ПРОЕКТ НА ДОГОВОР

Днес, ... 201... г., в град София, Република България, между страните:

(1) „ЧЕЗ РАЗПРЕДЕЛЕНИЕ БЪЛГАРИЯ" АД, със седалище и адрес на управление: Република България, гр. София 1784, Столична община, район „Младост", бул. "Цариградско шосе" № 159, БенчМарк Бизнес Център, вписано в Търговския регистър при Агенцията по вписванията с ЕИК: 130277958, представлявано от ..... – упълномощен за сключване на договора с Решение, отразено в т. ... от Протокол № ... от проведено на ... г. редовно заседание на Управителния съвет негов член, наричано за краткост „Възложител", от една страна
и
(2) „ВАЕ КОНТРОЛС СОФИЯ" ООД, със седалище и адрес на управление: гр. София, ул. "Орел" 2-4, адрес за кореспонденция: гр. София, ул „Козяк" 21А, бл 8, вх А, ап 8, тел. 02 / 868 44 35, факс: 02 / 868 44 35, ел. поща: info@vaecontrols.bg вписано в Търговския регистър при Агенцията по вписванията с ЕИК: 130467103, представлявано от Валя Раилич – Управител, наричано за краткост „Изпълнител", от друга страна,

в резултат на проведена процедура за възлагане на обществена поръчка за сключване на договор с референтен № _____ и предмет: „ _____", въз основа на сключено Рамково споразумение № _____ /_____ г. и на основание чл. 112 от ЗОП, се сключи настоящият договор за следното:

РАЗДЕЛ 1. ПРЕДМЕТ НА ДОГОВОРА

1.1. (1) Съгласно условията на настоящия договор и последващите поръчки за доставка, **Изпълнителят** се задължава да доставя и продава, а **Възложителят** да приема и купува **телеуправляеми триполюсни товарови прекъсвачи, секционен тип, за монтиране на открито**, описани по вид в **Приложение 1** и отговарящи на техническите изисквания (характеристики) от **Приложение 2** на договора. За целите на договора и за краткост телеуправляемите триполюсни товарови прекъсвачи, секционен тип, за монтиране на открито ще бъдат наричани по-долу "**СТОКА**".

(2) Предметът на договора включва и изпълнението на следните дейности от **Изпълнителя**:

a) предоставяне на неограничено по време право на ползване на софтуер за дистанционна параметризация на неограничен брой телеуправляеми триполюсни товарови прекъсвачи, секционен тип, за монтиране на открито за минимум 20 броя потребители;

b) предоставяне на неограничено по време право на ползване на софтуер за визуализация на фазни токове и сигнали минимум за 20 потребители;

c) обучение за работа със софтуерите за параметризация и визуализация за минимум 20 потребители;

d) обучение на минимум 20 служители за монтаж на телеуправляеми триполюсни товарови прекъсвачи, секционен тип, за монтиране на открито;

e) оказване на помощ при писмено искане от Възложителя за срока на гаранционния период;

f) лиценз за работа с комуникационен протокол IEC-60870-5-104 или еквивалент;

g) дистанционно надграждане (upgrade) и обновяване (update) на софтуерите (firmware) за срока на експлоатация.

1.2. Стоката, предмет на настоящия договор, се доставя и купува по поръчки, генерирани през SAP и отправени от ВЪЗЛОЖИТЕЛЯ до ИЗПЪЛНИТЕЛЯ. ВЪЗЛОЖИТЕЛЯТ не е длъжен да поръчва стока по предмета на договора всеки месец. ВЪЗЛОЖИТЕЛЯТ ще поръчва само толкова стока, колкото му е необходима според неговата готовност. В поръчката се включват данни за вида на стоката, конкретните количества, единична и обща цена, срок и място за доставка. Местата за доставка на стоката по предмета на договора са складове на ВЪЗЛОЖИТЕЛЯ, находящи се на територията на страната в следните населени места: гр. София, гр. Враца, гр. Левски и гр. Дупница. Точният адрес на съответната складова база се посочва в поръчката на ВЪЗЛОЖИТЕЛЯ.

1.3. (1) Реалното предаване респективно получаване на доставената стоката по предмета на договора между ИЗПЪЛНИТЕЛЯ и ВЪЗЛОЖИТЕЛЯ се извършва в посочения в поръчката склад на ВЪЗЛОЖИТЕЛЯ с приемно - предавателен протокол, двустранно подписан от страните по този договор или от техни надлежно упълномощени представители. Приемно-предавателният протокол се изготвя в 3 (три) еднообразни екземпляра в съответствие с образеца от Приложение 3 към договора, като един остава за ИЗПЪЛНИТЕЛЯ и два се предават на ВЪЗЛОЖИТЕЛЯ, заедно с документите, описани в Приложение 5 към т. 4.2 от настоящия договор. Съставянето и подписването на приемно – предавателния протокол по настоящата точка удостоверява единствено факта на реално предаване на доставената стока от ИЗПЪЛНИТЕЛЯ на ВЪЗЛОЖИТЕЛЯ респективно нейното физическо получаване от ВЪЗЛОЖИТЕЛЯ, но не и приемането на стоката от страна на последния, като съответстваща на изискванията по отношение на нейното качество, уговорени в настоящия договор и

0263

приложенията към него. Приемането на доставената стока, като съответстваща с изискванията за качество, уговорени в настоящия договор и приложенията към него, се извършва и удостоверява след „входящ контрол" по реда и при условията на т. 5.2 по-долу. На етап реална доставка, предаване и получаване на стоката съгласно настоящата точка, ВЪЗЛОЖИТЕЛЯТ може и е длъжен да направи всички свои възражения относно несъответствия на опаковката или липси на стока спрямо поръчаните количества, които могат да се установят при обикновен оглед. Всички останали възражения относно качеството на доставената стока се правят на етап „входящ контрол" при условията и по реда на т. 5.2 от договора или вследствие установяване на скрити недостатъци/гаранционни дефекти по т. 6.5 от договора. В случай на нарушена опаковка или липси на стока, установени на етапа на реалното предаване респективно получаване на стоката, ВЪЗЛОЖИТЕЛЯТ подписва приемно-предавателен протокол само за стоката, която отговаря на доставеното количество и изисквания към опаковката, а останалото количество не приема и връща (в случай на констатации за нарушена опаковка) с приемно-предавателен протокол на ИЗПЪЛНИТЕЛЯ с указания за отстраняване на несъответствията по опаковката съответно за попълване на липсващите количества в 7-дневен срок. За всички неуредени въпроси в настоящата точка относно възражения по отношение на количеството и опаковката на доставената стока се прилага съответно т. 5.2. по-долу.

(2) Дейностите по т. 1.1, ал. 2, букви „a", „b" „c", „d" и „f" се изпълняват при първата доставка на стока по договора. Дейностите по т. 1.1, ал. 2, буква „e" се изпълняват след писмено искане (поръчка) от страна на Възложителя. Дейностите по т. 1.1, ал. 2, буква „g" се изпълняват считано от датата на доставка на стоката, удостоверена с приемо-предавателния протокол по т. 1.3, без да е необходимо писмено искане (поръчка) от страна на Възложителя.

1.4. (1) Протоколът по т. 1.3. се подписва и от подизпълнителя, ако в поръчката по т. 1.2 са включени стоки, за доставка на които ИЗПЪЛНИТЕЛЯТ е сключил договор за подизпълнение, съгласно т. 4.10. от договора.

(2) Предходната ал. 1 не се прилага, ако ИЗПЪЛНИТЕЛЯТ представи на ВЪЗЛОЖИТЕЛЯ доказателства, че договорът за подизпълнение е прекратен, или доставката на стока или част от нея не е възложена на подизпълнителя.

1.5. Собствеността и рискът от погиването и повреждането на стока преминават върху ВЪЗЛОЖИТЕЛЯ с подписването на приемно-предавателния протокол по т. 1.3 по-горе.

РАЗДЕЛ 2. ЦЕНА И НАЧИН НА ПЛАЩАНЕ

2.1. (1) Единичната цена на стоката, предмет на договора, е описана в **Приложение 1**, неразделна част от настоящия договор. Посочената в Приложение 1 единична цена е окончателна и включва всички преки и непреки разходи на ИЗПЪЛНИТЕЛЯ, в това число:

k) предоставяне на неограничено по време право на ползване на софтуер за дистанционна параметризация на неограничен брой телеуправляемите триполюсни товарови прекъсвачи, секционен тип, за монтиране на открито за минимум 20 броя потребители;

l) предоставяне на неограничено по време право на ползване на софтуер за визуализация на фазни токове и сигнали минимум за 20 потребители;

m) обучение за работа със софтуерите за параметризация и визуализация за минимум 20 потребители;

n) обучение на минимум 20 служители за монтаж на телеуправляемите триполюсни товарови прекъсвачи, секционен тип, за монтиране на открито;

o) оказване на помощ при искане от Възложителя за срока на гаранционния период;

p) лиценз за работа с комуникационен протокол IEC-60870-5-104 или еквивалент;

q) дистанционно надграждане (upgrade) и обновяване (update) на софтуерите (firmware) за срока на експлоатация;

r) транспортни и организационни разходи, свързани с изпълнението на всички дейности, предмет на настоящия договор.

(2) При надлежно и своевременно изпълнение на предмета на договора ВЪЗЛОЖИТЕЛЯТ ще заплаща на ИЗПЪЛНИТЕЛЯ поръчаната по реда на т. 1.2, реално доставена и получена в склад на ВЪЗЛОЖИТЕЛЯ по реда на т. 1.3 и приета след извършен „входящ контрол" за качество по реда на т. 5.2 по-долу стока, по единични цени от Приложение 1. При фактурирането се начислява дължимият в момента ДДС според законодателството на Република България. Единичните цени, по които се плаща стоката, са определени до франко складове на ВЪЗЛОЖИТЕЛЯ, определени в съответствие с т. 1.2 по-горе, като включват всички разходи: транспорт, такси, застраховки, опаковка, документация и всички други съпътстващи доставката на стоката разходи.

2.2. ВЪЗЛОЖИТЕЛЯТ се задължава да заплаща поръчаната по реда на т. 1.2., реално доставена и получена в склад на ВЪЗЛОЖИТЕЛЯ по реда на т. 1.3. и приета след извършен „входящ контрол" за качество по реда на т. 5.2 по-долу стока чрез банкови преводи по банкова сметка на ИЗПЪЛНИТЕЛЯ, извършени в срок до 60 (шестдесет) календарни дни, считано от датата на издаване на оригинална фактура за стойността на конкретната доставка и представяне на документите, посочени в приложението по т. 4.2 от договора, които придружават стоката. Във фактурата трябва да са посочени:

№ и дата на договора, № и дата на приемно-предавателния протокол по т. 1.3 и № на поръчката за доставка. ИЗПЪЛНИТЕЛЯТ е длъжен да представи на ВЪЗЛОЖИТЕЛЯ издадената фактура и документите, които придружават стоката, най-късно в срок до 5 (пет) дни, считано от датата на издаването на фактурата, като при забава за представяне на фактура и придружаващите стоката документи, срокът за плащане се удължава съответно със срока на забавата.
2.3. Максималната стойност на договора е в размер на ..... (.....) лева без ДДС. Независимо от това дали срокът на договора по т. 3.1 е изтекъл или не, при достигане на максималната стойност по тази точка, договорът се прекратява автоматично, без която и да е от страните да дължи уведомление или предизвестие на другата страна.
2.4. ВЪЗЛОЖИТЕЛЯТ извършва окончателното плащане по договор за обществена поръчка, за който има сключени договори за подизпълнение, след като получи от ИЗПЪЛНИТЕЛЯ доказателства, че е заплатил на подизпълнителите всички работи, приети по реда на т. 5.7.
2.5. Условието по предходната т. 2.4. не се прилага в случаите по т. 5.8.

РАЗДЕЛ 3. СРОКОВЕ
3.1. Договорът се сключва за срок от **36 (тридесет и шест) месеца**, считано от датата на влизането му в сила. С изтичането на този срок, договорът се прекратява автоматично, без да е необходимо уведомление или предизвестие на която и да е от страните до другата страна, независимо от това, дали максималната стойност на договора, определена в т. 2.3 по-горе е изчерпана или не.
3.2. Съответните срокове за доставка на съответните максимални количества от стоката са посочени в Приложение 8 към договора.
3.3. Сроковете за доставка, посочени в приложението към предходната т. 3.2 текат от датата на поръчка по т. 1.2.
3.4. В случай че в поръчката са включени количества, по-големи от договорените в приложението по т. 3.2., за количеството над максималното, това обстоятелство ще бъде посочено текстово в съответната поръчка изпратена към ИЗПЪЛНИТЕЛЯ. С потвърждението на поръчката, ИЗПЪЛНИТЕЛЯТ вписва в същата очаквана дата за доставка, която се отнася само за количествата над максималните, посочени в приложението по т. 3.2, като ИЗПЪЛНИТЕЛЯТ е длъжен да достави уговореното максимално количество в приложението по т. 3.2 в 30-дневен срок от датата на поръчката.

РАЗДЕЛ 4. ПРАВА И ЗАДЪЛЖЕНИЯ НА ИЗПЪЛНИТЕЛЯ
4.1. ИЗПЪЛНИТЕЛЯТ е длъжен да достави стоката във вид, качество и с технически показатели, отговарящи на техническите изисквания, определени в Приложение 2 от настоящия договор.
4.2. ИЗПЪЛНИТЕЛЯТ е длъжен да достави стоката, комплектована с документите, описани в Приложение 5, неразделна част от настоящия договор.
4.3. ИЗПЪЛНИТЕЛЯТ се задължава да уведоми писмено ВЪЗЛОЖИТЕЛЯ най-малко два дни преди изпращането на стоката за очакваната дата на пристигането й в местоизпълнението /местоназначението/, посочено в съответната поръчка, чрез факс съобщение или съобщение на електронна поща. Неизпълнението на това задължение освобождава ВЪЗЛОЖИТЕЛЯ от забава за приемането на стоката.
4.4. ИЗПЪЛНИТЕЛЯТ отговаря пред ВЪЗЛОЖИТЕЛЯ, ако трети лица предявят правото си на собственост или други права по отношение на стоката, които могат да бъдат противопоставени на ВЪЗЛОЖИТЕЛЯ.
4.5. ИЗПЪЛНИТЕЛЯТ е длъжен да върне на ВЪЗЛОЖИТЕЛЯ платената цена заедно с лихвите, както и да заплати разноските по договора в случаите, когато се докаже, че продадената стока принадлежи изцяло или отчасти на трето лице, като в тези случаи ВЪЗЛОЖИТЕЛЯТ има право да развали договора по реда и при условията на т. 9.1.1.
4.6. ИЗПЪЛНИТЕЛЯТ се задължава да определи свой представител за реалното предаване на стоката по т. 1.1 с приемно-предавателния протокол по т. 1.3.
4.7. ИЗПЪЛНИТЕЛЯТ е длъжен да замени дефектната или неотговаряща на изискванията стока, констатирано в съответствие с т. 5.2 или т. 6.5 на договора, в сроковете, определени в т. 5.2, ал. 2 и ал. 3.
4.8. ИЗПЪЛНИТЕЛЯТ има право да получи цената на поръчаната, реално доставена в склад на ВЪЗЛОЖИТЕЛЯ и приета за качествена, вследствие извършен «входящ контрол» стока, съгласно условията на настоящия договор.
4.9. При изпълнението на настоящия договор ИЗПЪЛНИТЕЛЯТ няма да използва/ще използва следния/те подизпълнител/и ..... (попълва се при сключване на договора, ако участникът, определен за изпълнител е декларирал в заявлението си, че при изпълнение на договора ще използва подизпълнители) за изпълнение на ..... (посочват се видовете работи, които ще се изпълняват от подизпълнителя/ите), представляващи .....% от общата стойност на поръчката).
4.10. В случай че сключи договор за подизпълнение с подизпълнител, в срок до 3 /три/ дни от датата на сключването му, ИЗПЪЛНИТЕЛЯТ изпраща оригинален екземпляр от договора за подизпълнение на ВЪЗЛОЖИТЕЛЯ.

4.11. ИЗПЪЛНИТЕЛЯТ няма право да възлага изпълнението на една или повече от работите, включени в предмета на договора, на лица, с които не е сключен и представен на ВЪЗЛОЖИТЕЛЯ договор за подизпълнение.
4.12. ИЗПЪЛНИТЕЛЯТ има право да замени подизпълнителя/ите по т. 4.9, когато:
а) За подизпълнителя/ите е налице или възникне обстоятелство чл. 54, ал. 1 съответно чл. 55, ал. 1, т. 1 или т. 4 от ЗОП;
б) Подизпълнителят/ите не отговаря/т на нормативно изискване за изпълнение на работите, включени в предмета на договора за подизпълнение;
в) Договорът за подизпълнение е прекратен по вина на подизпълнителя/ите, включително ако подизпълнителят/ите превъзлага/т една или повече работи, включени в предмета на договора, за подизпълнение.
4.13. ИЗПЪЛНИТЕЛЯТ е длъжен да прекрати договор за подизпълнение, ако по време на изпълнението му възникне за подпизпълнителя обстоятелство по чл. 54, ал. 1 съответно по чл. 55, ал. 1, т. 1 или т. 4 от ЗОП, както и ако подизпълнителят превъзлага една или повече работи, включени в предмета на договора за подизпълнение.
4.14. В случаите по т. 4.12 и т. 4.13, ИЗПЪЛНИТЕЛЯТ сключва нов договор за подизпълнение или допълнително споразумение към договор за подизпълнение и изпраща оригинален екземпляр на ВЪЗЛОЖИТЕЛЯ в срок до три дни от датата на сключване заедно с доказателства за изпълнение на условията по чл. 66, ал. 2 във връзка с ал. 14 от ЗОПза подизпълнителя.
4.15. Сключване на договор за подизпълнение или на допълнително споразумение към договор за подизпълнение не освобождава ИЗПЪЛНИТЕЛЯ от отговорността му за изпълнение на настоящия договор. Използване на подизпълнител/и не изменя задълженията на ИЗПЪЛНИТЕЛЯ по договора. ИЗПЪЛНИТЕЛЯТ отговаря за действията на подизпълнителя/ите като за свои действия.
4.16. Приложимите клаузи на договора са задължителни за изпълнение от подизпълнителя/ите.
4.17. Подизпълнителите нямат право да превъзлагат една или повече от дейностите, които са включени в предмета на договора за подизпълнение.
4.18. Доставката на стоки, материали или оборудване, необходими за изпълнението на обществената поръчка не се счита за наемане на подизпълнител, когато такава доставка не включва монтаж, както и сключването на договори за услуги, които не са част от настоящия договор за обществена поръчка, съответно - от договора за подизпълнение.
4.19. ВЪЗЛОЖИТЕЛЯТ се разплаща директно с подизпълнителя в случай че едновременно са изпълнени следните условия:
а) част от поръчката се изпълнява от подизпълнителя и тя е предадена в склад на ВЪЗЛОЖИТЕЛЯ и е надлежно приета за качествена от същия, вследствие осъществен „входящ контрол", като отделен обект на изпълнение по предмета на договора;
б) подизпълнителят е направил искане за директно плащане до ВЪЗЛОЖИТЕЛЯ, което е представил на ИЗПЪЛНИТЕЛЯ, в което посочил своя банкова сметка, по която да се направи плащането;
в) в срок до 15 дни от получаването на искането по предходната буква. „б", ИЗПЪЛНИТЕЛЯТ е представил искането за директно плащане на ВЪЗЛОЖИТЕЛЯ, към което е приложил свое становище, от което се установява, че не оспорва плащанията или част от тях като недължими.
4.20. В случаите на т. 4.19. плащането в полза на подизпълнителя се извършва по банков път по посочената от подизпълнителя банкова сметка в срок до 60 дни след получаване от страна на ВЪЗЛОЖИТЕЛЯ на оригинална фактура за стойността на конкретното плащане и документите, посочени в приложението по т. 4.2 от договора, които придружават стоката. Във фактурата трябва да са посочени: № и дата на договора, № и дата на приемно-предавателния протокол по т. 1.3 и № на поръчката за доставка и № и дата представяне на документите по т. 4.19., буква „в"
4.21. (1) В случай че е налице искане за директно разплащане, към което е приложено становище от ИЗПЪЛНИТЕЛЯ, оспорващо плащанията или част от тях като недължими, ВЪЗЛОЖИТЕЛЯТ отказва плащане до отстраняване на причината за отказа.
(2) В случай че в настоящият договор има празнота по отношение на приложимите правила относно директните разплащания с подизпълнители, страните се споразумяват да прилагат чл. 66 от ЗОП и съответните относими правни норми от ППЗОП.
4.22. ИЗПЪЛНИТЕЛЯТ се задължава да обезпечи спазването на задълженията във връзка с обработването и защитата на лични данни, уговорени в т. 11.4 по-долу от подизпълнителя/ите. В случай на нерегламентирано обработване на лични данни или нарушаване на нормативните изисквания относно тяхната защита от страна на подизпълнителя, ИЗПЪЛНИТЕЛЯТ отговаря за причинените вреди и за всички наложени на ВЪЗЛОЖИТЕЛЯ имуществени санкции/глоби.
4.23. (1) При и по повод изпълнението на предмета на договора, ИЗПЪЛНИТЕЛЯТ се задължава да спазва следните нормативни актове, ако същите имат отношение към дейността му по изпълнение на поръчката, както следва:
1. Закона за опазване на околната среда (Обн. ДВ. бр. 91 от 25 Септември 2002 г.);
2. Закона за управление на отпадъците (Обн. ДВ. бр. 53 от 13 Юли 2012 г.);
3. Закона за биологичното разнообразие (Обн. ДВ. бр. 77 от 9 Август 2002 г.);
4. Закона за защитените територии (Обн. ДВ. бр. 133 от 11 Ноември 1998 г.);

5. Закона да културното наследство (Обн. ДВ. бр. 19 от 13 Март 2009 г.).
ИЗПЪЛНИТЕЛЯТ е длъжен да обезпечи спазването на описаните по-горе нормативни актове и от страна на неговите служители, ангажирани с изпълнението на договора или подизпълнители. За неспазването им от страна на неговите служители и подизпълнители, отговорността се носи от страна на ИЗПЪЛНИТЕЛЯ.
(2) ИЗПЪЛНИТЕЛЯТ се е запознал със съдържанието на по-долу посочените клаузи на договора за социална отговорност и ще спазва същите при или по повод на изпълнението на предмета на договора, като декларира:
1. Че ще спазва човешките права, като признава и ще прилага Всеобщата Харта за правата на човека на ООН и гарантира, че дружеството му по никакъв начин не е замесено в нарушения на човешките права.
2. Не е ползвал, не ползва и няма да се ползва от детски и принудителен труд, като за целта ИЗПЪЛНИТЕЛЯТ се задължава за срока на действие на договора да не използва или допуска детски, принудителен или друг недоброволен труд съгласно Конвенциите на Международната Организация на Труда (ILO) във връзка или по повод на изпълнението на предмета на договора и гарантира, че стриктно ще спазва изискванията на Кодекса на труда.
3. Липса на дискриминация или тормоз на работното място, като гарантира недопускане на физически, психически, сексуален или словесен тормоз, дискриминация или злоупотреба поради полова принадлежност, раса, религия, възраст, произход, увреждане, сексуална или политическа ориентация, мироглед.
4. Че ще прилага правилата за осигуряване на безопасни и здравословни условия на труд на работното място, като за целта гарантира безопасни и здравословни условия на труд за своите служители и служителите на подизпълнителите и спазване на прилаганите за това закони и правилници, както и осигуряване на свободен достъп до питейна вода, санитарни помещения, съответната пожарна защита, осветление, вентилация и ако е необходимо - подходящи лични предпазни средства, както и гарантира изпълнение на всички изисквания на приложимите нормативни документи за безопасно изпълнение на задълженията, както и че ще спазва всички предоставени от ВЪЗЛОЖИТЕЛЯ вътрешно-фирмени инструкции за безопасност при работи, приложими за изпълнение на дейностите, предмет на договора, гарантира също така осигуряването на квалифициран персонал и провеждане на обучения и инструктажи по техника на безопасност.
5. Че ще спазва приложимите Трудови и социално правни разпоредби, като за целта гарантира, че при и по повод изпълнението на договора ще спазва действащите трудови, социални и осигурителни норми на действащото българско законодателство.
6. Че ще полага всички грижи за защита и опазване на околната среда, като за целта гарантира, че при и по повод изпълнението на договора ще спазва приложимите закони, подзаконови нормативни актове и правилници за опазване на околната среда и при изпълнение предмета на договора ще бъдат преценявани икономическите, екологичните и социалните аспекти и по този начин ще бъдат взети предвид принципите на устойчивото развитие, както и гарантира, че при изпълнението на договора няма да допуска замърсяване на околната среда, ще минимизира влиянието върху околната среда, предизвикано от съответната дейност и ще организира за своя сметка отстраняване на замърсяването в случай на допускане на такова.
7. Че ще защитава биологичното разнообразие, като за целта гарантира, че при или по повод изпълнението на договора ще опазва и няма да допуска увреждането на биологичното разнообразие.
8. Че ще опазва околната среда в зони от «Натура 2000», като за целта гарантира, че ще координира мерките за спазване на законовите изисквания в областта на опазването на околната среда при изпълнение предмета на договора, включително в зоните от «Натура 2000» и ще опазва растителните и животински видове, както и местата, които обитават.
9. Че ще осигурява намаляването на използването на ресурси, отделяне на отпадъци и емисии, като за целта гарантира минимизирането на отделянето на отпадъци от всякакъв вид, както и отделяне на всички емисии във въздуха, водата или почвата при или по повод изпълнението на договора.
10. Че ще прилага в своята дейност високи етични стандарти, като за целта гарантира спазване на високи стандарти на фирмена етика, спазване на съответните национални закони (трудовоправните, разпоредбите за защита на конкуренцията и правата на потребителите) и недопускане на корупционни схеми, лъжа или изнудване.
11. Че ще спазва прозрачни бизнес отношения при осъществяване на своята дейност, като за целта гарантира, че неговите служители и подизпълнители няма да предлагат нито да изискват, нито да гарантират, нито да приемат подаръци, плащания или други предимства от подобен род или облаги, които може да са предназначени да подтикнат дадено лице да наруши задълженията си.
12. Че ще обезпечи в своята дейност правото за провеждане на събрания и стачки, като за целта гарантира, че неговите служители имат възможност в рамките на законовите разпоредби на страната, да участват в събрания и стачки, без да се страхуват от последствия.
ИЗПЪЛНИТЕЛЯТ се задължава да обезпечи спазването на декларираните по-горе в настоящата алинея задължения от всички свои служители или подизпълнители, които са натоварени с

изпълнението на договора, като при неизпълнението им ИЗПЪЛНИТЕЛЯТ отговаря за причинените вреди, наложени санкции и обезщетения.
(3) При или по повод на изпълнението на предмета на договора ИЗПЪЛНИТЕЛЯТ се задължава (ако е приложимо във връзка с изпълнението на уговорените дейности):
1. да спазва установените от ВЪЗЛОЖИТЕЛЯ мерки за сигурност на обектите на ВЪЗЛОЖИТЕЛЯ, като изпълнява указанията на охраната, разпоредбите на органите на МВР и спазва реда за контрол на достъп и пропускателния режим.
2. да не въздейства, по никакъв начин, на изградените от ВЪЗЛОЖИТЕЛЯ системи за сигурност, чрез преместване, покриване, препречване или други действия, водещи до елиминирането им или намаляващо тяхната функционално състояние.
3. да не носи и използва оръжие и други общоопасни средства на територията на обекта, да не пипа, проверява или пренася, открити безконтролни пакети и багажи в обекта, като при откриване на такива, да предприема мерки за уведомяване на охраната и органите на МВР.
ИЗПЪЛНИТЕЛЯТ се задължава да обезпечи спазването на задълженията, описани по-горе в настоящата алинея, и от страна на неговите служители и подизпълнители, които са ангажирани с изпълнението на Договора. При нарушение на тези задължения от служител или подизпълнител, ИЗПЪЛНИТЕЛЯТ отговаря за констатираното неизпълнение и за вредите причинени от него.
4.24. С изпълнението на настоящия договор Възложителят придобива, за неограничен срок неизключително, непрехвърлимо право на ползване (лиценз/и) на софтуера/и на оборудването и на комуникационен протокол IEC-60870-5-104 или еквивалент.
4.25. Под термина „лиценз" или „право на ползване" на софтуер/и по предходната точка се разбира обработване на информация и/или процеса на копиране и/или записване и/или транскрибиране на софтуера, като за целта Изпълнителят предоставя на Възложителя паролите за достъп до софтуера, за извършване на настройки, актуализация, включване и изключване на обекти, дистрибутивни права да се деинсталира и преинсталира, и други функции, касаещи софтуера и неговото ползване. Ползването не включва модифициране на софтуера, създаване на производни версии от него, преасемблиране, пресъставяне или преконструиране на софтуера на ниво сорс файлове и разпространяването му сред трети лица или предоставянето му за ползване по какъвто и да е начин, пряко или непряко на други лица, освен в случаите по т. 4.26.
4.26. Непрехвърлимо право на ползване по т. 4.24 по-горе означава, че Възложителят не може да прехвърля това право на трети лица. Това не се отнася до юридически лица, които са свързани лица по смисъла на § 1, ал. 1 от ДР на ТЗ и § 1, т. 13 и т. 14 от ДР на ЗППЦК с Възложителя, преобразуване на фирмата на Възложителя и при предоставяне от Възложителя или ползване на услуги на трети лица, чрез използването на софтуера.
4.27. В случаите на използване на софтуер, чиито права на интелектуална собственост принадлежат на трети лица, Изпълнителят гарантира, че притежава право на ползване върху софтуера и право да го предоставя на Възложителя. Всички претенции, които биха възникнали към Възложителя от страна на трети лица, носители на правата върху предоставения/те софтуер/и, както и всички разходи и вреди, претърпени от него, са за сметка на Изпълнителя. Настоящата клауза се прилага и по отношение на лиценза за работа с комуникационен протокол IEC-60870-5-104 или еквивалент.
4.28. Изпълнителят е длъжен с доставката на първата поръчка от договорената стока да инсталира двата вида софтуер (за параметризация и визуализация) на компютри на Възложителя и да проведе обучение за работа с двата вида софтуер (за параметризация и визуализация) на 20 служители на Възложителя, както и да проведе обучение за монтаж на стоката на минимум 20 служители на Възложителя. Инсталацията на двата вида софтуер се удостоверява с приемо-предевателен протокол, а провеждането на обучението се удостоверява с издаване на сертификати за обучение на служителите на Възложителя, които са минали курса на обучение.
4.29. Изпълнителят е длъжен да осигури следгаранционно обслужване и доставка на модули и резервни части за срока на експлоатация на стоката.
4.30. Изпълнителят се задължава да осигури дистанционно надграждане (upgrade) и обновяване (update) на софтуерите (firmware) за срока на експлоатация на стоката.

РАЗДЕЛ 5. ПРАВА И ЗАДЪЛЖЕНИЯ НА ВЪЗЛОЖИТЕЛЯ
5.1. ВЪЗЛОЖИТЕЛЯТ се задължава да определи свой представител за реалното получаване на стоката по т. 1.1. с приемно-предавателния протокол по т. 1.3
5.2. (1) ВЪЗЛОЖИТЕЛЯТ провежда «входящ контрол» за качество на доставената стока, с цел установяване на съответствието ѝ с изискванията за качество, посочени в настоящия договор и приложенията към него, в 30-дневен срок, считано от датата на подписване от страните на протокола за реалното предаване съответно получаване на стоката в склад на ВЪЗЛОЖИТЕЛЯ по т. 1.3 по-горе. За проведения «входящ контрол» ВЪЗЛОЖИТЕЛЯТ изготвя протокол за приемане на доставената стока за съответстваща на изискванията за качество, уговорени в договора и приложенията към него. При констатиране на несъответствия на стоката по реда на следващата алинея, протоколът по настоящата алинея се съставя в съответствие с условията по т. 5.6. (1) по-долу.

0268

(2) При установяване на недостатъци/несъответствия на доставената стока по време на «входящия контрол», протоколът по предходната алинея не се съставя, а ВЪЗЛОЖИТЕЛЯТ е длъжен писмено да уведоми ИЗПЪЛНИТЕЛЯ в 10-дневен срок, считано от датата на извършване на „входящия контрол". В писменото уведомление по предходното изречение ВЪЗЛОЖИТЕЛЯТ описва недостатъците/несъответствията (дефектите) на доставената стока и начинът за отстраняването им. ИЗПЪЛНИТЕЛЯТ е длъжен да прегледа уведомлението с констатациите на ВЪЗЛОЖИТЕЛЯ за недостатъци (дефекти) на стоката и да го уведоми писмено (по факс или на електронна поща) за това дали приема констатациите - съответно предложеният начин за отстраняване на недостатъците (дефектите) или не ги приема. ИЗПЪЛНИТЕЛЯТ следва да изпълни задължението си за уведомяване по предходното изречение в срок до 1 /един/ работен ден от датата на получаване на уведомлението на ВЪЗЛОЖИТЕЛЯ за резултатите от входящия контрол. В случай че ИЗПЪЛНИТЕЛЯТ не уведоми ВЪЗЛОЖИТЕЛЯ за решението си относно констатациите от входящия контрол в срока по предходното изречение, се счита, че не ги приема, вследствие на което ВЪЗЛОЖИТЕЛЯТ пристъпва към съставянето на констативен протокол по ал. 3. В случай че ИЗПЪЛНИТЕЛЯТ приеме констатациите и предложенията на ВЪЗЛОЖИТЕЛЯ, констативен протокол по ал. 3 не се съставя, а ИЗПЪЛНИТЕЛЯТ е длъжен да отстрани констатираните недостатъци/несъответствия (дефекти) в срок до 15 /петнадесет/ календарни дни, считано от датата на писменото им приемане. В случай че ИЗПЪЛНИТЕЛЯТ не приеме констатациите и предложенията на ВЪЗЛОЖИТЕЛЯ, последният го уведомява писмено за дата, час и място за съставяне на констативен протокол по ал. 3. Писменото уведомление за съставянето на констативен протокол по ал. 3 се изпраща на ИЗПЪЛНИТЕЛЯ не по-късно от 3 /три/ дни преди посочената в уведомлението дата за съставяне на протокола.

(3) При отказ на ИЗПЪЛНИТЕЛЯ да приеме констатациите на ВЪЗЛОЖИТЕЛЯ относно недостатъците/несъответствията (дефектите) на стоката и начина на тяхното отстраняване по предходната алинея, страните по договора съставят и подписват констативен протокол, в който се описват установените недостатъци/несъответствия, начинът и срокът за тяхното отстраняване. Срокът за отстраняване на недостатъците/несъответствията (дефектите) на стоката не може да бъде по-дълъг от 15 /петнадесет/ календарни дни, считано от датата на подписване от страните на констативния протокол.

(4) Неявяването на ИЗПЪЛНИТЕЛЯ или отказът за съставяне и подписване на констативния протокол по предходната алинея не го освобождава от отговорност. В този случай констативният протокол се съставя само от представители на ВЪЗЛОЖИТЕЛЯ и се изпраща на ИЗПЪЛНИТЕЛЯ по факс или електронна поща за изпълнение. В този случай срокът за отстраняване на недостатъците, посочен в констативния протокол, започва да тече от датата на изпращането на протокола на ИЗПЪЛНИТЕЛЯ.

(5) При съставянето на констативния протокол по ал. 3, съответно по ал. 4, страните отчитат уговореното в т. 5.3. от договора.

5.3. При установяване на недостатъци/несъответствия (дефекти) на стоката по реда на т. 5.2. или т. 6.5. от договора ВЪЗЛОЖИТЕЛЯТ има следните алтернативни права:

5.3.1. да иска замяна на дефектната или неотговаряща на изискванията стока с нова за сметка на ИЗПЪЛНИТЕЛЯ; или

5.3.2. да задържи стоката и да иска отбив от цената; или

5.3.3. да откаже да приеме стоката или да върне доставената и получена по реда на т. 1.3, но дефектна или неотговаряща на изискванията стока, съответно да не я заплати или ако вече е заплатена, да иска връщането на платената за нея цена.

5.4. При доставка на дефектна стока или стока, която не отговаря на изискванията на ВЪЗЛОЖИТЕЛЯ, констатирано в съответствие с т. 5.2. или т. 6.5., и в случай че ИЗПЪЛНИТЕЛЯТ не отстрани недостатъците, съответно не замени дефектната или несъответстваща стока с качествена в уговорените срокове, то ВЪЗЛОЖИТЕЛЯТ има право да предприеме действия за отстраняване на недостатъците от трета страна или да ги отстрани сам, за сметка на ИЗПЪЛНИТЕЛЯ. В този случай ВЪЗЛОЖИТЕЛЯТ има право на неустойката по т. 7.2.

5.5. В случаите на т. 5.3., ВЪЗЛОЖИТЕЛЯТ може да приеме неотговарящата на изискванията или дефектна стока на отговорно пазене, като вземе всички възможни мерки за безопасното й съхранение за максимален срок от 30 /тридесет/ календарни дни.

5.6. (1) В случай на констатирани недостатъци/несъответствия (дефекти) на стоката при условията и по реда на т. 5.2. (2) и следващите алинеи на тази точка, протокола по т. 5.2. (1) се съставя и подписва след отстраняването на всички недостатъци/несъответствия (дефекти) респективно след замяната на дефектната или несъответстаща стока с нова и качествена от и за сметка на ИЗПЪЛНИТЕЛЯ, ако ВЪЗЛОЖИТЕЛЯТ се е позовал на тази своя правна възможност съгласно т. 5.3 по-горе. За периода от датата на уведомяване на изпълнителя за отстраняване на недостатъците/несъответствията, съгласно т. 5.2, до реалното отстраняване на констатираните недостатъци/несъответствия (дефекти) на доставената стока респективно до замяната и с нова и качествена, удостоверено със съответния протокол за успешно преминат «входящ контрол», ИЗПЪЛНИТЕЛЯТ е в забава и дължи на ВЪЗЛОЖИТЕЛЯ съответната неустойка за забава, уговорена в т. 7.1. (1).

(2) ВЪЗЛОЖИТЕЛЯТ е длъжен, съгласно условията на този договор, да изплати на ИЗПЪЛНИТЕЛЯ договорената цена единствено на поръчана, реално доставена и получена в склад на ВЪЗЛОЖИТЕЛЯ

и приета за качествена, вследствие успешно преминат „входящ контрол" по реда на т. 5.2. (1) стока. Преди приемането на стоката за качествена, което се удостоверява със съставянето и подписването на протокола по т. 5.2. (1), ВЪЗЛОЖИТЕЛЯТ не е задължен да заплати цената на реално доставената и приета в негов склад по реда на т. 1.3 по-горе стока по предмета на договора. Докато стоката не бъде приета за качествена въз основа на проведен «входящ контрол» и не бъде съставен и подписан протокола за приемането и по т. 5.2. (1) ВЪЗЛОЖИТЕЛЯТ не изпада в забава за плащане на дължимата цена на стоката.

5.6.1. В хипотезата на установяване на недостатъци/несъответствия по време на входящия контрол, които са отстранени от ИЗПЪЛНИТЕЛЯ в 15-дневния срок съгласно т. 5.2, ал. 2 или ал. 3, след което заменената стока или стоката с отстранени недостатъци/несъответствия е преминала успешно повторен входящ контрол и е съставен и подписан валиден протокол за приемането и за качествена, плащането на дължимата цена за тази стока се извършва в уговорения 60-дневен срок съгласно т. 2.2 от настоящия договор, който започва да тече считано от датата на издаване от страна на ИЗПЪЛНИТЕЛЯ на първоначалната фактура и представяне на документите, които придружават стоката. При отстраняване на констатираните недостатъци/несъответствия на стоката по време на „входящия контрол" в 15-дневния срок по т. 5.2, ал. 2 или ал. 3, в съответствие с уговореното по-горе в настоящата точка, ИЗПЪЛНИТЕЛЯТ не изпада в забава и не дължи на ВЪЗЛОЖИТЕЛЯ неустойка за забава.

5.6.2. Ако обаче са установени недостатъци/несъответствия по време на входящия контрол, които не са отстранени от ИЗПЪЛНИТЕЛЯ в 15-дневния срок съгласно т. 5.2, ал. 2 или ал. 3, за да получи плащане ИЗПЪЛНИТЕЛЯТ е длъжен да издаде кредитно известие за доставената стока, по отношение на която са констатирани недостатъци/несъответствия вследствие осъществен входящ контрол по реда на т. 5.2 (2), след което да си я получи обратно от мястото на което тази стока е доставена на ВЪЗЛОЖИТЕЛЯ, като връщането на стоката се удостоверява с протокол. В тези случаи, ако след изтичане на 15-дневния срок по т. 5.2, ал. 2 или ал. 3, неотговарящата на изискванията или дефектна стока бъде все пак заменена или недостатъците/несъответствията по нея бъдат отстранени и ВЪЗЛОЖИТЕЛЯТ все още има интерес от това, същата преминава отново входящ контрол по реда на т. 5.2., ал. 1 и ако вследствие на контрола бъде приета за качествена, страните съставят и подписват нов протокол за приемане на заменената стока или стока с отстранени недостатъци/несъответствия, а ИЗПЪЛНИТЕЛЯТ издава и представя на ВЪЗЛОЖИТЕЛЯ нова фактура за дължимата цена, като плащането на цената се извършва в срок до 60 (шестдесет) календарни дни, считано от датата на издаване на новата оригинална фактура и предоставяне на документите, посочени в приложението по т. 4.2 от договора за заменената стока или за стоката, чиито недостатъци/несъответствия са били отстранени. За периода от датата на уведомяване на изпълнителя за отстраняване на недостатъци/несъответствия или за замяна на некачествената стока с нова по т. 5.2, ал. 2 или 3 до датата на приемане, вследствие извършен нов „входящ контрол" по реда на т. 5.2., на доставената нова и качествена стока или стока с отстранени недостатъци/несъответствия, което се удостоверява със съставянето и подписването на съответния протокол между страните, ИЗПЪЛНИТЕЛЯТ е в забава и дължи на ВЪЗЛОЖИТЕЛЯ неустойка за забава съгласно т. 7.1, ал. 1 от настоящия договор.

5.7. ВЪЗЛОЖИТЕЛЯТ приема изпълнението на дейност по договора за обществена поръчка, за която ИЗПЪЛНИТЕЛЯТ е сключил договор за подизпълнение, в присъствието на ИЗПЪЛНИТЕЛЯ и на подизпълнителя.

5.8. При приемането на доставката/работата ИЗПЪЛНИТЕЛЯТ може да представи на ВЪЗЛОЖИТЕЛЯ доказателства, че договорът за подизпълнение е прекратен, или доставката/работата или част от нея не е извършена от подизпълнителя.

РАЗДЕЛ 6. ГАРАНЦИИ И РЕКЛАМАЦИИ

6.1. При подписване на настоящия договор ИЗПЪЛНИТЕЛЯТ представя гаранция за изпълнение на стойност от ..... (.....) лева, представляваща 5% от максималната стойност на договора, посочена в т. 2.3 по-горе, под формата на паричен депозит по сметка на ВЪЗЛОЖИТЕЛЯ, както следва: SWIFT (BIC): UNCRBGSF; банкова сметка (IBAN) в лева: BG 43 UNCR 7630 1002 ERPBUL; при банка: «УниКредит Булбанк» АД или под формата на безусловна и неотменяема банкова гаранция или под формата на застраховка, която обезпечава изпълнението чрез покритие на отговорността на ИЗПЪЛНИТЕЛЯ, издадена в полза на ВЪЗЛОЖИТЕЛЯ, като срокът на валидност на гаранцията под формата на банкова гаранция трябва да е не по-кратък от 39 /тридесет и девет/ месеца, съответно 41 (четиридесет и един) месеца, когато гаранцията е под формата или застраховка, считано от датата на издаването на съответния вид гаранция. Гаранцията за изпълнение под формата на банкова гаранция или застраховка се издава не по-рано от датата на поканата на ВЪЗЛОЖИТЕЛЯ до лицето, избрано за ИЗПЪЛНИТЕЛ в резултат на обществената поръчка за сключване на настоящия договор и не по-късно от датата на влизане в сила на договора.

6.2. Гаранцията за изпълнение ще компенсира и обезпечава ВЪЗЛОЖИТЕЛЯ за всякакви вреди и загуби, причинени вследствие виновно неизпълнение/забава за изпълнение на задълженията по договора от страна на ИЗПЪЛНИТЕЛЯ, както и за произтичащите от тях санкции и неустойки. В случай че претърпените вреди на ВЪЗЛОЖИТЕЛЯ са в по-голям размер от размера на гаранцията за

изпълнение по предходната точка, ВЪЗЛОЖИТЕЛЯТ има право да потърси обезщетение по общия съдебен ред пред компетентния български съд.
6.2.1. При всяко усвояване на суми от гаранцията за изпълнение ВЪЗЛОЖИТЕЛЯТ е длъжен да уведоми ИЗПЪЛНИТЕЛЯ, а последният – да допълни размера на гаранцията за изпълнение до посочения в договора размер. Допълването се извършва в срок до 14 (четиринадесет) календарни дни след датата на уведомяване за усвояването. В противен случай ВЪЗЛОЖИТЕЛЯТ има право да развали договора по вина на ИЗПЪЛНИТЕЛЯ при условията и по реда на т. 9.1.6 по-долу.
6.2.2. При прекратяване или разваляне на договора по вина на ИЗПЪЛНИТЕЛЯ, ВЪЗЛОЖИТЕЛЯТ усвоява в своя полза и в пълен размер гаранцията за изпълнение, като има право да претендира дължимите от ИЗПЪЛНИТЕЛЯ санкции и неустойки по общия съдебен ред.
6.2.3. Банковите разходи по откриването и поддържането на гаранцията съответно разходите по сключването и поддържането на застраховката са за сметка на ИЗПЪЛНИТЕЛЯ. ВЪЗЛОЖИТЕЛЯТ не му дължи възстановяване на тези разходи.
6.2.4. ВЪЗЛОЖИТЕЛЯТ не дължи лихва за периода, през който паричната сума, внесена като гаранция за изпълнение законно е престояла у него.
6.2.5. ВЪЗЛОЖИТЕЛЯТ има право да инкасира суми от тази гаранция при неизпълнение или забава за изпълнение на договорените задължения от страна на ИЗПЪЛНИТЕЛЯ.
6.3. Гаранцията за изпълнение или неинкасираната част от нея ще бъде освободена от ВЪЗЛОЖИТЕЛЯ и върната на ИЗПЪЛНИТЕЛЯ в срок до 30 /тридесет/ календарни дни след изтичане на срока на договора, съответно след прекратяването му на друго основание без вина на ИЗПЪЛНИТЕЛЯ, ако изпълнението е надлежно, освен ако не е усвоена поради неизпълнение или забава за изпълнение на договорни задължения на ИЗПЪЛНИТЕЛЯ.
6.4. Гаранционният срок на закупената стока е ..... /...../ месеца, считано от датата на подписването на приемно-предавателния протокол по т. 1.3 по-горе за доставката съответно получаването й в склада на ВЪЗЛОЖИТЕЛЯ, при спазване на указанията за съхранение, монтаж и експлоатация на производителя.
6.5. (1) По всяко време от действието на договора, ВЪЗЛОЖИТЕЛЯТ има право да проверява доставената стока, която не е в режим на експлоатация, за наличие на скрити недостатъци. Проверката по предходното изречение се извършва от служители на ВЪЗЛОЖИТЕЛЯ, притежаващи съответната техническа компетентност, притежаващи сертификат за обучение съгласно т. 4.28, и се удостоверява със съставянето на констативен протокол. При откриване на скрити недостатъци на доставената стока по реда на настоящата точка, същите се считат за гаранционни дефекти и ИЗПЪЛНИТЕЛЯТ е длъжен да ги отстрани в съответствие с гаранционните условия, при условие, че са спазени условията за съхранение на стоката.
(2) За гаранционни дефекти на стоката, освен скритите недостатъци по т. 6.5, ал. 1, се считат и всички дефекти на стоката, които са се проявили по време на експлоатацията й и не са резултат от неправилни действия на ВЪЗЛОЖИТЕЛЯ и/или негови служители и са в рамките на гаранционния срок по т. 6.4.
(3) При констатиране на дефекти (неизправности) на стоката в рамките на гаранционния срок, ВЪЗЛОЖИТЕЛЯТ е длъжен да уведоми писмено ИЗПЪЛНИТЕЛЯ в 10-/десет/ дневен срок от откриването им. В писменото уведомление по предходното изречение ВЪЗЛОЖИТЕЛЯТ описва недостатъците (дефектите) на стоката и начинът за отстраняването им. ИЗПЪЛНИТЕЛЯТ е длъжен да прегледа уведомлението с констатациите на ВЪЗЛОЖИТЕЛЯ за недостатъци (дефекти) на стоката и да го уведоми писмено (по факс или на електронна поща) за това дали приема констатациите - съответно предложеният начин за отстраняване на недостатъците (дефектите) или не ги приема. ИЗПЪЛНИТЕЛЯТ следва да изпълни задължението си за уведомяване по предходното изречение в срок до 5 /пет/ работни дни от датата на получаване на уведомлението на ВЪЗЛОЖИТЕЛЯ за констатирания дефект на стоката в рамките на гаранционния срок. В случай че ИЗПЪЛНИТЕЛЯТ не уведоми ВЪЗЛОЖИТЕЛЯ за решението си по отношение на предявената рекламация в срока по предходното изречение, се счита, че не я приема, вследствие на което ВЪЗЛОЖИТЕЛЯТ пристъпва към съставянето на констативен протокол. За съставянето и съдържанието на констативния протокол се прилагат съответно т. 5.2, ал. 2, 3, 4 и 5. При съставянето на констативния протокол страните отчитат уговореното в т. 6.6.
6.6. В рамките на гаранционния срок по т. 6.4, всички разходи по отстраняване на дефекти и/или замяна на стоката с нова, са за сметка на ИЗПЪЛНИТЕЛЯ.
6.7. Ако в рамките на гаранционния срок се констатират фабрични дефекти, ИЗПЪЛНИТЕЛЯТ е длъжен да ремонтира или да замени дефектната стока с нова в срок до 1 (един) месец, считано от получаването на уведомление по т. 6.5, ал. 3.

РАЗДЕЛ 7. ДОГОВОРНА ОТГОВОРНОСТ

7.1. (1) При забава за изпълнение на задължения по този договор, с изключение на случаите по т. 8.1 на договора, ИЗПЪЛНИТЕЛЯТ дължи на ВЪЗЛОЖИТЕЛЯ неустойка в размер на 0,2% за всеки пълен ден забава, но не повече от 10% общо върху стойността на забавянето задължение.

0271

(2) При неизпълнение на задължения по този договор, с изключение на случаите по т. 8.1 на договора, ИЗПЪЛНИТЕЛЯТ дължи на ВЪЗЛОЖИТЕЛЯ неустойка в размер на 10% върху стойността на неизпълненото задължение.
(3) За неизпълнение по смисъла на предходната алинея се счита и прекомерната забава за изпълнение, продължила повече от 50 дни. В този случай ИЗПЪЛНИТЕЛЯТ дължи на ВЪЗЛОЖИТЕЛЯ кумулативно както неустойката за забава в максимален размер съгласно ал. 1, така и неустойката за неизпълнение по предходната ал. 2.
7.2.За всеки отделен случай на неизпълнение на задълженията в рамките на гаранционния срок (с изключение на случаите по т. 8.1), ИЗПЪЛНИТЕЛЯТ дължи на ВЪЗЛОЖИТЕЛЯ неустойка, равна на 10% от стойността на реално доставената, но дефектна (неизправна) стока, по отношение на която е възникнало неизпълненото гаранционно задължение.
7.3. (1) ВЪЗЛОЖИТЕЛЯТ има право да претендира неустойка в размер на 100 % от стойността на гаранцията за изпълнение на договора, посочена в т. 6.1, при прекратяване или разваляне на договора по реда и при условията на точки от 9.1.1 до 9.1.6.
(2) В случай че ИЗПЪЛНИТЕЛЯТ не изпълни задължението си да изпрати на ВЪЗЛОЖИТЕЛЯ оригинален екземпляр от договор за подизпълнение/допълнително споразумение към договор за подизпълнение съгласно т. 4.10. и/или 4.14. от настоящия договор в срок до 3 /три/ дни от датата на сключване на договора, съответно споразумението към него, то той дължи на ВЪЗЛОЖИТЕЛЯ неустойка в размер на 2 000.00 лева.
7.4. При забава за плащане, ВЪЗЛОЖИТЕЛЯТ дължи на ИЗПЪЛНИТЕЛЯ обезщетение в размер на законната лихва за забава (равна на основния лихвен процент (ОЛП), обявен от БНБ, плюс 10%), начислена върху стойността на закъснялото плащане за периода на забавата, като стойността на обезщетението не може да бъде повече от 10% общо от стойността на забавеното плащане.
7.5. Неустойките по настоящия договор се заплащат в срок до 10 (десет) календарни дни, считано от датата на писмената претенция за тях от изправната до неизправната страна. ВЪЗЛОЖИТЕЛЯТ има право, ако в определения срок за плащане на дължимата неустойка ИЗПЪЛНИТЕЛЯТ не изпълни задължението си, да се удовлетвори за сумата на неустойката от гаранцията за изпълнение на договора в съответствие с т. 6.2 по-горе или да я прихване от следващо дължимо плащане по договора.
7.6. В случай че не е уговорено друго, неустойките се начисляват върху стойността на закъснялото/неизпълнено задължение без ДДС.
7.7. В случаите, когато посочените по-горе неустойки не покриват действителния размер на претърпените от ВЪЗЛОЖИТЕЛЯ вреди, той може да търси от ИЗПЪЛНИТЕЛЯ по съдебен ред разликата до пълния размер на претърпените вреди и пропуснатите ползи.
7.8. При нарушаване на задължение по раздел 11 по-долу (с изключение на задължението по т. 11.4, за което се дължи неустойката по т. 7.9), виновната страна дължи на изправната страна неустойка за всеки конкретен случай на нарушение в размер на 50% от гаранцията за изпълнение, заедно с обезщетяване на всички вреди над сумата на неустойката, настъпили вследствие нарушаване на задълженията по раздел 11 от договора, с изключение на задълженията по т. 11.4.
7.9. Страната, която е нарушила своите задължения за обработване и защита на лични данни по т. 11.4 по-долу, които е получила от другата страна или от трето лице или по друг начин, във връзка със сключването и изпълнението на настоящия договор за възлагане на обществена поръчка, е длъжна от една страна да обезщети всички вреди (включително наложени имуществени санкции/глоби), които ответната страна или трето лице е претърпяло вследствие неправомерното обработване и/или съхранение и/или разпространяване и/или допускане на разпространяване на лични данни или вследствие неосъществяване на необходимата и следващата се от нормативните правила защита на лични данни или вследствие неуведомяване на собственика на данни, насрещната страна или надзорния орган за опасност или кражба или неправомерно разпространение на лични данни, а от друга страна да заплати на насрещната страна по договора неустойка в размер на 100% от гаранцията за изпълнение по т. 6.1, в случай на развалянето на договора, съгласно т. 9.6 по-долу. Всички имуществени вреди и санкции, които подлежат на възстановяване съгласно настоящата точка се доказват по размер единствено с валидни писмени документи.

РАЗДЕЛ 8. НЕПРЕОДОЛИМА СИЛА ИЛИ НЕПРЕДВИДИМИ СЪБИТИЯ
В случаи на непреодолима сила по смисъла на чл. 306 от Търговския закон или на непредвидими събития и доколкото тези събития се отразяват върху изпълнението на задълженията на двете страни по договора, сроковете за изпълнение трябва да бъдат удължени за времето, през което е траела непреодолимата сила или непредвидимите събития. Страните се споразумяват за непредвидими събития да се считат издадени или изменени нормативни или ненормативни актове на държавни или общински органи, настъпили по време на изпълнение на договора, които се отразяват на изпълнението на задълженията, на която и да е от страните.
Двете страни трябва взаимно да се уведомяват писмено за началото и края на тези събития, както следва:

0272

8.2.1. за непреодолимата сила известието трябва да бъде потвърдено от Търговската камара на страната, в която е настъпило, и да бъде изпратено на другата страна до 14 (четиринадесет) дни след започването му.
8.2.2. за непредвидимите събития – в 14-дневен срок от издаването или изменението на нормативен или ненормативен акт на държавен или общински орган.
В случай на непреодолима сила или непредвидимо събитие в страната на ИЗПЪЛНИТЕЛЯ и/или ВЪЗЛОЖИТЕЛЯ и ако то доведе до закъснение в изпълнението на задълженията на някоя от страните за повече от 1 (един) месец, всяка от страните има право да прекрати договора по реда и при условията на т. 9.3 по-долу.

РАЗДЕЛ 9. РАЗВАЛЯНЕ И ПРЕКРАТЯВАНЕ НА ДОГОВОРА
ВЪЗЛОЖИТЕЛЯТ има право:
9.1.1. да развали договора по вина на ИЗПЪЛНИТЕЛЯ в случаите на т. 4.5. от договора, като в този случай ВЪЗЛОЖИТЕЛЯТ има право на неустойката по т. 7.3., ал. 1;
9.1.2. да прекрати договора с 10-дневно писмено предизвестие, отправено до ИЗПЪЛНИТЕЛЯ, при забава на ИЗПЪЛНИТЕЛЯ с повече от 30 дни, без да са налице обстоятелствата по т. 8.1, като в този случай ВЪЗЛОЖИТЕЛЯТ има право на неустойката по т. 7.3., ал. 1;
9.1.3. да прекрати договора с 10-дневно писмено предизвестие, отправено до ИЗПЪЛНИТЕЛЯ, при отказ на ИЗПЪЛНИТЕЛЯ да изпълни поръчка за доставка при условията на този договор, без да са налице обстоятелствата по т. 8.1, като в този случай ВЪЗЛОЖИТЕЛЯТ има право на неустойката по т. 7.3., ал. 1;
9.1.4. да прекрати договора с 30-дневно писмено предизвестие до ИЗПЪЛНИТЕЛЯ, при повторна доставка на партида дефектна стока или на стока, неотговаряща на изискванията на ВЪЗЛОЖИТЕЛЯ, посочени в договора и в приложенията към него, когато това обстоятелство е установено по реда на точка 5.2., ал. 2 от настоящия договор, като в този случай ИЗПЪЛНИТЕЛЯТ дължи неустойката по т. 7.3, ал. 1. Настоящата клауза се прилага и в случаите, когато:
а) двете доставени партиди дефектна стока и/или стока, неотговаряща на изискванията на ВЪЗЛОЖИТЕЛЯ, не са поредни;
б) в рамките на срока на договора е установено един или повече пъти по реда на т. 6.5. и един или повече пъти по реда на т. 5.2., ал. 2 (кумулативно), че доставена стока е дефектна и/или не отговаря на изискванията на ВЪЗЛОЖИТЕЛЯ, посочени в договора и в приложенията към него.
9.1.5. да прекрати договора без предизвестие, в случай че по реда на т. 6.5 към ИЗПЪЛНИТЕЛЯ са отправяни три или повече претенции (които не е задължително да са последователни) за гаранционни дефекти на доставената стока, дори същите да са били отстранени. В този случай ИЗПЪЛНИТЕЛЯТ дължи неустойката по т. 7.3., ал. 1.
9.1.6. да развали договора без предизвестие по вина на ИЗПЪЛНИТЕЛЯ, чрез писмено уведомление до същия, в хипотезата на т. 6.2.1. по-горе. В тези случаи ИЗПЪЛНИТЕЛЯТ дължи на ВЪЗЛОЖИТЕЛЯ неустойката по т. 7.3, ал. 1.
9.2. Настоящият договор може да се прекратява по взаимно писмено съгласие на страните по всяко време, като двете страни уреждат взаимоотношенията си до момента на прекратяването.
9.3. В случаите на т. 8.3., всяка от страните има право да прекрати договора с 10-дневно писмено предизвестие до другата страна.
9.4. Договорът се прекратява и в следните случаи:
9.4.1. по т. 2.3; и
9.4.2. по т. 3.1.
9.5. (1) Извън хипотезите по предходните точки, настоящият договор се разваля по инициатива на всяка от страните и на общо основание, при условията и по реда на чл. 87 от Закона за задълженията и договорите (ЗЗД).
(2) Договорът може да бъде прекратен на общо основание и при наличието на хипотезите по чл. 118 от Закона за обществените поръчки (ЗОП).
9.6. Всяка от Страните има право да развали едностранно настоящият договор за възлагане на обществена поръчка без предизвестие до другата Страна, ако тя е нарушила своите задължения във връзка с обработването и защитата на лични данни, станали и известни във връзка със сключването и изпълнението на договора, както и да претендира и получи обезщетенията за претърпените щети (включително стойността на наложените имуществени санкции/глоби) и неустойката по т. 7.9 по-горе.

РАЗДЕЛ 10. РЕШАВАНЕ НА СПОРОВЕ
10.1. Всички спорове, възникнали във връзка с тълкуването и/или изпълнението на договора, се решават чрез преговори и постигане на взаимно изгодни договорености, материализирани в писмена форма за валидност.
10.2. Всички спорове, породени от този договор или отнасящи се до него, включително споровете, породени или отнасящи се до неговото тълкуване, недействителност, изпълнение или прекратяване, както и споровете за попълване празноти в него или приспособяването му към нововъзникнали обстоятелства, за които не е постигнато съгласие по реда на предходната точка, ще бъдат разрешавани

по общия гражданскоправен ред, от компетентния съд в Република България със седалище в гр. София.
10.3. Отнасянето на спора за решаване от компетентния съд не ще се счита за причина за спирането на изпълнението на други задължения по настоящия договор, които нямат отношение към предмета на спора.
10.4. Решение от компетентен съд или изменение на законодателството, което прави някое от условията на този договор невалидно, недействително или неизпълнимо, ще се отнася само до това условие и няма да прави целия договор или някакво друго условие от него невалиден, недействителен или неизпълним и всички други условия на договора ще останат в пълна сила и ефект, така както са уговорени от страните. Страните поемат задължението да положат всички усилия, за да се договорят за заместващо условие на невалидното, недействителното или неизпълнимото условие с валидно, действително и изпълнимо условие, което най-близко отразява целта на невалидното, недействителното или неизпълнимото условие.

