

SM1-SM6

TECHNICAL

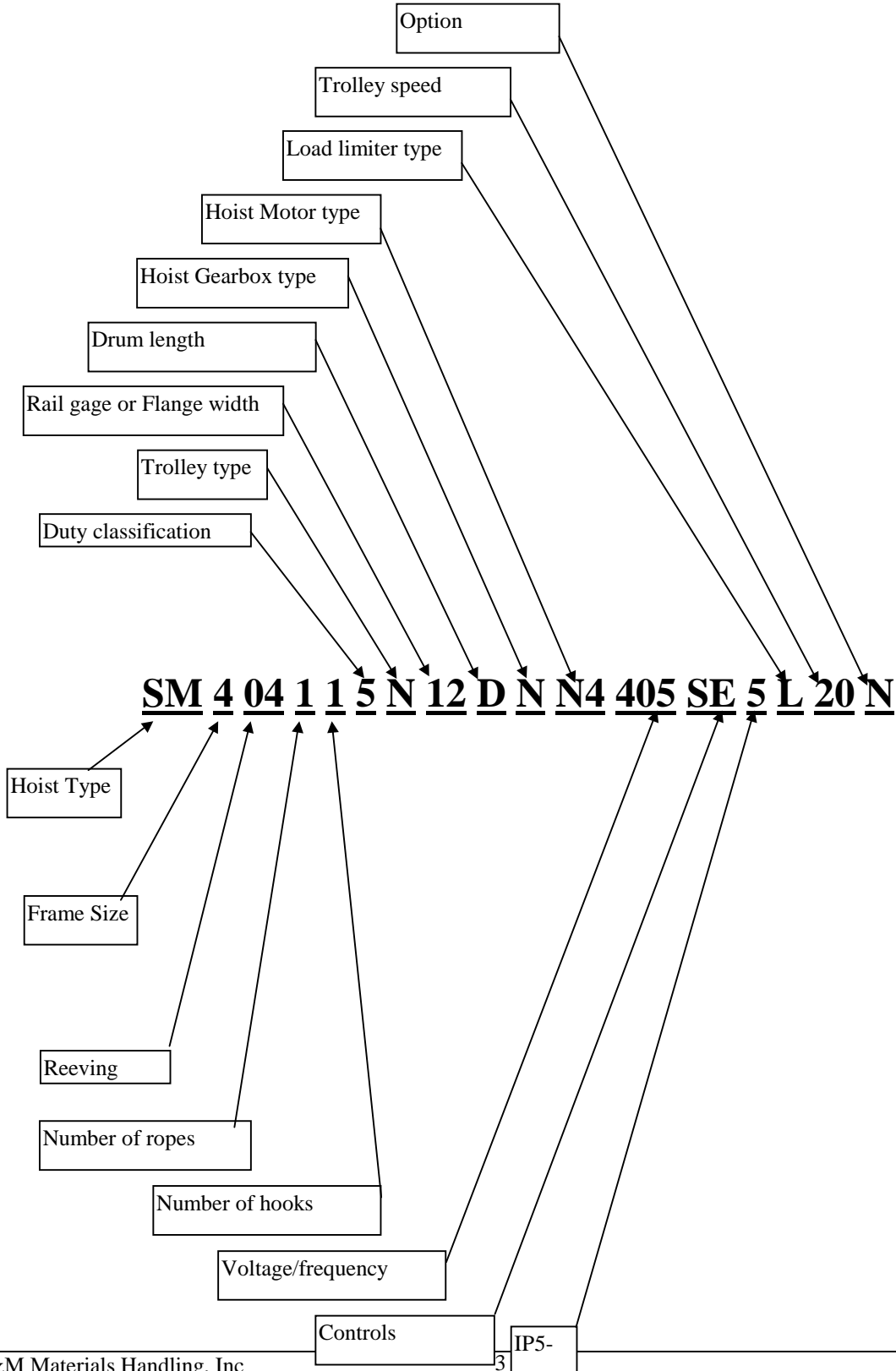
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DUTY CLASSIFICATION**2**

According to FEM classification, two fundamental criteria must be taken into account:

- Type of duty (load spectrum)(k)
- Average daily operated time (T_m)

I) Type of Duty (load spectrum)**I.a) Approximate determination**

- Light duty (k < or = at 0.5)

Hoist only exceptionally lifts maximum load and regularly lifts considerably lighter loads.

- Medium duty (0.5 < k < or = at 0.63)

Hoist lifts for equal periods, light, medium and maximum loads.

- Heavy duty (0.63 < k < or = at 0.8)

Hoist subjected equally frequently to maximum and medium loads.

- Very heavy duty (0.8 < k < or = at 1)

Hoist lifts loads mainly approaching maximum.

I.b) Strict determination

For an exact classification into groups the cubic mean value k referred to the load to be lifted is required. It is calculated by using the following formula:

$$k = \sqrt[3]{\left(\left(\frac{C1}{Cm}\right)^3 \cdot \left(\frac{T1}{Tm}\right) + \left(\frac{C2}{Cm}\right)^3 \cdot \left(\frac{T2}{Tm}\right) + \left(\frac{C3}{Cm}\right)^3 \cdot \left(\frac{T3}{Tm}\right) + \dots\right)}$$

Since the life of the mechanism is inversely proportional to the third power of the load.

Symbols:

- C1, C2, C3, ... useful or partial load
- T1, T2, T3, ... daily operating time under useful or partial load
- T_m = T1+T2+T3+... average daily operated time

DUTY CLASSIFICATION	2
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II) Daily Operated Time (Tm)

Tm is the daily operated time with load and without load

III) Determination of the FEM Classification

Class of duty (load spectrum)		Average daily operating time in hours					
		< 0,5 h	< 1 h	< 2 h	< 4 h	< 8 h	< 16 h
service	k						
light	k < 0.5	-	1 Cm	1 Bm	1 Am	2m	3m
medium	0.5 < k < 0.63	1 Cm	1 Bm	1 Am	2m	3m	4m
heavy	0.63 < k < 0.8	1 Bm	1 Am	2m	3m	4m	5m
very heavy	0.8 < k < 1	1 Am	2m	3m	4m	5m	-
		Life of the mechanisms under full load 250 hours/year					
		800	1600	3200	6300	12500	25000

IV) FEM Classification Checking

It is necessary to check the Duty factor and the Number of starts per hour.

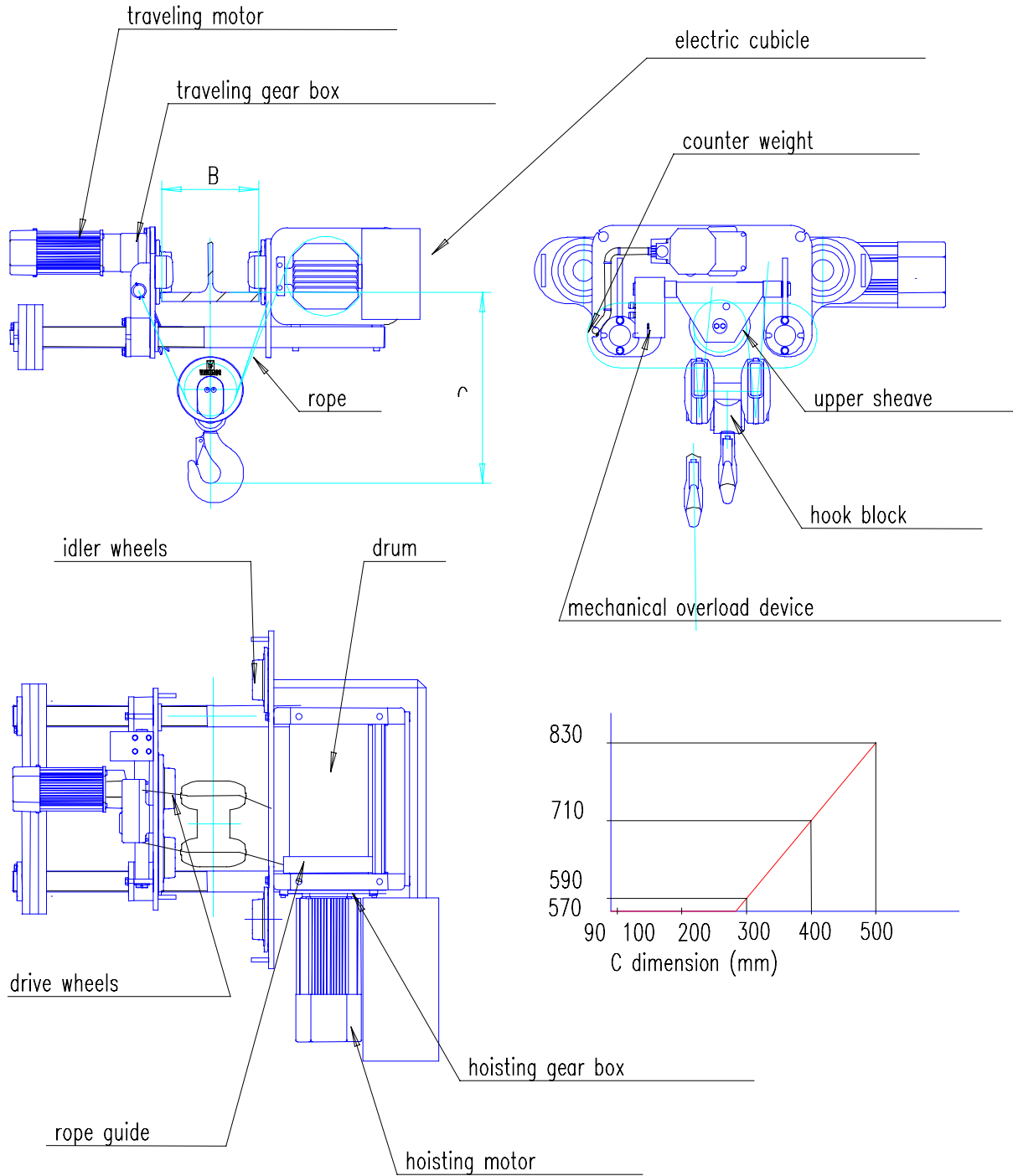
$$\text{Duty factor} = \frac{\text{(lifting time + lowering time)}}{\text{(lifting time + idle time + lowering time + idle time)}}$$

