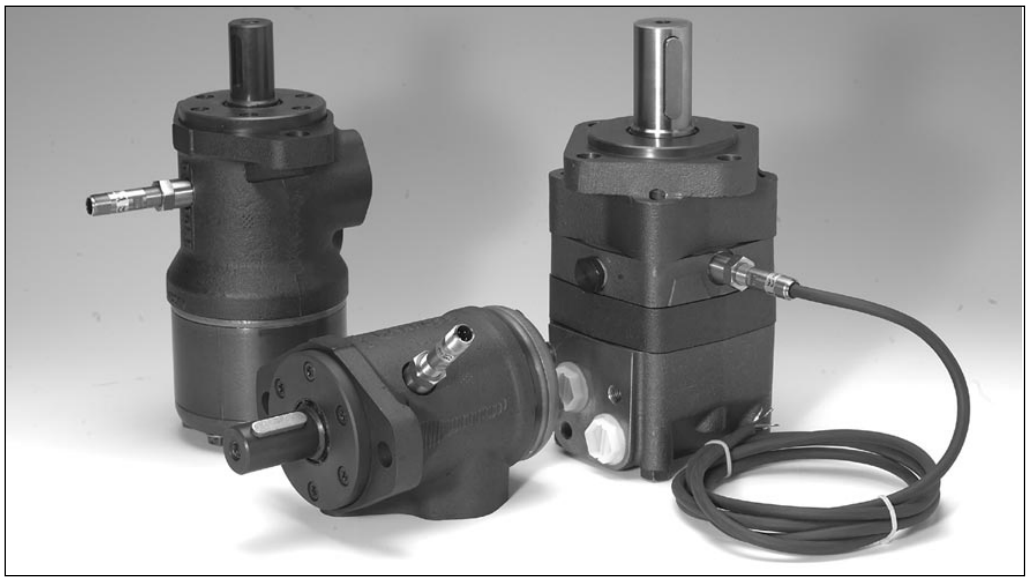
Tech Note

Hydraulics

Hydraulic motors with speed sensor, types OMM EM, OMP EM, OMR EM, OMS EM, OMSW EM, OMT EM, and OMV EM

DKMH.PN.100.A1.02 replaces HN.71.A3.02



Introduction

Danfoss is now introducing hydraulic motors with a new generation of speed sensor. The electric output signal is a standard voltage signal that can be used for regulating the speed of a motor.

Principle

The speed is measured by a sensor in accordance with the Hall principle. Signal processing and amplification are performed in the sensor housing. A connection is provided in the housing for a Binder Series 713 plug or a plug with 5 metres of cable (available from Danfoss). As an option the sensor can be supplied with 2 metres of moulded-in cable.

Advantages

- Robust design
- CE-marked
- Fulfils EMC requirements of EN50081 and EN50082
- Large frequency range, precise regulation
- No limit on motor performance when compared to corresponding motors without speed sensor (except OMM EM)
- IEC 529 degree of protection: IP 67
- Replaceable transducer
- Standard speed signal
- Easy installation
- Electronic signal processing and amplification integrated in the sensor's housing and requiring no maintenance.

Typical applications

- Speed indication
- Setting tightening speed in machine tools
- Extend/retract positioning of work platforms
- Granulate dosing on injection moulding machines
- Conveyor speed regulation
- Dosing on salt spreaders

Code numbers and OMM EM versions

Motor type [1]		OMM EM	OMM EM	OMM EM	OMM EM	OMM EM
Motor size		8	12,5	20	32	50
cylindrical shaft ∅16	End port version	151G5040	151G5041	151G5042	151G5043	151G5044*
	Side port version	151G5045*	151G5046	151G5047	151G5048	151G5049*

Technical data

Motor type			OMM EM	OMM EM	OMM EM	OMM EM	OMM EM
Motor size			8	12,5	20	32	50
Max. speed	(U/min)	cont.	1950	1540	1000	630	400
		int.	2450	1940	1250	800	500
Max. torque	(daNm)	cont.	1,1	1,6	2,5	4,0	4,5
		int.	1,5	2,2	3,5	5,7	8,8
Max.pressure drop	(bar)	cont.	100	100	100	100	70
		int.	140	140	140	140	140
Max. oil flow	(l/min)	cont.	16	20	20	20	20
		int.	20	25	25	25	25
frequence range min. - max.	(Hz)		18 - 898	15 - 711	11 - 458	11 - 293	11 - 183
Permissible shaft load			Max. permissible radial load must be reduced by 30% compared to motors without speed sensor. For max. radial loads see catalogue HK.18.B1.02.				

Code numbers and OMP EM versions

Motor type [1]		OMP EM	OMP EM	OMP EM	OMP EM	OMP EM	OMP EM	OMP EM	OMP EM
Motor size		50	80	100	160	200	250	315	400
Cylindrical shaft ∅25	A-2 flange	151-5391	151-5392*	151-5393	151-5395*	151-5396*	151-5397*	151-5398*	151-5399*

Technical data

Motor type			OMP EM	OMP EM	OMP EM	OMP EM	OMP EM	OMP EM	OMP EM	OMP EM
Motor size			50	80	100	160	200	250	315	400
Max. speed	(r/min)	cont.	1230	770	615	385	310	250	195	155
		int.	1540	960	770	480	385	310	245	190
Max. torque	(daNm)	cont.	9,3	15	19	30	30	30	30	30
		int.	12	19	23	37	38	41	39	42
Max. pressure drop	(bar)	cont.	140	140	140	140	115	90	75	60
		int.	175	175	175	175	150	125	100	80
Max. oil flow	(l/min)	cont.	60	60	60	60	60	60	60	60
		int.	75	75	75	75	75	75	75	75
Frequence range	min. - max.	(Hz)	6 - 898	6 - 560	5 - 449	5 - 280	4 - 225	3 - 181	3 - 143	3 - 111

Code numbers and OMR EM versions

Motor type [1]		OMR EM	OMR EM	OMR EM	OMR EM	OMR EM	OMR EM	OMR EM	OMR EM	OMR EM
Motor size		50	80	100	125	160	200	250	315	375
Cylindrical shaft ∅25	A-2 flange	151-6391*	151-6392	151-6393	151-6394*	151-6395	151-6396	151-6397*	151-6398	151-6399*

Technical data

Motor type			OMR EM	OMR EM	OMR EM	OMR EM	OMR EM	OMR EM	OMR EM	OMR EM	OMR EM
Motor size			50	80	100	125	160	200	250	315	375
Max. speed	(r/min)	cont.	775	750	600	475	375	300	240	190	160
		int.	970	940	750	600	470	375	300	240	200
Max. torque	(daNm)	cont.	10	19,5	24	30	30	30	30	30	30
		int.	13	22	28	34	39	39	38	42	43
Max. pressure drop	(bar)	cont.	140	175	175	175	130	110	80	70	55
		int.	175	200	200	200	175	140	110	100	85
Max. oil flow	(l/min)	cont.	40	60	60	60	60	60	60	60	60
		int.	50	75	75	75	75	75	75	75	75
Frequence range	min. - max.	(Hz)	6 - 566	6 - 548	6 - 438	5 - 350	4 - 274	3 - 219	3 - 175	3 - 140	3 - 117

