

# COOLING SYSTEMS

## CLAMPING ARRANGEMENTS

## INSULATORS

HIGH EFFECTIVE HEATSINKS FOR ALL TYPES OF POWER SEMI-  
CONDUCTOR DEVICES

AIR AND FLUID COOLING

ONE-SIDE AND TWO-SIDE COOLING

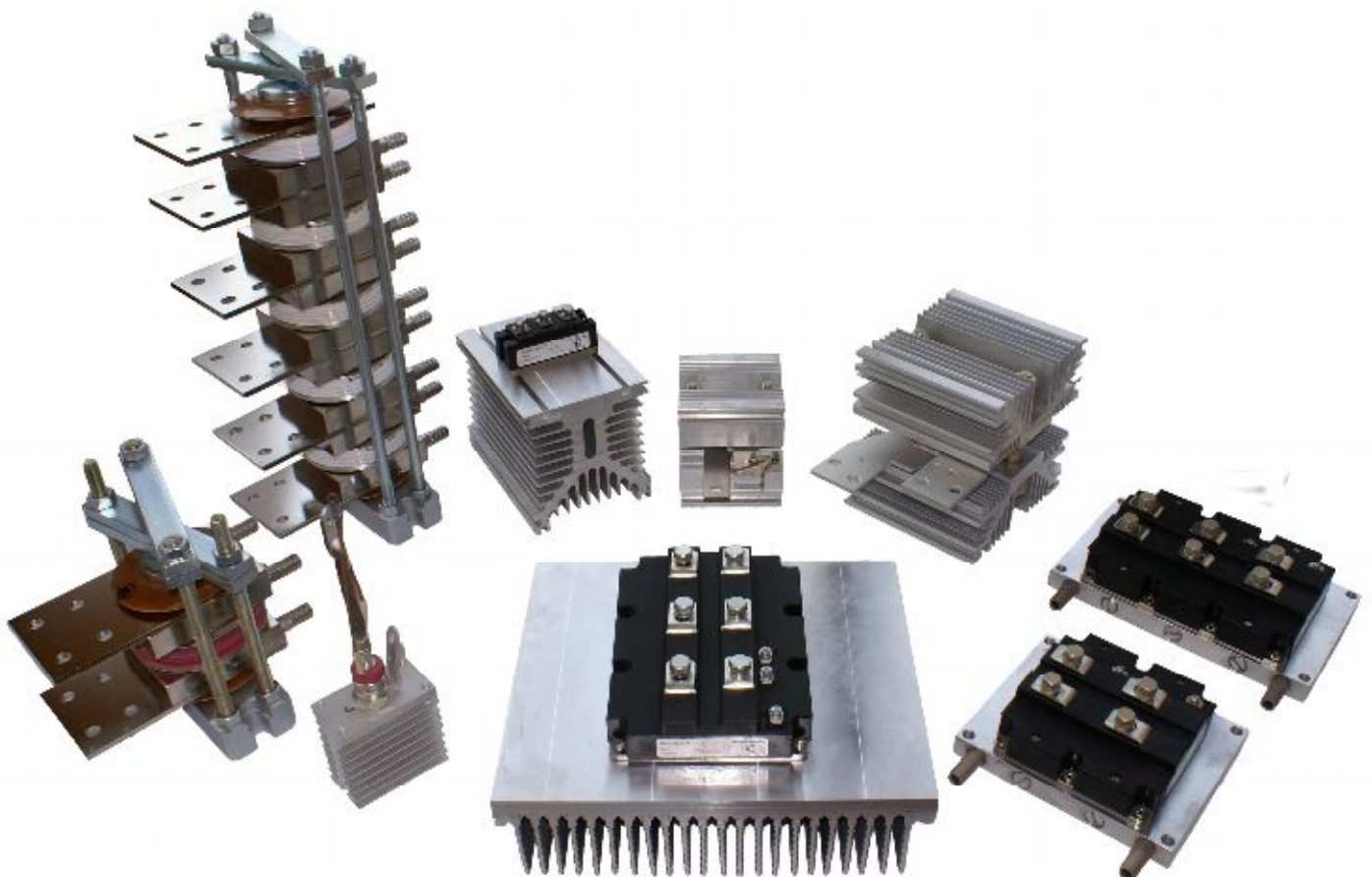
COOLING PLATES WITH PRESSED-IN FINS FOR MODULES

CLAMPING AND PRESSURE CONTROL ARRANGEMENTS

MOUNTING MATERIALS

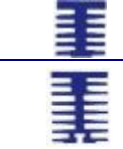
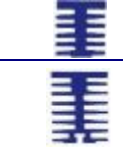


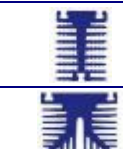

HEAT CONDUCTIVE INSULATION ELEMENTS

TEMPERATURE SENSORS










## AIR COOLING HEATSINKS FOR STUD DESIGN DEVICES

- For one-side cooling of stud design power semiconductor devices
- Heatsinks with different length are available
- Some devices can be mounted on the same heatsink

Type		w g	Thread	$R_{thha} (P_F)$		$\Delta_{phr}$ ( $V_{cft}=6m/s$ ) Pa	For cases
				convection °C/W (W)	$V_{cft}=6m/s$ °C/W		
0111		92	M5	5.60 (10)	-	-	SD1, ST1
0121		92	M6	5.60 (10)	-	-	SD2, ST2
0221		156	M6	2.80 (18)	-	-	SD3, ST3, ST3-1 SD4, ST4, ST4-1
0131		157	M8	2.80 (18)	-	-	
0141		166	M10	2.80 (18)	-	-	
0231		369	M8	2.12 (30)	-	-	SD3, ST3, ST3-1
0331		378	M8	2.12 (30)	0.670	15	SD4, ST4, ST4-1
0241		375	M10	2.12 (30)	0.670	15	
0541		420	M10	1.90 (50)	0.670	15	
0151		420	M12	1.90 (50)	0.670	15	
0371		420	M20x1.5	1.90 (50)	0.670	15	
0171		670	M20x1.5	1.12 (80)	0.355	18	
0181		700	M24x1.5	1.12 (80)	0.355	18	SD7, ST7
0271		1750	M20x1.5	0.71 (130)	0.236	25	SD6, ST6
0281		1750	M24x1.5	0.71 (130)	0.236	25	SD7, ST7

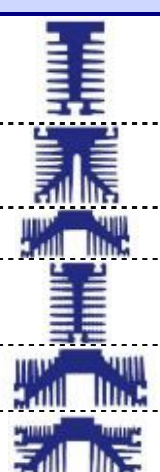





## AIR COOLING HEATSINKS FOR PRESS PACK DEVICES

- For one-side cooling of presspack devices
- Heatsinks with different length are available
- Some devices can be mounted on the same heatsink

