50
XT4H	250	440	0,19	143	65	65
XT4L	250	440	0,19	220	100	100
XT4V	250	440	0,19	330	150	150
XT4N	250	690	0,21	17	10	10
XT4S	250	690	0,21	24	12	12
XT4H	250	690	0,21	30	15	15
XT4L	250	690	0,21	40	20	20
XT4V	250	690	0,21	52,5	25	20

"This Certificate is not valid for equipment, the design, ratings or operating parameters of which have been varied from the specimen tested. The manufacturer should notify Lloyd's Register EMEA of any modification or changes to the equipment in order to obtain a valid certificate."

The Design Appraisal Document No. 12/00065 *and its supplementary Type Approval Terms and Conditions form part of this Certificate.*

Certificate No. 12/00065

Issue Date 10 October 2012

Expiry Date 9 October 2017

Sheet 3 of 3

P. Scialla
London Design Support Office
Lloyd's Register EMEA

Lloyd's Register EMEA
71 Fenchurch Street, London EC3M 4BS

ACAE
ASSOCIAZIONE PER LA CERTIFICAZIONE DELLE APPARECCHIATURE ELETTRICHE
V.le delle Brigate Partigiane 6/21 - 16129 - GENOVA (Italy)
tel. +10/565197 fax. +10/5848607 e-mail: acaocert@tin.it

LOVAG

Certificate
of Conformity

LOVAG-Certificate No. IT 00.032

This Certificate applies only to the apparatus tested. The responsibility for conformity of any apparatus having the same designation with that tested rests with the manufacturer or responsible vendor.

This certificate has been prepared according to LOVAG (Low Voltage Agreement Group) Objectives and Operating Principles of mutual recognition. The responsible certification body as member of LOVAG issues a Certificate of Conformity with the above mentioned Standard(s) following the exclusive use of LOVAG Test Instructions wherever applicable.

Only integral reproduction of this Certificate or reproductions of this page accompanied by any page(s) on which are stated the tests performed and the assigned rated characteristics of the apparatus tested, are permitted without written permission from the LOVAG Signatory responsible for this Certificate.

Apparatus
Moulded case Three Pole Air-break Independent operation Circuit-breakers Frame size 250 A - 800 V (U_i) - 50/60 Hz - with short-circuit and overload releases:

I_n = 250 A

Designation

T3N

Manufacturer or responsible vendor
ABB SACE S.p.A. - Via Baioni, 35 - 24123 Bergamo (Italy)

Tested for: ABB SACE S.p.A. - Via Baioni, 35 - 24123 Bergamo (Italy)
Tested by: ACAE Laboratory IA.01
The apparatus, constructed in accordance with the description mentioned in the Test Report listed on this Certificate has been subjected to the series of proving tests in accordance with IEC 60947-2 (1995), Corrigendum (1997) and Amendment 1 (1997).

The results are shown in the Test Report in accordance to LOVAG. The values obtained and the general performance are considered to comply with the above Standard(s) and to justify the characteristic assigned by the manufacturer as stated below.
Utilization category A

Test sequence: III

U_e = 415 V I_{cu} = 36 kA

This document includes Report No.: 00.305/T01
Issue Date: 2000.09.18

Responsible Certification Body

Authorized Signature
Date:2000.12.19

LOVAG
Low Voltage Agreement Group

Test Report No. 00.305 / T 01

Test laboratory:	ACAE IA.01
Client:	ABB SACE S.p.A.
Manufacturer:	ABB SACE S.p.A.
Test object:	Low voltage moulded case c.b. series TMAX
Type designation:	T3N
Date(s) of test(s):	from 2000.08.01 to 2000.09.15
Test specification:	IEC 60947-2 (1995), Corrigendum (1997) and Amendement 1 (1997)
Test sequence(s):	III
Test results:	Icu at 415 V found in compliance with rated characteristics

The Record of Proving Test consists of:

34 pages LOVAG test report forms	5 oscillograms included
no other pages	drawing nr. RH0013.309 issued 00.02.14 enclosed
1 diagram included	1 photograph included

Date of issue: 2000.09.18

Signatures: (Authorized representative)

Responsible Test Laboratory

Note:
The test result relates only to the items tested.
The test report shall not be reproduced except in full without the written approval of the test laboratory.

Description and characterization of the test object

Characteristics

Type of circuit-breaker:

Number of poles	3
Kind of current	a.c.
Number of phases	3
Rated frequency	50 – 60 Hz
Utilization category	A
Reference temperature	40 °C
Suitability for isolation	Yes

Rated and limiting values: (according to test volume)

Main circuit:

Rated impulse withstand voltage U_{imp}	8 kV
Rated insulation voltage U_i	800 V
Conventional thermal current I_{th} / I_{the}	250 A / -
Rated current I_n	250 A
Rated current in the neutral pole	-

Short-circuit characteristics:

U_e/V	I_{cm}/kA	I_{cu}/kA	I_{cw}/kA	I_{ew}/kA	I_{su}/kA	I_{rr}/kA
220/230	105	50	37,5	-	-	-
380/415	75,6	36	27	-	-	-
440	52,5	25	18,8	-	-	-
500	40	20	15	-	-	-
690	7,7	5	3,8	-	-	-

Control circuits:

Electrical control circuits:

Kind of current	-
Rated frequency	-
Rated control circuit voltage U_c	-
Rated control supply voltage U_s	-
Rated impulse withstand voltage U_{imp}	-
Rated insulation voltage U_i	-

Air-supply control circuits:

Rated supply pressure	-
Limits of pressure	-
Required volume for each closing operation	-
Required volume for each opening operation	-

Auxiliary circuits:

Rated operational voltage U_e	-
Rated impulse withstand voltage U_{imp}	-
Rated insulation voltage U_i	-
Rated frequency	-
Rated operational current I_e	-
Number of circuits	-
Number and kind of contact elements	-

Releases:

- Shunt release:

- Rated control circuit voltage U_c	-
- Kind of current	-
- Rated frequency if a.c.	-

- Undervoltage or no-voltage release

- Rated control circuit voltage U_c	-
- Kind of current	-
- Rated frequency if a.c.	-

- Over-current release:

- Short-circuit release

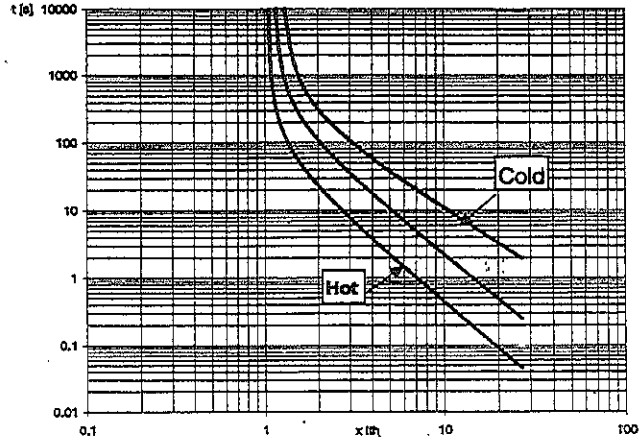
- instantaneous release	Yes
- definite time-delay release	-
- Rated current I_n	32 A to 250 A
- Kind of current	a.c.
- Rated frequency if a.c.	50 - 60 Hz
- Current setting (or range of settings)	from 500 A up to 2500 A
- Time setting (or range of settings)	-

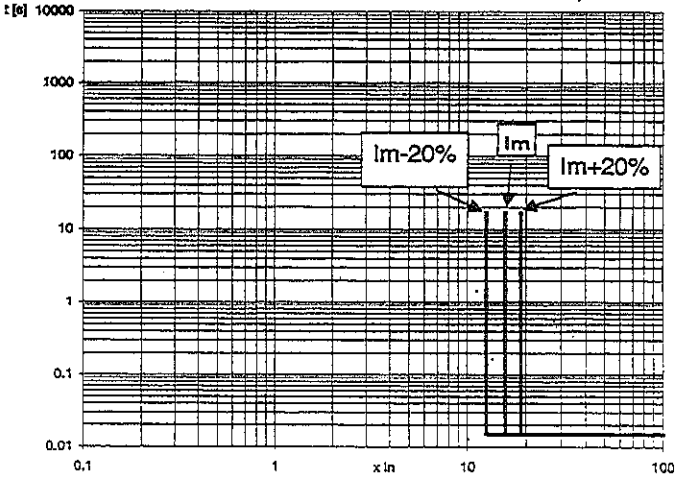
- Overload release (IEC 60947-1; 2.4.30):

- instantaneous release	-
- definite time-delay release	-
- inverse time-delay release	R32 to R250
dependent on ambient air temperature	yes
independent of ambient air temperature	-
- Reference temperature	40 °C
- Rated current I_n	32 A to 250 A
- Kind of current	a.c.
- Rated frequency if a.c.	50 - 60 Hz
- Current setting (or range of settings)	22 A to 32 A and 175 A to 250 A
- Time setting (or range of settings)	-

Time / current characteristics settings R32

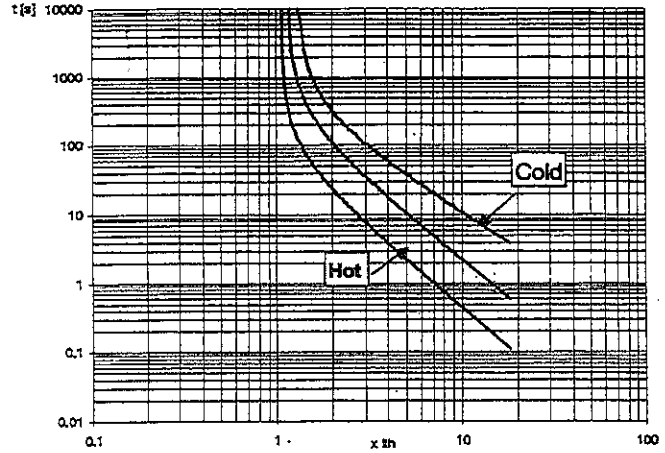
Type designation : T3N

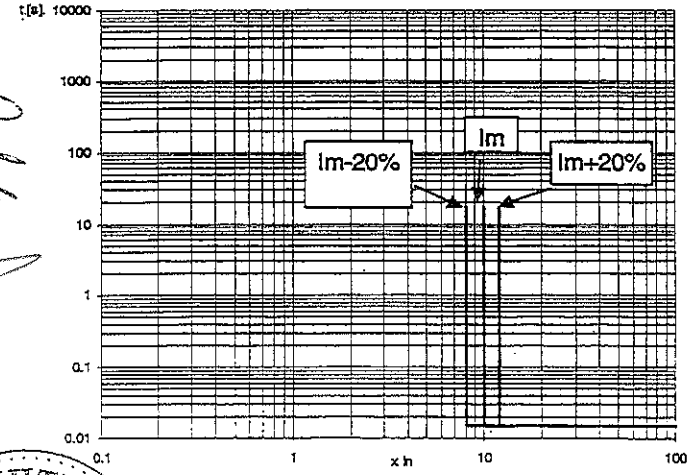




Time / current characteristics settings R250

Type designation : T3N





Integral fused circuit-breakers:
(Co-ordination with short-circuit protective devices)

Kind of protective devices	-
- Type of fuse	-
- Maximum operational voltage	-
- Rated current I_n	-
- Maximum prospective short-circuit peak current	-

Switching overvoltages:
(Characteristics not defined)

Individual enclosure:

- Type	-
- Kind of material	-
- Degree of protection	-
- Inside dimensions (in millimetres)	
height	-
width	-
depth	-

When no enclosure:

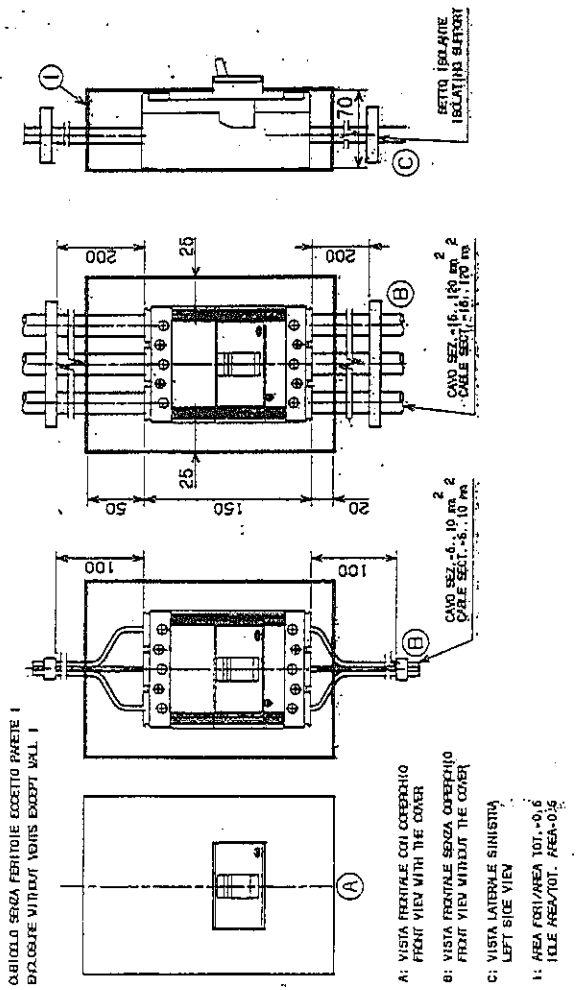
Safety perimeter defined:	
height	220 mm
width	155 mm
depth	70 mm
Kind of screen (woven wire mesh, perforated metal, expanded metal)	metal sheet
Size of holes (≤ 30 mm²)	yes
Distance during test	-

Openings around the manual operating means:

Openings in the area of the manual operating means through which the arc chamber can be reached by a music wire of 0.25 mm diameter.	No

LOVAG	Test report No.: 00.305 / T 01 Page 8 / 34
Type test according to: IEC 60947-2	Type: T3N

INSTALLATION INSIDE METAL ENCLOSURE FOR SHORT-CIRCUIT TESTS



LOVAG	Test report No. 00.305 / T 01 Page 9 / 34
Type test according to : IEC 60947-2	Type : T3N

SAMPLE UNDER TEST

Sample	Serial number	In (A)	Test sequence	Test result at page	Delivery term of the sample to the laboratory
1	0219	32	III	11	31.07.00
2	0215	250	III	18	31.07.00

REFERENCE DRAWINGS

Nr. Drawings	Denomination	Issue status
RA 0450.801-834	Standard circuit breaker assembly	99.05.19
RA 0450	Material list	99.05.19
RA 0457.801	Case assembly	99.05.19
RA 0457	Material list	99.05.19
RA 0458	Cover	99.05.19
RA 0531	Trip shaft assembly	99.05.19
RA 0487.801-802	Moving contact assembly	99.05.19
RA 0487	Material list	99.05.19
RA 0497	Moving contact plate	99.05.19
RA 0470.801	Operating mechanism assembly	99.05.19
RA 0470	Material list	99.05.19
RA 0493	Operating mechanism spring	99.05.19
RA 0505.801	Arching chamber assembly	99.05.19
RA 0505	Material list	99.05.19
RA 0512.801	Fixed contact assembly	99.05.19
RA 0512	Material list	99.05.19
RA 0510	Fixed contact plate	99.05.19
RA 0519.801-810	Relay assembly	99.05.19
RA 0519	Material list	99.05.19
RA 0720.801	Clamp assembly	99.05.19
RA 0720	Material list	99.05.19

TEST SEQUENCE III

Rated ultimate short-circuit breaking capacity

Test sequence III comprises the following tests:

Sub-clause	Test	Pageform
8.3.5.1	Verification of overload releases	F 947-2/41
8.3.5.2	Rated ultimate short-circuit breaking capacity	F 947-2/42 + F 947-2/36
	Additional sequence of short-circuit operations on four-pole circuit-breakers (if applicable)	F 947-2/43 - F 947-2/44
8.3.5.3	Verification of dielectric withstand	F 947-2/27
	Verification of leakage current (if applicable)	F 947-2/20
8.3.5.4	Verification of overload releases	F 947-2/41

Standard and clause	Kind of tests and requirements			Test values Results
	VERIFICATION OF OVERLOAD RELEASES ON EACH POLE SEPARATELY			
60947-1 Table IX, X and XI	Cabling characteristics			
	Cable		6 mm²	6 mm²
	Bar		- x - mm	- x - mm
	Number		1	1
	Length		2000 mm	2000 mm
	Tightening torque			10 Nm
	Reference temperature		40 °C ± 2 °C	
	Ambient temperature			40 °C
	Correction factor		k	-
	(k = 1 for releases independent of ambient temperature)			
	Current setting value		I_n	22 A
	Test current			
	either k x 2.0 x I_n		44 A	44 A
8.3.5.1	Test sequence II ($I_{cs} = I_{cu}$)	before 8.3.4.1		
8.3.5.1	Test sequence III,	before 8.3.5.2		
8.3.6.1	Test sequence IV,	before 8.3.6.2		
8.3.6.6	Test sequence IV	after 8.3.6.5		
8.3.7.4	Test sequence V,	before 8.3.7.5		
8.3.8.1	Combined test sequence	before 8.3.8.2		
	or k x 2.5 x I_n		- A	- A
8.3.5.4	Test sequence II ($I_{cs} = I_{cu}$)	after 8.3.4.4		
8.3.5.4	Test sequence III,	after 8.3.5.3		
8.3.7.8	Test sequence V,	after 8.3.7.7		
8.3.8.7	Combined test sequence	after 8.3.8.6		
C.4	Individual pole short-circuit test sequence			
H.4	Test sequence for circuit-breakers for IT-systems			
	Tripping time (for twice the value of current setting on single pole)			
		Ph_1	≤ 310 s	282 s
		Ph_2	≤ 310 s	285 s
		Ph_3	≤ 310 s	266 s

Standard and clause	Kind of tests and requirements		Test values Results
8.3.5.2	**RATED ULTIMATE SHORT-CIRCUIT BREAKING CAPACITY**		
	Utilization category	A	
	Rated operational voltage U_e	415 V	
	Recovery voltage	1.05 x U_e	436 V
	Rated ultimate short-circuit breaking capacity	I_{cu}	38,7 kA
	Rated short-circuit making capacity	I_{cm}	76,3 kA
Table XI	Power factor	0,25	0,23
	Frequency	50 Hz	50 Hz
8.3.2.1	Control supply voltage	0.85 x U_s – V	- V
7.2.1.1.3	Maximum value of the closing time		- ms
	Sequence of operation	O - t – CO	O - t – CO
	Circuit diagram		Page 26 / 34
	Calibration of the test circuit		Page 13 / 34
	Safety area	Pageform 6	Page 7 / 34
	Installation of the material tested	Pageform 73	Page 8 / 34
	Energization direction	Top/Bottom	Top
8.3.2.1	Smallest individual enclosure (if applicable)		
	Type		-
	Kind of material		-
	Inside dimensions		
	Height		- mm
	Width		- mm
	Depth		- mm
60947-1 Table IX, X and XI	Cabling characteristics		
	Cable	6 mm²	6 mm²
	Bar	- x – mm	- x – mm
	Number	1	1
	Length supply side	500 mm	500 mm
	load side	250 mm	250 mm
	Tightening torque		10 Nm

Standard and clause	Kind of tests and requirements		Test values Results
60947-1 8.3.4.1.5	**CALIBRATION OF THE TEST CIRCUIT (*)**		
	Oscillogram		Page 28 / 34
	Applied voltage		438 V
	Frequency	50 Hz	50 Hz
	RMS. current value	i_1	36,5 kA
	At 20 ms	i_2	36,9 kA
		i_3	36,7 kA
	Average RMS. Value		36,7 kA
	Peak current maximum value		76,3 kA
	Power factor		0,23
	(*) Description of the method for determination of short-circuit power factor is given at page 25 / 34		

Standard and clause	Kind of tests and requirements		Test values Results
	OPERATION „O"		
	Oscillogram		Page 29 / 34
	Peak current value	i_1	9,81 kA
		i_2	17,5 kA
		i_3	12,8 kA
	Maximum total duration		6,5 ms
	Recovery voltage	$U_{r(1-2)}$ ☒ or $U_{r(1-N)}$ ☐	438 V
	(phase to phase or phase to neutral)	$U_{r(2-3)}$ ☒ or $U_{r(2-N)}$ ☐	438 V
		$U_{r(3-1)}$ ☒ or $U_{r(3-N)}$ ☐	439 V
	Average	U_{rm}	438 V
	Ratio between U_{rm} and U_e	U_{rm}/U_e	1,05
	Joule integral	Ph_1	$167x10^3$ A^2s
		Ph_2	$848x10^3$ A^2s
		Ph_3	$419x10^3$ A^2s
	Melting of the fusible element	Yes/No	No
	Holes in the PE-sheet (if applicable)	Yes/No	No
	Cracks observed	Yes/No	No
	if Yes		Page - / -
	Time interval between operations	3 min	6 min
	OPERATION „CO"		
	Oscillogram		Page 30 / 34
	Applied voltage		439 V
	Peak current value	i_1	13,1 kA
		i_2	17,4 kA
		i_3	12,2 kA
	Maximum total duration		7,5 ms
	Recovery voltage	$U_{r(1-2)}$ ☒ or $U_{r(1-N)}$ ☐	440 V
	(phase to phase or phase to neutral)	$U_{r(2-3)}$ ☒ or $U_{r(2-N)}$ ☐	438 V
		$U_{r(3-1)}$ ☒ or $U_{r(3-N)}$ ☐	437 V
	Average	U_{rm}	438 V
	Ratio between U_{rm} and U_e	U_{rm}/U_e	1,05
	Joule integral	Ph_1	$330x10^3$ A^2s
		Ph_2	$944x10^3$ A^2s
		Ph_3	$360x10^3$ A^2s
7.2.1.1.3	Closing operation time		- ms
	Melting of the fusible element	Yes/No	No
	Cracks observed	Yes/No	No
	if Yes		Page - / -

Standard and clause	Kind of tests and requirements		Test values Results
	VERIFICATION OF DIELECTRIC WITHSTAND		
	Test voltage		
	$2 \times U_e$, min. 1000 V	1000 V	1000 V
8.3.3.5	Test sequence I		
8.3.4.2	Test sequence II		
8.3.5.3	Test sequence III		
8.3.6.5	Test sequence IV		
8.3.7.3	Test sequence V, stage 1		
8.3.7.7	Test sequence V, stage 2		
8.3.8.4	Combined test sequence		
C.3	Individual pole short-circuit test sequence		
B.10.3.1	Test sequence B.II		
H.3	Test sequence for circuit-breakers for IT-systems		
8.3.3.2.2 a)	Application of the test voltage - Main circuit of the circuit-breaker - Isolating contacts of the withdrawable unit (if applicable)		
	Test duration	1 min	1 min

Standard and clause	Kind of tests and requirements		Test values Results
	VERIFICATION OF LEAKAGE CURRENT		
	For circuit-breakers suitable for isolation having an operational voltage U_e greater than 50 V.		
8.3.3.2	**- Main circuit of the circuit-breaker** **- isolating contacts of a withdrawable unit (if applicable)**		
	Test voltage	1.1 x U_e 415 V	456 V
60947-1 7.2.7	Application of the test voltage		
	Leakage current		
8.3.3.2	Test sequence I (in new condition)	≤ 0.5 mA	- mA
8.3.3.5	Test sequence I (after overload performance)	≤ 2 mA	- mA
8.3.4.3	Test sequence II	≤ 2 mA	- mA
8.3.5.3	Test sequence III	≤ 6 mA	< 6 mA
8.3.6.5	Test sequence IV	≤ 2 mA	- mA
8.3.7.3	Test sequence V, stage 1	≤ 2 mA	- mA
8.3.7.7	Test sequence V, stage 2	≤ 6 mA	- mA
8.3.8.5	Combined test sequence	≤ 2 mA	- mA
C.3	Individual pole short-circuit test sequence I_{su}	≤ 6 mA	- mA
H.3	Individual pole short-circuit test sequence I_{IT}	≤ 6 mA	- mA

Standard and clause	Kind of tests and requirements			Test values Results
	VERIFICATION OF OVERLOAD RELEASES ON EACH POLE SEPARATELY			
60947-1 Table IX, X and XI	Cabling characteristics			
	Cable		10 mm²	10 mm²
	Bar		- x - mm	- x - mm
	Number		1	1
	Length		2000 mm	2000 mm
	Tightening torque			10 Nm
	Reference temperature		40 °C ± 2 °C	
	Ambient temperature			40 °C
	Correction factor		k	-
	(k = 1 for releases independant of ambient temperature)			
	Current setting value		I_n	22 A
	Test current			
	either k x 2.0 x I_n		- A	- A
8.3.5.1	Test sequence II ($I_{cs} = I_{cu}$)	before 8.3.4.1		
8.3.5.1	Test sequence III,	before 8.3.5.2		
8.3.6.1	Test sequence IV,	before 8.3.6.2		
8.3.6.6	Test sequence IV	after 8.3.6.5		
8.3.7.4	Test sequence V,	before 8.3.7.5		
8.3.8.1	Combined test sequence	before 8.3.8.2		
	or k x 2.5 x I_n		55 A	55 A
8.3.5.4	Test sequence II ($I_{cs} = I_{cu}$)	after 8.3.4.4		
8.3.5.4	Test sequence III,	after 8.3.5.3		
8.3.7.8	Test sequence V,	after 8.3.7.7		
8.3.8.7	Combined test sequence	after 8.3.8.6		
C.4	Individual pole short-circuit test sequence			
H.4	Test sequence for circuit-breakers for IT-systems			
	Tripping time			
	(for twice the value of current setting on single pole)			
		Ph_1	≤ 310 s	206 s
		Ph_2	≤ 310 s	112 s
		Ph_3	≤ 310 s	188 s

Standard and clause	Kind of tests and requirements			Test values Results
	VERIFICATION OF OVERLOAD RELEASES ON EACH POLE SEPARATELY			
60947-1 Table IX, X and XI	Cabling characteristics			
	Cable		120 mm²	120 mm²
	Bar		- x - mm	- x - mm
	Number		1	1
	Length		2000 mm	2000 mm
	Tightening torque			10 Nm
	Reference temperature		40 °C ± 2 °C	
	Ambient temperature			40 °C
	Correction factor		k	-
	(k = 1 for releases independent of ambient temperature)			
	Current setting value		I_n	250 A
	Test current			
	either k x 2.0 x I_n		500 A	500 A
8.3.5.1	Test sequence II ($I_{cs} = I_{cu}$)	before 8.3.4.1		
8.3.5.1	Test sequence III,	before 8.3.5.2		
8.3.6.1	Test sequence IV,	before 8.3.6.2		
8.3.6.6	Test sequence IV	after 8.3.6.5		
8.3.7.4	Test sequence V,	before 8.3.7.5		
8.3.8.1	Combined test sequence	before 8.3.8.2		
	or k x 2.5 x I_n		- A	- A
8.3.5.4	Test sequence II ($I_{cs} = I_{cu}$)	after 8.3.4.4		
8.3.5.4	Test sequence III,	after 8.3.5.3		
8.3.7.8	Test sequence V,	after 8.3.7.7		
8.3.8.7	Combined test sequence	after 8.3.8.6		
C.4	Individual pole short-circuit test sequence			
H.4	Test sequence for circuit-breakers for IT-systems			
	Tripping time (for twice the value of current setting on single pole)			
		Ph_1	≤ 310 s	106 s
		Ph_2	≤ 310 s	107 s
		Ph_3	≤ 310 s	113 s

Standard and clause	Kind of tests and requirements			Test values Results
8.3.5.2	**RATED ULTIMATE SHORT-CIRCUIT BREAKING CAPACITY**			
	Utilization category		A	
	Rated operational voltage U_e		415 V	
	Recovery voltage		1.05 x U_e	436 V
	Rated ultimate short-circuit breaking capacity		I_{cu}	36,7 kA
	Rated short-circuit making capacity		I_{cm}	76,3 KA
Table XI	Power factor		0,25	0,23
	Frequency		50 Hz	50 Hz
8.3.2.1	Control supply voltage		0.85 x U_s – V	- V
7.2.1.1.3	Maximum value of the closing time			- ms
	Sequence of operation		O - t – CO	O - t - CO
	Circuit diagram			Page 26 / 34
	Calibration of the test circuit			Page 20 / 34
	Safety area		Pageform 6	Page 7 / 34
	Installation of the material tested		Pageform 73	Page 8 / 34
	Energization direction		Top/Bottom	Bottom
8.3.2.1	Smallest individual enclosure (if applicable)			
	Type			-
	Kind of material			-
	Inside dimensions			
	Height			- mm
	Width			- mm
	Depth			- mm
60947-1 Table IX, X and XI	Cabling characteristics			
	Cable		120 mm²	120 mm²
	Bar		- x – mm	- x – mm
	Number		1	1
	Length	supply side	500 mm	500 mm
		load side	250 mm	250 mm
	Tightening torque			10 Nm

LOVAG	Test report No.: 00.305 / T 01 Page 20 / 34
Type test according to: IEC 60947-2	Type: T3N

Standard and clause	Kind of tests and requirements		Test values Results
60947-1 8.3.4.1.5	**CALIBRATION OF THE TEST CIRCUIT**		
	Oscillogram		Page 28 / 34
	Applied voltage		438 V
	Frequency	50 Hz	50 Hz
	RMS. current value At 20 ms	i_1 i_2 i_3	36,5 kA 36,9 kA 36,7 kA
	Average RMS. Value		36,7 kA
	Peak current maximum value		76,3 kA
	Power factor		0,23
	(*) Description of the method for determination of short-circuit power factor is given at page 25 / 34		

LOVAG	Test report No.: 00.305 / T 01 Page 21 / 34
Type test according to: IEC 60947-2 Test sequence III	Type: T3N

Standard and clause	Kind of tests and requirements		Test values Results
	OPERATION „O"		
	Oscillogram		Page 31 / 34
	Peak current value	i_1	13,1 kA
		i_2	23,9 kA
		i_3	19,1 kA
	Maximum total duration		7,40 ms
	Recovery voltage (phase to phase or phase to neutral)	$U_{r(1-2)}$ ☒ or $U_{r(1-N)}$ ☐	437 V
		$U_{r(2-3)}$ ☒ or $U_{r(2-N)}$ ☐	438 V
		$U_{r(3-1)}$ ☒ or $U_{r(3-N)}$ ☐	440 V
	Average	U_m	438 V
	Ratio between U_m and U_e	U_m/U_e	1,05
	Joule integral	Ph_1	$313x10^3$ A^2s
		Ph_2	$1830x10^3$ A^2s
		Ph_3	$990x10^3$ A^2s
	Melting of the fusible element	Yes/No	No
	Holes in the PE-sheet (if applicable)	Yes/No	No
	Cracks observed	Yes/No	No
	if Yes		Page - / -
	Time interval between operations	3 min	3 min
	OPERATION „CO"		
	Oscillogram		Page 32 / 34
	Applied voltage		438 V
	Peak current value	i_1	20,1 KA
		i_2	22,5 kA
		i_3	16,5 kA
	Maximum total duration		8,80 ms
	Recovery voltage (phase to phase or phase to neutral)	$U_{r(1-2)}$ ☒ or $U_{r(1-N)}$ ☐	436 V
		$U_{r(2-3)}$ ☒ or $U_{r(2-N)}$ ☐	438 V
		$U_{r(3-1)}$ ☒ or $U_{r(3-N)}$ ☐	439 V
	Average	U_m	438 V
	Ratio between U_m and U_e	U_m/U_e	1,05
	Joule integral	Ph_1	$916x10^3$ A^2s
		Ph_2	$1940x10^3$ A^2s
		Ph_3	$746x10^3$ A^2s
7.2.1.1.3	Closing operation time		- ms
	Melting of the fusible element	Yes/No	No
	Cracks observed	Yes/No	No
	If Yes		Page - / -

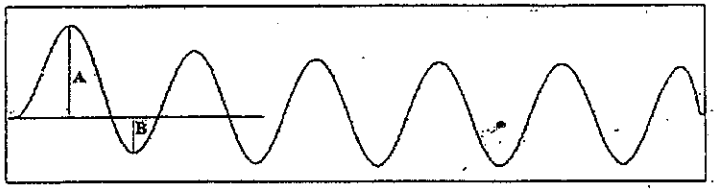
Standard and clause	Kind of tests and requirements		Test values Results
	VERIFICATION OF DIELECTRIC WITHSTAND		
	Test voltage		
	2 x U_e, min. 1000 V	1000 V	1000 V
8.3.3.5	Test sequence I		
8.3.4.2	Test sequence II		
8.3.5.3	Test sequence III		
8.3.6.5	Test sequence IV		
8.3.7.3	Test sequence V, stage 1		
8.3.7.7	Test sequence V, stage 2		
8.3.8.4	Combined test sequence		
C.3	Individual pole short-circuit test sequence		
B.10.3.1	Test sequence B.II		
H.3	Test sequence for circuit-breakers for IT-systems		
8.3.3.2.2 a)	Application of the test voltage - Main circuit of the circuit-breaker - Isolating contacts of the withdrawable unit (if applicable)		
	Test duration	1 min	1 min

Standard and clause	Kind of tests and requirements		Test values Results
	VERIFICATION OF LEAKAGE CURRENT		
	For circuit-breakers suitable for isolation having an operational voltage U_e greater than 50 V.		
8.3.3.2	**- Main circuit of the circuit-breaker** **- Isolating contacts of a withdrawable unit (if applicable)**		
	Test voltage	1.1 x U_e 415 V	456 V
60947-1 7.2.7	Application of the test voltage		
	Leakage current		
8.3.3.2	Test sequence I (in new condition)	≤ 0.5 mA	- mA
8.3.3.5	Test sequence I (after overload performance)	≤ 2 mA	- mA
8.3.4.3	Test sequence II	≤ 2 mA	- mA
8.3.5.3	Test sequence III	≤ 6 mA	< 6 mA
8.3.6.5	Test sequence IV	≤ 2 mA	- mA
8.3.7.3	Test sequence V, stage 1	≤ 2 mA	- mA
8.3.7.7	Test sequence V, stage 2	≤ 6 mA	- mA
8.3.8.5	Combined test sequence	≤ 2 mA	- mA
C.3	Individual pole short-circuit test sequence I_{su}	≤ 6 mA	- mA
H.3	Individual pole short-circuit test sequence I_{IT}	≤ 6 mA	- mA

Standard and clause	Kind of tests and requirements			Test values Results
	VERIFICATION OF OVERLOAD RELEASES ON EACH POLE SEPARATELY			
60947-1 Table IX, X and XI	Cabling characteristics			
	Cable		120 mm²	120 mm²
	Bar		- x - mm	- x - mm
	Number		1	1
	Length		2000 mm	2000 mm
	Tightening torque			10 Nm
	Reference temperature		40 °C ± 2 °C	
	Ambient temperature			40 °C
	Correction factor		k	-
	(k = 1 for releases independent of ambient temperature)			
	Current setting value		I_n	250 A
	Test current			
	either k x 2.0 x I_n		- A	- A
8.3.5.1	Test sequence II ($I_{cs} = I_{cu}$)	before 8.3.4.1		
8.3.5.1	Test sequence III,	before 8.3.5.2		
8.3.6.1	Test sequence IV,	before 8.3.6.2		
8.3.6.6	Test sequence IV	after 8.3.6.5		
8.3.7.4	Test sequence V,	before 8.3.7.5		
8.3.8.1	Combined test sequence	before 8.3.8.2		
	or k x 2.5 x I_n		625 A	625 A
8.3.5.4	Test sequence II ($I_{cs} = I_{cu}$)	after 8.3.4.4		
8.3.5.4	Test sequence III,	after 8.3.5.3		
8.3.7.8	Test sequence V,	after 8.3.7.7		
8.3.8.7	Combined test sequence	after 8.3.8.6		
C.4	Individual pole short-circuit test sequence			
H.4	Test sequence for circuit-breakers for IT-systems			
	Tripping time (for twice the value of current setting on single pole)			
		Ph_1	≤ 310 s	68 s
		Ph_2	≤ 310 s	79 s
		Ph_3	≤ 310 s	80 s

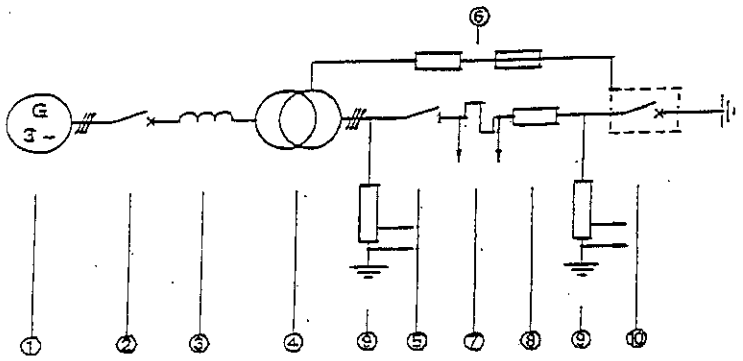
Method for determination of short-circuit power factor:

The method is based on a three-phase current calibration with the maximum asymmetry on one phase. This condition is obtained by the operation of the closing device when no-load voltage wave is passing through zero value.In order to guarantee the required precision the tolerance on the closing time is ± 0.2 ms of the passing time through the zero value of this voltage.
Power factor is checked on only one phase, in according with 8.3.2.2.4 of Test Instruction LOVAG LTI IEC 947-2 rev.3.
The measurement of the power factor is performed by a digital recorder associated with a computer.
The amplitude A (first positive peak) and B (first negative peak) are measured and from the formula k = [B/A] is deduced the power factor value showed in the annexed table.



Power factor	k	Power factor	k	Power factor	k	Power factor	k	Power factor	k
0	0	0,12	0,313	0,24	0,529	0,36	0,682	0,48	0,794
0,01	0,031	0,13	0,334	0,25	0,544	0,37	0,693	0,49	0,801
0,02	0,061	0,14	0,355	0,26	0,558	0,38	0,707	0,5	0,809
0,03	0,09	0,15	0,375	0,27	0,572	0,39	0,713	0,51	0,817
0,04	0,118	0,16	0,394	0,28	0,586	0,4	0,723	0,52	0,824
0,05	0,145	0,17	0,413	0,29	0,599	0,41	0,733	0,53	0,831
0,06	0,172	0,18	0,431	0,3	0,612	0,42	0,742	0,54	0,838
0,07	0,197	0,19	0,448	0,31	0,624	0,43	0,751	0,55	0,845
0,08	0,222	0,2	0,465	0,32	0,636	0,44	0,76		
0,09	0,246	0,21	0,482	0,33	0,648	0,45	0,769		
0,1	0,269	0,22	0,498	0,34	0,66	0,46	0,777		
0,11	0,292	0,23	0,514	0,35	0,674	0,47	0,785		

CIRCUIT DIAGRAM B



1 - Three-phase generator
2 - Back up circuit breaker
3 - Air reactors
4 - Three-phase transformer
5 - Short-circuit making switch
6 - Device for the detection of fault current
7 - Non inductive shunt for current measurement
8 - Resistors
9 - Divider for voltage measurement
10 - Apparatus under test

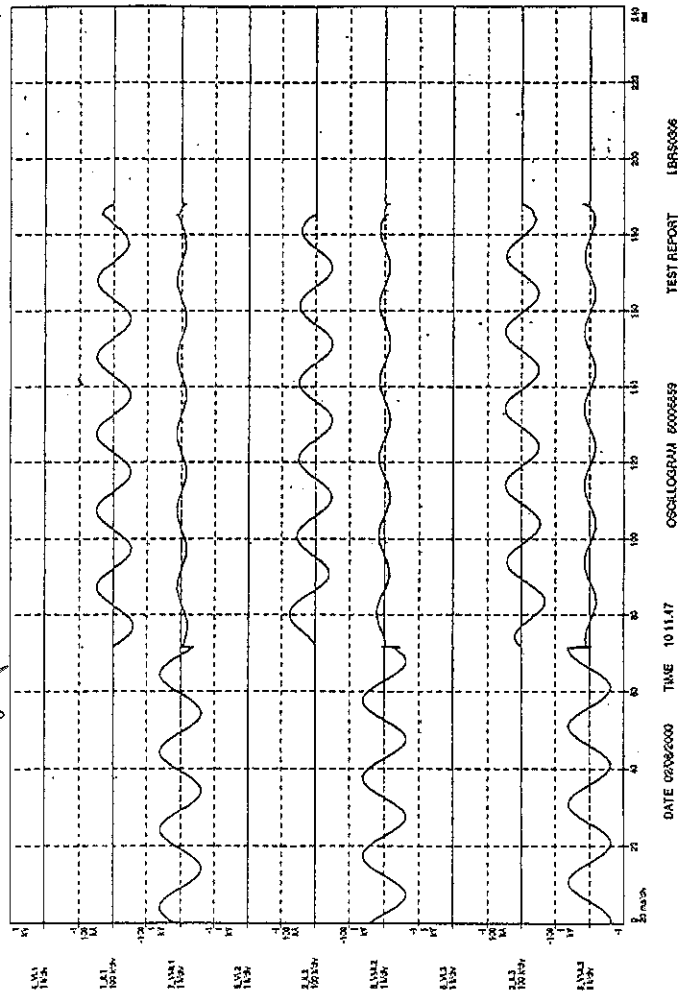
SYMBOLS USED FOR THE IDENTIFICATION OF THE MEASUREMENTS RECORDED BY THE OSCILLOGRAM

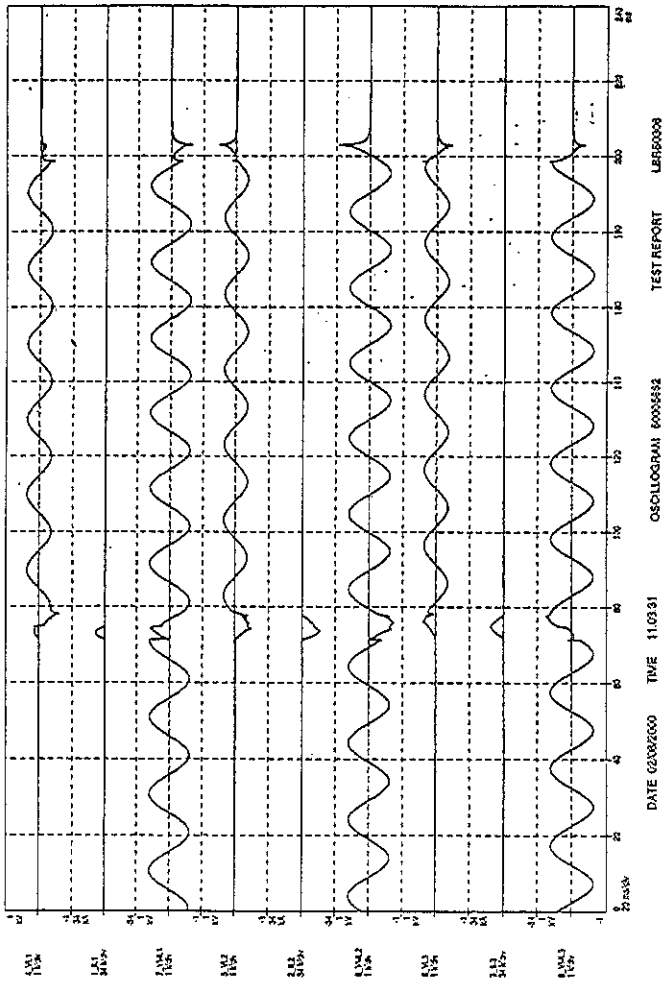
1 First phase current
2 Second phase current
3 Third phase current

4 First phase voltage measured across the pole of the circuit breaker
5 Second phase voltage measured across the pole of the circuit breaker
6 Third phase voltage measured across the pole of the circuit breaker

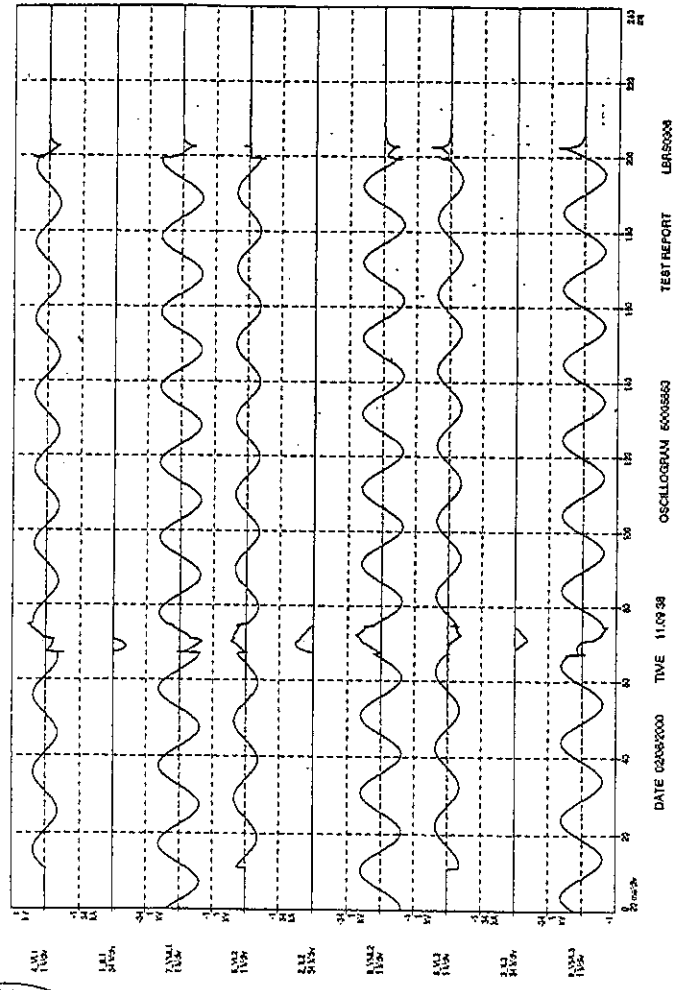
7 First phase voltage measured phase to phase across the closing device
8 Second phase voltage measured phase to phase across the closing device
9 Third phase voltage measured phase to phase across the closing device

11 Shunt closing release voltage


TEST REPORT LBR60306
OSCILLOGRAM 60006859
TIME 10:11:47
DATE 02/08/2000


TEST REPORT LBR60309
OSCILLOGRAM 60006862
TIME 11:03:31
DATE 02/08/2000

LOVAG	Test report No.: 00.305 / T 01 Page 30 / 34
Type test according to: IEC 60947-2	Type: T3N



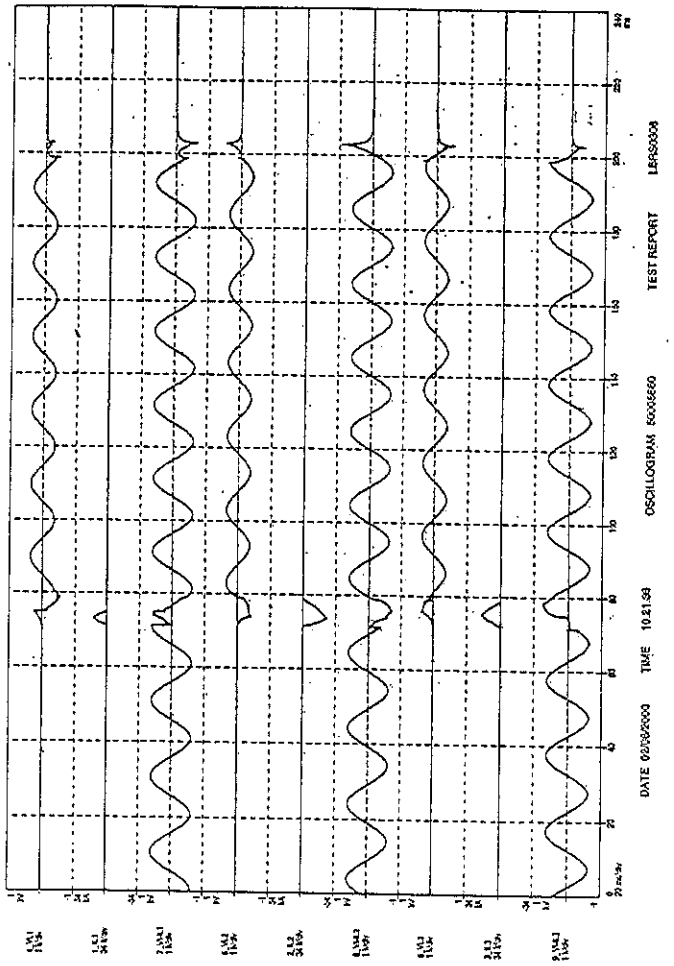
Test laboratory: ACAE IA.01

F 947-2/73 ind 0

Authorized representative

Date 00.09.18

LOVAG	Test report No.: 00.305 / T 01 Page 31 / 34
Type test according to: IEC 60947-2	Type: T3N

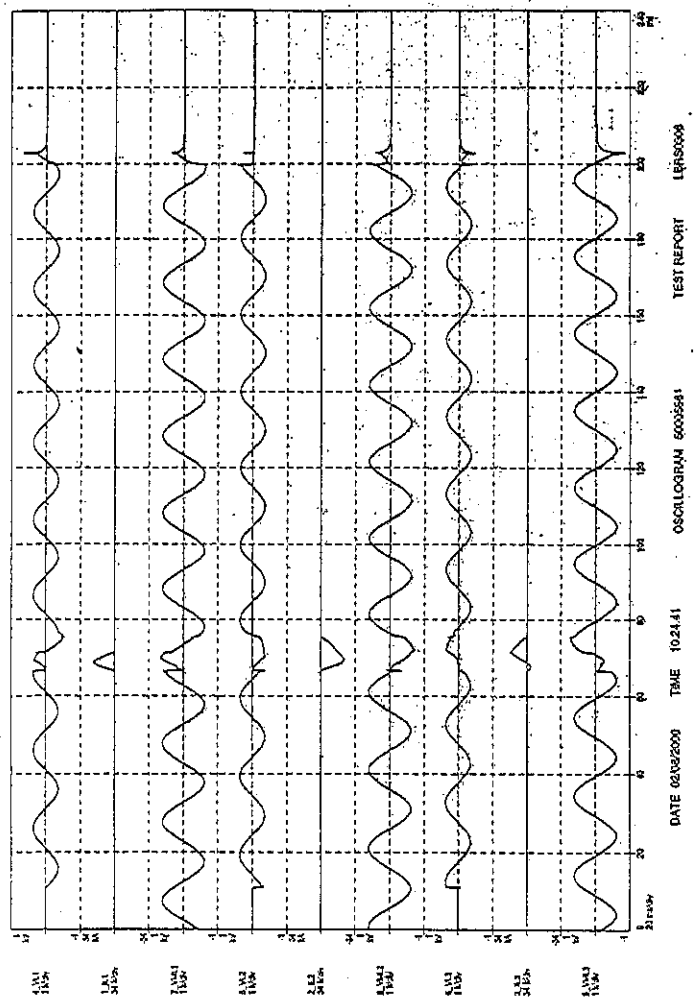


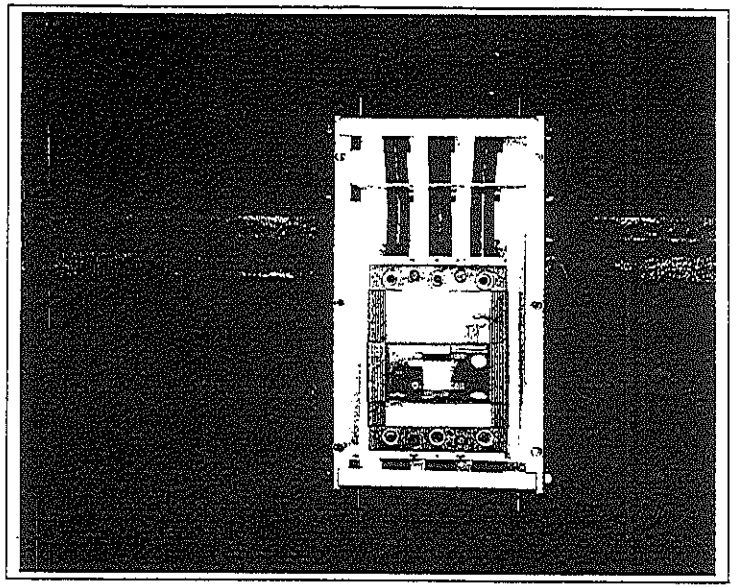
Test laboratory: ACAE IA.01

F 947-2/73 ind 0

Authorized representative

Date 00.09.18


TEST REPORT LER80008
OSCILLOGRAM 60005681
TIME 10:24:41
DATE 02/08/2009



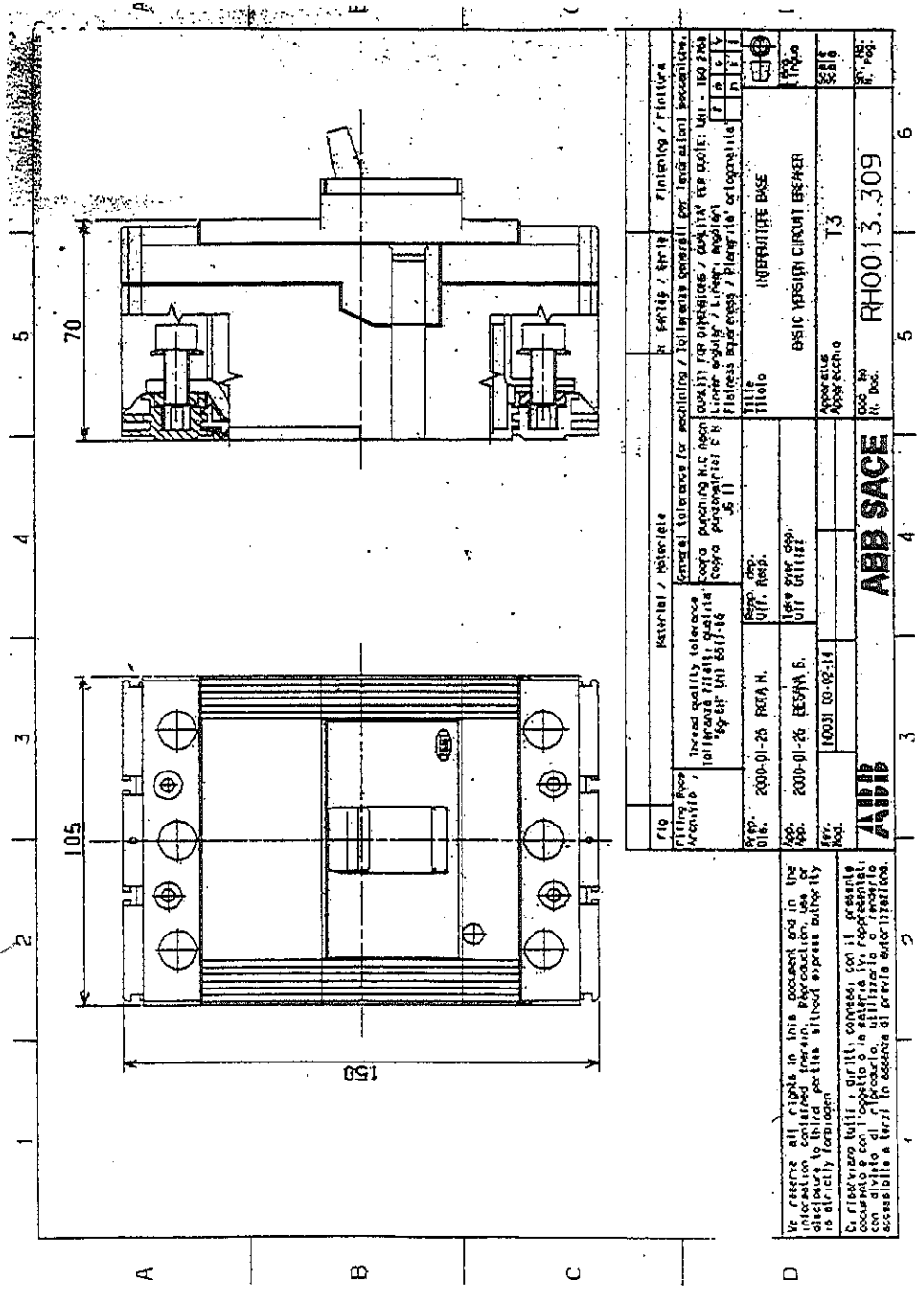
LOVAG	Test report No.: 00.305 / T'01 Page 34 / 34
Type test according to: IEC 60947-2	Type: T3N

COMPLETE LIST OF DRAWINGS AN DRAWINGS
CHEKED FOR THE COMPLIANCE OF THE PRODUCT

Nr. Drawings	Denomination	Issue status
RA 0450.801-834	Standard circuit breaker assembly	99.05.19
RA 0450	Material list	99.05.19
RA 0457.801	Case assembly	99.05.19
RA 0457	Material list	99.05.19
RA 0458	Cover	99.05.19
RA 0531	Trip shaft	99.05.19
RA 0487.801-802	Moving contact assembly	99.05.19
RA 0487	Material list	99.05.19
RA 0497	Moving contact plate	99.05.19
RA 0470.801	Operating mechanism assembly	99.05.19
RA 00470	Material list	99.05.19
RA 0493	Operating mechanism spring	99.05.19
RA 0505.801	Arching chamber assembly	99.05.19
RA 0505	Material list	99.05.19
RA 0512.801	Fixed contact assembly	99.05.19
RA 0512	Material list	99.05.19
RA 0510	Fixed contact plate	99.05.19
RA 0519.801-810	Relais assembly	99.05.19
RA 0519	Material list	99.05.19
RA 0720.801	Clamp assembly	99.05.19
RA 0720	Material list	99.05.19

Test laboratory: ACAE 1A.01 F 947-2/73 Ind 0

Authorized representative Date 00.09.18



ASSOCIAZIONE PER LA CERTIFICAZIONE
DELLE APPARECCHIATURE ELETTRICHE

V.le delle Brigate Partigiane 6/21 - 16129 - GENOVA (Italy)
tel. +10/565197 fax. +10/5848607 e-mail: acaecert@tin.it

LOVAG

Certificate
of Conformity

LOVAG-Certificate No. IT 00.031

This Certificate applies only to the apparatus tested. The responsibility for conformity of any apparatus having the same designation with that tested rests with the manufacturer or responsible vendor.

This certificate has been prepared according to LOVAG (Low Voltage Agreement Group) Objectives and Operating Principles of mutual recognition. The responsible certification body as member of LOVAG issues a Certificate of Conformity with the above mentioned Standard(s) following the exclusive use of LOVAG Test instructions wherever applicable.

Only integral reproduction of this Certificate or reproductions of this page accompanied by any page(s) on which are stated the tests performed and the assigned rated characteristics of the apparatus tested, are permitted without written permission from the LOVAG Signatory responsible for this Certificate.

Apparatus
Moulded case Three Pole Air-break Independent operation Circuit-breakers Frame size 160 A - 800 V (U_i) - 50/60 Hz - with short-circuit and overload releases:

I_n = 160 A

Designation

T1B

Manufacturer or responsible vendor
ABB SACE S.p.A. - Via Baioni, 35 - 24123 Bergamo (Italy)

Tested for: ABB SACE S.p.A. - Via Baioni, 35 - 24123 Bergamo (Italy)
Tested by: ACAE Laboratory IA.01
The apparatus, constructed in accordance with the description mentioned in the Test Report listed on this Certificate has been subjected to the series of proving tests in accordance with IEC 60947-2 (1995), Corrigendum (1997) and Amendment 1 (1997).

The results are shown in the Test Report in accordance to LOVAG. The values obtained and the general performance are considered to comply with the above Standard(s) and to justify the characteristic assigned by the manufacturer as stated below.
Utilization category A

Test sequence: II ($I_{cs} = I_{cu}$)

U_e = 415 V $I_{cs} = I_{cu}$ = 16 kA

This document includes Report No.: 00.291/T01
Issue Date: 2000.09.18

Responsible Certification Body

Authorized Signature
Date:2000.12.19

LOVAG
Low Voltage Agreement Group

Test Report No. 00.291 / T 01

Test laboratory:	ACAE IA.01
Client:	ABB SACE S.p.A.
Manufacturer:	ABB SACE S.p.A.
Test object:	Low voltage moulded case c.b. series TMAX
Type designation:	T1B
Date(s) of test(s):	from 2000.08.01 to 2000.09.15
Test specification:	IEC 60947-2 (1995), Corrigendum (1997) and Amendement 1 (1997)
Test sequence(s):	II ($I_{cs} = I_{cu}$)
Test results:	Icu / Ics at 415 V found in compliance with rated characteristics

The Record of Proving Test consists of:

45 pages LOVAG test report forms	7 oscillograms included
no other pages	drawing nr. RH0011.309 issued 00.01.25 enclosed
2 diagram included	1 photograph included

Date of issue: 2000.09.18

Responsible Test Laboratory

Signatures: (Authorized representative)

Note:
The test result relates only to the items tested.
The test report shall not be reproduced except in full without the written approval of the test laboratory.

Description and characterization of the test object

Characteristics

Type of circuit-breaker:

Number of poles	3
Kind of current	a.c.
Number of phases	3
Rated frequency	50 – 60 Hz
Utilization category	A
Reference temperature	40 °C
Suitability for isolation	Yes

Rated and limiting values: (according to test volume)

Main circuit:

Rated impulse withstand voltage U_{imp}	8 kV
Rated insulation voltage U_i	800 V
Conventional thermal current I_{th} / I_{the}	160 A / -
Rated current I_n	160 A
Rated current in the neutral pole	-

Short-circuit characteristics:

U_e/V	I_{cm}/kA	I_{cu}/kA	I_{cs}/kA	I_{cw}/kA	I_{sd}/kA	I_{IT}/kA
220/230	52,5	25	25	-	-	-
380/415	32	16	16	-	-	-
440	17	10	10	-	-	-
500	13,6	8	8	-	-	-
690	5,9	4	4	-	-	-

Control circuits:

Electrical control circuits:

Kind of current	-
Rated frequency	-
Rated control circuit voltage U_c	-
Rated control supply voltage U_s	-
Rated impulse withstand voltage U_{imp}	-
Rated insulation voltage U_i	-

Air-supply control circuits:

Rated supply pressure	-
Limits of pressure	-
Required volume for each closing operation	-
Required volume for each opening operation	-

Auxiliary circuits:

Rated operational voltage U_e	-
Rated impulse withstand voltage U_{imp}	-
Rated insulation voltage U_i	-
Rated frequency	-
Rated operational current I_e	-
Number of circuits	-
Number and kind of contact elements	-

Releases:

- Shunt release:

- Rated control circuit voltage U_c	-
- Kind of current	-
- Rated frequency if a.c.	-

- Undervoltage or no-voltage release

- Rated control circuit voltage U_c	-
- Kind of current	-
- Rated frequency if a.c.	-

- Over-current release:

- Short-circuit release

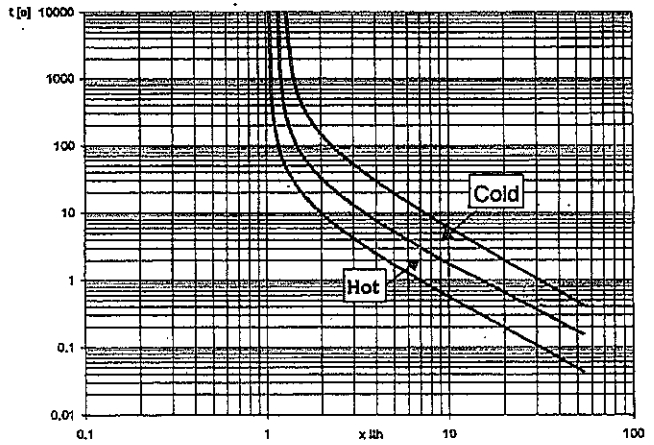
- instantaneous release	Yes
- definite time-delay release	-
- Rated current I_n	16 A to 160 A
- Kind of current	a.c.
- Rated frequency if a.c.	50 - 60 Hz
- Current setting (or range of settings)	from 500 A up to 1600 A
- Time setting (or range of settings)	-

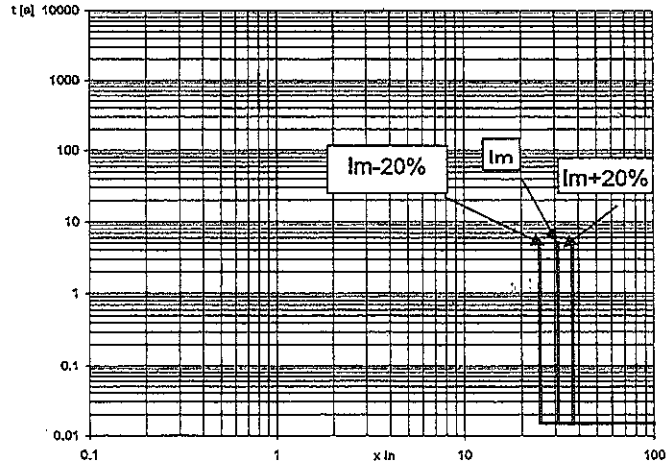
- Overload release (IEC 60947-1; 2.4.30):

- instantaneous release	-
- definite time-delay release	-
- Inverse time-delay release	R16 to R160
dependent on ambient air temperature	yes
independent of ambient air temperature	-
- Reference temperature	40 °C
- Rated current I_n	16 to 160 A
- Kind of current	a.c.
- Rated frequency if a.c.	50 - 60 Hz
- Current setting (or range of settings)	11 A to 16 A and 112 A to 160 A
- Time setting (or range of settings)	-

Time / current characteristics settings R16

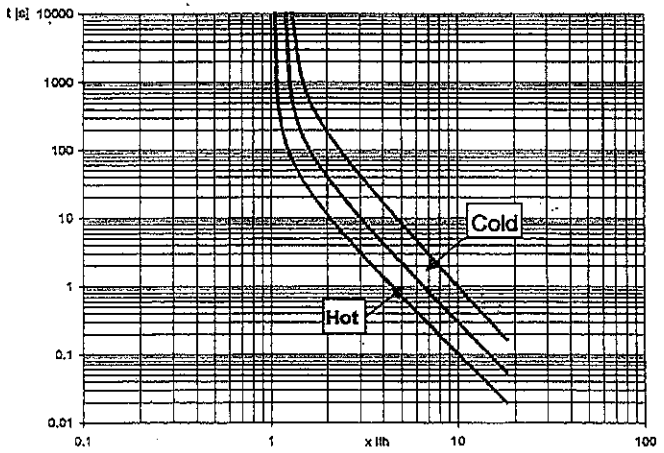
Type designation : T1B

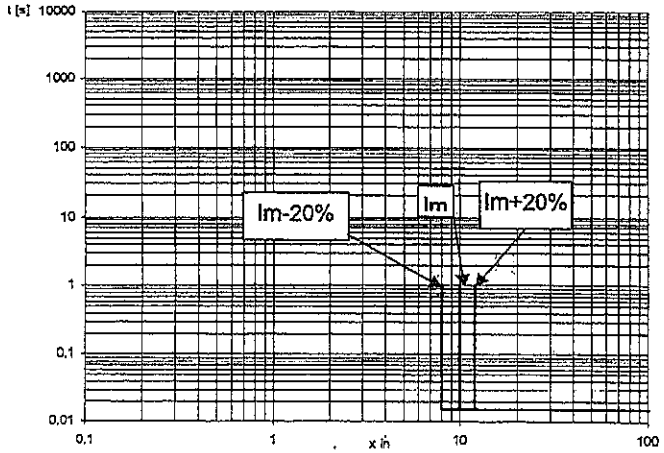




Time / current characteristics settings R160

Type designation : T1B





Integral fused circuit-breakers:
(Co-ordination with short-circuit protective devices)

Kind of protective devices	-
- Type of fuse	-
- Maximum operational voltage	-
- Rated current I_n	-
- Maximum prospective short-circuit peak current	-

Switching overvoltages:
(Characteristics not defined)

Individual enclosure:

- Type	-
- Kind of material	-
- Degree of protection	-
- Inside dimensions (in millimetres)	
height	-
width	-
depth	-

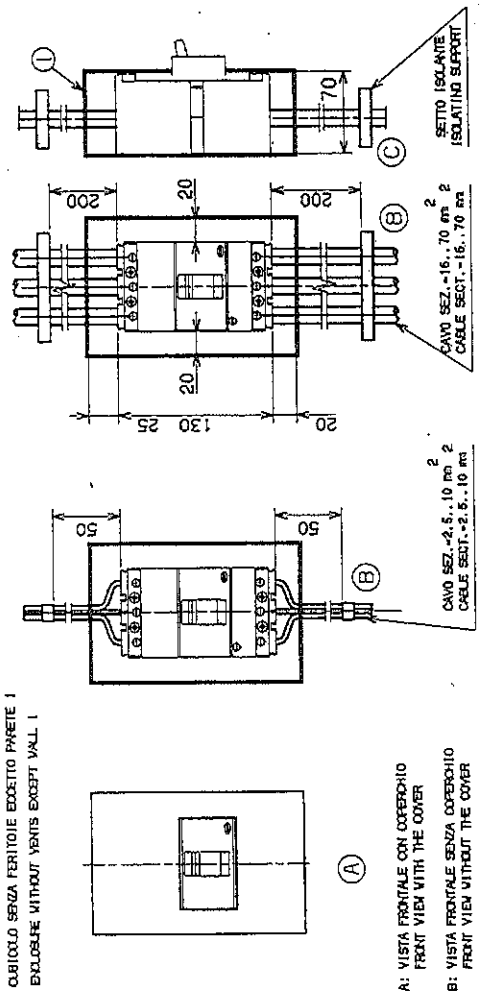
When no enclosure:

Safety perimeter defined:	
height	175 mm
width	116 mm
depth	70 mm
Kind of screen (woven wire mesh, perforated metal, expanded metal)	metal sheet
Size of holes (≤ 30 mm²)	yes
Distance during test	-

Openings around the manual operating means:

Openings in the area of the manual operating means through which the arc chamber can be reached by a music wire of 0.26 mm diameter.	no

INSTALLATION INSIDE METAL ENCLOSURE FOR SHORT-CIRCUIT TESTS



SAMPLE UNDER TEST

Sample	Serial number	In (A)	Test sequence	Test result at page	Delivery term of the sample to the laboratory
1	0309	16	II	11	31.07.00
2	0322	160	II	22	31.07.00

REFERENCE DRAWINGS

Nr. Drawings	Denomination	Issue status
RA 0050.801-857	Standard circuit breaker assembly	99.05.19
RA 0050	Material list	99.05.19
RA 0054.801	Case assembly	99.05.19
RA 0054	Material list	99.05.19
RA 055	Cover	99.05.19
RA 0056.801-802	Trip shaft assembly	99.05.19
RA 0056	Material list	99.05.19
RA 0082.801	Operating mechanism assembly	99.05.19
RA 0082	Material list	99.05.19
RA 0106.801	Arching chamber assembly	99.05.19
RA 0106	Material list	99.05.19
RA 0112.801	Fixed contact assembly	99.05.19
RA 0112	Material list	99.05.19
RA 0115	Fixed contact plate	99.05.19
RA 0116.801	Clamp assembly	99.05.19
RA 0116	Material list	99.05.19
RA 0132	Spring	99.05.19
RA 0134.801-810	Moving contact + relais assembly	99.05.19
RA 0134	Material list	99.05.19
RA 0136	Moving contact plate	99.05.19

TEST SEQUENCE II ($I_{cs} = I_{cu}$)

Rated ultimate short-circuit breaking capacity
For circuit-breakers with $I_{cs} = I_{cu}$

Test sequence II ($I_{cs} = I_{cu}$) comprises the following tests:

Sub-clause	Test	Pageform
8.3.5.1	Verification of overload releases	F 947-2/41
8.3.4.1	Rated service short-circuit breaking capacity	F 947-2/35 + F 947-2/37
8.3.4.2	Verification of operational capability	F 947-2/38
8.3.4.3	Verification of dielectric withstand	F 947-2/27
	Verification of leakage current (if appicable)	F 947-2/20
8.3.4.4	Verification of temperature-rise	F 947-2/39
8.3.4.5	Verification of overload releases	F 947-2/30
8.3.5.4	Verification of overload release	F 947-2/41

Standard and clause	Kind of tests and requirements			Test values Results
	VERIFICATION OF OVERLOAD RELEASES ON EACH POLE SEPARATELY			
60947-1 Table IX, X and XI	Cabling characteristics			
	Cable		2,5 mm²	2,5 mm²
	Bar		- x - mm	- x - mm
	Number		1	1
	Length		2000 mm	2000 mm
	Tightening torque			7 Nm
	Reference temperature		40 °C ± 2 °C	
	Ambient temperature			40 °C
	Correction factor		k	-
	(k = 1 for releases independent of ambient temperature)			
	Current setting value		I_n	11 A
	Test current			
	either k x 2.0 x I_n		22 A	22 A
8.3.5.1	Test sequence II ($I_{cs} = I_{cu}$)	before 8.3.4.1		
8.3.5.1	Test sequence III,	before 8.3.5.2		
8.3.6.1	Test sequence IV,	before 8.3.6.2		
8.3.6.6	Test sequence IV	after 8.3.6.5		
8.3.7.4	Test sequence V,	before 8.3.7.5		
8.3.8.1	Combined test sequence	before 8.3.8.2		
	or k x 2.5 x I_n		- A	- A
8.3.5.4	Test sequence II ($I_{cs} = I_{cu}$)	after 8.3.4.4		
8.3.5.4	Test sequence III,	after 8.3.5.3		
8.3.7.8	Test sequence V,	after 8.3.7.7		
8.3.8.7	Combined test sequence	after 8.3.8.6		
C.4	Individual pole short-circuit test sequence			
H.4	Test sequence for circuit-breakers for IT-systems			
	Tripping time (for twice the value of current setting on single pole)			
		Ph_1	≥ 150 s	121 s
		Ph_2	≤ 150 s	118 s
		Ph_3	≥ 150 s	125 s

LOVAG	Test report No.: 00.291 / T 01 Page 12 / 45
Type test according to: IEC 60947-2 Test sequence II ($I_{cs} = I_{cu}$)	Type: T1B

Standard and clause	Kind of tests and requirements			Test values Results
8.3.4.1 8.3.8.3	**TEST OF RATED SERVICE SHORT-CIRCUIT BREAKING CAPACITY**			
Table 4	Utilization category		A	
Table 1	Rated operational voltage U_e		415 V	
	Recovery voltage		1.05 x U_e	436 V
	Rated service short-circuit breaking capacity I_{cs}		16 kA	16,7 kA
	Rated ultimate short-circuit making capacity I_{cu}		16 kA	
	Ratio between Ics and Icu		Ics/Icu = 100 %	
Table XI	Power factor		0,30	0,28
	Frequency		50 Hz	50 Hz
8.3.2.1 7.2.1.1.3	Control supply voltage		0.85 x U_s - V	- V
	Maximum value of the closing time			- ms
	Sequence of operation		O - t - CO - t - CO	O - t - CO - t - CO
	Circuit diagram			Page 34 / 45
	Calibration of the test circuit			Page 13 / 45
	Safety area		Pageform 6	Page 7 / 45
	Installation of the material tested		Pageform 73	Page 8 / 45
	Energization direction		Top/Bottom	Top
60947-1 Table IX, X and XI	Cabling characteristics			
	Cable		2,5 mm²	2,5 mm²
	Bar		- x - mm	- x - mm
	Number		1	1
	Length	supply side	500 mm	500 mm
		load side	250 mm	250 mm
	Tightening torque			7 Nm

LOVAG	Test report No.: 00.291 / T 01 Page 13 / 45
Type test according to: IEC 60947-2	Type: T1B

Standard and clause	Kind of tests and requirements		Test values Results
60947-1 8.3.4.1.5	**CALIBRATION OF THE TEST CIRCUIT (*)**		
	Oscillogram		Page 37 / 45
	Applied voltage		438 V
	Frequency	50 Hz	50 Hz
	RMS. current value	i_1	17,0 kA
	At 20 ms	i_2	18,7 kA
		i_3	16,6 kA
	Average RMS. value		16,7 kA
	Peak current maximum value		34,3 kA
	Power factor		0,28
	(*) Description of the method for determination of short-circuit power factor is given at page 33 / 45		

Standard and clause	Kind of tests and requirements		Test values Results
	OPERATION „O"		
	Oscillogram		Page 38 / 45
	Peak current value	i_1	5,11 kA
		i_2	9,47 kA
		i_3	5,44 kA
	Maximum total duration		6,30 ms
	Recovery voltage	$U_{r(1-2)}$ ☒ or $U_{r(1-N)}$ ☐	440 V
	(phase to phase or phase to neutral)	$U_{r(2-3)}$ ☒ or $U_{r(2-N)}$ ☐	439 V
		$U_{r(3-1)}$ ☒ or $U_{r(3-N)}$ ☐	438 V
	Average	U_{rm}	439 V
	Ratio between U_{rm} and U_e	U_{rm}/U_e	1,06
	Joule integral	Ph_1	$49,4x10^3$ A^2s
		Ph_2	$206x10^3$ A^2s
		Ph_3	$74,7x10^3$ A^2s
	Melting of the fusible element	Yes/No	No
	Holes in the PE-sheet (if applicable)	Yes/No	No
	Cracks observed	Yes/No	No
	If Yes		Page - / -
	Time interval between operations	3 min	6 min
	OPERATION „CO"		
	Oscillogram		Page 39 / 45
	Applied voltage		438 V
	Peak current value	i_1	8,64 kA
		i_2	2,83 kA
		i_3	8,41 kA
	Maximum total duration		7,30 ms
	Recovery voltage	$U_{r(1-2)}$ ☒ or $U_{r(1-N)}$ ☐	438 V
	(phase to phase or phase to neutral)	$U_{r(2-3)}$ ☒ or $U_{r(2-N)}$ ☐	438 V
		$U_{r(3-1)}$ ☒ or $U_{r(3-N)}$ ☐	439 V
	Average	U_{rm}	438 V
	Ratio between U_{rm} and U_e	U_{rm}/U_e	1,05
	Joule integral	Ph_1	$194x10^3$ A^2s
		Ph_2	$24,4x10^3$ A^2s
		Ph_3	$169x10^3$ A^2s
7.2.1.1.3	Closing operation time		- ms
	Melting of the fusible element	Yes/No	No
	Cracks observed	Yes/No	No
	if Yes		Page - / -

Standard and clause	Kind of tests and requirements		Test values Results
	Time interval between operations	3 min	6 min
	OPERATION „CO"		
	Oscillogram		Page 40 / 45
	Applied voltage		439 V
	Peak current value	i_1	4,86 kA
		i_2	9,58 kA
		i_3	6,25 kA
	Maximum total duration		5,80 ms
	Recovery voltage	$U_{r(1-2)}$ ☒ or $U_{r(1-N)}$ ☐	438 V
	(phase to phase or phase to neutral)	$U_{r(2-3)}$ ☒ or $U_{r(2-N)}$ ☐	437 V
		$U_{r(3-1)}$ ☒ or $U_{r(3-N)}$ ☐	438 V
	Average	U_{rm}	438 V
	Ratio between U_{rm} and U_e	U_{rm}/U_e	1,05
	Joule integral	Ph_1	$44,7x10^3$ A^2s
		Ph_2	$222x10^3$ A^2s
		Ph_3	$92,7x10^3$ A^2s
7.2.1.1.3	Closing operation time		- ms
	Melting of the fusible element	Yes/No	No
	Cracks observed	Yes/No	No
	if Yes		Page - / -

Type test according to: IEC 60947-2 Test sequence II ($I_{cs} = I_{cu}$) | Type: T1B

Standard and clause	Kind of tests and requirements		Test values Results
8.3.4.2 8.3.8.4	**VERIFICATION OF OPERATIONAL CAPABILITY**		
	Short-circuit release	min. setting	500 A
	Overload release	max. setting	16 A
	Circuit diagram		
	Rated operational voltage U_e	415 V	415 V
	(Same rated operational voltage as used for the test of the rated service short-circuit breking capacity)		
	Rated current I_n	16 A	16A
	Power factor	0,8	0,8
Table XI	Time constant	- ms	- ms
	Frequency	50 Hz	50 Hz
	Operating cycles per hour	120 /h	120 /h
Table VIII	On-time		180 ms
	Number of operating cycles	75	75
	(5% of the number of operations given in column 4 of table 8)		

Authorized representative | Date 00.09.18

Type test according to: IEC 60947-2 Test sequence II ($I_{cs} = I_{cu}$) | Type: T1B

Standard and clause	Kind of tests and requirements		Test values Results
	VERIFICATION OF DIELECTRIC WITHSTAND		
	Test voltage		
	$2 \times U_e$, min. 1000 V	1000 V	1000 V
8.3.3.5	Test sequence I		
8.3.4.3	Test sequence II		
8.3.5.3	Test sequence III		
8.3.6.5	Test sequence IV		
8.3.7.3	Test sequence V, stage 1		
8.3.7.7	Test sequence V, stage 2		
8.3.8.5	Combined test sequence		
B.10.3.1	Test sequence B.II		
C3	Individual pole short-circuit test sequence		
H.3	Test sequence for circuit-breakers for IT-systems		
8.3.3.2.2 a)	Application of the test voltage - Main circuit of the circuit-breaker - isolating contacts of the withdrawable unit (if applicable)		
	Test duration	1 min	1 min

Authorized representative | Date 00.09.18

Standard and clause	Kind of tests and requirements		Test values Results
	VERIFICATION OF LEAKAGE CURRENT		
	For circuit-breakers suitable for isolation having an operational voltage U_e greater than 50 V.		
8.3.3.2	**- Main circuit of the circuit-breaker** **- Isolating contacts of a withdrawable unit (if applicable)**		
	Test voltage	1.1 x U_e 415 V	456 V
60947-1 7.2.7	Application of the test voltage		
	Leakage current		
8.3.3.2	Test sequence I (in new condition)	≤ 0.5 mA	- mA
8.3.3.5	Test sequence I (after overload performance)	≤ 2 mA	- mA
8.3.4.3	Test sequence II	≤ 2 mA	< 2 mA
8.3.5.3	Test sequence III	≤ 6 mA	- mA
8.3.6.5	Test sequence IV	≤ 2 mA	- mA
8.3.7.3	Test sequence V, stage 1	≤ 2 mA	- mA
8.3.7.7	Test sequence V, stage 2	≤ 6 mA	- mA
8.3.8.5	Combined test sequence	≤ 2 mA	- mA
C.3	Individual pole short-circuit test sequence I_{su}	≤ 6 mA	- mA
H.3	Individual pole short-circuit test sequence I_{IT}	≤ 6 mA	- mA

Standard and clause	Kind of tests and requirements		Test values Results
8.3.4.4 8.3.6.3 8.3.7.2 8.3.8.6	**VERIFICATION OF TEMPERATURE-RISE ONLY FOR TERMINALS**		
8.3.2.5	**Temperature-rise test**		
60947-1 8.3.3.3.1	Ambient temperature	10...40°C	- °C
	Main circuits		
60947-1 8.3.3.3.4	Conventional thermal current I_{th}	.A	- A
	Conventional thermal current for enclosure I_{the}	.A	- A
	Conventional thermal current for neutral pole	- A	- A
	Cabling characteristics		
	Phase poles		
	Cable	- mm^2	- mm^2
	Bar	- x - mm	- x - mm
	Number	-	
	Length	- mm	
	Tightening torque		
	Neutral pole (if applicable)		
	Cable	- mm^2	- mm^2
	Bar	- x - mm	- x - mm
	Number	-	-
	Length	- mm	- mm
	Tightening torque		- Nm
	Arrangement:	3 phase ☐ or poles in series ☐	
	Temperature-rise limits		
	Terminals	≤ - K	- K
	Note : Test not carried out (see table X IEC 947-2 Amendment 2)		

LOVAG	Test report No.: 00.291 / T 01 Page 20 / 45
Type test according to: IEC 60947-2 Test sequence II ($I_{cs} = I_{cu}$)	Type: T1B

Standard and clause	Kind of tests and requirements		Test values Results
	VERIFICATION OF OVERLOAD RELEASES		
60947-1 Table IX, X and XI	Cabling characteristics		
	Cable	2,5 mm²	2,5 mm²
	Bar	- x - mm	- x - mm
	Number	1	1
	Length	2000 mm	2000 mm
	Tightening torque		7 Nm
	Arrangement	3 phase ☐ or poles in series ☒	
	Reference temperature	40 °C ± 2 °C	
	Ambient temperature		40 °C
	Correction factor	k	-
	(k = 1 for releases independent of ambient temperature)		
	Current setting value	I_n	11 A
	Test current		
	k x 1.45 x current setting value		16 A
8.3.3.7	Test sequence I	after 8.3.3.6	
8.3.4.5	Test sequence II	after 8.3.4.4	
8.3.8.7	Combined test sequence	after 8.3.8.6	
Table VI	Tripping time	≤ 60 min	6 min

Test laboratory: ACAE IA.01 F 947-2/30 Ind 2

Authorized representative Date 00.09.18

LOVAG	Test report No.: 00.291 / T 01 Page 21 / 45
Type test according to: IEC 60947-2 Test sequence II ($I_{cs} = I_{cu}$)	Type: T1B

Standard and clause	Kind of tests and requirements		Test values Results
	VERIFICATION OF OVERLOAD RELEASES ON EACH POLE SEPARATELY		
60947-1 Table IX, X and XI	Cabling characteristics		
	Cable	2,5 mm²	2,5 mm²
	Bar	- x - mm	- x - mm
	Number	1	1
	Length	2000 mm	2000 mm
	Tightening torque		7 Nm
	Reference temperature	40 °C ± 2 °C	
	Ambient temperature		40 °C
	Correction factor	k	-
	(k = 1 for releases independent of ambient temperature)		
	Current setting value	I_n	11 A
	Test current		
	either k x 2.0 x I_n	- A	- A
8.3.5.1	Test sequence II ($I_{cu} = I_{cu}$)	before 8.3.4.1	
8.3.5.1	Test sequence III,	before 8.3.5.2	
8.3.6.1	Test sequence IV,	before 8.3.6.2	
8.3.6.6	Test sequence IV	after 8.3.6.5	
8.3.7.4	Test sequence V,	before 8.3.7.5	
8.3.8.1	Combined test sequence	before 8.3.8.2	
	or k x 2.5 x I_n	27,5 A	27,5 A
8.3.5.4	Test sequence II ($I_{cs} = I_{cu}$)	after 8.3.4.4	
8.3.5.4	Test sequence III,	after 8.3.5.3	
8.3.7.8	Test sequence V,	after 8.3.7.7	
8.3.8.7	Combined test sequence	after 8.3.8.6	
C.4	Individual pole short-circuit test sequence		
H.4	Test sequence for circuit-breakers for IT-systems		
	Tripping time (for twice the value of current setting on single pole)		
	Ph_1	≤ 190 s	65 s
	Ph_2	≤ 190 s	68 s
	Ph_3	≤ 190 s	74 s

Test laboratory: ACAE IA.01 F 947-2/41 Ind 2

Authorized representative Date 00.09.18

Type test according to: IEC 60947-2 Test sequence II ($I_{cs} = I_{cu}$) | Type: T1B

Standard and clause	Kind of tests and requirements		Test values Results
	VERIFICATION OF OVERLOAD RELEASES ON EACH POLE SEPARATELY		
60947-1 Table IX, X and XI	Cabling characteristics		
	Cable	70 mm²	70 mm²
	Bar	- x - mm	- x - mm
	Number	1	1
	Length	2000 mm	2000 mm
	Tightening torque		7 Nm
	Reference temperature	40 °C ± 2 °C	
	Ambient temperature		40 °C
	Correction factor	k	-
	(k = 1 for releases independent of ambient temperature)		
	Current setting value	I_n	160 A
	Test current		
	either k x 2.0 x I_n	320 A	320 A
8.3.5.1	Test sequence II ($I_{cs} = I_{cu}$) before 8.3.4.1		
8.3.5.1	Test sequence III, before 8.3.5.2		
8.3.6.1	Test sequence IV, before 8.3.6.2		
8.3.6.6	Test sequence IV after 8.3.6.5		
8.3.7.4	Test sequence V, before 8.3.7.5		
8.3.8.1	Combined test sequence before 8.3.8.2		
	or k x 2.5 x I_n	- A	- A
8.3.5.4	Test sequence II ($I_{cs} = I_{cu}$) after 8.3.4.4		
8.3.5.4	Test sequence III, after 8.3.5.3		
8.3.7.8	Test sequence V, after 8.3.7.7		
8.3.8.7	Combined test sequence after 8.3.8.6		
C.4	Individual pole short-circuit test sequence		
H.4	Test sequence for circuit-breakers for IT-systems		
	Tripping time (for twice the value of current setting on single pole)		
	Ph_1	≤ 190 s	68 s
	Ph_2	≤ 190 s	63 s
	Ph_3	≤ 190 s	70 s

Test laboratory: ACAE IA.01 F 947-2/41 Ind 2

Authorized representative Date 00.09.18

Type test according to: IEC 60947-2 Test sequence II ($I_{cs} = I_{cu}$) | Type: T1B

Standard and clause	Kind of tests and requirements		Test values Results
8.3.4.1 8.3.8.3	**TEST OF RATED SERVICE SHORT-CIRCUIT BREAKING CAPACITY**		
Table 4	Utilization category	A	
	Rated operational voltage U_e	415 V	
	Recovery voltage	1.05 x U_e	436 V
	Rated service short-circuit breaking capacity I_{cs}	16 kA	16,7 kA
Table 1	Rated ultimate short-circuit making capacity I_{cu}	16 kA	
	Ratio between Ics and Icu	Ics/Icu = 100 %	
Table XI	Power factor	0,30	0,28
	Frequency	50 Hz	50 Hz
8.3.2.1	Control supply voltage	0,85 x U_s - V	- V
7.2.1.1.3	Maximum value of the closing time		- ms
	Sequence of operation	O - t - CO - t - CO	O - t - CO - t – CO
	Circuit diagram		Page 34 / 45
	Calibration of the test circuit		Page 24 / 45
	Safety area	Pageform 8	Page 7 / 45
	Installation of the material tested	Pageform 73	Page 8 / 45
	Energization direction	Top/Bottom	Bottom
60947-1 Table IX, X and XI	Cabling characteristics		
	Cable	70 mm²	70 mm²
	Bar	- x - mm	- x – mm
	Number	1	1
	Length supply side	500 mm	500 mm
	load side	250 mm	250 mm
	Tightening torque		7 Nm

Test laboratory: ACAE IA.01 F 947-2/35 Ind 2

Authorized representative Date 00.09.18

LOVAG	Test report No.: 00.291 / T 01 Page 24 / 45
Type test according to: IEC 60947-2	Type: T1B

Standard and clause	Kind of tests and requirements		Test values Results
60947-1 8.3.4.1.5	**CALIBRATION OF THE TEST CIRCUIT**		
	Oscillogram		Page 37 / 45
	Applied voltage		438 V
	Frequency	50 Hz	50 Hz
	RMS. current value At 20 ms	i_1 i_2 i_3	17,0 kA 16,7 kA 16,6 kA
	Average RMS. value		16,7 kA
	Peak current maximum value		34,3 kA
	Power factor		0,28
	(*) Description of the method for determination of short-circuit power factor is given at page 33 / 45		

LOVAG	Test report No.: 00.291 / T 01 Page 25 / 45
Type test according to: IEC 60947-2 Test sequence II ($I_{cs} = I_{cu}$)	Type: T1B

Standard and clause	Kind of tests and requirements		Test values Results
	OPERATION „O"		
	Oscillogram		Page 41 / 45
	Peak current value	i_1	6,69 kA
		i_2	13,3 kA
		i_3	9,19 kA
	Maximum total duration		6,5 ms
	Recovery voltage (phase to phase or phase to neutral)	$U_{r(1-2)}$ ☒ or $U_{r(1-N)}$ ☐	436 V
		$U_{r(2-3)}$ ☒ or $U_{r(2-N)}$ ☐	438 V
		$U_{r(3-1)}$ ☒ or $U_{r(3-N)}$ ☐	438 V
	Average	U_{rm}	437 V
	Ratio between U_{rm} and U_e	U_{rm}/U_e	1,05
	Joule integral	Ph_1	$85,9 \times 10^3$ A^2s
		Ph_2	457×10^3 A^2s
		Ph_3	207×10^3 A^2s
	Melting of the fusible element	Yes/No	No
	Holes in the PE-sheet (if applicable)	Yes/No	No
	Cracks observed	Yes/No	No
	If Yes		Page - / -
	Time interval between operations	3 min	3 min
	OPERATION „CO"		
	Oscillogram		Page 42 / 45
	Applied voltage		438 V
	Peak current value	i_1	9,34 kA
		i_2	6,64 kA
		i_3	13,1 kA
	Maximum total duration		6,5 ms
	Recovery voltage (phase to phase or phase to neutral)	$U_{r(1-2)}$ ☒ or $U_{r(1-N)}$ ☐	438 V
		$U_{r(2-3)}$ ☒ or $U_{r(2-N)}$ ☐	437 V
		$U_{r(3-1)}$ ☒ or $U_{r(3-N)}$ ☐	438 V
	Average	U_{rm}	438 V
	Ratio between U_{rm} and U_e	U_{rm}/U_e	1,05
	Joule integral	Ph_1	226×10^3 A^2s
		Ph_2	$90,7 \times 10^3$ A^2s
		Ph_3	485×10^3 A^2s
7.2.1.1.3	Closing operation time		- ms
	Melting of the fusible element	Yes/No	No
	Cracks observed	Yes/No	No
	If Yes		Page - / -

Standard and clause	Kind of tests and requirements		Test values Results
	Time interval between operations	3 min	3 min
	OPERATION „CO"		
	Oscillogram		Page 43 / 45
	Applied voltage		438 V
	Peak current value	i_1	3,60 kA
		i_2	12,3 kA
		i_3	11,0 kA
	Maximum total duration		7,4 ms
	Recovery voltage (phase to phase or phase to neutral)	$U_{r(1-2)}$ ☒ or $U_{r(1-N)}$ ☐	439 V
		$U_{r(2-3)}$ ☒ or $U_{r(2-N)}$ ☐	440 V
		$U_{r(3-1)}$ ☒ or $U_{r(3-N)}$ ☐	437 V
	Average	U_m	439 V
	Ratio between U_m and U_e	U_m/U_e	1,06
	Joule integral	Ph_1	$36,6x10^3$ A^2s
		Ph_2	$371x10^3$ A^2s
		Ph_3	$308x10^3$ A^2s
7.2.1.1.3	Closing operation time		- ms
	Melting of the fusible element	Yes/No	No
	Cracks observed	Yes/No	No
	if Yes		Page - / -

Standard and clause	Kind of tests and requirements		Test values Results
8.3.4.2 · 8.3.8.4	**VERIFICATION OF OPERATIONAL CAPABILITY**		
	Short-circuit release	min. setting	1600 A
	Overload release	max. setting	160 A
	Circuit diagram		
	Rated operational voltage U_e (Same rated operational voltage as used for the test of the rated service short-circuit breaking capacity)	V	415 V
	Rated current I_n	160 A	160 A
	Power factor		
Table XI	Time constant	0,8 ms	0,8 ms
	Frequency	50 Hz	50 Hz
	Operating cycles per hour	120 /h	120 /h
Table VIII	On-time		180 ms
	Number of operating cycles (5% of the number of operations given in column 4 of table 8)	50	50

LOVAG	Test report No.: 00.291 / T 01 Page 28 / 45
Type test according to: IEC 60947-2 Test sequence II ($I_{cs} = I_{cu}$)	Type: T1B

Standard and clause	Kind of tests and requirements		Test values Results
	VERIFICATION OF DIELECTRIC WITHSTAND		
	Test voltage		
	2 x U_e, min. 1000 V	1000 V	1000 V
8.3.3.5	Test sequence I		
8.3.4.2	Test sequence II		
8.3.5.3	Test sequence III		
8.3.6.5	Test sequence IV		
8.3.7.3	Test sequence V, stage 1		
8.3.7.7	Test sequence V, stage 2		
8.3.8.4	Combined test sequence		
C.3	Individual pole short-circuit test sequence		
B.10.3.1	Test sequence B.II		
H.3	Test sequence for circuit-breakers for IT-systems		
8.3.3.2.2 a)	Application of the test voltage - Main circuit of the circuit-breaker - Isolating contacts of the withdrawable unit (if applicable)		
	Test duration	1 min	1 min

Authorized representative Date 00.09.18

LOVAG	Test report No.: 00.291 / T 01 Page 29 / 45
Type test according to: IEC 60947-2 Test sequence II ($I_{cs} = I_{cu}$)	Type: T1B

Standard and clause	Kind of tests and requirements		Test values Results
	VERIFICATION OF LEAKAGE CURRENT		
	For circuit-breakers suitable for isolation having an operational voltage U_e greater than 50 V.		
8.3.3.2	**- Main circuit of the circuit-breaker** **- Isolating contacts of a withdrawable unit (if applicable)**		
	Test voltage	1.1 x U_e 415 V	456 V
60947-1 7.2.7	Application of the test voltage		
	Leakage current		
8.3.3.2	Test sequence I (in new condition)	≤ 0.5 mA	- mA
8.3.3.5	Test sequence I (after overload performance)	≤ 2 mA	- mA
8.3.4.3	Test sequence II	≤ 2 mA	< 2 mA
8.3.5.3	Test sequence III	≤ 6 mA	- mA
8.3.6.5	Test sequence IV	≤ 2 mA	- mA
8.3.7.3	Test sequence V, stage 1	≤ 2 mA	- mA
8.3.7.7	Test sequence V, stage 2	≤ 6 mA	- mA
8.3.8.5	Combined test sequence	≤ 2 mA	- mA
C.3	Individual pole short-circuit test sequence I_{su}	≤ 6 mA	- mA
H.3	Individual pole short-circuit test sequence I_{IT}	≤ 6 mA	- mA

Authorized representative Date 00.09.18

Type test according to: IEC 60947-2 Test sequence II ($I_{cs} = I_{cu}$) | Type: T1B

Standard and clause	Kind of tests and requirements		Test values Results
8.3.4.4 8.3.6.3 8.3.7.2 8.3.8.6	**VERIFICATION OF TEMPERATURE-RISE ONLY FOR TERMINALS**		
8.3.2.5	**Temperature-rise test**		
60947-1 8.3.3.3.1	Ambient temperature	10...40°C	40 °C
	Main circuits		
60947-1 8.3.3.3.4	Conventional thermal current I_{th}	- A	- A
	Conventional thermal current for enclosure I_{the}	- A	- A
	Conventional thermal current for neutral pole	- A	- A
	Cabling characteristics		
	Phase poles		
	Cable	70 mm²	70 mm²
	Bar	- x - mm	- x - mm
	Number	1	1
	Length	2000 mm	2000 mm
	Tightening torque		7 Nm
	Neutral pole (if appicable)		
	Cable	- mm²	- mm²
	Bar	- x - mm	- x - mm
	Number	-	-
	Length	- mm	- mm
	Tightening torque		- Nm
	Arrangement: 3 phase ☐ or poles in senes ☒		
	Temperature-rise limits		
	Terminals	≤ 80 K	72 K

Test laboratory: ACAE IA.01 F 947-2/39 ind 2

Authorized representative Date 00.09.18

Type test according to: IEC 60947-2 Test sequence II ($I_{cs} = I_{cu}$) | Type: T1B

Standard and clause	Kind of tests and requirements		Test values Results
	VERIFICATION OF OVERLOAD RELEASES		
60947-1 Table IX, X and XI	Cabling characteristics		
	Cable	70 mm²	70 mm²
	Bar	- x - mm	- x - mm
	Number	1	1
	Length	2000 mm	2000 mm
	Tightening torque		7 Nm
	Arrangement: 3 phase ☐ or poles in series ☒		
	Reference temperature	40 °C ± 2 °C	
	Ambient temperature		40 °C
	Correction factor (k = 1 for releases independent of ambient temperature)	k	-
	Current setting value	I_n	160 A
	Test current		
	k x 1.45 x current setting value		232 A
8.3.3.7	Test sequence I after 8.3.3.6		
8.3.4.5	Test sequence II after 8.3.4.4		
8.3.8.7	Combined test sequence after 8.3.8.6		
Table VI	Tripping time	≤ 120 min	1 min

Test laboratory: ACAE IA.01 F 947-2/30 ind 2

Authorized representative Date 00.09.18

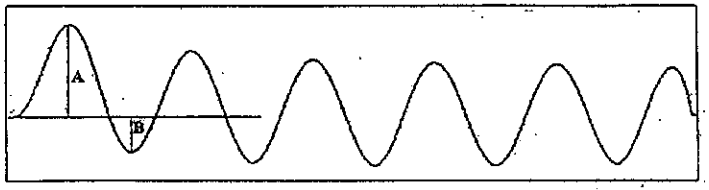
Type test according to: IEC 60947-2 Test sequence II ($I_{cs} = I_{cu}$) | Type: T1B

Standard and clause	Kind of tests and requirements			Test values Results
	VERIFICATION OF OVERLOAD RELEASES ON EACH POLE SEPARATELY			
60947-1 Table IX, X and XI	Cabling characteristics			
	Cable		70 mm²	70 mm²
	Bar		- x - mm	- x - mm
	Number		1	1
	Length		2000 mm	2000 mm
	Tightening torque			7 Nm
	Reference temperature		40 °C ± 2 °C	
	Ambient temperature			40 °C
	Correction factor		k	-
	(k = 1 for releases independent of ambient temperature)			
	Current setting value		I_n	160 A
	Test current			
	either k x 2.0 x I_n		- A	- A
8.3.5.1	Test sequence II ($I_{cs} = I_{cu}$)	before 8.3.4.1		
8.3.5.1	Test sequence III,	before 8.3.5.2		
8.3.6.1	Test sequence IV,	before 8.3.6.2		
8.3.6.6	Test sequence IV	after 8.3.6.5		
8.3.7.4	Test sequence V,	before 8.3.7.5		
8.3.8.1	Combined test sequence	before 8.3.8.2		
	or k x 2.5 x I_n		400 A	400 A
8.3.5.4	Test sequence II ($I_{cs} = I_{cu}$)	after 8.3.4.4		
8.3.5.4	Test sequence III,	after 8.3.5.3		
8.3.7.8	Test sequence V,	after 8.3.7.7		
8.3.8.7	Combined test sequence	after 8.3.8.6		
C.4	Individual pole short-circuit test sequence			
H.4	Test sequence for circuit-breakers for IT-systems			
	Tripping time (for twice the value of current setting on single pole)			
		Ph_1	≤ 190 s	48 s
		Ph_2	≤ 190 s	46 s
		Ph_3	≤ 190 s	42 s

Type test according to : IEC 60947-2 | Type: T1B

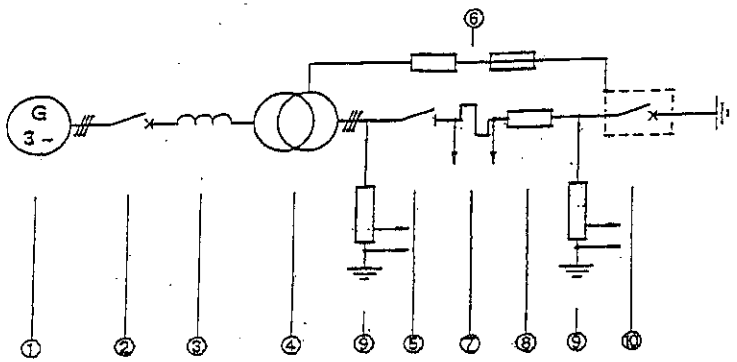
Method for determination of short-circuit power factor

The method is based on a three-phase current calibration with the maximum asymmetry on one phase. This condition is obtained by the operation of the closing device when no-load voltage wave is passing through zero value.In order to guarantee the required precision the tolerance on the closing time is ± 0.2 ms of the passing time through the zero value of this voltage.
Power factor is checked on only one phase, in according with 8.3.2.2.4 of Test instruction LOVAG LTI IEC 947-2 rev.3.
The measurement of the power factor is performed by a digital recorder associated with a computer.
The amplitude A (first positive peak) and B (first negative peak) are measured and from the formula k = [B/A] is deduced the power factor value showed in the annexed table.



Power factor	k	Power factor	k	Power factor	k	Power factor	k	Power factor	k
0	0	0,12	0,313	0,24	0,529	0,36	0,682	0,48	0,794
0,01	0,031	0,13	0,334	0,25	0,544	0,37	0,693	0,49	0,801
0,02	0,061	0,14	0,355	0,26	0,558	0,38	0,707	0,5	0,809
0,03	0,09	0,15	0,375	0,27	0,572	0,39	0,713	0,51	0,817
0,04	0,118	0,16	0,394	0,28	0,586	0,4	0,723	0,52	0,824
0,05	0,145	0,17	0,413	0,29	0,599	0,41	0,733	0,53	0,831
0,06	0,172	0,18	0,431	0,3	0,612	0,42	0,742	0,54	0,838
0,07	0,197	0,19	0,448	0,31	0,624	0,43	0,751	0,55	0,845
0,08	0,222	0,2	0,465	0,32	0,636	0,44	0,76		
0,09	0,246	0,21	0,482	0,33	0,648	0,45	0,769		
0,1	0,269	0,22	0,498	0,34	0,66	0,46	0,777		
0,11	0,292	0,23	0,514	0,35	0,674	0,47	0,785		

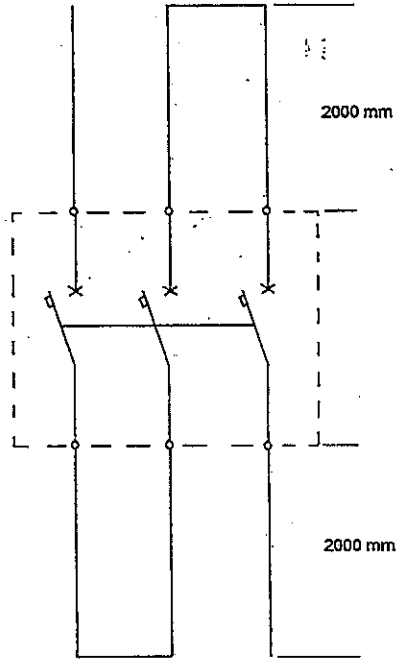
CIRCUIT DIAGRAM B



1 - Three-phase generator
2 - Back up circuit breaker
3 - Air reactors
4 - Three-phase transformer
5 - Short-circuit making switch
6 - Device for the detection of fault current
7 - Non inductive shunt for current measurement
8 - Resistors
9 - Divider for voltage measurement
10 - Apparatus under test

Testing circuit scheme

Adopted for performing the verification temperature rise and overload releases



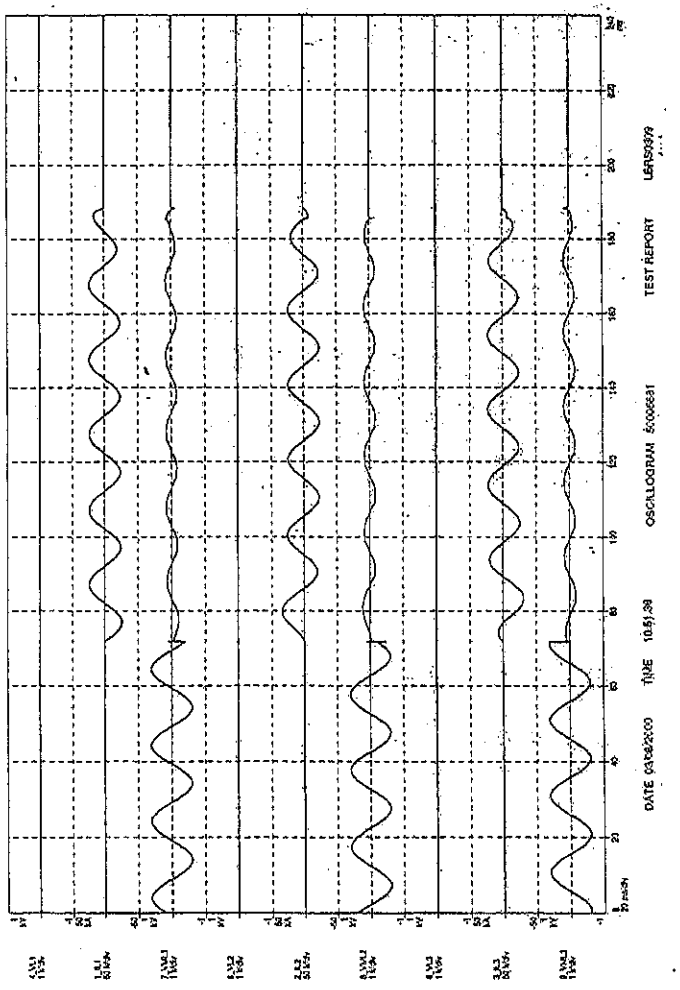
SYMBOLS USED FOR THE IDENTIFICATION OF THE MEASUREMENTS RECORDED BY THE OSCILLOGRAM

1 First phase current
2 Second phase current
3 Third phase current

4 First phase voltage measured across the pole of the circuit breaker
5 Second phase voltage measured across the pole of the circuit breaker
6 Third phase voltage measured across the pole of the circuit breaker

7 First phase voltage measured phase to phase across the closing device
8 Second phase voltage measured phase to phase across the closing device
9 Third phase voltage measured phase to phase across the closing device

11 Shunt closing release voltage



LOVAG	Test report No.: 00.291 / T 01 Page 39 / 45
Type test according to: IEC 60947-2	Type: T1B

Test laboratory: ACAE IA.01 F 947-2/73 ind 0

Authorized representative Date 00.09.18

LOVAG	Test report No.: 00.291 / T 01 Page 38 / 45
Type test according to: IEC 60947-2	Type: T1B

Test laboratory: ACAE IA.01 F 947-2/73 ind 0

Authorized representative Date 00.09.18

ВЯРНО С ОРИГИНАЛА

LOVAG	Test report No.: 00.291 / T 01 Page 41 / 45
Type test according to: IEC 60947-2	Type: T1B

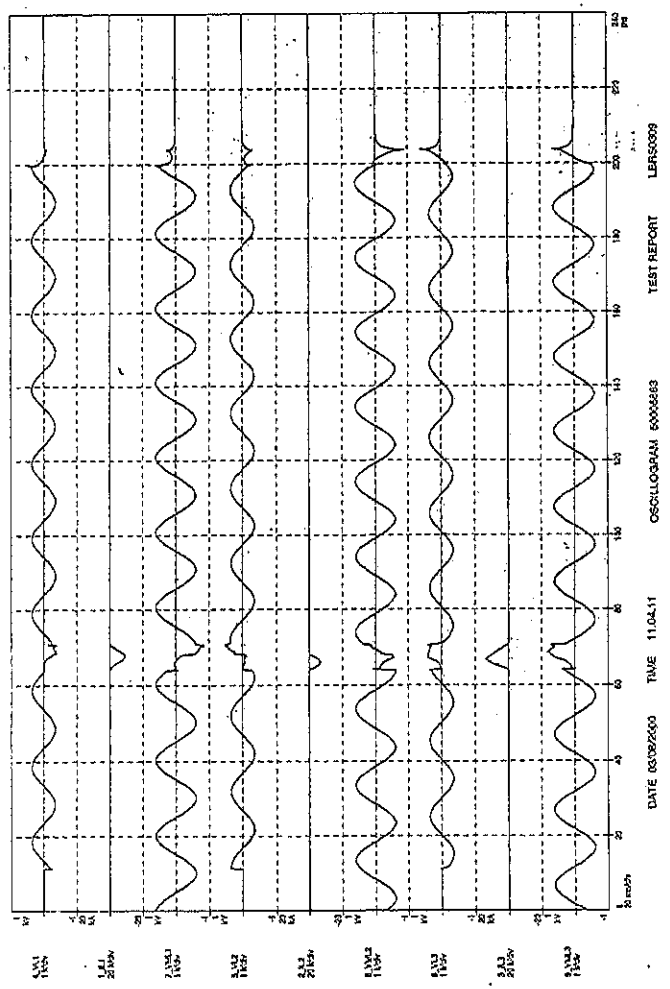
Test laboratory: AC/AE IA.01 — Authorized representative — Date 00.09.18 — F 947-2/73 ind 0

LOVAG	Test report N° : 00.291 / T 01 Page 40 / 45
Type test according to : IEC 60947-2	Type: T1B

Test laboratory: AC/AE IA.01 — Authorized representative — Date 00.09.18 — 947-2/73 ind 0

ВЯРНО С ОРИГИНАЛА

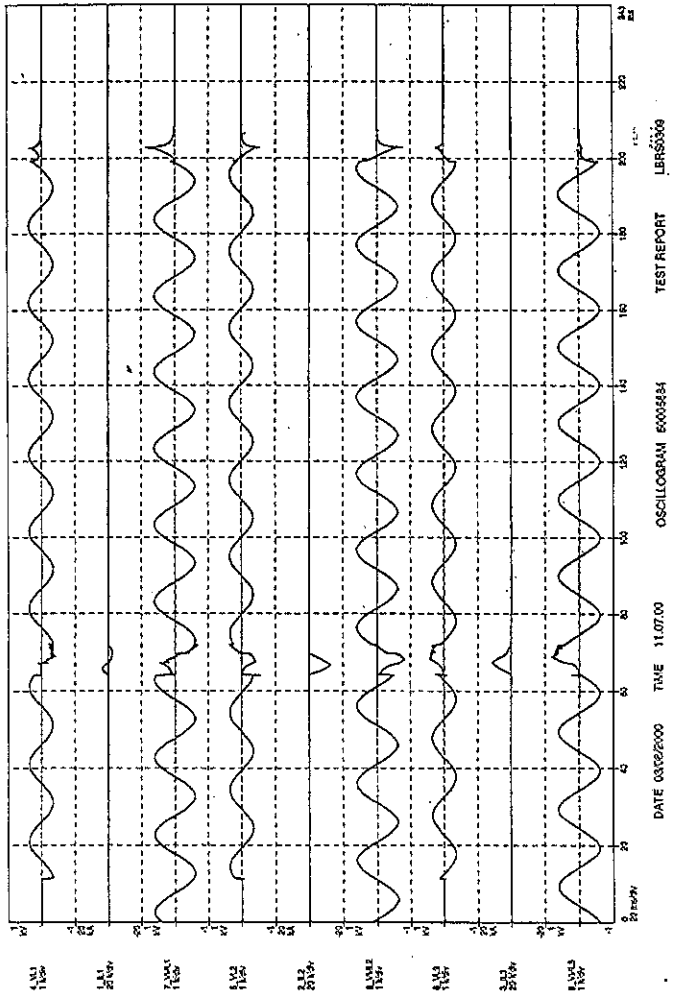
LOVAG	Test report No.: 00.291 / T 01 Page 42 / 45
Type test according to: IEC 60947-2	Type: T1B



Test laboratory: ACAE IA.01 F 947-2/73 ind 0

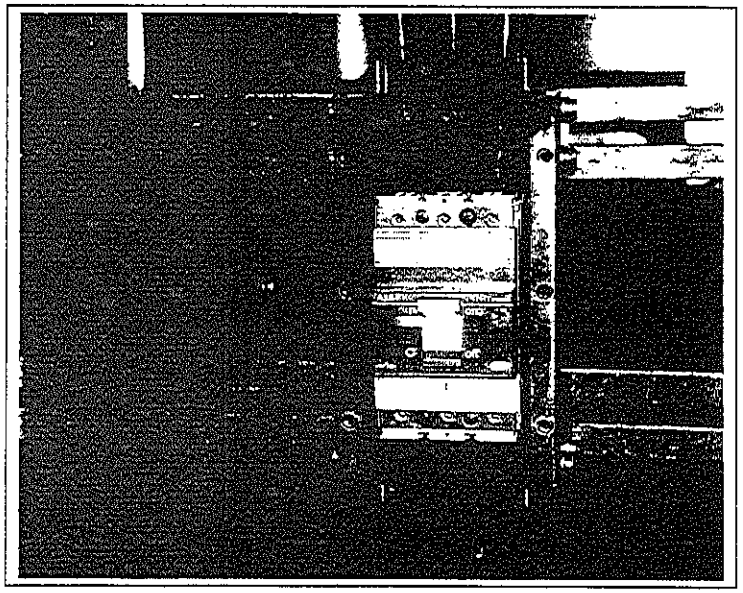
Authorized representative Date 00.09.18

LOVAG	Test report No.: 00.291 / T 01 Page 43 / 45
Type test according to: IEC 60947-2	Type: T1B



Test laboratory: ACAE IA.01 F 947-2/73 ind 0

Authorized representative Date 00.09.18



COMPLETE LIST OF DRAWINGS AN DRAWINGS
CHEKED FOR THE COMPLIANCE OF THE PRODUCT

Nr. Drawings	Denomination	Issue status
RA 0050.801-857	Standard circuit breaker assembly	99.05.19
RA 0050	Material list	99.05.19
RA 0054.801	Case assembly	99.05.19
RA 0054	Material list	99.05.19
RA 0055	Cover	99.05.19
RA 0056.801-802	Trip shaft assembly	99.05.19
RA 0056	Material list	99.05.19
RA 0082.801	Operating mechanism assembly	99.05.19
RA 0082	Material list	99.05.19
RA 0106	Arching chamber assembly	99.05.19
RA 0106	Material list	99.05.19
RA 0112.801	Fixed contact assembly	99.05.19
RA 0112	Material list	99.05.19
RA 0115	Fixed contact plate	99.05.19
RA 0116.801	Clamp assembly	99.05.19
RA 0116	Material list	99.05.19
RA 0132	Spring	99.05.19
RA 0134.801-810	Moving contact + relais assembly	99.05.19
RA 0134	Material list	99.05.19
RA 0136	Moving contact plate	99.05.19

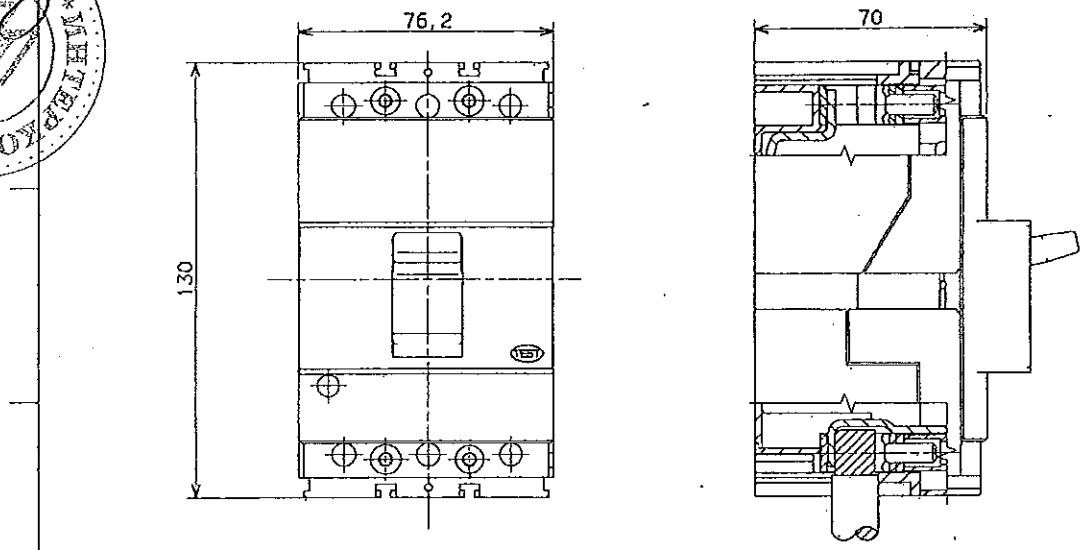


Fig.	Material / Materiale		N. Series / Serie	Finishing / Finitura
Filing Rack / Archivio	Thread quality tolerance / Tolleranza filetti qualita' "6g-6H" UNI EN41-85	General tolerance for machining / Tolleranze generali per lavorazioni meccaniche: Coord. punching N.C.mach. / Coord. punzonatrici C.N. JS 11	QUALITY FOR DIMENSIONS / QUALITA' PER QUOTE: UNI - ISO 2768 Linear angular / Lineari angolari Flatness squareness / Planarita' ortogonalita'	f m o v / h k t
Prep. / Dis. 2000-01-25 ROTA M.	Resp. dep. / Uff. Resp.		Title / Titolo: INTERRUTTORE BASE / BASIC VERSION CIRCUIT BREAKER	Lang. / Lingua
App. / App. 2000-01-25 BESANA S.	Take over dep. / Uff. Utilizz.			
Rev. / Mod. N0026 00-01-25			Apparatus / Apparecchio: T1	Scale / Scala
ABB	ABB SACE		Doc. No. / N. Doc.: RH0011.309	Sh. No. / N. Pag.

ASSOCIAZIONE PER LA CERTIFICAZIONE
DELLE APPARECCHIATURE ELETTRICHE

Via Tito Livio, 5 - 24123 - BERGAMO (Italy)
tel. +390354175244 fax. +390354534662 e-mail: acaecert@tin.it

LOVAG

Certificate
of Conformity

LOVAG-Certificate No. **IT 04.016**

Apparatus
Moulded case Three Pole Air-break Independent operation Circuit-breakers Frame size 630 A - 1000 V (U) - 50/60 Hz - with **microprocessor based overcurrent releases:**

I_n = 320 A to 630 A

Designation

T5N 630

Manufacturer or responsible vendor
ABB SACE S.p.A. - Via Baioni, 35 - 24123 Bergamo (Italy)

Tested for: ABB SACE S.p.A.
Tested by: ACAE Laboratory IA.01
The apparatus, constructed in accordance with the description mentioned in the Test Report listed on this Certificate has been subjected to the series of proving tests in accordance with IEC 60947-2 (1995), Corrigendum (1997) and IEC 60947-2:1995/A1/1997 EN 60947-2:1996 and EN 60947-2:1996/A1:1997

The results are shown in the Test Report in accordance to LOVAG. The values obtained and the general performance are considered to comply with the above Standard(s) and to justify the characteristic assigned by the manufacturer as stated below.
Utilization category A

Test sequence: II ($I_{cs} = I_{cu}$)

U_e = 440 V $I_{cs} = I_{cu}$ = 30 kA

This document includes Report No.: 03.089
Issue Date: 2004.02.24

Responsible Certification Body: ACAE

Mauro Marchi
Authorized Signature
Date: 2004.03.18

This Certificate applies only to the apparatus tested. The responsibility for conformity of any apparatus having the same designation with that tested rests with the manufacturer or responsible vendor

This certificate has been prepared according to LOVAG (Low Voltage Agreement Group) Objectives and Operating Principles of mutual recognition. The responsible certification body as member of LOVAG issues a Certificate of Conformity with the above mentioned Standard(s) following the exclusive use of LOVAG Test Instructions wherever applicable

Only integral reproduction of this Certificate or reproductions of this page accompanied by any page(s) on which are stated the tests performed and the assigned rated characteristics of the apparatus tested, are permitted without written permission from the LOVAG Signatory responsible for this Certificate

SINCERT
PRD N°070B Rev.00
Signatory of EA and IAF Mutual Recognition Agreements

ВЯРНО С ОРИГИНАЛА

65

LOVAG CERTIFICATES

LOVAG	is the Low Voltage Agreement Group which is an Agreement Group registered by EOTC the European Organisation for Conformity Assessment, Registration No. 0009. LOVAG's main purpose as an Agreement Group shall be for the mutual recognition of the test reports and/or certificates of conformity by its signatories.
Membership	LOVAG presently has five signatories to the Agreement, ACAE (Italy), ALPHA (Germany), ASEFA (France), CEBEC (Belgium) and Intertek SEMKO AB (Sweden) and employs around 40 European Testing Laboratories.
Certificates	LOVAG Certificates are issued by the signatory bodies to the Agreement using test reports and certificates in a common and recognisable format in the market. They are recognised and accepted in the European Economic Area and elsewhere in the world.
Test Instructions	LOVAG uses common LOVAG Test Instructions for each of the International and European Standards covered by the Agreement and signatories to the Agreement abide by these when testing for LOVAG Certification.
Qualifications	All signatory bodies to the Agreement are accredited and/or assessed to EN 45011 (ISO/IEC Guide 65) and their laboratories are accredited and/or assessed to EN ISO/IEC 17025.

