AUTOMATIC POWER FACTOR CORRECTION SYSTEMS WITH 3U CAPACITORS

3Ut

UNI EN 29001 (ISO 9001)

VMTEC

HIGH PERFORMANCE METALLISED POLYPROPYLENE CAPACITORS, 3U$_t$ RANGE

VMtec capacitors of the 3Ut range are destined to revolutionize the Power Factor Correction market. The design offers.

- *high density metallised polypropylene film capacitor element*
- *capacitive elements housed in an aluminium can complete with overpressure device*
- *tested for 60 seconds at 3 times rated voltage*

The HP and FH Automatic power factor correction range enjoy the reliability of the 3Ut with the added benefits of reduced physical dimensions, enhanced global performances in terms of durability and ability to withstand voltage fluctuations.
In compliance to this product development, selection criteria is now as follow.

CHOICE PRINCIPLES OF THE SYSTEMS IN FUNCTION OF THE PLANT TYPE

THE KEY: N^2

For the correct choice of the capacitor bank to install in a system, it is necessary to establish the value of the parameter N^2. Without this parameter, the selection of the capacitor bank can't be correctly done and the only solution is the use of capacitors in series with reactances (detuned Filter).

DETERMINATION OF PARAMETER N^2

The parameter N^2 is calculated by the following equation:

$$N^2 = \frac{A_N \times 100}{v_{cc} \times Q}$$

where:

A_N=Transformer rated power in kVA (this value is present on the transformer plate)
v_{cc} %= Short-circuit voltage % (this value is present on the transformer plate)
Q = Capacitor bank rated output to install in the system in kvar
As N^2 increases the risk of capacitor overloading decreases. Herein after it is considered the correspondence between the parameter Nand the VMtec suggested product.

MEANING OF THE PARAMETER THDI$_R$%

THDI$_R$% represents the current total harmonic distortion in the system; this parameter is measurable with an appropriate instrumentation or it is approximately calculable using the following empirical equation:

$$THDI_R\,\% = \frac{A_C}{A_{NC}} \times 35$$

where:

A_C= Total rated output of the non-linear loads installed in the system expressed in kVA (for example: inverter, rectifier, etc)
A_{NC}= Total rated output of loads installed in the system expressed in kVA (linear + non-linear loads)

MEANING OF THE PARAMETER THDI$_C$%

THDI$_C$% represents the current harmonic distortion on the capacitors. This value allows us to comprehend how much a capacitor could be overloaded in presence of harmonics.

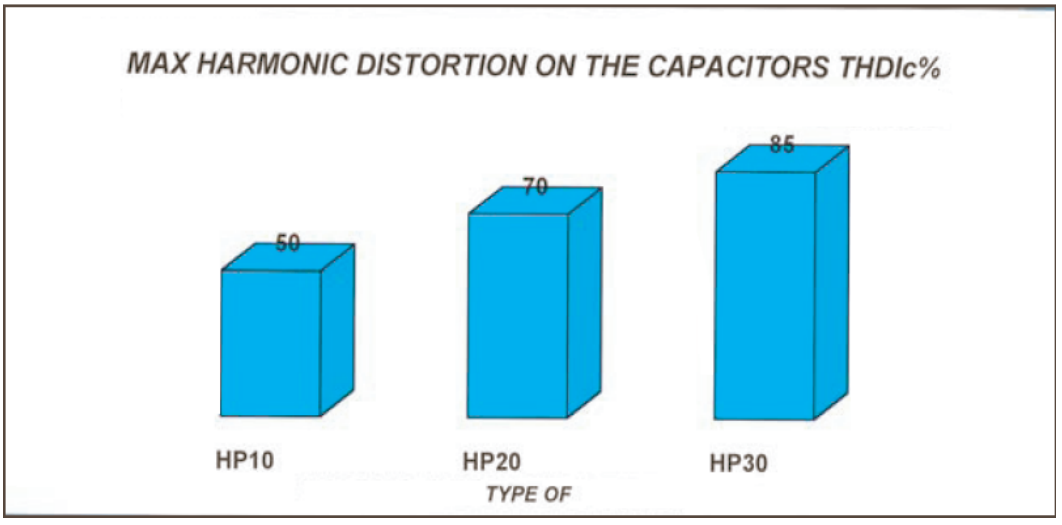
VMtec PRODUCTS CHOICE

Known N^2 and THDI$_R$% it is possible to choose the correct power factor correction equipment for the system under consideration. Equipment with higher values of THDI$_C$% will have higher performances.
The table was done based on the following hypotheses:

- *Network voltage 400Vac-50Hz*
- *Power factor of the system 0.7*
- *Power factor that we would obtain 0.95*
- *Non linear load with 5°-7°-11°-13° harmonics current*

The hypotheses used are general and are valid in the most of cases. In particular situations (harmonics of other branch of network, presence of even or multiples of 3 harmonics, etc) previous considerations may not be true. In these cases, we have the guarantee of a correct choice of the equipment only after a harmonic analysis and/or after correct cal¬culations. VMtec will not be liable for any wrong choice of product.

$THDI_R\%>25$	FH20 FH30			
$THDI_R\%<=25$	HP30 FH20	HP30 FH20		
$THDI_R\%<=18$	HP20 HP30 FH20	HP20 HP30 FH20	HP30 FH20 FH30	
$THDI_R\%<=10$	HP10 HP20 HP30 FH20		HP20 FH20	
	$N^2>196$	$100<N^2<=196$	$64<N^2<=100$	$N^2<=64$



EXAMPLE

A = 630kVA (transformer rated power)
Vcc%= 6 (short-circuit voltage %)
P = 330kW (total active power of loads)
cos φi = 0.7 (power factor of the system)

We want increase the power factor of the system to 0.95. We calculate the capacitor bank value to install is

$$Q_c = k \times P$$

where k is from the following table and in consequence we obtain the value of the capacitor bank:

Starting power factor / *Final power factor*	0.80	0.85	0.90	0.91	0.92	0.93	0.94	0.95	0.96	0.97	0.98	0.99	1
0.40	1.541	1.668	1.805	1.832	1.861	1.895	1.924	1.959	1.998	2.037	2.085	2.146	2.288
0.41	1.474	1.605	1.742	1.769	1.798	1.831	1.860	1.896	1.935	1.973	2.021	2.082	2.225
0.42	1.413	1.544	1.681	1.769	1.738	1.771	1.800	1.836	1.874	1.913	1.961	2.022	2.164
0.43	1.356	1.487	1.624	1.709	1.680	1.713	1.742	1.778	1.816	1.855	1.903	1.964	2.107
0.44	1.290	1.421	1.558	1.651	1.614	1.647	1.677	1.712	1.751	1.790	1.837	1.899	2.041
0.45	1.230	1.360	1.501	1.585	1.561	1.592	1.626	1.659	1.695	1.737	1.784	1.846	1.988
0.46	1.179	1.309	1.446	1.532	1.502	1.533	1.567	1.600	1.636	1.677	1.725	1.786	1.929
0.47	1.130	1.260	1.397	1.473	1.454	1.485	1.519	1.532	1.588	1.629	1.677	1.758	1.881
0.48	1.076	1.206	1.343	1.425	1.400	1.430	1.464	1.497	1.534	1.575	1.623	1.684	1.826
0.49	1.030	1.160	1.297	1.370	1.355	1.386	1.420	1.453	1.489	1.530	1.578	1.639	1.782
0.50	0.982	1.112	1.248	1.326	1.303	1.337	1.369	1.403	1.441	1.481	1.529	1.590	1.732
0.51	0.936	1.066	1.202	1.276	1.257	1.291	1.323	1.357	1.395	1.435	1.483	1.544	1.686
0.52	0.894	1.024	1.160	1.230	1.215	1.249	1.281	1.315	1.353	1.393	1.441	1.502	1.644
0.53	0.850	0.980	1.116	1.188	1.171	1.205	1.237	1.271	1.309	1.349	1.397	1.458	1.600
0.54	0.809	0.939	1.075	1.144	1.130	1.164	1.196	1.230	1.268	1.308	1.356	1.417	1.559
0.55	0.769	0.899	1.035	1.103	1.090	1.124	1.156	1.190	1.228	1.268	1.316	1.377	1.519
0.56	0.730	0.865	0.996	1.063	1.051	1.085	1.117	1.151	1.189	1.229	1.277	1.338	1.480
0.57	0.692	0.822	0.958	0.986	1.013	1.047	1.079	1.113	1.151	1.191	1.239	1.300	1.442
0.58	0.665	0.785	0.921	0.949	0.976	1.010	1.042	1.076	1.114	1.154	1.202	1.263	1.405
0.59	0.618	0.748	0.884	0.912	0.939	0.973	1.005	1.039	1.077	1.117	1.165	1.226	1.368
0.60	0.584	0.714	0.849	0.878	0.905	0.939	0.971	1.005	1.043	1.083	1.131	1.192	1.334
0.61	0.549	0.679	0.815	0.843	0.870	0.904	0.936	0.970	1.008	1.048	1.096	1.157	1.299
0.62	0.515	0.645	0.781	0.809	0.836	0.870	0.902	0.936	0.974	1.014	1.062	1.123	1.265
0.63	0.483	0.613	0.749	0.777	0.804	0.838	0.870	0.904	0.942	0.982	1.030	1.091	1.233
0.64	0.450	0.580	0.716	0.744	0.771	0.805	0.837	0.871	0.909	0.949	0.997	1.058	1.200
0.65	0.419	0.549	0.685	0.713	0.740	0.774	0.806	0.840	0.878	0.918	0.966	1,007	1.169
0.66	0.388	0.518	0.654	0.682	0.709	0.743	0.775	0.809	0.847	0.887	0.935	0.996	1.138
0.67	0.358	0.488	0.624	0.652	0.679	0.713	0.745	0.779	0.817	0.857	0.905	0.966	1.108
0.68	0.329	0.459	0.595	0.623	0.650	0.684	0.716	0.750	0.788	0.828	0.876	0.937	1.079
0.69	0.299	0.429	0.565	0.593	0.620	0.654	0.686	0.720	0.758	0.798	0.840	0.907	1.049
0.70	0.270	0.400	0.536	0.564	0.591	0.625	0.657	0.691	0.729	0.769	0.811	0.878	1.020
0.71	0.242	0.372	0.508	0.536	0.563	0.597	0.629	0.663	0.701	0.741	0.783	0.850	0.992
0.72	0.213	0.343	0.479	0.507	0.534	0.568	0.600	0.634	0.672	0.712	0.754	0.821	0.963
0.73	0.186	0.316	0.452	0.400	0.507	0.541	0.573	0.607	0.645	0.685	0.727	.0794	0.936
0.74	0.159	0.289	0.425	0.453	0.480	0.514	0.546	0.580	0.618	0.658	0.700	0.767	0.909
0.75	0.132	0.262	0.389	0.426	0.453	0.487	0.519	0.553	0.591	0.631	0.673	0.740	0.882
0.76	0.105	0.235	0.371	0.399	0.426	0.460	0.492	0.526	0.564	0.604	0.652	0.713	0.855
0.77	0.079	0.209	0.345	0.373	0.400	0.434	0.466	0.500	0.538	0.578	0.620	0.687	0.829
0.78	0.053	0.183	0.319	0.347	0.374	0.408	0.440	0.474	0.512	0.552	0.594	0.661	0.803
0.79	0.026	0.156	0.292	0.320	0.347	0.381	0.413	0.447	0.485	0.525	0.567	0.634	0.776
0.80	-	0.130	0.266	0.294	0.321	0.355	0.387	0.421	0.459	0.499	0.541	0.608	0.750

$$Q_c = 0.691 \times 330 = 228 \text{ kvar}$$

Now it is possible identify the type of the system estimating the parameter N^2:

$$N^2 = \frac{A_N \times 100}{V_{CC}\% \times Q} = \frac{630 \times 100}{6 \times 228} \cong 46$$

From the obtained value the system has a highest risk of capacitor overloading. The system has present 100kVA of non-linear loads (ex. Inverter, UPS etc.). Known that the total power of loads is about 470kVA, it is possible to calculate $THDI_R\%$:

$$THDI_R\% = \frac{A_C}{A_{NC}} \times 35 = \frac{100}{470} \times 35 \cong 7\%$$

Consulting the table of the product choice we find two possible choices: equipment series FH20 or FH30.

