# ACOUSTIC PIPE SYSTEM



POLO-KAL NG
POLO-KAL 3S
POLO-CLIP HS / POLO-CLIP
POLO-FLAMM BSM
POLO-BSM
POLO-ASV

# ABOVE-GROUND DRAINAGE

TECHNICAL MANUAL

poloplast
PIPE SYSTEMS

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**GENERAL INFORMATION**

The details contained in the present product information have been designed to help you select our products for your purposes. Texts and illustrations have been collated with utmost care. Nevertheless, errors cannot be ruled out entirely. POLOPLAST cannot take legal or any other kind of responsibility for incorrect information and its consequences. POLOPLAST shall be grateful for any suggestions for improvement.

For further information please do not hesitate to contact our technical field service – or our head office at: 0732 / 38 86 -0, office@poloplast.com

# 1.1_STANDARDS

## 1.1.1. POLO-KAL NG AND POLO-KAL 3S

| | |
|---|---|
| **EN 12056 PARTS 1-5** | > Gravity discharge systems within buildings |
| **DIN 1986 PART 100** | > Drainage systems for buildings and plots TPart 100 Regulations in addition to DIN EN 12056 |
| **DIN 4109** | > Sound protection in structural engineering |
| **DIN 4100** | > Sound protection of residential buildings |

## 1.1.2. POLO-BSM

| | |
|---|---|
| **EN 1366-3** | > Fire resistance tests for service installations – penetration seals |
| **DIN 4102-11** | > Fire behaviour of building materials and structural elements |



# 1.2_TESTS OF SPECIFIC PARAMETERS AND APPLICATIONS

## 1.2.1. POLO-KAL NG

| | |
|---|---|
| **TGM-VA KU 22115** | > Resistance to external impact, tested in stepped tests at - 20°C |
| **SIEGEN IB-WEG 2003.4** | > Charging tests of ventilation pipes (Controlled housing ventilation, centralised vacuum cleaning system) |
| **SIEGEN G02-146/2** | > Assessment and comparison of loss of pressure for plastic pipe sections and fittings of ventilation pipes (Controlled housing ventilation, centralised vacuum cleaning system) |
| **OFI 47.423** | > Coefficient of linear expansion of plastic pipe sections |
| **ÖKI 33.044** | > Resistance to low pressure |
| **OFI 301.449** | > Emission measurements on inner pipe layers following VDA 278 |
| **OFI 304.324** | > Emission measurements on POLO-KAL NG fittings and seals following VDA 278 |

**OFI 311.480** > Dynamic pressure tests of extension-proof connections

**ZF-STEYR WERKSTOFFTECHNIK A-SQ 24.05.2006** > Proof of radon impermeability

## I.2.2. POLO-KAL 3S

**OFI 47.423** > Coefficient of linear expansion of plastic pipe sections



# I.3_APPROVALS

**Germany**

poloplast Z-42.1-241 SKZ poloplast Z-42.1-341 SKZ

**POLO-KAL NG:**
DiBt-approval No. Z-42.1-241
**POLO KAL 3S:**
DiBt-approval No. Z-42.1-341

**Austria**

TGM Versuchsanstalt

**TGM KU 15.300**

**Norway**

**POLO-KAL NG:**
Approval No. NPS 0396
**POLO KAL 3S:**
Pipe approval No. PS 0697
Fittings approval No. PS 0702

**Sweden**

**POLO-KAL NG:**
Approval No. 0704/99
**POLO-KAL 3S:**
Zulassung Nr. 0990/99

**Czech Republic**

ITC

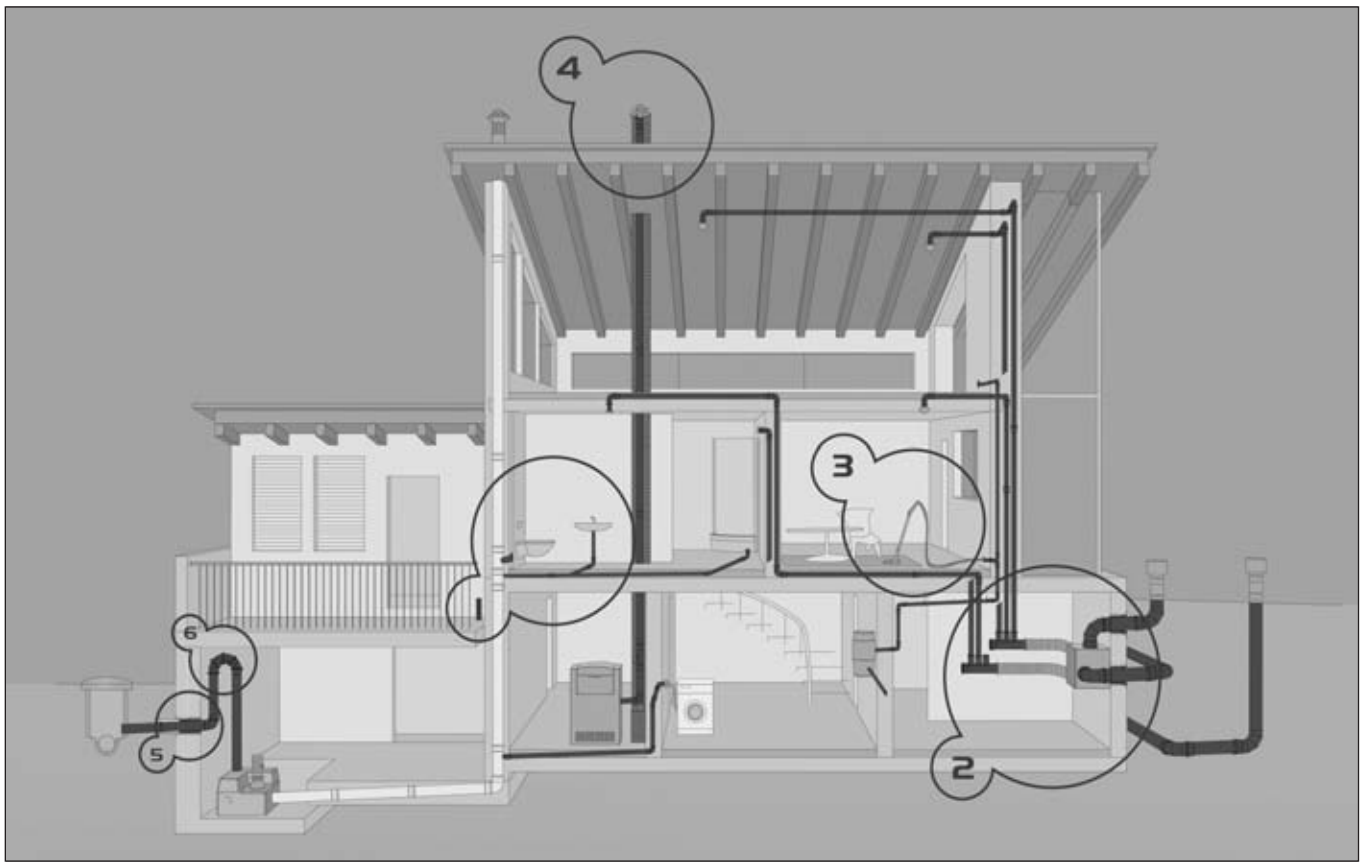
**POLO-KAL NG:**
Approval No. 04 0743 V/AO
**POLO KAL 3S:**
Zulassung Nr. 01 0557 V/AO

**Slovakia**

VÚSAPL NITRA

# 2.1_POLO-KAL NG AND POLO-KAL 3S - FIELDS OF APPLICATION






## 2.1.1. POLO-KAL NG AND POLO-KAL 3S

ABOVE-GROUND DRAINAGE SYSTEM, HIGHLY / SOUND INSULATED
The high-grade above-ground drainage system POLO-KAL NG, a sound-insulating plastic pipe system made with innovative 3-layer technology, provides high quality and convincing sound insulation values. Wherever particularly high sound protection is required, POLOPLAST offers a convincing solution with POLO-KAL 3S, its highly sound insulating pipe system, especially for the downpipes of domestic waste disposal systems.

## 2.1.2. POLO-KAL NG EWT/KWL

GEOTHERMAL HEAT EXCHANGER / CONTROLLED DWELLING VENTILATION
Thanks to its high quality and excellent properties POLO-KAL NG is the tailor-made solution even for modern ventilation systems with geothermal heat exchangers. This is how POLO-KAL NG contributes to make living even more comfortable and to increase energy efficiency (see technical manual or visit www.poloplast.com).

## 2.1.3. POLO-KAL NG ZSA

CENTRALISED VACUUM CLEANING SYSTEM
POLO-KAL NG product highlights, such as its innovative 3-layer structure, the smooth inner surface and jointless sleeves, provide noiseless and efficient suction performance in the “centralised vacuum cleaning system” (see separate folder or visit www.poloplast.com).

④ 

### 2.1.4. POLO-KAL AGT

EXHAUST GAS SYSTEMS
Thanks to its resistance to chemicals and temperature POLO-KAL NG is the winning number in chimney pipes for oil- or gas-operated condensing-value boilers of the “exhaust gas system“ range. As POLO-KAL NG has been CE certified, it can be used in such systems all over Europe.
(See technical manual or visit www.poloplast.com)

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### 2.1.5. POLO-RDS EVOLUTION

PIPE DUCTING SYSTEM
This innovative pipe ducting system that prevents groundwater from seeping into basements can be used with cables and pipes from 8 mm up to 250 mm diameter.
(See technical manual or visit www.poloplast.com)

⑥

### 2.1.6. POLO-ASV

The POLO-ASV extension-proof connection increases safety by providing a firmer grip in case the push-fit connections of the POLO-KAL NG domestic waste disposal system are exposed to extreme strain. POLO-ASV can be easily assembled and disassembled.

# 2.2_POLO-KAL NG



## 2.2.1 TECHNICAL DATA

**Material** > Pipe: PP–C / PP–TV / PP–C
> Fitting: PP–C–KV
(free of halogen)

**Colour** > blue RAL 5014 (halogen and cadmium free)

**Resistance to hot water 50 years of service life**
> Short-term 97°C 30 sec/day = 152 h/50 years
> Long-term 95°C 10 min/day = 3000 h/50 years
> Permanent load 60°C 5h/day = 87.600 h/50 years

**Application class** > B/D (building / drainage)
In Germany: approved for underground laying to the plot boundary.
In Austria: suitable for underground laying to the plot boundary.

**Pipe marking** > Domestic waste disposal pipes of POLO-KAL NG denomination are marked in the following way: charge number, year and week of manufacture, company name, dimension, category of application, category of rigidity, check marking and indication of material.

**Chemical resistance** > Pipes and fittings made of PP - according to DIN 8078, supplement 1 Seals made of SBR - according to ISO TR7620

**Connections** > Push-fit sockets with factory-inserted lip seals.
Seal material = SBR (from DIN/OD 200 it is NBR)

**Fire protection** > The pipe and joint programme meets the requirements of the

| | |
|---|---|
| fire classification: | B2 normal inflammability, |
| smoke development category | Q1 low smoke development, |
| drip formation category | TR1 no drip formation, |

according to ÖNORM B 3800 and DIN 4102, Part 2, respectively.

**Fire behaviour** > according to EN 13501-1 : D – s2, d1

**Ring rigidity** > The ring rigidity of the pipe has been proved according to ISO/DIN 9969. The rigidity is at least 4.0 kN/m2 over the entire range of dimensions da 32 – da 160 (ÖKI test report no. 33.870 dated 30th November 1995). The rigidity of da 200 and 250 is 8.0 kN/m2.

**E-Modulus** > 2400 – 3100 MPa according to ISO 178

**Leakproofness** > TGM VA KU 2164

**Mean coefficient of elongation LAK** > 0,05 mm/m°K
(OFI test report Nr. 47.423)

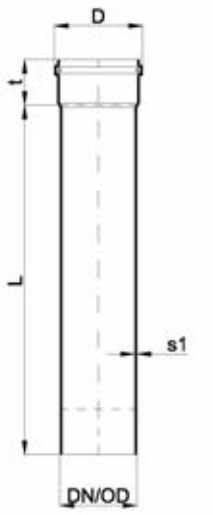
**Low-temperature impact strength** > To -20°C, transportation and laying are safe also at low temperatures.

**Third-party monitoring of product quality** > POLO-KAL NG pipes and fittings have been third-party monitored by authorised German and Austrian plastics testing institutes.

