

As Built Documentation

Chapter 4.2.2 Uninterruptible power system

Battery System for supply T80

• Technical Report	Document No. ELV38-6-06092
• List of Devices	Document No. ELV38-6-06093a
• Cable List	Document No. ELV38-6-06094
• Layout plan of the 220 VDC system	Document No. ELV38-3-07141
• DC System T80 – Single line diagram	Document No. ELV38-4-00466
• Block diagram of the battery system	Document No. 725-101
• "N" DC System T81 – Preh 1/4 adova schema rozvadzaea ATJ	Document No. 725-102
• Prehladov schema rozvadzaea ATJ	Document No. 725-103
• T80 - LV Switchboard ATJ - Single line diagram	Document No. 725-104
• T80 - LV Switchboard ATJ - Wiring diagram of control and measurement of inlets	Document No. 725-105
• Technical report	Document No. 725-106
• Technical report	Document No. 725-107
• List of devices	Document No. 725-108
• Cable list	Document No. 725-109
• DC System T80 - Single line diagram	Document No. 725-110
• Layout plan of the 220 VDC system	Document No. 725-111

Battery System for supply T81

• Technical Report	Document No. ELV38-6-06114
• Cable List	Document No. ELV38-6-06116
• Layout plan of the 220 VDC system	Document No. ELV38-3-07152
• Wiring diagram of 220 VDC Devices	Document No. ELV38-4-00468
• T81 – LV Switchboard ATJ – Single line diagram	Document No. 725-204
• T81 – Schema ovladania a merania privodov rozvadzaea 220 V ATJ	Document No. 725-205
• Cable list	Document No. 725-206
• Wiring diagram of 230 V DC devices	Document No. 725-207
• Layout plan of the 220 VDC system	Document No. 725-208
• Technical report	Document No. 725-209
• List of devices	Document No. 725-210

As Built Documentation

Uninterruptible power supply

- | | |
|--|----------------------|
| • 400 VAC Switchboard ANL wiring diagram | Document No. 725-300 |
| • Technical report | Document No. 725-301 |
| • List of devices | Document No. 725-302 |
| • UPS unit | Document No. 725-303 |

Manuals

- Zdroj záložného napájania IP220, Užívateľ'ská príručka
- Záložní zdroje SitePro 10-40 série 6 10-40 kVA, Užívateľ'ská príručka

Revision Reports

- Battery System for supply T80
- Battery System for supply T81
- Uninterruptible power supply



AIR LIQUIDE

INGENIERIE

57, Ave Carnot - B.P. 313
94503 Champigny Cedex
(FRANCE)Job Number: 50 - 3023 - 01
Name: KOSICEDocument Nbr
ELV38-6-06092


M Battery System for supply T80

TECHNICAL REPORT / TECHNICKÁ SPRÁVA

Rev.	Date	Supervis.	Appr.	Modifications
a				<p>TECHNICKÁ SPRÁVA KONTROLOVANÉ 22.10.05 06092 KONTROLOVANE • CHECKED</p>
b				
c				
d				
0	05/2005	Ing. Németh	Ing. Richman	Initial edition
0a				
0b				
1				
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	57, Ave Carnot - B.P. 313 94503 Champigny Cedex (FRANCE)	Job Number: 50 – 3023 - 01	Document Nbr
		Name: KOSICE	ELV38-6-06092
M Battery System for supply T80			

TECHNICKA SPRAVA

JANUÁR 2003
Príloha 6.2.2.6

22.10.2003

(5)
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1. VŠEOBECNÉ ÚDAJE

1.1 Predmet a rozsah projektu

Predmetom projektu je návrh elektrotechnologických zariadení, zabezpečujúcich napájanie prístrojov rozvodne T80 napätím 220V DC. Projekt je vypracovaný na úrovni projektu pre realizáciu. Projektované zariadenie bude umiestnené v areály US Steel Košice v novej budove rozvodne T80.

1.2 Použité podklady, predpisy a normy

- Záznamy z konzultácií
- Technické podklady od použitých prístrojov
- Príslušné normy STN, IEC, vyhlášky, technické smernice a katalógy

1.3 Použité normy

STN 01 8010	Bezpečnostné farby a značky. Všeobecné ustanovenia.
STN 33 2000-3	Elektrické inštalácie budov. Stanovenie základných podmienok.
STN 33 0300	Druhy prostredí pre elektrické zariadenia.
STN 33 0330	Stupne ochrán krytím.
STN 33 3220	Spoločné ustanovenia pre elektrické stanice.
STN 33 2000-4-41	Elektrické inštalácie budov. Zaistenie bezpečnosti. Ochrana pred úrazom elektrickým prúdom.
STN 33 2000-4-43	Elektrotechnické predpisy. Elektrické zariadenia. Bezpečnosť. Ochrana proti nadprúdom.
STN 33 2000-4-46	Elektrotechnické predpisy. Elektrické zariadenia. Bezpečnosť. Odpojovanie a spínanie.
STN 33 2000-4-471	Elektrotechnické predpisy. Elektrické zariadenia. Bezpečnosť. Použitie ochranných opatrení pre zaistenie bezpečnosti. Všeobecne. Opatrenia k zaisteniu ochrany pred úrazom elektrickým prúdom
STN 33 2000-4-473	Elektrotechnické predpisy. Elektrické zariadenia. Bezpečnosť. Použitie ochranných opatrení pre zaistenie bezpečnosti. Opatrenia proti nadprúdom.
STN IEC 611140	Ochrana pred úrazom elektrickým prúdom. Spoločné hľadiská pre inštaláciu a zariadenia.
STN 33 2000-5-54	Elektrické inštalácie budov. Výber a stavba elektrických zariadení. Uzemňovacie sústavy a ochranné vodiče.
STN 34 3100	Bezpečnostné predpisy pre obsluhu a prácu na elektrických zariadeniach
STN EN 50 272-2	Bezpečnostné požiadavky na akumulátorové batérie a inštalácie batérií.
	Časť 2: Stacionárne batérie

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M Battery System for supply T80

A s nimi súvisiace normy.

1.4 Napäťové sústavy

2-220VDC/IT

- izolovaná sústava s kontrolou izolačného stavu

1.5 Skratové údaje

Jednosmerný skratový prúd $I_{k2}=2,1\text{kA}$

CHNICKÁ INSPEKCIA SR
Pracovisko 101/04

22.10.2006 14:52:30

1.6 Prostredie

Elektrické zariadenia, ktoré sú predmetom tohto projektu podľa normy STN 33 0300, sú umiestnené v prostredí čl. 3.1.1 - základné.

3
KONTROLOVANE • CHECKED

1.7 Ochrana pred úrazom elektrickým prúdom

Ochrana je riešená v zmysle STN 33 2000-4-41 nasledovne:

- 2 - 220VDC/ IT - živé časti: ochrana izolovaním, ochrana krytmi
- neživé časti: ochrana samočinným odpojením pájania

1.8 Odborná spôsobilosť (spracovateľ a projektu v zmysle vyhl.č. 718/2002 Z.z.)

Dokumentácia je vypracovaná pracovníkom, ktorý je držiteľom osvedčenia na činnosť elektrotechnik špecialista – projektant elektrotechnických zariadení v zmysle §24, vyhlášky MPSVaR č.718/2002 Z.z. Osvedčenie bolo vydané IBP Bratislava pod č.0068 IBA 1999 EZ PA,B E1.0 na meno Ing. Štefan Halač.

1.9 Zaradenie zariadenia v zmysle vyhlášky č. 718/2002 Z.z.

Elektrické zariadenie, ktoré je predmetom tohto projektu je skupiny „A“ v zmysle vyhlášky MPSVaR SR č.718/2002 Z.z, príloha č.1 časť III.

2. TECHNICKÉ RIEŠENIE

2.1 Popis nového stavu

Zariadenia pre zaistenie jednosmerného napätia 220V DC budú umiestnené v prízemí objektu T80. Rozsah budovaných zariadení:

- -1ks jednosmerný rozvádzač 220V DC-funkčné označenie ATJ, zložený z dvoch polí
- -2ks usmerňovač pre napájanie rozvádzača ATJ- funkčné označenie ATF1, ATF2
- -2ks akumulátorová batéria pre napájanie rozvádzača ATJ - funkčné označenie ATB1, ATB2

Rozvádzač ATJ (2-220V/IT) je skriňový, umiestnený pri stene s dvoma systémami prípojníc – W1, W2, zložený z dvoch polí. Rozvádzač je napájaný z usmerňovačov ATF1, ATF2 s paralelným pripojením akumulátorových batérií ATB1, ATB2 prírodnými káblowymi vedeniami zdola. V skriní

M Battery System for supply T80

ATJ1 sú umiestnené prírody do rozvádzača, skriňa ATJ2 je vyčlenená pre odpínačové a poistkové vývody.

Prípojnice W1 a W2 bude možné spojiť cez istič QW12.

Na jednu prípojnicu je možné pripojiť jeden usmerňovač a jednu akumulátorovú batériu. Paralelné zapojenie akumulátorových batérií nie je povolené. Vývody možno zapojiť na prípojnice W1, alebo W2 prepínačmi. Manipulácia s prepínačmi je dovoľená len bez záťaže, keď je istič alebo odpínač v príslušnom vývode vypnutý.

Na každej prípojnici bude signalizácia podpäť, nadpäť a zemného spojenia. Signalizovaný bude vypnutý stav ističov (nie odpínačov) vo vývodoch. Zemné spojenie bude signalizované do riadiaceho systému a signál bude prenášaný na riadiace pracovisko rozvodne T80. Prístroj pre kontrolu izolačného stavu bude nastavený na hodnotu $1k\Omega/V$.

Usmerňovače ATF1, ATF2 typ IP220 (osadené 6-timi modulmi meničov typu IC 3000/250V, 7,5A) sú umiestnené v miestnosti vlastnej spotreby. Napájanie každého usmerňovača je dvomi prívodmi z rozvádzača striedavej vlastnej spotreby (3x400V, 50Hz, 25A) Pre tri moduly IC3000/250V je určený jeden prívod z rozvádzača striedavej vlastnej spotreby. Výstupy z modulov sú spojené do spoločného vývodu. Slúžia pre napájanie rozvádzača ATJ a zároveň na dobíjanie akumulátorovej batérie.

Každý usmerňovač obsahuje riadiaci a dohľadový systém PSMS4. Pre komunikáciu slúži rozhranie RS422.

Akumulátorové batérie ATB1, ATB2 budú umiestnené v priestoroch akumulátorovne na kovových stojanoch. Každá má kapacitu 122Ah pre dobu zálohovania 6h. Batérie budú olovené, ventilom riadené typu Sprinter P6V 1700, 6V, bezúdržbové počas celej životnosti (10 rokov pri teplote okolia 20C), plynottesné s vnútornou rekombináciou vznikajúcich plynov, odolné proti hĺbkovému vybitiu, klasifikované ako "S vysokou výkonnosťou" podľa Eurobat.

TECHNICKÁ ŠPECIFIKÁCIA
Pracovisko Kosice

22.10.95 04523

2.2 Kabeláž

Súčasťou tohto projektu sú len káble medzi rozvádzačom ATJ, usmerňovačmi a akumulátorovými batériami. Nasledujúce káblové prepojenia musia byť urobené dodávateľom technologickej časti:

- 4x trojfázový prívod pre usmerňovače: kábel 5x2,5mm² Cu
- všetky káble pre napájanie spotrebičov

Istenie prívodových káblov musí byť 25A.

2.3 Uzemnenie

Nové zariadenia musia byť spojené s uzemňovacou sústavou rozvodne T80. Uzemnenie sa urobí z pásu FeZn 30x4. Spojenie bude zvarované a skrutkované. Uzemnenie bude zodpovedať norme STN 33 2000-5-54.

2.4 Protipožiarne opatrenia

Protipožiarne prepážky pod rozvádzačmi a na prestupoch cez steny sú predmetom stavebnej časti.

M Battery System for supply T80

3. BEZPEČNOST A OCHRANA ZDRAVIA

Pri montážnych prácach je nutné dodržiavať všeobecné bezpečnostné predpisy platné v energetike a to hlavne :

- STN 34 3100 ÷ STN 34 3110 Bezpečnostné predpisy
- STN 33 2000-4-41 Ochrana pred úrazom elektrickým prúdom.
- Vyhláška č. 59/82 Zb. Slovenského úradu bezpečnosti práce o základných požiadavkách na zaistenie bezpečnosti práce a technických zariadení.
- Vyhláška č. 218/2002 Z.z. o odbornej spôsobilosti pracovníkov.

Pred začatím prác musia byť všetci zúčastnení pracovníci oboznámení s uvedenými bezpečnostnými predpismi, so zásadami technologického postupu a so zásadami bezpečnosti a ochrany zdravia pri práci. Ďalej musia byť oboznámení s pracoviskom, prístupovými a únikovými cestami, musia byť poučení o zvláštnosti povahy a stavu zariadenia, v blízkosti ktorého budú práce vykonávané. V celom priestore rozvodne T80 musia byť vyznačené priestory, do ktorých nesmú pracovníci vykonávajúci opravu vstupovať. Všetci pracovníci musia byť vybavení osobnými ochrannými prostriedkami, a to najmä pracovnými rukavicami pre manipuláciu s materiálom a ochrannou prilbou.

Pri vykonávaní prác sú pracovníci povinní dodržiavať zásady technologického postupu a zásady bezpečnosti a ochrany zdravia pri práci.

Únikové cesty musia byť vyznačené.

4. PREDKOMPLEXNE A KOMPLEXNE VYSKUSANIE

4.1 Účelom vyskúšania je :

- Overenie správnosti a komplexnosti dodávok, montáže, prevádzkyschopnosť el. zariadenia a vzájomná súčinnosť s ostatnými prevádzkovými súbormi.
- Vytvorenie predpokladov pre odovzdanie a prevzatie dotknutých zariadení a ich uvedenie do skúšobnej prevádzky.

Skúšky budú vykonané v súlade s STN 33 3210 - čl. 6.1 ÷ 6.4. Súčasťou skúšok sú požiadavky na bezpečnosť a ochranu zdravia so zreteľom na vyhradené technické zariadenia.

4.2 Predkomplexné vyskúšanie

Zahrňuje súbor skúšok, meraní, nastavení, preverenie strojov, súčinnosť funkčných celkov a ďalších úkonov, ktoré je potrebné vykonať, aby bolo el. zariadenie schopné komplexného vyskúšania.

Východiskové predpoklady na vykonanie predkomplexného vyskúšania sú :

- ukončená montáž
- ukončené individuálne skúšky
- vystavená revízná správa

K dispozícii musí byť:

- dokumentácia pre realizáciu opravená podľa skutočného vyhotovenia

M Battery System for supply T80

- sprievodná dokumentácia jednotlivých výrobkov a návody na obsluhu
Zhotoviteľ vyzve obstarávateľa na účasť pri skúškach 14 dní pred zahájením skúšok.
Obstarávateľ je povinný zhotoviteľovi na jeho požiadanie poskytnúť :

- pracovníkov prevádzky s príslušnou kvalifikáciou
- prevádzkové hmoty a materiál
- el. energiu.

CHNICKÁ KONTROLA
Pracovisko číslo

20.10.05 84520

Pred zahájením skúšok je nutné stanoviť rozsah meraní a skúšok jednotlivých el. zariadení.
O priebehu a výsledkoch predkomplexných skúšok vystaví zhotoviteľ písomné doklady.

SKONTROLOVANE - CHECKED

4.3 Komplexné vyskúšanie

Súhlas na zahájenie komplexného vyskúšania dá preberacia komisia (zložená zo zástupcov obstarávateľa a zhotoviteľa) po overení, že el. zariadenie je možné pripojiť na menovité napätie.

K termínu komplexného vyskúšania musí byť zabezpečené:

- ukončené montážne práce
- úspešne ukončené individuálne skúšky a predkomplexné vyskúšanie

Zhotoviteľ k tomuto termínu musí mať k dispozícii príslušné doklady v zmysle hospodárskeho zákonníka a náležitosti, vyplývajúce z dodávateľsko-odberateľských vzťahov.

Komplexným vyskúšaním preukáže zhotoviteľ kvalitu a schopnosť el. zariadenia na uvedenie do prevádzky.

Zhotoviteľ spolu s obstarávateľom budú viesť podrobné technické záznamy o priebehu skúšok a vypracujú zápis s celkovým vyhodnotením, ktorý bude súčasťou preberacieho protokolu.

5. BEZPEČNOSTNE OPATRENIA POCAS PREVADZKY

Pre zaistenie bezpečnosti pri práci na el. zariadeniach sú urobené tieto opatrenia :

- do priestorov elektrotechnologických zariadení bude mať prístup len vyškolený personál
- na rozvodnom zariadení a na vstupoch do priestorov musia byť umiestnené bezpečnostné

tabuľky v zmysle STN 34 03510

- prevádzka transformovne bude vybavená ochrannými a pracovnými pomôckami v zmysle STN 34 2000-4-41, STN 38 1981.

Prevádzka zariadenia je čistá, neznečisťuje ovzdušie a nevplýva škodlivo na ľudský organizmus.
Z protipožiarnych dôvodov budú káble uložené v zmysle STN 33 2000-5-52. Prestupy káblov cez stavebné konštrukcie budú protipožiarne utesnené (rieši stavebná časť).

