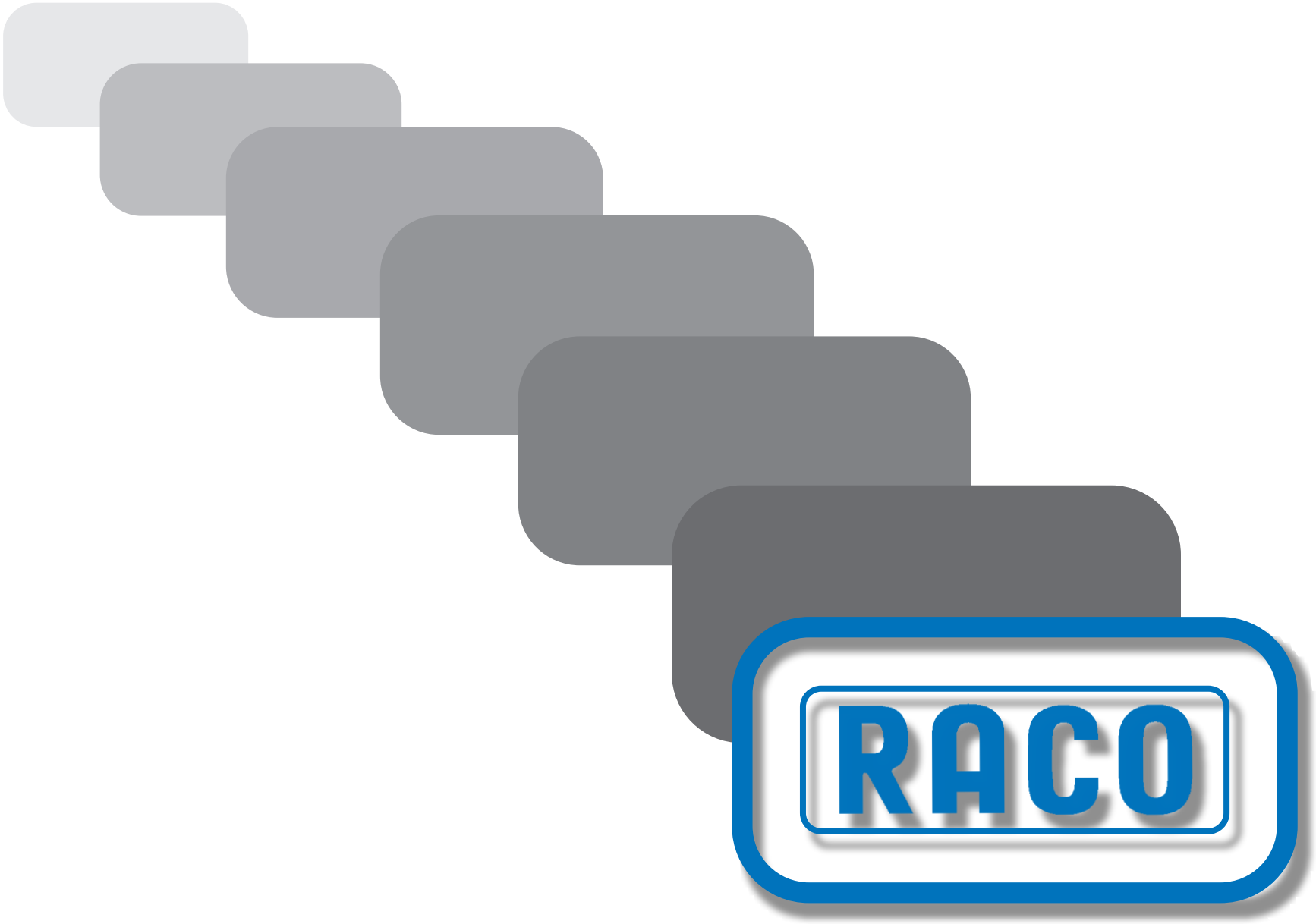

The flexible RACO modular system

Index

RACO SCHWELM

RACO-ELEKTRO-MASCHINEN GMBH

Jesinghauser Str. 56-64 · D-58332 Schwelm
Postfach 660 · D-58319 Schwelm
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Telefax +49 23 36 40 09 10
e-Mail: RACO@raco.de
Internet: http://www.raco.de

RACO INTERNATIONAL

RACO International, Inc. USA

3350 Industrial Blvd.
Bethel Park, PA 15102
(888) BUY-RACO (888) 289-7226
Ph: (412) 835-5744
Fx: (412) 835-0338

e-Mail: raco@racointernational.com
Home page: www.racointernational.com

CERTIFICATE

DNV ZERTIFIZIERUNG UND UMWELTGUTACHTER GMBH

certifies that the company

RACO SCHWELM

RACO Elektro Maschinen GmbH

Jesinghauser Str. 56-64
58332 Schwelm
Germany

has established a

quality system
in conformity with

EN ISO 9001 : 1994

This Certificate is valid for:

Development, Design, Manufacturing, Sales and Service of Electic Mechanical Drive Units, Electric Actuators, Linear Drives, Brake Systems, Ball Screws and Electronic Control and Positioning Components

This Certificate is valid until:
2003-03-31

Certificate-Registration-No.:
CERT-08909-2000-AQ-ESN-TGA

Essen, 2000-04-04
M. Fröhlich
Manager

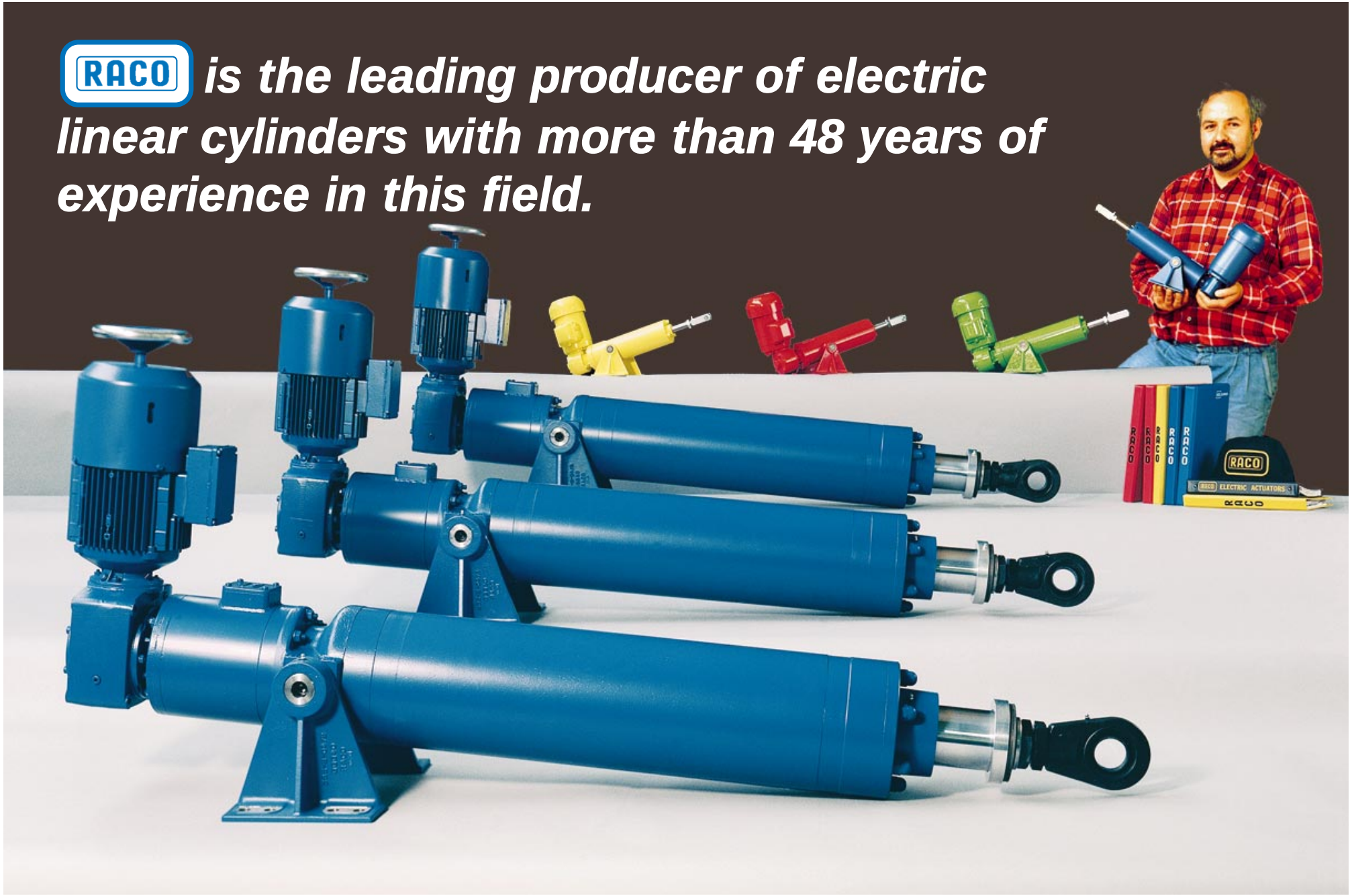
TGA-ZM-004/92-00

Essen, 2000-04-04
K. Nordhause
Lead-Auditor

This Certificate is only valid in connection with the original Certificate CERT-08909-2000-AQ-ESN-TGA.

Stand 01.98 E / APRJ 22506 98 CRT-ESN

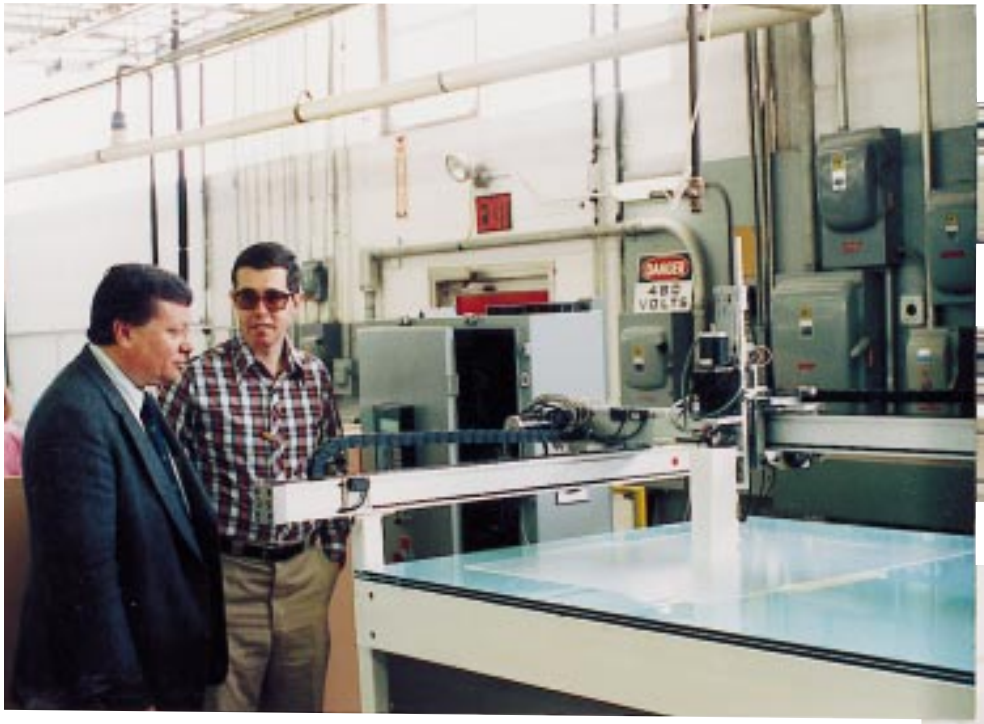
RACO


RACO is the leading producer of electric linear cylinders with more than 48 years of experience in this field.
RACO
RACO ELECTRIC ACTUATORS

In our modern equipped workshops experienced and skilled metal workers take pride in producing precision equipment.

