1. Contact details

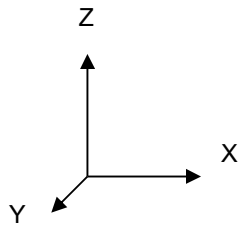
Company:		Address:	
Contact person:		Phone:	
Email:		Date:	
Schunk customer no.:		Schunk contact person:	

2. Definition of the project

Please describe the project exactly.

3. Arrangement of the application

Please sketch the requested operation under specification of dimensions and mass of the separate parts.



4. Requirement information (please check)

☐ Single application	☐ Technical improvement
☐ Series, quantity per year:	☐ Reduction of expenses
☐ New construction	☐

Anfrageformular bitte senden an: Automationsolution@de.schunk.com

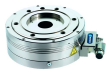
5. Work piece

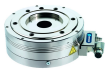
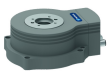
Weight work piece:	[kg]		
Distance to balance point (coordinate and zero point see torque info catalog):	[mm]	in X:	in Y: in Z:
Resulting inertia	[kgm²]		

6. Application data

Orientation of swivel unit …is…	☐ vertical (hanging)	☐ vertical (standing)	☐ horizontal (lying)	☐			
Type of application	☐ swiveling (shuttle service)		☐ rotating (endless/Step)				
Swivel angle [°]		Maximum swivel angle [°]					
Maximum allowed swivel time 0°-x° [s]		Total cycle time 0°-x°-0° (incl. pause) [s]					
Number of cycle per hour		Offset to start position in sketch [°]					
Additional force and direction (e.g.. pressure 5 N in X+) [N]		N in - direction					
Additional torque allocated to axis (e.g. process torque) [Nm]		Nm um - axis					
Velocity V_{max} [U/min]							
Acceleration a_{max} [rad/s²]							
Accuracy (1 arcsec=1/360°) [arcsec]							

7. Swivel unit

Type	ERP	PW	PSM 2	PR 2	PDU 2	PRH	ERS	ERT	ERD	ERM
	 ☐	 ☐	 ☐	 ☐	 ☐	 ☐	 ☐	 ☐	 ☐	 ☐
Size	☐ 25	☐ 70 ☐ 90 ☐ 110				☐ 50 ☐ 60 ☐ 75	☐ 135 ☐ 170 ☐ 210	☐ 12 ☐ 50 ☐ 300	☐ 04 ☐ 08 ☐ 12	☐ 160
Ratio / brake / rotary feed through					ratio ☐ i=51 ☐ i=101 ☐ i=161	☐ i=30 ☐ i=50 ☐ i=100	brake ☐ yes rotary feed through ☐ yes			brake
Protection class							☐ IP40 ☐ IP54			
Drive controller							☐ BoschRexroth Indradrive CS ☐ Siemens Sinamics ☐ sonstige			
Field bus		☐ PB ☐ CAN					☐ PB ☐ PN ☐ sonstige ☐ Ethernet ☐ Ethercat			
Cable	☐ 5m ☐ 10m	☐ 0,3m ☐ 0,46m	☐ 1,5m ☐ 3m ☐ 5m ☐ 10m			☐ 2m ☐ 5m ☐ 10m ☐ 15m	☐ 5m ☐ 10m ☐ 15m ☐ 20m			
Power supply	☐ yes									

Type	ERP	PW	PSM 2	PR 2	PDU 2	PRH	ERS	ERT	ERD	ERM
										
Motor assembling										☐ yes
Terminating resistor			☐ yes							

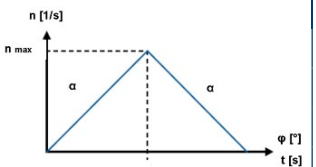
8. Additional

Environmental conditions	Temperature	[°C]	
	Humidity	[%]	
	Dirt, interference fields, site		
Regulations	(Resources regulations,..):		
Documentation	☐ Schunk standard design Language: German / Scale: Installation instruction, Drawing(s), bill of material / Shipping mode: CD-Rom with PDFs		
	☐ Special design (chargeable) definition:		
Additional:			

9. Cycle table

Cycle step	Swivelling angle +/- [Grad]	Permitted travel time [s]	Dwell time after positioning [s]	Mass moment of inertia [kgm²]
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				