M Battery System for supply T80

LIST OF DEVICES / ZOZNAM STROJOV A ZARIADENÍ

Rev.	Date	Supervis.	Appr.	Modifications
a	09/2005	Ing. Németh	Ing. Richman	Zmeny v ATJ
b				TECHNICKÁ SPRÁVA Príprava kódu
c				22.005 47323
d				3 KONTROLOVANE - CHECKED
0	05/2005	Ing. Németh	Ing. Richman	Initial edition
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1.	pcs	2	Usmerňovač typ IC 3000/250V 45A (6x IC 3000/250V 7,5A) Technické údaje: Napájacie napätie: 3x400V, 50Hz Výstupné napätie: 189-250V DC Výstupný prúd: 45A Rozmery: š x h x v = 600 x 600 x 2000 mm Umiestnený pri stene Dodávateľ: ALTRON SK, a.s. Bratislava
2.	pcs	1	Skriňový rozvádzač ATJ Skriňový rozvádzač nástenný s uzamykateľnými dverami. Zaústenie káblov zospodu. Krytie IP43/IP30 Prístroje upevnené na lište. Skriňu privodov (č.1) vyhotoviť tak, aby ovládacie páky silových vypínačov prečnievali cez výrezy vo dverách. Dvere podľa č. 1 budú opatrené slepou schémou. Technické údaje: Napätiová sústava: 2-220 Vjs / IT Menovitý prúd prípojnic: 150 A, 5kA Farba: RAL 7032 Rozmery: Celková dĺžka: 1600mm (2 polia á 800mm) Hĺbka: 600mm Výška: 2250mm Prístrojová náplň: ATJ - POLE č.1
2.1	ks	1	Dvojpolový istič Schneider NS 100 STR22SE, 250VDC, 100A, Príslušenstvo: - pomocné kontakty OF1, OF2, kryt svoriek
2.2	ks	10	Dvojpolový odpínač Schneider NS 100NA, 250VDC, 100A Príslušenstvo: pomocné kontakty OF1, OF2, kryt svoriek
2.3	ks	2	Vačkový spínač S10J-D-2402-B8.VP.S
2.4	ks	2	Ovládacia hlavica T10A ČE, čierna
2.5	ks	2	Spínacia jednotka T10Z111Z
2.6	ks	2	Spojovací diel T10SD3
2.7	ks	2	Digitálny voltmeter, 0-250V
2.8	ks	2	Ampérmeter Ma96c so stupnicou 150-0-150 / 15-0-15A, s bočníkom 600/60mV
2.9	ks	2	Ampérmeter Ma96c so stupnicou 0-60A, s bočníkom 60mV
2.10			



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INGENIERIE

57, Ave Carnot - B.P. 313
94503 Champigny Cedex
(FRANCE)

Job Number: 50 - 3023 - 01

Name: KOSICE

Document Nbr
ELV38-6-06093a

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2.11			
2.12			
2.13			
2.14	ks	2	Podpät'ové relé PR 01, 100-200V, 2x prepínací kontakt
2.15	ks	2	Nadpät'ové relé PR 01, 200-400V, 2x prepínací kontakt
2.16	ks	2	Zástrčkové relé 700-HA33Z2-3, 220Vjs, 3P
2.17	ks	2	Pät'ica pre relé 700-HN203
2.18	ks	4	Poistkový spodok SPB00, OEZ Letohrad
2.19	ks	4	Poistková patróna nožová PN000 25A gG/gL
2.20	ks	2	Dvojpólová zásuvka, 32A, 220V DC, zapustené vyhotovenie, s vidlicou
2.21	ks	6	Dvojpólový istič LSN-DC2C/2, 250V, 2A
2.22	ks	10	Svorka 50 mm ²
2.23	ks	81	Radová svorka 1,5 - 4 mm ²
2.24	ks	2	Merač zemného odporu MIO200, 220VDC
2.25	ks	4	Poistkový odpínač FH00-1S/F, 160A, 220V DC, s poistkou PN000 gG/80A obsahujúci :
2.25a	ks	2	Zostavovacia sada pre dvojpólový odpínač 0D-FH00-SS24
2.25b	ks	2	Pomocný kontakt 0D-FH-SK
2.25c	ks	4	Zábrana pred nebezp. dotykom
ATJ - POLE2			
2.28	ks	3	Dvojpólový istič LSN-DC16C/2, 250VDC, 16A, Schneider
2.29	ks	3	Dvojpólový istič LSN-DC10C/2, 250VDC, 10A, Schneider
2.30	ks	6	Dvojpólový istič LSN-DC6C/2, 250VDC, 6A, Schneider
2.31	ks	18	Dvojpólový poistkový odpínač OPV14, 220V DC, 63A s poistkou 14x51
2.32	ks	12	Valcová poistka 14x51, typ PV14 6A gG
2.33	ks	12	Valcová poistka 14x51, typ PV14 10A gG
2.34	ks	8	Valcová poistka 14x51, typ PV14 16A gG
2.35	ks	4	Valcová poistka 14x51, typ PV14 25A gG
2.36	ks	30	Otočný spínač typ S32J D 2204 C6, 220V DC, 32A, štítok : W1 - 0 - W2
2.37	ks	78	Radová svorka 1,5 - 4 mm ²
2.38	ks	4	Káblové oko lisovacie pre Cu vodič 1x25mm ²
2.39			
3	ks	2	Akumulátorová batéria staničná, dodaná spolu so stojanom, menovité napätie 220V DC kapacita C10 122Ah typ batérie Sprinter P 6V 1700 6V (36ks pre 220V) Umiestnenie : podľa výkresu č. ELV38-3-07141 Dodávateľ: ALTRON SK, a.s. Bratislava



AIR LIQUIDE

INGENIERIE

57, Ave Carnot - B.P. 313
94503 Champigny Cedex
(FRANCE)

Job Number: 50 - 3023 - 01

Name: KOSICE

Document Nbr

ELV38-6-06093a

M Battery System for supply T80

4.	m	40	Kábel CYA 1x25
5.	m	140	Kábel CYA 1x50
6.	m	5	Kábel JQTQ 7Dx0,8
7.	m	20	Uzemňovací pásik FeZn 30/4

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AIR LIQUIDE
INGENIERIE

57, Ave Carnot - B.P. 313
94503 Champigny Cedex
(FRANCE)

Job Number: 50 - 3023 - 01
Name: KOSICE

Document Nbr
ELV38-6-06094

M Battery System for supply T80

CABLE LIST / SÚPIS KÁBLOV

Rev.	Date	Supervis.	Appr.	Modifications
a				<p>CHNICKÁ DISPEKČIA SK Pracovisko Košice</p> <p>29.10.05, 04523</p> <p>3 CONTROLOVANÉ + CHECKED</p>
b				
c				
d				
0	05/2005	Ing. Németh	Ing. Richman	Initial edition
0a				
0b				
1				
2				
3				
4				
5				
6				
7				
8				
9				

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CABLE LIST / SÚPIS KÁBLOV

Elektrovod
Holding, a. s.

PROJECT:

KOŠICE

DOCUMENT No:

ELV38-6-06094

PART:

M Battery System for Supply T80

DATE: 05/2005

PAGE: 2/2

CABLE	FROM	TO	CABLE					REMARK
			TYPE	LENGHT (m)				
=ATJ-WL50201	ATJ1	ATF1	CYA 1x25				10	
=ATJ-WL50202	ATJ1	ATF1	CYA 1x25				10	
=ATJ-WL50204	ATJ1	+ATB1	CYA 1x50				35	
=ATJ-WL50205	ATJ1	-ATB1	CYA 1x50				35	
=ATJ-WL50211	ATJ2	ATF2	CYA 1x25				10	
=ATJ-WL50212	ATJ2	ATF2	CYA 1x25				10	
=ATJ-WL50214	ATJ2	+ATB2	CYA 1x50				35	
=ATJ-WL50215	ATJ2	-ATB2	CYA 1x50				35	
=ATJ-WS50101	ATJ1	ATJ2	JQTQ 7Dx0,8				3	

22.10.55 07:52

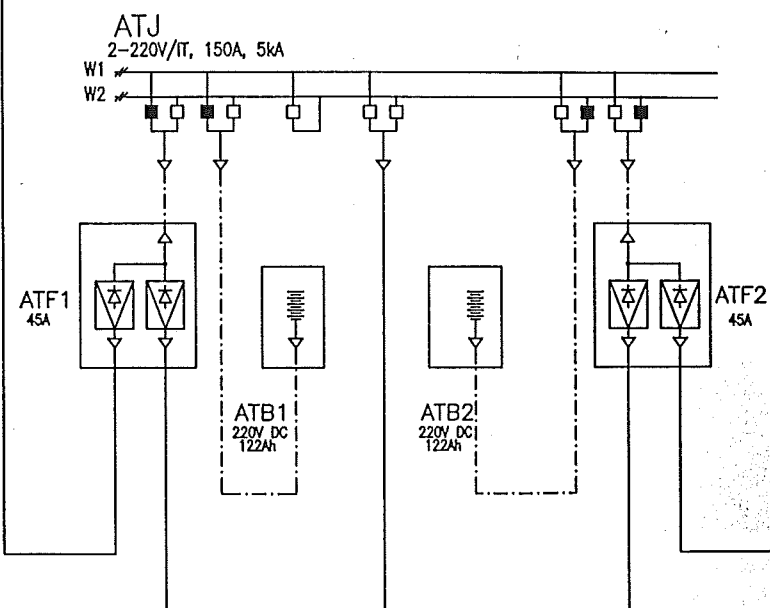
Prizivsko Kušine

ČIMA KA IŠPEŠČIA

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3NPE~50Hz 400V/TN-S

LV SWITCHBOARD NOT IN ELEKTROVOD SCOPE
ROZVÁDZAČ NN – NIE JE DODÁVKA ELEKTROVODU



U.S. STEEL
EMERGENCY POWER SUPPLY
ZÁLOŽNÉ NAPÁJANIE

LEGENDA:

- VYPÍNAČÍ PRVOK V ZAPNUTOM STAVE
TRANS SWITCH IN CLOSED STATE
- VYPÍNAČÍ PRVOK VO VYPNUTOM STAVE
TRANS SWITCH IN OPEN STATE

----- KÁBLE DODÁVA ELEKTROVOD
CABLE IN ELEKTROVOD SCOPE

----- KÁBLE NEDODÁVA ELEKTROVOD
CABLE NOT IN ELEKTROVOD SCOPE

CHNICKÁ SPRÁVA S.
PROJEKTU KOSICE

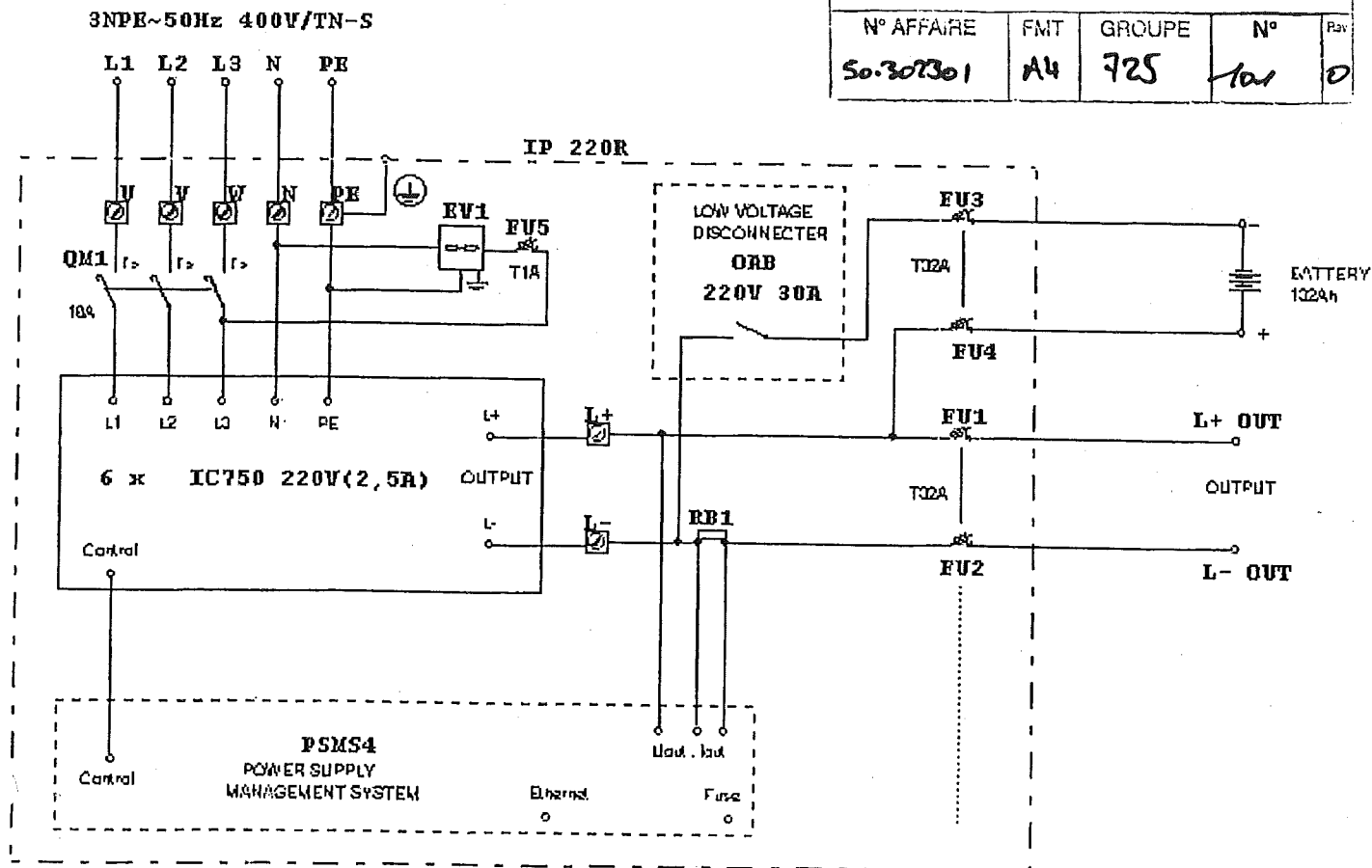
22.06.2005

3
KONTROLOVANE - CHECKED

0		05/2005	Ing. HALAČ	INITIAL EDITION /		Ing. NEMETH	Ing. RICHMAN
REV	REV	DATE	DESSINE PAR DRAWN BY	MODIFICATIONS REVISIONS		VERIFIE PAR CHECKED BY	APPROUVE PAR APPROVED BY
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AFFAIRE / JOB KOSICE				This document, which is L'AIR LIQUIDE's property, may contain valuable confidential informations and must not be copied, or disclosed without the prior written consent of L'AIR LIQUIDE.			
DESCHIE / PART M Battery System for Suply T80							
TITRE / TITLE DC SYSTEM T80 - SINGLE LINE DIAGRAM				ECHELLE / SCALE 50-3023-01			
SCHÉMA ZAPOJENIA ZARIAD. 220VDC PRE T80				FMT GROUPE SIZE GROUP ELV38-4-00466			

ORIGINAL
DATE :

