Benefits

The smoke-extraction motors operate as so-called "Dual-function motors":

- Normal operation (no instance of fire): Incoming/outgoing air flow
- Fault operation (in case of fire):
  - Removal of smoke from escape and access routes
  - Supporting fire fighting by creating a smoke-free zone
  - Protecting devices and equipment
  - Reducing the heat stress of components during a fire
  - Reducing secondary damage due to thermal byproducts and hot gases.

Admissible normal operating temperature:

-20 °C … 40 °C as standard

The smoke-extraction motors offer the user a number of advantages:

- The assignment of standard outputs is unchanged – this means that a larger construction size is not required for smoke-extraction motors
- IE2 and IE3 efficiency grades comply with the European EUP Directive
- Smoke-extraction motors are generally equipped with located bearings at the drive-end (DE) of the motor
- A fire event plate is screwed onto the motor
- Freely protruding cables are included in the scope of supply
- Radial-flow and axial-flow fan drive are possible
  - Self-ventilated 1PC1300 and 1PC1301 series motors with a metal fan impeller can be used as radial-flow fan drives
  - Forced-air cooled 1PC1300 and 1PC1301 series motors can be implemented as axial flow fan drives (in each case Article No. with **-Z** and order code **F90**) taking into account the required volumetric flow for motor cooling. In this case the driven fan performs the ventilation.

Application

The smoke-extraction motors are designed for use in automatic smoke and heat extraction units to EN 12101-3. Typical application examples include:

- Tunnels
- Single and multi-storey shopping centers
- Industrial buildings and warehouses
- Building complexes and atriums
- Theaters
- Indoor car parks
- Staircases

Technical specifications

Standards and regulations

In addition to the relevant standards and regulations, EN 12101-3 applies for non-portable fire-fighting systems:

Systems for controlling smoke and heat flows, part 3, specifications for smoke and heat extraction units.

Voltage and frequency

Rated voltages according to IEC 60038

- 230 VΔ 50 Hz
- 400 VΔ 50 Hz and 400 VY 50 Hz
- 500 VΔ 50 Hz and 500 VY 50 Hz
- 690 VY 50 Hz

Non-standard voltages (voltage codes **9** in position 12 of Article No., **0** in position 13 of Article No. and order code **M1Y**) as well as 60 Hz on request for 4 to 6-pole machines. Converter operation is permissible up to a line voltage of $U_{rated} \leq 460$ V (see section "Insulation system").
Measures must be implemented in the plant by the system supplier for switchover to line operation in the event of a fire.

The following rating plates are available for the smoke-extraction motors:

- Rating plate
  For the listed rated voltages with 50 Hz output data including information on bearing types and optional regreasing data
- Fire event plate
  Complete with number and year of issue of the European standard, temperature/time class and minimum duration of function.

All plates are resistant to corrosion. A second set of plates is included with the motor, loose.

Rated output, duty type, number of poles

The rated output applies for continuous duty (normal duty) according to IEC 60034-1, for a frequency of 50 Hz, ambient temperatures up to 40 °C and installation altitudes up to 1000 m above sea level.

Derating is necessary at higher ambient temperatures and installation altitudes (reduction factor k_{HT}), see table below.

Reduction factor k_{HT} for different installation altitudes and/or coolant temperatures

Reduction factor k_{HT}						
Installation altitude above **sea level**	Ambient temperature in °C					
m	< 30 °C	30 … 40 °C	45 °C	50 °C	55 °C	60 °C
1000	1.07	1.00	0.96	0.92	0.87	0.82
1500	1.04	0.97	0.93	0.89	0.84	0.79
2000	1.00	0.94	0.9	0.86	0.82	0.77
2500	0.96	0.90	0.86	0.83	0.78	0.74
3000	0.92	0.86	0.82	0.79	0.75	0.70
3500	0.88	0.82	0.79	0.75	0.71	0.67
4000	0.82	0.77	0.74	0.71	0.67	0.63

Coolant temperature and installation altitude are rounded to 5 °C and 500 m respectively

Technical specifications (continued)

Operation in the event of a fire

In addition to normal duty, operation in the event of a fire as specified in EN 12101-3 is available.

At the end of the fire incident, the motor may be unfit for normal duty. **For this reason, regulations stipulate that the motor be replaced as a matter of course.**

In the event of a fire, any "thermal motor protection" must be deactivated.

Standard number of poles

2, 4 and 6
For more poles and pole-changing motors, please inquire.

Insulation system

The special insulation systems are adapted to the respective temperature/time classes.

The insulation of the smoke-extraction motors is designed such that converter operation is permissible for line voltages ≤ 460 V.

