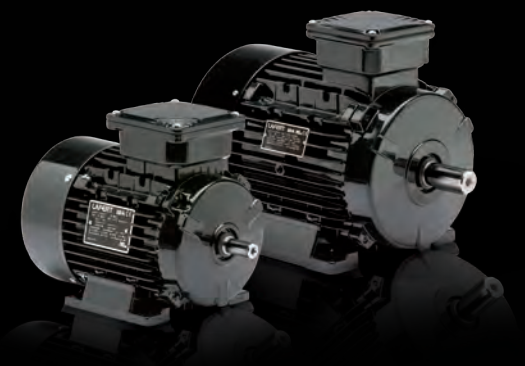
LAFERTMOTORS

HP SERIES

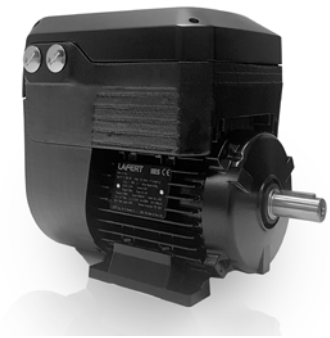
HIGH PERFORMANCE MOTORS
INTEGRAL DRIVE (HPI RANGE)
STAND ALONE MOTOR (HPS/HPF RANGE)

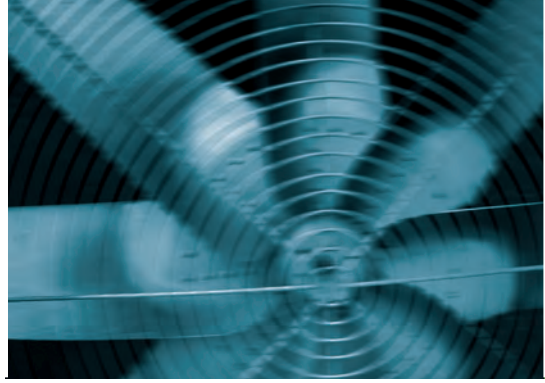




BROCHURE 2020

IE4 IE5 c UL us







PM IE4 AND IE5 MOTORS MEET KEY INDUSTRY CHALLENGES

Mandatory energy efficiency regulations for energy using products (EuPs) and energy related products (ErPs) have been enforced by the European Union. To meet the upcoming deadlines for the implementation of these regulations, Lafert have developed high efficiency AC motors meeting both IE2 and IE3 levels. Permanent Magnet (PM) electric motors have been developed to meet the IE4 and IE5 levels.

Lafert's current range of PM IE4-IE5 motors, named HPS, are based upon **Surface Mounted Permanent Magnet Motor (SMPM) design.** Permanent magnet electric motors typically use rare earth elements such as Samarium and Neodymium in the construction of the magnet elements. The commodity price of such elements has been increasing year on year over the past decade. Therefore, in order to address these market challenges, Lafert have introduced an innovative, cost effective **Interior Permanent Magnet Electric Motor (IPM) design** that will be better positioned to enjoy a key competitive edge. The new IPM design will be launched under the name HPF.

Innovation of the Product

The new sensorless IPM design has been constructed **without the use of rare earth element magnets.** The HPF range from Lafert offers an energy efficient IE4 compliant motor with a sustainable cost base.

Leveraging Leading-Edge Technologies

Lafert's in house servo and AC induction motor design and manufacturing capabilities have facilitated the development of this uniquely engineered product. In order to develop the HP Motor, Lafert used a combination of product designs inspired by the brushless servo motor's electrical design and the AC induction motor's mechanical design.

With higher efficiencies than standard AC induction motors they also enhance the power/weight ratio, thereby allowing for significant **size and weight reductions of up to 50%.**

Lafert place great emphasis on materials research. This has resulted in reduced dependency on rare earth magnets, allowing the use of more readily available permanent magnets, which ensures price and supply stability into the future. Following this development work Lafert have introduced a **second generation of PM Synchronous Motors**, named HPF, achieving **IE4 Super Premium Efficiency** level, with more stable and reduced production costs **without applying rare earth magnets.**

Value Added Features & Benefits

The Lafert PM Motor range is primarily targeted toward **HVAC applications** in pumps, fans, compressors, and blowers, where there is an emphasis on reducing the operating cost or weight, and size of the motors. Lafert also offer flexibility in terms of design, customising the active and mechanical parts of the motor to suit specific customer requirements.

A **High Performance Integrated (HPI) version** of the product is also available, which includes an integrated drive control system.