industry chemistry energy

mining environment food

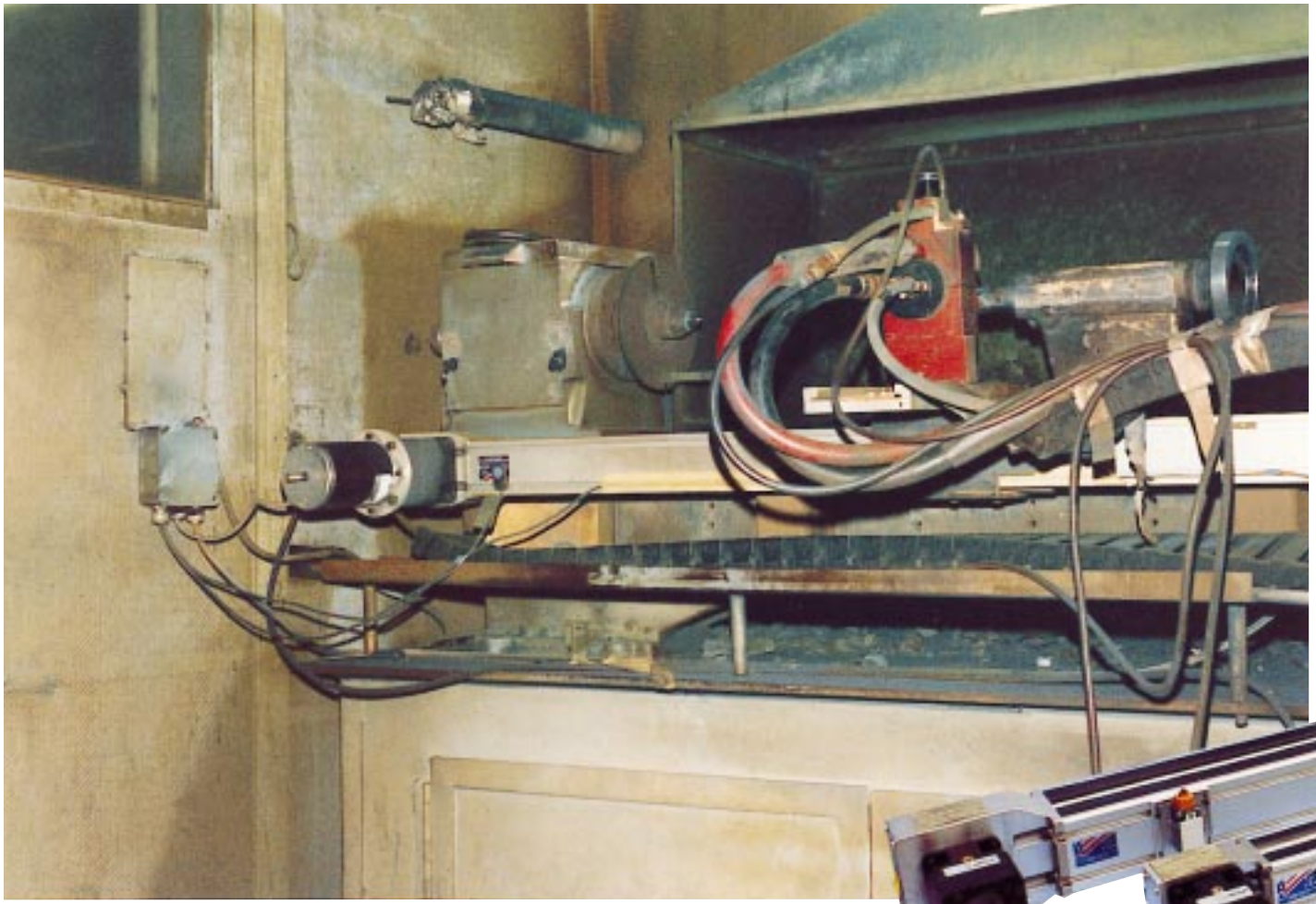


Multiple Axis

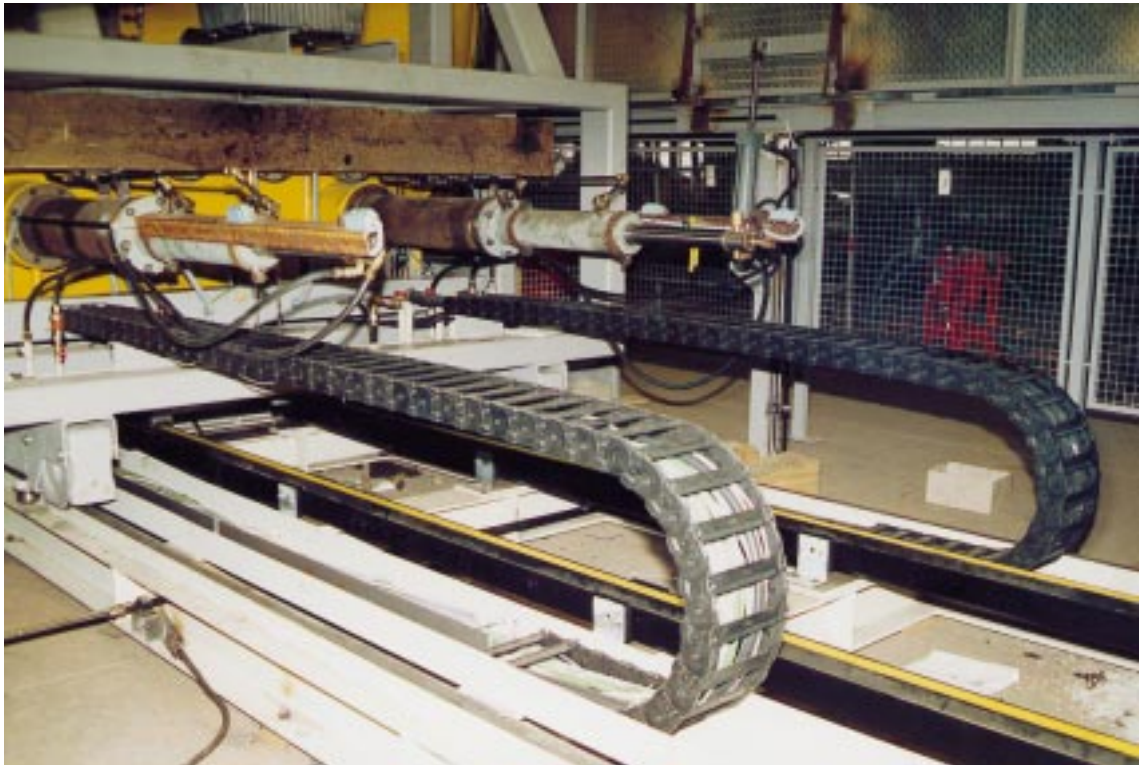
RACO ***LM System***

…the State of the art
approach to solve YOUR
demanding AUTOMATION TASKS

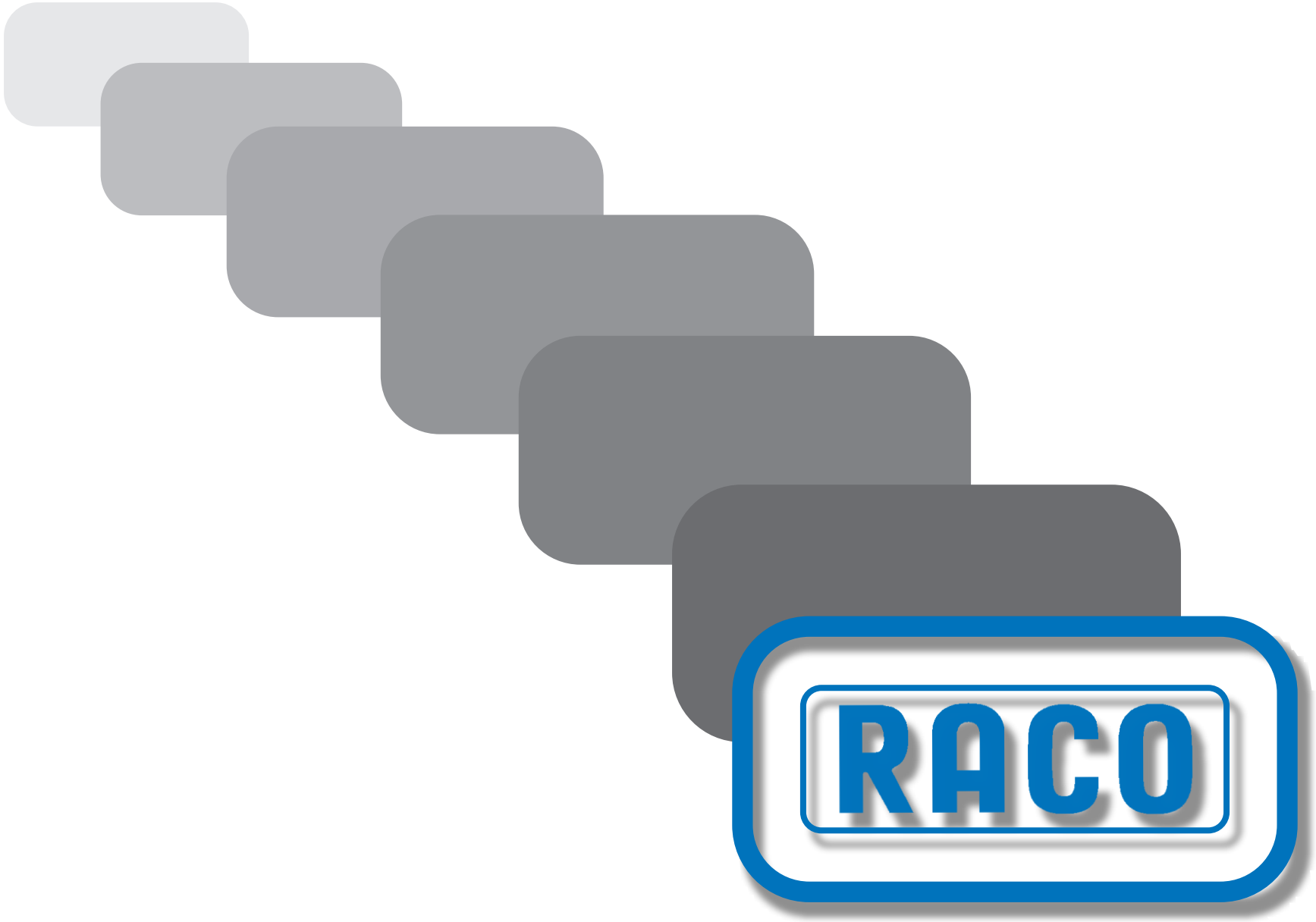
RACO LM Drive in Action



Even in adverse, dusty, abrasive environment such as coating processes or fiber glass cutting the RACO electric linear drive gives you a virtually maintenance free long service life.



*Nitrating oven at General Motors plant driven by 2 RACO electric linear drives type **T4R6** 20 kN thrust, 4000 mm stroke*



Custom made linear cylinder for your application

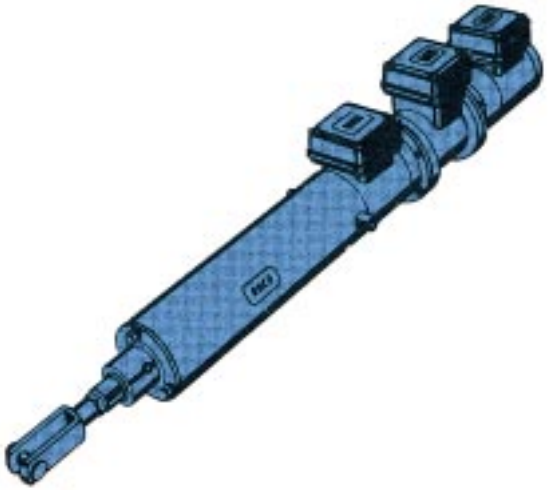
RACO *electric cylinder type* ***T1M8***
80 kN thrust, 2000 stroke

RACO *electric interlocking a bridge*

Antenna Positioning

RACO helps you to ”see better” into remote Galaxies ……

……. and also to enjoy more your favorite TV Show.



RACO *electric actuator type* ***K1F8***
80 kN dyn, 200 kN stat.

RACO *in Telecommunications*

Daimler-Benz Aerospace
Dornier

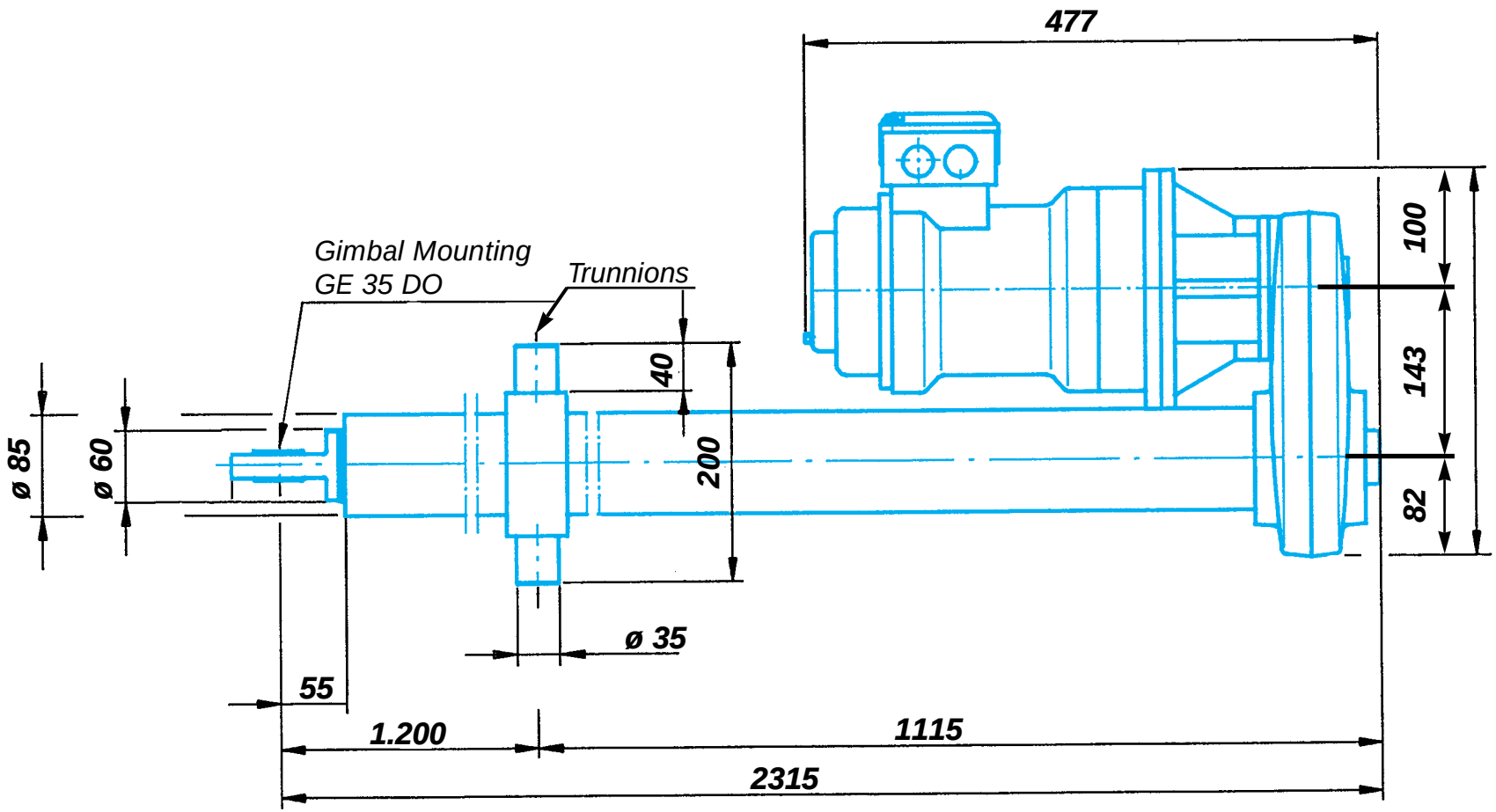
Mast

Mobile Antenna and Sensor Tower

The new trailer-mounted Dornier Mast is able to raise antennas and sensors up to a height of 30 m and to align them precisely in very short time.

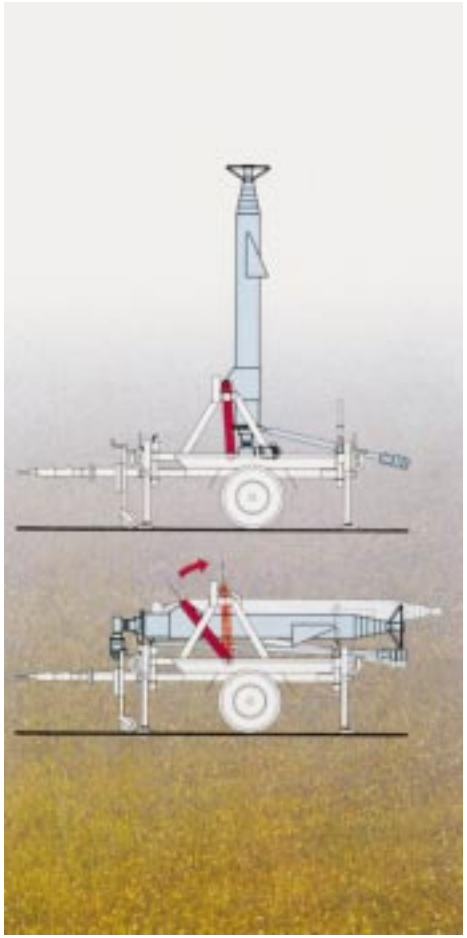
Trailer-mounted Mast; Transportation mode

RACO Compact electric cylinder



all dimensions in mm

The RACO *electric cylinder type* ***T6c7***, 30000 N thrust, 2000 stroke, deploys the mast with 30 mm/sec, but also maintains it in vertical position without any further lock mechanism.



Trailer-mounted Mast

Payloads of up 300 kg can be elevated to a height of 25 m (Option: 30 m) with the trailer-mounted mast. Deployment and demounting can be performed in 10 minutes respectively with a manpower demand of two persons.

The support base is dimensioned so as to make, as a rule, on outer tensioning with ground anchoring unnecessary. However, this possibility still exists.

Technical Data

Maximum height:		*25 m*
Deployment time:		*approx. 10 min*
Demounting time:		*approx. 10 min*
Manpower demand:		*2 men*
Surface required:		*approx. 6,5 x 6,5 m*
Payload (Example):	*4 antennas*	*FM 15000*
	adjustable	*in azimuth ± 180°*
		in elevation ± 15°
*Alignment accuracy at a wind velocity of 25 m/sec**		*azimuth ± 0,5°*
		elevation ± 1,5°
*Permissible wind velocities**		
Deployment:		*approx. 20 m/ sec.*
Operation/Demounting:		*approx. 25 m/ sec.*
Survival:		*approx. 30 m/ sec.*
Gross weight:*		*approx. 4 t*

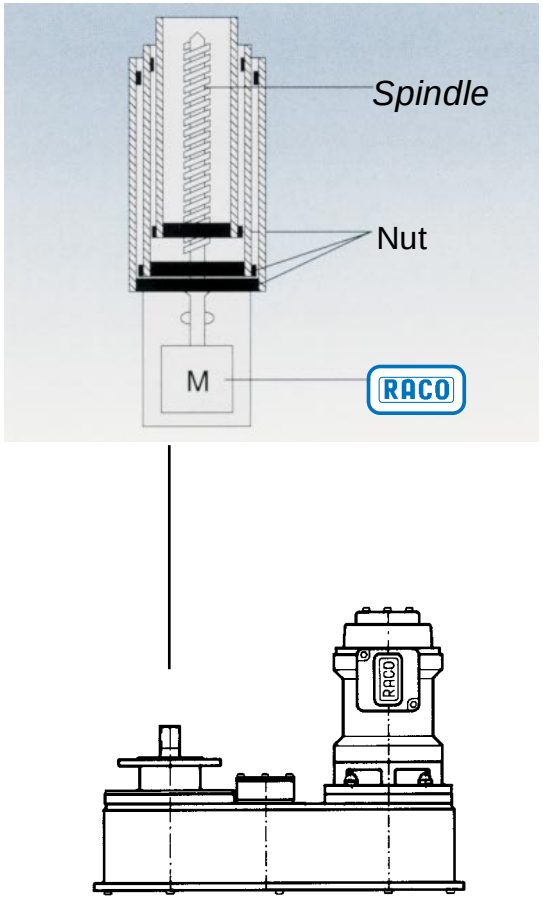
Possible deployment in sloping terrain in longitudinal and lateral axis at a gradient of up to 10°

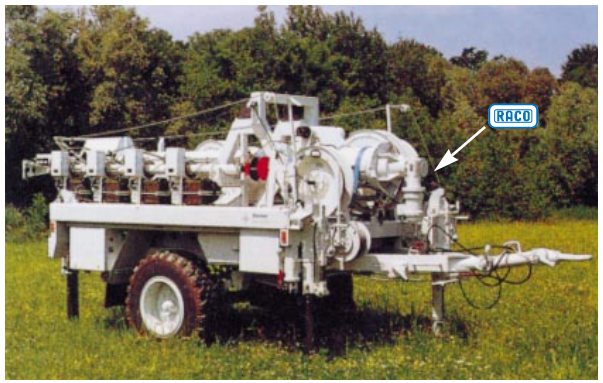
** Example for given payload.*

Principle of the mechanical spindle drive

The use of the reliable Dornier telescopic tube mast with mechanical spindle drive leads to the following advantages:

- *Compact design, minimum air surface*
- *Continuously adjustable height*
- *Continuous automatic extension and retraction*
- *High torsional rigidity*
- *Insusceptible to ice accretion*
- *Drive system fully protected against environmental effects*
- *Practically maintenance-free, high availability*





Trailer-mounted Mast;
Transportation mode

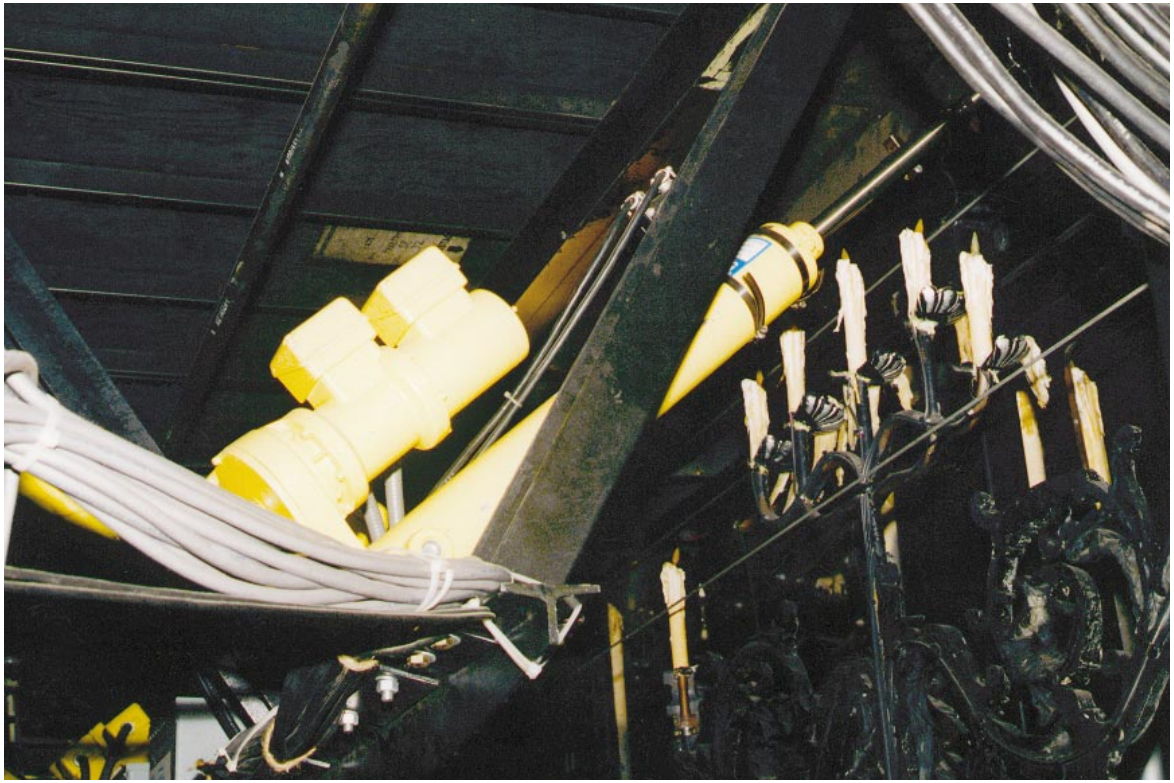
RACO *electric drive type* ***DM V,*** *90 Nm, n2 273 UpM, with electromechanical interlock.*

