RECTIFIERS – ACCUMULATOR CHARGERS AND DISCHARGERS FOR INDUSTRIAL APPLICATIONS – OVERVIEW

General:

In various areas of industry and in many institutions are used the electric appliances, they have to be protected from power failure. Supply backup can be provided direct from accumulator or through standby power supplies backed up by accumulators.

Long-time stability, reliability and forming of these accumulators is provided by rectifiers - chargers – switching power supplies that operate with middle-frequency power transmission system.

Application:

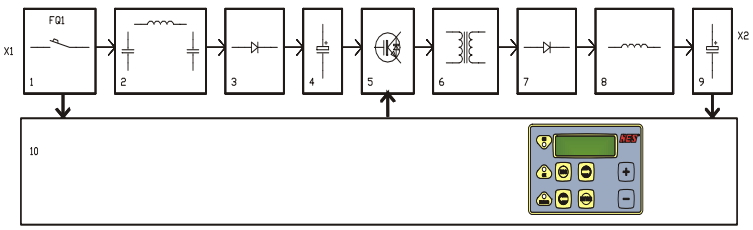
- **Type M.1, M.5 – charging of stationary batteries (characteristics Uo, IUo, IUUo, IUIUUo)**
- **Type M.3 – charging / compensating charging of starting and traction batteries (IUIa, IUIIa)**
- **Type M.2 - universal chargers for charging stationary and traction batteries (Uo, IUo, IUUo, IUIUUo, IUIa, IUIaP, types without M.2 in tag – only characteristics Uo)**
- **Charging and simultaneous load / appliance feeding (types M.1, M.2, M.5, M.2-19)**
- **Battery charging for general application**

Construction:

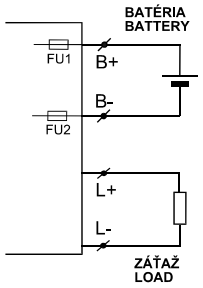
The chargers are constructed in boxes with input and output in front or down. The keyboard (only types with microprocessor control system) for control with LCD display is located on the front panel. The openings for heat conduction are located up; chargers with higher power have fans on the back panel.

Jiráskova 413
436 01 Litvínov, Czech Republic
tel./fax: +420 476 731 365
e-mail: dehor@dehor.cz, http://www.dehor.cz

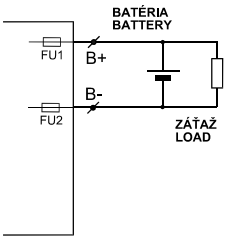
Block diagram of charger:



Output – type M.1:



Output – type M.2, M.5:



Block description:
1. input circuit breaker, 2. input filter, 3. input rectifier, 4.voltage inter-circuit, 5. inverter unit, 6. power transformer, 7. output rectifier, 8. output filter, 9. output filter, 10. power supply control and communication (types M.X only)

Characteristics:
Chargers – type M.1, M.5 have standardly microprocessor control system ADUC with keyboard and two-line 2x16 character alphanumeric display. Control system is built on the modern microprocessor by Analog Devices. The microprocessor is based on core 8052 with 12-bit AD converter (therethrough will be reached control accuracy and quantity measuring) and FLASH memory. ADUC enables programming of charging parameters, characteristics selection, charging start-up, displaying of measured battery values, displaying of error messages etc. With chargers is possible to communicate via serial interface RS 232, (RS485 option).
Advantages of microprocessor control system ADUC:

- **chargers functionality by power failure**. Control unit is supplied in case of power failure from connected accumulators, i.e. all the accessible charger functions stay monitored, while the battery voltage does not drop on 50% U_{nom}.
- connection in **parallel-redundant** version; individual devices communicate with each other and thereby are optimized operating parameters

Chargers principle – type M.1:

Power part enables to measure independently battery current through measuring current transformer, regardless of load current. It is possible to monitor the battery and load voltage, input and output battery current and total current of rectifier. It is possible to adjust battery current and voltage. Load current is limited from the side of charger only with charger current limit and from the side of **connected battery is limited and protected by fuses FU1, FU2!**

Chargers – type M.2, M.3 have standardly microprocessor control system MAJOR with keyboard, two-line 2x16 character alphanumeric display and with possibility of communication via RS 232 or RS 485 serial interface (option). Control system is based on microprocessor Philips with core 80C51 and 10-bit AD converter (therethrough will be reached control accuracy and quantity measuring). Control system enables programming of charging parameters, characteristics selection, charging start-up, displaying of measured battery values, displaying of error messages etc.

