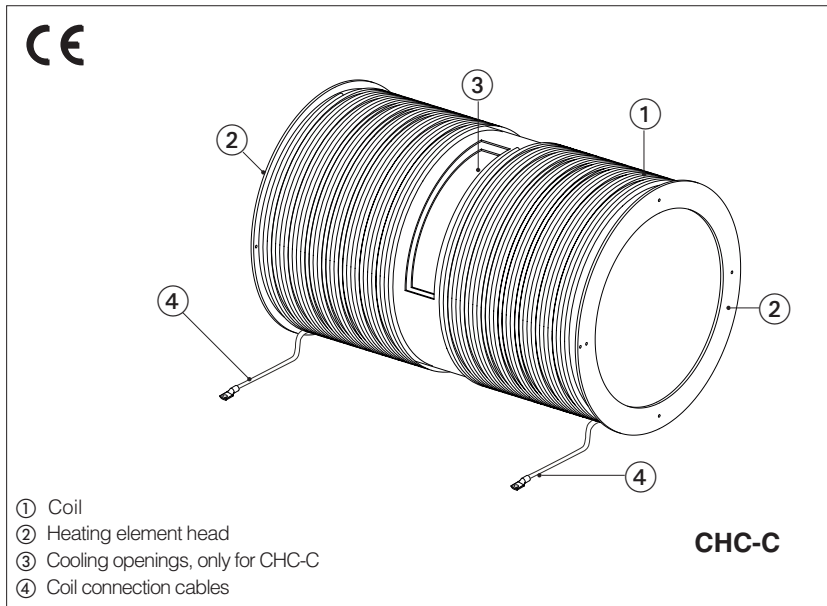


Closed heating coils

for plasticising barrels



CHC

Heating coils in closed execution, designed for fast and efficient heating of plasticising barrels of extruders and injection molding machines. These consist of cylindrical inductors, powered by EPG power generators, which exploit the principle of magnetic induction to heat the ferromagnetic material.

The CHC coils offer significant benefits over traditional resistive heating systems:

- Fast heating **up to 350°C**
- Higher power density
- High energy savings (up to 30%)
- No thermal inertia: instantaneous start and stop of heat transmission
- Greater precision in temperature achievement and maintenance

1 MODEL CODE

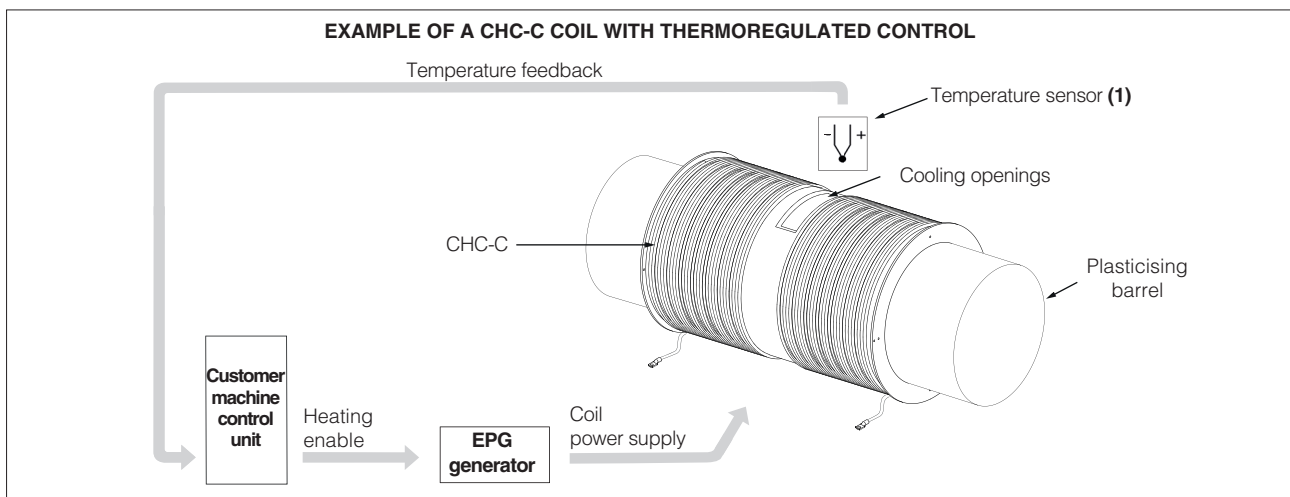
CHC	-	C	-	M	-	300 / 350	-	02	-	*
Closed Heating Coil								Length of connection cable		Series number
Coil type										
N = Not cooled										
C = Predisposed for cooling										
Size (1)										
L = for connection to EPG-L										
M = for connection to EPG-M										
H = for connection to EPG-H										
		Coil length (3)								
		*** = from 150 mm to 700 mm with step 25 mm								
		Barrel diameter (2)								
		*** = from 80 mm to 400 mm with step 10 mm								