## 2.2.2 PRODUCT RANGE

Dimensions in mm

**POLO-KAL NG**
**Socket pipe**
**PKEM**
with factory-fitted lip ring




| DN/OD* | Art. No. | L | s1(min) | t(min.) | D(max.) | kg/pc. |
|---|---|---|---|---|---|---|
| 32 | 2000 | 150 | 1,8 | 41 | 41 | 0,04 |
| 32 | 2001 | 250 | 1,8 | 41 | 41 | 0,06 |
| 32 | 2002 | 500 | 1,8 | 41 | 41 | 0,12 |
| 32 | 2003 | 1000 | 1,8 | 41 | 41 | 0,22 |
| 32 | 2004 | 1500 | 1,8 | 41 | 41 | 0,31 |
| 32 | 2005 | 2000 | 1,8 | 41 | 41 | 0,44 |
| 40 | 2010 | 150 | 1,8 | 45 | 53 | 0,06 |
| 40 | 2011 | 250 | 1,8 | 45 | 53 | 0,08 |
| 40 | 2012 | 500 | 1,8 | 45 | 53 | 0,15 |
| 40 | 2019 | 750 | 1,8 | 45 | 53 | 0,20 |
| 40 | 2013 | 1000 | 1,8 | 45 | 53 | 0,28 |
| 40 | 2014 | 1500 | 1,8 | 45 | 53 | 0,40 |
| 40 | 2015 | 2000 | 1,8 | 45 | 53 | 0,53 |
| 40 | 2016 | 3000 | 1,8 | 45 | 53 | 0,79 |
| 50 | 2020 | 150 | 2,0 | 47 | 63 | 0,08 |
| 50 | 2021 | 250 | 2,0 | 47 | 63 | 0,11 |
| 50 | 2022 | 500 | 2,0 | 47 | 63 | 0,21 |
| 50 | 2029 | 750 | 2,0 | 47 | 63 | 0,29 |
| 50 | 2023 | 1000 | 2,0 | 47 | 63 | 0,38 |
| 50 | 2024 | 1500 | 2,0 | 47 | 63 | 0,55 |
| 50 | 2025 | 2000 | 2,0 | 47 | 63 | 0,72 |
| 50 | 2026 | 3000 | 2,0 | 47 | 63 | 1,10 |
| 75 | 2030 | 150 | 2,6 | 53 | 89 | 0,16 |
| 75 | 2031 | 250 | 2,6 | 53 | 89 | 0,24 |
| 75 | 2032 | 500 | 2,6 | 53 | 89 | 0,42 |
| 75 | 2039 | 750 | 2,6 | 53 | 89 | 0,59 |
| 75 | 2033 | 1000 | 2,6 | 53 | 89 | 0,78 |
| 75 | 2034 | 1500 | 2,6 | 53 | 89 | 1,13 |
| 75 | 2035 | 2000 | 2,6 | 53 | 89 | 1,51 |
| 75 | 2036 | 3000 | 2,6 | 53 | 89 | 2,27 |
| 90 | 2070 | 150 | 3,0 | 57 | 106 | 0,23 |
| 90 | 2071 | 250 | 3,0 | 57 | 106 | 0,34 |
| 90 | 2072 | 500 | 3,0 | 57 | 106 | 0,60 |
| 90 | 2079 | 750 | 3,0 | 57 | 106 | 0,84 |
| 90 | 2073 | 1000 | 3,0 | 57 | 106 | 1,13 |
| 90 | 2074 | 1500 | 3,0 | 57 | 106 | 1,65 |
| 90 | 2075 | 2000 | 3,0 | 57 | 106 | 2,17 |
| 90 | 2076 | 3000 | 3,0 | 57 | 106 | 3,23 |
| 110 | 2040 | 150 | 3,4 | 62 | 128 | 0,33 |
| 110 | 2041 | 250 | 3,4 | 62 | 128 | 0,49 |
| 110 | 2042 | 500 | 3,4 | 62 | 128 | 0,84 |
| 110 | 2049 | 750 | 3,4 | 62 | 128 | 1,17 |
| 110 | 2043 | 1000 | 3,4 | 62 | 128 | 1,57 |
| 110 | 2044 | 1500 | 3,4 | 62 | 128 | 2,27 |
| 110 | 2045 | 2000 | 3,4 | 62 | 128 | 2,99 |
| 110 | 2046 | 3000 | 3,4 | 62 | 128 | 4,43 |
| 125 | 2050 | 150 | 3,9 | 67 | 145 | 0,46 |
| 125 | 2051 | 250 | 3,9 | 67 | 145 | 0,61 |
| 125 | 2052 | 500 | 3,9 | 67 | 145 | 1,10 |
| 125 | 2053 | 1000 | 3,9 | 67 | 145 | 1,99 |
| 125 | 2054 | 1500 | 3,9 | 67 | 145 | 2,88 |
| 125 | 2055 | 2000 | 3,9 | 67 | 145 | 3,76 |
| 125 | 2056 | 3000 | 3,9 | 67 | 145 | 5,52 |
| 160 | 2060 | 150 | 4,9 | 77 | 184 | 0,73 |
| 160 | 2061 | 250 | 4,9 | 77 | 184 | 1,04 |
| 160 | 2062 | 500 | 4,9 | 77 | 184 | 1,79 |

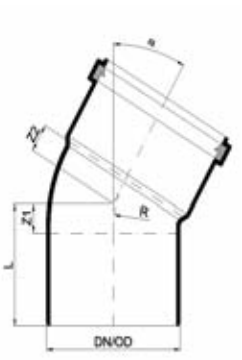
* DN/OD according to European standardisation CEN/TC 155: Dimension Nominal / Outside Diameter
**The current version of MEP specification (LB-HT), dated 7th April 2005 (http://www.bmwa.gv.at/BMWA/Service/Bauservice/default.htm), assigns highly sound insulating (LG 66.07) and sound insulating (LG 66.06) domestic waste disposal pipes to the waste-water systems group (LG) 66. For your information we state the respective LB-HT numbers together with the product names.
Subject to technical alterations

Dimensions in mm

**POLO-KAL NG**
**Socket pipe**
**PKEM**
with factory-fitted lip ring

| DN/OD* | Art. No. | L | s1-min | t-min. | D-max. | kg/pc. |
|---|---|---|---|---|---|---|
| 160 | 2063 | 1000 | 4,9 | 77 | 184 | 3,26 |
| 160 | 2064 | 1500 | 4,9 | 77 | 184 | 4,71 |
| 160 | 2065 | 2000 | 4,9 | 77 | 184 | 6,20 |
| 160 | 2066 | 3000 | 4,9 | 77 | 184 | 10,61 |
| 200 | 2951 | 1000 | 6,8 | 122 | 228 | 5,92 |
| 200 | 2953 | 3000 | 6,8 | 122 | 228 | - |
| 200 | 2954 | 6000 | 6,8 | 122 | 228 | - |
| 250 | 2956 | 1000 | 8,6 | 156 | 289 | 9,73 |
| 250 | 2959 | 3000 | 8,6 | 156 | 289 | - |

**POLO-KAL NG**
**Blend**
**PKB**
with factory-fitted lip ring



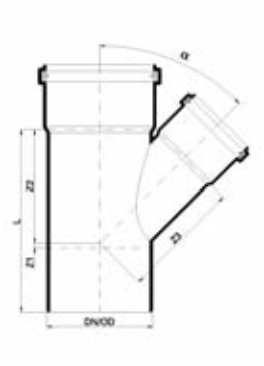

| | DN/OD | Art. No. | Z1 | Z2 | R | L | kg/pc. |
|---|---|---|---|---|---|---|---|
| 15° | 32 | 2100 | 3 | 7 | 18 | 44 | 0,01 |
| | 40 | 2110 | 7 | 8 | 21 | 51 | 0,04 |
| | 50 | 2120 | 7 | 8 | 27 | 56 | 0,05 |
| | 75 | 2130 | 9 | 10 | 40 | 64 | 0,10 |
| | 90 | 2170 | 13 | 8 | 47 | 73 | 0,16 |
| | 110 | 2140 | 13 | 13 | 57 | 80 | 0,26 |
| | 125 | 2150 | 12 | 13 | 90 | 85 | 0,36 |
| | 160 | 2160 | 13 | 16 | 115 | 98 | 0,65 |
| | 200 | 2960 | 13 | 23 | - | 131 | 1,56 |
| 30° | 32 | 2101 | 5 | 9 | 18 | 46 | 0,03 |
| | 40 | 2111 | 10 | 11 | 21 | 54 | 0,03 |
| | 50 | 2121 | 11 | 12 | 27 | 60 | 0,06 |
| | 75 | 2131 | 15 | 15 | 40 | 70 | 0,12 |
| | 90 | 2171 | 13 | 19 | 47 | 72 | 0,18 |
| | 110 | 2141 | 21 | 20 | 58 | 88 | 0,28 |
| | 125 | 2151 | 20 | 22 | 90 | 93 | 0,39 |
| | 160 | 2161 | 25 | 28 | 115 | 110 | 0,71 |
| | 200 | 2962 | 27 | 37 | - | 144 | 1,70 |
| 45° | 32 | 2102 | 7 | 12 | 18 | 48 | 0,03 |
| | 40 | 2112 | 13 | 14 | 21 | 57 | 0,04 |
| | 50 | 2122 | 15 | 16 | 27 | 63 | 0,06 |
| | 75 | 2132 | 21 | 21 | 40 | 75 | 0,13 |
| | 90 | 2172 | 26 | 20 | 47 | 85 | 0,19 |
| | 110 | 2142 | 29 | 29 | 57 | 96 | 0,30 |
| | 125 | 2152 | 29 | 31 | 90 | 103 | 0,43 |
| | 160 | 2162 | 37 | 41 | 115 | 122 | 0,78 |
| | 200 | 2963 | 41 | 52 | - | 159 | 1,85 |
| | 250 | 2968 | 113 | 152 | Segmente | 270 | 5,02 |
| 67,5° | 32 | 2103 | 12 | 16 | 18 | 52 | 0,03 |
| | 40 | 2113 | 18 | 19 | 21 | 62 | 0,05 |
| | 50 | 2123 | 22 | 22 | 27 | 70 | 0,06 |
| | 75 | 2133 | 31 | 31 | 40 | 86 | 0,15 |
| | 90 | 2173 | 33 | 27 | 47 | 92 | 0,21 |
| | 110 | 2143 | 44 | 44 | 58 | 111 | 0,33 |
| | 125 | 2153 | 46 | 48 | 90 | 119 | 0,49 |
| | 160 | 2163 | 59 | 62 | 115 | 144 | 0,90 |
| 87,5° | 32 | 2104 | 16 | 20 | 18 | 57 | 0,03 |
| | 40 | 2114 | 24 | 25 | 21 | 68 | 0,05 |
| | 50 | 2124 | 29 | 30 | 27 | 78 | 0,07 |
| | 75 | 2134 | 42 | 42 | 40 | 97 | 0,15 |
| | 90 | 2174 | 50 | 43 | 47 | 109 | 0,22 |
| | 110 | 2144 | 60 | 60 | 58 | 128 | 0,37 |
| | 125 | 2154 | 64 | 66 | 90 | 138 | 0,53 |
| | 160 | 2164 | 84 | 87 | 115 | 169 | 0,98 |
| | 200 | 2965 | 106 | 115 | - | 230 | 2,36 |
| | 250 | 2970 | 236 | 275 | Segmente | 392 | 6,32 |