Charger function – type M.2, M.5:

It is possible to monitor only one voltage and one current, it is possible to adjust battery voltage and current. One output enables:

- to charge the batteries and to feed simultaneous the load
- to charge the batteries
- to feed the load

Charger function – type M.3:

One output enables to charge the starting and traction batteries.

Technical parameters – general:

- High switching frequency is reached due to used IGBT technology
- Output voltage rippling, stabilization ≤ ±1%
- Efficiency min. 90%
- Output voltage adjustment range from 45 to 145% from nominal value – type M.X only
- Output current adjustment range from 1 to 100% from nominal value – type M.X only
- Insulation strength input-output 4 kVac, galvanically isolated
- Covering IP 20
- Cooling own air, with forced air flow – standard for type M.X with natural - no letter M in tag

Standard equipment:

- Control unit — microprocessor control system – type M.X only; without microprocessor – no letter M in tag
- Required current and voltage entering — from charger keyboard, evaluated on LCD display – type M.X only
- Device state and error signalling — LED - running, charging, overheating, LCD type M.X only
- Programming/adjusting of battery type — NiCd or Pb – type M.X only
- Programmed error signalling with one relay – type M.2, M.3, three relay – type M.1, M.5 (voltage-free contacts):
  - requires stopping the charging:
    - 1st error – overheating
    - 2nd error – internal charger error
    - 3rd error – output voltage loss (shutdown from keyboard)
    - 4th error – input voltage loss (supply) – type M.1, M.5 only
  - does not require stopping of charging:
    - 5th error – discharged battery (RE1)
    - 6th error – temperature sensor error
    - 7th error – short-circuit – type M.1, M.5 only
    - 8th error – battery circuit opening – type M.1, M.5 only

- On the panel of SN 10 24/230 charger are located 3 LED diodes that signal the operating states of charger – charging mode, keeping mode and error.
- On the panel of SN 20 24/230MST charger is located a keyboard by that programs charging parameters and displays operating states of charger on 2x3 digits LED display. On the terminal block is running out the programmable voltage-free contact for error message, clamps for temperature sensor, clamps pre load connection and clamps for battery connection.
- Others chargers with output error from 0,29kW to 0,57kW have 2 LED diodes that signal operating states of charger. Voltage-free contact for error message is running out on the terminal block.

Ambient conditions according to IEC 60 364-3 (STN 33 2000-3):

Ambient temperature	AB4 (from -5 °C to + 40 °C)
Altitude	AC1 (to 2000 m above sea level)
Water occurrence	AD1 (insignificant)
Occurrence of foreign matters	AE1 (insignificant)
Occurrence of corrodents or pollutants	AF1 (insignificant)
Vibrations	AH2 (middle)
EMC	STN EN 50081-1: 1998 STN EN 50082-2: 1999
Storage temperature range	from -25 to +40°C, no longer than 24 h to +70°C

Standard control panel of chargers – type M.X:

BOX DIMENSIONS

Charger box type	Dimensions W x H x D (mm)	Charger box type	Dimensions W x H x D (mm)
N1	135 x 190 x 100	N4	255 x 620 x 500
N2.1	185 x 260 x 175	N5.1	600 x 800 x 350
N2.2	170 x 240 x 180	N5.4	606 x 1800 x 450
N8	260 x 440 x 300	N6.4	806 x 1800 x 450
N3	260 x 490 x 480	N19.4	19“(480) x 4HU(177) x 430
		N19.6	19“(480) x 6HU(265) x 450

OPTIONS – CHARGER ACCESSORIES

MONITORING AND COMMUNICATION ACCESSORIES

For remote parameter adjustment and monitoring is possible to provide the chargers with SNMP adapter (for Ethernet) or with modem (radiomodem). In this way is possible to transmit the alarm signals and outputs (system and alarm messages) and various external signals and alarms preferred by customer, e.g.: power failure, temperature sensor fault, undervoltage signalling etc.

