2008-2009

A Study of Energy Consumption of Passenger Lifts in Different Types of Buildings in Accordance with E4 Programme Methodology

Introduction

The measurements were taken between November 18th, 2008 and April 30th, 2009 following the methodology developed by KAPE in accordance with E4 guidelines.

Measurement Methodology Description

The studies were conducted in accordance with the following methodology. For lifts:
Measurement no. 1; main circuit, 5-minute measurement during full cycle up-and-down travel;
Measurement no. 2; main circuit, 5-minute measurement in standby mode;
Measurement no. 3; ancillary circuit, 5-minute measurement in active and standby mode.

No.	Address	Date of Measurement	Load	Building	Type of Machine
1	Warszawa, al. Solidarności 119/125	Nov. 18, 2008	630kg	residential	passenger traction lift
2	Warszawa, ul. Sonaty 2	Nov. 22, 2008	1000kg	residential	passenger traction lift
3	Warszawa. ul. Bolesławicka 24	Nov. 26, 2008	500kg	residential	passenger traction lift
4	Warszawa, ul. Zwycięzców 42	Nov. 27, 2008	630kg	residential	passenger traction lift
5	Warszawa, al. Horbaczewskiego 5	Nov. 28, 2008	500kg	residential	passenger traction lift
6	Warszawa, ul. Grójecka 69	Feb. 11, 2009	400kg	residential	passenger traction lift
7	Warszawa, ul. Grójecka 69 (with a reactor installed in an inverter)	Feb. 11, 2009	400kg	residential	passenger traction lift
8	Lublin, ul. Jaczewskiego 8	Mar. 23, 2009	500kg	hospital	passenger traction lift
9	Lublin, ul. Jaczewskiego 8	Mar. 23, 2009	1500kg	hospital	hospital hydraulic lift
10	Warszawa, ul. Darwina 13	Apr. 5, 2009	450kg	residential	passenger traction lift
11	Warszawa, ul. Darwina 1A	Apr. 25, 2009	450kg	residential	passenger traction lift
12	Płock, ul. Piasta Kołodzieja 3	Apr. 28, 2009	375kg	residential	passenger traction lift
13	Płock, ul. Medyczna 19	Apr. 28, 2009	1425kg	hospital	hospital traction lift
14	Płock, ul. Medyczna 19	Apr. 28, 2009	1425kg	hospital	hospital traction lift
15	Lublin, ul. Wieniawska 14	Apr. 30, 2009	900kg	public office building	passenger traction lift
16	Lublin, ul. Wieniawska 14	Apr. 30, 2009	1425kg	public office building	passenger traction lift

17	CRH Lublin Plaza Lublin, ul. Lipowa 13	Apr. 30, 2009	-	shopping centre	travelator
18	CRH Lublin Plaza Lublin, ul. Lipowa 13	Apr. 30, 2009	-	shopping centre	escalator

1. A lift in a multifamily residential building. Warsaw, al. Solidarności 119/125

Lift description:

The subject under study is a lift installed in an existing shaft dated from 1956 in 2008. The following technical solutions were applied, with a direct influence on electricity consumption:

Controller type:

microprocessor controller (Sterlift), equipped with an inverter (Magnatec 630), working within a closed loop; safety chain and contactors powered by 48V DC transformer supplier.

Hoist:

gear machine (Penta 830) with an encoder and 7.5 kW VVVF motor.

Car door operator:

Hydra PLUS ECO with a DC motor controlled by a microprocessor controller.

Car lighting:

5 x 3W LED spot.

Display:

seven-segment LED indicators placed on each floor, working in parallel; highlighted buttons to confirm calls; highlighted LCD display with a car emergency lighting function.

Ancillary devices:

GSM communications module.

Additional control functions:

a. light switch off function after a specific period of time – not available;

b. inverter switch off function after a specific standby period – not available;

c. display switch off function after a specific standby period – not available;

d. parking function – not available.

General information about the lift and measuring instrument		
Description	**Specification**	**Comments**
Building category	residential	
Building address	Warszawa al.. Solidarności 119/125	
Number of storeys	10	
Lift manufacturer	ESENO Warszawa	
Year of installation	2008	
Type (Catalogue number)		
Technology (Geared, Geareless or Hydro)	geared	
Technology (Electro-mechanic or Electronic)	electronic	
Suspention (1:1 or 2:1)	1:1	
Nominal load [kg]	630kg	
Nominal power on motor plate [kW]	7.5	
Speed [m/s]	1	
Maximum travel heigh [m.]	28	
Number of trips per annum	100,000	
Instrument manufacturer	Hioki	
Instrument model number	3169-21	
Instrument settings:		
Current range (Main Energy Running) [A]	50A	
Current range (Main Energy Standby) [A]	5A	
Current range (Ancillary Energy Running) [A]	1A	
Current range (Ancillary Energy Standby) [A]	1A	
Interval Time [s]	100ms	
Other (plese specify)		
Date	18/11/2008	

2.1. **Main Active Energy - Running**

C_{bal}	C_{aml}	C_{atd}	Main Active Energy - Running per 1 cycle trip (Ecm)	Number of trips per annum (ntrip)	Main Active Energy - Running per annum (Eym)
-	-	-	Wh	-	kWh
0.5	0.35	0.5	28.27	100,000	494.73

2.2. **Main Active Energy - Standby**

		C_{atd}	Main Active Power - Standby (Pm)	Time of one cycle trip (C)	Main Active Energy - Standby per annum (Ems)
		-	W	s	kWh
		0.5	374.34	93	3037

2.3. **Ancillary Active Energy - Running**

		C_{atd}	Ancillary Active Energy - Running per 1 cycle trip (Eca)	Number of ttrips per annum (ntrip)	Ancillary Active Energy - Running per annum (Eya)
		-	Wh	-	kWh
		0.5	0.34	100,000	17

2.4. **Ancillary Active Energy - Standby**

		C_{atd}	Ancillary Active Power - Standby (Pa)	Time of one cycle trip (C)	Ancillary Active Energy - Standby per annum (Eas)
		-	W	s	kWh
		0.5	14.12	93	115.00

2.5.

Active Energy - Running (Main + Ancillary)	
Active Energy - Running (Main + Ancillary) per 1 cycle trip	Active Energy - Running (Main + Ancillary) per annum (Eyr)
Wh	kWh
28.61	511.73

2.6.

Active Energy - Standby (Main + Ancillary)	
Active Power - Standby (Main + Ancillary)	Active Energy - Standby (Main + Ancillary) per annum (Eys)
W	kWh
388.46	3152

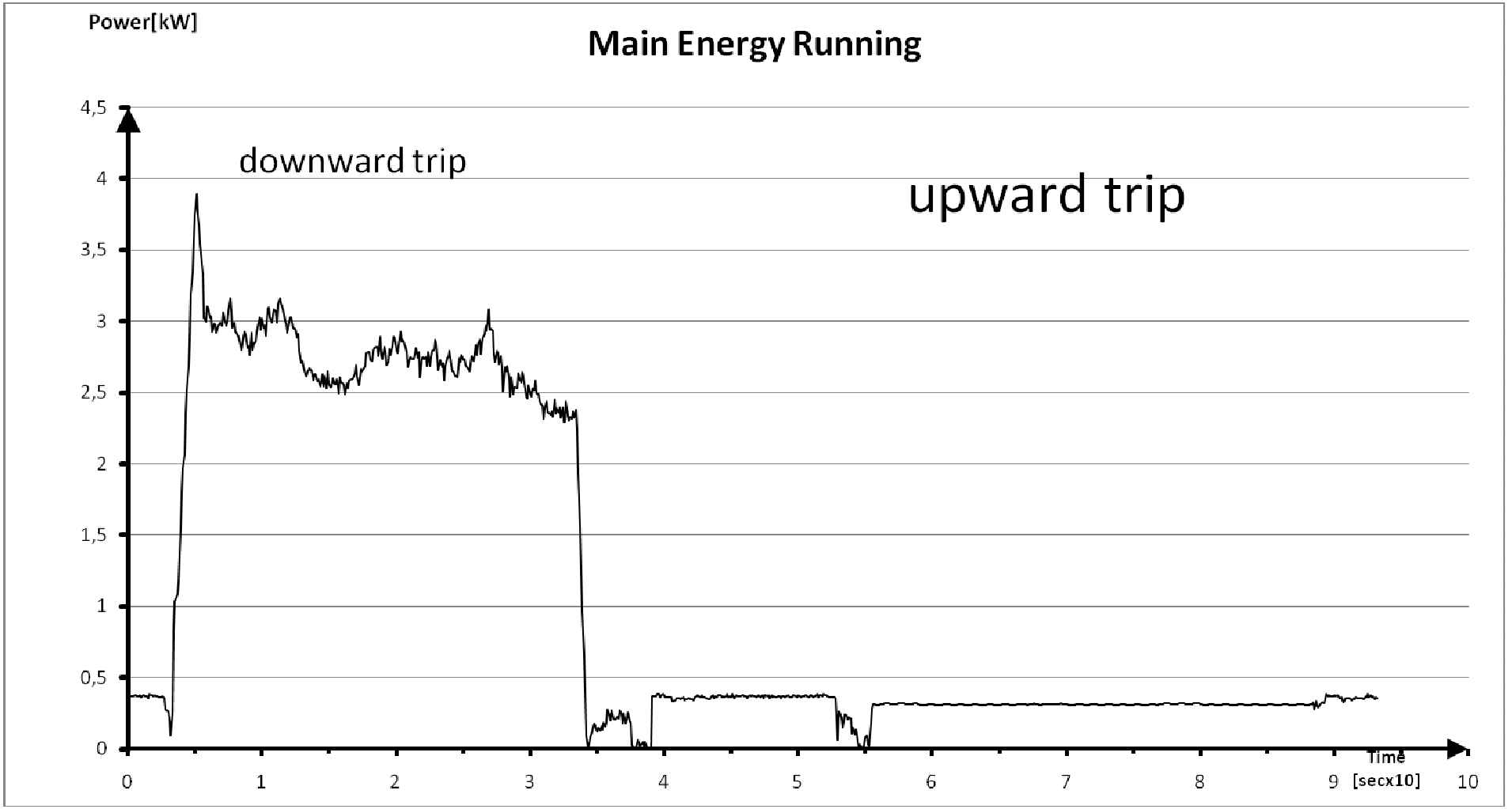
2.7.

Summary Active Energy - (Running + Standby) (Main + Ancillary) per annum
Summary Active Energy - Running + Standby (Main + Ancillary) per annum (Ey)
kWh
3663.73

2.8.

Relation of Active Energy - Standby, per annum to Summary Active Energy - (Running + Standby), per annum
%

86%


Power[kW]
Main Energy Running
4,5
4
3,5
3
2,5
2
1,5
1
0,5
0
downward trip
upward trip
0
1
2
3
4
5
6
7
8
9
10
Time
[secx10]

2. A lift in a multifamily residential building.
Warsaw, ul. Sonaty 2

Lift description:

The subject under study is a lift installed in an existing shaft dated from the 70's and modernized within the scope of major elements in 2002. The following technical solutions were applied, with a direct influence on electricity consumption:

Controller type:
microprocessor controller (Sterlift), equipped with an inverter (FUJI Frenic), working within a closed loop; safety chain and contactors powered by 48V DC transformer supplier.

Hoist:
gear machine (MF-82) with an encoder and 11 kW VVVF motor.

Car door operator:
regulated driver with a DC motor controlled by a microprocessor controller.

Car lighting:
6 x 40W light bulbs.

Display:
seven-segment LED indicators placed on the base floor, working in parallel; highlighted buttons to confirm calls; LED display in the car.

Ancillary devices:
not available.

Additional control functions:

a. light switch off function after a specific period of time – not available;
b. inverter switch off function after a specific standby period – not available;
c. display switch off function after a specific standby period – not available;
d. parking function – not available.

General information about the lift and measuring instrument		
Description	**Specification**	**Comments**
Building category	residential	
Building address	Warszawa al.Sonaty 2	
Number of storeys	12	
Lift manufacturer	Winda Warszawa	
Year of installation	2002	
Type (Catalogue number)		
Technology (Geared, Geareless or Hydro)	geared	
Technology (Electro-mechanic or Electronic)	electronic	
Suspention (1:1 or 2:1)	1:1	
Nominal load [kg]	1000kg	
Nominal power on motor plate [kW]	11	
Speed [m/s]	1	
Maximum travel heigh [m.]	28	
Number of trips per annum	100,000	
Instrument manufacturer	Hioki	
Instrument model number	3169-21	
Instrument settings:		
Current range (Main Energy Running) [A]	50A	
Current range (Main Energy Standby) [A]	5A	
Current range (Ancillary Energy Running) [A]	1A	
Current range (Ancillary Energy Standby) [A]	1A	
Interval Time [s]	100ms	
Other (plese specify)		
Date	22/11/2008	

2. Active Energy Consumption

2.1.

Main Active Energy - Running					
C_{bal}	C_{aml}	C_{atd}	Main Active Energy - Running per 1 cycle trip (Ecm)	Number of trips per annum (ntrip)	Main Active Energy - Running per annum (Eym)
-	-	-	Wh	-	kWh
0.5	0.35	0.3	90.10	100,000	946.05

2.2.

Main Active Energy - Standby					
		C_{atd}	Main Active Power - Standby (Pm)	Time of one cycle trip (C)	Main Active Energy - Standby per annum (Ems)
		-	W	s	kWh
		0.3	84.01	100	700.92

2.3.

Ancillary Active Energy - Running					
		C_{atd}	Ancillary Active Energy - Running per 1 cycle trip (Eca)	Number of ttrips per annum (ntrip)	Ancillary Active Energy - Running per annum (Eya)
		-	Wh	-	kWh
		0.3	7.31	100,000	219.00

2.4.

Ancillary Active Energy - Standby					
		C_{atd}	Ancillary Active Power - Standby (Pa)	Time of one cycle trip (C)	Ancillary Active Energy - Standby per annum (Eas)
		-	W	s	kWh
		0.3	262.71	100	2192.00

2.5.

Active Energy - Running (Main + Ancillary)	
Active Energy - Running (Main + Ancillary) per 1 cycle trip	Active Energy - Running (Main + Ancillary) per annum (Eyr)
Wh	kWh
97.41	1165.05

2.6.

Active Energy - Standby (Main + Ancillary)	
Active Power - Standby (Main + Ancillary)	Active Energy - Standby (Main + Ancillary) per annum (Eys)
W	kWh
346.72	2893

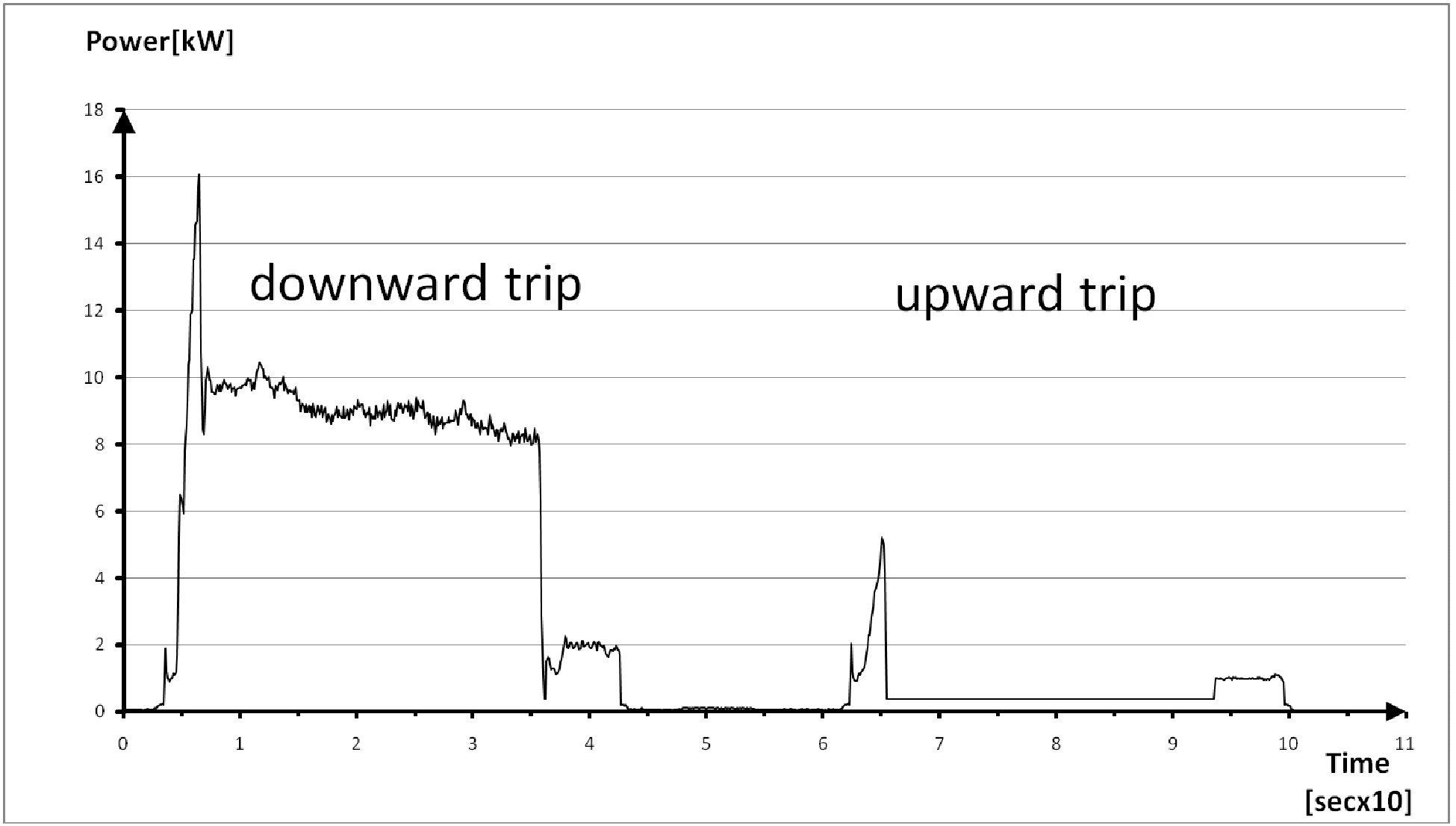
2.7.

