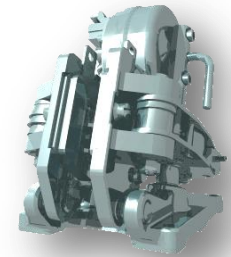
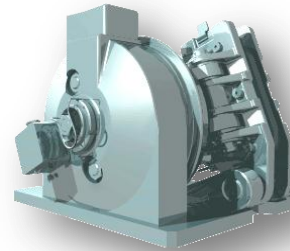
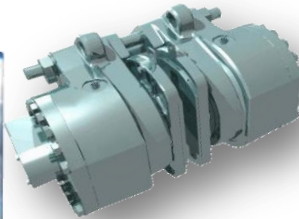


**SIME brakes**

***Stromag***  
safety in motion



***BRAKING SYSTEMS FOR NUCLEAR CRANES***

**SIME brakes**

***Stromag***  
safety in motion

# *STROMAG FRANCE*



 Stromag Group Factorles  
 SIME brakes  
sales offices



TURNOVER IN 2010 = 18 M€

CAPITALISATION = 3 M€

EXPORT SHARE = 67 %

PERSONNEL = 150

ESTABLISHED = 1927

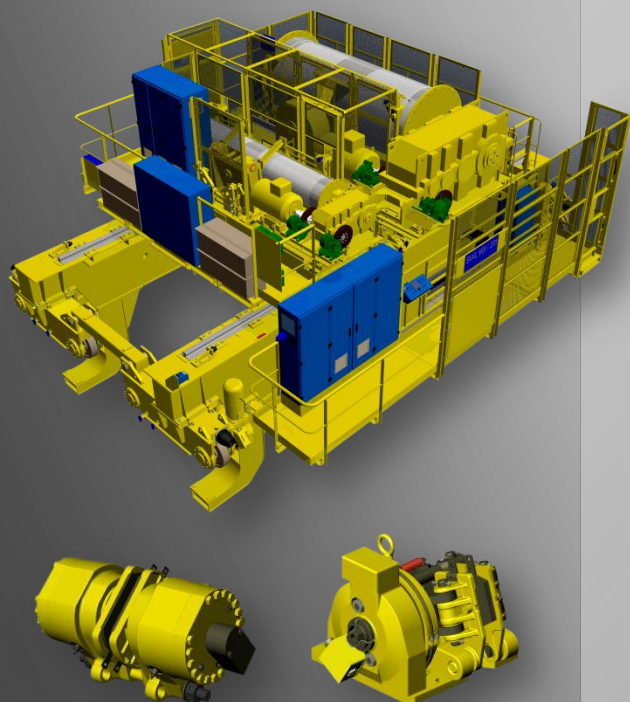
CERTIFIED ISO9001V2002 and by EDF

MANAGING DIRECTOR : B.GEOFFROY

## ACTIVITY AREAS



### NUCLEAR PLANT



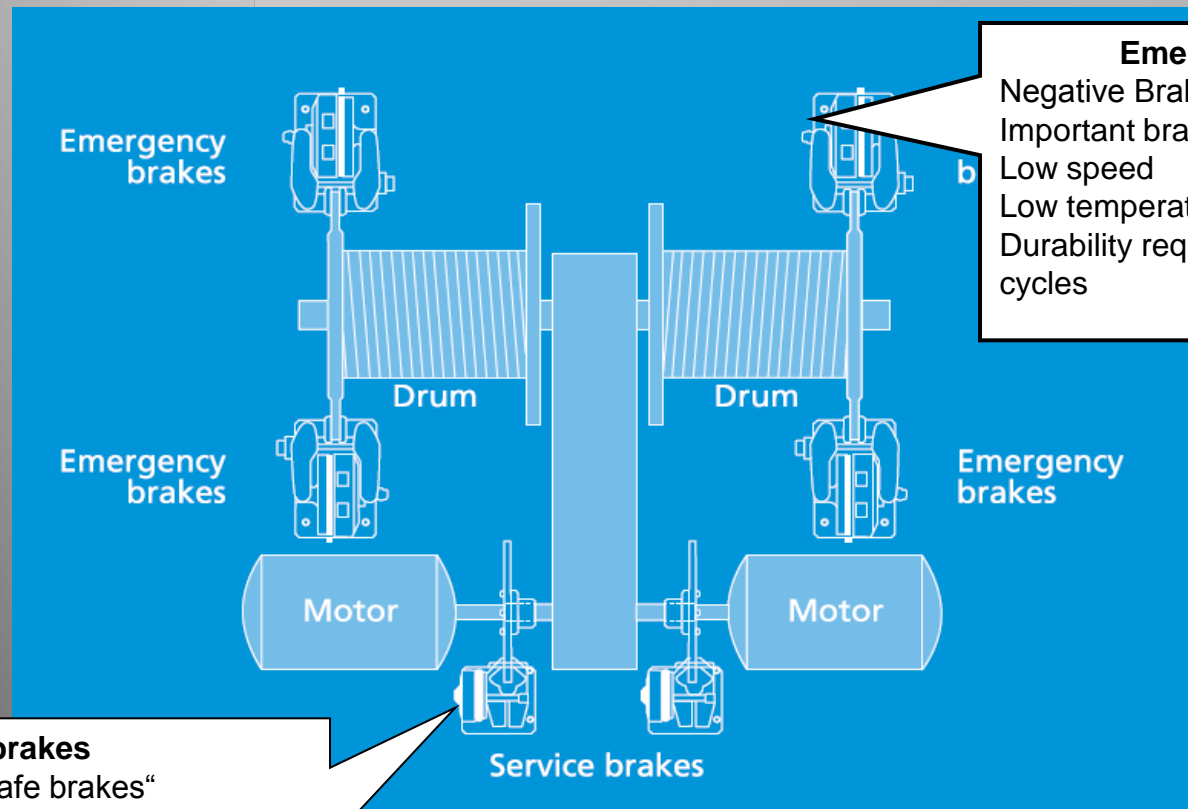
The handling of radioactive material **has to be totally fail-safe.**