NOTES

We must consider that using power factor correction equipment (without the tuned filter reactors) we will harmonic amplification in the network with an increasing of $THDI_R\%$ and increased losses of the transformer and of the lines. We could also have other negative effects, like:

- *Motor vibration*
- *Malfunctioning of protection relays and electronic equipment.*
- *Heating of cables, motors, transformers etc.*

HP10

AUTOMATIC POWER FACTOR CORRECTION SYSTEMS WITH HIGH ENERGY DENSITY METALLIZED POLYPROPYLENE CAPACITORS

Ue	U_N	U_{MAX} [1]	Hz	THDI $_R$ %	THDI $_C$ %[2]
400V 415V	415V	455V	50	≤ 10%	≤ 50%

Generalities

- *Zink-passivated metallic enclosure painted with epossidic dust paint, colour RAL 7032.*
- *Auxiliary transformer to separate power and auxiliary circuit parts (110V).*
- *Load-break switch with door interlock.*
- *Contactors with damping resistors to limit capacitors' inrush current.*
- *N07V-K self-extinguish cable according to CEI 20/22/II standards.*
- *Microprocessor Power Factor Correction relay*
- *Single phase self-healing polypropylene capacitors.*

All components inside this products are compliant with EU Safety Regulations

MINImatic

MIDImatic

MICROmatic

MULTImatic

TECHNICAL CHARACTERISTICS	
Rated operational voltage (other on request)	Ue= 400V-415V
Rated frequency	50Hz
Max current overload In	1.3xIn
Max voltage overload Vn	3xVn
Insulating voltage	690Vac
Temperature range (cabinet)	-5÷+40°C
Temperature range (capacitors)	-25÷+55°C
Discharge Device	*on each bank*
Use	*indoor*
Service	*continous*
Capacitors connection	*delta*
Operation devices	*capacitors contactors (AC6b)*
Total Joule losses	~2W/kvar
Inner surface finish	*zinc passivation*
Applicable standards	CEI EN 60439-1/2 CEI EN 61921-1
Capacitors standards	CEI EN 60831-1/2

	CODE IP3X	*POWER* Ue=415V (kvar)	*POWER* Ue=400V (kvar)	*STEPS*	*BANKS* Ue=400V (kvar)	*L.B. SWITCH* (A)	Icc [3] (kA)	*WEIGHT* (Kg)	IP3X	IP4X [4]	IP55 [4]
MICROmatic	IC0AKF214050004	14	12.6	7	1.8-3.6-7.2	40	80[5]	15	52	/	53
	IC0AKF222050004	22	19.8	11	1.8-3.6-2x7.2	100	80[5]	16	52	/	53
	IC0AKF230050004	30	27	15	1.8-3.6-7.2-14.4	100	80[5]	17	52	/	53
	IC0AKF236050004	36	32.4	10	3.6-2x7.2-14.4	100	80[5]	18	52	/	53
	IC0AKF238050004	38	34.2	19	1.8-3.6-2x7.2-14.4	100	80[5]	22	52	/	53
	IC0AKF244050004	44	39.6	11	3.6-7.2-2x14.4	100	80[5]	23	52	/	53
	IC0AKF252050004	52	46.8	13	3.6-2x7.2-2x14.4	125	80[5]	25	52	/	53
	IC0AKF260050004	60	54	15	3.6-7.2-14.4-14.4-14.4	125	80[5]	27	52	/	53
	IC0AKF272050004	72	64.8	9	7.2-4x14.4	250	80[5]	29	52	/	53
MINImatic	IF0AKF280050005	80	75	10	7.5-15-22.5-30	250	9	41	55	/	59
	IF0AKF311250005	112	105	14	7.5-15.22.5-2x30	250	9	47	56	/	59
	IF0AKF313650005	136	125	17	7.5-15-22.5-30-52.5	400	9	51	56	/	59
	IF0AKF316050005	160	150	10	15-30-45-60	400	9	54	56	/	59
	IF0AKF319250005	192	180	12	15-30-60-75	400	9	60	57	/	60
	IF0AKF321650005	216	200	13	15-30-60-90	500	9	65	57	/	60
	IF0AKF324050005	240	225	15	15-30-60-120	500	9	69	57	/	60
MIDImatic	IL0AKF325650006	256	240	8	2x30-3x60	630	13	205	63	/	/
	IL0AKF332050006	320	300	10	2x30-2x60-120	800	26	235	63	/	/
	IL0AKF338450006	384	360	12	30-2x60-90-120	800	26	258	63	/	/
	IL0AKF344850006	448	420	14	30-60-90-2x120	1000	35	271	63	/	/
MULTImatic	IL0AKF332050018	320	300	10	30-30-4x60	800	26	300	65	70	73
	IL0AKF340050018	400	375	10	37.5-37.5-4x75	1250	50	340	66	70	73
	IL0AKF348050018	480	450	10	45-45-4x90	1250	50	360	66	70	73
	IL0AKF356050018	560	525	10	52.5-52.5-4x105	1250	50	400	67	70	73
	IL0AKF364050018	640	600	10	60-60-4x120	2x800	26	560	86	90	93
	IL0AKF372050018	720	675	10	67.5-67.5-4x135	2x800	26	640	86	90	93
	IL0AKF380050018	800	750	10	75-75-4x150	2x1250	50	660	86	90	93
	IL0AKF388050018	880	825	10	82.5-82.5-4x165	2x1250	50	700	86	90	93
	IL0AKF396050018	960	900	10	90-90-4x180	2x1250	50	720	86	90	93
	IL0AKF410450018	1040	975	10	97.5-97.5-4x195	2x1250	50	760	87	90	93
	IL0AKF411250018	1120	1050	10	105-105-4x210	2x1250	50	800	87	90	93

1 Maximum allowed value according to CEI EN 60831-1 art. 20.1
2 Attention: in this conditions of load network harmonic amplification phenomena is possible
3 Other values upon request
4 For the codes of these executions contact VMtec
5 Short-circuit current with fuses

HP20

AUTOMATIC POWER FACTOR CORRECTION SYSTEMS WITH HIGH ENERGY DENSITY METALLIZED POLYPROPYLENE CAPACITORS

Ue	U_N	U_{MAX} [1]	Hz	$THDI_R$ %	$THDI_C$ %[2]
400V 415V	460V	500V	50	≤18%	≤70%

MINImatic

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MICROmatic

MULTImatic

Generalities

- *Zink-passivated metallic enclosure painted with epossidic dust paint, colour RAL 7032.*
- *Auxiliary transformer to separate power and auxiliary circuit parts (110V).*
- *Load-break switch with door interlock.*
- *Contactors with damping resistors to limit capacitors' inrush current.*
- *N07V-K self-extinguish cable according to CEI 20/22/II standards.*
- *Microprocessor Power Factor Correction relay*
- *Single phase self-healing polypropylene capacitors.*

All components inside this products are compliant with EU Safety Regulations

	TECHNICAL CHARACTERISTICS
Rated operational voltage (other on request)	Ue= 400V-415V
Rated frequency	50Hz
Max current overload In	1.3xIn
Max voltage overload Vn	3xVn
Insulating voltage	690Vac
Temperature range (cabinet)	-5÷+40°C
Temperature range (capacitors)	-25÷+55°C
Discharge Device	*on each bank*
Use	*indoor*
Service	*continous*
Capacitors connection	*delta*
Operation devices	*capacitors contactors (AC6b)*
Total Joule losses	~2W/kvar
Inner surface finish	*zinc passivation*
Applicable standards	CEI EN 60439-1/2 CEI EN 61921-1
Capacitors standards	CEI EN 60831-1/2

	CODE IP3X	*POWER* U_N=460V (kvar)	*POWER* Ue=415V (kvar)	*POWER* Ue=400V (kvar)	*STEPS*	*BANKS* Ue=400V (kvar)	*L.B. SWITCH* (A)	Icc[3] (kA)	*WEIGHT* (Kg)	IP3X	IP4X [4]	IP55 [4]
MICROmatic	IC0JLF214050004	14	11	10.5	7	1.5-3-6	40	80[5]	15	52	/	53
	IC0JLF222050004	22	18	16.5	11	1.5-3-6-6	40	80[5]	16	52	/	53
	IC0JLF230050004	30	24	22.5	15	1.5-3-6-12	100	80[5]	17	52	/	53
	IC0JLF236050004	36	29	27	10	3-6-6-12	100	80[5]	18	52	/	53
	IC0JLF238050004	38	31	28.5	19	1.5-3-6-6-12	100	80[5]	22	52	/	53
	IC0JLF244050004	44	36	33	11	3-6-12-12	100	80[5]	23	52	/	53
	IC0JLF252050004	52	42	39	13	3-6-6-12-12	100	80[5]	25	52	/	53
	IC0JLF260050004	60	49	45	15	3-6-12-12-12	100	80[5]	27	52	/	53
	IC0JLF272050004	72	58	54	9	6-12-12-12-12	125	80[5]	29	52	/	53
MINImatic	IF0JLF280050005	80	65	60	10	6-12-18-24	250	9	41	55	/	59
	IF0JLF311250005	112	91	84	14	6-12.18-24-24	250	9	47	56	/	59
	IF0JLF313650005	136	110	102	17	6-12-18-24-42	400	9	51	56	/	59
	IF0JLF316050005	160	130	120	10	12-24-36-48	400	9	54	56	/	59
	IF0JLF319250005	192	207	144	12	12-24-48-60	400	9	60	57	/	60
	IF0JLF321650005	216	168	156	13	12-24-48-72	400	9	65	57	/	60
	IF0JLF324050005	240	194	180	15	12-24-42-96	400	9	69	57	/	60
	IF0JLF327250005	272	220	204	8	24-48-48-84	500	9	74	58	/	61
MIDI matic	IL0ULF332050006	320	259	240	10	24-24-48-48-96	630	13	235	63	/	/
	IL0ULF338450006	384	311	288	12	24-48-48-72-96	800	26	258	63	/	/
	IL0ULF344850006	448	363	336	14	24-48-72-96-96	800	26	271	63	/	/
	IL0ULF351250006	512	415	384	16	24-48-96-96-120	1000	35	287	63	/	/
MULTImatic	IL0NLF332050018	320	259	240	10	24-24-4x48	630	13	252	65	70	73
	IL0NLF340050018	400	324	300	10	30-30-4x60	800	26	274	66	70	73
	IL0NLF348050018	480	389	360	10	36-36-4x72	800	26	300	66	70	73
	IL0NLF356050018	560	454	420	10	42-42-4x84	1250	50	320	67	70	73
	IL0NLF364050018	640	518	480	10	48-48-4x96	1250	50	340	67	70	73
	IL0NLF372050018	720	583	540	10	54-54-4x108	1250	50	526	68	70	73
	IL0NLF380050018	800	648	600	10	60-60-4x120	2x800	26	552	86	90	93
	IL0NLF388050018	880	713	660	10	66-66-4x132	2x800	26	574	86	90	93
	IL0NLF396050018	960	778	720	10	72-72-4x144	2x800	26	600	86	90	93
	IL0NLF410450018	1040	842	780	10	78-78-4x156	2x1250	50	620	87	90	93
	IL0NLF411250018	1120	907	840	10	84-84-4x168	2x1250	50	640	87	90	93
	IL0NLF412050018	1200	972	900	10	90-90-4x180	2x1250	50	660	87	90	93
	IL0NLF412850018	1280	1037	960	10	96-96-4x192	2x1250	50	680	87	90	93
	IL0NLF413650018	1360	1102	1020	10	102-102-4x204	2x1250	50	700	88	90	93
	IL0NLF414450018	1440	1166	1080	10	108-108-4x216	2x1250	50	720	88	90	93

1 Maximum allowed value according to CEI EN 60831-1 art. 20.1
2 Attention: in this conditions of load network harmonic amplification phenomena is possible
3 Other values upon request
4 For the codes of these executions contact VMtec
5 Short-circuit current with fuses

HP30

AUTOMATIC POWER FACTOR CORRECTION SYSTEMS WITH HIGH ENERGY DENSITY METALLIZED POLYPROPYLENE CAPACITORS

Ue	U_N	U_{MAX} [1]	Hz	THDI $_R$ %	THDI $_C$ %[2]
400V 415V	550V	600V	50	≤ 25%	≤ 85%

MINImatic

MIDImatic

MICROmatic

MULTImatic

Generalities

- *Zink-passivated metallic enclosure painted with epossidic dust paint, colour RAL 7032.*
- *Auxiliary transformer to separate power and auxiliary circuit parts (110V).*
- *Load-break switch with door interlock.*
- *Contactors with damping resistors to limit capacitors' inrush current.*
- *N07V-K self-extinguish cable according to CEI 20/22/II standards.*
- *Microprocessor Power Factor Correction relay*
- *Single phase self-healing polypropylene capacitors.*

All components inside this products are compliant with EU Safety Regulations

	TECHNICAL CHARACTERISTICS
Rated operational voltage (other on request)	Ue= 400V-415V
Rated frequency	50Hz
Max current overload In	1.3xIn
Max voltage overload Vn	3xVn
Insulating voltage	690Vac
Temperature range (cabinet)	-5÷+40°C
Temperature range (capacitors)	-25÷+55°C
Discharge Device	*on each bank*
Use	*indoor*
Service	*continous*
Capacitors connection	*delta*
Operation devices	*capacitors contactors (AC6b)*
Total Joule losses	~2W/kvar
Inner surface finish	*zinc passivation*
Applicable standards	CEI EN 60439-1/2 CEI EN 61921-1
Capacitors standards	CEI EN 60831-1/2