Summary Active Energy - (Running + Standby) (Main + Ancillary) per annum
Summary Active Energy - Running + Standby (Main + Ancillary) per annum (Ey)
kWh
4057.97

2.8.

Relation of Active Energy - Standby, per annum to Summary Active Energy - (Running + Standby), per annum
%

71%


Power[kW]
18
16
14
12
10
8
6
4
2
0
downward trip
upward trip
0
1
2
3
4
5
6
7
8
9
10
11
Time
[secx10]

3. A lift in a multifamily residential building.

Warsaw, ul. Bolesławickiej 24

Lift description:

The subject under study is a lift installed in an existing shaft dated from the 70's and modernized within the scope of major elements in 2002. The following technical solutions were applied, with a direct influence on electricity consumption:

Controller type:

Relay controller; safety chain and contactors Powerem by 48V DC transformer supplier.

Hoist:

gear machine (R-4) with a 5.5/1.375 kW AC2 drive motor.

Car door operator:

no automatic door – 200W electromagnetic cam.

Car lighting:

2 x 40W light bulbs.

Display:

not available.

Ancillary devices:

not available.

Additional control functions:

a. light switch off function after a specific period of time – not available;
b. inverter switch off function after a specific standby period – not available;
c. display switch off function after a specific standby period – not available;
d. parking function – not available.

General information about the lift and measuring instrument		
Description	**Specification**	**Comments**
Building category	residential	
Building address	Warszawa ul.Bolesławicka 24	
Number of storeys	11	
Lift manufacturer	ZUD Warszawa	
Year of installation	1974	
Type (Catalogue number)	MDA-500	
Technology (Geared, Geareless or Hydro)	geared	
Technology (Electro-mechanic or Electronic)	electro-mechanic	
Suspention (1:1 or 2:1)	1:1	
Nominal load [kg]	500kg	
Nominal power on motor plate [kW]	5.5	
Speed [m/s]	1	
Maximum travel heigh [m.]	28	
Number of trips per annum	100000	
Instrument manufacturer	Hioki	
Instrument model number	3169-21	
Instrument settings:		
Current range (Main Energy Running) [A]	50A	
Current range (Main Energy Standby) [A]	5A	
Current range (Ancillary Energy Running) [A]	1A	
Current range (Ancillary Energy Standby) [A]	1A	
Interval Time [s] - Running	100ms	
Other (plese specify)		
Date	26/11/2008	

2. Active Energy Consumption

2.1. Main Active Energy - Running

C_{bal}	C_{aml}	C_{atd}	Main Active Energy - Running per 1 cycle trip (Ecm)	Number of trips per annum (n_{trip})	Main Active Energy - Running per annum (Eym)
-	-	-	Wh	-	kWh
0.5	0.35	0.3	83.06	100000	872.13

2.2. Main Active Energy - Standby

		C_{atd}	Main Active Power - Standby (Pm)	Time of one cycle trip (C)	Main Active Energy - Standby per annum (Ems)
		-	W	s	kWh
		0.3	32.06	101	267

2.3. Ancillary Active Energy - Running

		C_{atd}	Ancillary Active Energy - Running per 1 cycle trip (Eca)	Number of ttrips per annum (n_{trip})	Ancillary Active Energy - Running per annum (Eya)
		-	Wh	-	kWh
		0.3	2.17	100,000	65

2.4. Ancillary Active Energy - Standby

		C_{atd}	Ancillary Active Power - Standby (Pa)	Time of one cycle trip (C)	Ancillary Active Energy - Standby per annum (Eas)
		-	W	s	kWh
		0.3	77.84	101	649

2.5. Active Energy - Running (Main + Ancillary)

Active Energy - Running (Main + Ancillary) per 1 cycle trip	Active Energy - Running (Main + Ancillary) per annum (Eyr)
Wh	kWh
85.23	937.13

2.6. Active Energy - Standby (Main + Ancillary)

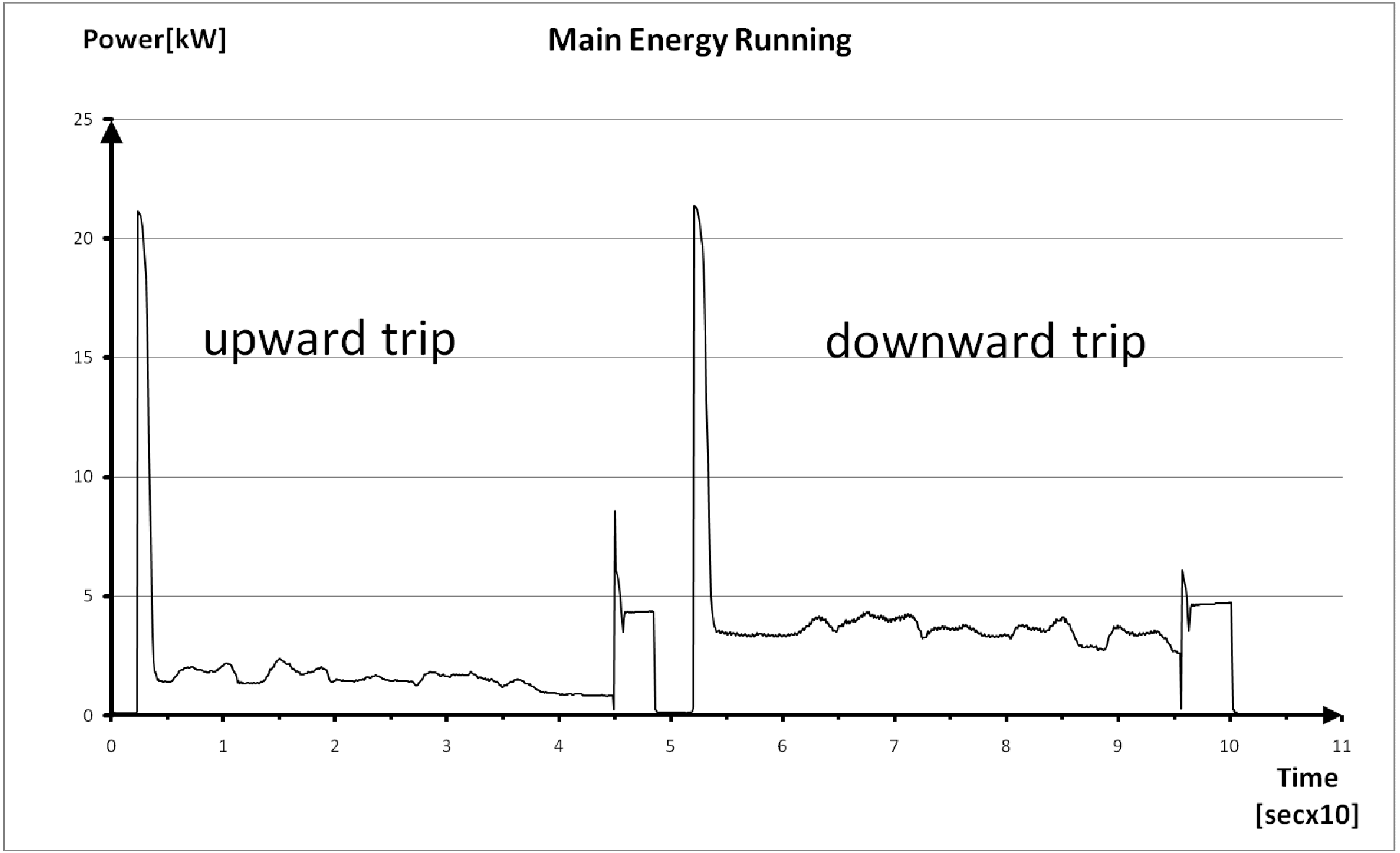
Active Power - Standby (Main + Ancillary)	Active Energy - Standby (Main + Ancillary) per annum (Eys)
W	kWh
109.90	916

2.7. Summary Active Energy - (Running + Standby) (Main + Ancillary) per annum

Summary Active Energy - Running + Standby (Main + Ancillary) per annum (Ey)
kWh
1853.13

2.8. Relation of Active Energy - Standby, per annum to Summary Active Energy - (Running + Standby), per annum

%
49%


Power[kW]
Main Energy Running
25
20
15
10
5
0
upward trip
downward trip
0
1
2
3
4
5
6
7
8
9
10
11
Time
[secx10]

4. A lift in a multifamily residential building.
Warsaw, ul. Zwycięzców 42

Lift description:

The subject under study is a lift installed in 1999. The following technical solutions were applied, with a direct influence on electricity consumption:

Controller type:

microprocessor controller, equipped with an inverter (Kone), working within a closed loop; safety chain and contactors powered by 230V DC transformer supplier.

Hoist:

gearless hoist with an encoder and 6.6 kW VVVF synchronous motor.

Car door operator:

with a DC motor.

Car lighting:

fluorescent lamps behind the false ceiling, about 80 W.

Display:

LED indicator in the car only; highlighted buttons to confirm calls.

Ancillary devices:

not available.

Additional control functions:

a. light switch off function after a specific period of time – not available;
b. inverter switch off function after a specific standby period – not available;
c. display switch off function after a specific standby period – not available;
d. parking function – not available.

General information about the lift and measuring instrument		
Description	**Specification**	**Comments**
Building category	residential	
Building address	Warszawa al.. Zwycięzców 42	
Number of storeys	10	
Lift manufacturer	Kone	
Year of installation	1999	
Type (Catalogue number)		
Technology (Geared, Geareless or Hydro)	geareles	
Technology (Electro-mechanic or Electronic)	electronic	
Suspention (1:1 or 2:1)	2:1	
Nominal load [kg]	630kg	
Speed [m/s]		
	1	
Maximum travel heigh [m.]	28	
Number of trips per annum	80000	
Instrument manufacturer	Hioki	
Instrument model number	3169-21	
Instrument settings:		
Current range (Main Energy Running) [A]	50A	
Current range (Main Energy Standby) [A]	5A	
Current range (Ancillary Energy Running) [A]	1A	
Current range (Ancillary Energy Standby) [A]	1A	
Interval Time [s] - Running	100ms	
Other (plese specify)		
Date	27/11/2008	

2.1. **Main Active Energy - Running**

C_{bal}	C_{aml}	C_{atd}	Main Active Energy - Running per 1 cycle trip (Ecm)	Number of trips per annum (n_{trip})	Main Active Energy - Running per annum (Eym)
-	-	-	Wh	-	kWh
0.5	0.35	0.3	38.11	100000	400.16

2.2. **Main Active Energy - Standby**

		C_{atd}	Main Active Power - Standby (Pm)	Time of one cycle trip (C)	Main Active Energy - Standby per annum (Ems)
		-	W	s	kWh
		0.3	513.36	74	4339

2.3. **Ancillary Active Energy - Running**

		C_{atd}	Ancillary Active Energy - Running per 1 cycle trip (Eca)	Number of ttrips per annum (n_{trip})	Ancillary Active Energy - Running per annum (Eya)
		-	Wh	-	kWh
		0.3	0.00	100000	0

2.4. **Ancillary Active Energy - Standby**

		C_{atd}	Ancillary Active Power - Standby (Pa)	Time of one cycle trip (C)	Ancillary Active Energy - Standby per annum (Eas)
		-	W	s	kWh
		0.3	0.00	74	0

2.5.

Active Energy - Running (Main + Ancillary)	
Active Energy - Running (Main + Ancillary) per 1 cycle trip	Active Energy - Running (Main + Ancillary) per annum (Eyr)
Wh	kWh
38.11	400.16

2.6.

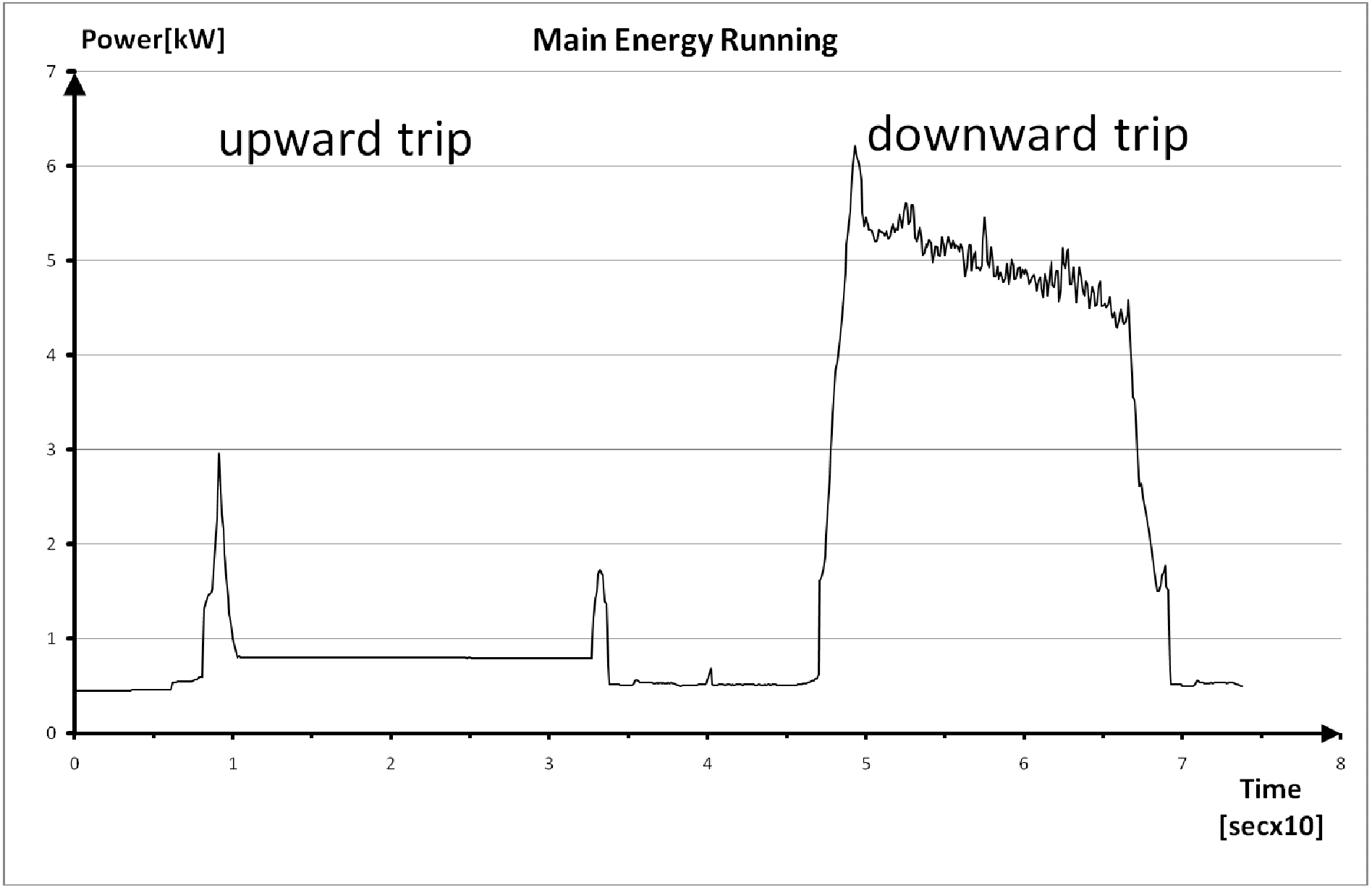
Active Energy - Standby (Main + Ancillary)	
Active Power - Standby (Main + Ancillary)	Active Energy - Standby (Main + Ancillary) per annum (Eys)
W	kWh
513.36	4339.00

2.7.

Summary Active Energy - (Running + Standby) (Main + Ancillary) per annum
Summary Active Energy - Running + Standby (Main + Ancillary) per annum (Ey)
kWh
4739.16

2.8. **Relation of Active Energy - Standby, per annum to Summary Active Energy - (Running + Standby), per annum**

%
92%


Power[kW]
Main Energy Running
upward trip
downward trip
7
6
5
4
3
2
1
0
0
1
2
3
4
5
6
7
8
Time
[secx10]

5. A lift In a multifamily residential building.
Warsaw, ul. Horbaczewskiego 5

Lift description:

The subject under study is a lift modernized in 2008. The following technical solutions were applied, with a direct influence on electricity consumption:

Controller type:

microprocessor controller, equipped with an inverter (Ziehl Abegg), working within a closed loop; safety chain and contactors powered by 230V PWM supplier.

Hoist:

gearless hoist with an encoder and 4.5 kW VVVF synchronous motor.

Car door operator:

not available.

Car lighting:

compact fluorescent lamps, about 22 W.