In the Nuclear field, Stromag France Disc Brakes are supplied **to meet very high requirement levels of quality, reliability and robustness.**

Due to the high safety requirements, and thanks to the proven confidence of customers, Stromag France **is selected to supply many Nuclear Plants** in France, Europe, China, USA, and South Korea, Russia and czech republic...



# *Disc braking system - Description*



## **Emergency Brakes**

Negative Brakes : “Fail-safe brakes”  
Important braking torque required  
Low speed  
Low temperature  
Durability requirement : 400 000 cycles

## **Service brakes**

Negative Brakes : “Fail-safe brakes”  
Low braking torque  
High speed  
Disc temperature : About 200°C  
Durability requirement : 4 000 000 cycles

# *Disc braking system - Calculation*

## SERVICE BRAKE

Torque due to the load

$$T_{load} = \text{Mass(kg)} \times 10 \times V_{hook(m/s)} / W(\text{rad/s})$$

Braking torque

$$BT = 1,7 \text{ to } 2,3 \times T_{motor}$$

## SELECTION

Respect of safety factors

Stopping time between 1 and 1,5s

Stopping distance impacted by inertia



## ELECTROMAGNETIC SERVICE BRAKES

Braking torque is the result of:

- Type of caliper
- Number of caliper
- Size of disc

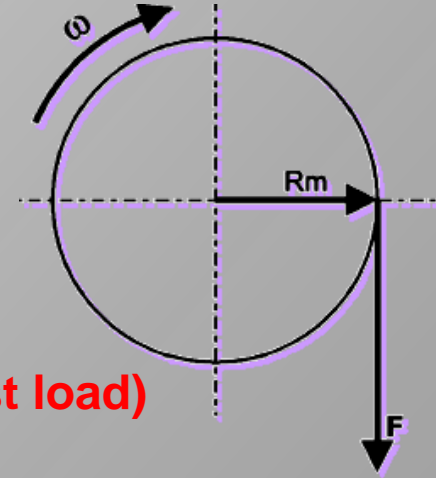


# *Disc braking system - Calculation*

Emergency brakes

Torque due to the load

$$T_{load} = \text{Mass(kg)} \times 10 \times R_m \times N_{BM} / N_{BT}$$



SELECTION

**Respect of safety factors**

**Static = 1.1x test load (with 25% minimum for test load)**

$$\text{Mini} = 1.1 \times 1.25 = 1.375 \Rightarrow \underline{1.4}$$

**Dynamic = 1.5x test load (with 10% minimum for test load)**

$$\text{Mini} = 1.5 \times 1.1 = 1.65 \Rightarrow \underline{1.7}$$

Stopping time between 1 and 1,5s

Stopping distance impacted by inertia

**And specifications example KTA 3902; cinematic chain failure**

## Disc braking system - Calculation

### BRAKE SELECTION

SAFETY FACTORS: dynamic and static

STOPPING DISTANCE

BRAKING TIME

Data			
Safe working load	6300	KN	
Total sprung weight	6300	KN	
Lowering speed	8	m/min	
Dynamic test	125	%	
Static test	133.6	%	
Motor number	4		
Motor speed	890	Rpm	
High speed inertia per motor	32.5	kgm <sup>2</sup>	
Transmission low speed inertia per drum		kgm <sup>2</sup>	
Overspeed detection at +	10	%	
Overspeed detection time	0.16	s	
Drum diameter	2.86	m	
Disc Ø	3.26	m	
Drum number	2		
Rope number per drum	2		
Total number of falls	68		
Gearbox ratio	68.81		
rendement	100	100	