RANGE OF PRODUCTS

A RANGE OF SOLUTIONS TO MEET SPECIFIC DEMAND

- **Integral construction** (HPI range) or **stand-alone drive** (HPS/HPF range)
- Sensorless control or with speed transducer
- **IPM** (Interior Permanent Magnets) or **SMPM** (Surface Mounted Permanent Magnets) **design**, depending on the performance demand

GENERAL SPECIFICATIONS

- Wide power output 0.37 to 37 kW
  - three-phase 380-480 V, 50/60 Hz
  - single-phase 200-240 V, 50/60 Hz
- Torque: 2 Nm to 190 Nm
- Compact range in IEC frames: 56 - 71 - 90 - 112 - 132 - 160
- Speed range up to 4500 rpm

PM MOTORS' AWARDS

2013 European New Product Innovation Leadership Award:
Electric Motors for Heating Ventilation Air Conditioning (HVAC) Applications
by **Frost & Sullivan**

2014 AHR EXPO Innovation Awards:
Green Building Category

ADI Index Design 2012:
Best Italian design in manufacturing



ENERGY EFFICIENCY

The highest efficiency today
while developing a better tomorrow.

EFFICIENCY STANDARD

Efficiencies are harmonized to the International Standard IEC 60034-30-2:2016 that extends the efficiency levels to Super Premium Efficiency IE4 and IE5

IE4 REFERENCE LIMIT				
Output kW	Rated speed within 600 to 900 /min	Rated speed within 901 to 1200 /min	Rated speed within 1201 to 1800 /min	Rated speed within 1801 to 6000 /min
0.12	62.3	64.9	69.8	66.5
0.18	67.2	70.1	74.7	70.8
0.2	68.4	71.4	75.8	71.9
0.25	70.8	74.1	77.9	74.3
0.37	74.3	78	81.1	78.1
0.4	74.9	78.7	81.7	78.9
0.55	77	80.9	83.9	81.5
0.75	78.4	82.7	85.7	83.5
1.1	80.8	84.5	87.2	85.2
1.5	82.6	85.9	88.2	86.5
2.2	84.5	87.4	89.5	88
3	85.9	88.6	90.4	89.1
4	87.1	89.5	91.1	90
5.5	88.3	90.5	91.9	90.9
7.5	89.3	91.3	92.6	91.7
11	90.4	92.3	93.3	92.6
15	91.2	92.9	93.9	93.3
18.5	91.7	93.4	94.2	93.7
22	92.1	93.7	94.5	94
30	92.7	94.2	94.9	94.5
37	93.1	94.5	95.2	94.8
45	93.4	94.8	95.4	95
55	93.7	95.1	95.7	95.3
75	94.2	95.4	96	95.6
90	94.4	95.6	96.1	95.8
110	94.7	95.8	96.3	96
132	94.9	96	96.4	96.2

IE5 REFERENCE LIMIT				
Output kW	Rated speed within 600 to 900 /min	Rated speed within 901 to 1200 /min	Rated speed within 1201 to 1800 /min	Rated speed within 1801 to 6000 /min
0.12	67.4	69.8	74.3	71.4
0.18	71.9	74.6	78.7	75.2
0.2	73	75.7	79.6	76.2
0.25	75.2	78.1	81.5	78.3
0.37	78.4	81.6	84.3	81.7
0.4	78.9	82.2	84.8	82.3
0.55	80.6	84.2	86.7	84.6
0.75	82	85.7	88.2	86.3
1.1	84	87.2	89.5	87.8
1.5	85.5	88.4	90.4	88.9
2.2	87.2	89.7	91.4	90.2
3	88.4	90.6	92.1	91.1
4	89.4	91.4	92.8	91.8
5.5	90.4	92.2	93.4	92.6
7.5	91.3	92.9	94	93.3
11	92.2	93.7	94.6	94
15	92.9	94.3	95.1	94.5
18.5	93.3	94.6	95.3	94.9
22	93.6	94.9	95.5	95.1
30	94.1	95.3	95.9	95.5
37	94.4	95.6	96.1	95.8
45	94.7	95.8	96.3	96
55	94.9	96	96.5	96.2
75	95.3	96.3	96.7	96.5
90	95.5	96.5	96.9	96.6
110	95.7	96.6	97	96.8
132	95.9	96.8	97.1	96.9



