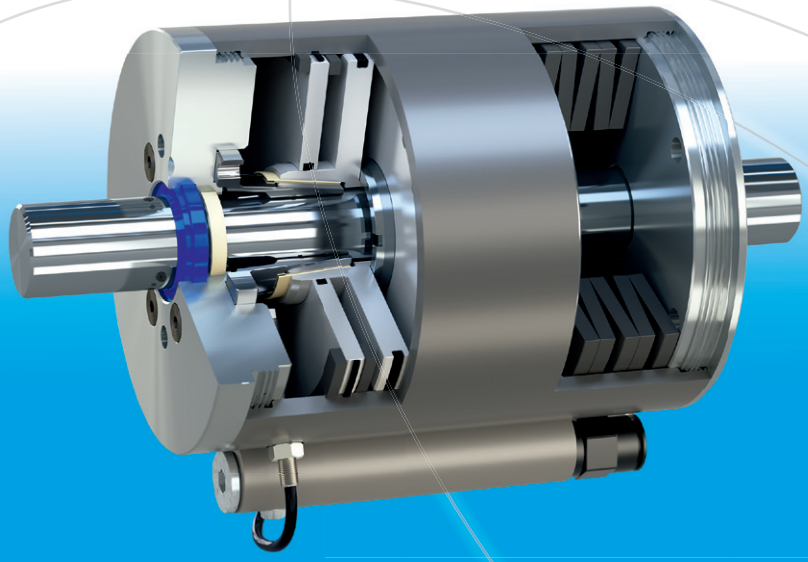
mayr®

your reliable partner



ROBA®-linearstop

K.381.V09.EN

www.mayr®.com

Expert know-how in development and design

As the technological leader, *mayr*® power transmission focuses on continuous further development. Today, highly qualified engineers and technicians work on tomorrow's innovations using the most up-to-date tools. The many years of experience and countless tests in the Development and Testing Department at the Mauerstetten Headquarters form the basis of conscientious lifetime dimensioning.

The values upheld by our traditional, family-run company also include long-term stability and independence as well as a good reputation and satisfied customers.

Therefore, we place emphasis on:

- Tested product quality,
- Optimum customer service,
- Comprehensive know-how,
- Global presence,
- Successful innovations and
- Effective cost management

Tested quality and reliability

mayr® brakes and clutches/couplings are subject to meticulous quality inspections. These include quality assurance measures during the design process as well as a comprehensive final inspection. Only the best, tested quality leaves our place of manufacture. All products are rigorously tested on calibrated test stands, and adjusted precisely to the requested values. An electronic database in which the measured values are archived together with the associated serial numbers guarantees 100 % traceability. On request, we confirm the product characteristics with a test protocol.

The certification of our quality management according to DIN EN ISO 9001:2015 confirms the quality-consciousness of our colleagues at every level of the company.

Specialists in power transmission for more than a century

mayr® power transmission is one of the most traditional and yet most innovative companies in the field of power transmission. From modest beginnings in the year 1897, the family enterprise has developed to become the world market leader. Worldwide, the company employs approximately 1200 people.

An unsurpassed standard product range

mayr® power transmission offers an extensive range of variants of torque limiters, safety brakes, backlash-free shaft misalignment compensation couplings and high-quality DC drives. Numerous renowned machine manufacturers trust in solutions by *mayr*® power transmission.

Represented worldwide

With eight subsidiaries in Germany, sales offices in the USA, France, Great Britain, Italy, Singapore and Switzerland as well as 36 additional country representatives, *mayr*® is available in all important industrial areas, guaranteeing optimum customer service around the globe.

Never compromise on safety

We make no compromises where safety is concerned. Only top products of a perfect quality guarantee that no people are injured or machines damaged in case of malfunctions, collisions and other hazardous situations. The safety of your employees and machines is our motivation to always provide the best and most reliable clutches, couplings or brakes.

mayr® power transmission holds numerous ground-breaking patents, and is the global market or technological leader for

- application-optimised **safety brakes,** for example for passenger elevators, stage technology and gravity-loaded axes
- **torque limiters** to protect against expensive overload damage and production losses and
- backlash-free **servo couplings**.

Strongly positioned

mayr® sets standards in power transmission with economically viable solutions. For maximum competitiveness of your machines and systems, we always aim for the best possible cost efficiency, starting with the development of your clutch/coupling or brake, right up to delivery of the finished and inspected product. For cost-efficient production, our factories in Poland and China represent the perfect supplement to the headquarters in Germany.

mayr® headquarters in Mauerstetten

Subsidiary with Production — *mayr*® China

Subsidiary with Production — *mayr*® Poland

mayr®
your reliable partner

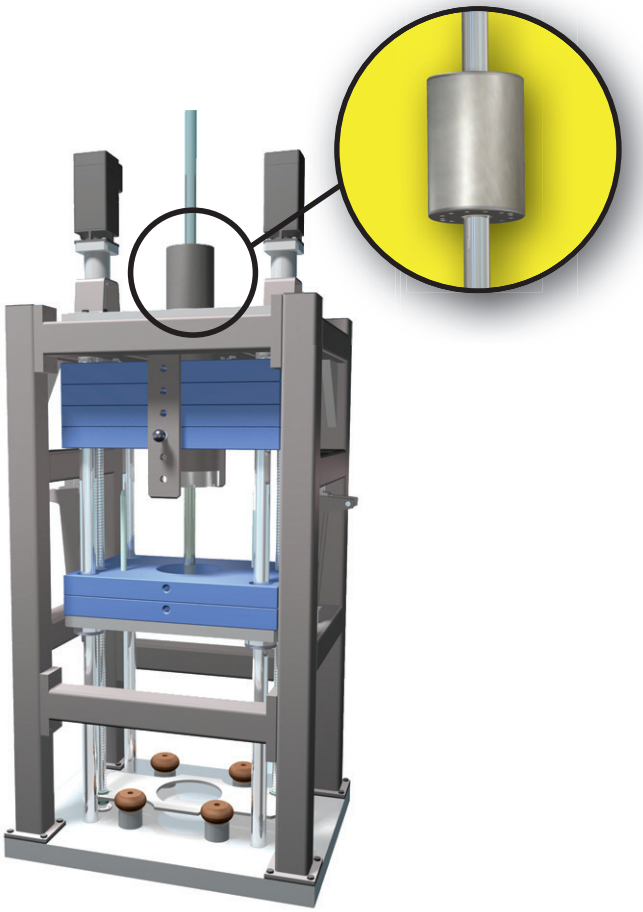
ROBA®-linearstop

the perfect safety brake for linearly moved axes

Versatile use as safety brake or clamping unit

As a new brake system, the ROBA®-linearstop offers unique possibilities for increasing the safety of machinery. As a compact brake unit it can be integrated into already existing machinery and system constructions easily, quickly and without extensive adjustment work. The unit having a direct effect on the rod brakes independently from the drive system.