Display:

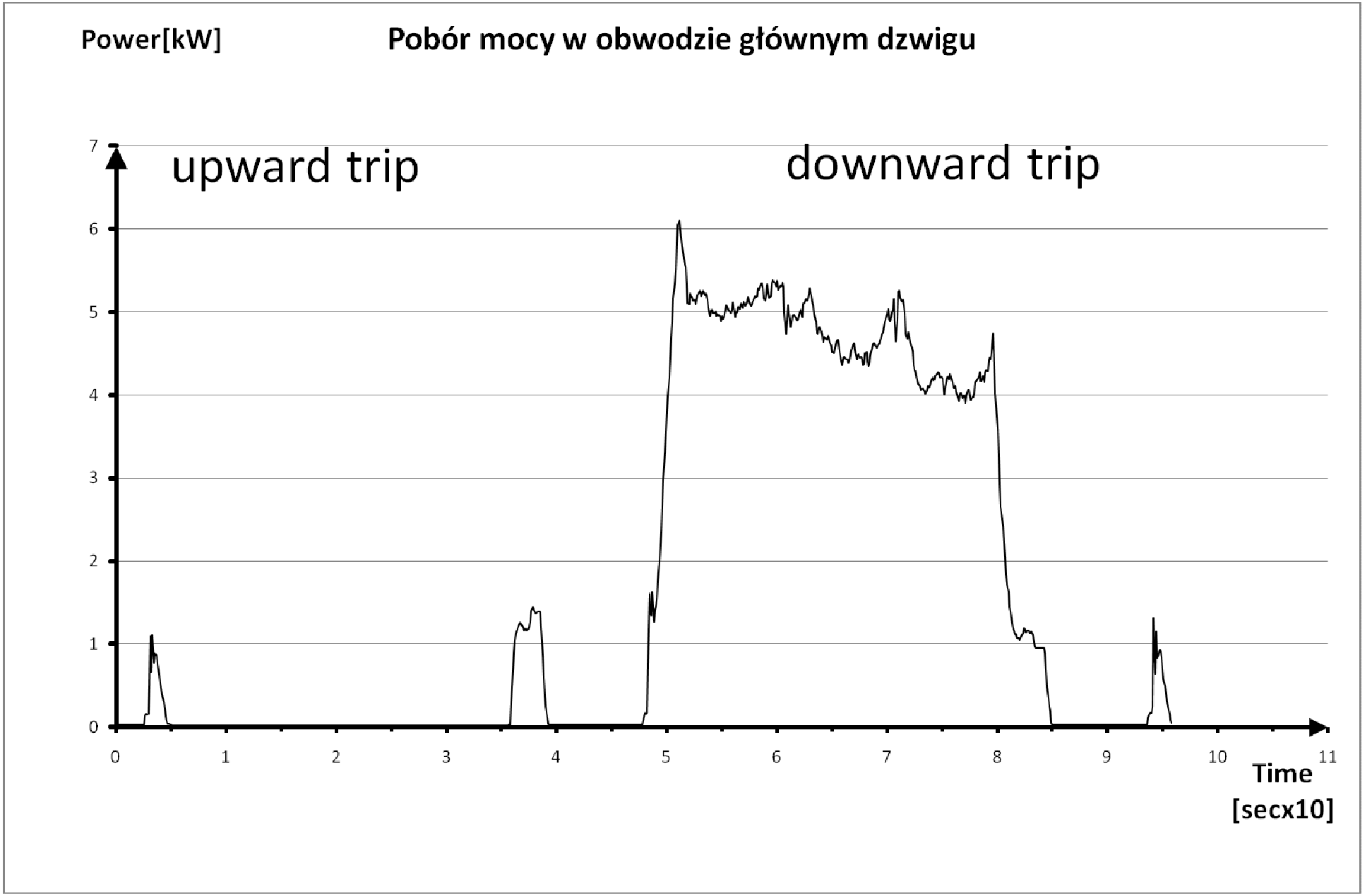
LED indicators in the car and on each floor; highlighted buttons to confirm calls.

Ancillary devices:

not available.

Additional control functions:

a. light switch off function after a specific period of time – 10-minute period;
b. inverter switch off function after a specific standby period – after 3-minute standby the controller takes full control over the inverter;
c. display switch off function after a specific standby period – not available;
d. parking function – not available.


Power[kW]
Pobór mocy w obwodzie głównym dzwigu
upward trip
downward trip
7
6
5
4
3
2
1
0
0
1
2
3
4
5
6
7
8
9
10
11
Time
[secx10]

General information about the lift and measuring instrument		
Description	**Specification**	**Comments**
Building category	residential	
Building address	Warszawa al..Horbaczewskiego 5	
Number of storeys	12	
Lift manufacturer	Mark Dźwig	
Year of installation	2008	
Type (Catalogue number)		
Technology (Geared, Geareless or Hydro)	geareles	
Technology (Electro-mechanic or Electronic)	electronic	
Suspention (1:1 or 2:1)	1:1	
Nominal load [kg]	500kg	
Nominal power on motor plate [kW]	4.5	
Speed [m/s]	1	
Maximum travel heigh [m.]	28	
Number of trips per annum	100,000	
Instrument manufacturer	Hioki	
Instrument model number	3169-21	
Instrument settings:		
Current range (Main Energy Running) [A]	50A	
Current range (Main Energy Standby) [A]	5A	
Current range (Ancillary Energy Running) [A]	1A	
Current range (Ancillary Energy Standby) [A]	1A	
Interval Time [s]	100ms	
Other (plese specify)		
Date	28/11/2008	

Main Active Energy - Running					
C_{bal}	C_{aml}	C_{atd}	Main Active Energy - Running per 1 cycle trip (Ecm)	Number of trips per annum (n_{trip})	Main Active Energy - Running per annum (Eym)
-	-	-	Wh	-	kWh
0.5	0.35	0.5	53.57	100,000	937.4083320

Main Active Energy - Standby					
		C_{atd}	Main Active Power - Standby (Pm)	Time of one cycle trip (C)	Main Active Energy - Standby per annum (Ems)
		-	W	s	kWh
		0.5	64.00	87	522

Ancillary Active Energy - Running					
		C_{atd}	Ancillary Active Energy - Running per 1 cycle trip (Eca)	Number of ttrips per annum (n_{trip})	Ancillary Active Energy - Running per annum (Eya)
		-	Wh	-	kWh
		0.5	2.00	100,000	100

Ancillary Active Energy - Standby					
		C_{atd}	Ancillary Active Power - Standby (Pa)	Time of one cycle trip (C)	Ancillary Active Energy - Standby per annum (Eas)
		-	W	s	kWh
		0.5	28.00	87	228

Active Energy - Running (Main + Ancillary)	
Active Energy - Running (Main + Ancillary) per 1 cycle trip	Active Energy - Running (Main + Ancillary) per annum (Eyr)
Wh	kWh
55.57	1037.41

Active Energy - Standby (Main + Ancillary)	
Active Power - Standby (Main + Ancillary)	Active Energy - Standby (Main + Ancillary) per annum (Eys)
W	kWh
92.00	750
Summary Active Energy - (Running + Standby) (Main + Ancillary) per annum	
Summary Active Energy - Running + Standby (Main + Ancillary) per annum (Ey)	
kWh	
1787.41	
Relation of Active Energy - Standby, per annum to Summary Active Energy - (Running + Standby), per annum	
%	
42%	

6. A lift in a multifamily residential building.
Warsaw, ul. Grójecka 69

Lift description:

The subject under study is a lift modernized in 2007. The following technical solutions were applied, with a direct influence on electricity consumption:

Controller type:

microprocessor controller, equipped with an inverter (FUJI Frenic Lift), working within a closed loop; safety chain and contactors powered by 230V traditional supplier.

Hoist:

gearless hoist with an encoder and 4.5 kW VVVF synchronous motor.

Car door operator:

DC motor controlled by a microprocessor controller.

Car lighting:

compact fluorescent lamps, about 72 W (4 x 18W).

Display:

Led indicators in the car and on the base floor; highlighted buttons to confirm calls.

Ancillary devices:

not available.

Additional control functions:

a. light switch off function after a specific period of time – not available;
b. inverter switch off function after a specific standby period – not available;
c. display switch off function after a specific standby period – not available;
d. parking function – not available.

General information about the lift and measuring instrument		
Description	**Specification**	**Comments**
Building category	residential	
Building address	Warszawa ul. Grójecka 69	
Number of storeys	8	
Lift manufacturer	Elektrodźwig	
Year of installation	2007	
Type (Catalogue number)		
Technology (Geared, Geareless or Hydro)	geareles	
Technology (Electro-mechanic or Electronic)	electronic	
Suspention (1:1 or 2:1)	1:1	
Nominal load [kg]	400kg	
Nominal power on motor plate [kW]	4.5	
Speed [m/s]	1	
Maximum travel heigh [m.]	25	
Number of trips per annum	70000	
Instrument manufacturer	Hioki	
Instrument model number	3169-21	
Instrument settings:		
Current range (Main Energy Running) [A]	50A	
Current range (Main Energy Standby) [A]	5A	
Current range (Ancillary Energy Running) [A]	1A	
Current range (Ancillary Energy Standby) [A]	1A	
Interval Time [s] - Running	100ms	
Other (plese specify)		
Date	11/2/2009	

Active Energy Consumption

Main Active Energy - Running						
	C_{bal}	C_{aml}	C_{atd}	Main Active Energy - Running per 1 cycle trip (Ecm)	Number of trips per annum (n_{trip})	Main Active Energy - Running per annum (Eym)
	-	-	-	Wh	-	kWh
	0.5	0.35	0.5	11.25	70000	137.81

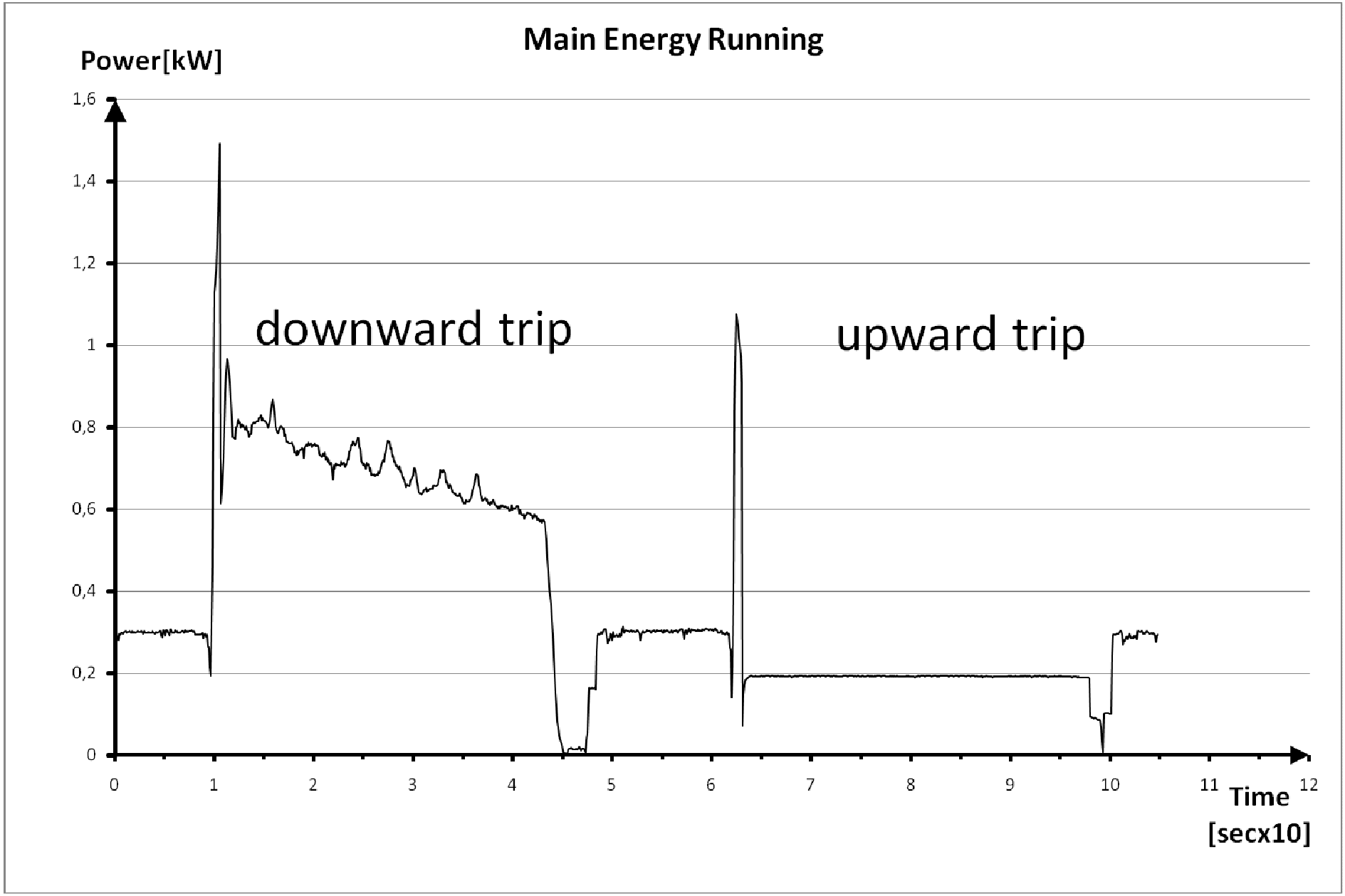
Main Active Energy - Standby						
			C_{atd}	Main Active Power - Standby (Pm)	Time of one cycle trip (C)	Main Active Energy - Standby per annum (Ems)
			-	W	s	kWh
			0.5	326.23	105	2691

Ancillary Active Energy - Running						
			C_{atd}	Ancillary Active Energy - Running per 1 cycle trip (Eca)	Number of ttrips per annum (n_{trip})	Ancillary Active Energy - Running per annum (Eya)
			-	Wh	-	kWh
			0.5	2.23	70000	78

Ancillary Active Energy - Standby						
			C_{atd}	Ancillary Active Power - Standby (Pa)	Time of one cycle trip (C)	Ancillary Active Energy - Standby per annum (Eas)
			-	W	s	kWh
			0.5	75.84	105	626

Active Energy - Running (Main + Ancillary)	
Active Energy - Running (Main + Ancillary) per 1 cycle trip	Active Energy - Running (Main + Ancillary) per annum (Eyr)
Wh	kWh
13.48	215.81
Active Energy - Standby (Main + Ancillary)	
Active Power - Standby (Main + Ancillary)	Active Energy - Standby (Main + Ancillary) per annum (Eys)
W	kWh
402.07	3317.00
Summary Active Energy - (Running + Standby) (Main + Ancillary) per annum	
Summary Active Energy - Running + Standby (Main + Ancillary) per annum (Ey)	
kWh	
3532.81	

Relation of Active Energy - Standby, per annum to Summary Active Energy - (Running + Standby), per annum
%
94%


Main Energy Running
Power[kW]
1,6
1,4
1,2
1
0,8
0,6
0,4
0,2
0
downward trip
upward trip
0
1
2
3
4
5
6
7
8
9
10
11
12
Time
[secx10]

7. A lift in a multifamily residential building.

Warsaw, ul. Grójecka 69

(with a reactor installed in an inverter)

Lift description:

The subject under study is a lift modernized in 2007. The following technical solutions were applied, with a direct influence on electricity consumption:

Controller type:

microprocessor controller, equipped with an inverter (FUJI Frenic Lift), working within a closed loop; safety chain and contactors powered by 230V traditional supplier.

Hoist:

gearless hoist with an encoder and 4.5 kW VVVF synchronous motor.

Car door operator:

DC motor controlled by a microprocessor controller.

Car lighting:

compact fluorescent lamps, about 72 W (4 x 18W).

Display:

Led indicators in the car and on the base floor; highlighted buttons to confirm calls.

Ancillary devices:

not available.

Additional control functions:

a. light switch off function after a specific period of time – not available;
b. inverter switch off function after a specific standby period – not available;
c. display switch off function after a specific standby period – not available;
d. parking function – not available.