Per Drum (Calculation to 125%)			
2 SH18B U8 2-1 / Ø 3.26 m P30			

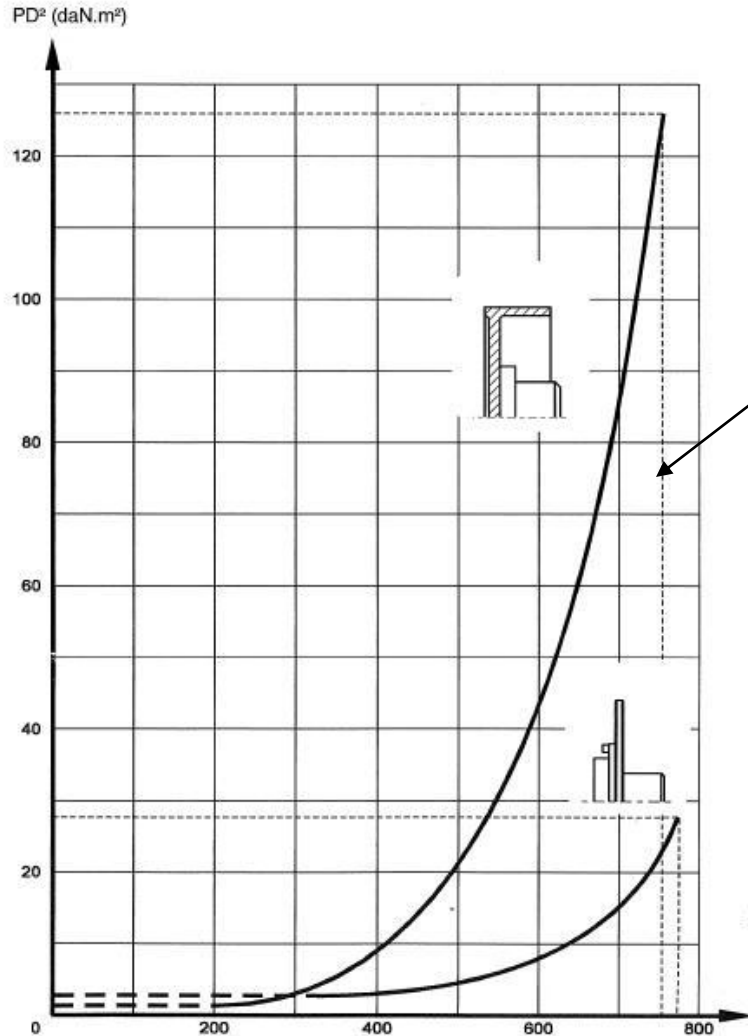
Static load torque for dynamic test	13504	Nm	High speed inertia on low speed	224773	kgm <sup>2</sup>
Static load torque for static test	334823	Nm	Low speed transmission inertia	0	kgm <sup>2</sup>
Dynamic safety factor	1.78		Test load inertia	3026	kgm <sup>2</sup>
Static safety factor	1.47		Inertia to stop per drum	227787	kgm <sup>2</sup>
Dynamic braking torque	652800	Nm	Drum speed when detection	18.86	Rpm
Static braking torque	491200	Nm	Overspeed during detection time	1.87	Rpm
Usefull torque	236688	Nm	Overspeed during response time	2.83	Rpm
Mean radius	1.536	m	Drum speed when braking	21.26	Rpm
Disc linear speed when braking	3.416	m/s	Lowering speed	12.84	m/min

Overspeed detection time	0.16	s	Distance during detection time	28.2	mm
Detect.time	0.2	s	Distance during response time	38.6	mm
Braking time	2.12	s	Distance during braking time	223.2	mm
Stopping time	2.470	s	Stopping distance	288.8	mm



## *Inertia & Response time*

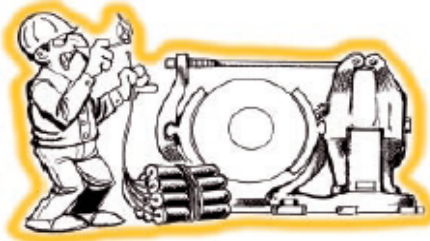


Big inertia= long stopping distance

## *Inertia & Response time*

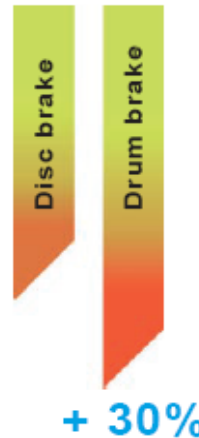
### ● Inertia - response time

*Disc brake inertia is lower than drum brake's (60% less)*

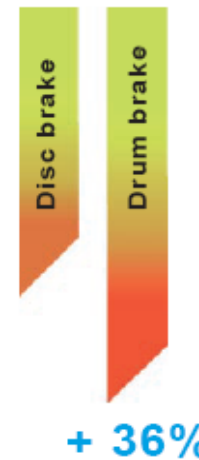


➔ *Shorter response time, no need to oversize brakes*

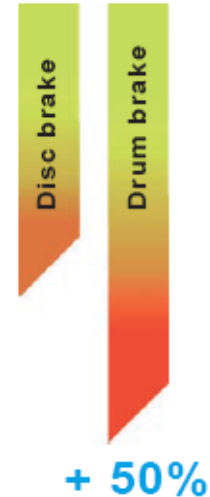
**Stopping distance**  
(same braking torque)