Die ROBA®-linearstop pneumatic can be attached to standardized cylinders acc. ISO 15552.
The ROBA®-linearstop pneumatic is not only a holding device, but can also brake dynamically on a rod. The system has been designed according to the “Principles for the inspection and certification of pneumatic braking/holding devices with safety function for linear drives” of the German Trade Association Institute for Work Safety (BIA Berufsgenossenschaftliches Institut für Arbeitsschutz) and has been tested by the **TÜV-SÜD** (German Technical Inspectorate).
The new electromagnetic ROBA®-linearstop is designed as a clamping unit.



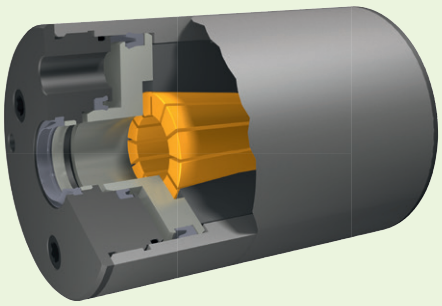
ROBA®-linearstop in an endurance test on a drop test stand
On the *mayr*®drop test stand specially designed for linear brakes, the braking force, dynamic braking path, switching times and position accuracy can be tested extensively.

Arrangement of the hydraulically actuated safety brake
ROBA®-linearstop in a universal lathe.
- Piston rod secured on one side

ROBA®-linearstop
Hydraulic – Pneumatic – Electromagnetic

Highlights and Advantages

- ❒ Safety brake system according to the fail-safe principle
- ❒ Backlash-free force transmission in both directions of motion
- ❒ No self-reinforcement during clamping
- ❒ Clearing the clamping device is not necessary
- ❒ Maximum performance density
- ❒ Suitable for EMERGENCY STOP braking actions
- ❒ Suitable for dynamic braking actions
- ❒ Minimum reaction times
- ❒ Integrated switching condition monitoring possible
- ❒ Long service lifetime
- ❒ Can easily be integrated into existing constructions

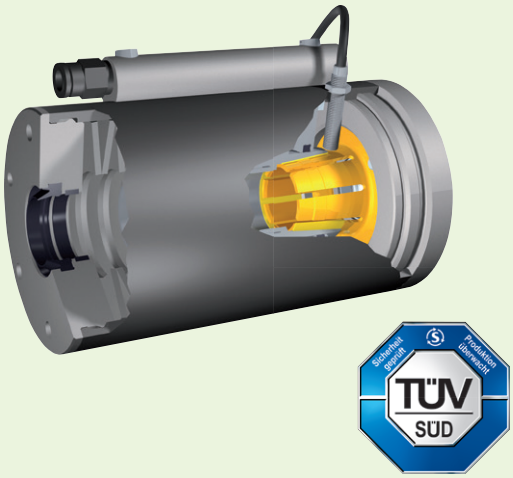


ROBA®-linearstop hydraulic
Type 380.01 _.0

Clamps a piston rod via a spring-loaded device at the exact position required and backlash-free. The brake is opened
with a hydraulic pressure of 35 – 75 bar.
Suitable for EMERGENCY STOP braking actions.

Nominal holding force: 4000 – 50000 N

For data and description, please see pages 6/7.



ROBA®-linearstop pneumatic
Type 381. 0 _ _ . _ (acc. Trade Association test regulation)

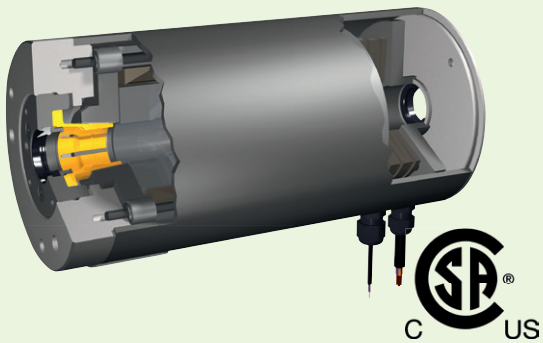
Clamps a piston rod via a spring-loaded device at the exact position required and backlash-free. The brake is opened with a pneumatic pressure of 4 – 6 bar.
Suitable for EMERGENCY STOP braking actions (tested by **TÜV-SÜD**, German Technical Inspectorate).

Type 381. 1 _ _ . _ for dynamic braking actions (acc. Trade Association test regulation)

Clamps and brakes a piston rod via a spring-loaded device at the exact position required and backlash-free. The brake is opened with a pneumatic pressure of 4 – 6 bar. If the Technical Data are observed, more than 20,000 dynamic braking actions are possible (tested by the **TÜV-SÜD**, German Technical Inspectorate).

Nominal holding force: 450 – 40000 N

For data and description, please see pages 8/9.



ROBA®-linearstop electromagnetic
Type 382.0_ _._

Clamps a piston rod via a spring-loaded device at the exact position required and backlash-free. Brake is opened through electromagnetic actuation with DC current.
Suitable for EMERGENCY STOP braking actions.

Nominal holding force: 70 – 17500 N

For data and description, please see pages 12/13.