[1] The speed sensor is not fitted at the factory, but is supplied in a plastic bag with the motor. For installation see enclosed instructions.
* Sales and code number not active. Please contact the Danfoss Sales Organisation for Hydraulics

Code numbers and OMS EM versions

[2] Temporary Code numbers

Motor type [1]		OMS EM	OMS EM	OMS EM	OMS EM	OMS EM	OMS EM	OMS EM
Motor size		80	100	125	160	200	250	315
Cylindrical shaft ∅32	Standard flange	151X1780[2]	151X1781[2]	151X1782[2]	151X1783[2]	151X1784[2]	151X1785[2]	151X1786[2]

Motor type [1]		OMSW EM	OMSW EM	OMSW EM	OMSW EM	OMSW EM	OMSW EM	OMSW EM
Motor size		80	100	125	160	200	250	315
Tapered shaft ∅35	Wheel motor	*	*	*	*	*	*	*

Technical data

Motor type			OMS EM OMSW EM	OMS EM OMSW EM	OMS EM OMSW EM	OMS EM OMSW EM	OMS EM OMSW EM	OMS EM OMSW EM	OMS EM OMSW EM
Motor size			80	100	125	160	200	250	315
Max. speed	(r/min)	cont.	810	750	600	470	375	300	240
		int.	1000	900	720	560	450	360	285
Max. torque	(daNm)	cont.	20	25	32	34	40	45	54
		int.	24	30	38	48	50	54	63
Max. pressure drop	(bar)	cont.	175	175	175	150	140	125	120
		int.	210	210	210	210	175	155	140
Max. oil flow	(l/min)	cont.	65	75	75	75	75	75	75
		int.	80	90	90	90	90	90	90
Frequence range min. - max. (Hz)			9 - 917	9 - 825	7 - 660	7 - 513	6 - 413	6 - 330	5 - 285

Code numbers and OMT EM versions

Motor type [1]		OMT EM	OMT EM	OMT EM	OMT EM	OMT EM	OMT EM
Motor size		160	200	250	315	400	500
Cylindrical shaft ∅40	Standard flange	151B3260	151B3261	151B3262	151B3263	151B3264	151B3265*

Technical data

Motor type			OMT EM	OMT EM	OMT EM	OMT EM	OMT EM	OMT EM
Motor size			160	200	250	315	400	500
Max. speed	(r/min)	cont.	625	625	500	380	305	240
		int.	780	750	600	460	365	285
Max . torque	(daNm)	cont.	47	59	73	95	108	122
		int.	56	71	88	114	126	137
Max. pressure drop	(bar)	cont.	200	200	200	200	180	160
		int.	240	240	240	240	210	180
Max. oil flow	(l/min)	cont.	100	125	125	125	125	125
		int.	125	150	150	150	150	150
Frequence range min. - max. (Hz)			13 - 1014	12 - 975	10 - 780	9 - 598	8 - 475	7-371

Code numbers and OMV EM versions

Motor type [1]		OMV EM	OMV EM	OMV EM	OMV EM	OMV EM
Motor size		315	400	500	630	800
Cylindrical shaft ∅50	Standard flange	151B3266	151B3267	151B3268	151B3269	151B3270

Technical data

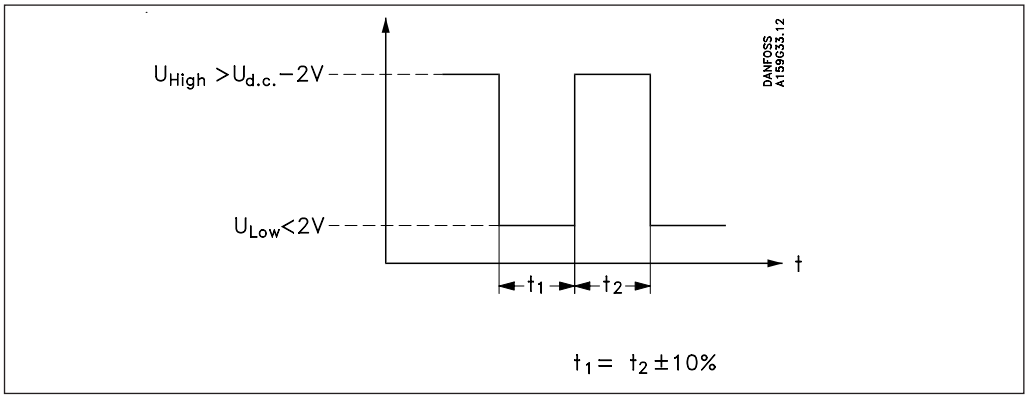
Motor type			OMV EM	OMV EM	OMV EM	OMV EM	OMV EM
Motor size			315	400	500	630	800
Max. speed	(r/min)	cont.	510	500	400	315	250
		int.	630	600	480	380	300
Max . torque	(daNm)	cont.	92	118	146	166	188
		int.	111	141	176	194	211
Max. pressure drop	(bar)	cont.	200	200	200	180	160
		int.	240	240	240	210	180
Max. oil flow	(l/min)	cont.	160	200	200	200	200
		int.	200	240	240	240	240
Frequence range min. - max. (Hz)			17 - 1071	15 - 1020	14 - 816	10 - 646	9 - 510

[1] The speed sensor is not fitted at the factory, but is supplied in a plastic bag with the motor. For installation see enclosed instructions.
* Sales and code number not active. Please contact the Danfoss Sales Organisation for Hydraulics

Technical data of the speed sensor

Mechanical data
Temperature range: –30°C to +90°C
Enclosure acc. to IEC 529: IP 67

Electrical data
Principle: Hall
Supply voltage; $U_{d.c.}$: 11 – 30 V ⎓
Output signal:

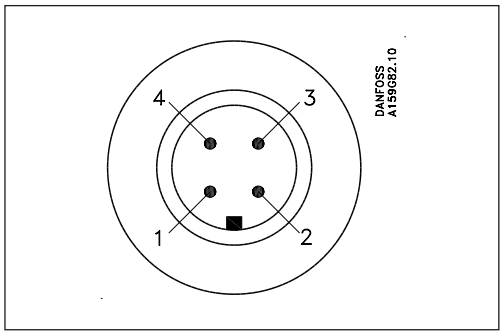


Load max.: $I_{high} = I_{low} \leq 50$ mA
No load current, max.: 20 mA
Resolution:

Pulses per revolution (PPR)	OMM EM	OMP EM	OMR EM	OMS EM	OMSW EM	OMT EM	OMV EM
	22	35	35	55	55	84	102