GROUP	1 Bm	1 Am	2m	3m
Duty factor	25%	30%	40%	50%
Number of starts per hour	150	180	240	300

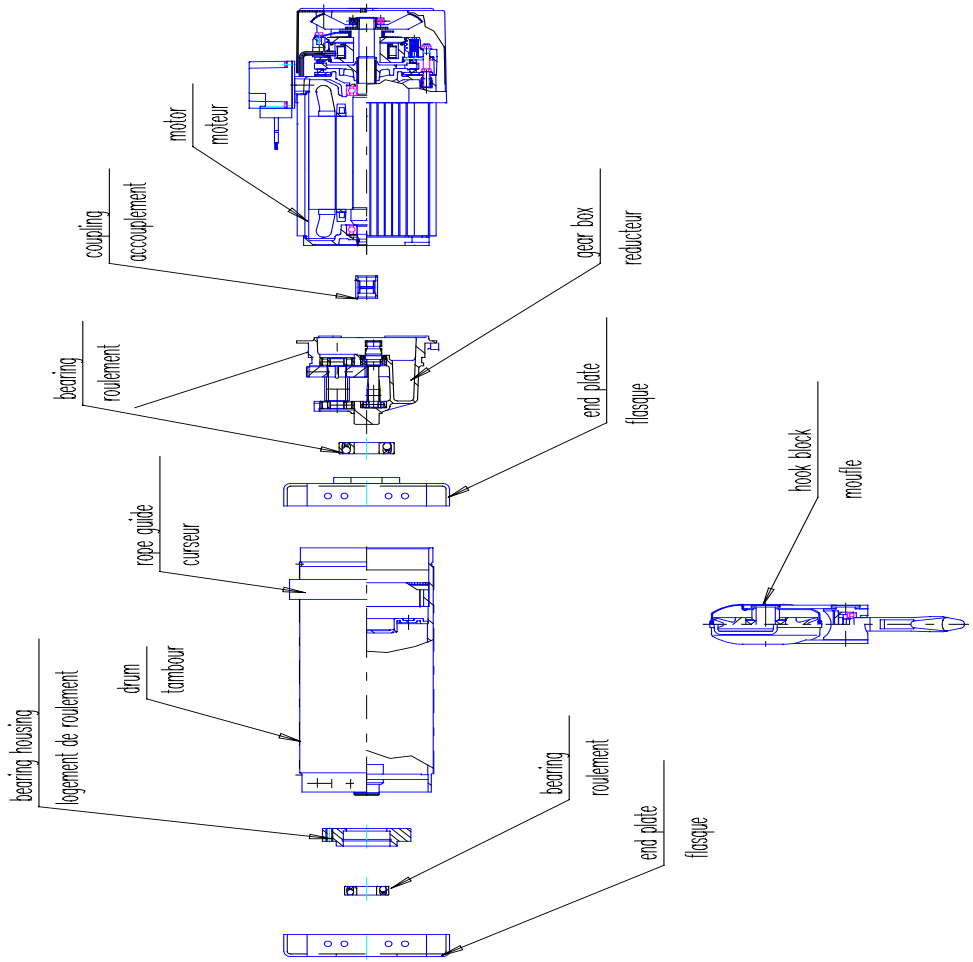
V) FEM / ISO

Group FEM	1Bm	1Am	2m	3m	4m
Group ISO	M3	M4	M5	M6	M7

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DESCRIPTION	3
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MAIN SPECIFICATIONS	4
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STANDARD REEVING	SM1	SM2	SM3	SM3	SM3	SM4	SM4	SM4	SM5	SM5	SM6	SM6
Rope diameter (mm)	6	7	9	9	9	13	13	13	16	16	20	20
Drum diameter (mm)	152	244	244	244	244	318	318	318	368	368	445	445
Hoisting gear	N	N	L	R	N	L	R	N	N	R	N	R
Motor / drum ratio	72	115	144	72	92	187	94	120	173	87	336	168
Hoist Motor Code	N1	N2	N2	N3	N3	N3	N4	N4	N4	N5	N4	N5
Drum load (1 fall) (Metric ton) 1Am Drum Load (1 fall) (ton)	0.5	1	1.25	1.25	1.6	2.5	2.5	3.2	4	4	6.3	6.3
High Speed (1fall) (m/min)*	20	20	16	32	25	16	32	25	20	40	12,5	25
High Speed (1fall) (m/min)**	24	24	19.2	38.4	30	19.2	38.4	30	24	48	15	30
High Speed (1fall) (ft/min)**	78.7	78.7	63	126	98.4	63	126	98.4	78.7	157.5	49.2	98.4
Load 2/1 (Metric ton) 1Am Load 2/1 (ton)	1	2	2.5	2.5	3.2	5	5	6.3	8	8	12.5	12.5
High Speed 2/1 (m/min)*	10	10	8	16	12,5	8	16	12,5	10	20	6,3	12,5
High Speed 2/1 (m/min)**	12	12	9.6	19.2	15	9.6	19.2	15	12	24	7.6	15
High Speed 2/1 (ft/min)**	39.4	39.4	31.5	63	49	31.5	63	49	39.4	78.7	25	49
Load 4/1 (Metric ton) 1Am Load 4/1 (ton)	2	4	5	5	6.3	10	10	12.5	16	16	25	25
High Speed 4/1 (m/min)*	5	5	4	8	6,3	4	8	6,3	5	10	3,2	6,3
High Speed 4/1 (m/min)**	6	6	4.8	9.6	7.6	4.8	9.6	7.6	6	12	3.9	7.6
High Speed 4/1 (ft/min)**	19.7	19.7	15.8	31.5	25	15.8	31.5	25	19.7	39.4	13	25
Load 6/1 (Metric ton) 1Am Load 6/1 (ton)	-	-	8	8	9	16	16	18	25	25	-	-
High Speed 6/1 (m/min)*	-	-	2.5	5	4	2.5	5	4	3.2	6.3	-	-
High Speed 6/1 (m/min)**	-	-	3	6	4.8	3	6	4.8	3.9	7.6	-	-
High Speed 6/1 (ft/min)**	-	-	9.9	19.7	15.8	9.9	19.7	15.8	13	25	-	-

Capacities and Speeds are listed in both metric and U.S. customary units.

* 50 Hertz Motor

**60 Hertz Motor

MAIN SPECIFICATIONS	4
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TRUE VERTICAL LIFT	SM1 LV	SM3 LV	SM3 LV	SM3 LV	SM4 LV	SM4 LV	SM4 LV	SM5 LV	SM5 LV	SM6 LV	SM6 LV	SM6 LV	SM6 LV
Rope diameter (mm)	6	7	7	7	9	9	9	13	13	16	16	16	16
Drum diameter (mm)	152	244	244	244	318	318	318	368	368	445	445	445	445
Hoisting gear	N	L	R	N	L	R	N	N	R	L	N	R	3
Motor / drum ratio	72	144	72	92	187	94	120	173	87	524	262	210	168
Hoisting motor	N1	N2	N3	N3	N3	N4	N4	N4	N5	N4	N5	N5	N5
Drum load (1 fall) (Metric ton) 1Am Drum load (1 fall) (ton)	0.5	1.25	1.25	1.6	2.5	2.5	3.2	4	4	8	8	8	8
High Speed (1fall) (m/min)*	20	16	32	25	16	32	25	20	40	8	16	20	25
High Speed (1fall) (m/min)**													
High Speed (1fall) (ft/min)**	(66)	(53)	(105)	(82)	(53)	(105)	(82)	(66)	(131)	(26.5)	(53)	(66)	(82)
Load 4/2 (Metric ton) 1Am Load 4/2 (ton)	1	2.5	2.5	3.2	5	5	6.3	8	8	16	16	16	16
High Speed 4/2 (m/min)*	10	8	16	12.5	8	16	12.5	10	20	4	8	10	12.5
High Speed 4/2 (m/min)**	12	9.6	19.2	15	9.6	19.2	15	12	24	4.8	9.6	12	15
High Speed 4/2 (ft/min)**	39.4	31.5	63	49	31.5	63	49	39.4	58.8	15.7	31.5	39.4	49
Load 8/2 (Metric ton) 1Am Load 8/2 (ton)	-	-	-	-	-	-	-	16	16	32	32	32	32
High speed 8/2 (m/min)*	-	-	-	-	-	-	-	5	10	2	4	5	6.3
High speed 8/2 (m/min)**	-	-	-	-	-	-	-	6	12	2.4	4.8	6	7.6
High Speed 8/2 (ft/min)**	-	-	-	-	-	-	-	19.7	39.4	7.9	15.7	19.7	24.8
Load 12/2 (Metric ton) 1Am Load 12/2 (ton)	-	-	-	-	-	-	-	25	25	50	50	50	-
High Speed 12/2 (m/min)*	-	-	-	-	-	-	-	3.2	6.3	1.3	2.5	3.2	-
High Speed 12/2 (m/min)**	-	-	-	-	-	-	-	3.8	7.6	1.6	3	3.8	-
High Speed 12/2 (ft/min)**	-	-	-	-	-	-	-	12.6	24.8	5.1	9.8	12.6	-
Load 16/2 (Metric ton) 1Am Load 16/2 (ton)	-	-	-	-	-	-	-	32	32	63	63	-	-
High Speed 16/2 (m/min)*	-	-	-	-	-	-	-	2.5	5	1	2	-	-
High Speed 16/2 (m/min)**	-	-	-	-	-	-	-	3	6	1.2	2.4	-	-
High Speed 16/2 (ft/min)**	-	-	-	-	-	-	-	9.8	19.6	3.9	7.9	-	-

Capacities and Speeds are listed in metric and U.S. customary units.