Subject to technical alterations

Dimensions in mm

## POLO-KAL NG
## Branch
## PKEA

with factory-fitted lip ring

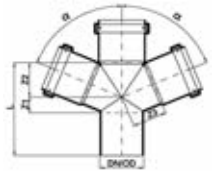



| | DN/OD | Art. No. | Z1 | Z2 | Z3 | L | kg/pc. |
|---|---|---|---|---|---|---|---|
| 45° | 32/32 | 2200 | 7 | 45 | 45 | 93 | 0,05 |
| | 40/32 | 2203 | 7 | 49 | 50 | 100 | 0,07 |
| | 40/40 | 2206 | 13 | 54 | 54 | 111 | 0,08 |
| | 50/32 | 2209 | 2 | 54 | 57 | 104 | 0,08 |
| | 50/40 | 2212 | 8 | 59 | 61 | 115 | 0,10 |
| | 50/50 | 2215 | 15 | 66 | 66 | 129 | 0,11 |
| | 75/50 | 2218 | 3 | 80 | 84 | 138 | 0,20 |
| | 75/75 | 2221 | 21 | 98 | 98 | 173 | 0,28 |
| | 90/50 | 2210 | -2 | 84 | 92 | 142 | 0,26 |
| | 90/75 | 2834 | 14 | 114 | 117 | 187 | 0,35 |
| | 90/90 | 2211 | 25 | 112 | 112 | 196 | 0,40 |
| | 110/40 | 2204 | -14 | 92 | 106 | 145 | 0,35 |
| | 110/50 | 2224 | -13 | 99 | 109 | 153 | 0,38 |
| | 110/75 | 2227 | 5 | 117 | 123 | 189 | 0,48 |
| | 110/90 | 2839 | 29 | 144 | 173 | 240 | 0,82 |
| | 110/110 | 2230 | 29 | 144 | 144 | 240 | 0,67 |
| | 125/75 | 2233 | 12 | 130 | 139 | 215 | 0,66 |
| | 125/90 | 2843 | 28 | 161 | 183 | 262 | 1,02 |
| | 125/110 | 2236 | 28 | 161 | 154 | 262 | 0,85 |
| | 125/125 | 2239 | 28 | 161 | 160 | 262 | 0,96 |
| | 160/90 | 2840 | 2 | 174 | 184 | 261 | 1,41 |
| | 160/110 | 2242 | 2 | 174 | 184 | 261 | 1,26 |
| | 160/125 | 2240 | 34 | 198 | 201 | 309 | 1,58 |
| | 160/160 | 2245 | 35 | 209 | 209 | 329 | 1,83 |
| | 200/160 | 2971 | 13 | 229 | 253 | 360 | 3,23 |
| | 200/200 | 2973 | 52 | 240 | 240 | 416 | 4,00 |
| | 250/160 | 2975 | 215 | 301 | 320 | 672 | 7,75 |
| 67,5° | 250/250 | 2979 | 144 | 369 | 363 | 669 | 10,31 |
| | 40/40 | 2207 | 18 | 35 | 35 | 97 | 0,76 |
| | 50/40 | 2213 | 16 | 36 | 40 | 101 | 0,09 |
| | 50/50 | 2216 | 22 | 42 | 42 | 112 | 0,09 |
| | 75/50 | 2219 | 17 | 49 | 56 | 121 | 0,18 |
| | 75/75 | 2222 | 52 | 88 | 85 | 193 | 0,29 |
| | 90/50 | 2835 | 14 | 69 | 71 | 142 | 0,29 |
| | 90/75 | 2832 | 100 | 88 | 84 | 247 | 0,38 |
| | 90/90 | 2831 | 36 | 77 | 76 | 172 | 0,35 |
| | 110/50 | 2225 | 11 | 57 | 76 | 136 | 0,36 |
| | 110/75 | 2228 | 25 | 71 | 82 | 163 | 0,43 |
| | 110/90 | 2837 | 44 | 93 | 121 | 203 | 0,75 |
| | 110/110 | 2231 | 44 | 93 | 92 | 203 | 0,58 |
| | 125/90 | 2844 | 75 | 104 | 105 | 248 | 0,79 |
| | 125/110 | 2237 | 63 | 116 | 117 | 248 | 0,73 |
| 87,5° | 160/90 | 2841 | 56 | 111 | 126 | 243 | 1,11 |
| | 160/110 | 2243 | 53 | 121 | 135 | 251 | 1,17 |
| | 40/40 | 2208 | 24 | 25 | 25 | 94 | 0,07 |
| | 50/40 | 2214 | 24 | 25 | 30 | 98 | 0,09 |
| | 50/50 | 2217 | 29 | 30 | 30 | 108 | 0,97 |
| | 75/50 | 2220 | 30 | 32 | 43 | 117 | 0,18 |
| | 75/75 | 2223 | 42 | 45 | 45 | 142 | 0,23 |
| | 90/50 | 2830 | 29 | 35 | 52 | 123 | 0,22 |
| | 90/75 | 2833 | 47 | 49 | 50 | 156 | 0,34 |
| | 90/90 | 2248 | 49 | 52 | 52 | 160 | 0,33 |
| | 110/50 | 2226 | 30 | 34 | 61 | 132 | 0,34 |
| | 110/75 | 2229 | 43 | 48 | 63 | 158 | 0,42 |
| | 110/90 | 2836 | 71 | 59 | 77 | 197 | 0,57 |
| | 110/110 | 2232 | 61 | 67 | 67 | 195 | 0,54 |
| | 125/75 | 2235 | 96 | 83 | 84 | 249 | 0,63 |
| | 125/90 | 2845 | 75 | 65 | 83 | 214 | 0,86 |
| | 125/110 | 2238 | 67 | 76 | 75 | 216 | 0,71 |
| | 125/125 | 2241 | 65 | 76 | 75 | 215 | 0,76 |
| | 160/90 | 2842 | 81 | 95 | 135 | 261 | 1,38 |
| | 160/110 | 2244 | 81 | 95 | 107 | 261 | 1,21 |
| | 160/125 | 2246 | 78 | 97 | 103 | 251 | 1,54 |
| | 160/160 | 2247 | 115 | 118 | 118 | 310 | 1,72 |
| | 200/160 | 2972 | 112 | 127 | 134 | 361 | 2,90 |
| | 200/200 | 2974 | 140 | 127 | 126 | 388 | 3,80 |
| | 250/160 | 2976 | 110 | 127 | 193 | 394 | 4,91 |
| | 250/250 | 2980 | 159 | 156 | 161 | 471 | 7,47 |

Subject to technical alterations

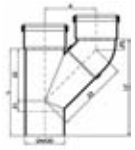
Dimensions in mm

## POLO-KAL NG
## Double branch PKDA
with factory-fitted lip ring



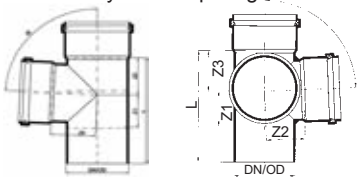
| DN/OD | Art. No. | Z1 | Z2 | Z3 | Z4 | L | kg/pc. |
|---|---|---|---|---|---|---|---|
| 67,5°/180° | | | | | | | |
| 50/50/50 | 2849 | 18 | 39 | 39 | - | 106 | 0,10 |
| 90/50/50 | 2848 | 16 | 59 | 74 | - | 144 | 0,28 |
| 90/90/90 | 2846 | 36 | 77 | 77 | - | 173 | 0,44 |
| 110/50/50 | 2260 | 14 | 57 | 78 | - | 139 | 0,38 |
| 110/75/75 | 2263 | 25 | 72 | 82 | - | 163 | 0,50 |
| 110/110/110 | 2261 | 44 | 95 | 96 | - | 206 | 0,74 |
| 125/110/110 | 2262 | 48 | 101 | 104 | - | 218 | 0,88 |
| 160/110/110 | 2264 | 73 | 127 | 133 | - | 268 | 1,37 |
| 87,5°/180° | | | | | | | |
| 90/90/90 | 2847 | 57 | 52 | 60 | - | 168 | 0,43 |
| 110/75/75 | 2269 | 44 | 50 | 68 | - | 160 | 0,48 |
| 110/110/110 | 2267 | 69 | 60 | 96 | - | 196 | 0,64 |

## POLO-KAL NG
## Parallel branch PKPA
with factory-fitted lip ring



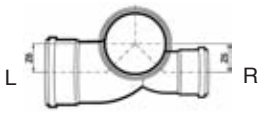
| DN/OD | Art. No. | Z1 | Z2 | Z3 | Z4 | L | L2 | A | kg/pc. |
|---|---|---|---|---|---|---|---|---|---|
| 110/110 | 2294 | 29 | 144 | 200 | 29 | 204 | 224 | 141 | 0,80 |
| 90/90 | 2828 | 28 | 118 | 167 | 20 | 205 | 225 | 117 | 0,48 |
| 110/75 | 2293 | 5 | 117 | 123 | 21 | 189 | 213 | 120 | 0,54 |

## POLO-KAL NG
## Double corner branch PKEDA
with factory-fitted lip ring



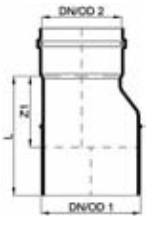

| DN/OD | Art. No. | Z1 | Z2 | Z3 | Z4 | L | kg/pc. |
|---|---|---|---|---|---|---|---|
| 87,5°/90° | | | | | | | |
| 90/90/90 | 2829 | 52 | 60 | 57 | 68 | 167 | 0,43 |
| 110/110/110 | 2275 | 61 | 68 | 68 | 79 | 198 | 0,66 |
| 110/110/75 L R | 2277 | 62 | 69 | 57 | 69 | 198 | 0,60 |
| 110/75/110 L R | 2279 | 62 | 69 | 69 | 71 | 198 | 0,60 |
| 125/110/110 | 2276 | 67 | 76 | 83 | 75 | 216 | 0,85 |
| 160/110/110 | 2278 | 81 | 95 | 107 | 106 | 261 | 1,36 |

## POLO-KAL NG
## Double branch (bent) PKKA
with factory-fitted lip ring




| DN/OD | Art. No. | Z1 | Z2 | Z3 | Z4 | Z5 | Z6 | L | kg/pc. |
|---|---|---|---|---|---|---|---|---|---|
| 87,5°/180° | | | | | | | | | |
| 110/110/75 L R | 2268 | 93 | 93 | 78 | 100 | 50 | 50 | 248 | 0,75 |
| 110/75/110 L R | 2273 | 93 | 93 | 100 | 78 | 50 | 50 | 144 | 0,75 |

## POLO-KAL NG
## Reducer PKR
with factory-fitted lip ring

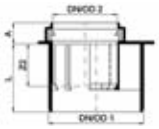



| DN/OD1 | DN/OD2 | Art. No. | Z1 | L | kg/pc. |
|---|---|---|---|---|---|
| 40 | 32 | 2280 | 23 | 65 | 0,03 |
| 50 | 32 | 2281 | 24 | 72 | 0,04 |
| 50 | 40 | 2282 | 20 | 65 | 0,04 |
| 75 | 50 | 2283 | 31 | 79 | 0,09 |
| 90 | 50 | 2885 | 34 | 90 | 0,13 |
| 90 | 75 | 2886 | 19 | 76 | 0,14 |
| 110 | 50 | 2284 | 47 | 113 | 0,19 |
| 110 | 75 | 2285 | 32 | 99 | 0,20 |
| 110 | 90 | 2887 | 26 | 88 | 0,21 |
| 125 | 110 | 2286 | 18 | 92 | 0,31 |
| 160 | 110 | 2287 | 39 | 124 | 0,51 |
| 160 | 125 | 2288 | 32 | 117 | 0,54 |
| 200 | 160 | 2981 | 47 | 171 | 1,31 |
| 250 | 200 | 2983 | 177 | 299 | 2,96 |

Subject to technical alterations

Dimensions in mm

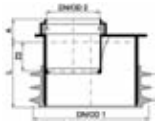
## POLO-KAL NG Reducer, short PKRK



| DN/OD | Art. No. | Z2 | A | L | kg/pc. |
|---|---|---|---|---|---|
| 70/50 | 2875 | 33 | 17 | 54 | 0,07 |
| 90/50 | 2292 | 32 | 17 | 66 | 0,11 |
| 90/75 | 2289 | 37 | 17 | 61 | 0,10 |
| 110/50 | 2876 | 32 | 18 | 66 | 0,16 |
| 110/75 | 2877 | 38 | 19 | 66 | 0,16 |
| 110/90 | 2290 | 40 | 19 | 66 | 0,15 |
| 160/110 | 2878 | 58 | 19 | 89 | 0,42 |

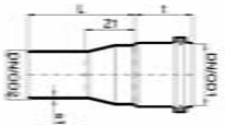
## POLO-KAL NG Reducer PKRI

inside/inside



| DN/OD | Art. No. | Z2 | A | L | kg/pc. |
|---|---|---|---|---|---|
| 110/50 | 2369 | -27 | 22 | 62 | 0,18 |
| 110/75 | 2370 | -37 | 18 | 62 | 0,17 |
| 110/90 | 2367 | 4 | 67 | 51 | 0,15 |
| 110/110 | 2381 | 22 | 75 | 41 | 0,28 |
| 160/110 | 2366 | 20 | 91 | 77 | 0,48 |
| | | | | | |

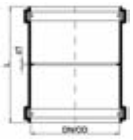
## POLO-KAL NG Reducer, centric PKRZ with small spigot end



| DN/OD1 | Art. No. | DN/OD2 | L | t | Z1 | kg/pc. |
|---|---|---|---|---|---|---|
| 50 | 1786 | 40 | 88 | 47 | 41 | 0,06 |
| 75 | 1787 | 50 | 94 | 55 | 46 | 0,11 |
| 110 | 1791 | 90 | 47 | 69 | 7 | 0,18 |
| | | | | | | |
| | | | | | | |
| | | | | | | |

## POLO-KAL NG Double socket PKD

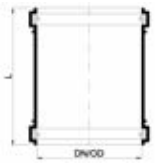
with factory-fitted lip ring



| DN/OD | Art. No. | L | Z1 | kg/pc. |
|---|---|---|---|---|
| 32 | 2300 | 87 | 2 | 0,03 |
| 40 | 2301 | 96 | 2 | 0,05 |
| 50 | 2302 | 104 | 1 | 0,06 |
| 75 | 2303 | 118 | 2 | 0,13 |
| 90 | 2307 | 127 | 1 | 0,17 |
| 110 | 2304 | 145 | 3 | 0,28 |
| 125 | 2305 | 157 | 4 | 0,40 |
| 160 | 2306 | 180 | 4 | 0,69 |
| 200 | 2986 | 240 | 4 | 1,53 |
| 250 | 2987 | 292 | 9 | 3,02 |

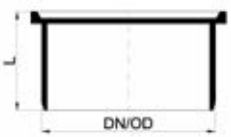
## POLO-KAL NG Sleeve socket PKU

with factory-fitted DD ring



| DN/OD | Art. No. | L | kg/pc. |
|---|---|---|---|
| 40 | 2311 | 96 | 0,05 |
| 50 | 2312 | 10 | 0,06 |
| 75 | 2313 | 118 | 0,13 |
| 90 | 2319 | 127 | 0,17 |
| 110 | 2314 | 145 | 0,28 |
| 125 | 2315 | 157 | 0,39 |
| 160 | 2316 | 180 | 0,68 |
| 200 | 2984 | 240 | 1,50 |