AIR LIQUIDE				
N° AFFAIRE	FMT	GROUPE	N°	Rev
50.307301	A4	725	101	0

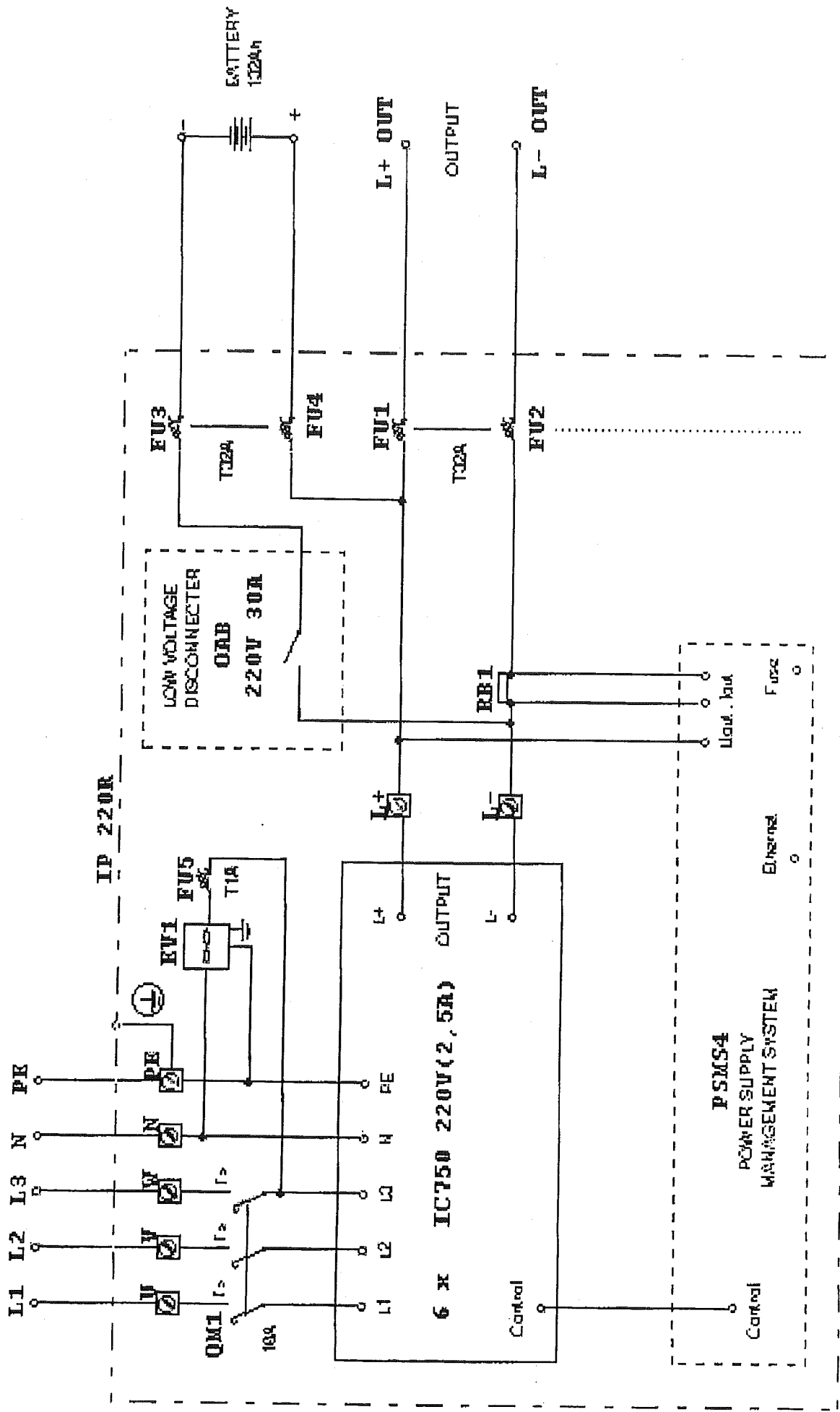


BLOCK DIAGRAM OF THE BATTERY SYSTEM

BLOKOVÁ SCHÉMA IP220R 3x400V, 50Hz/220VDC 15A + BATÉRIA 216V 132Ah

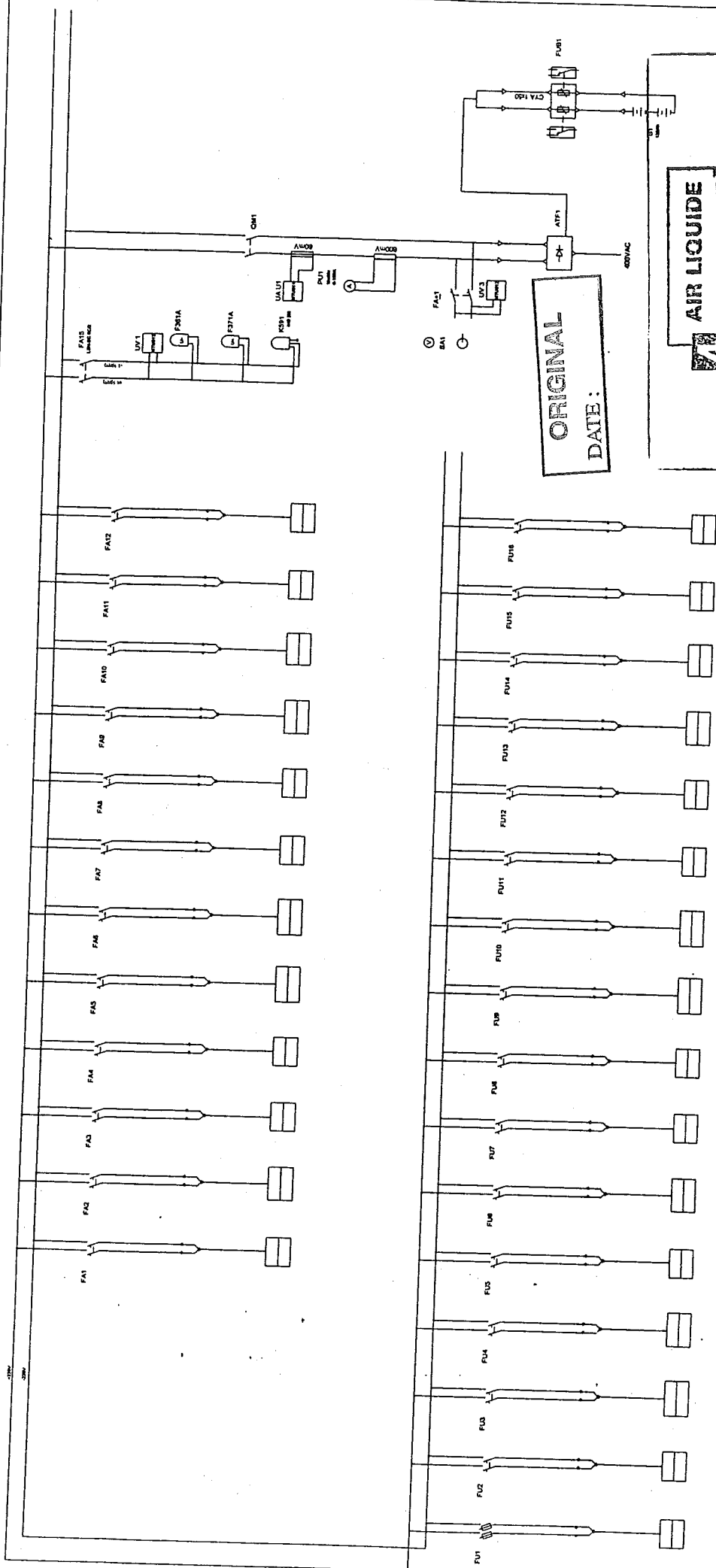
Please review the philosophy of arrangement according to the HL requirements (double inverter in our case, with double busbars in any case : according USSdel)

3NPE~50Hz 400V/TN-S



BLOCK DIAGRAM OF THE BATTERY SYSTEM

BLOKOVÁ SCHÉMA IP220R 3x400V, 50Hz/220VDC 15A + BATERIA 216V 132Ah

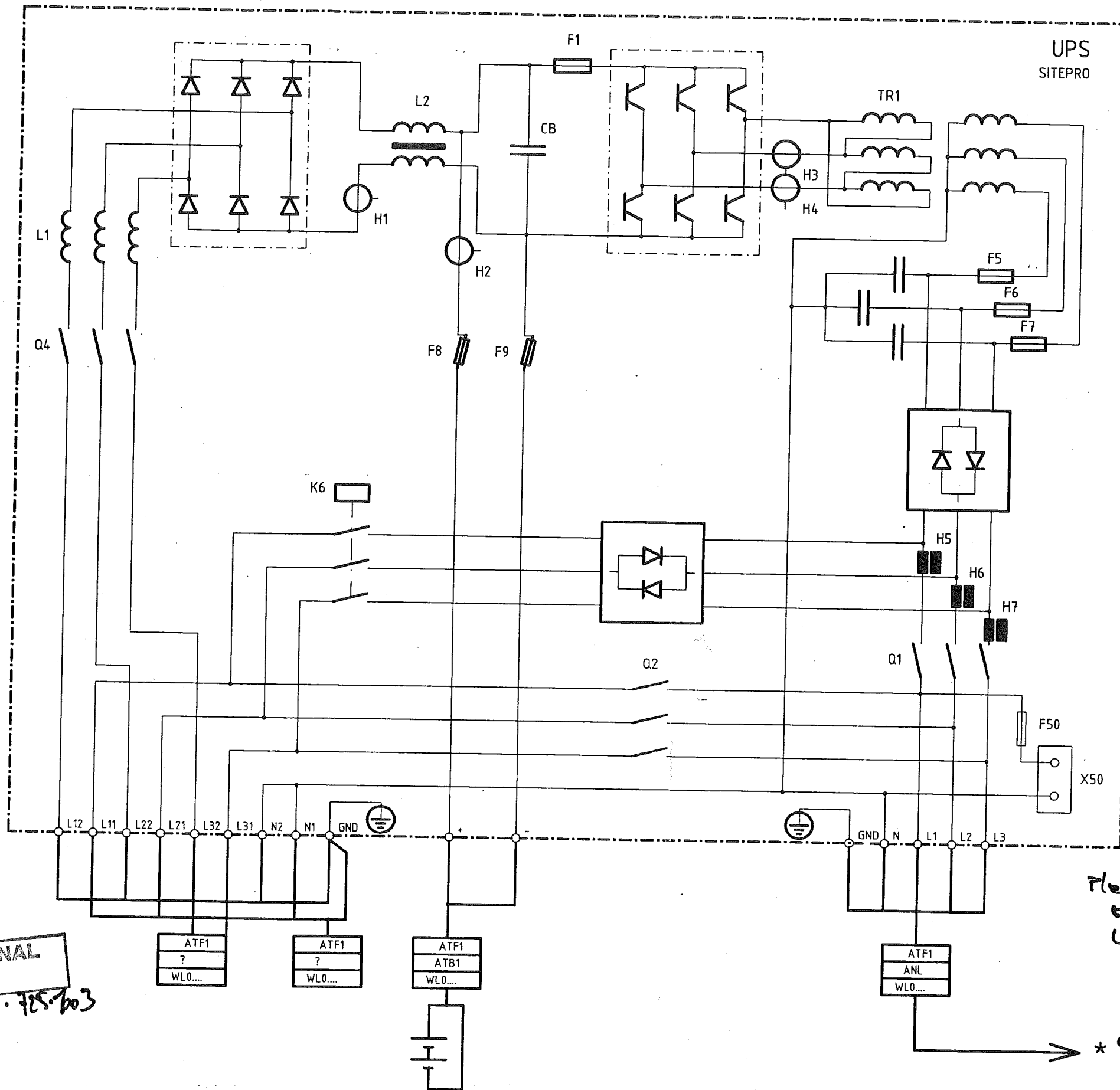


Sans comment, car on a 4.725.101

N° AFFAIRE	FMT	GROUPÉ	N°	Rev
50-202301	A 4	725	102	0

Elektrovod Holding, a. s.				
VÝKONOVATEL	ING. BACÍK	ING. BACÍK	ING. BACÍK	ING. BACÍK
PREVERITEL	ING. MATEJKA	ING. MATEJKA	ING. MATEJKA	ING. MATEJKA
SCHVÁLIL	ING. RICHMAN	ING. RICHMAN	ING. RICHMAN	ING. RICHMAN
STAVBA	ASU KOSICE C.3	ASU KOSICE C.3	ASU KOSICE C.3	ASU KOSICE C.3
SO. PS	N° DC SYSTEM T81	N° DC SYSTEM T81	N° DC SYSTEM T81	N° DC SYSTEM T81
NAZOV	PREHÝADOVÁ SCHÉMA ROZVÁDZAČA ATJ			
ZÁKLADNÉ DOKUM.	ARCHIVNÉ ČÍSLO			

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Please indicate inlets and outlets of the UPS.
Labels are - transformer
- AVR
according standard drawing
* during kick off testing (1801/07)

ORIGINAL
DATE: 50. 3023-01-AS-725-703

DATUM	04/2005
VYPRAC.	ING. HOLOD
PREVER.	ING. NEMETH
SCHVAL.	ING. RICHMAN

ASU KOŠICE č. 9
"O" UPS

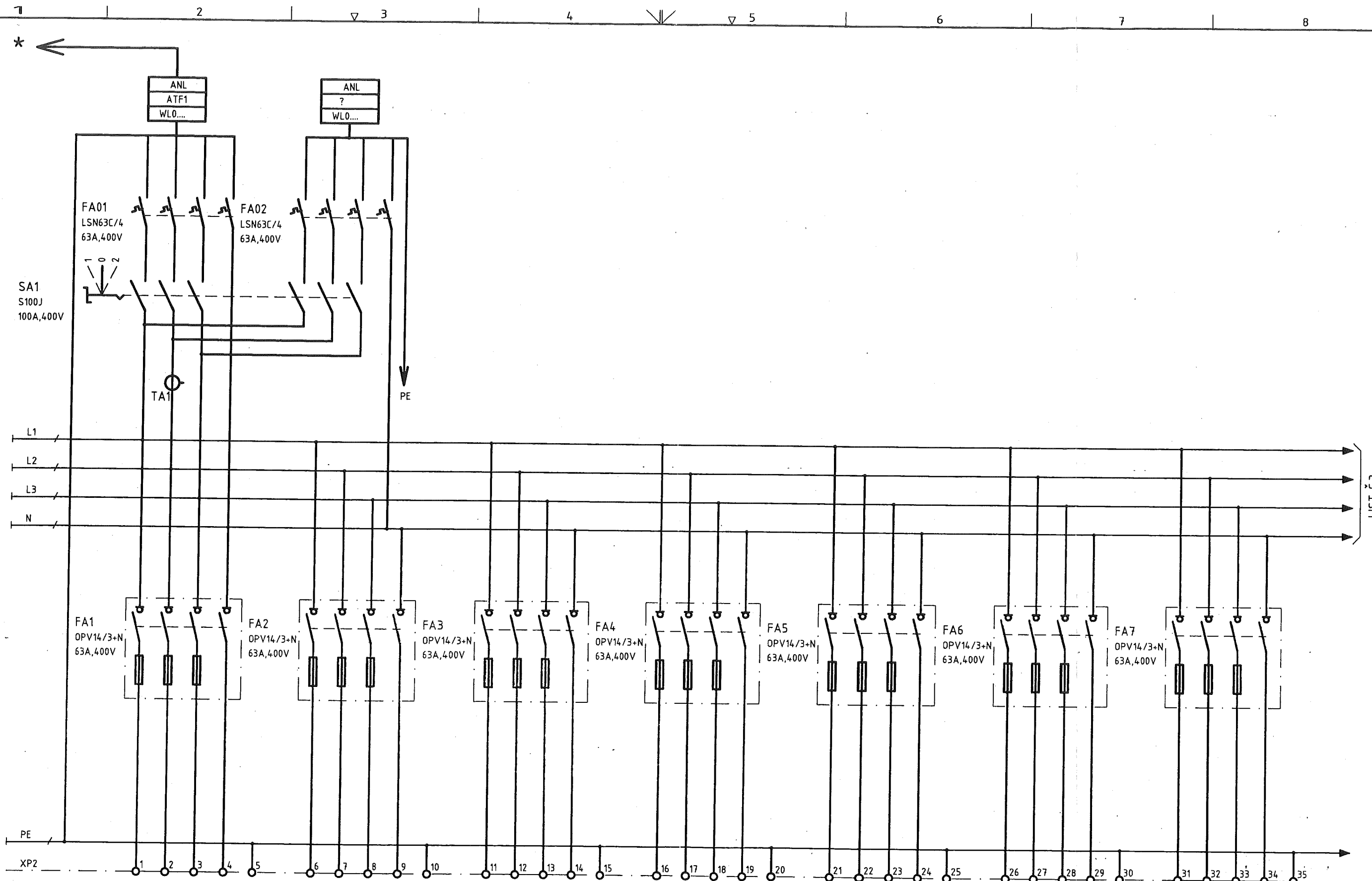
Elektrovod Holding, a.s.

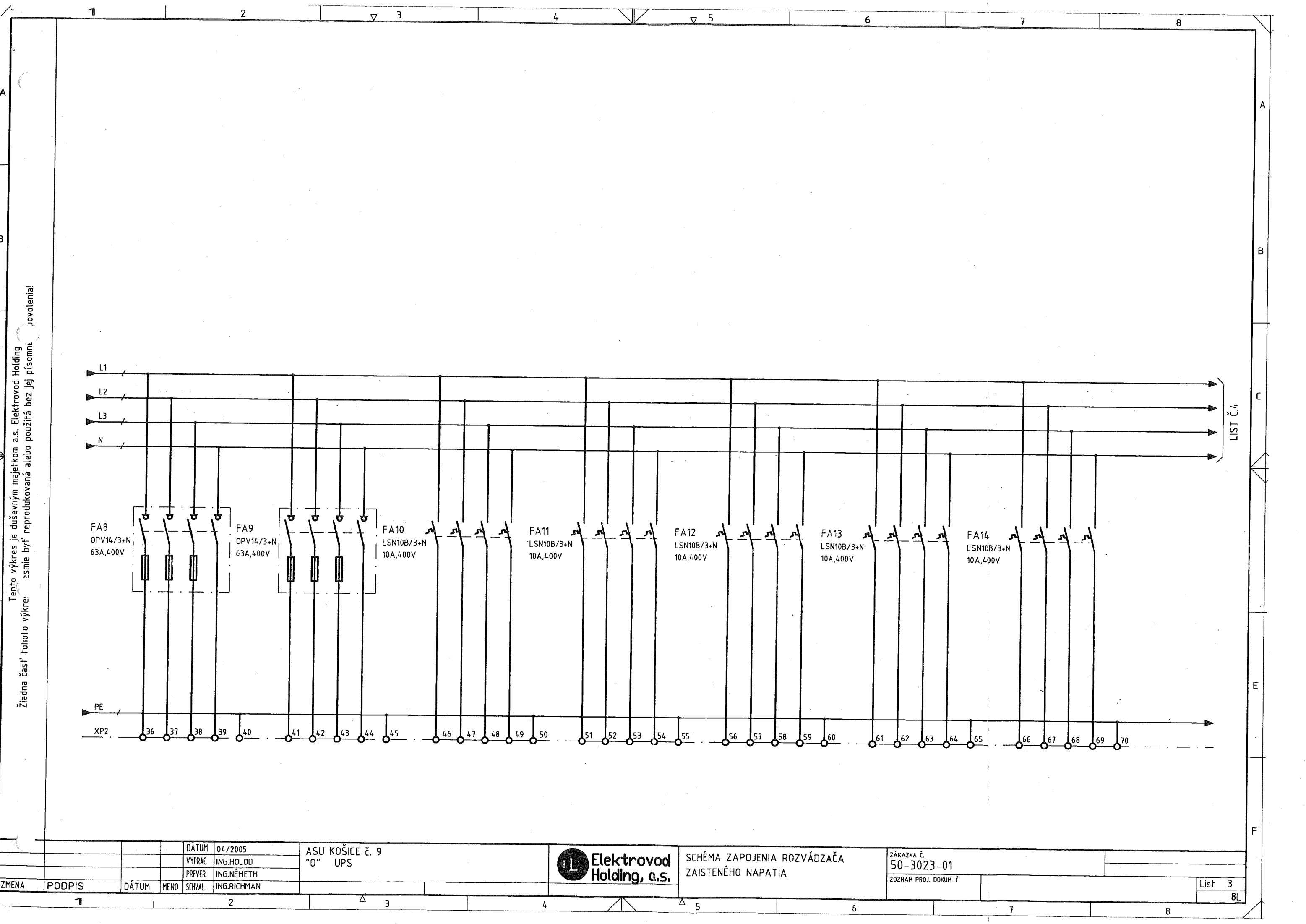
SCHÉMA ZAPOJENIA ROZVÁDZAČA
ZAISTENÉHO NAPATIA

ZÁKAZKA č.
50-3023-01
ZOZNAM PROJ. DOKUM. č.

