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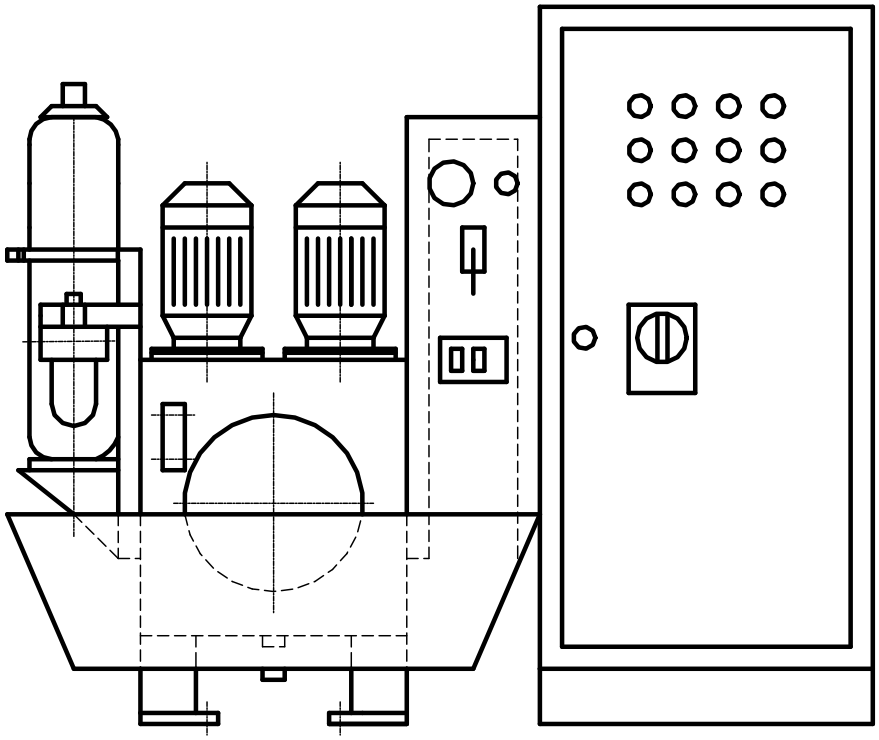
Hydraulic-Supply-Units

and valve actuators



MVA – Hydraulic-Supply-Unit

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MVA - OIL HYDRAULIC SUPPLY UNIT

1. SUPPLY CONCEPT: The most simply - built valve actuators are hydraulic jacks. With suitably selected oil pressures, they can be kept small and cheap, while delivering large forces and high power. In most applications, these actuators are mounted in groups, which are also supplied together. Group supply allows for effective and genuine redundancy with simple means.
The majority of valves in a modern power plant either are not in a continuous control operation or they only make large control movements when there is a failure, which means rarely. The average power demand generally lies well below peak demand. For these operating conditions, peak demand is satisfied from an accumulator, which means that the pump is not sized to satisfy peak power demand. This lowers investment - and operating costs.

While oil pressure considerably influences cost of large, powerful actuators, it is not the case for small actuators. Small supply systems requiring pumps are also for high pressure applications. This is in contrast to the last 10 to 20 years, which justify the jump to high pressure pumps in this time.

2. ACCUMULATOR CHARGING: The ON/OFF operation is the charging mode with motor stoppage times of 5 to 15 minutes. A mechanical reservoir charging valve is incorporated in the small units, which switches the pump to the zero pressure cycle, but not for redundant supply units.

3. POWER STEPS: A power step jump of 1.6 is appropriate and provides sufficient flexibility in the design. (A jump by the factor of 2 has proven to be too coarse.) In the following, hydraulic fluid flow in liters/minute is introduced as a type designation, followed by the nominal accumulator size (e.g. HHS2-20-30).

4. ACCUMULATOR SIZES: Long - life bubble accumulators are proven in operation, as are diaphragm accumulators for smaller volumes. Accumulator size is determined by the ratio of peak power to average power, but it can also be influenced by safety considerations. The charging ratio is usually selected to be 1.2 .... 1.4.