Trailer-mounted Mast;
Operational mode

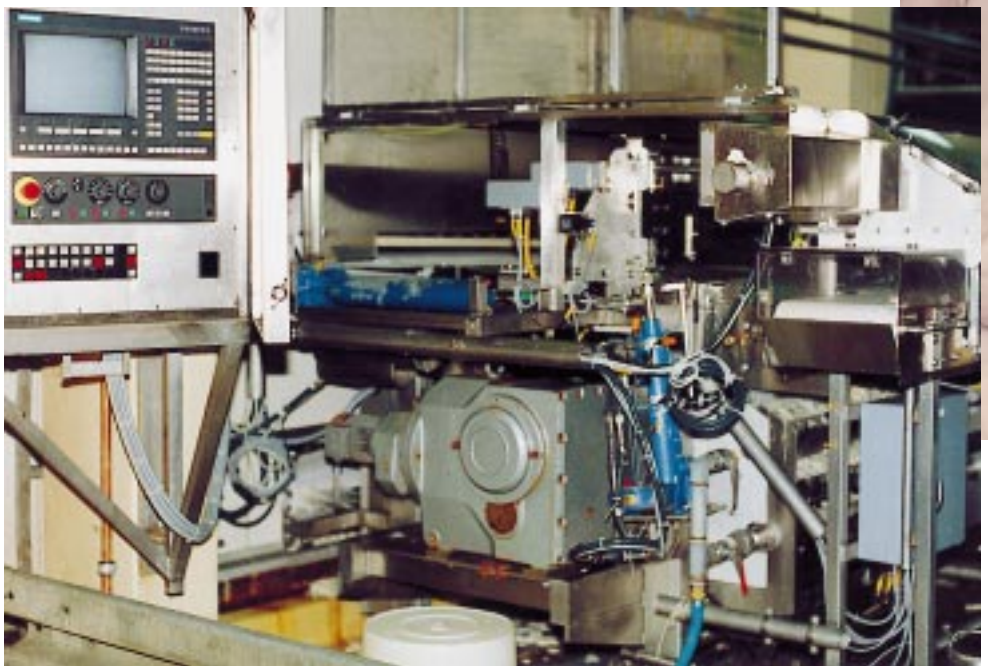
The Phantom of the Opera

*In December of 1988 East Coast Theater Supply purchased 12 RACO electric cylinders type **T1C4** to be used in the New York production of Phantom of the Opera. ECTS did extensive renovations to the basement of the theater. They were anticipating a very long "run" on Broadway. Their work paid off because they are still selling out the productions over 10 years later. The elaborate construction included the removal of over 20 m of concrete. Three long beams are installed horizontally that have two 2 m candelabras near each end. Some of the scenes take place in the cavernous sewers beneath the Opera House. During these scenes the candelabras rise up through the floor of the stage and a cable system also causes them to traverse about four feet to the sides. The 1,2 m by 0,6 m foot trap door in the floor of the stage is opened by 2 of the RACO cylinders.*

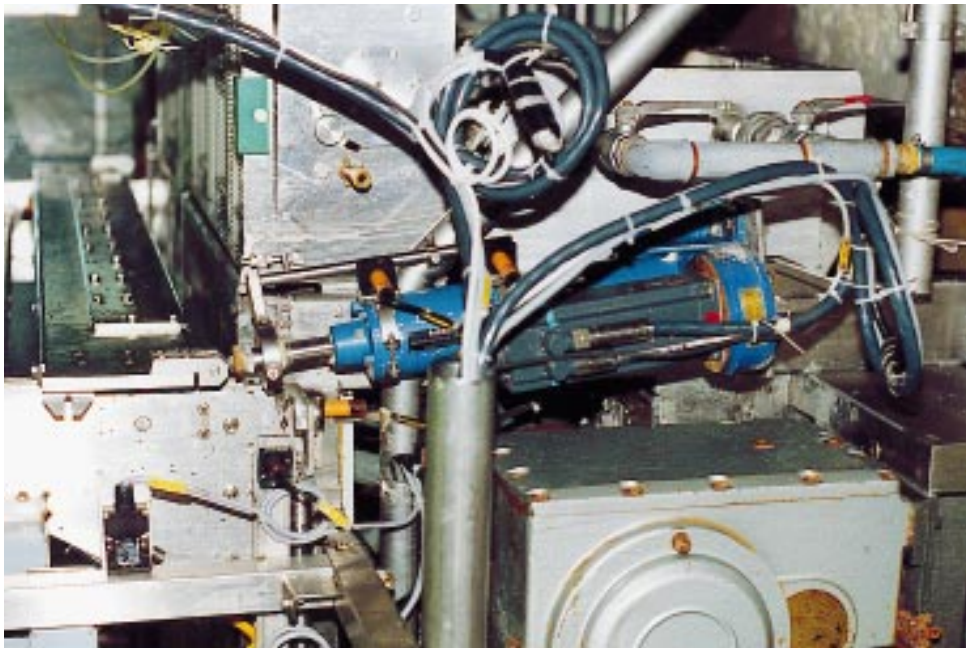
This procedure mystically places six of these huge candelabras on the fog-covered stage for the boat scenes in the bowels of the Opera House where the Phantom lives a ghostly existence. In order for the illusion to be effective. The RACO cylinders must be quiet and they must also support the trap door and all the other miscellaneous equipment and cast without any deflection during the play. Michael Girman has been in charge of animations at the Majestic Theater since the equipment was installed and he is very happy with the quality and reliability of the RACO electric cylinders.



We help to process YOUR favorite DELIGHT

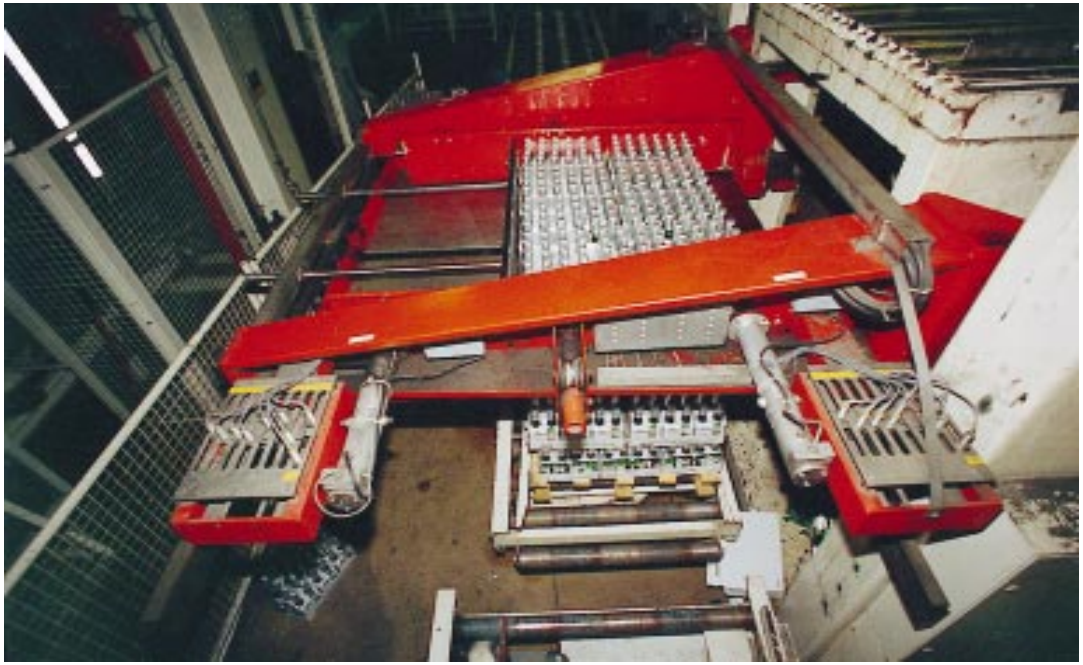


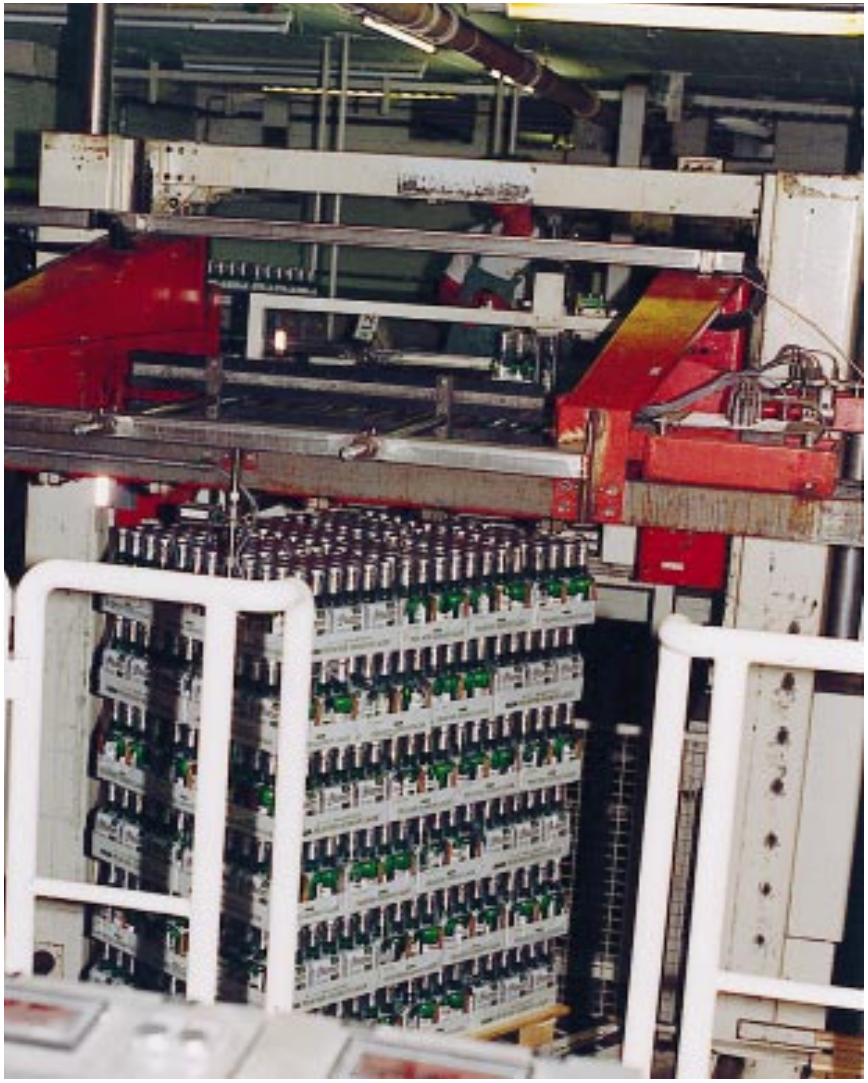
ICE DELIGHT



*Horizontal and vertical adjustment of the cutter is performed by two servo motor driven RACO electric cylinders type **K1Y4***

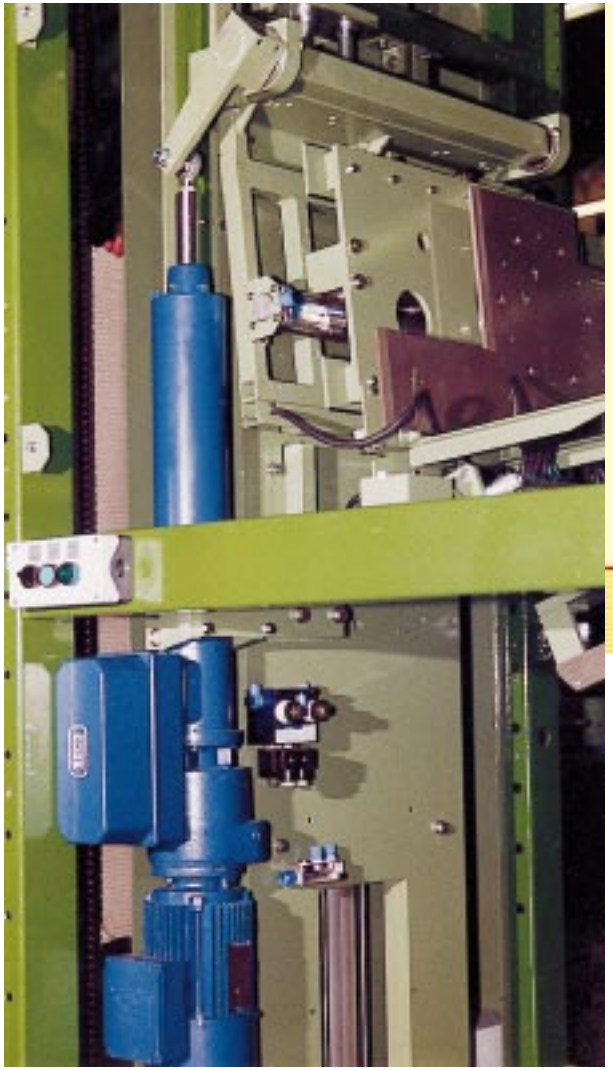
RACO Units in ACTION in a Brewery

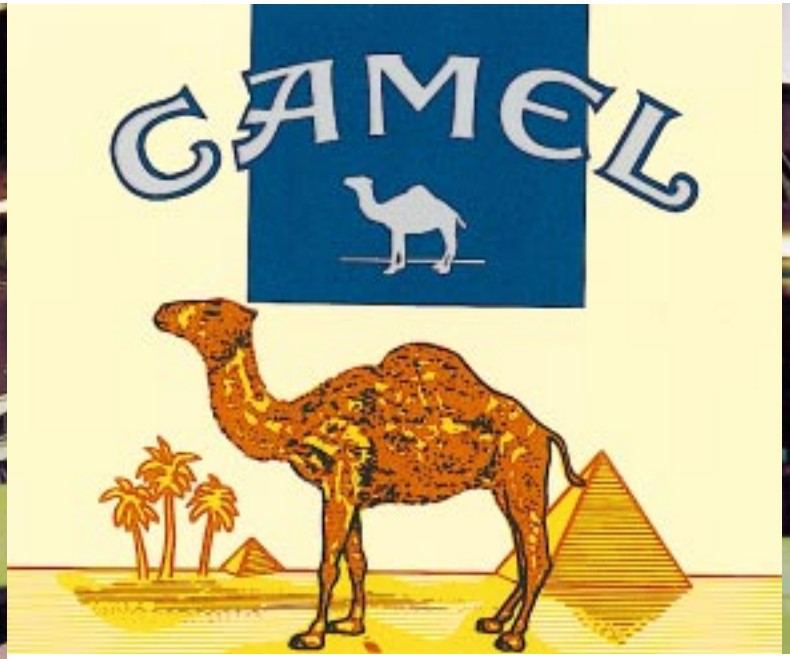




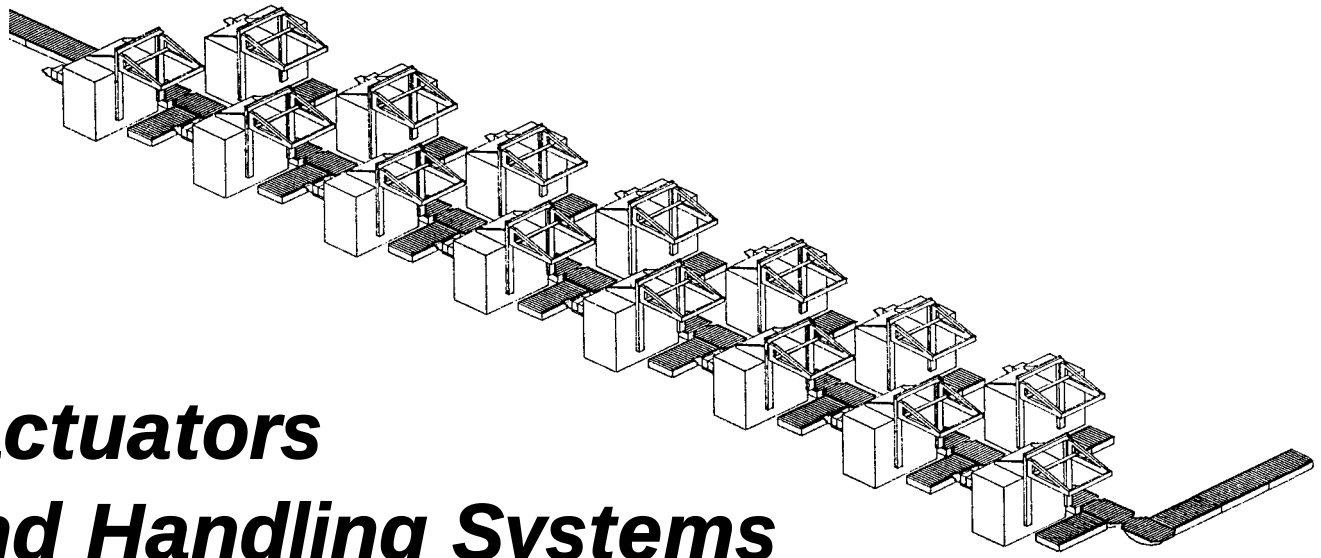
Bottle Handling in the Brewery

with RACO *electric cylinder type* ***T1A2*** *0.5 kW, 3000 RPM*





RACO *electric cylinders type* ***M1K4***



RACO *electric actuators in Packaging and Handling Systems*

PACKAGING-HANDLING-SYSTEMS have to perform a large number of fast, precise, repeatable and reliable