10. Basic calculation data

Definitionen						Most extreme motion cycle
Rotation speed	n	[1/s]	total moment of inertia	I	[kgm²]	
Angle of rotation	φ	[rad] *1	Inertia motor *2	I_M	[kgm²]	
Angular acceleration	α	[rad/s²] *1	Inertia mass *3	I_L	[kgm²]	
Angular speed	ω	[1/s]	Counter torque	M_{geg}	[Nm]	
Add. mass – weight	m_{zus}	[kg]	Theoretical torque	M_{teo}	[Nm]	

*1 1· rad = ~57,29° ; 360° = 2 · π · rad = ~6,28rad

*2 please refer to catalogue details

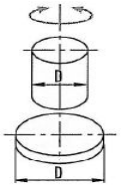
*3 please see following calculation of the mass moment of inertia

11. Formulas for accelerated / deccelerated movements

Angular speed	$\omega = 2 \cdot \pi \cdot n = \alpha \cdot t$	Angular acceleration	$\alpha = \omega / t$
Angle of rotation	$\varphi = ½ \cdot \alpha \cdot t^2 = ½ \cdot \omega \cdot t$	Time	$t = \omega / \alpha = \varphi / (2 \cdot \pi \cdot n)$
Mass moment of inertia	$I = I_M + I_L$	Motor torque	$M_{teo} = I \cdot \alpha + M_{geg}$
Motor torque	$M = (M_{teo}$ + control reserve) · dynamic correction factor – duty cycle factor		

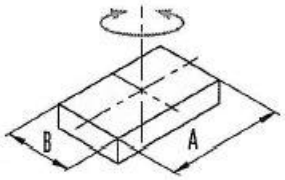
12. Calculation of the mass moment of inertia

Solid cylinder or flat disk, turning around the own axis.



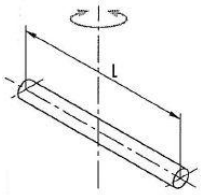
$$l = \frac{D^2}{8} \times m$$

Rectangular plate of any thickness, turning around a centered axis.



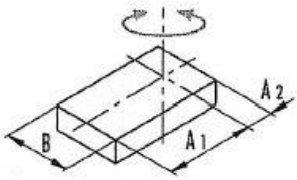
$$l = \frac{A^2 + B^2}{12} \times m$$

Long and thin stick of any cross section, turning around a centered axis.



$$l = \frac{L^2}{12} \times m$$

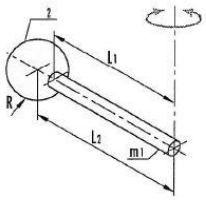
Rectangular plate of any thickness, turning around an excentric axis.



$$l = \left(\frac{4A_1{}^2 + B^2}{12}\right) \times m_1 + \left(\frac{4A_2{}^2 + B^2}{12}\right) \times m_2$$

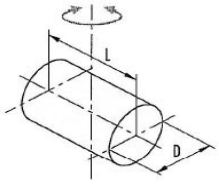
Long and thin stick with an additional mass, turning around an excentric axis.

For value K please add an additional mass moment of inertia.



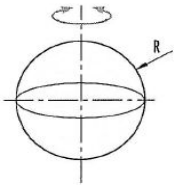
$$l = \frac{L_1{}^2}{3} \times m_1 + L_2{}^2 \times m_2 + K$$

Solid cylinder, turning around a cylinder axis vertical and centric to the axis.



$$l = \left(\frac{L^2}{12} + \frac{D^2}{16}\right) \times m$$

Ball, turning around the own axis.

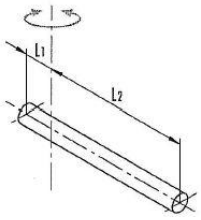


$$l = \frac{2 \times R^2}{5} \times m$$

Solid cylinder, turning around a cylinder axis vertical to an excentric axis.

$$l = \left(\frac{L_1{}^2}{3} + \frac{D^2}{16}\right) \times m_1 + \left(\frac{L_2{}^2}{3} + \frac{D^2}{16}\right) \times m_2$$

Long and thin stick of any cross section, turning around an excentric axis.



$$l = \frac{L_1{}^2}{3} \times m_1 + \frac{L_2{}^2}{3} \times m_2$$

l = Mass moment of inertia	**[kg m²]**
m_{zus} = Mass of payload	**[kg]**
A, B, D, L, R = Dimensions	**[m]**