High performance, compact, reliable.

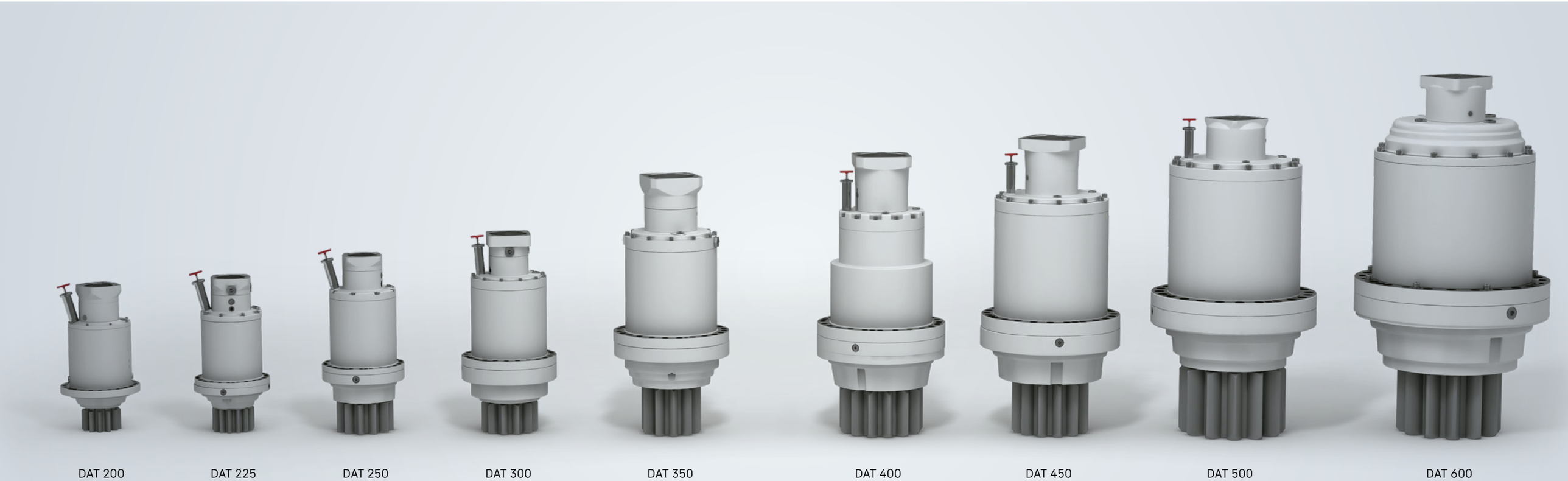
DAT gearbox series

Planetary gearboxes for slewing drives

LIEBHERR

Components
Slewing drives

Slewing drives by Liebherr



Liebherr has been developing, designing and manufacturing high-performance, versatile slewing drives for over 60 years. These drives are characterised by their outstanding quality and excellent reliability. Every year, tens of thousands of planetary gearboxes leave the Liebherr factory in Biberach/Riss (Germany) and successfully stand up to the hostile operating conditions in machinery and equipment of customers both inside and outside the Liebherr Group of companies.

With its slewing drives, Liebherr offers its customers a series-produced product range that covers many different application areas. Furthermore, individual solutions can also be produced to meet special requirements.

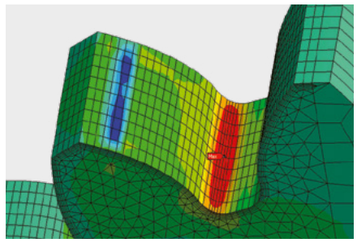
The gearboxes are designed using the very latest development and calculation methods. Extensive testing facilities and an in-house materials laboratory form the basis for ongoing development and even greater improvement. As a result, Liebherr slewing drives are characterised by maximum torque density with low installation space requirements.

Since the Group was established, Liebherr's strategy has been to focus on a high degree of vertical integration. For example, customers can be offered hydraulic and electric motors which are matched to the slewing drives and designed and manufactured in the company's own development and production departments.