In all operating states, the following limit values (voltage values are peak values) must be maintained:
$\hat{U}_{\text{phase-to-phase}} \leq 1500$ V, $\hat{U}_{\text{phase-to-ground}} \leq 1100$ V,
voltage rise times of $t_s > 0.1$ µs.

In the event of a fire, the motors must be switched over from converter operation to line operation. If converter operation is also required in the event of a fire, this must be ensured through system testing and full acceptance testing by the fan manufacturer.

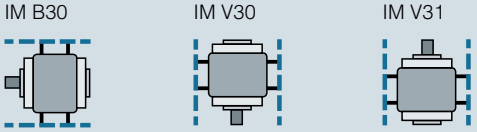
Drainage holes

Generally available; but closed if ordered according to IP55 degree of protection.

Bearing plates

All bearing plates of types of construction IM B3, IM B5 and IM B14 are cast-iron.

For smoke-extraction motors it is also possible to order on request the special types of construction IM B30 (horizontal type of construction) as well as IM V30 and IM V31 (both vertical types of construction) in accordance with EN 60034-7. (clamp mounting, pad mounting, shaft fan mounting)



On the motor side, either 3 or 4 radial mounting threads can be provided on the housing or the IM B3 bearing plates at DE and NDE. These can be used to fix the motor centrally inside a pipe or a fan unit.

Connection system

Protruding cable with casing, without terminal box with cover plate or "nozzle cap". The cable length, core ends and diameter depend on the frame size.

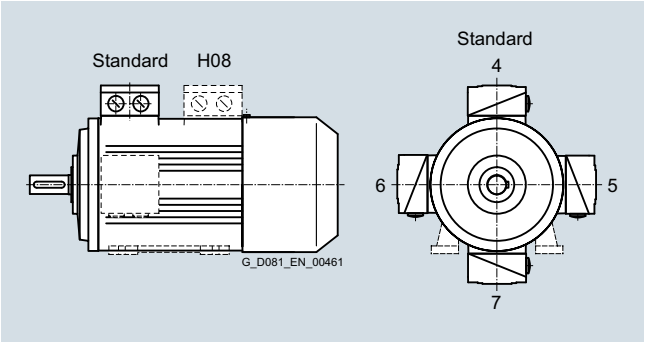
Frame size	Rated output	Number of cores	Cross-section	Length	Cable diameter ± 1 mm
	kW		mm^2	m	mm
80 … 112	0.37 … 4	7	1.5	1	12
132	3 … 7.5	7	1.5	1.5	12
160	7.5 … 18	7	4	1.5	16
180 … 200	15 … 37	7	10	1.5	25
225 … 280	30 … 55	7	10	2.5	25
280 … 315	75 … 90	2 × 4	16	2.5	24
315	110 … 132	2 × 4	3 × 35 + 25	2.5	33
315	160 … 200	2 × 4	3 × 50 + 25	2.5	38

Special versions of connecting cables are available on request.

Location of the terminal box base

Frame sizes 80 to 315:

- Top and at drive end (DE) as standard
  16th position of Article No. digit 4.
- Terminal box base on RHS
  16th position of Article No. digit 5.
- Terminal box base on LHS
  16th position of Article No. digit 6.
- Terminal box base below (not possible for IM B3)
  16th position of Article No. digit 7.



Location of terminal box base with corresponding digits in the 16th position of Article No. 0° position of cable outlet

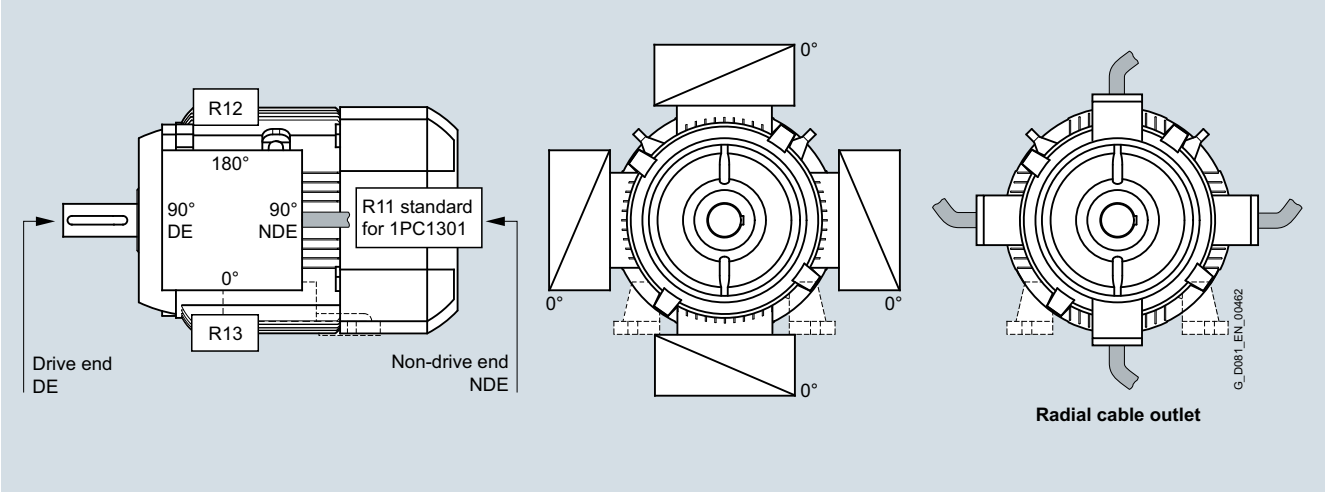
Optional: Terminal box base at NDE
– Order code **H08**