* 50 Hertz Motor

**60 Hertz Motor

HOISTING MOTORS

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1) MOTORS

- Asynchronous motors
- Double Winding
- Synchronous speed : 3000 / 500 rpm for 50 hertz
- Synchronous speed : 3600 / 600 rpm for 60 hertz
- Power range from 1.9 to 30 kW for 50 hertz
- Power range from 2.2 to 36 kW (2.9 to 48 HP) for 60 hertz
- IP55 protection
- Insulation Class F
- Tropicalized
- Thermistors for over temperature protection
- Aluminum frame
- N1...N5 are standard two speed hoisting motors.

The design of the motors is based on maximum ambient temperature of 40°C (104 °F) and at a maximum altitude of 1000 m (3280 ft).

If ambient temperature exceeds 40 °C, a motor from a higher classification must be selected:

- For ambient temperature in range 40°C-55°C, the motor must be selected from one step higher in the motor group classification.

- For ambient temperature in range 55°C-65°C, the motor must be selected from two steps higher in the motor group classification.

2) BRAKES

- Electromagnetic brake
- Self-adjusting for motors N1, N2, N3 & N4 and manual adjusting for motor N5
- Wear detection

HOISTING MOTORS	5
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3) Main characteristics (Motors 50 Hz)

DUTY GROUP (FEM)	MOTOR CODE*	N1	N2	N3	N4	N5
	HOIST TYPE	SM1	SM2 SM3	SM3 SM4	SM4 SM5 SM6	SM5 SM6
	Motor type	MF09ZA106	MF10Z-106	MF11Z-106	MF13ZA106	MF16Z-106
	synchronous speed r/min	3000/500	3000/500	3000/500	3000/500	3000/500
	Braking torque Nm	10.8	21.6	44	87	200
	El. Br. torque Nm	28.5/11.8	59/29	105/58	220/151	295/271
	Power fact. start	0.89/0.80	0.82/0.79	0.75/0.68	0.65/0.61	0.65/0.56
	Starting torque Nm	12/10.7	26/22	48/42	105/86	212/162
	Weight Kg	23	30	50	87	192
1 Bm 180 starts./h 40% ED	Load tm/min	10	20			160
	Nominal power * kW	1.9/0.3	3.5/0.5			30/5
	Nominal torque Nm	6.3	12.7			96
	Nominal speed r/min	2660/375	2780/400			2740/430
	Short time duty** min	15/15	15/11			15/30
	Power factor	0.91/0.70	0.87/0.63			0.89/0.55
	Efficiency	0.63/0.26	0.71/0.28			0.78/0.61
1 Am 180 starts./h 40% ED	Load tm/min	8	20	40	80	160
	Nominal power * kW	1.5/0.25	3.5/0.5	7.5/1.2	15/2.5	30/5
	Nominal torque Nm	4.7	12.7	24.7	48	96
	Nominal speed r/min	2750/400	2780/400	2750/360	2810/430	2740/430
	Short time duty** min	15/15	15/11	15/10	15/10	15/30
	Power factor	0.83/0.63	0.87/0.63	0.85/0.55	0.86/0.49	0.89/0.55
	Efficiency	0.67/0.25	0.71/0.28	0.74/0.30	0.78/0.44	0.78/0.61
2 m 240 starts./h 40% ED	Load tm/min	6.4	16	32	64	128
	Nominal power * kW	1.2/0.2	2.8/0.4	6.0/1.0	12.0/2.0	25/4
	Nominal torque Nm	3.8	9.6	19.2	39	77
	Nominal speed r/min	2810/420	2830/420	2820/400	2870/450	2790/440
	Short time duty** min	15/15	15/11	15/10	15/10	15/30
	Power factor	0.78/0.59	0.81/0.59	0.81/0.50	0.82/0.44	0.87/0.49
	Efficiency	0.66/0.22	0.72/0.27	0.76/0.30	0.80/0.43	0.79/0.60
3 m 300 starts./h 50% ED	Load tm/min	5	12.8	26	50	100
	Nominal power * kW	0.95/0.15	2.2/0.3	4.8/0.8	9.6/1.6	20/3
	Nominal torque Nm	3.0	7.7	15.6	30	61
	Nominal speed r/min	2840/440	2860/440	2870/430	2910/465	2830/460
	Short time duty** min	15/15	15/11	15/10	15/10	15/30
	Power factor	0.71/0.56	0.77/0.55	0.76/0.45	0.75/0.38	0.83/0.43
	Efficiency	0.65/0.19	0.72/0.26	0.78/0.30	0.79/0.40	0.80/0.58

*) Power with nominal load

***) Time with a cold motor

HOISTING MOTORS

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3) Main characteristics (Motors 60 Hz)

Duty Group (Fem)	Motor code		N1	N2	N3	N4	N5
	Motor type		MF09ZA106	MF10Z-106	MF11Z-106	MF13ZA106	MF16Z-106
	Synchronized speed	RPM	3600/600	3600/600	3600/600	3600/600	3600/600
	Braking torque	Nm	10.8	21.6	44	87	200
	El. brake torque	Nm	27.5/11.4	59/29	105/58	214/147	278/251
	Power fact. start		0.88/0.78	0.80/0.77	0.73/0.67	0.64/0.56	0.64/0.54
	Starting torque	Nm	11.6/10.3	26/22	48/42	102/82	200/150
	Weight	kg	23	30	50	87	192
	Inertia	kgm ²	0.0041	0.0047	0.0090	0.0393	0.1193
1Bm	Load	tm/min	12/2.0	23/3.0			195/33
180 starts/h	Nominal power ^{*)}	kW	2.2/0.37	4.2/0.60			36/6
40 % ED	Nominal torque	Nm	6.3	12.7			96
	Nominal speed	RPM	3260/475	3380/500			3320/520
	Short time duty	min	15/15	15/11			15/30
	Power factor		0.91/0.61	0.87/0.61			0.89/0.59
	Efficiency		0.67/0.31	0.75/0.31			0.77/0.65
1Am	Load	tm/min	9.5/1.5	23/3.0	49/8.0	95/16	195/33
180 starts/h	Nominal power ^{*)}	kW	1.8/0.3	4.2/0.6	9/1.5	18/3	36/6
40 % ED	Nominal torque	Nm	4.7	12.7	24.7	48	96
	Nominal speed	RPM	3350/500	3380/500	3350/450	3400/520	3320/520
	Short time duty	min			15/10	15/10	15/30
	Power factor		0.87/0.59	0.87/0.61	0.87/0.55	0.90/0.48	0.89/0.59
	Efficiency		0.68/0.29	0.75/0.31	0.73/0.33	0.79/0.48	0.77/0.65
2m	Load	tm/min	7.5/1.0	18/2.5	39/6.5	80/13	165/26
240 starts/h	Nominal power ^{*)}	kW	1.4/0.22	3.4/0.5	7.2/1.2	15/2.5	30/4.8
40 % ED	Nominal torque	Nm	3.8	9.6	19.2	39	77
	Nominal speed	RPM	3410/520	3430/520	3420/480	3440/540	3380/535
	Short time duty	min					
	Power factor		0.81/0.54	0.84/0.55	0.84/0.50	0.88/0.44	0.87/0.50
	Efficiency		0.68/0.25	0.75/0.29	0.74/0.34	0.80/0.47	0.79/0.65
3m	Load	tm/min	6.0/0.9	14/1.8	31/4.5	60/10	130/19
300 starts/h	Nominal power ^{*)}	kW	1.1/0.18	2.6/0.35	5.8/0.9	11.5/1.9	24/3.6
50 % ED	Nominal torque	Nm	3.0	7.7	15.6	30	61
	Nominal speed	RPM	3440/540	3470/540	3470/510	3490/560	3430/545
	Short time duty	min					
	Power factor		0.76/0.51	0.79/0.50	0.79/0.45	0.84/0.38	0.85/0.43
	Efficiency		0.66/0.22	0.74/0.28	0.76/0.32	0.81/0.45	0.81/0.64
4m	Load	tm/min		12/1.5			95/16
360 starts/h	Nominal power ^{*)}	kW		2.2/0.30			18/3.0
60 % ED	Nominal torque	Nm		6.0			48
	Nominal speed	RPM		3490/550			3460/555
	Short time duty	min					
	Power factor			0.69/0.46			0.82/0.38
	Efficiency			0.72/0.24			0.81/0.63

*) Powers are given with nominal load.