РАЗДЕЛ 11. КОНФИДЕНЦИАЛНОСТ И ЗАЩИТА НА ЛИЧНИТЕ ДАННИ

11.1. Страните се задължават да пазят и да не допускат разпространяването на информацията определена за конфиденциална, получена от всяка от страните по повод сключването или по време на срока на действие на този договор, както и да използват тази информация единствено за целите на изпълнението. Страните ще считат за конфиденциална информацията съдържаща се в договора и информацията във връзка с начина на изпълнението му, както и всяка информация която се съдържа на хартиен или магнитен носител и е създадена или предоставена на някоя от страните във връзка с изпълнението на договора. Конфиденциална е и всяка информация, която е станала достъпна на някоя от страните по повод изпълнението на договора и която представлява ноу-хау, схеми на складове съответно схеми за достъп и охрана или фирмена тайна на другата страна, или която е определена изрично при предоставянето ѝ от съответната страна за конфиденциална. Конфиденциална е и информацията свързана с лични данни, станали известни на някоя от страните във връзка със сключването или изпълнението на договора.
11.2. Страните се съгласяват, че въпреки прекратяването на този договор поради каквато и да е причина, клаузите свързани с конфиденциалност, ще са в сила и задълженията във връзка с тях ще бъдат валидни за период от 2 (две) години след прекратяване или разваляне на договора.
11.3. Клаузите за конфиденциалност не се прилагат когато някоя от страните е длъжна да предостави информация по договора на компетентен държавен, общински или др. публичен орган, който е поискал тази информация във връзка с правомощията му по закон. При предоставяне на информация по тази точка, страната която я дава е длъжна незабавно да уведоми писмено другата страна.
11.4. (1) Всяка от Страните се съгласява, че ще обработва личните данни („Лични данни"), посочени в настоящия договор на служителите-контактни лица на другата Страна, само и единствено за целите на обмен на данни и информация по договора, като никоя от Страните няма право да обработва Лични данни за други цели. Обработването на Лични данни от Страните се осъществява на територията на Република България. Не се допуска използването на каквото и да е оборудване за обработване на Личните данни, разположено извън определената Територия за обработване.
(2) Всяка от Страните се задължава да уведоми другата в случай:
а) на каквито и да е дейности по разследване, предприети от надзорен орган по защита на личните данни по отношение на дейността ѝ по обработване на Лични данни за целите на изпълнение на Договора;
б) че установи, че не е в състояние да изпълнява задълженията си относно обработването и защита на личните данни на другата Страна;
в) че установи каквото и да е нарушение на сигурността на обработването на Личните данни. Уведомлението за нарушение на сигурността следва да се извърши незабавно към другата Страна (но не по-късно от 3 (три) часа от установяването му) и следва да съдържа минимум следната информация:

- описание на естеството на нарушението и на фактите, свързани с нарушението на сигурността на личните данни, включително, ако е възможно, категориите и приблизителния брой на засегнатите субекти на данни и категориите и приблизителното количество на засегнатите записи на лични данни;
- описание на евентуалните последици от нарушението на сигурността на личните данни;
- описание на предприетите или предлаганите от нея мерки за справяне с нарушението на сигурността на личните данни, включително по целесъобразност мерки за намаляване на евентуалните неблагоприятни последици.

(3) В случай че е обективно невъзможно да осигури в посочения в ал. 2, б. „в" срок цялата необходима за уведомлението информация, съответната Страна уведомява в този срок другата като ѝ предоставя наличната към този момент информация и след съгласуване с нея допълва уведомлението.
(4) Всяка от Страните е задължена да обезщети вредите, които дадено лице може да претърпи в резултат на обработване на Лични данни от страна на някоя от тях, което обработване нарушава Регламент (ЕС) 2016/679 на Европейския парламент и на Съвета от 27 април 2016 година относно защитата на физическите лица във връзка с обработването на лични данни и относно свободното

движение на такива данни или други приложими законови разпоредби за защита на личните данни, освен ако последната не докаже, че по никакъв начин не е отговорна за вредите.

РАЗДЕЛ 12 ЗАКЛЮЧИТЕЛНИ РАЗПОРЕДБИ

12.1. Договорът влиза в сила считано от датата на подписването му от страните.

12.2. По отношение на този договор и за неуредените в него въпроси е приложимо действащото в Република България законодателство.

12.3. Всички съобщения и уведомления на страните по настоящия договор ще се извършват само в писмена форма, като условие за действителност. Тази форма ще се счита за спазена, ако съобщението е изпратено по e-mail или факс, доколкото съществува техническа възможност за установяване на момента на получаване на съобщението/уведомлението чрез генериране на известие за доставяне от техническото средство на изпращане.

12.4. Неразделна част от настоящия договор са следните приложения:

Приложение 1: Стока и цени;
Приложение 2: Технически изисквания;
Приложение 3: Образец на приемо-предавателен протокол;
Приложение 4: Образец на опаковъчен лист;
Приложение 5: Място на доставка и придружаващи доставката документи;
Приложение 6: Декларация по Закона за мерките срещу изпирането на пари;
Приложение 7: Декларация за обстоятелствата съгласно чл. 3, т. 8 от Закона за икономическите и финансовите отношения с дружествата, регистрирани в юрисдикции с преференциален данъчен режим, контролираните от тях лица и техните действителни собственици (ЗИФОДРЮПДРКТЛТДС);
Приложение 8: Срокове за доставка.

Договорът е изготвен в два еднообразни екземпляра на български език – по един за всяка от страните, които след като се запознаха със съдържанието му и го приеха го подписаха, както следва:

ВЪЗЛОЖИТЕЛ: ИЗПЪЛНИТЕЛ:

0275

Приложение 3

ПРИЕМО-ПРЕДАВАТЕЛЕН ПРОТОКОЛ

ИЗПЪЛНИТЕЛ: ……………………………………

ПОЛУЧАТЕЛ: „ЧЕЗ РАЗПРЕДЕЛЕНИЕ БЪЛГАРИЯ“ АД

Складова база………………………………………………

Договор №
………………………/………………г.

РО №……………………………………

Днес, ...г., беше извършено предаване и приемане на следните материали:

1. SAP № ……………-………………………………………………………….- …………………бр.
(посочва се наименованието на материала) *(посочва се количеството)*

2. SAP № ………………-…………………………………………………………….- ………………бр.
(посочва се наименованието на материала) *(посочва се количеството)*

➢ **Транспортно средство:**……………………………………………………………………
(посочва се регистрационния номер на транспортното средство)

Придружаващи доставката документи:

❖ Транспортен документ/ ***при чуждестранен изпълнител/***
❖ Други - документите, описани в таблица „Изисквания към документацията и изпитванията" от **Приложение 2** на договора

Забележка……………………………………………………………………………………
……………………………………………………………………………………………………
……………………………………………………………………………………………………
……………………………………………………………………………………………………

Предал:

……………………………………………………
(име и фамилия)

……………………………………………………
(длъжност)

(подпис)

Приел:

……………………………………………………
(име и фамилия)

……………………………………………………
(длъжност)

(подпис)

0276

Приложение 4

ОПАКОВЪЧЕН ЛИСТ

ИЗПЪЛНИТЕЛ *(име и адрес на фирмата)*	**Поръчка(и) за покупка №:** *(дата)*
ПОЛУЧАТЕЛ	*(име и адрес на фирмата)*
Вид транспортно средство	
Регистрационен номер на транспортното средство	
Място на съставяне	
Дата на съставяне	

SAP № на стоката	**Наименование на стоката**	**Вид опаковка**	**Брой на стоката в опаковка**	**Брутно тегло на опаковката със стоката, кг.**	**Общ брой опаковки**	**Общ брой стока**

Име и фамилия на отговорното лице,
съставило Опаковъчния лист: .....

.....
(подпис)

0277

МЯСТО НА ДОСТАВКА И ПРИДРУЖАВАЩИ ДОСТАВКАТА ДОКУМЕНТИ

1. Място на доставка.

1.1. Мястото за доставка е склад на Възложителя на територията на Република България в гр. София, гр. Враца, гр. Левски и гр. Дупница

1.2 **Изпълнителят** се задължава да уведоми писмено **Възложителя** най-малко два работни дни преди изпращането на стоката за очакваната дата на пристигането й в местоназначението на факс номер или електронен адрес за съответния склад.

2. Придружаващи доставката документи:

(1) декларация за съответствие;
(2) опаковъчен лист;
(3) инструкция за монтаж, експлоатация, транспорт и съхранение;
(4) документите, описани в таблица „Изисквания към документацията и изпитванията" от **Приложение 2** на договора.

Документите, описани по-горе в настоящата точка, трябва да бъдат предоставени от **Изпълнителя** на **Възложителя,** при (в момента на) доставката на Стоката, в два еднообразни екземпляра.

Всеки телеуправляем триполюсен товаров прекъсвач, секционен тип, за монтиране на открито - TTTПСЕ 24 kV/12,5 kA се доставя на самостоятелна транспортна единица /европалет, кашон/.

CERTIFICATION BODY FOR MANAGEMENT SYSTEMS
CERTIFICATION
No. S 3212, accredited by Czech Accreditation Institute

PRO-CERT s.r.o.
Tehovská 1290/64, 100 00 Praha 10

issues

CERTIFICATE

with registration number 387-05/2018 which certifies that the organisation

ELVAC a.s.

Registered office: Hasičská 930/53, 700 30 Ostrava
Sites: Mostárenská 2996/54, 703 00 Ostrava - Vítkovice,
Na Babě 1526/35, 160 00 Praha 6
Reg. No.: 25833812

in the field of

projection and production of switchgears, industrial electro-material wholesale, projects of common automation, design and supplies of single-purpose machines; development, production, supply and service of industrial and special PC systems, control systems and advertising and display panels

has implemented and maintains a management system
in accordance with

ISO 9001:2015

Approval date: 21st June 2018
Valid until: 21st June 2021
Initial certification: 12th April 2000

S 3212

Eva Jahodová
Certification Manager

0279

CERTIFICATION BODY FOR MANAGEMENT SYSTEMS
CERTIFICATION
No. S 3212, accredited by Czech Accreditation Institute

PRO-CERT s.r.o.
Tehovská 1290/64, 100 00 Praha 10

issues

CERTIFICATE

with registration number 387-06/2018 which certifies that the organisation

ELVAC a.s.

Registered office: Hasičská 930/53, 700 30 Ostrava
Sites: Mostárenská 2996/54, 703 00 Ostrava - Vítkovice,
Na Babě 1526/35, 160 00 Praha 6
Reg. No.: 25833812

in the field of

projection and production of switchgears, industrial electro-material wholesale, projects of common automation, design and supplies of single-purpose machines; development, production, supply and service of industrial and special PC systems, control systems and advertising and display panels

has implemented and maintains a management system
in accordance with

ISO 14001:2015

Approval date: 21st June 2018
Valid until: 21st June 2021
Initial certification: 3rd November 2010

S 3212

на основание чл. 36а, ал. 3 от ЗОП

Eva Jahodová
Certification Manager

0280

CERTIFICATION BODY FOR MANAGEMENT SYSTEMS
CERTIFICATION
No. S 3212, accredited by Czech Accreditation Institute

PRO-CERT s.r.o.
Tehovská 1290/64, 100 00 Praha 10

issues

CERTIFICATE

with registration number 387-07/2018 which certifies that the organisation

ELVAC a.s.

Registered office: Hasičská 930/53, 700 30 Ostrava
Sites: Mostárenská 2996/54, 703 00 Ostrava - Vítkovice,
Na Babě 1526/35, 160 00 Praha 6
Reg. No.: 25833812

in the field of

projection and production of switchgears, industrial electro-material wholesale, projects of common automation, design and supplies of single-purpose machines; development, production, supply and service of industrial and special PC systems, control systems and advertising and display panels

has implemented and maintains a management system
in accordance with

BS OHSAS 18001:2007

Approval date: 21st June 2018
Valid until: 21st June 2021
Initial certification: 3rd November 2010

S 3212

на основание чл. 36а, ал. 3 от ЗОП

Eva Jahodová
Certification Manager

0281

CERTIFICATION BODY FOR MANAGEMENT SYSTEMS
CERTIFICATION
No. S 3212, accredited by Czech Accreditation Institute

PRO-CERT s.r.o.
Tehovská 1290/64, 100 00 Praha 10

issues

CERTIFICATE

with registration number 387-08/2018 which certifies that the organisation

ELVAC a.s.

Registered office: Hasičská 930/53, 700 30 Ostrava
Sites: Mostárenská 2996/54, 703 00 Ostrava - Vítkovice,
Na Babě 1526/35, 160 00 Praha 6
Reg. No.: 25833812

in accordance with Declaration of applicability from the date 05/05/2017 in the field of

projection and production of switchgears, industrial electro-material wholesale, projects of common automation, design and supplies of single-purpose machines; development, production, supply and service of industrial and special PC systems, control systems and advertising and display panels

has implemented and maintains a management system
in accordance with

ISO/IEC 27001:2013

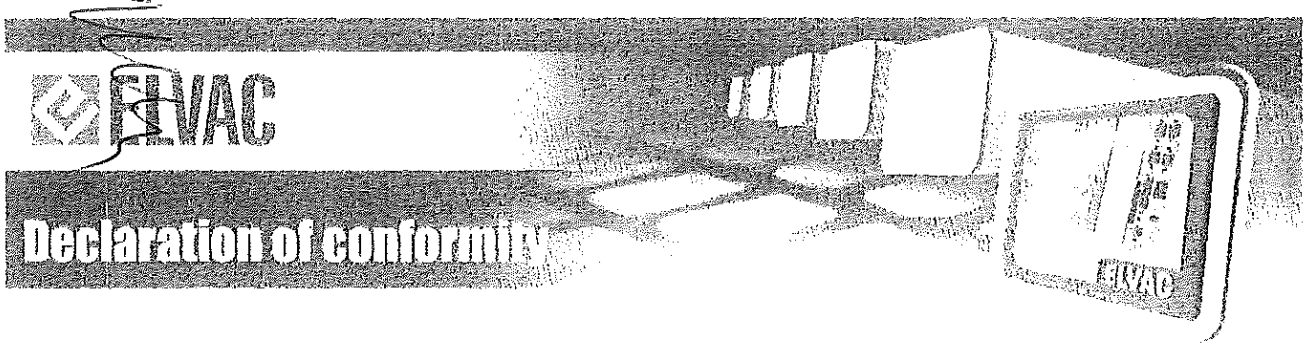
Approval date: 21st June 2018
Valid until: 21st June 2021
Initial certification: 17th May 2016

S 3212

на основание чл. 36а, ал. 3 от ЗОП

Eva Jahodová
Certification Manager

0282



Type of product: RTU7M

Product description: Modular control unit

The Product complies with following laws and standards as amended:

Directive 2004/108/EC of the European Parliament and of the Council of 15 December 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility and repealing Directive 89/336/EEC,
Technical standards:
ČSN EN 60950-1:2003 + A11:2004
ČSN EN 55022:1999+A1:2001 + A2:2003
ČSN EN 61000-4-2:1997 + A1:1999 + Z1:2001; ČSN EN 61000-4-3 ed. 3:2006; ČSN EN 61000-4-4 ed. 2:2005; ČSN EN 61000-4-5:1997 + Z1:2001 + Z2:2007; ČSN EN 61000-4-6:1997 + Z1:2001 + Z2:2007 + Z3:2008 ČSN EN 61000-4-8:1996 + Z1:2001; ČSN EN 61000-4-9:1996 + Z1:2001; ČSN EN 61000-4-10:1996 + Z1:2001; ČSN EN 61000-4-12:1997 + Z1:2001 + Z2:2007 + Z3:2007
and Czech Republic Government Regulation No. 17/2003 and 616/2006

Method of conformity assessment:

§12 paragraph 3 part a) of Act No. 22/1997 Coll. as amended

Name and address of the Manufacturer:

ELVAC a.s.
Hasičská 53, 700 30 Ostrava-Hrabůvka
Czech Republic

We hereby declare, that qualities of Product fulfill basic demands of above mentioned Czech Republic Government Regulations and technical standards and the Product is safe for use at ordinary and/or reasonably expectable conditions of use.
The Manufacturer owns a measure (quality management system), which guarantees a stability of Product qualities.

Name and address of the Manufacturer, which issued this Declaration:

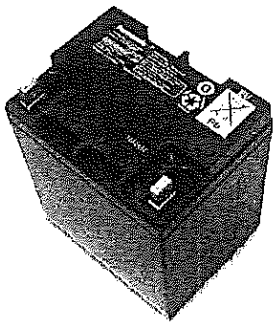
ELVAC a.s.
Hasičská 53
700 30 Ostrava-Hrabůvka
Czech Republic

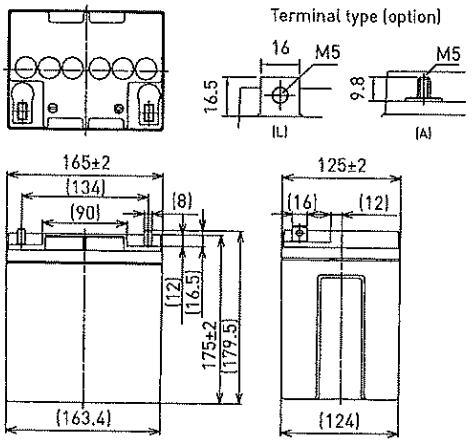
ID: 25833812

Date of issue: January 1, 2013
Place of issue: Ostrava, Czech Republic

Signature in behalf of the Manufacturer: Ing. Zbyšek Ciompa
Chairman of the board

LC-P1228P

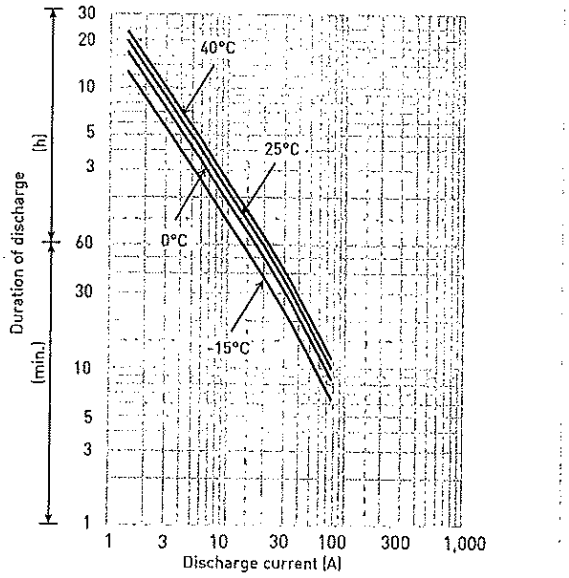




Contents indicated (including the recycle marking, etc.) are subject to change without notice.

Battery case resin: flame retardant (UL94 V-0)

Name		LC-P1228P/AP
Nominal voltage		12V
Nominal capacity (20 hour rate)		28Ah
Dimensions	Length	165mm
	Width	125mm
	Height	175mm/179.5mm
Approx. mass		9.40kg
Terminal		M5 bolt/nut & threaded post
Capacity (25°C)	20 hour rate	28Ah
	10 hour rate	26Ah
	3 hour rate	22Ah
	1 hour rate	21Ah
Impedance	Fully charged battery (25°C)	11mΩ
Temperature dependency of capacity (20 hour rate)	40°C	102%
	25°C	100%
	0°C	85%
	-15°C	65%
Self-discharge (25°C)	After 3 month	91%
	After 6 month	82%
	After 12 month	64%



(Wattage/battery)

Cut-off	5min.	10min.	15min.	20min.	30min.	45min.	1h	1.5h	2h	3h	4h	5h	6h	10h	20h
9.6V	1,160	865	664	585	410	304	260	159	129	91.6	74.1	61.1	50.8	31.8	16.8
9.9V	1,093	849	654	579	404	294	254	156	128	90.4	72.9	60.8	50.4	31.8	16.8
10.2V	1,026	818	643	567	397	288	251	155	127	89.3	71.7	60.5	49.9	31.8	16.8
10.5V	976	784	621	545	386	282	247	154	126	88.1	71.1	60.2	49.5	31.8	16.8
10.8V	903	773	610	539	374	255	218	149	118	84.5	70.5	59.9	49.0	31.8	16.8

(Ampere/battery)

Cut-off	5min.	10min.	15min.	20min.	30min.	45min.	1h	1.5h	2h	3h	4h	5h	6h	10h	20h
9.6V	104	77.2	57.7	50.4	35.0	25.9	22.1	13.5	10.9	7.70	6.20	5.10	4.30	2.60	1.40
9.9V	98.0	75.8	56.9	49.9	34.5	25.0	21.6	13.2	10.8	7.60	6.10	5.06	4.26	2.60	1.40
10.2V	92.0	73.0	55.9	48.9	33.9	24.5	21.3	13.1	10.7	7.50	6.00	5.03	4.25	2.60	1.40
10.5V	87.5	70.0	54.0	47.0	33.0	24.0	21.0	13.0	10.6	7.40	5.95	4.99	4.23	2.60	1.40
10.8V	81.0	69.0	53.0	46.5	32.0	21.7	18.5	12.6	10.0	7.10	5.90	4.95	4.20	2.60	1.40

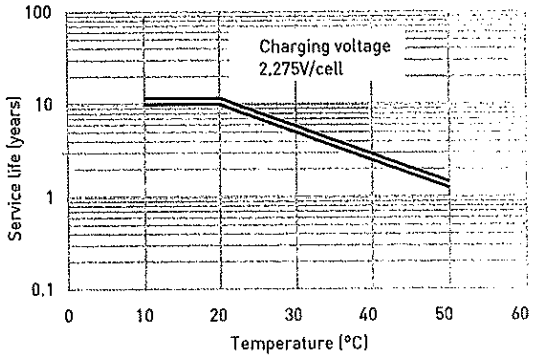
All mentioned values are average values

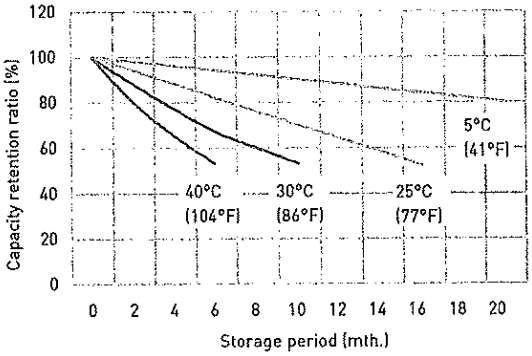
0284

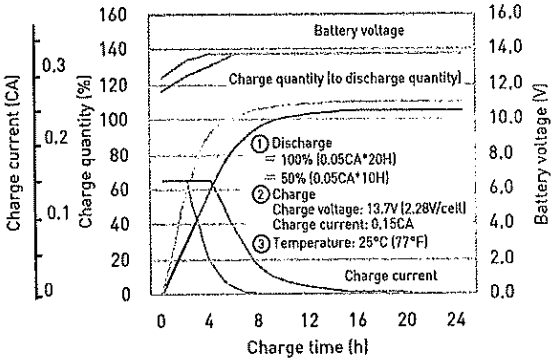
LC-P1228P

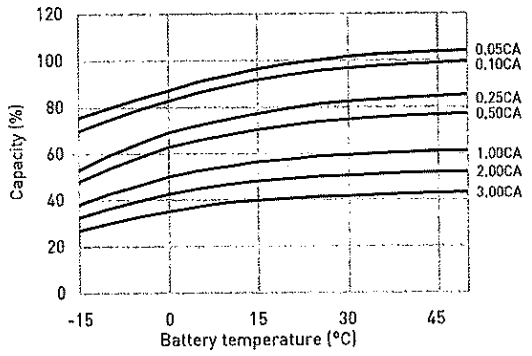
Trickle use	Control voltage: 13.6V - 13.8V Initial current: 4.20A or smaller

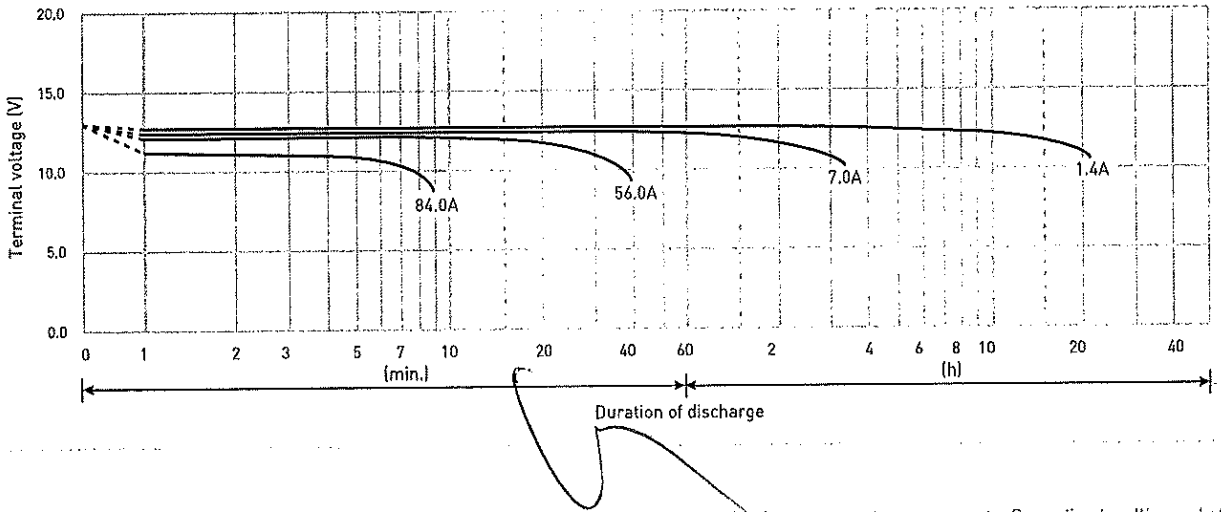
Discharge current	1.40A - 5.60A	5.60A - 14.0A	14.0A - 28.0A	28.0A - 56.0A	56.0A - 84.0A
Cut-off voltage	10.5V	10.2V	9.9V	9.3V	8.7V









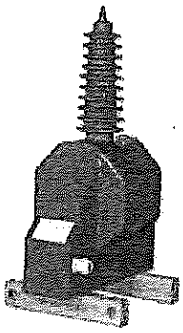


0285

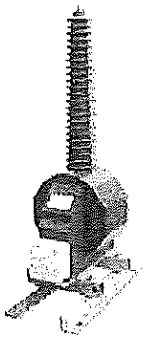
KPB Intra
Instrument Transformers

Outdoor voltage and current instrument transformers

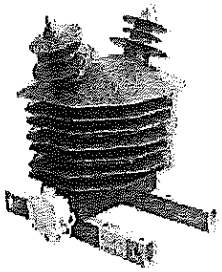
VTSO 25



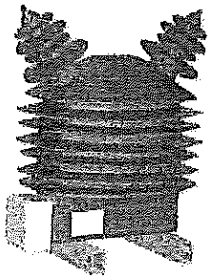
VTSO 38



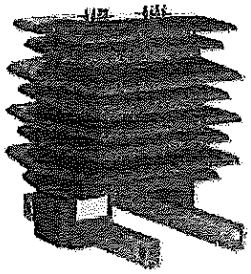
VPT 25



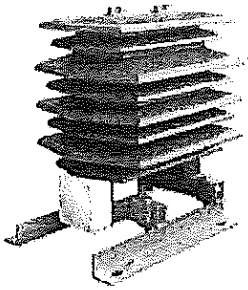
VPT 38



CTSO 38



CTSO 38



Voltage instrument transformers VPT and VTSO are single-phase transformers. They are designed for the use in the high voltage systems. They are designed for measuring and protection of high voltage distributing equipment for outdoor design.

They are suitable for supplying of drives of remote-controlled section switches.

The accuracy classes for measuring winding are 0.2, 0.5, 1, 3, for the securing winding of 3P and 6P. The transformers satisfy required accuracy class at intervals from 25% to 100% of rated load.
Magnetic circuit of voltage transformers VPT and VTSO is made of oriented transformer strips in the shape of "C" of core. The outlets of primary winding are brought out by the means of bolts M10. For contacting them we recommend use conductors of maximum cross section of 6 mm² and terminal ends by reason of suspension of dynamic forces and vibrations within the system.
ATTENTION! The isolators must not be pre-stressed mechanically in the direction away from the body of transformer during the other way of contacting.
Current instrument supporting transformer CTSO 38 is designed for measurement and protection of high voltage distributing equipment for outdoor design for nominal primary currents of 5-1250 A and for the highest voltage of system of 38.5 kV.

The value of secondary current is 5 A or 1 A with the possibility of combination. The accuracy classes for the circuits of measurement are 0.2, 0.5, 1, 3, for the circuits of protection are 5P, 10P. The transformers fulfill the required accuracy

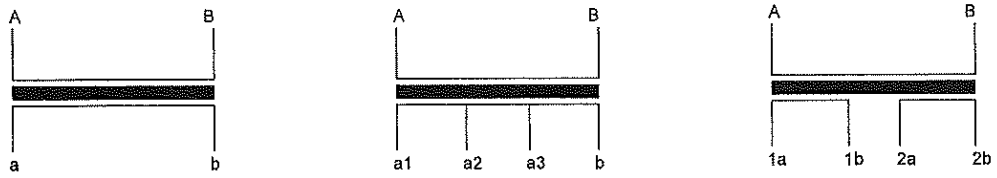
0286

class at intervals from 25 % to 100 % of rated load.
The terminal working current is 120 % I_N, in case of the agreement of the producer and the customer it is possible to deliver also the other values, for example 200% I_N. The length of the surfacial part is 1203 mm.
Transformers CTSO 38 are constructed as transformers with single-turn or multi-turn primary winding. The up-to-date construction of these transformers allows the switching not only on the secondary side, but also on the primary side. The advantage of the primary switching is the easy mounting by the means of connecting two jumpers into the circuit by the means of screws M8 (both the screws and jumpers are the parts of the transformer).
The secondary winding is wound on the magnetic core made of directed magnetic materials, eventually made of the alloy of nickel, iron and copper "permalloy". The maximum number of cores can be from 1 to 3 according to the request of customer.

All active parts of transformers VPT, VTSO and CTSO 38 are compound-insulated with epoxy-mixture resistant to the external effects (UV radiation, humidity, etc.) This material performs both the electrical insulating and the mechanical functions. Transformers are fixed by the means of four screws M12 in the holes in the basic frame. We recommend use terminal ends corresponding to the used cross-section of the conductor for attaching to the secondary outlets. The secondary terminal plate is provided with the waterproof cover. The cover can be sealed. Inside, there is the set with jumpers and small screws for the possibility of earth connection and short circuiting of the wiring. (See "The Instructions for the operation and mounting").

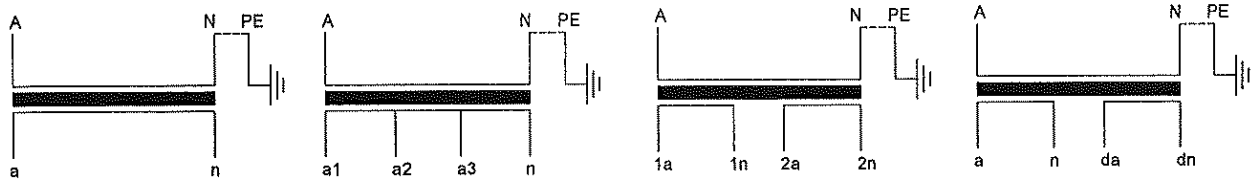
In cases where the substitution for the older types of transformers (various producers) is required, we supply transformers VPT, VTSO and CTSO 38 with modified basic plates that have identical mounting spacing to spacing of the substituted types

WIRING DIAGRAM



a) one secondary winding b) secondary switching c)two measuring windings

WIRING DIAGRAM

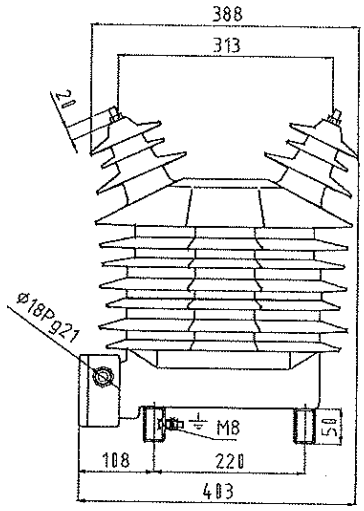


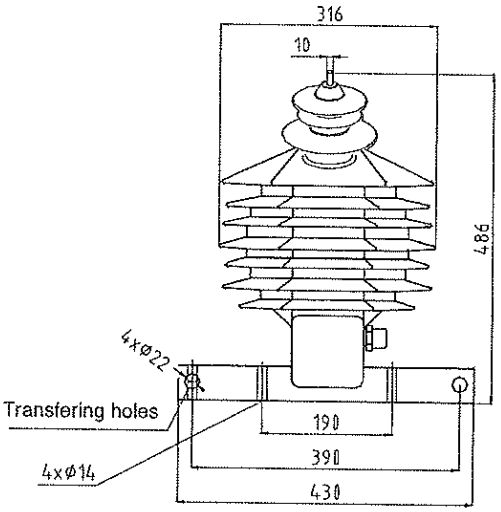
one secondary winding secondary reconnecting two secondary windings measuring and additional winding

Type	VPT 25	VPT 38	VTSO 25	VTSO 38	CTSO 38
Insulation voltage	3,6 ÷ 25 kV	3,6 ÷ 38.5 kV	3,6 ÷ 25 kV	3,6 ÷ 38.5 kV	3,6 ÷ 38.5 kV
Test voltage	10 ÷ 50 kV	10 ÷ 80 kV	10 ÷ 50 kV	10 ÷ 80 kV	10 ÷ 80 kV
Test impulse voltage	40 ÷ 125 kV	40 ÷ 180 kV	40 ÷ 125 kV	40 ÷ 180 kV	40 ÷ 180 kV
Nominal primary voltage	3 -22 kV	3-35 kV	3/√3-22/√3 kV	3/√3-35/√3 kV	
Nominal primary current					5-1250 A
Nominal secondary voltage	100,110, 120 V		100/√3,110/√3, 120/√3 V		
Nominal auxiliary voltage			100/3,110/3,120/3 V		
Nominal secondary current					5 (1) A
Nominal frequency	50 Hz		50 Hz		50 Hz
Power	10,30,50,75,100,150 VA		10,30,50,75,100,150 VA		5-60 VA
Accuracy class	0.2, 0.5, 1, 3P, 6P		0.2, 0.5, 1, 3P, 6P		0.2, 0.5, 0.2S, 0.5S, 1, 3P, 10P
Extreme power	400 VA		500 VA		
Weight	49 kg	55 kg	34/49 kg		62 kg
Approval	TCM 212/02-3636 TCM 212/02-3749		TCM 212/97-2720 TCM 212/00-3258		TCM 212/98-2963

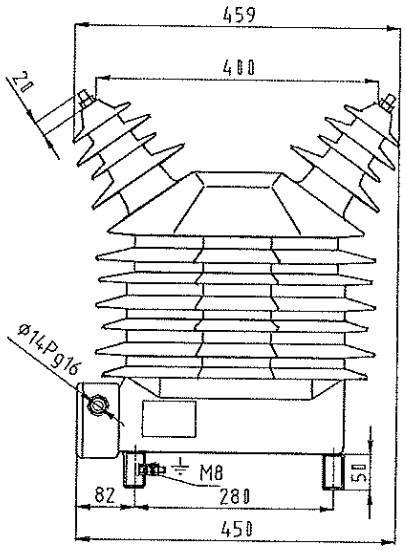
0287

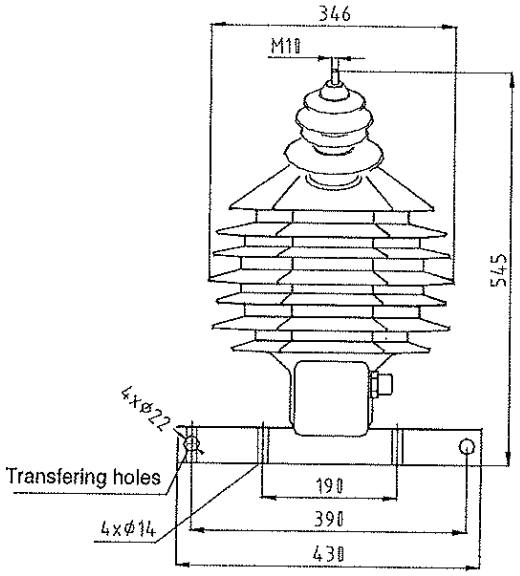
VPT 25



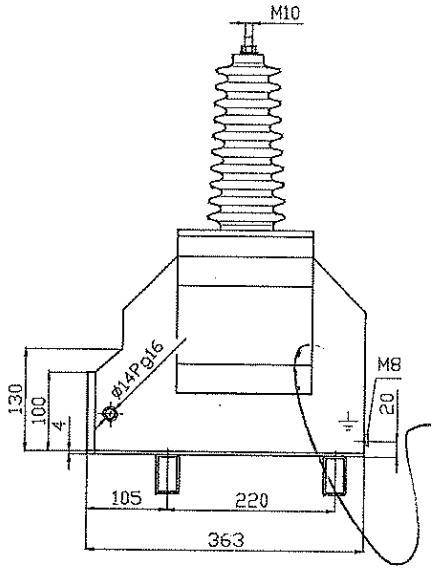


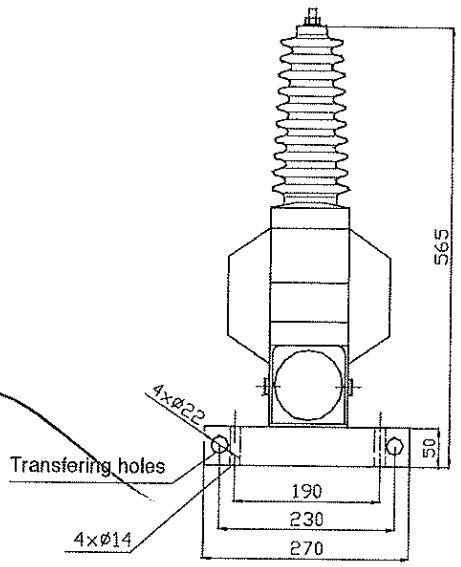
VPT 38





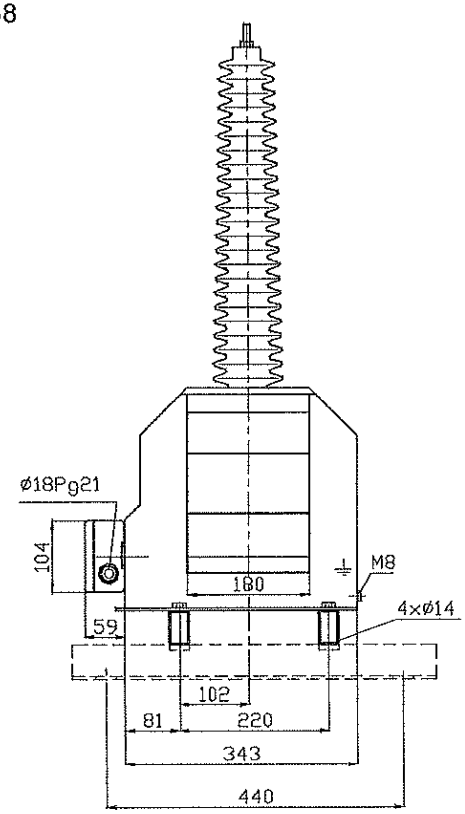
VTSO 25

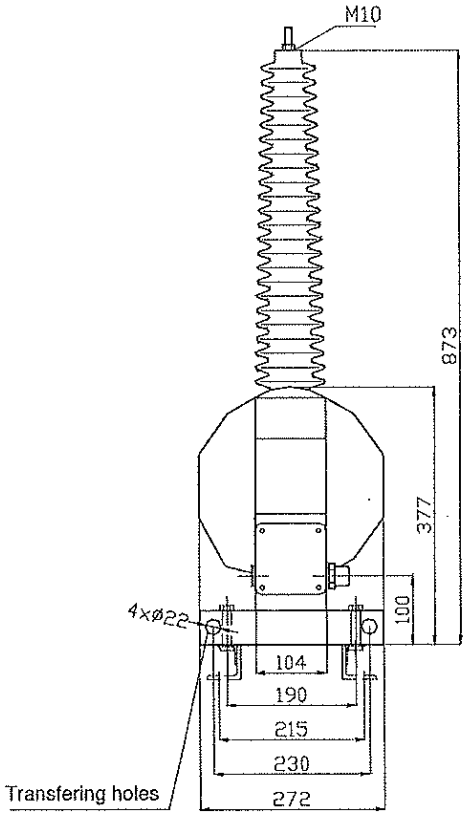




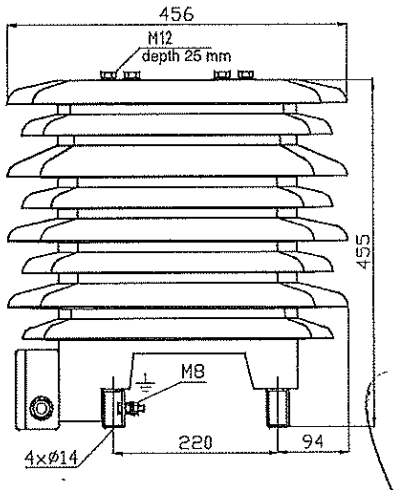
0288

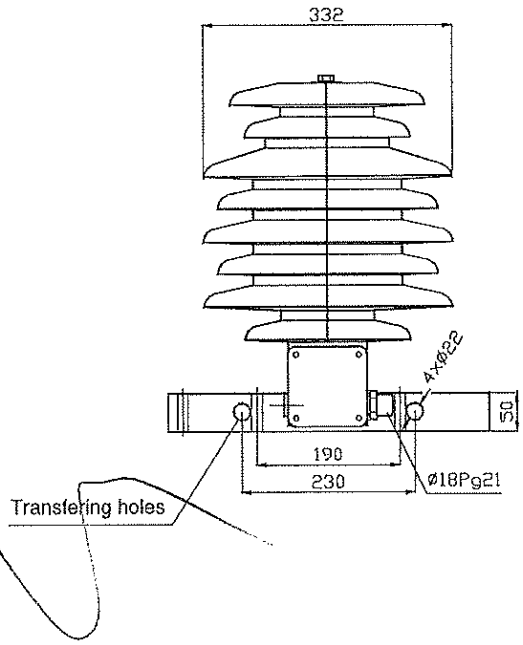
VTSO 38





CTSO 38

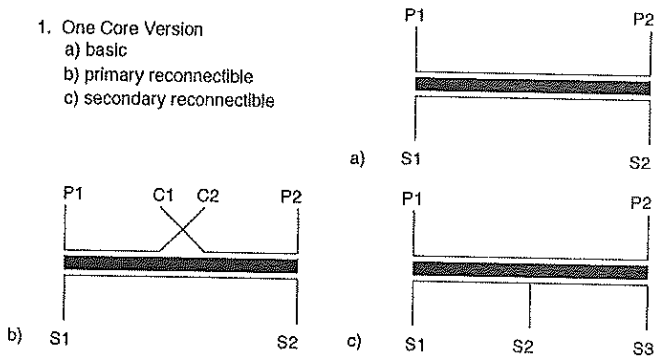




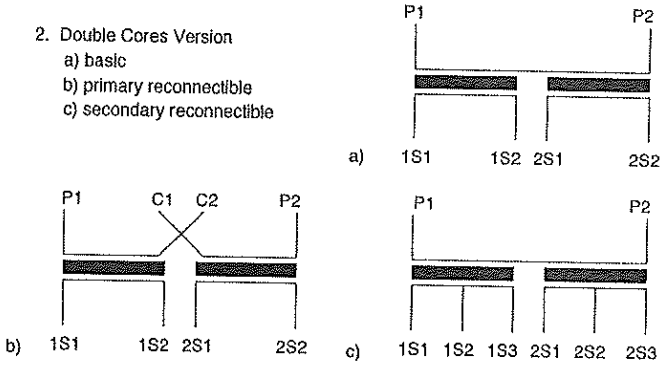
0289

WIRING DIAGRAM

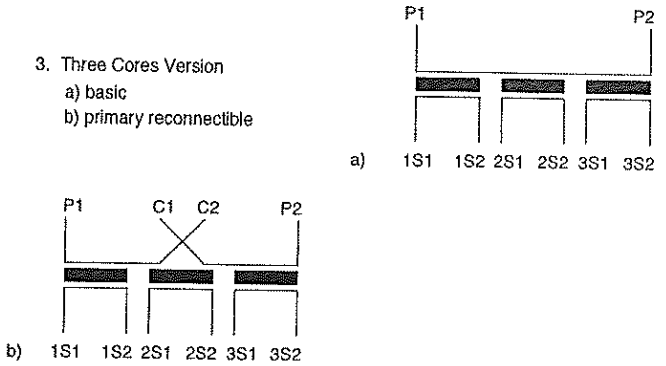
1. One Core Version
   a) basic
   b) primary reconnectible
   c) secondary reconnectible



2. Double Cores Version
   a) basic
   b) primary reconnectible
   c) secondary reconnectible

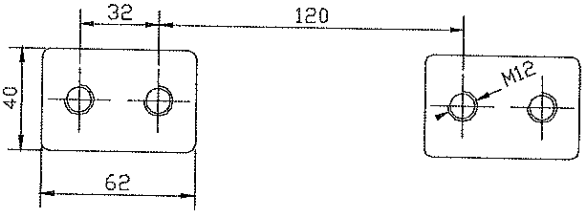


3. Three Cores Version
   a) basic
   b) primary reconnectible

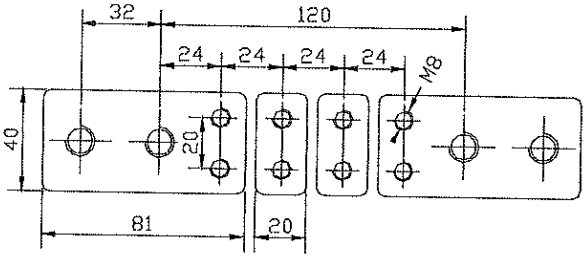


PRIMARY TERMINALS

Basic Version up to 1250 A



Reconnectible Version up to 1250 A



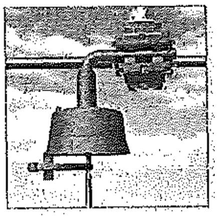
Voltage instrument transformers VPT and VTSO complied all the tests according to the ČSN EN 60044-2.
Current instrument transformers CTSO 38 complied all the tests according to the ČSN EN 60044-1.

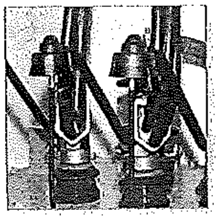
For the customer's request we provide official calibration.

It is possible to consult other technical parameters with the producer.

0290

PROTECTION PRODUCTS



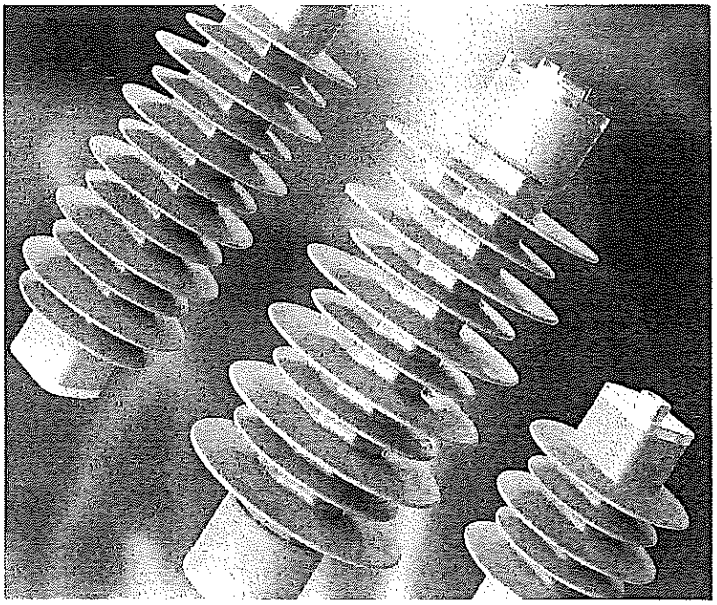


0291

Protection Products

Page

Metal Oxide Surge Arrestors for Distribution Networks up to 110 kV



Metal Oxide Surge Arresters

HDA, OCP and PCA are the newest ...pless, zinc oxide Raychem and ...owthorpe arrester families.

The development of these products is based on 25 years of experience in arrester design and manufacture within the Tyco Electronics Energy Division. The final qualifications were performed in independent laboratory facilities in Europe.

All arrester types are manufactured using superior ZnO varistors, which display excellent thermal and current handling characteristics due to the guaranteed homogeneity of the varistor volume.

This superior thermal behaviour yields products with:

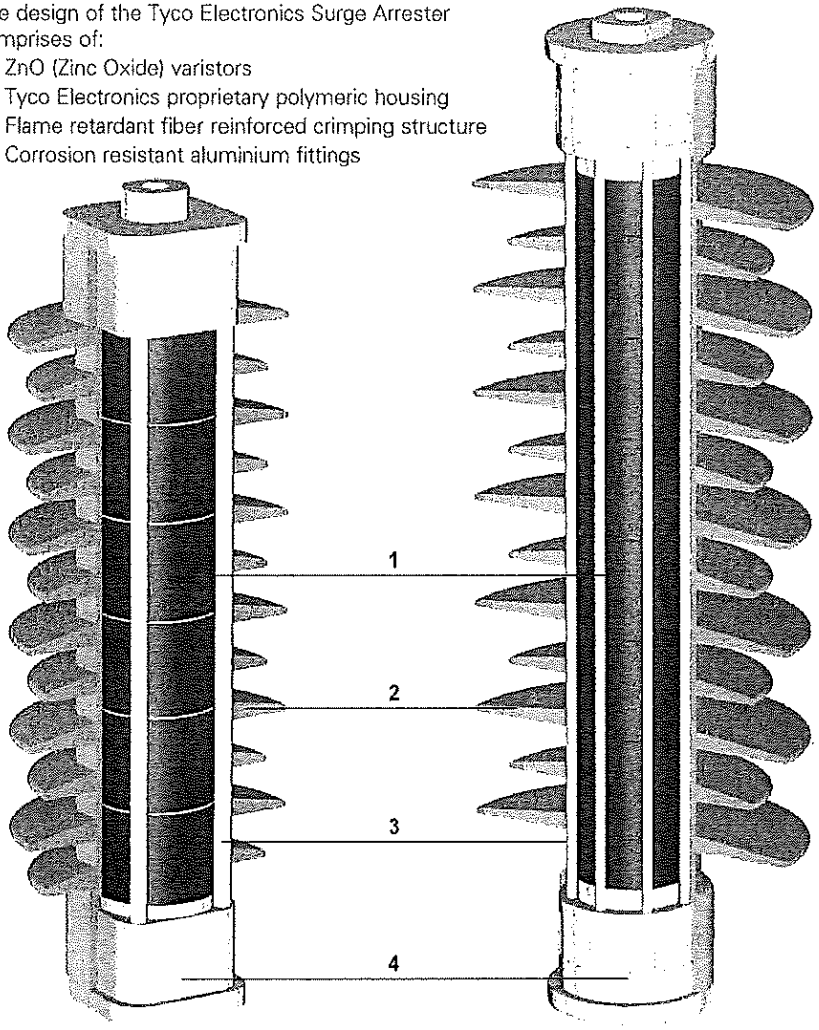
- Excellent TOV performance.
- Safe, non-shattering failure in the ...ort circuit test by pre-failing to ...igher fault currents.
- High energy handling capability.

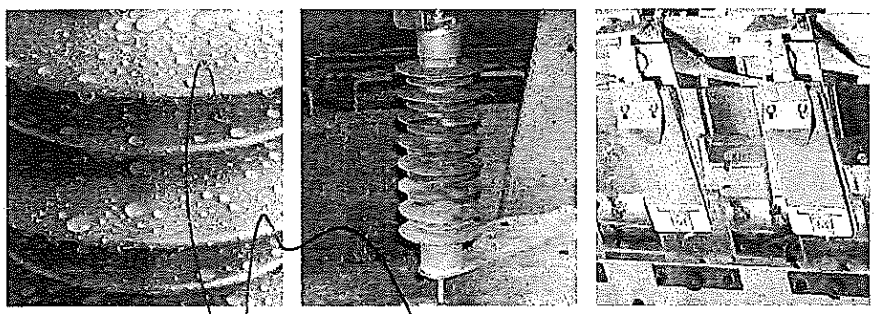
The crimped structural construction ensures a light weight arrester with optimal mechanical strength. The manufacturing process ensures void free construction and optimum interface sealing. This is achieved by bonding the polymeric housing directly to the ZnO discs and aluminium fittings using a Tyco Electronics proprietary bonding solution.

The polymer housing was developed using the knowledge accumulated over 40 years of materials science expertise and experience, resulting in an optimum shed profile and a material with excellent tracking and erosion resistance.

The design of the Tyco Electronics Surge Arrester comprises of:

1 - ZnO (Zinc Oxide) varistors
2 - Tyco Electronics proprietary polymeric housing
3 - Flame retardant fiber reinforced crimping structure
4 - Corrosion resistant aluminium fittings





Excellent hydrophobicity

Safe non-shattering failure mode

Track and erosion resistance

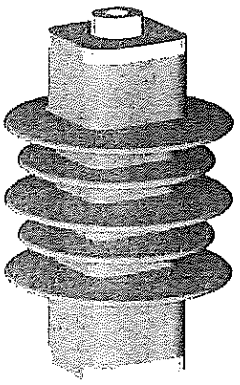
0293

UTILUX

Discharge Class 1 Surge Arrester – HDA-MA

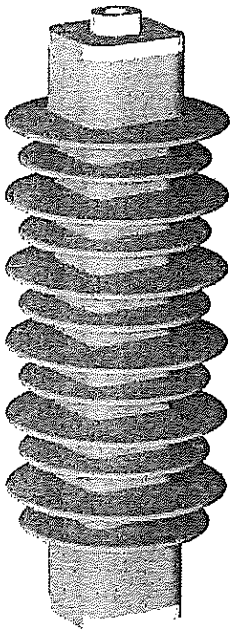
Generic technical data:

HDA-xxMA series		3-24 kV Uc
Rated discharge current (8/20µs):		10 kA
Line discharge class according to IEC 60099-4		Class 1
Operating duty impulse withstand current (4/10µs):		100 kA
Long duration current impulse (2000µs):		400 A
10 second temporary overvoltage, (U_{TOV}/U_C):		1,42
High current short circuit: (pre-failing method) (Safe non-shattering failure mode)		40 kA
Energy	2 long duration impulses 2 high current impulses	4,2 kJ/kV Uc 6,8 kJ/kV Uc
Service conditions	Ambient temperature:	- 60°C to + 60°C

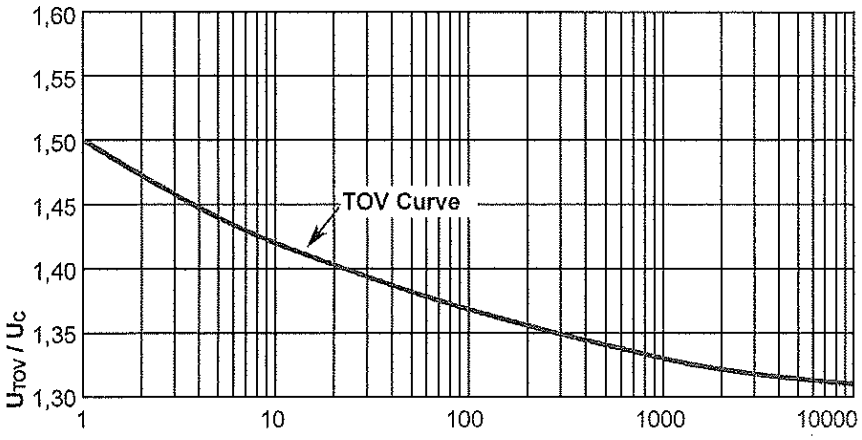


Mechanical strength data

Cantilever	350 Nm
Tensile	2000 N
Torque	50 Nm



Temporary Overvoltage (TOV) of HDA-xxMA with prior energy



Samples are pre-heated to a temperature of 60° C according to IEC 60099-4, Ed 2,0 2004. Samples were subjected to a pre-stress equivalent to one high current impulse of 100kA, 4/10 µs as per switching surge operating duty test.

U_{TOV} = TOV withstand voltage;
U_C = continuous operating voltage

Discharge Class 1 Surge Arrester – HDA-MA

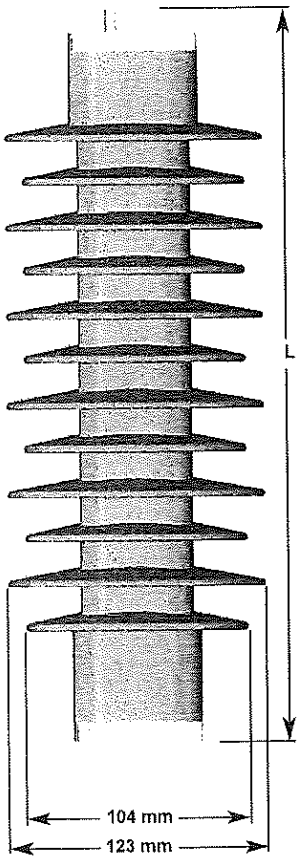
Protective Characteristics

HDA-MA	Uc kV	Ur kV	Ures in kV when tested to impulse waveforms Lightning (8/20µs) 5kA	10kA	20kA	Steep lightning (1/20µs) 10kA	Switching (30/60µs) 125A	500A
HDA-03MA-xxx	3	3,7	9,3	9,9	10,9	10,2	7,4	7,9
HDA-04MA-xxx	4	5,0	12,4	13,2	14,6	13,6	9,8	10,5
HDA-06MA-xxx	6	7,5	18,6	19,8	21,8	20,4	14,8	15,7
HDA-08MA-xxx	8	10,0	24,8	26,4	29,1	27,2	19,7	21,0
HDA-09MA-xxx	9	11,2	27,9	29,7	32,8	30,6	22,1	23,6
HDA-10MA-xxx	10	12,5	31,0	33,0	36,4	34,0	24,6	26,2
HDA-12MA-xxx	12	15,0	37,2	39,6	43,7	40,8	29,5	31,4
HDA-18MA-xxx	18	22,5	55,8	59,4	65,5	61,2	44,3	47,2
HDA-20MA-xxx	20	25,0	62,0	66,0	72,8	68,0	49,2	52,4
HDA-21MA-xxx	21	26,2	65,1	69,3	76,4	71,4	51,7	55,0
HDA-24MA-xxx	24	30,0	74,4	79,2	87,4	81,6	59,0	62,9

Uc: Continous Voltage; Ur: Rated Voltage; Ures: Residual Voltage

Standard Housing Parameter

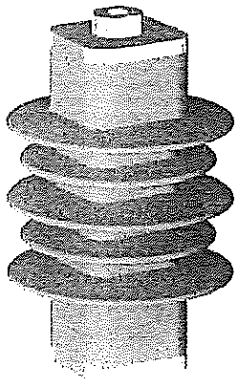
HDA-MA	Impulse voltage 1.2/50µs (kV)	Power frequency voltage withstand, wet (kV)	Flash over distance (mm)	Creepage length (mm)	Height L (mm)	Weight (kg)
HDA-03MA-xxx	106	47	176	380	183	1,80
HDA-04MA-xxx	106	47	176	380	183	1,80
HDA-06MA-xxx	106	47	176	380	183	1,80
HDA-08MA-xxx	106	47	176	380	183	1,80
HDA-09MA-xxx	106	47	176	380	183	1,80
HDA-10MA-xxx	106	47	176	380	183	1,80
HDA-12MA-xxx	106	47	176	380	183	1,80
HDA-18MA-xxx	190	93	310	830	316	3,25
HDA-20MA-xxx	190	93	310	830	316	3,25
HDA-21MA-xxx	190	93	310	830	316	3,25
HDA-24MA-xxx	190	93	310	830	316	3,25



Discharge Class 1 Surge Arrester – HDA-MA

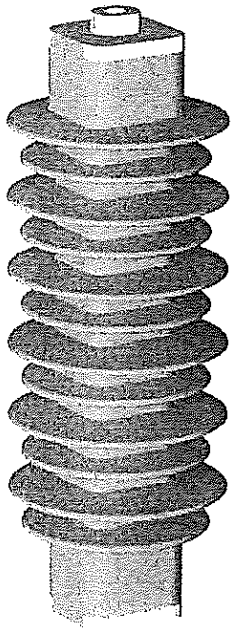
Generic technical data:

HDA-xxMA series		3-24 kV Uc
Rated discharge current (8/20µs):		10 kA
Line discharge class according to IEC 60099-4		Class 1
Operating duty impulse withstand current (4/10µs):		100 kA
Long duration current impulse (2000µs):		400 A
10 second temporary overvoltage, (U_{TOV}/U_C):		1,42
High current short circuit: (pre-failing method) (Safe non-shattering failure mode)		40 kA
Energy	2 long duration impulses 2 high current impulses	4,2 kJ/kV Uc 6,8 kJ/kV Uc
Service conditions	Ambient temperature:	- 60°C to + 60°C

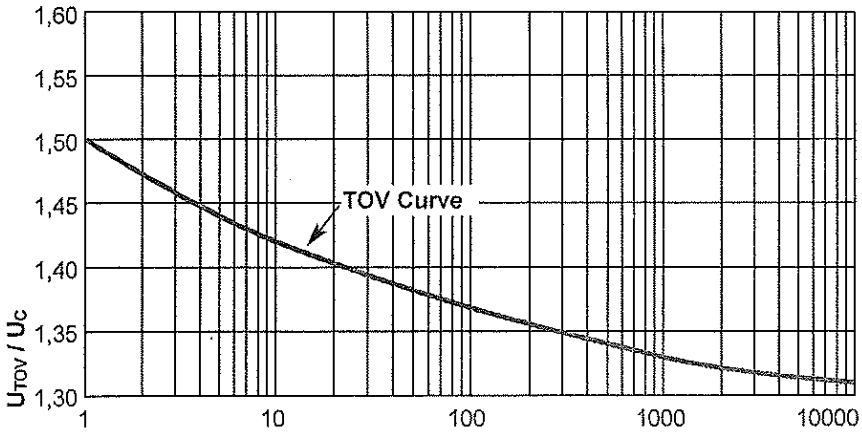


Mechanical strength data

Cantilever	350 Nm
Tensile	2000 N
Torque	50 Nm



Temporary Overvoltage (TOV) of HDA-xxMA with prior energy



Samples are pre-heated to a temperature of 60° C according to IEC 60099-4, Ed 2,0 2004. Samples were subjected to a pre-stress equivalent to one high current impulse of 100kA, 4/10 µs as per switching surge operating duty test.