Calculation of frequency:

$$fr = \frac{RPM \times PPR}{60} \text{ [Hz]}$$

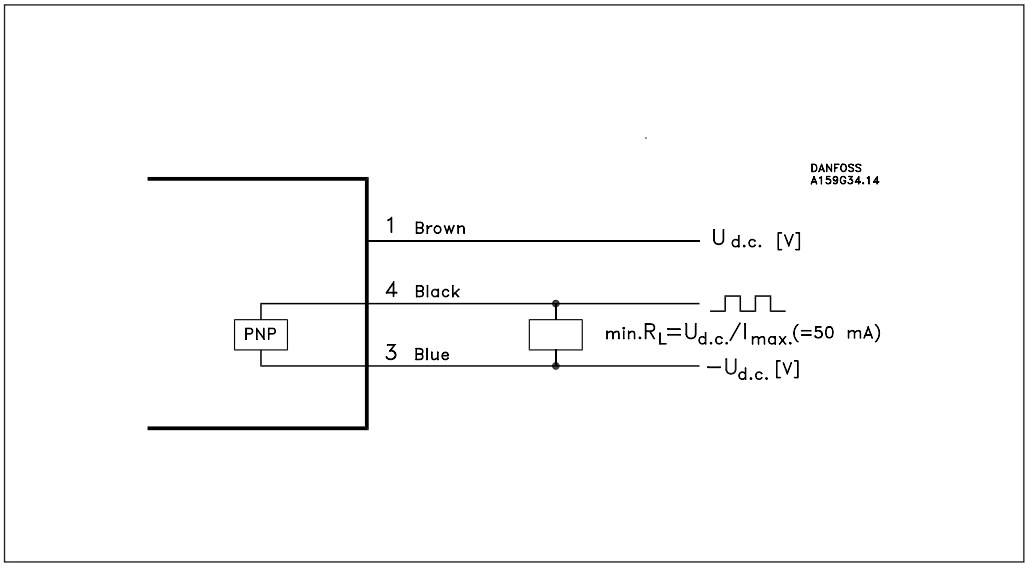


Stik type: Binder Series 713

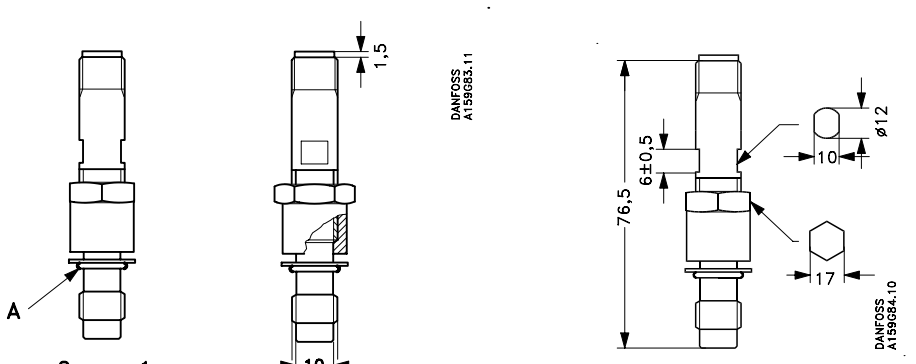
Stik type			
	Binder series 713	Moulded-in cable (option)	Connection
Terminal no.:	1	Brown	$U_{d.c.}$ (+ supply)
	2	White	No connection
	3	Blue	$U_{d.c.}$ (– supply)
	4	Black	Output signal

Protection: Protected against short circuit and incorrect polarization

Wiring diagram



Speed sensor dimensions



A: O-ring 10,5 x 1,8 mm

Spare parts

Speed sensor
Code numbers

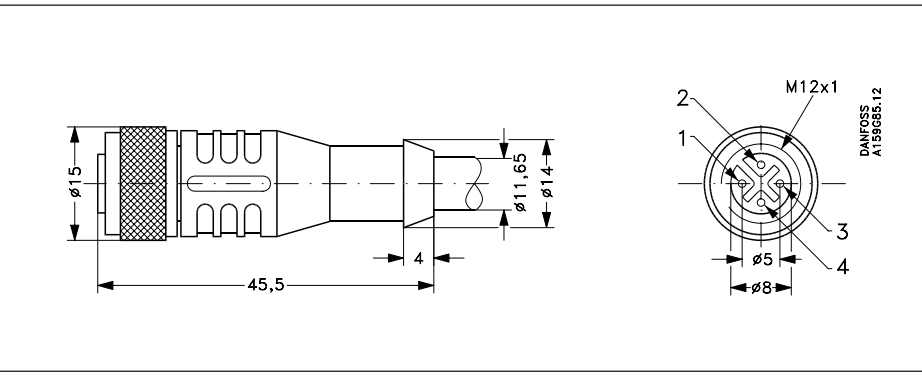
Type	Code no.
Sensor with plug	151-5662
Sensor with 2 m moulded-in cable	151-5663

Accessories

Cable with plug
Code numbers

Cable length 5 m	984F0101

Technical data, cable with plug



Wire (shield)
Coresr: Cu 4 × 0,34 mm²
Sheath: PUR/PVC, colour: grey

Plug
Type: Binder, Series 713

Cable colour

Cable no.:	1	brown
	2	White
	3	blue
	4	black

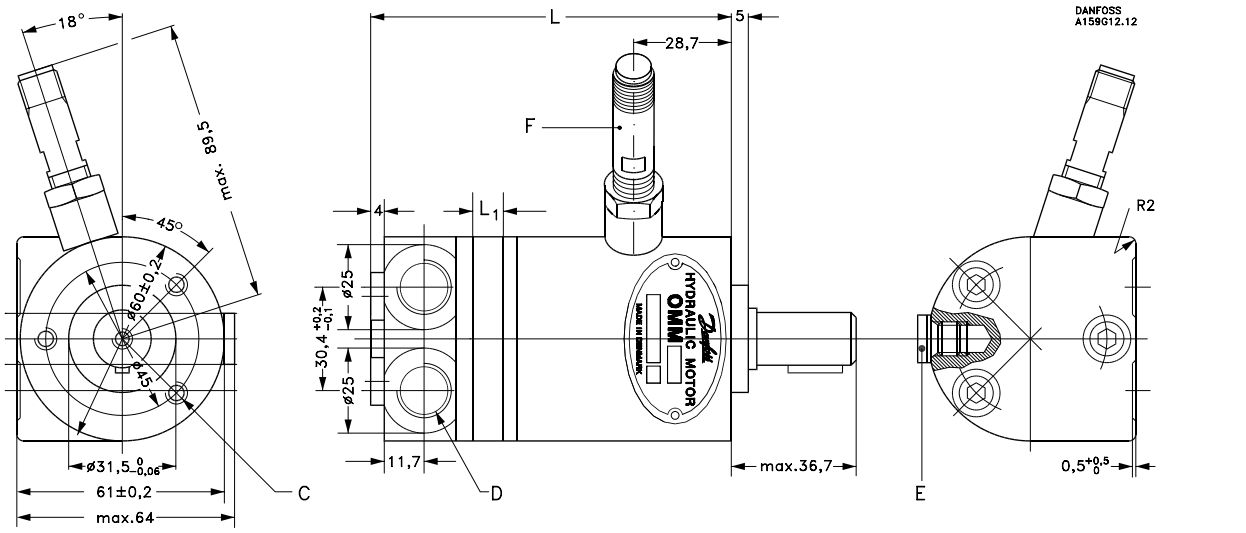
Temperature range: -30°C to +80°C.