(1) To be selected according to the proper EPG size; see sections 8 and 9

(2) For plasticising barrels with diameters not included in the standard dimensions, please contact Atos Induction's technical office

(3) The length of the coil should be as close as possible to the length of the zone to be heated. It is also necessary to consider the shield encumbrance (not included), see sections 3 and 7

2 FUNCTIONAL EXAMPLE

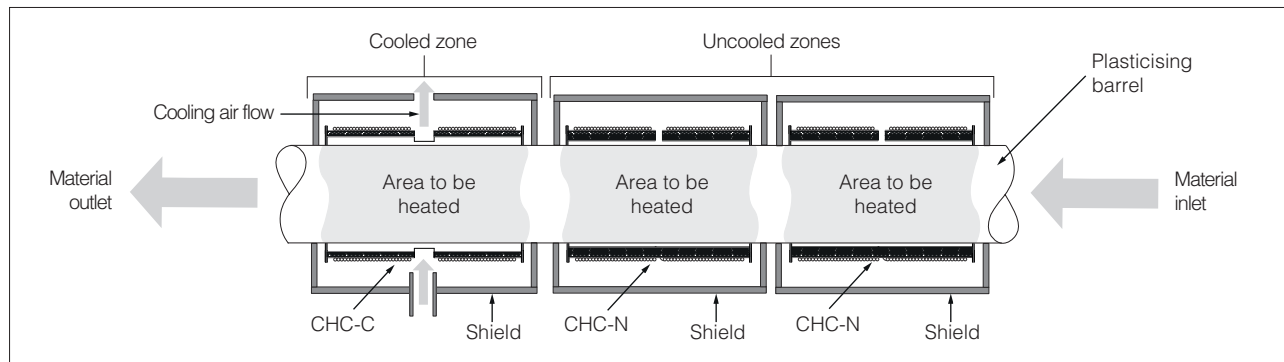


(1) It is recommended the use of K-type thermocouples or other sensors immune to electromagnetic interference

3 APPLICATION OF CHC COILS ON THE PLASTICISING CYLINDER

According to the type of process, the plasticising barrels may require heating with different powers to obtain different localised temperatures. In these conditions, it is necessary to install several CHC coils on the barrel, as many as the number of zones required. Each coil must be powered by a corresponding EPG generator (controlled by the machine control unit), which energises the coil to maintain the process temperature. In addition, some zones require forced cooling to dissipate the heat produced by the mechanical action of the plasticising screw (typical case of extruders). In these zones, should be used CHC-C coils with openings for the cooling air flow. The drawing below shows an example of a plasticising barrel equipped with CHC-C and CHC-N coils, including their own shield shields (not included).

! The length of the CHC coil should fit as closely as possible to the length of the zone to be heated, reduced by the lateral encumbrance of the shields; see dimensioning example in section 9



4 COIL/BARREL COUPLING

The nominal power density of the coil depends on the correct magnetic coupling between the inductor and the plasticising barrel. A poor magnetic coupling, e.g., irregular barrel surfaces, can lead to a reduction in the transmissible heating power.