General information about the lift and measuring instrument		
Description	**Specification**	**Comments**
Building category	residential	
Building address	Warszawa ul. Grójecka 69	
Number of storeys	8	
Lift manufacturer	Elektrodźwig	
Year of installation	2007	
Type (Catalogue number)		
Technology (Geared, Geareless or Hydro)	geareles	
Technology (Electro-mechanic or Electronic)	electronic	
Suspention (1:1 or 2:1)	1:1	
Nominal load [kg]	400kg	
Nominal power on motor plate [kW]	4.5	
Speed [m/s]	0.63	
Maximum travel heigh [m.]	25	
Number of trips per annum	70000	
Instrument manufacturer	Hioki	
Instrument model number	3169-21	
Instrument settings:		
Current range (Main Energy Running) [A]	50A	
Current range (Main Energy Standby) [A]	5A	
Current range (Ancillary Energy Running) [A]	1A	
Current range (Ancillary Energy Standby) [A]	1A	
Interval Time [s] - Running	100ms	
Other (plese specify)		
Date	11/2/2009	

Main Active Energy - Running					
C_{bal}	C_{aml}	C_{atd}	Main Active Energy - Running per 1 cycle trip (Ecm)	Number of trips per annum (n_{trip})	Main Active Energy - Running per annum (Eym)
-	-	-	Wh	-	kWh
0.5	0.35	0.5	14.03	70000	171.87

Main Active Energy - Standby					
		C_{atd}	Main Active Power - Standby (Pm)	Time of one cycle trip (C)	Main Active Energy - Standby per annum (Ems)
		-	W	s	kWh
		0.5	314.76	105	2597

Ancillary Active Energy - Running					
		C_{atd}	Ancillary Active Energy - Running per 1 cycle trip (Eca)	Number of ttrips per annum (n_{trip})	Ancillary Active Energy - Running per annum (Eya)
		-	Wh	-	kWh
		0.5	2.23	70000	78

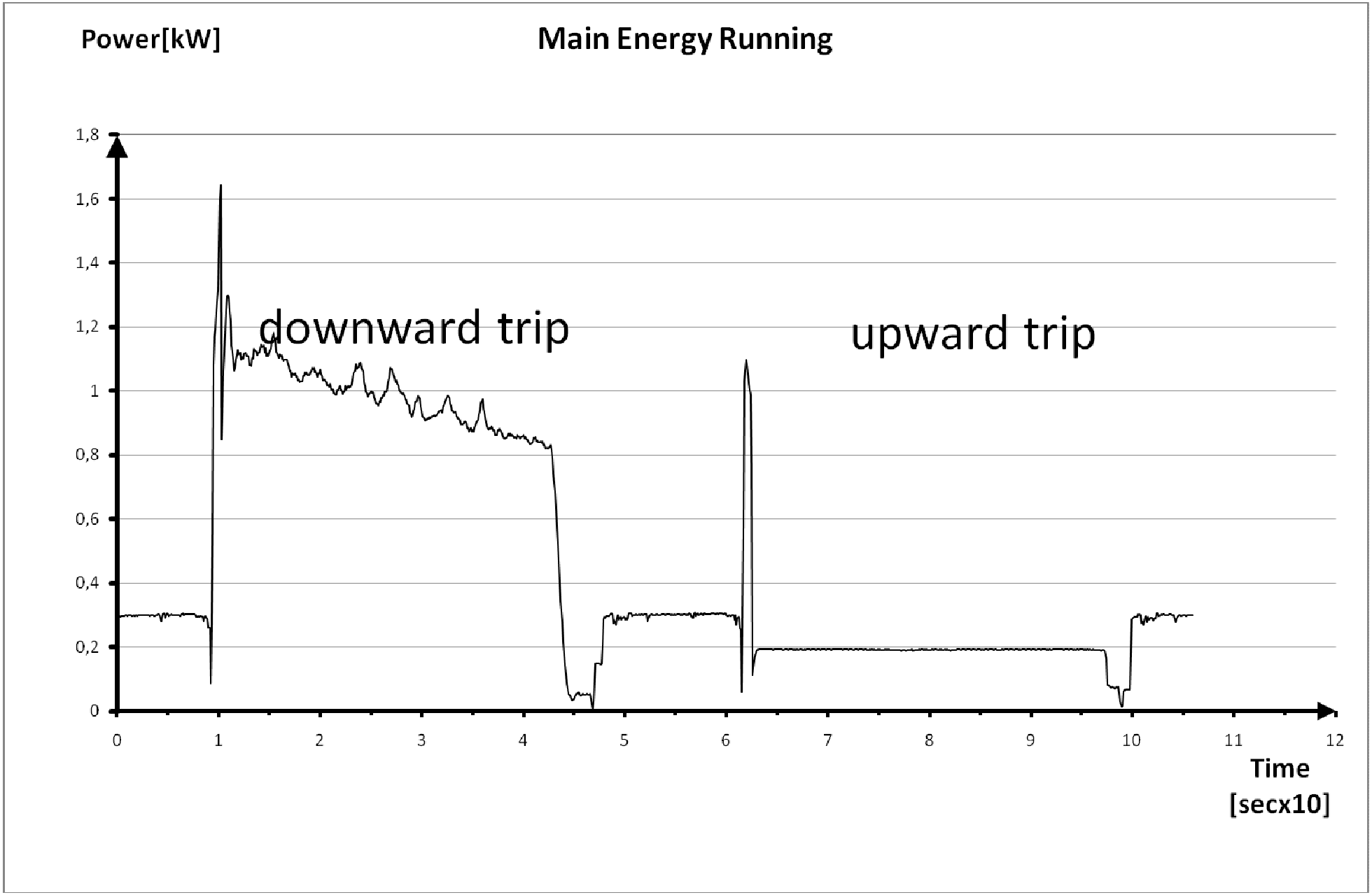
Ancillary Active Energy - Standby					
		C_{atd}	Ancillary Active Power - Standby (Pa)	Time of one cycle trip (C)	Ancillary Active Energy - Standby per annum (Eas)
		-	W	s	kWh
		0.5	75.84	105	626

Active Energy - Running (Main + Ancillary)	
Active Energy - Running (Main + Ancillary) per 1 cycle trip	Active Energy - Running (Main + Ancillary) per annum (Eyr)
Wh	kWh
16.26	249.87

Active Energy - Standby (Main + Ancillary)	
Active Power - Standby (Main + Ancillary)	Active Energy - Standby (Main + Ancillary) per annum (Eys)
W	kWh
390.60	3223.00

Summary Active Energy - (Running + Standby) (Main + Ancillary) per annum
Summary Active Energy - Running + Standby (Main + Ancillary) per annum (Ey)
kWh
3472.87

Relation of Active Energy - Standby, per annum to Summary Active Energy - (Running + Standby), per annum
%
93%


Power[kW]
Main Energy Running
1,8
1,6
1,4
1,2
1
0,8
0,6
0,4
0,2
0
downward trip
upward trip
0
1
2
3
4
5
6
7
8
9
10
11
12
Time
[secx10]

8. A lift in a multifamily residential building.
Lublin, ul. Jaczewskiego 8

Lift description:

The subject under study is a lift modernized in 2001. The following technical solutions were applied, with a direct influence on electricity consumption:

Controller type:

microprocessor; AC2 drive; safety chain and contactors powered by 48V traditional supplier.

Hoist:

gear machine with a 5.5 kW AC2 drive asynchronous motor.

Car door operator:

not available.

Car lighting:

compact fluorescent lamps, about 72 W (4 x 18W).

Display:

Led indicators in the car and on the base floor; highlighted buttons to confirm calls.

Ancillary devices:

not available.

Additional control functions:

a. light switch off function after a specific period of time – not available;
b. inverter switch off function after a specific standby period – not available;
c. display switch off function after a specific standby period – not available;
d. parking function – not available.

General information about the lift and measuring instrument		
Description	**Specification**	**Comments**
Building category	hospital	
Building address	Lublin ul. Jaczewskiego	
Number of storeys	7	
Lift manufacturer	LWDO Lift Service S.A	
Year of installation	2001	
Type (Catalogue number)		
Technology (Geared, Geareless or Hydro)	geared	
Technology (Electro-mechanic or Electronic)	electronic	
Suspention (1:1 or 2:1)	1:1	
Nominal load [kg]	500kg	
Nominal power on motor plate [kW]	5.5	
Speed [m/s]	0.63	
Maximum travel heigh [m.]	24.5	
Number of trips per annum	70,000	
Instrument manufacturer	Hioki	
Instrument model number	3169-21	
Instrument settings:		
Current range (Main Energy Running) [A]	50A	
Current range (Main Energy Standby) [A]	5A	
Current range (Ancillary Energy Running) [A]	1A	
Current range (Ancillary Energy Standby) [A]	1A	
Interval Time [s]	100ms	
Other (plese specify)		
Date	23/03/2009	

Main Active Energy - Running					
C_{bal}	C_{aml}	C_{atd}	Main Active Energy - Running per 1 cycle trip (Ecm)	Number of trips per annum (n_{trip})	Main Active Energy - Running per annum (Eym)
-	-	-	Wh	-	kWh
0.5	0.35	0.5	54.16	100,000	947.80
Main Active Energy - Standby					
		C_{atd}	Main Active Power - Standby (Pm)	Time of one cycle trip (C)	Main Active Energy - Standby per annum (Ems)
		-	W	s	kWh
		0.5	84.01	72	694

Ancillary Active Energy - Running					
		C_{atd}	Ancillary Active Energy - Running per 1 cycle trip (Eca)	Number of ttrips per annum (n_{trip})	Ancillary Active Energy - Running per annum (Eya)
		-	Wh	-	kWh
		0.5	0.13	100,000	7

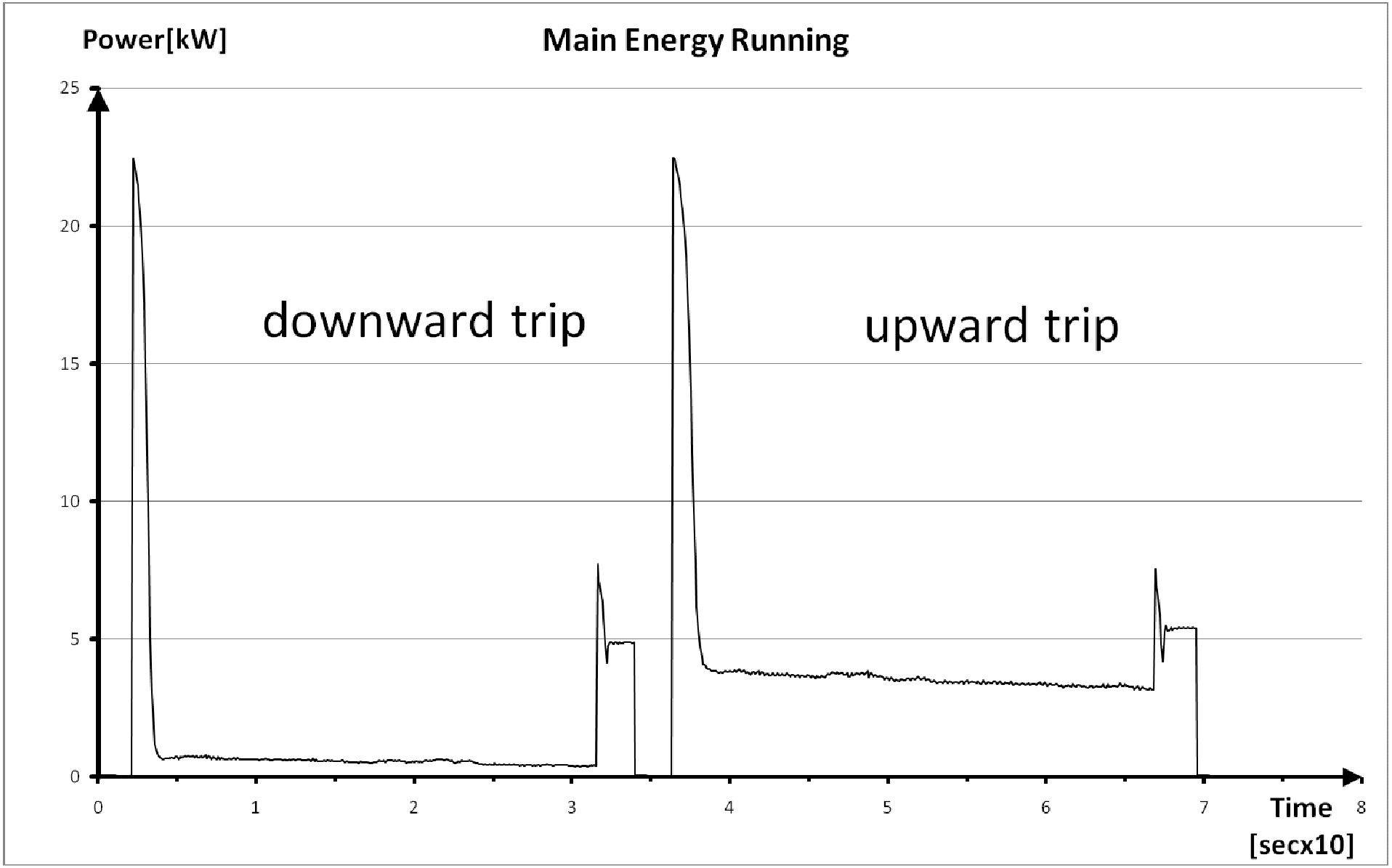
Ancillary Active Energy - Standby					
		C_{atd}	Ancillary Active Power - Standby (Pa)	Time of one cycle trip (C)	Ancillary Active Energy - Standby per annum (Eas)
		-	W	s	kWh
		0.5	6.54	72	54

Active Energy - Running (Main + Ancillary)	
Active Energy - Running (Main + Ancillary) per 1 cycle trip	Active Energy - Running (Main + Ancillary) per annum (Eyr)
Wh	kWh
54.29	954.80

Active Energy - Standby (Main + Ancillary)	
Active Power - Standby (Main + Ancillary)	Active Energy - Standby (Main + Ancillary) per annum (Eys)
W	kWh
90.55	748

Summary Active Energy - (Running + Standby) (Main + Ancillary) per annum
Summary Active Energy - Running + Standby (Main + Ancillary) per annum (Ey)
kWh
1702.80

Relation of Active Energy - Standby, per annum to Summary Active Energy - (Running + Standby), per annum
%
44%


Power[kW]
Main Energy Running
25
20
15
10
5
0
downward trip
upward trip
0
1
2
3
4
5
6
7
8
Time
[secx10]

9. A lift in a multifamily residential building.

Lublin, ul. Jaczewskiego 8

Lift description:

The subject under study is a lift modernized in 2001. The following technical solutions were applied, with a direct influence on electricity consumption:

Controller type:

microprocessor; hydraulic lift with proportional valves; safety chains and contactors powered by 48V traditional supplier.

Hoist:

24kW hydraulic power unit with proportional valve block.

Car door operator:

3 x 380 mechanical drive without regulator.

Car lighting:

8 x 25 W bulb with a reflector and reduction transformer, about 263 W (84 x 25 W + about 64 W loss on the transformer).

Display:

Led indicators in the car and on the base floor; highlighted buttons to confirm calls.

Ancillary devices:

not available.

Additional control functions:

a. light switch off function after a specific period of time – not available;
b. inverter switch off function after a specific standby period – not available;
c. display switch off function after a specific standby period – not available;
d. parking function – not available.

General information about the lift and measuring instrument		
Description	**Specification**	**Comments**
Building category	hospital	
Building address	Lublin ul. Jaczewskiego 8	
Number of storeys	7	
Lift manufacturer	LWDO Lift Service S.A	
Year of installation	2001	
Type (Catalogue number)		
Technology (Geared, Geareless or Hydro)	hydro	
Technology (Electro-mechanic or Electronic)	electronic	
Suspention (1:1 or 2:1)	1:1	
Nominal load [kg]	1500kg	
Nominal power on motor plate [kW]	24	
Speed [m/s]	0,63	
Maximum travel heigh [m.]	24.5	
Number of trips per annum	70,000	
Instrument manufacturer	Hioki	
Instrument model number	3169-21	
Instrument settings:		
Current range (Main Energy Running) [A]	50A	
Current range (Main Energy Standby) [A]	5A	
Current range (Ancillary Energy Running) [A]	1A	
Current range (Ancillary Energy Standby) [A]	1A	
Interval Time [s]	100ms	
Other (plese specify)		
Date	23/03/2009	

Main Active Energy - Running					
C_{bal}	C_{aml}	C_{atd}	Main Active Energy - Running per 1 cycle trip (Ecm)	Number of trips per annum (n_{trip})	Main Active Energy - Running per annum (Eym)
-	-	-	Wh	-	kWh
0.5	0.35	0.5	349.29	70,000	4,278.80

Main Active Energy - Standby					
		C_{atd}	Main Active Power - Standby (Pm)	Time of one cycle trip (C)	Main Active Energy - Standby per annum (Ems)
		-	W	s	kWh
		0.5	206.70	126	1,684

Ancillary Active Energy - Running					
		C_{atd}	Ancillary Active Energy - Running per 1 cycle trip (Eca)	Number of ttrips per annum (n_{trip})	Ancillary Active Energy - Running per annum (Eya)
		-	Wh	-	kWh
		0.5	5.12	70,000	179

Ancillary Active Energy - Standby					
		C_{atd}	Ancillary Active Power - Standby (Pa)	Time of one cycle trip (C)	Ancillary Active Energy - Standby per annum (Eas)
		-	W	s	kWh
		0.5	242.61	126	1,977