List 1
8L


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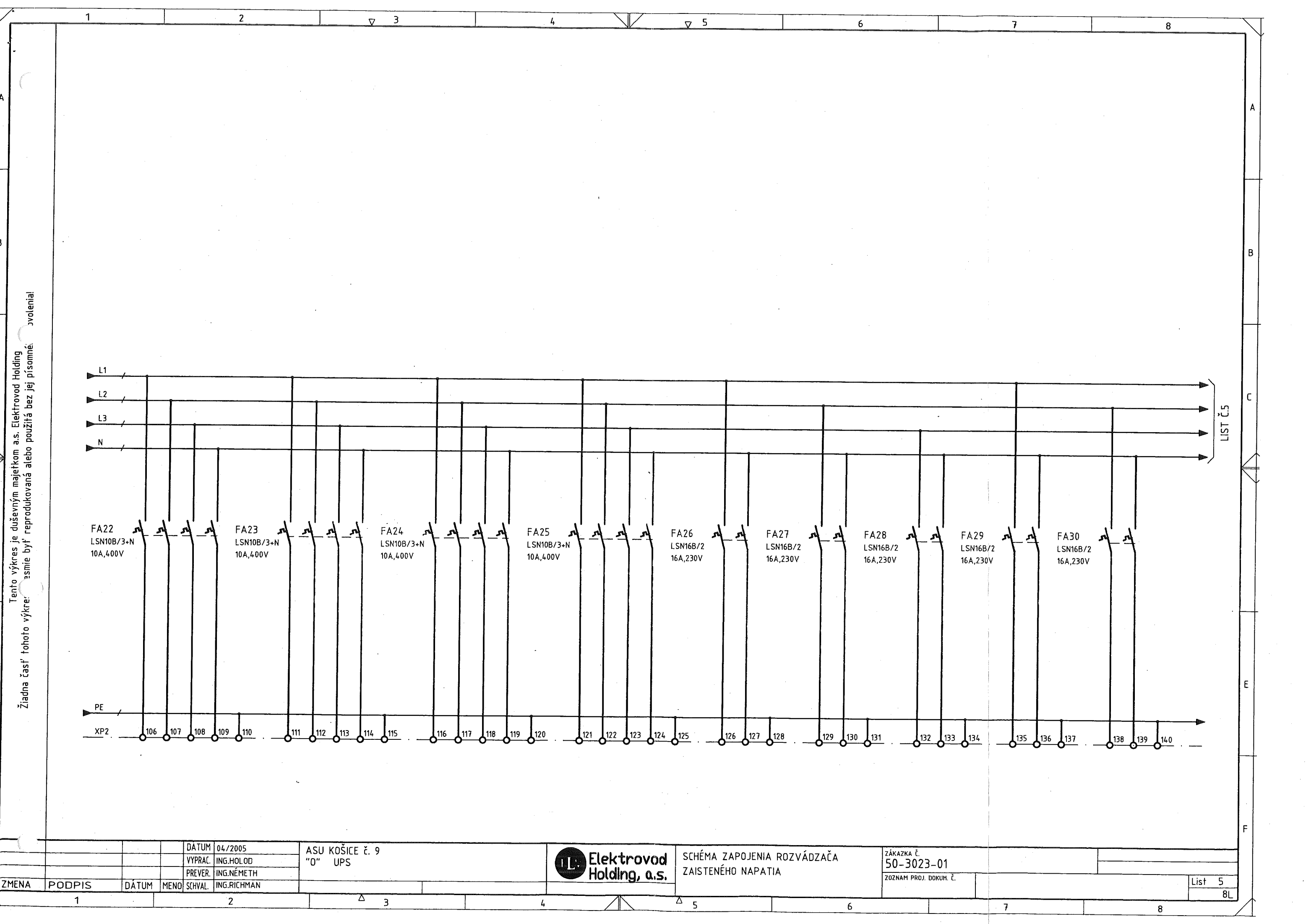





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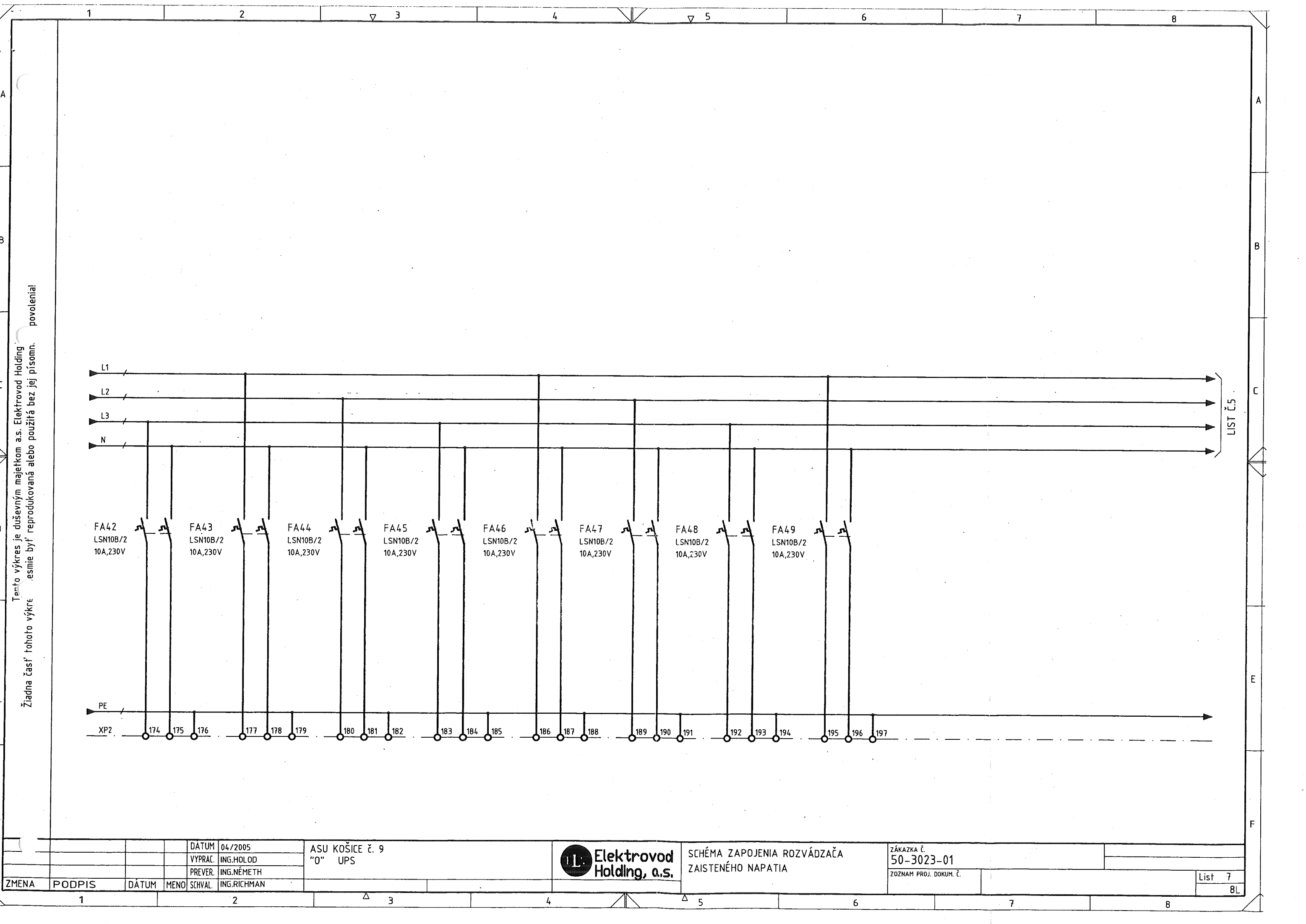
LIST č.4


		DÁTUM		04/2005		ASU KOŠICE č. 9		 Elektrovod Holding, a.s.		SCHÉMA ZAPOJENIA ROZVÁDZAČA		ZÁKAZKA č.			
		VYPRAC.		ING.HOLOD		"0" UPS				ZAISTENÉHO NAPATIA		50-3023-01			
		PREVER.		ING.NÉMETH								Zoznam proj. dokum. č.			
ZMENA	PODPIS	DÁTUM	MENO	SCHVAL.	ING.RICHMAN								List 3		
1		2		3		4		5		6		7		8	
														8L	

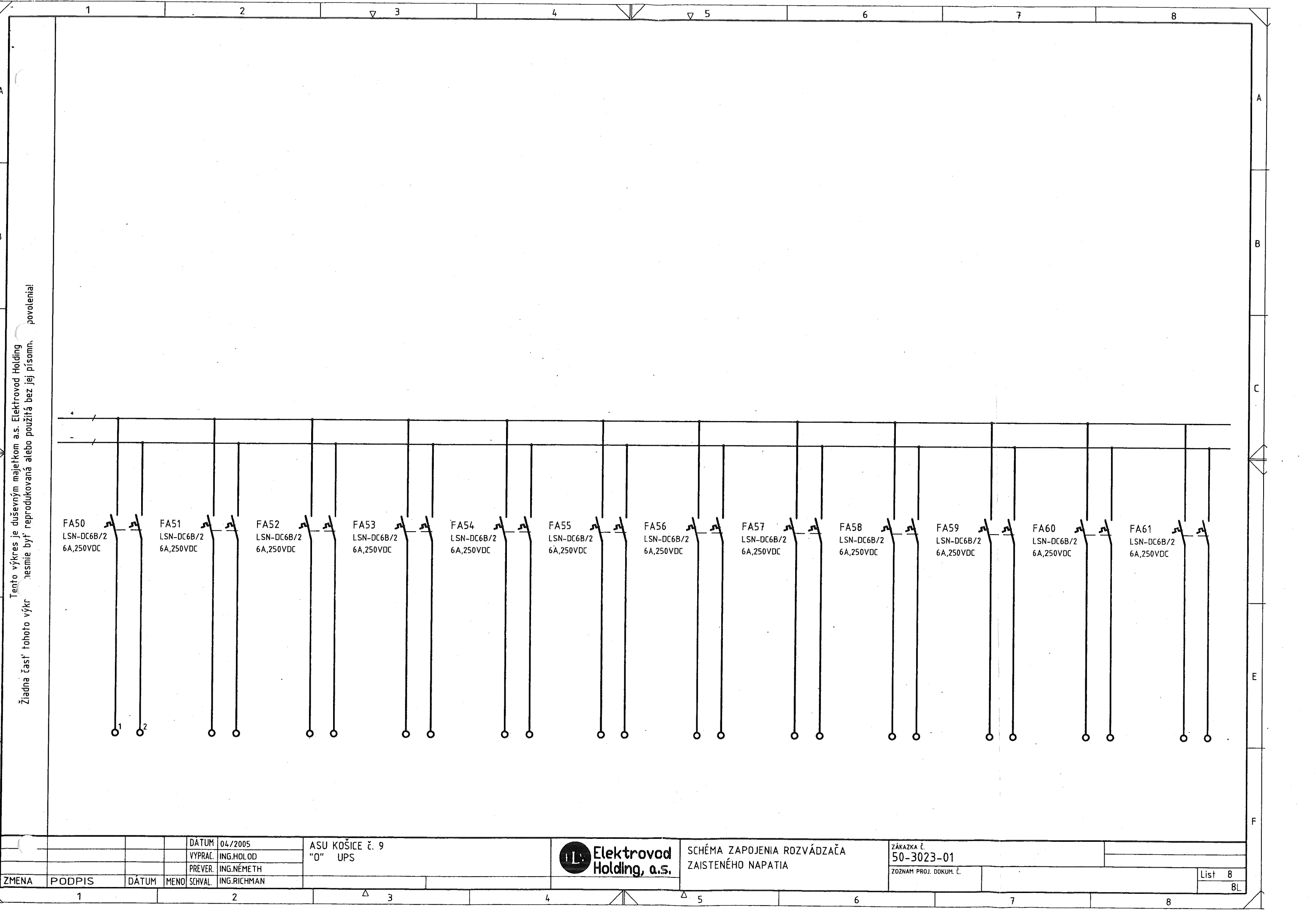


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ZMENA		PODPIS	DÁTUM	MENO	SCHVAL.	DATUM	04/2005	ASU KOŠICE č. 9		SCHÉMA ZAPOJENIA ROZVÁDZAČA ZAISTENÉHO NAPATIA	ZÁKAZKA č. 50-3023-01	Zoznam proj. dokum. č.	List 5
							ING.HOLOD	"0" UPS					
							ING.NÉMETH						
							ING.RICHMAN						8L



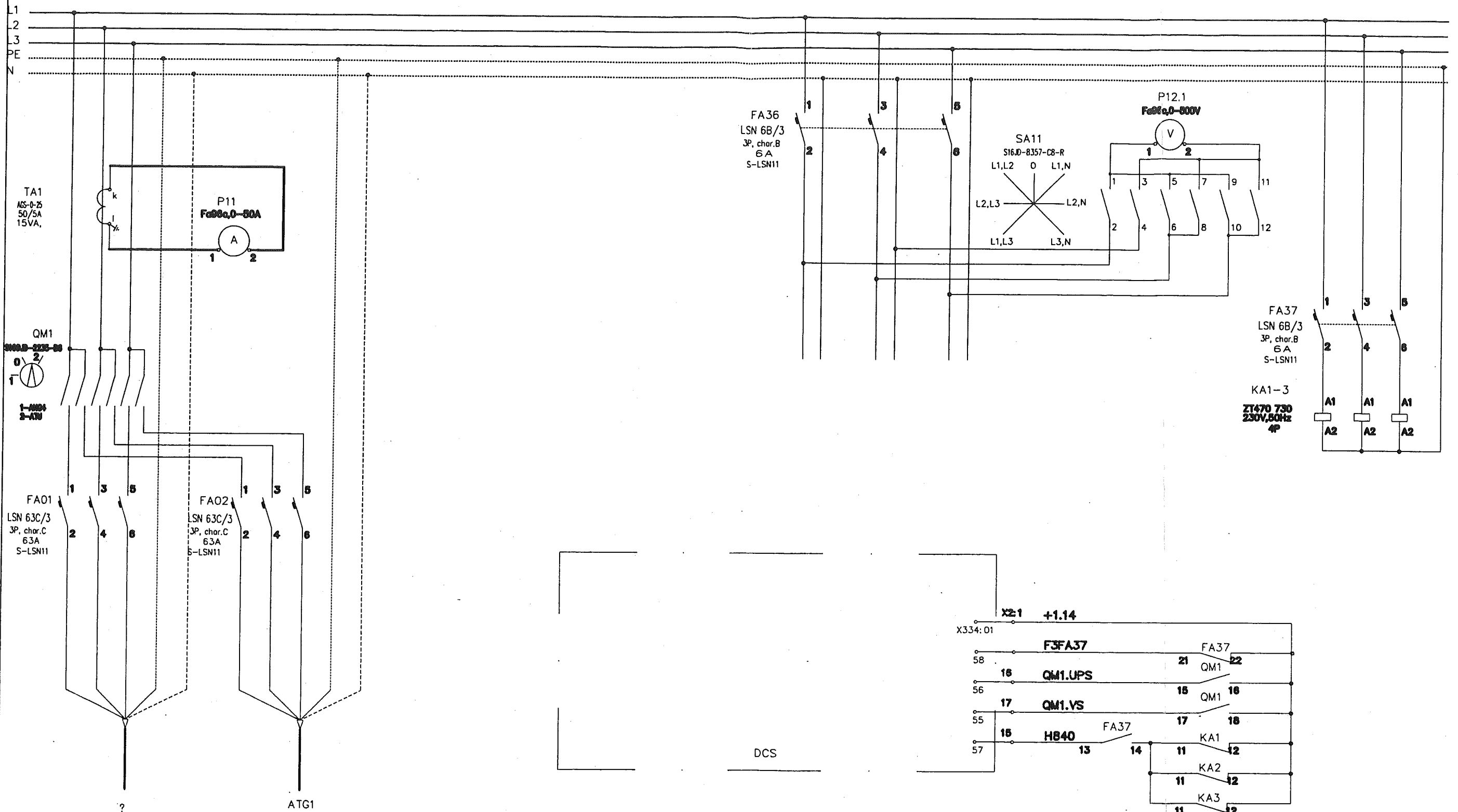
				DATUM	04./2005	ASU KOŠICE č. 9 "0" UPS		 Elektrovod Holding, a.s.	SCHÉMA ZAPOJENIA ROZVÁDZAČA ZAISTENÉHO NAPATIA	ZÁKAZKA č.							
				VYPRAC.	ING.HOLOD					50-3023-01							
				PREVER.	ING.NÉMETH												
ZMENA	PODPIS	DATUM	MENO	SCHVAL.	ING.RICHMAN					ZOZNAM PROJ. DOKUM. č.				List	7		
																8L	



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ZMENA		PODPIS		DÁTUM		MENO		SCHVAL.		ING. RICHMAN		DÁTUM		04/2005		VYPRAC.		ING. HOLOD		PREVER.		ING. NÉMETH		ASU KOŠICE č. 9		"0" UPS		IL Elektrovod Holding, a.s.		SCHÉMA ZAPOJENIA ROZVÁDZAČA		ZAIŠTENÉHO NAPÄTIA		ZÁKAZKA č.		50-3023-01		Zoznam proj. dokum. č.		List		8		8L	
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STRATA NAPÄTIA V ANL

DATUM	04/2005
VYPRAC.	ING.HOLOD
PREVER.	ING.NÉMETH
SCHVAL.	ING.RICHMAN

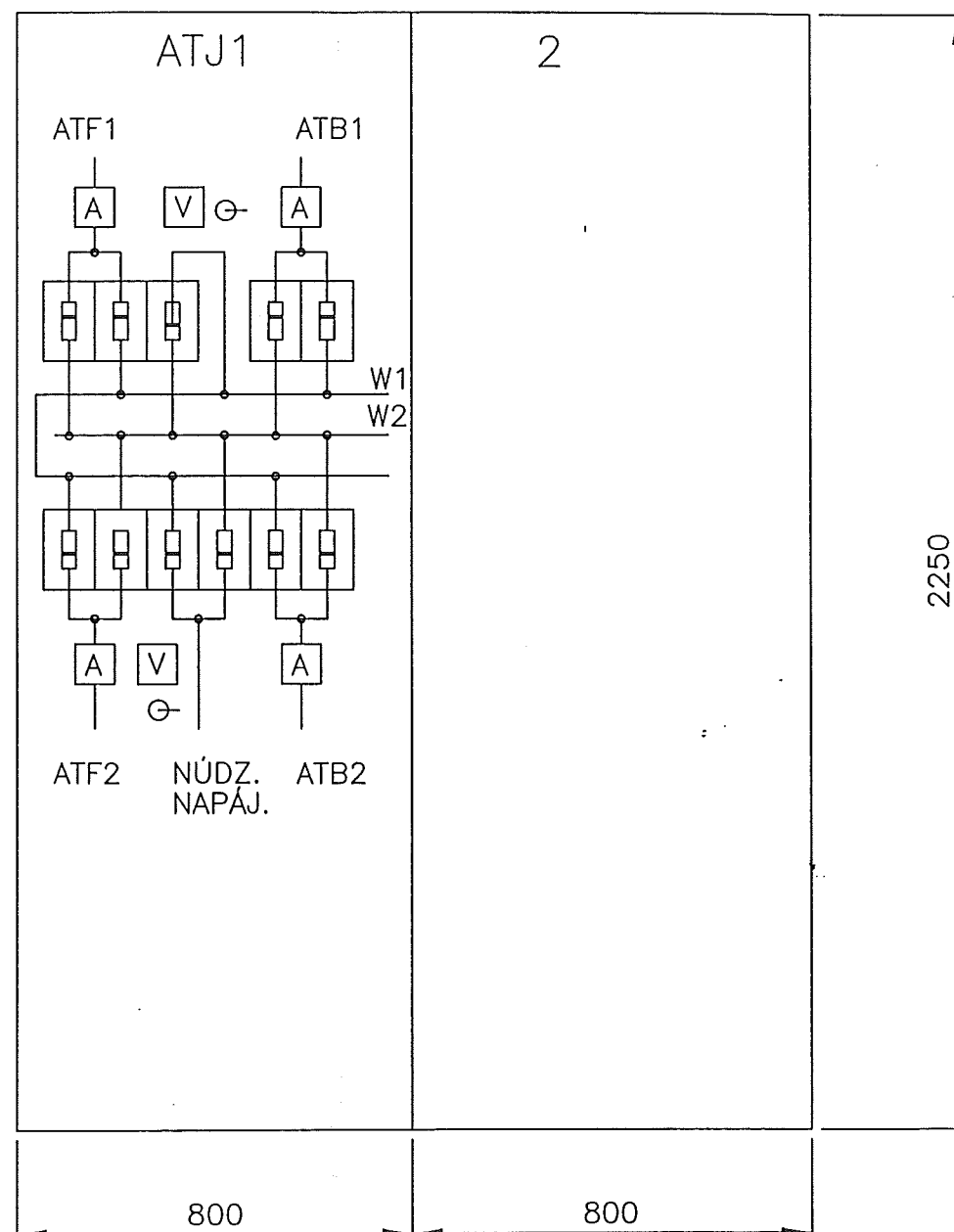
ASU KOŠICE č. 9
"0" UPS

Elektrovod Holding, a.s.