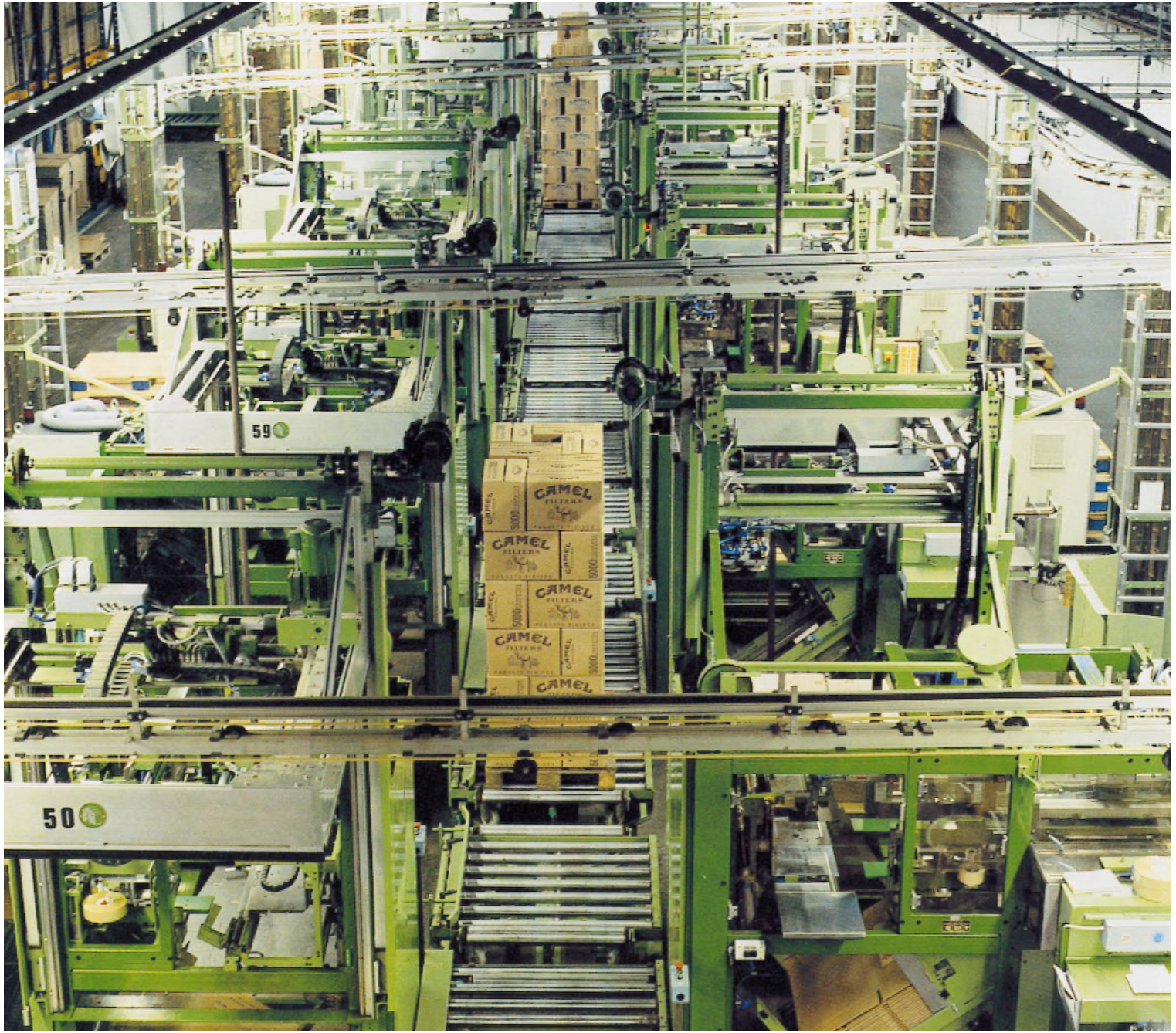
LINEAR MOVES

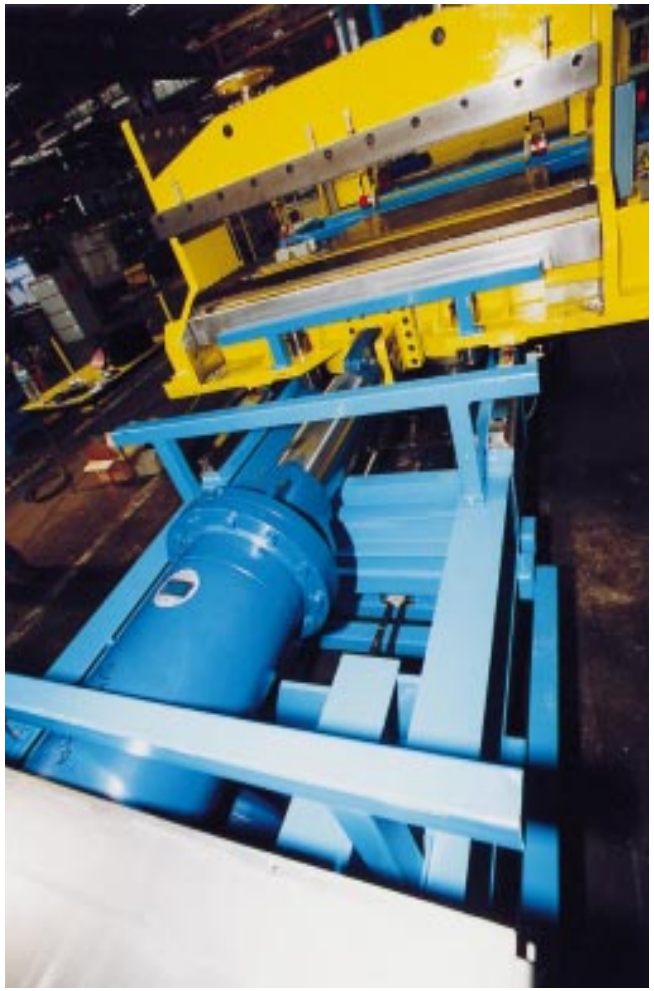
RACO *electric cylinder are here to*

SERVE YOU

AUTOMATION of the LINEAR MOTION

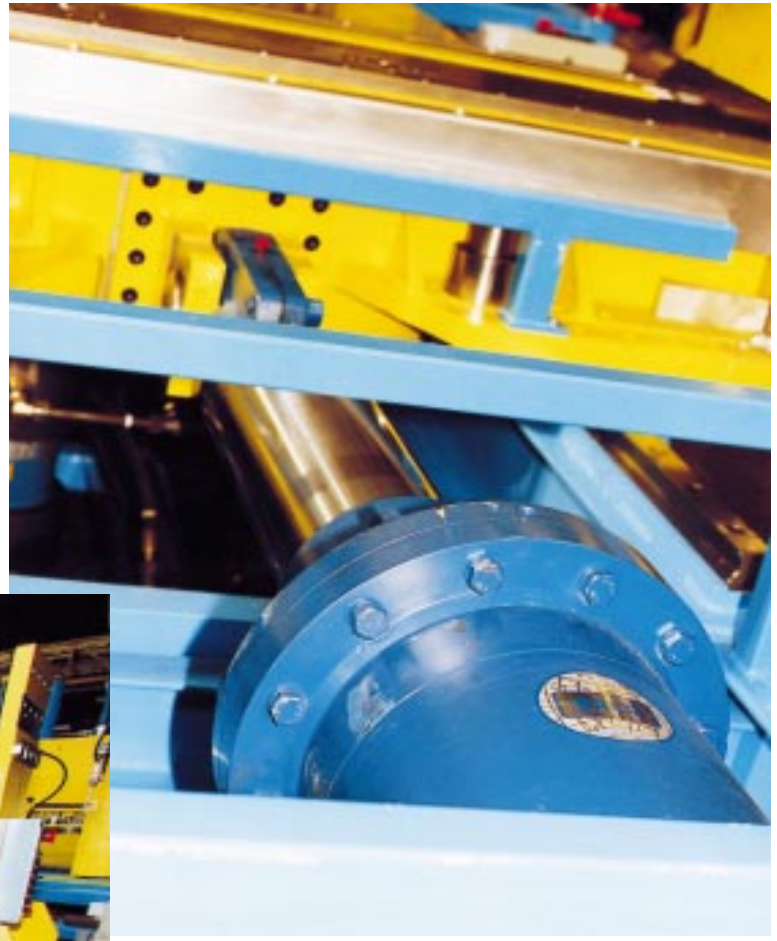
is RACO *DOMAIN*

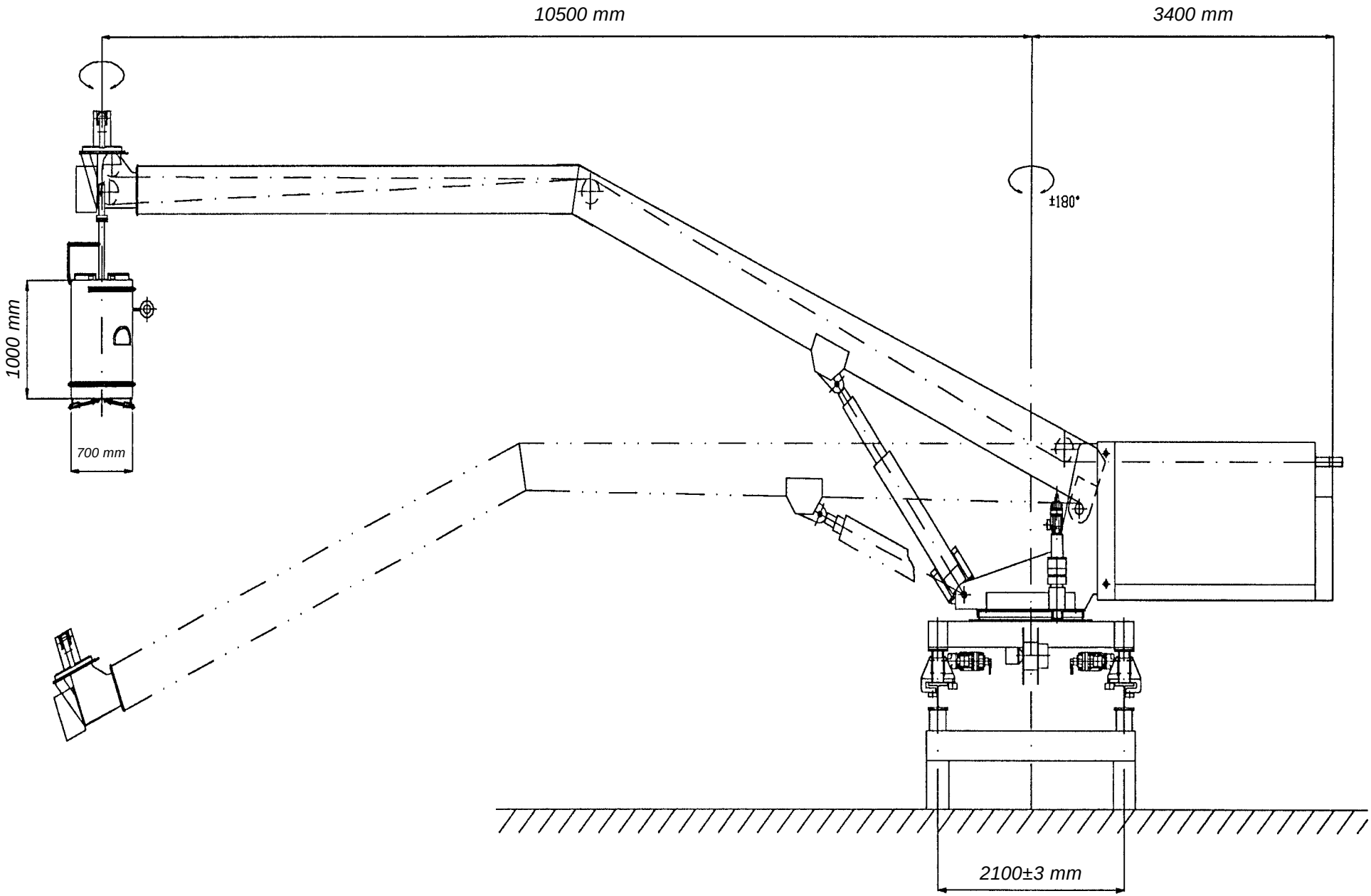




RACO *electric cylinder type* ***K1L10***
300 kN thrust

RACO *electric cylinder type* ***T6L2***
2 kN thrust




10500 mm
3400 mm
±180°
1000 mm
700 mm
2100±3 mm


MANNESMANN
MANNESMANN


mannesmann


MANNESMANN

Photograph courtesy of Allied Systems

Marine Crane

A RACO electric cylinder provides the lifting power for a marine crane boom located in the Reactor Building of Arkansas Nuclear One. The crane is used for the installation and maintenance of equipment at the Arkansas facility, and has a working radius of 9 m. With a boom capacity rating of 10 tons, the equipment is designed to withstand a forty year integrated radiation exposure of 50 x 10^6 rads. The crane may be idle for periods up to 18 months and must withstand temperatures up to 90°C with a relative humidity of 100%.

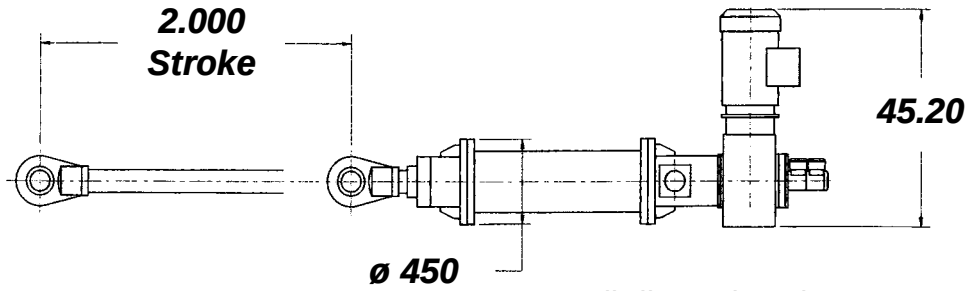
Cylinder Specificaltions

RACO electric cylinders type ***K1R11***

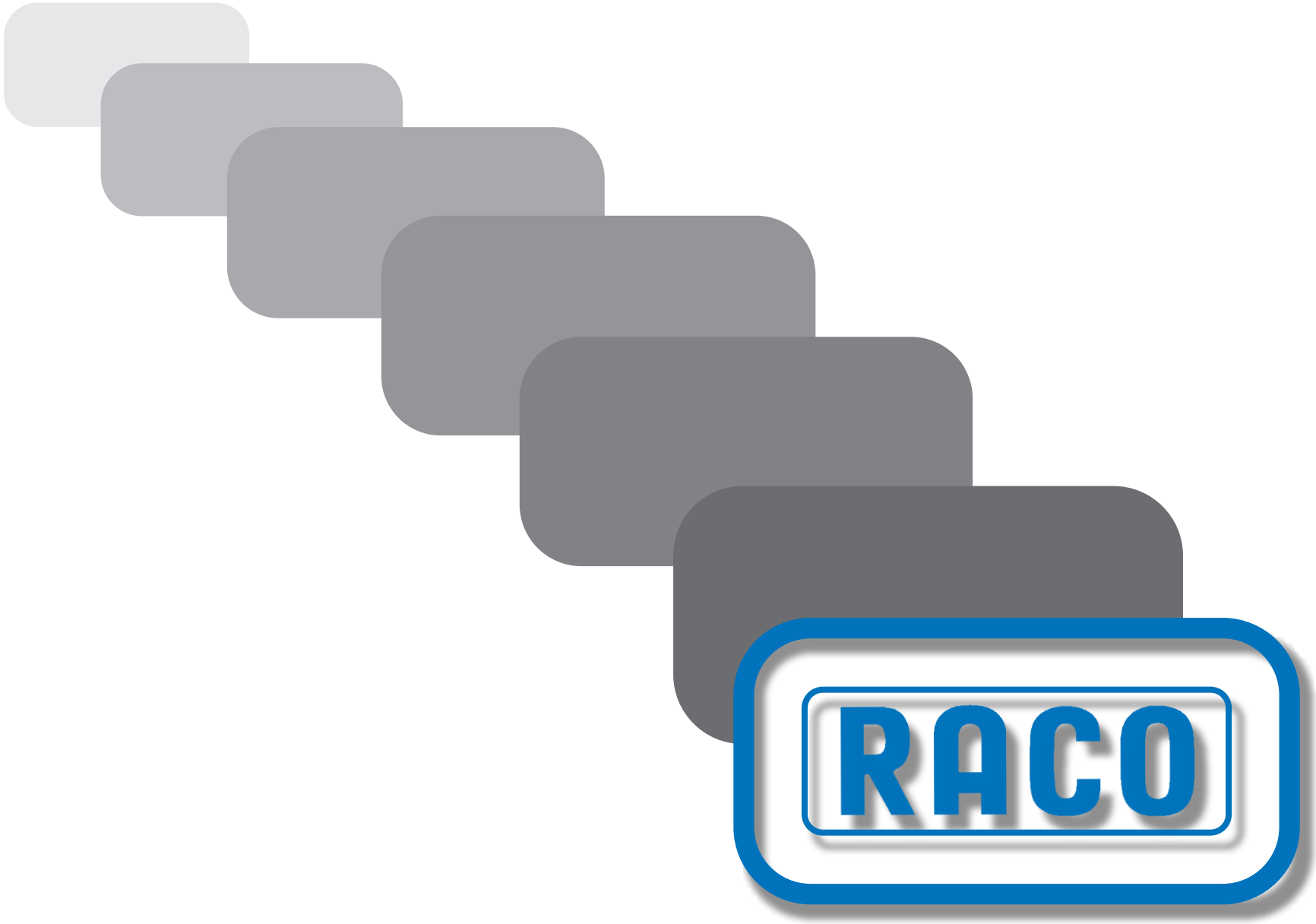
Screw Diameter/Type:	*80 mm ball screw*
Lead:	*25 mm*
Accuracy:	*0,05 mm per 300 mm of travel*
Rated Thrust Capacity:	*610 kN*
Stroke:	*2000 mm*
Linear Speed:	*20 mm/sec.*
Control:	*Manual Push-button*
Input Power:	*230/460V 3Ph 60Hz*

Installation Data

Required Force:	*160 kN*
Temperature Range:	*-10°C to 90° C*
Altitude:	*0 to 1000 mm*
Mounting Required:	*Trunnion Pins*
Front Attachment Required.	*Rod End*
Accuracy Required	*± 3,175 mm*



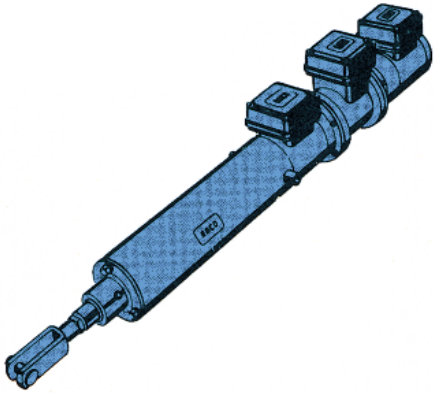
All dimensions in mm



Custom made linear cylinder

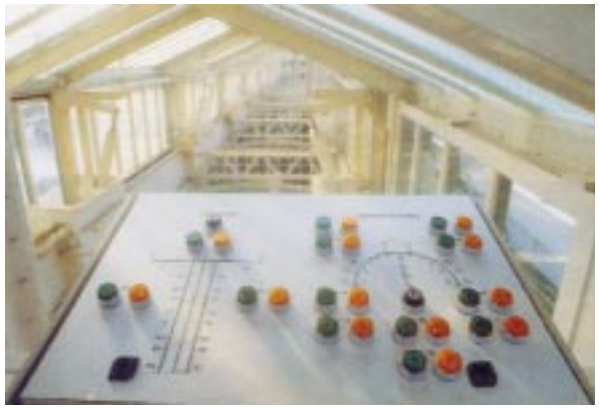
for your application

We Move the Kings old ”Glass-House”



This historic 110 year old Building made of Steel and Glass was modernized using RACO electric cylinders to ensure a perfect climate for the over 4000 exotic Plants.