ANALOG VOLTAGE REGULATOR

Analog voltage regulator (series PC) is an electronic device, used to voltage stabilization on the load or to load voltage drop on the allowable level and battery voltage can change in specified range only.

BATTERY DISCONNECTOR

Battery disconnector serves as a battery protection against deep discharge (destruction) in case of the long-time electricity failure, when is the load by electricity failure fed from the battery. By battery voltage drop under setting value of undervoltage, it comes to battery disconnection from the load. By charger feeding recovery, the system automatically connects battery to load.

For chargers with output power to 570W is battery disconnector solved like a separate external module, for chargers with output power over 570W is battery disconnector built-in into charger box.

INSULATION RESISTANCE METERS

Important device, which helps to uncover of first failure during operation.

CONTROL PANEL WITH BIG LCD FOR CHARGERS TYPE M.1 AND M.5

Control panel with illumined alphanumeric LCD, 4x20 characters serves to digest monitoring, parameter and charging characteristics programoming.

ANALOG SIGNALS - OUTPUTS

Chargers can be equipped with converters with output analog signals 0-10V or 0(4)-20mA for remote monitoring of output parameters.

STANDS FOR CHARGERS

Type	Dimensions W x H x D (mm)	Charger box type
Stand N8	270 x 500 x 315	N8
Stand N3	270 x 500 x 495	N3
Stand N4	265 x 500 x 510	N4
Stand N5	610 x 760 x 360	N5
Stand N3.1	270 x 250 x 495	N3
Stand N4.1	265 x 300 x 510	N4

TEMPERATURE PROBE

Serves for the temperature compensation – automatic charging voltage drop (rise) by 5mV/cell (keeping voltage o 4mV/cell) by rise (drop) of battery surface temperature by 1°C. By temperature 20°C is the voltage uncorrected.

Type	Description, parameters
TSV100	temperature –40° to +60°C, output 0-20mA

REMOTE CONTROL AND MONITORING OF TRACTION CHARGERS

Chargers – type M.3 can be equipped with OSK box = control and signalling box with accessory
on/off – output blocking, switch – charging/ compensating charging, signalling: end of charging, operation, failure.

ACCUMULATOR DISCHARGERS

Application and characteristics:
Dischargers enable to discharge the batteries of nominal voltage from 2 to 220V, with adjusted constant current from 2 to 200A according to the charger type.
Control unit MAJOR enable to program the discharging parameters i.e. required current and voltage, to value the battery should be discharged. After discharging process is on the LCD displayed total time and taken charge. Battery energy wastes by external resistor on the heat energy.

Discharger consists of: power regulator VA and resistor RV6.
Options: RS232 interface for PC – transmission, generation and printing of discharging characteristics.

RELATED PRODUCTS

- DEVICES FOR AUTOMATED ACCUMULATOR CHARGING AND ACCUMULATOR CAPACITY TESTING
- CHARGER / DISCHARGER – ACCUMULATOR TESTER
- SOFTWARE FOR CHARGERS, REMOTE CONTROL
- SERVICE CHARGERS AND DISCHARGERS
- UPS FOR EMERGENCY LIGHTNING
- BACK-UP POWER SUPPLIES - AC/DC, DC/DC, DC/AC

Technical parameters:

Rectifier - charger type	Output					Input	Box type (dimensions - see page 3)	Weight approx. [kg] / box type	X - option					
	nominal voltage of battery	number of cells		power [kW]	nominal current [A]	nominal voltage			M.1	M.2	M.3	M.5	M.2-19	M.1-19 M.5-19
		Pb	NiCd											
SN 10 24/230 B12	12V DC*	6*	10*	0,15	10	1NPE 230V ±10%, TN-S, 50-60Hz	N1	2						
SN 20 24/230.1 B12	12V DC*	6*	10*	0,3	20		N2.2	6						
SN 20 12/230MST	12-16V DC	6-8	-	0,32	20		N2.1	6						
SN 20 24/230.1 A30 B12	12V DC*	6*	10*	0,45	30		N2.2	6						
SN 10 24/230 A5	24V DC*	12*	20*	0,15	5	1NPE 230V ±10%, TN-S, 50-60Hz	N1	1,8						
SN 10 24/230	24V DC*	12*	20*	0,3	10		N1	2						
SN 20 24/230.1	24V DC*	12*	20*	0,56	20		N2.2	6						
SN 20 24/230MST	20-24V DC	10-12	-	0,62	20		N2.1	6,5						
SN 25 24/230X	12-24V DC	6-13	9-20	0,78	25		N3 -M.1,M.5 / N8 -M.2,M.3	20	X	X	X	X		
SN 35 24/230X	12-24V DC	6-13	9-20	1,1	35		N3	30		X	X			
SN 40 24/230X	12-24V DC	6-13	9-20	1,25	40		N3	30	X			X		
SN 50 24/230X	12-24V DC	6-13	9-20	1,56	50		N3 -M.1,M.2,M.3,M.5 / N19.4 -M.2-19	35-N3 / 19-N19.4	X	X	X	X	X	
SN 50 24/400X	12-24V DC	6-13	9-20	1,56	50	3NPE 400V AC ±10%, 50-60Hz, TN-S	N4 -M.1,M.5 / N3 -M.2,M.3 / N19.4 -M.2-19	35-N3 / 40-N4 / 19-N19.4	X	X	X	X	X	
SN 100 24/400X	12-24V DC	6-13	9-20	3,12	100		N4 -M.1,M.5 / N3 -M.2,M.3 / N19.6-M.1,M.5	36-N3 / 45-N4 / 25-N19.4	X	X	X	X	X	
SN 150 24/400X	12-24V DC	6-13	9-20	4,68	150		N4-M.1,M.2,M.3,M.5 / N19.6-M.1-19,M.5-19	50-N4 / 35-N19.6	X	X	X	X		X
SN 200 24/400X	12-24V DC	6-13	9-20	6,24	200		N5-M.1,M.2,M.3,M.5 / N19.6-M.1-19,M.5-19	58-N5 / 39-N19.6		X	X			X
SN 10 48/230	48V DC*	24*	40*	0,56	10	1NPE 230V ±10%, TN-S, 50-60Hz	N2.2	6						
SN 20 48/230X	24-48V DC	12-26	18-40	1,25	20		N8-M.2,M.3	25		X	X			
SN 20 48/400X	24-48V DC	12-26	18-40	1,25	20	3NPE 400V AC ±10%, 50-60Hz, TN-S	N3-M.2,M.3 / N19.4 -M.2-19	33-N3 / 23-N19.4		X	X		X	
SN 25 48/400X	24-48V DC	12-26	18-40	1,56	25		N4 -M.1,M.5 / N3 -M.2,M.3 / N19.4 -M.2-19	35-N3 / 23-N19.4		X	X		X	
SN 50 48/400X	24-48V DC	12-26	18-40	3,12	50		N4 -M.1,M.5 / N3 -M.2,M.3 / N19.4 -M.2-19	35-N3 / 40-N4 / / 24-N19.4	X	X	X	X	X	
SN 100 48/400X	24-48V DC	12-26	18-40	6,24	100		N4-M.1,M.2,M.3,M.5 / N19.6-M.1-19,M.5-19	50-N4 / 35-N19.6	X	X	X	X		X
SN 150 48/400X	24-48V DC	12-26	18-40	9,36	150		N5	55	X	X	X	X		
SN 300 48/400X	24-48V DC	12-26	18-40	18,7	300		N5.4	90	X	X	X	X		
SN 8 60/230	60V DC*	30*	50*	0,56	8	1NPE 230V ±10%, TN-S, 50-60Hz	N2.2	6						
SN 10 60/230X	30-60V DC	15-32	22-50	0,78	10		N8	20		X	X			
SN 25 60/400X	30-60V DC	15-32	22-50	1,95	25	3NPE 400V AC ±10%, 50-60Hz, TN-S	N4 -M.1,M.5 / N3 -M.2,M.3 / N19.4 -M.2-19	35-N3 / 40-N4 / 24-N19.4	X	X	X	X	X	
SN 50 60/400X	30-60V DC	15-32	22-50	3,9	50		N4-M.1,M.2,M.3,M.5 / N19.6-M.1-19,M.5-19	50-N4 / 35-N19.6	X	X	X	X		X
SN 100 60/400X	30-60V DC	15-32	22-50	7,8	100		N5	60	X	X	X	X		
SN 150 60/400X	30-60V DC	15-32	22-50	11,7	150		N5	65	X	X	X	X		
SN 25 80/400X	40-80V DC	20-44	30-67	2,6	25	3NPE 400V AC ±10%, 50-60Hz, TN-S	N3	35		X	X			
SN 60 80/400X	40-80V DC	20-44	30-67	6,24	60		N4	50		X	X			
SN 100 80/400X	40-80V DC	20-44	30-67	10,4	100		N5	60		X	X			
SN 150 80/400X	40-80V DC	20-44	30-67	15,6	150		N5.4	90		X	X			
SN 4 110/230	110V DC*	56*	86*	0,57	4	1NPE 230V, TN-S, 50Hz	N2.2	6						
SN 10 110/400X	54-110V DC	27-56	40-86	1,43	10	3NPE 400V AC ±10%, 50-60Hz, TN-S	N3 -M.2 / N19.4 -M.2-19	35-N3 / 24-N19.4		X			X	
SN 20 110/400X	54-110V DC	27-56	40-86	2,86	20		N4 -M.1,M.5 / N3 -M.2 / N19.4 -M.2-19	35-N3 / 40-N4 / 24-N19.4	X	X		X	X	
SN 40 110/400X	54-110V DC	27-56	40-86	5,7	40		N4-M.1,M.2,M.3,M.5 / N19.6-M.1-19,M.5-19	50-N4 / 35-N19.6	X	X		X		X
SN 50 110/400X	54-110V DC	27-56	40-86	7,15	50		N4-M.1,M.2,M.3,M.5 / N19.6-M.1-19,M.5-19	50-N4 / 35-N19.6	X	X		X		X
SN 100 110/400X	54-110V DC	27-56	40-86	14,3	100		N5	65	X	X		X		
SN 150 110/400X	54-110V DC	27-56	40-86	21,5	150		N6.4	95	X	X		X		
SN 200 110/400X	54-110V DC	27-56	40-86	28,6	200		N6.4	120	X	X		X		
SN 250 110/400X	54-110V DC	27-56	40-86	35,7	250		N6.4	140	X			X		