Type		w g	Contact sur- face diameter mm	$R_{thha} (P_F)$		$\Delta_{phr}$ $V_{cft}=6m/s$ Pa	For cases
				convection °C/W (W)	$V_{cft}=6m/s$ °C/W		
0232		1600	42	1.120 (80)	0.355	18	PD32, PD33 PT31, PT31-1, PT32
0242		2400	55	0.670 (150)	0.236	25	PD42, PD43 PT41, PT42, PT43
0342		3500	58	0.530 (150)	0.170	20	PD22, PD23 PT21, PT21-1, PT23
0123		2000	22	0.710 (120)	0.212	20	PD42, PD43 PT41, PT42, PT43
0143		3000	42	0.500 (120)	0.125	30	PD53 PT51, PT53, PT53-1
0243		5800	42	0.280 (220)	0.080	30	PT41, PT42, PT43
0153		6000	55	0.260 (220)	0.075	30	PD53 PT51, PT53, PT53-1
0343		5300	42	0.355 (220)	0.100	30	PD53 PT51, PT53, PT53-1
0253		5500	55	0.355 (220)	0.008	30	
0353		5700	55	0.355 (220)	0.008	30	
0453		6200	55	0.186 (230)	0.072	34	PD63, PD73 PT63, PT73
0173		12000	76	0.195 (400)	0.060	35	PD94 PT83, PT93, PT94
0273	13000	76	0.185 (400)	0.055	40		
0373	13000	76	0.185 (400)	0.055	40		
0473	25600	76	0.152 (400)	0.034	50		
0193		28000	100	0.101	0.030	50	

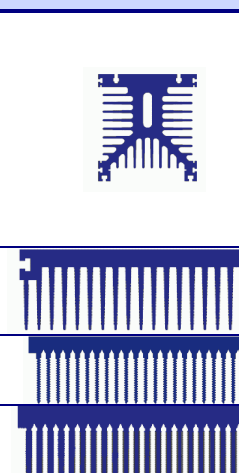


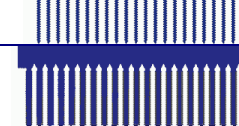


## AIR COOLING HEATSINKS FOR POWER MODULES

- For power modules with currents of 40, 63, 80, 100, 125, 160, 200 A.
- Heatsinks with different length are available

Type		w	$R_{thha} (P_F)$		$\Delta_{Phr}$	For cases
		g	convection °C/W (W)	$V_{cfh}=6m/s$ °C/W	$V_{cfh}=6m/s$ Pa	
O24		590	2.10(25)	0.48	25	MTD1, MTD2
O25		2170	0.75(80)	0.21	18	MI3, MI3-1
O26		2180	0.74(85)	0.20	30	MTD3
O34		720	1.20(50)	0.31	25	MTD1, MTD2
O35		1260	1.10(60)	0.23	30	MI3, MI3-1
O36		990	1.15(55)	0.28	30	MTD3
O45		1020	1,10(55)	0.23	30	MI3, MI3-1
O46		2580	0.55(100)	0.18	30	MTD3
O47		3250	0.40(150)	0.105	30	MTD5

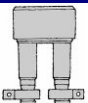
## HIGH EFFICIENCY HEATSINKS FOR POWER MODULES

- For all power module types with insulated base plates (diode/thyristor/IGBT/SFRD modules and other)
- For high power converters (rectifier/invertor)
- Optimum efficiency/volume ratio
- Heatsink length on request

Type		Dimen- sions (width- length- height) mm	Module contact surface mm	Modules Number on heatsink n	$R_{thha} (P_F)$		$\Delta_{Phr}$ $V_{cfh}=6m/s$ Pa	w g
					Convection °C/W (W)	$V_{cfh}=6m/s$ °C/W		
O55/120		125x120x137	20x92	1	0.536	0.11	17	2300
				2	0.500	0.097		
				3	0.496	0.093		
O55/180		125x180x137	34x92	1	0.436 (180)	0.142	20	3500
				2	0.400 (180)	0.105		
				3	0.388 (180)	0.090		
O55/265		125x265x137	50x92	1	0.338	0.091	25	5200
				2	0.296	0.065		
				3	0.292	0.063		
O56		260x300x80	130x140	1	0.222(340)	0.057	27	7500
			140x190	1	0.210(340)	0.051		
O57/300/300		300x300x88.5	130x140	1	0.208(350)	0.060	43	9200
				4	0.177(400)	0.034		
O58/300/300		300x300x88.5	130x140	4	0.220(400)	0.030	47	9500

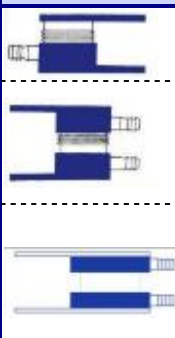
## FLUID COOLING HEATSINKS FOR STUD DESIGN DEVICES

- For one-side cooling of stud design devices series 161, 261, 361 (heatsink OM101) series 171, 271, 371 (heatsink OM102)
- For water/fluid cooling

Type		w	Thread	$R_{thha}$	$\Delta_{Phr}$	For cases
		g		(water flow rate 3 l/min) °C/W	(water flow rate 3 l/min) Pa	
OM101		680	M20x1.5	0.110	7000	SD6, ST6
OM105		710	M24x1.5	0.085	11000	SD7, ST7

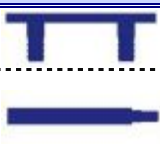
## FLUID COOLING HEATSINKS FOR PRESS PACK DEVICES

- For one-side and double-side cooling of press pack devices
- For water/fluid cooling

Type		w	Contact surface diameter	$R_{thha}$	$\Delta_{Phr}$	For cases
		g	mm	(water flow rate 3 l/min) °C/W	(water flow rate 3 l/min) Pa	
OM103		2000	50	0.0600	9000	PD32, PD33 PT31, PT31-1, PT32
OM104		2300	50	0.0300	18000	PD42, PD43 PT41, PT42, PT43
OM106		3600	58	0.0200	18000	PD53 PT51, PT53, PT53-1
OM107		10000	78	0.0140	8000	PD73
OM207		10000	78	0.0095	16000	PT73
OM108		11000	86	0.0130	9000	PD83, PT83
OM109		14000	102	0.0110	9000	PD94
OM209		14000	102	0.0085	16000	PT83, PT93, PT94

## FLUID COOLING HEATSINKS FOR POWER NODULES

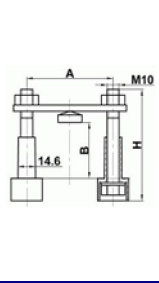
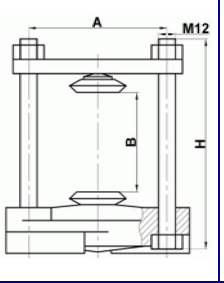
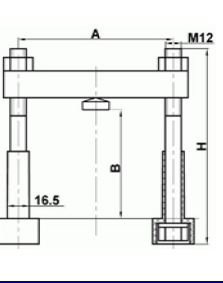
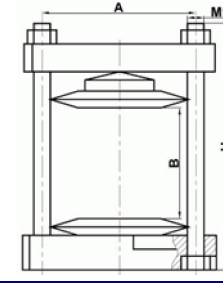
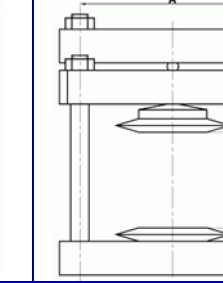
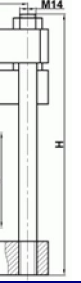