U_{TOV} = TOV withstand voltage;
U_C = continuous operating voltage

Discharge Class 1 Surge Arrester – HDA-M

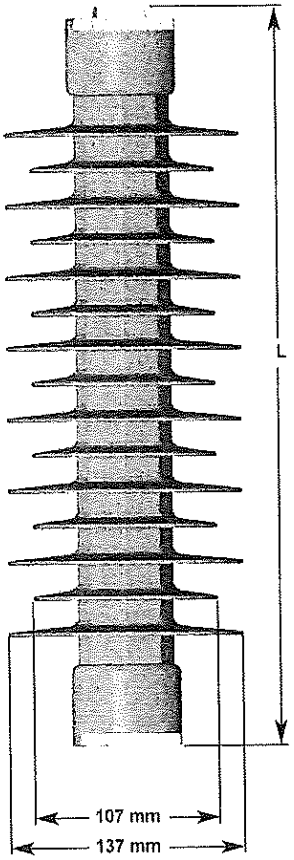
Protective Characteristics

HDA-M	Uc kV	Ur kV	Ures in kV when tested to impulse waveforms Lightning (8/20µs) 5kA	10kA	20kA	Steep lightning (1/20µs) 10kA	Switching (30/60µs) 125A	500A
HDA-26M-xxx	26	32,5	80,6	85,8	94,6	88,4	64,0	68,1
HDA-27M-xxx	27	33,7	83,7	89,1	98,3	91,8	66,4	70,7
HDA-29M-xxx	29	36,2	89,9	95,7	105,6	98,6	71,3	76,0
HDA-30M-xxx	30	37,5	93,0	99,0	109,2	102,0	73,8	78,6
HDA-33M-xxx	33	41,2	102,3	108,9	120,1	112,2	81,2	86,5
HDA-36M-xxx	36	45,0	111,6	118,8	131,0	122,4	88,6	94,3
HDA-39M-xxx	39	48,7	120,9	128,7	142,0	132,6	95,9	102,2
HDA-40M-xxx	40	50,0	124,0	132,0	145,6	136,0	98,4	104,8
HDA-41M-xxx	41	51,2	127,1	135,3	149,2	139,4	100,9	107,4

Uc: Continous Voltage; Ur: Rated Voltage; Ures: Residual Voltage

Standard Housing Parameter

HDA-M	Impulse voltage 1.2/50µs (kV)	Power frequency voltage withstand, wet (kV)	Flash over distance (mm)	Creepage length (mm)	Height L (mm)	Weight (kg)
HDA-26M-xxx	204	98	339	970	343	4,00
HDA-27M-xxx	204	98	339	970	343	4,00
HDA-29M-xxx	204	98	339	970	343	4,00
HDA-30M-xxx	204	98	339	970	343	4,00
HDA-33M-xxx	228	110	378	1125	383	4,50
HDA-36M-xxx	228	110	378	1125	383	4,50
HDA-39M-xxx	250	122	418	1279	423	5,00
HDA-40M-xxx	250	122	418	1279	423	5,00
HDA-41M-xxx	250	122	418	1279	423	5,00



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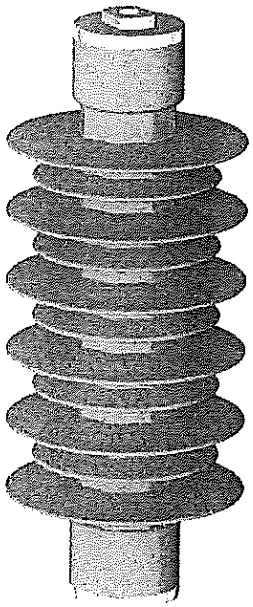
Discharge Class 1 Surge Arrester – HDA-M

Generic technical data:

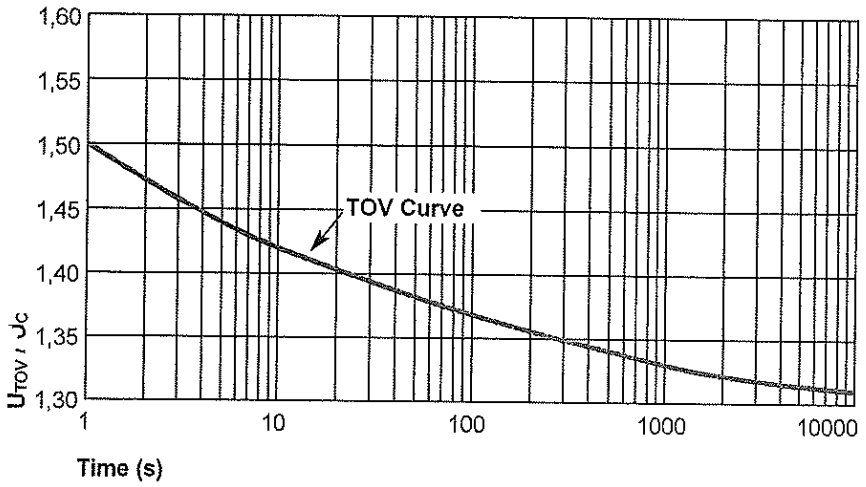
HDA-xxM series		26-41 kV Uc
Rated discharge current (8/20µs):		10 kA
Line discharge class according to IEC 60099-4		Class 1
Operating duty impulse withstand current (4/10µs):		100k A
Long duration current impulse (2000µs):		400 A
10 second temporary overvoltage, (U_{TOV}/U_C):		1,42
High current short circuit: (pre-failing method) (Safe non-shattering failure mode)		40 kA
Energy	2 long duration impulses	4,2 kJ/kV Uc
	2 high current impulses	6,8 kJ/kV Uc
Service conditions	Ambient temperature:	- 60°C to + 60°C

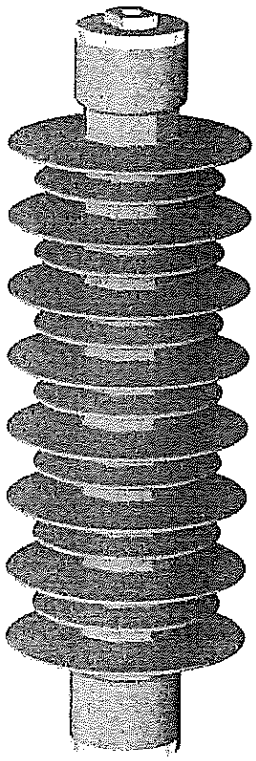
Mechanical strength data

Cantilever	250 Nm
Tensile	2000 N
Torque	50 Nm



Temporary Overvoltage (TOV) of HDA-xxM with prior energy





Samples are pre-heated to a temperature of 60° C according to IEC 60099-4, Ed 2,0 2004. Samples were subjected to a pre-stress equivalent to one high current impulse of 100kA, 4/10 µs as per switching surge operating duty test.

U_{TOV} = TOV withstand voltage;
U_C = continuous operating voltage

Discharge Class 1 Surge Arrester – DA1

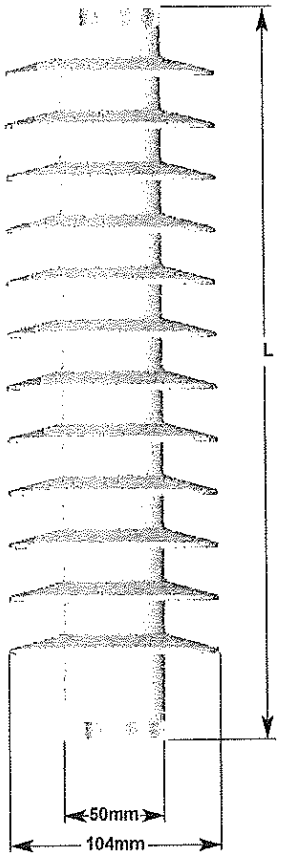
Protective Characteristics

DA1	U c	U r	U res in kV when tested to impulse waveforms					
	kV	kV	Lightning (8/20µs)			Steep lightning (1/20µs)	Switching (30/60µs)	
			5kA	10kA	20kA	10kA	125A	500A
DA1-08A-xxxxxx-I	6,4	8	19,9	21,2	23,2	22,3	15,9	16,9
DA1-10A-xxxxxx-I	8,0	10	24,9	26,5	29,1	27,9	19,9	21,1
DA1-12A-xxxxxx-I	9,6	12	29,9	31,8	34,9	33,4	23,9	25,3
DA1-15B-xxxxxx-I	12,0	15	37,3	39,8	43,6	41,8	29,9	31,6

Uc: Continous Voltage; Ur: Rated Voltage; Ures: Residual Voltage

Standard Housing Parameter

DA1 Housing code	Impulse Voltage 1.2/50µs	Power Frequency voltage withstand, wet	Flash Over Distance	Creepage Length	Height L	Weight
	(kV)	(kV)	(mm)	(mm)	(mm)	(kg)
DA1-08A-xxxxxx-I	134	50	152	329	147	1,2
DA1-10A-xxxxxx-I	134	50	152	329	147	1,2
DA1-12A-xxxxxx-I	134	50	152	329	147	1,2
DA1-15B-xxxxxx-I	160	56	177	404	172	1,4



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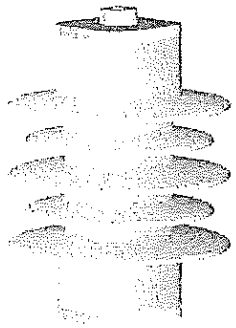
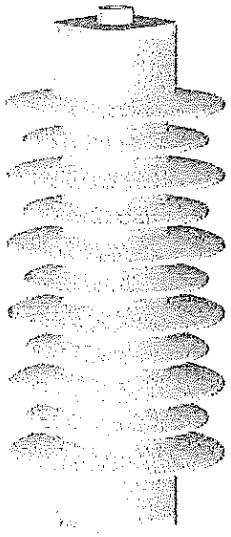
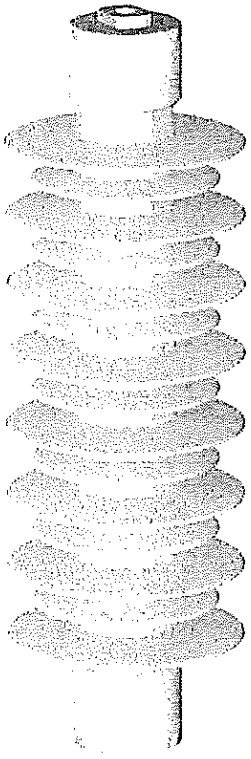
Discharge Class 2 Surge Arrester – OCP







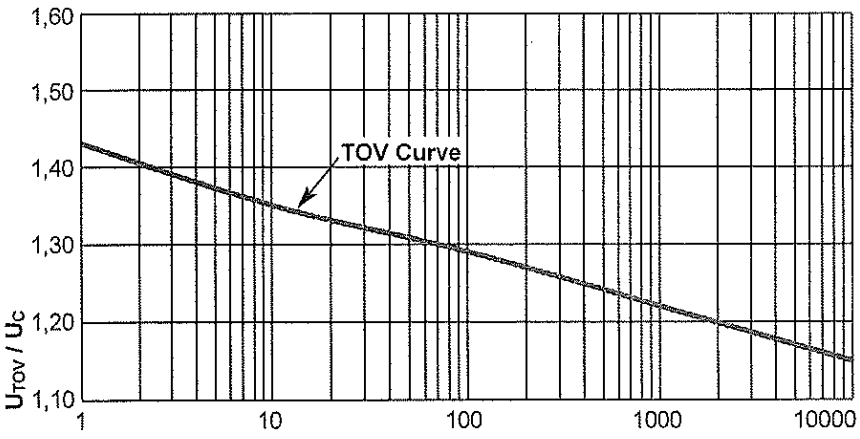
Generic technical data:

OCP2 series		3-41 kV Uc
Rated discharge current (8/20µs):		10 kA
Line discharge class according to IEC 60099-4		Class 2
Operating duty impulse withstand current (4/10µs):		100 kA
10 second Temporary Overvoltage (UTOV/UC):		1,35
Long duration current impulse (2000µs):		530 A
High current short circuit: (pre-failing method)		
(Safe non-shattering failure mode)		40 kA
Energy	2 long duration impulses	6,0 kJ/kV Uc
Service conditions	Ambient temperature:	- 60°C to + 60°C

Mechanical strength data

Cantilever	250 Nm
Tensile	2000 N
Torque	50 Nm

Temporary Overvoltage (TOV) of OCP2 with prior energy



Samples are pre-heated to a temperature of 60° C according to IEC 60099-4, Ed 2,0 2004. Sample was subjected to a pre-stress equivalent to one high current impulse of 100kA, 4/10 µs as per switching surge operating duty test.

U_{TOV} = TOV withstand voltage;
U_C = continuous operating voltage

Discharge Class 2 Surge Arrester – OCP

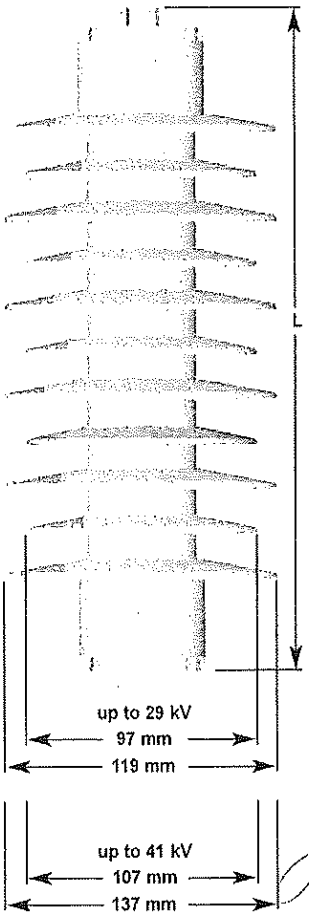
Protective Characteristics

OCP2	U c kV	U r kV	U res in kV when tested to impulse waveforms Lightning (8/20µs) 5kA	10kA	20kA	Steep lightning (1/20µs) 10kA	Switching (30/60µs) 125A	500A
OCP2-03S-xxx	3	3,7	9,18	9,72	10,84	10,10	7,37	7,76
OCP2-04S-xxx	4	5,0	12,24	12,96	14,46	13,47	9,83	10,35
OCP2-06S-xxx	6	7,5	18,36	19,44	21,68	20,21	14,75	15,53
OCP2-08S-xxx	8	10,0	24,48	25,92	28,91	26,94	19,66	20,70
OCP2-09S-xxx	9	11,2	27,54	29,16	32,53	30,31	22,12	23,29
OCP2-10S-xxx	10	12,5	30,60	32,40	36,14	33,68	24,58	25,88
OCP2-12S-xxx	12	15,0	36,72	38,88	43,37	40,42	29,50	31,06
OCP2-18S-xxx	18	22,5	55,08	58,32	65,05	60,62	44,24	46,58
OCP2-20S-xxx	20	25,0	61,20	64,80	72,28	67,36	49,16	51,76
OCP2-21S-xxx	21	26,2	64,26	68,04	75,89	70,73	51,62	54,35
OCP2-24S-xxx	24	30,0	73,44	77,76	86,74	80,83	58,99	62,11
OCP2-27S-xxx	27	33,7	82,60	87,50	97,60	90,90	66,40	69,90
OCP2-30M-xxx	30	37,5	91,80	97,20	108,40	101,00	73,70	77,60
OCP2-33M-xxx	33	41,2	101,00	106,90	119,30	111,10	81,10	85,40
OCP2-36M-xxx	36	45,0	110,20	116,60	130,10	121,20	88,50	93,20
OCP2-39M-xxx	39	48,7	119,30	126,40	140,90	131,40	95,90	100,90
OCP2-40M-xxx	40	50,0	122,40	129,60	144,60	134,70	98,30	103,50
OCP2-41M-xxx	41	51,2	125,50	132,80	148,20	138,10	100,80	106,10

Uc: Continous Voltage; Ur: Rated Voltage; Ures: Residual Voltage

Standard Housing Parameter

OCP2	Impulse Voltage 1.2/50µs (kV)	Power Frequency voltage withstand, wet (kV)	Flash Over Distance (mm)	Creepage Length (mm)	Height L (mm)	Weight (kg)
OCP2-03S-xxx	145	47	176	380	183	1,80
OCP2-04S-xxx	145	47	176	380	183	1,80
OCP2-06S-xxx	145	47	176	380	183	1,80
OCP2-08S-xxx	145	47	176	380	183	1,80
OCP2-09S-xxx	145	47	176	380	183	1,80
OCP2-10S-xxx	145	47	176	380	183	1,80
OCP2-12S-xxx	145	47	176	380	183	1,80
OCP2-18S-xxx	180	70	254	632	260	2,65
OCP2-20S-xxx	180	70	254	632	260	2,65
OCP2-21S-xxx	200	80	293	758	299	3,00
OCP2-24S-xxx	200	80	293	758	299	3,00
OCP2-27S-xxx	230	95	334	885	340	3,40
OCP2-30M-xxx	204	98	339	970	343	3,65
OCP2-33M-xxx	228	110	378	1125	383	4,15
OCP2-36M-xxx	228	110	378	1125	383	4,15
OCP2-39M-xxx	250	122	418	1279	423	4,65
OCP2-40M-xxx	250	122	423	1279	423	4,65
OCP2-41M-xxx	250	122	423	1279	423	4,65



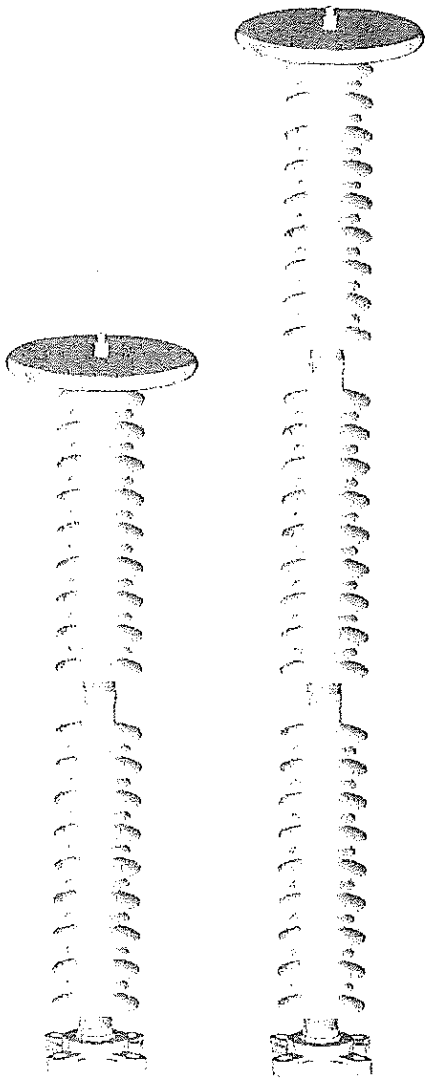
Discharge Class 2 Surge Arrester – HSR

Generic technical data:

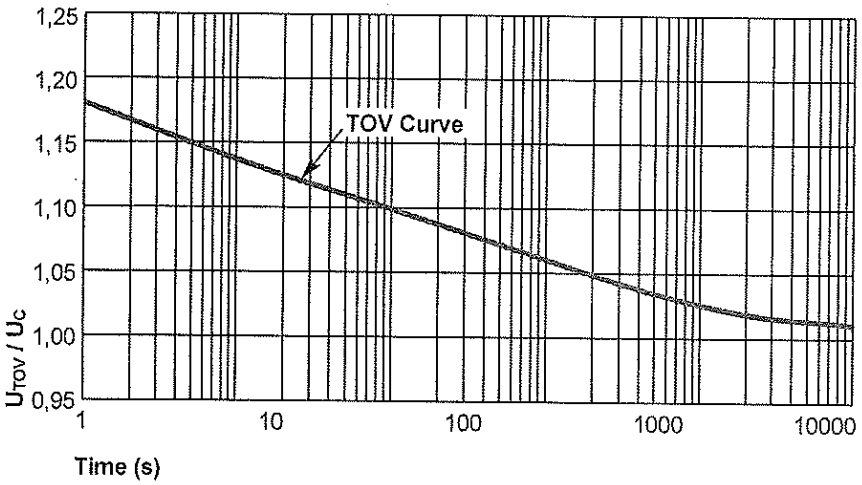
HSR series		up to 110 kV Ur
Rated discharge current (8/20µs):		10 kA
Line discharge class according to IEC 60099-4		Class 2
Operating duty impulse withstand current (4/10µs):		100 kA
Long duration current impulse (2000µs):		530 A
10 second temporary overvoltage (U_{TOV}/U_C):		1,13
High current short circuit: (pre-failing method) (Safe non-shattering failure mode)		40 kA
Energy	2 long duration impulses	6,0 kJ/kV Uc
Service conditions	Ambient temperature:	- 60°C to + 60°C

Mechanical strength data

Cantilever (2HSRC/3HSRC)	900/600 Nm
Tensile	2000 N
Torque	75 Nm



Temporary Overvoltage (TOV) of HSR with prior energy



Temperature of samples (pre-heated): 60° C according to IEC 60099-4, Ed 2.0 2004. TOV Curve applies to an arrester which has a pre-stress applied prior to TOV verification. This pre-stress is equivalent to two long duration current impulses of 2000 µs with total energy capability 5.6 kJ/kV Uc.

U_{TOV} = TOV withstand voltage
U_C = continuous operating voltage

Discharge Class 2 Surge Arrester – HSR

Protective Characteristics

HSRC	Uc kV	Ur kV	Ures in kV when tested to impulse waveforms								
			Lightning (8/20µs)			Steep lightning (1/200µs)		Switching (30/60µs)			
			5kA	10kA	20kA	10kA	20kA	250A	500A	1000A	2000A
2HSRCP48LxExMx	38,4	48,0	120	129	142	139	153	97,8	101	105	110
2HSRCP60LxExMx	48,0	60,0	148	159	175	171	189	120	125	129	136
2HSRCP72LxExMx	57,6	72,0	179	192	212	206	228	146	150	156	164
2HSRCP75LxExMx	60,0	75,0	185	199	219	213	236	151	156	162	170
3HSRCP84LxExMx	67,0	84,0	209	225	248	242	267	171	176	183	192
3HSRCP88LxExMx	70,0	87,5	219	235	259	252	279	178	184	192	201
3HSRCP91LxExMx	73,0	91,2	225	242	266	259	287	183	189	197	206
3HSRCP95LxExMx	76,0	95,0	237	255	281	274	302	193	200	208	218
3HSRCP96LxExMx	76,8	96,0	238	258	284	274	302	193	201	208	218
3HSRCP99LxExMx	79,0	98,7	243	261	288	281	310	198	205	213	223
3HSRCP102LxExMx	82,0	102,5	256	275	303	295	326	208	215	224	235
3HSRCP106LxExMx	85,0	106,2	265	285	314	306	338	216	223	232	243
3HSRCP108LxExMx	86,4	108,0	269	291	321	309	342	218	227	235	246
3HSRCP110LxExMx	88,0	110,0	271	291	321	313	346	221	228	237	249

Uc: Continous Voltage; Ur: Rated Voltage; Ures: Residual Voltage

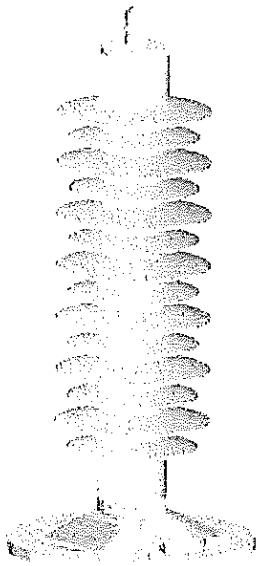
Standard housing parameters

HSRC	Impulse Voltage 1.2/50µs (kV)	Power Frequency voltage withstand, wet (kV)	Flash Over Distance (mm)	Creepage Length (mm)	Height L (mm)	Weight (kg)
2HSRCP48LxExMx	503	273	964	2650	952	11,2
2HSRCP60LxExMx	503	273	964	2650	952	11,2
2HSRCP72LxExMx	503	273	964	2650	952	11,2
2HSRCP75LxExMx	503	273	964	2650	952	11,2
3HSRCP84LxExMx	757	377	1446	3975	1428	16,8
3HSRCP88LxExMx	757	377	1446	3975	1428	16,8
3HSRCP91LxExMx	757	377	1446	3975	1428	16,8
3HSRCP95LxExMx	757	377	1446	3975	1428	16,8
3HSRCP96LxExMx	757	377	1446	3975	1428	16,8
3HSRCP99LxExMx	757	377	1446	3975	1428	16,8
3HSRCP102LxExMx	757	377	1446	3975	1428	16,8
3HSRCP106LxExMx	757	377	1446	3975	1428	16,8
3HSRCP108LxExMx	757	377	1446	3975	1428	16,8
3HSRCP110LxExMx	757	377	1446	3975	1428	16,8

Discharge Class 3 Surge Arrester – PCA

Generic technical data:

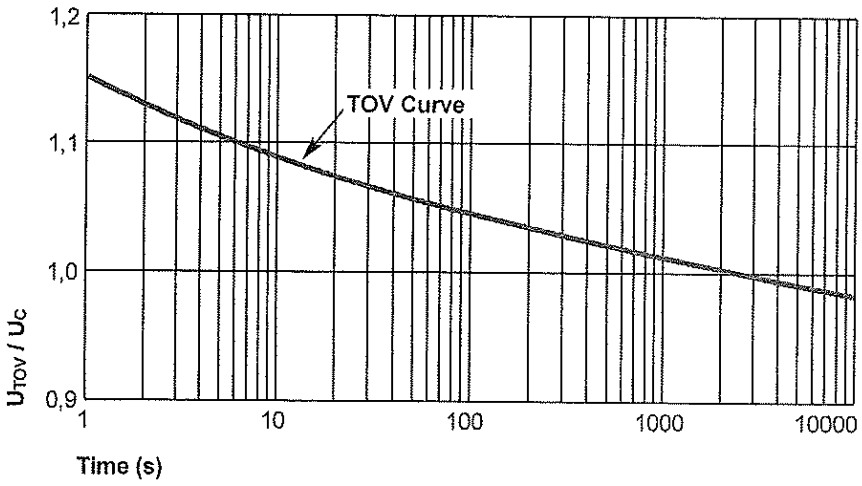
PCA series		up to 110 kV Ur
Rated discharge current (8/20µs):		10 kA
Line discharge class according to IEC 60099-4		Class 3
Operating duty impulse withstand current (4/10µs):		100 kA
Long duration current impulse (2000µs):		640 A
10 second TOV (UTOV/UC):		1,15
High current short circuit: (pre-failing method) (Safe non-shattering failure mode)		65 kA
Energy	2 long duration impulses	7,8 kJ/kV Uc
Service conditions	Ambient temperature:	- 60°C to + 60°C

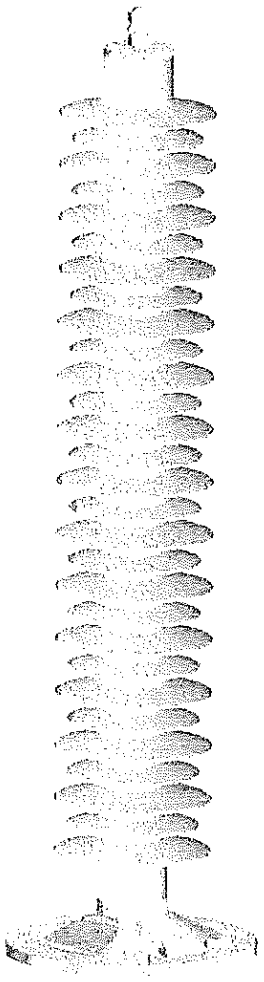


Mechanical strength data

Cantilever	2500 Nm
Tensile	75 kN
Torque	75 Nm

Temporary Overvoltage (TOV) of PCR with prior energy





Temperature of samples (pre-heated): 60° C according to IEC 60099-4, Ed 2.0 2004.
TOV Curve applies to an arrester which has a pre-stress applied prior to TOV verification. This pre-stress is equivalent to two long duration current impulses of 2000 µs with total energy capability 5.6 kJ/kV Uc.

U_{TOV} = допустимое напряжение в соответствии с нагрузочной характеристикой "TOV";
U_C = наибольшее длительно допустимое напряжение

Discharge Class 3 Surge Arrester – PCA

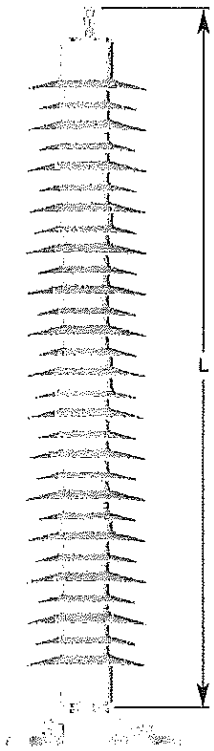
Protective Characteristics

PCA	Uc kV	Ur kV	Ures in kV when tested to impulse waveforms Lightning (8/20µs) 5kA	10kA	20kA	Steep lightning (1/200µs) 10kA	20kA	Switching (30/60µs) 250A	500A	1000A	2000A
PCA248LxExMx	38.4	48	123	129	141	140	152	99,7	103	106	111
PCA260LxExMx	48.0	60	149	156	170	169	184	120.0	124	128	134
PCA372LxExMx	57.6	72	180	188	206	205	223	146.0	151	155	162
PCA375LxExMx	60.0	75	185	193	212	210	228	150.0	155	159	166
PCA384LxExMx	67.2	84	209	219	240	238	259	169.0	173	180	188
PCA396LxExMx	76.8	96	234	245	268	266	289	189.0	196	201	211
PCA3108LxExMx	86.4	108	259	270	296	294	320	209.0	216	222	233

Uc: Continous Voltage; Ur: Rated Voltage; Ures: Residual Voltage

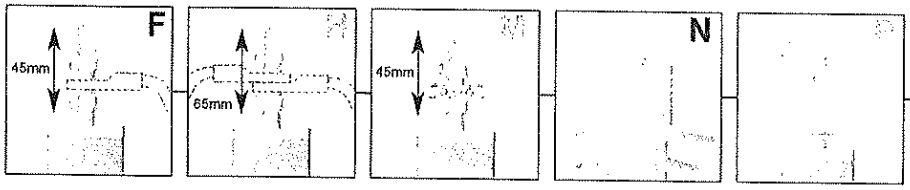
Standard housing parameters

PCA	Impulse Voltage 1.2/50µs (kV)	Power Frequency voltage withstand, wet (kV)	Flash Over Distance (mm)	Creepage Length (mm)	Height L (mm)	Weight (kg)
PCA248LxExMx	325	140	566	1815	655	14,0
PCA260LxExMx	325	140	566	1815	655	14,0
PCA372LxExMx	650	275	1059	3625	1150	26,5
PCA375LxExMx	650	275	1059	3625	1150	26,5
PCA384LxExMx	650	275	1059	3625	1150	26,5
PCA396LxExMx	650	275	1059	3625	1150	26,5
PCA3108LxExMx	650	275	1059	3625	1150	26,5



Accessories for Class 1 Surge Arrester (Type HDA)

Line lead accessories



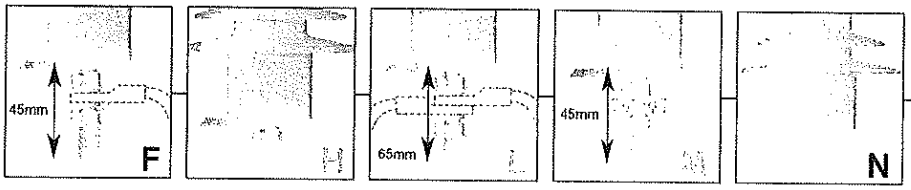
Arrester Type = Continuous Operating Voltage U_c in kV

03MA	04MA	05MA	06MA	08MA	09MA	10MA	12MA	14MA
15MA	16MA	17MA	18MA	19MA	20MA	21MA	22MA	24MA
26M	27M	29M	30M	33M	36M	39M	40M	41M

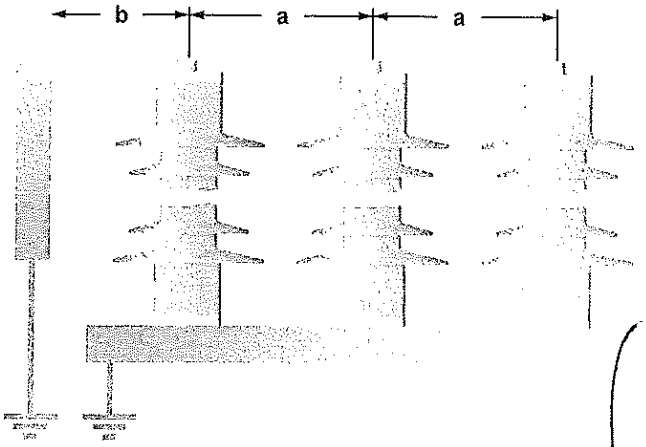
HDA – □ – □□□

Mounting accessories

Ground lead accessories



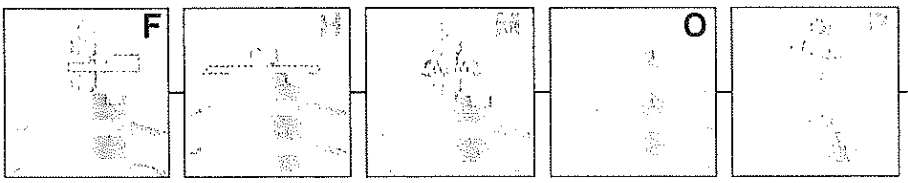
Installation Requirements



System Voltage U_0/U	ph/ph (a)	ph/ground (b)
6/10	185	165
12/20	315	295
20/35	510	490

Accessories for Class 1 Surge Arrester (Type DA1)

Line lead accessories

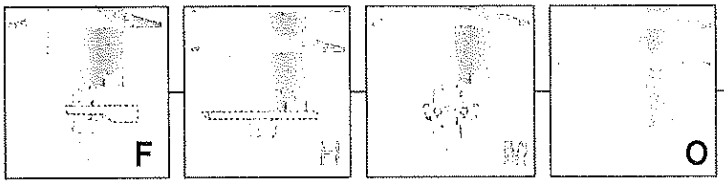


Arrester Type = Rated Voltage U_r in kV

08A	10A
12A	15B

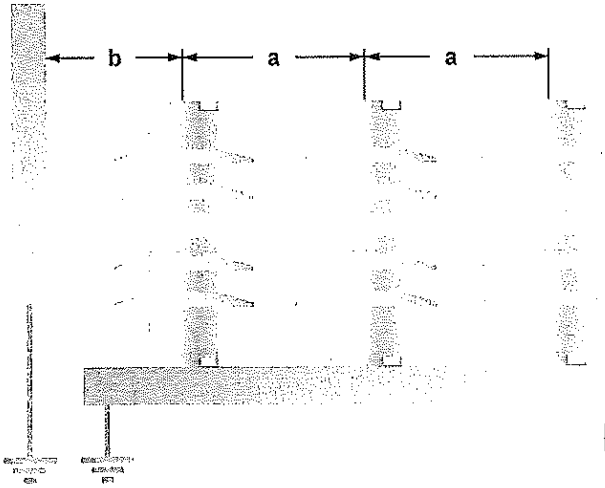
DA1 – ☐ – ☐ 0 ☐ 0 ☐ 0-I

Ground lead accessories



Mounting accessories

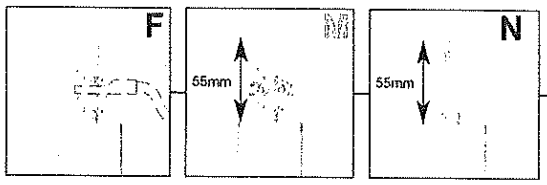
Installation Requirements



System Voltage U_0/U	ph/ph (a)	ph/ground (b)
6/10	185	165
12/20	315	295
20/35	510	490

Accessories for Class 2 Surge Arrester (Type OCP2)

Line lead accessories



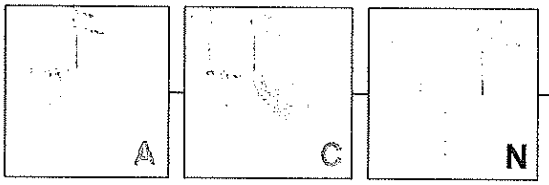
Arrester Type = Continuous Operating Voltage U_c in kV

03S	04S	06SA	08S	09S	10S
12S	18S	20S	21S	24S	27S
30M	33M	36M	39M	40M	41M

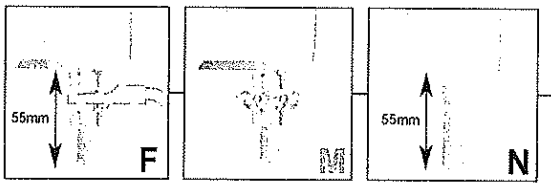
OCP2 – □ – □□□

All accessories with M12 stainless steel studs

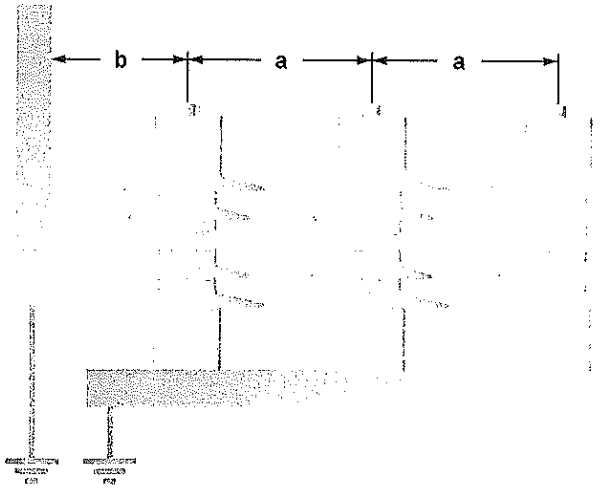
Mounting accessories



Ground lead accessories

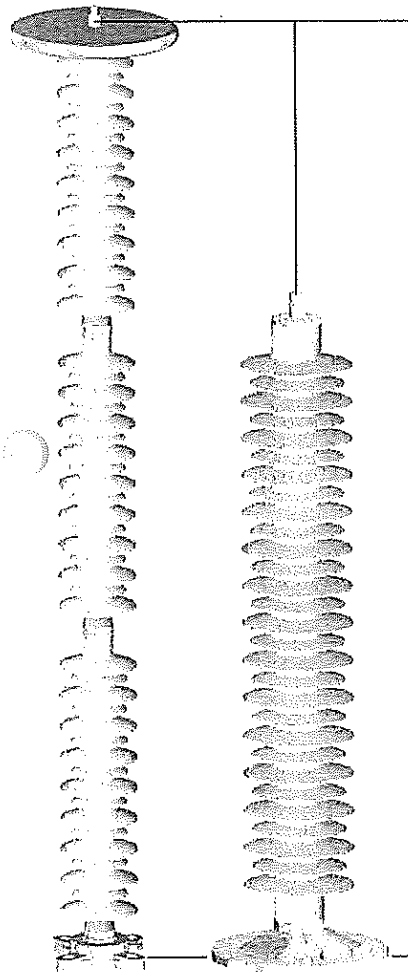


Installation Requirements

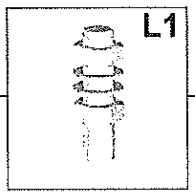


System Voltage U_0/U	ph/ph (a)	ph/ground (b)
6/10	185	165
12/20	315	295
20/35	510	490

Accessories for Class 2 and Class 3 Surge Arrester (Type HSR and PCA)

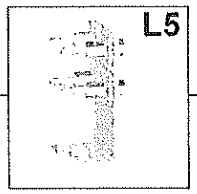


Line lead accessories

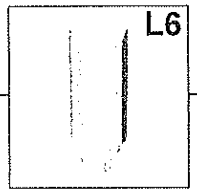


50 mm stud with washers and nut M16

Line Clamp to suit conductors up to Ø16 mm



Line Clamp to suit conductors up to Ø35 mm

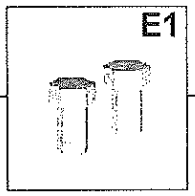


Aluminium Stem Ø30 x 80mm high

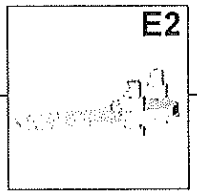
Arrester Type = Rated Voltage Ur in kV

2HSRCP	3HSRCP	→ HSRCP
48 60 72 75 84 96 108		
PCA2	PCA3	→ PCA

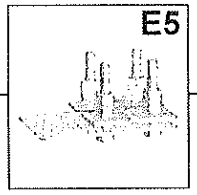
Earthing accessories



2 x M10 x 20mm Hexagon headed set screws and spring washers

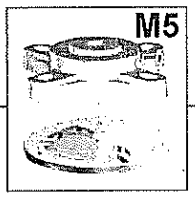


Earth Clamp to suit conductors up to Ø16 mm

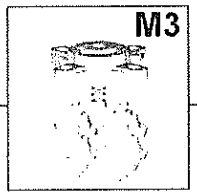


Line Clamp to suit conductors up to Ø35 mm

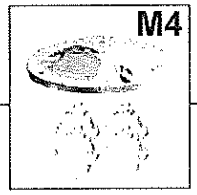
Mounting accessories



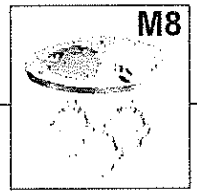
HSRCP or PCA
4 hole pedestal base
HSRCP: 127-140 PCO
PCA: 200-254 PCO



HSRCP
Set of 4 Ø 89 x 76
Polyfibre Base
Insulators
supplied with M5
Pedestal Base



PCA
Set of 4 Ø 89 x 76
Polyfibre Base
Insulators
supplied with M5
Pedestal Base



PCA
Set of 3 Ø 89 x 76
Polyfibre Base
Insulators
supplied with M5
Pedestal Base

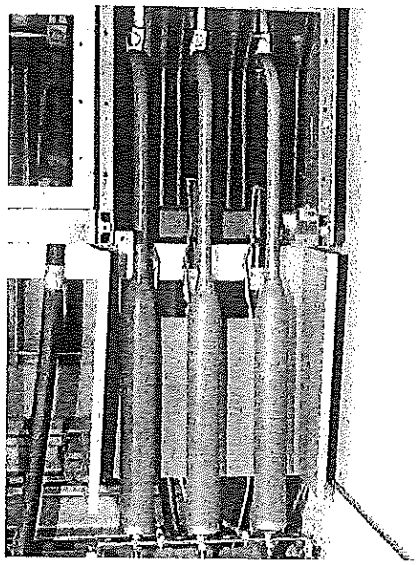
Ur kV	HSRCP	PCA	Recommended minimum distance mm between phase centers		line to earth	
			HSRCP	PCA	HSRCP	PCA
48	2HSRCP48LxExMx	PCA248LxExMx	510	542	260	306
60	2HSRCP60LxExMx	PCA260LxExMx	625	654	326	372
72	2HSRCP72LxExMx	PCA272LxExMx	735	767	391	437
75	2HSRCP75LxExMx	PCA275LxExMx	765	795	408	453
84	3HSRCP84LxExMx	PCA384LxExMx	840	880	456	502
88	3HSRCP88LxExMx	PCA388LxExMx	1213	993	518	567
91	3HSRCP91LxExMx	PCA391LxExMx	1213	993	518	567
95	3HSRCP95LxExMx	PCA395LxExMx	1213	993	518	567
96	3HSRCP96LxExMx	PCA396LxExMx	1213	993	518	567
99	3HSRCP99LxExMx	PCA399LxExMx	1326	1106	583	632
102	3HSRCP102LxExMx	PCA3102LxExMx	1326	1106	583	632
106	3HSRCP106LxExMx	PCA3106LxExMx	1326	1106	583	632
108	3HSRCP108LxExMx	PCA3108LxExMx	1326	1106	583	632
110	3HSRCP110LxExMx	PCA310LxExMx	1436	1218	648	698

0309

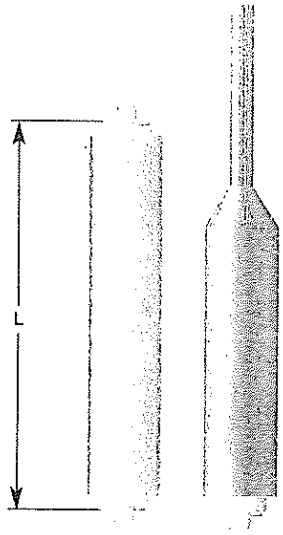
UTILUX

MV Surge Arresters for Indoor Applications – SPA

In air-spaced insulated switchgear systems
SPA type
A compact arrester with high mechanical strength. Even there are no sheds the housing material is fully track resistant and able to provide flashover resistance in damp indoor conditions.
The SPA type arrester is also available with a thick-wall insulated integrated line lead, which allows to considerably reduce the clearances between the arresters and to the earth. This line lead is available in lengths of 250mm, 500mm and 750mm. This SPA-I type arrester is the ideal solution when retrofitting compact switchgears with arresters.



Air-spaced switchgear with SPA-I arresters.



SPA SPA-I

Generic technical data:

SPA-xx series		6-36 kV Uc
Rated discharge current (8/20µs):		10 kA
Line discharge class according to IEC 60099-4		Class 1
Operating duty impulse withstand current (4/10µs):		100 kA
Long duration current impulse (2000µs):		400 A
10 second temporary overvoltage (U_{TOV}/U_C)		1,25
High current short circuit: (pre-failing method) (Safe non-shattering failure mode)		16 kA
Energy	line discharge impulse	2,6 kJ/kV Uc
	high current impulse	5,3 kJ/kV Uc

Mechanical strength data

Cantilever	200 Nm
Tensile	1000 N
Torque	58 Nm

SPA / SPA-I	Height L (mm)
SPA-06	138
SPA-09	168
SPA-10	177
SPA-12	200
SPA-15	299
SPA-18	329
SPA-21	361
SPA-24	393
SPA-27	491
SPA-30	522
SPA-33	554
SPA-36	586

Protective Characteristics

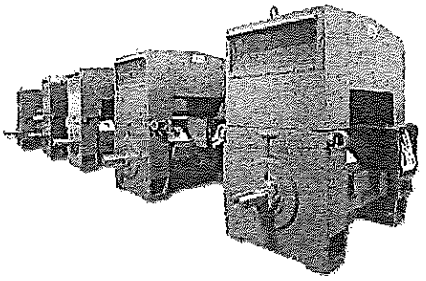
SPA / SPA-I	Uc kV	Ur kV	Ures in kV when tested to impulse waveforms						
			Lightning (8/20µs)				Steep lightning (1/20µs)	Switching (30/60µs)	
			5kA	10kA	20kA	40kA	10kA	125A	500A
SPA-06	6	7,5	18,6	20,0	22,4	26,2	21,8	13,8	14,8
SPA-09	9	11,0	27,9	30,0	33,6	39,3	32,7	20,6	22,2
SPA-10	10	12,5	31,0	33,3	37,4	43,7	36,3	22,9	24,7
SPA-12	12	15,0	37,2	40,0	44,9	52,4	43,6	27,5	29,6
SPA-15	15	18,0	46,5	50,0	56,1	65,5	54,5	34,4	37,0
SPA-18	18	22,0	55,8	60,0	67,3	78,6	65,4	41,3	44,4
SPA-21	21	26,0	65,1	70,0	78,5	91,7	76,3	48,1	51,8
SPA-24	24	30,0	74,4	80,0	89,7	105,0	87,2	55,0	59,2
SPA-27	27	33,0	83,7	90,0	101,0	118,0	98,1	61,9	66,6
SPA-30	30	37,0	93,0	100,0	112,0	131,0	109,0	68,8	74,0
SPA-33	33	41,0	102,0	110,0	123,0	144,0	120,0	75,6	81,4
SPA-36	36	45,0	112,0	120,0	135,0	157,0	131,0	82,5	88,8

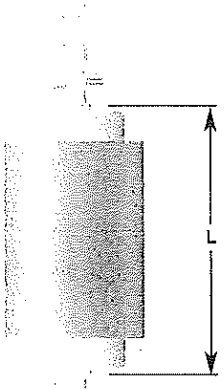
Uc: Continous Voltage; Ur: Rated Voltage; Ures: Residual Voltage

Arresters for other voltages are available on request.

MV Surge Arresters for Indoor Applications – MPA

For motor-connection boxes
MPA type
Design for the specific requirements of electric motors. A robust, non-tracking housing plus the high energy handling capabilities of the Tyco Electronics arrester family make it the ideal choice for the designer.





Generic technical data:

MPA-xx series		2-12 kV Uc
Rated discharge current (8/20µs):		10 kA
Line discharge class according to IEC 60099-4		Class 1
Operating duty impulse withstand current (4/10µs):		100 kA
Long duration current impulse (2000µs):		400 A
10 second temporary overvoltage (U_{TOV}/U_C)		1,25
High current short circuit: (pre-failing method) (Safe non-shattering failure mode)		16 kA
Energy	line discharge impulse	2,6 kJ/kV Uc
	high current impulse	5,3 kJ/kV Uc

MPA	Height L (mm)
MPA-02	101
MPA-03	107
MPA-04	114
MPA-06	138
MPA-07	148
MPA-09	168
MPA-10	177
MPA-12	200

Mechanical strength data

Cantilever	200 Nm
Tensile	1000 N
Torque	58 Nm

Protective Characteristics

MPA	Uc kV	Ur kV	Ures in kV when tested to impulse waveforms Lightning (8/20µs) 5kA	10kA	20kA	40kA	Steep lightning (1/20µs) 10kA	Switching (30/60µs) 125A	500A
MPA-02	2	2,5	6,2	6,7	7,5	8,7	7,3	4,6	4,9
MPA-03	3	3,7	9,3	10,0	11,2	13,1	10,9	6,9	7,4
MPA-04	4	5,0	12,4	13,3	15,0	17,5	14,5	9,2	9,9
MPA-06	6	7,5	18,6	20,0	22,4	26,2	21,8	13,8	14,8
MPA-07	7	8,7	21,7	23,3	26,2	30,6	25,4	16,0	17,3
MPA-09	9	11,0	27,9	30,0	33,6	39,3	32,7	20,6	22,2
MPA-10	10	12,5	31,0	33,3	37,4	43,7	36,3	22,9	24,7
MPA-12	12	15,0	37,2	40,0	44,9	52,4	43,6	27,5	29,6

Uc: Continous Voltage; Ur: Rated Voltage; Ures: Residual Voltage

Arresters for other voltages are available on request.

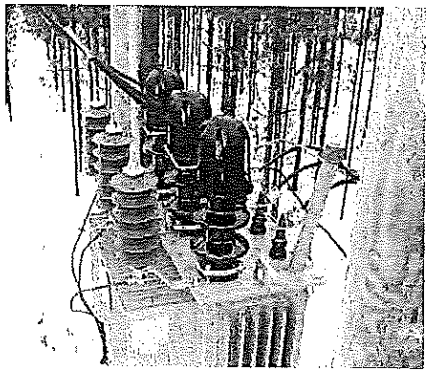
0311

UTILUX

Tyco Electronics MV Surge Arresters with external spark-gaps

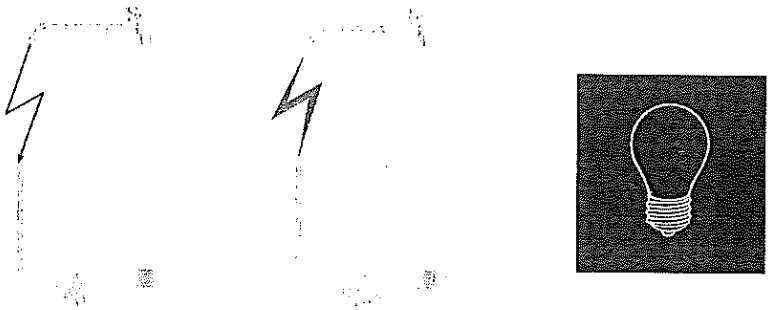
Protection system MORE for medium-voltage transformer overhead lines
This type of surge arresters is designed to protect the insulator assembly at transformers from the lightning over-voltages. It is connected parallel to the insulator assembly. It is defined as a device that contains a non-linear metal oxide resistor element in its arrester body (MORE) and an external series gap to isolate the MORE from the system.

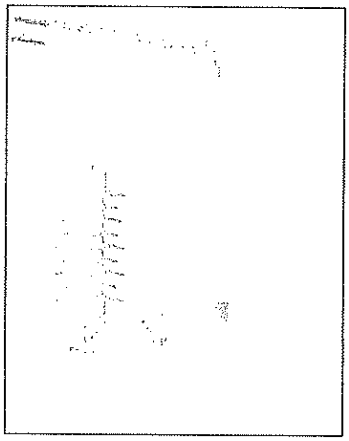
The protection is accomplished by raising the spark-over level of the external series gap to a level that isolates the arrester from power frequency overvoltages and from the worst case switching overvoltages expected on the line which it is applied. The external series gap acts as an isolating apparatus in the event of arrester body failure.



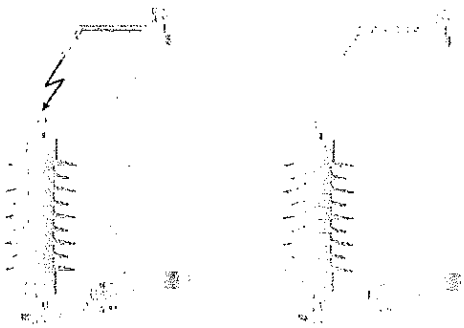
The pictures below show different constructions of the MORE system.

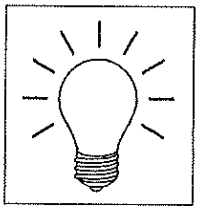
Without MORE
Lightning protection with arcing horns. In case of lightning overvoltage, the system is out of function based on the present voltage.

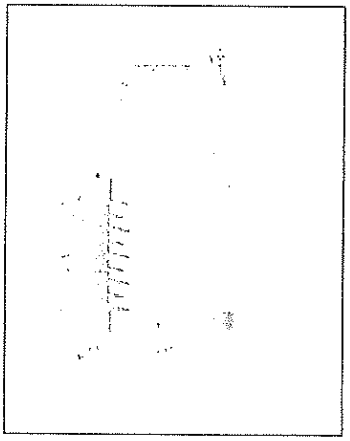




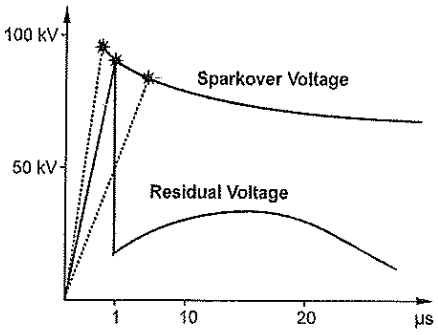
With MORE
Lightning protection with the MORE arrester. The MORE will be disconnect and the system will be in function.



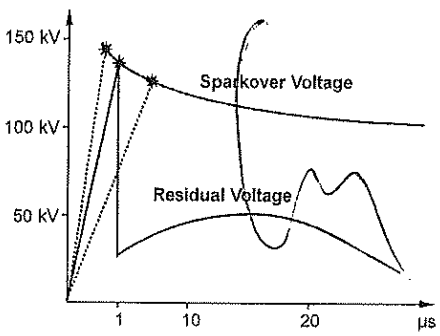


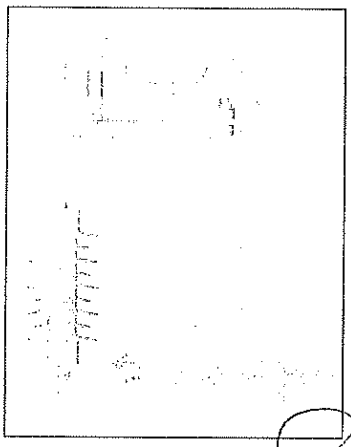


10 kV System



20 kV System



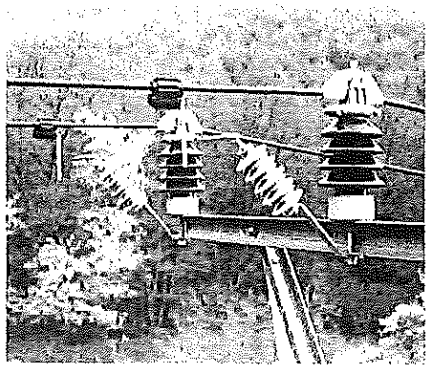


Tyco Electronics MV Surge Arresters for covered conductors – CLX

Protection system CLX for medium-voltage covered conductor overhead lines

An absolute must when covered conductor systems are used. CLX prevents covered conductors from melting and falling down to earth when lightning strikes generate overvoltages in overhead lines. CLX guides the lightning discharge current ground, prevents the insulator from flashing over and stops the high energy of the power frequency follow-on current. On top of this, CLX protected overhead lines will have almost no power supply interruptions during storms.

This makes it attractive also for bare conductor distribution systems.
Even in case of accidental bridging CLX will not cause a phase-to-ground fault.
The CLX device contains a Metal Oxide Resistive Element and an external series gap to isolate the Metal Oxide Resistive Element from the system.
The CLX device is installed next to the line / post insulators and can be adapted to the system. The series gap will be realized by different brackets, electrodes and connectors.
We offer engineering support to optimize the use of CLX.



Covered conductor system protected by CLX

Generic technical data:

CLX-xx series		12-42 kV Uc
Rated discharge current (8/20µs):		5 kA
Operating duty impulse withstand current (4/10µs):		65 kA
High current short circuit: (pre-failing method) (Safe non-shattering failure mode)		16 kA
Energy	line discharge impulse high current impulse	1,5 kJ/kV Uc 3,6 kJ/kV Uc
Service conditions	Ambient temperature:	- 60°C to + 60°C

Mechanical strength data

Cantilever	150 Nm
Torque	45 Nm

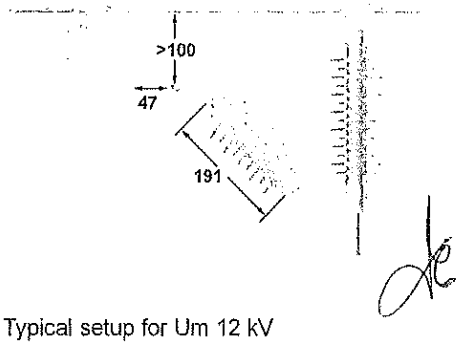
Protective Characteristics

CLX	Um kV	Ures in kV when tested to impulse waveforms					
		Lightning (8/20µs)				Lightning Impulse Sparkover Voltage	
		2,5kA	5kA	10kA	20kA	Standard (1/20µs)	Steep (1000kV/µs)
CLX-12NA	12,0	30,0	32,0	35,0	40,0	80,0	140,0
CLX-15NA	15,0	31,0	33,0	36,0	41,0	100,0	175,0
CLX-24NA	24,0	48,0	51,0	57,0	63,0	140,0	250,0
CLX-36NA	36,0	77,0	83,0	91,0	103,0	190,0	400,0
CLX-42NA	42,0	86,0	91,0	136,0	153,0	230,0	450,0

Um: Max. System Voltage; Ures: Residual Voltage / Sparkover Voltage

Metal Oxide Resistive Elements Houstng Parameter

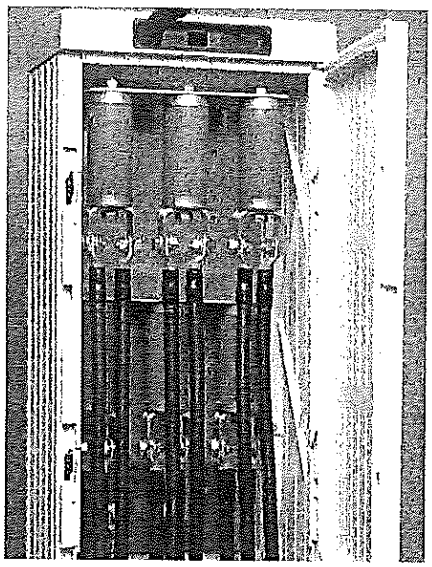
CLX	Power voltage withstand, wet (kV)	Flash over distance (mm)	Creepage length (mm)	Height L (mm)	Weight (kg)
CLX-12NA	31	182	375	191	1,20
CLX-15NA	31	182	375	191	1,20
CLX-24NA	50	283	715	286	1,90
CLX-36NA	50	283	715	286	1,90
CLX-42NA	81	465	1090	477	3,10



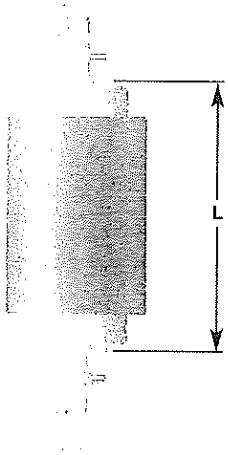
Typical setup for Um 12 kV

Tyco Electronics MV Surge Arresters for cable sheath protection system – CPA

High-voltage cable sheath protection system CPA
Designed to the specific requirements in cable sheath protection. A robust, non tracking housing plus the high energy handling capabilities of the Raychem arrester family make it the ideal choice for the designer.