	CODE IP3X	POWER U_N=550V (kvar)	POWER Ue=415V (kvar)	POWER Ue=400V (kvar)	STEPS	BANKS Ue=400V (kvar)	L.B. SWITCH (A)	Icc [3] (kA)	WEIGHT (Kg)	IP3X	IP4X [4]	IP55 [4]
MICROmatic	IC0TRF214050004	14	8	7	7	1-2-4	40	80 [5]	15	52	/	53
	IC0TRF222050004	22	12	11	11	1-2-4-4	40	80 [5]	16	52	/	53
	IC0TRF230050004	30	16	15	15	1-2-4-8	40	80 [5]	17	52	/	53
	IC0TRF236050004	36	19	18	10	2-4-4-8	40	80 [5]	18	52	/	53
	IC0TRF238050004	38	21	19	19	1-2-4-4-8	40	80 [5]	22	52	/	53
	IC0TRF244050004	44	24	22	11	2-4-8-8	100	80 [5]	23	52	/	53
	IC0TRF252050004	52	28	26	13	2-4-4-8-8	100	80 [5]	25	52	/	53
	IC0TRF260050004	60	32	30	15	2-4-8-8-8	100	80 [5]	27	52	/	53
	IC0TRF272050004	72	39	36	9	4-8-8-8-8	100	80 [5]	29	52	/	53
MINImatic	IF0TRF280050005	80	49	45	10	4.5-9-13.5-18	125	9	41	55	/	59
	IF0TRF311250005	112	68	63	14	4.5-9.13.5-18-18	125	9	47	56	/	59
	IF0TRF313650005	136	82	76	17	4.5-9-13.5-18-31.5	250	9	51	56	/	59
	IF0TRF316050005	160	97	90	10	9-18-27-36	250	9	54	56	/	59
	IF0TRF319250005	192	117	108	12	9-18-36-45	250	9	60	57	/	60
	IF0TRF321650005	216	126	117	13	9-18-36-54	400	9	65	57	/	60
	IF0TRF324050005	240	146	135	15	9-18-36-72	400	9	69	57	/	60
	IF0TRF327250005	272	165	153	8	18-36-36-63	400	9	78	58	/	61
	IF0TRF332050005	320	194	180	10	18-36-54-72	400	9	88	58	/	61
MIDImatic	IL1DRF338450006	384	233	216	12	18-36-36-54-72	630	13	258	63	/	/
	IL1DRF344850006	448	272	252	14	18-36-54-72-72	630	13	271	63	/	/
	IL1DRF351250006	512	311	288	16	18-36-72-72-90	630	13	287	63	/	/
MULTImatic	IL2DRF332050018	320	194	180	10	18-18-4x36	400	13	252	65	70	73
	IL2DRF340050018	400	243	225	10	22.5-22.5-4x45	630	13	274	66	70	73
	IL2DRF348050018	480	292	270	10	27-27-4x54	630	13	300	66	70	73
	IL2DRF356050018	560	340	315	10	31.5-31.5-4x63	800	26	320	67	70	73
	IL2DRF364050018	640	389	360	10	36-36-4x72	800	26	340	67	70	73
	IL2DRF372050018	720	437	405	10	40.5-40.5-4x81	1250	50	526	68	70	73
	IL2DRF380050018	800	486	450	10	45-45-4x90	1250	50	552	68	70	73
	IL2DRF388050018	880	535	495	10	49.5-49.5-4x99	1250	50	574	69	71	78
	IL2DRF396050018	960	583	540	10	54-54-4x108	1250	50	600	69	71	78
	IL2DRF410450018	1040	632	585	10	58.5-58.5-4x117	2x800	26	620	87	90	93
	IL2DRF411250018	1120	680	630	10	63-63-4x126	2x800	26	640	87	90	93
	IL2DRF412050018	1200	729	675	10	67.5-67.5-4x135	2x800	26	660	87	90	93
	IL2DRF412850018	1280	778	720	10	72-72-4x144	2x800	26	680	87	90	93
	IL2DRF413650018	1360	826	765	10	76.5-76.5-4x153	2x1250	50	705	88	90	93
	IL2DRF414450018	1440	875	810	10	81-81-4x162	2x1250	50	730	88	90	93
	IL2DRF415250018	1520	923	855	10	85.5-85.5-4x171	2x1250	50	755	88	90	93
	IL2DRF416050018	1600	972	900	10	90-90-4x180	2x1250	50	780	88	90	93
	IL2DRF416850018	1680	1021	945	10	94.5-94.5-4x189	2x1250	50	805	89	91	98
	IL2DRF417650018	1760	1069	990	10	99-99-4x198	2x1250	50	830	89	91	98
	IL2DRF418450018	1840	1118	1035	10	103.5-103.5-4x207	2x1250	50	855	89	91	98
	IL2DRF419250018	1920	1166	1080	10	108-108-4x216	2x1250	50	880	89	91	98

1 Maximum allowed value according to CEI EN 60831-1 art. 20.1
2 Attention: in this conditions of load network harmonic amplification phenomena is possible
3 Other values upon request
4 For the codes of these executions contact VMtec
5 Short-circuit current with fuses

FH 20

AUTOMATIC POWER FACTOR CORRECTION SYSTEMS WITH HIGH ENERGY DENSITY METALLIZED POLYPROPYLENE CAPACITORS AND DETUNING CHOKE

Ue	Hz	THDI $_R$ %
400V-415V	50	≤ 60%

DETUNING CHOKES (180Hz – N =3.6)

100% NON LINEAR LOAD IN NETWORK

Generalities

- *Zink-passivated metallic enclosure painted with epossidic dust paint, colour RAL 7032.*
- *Auxiliary transformer to separate power and auxiliary circuit parts (110V).*
- *Load-break switch with door interlock.*
- *Contactors.*
- *N07V-K self-extinguish cable according to CEI 20/22/II standards.*
- *Microprocessor Power Factor Correction relay*
- *Single phase self-healing polypropylene capacitors with 550V rated voltage.*
- *Three phase detuning choke with tuning frequency 180Hz.*

All components inside this products are compliant with EU Safety Regulations.

MULTImatic Filter

MINImatic Filter

TECHNICAL CHARACTERISTICS	
Rated operational voltage (other on request)	Ue= 400V-415V
Rated frequency	50Hz
Max current overload In	1.3xIn
Max voltage overload Vn	3xVn
Insulating voltage	690Vac
Temperature range (cabinet)	-5÷+40°C
Temperature range (capacitors)	-25÷+55°C
Discharge Device	*on each bank*
Use	*indoor*
Service	*continous*
Capacitors connection	*delta*
Operation devices	*contactors*
Total Joule losses	~6W/kvar
Inner surface finish	*zinc passivation*
Applicable standards	CEI EN 60439-1/2 CEI EN 61921-1
Capacitors standards	CEI EN 60831-1/2

	CODE IP3X	*POWER* Ue=415V (kvar)	*POWER* Ue=400V (kvar)	*STEPS*	*BANKS* Ue=400V (kvar)	*L.B. SWITCH* (A)	Icc [1] (kA)	*WEIGHT* (Kg)	IP3X	IP4X [2]	IP55 [2]
MINImatic FILTER	IF7AFF210050013	11	10	4	2x2.5-5	125	7	41	56	/	59
	IF7AFF220050015	21	20	8	2x2.5-5-10	125	7	47	56	/	59
	IF7AFF230050015	31	30	12	2x2.5-1x5-2x10	125	7	57	57	/	60
	IF7AFF240050015	42	40	8	2x5-10-20	125	7	74	57	/	60
	IF7AFF250050015	52	50	10	2x5-2x10-20	250	9	78	57	/	60
	IF7AFF260050015	62	60	6	2x10-2x20	250	9	100	57	/	61
	IF7AFF270050015	73	70	7	10-3x20	250	9	112	58	/	61
	IF7AFF280050015	83	80	8	2x10-3x20	250	9	126	58	/	61
MULTImatic FILTER	IL7AFF310050028	107	100	5	20-2x40	250	13	220	65	70	73
	IL7AFF314050028	150	140	7	20-40-80	400	13	260	65	70	73
	IL7AFF322050028	235	220	11	20-40-2x80	630	13	325	66	70	73
	IL7AFF326050028	278	260	13	20-2x40-2x80	630	13	365	67	70	73
	IL7AFF330050028	321	300	15	20-40-3x80	800	26	385	67	70	76
	IL7AFF338050028	407	380	19	20-40-4x80	1250	50	445	68	70	76
	IL7AFF346050028	492	460	23	20-40-5x80	1250	50	505	69	71	77
	IL7AFF356050028	600	560	7	80-3x160	2x800	26	800	87	90	96
	IL7AFF364050028	685	640	8	2x80-3x160	2x800	26	860	87	90	96
	IL7AFF372050028	770	720	9	80-4x160	2x1250	50	920	88	90	96
	IL7AFF380050028	856	800	10	2x80-4x160	2x1250	50	980	88	90	96
	IL7AFF388050028	942	880	11	80-5x160	2x1250	50	1040	89	91	95
	IL7AFF396050028	1027	960	6	6x160	2x1250	50	1100	89	91	95

1 Other values upon request
2 For the codes of these executions contact VMtec

FH30

AUTOMATIC POWER FACTOR CORRECTION SYSTEMS WITH HIGH ENERGY DENSITY METALLIZED POLYPROPYLENE CAPACITORS AND DETUNING CHOKE

Ue	Hz	THDI $_R$%
400V-415V	50	> 60%

DETUNING CHOKES (135Hz – N =2.7)

100% NON LINEAR LOAD IN NETWORK

Generalities

- *Zink-passivated metallic enclosure painted with epossidic dust paint, colour RAL 7032.*
- *Auxiliary transformer to separate power and auxiliary circuit parts (110V).*
- *Load-break switch with door interlock.*
- *Contactors.*
- *N07V-K self-extinguish cable according to CEI 20/22/II standards.*
- *Microprocessor Power Factor Correction relay*
- *Single phase self-healing polypropylene capacitors with 550V rated voltage.*
- *Three phase detuning choke with tuning frequency 135Hz.*

All components inside this products are compliant with EU Safety Regulations.

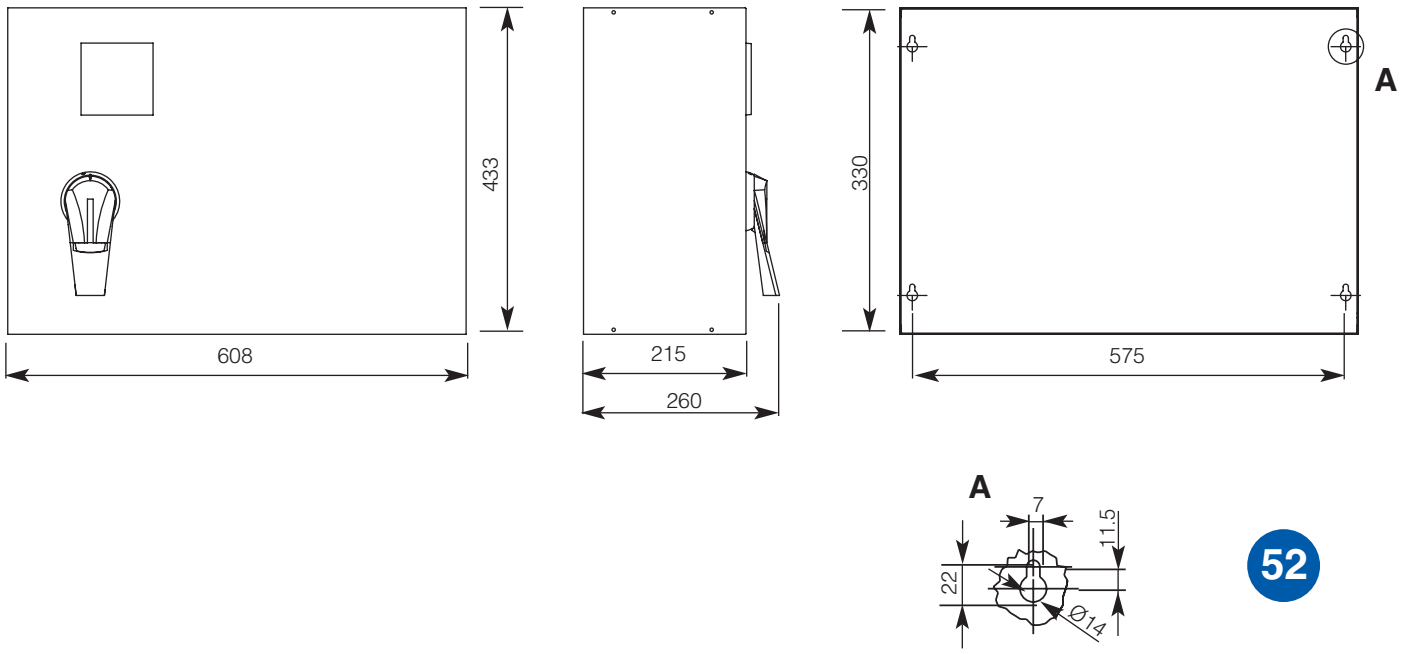
MULTImatic Filter

MINImatic Filter

TECHNICAL CHARACTERISTICS	
Rated operational voltage (other on request)	Ue= 400V-415V
Rated frequency	50Hz
Max current overload In	1.3xIn
Max voltage overload Vn	3xVn
Insulating voltage	690Vac
Temperature range (cabinet)	-5÷+40°C
Temperature range (capacitors)	-25÷+55°C
Discharge Device	*on each bank*
Use	*indoor*
Service	*continous*
Capacitors connection	*delta*
Operation devices	*contactors*
Total Joule losses	~6W/kvar
Inner surface finish	*zinc passivation*
Applicable standards	CEI EN 60439-1/2 CEI EN 61921-1
Capacitors standards	CEI EN 60831-1/2

	CODE IP3X	*POWER* Ue=415V (kvar)	*POWER* Ue=400V (kvar)	*STEPS*	*BANKS* Ue=400V (kvar)	*L.B. SWITCH* (A)	Icc [1] (kA)	*WEIGHT* (Kg)	IP3X	IP4X [2]	IP55 [2]
MINImatic FILTER	IF7JFF210050012	11	10	4	2x2.5-5	125	7	41	56	/	59
	IF7JFF220050014	21	20	8	2x2.5-5-10	125	7	47	56	/	59
	IF7JFF230050014	31	30	12	2x2.5-1x5-2x10	125	7	57	57	/	60
	IF7JFF240050014	42	40	8	2x5-10-20	125	7	74	57	/	60
	IF7JFF250050014	52	50	10	2x5-2x10-20	250	9	78	57	/	60
	IF7JFF260050014	62	60	6	2x10-2x20	250	9	100	57	/	61
	IF7JFF270050014	73	70	7	10-3x20	250	9	112	58	/	61
	IF7JFF280050014	83	80	8	2x10-3x20	250	9	126	58	/	61
MULTImatic FILTER	IL7JFF310050019	107	100	5	20-2x40	250	13	220	65	70	73
	IL7JFF314050019	150	140	7	20-40-80	400	13	260	65	70	73
	IL7JFF322050019	235	220	11	20-40-2x80	630	13	325	66	70	73
	IL7JFF326050019	278	260	13	20-2x40-2x80	630	13	365	67	70	73
	IL7JFF330050019	321	300	15	20-40-3x80	800	26	385	67	70	76
	IL7JFF338050019	407	380	19	20-40-4x80	1250	50	445	68	70	76
	IL7JFF346050019	492	460	23	20-40-5x80	1250	50	505	69	71	77
	IL7JFF356050019	600	560	7	80-3x160	2x800	26	800	87	90	96
	IL7JFF364050019	685	640	8	2x80-3x160	2x800	26	860	87	90	96
	IL7JFF372050019	770	720	9	80-4x160	2x1250	50	920	88	90	96
	IL7JFF380050019	856	800	10	2x80-4x160	2x1250	50	980	88	90	96
	IL7JFF388050019	942	880	11	80-5x160	2x1250	50	1040	89	91	95
	IL7JFF396050019	1027	960	6	6x160	2x1250	50	1100	89	91	95

