

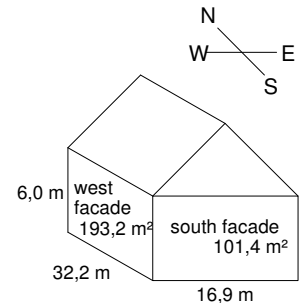
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Data sheet (1):

Geomerty:

Length (North-South):	16,9 m
Width (West-East):	32,2 m
Height (without roof):	6,0 m
Number of floors:	2
Deviation from South direction (west positive):	-45 °
Useful area:	870,7 m ²
Air volume	2612,1 m ³
A/V - value	0,51 1/m
Facade North/South:	101,4 m ²
Facade West/East	193,2 m ²

Sketch:



Insulation:

U value walls:	
North:	0,28 W/(m ² K)
South:	1,20 W/(m ² K)
East:	0,10 W/(m ² K)
West:	0,28 W/(m ² K)
Absorption coefficient of the walls:	0,5
Upper floor towards:	partly insulated roof
U value upper floor:	0,21 W/(m ² K)
Lower floor towards:	outside air
U value lower floor:	0,21 W/(m ² K)
Door area:	2,9 m ²
U value door	1,40 W/(m ² K)
Heat bridges:	ignore heat bridges

Building:

Interior temperature:	20,0 °C
Limit of overheating:	27,0 °C
Natural ventilation (infiltration):	0,60 1/h
Mechanical ventilation:	0,00 1/h
Heat recovery (only mech. ventilation):	0 %
efficiency factor of air conditioning:	0,5 kWh(cool)/kWh(electr.)
Internal Gains:	18,5 kWh/(m ² a)
Kind of indoor walls:	medium construction
Kind of outdoor walls:	light construction

Climate:

Climatic data:	Milano (Italia)
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Data sheet (2):

Windows

North:

Windows area:	5,1 m ²
Fraction of windows area at the facade:	5,0 %
Kind of windows:	others
U value glazing:	1,00 W/(m ² K)
U value frame:	1,00 W/(m ² K)
g value glazing:	0,36
Fraction of frame:	8,0 %
Shading:	65,0 %

South:

Windows area:	69,0 m ²
Fraction of windows area at the facade:	68,0 %
Kind of windows:	others
U value glazing:	1,00 W/(m ² K)
U value frame:	1,00 W/(m ² K)
g value glazing:	0,36
Fraction of frame:	8,0 %
Shading:	65,0 %

East:

Windows area:	23,2 m ²
Fraction of windows area at the facade:	12,0 %
Kind of windows:	others
U value glazing:	1,00 W/(m ² K)
U value frame:	1,00 W/(m ² K)
g value glazing:	0,36
Fraction of frame:	8,0 %
Shading:	65,0 %

West:

Windows area:	52,2 m ²
Fraction of windows area at the facade:	27,0 %
Kind of windows:	others
U value glazing:	1,00 W/(m ² K)
U value frame:	1,00 W/(m ² K)
g value glazing:	0,36
Fraction of frame:	8,0 %
Shading:	65,0 %

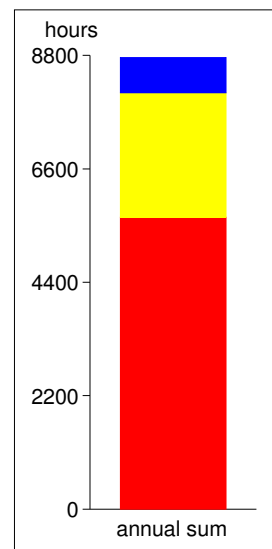
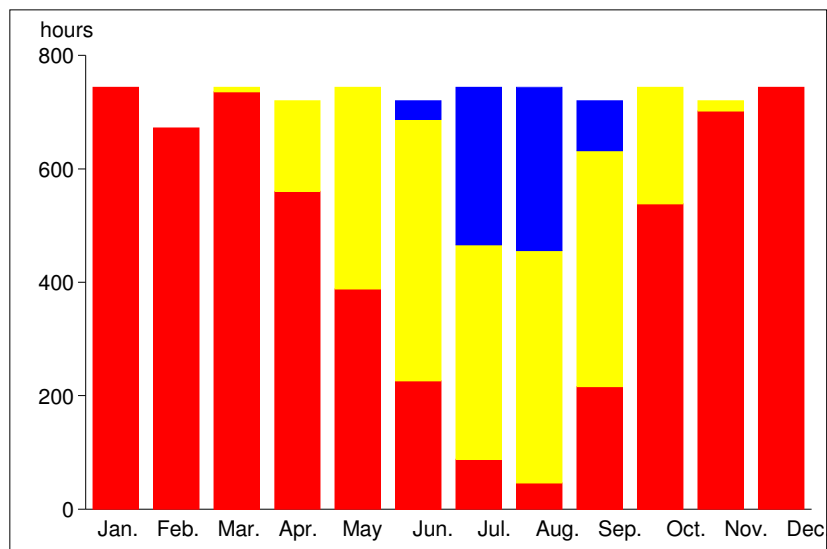
Energy:

Heating system:	soil heat pump, buffer storage and distribution inside the thermal zone
Heat transfer / system temperature:	underfloor heating (switch difference : 1K), system temperature: 35/28 °C
Source of energy:	electricity

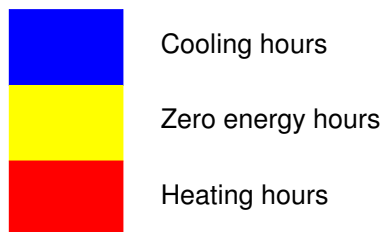
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Output: Heating and cooling hours

	Heating hours in h	Zero energy hours in h	Cooling hours in h
January	744	0	0
February	672	0	0
March	736	8	0
April	560	160	0
May	388	356	0
June	226	461	33
July	88	378	278
August	46	410	288
September	216	416	88
October	538	206	0
November	702	18	0
December	744	0	0
Total in h	5660	2413	687
Total in %	64,6	27,5	7,8



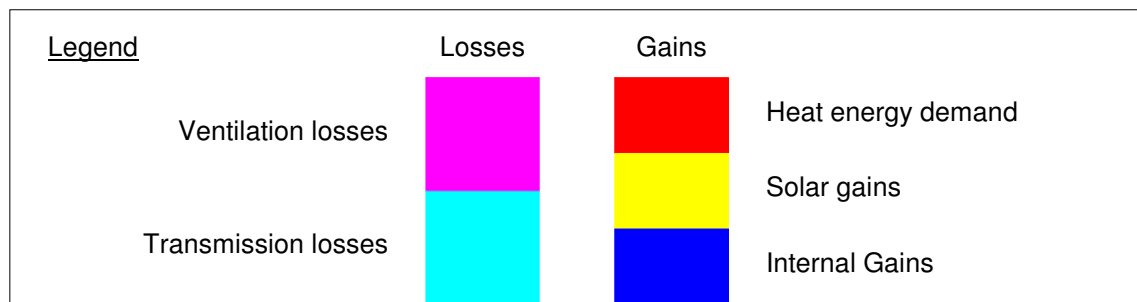
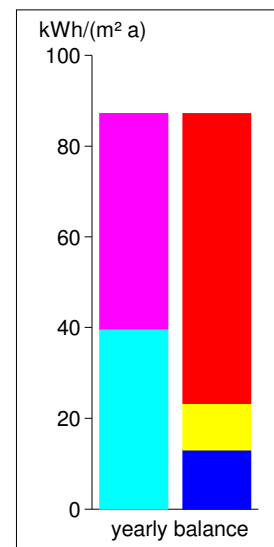
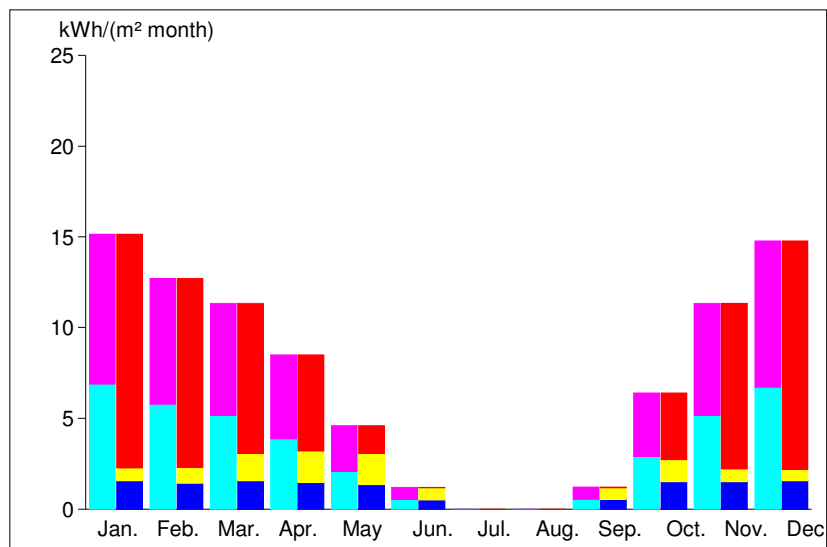
Legend:



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Output: Heat balance

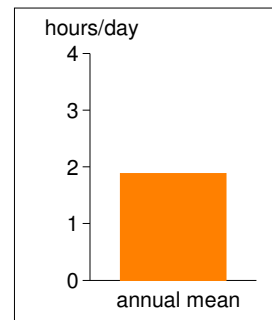
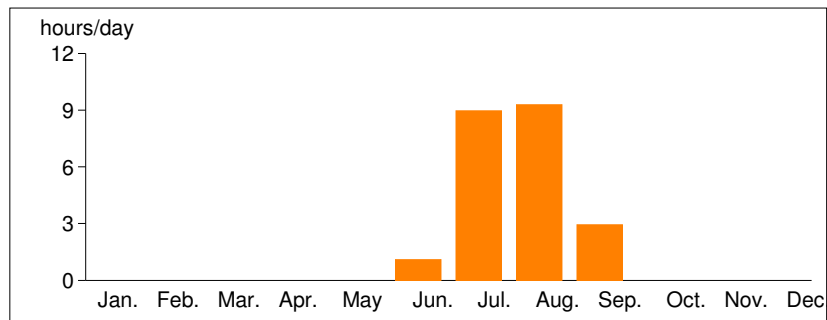
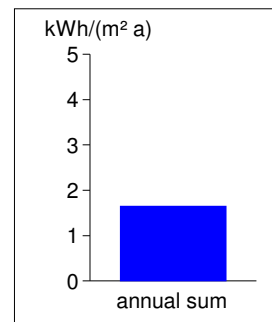
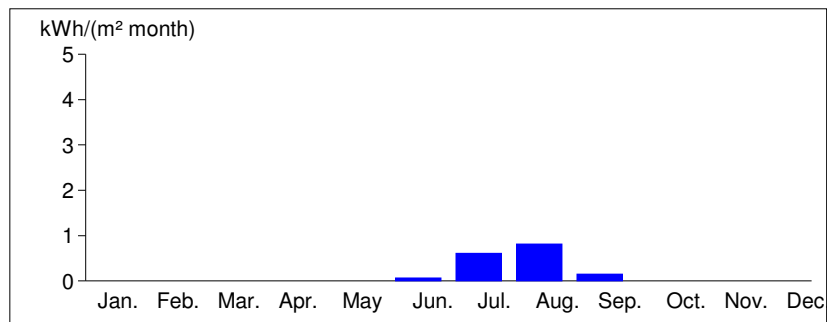
	Transmis- sion losses in kWh/m ²	Ventilation losses in kWh/m ²	Total heat losses in kWh/m ²	Internal gains in kWh/m ²	Solar gains in kWh/m ²	Usability factor	Heat energy demand in kWh/m ²
January	6,9	8,2	15,1	1,6	0,7	1,00	12,9
February	5,8	6,9	12,7	1,4	0,9	1,00	10,4
March	5,2	6,2	11,3	1,6	1,5	0,99	8,3
April	3,9	4,6	8,5	1,5	1,7	0,97	5,3
May	2,1	2,5	4,6	1,3	1,7	0,86	1,5
June	0,5	0,7	1,2	0,5	0,7	0,33	0,0
July	0,0	0,0	0,0	0,0	0,0	0,00	0,0
August	0,0	0,0	0,0	0,0	0,0	0,00	0,0
September	0,5	0,7	1,2	0,5	0,6	0,36	0,0
October	2,9	3,5	6,4	1,5	1,2	0,96	3,7
November	5,2	6,2	11,3	1,5	0,7	1,00	9,1
December	6,7	8,0	14,8	1,6	0,6	1,00	12,6
Total (absolute) in kWh/a	34556	41353	75910	11322	9003		55584
Total (specific) in kWh/(m ² a)	39,7	47,5	87,2	13,0	10,3		63,8