CPA arresters installed in a cubicle to protect HV cable sheath cross bonds



Generic technical data:

CPA-xx series		1-7 kV Uc
Rated discharge current (8/20µs):		10 kA
Line discharge class according to IEC 60099-4		Class 1
Operating duty impulse withstand current (4/10µs):		100 kA
Long duration current impulse (2000µs):		400 A
10 second temporary overvoltage (U_{TOV}/U_C)		1,25
High current short circuit: (pre-failing method) (Safe non-shattering failure mode)		16 kA
Energy	line discharge impulse	2,6 kJ/kV Uc
	high current impulse	5,3 kJ/kV Uc

CPA	Height L (mm)
CPA-01	94
CPA-02	101
CPA-03	107
CPA-04	114
CPA-05	123
CPA-06	138
CPA-07	148

Mechanical strength data

Cantilever	200 Nm
Tensile	1000 N
Torque	58 Nm

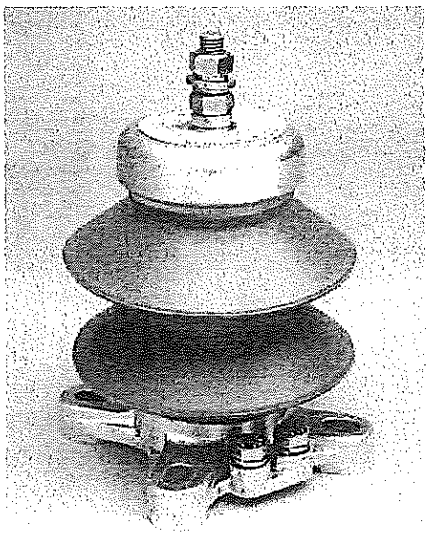
Protective Characteristics

CPA	Uc kV	Ur kV	Ures in kV when tested to impulse waveforms						
			Lightning (8/20µs)				Steep lightning (1/20µs)	Switching (30/60µs)	
			5kA	10kA	20kA	40kA	10kA	125A	500A
CPA-01	1	1,2	3,1	3,3	3,7	4,4	3,6	2,3	2,5
CPA-02	2	2,5	6,2	6,7	7,7	8,7	7,3	4,6	4,9
CPA-03	3	3,7	9,3	10,0	11,2	13,1	10,9	6,9	7,4
CPA-04	4	5,0	12,4	13,3	15,0	17,5	14,5	9,2	9,9
CPA-05	5	6,2	15,5	16,7	18,7	21,8	18,2	11,5	12,3
CPA-06	6	7,5	18,6	20,0	22,4	26,2	21,8	13,8	14,8
CPA-07	7	8,7	21,7	23,3	26,2	30,6	25,4	16,0	17,3

Uc: Continous Voltage; Ur: Rated Voltage; Ures: Residual Voltage

MV Surge Arresters for D.C. and A.C. Railway Applications

For D.C. Applications
Type HE 60
These DC-type surge arresters are particularly suitable for protection against overvoltages caused by lightning and switching in both DC railway systems and network up to 4.5kV.
The low residual voltage and high-energy capacity of the metal-oxide varistors ensure safety and reliability even under the most extreme conditions.
Thanks to its rugged, compact design, the arrester is capable of withstanding extreme mechanical stress (vibrations, shocks, pressure, torsion).
HE 60 surge arresters have been tested in compliance with the CENELEC standard for surge arresters in DC networks for railways EN 50123-5, 2003. Further tests have been carried out to examine the sealing properties of the arrester and its resistance to mechanical stress and fire.



For A.C. Applications
Type HDA-M / OCP
For installation on locomotive and other rolling stock Tyco Electronics offers special design solutions. Please contact your sales representative for further information.
For application on outdoor catenary please select the appropriate outdoor surge arrester documented on page 6, 8 and 10.

Generic technical data:

HE60MCxx series		1-6 kV Ur
Rated discharge current (8/20µs):		10 kA
Operating duty impulse withstand current (4/10µs):		100 kA
10 second temporary overvoltage (U_{TOV}/U_S):		1,31
High current short circuit: (pre-failing method) (Safe non-shattering failure mode)		25 kA
Energy	1 high current impulse	2,3 kJ/kV Ur
Service conditions	Ambient temperature:	- 60°C to + 60°C

Protective Characteristics

HE60MC	Us kV	Ur kV	Ures in kV when tested to impulse waveforms Lightning (8/20µs) 100A	200A	1kA	2,5kA	5kA	10kA	20kA	Steep current (1/20µs) 10kA	Switching current (30/60µs) 125A	500A
HE60MC07	0,7	1,0	1,8	1,8	2,0	2,1	2,2	2,4	2,7	2,7	1,8	1,9
HE60MC10	1,0	1,4	2,7	2,8	3,0	3,2	3,3	3,7	4,0	4,0	2,7	2,9
HE60MC15	1,5	2,0	3,6	3,7	4,0	4,3	4,5	4,9	5,4	5,4	3,6	3,8
HE60MC18	1,8	2,1	4,1	4,3	4,6	4,9	5,2	5,6	6,2	6,2	4,2	4,4
HE60MC20	2,0	2,8	5,4	5,7	6,1	6,5	6,7	7,4	8,1	8,1	5,5	5,8
HE60MC30	3,0	4,0	7,2	7,5	8,1	8,6	9,0	9,9	10,9	14,8	10,6	11,4
HE60MC39	3,9	4,9	9,1	9,3	10,2	10,9	11,9	12,4	13,6	13,7	9,3	9,7
HE60MC45	4,5	6,0	12,7	13,2	14,3	15,2	16,4	17,4	19,1	19,2	13,0	13,6

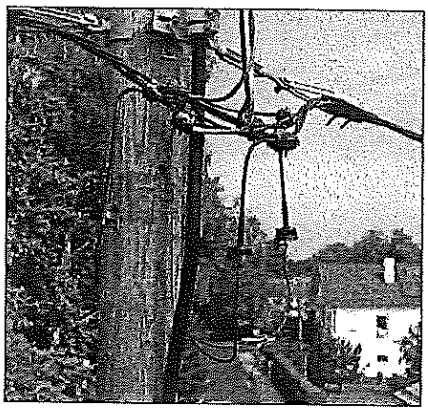
Us: System Voltage; Ur: Rated Voltage; Ures: Residual Voltage

Standard Housing Parameter

HE60MC	Impulse voltage 1.2/50µs (kV)	Power frequency voltage withstand, wet (kV)	Flash over distance (mm)	Creepage length (mm)	Weight (kg)
HE60MCxx	82	60	130	246	3,60

Accessories for Line Terminal, Ground Terminal and Mounting are available on request.

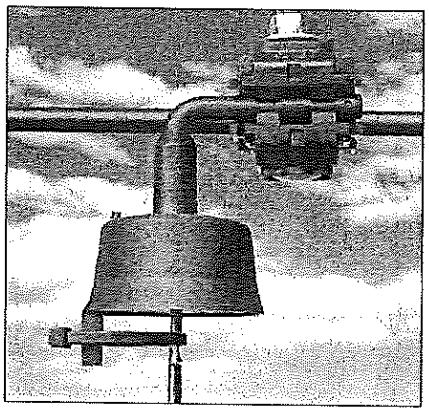
Metal Oxide Arresters for Applications in Low Voltage Networks LVA and MOSIPO



Type LVA

Low voltage surge arresters are installed at transitions of LV-ABC lines to underground or service cables and to transformers. The metal-oxide varistors incorporated in the surge arrester reliably protects the insulation of the network and the connected equipment from all kind of surges. In case of overload, e.g. by lightning strike in vicinity of arrester, an integrated disconnector disconnects the arrester from the network. A bundle of installation accessories like insulated line leads and mounting brackets are available to meet the individual requirements.

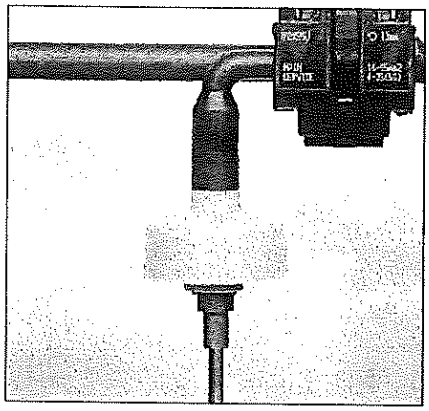
Two different types of arresters are available which are both tested according to Class II of IEC 61643-1 + Amd. 1 / EN 61643-11.



Type LVA

Following features are applicable for both arrester types:

- Gapless metal-oxide surge arrester
- Flame retardant and UV resistant
- High current impulse 4/10µs (IEC 60099-4): 100 kA
- Tested to exceed ambient temperature of -40 up to +70 °C
- Watertightness tested at 6 kV for 30 min in a waterbath
- Integrated 1 m ground lead as standard accessory



Type BOW MOSIPO

Differences between the both arrester types are the following:

BOW-MOSIPO 15:

- Silicone housing
- At disconnection the ground lead will be separated from the housing and the disconnection event is clearly visible

LVA:

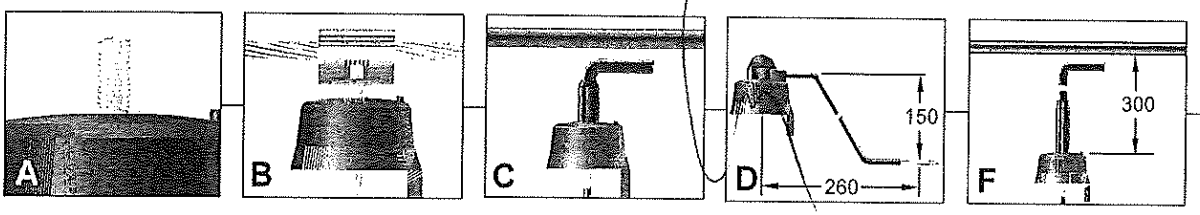
- Sturdy, weatherproof polymer housing
- At disconnection the ground lead remains in position and it is easy to spot coloured plate hanging down from the arrester

Technical Data	BOW-MOSIPO 15-275	BOW-MOSIPO 15-440	LVA-280B	LVA-440B
Continuous Voltage U_C	275 V	440 V	280 V	440 V
Residual Voltage at I_N (8/20µs Impulse)	1,80 kV	2,28 kV	1,20 kV	1,80 kV
Nominal discharge current (I_N)	15 kA	15 kA	10 kA	10 kA
Maximum discharge current (I_{max})	40 kA	40 kA	40 kA	40 kA

Ordering description for surge arrester and accessories

BOW-MOSIPO 15/ 280 / 440 - □

LVA 280 / 440 B- □ L



Line connection
Threaded bolt M8x16

Clamp for bare conductors 16mm² up to 120mm²

Insulated right angle adapter to fit to piercing connectors

Insulated adapter with bird cap to fit to transformators

Insulated flexible line lead to fit to piercing connectors

Raychem

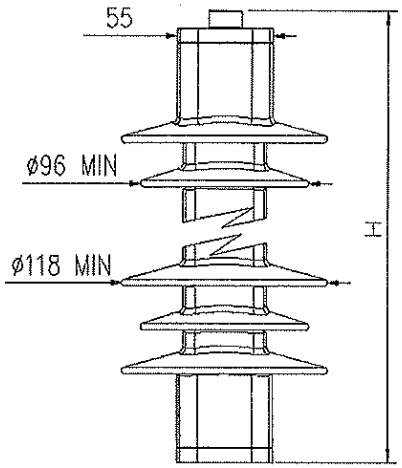
HDA Series

Distribution Surge Arrester

HDA-24MA-□□□

Metal oxide arrester		Continuous operating voltage	
Polymeric Housing		**Uc: 24 kV**	
IEC 60099-4, Ed 2.0		Rated voltage	
Nominal discharge current:	10 kA	**Ur: 30 kV**	Mounting
Line discharge class:	1		
High current impulse 4/10 µs:	100 kA	Short circuit rating (pre-failing method)	Ground Lead
Energy absorption capability at		Rated short-circuit current 40 kA	
– Line discharge imp.:	4.2 kJ/kV Uc	Low short-circuit current 600 A	Line Lead
Long Duration Ipeak	400 A	Safe non-shattering design	

Dimensions (mm)



Arrester Housing

Impulse voltage 1,2/50 µs	kV	190
Power frequency voltage -wet:	kV	93
Overall length, (H)	mm	316
Flashover distance	mm	310
Creepage Length	mm	830
Weight	kg	3.25
No of Sheds:		12
Cantilever strength *	Nm	350
Pull strength	N	2000
Max. Torque M12 *	Nm	50

* Ref: Thermomechanical & bending moment test 60099-4

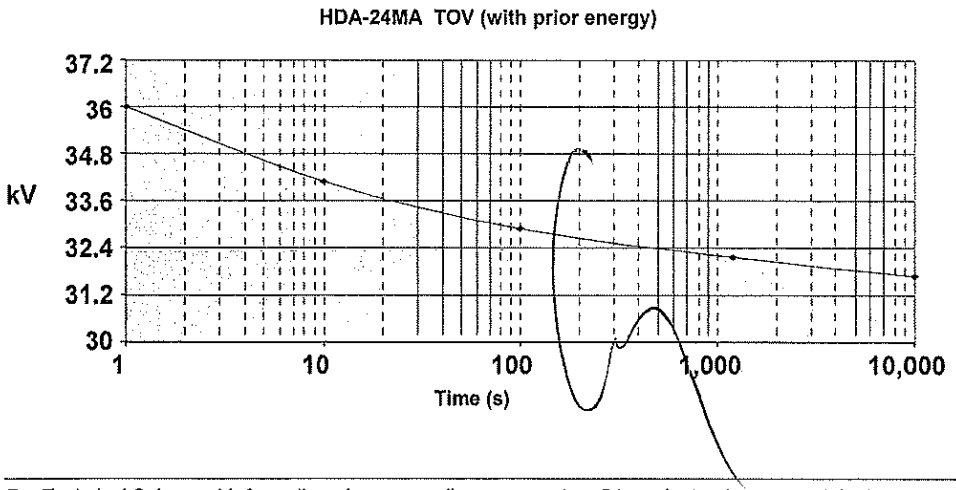
100% Routine testing
- Residual Voltage
- Reference Voltage
- Partial Discharge

Residual Voltages (kV)

Lightning current impulse 8/20 µs:			Steep lightning current impulse 1/20 µs	Switching current impulse 30/60 µs	
5 kA	10 kA	20 kA	10 kA	125 A	500 A
74.4	79.2	87.4	81.6	59.0	62.9

Power frequency voltage versus time

1 Sec. TOV: 36.0 kV
100 Sec. TOV: 32.9 kV



Marking

Raychem
MO Surge Arrester
50/60 Hz
IEC 60099-4
Isc 40 kA
In 10 kA Class 1
HDA-24MA
Uc: 24 kV
Ur: 30 kV
Manufacturing Year

MVSA-212-000-39/05-0

For Technical Sales and Information please e-mail: surgearresters@tycoelectronics.com or telephone: +353 61 470939 or +353 61 470848

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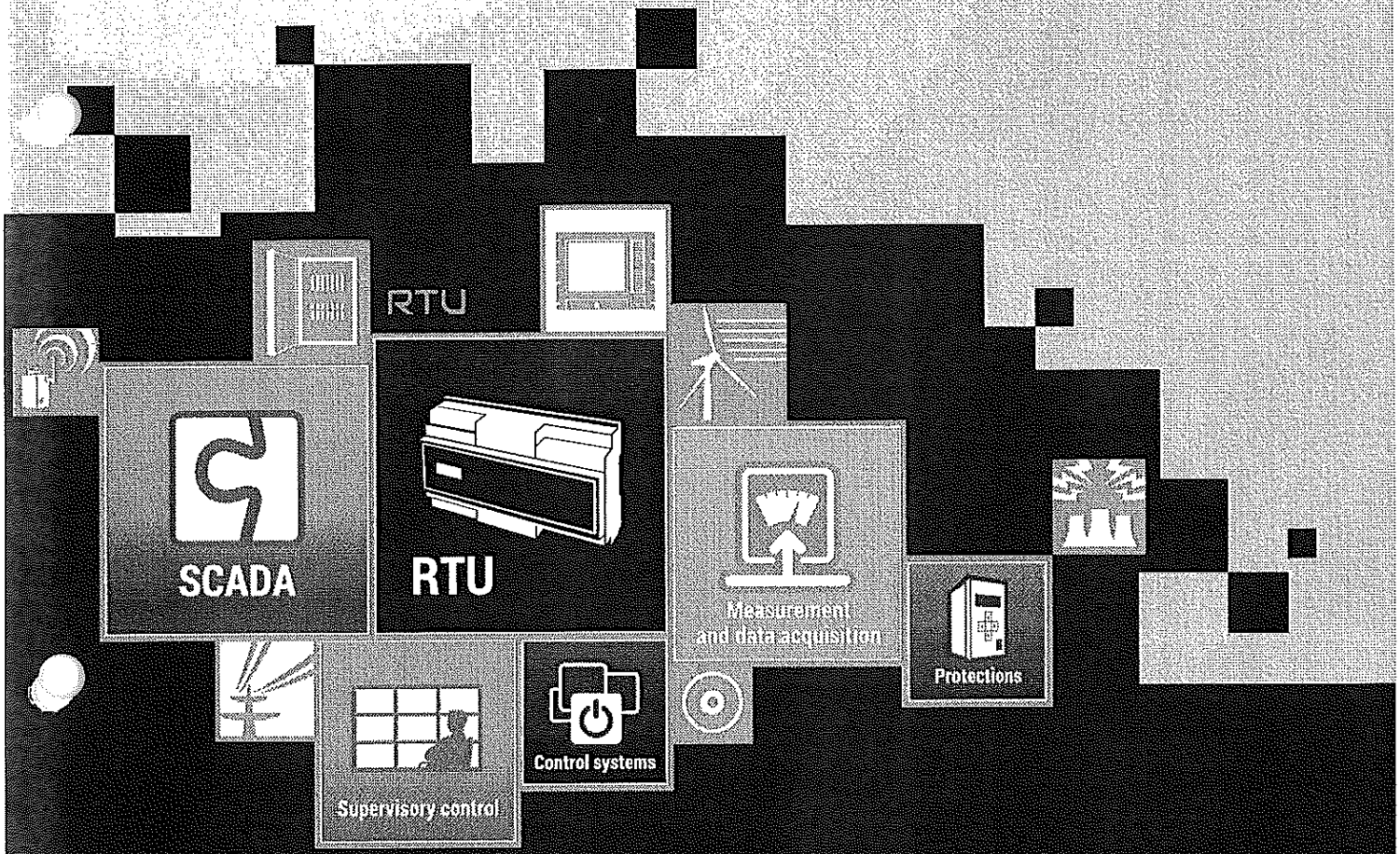
ELVAC

www.rtu.cz



Products for power industry

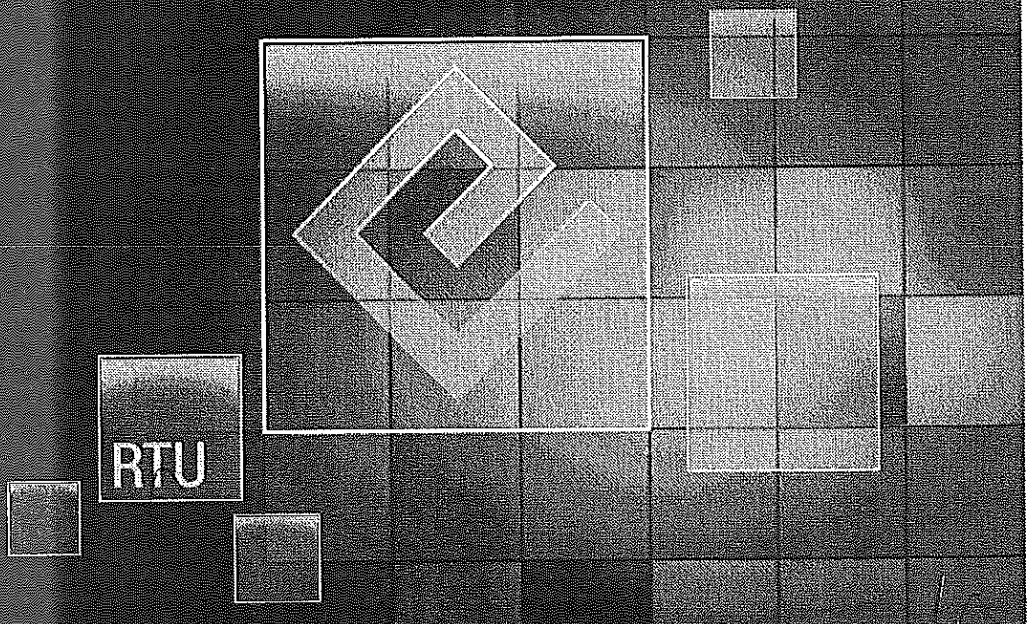
Catalogue

0318

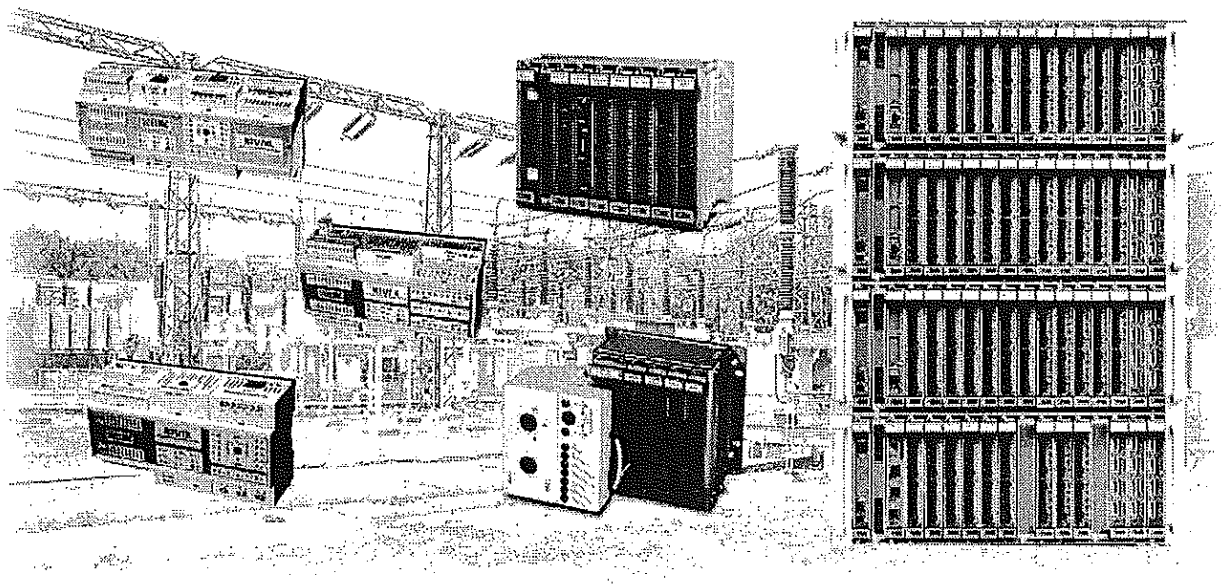
Content

0319

RTUs for control, protection, data acquisition and communication



Basic information about ELVAC RTU products



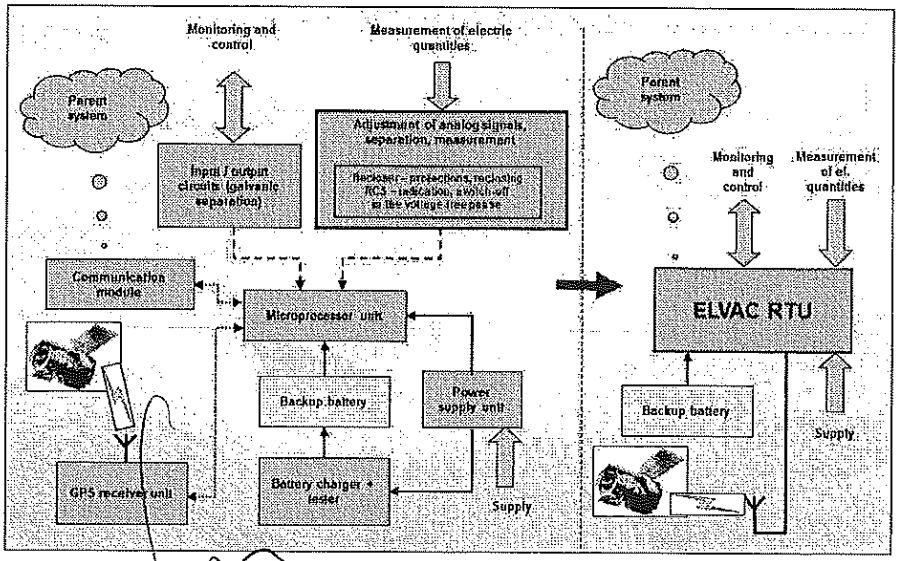
ELVAC RTU units are developed and produced directly in ELVAC a.s. and their features are a result of the knowledge and experience gained since the 1990s. Thanks to long-term cooperation with experts and perception of user needs we created devices that meet the highest demands of the energy field. Our own development and production mean a full product control to ensure the top quality based on top quality of components and manufacturing processes and we can provide also the highest standard of technical support along with customization and rapid response to market demands. The results of our work are the satisfied users of the many thousands of installations in the Czech Republic, but also in many other countries.

ELVAC RTUs include the following functions:

- control processor unit,
- wired and wireless communication interfaces with many communication protocols,
- digital inputs and outputs,
- analog inputs for measuring of current and voltage in three-phase systems and calculation of derived values,
- protection and automation functions for reclosing,
- programmable logic and relational functions,
- power supply with controlled backup battery recharging and battery status indication,
- temperature sensors, there can be connected the others, e.g. wind power or exposure measurement.

Internal architecture

Over years of development, simple units with digital inputs and outputs and a communication module have been replaced by unique devices that integrate many other devices typically used in energy sector. It simplifies installation, eliminates the trouble of connection and compatibility, increases reliability and user comfort. This all brings also cost effective complete solution.



Hasičská 53, 700 30 Ostrava - Hrabůvka, Czech Republic
Tel.: +420 597 407 323, Fax: +420 597 407 102, www.rtu.cz
ELVAC a.s.

0321

Compact and modular conception

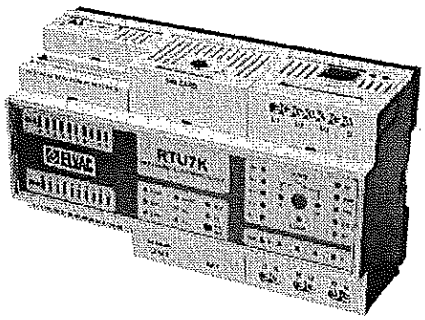
In principle, ELVAC RTU products are divided into two basic groups: Compact and modular RTU. From the user's perspective, they are fully compatible with the same software basis. The differences mainly concern the hardware capabilities of the various types and the resulting installation issues.

Compact RTU features

- the entire unit is fitted in plastic box for mounting on DIN rail,
- the number of digital and analogue inputs is firmly defined according to the type of compact version,
- the internal design has partially modular character, there can be selected for ex. the communication interfaces or parameters of analogue inputs,
- it is used an external power supply from 10V DC to 40V DC,
- the expansion is possible via the RS-485 or Ethernet.

Compact RTU advantage

- if the number of inputs and outputs of the compact unit is sufficient, it is cheaper solution.

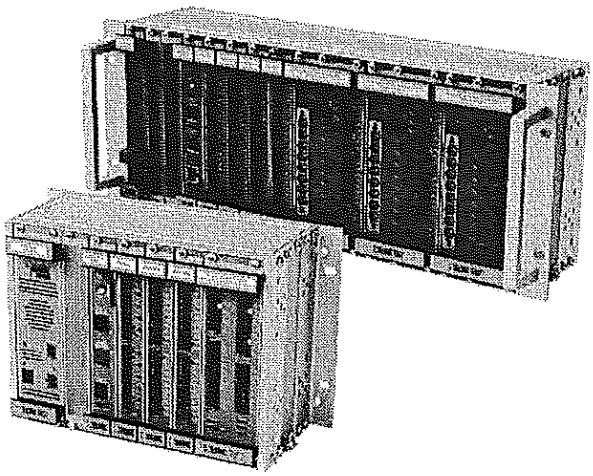


Modular RTU features

- optional chassis from 2 up to 16 slots for wall, panel or DIN rail mounting,
- the internal conception is fully modular, the system can be fitted according to the needs of the customer with the option of future expansion,
- there are available several types of power supply modules, which have an internal measurement of power input,
- the internal conception enables the use of direct and indirect cards. The basic difference is that the signal on direct cards is connected directly to the main processor of the unit, which means that they are very fast; however, the amount of these cards in the system is limited by the given number of CPU inputs. On the contrary, indirect cards are fitted with their own control processor and communicate with the system through an internal serial bus. This communication is slightly slower, although as a result, more of these cards can be installed into the system and this is only limited by the performance of the power supply or the space in the chassis. In case of using the protective functions evaluated by the processor that is directly located on the bus for the connection of I/O signals, then direct cards are used, indirect cards are recommended for the expansion of inputs and outputs for large systems. Some types of indirect cards with their own CPU can work as a multi-channel failure indicator or complete protection - it is possible to operate several protections for separate outlets in one RTU chassis.

Modular RTU advantages

- „all-in-one" solution = all necessary modules in one chassis,
- unlimited configuration options,
- due to the internal power supply, there is wide range of supply voltages (e.g. directly from the power lines via the transformer),
- by measuring of the supply input, it is possible to evaluate the status on the side of power lines, where the power supply transformer is mounted (another measured information for users),
- modules for special sensors are available (e.g. wind, exposure, temperature).



Control processor unit

The CPU board is equipped with reliable single-chip microcontroller, providing sufficient performance with low power consumption. For maximum safety of control, the switching of output relays is controlled by an auxiliary processor and the action occurs only when both CPUs are in accordance. The system provides the evaluation of each input quantity, calculation of derived quantities, recording of samples and signal filtering based on the defined limits.

0322

Communication unit

Communication options are wide. Units can be connected by wire and wirelessly with many types of protocols used in the energy industry. The user can do the remote device diagnostics, firmware update, remote parameterization, data reading, downloading records of measurements, etc.

There are available these communication interfaces: Ethernet, GPRS/UMTS, RS-232, RS-485, CLO, BT, proprietary optical RS-485 with the option of redundant ring communication with zero delay communication after the interruption of circle.

According to the used interface and the type of device there are available the following communication protocols:

IEC 60870-5-101, IEC 60870-5-103, IEC 60870-5-104, IEC 61850, DNP3, MODBUS, DLMS, HioCom2.

Units fitted with a communication card with built-in PC provide various options to secure the communication. As a standard, it is supported the security by means of TLS (Transport Layer Security). TLS can also be used for configuration in the web interface (access via HTTPS), as well as for the communication via protocols IEC 60870-5-104 and DNP3 (generally for any protocol on TCP). Security is fully in accordance with the standard IEC TS 62351-3. Communication through IPSEC can be activated at the request of the client.

Digital inputs and outputs

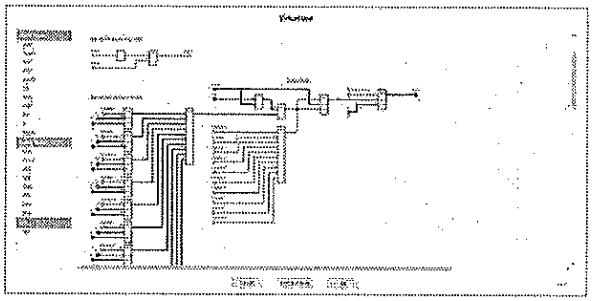
Active (internal excitation voltage) or passive (external excitation voltage) digital inputs can be used in ELVAC RTU units. The excitation voltage can be selected from 9 to 300V. The digital outputs are implemented using either a relay with NO (normally open) contact or changeover contact. The number and variations of the digital inputs and outputs are given in modular configurations according to the type of card, for the compact version is the number firmly defined.

Analog inputs

ELVAC RTUs can be equipped with analogue cards for measuring of currents and voltages in three-phase system. Current inputs are optional for AC or DC ranges 5 mA, 20 mA, 1 A and 5 A. Voltage inputs are available in ranges from 2V to 400V. Overloadability and galvanic isolation of analog inputs are defined by the type of card and the parameters can be found on product pages of this catalogue. ELVAC RTUs can calculate further data based on the measured data, e.g. P, Q, S, phase shifts, frequency, U_0, I_0 or line-to-line voltage. Some cards can measure also U_0 and I_0, what is useful for higher sensitivity of protection functions.

Programmable logic and relational expressions

With this feature, it can be defined a new functionality in our RTU without modification of the firmware. The input values in the expressions can be measured quantity, signal or constant. RTU behavior can thus be adjusted by the user to suit the given application.

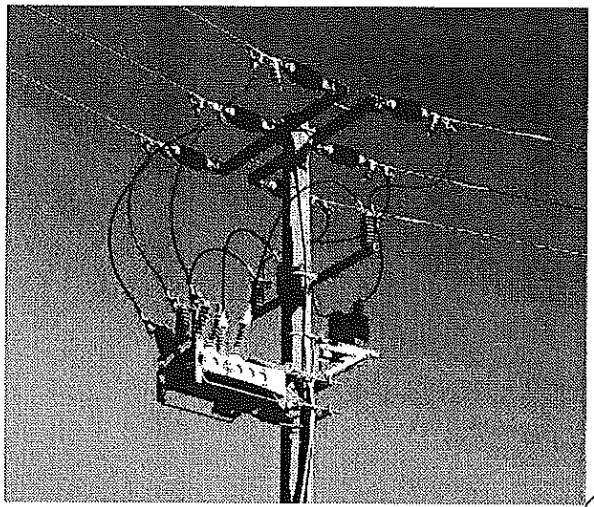


Protections and automation functions

Very interesting feature of ELVAC RTU are the protective functions which can so successfully replace the much more expensive devices in many applications. It is one of the important features that are built into our units and greatly simplify the installation of a complete application. According to the configuration of RTU, there are used the following protections:

- voltage protection,
- directional time-depending overcurrent and short circuit protection,
- current and voltage asymmetry,
- earth-fault directional protection,
- frequency protection.

Based on the evaluation of these protective functions, the user can use the automation functions, such as reclosing and disconnecting during non-voltage interval. According to the RTU configuration, there are available more blocks of protective functions.



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0323

Waveform recording

Standard part of ELVAC RTUs is the option to record the waveforms of measured currents and voltages and signal states. The recordings can be used for example for analysis of failures on lines. The recordings are stored in proprietary format or in COMTRADE format with period 1 ms.

Archiving

For slow speed recording of changes in measurements and signal states, there can be used a function of archiving. It is possible to use it for recording of values in different applications in utilities. The archiving is also used for measuring of power consumption. The advantage of archives is big memory capacity sufficient for long term records, depending on type of application.

Power supply with battery backup

Compact versions of RTU are supplied by voltage from 10 to 40V DC. External sources are used for the supply from other ranges. For modular versions, a wider range of sources with the supply voltage from 12V up to 360V DC or from 50V to 260V AC can be selected. ELVAC RTU checks the power supply input and in the case of outage, it is switched to the battery backup. The advantage of the modular version is that it can be directly connected to the AC source to provide the user with direct information about the status of the power lines, where it is connected. It is further measured information for users.

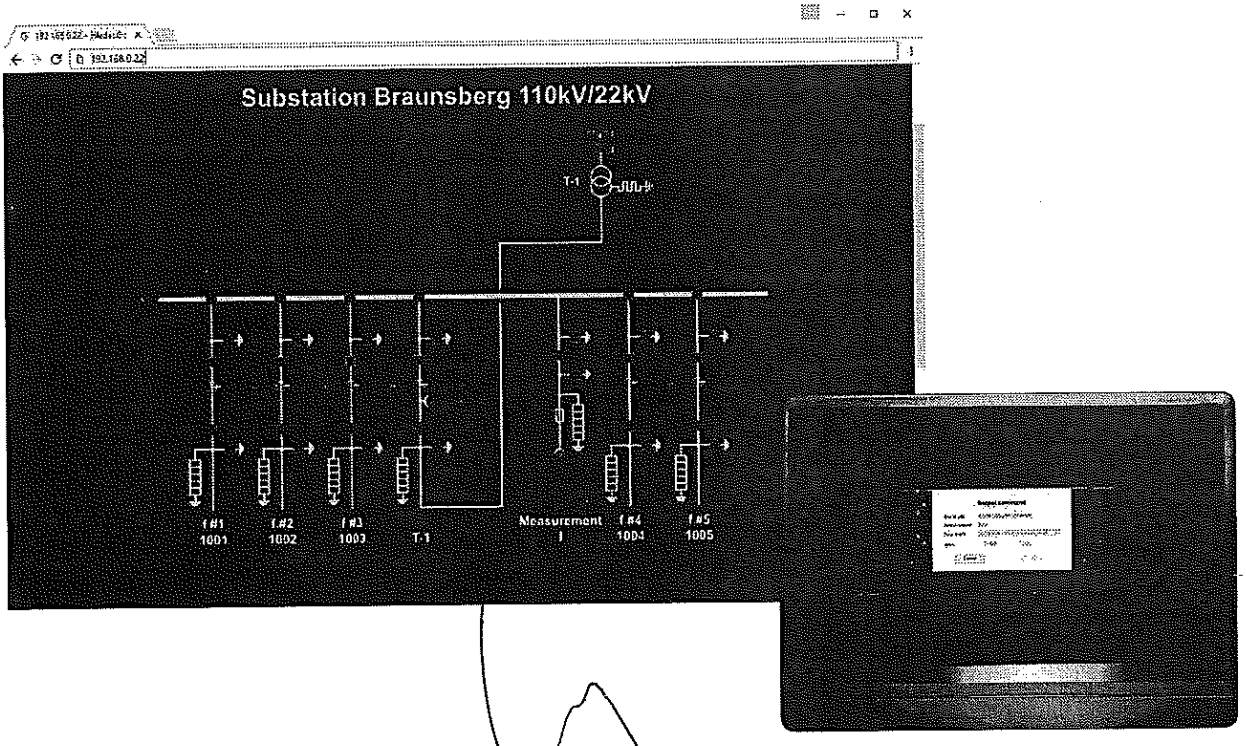
The modular and compact versions include an integrated battery charger and regularly inspects the capacity of the battery and also have an integrated function for battery protection against excessive discharging. If necessary, i.e. for backup of motor drives of switching elements, the configuration can also be strengthened for greater charging currents for higher battery capacities.

Human-machine interface (HMI)

Very interesting feature of ELVAC RTUs is embedded HMI. It means that you can prepare visualization of controlled technology directly in RTU without necessity of using any special and expensive software. Moreover, you need not to have any programming skills. Everything is designed to be easy and feasible for common computer users.

HMI in our RTUs use the SVG vector format graphic file, which represents the scheme of technology and the objects in this file can be linked to the addresses in RTU. Then these objects can have different behavior, like changing the color according to internal status in RTU, control button or showing the measuring values.

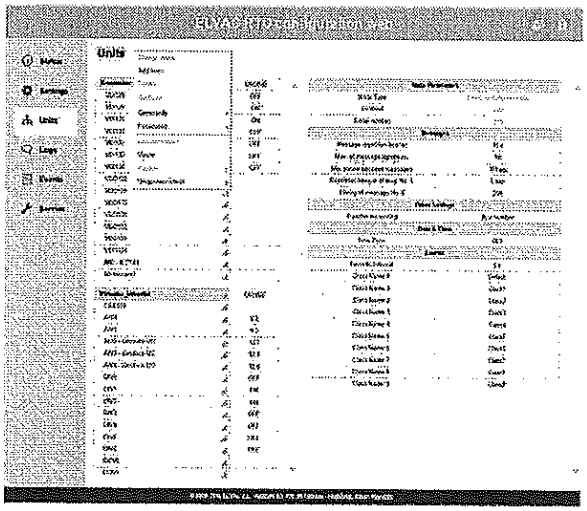
The graphic file is uploaded in memory of RTU and the access is done through the web interface. There can be used any web browser for access to this HMI or there can be used the ERIC panel (see this catalog in chapter Signaling and HMI panels).



0324

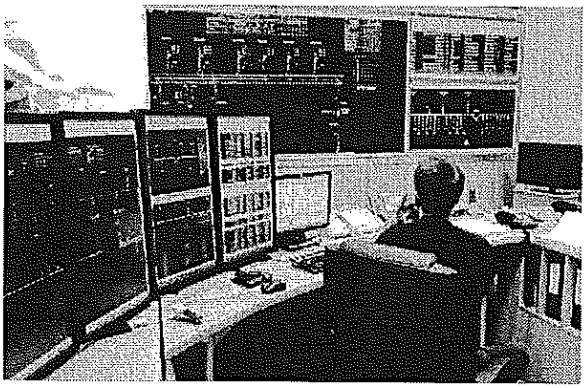
RTU parameterization

The parametrization of RTU is very important process of settings of the internal parameters of RTU according to signals from and to various devices and communication with SCADA. ELVAC RTUs have two options, how to do it. First, it can be done through the web site. The advantage is, that it is not needed any special software installed on your computer. It is useful especially in field, when only some setup adjustment is done. Second option is using of the software RTU User Center (see this catalog in chapter SW support), which is free of charge and offers very transparent way of parameterization, especially when higher number of RTUs must be managed.



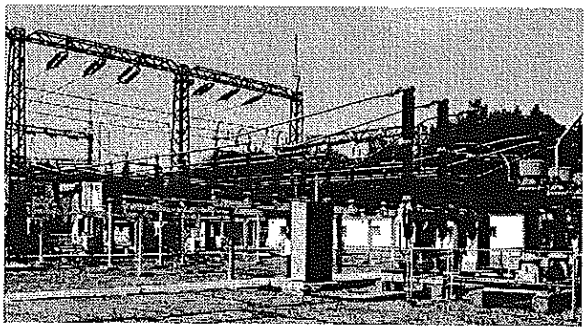
Expandability

Due to the wide range of communication capabilities, our RTUs can be used as separate units or in larger systems. Depending on the demands of the stated application, the system can be expanded by Ethernet communication or by the serial bus RS-485. This effective form of communication enables the RTU to be used as data concentrator, to which the other RTUs or the further external devices are subordinated. From the viewpoint of the application, everything looks like one unit.



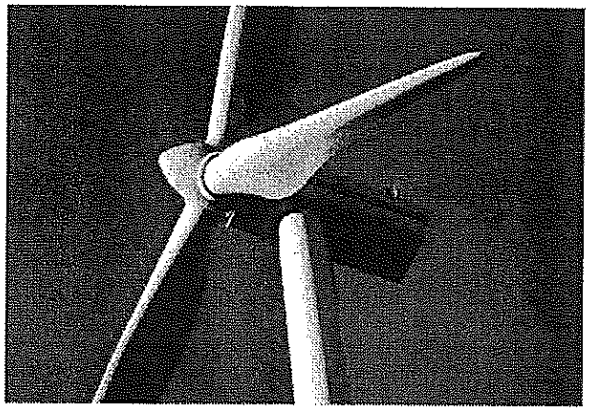
Further options

ELVAC RTU can measure the ambient temperature by external sensor. This information can be used also for a heating or cooling control in a switchboard cabinet. Certainly, there can be connected further sensors, for example for wind power or to measure the exposure, used in applications with renewable energy sources.



Quality management

All development, production, control and optimization processes, same as a management system of data and information protection, leads to the highest possible quality of our products. ELVAC a.s. is a certified holder of ISO 9001, ISO 14001, OHSAS 18001 and ISO 27001.



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0325

Typical ELVAC RTU applications

The general technical parameters of the units enable use in any area regarding the monitoring, processing and data acquisition. But in selected areas, the ELVAC RTUs with their specific properties significantly surpass the utility value of the third party standard units used for remote control.

A key area is the energy sector and its related industries where due to the direct three-phase measurement of voltage, current and the derived values in relation to the integrated protections and automation functions, the „all-in-one" solution for monitoring and control of distribution networks is offered. A galvanic isolation with high electric strength, digital inputs with impulse counter, period measurement and time filtering, enables easy and fast connection to consumption measuring devices (electricity meters, flow meters) in the electricity, thermal, gas, water sectors, etc. Great communication abilities, integrated temperature measurement, backup of power supply and other standard ELVAC RTU properties enable the use in a wide range of applications across the industry, transport and building automation.

The growing demand for intelligent networks (SMART GRID) in relation to the growing ratio of renewable energy sources, calls up the requirements for information about the status of the network. It is more important not only to indicate problems when they occur, but to prevent them and this can only be achieved by continuous measurement.

Control of power distribution

Substations

- measurement, monitoring, control and integrated protections,
- centralized/distributed system,
- optical communication with optional redundant ring.

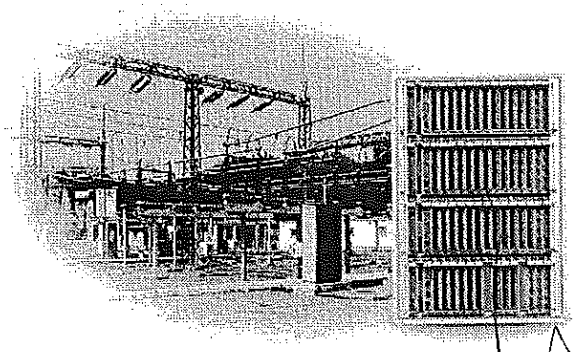
A typical product used in substations is the modular version **RTU7M** in bigger chassis (8, 10, 16 slots) due to the requirement for greater numbers of inputs and outputs in systems. Individual RTUs can be connected and cascaded into larger system and some of the units can be designated as data concentrator which communicates with the higher system (SCADA). Due to the extensive communication abilities, our RTUs can be used in new installations, but also for retrofitting.

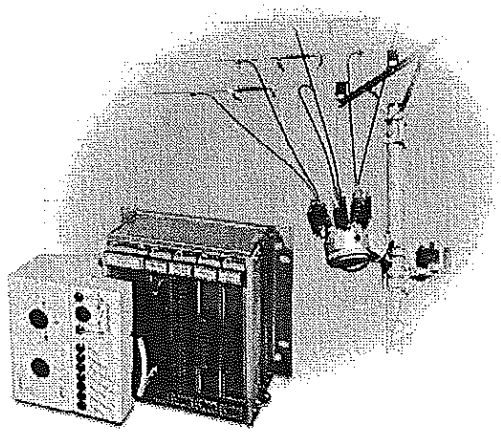
Overhead lines

- remote monitoring and control of reclosers and remotely controlled disconnectors,
- reclosers – automatic disconnection in the case of failure, reclosing,
- disconnectors – automatic disconnection in voltage-free pause,
- measurements of currents and voltages,
- fault detection (overcurrent, short circuit, current asymmetry, overvoltage, undervoltage, earth fault, incorrect frequency).

This area of applications has several solution options depending on the approach and requirements of the investor. In some distribution companies, only some current faults are indicated, which is stated by the fact that voltage and current sensors for outdoor use are important items in budgets. However, the best results in terms of evaluating the situation in the network are achieved in the case of complex current and voltage measurement. As a result, the whole range of protective functions exactly indicates the type and position of the problems in the network. Due to the fact that the RTU can analyze the records, then the exact reason of the problem can be stated and a service team can be sent to the site with more precise information about the position and type of defect. The end result is significantly shorter time for removing the defect and the resulting economic effect.

The most frequently used configurations for these applications are the compact **RTU7K** or modular **RTU7M** in five slots chassis equipped with the required communications, measurement inputs and digital inputs and outputs.





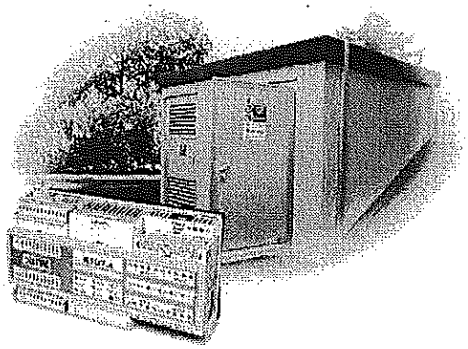
0326

Cable networks

- measurement of currents,
- faults indication (overcurrent, short circuit, earth fault, current asymmetry),
- monitoring of binary signals (door contact, protective elements),
- remote control option.

For medium voltage cable networks, it is usually sufficient to measure only currents, because the external influences on the voltage level are limited. This fact significantly decreases solution costs, because it eliminates the need to invest into voltage sensors and measuring inputs.

The space saved in the RTU configuration can be used for the installing a higher number of current inputs. As a result, the compact **RTU7.4** version can use up to 4 groups of 3-phase measurements (in total 12 inputs), which is usually sufficient for monitoring of whole distributional transformer station (MV/LV substation).



For modular versions of the **RTU7M** a similar solution can be used with cards **RTU7M M3ZQ**, where in addition to the option to measure and monitor medium voltage, there is the option to measure and monitor directly currents and voltages on low voltage side using the cards **EP-3U/xxx/3I/xxx** in the function of an indicator, as well as for complete protection. By combining these cards in one system, it is possible to resolve the control and measurement of the distributional transformer stations for both medium and low voltage sides. It significantly contributes to the solution from the viewpoint of the monitoring and control of networks, where a renewable energy sources are connected that can cause problematic fluctuations in the network.

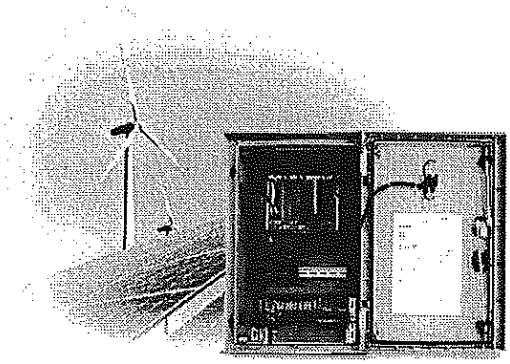
Self Healing Grid

The SHG concept can be explained as an intelligent network, equipped with a sufficient number of remote-controlled devices (RTUs), that allow automatic identification of failures in the network, their definition and reconfiguration of a health part. That leads to quick restore of power supply for the most possible part of the whole network, until failure is eliminated in the affected part. With the innovations in their HW and SW capabilities and the advanced application of automation functions, ELVAC RTUs can be effectively used to fulfill this modern network concept.

Dispatching control of renewable energy sources

System features

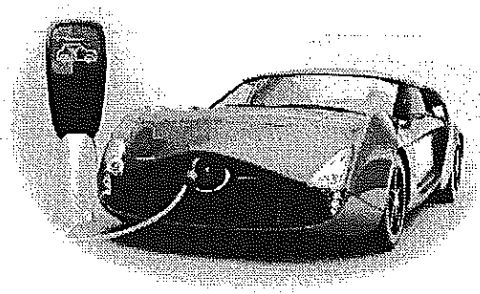
- measurement of P, Q, U, I and derived values,
- remote control of performance,
- data providing to a plant operator,
- communication with SCADA via GSM/GPRS using the protocol IEC 60870-5-104,
- optional connection of another sensors via RS-485 or Ethernet using the protocol MODBUS,
- short delivery times, superior technical support,
- possible modifications according to the request of the client.



RTU7KL units are most frequently used for these applications, or alternatively similar configurations of the modular **RTU7M**, where further sensors or required interfaces can be added due to the wider selection of cards.

Control of the other energy sources

The measurement, control and communication capabilities of ELVAC RTUs can be used in a wide range of applications, not just strictly within the power distribution. For these applications is necessary to adjust the signal processing concept and choose compatible firmware. Between typical applications are not only resource managements (water, heat, gas), but they can also be implemented into the electromobility segment, where RTU systems can be used for solutions of energy accumulation in battery storages and following implementation of recharging stations.



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0327

Enterprise energetics

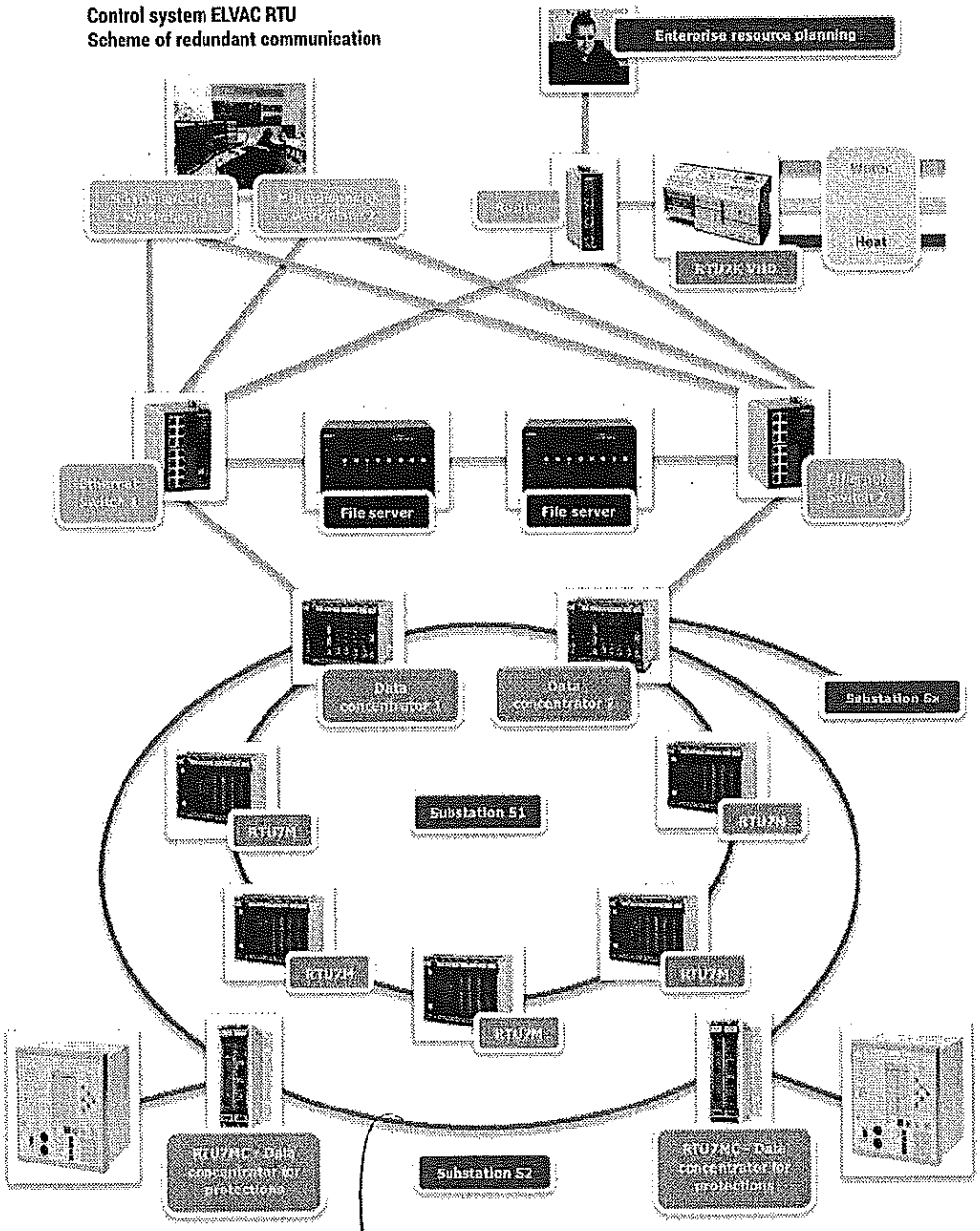
Energies are the basic input into production and therefore it is very important to monitor these resources and to control the processes of their management. The basic and the most frequently used resource of energy in companies is, of course, electricity and in this area the principles of control are similar to traditional electricity distribution, only in smaller scope. In industrial enterprises, important energy resources are also gas, heat or water.

All these resources can be monitored in a similar way, only the types of sensors are different for the stated types of energies. All data is then concentrated and sent to the control room and other databases serving for various purposes, e.g. sales and service systems.

Similar types of RTUs as for the above-mentioned applications in distribution systems are used for control and monitoring of electric energy. For other types of energies, it is recommended to modify the method of data evaluation, because it has other requirements for the speed and length of the data storage. Therefore, ELVAC offers different types of RTUs recommended for measurement and control of electric energy, as well as for other energies.

ELVAC provides also products that complete RTU systems and together they form a complex control system. These include the MikroDispečink SCADA system, redundant power supplies, large screens with rear projection or multi-displays.

Control system ELVAC RTU
Scheme of redundant communication



0328

Other applications

Power quality metering – there are power quality meters in our assortment, which can work as a standalone power metering device in class A and S. Data can be transferred through the LAN or our RTUs into SCADA systems or other databases. Power quality can be measured on MV or LV sides in substations, secondary substations, enterprise mains or for energy management and monitoring of the buildings, generators, transformers or others devices. Available are solutions for compact and also for modular systems.

Communication converters – communication modules with built-in PC (e.g. RTU7M COMIO PC2) are strong tools for conversion of communication between various protocols used in energy sector, e.g. IEC 61850, IEC 60870-5-101, IEC 60870-5-104, IEC 60870-5-103, DNP3 and others. The conversion of the communication can run between devices or with the SCADA system.

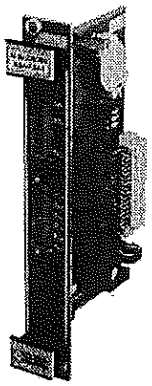
Communication gates – not all devices, especially the older ones, have the communication resolved. Connection to ELVAC products (e.g. RTU7C) resolves this problem at an acceptable price.

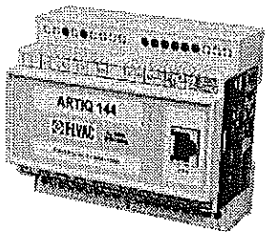
Time synchronization in systems – besides many other interfaces, ELVAC RTUs can be equipped with GPS interface, which is used for obtaining of exact time. This information can be provided further to the devices in the system.

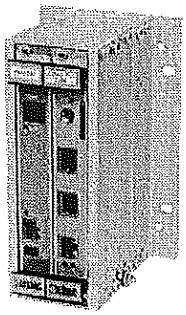
Monitoring of remote devices – monitoring and control of operating conditions of stand-alone devices used in industrial objects, which are working independently for long time periods, contributes to long-term reliability and allows efficient maintenance planning. For remote and stand-alone objects (various control shafts, etc.), are data collected with necessity of using special RTU systems. These systems must be mechanically durable, weather resistant and require optimization of power consumption - the solution can be battery-powered RTU7B with IP68 protection.

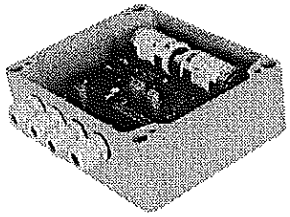
Processing of analog signals – part of measurement card portfolio for modular RTU7M systems is also card for measuring of fast voltage signals from various sensors. There are four voltage inputs, that are galvanically isolated from the rest of unit, but not between each other. The inputs are fitted with BNC connectors with input impedance 75 Ohms.

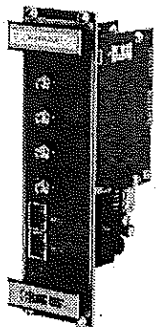
Data concentrators – ELVAC RTUs have wide communication abilities. If there are many devices in the network then it can be more effective, or in some cases it is even necessary, to concentrate data in the stated nodes and then send it to the master system. In this way, data can be col lected from various types of interfaces and protocols. Everything can be implemented as redundant system which can communicate with the master system, e.g. via two separate channels or, for example, it is possible to communicate within subordinated systems in the ring connection. The modular version of the concentrators can be designed according to the demands of applications.

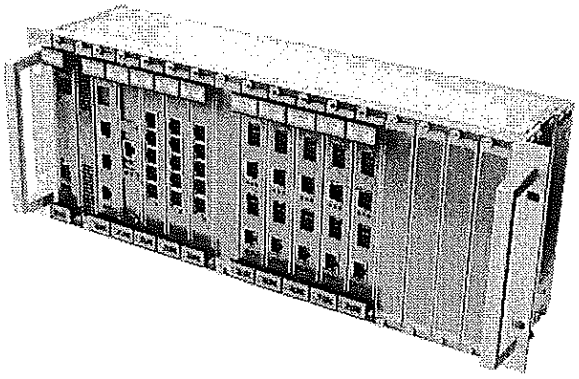












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0329

Compact RTU

0330

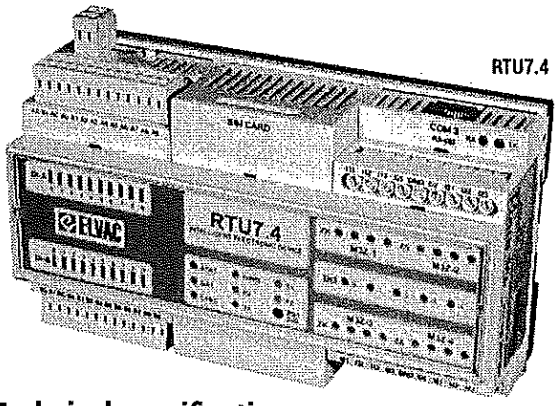
RTU7.4 (PC2) – control and communication unit, measurement 4 × 3I

Unit description

The RTU7.4 is derived from a well-established series of compact RTUs from ELVAC a.s., designed for remote monitoring of energy networks, and further areas with high requirements for system reliability and robustness. The compact design integrates in one unit four three-phase measurement of currents, digital inputs and outputs, a communication module and a charger of backup batteries which is very cost-effective and simplifies system installation and maintenance. The unit can record the waveforms of signals on analogue inputs triggered from fault events. These records can be remotely downloaded and analyzed. Similarly, it is possible to remotely parameterize the unit and upgrade firmware. The RTU7.4 PC2 version is fitted with a more powerful communication card to support more demanding communication tasks.

Typical applications

- indicator of fault currents in cable grids.



Basic features of unit

- 20 × digital input, periodical evaluation and filtering of input changes,
- 4 × three-phase measurement of currents, periodical evaluation of values,
- 5 × relay output, automation functions,
- auxiliary contact ON REL, useful for example for disconnection of a devices connected to battery,
- internal temperature of RTU is measured directly, another input for external sensor for environment measurement of RTU,
- external power supply 10 V DC to 40 V DC, the voltage must be 5 V higher than voltage of a backup battery,
- controlled charging of backup battery 12 V or 24 V, periodical testing of battery status (capacity),
- time analysis of measured values with option of recording and remote downloading of records,
- signaling of earth fault, overcurrent, short circuit, optional choice of automation functions,
- time information is provided by master system (SCADA) or via GPS receiver,
- the number of inputs or outputs of RTU can be extended with another external modules or RTUs via RS-485,
- optional control via HMI terminals,
- communication card COMIO4 - RS-232/485, Ethernet, GPRS/EDGE/UMTS, version PC2 additionally RS-422, CSD,
- supported communication protocols – MODBUS, HIOCom2, IEC 60870-5-101, IEC 60870-5-103, IEC 60870-5-104, FTP, HTTP,
- version RTU7.4 PC2 supports also IEC 61850, DNP3, L2TP, DLMS, secured communication according to IEC TS 62351-3 and another option according to user demands,
- user programming by logical and relational expressions,
- DIN rail or panel mounting.