SCHÉMA ZAPOJENIA ROZVÁDZAČA
ZAISTENÉHO NAPÄTIA

ZÁKAZKA č.
50-3023-01
ZOZNAM PROJ. DOKUM. č.

List 9
8L



LIST OF DRAWINGS:

1. ELV38-3-07140/1 LV SWITCHBOARD ATJ1 - SINGLE LINE DIAGRAM INLETS
2. ELV38-3-07140/2 LV SWITCHBOARD ATJ2 - SINGLE LINE DIAGRAM FUSE DISCONNECTORS OUTLETS
3. ELV38-3-07140/3 LV SWITCHBOARD ATJ2 - SINGLE LINE DIAGRAM FUSE DISCONNECTORS OUTLETS
4. ELV38-3-07140/4 LV SWITCHBOARD ATJ2 - SINGLE LINE DIAGRAM CIRCUIT BREAKERS OUTLETS

ZOZNAM PRÍLOH

- Prívody rozvádzača - pole ATJ1
 Polstkové vývody z rozvádzača - pole č.2
 Polstkové vývody z rozvádzača - pole č.2
 Isťčové vývody z rozvádzača - pole č.2

TECHNICKÁ SPRÁVA S.
 Prachovské 100 100

20.10.05 14:23

KONTROLOVANÉ - CHECKED

0	07/2005	Ing. HALÁČ	Bus coupler QV12 added	Ing. HMEETH	Ing. RICHMAN
0	08/2005	Ing. HALÁČ	INITIAL EDITION /	Ing. HMEETH	Ing. RICHMAN
REV	DATE	DESIGNED BY	MODIFICATIONS	VERIFIED BY	APPROVED BY
REV	DATE	DRAWN BY	REVISIONS	CHECKED BY	APPROVED BY

Elektrovod Holding, a.s.

KOSICE

M Battery System for Suply T80

LV SWITCHBOARD ATJ - SINGLE LINE DIAGRAM

PREHLADOVÁ SCHÉMA VÝSTROJA ROZVÁDZAČA 220V DC - ATJ

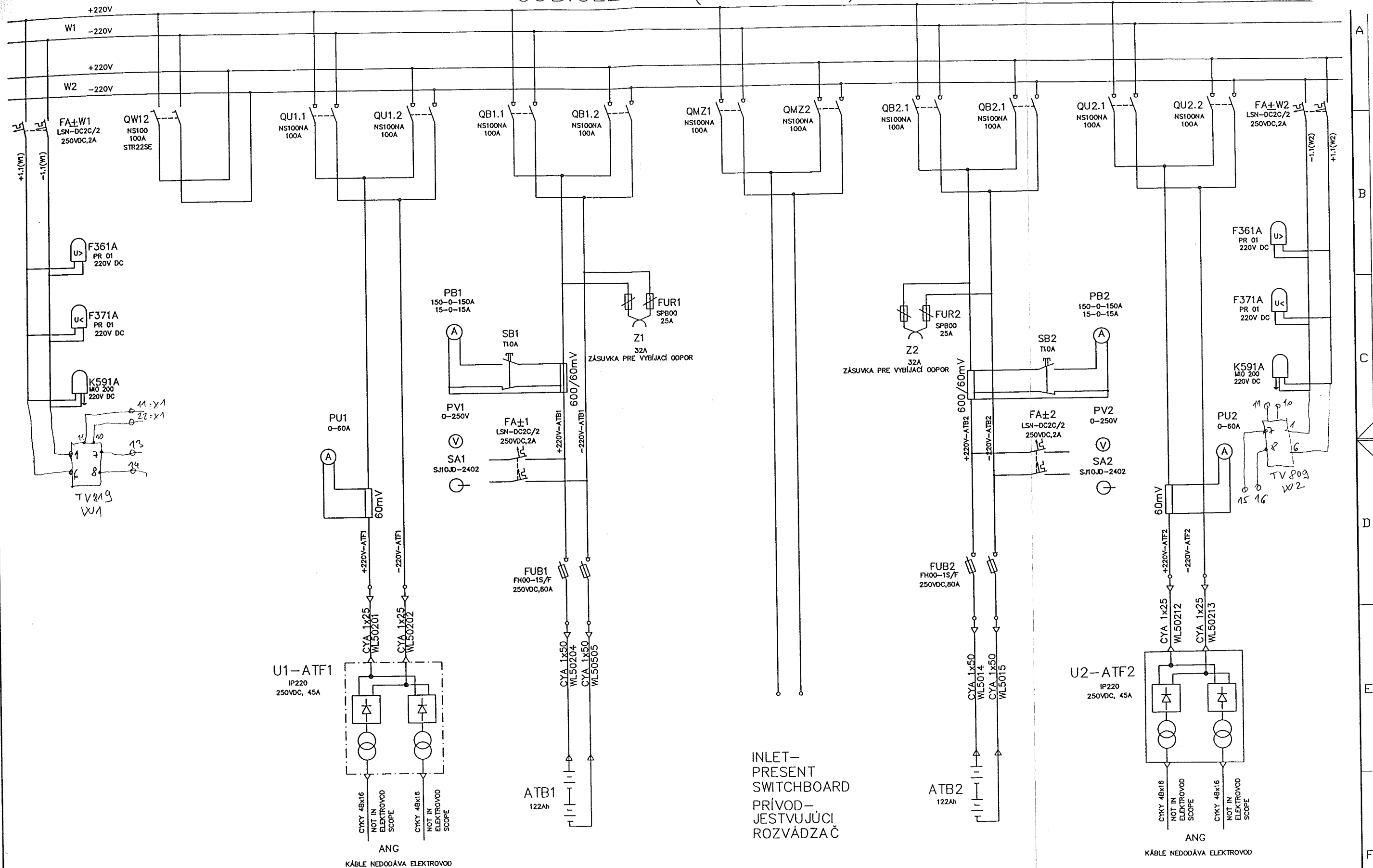
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AIR LIQUIDE

ECHELLE / SCALE: 50-3023-01 A3-725-104

CUBICLE No.1(W=800mm) Pole č.1(š=800mm)



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DATE	05/2005	KOŠICE
ELABOR.	ING. HALAČ	
CHECKED	ING. NÉMETH	
APPROV.	ING. RICHMAN	
DATE	07/2005	
MEMO		
CHANGE	SIGNATURE	



Elektrovd Holding a.s.

LV SWITCHBOARD ATJ1 - SINGLE LINE DIAGRAM - INLETS
Přehľadová schéma rozvádzača ATJ pole č.1 - prívody

PROJECT No.

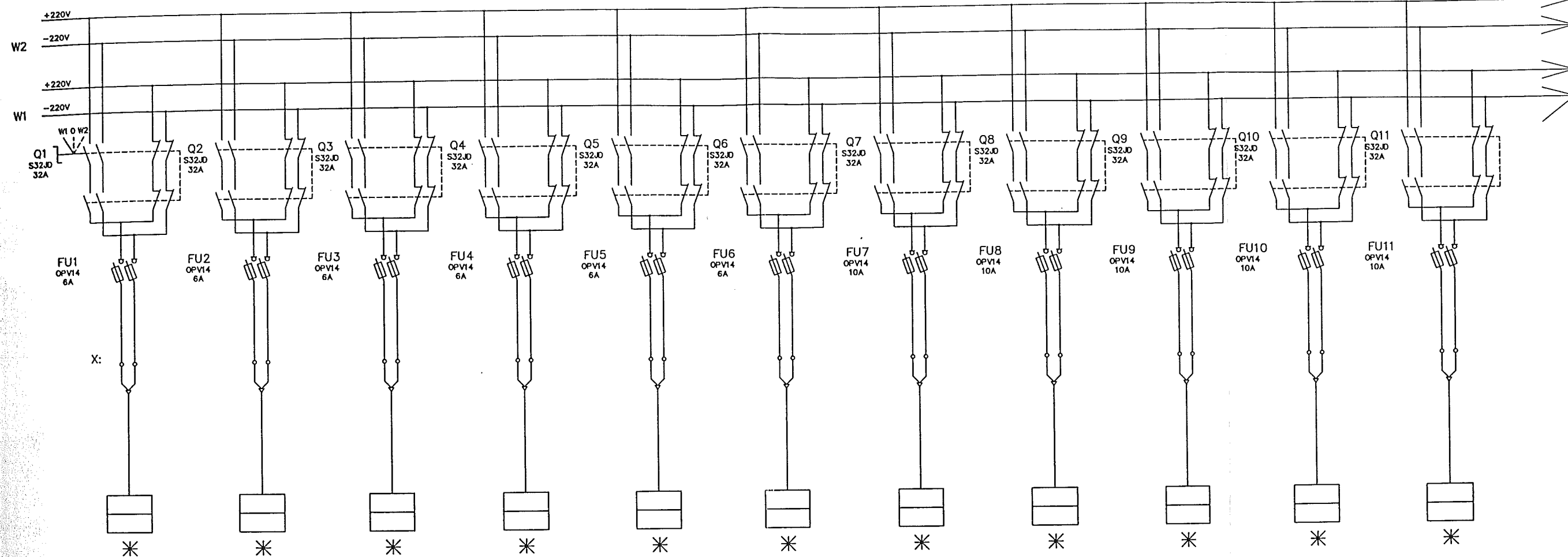
PRS

LIST OF DOCUMENTATION:
ELV 38-6-06091

A3-725-104 a

PAGE 1
4 L

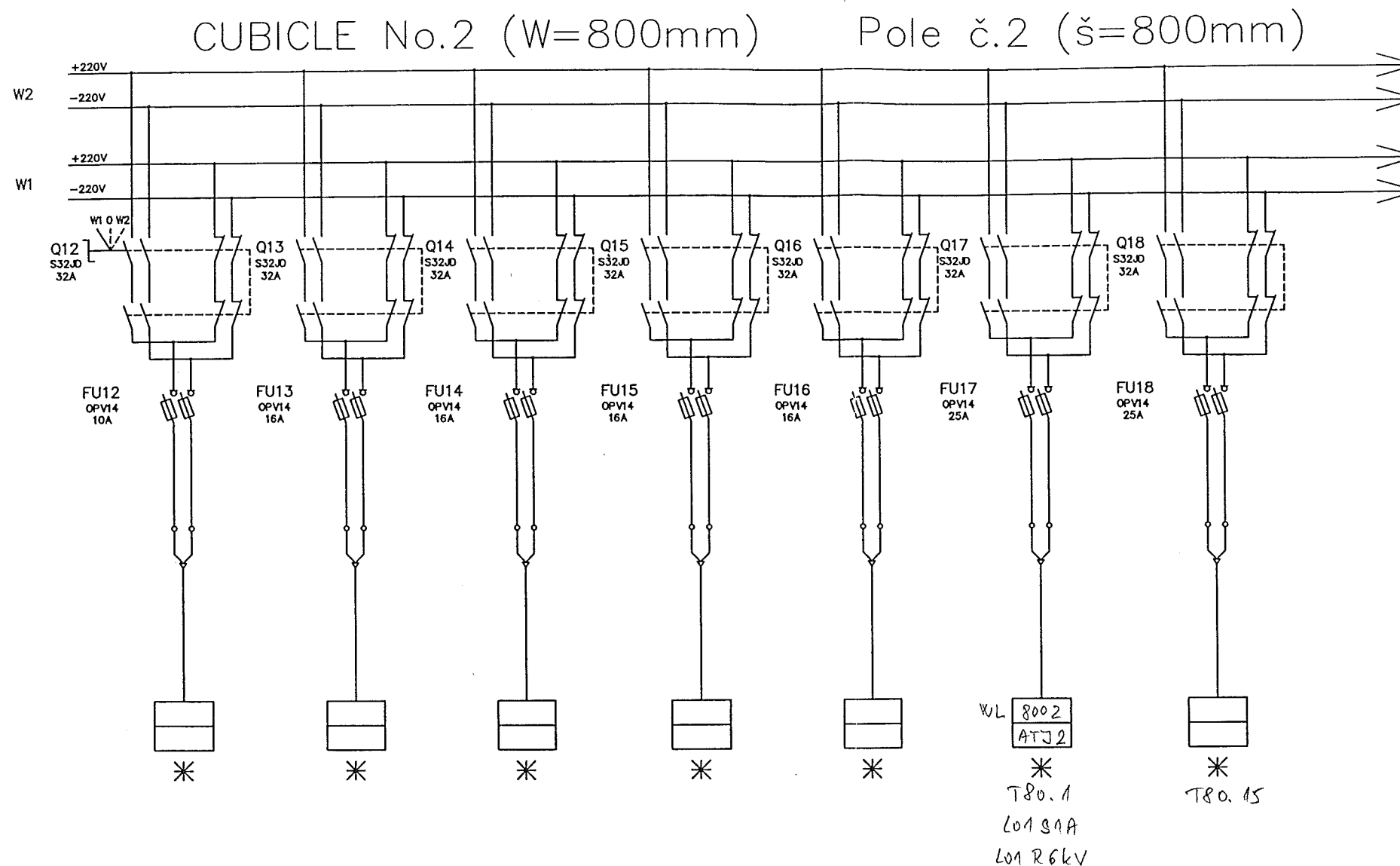
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* - CABLE NOT IN ELEKTROVOD SCOPE
* - KABEL NIE JE V DODAVKE ELEKTROVODU

DATE 05/2005		KOŠICE		ELV Elektrovod Holding a.s.	LV SWITCHBOARD ATJ2 - SINGLE LINE DIAGRAM OF FUSE DISCONNECTORS OUTLETS Prehľadová schéma rozvádzača ATJ2 - vývody s poistkovým odpoínačom	PROJECT No. PRS	LIST OF DOCUMENTATION: ELV 38-6-06091 A3-725-104	PAGE 2 4 L
ELABOR. ING. HALAČ		M Battery System for Supply T80						
CHECKED ING. NÉMETH		APPROV. ING. RICHMAN						
SIGNATURE	DATE	NAME	APPROV.					

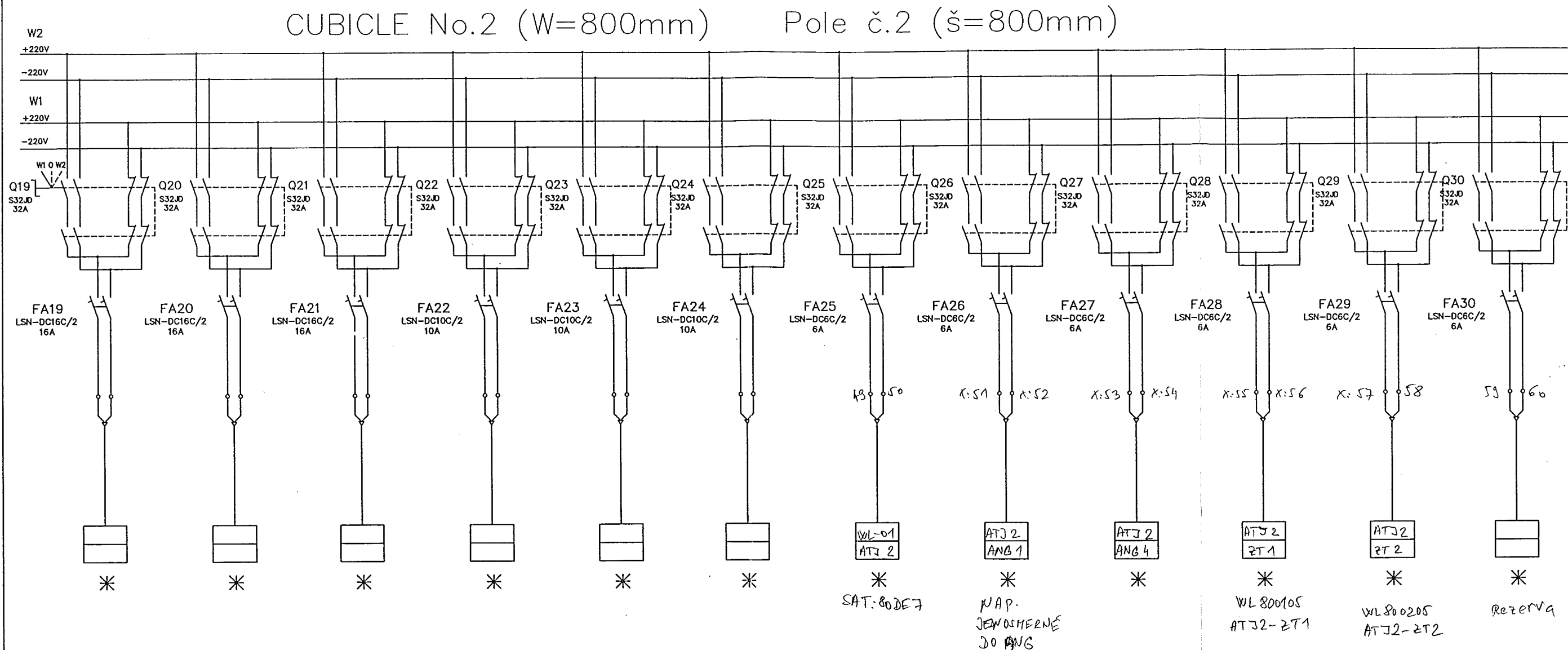
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* - KABEL NIE JE V DODAVKE ELEKTROVODU

CHANGE		DATE 05/2005		KOŠICE			LV SWITCHBOARD ATJ2 - SINGLE LINE DIAGRAM OF FUSE DISCONNECTORS OUTLETS Prehľadová schéma rozvádzača ATJ2 - vývody s poistkovým odpínačom		PROJECT No.		PRS	
		ELABOR. ING. HALAČ		M Battery System for Supply T80					LIST OF DOCUMENTATION:		A3-725-104	
SIGNATURE		DATE	NAME	APPROV.	ING. RICHMAN			ELV 38-6-06091		PAGE 3		4 L

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* - CABLE NOT IN ELEKTROVOD SCOPE
* - KABEL NIE JE V DODAVKE ELEKTROVODU

CHANGE		SIGNATURE	DATE	NAME	APPROV.	DATE	NAME	APPROV.	DATE	NAME	APPROV.
1											
2											
3											
4											
5											
6											
7											
8											

DATE 05/2005
ELABOR. ING. HALAČ
CHECKED ING. NÉMETH
APPROV. ING. RICHMAN

KOŠICE
M Battery System for Supply T80

Elektrovod Holding a.s.