ROBA®-linearstop hydraulic

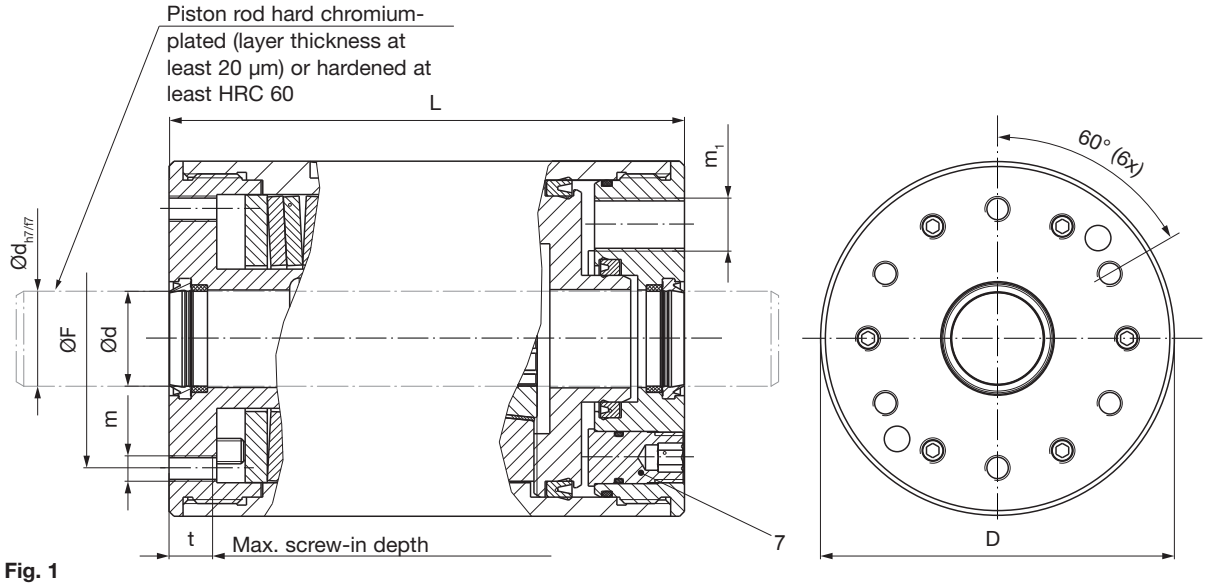


Fig. 1

State of Delivery

ROBA®-linearstop brakes are manufacturer-assembled ready for installation and set to the nominal holding force stipulated in the order.
If the customer does not stipulate a force adjustment in the order, the brake is set to the maximum nominal holding force acc. Table “Technical Data”.

Important!

If installation is to be carried out without pressurization, the three emergency release screws (7) must be screwed in up to their limit (state of delivery).
Before initial operation, please read and observe the respective Installation and Operational Instructions.

Function

Due to the spring-loaded system, the fail-safe principle is guaranteed, and the **ROBA®-linearstop** works as a safety brake. For the required release pressure (operating pressure), please see Table “Technical Data”.
The max. sliding speed is 2 m/s.

For permitted friction work in case of EMERGENCY STOP braking actions, please contact *mayr®* power transmission.

The spring-loaded, enclosed **ROBA®-linearstop**, which can be opened hydraulically, clamps a customer-side piston rod steplessly and backlash-free.

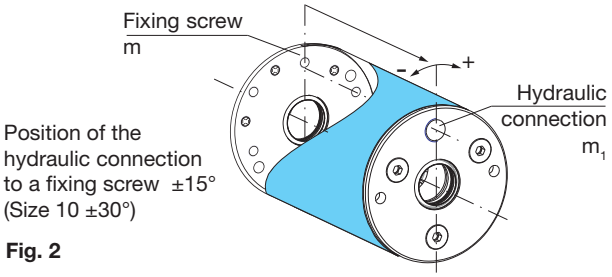


Fig. 2

Maintenance/Switching Frequency

The **ROBA®-linearstop** is designed for a switching frequency of 1.000.000 switchings (higher switching frequencies available on request).
The **ROBA®-linearstop** is mainly maintenance-free.
The piston rod must be checked regularly (at least every 6 months) for contamination with friction value-reducing materials; it must be cleaned, if necessary.
In case of major accumulation of dust and dirt, or in extreme ambient conditions, special maintenance work is required.
(Please contact *mayr®* power transmission).

Order Number

Standard (without additional part)	0
Switching condition monitoring (Fig. 4, Item 10)	1

Nominal holding force see “Technical Data”

__ / 3 8 0 . 0 1 __ . 0 / __ / __

Sizes 10 to 40

Operating pressure see “Technical Data”

Example: Order number 10 / 380.010.0 / 40 / 6000

Technical Explanations

Technical Data			Size															
			10				20				30				40			
Nominal holding force [1) 3)] **F_{Nenn}**		[kN]	4	6	8	10	8	12	16	20	20	25	30	35	35	40	45	50
Operating pressure [2)]	min.	[bar]	35	40	50	60	40	50	60	70	50	55	65	75	55	60	65	70
	max.	[bar]	150				150				160				160			
Weight		[kg]	4.9				11				14.7				26.8			
Threads for hydraulic connection	m_1		1/4”				3/8”				3/8”				3/8”			
Tightening torque against limit stop	Emergency release screw (7)	[Nm]	10															
Pressure medium			Use hydraulic oil acc. DIN 51524-1:2006-04															
Absorption volume		[cm^3]	4				7				11				16			
Ambient temperature		[°C]	-10 to +60															

Dimensions [mm]	Size			
	10	20	30	40
D	91	112	140	170
d	30	30	40	50
F	63	82	115	135
L	131	163	172	189
m	6 x M8	6 x M8	6 x M10	6 x M16
t	14	14	14	25

1) Minimum holding force when the brake is not pressurised and when the piston rod is dry or moistened with mineral oil.
2) Please contact *mayr*® power transmission if
- a nominal holding force other than the one stated is required
- the required minimum operating pressure is not available.

3) At a switching frequency > 200.000, please reckon with a nominal holding force reduction of 20 %.

Options (see also order number, page 6)

Switching condition monitoring
(Type 380.011.0)

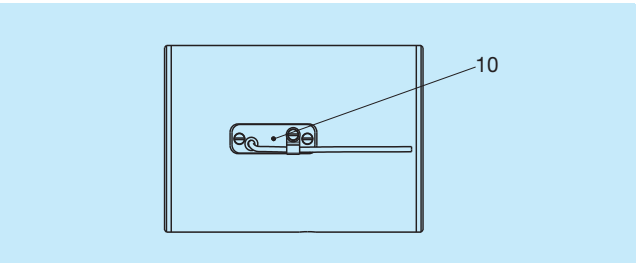


Fig. 4

Controls (Fig. 3)

The company *mayr*® power transmission recommends hydraulic controls as shown in Fig. 3. During every operating movement of the piston rod, the 3/2-directional control valve is switched electrically and the linear brake is released.
In all other operating conditions, the piston rod is held by the linear brake.

Recommendation:

- Pressure fluctuations can be reduced through a non-return valve.
- In order to guarantee fastest possible switching of the brake, the largest possible line diameter should be used in the area of the return flow line. Furthermore, do not install any choke valves in this area and keep the hydraulic lines between the brake and the valve as short as possible!

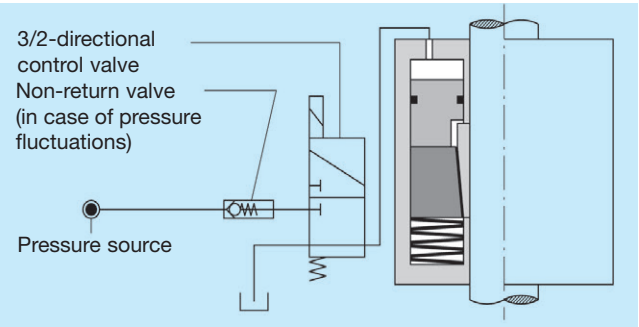


Fig. 3

Brake Rod

The *mayr*® power transmission recommends the use of piston rods.