5. PRESSURE CONTROL FOR THE SYSTEM SUPPLIED: Pressure control prevents deviations of the drive's running speed to get too large. When the accumulator /charging ratio is 1.2 ... 1.4, pressure control is not used, because pressure induced speed deviations remain within +/- 5 % ... +/10 %. Units for power plants are therefore delivered without pressure control.

6. SIZING THE CONTAINER: The container volume (gross tank volume) is comprised of the minimum oil volume, the floating volume (out of reservoir and pipe) as well as the air volume (or the volume of installed equipment, respectively). Container size is therefore, to some extent, determined by the presence of a reservoir. It is sized economically (= small), it offers sufficient cooling area, provides enough oil capacity and ensures a long service life without oil changes.

7. SELECTING PUMP TYPES: Long - duration laboratory tests of different types of pumps in the typical operating modes of such hydraulic units showed that, in the pressure region from 100 - 200 bar, aside from piston pumps (axial or radial), only certain heavy duty gear pumps achieve a service life which is acceptable in power plants. This good gear pumps are employed for power plants in the last 10 years up to 250 bar.

8. MOTORS TYPES AND SIZES: control systens are running Motors for pump systems with reservoir charging have the following operational characteristics: they never start at full load, normally at half or 3/4 load. Power demand increases continuously until switch - off or load relief in the idle mode. Heat stress is much smaller than at rated power of the motor. No masses have to be accelerated. Overloading of the motor occurs only when the charger fails at high pressure. In this case, the motor is switched off by its own protection. If it is oversized in terms of power, it will not do that. Such motors are designed with narrow margins, which lowers heat stress during start - up (as well as cost).The motors, generally four - poled three phase motors, are of the closed design, with exterior blower, protection type DIN 40050 - IP54, insulation class F (or equivalent).

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9. TWO MODEL RANGES: Sizes from 2 to 6 liters/minute are used in industry, while types from 8 to 50 liters/minute are for power plant applications. Both model ranges are also used in other kinds of hydraulic applications, i.e. machine tools, presses, hydraulic hoisting machinery etc.

10. DATA FOR HYDRAULIC - SUPPLY UNITS

10.1 BASIC DATA, OVERVIEW

Gradation of hydraulic fluid flow	Qv	=	2 ... 50 l/min (Gradation 1.4…1.6 x)
Tank gross volume with one pump	Vt	=	5 * qv l (<100…400 l)
with two pumps	Vt	=	4 * qv l (<100…400 l)
Design pressure	Pk	=	250 bar
Max. reservoir size	Vs	=	50 l (1 or more pcs.)
gear pumps for	P	=	130…210 bar (accumulator charging)
Motors	N	=	0.37 ... 15 kW
BASIC DATA, TABLES…	see technical data page 6		
HYDRAULIC SCHEMATIC SERIES HHS2….	see separate sheets		

11. MOTOR CONTROLING AND MONITORING: Control and monitoring is an integrated part of the hydraulic supply unit. It' s only different in periphery but equal in philosophy (depending on customers wishes):
The supply unit is reliable in service, is self protected and alarm in critical conditions. If there is a critical set point of the accumulator pressure remained under, stand – by pump will be started. The HHS - series has an expensive logic equipment to fulfil the above mentioned requirement. This is not only for permanent checking of the running system, but also as an "accumulator" equipment. She allows a various similar pump units working together. The motor-protection-switch is in the logic equipment integrated.
With a pressure transducer also the pressure limits (pressure high, pressure low) are supervised and indicated. Other set-points starting or stopping (pressure high or low) filling the accumulator. The logic equipment also watches for other possible faults of the unit and create a collective number to the switch board. The fault can be seen local.
If the supply unit has more than one pump, the logic equipment make sure, that proportionate service and warming will be on the safe side. A staggered starting-up will prevent high starting-up current impulse. If

during operation the set-point of the accumulator pressure remained under pressure low, the stand-by pump will be starting.
There is a difference in signal between **"WARNING"** and **"ALARM"**. In case of "WARNING" the operator has time for reaction (repairing), in case of "ALARM" he doesn't have the chance: The signal will be used for unit automatic safety supply.(for instance: automatic control system on "hand").