## POLO-KAL NG Socket plug PKM

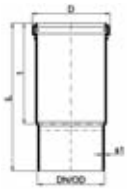



| DN/OD | Art. No. | L1 | kg/pc. |
|---|---|---|---|
| 40 | 2321 | 40 | 0,02 |
| 50 | 2322 | 44 | 0,02 |
| 75 | 2323 | 51 | 0,06 |
| 90 | 2327 | 55 | 0,09 |
| 110 | 2324 | 62 | 0,14 |
| 125 | 2325 | 81 | 0,19 |
| 160 | 2326 | 92 | 0,36 |
| 200 | 2990 | 122 | 0,85 |
| 250 | 2991 | 110 | 1,36 |

Subject to technical alterations

Dimensions in mm

## POLO-KAL NG
## Long sleeve PKL
with factory-fitted DD ring

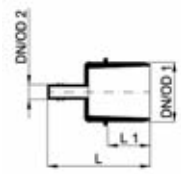


| DN/OD | Art. No. | L | D | t | s1 | kg/pc. |
|---|---|---|---|---|---|---|
| 40 | 2331 | 158 | 53 | 107 | 1,8 | 0,05 |
| 50 | 2332 | 174 | 63 | 119 | 1,8 | 0,07 |
| 75 | 2333 | 198 | 89 | 136 | 2,6 | 0,18 |
| 90 | 2338 | 212 | 105 | 143 | 3,1 | 0,23 |
| 110 | 2334 | 243 | 127 | 165 | 3,4 | 0,37 |
| 125 | 2335 | 316 | 144 | 187 | 3,9 | 0,63 |
| 160 | 2336 | 328 | 182 | 215 | 4,9 | 1,02 |
| 200 | 2339 | 422 | 229 | 280 | 6,8 | 2,36 |
| 250 | 2340 | 531 | 289 | 347 | 8,9 | 4,78 |

## POLO-KAL NG
## Cleanout pipe PKRE
with factory-fitted lip ring DN/OD 50-110, pressure-sealed up to 0.5 bar

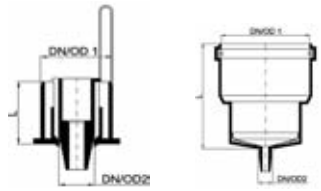
| DN/OD | Art. No. | Z1 | Z2 | B | L | kg/pc. |
|---|---|---|---|---|---|---|
| 50 | 2342 | 68 | 33 | 63 | 116 | 0,09 |
| 75 | 2343 | 102 | 52 | 94 | 156 | 0,25 |
| 90 | 2347 | 115 | 55 | 116 | 174 | 0,40 |
| 110 | 2344 | 144 | 76 | 138 | 205 | 0,46 |
| 125 | 2345 | 187 | 89 | 165 | 256 | 0,72 |
| 160 | 2346 | 168 | 92 | 213 | 244 | 1,14 |
| 200 | 2992 | 236 | 117 | 238 | 358 | 2,62 |
| 250 | 2993 | 253 | 133 | 295 | 409 | 4,80 |
| | | | | | | |
| | | | | | | |

## POLO-KAL NG
## Condensate discharge connection to hose di 8 mm



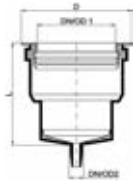

| DN/OD1 | DN/OD2 | Art. No. | L1 | kg/pc. |
|---|---|---|---|---|
| 32 | 8 | 2356 | 22 | 0,01 |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

## POLO-KAL NG
## Condensate discharge for plastic pipes PKKO




| DN/OD1 | DN/OD2 | Art. No. | L | B | kg/pc. |
|---|---|---|---|---|---|
| 40 | 1/2“ | 2357 | 39 | 40 | 0,03 |
| 50 | 1/2“ | 2358 | 39 | 50 | 0,04 |
| 110 | 1/2“ | 2387 | 131 | - | 0,02 + 0,02 (two parts) |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |

## POLO-KAL NG Condensate discharge for flexible hoses PKKO

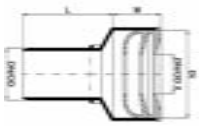


| DN/OD1 | DN/OD2 | Art. No. | L | kg/pc. |
|---|---|---|---|---|
| 100 | 1/2“ | 2388 | 134 | 0,14 |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |

Subject to technical alterations

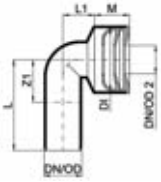
Dimensions in mm

## POLO-KAL NG
## Siphon fitting PKS
with push-fit seal



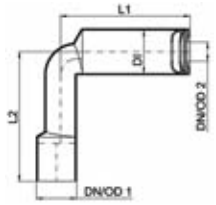
| DN/OD1 | DN/OD2 | d | Art. No. | L | M | DI | kg/pc. |
|---|---|---|---|---|---|---|---|
| 32 | 1 1/4“ | 32 mm | 2350 | 56 | 29 | 54 | 0,06 |
| 40 | 1 1/4“ | 32 mm | 2351 | 56 | 29 | 54 | 0,06 |
| 40 | 1 1/2“ | 40 mm | 2352 | 56 | 29 | 54 | 0,05 |
| 50 | 1 1/2“ | 40 mm | 2353 | 56 | 29 | 54 | 0,07 |
| 50 | 1 1/2“ | 40 mm | 2354 | 56 | 29 | 54 | 0,06 |
| 50 | 2“ | 50 mm | 2355 | 60 | 29 | 67 | 0,08 |

## POLO-KAL NG
## Siphon bend PKSW
with push-fit seal



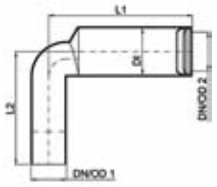

| DN/OD1 | DN/OD2 | da | Art. No. | L | Z1 | L1 | M | DI | kg/pc. |
|---|---|---|---|---|---|---|---|---|---|
| 32 | 1 1/4“ | 32 mm | 2360 | 77 | 36 | 27 | 29 | 54 | 0,07 |
| 40 | 1 1/4“ | 32 mm | 2361 | 79 | 34 | 29 | 29 | 54 | 0,07 |
| 40 | 1 1/2“ | 40 mm | 2362 | 79 | 34 | 29 | 29 | 54 | 0,06 |
| 50 | 1 1/4“ | 32 mm | 2363 | 88 | 41 | 30 | 29 | 54 | 0,08 |
| 50 | 1 1/2“ | 40 mm | 2364 | 88 | 41 | 30 | 29 | 54 | 0,07 |
| 50 | 2“ | 50 mm | 2365 | 89 | 42 | 35 | 29 | 67 | 0,09 |

## POLO-KAL NG
## Siphon bend, long, reduced PKSBR
with push-fit seal



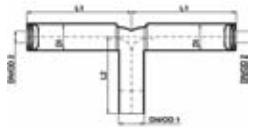

| DN/OD | DN/OD2 | da | Art. Nr | L1 | L2 | DI | kg/pc. |
|---|---|---|---|---|---|---|---|
| 50 | 1 1/4” | 32 mm | 2250 | 203 | 160 | 67 | 0,15 |
| 50 | 11/2” | 40 mm | 2251 | 203 | 160 | 67 | 0,14 |

## POLO-KAL NG
## Siphon bend, long, PKSB
with push-fit seal




| DN/OD | DN/OD2 | da | Art. Nr | L1 | L2 | DI | kg/pc. |
|---|---|---|---|---|---|---|---|
| 50 | 2“ | 50 mm | 2252 | 203 | 160 | 67 | 0,19 |

## POLO-KAL NG
## Doppelsiphonbogen lang PKDSB
with two push-fit seals

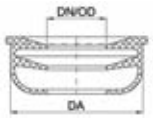


| DN/OD | DN/OD2 | da | Art. Nr | L1 | L2 | DI | kg/pc. |
|---|---|---|---|---|---|---|---|
| 50 | 1 1/4“ | 32 mm | 2253 | 203 | 160 | 54 | 0,29 |
| 50 | 1 1/2“ | 40 mm | 2254 | 200 | 160 | 54 | 0,27 |

Subject to technical alterations

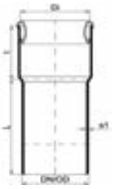
Dimensions in mm

## POLO-KAL NG
## Push-fit seal PKNI



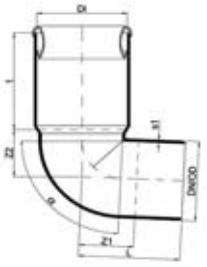

| DN/OD | da | Art. No. | DA | kg/pc. |
|---|---|---|---|---|
| 1 1/4” | 32 mm | 2378 | 54 | 0,04 |
| 1 1/2” | 40 mm | 2379 | 54 | 0,03 |
| 2“ | 50 mm | 2380 | 67 | 0,04 |

## POLO-KAL NG
## WC transition PKG
with seal



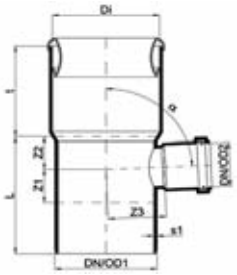

| DN/OD | Art. No. | DI | L | t | S1 | kg/pc. |
|---|---|---|---|---|---|---|
| 110 | 2371 | 115 | 185 | 105 | 3,8 | 0,62 |

## POLO-KAL NG
## WC connection PKGB
87,5°
with seal



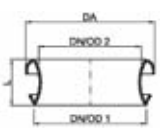

| DN/OD | Art. No. | Alpha | Di | L | t | Z1 | Z2 | s1 | kg/pc. |
|---|---|---|---|---|---|---|---|---|---|
| 110 | 2372 | 87,5° | 115 | 129 | 134 | 69 | 65 | 3,8 | 0,48 |

## POLO-KAL NG
## WC branch PKGA
87,5°
with seal




| DN/OD | Art. No. | Alpha | Di | L | t | Z1 | Z2 | Z3 | s1 | DN/OD2 | kg/pc. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 110 | 2373 | 87,5° | 115 | 135 | 105 | 39 | 38 | 62 | 3,8 | 50 | 0,43 |

## POLO-KAL NG
## WC seal PKGD




| DN/OD | DN/OD2 | Art. No. | DA | L | kg/pc. |
|---|---|---|---|---|---|
| 110 | 100 | 2376 | 126 | 46 | 0,07 |

Subject to technical alterations

Dimensions in mm

**POLO-KAL NG**
**Shift-on ventilating pipe PKDH**

| DN/OD | Art. No. | L1 | L | kg/pc. |
|---|---|---|---|---|
| 110 | 2384 | variabel | 775 | 1,12 |
| 125 | 2385 | variabel | 1063 | 1,85 |
| 160 | 2386 | variabel | 1175 | 3,28 |

**POLO-KAL NG**
**Flexible connection for ventilating pipe PKDAR**
with factory-fitted lip ring

| DN/OD | Art. No. | D | t | L | kg/pc. |
|---|---|---|---|---|---|
| 110 | 2390 | 125 | 68 | 415 | 0,75 |

**POLO-KAL NG**
**Replacement lip ring PKLI**


| DN/OD | Art. No. | kg/pc. |
|---|---|---|
| 32 | 2930 | 0,02 |
| 40 | 2931 | 0,05 |
| 50 | 2932 | 0,06 |
| 75 | 2933 | 0,01 |
| 90 | 2929 | 0,14 |
| 110 | 2934 | 0,19 |
| 125 | 2935 | 0,20 |
| 160 | 2936 | 0,46 |
| 200 | 2937 | 0,73 |
| 250 | 2938 | 0,18 |

**POLO-KAL NG**
**NBR lip ring PKNL**


| DN/OD | Art. No. | kg/pc. |
|---|---|---|
| 50 | 0149 | 0,01 |
| 75 | 0150 | 0,01 |
| 90 | 0151 | 0,01 |
| 110 | 0152 | 0,01 |
| 125 | 0153 | 0,03 |
| 160 | 0154 | 0,05 |
| 200 | 0155 | 0,07 |
| 250 | 0156 | 0,18 |

**POLO-KAL NG**
**Double replacement lip ring PKDL**


| DN/OD | Art. No. | kg/pc. |
|---|---|---|
| 40 | 2940 | 0,01 |
| 50 | 2941 | 0,01 |
| 75 | 2942 | 0,01 |
| 90 | 2946 | 0,01 |
| 110 | 2943 | 0,02 |
| 125 | 2944 | 0,03 |
| 160 | 2945 | 0,04 |
| 200 | 2947 | 0,07 |

Subject to technical alterations

# 2.3_POLO-KAL 3S



## 2.3.1 TECHNICAL DATA

**Material** > Pipe: PP–H / PP–MV / PP–C
> Fitting: PP–C–MV
(free of halogen)

**Colour** > light grey RAL 7035 (free of halogen and cadmium)

**Resistance to hot water** > Short-term 97°C 30 sec/day = 152 h/50 years
**50 years of service life** > Long-term 95°C 10 min/day = 3000 h/50 years
> Permanent load 60°C 5h/day = 87.600 h/50 years

**Application class** > B (building)

**Pipe marking** > Above-ground drainage pipes of POLO-KAL 3S denomination are marked in the following way: charge number, year and week of manufacture, company name, dimension and check marking.