Piston rod requirements

➔ see page 11

At higher loads, we recommend using a higher strength material.

Yield point	min. 520 N/mm^2 (e. g. 42CrMo4)

ROBA®-linearstop pneumatic

Can be attached to standardized cylinders acc. ISO 15552

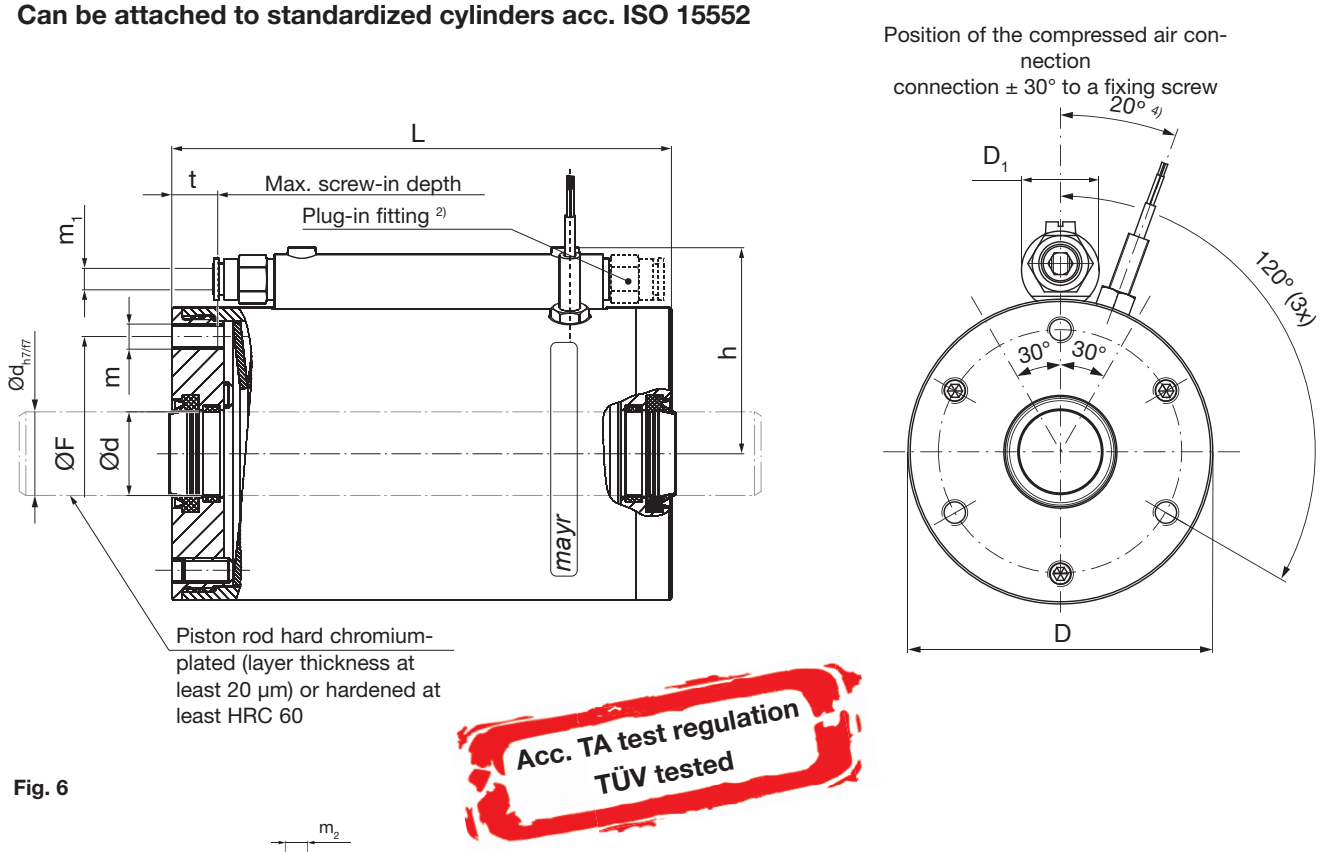


Fig. 6

Fig. 7: Adaptor for standardized cylinder (can be attached to standardized cylinder acc. ISO 15552)

Order Number

			Standard	0	
			Switching condition monitoring	1	
				0	Standard
				1	Adaptor for standard cylinder 3)

__ / 3 8 1 . __ __ __ . __ / __ / __

Size 1)	Clamping unit / Brake unit		Nominal holding force		Operating pressure	Nominal holding force
20 to 80	Clamping unit	**0**	**0**	Standard	see “Technical Data”	
	Brake unit	**1**	**1**	Increased		
			2	Maximum		

Example: Order number 60 / 381.121.0 / 5.0 / 10900

1) For other construction sizes, please contact *mayr*® power transmission
2) The plug-in fitting can be screwed onto both sides (not available on size 20 and 30)
3) Size 40 with adaptor for standard cyclinder can only be delivered with elbow connector (see “Options”)
4) On size 20 = 30°, on size 30 = 25°

Technical Data				Size					
				20	30	40	60	70	80
Nominal holding force [1) 2) 4)] (minimum holding force) F_{Nenn} [N] (the nominal holding force is adjusted at the place of manufacture depending on the existing operating pressure [3)])	Min. Operating pressure	4.0 bar	Type 381._0_._	450	800	1500	4600	7500	12500
			Type 381._1_._	625	1100	2100	6300	10000	17500
			Type 381._2_._	750	1400	2650	8200	13000	23000
		4.5 bar	Type 381._0_._	525	950	1800	5300	8500	14500
			Type 381._1_._	725	1250	2400	7300	11600	20000
			Type 381._2_._	875	1600	3050	9500	15200	26500
		5.0 bar	Type 381._0_._	575	1050	2000	6000	9600	16500
			Type 381._1_._	800	1450	2700	8300	13300	23500
			Type 381._2_._	1000	1800	3500	10900	17500	30500
		5.5 bar	Type 381._0_._	650	1200	2250	6700	10800	18500
			Type 381._1_._	900	1550	3000	9400	15000	26000
			Type 381._2_._	1100	2000	3950	12300	19700	35000
		6.0 bar	Type 381._0_._	700	1300	2500	7500	12000	21000
			Type 381._1_._	975	1750	3400	10500	16700	30000
			Type 381._2_._	1200	2200	4400	13800	22500	40000
Max. operating pressure		[bar]		8					
Weight		[kg]	Type 381._0_._	0.81	1.2	2	6	10.5	19
			Type 381._1_._	0.9	1.4	2.3	6.6	11.5	21
			Type 381._2_._	1.0	1.5	2.5	7.1	12.5	23
Air consumption per switching procedure in standard litres at 6.0 bar		[NL]	Type 381._0_._	0.025	0.045	0.083	0.244	0.389	0.635
			Type 381._1_._	0.034	0.060	0.111	0.325	0.519	0.847
			Type 381._2_._	0.042	0.075	0.139	0.406	0.648	1.058
Plug-in fitting m[1]		[mm]	Tube outer diameter	6	6	8	10	10	12
Pressure Medium				Compressed air quality acc. ISO 8573-1 Class 4					
Ambient temperature		[°C]		-10 to +60					

1) Type 381.0 Nominal holding force when the brake is not pressurized, and with the piston rod dry or moistened with mineral oil.
2) Type 381.1 Nominal holding force when the brake is not pressurized, and with a dry piston rod.
3) Please contact *mayr*® power transmission if
- a nominal holding force other than the one stated is required
- the required minimum operating pressure is not available.