4) Currents (Motors 50 Hz)

Motor type	Currents * (fast/slow speed)	Duty Group	Voltage					
			220 V	380 V	400 V	415 V	500 V	660 V
N1 MF09ZA106	Starting current (A)		29/5.5	17/3.2	16/3.0	15/2.9	13/2.4	9.7/1.8
	Nominal current (A)	1Bm	8.0/4.0	4.6/2.3	4.4/2.2	4.2/2.2	3.5/1.8	2.7/1.3
		1Am	6.4/4.0	3.7/2.3	3.5/2.2	3.4/2.2	2.8/1.8	2.1/1.3
		2m	5.8/4.0	3.4/2.3	3.2/2.2	3.1/2.2	2.6/1.8	1.9/1.3
		3m	5.3/4.0	3.1/2.3	2.9/2.2	2.8/2.2	2.3/1.8	1.8/1.3
		4m	-	-	-	-	-	-
N2 MF10Z-106	Starting current (A)		70/12	41/6.8	39/6.5	38/6.3	31/5.2	24/3.9
	Nominal current (A)	1Bm	15.0/7.8	8.5/4.5	8.1/4.3	7.8/4.1	6.5/3.4	4.9/2.6
		1Am	15.0/7.8	8.5/4.5	8.1/4.3	7.8/4.1	6.5/3.4	4.9/2.6
		2m	13.0/7.8	7.6/4.5	7.2/4.3	6.9/4.1	5.8/3.4	4.4/2.6
		3m	11.0/7.8	6.4/4.5	6.1/4.3	5.9/4.1	4.9/3.4	3.7/2.6
		4m	10.0/7.8	5.8/4.5	5.5/4.3	5.3/4.1	4.4/3.4	3.3/2.6
N3 MF11Z-106	Starting current (A)		133/22	77/13	73/12	70/12	58/9.6	44/7.3
	Nominal current (A)	1Bm	-	-	-	-	-	-
		1Am	30.0/14.0	17.0/8.2	16.5/7.8	16.0/7.5	13.0/6.2	10.0/4.7
		2m	26.0/14.0	15.0/8.2	14.0/7.8	14.0/7.5	11.0/6.2	8.5/4.7
		3m	22.0/14.0	13.0/8.2	12.0/7.8	12.0/7.5	9.6/6.2	7.3/4.7
		4m	-	-	-	-	-	-
N4 MF13ZA106	Starting current (A)		291/51	168/29	160/28	154/27	128/22	97/17
	Nominal current (A)	1Bm	-	-	-	-	-	-
		1Am	56.0/27.0	33.0/16.0	31.0/15.0	30.0/15.0	25.0/12.0	19.0/9.1
		2m	47.0/27.0	27.0/16.0	26.0/15.0	25.0/15.0	21.0/12.0	16.0/9.1
		3m	40.0/27.0	23.0/16.0	22.0/15.0	21.0/15.0	18.0/12.0	13.0/9.1
		4m	-	-	-	-	-	-
N5 MF16Z-106	Starting current (A)		433/76	239/42	239/42	227/40	191/34	145/26
	Nominal current (A)	1Bm	103.0/36.0	57.0/20.0	57.0/20.0	55.0/19.0	46.0/16.0	35.0/12.0
		1Am	103.0/36.0	57.0/20.0	57.0/20.0	55.0/19.0	46.0/16.0	35.0/12.0
		2m	85.0/34.0	47.0/19.0	47.0/19.0	45.0/18.0	38.0/15.0	29.0/12.0
		3m	71.0/33.0	39.0/18.0	39.0/18.0	37.0/17.0	31.0/15.0	24.0/11.0
		4m	60.0/31.0	33.0/17.0	33.0/17.0	31.0/16.0	27.0/14.0	20.0/10.0

*) Current with nominal load

HOISTING MOTORS

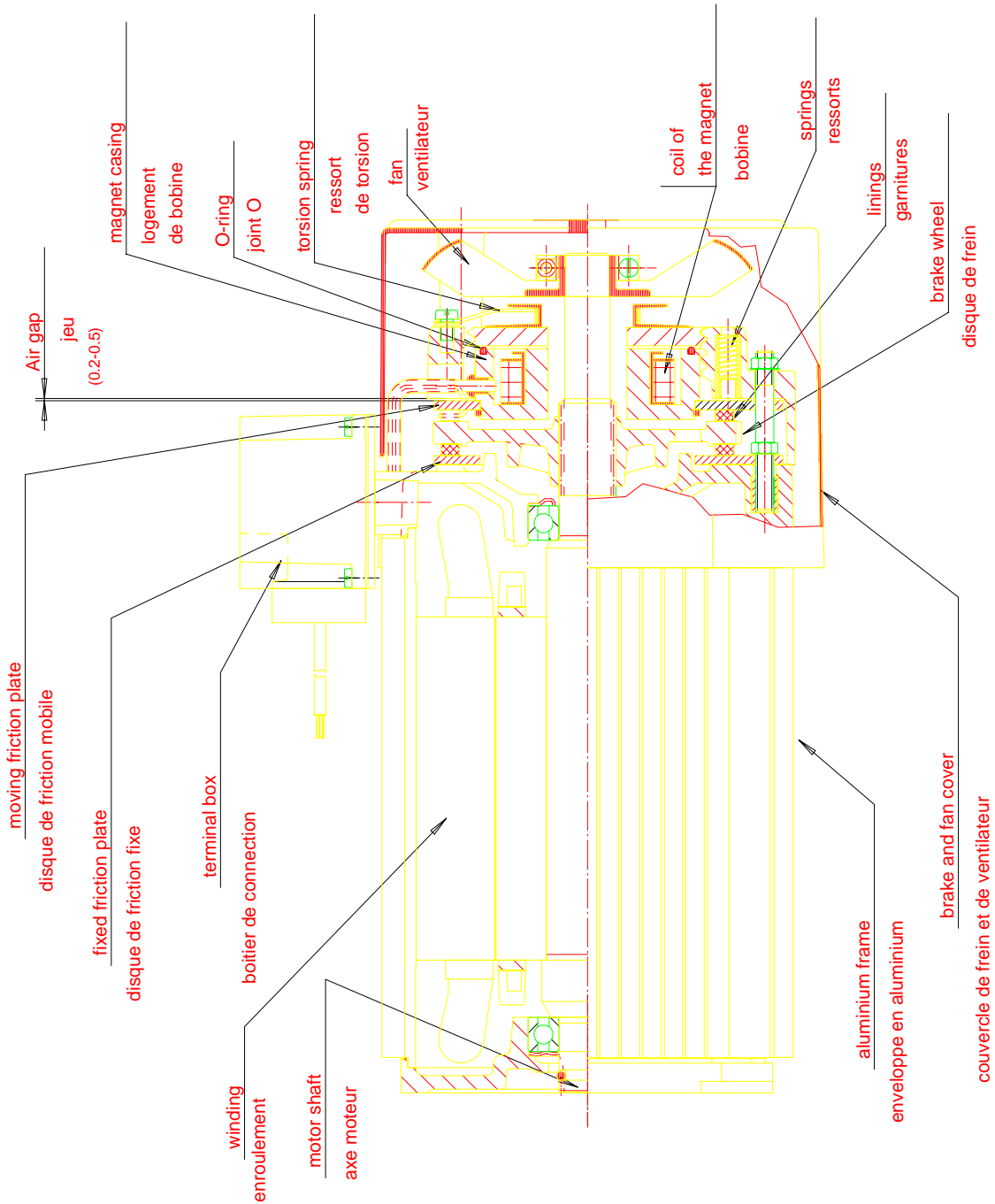
5

4) Currents (Motors 60 Hz)