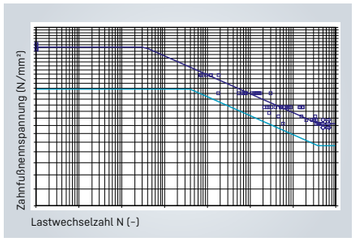
Product range
Nine gearbox sizes from the DAT 200 to the DAT 600 are available as series-production units. Further sizes are available on request. The coaxial planetary gearboxes are available as three-stage or four-stage units with a multitude of different gear ratios ranging from i = 20 to i = 1,500. The maximum dynamic torque is 142,000 Nm. Torques as high as 610,000 Nm have been implemented in special-design gearboxes. The series-production gearboxes with a short output shaft can be adapted both for electric motors and for hydraulic motors.

Areas of application
- Construction machinery, e.g. hydraulic excavators and concrete pumps
- Cranes, e.g. construction and mobile cranes
- Material handling and recycling equipment
- Mining equipment, e.g. mining excavators
- Maritime applications, e.g. port and ship cranes, ship propulsion units
- Renewable energy, e.g. wind turbines
- Automotive engineering, e.g. turntable ladder vehicles
- Industry

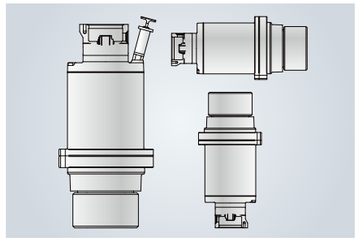
Technical design



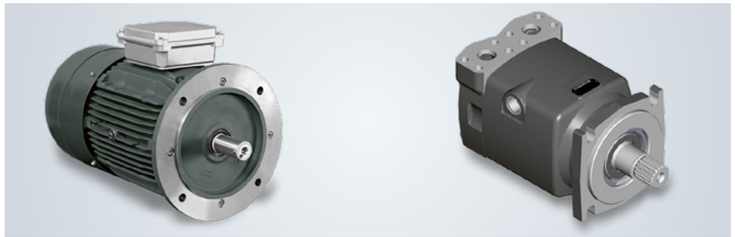
Gearbox design
The slewing drives are calculated and designed on the basis of the usual standards. In addition to the decades of experience in transmission engineering, the designers at Liebherr are also supported by measurements taken on the company's own high-frequency pulsator test stands and FZG-torque change devices.



Materials
All torque-bearing gearbox components are made of top-quality case-hardened and tempered steels which are certified to the Liebherr works standard. This standard, which goes beyond the currently applicable industrial standards, is based on Liebherr's decades of experience in a broad range of different application areas. The works standard also includes "3.1" material certification to DIN EN 10204.



Assembly position
As standard, the gearboxes are designed for vertical installation, with the output pinion at the bottom. Other installation positions are also possible on request.



Motor attachment
Liebherr slewing drives are designed for operation both with hydraulic motors and with electric motors.

If requested by the customer, the gearboxes can be prepared for motor attachment or can be supplied as a complete unit with the drive already installed.

Hydraulic or electric motors from Liebherr are recommended if a particularly compact design is required. The gearboxes can, however, be adapted to allow all motor types from other manufacturers to be fitted.

Holding brake/parking brake
Gearboxes with hydraulic drive are supplied with an integrated holding brake as standard. It is designed as a wet-running, hydraulically released, spring-operated multi-disc brake.

Adjustment of tooth backlash
The eccentricity of the gearbox allows simple adjustment of the optimum circumferential backlash between the slewing bearing and the slewing drive.

Efficiency
Liebherr planetary gearboxes have an efficiency of 0.98 per gear stage.

Gear structure
All sun gears and planet gears are case-hardened and ground. They have also been optimised to minimise circumferential backlash and have minimum play.

The nitrided inner gears are made of high-strength tempered steel, which is also used for the forged planet carriers. Well-devised design principles ensure uniform load distribution of the individual stages, resulting in a high power density.

In addition, the gearboxes are characterised by an integral design optimised to reduce the number of components to a minimum, thereby also minimising the number of sealing points.

Output shaft and bearing
The material from which the single-piece forged output shaft is made is case-hardened and ground in order to withstand the highest possible loads. Every size of series-production gearbox has a standard output pinion. This pinion can be adapted to the specific requirements of the customer. For example, a profile-corrected version of the gearing is possible as an option.

Pretensioned tapered roller bearings in an O-shaped arrangement prevent the output shaft from tilting when it is supported by the bearings, and ensure precise tooth meshing.

The outer tapered roller bearing has lifetime lubrication. The durable, field-tested outward seal ensures a long service life.