Technical specification

Current inputs	4 × (3 × 20 mA AC/DC)
Digital inputs	20 × optocoupler, active or passive inputs, signaling voltage 24 V (optionally 12 V)
Digital outputs	4 × relay (NO contact 3 A / 240 V AC / 30 V DC), 1 × relay (changeover contact 5 A / 240 V AC / 30 V DC)
Communication cards	Standard COMIO4, optionally card COMIO-PC2 with embedded PC
Communication interfaces	Depending on the type of communication card - Ethernet LAN, GPRS/EDGE/UMTS, RS-232/422/485
Antenna connector	FME with card COMIO4 or SMA with card COMIO PC2
Power supply voltage	10 V DC to 40 V DC
Voltage of backup battery	12 V, optionally 24 V
Max. charging current of battery	1 A
Max. maintenance battery voltage	13.7 V, optionally 27.4 V
Switch off voltage (battery protection)	11 V, optionally 22 V
Temperature sensor	Measured range -55 °C to 125 °C, accuracy ±0.5 °C in range -10 °C to 85 °C
Operating temperature	-25 °C to 50 °C (possible increase up to 65 °C – on demand)
Storage temperature	-30 °C to 75 °C
Ambient relative humidity	5 % – 95 % non-condensing
Dimensions	157 × 90 × 60 mm (W × H × D) without connectors
Ingress protection	IP20 (IP21 with protection cover – for free on demand)

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0331

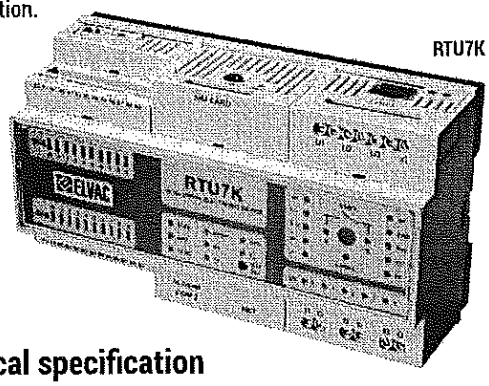
RTU7K (PC2) – control and communication unit, measurement 3V + 3I

Unit description

The RTU7.4 is derived from a well-established series of compact RTUs from ELVAC a.s., designed for remote monitoring of energy networks, and further areas with high requirements for system reliability and robustness. The compact design integrates in one unit three-phase measurement of voltages and currents, digital inputs and outputs, a communication module and a charger of backup batteries which is very cost-effective and simplifies system installation and maintenance. The unit can record the waveforms of signals on analogue inputs triggered from fault events. These records can be remotely downloaded and analyzed. Similarly, it is possible to remotely parameterize the unit and upgrade firmware. The RTU7K PC2 version is fitted with a more powerful communication card to support more demanding communication tasks.

Typical applications

- measurement of P, Q, U, I,
- reclosers and disconnectors control,
- protection.



RTU7K

Basic features of unit

- 20 × digital input, periodical evaluation and filtering of input changes,
- three-phase measurement of voltages and currents, periodical evaluation of values,
- 5 × relay output, automation functions,
- auxiliary contact ON REL, useful for example for disconnection of a devices connected to battery,
- internal temperature of RTU is measured directly, another input for external sensor for environment measurement of RTU,
- external power supply 10 V DC to 40 V DC, the voltage must be 5 V higher than voltage of a backup battery,
- controlled charging of backup battery 12 V or 24 V, periodical testing of battery status (capacity),
- protections – short circuit, overcurrent (time depending or not, directional or not), earth fault (directional or not) voltage, frequency, current and voltage asymmetry,
- automation functions – reclosing, switch off in zero voltage pause,
- time information is provided by master system (SCADA) or via GPS receiver,
- optional extension via RS-485 – external I/O modules, another RTUs,
- optional control via HMI terminals,
- communication card COMI04 - RS-232/485, Ethernet, GPRS/EDGE/UMTS, version PC2 additionally RS-422, CSD,
- supported communication protocols – MODBUS, HIOCom2, IEC 60870-5-101, IEC 60870-5-103, IEC 60870-5-104, FTP, HTTP,
- version RTU7K PC2 supports also IEC 61850, DNP3, L2TP, DLMS secured communication according to IEC TS 62351-3 and another option according to user demands,
- user programming by logical and relational expressions,
- DIN rail or panel mounting.

Technical specification

Voltage inputs	3 × 10 or 100 or 230 V AC (DC), optionally fourth input 100 V or inputs for capacitive sensors
Current inputs	3 × 20 mA, optionally 1 A AC (DC)
Digital inputs	20 × optocoupler, active or passive inputs, signaling voltage 24 V (optionally 12 V)
Digital outputs	4 × relay (NO contact 3 A / 240 V AC / 30 V DC), 1 × relay (changeover contact 5 A / 240 V AC / 30 V DC)
Communication cards	Standard COMI04, optionally card COMIO-PC2 with embedded PC
Communication interfaces	Depending on the type of communication card - Ethernet LAN, GPRS/EDGE/UMTS, RS-232/422/485
Antenna connector	FME with card COMI04 or SMA with card COMIO PC2
Power supply voltage	10 V DC to 40 V DC
Voltage of backup battery	12 V, optionally 24 V
Max. charging current of battery	1 A
Max. maintenance battery voltage	13.7 V, optionally 27.4 V
Switch off voltage (battery protection)	11 V, optionally 22 V
Temperature sensor	Measured range -55 °C to 125 °C, accuracy ±0.5 °C in range -10 °C to 85 °C
Operating temperature	-25 °C to 50 °C (possible increase up to 65 °C – on demand)
Storage temperature	-30 °C to 75 °C
Ambient relative humidity	5 % – 95 % non-condensing
Dimensions	157 × 90 × 60 mm (W × H × D) without connectors
Ingress protection	IP20 (IP21 with protection cover – for free on demand)

0332

RTU7KL (PC2) – control and communication unit, measurement 3V + strengthened 3I

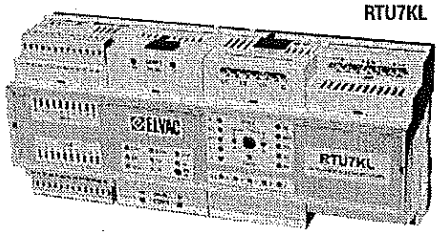
Unit description

The RTU7.4 is derived from a well-established series of compact RTUs from ELVAC a.s., designed for remote monitoring of energy networks, and further areas with high requirements for system reliability and robustness. The unit integrates three-phase measurement of voltages and currents (current inputs for 1A or 5A), digital inputs and outputs, a communication module and a charger of backup batteries. The unit can record the waveforms of signals from analog inputs triggered from fault events. Remote downloading of records, parameterization and FW upgrades are a matter of course. The RTU7KL PC2 version is fitted with a more powerful communication card to support more demanding communication tasks.

Typical applications

- measurement of P, Q, U, I,
- monitoring and control of renewable sources,
- monitoring and control of MV/LV substations,
- protection.

RTU7KL



Basic features of unit

- 20 × digital input, periodical evaluation and filtering of input changes,
- three-phase measurement of voltages and currents, periodical evaluation of values,
- 5 × relay output, automation functions,
- auxiliary contact ON REL, useful for example for disconnection of a devices connected to battery,
- internal temperature of RTU is measured directly, another input for external sensor for environment measurement of RTU,
- external power supply 10 V DC to 40 V DC, the voltage must be 5 V higher than voltage of a backup battery,
- controlled charging of backup battery 12 V or 24 V, periodical testing of battery status (capacity),
- protections – short circuit, overcurrent (time depending or not, directional or not), earth fault (directional or not) voltage, frequency, current and voltage asymmetry,
- automation functions – reclosing, switch off in zero voltage pause,
- time information is provided by master system (SCADA) or via GPS receiver,
- optional extension via RS-485 – external I/O modules, another RTUs,
- optional control via HMI terminals,
- communication card COMIO4 - RS-232/485, Ethernet, GPRS/EDGE/UMTS, version PC2 additionally RS-422, CSD,
- supported communication protocols – MODBUS, HIOCom2, IEC 60870-5-101, IEC 60870-5-103, IEC 60870-5-104, FTP, HTTP,
- version RTU7KL PC2 supports also IEC 61850, DNP3, L2TP, DLMS, secured communication according to IEC TS 62351-3 and another option according to user demands,
- user programming by logical and relational expressions,
- DIN rail or panel mounting.

Technical specification

Voltage inputs	3 × 10 or 100 or 230 V AC (DC), optionally fourth input 100 V or inputs for capacitive sensors
Current inputs	3 × 1 A AC or 3 × 5 A AC
Digital inputs	20 × optocoupler, active or passive inputs, signaling voltage 24 V (optionally 12 V)
Digital outputs	4 × relay (NO contact 3 A / 240 V AC / 30 V DC), 1 × relay (changeover contact 5 A / 240 V AC / 30 V DC)
Communication cards	Standard COMIO4, optionally card COMIO-PC2 with embedded PC
Communication interfaces	Depending on the type of communication card - Ethernet LAN, GPRS/EDGE/UMTS, RS-232/422/485
Antenna connector	FME with card COMIO4 or SMA with card COMIO PC2
Power supply voltage	10 V DC to 40 V DC
Voltage of backup battery	12 V, optionally 24 V
Max. charging current of battery	1 A
Max. maintenance battery voltage	13.7 V, optionally 27.4 V
Switch off voltage (battery protection)	11 V, optionally 22 V
Temperature sensor	Measured range -55 °C to 125 °C, accuracy ±0.5 °C in range -10 °C to 85 °C
Operating temperature	-25 °C to 50 °C (possible increase up to 65 °C – on demand)
Storage temperature	-30 °C to 75 °C
Ambient relative humidity	5 % – 95 % non-condensing
Dimensions	210 × 90 × 60 mm (W × H × D) without connectors
Ingress protection	IP20 (IP21 with protection cover – for free on demand)

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0333

RTU7C – control and communication unit

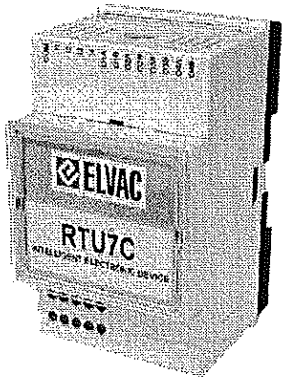
Unit description

The RTU7C is derived from a well-established series of compact RTUs from ELVAC a.s., designed for remote monitoring of energy networks, and further areas with high requirements for system reliability and robustness. The compact design integrates in one unit a communication module, digital inputs and outputs.

This compact unit is internally resolved as a modular system which enables high flexibility and the possibility to adapt to requirements of the client. An example is the wide range of communication interfaces ((E)GPRS, UMTS, Ethernet, RS-232, RS-485), which can be fitted into the unit in various combinations. Various communication protocols can be set for each communication interface. It is possible to communicate via several protocols in one time, for example with protocol IEC 60870-5-104 into the master system and protocol HioCom2 into the parameterization SW (remote parameterization, signal transmission, FW upgrade, etc.). Another communication options are various methods of backup communication.

Typical applications

- connection of devices without necessary communication,
- communication converter,
- communication gate.

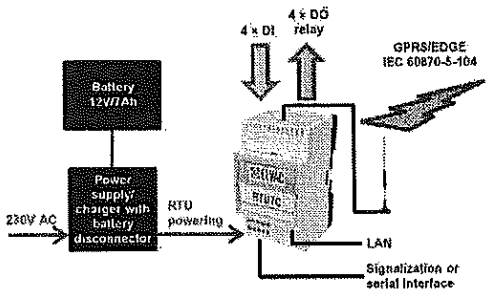


RTU7C

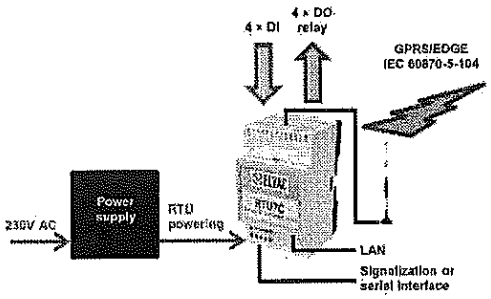
Basic features of unit

- 4 × digital inputs,
- 4 × relay outputs,
- external power supply 10 V DC to 30 V DC,
- communication interfaces – GPRS/EDGE/UMTS (optionally LTE), Ethernet, RS-232/485,
- supported communication protocols – MODBUS, HIOCom2, IEC 60870-5-101, IEC 60870-5-103, IEC 60870-5-104, DLMS,
- user programming by logical and relational expressions,
- DIN rail or panel mounting.

Variant of connection RTU7C with power supply backup



Variant of connection RTU7C without power supply backup



Technical specification

Digital inputs	4 × optocoupler, active or passive inputs, signaling voltage 24 V (optionally 12 V)
Digital outputs	4 × relay (NO contact) 3 A / 240 V AC / 30 V DC
Power supply voltage	10 V DC to 30 V DC
Consumption (all DO closed)	400 mA / 420 mA by 12 V DC
Communication interfaces	Ethernet LAN, GPRS/EDGE/UMTS (optionally LTE), RS-232/485
Antenna connector	FME(m) 50 Ohm
Temperature sensor	Measured range -55 °C to 125 °C, accuracy ±0.5 °C in range -10 °C to 85 °C
Operating temperature	-25 °C to 50 °C (possible increase up to 65 °C – on demand)
Storage temperature	-30 °C to 75 °C
Ambient relative humidity	5 % – 95 % non-condensing
Dimensions	53 × 90 × 60 mm (W × H × D) without connectors
Ingress protection	IP20

0334

RTU7MC3 – communication unit

Unit description

The RTU7MC3 is advanced universal communication unit, based on embedded computer with Linux core. The HW core is extended by ELVAC SW based on long time experience in power distribution field and protocols used in this area.

These all features offer to the user of this device very powerful tool for protocol conversion and communication between devices and SCADA system.

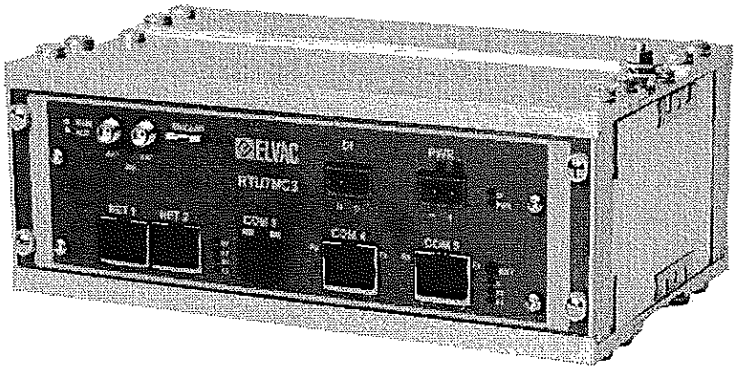
The device supports complete remote management, FW and OS updates.

Typical applications

- protocol conversion from IEC 61650 to IEC 60870-5-104 in power distribution objects (or other protocol combinations),
- redundant (backup) communicator with SCADA,
- data concentrator,
- router.

Basic features of unit

- 2 × independent network interfaces 10/100 Mbps Ethernet, VLAN support,
- 2 × RS-232/422/485,
- 1 × RS-232 console port,
- LTE modem with two antennas, connector SMA,
- 1 × DI (dry contact),
- supported communication protocols – IEC 61850, IEC 60870-5-101, IEC 60870-5-103, IEC 60870-5-104, DNP3, MODBUS, HIOCom2, DLMS,
- L2TP, OpenVPN and IPSEC tunneling,
- secured communication according to IEC 62351-3 (TLS),
- web based configuration interface,
- NAT, Firewall functionality,
- user access control, RADIUS,
- Syslog, SNMP,
- user programmable logic,
- built-in RTC,
- internal microSD socket for storage expansion,
- stand alone or DIN rail or panel mounting, possible horizontal or vertical placement.



Technical specification

Power supply voltage	24 V DC ±20 % (or others after consultation with producer)
Max. input current	0.6 A DC
Input protection	1.35 A polyswitch
Mobile network interfaces	LTE (700/800/900/1800/2100 MHz) Dual-Band UMTS/HSPA+ (900/2100MHz) Dual-Band GSM (900/1800 MHz) LTE UE Cat. 1, GPRS Class 12, EDGE Class 12
Interfaces NET1, NET2	2 x Ethernet 10/100 Mbps, isolation 1 kV AC for 1 minute
Interface COM3	Console RS-232 (RJ-11)
Interfaces COM4, COM5	2 x RS-232/422/485 (RJ-45), isolation 1.5 kV AC for 1 minute
Memories	Flash 8 GB, RAM 256 MB, MicroSD card
Another functions	Digital input, thermal sensor, RTC
Operating temperature	-25 °C to +55 °C (possible increase up to 65 °C – on demand)
Storage temperature	-30 °C to +75 °C
Ambient relative humidity	≤ 95 % non-condensing
Dimensions	178 (W) x 80 (H) x 120 (D)
Ingress protection	IP20

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0335

RTU7B – battery powered RTU

Unit description

The RTU7B is designed for remote data acquisition and control in places without power supply. It was optimized for extremally low power consumption, which allows long life battery operation. Typical battery life cycle is more than one year for usual communication period (3 x daily for 2 minutes). Besides battery powering it is possible also external powering 5-12 V DC.

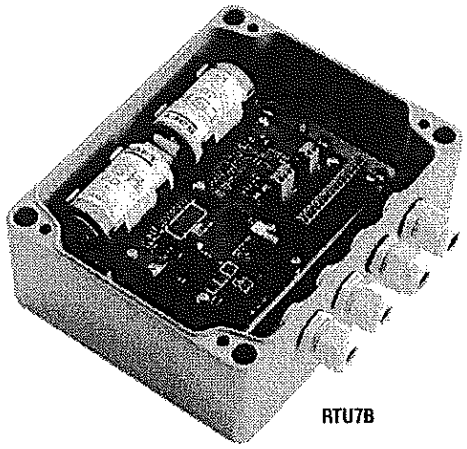
RTU is installed in robust aluminum wall-mount housing with IP68 and signals are connected to RTU through the bushings. Front panel is equipped with magnetic contact for communication wake-up without necessity of opening the housing. The communication of unit can be evoked by change of value, limit, alarm, full buffer or periodically.

Basic features of unit

- 4 × digital inputs, pulse counters, period measuring,
- 4 × OC digital outputs,
- 4 x analog inputs (2 x 10 V, 2 x 20 mA),
- battery powering, optionally external powering,
- communication interfaces – GSM/GPRS (optionally LTE), USB, RS-485, M-BUS,
- supported communication protocols – DNP3, MODBUS/TCP,
- optionally user programming by logical and relational expressions,
- RTC synchronized from SCADA,
- other values: battery status, temperature, GSM signal strength, logs,
- wall or panel mounting.

Typical applications

- data acquisition and control in utilities, e.g. water management.



RTU7B

Technical specification

Battery powering	2 × 3,6 V Li-SOCl2 (optionally external battery box for operation extension)
External power supply (optionally)	5-12 V DC
Digital inputs	4 × active or passive inputs (signaling voltage 12 V DC), pulse counters 20 ms
Digital outputs	4 × 30 V / 50 mA (open collector)
Voltage inputs	2 × 0–10 V (overloadability 12,5 V), configurable measuring period
Current inputs	2 × 0–20 mA (overloadability 25 mA), configurable measuring period
External sensors powering	2 × output (12 or 24 V / 25mA), active only during value measurement
Communication interfaces	GSM/GPRS (optionally LTE) USB for parameterization RS-485 (optional) M-BUS – master, maximally two Slave devices
Temperature sensor	Measured range -25 °C to 70 °C, accuracy ±2 °C
Operating temperature	-25 °C to 70 °C
Storage temperature	-30 °C to 75 °C
Ambient relative humidity	5 % – 95 % non-condensing
Dimensions	200 × 160 × 100 mm (W × H × D) without bushings
Ingress protection	IP68

0336

SMC 144, SMC 133, PA 144, PA133 – power monitors and data loggers

Unit description

All four products are designed for remote monitoring of electricity in power lines and its quality in class S. These devices have not display, so it is cost optimized solution for the applications with SCADA system, where local reading of data is not used.

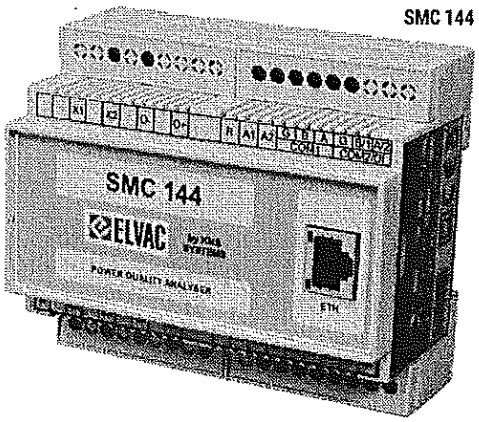
Measured data can be stored into database and then analyzed and evaluated in SW application ENVIS (free of charge). System can send regular reports about the power quality in given time period or can send automatic alarms, if some events exceed the set values.

PA devices are for measuring of actual values, SMC furthermore features large internal memory for data logging of measured values.

Typical applications

- power quality metering,
- remote monitoring of energy consumption.

SMC 144



Basic features of unit

- three or four independent voltage and current inputs (4x1p, 3p-wye, 3p-delta),
- energy meter supports 3 tariffs, single and three phase measurement in four quadrants for active and reactive energy,
- measurement U, I, P, Q, S, harmonic distortion power, PF, cos φ, symmetrical components, unbalance factor, THD, 50 harmonics, fundamental harmonics, frequency, active energy, reactive energy,
- 512MB memory for data logging (only SMC 133 and SMC 144),
- internal battery for 1 hour power backup (only SMC 133 and PA 133),
- optionally 2 × digital input, 2 × digital output (only SMC 144 and PA 144),
- communication interface RS-485, optionally Ethernet or USB,
- communication protocol MODBUS,
- standards IEC61557-12, EN50160, class S,
- DIN rail mounting.

Ordering options

PA 133	power quality monitor with 3V + 3I inputs with battery backup, 300V/CAT IV
PA 144	power quality monitor with 4V + 4I inputs
SMC 133	power quality monitor and data logger with 3V + 3I inputs with battery backup, 300V/CAT IV
SMC 144	power quality monitor and data logger with 4V + 4I inputs

Technical specification

Voltage inputs SMC 133 and PA 133	3 × 8 to 620 V_{LL} or 6 to 360 V_{LN} (wye, delta, aron)
Voltage inputs SMC 144 and PA 144	4 × 4 to 500 V_{LL} or 2.3 to 285 V_{LN} (wye, delta, aron)
Current inputs	3 or 4 × 100 mA AC
Digital inputs	Only SMC 144 and PA 144 - optionally 2 × DI (12-24 V)
Digital outputs	Only SMC 144 and PA 144 - optionally 2 × DO
Communication interfaces	RS-485, optionally Ethernet or USB
Power supply voltage	Optional 12 V DC / 24 V DC / 48 V DC, SMC 144 and PA 144 also 230 V AC
Consumption	3 W
Operating temperature	-25 °C to 60 °C
Storage temperature	-40 °C to 85 °C
Ambient relative humidity	5 % – 95 % non-condensing
Dimensions	105 × 90 × 58 mm (W × H × D)
Ingress protection	IP20

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0337

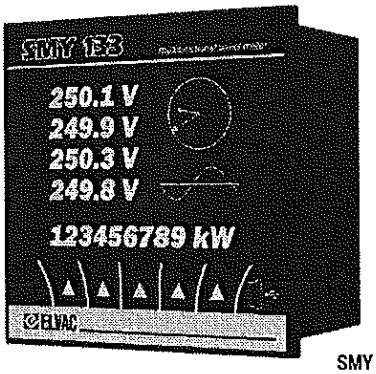
SMY 133 – power monitor and data logger with display

Unit description

The SMY 133 is advanced 3-phase multimeter with large color LCD display designed for local or remote monitoring of electricity in power lines and its quality in class S.

Measured data can be stored into database and then analyzed and evaluated in SW application ENVIS (free of charge). System can send regular reports about the power quality in given time period or can send automatic alarms, if some events exceed the set values.

Digital outputs can also work as an S0 pulse output from the embedded electricity meter.



SMY 133

Typical applications

- power quality metering,
- remote monitoring of energy consumption.

Basic features of unit

- three voltage and current inputs 1p, 3p-wye, 3p-delta, Aron,
- energy meter supports 3 tariffs, single and three phase measurement in four quadrants for active and reactive energy,
- measurement U, I, P, Q, S, harmonic distortion power, PF, cos φ, symmetrical components, unbalance factor, THD, 50 harmonics, fundamental harmonics, frequency, active energy, reactive energy,
- built-in temperature sensor,
- 512MB memory for data logging,
- optionally 2 × digital input, 2 × digital output,
- USB communication interface, optionally RS-485 or Ethernet,
- optional communication protocol MODBUS,
- standards IEC61557-12, EN50160, class S,
- panel mounting.

Technical specification

Voltage inputs	Optionally 3 × 100 V / 230 V / 400 V
Overvoltage category	230, 400: CAT III / 300 V 100: CAT IV / 150 V
Current inputs	Optionally 3 × 100 mA / 5 A
Current inputs overload	100mA: 1 mA ÷ 390 mA (max. 10A/1s) 5A: 5 mA ÷ 7 A (max. 70A/1s)
Digital inputs	Optionally 1 × DI (24 V)
Digital outputs	Optionally 2 × DO
Communication interfaces	USB, optionally RS-485 or Ethernet
Power supply voltage	Optionally 230 V AC / 12 V DC / 24 V DC / 48 V DC
Consumption	3 W
Operating temperature	-25 °C to 60 °C
Storage temperature	-40 °C to 80 °C
Ambient relative humidity	5 % – 95 % non-condensing
Dimensions	96 × 96 × 64 mm (W × H × D)
Installation depth	58 mm
Mounting hole dimensions	92 × 92 mm (W × H)
Ingress protection	IP40

0338

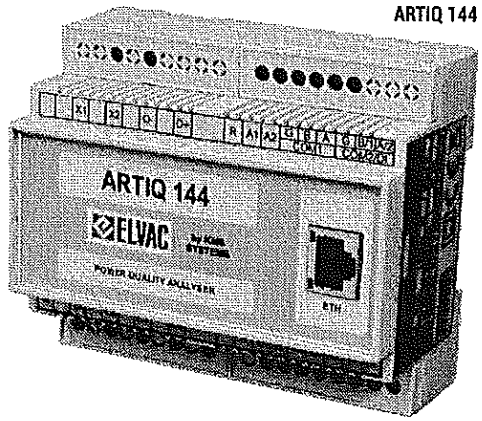
ARTIQ 144 — class A power quality analyzer

Unit description

The ARTIQ 144 is designed for remote monitoring of energy consumption and its quality in class A. The device has not display, so it is cost optimized solution for the applications with SCADA system, where local reading of data is not used.

Measured data can be stored into database and then analyzed and evaluated in SW application ENVIS (free of charge). System can send regular reports about the power quality in given time period or can send automatic alarms, if some events exceed the set values.

ARTIQ 144



Typical applications

- power quality metering in critical points,
- advanced remote monitoring of distribution networks,
- advanced energy management.

Basic features of unit

- four independent voltage and current inputs (4x1p, 3p-wye, 3p-delta),
- energy meter supports 3 tariffs, single and three phase measurement in four quadrants for active and reactive energy,
- measurement U, I, P, Q, S, deformed power, PF, cos φ, THD, 128 harmonics, fundamental harmonics, unbalance factor, symmetrical components, frequency, active energy, reactive energy,
- data logging,
- optionally 2 × digital input, 2 × digital output,
- communication interface RS-485, optionally Ethernet, M-Bus or USB,
- communication protocol MODBUS,
- standards IEC61557-12, EN50160, class A,
- DIN rail mounting.

Technical specification

Voltage inputs	4 × 1 to 1125 V_{LL} or 1 to 850 V_{LN} (wye, delta, aron)
Voltage inputs overload	Permanently 1300 V_{RMS}, surge 1950 V_{RMS} for 1s
Current inputs	4 × 100 mA AC
Current inputs overload	Permanently 2 × I_n, surge 10 × I_n for 1 s
Digital inputs	Optionally 2 × DI
Digital outputs	Optionally 2 × DO
Communication interfaces	RS-485, optionally Ethernet, M-Bus or USB
Power supply voltage	Optional 230 V AC or 12 V DC or 24 V DC
Consumption	5 W
Operating temperature	-25 °C to 60 °C
Storage temperature	-40 °C to 85 °C
Ambient relative humidity	5 % – 95 % non-condensing
Dimensions	105 × 90 × 58 mm (W × H × D)
Ingress protection	IP20

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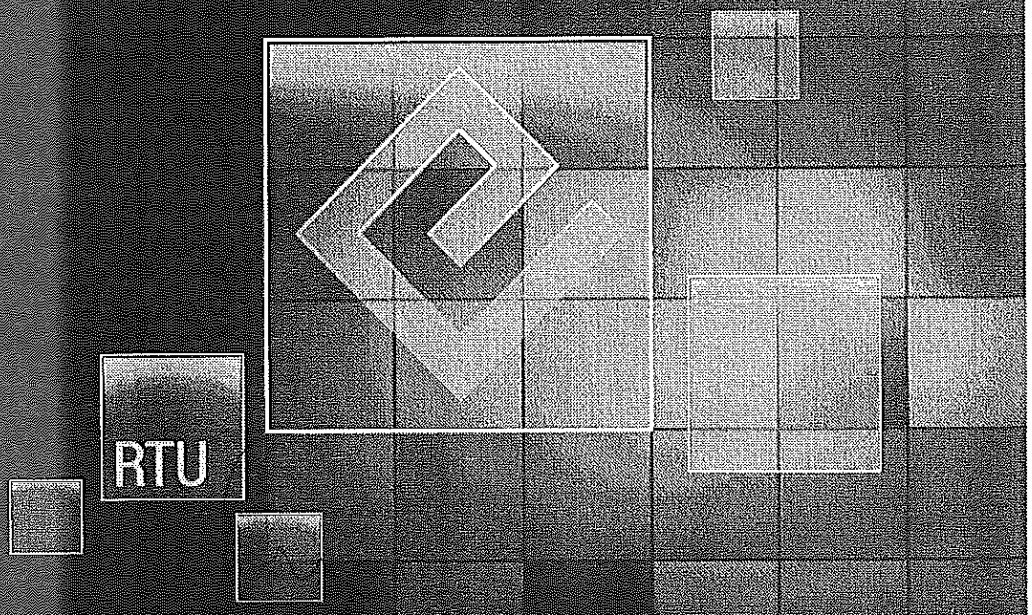
0339

Modular RTU



0340

RTU7M – modular RTU system

General description

Modular RTU system was from the beginning designed as a fully compatible system with compact versions of ELVAC RTUs. This is the reason of internal architecture, which was in the past based on signal CPU located on module CPU-02, which is installed on bus backplane. This CPU has several inputs, which are connected with external devices and their signals through so called **direct I/O cards**. It means that direct card only provides the connection interface for signal CPU module. The signal CPU processes these signals and sends them through the bus to the communication CPU (on COMIO cards), which collects all data and communicates with the external world (SCADA and other devices). This architecture was useful especially for smaller system.

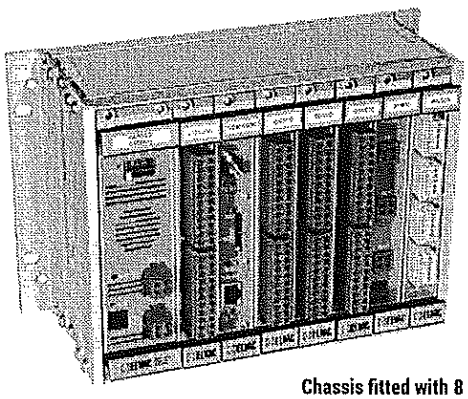
As the systems grow and the number of signals on signal CPU is limited, the extension of system is done via so called **indirect cards**. These cards have their own signal CPU, so they communicate directly with communication cards through the internal bus. The usage of indirect cards has also another advantage, that there can be designed new types of cards independently of CPU module.

Since the architecture with indirect cards is more flexible for the future development, so the plans for the future are to develop and produce only indirect cards. This decision started by development of new power supply cards – version PWRIC. They contain their own CPU, which serves for measuring of input voltage, temperatures and battery charging functions. This allows to remove the module CPU-02 from backplane.

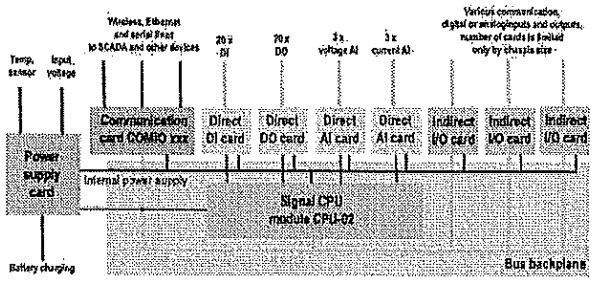
Another step ahead is the development of new bus backplanes (versions N), where:

1. The CPU-02 module will not be used,
2. new communication technologies will be used, which provide faster internal data exchange.

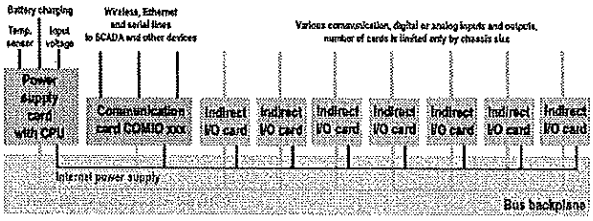
The users of older systems can be sure, that they will have available spare parts and technical support for all life cycle of these systems.



Chassis fitted with 8 cards



RTU7M internal architecture till 2017



RTU7M internal architecture from 2017

Standards

The whole modular unit RTU7M and its components were tested according to the following technical standards (unless stated otherwise in the detailed technical specifications of each card):

EMC:

EN 61000-4-2	EN 61000-4-8	EN 61000-4-16
EN 61000-4-3	EN 61000-4-9	EN 61000-4-18
EN 61000-4-4	EN 61000-4-10	EN 61000-3-2
EN 61000-4-5	EN 61000-4-11	EN 61000-3-3
EN 61000-4-6	EN 61000-4-12	

EMI:

EN 55011	EN 55022

Electrical safety:

EN 61010-1	EN 60950-1

Technical specification for all RTU7M products

Operating temperature	-25 °C to +55 °C (after consulting with produced up to 65 °C)
Storage temperature	-30 °C to +75 °C
Ambient relative humidity	5 % – 95 % non-condensing
Ingress protection	IP 20

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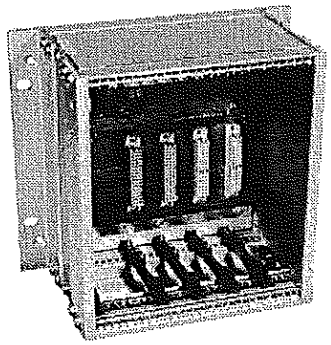
0341

RTU7M – chassis, bus and CPU modules



Chassis for 5 cards with bus

General description

The chassis consists of aluminum profiles and is adapted for mounting on a wall, panel, 19" rack (version with 16 slots), and also on DIN rails on demand. We offer versions for fitting with buses with 2, 5, 8, 10 and 16 slots.

There are two versions of bus backplanes. First type of bus (standard till Y2017) is equipped with the CPU module on a special connector, representing the core of the entire RTU. Some slots are universal, some others are designed for inserting of specific types of cards. This is stated by the fact that the internal processor has a defined number of inputs and outputs. The cards, which directly use CPU signals are called direct cards, indirect cards convert signals and communicate with the CPU by means of the communication line.

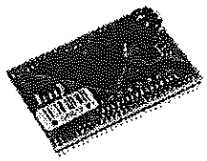
The second bus type (N versions, new standard from Y2017) does not have the connector for CPU module, it is thinner and supports the faster data exchange between cards. Both bus backplanes will be available for customers, who want to keep the same product lines in their companies.

All slots and cards have connectors with key, what protects against inserting an improper card into the slot. The specification, where it is possible to insert the specific type of card into the slot, is described for each card in the user manual for the modular RTU.

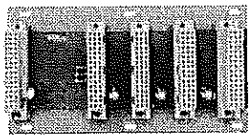
Basic features

- chassis with bus with 2, 5, 8, 10 or 16 slots,
- keyed slots, protection against the insertion of improper card into the position,
- optional signal processor (the core of RTU7M for systems with direct I/O cards),
- modularity, easy expandability of I/O,
- wall, panel or 19" rack mounting.

Bus with 8 slots with connector for module CPU-02



Module RTU7M CPU-02



New type of BUS-05N without CPU connector

Cards compatibility with different buses

Standard bus with CPU connector (till Y2017)

- YES – all cards produced till March 2017,
- some new type of cards can have limited functionalities, please check the compatibility with producer.

New bus without CPU connector (from Y2017)

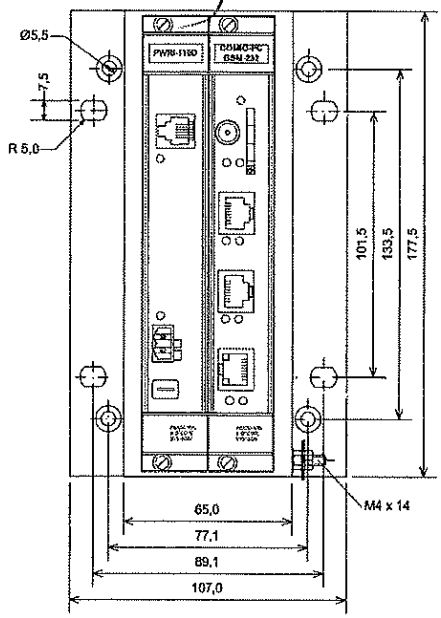
- YES – all indirect cards produced from April 2017,
- for cards produced till March 2017, please check the compatibility with producer,
- YES – new power supply cards PWRIC,
- NO – all direct cards.

Technical specification

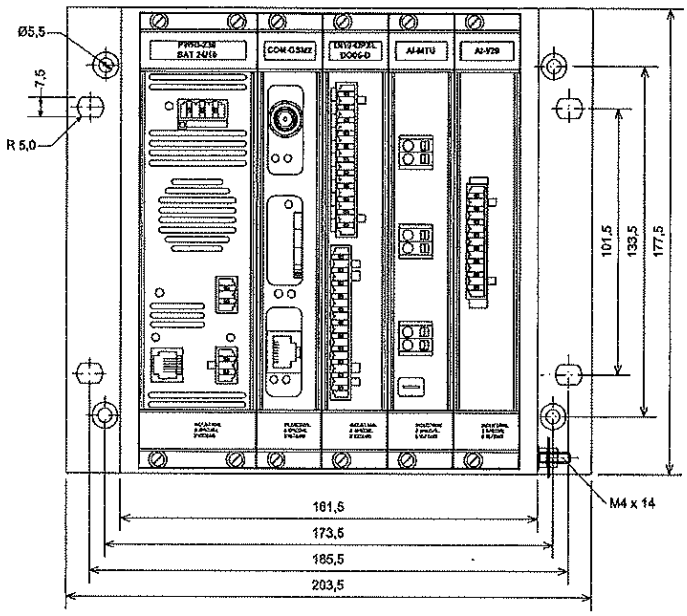
Labeling of chassis by number of slots	RTU7M CASE-2, RTU7M CASE-5, RTU7M CASE-8, RTU7M CASE-10, RTU7M CASE-16
Labeling of busses by number of slots (versions with CPU connector)	RTU7M BUS-2, RTU7M BUS-5, RTU7M BUS-8, RTU7M BUS-16 Note.: bus for 10 slots is made from buses 8+2
Labeling of busses by number of slots (versions without CPU connector)	RTU7M BUS-2N, RTU7M BUS-5N, RTU7M BUS-8N, RTU7M BUS-10N, RTU7M BUS-16N
Labeling of CPU module	RTU7M CPU-02
Signal processor	16-bit
Note	** Do not use a version with CPU connector in new projects. Support for existing ones is ensured.*

0342

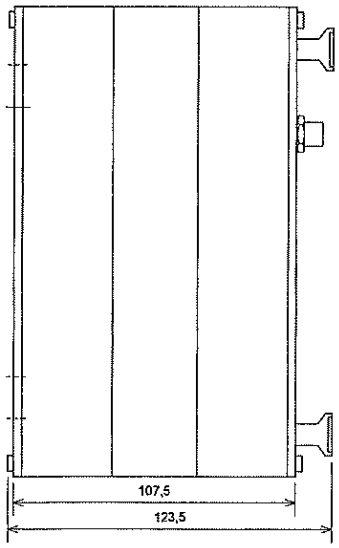
Chassis dimensions (mm)



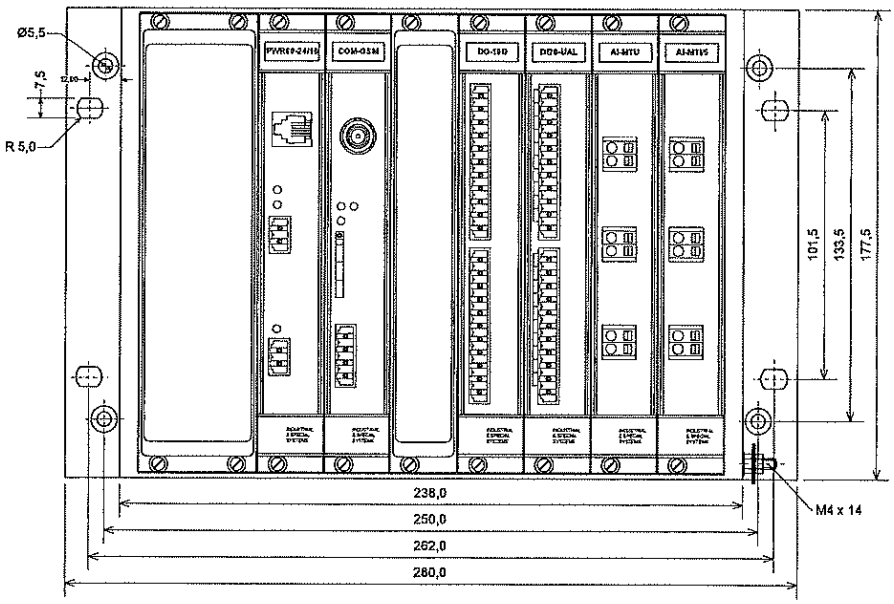
Dimensions of chassis with 2 slots



Dimensions of chassis with 5 slots



Side dimensions of all types of chassis



Dimensions of chassis with 8 slots

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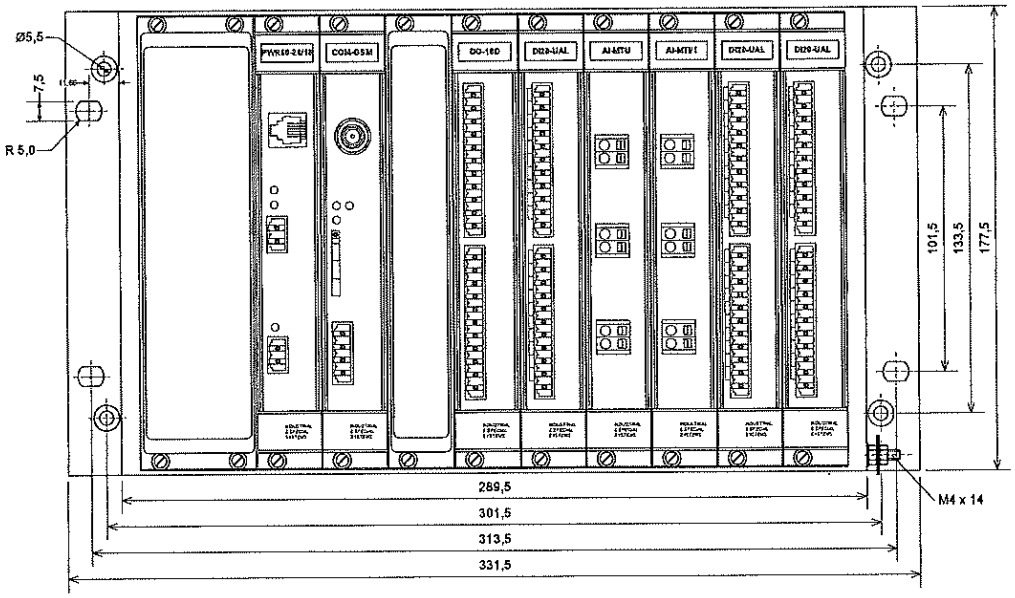
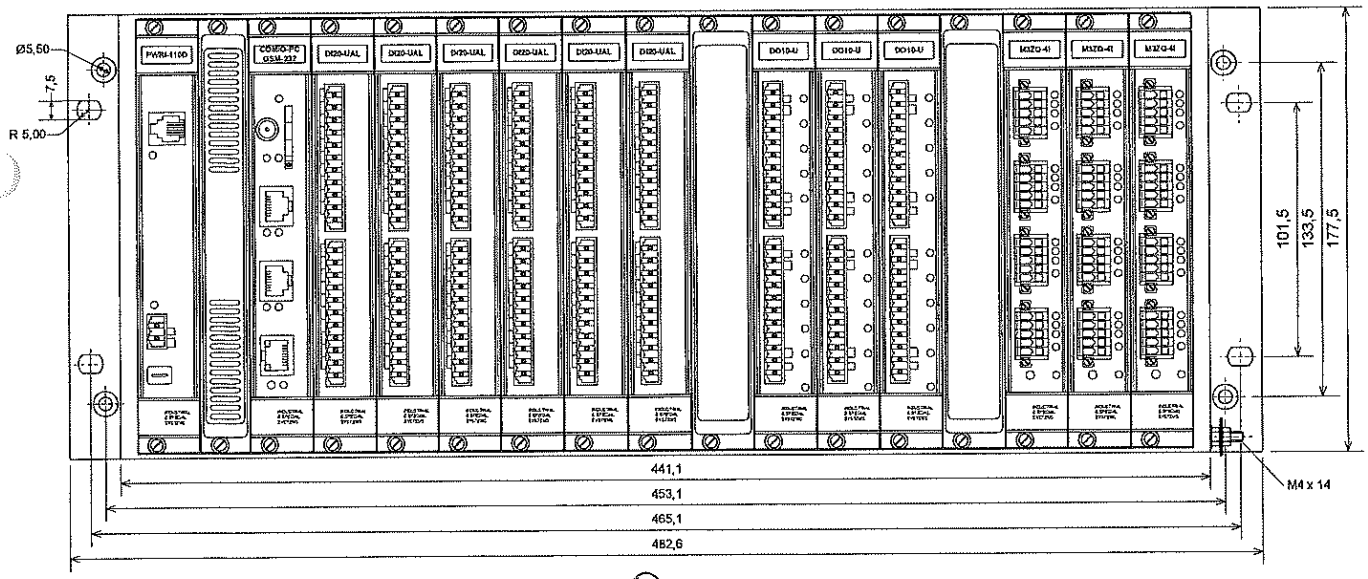
0343



Dimensions of chassis with 10 slots



Dimensions of 19" chassis with 16 slots

RTU7M – power supply cards

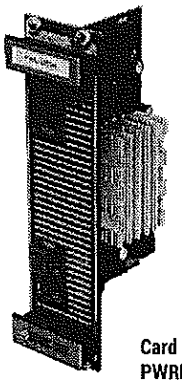
General description

Power supply cards serve for the powering of RTU7, all cards and slave units in bus. We deliver two principally different types:

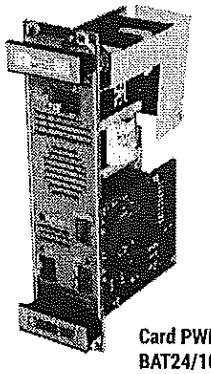
- DC, galvanically isolated card,
- AC / DC, galvanically isolated card with battery backup.

DC, galvanically isolated card

This card has a galvanically separated input from the output, a wide range of power supply voltage (according to the version of the card) and does not enable to connect the backup battery. The card is mostly used for the powering from DC power supplies or from a battery with various voltage levels according to the specification.



Card PWRI-220DH



Card PWRI-230 BAT24/10

AC / DC, galvanically isolated card with backup

This card can be used for powering from AC or DC and has two variants – PWRI without CPU and PWRIC with own CPU. When PWRI is used, then the module CPU-02 must be installed on bus, which controls the battery charging, input voltage and temperature measurement, etc. The CPU on card PWRIC solves these tasks, so the module CPU-02 on bus is not needed (but then the direct I/O cards cannot be used also). During operation from the backup battery, the battery status is checked for protection against the full discharging. In the case of a decrease of the battery voltage below the minimal value, the unit enters into the shutdown regime for one minute. Information about this status, as well as the information about the outage of the input voltage is transferred into the master system. After one minute, if there is no restoration of the supply of input voltage, the unit is automatically switched off. The power supply card includes the integrated charger for 12 V or 24 V backup batteries with various capacities. The maximum maintenance charging current is 1 A. The charging of the battery is controlled by the CPU depending on the temperature, measured by digital sensor connected via RJ-12 connector on card. The battery capacity is periodically tested (loaded with a current 9 A for a 24 V battery and 4.5 A for a 12 V battery) and the value is transferred to the master system. The card is equipped with an auxiliary contact - connector ON REL, which works as life contact, used for battery protection against another discharging, when system is off. There is button BAT ON on card, which activates the unit during the operation only from the backup battery. The card also enables to measure the effective value of the primary power supply voltage within the whole supply range.

Technical specification of galvanically isolated power supply cards

Card	PWRI-12D	PWRI-24D	PWRI-24DH	PWRI-48DH	PWRI(C)-60DH	PWRI-110DH	PWRI-220DH
Input voltage	9–18 V DC (max. 20 W)	19–36 V DC (max. 20 W)	19–36 V DC (max. 40 W)	36–75 V DC (max. 40 W)	10–60 V DC (max. 60 W)	70–150 V DC (max. 40 W)	180–370 V DC (max. 50 W)
Version availability	On demand	Standard	Standard	Standard, version 48D (20 W) on demand	PWRI standard, version PWRIC on demand	Standard, version 110D (20 W) on demand	Standard, version 220D (20 W) on demand
Range in User Center	0–10 V				0–60 V	0–10 V	
Max. input current	2.6 A DC	1.2 A DC	3 A DC	1.6 A DC	6 A DC	0.9 A DC	0.5 A DC
Input protection	Fuse 5 × 20 F 8 A	Fuse 5 × 20 F 8 A	Fuse 5 × 20 F 8 A	Fuse 5 × 20 F 8 A	Fuse 10 A	Fuse 5 × 20 F 5 A	Fuse 5 × 20 F 3.15 A
External protection	In case of connection to network system IT, it is necessary two-pole protection.						
Output voltage	+5 V DC / 3 A (15 W) -5 V DC / 0,3 A (1,5 W)		+5 V DC / 6 A (30 W), -5 V DC / 0,3 A (1,5 W)		+5 V DC / 10 A (50 W)	+5 V DC / 8 A (40 W)	
Isolation	Input-output 1.5 kV DC		Input-output 3 kV AC		Input-output 4 kV AC	Input-output 3 kV AC	
Battery voltage	Backup battery is not supported						
Connectors	1 × WAGO 231-302/026-000 (part of delivery)						
Wire cross-section	0.08–2.5 mm²						
Signaling LED	PWR				PWR, STAT	PWR	
Dimensions (with mounted front panel)	45 × 172 × 92 mm (W × H × D)						
Position in 5 / 8–10 / 16 slots bus	1						

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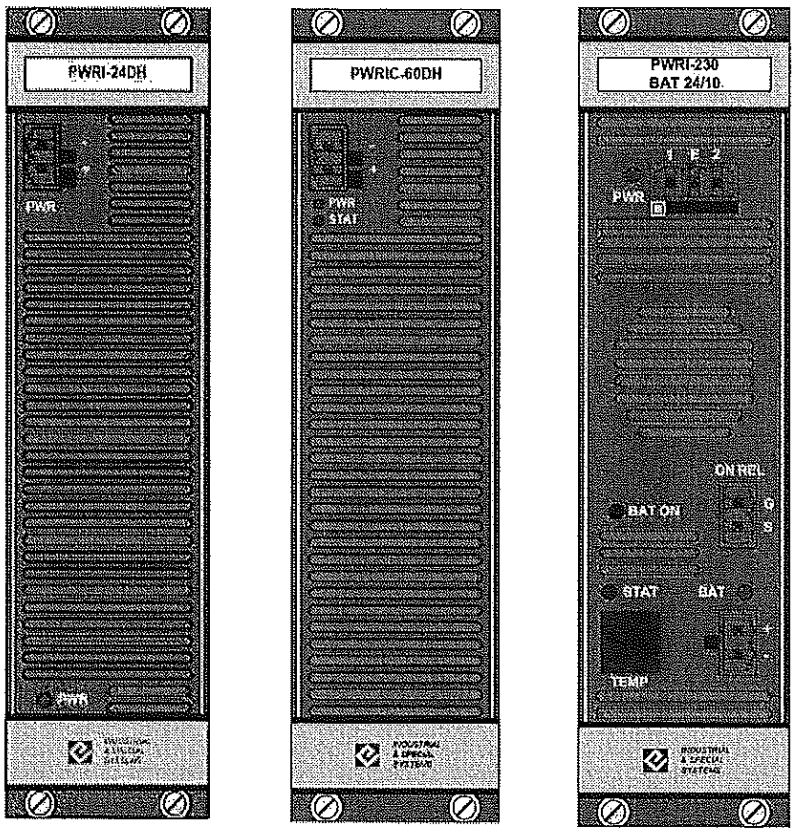
Technical specification of galvanically isolated power supply cards with battery backup

Card	PWRI-230 BAT24/10	PWRI-230 BAT12/10	PWRI-57 BAT24/10	PWRI-57 BAT12/10	PWRIC-230 BAT24/10	PWRIC-230 BAT12/10	PWRIC-57 BAT24/10	PWRIC-57 BAT12/10
Input voltage	90–260 V AC / 47–63 Hz 130–360 V DC		50–140 V AC / 47–63 Hz 70–200 V DC		90–260 V AC / 47–63 Hz 130–360 V DC		50–140 V AC / 47–63 Hz 70–200 V DC	
Range in User Center	0–360 V		0–200 V		0–360 V		0–200 V	
Max. input current	1 A AC; 0.8 A DC		1.7 A AC; 1.2 A DC		1 A AC; 0.8 A DC		1.7 A AC; 1.2 A DC	
Max. output power	40 W				50 W			
Input protection	Fuse T 4 A							
External protection	Recommended circuit breaker 4 A or 6 A char. C. In case of connection to network system IT, it is necessary two--pole protection.							
Output voltage	+5 V DC / 3 A (15 W), -5 V DC / 0.3 A (1.5 W)				+5 V DC / 5 A (25 W), -5 V DC / 0.3 A (1.5 W)			
Isolation	Primary – secondary 3 kV AC for 1 minute Primary – ground 1.5 kV AC for 1 minute Secondary – ground 500 V AC for 1 minute							
Battery voltage	24 V	12V	24V	12 V	24 V	12 V	24 V	12 V
Range in User Center	0–30 V	0–15 V	0–30 V	0–15 V	0–30 V	0–15 V	0–30 V	0–15 V
Max. battery loading current	1 A (optionally lower current after consulting with producer)							
Max. battery maintenance voltage	27.4 V	13.7 V	27.4 V	13.7 V	27.4 V	13.7 V	27.4 V	13.7 V
Battery protection	3.2 A polyswitch							
Switch off voltage (battery protection)	22 V	11 V	22 V	11 V	22 V	11 V	22 V	11 V
Battery tester	Yes							
Testing current	9 A	4.5 A	9 A	4.5 A	9 A	4.5 A	9 A	4.5 A
Auxiliary contact ON REL	Contact (type NO) 250 V / 3 A AC, 30 V / 3 A DC							
BAT ON (switch on button)	Yes, usage for switch on of unit running from battery							
Measurement accuracy	±0.5 %, measuring of voltage on input and battery							
Temperature sensor	Measured range -55 to +125 °C, accuracy ±0.5 °C in range -10 to +85 °C							
Connectors	2 × WAGO 231-302/026-000 (part of delivery), RJ-12		2 × WAGO 231-302/026-000, 1 × WAGO 231-303/026-000 (part of delivery), RJ-12					
Wire cross-section	0.08–2.5 mm²							
Signaling LED	PWR, STAT, BAT							
Dimensions (with mounted front panel)	45 × 172 × 92 mm (W × H × D)							
Position in 5 / 8–10 / 16 slots bus	1 / 1 / 1							
Note	** Do not use a version with CPU connector in new projects. Support for existing ones is ensured.*				–			

0346



Front panels with connectors for individual types of power supply cards

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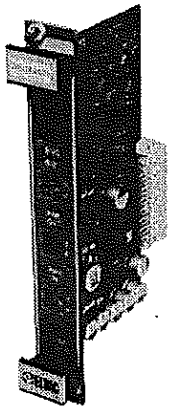
RTU7M – power backup cards

General description

Power backup card enables to use the batteries for RTU7M backup. Card switches automatically between external power supply and connected battery, if the power is lost. It also charges the battery and checks the status.

Power backup card RTU7M CHG(I)

Power backup cards are designed for DC. They do not have the function of power supply for the RTU, they only provide stable voltage on output, if the power is lost. There must be installed the appropriate power supply card in the RTU. The output from power backup card is connected to the input of power supply card.



Card RTU7M CHG24-24/30

One power backup card can provide the back-up for the RTU, where it is fitted in and also for another RTUs (up to maximal load). Thus it is not necessary to have the power backup card in each RTU in system, there is only necessary to use the batteries and external power supply with sufficient performance.

The charging process is controlled in accordance with ambient temperature and the status of battery is regularly checked. Version CHGI is galvanically isolated from bus.

Front panel of card RTU7M CHG

Technical specification

Card	RTU7M CHG24-24/30	RTU7M CHGI48-48/30
Input voltage	20–30 V DC (max. 250 W)	42–60 V DC (max. 450 W)
Range in User Center (Source voltage)	0–30 V	0–60 V
Max. input current	10 A DC	8,5 A
Input / output / battery protection	Fuse 5 × 20 F 16 A	Fuses F 12 A / F 8 A / F 8 A
External protection	In case of connection to network system IT, it is necessary two-pole protection.	
Output voltage / current	Same as input voltage 20-30 V DC / 8 A (200 W)	Same as input voltage 42-60 V DC / 5 A (250 W), 39V – when running from battery
Battery voltage	24 V	48 V
Range in User Center (Battery voltage)	0–30 V	0-60 V
Max. battery loading current	3.0 A (can be set in parameterization SW)	
Max. battery maintenance voltage	27.4 V	54.8 V
Switch off voltage (battery protection)	22 V	44 V
Battery tester	Yes	
Testing current	8.5 A	8 A
Temperature sensor	Measured range -55 to +125 °C, accuracy ±0.5 °C in range -10 to +85 °C	
Connectors	2 × WAGO 231-302/026-000 (part of delivery), RJ-12	
Wire cross-section	0.08–2.5 mm²	
Signaling LED	STAT, PWR IN, PWR OUT, BAT	
Measurement accuracy	±0.5 % for input and battery voltage	
Dimensions (with mounted front panel)	25 × 172 × 92 mm (W × H × D)	
Position in 5 / 8–10 / 16 slots bus	Any position	

0348

RTU7M – communication cards and modules

General description

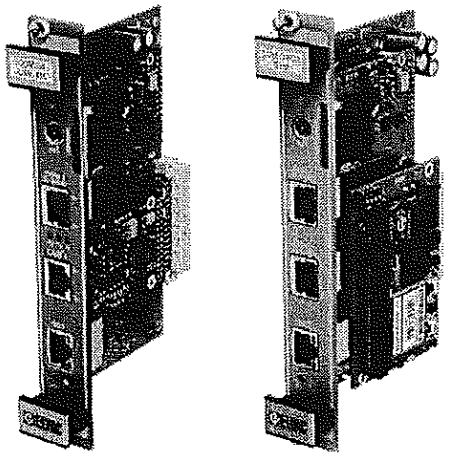
The communication cards serve for ensuring the communication of the RTU7M with the master system and for communication with slave units. These cards contain four communication interfaces and they have the direct support of many industrial protocols (according to the type of card and interfaces used, they are IEC 60870-5-101, IEC 60870-5-103, IEC 60870-5-104, IEC 61850, DNP3, Modbus, HioCom2, DLMS). The cards also support various company protocols (e.g. protocol for communication with wireless sensors of current Z7D).

We produce two principally different versions of the cards. The first version labeled as COMIO4 contains a 32-bit processor and the second version labeled as COMIO-PC2 and COMIO-PC3 (follow-up generation), contains a built-in PC with operating system on the basis of OS LINUX.

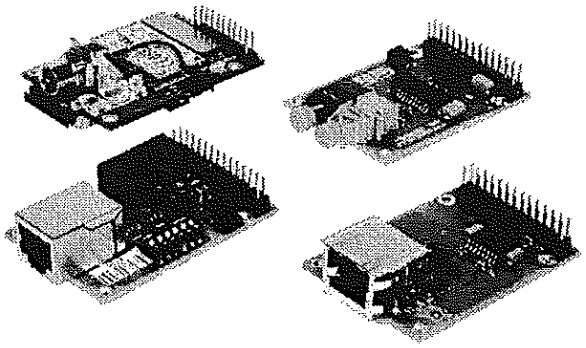
Both types of communication cards have some interfaces defined as fixed and some as optional. Optional interfaces can be fitted with modules CIOMOD and configured according to the demands of the stated application. It is necessary to separately specify these modules in orders. You can see the available options in the table below. Communication parameters are set in the web interface.

Communication card COMIO4

This card is fitted with four communication interfaces, which provide the user with freedom during the selection of a suitable communication protocol and the interface. The card can also be used as a communication converter or a data concentrator for slave units.



Cards COMIO4 and COMIO-PC2



Examples of communication modules

Table of standard combinations for individual interfaces of COMIO4 cards

Card	COMIO4-1ETH	COMIO4-2ETH	COMIO4-CIR	COMIO4-0
Communication interface COM1	Position for module CIOMOD-232/485 UMTS/GSM/(E)GPRS	Position for module CIOMOD-232/485/UMTS/ GSM/(E)GPRS/GPS2	Position for module CIOMOD-OPT	Position for module CIOMOD-232/485/OPT UMTS/GSM/(E)GPRS
Communication interface COM2	Switchable RS-232/422/485			Fixed opticalinterface OPT
Communication interface COM3	Position for module CIOMOD-232/485	Ethernet 10/100 Mbps	Position for module CIOMOD-OPT	Position for module CIOMOD-232/485-OPT
Communication interface COM4	Ethernet 10/100 Mbps			
Supported com. protocols	MODBUS, HIOCom2, IEC 60870-5-101, IEC 60870-5-103, IEC 60870-5-104, FTP, HTTP			
Memory	FLASH 64 Mbit, MRAM 256 kbit, optionally MicroSD card			
Consumption	1.5 W			
Position in 5 / 8–10 / 16 slots bus	Recommended 2 / 3 / 2			

Note: other combinations can be supplied according to the demands of customer after consultation with product manager.

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0349

Communication card COMIO-PC2 and COMIO-PC3

These cards are also fitted with four communication interfaces, compared with the COMIO4 card, and due to its higher intelligence, they offer greater options. For example, it includes the ability to manage a larger number of slave units, the use of special protocols for secured communication or in the case of special requirements, these cards can be used for client modification for communication options, such as the implementation of another standards and special protocols, etc.