LV SWITCHBOARD ATJ2 - SINGLE LINE DIAGRAM
OF CIRCUIT BREAKERS OUTLETS
Prehľadová schéma rozvádzača ATJ
- Ištičové vývody

PROJECT No. PRS

LIST OF DOCUMENTATION:
ELV 38-6-06091 A3-725-104



PAGE 4
4 L

LIST OF DRAWINGS:

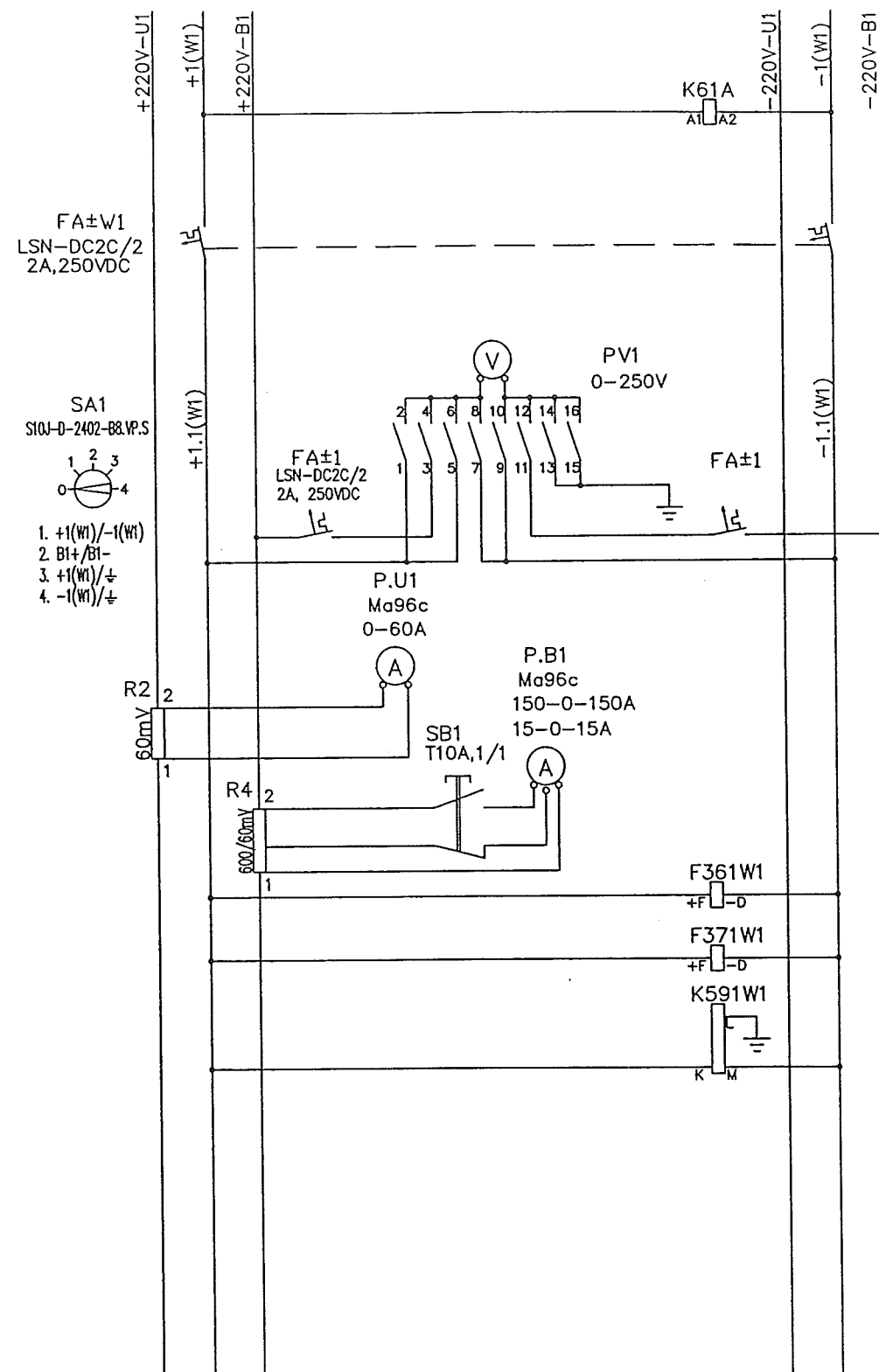
1. ELV38-3-03455/1 LV SWITCHBOARD ATJ - WIRING DIAGRAM OF CONTROL AND MEASUREMENT OF INLETS
2. ELV38-3-03455/2 LV SWITCHBOARD ATJ - WIRING DIAGRAM OF STATUS SIGNALIZATION OF CIRCUIT BREAKERS
3. ELV38-3-03455/3 LV SWITCHBOARD ATJ - WIRING DIAGRAM OF TERMINALS

ZOZNAM PRÍLOH

- Schéma ovládania a merania prívodov ATJ
 Schéma signalizácie stavu spínacích prístrojov
 Schéma vonkajších spojov rozvádzača ATJ

D		05/2005	Ing. HALAČ	INITIAL EDITION /		Ing. HONETH	Ing. RICHMAN
REV	DATE	DATE	DESIGNED BY	MODIFICATIONS	REVISIONS	VERIFIED BY	APPROVED BY
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DISCIPLE / PART M Battery System for Suply T80				 AIR LIQUIDE			
TITRE / TITLE LV SWITCHBOARD ATJ-WIRING DIAGRAM OF CONTROL AND MEASUREMENT SCHÉMA OVLÁDANIA A MERANIA PRÍVODOV ROZVÁDZAČA 220V ATJ				ECHELLE / SCALE 50-3023-01 A3-725-105			

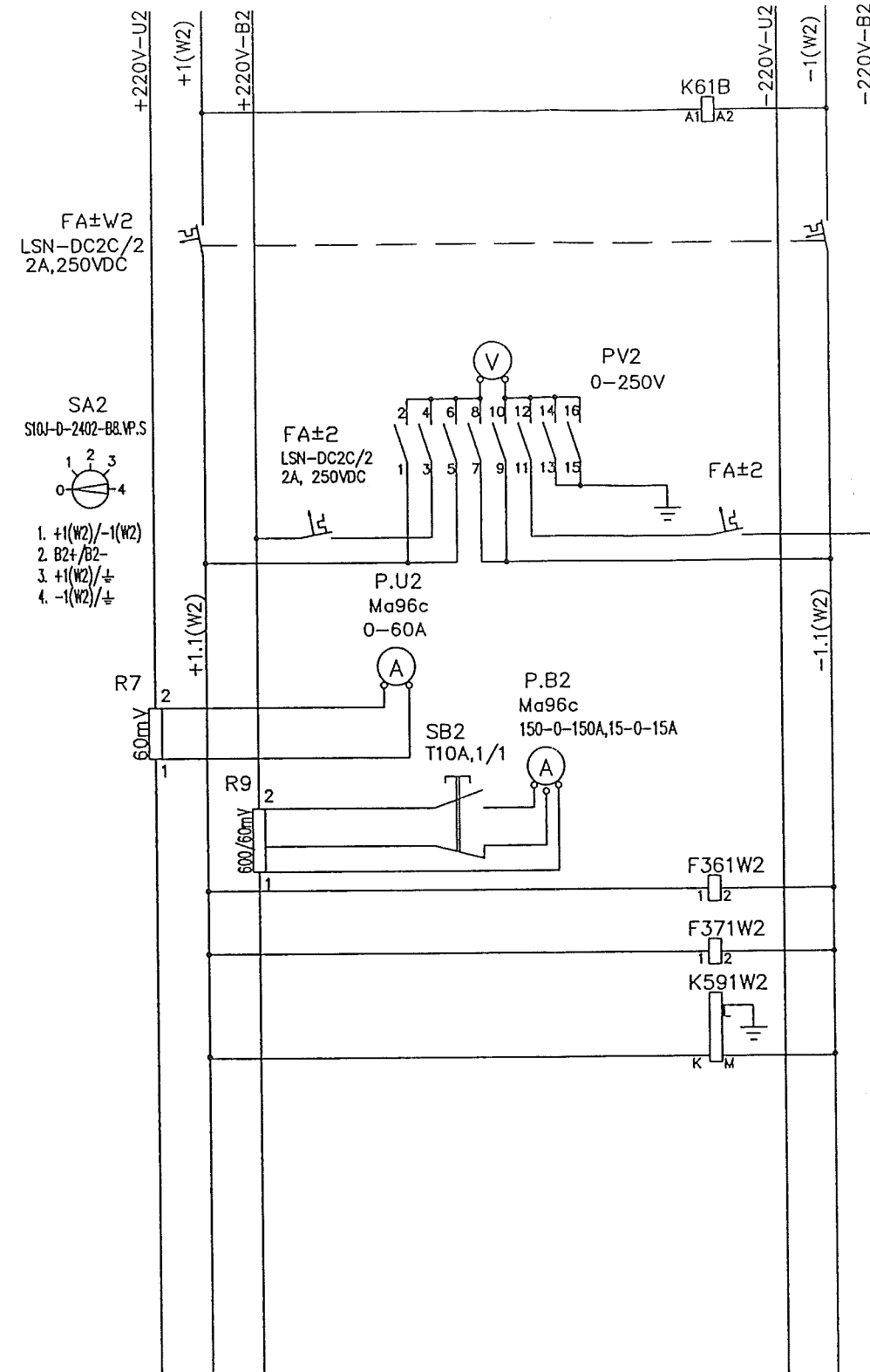
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PR 01, 2P, 220V DC U>

PR 01, 2P, 220V DC U<

MIO 200, 220VDC



V15S1.1Z.200-400Vjs U>

V15S1.1R.100-220Vjs U<

MIO 200, 220VDC

CHANGE	SIGNATURE	DATE	NAME	APPROV.	ING. RICHMAN
		05/2005	ING. HALAČ		
			ING. NÉMETH		

KOŠICE
M Battery System for Supply T80

ELV Elektrovod Holding a.s.

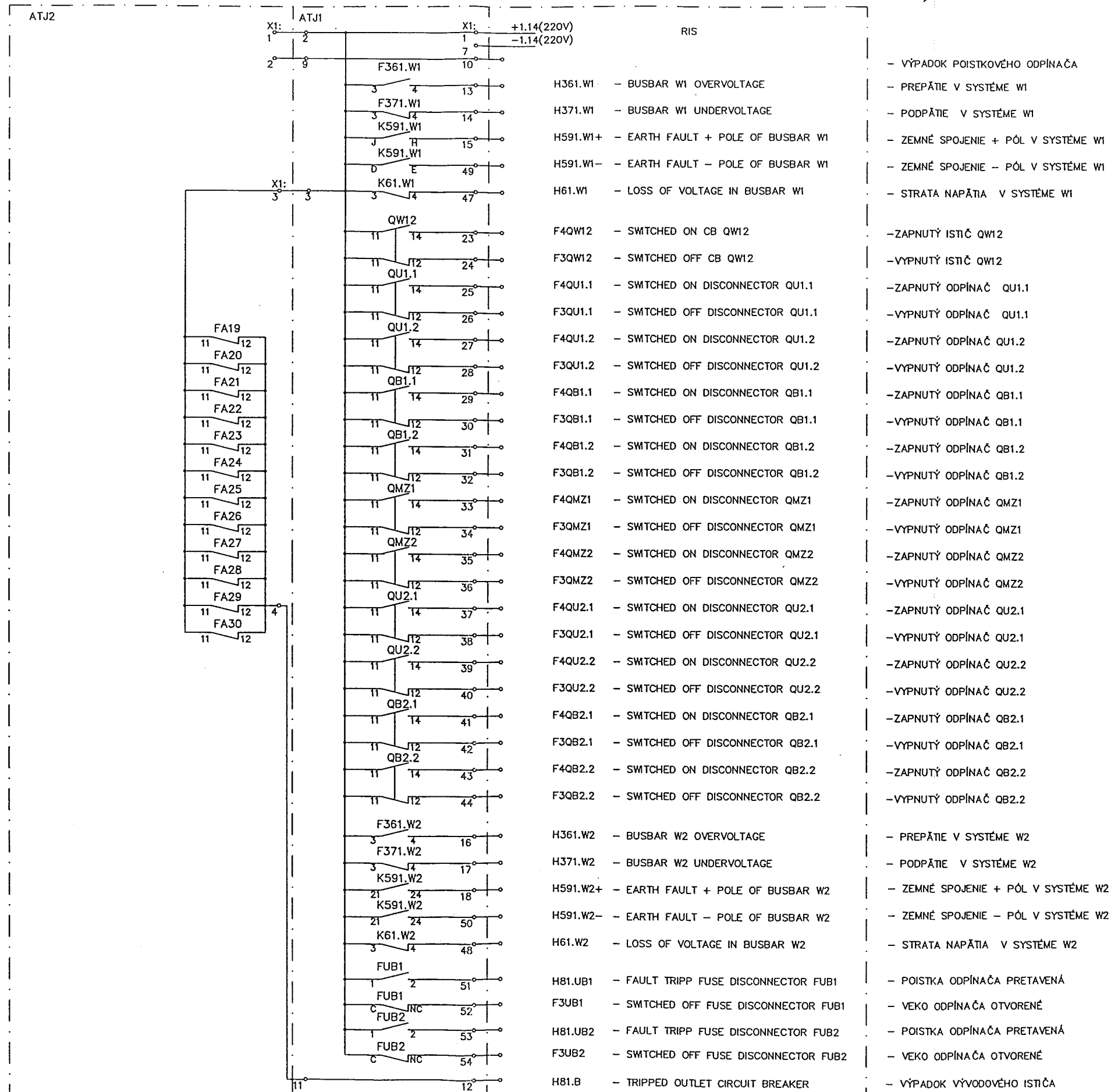
LV SWITCHBOARD ATJ - WIRING DIAGRAM
OF CONTROL AND MEASUREMENT OF INLETS
Schéma ovládania a merania
prívodov rozvádzača ATJ

PROJECT No. PRS

LIST OF DOCUMENTATION:
ELV 38-6-06091 A3-725-105

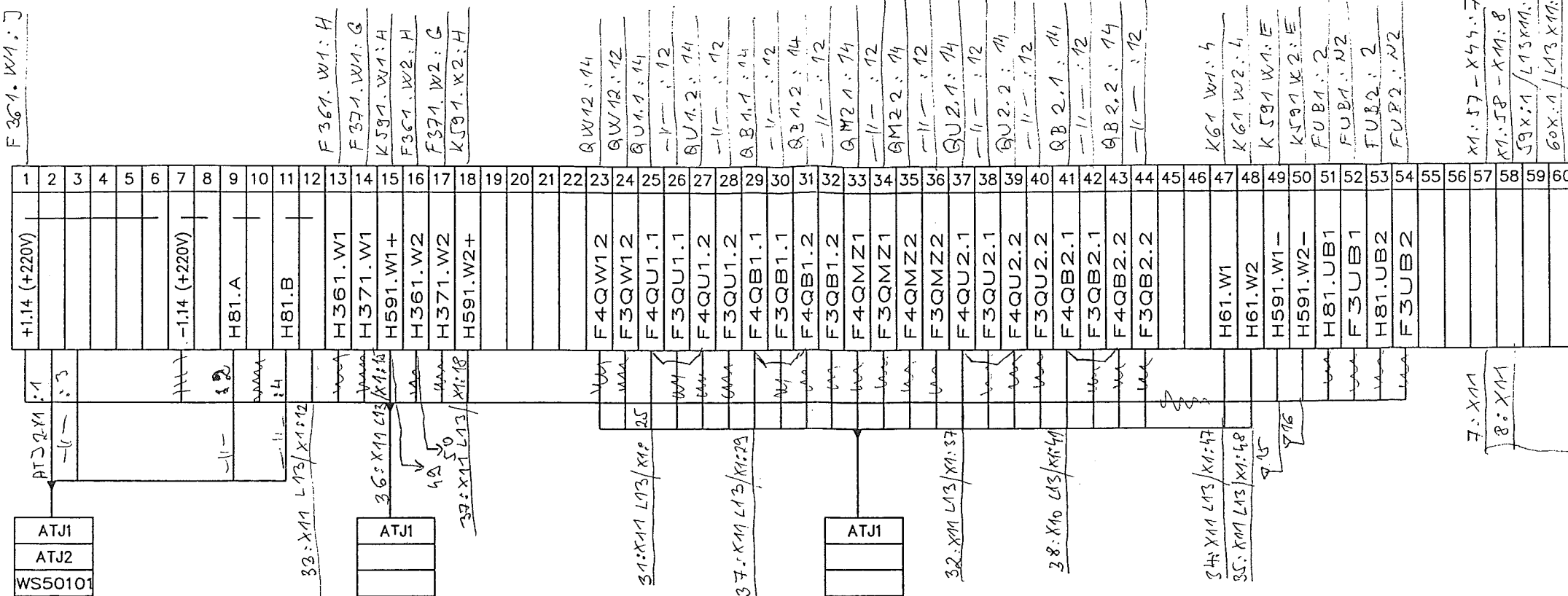
PAGE 1
3 L

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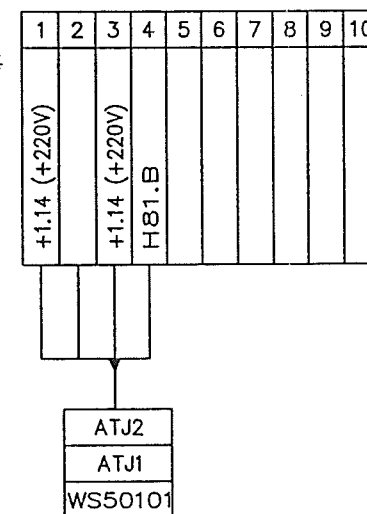
ATJ1

X1
60xCBD4



ATJ2

X1
10xCBD4



TV 189-11

TV 189-10

AT 11
ANG 2
WS 50102

AT 11
ANG 2
WS 50102

DATE 05/2005
ELABOR. ING. HALAČ
CHECKED. ING. NÉMETH
APPROV. ING. RICHMAN

KOŠICE
M Battery System for Supply T80

ELV Elektrovod
Holding a.s.