- Heatsinks OB15, OB16 are designed for water/fluid cooling of potentialless diode/thyristor modules with base plate width 20, 34, 50 mm.
- Heatsinks OB17, OB18 are designed for water/fluid cooling of high power IGBT modules with base plates 130x140 mm and 140x190 mm

Type		w	$R_{thha}$	$\Delta_{Phr}$	Heatsink material
		g	(water flow rate 3 l/min) °C/W	(water flow rate 3 l/min) Pa	
OB15		250	0.065	15	Copper
OB16		300	0.060	16	Copper
OB17		1400	0.022	7000	Aluminium
OB18		2000	0.019	7000	Aluminium
OB27		4700	0.010	18300	Copper


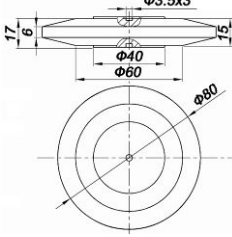
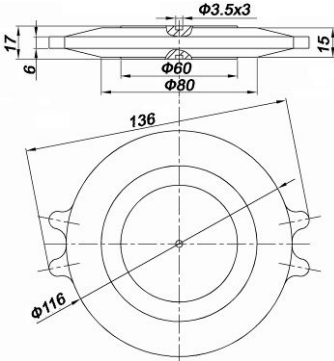
# CLAMPING ARRANGEMENTS FOR PRESS PACK DIODES AND THYRISTORS

## Features and application fields:



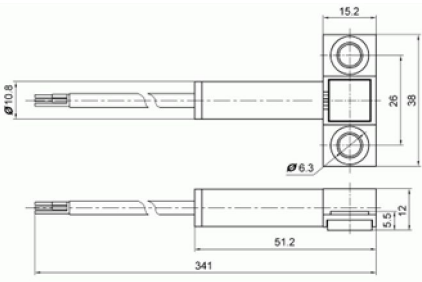
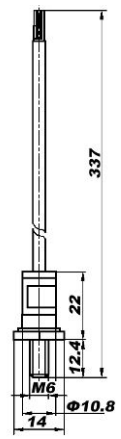
- These arrangements clamp press pack devices to heatsinks. Contact surface diameters from 19 mm up to 100 mm.
- Homogeneous pressure is provided
- Controllable clamping force

Type	O123P	OM103P	OM104P	O243P	O153P	OM106P	OM107P	OM109P
A, mm	72	98	98	116	116	116	144	170
B, mm	44	50	70	70	76	80	76	85
H, mm	92	135	145	120	127	180	210	245
F, kN	4 ÷ 8	10 ÷ 17	10 ÷ 17	9 ÷ 17	20 ÷ 28	20 ÷ 28	48	80
V <sub>isol</sub> , kV	5	5	5	5	5	5	5	5
w, g	230	330	340	420	660	2320	5500	8300
Outlines								

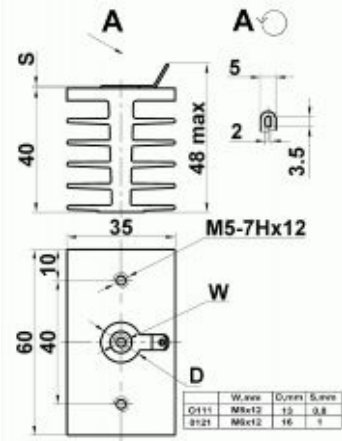
## INSULATION ELEMENTS

		IT40	IT60	IT60M <sup>®</sup>
 <p>Features and application fields:</p> <ul style="list-style-type: none"> <li>• Insulation elements are designed for insulation of press pack devices from cooling systems, allowing to place some devices on the same heatsink and to simplify converter design</li> <li>• Optimum design for low thermal resistance</li> <li>• Plastic housing, heat conductive insulation Al<sub>2</sub>O<sub>3</sub> or AlN</li> </ul>				
w	g	195	490	490
Heat resistance (insulation material)	°C/W	0.172 (Al <sub>2</sub> O <sub>3</sub> )	0.151 (Al <sub>2</sub> O <sub>3</sub> )	0.075 (AlN)
F	kN	13.0÷16.0	24.0÷28.0	24.0÷28.0
V <sub>isol</sub> (effective value)	kV	10	10	10

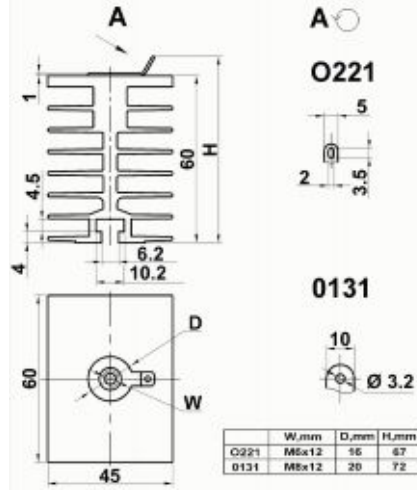
**MODULE DESIGN INSULATED TEMPERATURE SENSORS**  
**ANALOGUE TMBA 1.6, DIGITAL TMBC 4.6**

	TMBA 1.6	TMBC 4.6
		
Features	<ul style="list-style-type: none"> <li>▪ Plastic case</li> <li>▪ Screw clamping M5</li> <li>▪ Base is insulated from signal terminals</li> <li>▪ Analogue output for temperature control</li> <li>▪ Internal amplification of analogue signal for interference damping</li> </ul>	<ul style="list-style-type: none"> <li>▪ Plastic case</li> <li>▪ Base is insulated from signal terminals</li> <li>▪ Digital output signal for temperature control</li> <li>▪ 64-bit series code</li> </ul>
Parameter		
Operation temperature, °C	- 55...+ 125	- 55...+ 125
Insulation voltage base - terminals, V (eff)	6000	6000
Supply voltage, V	4,5÷5	4,5÷5
Output signal stabilization time by temperature sharp change from 25 °C to 100 °C, max, min	2	1
Output signal	analogue	digital
Signal transformation time in 12-bit digital code		750
64-bit series code		yes
Weight with conductors, kg	0,03	0,02
		