**Chemical resistance** > Pipes and fittings made of PP - according to DIN 8078, supplement 1
Seals made of SBR - according to ISO TR7620

**Connections** > Push-fit sockets with factory-inserted lip seals.
Seal material = SBR

**Fire protection** > The pipe and joint programme meets the requirements of the

| | |
|---|---|
| fire classification | B2 normal inflammability, |
| smoke development category | Q2 normal smoke development, |
| drip formation category | TR1 no drip formation, |

according to ÖNORM B 3800 and DIN 4102, Part 1, respectively.

**Fire behaviour** > according to EN 13501-1 : D – s2, d1

**Ring rigidity** > The ring rigidity value of POLO-KAL 3S pipes is above 4.0 kN/m2.

**E-Modulus** > 1000 MPA according to ISO 178

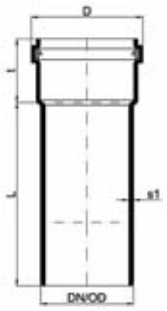
**Mean coefficient of elongation LAK** > 0,09 mm/m°K
(OFI test report 47.423)

**Third-party monitoring of product quality** > POLO-KAL 3S pipes and fittings have been third-party monitored by authorised German and Austrian plastics testing institutes.

## 2.3.2 PRODUCT RANGE

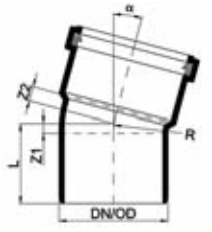
Dimensions in mm

**POLO-KAL 3S**
**Socket pipe PKSEM**
with factory-fitted lip ring




| DN/OD | Art. No. | L | s1-min | t-min | D-max | kg/pc. |
|---|---|---|---|---|---|---|
| 75 | 2420 | 150 | 3,8 | 52 | 91 | 0,27 |
| 75 | 2421 | 250 | 3,8 | 52 | 91 | 0,39 |
| 75 | 2422 | 500 | 3,8 | 52 | 91 | 0,64 |
| 75 | 2423 | 1000 | 3,8 | 52 | 91 | 1,28 |
| 75 | 2424 | 1500 | 3,8 | 52 | 91 | 1,90 |
| 75 | 2425 | 2000 | 3,8 | 52 | 91 | 2,47 |
| 75 | 2426 | 3000 | 3,8 | 52 | 91 | 3,65 |
| 90 | 2410 | 150 | 4,5 | 54 | 107 | 0,41 |
| 90 | 2411 | 250 | 4,5 | 54 | 107 | 0,54 |
| 90 | 2412 | 500 | 4,5 | 54 | 107 | 0,95 |
| 90 | 2413 | 1000 | 4,5 | 54 | 107 | 1,81 |
| 90 | 2414 | 1500 | 4,5 | 54 | 107 | 2,71 |
| 90 | 2415 | 2000 | 4,5 | 54 | 107 | 3,35 |
| 90 | 2416 | 3000 | 4,5 | 54 | 107 | 4,81 |
| 110 | 2430 | 150 | 4,8 | 59 | 129 | 0,54 |
| 110 | 2431 | 250 | 4,8 | 59 | 129 | 0,76 |
| 110 | 2432 | 500 | 4,8 | 59 | 129 | 1,30 |
| 110 | 2433 | 1000 | 4,8 | 59 | 129 | 2,42 |
| 110 | 2434 | 1500 | 4,8 | 59 | 129 | 3,43 |
| 110 | 2435 | 2000 | 4,8 | 59 | 129 | 4,58 |
| 110 | 2436 | 3000 | 4,8 | 59 | 129 | 6,74 |
| 125 | 2470 | 150 | 5,3 | 63 | 148 | 0,70 |
| 125 | 2471 | 250 | 5,3 | 63 | 148 | 0,93 |
| 125 | 2472 | 500 | 5,3 | 63 | 148 | 1,70 |
| 125 | 2473 | 1000 | 5,3 | 63 | 148 | 3,19 |
| 125 | 2474 | 1500 | 5,3 | 63 | 148 | 4,62 |
| 125 | 2475 | 2000 | 5,3 | 63 | 148 | 6,10 |
| 125 | 2476 | 3000 | 5,3 | 63 | 148 | 9,00 |
| 160 | 2450 | 150 | 7,5 | 70 | 187 | 1,25 |
| 160 | 2451 | 250 | 7,5 | 70 | 187 | 1,77 |
| 160 | 2452 | 500 | 7,5 | 70 | 187 | 3,08 |
| 160 | 2453 | 1000 | 7,5 | 70 | 187 | 5,48 |
| 160 | 2454 | 1500 | 7,5 | 70 | 187 | 7,99 |
| 160 | 2455 | 2000 | 7,5 | 70 | 187 | 10,60 |
| 160 | 2456 | 3000 | 7,5 | 70 | 187 | 15,72 |

**POLO-KAL 3S**
**Bend PKSB**
with factory-fitted lip ring

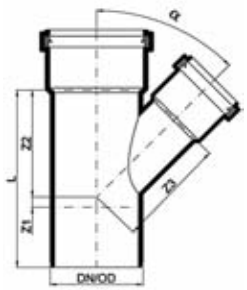



| | DN/OD | Art. No. | Z1 | Z2 | R | L | kg/pc. |
|---|---|---|---|---|---|---|---|
| 15° | 75 | 2520 | 7 | 10 | 46 | 55 | 0,26 |
| | 90 | 2526 | 20 | 13 | - | 71 | 0,36 |
| | 110 | 2530 | 9 | 11 | 57 | 64 | 0,48 |
| | 125 | 2560 | 11 | 13 | 90 | 85 | 0,48 |
| | 160 | 2550 | 13 | 16 | 115 | 98 | 0,87 |
| 30° | 75 | 2521 | 13 | 16 | 46 | 62 | 0,28 |
| | 90 | 2527 | 26 | 18 | - | 77 | 0,38 |
| | 110 | 2531 | 17 | 19 | 57 | 72 | 0,52 |
| | 125 | 2561 | 19 | 22 | 90 | 92 | 0,51 |
| | 160 | 2551 | 22 | 26 | 115 | 108 | 0,94 |
| 45° | 75 | 2522 | 19 | 23 | 46 | 68 | 0,30 |
| | 90 | 2528 | 31 | 25 | - | 82 | 0,41 |
| | 110 | 2532 | 25 | 27 | 57 | 72 | 0,59 |
| | 125 | 2562 | 30 | 31 | 90 | 104 | 0,57 |
| | 160 | 2552 | 37 | 41 | 115 | 122 | 1,30 |
| 67,5° | 75 | 2523 | 31 | 34 | 46 | 80 | 0,34 |
| | 110 | 2533 | 40 | 41 | 57 | 96 | 0,65 |
| 87,5° | 75 | 2525 | 44 | 48 | 46 | 93 | 0,37 |
| | 90 | 2529 | 58 | 49 | - | 109 | 0,51 |
| | 110 | 2535 | 56 | 58 | 57 | 111 | 0,63 |
| | 125 | 2565 | 64 | 67 | 90 | 138 | 0,68 |
| | 160 | 2555 | 84 | 87 | 115 | 169 | 1,35 |

* DN/OD according to European standardisation CEN/TC 155: Dimension Nominal / Outside Diameter
**The current version of MEP specification (LB-HT), dated 7th April 2005 (http://www.bmwa.gv.at/BMWA/Service/Bauservice/default.htm), assigns highly sound insulating (LG 66.07) and sound insulating (LG 66.06) domestic waste disposal pipes to the waste-water systems group (LG) 66. For your information we state the respective LB-HT numbers together with the product names.
Subject to technical alterations

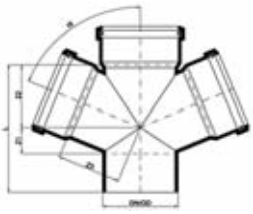
Dimensions in mm

## POLO-KAL 3S
## Branch PKSA
with factory-fitted lip ring



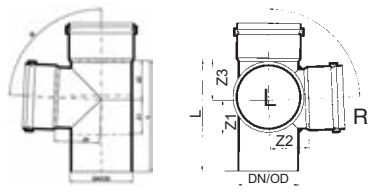

| | DN/OD | Art. No. | Z1 | Z2 | Z3 | L | kg/pc. |
|---|---|---|---|---|---|---|---|
| 45° | 75/50 | 2643 | 8 | 87 | 89 | 144 | 0,54 |
| | 75/75 | 2606 | 20 | 106 | 104 | 175 | 0,67 |
| | 90/50 | 2644 | 5 | 93 | 98 | 149 | 0,60 |
| | 90/75 | 2605 | 53 | 149 | 152 | 256 | 0,72 |
| | 90/90 | 2607 | 33 | 123 | 123 | 207 | 0,93 |
| | 110/50 | 2646 | -7 | 106 | 116 | 154 | 0,83 |
| | 110/75 | 2649 | 14 | 123 | 128 | 192 | 1,02 |
| | 110/90 | 2653 | 28 | 165 | 171 | 253 | 0,99 |
| | 110/110 | 2609 | 25 | 149 | 148 | 229 | 1,35 |
| | 125/110 | 2568 | 30 | 163 | 167 | 267 | 1,12 |
| | 125/125 | 2566 | 29 | 165 | 164 | 268 | 1,27 |
| | 160/110 | 2657 | 0,3 | 176 | 198 | 262 | 1,66 |
| | 160/160 | 2615 | 33 | 214 | 211 | 332 | 2,41 |
| 67,5° | 110/50 | 2647 | 20 | 60 | 79 | 135 | 0,78 |
| | 110/75 | 2650 | 35 | 74 | 83 | 164 | 0,03 |
| | 110/110 | 2610 | 40 | 92 | 95 | 188 | 1,05 |
| 87,5° | 75/50 | 2645 | 30 | 35 | 44 | 114 | 0,44 |
| | 75/75 | 2608 | 44 | 48 | 48 | 141 | 0,51 |
| | 90/50 | 2603 | 59 | 55 | 74 | 165 | 0,85 |
| | 90/75 | 2604 | 66 | 69 | 74 | 189 | 0,57 |
| | 90/90 | 2613 | 59 | 55 | 56 | 165 | 0,72 |
| | 110/50 | 2648 | 43 | 38 | 69 | 137 | 0,73 |
| | 110/75 | 2651 | 56 | 51 | 69 | 162 | 0,84 |
| | 110/90 | 2652 | 114 | 77 | 86 | 201 | 0,79 |
| | 110/110 | 2611 | 70 | 66 | 67 | 191 | 1,07 |
| | 125/110 | 2569 | 66 | 76 | 86 | 216 | 0,92 |
| | 125/125 | 2567 | 62 | 80 | 75 | 216 | 0,99 |
| | 160/110 | 2659 | 83 | 92 | 115 | 261 | 1,59 |
| | 160/160 | 2660 | 107 | 133 | 124 | 310 | 2,68 |

## POLO-KAL 3S
## Double branch PKSDA
67,5°/180°
with factory-fitted lip ring



| DN/OD | Art. No. | Z1 | Z2 | Z3 | L | kg/pc. |
|---|---|---|---|---|---|---|
| 110/110/110 | 2513 | 38 | 91 | 93 | 186 | 1,40 |

## POLO-KAL 3S
## Double corner branch PKSEDA
87,5°/90°
with factory-fitted lip ring

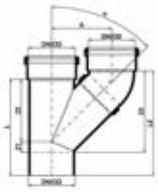



| DN/OD | Art. No. | Z1 | Z2 | Z3 | Z4 | L | kg/pc. |
|---|---|---|---|---|---|---|---|
| 110/110/110 | 2674 | 70 | 66 | 67 | 86 | 191 | 1,26 |

Subject to technical alterations

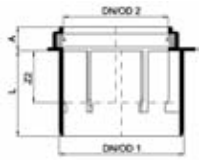
Dimensions in mm

## POLO-KAL 3S
### Parallel branch PKSPA
with factory-fitted lip ring



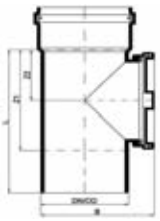
| DN/OD | Art. No. | L | L2 | Z1 | Z2 | Z3 | A | kg/pc. |
|---|---|---|---|---|---|---|---|---|
| 110 | 2684 | 229 | 249 | 25 | 149 | 194 | 142 | 1,57 |