11.1 LOGIC-EXPIRATION DIAGRAM FOR HHS–SERIES: see separate description for control- and monitoring logic

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11.2 INPUTS TO MOTOR CONTROL AND MONITORING:
11.21 INPUTS FROM THE OWN HYDRAULIC UNIT:

PAL	Pressure to low – Alarm	WARNING If another HY-units not o.k. then ALARM, locking actuators
PLL	Pressure to low	motor ON, WARNING If another HY-units not o.k. then ALARM, locking actuators
PL	Pressure low	motor ON
PH	Pressure high	motor OFF
PHH	Pressure to high	motor OFF, WARNING
OPTIONS: NLL	LEVEL OIL to low	motor OFF, WARNING If another HY-units not o. k. then ALARM, locking actuators
THH	Temperature to high	motor OFF, WARNING If another HY-units not o. k. then ALARM, locking actuators

11.22 MANUAL INPUTS:

ON	not locking	motor ON, pressure limits are not in order
AUTO	locking	logic and control systems are running

11.23 INTERNAL DECISION:

MOTOR RUNS AGAIN AND AGAIN time more than 10 to 20 minutes
WARNING

11.24 OUTPUTS:

M1, M2	motor ON/OFF	pump motors on and off with relay
WA	WARNING	fault – control systems are running
AL	ALARM	manual and automatic systems default, only safety direction are possible
OPTION:	M.A.D.	all actuator systems are locked

12. CONNECTING HYDRAULIC- AND PUMP-UNITS: If there is more than one pump unit installed for redundant reasons, so there are two units connected with one common tank. For service with two pumps are systems with one or two separated tanks suited, the difference is the internal circuit system.

DATA SHEET FOR HYDRAULIC UNIT

1	**Project:** Proj. ABB Meliti Achlada HDU - MVA No. 0805.99 and NDU for example			
2	Item no.:	I	II	III
3	kks code:	MAN10	LCE10	LBH20
4	**HYDRAULIC ACTUATOR:**	**AH200/80-80FO**	**AH100/50-45**	**AH100/50-35**

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5	nos.:	./.	2	2	1
6	oil supply min.	bar	130	130	130
7	piston diameter	mm	200	100	100
8	stem diameter	mm	80	50	50
9	effective stroke	mm	70	40	30
10	stroke max.	mm	80	45	35
11	actuating time control	s	20	20	./.
12	actuating time QO <=	s	4,50	4,50	4,50
13	actuating time QC <=	s	4,50	4,50	4,50
14	actuating time EMQO <=	s	1,50	./.	./.
15					
16	**CALCULATED DATAS:**				
17	effective area O	mm^2	26389,38	5890,49	5890,49
18	effective area C	mm^2	31415,93	7853,98	7853,98
19	actuator force FOo S	N	30000,00	0,00	0,00
20	actuator force FOc S	N	60000,00	0,00	0,00
21	actuator force FOo HY	N	0,00	75121,37	75121,37
22	actuator force FOc HY	N	0,00	75121,37	75121,37
23	actuator force FCo HY	N	370647,31	100161,83	100161,83
24	actuator force FCc HY	N	340647,31	100161,83	100161,83
25	actuator force FCo S	N	0,00	0,00	0,00
26	actuator force FCc S	N	0,00	0,00	0,00
27	volume O	dm^3	0,00	0,47	0,18
28	volume C	dm^3	4,40	0,63	0,24
29	average volume O/C	dm^3	4,40	0,55	0,21
30	total volume	dm^3	4,40	1,10	0,41
31					
32	**RESULT:**				
33	max. pump volume	dm^3/min		15,46	
34	min. accumulator volume	dm^3		5,91	1x stroke open and close kW= dm^3/min*bar/600
35	pump nos./capacity	./.		2 x 12 dm^3/min	/0,8
36	pressure pump "ON"	bar		180	
37	pressure pump "OFF"	bar		210	
38	nom. accumulator volume	dm^3		35	1x stroke open/close, oil pressure 210 bar
39					
40	**select HYDRAULIC UNIT for item I to III:**				**HHS2-12-35/35-400/50**
41					with 2 x 35 dm^3 accumulator
42					2 x stroke open/close, oil pressure 210 bar

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REFERENCES ABOUT DESIGN AND OPERATION

The calculation and the design of the actuators and the hydraulic units are according to DIN and "AD-Merkblätter".