A total of 150 RACO electric cylinders move the venting doors and windows for a relialbe climate control of the "Indoor Botanic Garden" in Wien, Austria

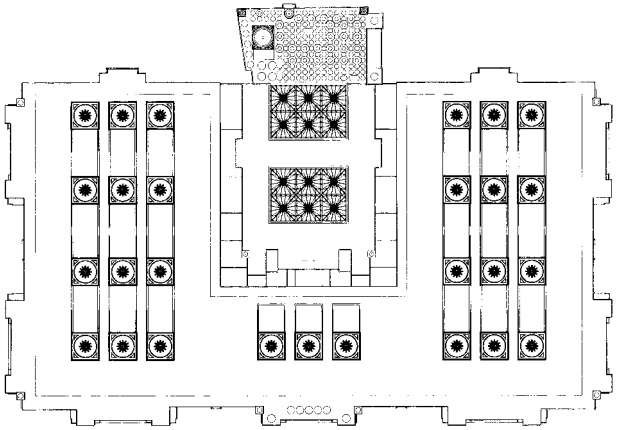


Sliding Domes of the C.T.H.M. King Fahd Bin Abdul Aziz Project for Extension of the Prophet´s Holy Mosque in Madinah

Photographs., Wolfgang Horny AVP, IPCA, Bristol

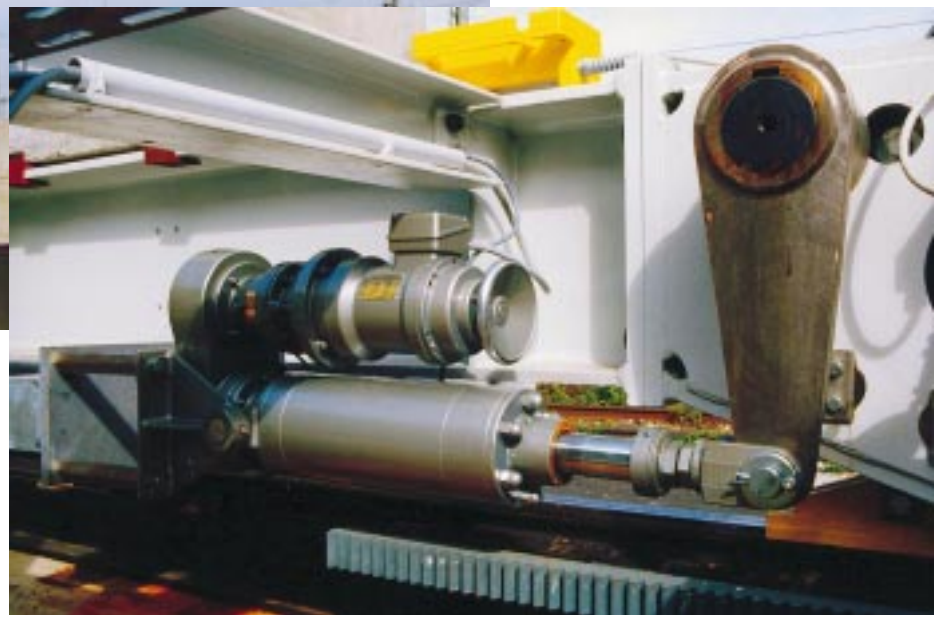
The vast roof area of the Prophet´s Mosque with the 27 sliding domes in their park position beside the opened courtyards.
Each sliding dome is equipped with a RACO electric cylinder type ***T1N7***

The Sliding Domes are a major feature of the CTHM King Fahd Bin Abdul Aziz extension of the Prophet`s Holy Mosque - the second most holy site in the Islamic world - which is being extended as a part of the programme to serve the ever-increasing numbers of pilgrims who visit the two holy cities of Makkah and Madinah in the Kingdom of Saudi Arabia.



With the rising of the morning sun the Sliding Domes silently move over the open courtyards. The domes are made to seal perfecty these openings, thus supporting the air-conditioning systtem of the entire Mosque.In the evening the courtyards are opened again and warm air radiates to the cold night sky.

This project was awarded the price for "Best Innovation" by the International Association for Automation and Robotics in Construction, Houston, USA in 1993.



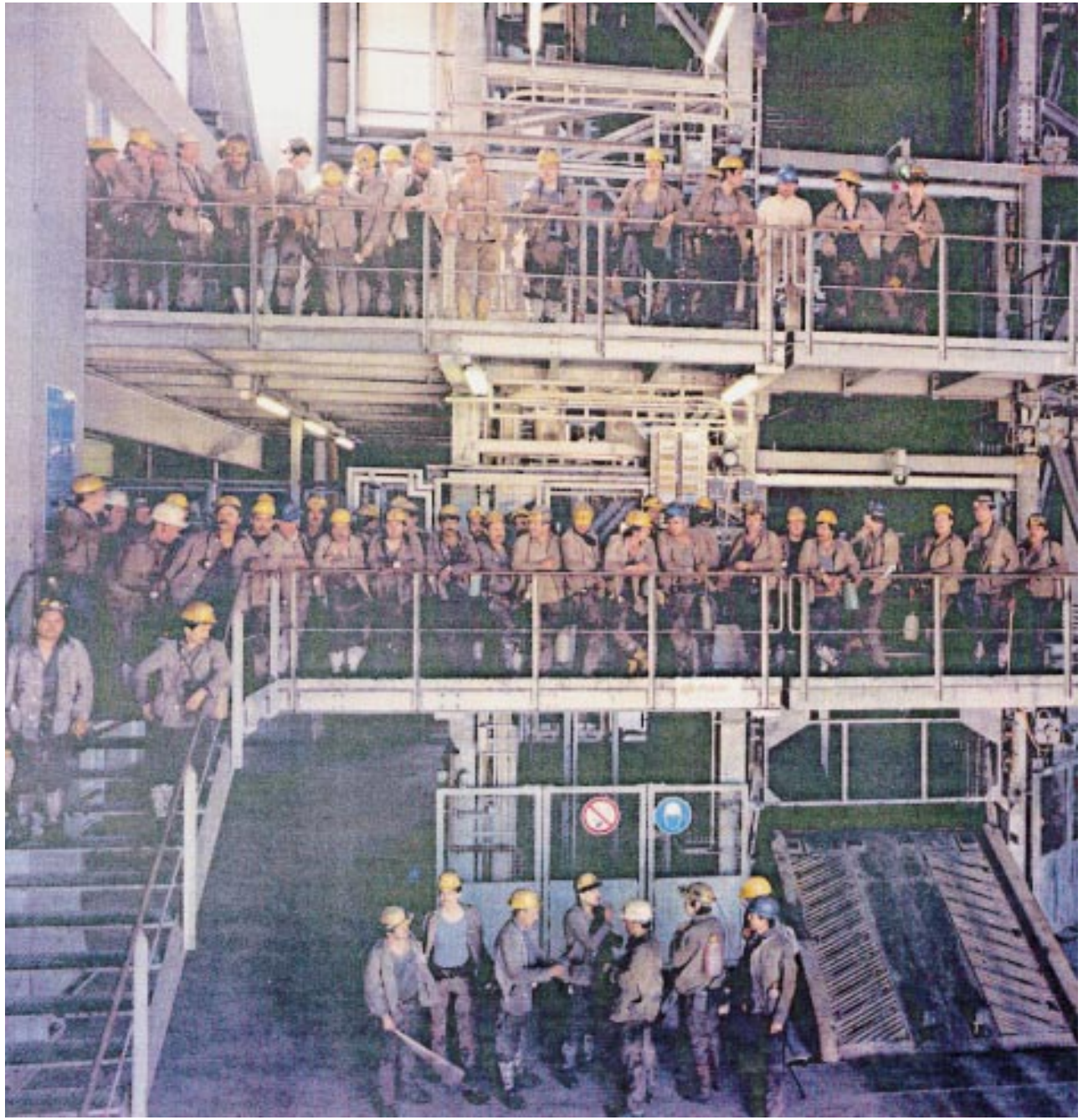
RACO *electric cylinder type **T1N7***
30 kN thrust, 200 mm stroke

Structure and mechanism

The Sliding Domes have a loadbearing steel framework of conventional modern girder construction, which includes four wheel carriages. Each wheel carriage contains a direct drive mechanism, powered by an electric motor that is frequency-controlled for gentle starts and stops. The whole system is digitally controlled by the "Building Automation and Control System" (BACS) of the Mosque.

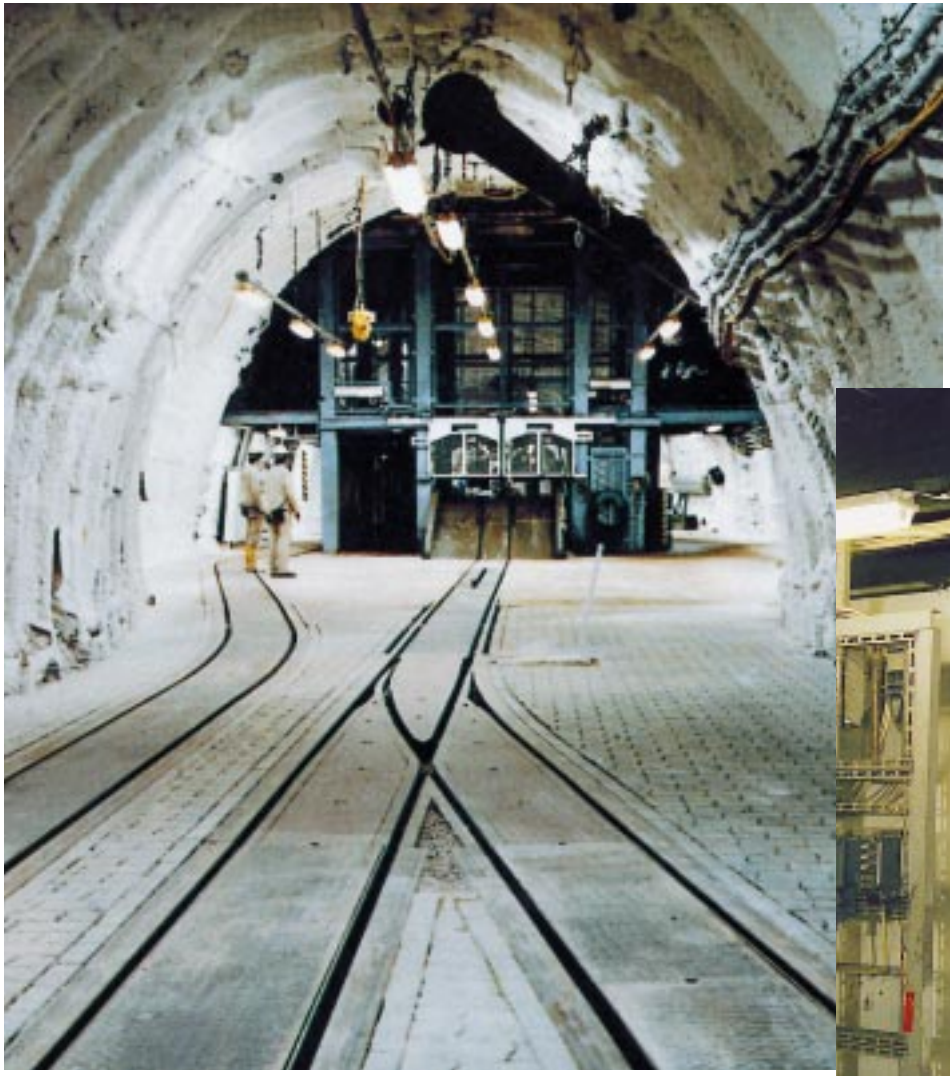
Our extensive experience in the mining industry is a valuable asset to all our customers.

actually we started here 48 years ago



Mines, steelmills, powerplants ... Gates, chutes for material handling

is RACO Domain



*Operation of sliding gates with RACO electric cylinder type **M1K7,** F = 20 kN, v = 300 mm/s, stroke 2500 mm, with electronical thrust overload protection type UPM 6, Exi, kind of motor protection EEx de llc T4*

*Mining elevator system with RACO rotary actuators type **DM IV** and RACO electric cylinders type **T1K4** for locking, type **M1F6** and type **M1K7** for door operating.*

RACO *electric cylinders with explosionproof motors*

Failsafe Brake Actuator in a Special Underground Mining Locomotive

The locomotive does nearly require no maintenance. The drive of the locomotive is effected by means of a three-phase asynchronous motor which is controlled by a pulse-controlled converter. The torque is positively transmitted to the bevel spur axle gear by means of articulated shafts mounted on both sides of the motor.

The locomotive is furnished with two brake systems consisting of the parking and RACO ***fail-safe brake*** *as well as the motor braking unit.*

Due to the fact that the RACO ***parking and fail-safe brake*** *is fitted at the high-speed gear side a braking system could be used which do not depend on the track and do nearly require no maintenance.*

The motor braking unit is a regenerative brake. The emergency-stop function has an effect on the mechanical disc brakes which do work independently of the drive power. Both brake systems are furnished with wheel slide protection device.

Due to the fact that the locomotive is not only furnished with a wheel slide protection device for the braking process but also with an anti-slip device for the starting process the rate of wear of the driven wheels is considerably reduced.

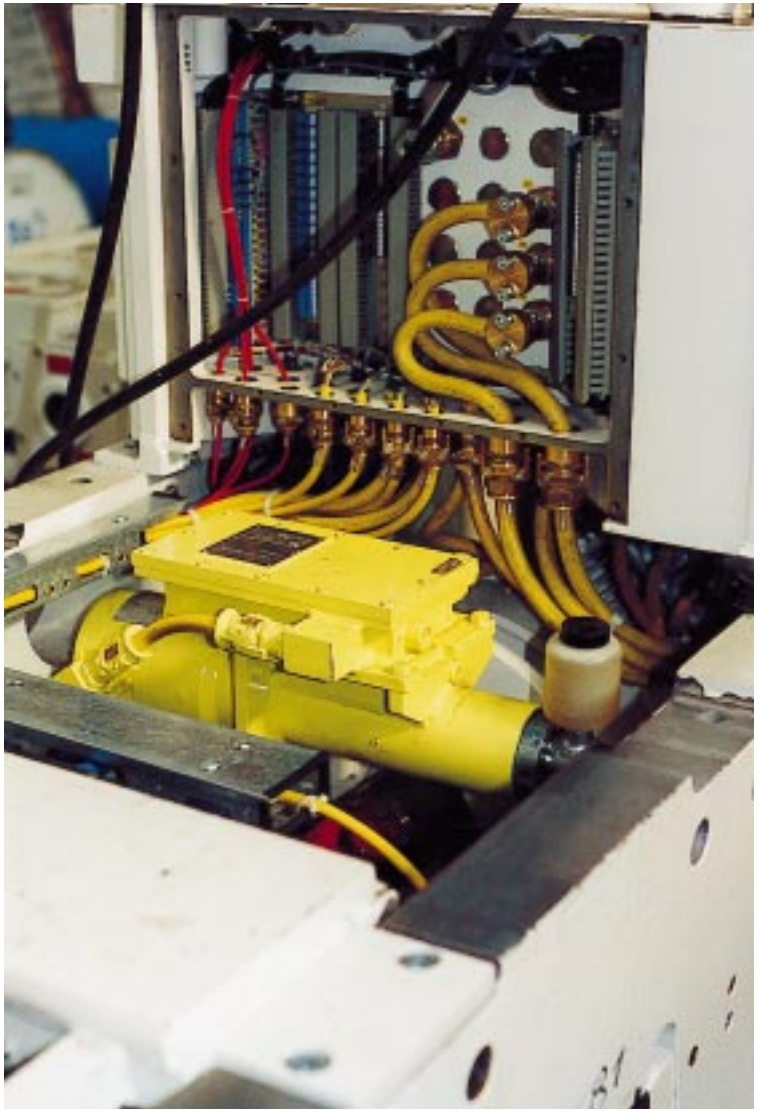
The storage-battery-operated locomotive realized as modular construction is a system which can be adapted to various field service conditions both in regard to the tractive efforts as well as to the dimensions.

Due to the constructive configuration of the single components and the machining of all connecting surfaces the flush joining of the individual modules is assured without any adjusting work.