## POLO-KAL 3S
### Connection pipe PKSR
with factory-fitted lip ring



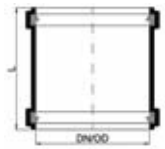
| DN/OD1 | DN/OD2 | Art. No. | Z1 | Z2 | A | L | kg/pc. |
|---|---|---|---|---|---|---|---|
| 75 | 50 | 2738 | 23 | - | - | 75 | 0,24 |
| 90 | 50 | 2739 | - | 32 | - | 66 | 0,15 |
| 90 | 75 | 2740 | - | 37 | - | 61 | 0,13 |
| 110 | 50 | 2742 | 41 | - | - | 100 | 0,38 |
| 110 | 75 | 2743 | 26 | - | - | 84 | 0,40 |
| 110 | 90 | 2741 | 40 | - | 20 | 66 | 0,20 |
| 125 | 110 | 2570 | 30 | - | - | 92 | 0,40 |
| 160 | 110 | 2745 | 70 | - | - | 140 | 0,66 |
| 160 | 125 | 2747 | 44 | - | - | 114 | 0,70 |

## POLO-KAL 3S
### Cleaning pipe PKSRE
with factory-fitted lip ring
pressure-sealed up to 0,5 Bar



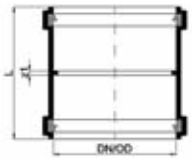
| DN/OD | Art. No. | L | Z1 | Z2 | B | kg/pc. |
|---|---|---|---|---|---|---|
| 75 | 2766 | 156 | 100 | 52 | 96 | 0,33 |
| 90 | 2772 | 150 | 93 | 45 | 139 | 0,82 |
| 110 | 2773 | 199 | 139 | 71 | 142 | 1,12 |
| 125 | 2559 | 252 | 190 | 90 | 167 | 1,03 |
| 160 | 2782 | 255 | 185 | 100 | 212 | 1,69 |

## POLO-KAL 3S
### Sleeve socket PKSU
with factory-fitted O-ring seals



| DN/OD | Art. No. | L | kg/pc. |
|---|---|---|---|
| 75 | 2712 | 110 | 0,26 |
| 90 | 2716 | 127 | 0,22 |
| 110 | 2713 | 120 | 0,50 |
| 125 | 2571 | 158 | 0,51 |
| 160 | 2715 | 181 | 0,87 |

## POLO-KAL 3S
### Double socket PKSD
with factory-fitted DD ring

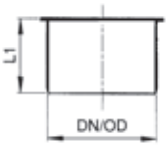


| DN/OD | Art. No. | Z1 | L | kg/pc. |
|---|---|---|---|---|
| 75 | 2722 | 3 | 110 | 0,28 |
| 110 | 2723 | 4 | 120 | 0,50 |

Subject to technical alterations

Dimensions in mm

**POLO-KAL 3S**
**Socket plug PKM**




| DN/OD | Art. No. | L | kg/pc. |
|---|---|---|---|
| 50 | 2322 | 44 | 0,02 |
| 75 | 2323 | 51 | 0,60 |
| 90 | 2327 | 55 | 0,09 |
| 110 | 2324 | 62 | 0,14 |
| 125 | 2325 | 81 | 0,19 |
| 160 | 2326 | 92 | 0,36 |
| 200 | 2990 | 122 | 0,85 |
| 250 | 2991 | 110 | 1,36 |

For special components refer to POLO-KAL NG

**POLO-KAL 3S**
**Replacement lip ring**
**PKSLI**


| DN/OD | Art. No. | kg/pc. |
|---|---|---|
| 50 | 2932 | 0,06 |
| 75 | 2933 | 0,01 |
| 90 | 2929 | 0,14 |
| 110 | 2934 | 0,19 |
| 125 | 2935 | 0,20 |
| 160 | 2936 | 0,46 |

**POLO-KAL 3S**
**NBR-lip rings**


| DN/OD | Art. No. | kg/pc. |
|---|---|---|
| 50 | 0149 | 0,01 |
| 75 | 0150 | 0,01 |
| 90 | 0151 | 0,01 |
| 110 | 0152 | 0,02 |
| 125 | 0153 | 0,03 |
| 160 | 0154 | 0,05 |
| 200 | 0155 | 0,07 |
| 250 | 0156 | 0,18 |

**POLO-KAL 3S**
**Double replacement lip rings PKDL**


| DN/OD | Art. No. | kg/pc. |
|---|---|---|
| 75 | 2942 | 0,01 |
| 90 | 2946 | 0,01 |
| 110 | 2943 | 0,02 |
| 125 | 2944 | 0,03 |
| 160 | 2945 | 0,04 |
| 200 | 2947 | 0,07 |

Subject to technical alterations

# 2.4_CONNECTIONS TO OTHER PIPE MATERIALS

> Use the specially developed transition fittings to connect POLO-KAL NG pipes to pipe elements made of other materials.

**Sealing range for spigot ends of cast-iron and fibre-cement pipes:**

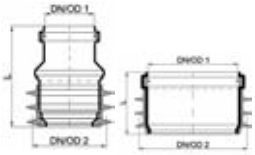
**DN/OD 50 from 58 - 67 mm**
**DN/OD 75 from 78 - 86 mm**
**DN/OD 110 from 110 - 116 mm**
**DN/OD 125 from 135 - 142 mm**
**DN/OD 160 from 160 - 172 mm**

**NOTE: Make sure to fit the pipe elements free from distortion. The floating-ring seal should be evenly pressed. When laid free from distortion, the transition fittings are leakproof up to 0.3 bar.**

## CONNECTION TO FIBRE-CEMENT PIPES

Dimensions in mm

Typ a) Typ b)

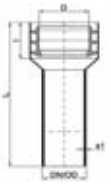



Connection from **POLO-KAL NG spigot end** to **fibre-cement socket PKUMAG**

| DN/OD1 | DN/OD2 | Art. No. | Typ | L | kg/pc. |
|---|---|---|---|---|---|
| 50 | fibre-cement socket | 2860 | a) | 98 | 0,09 |
| 75 | fibre-cement socket | 2861 | b) | 63 | 0,14 |
| 110 | fibre-cement socket | 2862 | b) | 76 | 0,24 |
| 125 | fibre-cement socket | 2863 | b) | 88 | 0,46 |
| 160 | fibre-cement socket | 2864 | b) | 98 | 0,53 |


Connection from **POLO-KAL NG spigot end** to **fibre-cement spigot end PKUSAG**

| DN/OD | Art. No. | D | L | t1 | t2 | kg/pc. |
|---|---|---|---|---|---|---|
| 50 | 2870 | cast iron spigot end | 148 | 47 | 49 | 0,11 |
| 75 | 2871 | cast iron spigot end | 178 | 53 | 74 | 0,22 |
| 110 | 2872 | cast iron spigot end | 194 | 66 | 70 | 0,41 |
| 125 | 2873 | cast iron spigot end | 208 | 69 | 73 | 0,63 |
| 160 | 2874 | cast iron spigot end | 216 | 77 | 78 | 0,88 |



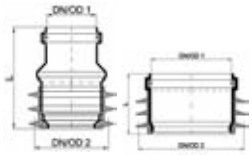

Connection with long spigot end from **fibre-cement spigot end** to **POLO-KAL NG socket PKULSAG**

| DN/OD | Art. No. | D | L | t | s1 | kg/pc. |
|---|---|---|---|---|---|---|
| 50 | 2850 | fibre-cement spigot end | 194 | 49 | 2,2 | 0,11 |
| 75 | 2851 | fibre-cement spigot end | 202 | 54 | 2,2 | 0,22 |
| 110 | 2852 | fibre-cement spigot end | 263 | 70 | 3,0 | 0,47 |
| 125 | 2853 | fibre-cement spigot end | 312 | 74 | 4,0 | 0,75 |
| 160 | 2854 | fibre-cement spigot end | 355 | 76 | 5,5 | 0,16 |

# CONNECTION TO CAST-IRON PIPES

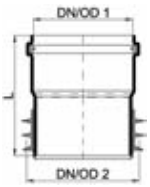
Dimensions in mm

Typ a) Typ b)



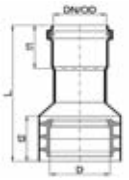

Connection from **POLO-KAL NG spigot end** to **cast iron socket PKUMAG**

| DN/OD1 | DN/OD2 | Art. No. | L | Typ | kg/pc. |
|---|---|---|---|---|---|
| 50 | cast-iron socket | 2860 | 98 | a) | 0,09 |
| 75 | cast-iron socket | 2861 | 63 | b) | 0,14 |
| 125 | cast-iron socket | 2863 | 88 | b) | 0,46 |
| | | | | | |
| | | | | | |
| | | | | | |



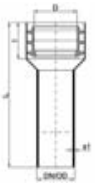

Connection from **POLO-KAL NG spigot end** to **cast iron socket PKUMG**

| DN/OD1 | DN/OD2 | Art. No. | L | kg/pc. |
|---|---|---|---|---|
| 110 | cast-iron socket | 2865 | 135 | 0,32 |
| 160 | cast-iron socket | 2867 | 165 | 0,73 |
| | | | | |
| | | | | |
| | | | | |




Connection from **POLO-KAL NG spigot end** to **cast iron spigot end PKUSAG**

| DN/OD | Art. No. | D | L | t1 | t2 | kg/pc. |
|---|---|---|---|---|---|---|
| 50 | 2870 | cast-iron spigot end | 148 | 47 | 49 | 0,11 |
| 75 | 2871 | cast-iron spigot end | 178 | 53 | 74 | 0,22 |
| 110 | 2872 | cast-iron spigot end | 194 | 66 | 70 | 0,41 |
| 125 | 2873 | cast-iron spigot end | 208 | 69 | 73 | 0,63 |
| 160 | 2874 | cast-iron spigot end | 216 | 77 | 78 | 0,88 |



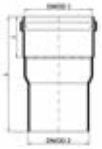

Connection with long spigot end from **cast iron spigot end** to **POLO-KAL NG socket PKULSAG**

| DN/OD | Art. No. | L | t | s1 | D | kg/pc. |
|---|---|---|---|---|---|---|
| 50 | 2850 | 194 | 49 | 2,2 | cast-iron spigot end | 0,11 |
| 75 | 2851 | 202 | 54 | 2,2 | cast-iron spigot end | 0,22 |
| 110 | 2852 | 263 | 70 | 3,0 | cast-iron spigot end | 0,47 |
| 125 | 2853 | 312 | 74 | 4,0 | cast-iron spigot end | 0,75 |
| 160 | 2854 | 355 | 76 | 5,5 | cast-iron spigot end | 1,16 |

Subject to technical alterations

## CONNECTION TO POLO-KAL PIPES „GENERATION BEFORE 1960"

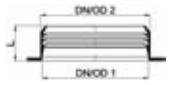
Dimensions in mm



Connection from
**POLO-KAL NG spigot end**
to
**POLO-KAL NG socket „Generation before 1960" PKUMA**

| DN/OD1 | DN/OD2 | Art. No. | L | t | kg/pc. |
|---|---|---|---|---|---|
| 50 | POLO-KAL spigot end before 1960 | 2880 | 114 | 47 | 0,05 |
| 110 | POLO-KAL spigot end before 1960 | 2881 | 190 | 67 | 0,25 |
| | | | | | |
| | | | | | |

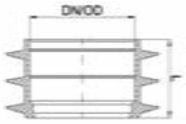
## RENOVATION AND TRANSITION FITTINGS




Connection from
**POLO-KAL NG socket**
to
**DN 100 spigot end**

| DN/OD1 | DN/OD2 | Art. No. | L | kg/pc. |
|---|---|---|---|---|
| 100 | 110 | 2389 | 34 | 0,09 |
| | | | | |
| | | | | |
| | | | | |

## REPLACEMENT SEALS

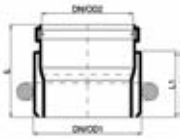



Seal for connection to fibre cement or cast iron pipes
**colour: black**
**PKUDGA**

| DN/OD | Art. No. | L | kg/pc. |
|---|---|---|---|
| 50 | 2890 | 41 | 0,05 |
| 75 | 2891 | 43 | 0,07 |
| 110 | 2892 | 58 | 0,09 |
| 125 | 2893 (*) | 64 | 0,20 |
| 125 | 2895 (**) | 64 | 0,18 |
| 160 | 2894 | 70 | 0,16 |

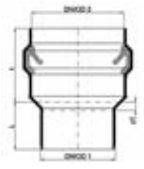
*) to be slipped on outer diameters from 135 to 142 mm
**) to be slipped on outer diameters from 125 – 130 mm ("old" generation)

## CONNECTION TO STONEWARE



Connection from
**POLO-KAL NG**
to
**stoneware sockets with roll ring**
**PKUSM**

| DN/OD1 | DN/OD2 | Art. No. | L | L1 | kg/pc. |
|---|---|---|---|---|---|
| Stoneware socket | 110 | 1720 | 106 | 75 | 0,45 |
| Stoneware socket | 125 | 1721 | 108 | 75 | 0,62 |
| Stoneware socket | 160 | 1722 | 112 | 75 | 0,87 |
| Stoneware socket | 200 | 1723 | 244 | 75 | 2,33 |
| | | | | | |
| | | | | | |
| | | | | | |