All pressures are in bar g.

Please check all datas!

Explanation:

FOo = actuator force - stem retracting, in position stem retracted

FOc = actuator force - stem retracting, in position stem extended

FCo = actuator force - stem extending, in position stem retracted

FCc = actuator force - stem extending, in position stem extended

HY = actuator force result from oil pressure and spring force

S = spring force of the actuator

The calculation of the developed force (thrust) for the actuator is given by the customer.

Revision 0, date 06.10.00

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Technical Data MVA Hydraulic Units
Series HHS...

Series denomination:

```
HHS 2 - 12 - 35 – 400/50 .... more descriptions with text
|   |   |   |   |   |
|   |   |   |   |   |
|   |   |   |   |   |___  frequency
|   |   |   |   |
|   |   |   |   |_______ power supply
|   |   |   |
|   |   |   |___________ nom. volume accumulator
|   |   |
|   |   |_______________ nom. flow pump (one number)
|   |
|   |___________________ number of pumps
|
|_____________________ series high pressure
```

Typen/series	Qv	Pr	Pl	Ph	Pk	Vt	VÖ	VP	Nmot	Fl	Fa	Fp	P,T	Vs	W
HHS 2 - 6	2 x 6	180	180	210	250	100	63	10	2 x 3	10	60	10	16	10	420
HHS 2 - 8	2 x 8	180	180	210	250	100	63	20	2 x 4	10	60	10	16	20	450
HHS 2 - 12	2 x 12	180	180	210	250	100	63	20	2 x 7,5	10	60	10	20	20	510
HHS 2 - 20	2 x 20	180	180	210	250	160	100	35	2 x 11	10	60	10	25	20	580
HHS 2 - 32	2 x 32	180	180	210	250	250	160	50	2 x 15	10	60	10	32	35	650
HHS 2 - 50	2 x 50	180	180	210	250	400	250	85	2 x 22	10	60	10	40	50	760

Qv [l/min] nom. flow of one pump with 4-pole motor and 50 Hz

Pr [bar] Highest pressure after control valve, if available

Pl [bar] start of accumulator charging

Ph [bar] switch off accumulator charging

Pk [bar] Design pressure

Vt [l] nom. volume tank

VÖ [l] volume oil

Vp [l] floating volume oil

Nmot [kW] nom. power rating motor

Fl [µm] air filter retention

Fa [µm] suction filter retention

Fp [µm] main flow pressure retention

P,T [mm] diameter connections DN

Vs [l] nom. volume accumulator available 10, 20, 35, 50 l

W [kg] wight without control cabinet

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Technical Data MVA Hydraulic Actuator
Series AH….

Type denomination: AHFS.C.200/80-120.900.60/80 __

- dimensions and forces disc spring
- max. stroke
- diameter piston rod
- diameter piston
- C = with positioner, O = without positioner
- FS = spring closing, FO = spring opening
  DA = duple acting
- series

Standards: The mounting dimensions and types of attachment of the cylinders are in conformity with the MVA-Standard or the indicated DIN and ISO Standards.

Pressures:	Nominal pressure	PN	250	
	Operating pressure	PB	210	
	Test pressure, statical		325	all pressures in bar

The actuators are designed for controlled operation, oriented at the VDE 0530 or ICE 34 standard, that means for an operation with 25% ED.
The piston rods, bearing surfaces and seal elements resist to extreme shock loads and load cycles. The do not require any maintenance. All seals are designed for pressures up to 400 bar.

Installation position: The installation position is at will and is determined by the installation position of the valve. For mounting on the valve and taking into operation the operating instructions must be respected.

Pressure fluid: Mineral oil according to DIN 51524 and 51525, others upon request; Temperature –30 to +80 °C, higher temperatures require different seals; Viscosity approx. (30 to 80)*10^6 m²/s equivalent to approx. 4,3 to 11°E at +50°C. A maximum grade of contamination according to ISO 4406 class 19/16 or NAS 1638 class 10 should not be exceeded.