Enclosure acc.to. IEC 529: IP 67

Dimensions

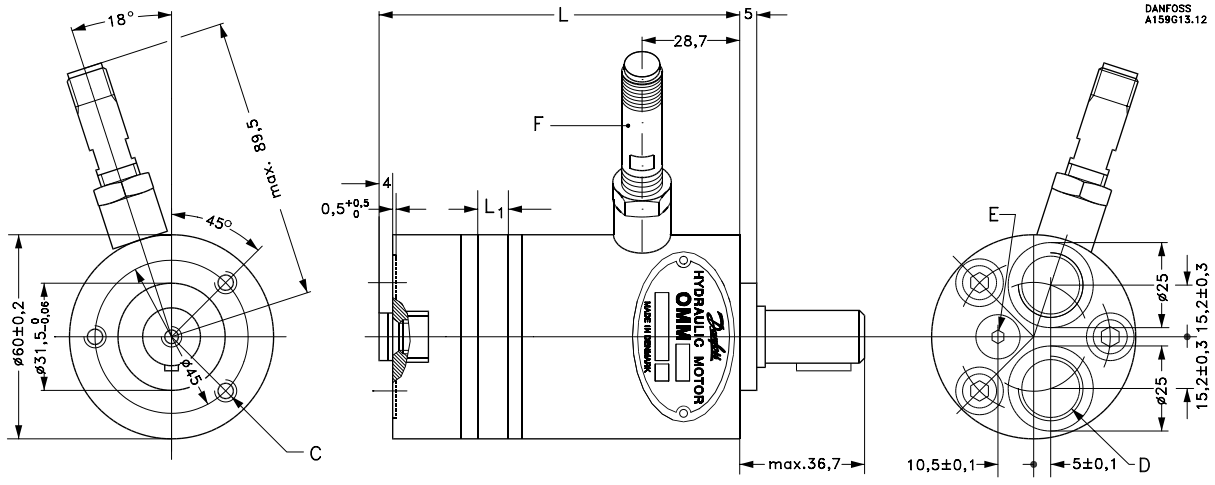
OMM EM side port version

	$L_{max.}$	L_1
OMM 8 EM	109	3,5
OMM 12,5 EM	111	5,5
OMM 20 EM	114	8,5
OMM 32 EM	119	13,5
OMM 50 EM	127	21,5



OMM EM end port version

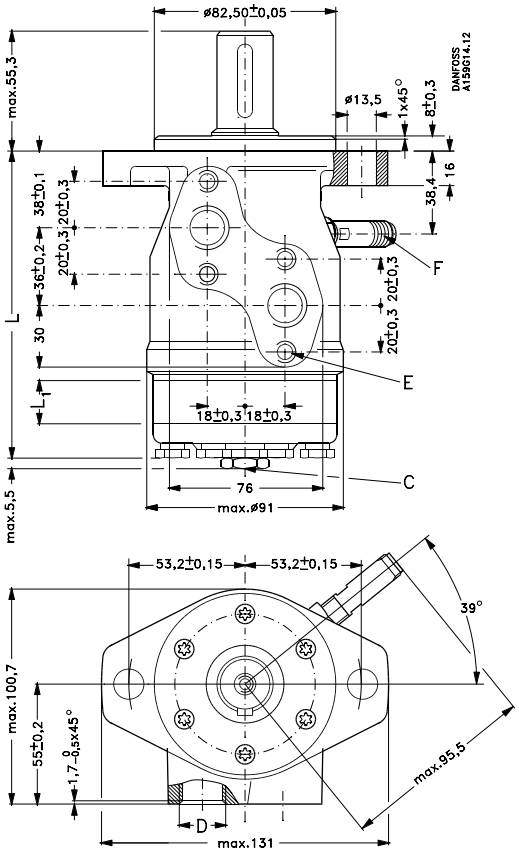
	$L_{max.}$	L_1
OMM 8 EM	104	3,5
OMM 12,5 EM	106	5,5
OMM 20 EM	109	8,5
OMM 32 EM	114	13,5
OMM 50 EM	126	21,5



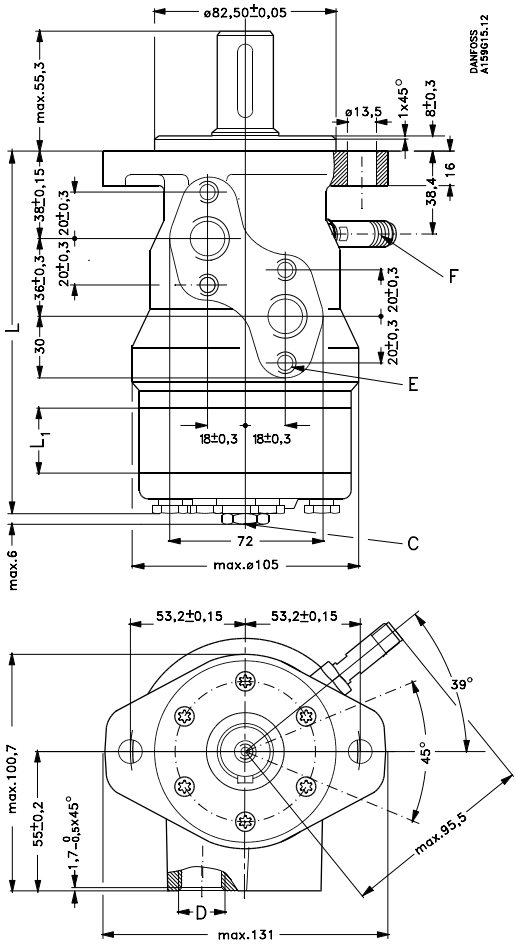
C: M6; 10 mm deep
D: G ⅜; 12 mm deep
E: Drain connection G ⅛; 8 mm deep
F: Plug connection: Binder Series 713