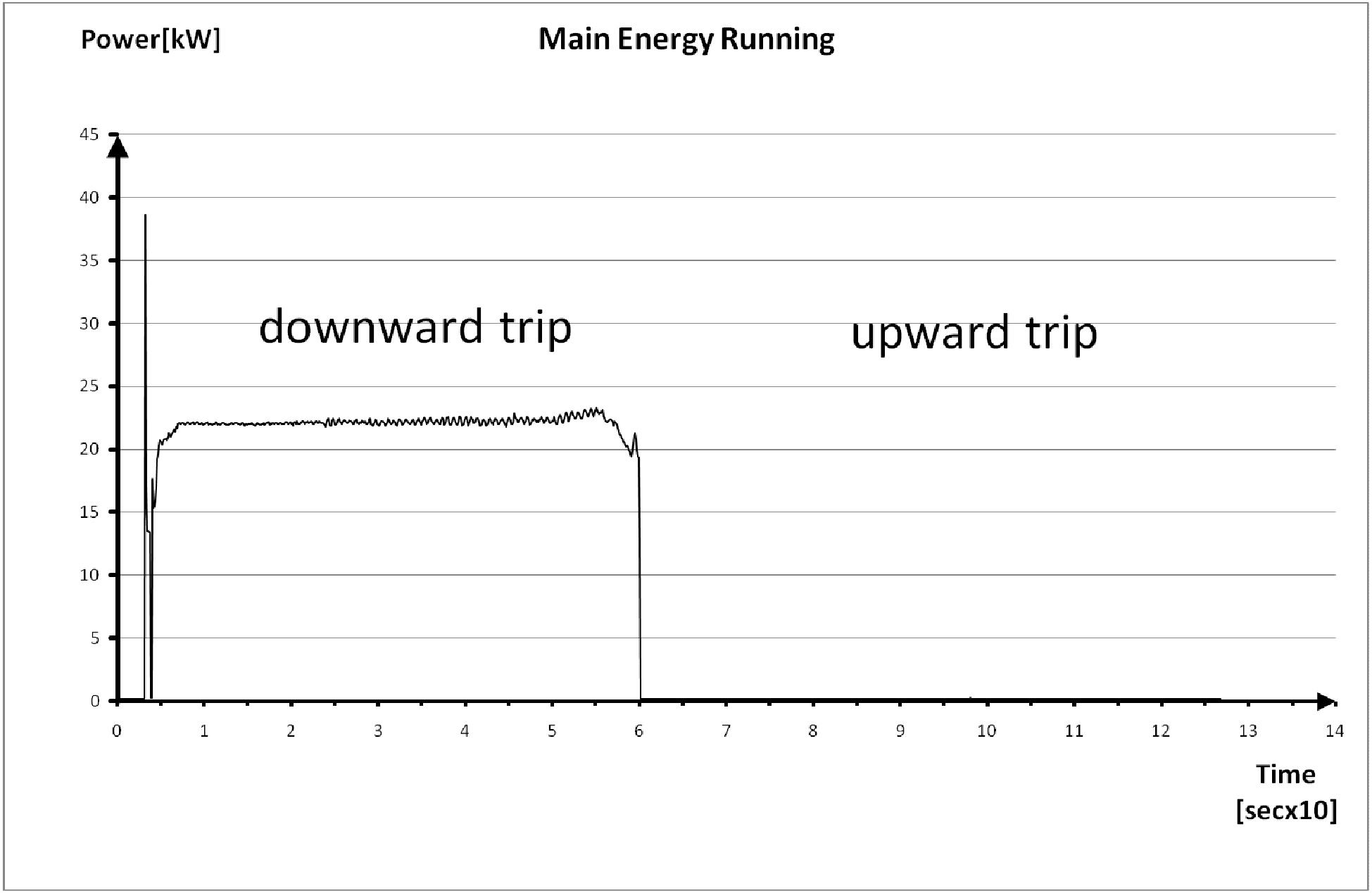
Active Energy - Running (Main + Ancillary)	
Active Energy - Running (Main + Ancillary) per 1 cycle trip	Active Energy - Running (Main + Ancillary) per annum (Eyr)
Wh	kWh
354.41	4457.80

Active Energy - Standby (Main + Ancillary)	
Active Power - Standby (Main + Ancillary)	Active Energy - Standby (Main + Ancillary) per annum (Eys)
W	kWh
449.31	3,661

Summary Active Energy - (Running + Standby) (Main + Ancillary) per annum
Summary Active Energy - Running + Standby (Main + Ancillary) per annum (Ey)
kWh
8118.80

Relation of Active Energy - Standby, per annum to Summary Active Energy - (Running + Standby), per annum

%
45%


Power[kW]
Main Energy Running
45
40
35
30
25
20
15
10
5
0
downward trip
upward trip
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
Time
[secx10]

10. A lift in a multifamily residential building.
Warsaw, ul. Darwina 13

Lift description:

The subject under study is a lift modernized in 2008. The following technical solutions were applied, with a direct influence on electricity consumption:

Controller type:

microprocessor with an inverter; safety chains and contactors powered by 220V traditional supplier.

Hoist:

gear machine (Penta 830) with 7.5 kW motor

Car door operator:

Hydra PLUS ECO with a DC motor controlled by a microprocessor controller.

Car lighting:

four fluorescent lamps (18 W) behind a false ceiling, at the time of measurement only three lamps were on; 54 W.

Display:

LED indicators placed on each floor and In the car; highlighted buttons to confirm calls.

Ancillary devices:

not available.

Additional control functions:

a. light switch off function after a specific period of time – not available;
b. inverter switch off function after a specific standby period – not available;
c. display switch off function after a specific standby period – not available;
d. parking function – not available.

General information about the lift and measuring instrument		
Description	**Specification**	**Comments**
Building category	residential	
Building address	Warszawa ul. Darwina 13	
Number of storeys	12	
Lift manufacturer	Mark-Dźwig	
Year of installation	2008	
Type (Catalogue number)		
Technology (Geared, Geareless or Hydro)	geared	
Technology (Electro-mechanic or Electronic)	electronic	
Suspention (1:1 or 2:1)	1:1	
Nominal load [kg]	450kg	
Nominal power on motor plate [kW]	7.5	
Speed [m/s]	1	
Maximum travel heigh [m.]	31	
Number of trips per annum	70,000	
Instrument manufacturer	Hioki	
Instrument model number	3169-21	
Instrument settings:		
Current range (Main Energy Running) [A]	50A	
Current range (Main Energy Standby) [A]	5A	
Current range (Ancillary Energy Running) [A]	1A	
Current range (Ancillary Energy Standby) [A]	1A	
Interval Time [s]	100ms	
Other (plese specify)		
Date	25/04/2009	

Main Active Energy - Running					
C_{bal}	C_{aml}	C_{atd}	Main Active Energy - Running per 1 cycle trip (Ecm)	Number of trips per annum (n_{trip})	Main Active Energy - Running per annum (Eym)
-	-	-	Wh	-	kWh
0.5	0.35	0.5	42.74	70,000	523.57
Main Active Energy - Standby					
		C_{atd}	Main Active Power - Standby (Pm)	Time of one cycle trip (C)	Main Active Energy - Standby per annum (Ems)
		-	W	s	kWh
		0.5	72.04	89	600.00

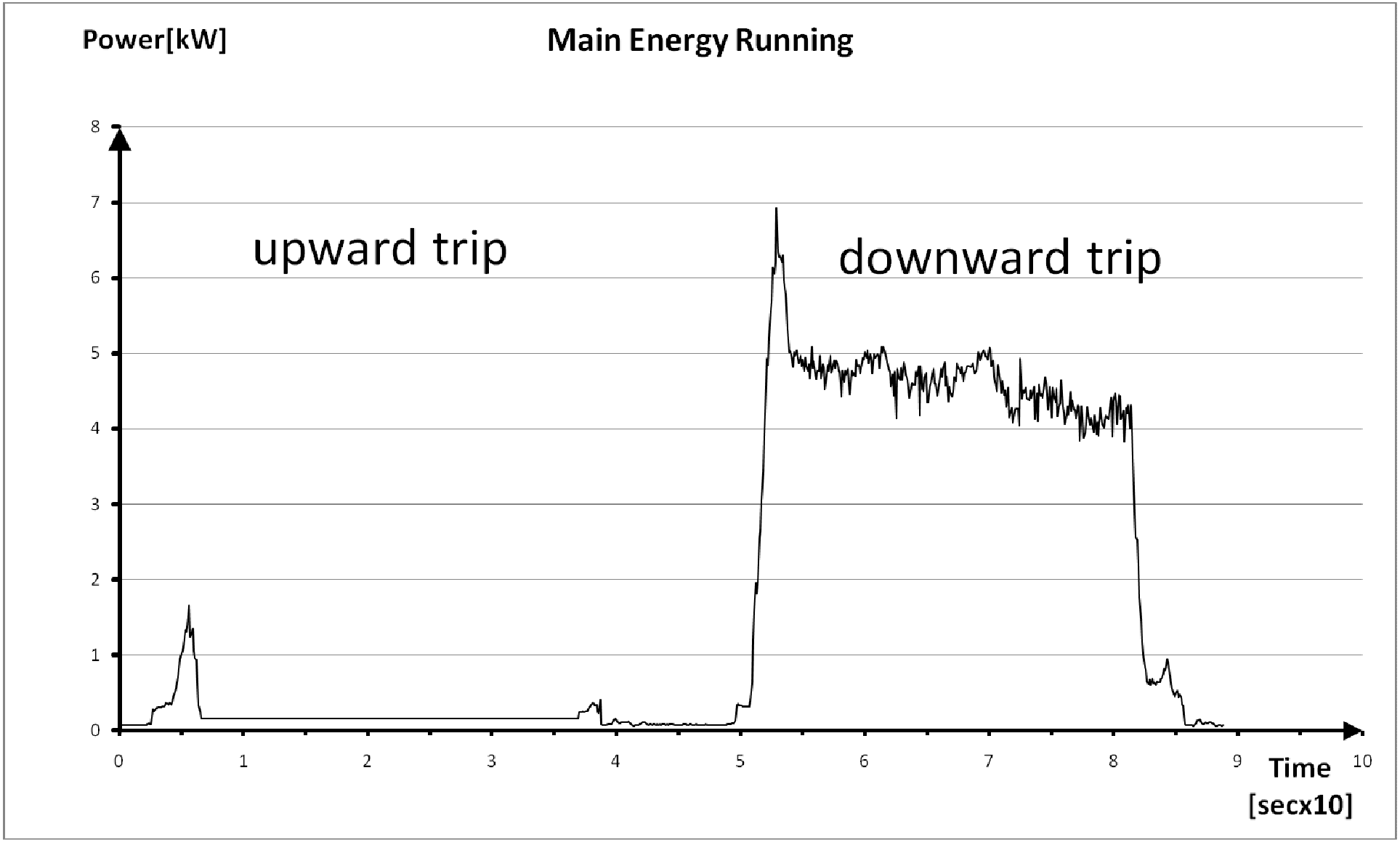
Ancillary Active Energy - Running					
		C_{atd}	Ancillary Active Energy - Running per 1 cycle trip (Eca)	Number of ttrips per annum (n_{trip})	Ancillary Active Energy - Running per annum (Eya)
		-	Wh	-	kWh
		0.5	1.23	70,000	43

Ancillary Active Energy - Standby					
		C_{atd}	Ancillary Active Power - Standby (Pa)	Time of one cycle trip (C)	Ancillary Active Energy - Standby per annum (Eas)
		-	W	s	kWh
		0.5	53.54	89	446

Active Energy - Running (Main + Ancillary)	
Active Energy - Running (Main + Ancillary) per 1 cycle trip	Active Energy - Running (Main + Ancillary) per annum (Eyr)
Wh	kWh
43.97	566.57

Active Energy - Standby (Main + Ancillary)	
Active Power - Standby (Main + Ancillary)	Active Energy - Standby (Main + Ancillary) per annum (Eys)
W	kWh
125.58	1,046

Summary Active Energy - (Running + Standby) (Main + Ancillary) per annum
Summary Active Energy - Running + Standby (Main + Ancillary) per annum (Ey)
kWh
1612.57
Relation of Active Energy - Standby, per annum to Summary Active Energy - (Running + Standby), per annum
%
65%


Power[kW]
Main Energy Running
upward trip
downward trip
8
7
6
5
4
3
2
1
0
0
1
2
3
4
5
6
7
8
9
10
Time
[secx10]

11. A lift in a multifamily residential building.
Warsaw, ul. Darwina 1a

Lift description:

The subject under study is a lift modernized in 2007. The following technical solutions were applied, with a direct influence on electricity consumption:

Controller type:

microprocessor with an inverter; safety chains and contactors powered by 220V traditional supplier.

Hoist:

gear machine (TORO) with 7.5 kW motor

Car door operator:

AC motor controlled by a microprocessor controller.

Car lighting:

four fluorescent lamps (18 W) behind a false ceiling, at the time of measurement only three lamps were on; 54 W.

Display:

LED indicators placed on each floor and In the car; highlighted buttons to confirm calls.

Ancillary devices:

not available.

Additional control functions:

a. light switch off function after a specific period of time – not available;
b. inverter switch off function after a specific standby period – not available;
c. display switch off function after a specific standby period – not available;
d. parking function – not available.

General information about the lift and measuring instrument		
Description	**Specification**	**Comments**
Building category	residential	
Building address	Warszawa ul. Darwina 1A	
Number of storeys	12	
Lift manufacturer	Mark-Dźwig	
Year of installation	2007	
Type (Catalogue number)		
Technology (Geared, Geareless or Hydro)	geared	
Technology (Electro-mechanic or Electronic)	electronic	
Suspention (1:1 or 2:1)	1:1	
Nominal load [kg]	450kg	
Nominal power on motor plate [kW]	7.5	
Speed [m/s]	1	
Maximum travel heigh [m.]	31	
Number of trips per annum	70,000	
Instrument manufacturer	Hioki	
Instrument model number	3169-21	
Instrument settings:		
Current range (Main Energy Running) [A]	50A	
Current range (Main Energy Standby) [A]	5A	
Current range (Ancillary Energy Running) [A]	1A	
Current range (Ancillary Energy Standby) [A]	1A	
Interval Time [s]	100ms	
Other (plese specify)		
Date	25/04/2009	

Main Active Energy - Running					
C_{bal}	C_{aml}	C_{atd}	Main Active Energy - Running per 1 cycle trip (Ecm)	Number of trips per annum (n_{trip})	Main Active Energy - Running per annum (Eym)
-	-	-	Wh	-	kWh
0.5	0.35	0.5	38.27	70,000	468.81

Main Active Energy - Standby					
		C_{atd}	Main Active Power - Standby (Pm)	Time of one cycle trip (C)	Main Active Energy - Standby per annum (Ems)
		-	W	s	kWh
		0.5	119.98	112	986

Ancillary Active Energy - Running					
		C_{atd}	Ancillary Active Energy - Running per 1 cycle trip (Eca)	Number of ttrips per annum (n_{trip})	Ancillary Active Energy - Running per annum (Eya)
		-	Wh	-	kWh
		0.5	0.00	70,000	0

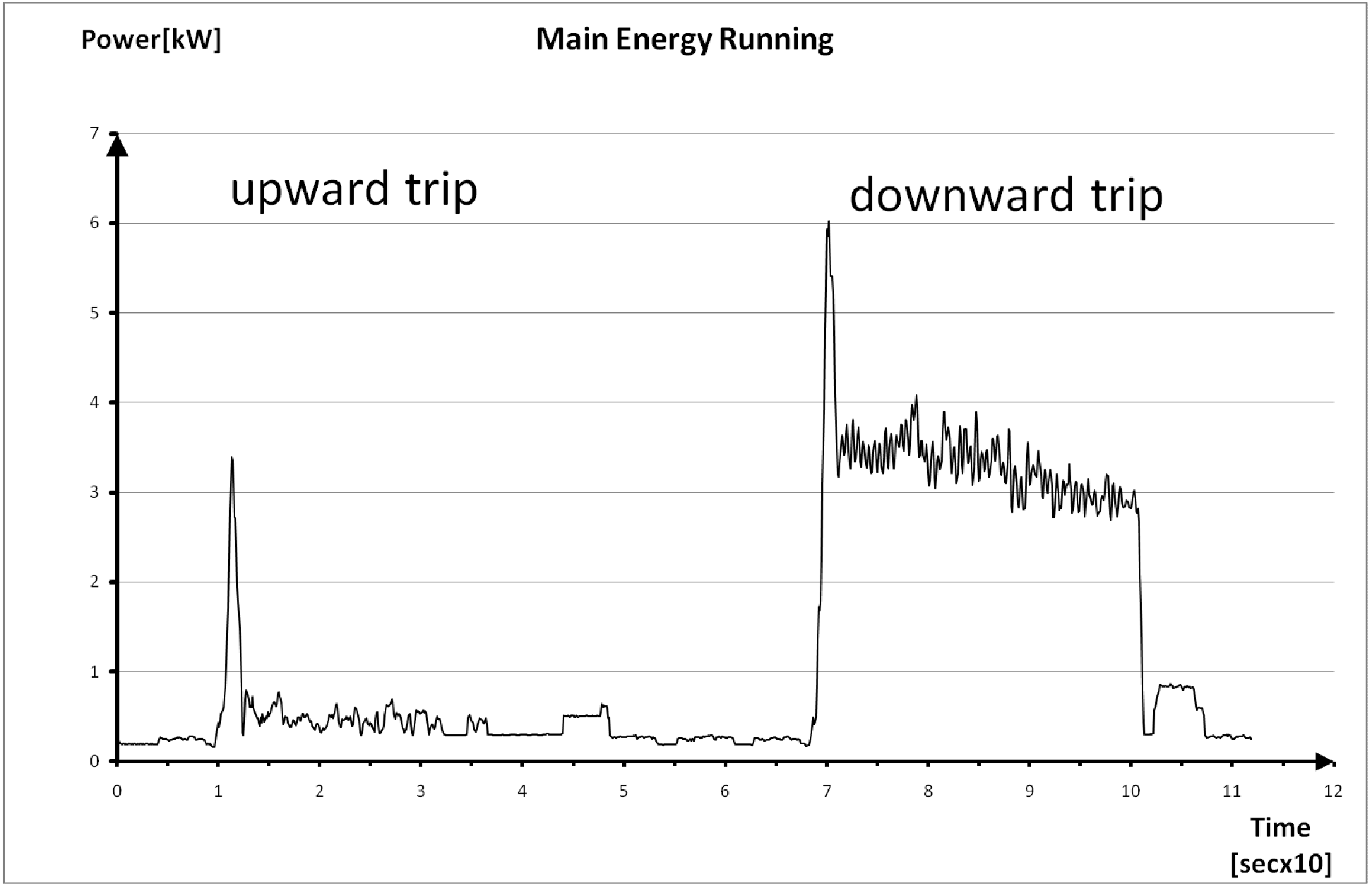
Ancillary Active Energy - Standby					
		C_{atd}	Ancillary Active Power - Standby (Pa)	Time of one cycle trip (C)	Ancillary Active Energy - Standby per annum (Eas)
		-	W	s	kWh
		0.5	0.00	112	0

Active Energy - Running (Main + Ancillary)	
Active Energy - Running (Main + Ancillary) per 1 cycle trip	Active Energy - Running (Main + Ancillary) per annum (Eyr)
Wh	kWh
38.27	468.81

Active Energy - Standby (Main + Ancillary)	
Active Power - Standby (Main + Ancillary)	Active Energy - Standby (Main + Ancillary) per annum (Eys)
W	kWh
119.98	986

Summary Active Energy - (Running + Standby) (Main + Ancillary) per annum
Summary Active Energy - Running + Standby (Main + Ancillary) per annum (Ey)
kWh
1454.81

Relation of Active Energy - Standby, per annum to Summary Active Energy - (Running + Standby), per annum
%
68%


Power[kW]
Main Energy Running
upward trip
downward trip
7
6
5
4
3
2
1
0
0
1
2
3
4
5
6
7
8
9
10
11
12
Time
[secx10]

12. A lift in a multifamily residential building.
Płock, ul. Piasta Kołodzieja 3

Lift description:

The subject under study is a lift modernized in 2008. The following technical solutions were applied, with a direct influence on electricity consumption:

Controller type:

microprocessor with an inverter; safety chains and contactors powered by 220V traditional supplier.