Structure of the Standard Hydraulic Cylinder: The cylinders are delivered as robust welded/screw structure with honed, seamless tubes (roughness of the inner surface max. 0,5 µm) and with hardened and subsequently tempered, polished, dimensioned-hard-chromium-plated piston rods (surface roughness max. 2 µm), thickness of the chromium layer 25 +/- 5 µm. The cylinders were provided with pressure fluid by the attached magnetic valve assembly. The connections are in conformity with the standards DIN 2353 for threaded pipe fittings with pipe thread of Whitworth form; the dimension is determined by the dimension of the cylinder. The connections of the piston rods are realized upon the customers request.
The dimensions for installation and integration without indication of tolerances are according to DIN 7168mT. Eventually installed disc springs are calculated and dimensioned for 100.000 load cycles with sufficient power reserve in case of a break of one spring.

Delivery status: The cylinders are delivered without fluid, provided with an one-layer transport protection coating Percotex LA-wash primer, a two component product on a polyacryl basis a with low solvent content, chromatic value black, layer thickness approx. 25 µm.

Each cylinder will be tested individually according to MVA standards; acceptance tests according to customers standards as an option.

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Instructions for Installation, Operation and Maintenance
for MVA – Hydraulic Actuators

W A R N I N G
Improper installation-, operation- and maintenance work might cause heavy accidents. Therefore these works should only be done by experienced specialized persons. The guide lines of the suppliers, especially of the suppliers of the hydraulic fluids must be respected.

General
Before installation and taking into operation of the hydraulic cylinders the advice of the following documents must be taken into account: attached drawings, hydraulic – and electrical diagrams, -DIN 51524/51525 Hydraulic fluids.

Installation
Before starting installation the completeness of all installation parts and auxiliary materials must be controlled. Also transport damages must be considered. Before installing the hydraulic cylinder the type denomination of the hydraulic cylinder should be compared with the data of the order. During the installation of the cylinder for cleanliness of the working area must be taken care.
Tubes, especially after their cutting and containers must be cleaned from cinder, filings and other contaminations before installing them. Hot curved or welded tubes must be acid cleaned, washed and oiled. Sealing materials like hemp, cement, silicon or sealing tape must not be used in any case, because said materials among others may cause contamination and thus produce system malfunction. For cleaning

purposes only use tissues which do not loose fibers or special paper. Using lifting devices use the soft side and/or the transport devices. For installation and in order to hold on the piston rod hock wrenches with round finger according to DIN 1810 are required. The fixing screws must be tightened homogeneous and if required with the indicated torque.

Installation position
At will. Hydraulic cylinders must not be installed preloaded. It must be considered that the attachments of the cylinder and the piston rod are shaped and adjusted in such a way (they must be in alignment), that during operation no side forces or bending forces act on the piston rod. If so, damages of the hydraulic cylinder may occur and the manufacturers liability will be terminated.

Pressure connections
The pressure connections in the mounted solenoid valve manifold are designed for connection screw usual in trade. In order to avoid leakages the installation advices of the connecting screw manufacturers must be observed. The correct laying of the flexible lines must be respected. Rubbing and pushing of the flexible lines must be avoided.

Electrical connections
The connections of position transmitters, inductive or mechanical limit switches, etc. must be taken from the respective installation guide lines.

Preparation for taking into operation
Before the real action of taking into operation of the hydraulic cylinder the following general controls beside the system specific checks should be realized:

- General visual check regarding damages, contamination and completeness.
- Are all pipes and flexible hoses properly installed and cleaned?
- Are the hydraulic and electrical connections correctly installed?
- Are eventually existing position transmitters, inductive or mech. limit switches correctly installed and adjusted?
- Are all screw connections and flanges tightened?
- Is the cylinder without preloading and in alignment?

- Are all tools, auxiliary materials, arresting and cleaning devices removed?
- Has the cylinder the necessary space for a free and proper movement
- Is the system filled up with the required fluid up to the upper oil level mark?

After the control the installation was completely and properly done, the putting into operation may be done.