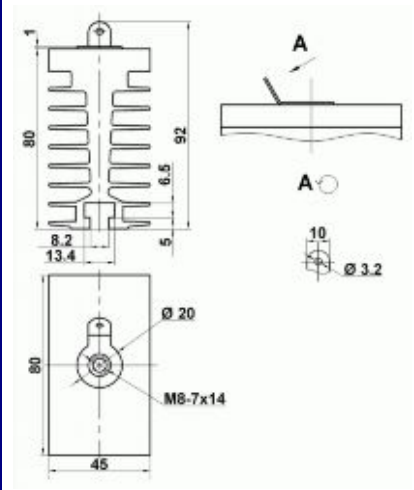
# OUTLINES



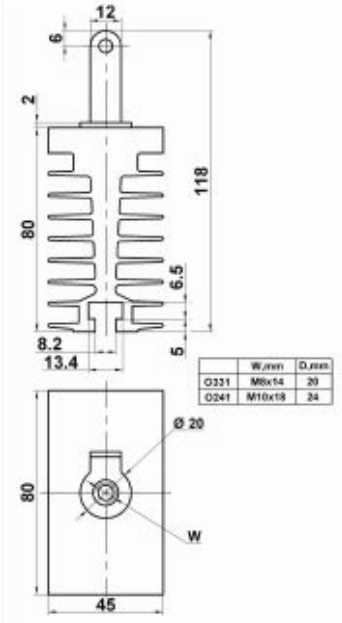
O111, O121



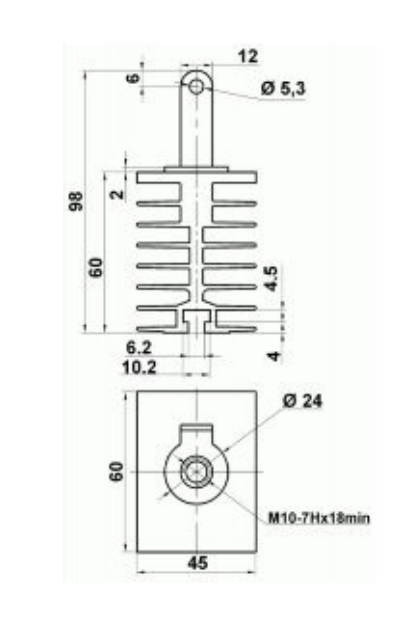
O221, O131



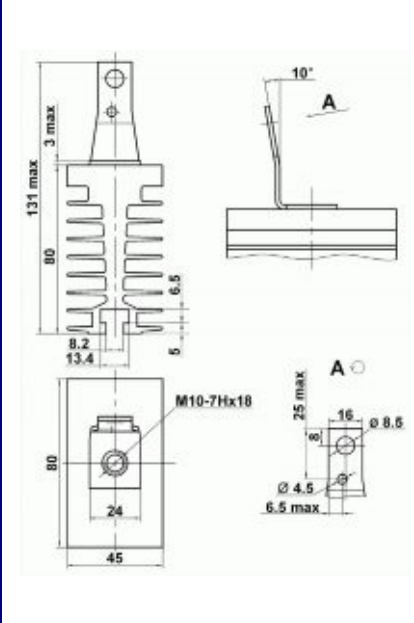
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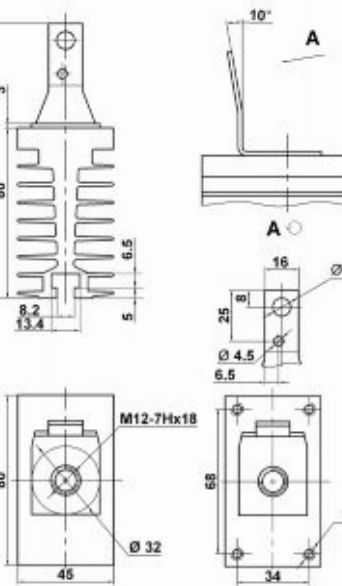
O331, O241



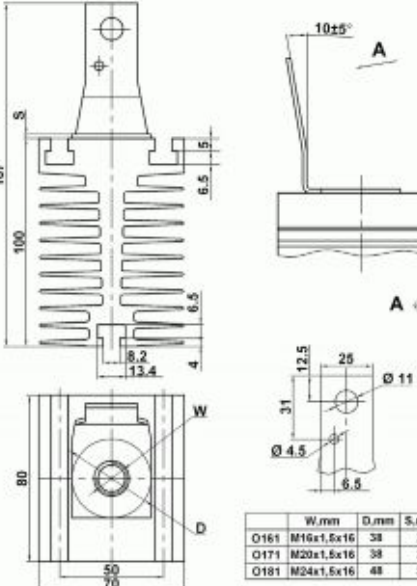
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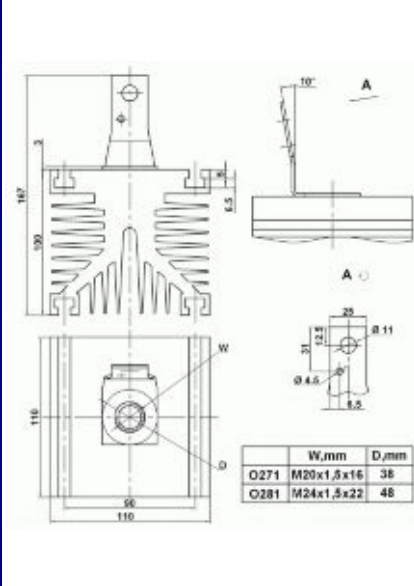
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O151