LV SWITCHBOARD ATJ - WIRING DIAGRAM
OF TERMINALS
Svorkovnicová schéma vonkajších
spojov rozvádzača ATJ - 220V DC

PROJECT No.

PRS

LIST OF DOCUMENTATION:
ELV 38-6-06091

A3-725-105

PAGE 3
3 L

GUIDE Date: 16/10/05
Name: A. KORBEL
Sign: AK

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Why do we have 2 documents "Technical Report"
with 2 different document numbers?

Please clarify.

with one do we have to take into account?

- ELV 38-6-06114 or ELV 38-6-06092?

ORIGINAL
DATE:

CHANGE	c					 Elektrovod Holding, a. s.
	b					
	a					
ORIGINATED BY		ING. HALAČ		PROJECT No.		50-3023-01
APPROVED BY		ING. NÉMETH		DOCUMENTATION		PRS
CHECKED BY		ING. RICHMAN		DATE		05/2005
PROJECT		KOŠICE		A4		5
PART		M Battery System for Supply T81		SCALE		ENCLOSURE 2
TITLE		TECHNICAL REPORT		LIST OF DOCUM.		ELV 38-6-06113
				DOCUMENT No.		ELV 38-6-06114

A4-725-106

TECHNICAL REPORT

1. GENERAL DATA

1.1 Subject and scope of the project

The scope of this project is completion of electrical devices, which provide supply of equipments of distribution system T81 by voltage 220V DC. This project is detailed design.

1.2 Used documents

The following documents were used for preparation of this project:

- Negotiation with operator and inspection of the current state of the substation
- Offers and technical documentation provided by manufacturers of electrical instruments and equipment.
- Technical norms

1.3 Related norms

This project was prepared in accordance with all valid norms related to quoted equipment:

STN 01 8010	Safety colours and designation. General prescriptions.
STN 33 2000-3	Electrical installation of buildings. Determination of basic conditions.
STN 33 0300	Types of environments of electrical equipment.
STN 33 0330	Degrees of protection.
STN 33 0400	Coordination of insulation in electrical networks with rated voltage over 1kV.
STN 33 3225	Earthing in substations.
STN 33 3015	Electric substations and electrical equipment. Regulation of dimensioning according to dynamic and thermal short circuit capacity.
STN 33 3051	Protection of electrical instruments and distribution equipment.
STN 33 3210	Distribution equipment. General prescriptions.
STN 33 3220	General prescriptions for electrical substations.
STN 33 3231	Three-phase substations for voltage up to 52 kV.
STN 33 2000-4-41	Electrical installations of buildings. Providing safety. Protection against injuries by electric current.
STN 33 2000-4-43	Electrotechnical norms. Electrical equipment. Safety. Protection against overcurrent.
STN 33 2000-4-46	Electrotechnical norms. Electrical equipment. Safety. Breaking and making.
STN 33 2000-4-471	Electrotechnical norms. Electrical equipment. Safety. Application of safety measures. General. Protection against injury by electrical current.
STN 33 2000-4-473	Electrotechnical norms. Electrical equipment. Safety. Application of safety measures. Protection against overcurrent.
STN IEC 611140	Protection against injury by el. current. Common regulations for installation and equipment.

STN 33 2000-5-54	Electrotechincal installations of buildings. Selection and installation of electrical equipment. Earthing systems and protection cables.
STN 34 1610	Electrical HV distribution lines in industrial operation sites.
STN 34 3100	Safety norms for operation of electrical equipment.
STN 38 2156	Cable channels, shafts, bridges and fields.

1.4 Voltage systems

- **2-220V/IT** – insulated system with control of insulation state – control, signalisation, disturbance voltage

1.5 Environment

The environment is according the STN 33 0300 paragraph 3.1.1.

1.6 Protection against injury by electrical current

Protection is planned according Slovak Technical Norm (STN 33 2000-4-41) in following way:

- 2-220V/IT – insulated system with control of state of insulation
 - in normal operation: by means of covers
by means of insulation

1.7 Expert qualification of project supplier

The documentation was prepared by experts qualified to work acc. to §24, Law 718/2002 as:
- electrotechnical specialist – designer of electrotechnical equipment.

The licence No. 0068 IBA 1999 EZ P A, B E1.0

2. TECHNICAL DATA

Device which provide supply of voltage 220V DC will be situated on the downstairs of building T81. The designed devices contains:

- 1 pcs 220V DC LV - switchboard, named ATJ, composed of two cubicles
- 1 pcs rectifier for charging of switchboard ATJ, named ATF1
- 1 pcs accumulators for supplying switchboard ATJ, named ATB1

LV switchboard ATJ (2-220V/IT) is produced as cubicles, with two busbar system – W1, W2, composed from two cubicles. LV switchboard is supplied from rectifiers ATF1, parallel – conected to accumulators ATB1 by cable inlets from below. The cubicle ATJ1 contains inlets (circuit breakers, switches), cubicle ATJ2 is strictly used for circuit breakers and fuse disconnectors outlets.

The rectifiers ATF1 (type IC 3000/250V 7,5A) is situated in area of self consumption. They are used for supply of ATJ accumulators.

Accumulators ATB1 is situated in accumulators room..

3. SAFETY AND HEALTH PROTECTION AT RECONSTRUCTION

Electrical equipment in the chamber will be during reconstruction put out of operation and the whole working area must be secured. During demounting and mounting it is inevitable to work according the general safety norms especially:

- STN 34 3100 ÷ STN 34 3110 Safety norms
- STN 33 2000-4-41 Protection against injury caused by electrical current.
- Law No. 59/82 issued by Slovak office of safety at work about basic requirements necessary in order to keep safety of work and technical equipment.
- Law No. 74/1996 about expertise of personnel.

Before starting of works, whole personnel must be informed about stated safety norms and prescriptions, technological procedures and about safety norms and health protection at work. Furthermore, they must be informed about entrance and escape ways, state and features of equipment, where the works will be carried out. Places where the personnel cannot enter must be clearly marked in the whole area of substation T40. Whole personnel must be equipped by protection aids, especially by protection gloves for manipulation with material and crash helmet.

Personnel must keep the technological requirements as well as safety and health protection norms. Escape ways must be clearly marked.

4. PRE-COMPLEX AND COMPLEX TESTING

4.1 The purpose of testing:

- Checking the correctness and complexity of deliveries, mounting, operation of electrical equipment and co-operation with other operation parts.
- Completing the requirements for putting the repaired equipment into testing operation.

Testing will be done according to the norm STN 33 3210 - cl. 6.1 ÷ 6.4. Testing includes requirements for safety and health protection given for stated technical equipment.

4.2 Pre-complex testing

Pre-complex testing includes set of tests, measurements, adjustments, equipment testing, co-operation of functional parts and other operations that must be carried out in order to prepare the equipment for complex testing.

The initial conditions of pre-complex testing are:

- finished installation
- finished individual testing
- report about expert inspection and testing

The following must be available:

- documentation for realisation updated acc. to real conditions.
- documentation about individual equipment and instruction manuals.

Supplier will ask the purchaser for co-operation 14 days before starting the tests.

Purchaser is obliged to supply the supplier with following:

- qualified operational personnel
- operational matter and material
- el. energy

Before test starting it is necessary to state the scope of measurements and testing of electrical equipment.

Supplier will prepare a written report about course and results of pre-complex testing.

4.3 Complex testing

Inspection commission composed of representatives of supplier and purchaser will check whether it is possible to connect the equipment to rated voltage and afterwards will approve the start of complex testing.

Before the start of complex testing the following must be finished:

- installation works
- individual tests and pre-complex testing

Before the start of complex testing supplier must prepare all the documents necessary in supplier-purchaser relation acc. to commercial law.

The complex testing proves that the equipment is ready for putting into operation.

Supplier and purchaser will keep detailed technical records about testing and will also prepare report with overall evaluation, which will be included in acceptance report.

5. SAFETY REQUIREMENTS DURING OPERATION

The following requirements must be followed in order to keep the safety at work with el. equipment:

- only the qualified personnel can enter the area of el. equipment
- the safety signs acc. to STN 34 03510 will be at distribution equipment as well as at all entrances
- the substation will be equipped with protection tools and aids acc. to STN 34 2000-4-41, STN 38 1981.

The operation site is clean, doesn't pollute the environment and doesn't negatively influence the human organism.

In order to prevent the fire, the cable will be located in cable channels acc. to STN 34 1050, STN 38 2156. The fireproof barriers in cable channels damaged during the reconstruction will be repaired.

GUIDE

Date: 16/10/05
Name: H. KORECH
Sign: H. KORECH

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Please clarify.

which one do we have to take into account?

- ELV 38-6-06114 or ELV 38-6-06092?

ORIGINAL
DATE:

CHANGE	c					 Elektrovod Holding, a. s.	
	b						
	a						
ORIGINATED BY		ING. HALAČ				PROJECT No.	50-3023-01
APPROVED BY		ING. NÉMETH				DOCUMENTATION	PRS
CHECKED BY		ING. RICHMAN				DATE	05/2005
PROJECT		KOŠICE				A4	5
PART		M Battery System for Supply T81				SCALE	ENCLOSURE 2
TITLE		TECHNICAL REPORT				LIST OF DOCUM.	ELV 38-6-06113
						DOCUMENT No.	ELV 38-6-06114

A4-725-106

TECHNICAL REPORT

1. GENERAL DATA

1.1 Subject and scope of the project

The scope of this project is completion of electrical devices, which provide supply of equipments of distribution system T81 by voltage 220V DC. This project is detailed design.

1.2 Used documents

The following documents were used for preparation of this project:

- Negotiation with operator and inspection of the current state of the substation
- Offers and technical documentation provided by manufacturers of electrical instruments and equipment.
- Technical norms

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This project was prepared in accordance with all valid norms related to quoted equipment:

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STN 33 3220	General prescriptions for electrical substations.
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STN 33 2000-4-46	Electrotechnical norms. Electrical equipment. Safety. Breaking and making.
STN 33 2000-4-471	Electrotechnical norms. Electrical equipment. Safety. Application of safety measures. General. Protection against injury by electrical current.
STN 33 2000-4-473	Electrotechnical norms. Electrical equipment. Safety. Application of safety measures. Protection against overcurrent.
STN IEC 611140	Protection against injury by el. current. Common regulations for installation and equipment.

STN 33 2000-5-54	Electrotechnical installations of buildings. Selection and installation of electrical equipment. Earthing systems and protection cables.
STN 34 1610	Electrical HV distribution lines in industrial operation sites.
STN 34 3100	Safety norms for operation of electrical equipment.
STN 38 2156	Cable channels, shafts, bridges and fields.

1.4 Voltage systems

- 2-220V/IT – insulated system with control of insulation state – control, signalisation, disturbance voltage

1.5 Environment

The environment is according the STN 33 0300 paragraph 3.1.1.

1.6 Protection against injury by electrical current

Protection is planned according Slovak Technical Norm (STN 33 2000-4-41) in following way:

- 2-220V/IT – insulated system with control of state of insulation
 - in normal operation: by means of covers
by means of insulation

1.7 Expert qualification of project supplier

The documentation was prepared by experts qualified to work acc. to §24, Law 718/2002 as:
- electrotechnical specialist – designer of electrotechnical equipment.

The licence No. 0068 IBA 1999 EZ P A, B E1.0

2. TECHNICAL DATA

Device which provide supply of voltage 220V DC will be situated on the downstairs of building T81. The designed devices contains:

- 1 pcs 220V DC LV - switchboard, named ATJ, composed of two cubicles
- 1 pcs rectifier for charging of switchboard ATJ, named ATF1
- 1 pcs accumulators for supplying switchboard ATJ, named ATB1

LV switchboard ATJ (2-220V/IT) is produced as cubicles, with two busbar system – W1, W2, composed from two cubicles. LV switchboard is supplied from rectifiers ATF1, parallel – conected to accumulators ATB1 by cable inlets from below. The cubicle ATJ1 contains inlets (circuit breakers, switches), cubicle ATJ2 is strictly used for circuit breakers and fuse disconnectors outlets.

The rectifiers ATF1 (type IC 3000/250V 7,5A) is situated in area of self consumption. They are used for supply of ATJ accumulators.

Accumulators ATB1 is situated in accumulators room..

3. SAFETY AND HEALTH PROTECTION AT RECONSTRUCTION

Electrical equipment in the chamber will be during reconstruction put out of operation and the whole working area must be secured. During demounting and mounting it is inevitable to work according to the general safety norms especially:

- STN 34 3100 ÷ STN 34 3110 Safety norms
- STN 33 2000-4-41 Protection against injury caused by electrical current.
- Law No. 59/82 issued by Slovak office of safety at work about basic requirements necessary in order to keep safety of work and technical equipment.
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Personnel must keep the technological requirements as well as safety and health protection norms. Escape ways must be clearly marked.

4. PRE-COMPLEX AND COMPLEX TESTING

4.1 The purpose of testing:

- Checking the correctness and complexity of deliveries, mounting, operation of electrical equipment and co-operation with other operation parts.
- Completing the requirements for putting the repaired equipment into testing operation.

Testing will be done according to the norm STN 33 3210 - cl. 6.1 ÷ 6.4. Testing includes requirements for safety and health protection given for stated technical equipment.

4.2 Pre-complex testing

Pre-complex testing includes set of tests, measurements, adjustments, equipment testing, co-operation of functional parts and other operations that must be carried out in order to prepare the equipment for complex testing.

The initial conditions of pre-complex testing are:

- finished installation
- finished individual testing
- report about expert inspection and testing

The following must be available:

- documentation for realisation updated acc. to real conditions.
- documentation about individual equipment and instruction manuals.

Supplier will ask the purchaser for co-operation 14 days before starting the tests.

Purchaser is obliged to supply the supplier with following:

- qualified operational personnel
- operational matter and material
- el. energy

Before test starting it is necessary to state the scope of measurements and testing of electrical equipment.

Supplier will prepare a written report about course and results of pre-complex testing.

4.3 Complex testing

Inspection commission composed of representatives of supplier and purchaser will check whether it is possible to connect the equipment to rated voltage and afterwards will approve the start of complex testing.

Before the start of complex testing the following must be finished:

- installation works
- individual tests and pre-complex testing

Before the start of complex testing supplier must prepare all the documents necessary in supplier-purchaser relation acc. to commercial law.

The complex testing proves that the equipment is ready for putting into operation.

Supplier and purchaser will keep detailed technical records about testing and will also prepare report with overall evaluation, which will be included in acceptance report.

5. SAFETY REQUIREMENTS DURING OPERATION


The following requirements must be followed in order to keep the safety at work with el. equipment:

- only the qualified personnel can enter the area of el. equipment
- the safety signs acc. to STN 34 03510 will be at distribution equipment as well as at all entrances
- the substation will be equipped with protection tools and aids acc. to STN 34 2000-4-41, STN 38 1981.

The operation site is clean, doesn't pollute the environment and doesn't negatively influence the human organism.


In order to prevent the fire, the cable will be located in cable channels acc. to STN 34 1050, STN 38 2156. The fireproof barriers in cable channels damaged during the reconstruction will be repaired.

AA-725.107

 AIR LIQUIDE INGENIERIE	57, Ave Carnot - B.P. 313 94503 Champigny Cedex (FRANCE)	Job Number: 50 - 3023 - 01 Name: KOSICE	Document Nbr ELV38-6-06092
	M Battery System for supply T80		


ORIGINAL
 DATE:

TECHNICAL REPORT / TECHNICKÁ SPRÁVA

Rev.	Date	Supervis.	Appr.	Modifications
a				
b				
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d				
0	05/2005	Ing. Németh	Ing. Richman	Initial edition
0a				
0b				
1				<div style="border: 1px solid black; padding: 10px;"> <div style="display: flex; justify-content: space-between;"> <div>  AIR LIQUIDE INGENIERIE </div> <div> Date: 26/10/05 Name: A. Gordon Sign: <i>[Signature]</i> </div> </div> <p style="text-align: center;">This Document is :</p> <p> <input type="checkbox"/> AGREED WITHOUT COMMENT <input checked="" type="checkbox"/> AGREED WITH COMMENTS <input type="checkbox"/> NOT AGREED <input checked="" type="checkbox"/> To be reviewed according comments and previous requirements </p> <p style="font-size: small;">In case of the AL approval of this document, the entire responsibility and contract obligations rest with the supplier.</p> </div>
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		Name: KOSICE	ELV38-6-06092
M Battery System for supply T80			

1. TECHNICAL REPORT

1. GENERAL DATA

1.1 Subject and scope of the project

The scope of this project is completion of electrical devices, which provide supply of 220VDC voltage for the 6kV switchboard T80 .

1.2 Used documents

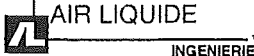
The following documents were used for preparation of this project:

- Negotiation with operator and inspection of the current state of the substation
- Offers and technical documentation provided by manufacturers of electrical instruments and equipment.
- Technical norms

1.3 Related norms

This project was prepared in accordance with all valid norms related to quoted equipment:

STN 01 8010	Safety colours and designation. General prescriptions.
STN 33 2000-3	Electrical installation of buildings. Determination of basic conditions.
STN 33 0300	Types of environments of electrical equipment.
STN 33 0330	Degrees of protection.
STN 33 3225	Earthing in substations.
STN 33 2000-4-41	Electrical installations of buildings. Providing safety. Protection against injuries by electric current.
STN 33 2000-4-43	Electrotechnical norms. Electrical equipment. Safety. Protection against overcurrent.
STN 33 2000-4-46	Electrotechnical norms. Electrical equipment. Safety. Breaking and making.
STN 33 2000-4-471	Electrotechnical norms. Electrical equipment. Safety. Application of safety measures. General. Protection against injury by electrical current.
STN 33 2000-4-473	Electrotechnical norms. Electrical equipment. Safety. Application of safety measures. Protection against overcurrent.
STN IEC 611140	Protection against injury by el. current. Common regulations for installation and equipment.
STN 33 2000-5-54	Electrotechnical installations of buildings. Selection and installation of electrical equipment. Earthing systems and protection cables.
STN 34 3100	Safety norms for operation of electrical equipment.