When the terminal box base is rotated to the non-drive end of the motor, it is important to note that dimensions "C" and "CA" will not comply with the values specified in EN 50347. Please request a dimension drawing.

Direction of cable outlet

- Frame sizes 80 to 160 (aluminum):
  Further routing of the connecting cable only in radial direction with respect to the position of the terminal box base.
- Frame sizes 180 to 315 (cast-iron):
  Further routing of the connecting cable towards NDE
  Option **R11** with respect to the position of the terminal box base.
  Other options are also possible after **R12** or **R13**.
  R13 = Cable entry in 0° position as shown in diagram.

Technical specifications (continued)



Location of the cable entries with corresponding order codes. The equipment is grounded with a protruding cable.

Bearings, grease

Special bearing systems are used.

Deep-groove bearings of series 60, 62 or 63 without play are used depending on the individual frame sizes.

The located bearing is generally at the drive-end (DE).

The nominal bearing lifetime $L_{10\,h}$ (fan drive) is at least 20 000 hours at full rated load.

The motors of frame sizes 80 to 250 generally have bearings that are greased for life.

Paint finish

The motors are shipped as standard with a two-component finish (worldwide) in the color RAL 7030.

Required minimum cooling air flow in standard duty

Required cooling air flow for 1PC1300/1PC1303 motors			
Frame size	No. of poles		
	2 m^3/min	4 m^3/min	6 m^3/min
80	1.36	0.66	0.42
90	2.66	1.34	0.87
100	3.8	2.1	1.5
112	5.0	2.9	1.9
132	6.3	4.6	3.1
160	10.9	6.7	5

Required cooling air flow for 1PC1301/1PC1304 motors			
Frame size	No. of poles		
	2 m^3/min	4 m^3/min	6 m^3/min
180	12.4	7.8	5.2
200	14.3	10.6	7.9
225	21.5	18.5	15
250	30	20	20
280	26.5	32	24
315	40	40	30

In the motor version without an integrated fan (with order code **F90**), the motor is located in the airflow of the driven fan that must drive the minimum cooling airflow over the motor housing. The operating temperature of the motor can be reduced at higher air flow rates. The decisive factor for the effectiveness of the increased cooling airflow is the actual increase in the winding temperature during rated operation.

Permissible loading on the shaft extension

The values specified in the table "Admissible loading on shaft extension" are the tested and approved maximum values (test duration two hours, temperature in case of fire 300 °C).

In standard duty at coolant temperatures up to 40 °C, a bearing lifetime L_{10h} > 20 000 hours was achieved.

The values apply to all horizontal mounting positions and to all vertical mounting positions with shaft pointing downwards.

Please inquire in the case of :

- Higher force pairings
- Motors with more poles
- Vertical arrangement, depending on the rotor mass and mounting location (shaft pointing downwards or shaft pointing upwards) of the smoke-extraction motor. If necessary, higher forces can be approved.

Technical specifications (continued)

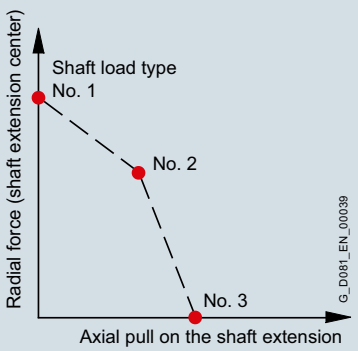
Permissible loading on the shaft extension in the event of fire