Dimensions

OMP EM Serie 7



OMR EM Serie 5



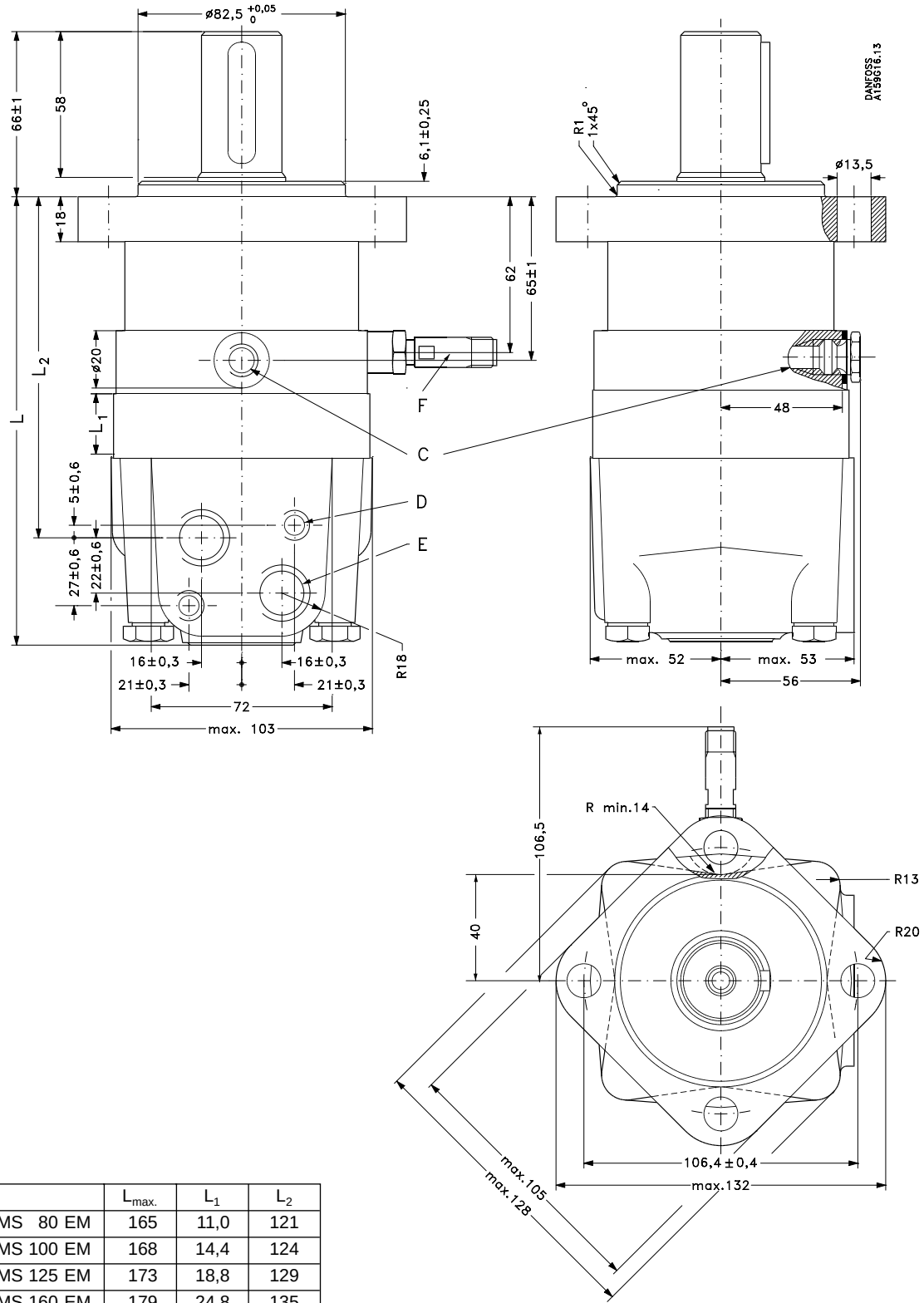
	$L_{max.}$	L_1
OMP 50 EM	131,4	9,0
OMP 80 EM	135,3	14,0
OMP 100 EM	137,9	17,4
OMP 160 EM	145,7	21,8
OMP 200 EM	150,9	27,8
OMP 250 EM	157,4	34,8
OMP 315 EM	165,8	43,5
OMP 400 EM	176,9	54,8

C: Drain connection G ¼; 12 mm deep
D: G ½; 15 mm deep
E: M8; 13 mm deep
F: Plug connection Binder Series 713

	$L_{max.}$	L_1
OMR 50 EM	136,1	9,0
OMR 80 EM	141,1	14,0
OMR 100 EM	144,5	17,4
OMR 125 EM	148,9	21,8
OMR 160 EM	154,9	27,8
OMR 200 EM	161,9	34,8
OMR 250 EM	170,6	43,5
OMR 315 EM	181,9	54,8
OMR 375 EM	192,1	65,0

Dimensions

OMS EM

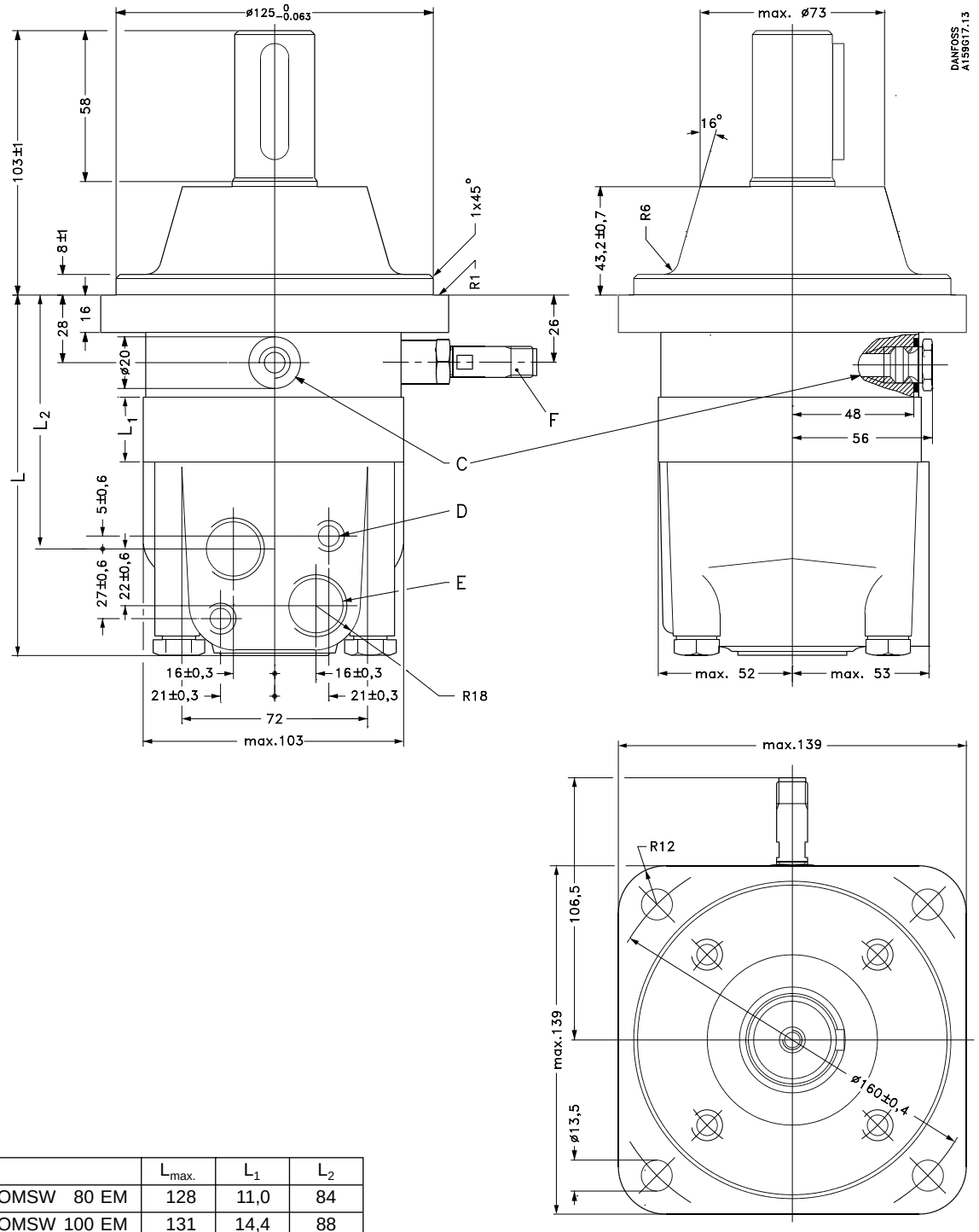


	$L_{max.}$	L_1	L_2
OMS 80 EM	165	11,0	121
OMS 100 EM	168	14,4	124
OMS 125 EM	173	18,8	129
OMS 160 EM	179	24,8	135
OMS 200 EM	186	31,8	142
OMS 250 EM	194	40,5	150
OMS 315 EM	206	51,8	162

C: Drain connection G ¼; 12 mm deep
D: M10; 13 mm deep
E: G ½; 15 mm deep
F: Plug connection Binder Series 713