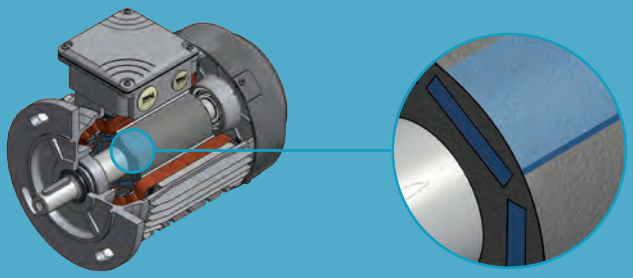


PM IE4 MOTOR HPF RANGE

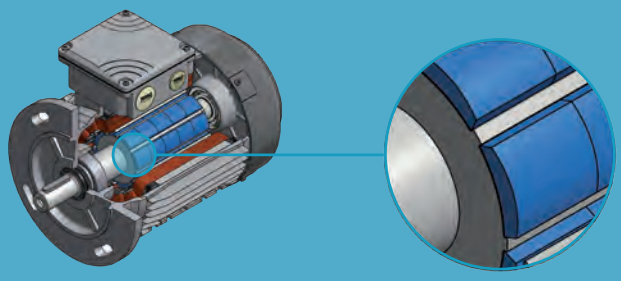
DESIGN
IPM Design - Interior Permanent Magnets
Cost efficient Design - No rare earth magnets - Stable price structure
Controlled by standard drives - Sensorless or closed loop speed control
Innovative high flux density rotor design for high torque density
Available with encoder/resolver or in sensorless execution
Available as stand-alone motor (HPF) or as motor/drive integrated (HPI)
PERFORMANCE
Energy efficiency according to IE4
Increased inertia, low cogging torque for stable high speed control
Improved performance for HVAC applications
Frame size reductions and weight savings up to 40%
TARGET APPLICATIONS
Water Pumps
Fans, Heating and Air Conditioning
Cooling and Air Compressors
Blowers

PM IE4-IE5 MOTOR HPS RANGE

DESIGN
SMPM Design - Surface Mounted Permanent Magnets
High flux rare earth magnets
Controlled by standard drives - Sensorless or closed loop speed control
Magnets shape and placement carefully optimized for higher performance
Available with encoder/resolver or in sensorless execution
Available as stand-alone motor (HPS) or as motor/drive integrated (HPI)
PERFORMANCE
Energy efficiency according to IE4-IE5
High performance due to low inertia, high peak torque
Designed for light Servo and higher performance applications
Frame size reductions and weight savings up to 50%
TARGET APPLICATIONS
HVAC and cost efficient light Servo Applications
Conveyors, Material Handling
Air Compressors
Vacuum Pumps



IPM DESIGN
INTERIOR PERMANENT MAGNETS



SMPM DESIGN
SURFACE MOUNTED PERMANENT MAGNETS





DRIVE SPECIFICATIONS

MAIN SUPPLY

Supply frequency	50 / 60Hz
Supply voltage	3 x 380/480V ± 10% - three-phase 1 x 200/240V ± 10% - single-phase

OUTPUT RATINGS

Output rated current	100% continuously @ 40°C
Overload capacity	150% for 60 sec 175% for 2 sec

DIGITAL INPUT

Programmable digital input	4
Voltage level	0-24VDC (user selectable npn/pnp)

ANALOG INPUT

Programmable analog voltage input	1
Voltage level	0:10VDC
Programmable analog current input	1
Current range	0:20mA

BUS COMMUNICATION

RS485 or CANbus	for cascade mode
RS485	serial communication
CANbus	CANopen

RELAY OUTPUT

Programmable relay output

PROGRAMMING

Keypad	Yes
PC	Yes

CONTROL SPECIFICATION

Frequency range	up to 400Hz
Control method	Sensorless AC Vector Control
Max PWM frequency	16KHz

EXTERNALS

Enclosure	IP55
Max operating ambient temperature (Full load)	0 - 40°C
Storage ambient temperature	÷ 25°C - 60°C

COMPLIANCE WITH STANDARDS

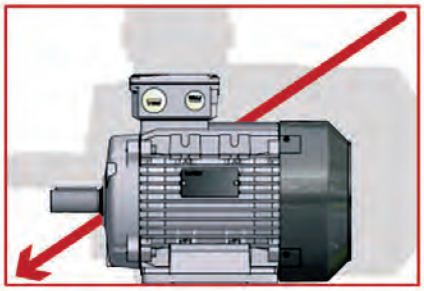
EN 61800-3:2004	Adjustable speed electrical power drive systems. EMC requirements
IEC 61800-5-1	Adjustable speed electrical drive systems - part 5-1: safety requirements - electrical, thermal and energy
EN 60204-1	Safety of machinery - electrical EMC equipment of machines - part 1: general rules