Motor type	Currents ^{*)} (fast / slow speed)	Duty Group	Voltage					
			220 V	380 V	440 V	460 V	480 V	600 V
N1 MF09ZA106	Starting current (A)		33/6.3	19/3.6	17/3.1	16/3	15/2.9	13/2.4
	Nominal current (A)	1Bm	9.2/4.6	5.3/2.9	4.6/2.3	4.2/2.2	4.2/2.1	3.5/1.8
		1Am	7.3/4.6	4.2/2.7	3.7/2.3	3.5/2.2	3.4/2.1	2.8/1.8
		2m	6.7/4.6	3.9/2.7	3.3/2.3	3.2/2.2	3.1/2.1	2.6/1.8
		3m	5.0/4.6	2.9/2.7	2.5/2.3	2.4/2.2	2.3/2.1	2.3/1.8
		4m	-	-	-	-	-	-
N2 MF10Z-106	Starting current (A)		82/14	47/7.9	41/6.8	39/6.5	37/6.2	31/5.2
	Nominal current (A)	1Bm	17/9.0	10/5.2	8.6/4.5	8.2/4.3	7.9/4.1	6.6/3.4
		1Am	17/9.0	10/5.2	8.6/4.5	8.2/4.3	7.9/4.1	6.6/3.4
		2m	15/9.0	8.7/5.2	7.5/4.5	7.2/4.3	6.9/4.1	5.8/3.4
		3m	13/9.0	7.4/5.2	6.4/4.5	6.1/4.3	5.8/4.1	4.9/3.4
		4m	12/9.0	6.7/5.2	6.8/4.5	5.5/4.3	5.3/4.1	4.4/3.4
N3 MF11Z-106	Starting current (A)		138/25	80/15	69/13	66/12	63/12	58/9.6
	Nominal current (A)	1Bm	-	-	-	-	-	-
		1Am	36/16	21/9.4	18/8.2	17/7.8	16/7.5	13/6.2
		2m	29/16	17/9.4	15/8.2	14/7.8	13/7.5	11/6.2
		3m	25/16	15/9.4	13/8.2	12/7.8	12/7.5	9.6/6.2
		4m	-	-	-	-	-	-
N4 MF13ZA106	Starting current (A)		335/59	194/34	167/29	160/28	153/27	128/22
	Nominal current (A)	1Bm	-	-	-	-	-	-
		1Am	65.0/31.0	38.0/18.0	32.0/16.0	31.0/15.0	30/14	25/12
		2m	54.0/31.0	31.0/18.0	27.0/16.0	26.0/15.0	25/14	21/12
		3m	46.0/31.0	27.0/18.0	23.0/16.0	22.0/15.0	21/14	18/12
		4m	-	-	-	-	-	-
N5 MF16Z-106	Starting current (A)		460/78	278/47	230/39	230/39	220/37	184/31
	Nominal current (A)	1Bm	118.0/38.0	71.0/23.0	59.0/19.0	59.0/19.0	56.0/18.0	47.0/15.0
		1Am	118.0/38.0	71.0/23.0	59.0/19.0	59.0/19.0	56.0/18.0	47.0/15.0
		2m	96.0/36.0	58.0/22.0	48.0/18.0	48.0/18.0	46.0/17.0	38.0/15.0
		3m	76.0/34.0	46.0/21.0	38.0/18.0	38.0/17.0	36.0/16.0	31.0/14.0
		4m	64.0/32.0	39.0/20.0	32.0/18.0	32.0/16.0	31.0/15.0	26.0/13.0

*) Currents are given with nominal load.

5) Hoisting motor description



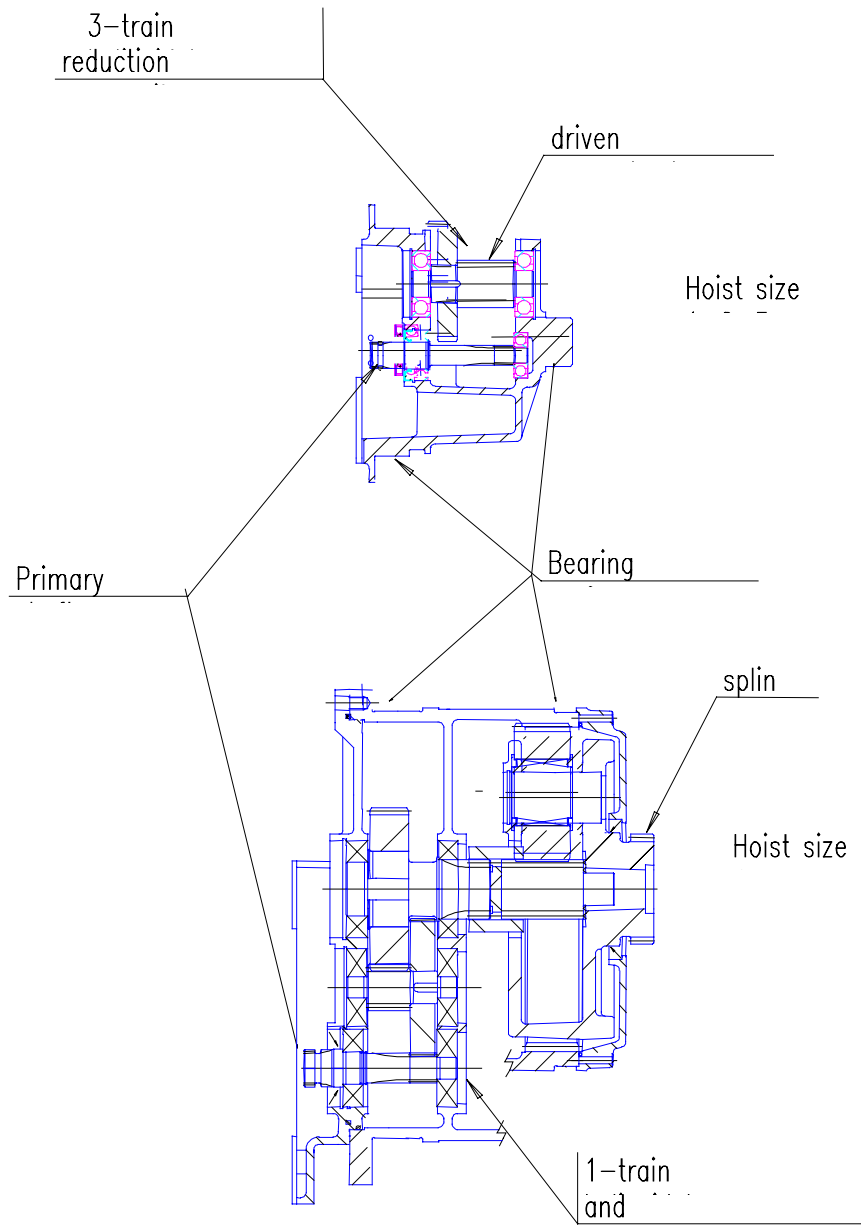
HOISTING GEARS	6
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Hoist types SM1, SM2, SM3 are fitted with 3-train helicoidal reduction gear units, lubricated by semi-liquid grease. The reduction gear is not sealed, and the drum plays the part of the casing. A pinion engaging on a geared wheel that is integral with the drum rotates the drum.

Hoist types SM4, SM5, SM6 are fitted with 2-stage reduction gears, the first of helicoidal trains and a second epicyclical stage. This is an oil-bath assembly, and the reduction gears are sealed units. The drum is actuated by a tapered shaft co-axial to the drum, actuating an end plate that is one piece (welded) with the drum.

HOIST	GEAR	NAME	CODE	MOTOR	RATIO Motor / drum	LUBRICANT FOR GEAR	QUANTITY
SM1	N	1G1100	1117502	N1	72	MOBIL SHC007	235 grams ½ lbs.
SM2	N	3G2300	1127502	N2	115	MOBIL SHC007	235 grams ½ lbs.
SM3	L	3G2200	1137502	N2	144	MOBIL SHC007	235 grams ½ lbs.
	N	3G3500	1137504	N3	92		
	R	3G3300	1137503	N3	72		
SM4	L	4G3300	1147502	N3	187	MOBIL GEAR 630	1.4 liter or 1.5 quarts except LHT Hoists 2 liter or 2.1 quarts
	N	4G4600	1147504	N4	120		
	R	4G4400	1147503	N4	94		
SM5	N	5G4400	1157502	N4	173	MOBIL GEAR 630	2.2 liter or 2.4 quarts
	R	5G5500	1157503	N5	87		
SM6	L	6G4400	3560P6G001	N4	336	MOBIL GEAR 630	6 liter or 6.4 quarts
	R	6G5500	3560P6G002	N5	168		
SM6 (LV)	L	7G4400	70P7G4001	N4	524	MOBIL GEAR 630	6 liter or 6.4 quarts
	N	7G5500	70P7G4001	N5	262		
	R	7G5600	70P7G4002	N5	210		
	3	7G5700	70P7G4003	N5	168		

HOISTING GEARS	6
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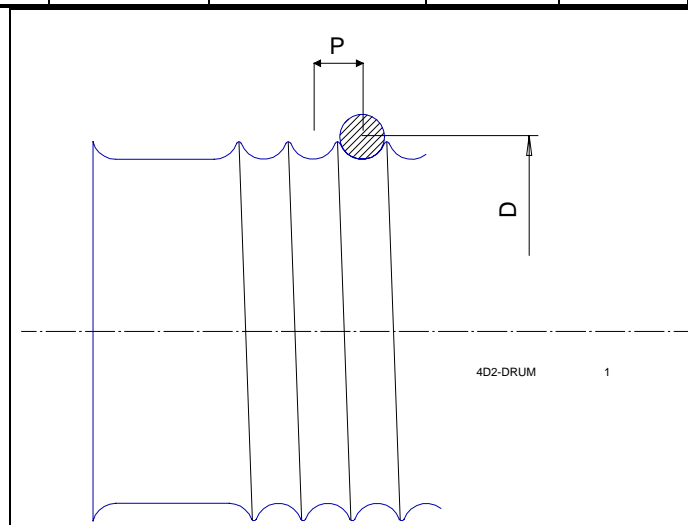
DRUMS	7
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SM2000