4) At a switching frequency > 200.000, please reckon with a nominal holding force reduction of 20 %.

Dimensions [mm]		Size					
		20	30	40	60	70	80
D		46	56	70	110	140	178
D_1		15	15	18	21	24	25
d		16	20	20	25	32	40
F		34	44	56	90	112	142
h		37.3	42.3	52.8	75.9	94.4	113.9
L	Type 381._0_._	110.5	114.5	119.5	140.5	161	187
	Type 381._1_. _	129.2	133.7	138.7	162.5	187	216.8
	Type 381._2_._	147.9	152.9	157.9	184.5	213	246.6
m		3 x M5	3 x M6	3 x M6	3 x M8	3 x M10	3 x M12
t		13.5	12.5	12.5	13.5	13.5	16.5

Adaptor for Standard Cylinder acc. ISO 15552

Dimensions [mm]		Size					
		20	30	40	60	70	80
D_2		54	65	72.5	109	136	175
D_3		35.5	40.5	45.5	55.5	60.5	65.5
L_1		**L** + 29	**L** + 39	**L** + 30	**L** + 39	**L** + 48	**L** + 57
m_2		4 x M6	4 x M8	4 x M8	4 x M10	4 x M12	4 x M16
TK		38	46.5	56.5	89	110	140
Suitable for standard-based cylinder [piston Ø]		40	50	63	100	125	160

We reserve the right to make dimensional and constructional alterations.

ROBA®-linearstop pneumatic

Technical Explanations

State of Delivery

ROBA®-linearstop brakes are manufacturer-assembled ready for installation and set to the nominal holding force stipulated in the order.

Before initial operation, please read and observe the respective Installation and Operational Instructions.

Function

The spring-loaded, enclosed ROBA®-linearstop (Type 381.0_ _ _), which can be opened pneumatically, clamps a piston rod steplessly and backlash-free.
The ROBA®-linearstop (Type 381.1_ _ _) clamps and brakes a piston rod steplessly and backlash-free.
Due to the spring-loaded system, the fail-safe principle is guaranteed, and the **ROBA®-linearstop** works as a safety brake. For the required operating pressure, please see Table "Technical Data".
The max. sliding speed is 2 m/s.

Maintenance/Switching Frequency

The ROBA®-linearstop is designed for a switching frequency of 2.000.000 switchings (higher switching frequencies available on request).
The ROBA®-linearstop is mainly maintenance-free.
The piston rod must be checked regularly (at least every 6 months) for contamination with friction value-reducing materials; it must be cleaned, if necessary.
In case of major accumulation of dust and dirt, or in extreme ambient conditions, special maintenance work is required.

(Please contact mayr® power transmission).

Controls (Fig. 8)

The piston space is filled with compressed air, thus suspending the spring force. The compressed air in the piston space is deduced in case of power failure. The spring force has an effect on the clamping element. The piston rod clamps/ brakes reliable and safely.

The *mayr*® power transmission recommends the following pneumatic control units.

Controls for switching time-related applications
Recommendation!
For applications to optimize the switching time
(reduction of the braking distance)

Controls for safety-related applications
Recommendation!
For applications to optimize the safety
(in case of danger to people)

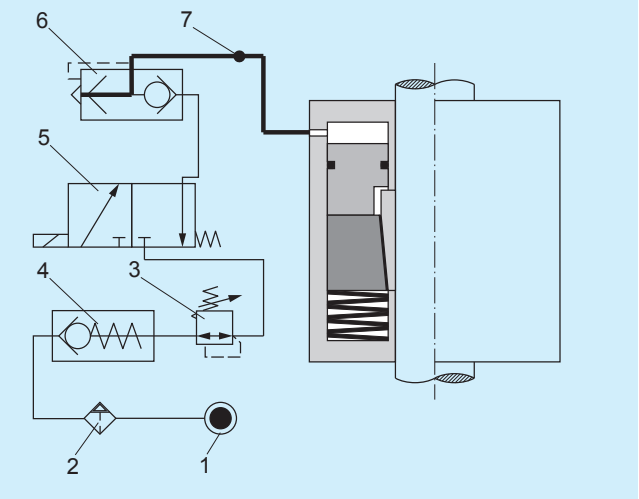


Fig. 8

Item	Name
1	Pressure source 4 – 6 bar
2	Maintenance unit
3	Pressure reducer (switching time-related application)
4	Non-return valve (in case of pressure fluctuations)
5	3/2-directional control valve
6	Quick-action ventilating valve (switching time-related application)
7	Pressure switch (safety-related applications)

Please find a detailed description in the respective Installation and Operational Instructions (go to www.mayr.com).

Options (available on request)

Wear monitoring
(proximity switch)

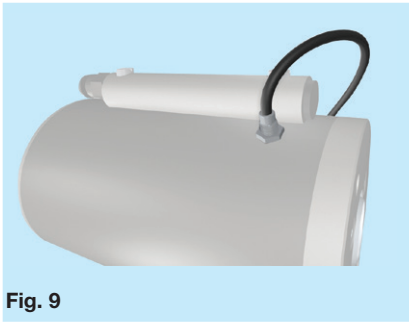


Fig. 9

Adaptor
(both ways)

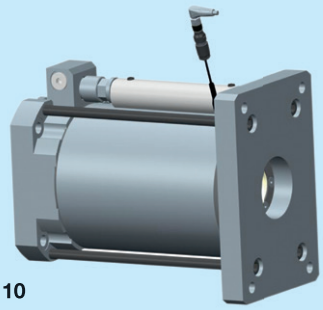


Fig. 10

Elbow connector
(for pneumatic connection)