EFFICIENCY @ 3000RPM

Rated Output [kW]	IEC Motor frame	HP Motor frame	IE3 (IEC 60034-30)	HPS Efficiency [%]	IE3 + FC	HPI Efficiency [%]
0.75	80	71	80.7	89.7	77.5	85.5
1.1			82.7	90.5	79.4	86.9
1.5	90		84.2	91.2	80.8	87.4
2.2			85.9	91.4	82.5	87.7
3	100	90	87.1	92.1	83.6	88.4
4	112		88.1	92.6	84.6	88.9
5.5			89.2	93.1	85.6	89.4
7.5	132	112	90.1	93.7	86.5	90.0
11	160		91.2	94.1	87.5	90.3
15			91.9	94.2	88.2	90.5
18.5		132	92.4	94.6	88.7	90.8
22	180		92.7	94.9	89.0	91.1
30	200		93.3	95.0	89.6	91.2

REDUCTION OF WEIGHT & DIMENSIONS

AC motor size 112



HPS motor size 90

Weight AC Motor
Size 112 - 5.5 kW - 34 Kg
Size 132 - 7.5 kW - 53 Kg
Weight HPS Motor
Size 90 – 5.5 kW - 16 Kg
Size 112 - 7.5 kW - 26 Kg

HPS - STAND ALONE MOTOR 1500 MIN^{-1}*

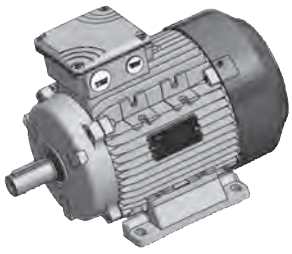
* For rated speeds 1800 - 3000 - 3600 - 4500 rpm, please refer to the catalogue

VALUES @ 400V **IE4** TEMPERATURE RISE TO CLASS B

Type	Size	Rated speed	Rated power	Rated torque	Peak torque	Voltage constant	Torque constant	BEMF at rated speed	Rated current	Efficiency HPS	Weight
		n 1/min	P_n kW	M_n Nm	M_{pk} Nm	K_e Vs	K_t Nm/A	E_n Vrs	I_n Arms	η %	Kg
1500 min^{-1}											
HPS 56 1500 4	**56**	1500	0.18	1.2	3.4	1.73	3	272	0.4	72.0%	2.8
HPS 56 1500 5	**56**	1500	0.25	1.6	4.8	1.73	3	272	0.5	75.4%	3.0
HPS 56 1500 8	**56**	1500	0.37	2.4	7.1	1.73	3	272	0.8	78.9%	3.2
HPS71 1500 12	**71**	1500	0.55	3.5	10.5	1.73	3	272	1.2	86.0%	4.8
HPS71 1500 16	**71**	1500	0.75	4.8	14.4	1.73	3	272	1.6	87.0%	5.4
HPS71 1500 23	**71**	1500	1.1	7.0	21.0	1.73	3	272	2.3	87.8%	6.2
HPS71 1500 32	**71**	1500	1.5	9.6	28.8	1.73	3	272	3.2	88.5%	7.0
HPS90 1500 32	**S-L**	1500	1.5	9.6	28.7	1.73	3	272	3.2	91.0%	10.0
HPS90 1500 47	**S-L**	1500	2.2	14.0	42.0	1.73	3	272	4.7	91.5%	12.0
HPS90 1500 64	**S-L**	1500	3.0	19.1	57.3	1.73	3	272	6.4	92.0%	14.0
HPS90 1500 85	**S-L**	1500	4.0	25.5	76.4	1.73	3	272	8.5	92.3%	17.0
HPS112 1500 85	**M**	1500	4.0	25.5	76.4	1.73	3	272	8.5	92.4%	23.0
HPS112 1500 117	**M**	1500	5.5	35.0	105.1	1.73	3	272	11.7	92.5%	26.0
HPS112 1500 159	**M**	1500	7.5	47.8	143.3	1.73	3	272	15.9	93.1%	30.0
HPS112 1500 195	**M**	1500	9.2	58.6	175.8	1.73	3	272	19.5	93.0%	33.0
HPS132 1500 233	**XL**	1500	11.0	70.0	210.1	1.73	3	272	23.3	94.0%	51.0
HPS132 1500 318	**XXL**	1500	15.0	95.5	286.5	1.73	3	272	31.8	94.4%	58.0
HPS132 1500 393	**XXL**	1500	18.5	117.8	353.4	1.73	3	272	39.3	94.8%	65.0
HPS160 1500 233	**M**	1500	11	70	175	1.73	3.0	272	23.3	93.3%	70
HPS160 1500 318	**M**	1500	15	95	239	1.73	3.0	272	31.8	93.9%	75
HPS160 1500 393	**M**	1500	18.5	118	294	1.73	3.0	272	39.3	94.2%	85
HPS160 1500 467	**L**	1500	22	140	350	1.73	3.0	272	46.7	94.5%	95
HPS160 1500 637	**L**	1500	30	191	477	1.73	3.0	272	63.7	94.9%	115