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Output: Cooling balance

	Cooling demand in kWh/m ²	Overheating (hours per day)	Cooling degree hours in Kh
January	0,0	0,0	0,0
February	0,0	0,0	0,0
March	0,0	0,0	0,0
April	0,0	0,0	0,0
May	0,0	0,0	0,0
June	0,1	1,1	11,7
July	0,6	9,0	317,5
August	0,8	9,3	578,6
September	0,2	2,9	46,9
October	0,0	0,0	0,0
November	0,0	0,0	0,0
December	0,0	0,0	0,0
Mean value / yearly sum	1,6	0,1	954,6



Legend:



Cooling demand
in kWh / m²



Monthly average of overheated
in hours per day

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Output: Balance of windows

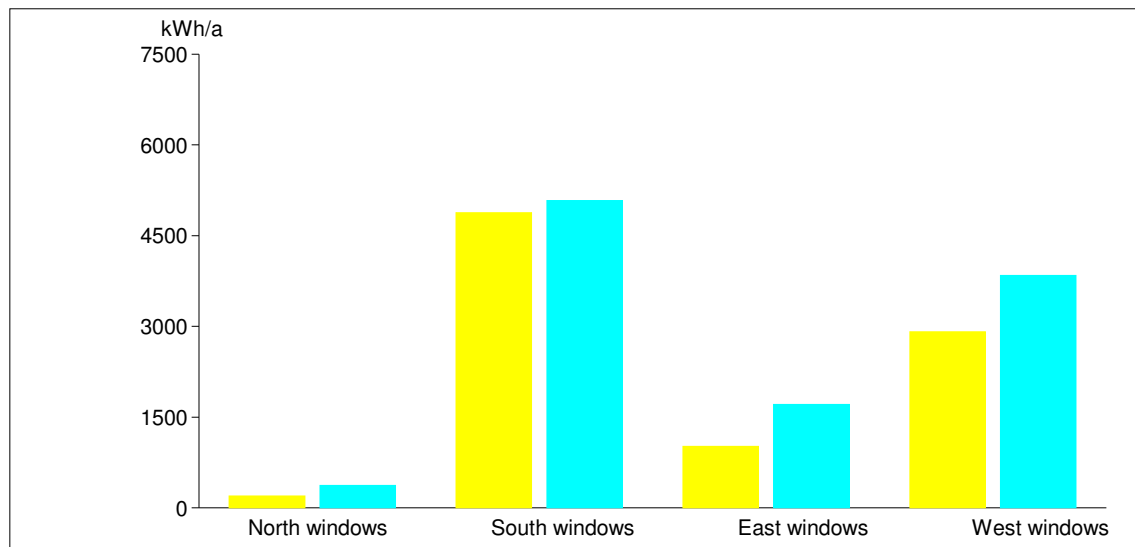
Orientation:

Deviation from South direction: 45 ° to East



Gains / losses:

	North in kWh/a	South in kWh/a	East in kWh/a	West in kWh/a	Total in kWh/a
Usable solar Gains	196,6	4878,7	1013,9	2914,2	9003,3
Transmission losses of windows	373,3	5077,3	1707,2	3841,1	10998,9
Balance	-176,7	-198,6	-693,3	-926,9	-1995,6



Legend:

Solar gains



Transmission losses
of windows



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Output: Primary and end energy demand for heating

Heat:

Heat energy demand:	63,8 kWh/(m ² a)
Losses of the heat storage:	0,0 kWh/(m ² a)
Heat losses from the distribution:	0,5 kWh/(m ² a)
Losses at the transmission to the rooms:	1,1 kWh/(m ² a)
Expense number of heat generation:	0,23

End energy demand electricity: 15,1 kWh/(m² a)

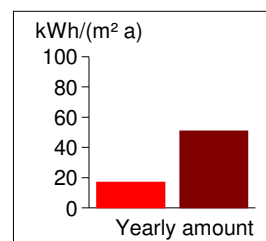
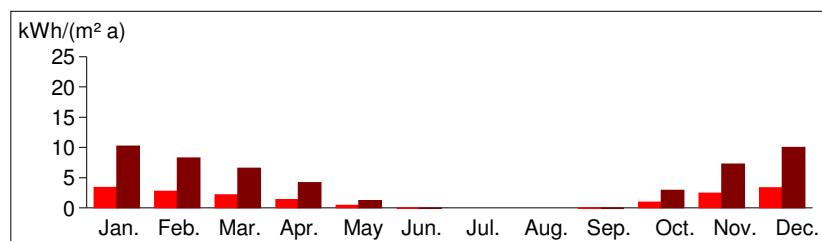
Auxiliary energy (electricity):