1 Other values upon request
2 For the codes of these executions contact VMtec



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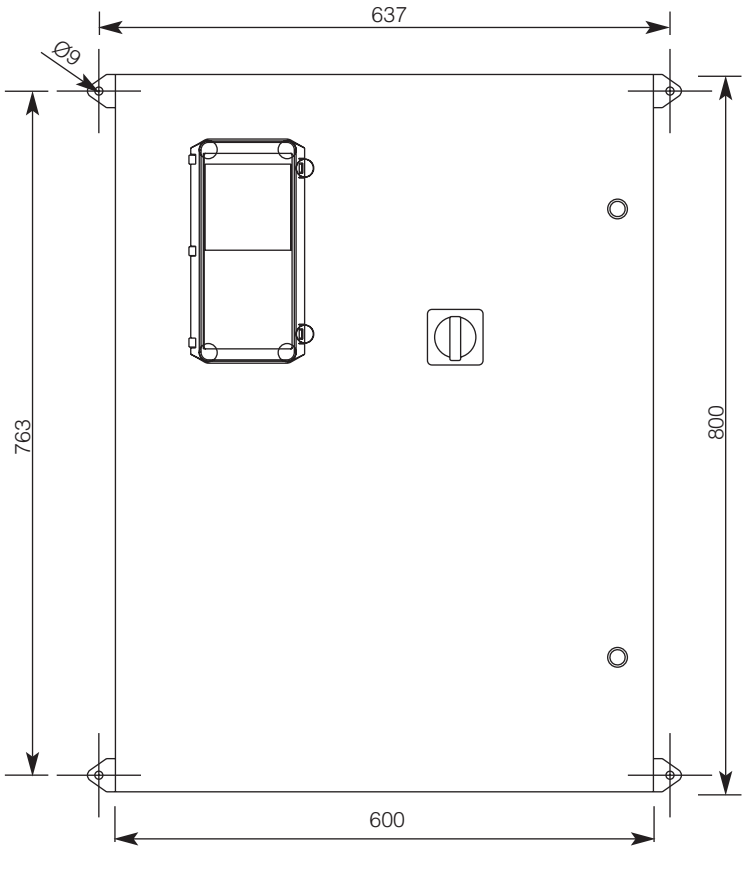

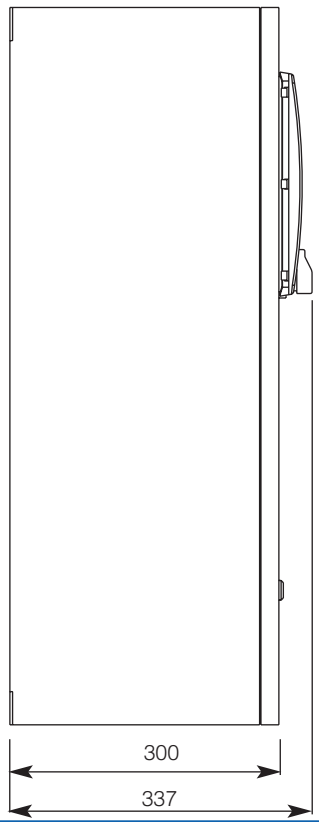

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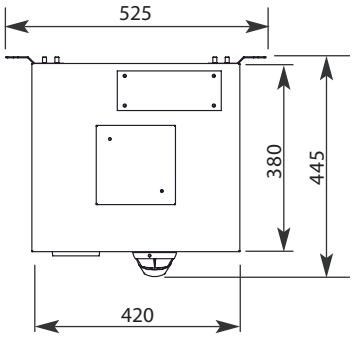
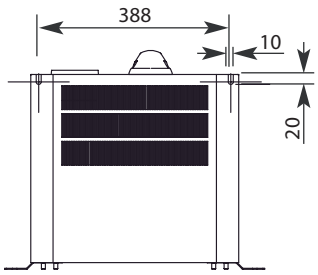
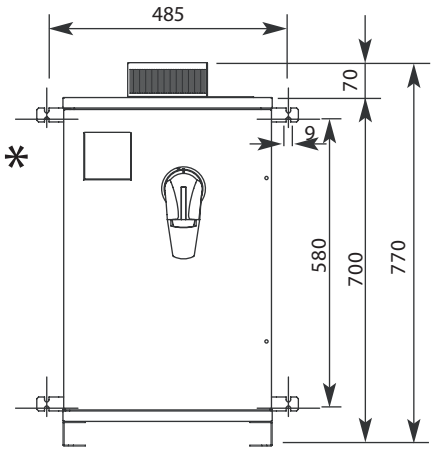


* *THE FIXING DEVICES ARE REMOVABLES*





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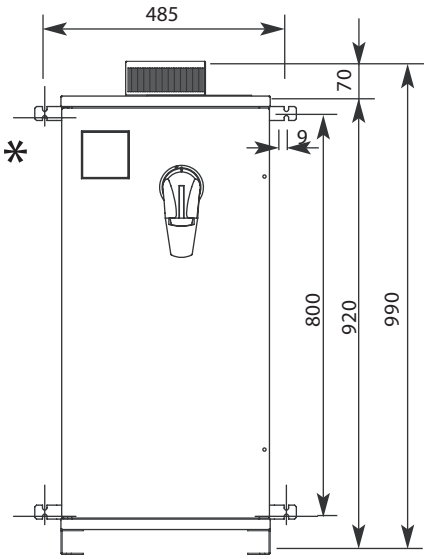

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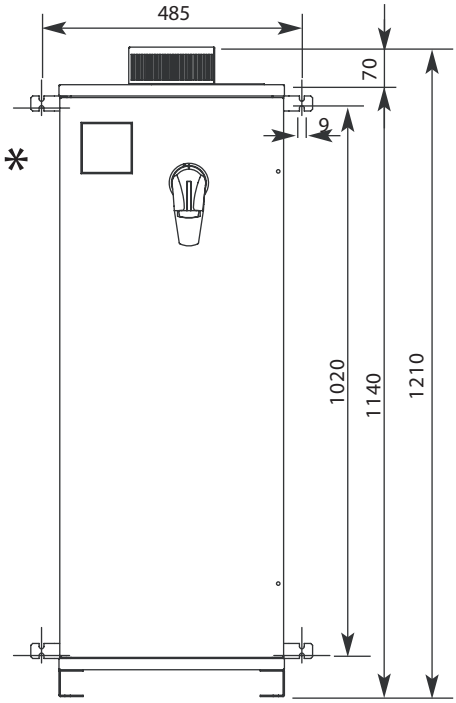

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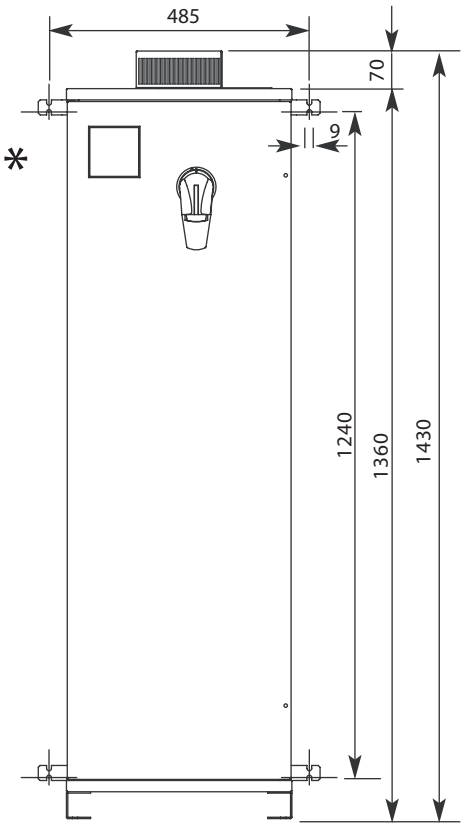

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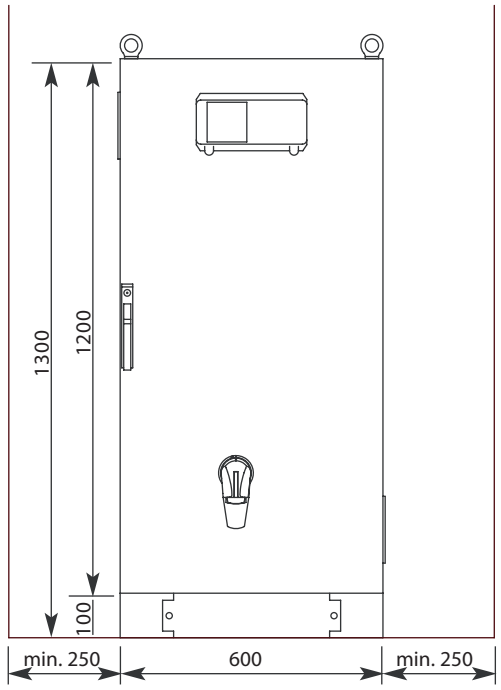
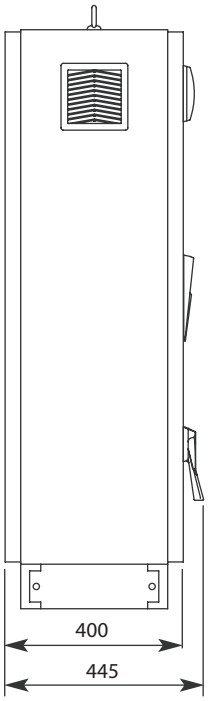
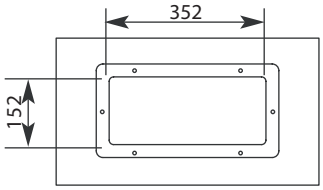
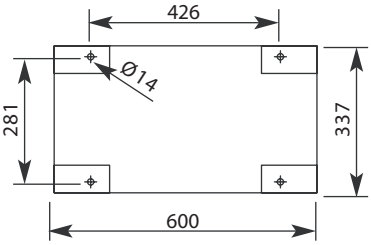




CABLES ENTRY FROM THE BOTTOM



CABINET FIXING



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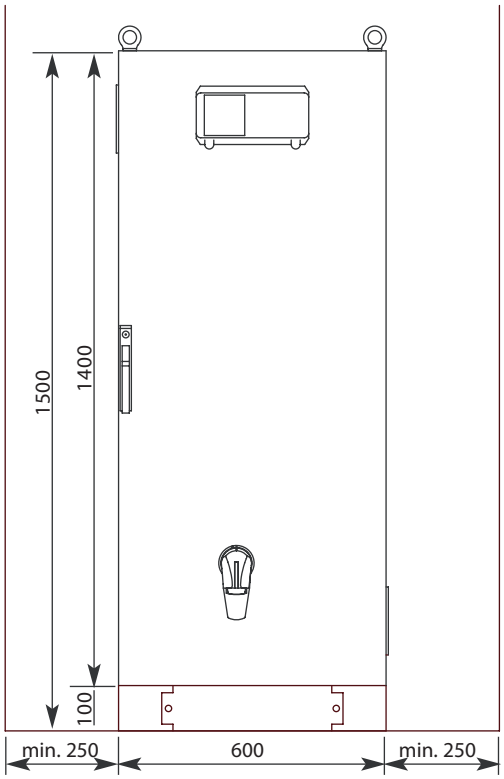

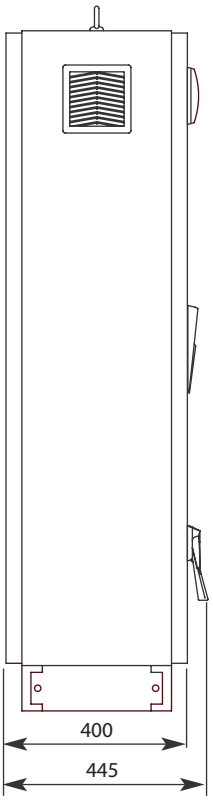

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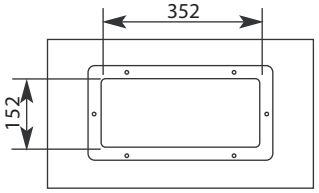
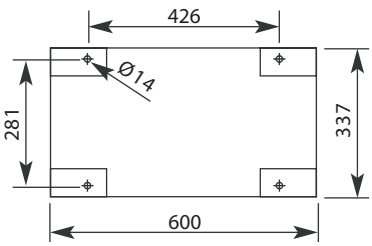