Dimensions

OMSW EM

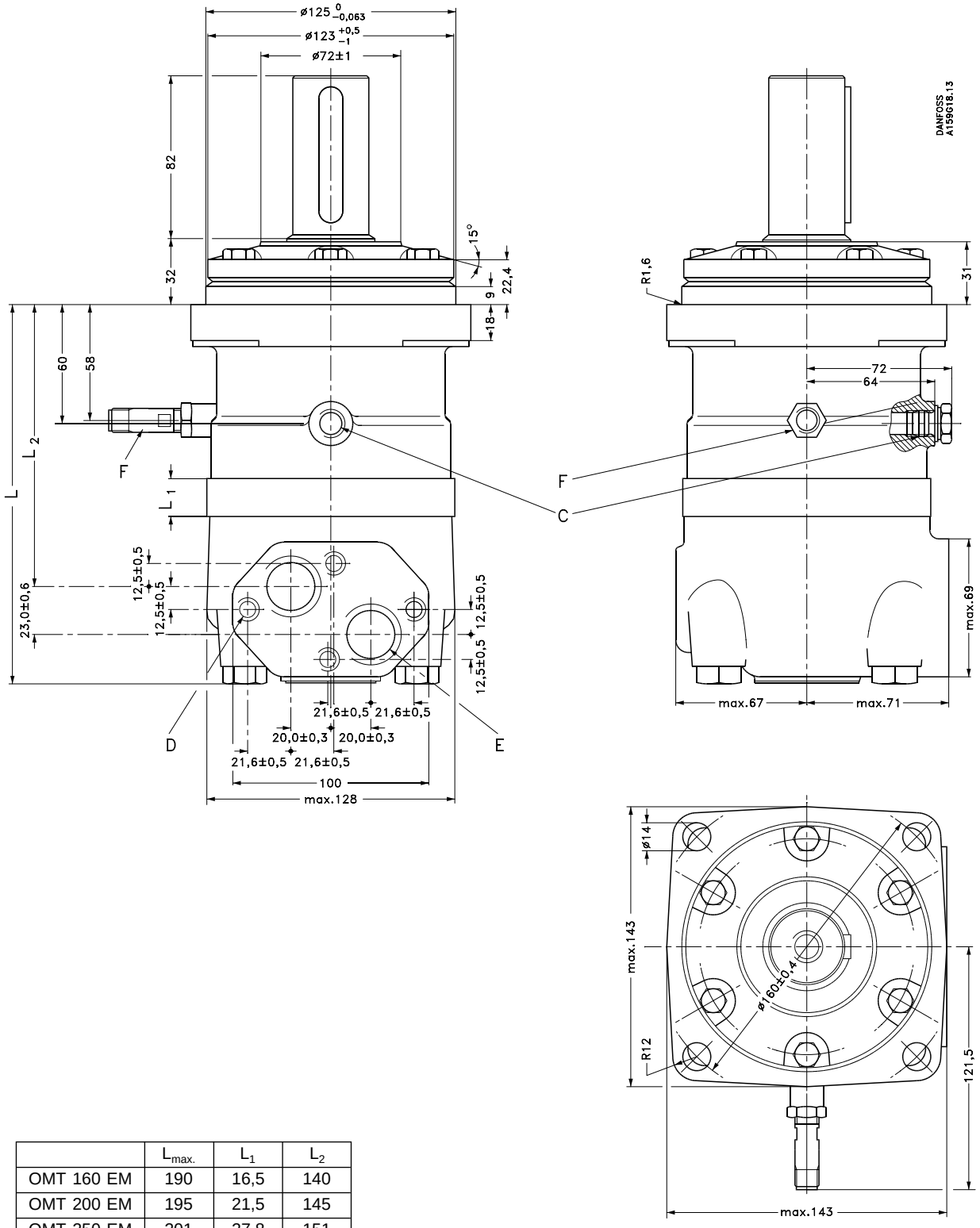


	$L_{max.}$	L_1	L_2
OMSW 80 EM	128	11,0	84
OMSW 100 EM	131	14,4	88
OMSW 125 EM	136	18,8	92
OMSW 160 EM	142	24,8	98
OMSW 200 EM	149	31,8	105
OMSW 250 EM	157	40,5	114
OMSW 315 EM	168	51,8	125

C: Drain connection G ¼; 12 mm deep
D: M10; 13 mm deep
E: G ½; 15 mm deep
F: Plug connection Binder Series 713