For further information contact your local certification body from the list below or contact the Secretariat of LOVAG at: ALPHA e.V., Stresemannallee 19, D-60596 Frankfurt am Main,
Phone: +49 69 9620 6343, Fax : +49 69 96206344, e-mail: secretariat@lovag.net

LIST OF LOVAG SIGNATORIES:

ACAE
Via Tito Livio 5
I-24123 Bergamo
ITALY
Fax: +39 035 453 4662
e-mail: acaecert@tin.it

CEBEC
Avenue Van Kalken 9A Bte 1
B-1070-Brussels
BELGIUM
Fax: +32 2 556 00 36
e-mail: info@cebec.be

ALPHA e. V.
Stresemannallee 19
D-60596 Frankfurt am Main
GERMANY
Fax: +49 69 9620 6344
e-mail: office@alpha-cert.de

Intertek SEMKO AB
Box 1103, Torshamnsgatan 43
SE-164 22 Kista
SWEDEN
Fax: +46 8 750 6030
e-mail: lovag@semko.se

ASEFA
33 av du general leclerc
F-92260 Fontenay-aux-roses
France
Fax: +33 1 40 95 68 18
e-mail: asefa@lcie.fr

ВЯРНО С ОРИГИНАЛА

Test Report No. 03.089

Test laboratory:	ACAE IA.01
	I - 24123 Bergamo
Client:	ABB SACE S.p.A.
Manufacturer:	ABB SACE S.p.A.
Test object:	Low voltage moulded case c.b. series TMAX
Type designation:	T5N 630
Date(s) of test(s):	from 2003.12.05 to 2004.01.09
Test specification:	IEC 60947-2:1995, Corrigendum (1997) and IEC 60947-2:1995/A1:1997 EN 60947-2:1996 and EN 60947-2:1996/A1:1997
Test sequence(s):	II (Ics = Icu)
Test results:	Ics / Icu at 440 V found in compliance with rated characteristics

The Record of Proving Test consists of:

44 pages LOVAG test report forms	- oscillograms
- other pages	drawings nr. 1SDH000437R0.102 enclosed
- diagrams	- photographs

Date of issue: 2004.02.24

Responsible Test Laboratory
S. Manganaro

Signatures: R. Oprandi .....
(Authorized representative)

Note:
The test result relates only to the items tested.
The test report shall not be reproduced except in full without the written approval of the test laboratory.

Description and characterization of the test object

Characteristics

Type of circuit-breaker:

Number of poles	3
Kind of current	a.c.
Number of phases	3
Rated frequency	50-60 Hz
Utilization category	A
Reference temperature	40 °C
Suitability for isolation	Yes

Rated and limiting values: (according to test volume)

Main circuit:

Rated impulse withstand voltage U_{imp}	8 kV
Rated insulation voltage U_i	1000 V
Conventional thermal current I_{th} / I_{the}	630 A / -
Rated current I_n	630 A
Rated current in the neutral pole	- A

Short-circuit characteristics:

U_e/V	I_{cm}/kA	I_{cu}/kA	I_{cs}/kA	I_{cw}/kA	I_{cu}/kA	I_{rr}/kA
415	75,6	36	36	-	-	-
440	63	30	30	-	-	-
690	40	20	20	-	-	-
-	-	-	-	-	-	-
-	-	-	-	-	-	-

Releases:

- Shunt release:

- Rated control circuit voltage U_c	- V
- Kind of current	-
- Rated frequency if a.c.	- Hz

- Undervoltage or no-voltage release

- Rated control circuit voltage U_c	- V
- Kind of current	-
- Rated frequency if a.c.	- Hz

- Over-current release:

  - Short-circuit release

- instantaneous release	Yes
- definite time-delay release	-
- Rated current I_n	320 A to 630 A
- Kind of current	a.c.
- Rated frequency if a.c.	50-60 Hz
- Current setting (or range of settings)	320 A to 3200 A and 630 A to 6300 A
- Time setting (or range of settings)	- s

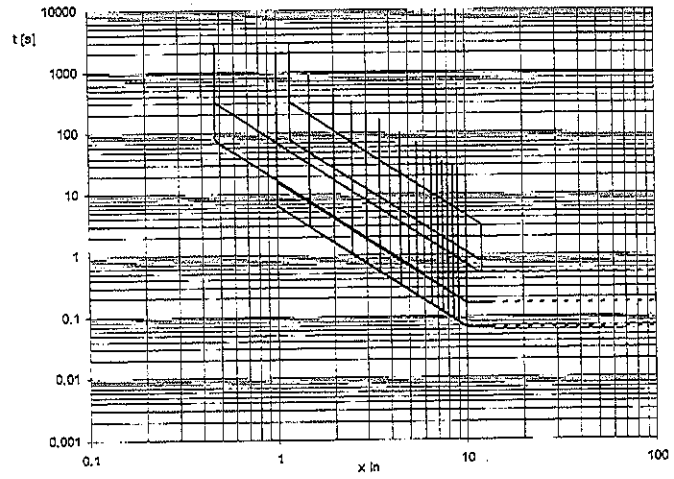
  - Overload release (IEC 60947-1; 2.4.30):

- instantaneous release	-
- definite time-delay release	-
- inverse time-delay release	R320 to R630
dependent on ambient air temperature	No
independent of ambient air temperature	Yes
- Reference temperature	40 °C
- Rated current I_n	128 A to 320 A and 252 A to 630 A
- Kind of current	a.c.
- Rated frequency if a.c.	50-60 Hz
- Current setting (or range of settings)	- A
- Time setting (or range of settings)	- s

Time / current characteristics

Type designation of ABB SACE PR221DS overcurrent release

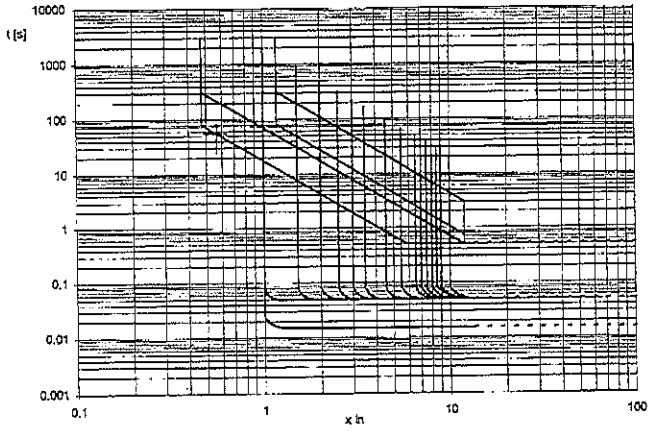
Functions L-S



Time / current characteristics

Type designation of ABB SACE PR221DS overcurrent release

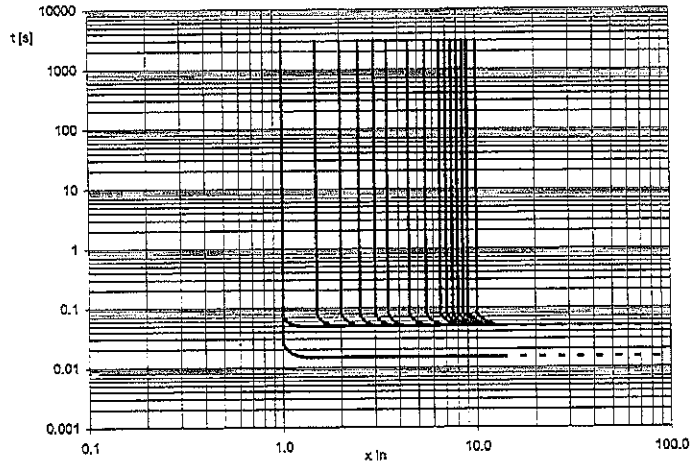
Functions L-I



Time / current characteristics

Type designation of ABB SACE PR221DS overcurrent release

Function I



Integral fused circuit-breakers:
(Co-ordination with short-circuit protective devices)

Kind of protective devices	-
- Type of fuse	-
- Maximum operational voltage	- V
- Rated current I_n	- A
- Maximum prospective short-circuit peak current	- kA

Individual enclosure:

- Type	-
- Kind of material	-
- Degree of protection	-
- Inside dimensions	-
height	- mm
width	- mm
depth	- mm

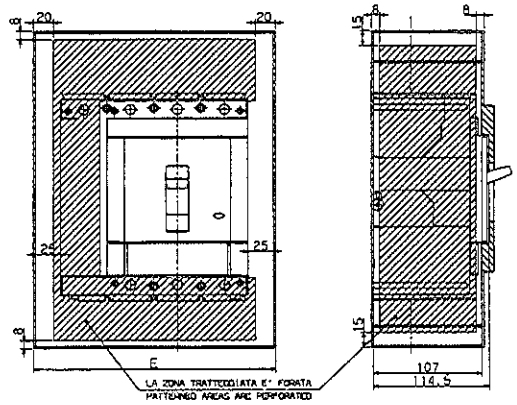
When no enclosure:

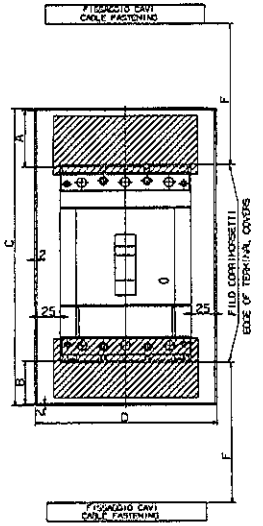
Safety perimeter defined:	
height	see page 8 / 44
width	see page 8 / 44
depth	see page 8 / 44
Kind of screen (woven wire mesh, perforated metal, expanded metal)	see page 8 / 44
Size of holes (≤ 30 mm²)	see page 8 / 44
Distance during test	see page 8 / 44

Openings around the manual operating means:

Openings in the area of the manual operating means through which the arc chamber can be reached by a music wire of 0.26 mm diameter.	none

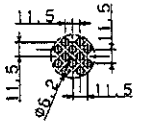
INSTALLATION INSIDE METAL SCREEN FOR SHORT-CIRCUIT TESTS





◎ Con Un=690V
Aggiungere piastra posteriore isolante a separatore di fase
◎ When Un=690V
Rear isolating barrier and phase separators should be added

INTER	TENSIONE VOLTAGE	A	B	C	D	E	F	N° DIS
T4	Un≤440V	30	25	264	159	194	50	RG0840/000
	Un>440V◎	60	45	314	159	194	50	
T4	Un≤440V	30	25	264	159	194	200	
	Un>440V◎	60	45	314	159	194	200	
T5 400A	Un≤440V	30	25	264	194	240	200	RG0840/001
	Un>440V◎	60	45	314	194	240	200	
T5 630A	Un≤440V	90	85	384	194	240	200	RG0840/500
	Un>440V◎	120	105	434	194	240	200	



QUOTE FORATURA
PERFORATION GAUGE
LAMIERA FORATA - RAPPORTO SUP. VUOTA/SUP. TOTALE=0.46
PERFORATED SHEET METAL HOLLOW-TOTAL SURFACE RATE=0.46

TEST SEQUENCE II ($I_{cs} = I_{cu}$)

Rated service short-circuit breaking capacity for circuit-breakers with $I_{cs} = I_{cu}$

Test sequence II ($I_{cs} = I_{cu}$) comprises the following tests:

Sub-clause	Test	Pageform
8.3.5.1	Verification of overload releases	46
8.3.4.1	Rated service short-circuit breaking capacity	40 - 42
8.3.4.2	Verification of operational capability	43
8.3.4.3	Verification of dielectric withstand	32
	Verification of leakage current (if applicable)	25
8.3.4.4	Verification of temperature-rise	44
8.3.4.5	Verification of overload releases	35
8.3.5.4	Verification of overload releases	46

Standard and clause	Kind of tests and requirements		Test values Results
	VERIFICATION OF OVERLOAD RELEASES ON EACH POLE SEPARATELY		
60947-1 Table 9, 10 and 11	Cabling characteristics		
	Cable	185 mm²	185 mm²
	Bar	- x - mm	- x - mm
	Number	1	1
	Length	2000 mm	2000 mm
	Tightening torque		25 Nm
	Reference temperature	40 °C ± 2 °C	
	Ambient temperature		22 °C
	Correction factor (k = 1 for releases independent of ambient temperature)	k	-
	Current setting value	I_n	128 A
	Test current		
	either k x 2.0 x I_n	256 A	256 A
8.3.5.1	Test sequence II ($I_{cs} = I_{cu}$)	before 8.3.4.1	
8.3.5.1	Test sequence III	before 8.3.5.2	
8.3.6.1	Test sequence IV	before 8.3.6.2	
8.3.6.6	Test sequence IV	after 8.3.6.5	
8.3.7.4	Test sequence V	before 8.3.7.5	
8.3.8.1	Combined test sequence	before 8.3.8.2	
A.5	Verification of discrimination	before 8.3.5.2	
A.6.3	Verification of back-up protection	before 8.3.5.2	
	or k x 2.5 x I_n	- A	- A
8.3.5.4	Test sequence II ($I_{cs} = I_{cu}$)	after 8.3.4.5	
8.3.5.4	Test sequence III	after 8.3.5.3	
8.3.7.8	Test sequence V	after 8.3.7.7	
8.3.8.7	Combined test sequence	after 8.3.8.6	
A.5	Verification of discrimination	after 8.3.5.3	
A.6.3	Verification of back-up protection	after 8.3.5.3	
C.4	Individual pole short-circuit test sequence		
H.4	Test sequence for circuit-breakers for IT-systems		
	Tripping time (for twice the value of current setting on single pole)		
	Ph_1	≤ 30 s	28 s
	Ph_2	≤ 30 s	28 s
	Ph_3	≤ 30 s	29 s

Type test according to: IEC 60947-2 Test sequence II (Ics = Icu) | Type: T5N 630

Standard and clause	Kind of tests and requirements		Test values Results
8.3.4.1 8.3.8.3	**TEST OF RATED SERVICE SHORT-CIRCUIT BREAKING CAPACITY**		
Table 4	Utilization category	A	
	Rated operational voltage U_e	440 V	
	Recovery voltage	1.05 x U_e	462 V
	Rated service short-circuit breaking capacity I_{cs}	30 kA	20 kA
	Rated ultimate short-circuit breaking capacity I_{cu}	30 kA	
Table 1	Ratio between I_{cs} and I_{cu}	I_{cs}/I_{cu} = 100 %	
Table 11	Power factor	0,25	0,25
	Frequency	50 Hz	50 Hz
8.3.2.1	Control supply voltage	0.85 x U_s - V	- V
7.2.1.1.3	Maximum value of the closing time		- ms
	Sequence of operation	O - t - CO - t - CO	O - t - CO - t - CO
	Circuit diagram		Page 33 /44
	Calibration of the test circuit	Pageform 169	Page 12 / 44
	Safety area	Pageform 6	Page 7 / 44
	Installation of the material tested	Pageform 6	Page 8 / 44
	Energization direction	Top/Bottom	Top
60947-1 Table 9, 10 and 11	Cabling characteristics		
	Cable	185 mm²	185 mm²
	Bar	- x - mm	- x - mm
	Number	1	1
	Length supply side	500 mm	500 mm
	load side	250 mm	250 mm
	Tightening torque .		25 Nm

Type test according to: IEC 60947-2 | Type: T5N 630

Standard and clause	Kind of tests and requirements		Test values Results
60947-1 8.3.4.1.5	**CALIBRATION OF THE TEST CIRCUIT (*)**		
	Oscillogram		Page 36 / 44
	Applied voltage		7462 V
	Frequency	50 Hz	50 Hz
	RMS current value	i_1	30,9 kA
	at 20 ms	i_2	31,8 kA
		i_3	31,9 kA
	Average RMS. value		31,5 kA
	Peak current maximum value		66,0 kA
	Power factor		0,25

(*) Description of the method for determination of short-circuit power factor is given at page 32 / 44

Type test according to: IEC 60947-2, Test sequence II (Ics = Icu) | Type: T5N 630

Standard and clause	Kind of tests and requirements		Test values Results
	OPERATION „O"		
	Oscillogram		Page 40 / 44
	Peak current value	I_1	17,0 kA
		I_2	18,8 kA
		I_3	25,4 kA
	Maximum total duration		6,9 ms
	Recovery voltage	$U_{r(1-2)}$ ☒ or $U_{r(1-N)}$ ☐	462 V
	(phase to phase or phase to neutral)	$U_{r(2-3)}$ ☒ or $U_{r(2-N)}$ ☐	463 V
		$U_{r(3-1)}$ ☒ or $U_{r(3-N)}$ ☐	463 V
	Average value	U_m	463 V
	Ratio between U_m and U_e	U_m/U_e	1,05
	Joule integral	Ph_1	641x10^3 A^{2}s
		Ph_2	737x10^3 A^{2}s
		Ph_3	1810x10^3 A^{2}s
	Melting of the fusible element	Yes/No	No
	Holes in the PE-sheet (if applicable)	Yes/No	No
	Cracks observed	Yes/No	No
	if Yes		Page - / -
	Time interval between operations	3 min	3 min
	OPERATION „CO"		
	Oscillogram		Page 41 / 44
	Applied voltage		463 V
	Peak current value	I_1	11,5 kA
		I_2	27,0 kA
		I_3	20,6 kA
	Maximum total duration		8,0 ms
	Recovery voltage	$U_{r(1-2)}$ ☒ or $U_{r(1-N)}$ ☐	463 V
	(phase to phase or phase to neutral)	$U_{r(2-3)}$ ☒ or $U_{r(2-N)}$ ☐	464 V
		$U_{r(3-1)}$ ☒ or $U_{r(3-N)}$ ☐	462 V
	Average value	U_m	463 V
	Ratio between U_m and U_e	U_m/U_e	1,05
	Joule integral	Ph_1	476x10^3 A^{2}s
		Ph_2	1710x10^3 A^{2}s
		Ph_3	1310x10^3 A^{2}s
7.2.1.1.3	Closing operation time		- ms
	Melting of the fusible element	Yes/No	No
	Cracks observed	Yes/No	No
	if Yes		Page - / -

Type test according to: IEC 60947-2, Test sequence II (Ics = Icu) | Type: T5N 630

Standard and clause	Kind of tests and requirements		Test values Results
	Time interval between operations	3 min	3 min
	OPERATION „CO"		
	Oscillogram		Page 42 / 44
	Applied voltage		462 V
	Peak current value	I_1	25,5 kA
		I_2	17,3 kA
		I_3	14,7 kA
	Maximum total duration		9,3 ms
	Recovery voltage	$U_{r(1-2)}$ ☒ or $U_{r(1-N)}$ ☐	464 V
	(phase to phase or phase to neutral)	$U_{r(2-3)}$ ☒ or $U_{r(2-N)}$ ☐	462 V
		$U_{r(3-1)}$ ☒ or $U_{r(3-N)}$ ☐	462 V
	Average value	U_m	463 V
	Ratio between U_m and U_e	U_m/U_e	1,05
	Joule integral	Ph_1	1720x10^3 A^{2}s
		Ph_2	996x10^3 A^{2}s
		Ph_3	642x10^3 A^{2}s
7.2.1.1.3	Closing operation time		- ms
	Melting of the fusible element	Yes/No	No
	Cracks observed	Yes/No	No
	if Yes		Page - / -

Standard and clause	Kind of tests and requirements		Test values Results
8.3.4.2	**VERIFICATION OF OPERATIONAL CAPABILITY**		
	Short-circuit release	min. setting	- A
8.3.8.4	Overload release	max. setting	- A
	Circuit diagram		Page -
	Rated operational voltage U_e	- V	- V
	(Same rated operational voltage as used for the test of the rated service short-circuit breaking capacity)		
	Rated current I_n	- A	- A
Table 11	Power factor	-	-
	Time constant	- ms	- ms
	Frequency	- Hz	- Hz
Table 8	Operating cycles per hour	- /h	- /h
	On-time		- ms
	Number of operating cycles	-	-
	(5 % of the number of operations given in column 4 of table 8)		
			Note : Test not carried out (see clause 8.3.4.2 Amendment 2)

Standard and clause	Kind of tests and requirements		Test values Results
	VERIFICATION OF DIELECTRIC WITHSTAND		
	Test voltage		
	2 x U_e, min. 1000 V	1000 V	1000 V
8.3.3.5	Test sequence I		
8.3.4.3	Test sequence II		
8.3.5.3	Test sequence III		
8.3.6.5	Test sequence IV		
8.3.7.3	Test sequence V, stage 1		
8.3.7.7	Test sequence V, stage 2		
8.3.8.5	Combined test sequence		
B.10.3.1	Test sequence B.II		
A.5	Verification of discrimination		
A.6.3	Verification of back-up protection		
C.3	individual pole short-circuit test sequence		
H.3	Test sequence for circuit-breakers for IT-systems		
8.3.3.2.2 a)	Application of the test voltage -Main circuit of the circuit-breaker -Isolating contacts of the withdrawable unit (if applicable)		
	Test duration	1 min	1 min

Standard and clause	Kind of tests and requirements		Test values Results
	VERIFICATION OF LEAKAGE CURRENT		
	For circuit-breakers suitable for isolation having an operational voltage U_e greater than 50 V.		
8.3.3.2	**- Main circuit of the circuit-breaker** **- Isolating contacts of a withdrawable unit (if applicable)**		
	Test voltage	1.1 x U_e 440 V	484 V
60947-1 7.2.7	Application of the test voltage		
	Leakage current		
8.3.3.2	Test sequence I (in new condition)	≤ 0.5 mA	- mA
8.3.3.5	Test sequence I (after overload performance)	≤ 2 mA	- mA
8.3.4.3	Test sequence II	≤ 2 mA	< 2 mA
8.3.5.3	Test sequence III	≤ 6 mA	- mA
8.3.6.5	Test sequence IV	≤ 2 mA	- mA
8.3.7.3	Test sequence V, stage 1	≤ 2 mA	- mA
8.3.7.7	Test sequence V, stage 2	≤ 6 mA	- mA
8.3.8.5	Combined test sequence	≤ 2 mA	- mA
C.3	Individual pole short-circuit test sequence I_{su}	≤ 6 mA	- mA
H.3	Individual pole short-circuit test sequence I_{IT}	≤ 6 mA	- mA

Standard and clause	Kind of tests and requirements		Test values Results
8.3.4.4 8.3.6.3 8.3.7.2 8.3.8.6	**VERIFICATION OF TEMPERATURE-RISE ONLY FOR TERMINALS**		
8.3.2.5	**Temperature-rise test**		
60947-1 8.3.3.3.1	Ambient temperature	10...40 °C	- °C
	Main circuits		
60947-1	Conventional thermal current I_{th}	- A	- A
8.3.3.3.4	Conventional thermal current for enclosure I_{the}	- A	- A
	Conventional thermal current for the neutral pole	- A	- A
60947-1 Table 9, 10 and 11	Cabling characteristics		
	Phase poles		
	Cable	- mm^2	- mm^2
	Bar	- x - mm	- x - mm
	Number	-	-
	Length	- mm	- mm
	Tightening torque		- Nm
	Neutral pole (if applicable)		
	Cable	- mm^2	- mm^2
	Bar	- x - mm	- x - mm
	Number	-	-
	Length	- mm	- mm
	Tightening torque		- Nm
	Arrangement:	3 phase ☐ or poles in series ☐	
Table 7	Temperature-rise limits		
	Terminals	≤ - K	- K
			Note : Test not carried out (see table X)

Standard and clause	Kind of tests and requirements		Test values Results
	VERIFICATION OF OVERLOAD RELEASES		
60947-1	Cabling characteristics		
Table 9, 10	Cable	185 mm²	185 mm²
and 11	Bar	- x - mm	- x - mm
	Number	1	1
	Length	2000 mm	2000 mm
	Tightening torque		25 Nm
	Arrangement: 3 phase ☐ or poles in series ☒		
	Reference temperature	40 °C ± 2 °C	
	Ambient temperature		40 °C
	Correction factor k		-
	(k = 1 for releases independent of ambient temperature)		
	Current setting value	128 A	128 A
	Test current		
	k x 1.45 x current setting value	185,6 A	185,6 A
8.3.3.7	Test sequence I	after 8.3.3.6	
8.3.4.5	Test sequence II	after 8.3.4.4	
8.3.8.7	Combined test sequence	after 8.3.8.6	
Table 6	Tripping time	≤ 60 min	1 min

Standard and clause	Kind of tests and requirements			Test values Results
	VERIFICATION OF OVERLOAD RELEASES ON EACH POLE SEPARATELY			
60947-1	Cabling characteristics			
Table 9, 10	Cable		185 mm²	185 mm²
and 11	Bar		- x - mm	- x - mm
	Number		1	1
	Length		2000 mm	2000 mm
	Tightening torque			25 Nm
	Reference temperature		40 °C ± 2 °C	
	Ambient temperature			22 °C
	Correction factor (k = 1 for releases independent of ambient temperature) k			-
	Current setting value		I_n	128 A
	Test current			
	either k x 2.0 x I_n		- A	- A
8.3.5.1	Test sequence II (I_{cs} = I_{cu})	before 8.3.4.1		
8.3.5.1	Test sequence III	before 8.3.5.2		
8.3.6.1	Test sequence IV	before 8.3.6.2		
8.3.6.6	Test sequence IV	after 8.3.6.5		
8.3.7.4	Test sequence V	before 8.3.7.5		
8.3.8.1	Combined test sequence	before 8.3.8.2		
A.5	Verification of discrimination	before 8.3.5.2		
A.6.3	Verification of back-up protection	before 8.3.5.2		
	or k x 2.5 x I_n		320 A	320 A
8.3.5.4	Test sequence II (I_{cs} = I_{cu})	after 8.3.4.5		
8.3.5.4	Test sequence III	after 8.3.5.3		
8.3.7.8	Test sequence V	after 8.3.7.7		
8.3.8.7	Combined test sequence	after 8.3.8.6		
A.5	Verification of discrimination	after 8.3.5.3		
A.6.3	Verification of back-up protection	after 8.3.5.3		
C.4	Individual pole short-circuit test sequence			
H.4	Test sequence for circuit-breakers for IT-systems			
	Tripping time (for twice the value of current setting on single pole)			
		Ph_1	≤ 30 s	19 s
		Ph_2	≤ 30 s	18 s
		Ph_3	≤ 30 s	18 s

Type test according to: IEC 60947-2 Test sequence II (Ics = Icu) | Type: T5N 630

Standard and clause	Kind of tests and requirements			Test values Results
	VERIFICATION OF OVERLOAD RELEASES ON EACH POLE SEPARATELY			
60947-1 Table 9, 10 and 11	Cabling characteristics			
	Cable		185 mm²	185 mm²
	Bar		- x - mm	- x - mm
	Number		2	2
	Length		2000 mm	2000 mm
	Tightening torque			25 Nm
	Reference temperature		40 °C ± 2 °C	
	Ambient temperature			22 °C
	Correction factor (k = 1 for releases independent of ambient temperature)		k	-
	Current setting value		I_n	630 A
	Test current			
	either k x 2.0 x I_n		1260 A	1260 A
8.3.5.1	Test sequence II (I_{cs} = I_{cu})	before 8.3.4.1		
8.3.5.1	Test sequence III	before 8.3.5.2		
8.3.6.1	Test sequence IV	before 8.3.6.2		
8.3.6.6	Test sequence IV	after 8.3.6.5		
8.3.7.4	Test sequence V	before 8.3.7.5		
8.3.8.1	Combined test sequence	before 8.3.8.2		
A.5	Verification of discrimination	before 8.3.5.2		
A.6.3	Verification of back-up protection	before 8.3.5.2		
	or k x 2.5 x I_n		- A	- A
8.3.5.4	Test sequence II (I_{cs} = I_{cu})	after 8.3.4.5		
8.3.5.4	Test sequence III	after 8.3.5.3		
8.3.7.8	Test sequence V	after 8.3.7.7		
8.3.8.7	Combined test sequence	after 8.3.8.6		
A.5	Verification of discrimination	after 8.3.5.3		
A.6.3	Verification of back-up protection	after 8.3.5.3		
C.4	Individual pole short-circuit test sequence			
H.4	Test sequence for circuit-breakers for IT-systems			
	Tripping time (for twice the value of current setting on single pole)			
		Ph_1	≤ 118 s	108 s
		Ph_2	≤ 118 s	108 s
		Ph_3	≤ 118 s	107 s

Test laboratory: ACAE IA.01 | TRF IEC/EN 60947-2 Ed. 2.1 form 46

Authorized representative | Date 04.02.24

Type test according to: IEC 60947-2 Test sequence II (Ics = Icu) | Type: T5N 630

Standard and clause	Kind of tests and requirements			Test values Results
8.3.4.1 8.3.8.3	**TEST OF RATED SERVICE SHORT-CIRCUIT BREAKING CAPACITY**			
Table 4	Utilization category		A	
	Rated operational voltage U_e		440 V	
	Recovery voltage		1.05 x U_e	462 V
	Rated service short-circuit breaking capacity I_{cs}		30 kA	30 kA
	Rated ultimate short-circuit breaking capacity I_{cu}		30 kA	
Table 1	Ratio between I_{cs} and I_{cu}		I_{cs}/I_{cu} = 100 %	
Table 11	Power factor		0,25	0,25
	Frequency		50 Hz	50 Hz
8.3.2.1	Control supply voltage		0.85 x U_s - V	- V
7.2.1.1.3	Maximum value of the closing time			- ms
	Sequence of operation		O - t - CO - t - CO	O - t - CO - t - CO
	Circuit diagram			Page 33 / 44
	Calibration of the test circuit		Pageform 169	Page 23 / 44
	Safety area		Pageform 6	Page 7 / 44
	Installation of the material tested		Pageform 6	Page 8 / 44
	Energization direction		Top/Bottom	Bottom
60947-1 Table 9, 10 and 11	Cabling characteristics			
	Cable		185 mm²	185 mm²
	Bar		- x - mm	- x - mm
	Number		2	2
	Length	supply side	500 mm	500 mm
		load side	250 mm	250 mm
	Tightening torque			25 Nm

Test laboratory: ACAE IA.01 | TRF IEC/EN 60947-2 Ed. 2.1 form 46

Authorized representative | Date 04.02.24

Standard and clause	Kind of tests and requirements		Test values Results
60947-1 8.3.4.1.5	CALIBRATION OF THE TEST CIRCUIT (*)		
	Oscillogram		Page 36 / 44
	Applied voltage		462 V
	Frequency	50 Hz	50 Hz
	RMS current value	i_1	30,9 kA
	at 20 ms	i_2	31,8 kA
		i_3	31,9 kA
	Average RMS value		31,5 kA
	Peak current maximum value		66,0 kA
	Power factor		0,25

(*) Description of the method for determination of short-circuit power factor is given at page 32 / 44

Standard and clause	Kind of tests and requirements		Test values Results
	OPERATION „O"		
	Oscillogram		Page 37 / 44
	Peak current value	i_1	14,6 kA
		i_2	21,6 kA
		i_3	24,4 kA
	Maximum total duration		7,4 ms
	Recovery voltage	$U_{r(1-2)}$ ☒ or $U_{r(1-N)}$ ☐	463 V
	(phase to phase or phase to neutral)	$U_{r(2-3)}$ ☒ or $U_{r(2-N)}$ ☐	462 V
		$U_{r(3-1)}$ ☒ or $U_{r(3-N)}$ ☐	462 V
	Average value	U_m	463 V
	Ratio between U_m and U_e	U_m/U_e	1,05
	Joule integral	Ph_1	$453x10^3$ A^2s
		Ph_2	$1030x10^3$ A^2s
		Ph_3	$1690x10^3$ A^2s
	Melting of the fusible element	Yes/No	No
	Holes in the PE-sheet (if applicable)	Yes/No	No
	Cracks observed	Yes/No	No
	if Yes		Page - / -
	Time interval between operations	3 min	3 min
	OPERATION „CO"		
	Oscillogram		Page 38 / 44
	Applied voltage		463 V
	Peak current value	i_1	21,9 kA
		i_2	23,9 kA
		i_3	14,0 kA
	Maximum total duration		7,6 ms
	Recovery voltage	$U_{r(1-2)}$ ☒ or $U_{r(1-N)}$ ☐	463 V
	(phase to phase or phase to neutral)	$U_{r(2-3)}$ ☒ or $U_{r(2-N)}$ ☐	462 V
		$U_{r(3-1)}$ ☒ or $U_{r(3-N)}$ ☐	463 V
	Average value	U_m	463 V
	Ratio between U_m and U_e	U_m/U_e	1,05
	Joule integral	Ph_1	$1060x10^3$ A^2s
		Ph_2	$1640x10^3$ A^2s
		Ph_3	$474x10^3$ A^2s
7.2.1.1.3	Closing operation time		- ms
	Melting of the fusible element	Yes/No	No
	Cracks observed	Yes/No	No
	if Yes		Page - / -

Standard and clause	Kind of tests and requirements		Test values Results
	Time interval between operations	3 min	3 min
	OPERATION „CO"		
	Oscillogram		Page 39 / 44
	Applied voltage		462 V
	Peak current value	I_1	22,8 kA
		I_2	22,1 kA
		I_3	12,2 kA
	Maximum total duration		7,7 ms
	Recovery voltage	$U_{r(1-2)}$ ☒ or $U_{r(1-N)}$ ☐	463 V
	(phase to phase or phase to neutral)	$U_{r(2-3)}$ ☒ or $U_{r(2-N)}$ ☐	464 V
		$U_{r(3-1)}$ ☒ or $U_{r(3-N)}$ ☐	462 V
	Average value	U_{rm}	463 V
	Ratio between U_{rm} and U_e	U_{rm}/U_e	1,05
	Joule integral	Ph_1	$1200x10^3$ A^2s
		Ph_2	$1390x10^3$ A^2s
		Ph_3	$335x10^3$ A^2s
7.2.1.1.3	Closing operation time		- ms
	Melting of the fusible element	Yes/No	No
	Cracks observed	Yes/No	No
	if Yes		Page - / -

Standard and clause	Kind of tests and requirements		Test values Results
8.3.4.2	VERIFICATION OF OPERATIONAL CAPABILITY		
	Short-circuit release	min. setting	630 A
8.3.8.4	Overload release	max. setting	630 A
	Circuit diagram		Page 34 / 44
	Rated operational voltage U_e (Same rated operational voltage as used for the test of the rated service short-circuit breaking capacity)	440 V	440 V
	Rated current I_n	630 A	648 A
Table 11	Power factor	0,80	0,77
	Time constant	- ms	- ms
	Frequency	50 Hz	50 Hz
Table 8	Operating cycles per hour	60 /h	60 /h
	On-time		145 ms
	Number of operating cycles (5 % of the number of operations given in column 4 of table 8)	50	50

Standard and clause	Kind of tests and requirements		Test values Results
	VERIFICATION OF DIELECTRIC WITHSTAND		
	Test voltage		
	2 x U_e, min. 1000 V	1000 V	1000 V
8.3.3.5	Test sequence I		
8.3.4.3	Test sequence II		
8.3.5.3	Test sequence III		
8.3.6.5	Test sequence IV		
8.3.7.3	Test sequence V, stage 1		
8.3.7.7	Test sequence V, stage 2		
8.3.8.5	Combined test sequence		
B.10.3.1	Test sequence B.II		
A.5	Verification of discrimination		
A.6.3	Verification of back-up protection		
C.3	Individual pole short-circuit test sequence		
H.3	Test sequence for circuit-breakers for IT-systems		
8.3.3.2.2 a)	Application of the test voltage -Main circuit of the circuit-breaker -Isolating contacts of the withdrawable unit (if applicable)		
	Test duration	1 min	1 min

Standard and clause	Kind of tests and requirements		Test values Results
	VERIFICATION OF LEAKAGE CURRENT **For circuit-breakers suitable for isolation having an operational voltage U_e greater than 50 V.**		
8.3.3.2	**- Main circuit of the circuit-breaker** **- Isolating contacts of a withdrawable unit (if applicable)**		
	Test voltage	1.1 x U_e 440 V	484 V
60947-1 7.2.7	Application of the test voltage		
	Leakage current		
8.3.3.2	Test sequence I (in new condition)	≤ 0.5 mA	- mA
8.3.3.5	Test sequence I (after overload performance)	≤ 2 mA	- mA
8.3.4.3	Test sequence II	≤ 2 mA	< 2 mA
8.3.5.3	Test sequence III	≤ 6 mA	- mA
8.3.6.5	Test sequence IV	≤ 2 mA	- mA
8.3.7.3	Test sequence V, stage 1	≤ 2 mA	- mA
8.3.7.7	Test sequence V, stage 2	≤ 6 mA	- mA
8.3.8.5	Combined test sequence	≤ 2 mA	- mA
C.3	Individual pole short-circuit test sequence I_{eu}	≤ 6 mA	- mA
H.3	Individual pole short-circuit test sequence I_{IT}	≤ 6 mA	- mA

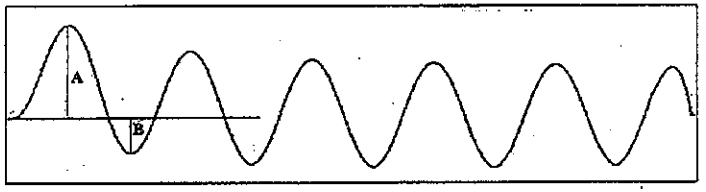
Standard and clause	Kind of tests and requirements		Test values Results
8.3.4.4 8.3.6.3 8.3.7.2 8.3.8.6	VERIFICATION OF TEMPERATURE-RISE ONLY FOR TERMINALS		
8.3.2.5	**Temperature-rise test**		
60947-1 8.3.3.3.1	Ambient temperature	10...40 °C	40 °C
	Main circuits		
60947-1 8.3.3.3.4	Conventional thermal current I_{th} Conventional thermal current for enclosure I_{the} Conventional thermal current for the neutral pole	630 A - A - A	630 A - A - A
60947-1 Table 9, 10 and 11	Cabling characteristics Phase poles Cable Bar Number Length Tightening torque Neutral pole (if applicable) Cable Bar Number Length Tightening torque Arrangement: 3 phase ☐ or poles in series ☒	 185 mm² - x - mm 2 2000 mm - mm² - x - mm - - mm 	 185 mm² - x - mm 2 2000 mm 25 Nm - mm² - x - mm - - mm - Nm
Table 7	Temperature-rise limits Terminals	 ≤ 80 K	 77 K

Standard and clause	Kind of tests and requirements		Test values Results
	VERIFICATION OF OVERLOAD RELEASES		
60947-1 Table 9, 10 and 11	Cabling characteristics Cable Bar Number Length Tightening torque Arrangement: 3 phase ☐ or poles in series ☒	 185 mm² - x - mm 2 2000 mm 	 185 mm² - x - mm 2 2000 mm 25 Nm
	Reference temperature Ambient temperature Correction factor k (k = 1 for releases independent of ambient temperature) Current setting value	40 °C ± 2 °C 630 A	 40 °C - 630 A
	Test current k x 1.45 x current setting value	913,5 A	913,5 A
8.3.3.7 8.3.4.5 8.3.8.7	Test sequence I Test sequence II Combined test sequence	after 8.3.3.6 after 8.3.4.4 after 8.3.8.6	
Table 6	Tripping time	≤ 120 min	4 min

Standard and clause	Kind of tests and requirements			Test values Results
	VERIFICATION OF OVERLOAD RELEASES ON EACH POLE SEPARATELY			
60947-1 Table 9, 10 and 11	Cabling characteristics			
	Cable		185 mm²	185 mm²
	Bar		- x - mm	- x - mm
	Number		2	2
	Length		2000 mm	2000 mm
	Tightening torque			25 Nm
	Reference temperature		40 °C ± 2 °C	
	Ambient temperature			26 °C
	Correction factor (k = 1 for releases independent of ambient temperature)		k	-
	Current setting value		I_n	630 A
	Test current			
	either k x 2,0 x I_n		- A	- A
8.3.5.1	Test sequence II ($I_{cs} = I_{cu}$)	before 8.3.4.1		
8.3.5.1	Test sequence III	before 8.3.5.2		
8.3.6.1	Test sequence IV	before 8.3.6.2		
8.3.6.6	Test sequence IV	after 8.3.6.5		
8.3.7.4	Test sequence V	before 8.3.7.5		
8.3.8.1	Combined test sequence	before 8.3.8.2		
A.5	Verification of discrimination	before 8.3.5.2		
A.6.3	Verification of back-up protection	before 8.3.5.2		
	or k x 2,5 x I_n		1575 A	1575 A
8.3.5.4	Test sequence II ($I_{cs} = I_{cu}$)	after 8.3.4.5		
8.3.5.4	Test sequence III	after 8.3.5.3		
8.3.7.8	Test sequence V	after 8.3.7.7		
8.3.8.7	Combined test sequence	after 8.3.8.6		
A.5	Verification of discrimination	after 8.3.5.3		
A.6.3	Verification of back-up protection	after 8.3.5.3		
C.4	Individual pole short-circuit test sequence			
H.4	Test sequence for circuit-breakers for IT-systems			
	Tripping time (for twice the value of current setting on single pole)			
		Ph_1	≤ 118 s	64 s
		Ph_2	≤ 118 s	67 s
		Ph_3	≤ 118 s	67 s

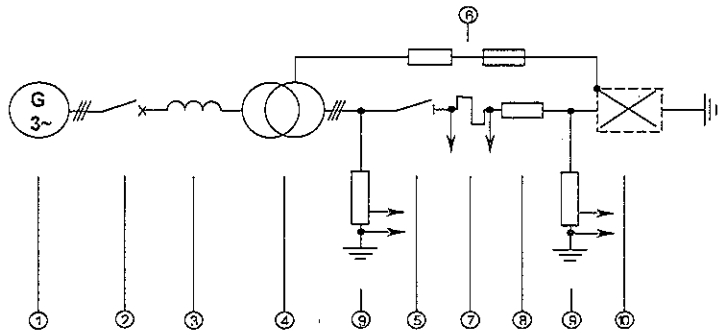
Method for determination of short-circuit power factor

The method is based on a three-phase current calibration with the maximum asymmetry on one phase. This condition is obtained by the operation of the closing device when no-load voltage wave is passing through zero value.In order to guarantee the required precision the tolerance on the closing time is ± 0,2 ms of the passing time through the zero value of this voltage.
Power factor is checked on only one phase, in according with 8.3.2.2.4 of Test Instruction LOVAG LTI IEC 947-2 rev.3.
The measurement of the power factor is performed by a digital recorder associated with a computer.
The amplitude A (first positive peak) and B (first negative peak) are measured and from the formula k = [B/A] is deduced the power factor value showed in the annexed table.



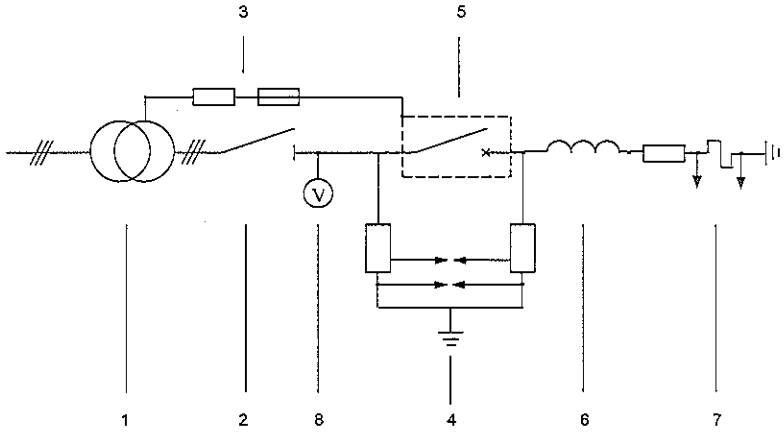
Power factor	k	Power factor	k	Power factor	k	Power factor	k	Power factor	k
0	0	0,12	0,313	0,24	0,529	0,36	0,682	0,48	0,794
0,01	0,031	0,13	0,334	0,25	0,544	0,37	0,693	0,49	0,801
0,02	0,061	0,14	0,355	0,26	0,558	0,38	0,707	0,5	0,809
0,03	0,09	0,15	0,375	0,27	0,572	0,39	0,713	0,51	0,817
0,04	0,118	0,16	0,394	0,28	0,586	0,4	0,723	0,52	0,824
0,05	0,145	0,17	0,413	0,29	0,599	0,41	0,733	0,53	0,831
0,06	0,172	0,18	0,431	0,3	0,612	0,42	0,742	0,54	0,838
0,07	0,197	0,19	0,448	0,31	0,624	0,43	0,751	0,55	0,845
0,08	0,222	0,2	0,465	0,32	0,636	0,44	0,76		
0,09	0,246	0,21	0,482	0,33	0,648	0,45	0,769		
0,1	0,269	0,22	0,498	0,34	0,66	0,46	0,777		
0,11	0,292	0,23	0,514	0,35	0,674	0,47	0,785		

CIRCUIT DIAGRAM TYPE A



1 - Three-phase generator
2 - Back-up circuit breaker
3 - Air reactors
4 - Three-phase transformer
5 - Short-circuit making switch
6 - Device for the detection of fault current
7 - Non inductive shunts for current measurement
8 - Resistors
9 - Dividers for voltage measurement
10 - Apparatus under test

CIRCUIT DIAGRAM TYPE S



1 - Three-phase transformer
2 - Short-circuit making switch
3 - Device for the detection of fault currents
4 - Dividers for the arcing voltage measurement
5 - Apparatus under test
6 - Load (reactors and resistances)
7 - Non inductive shunts for current measurement
8 Voltmeter for voltage measurement

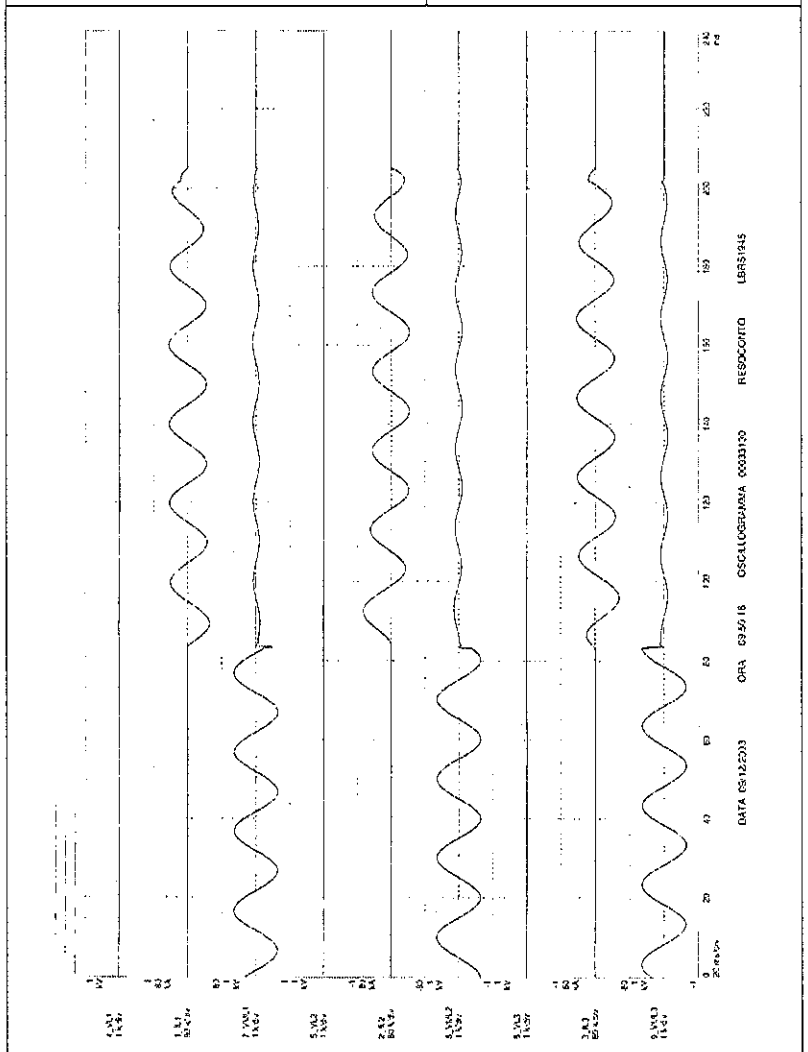
SYMBOLS USED FOR THE IDENTIFICATION OF THE MEASUREMENTS RECORDED BY THE OSCILLOGRAM

1 First phase current
2 Second phase current
3 Third phase current

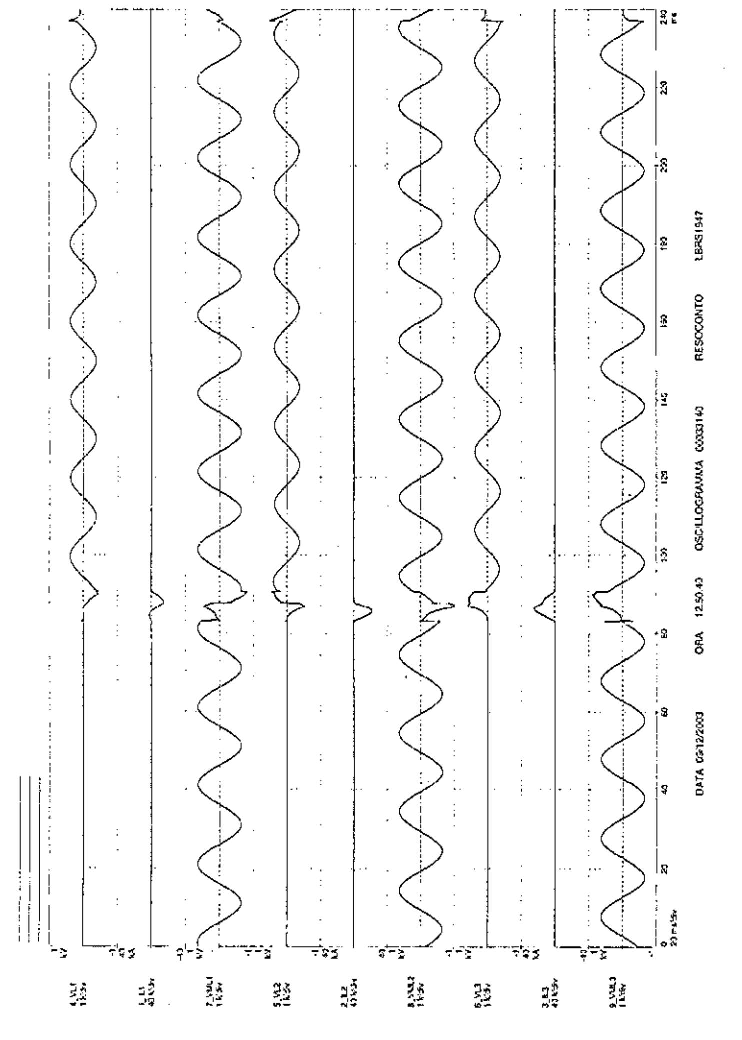
4 First phase voltage measured across the pole of the circuit breaker
5 Second phase voltage measured across the pole of the circuit breaker
6 Third phase voltage measured across the pole of the circuit breaker

7 First phase voltage measured phase to phase across the closing device
8 Second phase voltage measured phase to phase across the closing device
9 Third phase voltage measured phase to phase across the closing device

11 Shunt closing release voltage



LOVAG	Test report No.: 03.089 Page 37 / 44
Type test according to: IEC 60947-2	Type: T5N 630



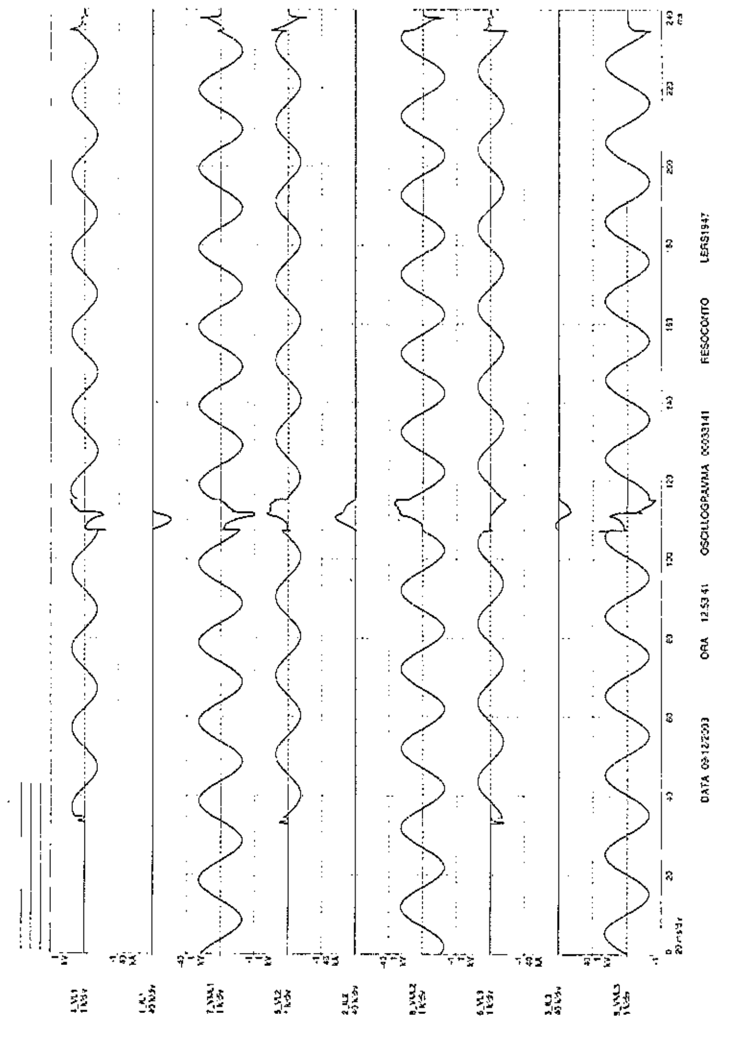
Test laboratory: ACAE IA.01

Authorized representative

Date 04.02.24

TRF IEC/EN 60947-2
Ed. 2.1 form 170

LOVAG	Test report No.: 03.089 Page 38 / 44
Type test according to: IEC 60947-2	Type: T5N 630



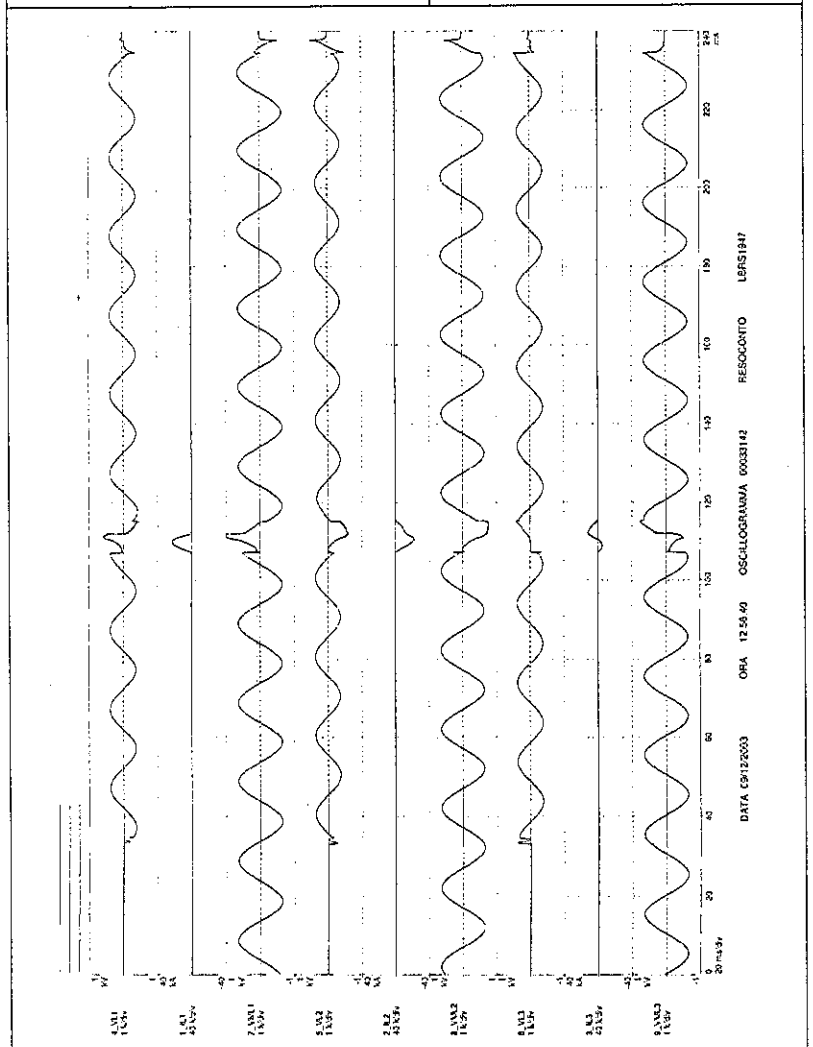
Test laboratory: ACAE IA.01

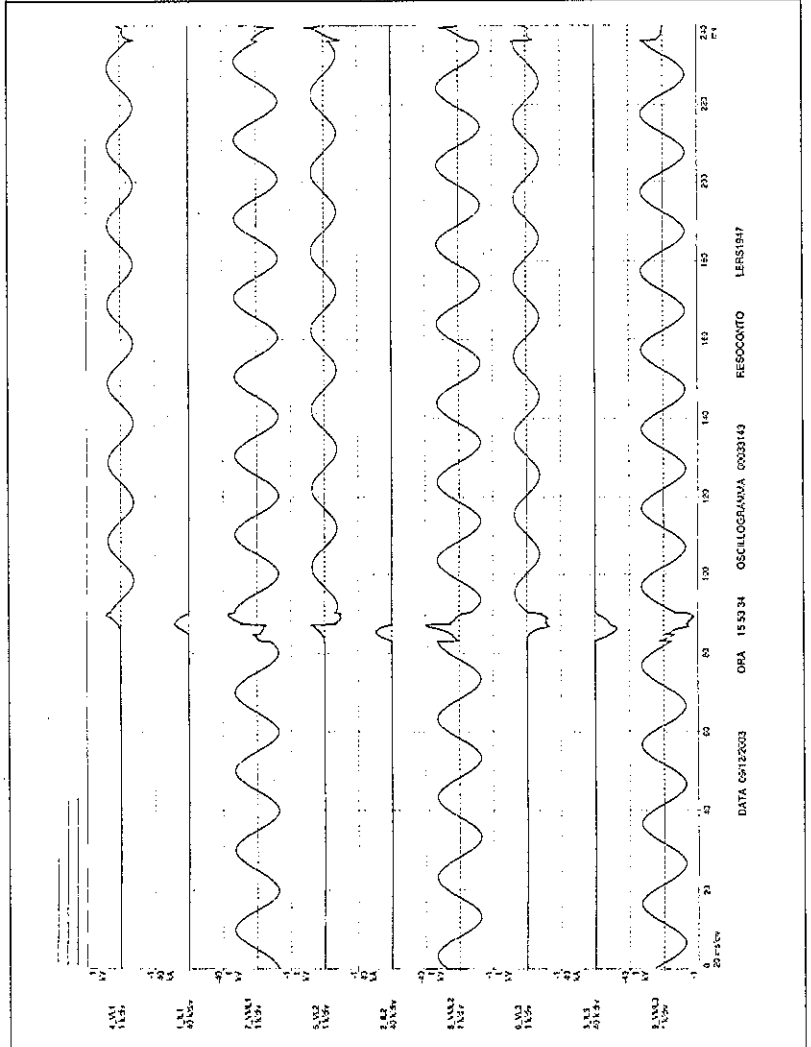
Authorized representative

Date 04.02.24

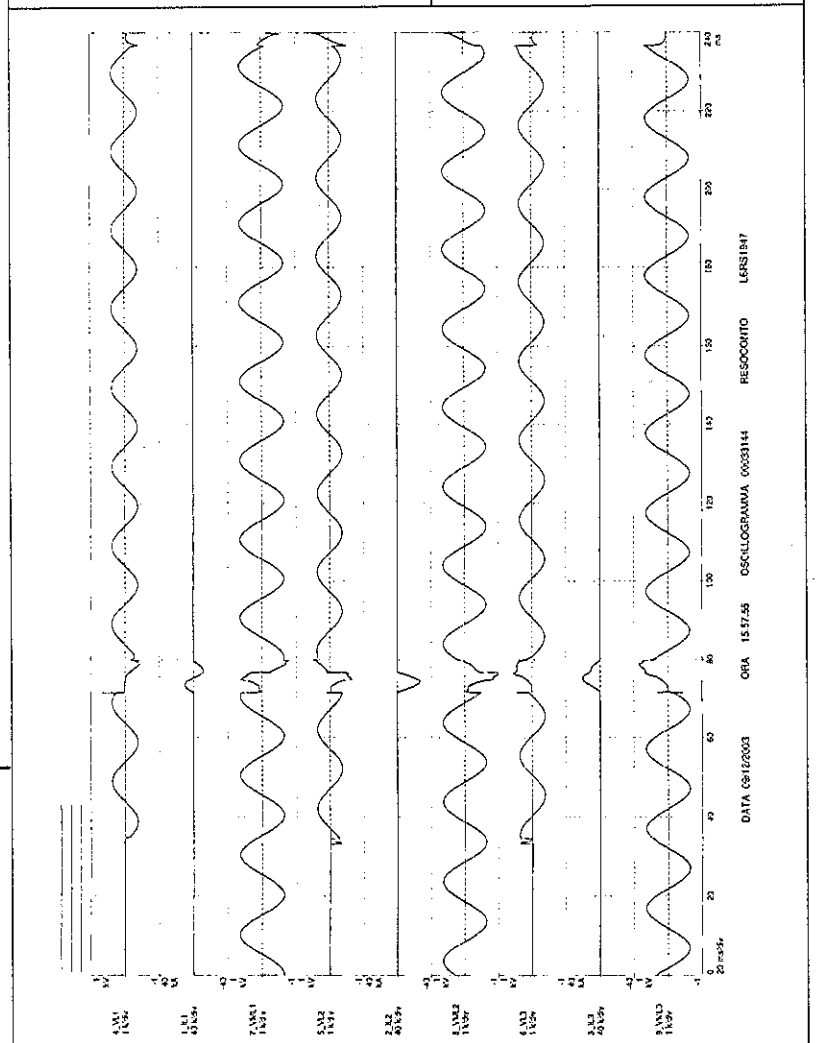
TRF IEC/EN 60947-2
Ed. 2.1 form 170

ВЯРНО С ОРИГИНАЛА


DATA 09/12/2003
ORA 12.58.49
OSCILLOGRAMMA 00033142
RESOCONTO
LERS1947


DATA 09/12/2003
ORA 15.53.34
OSCILLOGRAMMA 00033143
RESOCONTO
LERS1947

LOVAG	Test report No.: 03.089 Page 41 / 44
Type test according to: IEC 60947-2	Type: T5N 630



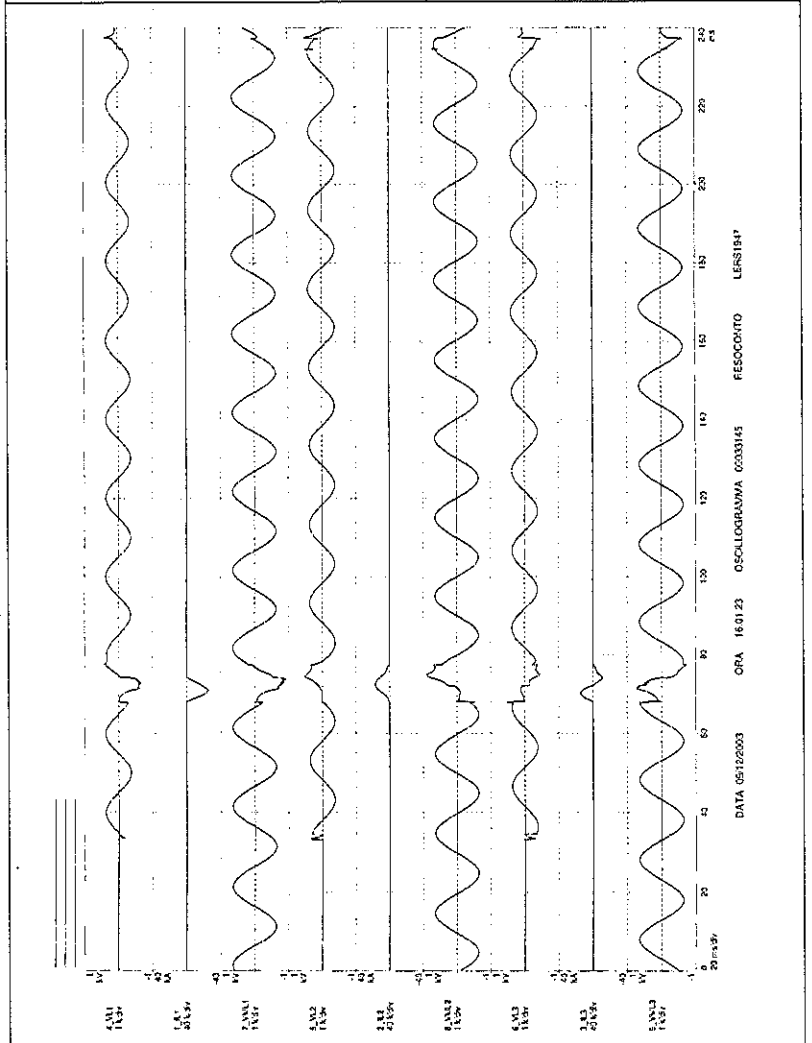
Test laboratory: ACAE IA.01

Authorized representative

Date 04.02.24

TRF IEC/EN 60947-2
Ed. 2.1 form 170

LOVAG	Test report No.: 03.089 Page 42 / 44
Type test according to: IEC 60947-2	Type: T5N 630

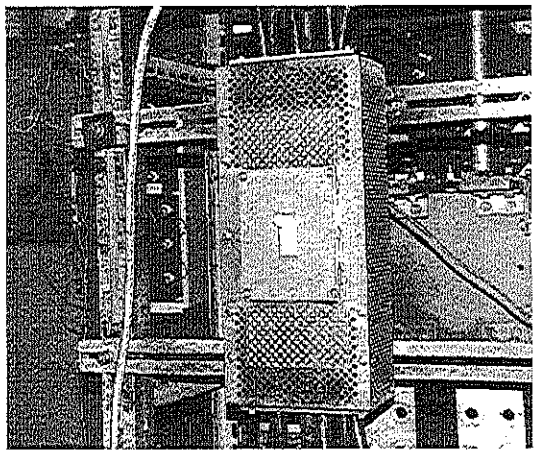


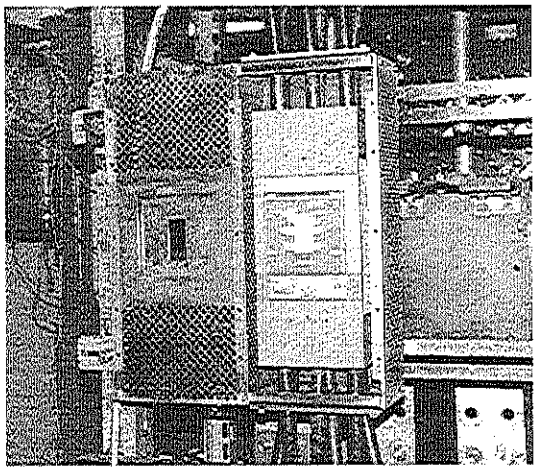
Test laboratory: ACAE IA.01

Authorized representative

Date 04.02.24

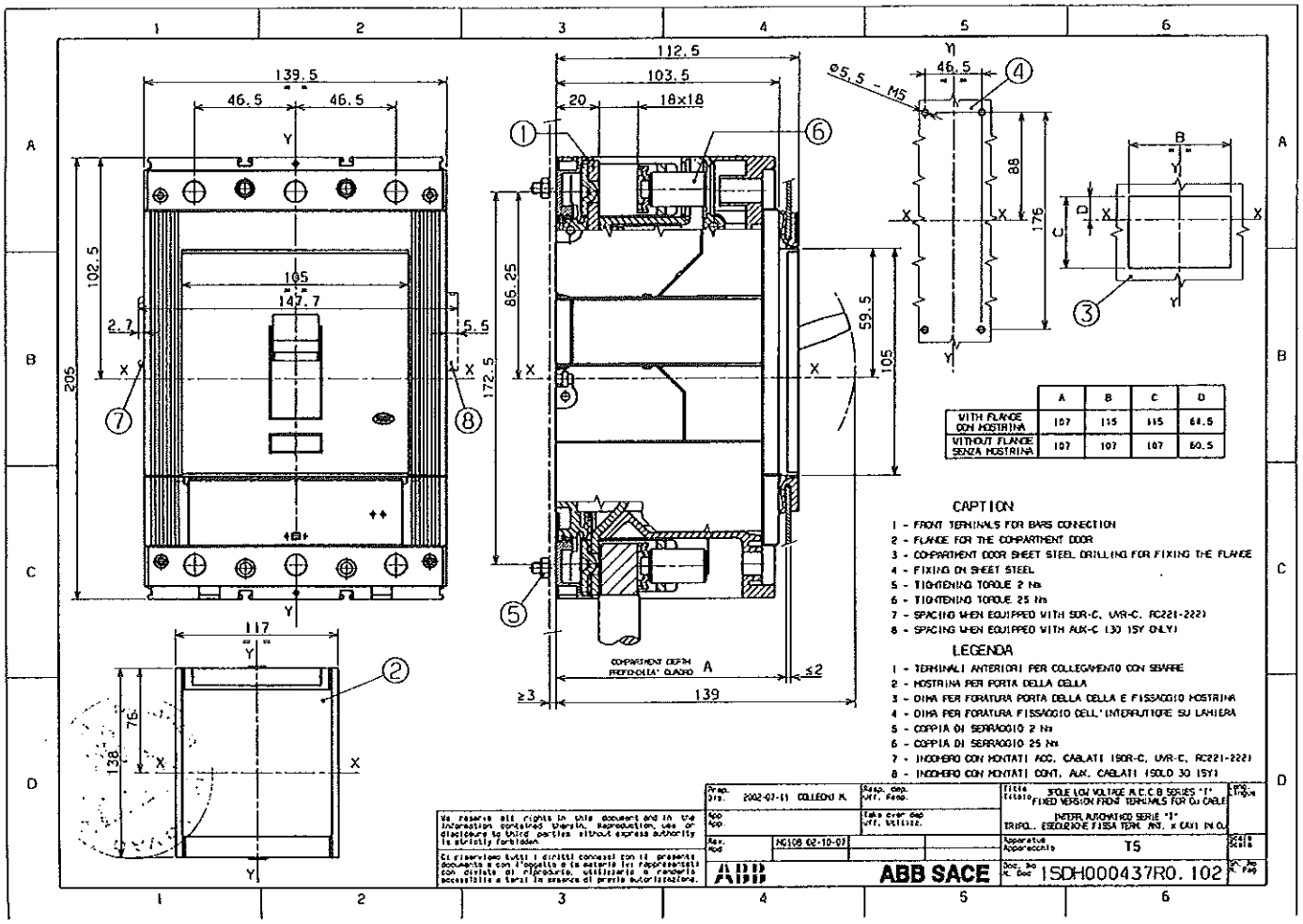
TRF IEC/EN 60947-2
Ed. 2.1 form 170





COMPLETE LIST OF DRAWINGS AND DRAWINGS
CHECKED FOR THE COMPLIANCE OF THE PRODUCT

TYPE OF DOCUMENT	N° DRAWING	Index of modification	Date
Assembly drawing*	1SDH000437R0.106	N0115	03-01-22
Instruction leaflet *	1SDH000437R0.001	L0815	03-07-21
Nameplate dwg *	Allegato L	-	03-03-20
Molded case or metal frame dwgs (all components)	RA1645	L0707	03-01-24
	RA1646	L0707	03-01-24
	RA1722	L0823	03-09-02
	RA1813	L0832	03-09-22
Material list	RA1722.801	L0707	03-01-24
	RA1813.801	L0707	03-01-24
Operating handle dwg	RA1675	L0808	03-06-30
Main and arcing fixed contacts assembly dwgs	RA1623	L0823	03-09-02
	RA1631	L0808	03-06-30
Material list	RA1624.802	L0808	03-06-30
	RA1631.802	L0808	03-06-30
Main and arcing moving contacts assembly dwgs	RA1612	L0823	03-09-02
	RA1613	L0707	03-01-24
Material list	RA1612.802	L0808	03-06-30
	RA1613.801	L0707	03-01-24
Main and arcing fixed contacts dwgs	RA1628	L0808	03-06-30
Main and arcing moving contacts dwgs	RA1616	L0707	03-01-24
Operating mechanism assembly dwgs	RA1659	L0707	03-01-24
Material list	RA1659.803	L0808	03-06-30
Operating mechanism springs dwg	RA1716	L0707	03-01-24
Main contact springs dwg	RA1651	L0707	03-01-24
Arc chute assembly dwg	RA1636	L0707	03-01-24
Material list	RA1636.802	L0707	03-01-24
Overcurrent release assembly dwg	RA1810	L0707	03-01-24
Material list	RA1810.830	L0707	03-01-24
	RA1810.833	L0707	03-01-24
Tripping device assembly dwg	RA2333	L0687	02-12-11
Material list	RA2333.801	L0687	02-12-11
Electronic release components dwgs	RE0374	L0351	01-04-19
	RE0522	L0456	01-10-01
Material list	RE0374-1	L0656	02-10-25
	RE0538/812	L0456	01-10-01
	RE0538/809	L0456	01-10-01
Main terminals dwg	159486	27875	94-10-07
Tripping characteristic *	1SDH000436R0.511	-	03-01-22
Screen for SC Tests	RG0840/050	-	02-10-18



	A	B	C	D
WITH FLANGE CON MOSTRINA	107	115	115	68.5
WITHOUT FLANGE SENZA MOSTRINA	107	107	107	60.5

ВЯРНО С ОРИГИНАЛА

ACAE
ASSOCIAZIONE PER LA CERTIFICAZIONE DELLE APPARECCHIATURE ELETTRICHE
Via Tito Livio, 5 - 24123 - BERGAMO (Italy)
tel. +39035 41 75244 fax. +39035 4534662 e-mail acaecert@tin.it

LOVAG

Certificate
of Conformity

LOVAG-Certificate No **IT 06.034**

Apparatus
Three poles circuit breaker 690 V (U_i) - 1000 V (U_r) - 1000 A (I_n/I_{nw}) - 50/60 Hz I_{cu}/I_{cs} 70 kA at 230V - 36 kA at 415 V - 30 kA at 440 V - 25 kA at 500 V - I_{cu} 15 kA at 690 V - I_{cs} 20 kA at 690 V, with short-circuit and overloaded releases: I_n = 1000 A

Designation

T6N 1000

Manufacturer or responsible vendor
ABB SACE S.p.A. - Via Baioni, 35 - 24123 Bergamo (Italy)

Tested for: ABB SACE S.p.A.

Tested by: ACAE Laboratory IA 01

The apparatus, constructed in accordance with the description mentioned in the Test Report listed on this Certificate has been subjected to the series of proving tests in accordance with IEC 60947-2 (2003) EN 60947-2 (2003)

Test sequence: I

The results are shown in the Test Report in accordance to LOVAG. The values obtained and the general performance are considered to comply with the above Standard(s) and to justify the characteristic assigned by the manufacturer as stated below.
Utilization category B
Suitable for isolation

U_i = 690 V a.c. 50/60 Hz I_n = 1000 A U_r = 1000 V U_{imp} = 8kV

This document includes Report No.: 05.087
Issue Date: 2006.07.13

Responsible Certification Body:ACAE

Mauro Marchi
Authorized Signature
Date: 2006.07.20

SINCERT
PRD N°070E
Signatory of EA and IAF Mutual Recognition Agreements

This Certificate applies only to the apparatus tested. The responsibility for conformity of any apparatus having the same designation with that tested rests with the manufacturer or responsible vendor.

This certificate has been prepared according to LOVAG (Low Voltage Agreement Group) Objectives and Operating Principles of mutual recognition. The responsible certification body as member of LOVAG issues a Certificate of Conformity with the above mentioned Standard(s) following the exclusive use of LOVAG Test Instructions wherever applicable.

LOVAG CERTIFICATES

LOVAG	is the Low Voltage Agreement Group which is a Mutual Agreement Group of Certification Bodies founded in 1991 which has achieved a high level of competence in testing and certification of low voltage equipment. LOVAG's main purpose as an Agreement Group shall be for the mutual recognition of the test reports and/or certificates of conformity by its signatories.
Membership	LOVAG presently has six signatories to the Agreement: ACAE (Italy), ALPHA (Germany), Applus CTC (Spain), ASEFA (France), Intertek Semko AB (Sweden) and SGS Belgium NV - Division SGS CEBEC (Belgium) and employs around 40 European Testing Laboratories.
Certificates	LOVAG Certificates are issued by the signatory bodies to the Agreement using test reports and certificates in a common and recognisable format in the market. They are recognised and accepted in the European Economic Area and elsewhere in the world.
Test Instructions	LOVAG uses common LOVAG Test Instructions for each of the International and European Standards covered by the Agreement and signatories to the Agreement abide by these when testing for LOVAG Certification.
Qualifications	All signatory bodies to the Agreement are accredited and/or assessed to EN 45011 (ISO/IEC Guide 65) and their laboratories are accredited and/or assessed to EN ISO/IEC 17025.

For further information contact your local certification body from the list below or contact the Secretariat of LOVAG at: ALPHA e.V., Stresemannallee 19, D-60596 Frankfurt am Main, Phone: + 49 69 9620 6343, Fax: + 49 69 9620 6344, e-mail: secretariat@lovag.net

LIST OF LOVAG SIGNATORIES:

ACAE
Via Tito Livio 5
I-24123 Bergamo
ITALY
Fax: + 39 035 453 4662
e-mail: acaecert@tin.it

ASEFA
33 av du general leclerc
F-92260 Fontenay-aux-roses
FRANCE
Fax: + 33 1 46 55 88 10
e-mail: asefa@free.fr

ALPHA e. V.
Stresemannallee 19
D-60596 Frankfurt am Main
GERMANY
Fax: + 49 69 9620 6344
e-mail: office@alpha-cert.de

SGS Belgium NV
- Division SGS CEBEC
Avenue Van Kalken 9A Bte 1
B-1070-Brussels
BELGIUM
Fax: + 32 2 556 00 36
e-mail: aline.pirmez@sgs.com

Applus+ CTC
Campus UAB
E-08193 Bellaterra
(Barcelona) SPAIN
Fax: + 34 93 567 20 01
e-mail: amsegmot@appluscorp.com

Intertek Semko AB
Box 1103
Torshamnsgatan 48
SE-164 22 Kista
SWEDEN
Fax: + 46 8 750 6090
e-mail: lovag@semko.se

LC-RV16, October 2005

Test Report No. 05.087

Test laboratory:	ACAE IA.01
	I – 24123 Bergamo
Client:	ABB SACE S.p.A.
Manufacturer:	ABB SACE S.p.A.
Test object:	Low voltage molded case circuit breaker TMAX
Type designation:	T6N 1000
Date(s) of test(s):	from 2006.01.30 to 2006.02.15
Test specification:	IEC 60947-2:2003 EN 60947-2:2003
Test sequence(s):	I
Test results:	Sequence I at 690V found in compliance with rated characteristics

The Record of Proving Test consists of:

35 pages LOVAG test report forms – oscillograms

– other pages drawing 1SDH000479R0.125 enclosed

– diagrams – photographs

Date of issue: 2006.07.13

Responsible Test Laboratory
M . Bortoli

Signatures: R.Oprandi
(Name, function and signature of authorized representative)

ACAE Inspector
M . Marchi

Note:
The test result relates only to the items tested.
The test report shall not be reproduced except in full without the written approval of the test laboratory.

Description and characterization of the test object

Characteristics

Type of circuit-breaker:	**T6N 1000**
Number of poles	3
Kind of current	a.c.
Number of phases	3
Rated frequency	50-60 Hz
Utilization category	B
Reference temperature	40 °C
Suitability for isolation	Yes

Rated and limiting values: (according to test volume)

Main circuit:

Rated impulse withstand voltage U_{imp}	8 kV
Rated insulation voltage U_i	1000 V
Conventional thermal current I_{th} / I_{the}	1000 / - A
Rated current I_n	1000 A
Rated current in the neutral pole	- A

Short-circuit characteristics:

U_e/V	I_{cm}/kA	I_{cu}/kA	I_{cs}/kA	I_{cw}/kA	I_{cu}/Ka	I_{rr}/Ka
230 ac	154	70	70	10	-	-
415 ac	75.6	35	35	10	-	-
440 ac	63	30	30	10	-	-
500 ac	52.5	25	25	10	-	-
690 ac	40	20	15	10	-	-

Control circuits:

Electrical control circuits:

Kind of current	-
Rated frequency	- Hz
Rated control circuit voltage U_c	- V
Rated control supply voltage U_s	- V
Rated impulse withstand voltage U_{imp}	- kV
Rated insulation voltage U_i	- V

Air-supply control circuits:

Rated supply pressure	- kPa
Limits of pressure	- kPa
Required volume for each closing operation	- m^3
Required volume for each opening operation	- m^3

Auxiliary circuits:

Rated operational voltage U_e	- V
Rated impulse withstand voltage U_{imp}	- kV
Rated insulation voltage U_i	- V
Rated frequency	- Hz
Rated operational current I_e	- A
Number of circuits	-
Number and kind of contact elements	-

Releases:

- Shunt release:

- Rated control circuit voltage U_c	- V
- Kind of current	a.c.
- Rated frequency if a.c.	50-60 Hz

- Undervoltage or no-voltage release

- Rated control circuit voltage U_c	- V
- Kind of current	-
- Rated frequency if a.c.	- Hz

- Over-current release:

- Short-circuit release

- instantaneous release	Yes
- definite time-delay release	-
- Rated current I_n	1000 A
- Kind of current	a.c.
- Rated frequency if a.c.	50-60 Hz
- Current setting (or range of settings)	1500 to 10000 A
- Time setting (or range of settings)	- s

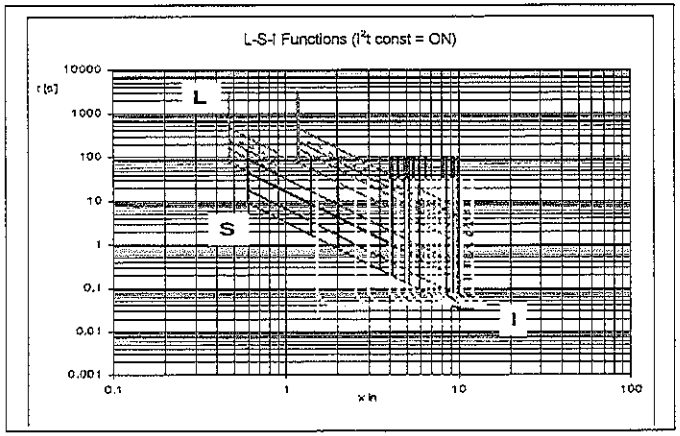
- Overload release (IEC 60947-1; 2.4.30):

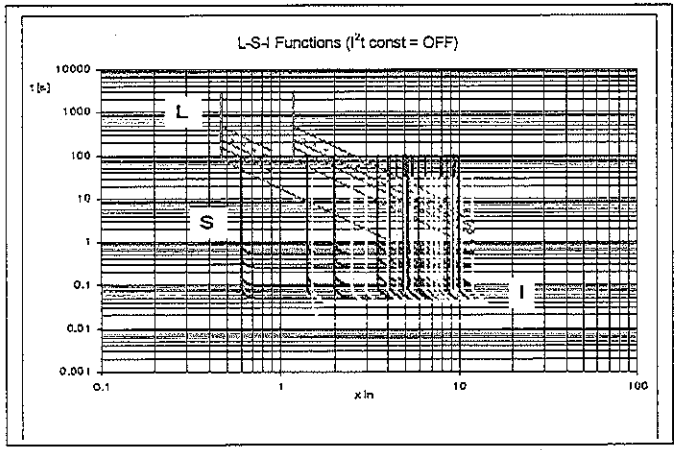
- instantaneous release	-
- definite time-delay release	-
- inverse time-delay release	Yes
dependent on ambient air temperature	-
independent of ambient air temperature	Yes
- Reference temperature	40 °C
- Rated current I_n	1000 A
- Kind of current	a.c.
- Rated frequency if a.c.	50-60 Hz
- Current setting (or range of settings)	400 to 1000 A
- Time setting (or range of settings)	from 3s to 18s at 6xI1 (1)

(1) Symbol explanation at page 6 / 35

Time / current characteristics

Type designation of ABB SACE PR 222DS/P L-S-I overcurrent release





Note : Symbol explanation at the following page

Time / current characteristics

Type designation of ABB SACE PR 222DS/ P L-S- I overcurrent release

PR222DS/P, PR222DS/PD and PR223DS(3) - Protection functions and parameterisations

Protection functions		Trip threshold	Trip curves(1)	Excludability	Resistant = f(t)
L	Against overload with long inverse time delay trip and trip characteristic according to an inverse time curve (I2t=k) according to IEC 60947-2 Standard	**Manual setting** I1 = 0.40...1 x In step = 0.02 x In	**Manual setting** at 6 x I1 t1 = 3 - 6 - 9 - 18s(2)	–	t = k/I2
		Electronic setting I1 = 0.40...1 x In step 0.01 x In Trip between 1.1...3 x I1	**Electronic setting** at 6 x I1 t1 = 3...18s step 0.5s(2) Tolerance: ± 10%		
S	Against short-circuit with inverse short time delay trip and trip characteristic with inverse time (I2t=k) or definite time	**Manual setting** I2 = 0.6-1.2-1.8-2.4-3-3.6-4.2-5.0-6.4-7-7.6-8.2-9.0-9.4-10 x In(3)	**Manual setting** at 8 x In t2 = 0.05 - 0.1 - 0.25 - 0.5s	n	t = k/I2
		Electronic setting I2 = 0.60...10 x In step 0.1 x In Tolerance: ± 10%	**Electronic setting** at 8 x In t2 = 0.05...0.5s step 0.01s Tolerance: ± 10%(4)		
		Manual setting I2 = 0.6-1.2-1.8-2.4-3-3.6-4.2-5.0-6.4-7-7.6-8.2-9.0-9.4-10 x In(3)	**Manual setting** t2 = 0.05 - 0.1 - 0.25 - 0.5s	n	t = k
		Electronic setting I2 = 0.60...10 x In step 0.1 x In Tolerance: ± 10%	**Electronic setting** t2 =0.05...0.5s step 0.01s Tolerance: ± 10%(4)		
I	Against short-circuit with instantaneous trip	**Manual setting** I3 = 1.5-2.5-3-4-4.5-5-5.5-6.5-7-7.5-8-9-9.5-10.5-12 x In(3)	Instantaneous	n	t = k
		Electronic setting I3 = 1.5...12 x In(3) step 0.1 x In Tolerance: ± 10%			
G	Against earth fault with inverse short time delay trip and trip characteristic according to an inverse time curve (I2t=k)	**Manual setting** I4 = 0.2-0.25-0.45-0.55-0.75-0.8-1 x In	**Manual setting** up to 3.15 x I4 up to 2.25 x I4 up to 1.6 x I4 up to 1.10 x I4 t4 = 0.1s t4 = 0.2s t4 = 0.4s t4 = 0.8s	n	t = k/I2
		Electronic setting I4 = 0.2...1 x In step 0.1 x In Tolerance: ± 10%	**Electronic setting** I4 = 0.1...0.8 x In step 0.01s Tolerance: ± 15%		

1) These tolerances hold in the following conditions:
   – self-powered trip unit at full power and/or auxiliary supply
   – two or three-phase power supply
   In conditions other than those considered, the following tolerances hold:

	Trip threshold	Trip time
S	± 20%	± 20%
I	± 20%	0 -30ms
G	± 20%	± 20%

2) For T4 In = 320 A and T5 In = 630 A => t1 = 12s
3) For T4 In = 320 A and T5 In = 630 A, T6 In = 1000 A => I2max = 0.8 x In and I3max = 9.5 x In
4) Tolerance: ± 10 ms
5) The setting of the PR223DS trip unit is electronic only (local/remote)
   The L protection can be set at I1 = 0.1/0...1 x In. For I1 < 0.4 x In the neutral setting must be set at 100% of that of the phases.

Integral fused circuit-breakers:
(Co-ordination with short-circuit protective devices)

Kind of protective devices	-
- Type of fuse	-
- Maximum operational voltage	- V
- Rated current I_n	- A
- Maximum prospective short-circuit peak current	- kA

Individual enclosure:

- Type	-
- Kind of material	-
- Degree of protection	-
- Inside dimensions	-
height	- mm
width	- mm
depth	- mm

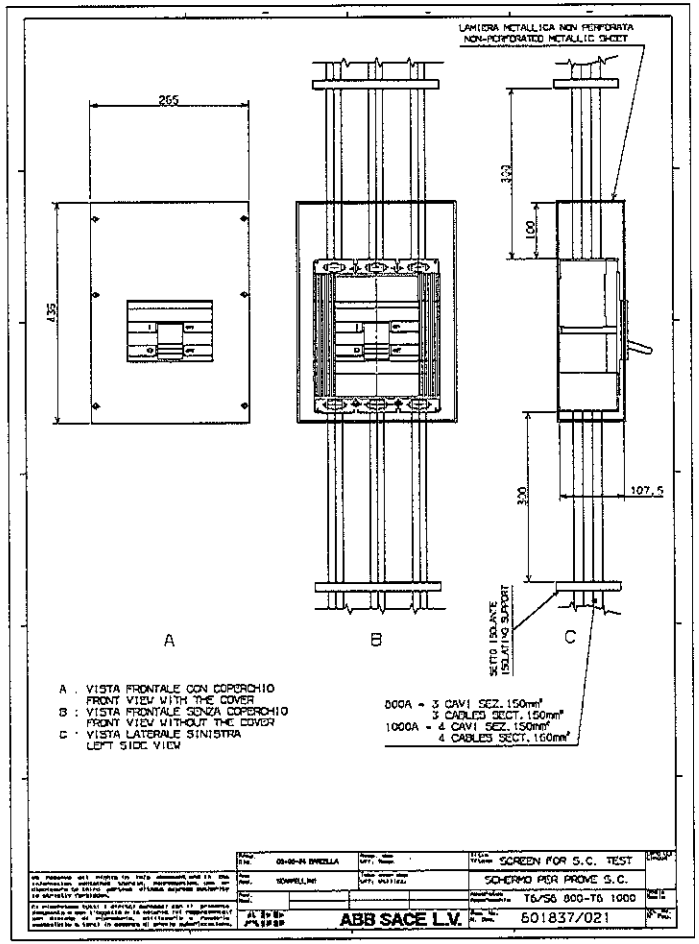
When no enclosure:

Safety perimeter defined:	refer to drawing at page 8 / 35
height	- mm
width	- mm
depth	- mm
Kind of screen (woven wire mesh, perforated metal, expanded metal)	refer to drawing at page 8 / 35 -
Size of holes (≤ 30 mm²)	refer to drawing at page 8 / 35
Distance during test	refer to drawing at page 8 / 35

Openings around the manual operating means:

Openings in the area of the manual operating means through which the arc chamber can be reached by a music wire of 0.26 mm diameter.	none

INSTALLATION INSIDE METAL SCREEN



THE SAMPLES UNDER TEST

N°	Identification Number	Rated current (A)	Sequence	Page
1	AG 01095074	1000	I at 690 V	10 – 31 / 35

TEST SEQUENCE I

General performance characteristics

Test sequence I comprises the following tests:

Sub-clause	Test	Page-Form	Test Report Page No.
8.3.3.1	Tripping limits and characteristics	14 – 24	11 - 16
8.3.3.2	Dielectric properties		
	Verification of impulse withstand voltage	25	17
	Power-frequency withstand verification	26	18
	Verification of creepage distances	26	18
	Verification of leakage current (if applicable)	27	19
8.3.3.3	Mechanical operation and operational performance capability	28 – 32	20 - 24
8.3.3.4	Overload performance (if applicable)	33	25
8.3.3.5	Verification of dielectric withstand	34	26
	Verification of leakage current (if applicable)	27	27
8.3.3.6	Verification of temperature-rise	35 – 36	28
8.3.3.7	Verification of overload releases	37	29
8.3.3.8	Verification of undervoltage and shunt releases (if applicable)	38	30
8.3.3.9	Verification of main contact position (if applicable)	39	31

LOVAG	Test report No.: 05.087 Page 11 / 35
Type test according to: IEC 60947-2 Test sequence I	Type: T6N 1000

Standard and clause	Kind of tests and requirements		Test values Results
8.3.3.1	**TEST OF TRIPPING LIMITS AND CHARACTERISTICS**		
60947-1 Table 9, 10 and 11	Cabling characteristics		
	Cable	150 mm²	150 mm²
	Bar	- x - mm	- x - mm
	Number	4	4
	Length	2000 mm	2000 mm
	Tightening torque		43 Nm
8.3.3.1.2	Opening under short-circuit conditions		
	Ambient air temperature	10...40 °C	20 °C
	Minimum / Maximum current setting	1500 / 9500 A	
	Single or combination of phase pole(s)	1 / 2	
	Test current(s)	0.8 x 1500 / 9500 A	1200 / 7600 A
	Duration of current flow	≥ 200 ms	220 / 220 ms
	No tripping		
	Test current(s)	1.2 x 1500 / 9500 A	1800 / 11400 A
	Duration of current flow	≤ 200 ms	33 / 30 ms
	Tripping		
	Combination of phase poles	2 / 3	
	Test current(s)	0.8 x 1500 / 9500 A	1200 / 7600 A
	Duration of current flow	≥ 200 ms	220 / 220 ms
	No tripping		
	Test current(s)	1.2 x 1500 / 9500 A	1800 / 11400 A
	Duration of current flow	≤ 200 ms	34 / 32 ms
	Tripping		
	Combination of phase poles	3 / 1	
	Test current(s)	0.8 x 1500 / 9500 A	1200 / 7600 A
	Duration of current flow	≥ 200 ms	220 / 220 ms
	No tripping		
	Test current(s)	1.2 x 1500 / 9500 A	1800 / 11400 A
	Duration of current flow	≤ 200 ms	32 / 28 ms
	Tripping		

LOVAG	Test report No.: 05.087 Page 12 / 35
Type test according to: IEC 60947-2 Test sequence I	Type: T6N 1000

Standard and clause	Kind of tests and requirements		Test values Results
8.3.3.1.2	**Additional test of opening under short-circuit conditions on each phase pole individually**		
	Minimum / Maximum current setting	1500 / 9500 A	
	Single pole tripping values given by manufacturer:		
	phase poles	1500 /9500 A	
	neutral pole (if different to phase pole)	- / - A	
	Phase pole 1		
LTI 8.3.3.1.2	Test current(s)	1.2 x 1500 / 9500 A	1800 / 11400 A
	Duration of current flow	≤ 200 ms	33 / 31 ms
	Tripping		
	Phase pole 2		
	Test current(s)	1.2 x 1500 / 9500 A	1800 / 11400 A
	Duration of current flow	≤ 200 ms	35 / 33 ms
	Tripping		
	Phase pole 3		
	Test current(s)	1.2 x 1500 / 9500 A	1800 / 11400 A
	Duration of current flow	≤ 200 ms	34 / 32 ms
	Tripping		
	Neutral pole (if applicable)		
	Test current(s)	1.2 x - / - A	- / - A
	Duration of current flow	≤ - ms	- / - ms
	Tripping		

Standard and clause	Kind of tests and requirements		Test values Results
8.3.3.1.3	**Opening under overload conditions**		
	Ambient air temperature:	10...40 °C	- °C
8.3.3.1.3 a)	**Instantaneous or definite time-delay releases**		
	Minimum / Maximum current setting	.- / - A	
	Single or combination of phase pole(s)	. . / . .	
	Test current(s)	0.9 x - / - A	- / - A
	Duration of current flow	≥ - s	- / - s
	No tripping		
	Test current(s)	1.1 x - / - A	- / - A
	Duration of current flow	≤ - s	- / - s
	Tripping		
	Single or combination of phase pole(s)	. . / . .	
	Test current(s)	0.9 x - / - A	- / - A
	Duration of current flow	≥ - s	- / - s
	No tripping		
	Test current(s)	1.1 x - / - A	- / - A
	Duration of current flow	≤ - s	- / - s
	Tripping		
	Single or combination of phase pole(s)	. . / . .	
	Test current(s)	0.9 x - / - A	- / - A
	Duration of current flow	≥ - s	- / - s
	No tripping		
	Test current(s)	1.1 x - / - A	- / - A
	Duration of current flow	≤ - s	- / - s
	Tripping		

Standard and clause	Kind of tests and requirements		Test values Results
8.3.3.1.3 b)	**Inverse time-delay releases dependent on ambient air temperature**		
	Minimum / Maximum current setting	- / - A	
Table 6	Conventional time	- h	
	Reference temperature (according to the manufacturer's data)	- °C	
	Ambient air temperature		- °C
	Tripping values in accordance with the manufacturer's temperature/current data:		
	at minimum current setting	- A to - A	
	at maximum current setting	- A to - A	
	Conventional non-tripping current	1.05 x - / - A	- / - A
	No tripping	> - min	- / - min
	Conventional tripping current	1.3 x - / - A	- / - A
	Operating time	≤ - min	- / - min

ВЯРНО С ОРИГИНАЛА

97

Standard and clause	Kind of tests and requirements		Test values Results
8.3.3.1.3 b)	**Inverse time-delay releases independent on ambient air temperature**		
Table 6	Minimum / Maximum current setting	400 / 1000 A	
	Conventional time	2 h	
	Measurement 1:		
	Ambient air temperature	$T_{ref} \pm 2$ °C	40 °C
	Reference temperature according to the manufacturer's data or standard (T_{ref})	40 °C	
7.2.1.2.4 b)	Conventional non-tripping current	1.05 x 400 / 1000 A	420 / 1050 A
	No tripping	> 2 h	2 / 2 h
	Conventional tripping current	1.3 x 400 / 1000 A	520 / 1300 A
	Operating time	≤ 2 h	1.1/ 6.5 min
	Measurement 2:		
	Ambient air temperature	(T_{ref} -10) ± 2 °C or (T_{ref} +10) ± 2 °C	30 °C
	Reference temperature according to the manufacturer's data or standard (T_{ref})	40 °C	
7.2.1.2.4 b)	Correction factor k_t		
	k_t = 0.3 %/K x | amb. air temp. - ref. temp. |	-	
7.2.1.2.4 b)	Conventional non-tripping current	(1.05 – k_t) x 400 / 1000 A	420 / 1050 A
	No tripping	> 2 h	2 / 2 h
	Conventional tripping current	(1.3 + k_t) x 400 / 1000 A	520 / 1300 A
	Operating time	≤ 2 h	1.1 / 6.5 min

Standard and clause	Kind of tests and requirements		Test values Results
8.3.3.1.3 b)	**Additional test: Time/current characteristics**		by arrangement
	Ambient air temperature		40 °C
	Reference temperature	40 °C	
	Minimum / Maximum current setting	400 / 1000 A	
LTI 8.3.3.1.3 b)	Test current given by manufacturer or, when no value is given, with 2.0 x current setting		1000 / 2500 A - / - A
	Operating time Maximum setting	93 s to 113 s	104 s
	Minimum setting	15,5 s to 19 s	18 s

LOVAG	Test report No.: 05.087 Page 17 / 35
Type test according to: IEC 60947-2 Test sequence I	Type: T6N 1000

Standard and clause	Kind of tests and requirements	Test values Results
8.3.3.2	**TEST OF DIELECTRIC PROPERTIES**	
60947-1 8.3.3.4.1 2)	**Verification of impulse withstand voltage** Tests 1.2 / 50 µs	
8.3.3.4.1 2) a)	Circuits incorporating solid-state devices disconnected ☒ No / ☐ Yes, if Yes	Page –
Table H.1, 12	Test voltage Main circuits 9.6 kV Control- and auxiliary circuits -kV	9.6 kV - kV
8.3.3.4.1 2) c)	Application of the test voltage 5 impulses per polarity	
i)	Main-poles to ground	
ii)	Between main-poles	
iii)	Control and auxiliary circuits (if rating is lower than main circuit)	
iv)	**Additional test across open contacts for equipment suitable for isolation**	
Table 14	Test voltage Main circuits 12.1 kV	12.1 kV
	Application of the test voltage 5 impulses per polarity Across open main contacts	
8.3.3.2 iii)	**Additional test across open contacts for equipment not suitable for isolation**	
Table 12A	Power-frequency test voltage 42 - 65 Hz Test voltage Main circuits – V	- Hz – V
	Application of the test voltage 5 s Across open main contacts	

LOVAG	Test report No.: 05.087 Page 18 / 35
Type test according to: IEC 60947-2 Test sequence I	Type: T6N 1000

Standard and clause	Kind of tests and requirements	Test values Results
60947-1 8.3.3.4.1 3)	**Power-frequency withstand verification of solid insulation**	
8.3.3.4.1 3) c)	Circuits incorporating solid-state devices disconnected ☒ No / ☐ Yes, if Yes	Page –
b) i)	Power-frequency test	
	Test frequency 42 - 65 Hz	50 Hz
Table 12A	Test voltage Main circuits 2200 V Control- and auxiliary circuits 2200 V	2200 V - V
8.3.3.4.1 2) c)	Application of the test voltage 5 s	
i)	Main-poles to ground	
ii)	Between main-poles	
iii)	Control and auxiliary circuits (if rating is lower than main circuit)	
b) ii)	Alternative test with direct voltage	
Table 12A	Test voltage Main circuits – V Control- and auxiliary circuits – V	– V – V
8.3.3.4.1 2) c)	Application of the test voltage 5 s	
i)	Main-poles to ground	
ii)	Between main-poles	
iii)	Control and auxiliary circuits (if rating is lower than main circuit)	
60947-1 8.3.3.4.1. 7)	**Verification of creepage distances**	
Appendix G	Working voltage or rated insulation voltage 1000 V Pollution degree 3 Material group I Minimum creepage distance 10 mm	37 mm

LOVAG	Test report No.: 05.087 Page 19 / 35
Type test according to: IEC 60947-2 Test sequence I	Type: T6N 1000

Standard and clause	Kind of tests and requirements		Test values Results
	VERIFICATION OF LEAKAGE CURRENT		
8.3.3.2 iv)	Test sequence I (in new condition)	≤ 0.5 mA	0.085 mA
8.3.3.5	Test sequence I (after overload performance)	≤ 2 mA	– mA
8.3.4.3	Test sequence II	≤ 2 mA	– mA
8.3.5.3	Test sequence III	≤ 6 mA	– mA
8.3.6.5	Test sequence IV	≤ 2 mA	– mA
8.3.7.3	Test sequence V, stage 1	≤ 2 mA	– mA
8.3.7.7	Test sequence V, stage 2	≤ 6 mA	– mA
8.3.8.5	Combined test sequence	≤ 2 mA	– mA
C.3	Individual pole short-circuit test sequence I_{su}	≤ 6 mA	– mA
H.3	Individual pole short-circuit test sequence I_{rr}	≤ 6 mA	– mA
8.3.3.2 iv)	**Leakage current**		
	For circuit-breakers suitable for isolation having an operational voltage U_e greater than 50 V.		
	Test frequency	42 - 65 Hz	50 Hz
	Test voltage	1.1 x U_e 690 V	760 V
	Application of the test voltage - Main circuit of the circuit-breaker - Isolating contacts of a withdrawable unit (if applicable)		

Test laboratory: ACAE IA.01 — TRF IEC/EN 60947-2 Ed. 3.0 form 27

Authorized representative — Date 06.07.13

LOVAG	Test report No.: 05.087 Page 20 / 35
Type test according to: IEC 60947-2 Test sequence I	Type: T6N 1000

Standard and clause	Kind of tests and requirements		Test values Results
8.3.3.3	**TEST OF MECHANICAL OPERATION AND OF OPERATIONAL PERFORMANCE CAPABILITY**		
8.3.3.3.2	**Construction and mechanical operation**		
8.3.3.3.2 a)	**Construction**		
7.1.1	**Withdrawable circuit-breakers**		
	A) Verification of isolating distances in the disconnected position		
	1. Main circuit and auxiliary circuit indicated as suitable for connection		
	Rated impulse withstand voltage U_{imp}	– kV	
	Pollution degree	–	
	Minimum clearance (inhomogeneous field)	– mm	
	Isolating distance of main circuit		– mm
	Isolating distance of auxiliary circuits		– mm
	2. Auxiliary circuit not connected to the main circuit		
	Rated impulse withstand voltage U_{imp}	– kV	
	Pollution degree	–	
	Minimum clearance (inhomogeneous field)	– mm	
	Isolating distance of auxiliary circuits		– mm
	B) Verification of the indication of isolating contact position	open	–
		closed	–
	C) Impossibility to re-close with the withdrawable mechanism when the circuit-breaker is closed		–
	D) Impossibility to separate with the withdrawable mechanism when the circuit-breaker is closed		–

Test laboratory: ACAE IA.01 — TRF IEC/EN 60947-2 Ed. 3.0 form 28

Authorized representative — Date 06.07.13

Standard and clause	Kind of tests and requirements	Test values Results
	E) Impossibility to close the circuit-breaker when the isolating contacts are not fully closed	-
	F) Impossibility to close the circuit-breaker when the withdrawable distance is less than the specified isolating distance	-
	G) The specified isolating distances cannot be inadvertently reduced	-
7.2.1.1.5	**Stored energy operating circuit-breaker**	
	- Verification of operating conditions of the device indicating the storing mechanism is fully charged	-
	- Verification of the direction of operation when the energy storing mechanism is manually operated	-
8.3.3.3.2 b)	**Mechanical operation**	
	- With the closing device energized (electrically, mechanically or manually), the opening order shall cause total tripping	yes
	- With the tripping device actuated (electrically, mechanically or manually), a closing order remains ineffective	yes
	- The circuit-breaker closed, a further closing order by a power-operated device, does not cause any anomaly	yes
	- Opening time (if indicated) - ms	- ms
	- Closing time (if indicated) - ms	- ms

Standard and clause	Kind of tests and requirements	Test values Results
7.2.1.1.3	**Dependent power closing circuit-breaker**	
	Verification of operating in no-load condition U = 1.1 x U_s	- V
	opening time (if indicated) - ms	- ms
	closing time (if indicated) - ms	- ms
	Verification of operating in no-load condition U = 0.85 x U_s	- V
	opening time (if indicated) - ms	- ms
	closing time (if indicated) - ms	- ms
	Verification of closing time when the current established by the circuit-breaker is equal to its rated making capacity I_{cm} U = 0.85 x U_s	see test sequence II or III Page -
7.2.1.1.5	**Stored energy closing circuit-breaker**	
	Verification of operating of the stored energy closing mechanism U = 0.85 x U_s	- V
	opening time - ms	- ms
	closing time - ms	- ms
	Verification of operating of the stored energy closing mechanism U = 1.1 x U_s	- V
	opening time - ms	- ms
	closing time - ms	- ms
	Impossibility for the closing mechanism to operate when it is charged to slightly below the full charge	-

Standard and clause	Kind of tests and requirements	Test values Results
8.3.3.3.2 c)	**Undervoltage release**	
	Minimum / Maximum rated control supply voltage U_s	
	- / - V	- / - V
8.3.3.3.2 c) i)	Drop-out voltage	
	-Lower limit $U \geq 0.35 \times U_{s\,max.}$	- V
	-Upper limit (at operational temperature of the circuit-breaker)	
	$U \leq 0.7 \times U_{s\,min.}$	- V
	$U \leq 0.7 \times U_{s\,max.}$	- V
ii)	Limits of operation	
	-Impossibility of closing by the operation of the actuator $U = 0.30 \times U_{s\,max.}$	- V
	-Verification of closing by the operation of the actuator $U = 0.85 \times U_{s\,min.}$	- V
iii)	Performance under overvoltage conditions	
	Verification of operating after the application of an overvoltage $U = 1.1 \times U_{s\,max.}$	- V
	-Impossibility of closing by the operation of the actuator $U = 0.30 \times U_{s\,max.}$	- V
	-Verification of closing by the operation of the actuator $U = 0.85 \times U_{s\,min.}$	- V
8.3.3.3.2 d)	**Shunt release**	
	Minimum rated control supply voltage $U_{s\,min.}$ - V	
	Verification of operating at an ambient temperature of + 55 °C ± 2 °C $U = 0.7 \times U_{s\,min.}$	- V
	-Tripping	

Standard and clause	Kind of tests and requirements		Test values Results
8.3.3.3.3	**Operational performance capability without current**		
	Number of closing operations with undervoltage release not energized (if applicable)	10	-
Table 8 Column 3	Number of operating cycles	2500	2500
Column 2	Operating cycles per hour	960 /h	960 /h
8.3.3.3.4	**Operational performance capability with current**		
	Short-circuit release	min. setting	1500 A
	Overload release	max. setting	1000 A
	Circuit diagram		Page 33 / 35
	Maximum rated operational voltage $U_{s\,max.}$	690 V	690 V
	Rated current I_n	1000 A	1000 A
Table 11	Power factor	0,8	0.77
	Time constant	- ms	- ms
	Frequency	50 Hz	50 Hz
Table 8 Column 2	Operating cycles per hour	20 /h	20 /h
	On-time		140 ms
Column 4	Number of operating cycles	500	500
8.3.3.3.5	**Additional test of operational performance capability without current for withdrawable circuit-breakers**		
	Number of operating cycles	100	-
	Visual inspection of isolating contacts, withdrawal mechanism and interlocks		-

Standard and clause	Kind of tests and requirements	Test values Results
8.3.3.4	**OVERLOAD PERFORMANCE**	
	Rated current I_n - A	
	Current setting Overload release (maximum) - A	
	Short-circuit release (maximum) - A	
8.3.2.1	Control supply voltage 0.85 x U_s - V	- V
	Maximum rated operational voltage $U_{e\,max.}$ - V	
Table 12	Recovery voltage 1.05 x $U_{e\,max.}$	- V
	reduced voltage on automatic opening according to note 2)	- V
Table 8 Column 2	Number of operating cycles per hour - / h	- / h
60947-1 8.3.3.5.2	Circuit diagram	Page -
8.3.2.1	Safety area Pageform 6	Page -
Table 12	Alternating current:	
	Test current 6 x I_n - A	- A
Table 11	Power factor -	-
	Frequency 45 – 62 Hz	- Hz
Table 12	Direct current:	
	Test current 2.5 x I_n - A	- A
Table 11	Time constant - ms	- ms

Test method	Number of operations manual	Automatic
☐ **Standard**	9	3
☐ **Reduced voltage on automatic opening according to note 2)**	12	3
☐ **Opening caused by short-circuit releases**	-	12

	On-time on manual operation min./max.	- / - ms
	Melting of the fusible element Yes/No	....

Standard and clause	Kind of tests and requirements	Test values Results
	VERIFICATION OF DIELECTRIC WITHSTAND	
8.3.3.5	Test sequence I	
8.3.4.3	Test sequence II	
8.3.5.3	Test sequence III	
8.3.6.5	Test sequence IV	
8.3.7.3	Test sequence V, stage 1	
8.3.7.7	Test sequence V, stage 2	
8.3.8.5	Combined test sequence	
B.10.3.1	Test sequence B.II	
A.5	Verification of discrimination	
A.6.3	Verification of back-up protection	
C.3	Individual pole short-circuit test sequence	
H.3	Test sequence for circuit-breakers for IT-systems	
60947-1 8.3.3.4.1 3)	**Power-frequency withstand verification**	
	Circuits incorporating solid-state devices disconnected ☒ No / ☐ Yes, if Yes	Page -
	Test frequency 42 - 65 Hz	50 Hz
	Test voltage 2 x U_e, min. 1000 V 1380 V	1380 V
8.3.3.2.2 a)	Application of the test voltage 5 s -Main circuit of the circuit-breaker -Isolating contacts of the withdrawable unit (if applicable) - Insert of withdrawable unit - Withdrawable unit (base) - Combination of base and insert	

Standard and clause	Kind of tests and requirements		Test values Results
	VERIFICATION OF LEAKAGE CURRENT		
8.3.3.2 iv)	Test sequence I (in new condition)	≤ 0.5 mA	- mA
8.3.3.5	Test sequence I (after overload performance)	≤ 2 mA	0.09 mA
8.3.4.3	Test sequence II	≤ 2 mA	- mA
8.3.5.3	Test sequence III	≤ 6 mA	- mA
8.3.6.5	Test sequence IV	≤ 2 mA	- mA
8.3.7.3	Test sequence V, stage 1	≤ 2 mA	- mA
8.3.7.7	Test sequence V, stage 2	≤ 6 mA	- mA
8.3.8.5	Combined test sequence	≤ 2 mA	- mA
C.3	Individual pole short-circuit test sequence I_{su}	≤ 6 mA	- mA
H.3	Individual pole short-circuit test sequence I_{IT}	≤ 6 mA	- mA
8.3.3.2 iv)	**Leakage current**		
	For circuit-breakers suitable for isolation having an operational voltage U_e greater than 50 V.		
	Test frequency	42 - 55 Hz	50 Hz
	Test voltage	1.1 x U_e 690 V	760 V
	Application of the test voltage - Main circuit of the circuit-breaker - Isolating contacts of a withdrawable unit (if applicable)		

Standard and clause	Kind of tests and requirements		Test values Results
8.3.3.6	**VERIFICATION OF TEMPERATURE-RISE**		
8.3.2.5	**Temperature-rise test**		
60947-1 8.3.3.3.1	Ambient temperature	10...40 °C	40 °C
	Main circuits		
60947-1	Conventional thermal current I_{th}	1000 A	1000 A
8.3.3.3.4	Conventional thermal current for enclosure I_{the}	- A	- A
	Conventional thermal current of the neutral pole	- A	- A
60947-1 Table 9, 10 and 11	Cabling characteristics		
	Phase poles		
	Cable	150 mm²	150 mm²
	Bar	- x - mm	- x - mm
	Number	4	4
	Length	2000 mm	2000 mm
	Tightening torque		43 Nm
	Neutral pole (if applicable)		
	Cable	- mm²	- mm²
	Bar	- x - mm	- x - mm
	Number	-	-
	Length	- mm	- mm
	Tightening torque		- Nm
	Arrangement:	☒ 3 phase or ☐ poles in series	
Table 7	Temperature-rise limits		
	-Terminals	≤ 80 K	61 K
	-Manual operating means:		
	metallic	≤ - K	- K
	non metallic	≤ 35 K	12 K
	-Parts intended to be touched:		
	metallic	≤ - K	- K
	non-metallic	≤ 50 K	26 K
	-Parts, which need not to be touched:		
	metallic	≤ - K	- K
	non-metallic	≤ 60 K	51 K

Standard and clause	Kind of tests and requirements		Test values Results
	VERIFICATION OF OVERLOAD RELEASES		
8.3.3.7	Test sequence I	after 8.3.3.6	
8.3.4.5	Test sequence II	after 8.3.4.4	
8.3.8.7	Combined test sequence	after 8.3.8.6	
	Tripping test		
	Time interval to previous test of temperature-rise (if applicable)		- min
60947-1	Cabling characteristics		
Table 9, 10	Cable	150 mm²	150 mm²
and 11	Bar	- x - mm	- x - mm
	Number	4	4
	Length	2000 mm	2000 mm
	Tightening torque		43 Nm
	Arrangement: ☒ 3 phase or ☐ poles in series		
	Reference temperature	40° C ± 2 °C	
	Ambient temperature		40 °C
	Correction factor k		-
	(k = 1 for releases independent of ambient temperature)		
	Current setting value	1000 A	1000 A
	Test current		
	Phase poles		
	k x 1.45 x current setting value	1450 A	1450 A
	or tripping current according to the manufacturer's temperature/current data		
	(for releases dependent on ambient temperature)	- A	- A
Table 6	Tripping time	≤ 120 min	5 min
	Neutral pole (if applicable)		
	k x 1.45 x current setting value	- A	- A
	or tripping current according to the manufacturer's temperature/current data		
	(for releases dependent on ambient temperature)	- A	- A
	Tripping time	≤ - min	- min

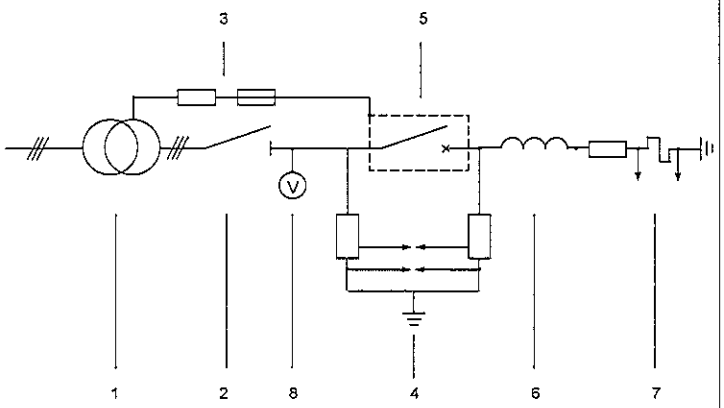
Standard and clause	Kind of tests and requirements		Test values Results
8.3.3.8	**VERIFICATION OF UNDER-VOLTAGE AND SHUNT RELEASES**		
8.3.3.3.2 c)	**Under-voltage releases**		
	Ambient temperature		- °C
	Minimum / Maximum rated control supply voltage U_s	- / - V	
	Drop-out-voltage	$0.35 \times U_{s\,max.} \leq U_{inp} \leq 0.70 \times U_{s\,min.}$	- V
8.3.3.3.2 d)	**Shunt releases**		
	Ambient temperature		- °C
	Minimum rated control supply voltage U_s	- V	
	Verification of operating -Tripping	$U = 0.70 \times U_{s\,min.}$	- V

Standard and clause	Kind of tests and requirements	Test values Results
8.3.3.9	**VERIFICATION OF THE MAIN CONTACT POSITION** **For circuit-breakers suitable for isolation having an operational voltage U_e greater than 50 V.**	
60947-1 8.2.5.2.1	**Dependent and Independent manual operation**	
60947-1 Figure 16	Type of actuator	-
8.2.5.2	Determination of the normal actuator opening force (F)	160 N
	Fixing of the moving contact in pole	yes
Table 17	Test force with contact kept close (3 x F; not less than the minimum nor more than the maximum given in table 17 corresponding to the type of actuator)	400 N
	Test duration 10 s	10 s
8.2.5.3	**Condition of equipment during and after test**	
	The actuator cannot be locked in the OFF-Position while test force is applied. Yes/No	-
	After the test, when the test force is no longer applied, the actuator being left free, the open position is not indicated. Yes/No	yes
	There is no damage to the equipment such as to impair its normal operation. Yes/No	yes

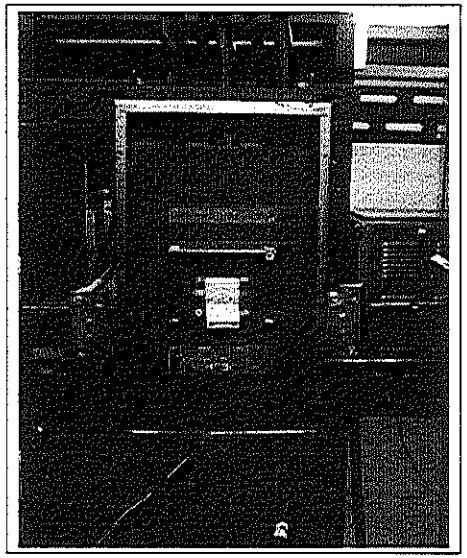
and the instruments have an measurement uncertainly like follow :

Quantity	
Voltage	≤ ±2.5% by transient recorders < ±1.5% by multimeters or similar ≤ ±2.5% for dielectric test
Current	≤ ±2.5%
Time	< ±1%
Force	< ±1 %
Torque	< ±5%
Resistance	< ±3%
Temperature	±2°C up to 100°C ±2% above 100°C
Linear dimensions	±0,05 mm
Relative humidity	≤±5% in the range 20% ÷ 95% RH

CIRCUIT DIAGRAM TYPE S



1 - Three-phase transformer
2 - Short-circuit making switch
3 - Device for the detection of fault currents
4 - Dividers for the arcing voltage measurement
5 - Apparatus under test
6 - Load (reactors and resistances)
7 - Non inductive shunts for current measurement
8 - Voltmeter for voltage measurement



LOVAG	Test report No.: 05.087 Page 35 / 35
Type test according to: IEC 60947-2	Type: T6N 1000

DOMANDA DI CERTIFICAZIONE LOVAG/ACAE O ACAE SECONDO IEC 60947-2
DOCUMENTI DI IDENTIFICAZIONE DELL'APPARECCHIO DA CERTIFICARE

Enclosed 2/C
Pagina 1 of 2
(*)Pratica N° 05.084

DESIGNAZIONE DELL'APPARECCHIO T6N1000 PR222DS/P

Disegno no	Descrizione	Indice di modifica	Data
1SDH000479R0125	Assembly drawing T6 1000		
1SDH000511R0001	Instruction leaflet T6 1000	1.2388	
1SDL000198R0001	Nameplate T5N1000		
RA3710	Standard circuit breaker assembly	1.2576	06-10-14
RA1710/001-302	Material list	1.2509	06-05-02
RA3712	Case circuit breaker	1.2227	04-06-06
RA3712/001	Material list	1.2227	04-06-06
RA3714	Cover circuit breaker	1.2504	05-09-10
RA3945	Case Solid-state release	1.2667	05-12-13
RA3929	Operating mechanism spring set	1.2445	05-03-15
RA3929/001	Material list	1.2227	04-06-06
1R0338	Arc chute assembly	27960	94-06-20
1605583/001	Material list	27414	92-03-18
1605563	Moving armature set	1.2227	04-06-06
1605563/002-808	Material list	1.2227	04-06-06
1R0900	Moving contact set	29218	98-11-10
1605900/001-802	Material list	29218	98-11-10
RA3015	Solid-state release assembly	1.2410	05-01-28
RA3015/001-916	Material list	1.2445	05-03-15
1605603	Moving contact plate	29036	97-04-30
1R0606	Fixed contact set	1.2311	04-09-22
1605604/001	Material list	27414	92-03-18
1R0605	Fixed contact plate	29034	97-04-30
RA2333	Tripping device assembly	1.2764	06-03-16
RA2333/001	Material list	1.2420	05-02-11
RH0496	PR222DS Base board PCA electronic group	1.0408	01-07-25
RH0496/001-302	Material list	1.0408	01-07-25
RH0754	C.T. Groups PCA T6 III PR222DS	1.2479	05-05-04
RH0754/001-806	Material list	1.0781	03-05-26
RH0755	C.T. Groups PCA T6 IV PR222DS	1.0781	03-05-26
RH0755/001-806	Material list	1.0781	03-05-26
RH0741	C.T. Assembly	1.0781	03-05-26
RH0741/001-806	Material list	1.0781	03-05-26
RA3951/009	T6N 1000 Circuit breaker label	1.2445	05-03-15
1R0415	Main terminals	1.2410	05-01-28
1R0415/031	T6N 1000 Main terminals material list	1.2410	05-01-28
1SDL000178R0002	PR222 Tripping characteristic		
1SDL537027	Screen for SC Tests T6 800-1000A		

Il richiedente il certificato garantisce che i disegni qui allegati corrispondono esattamente al prodotto in prova

Data

Firma del richiedente

Note per la compilazione di questa scheda vedere pagina 2

Prelievo n° 05.084
Certificato n°
Place BG Date 19/05/06
ACAE Inspector
Name M. MARCO
Sign
Manufacturer's representative
Name M. CARMINATI
Sign

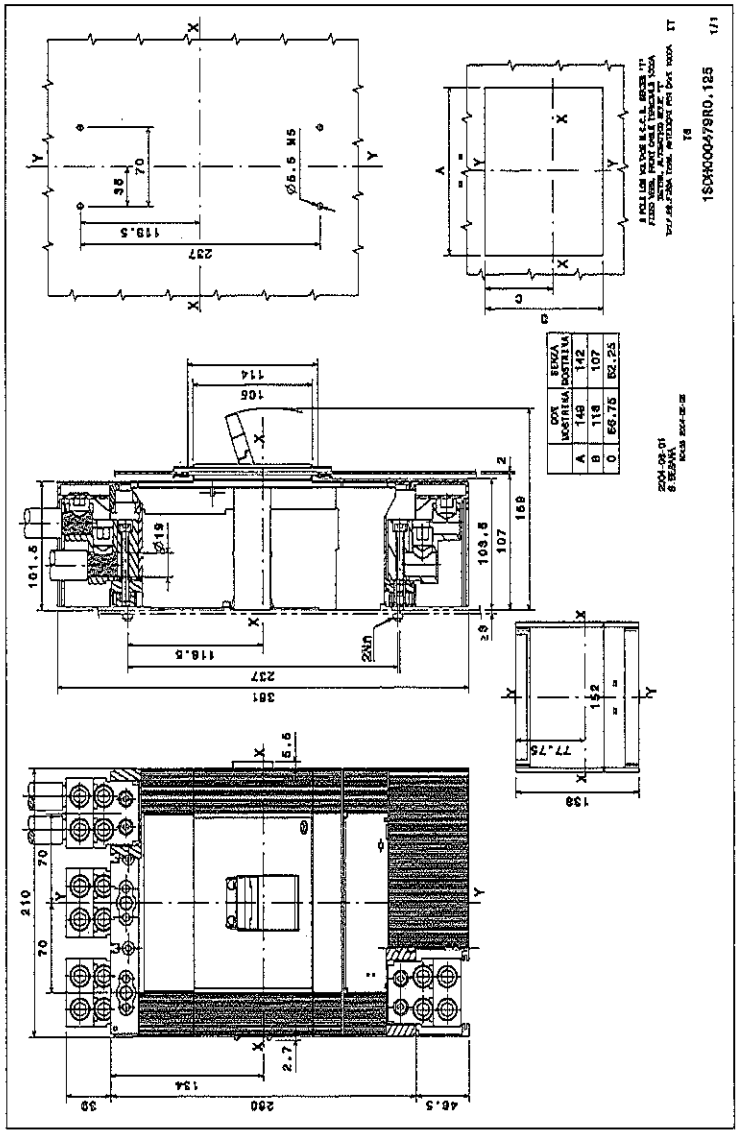
Test laboratory: ACAE IA.01

R. Grandi

Authorized representative

Date 06.07.13

TRF IEC/EN 60947-2
Ed. 3.0 form 177



ASSOCIAZIONE PER LA CERTIFICAZIONE DELLE APPARECCHIATURE ELETTRICHE
ACAE
Via Tito Livio, 5 - 24123 - BERGAMO (Italy)
tel +39035417544 fax. +39035534662 e-mail acaecert@tin.it

LOVAG

Certificate
of Conformity

LOVAG-Certificate No. IT 08.009

Apparatus
Four poles circuit breaker 690 V (U_e) - 1000 V (U_i) - 8 kV (U_{imp}) - 1250 A (I_n) - 50/60 Hz - I_{cu} or I_{cs} 200 kA at 230V - I_{cu} 50 kA at 690V - I_{cs} 45 kA at 690V - I_{cw} 15 kA with short-circuit and overload releases. PR331/P LI

This Certificate applies only to the apparatus tested. The responsibility for conformity of any apparatus having the same designation with that tested rests with the manufacturer or responsible vendor.