The trailer load can be doubled or trebled by coupling two or three locomotives. The coupling is effected in some minutes.

In case of multiple traction the autonomous single locomotives are controlled with the same setpoint values from one driver´s cab so that the driving units do work absolutely in synchronism.

Type of construction:	*Mining battery locomotive*
System D:	*Double locomotive*
System T:	*Tender locomotive*
Gauge:	*540 - 750 mm*
Wheel base:	*1500 - 2500 mm*
Length:	*5520 mm (Type GAM 15)*
Transport length:	*from 3200 mm without driver´s cab*
Width:	*1000 mm*
Height:	*1800 mm*
Motor brake:	*electrodynamic*
Parking and fail-safe brake:	*electrodynamic electromechanical* RACO ***Failsafe-brake actuator**, EEx d I*
Speed:	*4 m/s Conveyance of Material and Goods 7,5 m/s Passenger transport*
System voltage:	*216 V DC*
Battery voltage:	*2x108 V DC*
Battery capacity:	*2x600Ah*



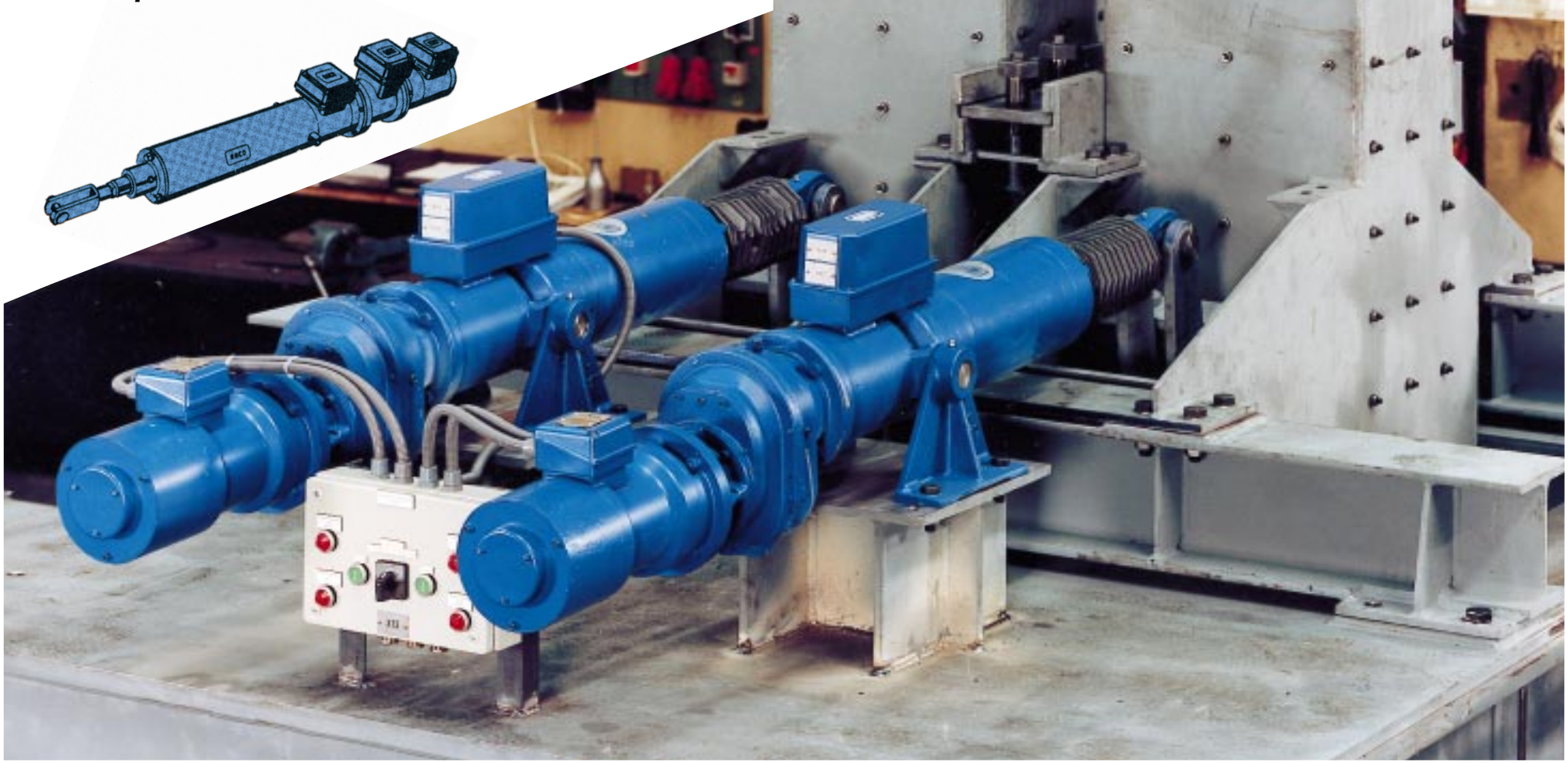
explosion proofed
RACO ***Failsafe Brake Actuator***
developed for the Ruhrkohle AG
Industrial Locomotive

RACO *electric cylinders*

*type **T1M7***

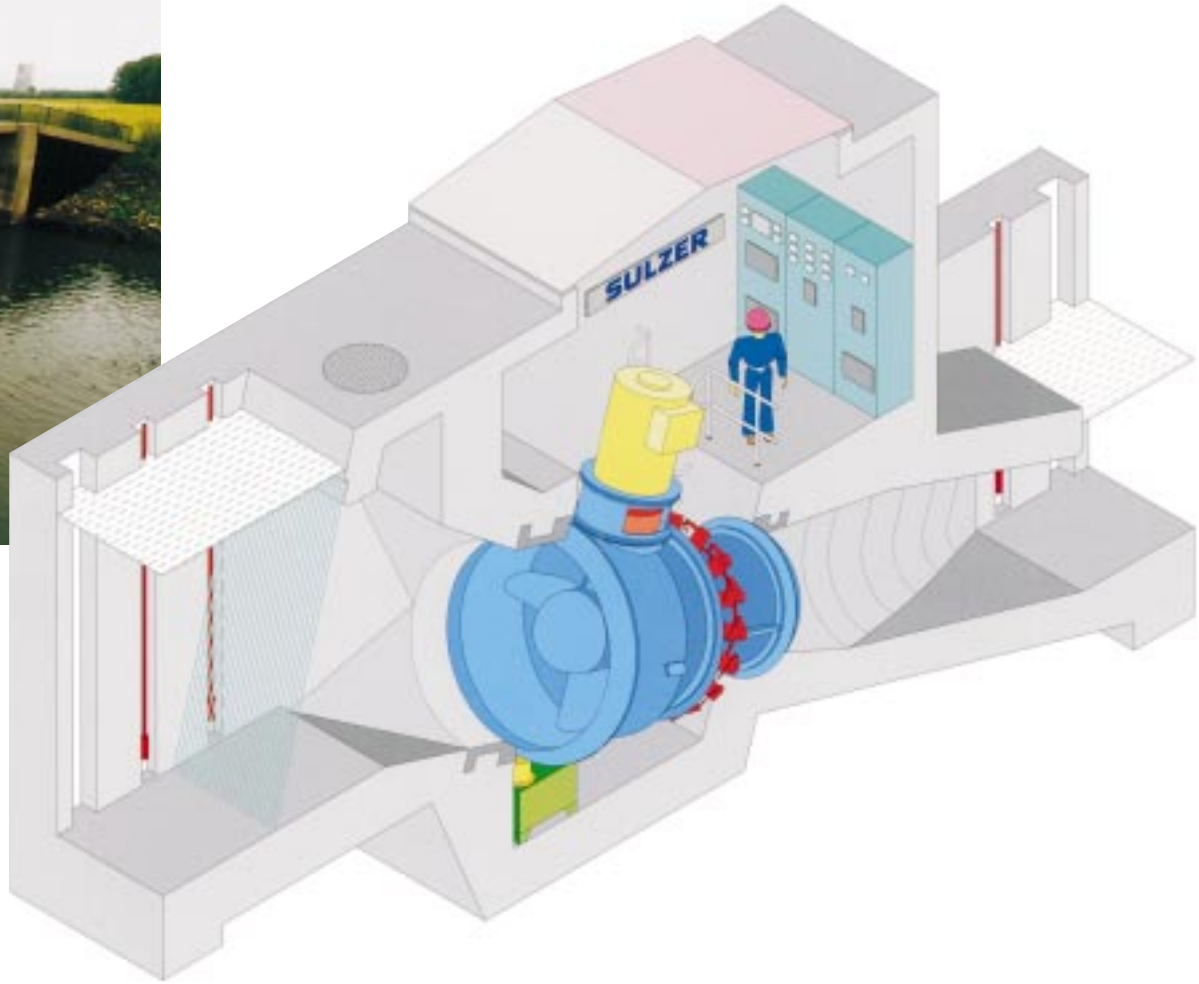
adjusting and positioning

a Briquette-Roll-Press



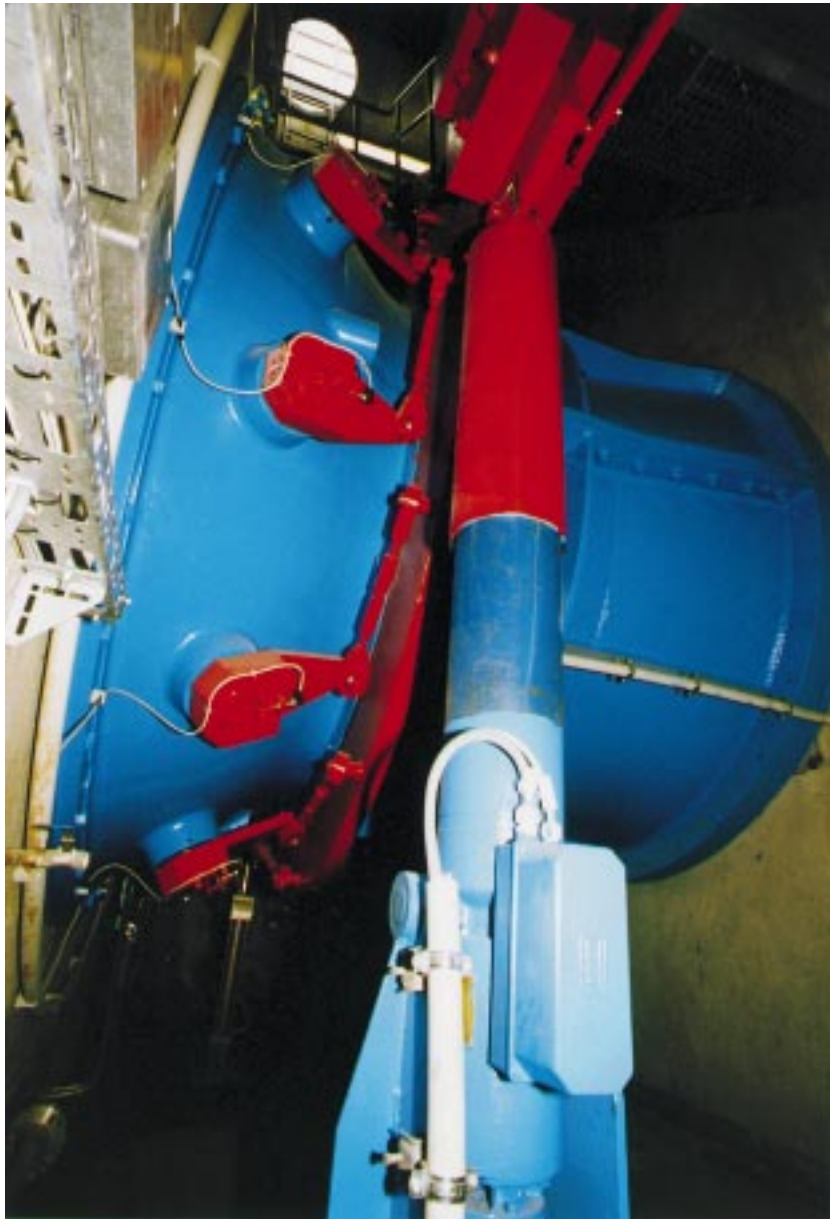

PROJECT

SULZER Hydro supplies complete electromechanical equipment for hydroelectric power plants up to 5 MW



Sulzer Hydro, a world leader in bulb turbine design and production, introduces the belt drive bulb turbine. This concept has been designed for low head applications where this low budget solution offers a cost-effective way of exploiting especially small water power.

Fig. 1: Bevel gear bulb turbine

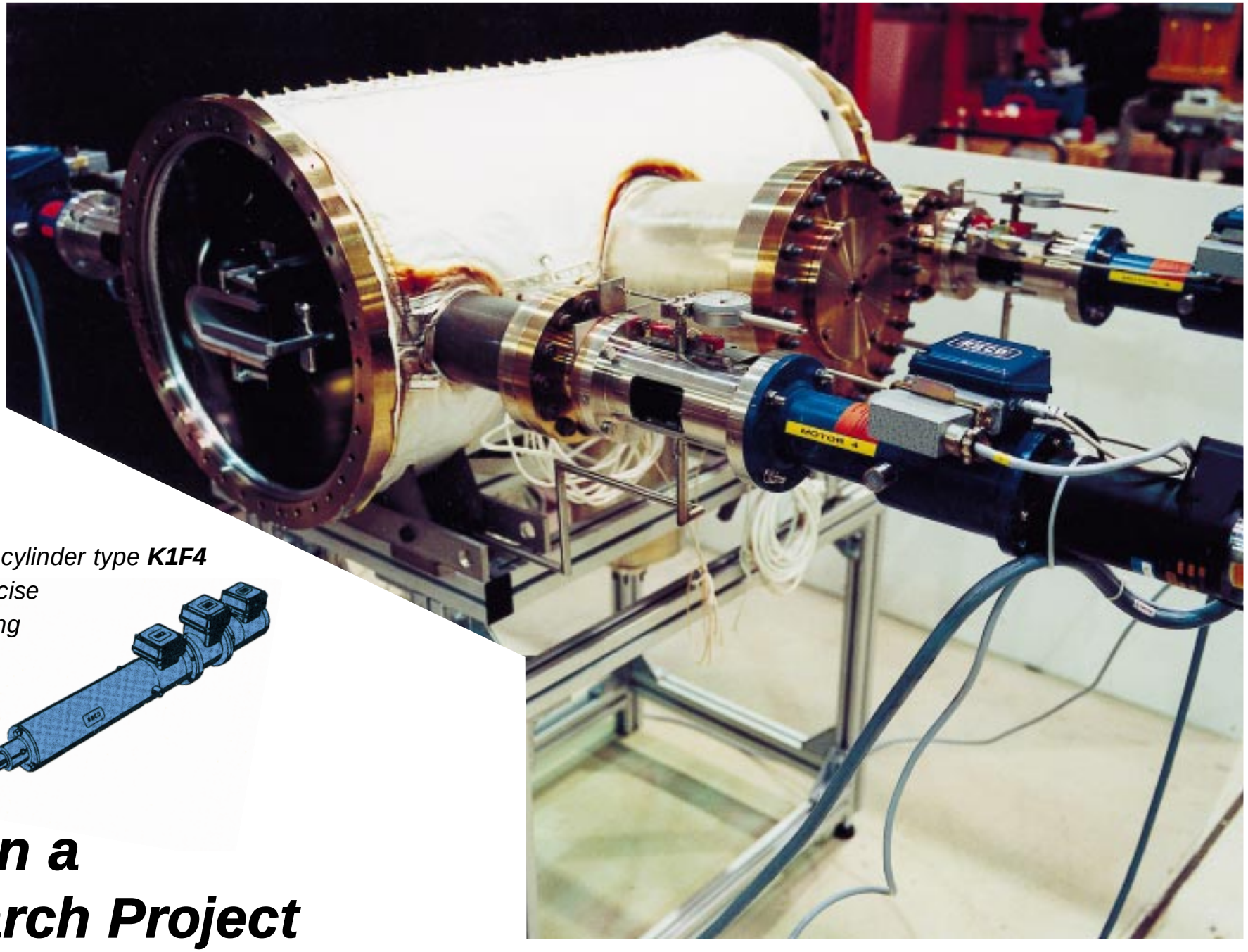


*Double-regulated turbine for optimal exploitation of available energy. The RACO electric cylinder type **K1K7** 25 kN thrust, 600 mm stroke, is also used for an automatically failsafe shutdown.*

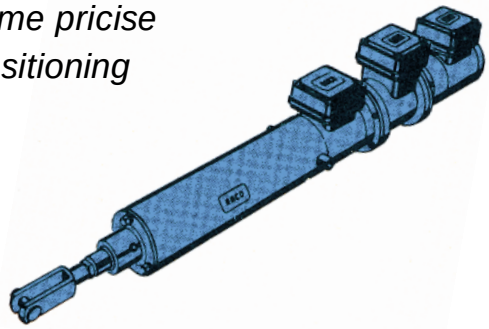
The German National Research Centre for Particle Physics DESY in Hamburg

(Release No: 611/87 LA HH)

The 6,3 km HERA tunnel runs predominantly under a large city park, under residential and industrial buildings, and under the DESY site with the 2,3 km pre-accelerator PETRA.