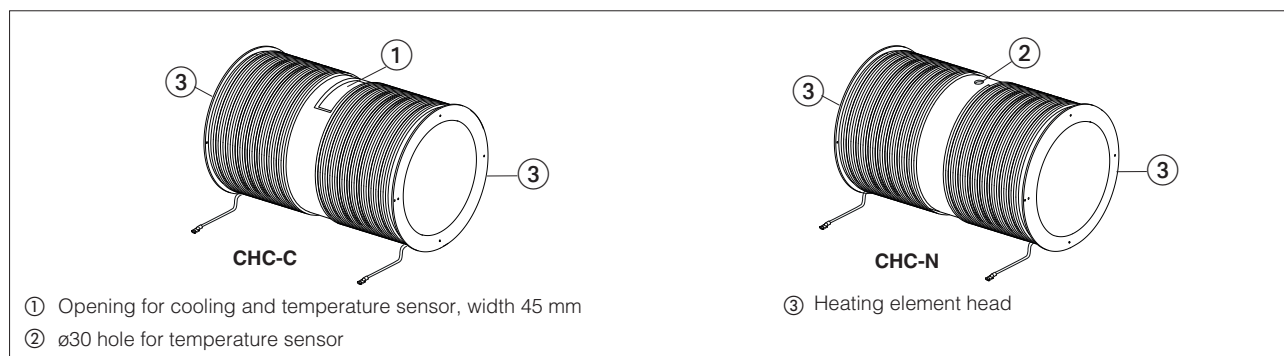
! The installation of CHC coils is intended for plasticising barrels with smooth surfaces. For applications on grooved surfaces, please contact Atos Induction's technical office

5 FUNCTIONAL DESCRIPTION

The closed heating coils are designed to be powered by EPG power generators (see tech. tab. AI100) and, by means of modulated magnetic fields, produce heating of the ferromagnetic materials on which they are placed. During the heating process, heat is generated directly inside the metal through the circulation of eddy currents induced by magnetic field. Heat transmission is not by conduction as with electrical resistors, improving efficiency and reducing dissipation losses. The structure of the inductor contains highly insulating materials that allow to maintain the heat inside the metal, further increasing efficiency. In case of significant lengths of the plasticising barrel or if different zones need to be heated up to different temperatures or powers, it is possible to install more coils on the same barrel.

CHC-C coils are equipped with two openings that allow internal air flow for barrel cooling, and the installation of the temperature sensor.

CHC-N coils are intended for applications where cooling of the plasticising barrel is not required. They have a hole for the temperature sensor, necessary to perform the closed-loop control.



6 MAIN CHARACTERISTICS

Coil execution	CHC-C (Predisposed for cooling), CHC-N (Not cooled),		
Size	L	M	H
Power supply device	EPG-L	EPG-M	EPG-H
Power density	See section 9		
IP protection degree [CEI EN 605229]	Not applicable, avoid contact between coils and liquids		
Cable type	Litz wire – Double Kapton wrapped; U-180		
Max heating temperature of the barrel	350°C		
External ambient temperature (1)	0°C ÷ +40°C		
Electromagnetic emissions [EN UNI 12198]	The use of the coils without protective shields is comparable to a Class 1 source		

(1) For higher ambient temperatures, contact the Atos Induction technical office

7 INSTALLATION PRESCRIPTIONS

During the heating process electromagnetic fields are produced and the barrel reach high temperatures, that could be dangerous for the health of the operators working in the nearby.

For this reason, the coils must be segregated inside aluminium shields with a thickness of at least 2 mm (not included), to protect the operators from accidental contact with coils and from electromagnetic fields.

The shields should consist of two half-shells, to allow positioning on the plasticising barrel. The two halves of the shield must be in direct contact with each other, and connected to the ground, see Fig. 1.

The shield have to guarantee at least a free space around the coil of about 200 mm, and 10 mm on both sides, see Fig. 1. In addition, they must be provided with lower and upper openings to permit natural air circulation inside.

Atos Induction's technical office is available to support customers in the shield design.

If CHC-C coils are installed, it is necessary to implement an air conveyor (made of non-magnetic material), positioned in the shield, to direct the inlet air flow towards the internal surface of the coil, improving the cooling of the plasticising barrel.