Dimensions

OMT EM

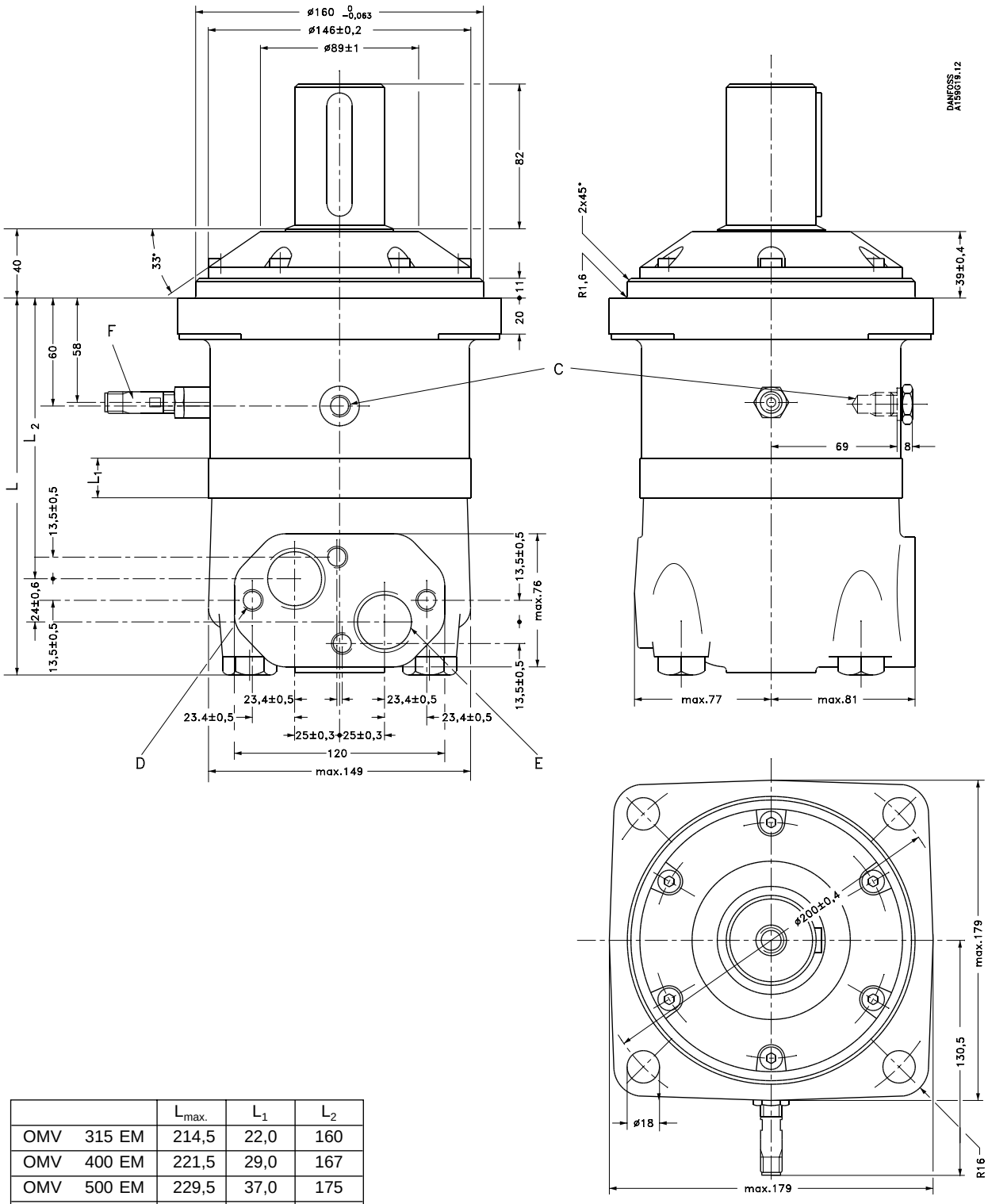


	$L_{max.}$	L_1	L_2
OMT 160 EM	190	16,5	140
OMT 200 EM	195	21,5	145
OMT 250 EM	201	27,8	151
OMT 315 EM	210	37,0	161
OMT 400 EM	221	47,5	171
OMT 500 EM	235	61,5	185

C: Drain connection G ¼; 12 mm deep
D: M10; 13 mm deep
E: G ¾; 17 mm deep
F: Plug connection Binders Series 713

Dimensions

OMV EM

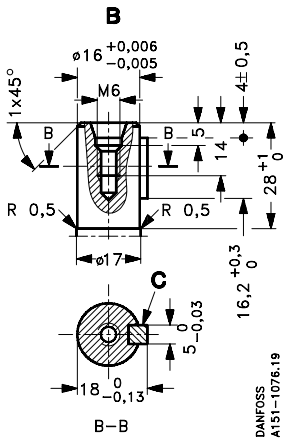


	$L_{max.}$	L_1	L_2
OMV 315 EM	214,5	22,0	160
OMV 400 EM	221,5	29,0	167
OMV 500 EM	229,5	37,0	175
OMV 630 EM	240,0	47,5	186
OMV 800 EM	254,0	61,5	200

C: Drain connection G ¼; 12 mm deep
D: M12; 12 mm deep
E: G 1; 18 mm deep
F: Plug connection Binder Series 713

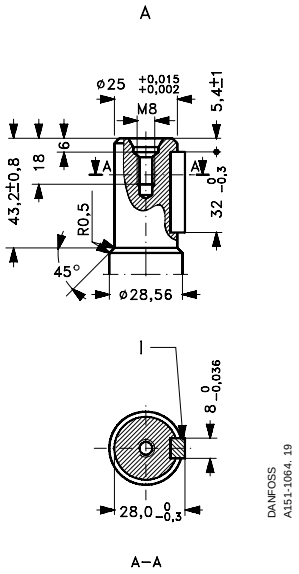
Shaft versions

OMM EM



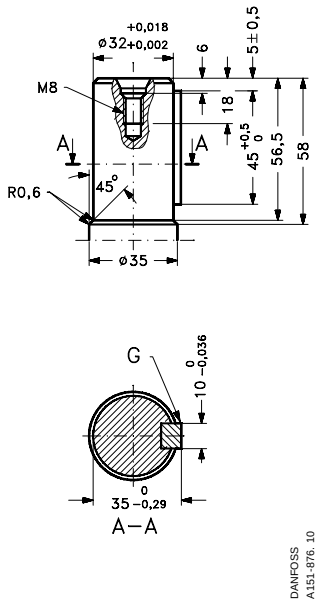
B: Cylindrical shaft ∅16 mm
C: Parallel key
A5 × 5 × 16
DIN 6885

OMP EM /OMR EM



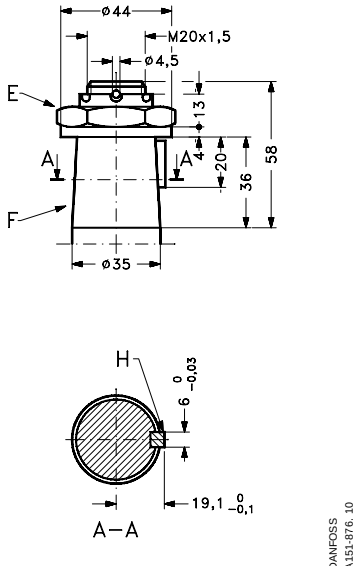
A: Cylindrical shaft ∅25 mm
I: Parallel key
A8 × 7 × 32
DIN 6885

OMS EM



Cylindrical shaft ∅32 mm
G: Parallel key
A10 × 8 × 45
DIN 6885

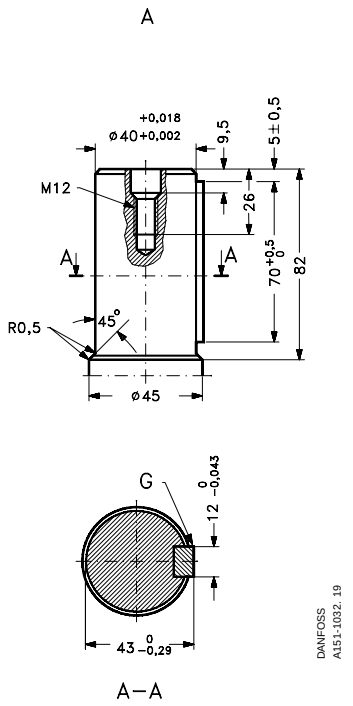
OMSW EM



Tapered shaft (ISO/R 775)
E: DIN 937
Across flats 41
Tightening torque: 20 ± 1 daNm
F: Taper 1:10
H: Parallel key
B6 × 6 × 20
DIN 6885

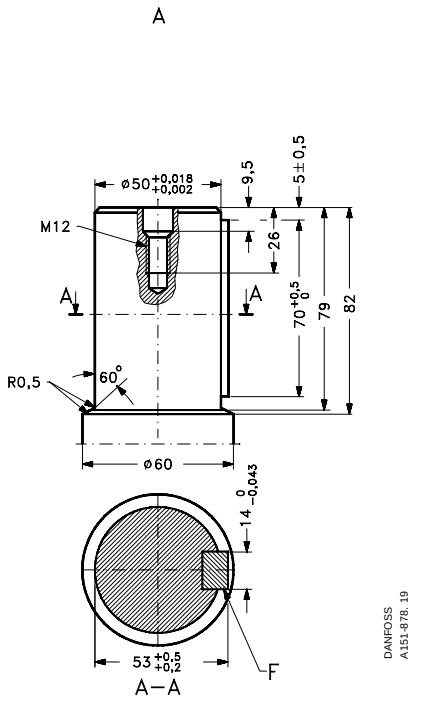
Shaft versions

OMT EM



A: Cylindrical shaft ∅40 mm
G: Parallel key
A12 × 8 × 70
DIN 6885

OMV EM



A: Cylindrical shaft ∅50 mm
G: Parallel key
A14 × 9 × 70
DIN 6885

Operating principle

Hydraulic oil converts hydraulic energy (pressure, oil flow) to mechanical energy (torque, shaft revolutions).

Danfoss hydraulic motors are high-torque units with constant displacement. For a given oil flow and given pressure, the displacement (motor size) determines the speed and torque output of the motor. For a given displacement (motor size) the oil flow determines the speed and torque output of the motor.