HPS FRAME SIZE 56 - 71 - 90 - 112 - 132 - 160 IM B3*

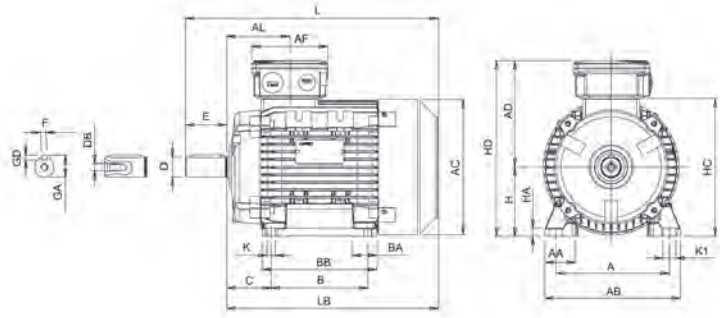
* For mounting arrangements IM B5 - IM B14, please refer to the catalogue



56 to 112 frame



132 to 160 frame



IEC	H	A	B	C	K[1]	AB	BB	AD[2]	HD[2]	AC	HC	HA
56	56	90	71	36	6	107	86	92	148	110	109	8
71	71	112	90	45	8	135	108	114	185	142	142	9
90S	90	140	100	56	10	170	150	148	238	177	181	11
90L	90	140	125	56	10	170	150	148	238	177	181	11
112M	112	190	140	70	12.5	220	176	171	283	225	226	15
112XL	112	190	140	70	12.5	220	176	171	283	225	226	15
132M	132	216	178	89	12	256	218	195	327	248	261	17
132XL	132	216	178	89	12	256	218	195	327	248	261	17
132XXL	132	216	178	89	12	256	218	195	327	248	261	17
160M	160	254	210	108	14	320	270	238	398	317	316	23
160L	160	254	254	108	14	320	310	238	398	317	316	23

IEC	K1	L	LB	AL	AF	BA	AA	D	E	F	GD	GA	DB[3]
56	9	188	168	61	93	27	27	14	30	5	5	16	M5
71	17	245	215	75	93	22	30	19	40	6	6	22	M6
90S	15	317	267	85	110	28/53	37	24	50	8	7	27	M8
90L	15	317	267	85	110	28/53	37	24	50	8	7	27	M8
112M	19	388	328	92	110	46	48	28	60	8	7	31	M10
112XL	19	410	350	92	110	46	48	28	60	8	7	31	M10
132M	20	485	405	122	133	45	59	38	80	10	8	41	M12
132XL	20	505	425	122	133	45	59	38	80	10	8	41	M12
132XXL	20	556	476	122	133	45	59	38	80	10	8	41	M12
160M	18	608	498	146	150	65	76	42*	110	12*	8*	45*	M16
160L	18	652	542	168	150	65	76	48	110	14	9	51.5	M16

1) Clearance hole for screw 2) Maximum dimension 3) Centering holes in shaft extensions to DIN 332 part 2