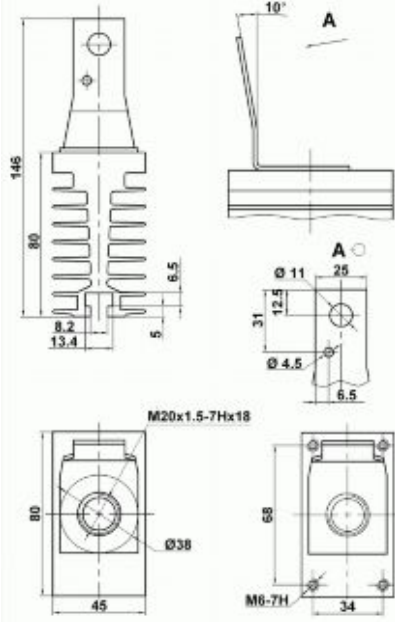


O161, O171, O181

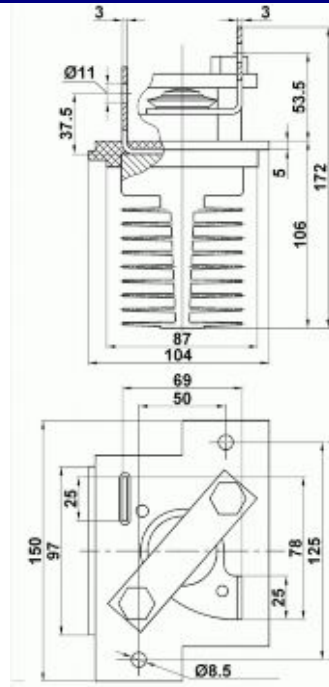


O271, O281

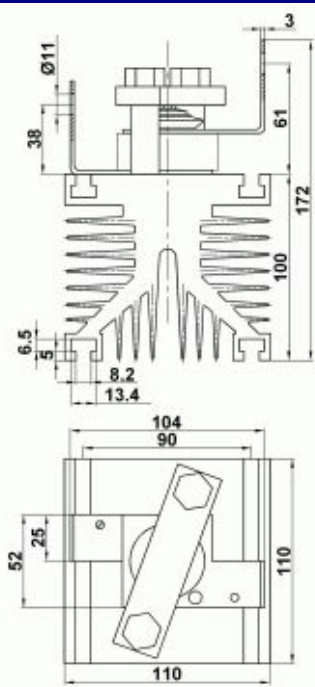
# OUTLINES



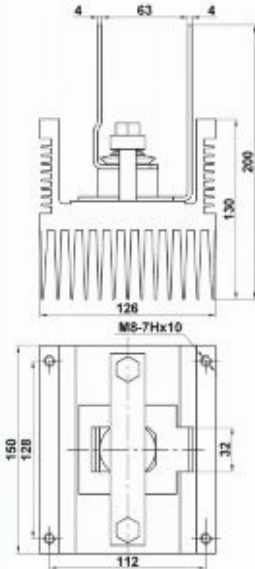
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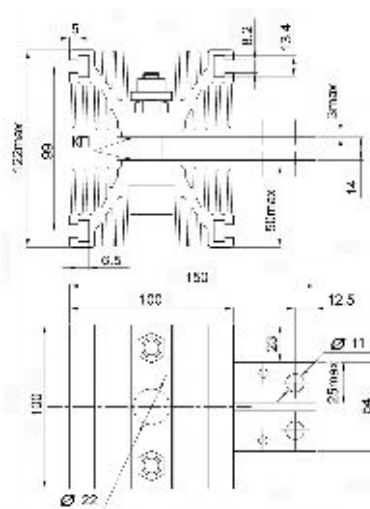
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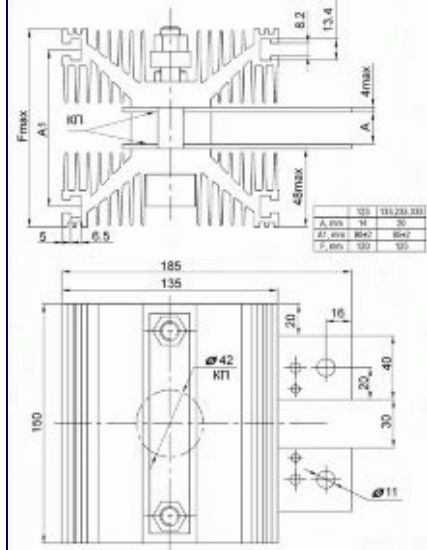
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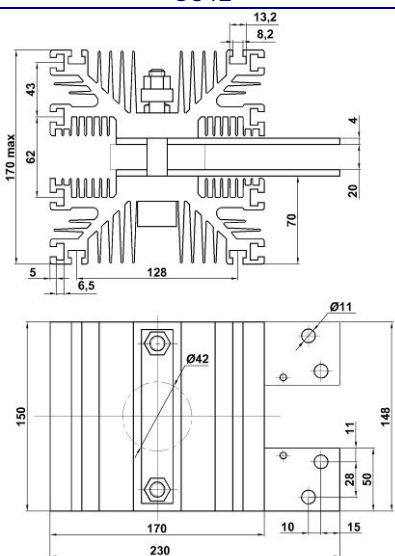
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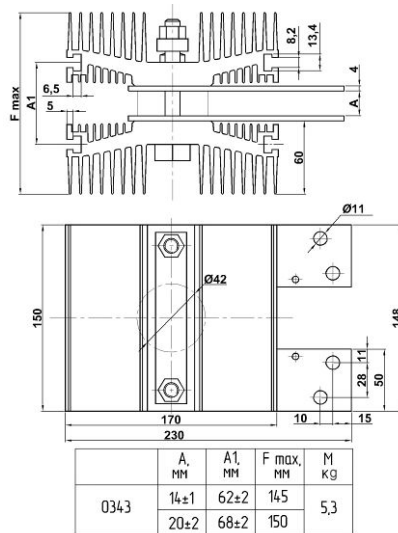
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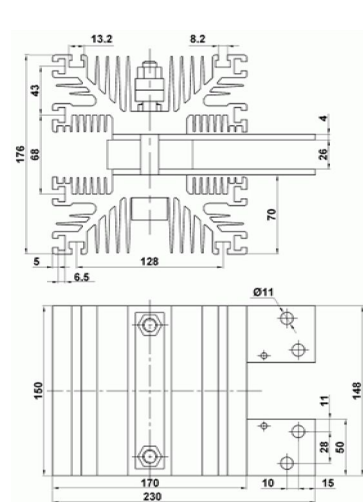
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O243

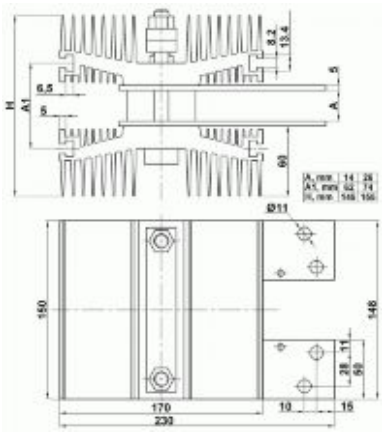


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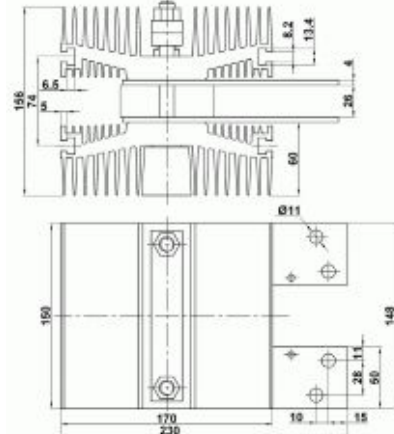