Hoist:

gear machine (TORO) with 7.5 kW motor

Car door operator:

AC motor controlled by a microprocessor controller.

Car lighting:

four fluorescent lamps (18 W) behind a false ceiling, at the time of measurement only three lamps were on; 54 W.

Display:

LED indicators placed on each floor and in the car; highlighted buttons to confirm calls.

Ancillary devices:

not available.

Additional control functions:

a. light switch off function after a specific period of time – not available;
b. inverter switch off function after a specific standby period – not available;
c. display switch off function after a specific standby period – not available;
d. parking function – not available.

General information about the lift and measuring instrument		
Description	**Specification**	**Comments**
Building category	residential	
Building address	ul. Piasta Kołodzieja 3 Płock	
Number of storeys	11	
Lift manufacturer	ED Jan Śniegocki	
Year of installation	2008	
Type (Catalogue number)		
Technology (Geared, Geareless or Hydro)	geareles	
Technology (Electro-mechanic or Electronic)	electronic	
Suspention (1:1 or 2:1)	1:1	
Nominal load [kg]	375kg	
Nominal power on motor plate [kW]	2.7	
Speed [m/s]	1	
Maximum travel heigh [m.]	28	
Number of trips per annum	70,000	
Instrument manufacturer	Hioki	
Instrument model number	3169-21	
Instrument settings:		
Current range (Main Energy Running) [A]	50A	
Current range (Main Energy Standby) [A]	5A	
Current range (Ancillary Energy Running) [A]	1A	
Current range (Ancillary Energy Standby) [A]	1A	
Interval Time [s]	100ms	
Other (plese specify)		
Date	28/04/2009	

Main Active Energy - Running					
C_{bal}	C_{aml}	C_{atd}	Main Active Energy - Running per 1 cycle trip (Ecm)	Number of trips per annum (n_{trip})	Main Active Energy - Running per annum (Eym)
-	-	-	Wh	-	kWh
0.5	0.35	0.5	36.30	70,000	444.68
Main Active Energy - Standby					
		C_{atd}	Main Active Power - Standby (Pm)	Time of one cycle trip (C)	Main Active Energy - Standby per annum (Ems)
		-	W	s	kWh
		0.5	74.10	79	621.00

Ancillary Active Energy - Running					
		C_{atd}	Ancillary Active Energy - Running per 1 cycle trip (Eca)	Number of ttrips per annum (n_{trip})	Ancillary Active Energy - Running per annum (Eya)
		-	Wh	-	kWh
		0.5	1.16	70,000	40.00

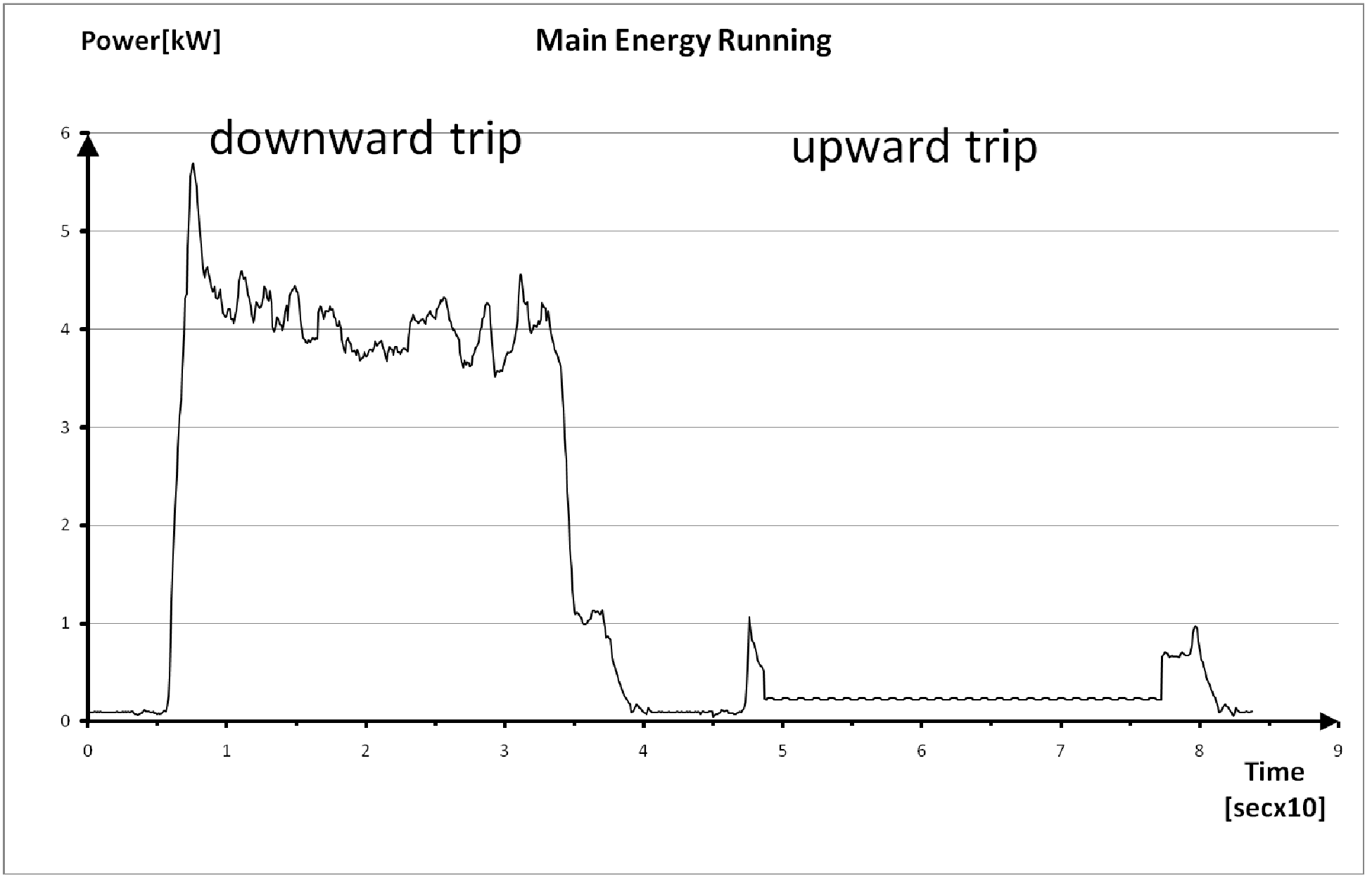
Ancillary Active Energy - Standby					
		C_{atd}	Ancillary Active Power - Standby (Pa)	Time of one cycle trip (C)	Ancillary Active Energy - Standby per annum (Eas)
		-	W	s	kWh
		0.5	52.64	79	441.00

Active Energy - Running (Main + Ancillary)	
Active Energy - Running (Main + Ancillary) per 1 cycle trip	Active Energy - Running (Main + Ancillary) per annum (Eyr)
Wh	kWh
37.46	484.68

Active Energy - Standby (Main + Ancillary)	
Active Power - Standby (Main + Ancillary)	Active Energy - Standby (Main + Ancillary) per annum (Eys)
W	kWh
126.74	1,062

Summary Active Energy - (Running + Standby) (Main + Ancillary) per annum
Summary Active Energy - Running + Standby (Main + Ancillary) per annum (Ey)
kWh
1546.68
Relation of Active Energy - Standby, per annum to Summary Active Energy - (Running + Standby), per annum

%
69%


Power[kW]
Main Energy Running
downward trip
upward trip
6
5
4
3
2
1
0
0
1
2
3
4
5
6
7
8
9
Time
[secx10]

13. A lift in a hospital.

Płock, ul. Medyczna 19

(with compensation chains installed)

Lift description:

The subject under study is a lift modernized in 2008. The following technical solutions were applied, with a direct influence on electricity consumption:

Controller type:

microprocessor with an inverter; safety chains and contactors powered by 220V traditional supplier.

Hoist:

gearless machine with 10.9 kW motor

Car door operator:

DC motor controlled by a microprocessor controller.

Car lighting:

fluorescent lamps behind a false ceiling; 138 W

Display:

LED indicators placed on each floor and in the car; highlighted buttons to confirm calls.

Ancillary devices:

not available.

Additional control functions:

a. light switch off function after a specific period of time – not available;
b. inverter switch off function after a specific standby period – not available;
c. display switch off function after a specific standby period – not available;
d. parking function – not available.

General information about the lift and measuring instrument		
Description	**Specification**	**Comments**
Building category	hospital	
Building address	Płock ul. Medyczna 19	
Number of storeys	9	
Lift manufacturer	ED Jan Śniegocki	
Year of installation	2008	
Type (Catalogue number)		
Technology (Geared, Geareless or Hydro)	geareles	
Technology (Electro-mechanic or Electronic)	electronic	
Suspention (1:1 or 2:1)	2:1	
Nominal load [kg]	1425kg	
Nominal power on motor plate [kW]	10.9	
Speed [m/s]	1	
Maximum travel heigh [m.]	26.7	
Number of trips per annum	540,000	
Instrument manufacturer	Hioki	
Instrument model number	3169-21	
Instrument settings:		
Current range (Main Energy Running) [A]	50A	
Current range (Main Energy Standby) [A]	5A	
Current range (Ancillary Energy Running) [A]	1A	
Current range (Ancillary Energy Standby) [A]	1A	
Interval Time [s]	100ms	
Other (plese specify)		
Date	28/04/2009	

Main Active Energy - Running					
C_{bal}	C_{aml}	C_{atd}	Main Active Energy - Running per 1 cycle trip (Ecm)	Number of trips per annum (n_{trip})	Main Active Energy - Running per annum (Eym)
-	-	-	Wh	-	kWh
0.5	0.35	0.3	53.54	540,000	3,035.72

Main Active Energy - Standby					
		C_{atd}	Main Active Power - Standby (Pm)	Time of one cycle trip (C)	Main Active Energy - Standby per annum (Ems)
		-	W	s	kWh
		0.3	26.50	79	185

Ancillary Active Energy - Running					
		C_{atd}	Ancillary Active Energy - Running per 1 cycle trip (Eca)	Number of ttrips per annum (n_{trip})	Ancillary Active Energy - Running per annum (Eya)
		-	Wh	-	kWh
		0.3	3.01	540,000	488

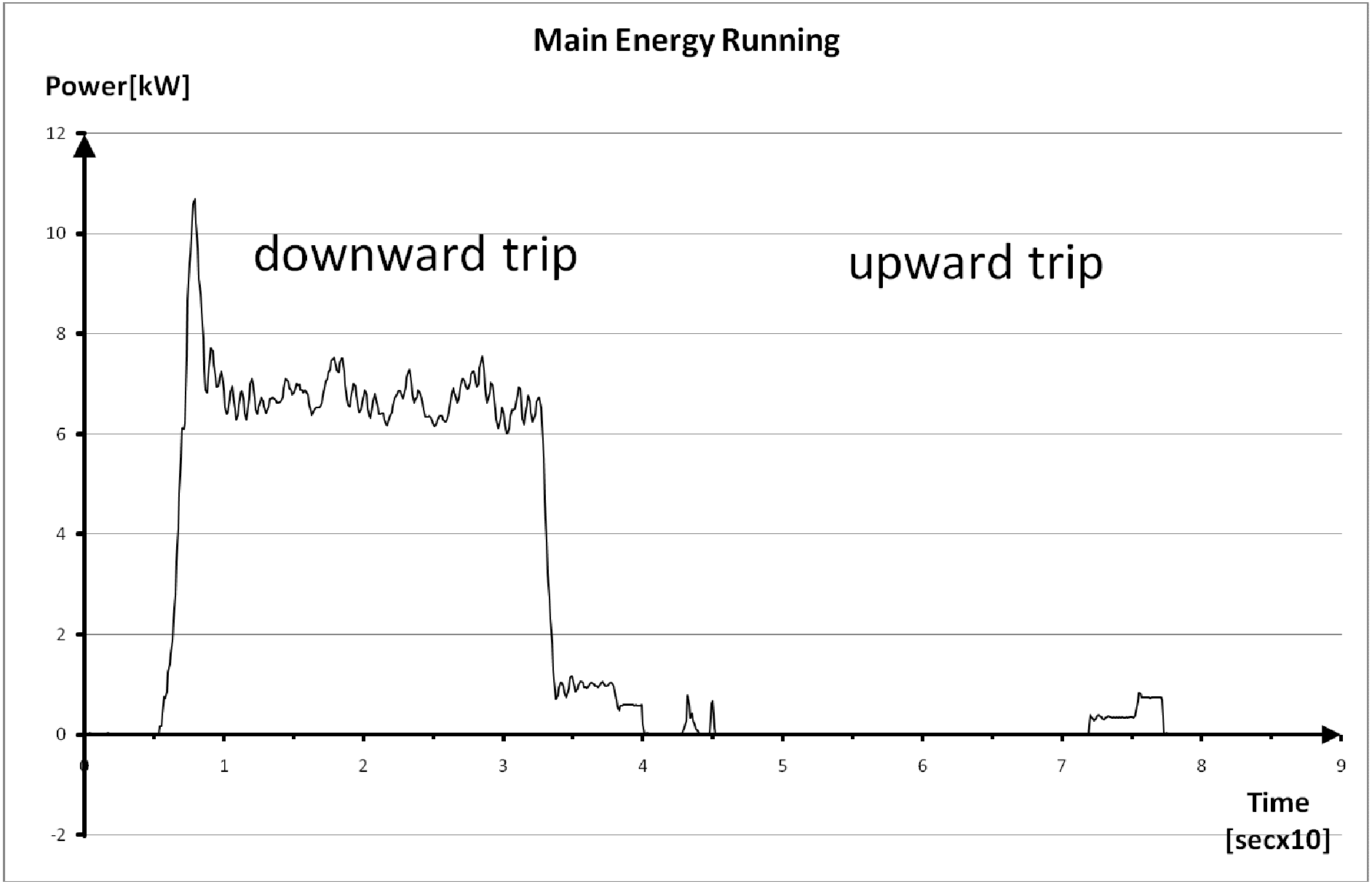
Ancillary Active Energy - Standby					
		C_{atd}	Ancillary Active Power - Standby (Pa)	Time of one cycle trip (C)	Ancillary Active Energy - Standby per annum (Eas)
		-	W	s	kWh
		0.3	137.21	79	958

Active Energy - Running (Main + Ancillary)	
Active Energy - Running (Main + Ancillary) per 1 cycle trip	Active Energy - Running (Main + Ancillary) per annum (Eyr)
Wh	kWh
56.55	3523.72

Active Energy - Standby (Main + Ancillary)	
Active Power - Standby (Main + Ancillary)	Active Energy - Standby (Main + Ancillary) per annum (Eys)
W	kWh
163.71	1,143

Summary Active Energy - (Running + Standby) (Main + Ancillary) per annum
Summary Active Energy - Running + Standby (Main + Ancillary) per annum (Ey)
kWh
4666.72

Relation of Active Energy - Standby, per annum to Summary Active Energy - (Running + Standby), per annum
%
24%


Main Energy Running
Power[kW]
12
10
8
6
4
2
0
-2
downward trip
upward trip
0
1
2
3
4
5
6
7
8
9
Time
[secx10]

14. A lift in a hospital.
Płock, ul. Medyczna 19

Lift description:

The subject under study is a lift modernized in 2008. The following technical solutions were applied, with a direct influence on electricity consumption:

Controller type:

microprocessor with an inverter; safety chains and contactors powered by 220V traditional supplier.

Hoist:

gearless machine with 10.9 kW motor

Car door operator:

DC motor controlled by a microprocessor controller.

Car lighting:

fluorescent lamps behind a false ceiling; 138 W

Display:

LED indicators placed on each floor and in the car; highlighted buttons to confirm calls.

Ancillary devices:

not available.

Additional control functions:

a. light switch off function after a specific period of time – not available;
b. inverter switch off function after a specific standby period – not available;
c. display switch off function after a specific standby period – not available;
d. parking function – not available.