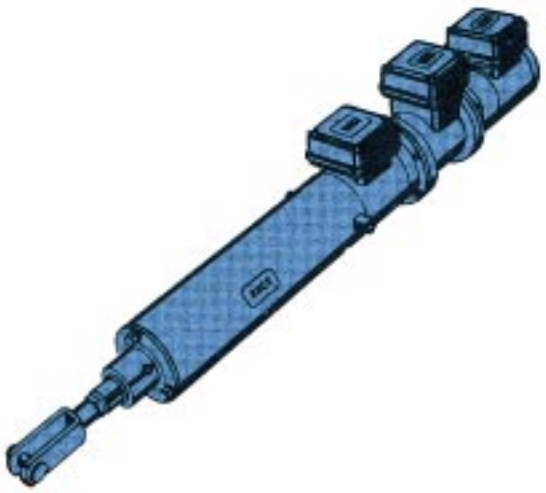


RACO *electric cylinder type* ***K1F4***
for extreme pricise
linear positioning

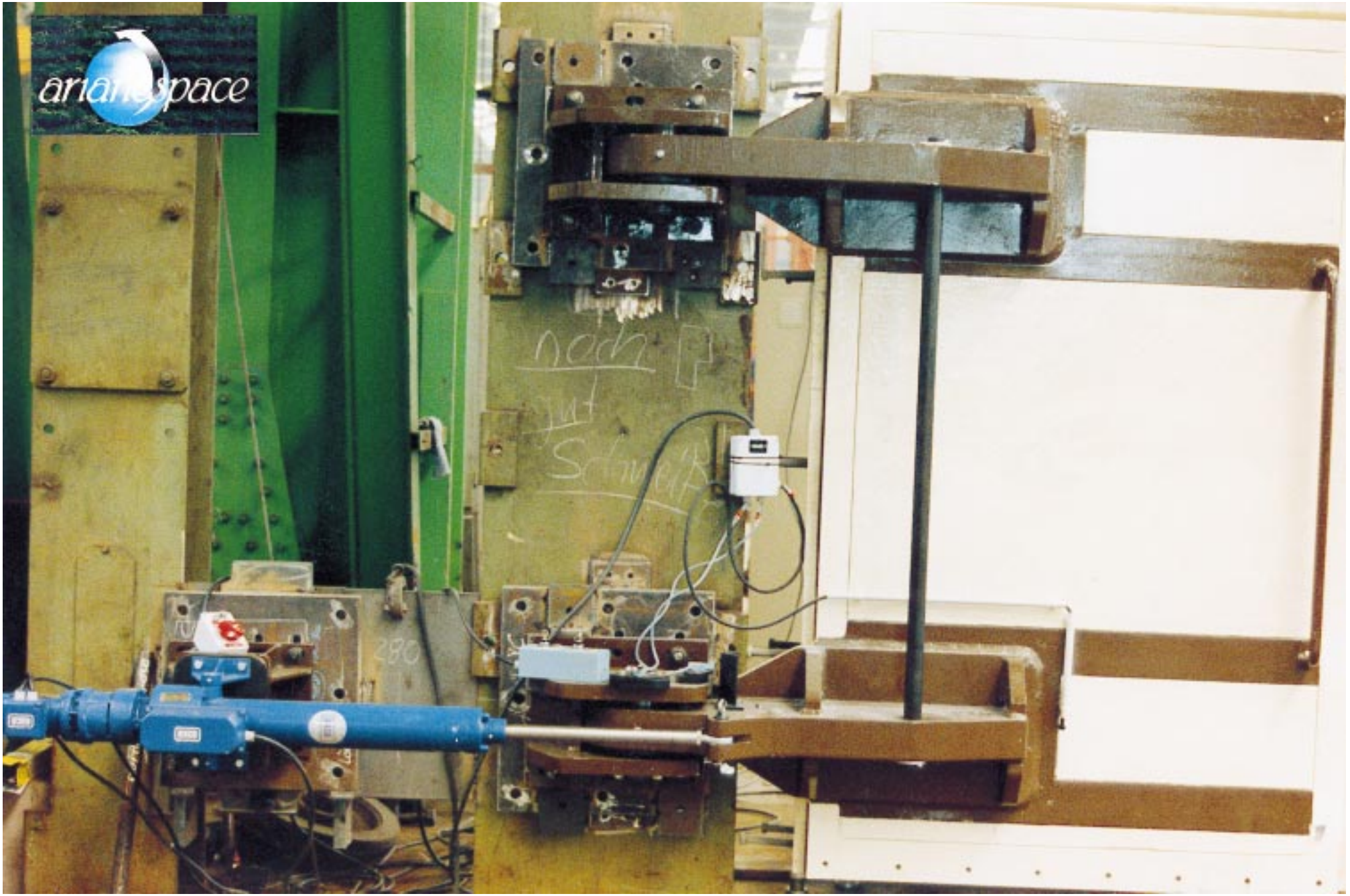


Here in a Research Project

Arianespace



RACO *is there at the Lauching Pad Contributing to a SUCCESSFUL BLAST OFF*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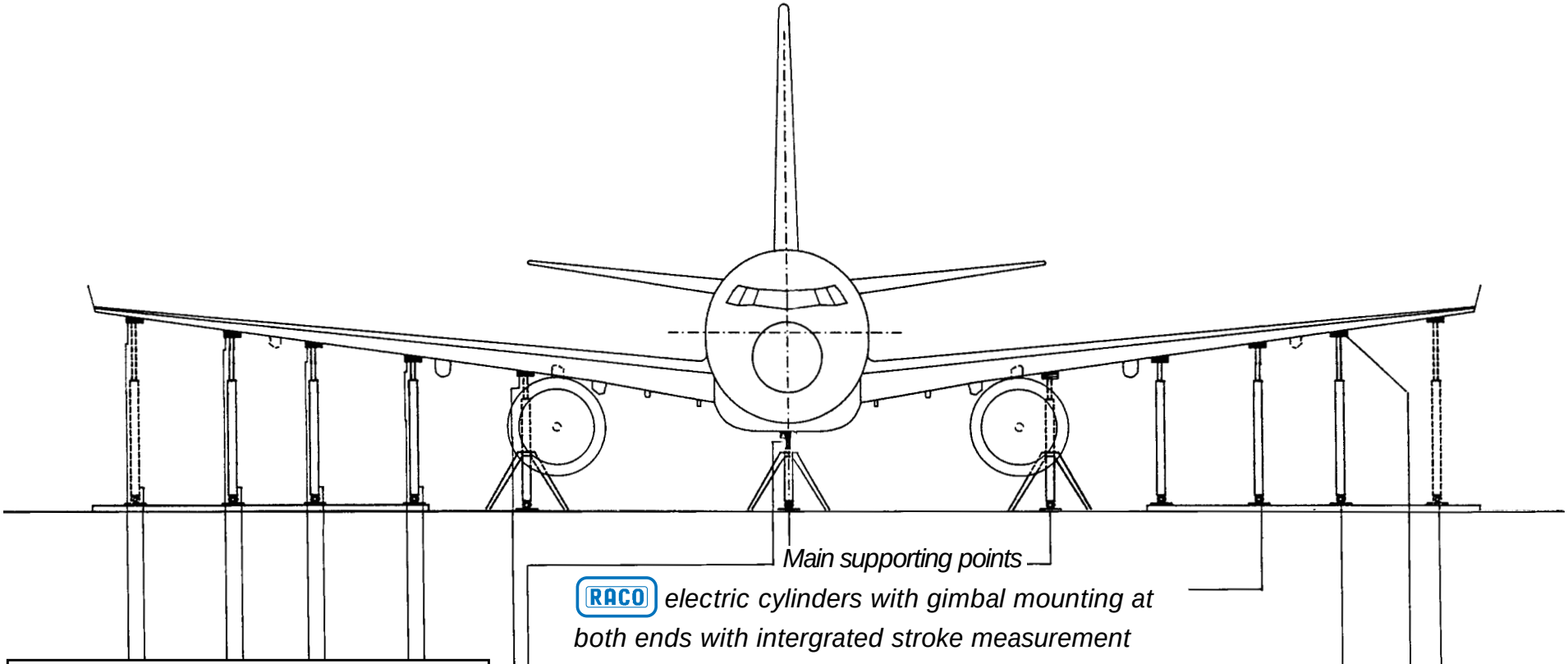
Airbus A 321
Wing Deflection (1g) and Wing Calibration



Main supporting points

RACO electric cylinders with gimbal mounting at both ends with intergrated stroke measurement device

Holding frame

Force measurement load cells

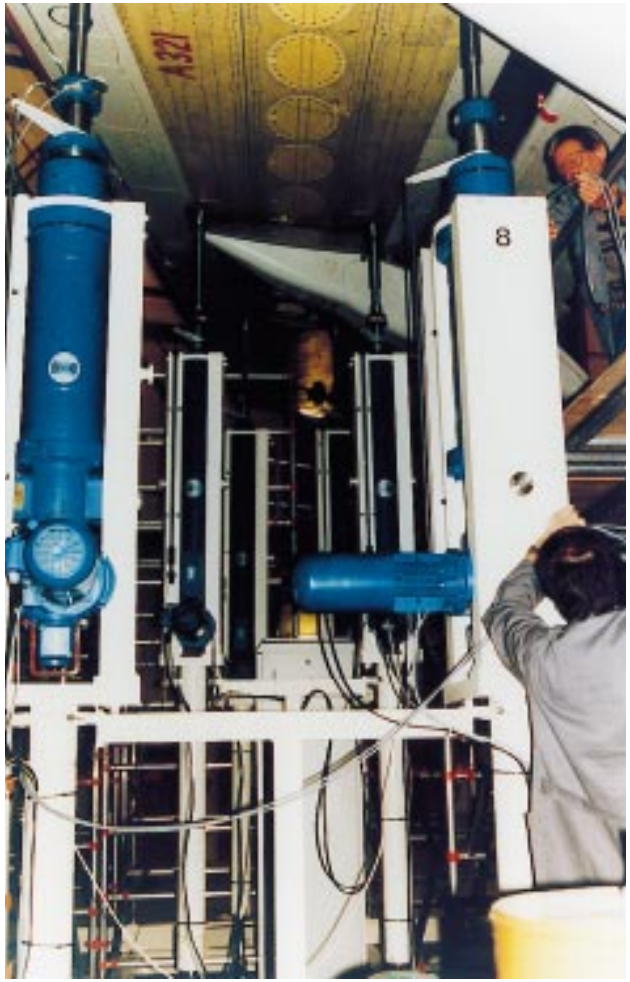
RACO electric cylinders for wing calibration

Controlling the RACO electric cylinders
- switch for stroke or force - single or group switching - electronic overload protection - emergency shutdown

Data processing
Presentation Storage on disk Printer output


1. Bauteil A321


KARUS
KARUS



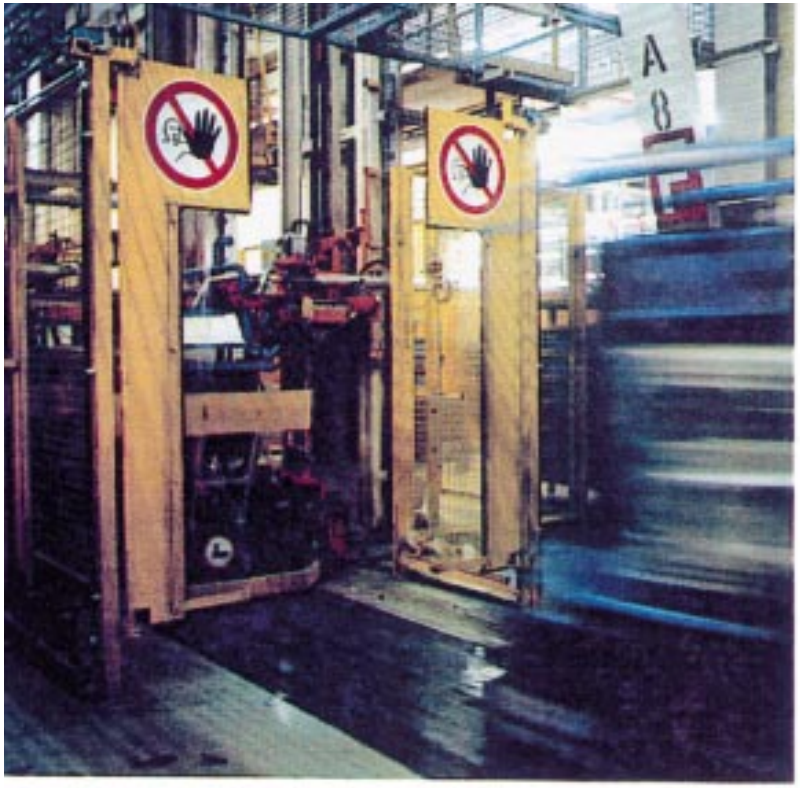
RACO *electric cylinders type **T1R7***
40 kN, 800 mm

RACO *electric cylinders type **T1R8***
80 kN, 1000 mm

RACO *electric cylinders type **T1R9***
150 kN, 600 mm

We are ”at Home” in many Assembly and Manufacturing Lines

RACO *electric cylinders do not need ”Pit - Stops”*



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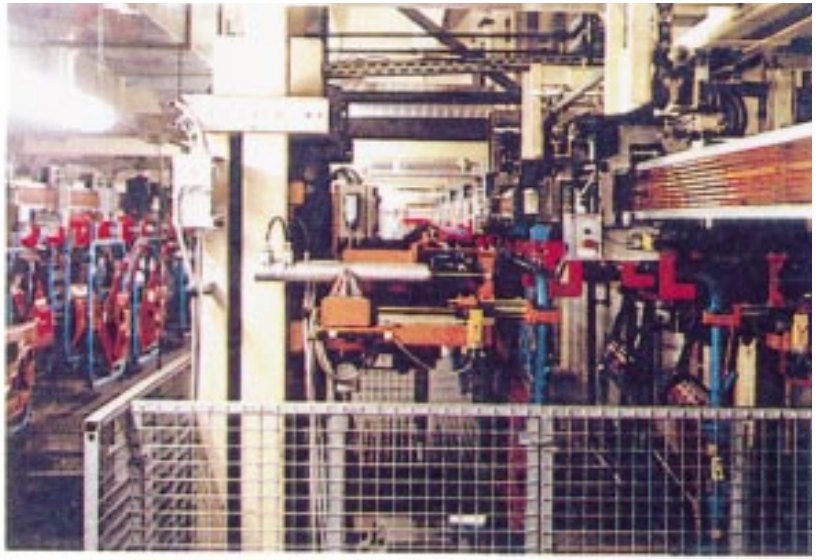
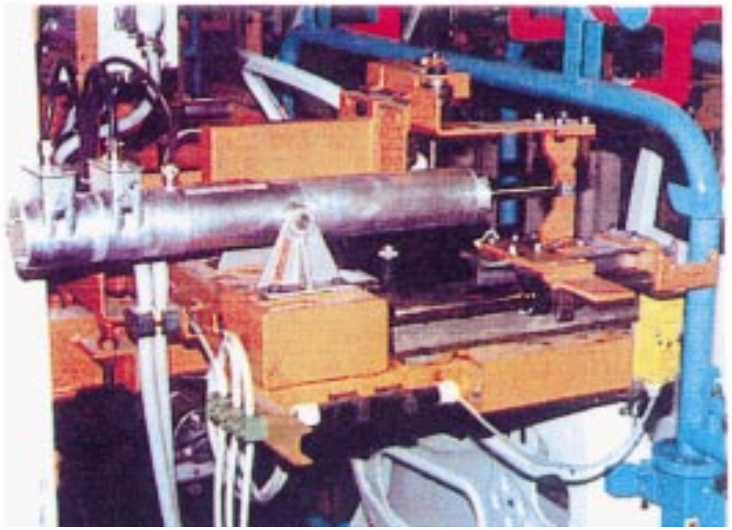
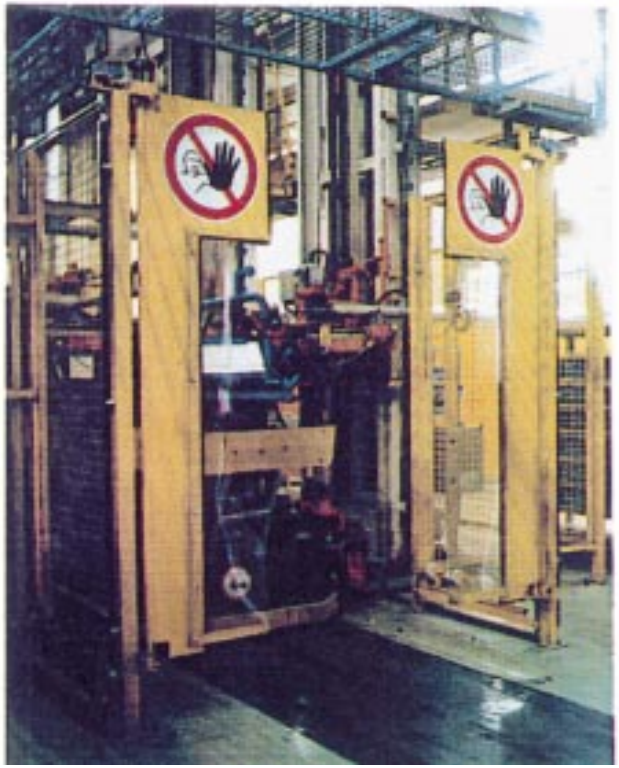
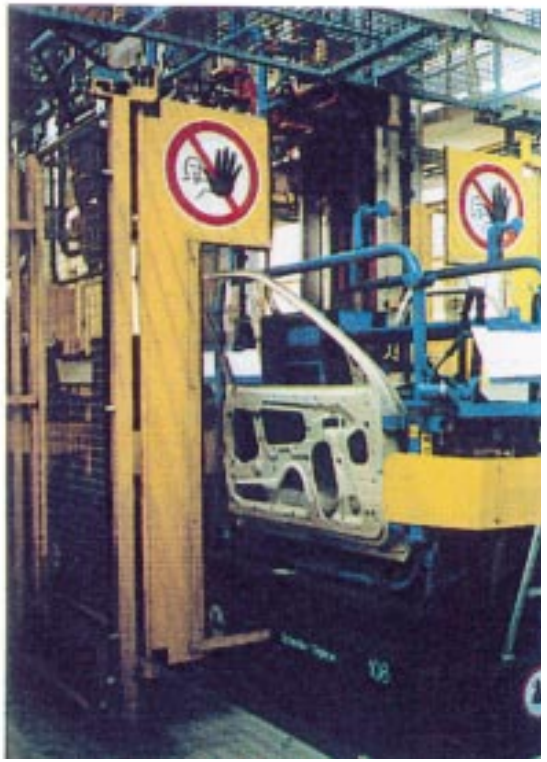