CABINET FIXING



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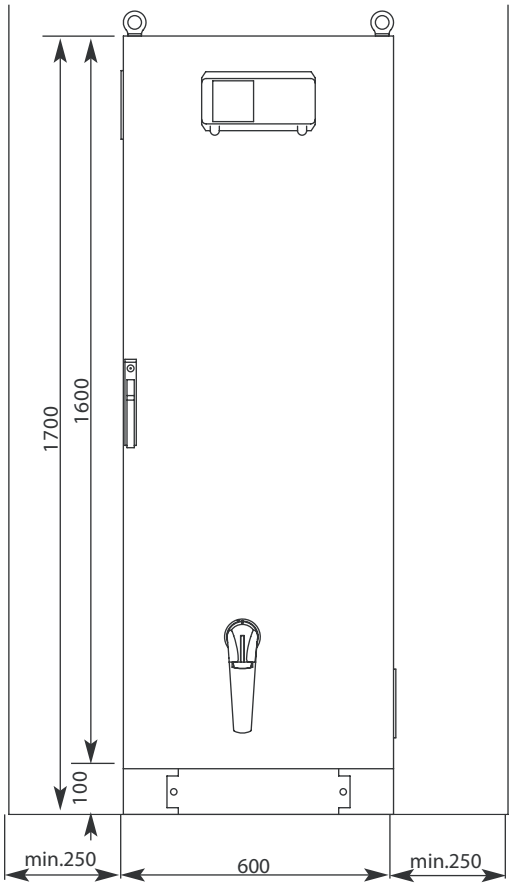
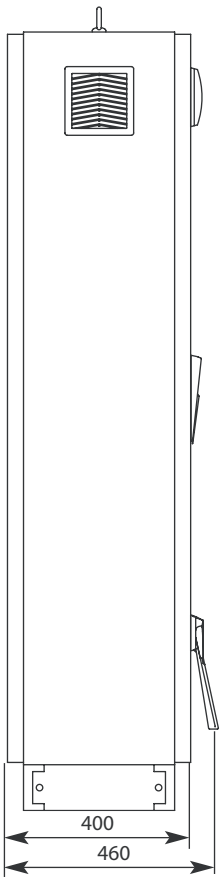
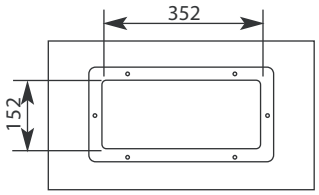
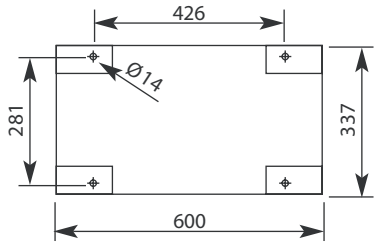




CABLES ENTRY FROM THE BOTTOM



CABINET FIXING



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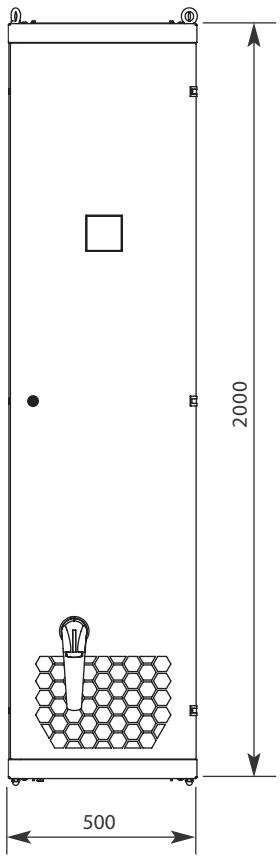
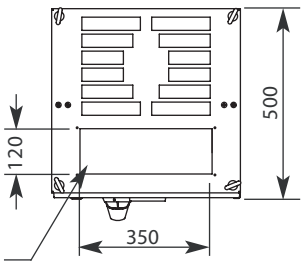
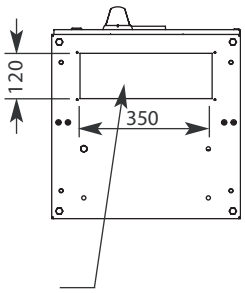


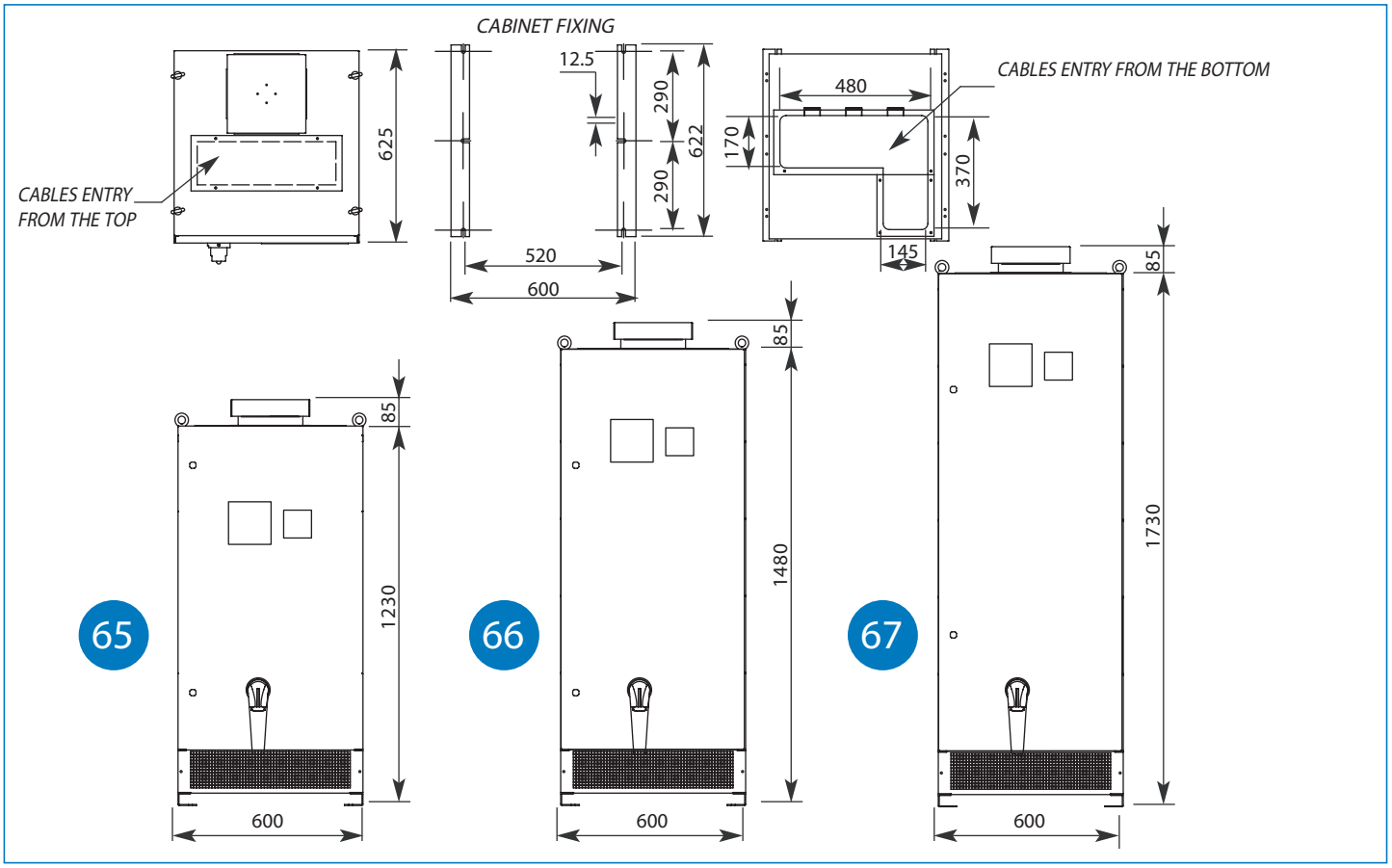


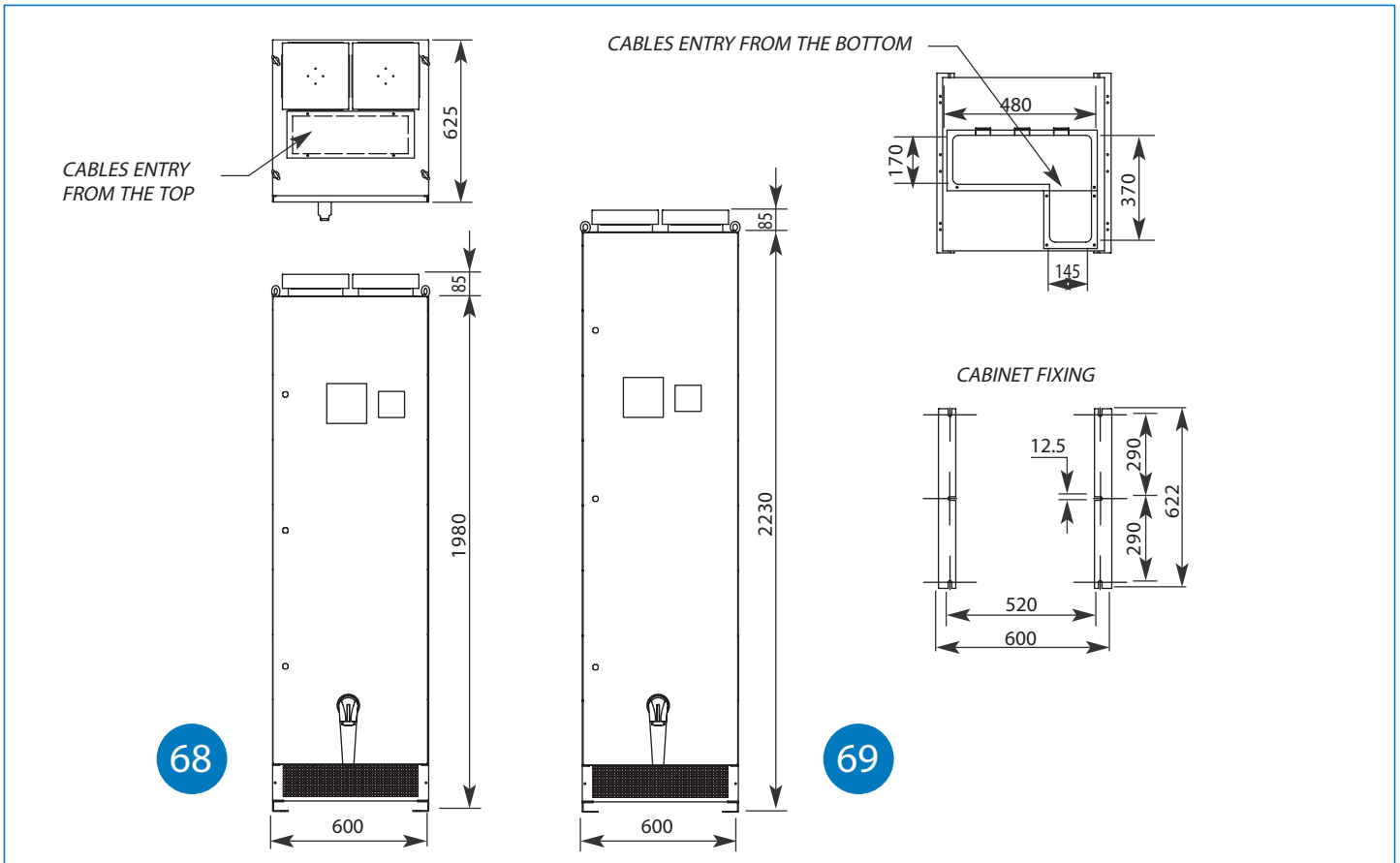
CABLES ENTRY FROM THE TOP



CABLES ENTRY FROM THE BOTTOM

63


CABINET FIXING
CABLES ENTRY FROM THE BOTTOM
CABLES ENTRY FROM THE TOP
625
12.5
290
622
290
520
600
480
170
370
145
85
1230
1480
1730
600
65
66
67


CABLES ENTRY FROM THE BOTTOM
CABLES ENTRY FROM THE TOP
625
480
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85
1980
2230
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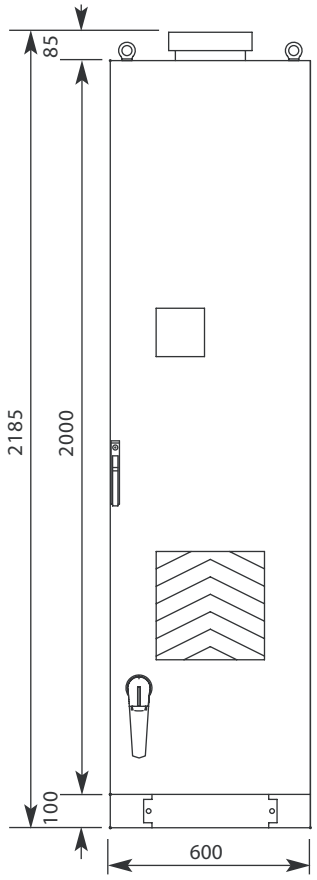
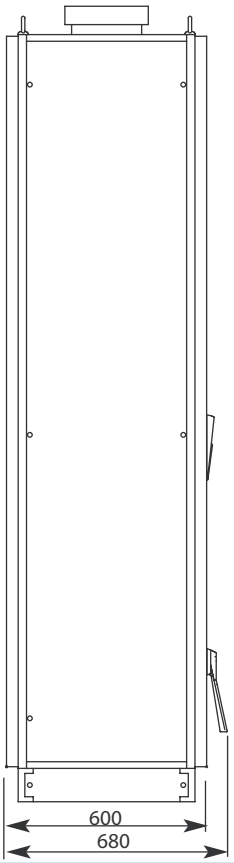
CABINET FIXING
12.5
290
622
290
520
600
68
69





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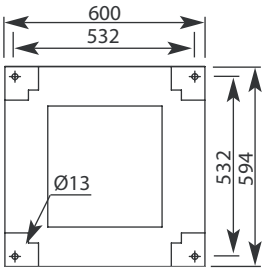

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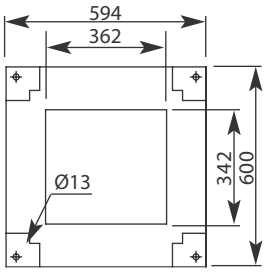