Lubrication
Liebherr slewing drives can be used at ambient temperatures down to −20 °C. The oil temperature must not exceed +90 °C.

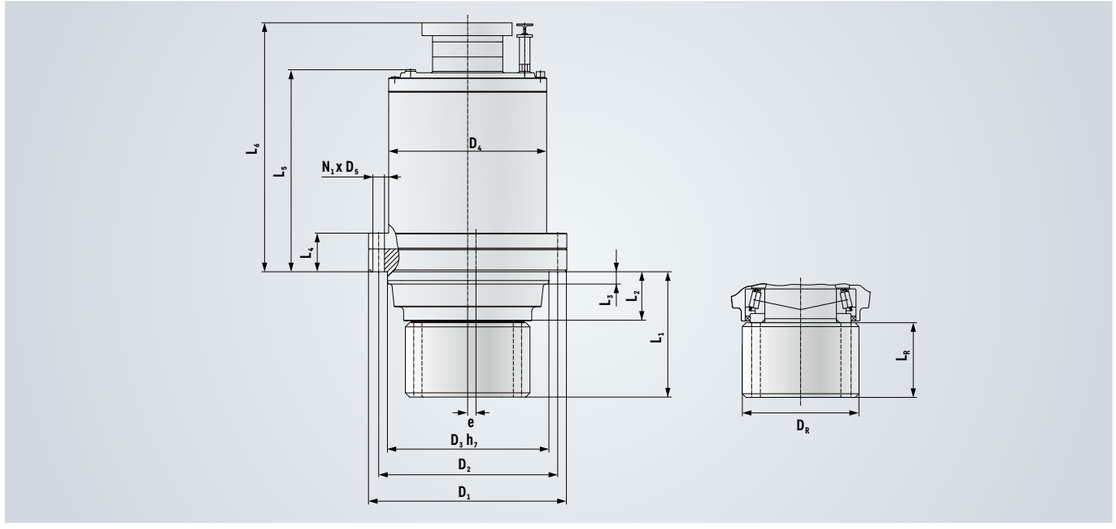
Depending on the application, the following oils are recommended:

- For low-temperature application from −40 °C to +50 °C: Liebherr Syntogear Plus 75W-90. For an optimal gearbox adaptation, consultation is necessary.
- For application in an ambient temperature range from −20 °C to +50 °C: Liebherr Gear Basic 90 LS.
- For application in highly stressed gearboxes in an ambient temperature range up to −40 °C: Liebherr Gear PG 220. For an optimal gearbox adaptation, consultation is necessary.

The types of lubricants used must comply with the indications in the installation drawing or the maintenance manual.

For further information about technical data, qualifications and characteristics of the oils, refer to **www.liebherr.com/lubricants**

Sizes and dimensions



Technical data of the series model range

	Output torques		Main dimensions											Output pinion				Weight	Backlash
	T_{FEM}	T_{max}	D_1	D_2	D_3 h_7	D_4	$N_1 \times D_5$[1]	L_1	L_2	L_3	L_4	L_5	L_6	z	m	D_R	L_R	3-stage design	Angular minute
	[Nm]	[Nm]	[mm]	[mm]	[mm]	[mm]	1 × [mm]	[mm]	[mm]	[mm]	[mm]	[mm]	[mm]			[mm]	[mm]	[kg]	[arc min]
DAT 200	5,000	10,000	⌀ 270	⌀ 240	⌀ 210	⌀ 212	24 × ⌀ 14	135	50	12	24	250	Depends on motor size	12	9	133	75	71	10
DAT 225	8,000	16,000	⌀ 260	⌀ 235	⌀ 210	⌀ 205	24 × ⌀ 14	135	55	15	44	280		13	9	156	75	75	10
DAT 250	11,000	22,000	⌀ 282	⌀ 258	⌀ 230	⌀ 228	24 × ⌀ 14	180	70	19	55	316		11	14	187	105	117	8
DAT 300	18,000	36,000	⌀ 326	⌀ 296	⌀ 265	⌀ 260	24 × ⌀ 18	182	72	55	83	364		11	14	187	105	165	8
DAT 350	30,000	60,000	⌀ 400	⌀ 362	⌀ 325	⌀ 315	24 × ⌀ 22	230	100	43	84	430		12	18	252	125	312	-
DAT 400	44,000	88,000	⌀ 437	⌀ 400	⌀ 365	⌀ 350	24 × ⌀ 22	265	100	22	115	501		13	18	273	160	405	-
DAT 450	60,000	120,000	⌀ 480	⌀ 435	⌀ 395	⌀ 390	24 × ⌀ 26	300	110	30	110	526		12	18	252	185	497	-
DAT 500	82,000	164,000	⌀ 565	⌀ 510	⌀ 460	⌀ 450	24 × ⌀ 33	375	140	35	110	571		12	24	324	230	785	-
DAT 600	142,000	284,000	⌀ 660	⌀ 600	⌀ 550	⌀ 540	24 × ⌀ 33	404	174	40	128	675		12	24	324	230	1.170	-
DAT 700	210,000	420,000								On request									
DAT 800	310,000	620,000								On request									
DAT 1.000	610,000	1,220,000								On request									