O153

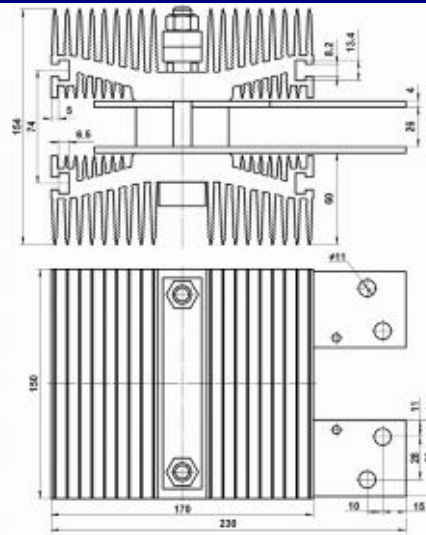
# OUTLINES



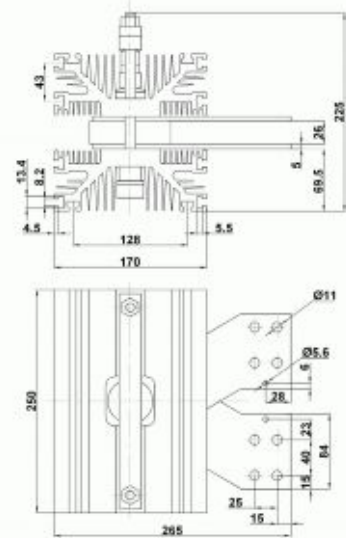
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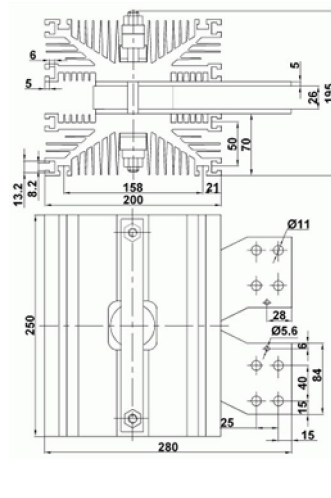
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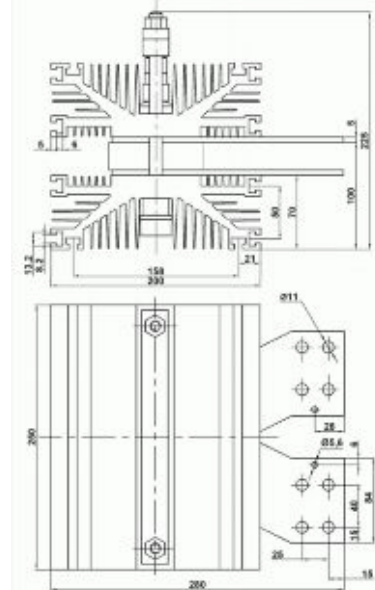
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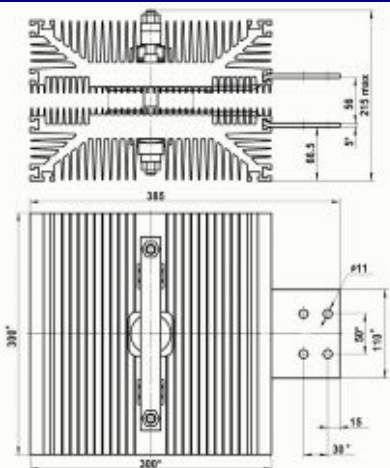
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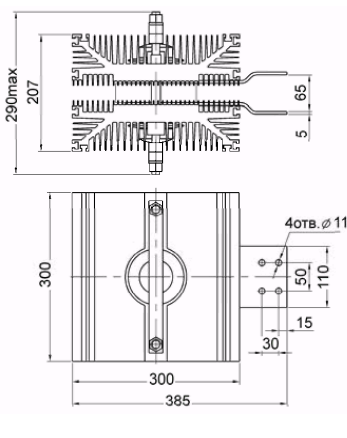
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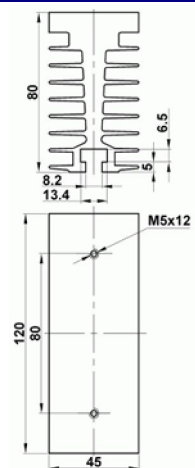
O373