**Generated energy**  
(same braking torque)

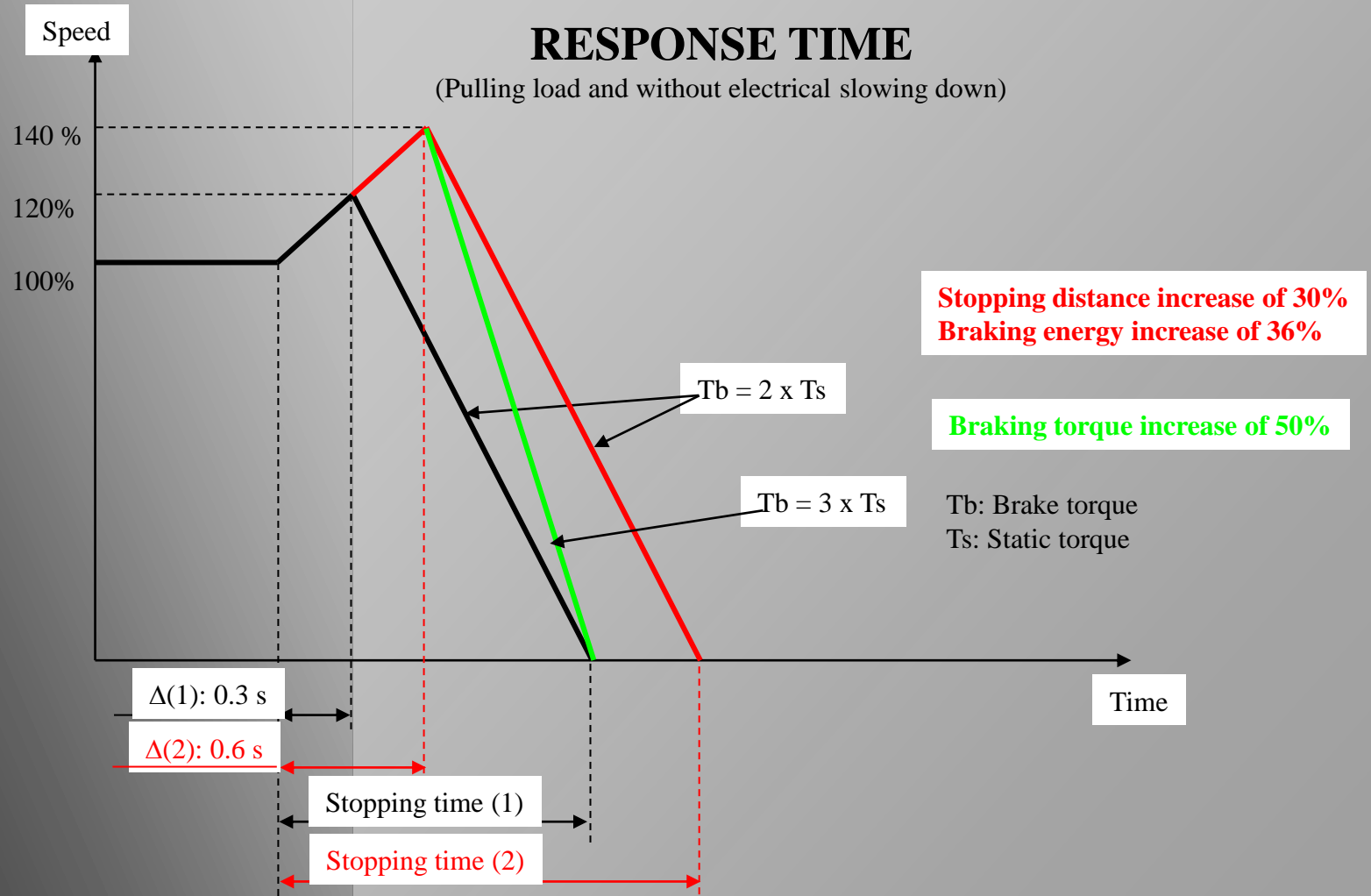


**Braking torque**  
(same stopping distance)

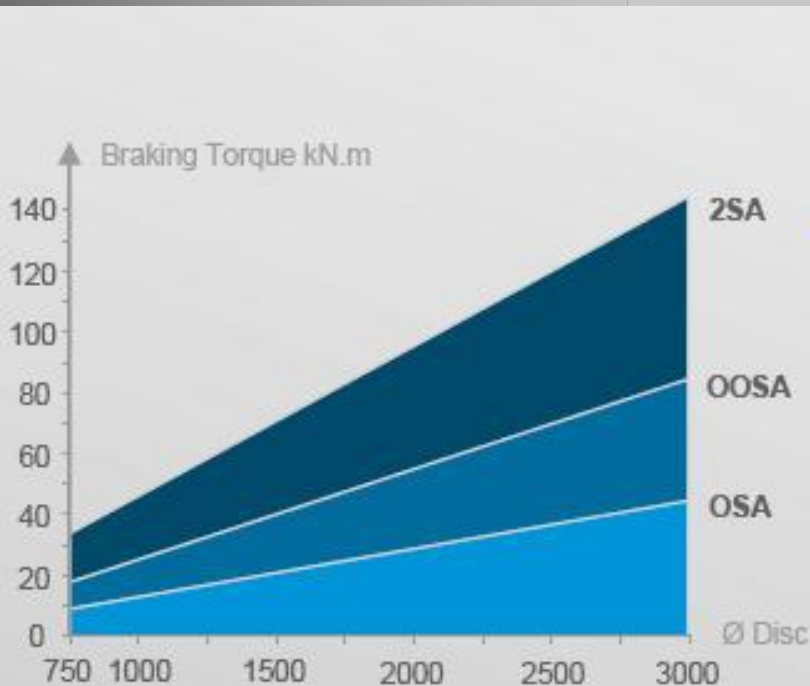


disc brakes solution as service brake= quicker response time; stopping distance shorter and optimize your emergency brake