Frame size	Bearings DE	Type of loading on shaft No.		Horizontal shaft 2-pole F_R N	2-pole $F_{A\,ten}$ N	4-pole F_R N	4-pole $F_{A\,ten}$ N	6-pole F_R N	6-pole $F_{A\,ten}$ N	Shaft pointing vertically downwards 2-pole F_R N	2-pole $F_{A\,ten}$ N	4-pole F_R N	4-pole $F_{A\,ten}$ N	6-pole F_R N	6-pole $F_{A\,ten}$ N
80	6204	1	Radial force	400	0	490	0	540	0	360	0	450	0	540	0
		2	Radial force + axial tensile force	150	130	170	170	190	200	40	172	40	225	40	275
		3	Axial tensile force	0	215	0	265	0	320	0	197	0	250	0	300
90	6205	1	Radial force	650	0	730	0	795	0	590	0	730	0	795	0
		2	Radial force + axial tensile force	250	205	280	260	310	305	100	259	100	330	100	390
		3	Axial tensile force	0	343	0	415	0	480	0	310	0	384	0	450
100	6206	1	Radial force	890	0	1000	0	1080	0	820	0	1000	0	1080	0
		2	Radial force + axial tensile force	400	265	500	325	600	345	300	265	300	385	300	455
		3	Axial tensile force	0	490	0	600	0	675	0	432	0	540	0	625
112	6206	1	Radial force	870	0	980	0	1055	0	760	0	970	0	1055	0
		2	Radial force + axial tensile force	400	252	500	310	600	330	250	260	250	380	250	450
		3	Axial tensile force	0	478	0	595	0	675	0	403	0	510	0	590
132	6208	1	Radial force	1070	0	1415	0	1530	0	810	0	1060	0	1220	0
		2	Radial force + axial tensile force	450	315	550	450	650	480	250	300	250	520	250	585
		3	Axial tensile force	0	580	0	775	0	850	0	450	0	640	0	820
160	6209	1	Radial force	1440	0	1630	0	1760	0	1210	0	1580	0	1780	0
		2	Radial force + axial tensile force	700	450	800	570	900	650	500	335	500	525	500	665
		3	Axial tensile force	0	824	0	1015	0	1140	0	620	0	790	0	920
180	6210	1	Radial force	1540	0	1750	0	1900	0	1020	0	1400	0	1670	0
		2	Radial force + axial tensile force	770	430	900	545	1000	630	550	218	550	420	550	575
		3	Axial tensile force	0	815	0	1040	0	1183	0	453	0	733	0	875
200	6212	1	Radial force	2050	0	2380	0	2620	0	1450	0	1700	0	2090	0
		2	Radial force + axial tensile force	1200	770	1350	970	1500	1075	500	460	500	750	500	1600
		3	Axial tensile force	0	1350	0	1650	0	1875	0	720	0	1040	0	1905
225	6213	1	Radial force	2460	0	2720	0	2970	0	1910	0	2450	0	2900	0
		2	Radial force + axial tensile force	1370	900	1500	1095	1700	1200	500	660	500	1000	500	1250
		3	Axial tensile force	0	1560	0	1910	0	2170	0	920	0	1290	0	1520
250	6215	1	Radial force	2770	0	3230	0	3500	0	1490	0	2230	0	2700	0
		2	Radial force + axial tensile force	1400	840	1600	1095	1800	1340	500	460	500	815	500	1080
		3	Axial tensile force	0	1500	0	1865	0	2130	0	710	0	1090	0	1375
280	6315 (2-pole), 6317 (4, 6-pole)	1	Radial force	3180	0	5000	0	5500	0	3000	0	5600	0	6100	0
		2	Radial force + axial tensile force	1700	1820	2000	2000	2300	2200	600	1085	600	2300	600	2750
		3	Axial tensile force	0	2630	0	3050	0	3500	0	1380	0	2600	0	3100
315	6316 (2-pole), 6319 (4, 6-pole)	1	Radial force	3470	0	5300	0	5900	0	1000	0	3600	0	3850	0
		2	Radial force + axial tensile force	1750	2200	2000	2170	2300	2530	200	363	1000	1150	1000	1610
		3	Axial tensile force	0	3000	0	3080	0	3560	0	463	0	1690	0	2100

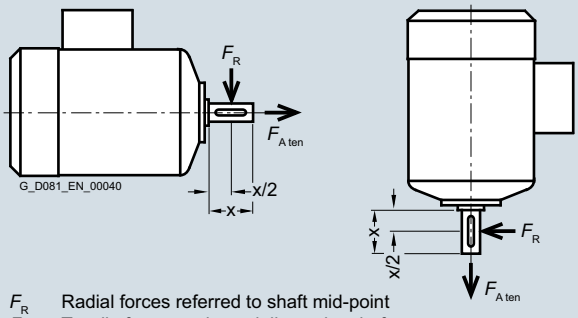
Note:

In the event of a fault (fire), the reduced loads given above must be observed and ensured by appropriate measures in the ventilation system.

Under normal operating conditions (CT 40 °C), the admissible loads specified in part 1 of the catalog under "Bearings and lubrication" must be complied with.



Load types



Forces on shaft extension