O473

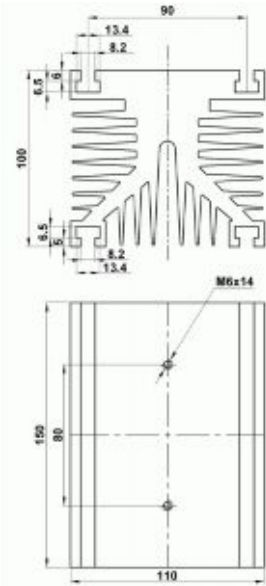


O193

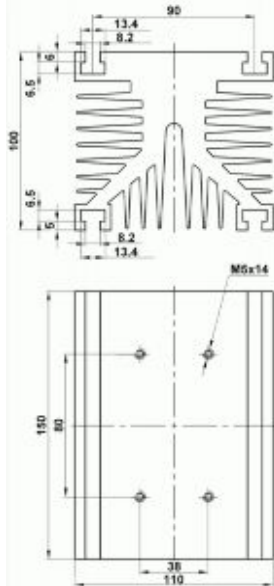


O24

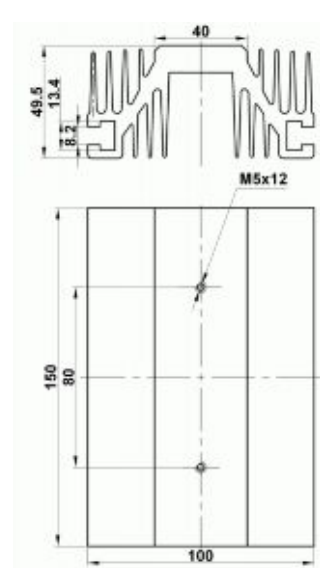
# OUTLINES



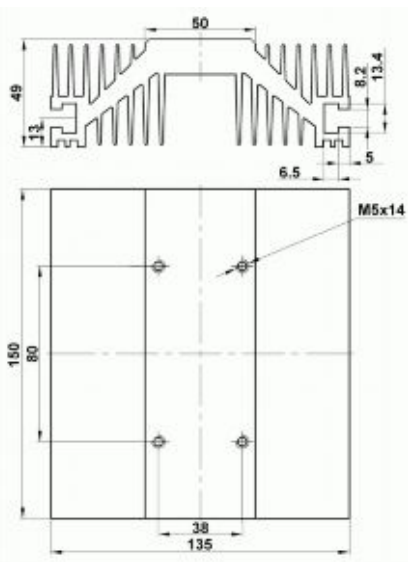
O25



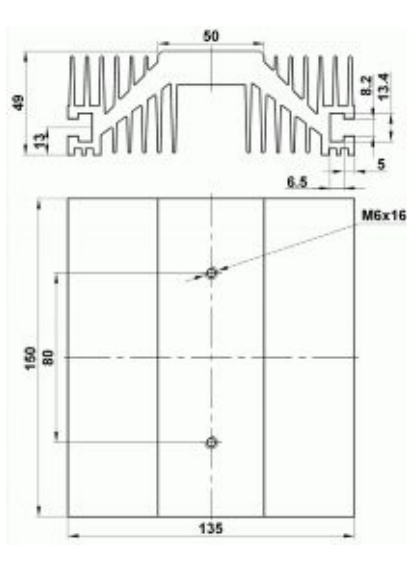
O26



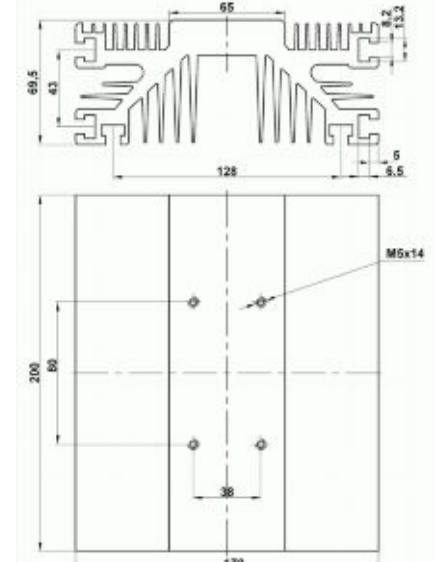
O34



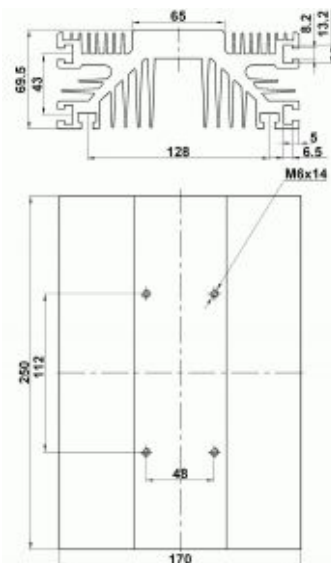
O36



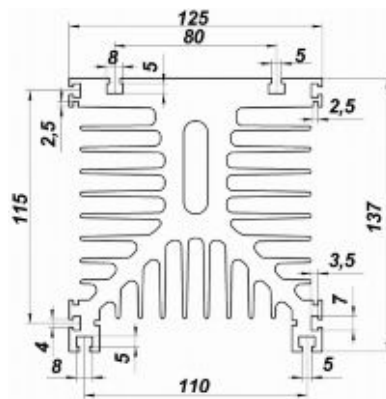
O45



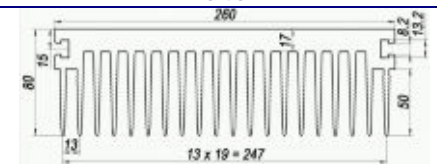
O46



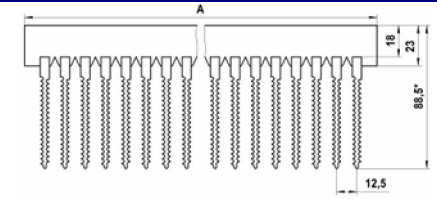
O47



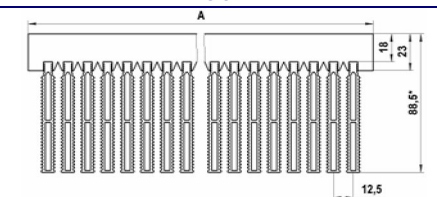
O55



O56

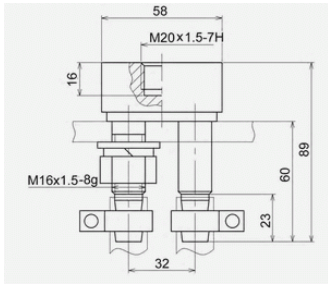


O57

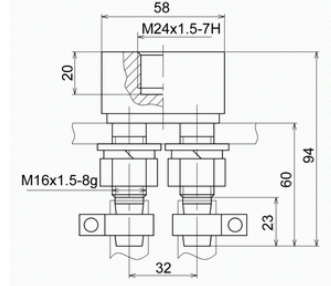