## Response time



## ELECTROMAGNETIC EMERGENCY BRAKES



2SA caliper



AC Electrical Power Supply

### ELECTROMAGNETIC TYPE:

The SA range of disc brakes, comprises of the models OSA, OOSA, and 2SA brake calipers.

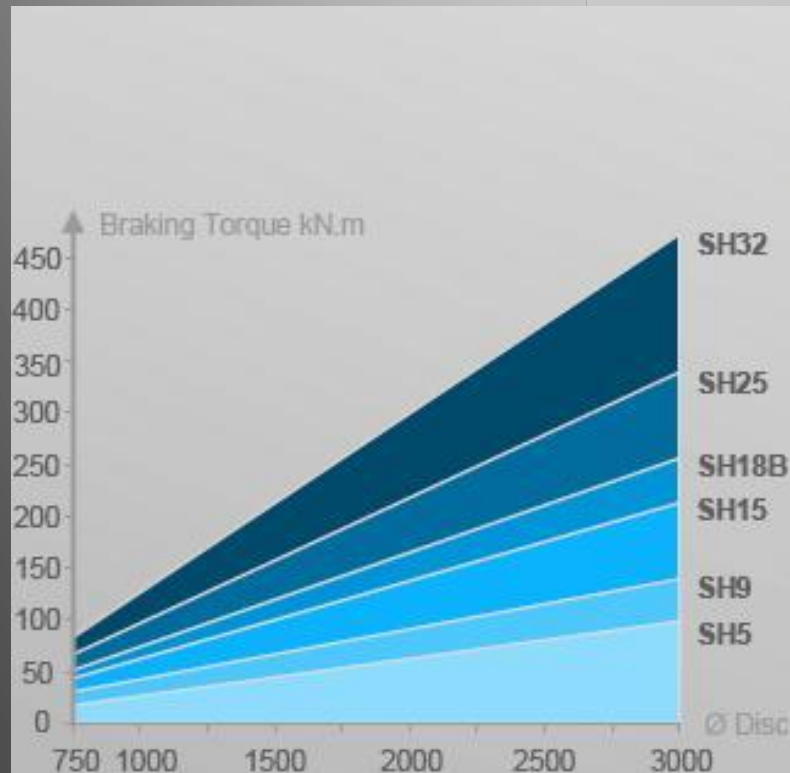
With optimum reliability, these brake calipers ensure very safe lifting of loads.

This range of disc brakes has low maintenance level requirements, and offers an incomparable performance of braking.

These brake calipers can be used in conjunction with the C4205 electrical power supply units, which allows the controlled manual load lowering.



## HYDRAULIC EMERGENCY BRAKES



SH18-B caliper



CE8L Power unit

### HYDRAULIC TYPE:

SH disc brake calipers are powerful Hydraulic Brakes with a symmetrical design. Robustly built and the simplicity of operation earn high customer approval for quality and safety. Two SH Brake Calipers can be mounted onto the same support frame, making it possible to use a single Hydraulic Power Pack.

The SHC version incorporates a support frame, a Hydraulic Power Pack (CE8L or CE12L) and connection piping, all integrally mounted onto the support frame of the Brake Caliper.

Specific options are available, such as: enhanced security return circuit, controlled manual load lowering, drip tray, etc.