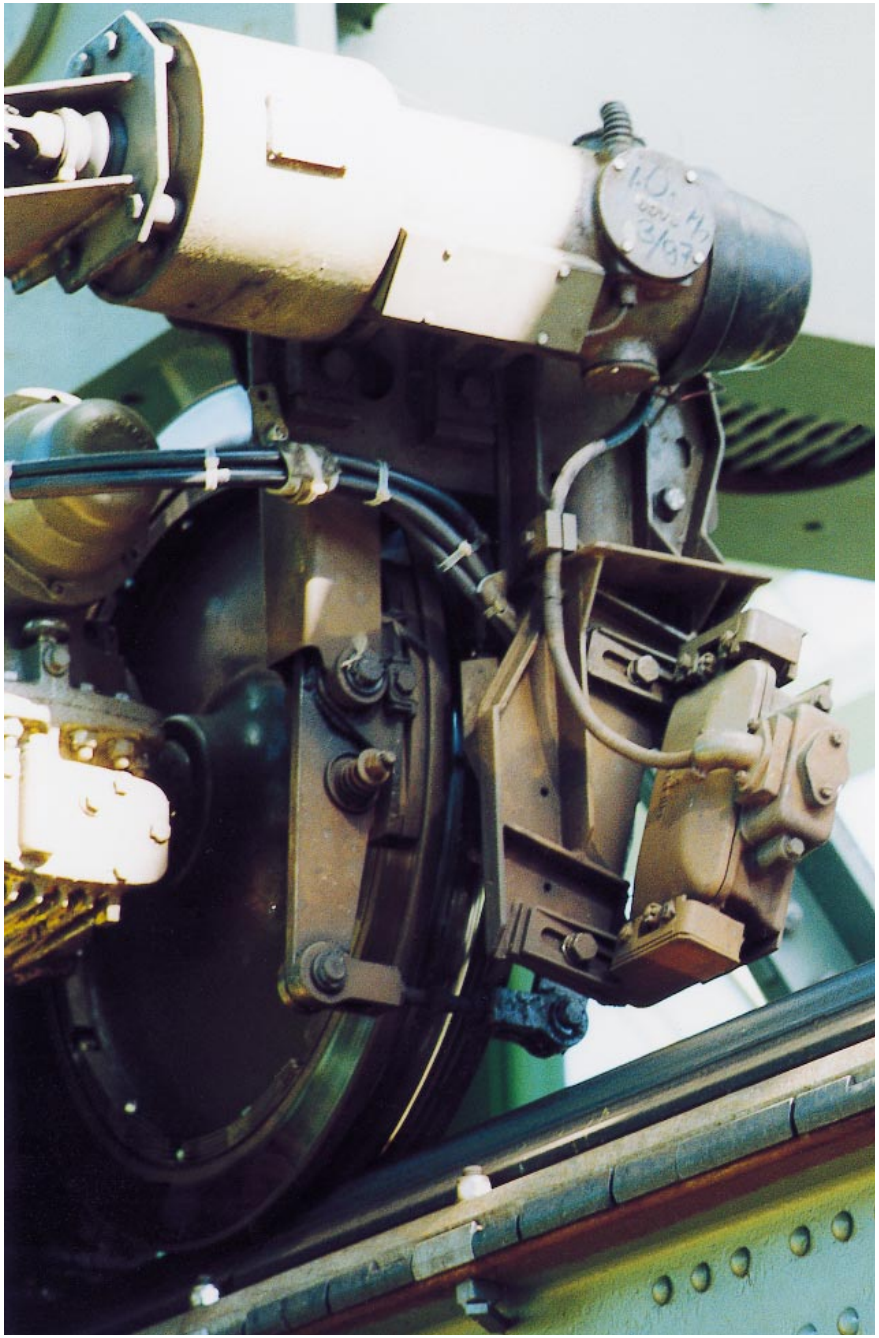
In many trams, light rail vehicles the RACO ***FAILSAFE BRAKE ACTUATOR*** *ensures the reliable and smooth stop.*

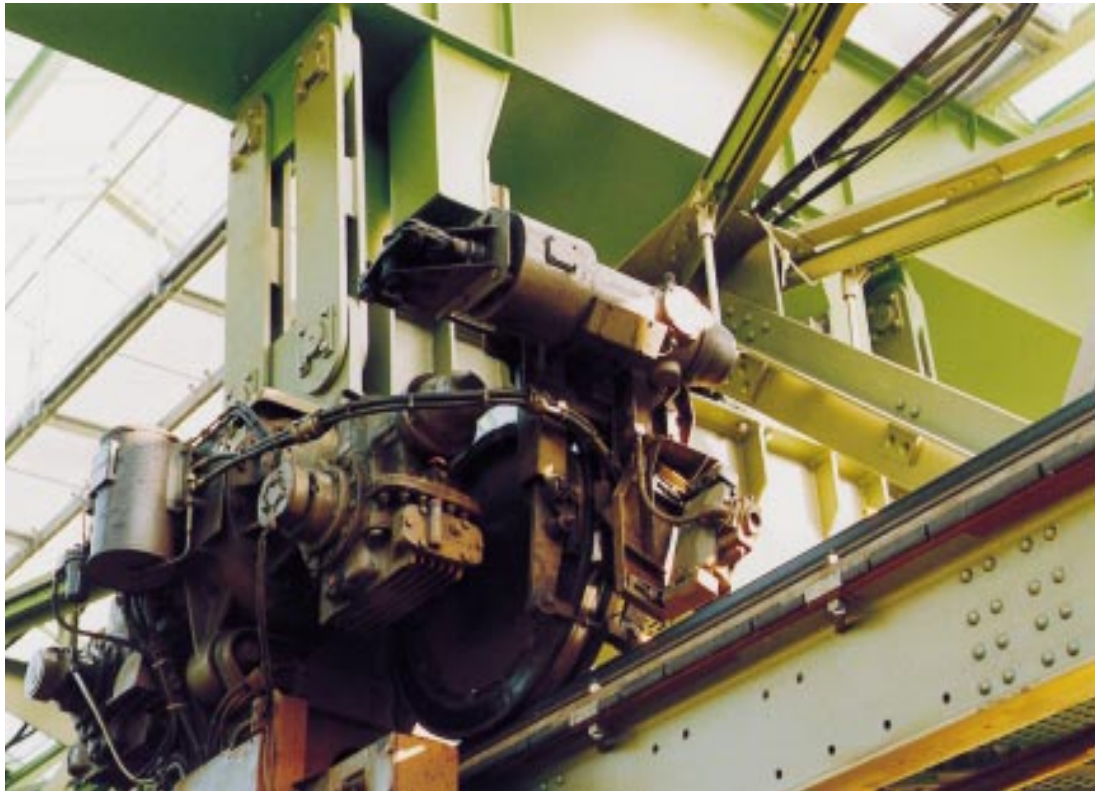
RACO *Spring loaded brake Systems*

electromechanical operation

Suspension railway ”City of Wuppertal”

The suspension railway fleed consists of 28 modern three-car coupled trains





*Each train is equipped with 4 RACO spring loaded failsafe brake actuators type **GBM II***

The train takes 35 minutes to complete one run which is 13,3 km and includes the stopping times at 17 stations. Each train has a capacity of 200 passengers. Between 65.000 and 70.000 people use the suspensiom railway every day. To date it has carried 1,5 billion passengers; every year some 25 million are added to that number, and the trend is rising.

It´s quicker, more pleasant and safer to go by suspension railway particularly during the rush hour periods.

RACO electric cylinders are installed on the underside of the Monongahela Incline passenger cars operating on Mt. Washington in Pittsburgh, Pennsylvania. The cylinders independently maintain tension on the Haul Cable and Safety Cable as the cables change length with tension, time, and temperature.

Monongahela Incline

In operation since 1877, this cable railway is one of the few remaining inclines in the United States. After an ascent at a 30-degree angle up Mt. Washington, you`ll be rewarded with a spectacular view of the Golden Triangle. Much of the original machinery is still in use, though it is now powered by electricity instead of steam.

Cylinder Specifications

*RACO electric cylinders type **T1L9***

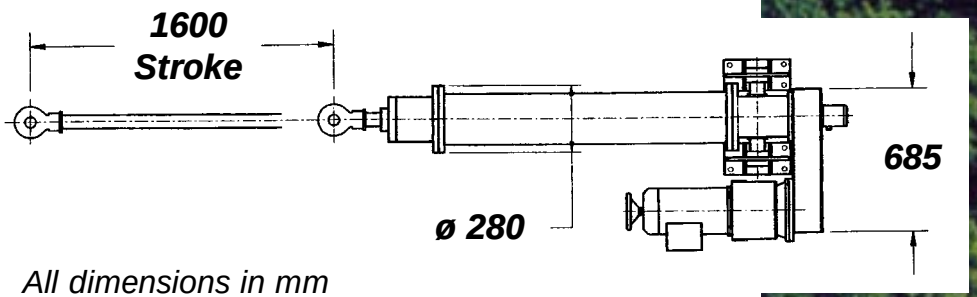
Screw Diameter/Type:	*63 mm ball screw*
Lead:	*20 mm*
Accuracy:	*0,05 mm. per 300 mm of travel*
Rated Thrust Capacity:	*150 kN*
Stroke:	*1600 mm*
Linear Speed:	*12 mm/sec.*
Motor:	*5.2 H.P. TEFC Class B*
Brake:	*Type "L" Power Release Brake*
Control:	*Manual Push-button*
Input Power:	*230/460V 3Ph 60Hz*

Installation Data

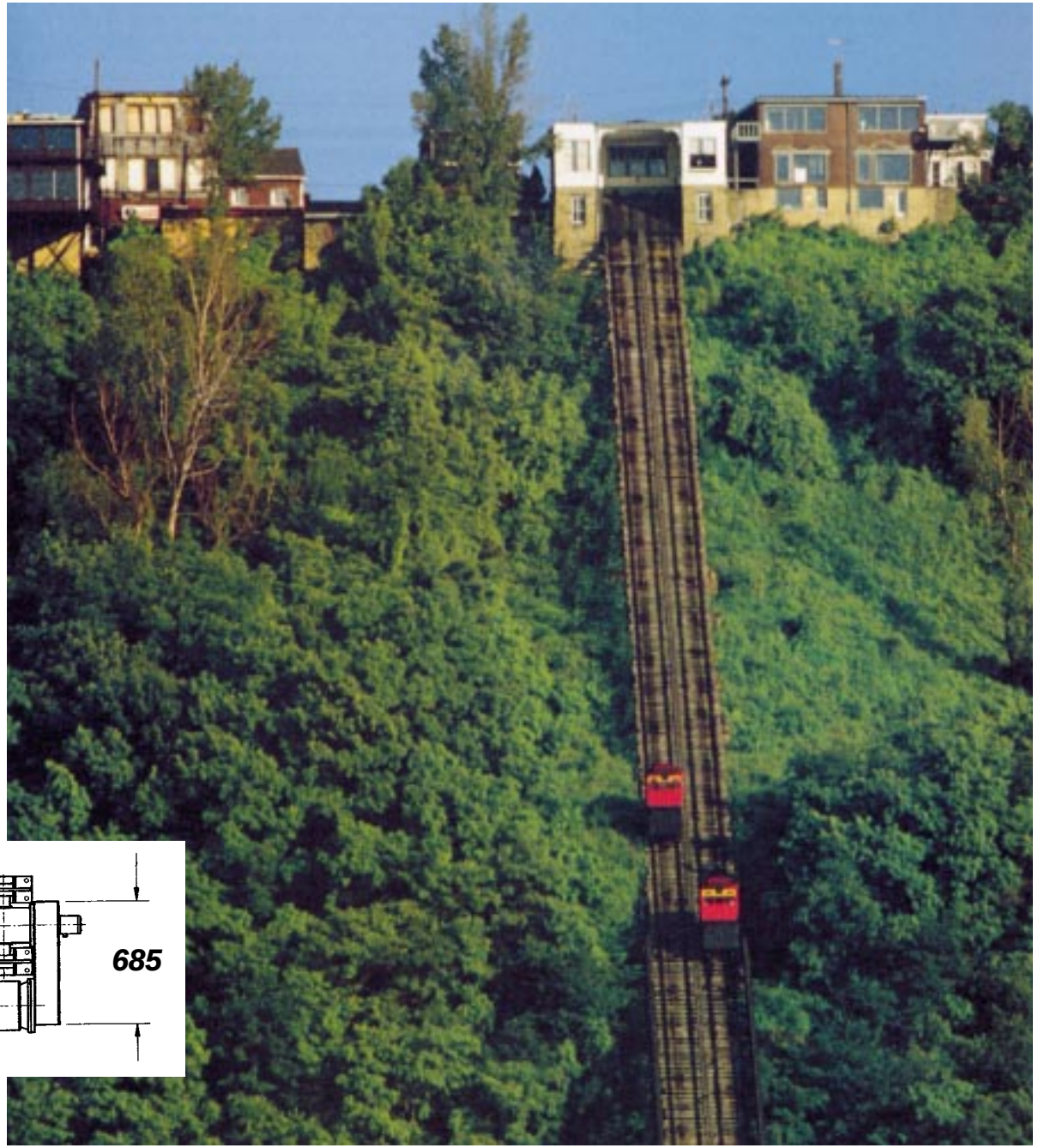
Required Force:	*150 kN Haul Cable;* *9 kN Safety Cable* *230 kN Static Load Capability for both*

Hydraulic Fluid Leakage unacceptable

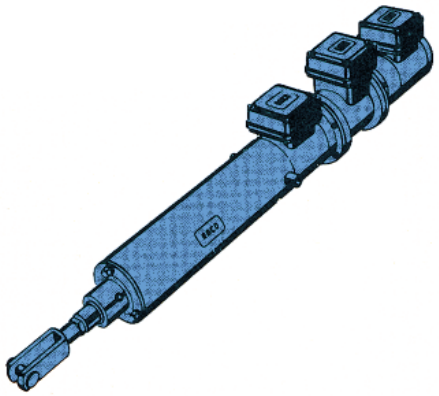
Temperature Range:	*-20°C to 50° C*
Mounting Required:	*Trunnion Pins and Brackets*
Front Attachment Required:	*Rod End*
Accuracy Required:	*± 0,38 mm*

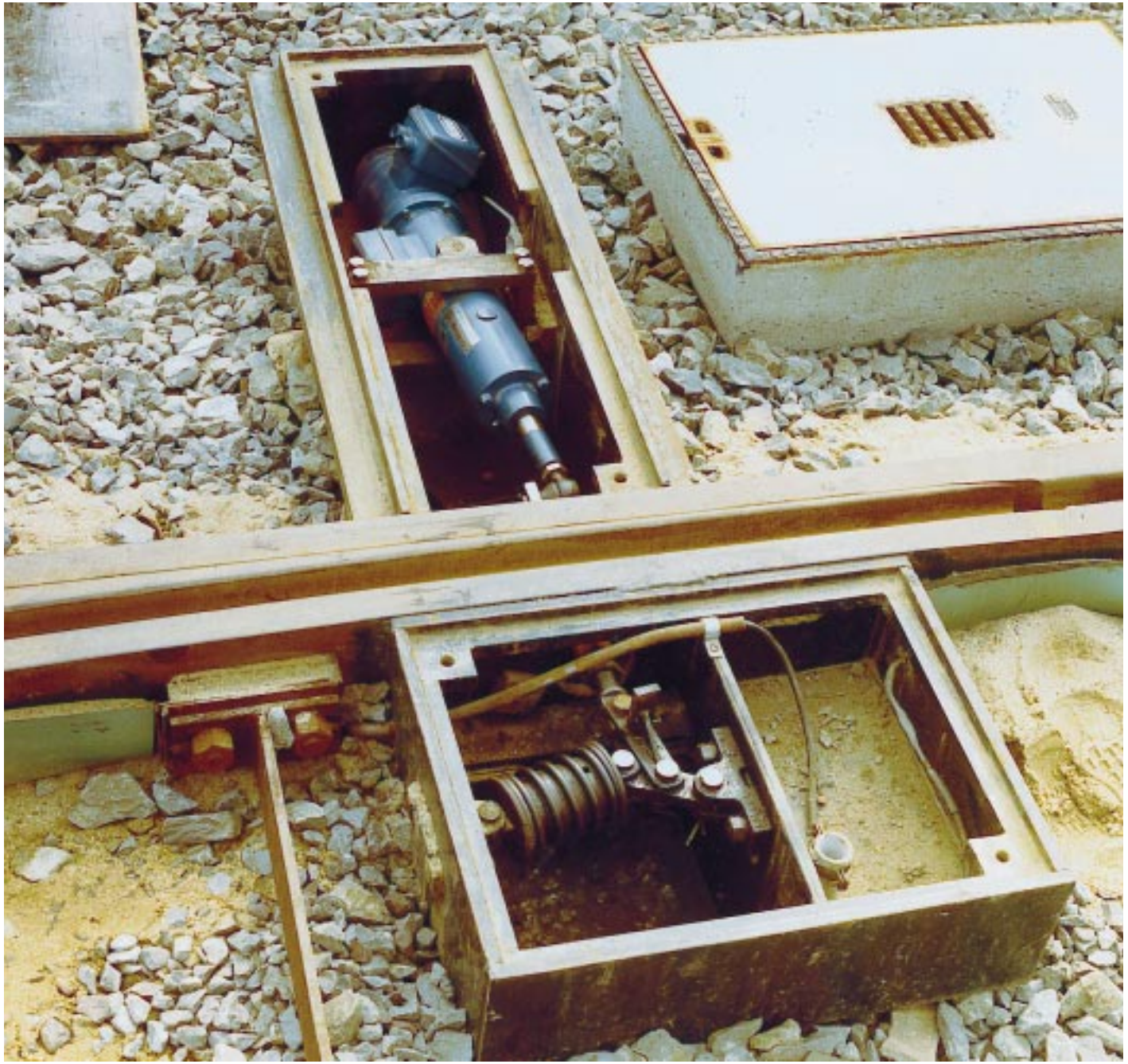


All dimensions in mm



We Switch You Over to the Right Track





Track switch in a yard of tramway main service depot with RACO *electric cylinder type* ***K1A4***

RACO Rotary (Part-turn/ Multi-turn) actuator


RACO


Thank you for your interest
in our products.
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