Connection from
**stoneware spigot end**
to
**POLO-KAL NG with profile ring**
**PKUS**

| DN/OD1 | DN/OD2 | Art. No. | L | t | Z1 | kg/pc. |
|---|---|---|---|---|---|---|
| Stoneware spigot end | 110 | 1725 | 70 | 107 | 12 | 0,48 |
| Stoneware spigot end | 125 | 1726 | 81 | 127 | 16 | 0,75 |
| Stoneware spigot end | 160 | 1727 | 94 | 142 | 17 | 1,29 |
| Stoneware spigot end | 200 | 1728 | 159 | 166 | 37 | 2,34 |
| | | | | | | |
| | | | | | | |
| | | | | | | |

Subject to technical alterations

# 2.5_PIPE FASTENING ELEMENTS



## 2.5.1 POLO-CLIP HS

### 2.5.1.1 PRODUCT RANGE

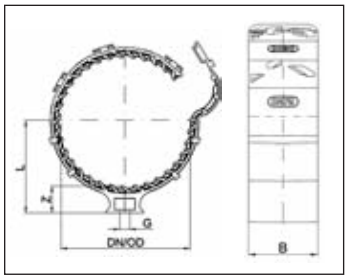



**FIGURE 1)**
Dimensions

Dimensions in mm

| for DN/OD | Art-No. | L | G | B | kg/pc. |
|---|---|---|---|---|---|
| 75 | 1851 | 78 | M8 | 50 | 0,10 |
| 90 | 1851 | 78 | M8 | 50 | 0,10 |
| 110 | 1851 | 78 | M8 | 50 | 0,10 |
| 75 | 1854 | 78 | M10 | 50 | 0,12 |
| 90 | 1854 | 78 | M10 | 50 | 0,12 |
| 110 | 1854 | 78 | M10 | 50 | 0,12 |

Material: polypropylene (PP)

### 2.5.1.2 Maximum working load in case of ceiling mounting

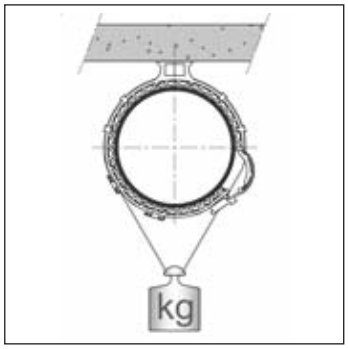



**FIGURE 2)**
Test setup for ceiling load determination

| for DN/OD | max. pipe weight*) kg/m | max. working load of the clip, kg |
|---|---|---|
| 75 | 4,42 | 90 |
| 90 | 7,46 | 90 |
| 110 | 9,50 | 90 |

*) dead weight of the pipe filled with water per running meter

### 2.5.1.3 Maximum working load in case of horizontal wall mounting

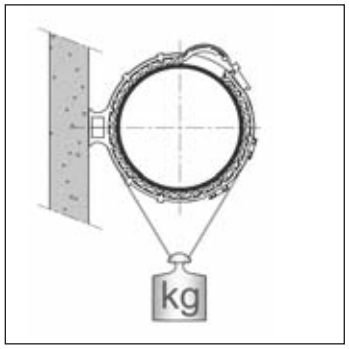



**FIGURE 3)**
Cross load determination

| for DN/OD | max. pipe weight*) kg/m | max. working load of the clip, kg |
|---|---|---|
| 75 | 4,42 | 60 |
| 90 | 7,46 | 60 |
| 110 | 9,50 | 60 |

*) dead weight of the pipe filled with water per running meter

Subject to technical alterations

## 2.5.2 POLO-CLIP

### 2.5.2.1 PRODUCT RANGE

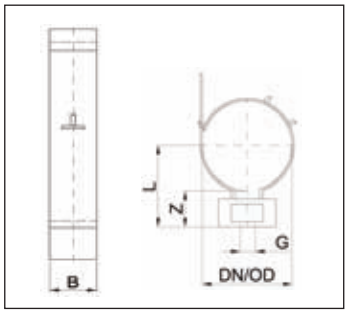



**FIGURE 4)**
Dimensions

Dimensions in mm

| for DN/OD | Art. No. | L | G | B | Z | kg/pc. |
|---|---|---|---|---|---|---|
| 32 | 1810 | 35 | M10 | 25 | 19 | 0,02 |
| 40 | 1810 | 35 | M10 | 25 | 19 | 0,02 |
| 50 | 1810 | 35 | M10 | 25 | 19 | 0,02 |
| 75 | 1815 | 61 | M10 | 25 | 23 | 0,04 |
| 110 | 1815 | 61 | M10 | 25 | 23 | 0,04 |
| 125 | 1819 | 86 | M10 | 25 | 24 | 0,07 |
| 135 | 1819 | 86 | M10 | 25 | 24 | 0,07 |
| 160 | 1819 | 86 | M10 | 25 | 24 | 0,07 |

Material: polypropylene (PP)

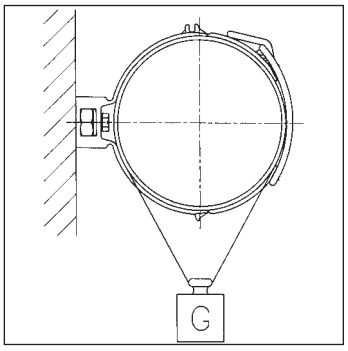
### 2.5.2.2 Maximum working load in case of ceiling mounting

**FIGURE 5)**
Tensile testing device for ceiling load determination

| for DN/OD | max. pipe weight*) kg/m | max. working load of the clip, kg |
|---|---|---|
| 32 | 0,81 | 30 |
| 40 | 1,28 | 30 |
| 50 | 1,96 | 30 |
| 75 | 4,42 | 60 |
| 110 | 9,50 | 60 |
| 125 | 12,27 | 120 |
| 160 | 20,11 | 120 |
| | | |

*) dead weight of the pipe filled with water per running meter

### 2.5.2.3 Maximum working load in case of horizontal wall mounting




**(FIGURE 6)**
Cross load determination

| for DN/OD | max. pipe weight*) kg/m | max. working load of the clip, kg |
|---|---|---|
| 32 | 0,81 | 20 |
| 40 | 1,28 | 20 |
| 50 | 1,96 | 20 |
| 75 | 4,42 | 50 |
| 110 | 9,50 | 50 |
| 125 | 12,27 | 100 |
| 160 | 20,11 | 100 |
| | | |

*) dead weight of the pipe filled with water per running meter

# 2.6_FIRE PROTECTIVE COLLAR



## 2.6.I POLO-BSM

### 2.6.2.1 Field of application

POLO-BSM fire protective collars, Intumex RS 10 system, tested to resist 90 minutes of fire (F90), can be used with the following above-ground drainage pipes made of plastics in the fire resistance category B1 and B2:

> **above ground drainage systems**

**_POLO-KAL NG** of DN/OD 50 - 250 mm

**_POLO-KAL 3S** of DN/OD 75 - 160 mm

**_PP–HT** and **PE** of DN/OD 50 - 160 mm

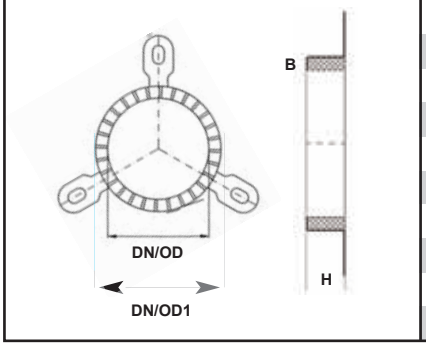
> **Sewage**

**_PVC** of DN/OD 110 - 200 mm

### 2.6.1.2 Sortiment

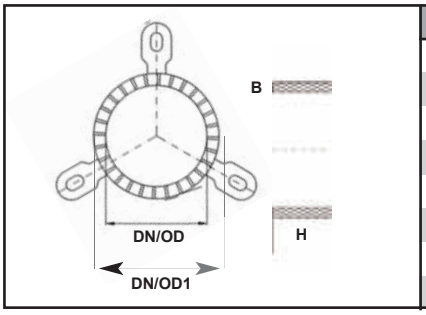
### Fitting on straight pipes

Dimensions in mm



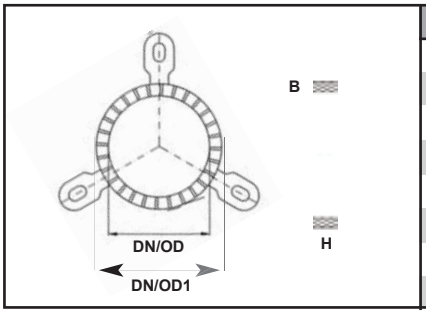

| DN/OD | Art. No. | DN/OD1 | H | B | kg./pc. |
|---|---|---|---|---|---|
| 32 | 2813 | 52 | 32 | 6,0 | 0,05 |
| 40 | 2814 | 65 | 32 | 8,5 | 0,07 |
| 50 | 2815 | 74 | 32 | 8,5 | 0,09 |
| 75 | 2818 | 107 | 32 | 11,0 | 0,14 |
| 90 | 2819 | 120 | 32 | 11,0 | 0,21 |
| 110 | 2820 | 142 | 32 | 11,0 | 0,23 |
| 125 | 2821 | 157 | 32 | 11,0 | 0,26 |
| 160 | 2822 | 200 | 32 | 15,0 | 0,43 |
| 200 | 2823 | 240 | 62 | 15,0 | 0,95 |
| 250 | 2824 | 320 | 62 | 29,0 | 1,82 |

### Fitting over the socket




| DN/OD | Art. No. | DN/OD1 | H | B | kg./pc. |
|---|---|---|---|---|---|
| 50 M | 2802 | 107 | 62 | 11,0 | 0,20 |
| 75 M | 2807 | 120 | 62 | 11,0 | 0,38 |
| 90 M | 2808 | 142 | 62 | 11,0 | 0,44 |
| 110 M | 2809 | 157 | 62 | 11,0 | 0,48 |
| 125 M | 2810 | 180 | 62 | 15,0 | 0,81 |
| 160 M | 2823 | 240 | 62 | 15,0 | 0,95 |
| | | | | | |
| | | | | | |

### Diagonal fitting at 45°




| DN/OD | Art. No. | DN/OD1 | H | B | kg./pc. |
|---|---|---|---|---|---|
| 50 S | 2806 | 120 | 62 | 10 | 0,272 |
| 75 S | 2808 | 142 | 62 | 11 | 0,440 |
| 90 S | 2809 | 157 | 62 | 11 | 0,482 |
| 110 S | 2811 | 200 | 62 | 15 | 0,626 |
| 125 S | 2810 | 240 | 62 | 15 | 0,814 |
| | | | | | |
| | | | | | |
| | | | | | |

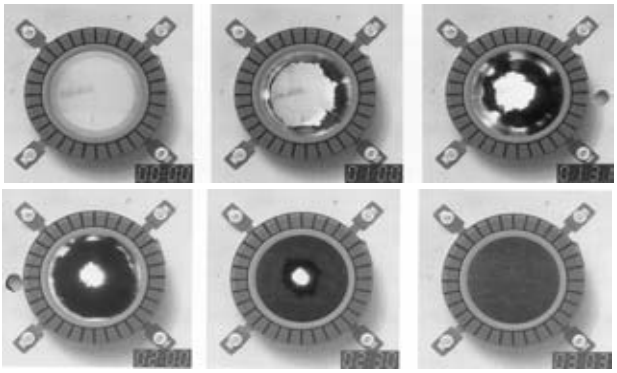
Subject to technical alterations

### 2.6.1.3 Description

In the case of fire and heat the plastic pipe becomes soft and deforms. At temperatures starting at 130°C the special fire protective laminate „INTUMEX L“ begins to expand to ten times its volume, provided that it is not restricted by the manner of construction.

Where expansion possibilities are limited, an expansion pressure of up to 10 bar results and ensures a reliable seal against fire and hot gas between the fire lobbies.

Within a few minutes the fire protective laminate fully squeezes the plastic pipe together and closes it completely. This makes it impossible for flames and smoke to spread across the pipe profile.



**(Figure 8)**
Fire test

### 2.6.1.4 Tests

POLO-BSM fire protective collar, Intumex RS10 system, for fire protection category F90, suitable for plastic above ground drainage systems of fire class B1 and B2.

- tested in Austria according to ÖNORM B 3800 and ÖNORM EN 1366-3, classified according to EN 13501-2 (ÖNORM B 3807)

- approved in Germany with the approval numbers: Z-19.17-1747 (Intumex) and Z-19.17-1716 (Promat).

# 2.7_EXTENSION-PROOF CONNETION



## 2.7.1 FIELD OF APPLICATION

The POLO-ASV extension-proof connection increases safety by providing a firmer grip in case the push-fit connections of the POLO-KAL NG domestic waste disposal system are exposed to extreme strain. POLO-ASV can be easily assembled and disassembled, allowing the extension protection of push-fit connections to be released if required.

**POLO-KAL NG can resist even increased strains with the POLO-ASV connection:**

**A) Maximum water impact as well as excess or low pressure acting from inside upon the push-fit connections**

**> The POLO-ASV connection of the dimensional range from DN/OD 32 to DN/OD 90 is suitable for use in water raising systems with maximum excess pressure of up to 2.5 (2.0) bar . (Water hammers have to be taken into account and in any event the equipment manufacturer or the planner must be consulted in advance).**
Conveying of sewage water into the sewer above the backwater level

**> In downpipes with a backwater level of up to 20 m**
During heavy rain, when the rain water is banked up in the pipe

**> In siphonic roof drainage systems**
For secure drainage of high rain yield through pipes of economical cross sections.