* For type HPS160M 18.5 kW, please refer to HPS160L

HPI - INTEGRAL DRIVE 3000 MIN^{-1}*

* For rated speeds 1500 - 1800 - 3600 - 4500 rpm, please refer to the catalogue

VALUES @ 400V

TEMPERATURE RISE TO CLASS B

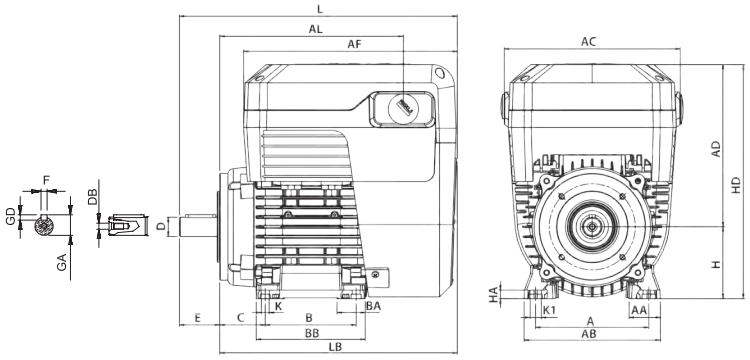
Type	Rated speed	Rated power	Rated torque	Peak torque	Motor Rated current	Motor Peak current	Efficiency HPI	Rated input current 380 Vac	Rated input current 480 Vac	Torque constant	Weight HPI
	n 1/min	P_n kW	M_n Nm	M_{pk} Nm	I_n Arms	I_{pk} Arms	η %	I_{in} Arms	I_{in} Arms	Kt Nm/A	Kg
3000 min^{-1}											
HPI71 3000 16*	3000	0.75	2.4	3.6	1.6	2.4	85.5%	1.7	1.3	1.5	7.3
HPI71 3000 23*	3000	1.1	3.5	5.3	2.3	3.5	86.9%	2.4	1.9	1.5	7.9
HPI71 3000 32*	3000	1.5	4.8	7.2	3.2	4.8	87.4%	3.3	2.6	1.5	8.5
HPI71 3000 47*	3000	2.2	7.0	10.5	4.7	7.0	87.7%	4.8	3.8	1.5	9.1
HPI90 3000 47	3000	2.2	7.0	10.5	4.7	7.0	86.9%	4.8	3.8	1.5	13.5
HPI90 3000 64	3000	3.0	9.6	14.4	6.4	9.6	88.4%	6.4	5.1	1.5	15.5
HPI90 3000 85	3000	4.0	12.7	19.1	8.5	12.7	88.9%	8.5	6.8	1.5	17.5
HPI90 3000 117	3000	5.5	17.5	26.3	11.7	17.5	89.4%	11.7	9.3	1.5	19.5
HPI112 3000 117	3000	5.5	17.5	26.3	11.7	17.5	88.4%	11.9	9.4	1.5	28.5
HPI112 3000 159	3000	7.5	23.9	35.9	15.9	23.9	90.0%	15.9	12.5	1.5	31.5
HPI112 3000 233	3000	11.0	35.0	52.5	23.3	35.0	90.3%	23.2	18.4	1.5	35.5
HPI112 3000 318	3000	15.0	47.8	71.7	31.8	47.8	90.5%	31.5	25.0	1.5	38.5
HPI132 3000 318	3000	15.0	47.8	71.7	31.8	47.8	90.2%	32.1	25.4	1.5	57.5
HPI132 3000 393	3000	18.5	58.9	88.4	39.3	58.9	90.8%	38.8	30.7	1.5	64.5
HPI132 3000 467	3000	22.0	70.0	105.0	46.7	70.0	91.1%	46.1	36.5	1.5	71.5

* HPI 71 Series is available also as single-phase design @ 230 V. For values @ 230 V, please contact us.

HPI FRAME SIZE 71 - 90 - 112 - 132 IM B3*

* For mounting arrangements IM B5 - IM B14, please refer to the catalogue





IEC	H	A	B	C	K[1]	AB	BB	AD[2]	HD[2]	AC	HA
71[4]	71	112	90	45	7	144	109	160	231	170	9
90S	90	140	100	56	10	170	150	183	273	196	11
90L	90	140	125	56	10	170	150	183	273	196	11
112	112	190	140	70	12.5	220	176	230	340	246	15
132[4]	132	216	178	89	12	256	218	243	375	280	17

IEC	K1	L	LB	AL	AF	BA	AA	D	E	F	GD	GA	DB[3]
71[4]	17	266	250	200	200	22	30	19	40	6	6	22	M6
90S	15	369	319	254	280	28/53	37	24	50	8	7	27	M8
90L	15	369	319	254	280	28/53	37	24	50	8	7	27	M8
112	19	457	397	332	350	46	48	28	60	8	7	31	M10
132[4]	20	545	465	380	415	45	59	38	80	10	8	41	M12

1) Clearance hole for screw 2) Maximum dimension 3) Centering holes in shaft extensions to DIN 332 part 2 4) Not binding dimensions, please contact us for more information.



LAFERTGROUP

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