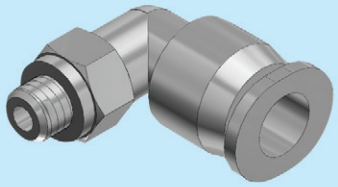


Fig. 11

Design
with increased corrosion protection

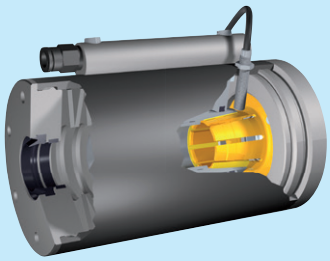


Fig. 12

Connection for sealing air

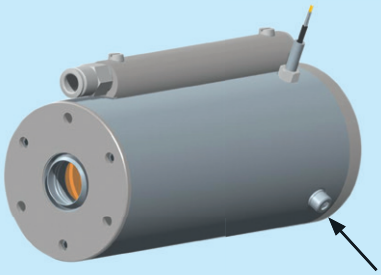


Fig. 13

Installation
(on both sides)

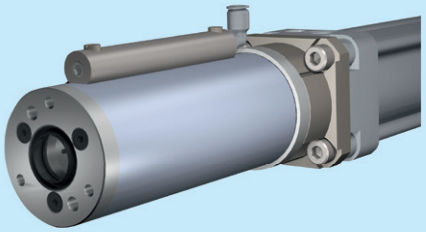


Fig. 14

Positioning flange

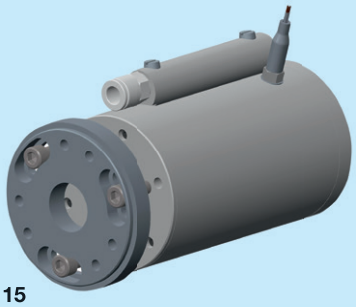


Fig. 15

Brake Rod

The *mayr*® power transmission recommends the use of piston rods.

Piston rod requirements*

	Steel, hard chromium-plated	Steel, hardened
Layer thickness	at least 20 µm	-
Hardness	-	at least HRC 60
Surface quality	Ra < 0.4 µm	
Yield point	min. 400 N/mm² (e.g. C45)	

Diameter tolerance	
Type 380, 381	h7 to f7
Type 382	f7

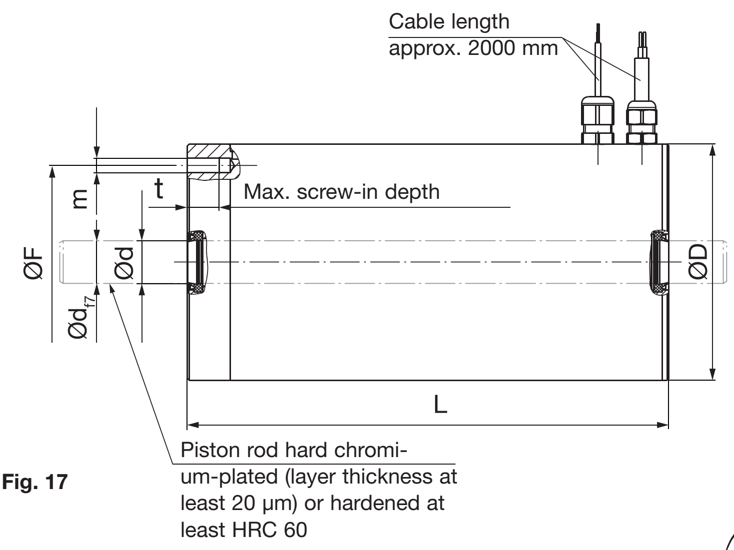
*) Piston rods are available as piece goods. Please contact the sales employee responsible or the company *mayr*® directly.

For the installation of the brake, we recommend an insertion chamfer (rounded edges) on the piston rod of min. 3 x 20 ° (Figure 16).

Friction value reducing residues on the piston rod must be avoided. Danger of load crashes.

Fig. 16 Piston rod with insertion chamfer

ROBA®-linearstop electromagnetic



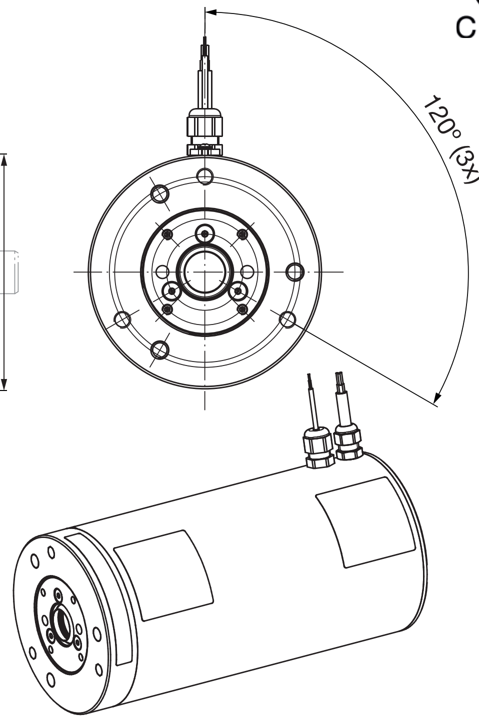


Fig. 17

Technical Explanations

State of Delivery

ROBA®-linearstop brakes are manufacturer-assembled ready for installation and set to the nominal holding force stipulated in the order.

Before initial operation, please read and observe the respective Installation and Operational Instructions.

Function

Due to the spring-loaded system, the fail-safe principle is guaranteed, and the **ROBA®-linearstop** works as a safety brake.
The max. sliding speed is 2 m/s.

For permitted friction work in case of EMERGENCY STOP braking actions, please contact *mayr*® power transmission.

The spring-loaded, enclosed ROBA®-linearstop, which can be opened electromagnetically, clamps a piston rod steplessly and backlash-free.

Maintenance/Switching Frequency

The **ROBA®-linearstop** is designed for a switching frequency of 200.000 switchings (higher switching frequencies available on request).
The **ROBA®-linearstop** is mainly maintenance-free.
The piston rod must be checked regularly (at least every 6 months) for contamination with friction value-reducing materials; it must be cleaned, if necessary.
In case of very dusty or dirty conditions or in extreme ambient conditions, special maintenance work is necessary (please contact *mayr*® power transmission).