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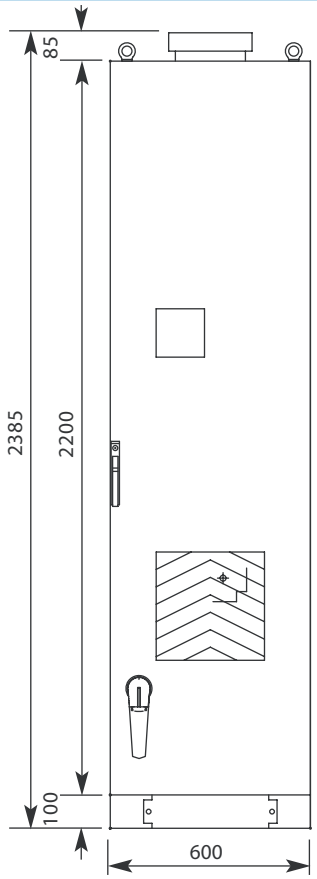

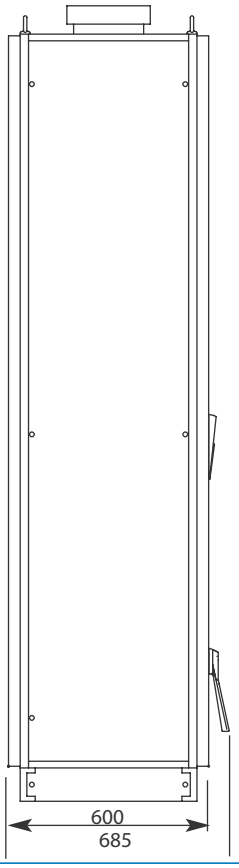

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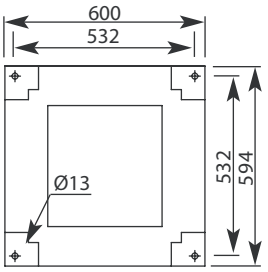

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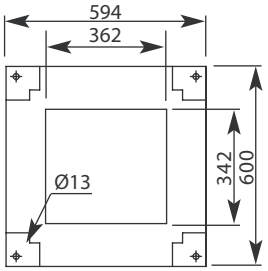

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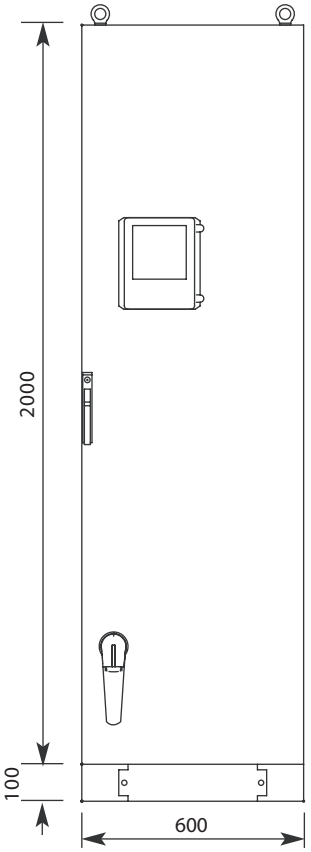

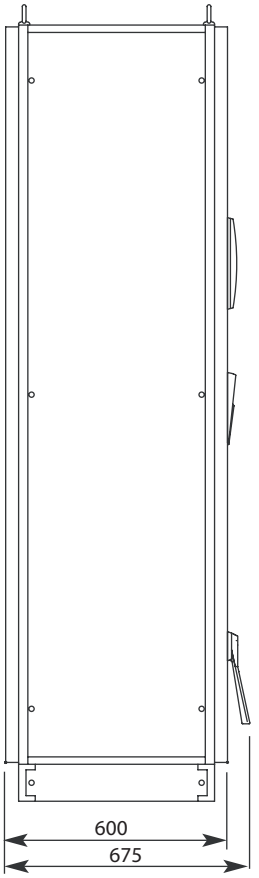

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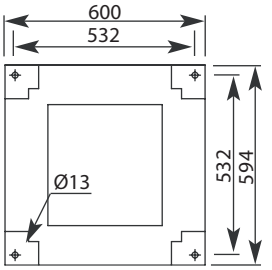

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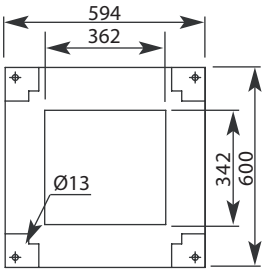

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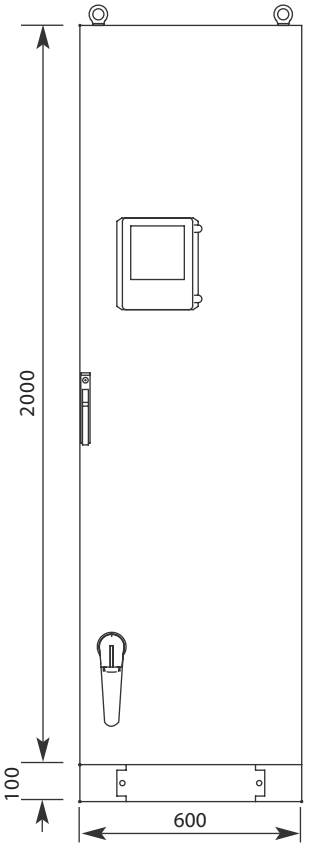

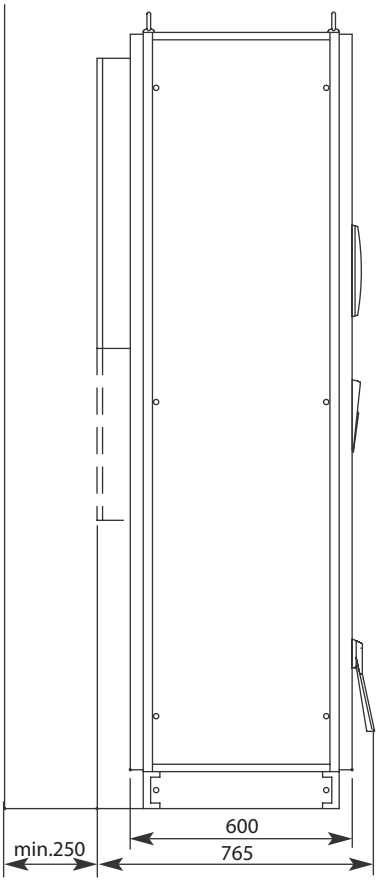

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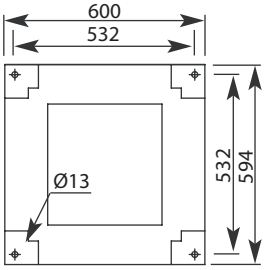

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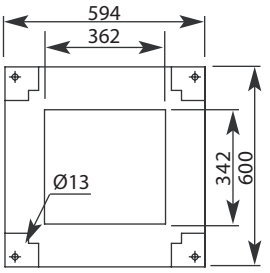

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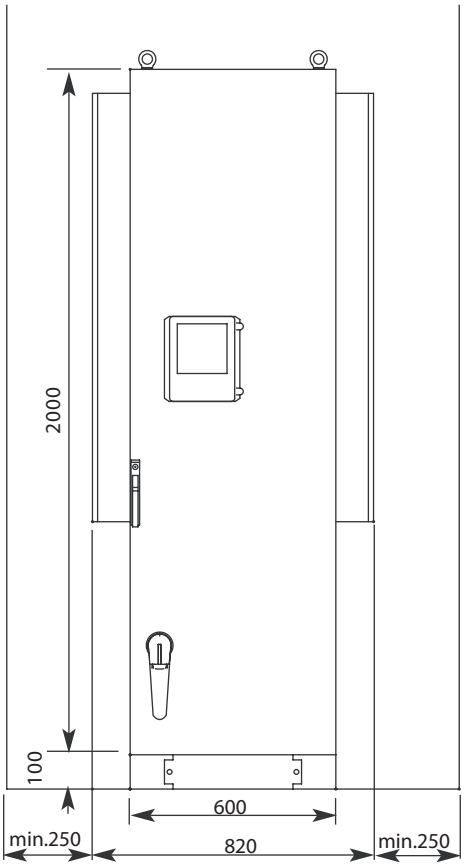

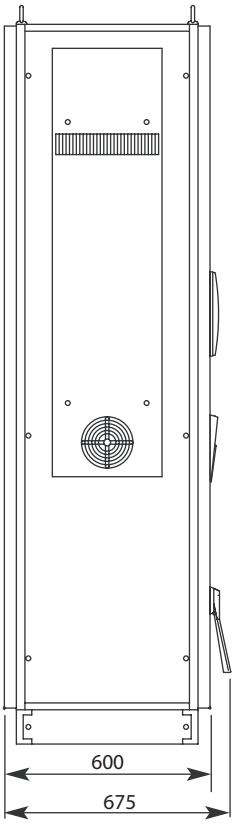

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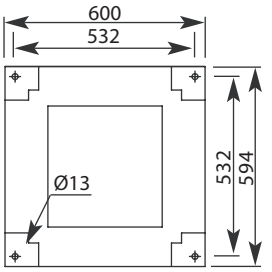

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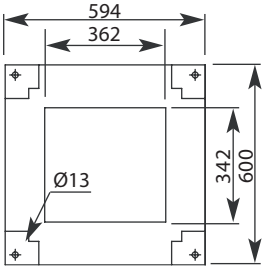

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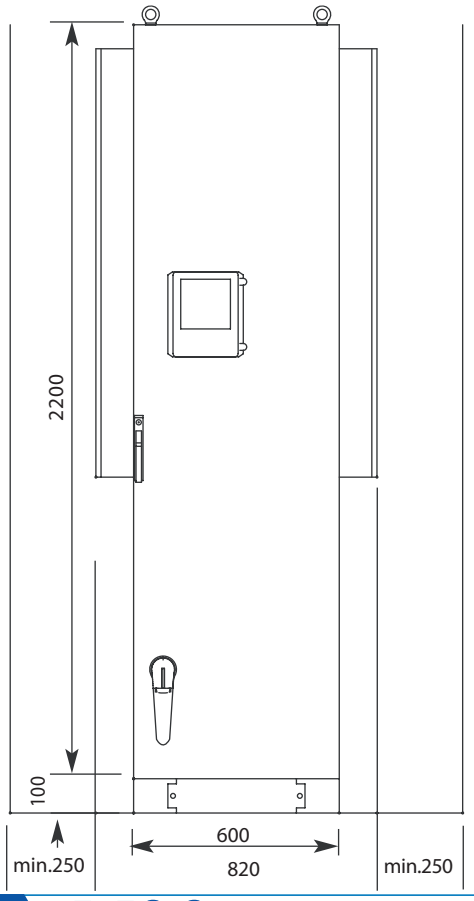

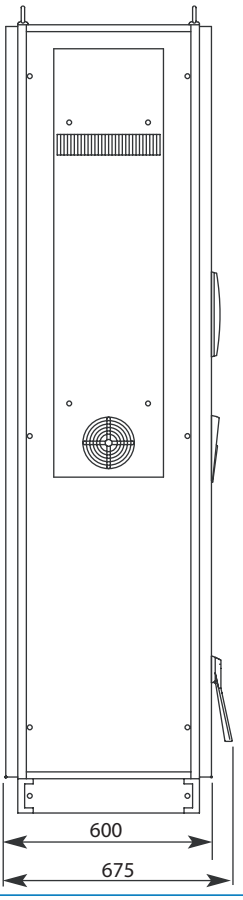

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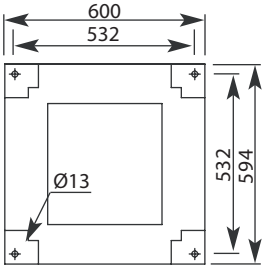

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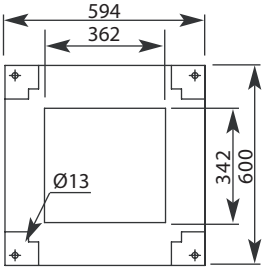

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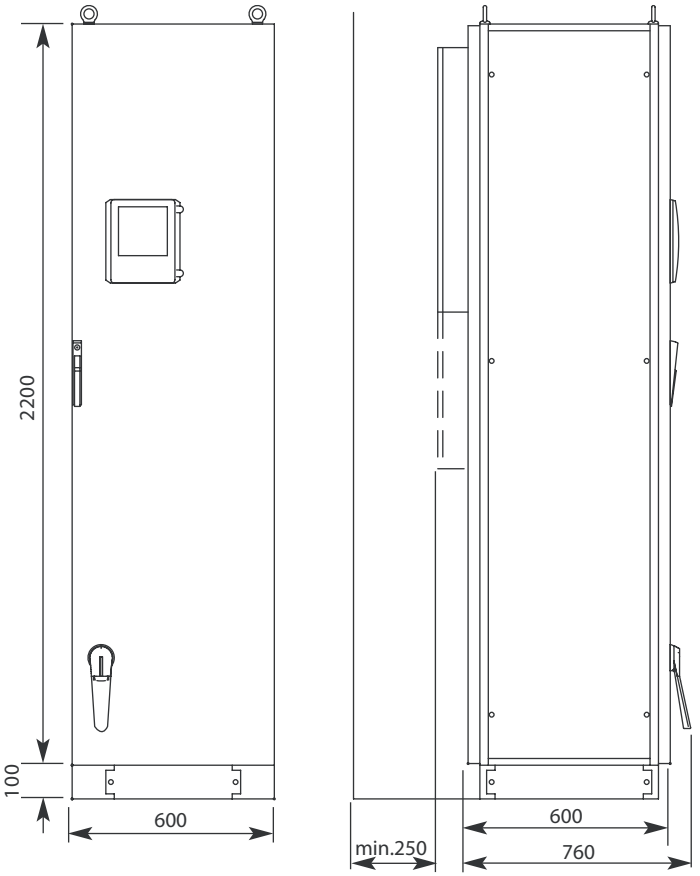

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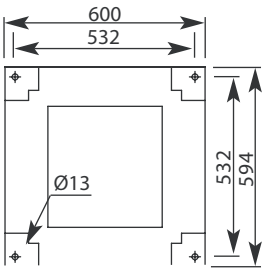