This certificate has been prepared according to LOVAG (Low Voltage Agreement Group) Objectives and Operating Principles of mutual recognition.

The responsible certification body as member of LOVAG issues a Certificate of Conformity with the above mentioned Standard(s) following the exclusive use of LOVAG Test instructions, wherever applicable.

Any integral reproduction of this Certificate or reproductions of this page accompanied by any register on which are stated the tests performed and the assigned rated characteristics of the apparatus shall be permitted without written permission from the LOVAG certification responsible of this Certificate.

At expiry of this certificate the above ACAE certification scheme.

Designation

T7V 1250

Manufacturer or responsible vendor
ABB S.p.A. - ABB SACE Division
Via Baioni 35 - 24123 Bergamo (Italy)

Tested for: ABB S.p.A. - ABB SACE Division
Tested by: ACAE Laboratory IA 01
The apparatus, constructed in accordance with the description mentioned in the Test Report listed on this Certificate has been subjected to the series of proving tests in accordance with IEC 60947-2 (2006) EN 60947-2 (2006).
Test sequence:
at 690 V

The results are shown in the Test Report in accordance to LOVAG. The values obtained and the general performance are considered to comply with the above Standard(s) and to justify the characteristic assigned by the manufacturer as stated below

Suitable for isolation

690 V (U_e) - 1000 V (U_i) - 8 kV (U_{imp}) - 1250 A (I_n) - 50/60 Hz

overload release performances according to the a.m. Standard

This document includes: Report No.: 07.053
Issue Date: 2008.04.14

Responsible Certification Body:ACAE

Mauro Marconi
Authorized Signature
Date: 2008.04.17

INTERNATIONAL SINCERT

LOVAG CERTIFICATES

LOVAG is the Low Voltage Agreement Group which is a Mutual Agreement Group of Certification Bodies founded in 1991 which has achieved a high level of competence in testing and certification of low voltage equipment.
LOVAG's main purpose as an Agreement Group shall be for the mutual recognition of the test reports and/or certificates of conformity by the signatories.

Membership LOVAG presently has seven signatories to the Agreement:
ACAE (Italy), ALPHA (Germany), Applus+CTC (Spain), ASEFA (France),
Intertek Semko AB (Sweden), SGS Belgium NV - Division SGS CEBEC (Belgium),
and VEIKI-VNL (Hungary) and employs around 40 European Testing Laboratories.

Certificates LOVAG Certificates are issued by the signatory bodies to the Agreement using test reports and certificates in a common and recognisable format in the market. They are recognised and accepted in the European Economic Area and elsewhere in the world.

Test instructions LOVAG uses common LOVAG Test Instructions for each of the International and European Standards covered by the Agreement and signatories to the Agreement abide by these when testing for LOVAG Certification.

Qualifications All signatory bodies to the Agreement are accredited and/or assessed to EN 45011 (ISO/IEC Guide 65) and their laboratories are accredited and/or assessed to EN ISO/IEC 17025.

For further information contact your local certification body from the list below or contact the Secretariat of LOVAG at: ALPHA e.V. Stresemannallee 19 D-60596 Frankfurt am Main
Phone: + 49 69 9620 6343 Fax: + 49 69 9620 6344, e-mail: secretariat@lovag.net

LIST OF LOVAG SIGNATORIES:

ACAE
Via Tito Livio 5
I-24123 Bergamo
ITALY
Fax: + 39 035 453 4662
e-mail: acaecert@tin.it

ALPHA e. V.
Stresemannallee 19
D-60596 Frankfurt am Main
GERMANY
Fax: + 49 69 9620 6344
e-mail: office@alpha-cert.de

Applus+CTC
Campus UAB
E-08193 Bellaterra
(Barcelona) SPAIN
Fax: + 34 93 567 20 01
e-mail: amargenti@appluscorp.com

ASEFA
33 av du general leclerc
F-92260 Fontenay-aux-roses
FRANCE
Fax: + 33 1 40 95 88 19
e-mail: asefa@icre.fr

SGS Belgium NV - Division SGS CEBEC
Avenue Van Kalken 9A Bte 1
B-1070-Brussels
BELGIUM
Fax: + 32 2 556 30 06
e-mail: sgscebec@sgs.com

Intertek Semko AB
Box 1402
Torshamnsgatan 43
SE-164 22 Kista
SWEDEN
Fax: + 46 8 750 30 02
e-mail: kista@intertek.se

VEIKI-VNL Electric Large Laboratories Ltd
Vasgolyo u. 2-4
H-1158 Budapest
HUNGARY
Fax: + 36 1 416-0163
e-mail: vnl@vei.hu

Test Report No. 07.053

Test laboratory:	ACAE IA.01
	I – 24123 Bergamo
Client:	ABB S.p.A.
Manufacturer:	ABB S.p.A.
Test object:	Low voltage molded case circuit breaker TMAX
Type designation:	T7V 1250
Date(s) of test(s):	from 2007.12.28 to 2008.01.31
Test specification:	IEC 60947-2:2006 EN 60947-2:2006
Test sequence(s):	I
Test results:	Sequence I at 690V found in compliance with rated characteristics

The Record of Proving Test consists of:

39 pages LOVAG test report forms	- oscillograms
- other pages	- drawing
- diagrams	- photographs

Date of issue: 2008.04.14

Responsible Test Laboratory
M . Bortoli

Signatures: R.Oprandi
(Name, function and signature of authorized representative)

ACAE Inspector
M . Marchi

Note:
The test result relates only to the items tested.
The test report shall not be reproduced except in full without the written approval of the test laboratory.

Description and characterization of the test object

Characteristics

Type of circuit-breaker:	**T7V 1250**
Number of poles	4
Kind of current	a.c.
Number of phases	3
Rated frequency	50-60 Hz
Utilization category	B
Reference temperature	40 °C
Suitability for isolation	Yes
Pollution degree	3
Material group	1

Rated and limiting values: (according to test volume)

Main circuit:

Rated impulse withstand voltage U_{imp}	8 kV
Rated insulation voltage U_i	1000 V
Conventional thermal current I_{th} / I_{the}	1250 / - A
Rated current I_n	1250 A
Rated current in the neutral pole	1250 A

Short-circuit characteristics:

U_e/V	I_{cm}/kA	I_{cu}/kA	I_{cw}/kA	I_{cw}/kA	I_{DU}/kA	I_{rm}/kA
230 ac	440	200	200	15	-	-
415 ac	330	150	150	15	-	-
440 ac	286	130	130	15	-	-
500 ac	220	100	100	15	-	-
690 ac	132	60	45	15	-	-

Control circuits:

Electrical control circuits:

Kind of current	a.c
Rated frequency	50 Hz
Rated control circuit voltage U_c	- V
Rated control supply voltage U_s	- V
Rated impulse withstand voltage U_{imp}	- kV
Rated insulation voltage U_i	- V

Air-supply control circuits:

Rated supply pressure	– kPa
Limits of pressure	– kPa
Required volume for each closing operation	– m^3
Required volume for each opening operation	– m^3

Auxiliary circuits:

Rated operational voltage U_e	– V
Rated impulse withstand voltage U_{imp}	– kV
Rated insulation voltage U_i	– V
Rated frequency	– Hz
Rated operational current I_e	– A
Number of circuits	–
Number and kind of contact elements	–

Releases:

- Shunt release:

- Rated control circuit voltage U_c	- V
- Kind of current	a.c
- Rated frequency if a.c.	- Hz

- Undervoltage or no-voltage release

- Rated control circuit voltage U_c	– V
- Kind of current	–
- Rated frequency if a.c.	– Hz

- Over-current release:

Kind of release: ☐ electromagnetic ☒ electronic

- Short-circuit release

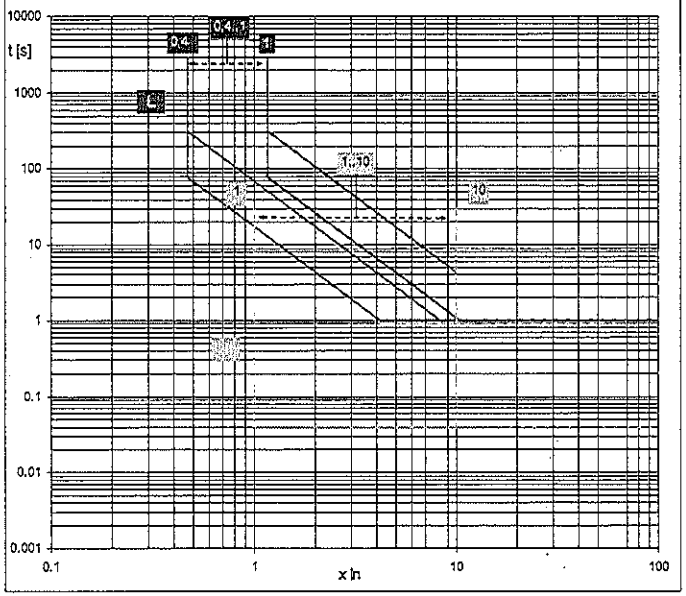
- instantaneous release	yes
- definite time-delay release	-
- Rated current I_n	1250 A
- Rated instantaneous short-circuit current setting I_i	-
- Kind of current	a.c.
- Rated frequency if a.c.	50-60 Hz
- Current setting (or range of settings)	1250 to 12500A
- Time setting (or range of settings)	- s

- Overload release (IEC 60947-1; 2.4.30):

- instantaneous release	-
- definite time-delay release	-
- inverse time-delay release	yes
dependent on ambient air temperature	-
independent of ambient air temperature	yes
- Reference temperature	40°C
- Rated current I_n	1250 A
- Kind of current	a.c.
- Rated frequency if a.c.	50-60 Hz
- Current setting (or range of settings)	500 to1250 A
- Time setting (or range of settings)	3 to 12 s at 6x1
- Time setting at 2 times I_R (on single pole)	- s

Time / current characteristics

T7 800/1000/1250/1600 PR231/P Functions L-I Trip curves



Note : Symbol explanation at page 6 / 39

PR231/P - Protection functions and parameterisations

Protection functions		Trip threshold	Trip curves(1)	Excluda-bility	Relation t = f(I)
L	Against overload with long inverse time delay trip and trip characteristic according to an inverse time curve (I2t= k) according to IEC 60947-2 Standard	I1 = 0.40...1 x In step = 0.04 x In Trip between 1.1...1.3 x I1	at 6 x I1 t1 = 3 - 12s Tolerance: ±10%	-	t = k/I2
I	Against short-circuit with istantaneous trip (selectable as an alternative to protection function S)	I3 = 1-1.5-2-2.5-3-3.5-4.5-5.5-6.5-7-7.5-8-8.5-9-10 x In Tolerance: ±10%	Instantaneous	-	t = k

1) These tolerances hold in the following conditions:
- self-powered trip unit at full power
- two or three-phase power supply

In conditions other than those considered, the following tolerances hold:

	Trip threshold	Trip time
S	± 10%	± 20%
I	± 15%	≤ 60ms

Integral fused circuit-breakers:
(Co-ordination with short-circuit protective devices)

Kind of protective devices	–
- Type of fuse	–
- Maximum operational voltage	– V
- Rated current I_n	– A
- Maximum prospective short-circuit peak current	– kA

Individual enclosure:

- Type	-
- Kind of material	–
- Degree of protection	–
- Inside dimensions	-
height	– mm
width	– mm
depth	– mm

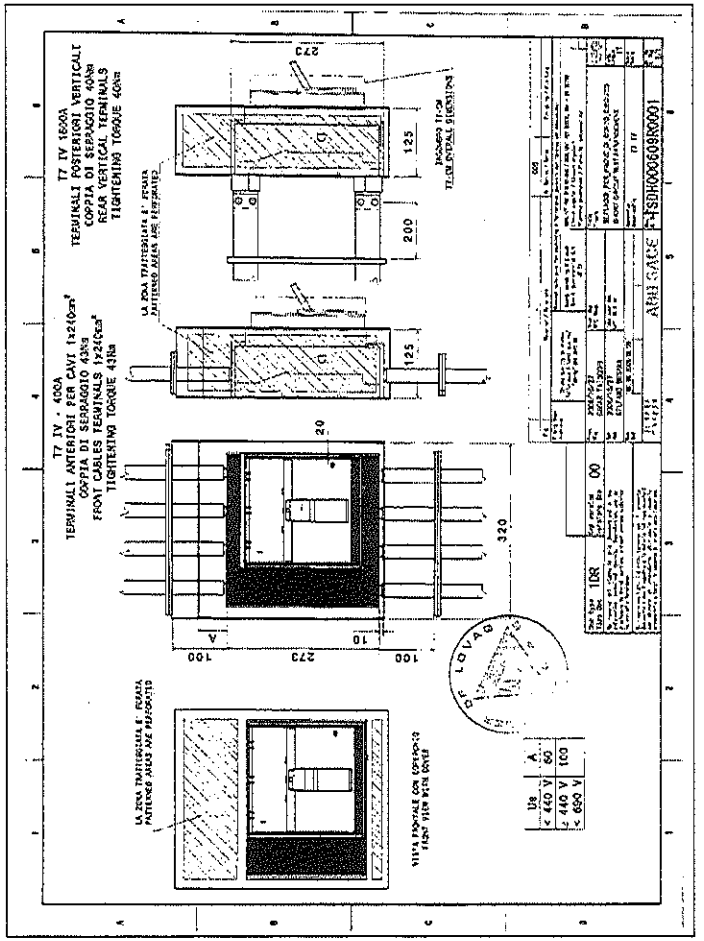
When no enclosure:

Safety perimeter defined:	refer to drawing at page 8 / 39
height	– mm
width	– mm
depth	– mm
Kind of screen (woven wire mesh, perforated metal, expanded metal)	refer to drawing at page 8 / 39 –
Size of holes (≤ 30 mm²)	refer to drawing at page 8 / 39
Distance during test	refer to drawing at page 8 / 39

Openings around the manual operating means:

Openings in the area of the manual operating means through which the arc chamber can be reached by a music wire of 0.25 mm diameter.	none

INSTALLATION INSIDE METAL SCREEN



List of samples under test

SAMPLE		Sequence	Ratings			Comments
No.	Identification No.		U_e (V)	I_n (A)	Specific ratings	
1	AH06113818	1	690	1250	1250	-

TEST SEQUENCE I

General performance characteristics

Test sequence I comprises the following tests:

Sub-clause	Test	form	Test Report Page No.
8.3.3.1	Tripping limits and characteristics	16 ÷ 26	11 ÷ 19
8.3.3.2	Dielectric properties		
	Verification of impulse withstand voltage	27	20
	Power-frequency withstand verification	28	21
	Verification of creepage distances	28	21
	Verification of leakage current (if applicable)	29	22
8.3.3.3	Mechanical operation and operational performance capability	30 ÷ 34	23 ÷ 27
8.3.3.4	Overload performance (if applicable)	35	-
8.3.3.5	Verification of dielectric withstand	36	29
	Verification of leakage current (if applicable)	29	30
8.3.3.6	Verification of temperature-rise	37 - 38	31
8.3.3.7	Verification of overload releases	39	32
8.3.3.8	Verification of undervoltage and shunt releases (if applicable)	40	33
8.3.3.9	Verification of main contact position (if applicable)	41 ÷ 42	34

Type test according to: IEC 60947-2
Test sequence I

Type: T7V 1250

Standard and clause	Kind of tests and requirements		Test values Results
8.3.3.1	**TEST OF TRIPPING LIMITS AND CHARACTERISTICS**		
60947-1 Table 9, 10 and 11	Cabling characteristics		
	Cable	- mm^2	- mm^2
	Bar	- x - mm	80 x 10 mm
	Number	-	1
	Length	- mm	500 mm
	Tightening torque		40 Nm
8.3.3.1.2	Opening under short-circuit conditions		
	Ambient air temperature	10...40 °C	23 °C
	Minimum current setting / Minimum time delay	1250 A / - s	
	Maximum current setting / Maximum time delay	12500 A / - s	
	Single or combination of phase pole(s)	1/2	
	Test current(s)	0.8 x 1250 / 12500 A	1000 / 10000 A
	Duration of current flow	≥ 200 ms	> 200 / > 200 ms
	No tripping		
	Test current(s)	1.2 x 1250 / 12500 A	1500 / 15000 A
	Duration of current flow	≤ 200 ms	41 / 39 ms
	Tripping		
	Combination of phase poles	2/3	
	Test current(s)	0.8 x 1250 / 12500 A	1000 / 10000 A
	Duration of current flow	≥ 200 ms	> 200 / > 200 ms
	No tripping		
	Test current(s)	1.2 x 1250 / 12500 A	1500 / 15000 A
	Duration of current flow	≤ 200 ms	44 / 41 ms
	Tripping		
	Combination of phase poles	3/1	
	Test current(s)	0.8 x 1250 / 12500 A	1000 / 10000 A
	Duration of current flow	≥ 200 ms	> 200 / > 200 ms
	No tripping		
	Test current(s)	1.2 x 1250 / 12500 A	1500 / 15000 A
	Duration of current flow	≤ 200 ms	40 / 43 ms
	Tripping		

Type test according to: IEC 60947-2
Test sequence I

Type: T7V 1250

Standard and clause	Kind of tests and requirements		Test values Results
8.3.3.1.2	**Tests on combinations of the neutral pole with the phase poles in the case of circuit-breakers having an neutral pole provided with an short-circuit release**		
60947-1 Table 9, 10 and 11	Cabling characteristics		
	Cable	- mm^2	- mm^2
	Bar	- x - mm	80 x 10 mm
	Number	-	1
	Length	- mm	500 mm
	Tightening torque		40 Nm
8.3.3.1.2	Opening under short-circuit conditions		
	Ambient air temperature	10...40 °C	23 °C
	Minimum current setting / Minimum time delay	1250 A / - s	
	Maximum current setting / Maximum time delay	12500 A / - s	
	Single or combination of poles	N/L1	
	Test current(s)	0.8 x 1250 / 12500 A	1000 / 10000 A
	Duration of current flow	≥ 200 / 200 ms	220 / 220 ms
	No tripping		
	Test current(s)	1.2 x 1250 / 12500 A	1500 / 15000 A
	Duration of current flow	≤ 200 / 200 ms	47 / 46 ms
	Tripping		

ВЯРНО С ОРИГИНАЛА

LOVAG	Test report No.: 07.053 Page 13 / 39
Type test according to: IEC 60947-2 Test sequence I	Type: T7V 1250

Standard and clause	Kind of tests and requirements		Test values Results
8.3.3.1.2	**Additional test of opening under short-circuit conditions on each phase pole individually**		
	Minimum current setting / Minimum time delay	1250 A / - s	
	Maximum current setting / Maximum time delay	12500 A / - s	
	Single pole tripping values given by manufacturer:		
8.3.3.1.2	Corrections factor k (for multiplied of current tripping value on two poles)		
	Correction factor for phase poles	k1 = -	
	neutral pole (if different to phase pole)	k2 = -	
	Phase pole 1		
	Test current(s)	1.2 x 1250 / 12500 A	1500 / 15000 A
	Duration of current flow	≤ 200 ms	44 / 40 ms
	Tripping		
	Phase pole 2		
	Test current(s)	1.2 x 1250 / 12500 A	1500 / 15000 A
	Duration of current flow	≤ 200 ms	42 / 42 ms
	Tripping		
	Phase pole 3		
	Test current(s)	1.2 x 1250 / 12500 A	1500 / 15000 A
	Duration of current flow	≤ 200 ms	48 / 45 ms
	Tripping		
	Neutral pole (if applicable)		
	Test current(s)	1.2 x 1250 / 12500 A	1500 / 15000 A
	Duration of current flow	≤ 200 ms	49 / 47 ms
	Tripping		

LOVAG	Test report No.: 07.053 Page 14 / 39
Type test according to: IEC 60947-2 Test sequence I	Type: T7V 1250

Standard and clause	Kind of tests and requirements		Test values Results
8.3.3.1.3 b)	**Inverse time-delay releases dependent on ambient air temperature**		
	Minimum current setting / Minimum time delay	.... A / .... s	
	Maximum current setting / Maximum time delay	.... A / .... s	
Table 6	Conventional time	.... h	
	Reference temperature		
	(according to the manufacturer's data)	.... °C	- °C
6.1.1.part1	Ambient temperature test room		
	(for electronic releases)	.... °C	
	Ambient air temperature	.... °C	- °C
	Correction factor at the minimum current setting	k1 = ...	
	Correction factor at the maximum current setting	k2 = ...	
	(k1 and k2 given by manufacturer)		
	Test at the minimum current setting		
	Conventional non-tripping current	k1 x 1.05 x .... A	- A
	No tripping	> .... min	- min
	Conventional tripping current	k1 x 1.3 x .... A	- A
	Operating time	≤ .... min	- min
	Test at the maximum current setting		
	Conventional non-tripping current	k2 x 1.05 x .... A	- A
	No tripping	> .... min	- min
	Conventional tripping current	k2 x 1.3 x .... A	- A
	Operating time	≤ .... min	- min

Standard and clause	Kind of tests and requirements		Test values Results
8.3.3.1.3 b)	**Inverse time-delay releases independent on ambient air temperature**		
	Minimum current setting / Minimum time delay	500 A / 3 s	
	Maximum current setting / Maximum time delay	1250 A / 12 s	
Table 6	Conventional time	2 h	
	Measurement 1:		
	Ambient air temperature	T_{ref} ± 2 °C	40 °C
	Reference temperature according to the manufacturer's data or standard (T_{ref})	40 °C	
7.2.1.2.4 b)	Conventional non-tripping current	1.05 x 500 / 1250 A	525 / 1312.5 A
	No tripping	> 2 h	> 2 h / >2 h
	Conventional tripping current	1.3 x 500 / 1250 A	650 / 1625 A
	Operating time	≤ 2 h	1 / 4 min
	Measurement 2:		
	Ambient air temperature	(T_{ref} -10) ± 2 °C or (T_{ref} +10) ± 2 °C	30 °C
	Reference temperature according to the manufacturer's data or standard (T_{ref})	40 °C	
7.2.1.2.4 b)	Correction factor k_1		
	k_1 = 0.3 %/K x | amb. air temp. - ref. temp. |	–	
7.2.1.2.4 b)	Conventional non-tripping current	(1.05 – k_1) x 500 / 1250 A	525 / 1312.5 A
	No tripping	> 2 h	> 2 h / > 2 h
	Conventional tripping current	(1.3 + k_1) x 500 / 1250 A	650 / 1312.5 A
	Operating time	≤ 2 h	1 / 4 min

Standard and clause	Kind of tests and requirements		Test values Results
8.3.3.1.3 b)	**Additional test: Time/current characteristics**		by arrangement
	Ambient air temperature		40 °C
	Reference temperature	40 °C	
	Correction factor at the minimum current setting	k1 = 1	
	Correction factor at the maximum current setting	k2 = 1	
	(k1 and k2 given by manufacturer)		
8.3.3.1.3 b)	Minimum current setting / Minimum time delay	500 A / 3 s	500 A / 3 s
	Maximum current setting / Maximum time delay	1250 A / 12 s	1250 A / 12 s
	With manufacturer agreement		
	Test at 2.5 times of current setting		
	Test at the minimum current setting	k1 x 2,5 x 500A	1250 A
	Operating time	from 15.5 s to 19 s	18 s
	Test at the maximum current setting	k2 x 2,5 x 1250 A	3125 A
	Operating time	from 62 s to 76 s	71 s

Standard and clause	Kind of tests and requirements		Test values Results
8.3.3.1	**TEST OF TRIPPING LIMITS AND CHARACTERISTICS** **For circuit-breakers having an neutral pole provided with an overload release**		
60947-1 Table 9, 10 and 11	Cabling characteristics (if not equal to phase poles) Cable Bar Number Length Tightening torque	- mm² - x - mm - - mm	- mm² 80 x 10 mm 1 500 mm 40 Nm
8.3.3.1.3	**Opening under overload conditions**		
	Ambient air temperature:	10...40 °C	40 °C
8.3.3.1.3 a)	**Instantaneous or definite time-delay releases**		
	Minimum current setting / Minimum time delay Maximum current setting / Maximum time delay	- A / - s - A / - s	
	Test current(s) Duration of current flow No tripping	0.9 x - / - A ≥ - / - s	- / - A - / - s
	Test current(s) Duration of current flow Tripping	1.2 x 1,1 x - / - ≤ - / - s	- / - A - / - s

Standard and clause	Kind of tests and requirements		Test values Results
8.3.3.1.3 b)	**Inverse time-delay releases** of the neutral pole		
	Minimum current setting / Minimum time delay Maximum current setting / Maximum time delay	500 A / 3 s 1250 A / 12 s	
Table 6	Conventional time	2 h	
	Releases dependent on ambient air temperature		
	Reference temperature (according to the manufacturer's data)	- °C	
6.1.1 part 1	Ambient temperature test room (for electronic releases)	- °C	
	Ambient air temperature	- °C	- °C
	Correction factor at the minimum current setting Correction factor at the maximum current setting (k1 and k2 given by manufacturer)	k1 = - k2 = -	
	Test at the minimum current setting Conventional non-tripping current No tripping Conventional tripping current Operating time	k1 x 1.05 x - A > - min k1 x 1,2 x 1.3 x - A ≤ - min	- / - A - / - h - / - A - / - min
	Test at the maximum current setting Conventional non-tripping current No tripping Conventional tripping current Operating time	k2 x 1.05 x - A > - min k2 x 1,2 x 1.3 x - A ≤ - min	- / - A - / - h - / - A - / - min
7.2.1.2.4 b)	**Releases independent of ambient air temperature**		
	Measurement 1: Ambient air temperature Reference temperature according to the manufacturer's data or standard (T_{ref})	T_{ref} ± 2 °C 40 °C	40 °C
	Conventional non-tripping current No tripping	1,05 x 500 / 1250 A > 2 h	525 / 1312.5 A > 2 / > 2 h
	Conventional tripping current Operating time	1.2 x 1,3 x 500 / 1250 A ≤ 2 h	780 / 1950 A 1 / 3 min

Standard and clause	Kind of tests and requirements	Test values Results
	Measurement 2:	
	Ambient air temperature (T_{ref} -10) ± 2 °C or (T_{ref} +10) ± 2 °C	30 °C
	Reference temperature (according to the manufacturer's data) 40 °C	
7.2.1.2.4 b)	Correction factor k_1:	
	k_1 = 0.3 %/K x | amb. air temp. - ref. temp. | -	
7.2.1.2.4 b)	Conventional non-tripping current (1.05 – k_1) x 500 / 1250 A	525 / 1312.5 A
	No tripping > 2 h	> 2 / > 2 h
	Conventional tripping current (1,2 x 1,3 + k_1) x 500 / 1250 A	780 / 1950 A
	Operating time ≤ 2 h	1 / 3 min
8.3.3.1.3 b)	**Additional test:** **Time/current characteristic** of the neutral pole overload release	by arrangement
	Ambient air temperature	40 °C
	Reference temperature 40 °C Correction factor at the minimum current setting k1 = 1 Correction factor at the maximum current setting k2 = 1 (k1 and k2 given by manufacturer)	
8.3.3.1.3 b)	Minimum current setting / Minimum time delay 500 A / 3 s Maximum current setting / Maximum time delay 1250 A / 12 s	500 A / 3 s 1250 A / 12 s
	With manufacturer agreement Test at 2.5 times of current setting	1250 A
	Test at the minimum current setting k1 x 2.5 x 500 A Operating time from 15.5 s to 19 s	1250A 17,5 s
	Test at the maximum current setting k2 x 2,5 x 1250 A Operating time from 62 s to 76 s	3125 A 71 s

Standard and clause	Kind of tests and requirements	Test values Results
8.3.3.2	**TEST OF DIELECTRIC PROPERTIES**	
60947-1 8.3.3.4.1 2)	**Verification of impulse withstand voltage** Tests 1.2 / 50 µs	
8.3.3.4.1 2) a)	Circuits incorporating solid-state devices disconnected ☒ No / ☐ Yes, if Yes	Page -
Table H.1, 12	Test voltage Main circuits 9,6 kV	9,6 kV
	Control circuits - kV	- kV
	Auxiliary circuits - kV	- kV
8.3.3.4.1 2) c)	Application of the test voltage 5 impulses per polarity	
i)	Main-poles to ground	
ii)	Between main-poles	
iii)	Control and auxiliary circuits (if rating is lower than main circuit)	
iv)	**Additional test across open contacts for equipment suitable for isolation**	
Table 14	Test voltage Main circuits 12.1 kV Application of the test voltage 5 impulses per polarity Across open main contacts	12.1 kV
iv)	**Test across open contacts for equipment <u>not</u> suitable for isolation**	
Table 12	Test voltage Main circuits - kV Application of the test voltage 5 impulses per polarity	- kV
8.3.3.2 iii)	Across open main contacts	

LOVAG	Test report No.: 07.053 Page 21 / 39
Type test according to: IEC 60947-2 Test sequence I	Type: T7V 1250

Standard and clause	Kind of tests and requirements			Test values Results
60947-1 8.3.3.4.1 3)	**Power-frequency withstand verification of solid insulation**			
8.3.3.4.1 3) c)	Circuits incorporating solid-state devices disconnected ☒ No / ☐ Yes, if Yes			Page -
b) i)	Power-frequency test			
	Test frequency		42 - 65 Hz	50 Hz
Table 12A	Test voltage	Main circuits	2200 V	2200 V
		Control- and auxiliary circuits	- V	- V
8.3.3.4.1 2) c)	Application of the test voltage		5 s	
i)	Main-poles to ground			
ii)	Between main-poles			
iii)	Control and auxiliary circuits (if rating is lower than main circuit)			
b) ii)	Alternative test with direct voltage			
Table 12A	Test voltage	Main circuits	- V	- V
		Control- and auxiliary circuits	- V	- V
8.3.3.4.1 2) c)	Application of the test voltage		5 s	
i)	Main-poles to ground			
ii)	Between main-poles			
iii)	Control and auxiliary circuits (if rating is lower than main circuit)			
60947-1 8.3.3.4.1. 7)	**Verification of creepage distances**			
Appendix G	Working voltage or rated insulation voltage		1000 V	
	Pollution degree		3	
	Material group		1	
	Minimum creepage distance		12.5 mm	96.6 mm

LOVAG	Test report No.: 07.053 Page 22 / 39
Type test according to: IEC 60947-2 Test sequence	Type: T7V 1250

Standard and clause	Kind of tests and requirements			Test values Results
	VERIFICATION OF LEAKAGE CURRENT			
8.3.3.2 iv)	Test sequence I (in new condition)		≤ 0.5 mA	0.11 mA
8.3.3.5	Test sequence I (after overload performance)		≤ 2 mA	- mA
8.3.4.3	Test sequence II		≤ 2 mA	- mA
8.3.5.3	Test sequence III		≤ 6 mA	- mA
8.3.6.5	Test sequence IV		≤ 2 mA	- mA
8.3.7.3	Test sequence V, stage 1		≤ 2 mA	- mA
8.3.7.7	Test sequence V, stage 2		≤ 6 mA	- mA
8.3.8.5	Combined test sequence		≤ 2 mA	- mA
C.3	Individual pole short-circuit test sequence I_{cu}		≤ 6 mA	- mA
H.3	Individual pole short-circuit test sequence I_{rr}		≤ 6 mA	- mA
L 7.2.2.3	Circuit-breaker CBIs Class X		≤ 6 mA	- mA
L 7.2.3.3	Circuit-breaker CBIs Class Y		≤ 6 mA	- mA
O 6.1.2	Circuit-breaker ICBs (sequence II / III)		≤ 2 / 6 mA	- / - mA
8.3.3.2 iv)	**Leakage current**			
	For circuit-breakers suitable for isolation having an operational voltage U_e greater than 50 V.			
	Test frequency		45 - 65 Hz	50 Hz
	Test voltage		1.1 x U_e 759 V	760 V
	Application of the test voltage - Main circuit of the circuit-breaker - Isolating contacts of a withdrawable unit (if applicable)			

Standard and clause	Kind of tests and requirements	Test values Results
8.3.3.3	**TEST OF MECHANICAL OPERATION AND OF OPERATIONAL PERFORMANCE CAPABILITY**	
8.3.3.3.2	**Construction and mechanical operation**	
8.3.3.3.2 a)	**Construction**	
7.1.1	**Withdrawable circuit-breakers**	
	A) Verification of isolating distances in the disconnected position	
	1. Main circuit and auxiliary circuit indicated as suitable for connection	
	Rated impulse withstand voltage U_{imp} - kV Pollution degree - Minimum clearance (inhomogeneous field) - mm Isolating distance of main circuit Isolating distance of auxiliary circuits	 - mm - mm
	2. Auxiliary circuit not connected to the main circuit	
	Rated impulse withstand voltage U_{imp} - kV Pollution degree - Minimum clearance (inhomogeneous field) - mm Isolating distance of auxiliary circuits	 - mm
	B) Verification of the indication of isolating contact position open closed	- -
	C) Impossibility to re-close with the withdrawable mechanism when the circuit-breaker is closed	-
	D) Impossibility to separate with the withdrawable mechanism when the circuit-breaker is closed	-

Standard and clause	Kind of tests and requirements	Test values Results
	E) Impossibility to close the circuit-breaker when the isolating contacts are not fully closed	-
	F) Impossibility to close the circuit-breaker when the withdrawable distance is less than the specified isolating distance	-
	G) The specified isolating distances cannot be inadvertently reduced	-
7.2.1.1.5	**Stored energy operating circuit-breaker**	
	- Verification of operating conditions of the device indicating the storing mechanism is fully charged	-
	- Verification of the direction of operation when the energy storing mechanism is manually operated	-
8.3.3.3.2 b)	**Mechanical operation**	
	- With the closing device energized (electrically, mechanically or manually), the opening order shall cause total tripping	P
	- With the tripping device actuated (electrically, mechanically or manually), a closing order remains ineffective	P
	- The circuit-breaker closed, a further closing order by a power-operated device, does not cause any anomaly	-
	- Opening time (if indicated) - ms	- ms
	- Closing time (if indicated) - ms	- ms

Standard and clause	Kind of tests and requirements		Test values Results
7.2.1.1.3	**Dependent power closing circuit-breaker**		
	Verification of operating in no-load condition	$U = 1.1 \times U_s$	- V
	opening time (if indicated)		- ms
	closing time (if indicated)		- ms
	Verification of operating in no-load condition	$U = 0.85 \times U_s$	- V
	opening time (if indicated)		- ms
	closing time (if indicated)		- ms
	Verification of closing time when the current established by the circuit-breaker is equal to its rated making capacity I_{cm}	$U = 0.85 \times U_s$	see test sequence II or III Page -
7.2.1.1.5	**Stored energy closing circuit-breaker**		
	Verification of operating of the stored energy closing mechanism	$U = 0.85 \times U_s$	- V
	opening time		- ms
	closing time		- ms
	Verification of operating of the stored energy closing mechanism	$U = 1.1 \times U_s$	- V
	opening time		- ms
	closing time		- ms
	Impossibility for the closing mechanism to operate when it is charged to slightly below the full charge		-

Standard and clause	Kind of tests and requirements		Test values Results
8.3.3.3.2 c)	**Undervoltage release**		
	Minimum / Maximum rated control supply voltage U_s	- / - V	- / - V
8.3.3.3.2 c) i)	Drop-out voltage		
	-Lower limit	$U \geq 0.35 \times U_{s\,max.}$	- V
	-Upper limit (at operational temperature of the circuit-breaker)	$U \leq 0.7 \times U_{s\,min.}$	- V
		$U \leq 0.7 \times U_{s\,max.}$	- V
ii)	Limits of operation		
	-Impossibility of closing by the operation of the actuator	$U = 0.30 \times U_{s\,max.}$	- V
	-Verification of closing by the operation of the actuator	$U = 0.85 \times U_{s\,min.}$	- V
iii)	Performance under overvoltage conditions		
	Verification of operating after the application of an overvoltage	$U = 1.1 \times U_{s\,max.}$	- V
	-Impossibility of closing by the operation of the actuator	$U = 0.30 \times U_{s\,max.}$	- V
	-Verification of closing by the operation of the actuator	$U \neq 0.85 \times U_{s\,min.}$	- V
8.3.3.3.2 d)	**Shunt release**		
	Minimum rated control supply voltage $U_{s\,min.}$	- V	
	Verification of operating at an ambient temperature of + 55 °C ± 2 °C -Tripping	$U = 0.7 \times U_{s\,min.}$	- V

Standard and clause	Kind of tests and requirements		Test values Results
8.3.3.3.3	**Operational performance capability without current**		
	Kind of release:		
	Shunt	☐	
	Undervoltage	☐	
	Number of closing operations with undervoltage release not energized (if applicable)	10	-
Table 8	Opening by release	5%	-
Column 3	Number of operating cycles	2500	2500
Column 2	Operating cycles per hour	20 /h	960 /h
	Opening by release	5%	-
8.3.3.3.4	**Operational performance capability with current**		
	Short-circuit release	min. setting	1250 A
	Overload release	max. setting	1250 A
	Circuit diagram		Page 33 / 39
	Maximum rated operational voltage $U_{e\,max.}$	690 V	690 V
	Rated current I_n	1250 A	1250 A
Table 11	Power factor	0.8	0.77
	Time constant	- ms	- ms
	Frequency	50 Hz	50 Hz
Table 8			
Column 2	Operating cycles per hour	20 /h	20 /h
	On-time		160 ms
Column 4	Number of operating cycles	500	500
8.3.3.3.5	**Additional test of operational performance capability without current for withdrawable circuit-breakers**		
	Number of operating cycles	100	-
	Visual inspection of isolating contacts, withdrawal mechanism and interlocks		-

Standard and clause	Kind of tests and requirements		Test values Results
8.3.3.4	**OVERLOAD PERFORMANCE**		
	Rated current I_n	- A	
	Current setting Overload release (maximum)	- A	
	Short-circuit release (maximum)	- A	
8.3.2.1	Control supply voltage	0.85 x U_s - V	- V
	Maximum rated operational voltage $U_{e\,max.}$	- V	
Table 12	Recovery voltage	1.05 x $U_{e\,max.}$	- V
	reduced voltage on automatic opening according to note 2)		- V
Table 8 Column 2	Number of operating cycles per hour	- / h	- / h
60947-1 8.3.3.5.2	Circuit diagram		Page -
8.3.2.1	Safety area	form 0	Page -
Table 12	Alternating current:		
	Test current	6 x I_n - A	- A
Table 11	Power factor	-	-
	Frequency	45 – 62 Hz	- Hz
Table 12	Direct current:		
	Test current	2.5 x I_n - A	- A
Table 11	Time constant	- ms	- ms

Test method	Number of operations manual	automatic
☐ **Standard**	9	3
☐ **Reduced voltage on automatic opening according to note 2)**	12	3
☐ **Opening caused by short-circuit releases**	-	12

On-time on manual operation	min./max.	- / - ms
Melting of the fusible element	Yes/No	-

LOVAG	Test report No.: 07.053 Page 29 / 39
Type test according to: IEC 60947-2 Test sequence	Type: T7V 1250

Standard and clause	Kind of tests and requirements	Test values Results
	VERIFICATION OF DIELECTRIC WITHSTAND	
8.3.3.5	Test sequence I	
8.3.4.3	Test sequence II	
8.3.5.3	Test sequence III	
8.3.6.5	Test sequence IV	
8.3.7.3	Test sequence V, stage 1	
8.3.7.7	Test sequence V, stage 2	
8.3.8.5	Test sequence VI, combined test sequence	
B.10.3.1	Test sequence B.II	
A.5	Verification of discrimination	
A.6.3	Verification of back-up protection	
C.3	Individual pole short-circuit test sequence	
H.3	Test sequence for circuit-breakers for IT-systems	
L.7.2.2.3	Circuit-breaker CBIs Class X	
L 7.2.3.3	Circuit-breaker CBIs Class Y	
O.6.1.2	Circuit-breaker ICBs (sequence II / III)	
60947-1 8.3.3.4.1 3)	**Power-frequency withstand verification**	
	Circuits incorporating solid-state devices disconnected ☒ No / ☐ Yes, if Yes	Page -
	Test frequency 42 - 65 Hz	50 Hz
	Test voltage $2 \times U_e$, min. 1000 V 1380 V	1380 V
8.3.3.2.2 a)	Application of the test voltage 5 s -Main circuit of the circuit-breaker -Isolating contacts of the withdrawable unit (if applicable) - Insert of withdrawable unit - Withdrawable unit (base) - Combination of base and insert	

Test laboratory: ACAE IA.01 R. Ghanem TRF IEC/EN 60947-2 Ed. 4.0 form 36

Authorized representative Date 08.04.14

LOVAG	Test report No.: 07.053 Page 30 / 39
Type test according to: IEC 60947-2 Test sequence	Type: T7V 1250

Standard and clause	Kind of tests and requirements		Test values Results
	VERIFICATION OF LEAKAGE CURRENT		
8.3.3.2 iv)	Test sequence I (in new condition)	≤ 0.5 mA	- mA
8.3.3.5	Test sequence I (after overload performance)	≤ 2 mA	0.1 mA
8.3.4.3	Test sequence II	≤ 2 mA	- mA
8.3.5.3	Test sequence III	≤ 6 mA	- mA
8.3.6.5	Test sequence IV	≤ 2 mA	- mA
8.3.7.3	Test sequence V, stage 1	≤ 2 mA	- mA
8.3.7.7	Test sequence V, stage 2	≤ 6 mA	- mA
8.3.8.5	Combined test sequence	≤ 2 mA	- mA
C.3	Individual pole short-circuit test sequence I_{cu}	≤ 6 mA	- mA
H.3	Individual pole short-circuit test sequence I_{cf}	≤ 6 mA	- mA
L.7.2.2.3	Circuit-breaker CBIs Class X	≤ 6 mA	- mA
L.7.2.3.3	Circuit-breaker CBIs Class Y	≤ 6 mA	- mA
O 6.1.2	Circuit-breaker ICBs (sequence II / III)	≤ 2 / 6 mA	- / - mA
8.3.3.2 iv)	**Leakage current**		
	For circuit-breakers suitable for isolation having an operational voltage U_e greater than 50 V.		
	Test frequency	45 - 65 Hz	50 Hz
	Test voltage	1.1 x U_e 759 V	760 V
	Application of the test voltage - Main circuit of the circuit-breaker - Isolating contacts of a withdrawable unit (if applicable)		

Test laboratory: ACAE IA.01 R. Ghanem TRF IEC/EN 60947-2 Ed. 4.0 form 29

Authorized representative Date 08.04.14

Standard and clause	Kind of tests and requirements		Test values Results
8.3.3.6	**VERIFICATION OF TEMPERATURE-RISE**		
8.3.2.5	**Temperature-rise test**		
60947-1 8.3.3.3.1	Ambient temperature	10...40 °C	21.6 °C
	Main circuits		
60947-1 8.3.3.3.4	Conventional thermal current I_{th}	1250 A	1250 A
	Conventional thermal current for enclosure I_{the}	- A	- A
	Conventional thermal current of the neutral pole	- A	- A
60947-1 Table 9, 10 and 11	Cabling characteristics		
	Phase poles		
	Cable	- mm^2	- mm^2
	Bar	100 x 5 mm	50 x 10 mm
	Number	2	2
	Length	3000 mm	3000 mm
	Tightening torque		40 Nm
	Neutral pole (if applicable)		
	Cable	- mm^2	- mm^2
	Bar	- x - mm	- x - mm
	Number	-	-
	Length	- mm	- mm
	Tightening torque		- Nm
	Arrangement: ☒ 3 phase or ☐ poles in series		
Table 7	Temperature-rise limits		
	-Terminals	≤ 80 K	61.6 K
	-Manual operating means:		
	metallic	≤ - K	- K
	non metallic	≤ 35 K	7 K
	-Parts intended to be touched:		
	metallic	≤ - K	- K
	non-metallic	≤ 50 K	8.5 K
	-Parts, which need not to be touched:		
	metallic	≤ - K	- K
	non-metallic	≤ 60 K	36 K

Standard and clause	Kind of tests and requirements		Test values Results
	VERIFICATION OF OVERLOAD RELEASES		
8.3.3.7	Test sequence I	after 8.3.3.6	
8.3.4.5	Test sequence II	after 8.3.4.4	
8.3.8.7	Test sequence VI	after 8.3.8.6	
	Tripping test		
	Time interval to previous test of temperature-rise (if applicable)		- min
60947-1 Table 9, 10 and 11	Cabling characteristics		
	Cable	- mm^2	- mm^2
	Bar	- x - mm	- x - mm
	Number	-	-
	Length	- mm	- mm
	Tightening torque		- Nm
	Arrangement: ☒ 3 phase or ☐ poles in series		
	Reference temperature	20-40°C ± 2 °C	
	Ambient temperature		21.6 °C
	Correction factor k (k = 1 for releases independent of ambient temperature)		-
	Current setting value	1250 A	1250 A
	Test current Phase poles		
	k x 1.45 x current setting value or tripping current according to the manufacturer's temperature/current data	1812.5 A	1812.5 A
	(for releases dependent on ambient temperature)	- A	- A
Table 6	Tripping time	≤ 120 min	3 min
	Neutral pole (if applicable)		
	k x 1.45 x current setting value or tripping current according to the manufacturer's temperature/current data	- A	- A
	(for releases dependent on ambient temperature)	- A	- A
	Tripping time	≤ - min	- min

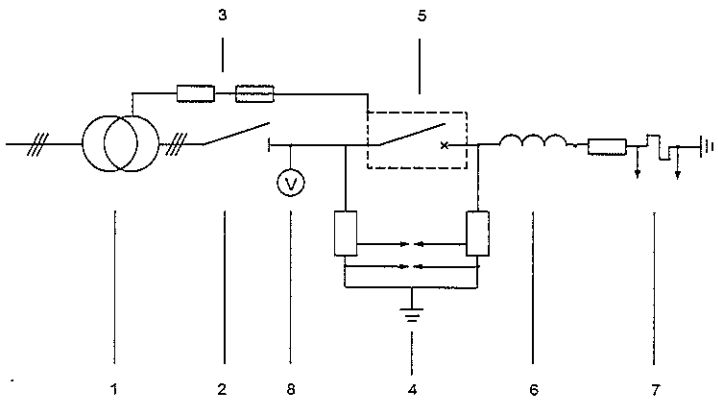
Standard and clause	Kind of tests and requirements	Test values Results
8.3.3.8	**VERIFICATION OF UNDER-VOLTAGE AND SHUNT RELEASES**	
8.3.3.3.2 c)	**Under-voltage releases**	
	Ambient temperature	- °C
	Minimum / Maximum rated control supply voltage U_s - / - V	
	Drop-out-voltage $0.35 \times U_{s\,max.} \leq U_{trip} \leq 0.70 \times U_{s\,min.}$	- V
8.3.3.3.2 d)	**Shunt releases**	
	Ambient temperature	- °C
	Minimum rated control supply voltage U_s - V	
	Verification of operating -Tripping $U = 0.70 \times U_{s\,min.}$	- V

Standard and clause	Kind of tests and requirements	Test values Results
8.3.3.9	**VERIFICATION OF THE MAIN CONTACT POSITION**	
	For circuit-breakers suitable for isolation having an operational voltage U_e greater than 50 V.	
60947-1 8.2.5.2.1	**Dependent and independent manual operation**	
60947-1 Figure 16	Type of actuator	-
8.2.5.2	Determination of the normal actuator opening force (F)	80 N
	Fixing of the moving contact in pole	right
Table 17	Test force with contact kept close (3 x F; not less than the minimum nor more than the maximum given in table 17 corresponding to the type of actuator)	240 N
	Test duration 10 s	10 s
8.2.5.3	**Condition of equipment during and after test**	
	The actuator cannot be locked in the OFF-Position while test force is applied. Yes/No	-
	After the test, when the test force is no longer applied, the actuator being left free, the open position is not indicated. Yes/No	yes
	There is no damage to the equipment such as to impair its normal operation. Yes/No	yes

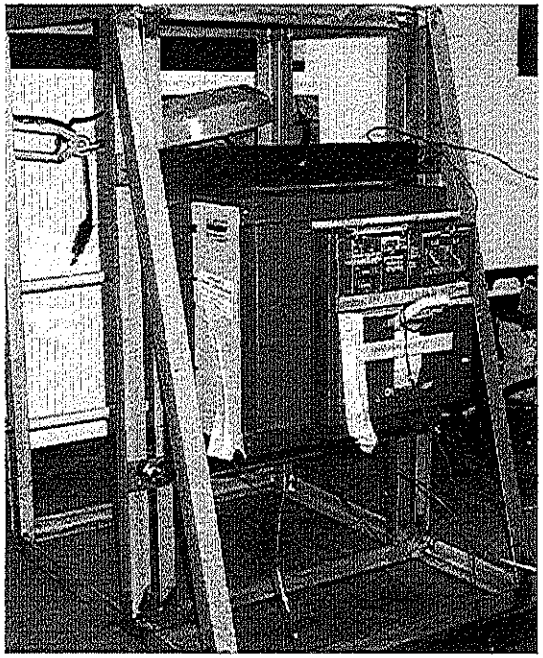
The instruments have an measurement uncertainty like follow :

Quantity	
Voltage	≤ ±2.5% by transient recorders < ±1.5% by multimeters or similar ≤ ±2.5% for dielectric test
Current	≤ ±2.5%
Time	< ±1%
Force	< ±1 %
Torque	< ±5%
Resistance	< ±3%
Temperature	±2°C up to 100°C ±2% above 100°C
Linear dimensions	±0,05 mm
Relative humidity	≤±5% in the range 20% ÷ 95% RH

CIRCUIT DIAGRAM TYPE S



1 - Three-phase transformer
2 - Short-circuit making switch
3 - Device for the detection of fault currents
4 - Dividers for the arcing voltage measurement
5 - Apparatus under test
6 - Load (reactors and resistances)
7 - Non inductive shunts for current measurement
8 - Voltmeter for voltage measurement



DOMANDA DI CERTIFICAZIONE LOVAG/ACAE O ACAE
SECONDO IEC 60947-2
DOCUMENTI DI IDENTIFICAZIONE DELL'APPARECCHIO DA CERTIFICARE

Enclosed 2/C
Pagina 1 of 2
(*)Pratica N° 07.053

DESIGNAZIONE DELL'APPARECCHIO T7V 1250 4p PR231/P LI

Disegno no	Descrizione	Indice di modifica	Data
1SDH000529R0101	Assembly drawing	N0100	2006-07-28
1SDH000509R0001	Instruction leaflet	L3101	2006-12-15
RA0651001	Circuit breaker frame assembly	L3210	2007-03-15
	Material list		
RA3310001	Cane	L3110	2007-01-04
RA3311501	Cover	L3110	2007-01-04
	Material list		
RA3258001	Operating mechanism spring	L2761	2006-05-25
RA0070001	Arc chamber	L3062	2006-11-20
	Material list		
RA3200401	Operating mechanism	L2926	2006-07-14
	Material list		
RA3334603	Moving contact assembly	L2761	2006-02-24
	Material list		
RA3413001	Moving contact plate	L3004	2006-05-26
RA4087804	Fixed contact	L3067	2006-02-20
	Material list		
RA4021002	Fixed contact plate	L2756	2006-02-24
RA3343601	C.T. Assembly	L2777	2006-03-09
	Material list		
RA3460802	Tripping device assembly	L2901	2006-08-30
	Material list		
RAR398/012	T7V 1250A Label	L2929	2006-07-10
RA3653804	Rear vertical term. assembly	L3094	2006-12-06
	Material list		
1SDH000509R0001	Short circuit test arrangements	N0188	2006-06-09
RC1163001	Relè PR231/P	L2902	2006-08-04
RL1058001	Protection board pos	L2909	2006-08-29
1SDL000181R0027	PR231 Tripping characteristic		

Il richiedente il certificato garantisce che i disegni qui elencati corrispondono esattamente al prodotto in prova

Data

Firma richiedente

Nota:per la compilazione di questa scheda vedere pagina 2

(*): Numero assegnato da ACAE

ВЯРНО С ОРИГИНАЛА

129

ACAE
ASSOCIAZIONE PER LA CERTIFICAZIONE DELLE APPARECCHIATURE ELETTRICHE
Via Tito Livio, 5 - 24123 - BERGAMO (Italy)
tel. +39 035 4175244 fax. + 39 035 453 4662 e-mail: acaecert@tin.it

LOVAG

Certificate
of Conformity

LOVAG-Certificate No. IT 08.018

Apparatus
Four poles circuit breaker 690 V (U_{ie}) - 1000 V (U_i) - 8 kV (U_{imp}) - 1250 A (I_{nA}) - 50/60 Hz - I_{cu} / I_{cs} 200 kA at 230V - I_{cu} 45 kA at 690V - I_{cs} 50 kA at 690V - I_{cs} 15 kA at 690V with microprocessor based overcurrent releases: PR33 : P

Designation

T7V 1250

Manufacturer or responsible vendor
ABB S.p.A. - ABB SACE Division
Via Baron, 35 - 24123 Bergamo (Italy)

Tested for: ABB S.p.A. - ABB SACE Division
Tested by: ACAE Laboratory IA 01
The apparatus, constructed in accordance with the description mentioned in the Test Report listed on this Certificate has been subjected to the series of proving tests in accordance with IEC 60947-2 (2006) EN 60947-2 (2006).
Test sequence: Annex H
at 690 V - 15 kA (1.2xMax current setting of short time delay release (12.5 kA)

The results are shown in the Test Report in accordance to LOVAG. The values obtained and the general performance are considered to comply with the above Standard(s) and to justify the characteristic assigned by the manufacturer as stated below
Utilization category B
Suitable for isolation

U_e 690 V 50/60 Hz I_{nA} 1250 A I_{cs} 15 kA

This document includes Report No. 08.005
Issue Date. 2008.04.16

Responsible Certification Body:ACAE

SINCERT

Mauro Marchi
Authorized Signature
Date. 2008.04.17

LOVAG CERTIFICATES

LOVAG	is the Low Voltage Agreement Group which is a Mutual Agreement Group of Certification Bodies founded in 1991 which has achieved a high level of competence in testing and certification of low voltage equipment. LOVAG's main purpose as an Agreement Group shall be for the mutual recognition of the test reports and/or certificates of conformity by its signatories.
Membership	LOVAG presently has seven signatories to the Agreement: ACAE (Italy), ALPHA (Germany), Applus+CTC (Spain), ASEFA (France), Intertek Semko AB (Sweden), SGS Belgium NV - Division SGS CEBEC (Belgium), and VEIKI-VNL (Hungary), and involves around 40 European Testing Laboratories.
Certificates	LOVAG Certificates are issued by the signatory bodies to the Agreement using test reports and certificates in a common and recognisable format in the market. They are recognised and accepted in the European Economic Area and elsewhere in the world.
Test Instructions	LOVAG uses common LOVAG Test Instructions for each of the International and European Standards covered by the Agreement and signatories to the Agreement abide by these when testing for LOVAG Certification.
Qualifications	All signatory bodies to the Agreement are accredited and/or assessed to EN 45011 (ISO/IEC Guide 65) and their laboratories are accredited and/or assessed to EN ISO/IEC 17025.

For further information contact your local certification body from the list below or contact the Secretariat of LOVAG at: ALPHA e.V., Stresemannallee 19, D-60596 Frankfurt am Main, Phone: + 49 69 9620 6343, Fax : + 49 69 9620 6344, e-mail: secretariat@lovag.net

LIST OF LOVAG SIGNATORIES:

ACAE
Via Tito Livio 5
I-24123 Bergamo
ITALY
Fax: + 39 035 453 4662
e-mail: acaecert@tin.it

SGS Belgium NV - Division SGS CEBEC
Avenue Van Kalken 9A Box 1
B-1070-Brussels
BELGIUM
Fax: + 32 2 556 00 36
e-mail: sales.cebec@sgs.com

ALPHA e. V.
Stresemannallee 19
D-60596 Frankfurt am Main
GERMANY
Fax: + 49 69 9620 6344
e-mail: office@alpha-cert.de

Intertek Semko AB
Box 1103
Torshamnsgatan 48
SE-164 22 Kista
SWEDEN
Fax: + 46 8 750 4520
e-mail: lovag@semko.se

Applus+CTC
Campus UAB
E-08193 Bellaterra
(Barcelona) SPAIN
Fax: + 34 93 567 20 01
e-mail: emargenat@appluscorp.com

VEIKI-VNL Electric Large Laboratories, Ltd.
Vasgolyo u. 2-4
H-2135 Budapest
HUNGARY
Fax: + 36 1 [illegible]
e-mail: [illegible]

ASEFA
35 av du general leclerc
F-92260 Fontenay-aux-roses
FRANCE
Fax: + 33 1 40 95 82 18
e-mail: asefa@clcm.fr

Test Report No. 08.005

Test laboratory:	ACAE IA.01
	I – 24123 Bergamo
Client:	ABB S.p.A.
Manufacturer:	ABB S.p.A.
Test object:	Low voltage molded case circuit-breaker series TMAX
Type designation:	T7V 1250
Date(s) of test(s):	from 2008.02.01 to 2008.02.04
Test specification:	IEC 60947-2:2006 EN 60947-2:2006
Test sequence(s):	Annex H
Test results:	Annex H at 690V found in compliance with rated characteristics

The Record of Proving Test consists of:

31 pages LOVAG test report forms	- oscillograms
- other pages	- drawings
- diagrams	- photographs

Date of issue: 2008.04.16

Responsible Test Laboratory
M. Bortoli

Signatures: .R.Oprandi
(Name, function and signature of authorized representative)

ACAE Inspector
M. Marchi

Note:
The test result relates only to the items tested.
The test report shall not be reproduced except in full without the written approval of the test laboratory.

Description and characterization of the test object

Characteristics

Type of circuit-breaker:

Number of poles	4
Kind of current	a.c.
Number of phases	3
Rated frequency	50÷60 Hz
Utilization category	B
Reference temperature	40 °C
Suitability for isolation	yes
Pollution degree	3
Material group	I

Rated and limiting values: (according to test volume)

Main circuit:

Rated impulse withstand voltage U_{imp}	8 kV
Rated insulation voltage U_i	1000 V
Conventional thermal current I_{th} / I_{the}	1250 / - A
Rated current I_n	1250 A
Rated current in the neutral pole	1250 A

Short-circuit characteristics:

U_e/V	I_{cm}/kA	I_{cu}/kA	I_{cs}/kA	I_{cw}/kA	I_{DU}/kA	I_{IT}/kA
230	440	200	200	15	-	-
415	330	150	150	15	-	-
440	286	130	130	15	-	-
500	220	100	100	15	-	-
690	132	60	45	15	-	15

Control circuits:

Electrical control circuits:

Kind of current	-
Rated frequency	- Hz
Rated control circuit voltage U_c	- V
Rated control supply voltage U_s	- V
Rated impulse withstand voltage U_{imp}	- kV
Rated insulation voltage U_i	- V

Air-supply control circuits:

Rated supply pressure	- kPa
Limits of pressure	- kPa
Required volume for each closing operation	- m^3
Required volume for each opening operation	- m^3

Auxiliary circuits:

Rated operational voltage U_e	- V
Rated impulse withstand voltage U_{imp}	- kV
Rated insulation voltage U_i	- V
Rated frequency	- Hz
Rated operational current I_e	- A
Number of circuits	-
Number and kind of contact elements	-

Releases:

- Shunt release:

- Rated control circuit voltage U_c	- V
- Kind of current	-
- Rated frequency if a.c.	- Hz

- Undervoltage or no-voltage release

- Rated control circuit voltage U_c	- V
- Kind of current	-
- Rated frequency if a.c.	- Hz

- Over-current release:

Kind of release: ☐ electromagnetic ☒ electronic

- Short-circuit release

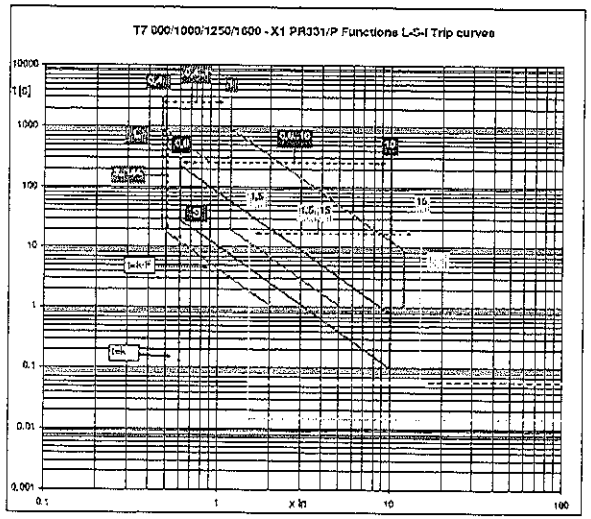
- instantaneous release	Yes
- definite time-delay release	-
- Rated current I_n	400-1250 A
- Rated instantaneous short-circuit current setting I_i	- A
- Kind of current	a.c.
- Rated frequency if a.c.	50÷60 Hz
- Current setting (or range of settings)	600A÷6000A - 1875A÷18750A
- Time setting (or range of settings)	- s

- Overload release (IEC 60947-1; 2.4.30):

- instantaneous release	-
- definite time-delay release	-
- inverse time-delay release	Yes
dependent on ambient air temperature	-
independent of ambient air temperature	Yes
- Reference temperature	40 °C
- Rated current I_n	400-1250 A
- Kind of current	a.c.
- Rated frequency if a.c.	50÷60 Hz
- Current setting (or range of settings)	160A÷400A – 500A÷1250A
- Time setting (or range of settings)	3÷144 s
- Time setting at 2 times I_n (on single pole)	≤ 144 s

Time / current characteristics

Type designation: ABB SACE PR 331/P – L S I overcurrent release



Time / current characteristics

Type designation: ABB SACE PR 331/P – L S I overcurrent release

PR331/P - Protection functions and parameterisations

Protection functions		Trip threshold	Trip curves(1)	Excludability	Relation t = f(I)
L	Against overload with long inverse time-delay trip and trip characteristic according to an inverse time curve (I2t=k) according to the IEC 60947-2 Standard	I1 = 0.40....1 x In step = 0.025 x In Trip between 1.05 ... 1.2 x I1	at 3 x I1 t1 = 3 - 12 - 24 - 36 - 48 - 72 - 108 - 144s Tolerance: ±10% up to 6 x In ±20% above 6 x In	-	t = k/I2
S	Against short-circuit with short inverse time-delay trip and trip characteristic with inverse time (I2t=k) or with definite time	I2 = 0.6 - 0.8 - 1.2 - 1.8 - 2.4 - 3 - 3.6 - 4.2 - 5 - 5.8 - 6.6 - 7.4 - 8.2 - 9 - 10 x In Tolerance: ±7% up to 4 x In ±10% above 4 x In	at 10 x In t2 = 0.1....0.8s step = 0.1s Tolerance: min (±10%, ±40ms)	n	t = k/I2
		I2 = 0.6 - 0.8 - 1.2 - 1.8 - 2.4 - 3 - 3.6 - 4.2 - 5 - 5.8 - 6.6 - 7.4 - 8.2 - 9 - 10 x In Tolerance: ±7% up to 4 x In ±10% above 4 x In	t2 = 0.1....0.8s step = 0.1s Tolerance: ±15% up to 4 x In ±20% above 4 x In	n	t = k
I	Against short-circuit with adjustable instantaneous trip	I3 = 1.5-2-3-4-5-6-7-8-9-10-11-12-13-14-15 x In(2) Tolerance: ±10%	Instantaneous ≤ 30ms	n	t = k

1) These tolerances hold in the following conditions:
- self-powered trip unit at full power and/or auxiliary supply
- two or three-phase power supply

In conditions other than those considered, the following tollerances hold:

	Trip threshold	Trip time
S	± 10%	± 20%
I	± 15%	60ms

2) For T7 In = 1250 A/1600 A => I3max = 12 x In

Integral fused circuit-breakers:
(Co-ordination with short-circuit protective devices)

Kind of protective devices	-
- Type of fuse	-
- Maximum operational voltage	- V
- Rated current I_n	- A
- Maximum prospective short-circuit peak current	- kA

Individual enclosure:

- Type	-
- Kind of material	-
- Degree of protection	-
- Inside dimensions	-
height	- mm
width	- mm
depth	- mm

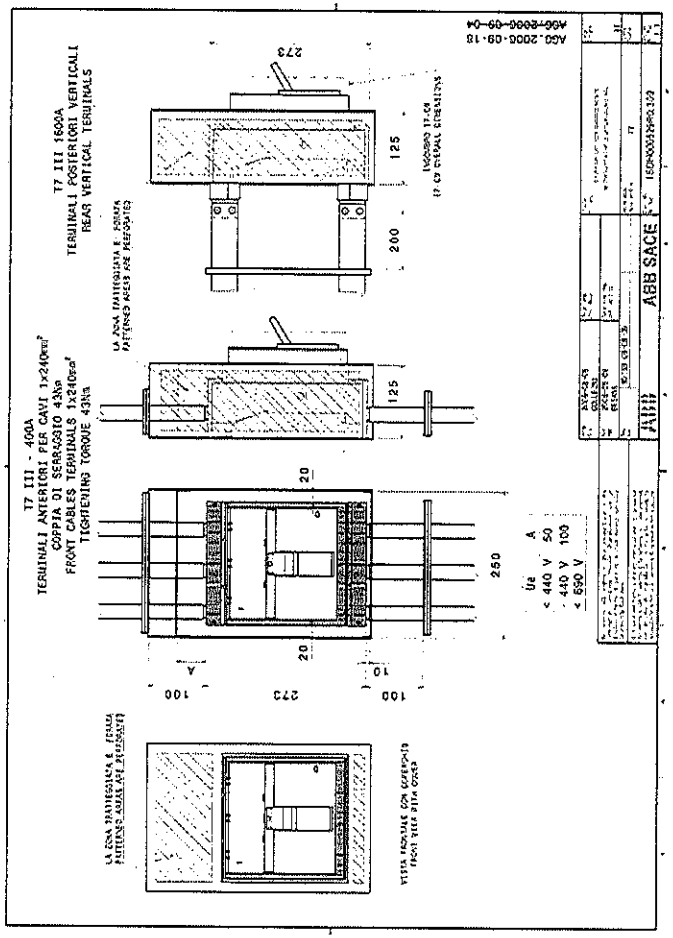
When no enclosure:

Safety perimeter defined:	refer to drawing at page 8 / 31
height	- mm
width	- mm
depth	- mm
Kind of screen (woven wire mesh, perforated metal, expanded metal)	refer to drawing at page 8 / 31 -
Size of holes (≤ 30 mm²)	refer to drawing at page 8 / 31
Distance during test	refer to drawing at page 8 / 31

Openings around the manual operating means:

Openings in the area of the manual operating means through which the arc chamber can be reached by a music wire of 0.26 mm diameter.	none

INSTALLATION INSIDE METAL SCREEN



List of samples under test

SAMPLE		Sequence	Ratings			Comments
No.	Identification No.		U_e (V)	I_n (A)	Specific ratings	
1	AL01142923	Annex H	690	1250	15kA	

TEST SEQUENCE FOR CIRCUIT-BREAKERS FOR IT-SYSTEMS

Performance of circuit-breakers for use on IT-systems

T7V 1250 serial number AL01142923

Test sequence for circuit-breakers for IT-systems comprises the following tests:

Sub-clause	Test	form	Test Report Page No.
H.2	Individual pole short-circuit (I_{IT})	151 + 120	11+15
	Additional sequence of short-circuit operations on four-pole circuit-breakers (if applicable)	53 - 54	-
H.3	Verification of dielectric withstand	36	16
	Verification of leakage current (if applicable)	29	17
H.4	Verification of overload releases	51	18

LOVAG		Test report No.: 08.005 Page 11 / 31	
Type test according to: IEC 60947-2; Annex H Test sequence H		Type: T7V 1250	
Standard and clause	Kind of tests and requirements		Test values Results
H.2	**INDIVIDUAL POLE SHORT-CIRCUIT (I_m)**		
	Maximum rated operational voltage for application on IT-systems $U_{e\,max.}$	690 V	
	Recovery voltage	1.05 x U_e	726 V
	Maximum current setting of (a) instantaneous release	- A	
	or, in the absence of such a release, (b) short-time delay release	12500 A	
	or, if applicable (c) definite time delay release	- A	
	Test current: 1,2 times max. value of (a) ☐, (b) ☒ or (c) ☐		15000 A
Table 10	Setting of adjustable overcurrent releases overload releases	maximum	1250 A
	short-circuit releases	maximum	11250 A
Table 11	Power factor	0,3	0.3
	Frequency	50 Hz	50 Hz
8.3.2.1	Control supply voltage	0.85 x U_s - V	- V
7.2.1.1.3	Maximum value of the closing time		- ms
	Sequence of operation	O - t - CO	O - t - CO
	Circuit diagram		Page 20 / 31
	Calibration of the test circuit	form 247	Page 12 / 31
	Safety area	form 6	Page 7 / 31
	Installation of the material tested	form 6	Page 7 / 31
	Energization direction	Top/Bottom	Top
8.3.2.1	Smallest individual enclosure (if applicable) Type	-	
	Kind of material	-	
	Inside dimensions (H x W x D)	- x - x - mm	
60947-1 ~~Table 9, 10~~ and 11	Cabling characteristics Cable	- mm^2	- mm^2
	Bar	100 x 5 mm	50 x 10mm
	Number	2	2
	Length supply side	500 mm	500 mm
	load side	250 mm	250 mm
	Tightening torque		40 Nm

Test laboratory: ACAE IA.01 — R. Gmondi — Authorized representative — Date 2008.04.16 — TRF IEC/EN 60947-2 Ed. 4.0 form 151

LOVAG		Test report No.: 08.005 Page 12 / 31	
Type test according to: IEC 60947-2		Type: T7V 1250	
Standard and clause	Kind of tests and requirements		Test values Results
60947-1 8.3.4.1.5	**CALIBRATION OF THE TEST CIRCUIT**		
	Oscillogram		Page 22 / 31
	Applied voltage		726 V
	Frequency		50 Hz
	☒ **Short-circuit making/breaking current**		
	r.m.s. current value	I_1	15.9 kA
		I_2	- kA
		I_3	- kA
	Average r.m.s. value	$I\varnothing$	19.6 kA
	at		20 ms
	Peak current value	$\hat{\imath}$	31.2 kA
	Power factor		0.29
	☐ **Short-time withstand current**		
	r.m.s. current value	i_1	- kA
		i_2	- kA
		i_3	- kA
	Average r.m.s. value		- kA
	at		- ms
	Peak current value		- kA
	Power factor		-
	Current-flow time		- ms
	Joule integral	Ph_1	- A^2s
		Ph_2	- A^2s
		Ph_3	- A^2s
	Average value		- A^2s

Test laboratory: ACAE IA.01 — R. Gmondi — Authorized representative — Date 2008.04.16 — TRF IEC/EN 60947-2 Ed. 4.0 form 247

LOVAG		Test report No.: 08.005 Page 13 / 31	
Type test according to: IEC 60947-2 Test sequence H		Type: T7V 1250	
Standard and clause	Kind of tests and requirements		Test values Results
	Test carried out on circuit-breaker pole		Ph1
	OPERATION „O"		
	Oscillogram		Page 23 / 31
	Applied voltage		726 V
	Peak current value		30.7 kA
	Total duration		21.3 ms
	Recovery voltage (phase to phase)	U_r (- / -)	726 V
	Ratio between U_r and U_e	U_r/U_e	1.05
	Joule integral		6.61×10^6 A^2s
	Melting of the fusible element	Yes/No	No
	Holes in the PE-sheet (if applicable)	Yes/No	-
	Cracks observed	Yes/No	No
	If Yes		Page -
	Time interval between operations	≥3 min	3 min
	OPERATION „CO"		
	Oscillogram		Page 24 / 31
	Applied voltage		726 V
	Peak current value		30 kA
	Total duration		30.8 ms
	Recovery voltage (phase to phase)	U_r (- / -)	726 V
	Ratio between U_r and U_e	U_r/U_e	1.05
	Joule integral		8.1×10^6 A^2s
7.2.1.1.3	Closing operation time		- ms
	Melting of the fusible element	Yes/No	No
	Cracks observed	Yes/No	No
	if Yes		Page -

Test laboratory: ACAE IA.01 — Authorized representative — Date 2008.04.16 — TRF IEC/EN 60947-2 Ed. 4.0 form 120

LOVAG		Test report No.: 08.005 Page 14 / 31	
Type test according to: IEC 60947-2 Test sequence H		Type: T7V 1250	
Standard and clause	Kind of tests and requirements		Test values Results
	Test carried out on circuit-breaker pole		Ph2
	OPERATION „O"		
	Oscillogram		Page 25 / 31
	Applied voltage		726 V
	Peak current value		30.5 kA
	Total duration		31.1 ms
	Recovery voltage (phase to phase)	U_r (- / -)	726 V
	Ratio between U_r and U_e	U_r/U_e	1.05
	Joule integral		8.35×10^6 A^2s
	Melting of the fusible element	Yes/No	No
	Holes in the PE-sheet (if applicable)	Yes/No	-
	Cracks observed	Yes/No	No
	If Yes		Page -
	Time interval between operations	≥3 min	3 min
	OPERATION „CO"		
	Oscillogram		Page 26 / 31
	Applied voltage		726 V
	Peak current value		22.5 kA
	Total duration		28.3 ms
	Recovery voltage (phase to phase)	U_r (- / -)	726 V
	Ratio between U_r and U_e	U_r/U_e	1.05
	Joule integral		5.83×10^6 A^2s
7.2.1.1.3	Closing operation time		- ms
	Melting of the fusible element	Yes/No	No
	Cracks observed	Yes/No	No
	if Yes		Page -

Test laboratory: ACAE IA.01 — Authorized representative — Date 2008.04.16 — TRF IEC/EN 60947-2 Ed. 4.0 form 120

Standard and clause	Kind of tests and requirements		Test values Results
	Test carried out on circuit-breaker pole		Ph3
	OPERATION „O"		
	Oscillogram		Page 27 / 31
	Applied voltage		726 V
	Peak current value		30.5 kA
	Total duration		31.1 ms
	Recovery voltage (phase to phase)	U_r (- / -)	726 V
	Ratio between U_r and U_e	U_r/U_e	1.05
	Joule integral		8.36x10^6 A^{2}s
	Melting of the fusible element	Yes/No	No
	Holes in the PE-sheet (if applicable)	Yes/No	-
	Cracks observed	Yes/No	No
	If Yes		Page -
	Time interval between operations	≥3 min	3 min
	OPERATION „CO"		
	Oscillogram		Page 28 / 31
	Applied voltage		726 V
	Peak current value		24 kA
	Total duration		28.3 ms
	Recovery voltage (phase to phase)	U_r (- / -)	726 V
	Ratio between U_r and U_e	U_r/U_e	1.05
	Joule integral		5.91x10^6 A^{2}s
7.2.1.1.3	Closing operation time		- ms
	Melting of the fusible element	Yes/No	No
	Cracks observed	Yes/No	No
	If Yes		Page -

Standard and clause	Kind of tests and requirements		Test values Results
	VERIFICATION OF DIELECTRIC WITHSTAND		
8.3.3.5	Test sequence I		
8.3.4.3	Test sequence II		
8.3.5.3	Test sequence III		
8.3.6.5	Test sequence IV		
8.3.7.3	Test sequence V, stage 1		
8.3.7.7	Test sequence V, stage 2		
8.3.8.5	Test sequence VI, combined test sequence		
B.10.3.1	Test sequence B.II		
A.5	Verification of discrimination		
A.6.3	Verification of back-up protection		
C.3	Individual pole short-circuit test sequence		
H.3	Test sequence for circuit-breakers for IT-systems		
L.7.2.2.3	Circuit-breaker CBIs Class X		
L.7.2.3.3	Circuit-breaker CBIs Class Y		
O.6.1.2	Circuit-breaker ICBs (sequence II / III)		
60947-1 8.3.3.4.1 3)	**Power-frequency withstand verification**		
	Circuits incorporating solid-state devices disconnected	☒ No / ☐ Yes, if Yes	Page -
	Test frequency	42 - 65 Hz	50 Hz
	Test voltage	2 x U_e, min. 1000 V	1380 V
8.3.3.2.2 a)	Application of the test voltage -Main circuit of the circuit-breaker -Isolating contacts of the withdrawable unit (if applicable) - Insert of withdrawable unit - Withdrawable unit (base) - Combination of base and insert	5 s	

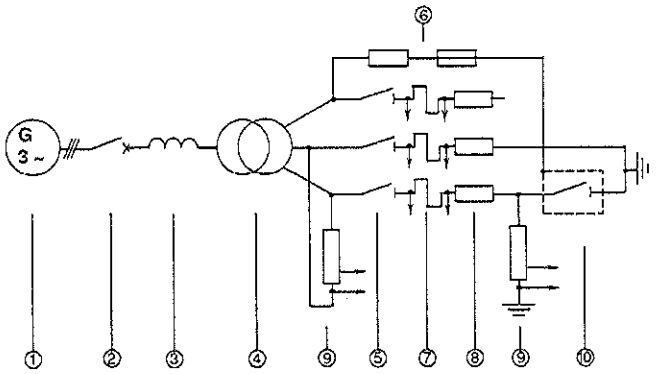
Standard and clause	Kind of tests and requirements		Test values Results
	VERIFICATION OF LEAKAGE CURRENT		
8.3.3.2 lv)	Test sequence I (in new condition)	≤ 0.5 mA	- mA
8.3.3.5	Test sequence I (after overload performance)	≤ 2 mA	- mA
8.3.4.3	Test sequence II	≤ 2 mA	- mA
8.3.5.3	Test sequence III	≤ 6 mA	- mA
8.3.6.5	Test sequence IV	≤ 2 mA	- mA
8.3.7.3	Test sequence V, stage 1	≤ 2 mA	- mA
8.3.7.7	Test sequence V, stage 2	≤ 6 mA	- mA
8.3.8.5	Combined test sequence	≤ 2 mA	- mA
C.3	Individual pole short-circuit test sequence I_{cu}	≤ 6 mA	- mA
H.3	Individual pole short-circuit test sequence I_{IT}	≤ 6 mA	0.099 mA
L.7.2.2.3	Circuit-breaker CBIs Class X	≤ 6 mA	- mA
L.7.2.3.3	Circuit-breaker CBIs Class Y	≤ 6 mA	- mA
O 6.1.2	Circuit-breaker ICBs (sequence II / III)	≤ 2 / 6 mA	- / - mA
8.3.3.2 lv)	**Leakage current**		
	For circuit-breakers suitable for isolation having an operational voltage U_e greater than 50 V.		
	Test frequency	45 - 65 Hz	50 Hz
	Test voltage	1.1 x U_e 690 V	760 V
	Application of the test voltage - Main circuit of the circuit-breaker - Isolating contacts of a withdrawable unit (if applicable)		

Standard and clause	Kind of tests and requirements			Test values Results
	VERIFICATION OF OVERLOAD RELEASES ON EACH POLE SEPARATELY			
	Test with k x 2.0 x I_R		- A	- A
8.3.5.1	Test sequence II ($I_{cs} = I_{cu}$)	before 8.3.4.1		
8.3.5.1	Test sequence III	before 8.3.5.2		
8.3.6.1	Test sequence IV	before 8.3.6.2		
8.3.7.4	Test sequence V	before 8.3.7.5		
8.3.8.1	Combined test sequence	before 8.3.8.2		
A.5	Verification of discrimination	before 8.3.5.2		
A.6.3	Verification of back-up protection	before 8.3.5.2		
	Test with k x 2.5 x I_R		3125 A	3125 A
8.3.5.4	Test sequence II ($I_{cs} = I_{cu}$)	after 8.3.4.5		
8.3.5.4	Test sequence III	after 8.3.5.3		
8.3.6.6	Test sequence IV	after 8.3.6.5		
8.3.7.8	Test sequence V	after 8.3.7.7		
8.3.8.7	Combined test sequence	after 8.3.8.6		
A.5	Verification of discrimination	after 8.3.5.3		
A.6.3	Verification of back-up protection	after 8.3.5.3		
C.4	Individual pole short-circuit test sequence			
H.4	Test sequence for circuit-breakers for IT-systems			
	Tripping test			
	Cabling characteristics			
	Cable		- mm²	- mm²
	Bar		- x - mm	50 x 10 mm
	Number		-	1
	Length		- mm	500 mm
	Tightening torque			40 Nm
	Reference temperature		40 °C ± 2 °C	
	Ambient temperature			21 °C
	Correction factor (k = 1 for releases independent of ambient temperature)		k	1
	Current setting value of overload release I_R ☐ min. / ☒ max.			1250 A
	Time setting overload release		144 s	
	Tripping time (for twice the value of current setting on single pole)			
		Ph_1	≤ 356 s	209 s
		Ph_2	≤ 356 s	209 s
		Ph_3	≤ 356 s	207 s
		N (if applicable)	≤ 356 s	209 s

The instruments have an measurement uncertainty like follow :

Quantity	
Voltage	≤ ±2.5% by transient recorders < ±1.5% by multimeters or similar ≤ ±2.5% for dielectric test
Current	≤ ±2.5%
Time	< ±1%
Force	< ±1 %
Torque	< ±5%
Resistance	< ±3%
Temperature	±2°C up to 100°C ±2% above 100°C
Linear dimensions	±0,05 mm
Relative humidity	≤±5% in the range 20% ÷ 95% RH

CIRCUIT DIAGRAM TYPE C



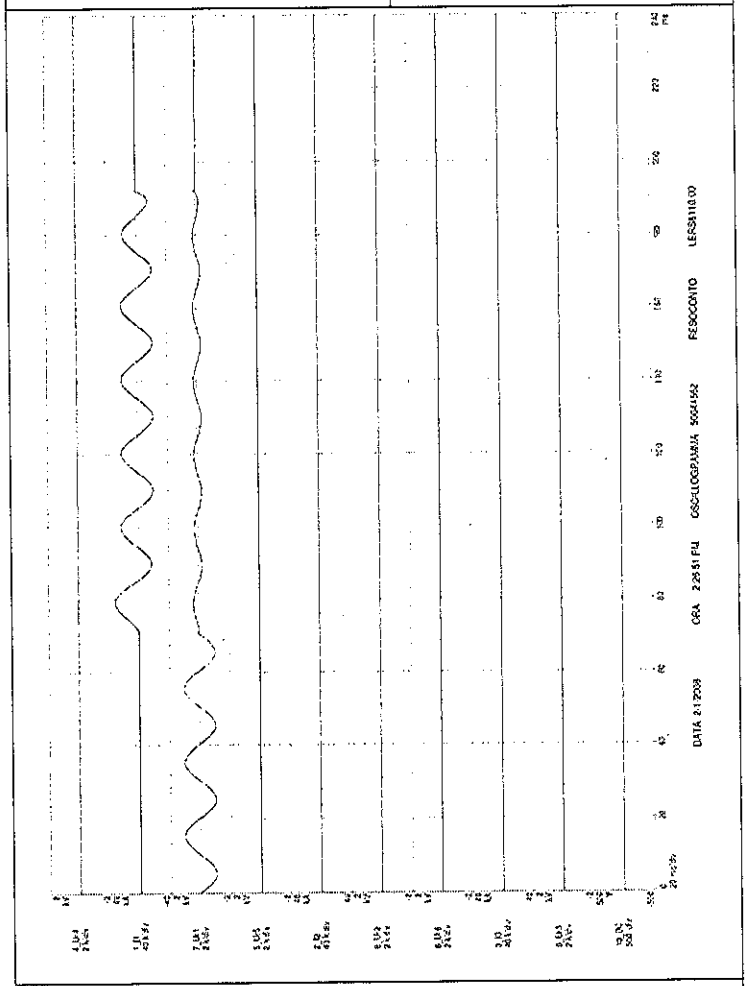
1 - Three-phase generator
2 - Back-up circuit breaker
3 - Air reactors
4 - Three-phase transformer
5 - Short-circuit making switch
6 - Device for the detection of fault currents
7 - Non inductive shunts for current measurement
8 - Resistors
9 - Dividers for voltage measurement
10 - Apparatus under test

SYMBOLS USED FOR THE IDENTIFICATION OF THE MEASUREMENTS RECORDED BY THE OSCILLOGRAM

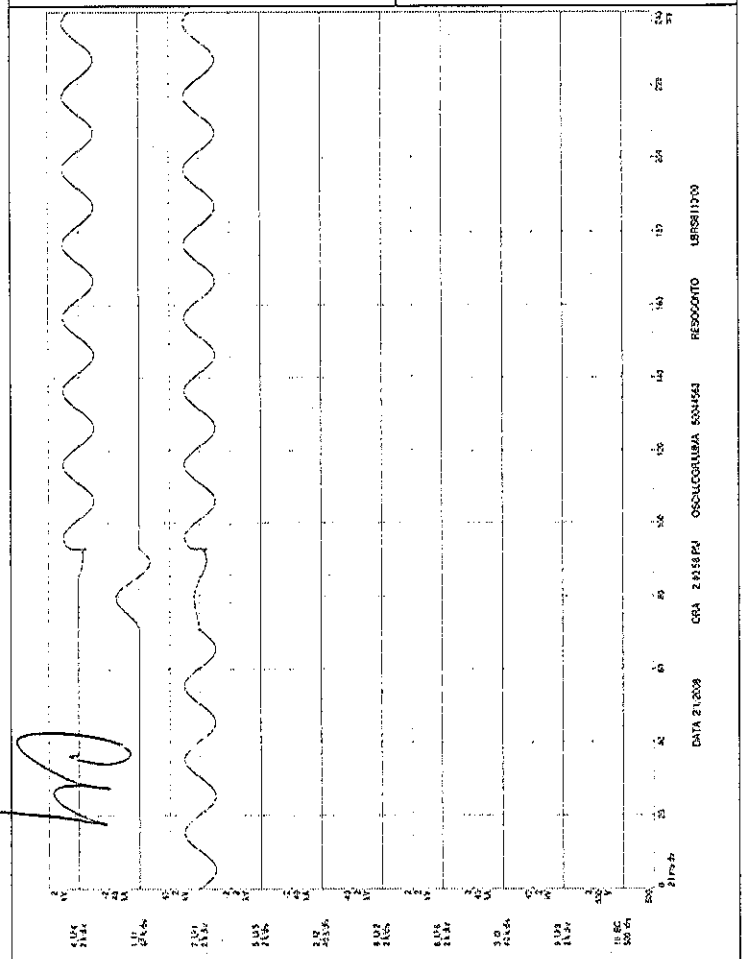
1_I1 L1 phase current
2_I2 L2 phase current
3_I3 L3 phase current

4_Ur4 L1 phase arc voltage and recovery voltage
5_Ur5 L2 phase arc voltage and recovery voltage
6_Ur6 L3 phase arc voltage and recovery voltage

7_Ur1 L1 – L2 phases applied voltage
8_Ur2 L2 – L3 phases applied voltage
9_Ur3 L3 – L1 phases applied voltage
10_BC Closing coil

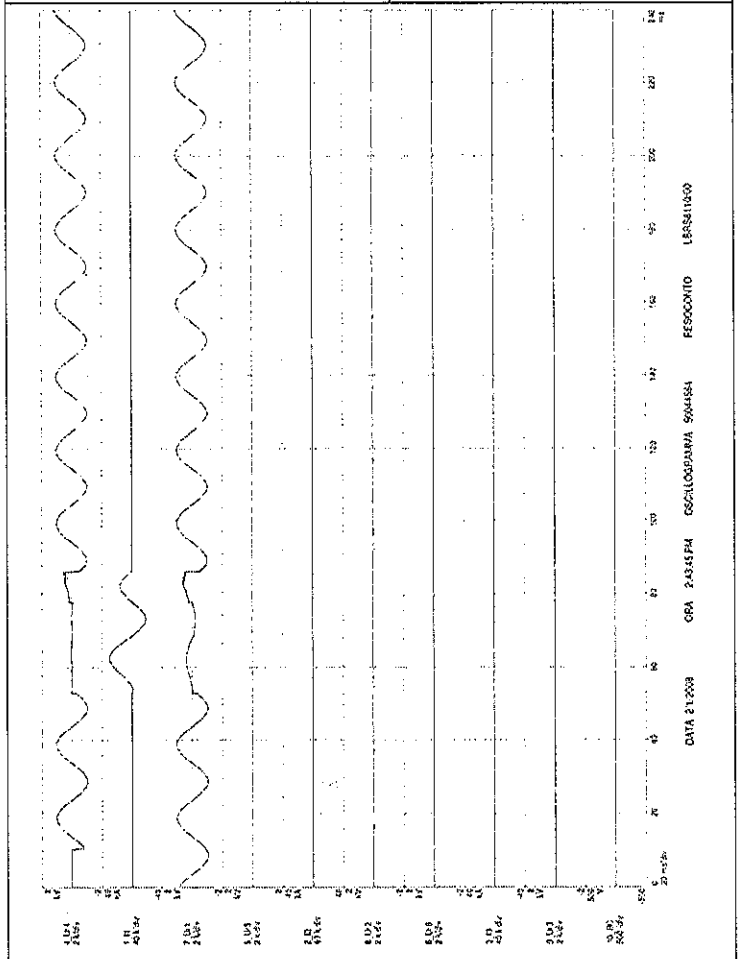


LOVAG	Test report No.: 08.005 Page 23 / 31
Type test according to: IEC 60947-2	Type: T7V 1250



Test laboratory: ACAE IA.01	TRF IEC/EN 60947-2 Ed. 4.0 form 248
Authorized representative	Date 2008.04.16

LOVAG	Test report No.: 08.005 Page 24 / 31
Type test according to: IEC 60947-2	Type: T7V 1250



Test laboratory: ACAE IA.01	TRF IEC/EN 60947-2 Ed. 4.0 form 248
Authorized representative	Date 2008.04.16

LOVAG	Test report No.: 08.005 Page 26 / 31
Type test according to: IEC 60947-2	Type: T7V 1250

Test laboratory: ACAE IA.01 — Authorized representative — Date 2008.04.16

TRF IEC/EN 60947-2
Ed. 4.0 form 248

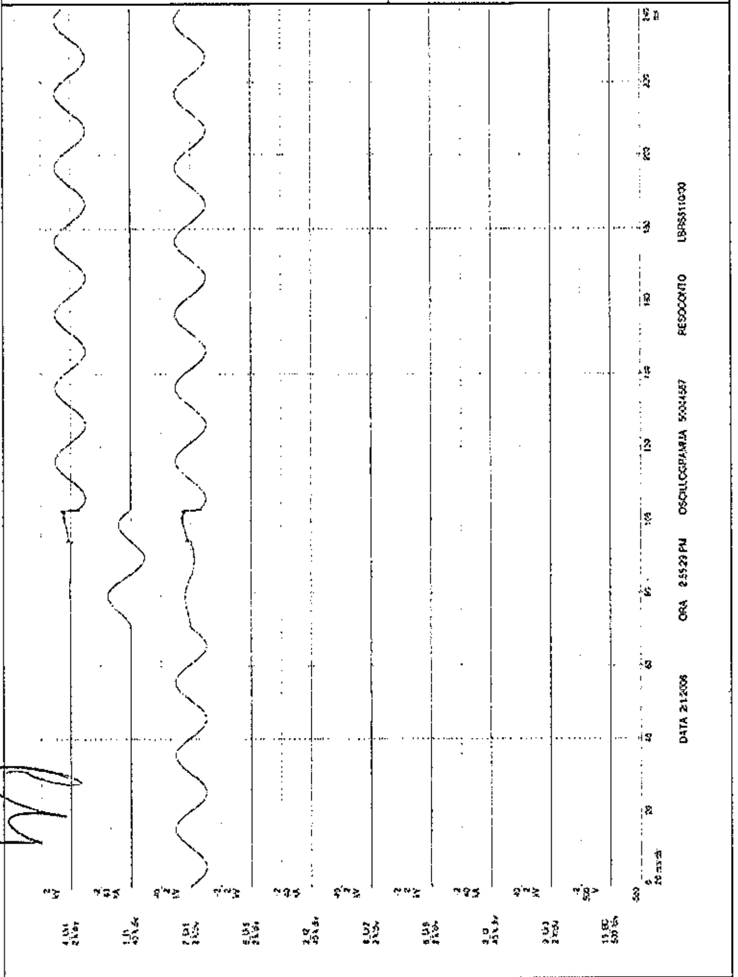
LOVAG	Test report No.: 08.005 Page 25/ 31
Type test according to: IEC 60947-2	Type: T7V 1250

Test laboratory: ACAE IA.01 — Authorized representative — Date 2008.04.16

TRF IEC/EN 60947-2
Ed. 4.0 form 248

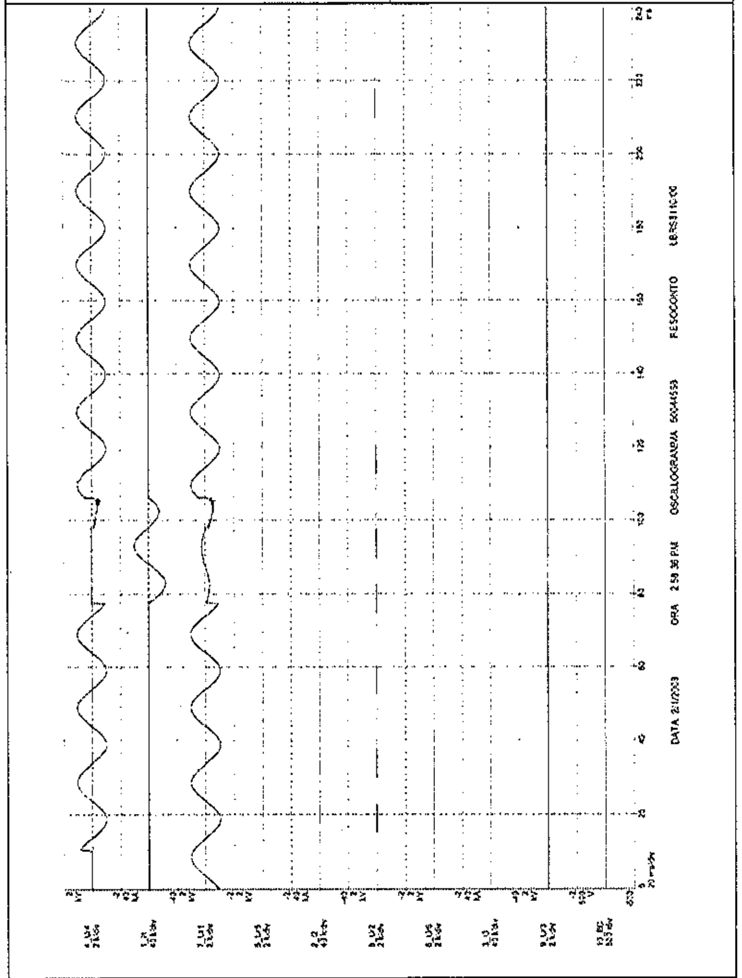
ВЯРНО С ОРИГИНАЛА

LOVAG	Test report No.: 08.005 Page 27 / 31
Type test according to: IEC 60947-2	Type: T7V 1250



Test laboratory: ACAE IA.01	R. Gnandi Authorized representative	TRF IEC/EN 60947-2 Ed. 4.0 form 248 Date 2008.04.16

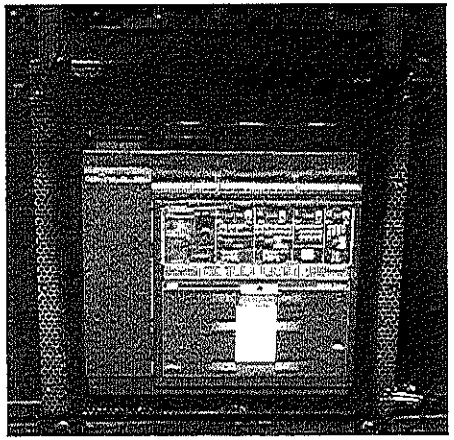
LOVAG	Test report No.: 08.005 Page 28 / 31
Type test according to: IEC 60947-2	Type: T7V 1250

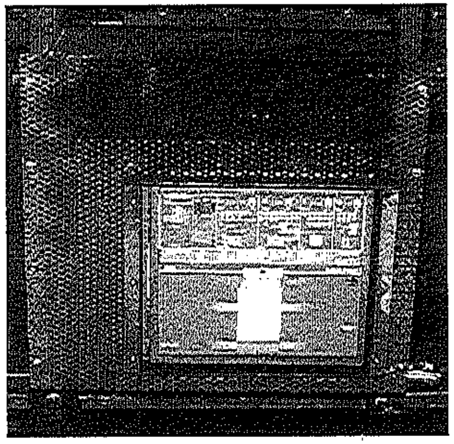


Test laboratory: ACAE IA.01	R. Gnandi Authorized representative	TRF IEC/EN 60947-2 Ed. 4.0 form 248 Date 2008.04.16

ВЯРНО С ОРИГИНАЛА

T7V 1250





ACAE	DOMANDA DI CERTIFICAZIONE LOVAG/ACAE O ACAE SECONDO IEC 60947-2 DOCUMENTI DI IDENTIFICAZIONE DELL'APPARECCHIO DA CERTIFICARE	Enclosed 2/C Pagina 1 of 2 (*)Pratica N° 08.005

DESIGNAZIONE DELL'APPARECCHIO T7V 1250 4p PR331/P LSIG

Disegno no	Descrizione	Indice di modifica	Data
1SDH000529R0101	Assembly drawing	N0166	2006-07-28
1SDH000606R0001	Instruction leaflet	L3101	2006-12-15
RA0031801	Circuit breaker base assembly	L3718	2007-03-15
	Material list		
RA3310001	Case	L3119	2007-01-04
RA3311801	Cover	L3119	2007-01-04
	Material list		
RA3285001	Operating mechanism spring	L2761	2006-02-23
RA6070601	Arc chamber	L3062	2006-11-20
	Material list		
RA3260601	Operating mechanism	L2028	2006-07-10
	Material list		
RA3334003	Moving contact assembly	L2761	2006-02-23
	Material list		
RA3413001	Moving contact plate	L3004	2006-09-28
RA4887203	Fixed contact	L3002	2006-02-28
	Material list		
RA4921002	Fixed contact plate	L2798	2006-02-24
RA3343801	C.T. Assembly	L2777	2006-03-09
	Material list		
RA3460302	Tripping device assembly	L2061	2006-08-30
	Material list		
RA6309012	T7V 1250A Label	L2029	2006-07-10
RA3663004	Rear vertical term. assembly	L3094	2006-12-05
	Material list		
1SDH000009R0001	Short circuit test arrangements	N0160	2006-06-09
RE1160801	rele PR331/P	L3006	2006-11-10
RE0904001	Protection board pcs	L3100	2006-12-15
1SDL000181R0034	PR331 LSI Tripping characteristic		
1SDL000181R0020	PR331 G Tripping characteristic		

Il richiedente il certificato garantisce che i disegni qui elencati corrispondono esattamente al prodotto in prova

Data

Firma richiedente

Nota: per la compilazione di questa scheda vedere pagina 2

08.005 26/02/08 G. Lavrà M. Morbi

ВЯРНО С ОРИГИНАЛА

* ИНТЕРКОМПАНЕКС * ПЛОВДИВ * ЕООД

145

LOVAG	Test report No.: 08.005 Page 31 / 31	
Type test according to: IEC 60947-2	Type: TTV 1250	

Test laboratory: ACAE IA.01	Authorized representative	Date 2008.04.16

TRF IEC/EN 60947-2
Ed. 4.0 form 248

ВЯРНО С ОРИГИНАЛА

146

SUMMARY TABLE OF BASE CERTIFICATION

TMAX
T1 - T2 - T3 – T4 – T5

Lovag Acae ____ 2
Special test ____ 3
Coordination ____ 5
Special test at 1000 V ____ 5
Special test at 400 Hz ____ 5

Prep. LB-DTS G. Consolandi Dis.		Resp-Dep. LB-DTS A. Bottarelli Uff. Resp.		Tiltle / Titolo: SUMMARY TABLE OF BASE CERTIFICATION
App. LB-DTS M. Carminati App.		Take over dep. Uff. utilizz.		Tmax
Rev.	emission	I	L	M
Mod.	01-02-16	03-09-11	04-10-29	05-04-12
ABB SACE S.p.a.				Doc. No. / N° Doc: RL0038

Lang. / Lingua: EN
Scale / Scala:
Sh. No / N. Pag.: 1(5)

ВЯРНО С ОРИГИНАЛА

147

Tmax

CB TYPE	SEQ. I	SEQUENCE II (Ics)				SEQUENCE III (Icu)				SEQUENCE IV (Icw)
		415 V	440 V	500 V	690 V	415 V	440 V	500 V	690 V	
T1B 1P 160	02.041					02.043 (240V)				NA
T1B-160	00.046	00.031	02.047		02.048	00.031	02.047		02.048	NA
T1C-160		03.104	00.053		00.054	00.030	00.055		00.056	NA
T1E-100	04.056	04.057				04.058				
T1N-160		04.010	00.057		00.058	02.044	00.059		00.060	NA
T2N-160	01.039	01.020	01.038		01.052	01.020	01.038		01.052	NA
T2S-160		01.022	01.040		01.053	01.022	01.040		01.053	NA
T2H-160		01.023	01.041		01.054	01.023	01.041		01.054	NA
T2L-160	03.001	01.024	01.042			01.021	01.043			NA
T3N-250	00.052	01.104	00.034		00.042	00.032	00.035		00.043	NA
T3S-250		01.105	00.036		00.044	00.033	00.037			NA
T4N-250										NA
T4S-250		03.045	03.087		03.046	03.045	03.087		03.046	NA
T4H-250		03.042	03.094		03.091	03.042	03.094		03.091	NA
T4L-250		04.030	03.096		03.090	04.030	03.096		03.090	NA
T4V-250	04.009	03.084	03.081		03.116	03.084	03.081		03.116	NA
T4N-320	03.143									NA
T4S-320	03.144	03.047	03.088		03.048	03.047	03.088		03.048	NA
T4H-320	03.145	03.044	03.095		03.092	03.044	03.095		03.092	NA
T4L-320	03.147	04.031	03.097		03.093	04.031	03.097		03.093	NA
T4V-320	03.146	03.085	03.086		03.117	03.085	03.086		03.117	NA
T5N-400			04.011		04.017		04.011		04.017	
T5S-400	04.015	04.036	04.014		04.012	04.036	04.014		04.012	
T5H-400	04.024	04.037	03.118		03.135	04.037	03.118		03.135	
T5L-400	04.025		03.119		03.150		03.119		03.150	
T5V-400	04.026	04.029	03.123		03.151	04.029	03.123		03.151	04.027
T5N-630			04.016		04.018		04.016		04.018	NA
T5S-630	04.019		03.120		04.013		03.120		04.013	NA
T5H-630			03.121		03.136		03.121		03.137	NA
T5L-630			03.122		03.138		03.122		03.139	NA
T5V-630	04.124	04.122	03.124		03.134		03.124		03.140	NA

ВЯРНО С ОРИГИНАЛА

148

Special test

CB type	Trip	Type test	Rated	Standard	Certificate number
T2	PR221-DS	ESD, EMC....		IEC 61000-4... IEC 60947-2 Annex F	ABB SACE TMS 20994
YU T1-T2-T3		EFT		CEI EN 61000-4-4/4-5	ABB SACE TMS 21081
Solenoid Operator T1-T2		ESD, EMC....		IEC 61000-4-....	ABB SACE TMS 21085
T4	PR221-DS	ESD, EMC....		IEC 61000-4... IEC 60947-2 Annex F	TR-21160
T4 with MOE-E / AUX-E		ESD, EMC....		IEC 61000-4... IEC 60947-2	TR-21221
PR020/k		ESD, EMC....		IEC 61000-4... EN 50081/2	TR-21263
T1-T2-T3		Environmental tests		Ship registers	LBPR 5157
T4 - T5	PR221-222	Environmental tests		Ship registers	LBRT 5351
T2L160+side-mounted remote control mechanism		Mechanical vibrations		ABB SACE IT0102	Mariperman 9797
T1N160+front-mounted remote control mechanism		Mechanical vibrations		ABB SACE IT0102	Mariperman 9798
T1N160+side-mounted remote control mechanism		Mechanical vibrations		ABB SACE IT0102	Mariperman 9799
T2L160+PR221 DS		Mechanical vibrations		ABB SACE IT0102	Mariperman 9800
T3S250+direct rotary handle		Mechanical vibrations		ABB SACE IT0102	Mariperman 9801
T3S250+front-mounted remote control mechanism		Mechanical vibrations		ABB SACE IT0102	Mariperman 9802
T2L160+front-mounted remote control mechanism		Mechanical vibrations		ABB SACE IT0102	Mariperman 9803
T3S 250		Mechanical vibrations		ABB SACE IT0102	Mariperman 9806
T4S 250	PR221-DS	Mechanical vibrations		ABB SACE IT0228	M.M. 57-03
T4H 320	PR221-DS	Mechanical vibrations		ABB SACE IT0228	M.M. 58-03
T5V 630	PR222DS/PD	Mechanical vibrations		ABB SACE IT0228	M.M. 59-03
T5L 400	PR221DS	Mechanical vibrations		ABB SACE IT0228	M.M. 60-03
T1C 160		Sequence II	415V 20 KA	IEC 60947-2	LBRP 5210
T1C 160		Mechanical properties of terminals		IEC 60947-1	LBRP 5352
T1 – T2 – T3	TM	Icu a 500 V		CNS 2931	LBRP 5260
T3C	TM	Sequence III	415V 25 KA	IEC 60947-2	LOVAG IT 02.045
T4 - T5	EL	Icu a 415 V		CNS 2931	LBRP 5423
T5V 400		Annex H	415-690 V It 5,76 KA	IEC 60947-2	LOVAG IT 04.051
T4V 250		Climatic Test		IEC 60947-2	LOVAG A 04.017-7
T5V 630		Climatic Test		IEC 60947-2	LOVAG A 04.018-7
T5V 630		Annex H	690 V - It 7,56 KA	IEC 60947-2	LOVAG IT 04.121
Relè	PR 222 MP	Sgancio della SA per	100 A		LBRS 2030

149

		intervento di L o R			
T2H 160		Shock Test	22 g 11 ms	IEC 60068-2-27	LBRP 6314-00
T4 250	PR 222 MP	EMC	690 V	EN 60947-2:2003	80SD00653/1
T4 250	PR 222 MP	EMC	690 V	RINA Rules:2002	80SD00653/2
T4 250	PR 221 DS	EMC	690 V	EN 60947-2:2003	80SE00624
T4 250	PR 222 DS/PD	EMC	690 V	RINA Rules:2002	80SE00625
T4 160	PR223 EF/DS	EMC	415 V	IEC 60947-1/2	TR 21364
T4 160	PR223 EF/DS	EMC	415 V	IEC 60533 - DNV 2.4	TR 21369
T5 250	PR223 EF/DS	EMC	690 V	IEC 60947-2	TR 80SE00622/1
T5 250	PR223 EF/DS	EMC	690 V	RINA Rules: 2002	TR 80SE00622/2
T4 250		Shock	22 g 11 ms	IEC 60068-2-27	LBRP 6315-00
T5 400		Shock	22 g 11 ms	IEC 60068-2-27	LBRP 6316-00

Coordination

CB type	Trip	Type test	Rated	Standard	Certificate number
T2S160	MA 20	Type '2' co-ordination with A30 & TA25DU19	415V 50KA	IEC 60947-4-1	LOVAG 01.106
T2S160	MA 32	Type '2' co-ordination with A30 & TA42DU25	415V 50KA	IEC 60947-4-1	LOVAG 01.107
T2H160	MA 52	Type '2' co-ordination with A50 & TA75DU42	440V 50KA	IEC 60947-4-1	LOVAG 01.112
T2H160	MA 80	Type '2' co-ordination with A63 & TA75DU63	440V 50KA	IEC 60947-4-1	LOVAG 01.113
T2L160	MA 20	Type '2' co-ordination with A30 & TA25DU19	500V 50KA	IEC 60947-4-1	LOVAG 02.026
T2L160	MA 52	Type '2' co-ordination with A50 & TA75DU32	500V 50KA	IEC 60947-4-1	LOVAG 02.027
T2L160	MA 80	Type '2' co-ordination with A75 & TA75DU63	500V 50KA	IEC 60947-4-1	LOVAG 02.028
T3S250	MA 160	Type '2' co-ordination with A110 & TA110DU110	400V 50KA	IEC 60947-4-1	LOVAG 02.042
T3C	TM	Sequence III	415V 25KA	IEC 60947-2	LOVAG 02.045
T2S160	MA 52	Type '2' co-ordination with A50 & TA75DU42	415V 50KA	IEC 60947-4-1	LOVAG 01.108
T2S160	MA 80	Type '2' co-ordination with A63 & TA75DU80	415V 50KA	IEC 60947-4-1	LOVAG 01.109
T2H160	MA 32	Type '2' co-ordination with A30 & TA42DU25	440V 50KA	IEC 60947-4-1	LOVAG 01.111
T2L160	MA 52	Type '2' co-ordination with A50 & TA75DU42	415V 80kA	IEC 60947-4-1	LOVAG 03.021
T2L160	MA 80	Type '2' co-ordination with A63 & TA75DU80	415V 80kA	IEC 60947-4-1	LOVAG 03.022
T2L160	MA 100	Type '2' co-ordination with A95 & TA110DU110	415V 80kA	IEC 60947-4-1	LOVAG 03.023

Special test at 1000 V

CB type	Trip	Type test	Rated	Standard	Certificate number

Special test at 400 Hz

CB type	Trip	Type test	Rated	Standard	Certificate number

ОРИГИНАЛ

151

Приложение ТС 5

ACCREDIA
L'ENTE ITALIANO DI ACCREDITAMENTO
Membro degli Accordi di Mutuo Riconoscimento EA, IAF e ILAC
Signatory of EA, IAF and ILAC Mutual Recognition Agreements

License Number 024

CERTIFICATO DI ACCREDITAMENTO
Accreditation Certificate

Registrazione n°
Registration n°

070B Rev. **08**

Si dichiara che
We declare that

ACAE

Via Tito Livio, 5 24123 - BERGAMO (BG) - Italia

è conforme ai requisiti della norma

UNI CEI EN 45011 Ed. 1999

meets the requirements of the standard

EN 45011 Ed. 1998

quale Organismo di

Certificazione di prodotti/servizi
(così come dettagliato negli Allegati al presente Certificato)

as Body for the

Certification of products/services
(as stated in the Enclosures to this Certificate)

Il presente Certificato non è da ritenersi valido se non accompagnato dai relativi Allegati e può essere sospeso o revocato in qualsiasi momento nel caso di inadempienza accertata da parte di ACCREDIA. La vigenza dell'accreditamento può essere verificata sul sito WEB (www.accredia.it) o richiesta direttamente al Dipartimento di competenza.
This Certificate is not valid without the relative Enclosures and can be suspended or withdrawn at any time in the event of non fulfilment as ascertained by ACCREDIA. Confirmation of the validity of accreditation can be verify on website (www.accredia.it) or by contacting the relevant Department.

MD-17-DC Rev. 00

Data di 1ª emissione
1st issue date
2003 -05 -21

Il Direttore di Dipartimento
The Department Director

Data di modifica
Modification date
2011 -11 -08

Il Presidente
The President

Data di scadenza
Expiring date
2015 -05 -20

Il Direttore Generale
The General Director

ВЯРНО С ОРИГИНАЛА

152

ACCREDIA
L'ENTE ITALIANO DI ACCREDITAMENTO
Membro degli Accordi di Mutuo Riconoscimento EA, IAF e ILAC
Signatory of EA, IAF and ILAC Mutual Recognition Agreements

License Number 024

Allegato 1 al Certificato di accreditamento n° 070B Rev. 08

Enclosure 1 to the accreditation Certificate n° 070B Rev. 08

rilasciato a / *issued to:* **ACAE**

Certificazione di prodotti nei seguenti settori:

- Apparecchiature e componenti elettrici di bassa e alta tensione (Vedere l'Allegato al Certificato).

Certification of products within the following sectors:

- *Low and medium voltage electrical products (see Enclosure to the Certificate).*

L'accreditamento per i settori elencati nel presente Allegato è valido fino a tutto il 2015 -05 -20
The accreditation for the sectors listed in this Enclosure is valid until 2015 -05 -20

Il Direttore di Dipartimento
The Department Director

Il Presidente
The President

Il Direttore Generale
The General Director

Milano, 2011 -11 -08

ACCREDIA
L'ENTE ITALIANO DI ACCREDITAMENTO
Membro degli Accordi di Mutuo Riconoscimento EA, IAF e ILAC
Signatory of EA, IAF and ILAC Mutual Recognition Agreements

License Number 024

Allegato 2 al Certificato di accreditamento n° 070B Rev. 08

Enclosure 2 to the accreditation Certificate n° 070B Rev. 08

rilasciato a / *issued to:* **ACAE**

Aggiornato in data: 2011 -11 -08

LOW AND HIGH VOLTAGE PRODUCTS - LIST OF IEC - EN - CEI STANDARDS
ELENCO NORME IEC - EN - CEI PER PRODOTTI DI BASSA E ALTA TENSIONE

TC 11 Overhead lines
CT 11 Impianti elettrici ad alta tensione e di distribuzione pubblica di bassa tensione

61284	Requirements and tests for fittings
61219	Earthing or earthing and short-circuiting equipment using lances as a short-circuiting device
61230	Portable equipment for earthing or earthing and short-circuiting
61235	Insulating hollow tubes for electrical purposes
TC 14	Power transformers
CT 14	Trasformatori
60076-1	Power transformers - Part 1: General
50464-1	Three phase oil immersed distribution transformers 50 Hz up to 36 kV from 50 kVA to 2500 kVA

TC 17 Switchgear and controlgear
CT 17 Grossa apparecchiatura

60947-1	Low voltage switchgear and controlgear - Part 1: General rules
60947-2	Low voltage switchgear and controlgear - Part 2: Circuit breakers
60947-3	Low voltage switchgear and controlgear - Part 3: Switch disconnectors, switch disconnectors and Fuse-combination units
60947-4-1	Low voltage switchgear and controlgear - Part 4: Contactors and motor-starters-Section 1- Elettrotechnical contactors and motor-starters
60947-4-2	Low voltage switchgear and controlgear - Part 4: Contactors and motor- starters-Section 2- AC semiconductor motor controllers and starters
60947-4-3	Low voltage switchgear and controlgear - Part 4-3: AC semiconductor starters for non-motor loads
60947-5-1	Low voltage switchgear and controlgear - Part 5: Control circuit devices and switching elements - Section 1- Elettromechanical control circuit devices
60947-5-2	Low voltage switchgear and controlgear - Part 5-2: Control circuit devices and switching elements - Proximity switches
60947-5-3	Low voltage switchgear and controlgear - Part 5-3: Control circuit devices and switching elements - Requirements for proximity devices with defined behaviour under fault conditions
60947-5-5	Low voltage switchgear and controlgear - Part 5-5: Control circuit devices and switching devices -Electrical emergency stop device with mechanical latching function
60947-6-1	Low voltage switchgear and controlgear - Part 6-1: Multiple function equipment-Section 1: Automatic transfer switching equipment
60947-6-2	Low voltage switchgear and controlgear - Part 6-2: Multiple function equipment-Section 2: Control and protective switching device(CPS)
60947-7-1	Low voltage switchgear and controlgear - Part 7-1: Ancillary equipment-Section 1:Terminal blocks or copper conductors
60947-7-2	Low voltage switchgear and controlgear - Part 7-2: Ancillary equipment-Section 2::Protective conductor terminal blocks for copper conductors
60947-7-3	Low voltage switchgear and controlgear - Part 7-3: Ancillary equipment-Section 7-3:Safety Requirements for fuse terminal blocks
60439-1	Low-voltage switchgear and controlgear assemblies-Part 1:Type- tested and partially type- tested assemblies
60439-2	Low-voltage switchgear and controlgear assemblies-Part 2:Particular requirements for busbar trunking systems (busway)
60439-3	Low-voltage switchgear and controlgear assemblies-Part 3:Particular requirements for low-voltage switchgear and controlgear assemblies intended to be installed in places where unskilled persons have access for their use-Distribution boards.
60439-4	Low-voltage switchgear and controlgear assemblies.Part 4:Particular requirements for assemblies for construction sites (ACS)

L'accreditamento per i settori elencati nel presente Allegato è valido fino a tutto il 2015 -05 -20
The accreditation for the sectors listed in this Enclosure is valid until 2015 -05 -20

Il Direttore di Dipartimento
The Department Director

Il Presidente
The President

Il Direttore Generale
The General Director

ВЯРНО С ОРИГИНАЛА

154

Allegato 2 al Certificato di accreditamento n° 070B Rev. 08

Enclosure 2 to the accreditation Certificate n° 070B Rev. 08

60439-5	Low-voltage switchgear and controlgear assemblies.Part 5:Particular requirements for assemblies intended to be installed outdoors in public places-Cabledistribution cabinets(CDCs)for power Distribution in networks.
62208	Empty enclosures for low-voltage switchgear and controlgear-General requirements
61095	Elettromechanical contactors for household and similar purposes
62271-100	High-voltage alternating current circuit-breakers
62271-102	High-voltage alternating current disconnectors and hearting switches
60271-103	High-voltage switches for rated voltage above 1 kV and less than 52 kV
62271-104	High-voltage switches for rated voltage of 52 kV and above
62271-105	High-voltage alternating current switch-fuse combinations
62271-106	High-voltage alternating current contactors and contactor based motor-starters
62271-200	Metal enclosed switchgear and controlgear for rated voltages up to anf including 36 kV
62271-202	High-voltage/low voltage prefabricated substations
62271-203	Gas-insulated metal enclosed switchgear for rated voltages above 52 Kv

TC 23 Electrical accessories
CT 23 Apparecchiatura a bassa tensione

60898	Electrical accessories-Circuit-breakers for overcurrent protectio for household and similar installations Part 1:Circuit-breakers for a.c. operation
60309-1	Plug,socket-outlets and couplers for industrial purposes - Part 1: General requirements
60309-2	Plug,socket-outlets and couplers for industrial purposes - Part 2: Dimensional interchangeability requirements for top pin an contact-tube accessories.
60309-3	Plug,socket-outlets and couplers for industrial purposes - Part 3: Particular requirements for plug, socket-outlets,connectors and appliance Inlets for use in explosive gas atmospheres
61008-1	Residual current operated circuit-breakers without integral overcurrent protection for household and similar use (RCCB's) - Part 1: General rules
61008-2-1	Residual current operated circuit-brakers without Integral overcurrent protection for household similar use (RCCB's) - Part 2-1: Applicability of the general rules to RCCB's functionally independent of line voltage
61008-2-2	Residual current operated circuit-breakers without integral overcurrent protection for household and similar use (RCCB's) - Part 2-2:Applicsbility of the general rules to RCCB's functionall dependent of line voltage
61009-1	Residual current operated circuit-breakers with integral overcurrent protection for household and similar use (RCBO's) - Part 1: General rules
61009-2-1	Residual current operated circuit-breakers with integral overcurrent protection for household and similar use (RCBO's) - Part 2-1: Applicability of general rules to RCBO's functionally Independent of line voltage
61009-2-2	Residual current operated circuit-brakers with integral overcurrent protection for household and similar use (RCBO's) - Part 2-2: Applicability of general rules to RCBO's functionally dependent of line voltage
62019	Electrical accessories circuit-breakers and similar equipment for household use - Auxiliary contact units
50085-1	Cable trunking systems and cable ducting systems for electrical Installation: General requirements
50086-1	Conduit systems for cable management - Part 1:General requirements
50086-2-1	Conduit systems for cable management - Part 2-1: Particular requirements for rigid conduits systems
50086-2-2	Conduit systems for cable management - Part 2-2: Particular requirements for pliable conduits systems
50086-2-3	Conduit systems for cable management - Part 2-3: Particular requirements for flexible conduitv systems
50086-2-4	Conduit systems for cable management - Part 2-4: Particular requirements for conduit systems buried underground
60669-1	Switches for household and similar fixed-electrical installations - Part 1: General requirements
60669-2-1	Switches for household and similar fixed-electrical installations - Part 2: Electronic switches
60755	General requirements for residual current operated protective devices

TC 32 Fuses
CT 32 Fusibili

60282-1	High-voltage fuses-Part 1: Current- limiting fuses
60282-2	High-voltage fuses-Part 2: Expulsion fuses
60269-1	Low-voltage fuses - Part 1: General requirements
60269-2	Low-voltage fuses - Part 2: Supplementary requirements for fuses for use by authorized persons

L'accreditamento per i settori elencati nel presente Allegato è valido fino a tutto il 2015 -05 -20
The accreditation for the sectors listed in this Enclosure is valid until 2015 -05 -20

Il Direttore di Dipartimento
The Department Director

Il Presidente
The President

Il Direttore Generale
The General Director

Allegato 2 al Certificato di accreditamento n° 070B Rev. 08

Enclosure 2 to the accreditation Certificate n° 070B Rev. 08

60269-3 Low-voltage fuses - Part 3: Supplementary requirements for fuses for use by unskilled persons
60269-4 Low-voltage fuses - Part 4: Supplementary requirements for fuse-links for the protection of semiconductor devices
60644 Specification for high-voltage fuse-links for motor circuit applications

TC 33 Power capacitor
CT 33 Condensatori
60358 Coupling capacitors and capacitor dividers

TC 36 Insulator
CT 36 Isolatori
50180 Bushings above 1kV up to 36kV and from 250A up to 3150A for liquid filled transformer
50181 Bushings above 1kV up to 36kV and from 250A to 1250A for equipment other than liquid filled transformers
50243 Outdoor bushings for 24kV and 36kV ,5kA and 8kA for liquid filled transformers
50386 Bushings up to 1 kV and from 250A up to 5000A for liquid filled transformers
50387 Busbar bushings up to 1kV and from 1,25kA to 5kA for liquid filled transformers
60137 Insulated bushings for alternating voltages above 1kV
60168 Tests on indoor and outdoor post insulators of ceramic material or glass for systems with nominal voltage greater than 1000 V
273 Characteristics of indoor an outdoor post insulators for systems with nominal voltages greater than 1000 V

TC 37 Surge arresters
CT 37 Scaricatori
60099-4 Metal oxide surge arresters without gaps for a.c. systems

TC 38 Instruments trasformers
CT 38 Trasformatori di misura
60044-1 Instruments transformers - Part 1: Current transformers
60044-2 Instruments transformers - Part 2: Inductive voltage transformers
60044-3 Instruments transformers - Part 3: Combined transformers
60044-5 Instruments transformers - Part 5: Capacitor voltage transformers
60044-6 Instruments transformers - Part 6: Requirements for protective current transformers for transient performance
60044-7 Instruments transformers - Part 7: Electronic voltage transformers
60044-8 Instruments transformers - Part 8: Electronic current transformers

TC 65 Industrial-process measurement and control
CT 65 Controllo e misura dei processi industriali
61131-1 Programmable controllers – Part 1: General informations
61131-2 Programmable controllers – Part 2: Equipment requirements and tests

TC 70 Degree of protection by enclosures
CT 70 Involucri di protezione
60529 Degree of protection provided by enclosures (IP Code)

TC 78 Live working
CT 78 Lavori elettrici sotto tensione
60832-1 Insulating sticks and attachable devices – Part 1: Insulating sticks
60832-2 Insulating sticks and attachable devices – Part 2: Attachable devices
60855 Insulating foam-filled tubes and solid rods - Part 1: Tubes and rods of a circular cross-section
60984 Sleeves of insulating meterial for live working
61111 Electrical insulating matting
61219 Earthing or earthing and short-circuit equipment using lances as a short-circuiting device Lance earthing
61230 Portable equipment for earthing or earthing and short- circuiting

L'accreditamento per i settori elencati nel presente Allegato è valido fino a tutto il 2015 -05 -20
The accreditation for the sectors listed in this Enclosure is valid until 2015 -05 -20

Il Direttore di Dipartimento
The Department Director

Il Presidente
The President

Il Direttore Generale
The General Director

ВЯРНО С ОРИГИНАЛА

ACCREDIA
L'ENTE ITALIANO DI ACCREDITAMENTO
Membro degli Accordi di Mutuo Riconoscimento EA, IAF e ILAC
Signatory of EA, IAF and ILAC Mutual Recognition Agreements

License Number 024

Allegato 2 al Certificato di accreditamento n° 070B Rev. 08

Enclosure 2 to the accreditation Certificate n° 070B Rev. 08

61235 Insulating hollow tubes for electrical purposes
61243-1 Voltage detectors – Part 1: Capacitive type to be used for voltages exceeding
61243-5 Voltage detectors – Part 5: Voltage detecting systems (VDS)

TC 95 Measuring relays and protection equipment
CT 95 Relè di misura e dispositivi di protezione
60255-6 Electrical relays – Part6: Measuring relays and protection equipment

TC 96 Small transformers, reactors and power supply units and special transformers, reactors and power supply units: safety requirements
CT 96 Trasformatori di sicurezza ed isolamento
61558-1 Safety of power transformers, power supply units and similar – Part 1: General requirements and tests

TC 104 Enviromental condition, classification and methods of test
CT 104 Condizioni ambientali. Classificazioni e metodi di prova
60068-2-6 Enviromental testing – Part 2: Test FC Vibration (sinusoidal)

L'accreditamento per i settori elencati nel presente Allegato è valido fino a tutto il 2015 -05 -20
The accreditation for the sectors listed in this Enclosure is valid until 2015 -05 -20

Il Direttore di Dipartimento
The Department Director

Il Presidente
The President

Il Direttore Generale
The General Director

ВЯРНО С ОРИГИНАЛА

15

WE
THE IDEA OF PROOVEN AND CERTIFIED QUALITY

THE VISION

LOVAG is the European Compliance Scheme providing global access to the largest worldwide markets for Low Voltage Industrial products.