Besides the basic communication functions in RTUs, they can be also used as a communication/protocol converter or data concentrator (also simultaneously). The COMIO-PC3 card is designed for a new internal bus architecture, is equipped with real-time RTC circuit (with backup) and internal temperature sensor. Its communication interfaces can be enhanced via card ESW2, which is then connected with COMIO PC3 card internally and offers physical separation of two LANs.

Table of standard combinations for individual interfaces of COMIO-PC2 a PC3 cards

Card	COMIO-PC2	COMIO-PC3
Communication interface COM1	Position for modules LTE, UMTS, GSM/(E)GPRS, RS-232, RS-485	
Communication interface COM2	Switchable RS-232 / RS-485	Ethernet 10/100 Mbps
Communication interface COM3	Switchable RS-232 / RS-485 power supply +5 V / 0,3 A	Switchable RS-232 / RS-422 / RS-485
Communication interface COM4	Ethernet 10/100 Mbps	Switchable RS-232 / RS-422 / RS-485 power supply +5 V / 0,3 A
Supported communication protocols	MODBUS, HIOCom2, IEC 60870-5-101, IEC 60870-5-103, IEC 60870-5-104, FTP, HTTP, IEC 61850, DNP3, L2TP, DLMS, secured communication according to IEC TS 62351-3	
Memory	FLASH 256 MB, RAM 128 MB, optionally MicroSD	FLASH 8 GB, RAM 256 MB, optionally MicroSD
Consumption	3,5 W (without fitted CIOMOD module in position COM1)	
Position in 5 / 8–10 / 16 slots bus	Recommended 2 / 3 / 2	

Technical specification of CIOMOD modules

Module	CIOMOD-GSM5	CIOMOD-GSM6_EHS6	CIOMOD-GSM6_ELS61-E	CIOMOD-GSM8
Communication interface	UMTS Dual-Band GSM Dual-band GPRS Class 12 EDGE Class 12 HSDPA Cat. 8 HSUPA Cat. 6	UMTS Penta-band GSM Quad-band GPRS Class 12 EDGE Class 12 HSDPA Cat. 8 HSUPA Cat. 6	LTE Penta-band GSM Dual-band LTE UE Cat. 1 GPRS Class 12 EDGE Class 12	LTE Penta-band UMTS Dual-band GSM Dual-band LTE UE Cat. 1 HSDPA Cat. 24 HSUPA Cat. 6 GPRS Class 12 EDGE Class 12
Antenna connector	FME	SMA	SMA	SMA
Signals	RxD, TxD, RTS, CTS	RxD, TxD, RTS, CTS	RxD, TxD, RTS, CTS	RxD, TxD, RTS, CTS
Max. consumption	1 W	1 W	1 W	1 W

Module	CIOMOD-OPT	CIOMOD-232	CIOMOD-485	CIOMOD-GPS2
Communication interface	Optical interface	RS-232 (isolation 2 kV AC for 1 min.)	RS-485 (isolation 2 kV AC for 1 min.)	GPS antenna GPS/QZSS GLONASS
Connector	SC	RJ45	RJ45	SMA
Max. communication speed	–	230.4 kbps (460.8 kbps)	230.4 kbps (921.6 kbps)	–
Signals	RxD, TxD	RxD, TxD, RTS, CTS	A, B, (+5 V)	–
Max. consumption	1 W	1 W	1 W (2 W)	0.5 W

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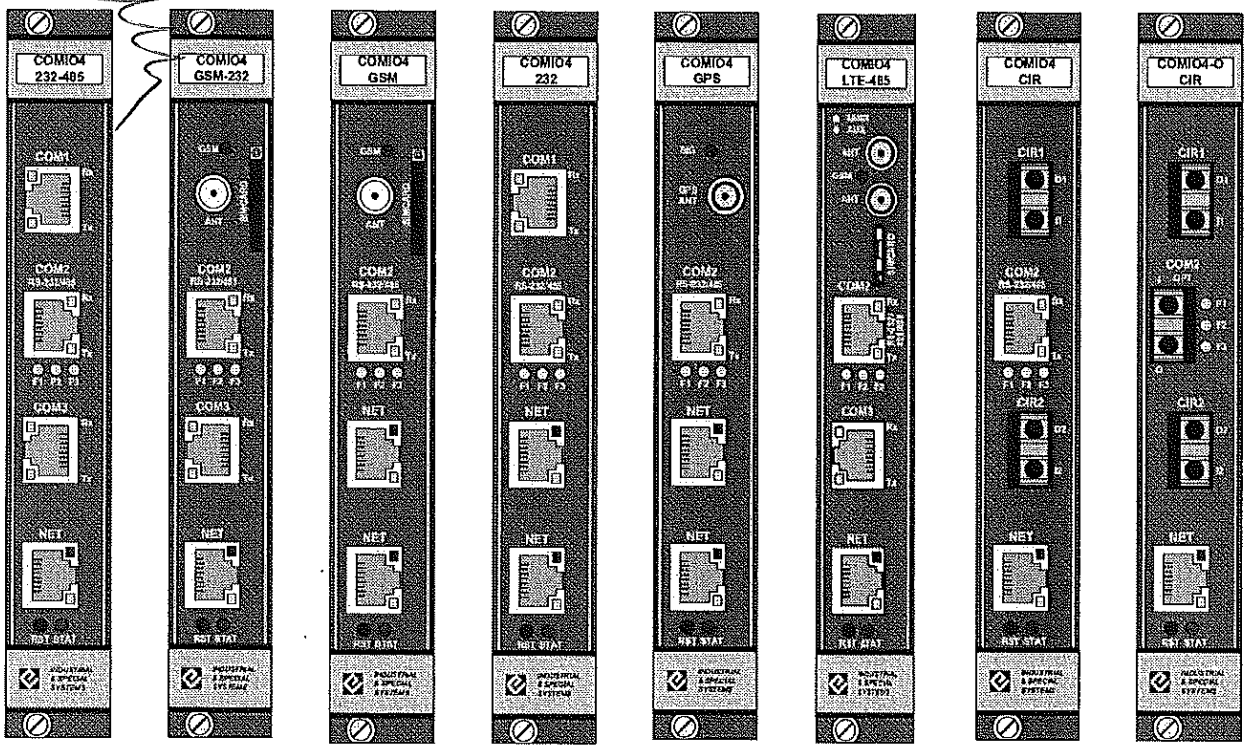
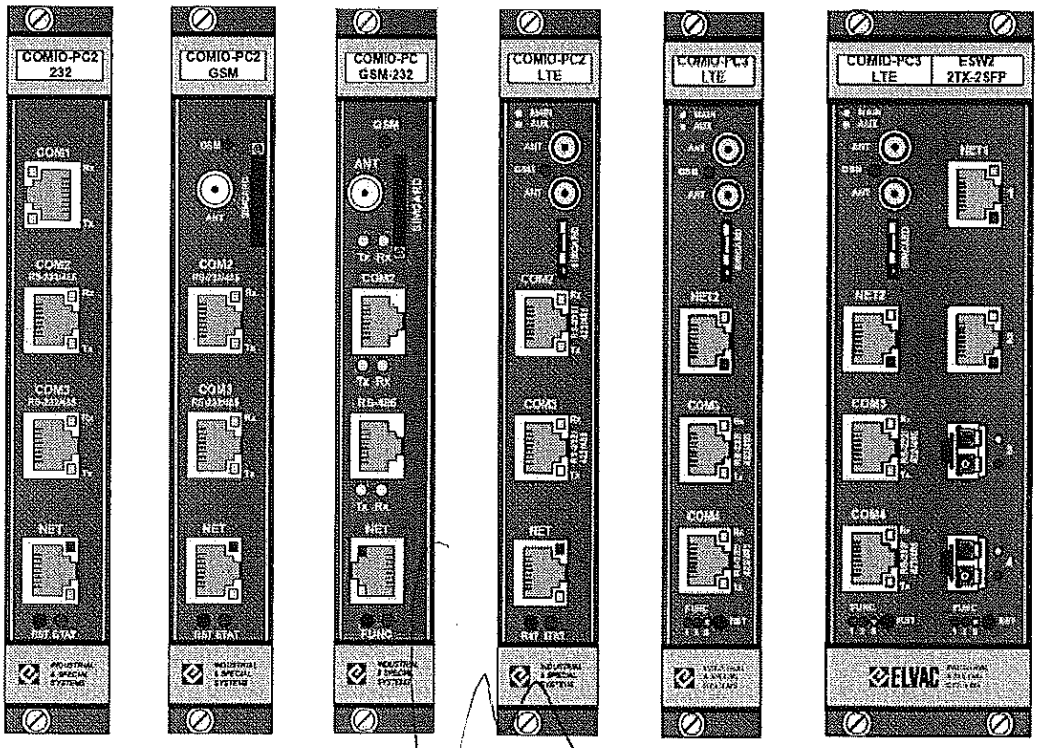


Front panels with connectors of cards COMI04



Front panels with connectors of cards COMIO-PC2 and PC3

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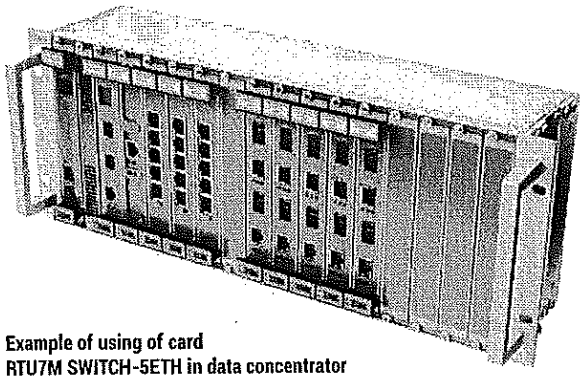
RTU7M – card with ethernet switch

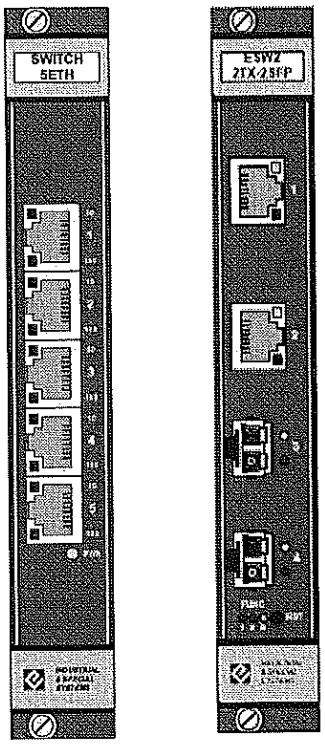
General description

In cases where it is necessary to expand the number of communication links with an Ethernet interface, the RTU7M SWITCH-5ETH card is available. Basically, it is the traditional Ethernet switch in the form of the card for RTU7M, which means that internally, this card does not communicate with the RTU unit, it only takes the power from it. All connections are done externally using connecting cables. The advantage is that it is not necessary to resolve the power supply and backup as in the case of external switches, and it will save the space. The number of cards installed into the system is limited only by the space in the chassis.

Another option is card ESW2 equipped with two metalic Ethernet ports and two SFP ports, which can be internally connected with COMIO-PC3 communication card. Then Ethernet ports on COMIO PC3 card and on ESW2 can work in physically separated networks.



Example of using of card RTU7M SWITCH-5ETH in data concentrator



Front panel of cards RTU7M SWITCH-5ETH and ESW2 2TX-2SFP

Technical specification

Card	RTU7M SWITCH-5ETH	ESW2 2TX-2SFP
Interface	5 × RJ-45, 10/100BaseT(X) auto negotiation speed, Full/Half duplex mode, auto MDI/MDI-X connection	2× RJ-45, 10/100BaseT(X) auto negotiation speed, Full/Half-duplex mode, auto MDI/MDI-X connection, 2× SFP module
Standards	IEE 802.3, 802.3u, 802.3x	
Consumption	Max. 3 W	Max. 1,5 W without SFP modules
Position in 5 / 8 - 10 / 16 slots bus	Any position	

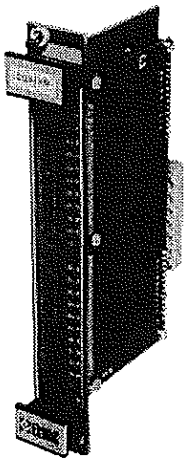
0352

RTU7M – digital inputs

General description

Digital input cards for RTU7M are produced in several basic variants:

- direct DI, active,
- direct DI, passive,
- indirect DI, active,
- indirect DI, passive.



Digital input card

Direct DI

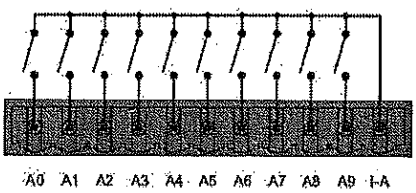
This card has inputs directly connected to the CPU of the RTU7M. The processor then evaluates and filters the input signals, etc. This card can be fitted only one in RTU7M chassis in the defined slot position (according to FW, see the user manual). The advantage is the support of automation functions such as conditioned control (relay switching on the basis of the status of the inputs on the direct DI card).

Indirect DI

The indirect digital input card has its own processor, which processes the input signals (without the participation of the main processor of the RTU7M). The card behaves as a slave unit for the RTU7 series and data is transferred on an internal bus of the RTU7M unit, which serves as the communication bridge. New versions of card (from Y2019) support new high-speed bus, which enables to use automation functions. There is also available backward reading of relay status. The advantage is the option to fit the cards into any position in the chassis up to the maximum number of free positions in the chassis.

Active DI

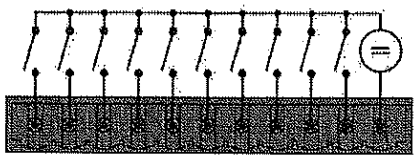
Card is equipped with its own galvanically isolated voltage source. Input is excited after connection of input pin with external shared pin via external contact.



Active inputs connection

Passive DI

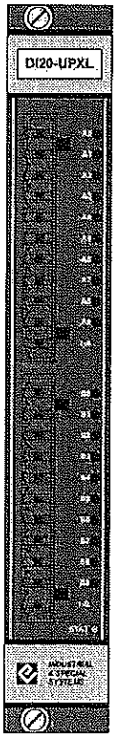
These inputs do not have the voltage source fitted. They are activated after connection of external voltage.



Passive inputs connection

Basic features

- 20 × digital input,
- isolation 3.75 kV AC,
- indication of excitation of input,
- time filter can be set up by SW for both logical levels,
- optional double-bit signaling (ex. defining of interposition of power element),
- configurable maximal allowed number of changes on input per time interval,
- input sampling with period 1 ms,
- impulse counter and period measuring with data storage into memory with backup.



Front panel of DI card

Processing of input digital signals

Digital inputs are sampled with the period of 1 ms. The following step is filtration of the signal changes. The time filter can be set for both logical levels. If the change on the digital input lasts the stated time, the stated logical level is declared valid and sent to the master system, if required. With each change, it is monitored the exceeding of the maximal set number of changes per minute. If the maximal number of changes is exceeded, the value is transferred with a telemetric error. This prevents the useless transfer of oscillating values.

These cards can be used as simple digital inputs with one or double-bit signaling and can also be used for reading of impulses and measuring of the period with the storage of the status into the memory with backup. This can be used in applications for measuring of energy and media consumption (the function depends on the firmware used).

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0353

Technical specification of direct DI cards

Karta	DI20-DAM	DI20-DPS	DI20-DPM	DI20-DPL	DI20-DPX	DI20-DPXL
Inputs number	20					
Inputs type	Active (switching by dry contact)	Passive (switching by external voltage, both polarities)				
Status transfer	Direct connection into main CPU					
Level H	Closed	9–25 V	20–60 V	35–60 V	75–150 V	150–300 V
Level L	Open	0–4 V	0–10 V	0–17 V	0–20 V	0–60 V
Current in inputs	2.4 mA	2.5–7 mA	1.9–6 mA	1.7–3 mA	1.3–2.7 mA	1–2 mA
SW filter for level H and L	0–16777.215 seconds, step 1 ms					
Allowed number of changes per minute	0–255					
Isolation voltage	3.75 kV AC for 1 minute					
Consumption	Max. 3 W	0.2 W				
Connectors	2 × WAGO 231-311/026-000, part of delivery					
Wire cross-section	0.08–2.5 mm²					
Position in 5 / 8–10 / 16 slots bus	3 / 6					
Note	** Do not use a version with CPU connector in new projects. Support for existing ones is ensured.*					

Technical specification of indirect DI cards

Card	DI20-UAM	DI20-UPS	DI20-UPM	DI20-UPL	DI20-UPX	DI20-UPXL	DI10-UPXL
Inputs number	20						10
Inputs type	Active (switching by dry contact)	Passive (switching by external voltage, both polarities)					
Level H	Closed	9–25 V	20–60 V	35–60 V	75–150 V	150–300 V	150–300 V
Level L	Open	0–4 V	0–10 V	0–17 V	0–20 V	0–60 V	0–60 V
Current in inputs	2.4 mA	2.5–7 mA	1.9–6 mA	1.7–3 mA	1.3–2.7 mA	1–2 mA	1–2 mA
SW filter for level H and L	0–16777.215 seconds, step 1 ms						
Allowed number of changes per minute	0-255						
Isolation voltage	3.75 kV AC for 1 minute						
Overvoltage category						CATIII/300V	CATIII/600V CATIV/300V
Consumption	2.3 W	1.1 W					
Connectors	2 × WAGO 231-311/026-000, part of delivery						
Wire cross-section	0.08–2.5 mm²						
Position in bus	Any position						

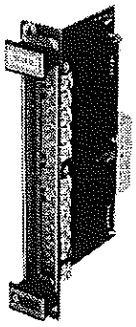
0351

RTU7M – digital outputs

General description

Digital output cards (DO) offer 10 relay outputs with eight NO contacts and two changeover contacts and they are produced in two variants for RTU7M:

- direct DO,
- indirect DO.



Digital output card

Direct DO

The direct digital output card is directly physically connected through power exciters to the digital outputs of the main processor of the RTU7M. A maximum of two cards can be fitted into the RTU7M bus. The advantage is the support of automation functions and the conditioned control (relay switching on the basis of the status of the inputs on the direct DI card).

Indirect DO

The indirect digital output card has its own processor, which, through the signal exciter, switches the relay according to the stated requirements. The card behaves as a slave unit in the RTU7 series, data is transferred on an internal bus of the RTU7M, which serves as the communication bridge. New versions of card (from Y2019) support new high-speed bus, which enables to use automation functions. There is also available backward reading of relay status. The card enables the remote upgrading of FW.

Basic features

- 10 × relay DO 8 A/250 V AC or 8 A/24 V DC,
- 8 × NO contact, 2 × changeover contact,
- HW and SW protection against accidental switching of output,
- adjustable time of closed contact,
- interference protection during switching of relay contact,
- special functions of some DO (thermostat control, protection).

Security of digital outputs

Great attention is focused on protection against accidental switching of the DO. It is resolved at two levels:

- SW level - a two-phase control of the relay switching is used. To be the command executed, the unit must receive two identical commands for switching of a relay in the stated time interval,
- HW level - each relay is controlled by two exciters. To perform the switching, both exciters must be activated at the same time. Each exciter is controlled by its own processor.

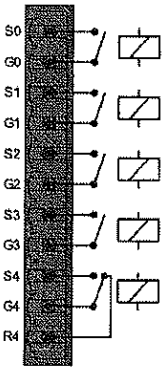
Special functions

Depending on the type of FW, some DO may have a reserved function. An example is the switching of the heating in the switchboard cabinet depending on the temperature measured by the external sensor, function for controlling of the power element during the evaluation of the earth fault, short circuit or overcurrent, etc.

Technical specification of DO cards

Karta	DO10-D	DO10-U
Outputs number	8 × relay (NO contact), 2 × relay (changeover contact)	
Time of closed contact	10 ms to 655 with step 10 ms	
Isolation contact-coil	5 kV AC for 1 minute	
Isolation between open contacts	1 kV AC for 1 minute	
Contacts load	8 A/250 V AC, 8 A/24 V DC	
Durability	2×10^7 cycles	
Relay switching	Protected against accidental switching. Controlled via digital signals from main CPU.	Protected against accidental switching. It is separated slave unit for RTU7 series.
Consumption	2.3 W	3 W
Connectors	2 × WAGO 231-311/026-000, part of delivery	
Wire cross-section	0.08–2.5 mm²	
Position in 5 / 8–16 slots bus	3 / 4, 5	Any position
Note	** Do not use a version with CPU connector in new projects. Support for existing ones is ensured.*	–

Front panel of DO card



Output connectors wiring

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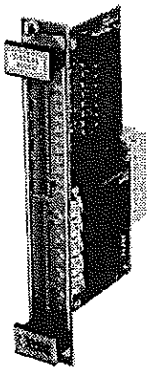
0355

RTU7M – combined cards of digital inputs and outputs

General description

The card provides 10 digital inputs, 5 relay outputs with 4 normally open contacts and 1 changeover contact. It is also available in direct and indirect version with passive or active DI.

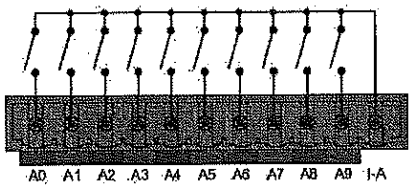
Indirect card has its own CPU and time stamps are assigned directly on card. New versions of card (from Y2019) support new high-speed bus, which enables to use automation functions. There is also available backward reading of relay status.



Combined card of digital I/O

Active DI

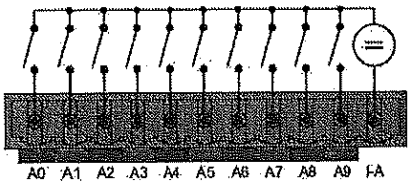
Card is equipped with its own galvanically isolated voltage source. Input is excited after connection of input pin with external shared pin via external contact.



Active inputs connection

Passive DI

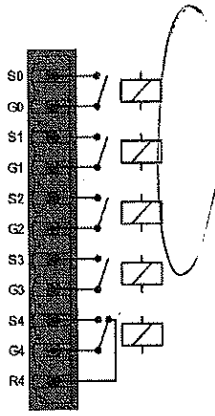
These inputs do not have the voltage source fitted. They are activated after connection of external voltage.



Passive inputs connection

Digital outputs

Relays are excited through power exciters directly from main CPU of RTU7M. The advantage is the support of automation functions and the conditioned control (relay switching on the basis of the status of the inputs).



Outputs connection

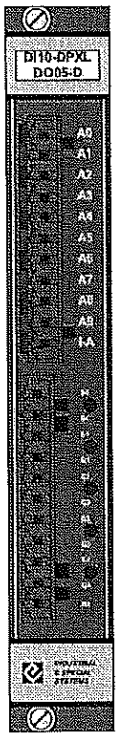
Basic features

Inputs

- 10 × digital input with indication of input excitation,
- isolation 3.75 kV AC,
- time filter can be set up by SW for both logical levels,
- optional double-bit signaling,
- configurable maximal allowed number of changes on input per
- time interval,
- input sampling with period 1 ms,
- impulse counter and period measuring with data storage into
- memory with backup.

Outputs

- 5 × relay 8 A/250 V AC / 8 A/24 V DC,
- 4 × normally open contact, 1 × changeover contact,
- HW and SW protection against accidental switching,
- adjustable time of closed contact,
- interference protection during switching of relay contact,
- special functions (thermostat control, protection).



Front panel of combined DIO card

Processing of input digital signals

DI are sampled with the period of 1 ms. The following step is filtration of the signal changes. The time filter can be set for both logical levels. If the change on the DI lasts the stated time, the stated logical level is declared valid and sent to the master system, if required. With each change, it is monitored the exceeding of the maximal set number of changes per minute. If the maximal number of changes is exceeded, the value is transferred with a telemetric error. This prevents the useless transfer of oscillating values.

Cards can be used as DI with one or double-bit signaling and can also be used for reading of impulses and measuring of the period with the storage of the status into the memory with backup (ex. for consumption metering applications).

0356

Security of digital outputs

Great attention is focused on protection against accidental switching of the DO. It is resolved at two levels:

- SW level - a two-phase control of the relay switching. To be the command executed, the unit must receive two identical commands for switching of a relay in the stated time interval,
- HW level - each relay is controlled by two exciters. To perform the switching, both exciters must be activated at the same time. Each exciter is controlled by its own processor.

Special functions

Depending on the type of FW, some DO may have a reserved function. An example is the switching of the heating in the switchboard cabinet depending on the temperature measured by the external sensor, function for controlling of the power element during the evaluation of the fault on the line, etc.

Technical specification of combined DI and DO cards

Card	DI10-DAM DO05-D	DI10-DPS DO05-D	DI10-DPM DO05-D	DI10-DPL DO05-D	DI10-DPX DO05-D	DI10-DPXL DO05-D
Inputs number	10					
Inputs type	Active (switching by dry contact)	Passive (switching by external voltage, both polarities)				
Status transfer	Direct connection into main CPU					
Level H	Closed	9–25 V	20–60 V	35–60 V	75–150 V	150–300 V
Level L	Open	0–4 V	0–10 V	0–17 V	0–20 V	0–60 V
Current in inputs	2.4 mA	2.5–7 mA	1.9–6 mA	1.7–3 mA	1.3–2.7 mA	1–2 mA
SW filter for level H and L	0–16777.215 seconds, step 1 ms					
Allowed number of changes per minute	0–255					
Isolation voltage	3.75 kV AC for 1 minute					
Outputs number	4 × relay (NO contact), 1 × relay (changeover contact)					
Time of closed contact	10 ms to 655 with step 10 ms					
Isolation contact-coil	5 kV AC for 1 minute					
Isolation between open contacts	1 kV AC for 1 minute					
Contacts load	8 A/250 V AC, 8 A/24 V DC					
Durability	2 × 10^7 cycles					
Relay switching	Protected against accidental switching. Controlled via digital signals from main CPU.					
Consumption	Max. 3.5 W	Max. 1.3 W				
Connectors	2 × WAGO 231-311/026-000, part of delivery					
Wire cross-section	0.08–2.5 mm²					
Position in 5 / 8–16 slots bus	3 / 6					
Note	** Do not use a version with CPU connector in new projects. Support for existing ones is ensured.* *- since Q2 of 2018 are available also indirect versions of these cards with the same parameters as above (e.g. DI10-UAM DO05-U etc.)*					

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0357

Technical specification of combined DI and DO cards

Card	DI10-UAM DO05-U	DI10-UPS DO05-U	DI10-UPM DO05-U	DI10-UPL DO05-U	DI10-UPX DO05-U	DI10-UPXL DO05-U
Inputs number	10					
Inputs type	Active (switching by dry contact)	Passive (switching by external voltage, both polarities)				
Level H	Closed	9–25 V	20–60 V	35–60 V	75–150 V	150–300 V
Level L	Open	0–4 V	0–10 V	0–17 V	0–20 V	0–60 V
Current in inputs	2.4 mA	2.5–7 mA	1.9–6 mA	1.7–3 mA	1.3–2.7 mA	1–2 mA
SW filter for level H and L	0–16777.215 seconds, step 1 ms					
Allowed number of changes per minute	0–255					
Isolation voltage	3.75 kV AC for 1 minute					
Outputs number	4 × relay (NO contact), 1 × relay (changeover contact)					
Time of closed contact	10 ms to 655 with step 10 ms					
Isolation contact-coil	5 kV AC for 1 minute					
Isolation between open contacts	1 kV AC for 1 minute					
Contacts load	8 A / 250 V AC, 8 A / 24 V DC					
Durability	2×10^7 cycles					
Relay switching	Protected against accidental switching. Controlled via digital signals from main CPU.					
Consumption	Max. 2.5 W	Max. 2 W				
Connectors	2 × WAGO 231-311/026-000, part of delivery					
Wire cross-section	0.08–2.5 mm²					
Position in 5 / 8–16 slots bus	Any position					

0358

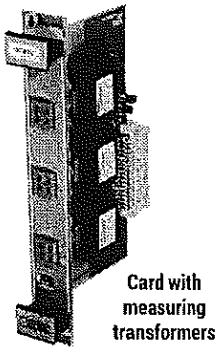
RTU7M – direct analog inputs

General description

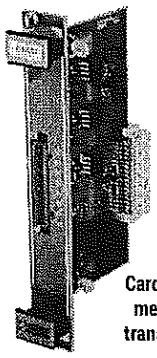
These cards serve for adjustment of the measured signal to the internal unified voltage signal, which is then processed by the main CPU. After the adjustment, the signal is connected to the inputs on the A/D converter. According to the type of card and the firmware, the measuring processor continuously measures the voltage, current and performs the digital filtering, when demanded. The cards enable to test each period of the signal for limiting states and when the limit is exceeded, to assign the system time information with the precision to one millisecond. The effective values and other necessary values are calculated from the sampled instantaneous values. In addition, the cards ensure galvanic isolation and over-voltage protection of the analog inputs of the unit (according to the type of card).

A maximum of two direct measurement cards can be fitted into the RTU7M units, the number of analogue input cards can be expanded by indirect measurement cards. The input ranges are designed so that it is easily possible to integrate the unit into various monitoring and control applications in the industry and especially in energy sector. In addition to the mentioned types below, other ranges of measurement are possible after consultation with the manufacturer.

** Do not use a version with CPU connector in new projects. Support for existing ones is ensured.*



Card with measuring transformers



Card without measuring transformers

AI-MTI cards

These cards with the precise measuring current transformers can measure alternating currents. Some types have two-range measuring for increasing the accuracy of measuring in nominal range. The advantage is the high overloadability demanded especially in power industry applications for detection of fail states on lines (short circuits, overcurrents, earth faults). Cards are suitable also for measuring in other general industrial applications. Inputs are galvanically isolated from unit, between input conductors are fitted overvoltage protections.

AI-MTU cards

These cards with measuring transformers can measure an alternating voltage. The overloadability is 1.2 × Un. The inputs are galvanically isolated from unit, between input conductors are fitted overvoltage protections.

AI-I/xx cards

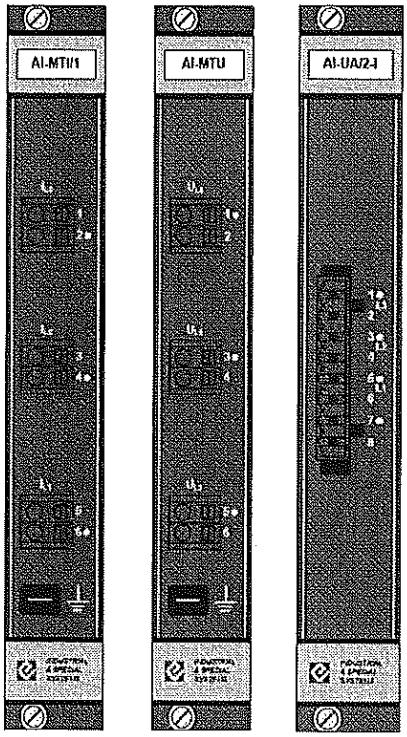
These cards can be used for measuring of alternating or direct currents. They are produced in versions with and without galvanic isolation.

AI-U/xx-I cards

These cards with galvanic isolation can measure AC or DC voltages. Some types have the inputs adjusted for usage with resistance or capacitive voltage sensors.

Basic features

- measuring inputs for 3 (optionally 4) voltages or currents,
- measuring of AC or AC/DC – by type of card,
- wide range of input measuring ranges,
- overloadability of measuring,
- galvanic isolation - by type of card,
- overvoltage protections on inputs,
- measuring is evaluated in powerful signal processor,
- sampling, filtering according to FW used,
- possible change of input ranges on demand.



Front panels of direct analog measuring cards

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0359

Technical specification of cards with measuring transformers for direct current and voltage measuring

Card	AI-MTI/5	AI-MTI/1	AI-MTI/5-1	AI-MTU	AI-MTU/400
Measured variable	Current			Voltage	
Inputs number	3				
Nominal range	5 A AC	1 A AC	5 A AC	100 V AC	400 V AC
Overloadability	20 A AC for 1 minute, 200 A AC for 1 s	4 A AC for 1 minute, 100 A AC for 1 s	5 A AC permanently	120 V AC permanently	480 V AC permanently (520 V AC pulse)
Consumption per phase	< 0.1 VA by 5 A	< 0.05 VA by 1 A	< 0.1 VA by 5 A	< 0.1 VA by 100 V	< 0.05 VA by 230 V
Range in RTU UC (type of unit 176)	0–20 A	0–4 A	0–5 A	0–120 V	0–520 V
Range in RTU UC (type of unit 175)	0–5 A	0–1 A	0–5 A	0–120 V	0–520 V
Inputs type	Isolated 4 kV			Isolated 3.7 kV	
Measuring accuracy (nominal range)	±0.5 %				
Measuring accuracy (overloaded)	±1.5 %		–	±0.5 %	
Signal processing	10-bit A/D converter				
Sampling	According to the used firmware				
Power consumption	+5 V an. / 0.1 W; -5 V an. / 0.1 W				
Connectors	3 × connector WAGO; direct wire connection; wire cross-section 0.08–2.5 mm²				
Position in 5 / 8–10 / 16 slots bus	5 / 8		4, 5 / 7,8		
Note	* *Do not use a version with CPU connector in new projects. Support for existing ones is ensured.*				

Technical specification of cards without measuring transformers for direct current measuring

Card	AI-I/05	AI-I/10	AI-I/20	AI-I/20-E	AI-I/20-I	AI-3I/10/20-I
Measured variable	Current					
Inputs number	3 (4 on demand)					
Nominal range	5 mA AC ±5 mA DC	10 mA AC ±10 mA DC	20 mA AC ±20 mA DC	20 mA AC ±20 mA DC	20 mA AC ±20 mA DC	10 mA AC ±10 mA DC
Overloadability	20 mA AC ±20 mA DC permanently	40 mA AC ±40 mA DC permanently	40 mA AC ±40 mA DC permanently	80 mA AC ±80 mA DC permanently	40 mA AC ±40 mA DC permanently	20 mA AC ±20 mA DC permanently
Range in RTU UC (type of unit 176)	0–20 mA	0–40 mA	0–40 mA	0–80 mA	0–40 mA	0–20 mA
Range in RTU UC (type of unit 175)	0–5 mA	0–10 mA	0–40 mA	0–20 mA	0–40 mA	0–20 mA
Inputs type	Not isolated	Not isolated	Not isolated	Not isolated	Isolated 4 kV	Isolated 4 kV
Measuring accuracy (nominal range)	±0.5 %	±0.5 %	±0.5 %	±0.5 %	±0.5 %	±1 %
Measuring accuracy (overloaded)	±1 %					
Signal processing	10-bit A/D converter					
Sampling	According to the used firmware					
Power consumption	+5 V an. / 0.1 W -5V an. / 0.1 W				+5 V dig. / 1 W, +5 V an. / 0.1 W - 5V an. / 0.1 W	
Connectors	1 × WAGO 231-308/037-000, part of delivery; wire cross-section 0.08–2.5 mm²					
Position in 5 / 8–10 / 16 slots bus	For 3 inputs - position 5 / 8 For 4 inputs - position 5 / 8		4, 5 / 7,8 4, 5 / 8	5 / 8 5 / 8	4, 5 / 7,8 4, 5 / 8	4, 5 / 7,8 4, 5 / 8
Note	* *Do not use a version with CPU connector in new projects. Support for existing ones is ensured.*					

0360

Technical specification of cards without measuring transformers for direct voltage measuring

Card	AI-U/1-I	AI-U/1a-I	AI-U/2	AI-UA/1-I	AI-UA/2-I	AI-U/10-I
Usage	Substitution for SADS unit, resistance sensor 220/0.5 MΩ	Substitution for SADS unit, resistance sensor 82/0.5 MΩ	MV sensor FSI36	Capacitive sensor 20–25 pF	Capacitive sensor 50–60 pF	General
Measured variable	Voltage					
Inputs number	3 (4 on demand)					
Nominal range	1 V AC ±1 V DC	1 V AC ±1V DC	2 V AC ±2 V DC	1 V AC	2 V AC	10 V AC ±10 V DC
Overloadability	1.2 V AC ±1.2 V DC	1.2 V AC ±1.2V DC	8 V AC ±8 V DC permanently	1.2 V AC permanently	2.4 V AC permanently	12 V AC ±12 V DC permanently
Range in RTU UC (type of unit 176)	0–1.2 V	0–1.2 V	0–8 V	0–1.2 V	0–2.4 V	0–12 V
Range in RTU UC (type of unit 175)	0–1.2 V	0–1.2 V	0–2 V	0–1.2 V	0–2.4 V	0–12 V
Inputs type	Isolated 4 kV		Not isolated	Isolated 4 kV		
Measuring accuracy (nominal range)	±0.5 %					
Measuring accuracy (overloaded)	±0.5 %					
Signal processing	10-bit A/D converter					
Sampling	According to the used firmware					
Power consumption	+5 V an. / 0.1 W -5 V an. / 0.1 W +5 V dig. / 1 W	+5 V an. / 0.1 W -5 V an. / 0.1 W +5 V dig. / 1 W	+5 V an. / 0.1 W -5 V an. / 0.1 W	+5 V an. / 0.1 W -5 V an. / 0.1 W +5 V dig. / 1 W	+5 V an. / 0.1 W -5 V an. / 0.1 W +5 V dig. / 1 W	+5 V an. / 0.1 W -5 V an. / 0.1 W +5 V dig. / 1 W
Connectors	1 × WAGO 231-308/037-000, part of delivery; wire cross-section 0.08– 2.5 mm²					
Position in 5 / 8–10 / 16 slots bus	For 3 inputs positions 4, 5 / 7, 8 For 4 inputs positions 4, 5 / 8		5 / 8 5 / 8	For 3 inputs positions 4, 5 / 7, 8 For 4 inputs positions 4, 5 / 8		
Note	** Do not use a version with CPU connector in new projects. Support for existing ones is ensured.*					

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0361

RTU7M – indirect analog inputs, fault indicators

General description

Indirect measurement cards are fitted with a powerful signal processor for processing of measured signals. In this case, the RTU7M unit serves only as a communication bridge for the data transmission. The advantage of these cards is the possibility to use more cards in one chassis in any position, the disadvantage is that it is impossible to use them for protective functions. After consultation with the manufacturer, it is possible to adjust the parameters of inputs.

M3ZQ cards with fault indicator function

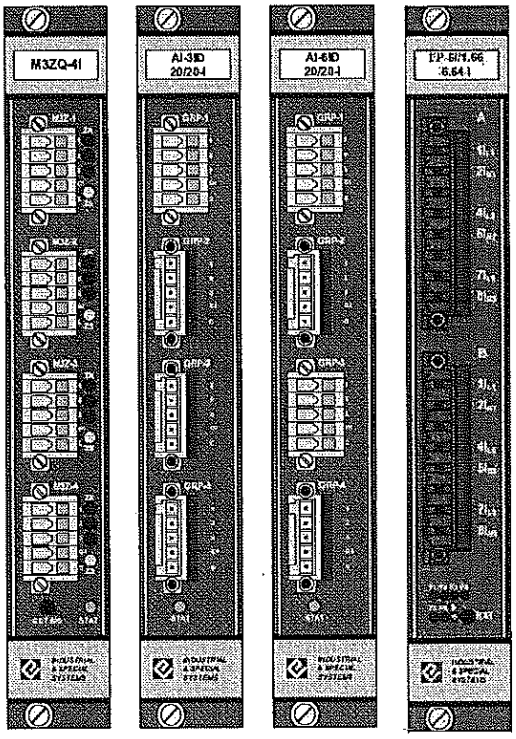
In power industry applications, these cards are used as indicators of short circuits, over-currents and earth faults. They are especially suitable for use in cable networks. In the case of three-phase alternating measurements, there are regularly calculated the effective values of currents in individual phases, effective value I_0 and average value of current I_{avg}. In addition, there is evaluated the exceeding of the parameterized limits for individual phase currents and the current 0. After exceeding of the limits during the stated period, there are signaled the earth fault, short circuit and the overcurrent. All inputs are galvanically isolated from the remaining part of the unit. Individual inputs are not galvanically separated between each other.

AI-xI a AI-xID cards

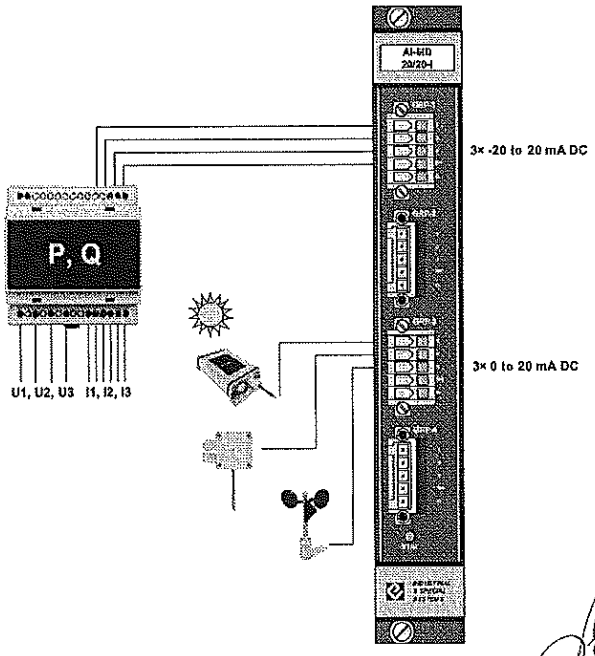
These cards are designed for the measurement of output DC current signals from sensors and measuring converters. They are produced with various input numbers (3, 6, and on request up to 9 or 12). All inputs are galvanically isolated from the remaining part of the unit. Individual inputs are not galvanically separated between each other. The measuring range can be parameterized in the RTU UC. Ranges 0 to 20 mA DC, 4 to 20 mA DC, -20 to +20 mA DC are available. Measurements of current are processed using a powerful signal processor. If the measured value is out of the parameterized range of measurement, it is transferred as invalid.

EP-6I cards with fault indicator function

Card is designed as an independent unit with two groups of three-phase current measurements. All inputs are galvanically isolated from each other and also from the unit. Three-phase current measurements are processed by the high-performance digital signal processor. For each three-phase measurement input is implemented function of short-circuits detection, overcurrents and earth-faults detection Optionally is possible to evaluate the short-circuits and overcurrents by activation of a filters for the first harmonic component of measured signal. All limits for fault on lines evaluation, parameters for auto-transferring of measurements and failure notifications can be parametrized remotely.



Front panels of indirect analog measuring cards



Example of connection of card AI-6ID with different measuring ranges of input groups

0362

Technical specification of indirect analog input cards

Card	M3ZQ-2I	M3ZQ-4I	AI-12I/5/6-I	AI-3ID/20/20-I	AI-6ID/20/20-I	AI-6ID/20/20-AI	* EP-6I/1.66/6.64-I
Inputs number	2 × 3	4 × 3	4 × 3	1 × 3	2 × 3	2 × 3	2 × 3
Inputs type	Isolated differential inputs 2,5 kV for 1 min.					Isolated from the rest of the unit and between themselves, 4 kV for 1 minute	
Signal processing	Own processor, 10-bit A/D converter					Own processor, 16-bit A/D converter	
Measured variable	Current						
Nominal range	20 mA AC ±20 mA DC		5 mA AC ±5 mA DC	0–20 mA DC 4–20 mA DC ±20 mA DC			1,66 mA AC ± 1,66 mA DC
Overloadability	40 mA AC permanently ±40 mA DC permanently		6 mA AC permanently ±6 mA DC permanently	±24 mA DC permanently			6,64 mA AC permanently ± 6,64 mA DC permanently 0,166 A AC for 1 s ± 0,166 A DC for 1 s
Range in RTU UC	0–40 mA		0–6 mA	0– 20 mA for measuring 0–20 mA 0–20 mA for measuring ±20 mA 4–20 mA for measuring 4–20 mA			0–6,64 mA
Input resistance	20.13 Ω	20.13 Ω	130 Ω	26.5 Ω		10 Ω	25,5 Ω
Measuring accuracy (nominal range)	±0.5 %					± 0,3 %	± 0,3 %
Measuring accuracy (overloaded)	±1 %			±0.5 %		± 0,3 %	± 0,3 %
Sampling	According to the used firmware						
Power consumption	3 W	3 W	1.5 W	2 W	2,5 W	2,5 W	2,5 W
Connectors	4 × WAGO 734-105/107-000	4 × WAGO 734-105/107-000		1 × WAGO 734-105/107-000	2 × WAGO 734-105/107-000	2× WAGO 231-308/107-000	
Wire cross-section	0.08–1.5 mm²					0,08–2,5 mm²	
Position in bus	Any position						

* Next standard versions: EP-6I/20/200-I (20/200mA), EP-6I/1-5A/10A-I, EP-6I/1A/30A-I, see EP cards

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0363

RTU7M – combined indirect analog input cards, fault indicators and protection relays

General description

Combined indirect analogue input cards are fitted with their own powerful signal processor for processing of the measured signals. Moreover, some types are fitted with their own digital inputs and outputs. The RTU7M unit serves in this case only as a communication bridge for the data transmission. According to the type and construction of the analogue inputs and the digital inputs and outputs, each card in this series is designed for specific application.

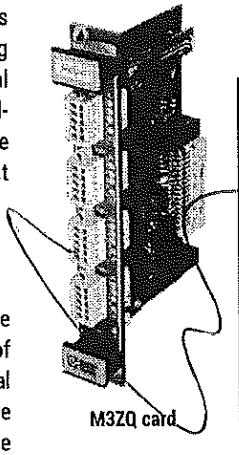
M3ZQ-xI cards

M3ZQ-AI card

This card is fitted with one group of 3-phase voltage inputs 1 V AC, one group of 3-phase current inputs 5 mA AC and six inputs 0 - 20 mA DC (+/- 20 mA DC). The card is designed, for example, for use in dispatch control applications and monitoring of renewable energy sources.

Analogue inputs in the first two groups are designed for connection to the modules of series EXT AI-MTI, EXT AI-MTU, which are fitted with measuring transformers for current or voltage. Analogue inputs in the further two groups (in total 6 analogue inputs) are primarily designed for the connection of sensors and converters of electric (P, Q) and non-electric values (temperature, exposure, etc.).

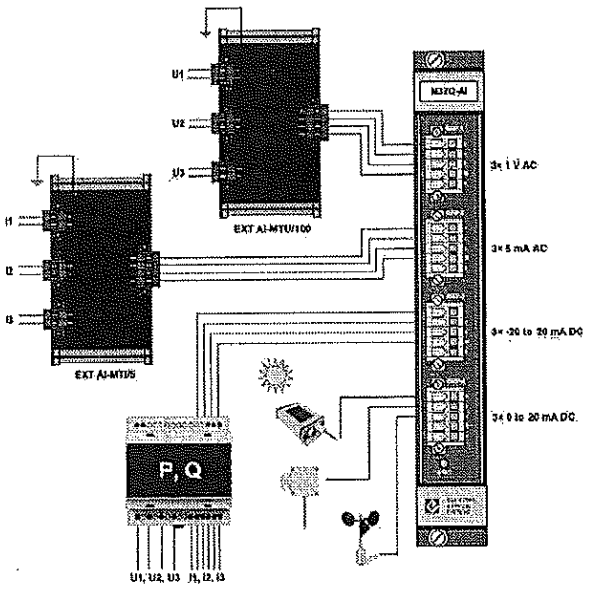
The three-phase measurement of currents and voltage in the first two groups of analog inputs are processed by the powerful signal processor on the card. Other values are calculated, e.g. U_{12}, U_{23}, U_{13}, P, Q, S, f, etc. The card does not provide protection or fault recording functions.


M3ZQ card

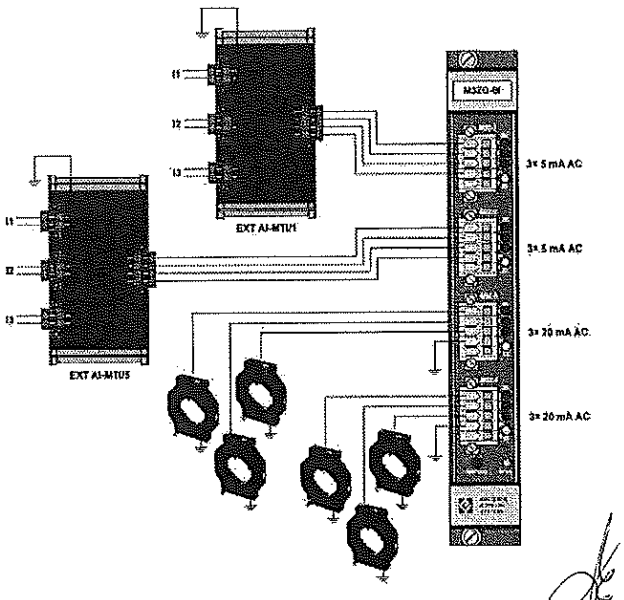
M3ZQ-BI card

This card is fitted with two groups of 3-phase current inputs 5 mA AC and two groups of 3-phase current inputs 20 mA AC. Individual inputs are galvanically isolated from the remaining part of the unit. Three-phase measurements of the current are processed by a powerful signal processor. For each 3-phase measurement, the functions of the indicators for short circuits, overcurrents and earth faults are supported. Optionally, for the evaluation of the short circuit and overcurrent, it is possible to activate filters for the first harmonic component of the measured signal. In the case of failure, the individual failure indicators provide failure records in the COMTRADE format or in a binary file.

Analogue inputs in the first two GRP-1 and GRP-2 groups are designed for connection to the modules of the EXT AI MTI series, which are fitted with measuring current transformers. Analogue inputs in the further two GRP 3 and GRP 4 groups are primarily designed for the connection of measuring transformers of currents with an output of 20 mA.



Example of connection of RTU7M M3ZQ-AI analog inputs, RES monitoring



Example of connection of RTU7M M3ZQ-BI analog inputs

0364

Technical specification of M3ZQ-AI card

Card	M3ZQ-AI		
Inputs number	4 × 3		
Inputs type	Isolated differential inputs 2.5kV for 1min.		
Signal processing	Its own processor, 10-bit A/D converter		
Input group	GRP-1	GRP-2	GRP-3, GRP-4
Measured variable	3 × voltage	3 × current	6 × current
Nominal range	1 V AC ±1 V DC	5 mA AC ±5 mA DC	0–20 mA DC 4–20 mA DC ±20 mA DC
Overloadability	1.2 V AC ±1.2 V DC	6 mA AC permanently ±6 mA DC permanently	±24 mA DC permanently
Range in RTU UC	0–1.2 V without module EXT 0–120 V s EXT AI-MTU/100 0–480 V s EXT AI-MTU/400	0–6 mA without module EXT 0–1.2 A s EXT AI-MTI/1 0–6 A s EXT AI-MTI/5	0–20 mA for measuring 0–20 mA 0–20 mA for measuring ±20 mA 4–20 mA for measuring 4–20 mA
Measuring accuracy (nominal range)	±0.5 %		
Measuring accuracy (overloaded)	±1 %		
Sampling	According to the used firmware		
Power consumption	3 W		
Connectors	4 × WAGO 734-105/107-000, part of delivery		
Wire cross-section	0.08–1.5 mm²		
Position in bus	Any position		

Technické parametry karty M3ZQ-BI

Card	M3ZQ-BI	
Inputs number	4 × 3	
Inputs type	Isolated differential inputs 2.5kV for 1min.	
Signal processing	Its own processor, 10-bit A/D converter	
Input group	M3Z-1, M3Z-2	M3Z-3, M3Z-4
Measured variable	6 × current	6 × current
Nominal range	5 mA AC ±5 mA DC	20 mA AC ±20 mA DC
Overloadability	10 mA AC permanently ±10 mA DC permanently	40 mA AC ±40 mA DC
Range in RTU UC	0–10 mA without module EXT 0–2 A s EXT AI-MTI/1 0–10 A s EXT AI-MTI/5	0–40 mA
Measuring accuracy (nominal range)	±0.5 %	
Measuring accuracy (overloaded)	±1 %	
Sampling	According to the used firmware	
Power consumption	3 W	
Connectors	4 × WAGO 734-105/107-000, part of delivery	
Wire cross-section	0.08–1.5 mm²	
Position in bus	Any position	

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0365

EP cards – fault indicators and protection relays

EP card without DI/DO with 3V and 3I measurement

This card is the basic type of card fitted with three voltage inputs with overloading of 1.2 (optionally 1.3 × U_n) and three current inputs with different overloadability according to the type of application. Nominal ranges are adapted to various types of measuring transformers of voltage (MTU) and current (MTI). The values in the overloaded ranges are also measured. In all cases, the maximal overloading (the robustness) of the analogue inputs is 100 A for 1 s.

Usually, the overloading about 2 × I_n is used in applications of P, Q, U, I measurement, the overloading 10 × I_n is used in applications like indicator of earth faults and short circuits and the overloading 30 × I_n is used in applications working as a protection of outlet.

Three-phase measurements of current and voltage are processed by a powerful signal processor. Other values are calculated, e.g. U_{12}, U_{23}, U_{13}, P, Q, S, f, etc. Both groups of inputs are galvanically isolated from the remaining part of the unit with 4 kV AC isolation for one minute. This isolation is also between both groups of analogue inputs and between individual current inputs.

The card provides two blocks of protective functions with the option of local and remote indication of faults and provides faults recording. From the protective functions, the functions ANSI 27/59, 46BC, 47, 50, 50N, 51, 51N, 67, 67N are supported, along with voltage and frequency protection, current and voltage asymmetry and sensitive directional earth fault protection.

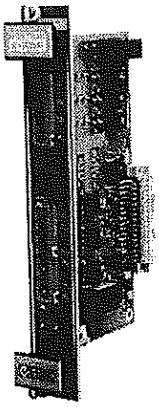
There are six programmable LED indicators on the front panel of the card that can be used for local signaling of faults. For the local reset of the signaling, it is possible to use the RST button whose function can also be programmed.

EP card with DI/DO with 4V and 4I measurement

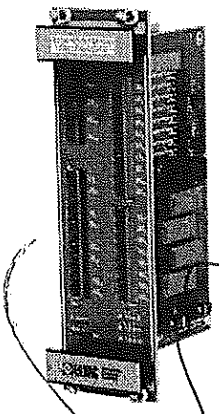
Compared with EP cards without DI/DO, these cards are fitted with digital inputs and outputs and with analogue inputs for measurement of I_0 and U_x (for measurement of U_0 or other voltage variable). The card can serve as complete protection with the option to control the power element on the lines. Cards are produced with eight digital inputs and four digital outputs. Through the card parameterization, it is possible to set the source of measurement I_0 and U_0. The card can calculate I_0 and U_0 from the measurements of the phase currents and voltages or can measure them via fourth analogue inputs. This solution increases the sensitivity and accuracy of earth fault protection, if summation measuring current and voltage transformers are available.

Similarly to EP card without DI/DO, all protective functions are available, as well as fault recorder. In addition, automation functions for reclosing and disconnection in the voltage-free pause are available.

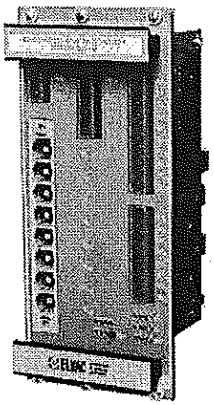
According to the type of the card, digital inputs are designed for various values of signaling voltages 24, 48, 110 and 220 V DC. They can be connected as active or passive.



EP card 3U3I
without DI/DO



EP card 4U4I
with 8DI 4DO



EP card 4U4I with 8DI 4DO, 5A inputs
with 30x overloadability

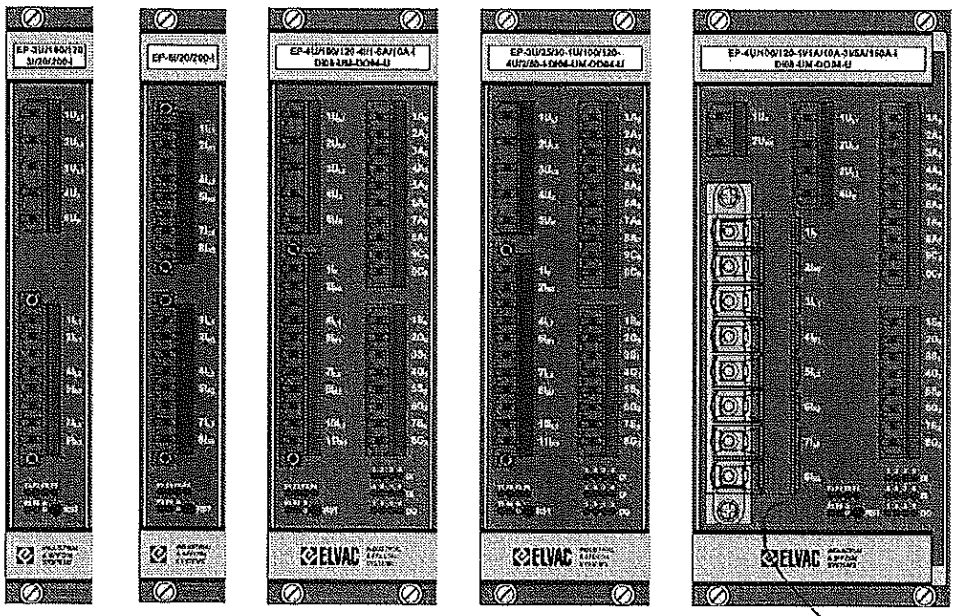
EP cards with special combinations of inputs

EP cards are designed with certain number of analog and inputs that can be combined according to the needs of customer. After consultation with the producer, it is possible to prepare special combination of voltage or current inputs adjusted to the specific range of sensors used in given application. All protection functions, automation functions and fault logger are available (same as EP cards with 4U 4I measurements). Using this way have been developed especially cards for recloser applications and remote-controlled LBU`s, where are used different types of current and voltage sensors:

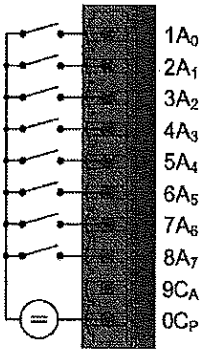
Typical applications with special EP cards with DI/DO

- with sensors FSI 36 and FSU 36,
- with capacitive sensors VSO 25,
- for GVR reclosers,
- for Tavrida reclosers (including the solution with Rogowski coils for current measurements).

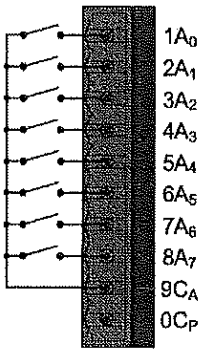
Standard combinations of cards are mentioned in the Ordering information table at the end of this chapter.



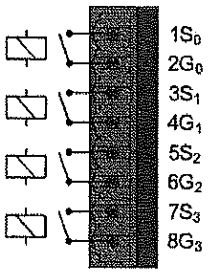
Examples of front panels of EP cards in 1-slot, 2-slot and 3-slot version



Passive DI connection



Active DI connection



DO connection

Product code description of EP cards

RTU7M EP-4U/100/120-4I/20/200-I-DI08-U M-DO04-U

- Product group
- Number of voltage inputs (optionally AC or DC only)
- Nominal range of voltage inputs
- Range for overloading of voltage inputs
- Number of current inputs (optionally AC or DC only)
- Nominal range of current inputs
- Range for overloading of current inputs
- Isolation of inputs and the rest of card
- Eight digital inputs
- Indirect DI card
- Signaling (excitation) voltage level for DI
- Four digital outputs
- Indirect DO card

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General parameters of EP cards

Signal processing	Its own processor, 16-bit A/D converter
Position in bus	Any position

Voltage inputs specification

Part of code	0.225/2.25	0.225/6.75	2/60	2.2/2.64	2.5/3
Inputs type	Isolation 4 kV AC for 1 min. from other parts of unit and second analog inputs group.				
Nominal range	0.225 V AC ±0.225 V DC	0.225 V AC ±0.225 V DC	2 V AC ±2 V DC	2.2 V AC ±2.2 V DC	2.5 V AC
Overloadability	2.25 V AC perm. ±2.25 V DC perm.	6.75 V AC perm. ±6.75 V DC perm.	60 V AC perm. ±60 V DC perm.	2.64 V AC perm. ±2.64 V DC perm.	3 V AC perm.
Range in RTU UC	0–2.25 V	0–6.75 V	0–60 V	0–2.64 V	0–3 V
Input consumption	1 mW by 2.25 V	1.7 mW by 6.75 V	35 mW by 60 V	1 mW by 2.64 V	1.5 mW by 3 V
Measuring accuracy (nominal range)	±0.3 %	±0.5 %	±0.5 %	±0.3 %	±0.3 %
Measuring accuracy (overloaded)	±0.3 %	±0.3 %	±0.3 %	±0.3 %	±0.3 %

Part of code	3.25/3.9	4/4.8	25/30	100/120	230/295
Inputs type	Isolation 4 kV AC for 1 min. from other parts of unit and second analog inputs group.				
Nominal range	3.25 V AC ±3.25 V DC	4 V AC	25 V AC ±25 V DC	100 V AC ±100 V DC	230 V AC ±230 V DC
Overloadability	3.9 V AC perm. ±3.9 V DC perm.	4.8 V AC perm.	30 V AC perm. ±30 V DC perm.	120 V AC perm. ±120 V DC perm.	295 V AC perm. ±295 V DC perm.
Range in RTU UC	0–3.9 V	0–4.8 V	0–30 V	0–120 V	0–295 V
Input consumption	1.6 mW by 3.9 V	1.6 mW by 4.8 V	2 mW by 30 V	70 mW by 120 V	0.1 W by 295 V
Measuring accuracy (nominal range)	±0.3 %	±0.3 %	±0.3 %	±0.3 %	±0.3 %
Measuring accuracy (overloaded)	±0.3 %	±0.3 %	±0.3 %	±0.3 %	±0.3 %

0368

Current inputs specification

Part of code	5/150	20/200	20/600	1/2A
Inputs type	Isolation 4 kV AC for 1 min. from other parts of unit and second analog inputs group. Individual current inputs are mutually isolated.			
Nominal range	5 mA AC ±5 mA DC	20 mA AC ±20 mA DC	20 mA AC ± 20 mA DC	1A AC ± 1 A DC
Overloadability	150 mA AC perm. ± 150 mA DC perm. 0.5 A AC for 1 s ± 0.5 A DC for 1 s	200 mA AC perm. ±200 mA DC perm. 2 A AC for 1 s ±2 A DC for 1 s	600 mA AC perm. ± 600 mA DC perm. 2 A AC for 1 s ± 2 A DC for 1 s	2 A AC perm. ± 2 A DC perm. 30 A AC for 1 s ± 30 A DC for 1 s
Range in RTU UC	0–150 mA	0–200 mA	0–600 mA	0–2 A
Input consumption	25 mW by 150 mA	35 mW by 200 mA	0.1 W by 600 mA	0.27 W by 2 A
Measuring accuracy (nominal range)	±0.5 %	±0.3 %	± 0.5 %	±0.3 %
Measuring accuracy (overloaded)	±0.3 %	±0.3 %	± 0.3 %	±0.3 %

Part of code	1-5A/10A	1A/20A	1A/30A	5A/150A
Inputs type	Isolation 4 kV AC for 1 min. from other parts of unit and second analog inputs group. Individual current inputs are mutually isolated.			
Nominal range	1 A AC ±1 A DC	1 A AC ± 1 A DC	1 A AC ± 1 A DC	5 A AC ± 5 A DC
Overloadability	5 A AC perm. ±5 A DC perm. 10 A AC for 1 min. ±10 A DC for 1 min. 100 A AC for 1 s ±100 A DC for 1 s	5 A AC perm. ±5 A DC perm. 10 A AC for 1 min. ±10 A DC for 1 min. 100 A AC for 1 s ±100 A DC for 1 s	8 A AC perm. ± 8 A DC perm. 20 A AC for 1 min. ± 20 A DC for 1 min. 100 A AC for 1 s ± 100 A DC for 1 s	20 A AC perm. ± 20 A DC perm. 150 A AC for 1 min. ± 150 A DC for 1 min. 500 A AC for 1 s ± 500 A DC for 1 s 1250 A peak for 100 ms
Range in RTU UC	0–10 A	0–20 A	0–30 A	0-150 A
Input consumption	0.85 W by 10 A	1.7 W by 20 A	5 W by 30 A	7 W by 150 A
Measuring accuracy (nominal range)	±0.3 %	± 0.5 %	± 0.5 %	± 0.5 %
Measuring accuracy (overloaded)	±0.3 %	± 0.3 %	± 0.3 %	± 0.3 %

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0369

Technical specification of digital inputs and outputs of EP cards

Part of code	DI08-UM-DO04-U	DI08-UL-DO04-U	DI08-UPX-DO04-U	DI08-UPXL-DO04-U
Inputs number	8			
Inputs type	Active (dry contact switching) Passive (switching by ext. voltage, both polarities)		Passive (switching by external voltage, both polarities)	
Level H of active DI Level H of passive DI	Closed 20–60 V	Closed 35–60 V	– 75–150 V	– 150–300 V
Level L of active DI Level L of passive DI	Open 0–10 V	Open 0–17 V	– 0–20 V	– 0–60 V
Input current of active DI Input current of passive DI	2.4 mA 1.9–6 mA	2.4 mA 1.7–3 mA	– 1.3–2.7 mA	– 1–2 mA
SW filter for level H and L	0–16777.215 seconds, step 1 ms			
Allowed number of changes per min.	0–255			
Isolation voltage	4 kV AC for 1 minute			
Outputs number	4 × relay (NO contact)			
Time of closed contact	10 ms to 655 s, step 10 ms			
Isolation contact-coil	5 kV AC for 1 minute			
Isolation between open contacts	1 kV AC for 1 minute			
Contacts load	8 A/250 V AC, 8 A/24 V DC			
Durability	2×10^7 cycles			
Relay switching	Protected against accidental switching			
Connectors	1 × WAGO 231-310/026-000, 1 × WAGO 231-308/026-000, part of delivery			
Wire cross-section	0.08–2.5 mm²			

Power consumption of EP cards

- one-slot card – voltage and current measurement – 1.6 W,
- two or three-slot card – voltage and current measurement combined with passive DI/DO – 3.1 W,
- two or three-slot card – voltage and current measurement combined with active DI/DO – 3.5 W.