[1] Strength class 10.9 for fastening screws
Eccentricity of output pinion e = 1.5
Profile offset factor x = 0.5
Backlash: Reference values. Backlash at the output with blocked drive in new condition of the gear.

T_{FEM} = Reference torque T_{FEM} based on $M_S / L_3 / T_S$ at 10 rpm at output pinion
T_{max} = Safety ≥ 1.5 against fracture
m = Gear module
D_{1-5} = Diameter
D_R = Tip diameter
$L_{1-6, R}$ = Length
N_1 = Number of screws

Enquiry data for slewing drives

General information

Request date:		Telephone:
Company:		Email:
Contact person:		Application:
Street address:		Machine/Type:
Postcode:	**Location:**	Required quantity:
Country:		Requested delivery date:

Design data

Operating data

	Nominal dyn. output torque $T_{dyn,\ nom}$	Max. dyn. output torque** $T_{dyn,\ max}$	Static output torque T_{stat}
Load [Nm]			
Speed [rpm]			–

Classification according to FEM*

Drive unit class M	
Load condition L	
Running time classification T	

* Liebherr recommends design according to the guidelines of the FEM (European Materials Handling Federation) Section I, Rules for the design of hoisting appliances

** Incl. all influencing factors

Design size selection

Design size	DAT 200	DAT 225	DAT 250	DAT 300	DAT 350	DAT 400	DAT 450	DAT 500	DAT 600
Reference torque $T_{dyn,\ r}$ [Nm]	5,000	8,000	11,000	18,000	30,000	44,000	60,000	82,000	142,000
Please tick selected design size	☐	☐	☐	☐	☐	☐	☐	☐	☐
Selected gear ratio i									

Gearing data

	Pinion	Counter wheel
Module m [mm]		
Number of teeth z		
Tooth width (or pinion height) L_R [mm]		
Profile displacement factor x	0.5	
Number of gearboxes per counter wheel		
		Interior gear ☐ **Exterior gear** ☐

Motor data, hydraulic motor

Manufacturer	
Type	
Displacement [l/min]	
Pressure differential [bar]	
Holding brake (for hydraulic motor)* **	
Include in delivery	**yes** ☐ **no** ☐
Min. release pressure [bar]	
Max. release pressure [bar]	
Max. dynamic pressure [bar]	

*** Designed as wet-running, hydraulically released, spring-loaded multiple-disc brake

Motor data, electric motor

Manufacturer	
Type	
Power [kW]	
Speed [rpm]	
Starting torque [Nm]	
Duty rate [%]	

Comments/Additional requirements

Please send to:
Liebherr-Components AG
Kirchweg 46, 5415 Nussbaumen, Switzerland
Fax +41 56 296 43 01, components@liebherr.com

Selection of gearbox size and selection of gear ratios

The dynamic torques specified in the reference table refer to the load spectrum L_2 and the operating class T_5 given in the directives published by the FEM*. They were calculated for a rotational speed of 10 rpm at the output pinion.