Auxiliary energy for heat generation:	1,0 kWh/(m ² a)
Auxiliary energy for heat storage:	0,1 kWh/(m ² a)
Auxiliary energy for heat distribution:	0,8 kWh/(m ² a)

End energy demand auxiliary energy (electricity): 1,9 kWh/(m² a)

Primary energy factor electricity: 3,0
Primary energy demand electricity: 50,7 kWh/(m² a)

	End energy demand demand	Primary energy demand demand
January	3,4	10,2
February	2,8	8,3
March	2,2	6,6
April	1,4	4,2
May	0,4	1,2
June	0,0	0,0
July	0,0	0,0
August	0,0	0,0
September	0,0	0,0
October	1,0	2,9
November	2,4	7,3
December	3,3	10,0
Sum specific in kWh/(m ² a)	16,9	50,7
Sum absolute in kWh/a	14726	44179



Legend:

■ End energy demand electricity ■ Primary energy demand electricity

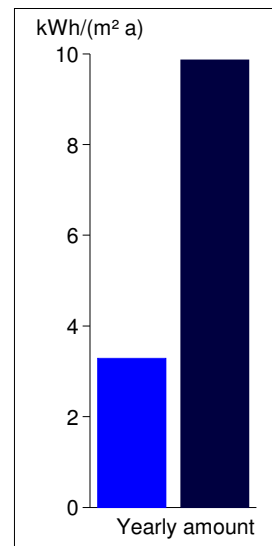
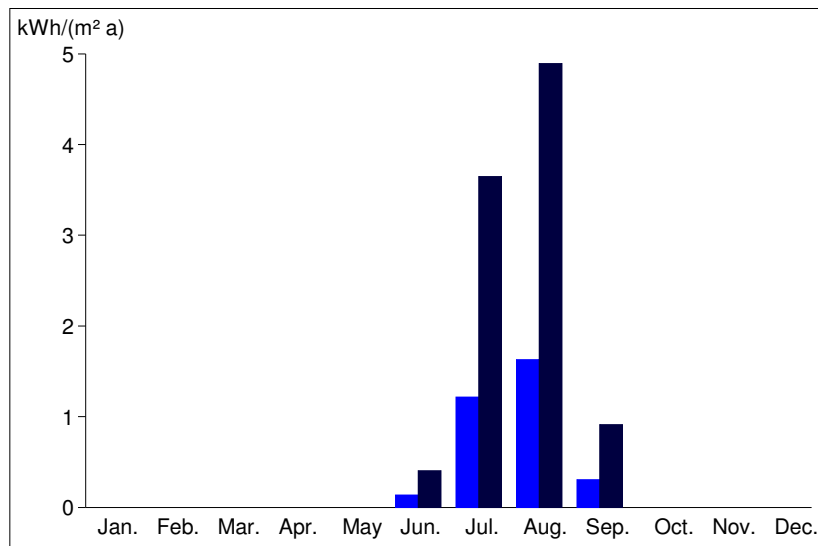
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Output: Primary and end energy demand for cooling

Efficiency factor air-conditioning:

0,5 kWh cooling / kWh electricity

	Cooling demand in kWh/m ²	End energy demand cooling (electricity) in kWh/m ²	Primary energy demand (electricity) in kWh/m ²
January	0,0	0,0	0,0
February	0,0	0,0	0,0
March	0,0	0,0	0,0
April	0,0	0,0	0,0
May	0,0	0,0	0,0
June	0,1	0,1	0,4
July	0,6	1,2	3,6
August	0,8	1,6	4,9
September	0,2	0,3	0,9
October	0,0	0,0	0,0
November	0,0	0,0	0,0
December	0,0	0,0	0,0
Sum specific in kWh/(m ² a)	1,6	3,3	9,9
Sum absolute in kWh/a	1431,4	2862,8	8588,3



Legend:

Cooling energy demand



Primary energy demand