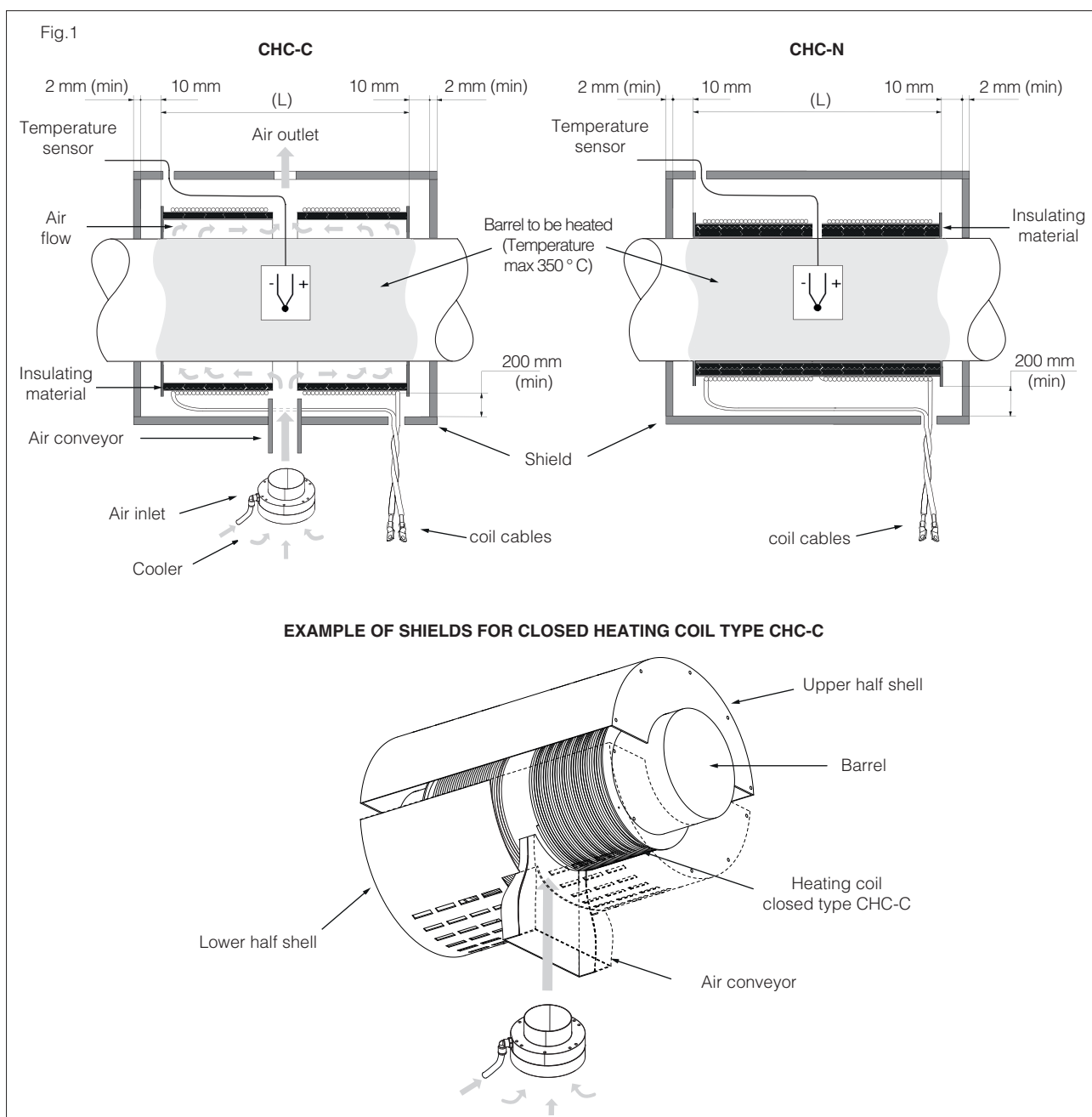
⚠ Do not install insulated shield, as for resistance systems, because they could lead to excessive air temperature increase around the inductor. Do not install two or more coils under the same shield to reduce risks of magnetic interference between coils