To select the appropriate gearbox size, the torque required for the application in question must be multiplied by the application factor k given below. The result is used to select the appropriate gearbox size from the table “Technical data of the series model range” p. 6/7. The reference torque of the gearbox must be greater than the calculated torque. Selecting both the operating class appropriate to the application and the correct load spectrum in accordance with the FEM directives is recommended.

$$T_{FEM,\ max} \times k \leq T_{FEM,\ r}$$

$T_{FEM,\ max}$	Required maximum dynamic output torque
k	Application factor
$T_{FEM,\ r}$	Reference torque (dynamic)

Operating class T_i*	T_2	T_3	T_4	T_5	T_6	T_7	T_8
Mean running time per day in hours (h) in relation to one year	0.25–0.5	0.5–1	1–2	2–4	4–8	8–16	>16
Lifetime in hours (h) when operating for 8 years with 200 days per year	up to 800	up to 1,600	up to 3,200	up to 6,300	up to 12,500	up to 25,000	up to 50,000

Load spectrum L_i*		**Drive unit class with application factor k**						
L_1 light	Maximum load is the exception, otherwise low loads	M_1 0.66	M_2 0.73	M_3 0.81	M_4 0.89	M_5 1.00	M_6 1.13	M_7 1.27
L_2 medium	About the same proportions of low, medium and high loads	M_2 0.73	M_3 0.81	M_4 0.89	M_5 1.00	M_6 1.13	M_7 1.27	M_8 1.39
L_3 heavy	Loads are always close to the maximum load	M_3 0.81	M_4 0.89	M_5 1.00	M_6 1.13	M_7 1.27	M_8 1.39	M_8 1.70
L_4 very heavy	Always maximum load	M_4 0.89	M_5 1.00	M_6 1.13	M_7 1.27	M_8 1.39	M_8 1.70	M_8 2.10

* FEM (European Materials Handling Federation), Section I, Rules for the design of hoisting appliances, 3rd edition (1998)

Gear ratios

DAT 200	63.91	66.52	79.00													
DAT 225	59.89	70.00	76.56	83.74	92.97	105.27	116.88	136.00	154.00	179.20						
DAT 250	67.20	78.87	86.45	94.76	105.45	119.70	133.20	155.40	176.40	205.80	249.90					
DAT 300	66.67	78.24	85.76	95.44	104.61	118.75	132.14	154.17	175.00	204.17	247.92					
DAT 350	35.42	57.89	66.67	79.17	94.01	104.61	118.75	132.14	154.17	175.00	204.17	247.92				
DAT 400	66.67	78.24	85.76	94.01	104.61	118.75	132.14	154.17	175.00	204.17	247.92					
DAT 450	29.17	66.67	78.24	85.76	95.44	104.61	118.75	138.54	154.17	175.00	204.17	247.92				
DAT 500	29.17	57.89	66.67	72.22	79.17	88.10	95.44	108.33	126.39	132.14	154.17	175.00	204.17	212.50	247.92	
DAT 600	19.79	22.02	29.17	35.42	66.67	72.22	85.76	95.44	104.61	118.75	132.14	154.17	175.00	204.17	247.92	301.04
DAT 700	On request															
DAT 800	On request															
DAT 1.000	On request															

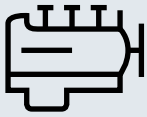
Note: Gear ratios from 20 to 1,500 are possible. Other gear ratios on request.

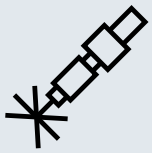
Components

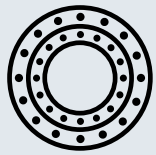
From A to Z – the components division of the Liebherr Group offers a broad range of solutions in the area of mechanical, hydraulic, electric and electronic drive system and control technology. The efficient components and systems are produced at a total of ten production sites around the world to the highest standards of quality. Central contact persons for all product lines are available to our customers at Liebherr-Components AG and the regional sales and distribution branches.

Liebherr is your partner for joint success: from the product idea to development, manufacture and commissioning right through to customer service solutions like remanufacturing.

components.liebherr.com

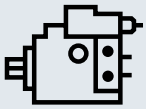

Engines


Fuel injection systems

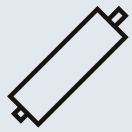

Slewing bearings


Gearboxes

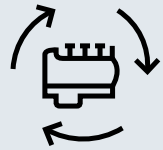

Winches

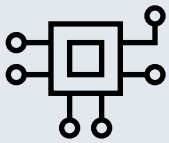

Hydraulic pumps and motors


Hydraulic cylinders

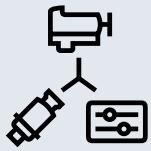

Piston accumulators


Electric machines


Remanufacturing


Industrial electronics


Electrical drive and control technology


Drive systems


Aerospace electronics


Fibre composite

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Printed in Germany by Druckerei Fink GmbH · COB · 02/24_en
Changes and errors excepted