Our Agreement stands for certified quality:
- minimisation of risk
- shaping of the future
- assumption of responsibility and
- enthusiasm for joint tasks.

THE MISSION

We provide to our customer the most credible global compliance mark for Low Voltage Industrial products
- Based on strict application of international standards
- Based on factory audits and market surveillance actions
- Embedding the European values: Quality, Safety, Performance, Ethic, Know How, Seniority
- Without compromise on integrity, quality and honesty of our services

We provide to our customer the largest certification body and laboratories network in Europe. We provide to our customers and to our members, a network of highest expertise. Participating to the standardization and certification bodies by providing high-level added value. Contributing to peace-of-mind of our customers by guaranteeing compliance of products.

THE LOVAG MEMBERS

Today, 7 Certification Bodies are LOVAG Members.

Read more

Top

LOVAG Mark:
ONE SIGN - WORLDWIDE
for Low Voltage Industrial Products

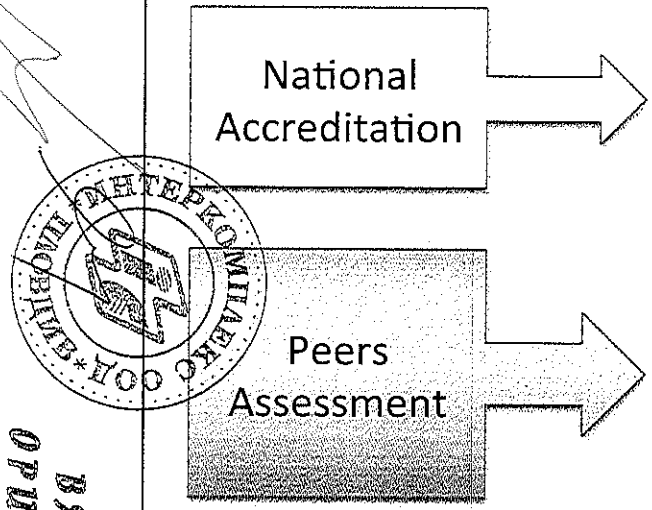
"We carry the idea of European certified quality - worldwide." Marie-Elisabeth d'Ornano, Chairman, LOVAG

Contact
PR-News
Imprint/Copyright/Legal

ВЯРНО С ОРИГИНАЛА

Nat. Accreditation + Peer Assessment

LOVAG
What are we doing ?



ACCREDITATION & PEER ASSESSMENTS

OF LOVAG CERTIFICATION BODIES

According to EN 45011 (ISO/IEC Guide 65)
GUARANTY OF IMPARTIALITY AND INTEGRITY

		LOVAG Certification Bodies	ACAE	ALPHA *)	ALPHA at VDE	ASEFA	APPLUS+ Labora-tories	IMQ	Intertek Semko AB	SGS CEBEC
Accreditation by EA/IAF Members		Accreditation Body	ACCREDIA	DATech	DAkkS	COFRAG	***)	ACCREDIA	SWEDAC	BELCERT
		Reg.Code	PRD nº0708 Rev.08	DAT-ZE-001/92-03	D-ZE-12061-01-01	Nº 5-0037		No. 005B Rev 15	No. 1003	Nº 041 PR
LOVAG Peers Assessments after 1999 **)										
		Assessors	SGS CEBEC	IT SEMKO		ALPHA			ALPHA	CESI
			FIMKO	ACAE		FIMKO			ASEFA	KEMA
		Year	2001	1999		2002			2003	2000
		Assessors	SGS CEBEC	ACAE		IT SEMKO	ACAE		ALPHA	ALPHA
			APPLUS+	SGS CEBEC		ALPHA	ALPHA		APPLUS+	IT SEMKO
		Year	2005	2003		2006	2004		2007	2004
		Assessors	ALPHA	CEBEC		ALPHA	ALPHA		APPLUS+	IT SEMKO
			VEIKI-VNL	ASEFA		APPLUS	SGS CEBEC		SGS CEBEC	ASEFA
		Year	2009	2007		2010	2008		2011	2009
		Assessors	IT SEMKO		ASEFA	ALPHA at VDE	SGS CEBEC	ALPHA at VDE		ASEFA
			APPLUS+		IT SEMKO	IMQ	ACAE	SGS CEBEC		IT SEMKO
		Year	2013		2011	2014	2012	2012		2013
		OTHER RECOGNITIONS	Ministry of Industry G.U. 258 94A6997		NCB for CB- & CCA-Scheme			NCB for CB- & CCA-Scheme	NCB for CB- & CCA-Scheme	NCB for CB- & CCA-Scheme

*) ALPHA was taken over by ALPHA at VDE in January 2011

**) LOVAG Peers Assessments have to be performed periodically every 4 years

***) Qualification according to EN 45011 checked and approved by LOVAG Management Committee

Intercomplex Ltd.®
4002 Пловдив, бул. "Пещерско шосе" № 201, тел. (032) 241 415, тел./факс: (032) 241 414, e-mail: office@intercomplex.bg
1113 София, ул. "Акад. Г. Бончев" № 20, тел. (02) 971 70 41, факс: (02) 971 71 41, e-mail: office.sf@intercomplex.bg

Приложение ТС 7
към Технически спецификации
за обособена позиция 1
от процедура PPD 15-033

Инструкции за транспортиране и складиране
въвеждане в експлоатация и поддържане

на триполюсни автоматични прекъсвачи НН с лят корпус, ABB SACE, серия Tmax

Триполюсните автоматични прекъсвачи НН с лят корпус се монтират в разпределителни табла в трансформаторните постове и се използват за защита на електропроводните линии.

Триполюсните автоматични прекъсвачи НН с лят корпус представляват механични комутационни апарати от фиксиран тип с предно свързване на шинната система.

Автоматичните прекъсвачи са способни да провеждат и да включват/изключват ръчно електрически токове във вериги при нормални условия и да включват, да провеждат за определено време и да изключват автоматично посредством електромеханична защита от термомагнитен тип токове във вериги при условията на претоварване и късо съединение.

2. Транспорт
Електрооборудването/ електроматериалите се транспортират в оригиналната транспортна опаковка на производителя, в която стандартно се доставя.

Препоръчва се избягването на натоварване и слагане на тежки предмети/товари върху опаковките на оборудването. Така се гарантира предпазване от счупване или деформация при съхранение и транспорт.

3. Съхранение
Доставяното електротехническо оборудване се съхранява в сухи и затворени складови помещения предоставящи нормални условия за съхраняване на стандартно електрооборудване и електротехническа продукция.
Оборудването да се предпазва от влага и течаща вода.

4. Монтаж
Монтажътсе извършва само от компетентен и упълномощен за работа с електротехническа продукция персонал, съгласно пълните инструкциите за монтаж приложени към всяко изделие, където са посочени и стойностите на въртящия момент за затягане на резбовите съединения.

5. Обслужване и поддържане

Производителя на електрооборудването не предвижда специализирани дейности по обслужването и поддръжката на апаратурата.

07.08.2015 г.

Кандидат: ИНТЕРКОМПЛЕКС ООД
.....
Ехиязар Узунян - управител

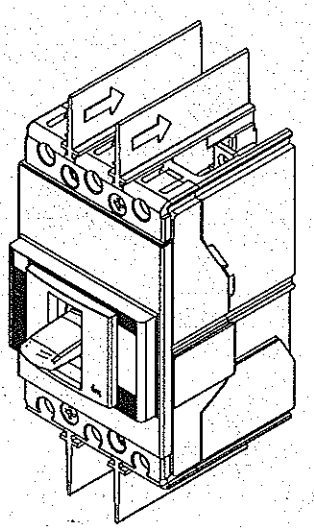
Doc. N.° 1SDH000719R0001 - L4099

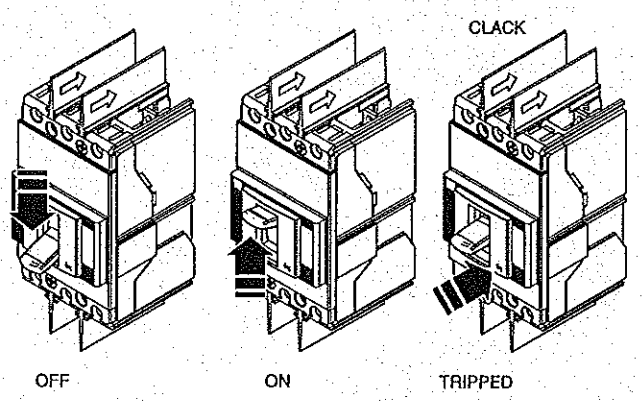
SACE Tmax XT

Istruzioni di installazione XT1
Installation instructions XT1
Installationsanleitung XT1
Instructions pour l'installation XT1
Instrucciones de instalación XT1

A

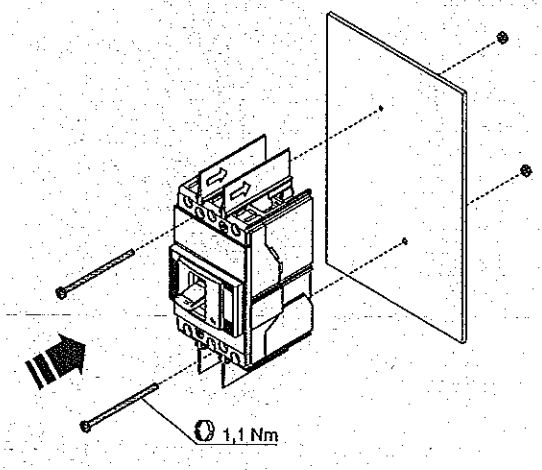
XT1/III-IV





B

XT1/III-IV



C

XT1/III-IV

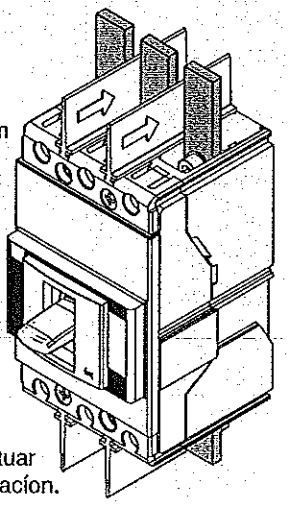
Usare cavi o barre isolate/ o eseguire prove di tipo specifiche sull' installazione.

Use cable or insulated busbars/ or perform specific type test on the installation.

Kabel oder isolierte Sammelschienen verwenden / oder die spezifische Typprüfung auf derInstallation durchführen.

Utiliser un câble ou des barres isolées/ ou réaliser un test de type spécifique sur installation.

Utilizar un cable o barras aisladas / o efectuar una prueba de tipo específico sobre instalacion.

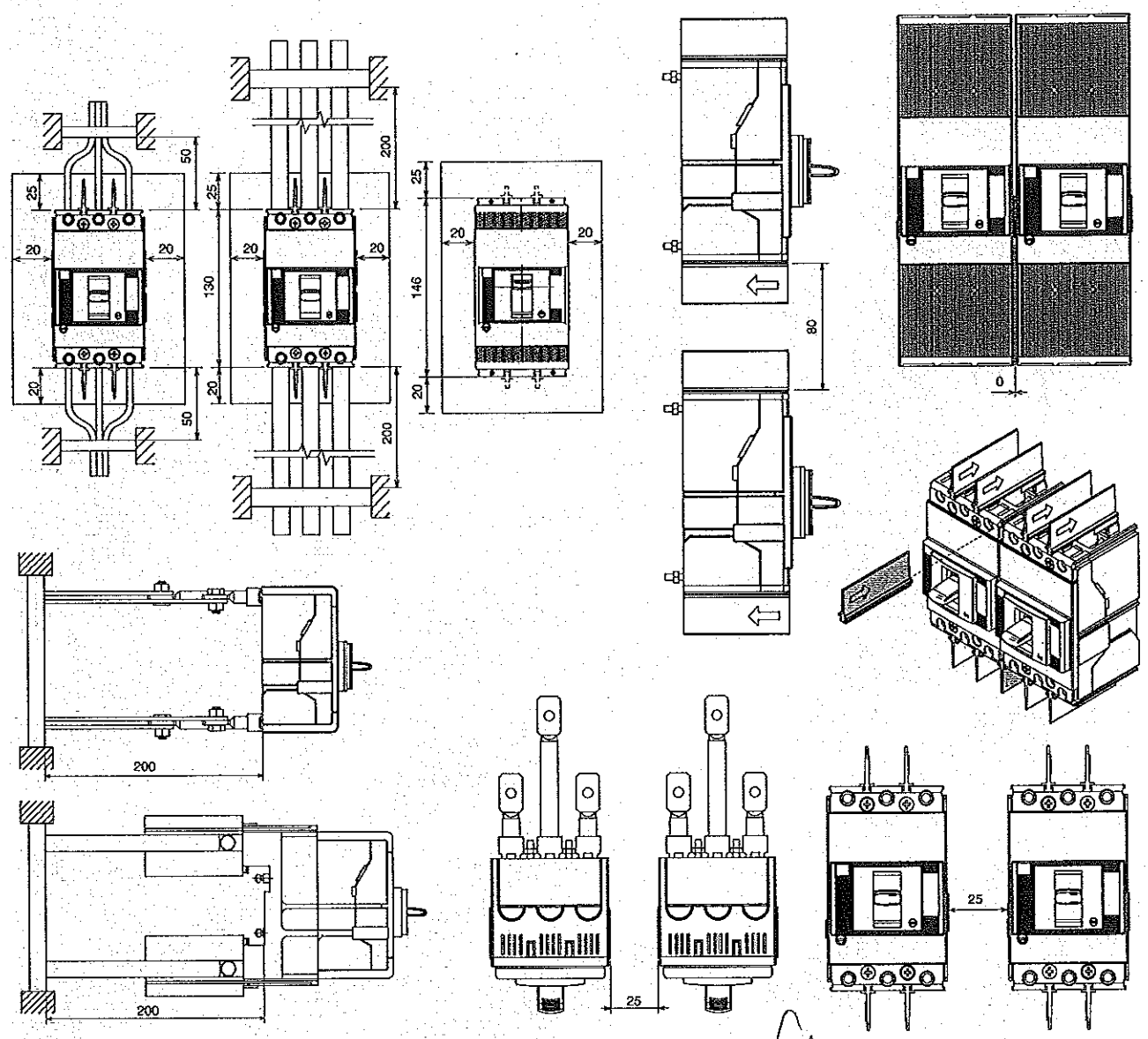


Power and productivity for a better world™

ABB

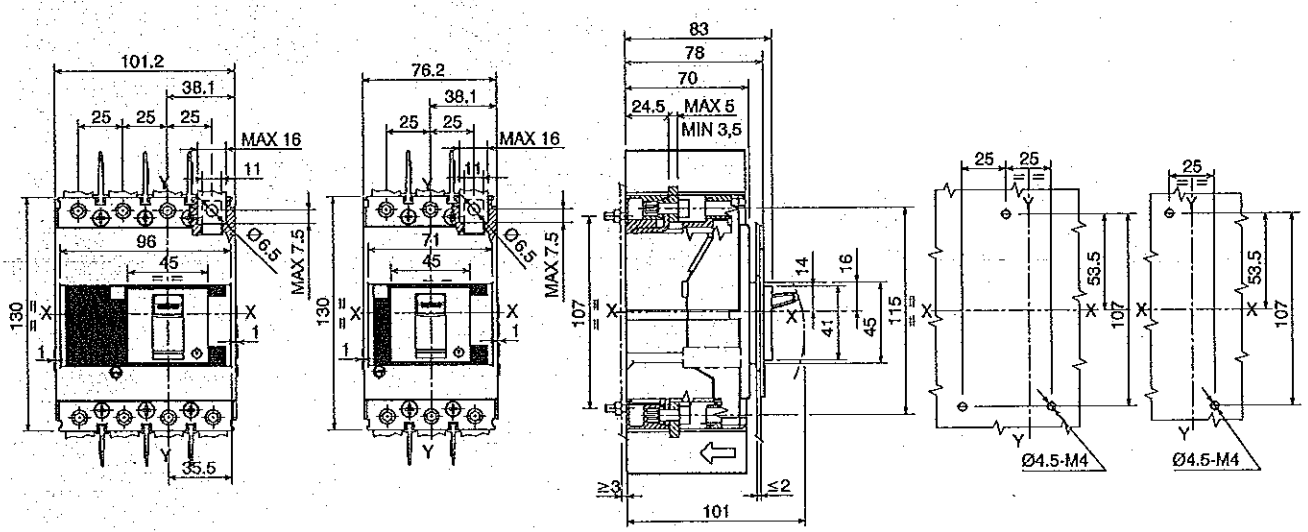
D

XT1//III-IV



E

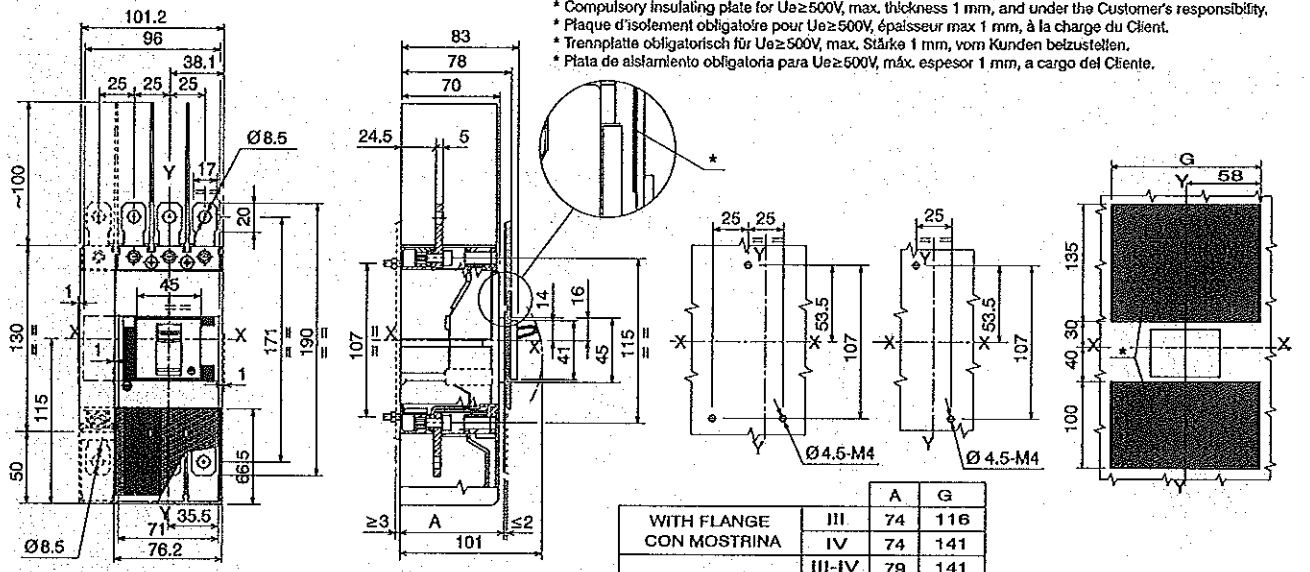
XT1-F/III-IV/F



F

XT1-F/III-IV/EF

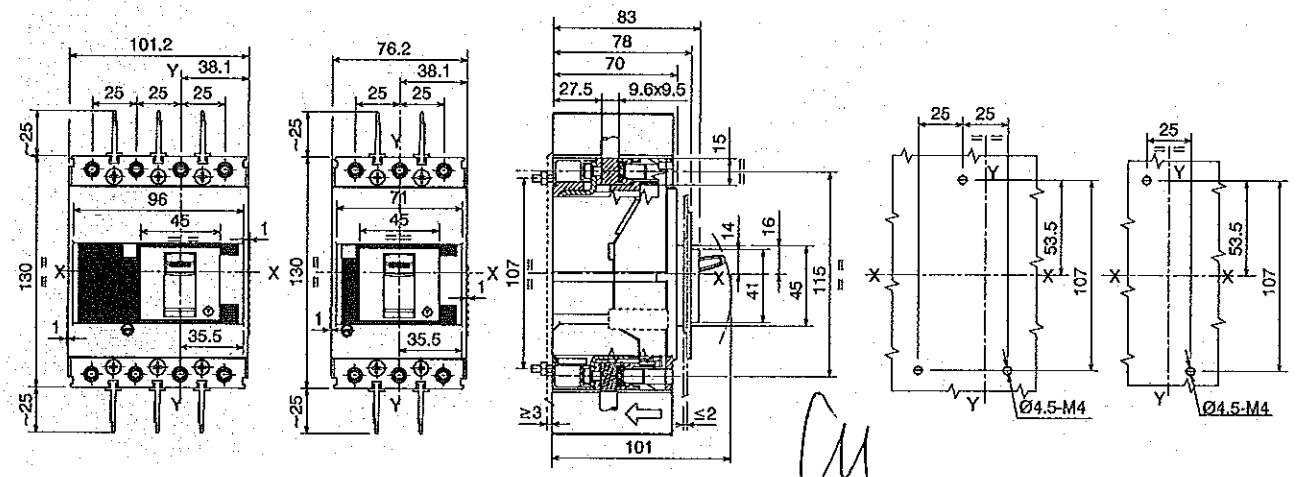
* Piastra di isolamento obbligatoria per Ue≥500V, spessore max 1 mm, a cura del Cliente.
* Compulsory insulating plate for Ue≥500V, max. thickness 1 mm, and under the Customer's responsibility.
* Plaque d'isolement obligatoire pour Ue≥500V, épaisseur max 1 mm, à la charge du Client.
* Trennplatte obligatorisch für Ue≥500V, max. Stärke 1 mm, vom Kunden beizustellen.
* Placa de aislamiento obligatoria para Ue≥500V, máx. espesor 1 mm, a cargo del Cliente.



		A	G
WITH FLANGE CON MOSTRINA	III	74	116
	IV	74	141
WITHOUT FLANGE SENZA MOSTRINA	III-IV	79	141
	III	71	116
	IV	71	141

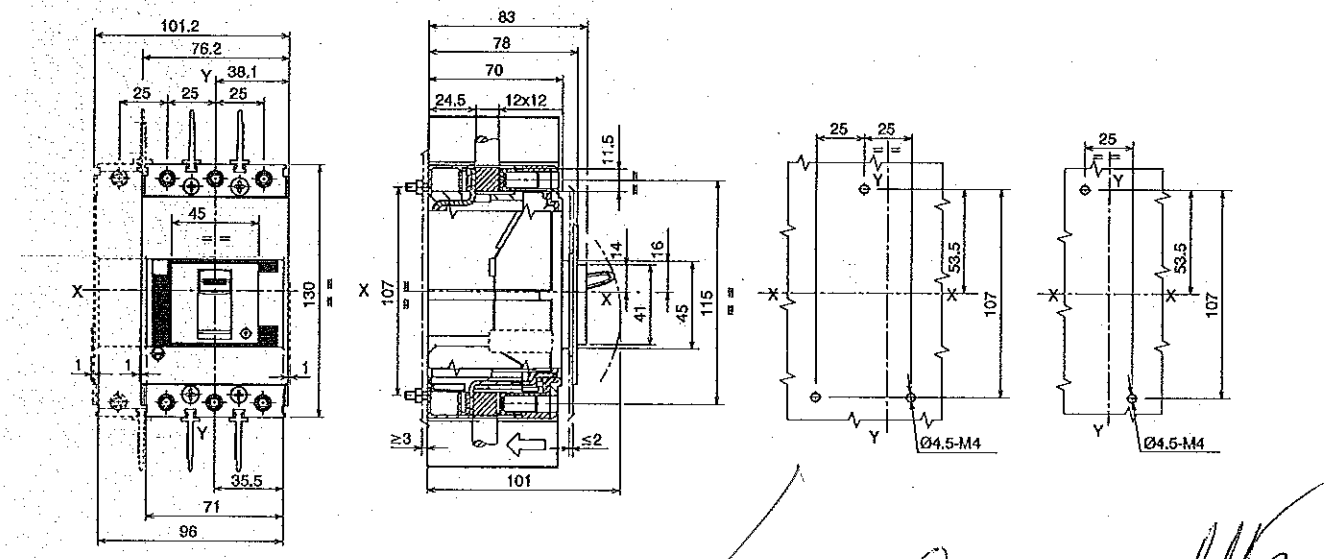
G

XT1-F/III-IV/Fc CuAl



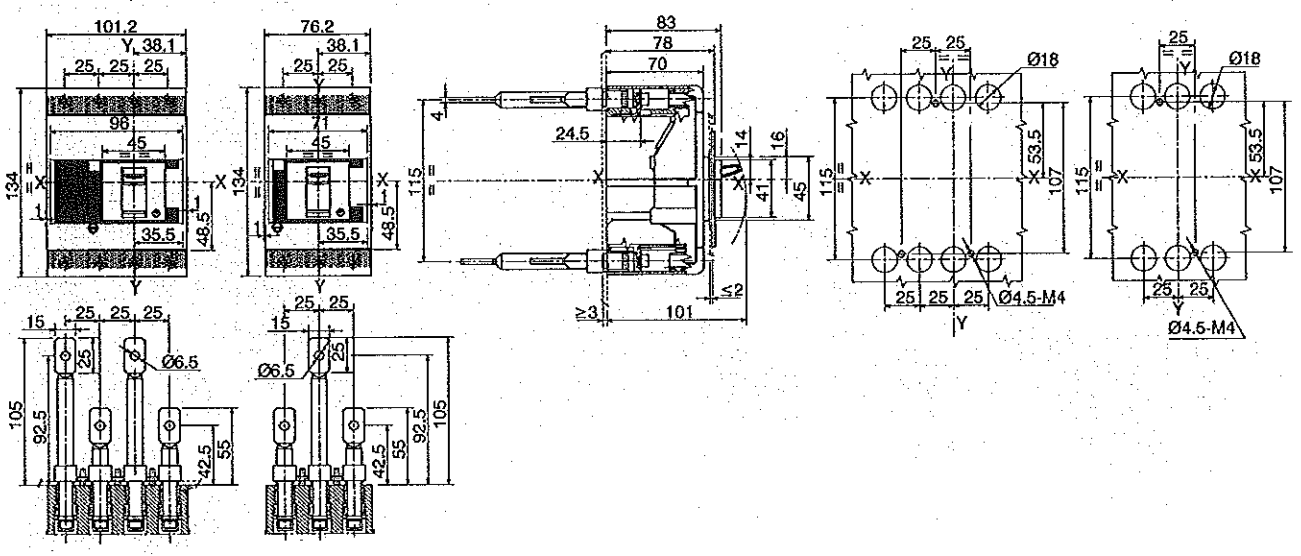
H

XT1-F/III-IV/FC Cu



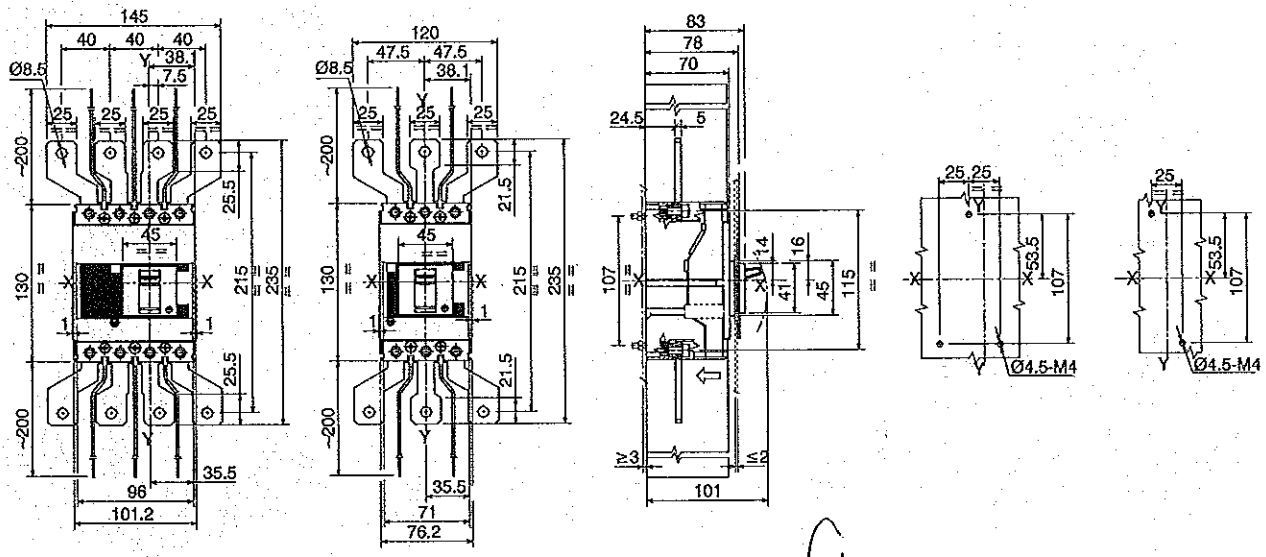
I

XT1-F/III-IV/R



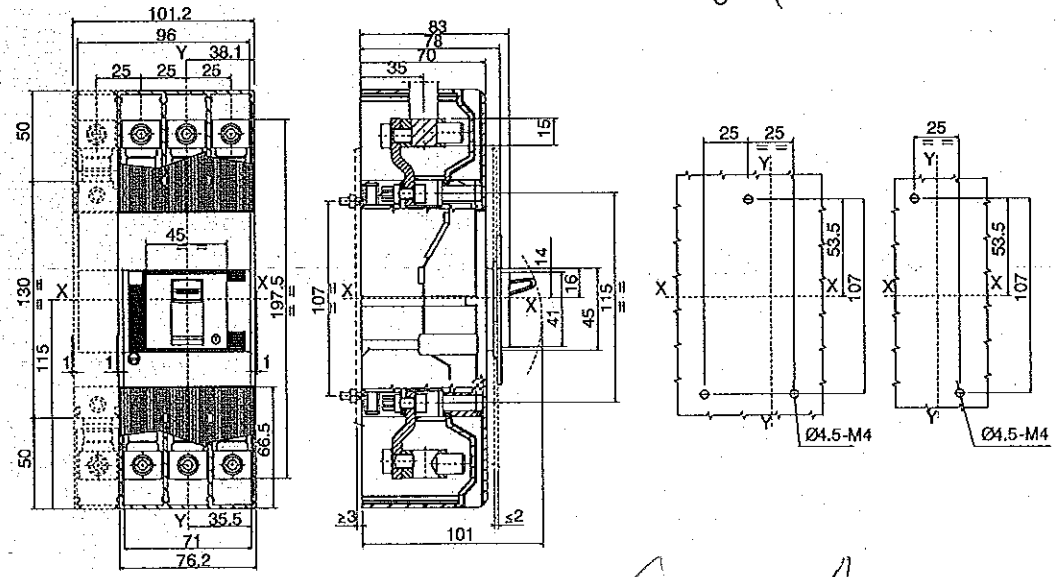
J

XT1-F/III-IV/ES



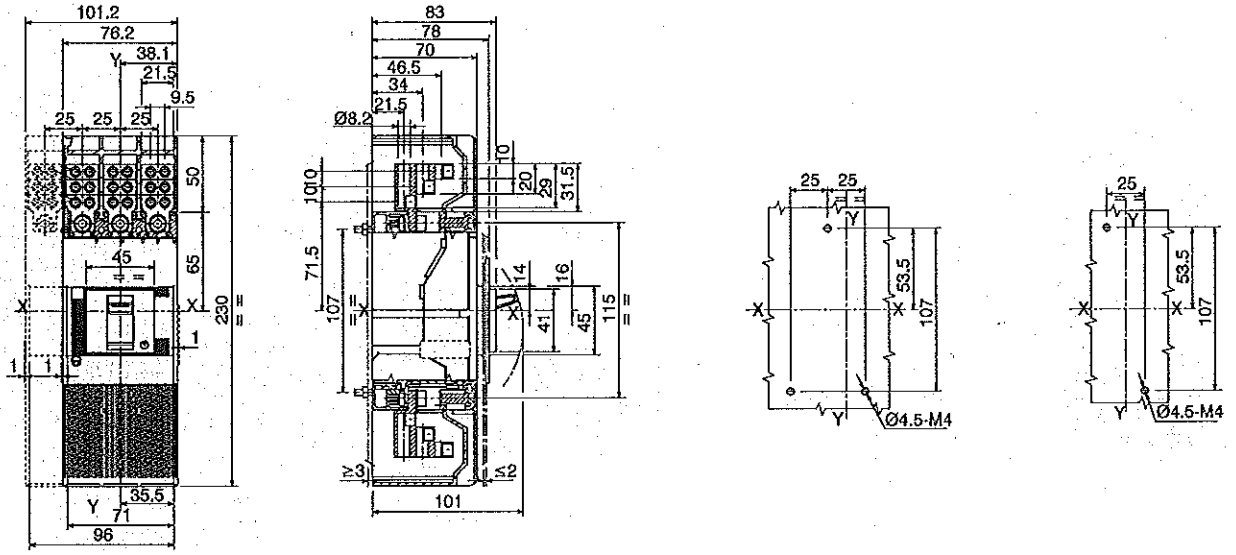
K

XT1-F /III-IV/Fc-CuAl EXT



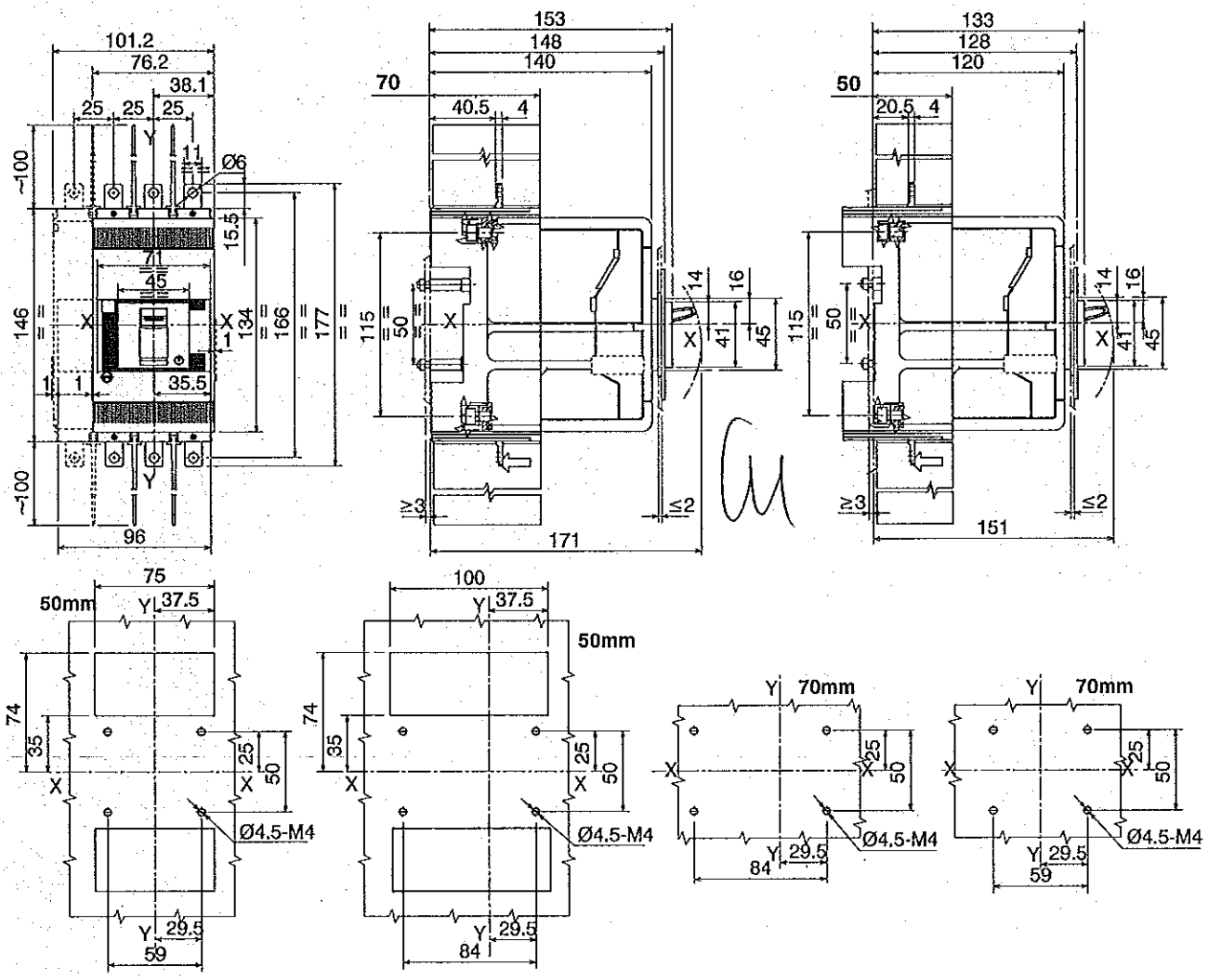
L

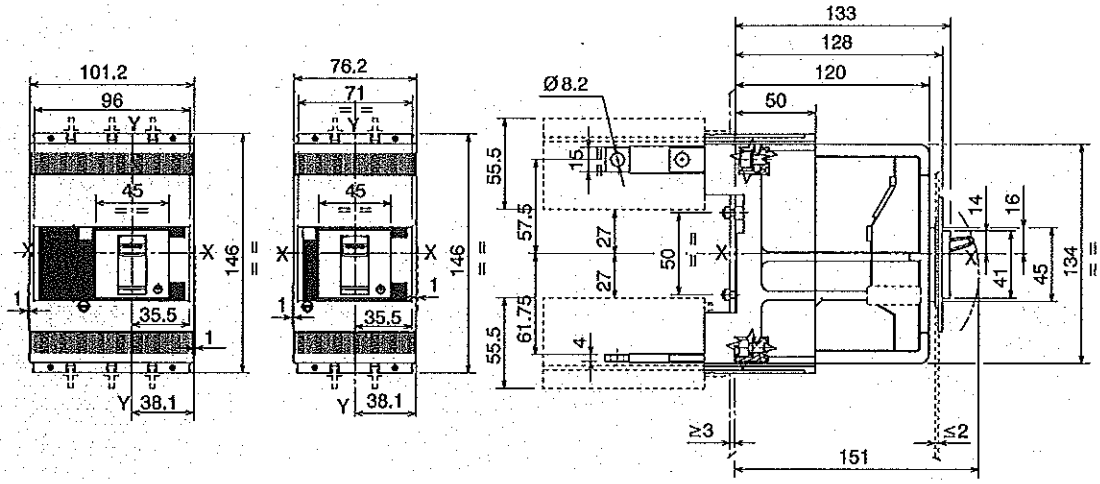
XT1-F/III-IV/Mc

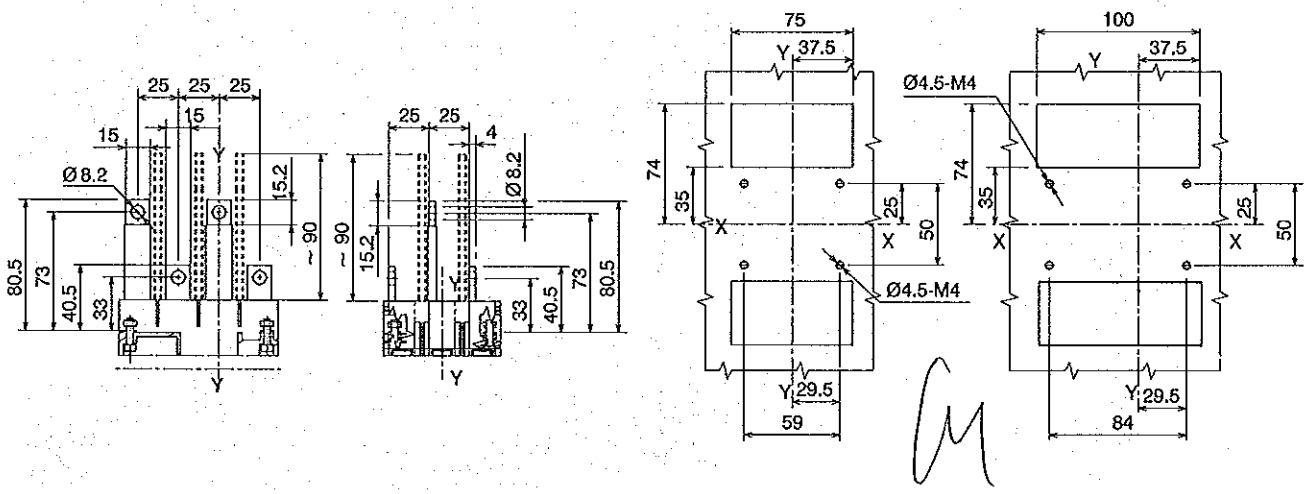


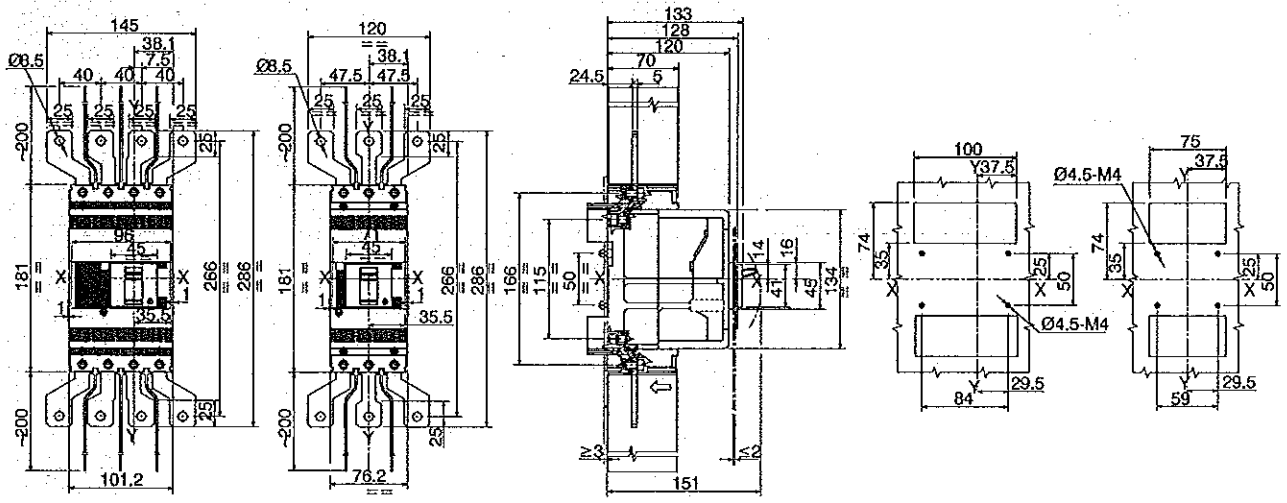
M

XT1-P/III-IV/EF



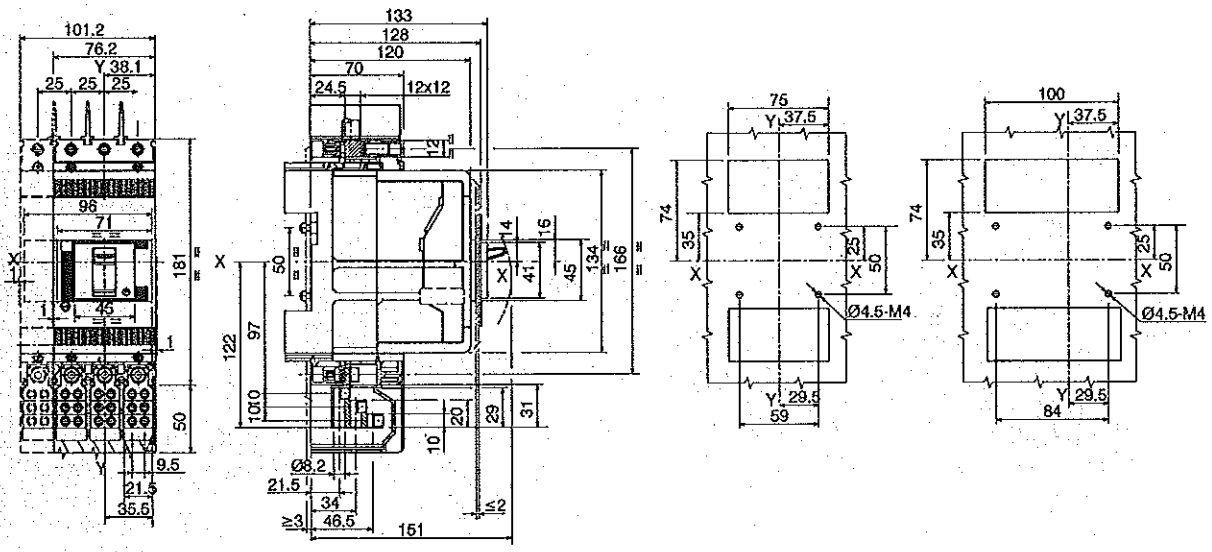

101.2
96
76.2
71
45
35.5
38.1
146
Ø8.2
133
128
120
50
55.5
57.5
61.75
27
14
16
41
45
134
151


25
15
Ø8.2
15.2
~ 90
80.5
73
40.5
33
4
75
100
37.5
Ø4.5-M4
74
35
50
29.5
59
84


145
120
Ø8.5
38.1
7.5
40
47.5
25
~200
181
266
286
95
45
35.5
101.2
76.2
133
128
120
70
24.5
5
166
115
50
14
16
41
45
134
151
100
75
37.5
Ø4.5-M4
74
35
84
59
29.5

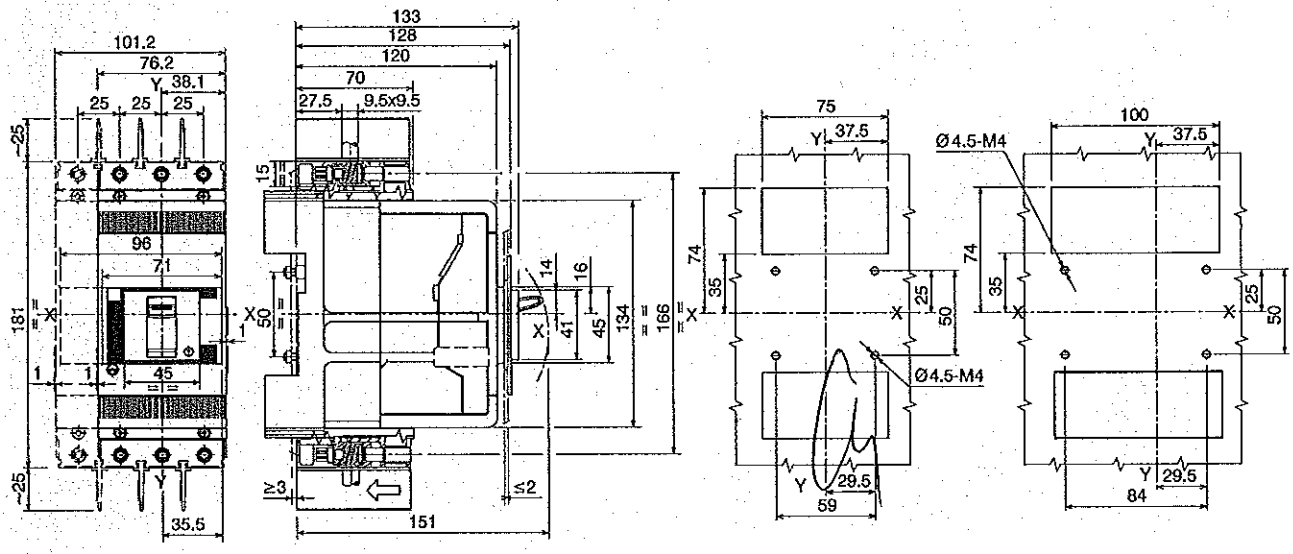
P

XT1-P/III-IV/Fc Cu/MC



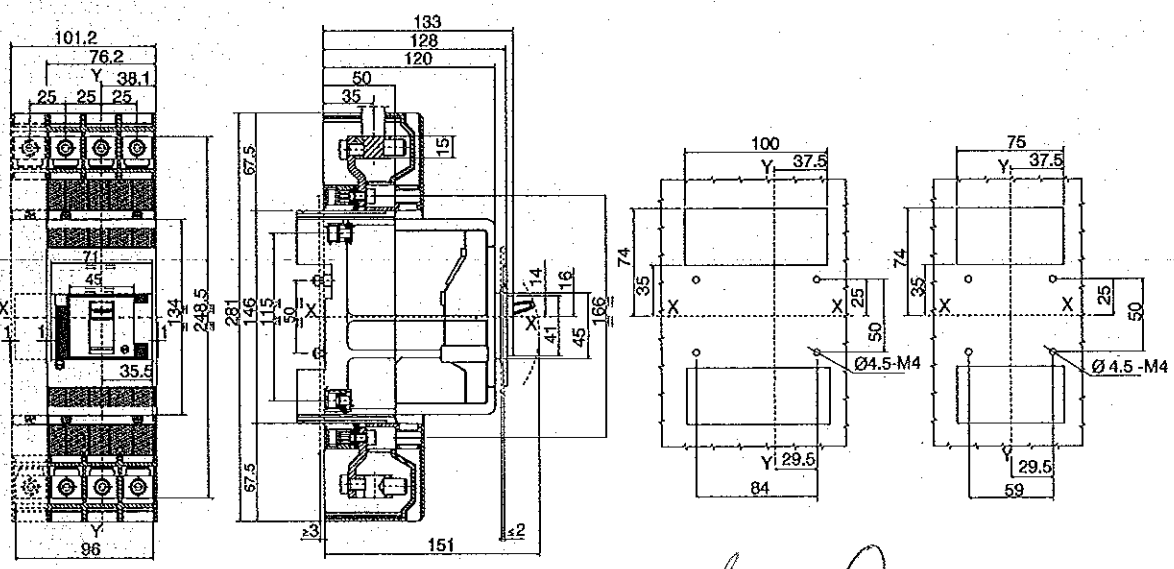
Q

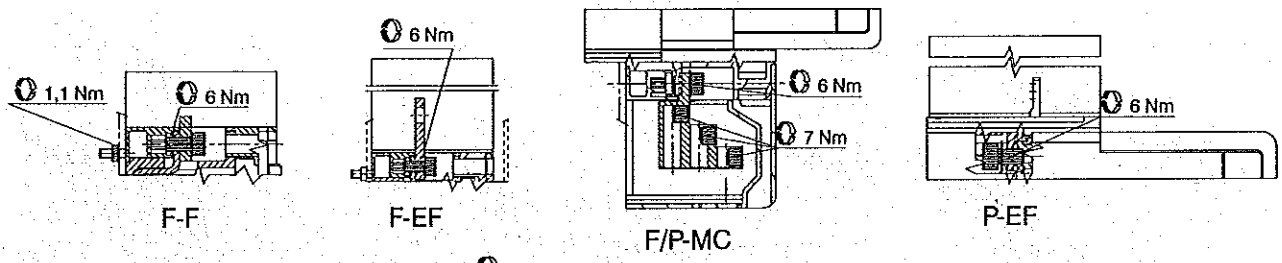
XT1-P/III-IV/Fc-CuAl

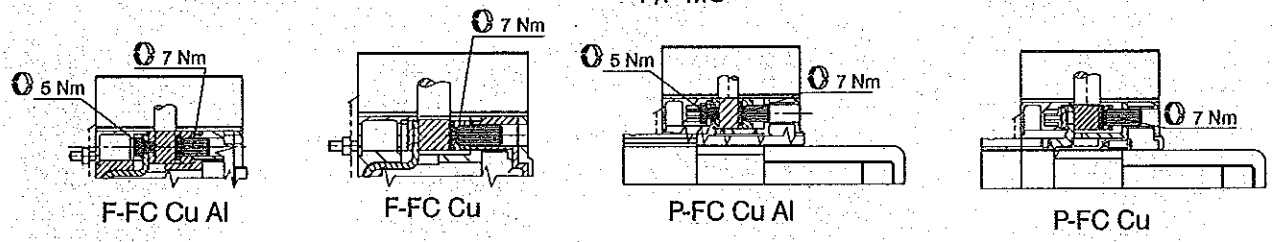


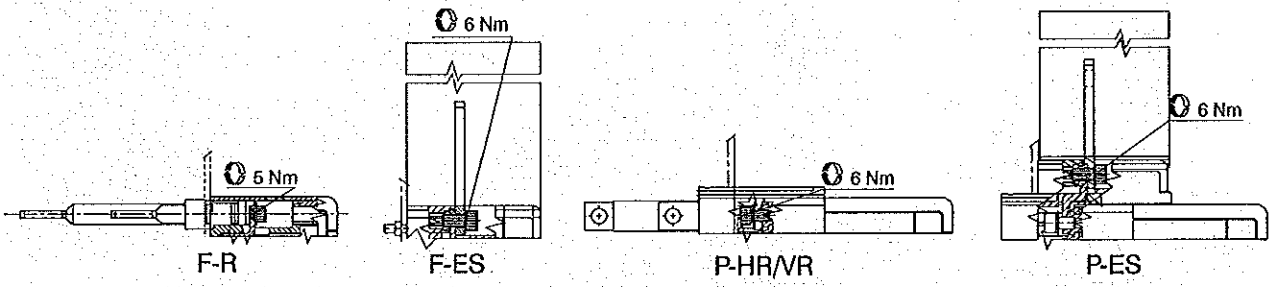
R

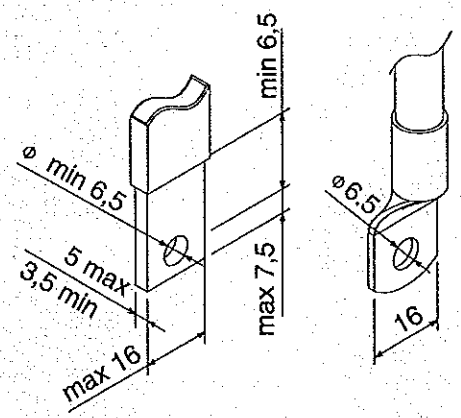
XT1-P/III-IV/Fc-CuAl EXT

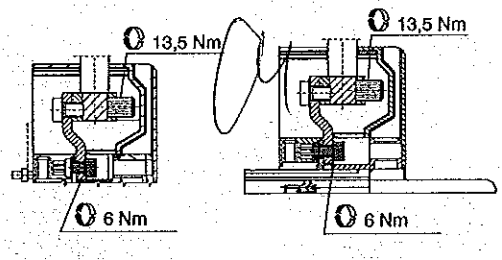


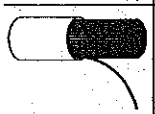




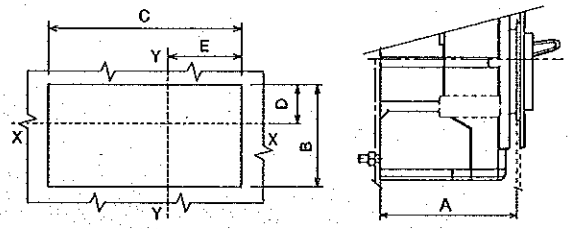


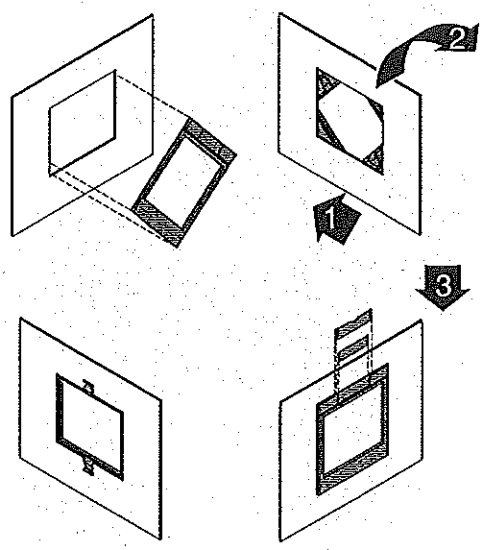




		FC Cu		FC CuAl		Mc		FC CuAl Ext	
		MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
Stranded		70 mm²	2,5 mm²	50 mm²	1,5 mm²	35 mm²	2,5 mm²	95 mm²	35 mm²
Flexible		50 mm²	2,5 mm²	50 mm²	1,5 mm²	25 mm²	2,5 mm²		

T



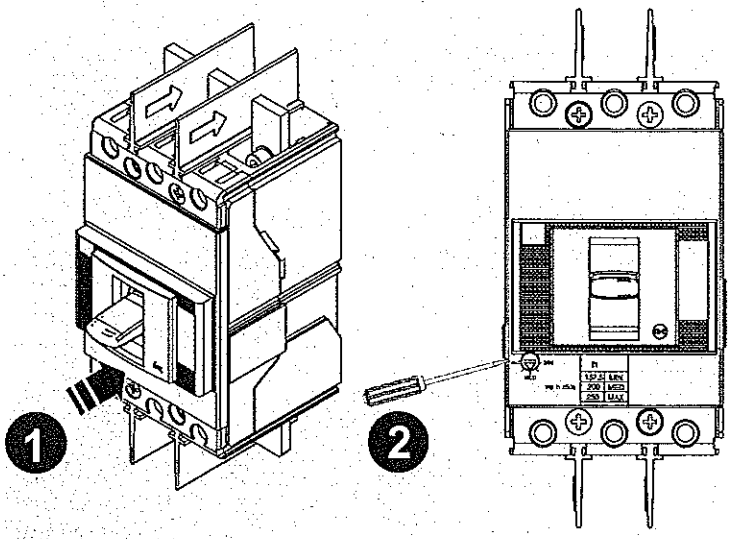


		A			B	C	D	E
		F	P					
			50mm	70mm				
XT1 WITH FLANGE CON MOSTRINA	III	74	124	144	55	81	21	40,5
	IV	74	124	144	55	106	21	40,5
	OPTIONAL FLANGE III-IV	79	129	149	73	57	30	28,5

		A			B	C	D	E
		F	P					
			50mm	70mm				
XT1 WITHOUT FLANGE SENZA MOSTRINA	III-IV	79	129	149	43	47	15	23,5
	III	71	121	141	47	73	17	36,5
	IV	71	121	141	47	98	17	36,5

U

TMD



E'obbligatorio mettere l'interruttore in posizione Trip test prima di regolare il termomagnetico.

It is compulsory to turn the circuit breaker to Trip test mode before adjusting the thermomagnetic release.

Der Leistungsschalter muss vor Einstellung des thermomagnetischen Auslösers zwingend in die Prüfstellung geschaltet werden.

Il est obligatoire de mettre le disjoncteur en position de Test de Déclenchement avant de régler le déclencheur magnétothermique.

Es obligatorio situar el interruptor en posición "Test de Disparo" antes de realizar el ajuste del relé termomagnético.

	I1		
In	MIN (0,7)	MED (0,85)	MAX (1xIn)
16	11,2	13,6	16
20	14	17,7	20
25	17,5	21,3	25
32	22,4	27,2	32
40	28	34	40
50	35	42,5	50
63	44,1	53,6	63
80	56	68	80
100	70	85	100
125	87,5	106,3	125
160	112	136	160

For more information please contact:

ABB S.p.A.
ABB SACE Division
Via Baioni, 35
24123 Bergamo - Italy
Phone: +39 035 395 111
Fax: +39 035 395 306 - 433

www.abb.com

Power and productivity for a better world™

ABB

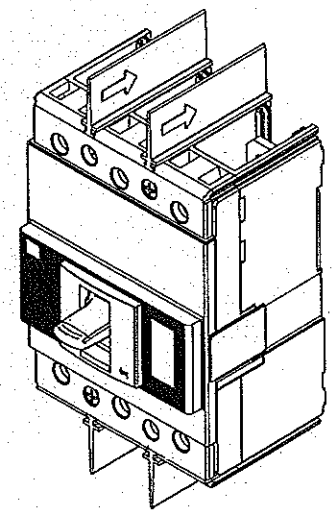
Doc. N.° 1SDH000720R0001 - L4099

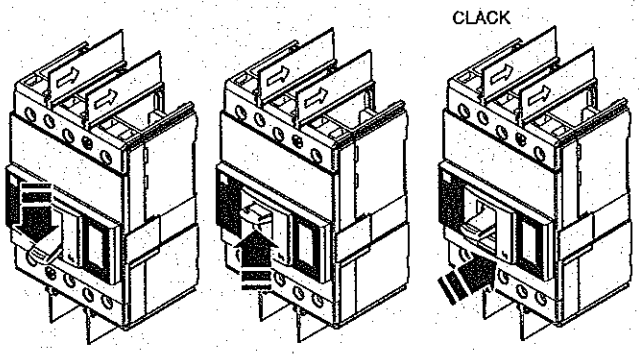
SACE Tmax XT

Istruzioni di installazione XT3
Installation Instructions XT3
Installationsanleitung XT3
Instructions pour l'installation XT3
Instrucciones de instalación XT3

A

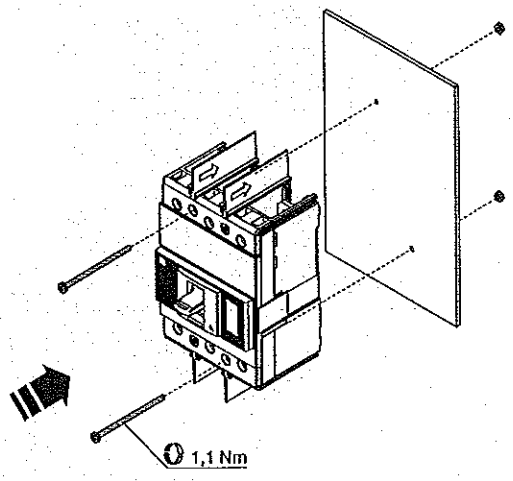
XT3/III-IV





B

XT3/III-IV



C

XT3/III-IV

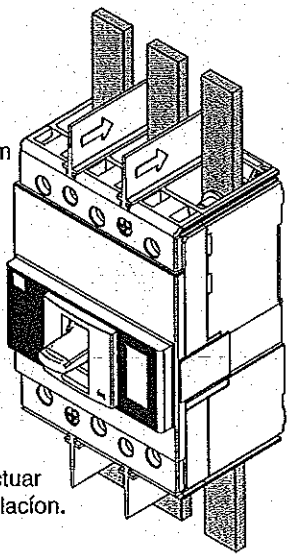
Usare cavi o barre isolate/ o eseguire prove di tipo specifiche sull' installazione.

Use cable or insulated busbars/ or perform specific type test on the installation.

Kabel oder isolierte Sammelschienen verwenden / oder die spezifische Typprüfung auf derInstallation durchführen.

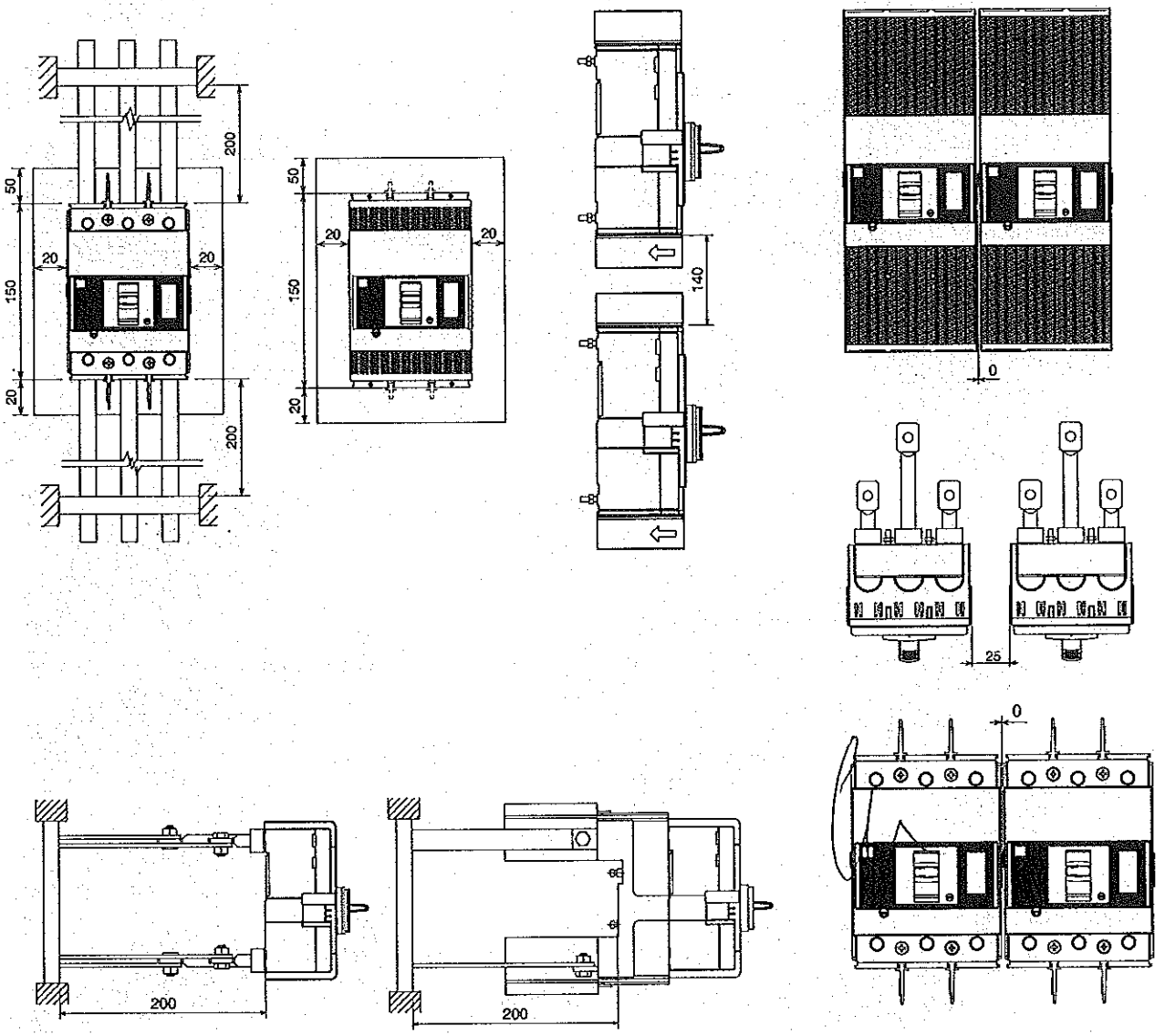
Utiliser un câble ou des barres isolées/ ou réaliser un test de type spécifique sur installation.

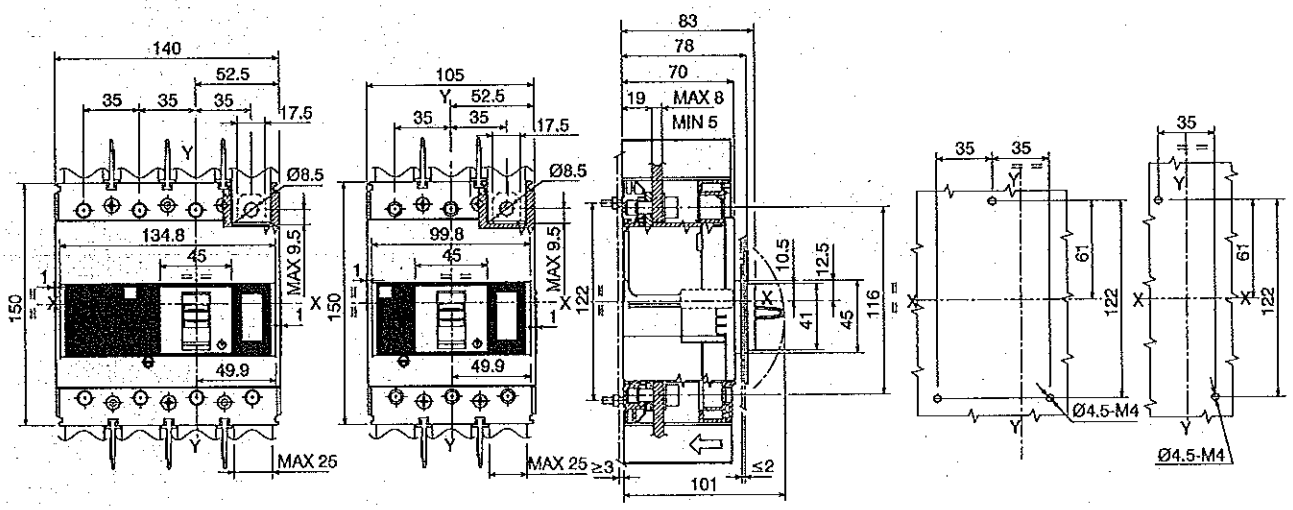
Utilizar un cable o barras aisladas / o efectuar una prueba de tipo específico sobre instalación.



Power and productivity for a better world™

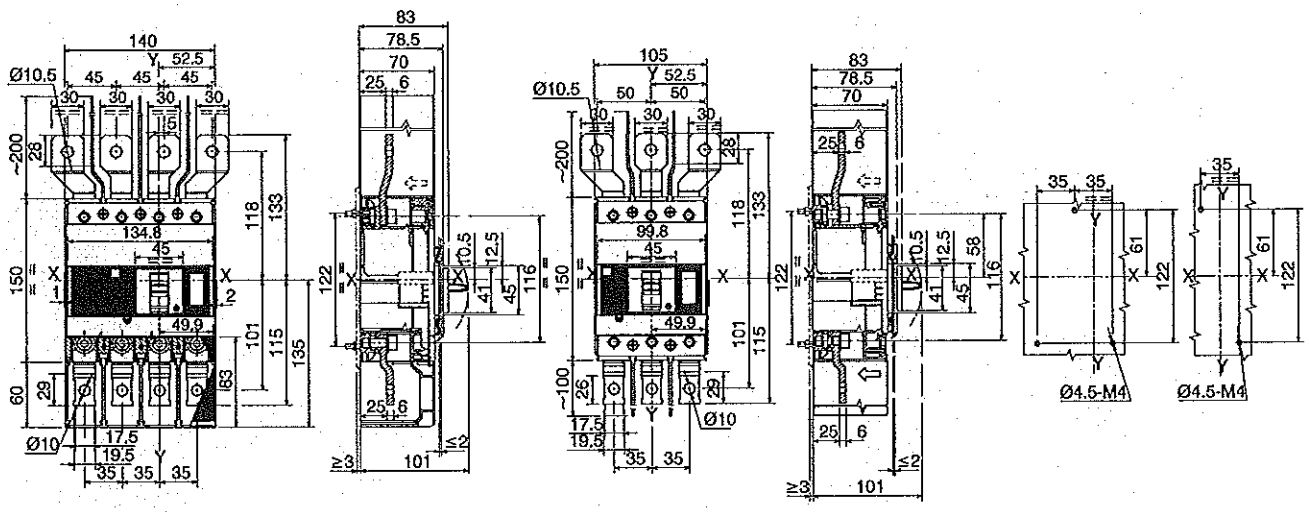
ABB


200
50
20
150
20
20
200
20
20
50
150
20
20
140
0
25
0
200
200


140
52.5
35
35
35
17.5
Y
Ø8.5
134.8
45
MAX 9.5
150
49.9
MAX 25
105
52.5
35
35
17.5
Ø8.5
99.8
45
MAX 9.5
150
49.9
MAX 25
83
78
70
19
MAX 8
MIN 5
10.5
12.5
41
45
116
122
≥3
≤2
101
35
35
61
122
Ø4.5-M4
35
61
122
Ø4.5-M4

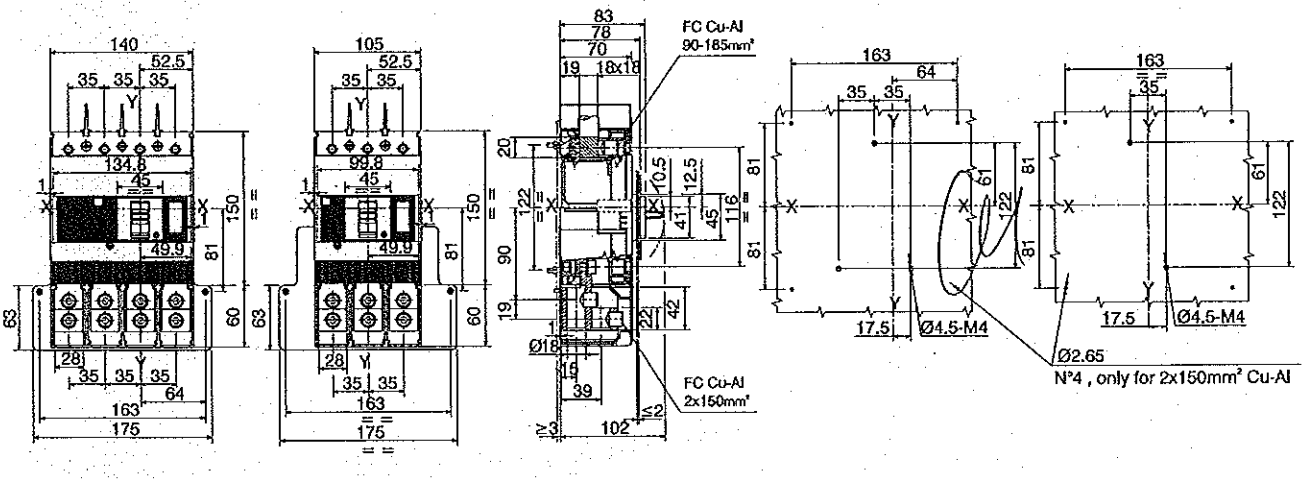
F

XT3-F/III-IV/EF-ES



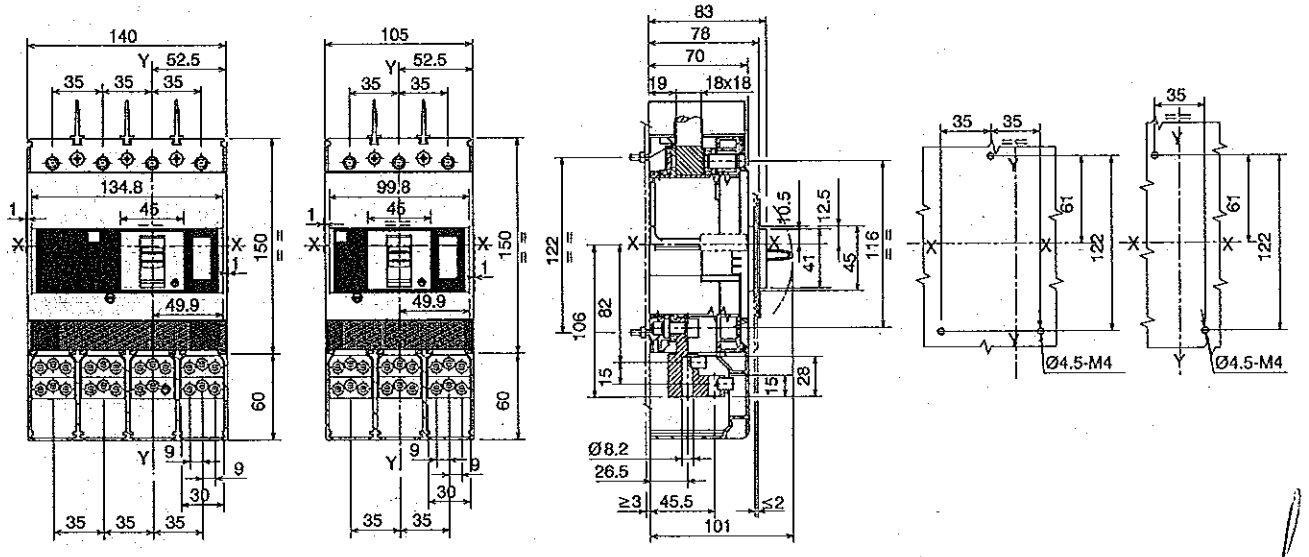
G

XT3-F/III-IV/Fc Cu Al 90-185mm²/2x150mm²



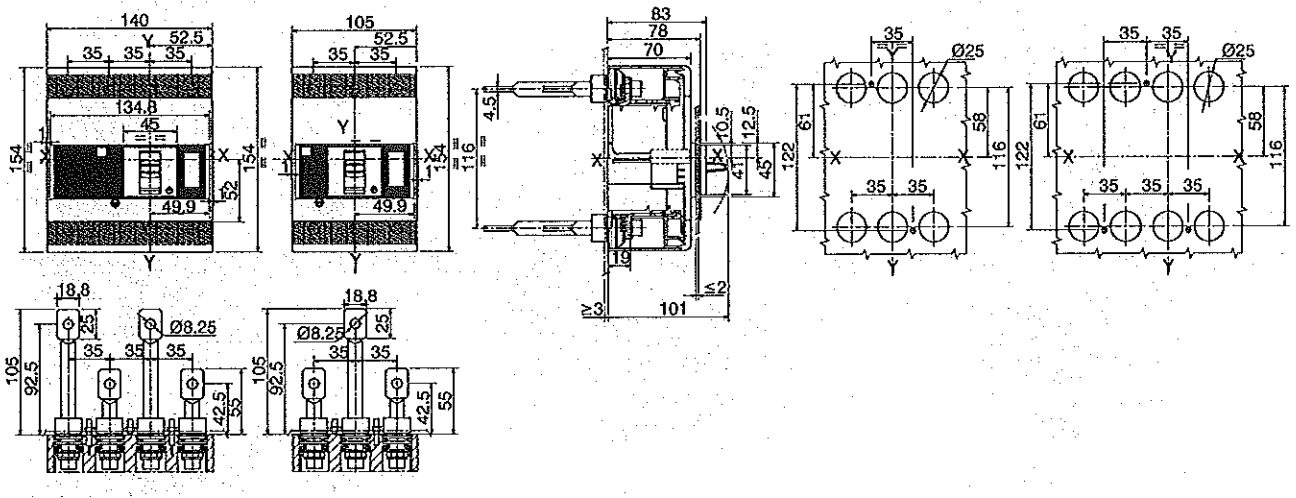
H

XT3-F/III-IV/Fc Cu-MC



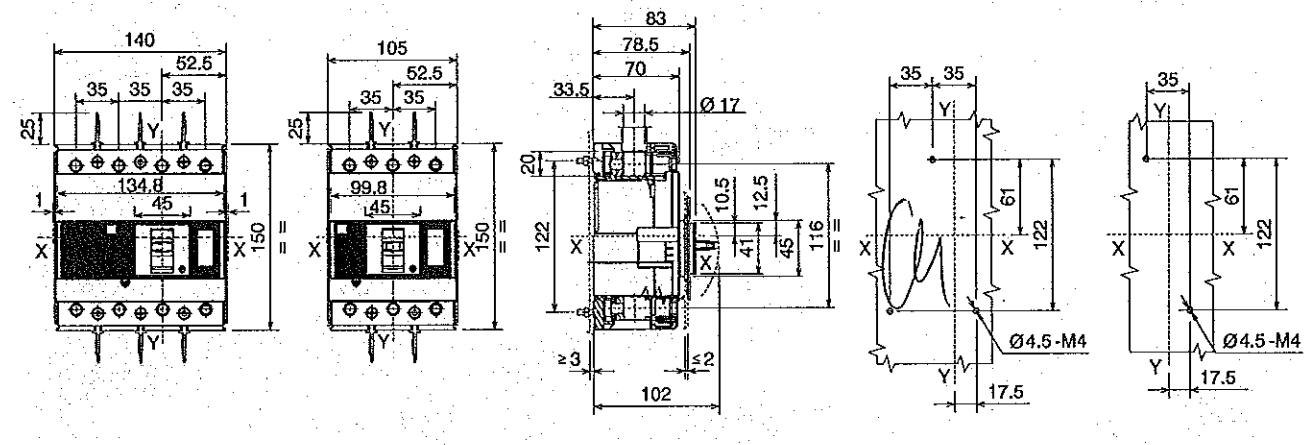
I

XT3-F/III-IV/R



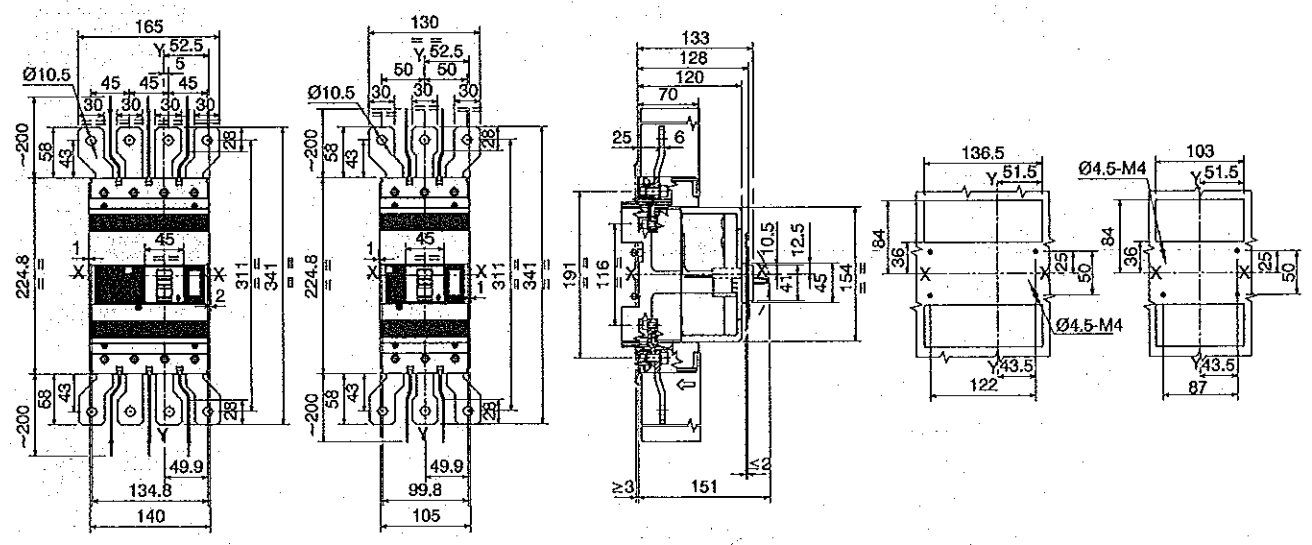
J

XT3-P/III-IV/Fc-Cu Al 30-150mm²



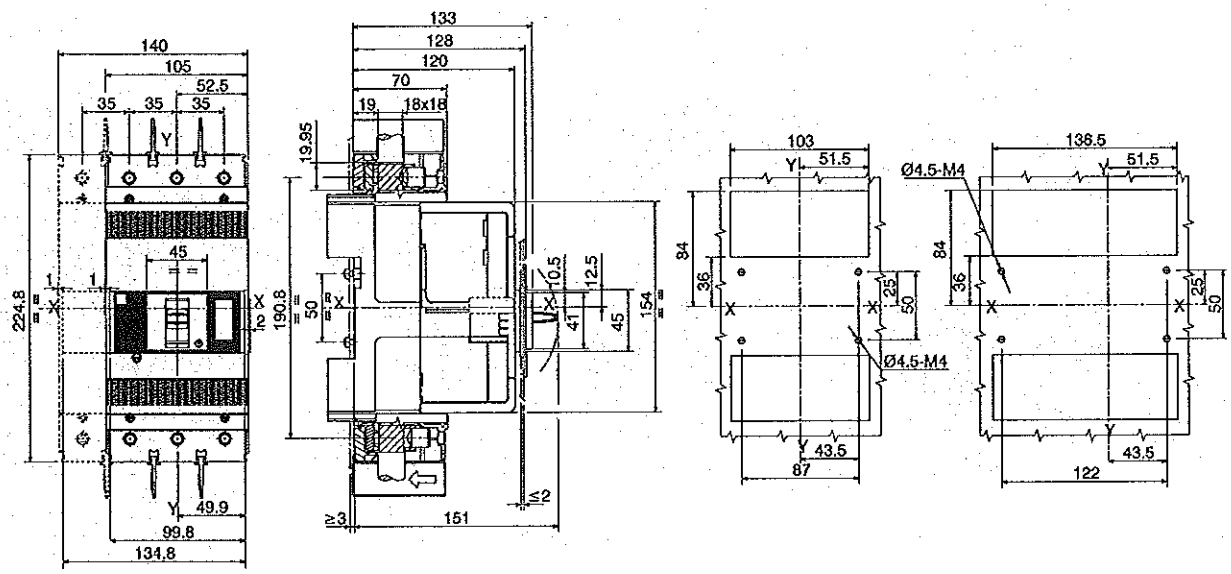
K

XT3-P/III-IV/ES



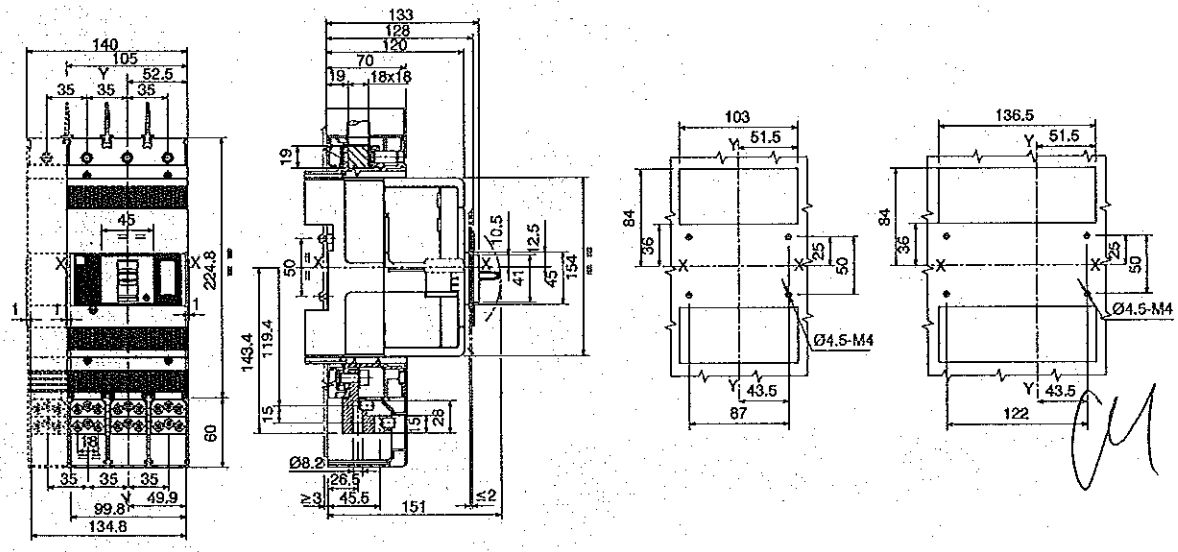
L

XT3-P/III-IV/Fc-Cu Al 90-185mm²



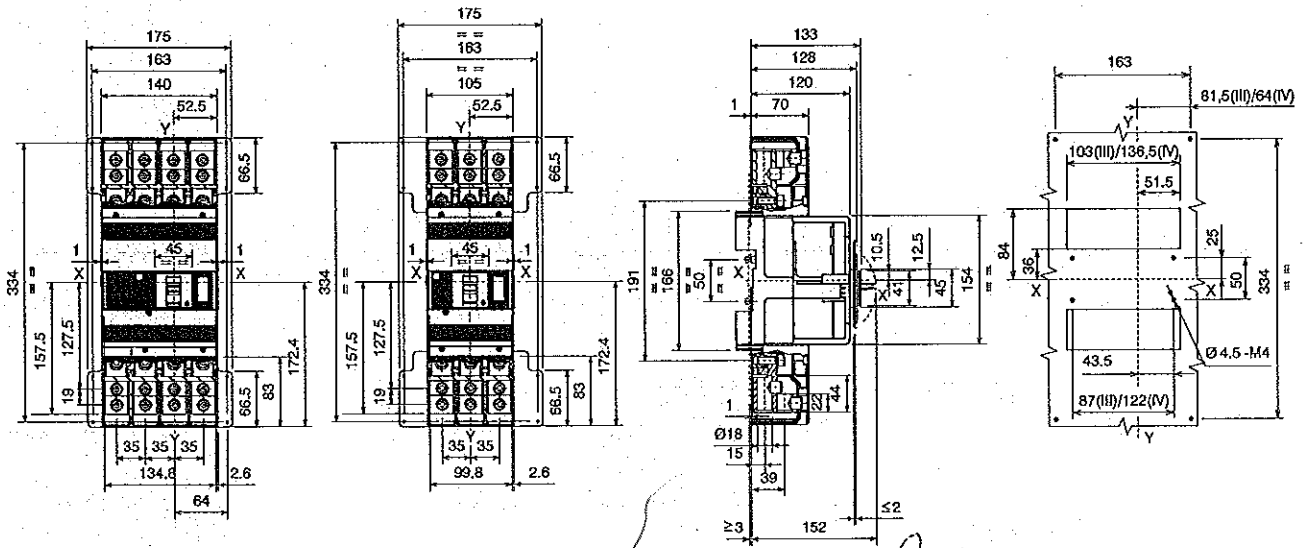
M

XT3-P/III-IV/Fc-Cu MC



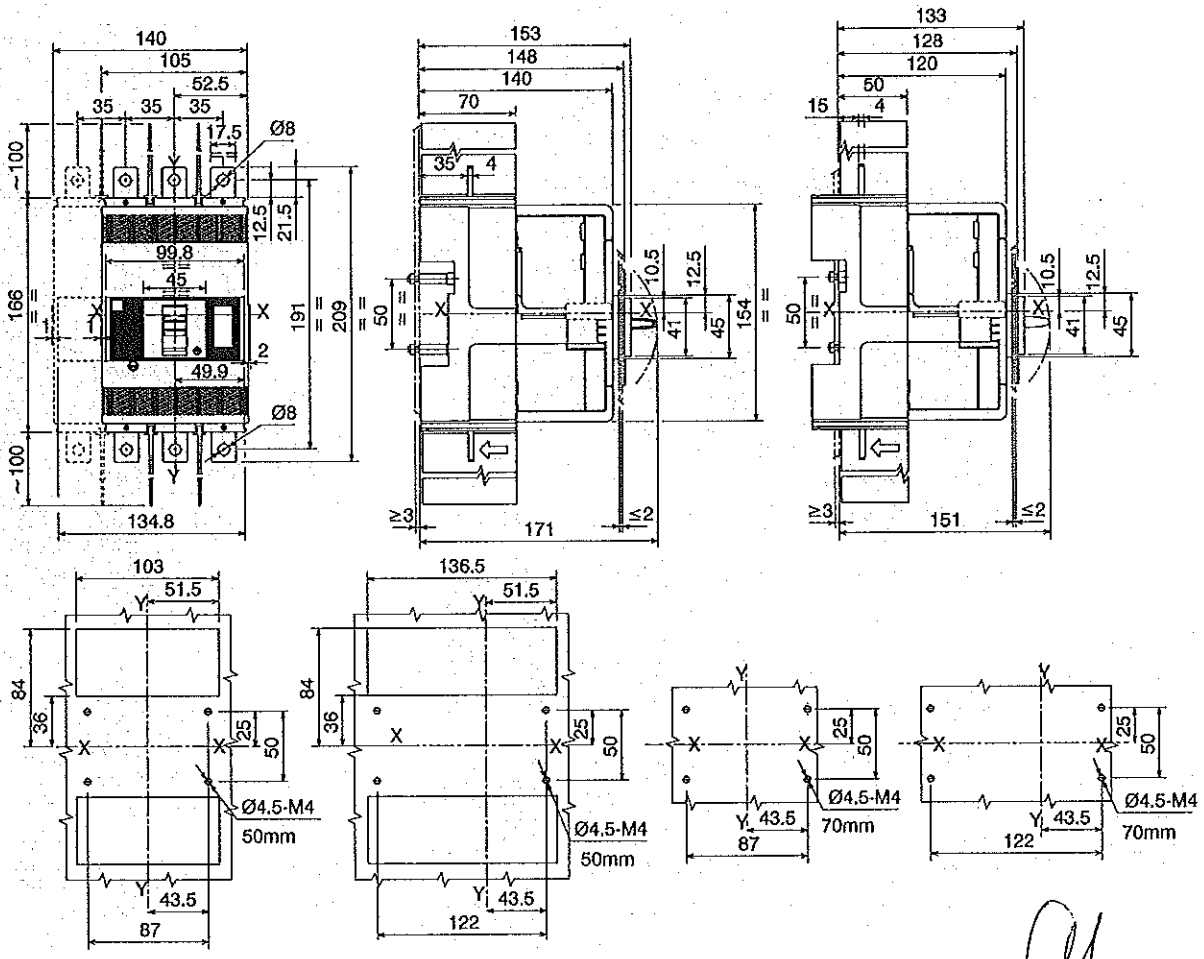
N

XT3-P/III-IV/Fc-Cu Al 2x150mm² EXT



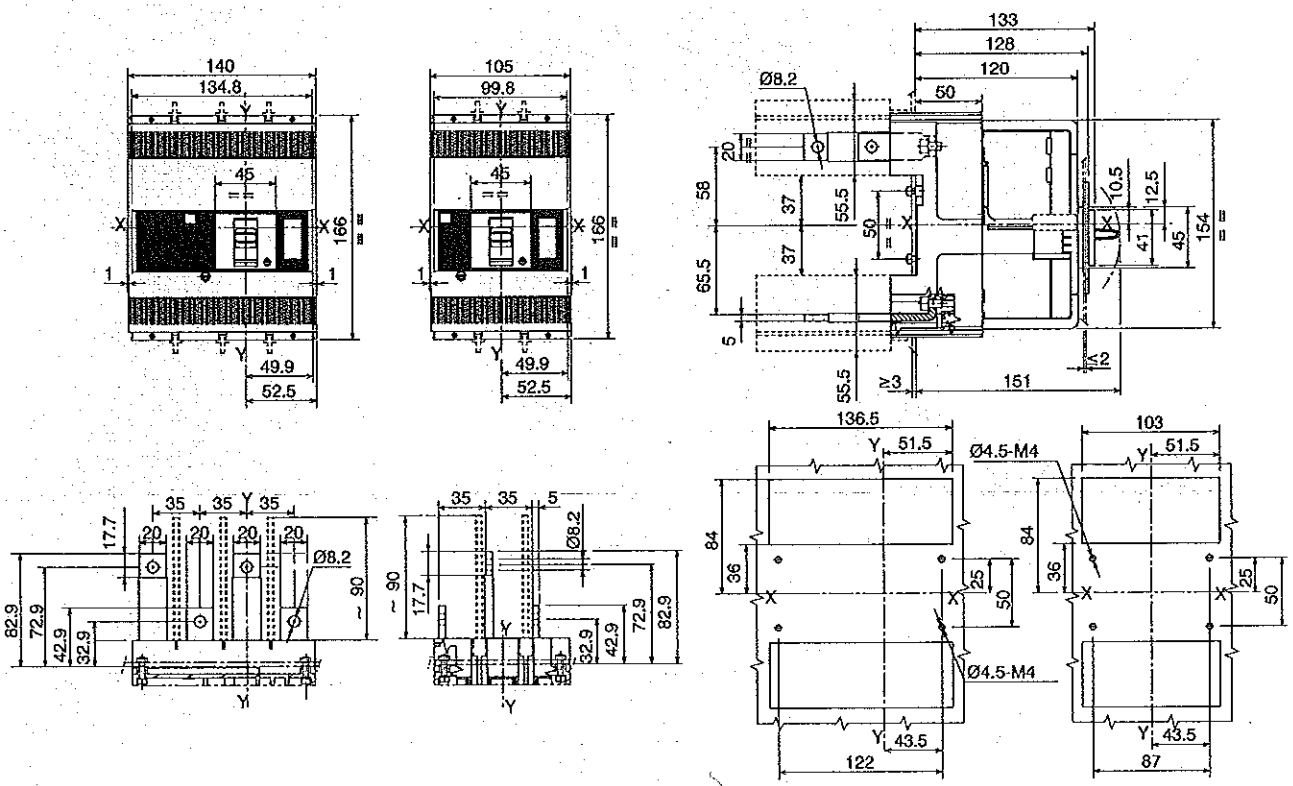
O

XT3-P/III-IV/EF



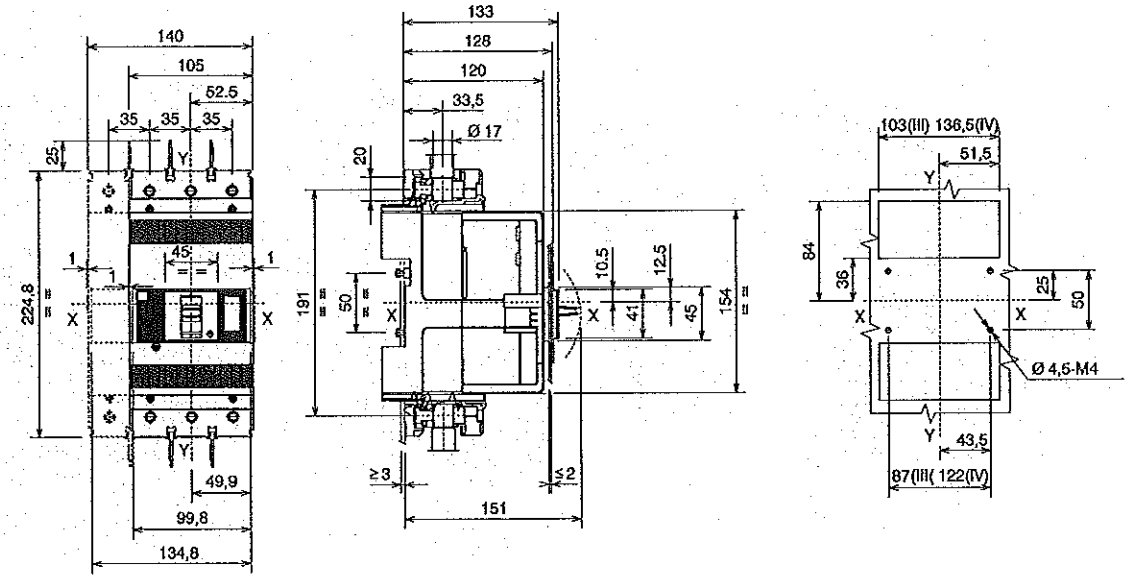
P

XT3-P/III-IV/HR-VR



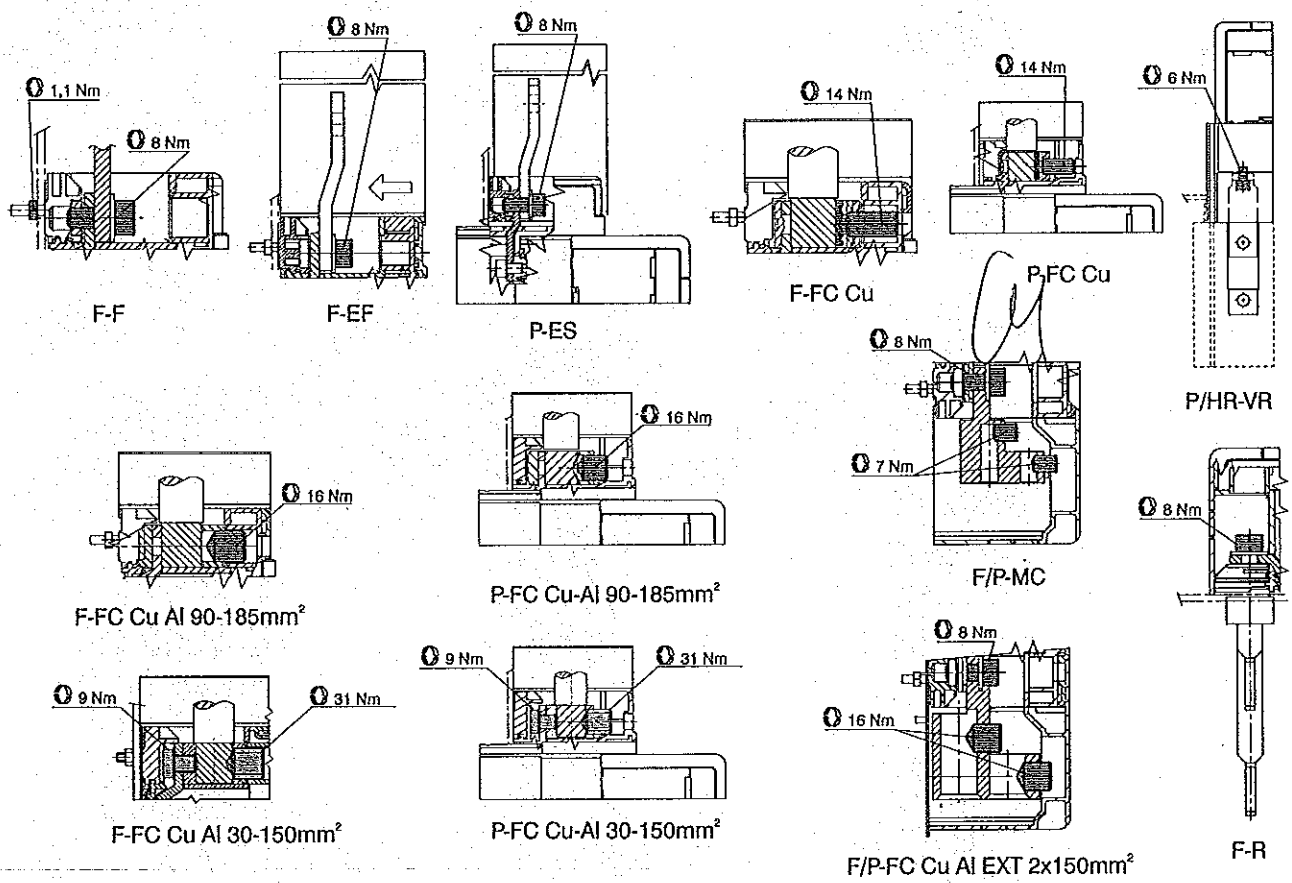
Q

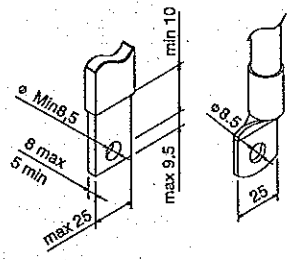
XT3-P/III-IV/Fc Cu Al 30-150mm²



R

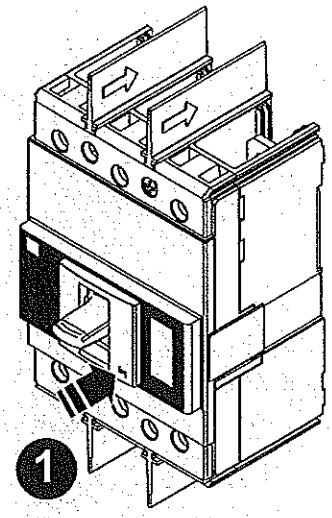
XT3/III-IV

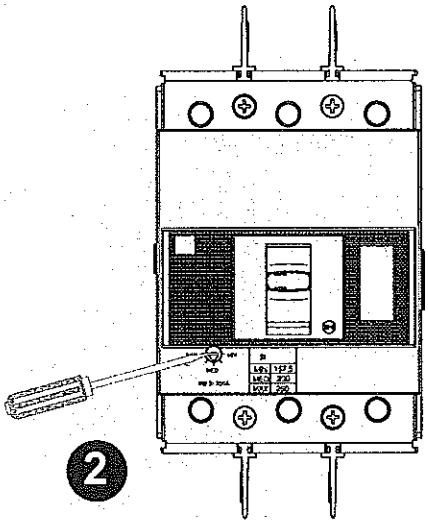




		FC Cu		MC		FC CuAl 90-185mm²		FC CuAl 30-150mm²		FC CuAl EXT 2X150mm²	
		MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN	MAX	MIN
Stranded		185 mm²	6 mm²	35 mm²	2,5 mm²	185 mm²	90 mm²	150 mm²	30 mm²	150 mm²	35 mm²
Flexible		150 mm²	6 mm²	25 mm²	2,5 mm²						

S





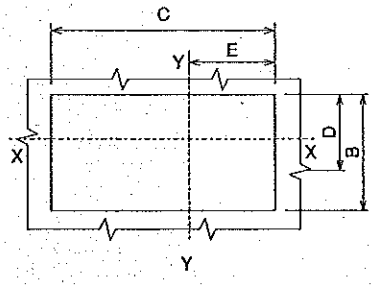
TMD/TMG

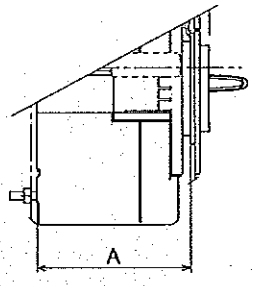
	I1		
In	MIN (0,7)	MED (0,85)	MAX (1xIn)
63	44,1	53,5	63
80	56	68	80
100	70	85	100
125	87,5	106,2	125
160	112	136	160
200	140	170	200
250	175	212,5	250

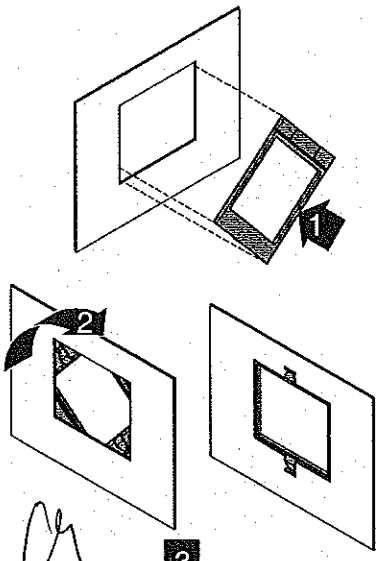
MA

	I1		
In	MIN (Inx6)	MED (Inx9)	MAX (Inx12)
100	600	900	1200
125	750	1125	1500
160	960	1440	1920
200	1200	1800	2400

T







		A			B	C	D	E
		F	P					
			50mm	70mm				
XT3 WITH FLANGE CON MOSTRINA	III	74	124	144	55	110	17,5	55
	IV	74	124	144	55	145	17,5	55
	OPTIONAL FLANGE III-IV	79	129	149	73	57	26,5	28,5

		A			B	C	D	E
		F	P					
			50mm	70mm				
XT3 WITHOUT FLANGE SENZA MOSTRINA	III-IV	79	129	149	43	47	11,5	23,5
	III	71	121	141	47	102	13,5	51
	IV	71	121	141	47	137	13,5	51

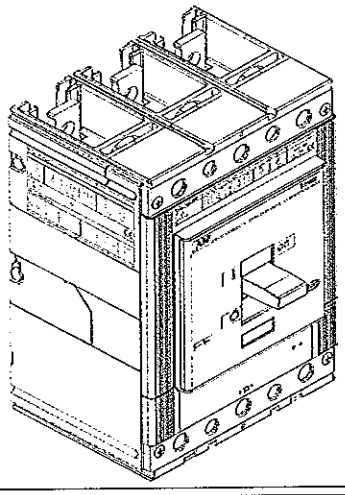
For more information please contact:

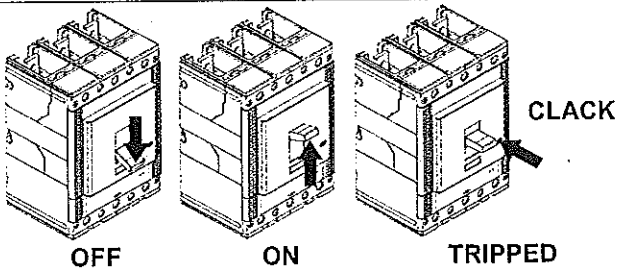
ABB S.p.A.
ABB SACE Division
Via Baioni, 35
24123 Bergamo - Italy
Phone: +39 035 395 111
Fax: +39 035 395 306 - 433

www.abb.com

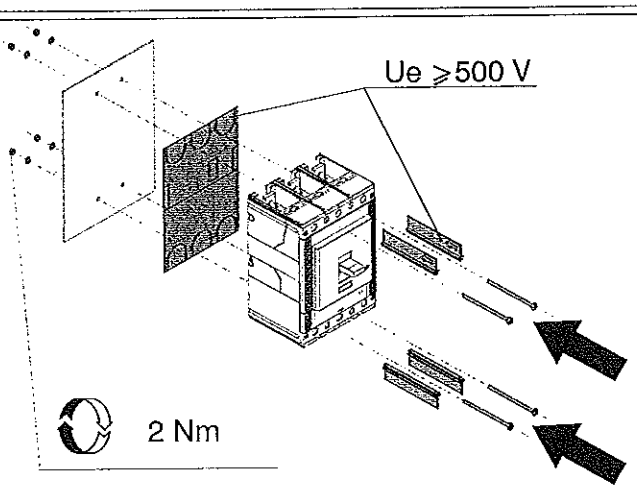
Tmax T5

DOC. N.° 1SDH000437R0001 - L2233

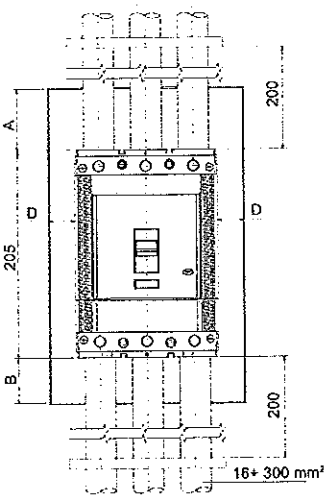




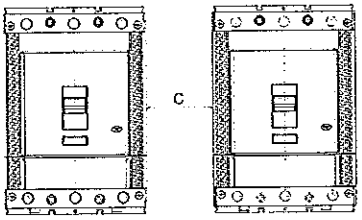
2

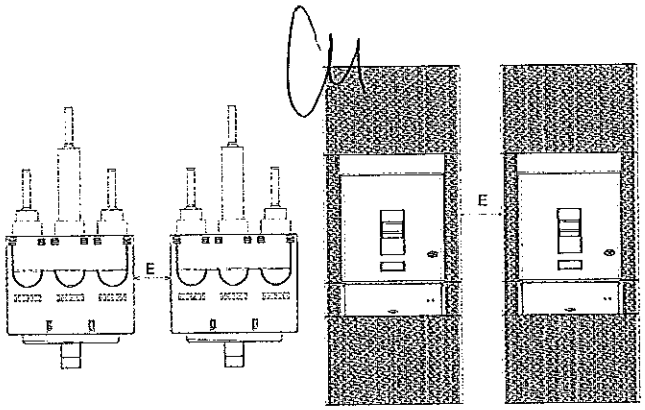


1

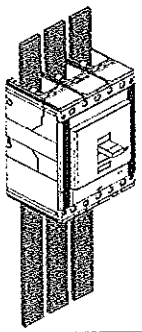


Ue	A	B	C	D	E
< 440 V	30	25	0	25	0
≥ 440 V < 500 V	60	45	0	25	0
≥ 500 V ≤ 690 V	60	45	40	25	0
750 V	160	160	50	50	0





3

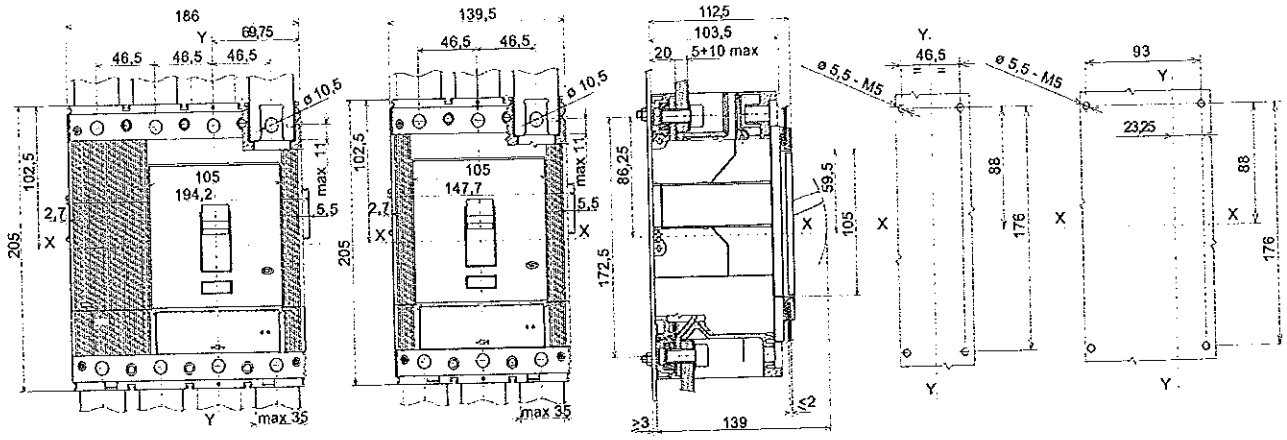


Usare cavi o barre isolate/ o eseguire prove di tipo specifiche sull' installazione.
Use cable or insulated busbars/ or perform specific type test on the installation.
Kabel oder isolierte Sammelschienen verwenden / oder die spezifische Typprüfung auf der Installation durchführen.
Utiliser un câble ou des barres isolées/ ou réaliser un test de type spécifique sur installation.
Utilizar un cable o barras aisladas / o efectuar una prueba de tipo específico sobre instalacíon.

ABB

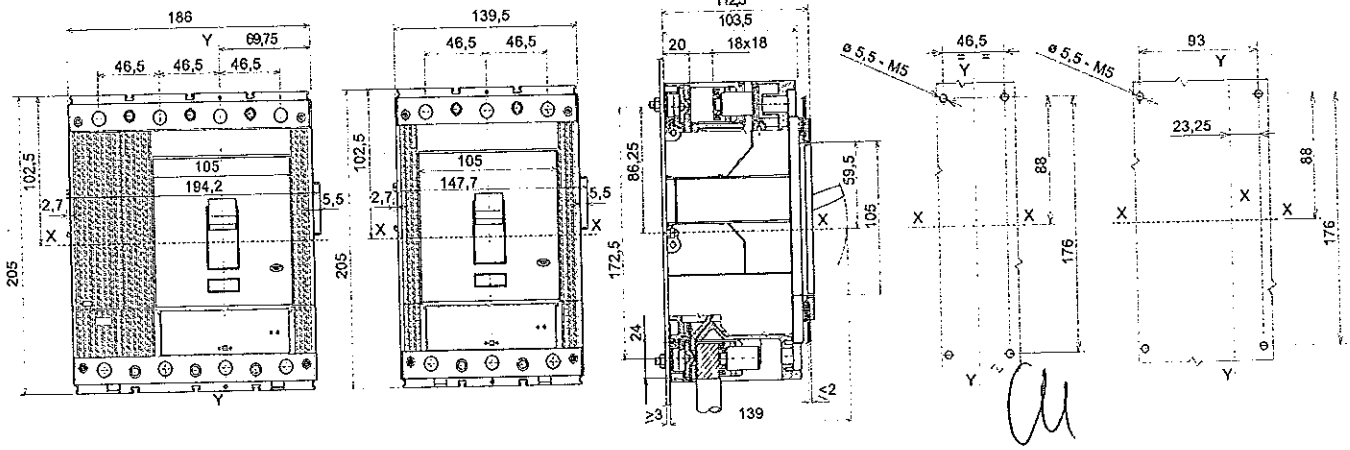
4

F - F



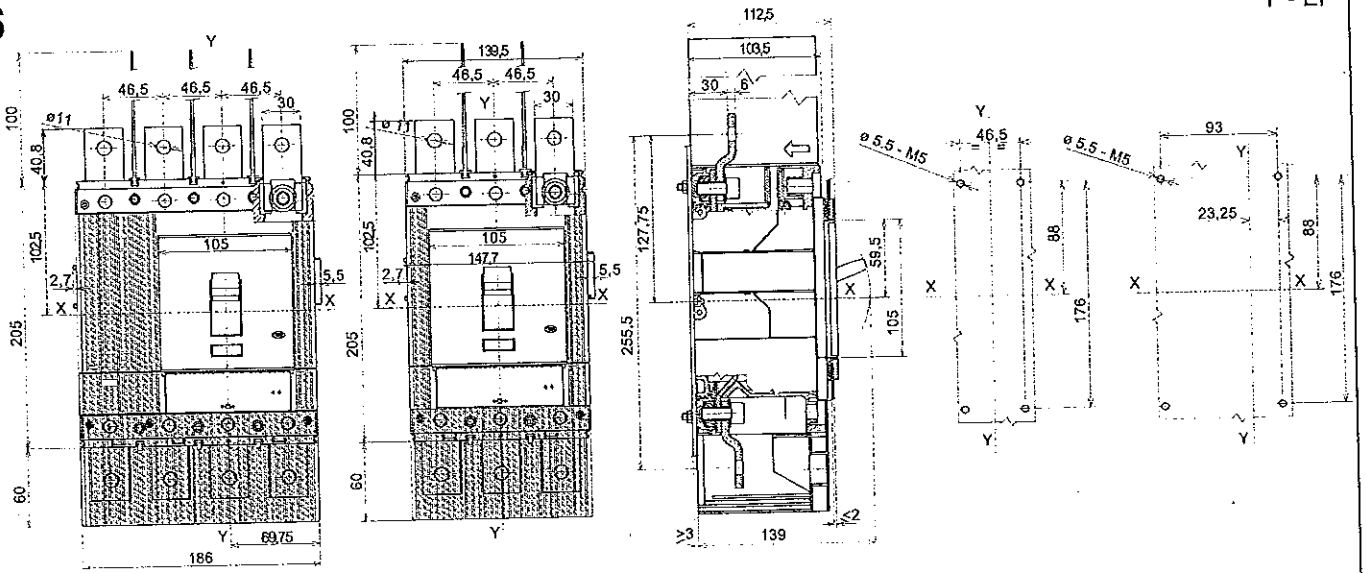
5

F- FC Cu



6

F - EF

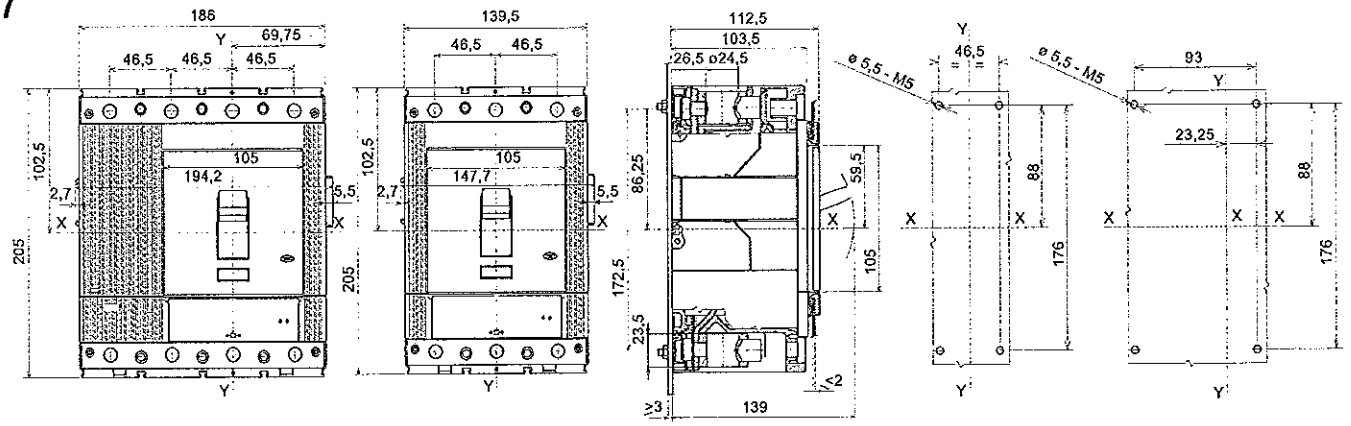


ABB

179

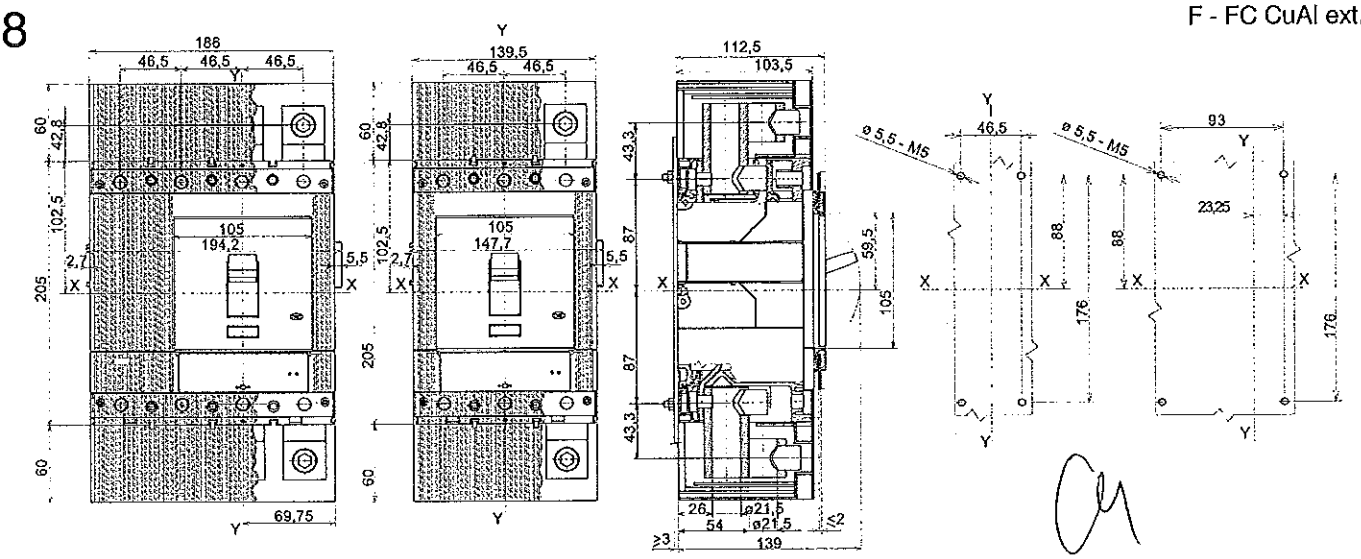
7

F - FC CuAl



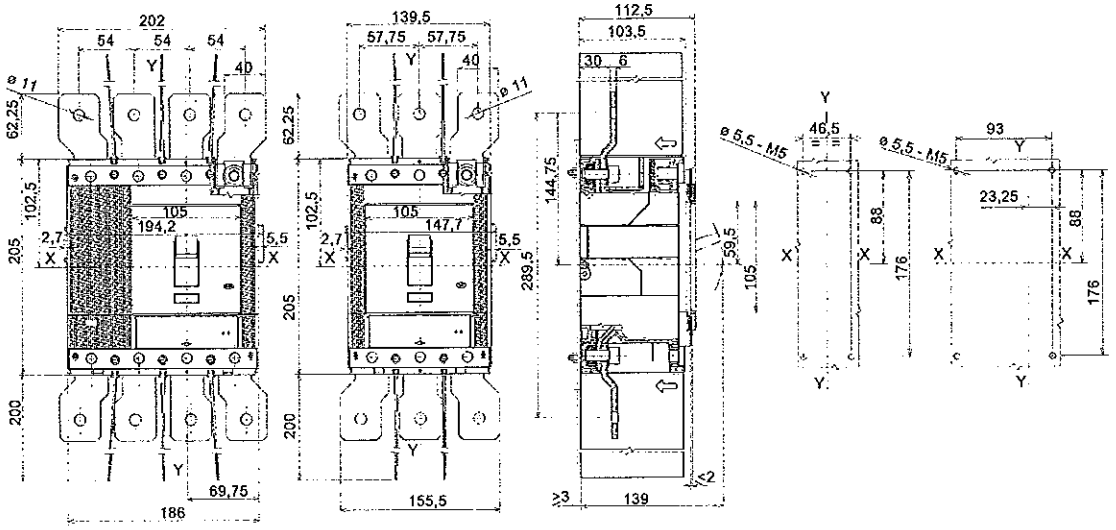
8

F - FC CuAl ext.