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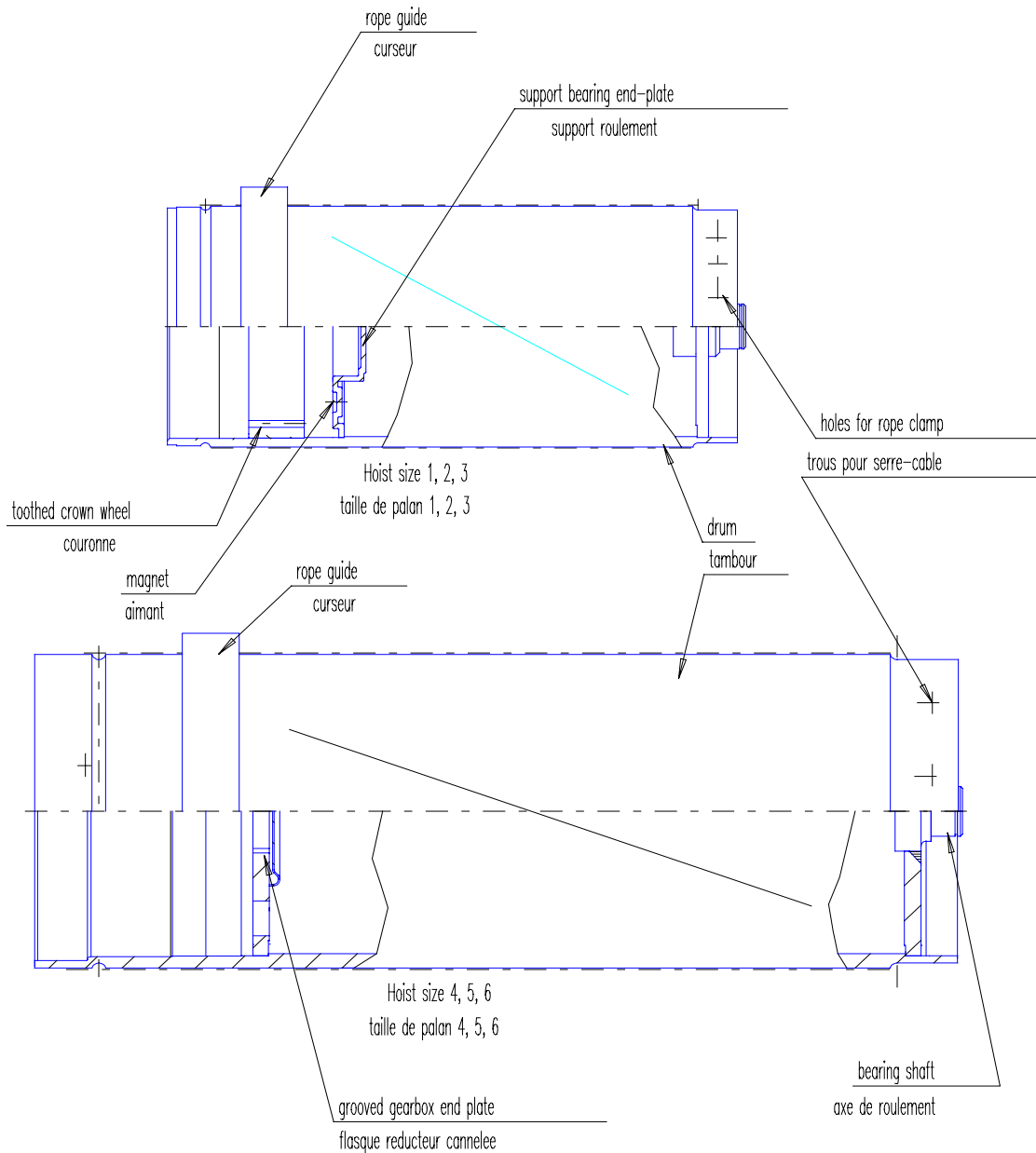
NAME	A	B	C, Z	D, Y, V	E, W, U, T	F	G	H	J	K	L	M	N
LG (MM)	510	620	720	900	1400	1700	2000	2400	2700	3100	3400	3800	4200

HOIST	DRUM D Ø (MM)	LENGTH	REEVING	ROPE d ø (mm)	PITCH (mm)	D/d	CLAMPS QUANTITY
SM1	152	A	1/1,2/1,4/1,4/2	6	6.3	25.33	2
SM2	244	A,C	1/1,2/1,4/1	7	7.8	34.85	2
		Z	2/1	6	6.3	40.66	2
SM3	244	A,C	1/1,2/1,4/1	9	9.9	27.1	3
		A,C	4/2	7	7.8	34.85	6
		D,E	6/1	9	9.9	27.1	3
SM4	318	B,D	1/1,2/1,4/1	13	14.3	24.5	5
		B,D	4/2	9	9.9	35.3	10
		E,F,G	6/1	13	14.3	24.5	5
		Y	2/1	9	9.9	35.3	5
		V	2/1	7	7.8	45.43	5
SM5	368	D,E	1/1,2/1,4/1	16	17.5	23.1	4
		D,E	4/2	13	14.3	28.4	8
		G,J	4/2,8/2,12/2	13	14.3	28.4	8
		F,H,G	16/2	10	11.3	36.9	8
		F,G,H	6/1	16	17.5	23.1	4
		W	2/1	13	14.3	28.4	4
		U	2/1	9	9.9	40.89	4
		T	2/1	7	7.8	52.57	4
SM6	445	D,E,F,G,H	2/1,4/1	20	22.3	21.5	5
		E-N	4/2,8/2,12/2	16	17.5	27.8	10
		E-N	16/2	14	15.3	31.5	10

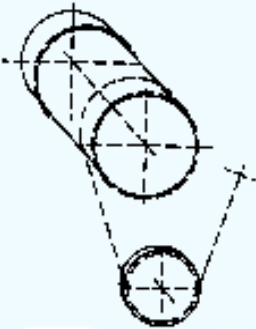


DRUMS

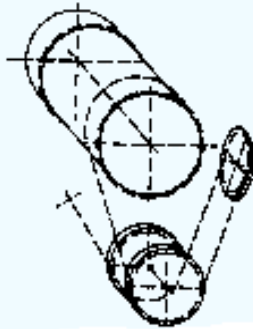
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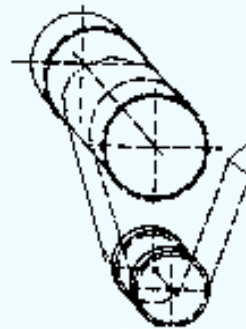
REEVING	8
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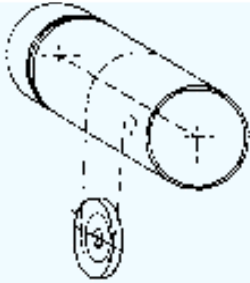
2/1 STD (SM1-SM5)



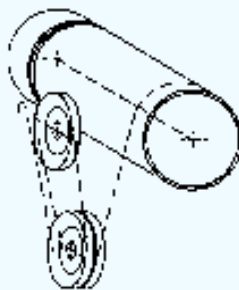
4/1 STD (SM1-SM5)



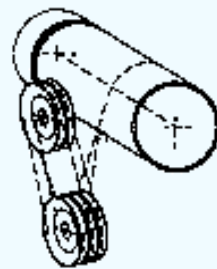
4/2 STD LV (SM1-



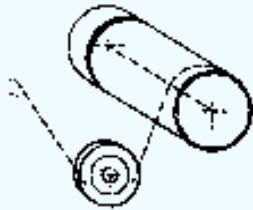
2/1 (SM6)



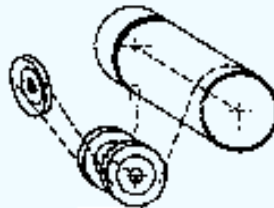
4/1 (SM6)



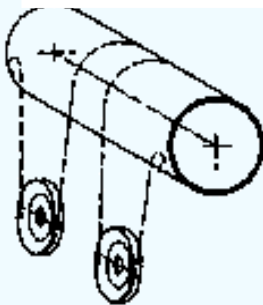
6/1 (SM3-SM5)



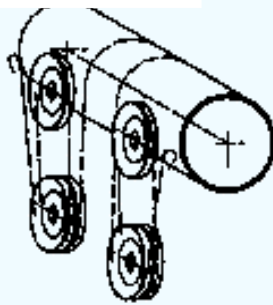
2/1 LHT / HPR (SM1-SM4)



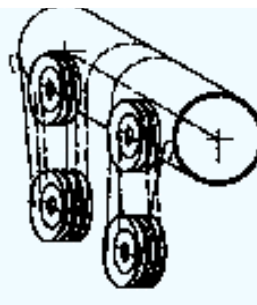
4/1 LHT / HPR (SM1-SM4)



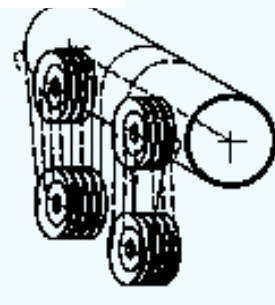
4/2 LV
(SM5-SM6)



8/2 LV
(SM5-SM6)



12/2 LV
(SM5-SM6)



16/2 LV
(SM5-SM6)

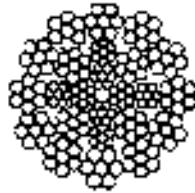
HOISTING ROPE

9

I) ROPE TYPES USED



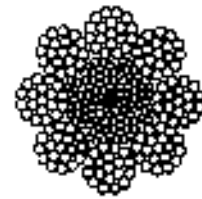
17 x 7 AGM



NRHD 24 x 7
NRHD 24 x 17



6 x 21 FC dyform
6 x 31 FC dyform



8 x 25 F - CWP

Note! The used rope types are subject to change. If the rope information is critical always check the currently used rope type case by case.