Technical parameters:

Rectifier - charger type	Output					Input	Box type (dimensions - see page 3)	Weight approx. [kg] / box type	X - option					
	nominal voltage of battery	number of cells		power [kW]	nominal current [A]	nominal voltage			M.1	M.2	M.3	M.5	M.2-19	M.1-19 M.5-19
		Pb	NiCd											
SN 2 220/230	220V DC*	110*	170*	0,57	2	1NPE 230V, TN-S, 50Hz	N2.2	6						
SN 10 220/400X	108-220V DC	54-110	80-170	2,86	10	3NPE 400V AC ±10%, 50-60Hz, TN-S	N4-M.1,M.5 / N3-M.2 / N19.4-M.2-19	35-N3 / 40-N4 / 23-N19.4	X	X		X	X	
SN 20 220/400X	108-220V DC	54-110	80-170	5,7	20		N4-M.1,M.2,M.3,M.5 / N19.6-M.1-19,M.5-19	50-N4 / 35-N19.6	X	X		X		X
SN 25 220/400X	108-220V DC	54-110	80-170	7,1	25		N4-M.1,M.2,M.3,M.5 / N19.6-M.1-19,M.5-19	50-N4 / 35-N19.6	X	X		X		X
SN 50 220/400X	108-220V DC	54-110	80-170	14,3	50		N5	60	X	X		X		
SN 100 220/400X	108-220V DC	54-110	80-170	28,6	100		N5.4	110	X			X		
SN 150 220/400X	108-220V DC	54-110	80-170	42,9	150		N6.4	150	X			X		
SN 200 220/400X	108-220V DC	54-110	80-170	57,2	200		w-1000 x h-1800 x d-450 mm	180	X			X		
SN 240 220/400X	108-220V DC	54-110	80-170	62,4	240		w-1000 x h-1800 x d-450 mm	195	X			X		

Min./ max. voltage per cell at charging or maintaining for X - extended equipment: 2 to 2,8V/cell Pb, 1 to 1,8V/cell NiCd, for the type MST 2,2 to 2,6V/cell

*** Fixed values of voltage are set, changeable only in some range and only manufacturer NES can change them**

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