Order Number

Standard 0
Switching condition monitoring [4] 1

0 Standard

DC voltage module (Article number)

__ / 3 8 2 . 0 __ __ . 0 / __ / __ / __

Size [1]
10
to
80

Clamping unit 0

Nominal holding force
0 Standard
1 Increased
2 Maximum

Coil nominal voltage [2]
52 [VDC]
6 [VDC] [3]
other voltages available on request

Nominal holding force
see "Technical Data"

Example: Order number 60 / 382.021.0 / 52 / 6500 / 8237887

1) For other construction sizes, please contact *mayr*® power transmission
2) Brake operation only possible with overexcitation and reduced voltage
3) Only on Size 20
4) Not available for Size 20

Technical Data		Type	Size 10	20	40	60	80
Nominal holding force [1) 2)] (minimum holding force) F_{Nenn}	[N]	382.00_._	70	180	600	1800	4500
		382.01_._	-	360	1300	4000	10500
		382.02_._	-	550	2100	6500	17500
Weight	[kg]	382.00_._	0.23	0.9	2.4	3.4	14
		382.01_._	-	1.3	3.2	6.8	20
		382.02_._	-	1.7	4	10.3	26.3
Electrical Power [W]		P_N 382.00_._	5.9	8.4	12.1	19.8	42
		P_O 382.00_._	94	126	191	314	665
		P_H 382.00_._	2.6	2.7	4	6.6	14
		P_N 382.01_._	-	16.7	24	40	84
		P_O 382.01_._	-	253	382	628	1329
		P_H 382.01_._	-	5.4	8	13.2	28
		P_N 382.02_._	-	25.1	36	59	126
		P_O 382.02_._	-	379	573	941	1994
		P_H 382.02_._	-	8.1	12	19.8	42
Max. switching frequency	[1/min]		3				
Ambient temperature	[°C]		-20 to +40				

Dim. [mm]	Type	Size 10	20	40	60	80
D		35	50	75	110	160
d		8	10	12	20	25
F		30.5	42	56	90	140
L	382.00_._	83.5	95	107	132	155
	382.01_._	-	132	148	178	213
	382.02_._	-	169	189	224	270
m		3xM3	3xM5	3xM6	3xM8	3 x M10
t		6	8	10	15	14

We reserve the right to make dimensional and constructional alterations.

1) Minimum holding force when the brake is de-energised, and with the piston rod dry or moistened with mineral oil.
2) Please contact *mayr*® power transmission if
- a nominal holding force other than the one stated is required.
- a construction length other than the one stated is required.

Brake Rod

The *mayr*® power transmission recommends the use of piston rods.

Piston rod requirements

➔ see page 11

Electrical connection

The following *mayr*® DC voltage module is recommended for the ROBA®-linearstop electrical Type 382.0_ _._ **Size 20**:

Size ROBA®-linearstop	**DC voltage module**
10/20	ROBA®-brake-checker plus DC Article number 8262586

- Connection to 24 VDC
- Overexcitation voltage 24 VDC
- Holding voltage 4 VDC

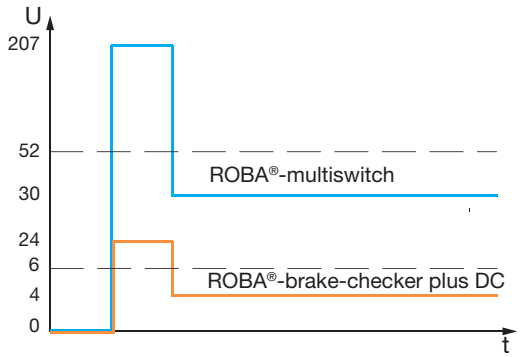
In case of operation of the brake without ROBA®-brake-checker plus DC, please consult *mayr*® power transmission.

The following *mayr*® DC voltage modules are recommended for the ROBA®-linearstop Type 382.0_ _._ **Sizes 40/60/80**:

Size ROBA®-linearstop	**DC voltage module**
40/60	ROBA®-multiswitch Article number 8225580
80	ROBA®-multiswitch Article number 8237887

- Connection to 230 VAC (other connection voltages available on request)
- Overexcitation voltage 207 VDC
- Holding voltage 30 VDC

In case of operation of the brake without ROBA®-multiswitch, please consult *mayr*® power transmission.



Time Diagram: Operation of the brake

For opening of the ROBA®-linearstop electrical, it is switched on with overexcitation voltage, meaning with a substantially higher-voltage than the coil nominal voltage.

When switched on, the DC voltage module briefly outputs over-excitation voltage to the magnetic coil.

Brake Dimensioning Type 380.01 _.0 / Type 381._ _ _._ / Type 382.0 _ _.0

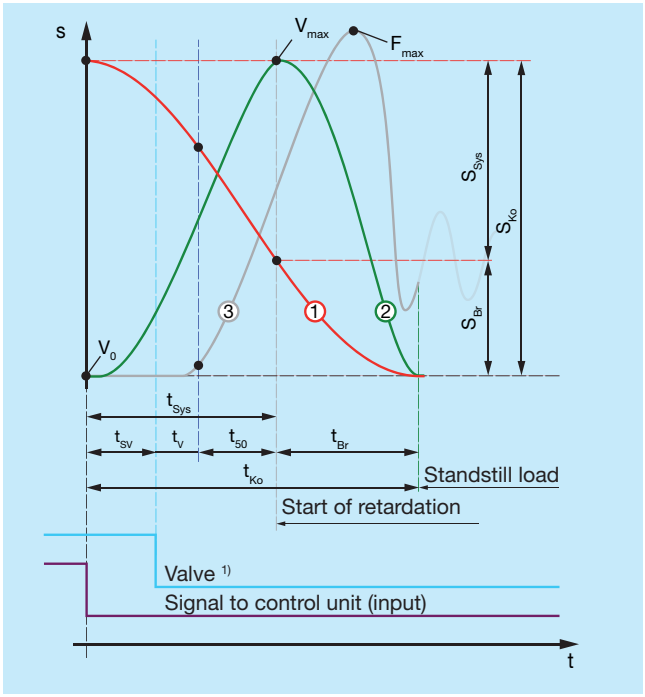


Diagram 1: Switching / Braking Times / Distances

Name

1		**Distance**
2		**Speed**
3		**Axial force**
□	[°]	Angular position 0° (horizontal) to 90° (vertical)
a_B	[m/s²]	**Acceleration** of the downward-moving load, dependent on the angular position
a_v	[m/s²]	Retardation
g	[m/s²]	Gravitational acceleration (9.81 m/s²)
F_{Br}	[N]	Braking force for dynamic calculation
$F_{erf.}$	[N]	Required holding force
F_{Nenn}	[N]	Nominal holding force (minimum holding force)
F_{NGes}	[N]	Total nominal holding force (one or more brakes)
F_{max}	[N]	Maximum holding force
m	[kg]	Load mass
S_{Br}	[m]	**Braking distance:** Distance from the beginning of the retardation up to the standstill of the load
S_{Sys}	[m]	**System distance:** Distance travelled by the load until the retardation begins.
S_{Ko}	[m]	**Stopping distance:** Distance from the signal interruption up to standstill of the load
t_{50}	[s]	Brake switching time
t_V 1)	[s]	Valve switching time (not applicable for Type 382.0 _ _._)
t_{SV}	[s]	Switching time control unit (signal processing time)
t_{Sys}	[s]	System switching time
t_{Br}	[s]	Brake braking time
t_{Ko}	[s]	**Stopping time:** Time from the signal interruption up to standstill of the load
Q_r	[J]	Friction work per braking action

General

When selecting the brake, the nominal holding force must be greater or equal to the required holding force.

$$F_{Nenn} \geq F_{erf.} \quad [N]$$

Dimensioning for dynamic braking (EMERGENCY STOP)

For safety reasons, at least the weight load of the masses to be held +100 % reserve must be provided.