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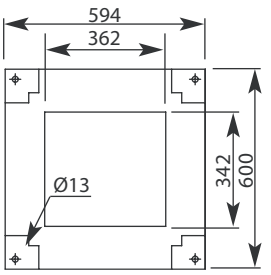

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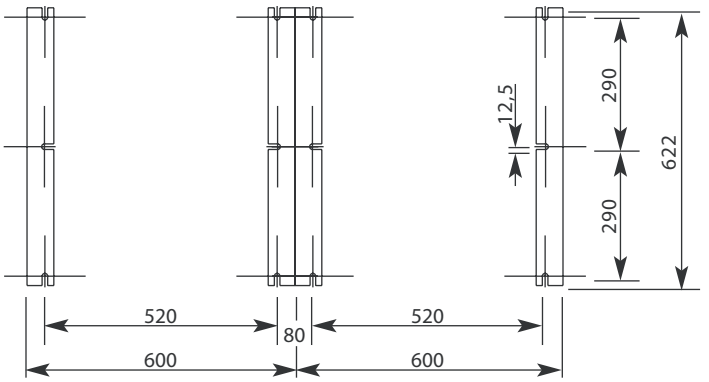
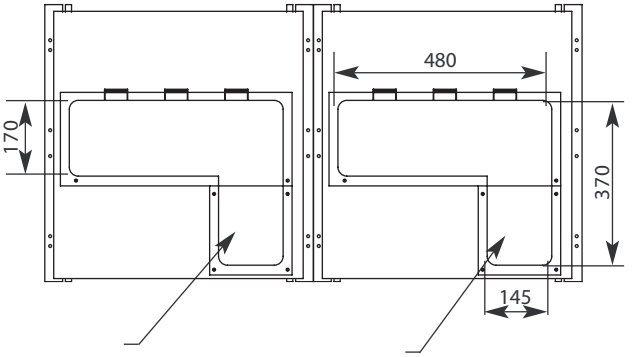
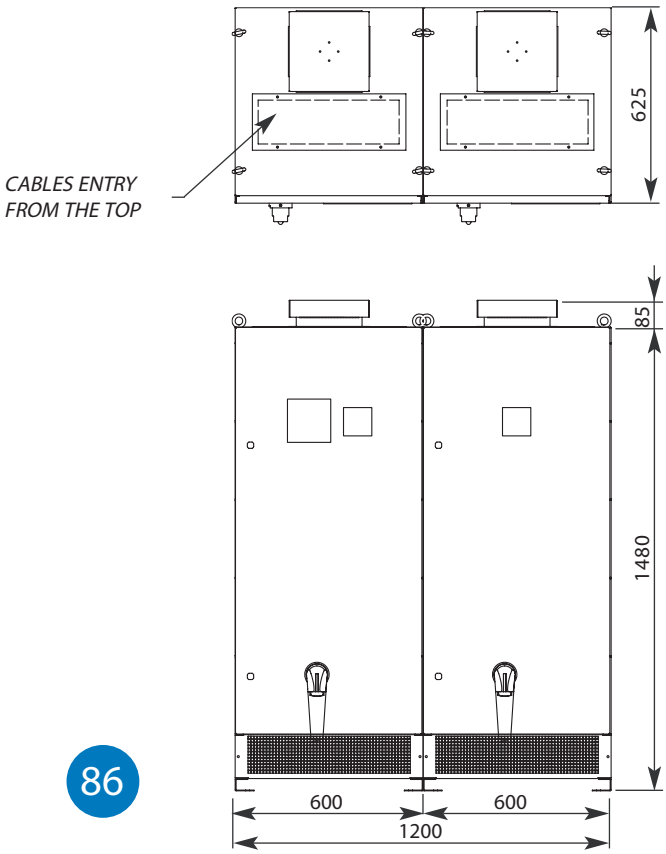




CABLES ENTRY FROM THE BOTTOM

CABLES ENTRY FROM THE BOTTOM



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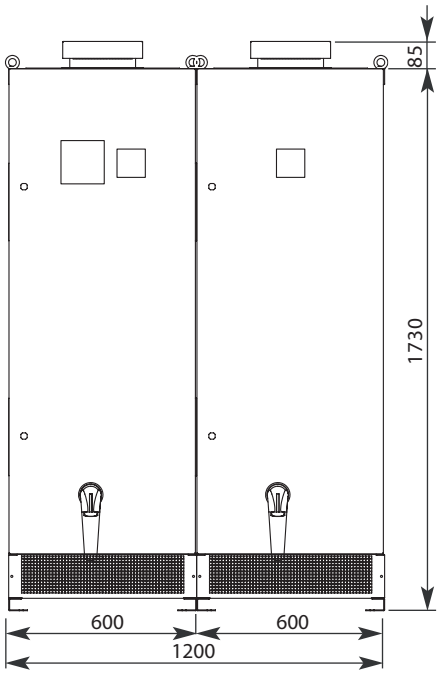

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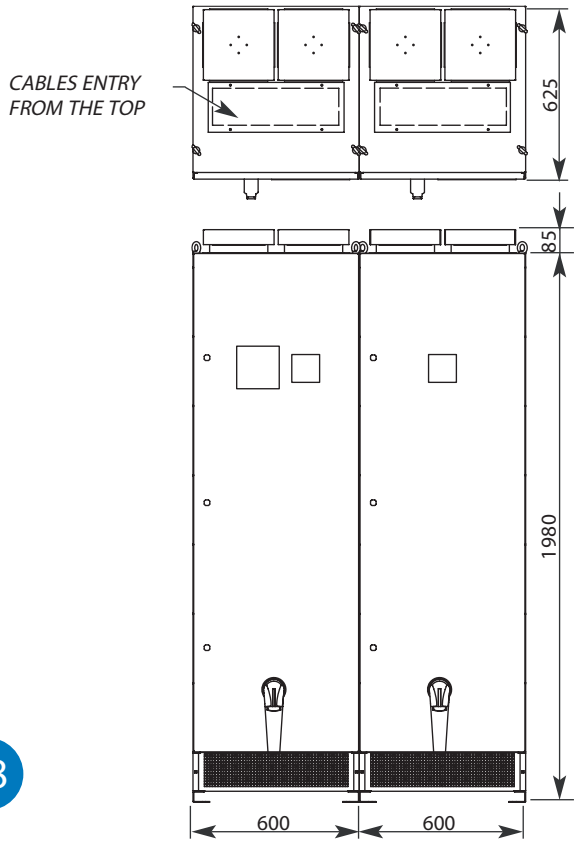

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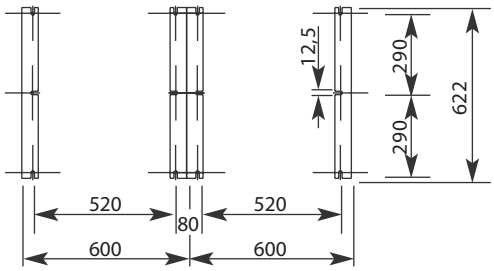

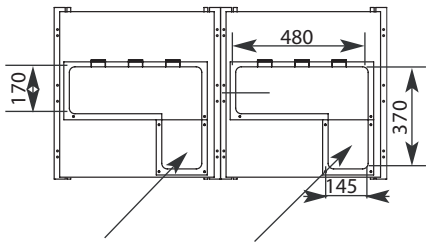

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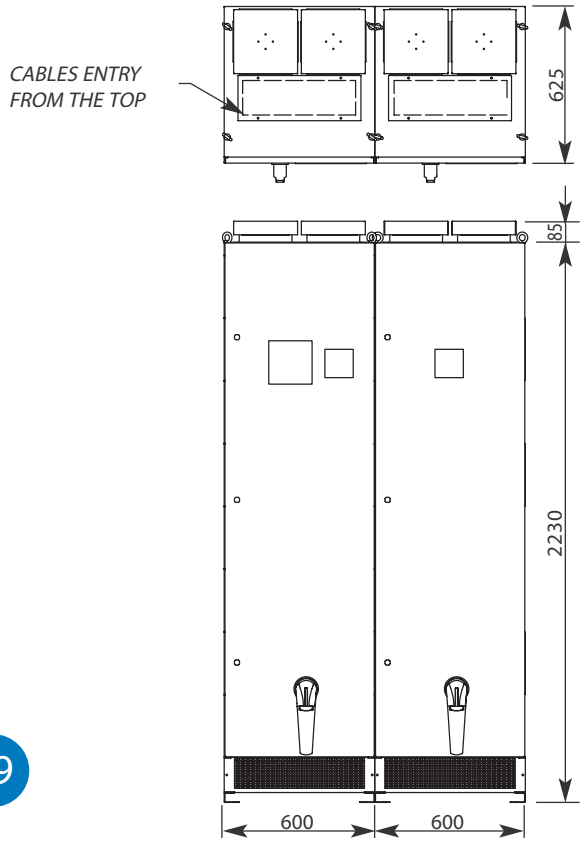

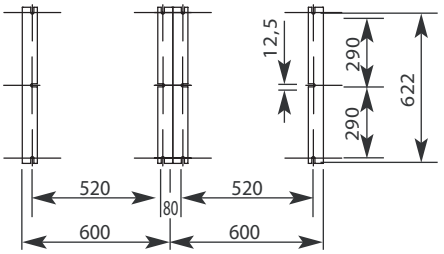

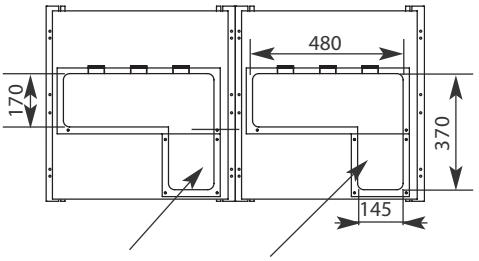

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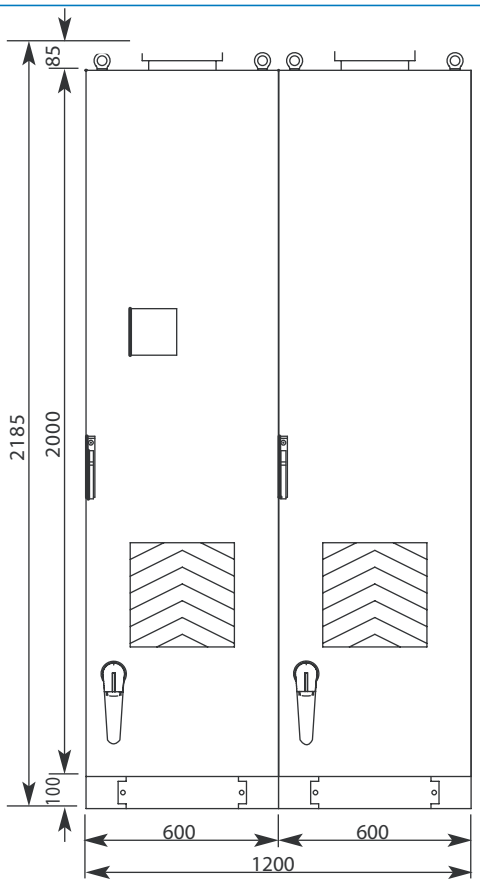

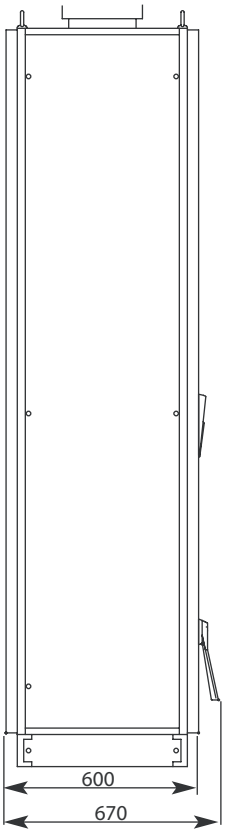

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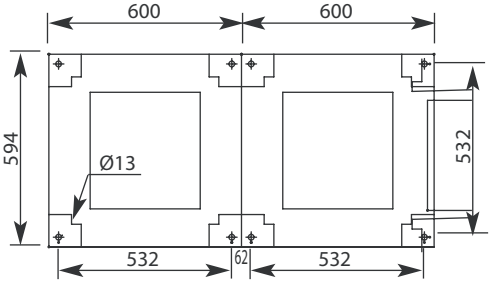

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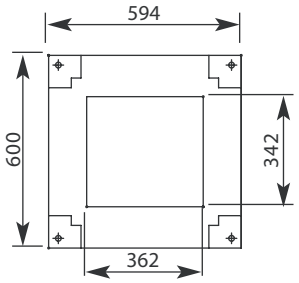

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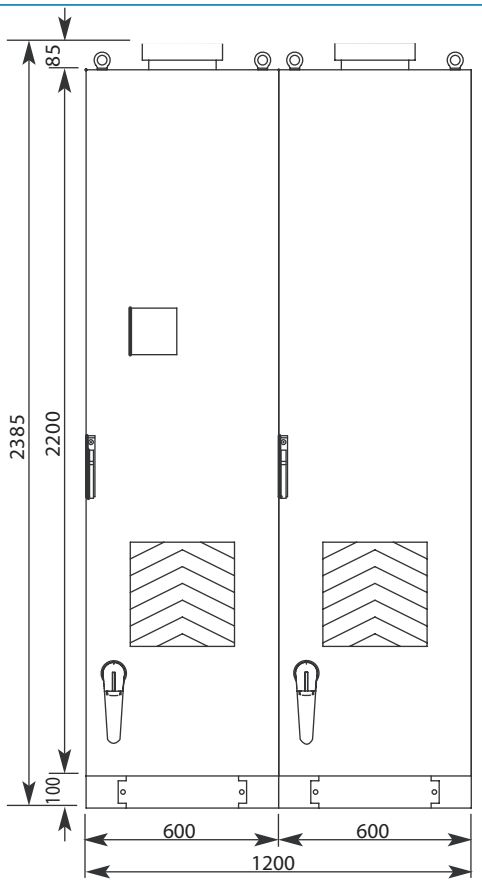