⚠ Use only the cables supplied with the coil. Due to their special design, the coil connection cables cannot be shortened or extended. When ordering, please select the required length carefully from the available lengths, see section 1

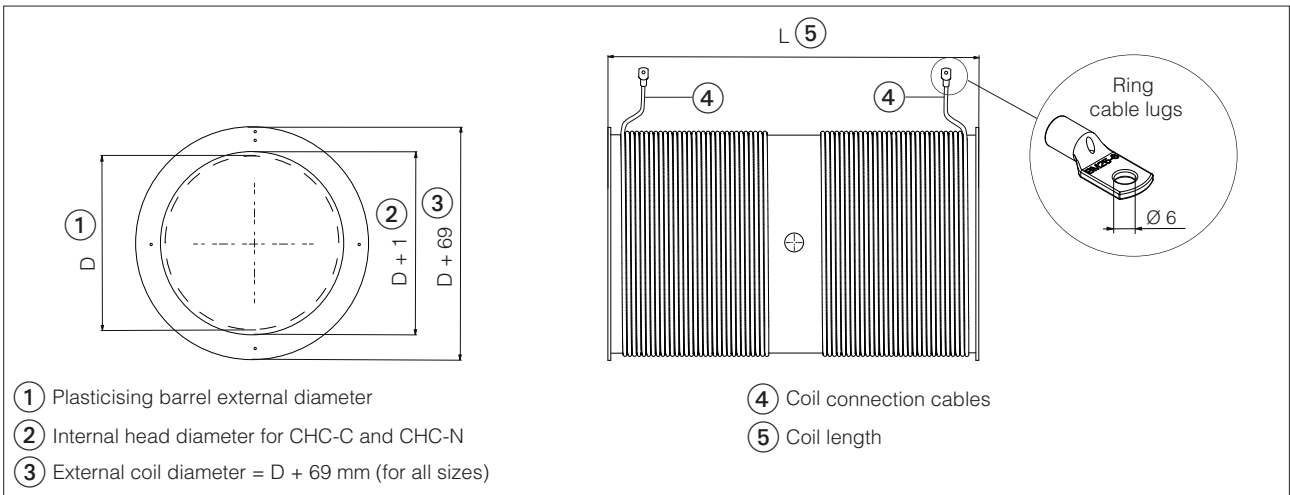
⚠ Lay the coil cables inside non-metallic corrugated, to protect them from mechanical stress. Coil cables must be separated from temperature sensor cables

⚠ Always position the shield after installing the coils. If the heating element must be started without shield, e.g., for maintenance work, must be ensured a safety distance of at least 1000 mm from the operating coil, within which access to personnel is prohibited

⚠ Following the installation, the customer will have to perform fields measurements in compliance with safety regulations in force in the country of installation (e.g., in Europe EN UNI 12198)



8 DIMENSIONS [mm]



For possible combinations of diameter D and length L, see the tables in section 9.

9 POWER DENSITY [W/cm²]

Example of coil sizing to heat a zone with length 430 mm and diameter D = 200 mm, with a specific power of at least 5 W/cm² and a temperature of 300°C.

Sizing of CHC coil length L

The useful length for installation of CHC coil is obtained from the total length of the area to be heated 430 mm, reduced by the lateral dimensions of the shields = 10 mm + 2 mm from both ends of the coil; see section 7. This results in a useful length of 406 mm. Checking the available lengths in the column of the tables below, the closest lower dimension to the usable length 406 mm corresponds to a coil length L = 400 mm.

Sizing of CHC coil

With reference to Tables I, II and III below, the power density is obtained by crossing the column corresponding to the length of the coil L = 400 mm with the line corresponding to the diameter of the plasticising barrel D = 200 mm.

In table I (CHC-*-L + EPG-L) the power value is 2,1 W/cm², which is lower than required.