## SIME brakes

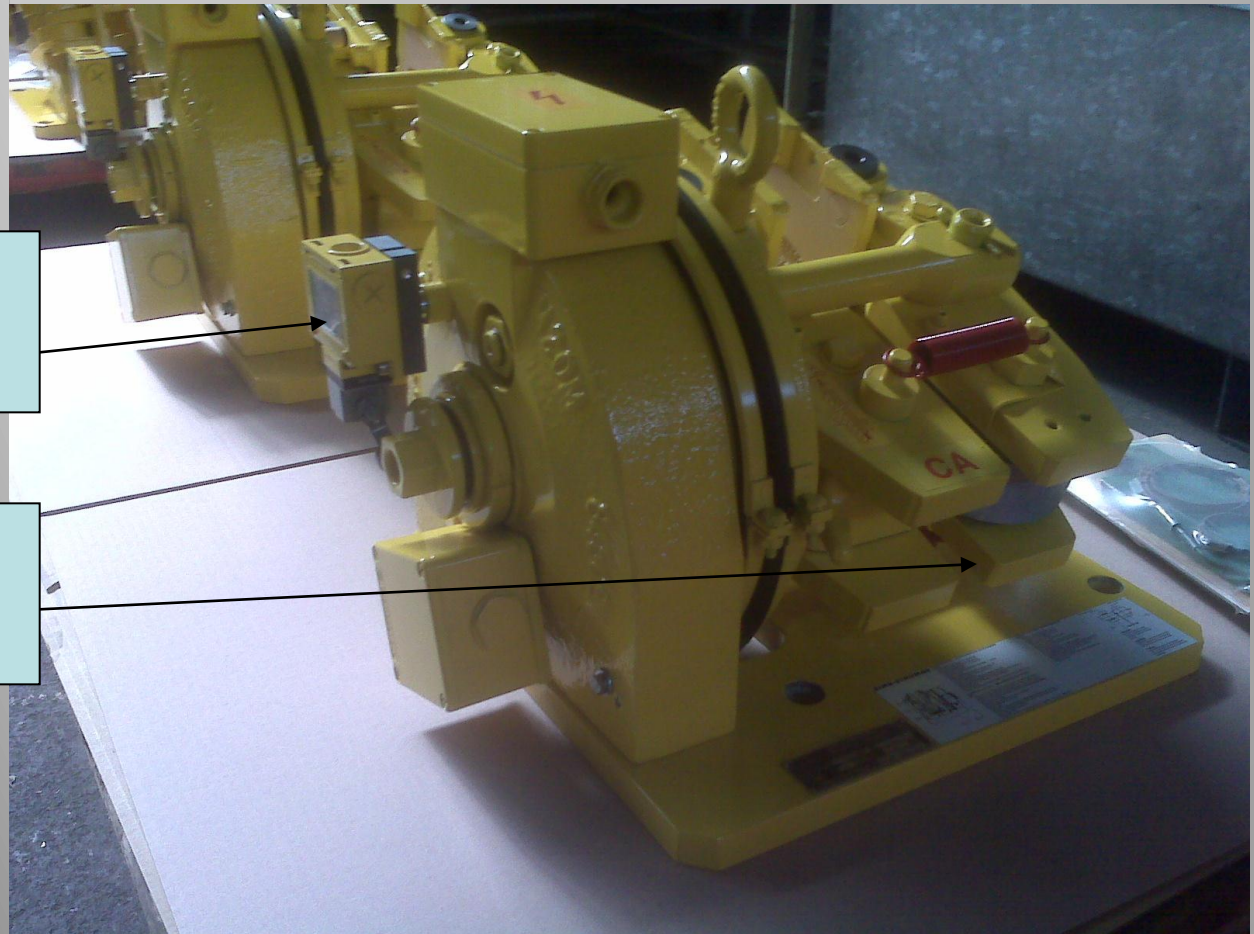
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# 4CA FOR NPP

Decontaminating painting

Switch to detect  
position of nut

Automatic wear  
compensation



## 45K FOR NPP

Terminal box

Opening switch  
with redundancy 2OF

3.1 certificate



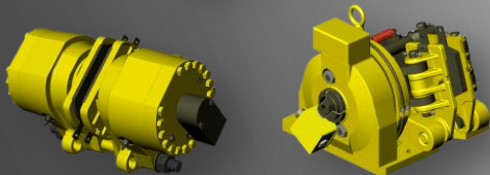
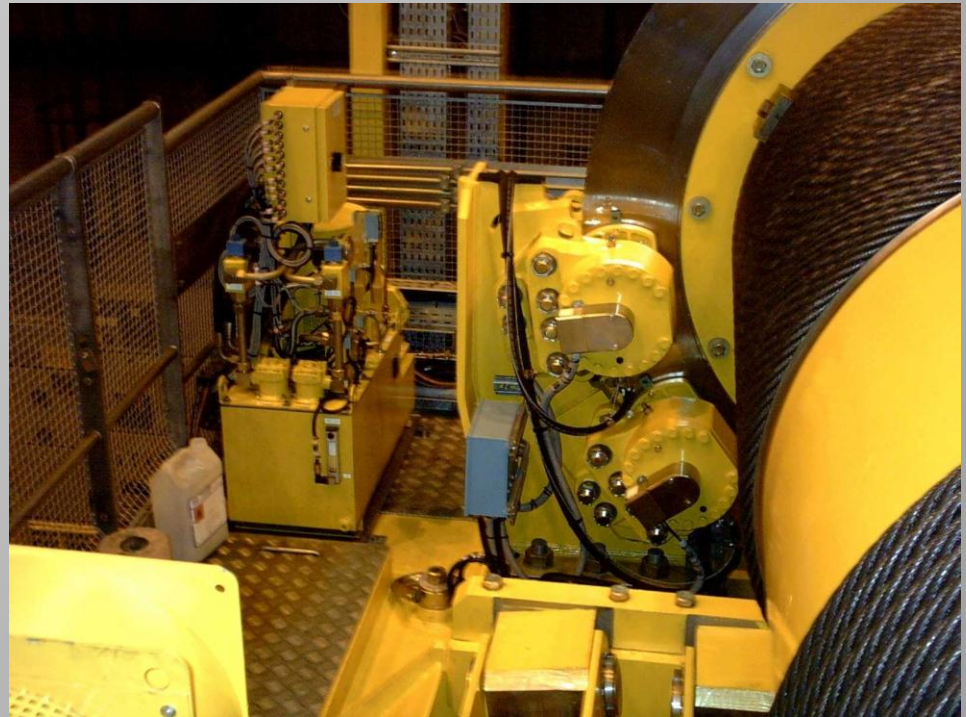
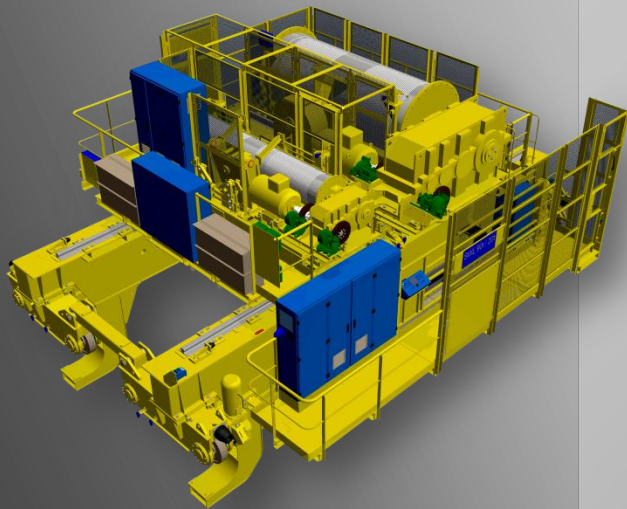