O58

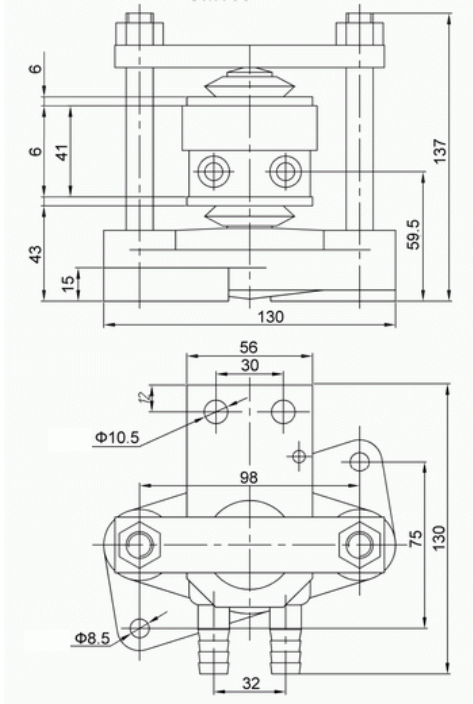
# OUTLINES



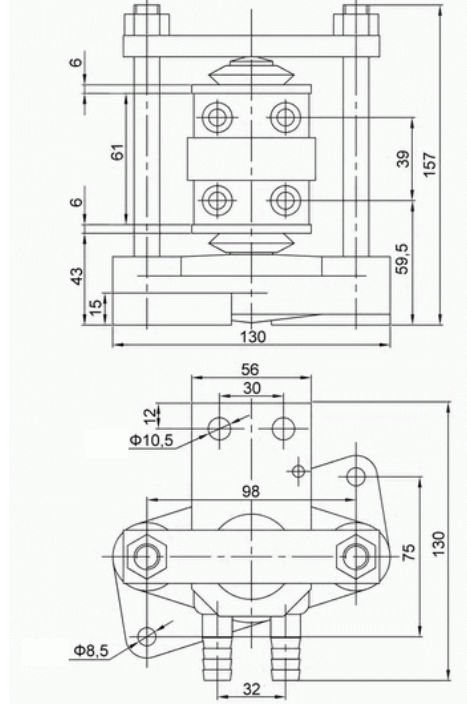
OM101



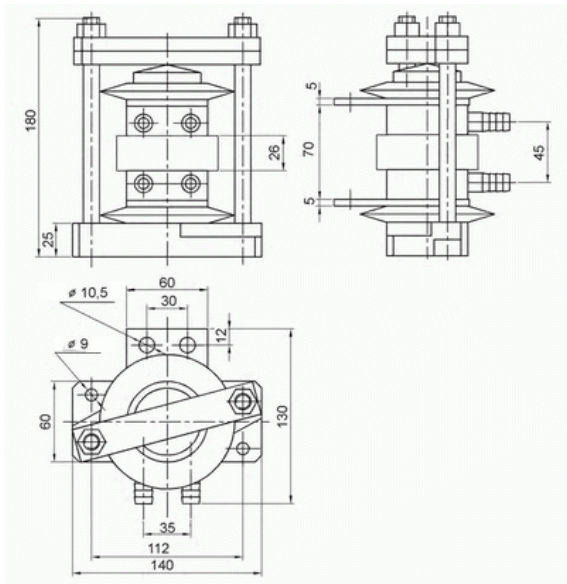
OM105



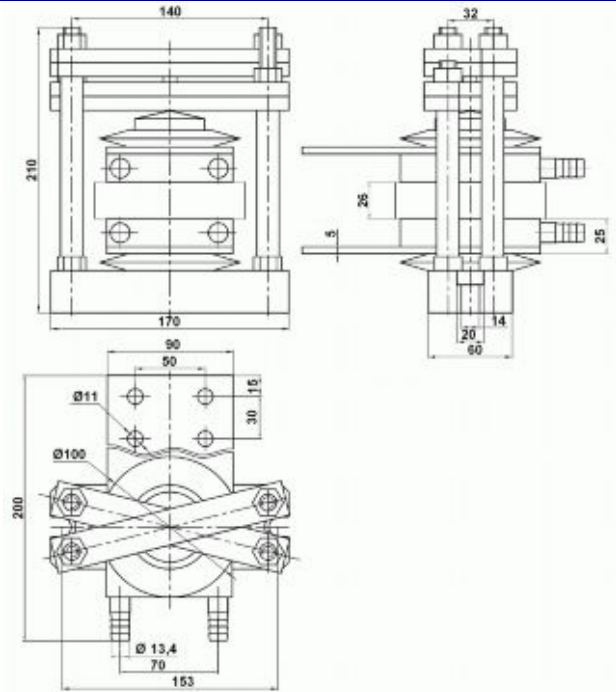
OM103



OM104

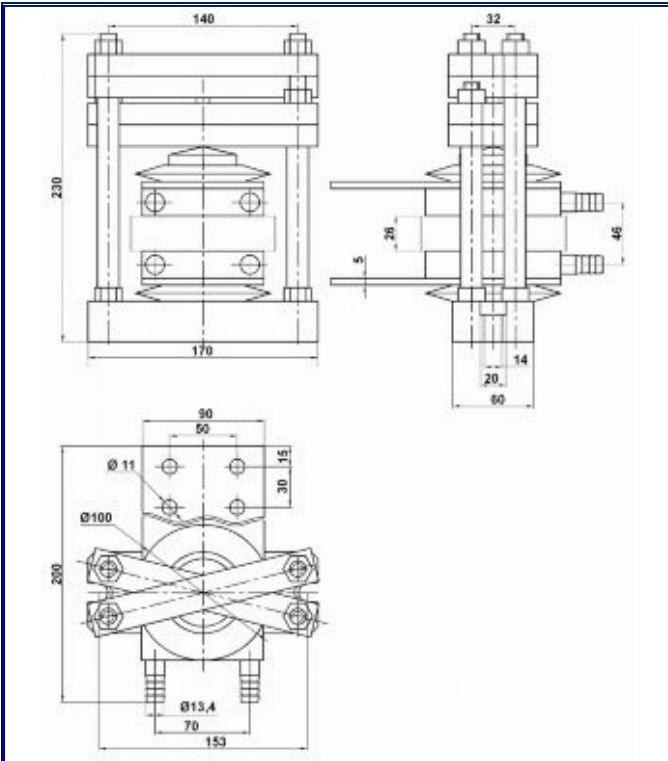


OM106

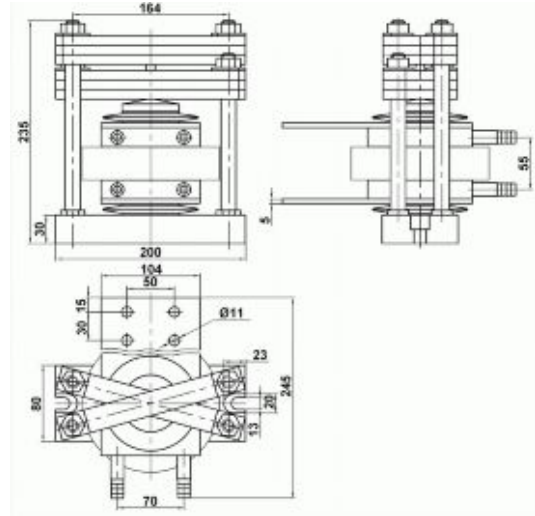


OM107, OM207

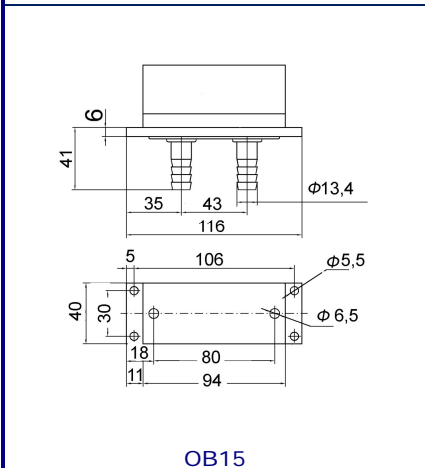
# OUTLINES



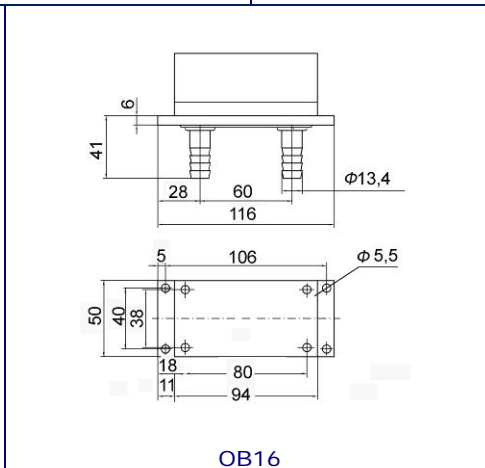
OM108



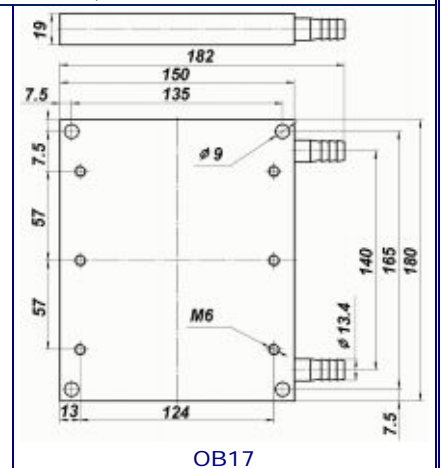
OM109, OM209



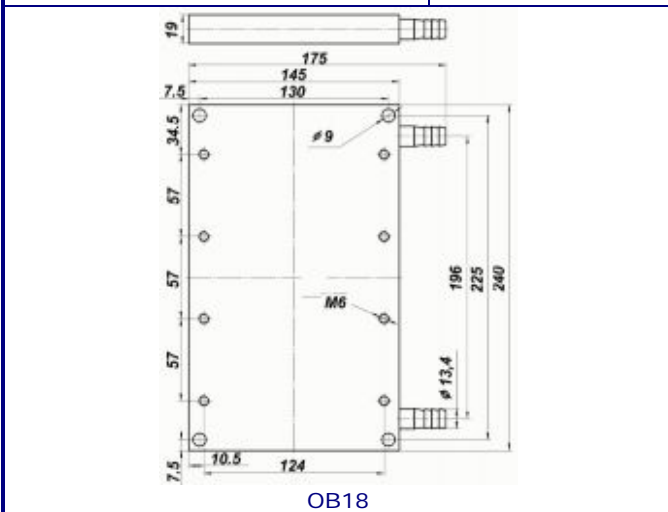
OB15



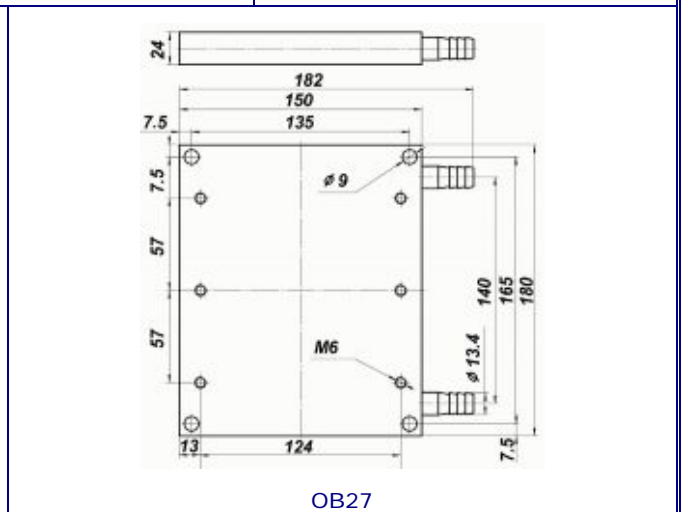
OB16



OB17



OB18



OB27