In table II (CHC-*-M + EPG-M) the power value is 3,6 W/cm², which is lower than required.

In Table III (CHC-*-H + EPG-H) the power value is 5,4 W/cm², which satisfies the requirement for a temperature up to 350°C.

The coil code to be selected is therefore:

CHC-C-H-200/400-*, in case of coil predisposed for cooling

CHC-N-H-200/400-*, in case of coil not cooled

Tab. I - Power density performed by coupling CHC-*-L coils with EPG-L generators, divided by size

		Coil length = L [mm]																							
		150	175	200	225	250	275	300	325	350	375	400	425	450	475	500	525	550	575	600	625	650	675	700	
Plasticising barrel diameter = D [mm]	80										5,7	5,4	5,1	4,8	4,5	4,3	4,1	3,9	3,7	3,6	3,4	3,3	3,2	3,1	
	90								5,9	5,5	5,1	4,8	4,5	4,2	4	3,8	3,6	3,5	3,3	3,2	3,1	2,9	2,8	2,7	
	100							5,7	5,3	4,9	4,6	4,3	4	3,8	3,6	3,4	3,3	3,1	3	2,9	2,8	2,6	2,5	2,5	
	110						5,7	5,2	4,8	4,5	4,2	3,9	3,7	3,5	3,3	3,1	3	2,8	2,7	2,6	2,5	2,4	2,3	2,2	
	120				5,7	5,2	4,8	4,4	4,1	3,8	3,6	3,4	3,2	3	2,9	2,7	2,6	2,5	2,4	2,3	2,2	2,1	2,1	2	
	130				5,3	4,8	4,4	4,1	3,8	3,5	3,3	3,1	2,9	2,8	2,6	2,5	2,4	2,3	2,2	2,1	2	2	1,9	1,8	1,8
	140			5,5	4,9	4,5	4,1	3,8	3,5	3,3	3,1	2,9	2,7	2,6	2,5	2,3	2,2	2,1	2	2	1,9	1,8	1,7	1,6	1,6
	150			5,1	4,6	4,2	3,8	3,5	3,3	3,1	2,9	2,7	2,5	2,4	2,3	2,2	2,1	2	1,9	1,8	1,7	1,6	1,5	1,4	1,4
	160		5,4	4,8	4,3	3,9	3,6	3,3	3,1	2,9	2,7	2,5	2,4	2,3	2,1	2	1,9	1,8	1,7	1,6	1,5	1,4	1,3	1,2	1,2
	170		5,1	4,5	4	3,7	3,4	3,1	2,9	2,7	2,5	2,4	2,2	2,1	2	1,9	1,8	1,8	1,7	1,6	1,5	1,4	1,3	1,2	1,2
	180		4,8	4,2	3,8	3,5	3,2	2,9	2,7	2,5	2,4	2,2	2,1	2	1,9	1,8	1,7	1,7	1,6	1,5	1,5	1,4	1,3	1,2	1,2
	190		4,5	4	3,6	3,3	3	2,8	2,6	2,4	2,3	2,1	2	1,9	1,8	1,7	1,6	1,6	1,5	1,4	1,4	1,3	1,3	1,2	1,2
	200	4,9	4,3	3,8	3,4	3,1	2,9	2,6	2,5	2,3	2,1	2	1,9	1,8	1,7	1,6	1,6	1,5	1,4	1,4	1,3	1,3	1,2	1,2	1,1
	210	4,7	4,1	3,6	3,3	3	2,7	2,5	2,3	2,2	2	1,9	1,8	1,7	1,6	1,5	1,4	1,4	1,3	1,3	1,2	1,2	1,1	1,1	1,1