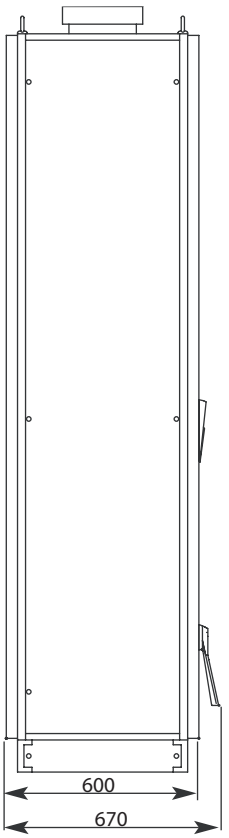

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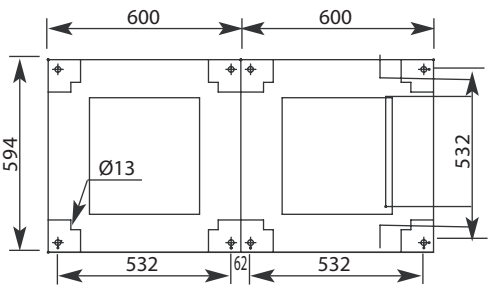

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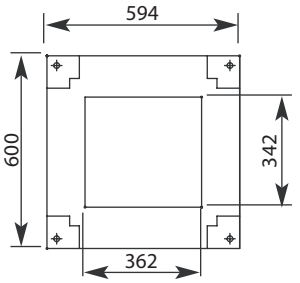

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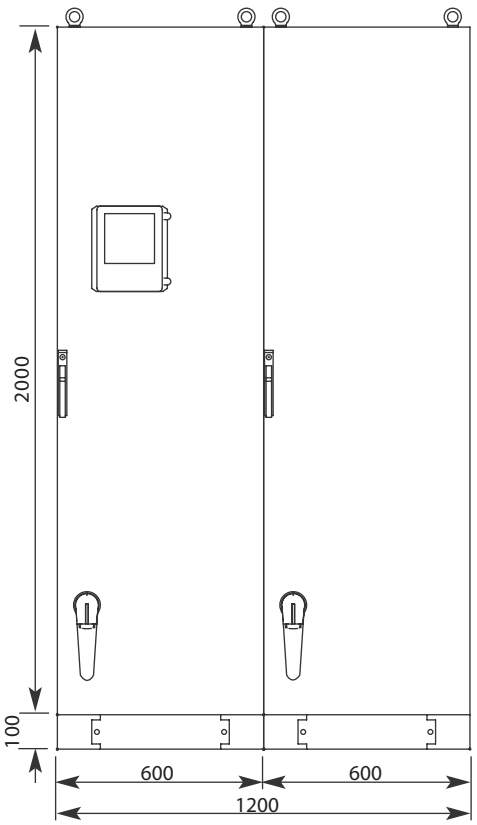

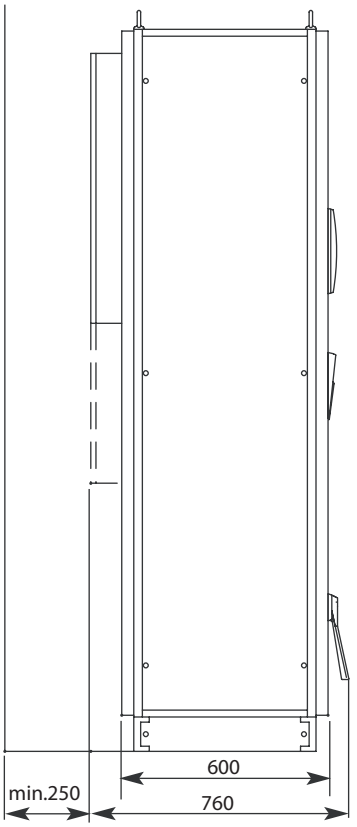

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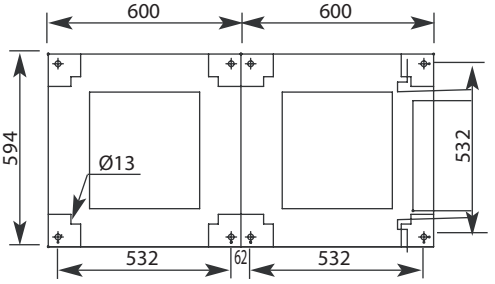

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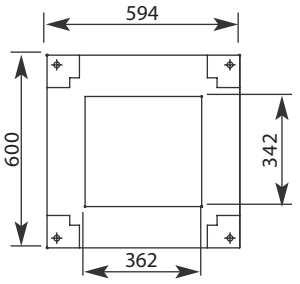

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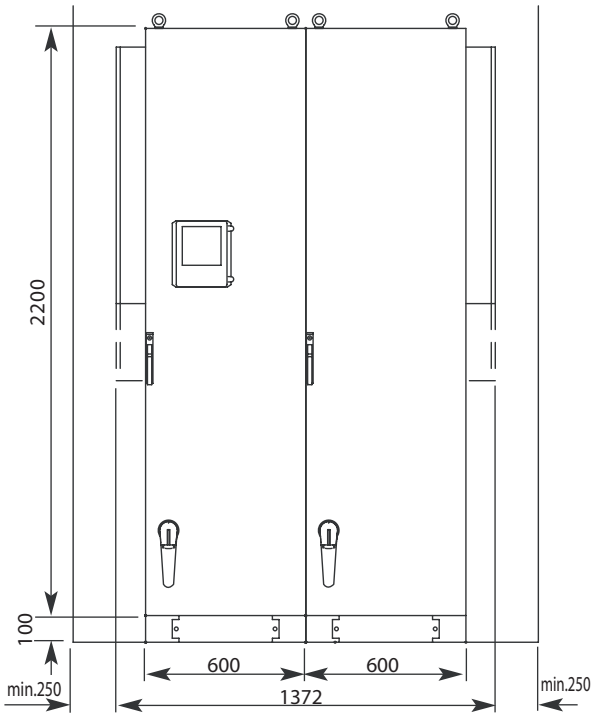

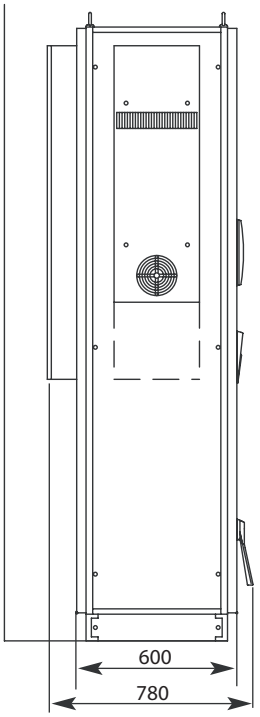

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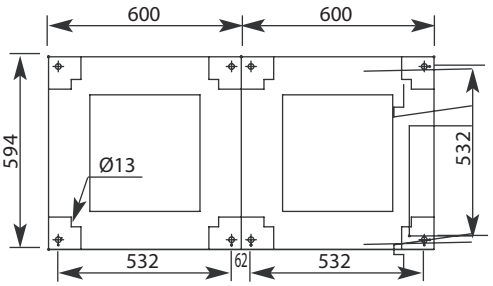

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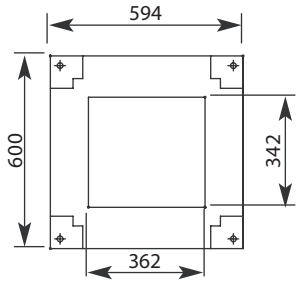

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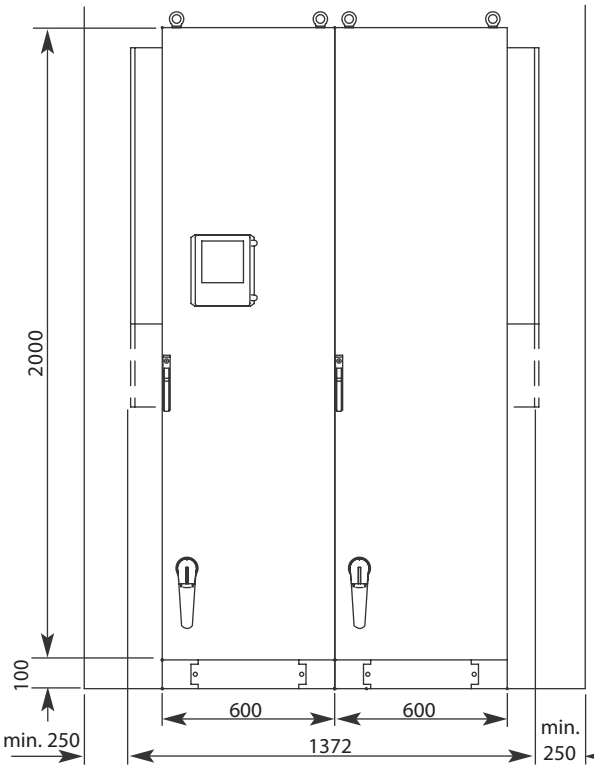

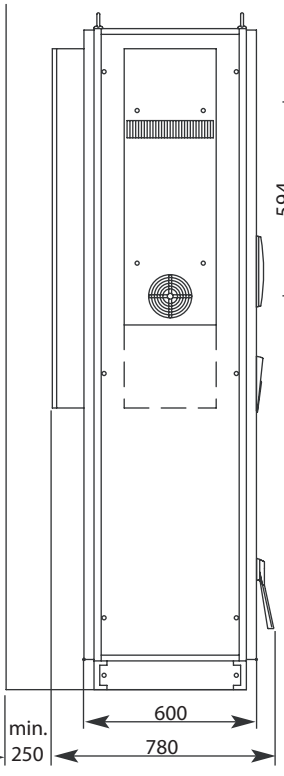

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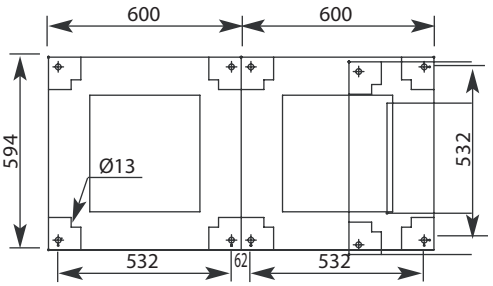

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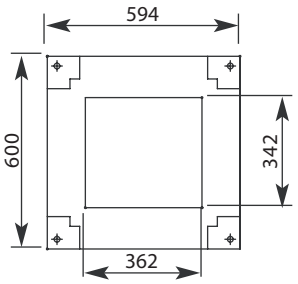

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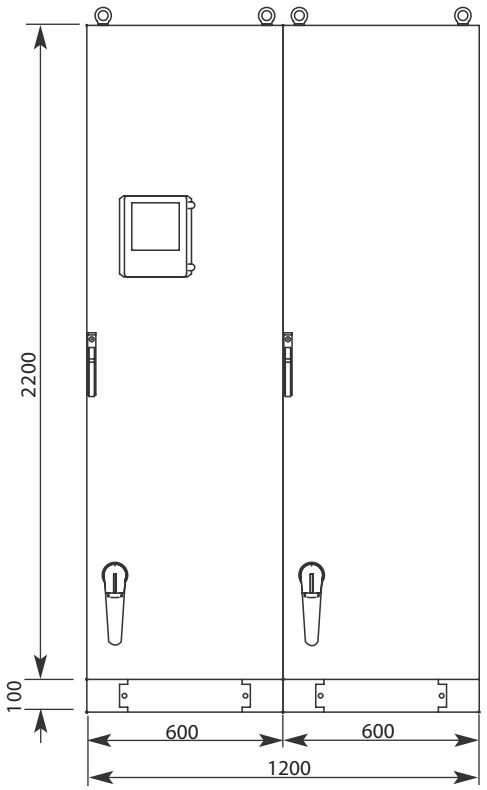

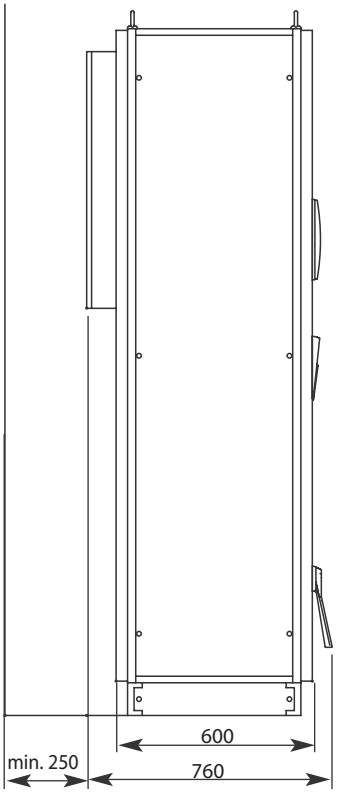

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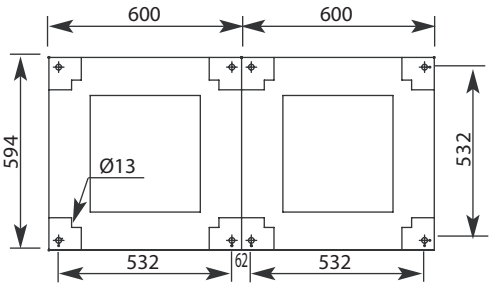

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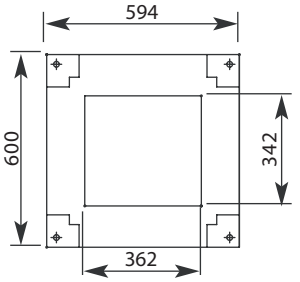

NOTES

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