General information about the lift and measuring instrument		
Description	**Specification**	**Comments**
Building category	hospital	
Building address	Płock ul. Medyczna 19	
Number of storeys	9	
Lift manufacturer	ED Jan Śniegocki	
Year of installation	2008	
Type (Catalogue number)		
Technology (Geared, Geareless or Hydro)	geareles	
Technology (Electro-mechanic or Electronic)	electronic	
Suspention (1:1 or 2:1)	2:1	
Nominal load [kg]	1425kg	
Nominal power on motor plate [kW]	10.9	
Speed [m/s]	1	
Maximum travel heigh [m.]	26.7	
Number of trips per annum	540,000	
Instrument manufacturer	Hioki	
Instrument model number	3169-21	
Instrument settings:		
Current range (Main Energy Running) [A]	50A	
Current range (Main Energy Standby) [A]	5A	
Current range (Ancillary Energy Running) [A]	1A	
Current range (Ancillary Energy Standby) [A]	1A	
Interval Time [s]	100ms	
Other (plese specify)		
Date	28/04/2009	

Main Active Energy - Running					
C_{bal}	C_{aml}	C_{atd}	Main Active Energy - Running per 1 cycle trip (Ecm)	Number of trips per annum (n_{trip})	Main Active Energy - Running per annum (Eym)
-	-	-	Wh	-	kWh
0.5	0.35	0.3	54.04	540,000	3,064.07

Main Active Energy - Standby					
		C_{atd}	Main Active Power - Standby (Pm)	Time of one cycle trip (C)	Main Active Energy - Standby per annum (Ems)
		-	W	s	kWh
		0.3	26.50	79	185

Ancillary Active Energy - Running					
		C_{atd}	Ancillary Active Energy - Running per 1 cycle trip (Eca)	Number of ttrips per annum (n_{trip})	Ancillary Active Energy - Running per annum (Eya)
		-	Wh	-	kWh
		0.3	3.01	540,000	488

Ancillary Active Energy - Standby					
		C_{atd}	Ancillary Active Power - Standby (Pa)	Time of one cycle trip (C)	Ancillary Active Energy - Standby per annum (Eas)
		-	W	s	kWh
		0.3	137.21	79	958

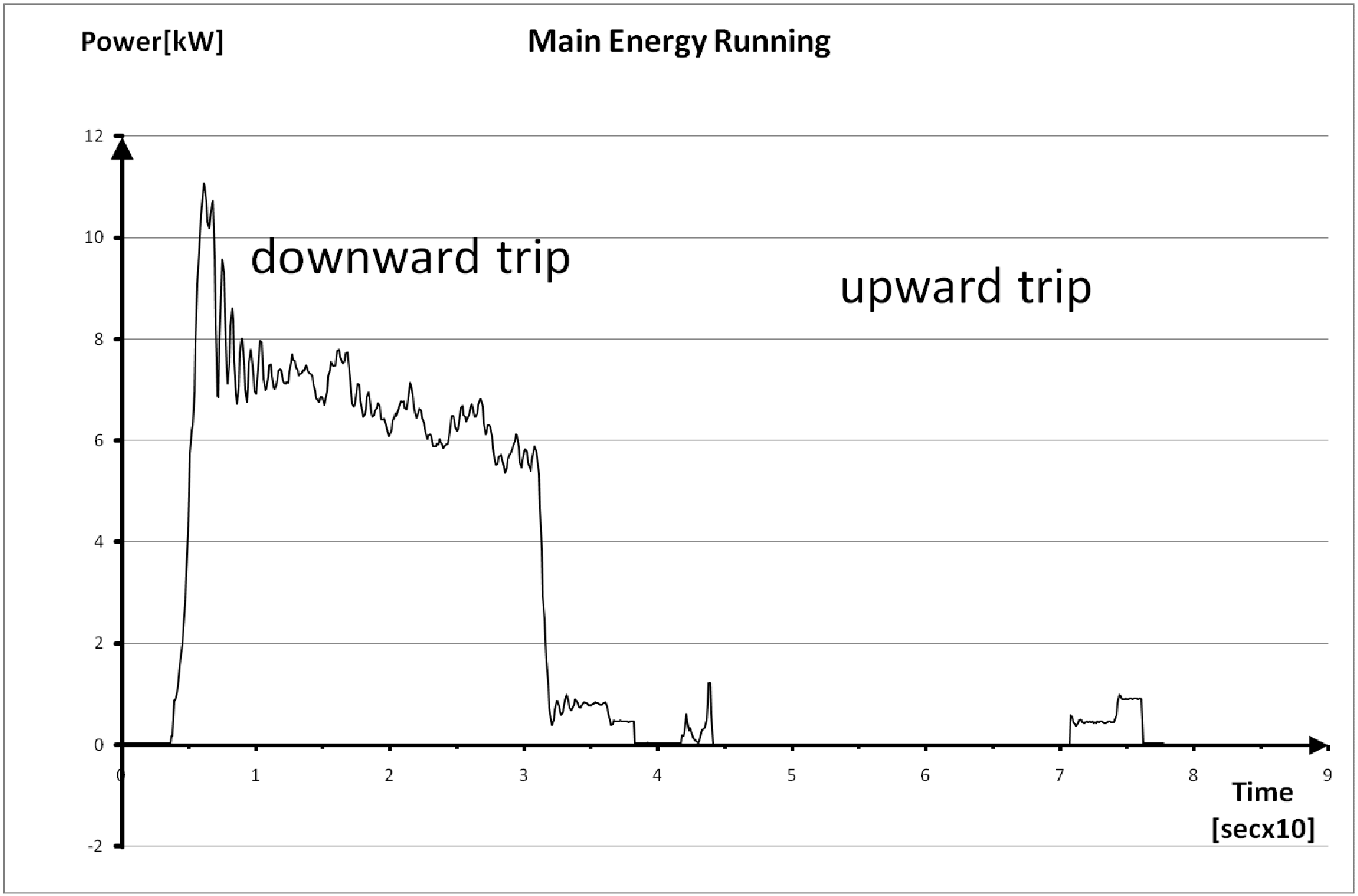
Active Energy - Running (Main + Ancillary)	
Active Energy - Running (Main + Ancillary) per 1 cycle trip	Active Energy - Running (Main + Ancillary) per annum (Eyr)
Wh	kWh
57.05	3552.07

Active Energy - Standby (Main + Ancillary)	
Active Power - Standby (Main + Ancillary)	Active Energy - Standby (Main + Ancillary) per annum (Eys)
W	kWh
163.71	1,143

Summary Active Energy - (Running + Standby) (Main + Ancillary) per annum
Summary Active Energy - Running + Standby (Main + Ancillary) per annum (Ey)
kWh
4695.07

Relation of Active Energy - Standby, per annum to Summary Active Energy - (Running + Standby), per annum
%

24%


Power[kW]
Main Energy Running
12
10
8
6
4
2
0
-2
0
1
2
3
4
5
6
7
8
9
downward trip
upward trip
Time
[secx10]

15. A lift in an office building.
Warsaw, ul. Wieniawska 14

Lift description:

The subject under study is a lift modernized in 2009. The following technical solutions were applied, with a direct influence on electricity consumption:

Controller type:

microprocessor with an inverter; safety chains and contactors powered by 48V traditional supplier.

Hoist:

gear machine with 13 kW motor

Car door operator:

DC motor controlled by a microprocessor controller.

Car lighting:

LED lamps; direct lighting, 6 x 3 W; 18 W

Display:

LED indicators placed on each floor and in the car

Ancillary devices:

not available.

Additional control functions:

a. light switch off function after a specific period of time – not available;
b. inverter switch off function after a specific standby period – not available;
c. display switch off function after a specific standby period – not available;
d. parking function – not available.

General information about the lift and measuring instrument		
Description	**Specification**	**Comments**
Building category	office	
Building address	Lublin. Ul. Wieniawska 14	
Number of storeys	13	
Lift manufacturer	L.P. D Winda Serwis	
Year of installation	2009	
Type (Catalogue number)		
Technology (Geared, Geareless or Hydro)	geared	
Technology (Electro-mechanic or Electronic)	electronic	
Suspention (1:1 or 2:1)	1:1	
Nominal load [kg]	900kg	
Nominal power on motor plate [kW]	13	
Speed [m/s]	1,2	
Maximum travel heigh [m.]	42	
Number of trips per annum	900,000	
Instrument manufacturer	Hioki	
Instrument model number	3169-21	
Instrument settings:		
Current range (Main Energy Running) [A]	50A	
Current range (Main Energy Standby) [A]	5A	
Current range (Ancillary Energy Running) [A]	1A	
Current range (Ancillary Energy Standby) [A]	1A	
Interval Time [s]	100ms	
Other (plese specify)		
Date	30/04/2009	

Main Active Energy - Running					
C_{bal}	C_{aml}	C_{atd}	Main Active Energy - Running per 1 cycle trip (Ecm)	Number of trips per annum (n_{trip})	Main Active Energy - Running per annum (Eym)
-	-	-	Wh	-	kWh
0.5	0.35	0.3	98.78	900,000	9,334.71

Main Active Energy - Standby					
		C_{atd}	Main Active Power - Standby (Pm)	Time of one cycle trip (C)	Main Active Energy - Standby per annum (Ems)
		-	W	s	kWh
		0.3	127.01	119	546

Ancillary Active Energy - Running					
		C_{atd}	Ancillary Active Energy - Running per 1 cycle trip (Eca)	Number of ttrips per annum (n_{trip})	Ancillary Active Energy - Running per annum (Eya)
		-	Wh	-	kWh
		0.3	0.00	900,000	0

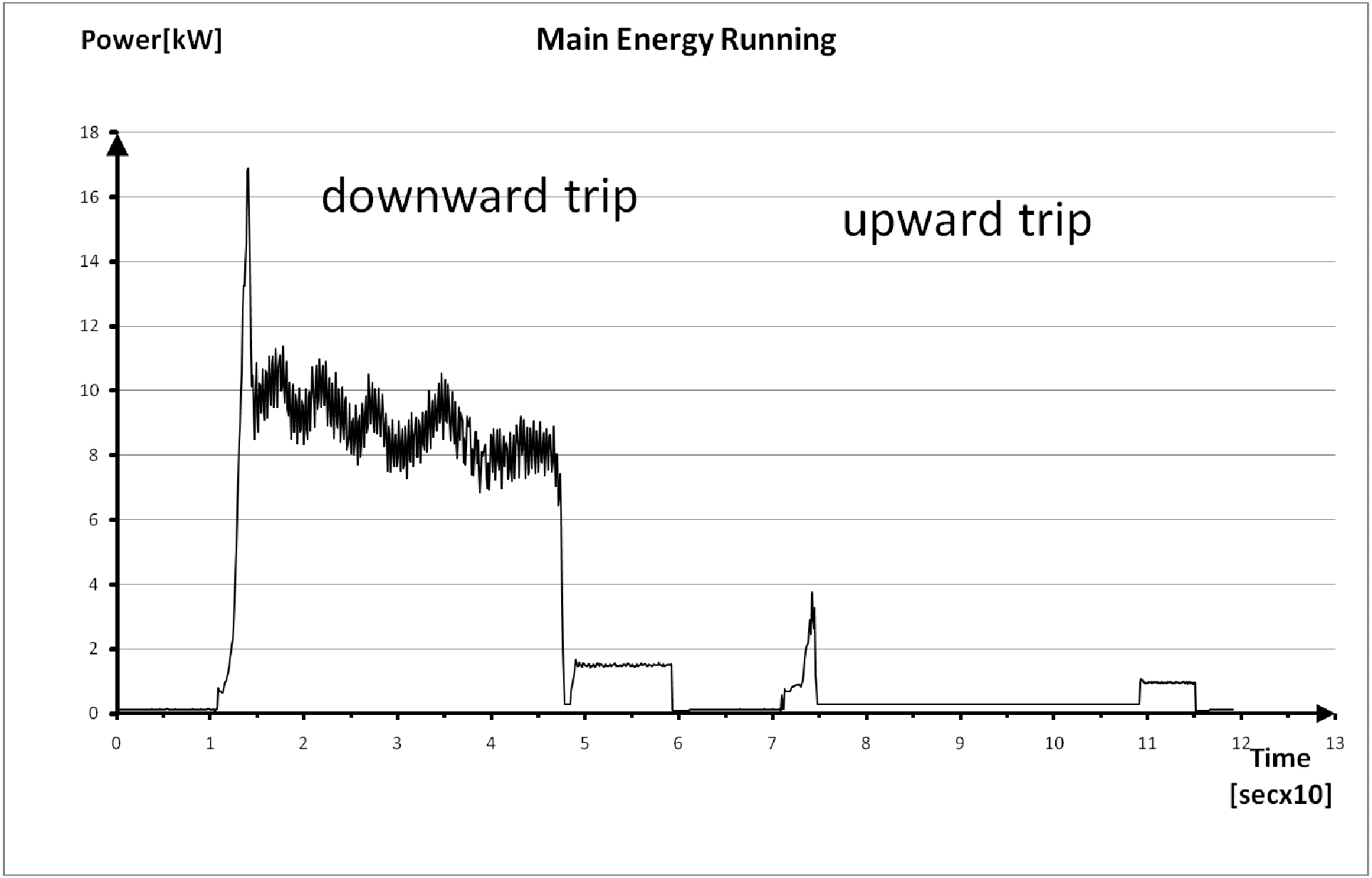
Ancillary Active Energy - Standby					
		C_{atd}	Ancillary Active Power - Standby (Pa)	Time of one cycle trip (C)	Ancillary Active Energy - Standby per annum (Eas)
		-	W	s	kWh
		0.3	0.00	119	0

Active Energy - Running (Main + Ancillary)	
Active Energy - Running (Main + Ancillary) per 1 cycle trip	Active Energy - Running (Main + Ancillary) per annum (Eyr)
Wh	kWh
98.78	9334.71

Active Energy - Standby (Main + Ancillary)	
Active Power - Standby (Main + Ancillary)	Active Energy - Standby (Main + Ancillary) per annum (Eys)
W	kWh
127.01	546

Summary Active Energy - (Running + Standby) (Main + Ancillary) per annum
Summary Active Energy - Running + Standby (Main + Ancillary) per annum (Ey)
kWh
9880.71

Relation of Active Energy - Standby, per annum to Summary Active Energy - (Running + Standby), per annum
%
6%


Power[kW]
Main Energy Running
18
16
14
12
10
8
6
4
2
0
downward trip
upward trip
0
1
2
3
4
5
6
7
8
9
10
11
12
13
Time
[secx10]

16. A lift in an office building.
Warsaw, ul. Wieniawska 14

Lift description:

The subject under study is a lift modernized in 2009. The following technical solutions were applied, with a direct influence on electricity consumption:

Controller type:

microprocessor with an inverter; safety chains and contactors powered by 48V traditional supplier.

Hoist:

gear machine with 13 kW motor

Car door operator:

DC motor controlled by a microprocessor controller.

Car lighting:

LED lamps; direct lighting, 6 x 3 W; 18 W

Display:

LED indicators placed on each floor and in the car

Ancillary devices:

not available.

Additional control functions:

a. light switch off function after a specific period of time – not available;
b. inverter switch off function after a specific standby period – not available;
c. display switch off function after a specific standby period – not available;
d. parking function – not available.