Putting into operation
In order to avoid injuries, hydraulic cylinders should be put into operation only if installed or fixed to special jigs, **- especially if a disc spring is built in -** because the extending and retracting piston rod might present a danger for injuries. For safety reasons in the putting into operation activities only the directly involved persons should be present in situ. If required the dangerous area should be protected by protecting grids or similar devices.
Due to the fact that these instructions only refer to the hydraulic cylinder(s) and the missing of the detailed information regarding the complete system, the operating manual of the complete system is valid for the putting into operation of the complete system and must be respected.

Pressure Fluid
Please control if the pressure fluid of the system is in conformity with the required pressure fluid of the hydraulic cylinder. Please respect the recommendations of the cylinder manufacturers or the data sheet. The cautious selection of tested and approved hydraulic fluids is prerequisite for an optimal function of the hydraulic system. Generally mineral fluids HL or better HLP according to DIN 51524 or 51525 can be used. Other pressure fluids upon request.
The temperature ranges recommended by the manufacturers of the pressure fluids and the hydraulic cylinder should be in conformity and be not exceeded or undercut. In order to assure a constant response behavior, it is recommended to maintain the temperature of the pressure fluid at the same level.

Hydraulic fluid in hydraulic systems is exposed according its operation to more or less higher impacts, as for example the atmospheric oxygen, eventually high or heavily changing temperatures, condensation, dust, abrasion etc.
By ageing processing the fluid looses progressively its important characteristics like grease potential, viscosity, density, low compressibility etc. thus reducing the mechanical performance, increasing the abrasion and corrosion in the system, damaging the seals etc.
Because these processes will take place in an accelerated manner at temperatures above +80 °C, in hydraulic systems temperatures above +80°C should be avoided (if indicated a cooling system should be foreseen). In order to reach a high operating life time of the hydraulic system, a regular control of the hydraulic fluid is extremely important. The meantime between control and change of the hydraulic fluid is depending beside on its operation, on its location and the environment (humidity, dust, temperature etc.). Highly aged hydraulic fluid cannot be improved by adding fresh fluid. As an orientation, the meantime between a change of the fluid at normal conditions and a operation with 8.000 hours per year are some years. It is necessary once per year to take a fluid-sample and to investigate by supplier or a qualified laboratory. With the solution you have to decided to make a fluid change. For the dangerous area should changing the fluid at its operational temperature should be extracted and renewed. The refilling should only be done using system filters or movable filter stations with fine filters – filter retention value of 10 µm.

Filtration
A reliable filtration increases the life time of the hydraulic cylinders and the whole system. The required filter retention value depends on the system components and the application. A filter with clogging indicator with a filter retention value of 10 µm is recommended. A maximum grade of contamination of the hydraulic fluid according to ISO 4406 class 19/16 equivalent to NAS 1638 class 10 should not be exceeded. During filter change for cleanliness should be taken care. Contamination at the exit side of the filter can be washed into the system and produce discrepancies. Contamination at the filter entrance side reduce the operation time of the filter cell.

Maintenance
Properly installed and using perfect media hydraulic cylinders do not need any maintenance. It is recommended, to recheck after an operation time of approx. 100 hours the screw connections at the cylinder and the connections regarding tightness and if necessary retighten them (the system must not be

under pressure). In short intervals the leak-proofness must be controlled. Leakages at places, which are sealed with soft seals (O-rings, form joint rings etc.) cannot be eliminated by fastening it, because these seal elements are destroyed or hard dry. An elimination of the leakage is only possible by an exchange of the seal. Damaged pipes and flexible hoses must be replaced immediately.

Change of seals
Motion seals are wearing parts. If the inner or outer leakage an unacceptable status, we recommend to send back the hydraulic cylinders to our factory, because changing the seals we also control the guides etc. Only in emergency cases a seal change according to the manufacturers instructions should be applied.

Storage
The stores must be dry, clean, free of dust and corrosion. If stored longer than 6 months: Please fill the hydraulic cylinders with a conservation fluid and close it. If indicated please contact the manufacturer.

Spares and wearing parts
Ordering spares and wearing parts it is sufficient to indicate the commission and number of the cylinder.