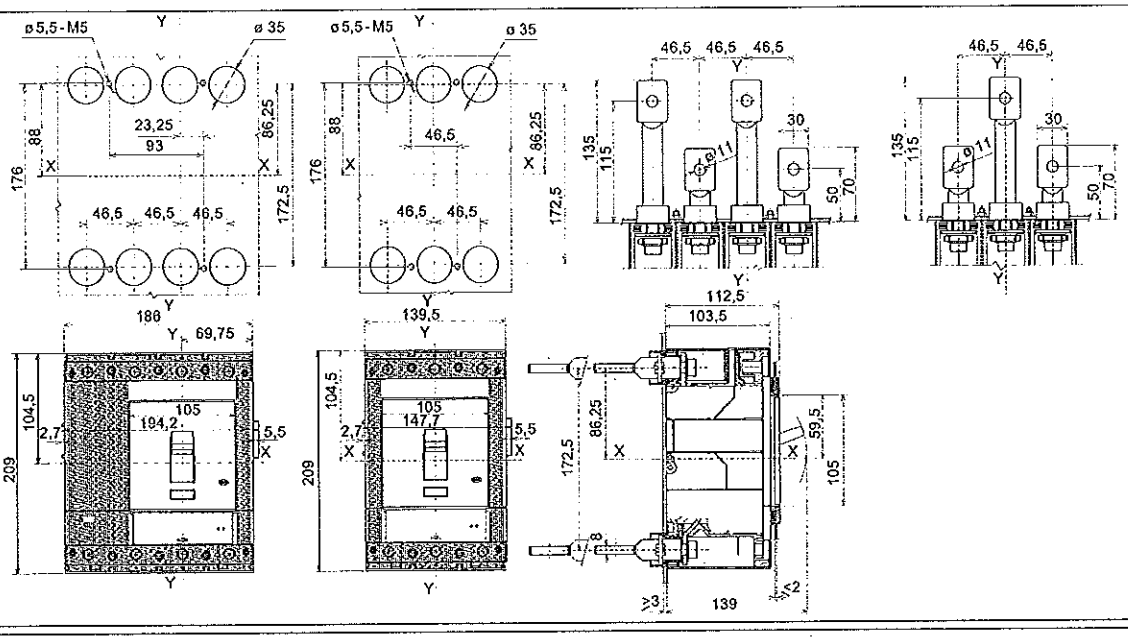
9

F - ES



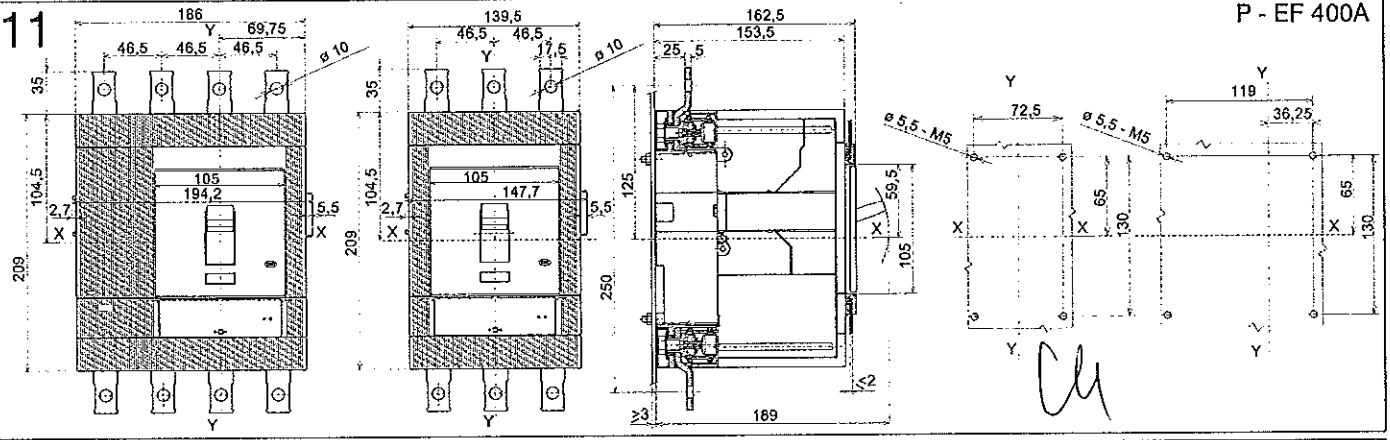
10

F- R



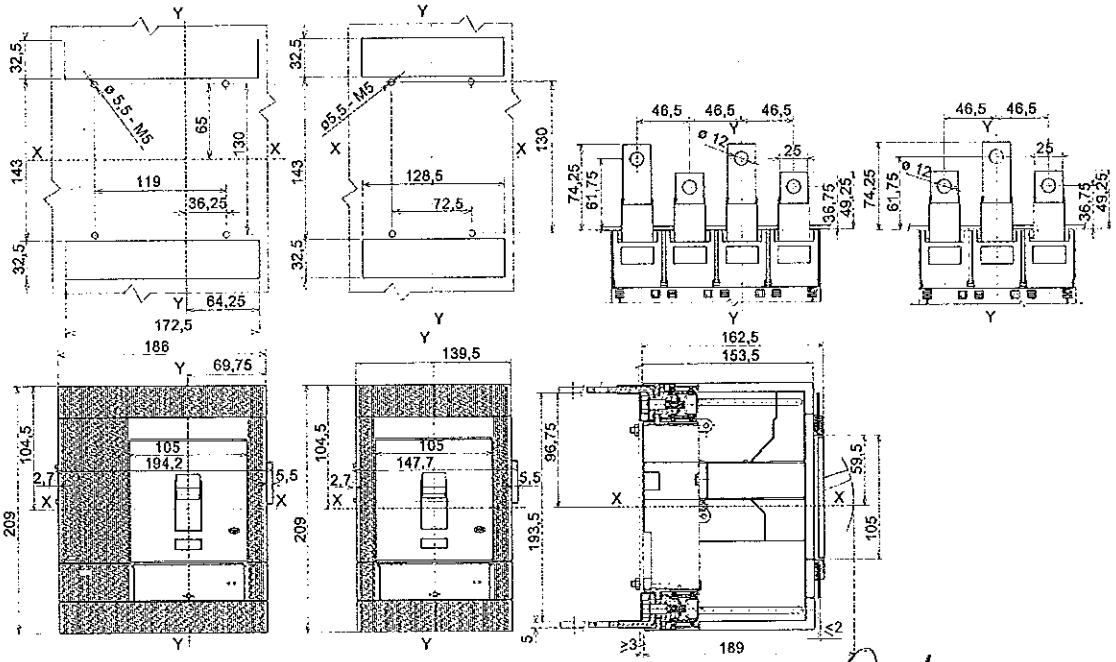
11

P - EF 400A



12

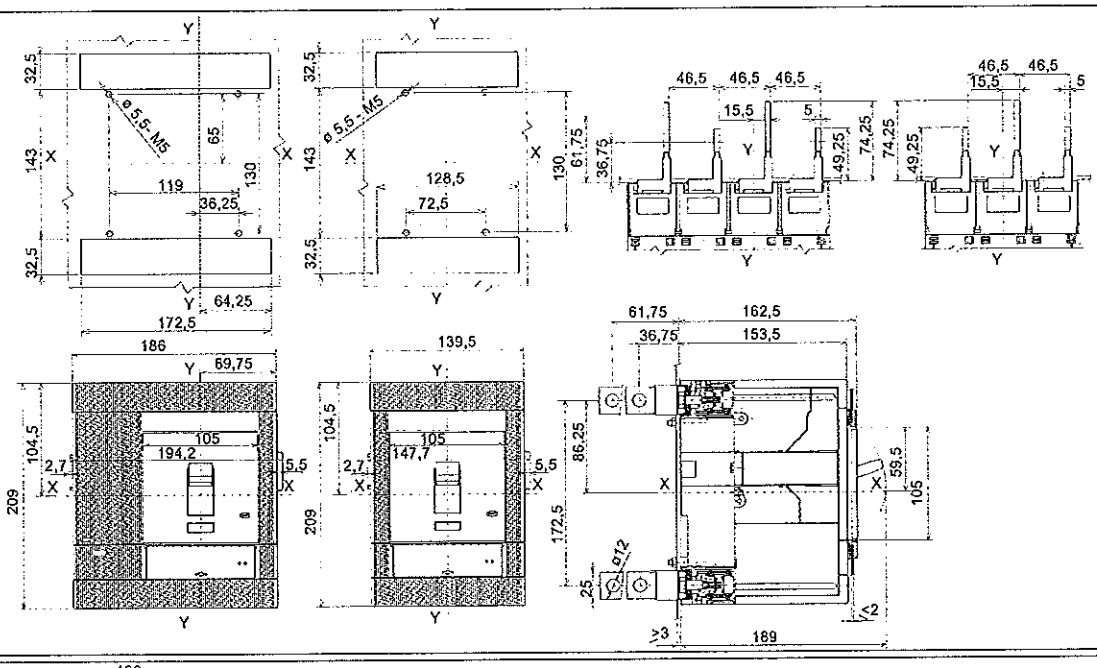
P - HR 400A



ABB

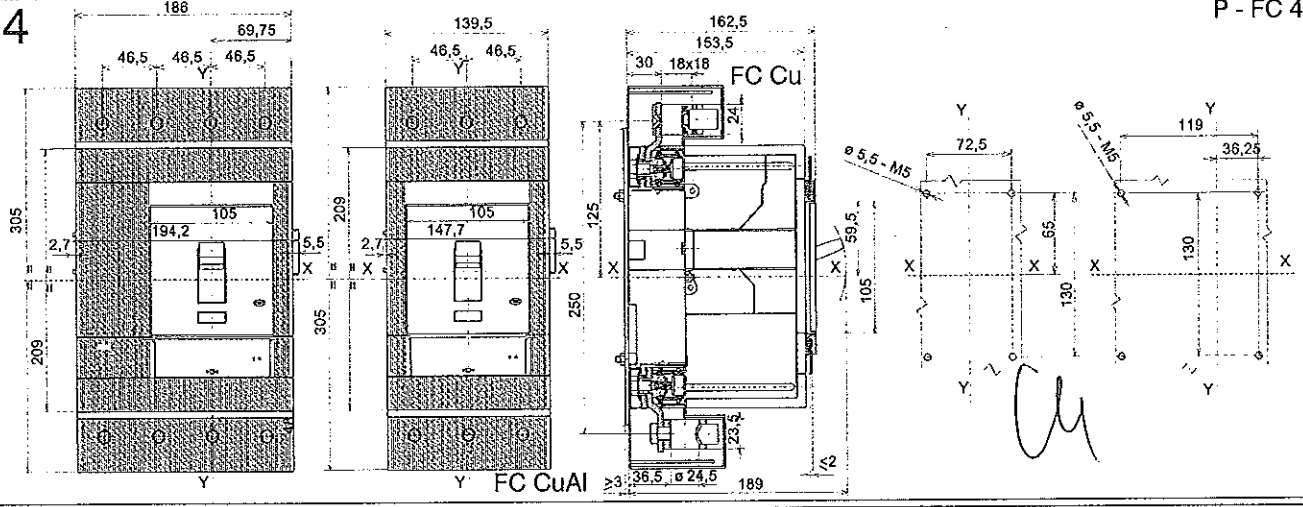
13

P - VR 400A



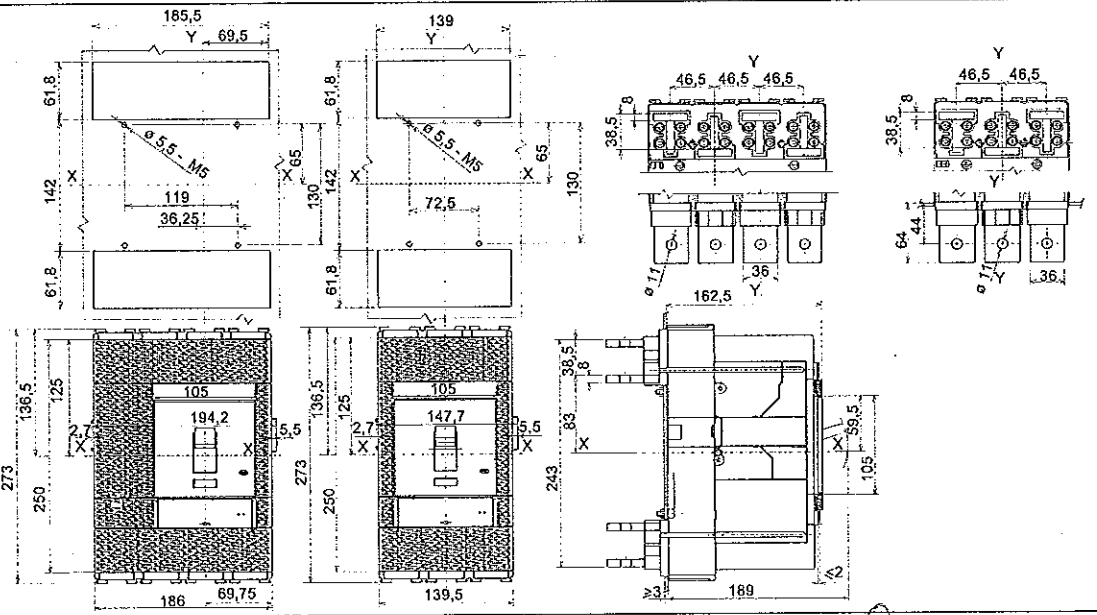
14

P - FC 400A



15

P - HR 630A

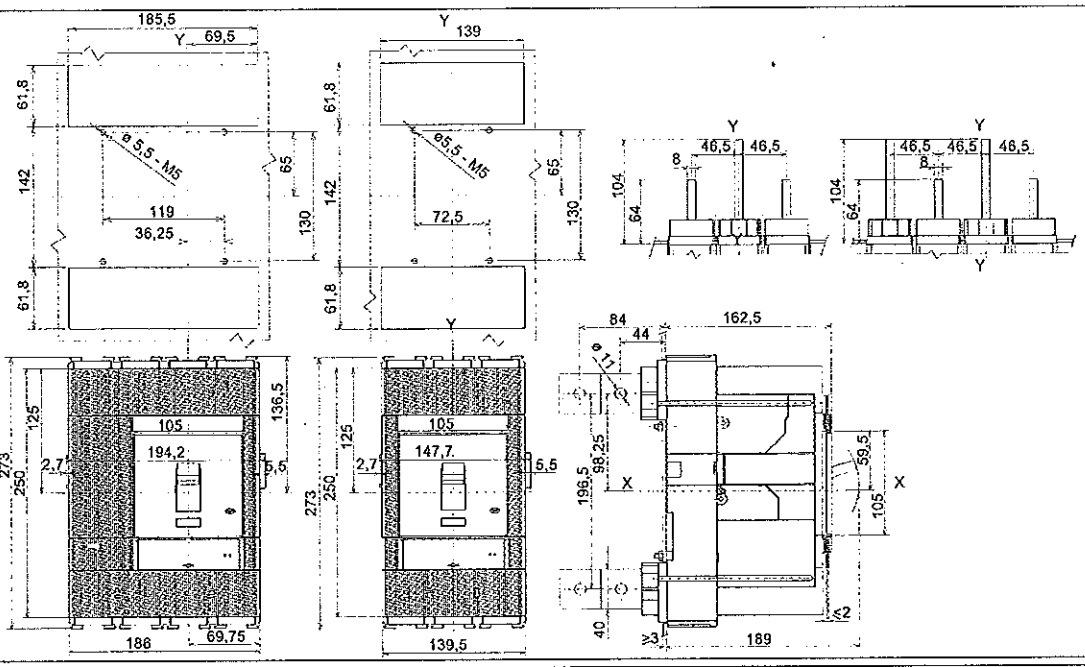


ABB

182

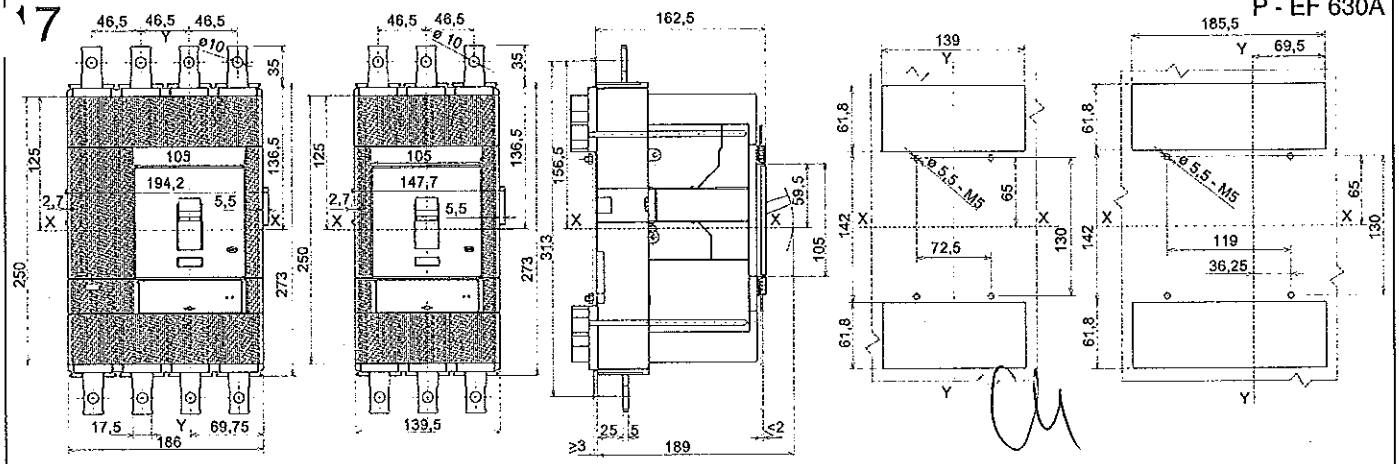
16

P - VR 630A



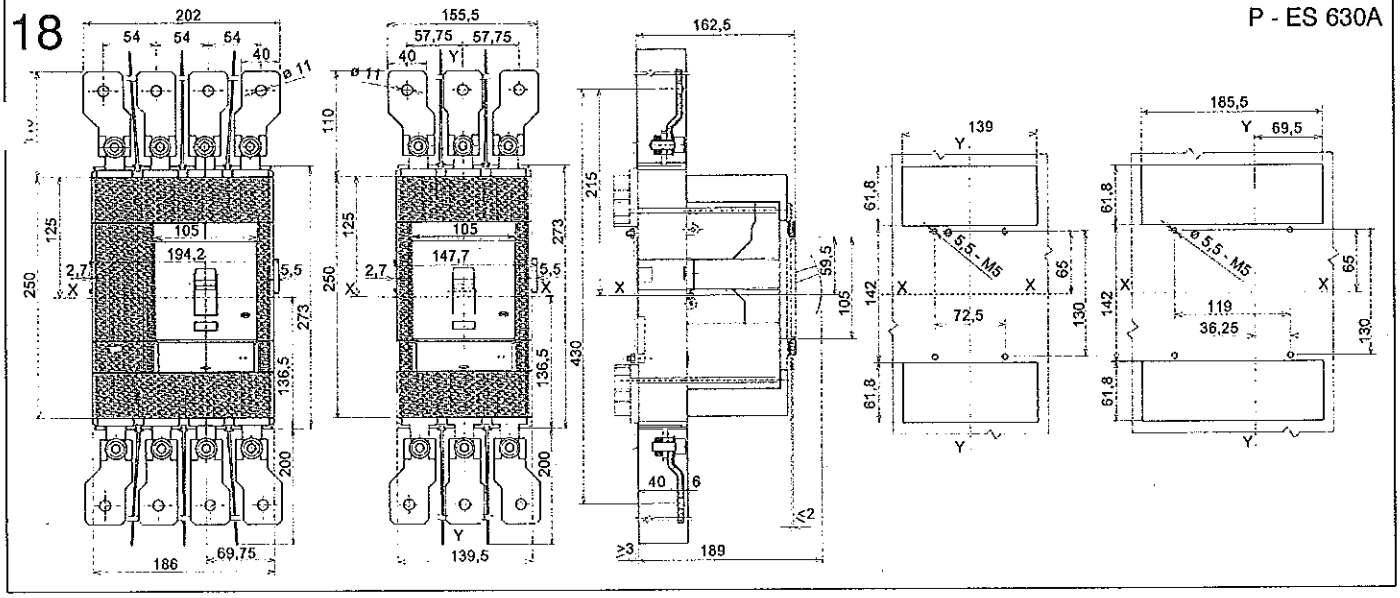
17

P - EF 630A



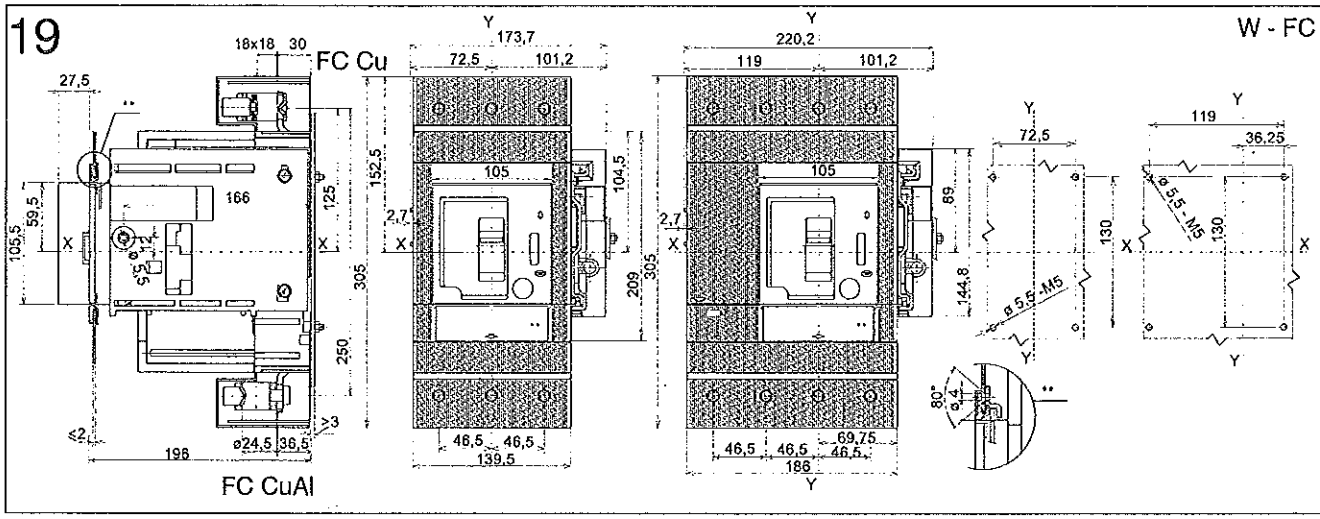
18

P - ES 630A



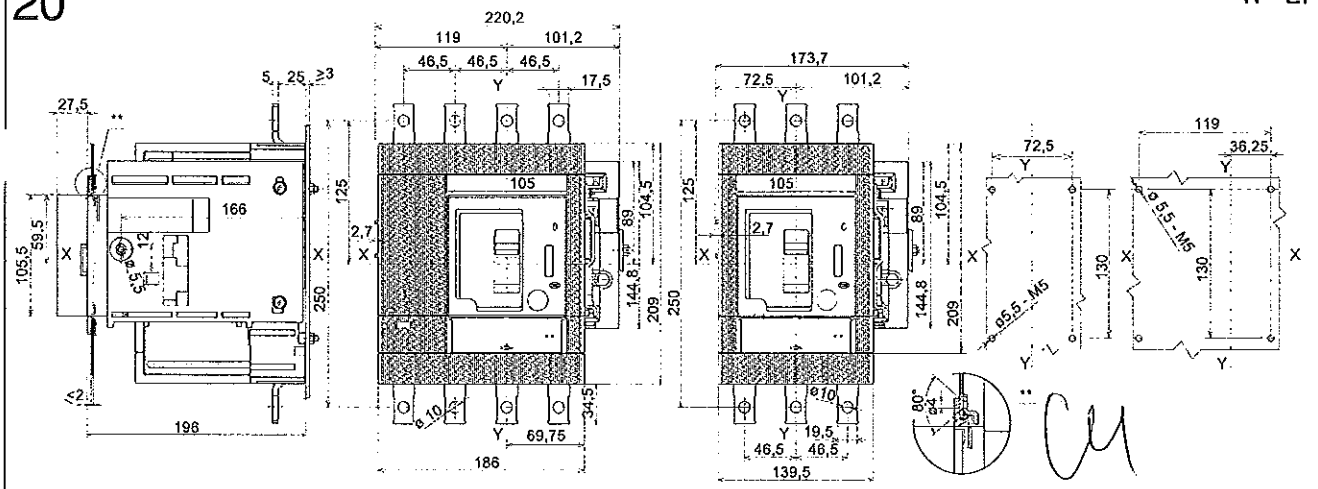
19

W - FC 400A



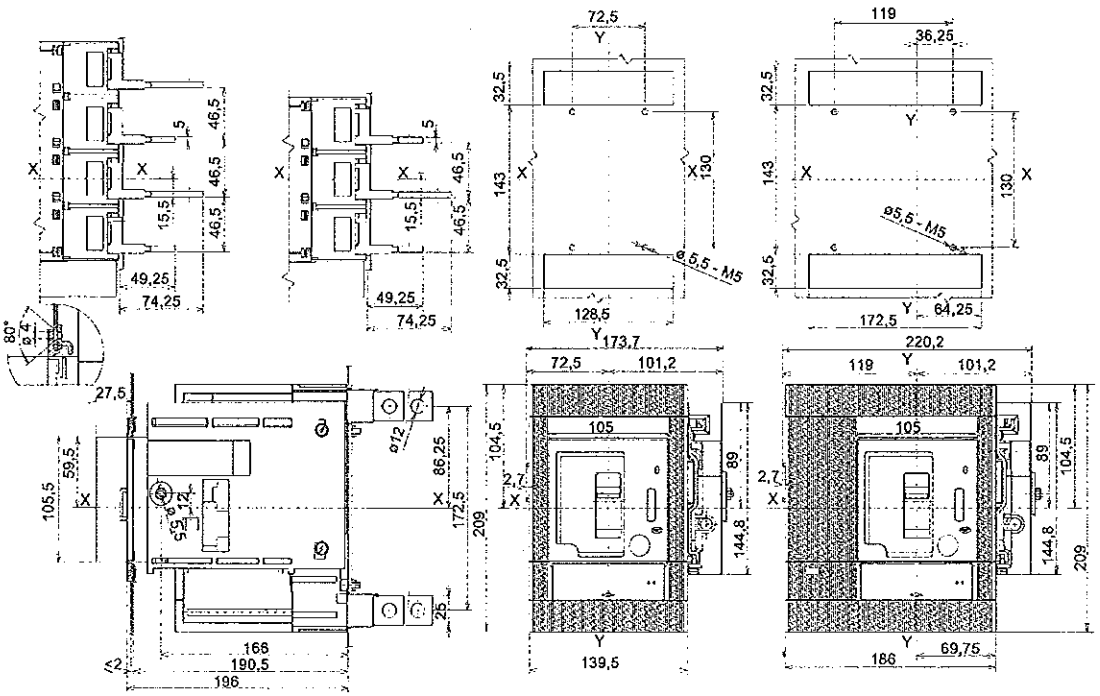
20

W - EF 400A



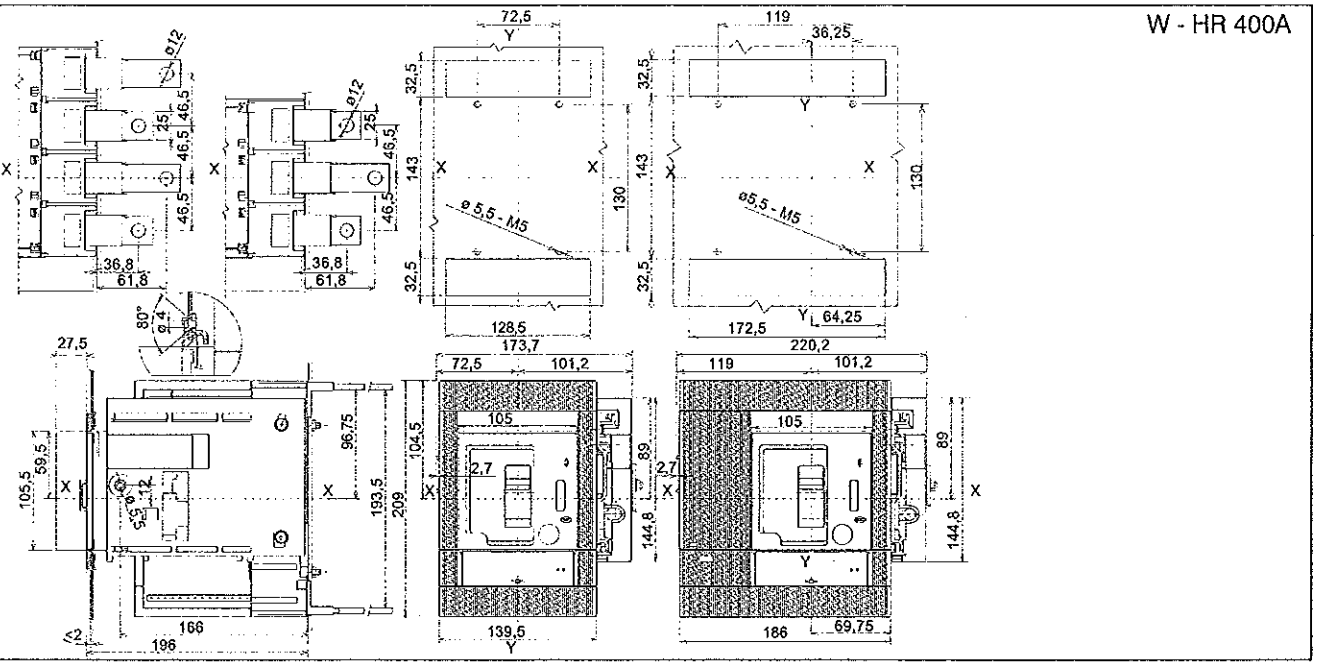
21

W - VR 400A



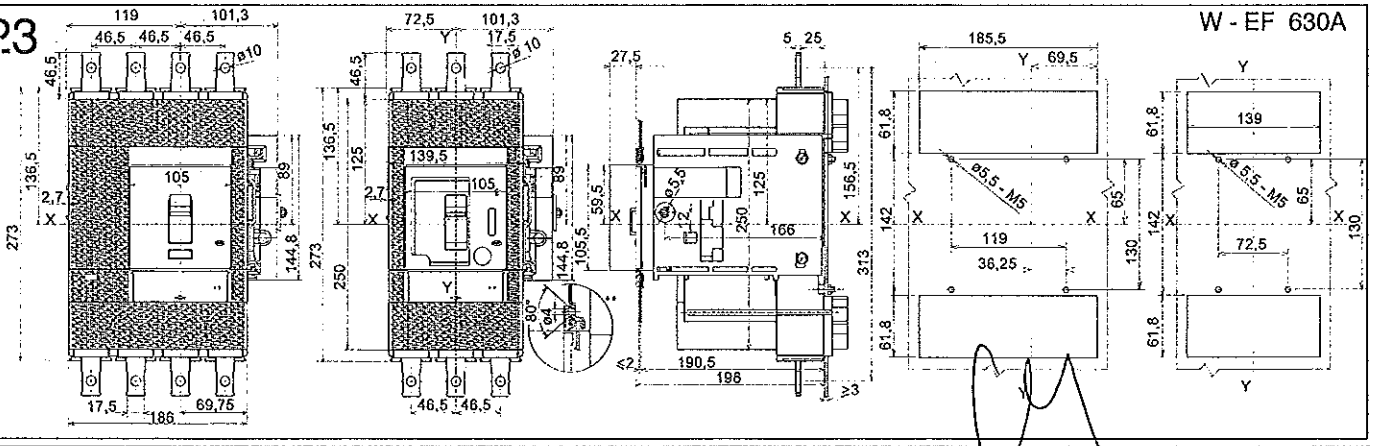
22

W - HR 400A



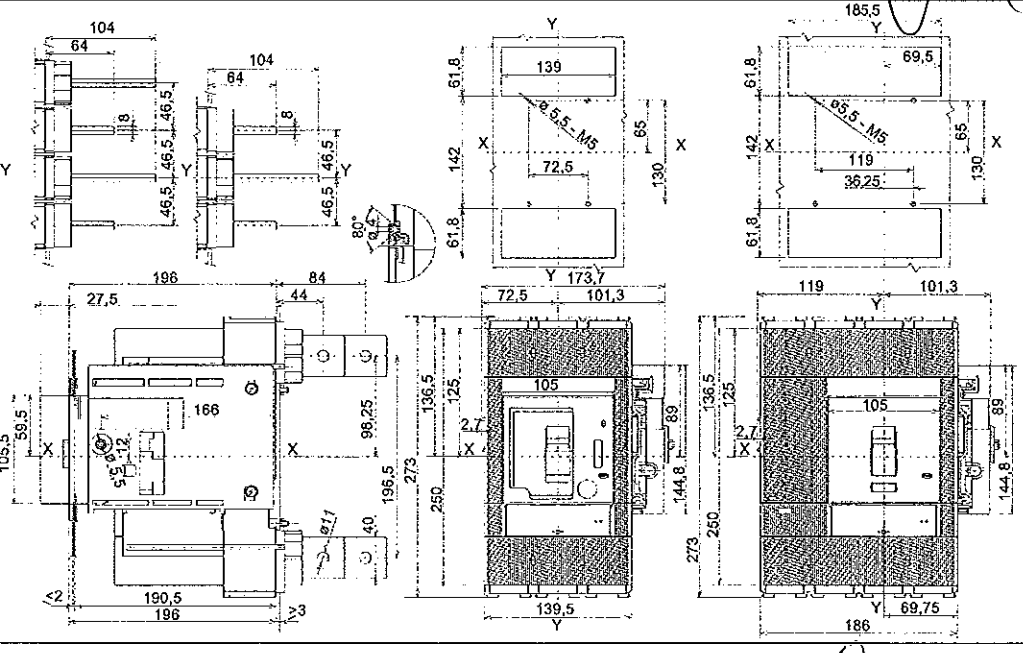
23

W - EF 630A



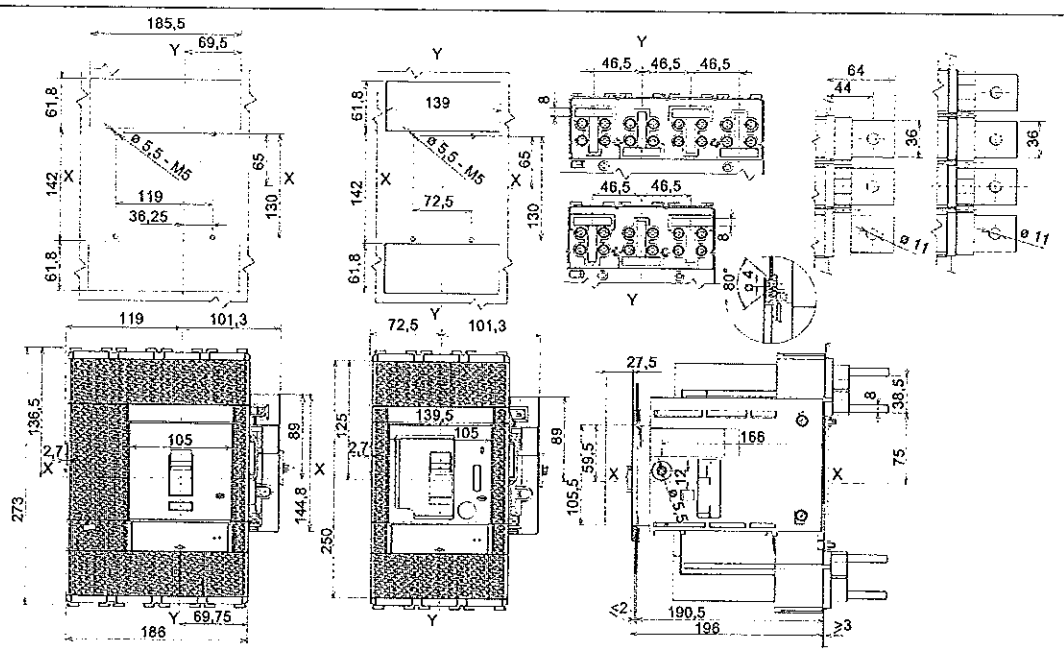
24

W- VR 630A



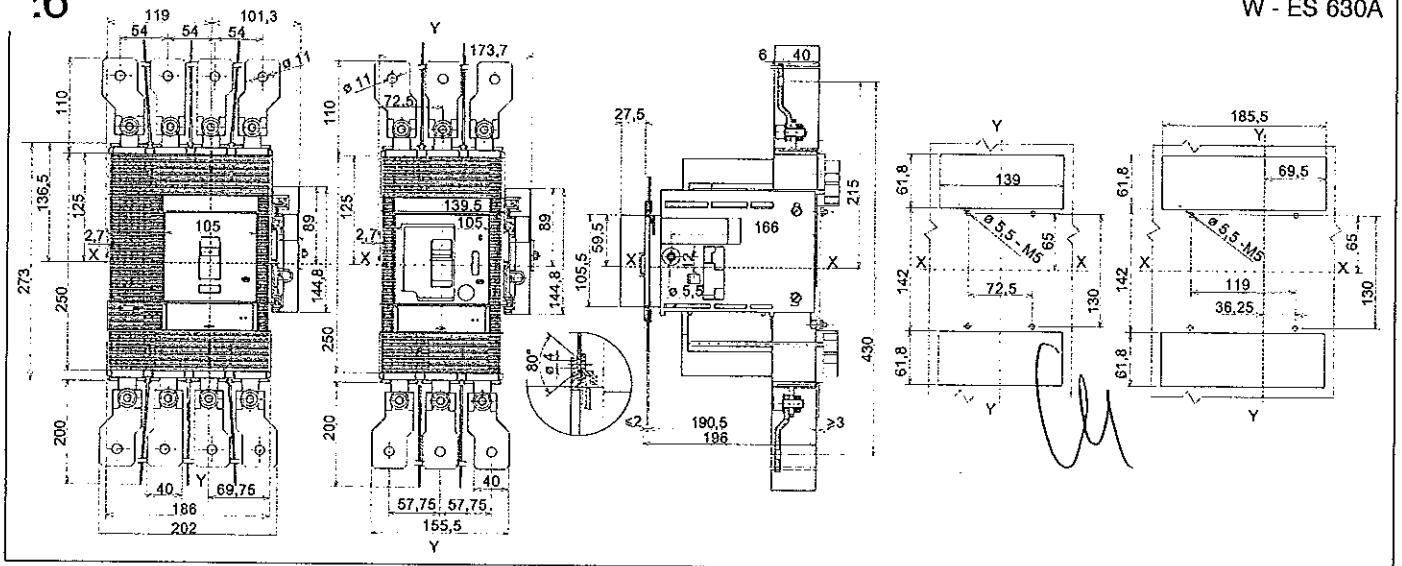
25

W - HR 630A



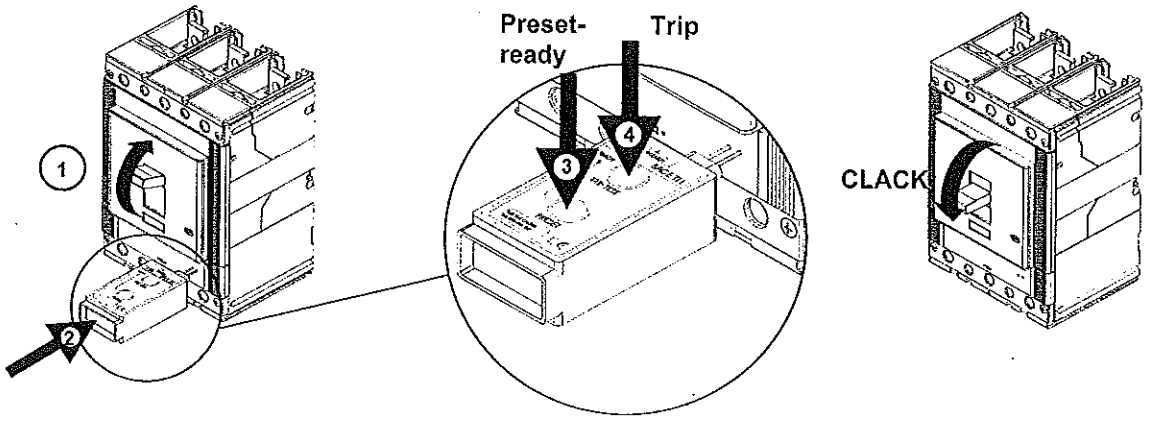
26

W - ES 630A



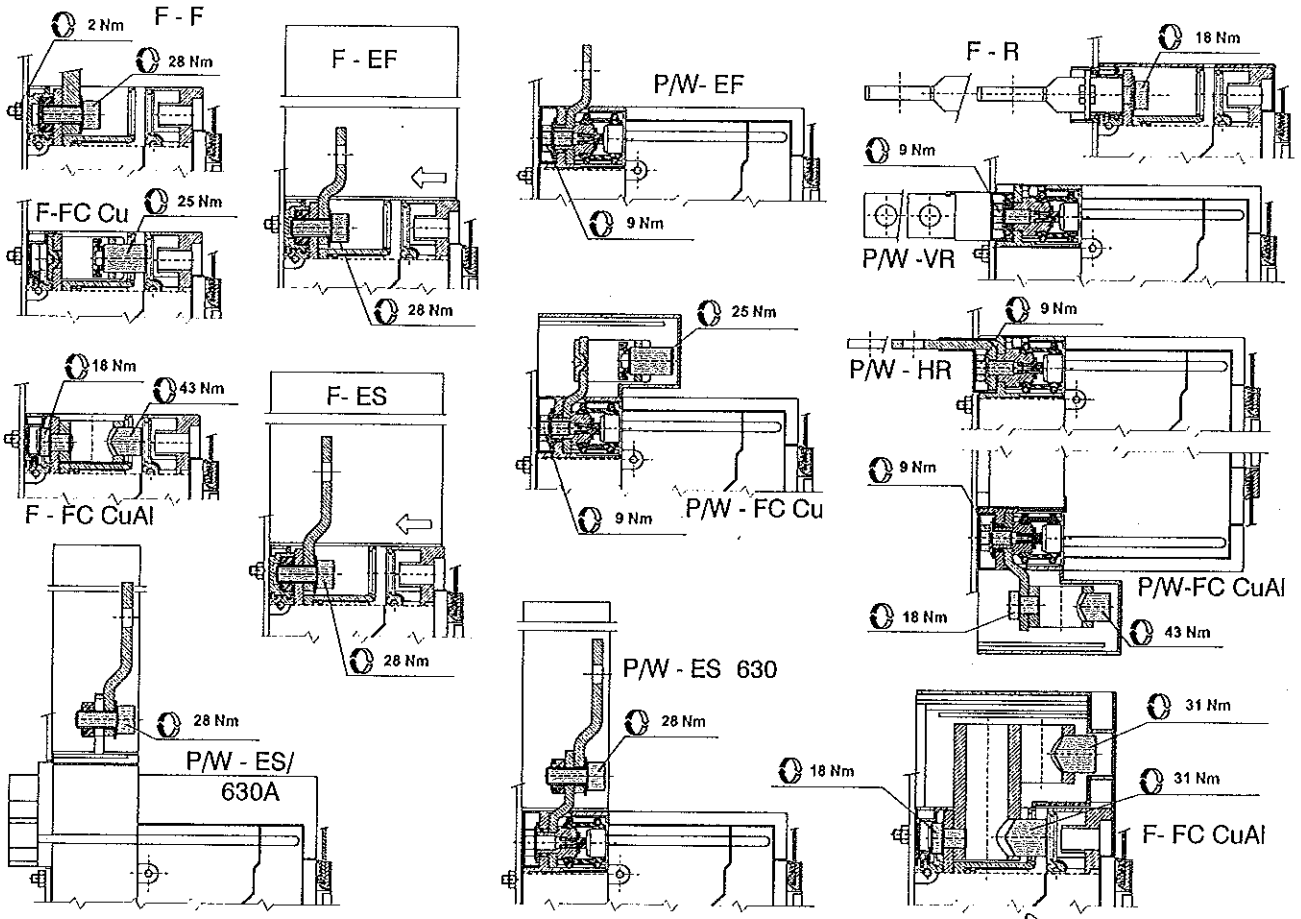
27

TRIP TEST

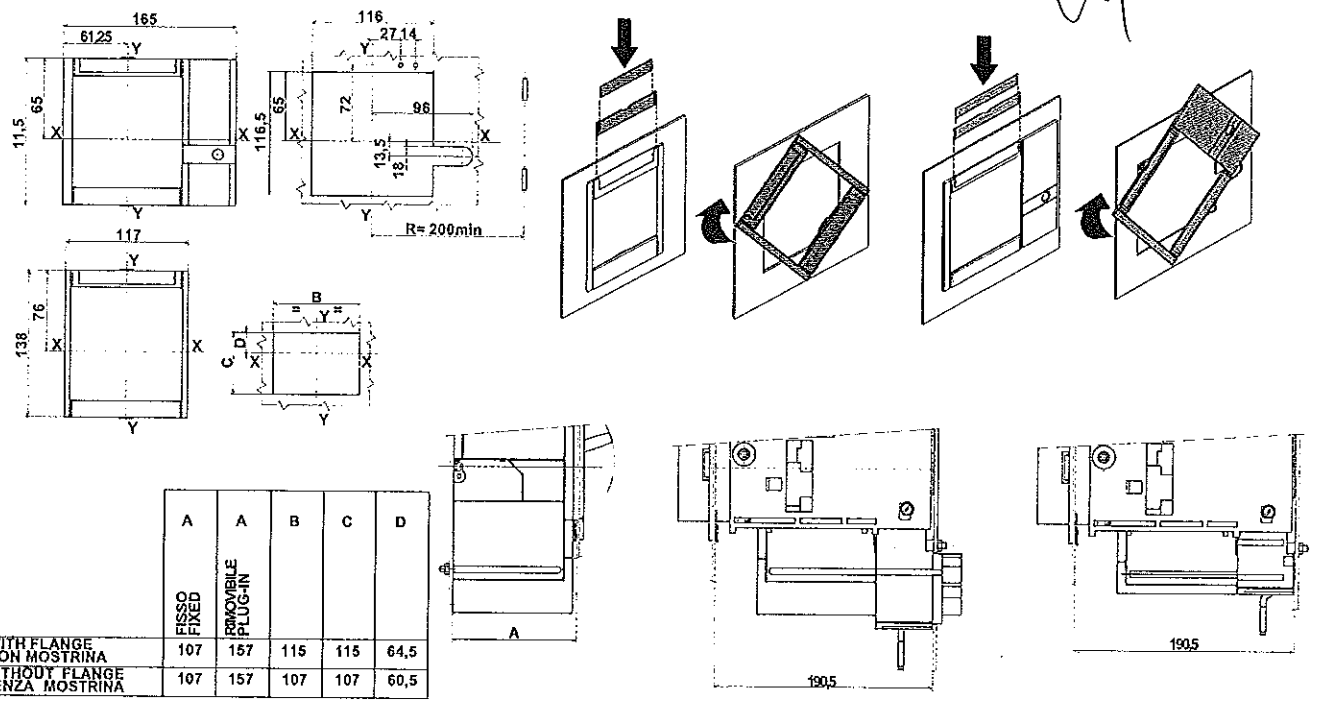


ABB

28



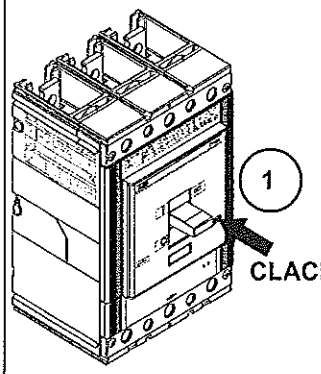
29

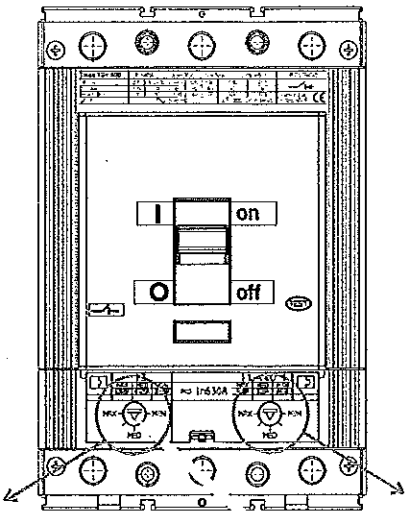


	A FISSO FIXED	A RIMOVIBILE PLUG-IN	B	C	D
WITH FLANGE CON MOSTRINA	107	157	115	115	64,5
WITHOUT FLANGE SENZA MOSTRINA	107	157	107	107	60,5

ABB

30 TMA

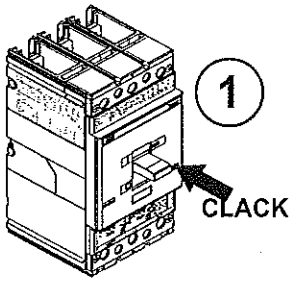


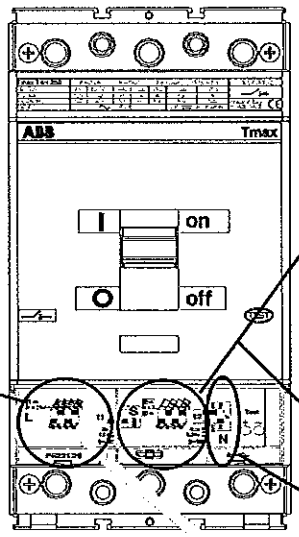


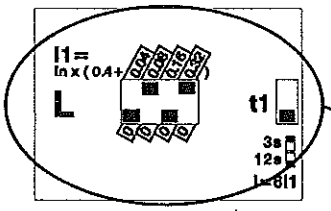
	I3		
In	MIN (Inx5)	MED (Inx7,5)	MAX (Inx10)
630	3150	4725	6300
500	2500	3750	5000
400	2000	3000	4000
320	1600	2400	3200

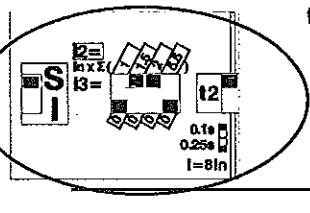
	I1		
In	MIN (0,7)	MED (0,85)	MAX (1xIn)
630	441	536	630
500	350	425	500
400	280	340	400
320	224	272	320

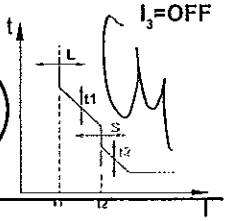
31 PR221DS

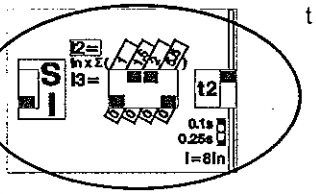


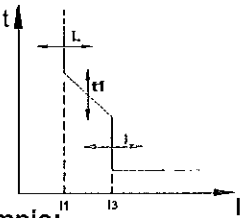


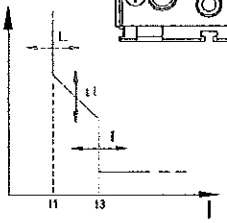


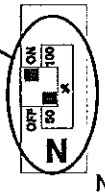


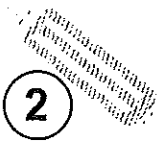












In=400A
Esempio: I_2 =400 x (1,5+2)=1400A
Example: t_2= 0,1 s @3200 A (8In)

Esempio:
Example:

In = 400 A
I_1 = 400 x (0,4+0,08+0,32)= 320A
t_1= 12 s @1920 A (6I_1)

Esempio: In=400 A
Example: I_3 =400 x (1,5+2)=1400A

I_2=OFF

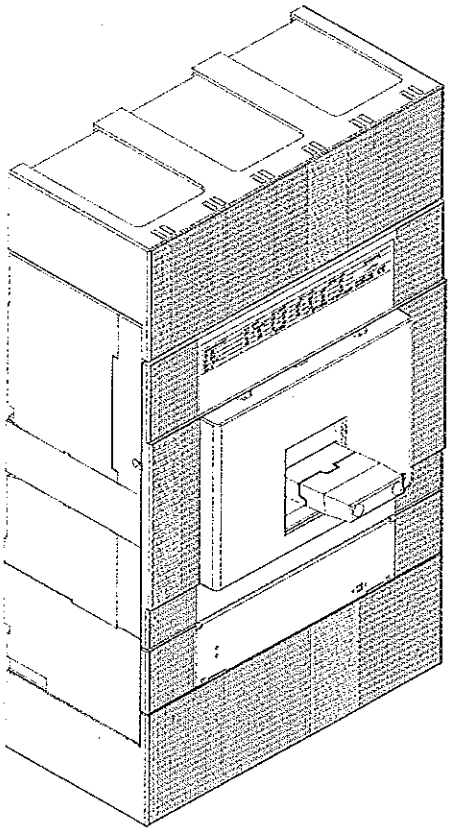
Esempio:
Example:
Ne=ON ; 50%

ABB SACE S.p.a.
Via Baioni, 35
24123 Bergamo Italy
Tel. +39 035 395.111 - Telefax +39 035 395.306-433

http://www.abb.com

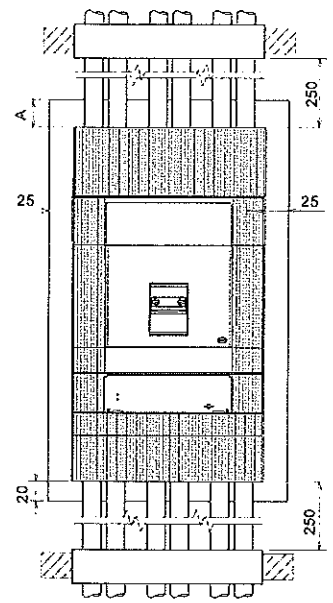
Tmax T6 1000A

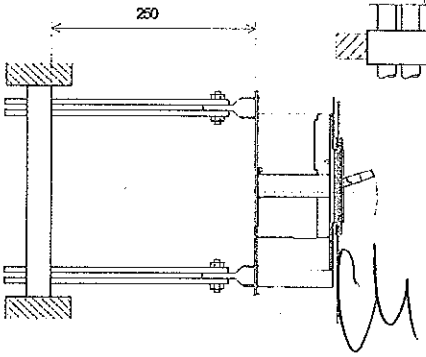
DOC. N.° 1SDH000511R0003 - L3756

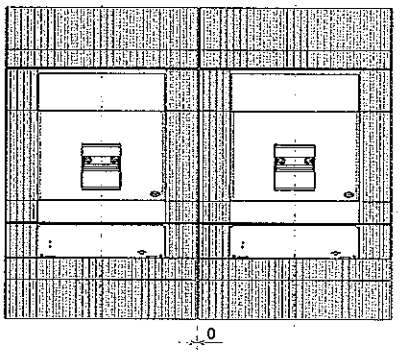


1

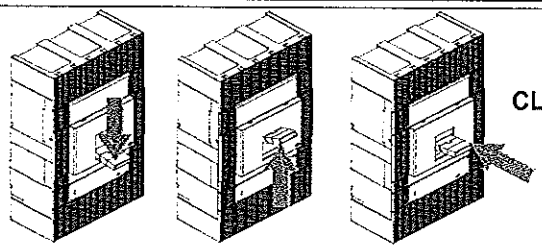
Ue	A (T6N, T6S, T6H)	A (T6L)
< 440 V	35	100
≥ 440 V ≤ 690 V	100	100
750 V	100	100



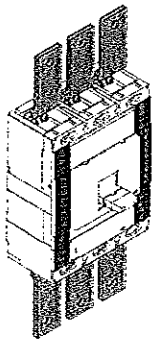




2

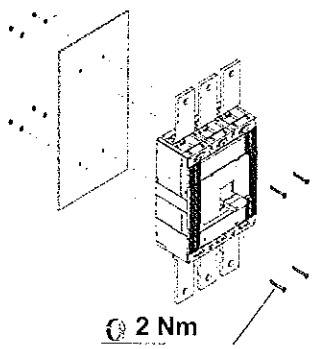


3



Usare cavi o barre isolate/ o eseguire prove di tipo specifiche sull' installazione.
Use cable or insulated busbars/ or perform specific type test on the installation.
Kabel oder isolierte Sammelschienen verwenden / oder die spezifische Typprüfung auf der Installation durchführen.
Utiliser un câble ou des barres isolées/ ou réaliser un test de type spécifique sur installation.
Utilizar un cable o barras aisladas / o efectuar una prueba de tipo específico sobre instalación.

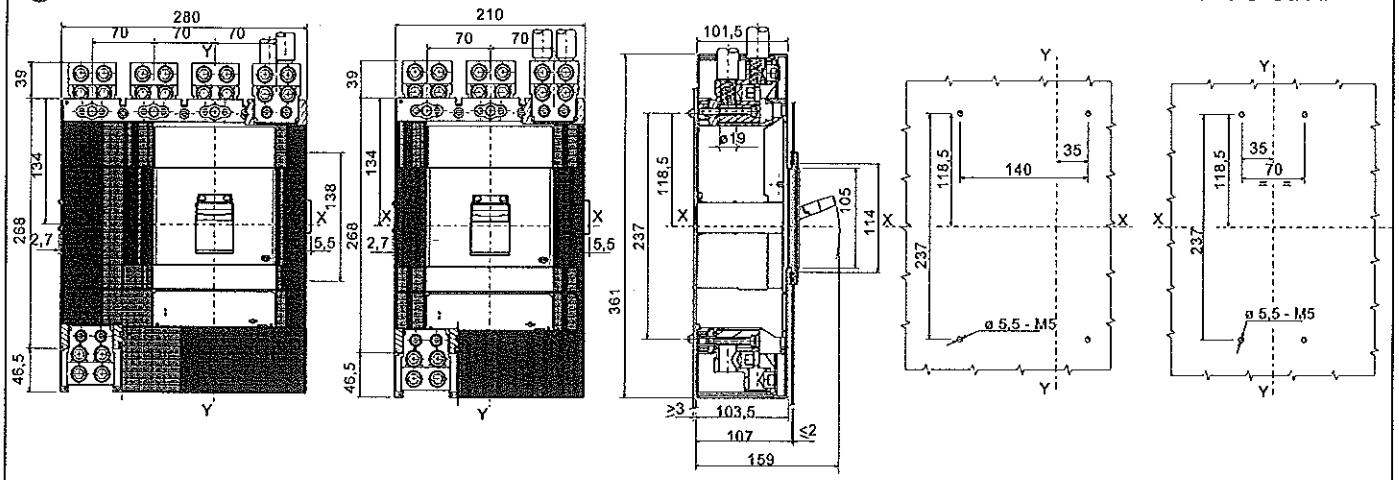
4



ABB

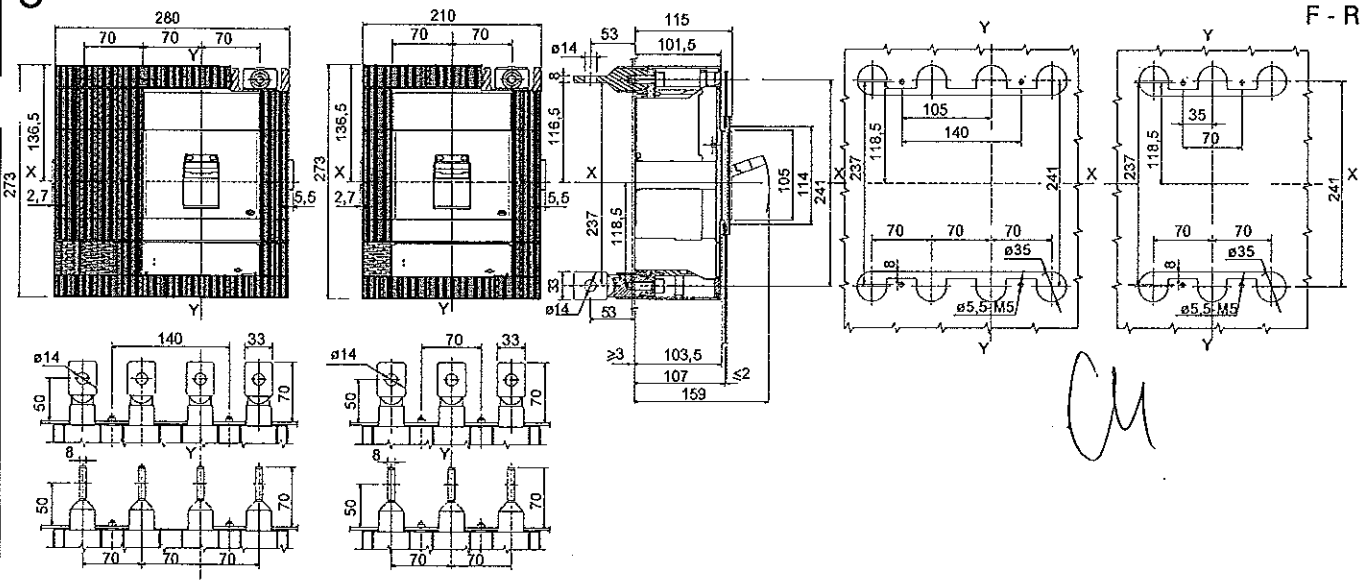
5

F- FC Cu Al



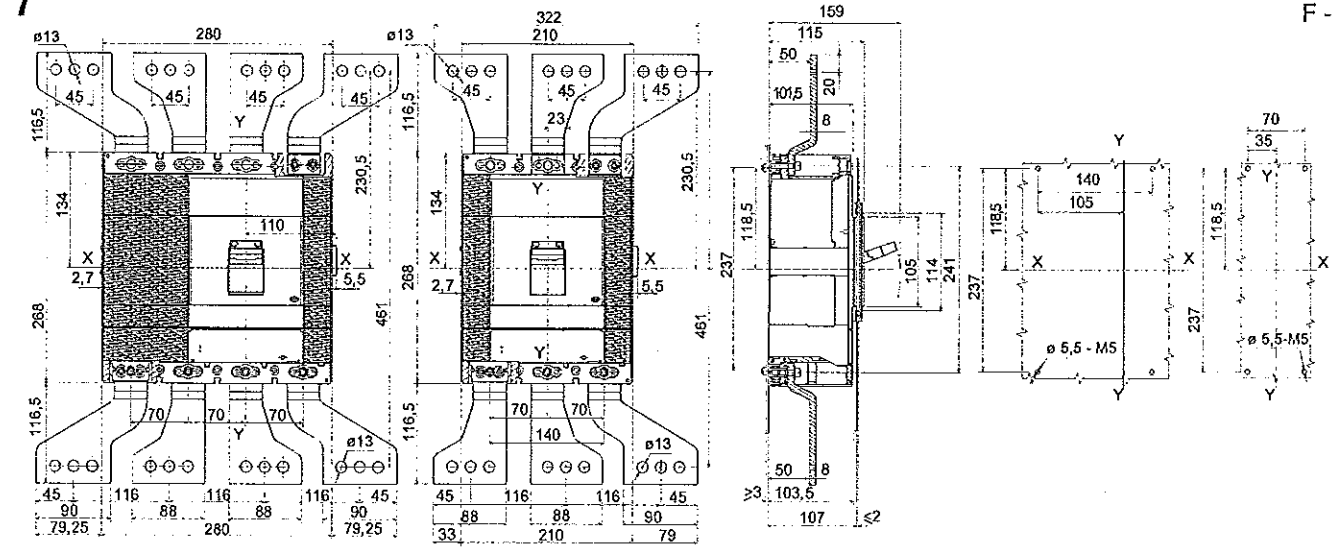
6

F - R



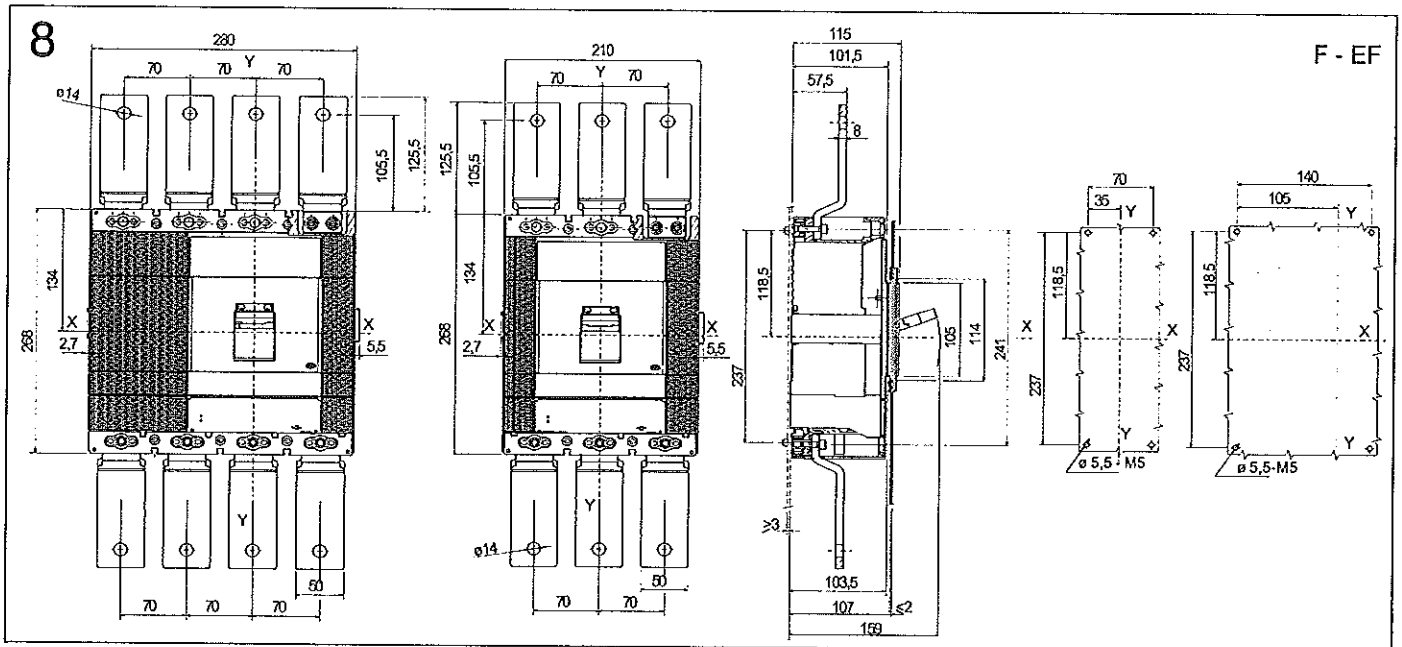
7

F - ES

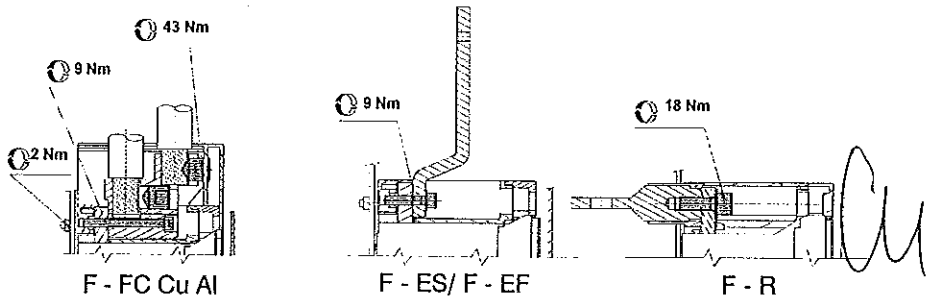


8

F - EF

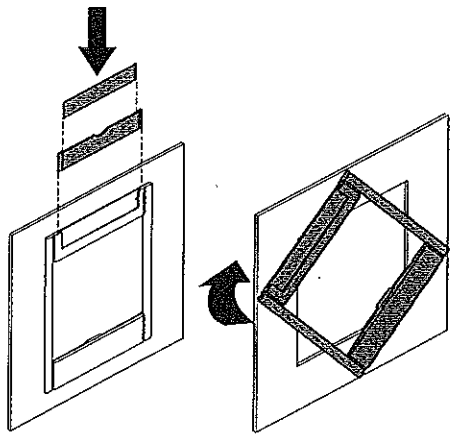


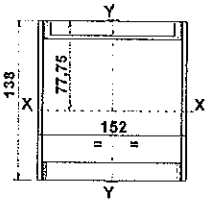
9

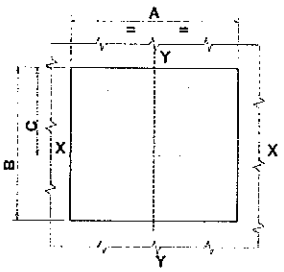


F - FC Cu Al F - ES/ F - EF F - R

10





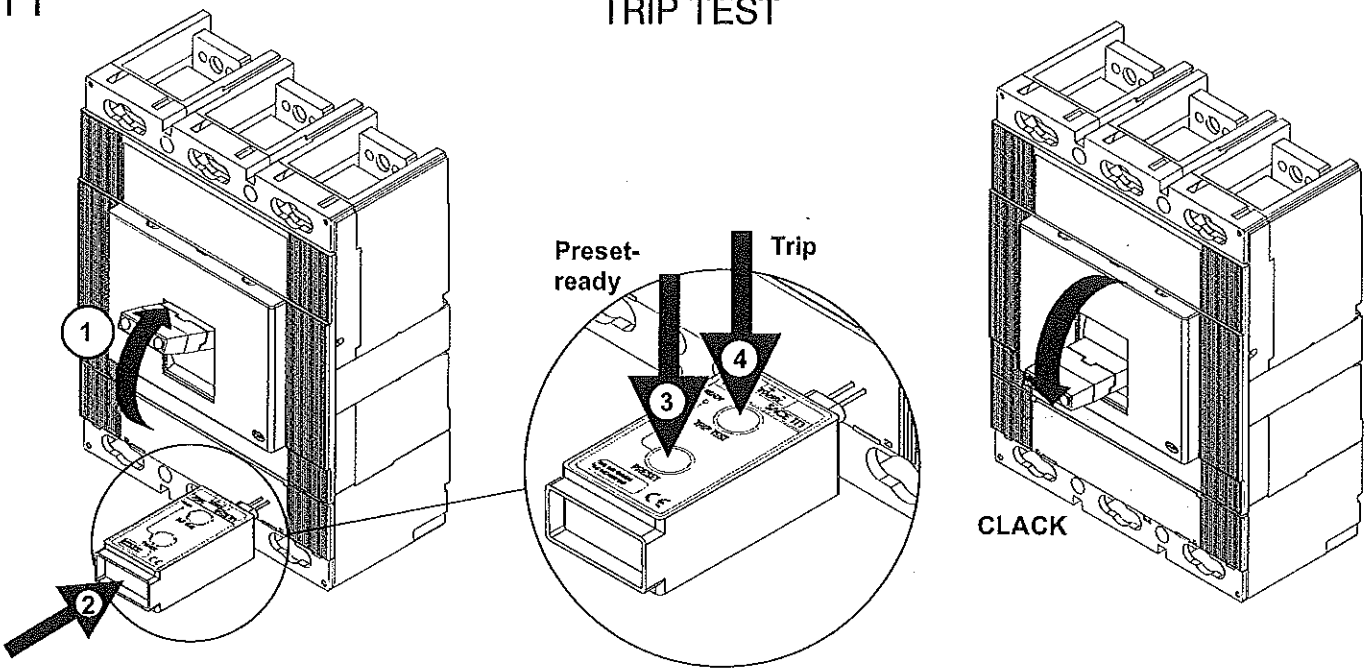


	A FISSO FIXED	B FISSO FIXED	C FISSO FIXED
WITH FLANGE CON MOSTRINA	149	116	66,75
WITHOUT FLANGE SENZA MOSTRINA	142	107	62,25

Non valido per interruttore fisso con RHD-FLD-MOE. Vedere documentazione specifica.
Not valid for fixed circuit breakers with RHD-FLD-MOE. See specific documentation.
Gilt nicht für festen Leistungsschalter mit RHD-FLD-MOE. Siehe die spezifische Dokumentation.
Non valable pour disjoncteur fixe avec RHD-FLD-MOE. Voir la documentation spécifique.
No válido para interruptor fijo con RHD-FLD-MOE. Véase documentación específica.

11

TRIP TEST



12

PR221DS

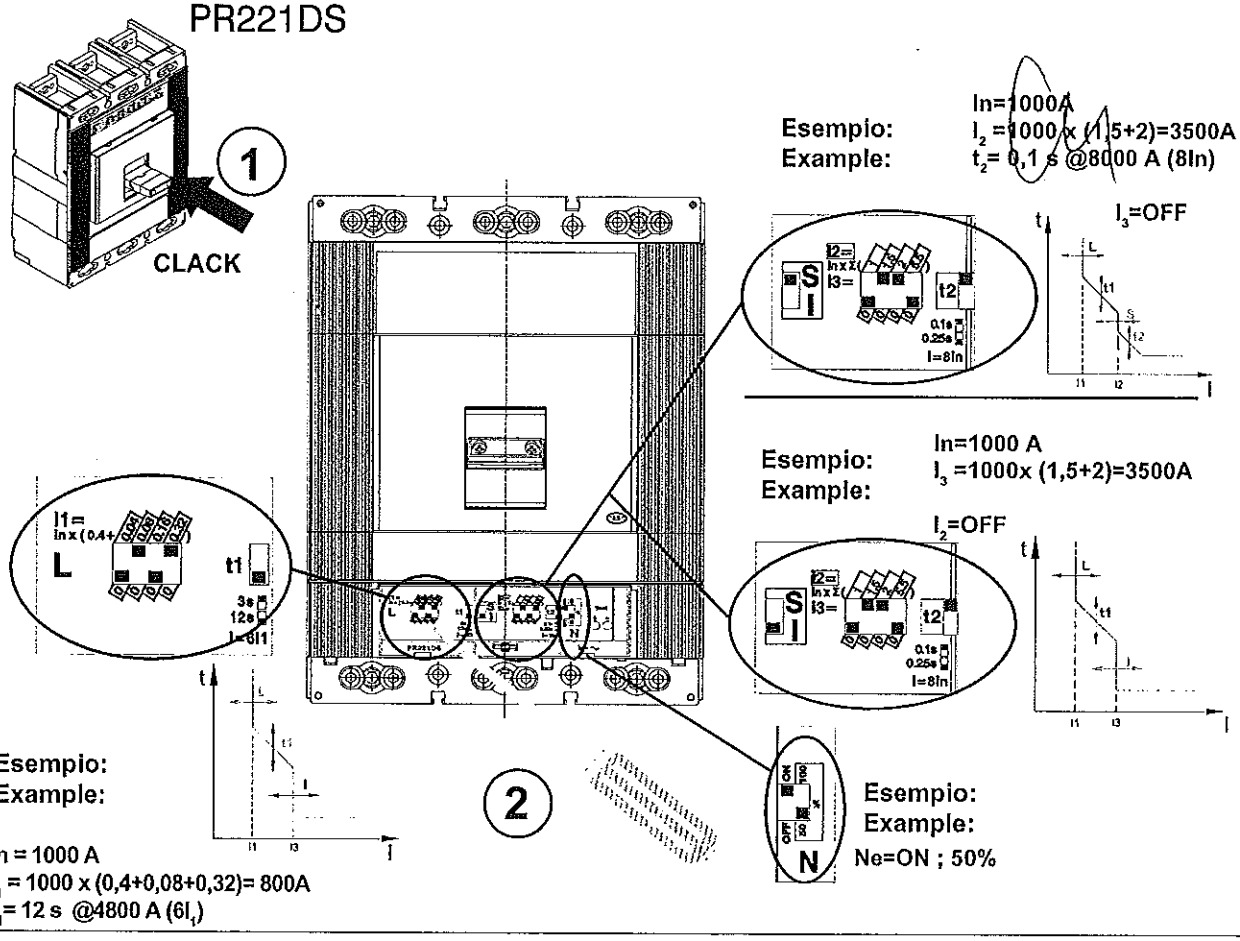
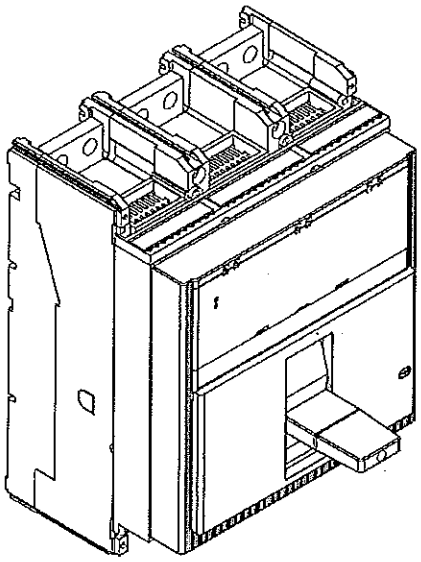


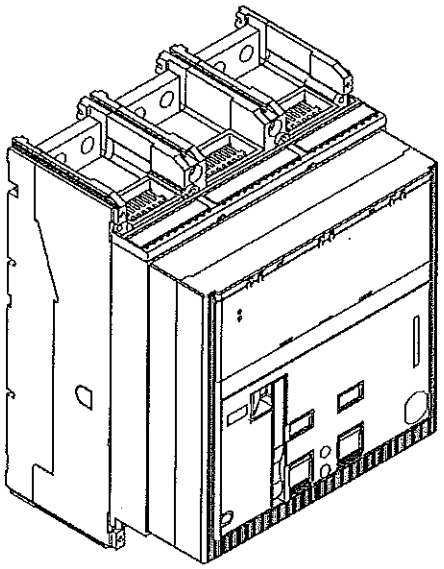
ABB S.p.a.
ABB SACE Division
Via Baioni, 35
24123 Bergamo Italy
Tel. +39 035 395.111 - Telefax +39 035 395.306-433

http://www.abb.com

Tmax T7-T7M

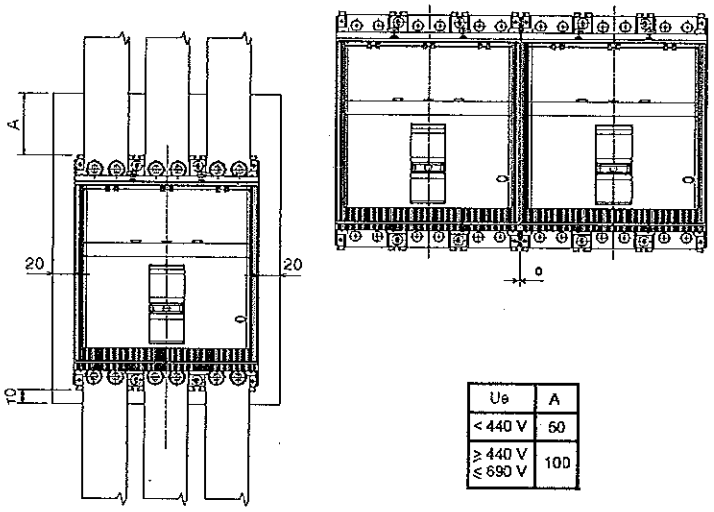
DOC. N.° 1SDH000606R0001 - L3194





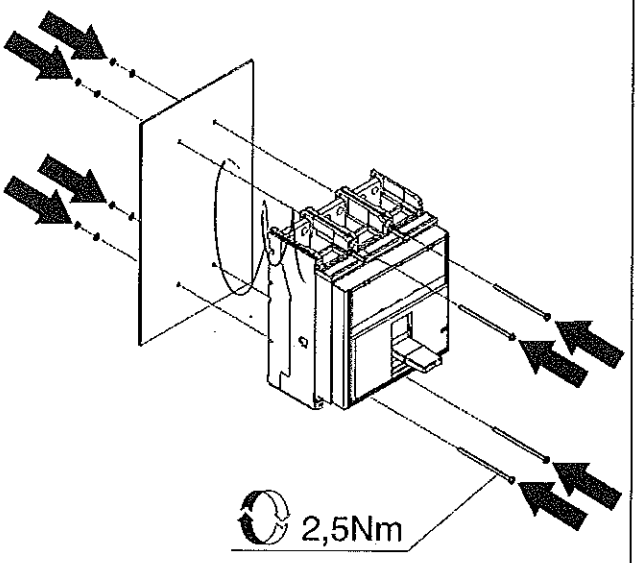
1÷5 Installation directions

1

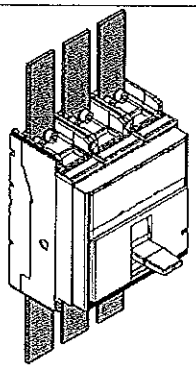


Ue	A
< 440 V	50
≥ 440 V ≤ 690 V	100

2

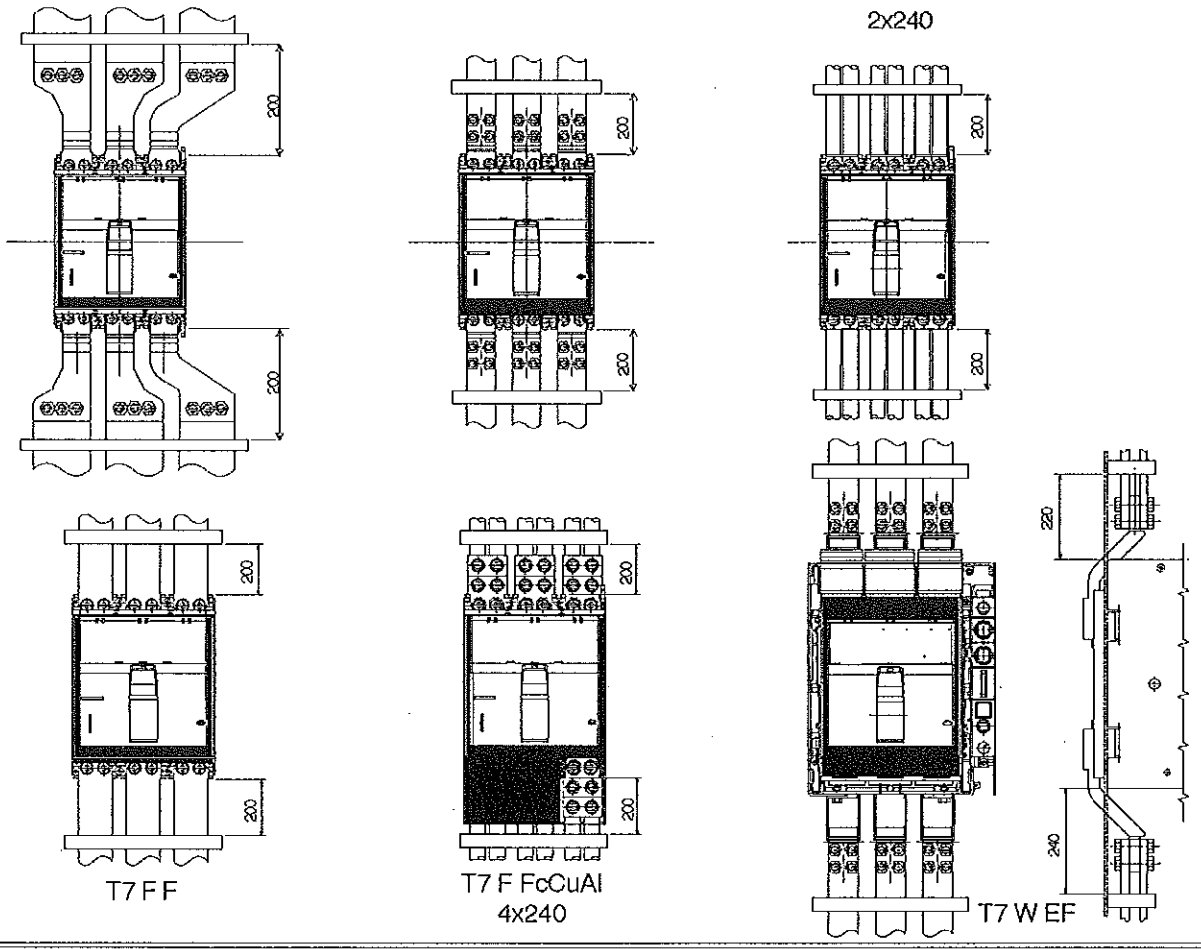


3

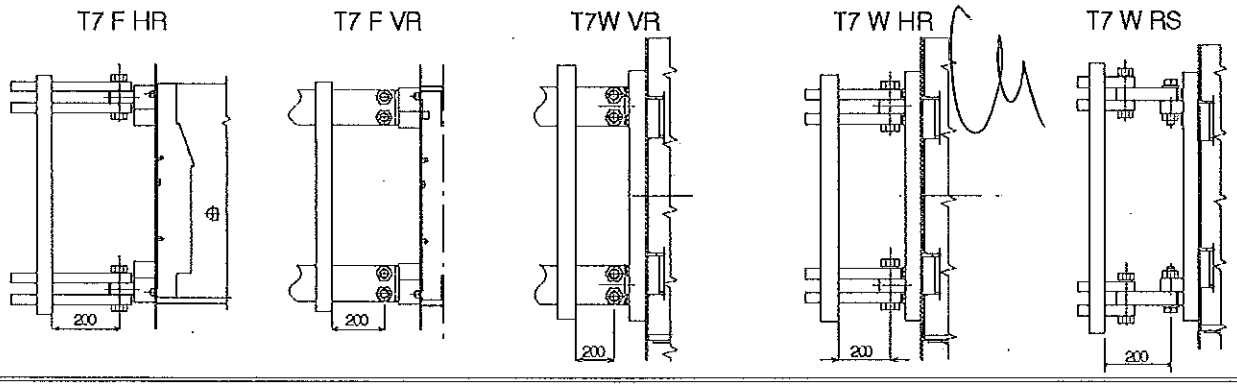


Usare cavi o barre isolate/o eseguire prove di tipo specifiche sull' installazione.
Use cable or insulated busbars/or perform specific type test on the installation.
Kabel oder isolierte Sammelschienen verwenden /oder die spezifische Typprüfung auf der Installation durchführen.
Utiliser un câble ou des barres isolées/ou réaliser un test de type spécifique sur installation.
Utilizar un cable o barras aisladas /o efectuar una prueba de tipo específico sobre instalación

4

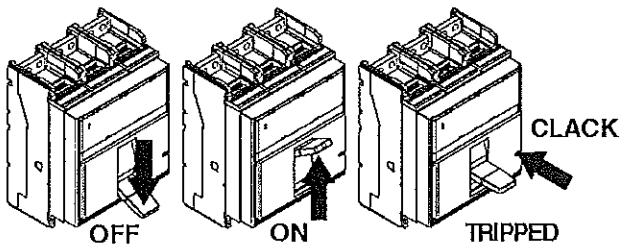


5

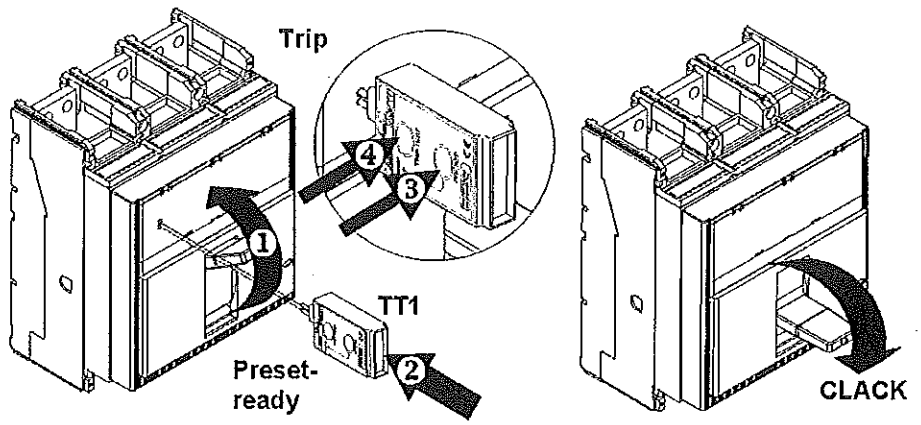


6÷9 Operating sequences and resetting due to tripping of release

6



7



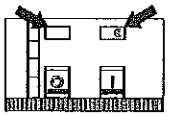
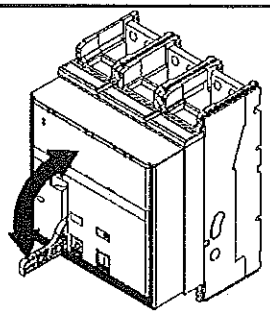
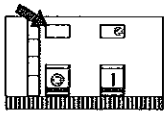
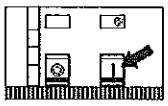
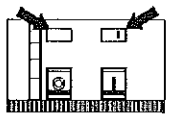
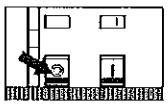
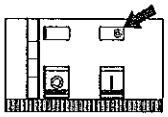
Trip test
Trip test
Auslöseprüfung
Test de déclenchement
Test de disparo

T7
PR231
PR232

8

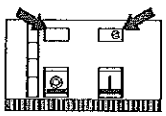
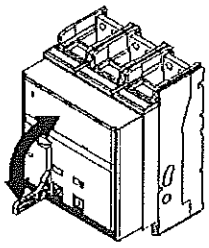
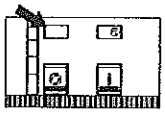
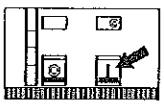
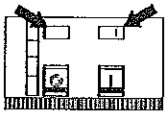
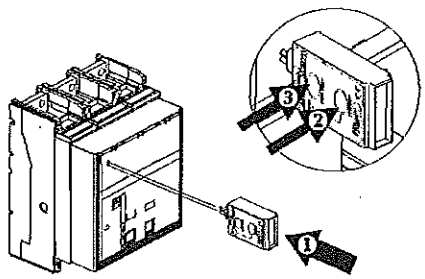
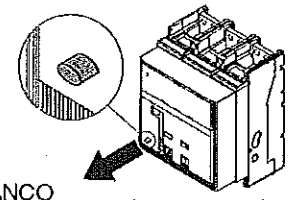
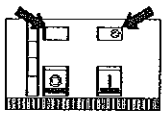
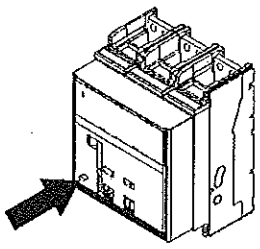
SEQUENZA DI MANOVRA
OPERATING SEQUENCE
SCHALTSEQUENZ
SÉQUENCE DE MANŒUVRES
SECUENCIA DE MANIOBRA

T7M

BIANCO WHITE WEISS BLANC BLANCO		APERTO OPEN AUS-STELLUNG OUVERT ABIERTO
		Carica molle Spring loading Federn spannen Réarmement resorts Carga resortes
GIALLO YELLOW GELB JAUNE AMARILLO		Molle cariche Springs loaded Federn gespannt Ressorts armés Resortes cargados
		CHIUSURA CLOSING EINSCHALTEN FERMETURE CIERRE Chiusura interruttore Circuit breaker closing Leistungsschalter einschalten Fermeture disjoncteur Cierre interruptor
BIANCO WHITE WEISS BLANC BLANCO		CHIUSO CLOSED EINGESCHALTET FERMÉ CERRADO Interruttore chiuso, molle scariche Circuit breaker closed, springs unloaded Leistungsschalter geschlossen, Federn entspannt Disjoncteur fermé, ressorts désarmés Interruptor cerrado, resortes descargados
APERTURA OPENING AUSSCHALTEN OUVERTURE APERTURA		Apertura interruttore Circuit breaker opening Ausschaltung Leistungsschalter Ouverture disjoncteur Apertura interruptor
		APERTO OPEN AUS-STELLUNG OUVERT ABIERTO Interruttore aperto, molle scariche Circuit breaker open, springs unloaded Leistungsschalter ausgeschaltet, Federn entspannt Disjoncteur ouvert, ressorts désarmés Interruptor abierto, resortes descargados

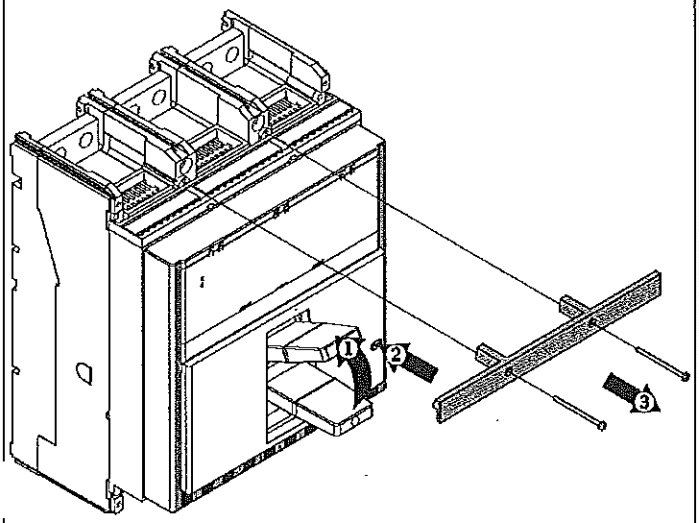
9

T7M

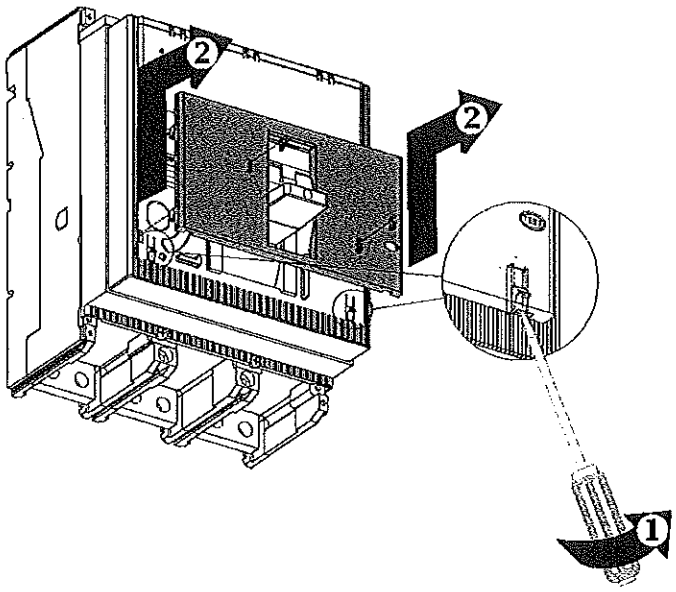
BIANCO WHITE WEISS BANC BLANC  APERTO OPEN AUS-STELLUNG OUVERT ABIRTO	RIPRISTINO PER INTERVENTO SGANCIATORE RESETTING DUE TO TRIPPING OF RELEASE RÜCKSETZUNG WEGEN AUSLÖSUNG DES AUSLÖSERS RÉTABLISSEMENT APRÈS DÉCLENCHEMENT DU DÉCLENCHEUR RESTABLECIMIENTO POR ACTUACIÓN DEL RELÉ
	Carica molle Spring loading Federn spannen Réarmement resorts Carga resortes
GIALLO YELLOW GELB JAUNE AMARILLO 	Molle cariche Springs loaded Federn gespannt Ressorts armés Resortes cargados
 CHIUSURA CLOSING EINSCHALTEN FERMETURE CIERRE	Chiusura interruttore Circuit breaker closing Leistungsschalter einschalten Fermeture disjoncteur Cierre interruptor
BIANCO WHITE WEISS BANC BLANC  CHIUSO CLOSED EINGESCHALTET FERMÉ CERRADO	Interruttore chiuso, molle scariche Circuit breaker closed, springs unloaded Leistungsschalter geschlossen, Federn entspannt Disjoncteur fermé, ressorts désarmés Interruptor cerrado, resortes descargados
	Inserire unità di test ed eseguire come in figura, premendo i pulsanti 2 e 3 in sequenza. Connect test unit and perform as shown in the figure by pressing keys 2 and 3 in sequence. Das Prüfgerät einstecken und die Prüfung wie in der Abbildung gezeigt ausführen. Hierzu nacheinander die Tasten 2 und 3 drücken. Brancher l'unité de test et agir comme indiqué sur la figure, en appuyant sur les boutons 2 et 3 en sequence. Insertar la unidad de prueba y seguir los pasos que se muestran en la figura, pulsando los botones 2 y 3 en secuencia.
 BIANCO WHITE WEISS BANC BLANC  APERTO OPEN AUS-STELLUNG OUVERT ABIRTO	Quando avviene lo sganclo fuoriesce come indicato l'indicazione meccanica di trip. When tripping takes place, the mechanical trip indicator comes out. Wenn die Auslösung erfolgt, tritt wie gezeigt die mechanische Auslösungsanzeige aus. Comme illustré, quand le déclenchement se produit, on a la sortie de l'indicateur mécanique. Cuando se cumple el desenganche, sale -tal y como se muestra en la indicación mecánica de disparo.
	Per ricominciare la sequenza reinserire manualmente l'indicatore. To restart the sequence, the indicator should be re-introduced by hand. Für den erneuten Beginn der Sequenz die Anzeige von Hand wieder hineindrücken. Pour recommencer la séquence, enfoncer de nouveau manuellement l'indicateur. Para reiniciar la secuencia, reinsertar manualmente el indicador.

ABB

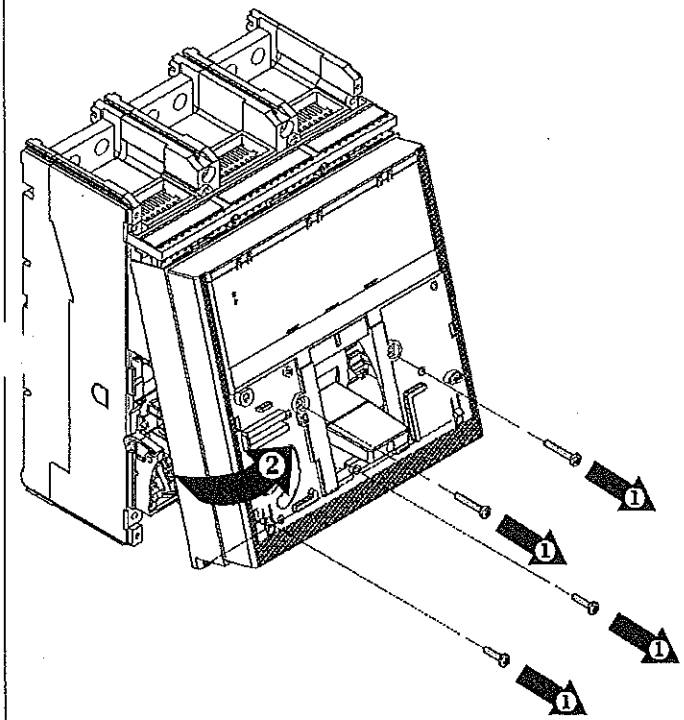
10 T7



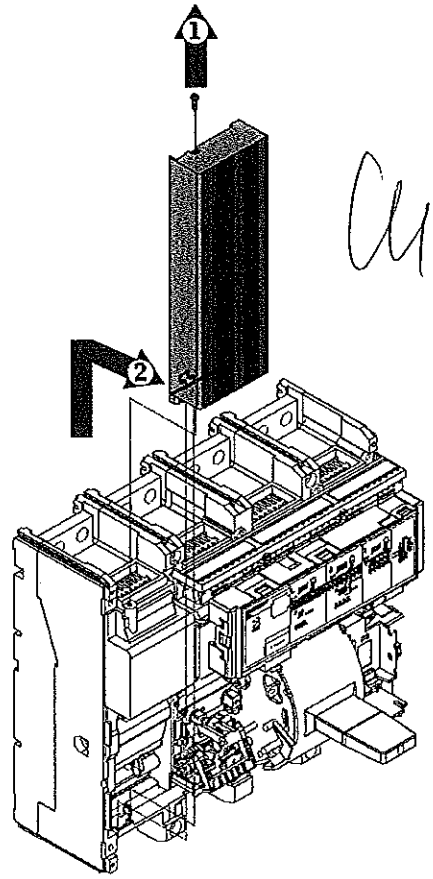
11 T7



12 T7

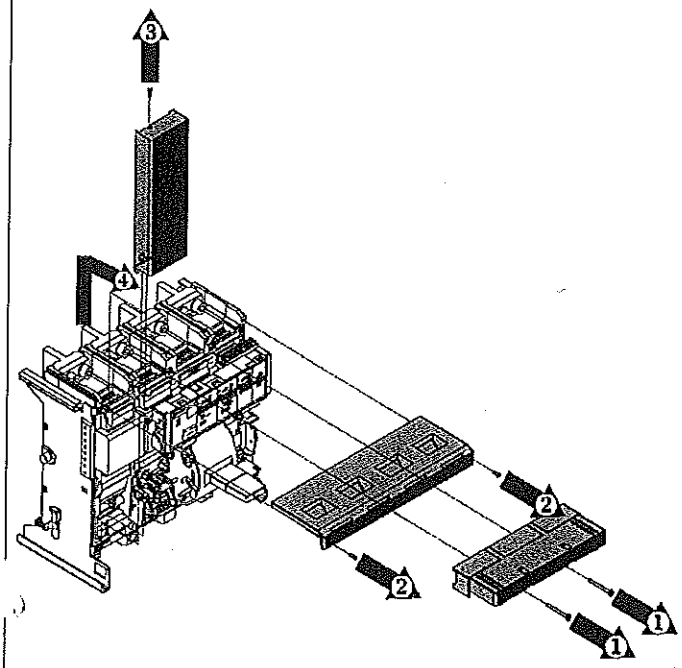


13 T7 IV

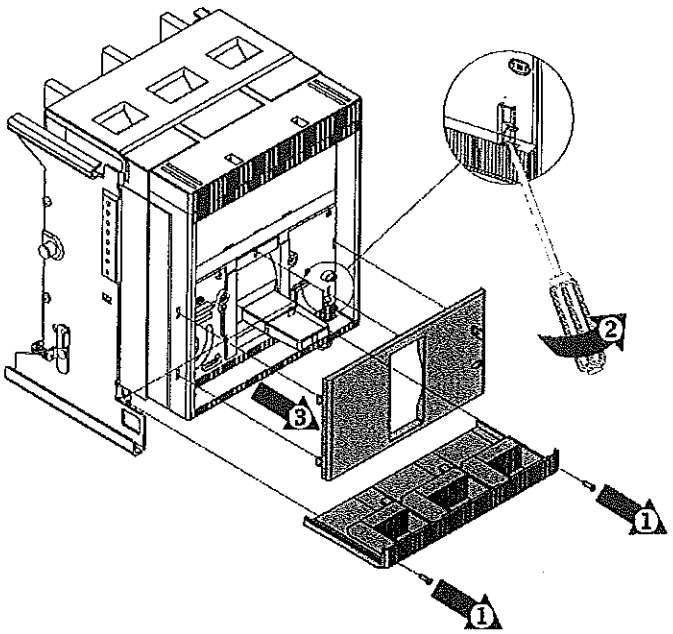


ABB

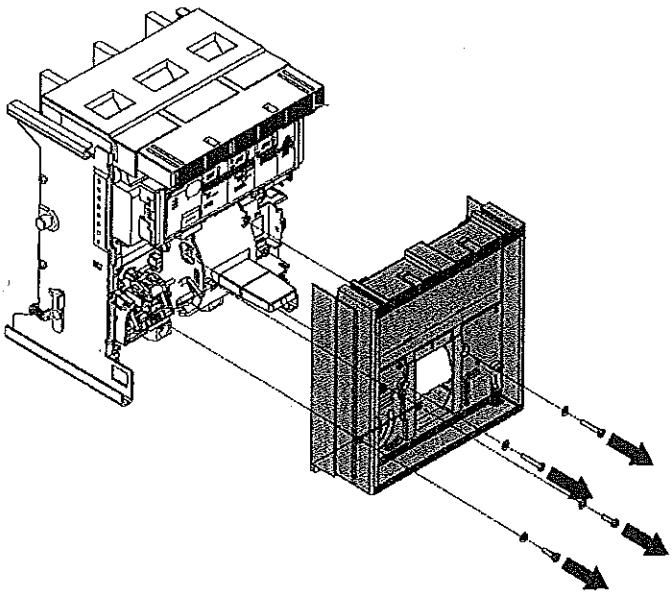
14 T7 IV/W



15 T7/W

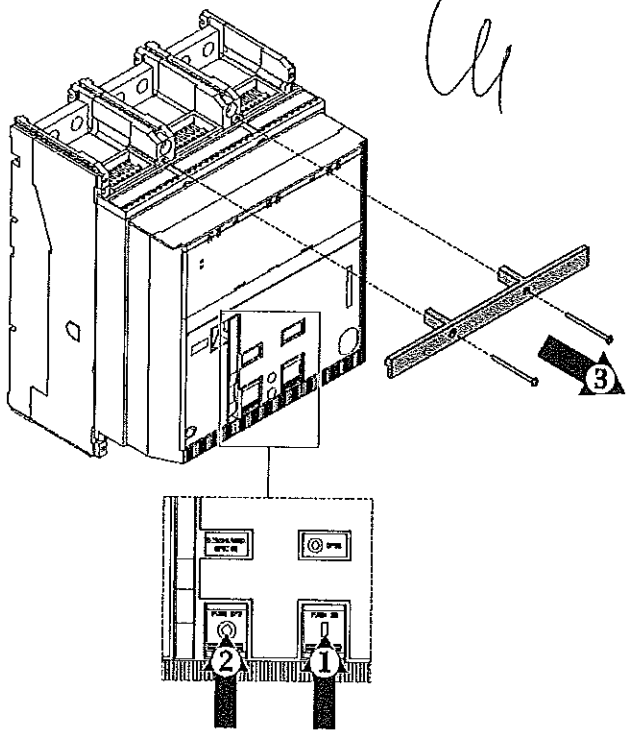


16 T7/W



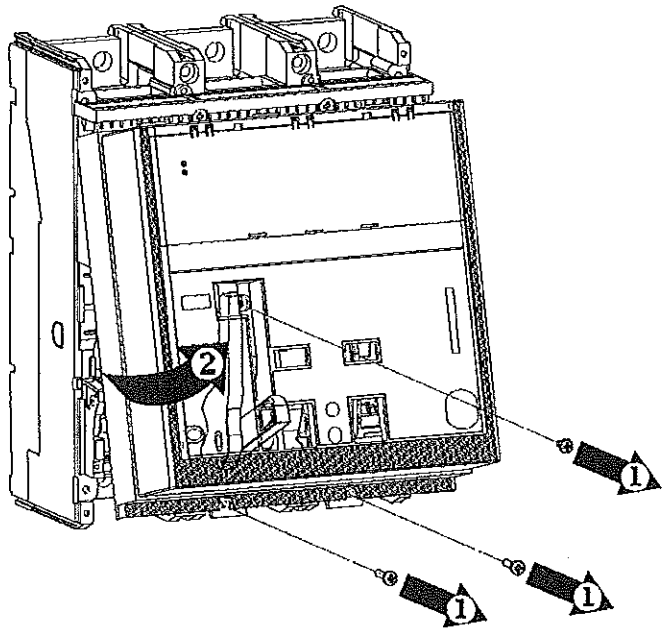
17÷22 Disassembly sequence to install internal accessories T7M

17 T7M

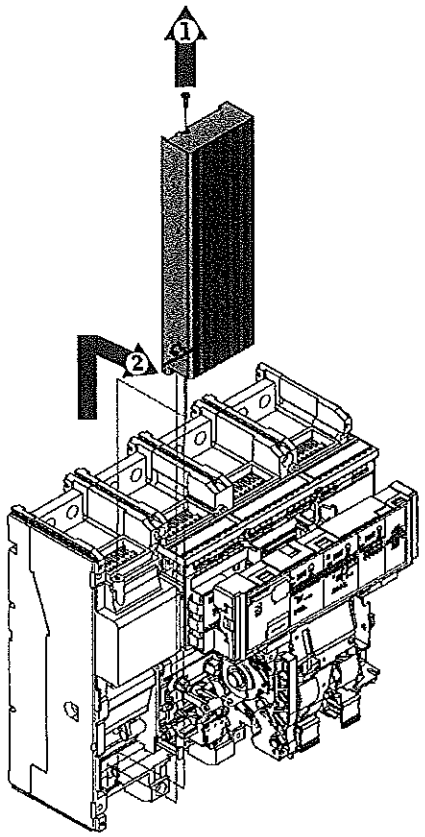


ABB

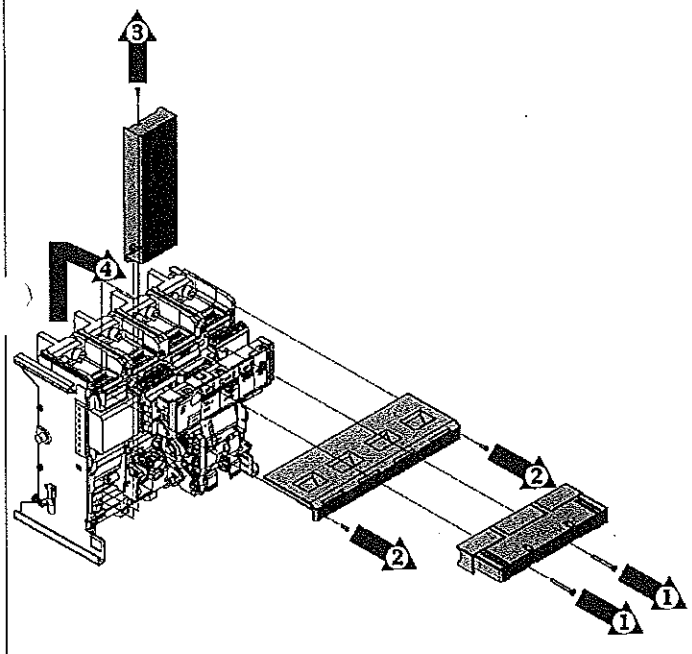
18 T7M



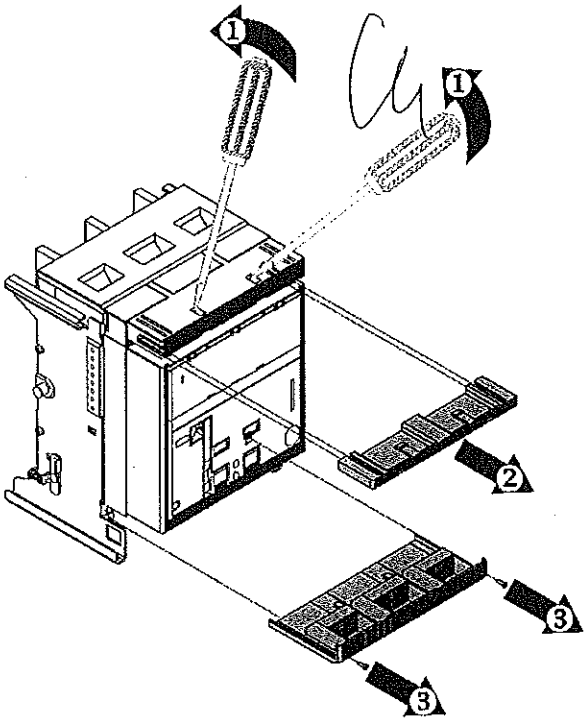
19 T7M IV



20 T7M IV/W



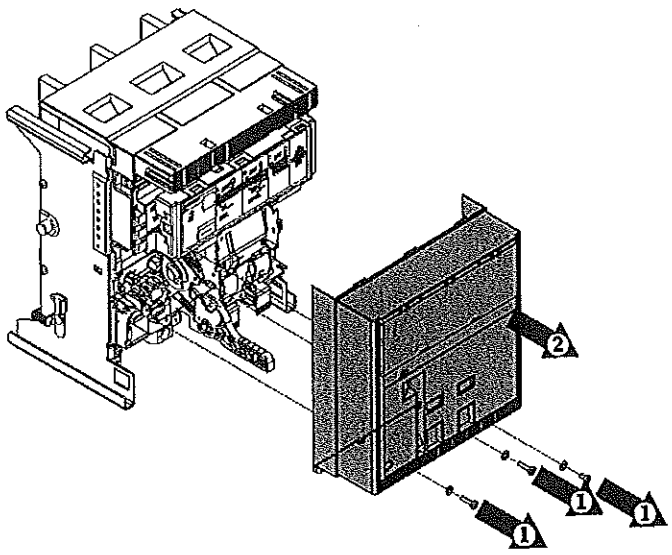
21 T7M/W



ABB

199

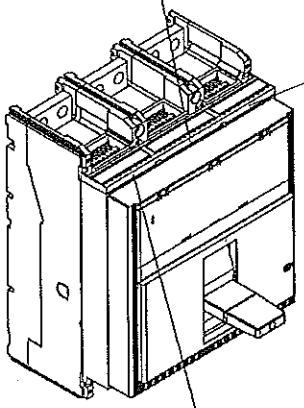
22 T7/W



23 T7

D1	C1	C13	C12	42	11	12	22	31	32
D2	C2	C3	C11	44	41	14	24	21	34

T9	T7	T6	W4	98S	W2	K15	K13	K21	K2	T3	T4
T10	T8	T5	W3	95S	W1	K14	K12	K11	K1	T2	T1

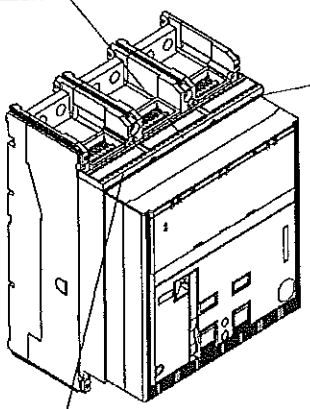


77	67	57	98						
78	68	58	95	96					

24 T7M

D1	C1	C13	C12	42	11	12	22	31	32
D2	C2	C3	C11	44	41	14	24	21	34

T9	T7	T6	W4	98S	W2	K15	K13	K21	K2	T3	T4
T10	T8	T5	W3	95S	W1	K14	K12	K11	K1	T2	T1

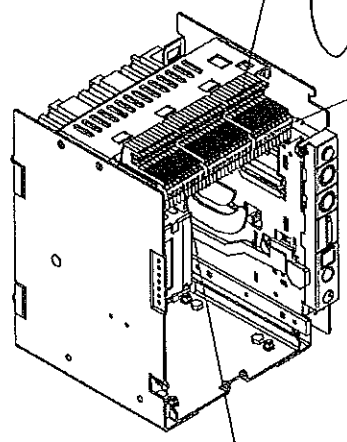


U1	38		98		R1	48			
U2	36	35	95	96	R2	46	45		

25 T7-T7M/W

D1	C1	C13	C12	42	11	12	22	31	32
D2	C2	C3	C11	44	41	14	24	21	34

T9	T7	T6	W4	98S	W2	K15	K13	K21	K2	T3	T4
T10	T8	T5	W3	95S	W1	K14	K12	K11	K1	T2	T1



U1	38		98		R1	48				*T7M*
U2	36	35	95	96	R2	46	45			

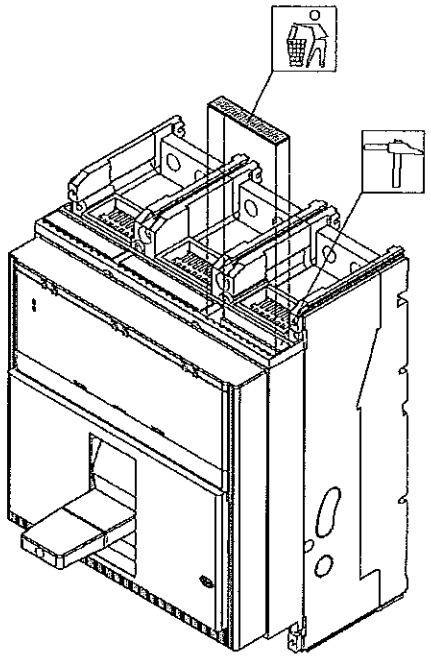
77	67	57	98							*T7*
78	68	58	95	96						

ABB

200

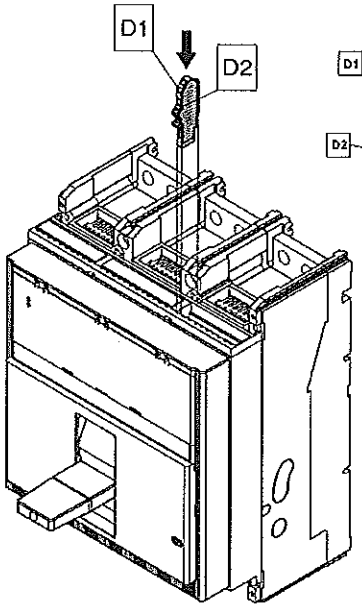
26

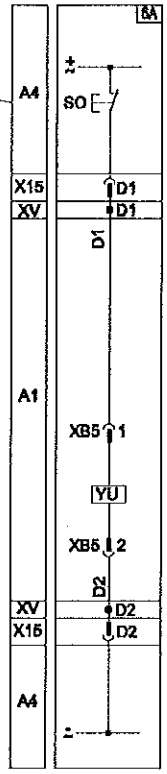
T7-T7M



27

T7-T7M

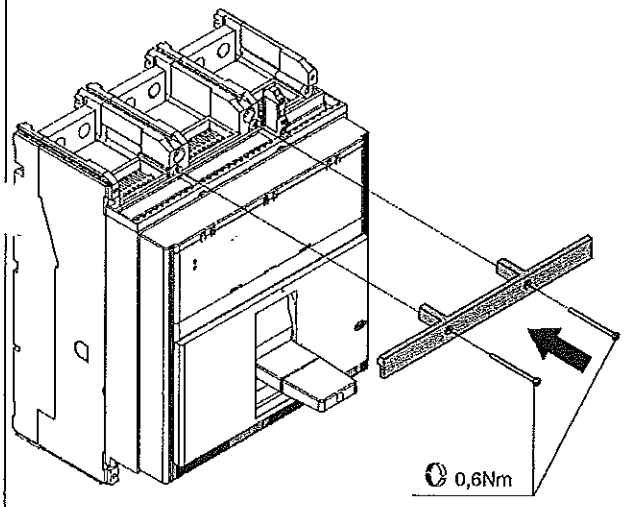




Esempio di cablaggio per interruttore fisso
Wiring example for fixed circuit breaker
Verdrahtungsbeispiel für festen Leistungsschalter
Exemple de câblage pour disjoncteur fixe
Ejemplo de cableado para interruptor fijo

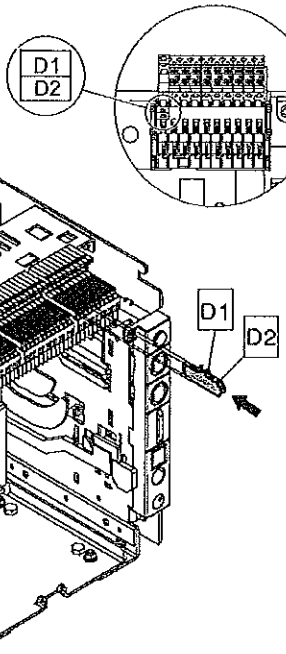
28

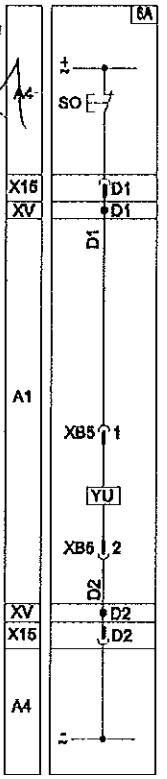
T7-T7M



29

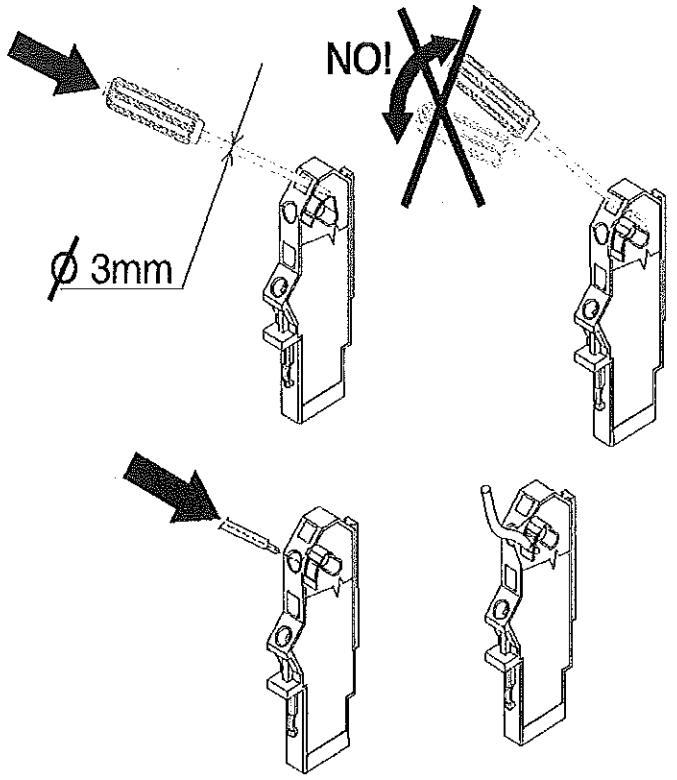
T7-T7M/W



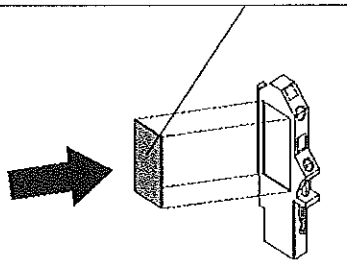


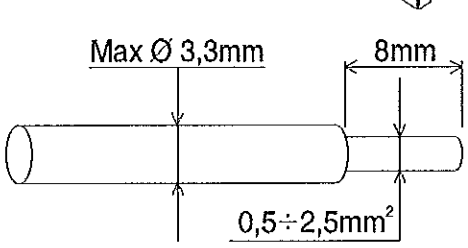
Esempio di cablaggio per parte fissa
Wiring example for fixed part
Verdrahtungsbeispiel für Unterteil
Exemple de câblage pour partie fixe
Ejemplo de cableado para parte fija

30

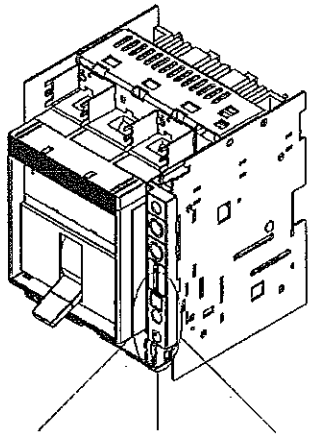


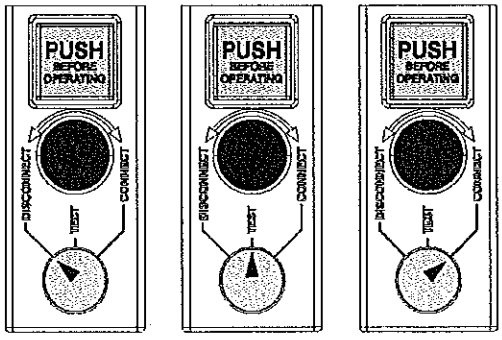
OPZIONALE – DATI DEI CABLAGGI RIPORTABILI A CURA DEL CLIENTE
OPTIONAL – WIRING DATA TO BE GIVEN BY CUSTOMER
OPTIONAL - DIE DATEN DER VERDRAHTUNG KÖNNEN VOM KUNDEN VERMERKT WERDEN.
OPTION – INDICATION DES DONNÉES DES CÂBLAGES À LA CHARGE DU CLIENT
OPCIONAL – DATOS DE LOS CABLEADOS REALIZABLES POR CUENTA DEL CLIENTE





31





DISCONNECT TEST CONNECT

L'interruttore si può manovrare soltanto se il pulsante "PUSH BEFORE OPERATE" non è premuto, e cioè soltanto quando l'interruttore è in una di queste tre posizioni.

The circuit breaker can operate only when the "PUSH BEFORE OPERATE" button is not pressed, i.e. only when the CB is set to one of the following three positions.