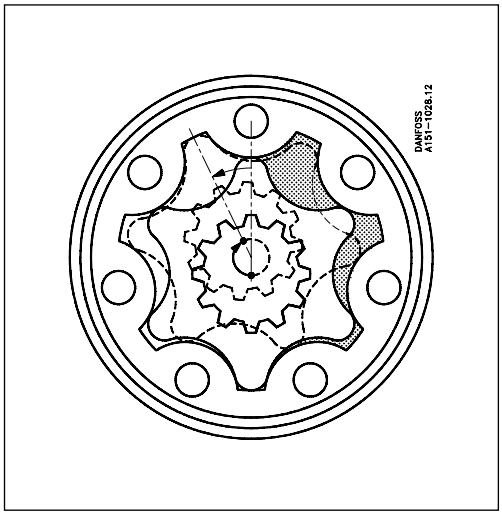
Gearwheel set
The motor gearwheel set consists of a gear rim with internal teeth and a gearwheel the centre of which describes a circle about the centre of the gear rim when the gearwheel rotates.
The gear rim is in two forms:
- OMM EM and OMP EM with fixed gear rim
- OMR EM, OMS EM, OMSW EM, OMT EM and OMV EM with rollers in the gear rim

Distribution valve
The motor cardan shaft drives the distribution valve synchronously with the gearwheel set so that the individual chambers in the motor are filled and emptied precisely - without loss. The distribution valve is in two forms:

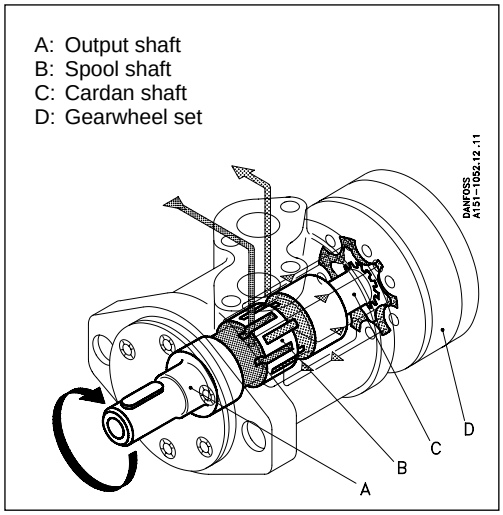
- Spool valve
  OMM EM, OMP EM and OMR EM have a spool valve: the distribution valve is integrated in the output shaft. The cardan shaft thus rotates the distribution valve and transfers mechanical energy from the gearwheel set to the output shaft.

- Disc valve
  OMS EM, OMSW EM, OMT EM and OMV EM have a disc valve: a separate distribution valve driven by a short cardan shaft (valve drive). A balance plate equalises the hydraulic forces around the distribution valve.

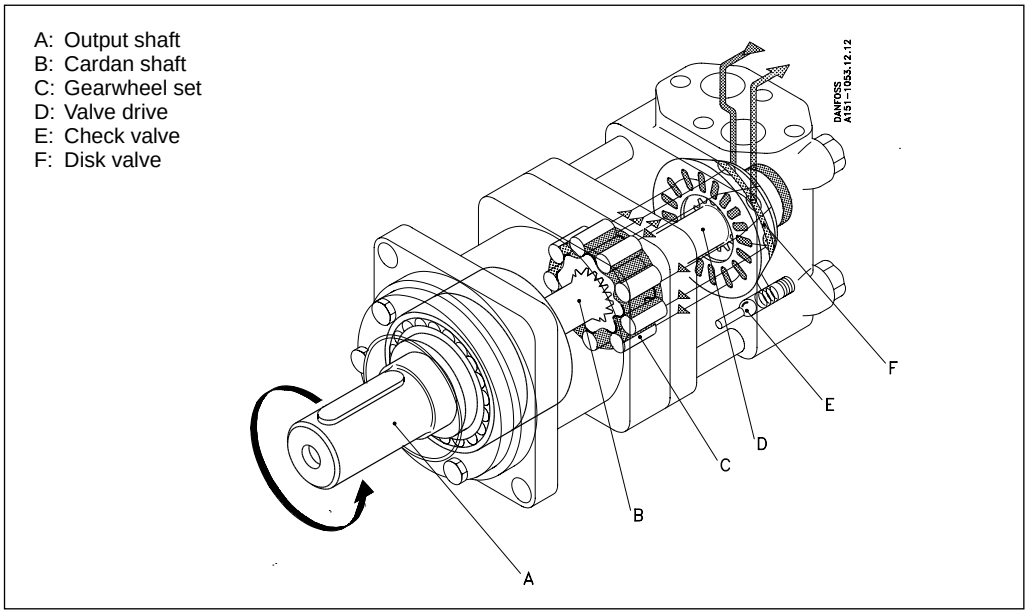
Gearwheel set



Danfoss motors with spool valve



Danfoss motors with disc valve



Oil types

In a hydraulic system the most important task of the oil is to transfer energy. At the same time the oil must lubricate moving parts in hydraulic components, protect them from corrosion, and conduct dirt particles and heat out of the system.

To ensure that the hydraulic components operate without problems and have a long operating life it is therefore vital to select the correct oil type with the necessary additives.

Mineral oils
For systems containing Danfoss hydraulic motors, we recommend mineral hydraulic oil with anti-wear additives, type HLP (DIN 51524) or HM (ISO 6743/4). Mineral oils without anti-wear additives or engine oils can also be used, provided operating conditions are suitable.

If oil types that have not been classified are being considered, please contact the Danfoss Sales Organisation for Hydraulics.

Non-flammable or biodegradable fluids
Danfoss hydraulic motors can also be used in systems with non-flammable or biodegradable fluids. However, the function and life of the motor will depend on the type and condition of the fluid used. To achieve satisfactory operation and life it is therefore necessary to match the operating conditions to the properties of the fluid used.

Before using non-flammable or biodegradable fluids we recommend contact with the Danfoss Sales Organisation for Hydraulics.

Filtering

It is necessary to keep the level of oil contamination at an acceptable level to ensure problem-free operation. The recommended maximum level of contamination in systems with Danfoss hydraulic motors is 20/16 (see ISO 4406).

In our experience the 20/16 contamination level can be met by using a return filter finer than 40 µm absolute or 25 µm nominal.

In very dirty environments, in complex systems, and in closed circuits, the recommended filtration level is 20 µm absolute or 10 µm nominal. (In systems with quick release couplings a pressure filter having a fineneness of 40 µm absolute should be inserted just ahead of the motor).

ISO 9001

INTERNATIONAL STANDARD

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION
ORGANISATION INTERNATIONALE DE NORMALISATION
МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ

Quality management and quality assurance standards

ISO 9001

Danfoss Mobile Hydraulics have been manufactured to meet the quality demands specified by ISO 9001.

Danfoss hydraulic range

Catalogues and leaflets are available with detailed information on the following hydraulic components

- Low speed high torque hydraulic motors
- Planetary gear
- Hydrostatic steering units
- Steering columns
- Valve blocks
- Flow-amplifiers
- Priority valves
- Torque amplifiers
- Variable radial piston pumps
- Pumps for hydrostatic transmissions
- Pump controls
- Proportional valves
- Remote control units
- Electronic modules

Please contact the Danfoss Sales Organisation for Hydraulics for further information

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