	220	4,5	3,9	3,5	3,1	2,8	2,6	2,4	2,2	2,1	2	1,8	1,7	1,6	1,6	1,5	1,4	1,4	1,3	1,3	1,2	1,2	1,1	1,1	1,1
	230	4,3	3,7	3,3	3	2,7	2,5	2,3	2,1	2	1,9	1,8	1,7	1,6	1,5	1,4	1,4	1,3	1,2	1,2	1,2	1,1	1,1	1,1	1,1
	240	4,1	3,6	3,2	2,9	2,6	2,4	2,2	2	1,9	1,8	1,7	1,6	1,5	1,4	1,4	1,3	1,2	1,2	1,1	1,1	1,1	1,1	1	1
	250	4,6	3,9	3,4	3,1	2,8	2,5	2,3	2,1	2	1,8	1,7	1,6	1,5	1,4	1,4	1,3	1,3	1,2	1,1	1,1	1,1	1,1	1	1
	260	4,4	3,8	3,3	2,9	2,6	2,4	2,2	2	1,9	1,8	1,7	1,6	1,5	1,4	1,3	1,3	1,2	1,2	1,1	1,1	1,1	1	1	0,9
	270	4,2	3,6	3,2	2,8	2,5	2,3	2,1	2	1,8	1,7	1,6	1,5	1,4	1,3	1,3	1,2	1,2	1,1	1,1	1	1	0,9	0,9	0,9
280	4,1	3,5	3,1	2,7	2,5	2,2	2	1,9	1,8	1,6	1,5	1,4	1,4	1,3	1,2	1,2	1,1	1,1	1	1	0,9	0,9	0,9	0,9	
290	4	3,4	3	2,6	2,4	2,2	2	1,8	1,7	1,6	1,5	1,4	1,3	1,2	1,2	1,1	1,1	1	1	0,9	0,9	0,9	0,8	0,8	
300	3,8	3,3	2,9	2,5	2,3	2,1	1,9	1,8	1,6	1,5	1,4	1,3	1,3	1,2	1,1	1,1	1	1	0,9	0,9	0,9	0,8	0,8	0,8	
310	3,7	3,2	2,8	2,5	2,2	2	1,8	1,7	1,6	1,5	1,4	1,3	1,2	1,2	1,1	1,1	1	1	0,9	0,9	0,9	0,8	0,8	0,8	
320	3,6	3,1	2,7	2,4	2,1	2	1,8	1,7	1,5	1,4	1,3	1,3	1,2	1,1	1,1	1	1	0,9	0,9	0,9	0,8	0,8	0,8	0,8	
330	3,5	3	2,6	2,3	2,1	1,9	1,7	1,6	1,5	1,4	1,3	1,2	1,2	1,1	1	1	0,9	0,9	0,9	0,8	0,8	0,8	0,7	0,7	
340	3,4	2,9	2,5	2,2	2	1,8	1,7	1,6	1,4	1,3	1,3	1,2	1,1	1,1	1	1	0,9	0,9	0,8	0,8	0,8	0,7	0,7	0,7	
350	3,3	2,8	2,5	2,2	2	1,8	1,6	1,5	1,4	1,3	1,2	1,2	1,1	1	1	0,9	0,9	0,8	0,8	0,8	0,8	0,7	0,7	0,7	
360	3,2	2,7	2,4	2,1	1,9	1,7	1,6	1,5	1,4	1,3	1,2	1,1	1,1	1	1	0,9	0,9	0,8	0,8	0,8	0,7	0,7	0,7	0,7	
370	3,1	2,7	2,3	2,1	1,9	1,7	1,5	1,4	1,3	1,2	1,2	1,1	1	1	0,9	0,9	0,8	0,8	0,8	0,7	0,7	0,7	0,7	0,7	
380	3	2,6	2,3	2	1,8	1,6	1,5	1,4	1,3	1,2	1,1	1,1	1	1	0,9	0,9	0,8	0,8	0,8	0,7	0,7	0,7	0,6	0,6	
390	2,9	2,5	2,2	2	1,8	1,6	1,5	1,4	1,3	1,2	1,1	1	1	0,9	0,9	0,8	0,8	0,8	0,7	0,7	0,7	0,7	0,6	0,6	
400	2,9	2,5	2,1	1,9	1,7	1,6	1,4	1,3	1,2	1,1	1,1	1	1	0,9	0,9	0,8	0,8	0,7	0,7	0,7	0,7	0,6	0,6	0,6	