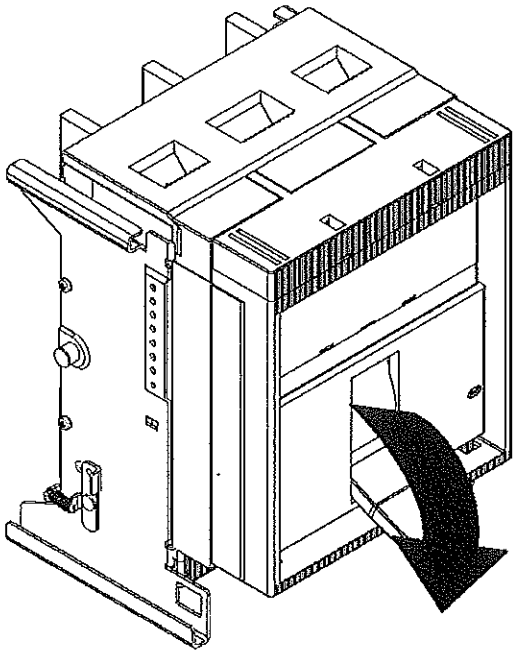
Das Schalten des Leistungsschalters ist nur dann möglich, wenn die Taste "PUSH BEFORE OPERATE" nicht gedrückt ist, d.h. wenn sich der Leistungsschalter in einer dieser drei Stellungen befindet.

Le disjoncteur ne peut être manœuvré que si le bouton "PUSH BEFORE OPERATE" n'est pas enfoncé, c'est-à-dire uniquement quand le disjoncteur est dans l'une de ces trois positions.

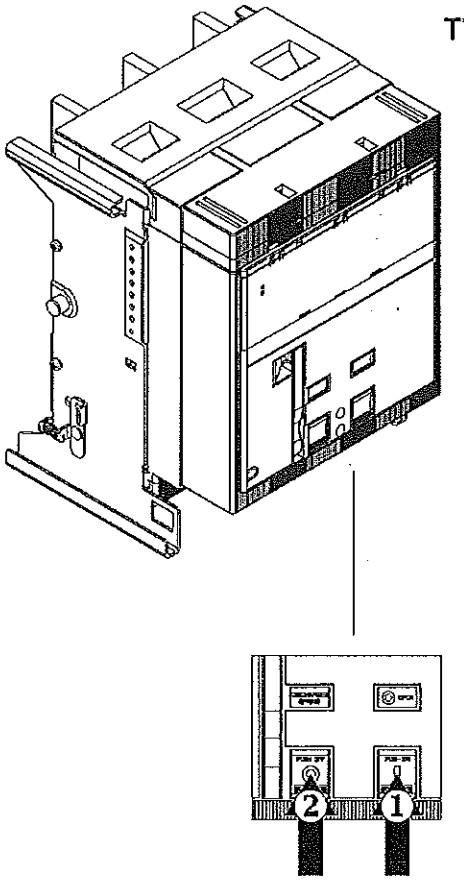
El interruptor puede manipularse sólo si el botón "PUSH BEFORE OPERATE" no ha sido pulsado; es decir, sólo cuando el interruptor se encuentra en una de las siguientes tres posiciones.

ABB

32 T7/W

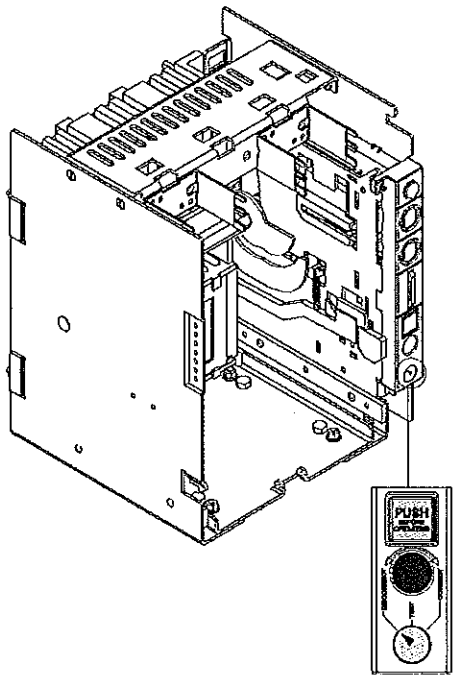


33 T7M/W

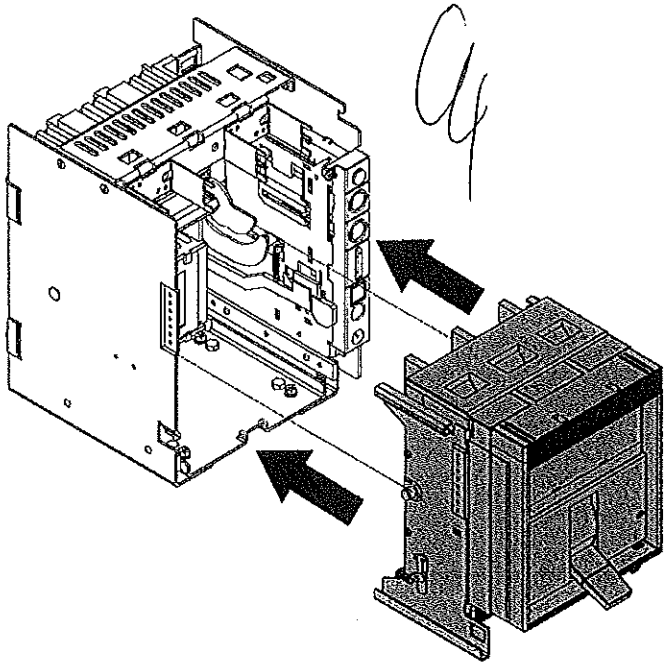


34

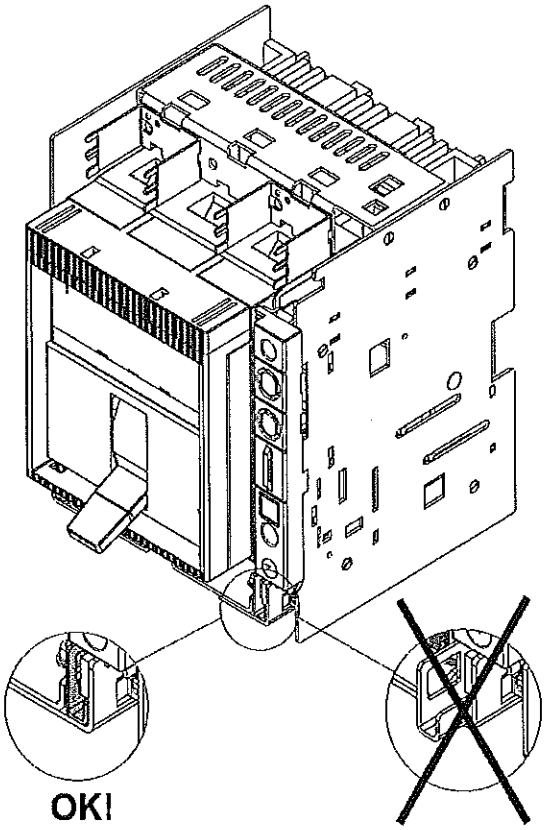
Posizione di partenza (estratto)
Starting position (disconnected)
Ausgangsstellung (Trennstellung)
Position de départ (débroché)
Posición de salida (extraído)



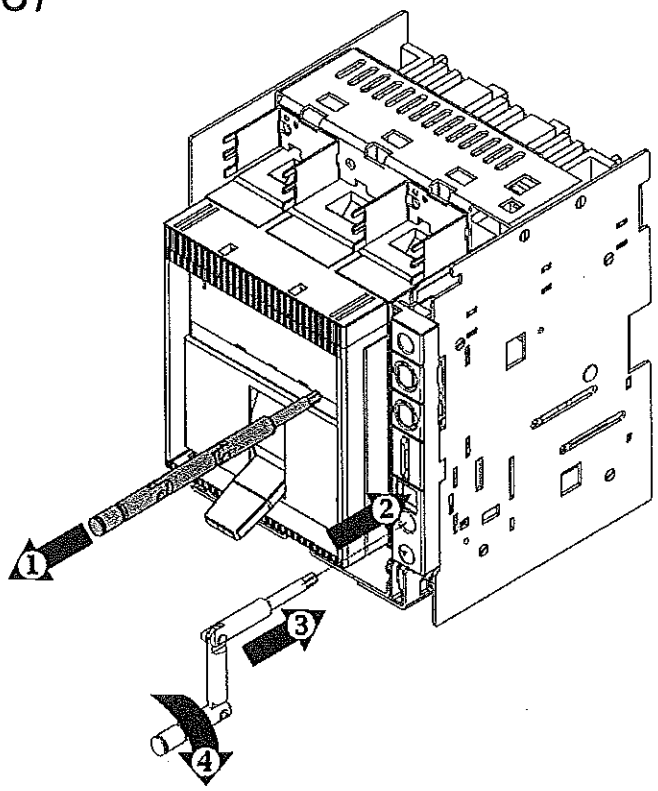
35



36

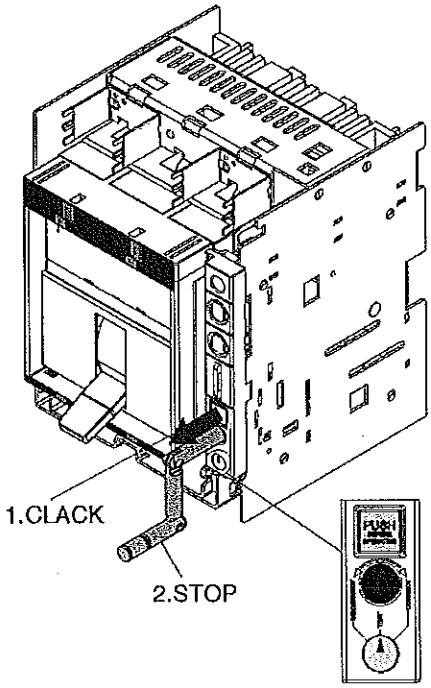


37

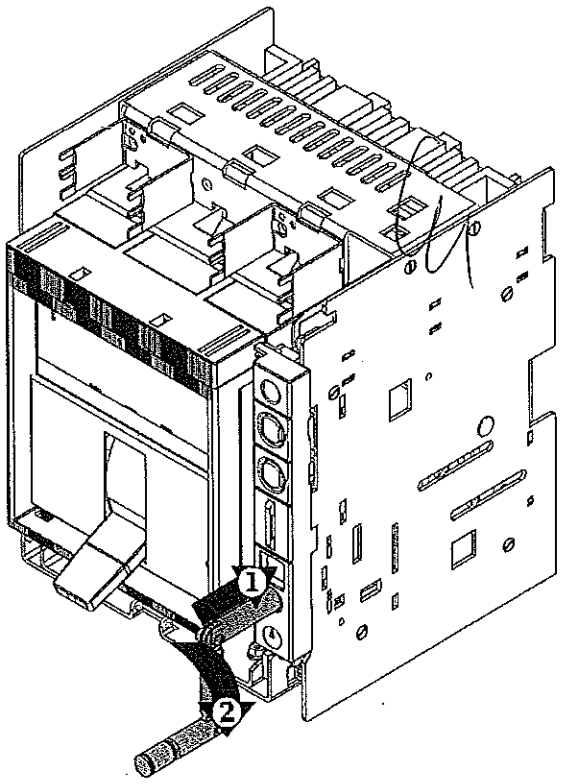


38

Posizione test
Test position
Prüfstellung
Position de test
Posición de prueba



39

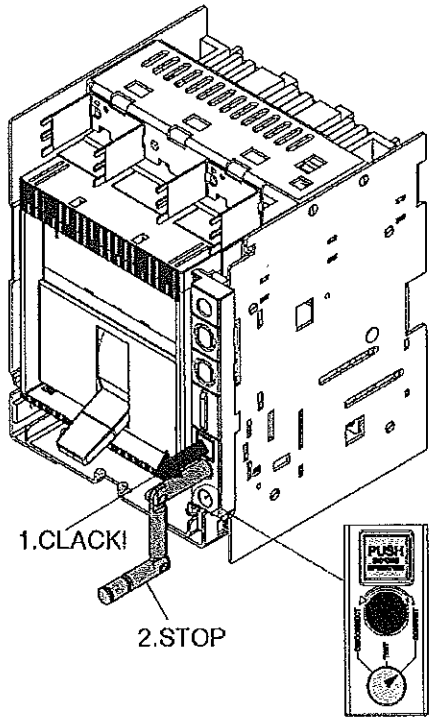


ABB

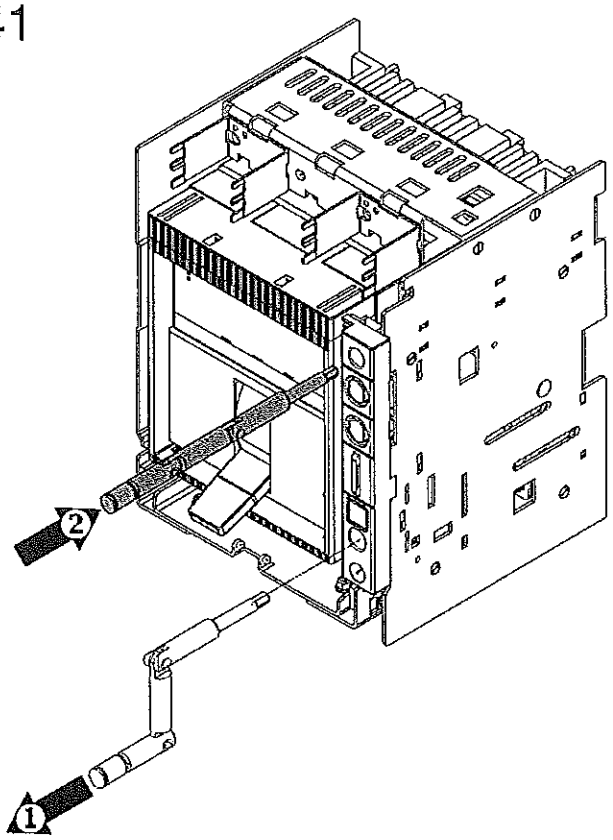
204

40

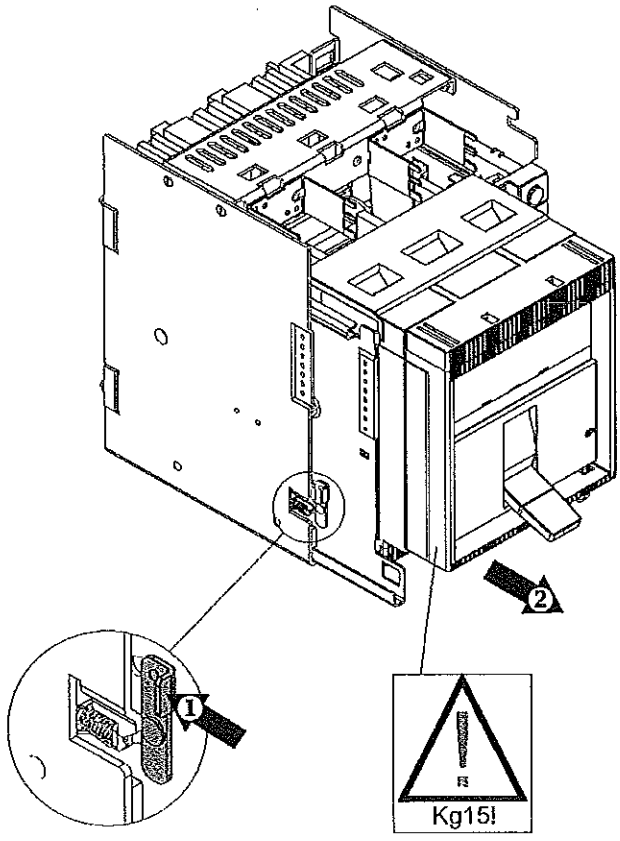
Posizione di inserito
Connected
Betriebsstellung
Position embroché
Posición de insertado



41



42



Per estrarre la parte mobile dalla parte fissa ripercorrere le operazioni descritte nelle fig. 37-41 in senso inverso. Al termine effettuare le due operazioni illustrate nella figura a lato.

To remove the moving part from fixed part, repeat the operations described in figures 37 to 41 in reverse order When accomplished, perform the two operations shown in the figure.

Zum Herausnehmen des beweglichen Teils aus dem Unterteil die in den Abb. 37 - 41 gezeigten Vorgänge in der umgekehrten Reihenfolge ausführen. Zum Schluss die zwei in der nebenstehenden Abbildung gezeigten Vorgänge ausführen.

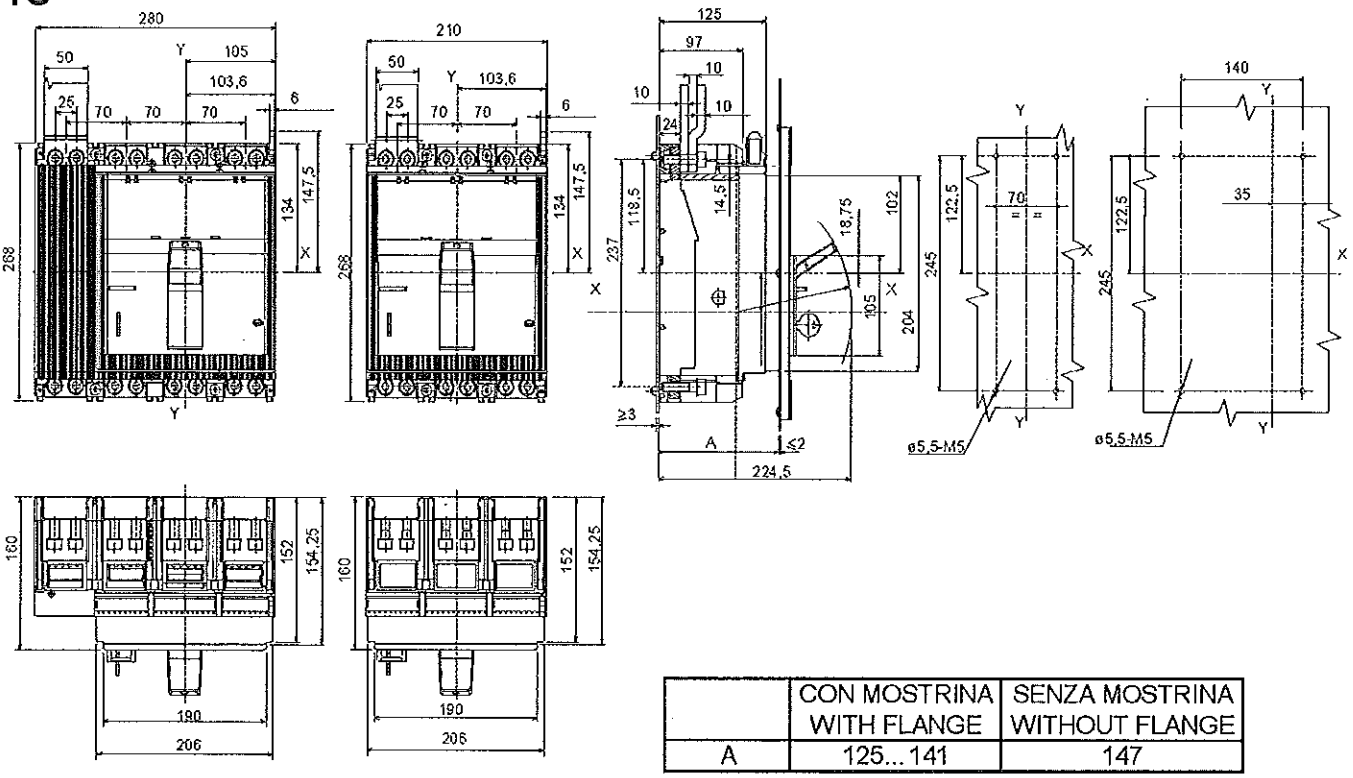
Pour débrocher la partie mobile de la partie fixe, refaire à l'inverse les opérations décrites sur les fig. 37 - 41. Pour finir, effectuer les deux opérations illustrées sur la figure ci-contre.

Para extraer la parte móvil de la parte fija, repetir -en sentido inverso- las operaciones que han sido descritas en las figs. 37-41. Al terminar, realizar las dos operaciones que se muestran en la figura puesta a un lado.

ABB

43

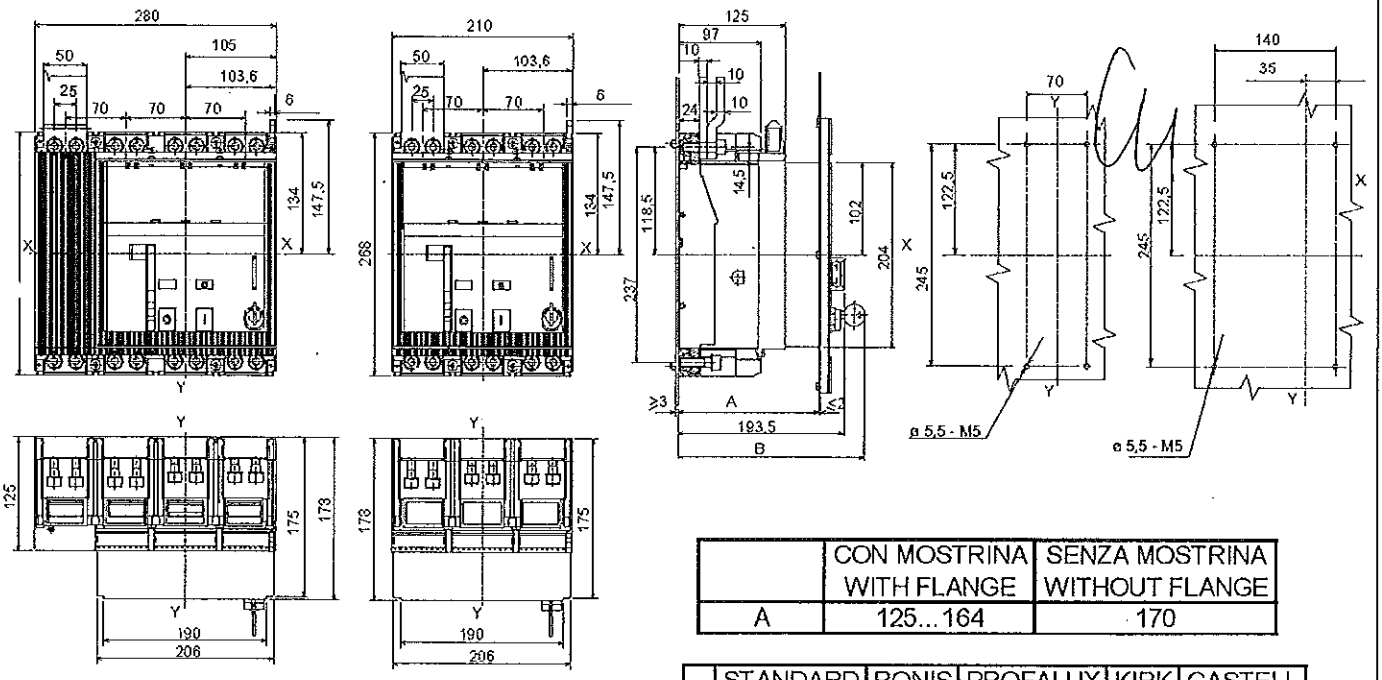
F-F



	CON MOSTRINA WITH FLANGE	SENZA MOSTRINA WITHOUT FLANGE
A	125...141	147

44

F-F



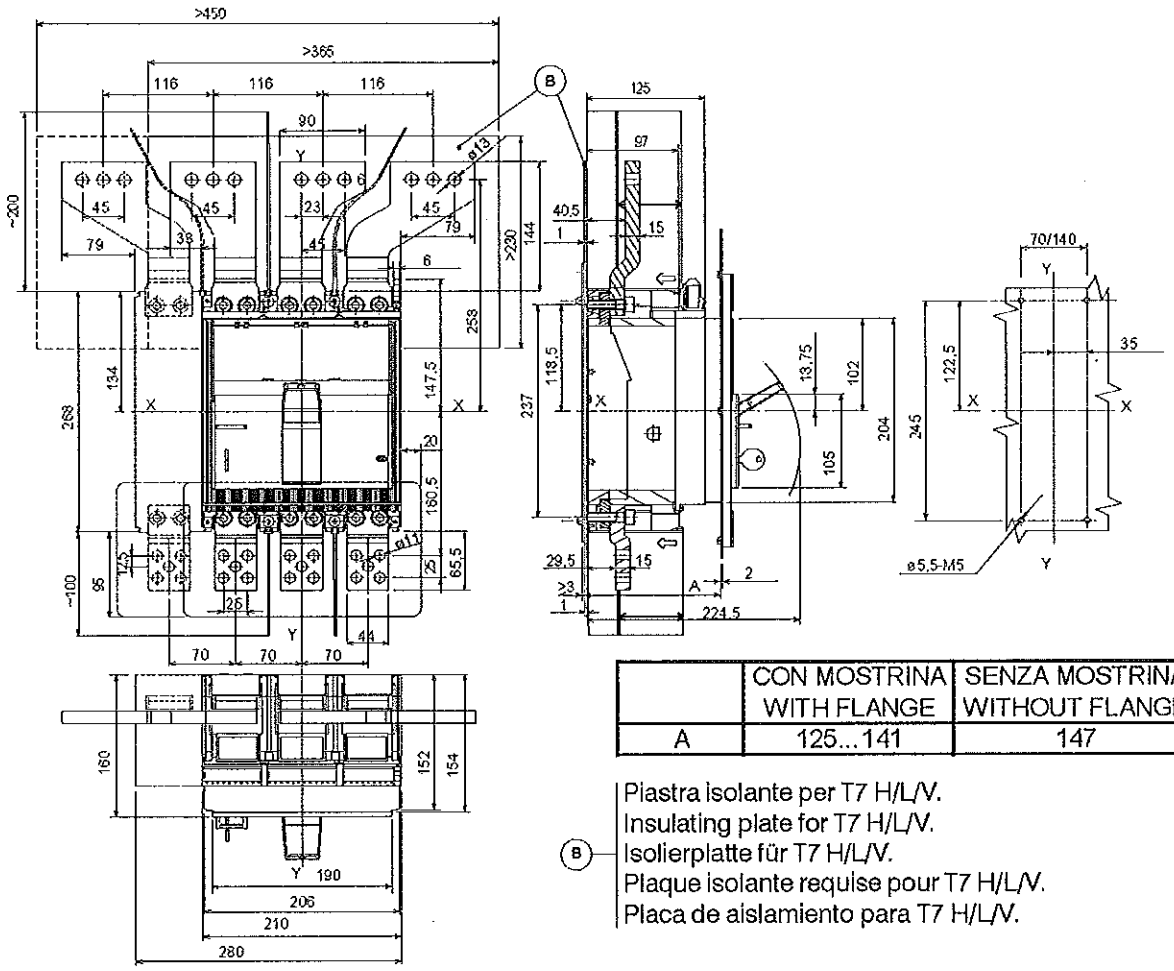
	CON MOSTRINA WITH FLANGE	SENZA MOSTRINA WITHOUT FLANGE
A	125...164	170

	STANDARD	RONIS	PROFALUX	KIRK	CASTELL
B	208	216	224	NO	NO

1206

45

F-ES/EF

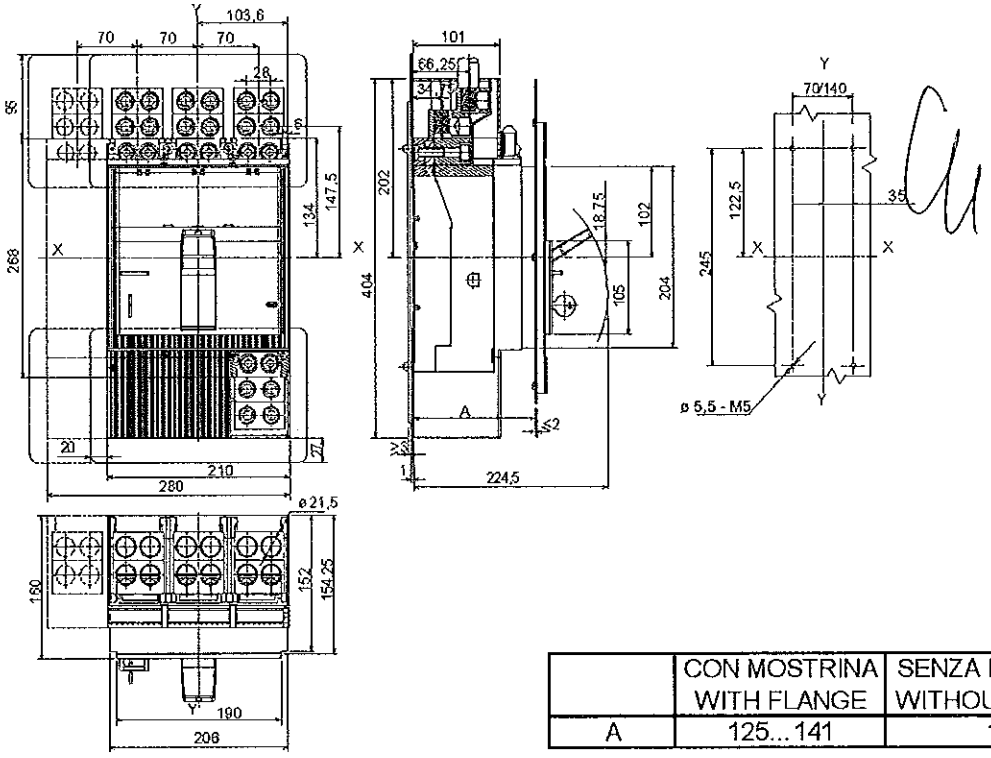


	CON MOSTRINA WITH FLANGE	SENZA MOSTRINA WITHOUT FLANGE
A	125...141	147

(B) Piastra isolante per T7 H/L/V.
Insulating plate for T7 H/L/V.
Isolierplatte für T7 H/L/V.
Plaque isolante requise pour T7 H/L/V.
Placa de aislamiento para T7 H/L/V.

46

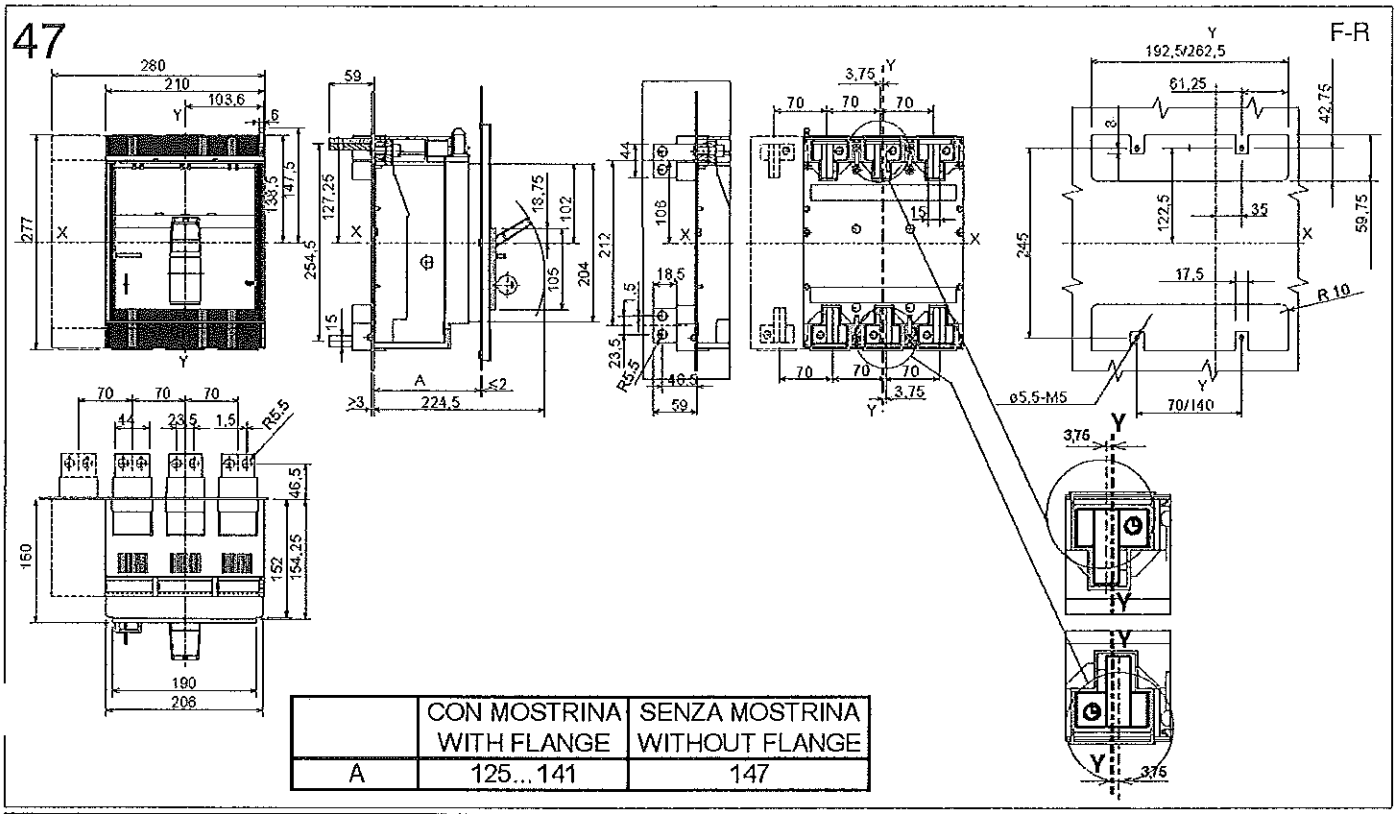
F-FcCuAl
4x240



	CON MOSTRINA WITH FLANGE	SENZA MOSTRINA WITHOUT FLANGE
A	125...141	147

47

F-R



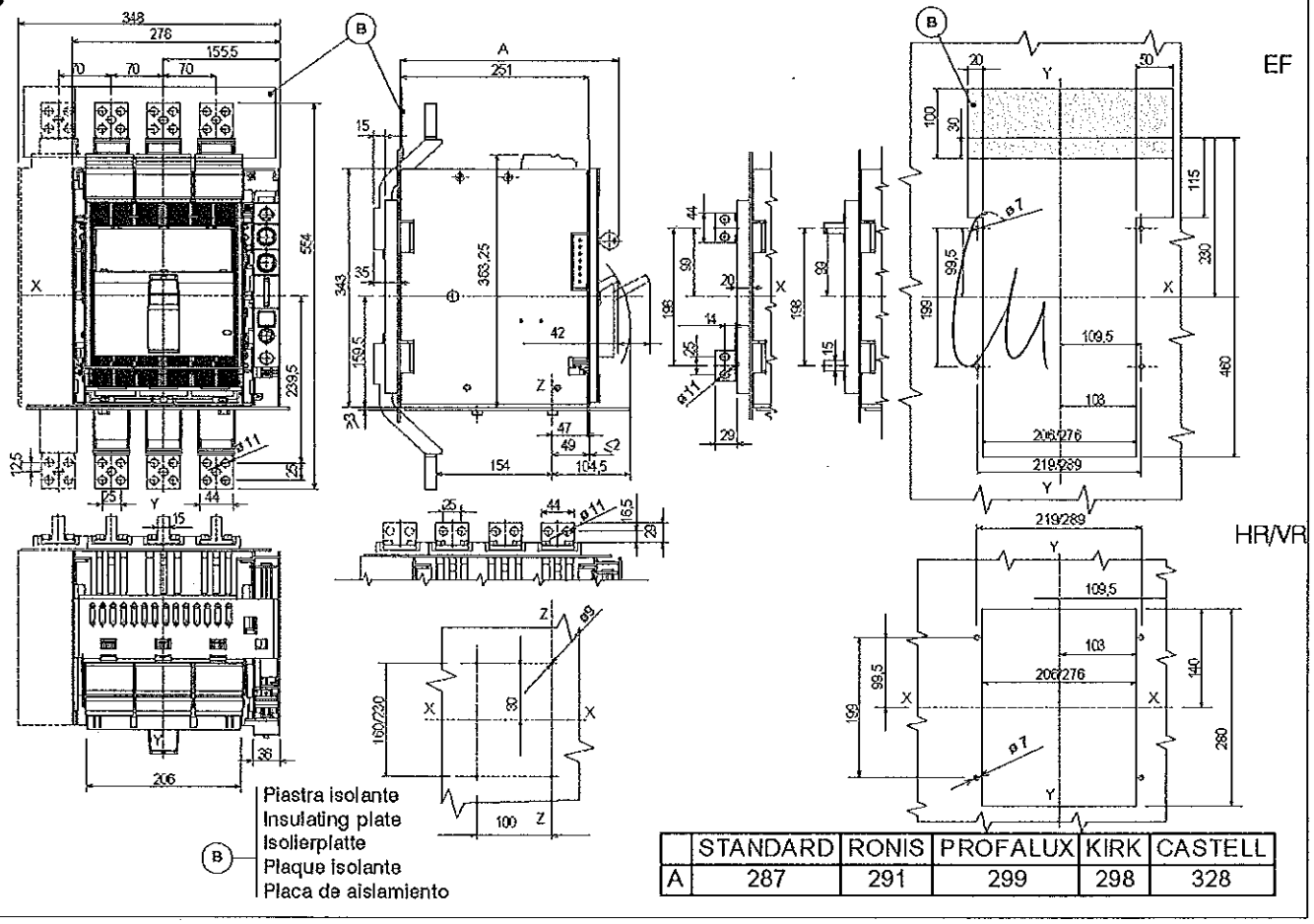
	CON MOSTRINA WITH FLANGE	SENZA MOSTRINA WITHOUT FLANGE
A	125...141	147

48

W-EF

EF

HR/VR



Piastra isolante
Insulating plate
Isolierplatte
Plaque isolante
Placa de aislamiento

	STANDARD	RONIS	PROFALUX	KIRK	CASTELL
A	287	291	299	298	328

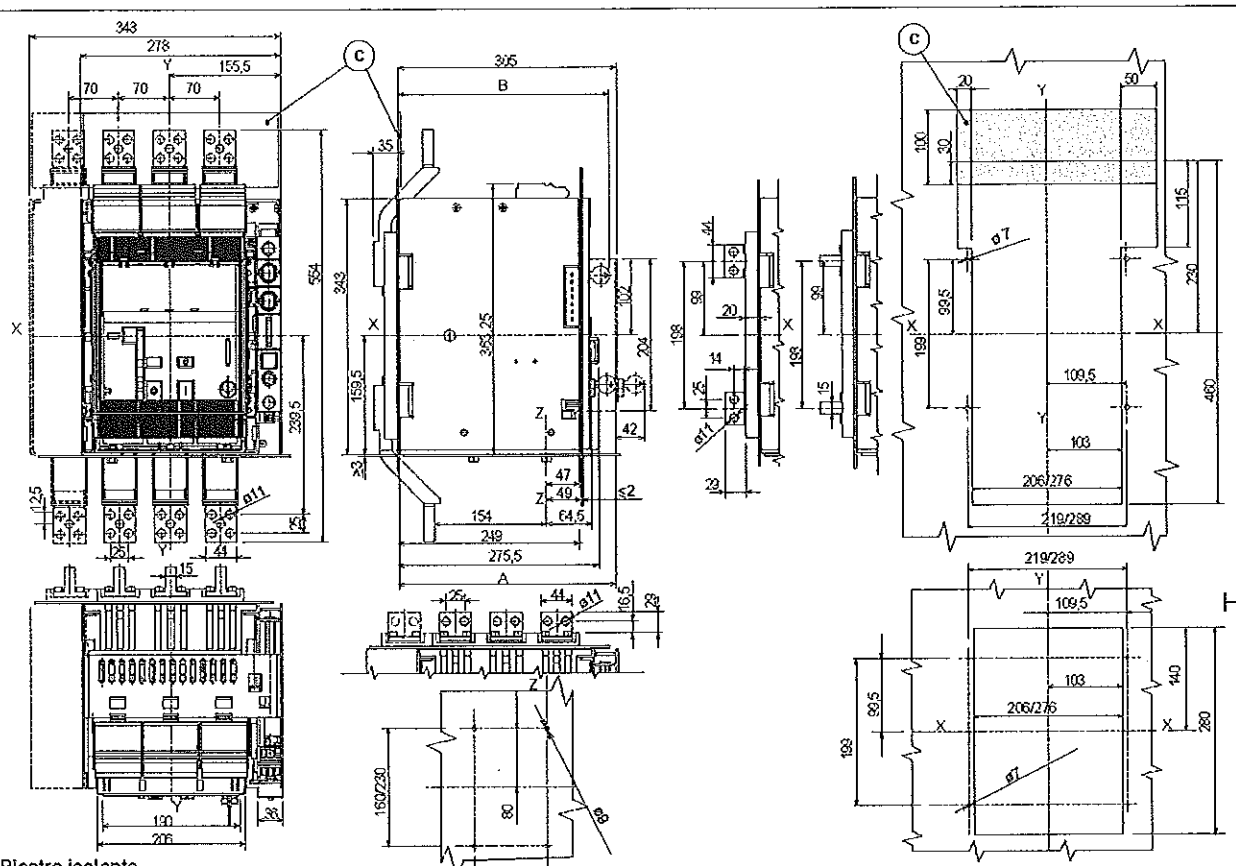
ABB

208

49

W-EF

EF



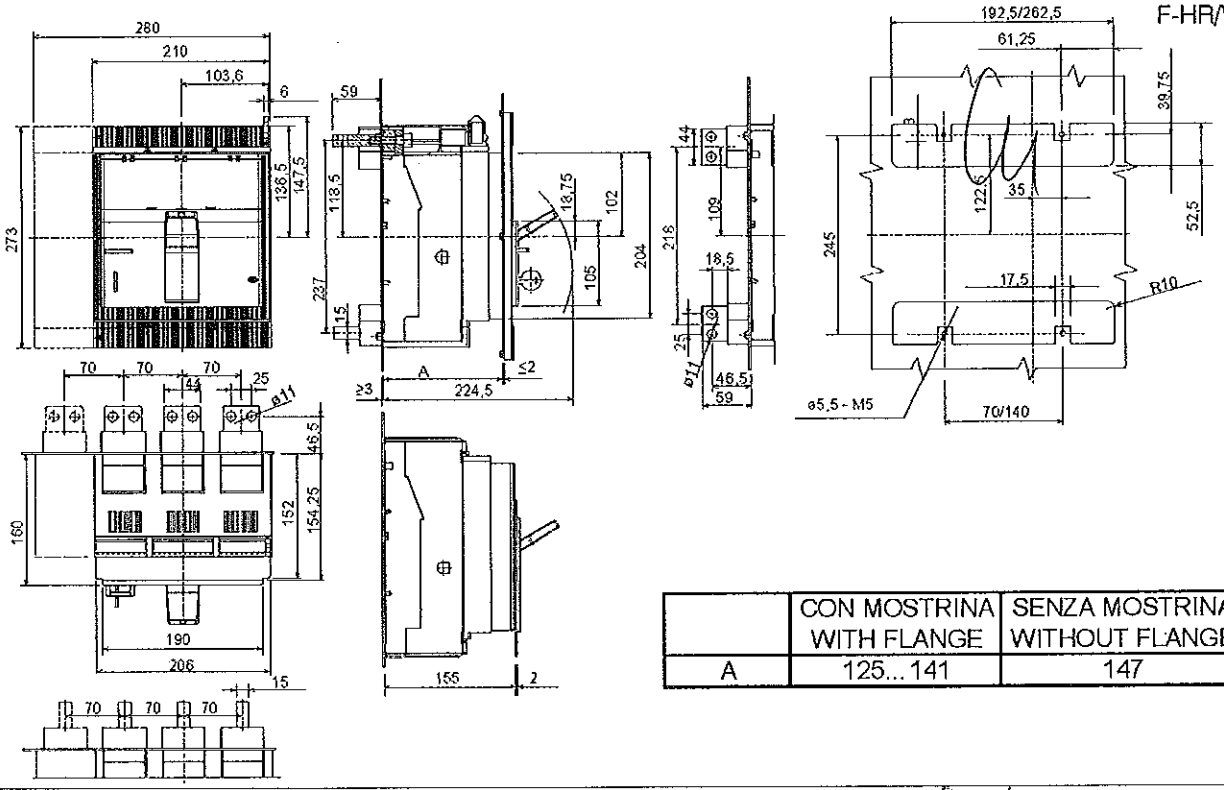
HR/VR

C — Plastra isolante / Insulating plate / Isolierplatte / Plaque isolante / Placa de aislamiento

	STANDARD	RONIS	PROFALUX	KIRK	CASTELL
A	290	298	306	NO	NO
B	307	311	319	318	348

50

F-HR/VR

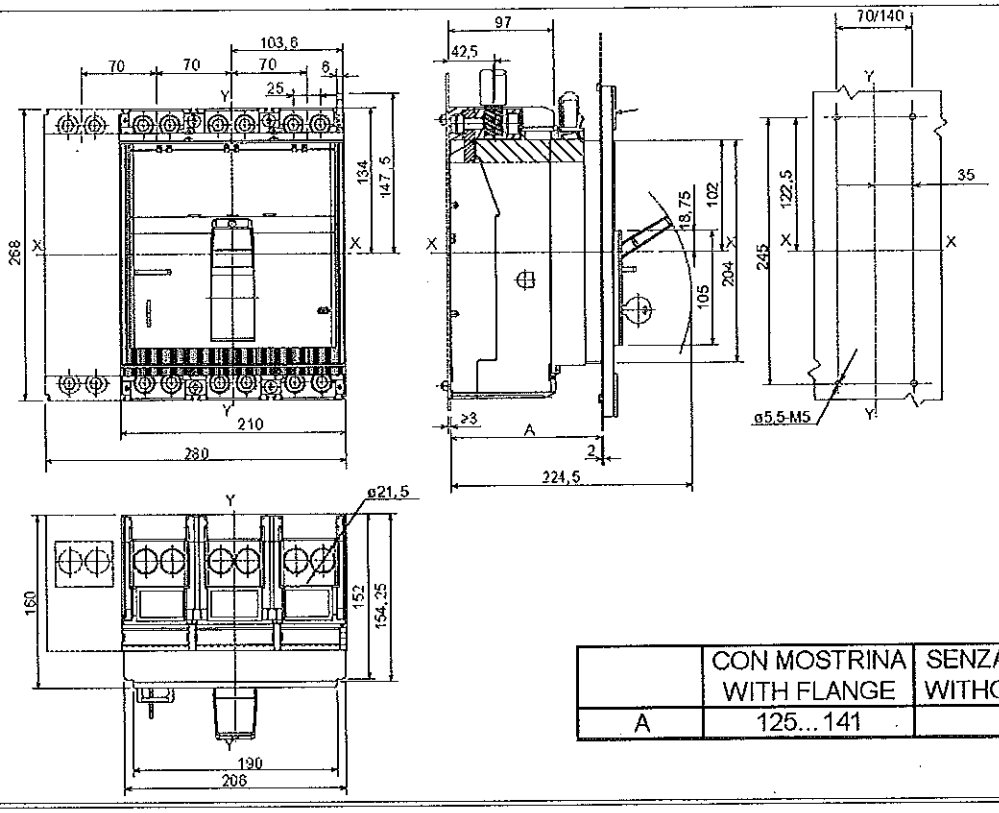


	CON MOSTRINA WITH FLANGE	SENZA MOSTRINA WITHOUT FLANGE
A	125... 141	147

ABB

51

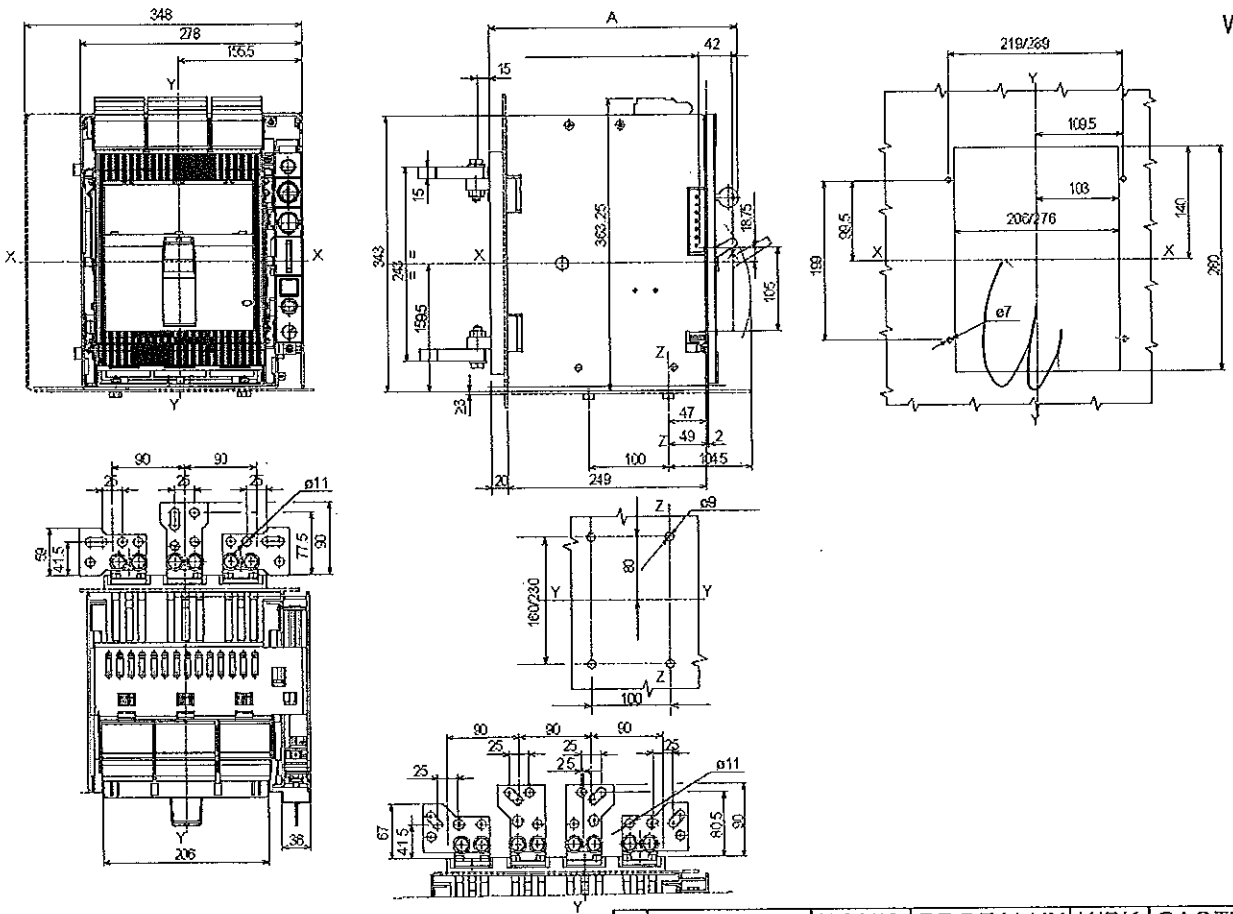
F-FCCuAl
2x240



	CON MOSTRINA WITH FLANGE	SENZA MOSTRINA WITHOUT FLANGE
A	125...141	147

52

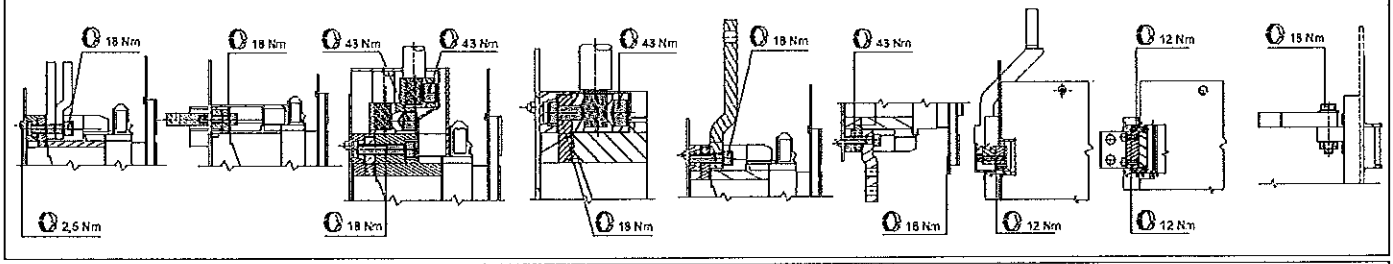
W-RS



	STANDARD	RONIS	PROFALUX	KIRK	CASTELL
A	307	311	319	318	348

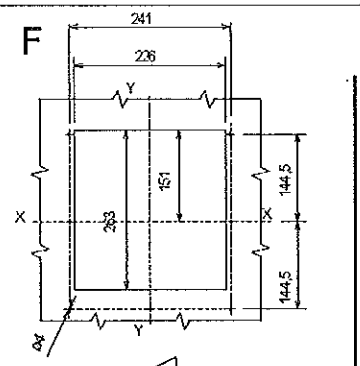
53

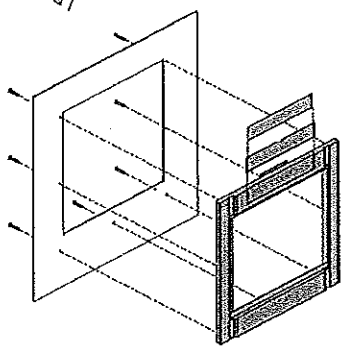
F | HR-VR | Fc Cu Al 4x240mm² | Fc Cu Al 2x240mm² | ES | EF | W-EF | W-R | W-RS



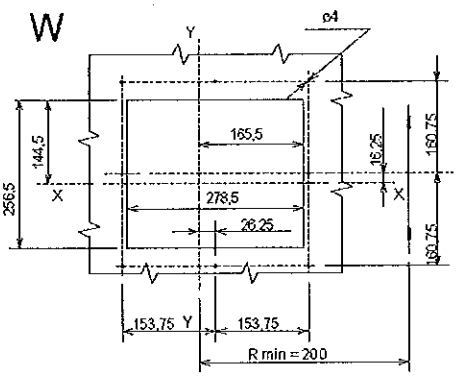
54

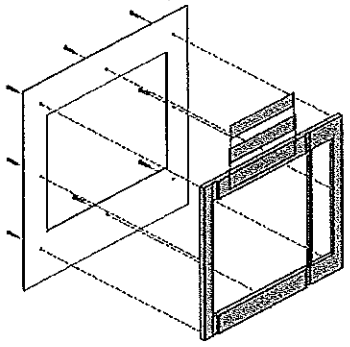
F



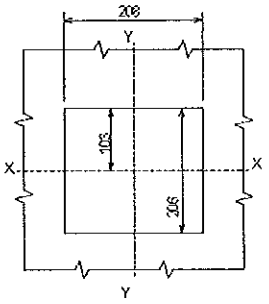


W



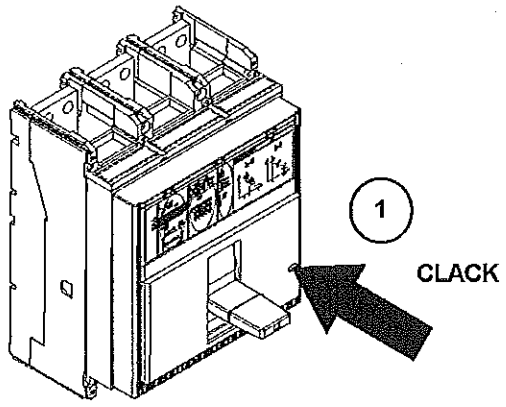


Senza mostrina
Whithout Flange



55

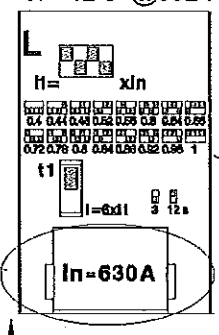
PR231/P

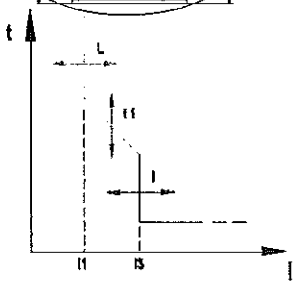


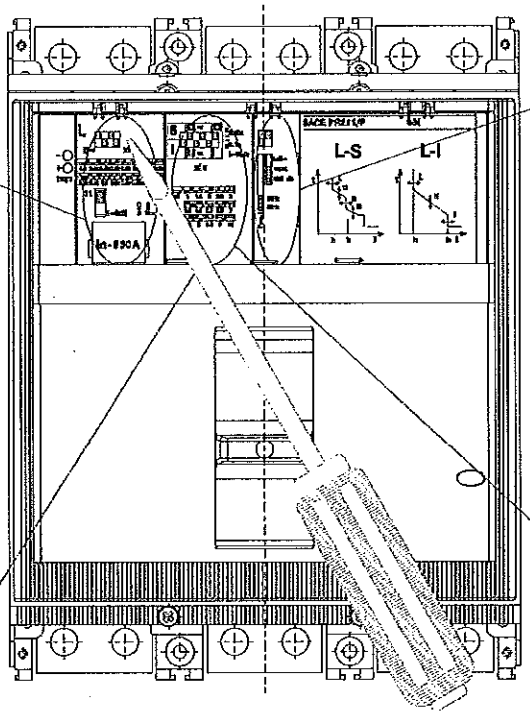
Esempio-Example-Beispiel-Exemple-Ejemplo

In = 630 A
I1 = 630 x 0,8= 504A
t1= 12 s @3024 A (6I1)

In
400A
630A
800A
1000A
1250A
1600A

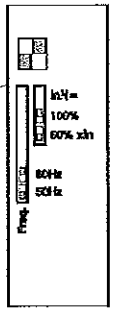


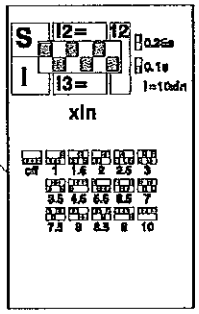


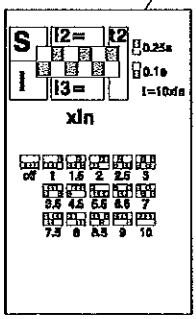


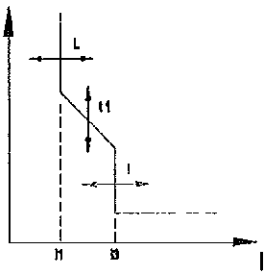
Esempio-Example-Beispiel-Exemple-Ejemplo

InN=100% In
Freq.=50Hz









In=630 A
I3 =630x 7=4410A

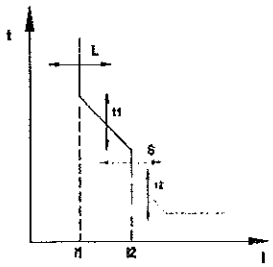
I2=OFF

Esempio-Example-Beispiel-Exemple-Ejemplo

2

In=630A
I2 =630 x 3=1890A
t2= 0,1 s @6300 A (10In)

I3=OFF

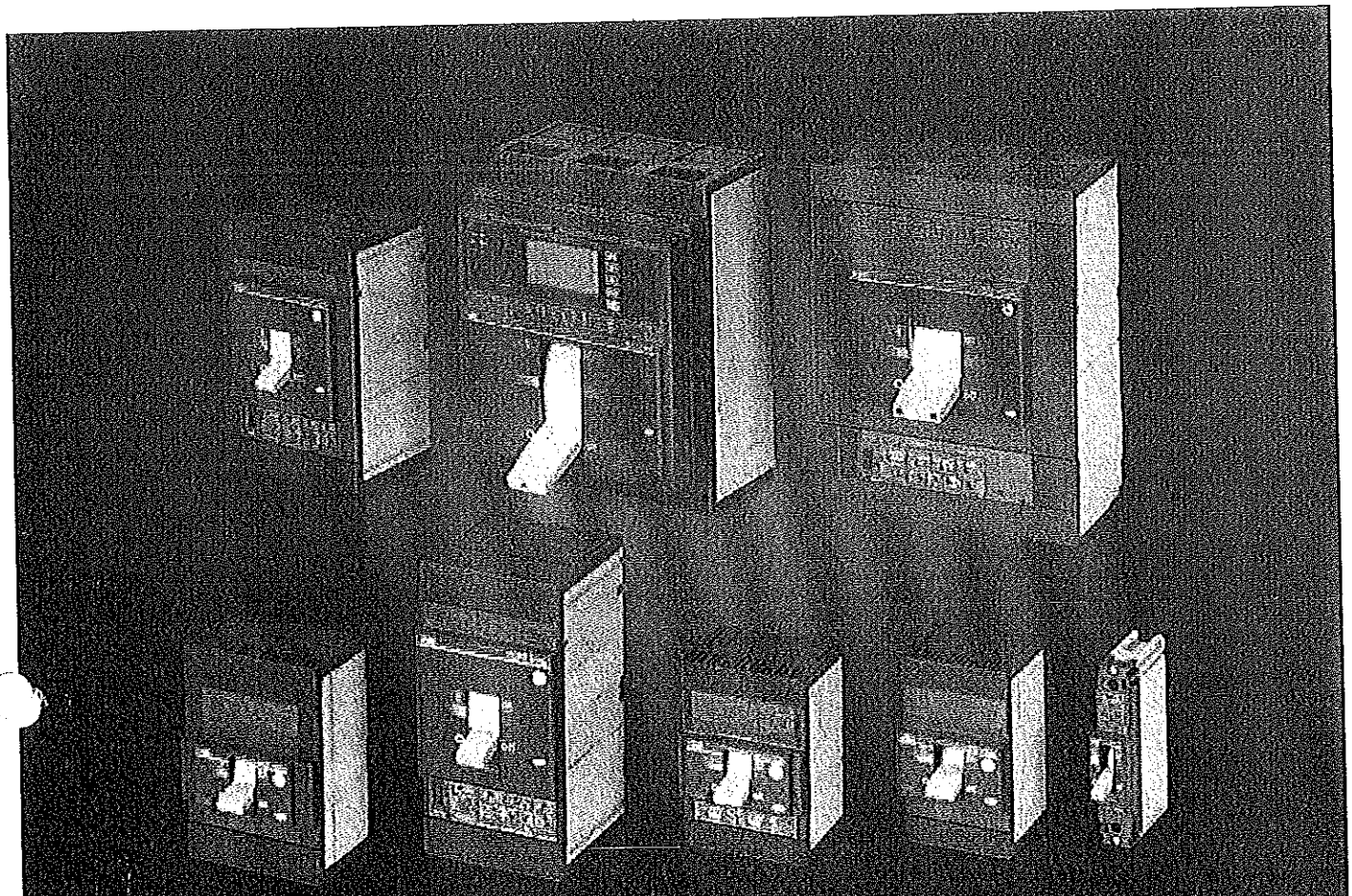


Esempio-Example-Beispiel-Exemple-Ejemplo

Prescrizioni per l'installazione	1÷5
Sequenze di manovra e ripristino per intervento sganciatore	6÷9
Sequenza di smontaggio per installazione accessori interni T7	10÷16
Sequenza di smontaggio per installazione accessori interni T7M	17÷22
Connessione ai circuiti ausiliari	23÷30
Inserzione ed estrazione degli interruttori in esecuzione estraibile	31÷42
Tabelle dimensionali	43÷54
Getting started per PR231/P	55
Installation directions	1÷5
Operating sequences and resetting due to tripping of release	6÷9
Disassembly sequence to install internal accessories T7	10÷16
Disassembly sequence to install internal accessories T7M	17÷22
Connection to auxiliary circuits	23÷30
Connection and disconnection of withdrawable-type CBs	31÷42
Dimensions table	43÷54
Getting started for PR231/P	55
Installationsvorschriften	1÷5
Schaltsequenzen und Rücksetzung wegen Auslösung des Auslösers	6÷9
Demontagesequenz für den Einbau interner Zubehöreinrichtungen T7	10÷16
Demontagesequenz für den Einbau interner Zubehöreinrichtungen T7M	17÷22
Anschluss an die Hilfsstromkreise	23÷30
Einschieben und herausfahren der Leistungsschalter in ausfahrbarer Ausführung	31÷42
Maßtabellen	43÷54
Erste Schritte für PR231/P	55
Prescriptions pour l'installation	1÷5
Séquences de manœuvre et rétablissement pour déclenchement du déclencheur	6÷9
Séquence de démontage pour installation des accessoires internes T7	10÷16
Séquence de démontage pour installation des accessoires internes T7M	17÷22
Connexion aux circuits auxiliaries	23÷30
Embrochage et débrochage des disjoncteurs en version débrochable sur chariot	31÷42
Tableaux des dimensions	43÷54
Guide de démarrage pour PR231/P	55
Disposiciones para la instalación	1÷5
Secuencias de maniobra y restablecimiento para actuación del relé	6÷9
Secuencia de desmontaje para instalación accesorios internos T7	10÷16
Secuencia de desmontaje para instalación accesorios internos T7M	17÷22
Conexionado con los circuitos auxiliares	23÷30
Inserción y extracción de los interruptores en ejecución extraíble	31÷42
Tablas dimensionales	43÷54
Getting started para PR231/P	55

ABB SACE S.p.a.
Via Baioni, 35
24123 Bergamo Italy
Tel. +39 035 395.111 - Telefax +39 035 395.306-433

http://www.abb.com



Technical catalogue | January 2013

SACE Tmax T Generation
Low voltage moulded-case circuit-breakers up to 1600 A

Power and productivity
for a better world™

ABB

Main characteristics

Overview of the Tmax family 1/2

General 1/4

Construction characteristics

Modularity of the series 1/6

Distinguishing features of the series 1/8

T2	T3	T4	T5	T6	T7
160	250	250/320	400/630	630/800/1000	800/1000/1250/1600
1.6...160	63...250	20...320	320...630	630...1000	200...1600
3/4	3/4	3/4	3/4	3/4	3/4
690	690	690	690	690	690
500	500	750	750	750	
36	36	36	36	36	
50	50	50	50	50	50
70		70	70	70	70
85		120	120	100	120
		200	200		150

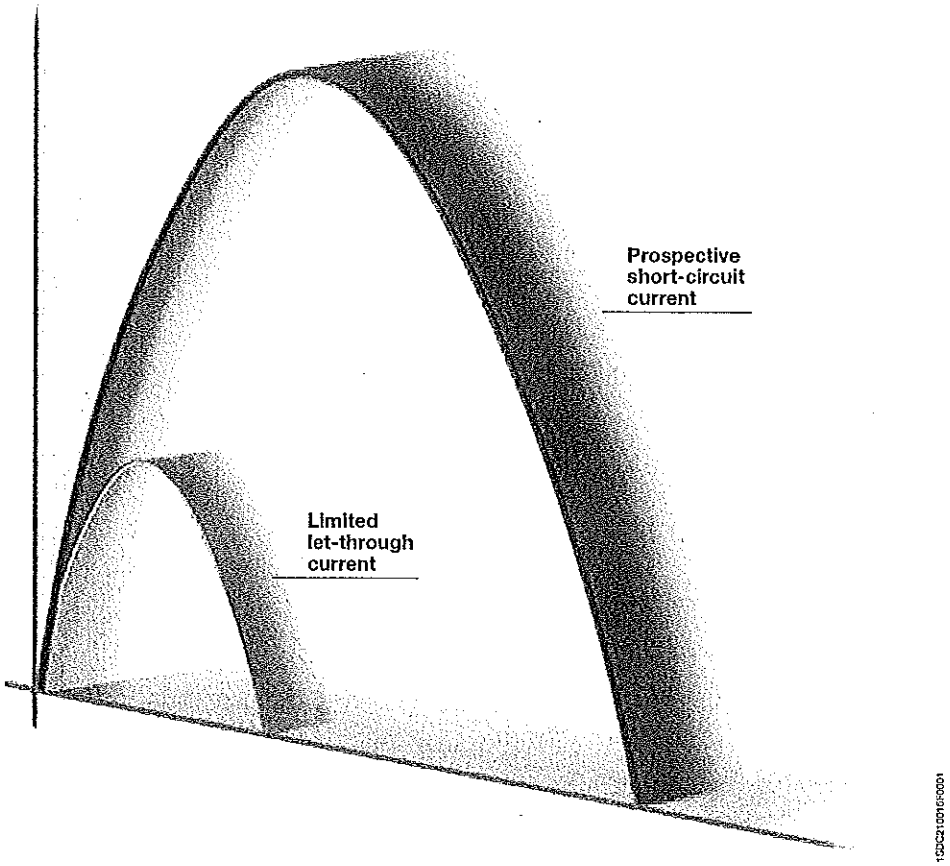
	T4	T5	T6	T7
	250/320	400/630	630/800/1000	800/1000/1250/1600
	3/4	3/4	3/4	3/4
	690/1000	690/1000	690	690
	■	■	■	
				■

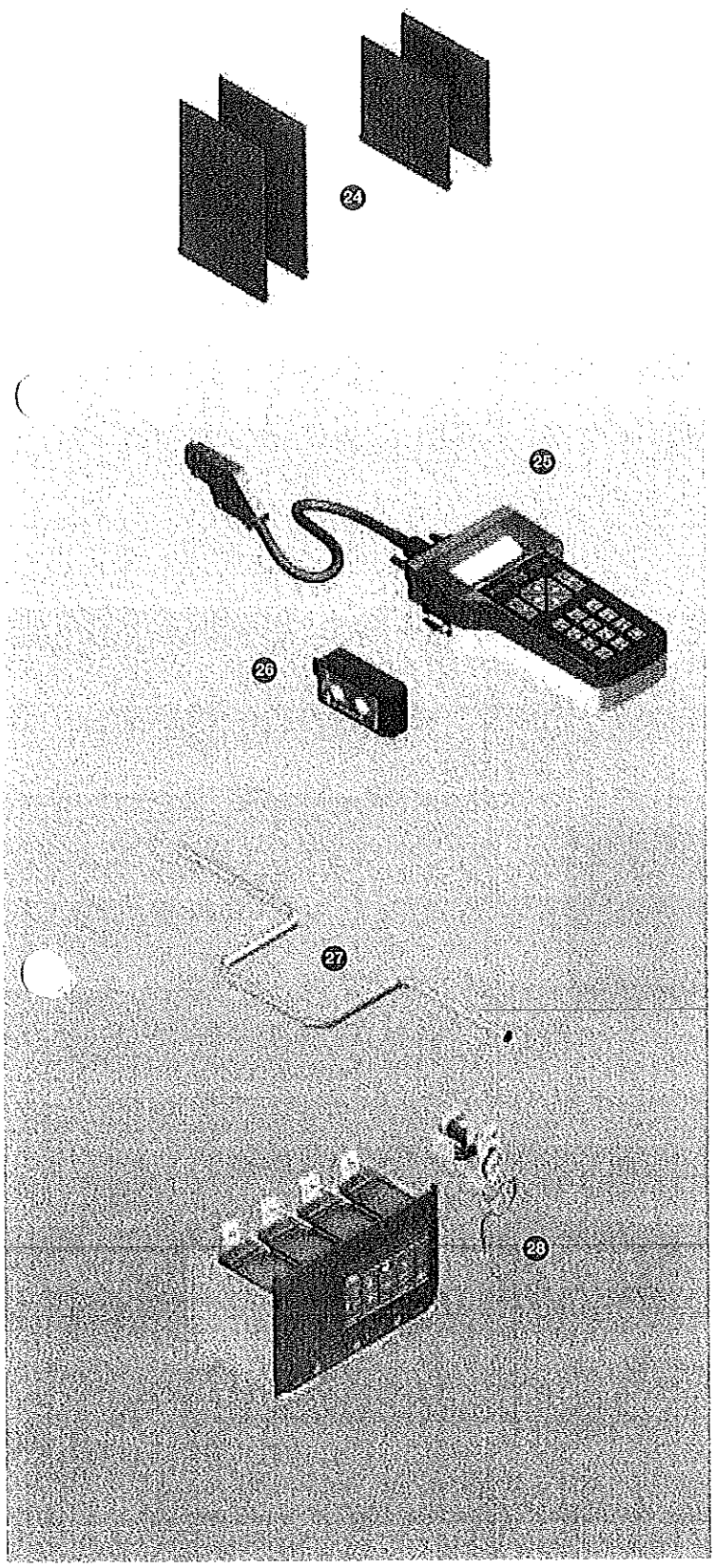
T2	T3	T4	T5	T6	T7
160	250	250/320	400/630	800	800/1000/1250
3	3	3	3	3	3
690	690	690	690	690	690
■	■	■			
■		■	■	■	
		■	■	■	
					■

	T4	T5	T6	
	250	400/630	630/800	
	3/4	3/4	3/4	
	20	20	12	
	12	12		
	40	40	40	

	T3D	T4D	T5D	T6D	T7D
	250	250/320	400/630	630/800/1000	1000/1250/1600
	200	250/320	400/630	630/800/1000	1000/1250/1600
	3/4	3/4	3/4	3/4	3/4
	690	690	690	690	690
	500	750	750	750	750
	5.3	5.3	11	30	52.2
	3.6	3.6	6	15	20

The electric arc interruption system used on the Tmax circuit-breakers allows the short-circuit currents of very high value to be interrupted extremely rapidly. The considerable opening speed of the contacts, the dynamic blasting action carried out by the magnetic field and the structure of the arcing chamber contribute to extinguishing the arc in the shortest possible time, notably limiting the value of the specific let-through energy I^2t and the current peak.





Starting from the fixed version circuit-breaker, all the other versions used for various requirements are obtained by means of mounting conversion kits.
The following are available:

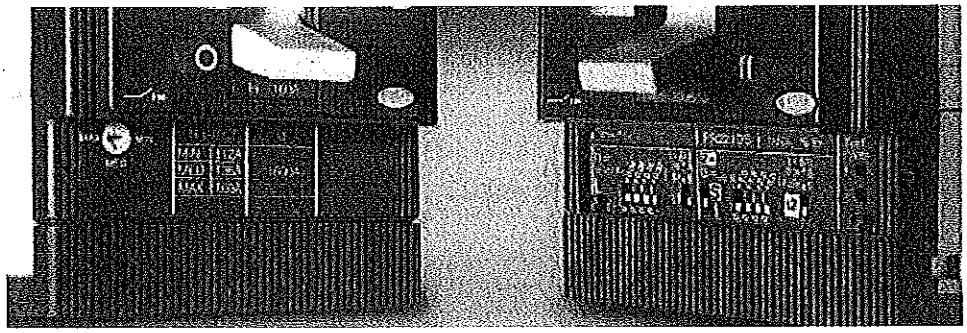
- kit for converting a fixed circuit-breaker into the moving part of a plug-in and withdrawable one
- circuit-breaker fixed parts for plug-in and withdrawable circuit-breakers
- conversion kit for the connection terminals.

Various accessories are also available:

1. Breaking unit
2. Trip units
3. Front
4. Auxiliary contacts - AUX and AUX-E
5. Undervoltage release - UVR
6. Shunt opening release - SOR and P-SOR
7. Terminal covers
8. Front for lever operating mechanism - FLD
9. Direct rotary handle - RHD
10. Stored energy motor operator - MOE
11. Key lock - KLF
12. Early auxiliary contact - AUE
13. Transmitted rotary handle - RHE
14. Front terminal for copper cable - FC Cu
15. Front extended terminal - EF
16. Multi-cable terminal (only for T4) - MC
17. Front terminal for copper-aluminium - FC CuAl
18. Front extended spread terminal - ES
19. Rear orientated terminal - R
20. Conversion kit for plug-in/withdrawable versions
21. Guide of fixed part in the withdrawable version
22. Fixed part - FP
23. Auxiliary position contact - AUP
24. Phase separators
25. PR010T
26. TT1
27. Racking out crank handle
28. Residual current release.

Operating temperature

The Tmax circuit-breakers can be used in ambient conditions where the surrounding air temperature varies between -25 °C and +70 °C, and stored in ambients with temperatures between -40 °C and +70 °C.
The circuit-breakers fitted with thermomagnetic trip units have their thermal element set for a reference temperature of +40 °C. For temperatures other than +40 °C, with the same setting, there is a thermal trip threshold variation as shown in the table on page 4/50 and following.
The electronic trip units do not undergo any variations in performance as the temperature varies but, in the case of temperatures exceeding +40 °C, the maximum setting for protection against overloads L must be reduced, as indicated in the derating graph on page 4/37 and following, to take into account the heating phenomena which occur in the copper parts of the circuit-breaker passed through by the phase current.
For temperatures above +70 °C the circuit-breaker performances are not guaranteed.
To ensure service continuity of the installations, the way to keep the temperature within acceptable levels for operation of the various devices and not only of the circuit-breakers must be carefully assessed, such as using forced ventilation in the switchboards and in their installation room.

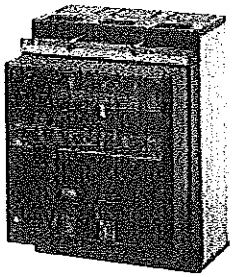


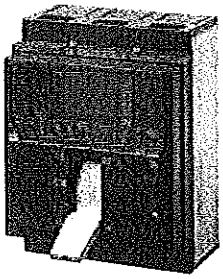
1SDC210A01P0001

Altitude

Up to an altitude of 2000 m the Tmax circuit-breakers do not undergo any alterations in their rated performances. As the altitude increases, the atmospheric properties are altered in terms of composition, dielectric resistance, cooling capacity and pressure. Therefore the circuit-breaker performances undergo derating, which can basically be measured by means of the variation in significant parameters such as the maximum rated operating voltage and the rated uninterrupted current.

Altitude	[m]	2000	2600	3000	3900	4000	5000
Derating on service voltage, Ue	[%]	100	93	88	79	78	68
Derating on uninterrupted current	[%]	100	99	98	94	93	90





Versions and types

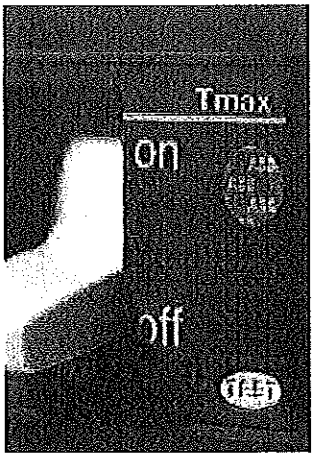
All the Tmax circuit breakers are available in fixed versions, T2, T3, T4 and T5 in the plug-in version and T4, T5, T6[1] and T7 also in the withdrawable one.
All the circuit breakers can be manually operated, by the operating lever or the rotary handle (direct or transmitted), and electrically operated. For this issue different solutions are available:

- The solenoid operator for T1, T2 and T3
- The stored energy motor operator for T4, T5 and T6
- T7 with the stored energy operating mechanism, gear motor for the automatic charging of the closing springs and shunt opening and closing releases.

Installation

Tmax circuit-breakers can be installed in the switchboards, mounted in any horizontal, vertical or lying down position on the back plate or on rails, without undergoing any derating of their rated characteristics. Tmax circuit-breakers can be installed easily in all types of switchboards, above all thanks to the possibility of being supplied either by top or bottom terminals, without jeopardizing the apparatus functionality[2].
Apart from fixing on the base plate, T1, T2 and T3 can also be installed on DIN 50022 rails, thanks to the special fixing brackets.
Furthermore, the depth of 70 mm takes Tmax T3 to the same standard as the two smaller sizes, making assembly of circuit-breakers up to 250 A in standard switchboards even simpler. In fact, it is possible to prepare standardised support structures, facilitating the design stage and construction of the switchboard metalwork.

[1] Not available on the 1000 A version.
[2] For uses at a voltage of 1000 V, T4V250 and T5V400 in the fixed version, and T4L250 and T5L400 in the plug-in version must be supplied from above.



1SDC210043F0001

Compliance with Standards and company quality system

Tmax circuit-breakers and their accessories comply with the international IEC 60947-2 Standards and the EC directive:

- "Low Voltage Directives" (LVD) no. 2006/95/CE (replaces 72/23/EEC and subsequent amendments)
- Electromagnetic Compatibility Directive (EMC) no. 89/336 EEC.

Certification of compliance with the product Standards mentioned above is carried out, in accordance with the European EN 45011 Standard, by the Italian certification organisation ACAE (Association for Certification of Electrical Apparatus), member of the European organization LOVAG (Low Voltage Agreement Group) and by the Swedish certification organization SEMKO.

The Test Room at ABB SACE is accredited by SINAL (certificate No. 062). The Tmax series also has a range which has undergone certification according to the severe American UL 489 and CSA C22.2 Standards. Furthermore, the Tmax series is certified by the Russian GOST (Russia Certificate of Conformity) certification organisation. The pieces of apparatus comply with the prescriptions for on-board shipping installations and are approved by the major Naval Registers - Lloyd's Register of Shipping, Germanischer Lloyd, Bureau Veritas, Rina, Det Norske Veritas, Russian Maritime Register of Shipping, and ABS (please ask ABB SACE for confirmation about the versions available).

ABB SACE's Quality System complies with the international ISO 9001-2000 Standard (model for quality assurance in design, development, construction, installation and service assistance) and with the equivalent European EN ISO 9001 and Italian UNI EN ISO 9001 Standards.

The third certifying Organisation is RINA-QUACER. ABB SACE received the first certification in 1990 with three-year validity and this has now reached its fifth confirmation. The ABB SACE quality system complies also with IRIS International Railway Industry Standard.

The new Tmax series has a hologram on the front, obtained using special anti-imitation techniques - a guarantee of the quality and genuineness of the circuit-breaker as an ABB SACE product. Attention to protection of the environment is another priority commitment for ABB SACE, and, as confirmation of this, the environmental management system has been certified by RINA. ABB SACE - the first industry in the electromechanical sector in Italy to obtain this recognition - thanks to a revision of the production process with an eye to ecology - has been able to reduce the consumption of raw materials and waste from processing by 20%. ABB SACE's commitment to safeguarding the environment is also shown in a concrete way by Life Cycle Assessments (LCA) of the products, carried out directly by ABB SACE's Research and Development in collaboration with the ABB Research Centre. Selection of materials, processes and packing materials is made optimising the true environmental impact of the product, also foreseeing the possibility of its being recycled.

Furthermore, in 1997 ABB SACE developed its Environmental Management system and got it certified in conformity with the international ISO14001 Standard, integrating it in 1999 with the Management System for Health and Safety in the workplace according to OHSAS 18001 (Swedish National Testing and Research Institute).

ISO 14001, 18001 and SA8000 recognitions together with ISO 9001 made it possible to obtain RINA, BEST FOUR CERTIFICATION.

Circuit-breakers for power distribution
Electrical characteristics

			Tmax T1 1P	Tmax T1			Tmax T2			
Rated uninterrupted current		[A]	160	160			160			
Poles		[No.]	1	3/4			3/4			
Rated service voltage, **Ue**	(AC) 50-60 Hz	[V]	240	690			690			
	(DC)	[V]	125	500			500			
Rated impulse withstand voltage, **Uimp**		[kV]	8	8			8			
Rated insulation voltage, **Ui**		[V]	500	800			800			
Test voltage at industrial frequency for 1 min.		[V]	3000	3000			3000			
Rated ultimate short-circuit breaking capacity, **Icu**			**B**	**B**	**C**	**N**	**N**	**S**	**H**	**L**
	(AC) 50-60 Hz 220/230 V	[kA]	25*	25	40	50	65	85	100	120
	(AC) 50-60 Hz 380/400/415 V	[kA]	–	16	25	36	36	50	70	85
	(AC) 50-60 Hz 440 V	[kA]	–	10	15	22	30	45	55	75
	(AC) 50-60 Hz 500 V	[kA]	–	8	10	15	25	30	36	50
	(AC) 50-60 Hz 690 V	[kA]	–	3	4	6	6	7	8	10
	(DC) 250 V - 2 poles in series	[kA]	25 (at 125 V)	16	25	36	36	50	70	85
	(DC) 250 V - 3 poles in series	[kA]	–	20	30	40	40	55	85	100
	(DC) 500 V - 2 poles in series	[kA]	–	–	–	–	–	–	–	–
	(DC) 500 V - 3 poles in series	[kA]	–	16	25	36	36	50	70	85
	(DC) 750 V - 3 poles in series	[kA]	–	–	–	–	–	–	–	–
Rated service short-circuit breaking capacity, **Ics**										
	(AC) 50-60 Hz 220/230 V	[%Icu]	75%	100%	75%	75%	100%	100%	100%	100%
	(AC) 50-60 Hz 380/400/415 V	[%Icu]	–	100%	100%	75%	100%	100%	100%	75% (70 kA)
	(AC) 50-60 Hz 440 V	[%Icu]	–	100%	75%	50%	100%	100%	100%	75%
	(AC) 50-60 Hz 500 V	[%Icu]	–	100%	75%	50%	100%	100%	100%	75%
	(AC) 50-60 Hz 690 V	[%Icu]	–	100%	75%	50%	100%	100%	100%	75%
Rated short-circuit making capacity, **Icm**										
	(AC) 50-60 Hz 220/230 V	[kA]	52.5	52.5	84	105	143	187	220	264
	(AC) 50-60 Hz 380/400/415 V	[kA]	–	32	52.5	75.6	75.6	105	154	187
	(AC) 50-60 Hz 440 V	[kA]	–	17	30	46.2	63	94.5	121	165
	(AC) 50-60 Hz 500 V	[kA]	–	13.6	17	30	52.5	63	75.6	105
	(AC) 50-60 Hz 690 V	[kA]	–	4.3	5.9	9.2	9.2	11.9	13.6	17
Opening time (415 V)		[ms]	7	7	6	5	3	3	3	3
Utilisation category (IEC 60947-2)			A	A			A			
Reference Standard			IEC 60947-2	IEC 60947-2			IEC 60947-2			
Isolation behaviour			■	■			■			
Trip units:	thermomagnetic									
	T fixed, M fixed	TMF	■	–			–			
	T adjustable, M fixed	TMD	–	■			■			
	T adjustable, M adjustable (5...10 x In)	TMA	–	–			–			
	T adjustable, M fixed (3 x In)	TMG	–	–			■ ■			
	T adjustable, M adjustable (2.5...5 x In)	TMG	–	–			–			
	magnetic only	MA	–	–			■ (MF up to In 12.5 A)			
	electronic	PR221DS	–	–			■			
		PR221GP/PR221MP	–	–			■			
		PR222DS	–	–			–			
		PR223DS	–	–			–			
		PR231/P	–	–			–			
		PR232/P	–	–			–			
		PR331/P	–	–			–			
		PR332/P	–	–			–			
Interchangeability			–	–						
Versions			F	F			F-P			
Terminals	fixed		FC Cu	FC Cu-EF-FC CuAl-HR			F-FC Cu-FC CuAl-EF-ES-R			
	plug-in		–	–			F-FC Cu-FC CuAl-EF-ES-R			
	withdrawable		–	–			–			
Fixing on DIN rail			–	DIN EN 50022			DIN EN 50022			
Mechanical life		[No. operations]	25000	25000			25000			
		[No. Hourly operations]	240	240			240			
Electrical life @ 415 V AC		[No. operations]	8000	8000			8000			
		[No. Hourly operations]	120	120			120			
Basic dimensions - fixed version		3 poles W [mm]	25.4 (1 pole)	76			90			
		4 poles W [mm]	–	102			120			
		D [mm]	70	70			70			
		H [mm]	130	130			130			
Weight	fixed	3/4 poles [kg]	0.4 (1 pole)	0.9/1.2			1.1/1.5			
	plug-in	3/4 poles [kg]	–	–			1.5/1.9			
	withdrawable	3/4 poles [kg]	–	–			–			

TERMINAL CAPTION
F = Front
EF = Front extended
ES = Front extended spread

FC Cu = Front for copper cables
FC CuAl = Front for copper-aluminium cables
R = Rear orientated
HR = Rear flat horizontal

VR = Rear flat vertical
HR/VR = Rear flat orientated
MC = Multicable
F = fixed circuit-breakers

P = plug-in circuit-breakers
W = withdrawable circuit-breakers
[B] The breaking capacity for settings In = 16 A and In = 20 A is 16 kA

Circuit-breakers for power distribution
General characteristics

The series of Tmax moulded-case circuit-breakers - complying with the IEC 60947-2 Standard - is divided into seven basic sizes, with an application range from 1 A to 1600 A and breaking capacities from 16 kA to 200 kA (at 380/415 V AC). For protection of alternating current networks, the following are available:

- T1B 1p circuit-breaker, equipped with TMF thermomagnetic trip units with fixed thermal and magnetic threshold (I_3 = 10 x In);
- T1, T2, T3 and T4 (up to 50 A) circuit-breakers equipped with TMD thermomagnetic trip units with adjustable thermal threshold (I_1 = 0.7...1 x In) and fixed magnetic threshold (I_3 = 10 x In);
- T2, T3 and T5 circuit-breakers, fitted with TMG trip units for long cables and generator protection with adjustable thermal threshold (I_1 = 0.7...1 x In) and fixed magnetic threshold (I_3 = 3 x In) for T2 and T3 and adjustable magnetic threshold (I_3 = 2.5...5 x In) for T5;
- T4, T5 and T6 circuit-breakers with TMA thermomagnetic trip units with adjustable thermal threshold (I_1 = 0.7...1 x In) and adjustable magnetic threshold (I_3 = 5...10 x In);
- T2 with PR221DS electronic trip unit;
- T4, T5 and T6 with PR221DS, PR222DS/P, PR222DS/PD and PR223DS electronic trip units;
- the T7 circuit-breaker, which completes the Tmax family up to 1600 A, fitted with PR231/P, PR232/P, PR331/P and PR332/P electronic trip units. The T7 circuit-breaker is available in the two versions: with manual operating mechanism or motorizable with stored energy operating mechanism[1].

The field of application in alternating current of the Tmax series varies from 1 A to 1600 A with voltages up to 690 V. The Tmax T1, T2, T3, T4, T5 and T6 circuit-breakers equipped with TMF, TMD and TMA thermomagnetic trip units can also be used in direct current plants, with a range of application from 1 A to 800 A and a minimum operating voltage of 24 V DC, according to the appropriate connection diagrams.
The three-pole T2, T3 and T4 circuit-breakers can also be fitted with MF and MA adjustable magnetic only trip units, both for applications in alternating current and in direct current, in particular for motor protection (see page 2/40 and following).
For all the circuit-breakers in the series, fitted with thermomagnetic and electronic trip units, the single-phase trip current is defined (see page 4/57).

[1] For motorisation, the T7 circuit-breaker with stored energy operating mechanism must be ordered, complete with geared motor for automatic spring charging, opening coil and closing coil.

Interchangeability

The Tmax T4, T5 and T6 circuit-breakers can be equipped either with TMF, TMD, TMG or TMA thermomagnetic trip units, MA magnetic only trip units or PR221DS, PR222DS/P, PR222DS/PD, PR222MP and PR223DS electronic trip units. Similarly, Tmax T7 can also mount the latest generation PR231/P, PR232/P, PR331/P[1] and PR332/P[1] electronic trip units.
Thanks to their simplicity of assembly, the end customer can change the type of trip unit extremely rapidly, according to their own requirements and needs: in this case, correct assembly is the customer's responsibility. Above all, this means into increased flexibility of use of the circuit-breakers with considerable savings in terms of costs thanks to better rationalisation of stock management.

Trip units

Circuit-breakers	TMD			TMA						TMG			MA							
In [A]	20	32	50	80	100	125	160	200	250	320	400	500	630	800	320	400	500	10	25	52	80	100	125	160	200
T4 250	■	■	■	■	■	■	■	■	■									■	■	■	■	■	■	■	■
T4 320	▲	▲	▲	▲	▲	▲	▲	▲	▲									▲	▲	▲	▲	▲	▲	▲	▲
T5 400										■	■				▲	▲									
T5 630										▲	▲	■			▲	▲	▲								
T6 630													■												
T6 800														■											
T6 1000																									
T7 800																									
T7 1000																									
T7 1250																									
T7 1600																									

■ = Complete circuit-breaker already coded
▲ = Circuit-breaker to be assembled

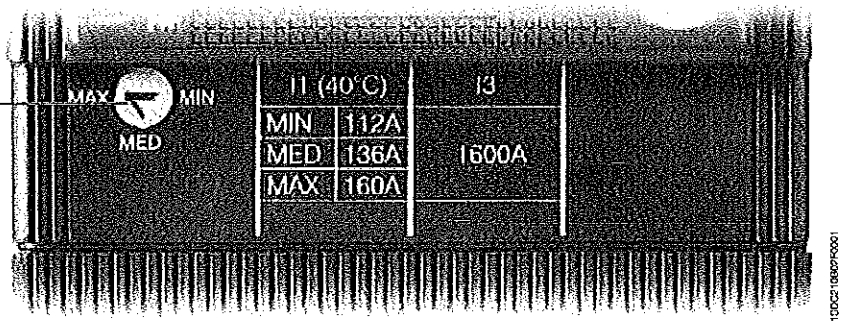
[1] If ordered loose PR331/P and PR332/P must be completed with the "trip unit adapters" (see page 3/48)

Circuit-breakers for power distribution
Thermomagnetic trip units

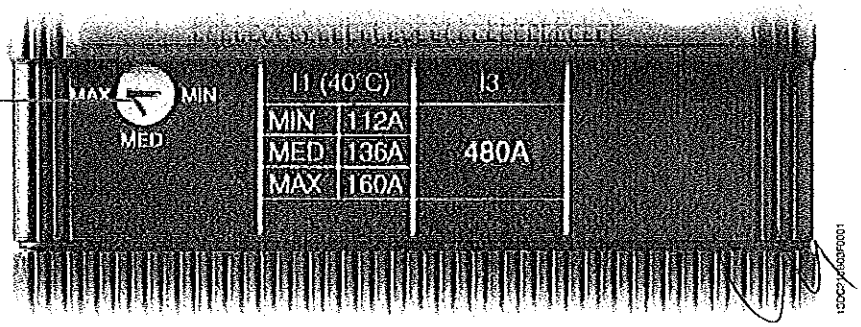
The Tmax T1 1p, T1, T2, T3, T4, T5 and T6 circuit-breakers can be fitted with thermomagnetic trip units and are used in protection of alternating and direct current networks with a range of use from 1.6 A to 800 A. They allow the protection against overload with a thermal device (with fixed threshold for T1 1p and adjustable threshold for T1, T2, T3, T4, T5 and T6) realised using the bimetal technique, and protection against short-circuit with a magnetic device (with fixed threshold for T1, T2 and T3 and T4 up to 50 A and adjustable threshold for T4, T5 and T6).
The four-pole circuit-breakers are always supplied with the neutral protected by the trip unit and with protection of the neutral at 100% of the phase setting for settings up to 100 A.
For higher settings, the protection of the neutral is at 50% of the phase setting unless the protection of the neutral at 100% of the phase setting is required.
Furthermore, for Tmax T2, T3 and T5, the TMG thermomagnetic trip units with low magnetic trip threshold are available. For T2 and T3 the trip unit has adjustable thermal threshold (I_1 = 0.7...1 x In) and fixed magnetic threshold (I_3 = 3 x In), whereas for T5 the trip unit has adjustable thermal threshold (I_1 = 0.7...1 x In) and adjustable magnetic threshold (I_3 = 2.5...5 x In). The thermomagnetic trip units can be used to protect long cables and for generator protection, both in direct current and in alternating current.

Thermomagnetic trip units TMD e TMG (for T1, T2 and T3)

Thermal threshold
Adjustable from 0.7 to 1 x In



Thermal threshold
Adjustable from 0.7 to 1 x In

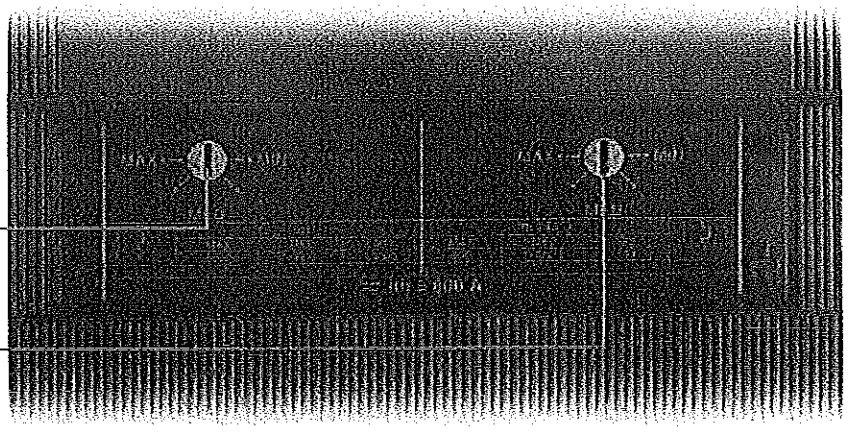


TMD = thermomagnetic trip unit with adjustable thermal threshold (I_1 = 0.7...1 x In) and fixed magnetic threshold (I_3 = 10 x In).
TMG = thermomagnetic trip unit with adjustable thermal threshold (I_1 = 0.7...1 x In) and fixed magnetic threshold (I_3 = 3 x In).

Circuit-breakers for power distribution
Thermomagnetic trip units

Thermomagnetic trip units TMD/TMA and TMG (for T4, T5 and T6)

2



TMA = thermomagnetic trip unit with adjustable thermal threshold (I_1 = 0.7...1 x In) and adjustable magnetic threshold (I_3 = 5...10 x In)
TMG (for T5) = thermomagnetic trip unit with adjustable thermal threshold (I_1 = 0.7...1 x In) and adjustable magnetic threshold (I_3 = 2.5...5 x In)

Circuit-breakers for power distribution
Electronic trip units

The Tmax T2, T4, T5, T6 and T7 circuit-breakers, for use in alternating current, can be equipped with overcurrent releases constructed using electronic technology. This allows protection functions to be obtained which guarantee high reliability, tripping precision and insensitivity to temperature and to the electromagnetic components in conformity with the standards on the matter.
The power supply needed for correct operation is supplied directly by the current sensors of the release, and tripping is always guaranteed, even under single-phase load conditions and in correspondence with the minimum setting.

Characteristics of the Tmax electronic trip units

Operating temperature	-25 °C ... +70 °C
Relative humidity	98%
Self-supply	0.2 x In (single phase)
Auxiliary power supply (where applicable)	24 V DC
Operating frequency	45...66 Hz
Electromagnetic compatibility (LF and HF)	IEC 60947-2 Annex F

For Tmax T2, T4, T5 and T6 the protection trip unit consists of:
- 3 or 4 current sensors (current transformers)
- external current sensors (e.g. for the external neutral), when available
- a trip unit
- a trip coil (for T2 housed in the right slot, for T4, T5 and T6 integrated in the electronic trip unit).

For Tmax T7 the protection trip unit consists of:
- 3 or 4 current sensors (Rogowski coils and current transformers)
- external current sensors (e.g. for the external neutral)
- interchangeable rating plug
- a trip unit
- a trip coil housed in the body of the circuit-breaker.

Rating plugs

Circuit-breaker	CS Rated current	In [A] 400	630	800	1000	1250	1600
T7	800	■	■	■			
	1000	■	■	■	■		
	1250	■	■	■	■	■	
	1600	■	■	■	■	■	■

The current sensors supply the electronic trip unit with the energy needed for correct operation of the trip unit and the signal needed to detect the current.
The current sensors are available with rated primary current as shown in the table.

Circuit-breakers for power distribution
Electronic trip units

Basic protection functions

(L) Protection against overload
This protection function trips when there is an overload with inverse long-time delay trip according to the IEC 60947-2 Standard (I^2t=k). The protection cannot be excluded.

(S) Protection against short-circuit with time delay
This protection function trips when there is a short-circuit, with long inverse time-delay trip (I^2t=k ON) or a constant trip time (I^2t=k OFF). The protection can be excluded.

(I) Instantaneous protection against short-circuit
This protection function trips instantaneously in case of a short-circuit. The protection can be excluded.

(G) Protection against earth fault
The protection against earth fault trips when the vectorial sum of the currents passing through the current sensors exceeds the set threshold value, with long inverse time-delay trip (I^2t=k ON) or a constant trip time (I^2t=k OFF). The protection can be excluded.

Advanced protection functions

The PR332/P trip unit makes it possible to carry out highly developed protection against the most varied types of fault.

In fact, it adds the following advanced protection functions to the basic protection functions.

IEC 60255-3

(L) Protection against overload (IEC 60255-3)
This protection trips in case of an overload with inverse long-time delay according to IEC 60255-3 Standard, for the coordination with fuses and MV protections. The protection can be excluded.

(U) Protection against unbalanced phase
The protection function against unbalanced phase U can be used in those cases where a particularly precise control is needed regarding missing and/or unbalance of the phase currents. The trip time is instantaneous. The protection can be excluded.

(OT) Protection against overtemperature
The protection against overtemperature trips instantaneously when the temperature inside the trip unit exceeds 85 °C, in order to prevent any temporary or continual malfunction of the microprocessor. The protection cannot be excluded.

(Rc) Protection against residual current [1]
This integrated protection is based on current measurements made by an external toroid and is alternative to protection against earth fault G. The protection can be excluded.

(ZS) Zone selectivity [2]
ZS zone selectivity is an advanced method for carrying out coordination of the protections in order to reduce the trip times of the protection closest to the fault in relation to the time foreseen by time selectivity. Zone selectivity can be applied to the protection functions S and G, with constant time-delay trip. The protection can be excluded.

(UV, OV, RV) Protections against voltage
The three protections trip with a constant time-delay in the case of undervoltage, overvoltage and residual voltage respectively. The latter allows to detect interruptions of the neutral (or of the earthing conductor in systems with earthed neutral) and faults which cause movement of the star centre in systems with isolated neutral (e.g. large earth faults) to be identified. Movement of the star centre is calculated by vectorially summing the phase voltages. The protections can be excluded.

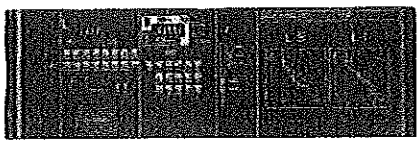
(RP) Protection against reversal of power
The protection against reversal power causes tripping of the breaker, with constant time-delay trip, when the flow of power reverses sign and exceeds, as an absolute value, the set threshold. It is particularly suitable for protection of large machines such as generators. The protection can be excluded.

(UF, OF) Protections of frequency
The two protections detect the variation in network frequency above or below the adjustable thresholds, opening the circuit-breaker, with constant time-delay trip. The protection can be excluded.

[1] It is not suitable for human protection.
[2] For further information about zone selectivity, please see the section: "Circuit-breakers for zone selectivity".

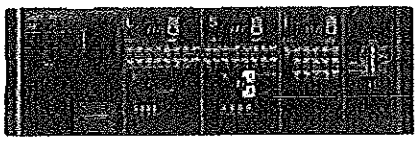
Circuit-breakers for power distribution
Electronic trip units

SACE PR231/P



	PR231/P	PR231/P
Protection functions	L S / U	U

SACE PR232/P

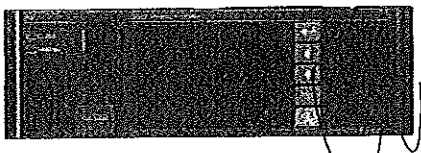


	PR232/P
Protection functions	L S U

SACE PR331/P

	PR331/P
Protection functions	L S U G

SACE PR332/P



	PR332/P	PR332/P	PR332/P	PR332/P
Protection functions	L U	L S U	L S U G[1]	L S U G
Advanced protection function[1]	L[2] U ⑤	L[2] U ⑤	L[2] U ⑤	L[2] U ⑤
Opt.[3]	⑪ ⑤ ⑥ ⑦ ⑧ ⑨	⑪ ⑤ ⑥ ⑦ ⑧ ⑨	⑪ ⑤ ⑥ ⑦ ⑧ ⑨	⑪ ⑤ ⑥ ⑦ ⑧ ⑨

[1] In alternative to Rc (with external toroid).
[2] For all versions.
[3] Available with PR330/V. Measurement module.
[4] According to IEC 60255-3.

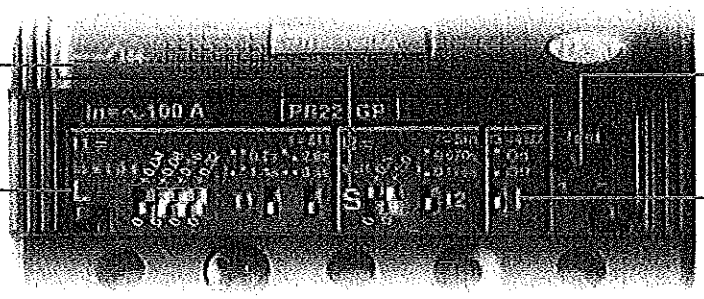
Circuit-breakers for power distribution
Electronic trip units

PR221GP

The PR221GP electronic release, only available on Tmax T2, is specific for protection of generators with the following rated currents: In = 63 A, In = 100 A, In = 160 A.
It allows wide adjustment of the protection against overload L, I_1 = 0.4...1 x In and above all provides the possibility of selecting four trip curves.
Generator protection typically requires low trip thresholds with regard to protection against short-circuit. Thanks to the PR221GP protection with time delay adjustable up to 2.5 times the rated current, I_2 = 1...2.5 x In is guaranteed, with the possibility of selecting between two trip curves.
It is also possible to set an instantaneous protection again short-circuit (I) fixed at 4 times the trip threshold of the protection against delayed short-circuit (S).
The S and I protection functions are not alternative to each other. As for Tmax T2 PR221DS, it is necessary to house the opening solenoid (SA) in the right-hand slot of the circuit-breaker. Tmax T2 PR221GP can be fitted with the same electrical accessories available with PR221DS.
The functions present on this release allow the requirements imposed by the major naval registers, such as LLRRS, ABS and RINA to be satisfied.

Protection S
Against short-circuit with delayed trip

Protection L
Against overload



Socket for TT1 test unit

Protection I
Against short-circuit with instantaneous trip

1SDC210036F0001

Protection and parameterisation functions

Protection function[1]		Trip threshold	Trip curves	Excludability	Relation t=f(I)
L	Against overload with long inverse time delay trip and trip characteristic according to an inverse time curve (I^2t=k) according to IEC 60947-2 Standard	I_1 = 0.40 - 1 x In step = 0.04 x In	at 6 x I_1 t_1 = 0.7 - 1.4 - 2.8 - 5.5 s Tolerance: ± 10% up to 2 x In ± 20% over 2 x In	–	–
S	Against short-circuit with inverse short time delay trip and trip characteristic with inverse time (I^2t=k)	I_2 = 1...2.5 x In step = 0.5 x In Tolerance: ± 10%	at 5 x In t_2 = 0.07 - 0.175 s Tolerance: ± 10% up to 2 x In	–	t = k/I
I	Against short-circuit with instantaneous trip with adjustable threshold	I_3 = 4 x I_2 fixed Tolerance: ± 20%	instantaneous	■	t = k

[1] The tolerances are valid with these hypotheses:
– self-supplied release at full power and/or auxiliary power supply (without start up)
– two-phase or three-phase power supply
For all the cases not foreseen in the above hypotheses, the following tolerance values are valid:

	Trip threshold	Trip time
S	± 20%	± 20%
I	± 20%	≤ 40ms

Circuit-breakers for power distribution
Electronic trip units

Communication functions	PR222DS/P	PR222DS/PD	PR223DS
Protocol		Modbus RTU standard	Modbus RTU standard
Physical medium		EIA RS485	EIA RS485
Speed (maximum)		19.2 kbps	19.2 kbps
Measurement functions			
Phase currents	■ [1]	■	■
Neutral current	■ [1]	■	■
Ground current	■ [1]	■	■
Voltages (phase to phase, phase to earth)			■ [6]
Powers (active, reactive, apparent)			■ [6]
Power factors			■ [6]
Energies			■ [6]
Peak factor			■
Frequency			■ [6]
Signalling functions			
L pre-alarm and alarm LED	■ [5]	■ [5]	■
L alarm output contact [2]	■	■	■
Available data			
Circuit-breaker status (open, closed) [3]		■	■
Mode (local, remote)		■	■
Protection parameters set	■ [1]	■	■
Alarms			
Protections: L, S, I, G	■ [1]	■	■
Failed tripping under fault conditions	■ [1]	■	■
Maintenance			
Total number of operations [3]		■	■
Total number of trips		■	■
Number of trip tests		■	■
Number of manual operations		■	■
Number of trips for each individual protection function		■	■
Record of last trip data		■	■
Commands			
Circuit-breaker opening/closing (with motor operator)		■	■
Alarm reset	■ [1]	■	■
Circuit-breaker reset (with motor operator)		■	■
Setting the curves and protection thresholds	■ [1]	■	■
Safety function			
Automatic opening in the case of failed Trip command fail (with motor operator) [4]		■	■
Events			
Changes in circuit-breaker state, in the protections and all the alarms		■	■

[1] With PR010/T unit or BT030 unit
[2] Typical contact: MOS photo Vmax: 48 V DC/30 V AC
Rmax = 35 ohm
[3] Available with AUX-E electronic auxiliary contacts
[4] The motor operator must be in electronic version (MOE-E) and electronic auxiliary contacts (AUX-E) have to be used
[5] Signals: – Pre-alarm L - permanently lit
– Alarm L - flashing (0.5 s ON / 0.5 s OFF)
– Incongruent manual setting (L > S / S > I) - flashing (1 s ON / 2 s OFF)
– WINK (remote control to identify the relay) - flashing (0.125 s ON / 0.125 s OFF)
[6] With VM210

Circuit-breakers for power distribution
Electronic trip units

PR222DS/P, PR222DS/PD and PR223DS[5] - Protection functions and parameterisations

Protection functions		Trip threshold	Trip curves[1]	Excludability	Relation t = f(I)
2 L	Against overload with long inverse time delay trip and trip characteristic according to an inverse time curve (I^2t=k) according to IEC 60947-2 Standard	**Manual setting** I_1 = 0.40....1 x In step = 0.02 x In **Electronic setting** I_1= 0.40...1 x In step 0.01 x In Trip between 1.1...1.3 x I_1	**Manual setting** at 6 x I_1 t_1 = 3 - 6 - 9/12 - MAX[2] **Electronic setting** at 6 x I_1 t_1 = 3...18s step 0.5s[2] Tolerance: ± 10%	-	$t = k/I^2$
S	Against short-circuit with inverse short time delay trip and trip characteristic with inverse time (I^2t=k) or definite time	**Manual setting** I_2 = 0.6-1.2-1.8-2.4-3-3.6-4.2-5.8-6.4-7-7.6-8.2-8.8-9.4-10 x In[3] **Electronic setting** I_2 = 0.60...10 x In step 0.1 x In Tolerance: ± 10%	**Manual setting** at 8 x In t_2 = 0.05 - 0.1- 0.25 - 0.5s **Electronic setting** at 8 x In t_2 = 0.05...0.5s step 0.01s Tolerance: ± 10%[4]	■	$t = k/I^2$
		Manual setting I_2 = 0.6-1.2-1.8-2.4-3-3.6-4.2-5.8-6.4-7-7.6-8.2-8.8-9.4-10 x In[3] **Electronic setting** I_2 = 0.60...10 x In step 0.1 x In Tolerance: ± 10%	**Manual setting** t_2 = 0.05 - 0.1 - 0.25 - 0.5s **Electronic setting** t_2 =0.05...0.5s step 0.01s Tolerance: ± 10%[4]	■	t = k
I	Against short-circuit with instantaneous trip	**Manual setting** I_3 = 1.5-2.5-3-4-4.5-5-5.5-6.5-7-7.5-8-9-9.5-10.5-12 x In[3] **Electronic setting** I_3 = 1.5...12 x In[3] step 0.1 x In Tolerance: ± 10%	Instantaneous	■	t = k
G	Against earth fault with inverse short time delay trip and trip characteristic according to an inverse time curve (I^2t=k)	**Manual setting** I_4 = 0.2-0.25-0.45-0.55-0.75-0.8-1 x In **Electronic setting** I_4 = 0.2...1 x In step 0.1 x In Tolerance: ± 10%	**Manual setting** up to 3.15 x I_4 t_4 = 0.1s; up to 2.25 x I_4 t_4 = 0.2s; up to 1.6 x I_4 t_4 = 0.4s; up to 1.10 x I_4 t_4 = 0.80s **Electronic setting** t_4 = 0.1...0.8s step 0.01s Tolerance: ± 15%	■	$t = k/I^2$ [6]

[1] These tolerances hold in the following conditions:
- self-powered trip unit at full power and/or auxiliary supply
- two or three-phase power supply

In conditions other than those considered, the following tolerances hold:

	Trip threshold	Trip time
S	± 20%	± 20%
I	± 20%	≤ 50ms
G	± 20%	± 20%

[2] t_1 values for MAX setting:

CB	Electronic setting	Manual setting
T4 320		
T5 630	3...10.5s Step 0.5s	3-6-9-10.5
T6 1000		
T4 250		
T5 400	3...18s Step 0.5s	3-6-9-18
T6 800	3...18s Step 0.5s	3-6-9-18
T6 630	3...18s Step 0.5s	3-6-12-18

[3] For T4 In = 320 A and T5 In = 630 A. T6 In = 1000 A ⇒ I_2max = 9.5 x In and I_3max = 9.5 x In
For T6 In = 800 A ⇒ I_3max = 10.5 x In

[4] Tolerance: ± 10 ms

[5] The setting of the PR223DS trip unit is electronic only (local/remote)
The L protection can be set at I_1 = 0.18...1 x In. For I_1 < 0.4 x In the neutral setting must be at 100% of that of the phases

[6] $t = k/I^2$ up to the current value indicated, $t = k$ (equating to the chosen setting) beyond the current value indicated

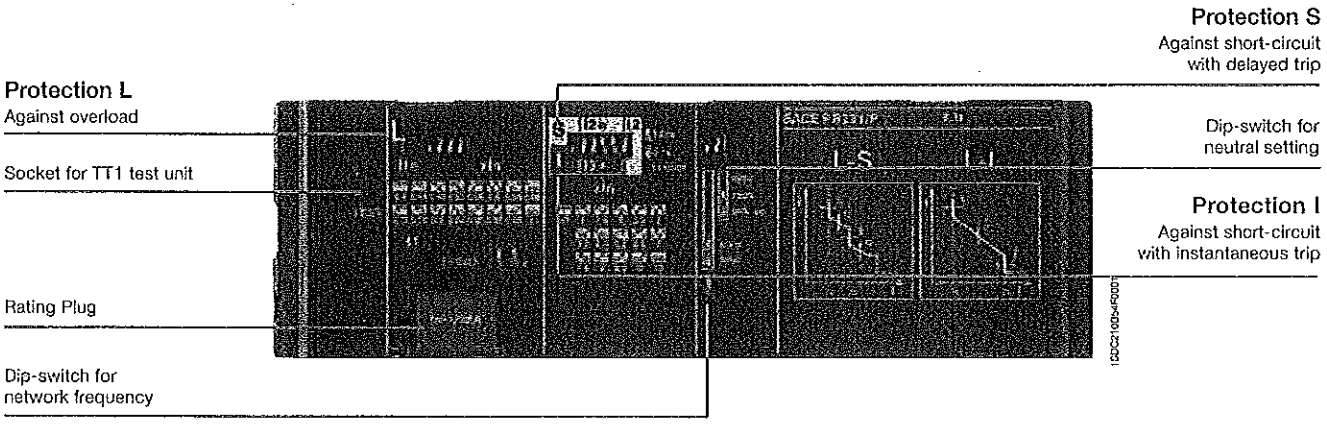
Circuit-breakers for power distribution
Electronic trip units

PR231/P

The PR231/P trip unit is the basic trip unit for Tmax T7. It provides protection functions against overload L and short-circuit S/I (version PR231/P-LS/I): with this version, by moving the dedicated dip-switch, you can choose whether to have protection S or protection I. Alternatively the version with only the protection function against instantaneous short-circuit I is available (version PR231/P-I see also page 2/45 and following). Setting the trip parameters of the PR231/P trip unit is made directly on the front of the circuit-breaker by means of dip switches, and there is only one for the phases and the neutral, so it is possible to set the protection threshold, at 50% or at 100% of the phase protection.

To guarantee protection of the installation by means of the PR231/P protection trip unit, it is necessary to select the rated network frequency (50/60 Hz), by means of the special dip-switch.

Interchangeability of PR231/P can be requested by means of the dedicated ordering code 1SDA063140R1.



Protection functions and parameterisations

Protection function		Trip threshold	Trip curves [1]	Excludability	Relation t=f(I)
L	Against overload with long inverse time delay trip and trip characteristic according to an inverse time curve (I^2t=k) according to IEC 60947-2 Standard	I_1 = 0.40...1 x In step = 0.04 x In Trip between 1.1...1.3 x I_1	at 6 x I_1 at 6 x I_1 t_1 = 3 - 12s Tolerance: ±10%	–	$t = k/I^2$
S	Against short-circuit with long inverse time delay trip and trip characteristic with inverse time (I^2t= k) (selectable as an alternative to protection function I)	I_2 = 1-1.5-2-2.5-3-3.5-4.5-5.5-6.5-7-7.5-8-8.5-9-10 x In Tolerance: ±10%	at 10 x In at 10 x In t_2 = 0.1 - 0.25s Tolerance: ±10%	■	$t = k/I^2$
I	Against short-circuit with istantaneous trip (selectable as an alternative to protection function S)	I_3 = 1-1.5-2-2.5-3-3.5-4.5-5.5-6.5-7-7.5-8-8.5-9-10 x In Tolerance: ±10%	instantaneous	–	t = k

[1] These tolerances hold in the following conditions:
– self-powered trip unit at full power
– two or three-phase power supply
In conditions other than those considered, the following tollerances hold:

	Trip threshold	Trip time
S	± 10%	± 20%
I	± 15%	≤ 60ms

There are three red LEDs available on the front of the PR232/P trip unit dedicated to signalling alarm of protections L, S, and I. Furthermore, a yellow flashing LED allows the state of pre-alarm of function L to be signalled, which is activated when 90% of the set trip threshold is reached. The yellow flashing LED every 3s indicates the normal operation.

PR232/P - Alarm and Pre-alarm LED

Protection	Colour	Pre-alarm	Alarm	Last trip
L	Yellow	■	–	–
	Red	–	■	■
S	Red	–	■	■
I	Red	–	■	■

Following circuit-breaker opening, it is possible to know which protection function made the release trip by connecting the PR030/B battery unit onto the front of the release. This is also possible thanks to the PR010/T test and configuration unit. By means of the BT030 wireless communication unit the PR232/P can be connected to a PDA or to a personal computer, extending the range of information available for the user. Infact, by means of the ABB SACE's SD-Pocket communication software, it is possible to read the values of the currents flowing through the circuit-breaker, the value of the last 20 interrupted currents, and the protection settings.

User interface

The user communicates directly with the trip unit by means of the dip switches. Up to four LEDs (according to the version) are also available for signalling. These LEDs (one for each protection) are active when:

- a protection is timing. For protection L the pre-alarm status is also shown;
- a protection has tripped (the corresponding LED is activated by pressing the "Info/Test" pushbutton);
- a failure in connection of a current sensor or in the trip coil is detected. The indication is active when the unit is powered (through current sensors or an auxiliary power supply);
- wrong rating plug for the circuit-breaker.

The protection tripped indication works even with the circuit-breaker open, without the need for any internal or external auxiliary power supply. This information is available for 48 hours of inactivity after the trip and is still available after reclosing. If the query is made more than 48 hours later it is sufficient to connect a PR030/B battery unit, PR010/T, or a BT030 wireless communication unit.

Setting the neutral

Protection of the neutral can be set at 50%, 100% or 200% of the phase currents. In particular, adjustment of the neutral at 200% of the phase current is possible if the following inequality is respected: $I_1 \times In \times \%Ne \leq Iu$. The user can also switch the neutral protection OFF.

Test function

The Test function is carried out by means of the Info/Test pushbutton and the PR030/B battery unit (or BT030) fitted with a polarized connector housed on the bottom of the box, which allows the device to be connected to the test connector on the front of PR331/P trip units. The PR331/P electronic trip unit can be tested by using the SACE PR010/T test and configuration unit by connecting it to the TEST connector.

Power supply

The unit does not require an external power supply either for protection functions or for alarm signalling functions. It is self-supplied by means of the current sensors installed on the circuit-breaker.
For operation, it is required for the three phases to be passed through by a current of 70 A. An external power supply can be connected in order to activate additional features, and in particular for connection to external devices: HMI030 and PR021/K.

PR331/P - Electrical characteristics

Auxiliary power supply (galvanically insulated)	24 V DC ± 20%
Maximum ripple	5%
Inrush current @ 24 V	3 A for 5 ms
Rated power @ 24 V	1 W

Communication

By means of the BT030 wireless communication unit, PR331/P can be connected to a PDA or to a personal computer, extending the range of information available for the user. In fact, by means of ABB SACE's SD-Pocket communication software, it is possible to read the values of the currents flowing through the circuit-breaker, the value of the last 20 interrupted currents, and the protection settings. PR331/P can also be connected to the optional external PR021/K signalling unit, for the remote signalling of protections alarms and trips, and to HMI030, for the remote user interfacing.

Circuit-breakers for power distribution
Electronic trip units

PR332/P - Protection functions and parameterisations

Protection functions		Trip threshold	Trip curves[1]	Excludability	Relation t = f(I)	Thermal memory[2]	Zone selectivity[2]
L	Against overload with inverse long-time delay trip according to IEC 60947-2 Standard ($I^2t=k$) or in accordance with the IEC 60255-3 Standard ($t=f(\alpha)$[3])	I_1 = 0.4...1 x In step = 0.01 x In Trip between 1.05...1.2 x I_1	at 3 x I_1 t_2 = 3...144s step = 3s Tolerance: up to 6 x In ±20% above 6 x In	–	$t = k/I^2$	■	–
		I_1 = 0.4...1 x In step = 0.01 x In Trip between 1.05...1.2 x I_1	at 3 x I_1 t_2 = 3...144s step = 3s Tolerance: ±10% up to 6 x In ±20% above 6 x In	■	$t = f(\alpha)$[3] α = 0.02-1-2	■	–
S	Against short-circuit with short inverse time-delay trip and trip characteristic with inverse time ($I^2t=k$) or with definite time	I_2 = 0.6...10 x I step = 0.1 x In Tolerance: ±7% up to 6 x In ±10% above 6 x In	at 10 x In t_2 = 0.05...0.8s step = 0.01s Tolerance: ±15% up to 6 x In ±20% over 6 x In	■	$t = k/I^2$	■	–
		I_2 = 0.6...10 x In step = 0.1 x In Tolerance: ±7% up to 6 x In ±10% above 6 x In	t_2 = 0.05...0.8s step = 0.01s t_2 sel = 0.04...0.2s step = 0.01s Tolerance: min (±10%; ±40ms)	■	t = k	–	■
I	Against short-circuit with adjustable instantaneous trip	I_3 = 1.5...15 x In step = 0.1 x In Tolerance: ±10%	≤ 30 ms	■	t = k	–	–
G	Against earth fault with short inverse time-delay trip and trip characteristic according to an inverse time curve ($I^2t=k$) or with definite time	I_4 = 0.2...1 x In step = 0.02 x In Tolerance: ±7%	t_4 = 0.1...1s step = 0.05s Tolerance: ±15%	■	$t = k/I^2$[5]	–	–
		I_4 = 0.2...1 x In step = 0.02 x In Tolerance: ±7%	t_4 = 0.1...1s step = 0.05s t_4 sel = 0.04...0.2s step = 0.05s Tolerance: min (±10%; ±40ms)	■	t = k	–	■
Rc	Against residual current fault with definite time-delay trip	IΔ = 3-5-7-10-20-30 A Tolerance: 0-20%	tΔ = 0.06-0.1-0.2-0.3-0.4-0.5-0.8s Tolerance: ±20%	■	t = k	–	–
OT	Against overtemperature of the trip unit with instantaneous trip	Trip unit temperature over 85 °C	instantaneous	–	temp = k	–	–
U	Against unbalanced phase with definite time-delay trip	I_6 = 2%...90% x I_1 step = 1% x I_1 Tolerance: ±10%	t_6 = 0.5...60 s step = 0.5s Tolerance: min (±20%; ±100ms)	■	t = k	–	–

PR332/P with PR330/V - Advanced protection functions and parameterisations

Advanced protection functions		Trip threshold	Trip curves[1]	Excludability	Relation t = f(I)	Thermal memory[2]	Zone selectivity
UV	Against undervoltage with adjustable constant time	U_8= 0.5...0.95 x Un step = 0.01 x Un Tolerance: ±5%	t_8 = 0.1...5s step = 0.1s Tolerance: min (±20% ±100ms)	■	t = k	–	–
OV	Against overvoltage with adjustable constant time	U_9= 1.05...1.2 x Un step = 0.01x Un Tolerance: ±5%	t_9 = 0.1...5s step = 0.1s Tolerance: min (±20% ±100ms)	■	t = k	–	–
RV	Against residual voltage with adjustable constant time	U_{10}= 0.1...0.4 x Un step = 0.01 x Un Tolerance: ±5%	t_{10} = 0.5...30s step = 0.5s Tolerance: min (±10% ±100ms)	■	t = k	–	–
RP	Against reversal of power with adjustable constant time	P_{11}= -0.3...-0.1 x Pn step = 0.02xPn Tolerance: ±10%	t_{11} = 0.5...25s step = 0.1s Tolerance: min (±10% ±100ms)	■	t = k	–	–
UF	Against underfrequency with adjustable constant time	f_{12}= 0.90...0.99 x fn step = 0.01 x fn Tolerance:±5%	t_{12} = 0.5...3s step = 0.1s Tolerance: min (±10% ±100ms)	■	t = k	–	–
OF	Against overfrequency with adjustable constant time	f_{13}= 1.01...1.10 x fn step = 0.01 x fn Tolerance:±5%	t_{13} = 0.5...3s step = 0.1s Tolerance: min (±10% ±100ms)	■	t = k	–	–

[1] These tolerances are valid under the following conditions:
- trip unit self-supplied at full power and/or auxiliary supply
- two or three-phase power supply

In conditions other than those considered, the following tolerances hold:

	Trip threshold	Trip time
L	Release between 1.05 and 1.25 x I_1	± 20%
S	± 10%	± 20%
I	± 15%	≤ 60ms
G	± 15%	± 20%
Other	± 10%	± 20%

[2] Active with 24V auxiliary power supply

[3] $t = \frac{(3^{\alpha}-1)}{\left(\frac{I}{I_1}\right)^{\alpha}-1} t_1 \ (3 \times I_1)$

[4] For T7 In = 1250 A/1600 A ⇒ I_3max = 12 x In

[5] $k = (2s) \cdot (I_1)^2$

Indicator LEDs

LEDs on the front panel of the trip unit are used to indicate all the pre-alarms ("WARNING") and alarms ("ALARM"). A message on the display always explicitly indicates the type of event concerned.