General information about the lift and measuring instrument		
Description	**Specification**	**Comments**
Building category	office	
Building address	Lublin. Ul. Wieniawska 14	
Number of storeys	13	
Lift manufacturer	LWDO Lift service S.A.	
Year of installation	2007	
Type (Catalogue number)		
Technology (Geared, Geareless or Hydro)	geared	
Technology (Electro-mechanic or Electronic)	electronic	
Suspention (1:1 or 2:1)	2:1	
Nominal load [kg]	1425kg	
Nominal power on motor plate [kW]	11	
Speed [m/s]	1	
Maximum travel heigh [m.]	42	
Number of trips per annum	800,000	
Instrument manufacturer	Hioki	
Instrument model number	3169-21	
Instrument settings:		
Current range (Main Energy Running) [A]	50A	
Current range (Main Energy Standby) [A]	5A	
Current range (Ancillary Energy Running) [A]	1A	
Current range (Ancillary Energy Standby) [A]	1A	
Interval Time [s]	100ms	
Other (plese specify)		
Date	30/04/2009	

Main Active Energy - Running					
C_{bal}	C_{aml}	C_{atd}	Main Active Energy - Running per 1 cycle trip (Ecm)	Number of trips per annum (n_{trip})	Main Active Energy - Running per annum (Eym)
-	-	-	Wh	-	kWh
0.5	0.35	0.3	124.87	800,000	10,489.08

Main Active Energy - Standby					
		C_{atd}	Main Active Power - Standby (Pm)	Time of one cycle trip (C)	Main Active Energy - Standby per annum (Ems)
		-	W	s	kWh
		0.3	93.69	139	387

Ancillary Active Energy - Running					
		C_{atd}	Ancillary Active Energy - Running per 1 cycle trip (Eca)	Number of ttrips per annum (n_{trip})	Ancillary Active Energy - Running per annum (Eya)
		-	Wh	-	kWh
		0.3	4.31	800,000	1,034

Ancillary Active Energy - Standby					
		C_{atd}	Ancillary Active Power - Standby (Pa)	Time of one cycle trip (C)	Ancillary Active Energy - Standby per annum (Eas)
		-	W	s	kWh
		0.3	111.61	139	461

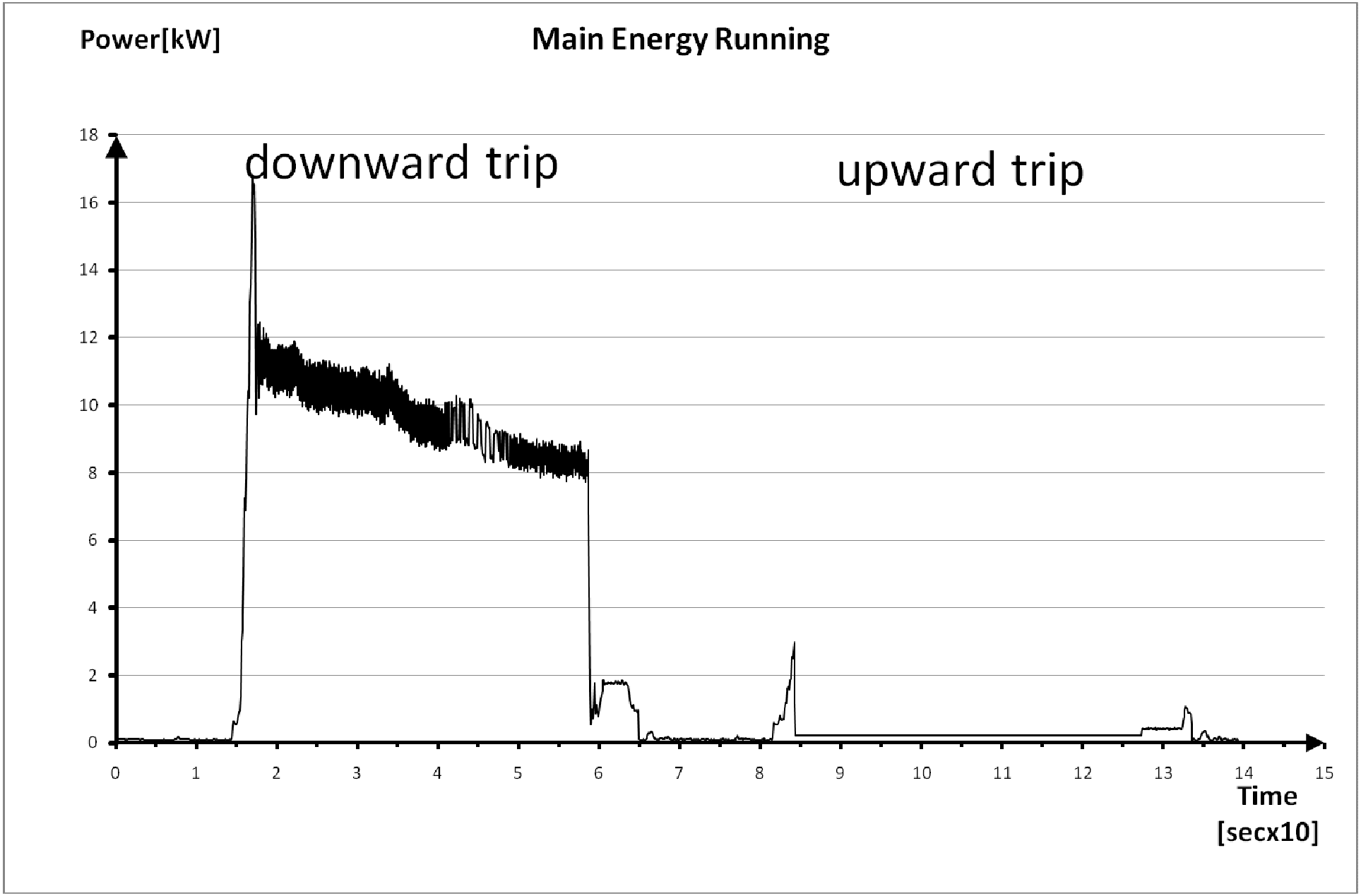
61

Active Energy - Running (Main + Ancillary)	
Active Energy - Running (Main + Ancillary) per 1 cycle trip	Active Energy - Running (Main + Ancillary) per annum (Eyr)
Wh	kWh
129.18	11523.08

Active Energy - Standby (Main + Ancillary)	
Active Power - Standby (Main + Ancillary)	Active Energy - Standby (Main + Ancillary) per annum (Eys)
W	kWh
205.30	848

Summary Active Energy - (Running + Standby) (Main + Ancillary) per annum
Summary Active Energy - Running + Standby (Main + Ancillary) per annum (Ey)
kWh
12371.08

Relation of Active Energy - Standby, per annum to Summary Active Energy - (Running + Standby), per annum
%
7%


Power[kW]
Main Energy Running
downward trip
upward trip
18
16
14
12
10
8
6
4
2
0
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
Time
[secx10]

17. A travelator in CRH Lublin Plaza
Lublin, ul. Lipowa 13

Object description:

The subject under study is a new travelator installed in 2006. The following technical solutions were applied, with a direct influence on electricity consumption:

Controller type:

Microprocessor; direct start-up; safety chains and contactors powered by 230V traditional supplier.

Hoist:

gear machine with 7.5 kW motor

Ancillary devices:

not available.

Additional control functions:

a. not available.

General information about the lift and measuring instrument		
Description	**Specification**	**Comments**
Building category	commercial	
Building address	CRH Lublin Plaza ul.Lipowa 13 Lublin	
Escalator / moving walk manufacturer	moving walk shindler	
Year of installation	2006	
Type (Catalogue number)		
Nominal power on motor plate [kW]	7.5	
Speed [m/s]		
Instrument manufacturer		
Instrument model number		
Instrument settings:		
Current range (Running) [A]		
Current range (Standby in Low Speed Mode) [A]		
Current range (Standby in Stop Mode) [A]		
Interval Time [s] Running		
Other (plese specify):		
Date	30/5/2009	

Active Energy Consumption

Active Energy - Running			
k1	Active Energy-Running, 5 minutes test (Ecr)	Number of hours of Active Energy-Running, per annum (T1)	Active Energy-Running per annum (Eyr)
-	Wh	h	kWh
1.08	166.31	4589	9,891

Active Energy - Standby in a LOW SPEED mode		
Active Energy-Standby in a LOW SPEED mode, 5 minutes test (Ecsl)	Number of hours of Active Energy-Standby in a LOW SPEED mode, per annum (T2)	Active Energy-Standby in a LOW SPEED mode, per annum (Eysl)
Wh	h	kWh
0	0	0

Active Energy - Standby in a STOP mode		
Active Power - Standby in a STOP mode (Pss)	Number of hours of Active Eenergy Standby in a STOP mode, per annum (T3)	Active Energy-Standby in a STOP mode per annum (Eyss)
W	h	kWh
38.84	4171	162

Summary Active Energy - Standby (LOW SPEED mode + STOP mode) per annum
Summary Active Energy-Standby, per annum (Eys)
kWh
162

Summary Active Energy - (Running + Standby) per annum
Summary Active Energy-(Running + Standby), per annum (Ey)
kWh
10,053

Active Energy-Standby in relation to Summary Annual Active Energy-(Running + Standby)
%
2%

18. An escalator in CRH Lublin Plaza
Lublin, ul. Lipowa 13

Object description:

The subject under study is a new escalator installed in 2006. The following technical solutions were applied, with a direct influence on electricity consumption:

Controller type:

Microprocessor; direct start-up; safety chains and contactors powered by 230V traditional supplier.

Hoist:

gear machine with 7.5 kW motor

Ancillary devices:

not available.

Additional control functions:

a. not available.

General information about the lift and measuring instrument		
Description	**Specification**	**Comments**
Building category	commercial	
Building address	CRH Lublin Plaza ul.Lipowa 13 Lublin	
Escalator / moving walk manufacturer	Escalator shindler	
Year of installation	2006	
Type (Catalogue number)		
Nominal power on motor plate [kW]	4	
Speed [m/s]		
Instrument manufacturer		
Instrument model number		
Instrument settings:		
Current range (Running) [A]		
Current range (Standby in Low Speed Mode) [A]		
Current range (Standby in Stop Mode) [A]		
Interval Time [s] Running		
Other (plese specify):		
Date	30/5/2009	

Active Energy Consumption

Active Energy - Running			
k1	Active Energy-Running, 5 minutes test (Ecr)	Number of hours of Active Energy-Running, per annum (T1)	Active Energy-Running per annum (Eyr)
-	Wh	h	kWh
1.08	164.55	4589	9,786

Active Energy - Standby in a LOW SPEED mode		
Active Energy-Standby in a LOW SPEED mode, 5 minutes test (Ecsl)	Number of hours of Active Energy-Standby in a LOW SPEED mode, per annum (T2)	Active Energy-Standby in a LOW SPEED mode, per annum (Eysl)
Wh	h	kWh
0	0	0

Active Energy - Standby in a STOP mode		
Active Power - Standby in a STOP mode (Pss)	Number of hours of Active Eenergy Standby in a STOP mode, per annum (T3)	Active Energy-Standby in a STOP mode per annum (Eyss)
W	h	kWh
40.93	4171	171

Summary Active Energy - Standby (LOW SPEED mode + STOP mode) per annum
Summary Active Energy-Standby, per annum (Eys)
kWh
171

Summary Active Energy - (Running + Standby) per annum
Summary Active Energy-(Running + Standby), per annum (Ey)
kWh
9,957

Active Energy-Standby in relation to Summary Annual Active Energy-(Running + Standby)
%
2%

Summary

In order to analyze the results of the measurements, the criteria should depend upon the following parameters:

- load;
- number of travels;
- elevation height.

Therefore, a lift's electricity consumption should be examined from two points of view.

Lifts, escalators, and travelators, like most complex electromechanical machines, allot part of the consumed energy to the work, in this case to transport people, and to power the elements strictly connected with it. The other part goes to their own needs, i.e. powering control, lighting, emergency communication systems and safety devices. All the data needed for the analysis can be easily obtained from the results of the study, after the relevant formulae have been appropriately transformed.

There are two components in the energy drawn by a lift:

- a constant component connected with its own needs;
- a variable component connected with its actual work.

The annual energy demand formula of the main active circuit, described in WP3 methodology as follows:

$$Eym = Ecm* ntrip*Catd* Caml *2*(1-Cbal)/1000 \ [kWh]$$

allows both the components to be distinguished:

- energy connected strictly with the work:

$$Eyma= (Ecm-Ecmp)* ntrip*Catd* Caml *2*(1-Cbal)/1000 \ [kWh]$$

where:

Eyma – energy allotted to the work

Ecmp – energy allotted to the lift's own needs within a single cycle, formulated as follows:

$$Ecmp=pm*C\ [Wh]$$

- energy allotted to the lifts own needs, formulated as follows:

$$Ep=Eymp+Ems+Ey$$

where:

$$Ey=Eya+Eas$$

As the result of the above transformation, the own needs energy can be easily analyzed. The other part of the energy drawn poses a greater challenge, since it depends on travel, a period of time, and load. In this case a "z" factor must be introduced:

$$z = \frac{Eyma}{P * hp * \left(\frac{ntrip}{100000}\right)}$$

where:
P – load;
ntrip – trips per year.

The "z" factor is formulated as follows:

$$z = \frac{Wh}{kg * m}$$

The "z" factor can be called *lift drive system efficiency*, that is the quantity of energy needed to move a specific load (1 kg) at a height of 1 meter. It seems that this sort of energy consumption parameterisation will allow lift energy efficiency to be fully characterised independently of the device environment variables.
In case of escalators and travelators the procedure is similar, however, the "z" factor is not formulated.

No.	Address	Date of Measurement	Load	Building	Type of Machine	Drive	Travel Use [kWh]	Own Use [kWh]	Sum of Energy [kWh]	z [kWh/kg*m*10^{-2}]
1	Warszawa, al. Solidarności 119/125	Nov. 18, 2008	630kg	residential	passenger traction lift	reductor gear vvvf	325	3338	3663.73	1.85
2	Warszawa, ul. Sonaty 2	Nov. 22, 2008	1000kg	residential	passenger traction lift	reductor gear vvvf	922	3136	4057.97	3.29
3	Warszawa. ul. Bolesławicka 24	Nov. 26, 2008	500kg	residential	passenger traction lift	reductor gear AC2	863	990	1853.13	6.16
4	Warszawa, ul. Zwycięzców 42	Nov. 27, 2008	630kg	residential	passenger traction lift	gearless vvvf	289	4450	4739.16	1.64
5	Warszawa, al. Horbaczewskiego 5	Nov. 28, 2008	500kg	residential	passenger traction lift	gearless vvvf	910	877	1787.41	6.50
6	Warszawa, ul. Grójecka 69	Feb. 11, 2009	400kg	residential	passenger traction lift	gearless vvvf	21	3512	3532.81	0.30
7	Warszawa, ul. Grójecka 69 (with a reactor installed in an inverter)	Feb. 11, 2009	400kg	residential	passenger traction lift	gearless vvvf	59	3413	3472.87	0.85
8	Lublin, ul. Jaczewskiego 8	Mar. 23, 2009	500kg	hospital	passenger traction lift	reductor gear AC2	918	784	1702.80	7.50
9	Lublin, ul. Jaczewskiego 8	Mar. 23, 2009	1500kg	hospital	hospital hydraulic lift	hydraulic power unit	4190	3929	8118.80	16.29
10	Warszawa, ul. Darwina 13	Apr. 5, 2009	450kg	residential	passenger traction lift	reductor gear vvvf	502	1111	1612.57	5.14
11	Warszawa, ul. Darwina 1A	Apr. 25, 2009	450kg	residential	passenger traction lift	reductor gear vvvf	423	1032	1454.81	4.33

12	Płock, ul. Piasta Kołodzieja 3	Apr. 28, 2009	375kg	residential	passenger traction lift	gearless vvvf	425	1122	1546.68	5.78
13	Płock, ul. Medyczna 19	Apr. 28, 2009	1425kg	hospital	hospital traction lift	gearless vvvf	3003	1664	4666.72	1.46
14	Płock, ul. Medyczna 19	Apr. 28, 2009	1425kg	hospital	hospital traction lift	gearless vvvf	3031	1664	4695.07	1.48
15	Lublin, ul. Wieniawska 14	Apr. 30, 2009	900kg	public office building	passenger traction lift	reductor gear vvvf	8938	943	9880.71	2.63
16	Lublin, ul. Wieniawska 14	Apr. 30, 2009	1425kg	public office building	passenger traction lift	reductor gear vvvf	10185	2186	12371.08	2.13
17	CRH Lublin Plaza Lublin, ul. Lipowa 13	Apr. 30, 2009	-	shopping centre	travelator	reductor gear	9699	354	10053	–
18	CRH Lublin Plaza Lublin, ul. Lipowa 13	Apr. 30, 2009	-	shopping centre	escalator	reductor gear	9584	373	9954	–

Conclusions:

The above table presents the results of measurements and calculations made in accordance with the methodology contained in the summary. The results show that in most cases, the energy consumed by lifts goes largely to their own needs. The following devices make up the structure of this part of energy consumption:

- controller;
- supplier or transformer;
- signalling devices (displays and direction arrows);
- emergency voice communication system;
- inverter;
- car door operator;
- car lighting;
- oil heater;
- oil cooler.

Controller

It pertains to the work logic system, functions realization, lift-location-in-the-shaft representation system, and control box contactors and transmitters turned on while parking or on standby. The device's energy consumption largely depends on its technological advancement and structure. For instance, relay controllers use no energy on standby while at the same time, microprocessor ones consume several to tens of watts.

Supplier or transformer

The device has considerable influence over energy consumption of a lift. It is caused by the wide range of power needed to supply various lift elements such as an electromagnetic cam, or a hoist brake release. The devices require even several hundred of watts, hence the transformers must be of appropriate dimensions, which consequently have the direct influence on iron losses in no-load state, frequently coming up to tens of watts.

Signalling devices (displays and direction arrows)

In some cases, they are responsible for additional tens of watts. In traditional control systems, display units of car location signalling on each floor are connected in parallel. Electricity reducing resistors are installed to secure LED lamps placed in

display segments. Those elements generate energy losses in the form of heat emitted from the resistors, which can be reduced by serial transmission systems with multiplexing control systems of display units.

Emergency voice communication system

For the last few years, the systems of voice communication with rescue services have been compulsory in order to ensure a high level of lift passenger safety. In most cases, they are GSM devices which consume up to 30 watts.

Inverter

On standby, the device can consume from several to a hundred watts. Some control systems turn off the inverters after a specific period of standby.

Car door operator

Presently, mechanical drives are frequently replaced by microprocessor drives of automatic car doors which are reliable to realize all the necessary functions.

Car lighting

The lighting constitutes a heavy financial burden every year. In order to reduce energy consumption, time relays turning off lamps after a specific period of standby are often used. The function, however, is routinely disabled by maintenance workers, as frequent turning on and off considerably shorten the working time of traditional bulbs and fluorescent lamps. Significant energy reduction together with longer working time and reliability can be accomplished with the use of high efficiency LED lamps.

Oil heater and cooler

The devices pertain to hydraulic lifts. They ensure proper working conditions of oil, which is a work medium. While heaters work for short periods of time, coolers' work hardly ever stops.

The remaining part of the consumed energy is allotted to the work, i.e. to transport people. In case of traction lifts, the energy is distributed to:

- hoist motor;
- break release;

- contactors of the motor circuit
- electromagnetic cam (if present).

Energy efficiency of lift travel is significantly influenced by:

- type of hoist motor control (VVVF, AC2, or AC1);
- type of hoist (gear, gearless);
- choice of the hoist motor working point (nominal power, nominal frequency);
- realization of travel curve (optimization of temporary states);
- friction resistance on guide rails of the car frame and counterweight;
- introduction of additional mass compensating the mass of traction ropes.

The oil screw pump together with the flow controlling valve block constitute the heart of the hydraulic lift motion system. The system is highly ineffective due to the type of speed control, i.e. oil throttling, as the consumed electricity is indirectly converted into work.