	57, Ave Carnot - B.P. 313 94503 Champigny Cedex (FRANCE)	Job Number: 50 – 3023 - 01	Document Nbr
		Name: KOSICE	ELV38-6-06092
M Battery System for supply T80			

STN EN 50 272-2

Safety requirements for secondary batteries and battery installations. Part 2: Stationary batteries.

1.4 Voltage systems

- 2-220VDC/IT – insulated system with control of insulation state

1.5 Environment

The environment is according the STN 33 0300 paragraph 3.1.1.

1.6 Electrical shock protection

Protection is planned according Slovak Technical Norm (STN 33 2000-4-41) in following way:

- 2-220VDC/IT – insulated system with control of state of insulation
 - in normal operation: by means of covers
by means of insulation
 - by disturbance: automatic disconnection of power supply

1.7 Expert qualification of project supplier

The documentation was prepared by experts qualified to work acc. to §24, Law 718/2002 as:

- electrotechnical specialist – designer of electrotechnical equipment.

The licence No. 0068 IBA 1999 EZ P A, B E1.0

2. TECHNICAL DATA

2.1 Description

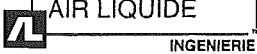
Device which provide supply of voltage 220V DC will be situated on the downstairs of building T80. The designed devices contains:

- 1 pcs 220V DC LV - switchboard, named ATJ, composed of two cubicles
- 2 pcs rectifier for charging of switchboard ATJ, named ATF1, ATF2
- 2 pcs accumulators for supplying switchboard ATJ, named ATB1, ATB2

LV switchboard ATJ (2-220V/IT) is produced as cubicles, with two busbar system – W1, W2, composed from two cubicles. LV switchboard is supplied from rectifiers ATF1 and ATF2, parallel – conected to accumulators ATB1, ATB2 by cable inlets from below. The cubicle ATJ1 contains inlets (circuit breakers, switches), cubicle ATJ2 is used for circuit breakers and fuse disconnectors outlets. The busbars W and W2 is possible to connect via the circui breaker QW12.

To one busbar system is possible to connect one rectifier and one battery. Paralell operation of the batteries is not allowed. The outlets can be connected to the busbars W1 or W2 via selector switches. These switches are capable for no load operation only, when the circuit breakers or fuse switches are switched off.

			Page 3 / 6
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	57, Ave Carnot - B.P. 313 94503 Champigny Cedex (FRANCE)	Job Number: 50 – 3023 - 01	Document Nbr
		Name: KOSICE	ELV38-6-06092
M Battery System for supply T80			

Signallisation of overvoltage, undervoltage and earth fault will be provided for each busbar system. The rectifiers ATF1, ATF2 type IP220 (equipped with 6 converters type IC 3000/250V 7,5A) are situated in the lv room. They are used for supply of ATJ and charging of batteries. Each rectifier is supplied by two outlets (3x400V, 25A) from the 400V distribution board. The rectifiers are equipped with a monitoring system PSMS4 and RS 422 communication interface.

The batteries are placed in the battery room. The valve regulated lead acid block batteries Sprinter P6V 1700, 6V, are maintenance-free during the whole service life (10 years at 20C ambient), very low gassing due to internal gas recombination, proof against deep discharge, with very low gassing due to internal gas recombination. Eurobat classification: high performance. The capacity of batteries is 122Ah to supply the 6kV switchboard T80 for 6h.

2.2 Cabling

This design consist only the cable connection between the 220VDC distribution board, rectifiers and batteries. The following cable connections are to be provided by others:

- power supply for rectifiers: 4x cable 5x2,5mm² Cu
- cables to the consumers

provide cable cross section calculation

The input fuses for power supply shall be rated 3x25A.

2.3 Earthing

The new equipment will be connected to the earthing system. Earthing of equipment will be provided by band conductor - FeZn 30x4. Connections of earthing conductors will be bolted or welded. Earthing will fulfill the requirements of standard STN 33 2000-5-54.

2.4 Fireproof barriers

Fireproof barriers are in scope of the civil part.

3. SAFETY AND HEALTH PROTECTION AT RECONSTRUCTION

During demounting and mounting it is inevitable to work according the general safety norms especially:

- STN 34 3100 ÷ STN 34 3110 Safety norms
- STN 33 2000-4-41 Protection against injury caused by electrical current.
- Law No. 59/82 issued by Slovak office of safety at work about basic requirements necessary in order to keep safety of work and technical equipment.
- Law No. 218/2002 Z.z about expertise of personnel.

Before starting of works, whole personnel must be informed about stated safety norms and prescriptions, technological procedures and about safety norms and health protection at work. Furthermore, they must be informed about entrance and escape ways, state and features of equipment,

			Page 4 / 6
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M Battery System for supply T80

where the works will be carried out. Places where the personnel cannot enter must be clearly marked in the whole area of substation T40. Whole personnel must be equipped by protection aids, especially by protection gloves for manipulation with material and crash helmet.

Personnel must keep the technological requirements as well as safety and health protection norms.

Escape ways must be clearly marked.

4. PRE-COMPLEX AND COMPLEX TESTING

4.1 The purpose of testing:

Checking the correctness and complexity of deliveries, mounting, operation of electrical equipment and co-operation with other operation parts.

Completing the requirements for putting the repaired equipment into testing operation.

Testing will be done according to the norm STN 33 3210 - cl. 6.1 ÷ 6.4. Testing includes requirements for safety and health protection given for stated technical equipment.

4.2 Pre-complex testing

Pre-complex testing includes set of tests, measurements, adjustments, equipment testing, co-operation of functional parts and other operations that must be carried out in order to prepare the equipment for complex testing.

The initial conditions of pre-complex testing are:

- finished installation
- finished individual testing
- report about expert inspection and testing

The following must be available:

- documentation for realisation updated acc. to real conditions.
- documentation about individual equipment and instruction manuals.

Supplier will ask the purchaser for co-operation 14 days before starting the tests.

Purchaser is obliged to supply the supplier with following:


- qualified operational personnel
- operational matter and material
- el. energy

Before test starting it is necessary to state the scope of measurements and testing of electrical equipment.

Supplier will prepare a written report about course and results of pre-complex testing.

4.3 Complex testing

			Page 5 / 6
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 AIR LIQUIDE INGENIERIE	57, Ave Carnot - B.P. 313 94503 Champigny Cedex (FRANCE)	Job Number: 50 – 3023 - 01	Document Nbr
		Name: KOSICE	ELV38-6-06092
M Battery System for supply T80			

Inspection commission composed of representatives of supplier and purchaser will check whether it is possible to connect the equipment to rated voltage and afterwards will approve the start of complex testing.

Before the start of complex testing the following must be finished:

- installation works
- individual tests and pre-complex testing

Before the start of complex testing supplier must prepare all the documents necessary in supplier-purchaser relation acc. to commercial law.

The complex testing proves that the equipment is ready for putting into operation.

Supplier and purchaser will keep detailed technical records about testing and will also prepare report with overall evaluation, which will be included in acceptance report.

5. SAFETY REQUIREMENTS DURING OPERATION

The following requirements must be followed in order to keep the safety at work with el. equipment:

- only the qualified personnel can enter the area of el. equipment
- the safety signs acc. to STN 34 3510 will be at distribution equipment as well as at all entrances
- the substation will be equipped with protection tools and aids acc. to STN 34 2000-4-41, STN 38 1981.

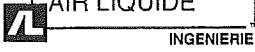
The operation site is clean, doesn't pollute the environment and doesn't negatively influence the human organism.

In order to prevent the fire, the cable will be located in cable channels acc. to STN 34 1050, STN 38 2156.

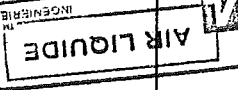
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A4-725-108

	57, Ave Carnot - B.P. 313 94503 Champigny Cedex (FRANCE)	Job Number: 50 - 3023 - 01 Name: KOSICE	Document Nbr ELV38-6-06093
	M Battery System for supply T80		

LIST OF DEVICES / ZOZNAM STROJOV A ZARIADENÍ

Rev.	Date	Supervis.	Appr.	Modifications
a				
b				
c				
d				
0	05/2005	Ing. Németh	Ing. Richman	Initial edition
0a				<div style="border: 1px solid black; padding: 5px; transform: rotate(-5deg);"> ORIGINAL DATE : </div>
0b				
1				
2				<div style="border: 1px solid black; padding: 10px; transform: rotate(-10deg);"> <p style="text-align: right;">In Spite of the AL approval of this document, the entire responsibility and contract obligations rest with the supplier.</p> <p style="text-align: center;">This Document is :</p> <p> <input checked="" type="checkbox"/> AGREED WITHOUT COMMENTS <input checked="" type="checkbox"/> AGREED WITH COMMENTS <input type="checkbox"/> NOT AGREED </p> <p style="text-align: right;">Solely Committed to ELV38-6-06092</p> <div style="display: flex; justify-content: space-between;"> <div> Date: 8/10/05 Name: K. Richman Sgt: </div> <div style="text-align: right;">  </div> </div> </div>
3				
4				
5				
6				
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9				

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M Battery System for supply T80

1.	pcs	2	<p>Rectifier type IC 3000/250V 45A (6x IC 3000/250V 7,5A)</p> <p>Technical data of rectifier:</p> <p>Supply voltage: 3x 400V, 50Hz Output voltage: 189-250V DC Output current: 45A Size: w x d x h = 600 x 600 x 2000 mm</p> <p>Producer: ALTRON SK, a.s. Bratislava</p>
2.			<p>LV switchboard ATJ</p> <p>Cubicle LV switchboard with lockable door. Cable inlets from below. Coverage IP43/30. Devices installed on molding. Cubicle of inlet (No.1) will be made with lap over of control actuators of circuit breakers through opening in front door. The door of cubicle No. 1 contains mimic diagram.</p> <p>Technical data: Voltage system: 2-220 Vjs / IT Rated current of busbars : 150 A, 5kA</p> <p>Color: RAL 7032 Size: Total length: 2x800mm Width: 600mm Height: 2250mm</p> <p>Device list: ATJ - Cubicle No.1</p>
2.1	pcs	1	Two pole circuit breaker Schneider NS 100 STR22SE, 250VDC, 100A Breaker auxiliaries: - Auxiliary contacts OF1, OF2, cover for terminals
2.2	pcs	10	Two pole switch disconnecter Schneider NS 100NA, 250VDC, 100A Breaker auxiliaries: auxiliary contacts OF1, OF2, cover for terminals
2.3	pcs	2	Cam switch S10J-D-2402-B8.VP.S
2.4	pcs	2	Actuator T10A ČE, black
2.5	pcs	2	Switch unit T10Z111Z
2.6	pcs	2	Fitting T10SD3
2.7	pcs	2	Voltmeter Ma96c, 0-250V DC
2.8	pcs	2	Amperemeter Ma96c with scale 150-0-150 / 15-0-15A, shunt with tap 600/60mV
2.9	pcs	2	Amperemeter Ma96c with scale 0-60A, with shunt 60mV
2.10	pcs		



M Battery System for supply T80

2.11			
2.12			
2.13			
2.14	pcs	2	Undervoltage relay PR 01, 100-200V, 2x change-over contact
2.15	pcs	2	Overvoltage relay PR 01, 200-400V, 2x change-over contact
2.16	pcs	2	Auxiliary relay 700-HA33Z2-3, 220V DC, 3P
2.17	pcs	2	Relay socket 700-HN203
2.18	pcs	4	Fuse socket SPB00, OEZ Letohrad
2.19	pcs	4	Fuse PN000 50A gG/gL
2.20	pcs	2	Four pole socket CEG3243, 32A, 400V, recessed model
2.21	pcs	4	Two pole breaker LSN-DC2C/2, 250V, 2A
2.22	pcs	10	Terminal 50 mm2
2.23	pcs	81	Row terminal 1,5 - 4 mm2
2.24	pcs	2	Measurement device of ground resistance MIO200, 220VDC
2.25	pcs	4	Fuse switch disconnecter FH00-1S/F, 100A, 220VDC with fuse PHN000 gG/gL 80A
2.25a	pcs	2	set for 2-pole disconnecter OD-FH00-SS24
2.25b	pcs	2	Auxiliary contact OD-FH-SK
2.25c	pcs	4	Protection against direct contact
ATJ - Cubicle 2			
2.28	pcs	3	Two pole breaker LSN-DC16C/2, 250VDC, 16A, Schneider
2.29	pcs	3	Two pole breaker LSN-DC10C/2, 250VDC, 10A, Schneider
2.30	pcs	6	Two pole breaker LSN-DC6C/2, 250VDC, 6A, Schneider
2.31	pcs	18	2-pole fuse switch disconnecter OPV14, 220V DC, 63A with fuse 14x51
2.32	pcs	12	Fuse PV14 6A gG
2.33	pcs	12	Fuse PV14 10A gG
2.34	pcs	8	Fuse PV14 16A gG
2.35	pcs	4	Fuse PV14 25A gG
2.36	pcs	30	Cam switch type S25J D 2202 C6, 220V DC, 25A, W1 - 0 - W2
2.37	pcs	78	Row terminal 1,5 - 4 mm2
2.38	pcs	4	Moulding cable lug for Cu conductor 1x25mm2
2.39			
3.	pcs	2	Station accumulator battery, with included steel frame rated voltage 220V DC capacity C10 122Ah battery type Sprinter P 6V 1700 6V (36pcs for one unit) Arrangement acc. ELV38-3-07141 Supplier : Altron SK, a.s. Bratislava



AIR LIQUIDE

INGENIERIE

57, Ave Carnot - B.P. 313
94503 Champigny Cedex
(FRANCE)

Job Number: 50 - 3023 - 01

Name: KOSICE

Document Nbr

ELV38-6-06093

M Battery System for supply T80

4.	m	40	Cabel CYA 1x25
5.	m	140	Cabel CYA 1x50
6.	m	5	Cabel JQTQ 7Dx0,8
7.	m	20	Earthing strip FeZn 30/4

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ORIGINAL

DATE:

A4-725-109



CABLE LIST / SÚPIS KÁBLOV

Elektrovod
Holding, a. s.

PROJECT:

KOŠICE

DOCUMENT No:

ELV38-6-06094

PART:


M Battery System for Supply T80

DATE: 05/2005

PAGE: 1/1


PAGE: 1/1

CABLE	FROM	TO	CABLE				REMARK	
			TYPE	LENGTH (m)				
=ATJ-WL50201	ATJ1	ATF1	CYA 1x25			10		
=ATJ-WL50202	ATJ1	ATF1	CYA 1x25			10		
=ATJ-WL50204	ATJ1	+ATB1	CYA 1x50			35		
=ATJ-WL50205	ATJ1	-ATB1	CYA 1x50			35		
=ATJ-WL50211	ATJ2	ATF2	CYA 1x25			10		
=ATJ-WL50212	ATJ2	ATF2	CYA 1x25			10		
=ATJ-WL50214	ATJ2	+ATB2	CYA 1x50			35		
=ATJ-WL50215	ATJ2	-ATB2	CYA 1x50			35		
=ATJ-WS50101	ATJ1	ATJ2	JQTQ 7Dx0,8			3		
Same Comments as for N. Documents								

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	Name <u>A. KORCHI</u>
Signature <u>[Signature]</u>	
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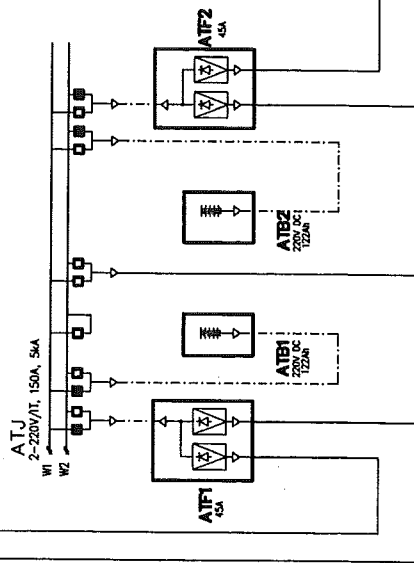
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LV SWITCHBOARD  IN ELEKTROVOD SCOPE
ROZVADZAC NN - NIE JE DODANÁ ELEKTROVODU

3NFE-50Hz 400V/7N-S


ATJ
2-220V/AT 150A 5KA
W1
W2



U.S. STEEL
EMERGENCY POWER SUPPLY
ZALOŽNÉ NAPÁJANIE

- LEGENDA:**
-  VÝPRAČ POKOJ V ZAPNUTOM STAVE
TRANSWITCH IN CLOSED STATE
 -  VÝPRAČ POKOJ VO VYPNUTOM STAVE
TRANSWITCH IN OPEN STATE

- KÁBLE DODANÁ ELEKTROVOD
CABLE IN ELEKTROVOD SCOPE
- KÁBLE NEDODANÁ ELEKTROVOD
CABLE NOT IN ELEKTROVOD SCOPE

AIR LIQUIDE INGENIERIE		Date : 26/10/01
Name : H. J. J. J.		Sign : 
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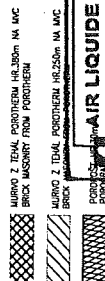
DATE :

KOSICE		AIR LIQUIDE	
M Battery System for Supply T80		N° D'AFFAIRE / JOB NUMBER	
DC SYSTEM T80 - SINGLE LINE DIAGRAM		50-3023-01	
SCHEMA ZAPOJENIA ZARIAD. 220VDC PRE T80		ELV38-4-00466	
Echelle / SCALE		N° D'AFFAIRE / JOB NUMBER	
50-3023-01		ELV38-4-00466	

A3725-110

[illegible]

LEGENDA HMÔT/LEGENDE SUBSTANCES



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22

Same comments as for T7 equipment

Provide guide line drawings for civil works, and installation of the UPS and battery charges

[illegible]

A3, 725, 111