Example of events indicated by the "WARNING" LED:
- unbalance between phases;
- pre-alarm for overload (L1>90% x I_1);
- first temperature threshold exceeded (70 °C);
- contact wear beyond 80%;
- phase rotation reversed (with optional PR330/V).

Example of events indicated by the "ALARM" LED:
- timing of function L;
- timing of function S;
- timing of function G;
- second temperature threshold exceeded (85 °C);
- contact wear 100%;
- timing of Reverse Power flow protection (with optional PR330/V).

Data logger

By default PR332/P, is provided with the Data Logger function that automatically records in a wide memory buffer the instantaneous values of all the currents and voltages. Data can be easily downloaded from the unit by means of SD-Pocket or SD-TestBus2 applications and can be transferred to any personal computer for elaboration. The function freezes the recording whenever a trip occurs or in case of other events, so that a detailed analysis of faults can be easily performed. SD-Pocket and SD-TestBus2 allow also reading and downloading of all the others trip information.
- Number of analog channels: 8
- Maximum sampling rate: 4800 Hz
- Maximum sampling time: 27 s (@ sampling rate 600 Hz)
- 64 events tracking.

Trip information and opening data

In case a trip occurs PR332/P store all the needed information:
- Protection tripped
- Opening data (current)
- Time stamp (guaranteed with auxiliary supply or self-supply with power failure no longer than 48h).

By pushing the "Info/Test" pushbutton the trip unit shows all these data directly on display.

No auxiliary power supply is needed. The information is available to user for 48 hours with the circuit breaker open or without current flowing.

The information of the latest 20 trips are stored in memory.

If the information can be furthermore retrieved more than 48 hours later, it is sufficient to connect a PR030/B battery unit or a BT030 wireless communication unit.

Load control

Load control makes it possible to engage/disengage individual loads on the load side before the overload protection L is tripped, thereby avoiding unnecessary trips of the circuit-breaker on the supply side. This is done by means of contactors or switch-disconnectors (externally wired to the trip unit), controlled by the PR332/P through PR021/K unit.

Two different Load Control schemes can be implemented:
- disconnection of two separate loads, with different current thresholds
- connection and disconnection of a load, with hysteresis.

Current thresholds and trip times are smaller than those available for selection with protection L, so that load control can be used to prevent overload tripping. External PR021/K accessory unit is required for Load Control. The function is only active when an auxiliary power supply is available.

PR330/V Measurement Module

This optional internal module, installed in PR332/P, allows the trip unit to measure the phase and neutral voltages and to process them in order to achieve a series of features, in terms of protection and measurement.

PR330/V module, when is ordered mounted on the circuit-breaker, does not require any external connection or voltage transformers since it is connected internally to the upper terminals of Tmax T7 (selector in "INT" position) through the internal voltage sockets. When necessary, the connection of voltage pick-ups can be moved to any other point (i.e. lower terminals), by using the alternative connection located in the terminal box and switching the selector to the "EXT" position. For the dielectric test of the circuit-breaker the selector must be switched to the "Insulating TEST" position. PR330/V is able to energize the PR332/P while line voltage input is above 85 V. The use of Voltage Transformers is mandatory for rated voltages higher than 690 V.

Voltage transformers shall have burdens between 5 VA and 10 VA and accuracy class 0.5 or better.

Additional Protections with PR330/V:
- Undervoltage (UV) protection
- Overvoltage (OV) protection
- Residual voltage (RV) protection
- Reversal of power (RP) protection
- Underfrequency (UF) protection
- Overfrequency (OF) protection.

All the above indicated protections can be excluded, although it is possible to leave only the alarm active when required: in this case the trip unit will indicate the "ALARM" status. With the circuit-breaker closed, these protections also operate when the trip unit is self-supplied. With the circuit-breaker open, they operate when the auxiliary power supply (24 V DC or PR330/V) is present.

Measurement, signalling and available data functions

Details about functions available on PR332/P, trip units with PR330/D-M and EP010 - FBP - PDP22 are listed in the table below:

Communication functions	PR332/P +PR330/D-M	PR332/P+PR330/D-M and EP010
Protocol	Modbus RTU standard	FBP-PDP22
Physical means	RS485	Profibus-DP or DeviceNet cable
Speed (maximum)	19.2 kbps	115 kbps
Measurement functions		
Phase currents	■	■
Neutral current	■	■
Ground current	■	■
Voltage (phase-phase, phase-neutral, residual)	opt.[1]	opt.[1] [2]
Power (active, reactive, apparent)	opt.[1]	opt.[1] [3]
Power factor	opt.[1]	[4]
Frequency and peak factor	opt.[1]	[4]
Energy (active, reactive, apparent)	opt.[1]	[4]
Harmonic analysis	–	–
Signalling functions		
LED: auxiliary power supply, pre-alarm, alarm, transmission, reception	■	■
Temperature	■	■
Indication for L, S, I, G and other protection	■	■
Available data		
Circuit-breaker status (open, closed)	■	■
Circuit-breaker position (racked-in, racked-out)	■	■
Mode (local, remote)	■	■
Protection parameters set	■	■
Load control parameters	■	■
Alarms		
Protections: L, S, I, G	■	■
Undervoltage, overvoltage and residual voltage protection (timing and trip)	opt.[1]	opt.[1]
Reverse power protection (timing and trip)	opt.[1]	opt.[1]
Directional protection (timing and trip)	–	–
Underfrequency/overfrequency protection (timing and trip)	opt.[1]	opt.[1]
Phases rotation	–	–
Failed tripping under fault conditions	■	■
Maintenance		
Total number of operations	■	■
Total number of trips	■	■
Number of trip tests	■	■
Number of manual operations	■	■
Number of separate trips for each protection function	■	■
Contact wear (%)	■	■
Record data of last trip	■	■
Commands		
Circuit-breaker open/close	■	■
Alarms reset	■	■
Setting of curves and protection thresholds	■	■
Synchronize system time	■	■
Events		
Status changes in circuit-breaker, protections and all alarms	■	■

[1] with PR330/V
[2] no residual voltage
[3] no apparent power available
[4] please ask ABB for further details

Switch-disconnectors
Electrical characteristics

The Tmax switch-disconnectors derive from the corresponding circuit-breakers, of which they keep the overall dimensions, versions, fixing systems and the possibility of mounting accessories unchanged.

This version only differs from the circuit-breakers in the absence of the protection trip units. They are characterised by a rated voltage of 690 V in alternating current and 750 V in direct current.

Switch-disconnectors

				Tmax T1D
Conventional thermal current, **Ith**			[A]	160
Rated service current in category AC22, **Ie**			[A]	160
Rated service current in category AC23, **Ie**			[A]	125
Poles			[No.]	3/4
Rated service voltage, **Ue**	(AC) 50-60 Hz		[V]	690
	(DC)		[V]	500
Rated impulse withstand voltage, **Uimp**			[kV]	8
Rated insulation voltage, **Ui**			[V]	800
Test voltage at industrial frequency for 1 minute			[V]	3000
Rated short-circuit making capacity, **Icm**	(min) switch-disconnector only		[kA]	2.8
	(max) with circuit-breaker on supply side		[kA]	187
Rated short-time withstand current for 1s, **Icw**			[kA]	2
Reference Standard				IEC 60947-3
Versions				F
Terminals				FC Cu - EF - FC CuAl
Mechanical life			[No. operations]	25000
			[No. Hourly operations]	120
Basic dimensions, fixed		3 poles	W [mm]	76
		4 poles	W [mm]	102
			D [mm]	70
			H [mm]	130
Weight	fixed	3/4 poles	[kg]	0.9/1.2
	plug-in	3/4 poles	[kg]	–
	withdrawable	3/4 poles	[kg]	–

Switch-disconnector coordination [380/415 V AC]

	T1			T2				T3		T4					T5 400					T5 630				
	B	C	N	N	S	H	L	N	S	N	S	H	L	V	N	S	H	L	V	N	S	H	L	V
Icu [kA]	16	25	36	36	50	70	85	36	50	36	50	70	120	200	36	50	70	120	200	36	50	70	120	200
T1D 160	16	25	36	36	50	70	85																	
T3D 250								36	50	36	50	70	120	200										
T4D 320										36	50	70	120	200										
T5D 400															36	50	70	120	200					
T5D 630																				36	50	70	120	200
T6D 630																								
T6D 800																								
T6D 1000																								
T7D 1000																								
T7D 1250																								
T7D 1600																								

Switch-disconnectors
Electrical characteristics

Applications
They can be used as general circuit-breakers in sub-switchboards as switching and isolation parts
for lines, busbars or groups of apparatus, or as bus-ties. They can be part of general isolation devices of groups of machines or of complexes for motor switching and protection.

Isolation
The main function carried out by this apparatus consists of isolation of the circuit they are inserted in. Once the contacts are open they are at a distance which prevents an arc from striking, in accordance with the prescriptions in the standards regarding isolation behaviour. The position of the operating lever corresponds definitely with that of the contacts (positive operation).

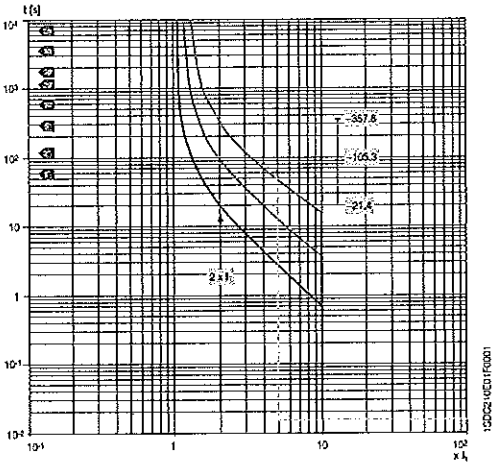
Protection
Each switch-disconnector must be protected on the supply side by a coordinated device which safeguards it against short-circuits. The coordination table below indicates the Tmax circuit-breaker which can carry out the protection function for each switch-disconnector. These are always pieces of apparatus of a size corresponding to or smaller than that of the switch disconnector.

Making capacity
The making capacity Icm is a performance of notable importance since a switch-disconnector must be able to withstand the dynamic, thermal and current stresses which can occur during closure without being destroyed, up to the short-circuit closing conditions.

Examples of curve readout

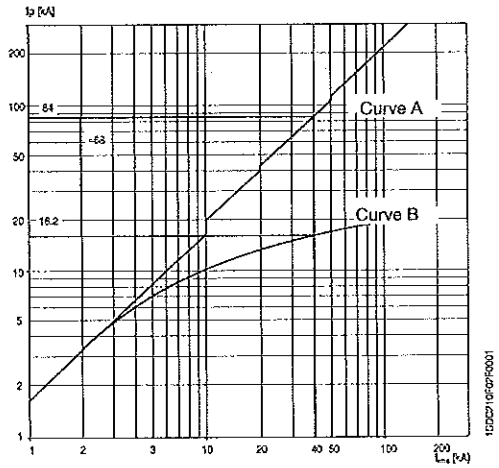
Example 1 - T4N 250
Trip curves for power distribution (thermomagnetic trip unit)

Considering a T4N 250 In = 250 A circuit-breaker. By means of the thermal adjustment trimmer, the current threshold I_1 is selected, for example at 0.9 x In (225 A); the magnetic trip threshold I_3, adjustable from 5 to 10 x In, we select at 10 x In, equal to 2500 A.
It can be noted that, on the basis of the conditions in which the overload is presented, i.e. with the circuit-breaker at thermal running or not, the thermal relay trip varies considerably. For example, for an overload current of 2 x I_1, the trip time is between 21.4 and 105.3 s for hot trip, and between 105.3 and 357.8 s for cold trip.
For fault current values higher than 2500 A, the circuit-breaker trips instantaneously with the magnetic protection.



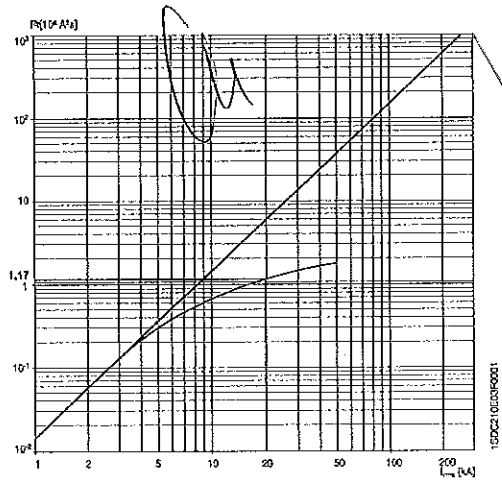
Example 2 - T2S 160
Limitation curves

The following figure shows the trend of the Tmax T2S 160, In = 160 A circuit-breaker current-limiting curve. The r.m.s. of the prospective symmetrical short-circuit current is indicated on the abscissa of the diagram, whereas the peak short-circuit current value is indicated on the ordinates. The current-limiting effect can be assessed by comparing - at the same symmetrical short-circuit current value, the corresponding peak value at the prospective short-circuit current (curve A) with the limited peak value (curve B).
The T2S 160 circuit-breaker with thermomagnetic trip unit In = 160 A at a voltage of 400 V limits the short-circuit current to 16.2 kA for a fault current of 40 kA, with a reduction of about 68 kA compared with the peak value of the 84 kA prospective short-circuit current.



Example 3 - T3S 250
Specific let-through energy curves

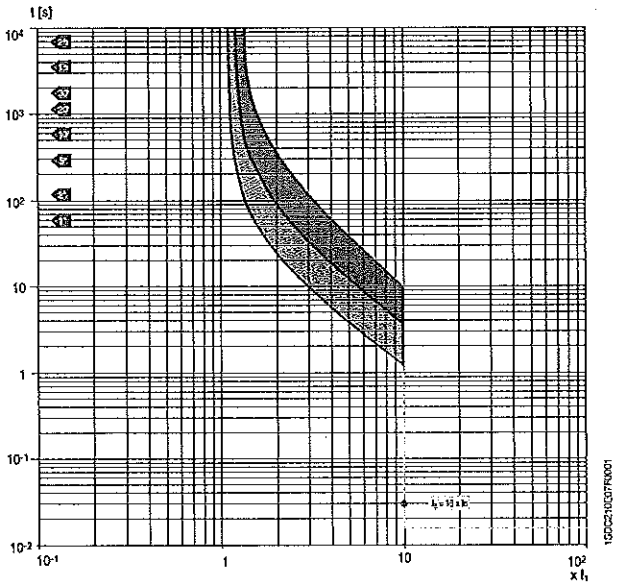
An example of reading the graph of the specific let-through energy curve of the T3S 250 In = 160 A circuit-breaker at a voltage of 400 V is given below.
The prospective symmetrical short-circuit current is indicated on the abscissa of the diagram, whereas the ordinates show the specific let-through energy values expressed in A^2s.
In correspondence with a short-circuit current of 20 kA, the circuit-breaker lets through a value of I^2t equal to $1.17 \cdot 10^6 \cdot A^2s$.



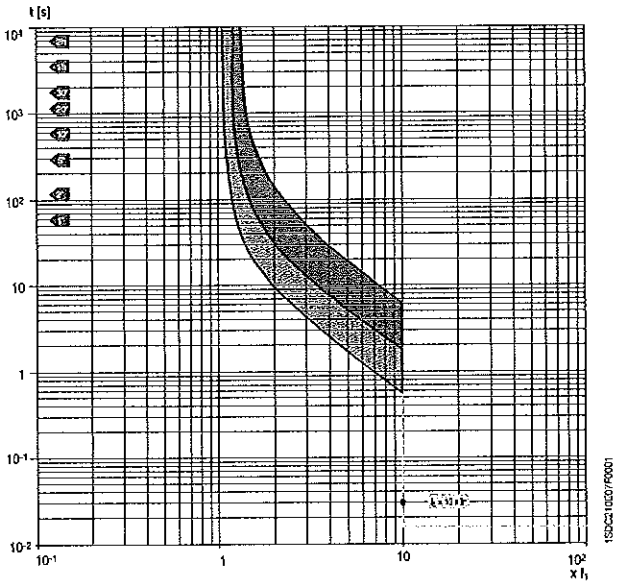
Abbreviations used
In = rated current of the thermomagnetic or electronic trip unit
I_1 = set trip current for overload
I_3 = trip current for short-circuit
I_{cs} = prospective symmetrical short-circuit current

Trip curves for power distribution
Circuit-breakers with thermomagnetic trip units

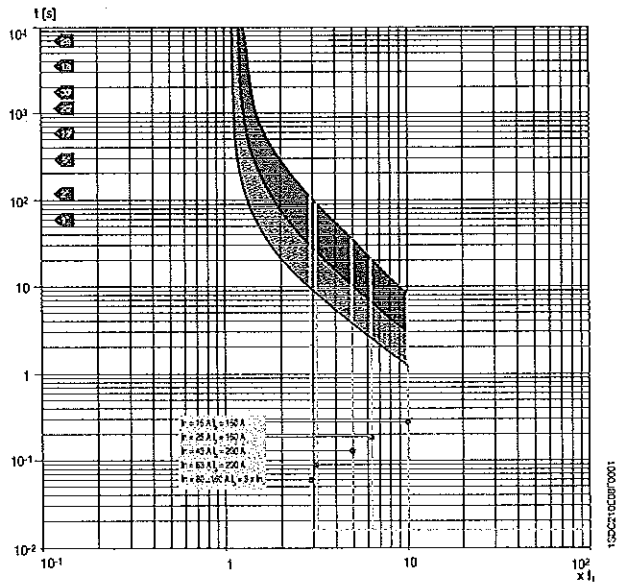
T2 160 – TMD
In = 125 A



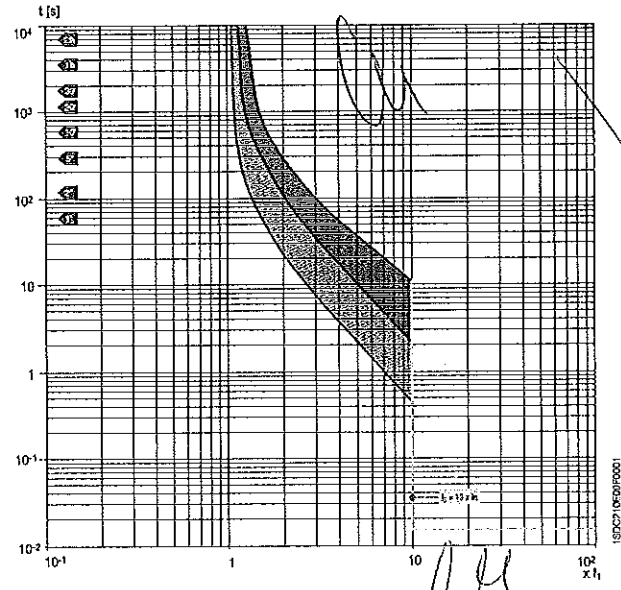
T2 160 – TMD
In = 160 A



T2 160 – TMG

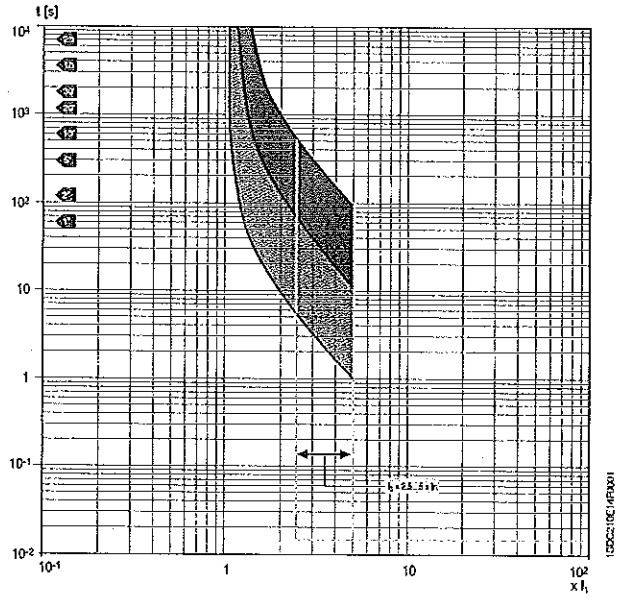


T3 250 – TMD
In = 63÷250 A

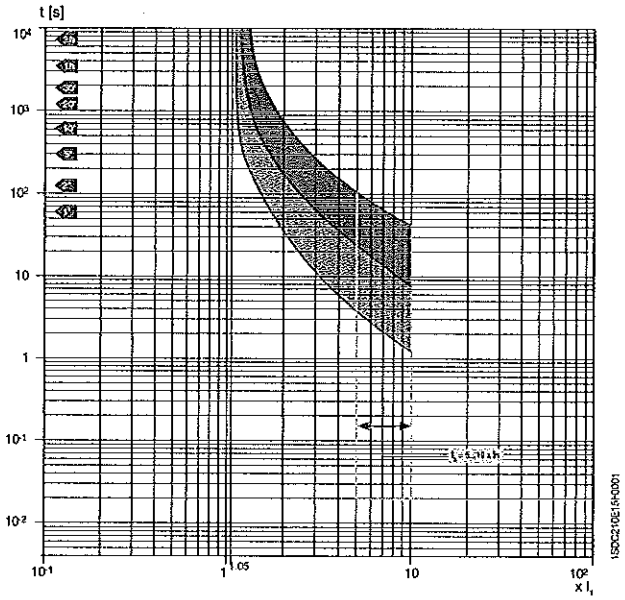


Trip curves for power distribution
Circuit-breakers with thermomagnetic trip units

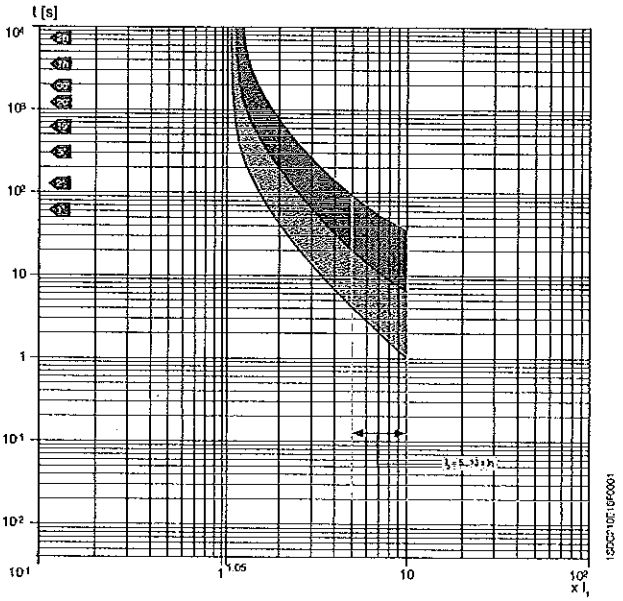
T5 400/630 – TMG
In = 320÷500 A



T6 630 – TMA
In = 630 A



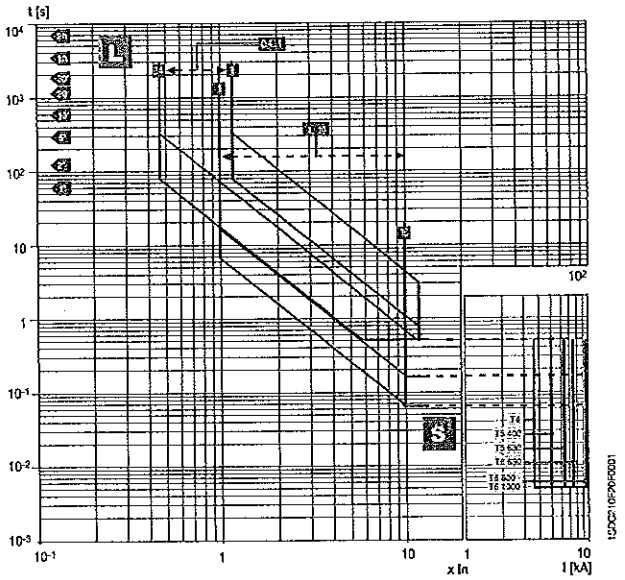
T6 800 – TMA
In = 800 A



Trip curves for power distribution
Circuit-breakers with electronic trip units

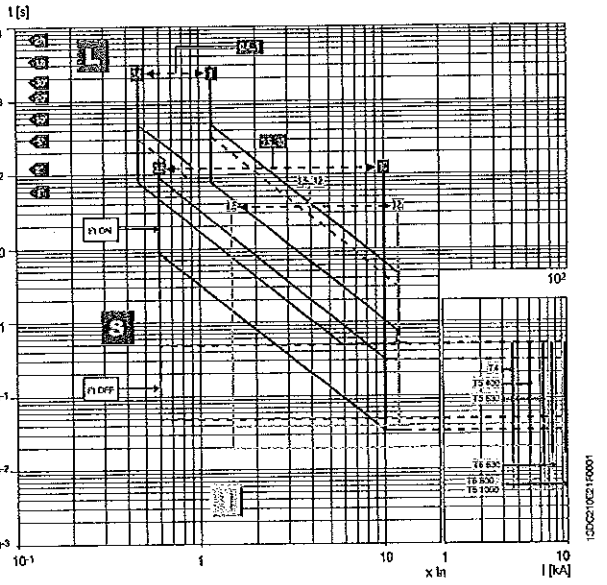
T4 250/320 - T5 400/630 - T6 630/800/1000
PR221DS
L-S Functions

Note: For T4 In = 320 A, T5 In = 630 A and T6 In = 1000 A ⇒ I_2max = 9.5 x In

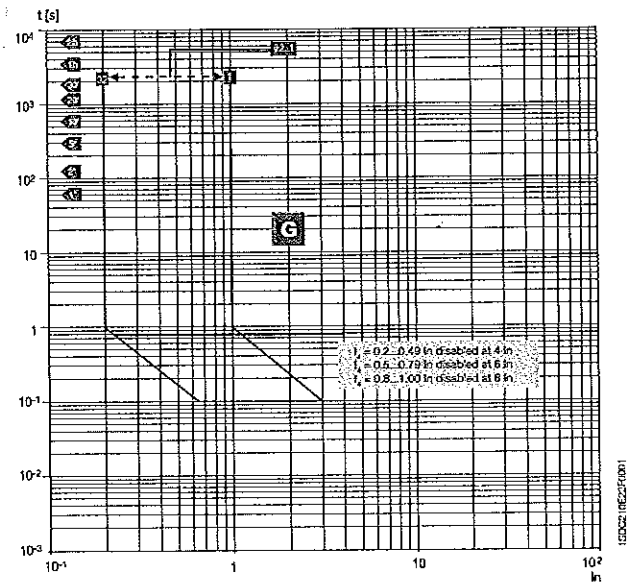


T4 250/320 - T5 400/630 - T6 630/800/1000
PR222DS - PR222DS/PD - PR223DS
L-S-I Functions

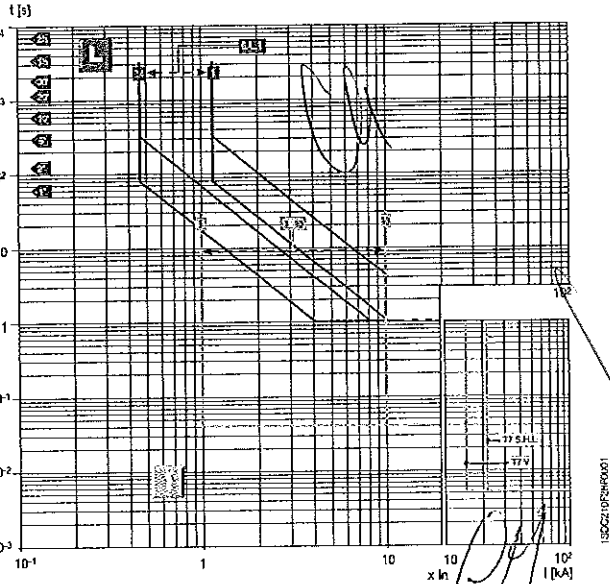
Note: The dotted curve of function L corresponds to the maximum delay (t_1) which can be set at 6 x I_1, in the case where 320 A CTs are used for T4 and 630 A for T5. For all the CT sizes t_1 = 18s except with 320 A CT (T4), 630 A CT (T5) and 1000 A CT (T6) where t_1 = 10.5s. For T4 In = 320 A, T5 In = 630 A and T6 In = 1000 A ⇒ I_2max = 9.5 x In, I_2max = 9.5 x In. For T6 In = 800 A ⇒ I_2max = 10.5 x In. For PR223DS the L protection function can be set to I_1 = 0.18...1 x In.



T4 250/320 - T5 400/630 - T6 630/800/1000
PR222DS - PR222DS/PD - PR223DS
G Function



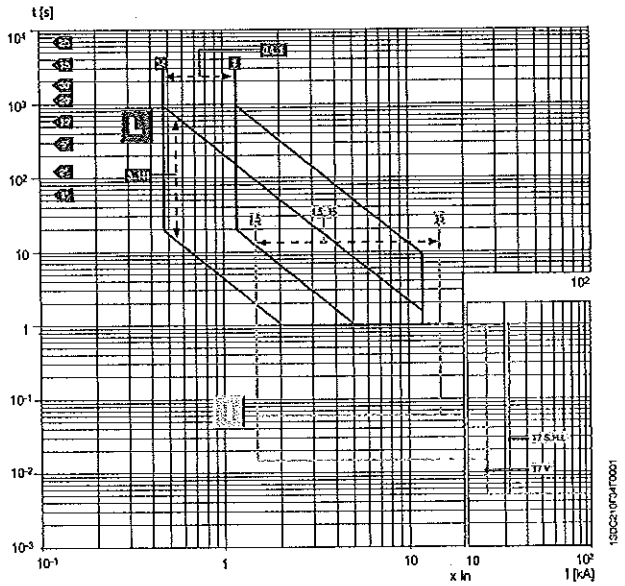
T7 800/1000/1250/1600 – PR231/P
L-I Functions



Trip curves for power distribution
Circuit-breakers with electronic trip units

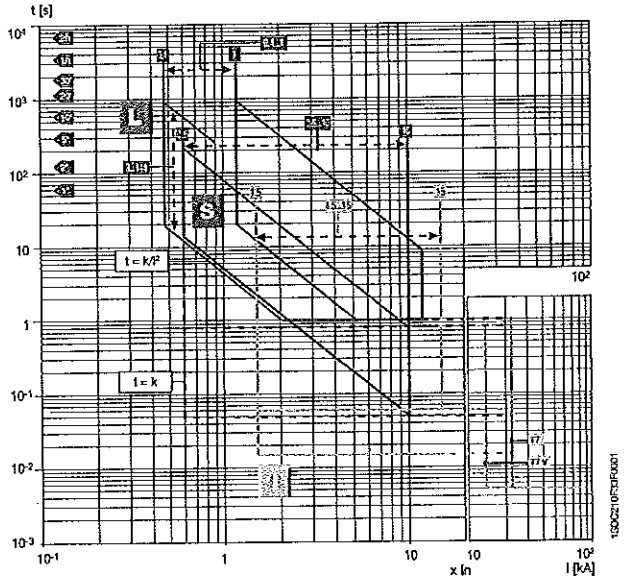
T7 800/1000/1250/1600 – PR332/P
L-I Functions

Note: For T7 In = 1250 A, 1600 A ⇒ I_3max = 12 x In

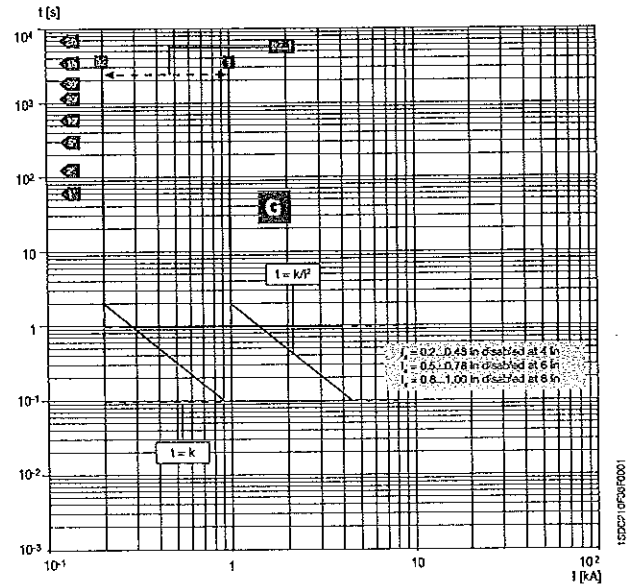


T7 800/1000/1250/1600 – PR332/P
L-S-I Functions

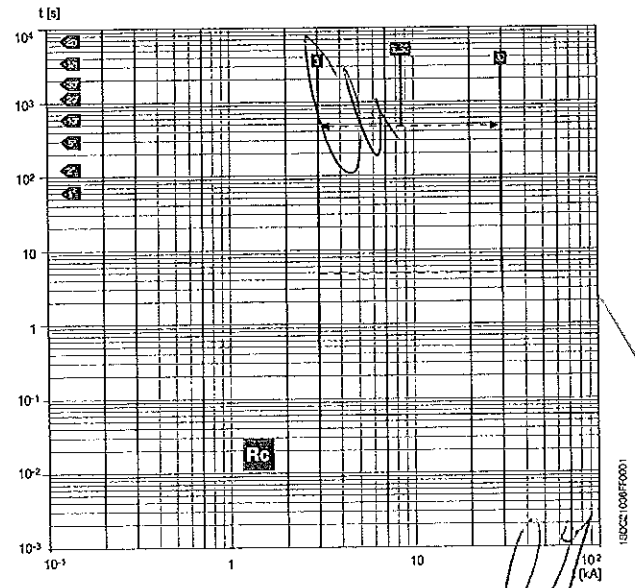
Note: For T7 In = 1250 A, 1600 A ⇒ I_3max = 12 x In



T7 800/1000/1250/1600 – PR332/P
G Function



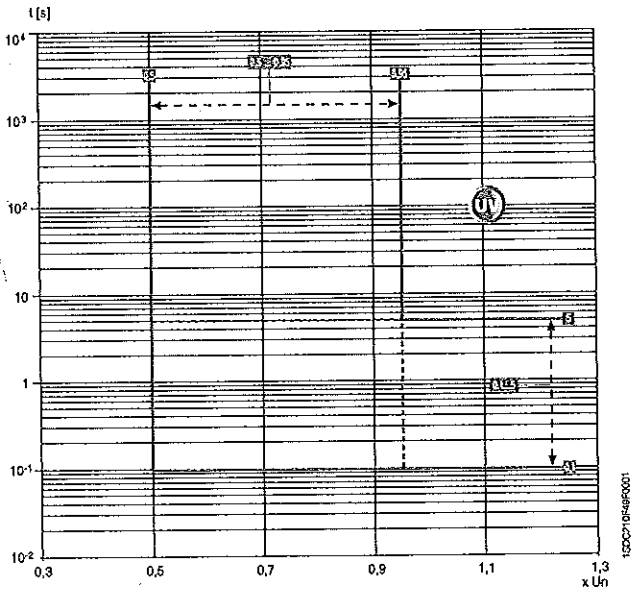
T7 800/1000/1250/1600 – PR332/P
Rc Function



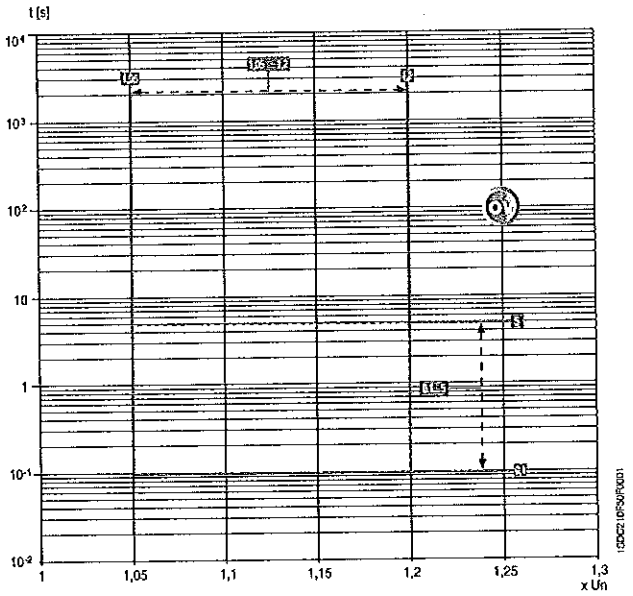
Trip curves for power distribution
Circuit-breakers with electronic trip units

T7 800/1000/1250/1600
PR332/P with PR330/V
UV Function

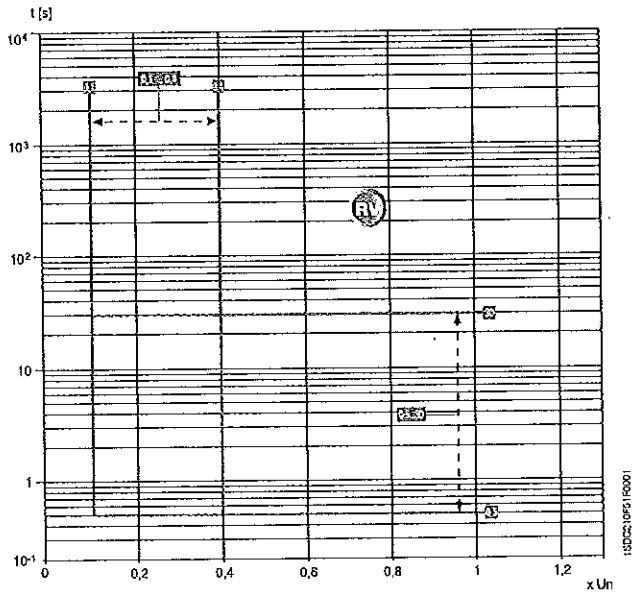
k = 13.5 α = 1



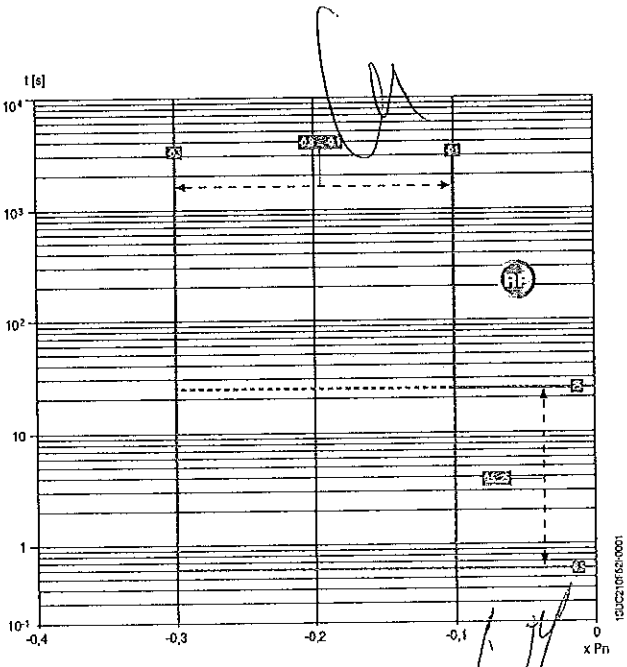
T7 800/1000/1250/1600
PR332/P with PR330/V
OV Function



T7 800/1000/1250/1600
PR332/P with PR330/V
RV Function



T7 800/1000/1250/1600
PR332/P with PR330/V
RP Function



Wiring diagrams
Information for reading - Circuit-breakers T1...T6

State of operation represented

The diagram is shown in the following conditions:
- plug-in version circuit-breaker open and racked-in
- contactor for motor starting open
- circuits de-energised
- trip units not tripped
- motor operator with springs charged.

Version

The diagram shows a circuit-breaker or switch-disconnector in the plug-in version (only T2, T3, T4 and T5) or in the withdrawable version (T6). The diagram is also valid for the fixed and withdrawable version circuit-breakers or switch-disconnectors.
With the fixed version circuit-breakers or switch-disconnectors, the applications indicated in figures 26-27-28-29-30-31 and 32 cannot be provided.

Caption

□ = Figure number of the diagram
* = See note indicated by the letter
A1 = Circuit-breaker applications
A11 = FDU interfacing unit (front display)
A12 = AUX-E type signalling unit, with auxiliary relays for electrical signalling of circuit-breaker open and circuit-breaker tripped
A13 = PR021/K type signalling unit, with auxiliary relays for electrical signalling of the protection functions of electronic trip unit
A14 = MOE-E type actuation unit, with auxiliary relays for carrying out the commands coming from the dialogue unit
A15 = PR212/CI type contactor control unit for motor starting
A16 = Solenoid operating mechanism
A17 = Unit for M motor electrical latching
A18 = VM210 type voltage measuring unit
A2 = Applications of the solenoid operator or motor operator
A3 = Applications of the RC221, RC222 or RC223 type residual current release
A4 = Indication apparatus and connections for control and signalling, outside the circuit-breaker
D = Electronic time-delay device of the undervoltage release (outside the circuit-breaker)
H, H1 = Signalling lamps
K = Contactor for motor starting
K51 = Electronic trip unit:
- PR221 type overcurrent release, with the following protection functions:
  - L against overload with inverse long time delay
  - S against short-circuit with inverse or definite short time delay
  - I against short-circuit with instantaneous trip
- PR222DS/P, PR222DS/PD, PR223DS or PR223EF, type overcurrent release, with the following protection functions:
  - L against overload with inverse long time delay
  - S against short-circuit with inverse or definite short time delay
  - I against short-circuit with instantaneous trip time
  - G against earth fault with short time trip
- EFDP protection (Earth Fault Detector Prevention) for PR223EF trip unit only
- PR222MP motor protection type trip unit, with the following protection functions:
  - against overload (thermal protection)
  - against rotor block
  - against short-circuit
  - against missing or unbalanced current between the phases

K51/1...8 = Contact for electrical signalling of the protection functions of the electronic trip unit
K87 = RC221, RC222 or RC223 type residual current trip unit
M = Motor for circuit-breaker opening and circuit-breaker closing spring charging
M1 = Three-phase asynchronous motor
Q = Main circuit-breaker
Q/0,1,2,3 = Auxiliary circuit-breaker contacts
R = Resistor (see note F)
R1 = Motor thermistor
R2 = Thermistor in the motor operator
S1, S2 = Contacts controlled by the cam of the motor operator
S3, S3/1 = Change-over contact for electrical signalling of local/remote selector status
S4/1-2 = Contacts activated by the circuit-breaker rotary handle (see note C)
S51/S = Contact for electrical signalling of overload in progress (start)

Wiring diagrams
Information for reading - Circuit-breakers T1...T6

Description of figures

Fig. 1 = Opening release.
Fig. 2 = Permanent opening release.
Fig. 3 = Instantaneous undervoltage release (see note B and F).
Fig. 4 = Undervoltage release with electronic time-delay device outside the circuit-breaker (see note B).
Fig. 5 = Instantaneous undervoltage release in version for machine tools with one contact in series (see note B, C, and F).
Fig. 6 = Instantaneous undervoltage release in version for machine tools with two contacts in series (see note B, C, and F).
Fig. 7 = One changeover contact for electrical signalling of circuit-breaker open due to RC221, RC222 or RC223 type residual current release trip.
Fig. 8 = RC222 or RC223 type residual current release circuits.
Fig. 9 = Two electrical signalling contacts for RC222 or RC223 type residual current release pre-alarm and alarm.
Fig. 10 = Solenoid operator.
Fig. 11 = Stored energy motor operator.
Fig. 12 = Local/remote auxiliary contact for stored-energy motor operating mechanism.
Fig. 21 = Three changeover contacts for electrical signalling of circuit-breaker open or closed and one changeover contact for electrical signalling of circuit-breaker open due to YO, YO1, YO2 and YU thermomagnetic trip unit intervention (tripped position).
Fig. 22 = One changeover contact for electrical signalling of circuit-breaker open or closed and a changeover contact for electrical signalling of circuit-breaker open due to YO, YO1, YO2 or YU the thermomagnetic trip unit intervention (tripped position).
Fig. 23 = Two changeover contacts for electrical signalling of circuit-breaker open or closed.
Fig. 24 = One changeover contact for electrical signalling of circuit-breaker open due to overcurrent release trip (T2-T6).
Fig. 25 = One contact for electrical signalling of circuit-breaker open due to overcurrent release trip (T4-T5).
Fig. 26 = First position of circuit-breaker changeover contact, for electrical signalling of racked-in.
Fig. 27 = Second position of circuit-breaker changeover contact, for electrical signalling of racked-in.
Fig. 28 = Third position of circuit-breaker changeover contact, for electrical signalling of racked-in.
Fig. 29 = First position of circuit-breaker changeover contact, for electrical signalling of isolated.
Fig. 30 = Second position of circuit-breaker changeover contact, for electrical signalling of isolated.
Fig. 31 = Third position of circuit-breaker changeover contact, for electrical signalling of isolated.
Fig. 32 = Circuit of the current transformer on neutral conductor outside the circuit-breaker (for plug-in and withdrawable version circuit-breaker).
Fig. 39 = Auxiliary circuits of the PR223DS trip units connected to VM210 voltage measuring unit.
Fig. 40 = Auxiliary circuits of the PR223EF trip units connected to VM210 voltage measuring unit.
Fig. 41 = Auxiliary circuits of the PR222DS/P, PR222DS/PD, PR223DS or PR223EF electronic trip unit connected with FDU front display unit.
Fig. 42 = Auxiliary circuits of the PR222DS/PD, PR223DS or PR223EF electronic trip unit connected with PR021/K type signalling unit.
Fig. 43 = Auxiliary circuits of the PR222DS/PD, PR223DS or PR223EF electronic trip unit connected with FDU front display unit and with PR021/K type signalling unit.
Fig. 44 = Auxiliary circuits of the PR222DS/PD, PR223DS or PR223EF electronic trip unit connected with the AUX-E auxiliary contacts.
Fig. 45 = Auxiliary circuits of the PR222DS/PD, PR223DS or PR223EF electronic trip unit connected with the auxiliary contacts AUX-E and with MOE-E type actuation unit.
Fig. 46 = Auxiliary circuits of the PR222DS/PD, PR223DS or PR223EF electronic trip unit connected with FDU front display unit and with the AUX-E auxiliary contacts.
Fig. 47 = Auxiliary circuits of the PR222MP electronic trip unit connected with PR021/K signalling unit (see note I).
Fig. 48 = Auxiliary circuits of the PR222MP electronic trip unit connected with PR021/K signalling unit and with PR212/CI type contactor control unit for motor starting (see note I).
Fig. 49 = Auxiliary circuits of the PR222MP electronic trip unit connected with PR021/K signalling unit and with PR212/CI type contactor control unit and an ABB series AF contactor (see note I).
Fig. 51 = Auxiliary circuit of the PR222MP trip unit connected to SACE PR212/CI motor starting contactor control unit and 24 V DC auxiliary supply (see note I).

Wiring diagrams
Information for reading - Circuit-breakers T7

Warning
Before installing the circuit-breaker, carefully read notes F and O on the circuit diagrams.

Operating status shown
The circuit diagram is for the following conditions:
- withdrawable circuit-breaker, open and racked-in
- circuits de-energised
- releases not tripped
- motor operating mechanism with springs discharged.

Versions
Though the diagram shows a circuit-breaker in withdrawable version, it can be applied to a fixed version circuit-breaker as well.

Fixed version
The control circuits are fitted between terminals XV (connectors X12-X13-X14-X15 are not supplied).
With this version, the applications indicated in figure 31A cannot be provided.

Withdrawable version
The control circuits are fitted between the poles of connectors X12-X13-X14-X15 (terminal box XV is not supplied).

Version without overcurrent release
With this version, the applications indicated in figures 13A, 14A, 41A, 42A, 43A, 44A, 45A, 62A cannot be provided.

Version with PR231/P or PR232/P electronic trip unit
With this version, the applications indicated in figures 41A, 42A, 43A, 44A, 45A, 62A cannot be provided.

Version with PR331/P electronic trip unit
With this version, the applications indicated in figures 42A, 43A, 44A, 45A cannot be provided.

Version with PR332/P electronic trip unit
With this version, the applications indicated in figure 41A cannot be provided.

Caption
□	= Circuit diagram figure number
*	= See note indicated by letter
A1	= Circuit-breaker accessories
A3	= Accessories applied to the fixed part of the circuit-breaker (for withdrawable version only)
A4	= Example switchgear and connections for control and signalling, outside the circuit-breaker
A13	= PR021/K signalling unit (outside the circuit-breaker)
A19	= PR330/R actuation unit
AY	= SOR TEST UNIT Test/monitoring Unit (see note R)
D	= Electronic time-delay device of the undervoltage release, outside the circuitbreaker
K51	= PR231/P, PR232/P, PR331/P, PR332/P type electronic trip unit with the following protection functions: – L overload protection with inverse long time-delay trip - setting I_1 – S short-circuit protection with inverse or definite short time-delay trip - setting I_2 – I short-circuit protection with instantaneous time-delay trip - setting I_3 – G earth fault protection with inverse short time-delay trip - setting I_4
K51/1...8	= Contacts of the PR021/K signalling unit
K51/GZin (DBin)	= Zone selectivity: input for protection G or "reverse" direction input for protection D (only with Uaux. and PR332/P trip unit)
K51/GZout (DBout)	= Zone selectivity: output for protection G or "reverse" direction output for protection D (only with and PR332/P trip unit)
K51/SZin (DFin)	= Zone selectivity: input for protection S or "direct" input for protection D (only with Uaux. and PR332/P trip unit)
K51/SZout (DFout)	= Zone selectivity: output for protection S or "direct" output for protection D (only with Uaux. and PR332/P trip unit)
K51/YC	= Closing control from PR332/P electronic trip unit with communication module PR330/D-M and PR330/R actuation unit
K51/YO	= Opening control from PR332/P electronic trip unit with communication module PR330/D-M and PR330/R actuation unit
M	= Motor for charging the closing springs
Q	= Circuit-breaker
Q/1...6	= Circuit-breaker auxiliary contacts

Wiring diagrams
Information for reading - Circuit-breakers T7

Description of figures

Fig. 1A = Motor circuit to charge the closing springs.
Fig. 2A = Circuit of shunt closing release.
Fig. 4A = Shunt opening release.
Fig. 6A = Instantaneous undervoltage release (see notes B, C and Q).
Fig. 7A = Undervoltage release with electronic time-delay device, outside the circuit-breaker (see notes B and Q).
Fig. 8A = Second shunt opening release (see note Q).
Fig. 11A = Contact for electrical signalling of springs charged or discharged.
Fig. 12A = Contact for electrical signalling of circuit-breaker open, with springs charged, and ready to close.
Fig. 13A = Contact for electrical signalling of circuit-breaker open due to tripping of the overcurrent release. The circuit-breaker may be closed only after pressing the reset pushbutton, or after energizing the coil for electronic reset (if available).
Fig. 14A = Electrical reset control.
Fig. 15A = Contact operated by the circuit-breaker rotary handle – for circuit-breakers with manual control only (see note C).
Fig. 21A = Circuit-breaker auxiliary contacts (for circuit-breakers with manual control only).
Fig. 22A = Circuit-breaker auxiliary contacts (for circuit-breakers with motor control only).
Fig. 31A = First set of contacts for electrical signalling of circuit-breaker in racked-in, test isolated, racked out position.
Fig. 41A = Auxiliary circuits of PR331/P trip unit (see note F).
Fig. 42A = Auxiliary circuits of PR332/P trip units (see notes F and N).
Fig. 43A = Circuits of the measuring module PR330/V of the PR332/P trip units internally connected to the circuit-breaker (optional).
Fig. 44A = Circuits of the measuring module PR330/V of the PR332/P trip units externally connected to the circuit-breaker (optional; see note O).
Fig. 45A = Circuits of the PR332/P trip unit with communication module PR330/D-M connected to PR330/V actuation unit (see notes E, F and N).
Fig. 46A = Circuits of the PR332/P trip unit PR330/V measuring module connected internally to the three-pole circuit-breaker with external neutral conductor (optional)
Fig. 61A = SOR TEST UNIT Test/monitoring unit (see note R).
Fig. 62A = Circuits of the PR021/K signalling module (outside the circuit-breaker).

Incompatibilities

The circuits indicated in the following figures cannot be supplied simultaneously on the same circuit-breaker:
6A - 7A - 8A
21A - 22A
41A - 42A - 45A
43A - 44A - 46A

Notes

A) The circuit-breaker is only fitted with the applications specified in the ABB SACE order confirmation. To make out the order, please consult this catalogue.

B) The undervoltage release is supplied for operation using a power supply branched on the supply side of the circuit-breaker or from an independent source. The circuit-breaker can only close when the release is energized (there is a mechanical lock on closing).

C) In conformity with the Standards governing machine tools, contacts S4 shown in Fig. 15A can be used to open the Yu undervoltage release circuit (Fig. 6A) when the circuit-breaker is open and close it again upon a manual closing command from the rotary handle.

E) For the EIA RS485 serial interface connection see document RH0298 regarding MODBUS communication.

F) The auxiliary voltage Vaux allows actuation of all operations of the PR331/P, PR332/P and trip units. Having requested a Vaux insulated from earth, one must use "galvanically separated converters" in compliance with IEC 60950 (UL 1950) or equivalent standards that ensure a common mode current or leakage current (see IEC 478/1, CEI 22/3) not greater than 3.5 mA, IEC 60364-41 and CEI 64-8.

G) Earth fault protection is available with the PR332/P trip unit by means of a current sensor located on the conductor connecting to earth the star centre of the MV/LV transformer.
The connections between terminals 1 and 2 (or 3) of current transformer UI/O and poles T7 and T8 of the X (or XV) connector must be made with a two-pole shielded and stranded cable (see user manual), no more than 15 m long. The shield must be earthed on the circuit-breaker side and current sensor side.

N) With PR332/P trip unit, the connections to the zone selectivity inputs and outputs must be made with a two-pole shielded and stranded cable (see user manual), no more than 300 m long. The shield must be earthed on the selectivity input side.

Wiring diagrams
Information for reading - ATS021-ATS022 for T3-T4-T5-T6-T7

State of operation represented

The diagram indicates the following conditions:

- circuit-breakers off and connected #
- circuits de-energized
- overcurrent relays not tripped *
- motor operator with charged springs (for T4-T5-T6 circuit-breakers)
- closing springs charged (for T7-X1-EMAX circuit-breakers).

The diagram indicates circuit-breakers in plug-in or withdrawable version but it may be applied also to circuit-breakers in fixed version: in this case it's not necessary connect S75I/1 contacts to the input X31:1 of ATS021 device or it's necessary connect the terminals X32:5 and X32:6 to the terminal X32:9 of ATS022 device.

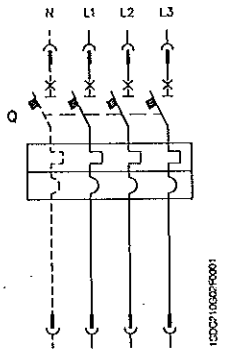
* The diagram indicates circuit-breakers equipped with overcurrent relay but it may be applied also to circuit-breakers without overcurrent relay (switch-disconnectors). If SY (or S51) contact is not foreseen it's necessary not consider SY /or S51) contacts to the input X31:1 of ATS021 device or it's necessary connect the terminals X32:7 and X32:8 to the terminal X32:9 of AT022 device.

Caption

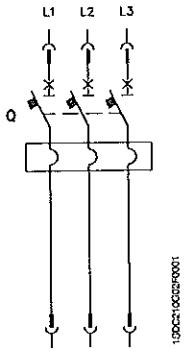
A	=	Devices type ATS021 and ATS022 for the automatic transfer switch of two circuit-breakers
A16	=	Solenoid operating mechanism (for T3 circuit-breakers)
A17	=	Unit for M motor electrical latching (for T4-T5-T6 circuit-breakers)
CB1-N	=	Circuit-breakers for normal supply line
CB2-E	=	Circuit-breakers for emergency supply line
K1	=	Auxiliary contactor type NF22E for the normal supply voltage presence
K2	=	Auxiliary contactor type NF22E for the emergency supply voltage presence
KC1-KC2	=	Auxiliary contactors type AL__-30 for circuit-breakers closing
KO1-KO2	=	Auxiliary contactors type AL__-30 for circuit-breakers opening
M	=	Closing springs charging motor (for T7-X1-EMAX circuit-breakers)
M	=	Motor for opening the circuit-breaker and loading the closing springs of the circuit-breaker (for T4-T5-T6 circuit-breakers)
Q/1	=	Circuit-breaker auxiliary contact
Q60	=	Miniature breaker with thermomagnetic overcurrent relay for isolation and protection of safety auxiliary voltage supply circuit
Q61/1-2	=	Miniature breakers with thermomagnetic overcurrent relay for isolation and protection of the lines auxiliary circuits
S11	=	Contact for the automatic transfer enabling in the ATS021 device
S11...S15	=	Contacts for the ATS022 device inputs
S1-S2	=	Contacts controlled by the cam of the motor operator
S3	=	Change-over contact for electrical signalling of local/remote selector status
S33M/1	=	Limit contact for spring-charging motor
S51	=	Contact for electrical signalling of circuit-breaker open due to tripping of the overcurrent trip unit
S75I/1	=	Contact signalling circuit-breaker connected #
SY	=	Contact signalling circuit-breaker tripped through releases operation (tripped position) *
W1	=	Serial interface with control system (MODBUS EIA RS485 interface) available with ATS022 device
X	=	Delivery connector for the auxiliary circuits of EMAX withdrawable version circuit-breaker
X12-X15	=	Delivery connectors for the auxiliary circuits of T7-X1 withdrawable version circuit-breaker
X2-XA..	=	Connectors for T3-T4-T5-T6 circuit-breakers auxiliary circuits
XF	=	Delivery terminal board for the position contacts of the circuit-breaker
XV	=	Delivery terminal board for the auxiliary circuits of T7-X1-EMAX fixed circuit-breakers
XV	=	Terminal boxes of the applications (for T3-T4-T5-T6 circuit-breakers)
YC	=	Closing release
YO	=	Opening release

Wiring diagrams
Wiring diagram of the T1...T6 circuit-breakers

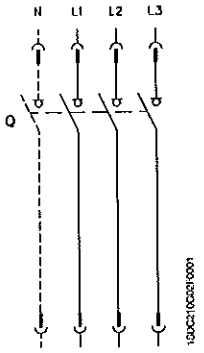
State of operation



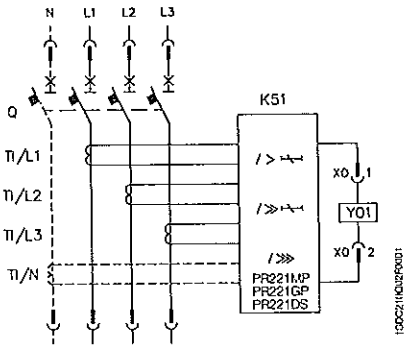
Three-pole or four-pole circuit-breaker with thermomagnetic trip unit



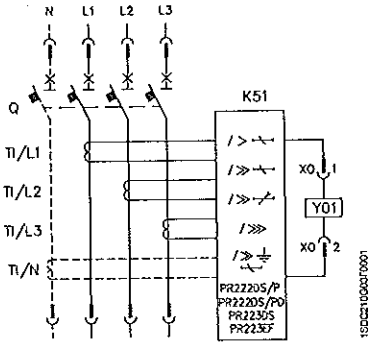
Three-pole circuit-breaker with magnetic trip unit



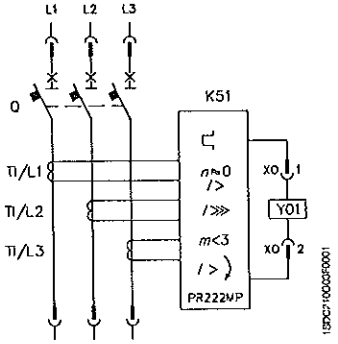
Three-pole or four-pole switch-disconnector (on-load isolating switch)



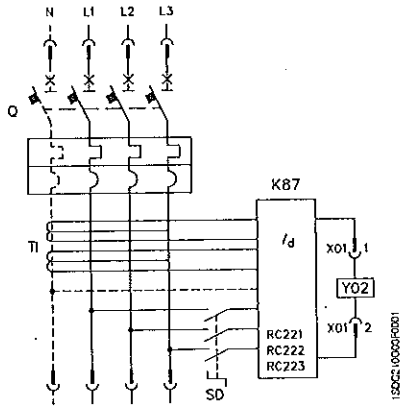
Three-pole or four-pole circuit-breaker with PR221 electronic trip unit



Three-pole or four-pole circuit-breaker with PR222DS/P, PR222DS/PD, PR223DS or PR223EF electronic trip unit (for T4, T5 and T6)



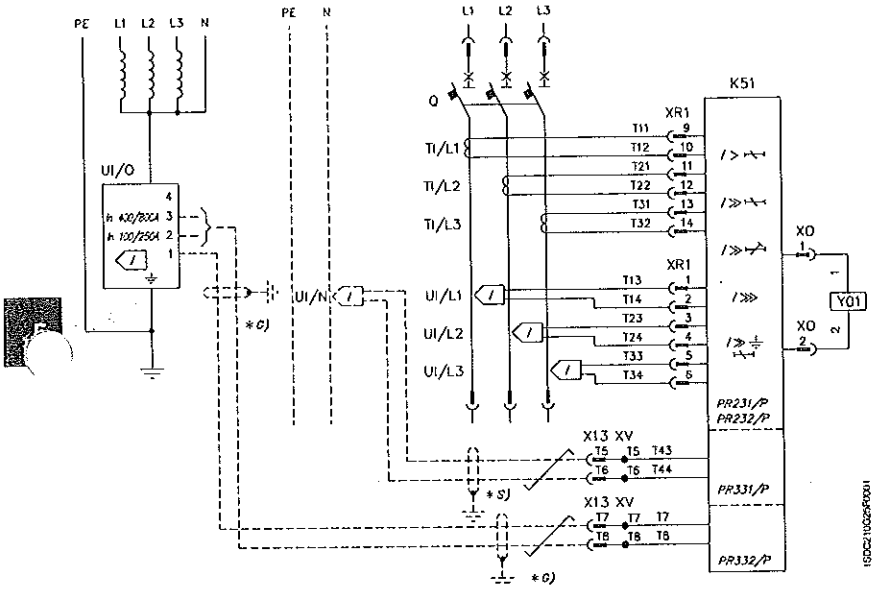
Three-pole circuit-breaker with PR222MP electronic trip unit



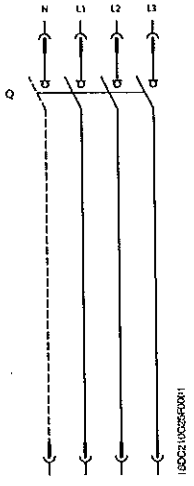
Three-pole or four-pole circuit-breaker with RC221, RC222 or RC223 residual current trip unit

Wiring diagrams
Wiring diagram of the T7 circuit-breakers

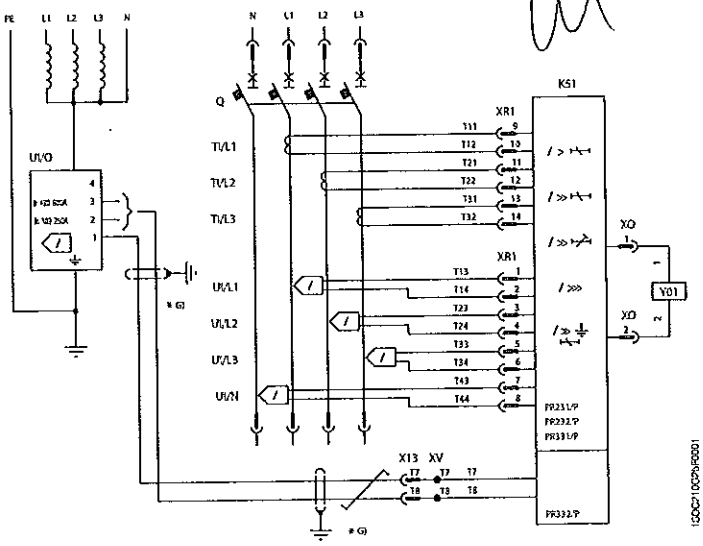
State of operation



Three-pole circuit-breaker with PR231/P, PR232/P, PR331/P, PR332/P electronic trip unit



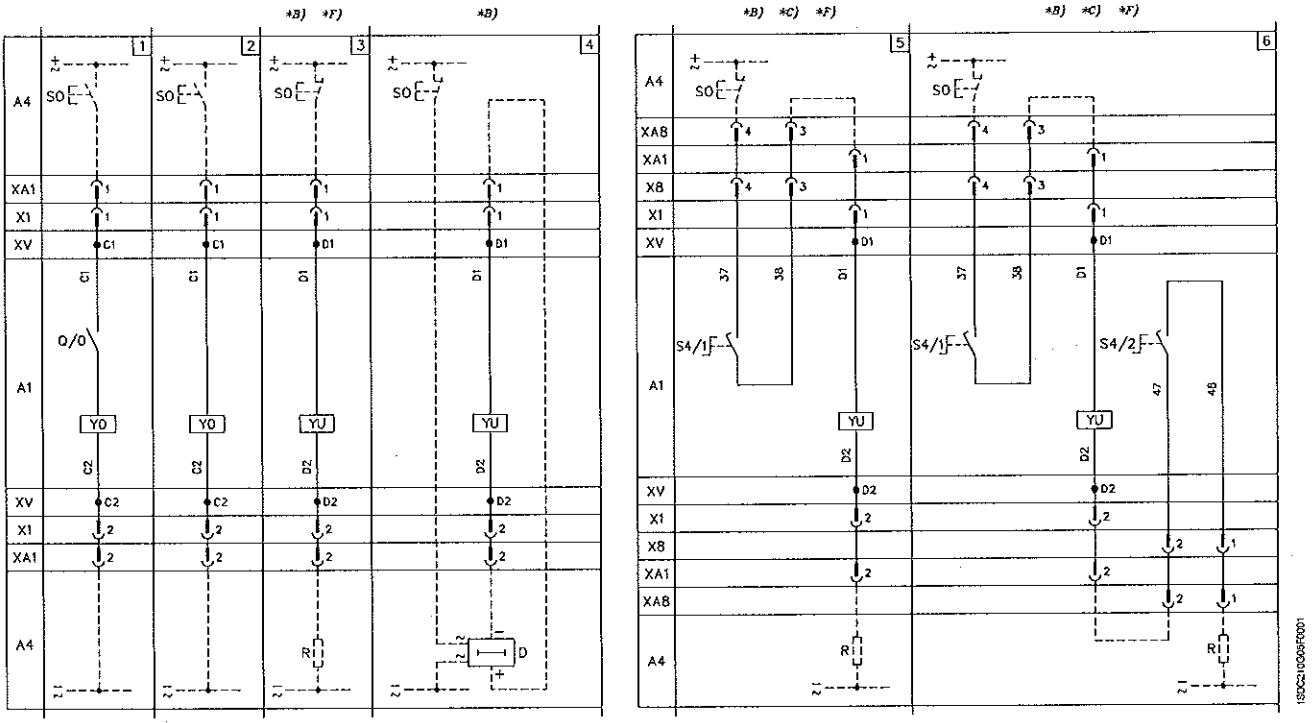
Three- or four-pole switch-disconnector



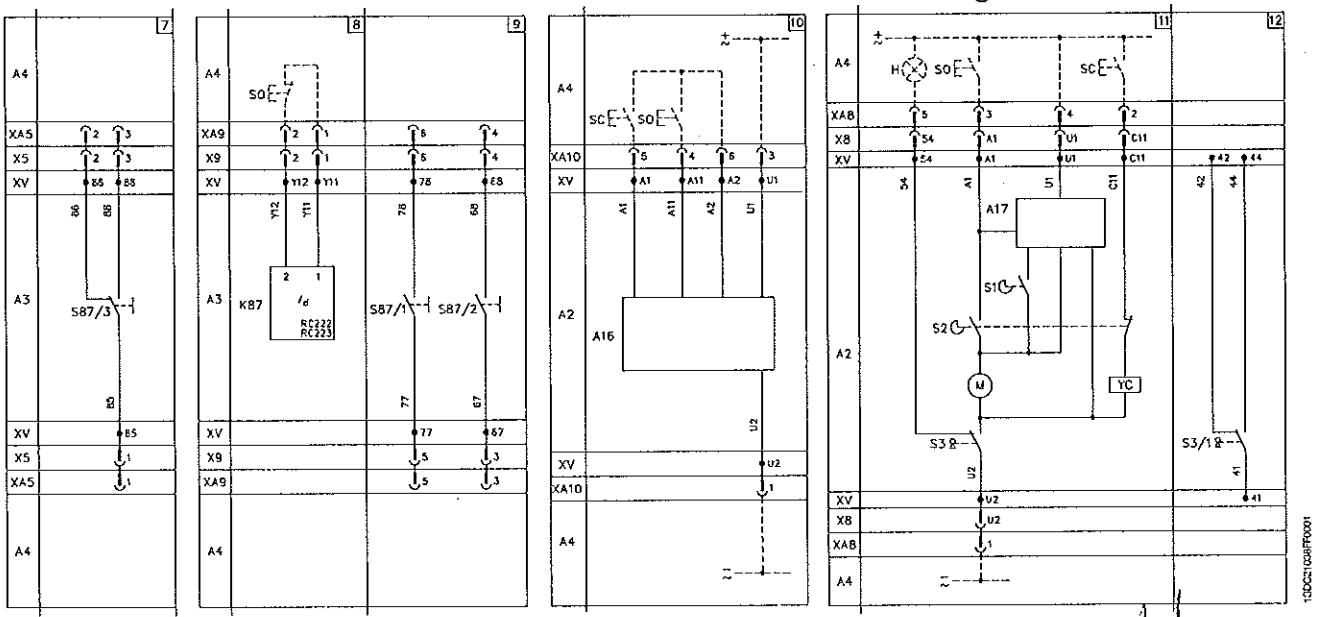
Four-pole circuit-breaker with PR231/P, PR232/P, PR331/P, PR332/P electronic trip unit

Wiring diagrams
Electrical accessories for T1...T6

Shunt opening and undervoltage releases

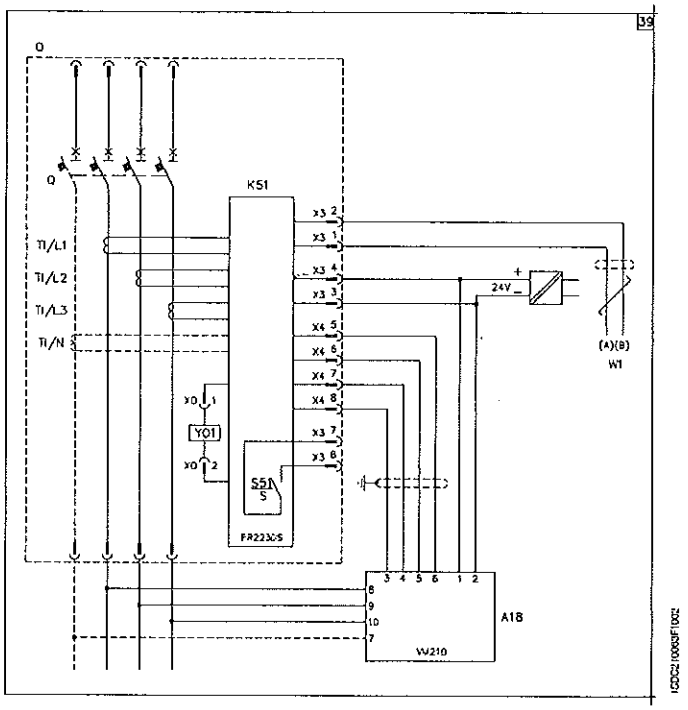


Residual current releases and remote controls

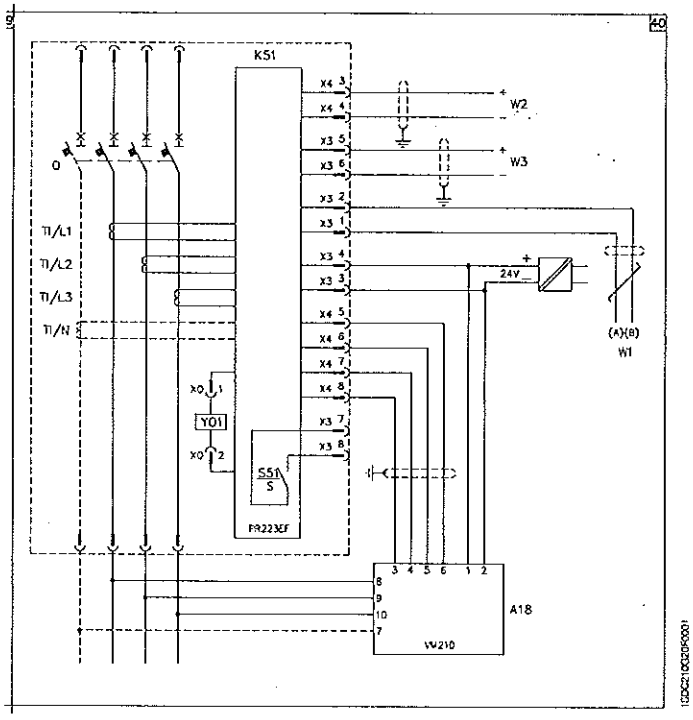


Wiring diagrams
Electrical accessories for T1...T6

PR223DS electronic trip unit connected with the VM210 voltage measuring device

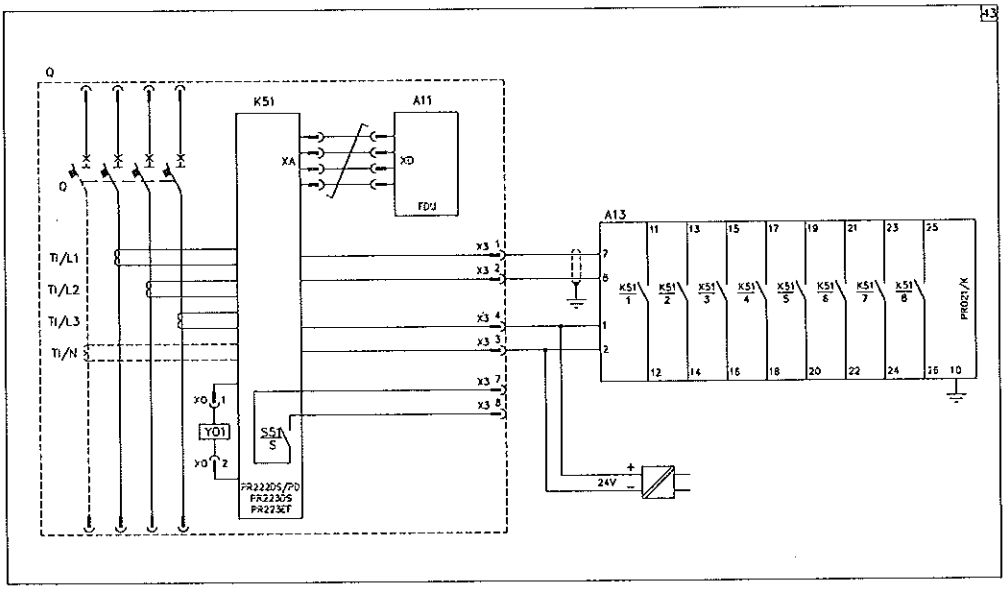


PR223EF electronic trip unit connected with the VM210 voltage measuring device

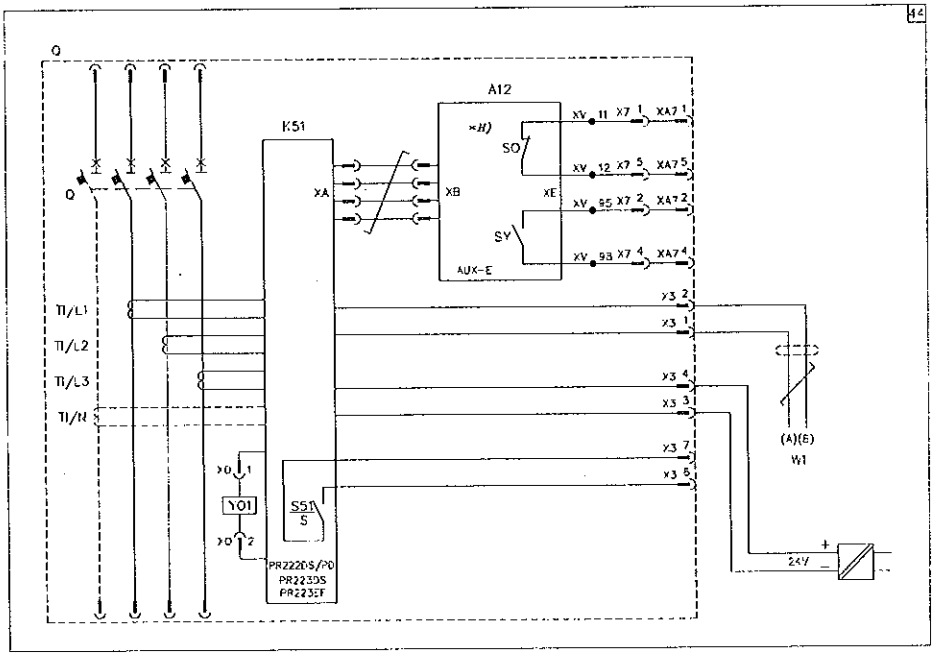


Wiring diagrams
Electrical accessories for T1...T6

PR222DS/PD, PR223DS or PR223EF electronic trip unit connected with the FDU front display unit and the PR021/K signalling unit

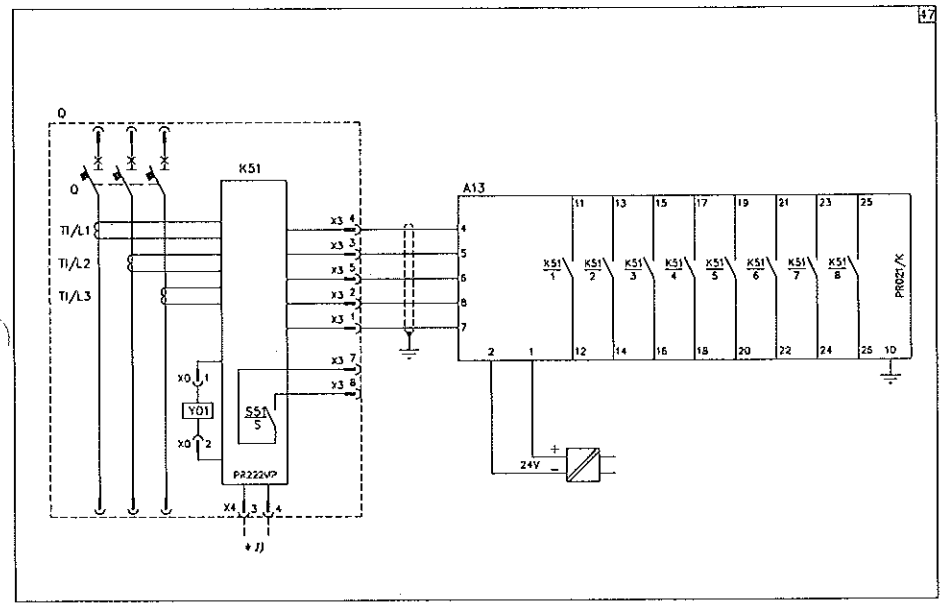


PR222DS/PD, PR223DS or PR223EF electronic trip unit connected with the AUX-E auxiliary contacts

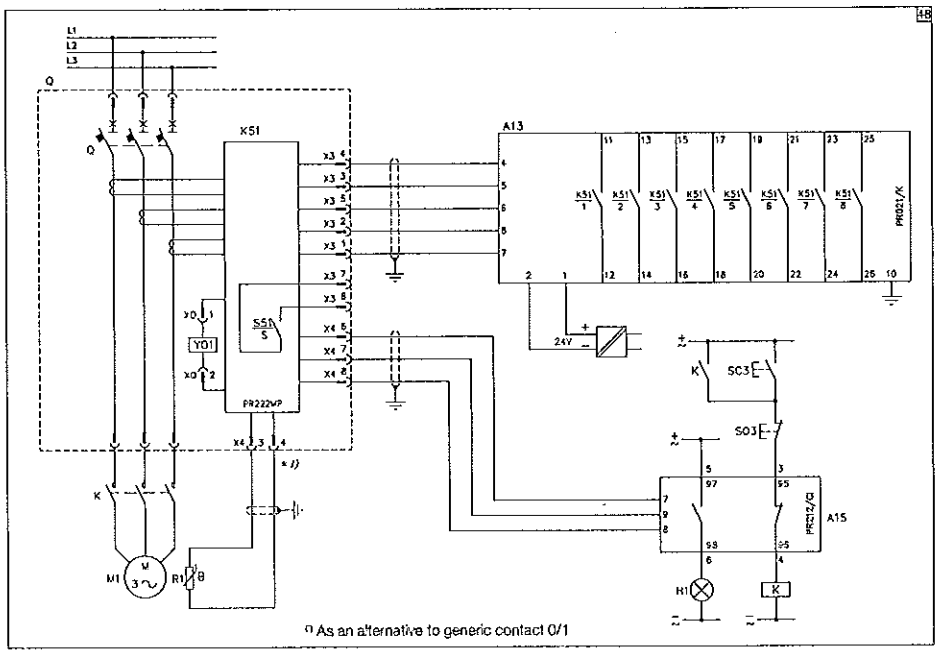


Wiring diagrams
Electrical accessories for T1...T6

PR222MP electronic trip unit connected with the PR021/K signalling unit



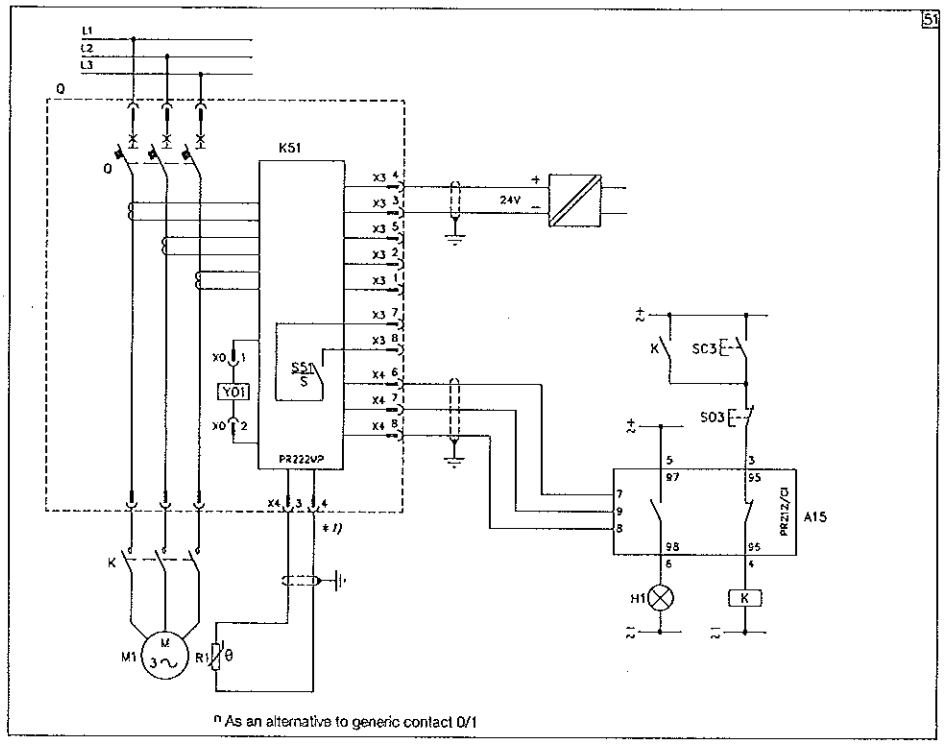
PR222MP electronic trip unit connected with the PR021/K signalling unit and with the PR212/CI contactor control unit



*) As an alternative to generic contact Q/1

Wiring diagrams
Electrical accessories for T1...T6

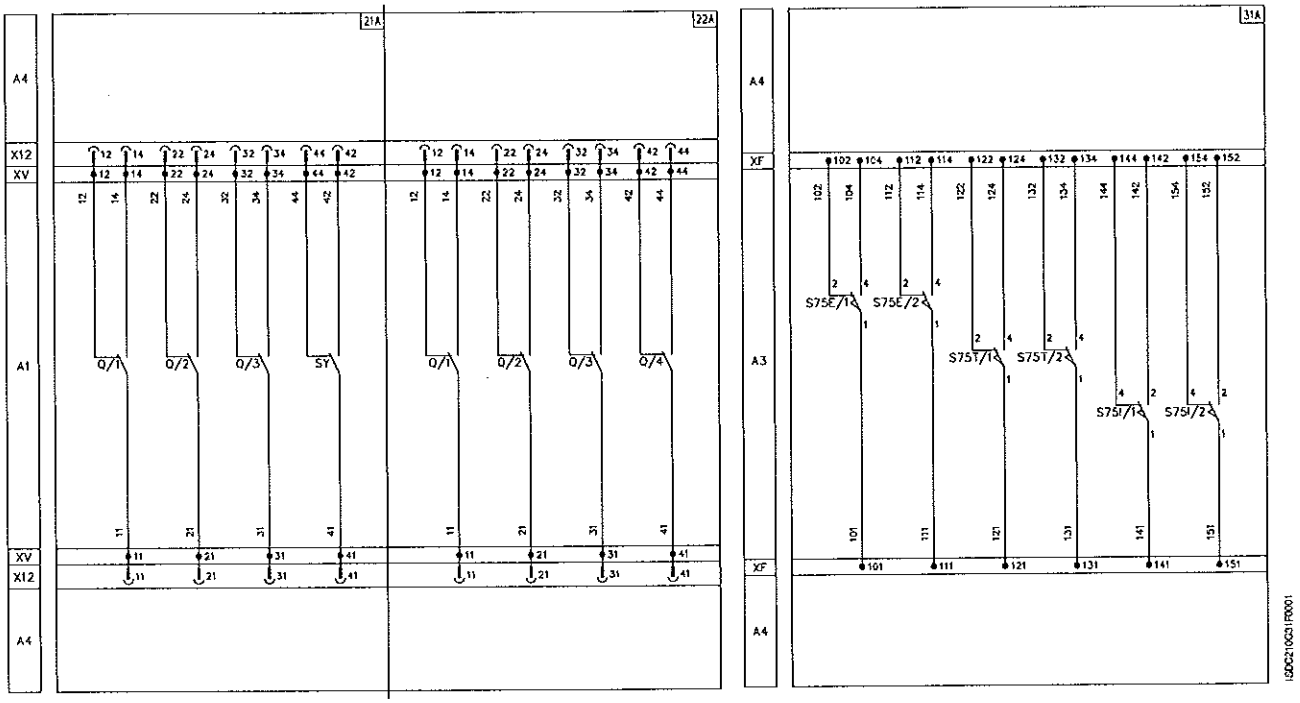
PR222MP electronic trip unit with auxiliary power supply and PR212/CI contactor control unit



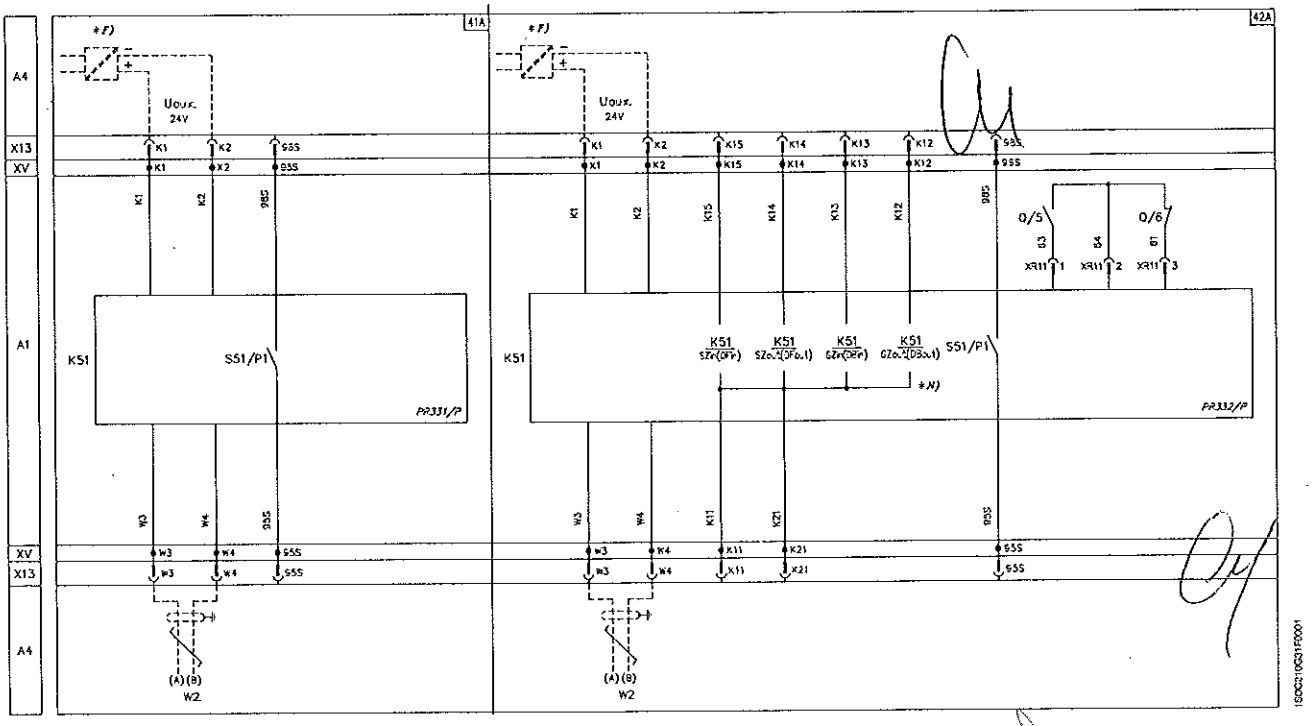
n) As an alternative to generic contact Q/1

Wiring diagrams
Electrical accessories for T7

Signalling contacts

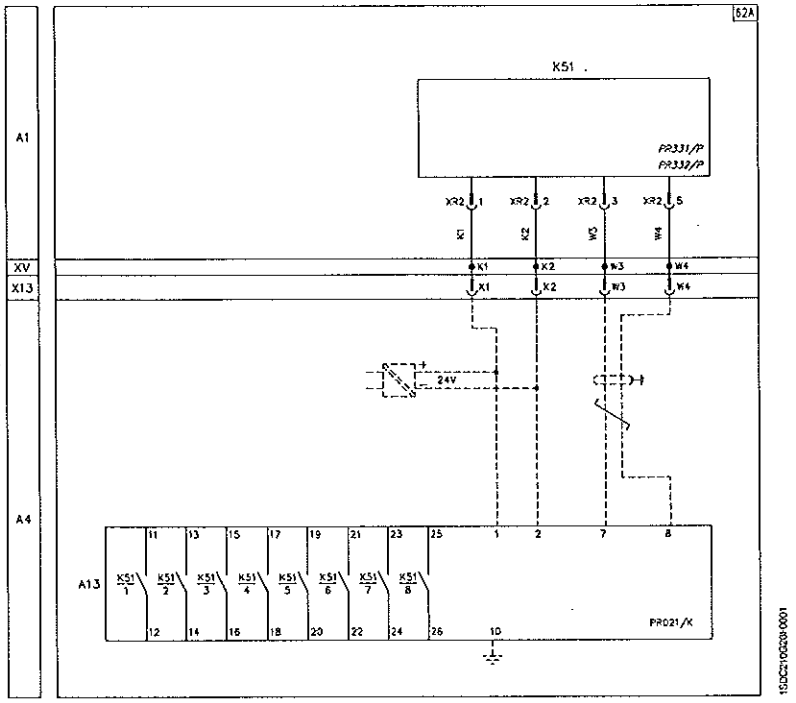


Auxiliary circuits of the PR331/P and PR332/P trip units



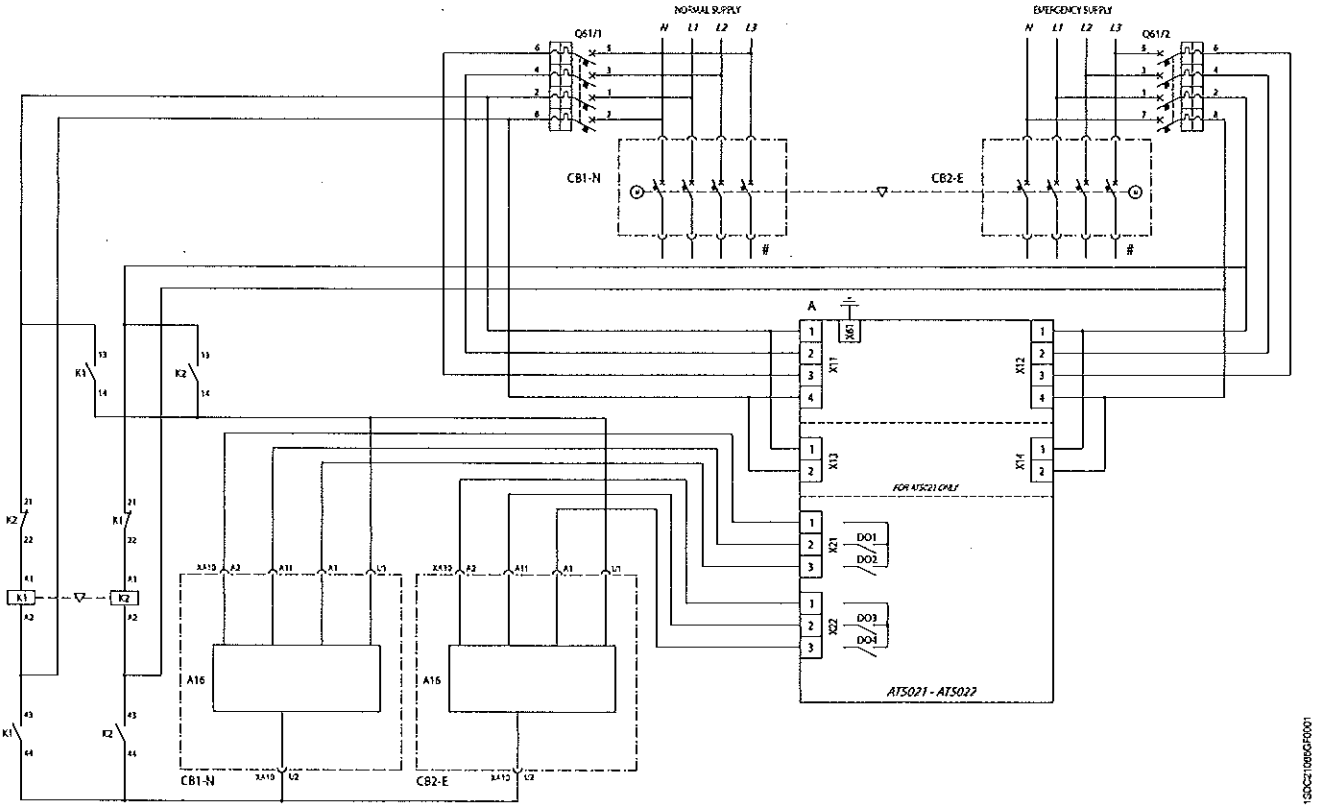
Wiring diagrams
Electrical accessories for T7

PR021/K signalling unit for PR331/P and PR332/P



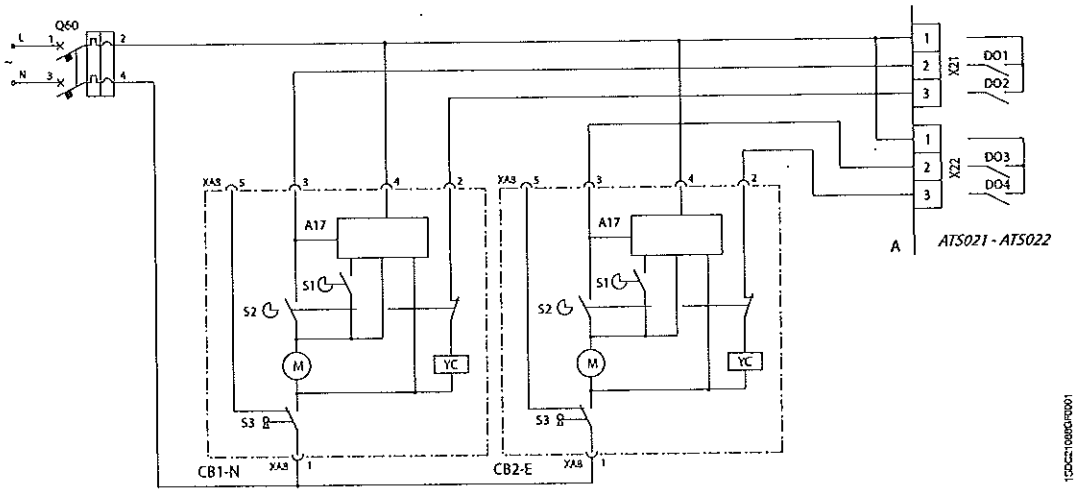
Wiring diagrams
Automatic transfer-switch ATS021-ATS022 for T3-T4-T5-T6

ATS021-ATS022 device for the automatic transfer switch of two T3 circuit-breakers without safety auxiliary voltage supply

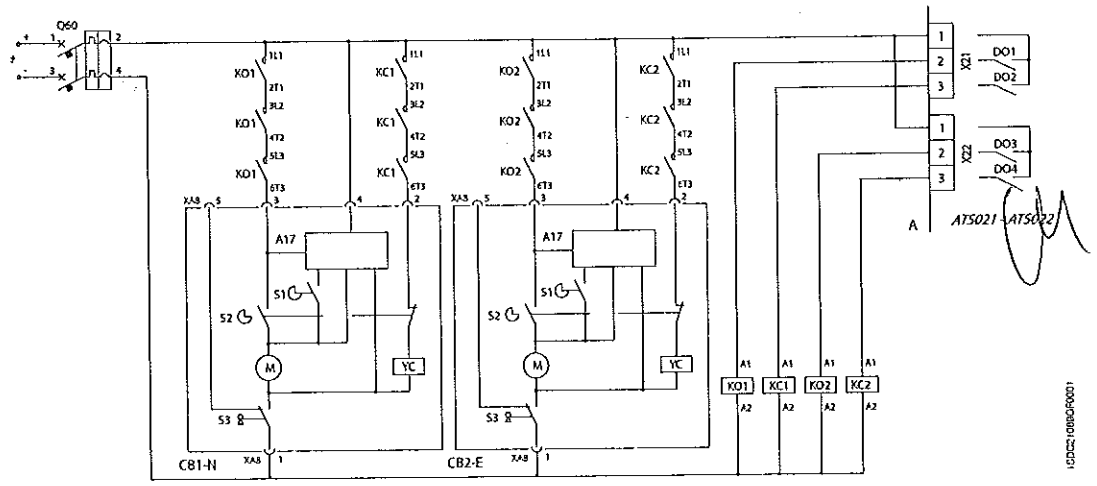


Wiring diagrams
Automatic transfer-switch ATS021-ATS022 for T3-T4-T5-T6

ATS021-ATS022 device for the automatic transfer switch of two T4-T5-T6 circuit-breakers with safety auxiliary voltage supply in alternating current (AC)

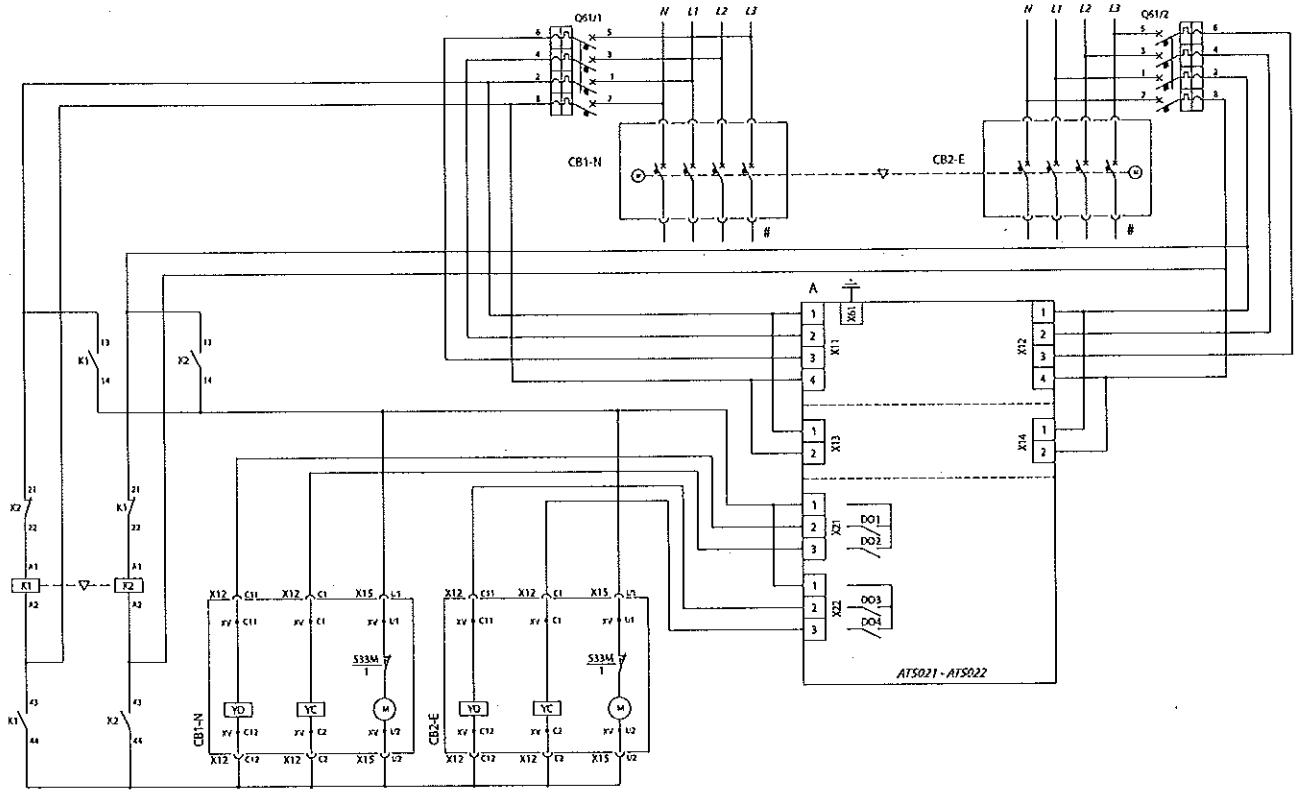


ATS021-ATS022 device for the automatic transfer switch of two T4-T5-T6 circuit-breakers with safety auxiliary voltage supply in direct current (DC)



Wiring diagrams
Automatic transfer-switch ATS021-ATS022 for T7

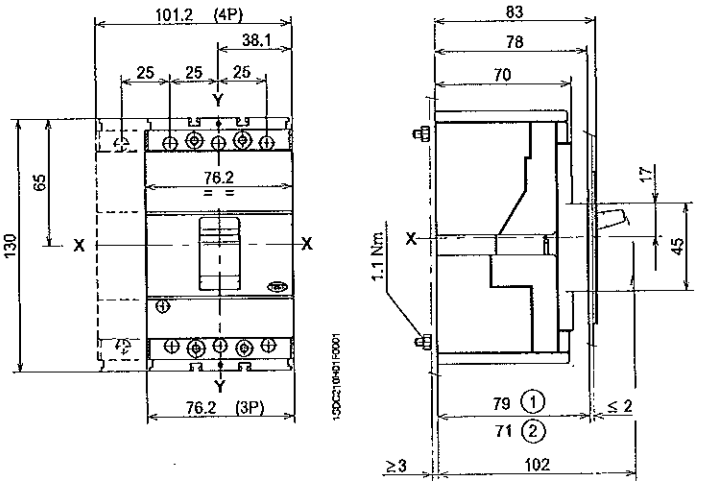
Automatic transfer-switch ATS021-ATS022 for the automatic transfer switch of the two T7 circuit-breakers, without safety auxiliary voltage supply



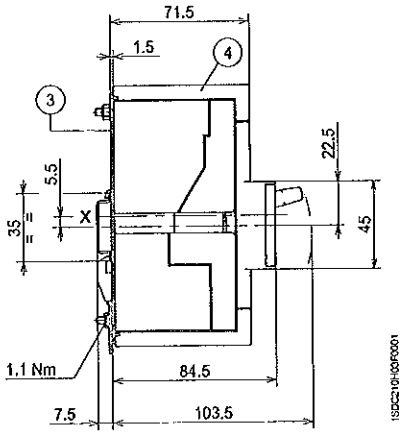
Overall dimensions
Tmax T1 and single-pole Tmax T1

Fixed circuit-breaker

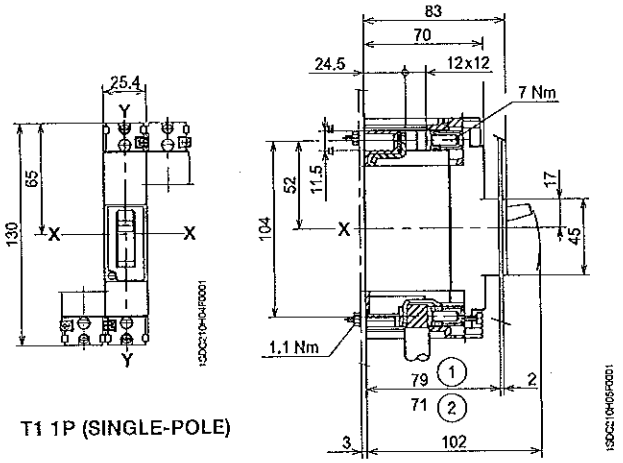
Fixing on sheet



Fixing on DIN EN 50022 rail

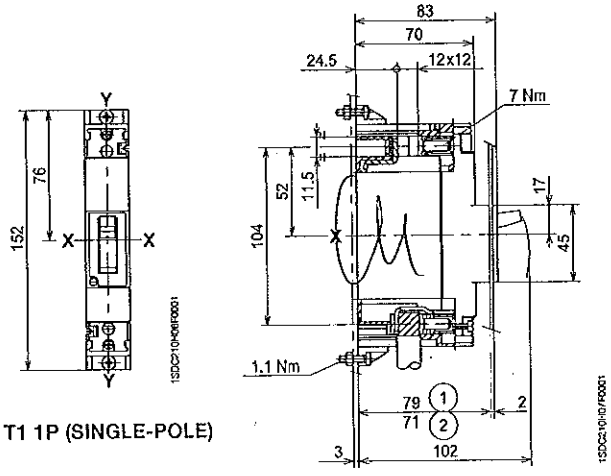


Without inserts



T1 1P (SINGLE-POLE)

With inserts



T1 1P (SINGLE-POLE)

Caption

(1) Depth of the switchboard in the case of circuit-breaker with face not extending from the compartment door, with or without flange

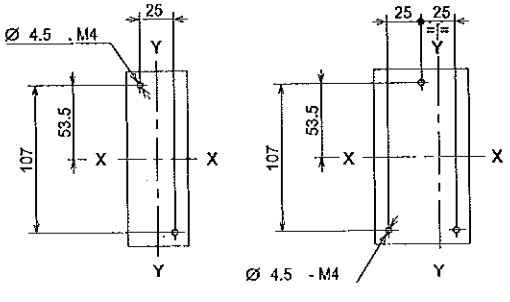
(2) Depth of the switchboard in the case of circuit-breaker with face extending from the compartment door, without flange

(3) Bracket for fixing onto rail

(4) Bottom terminal covers with IP40 degree of protection

Drilling templates for support sheet

For front terminals

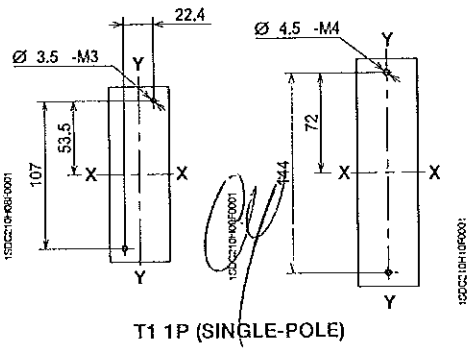


3 POLES

4 POLES

Without inserts

With inserts

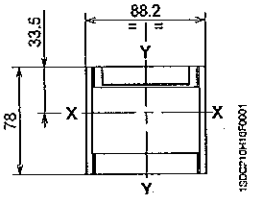


T1 1P (SINGLE-POLE)

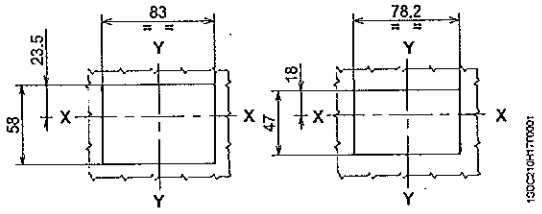
Overall dimensions
Tmax T1 and single-pole Tmax T1

Terminals

Flange for the compartment door

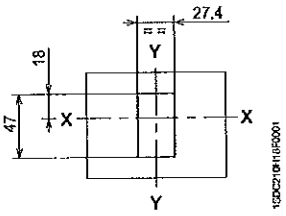


Drilling templates of the compartment door

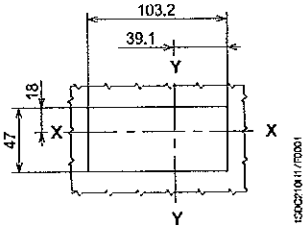


With flange and circuit-breaker face flush with door (3-4 POLES)

Without flange and circuit-breaker face flush with door (3-4 POLES) or extending (3 POLES)



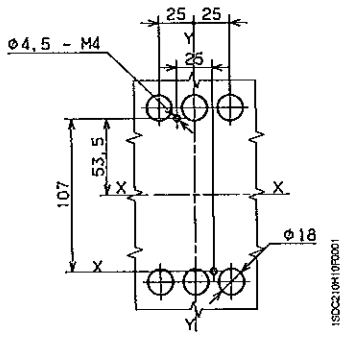
(SINGLE-POLE)



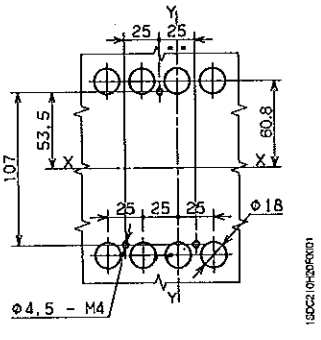
Without flange and circuit-breaker face extending (4 POLES)

Drilling templates for support sheet

For rear terminals



3 POLES

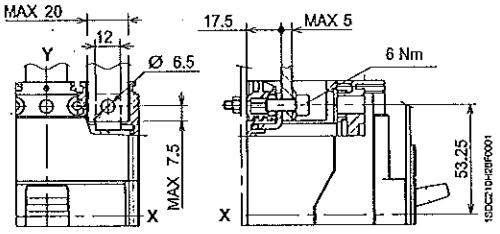


4 POLES

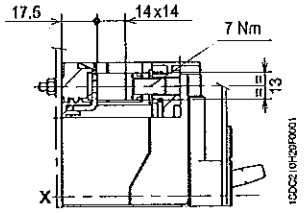
Overall dimensions
Tmax T2

Terminals

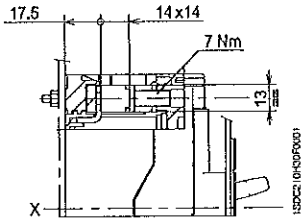
Front - F



Front for copper cables - FC Cu



Front for copper/aluminium cables - FC CuAl 95 mm²



Caption

(1) Front extended terminals

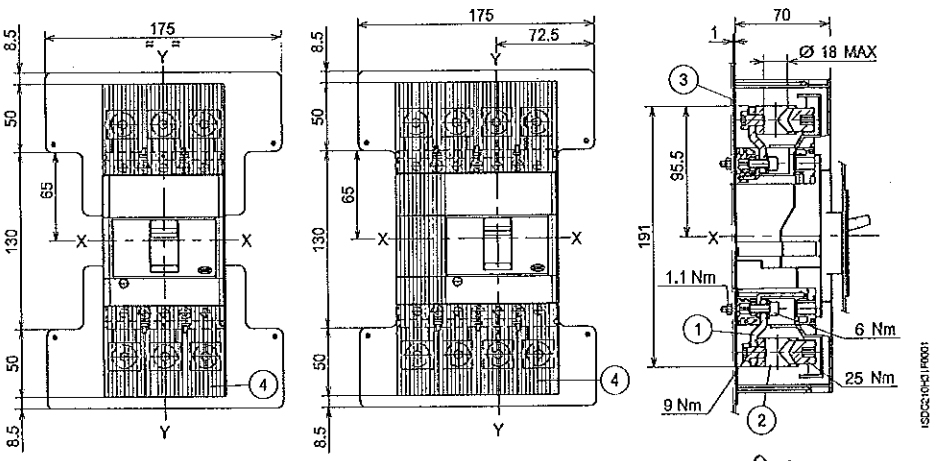
(2) Front terminals for cables 185 mm² CuAl

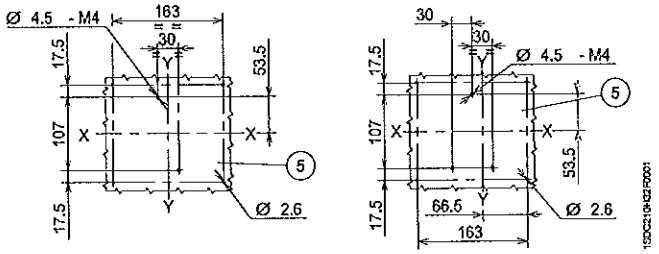
(3) Insulating courtse plate (compulsory)

(4) High terminal covers with degree of protection IP40 (compulsory)

(5) Drilling templates for support sheet

Front for copper/aluminium cables - FC CuAl 185 mm²





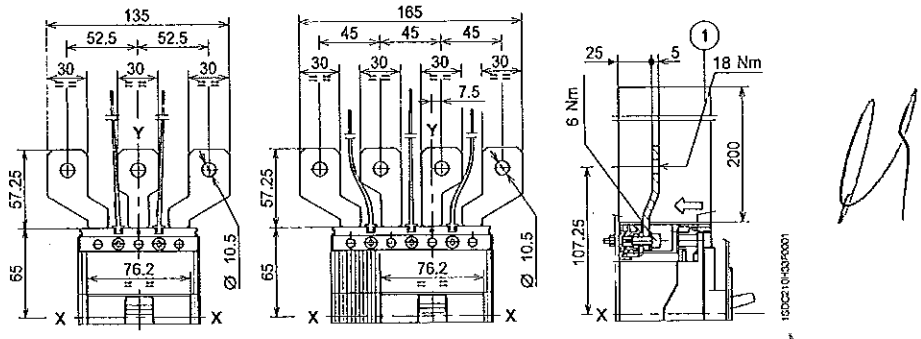
3 POLES

4 POLES

Caption

(1) Insulating barriers between phases (compulsory)

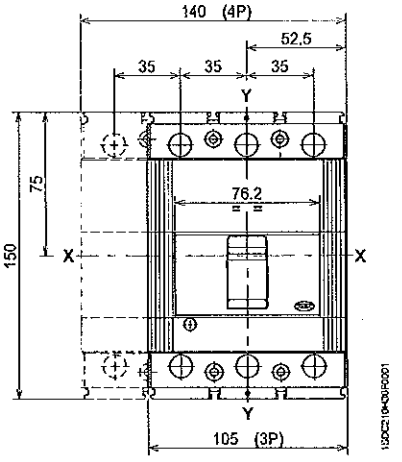
Front extended spread - ES

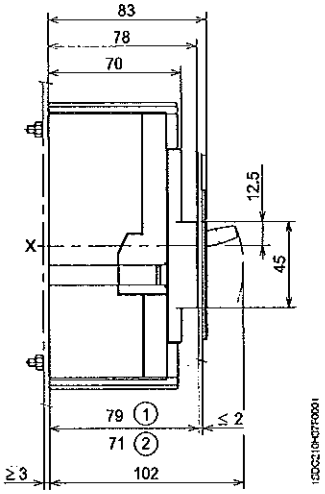


Overall dimensions
Tmax T3

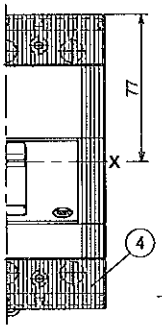
Fixed circuit-breaker

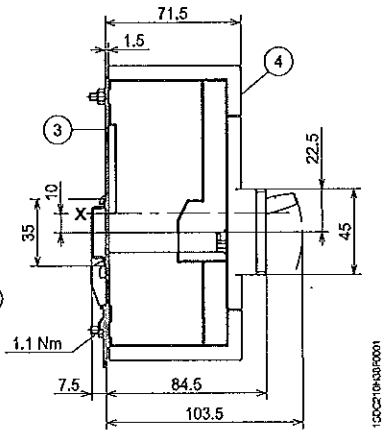
Fixing on sheet





Fixing on DIN EN 50022 rail





Caption

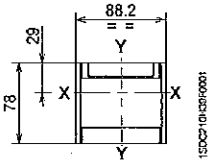
(1) Depth of the switchboard in the case of circuit-breaker with face not extending from the compartment door, with or without flange

(2) Depth of the switchboard in the case of circuit-breaker with face extending from the compartment door

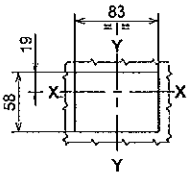
(3) Bracket for fixing on rail

(4) Low terminal covers with degree of protection IP40

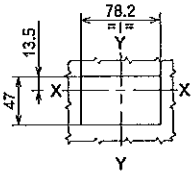
Flange for compartment door



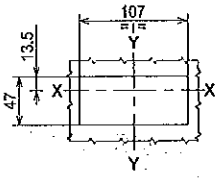
Drilling templates of the compartment door



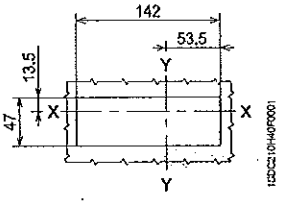
With flange and circuit-breaker face flush with door (3-4 POLES)



Without flange and circuit-breaker face flush with door (3-4 POLES)



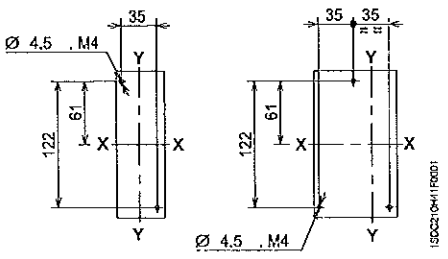
Without flange and circuit-breaker face extending (3 POLES)



Without flange and circuit-breaker face extending (4 POLES)

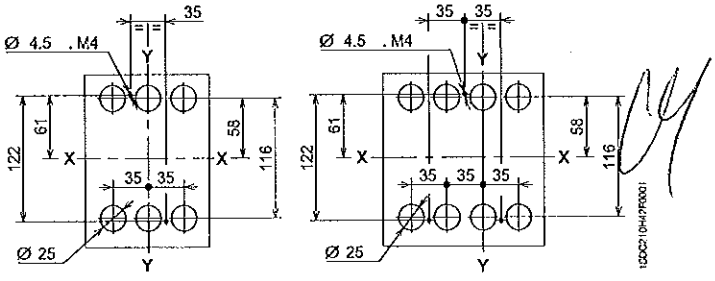
Drilling templates for support sheet

For front terminals



3 POLES 4 POLES

For rear terminals



3 POLES 4 POLES

Overall dimensions
Tmax T3

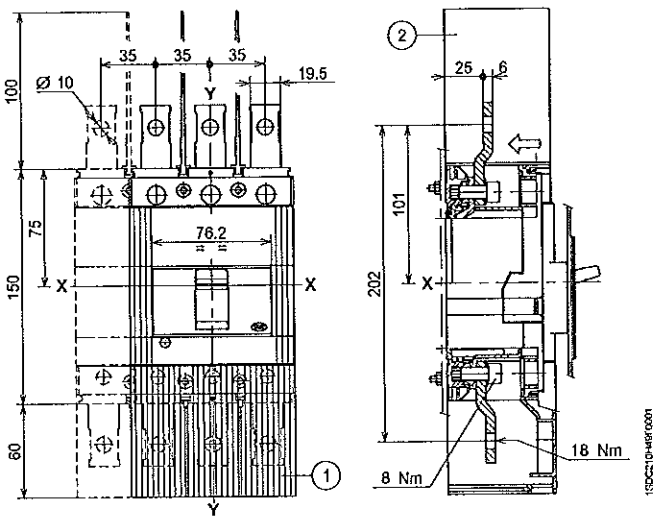
Terminals

Caption

(1) High terminal covers with degree of protection IP40

(2) Insulating barriers between phases (compulsory without 1)

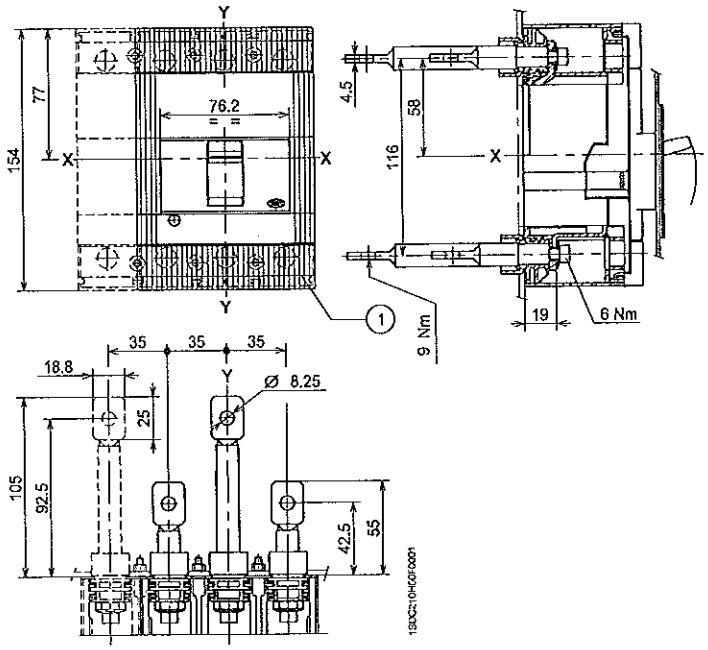
Front extended - EF



Caption

(1) Low terminal covers with degree of protection IP40

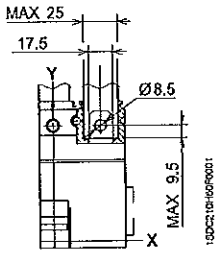
Rear horizontal - R

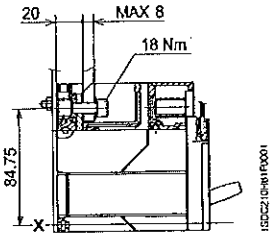


Overall dimensions
Tmax T4

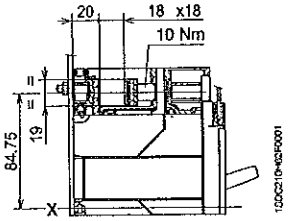
Terminals

Front - F

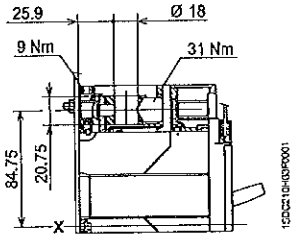


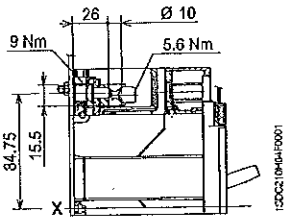


Front for copper cables - FC Cu



Front for copper/aluminium cables - FC CuAl





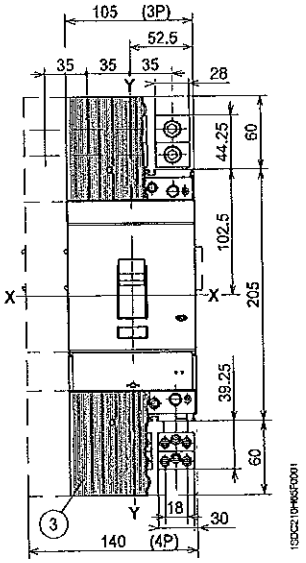
Caption

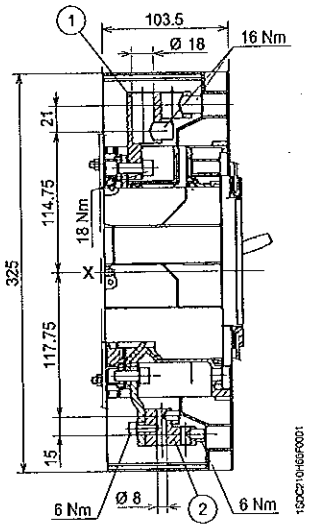
(1) Front terminals for cable connection 2x150 mm²