Available combinations of EP cards - supported sensors and transformers

According to above mentioned list of voltage, current and digital inputs and outputs, there can be delivered different I/O combinations of EP cards. Some of them are standardly available, some of them can be prepared on demand. Then the combination can perfectly fit into any application with sensors used by different customers. Actual situation can be checked with producer.

There are typically supported the following sensors and transformers:

Voltage measurement:

- direct measuring of 230 V AC,
- measuring transformers with 100 V output,
- other measuring transformers with outputs lower than 230 V AC,
- capacitive dividers - example brand KPB Intra,
- resistive type sensors with output 3.25 V – example brand Zelisko,
- capacitive type sensors with output 3.25 V – example brand TE Connectivity,
- voltage sensors in different types of Reclosers – Tavrida, GVR, Siemens and others.

Current measurement:

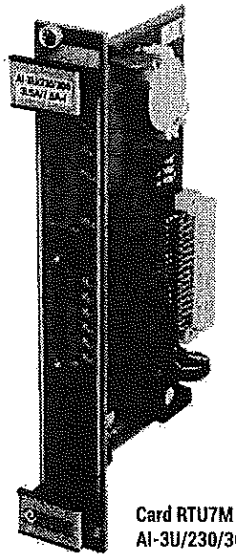
- standard current transformers with 1 A or 5 A outputs,
- split-core or closed core current transformers with outputs from 1.66 mA up to 5 A,
- current transformers with voltage outputs 225 mV – example brand Zelisko,
- Rogowski coils.

0370

RTU7M AI-3U3I – quality metering card

General description

This card is designed for measurement of voltages and currents in three-phase systems with consecutive evaluation of quality of electrical energy (measurements in class S) and associated pointers, what is providing a complex picture about distribution grid and energy stream. Measured data can be stored into database and then analyzed and evaluated in SW application ENVIS (free of charge). System can send regular reports about the power quality in given time period or can send automatic alarms, if some selected parameters exceed the set values.



Card RTU7M
AI-3U/230/300-3I/5A/7.5A-I

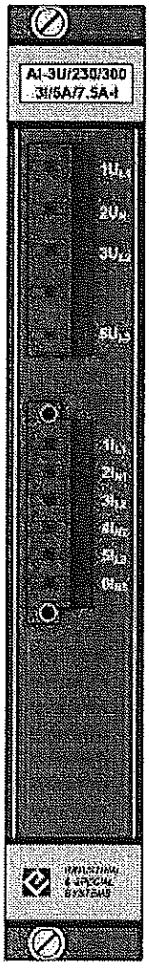
Typical applications

- power quality metering,
- diagnosis and searching for causes of problems in network,
- remote monitoring of energy consumption or production.

Basic features

- three or four independent voltage and current inputs (3x1p, 3p-wye, 3p-delta),
- energy meter supports 3 tariffs, single and three phase measurement in four quadrants for active and reactive energy,
- measurement U, I, P, Q, S, harmonic distortion power, PF, cos φ, symmetrical components, unbalance factor, THD, 50 harmonics, fundamental harmonics, frequency, active energy, reactive energy,
- 512MB memory for data logging,
- internal battery for 1 hour power backup,
- standards IEC61557-12, EN50160, class S.

Front panel RTU7M
AI-3U/230/300-3I/5A/7.5A-I



Technical specification

Card	RTU7M AI-3U/230/300-3I/5A/7.5A-I
Voltage inputs number	3
Nominal range	3 × 230 V AC (wye, delta, aron)
Overloadability	300 V AC perm.
Range in RTU UC	4 - 300 V
Current inputs number	3
Nominal range	3 × 5 A AC
Overloadability	10 A AC perm., 90 A AC for 1s
Range in RTU UC	0,0125 - 7,5 A AC
Measuring accuracy (nominal range)	±0,05 %
Consumption	1W
Connectors	1× WAGO 231-536/108-000, 1× WAGO 231-935/001-000 (part of delivery)
Wire cross-section	0,08–2,5 mm²
Position in bus	Any position

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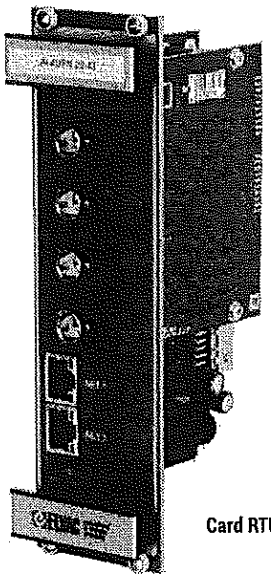
0371

RTU7M-AI-4UF – fast analog input card

General description

Fast measuring card is indirect card (card with internal CPU communicating through the internal serial bus with communication CPU) equipped with A/D converter and powerful signal CPU for processing of measured signals with fast changes. The card is equipped with 2 Ethernet ports, that allow to transfer a huge amount of data directly into communication card without occupation of internal bus.

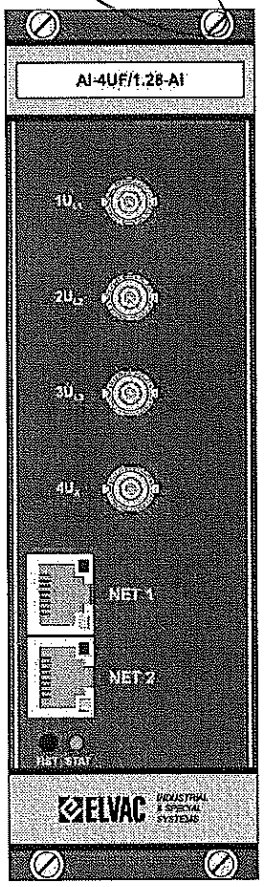
This card is designed for measuring of fast voltage signals from various sensors. There are four voltage inputs, that are galvanically isolated from the rest of unit, but not between each other. The inputs are fitted with BNC connectors with input impedance 75 Ohms. The measuring range is adjustable in parameterization. Maximal voltage value on input is 1.28 V. Voltage is measured by 8-bit A/D converter with maximal sample rate 40MS/s. The card processes the signal from 10Hz to 20MHz. The upper frequencies are limited by fourth-order filter to 20 MHz.



Card RTU7M AI-4UF/1.28-AI

Typical applications

- fault detection on isolated overhead MV lines (contact of isolation with vegetation, subject lying on lines, conductor fallen on the ground),
- early warning of insulation failure and its transition into the earth fault or short circuit.



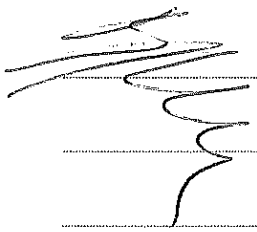
Front panel of RTU7M AI-4UF/1.28-AI

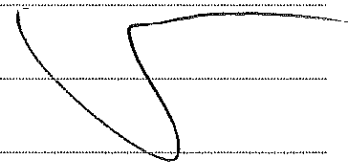
Technical specification

Card	RTU7M AI-4UF/1.28-AI
Inputs	4
Measured variable	Voltage
Maximal measured value	1.28 Vpeak
Overloadability	4.3 V AC
Inputs type	Isolated 4 kV DC for 1 second from rest of the unit
Input impedance	75 Ω
Signal processing	8-bit A/D converter
Measured frequencies	10 Hz – 20 MHz for 3dB decrease
Accuracy	1% (10kHz, 25 °C)
Measuring category	CAT III, 150V
Sampling	According to used FW, usually 40 MS/s
Interfaces	2 × Ethernet 10/100 Mbps, embedded isolation 1,5 kV AC / 1 minute
Memory	SRAM 4MB
Connectors	4 × BNC, 2 × RJ-45
Consumption	6 W
Position in 5 / 8–10 / 16 slots bus	Any position

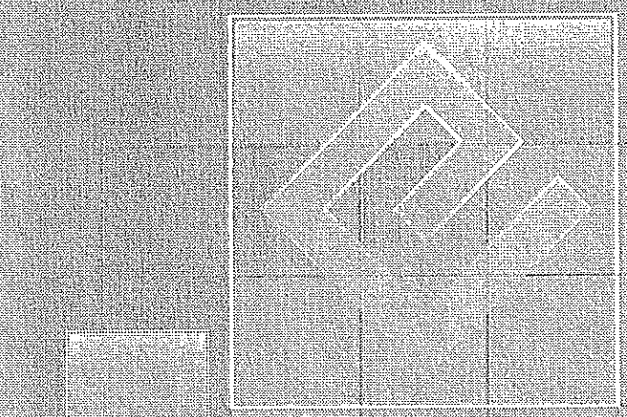
0372

Notes





Signaling and HMI panels



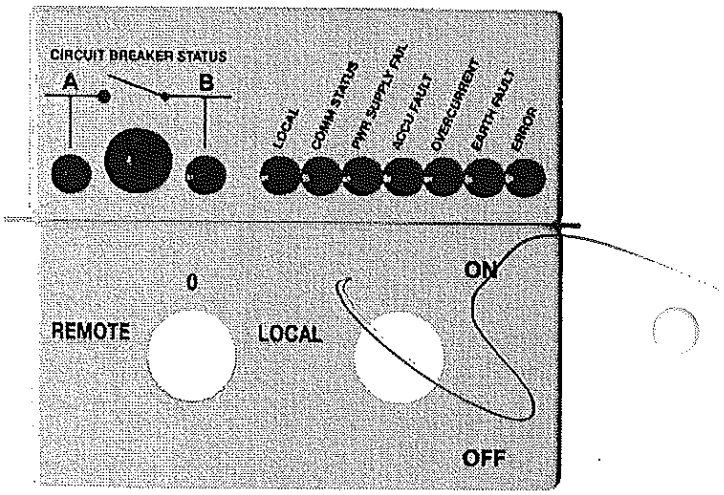
Panel SIG-D-EXTxx

General description

This panel is designed and adapted for mounting to the RTU7M modular units. It is fitted with LED indication, control buttons and a switch for local and remote control. The panel is used in the power industry applications, mainly for remotely controlled disconnectors and remotely controlled reclosers. There are signaled the statuses of the disconnector, as error statuses on the lines, the communication and the backup battery statuses.

The panel is typically installed so that after opening the switchboard cabinet door, only this signaling and control panel is visible when passing through the sub-panel which covers the other electronic system, including RTU. As the panel is mounted directly on the RTU7M unit, it is not necessary to use the sub-panel if the user does not require it.

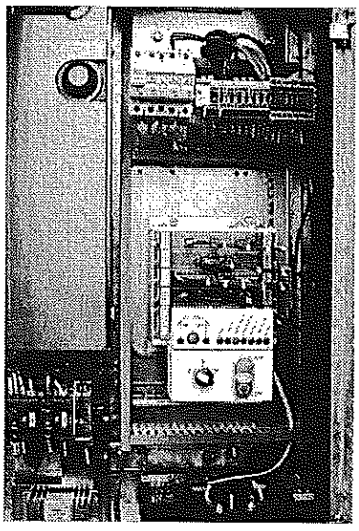
SIG-D-EXT can be connected to the RTU7M unit using the RS-485 line. The supply voltage for this panel is installed on the same communication line (RS-485). The panel can be supplied on client demand in a version where the signaling is solved using electro-magnetic flip dot signs instead the LED. In this case, the status after the RTU switch off remains displayed.



Signaling panel SIG-D-ETX without fitted switch and buttons

Technical specification

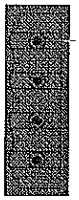
Panel	SIG-D-EXT05	SIG-D-EXT12	SIG-D-EXT24
Number of LED	10 × LED (9 × red LED ø 5 mm and 1 × red-green LED ø 10 mm)		
Communication with RTU	RS-485		
External power supply	5 V DC	9–18 V DC (max. 3 W)	18–36 V DC (max. 3 W)
Consumption	1 W		
Connector	1 × WAGO 231-304/026-000, part of delivery; wire 0,08–2,5 mm²		
Operating temperature	-20 to +55 °C		
Storage temperature	-30 to +75 °C		
Ambient relative humidity	5 % – 95 % non-condensing		
Ingress protection	IP20		



Example of application with signaling panel

Connector wiring on SIG-D-EXTxx

Pin	Description
+, -	Power supply
A, B	Signals of communication line RS-485



Connector on rear panel

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0375

Panels ESP7

General description

Panel ESP7 – basic version

This panel is fitted with 22 LEDs, where the function can be configured using the standard parameterizing software supplied with RTU (RTU User center). The parameterization is carried out in the expressions editor. The RTU FW must be 105.02 or higher. The function of the individual LED can be set on the basis of the internal statuses of the RTU (digital inputs, digital outputs, analog inputs, virtual analog and digital inputs, internal statuses, etc.). Permanent on or off, fast or slow flashing, response delay, etc. can be set for each LED. The description of the LED functions on the front panel can be changed by the user using insert labels. This signaling panel is powered by the voltage which is available on RS-485 connector of the communication interface on the RTU7M. Therefore it is not necessary to solve the backup of the power supply for the signaling panel. Interconnection is via a direct cable with RJ-45 terminals on the rear of the panel.

Panel ESP7-2ETH/F-xxx

This version of signaling panel contains the same number of signaling LEDs as the basic version, but it communicates with RTU via an Ethernet interface. The same options for individual LED setting and displaying are valid as in basic version. Unlike the basic version, this panel has the option of configuration via the web interface.

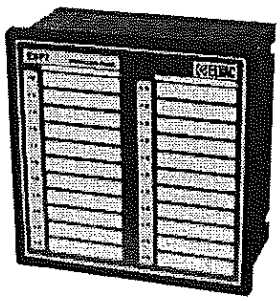
The panel has two RJ-45 communication connectors - from the front part of the panel, the other from the rear (the panel works as a 2-port Ethernet switch). In the rear of the panel are a power supply connector and a reset button for the initial parameters setting of the Ethernet interface. The panel can be connected to all RTU7M, RTU7K/KL and RTU7.4 units that have an Ethernet communication interface.

Panel ESP7-2ETH/F-LCD-xxx

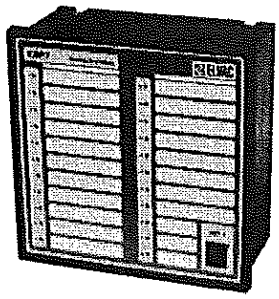
Against previous, a third version of signaling panel contains only 12 signaling LEDs. However, is equipped with an LCD display for displaying of measured values and control buttons for possible changes of selected parameters. Panel can be powered by DC or AC voltage, see table below.

Panel ESP7-60-DTS and ESP7-2ETH-60-DTS

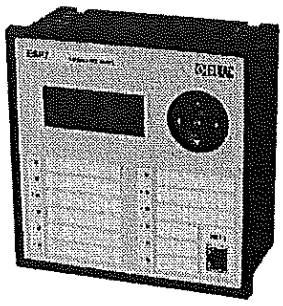
These panels were designed as an extension of previous types and offer direct status displaying and control of up to 4 feeders in switching stations and substations. It indicates the states of load break switch in feeder, earthing knife and any fault. Each feeder can be controlled by pushing button OK and button On or Off simultaneously, which ensures safe operation. These panels can be connected more in chain, so more feeders can be indicated and controlled. It is equipped with wide range power supply for 24 V and 48 V system support.



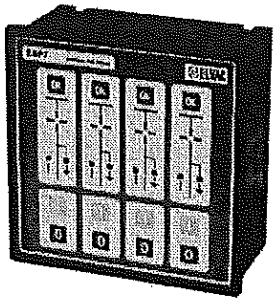
Panel ESP7 – serial line version



Panel ESP7-2ETH/F-230



Panel ESP7-2ETH/F-LCD-xxx



Panel ESP7-60-DTS

0376

Technical specification

Panel	ESP7	ESP7-2ETH/F-230	ESP7-2ETH/F-LCD-xxx	ESP7-60-DTS	ESP7-2ETH-60-DTS
Status signaling	22 × LED (ø 3 mm, green)	22 × LED (ø 3 mm, green)	12 × LED (ø 3 mm, green)	8 × LED, 4 x cross LED (green and red)	
Display	–	–	Alphanumeric LCD, 4x16 characters	–	
Keyboard	–	–	4x navigation button, 1x OK	12 × control buttons (3 × button for each feeder)	
Communication with RTU	1 × RS-485	2 × Ethernet 10/100 Mbs (front + rear)		1 × RS-485	2 × Ethernet 10/100 Mbs
External power supply	5 V DC	90–260 V AC / 90–270 V DC	(optionally 24V DC or others)	10–60 V DC	
Consumption	Max. 1 W	Max. 11 W	Max. 3 W	Max. 2 W	
Communication connector	1× RJ-45	2 × RJ-45		1× WAGO	2 × RJ-45
Powering connector	–	1 × WAGO 231-302/026-000			
Power supply wire cross-section	–	0.08–2.5 mm²			
Dimensions	144 × 144 × 71 mm (W × H × D)				
Mounting hole dimensions	138 × 138 mm				
Max. thickness of the mounting sub-panel	Max. 5.5 mm				
Installation depth	64 mm (without connectors)				
Operating temperature	-20 to +55 °C				
Storage temperature	-30 to +75 °C				
Ambient relative humidity	5 % – 95 % non-condensing				
Ingress protection	IP20 (optionally IP54 on front panel)				

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0377

Panel ERIC TCP/SP

General description

Panel ERIC TCP/SP is the set of two devices, which work as user interface for ELVAC RTUs. The core is created by a touch control panel (TCP) with installed application ERICA, which works as a viewer of web interface in ELVAC RTU and a communicator for side panel (SP) connected into TCP. Side panel has three functions. Main function is the button Execute, which carries out the chosen action on TCP screen. This increases the security to prevent an accidental control. Another function of SP is an indication Attention, which can be user defined, for example for some system alarms signalization. Third function is the motion sensor, which automatically wakes up the TCP, when somebody is close, what saves the energy and screen. Some types of applications do not need SP, so the system can operate without it.

The set uses state of the art technologies and an average IT user is able to create a graphic application interface and setup of a control functions. It is possible to define any pictures, menu etc. for easy switching between screens and to display a data from ELVAC RTU in certain places or to define the control commands.

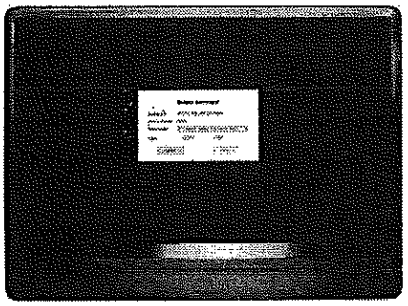
The set can be mounted in front panel (door) holes or in 19" rack using the reduction 5U panel.

Typical applications

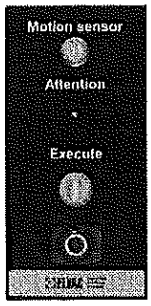
- user interface of control systems for substations, secondary substations etc.,
- user interface for applications like EMS, building management, family houses etc.,
- substitution of easy local SCADA system in substations, renewable energy sources etc.

Technical specification

Panel	ERIC TCP/SP
Size of TCP touchscreen	8"
Communication with ELVAC RTU	Ethernet
Communication TCP and SP	Cabling is a part of delivery
External power source voltage	24 V DC
Power supply connector	2-pin terminal block
Wire cross-section	1.5–2.5 mm²
Dimensions of TCP	219 × 163 × 47 mm (W × H × D)
Dimensions of mounting hole for TCP	170 × 119 mm (W × H)
Dimensions of SP	72 × 144 × 84 mm (W × H × D)
Dimensions of mounting hole for SP	67 × 136 mm (Š × V)
Installation depth (TCP / SP)	26 / 75 mm
Operating temperature	-10 to +50 °C
Storage temperature	-20 to +60 °C
Ambient relative humidity	5 % – 90 % non-condensing



ERIC TCP



ERIC SP

Basis features

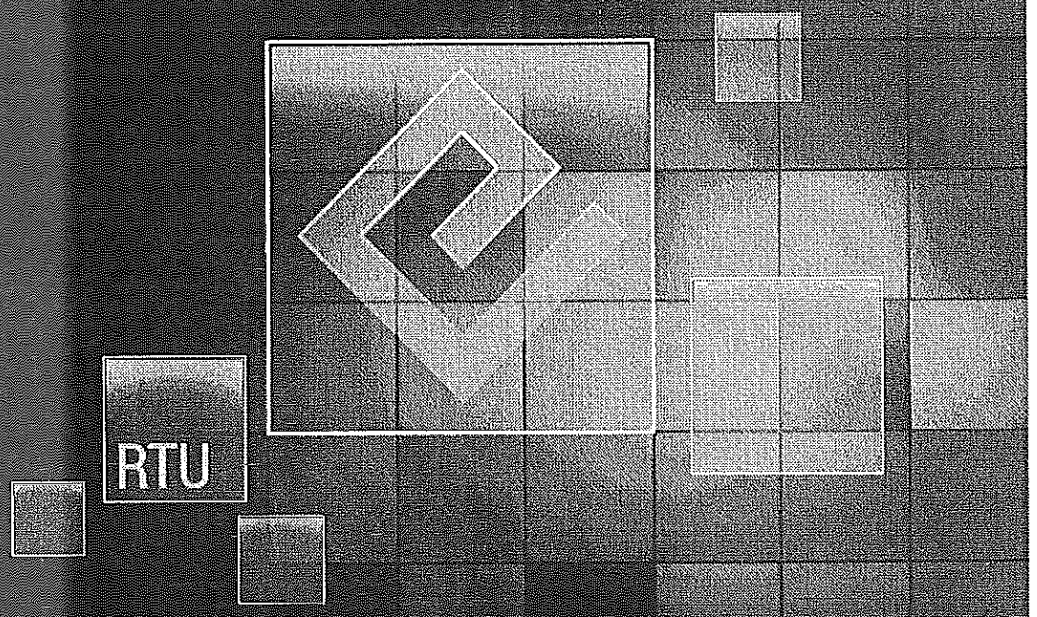
- graphical intuitive interface and displaying of applications data for applications controlled via ELVAC RTU,
- unlimited number of read details (DI states, measurements etc.) and controlled outputs (DO), given only by RTU system configuration,
- button On/Off for selected command execution,
- alarms signalization, source of alarm can be shown on display,
- automatic wake up by motion sensor,
- another options, like switching of local and remote control, signaling reset etc.,
- substitution of complicated cabling used in other types of signalization,
- saves the number of inputs and outputs in RTUs, which are usually used for other types of signalization.

19" cabinet with ELVAC RTU and ERIC TCP/SP

0378

Notes

RTU accessories



GSM and GPS antennas

ELVAC RTUs are used with GSM antennas with these types of connectors:

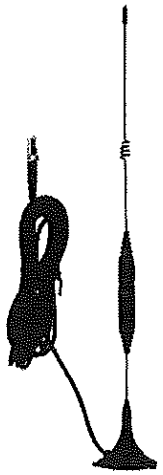
- FME – the most frequently used version by ELVAC RTU. The female antenna connector has an outside thread and the RTU has a male connector with an inside thread,
- SMA – male antenna connector with inside thread and the RTU has a female connector with an outside thread.

In addition to the required type of connectors, for the specification it is necessary to mention the following requirements for the type of antenna:

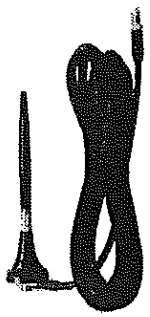
- antenna is fastened directly to RTU connector or through the cable with defined length,
- outdoor or indoor placement,
- type of fixation of the antenna rod - magnetic, screwed,
- a gain of the antenna in dB.

According to these specifications, we can provide the most suitable type of the antenna. The most frequently used types of GSM aerials are in the pictures.

GPS signal used in systems for time synchronization can be received through outdoor screw GPS antenna. An example is the type in the picture.



Magnetic GSM antenna 5dB
for indoor use
with connector FME
with length of cable 3 m



Screw GSM antenna 3dB
for outdoor use
with connector FME
with length of cable 4.5 m

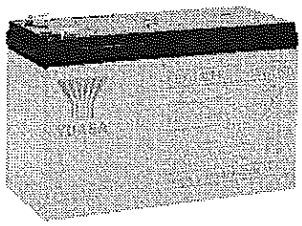
Screw GPS antenna 30 dB for outdoor use
with connector SMA with length of cable 3 m

Backup batteries

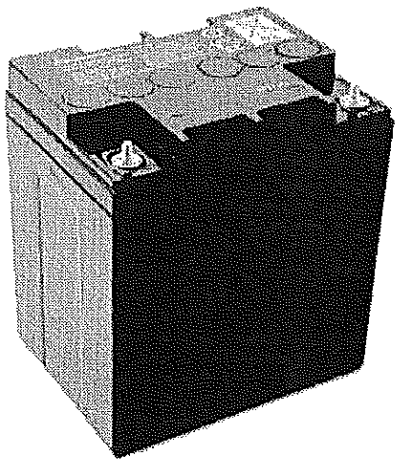
ELVAC RTUs use lead acid batteries with the voltage 12V for backup. The capacity is chosen according to the system consumption and the operation time when powered from battery.

Two most frequently used types are shown in the pictures. The upper one shows the battery with capacity 7Ah used for backup of the separate RTU. The lower one shows the battery with capacity 28Ah used for powering the RTU including another devices, like motor of disconnector. These batteries are connected two into 24V backup.

We can provide for smaller types also battery holders for DIN rail or panel.



Battery 12 V/7 Ah



Battery 12 V/28 Ah

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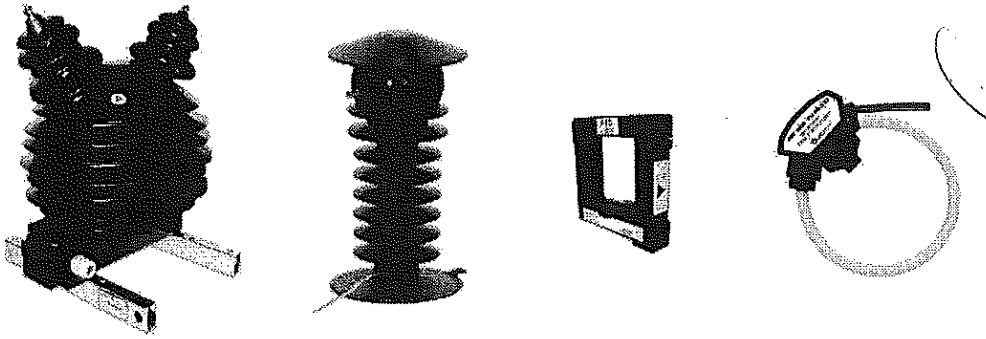
Measuring transformers, power supply transformers and sensors

In situations where the measured variable achieves values outside the range of measuring inputs, various types of transformers and sensors are used which modify the signal for the required range. We offer:

- power supply (interphase) transformers,
- measuring voltage transformers,
- measuring current transformers,
- measuring current transformers with split core,
- capacitive sensors for voltage measuring,
- Rogowski coils.

The measuring range of cards can be modified via external modules with the following labels:

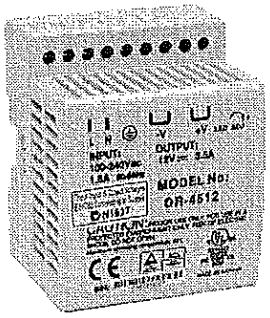
- EXT AI-MTI for current measuring,
- EXT AI-MTU for voltage measuring.



Power supply transformer, capacitive sensor for voltage measurement, measuring transformer with split core and Rogowski coil

External power supplies

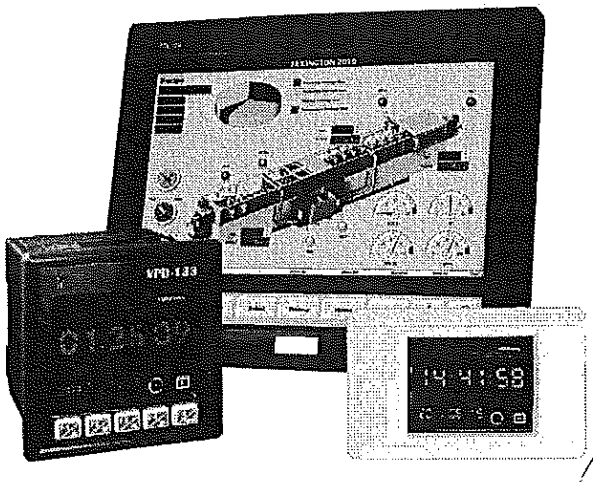
In some cases, due to various reasons regarding the RTU configuration, it is necessary to use an external power supply. We offer high-quality and reliable power supplies from verified brands.



Power supply 12 V for mounting on DIN rail

Panel computers and HMI

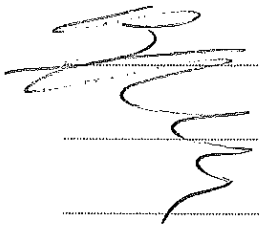
In modern energy applications, there are requirements for high-quality visualization of monitored processes, simple control and setting of required parameters. Wide range of panel computers and HMI panels connected through Ethernet interface or RS-485 can be used for these purposes. The powerful processors with the required LCD displays with touchscreen, eventually with membrane keyboards for easy control, fully satisfy all requirements. Of course, we offer custom configurations including HMI applications for controlling and SCADA systems, dispatchers and server workstations.

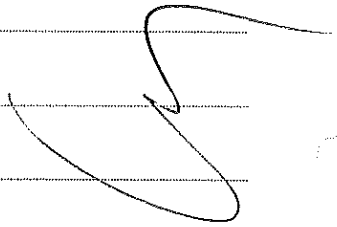


Examples of panel PCs and HMIs

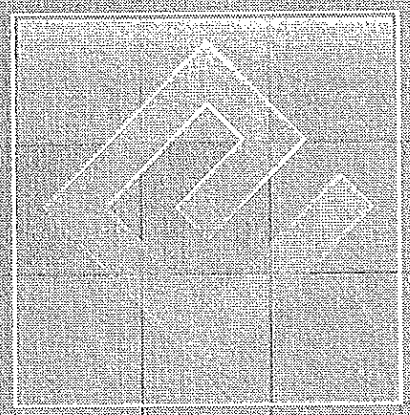
0382

Notes





Testing devices



EPG7

General description

The EPG7 is a compact generator of AC or DC three-phase currents in values up to the tens of mA primarily designed for testing of the correct functions of the measurements and protections of RTU units or other devices, where are the parameters of EPG7 suitable. The device can also be used as a simple process calibrator - the output current corresponds within the declared accuracy to the value shown on the display.

When fitted with a voltage card, the device can generate three-phase AC or DC voltage up to units of volts. There are 4 digital inputs and 4 digital outputs which can be used in advanced functions for testing of the protections.

All versions of the device are fitted with a 4-line LCD display with a rotary knob with an integrated control button. A USB interface is used for communication with the user SW. The analogue outputs, digital outputs, digital inputs and USB interface are galvanically isolated.

The device can be powered by 4 x AA NiMh batteries or from an external adapter. When powered from batteries, the operating time is approximately 2 hours (permanent generation of 45 mA AC currents on all outputs). The discharging of batteries is indicated by the LED diode. The internal fast charger has LED signaling of the charging process.

EPG7

Basic features

- three-channel currents generator in range 0 to 45 mA AC and 0 to ±60 mA DC,
- in extended version three-channel voltage generator 0 to 7 V AC and 0 to ±10 V DC,
- analog output protection against overloading with indication,
- 4 × DI and in extended version 4 × DO for tests of protections,
- alphanumeric LCD display and rotary knob with integrated button for easy control,
- powering from NiMH batteries or external adapter,
- integrated fast battery charger,
- USB 2.0 interface with galvanic isolation,
- wide range of user FW,
- optional user upgrade of FW according to demanded functionality,
- upper versions of FW can generate fault waveforms obtained from protections (format COMTRADE, proprietary format REC of ELVAC RTU),
- optional storage of generated waveforms in internal memory,
- upper function for tests of protection functions are in specialized FW,
- operating SW is available for PC.

EPG7 ways of using

- currents generation, eventually voltage, AC / DC,
- P, Q generation,
- phase to phase voltage setup,
- independent amplitude, frequency, phase setup for individual outputs,
- playing of records from protections (proprietary format REC from ELVAC RTU, COMTRADE),
- simulator of status of power element, including the interposition,
- optional control and reading of DI/DO,
- protection tests - current, earth, voltage, frequency,
- tests of fault currents indicators,
- test of reclosing,
- test of disconnecting in voltage-free pause,
- multichannel process calibrator.

Available HW variants of EPG7

Equipment according to variant	Basic	Advanced
Current AC/DC outputs	3	3
Voltage AC/DC outputs	-	3
Digital inputs	4	4
Digital outputs	-	4
Batteries	-	4 × NiMH AA
Power adapter	-	230 V AC / 9 V DC
Type of FW	Basic	Basic + Voltage generator

Note: FW versions, which are not mentioned in equipment of given version, are extra cost.

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0385

Description of available FW for EPG7

Basic

The basic version of FW can generate AC or DC currents. Fixed frequency 50Hz and phase shift 120° are set for AC waveforms. The user only changes the amplitude of the generated signal - the same in all three phases. There is the option to read DI. This SW module is always available.

Voltage generator

Generation of AC or DC currents and voltages. The other functions are the same as for the basic FW. In addition, the option to control and read DI/DO is available.

Function generator

It enables to set independent amplitudes, frequencies and phase shifts on individual voltage and current outputs.

Record player

Option to play fault records from protections (formats COMTRADE, proprietary REC) – requires SW on PC.

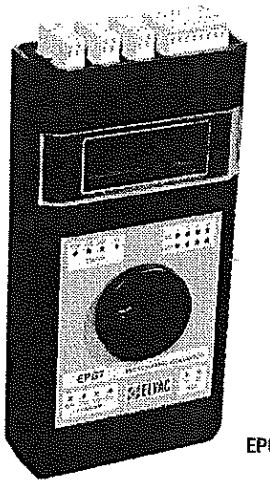
IPP tester

FW provides functions for automatic testing of the indicators of fault currents.

Protection tester

Automatic testing of protection in RTU units.

Individual modules can be mutually combined, according to the demand for the specific use. To activate, it is necessary to upload into the device the appropriate license bundled with the serial number (if the device is ordered together with the required configuration of FW modules, the appropriate licenses will be uploaded in the production).

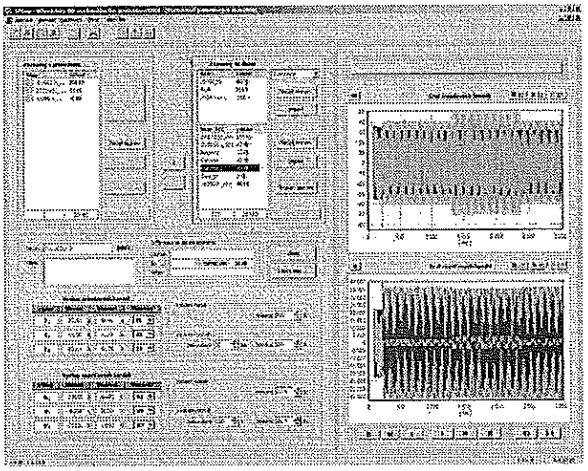


EPG7

User SW for EPG7

User software **EPGAP** for PC (OS MS Windows) can be purchased for using of the EPG7 with maximum comfort. The basic functions include firmware updates and the uploading of license numbers for FW modules. The number of functions accessible from the user interface corresponds to the options of the EPG7 according to the license of FW. Besides the comfortable control of all parameters (amplitude, frequency, phase, ...), it is possible, with the appropriate FW license, to download fault records from ELVAC RTU units in the REC format, or from any protection in the standard format COMTRADE, upload them into the generator memory and then to generate on its output. There is also the option to create own waveforms for specific testing purposes. There can be read from the generator an error statuses (diagnostics, checking of generated values is available) and timestamps of changes on digital inputs (DI data logger). The user interface also enables to set the digital outputs, eventually the parameters of the routines for automatic testing of the RTU units (including simulation of the response of the power element).

Bi-directional communication between the PC and the generator is ensured through an USB communication interface.



SW EPGAP

Summary of SW EPGAP functions

- operating parameters setting of generator in remote control mode, setting of primary and secondary values conversion, generating of V and I,
- user parameters settings of device,
- work with fault records,
- formats REC and COMTRADE,
- records player,
- records storage in device,
- uploading of records from device,
- FW updates,
- support of all EPG7 functions, tests of protections and automatics.

0386

Technical specification of EPG7 (according to the equipment of particular type)

Basic specification		
Display	LCD 16×4	
Control	Rotary knob with integrated button	
Power supply voltage	9 V DC	
Input protection	Polyswitch 2.5 A	
Backup battery	4 × NiMH AA, capacity 2100 mAh max.	
Charging current of battery	1.5 A	
Battery protection	Polyswitch 2.5 A	
Dimensions	196 (207) × 100 × 40 mm	
Weight	1 kg	
Operating temperature	0 °C to +50 °C	
Storage temperature	-20 °C to +75 °C	
Ambient relative humidity	5% – 95 % non-condensing	
Ingress protection	IP20	
Current outputs		
Number	3	
Generated currents ranges	45 mA AC / ±60 mA DC	
Accuracy of generated currents	±0.1 % from range	
Load impedance	Max. 100 Ω @ 45 mA AC	
Frequency of generated current	40–350 Hz	
Individual outputs phase shift setup	0–360 °	
Protection against current loop disconnection	Yes, indication of exceeding of maximal load impedance – LED AOF	
Signal processing	16-bit D/A converter	
Connectors	2 × WAGO 734-102; spacing 3.5 mm; part of delivery	
Wire cross-section	0.08–1.5 mm²	
Voltage outputs		
Number	3	
Generated voltages ranges	7 V AC / ±10 V DC	
Accuracy of generated voltages	±0.1 % from range	
Output current	Max. 30 mA AC	
Frequency of generated voltage	40–350 Hz	
Individual outputs phase shift setup	0–360 °	
Overload protection	Yes, indication of low load impedance connection – LED AOF	
Signal processing	16-bit D/A converter	
Connectors	2 × WAGO 734-102; spacing 3.5 mm; part of delivery	
Wire cross-section	0.08–1.5 mm²	
Digital inputs		
Number	4 digital inputs	
Signaling voltage	12 V / 24 V	
Inputs configuration	Active (dry contact)	Passive (switching by external voltage, both polarities)
Level H	Close	11–40 V
Level L	Open	0–8 V
Input current	6.6 mA max.	2–6.6 mA; 3.3 mA @ 12 V
Isolation voltage	1.5 kV DC for 1 minute	
Connectors	2 × WAGO 734-108; spacing 3.5 mm; part of delivery	
Wire cross-section	0.08–1.5 mm²	
Digital outputs		
Number	4 digital outputs	
Isolation voltage	3750 Vrms for 1 minute	
Switch loadability	1.75 A @ 35 V AC; 2.5 A @ 50 V DC	
Resistance in close status	0.1 Ω max.	
Connectors	1 × WAGO 734-108; spacing 3.5 mm; part of delivery	
Wire cross-section	0.08–1.5 mm²	
Communication interface		
Type	USB 2.0	
Connector	Mini USB B, 5 pins	
Isolation	4 kV for 1 minute	

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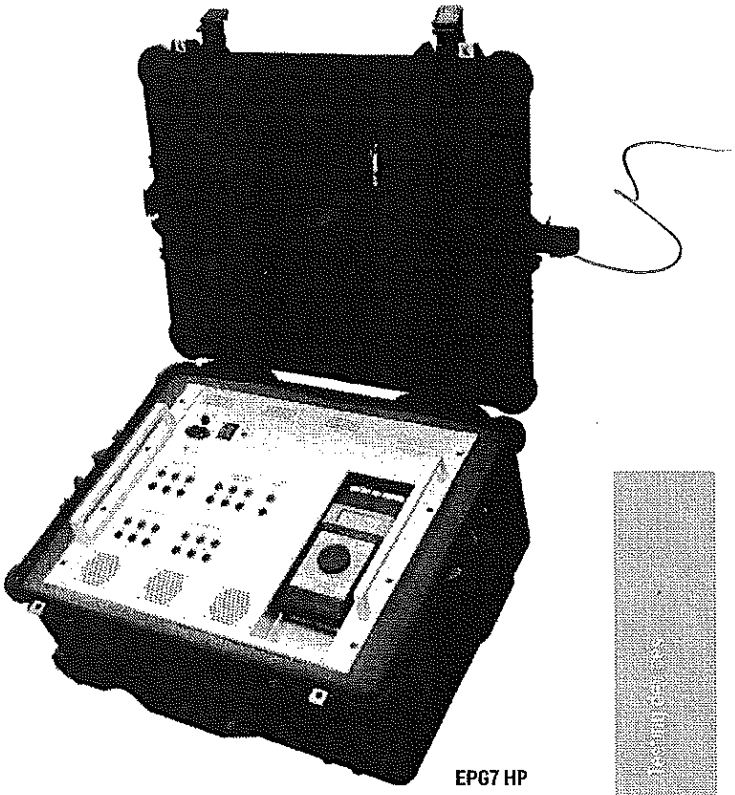
0387

EPG7 HP

Basic features

- expansion of generator EPG7 by power outputs,
- designed for testing the correct function of protection and measurements in the standard ranges (100 V, 1 or 5 A),
- communication between the generator and the power module, transmission of ranges, calibration and error messages,
- easy transport in case with wheels, the device can be removed and placed on a table,
- optional external battery pack, converter for powering from 12 / 24 V.



EPG7 HP

Technical specification

Current outputs	3 × max. 20 A AC
Voltage outputs	3 × max. 300 V AC
Amplitude control	0–100 % (signal from EPG7)
Frequency	40–350 Hz (signal from EPG7)
Angle between phases	0–360 ° (signal from EPG7)
Digital inputs	3 × optocoupler (from EPG7)
Digital outputs	3 × SSR (from EPG7)
Control and signaling	through EPG7
Communication	Connected with EPG7 through 1 × DI/DO
Powering	230 V AC, 50 Hz optional converter from 12 / 24 V optional battery pack
Dimensions	600 × 490 × 300 mm (case)
Weight	32 kg (with case)

0388

ELF7 – portable earth fault locator

General description

Definition of a specific earth fault location, based on values measured at suppling substations is still not fully satisfactory and reliable, so there is still necessary to perform visual inspections directly in the field. Portable device ELF7 was designed as a lightweight tool for the service teams to help them with searching of a problematic line segment.

The measurement is done directly under the overhead MV lines by a service technician – during evaluation process must be ELF7 in parallel orientation with the overhead lines, no matter in which direction. Locator can`t only automatically recognize an earth fault occurrence, but also can determine its relative position. So, the result of this process is a clear information, if the earth fault is behind or in front of a measurement point relatively to the supplying substation.

Basic features

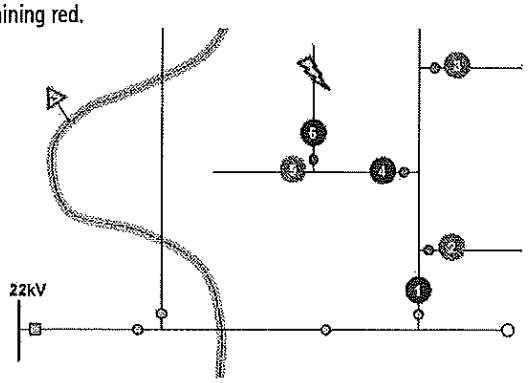
- fast and reliable determination of an earth fault location on compensated, isolated and low impedance earthed MV networks,
- contactless method based on electric and magnetic field measurement principle,
- simple and accurate definition of examined fault location – behind or in front of a measurement point relatively to the supplying substation,
- possibility of device configuration and fault records downloading via USB connector,
- acoustic and optical signalization, lightweight and durable case,
- rechargeable accumulator with status signalization (USB charging).

Main benefits

- significant reduction of time required to find a specific fault location,
- shortening of power outages,
- reduced number of necessary manipulations in the network,
- limitation of fire risk and other destructions caused by high current at the earth fault location,
- positive impact on SAIDI and SAIFI indicators.

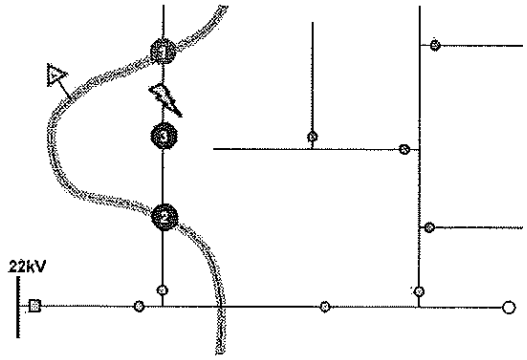
Example of use – a line segment with branches

The numbers below represent the measurement order, each colors represent the result of each measurements – so as a LED color on ELF7. Service technician performs the measurement on each branch - when the branch is affected by the earth fault, the LED is shining red.



Example of use – a long line segment

The numbers below represent the measurement order, each colors represent the result of each measurements – so as a LED color on ELF7. Service technician performs the measurement on places with easy access – for example directly from the road.



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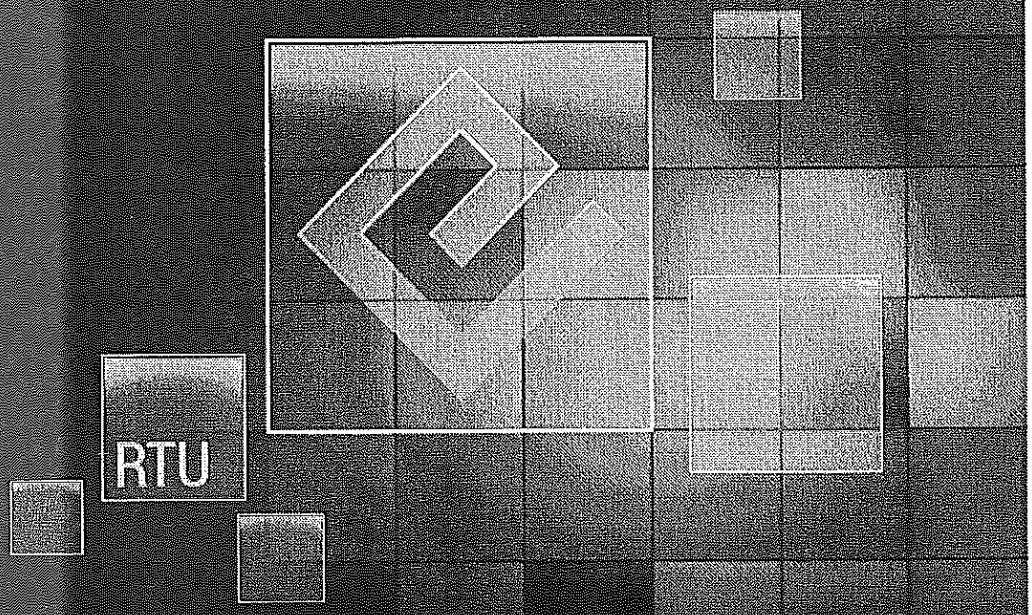
0389

Redundant power supply RPS II



RPS II

General description

In many critical applications, the necessary requirement is to ensure a permanent power supply for key equipment irrespective of any breakdown in the electric network. This requirement is usually solved by power supplies with battery backup (UPS), although this is not the only possible and technically suitable solution. UPS ensures the delivery of energy only during the limited time depending on the capacity of batteries, while batteries are often the source of problems from long term point of view. Their capacity decreases in time and it is necessary to ensure a regular maintenance. The alternative for reliable powering of electronic control systems is powering from two independent sources of electric energy, eventually from one primary source and centrally managed battery backup. For this purpose has been designed the redundant power supply RPS II.

This power supply has fully modular concept with wide range of diagnostic functions. Two input modules serve for the connection of independent sources at various voltage levels. It allows the using of two sources at 230 V AC, as well as any other combination of AC or DC sources. Their task is also to ensure the galvanic isolation of individual inlets.

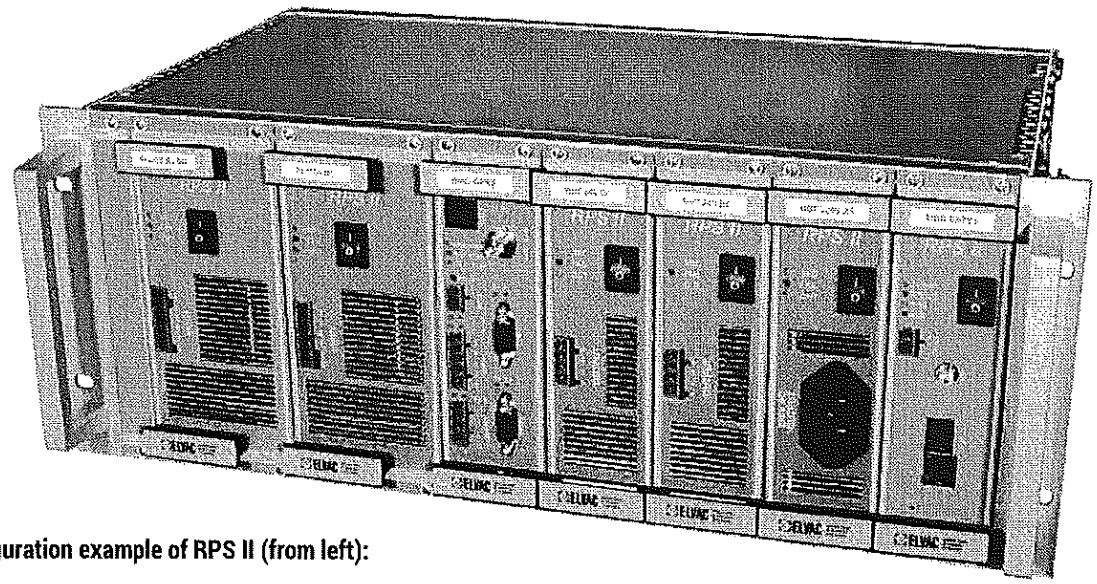
Up to four independent output modules can be fitted into the output positions. They ensure the conversion into needed voltage levels and also the overcurrent limitation, eventually another galvanic isolation for individual outputs.

All input and output modules can be replaced during the operation which enables to replace damaged modules or exchange with another type without the need to turn off the entire device. The unit is suitably completed by a diagnostic module in the version with an Ethernet or GSM interface for remote supervision and control of the device. The diagnostics provides information about the actual status of each module, value of the voltages and current consumptions. In addition, the ventilators in the box and the temperature on each module are checked.

The RPS II is the ideal power supply center for important technological equipment and devices.

Typical areas of use:

- control systems in energetics,
- control systems of important technology lines and machines in industry,
- telecommunication systems and industrial data networks,
- mobile measuring equipment (installation in vehicles, alternative power supply of 12/24 V DC or external inlet 230 V AC with optional switching during operation).



Configuration example of RPS II (from left):

- 2 x input cards with optional source voltage,
- 1 x diagnostic and communication card,
- 3 x output cards with optional output voltage,
- 1 x special card with integrated GSM modem and backup battery for communication backup.

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0391

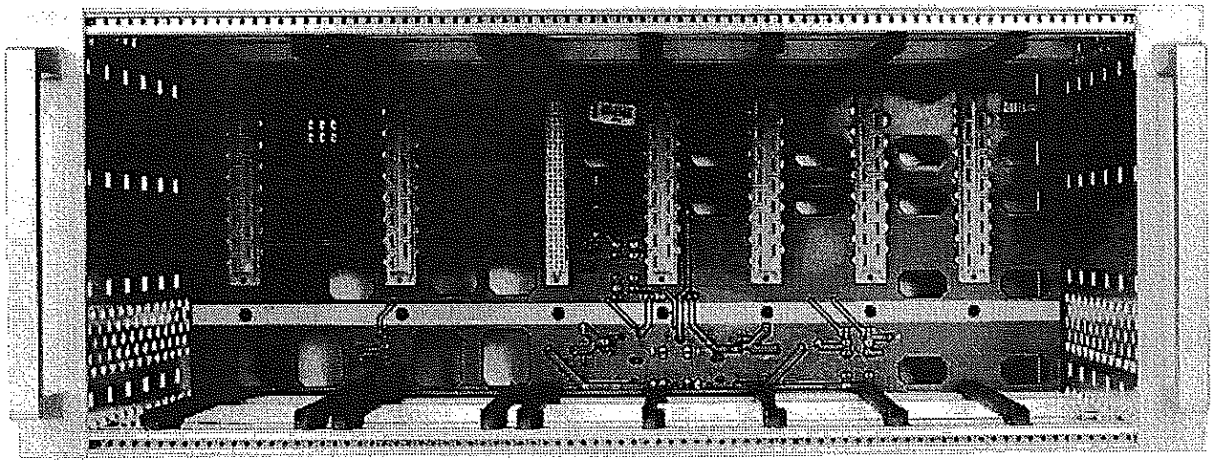
RPS II – chassis and bus

General description

The chassis and metal sheets are constructed from high-quality aluminum alloy with an anodizing surface treatment. The chassis has high mechanical stability and is designed for assembly into a 19" construction. In the chassis, which is fitted with a bus, is space for 7 modules. Input modules can be fitted into positions 1 and 2, while position 3 is designed for the diagnostic card and positions 4, 5, 6 and 7 are designed for output modules. The bus ensures the merging of the outputs of both input modules, the division of power between these modules in normal operation, separation of the disconnected or damaged module. From the merged 28.3 V voltage, the auxiliary 12 V voltage is stabilized which serves for the powering of thermally regulated ventilators and the control part of the output modules. 12 V is stabilized by two switching stabilizers in the redundant mode for increasing of the reliability (voltage 12 V A, 12 V B). If a diagnostic card is installed, the voltage values of 28.3 V, 12 V A and 12 V B are measured and transferred into the supervisory system. The maximum total permanent power supplied by all output modules connected to the bus is 250 W.

Basic features

- 2 positions for input power modules,
- 4 positions for output power modules,
- 1 positions for diagnostic card,
- width 19" (482.6 mm),
- height 4 U (177 mm),
- interior and exterior dimensions comply with IEC 60 297-3-101, 102, 103,
- EMC/EMI compatibility.



Bus in chassis of RPSII

Technical specification

Item	RPS II-CASE
Interior and exterior dimensions	Comply with IEC 60 297-3-101, 102, 103
Width	482.6 mm - 19" (84HP)
Height	177 mm - 4 U
Depth	245 mm
Consumption	Max. 15 W
Operating temperature	-20 °C to +60 °C
Storage temperature	-30 °C to +75 °C
Shock and vibration	According to IEC 61587-1, EN 50 155

0392

RPS II – input power supply cards

General description

The chassis of the RPS II can be fitted with two input power cards. These cards ensure the redundancy of the whole power supply. To keep the full redundancy, the total output load from these cards must not exceed 250W. The hardware ensures the equal division of power from input cards, if both are installed.

Cards are designed as Hot-Swap; this means that they can be changed during the operation of the power supply without affecting the function of the remaining cards. The cards are produced for a wide range of input voltages. Cards with various input voltages can be freely combined.

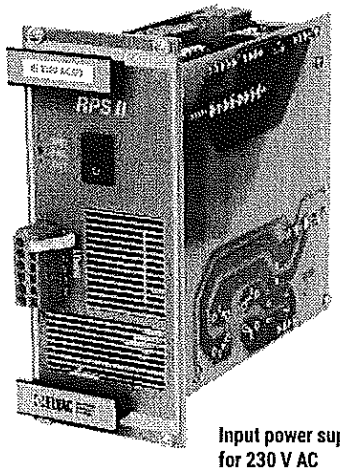
Input cards are fitted with DC/DC converters which transform input voltage to 28.3 V. In addition, the converters ensure galvanic isolation between input inlets and the 28.3 V voltage distribution on the bus. This voltage serves for powering of the power parts of the output and diagnostic cards. The input power supply cards communicate with the other cards via internal communication bus. Each input power supply card is fitted with its own measurement of the output current and voltage. This data is used for the built-in function of protection (short circuit, overcurrent, undervoltage and overvoltage).

The short circuit protection cannot be parameterized and is solved on the card using two methods. The first is the hardware solution, electronic current fuse. The second is the software solution where the short circuit is evaluated by the processor from the measurement of the output current and voltage. Over-current, under-voltage and over-voltage protection is evaluated from the measured current and voltage by the processor and can be parameterized from the supervisory system. It is also possible to enable or disable these protections.

Thermal sensor placed on the cards evaluates the temperature near the power elements and transfers the measured values to the supervisory system.

Basic features

- redundant mode,
- Hot-Swap,
- isolation input/output 2 kV AC (for 1 minute),
- power 250 W,
- measured output voltage, current and temperature,
- protective functions (overcurrent, short circuit, overvoltage and undervoltage),
- signaling LED for card status,
- remote control and monitoring (with diag. card),
- remote firmware upgrade (with diag. card),
- wide range of input voltages.



Input power supply card for 230 V AC

Technical specification

Card	RPS II-IN 230 V AC/DC	RPS II-IN 24 V DC	RPS II-IN 48 V DC	RPS II-IN 110 V DC
Input voltage	230 V / 50 Hz AC (+/-10 %) 230 V DC (210-380 V DC)	24 V DC (20-30 V DC)	48 V DC (38-72 V DC)	110 V DC (90-170 V)
Input current	1.3 A (max. 2 A)	12.5 A (by 24 V DC)	6.25 A (by 48 V DC)	2.8 A (by 110 V DC)
Input protection	Fuse 5 A F	Fuse 25 A F	Fuse 20 A F	Fuse 10 A F
Output voltage	+28.3 V DC (250 W)			
Galvanic isolation	Input/output 2 kV AC (for 1 min.)			
Connector	WAGO 231-306/026-000			
Operating temperature	-20 °C to +60 °C			
Storage temperature	-30 °C to +75 °C			
Position in bus	1, 2			

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0393

RPS II – output power supply cards

General description

The chassis of the RPS II can be fitted with up to four output power supply cards (positions 4-7). The total maximum output load from these cards is 250 W while keeping full redundancy of input cards. The cards are designed as Hot-Swap. This means that they can be changed during the operation of the power supply without affecting the function of the remaining cards.

Each output power supply card is fitted with its own measurement of the output current and voltage - this data is used for the built-in protection functions (short circuit, overcurrent, undervoltage and overvoltage).

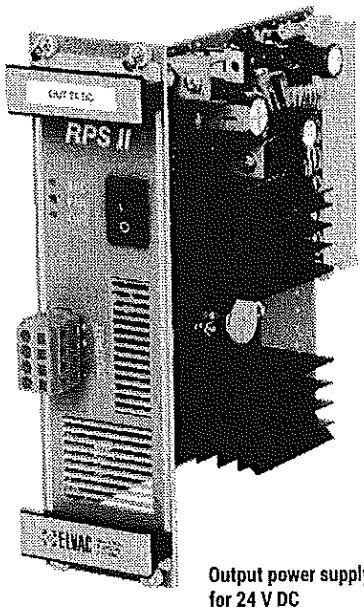
The short circuit protection cannot be parameterized and is solved on the card using two methods. The first is the hardware solution, electronic current fuse. The second is the software solution where the short circuit is evaluated by the processor from the measurement of the output current and voltage.