**SIME brakes**

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safety in motion

# *APPLICATIONS*

## NUCLEAR PLANT



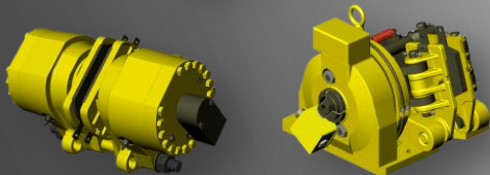
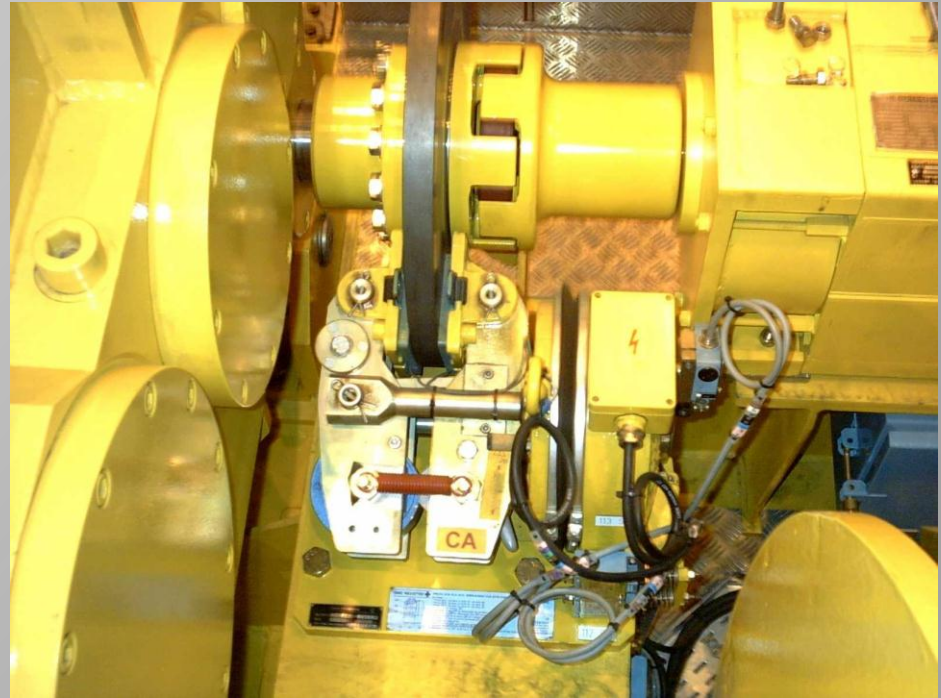
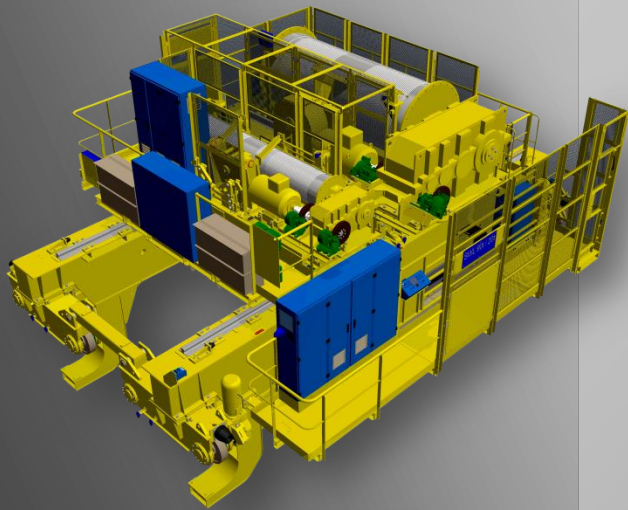