The actual rope diameter is between the tolerance of the nominal diameter as follow:

Nominal diameter (mm)	Tolerance %	
	Rope with strands exclusively of wire	Rope with fiber strand cores
6 <...< 7	+5 -1	+7 -1
> 8	+4 -1	+6 -1

II) ROPES CALCULATED BY FEM

FEM recommendations:

Hoist FEM duty group	1Bm	1Am	2m	3m	4m
Min. safety factor	3.55	4	4.5	5.6	7.1

HOISTING ROPE	9
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III) ROPE TYPE AND SAFETY FACTOR (1 Am)

Hoist	Drum	Rope ø	Rope construction	Strength of wire	Min. breaking load	Max. load / rope	safety factor
		mm		N/mm ²	kg	kg	
SM10111 4	A	6	AGM 17x7	2160	2966	500	5.93
SM10211 4							
SM10421 4							
SM10411 4							
SM20111 4	A, C	7	AGM 17x7	2160	4118	1000	4.12
SM20211 4							
SM20411 4							
SM30111 4	A, C	9	NRHD 24x7	2160	6983	1600	4.36
SM30211 4	A, C D, E	9	COMPACT 9x17	2160	7289	1600	4.46
SM30411 4							
SM30611 4							
SM30421 4	A, C	7	AGM 17x7	2160	4118	800	5.15
SM30211 4	Z	6	AGM 17x7	2160	2966	500	5.93
SM40111 4	B, D	13	NRHD 24x7	2160	14780	3200	4.61
SM40211 4SM4041 14	B, D E, F, G	13	Compact 9x17	2160	15495	3200	4.67
SM40611 4							
SM40421 4	B, D	9	COMPACT 9x17	2160	7289	1600	4.46

SM40211 4	Y	9	NRHD 24x7	2160	6983	1600	4.36
SM40211 4	V	7	AGM 17x7	2160	4118	1000	4.12
SM50111 4 SM50211 4	D, E	16	NRHD 24x17	2160	22100	4000	5.63
SM50411 4 SM50611 4	D, E F, G, H	16	6x31 FC DYFORM	2160	26198	4000	6.55
SM50421 4	D, E	13	Compact 9x17	2160	15495	2000	7.74
SM50211 4	W	13	NRHD 24x7	2160	14780	3200	4.61
SM50211 4	U	9	NRHD 24x7	2160	6983	1600	4.36
SM50211 4	T	7	AGM 17x7	2160	4118	1000	4.12
SM50421 4 SM50821 4 SM51221 4	E, G, J	10	8x19 SR DYFORM	2160	11621	2000	5.81
SM51621 4	F, H, K	10	8x19 SR DYFORM	2160	11621	2000	5.81

HOISTING ROPE

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III) ROPE TYPE AND SAFETY FACTOR (1 Am)

Hoist	Drum	Rope	Rope construction	Strength of wire	Min. breaking load	Max. load / rope	safety factor
		mm		N/mm ²	kg	kg	
SM60211	F, G, H	20	NRHD	2160	25994	6300	4.12

4			24x17				
SM60411 4	F,G,H	20	6 x 36 FC	1960	32416	6300	5.14
SM60421 4 SM60821 4 SM61221 4	E-N	16	6x31 FC DYFORM	1960	26198	4000	6.55
SM61621 3	E-N	14	8x25F-CWP	2160	24231	5000	4.85 (1 Bm)

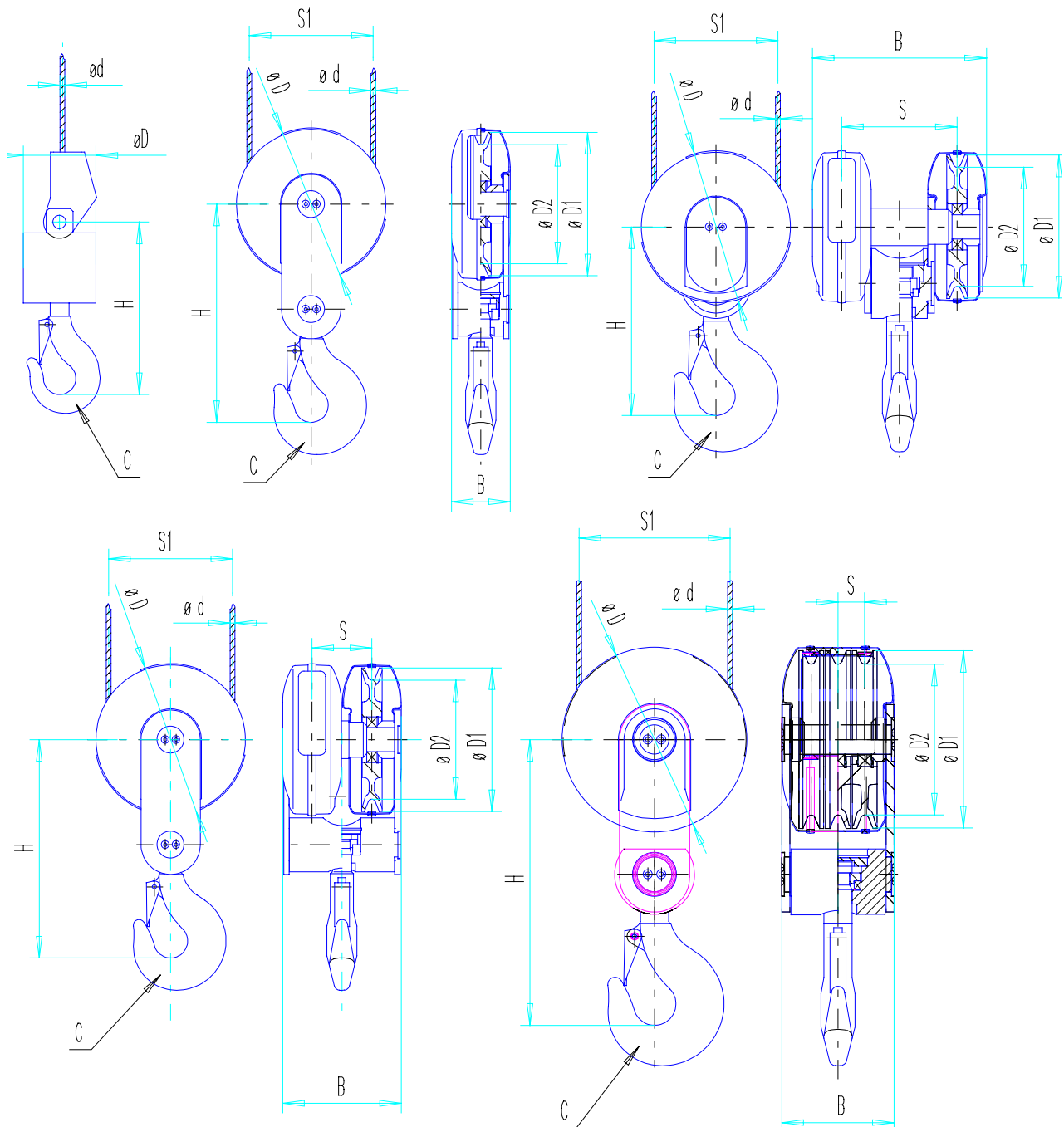
Caution regarding hoist ropes:

A damaged rope may cause other components such as guide ring and/or sheaves to become damaged. A damaged sheave or rope guide may destroy or even break the new wire rope if damaged sheave or related item is not replaced. Wire rope and all related items shall be checked for excessive wear or damage. All appropriate items shall be greased on regular basis.

HOOK BLOCK

10

I) HOOK BLOCK DIMENSIONS



HOOK BLOCK	10
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I) HOOK BLOCK DIMENSIONS

Hoist	FEM	Hook size	d	H	S	S1	B	D	D1	D2
			mm	mm	mm	mm	mm	mm	mm	mm
SM10111-	1Am,2m,3m	N°25	6	290	-	-	-	135	-	-
SM10211-	1Am,2m,3m	RSN1	6	300	-	125	90	164	148	119
SM10411-	1Am,2m,3m	RSN1	6	245	156	125	246	164	148	119
SM10421-	1Am,2m,3m	RSN1	6	300	91	125	181	164	148	119
SM20111-	1Am,2m,3m	N°25	7	290	-	-	-	135	-	-
SM20211 4	1Am	RSN1	7	300	-	125	90	164	148	119
SM20211-	2m,3m	RSN1	7	320	-	156	90	204	188	149
SM20411-	1Am,2m,3m	RSN2.5	7	290	179	156	265	204	188	149
SM30111-	1Am,2m,3m	N°25	9	290	-	-	-	135	-	-
SM30211 4	1Am	RSN1	9	320	-	162	90	204	188	153
SM30211-	2m,3m	RSN2.5	9	405	-	231	109	282	265	222
SM30411 4	1Am	RSN2.5	9	290	175	162	265	204	188	153
SM30411-	2m,3m	RSN4	9	350	214	231	323	282	265	222
SM30611-	1Am,2m,3m	RSN4	9	454	37	231	154	282	265	222
SM30421-	1Am,2m,3m	RSN1	7	320	95	156	181	204	188	149
SM40111-	1Am,2m,3m	N°25	13	290	-	-	-	135	-	-
SM40211 4	1Am	RSN2.5	13	405	-	235	109	282	265	221
SM40211-	2m,3m	RSN4	13	490	-	293	133	347	330	280
SM40411 4	1Am	RSN4	13	350	214	235	323	282	265	221
SM40411-	2m,3m	RSN5	13	400	259	293	392	347	330	280
SM40611-	1Am,2m,3m	RSN5(L,R)	13	530	50	293	209	347	330	280
SM40611-	1Am,2m,3m	RSN6 (N)	13	600	50	293	209	347	330	280
SM40421-	1Am,2m,3m	RSN2.5	9	405	111	231	220	282	265	222
SM50211 4	1Am	RSN4	16	490	-	291	133	347	330	275
SM50211-	2m,3m	RSN4	16	540	-	359	408	448	420	343
SM50411	1Am	RSN5	16	400	259	291	392	347	330	275