(2) Front terminals for multicable connection

(3) High terminal covers with degree of protection IP40

Front multicable - MC

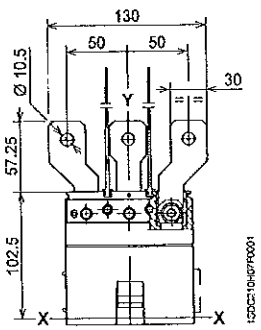


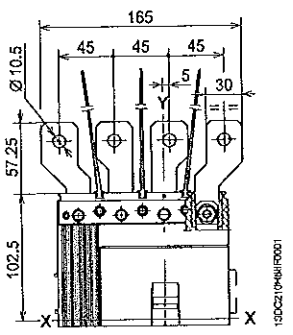


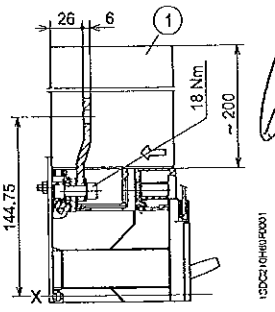
Caption

(1) Insulating barriers between phases (compulsory)

Front extended spread - ES







Overall dimensions
Tmax T5

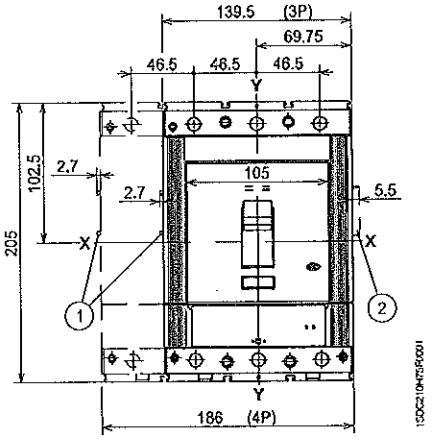
Fixed circuit-breaker

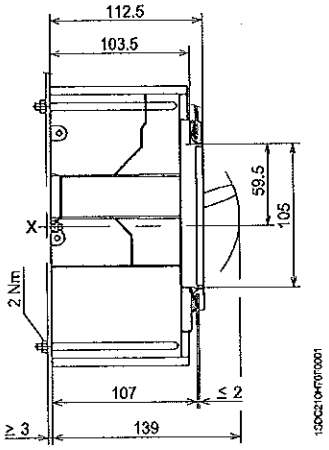
Caption

(1) Overall dimensions with cabled accessories mounted (SOR-C, UVR-C, RC222)

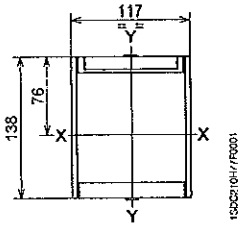
(2) Overall dimensions with cabled auxiliary contacts mounted (only 3Q 1SY)

Fixing on sheet

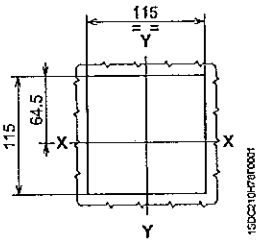




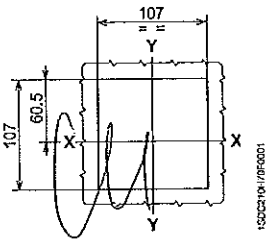
Flange for compartment door



Drilling templates of the compartment door



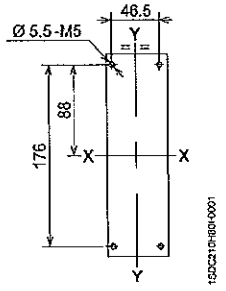
With flange
(3-4 POLES)



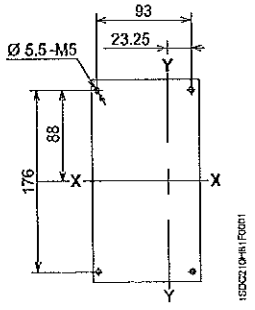
Without flange
(3-4 POLES)

Drilling templates for support sheet

For front terminals

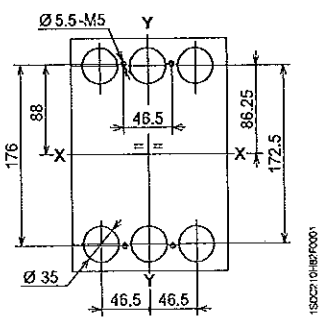


3 POLES

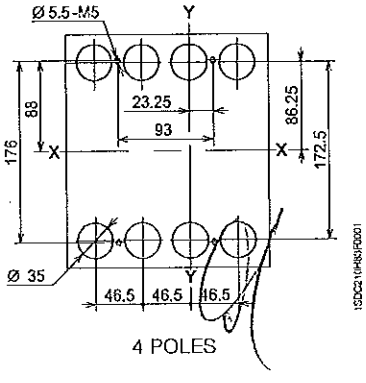


4 POLES

For rear terminals



3 POLES



4 POLES

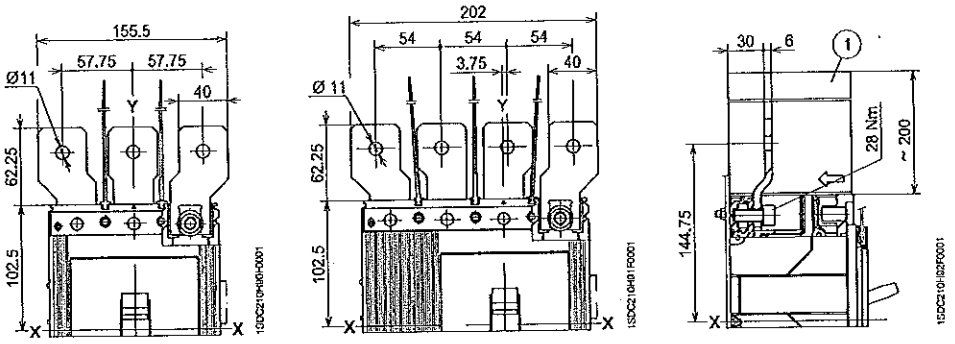
Overall dimensions
Tmax T5

Terminals

Caption

(1) Insulating barriers between phases (compulsory)

Front extended spread - ES



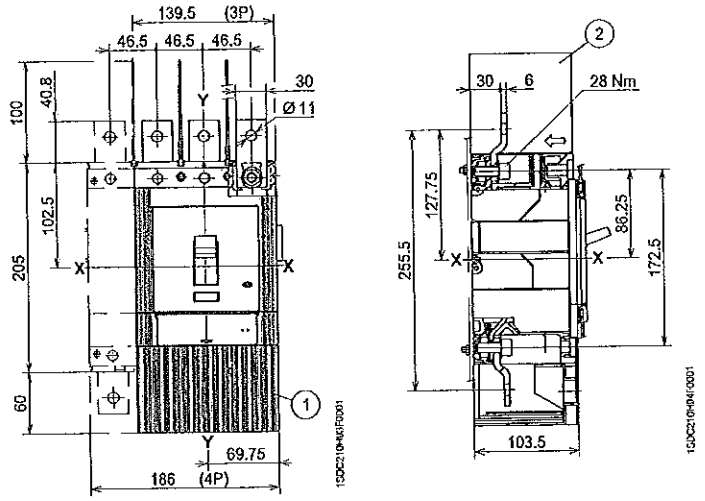
6

Caption

(1) High terminal covers with degree of protection IP40

(2) Insulating barriers between phases (compulsory without 1)

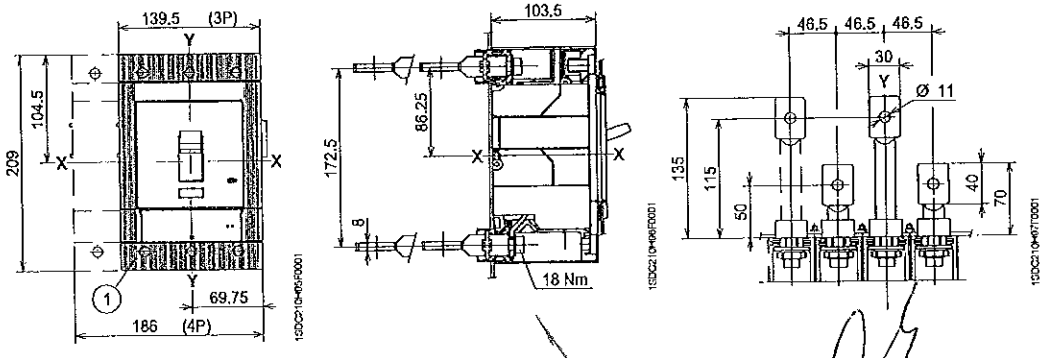
Front extended - EF



Caption

(1) Low terminal covers with degree of protection IP40

Rear horizontal - R

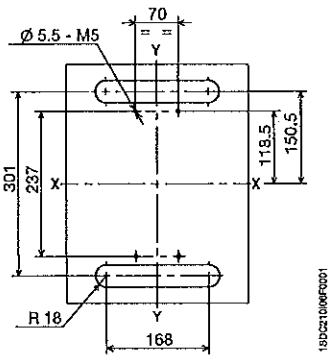


Overall dimensions
Tmax T6

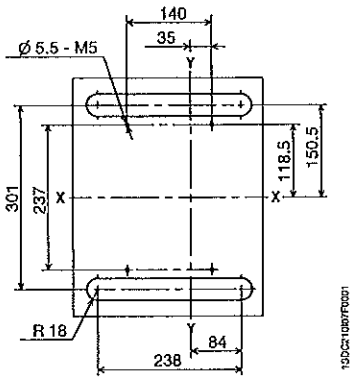
Fixed circuit-breaker

Drilling templates for support sheet

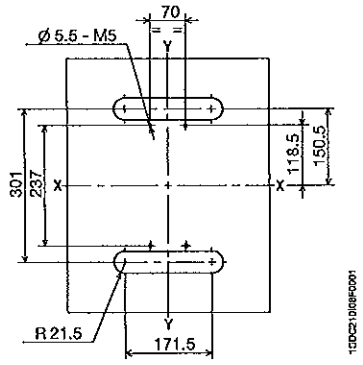
For rear terminals for copper/aluminium cables - RC CuAl



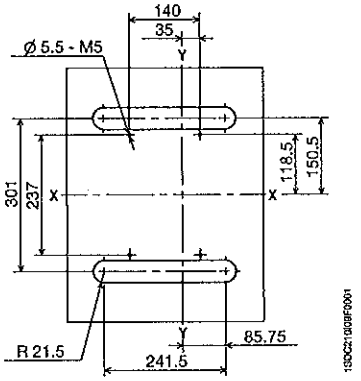
630 A (3 POLES)



630 A (4 POLES)

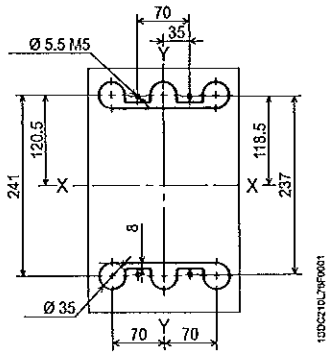


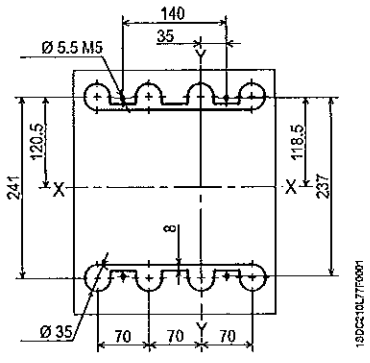
800 A (3 POLES)



800 A (4 POLES)

For rear terminals - R

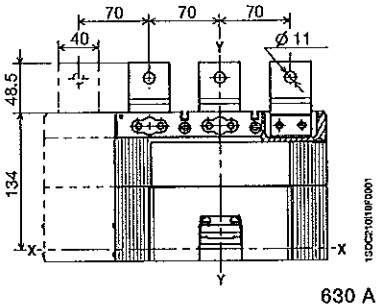


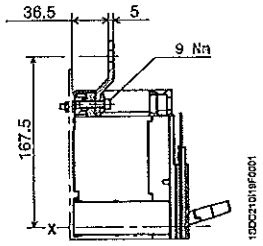


Overall dimensions
Tmax T6

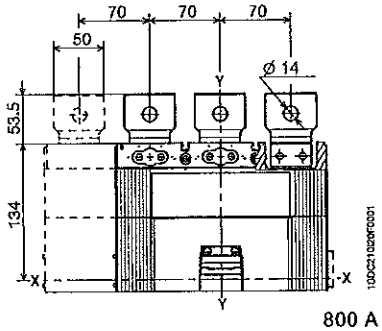
Terminals

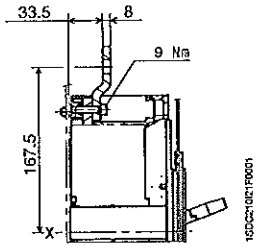
Front extended - EF



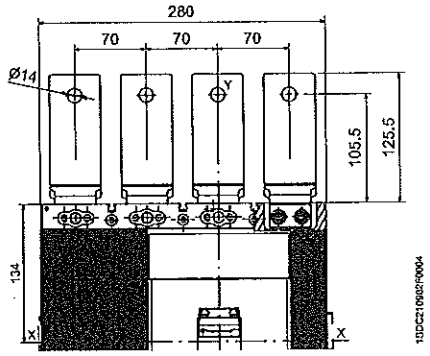


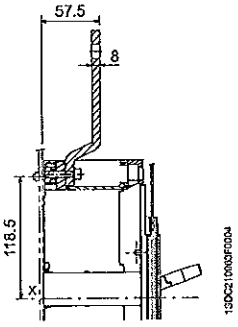
630 A





800 A



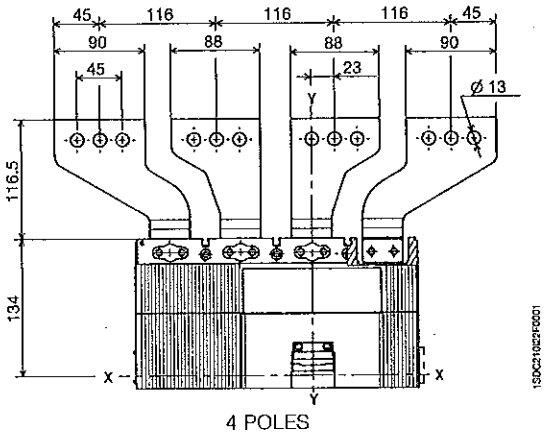


1000 A

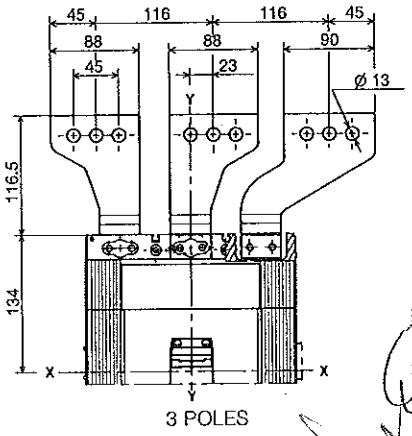
Caption

(1) Insulating barriers between phases (compulsory)

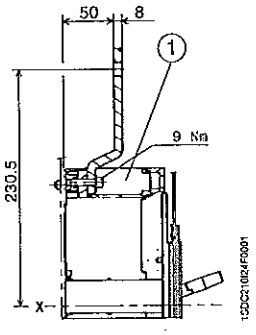
Front extended spread - ES



4 POLES



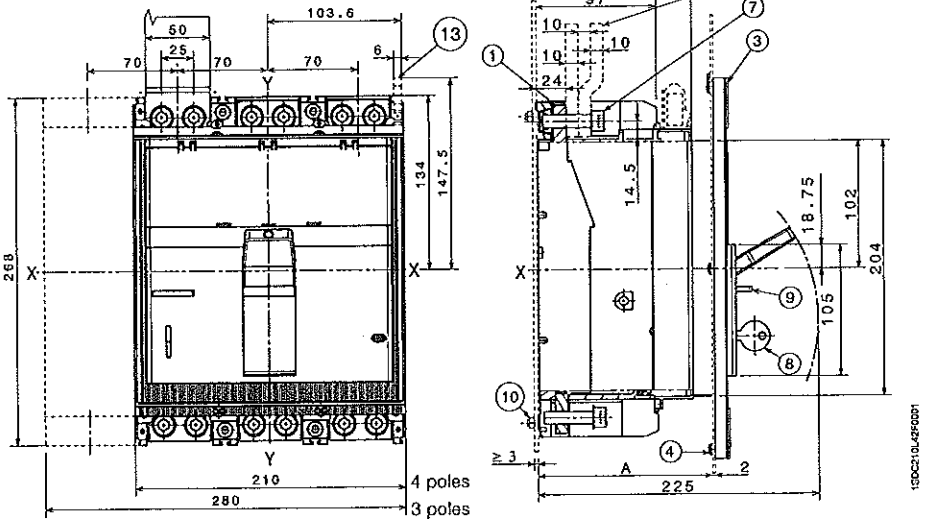
3 POLES

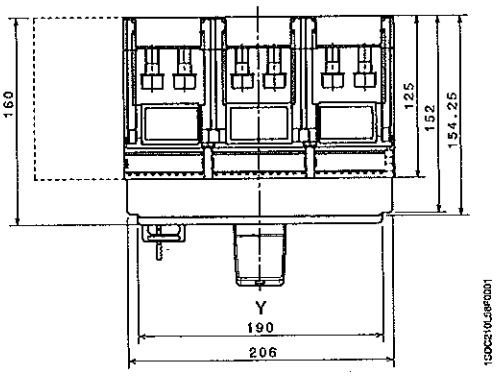


Overall dimensions
Tmax T7

Fixed circuit-breaker

Front - F



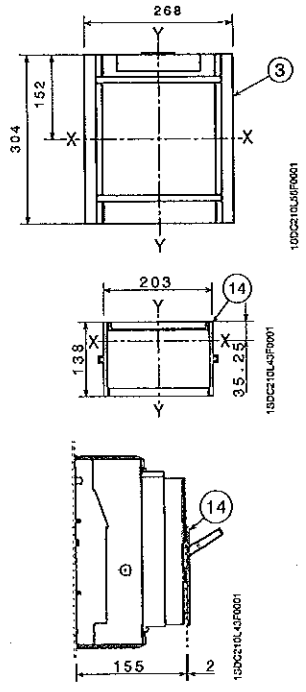


Caption

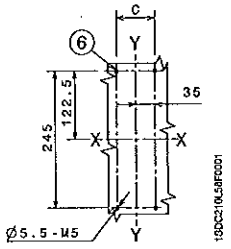
1. Front terminals for flat connection
2. Busbars
3. Flange for the compartment door
4. Flange fixing screws
6. Drilling template for fixing onto support sheet
7. Tightening torque: 18 Nm
8. Key lock (optional)
9. Padlock (optional)
10. Tightening torque: 2.5 Nm
11. Sheet drilling for compartment door with flange
12. Sheet drilling for compartment door for front 206 x 204
13. Terminal for auxiliary contacts
14. Reduce flange for the compartment door (optional)
15. Sheet drilling for compartment door with reduced flange
16. Sheet drilling for compartment door for front 190 x 105

	With flange	Without flange
A	125...141	147

Flange for the compartment door (supplied as standard)

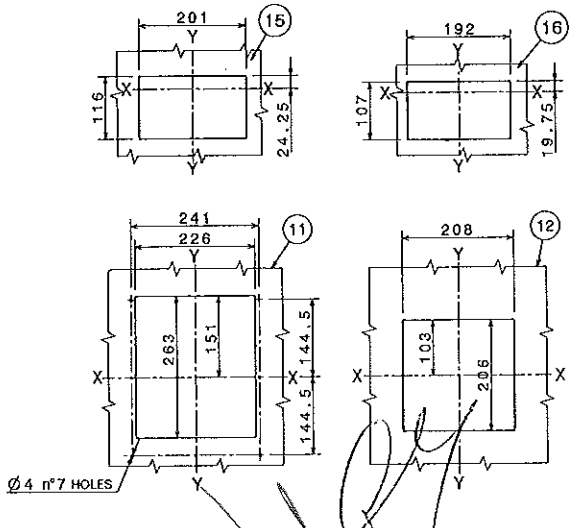


Drilling templates for support sheet



	III	IV
C	70	140

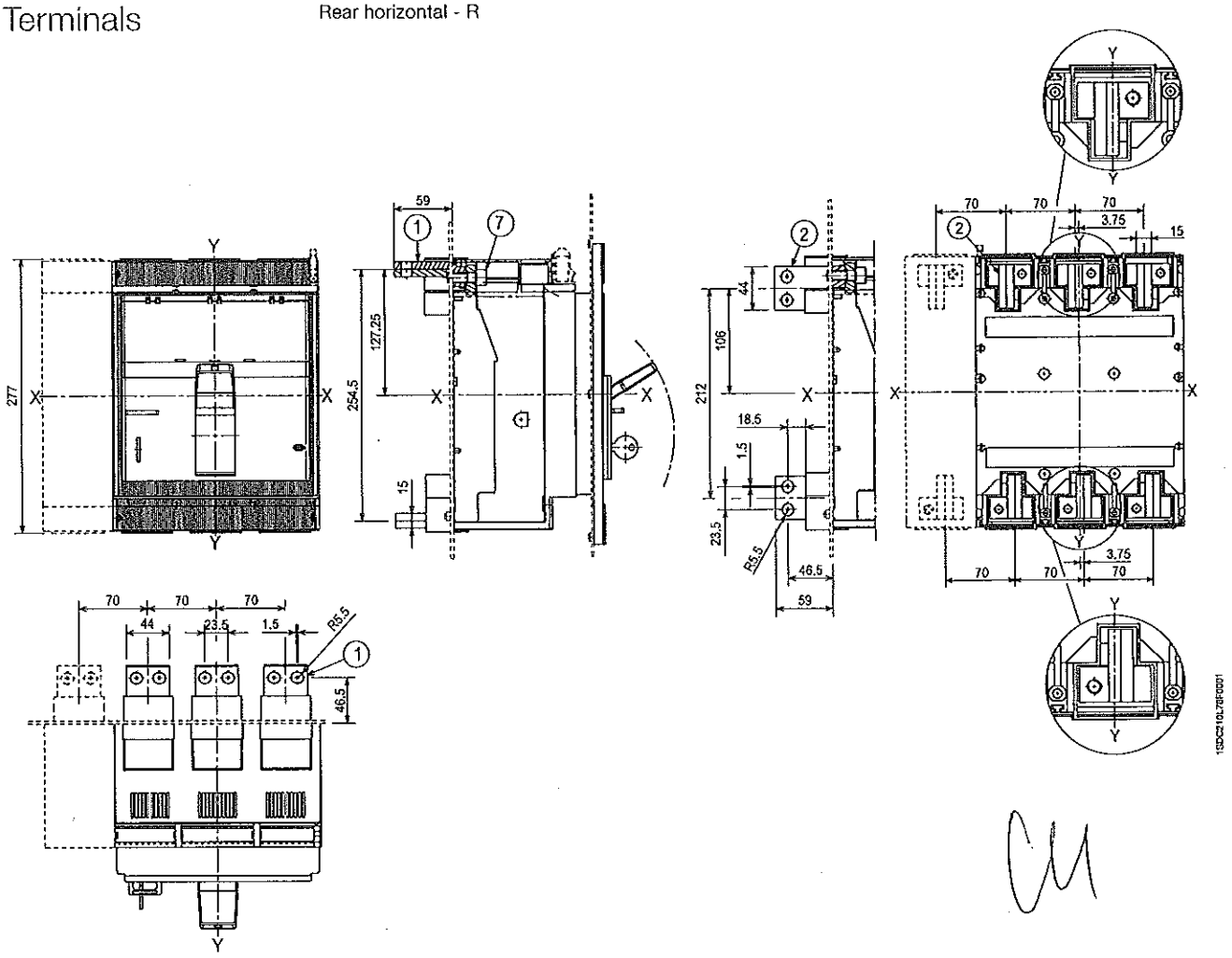
Drilling templates of the compartment door



Overall dimensions
Tmax T7

Terminals

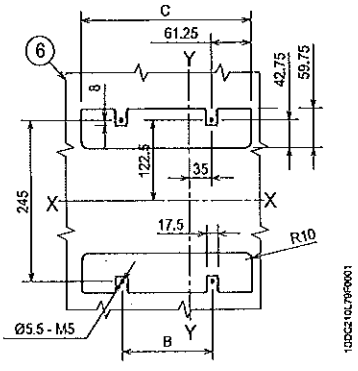
Rear horizontal - R



Caption

(1) Rear horizontal terminals
(2) Rear vertical terminals
(6) Drilling template for fixing onto support sheet
(7) Tightening torque: 20 Nm

Drilling templates for support sheet



	III	IV
B	70	140
C	192.5	262.5

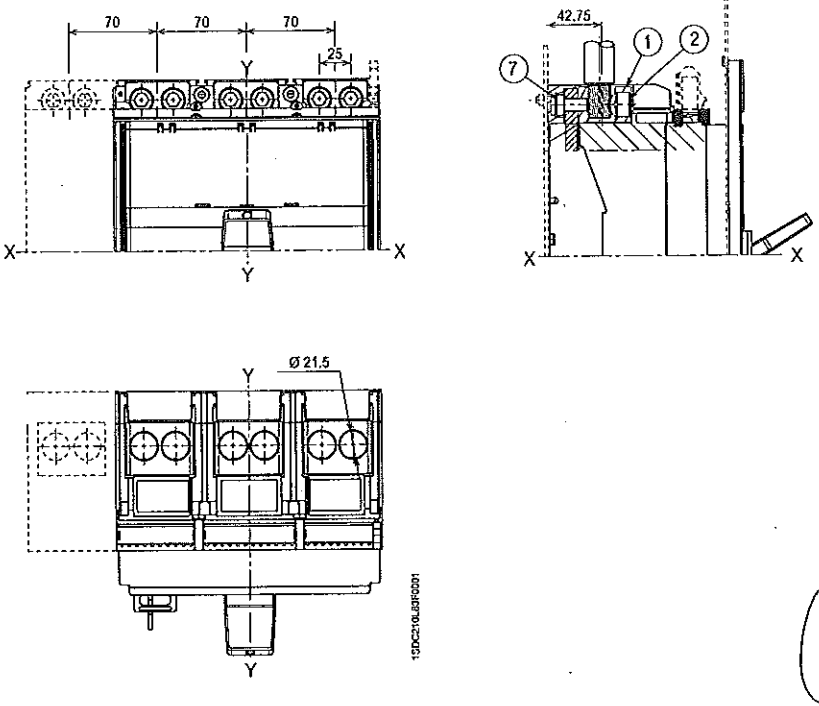
Overall dimensions
Tmax T7

Terminals

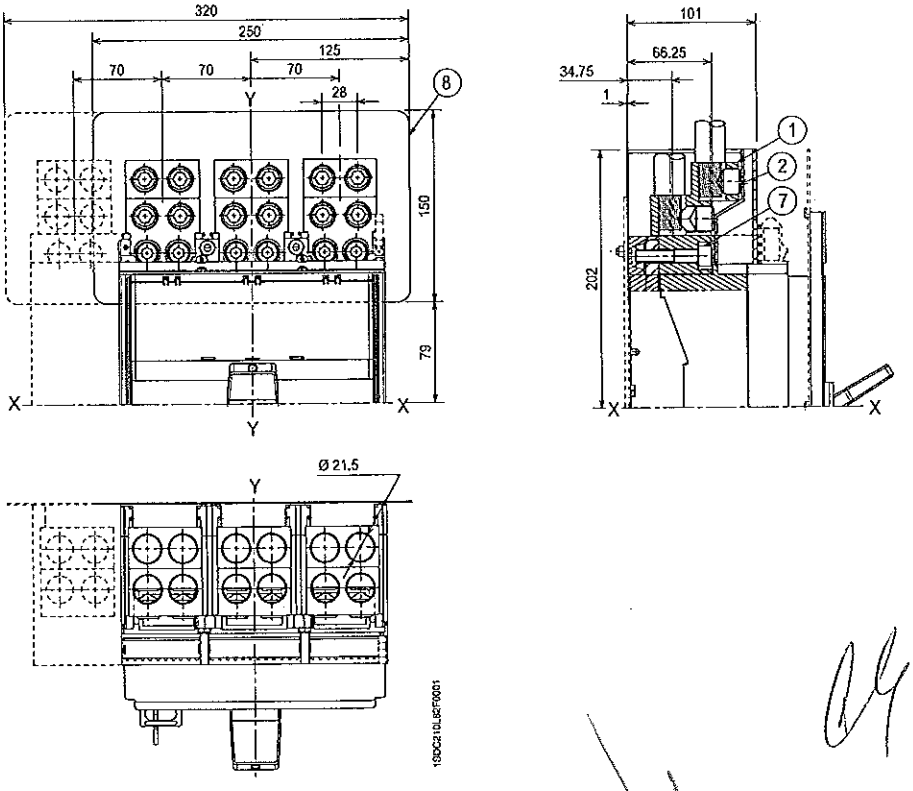
Caption

1. Front terminals for cables FC CuAl
2. Tightening torque: 43 Nm
6. Drilling template for fixing onto support sheet
7. Tightening torque: 18 Nm
8. Protection plate

Front for copper/aluminium cables - FC CuAl 2x240 mm²

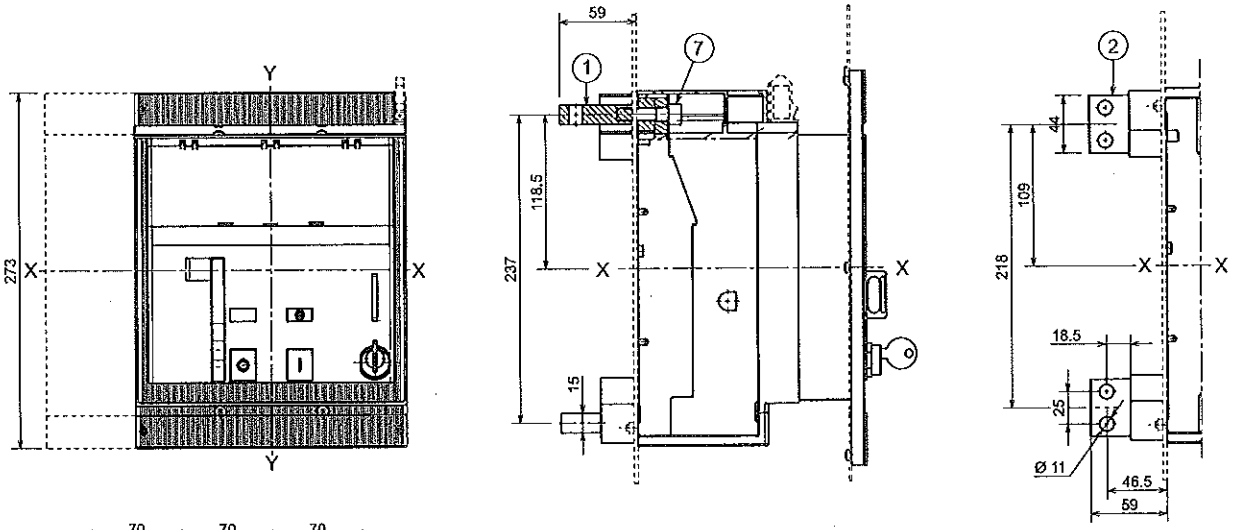


Front for copper/aluminium cables - FC CuAl 4x240 mm²



Overall dimensions
Tmax T7M

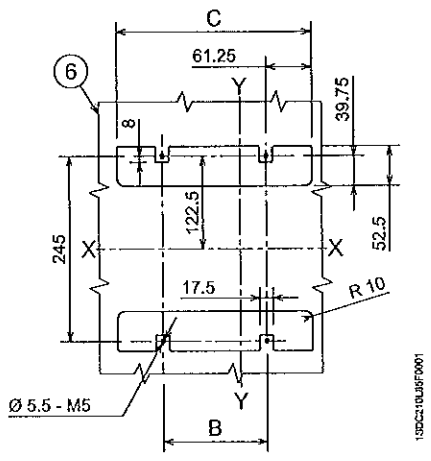
Rear flat horizontal or vertical - HR/VR



Caption

1. Rear horizontal terminals
2. Rear vertical terminals
6. Drilling template for fixing onto support sheet
7. Tightening torque 20 Nm

Drilling templates for support sheet



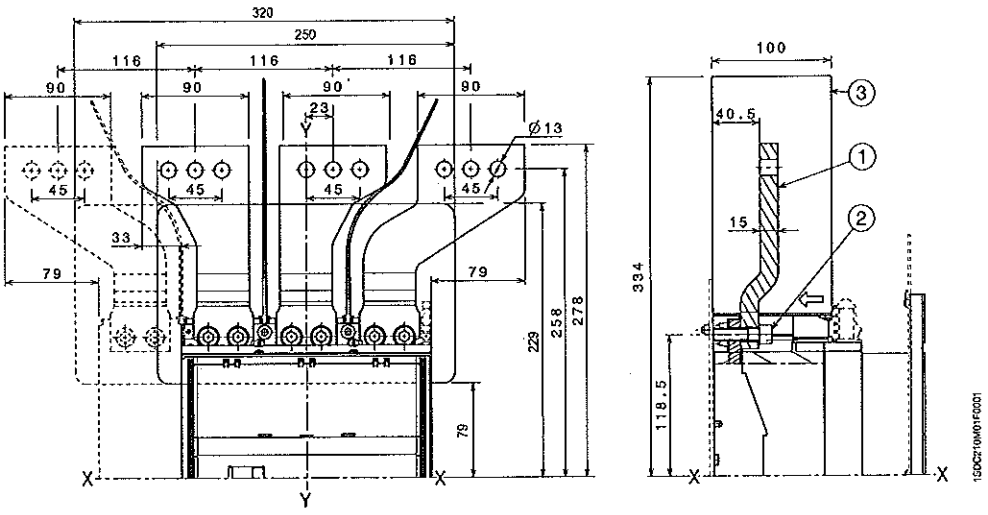
	III	IV
B	70	140
C	192.5	262.5

Overall dimensions
Tmax T7M

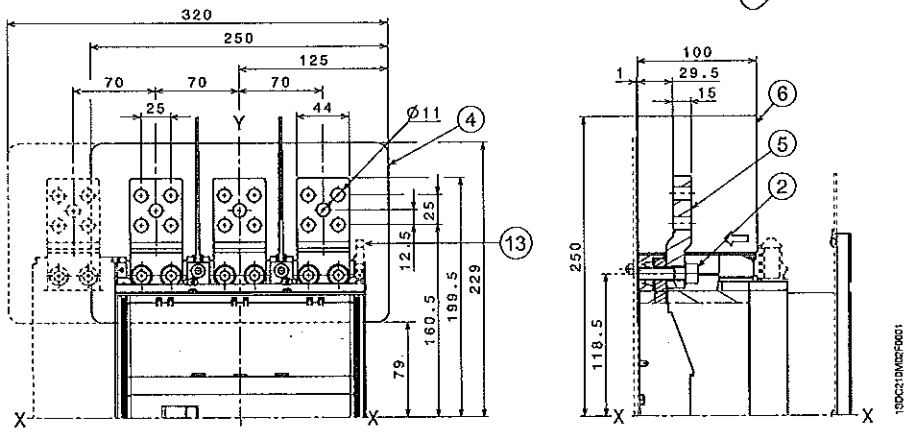
Caption

1. Front extended spread terminals - ES
2. Tightening torque 18 Nm
3. Phase separators 200 mm
4. Protection plate
5. Extended front terminals - EF
6. Phase separators 100 mm
13. Overall dimensions of auxiliary contact terminal

Front extended spread - ES



Front extended - EF



Overall dimensions
Tmax T2

Plug-in circuit-breaker

Fixing on sheet

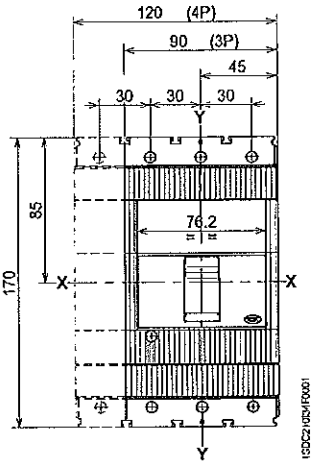
Caption

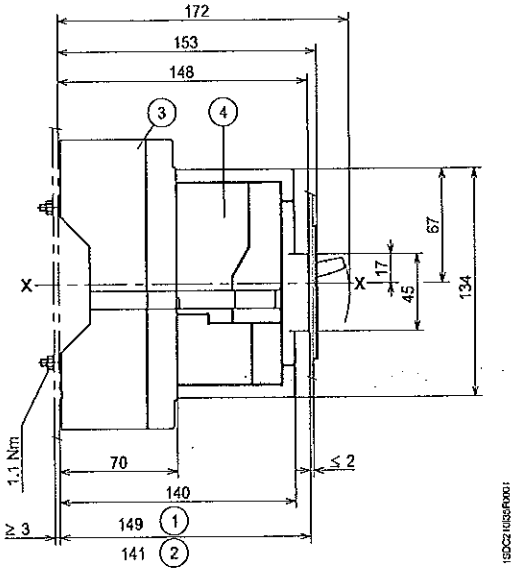
(1) Depth of the switchboard in the case of circuit-breaker with face not extending from the compartment door, with or without flange

(2) Depth of the switchboard in the case of circuit-breaker with face extending from the compartment door, without flange

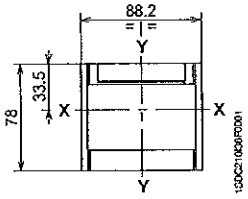
(3) Fixed part

(4) Moving part with terminal covers, degree of protection IP40

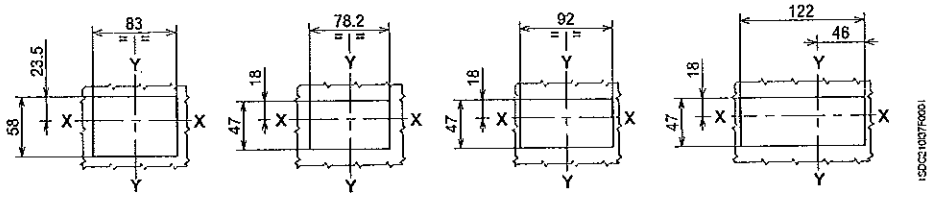




Flange for compartment door



Drilling templates of the compartment door



With flange and circuit-breaker face flush with door (3-4 POLES)

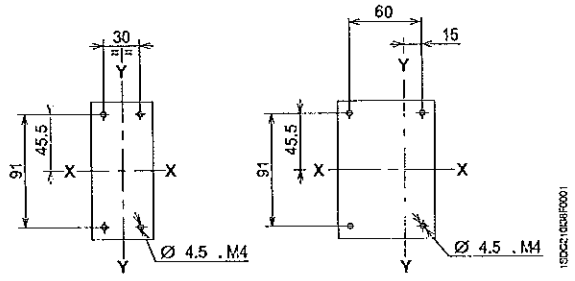
Without flange and circuit-breaker face flush with door (3-4 POLES)

Without flange and circuit-breaker face extending (3 POLES)

Without flange and circuit-breaker face extending. (4 POLES)

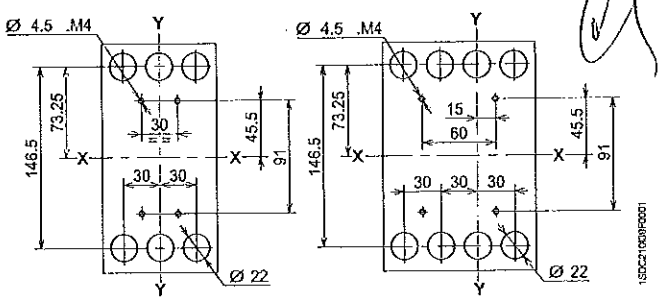
Drilling templates for support sheet

For front terminals



3 POLES 4 POLES

For rear terminals



3 POLES 4 POLES

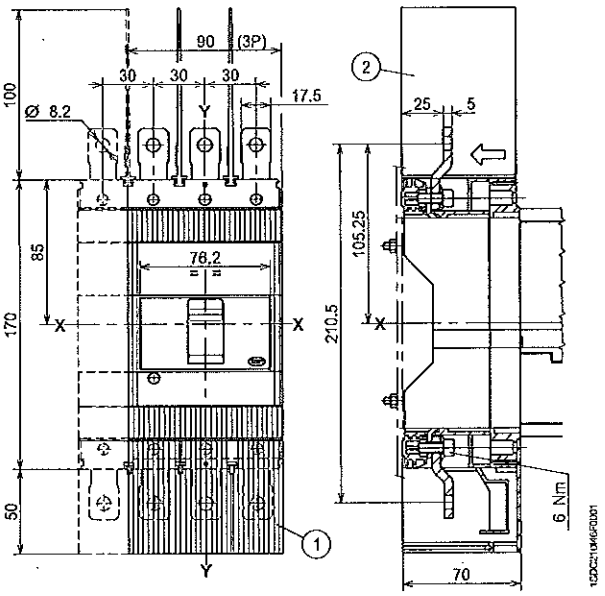
Overall dimensions
Tmax T2

Caption

① High terminal covers with degree of protection IP40

② Insulating barriers between phases (compulsory without 1)

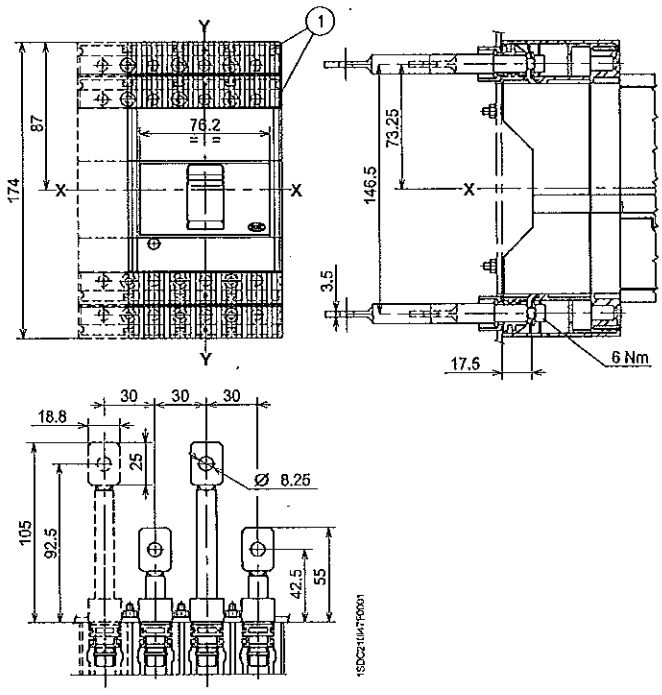
Front extended - EF



Caption

① Low terminal covers with degree of protection IP40

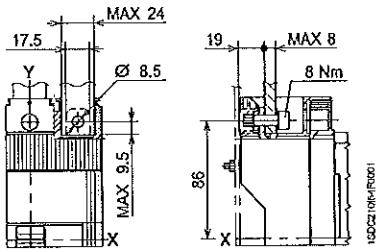
Rear horizontal - R



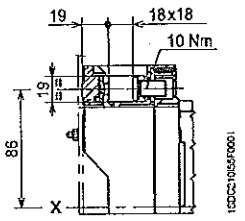
Overall dimensions
Tmax T3

Terminals

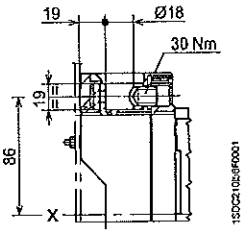
Front - F



Front for copper cables - FC Cu



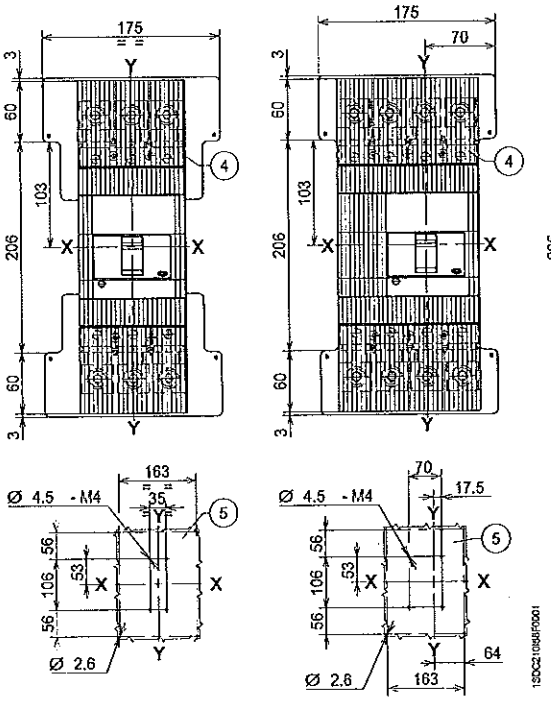
Front for copper/aluminium cables - FC CuAl 185 mm²



Caption

1. Front extended terminals
2. Front terminals for cables 240 mm² CuAl
3. Insulating courtse plate (compulsory)
4. High terminal covers with degree of protection IP40
5. Drilling templates for support sheet

Front for copper/aluminium cables - FC CuAl 240 mm²



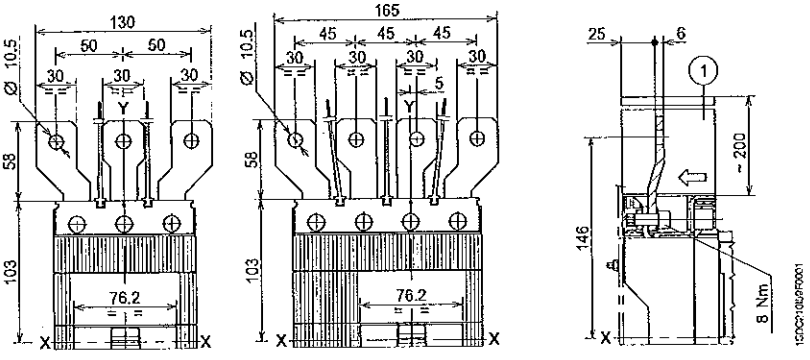
3 POLES

4 POLES

Caption

1. Insulating barriers between phases (compulsory)

Front extended spread - ES



Overall dimensions
Tmax T4

Plug-in circuit-breaker

Fixing on sheet

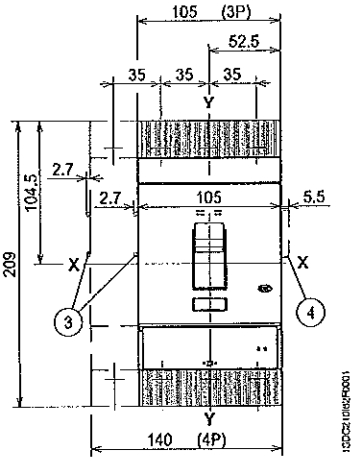
Caption

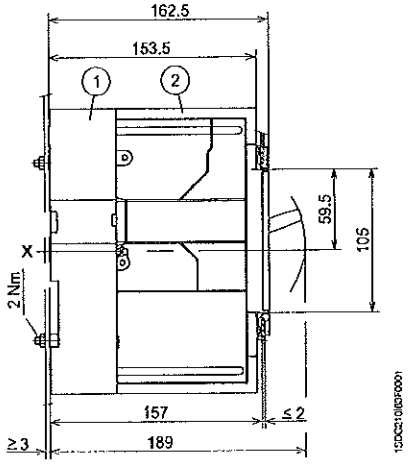
(1) Fixed part

(2) Moving part with terminal covers, degree of protection IP40

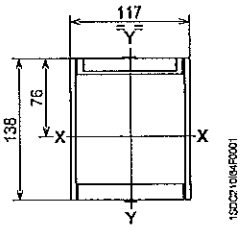
(3) Overall dimensions with cabled accessories mounted (SOR-C, UVR-C, RC222-223)

(4) Overall dimensions with cabled auxiliary contacts mounted (only 3Q 1SY)

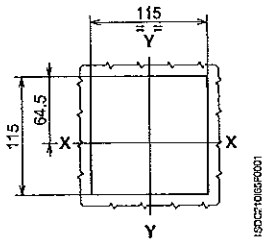




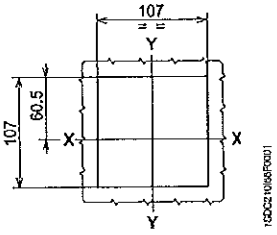
Flange for compartment door



Drilling templates of the compartment door



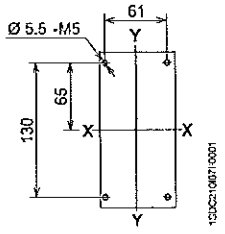
With flange



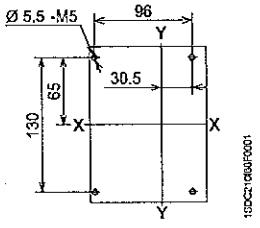
Without flange

Drilling templates for support sheet

For front terminals

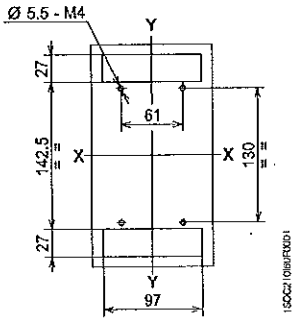


3 POLES

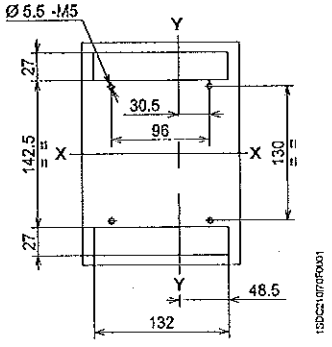


4 POLES

For rear terminals



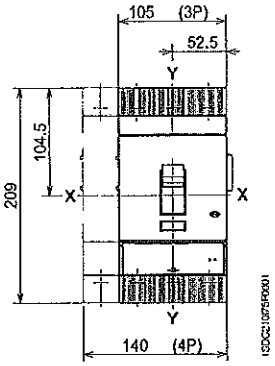
3 POLES

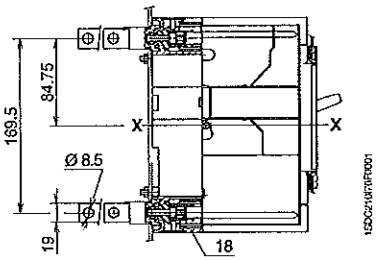


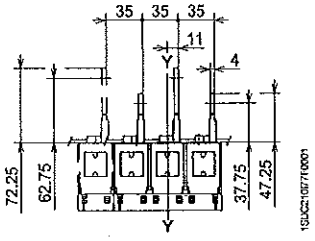
4 POLES

Overall dimensions
Tmax T4

Rear flat vertical - VR

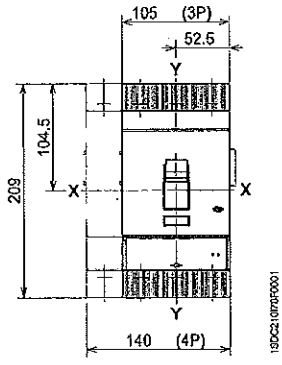


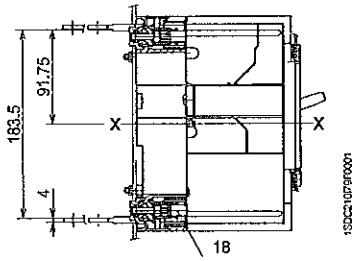


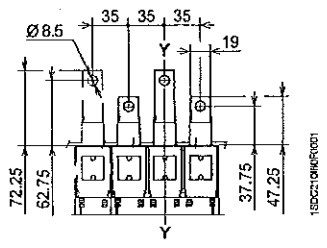


3-4 POLES

Rear flat horizontal - HR





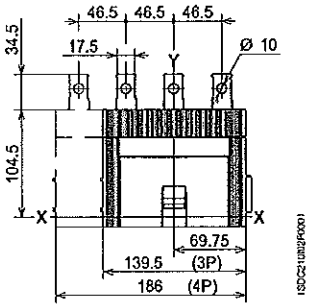


3-4 POLES

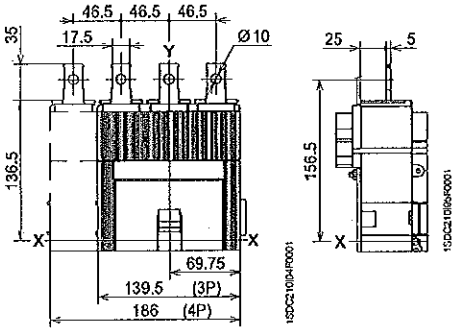
Overall dimensions
Tmax T5

Terminals

Front extended 400 A - EF



Front extended 630 A - F



6

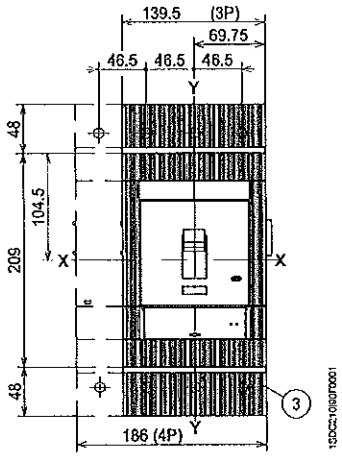
Caption

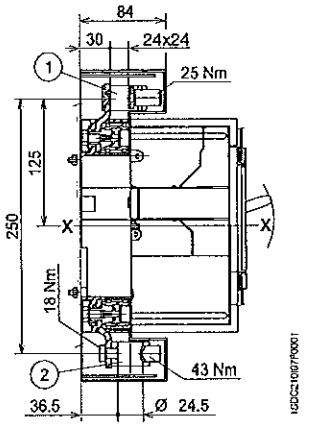
(1) Front terminals for cables Cu

(2) Front terminals for cables Cu/Al

(3) High terminal covers with degree of protection IP40

Front for copper cables - FC Cu or for copper/aluminium cables - FC CuAl

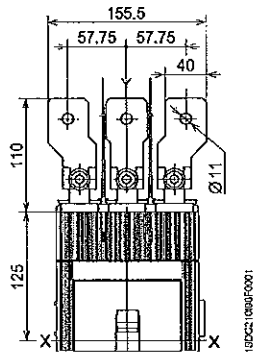


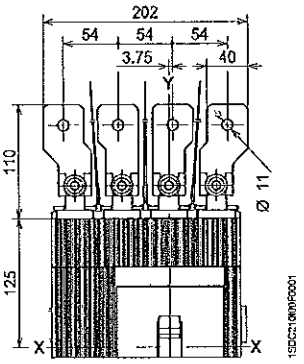


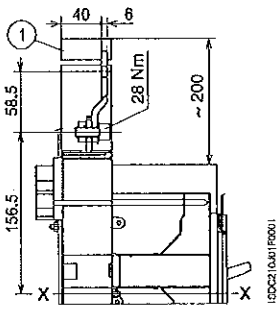
Caption

(1) Insulating barriers between phases (compulsory)

Front extended spread 630 A - ES







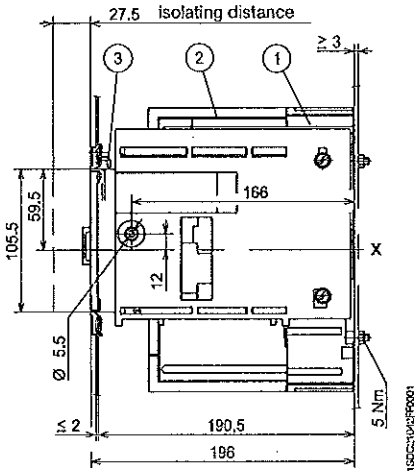
Overall dimensions
Tmax T4

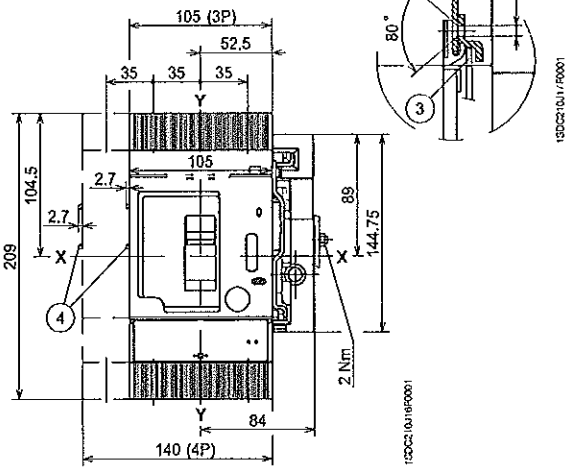
Withdrawable circuit-breaker

Fixing on sheet

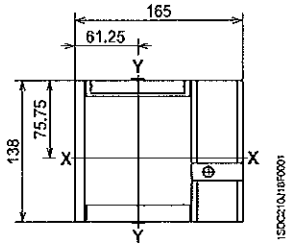
Caption

1. Fixed part
2. Moving part
3. Lock for compartment door (available on request)
4. Overall dimensions with cabled accessories mounted (SOR-C, UVR-C, RC222-223)

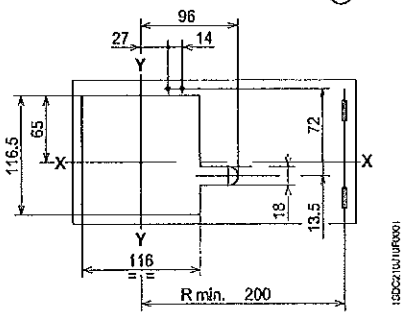




Flange for compartment door

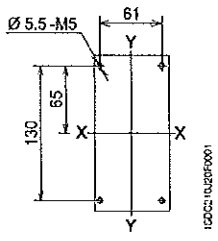


Drilling templates of the compartment door

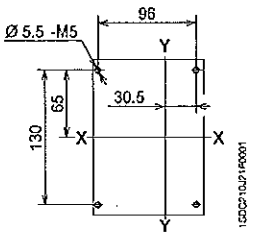


Drilling templates for support sheet

For front terminals

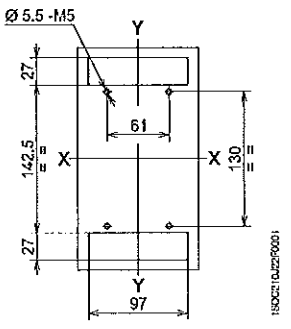


3 POLES

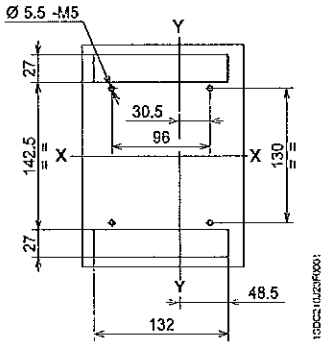


4 POLES

For rear terminals



3 POLES

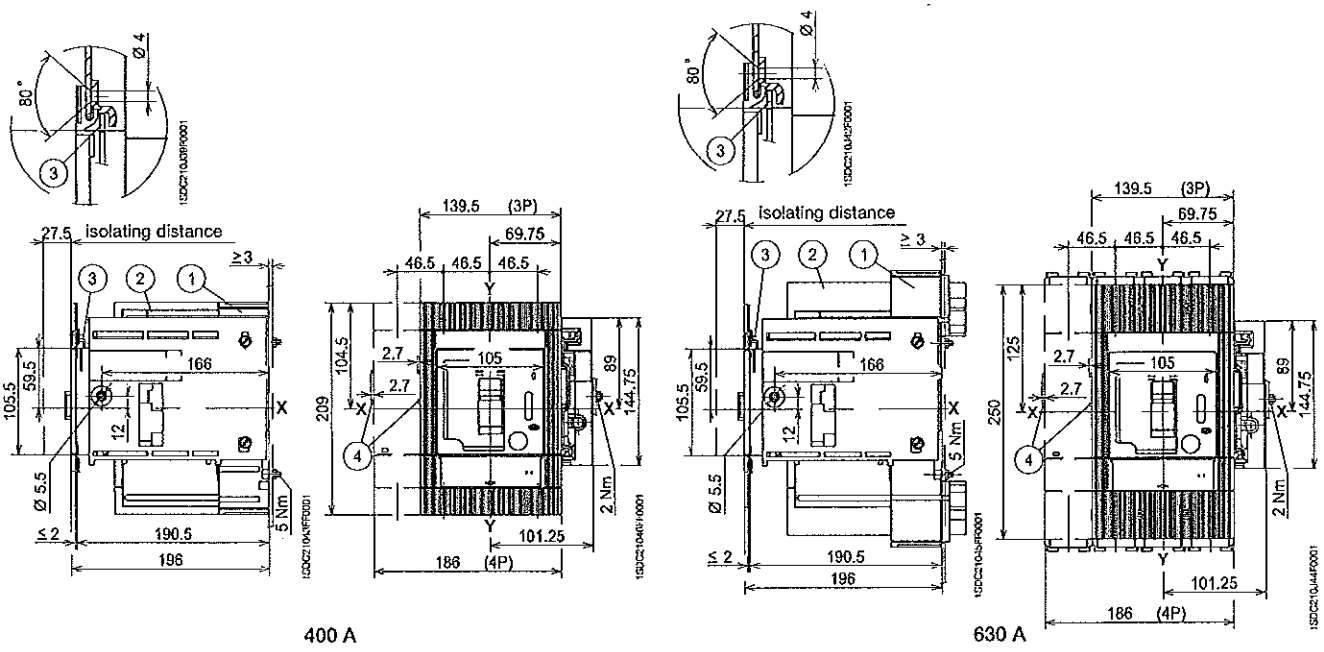


4 POLES

Overall dimensions
Tmax T5

Withdrawable circuit-breaker

Fixing on sheet

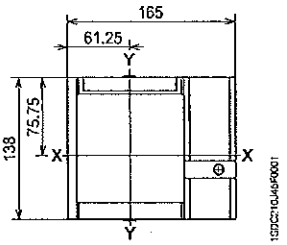


400 A 630 A

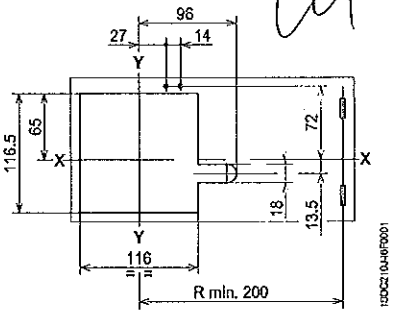
Caption

1. Fixed part
2. Moving part with terminal covers, degree of protection IP40
3. Lock for compartment door (available on request)
4. Overall dimensions with cabled accessories mounted (SOR-C, UVR-C, RC222)

Flange for compartment door

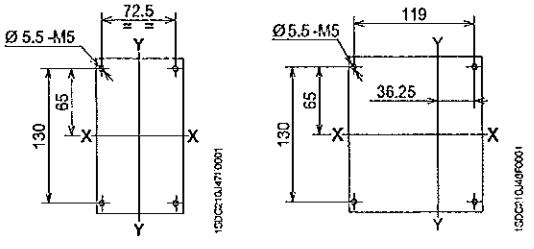


Drilling templates of the compartment door



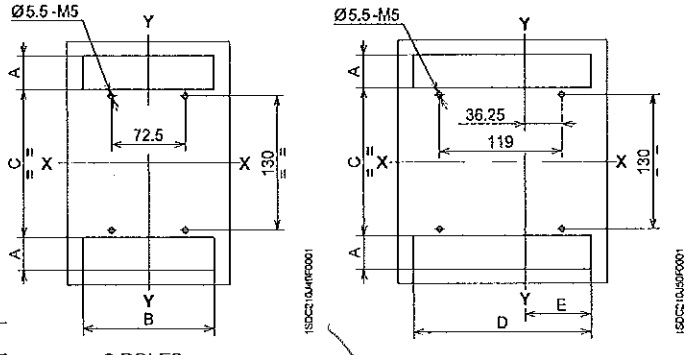
Drilling templates for support sheet

For front terminals 400 A



3 POLES 4 POLES

For front terminals 630 A
For rear terminals 400 A - 630 A

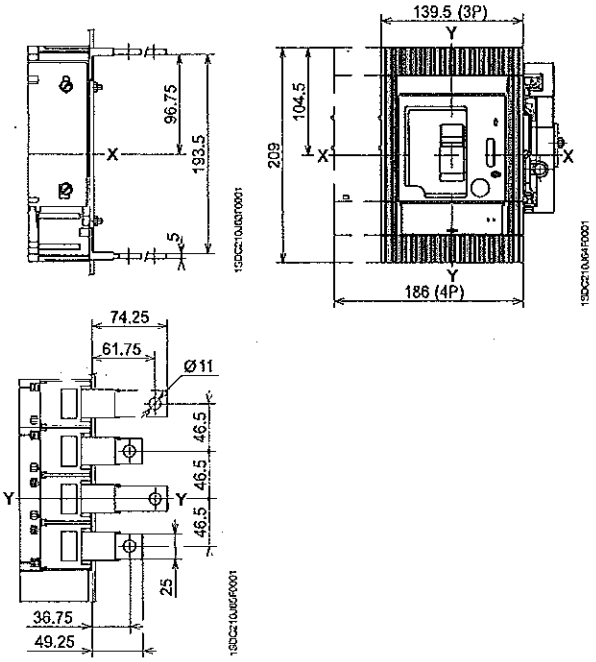


3 POLES 4 POLES

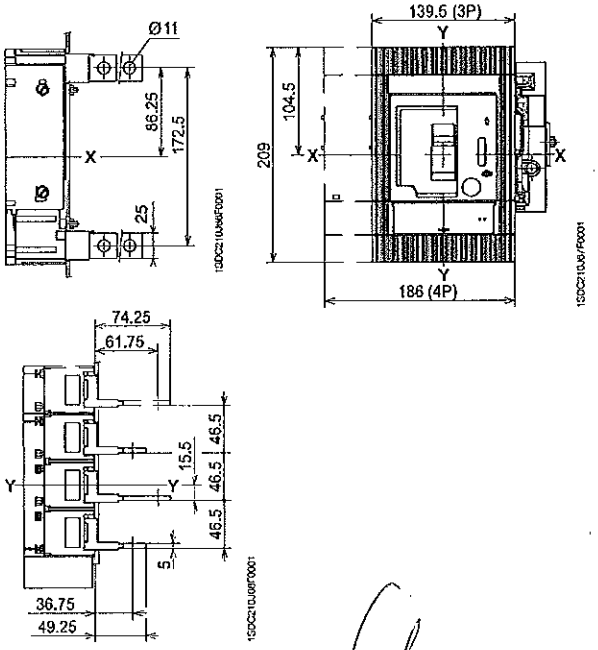
	A	B	C	D	E
Rear 400 A	32.5	128.5	143	172.5	64.5
Front and rear 630 A	61.8	139	142	185.5	69.5

Overall dimensions
Tmax T5

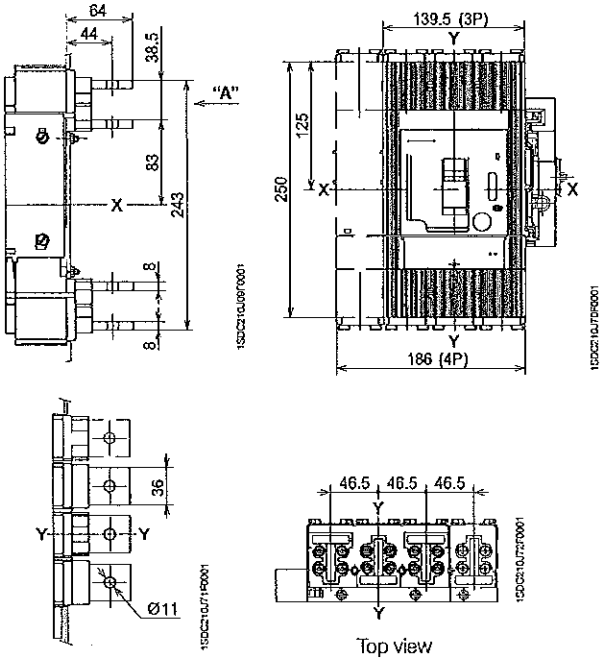
Rear flat horizontal 400 A - HR



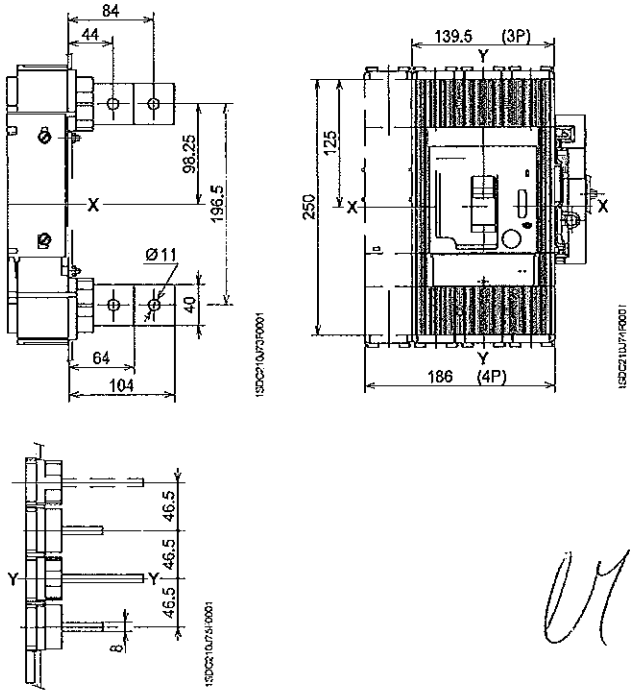
Rear flat vertical 400 A - VR



Rear flat horizontal 630 A - HR



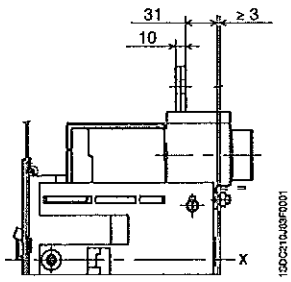
Rear flat vertical 630 A - VR

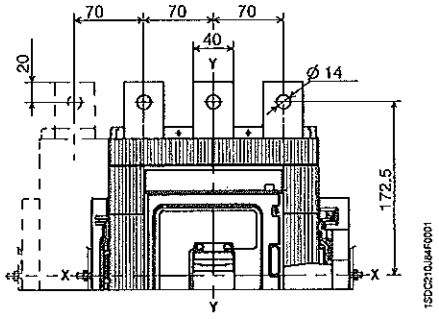


Overall dimensions
Tmax T6 630 A - T6 800 A

Terminals

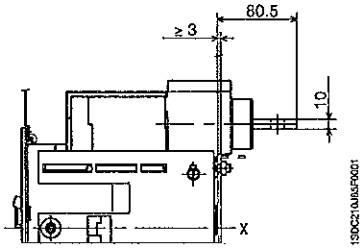
Front extended - EF

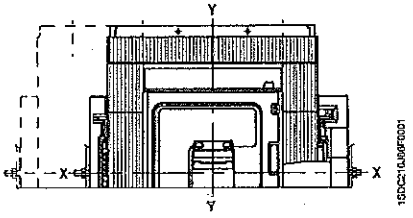


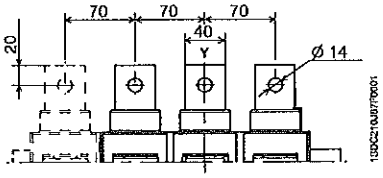


6

Rear flat horizontal - HR

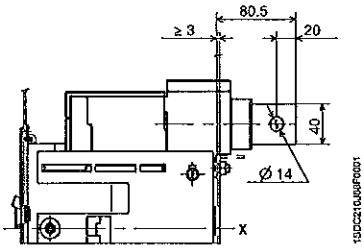


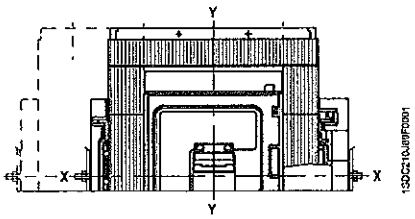


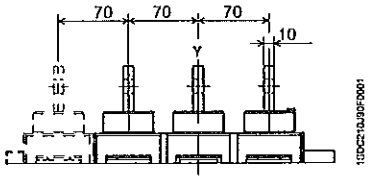


3-4 POLES

Rear flat vertical - VR





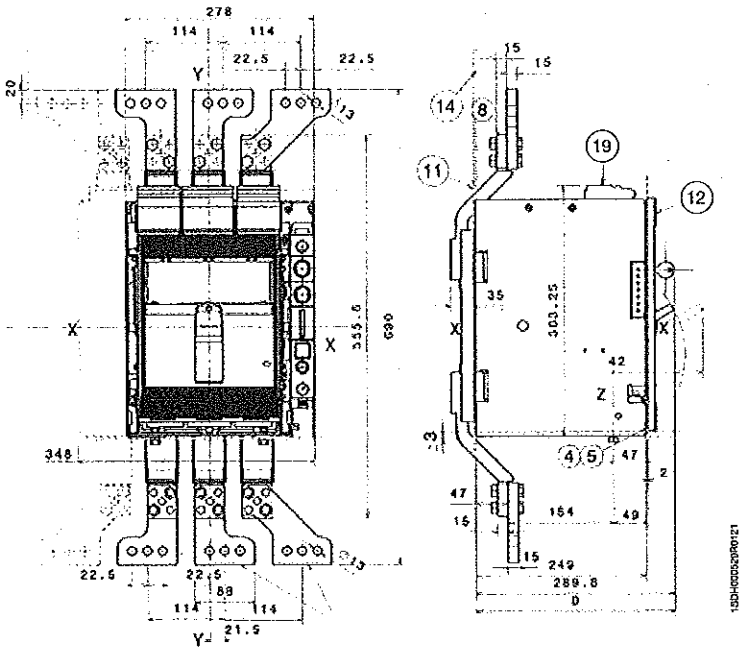


3-4 POLES

Overall dimensions
Tmax T7

Withdrawable circuit-breaker

Front extended spread - ES



Caption

(1) Drilling a hole in the sheet metal door to the compartment with the flange for the RS-VR-HR-EF-ES terminals

(2) Rear segregation for rear terminals

(4) Flange fixing screws

(5) Tightening torque: 1.5 Nm

(6) Drilling template for fixing onto support sheet

(8) Front terminals

(11) Rear segregation for front terminals

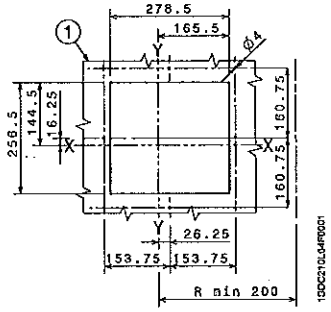
(12) Flange for compartment door

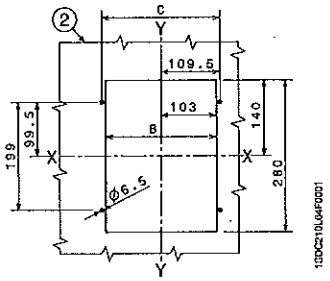
(14) Insulating protection

(18) Spread terminals

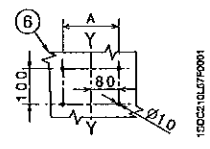
(19) Overall dimensions of auxiliary contact terminal

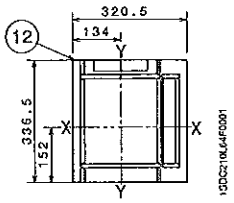
Drilling templates of the compartment door

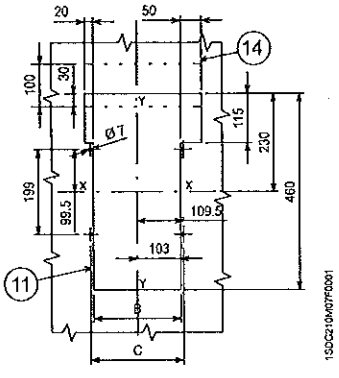




Drilling templates for support sheet







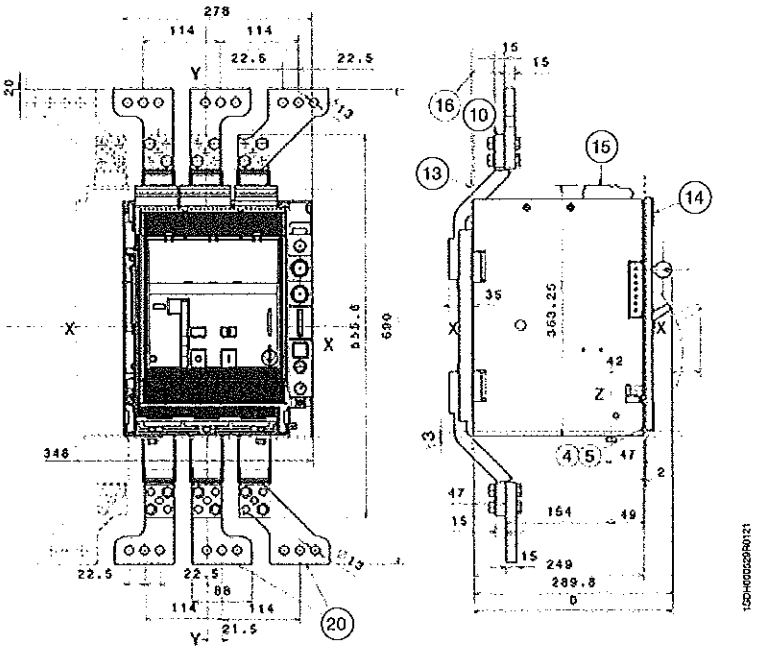
	III	IV
A	160	230
B	206	276
C	219	289

	Standard	Ronis	Profalux	Kirk	Castell
D	287	291	299	298	328

Overall dimensions
Tmax T7M

Withdrawable circuit-breaker

Front extended spread - ES



Caption

(1) Drilling a hole in the sheet metal door to the compartment with the flange for the RS-VR-HR-EF-ES terminals

(2) Rear segregation for rear terminals

(4) Flange fixing screws

(5) Tightening torque: 1.5 Nm

(6) Drilling template for fixing onto support sheet

(10) Front terminal

(13) Rear segregation for front terminals

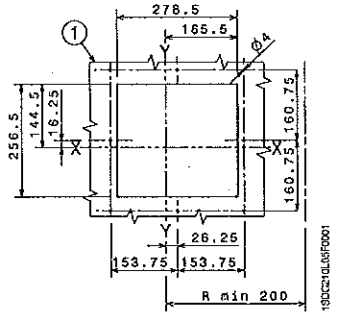
(14) Flange for compartment door

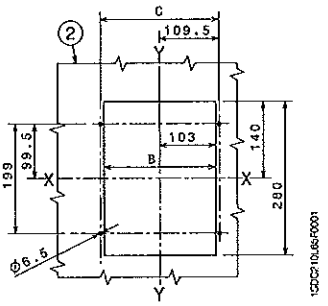
(15) Clamp for auxiliary contacts

(16) Insulating protection

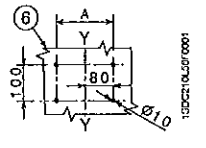
(20) Spread terminals

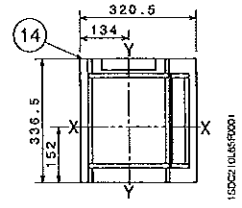
Drilling templates of the compartment door

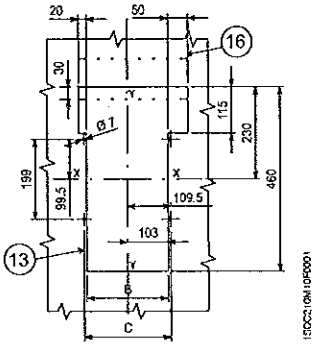




Drilling templates for support sheet







	III	IV
A	160	230
B	206	276
C	219	289

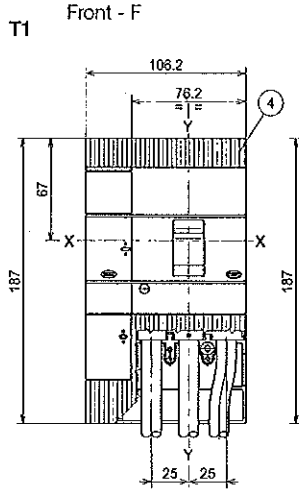
	Standard	Ronis	Profalux	Kirk	Castell
D	290	298	306	NO	NO
E	287	291	299	298	328

Overall dimensions
Circuit-breaker with RC221/222 residual current release
Tmax T1 - T2 - T3

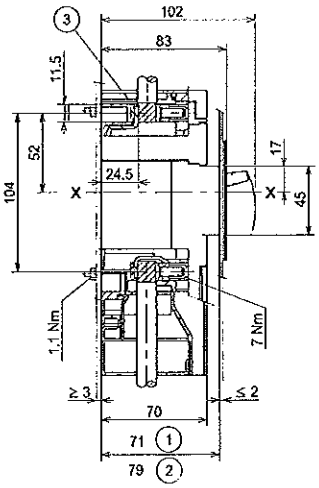
Fixed version

T1

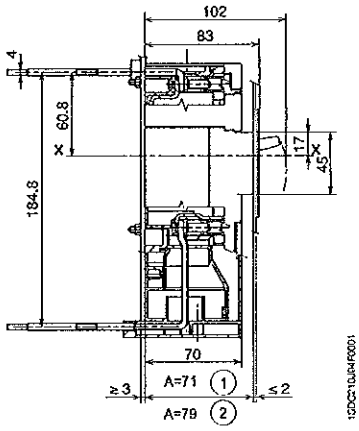
Front - F



Fixing on sheet



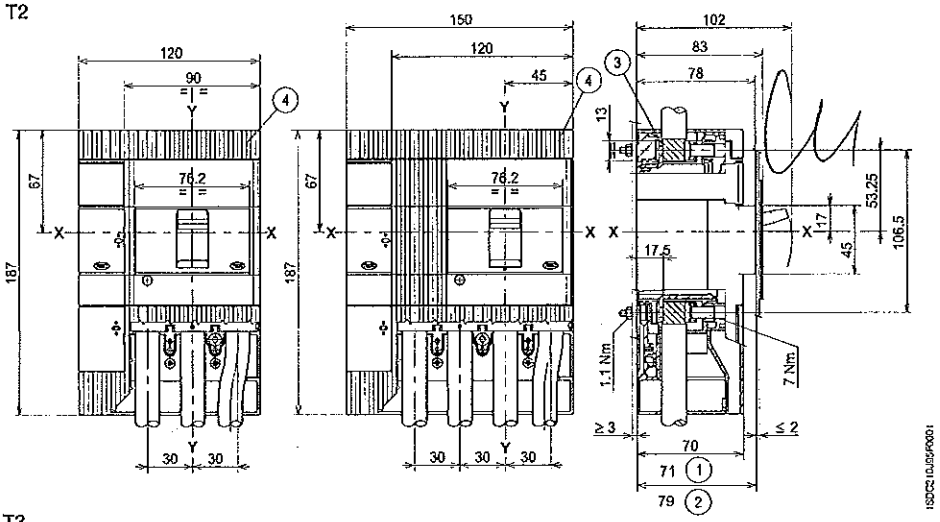
Rear flat horizontal - HR



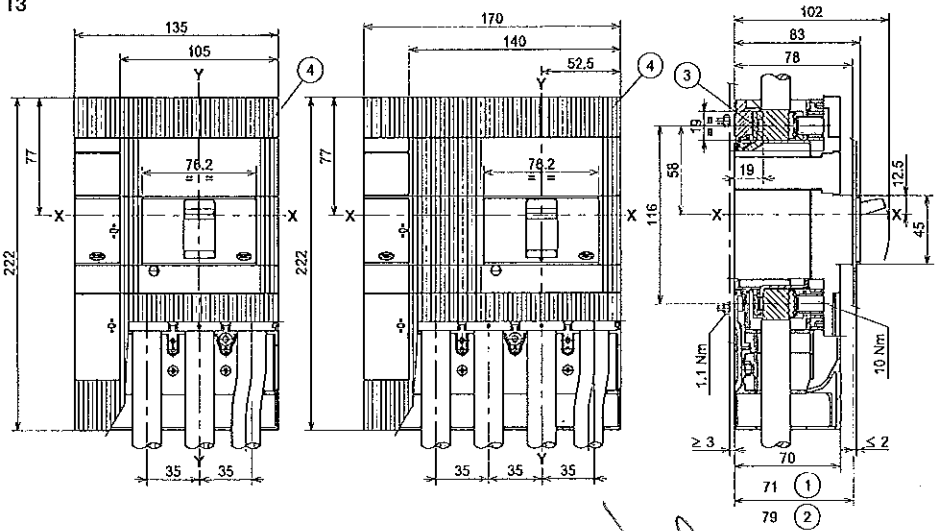
Caption

1. Depth of the switchboard with circuit-breaker face extending
2. Depth of the switchboard with circuit-breaker face flush with door
3. Front terminals for cable connection
4. Low terminal covers with degree of protection IP40

T2



T3



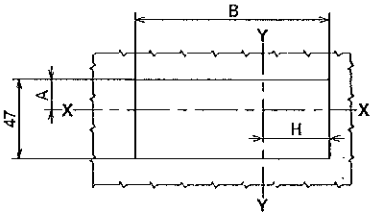
Overall dimensions
Circuit-breaker with RC221/222 residual current release
Tmax T1 - T2 - T3

Drilling templates of the compartment door

Without flange
face extending

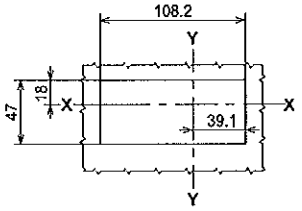
3 POLES

T1 - T2 - T3

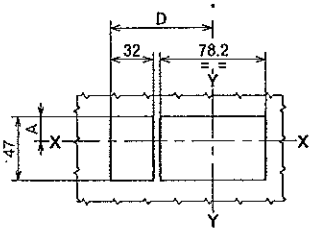


Without flange
face not extending

T1

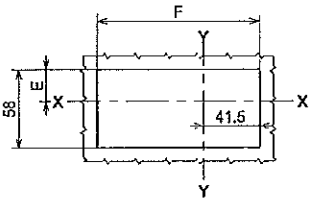


T2 - T3



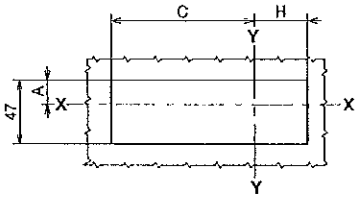
With flange
face not extending

T1 - T2 - T3

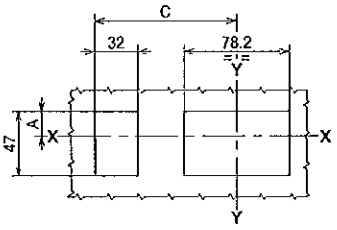


4 POLES

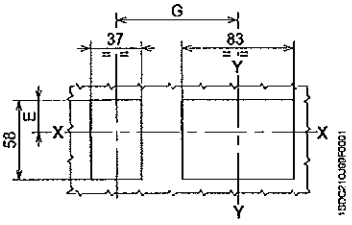
T1 - T2 - T3



T1 - T2 - T3



T1 - T2 - T3



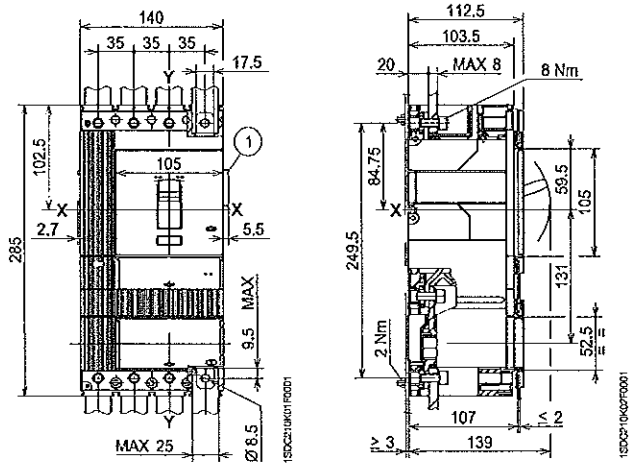
	A	B	C	D	E	F	G	H
T1	18	108.2	94.1	–	23.5	113	78.1	39.1
T2	18	122	106	76	23.5	120	90	46
T3	13.5	137	118.5	83.5	19	127.4	102.5	53.5

Overall dimensions
Circuit-breaker with RC222 residual current release
Tmax T4 - T5

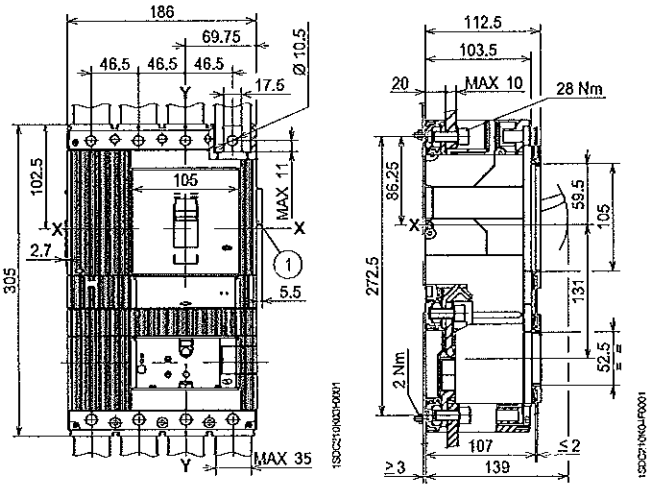
Fixed version

Front - F, fixing on sheet

T4



T5 (400 A)

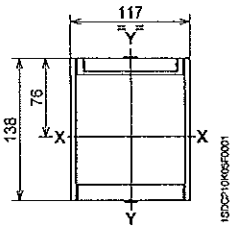


Caption

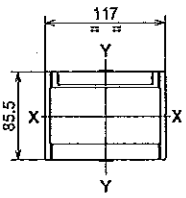
(1) Overall dimensions with cabled auxiliary contacts mounted (only 3Q 1SY)

(1) For T5 (630 A) ask ABB SACE

Flange for the compartment door

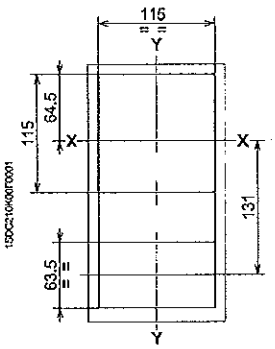


For circuit-breakers

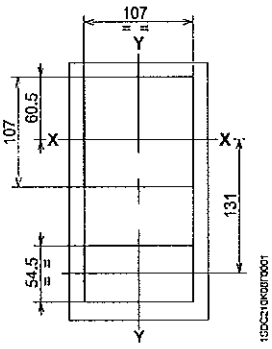


For residual current release

Drilling templates of compartment door and fitting flange



With flange



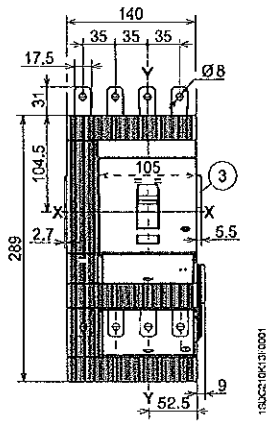
Without flange

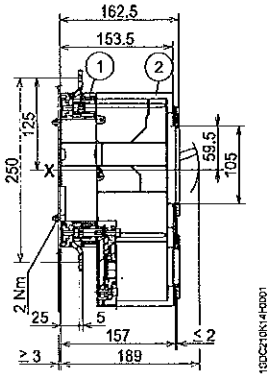
Overall dimensions
Circuit-breaker with RC222 residual current release
Tmax T4 - T5

Plug-in version

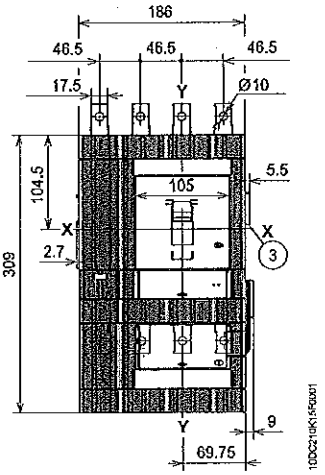
Front - F, fixing on sheet

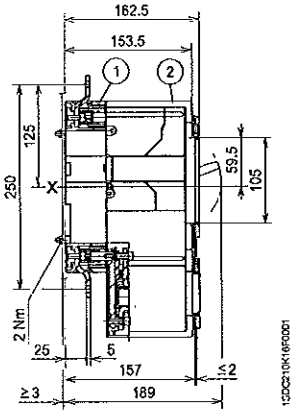
T4





T5 (400 A)[1]





Caption

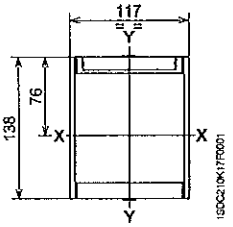
(1) Fixed part

(2) Mobile part

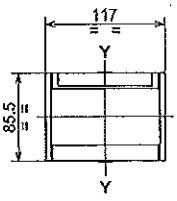
(3) Overall dimensions with cabled auxiliary contacts mounted (only 3Q 1SY)

[1] For T5 (630 A) ask ABB SACE

Flange for the compartment door

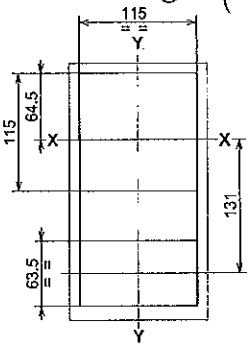


For circuit-breakers

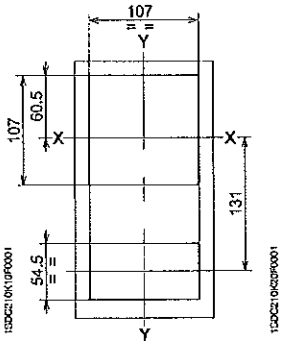


For residual current release

Drilling templates of compartment door and fitting flange



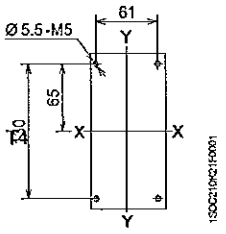
With flange

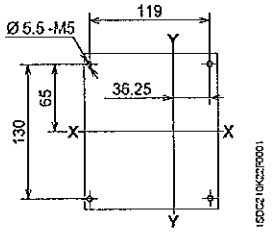


Without flange

Drilling templates for support sheet

T5





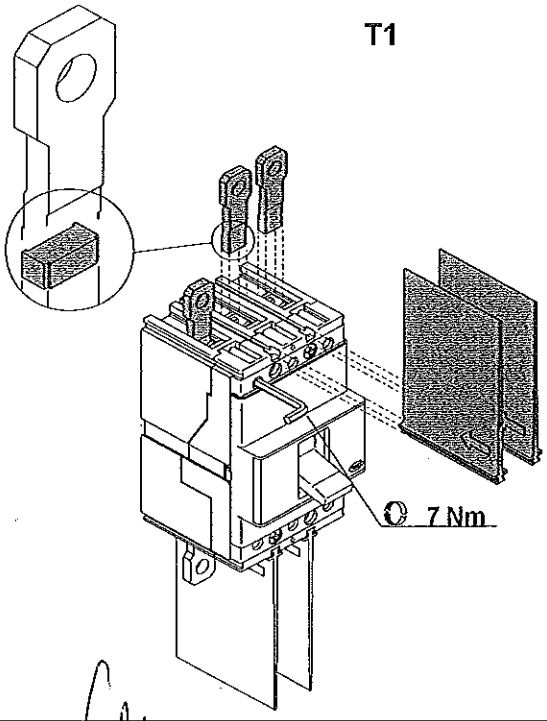
Tmax

DOC. N.° RH0011.803- L0377

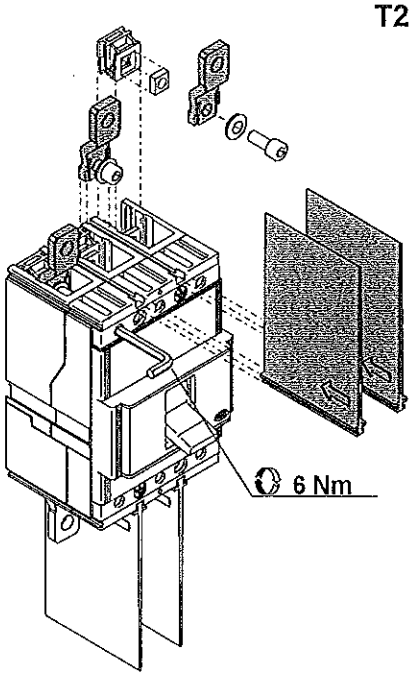
EF - Terminali anteriori prolungati T1-T2-T3 fisso/parte fissa di rimovibile
EF - Extended front terminals T1-T2-T3 Fixed/plug-in fixed part
EF - Vorderseitige verlängerte Anschlüsse T1-T2-T3 fest/ausfahrbarer festes teil
EF - Prises avant prolongées T1-T2-T3 fixe/partie fixe de débrochable
EF - Terminales anteriores prolongados T1-T2-T3 fijo/parte fija de enchufable

	T1 III	T1 IV	T2 III	T2 IV	T3 III	T3 IV
	3 (6)	4 (8)	-	-	-	-
	-	-	3 (6)	4 (8)	-	-
	-	-	-	-	3 (6)	4 (8)
	2 (4)	3 (6)	2 (4)	3 (6)	2 (4)	3 (6)

A T1



B T2



C T3

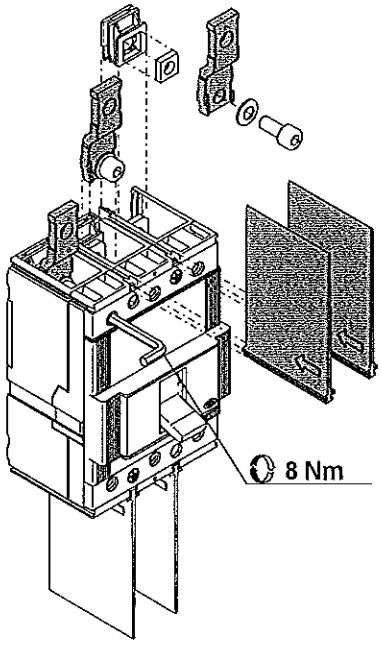
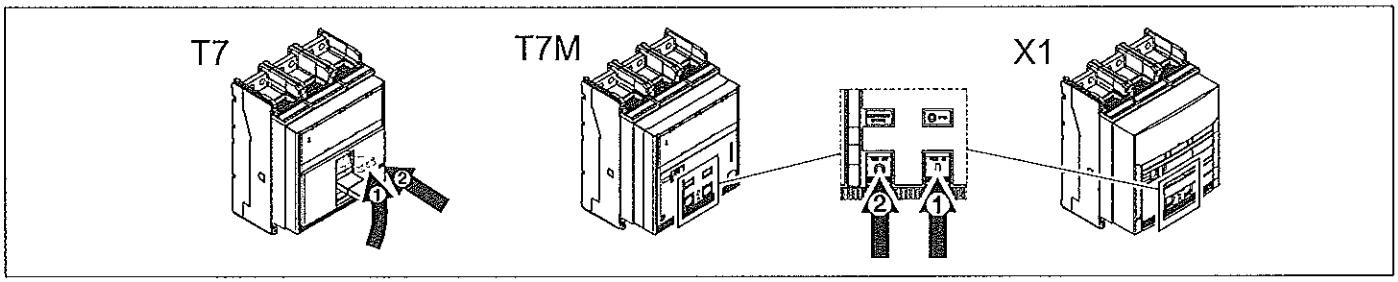


ABB SACE S.p.A.
Via Baioni, 35
24123 Bergamo- Italy
Tel. +39 035.395.111 - Telefax +39 035.395.306-433

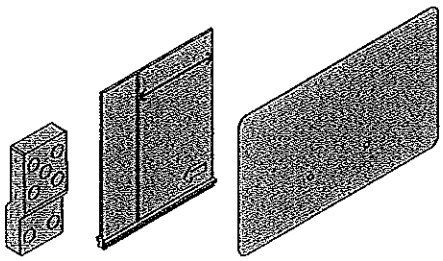
http://www.abb.com

DOC. N.° 1SDH000529R0804 - L3486

EF/ES - Terminali anteriori prolungati e divaricati fisso T7-T7M-X1
EF/ES - Front terminals extended and splayed fixed T7-T7M-X1
EF/ES - Vorderseitige verlängerte und verbreiterte Anschlüsse, fest T7-T7M-X1
EF/ES - Prises avant prolongées et épanouies fixe T7-T7M-X1
EF/ES - Terminales frontales prolongados y separadores fijo T7-T7M-X1

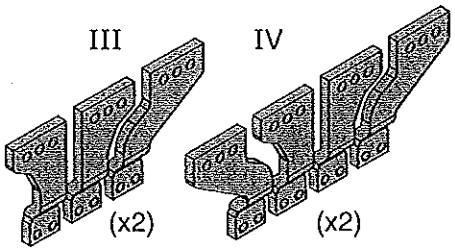


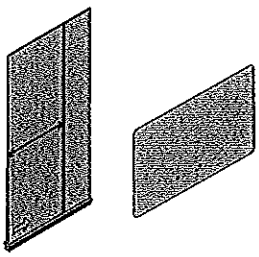
EF



III	3(6)	2(4)	1(2)
IV	4(8)	3(6)	1(2)

ES

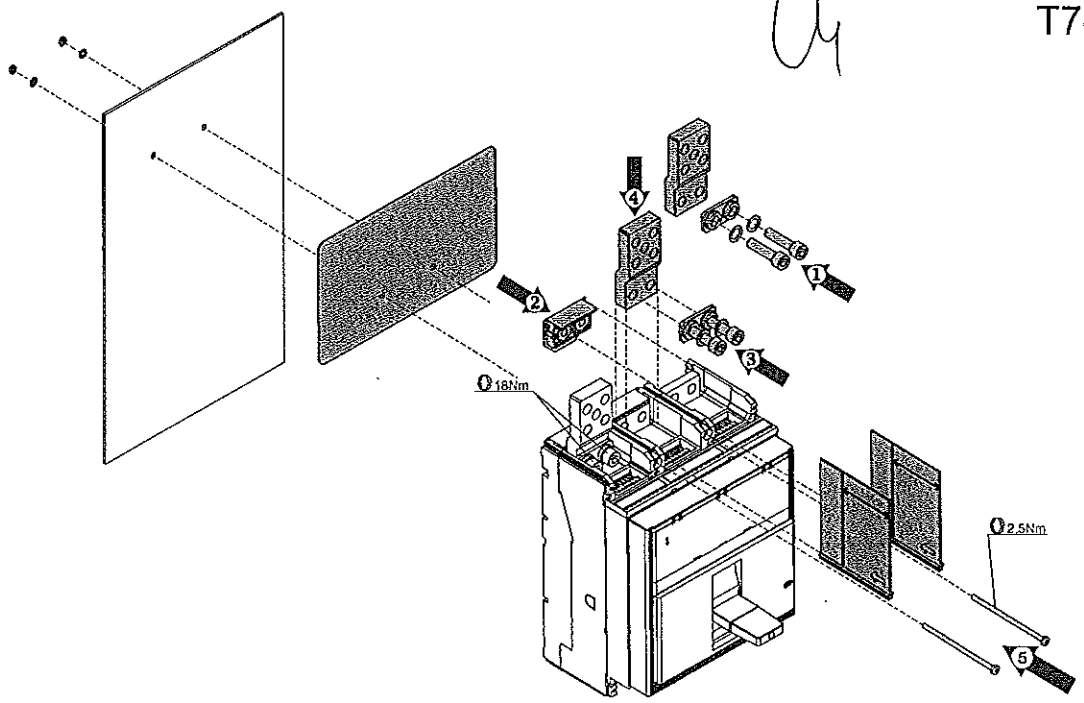




III	2(4)	1(2)
IV	3(6)	1(2)

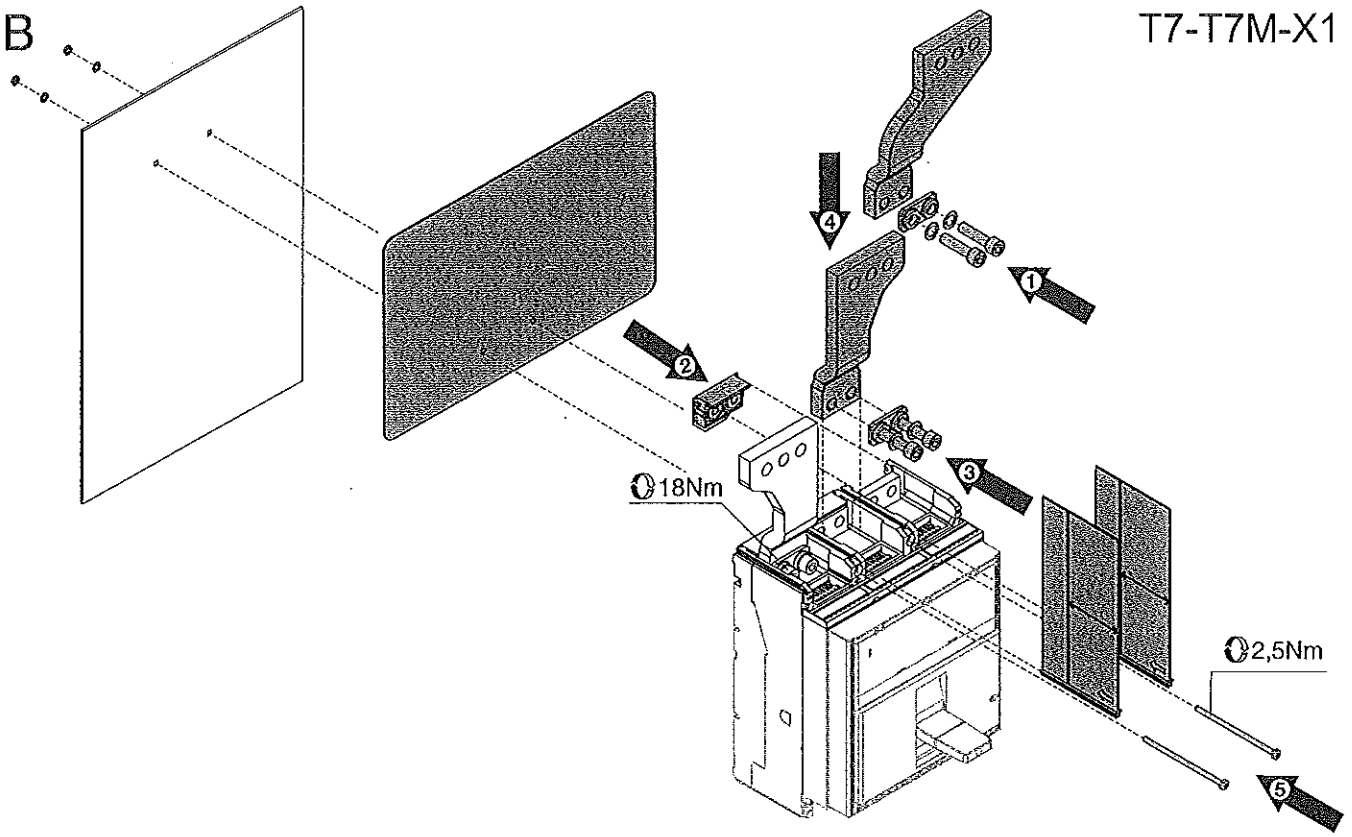
A

T7-T7M-X1

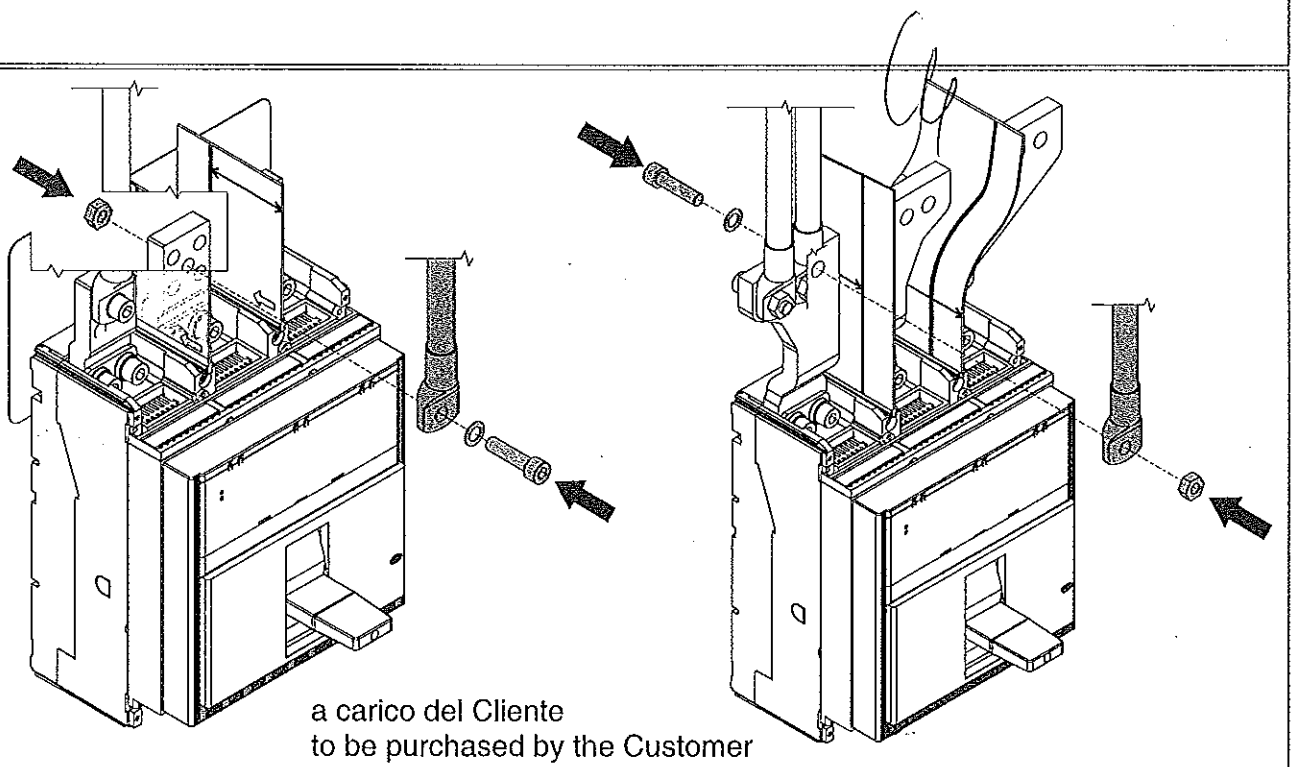


B

T7-T7M-X1



C



a carico del Cliente
to be purchased by the Customer
muß vom Kunden erworben werden
à la charge du Client
a cargo del Cliente

ABB SACE S.p.A.
Via Baioni, 35
24123 Bergamo Italy
Tel.: +39 035 395.111 - Telefax: +39 035 395.306-433

http://www.abb.com

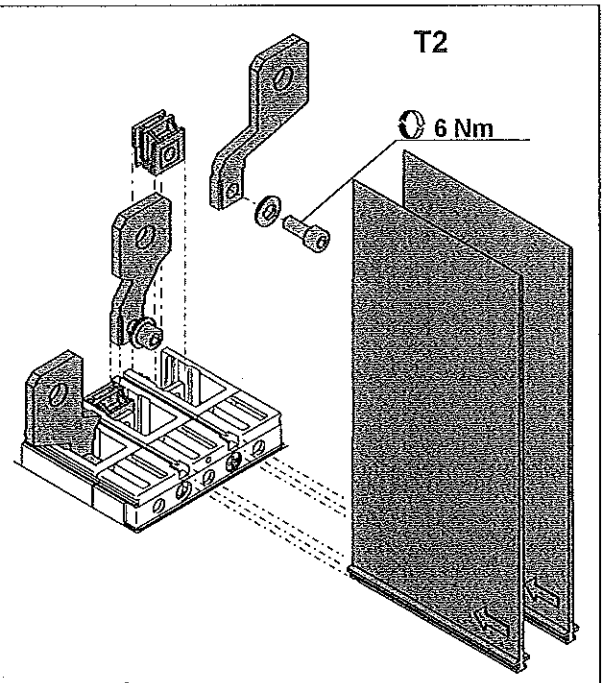
Tmax

DOC. N.° RH0012.806 - L0377

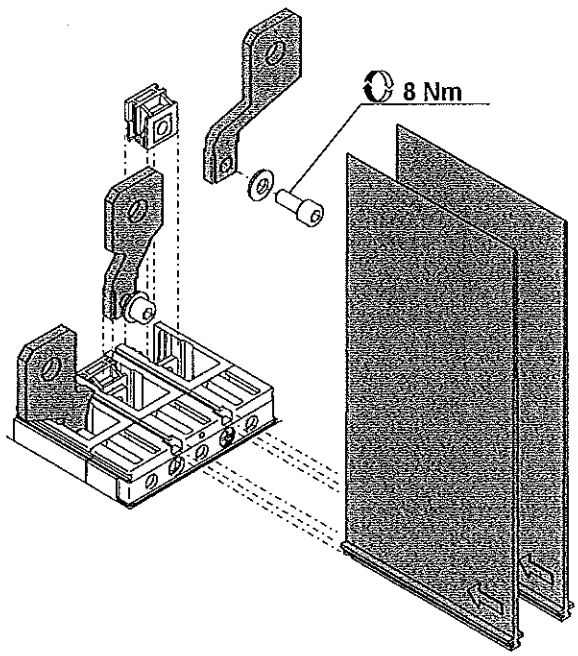
ES – Terminali anteriori divaricati T2 fisso/parte fissa di rimovibile
ES – Splayed front terminals T2 Fixed/plug-in fixed part
ES – Vorderseitige V-förmige Anschlüsse T2 fest/ausfahrbarer festes teil
ES - Prises avant écartées T2 fixe/partie fixe de débrochable
ES – Terminales anteriores separados T2 fijo/parte fija de enchufable

	T2 II	T2 IV	T3 III	T3 IV
	2 (4)	3 (6)	2 (4)	3 (6)
	1 (2)	1 (2)	-	-
	1 (2)	-	-	-
	1 (2)	1 (2)	-	-
	-	1 (2)	-	-
	-	1 (2)	-	-
	-	-	1 (2)	1 (2)
	-	-	1 (2)	-
	-	-	1 (2)	1 (2)
	-	-	-	1 (2)
	-	-	-	1 (2)

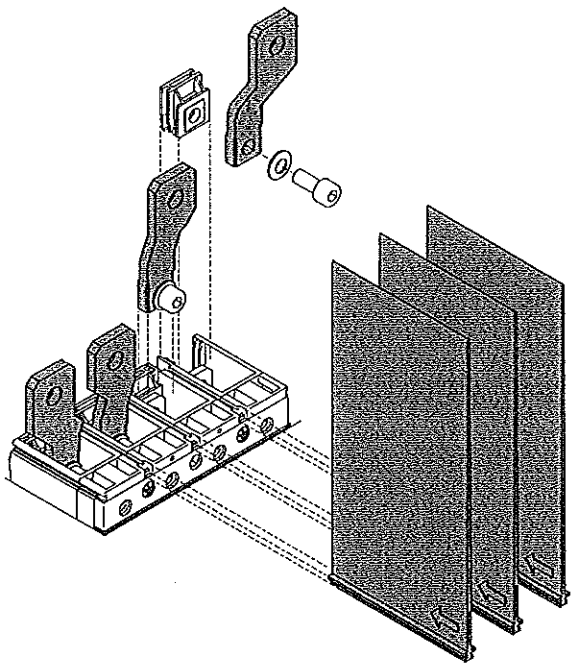
A



B



C



D

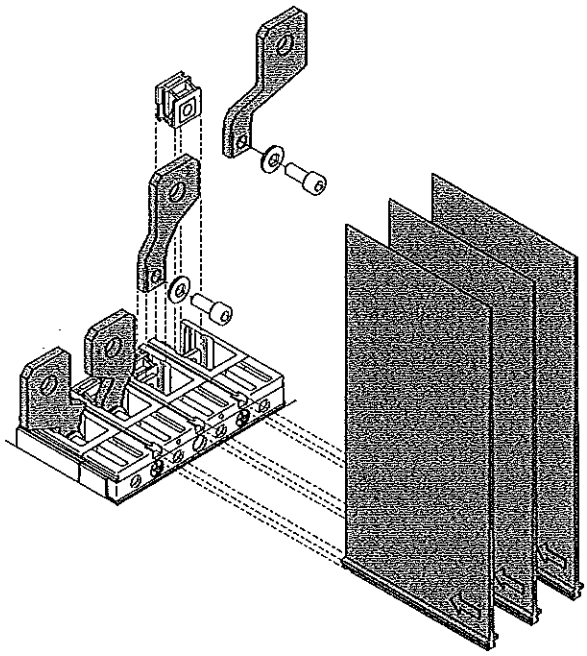


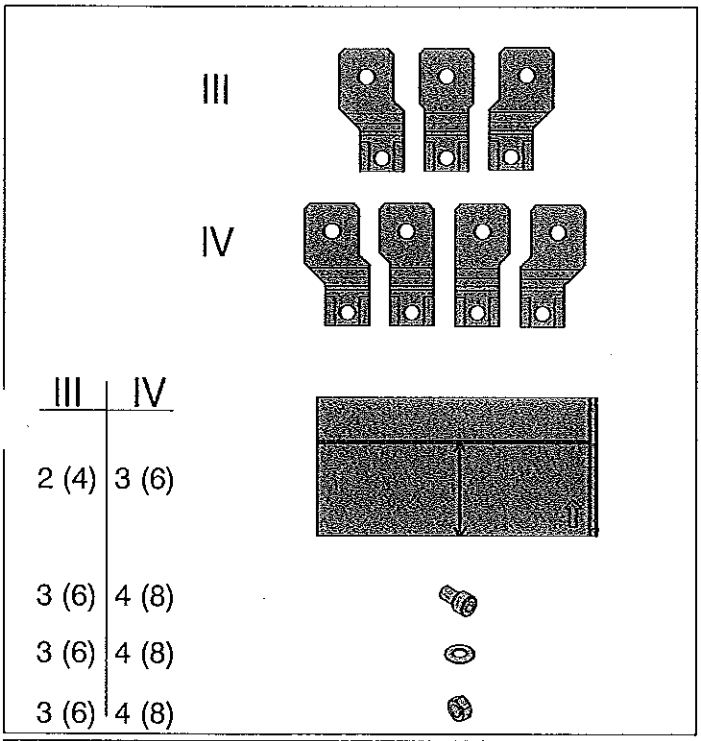
ABB SACE S.p.A.
Via Baioni, 35
24123 Bergamo- Italy
Tel. +39 035.395.111 - Telefax +39 035.395.306-433

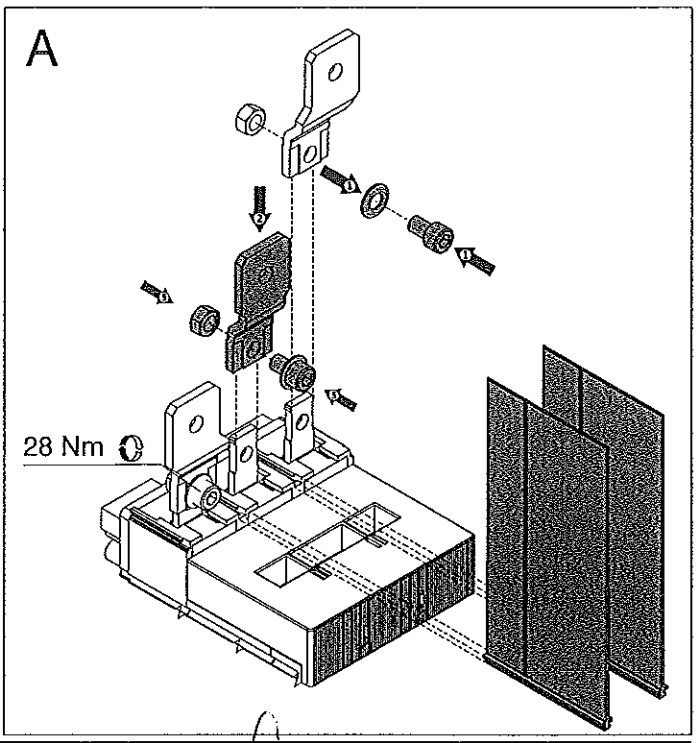
http://www.abb.com

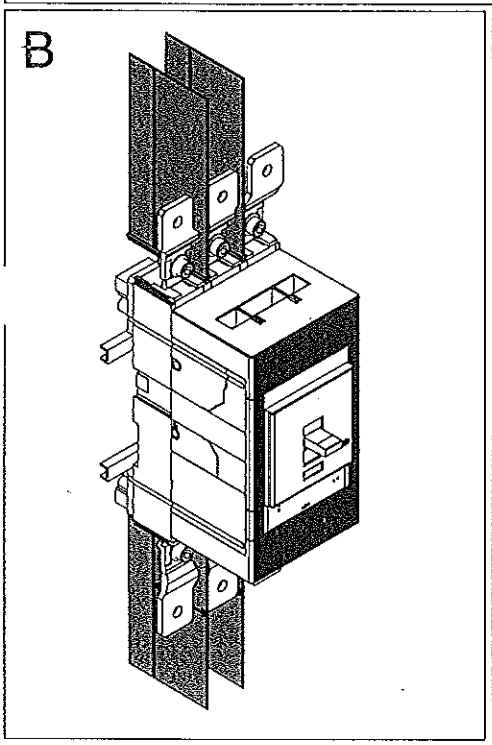
Tmax

DOC. N.° 1SDH000436R0.843 - L0785

ES – Terminali anteriori divaricati T5 630A parte fissa di rimovibile
ES – Splayed front terminals T5 630A plug-in fixed part
ES – Vorderseitige V-förmige Anschlüsse T5 630A ausfahrbarer festes teil
ES - Prises avant écartées T5 630A partie fixe de débrochable
ES – Terminales anteriores separados T5 630A parte fija de enchufable







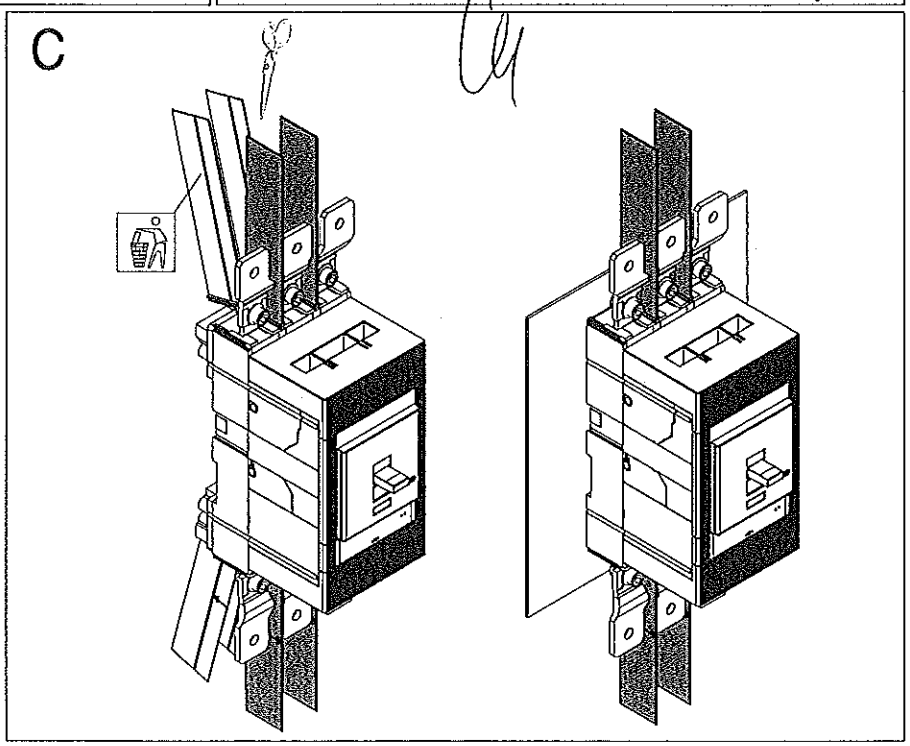


ABB SACE S.p.A.
Via Baioni, 35
24123 Bergamo Italy
Tel.: +39 035 395.111 - Telefax: +39 035 395.306-433

http://www.abb.com