Overcurrent, undervoltage and overvoltage protection protects equipment connected to the output terminals of the card against exceeding the parameters, which can occur in the case of the failure of the card. This protection is evaluated from the measured current and voltage by the processor and can be parameterized from the supervisory system. It is also possible to enable or disable these protections.

Thermal sensor placed on the cards evaluates the temperature near the power elements and transfers the measured values to the supervisory system. The output power supply cards communicate with the other cards via internal communication bus.

Basic features

- Hot-Swap,
- measured output voltage, current and temperature,
- protective functions (overcurrent, short circuit, overvoltage and undervoltage),
- signaling LED for card status,
- remote control and monitoring (with diag. card),
- remote firmware upgrade (with diag. card).



Output power supply card for 24 V DC

Technical specification

Card	RPS II-OUT 12 V DC	RPS II-OUT 24 V DC	RPS II-OUT 24 V DC/I	RPS II-OUT 48 V DC/I	RPS II-OUT 230 V AC
Output voltage	12 V DC	24 V DC		48 V DC	230 V AC / 50 Hz (modified sine waveform)
Output current	1.5 A (18 W)	5 A (120 W)	3.75 A (90 W)	1.9 A (90 W)	0.4 A (90 W)
Tolerance	±3 %		±2 %		±5 %
Galvanic isolation	No		2 kV AC (for 1 min.)		No
Connector	WAGO 231-304/026-000				EURO outlet
Operating temperature	-20 °C to +60 °C				
Storage temperature	-30 °C to +75 °C				
Position in bus	4, 5, 6, 7				

0394

RPS II – diagnostic card

General description

The RPS II can be fitted with the diagnostic card with many functions and built-in peripherals. As a concept, the card is derived from RTU units produced by ELVAC, a.s. Like with other modules, the card communicates with the surroundings through the proprietary protocol HioCom2..

The function of the diagnostic card is to monitor the internal supply voltage on the bus in chassis RPS II, the revolutions of ventilators in the chassis, and to control the charging of the backup battery (external or on the MOD BATT module). In addition, the diagnostic card enables the supervisory system to communicate with individual cards, and enables the remote monitoring and control of cards.

The following peripherals are fitted on the diagnostic card:

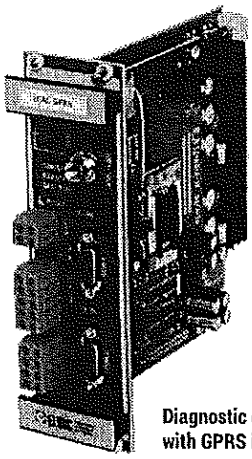
- 2 digital outputs (contact relay NO),
- 4 digital inputs (active, 24 V, other configurations are possible),
- input for external thermal sensor,
- 2 serial, galvanically isolated ports.

Using peripherals, it is possible to control, monitor and communicate with other equipment in the technology. The powering of the diagnostic card module is backed up by a battery which can be external or located on the MOD BATT module directly in the chassis of RPS II.

The diagnostic card can be fitted with various communication interfaces such as GPRS, Ethernet, or others according to request of the client (RS-232, RS-485, CLO, optical).

Basic features

- Hot-Swap,
- interfaces GPRS/Ethernet,
- 4 digital inputs,
- 2 digital outputs,
- internal and external thermal sensor,
- 2 × serial galvanically isolated port,
- monitoring of bus voltage and fan speed,
- backup battery charging control (12 V),
- signaling LED for card status,
- enables supervisory system to communicate with individual cards,
- enables the remote control and monitoring of cards,
- remote upgrade of firmware.



Diagnostic card with GPRS interface

Technical specification

Card	RPS II-DIAG GPRS	RPS II-DIAG NET
Communication interface with supervisory system	GSM/GPRS	Ethernet
Digital inputs	4 × active (dry contact), input current 5.9 mA, galvanic isolation 3.75 kV AC (for 1 min.), signaling of excitation 4 × LED	
Digital outputs	2 × relay contact NO, max. switching voltage 30 V DC / 250 V AC, max. switching current 5 A, galvanic isolation 3.75 kV AC (for 1min.), signaling of excitation 2 × LED	
Serial ports	2 × RS-232 (TxD, RxD), connector Canon DB9/F, galvanic isolation 1 kV AC (for 1 min.)	
Other interfaces	Connector for external thermal sensor	
Backup battery charger	12 V/0.3 A (charges to max. voltage 13.8 V)	
Consumption	Max. 300 mA	
Connectors	FME, WAGO 231-302/026-000, 231-304/026-000, 231-305/026-000	RJ45, WAGO 231-302/026-000, 231-304/026-000, 231-305/026-000
Operating temperature	-20 °C to +60 °C	
Storage temperature	-30 °C to +75 °C	
Position in bus	3	

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0395

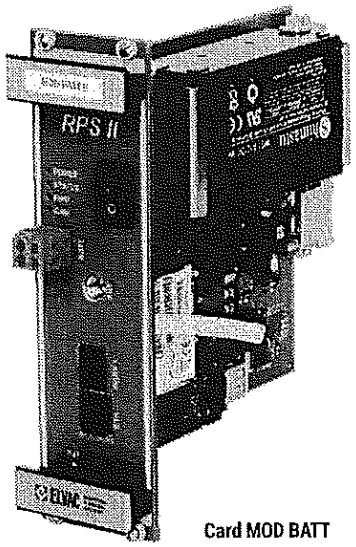
RPS II – special cards

ELVAC, a.s. while aiming to meet client demands, constantly expands its product portfolio. The result is, among others, an expansion of product line of output cards for the RPS II by special cards. These cards are a specialized devices which have different function than power supply but they use the advantage of redundant power supply which is provided by input modules fitted in the RPS II chassis and the compact character of such solution. Another advantage is the option of remote control if the diagnostic card is installed.

RPS II – MOD BATT

General description

MOD BATT is a special output card which integrates the GSM/GPRS modem with the RS-232 interface together with the backup battery which is designed for backup of the diagnostic card. The chassis of the RPS II can be fitted with one to four MOD BATT modules. If the chassis is fitted with a diagnostic card, the card RPS II–MOD BATT provides the supervisory system with information about the supply voltage of the GSM/GPRS module, temperature of the battery, switch status, modem status and the position of the module in the chassis.



Card MOD BATT

Basic features

- Hot-Swap,
- GSM/GPRS/EDGE modem with RS-232,
- backup battery for diagnostic card,
- internal thermal sensor,
- signaling LED for card status,
- remote control and monitoring (with diag. card),
- remote upgrade of firmware (with diag. card).

Technical specification

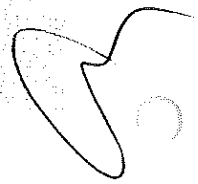
Card	RPS II-MOD BATT
Modem	GSM/GPRS modem (Enfora Enabler II-G)
Serial port	RS-232 (TxD, RxD, RTS, CTS, DTR, DSR, RI, CD), connector Canon DB9/F, ESD protection on all lines 15 kV
Backup battery	Lead acid battery 12 V/1.3 Ah (WP1.3-12)
Consumption	Max. 150 mA
Connectors	FME, WAGO 231-302/026-000
Operating temperature	-20 °C to +55 °C
Storage temperature	-30 °C to +75 °C
Position in bus	4, 5, 6, 7

0396

RPS II – accessories

Technical specification

Type	Description
RPS -OUT230 CAB	90 cm cable for connection of card RPS II-OUT 230 V AC with device powered from 230 V AC
RPS -BATT CAB	60 cm cable for connection of card RPS II-DIAG and RPS II-MOD BATT
RPS -COM CAB	2 m communication cable (RS-232) for connection of RPS II and PC
RPS -CAB-24	1,4 m cable for connection of card RPS II-OUT 24 V DC with device powered from DC
RPS -MCS CAB	1 cable for connection of card RPS II-OUT 24 V DC with system MCS
RPS -TEMP CAB	2 m cable with thermal sensor for connection to RPS II-DIAG
Antenna	GSM dual antenna, magnetic, 5 dB, connector FME (f)



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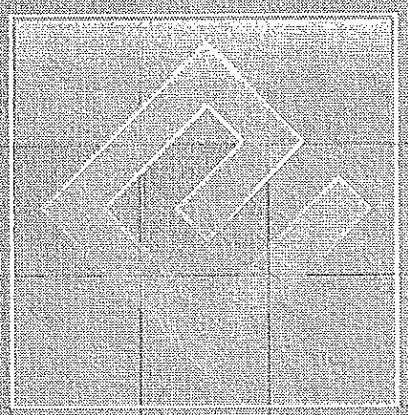
0397

Other electronics



Diagnostic card MPC3

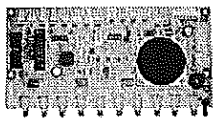
General description

The MPC3 card is designed for remote monitoring of the status of the PC. In the basic version, it is a diagnostic module installed in the chassis of the computer which monitors and indicates the status of key functions of the computer. In the expanded version, the PC can be fitted with the communication card for remote monitoring.

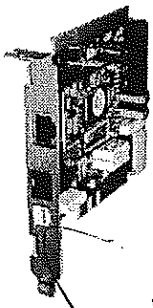
It can be used either together with the expanding SNMP agent for the Windows system (available free of charge), or directly controlled by the RTU Communication set, which enables access to data by means of standard interfaces for further user applications.

Basic features

- temperature measurement,
- fan speed measurements,
- 6× measurement of DC voltage on power supply,
- signaling of status by LED,
- galvanically isolated binary inputs,
- communicates via serial interface RS-232, Ethernet or GSM/GPRS,
- four free I/O pins,
- optical or acoustic signaling of statuses,
- powered directly from bus or standard PC connector.



Diagnostic module for chassis



Expansion card for communication

Function description

Temperature measurement

Up to four thermal sensors can be connected.

Fan speed measurement

The module is fitted with eight connectors for 3-wire fans and forwarding the information about the fan speed back to the mainboard. Four LEDs provide the indication of the status.

Voltage measurement

Four inputs for the measurement of positive voltage and two inputs for negative voltage are available (max. 15 V). Their status is merged into one signaling LED.

Binary inputs

Two digital inputs are designed for reading of the status of the redundant power supply. The inputs are optically isolated. A voltage of 2 V with any polarity is required for switching on. The statuses of these inputs are indicated by LED 8 and 9.

Communication

Expanded version can provide a data through a serial line, Ethernet or GSM modem.

Technical specification

Card	MPC3 (basic version)	MPC3 (expanded version)
Internal temperature measurement	4 × internal thermal sensor	
Measured range of int. temperatures	-40 °C to 125 °C, accuracy ±1.3 °C in range 25 °C to 85 °C	
External temperature measurement	–	1 × external thermal sensor
Measured range of ext. temperatures	-55 to 125 °C, accuracy ±0.5 °C in range -10 °C to 85 °C	
Fan speed measurement	4 × fan with OC output	
Voltage measurement	4 × input for positive voltage and 2 × input for negative voltage measurement (max. 15 V resp. -15 V)	
Redundant PS status check	2 × binary inputs PWR, sensitivity 1.5 V-5 V (information connected from redundant power supply)	
Digital inputs	–	1 digital input passive, level L 0-4 V, level H 8-28 V (optionally active or other voltage)
	–	1 × ALARM, 2 × NO contacts (relay 50 V/1 A AC/DC)
Function WDT	–	Yes, 1 × contact for reset of device
Communication with supervisory system	–	Optionally Ethernet, RS-232, RS-485, GSM/GPRS
Optical signaling	10 × two-color LED (4 × fans, 2 × temperature, HDD, voltage, 2 × redundant power supply)	
Sound signaling	1 × buzzer (can be turned off)	
Powering	5 V and 12 V from PC (from external PS)	
Consumption	1 W	3 W
Montage	4 × mounting hole, diameter 3.2 mm	PCI, PCI Express, ISA
Dimensions	168 mm × 82 mm	109 mm × 100 mm
Further information	Speaker 40 × 40 mm 8 Ohm, 0.2 W	
Operating temperature	-20 °C to 55 °C	
Storage temperature	-30 °C to 75 °C	

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0399

Universal USB converter CONV7

General description

The CON7 universal USB converter serves as a carrier for the CIOMOD communication module series and converts USB communication to various physical interfaces. The communication runs through the Virtual COM port drivers. The installed communication interface (CIOMOD module) is mapped in the OS as a serial line. Individual modules can be easily replaced according to the actual demand for the physical communication interface.

The CONV7 converter can be used as a service communication interface between the PC with the User Centre and the RTU7x series.

The delivery includes a 1m USB cable, CD with drivers, user manual and set of replaceable covers for various types of modules. An aerial is included for the CONV7-GSM with the CIOMOD-GSM module.

Individual CIOMOD series modules can be ordered separately.

Converter CONV7 with GPRS module

Basic features

- communication USB converter for various physical interfaces (replaceable by user),
- carrier for all CIOMOD modules,
- USB 2.0 Full Speed compatible,
- galvanic isolation 2 kV AC (with modules CIOMOD-232 and CIOMOD-485),
- ESD protection on USB interface side,
- ESD protection on CIOMOD modules,
- transfer rate 300 bps up to 1 Mbps with modules CIOMOD-232 and CIOMOD-485),
- with CIOMOD-GSM can be used as an USB (E)GPRS modem.

Support in OS

Virtual COM Port drivers are available for these OS:

- Windows XP, Windows Server 2003, Windows Vista, Windows 7, Windows Server 2008, Windows Server 2008 R2 and Windows 8/8.1,
- Windows Mobile 2003, Windows Mobile 2003 SE, Windows Mobile 5, Windows Mobile 6, Windows Mobile 6.1, Windows Mobile 6.5, Windows CE 6.0,
- Mac OS X,
- Linux (drivers are part of core from version 2.6.31).

Technical specification

USB interface	USB 2.0 Full Speed compatible
Connector	USB B
Consumption from USB port	Max. 500 mA (max. 1 A with module COMIO-GSM)
Isolation	2 kV AC for 1 minute (for modules CIOMOD-232 and CIOMOD-485)
Transfer rate	300 bps – 1 Mbps (for modules COMIO-232 and COMIO-485)
Drivers	Windows, Linux, Mac OS (see text)
Operating temperature	-20 °C to +55 °C
Storage temperature	-30 °C to +75 °C
Ambient relative humidity	5% – 95 % non-condensing
Ingress protection	IP20
Dimensions	94.5 x 63 x 28 mm
Weight	0.1 kg

Ordering information

Type	Description
CONV7-UNI	USB converter without module CIOMOD
CONV7-232	USB converter with module CIOMOD-232
CONV7-485	USB converter with module CIOMOD-485
CONV7-GSM	USB converter with module CIOMOD-GSM ((E)GPRS modem)
CONV7-OPT	USB converter with module CIOMOD-OPT
CONV7-BT	USB converter with module CIOMOD-BT

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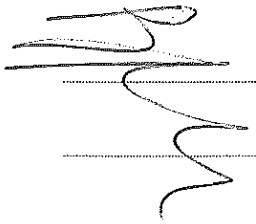
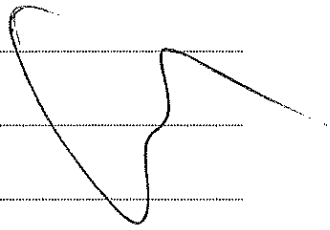
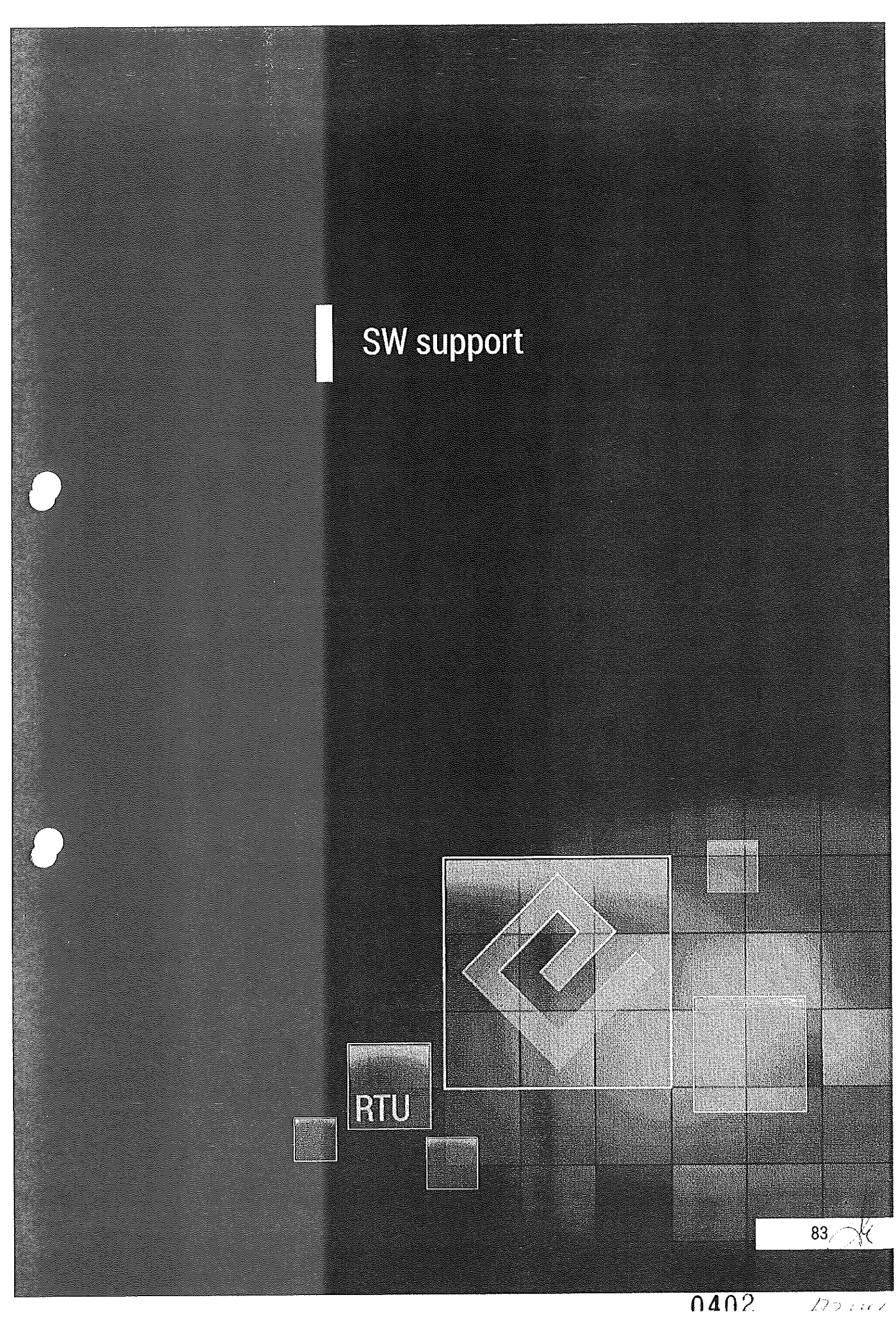
Notes





SW support



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RTU Communication set

Brief characteristics

- parametrization of RTUs and similar devices (redundant power supplies RPS II or diagnostic cards MPC),
- archiving of parameters in database or XML files,
- diagnostics of units and connected technologies,
- continuous indication of momentary status of units,
- recording of communication with units to file,
- control of units outputs,
- communication link between units and control and visualization system,
- recording of communication with control and visualization system to file,
- support of standards DDE and OPC, support of communication protocols IEC 60870-5-101 and IEC 60870-5-104,
- various system topologies,
- optional redundant use in hot backup mode.

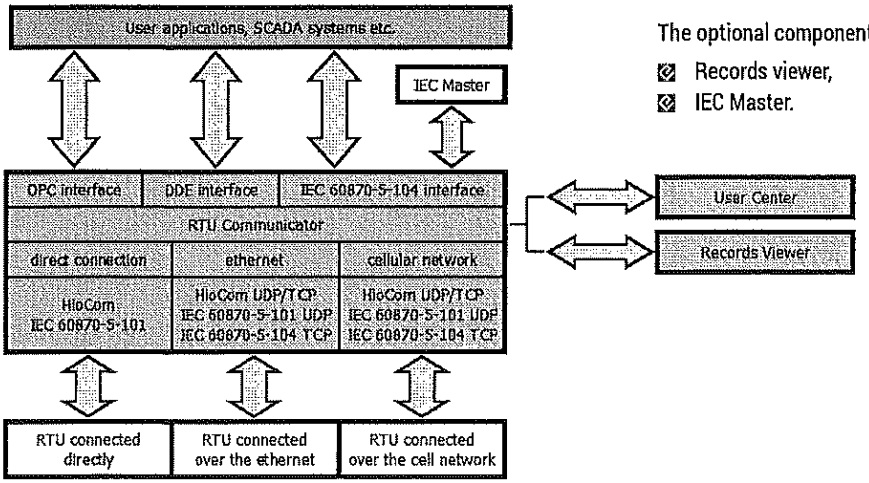
Basic description

The RTU Communication set is a set of programs which enable the complete and comfortable operation of RTU units and similar equipment. By using these programs, it is possible to use the mentioned equipment to its full potential. The communication set consists of the following basic programs:

- RTU Communicator,
- RTU User center.

The RTU communicator ensures communication with the operated equipment or with the SCADA system and RTU. The User center provides the user of the Communication set with a comfortable graphic user interface. The Communication set includes the Microsoft SQL database server.

Communication scheme



Topology of Communication set

The Communication set programs (including the SQL server) can be installed on one computer or each on separate computer or they can be arbitrarily combined on their host computers. It is also possible to use a multi-user installation where the Communicator and the SQL server are located on one or two central computers and the User center is installed on several client computers.

Redundancy

The RTU Communicator can be doubled and used with the redundant connection of such a pair. In this mode, the connection and communication with RTU units is maintained by one of the Communicators from the pair and the second fulfills the role of hot backup. In the case of the breakdown of the first communicator, the second communicator automatically takes over the communication. Depending on the MS SQL server used, the backup Communicator provides services for the User center.

If one MS SQL server in the Express edition is installed with each Communicator (standard Communication set), then in the case of the failure of the main Communicator, the backup Communicator only takes over communication functions, so it maintains the communication between the SCADA system and the units. It is not possible to connect to the backup Communicator through the User center.

However, if the user provides MS SQL server with guaranteed availability or selects the set with MS SQL server standard edition, the backup Communicator takes over all functions in the case of failure of the main Communicator, including the possibility of work in the User center.

Optional components

The optional component of the Communication set can be:

- Records viewer,
- IEC Master.

The Records viewer is a suitable accessory of basic programs if the function for recording of fault waveforms is used in the RTUs. The IEC Master serves for the diagnosis - during the verification of communication with the units or by RTU Communicator, it simulates the master SCADA system.

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RTU Communicator

Brief characteristics

- server for communication with the RTUs and similar equipment (redundant power supply RPS II or diagnostic cards MPC),
- communication gate or concentrator between the control and visualization system and the RTUs,
- communication with RTUs through the TCP/IP network by TCP and UDP communication protocols,
- communication with RTUs through the RS485 network and RS232 line,
- standards DDE and OPC, communication protocols IEC 60870-5-101, IEC 60870-5-104, IEC 61850 (optionally),
- operation on the background as OS service,
- configuration in the database and/or in XML file,
- storage of records from RTUs into files,
- recording of values into daily files,
- recording of communication with units into the file,
- recording of communication with control and visualization system into the file,
- recording of fault and operating messages into the file,
- option of redundant application in hot backup mode.

Basic description

The RTU Communicator is a server for communication with remote terminal devices which use the communication protocol HioCom or HioCom2 (RTUs, RPS II, diagnostic cards MPC), communication protocol IEC 60870-5-101 or IEC 60870-5-104 (IEC 61850 optionally). It collects a data from the connected terminal devices and enables the control of these devices. It runs in the background of the operating system as its service. The actual status of the signals and measurements (only for these transmitted via protocols IEC 60870-5-101/104) can be browsed on the service web interface. The communicator itself does not have a user interface; it is implemented by the RTU User center. This pair of applications must be completed by the database server Microsoft SQL.

Communication on the line

The RTU Communicator, in addition to the standard implementation of the IEC 60870-5-101 protocol, has implemented a special optimizing algorithm for communication on the line. The line communication is optimized for the radio network with high latency where commands from the control station must be sent preferably before less critical data. During the command, the stated communication channel is reserved only for the control which ensures the shortest possible time for the execution of the command and gathering back information about the execution.

For communication on the line, it is not necessary to implement any additional configuration. The Communicator itself detects a way of communication with slave devices on the basis of the presence of one or more devices under one communication interface.

External data interfaces

The communicator can provide a collected data to other applications through its external data interfaces. The applications can also control terminal devices by means of these interfaces. The Communicator has three interfaces:

- DDE – interface uses DDE technology,
- OPC – the interface uses OPC technology. The interface is implemented through the DLL library which operates without the license only for the first 30 minutes after start of the Communicator. For full operation, the Communicator with OPC license must be purchased,
- IEC-104 – operates according to the standard IEC 60870-5-104, in the role of TCP server.

Implementation of the RTU Communicator

The most common implementation of the RTU Communicator is use as a part of the Communication set delivered to the RTUs (including the SQL server in the Express edition). In this implementation, the Communicator is used as a parametrizing tool, so external data interfaces are not used. The configuration of the parameterized units is stored in the database or in an XML file. No extended license is provided for the Communicator, at the stated moment it is possible to communicate only with one RTU. All Communication set programs are installed on one computer and the Communication set is a single user.

A further type of implementation is the independent concentrator or communication gate. The Communicator is used this way if there is demanded a mediator between RTUs and SCADA. It is presumed that the number of terminal units is static. Then it is possible to apply the Communicator independently without the User center and without the MS SQL server, to set it for using an XML file as a storage area for configurations of RTUs and to exploit some of its external interface. In this case, it is necessary to purchase the Communicator with the expanded license for the appropriate number of terminal units. To achieve the redundancy, the Communicator can be doubled.

If the mediator is required between the SCADA system and the RTUs but it is presumed that during the operation the system will be expanded or decreased or that the configuration of the units will be changed during the operation, it is recommended to apply the whole Communication set in the role of the concentrator or the communication gate. The Communicator is then installed on the central server and is set so that the storage of the configuration only uses the database. The SQL server is installed either on the same computer as the Communicator or on another central server. The User centers are installed on client computers. Such an implemented Communication set is multi-user and it is necessary to purchase the Communication set with the expanded license for the appropriate number of terminal units and for the appropriate number of the User centers installations. By doubling the Communicator, eventually also the MS SQL server, it is possible to achieve a redundant character of the operation in the hot backup mode (the detailed description is in the chapter about the RTU Communication set).

0404

RTU User center

Brief characteristics

- user interface for configuration of RTUs,
- data organization in tree structure,
- filtered displaying of tree structure,
- bulk operations,
- easy user scripts,
- multi-user mode, access control,
- possibility of connection of hundreds of units,
- storage of tree structure into XML file,
- data storage in SQL server,
- support of Drag&Drop operations,
- integrated function blocks editor,
- management of users and access to RTUs
- support of Windows authentication,
- Import/export of IEC 61850 SCL files.

Basic description

The RTU User center is a user add-on of the RTU Communicator and enables the complete and comfortable service of ELVAC RTUs and similar devices. It does not communicate with RTUs directly, but through the RTU Communicator. Both applications use the SQL database as a storage area of the whole data structure. All three programs are an integral part of the whole package with the name RTU Communication set and they communicate between each other through the Ethernet network.

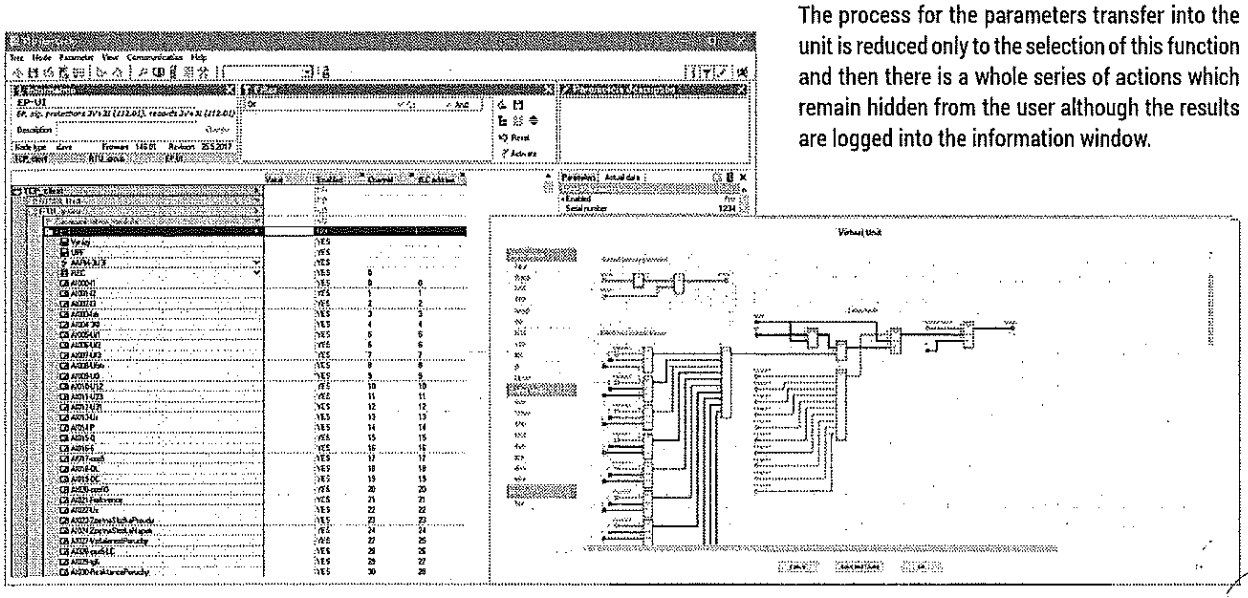
The User center is designed so that it can run in the system in several installations, it means in multi-user work. Each User center in the system can only display an image of the status of the system (measurements and signals) - the off-line mode, or can display live data as it changes in real time - the on-line mode. The number of User center running at the stated moment in the on-line mode is restricted by the provided license. The license provided free of charge to any purchased ELVAC RTU enables only one on-line User center.

However, it is always valid that one RTU can be configured at the same time only by one user, the other users only have access for reading.

All data concerning RTUs is arranged into the tree structure. At the lower layer are the communication channels used by RTUs for communication (RS-232, UDP / HioCom, TCP client / IEC 60870-5-104, etc.), then there are its own units or the slave units and then there are channels or sub-channels. Each node of this tree structure contains a set of parameters which describes its properties and also a set of the actual data which, after the connection to the unit, displays the status of the node. The display of this information can be configured according to the demands of the user. The optional display also includes the option of filtering and help for individual parameters.

The selected operations can be executed together for more terminal units or measuring, signaling or control channels. Some mass operations are directly integrated into the user interface, some must be implemented through simple user scripts.

The main goal of the application is the parameterization of units which represents setting the correct values of all parameters and then the transfer of these parameters through parametrizing files into the RTU. Everything is fully simplified. There is Help for parameter settings, displaying of data types, ranges of values and units, option for the mass change of parameters for more nodes and some functions for finding potential conflicts in the setting. The process for the parameters transfer into the unit is reduced only to the selection of this function and then there is a whole series of actions which remain hidden from the user although the results are logged into the information window.



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0405

Records viewer

Brief characteristics

- viewer of records from ELVAC RTUs,
- easy analysis of failures (short circuits, overcurrents, earth faults),
- analysis of the behavior of protections and signaling,
- automatic detection of the type of record (according to the type of unit),
- display of waveforms with the instantaneous voltage and current value,
- display of waveforms with effective voltage and current values,
- calculation and display of waveforms of instantaneous and effective values I_0, U_0,
- calculation and display of waveforms of instantaneous and effective values of harmonic I_0, U_0,
- display of phase diagrams,
- calculation and display of the time waveform of angle φ_0,
- change of the scale on the timeline, timestamps (real time),
- export of records (formats CSV and Comtrade),
- demo mode for testing.

Basic description

The Records viewer displays the time waveforms of the measured values, calculated values and flags of protections, indicators of fail currents and the automatics generated by the ELVAC RTU series.

This enables a fast analysis of failure states, such earth fault, short circuits and overcurrents. This SW can be used with an advantage during the verification of the correct function of the newly installed devices, e.g. for checking the phase sequence.

The main window of the application is divided into three parts:

- the first and second panel contain the waveforms of three-phase measurements of the voltages or currents (combination of 3V+3I, 6V, 6I according to the RTU configuration),
- in the third panel are timelines for individual protection flags, the reasons for running the records.

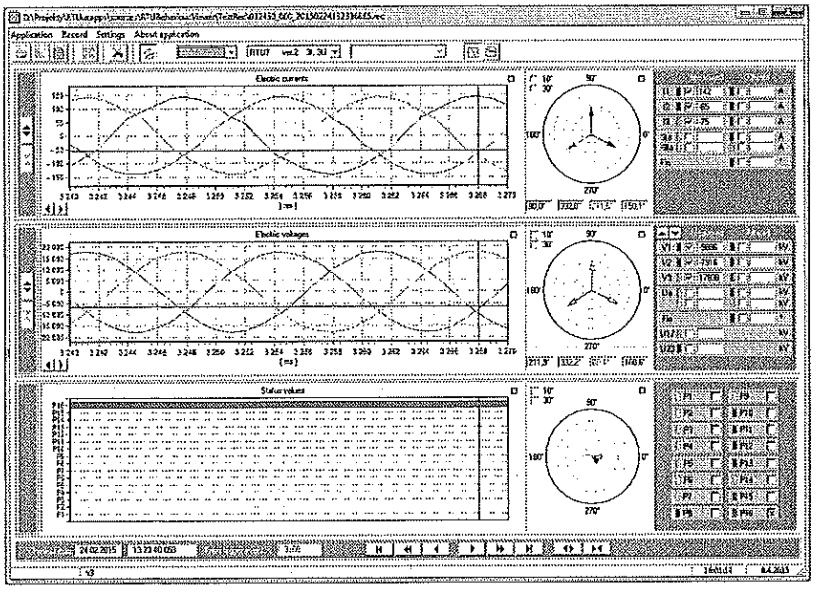
In the first two panels is possible to display the waveforms of instantaneous values of three-phase measurements of the voltages or currents. The values can also be displayed in the form of phasor diagrams.

In addition, it is possible to switch display into the mode with timeline of the effective values of three-phase measurements. Instantaneous and effective values I_0 and U_0 and the first harmonic I_0 and U_0 are calculated. There can also be displayed timeline of the angle φ_0, which is also calculated.

The displaying of individual waveforms can be enabled or disabled using the check boxes next to both panels. In this area, all the values are displayed depending on the position of the cursor in the graphs.

Third panel shows the protection flags, flags for signaling of the protection activation, status of the power element etc. It is possible to detect the reason of running the record and the protection activation. The meaning of each flag is displayed using the tooltip.

In ELVAC RTU series, the waveforms are recorded typically 100 ms before the trigger event. The trigger event is displayed on all three panels. The records also include the timestamps (real time). On the timeline, it is possible to change the scale and it is possible to scroll fluently through the records.



The Records viewer enables to export data in several formats for use in further applications - with respect to the option of analysis of the records from ELVAC RTUs in third parties SW, where the Comtrade format is especially important.

IEC Master

Brief characteristics

- communicates through protocols IEC 60870-5-101 and IEC 60870-5-104,
- data transfer through serial line, TCP (client and server) and UDP,
- displaying of actual signal states and measurement values,
- generating of general query, time synchronization, commands,
- ongoing communication recording and storage,
- statistics displaying,
- easy configuration of application,
- possibility of storage and uploading of configuration,
- demo mode for tests.

Basic description

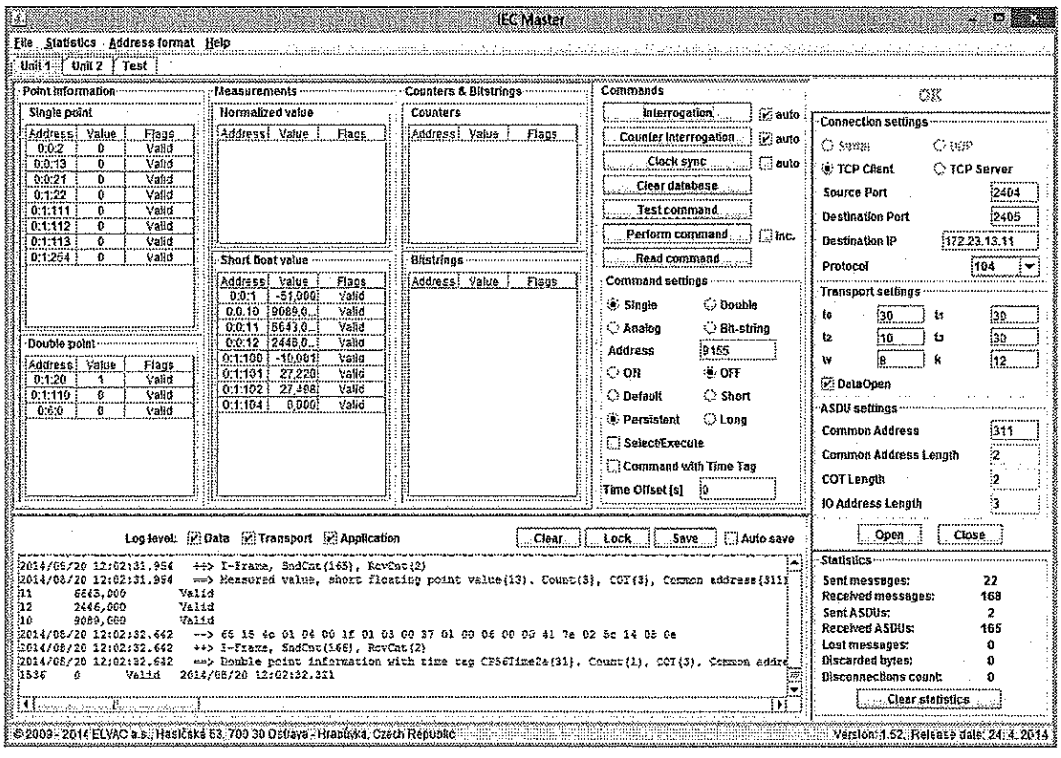
The IEC Master primarily serves for testing and verifying the slave devices which communicate through IEC 60870-5-101 and IEC 60870-5-104 protocols. For the data transfer, it is possible to use serial line, TCP protocols (client and server) and UDP. In the configuration of the application, it is sufficient to set only several communication parameters and the application is ready for the use. The database of signals and measurements is created dynamically, it is not necessary to define it in advance. The application provides the states of the signals and the values of measurements (standardized values and decimal numbers), including quality attributes. It is possible to send a general query to the slave device, time synchronization, testing command, single-bit and double-bit command with or without the timestamp. For diagnostic purposes, the list of the ongoing communication is displayed. For automatic testing of the application, there is the interface for running of the test scripts.

Communication log

The ongoing communication can be logged. The user can select the level of logging. At the first level, clean data is logged which is sent/comes into/from the selected communication interface. At the second level, transferred data is processed at the level of the connecting/transport layer (establishment and maintenance of the connection, ...). The third level logs the application data (values of signals, measurements ...). It is possible to save the communication log for further analysis at the request of the user, or automatically.

Testing interface

The IEC Master automatically tests the inputs and outputs of the slave device. It is possible to define the scenario with the events (output control) and the responses to them (requested signal states). In addition, there is defined the time limit (the response must occur within the predefined time). The output of the test is the report which contains the list of changes occurred on the monitored device, including information of whether this change was or was not expected. After termination of the test, there is displayed the statistics of faulty (unexpected) signal states. The incoming measurement only evokes a warning.



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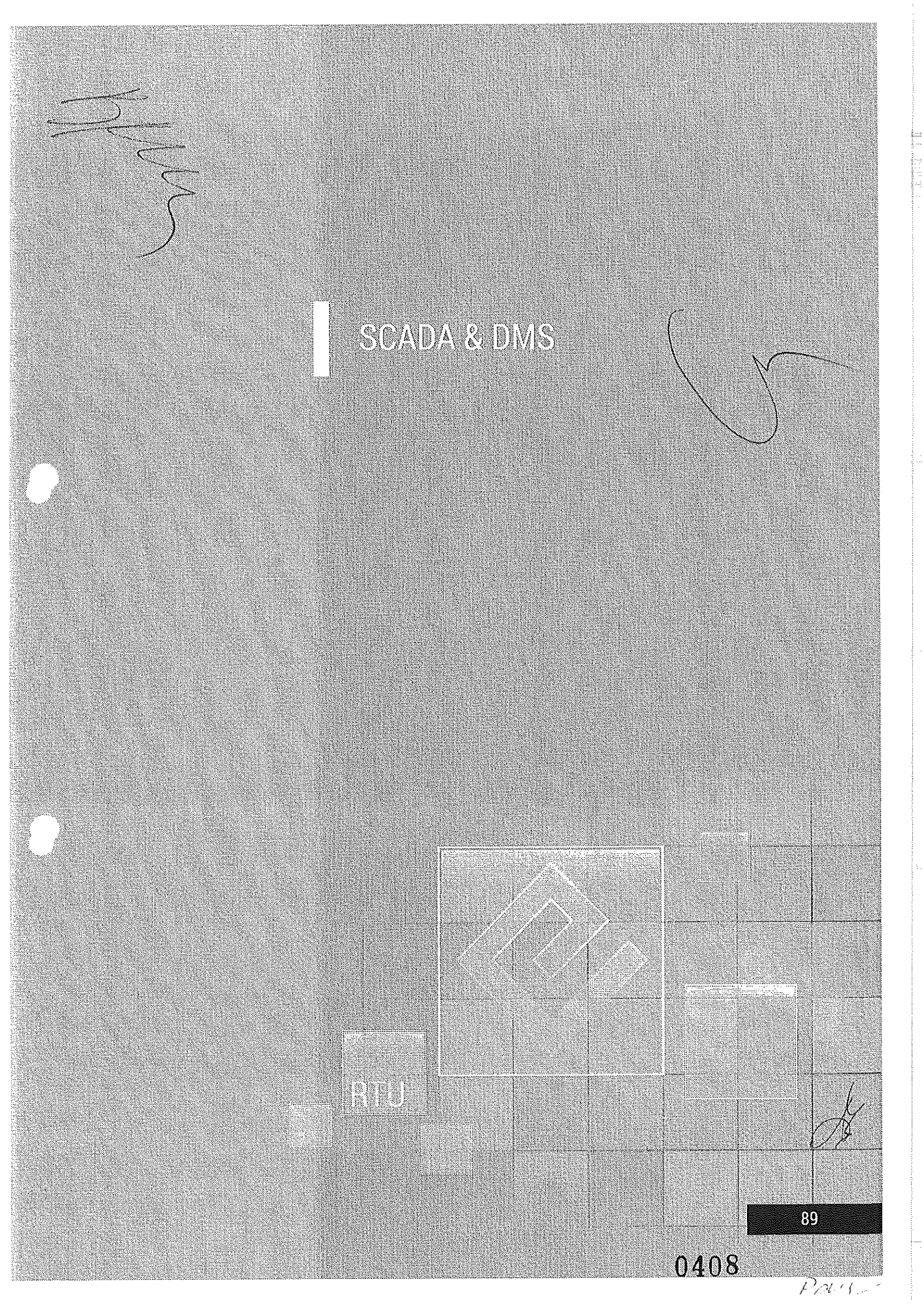


0408

SCADA SW Mikrodispečink

General description

Mikrodispečink is a specialized SCADA system for the monitoring, control and evaluation of processes in real time which is particularly recommended for the control of electrical networks with high, medium and low voltage, for applications in power stations and in control centers. The system enables the safe and effective control of technology from the control center, integrates control systems in power stations and networks into one unit, and provides actual images of the controlled technology, historical data and eventually the predicted data. It creates a support for the preparation, operative control and the consequent evaluation of the operational processes.

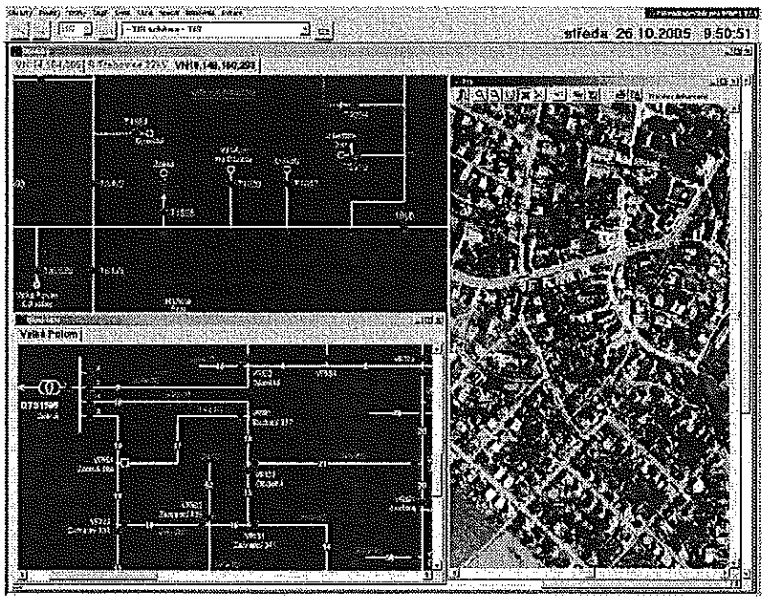
This product has been successfully used for many years in control center and substations not only in the Czech Republic, but also abroad and is regularly improved and developed.

Mikrodispečink can be operated on servers and client stations with OS MS Windows, for data storage there can be used a cluster solutions working with other operating systems (Unix, Linux). Standard HW and SW is used, no special HW and SW is required. The creation and maintenance of SW SCADA Mikrodispečink is usually implemented in the Borland Delphi development environment. The Mikrodispečink control system is designed with maximum modularity and an open character. The basic interface for data access is at the level of DLL, COM/DCOM, UDP/IP and TCP/IP.

The configuration of the real control system is created by writing the data into configuration tables and drawing diagrams in the graphic editor. Important attributes of the system are reliability, easy applicability, preparation for connection with systems from other suppliers, effective maintenance and focus on the user. The system is designed on a modular principle, is sufficiently adaptable, expandable and enables problem-free interconnection with further systems. It ensures maximum accessibility of data from the individual integrated monitoring and control systems.

The control systems for power stations and control center are integrated into LAN and WAN SCADA. The system in the control center is designed in a standard manner with certain HW redundancy. This redundancy ensures, in the case of a breakdown of one or more elements, the access of functions and data and the minimal or no restriction for users. Remote service and user access is possible in the system, including access through the Intranet (Internet). The system enables the backup, including control from another workplace or from another locality. It enables the operative change of the scope of the area controlled from each workplace. The uniform central model of the whole controlled electricity network is important for ensuring the effective and safe system administration, individual data and outputs for users. In one control system, there is an actual telemetric, eventually manually inserted image of all controlled networks of high, medium and low voltage. Maximum access to data from individual integrated control systems is ensured. In the case of non-accessibility of the master system, usually in the control center, the work is done by local data copy. In this time, the restriction is only in the fact that in subordinated systems it is not possible to create and edit shared data; the telemetric data remains actual.

During the resolution of the communication with other systems, standard input/output communication interfaces are used. Mikrodispečink can also run as a mediator between various mutually incompatible systems that cannot be directly connected. It can also be operated as a data concentrator and as a simple or network communication server. Various types of communications are used, point to point and point to multipoint, including communication through GSM CSD and GPRS (according to available mobile network generation in the stated region). Mikrodispečink has the implemented support of communication TG 800 Master and Slave (point to point, transit, line emulation), IEC 870-5-x, MDXL including network version, MCS, CVM Modbus, DMS, DO100, SAIA S-Bus and others, with the RTU Communicator there is available also protocol IEC 61850. Great attention is focused on data security, particularly during the control when the blocking conditions can be also evaluated. In the case of a request for the connection of Mikrodispečink to another system, some of the currently directly supported serial communications, including network, COM/DCOM interfaces can be used, eventually a further type of interface or communication can be included into the system.



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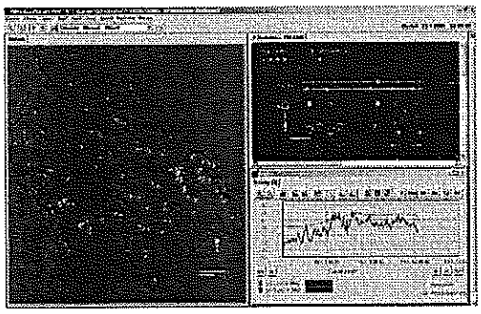
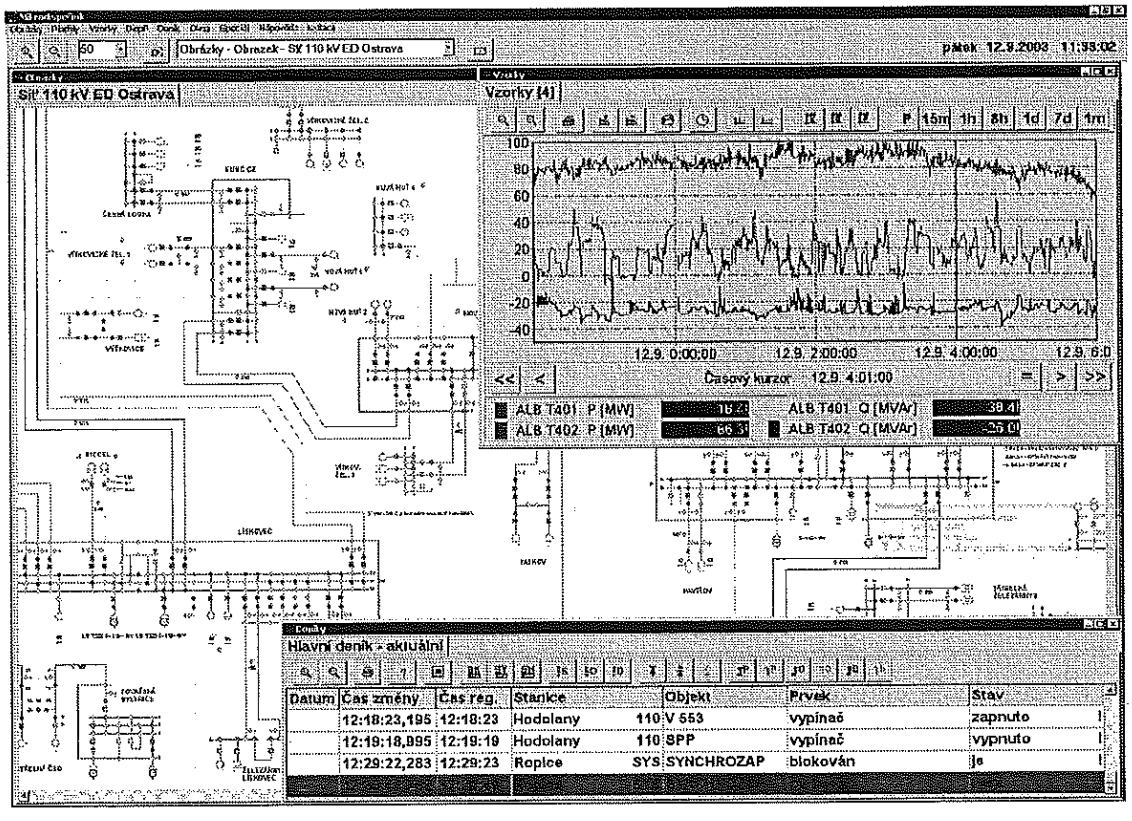
Brief list of features

- **Images** – diagrams of electric stations and networks with the actual statuses and values of measurement, with the option to place marks and comments, with control, with possible change of the scale of display and switching into further diagrams.
- **Diary** – protocol with changes and alarm messages with wide options of the filtration for the displaying, confirmation of changes, insertion of comments, consequent processing of archived data.
- **DispP** – the module automatically evaluates the actual and planned values of loading, supports trade dispatching control in real time.
- **Sheets** – actual and archive summaries of measurements of hourly sections, maximal, minimal and mean values of loading, including archiving and possible consequent off-line processing.
- **Samples** – module for sampling and archiving of all changes of measurement values, with on-line and off-line processing of the values in graphs.
- **Change calculations** – this function enables to perform effective, fast and secure generation and maintenance of the control system and automatic outputs for displaying, supports the transparency of the system from the viewpoint of the user during the accumulation of changes.
- **Simulation of connection** – the user can set the required configuration (model) of the network with the consequent automatic recalculation of the topology and evaluation (colouring) of the network parts and consumers without voltage (for ex. during a downtime).
- **Colouring of diagrams** – according to various criteria it is possible to colour the diagrams of the electric stations and networks, e.g. according to sources, i.e. with the indication of the connection to the defined supply node, etc.
- **Sending of SMS and e-mails** – using GSM and Intranet it is possible to automatically send information about changes of specified signals or user-typed text messages.
- **Access through WEB** – the pages use the advantages of web technologies. Necessary components are downloaded automatically to the user's PC. The access to SCADA data is possible through the intranet (Internet), including the option of mobile access through GSM.
- **Displaying of information from TIS/GIS/CIS** (orthofotomap, clients, ...) to the selected object in the control system (to DTS, line section, ...).
- **Easy export of schemes for HMI in substations** – complete HW solutions for HMI systems in substations are included in our product portfolio.





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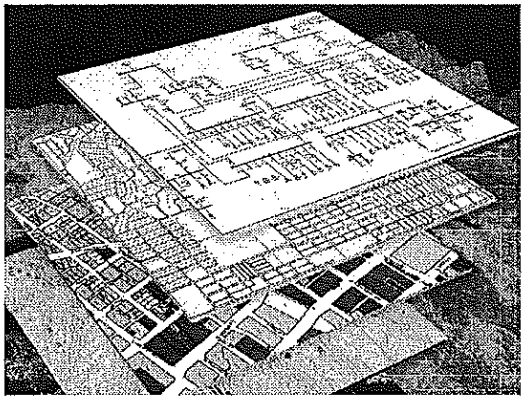
ELVAC & ETAP

ELVAC is not only a manufacturer of successful intelligent RTUs for power engineering but has been also involved in the development and deployment of SCADA systems for its customers since the beginning of its energy activities. In addition to the SCADA MicroDispečink system, we also offer a comprehensive ETAP software suite from Operation Technologies (USA). ETAP SW offers a wide range of SW tools that cover both off-line and on-line functions to analyze events in power grids and their parts. These functions may be simply linked to ETAP Real-TimeTM SCADA solution, DMS (Distribution Management System), EMS (Energy Management System), OMS (With server redundancy) etc., what significantly reduces the cost of deploying, maintaining, and extending of system while minimizing the risk of data inconsistency which may happen with stand-alone databases for each function module.

ETAP SW (analysis, SCADA, DMS, EMS, OMS)

ETAP is a suite of fully integrated electrical engineering software that provides engineers, operators, and managers a platform for continuous functionality from modeling to operation.



Modeling & Visualization

A one-stop solution with intelligent interface views and core capabilities to create, configure, customize, and manage your electrical power system model. Core modeling tools allow you to quickly and easily build 3-phase and 1-phase AC and DC network one-line diagrams and GIS views with unlimited buses and elements including detailed instrumentation and grounding components.

- one-line diagram,
- geographic information systems,
- feeder & substation views,
- functional & logic view – UDM,
- U/G raceways & ground grid views,
- schematic & control diagrams,
- multi-dimensional database,
- web clients & mobile views.

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SYSTEM INTEGRATOR
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Analysis & Optimization

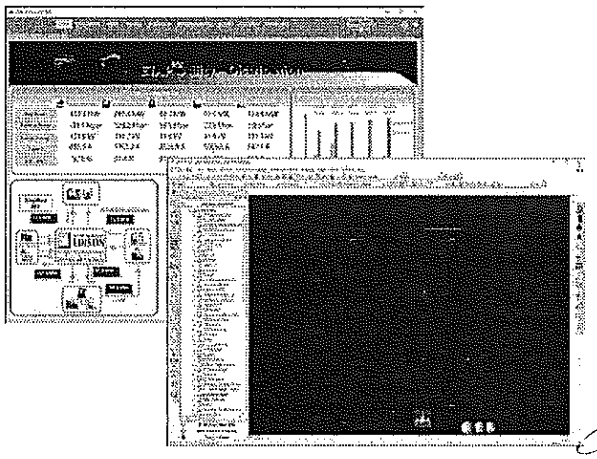
A powerful set of analysis and optimization software products that allow for simulation, prediction, design and planning of system behavior, utilizing an intelligent one-line diagram and the flexibility of a multi-dimensional database.

- network analysis,
- dynamic & transients,
- cable systems,
- power quality,
- renewable energy,
- unified AC / DC solutions,
- systems optimization,
- multi-study analyzers.

Protection & Coordination

Fully integrated Protective Device Coordination software for steady--state and dynamic device coordination, protection, and testing. ETAP provides intelligent tools and powerful capabilities to analyze system protection and troubleshoot false trips, relay and breaker mis-operation, mis-coordination, and more.

- protective device coordination – Star™,
- auto protection & coordination evaluation,
- distance relay coordination – StarZ™,
- sequence-of-operation,
- selectivity zone detection,
- protective device library.



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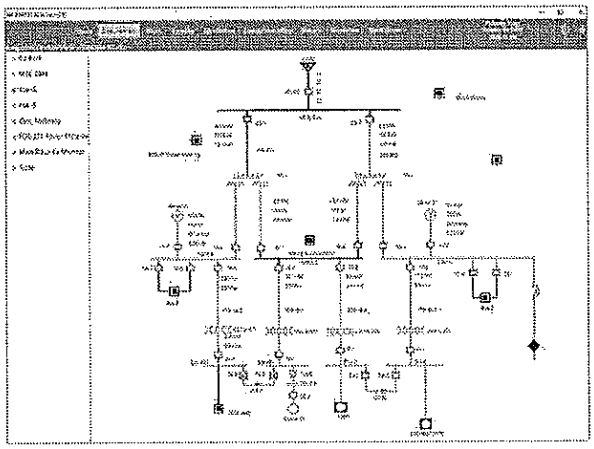
0411

Electrical Safety & Grounding

Comprehensive and integrated solution to help evaluate, analyze, and assess the safety and grounding of AC and DC electrical systems. Generate Arc Flash labels, create a switching sequence management plan, or evaluate the most efficient configuration for ground grid systems.

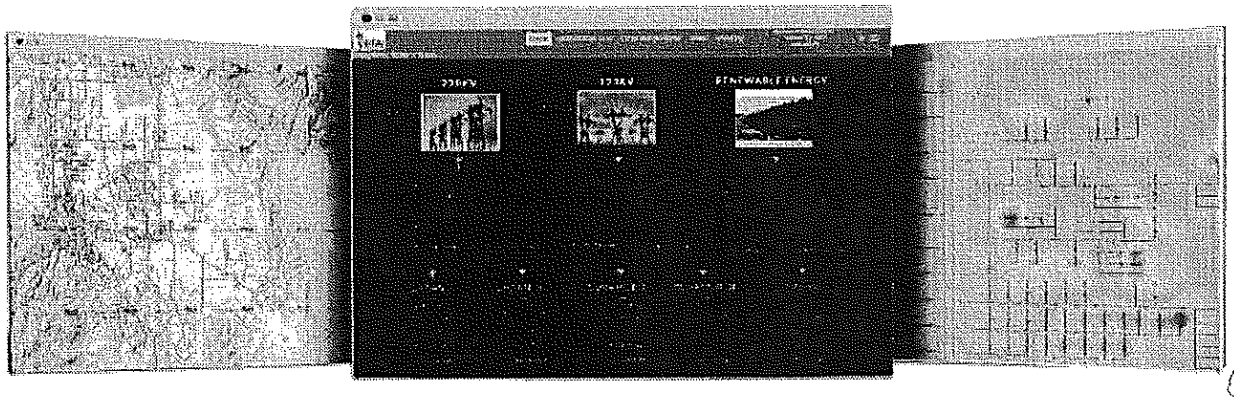
- arc flash analysis,
- switching management,
- ground grid systems,
- electric shock protection,
- protective earthing conductor sizing,
- system grounding & earthing.



Data Exchange & Conversion

ETAP offers conversion tools from legacy power system analysis software. In addition, ETAP offers data import/export capabilities to other third-party platforms and provides bi-directional data Exchange interfaces to complimentary products.

- **ETAP Real-TimeTM**
  As a fully integrated enterprise solution, ETAP extends to a Real-Time Intelligent Power Management System to monitor, control, automate, simulate, and optimize the operation of power systems.
- **SCADA & Monitoring – eSCADA**
  Model-driven monitoring provides an intuitive real-time visualization and analyses platform via intelligent graphical user interface, one-line diagram, geospatial view, and digital dashboards.
- **Power Management System – PMS**
  PMS includes powerful analytical tool that allows for detection of system behavior in response to operator actions and events via the use of real-time and archived data.
- **Generation Management System – GMS**
  GMS provides system balance and optimization changes to meet network security, economic, operational, regulation, and environmental requirements. Monitor, control, and optimize the performance of generation and transmission systems.
- **Transmission Energy Management System – EMS**
  Reduce energy consumption, increase electrical system reliability, improve equipment utilization, and predict system performance, as well as optimize energy usage.
- **Distribution Management System – DMS / ADMS**
  ETAP ADMS provides the necessary mission critical applications to efficiently, reliably and securely manage, control, visualize, and optimize distribution networks.
- **Microgrid Master Controller – MMC**
  MMC allows for design, modeling, detailed analysis, islanding detection, optimization and automated control of Microgrids used for offices, retail parks, industrial facilities, data centers, campuses, offshore facilities, ships, etc.
- **Intelligent Load Shedding – ILS™**
  ILS is a model-driven load preservation system offering proactive and optimal load shedding that can dynamically manage the stability of the system by responding faster to disturbances.
- **Intelligent Substation Automation – iSub™**
  iSub provides protection, control, automation, monitoring, and communication capabilities as a part of a comprehensive substation solution.



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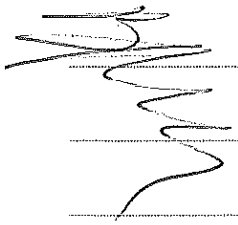

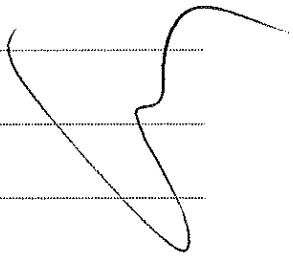

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