**SIME brakes**

***Stromag***  
safety in motion

# *APPLICATIONS*

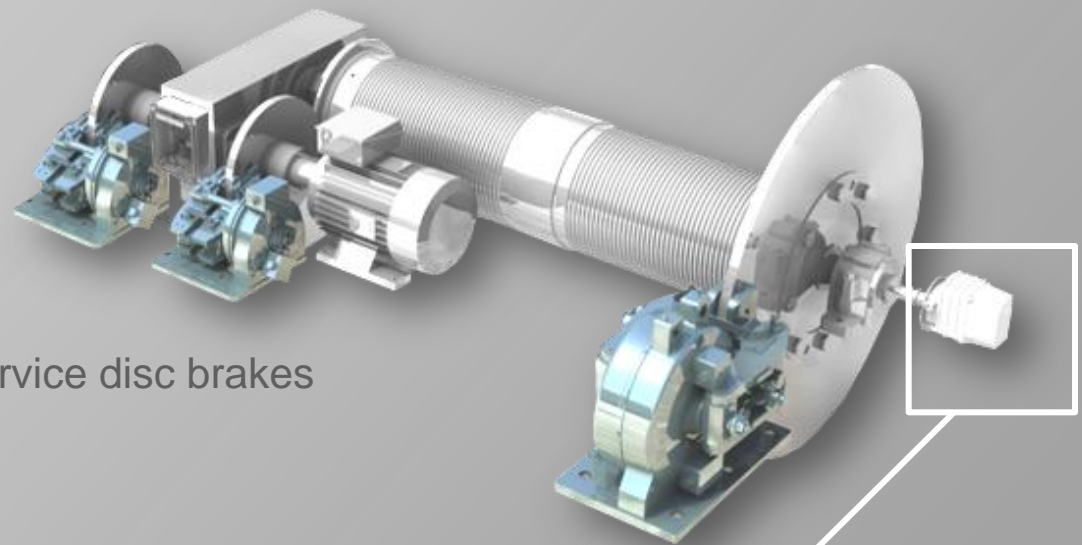
## NUCLEAR PLANT



# *SIDEOS SYSTEM*

## SIDEOS

The SIDEOS is a hoisting speed monitoring system capable of detecting any cases of overspeed, slipping and lack of speed signal.



Service disc brakes

Emergency disc brake

← Analogical system; category 2 Pl=d; easy to adjust; 450 sold units worldwide...

# ***SIDEOS SYSTEM***

## **OVERSPEED**

**When the speed is over the programmed threshold.**

The customer has emergency brake on the drum → Close the emergency brake

The customer doesn't have emergency brake on the drum → Close the service brake

*Attention, emergency brakes are strongly advise with the logic of safety requirement*

**Possible causes: Breaking of the cinematic  
Speed variator fault**

## **STATIC SLIPPING FAULT**

**When a rotation is detected while the system is stopped.**

The customer has emergency brake on the drum → Close the emergency brake

The customer doesn't have emergency brake on the drum → Set off an audible alarm

*Attention, emergency brakes are strongly advise with the logic of safety requirement*

**Possible cause: Fault of the static torque of the brake**

# ***SIDEOS SYSTEM***

## **SIDEOS FAULT: SPEED SIGNAL = 0 or INTERNE FAULT**

**When a loss of the speed signal is detected during a running order**

**Absence of incoder current**

**Simultaneous information to go up or go down**

**Impulsion number by turn of the encoder wrong**

**Voltage 24V inferior at 20V**

The customer can cause a normal stop, and search the fault reason

The signal loss ⇒ SIDEOS inoperative, it's obligatory to dealt the SIDEOS FAULT

**Possible causes: The encoder cable is cut**

## **DYNAMIC SLIPPING FAULT**

**When the detected direction of rotation is different from that required.**

The customer has emergency brake on the drum → Close the emergency brake

The customer doesn't have emergency brake on the drum → Close the service brake

*Attention, emergency brakes are strongly advise with the logic of safety requirement*

**Possible causes: Speed variator fault: The motor intensity to maintain the load at the starting (opening of brakes) is too small**



# *SIDEOS SYSTEM*

**RESPONSE TIME**= time between fault detection and opening of output switch

DEFAULT	RESPONSE TIME
OVERSPEED	45ms with TSV=20ms
STATIC SLIPPING	15ms
DYNAMIC SLIPPING	15ms
SPEED SIGNAL FAULT	
loss of speed signal	15ms
absence of encoder	25ms
wrong number of pulses/rev.	25ms
CONTROL FAULT	
running up or down	15ms
external 24V supply	25ms

# *Conclusion*

Stromag France is able to support you to choose technical solutions for:

- Cinematic chains
- Calculation and optimization
- Service braking system
- Emergency braking system
- Monitoring system

THANK FOR YOUR ATTENTION