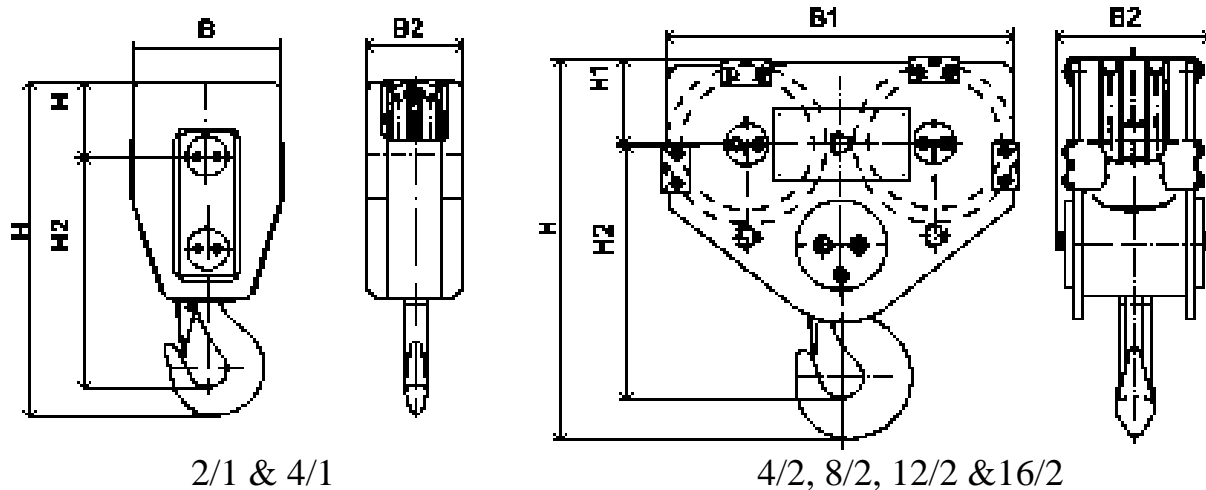
SM2000

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4										
SM50411-	2m,3m	RSN5	16	402	295	359	408	448	420	343
SM50611-	1Am,2m,3m	RSN10	16	670	66	359	322	448	420	343
SM50421-	1Am,2m,3m	RSN4	13	490	267	293	134	347	330	280

HOOK BLOCK	10
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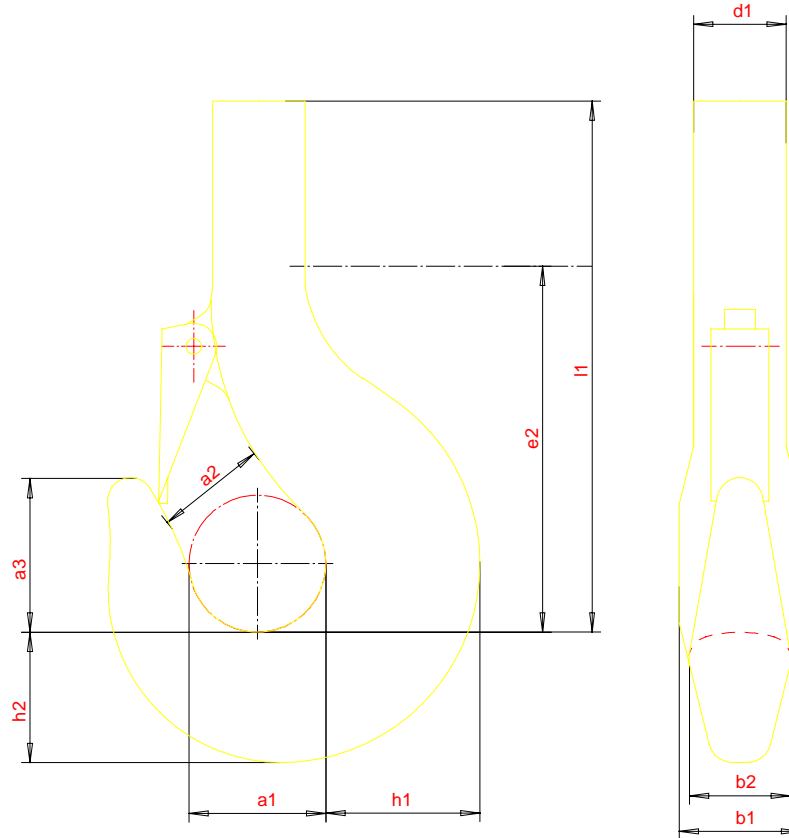
D) HOOK BLOCK DIMENSIONS



Hoist	FEM	Hook size	d	H	H1	H2	B1	B2
			mm	mm	mm	mm	mm	mm
SM504214	1Am	RSN4	13	600	145	400	666	252
SM50421-	2m, 3m	RSN4	13	675	175	445	730	252
SM508214	1Am	RSN6	13	710	145	495	666	252
SM50821-	2m, 3m	RSN6	13	790	175	540	730	252
SM512214	1Am	RFN10	13	740	145	500	666	272
SM51221-	2m, 3m	RFN10	13	820	175	550	730	272
SM516214	1Am	RFN10	10	740	145	500	666	272
SM602114	1Am	RSN6	20	969	220	663	440	196
SM60211-	2m, 3m	RFN10	20	1148	265	776	530	234
SM604114	1Am	RFN10	20	1058	220	731	440	234
SM60411-	2m, 3m	RFN10	20	1148	265	776	530	234
SM60421-	1Bm, 1Am	RSN10	16	856	200	550	880	270
SM60421-	2m, 3m	RSN10	16	811	165	540	740	270
SM60821-	1Bm, 1Am	RSN10	16	856	200	550	880	270
SM60821-	2m, 3m	RSN10	16	811	165	540	740	270
SM61221-	1Bm, 1Am	RSN16	16	973	200	676	880	270
SM61221-	2m, 3m	RSN16	16	923	165	626	800	270
SM616213	1Bm	RSN20	14	1029	165	714	800	315

HOOK BLOCK	10
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II) HOOK DIMENSIONS



	RSN1	RSN2.5	RSN4	RSN5	RSN6	RSN10	RFN10	RFN16	RFN20	RSN25
a1	50	63	71	80	90	112	112	140	160	180
a2	40	50	56	63	71	90	90	112	125	140
a2' *	35	41	44	48	56	75	75	97	110	125
a3	57	72	80	90	101	127	127	160	180	202
b1	38	53	63	71	80	100	100	125	140	160
b2	32	45	53	60	67	85	85	106	118	132
d1	30	42	48	53	60	75	75	95	106	118
e2	128	167	190	215	240	286	286	357	405	455
h1	48	67	80	90	100	125	125	160	180	200
h2	40	58	67	75	85	106	106	132	150	170
l1	197	253	285	318	374	452	460	595	665	724
poids weight	3.2 kg	6.3 kg	8.8 kg	12.3 kg	17.1 kg	40 kg	40.0 kg	77.0 kg	112 kg	160 kg

* a2 dimension with safety catch. Dimensions are mm.

SHEAVE	11
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- Groove 45°
- Life lubricated bearing
- Groove hardness is 220 HB

hoist	FEM classification	D nominal (mm) hook block	D nominal (mm) frame	Groove radius mm	D rope mm
SM1021	1Am, 2m , 3m	126	-	3.7	5.5
SM1042	1Am, 2m , 3m	126	-	3.7	5.5
SM1041	1Am, 2m , 3m	126	126	3.7	5.5
SM2021	1Am	126	-	3.7	7
SM2021	2m , 3m	156.5	-	3.7	7
SM2041	1Am	156.5	126	3.7	7
SM2041	2m , 3m	156.5	156.5	3.7	7
SM3021	1Am	162	-	4.8	9
SM3021	2m , 3m	231	-	4.8	9
SM3042	1Am, 2m , 3m	156.5	-	3.7	7
SM3041	1Am	162	162	4.8	9
SM3041	2m , 3m	231	231	4.8	9
SM3061	1Am, 2m , 3m	231	231	4.8	9
SM4021	1Am	235	-	7	13
SM4021	2m , 3m	293	-	7	13
SM4042	1Am, 2m , 3m	231	-	4.8	9
SM4041	1Am	235	235	7	13
SM4041	2m , 3m	293	293	7	13
SM4061	1Am, 2m , 3m	293	293	7	13
SM5021	1Am	291	-	8.5	16
SM5021	2m , 3m	360	-	8.5	16
SM5042	1Am, 2m , 3m	293	-	7	13
SM5041	1Am	291	291	8.5	16
SM5041	2m , 3m	360	360	8.5	16
SM5061	1Am, 2m , 3m	360	360	8.5	16
SM5082	1 Am	235	293	7	13
SM5122					
SM5082	2m, 3m	293	293	7	13
SM5122					
SM5162	1 Am	226	226	5.3	10
SM6021	1 Am	371	371	10.6	20
SM6041					
SM6021	2m, 3m	448	448	10.6	20
SM6041					
SM6042	1 Am	291	360	8.5	16
SM6082					
SM6122					
SM6042	2m, 3m	360	360	8.5	16
SM6082					
SM6122					
SM6162	1 Bm	289	358	7.5	14