The larger the ratio of the nominal holding force to the required holding force, the shorter the stopping distance (for the same technical conditions)

The minimum required holding force can be calculated with the following formula:

$$F_{erf.} = \frac{m \times g}{0.5} \quad [N]$$

Dimensioning for static holding (clamping)

For safety reasons, at least the minimum weight load of the masses to be held +20 % reserve must be provided.

The minimum required holding force can be calculated with the following formula:

$$F_{erf.} = \frac{m \times g}{0.8} \quad [N]$$

The stopping distance / stopping time of the load to be braked is strongly dependent on the following influences:

- Switching time control unit (signal processing)
- Switching time of the control valve 1)
- Switching time of the brake
- Cross-section and length of the lines

The larger the sum of the switching times, the later the retardation of the load occurs (due to longer periods of acceleration). The stopping distance / the stopping time becomes longer (with constant holding force).

Please ensure sufficient dimensioning of the components of your system which may be placed under heavy loads during acceleration / retardation as a result of dynamic braking actions.

Name

$Q_{r\,zul.}$	[J]	Permitted friction work per braking action
$Q_{r\,ges.}$	[J]	Total friction work up to wear end (one or more brakes)
V_0	[m/s]	Initial speed
V_{max}	[m/s]	Maximum speed
$Z_{zul.}$		Number of braking actions up to wear end

If you have any questions, please contact *mayr*® power transmission.

1) With the exception of Type 382.0_ _._

Calculation example (dynamic braking)

Data:		
Angular position piston rod	β	= 90° (vertical axis)
Mass	m	= 800 kg
Initial speed	V_0	= 0.5 m/s
Valve switching time	t_V	= 0.016 s
Switching time control system	t_{SV}	= 0.020 s
Existing operating pressure		= 5 bar

1. Pre-selection of braking force

$$F_{erf.} = \frac{m \times g}{0.5} \quad [N]$$

$$F_{erf.} = \frac{800 \times 9.81}{0.5} = \mathbf{15696} \quad [N]$$

Selected: ROBA®-linearstop Size 70, Type 381.12_._

Nominal holding force $\mathbf{F_{Nenn} = 17500\ N}$ at 5 bar operating pressure (from Table "Technical Data")

2. Calculation of the stopping distance /stopping time

Checking the selected brake size

Acceleration of the load

$$a_B = g \times \sin(\beta) = 9.81 \times \sin(90°) = \mathbf{9.81}\ [m/s^2]$$

System distance

$$S_{Sys} = V_0 \times t_{Sys} + a_B \times t_{Sys}^2 \times 0.5 \quad [m]$$

$$S_{Sys} = 0.5 \times 0.096 + 9.81 \times 0.096^2 \times 0.5 = \mathbf{0.093}\ [m]$$

$$t_{Sys} = t_{50} + t_V + t_{SV} = 0.060 + 0.016 + 0.02 = 0.096\ [s]$$

Braking distance

$$S_{Br} = \frac{V_{max}^2}{2 \times \left(\frac{F_{NGes}}{m} - a_B\right)} = \frac{1.44^2}{2 \times 12.065} = \mathbf{0.086}\ [m]$$

$$V_{max} = V_0 + a_B \times t_{Sys} = 0.5 + 9.81 \times 0.096 = 1.44\ [m/s]$$

Stopping distance

$$S_{Ko} = S_{Br} + S_{Sys} = 0.086 + 0.093 = \mathbf{0.179}\ [m]$$

Stopping time

$$t_{Ko} = t_{Br} + t_{Sys} = 0.119 + 0.096 = \mathbf{0.215}\ [s]$$

$$t_{Br} = \frac{V_{max}}{\frac{F_{NGes}}{m} - a_B} = \frac{1.44}{\frac{17500}{800} - 9.81} = 0.119\ [s]$$

Retardation (for system dimensioning)

$$a_v = \frac{F_{NGes} \times 2.5}{m} - g = \frac{17500 \times 2.5}{800} - 9.81 = \mathbf{44.87}\ [m/s^2]$$

$$\text{Load} = \frac{a_v}{g} = \frac{44.87}{9.81} = \mathbf{4.57}\ [g]$$

3. Friction work (Type 381.1_ _._)

Friction work per braking action

$$Q_r = m \times a_B \times S_{Br} + 0.5 \times m \times V_{max}^2 \quad [J]$$

$$Q_r = 800 \times 9.81 \times 0.086 + 0.5 \times 800 \times 1.44^2 \quad [J]$$

$$Q_r = \mathbf{1504}\ (< Q_{r\,zul} = 12948) \quad [J]$$

Number of braking actions up to wear end

$$Z_{zul.} = \frac{Q_{r\,ges}}{Q_r}$$

$$Z_{zul.} = \frac{5.85 \times 10^6}{1504} = \mathbf{3890}\ \text{dynamic braking actions}$$

ROBA®-linearstop hydraulic

Switching time (Type 380.00 _.0) 3)			Size			
			10	20	30	40
Brake switching time	t_{50}	[s]	0.030	0.045	0.055	0.065

ROBA®-linearstop pneumatic

Friction Work and Switching Times (Type 381.1_ _._) 1) 3)			Size					
			20	30	40	60	70	80
Permitted total friction work up to wear end 2)	$Q_{r\,ges.}$	[10^6 J]	0.36	0.75	1.14	3.6	5.85	10.35
Maximum permitted friction work per braking action 2)	$Q_{r\,zul.}$	[J]	579	1049	2097	7361	12948	24708
Brake switching time	t_{50}	[s]	0.037	0.038	0.035	0.050	0.060	0.070

1) For friction work Type 381.0_ _._, please contact *mayr*® power transmission. The switching times also apply for Type 381.0_ _._.
2) For higher friction work / total friction work, please contact *mayr*® power transmission.
3) Switching times are influenced by line length, operating pressure and wear

ROBA®-linearstop electromagnetic

Switching times (Type 382.0_ _._)			Size				
			10	20	40	60	80
Brake switching time	t_{50}	[s]	0.020	0.030	0.030	0.035	0.045

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