**B) Mechanical loads acting on the push-fit connection during construction or in the finished structure**

**> Backflow of waste water from the sewer**
In exposed downpipes or collectors in domestic waste disposal piping

**> In case of improper loading**
During plumbing repair work or in order to protect connecting pipes during construction

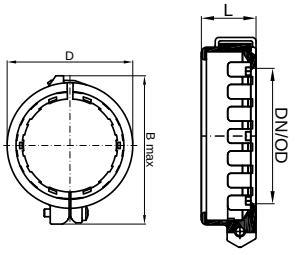
**> In exhaust-gas lines during assembly**
When the pipe is being threaded

**> In any events of increased strain**
As, e. g., in the area of bends

## 2.7.2 PRODUCT RANGE

Dimensions in mm

**POLO-ASV**




| DN/OD | Art. No. | L | D | B-max | admissible extension | admissible pressure | kg/pc. |
|---|---|---|---|---|---|---|---|
| 32 | 1750 | 20,50 | 49,50 | 62,80 | 100 | 2,5 | 0,03 |
| 40 | 1751 | 24,00 | 60,50 | 72,80 | 100 | 2,5 | 0,04 |
| 50 | 1752 | 28,40 | 76,40 | 92,00 | 100 | 2,5 | 0,05 |
| 75 | 1753 | 30,30 | 98,50 | 116,3 | 130 | 2,5 | 0,06 |
| 90 | 1754 | 31,60 | 115,20 | 131,5 | 130 | 2,0 | 0,07 |
| 110 | 1755 | 37,20 | 137,60 | 152,8 | 180 | 1,0 | 0,10 |
| 125 | 1756 | 38,50 | 157,80 | 196,00 | 440 | 2,0 | 0,18 |
| 160 | 1757 | 42,50 | 197,20 | 234,00 | 550 | 2,0 | 0,26 |
| 200 | 1758 | 66,90 | 242,50 | 281,00 | 650 | 1,5 | 0,50 |
| 250 | 1759 | 87,10 | 305,60 | 345,00 | 650 | 1,0 | 0,92 |

## 2.7.3 THE ADVANTAGES OF POLO-ASV:

> Strengthens the secure hold of the push-fit connection under increased strain and opens up new sphe res of use
> Increases safety under extreme load conditions
> Easy and fast to fit, at a reasonable price
> Easy assembly and disassembly
> Whenever necessary, the extension protection and thus also the pipe connection can be unfastened

Subject to technical alterations

## 2.7.4 HOW TO FIT POLO-ASV DA 32 - DA 250

**(FIGURE 9)**
Establish the push-fit connection between POLO-KAL NG and POLO-KAL NG (pipe or fitting)..

**(FIGURE 10)**
Before fitting the POLO-ASV over the socket, disassemble it.

**(FIGURE 11)**
Slide the POLO-ASV clip over the socket connection and fit it together making sure that the spike is hooked into the retaining end.

**(FIGURE 12)**
Then drive in the screw on the opposite side. **The maximum admissible tightening moment is 7 Nm.**

**(FIGURE 13)**
Clips with dimensions equalling da 125 or larger are equipped with 2 opposite screws which both must be driven in.
**The maximum admissible tightening moment is 7 Nm.**

**(FIGURE 14)**
The result: The extension-proof connection has been fitted.

## 2.7.5 CONNECTION TO RAISING SYSTEMS OR IMMERSION PUMPS

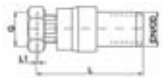
Backpressure in sewage systems can have numerous causes that are stated in detail in the EN 12056-4; these possible causes must be taken into consideration as early as at the stage of planning and installation of the plot drainage system in order to provide proper operation later on. The stipulations of the standard aim to prevent buildings and plots from being flooded. Measures preventing backpressure from the sewage system, such as waste-water raising plants or, under certain circumstances, antiflooding valves, need to be taken into consideration during planning.

Waste water that collects above the backpressure plane has to be gravity-drained into the sewage system. If no sufficient gradient to the sewage system exists, the waste water must be led into the sewage via waste-water raising systems; in this case laying requirements according to EN 12056-4 apply.

## 2.7.5.2 Product range

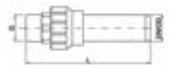
Dimensions in mm

**POLO-KAL NG**
**Adaptor union with internal screw thread**
with long spigot



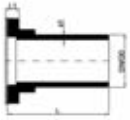
| DN/OD | Art. No. | G | L | L1 | kg/pc. |
|---|---|---|---|---|---|
| 32/1“ | 1732 | 1” | | | |
| 40/1 1/4“ | 1734 | 1 1/4“ | 125 | 2 | 0,32 |
| 50/1 1/2“ | 1737 | 1 1/2“ | 179 | 2 | 0,45 |

**POLO-KAL NG**
**Adaptor union with external screw thread**
with long spigot



| DN/OD | Art. No. | G | L | kg/pc. |
|---|---|---|---|---|
| 32/1“ | 1733 | 1” | | |
| 40/1 1/4“ | 1735 | 1 1/4“ | 188,5 | 0,446 |
| 50/1 1/2“ | 1736 | 1 1/2“ | | |

**POLO-KAL NG**
**Flange sleeve including seal**
with long spigot

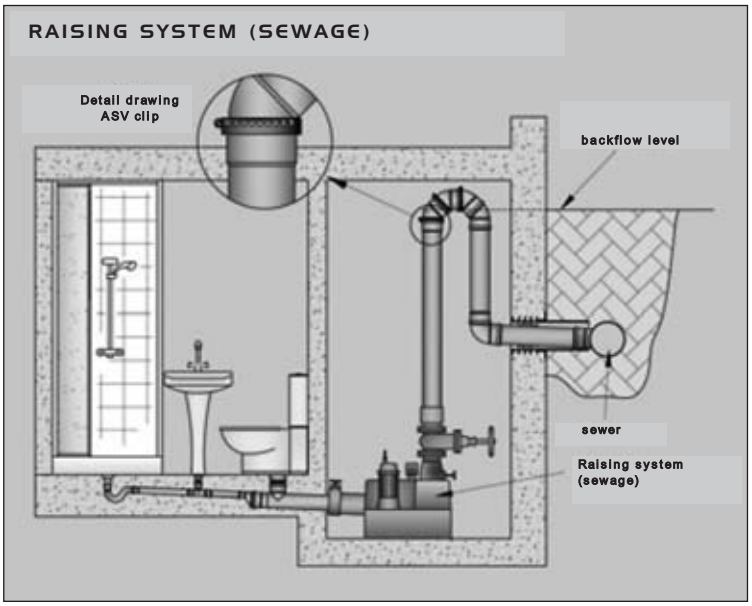


| DN/OD | Art. No. | L | L1 | s1 | kg/pc. |
|---|---|---|---|---|---|
| 75 | 1740 | 143,3 | 19 | 7,3 | 0,33 |
| 90 | 1742 | 146 | 19 | 8,7 | 0,46 |

**POLO-KAL NG**
**Lapped flange**

| DN/OD | Art. No. | DA | DI | LKR | D | B | kg/pc. |
|---|---|---|---|---|---|---|---|
| 75 | 1741 | 185 | 92 | 145 | 18 | 18,8 | 1,147 |
| 90 | 1743 | 202 | 106 | 160 | 18 | 19 | 1,2 |

## 2.7.5.3 Sketch of a raising system




**(FIGURE 15)**

POLO-ASV in connection with POLO-KAL NG is suitable to be used in raising systems, as well as for connections to pumps with dimensions up to DN/OD 90 mm. A vibration isolation device must be fitted in the transition area between the raising system or, respectively, the pump and the pipe. The pipe must be fastened according to the laying instructions with suitable pipe clamps. The use of POLO-ASV in no way makes up for expert fastening of the pipe.

Subject to technical alterations

# 3.1_GENERAL INFORMATION

Noise transmission can be air-borne or structure-borne. This leads to air-borne noise emission in the transmitter and/or receiver room, which good sound absorption intends to reduce to a minimum.

## 3.1.1 NOISE

Noise is an acoustic event that is usually perceived as a disturbance.

**The following factors decisively influence the extent of subjective noise perception:**
> the sound volume;
> the frequency (pitch);
> the activity of the sound receiver (e.g.,sleeping or working)
> his private attitude towards the source of noise (e.g. pleasant music).

Noise pollution can be measured **objectively** with the A-weighted sound level in decibel.

## 3.1.2 SOUND LEVELS

| | dB, A |
|---|---|
| Jet engine | 140 |
| Pop-concert | 120 |
| Construction site | 100 |
| Traffic, motorway | 90 |
| Office noise | 70 |
| Conference | 60 |
| Living space | 50 |
| Sleeping room | 25 |
| Forest | 15 |
| Minimum perceptible level | 0 |

## 3.1.3. SUPERPOSITION OF SOUND SOURCES

Any sound level that results from several superimposing sound sources must be determined logarithmically, not by linear addition.

**The following formula applies to a number n of different sound levels $L_1$, $L_2$, ... $L_n$:**

$$L_{ges} = 10 \cdot \log \left(10^{0,1 \cdot L_1} + 10^{0,1 \cdot L_2} + \ldots 10^{0,1 \cdot L_n}\right)$$

$$= 10 \cdot \log \sum_{i=1}^{n} 10^{\frac{Li}{10}}$$

| | |
|---|---|
| n | number of sound sources |
| $L_i$ | sound pressure level in dB |
| x | number of equal sound sources |
| L | sound pressure level in dB |

**The following formula applies to a number x of equal sources with a sound level L:**

$L_{ges} = L + 10 \cdot \log(x)$

| x number of equal sources of sound | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 100 | 1000 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10·log(x) increase in dB | 0 | 3 | 5 | 6 | 7 | 8 | 8 | 9 | 10 | 10 | 20 | 30 |

**Example:**
Two sources of sound with equal sound level lead to an increase of the sound level by +3dB.
70 dB + 70 dB amount to 73 dB!

**ATTENTION:**
At sound levels of approximately 15-30 dB, as they are usual in building engineering, an increase or reduction by 3 – 5 dB leads to double or half the sound impact.

## 3.I.4 PURPOSES OF SOUND PROTECTION

Sound protective measures in a building pursue the purpose of minimizing noise pollution in rooms. Occupants need to be protected from disturbing airborne and structure-borne sound. Architectural sound protection measures apply to buildings and those building elements where people spend longer time periods (offices, flats). Disturbing noise is mainly caused by noise sources within the building that directly (structure-borne noise) or indirectly (e. g. noise deriving from building engineering systems) give rise to noise.

## 3.I.5 SOUND PROTECTION AT THE STAGE OF PLANNING

Sound protection for buildings comprises all those planning measures that are suitable for attenuating sound that comes into the building from outside or develops within the building. Apart from the choice of location the situation of the individual rooms in the building, relative to one another, as well as to their surroundings, is also decisive for sound protection.

Rooms that need to be protected should be situated on the far side away from traffic, living and sleeping rooms should, as far as possible, be separated from stairways, lifts, etc., by corridors or side rooms. „Noisy“ rooms, such as kitchens, WC etc., should not be adjacent to living or sleeping rooms of other flats. And finally it should be the aim to avoid situating sleeping rooms above or below living rooms of other flats.

**In order to provide proper sound protection, several issues must be taken into consideration as early as at the stage of planning and constructing the building:**

> Choice of location of the building and its orientation.
> Layout design (bathroom, WC, kitchen, lifts relative to sleeping rooms)
> On either side of partition walls or ceilings that separate one flat from another it is advisable to locate rooms of similar use, e. g., kitchens next to / above kitchens; sleeping rooms next to / above sleeping rooms
> Choice of the type of partition walls, ceilings.
> Walls with sanitary installations should not be adjacent to sleeping rooms; if possible, such Sinstallations should be fitted in “pre-walls”.
> Sound isolation of water / waste water systems.
> Selection of building materials.
> Selection and installation of technical equipment (washing machines, ventilation systems etc.).

# 3.2_SOUND PROTECTION REGULATIONS FOR DOMESTIC WASTE WATER SYSTEMS

## 3.2.1 MINIMUM SOUND PROTECTION

Most countries have their own minimum requirements to sound insulation in structural engineering. If no specific regulations are available, other standards, such as, e. g., DIN 4109, can be used.

## 3.2.2 MINIMUM SOUND PROTECTION ACCORDING TO DIN 4109

DIN 4109 stipulates that the plumbing noise level lin be taken as the measurement for waste water systems. Common rooms need to be protected against noise. According to this standard these are:
> living rooms
> sleeping rooms, including sleeping rooms in hotels and wards in hospitals
> classrooms in schools
> office rooms, surgery rooms, conference rooms

Admissible sound level in rooms needing protection from noise caused by waste water piping: $_n$ ≤ 30 dB, (A)

**Stages of sound protection according to DIN 4109-10**

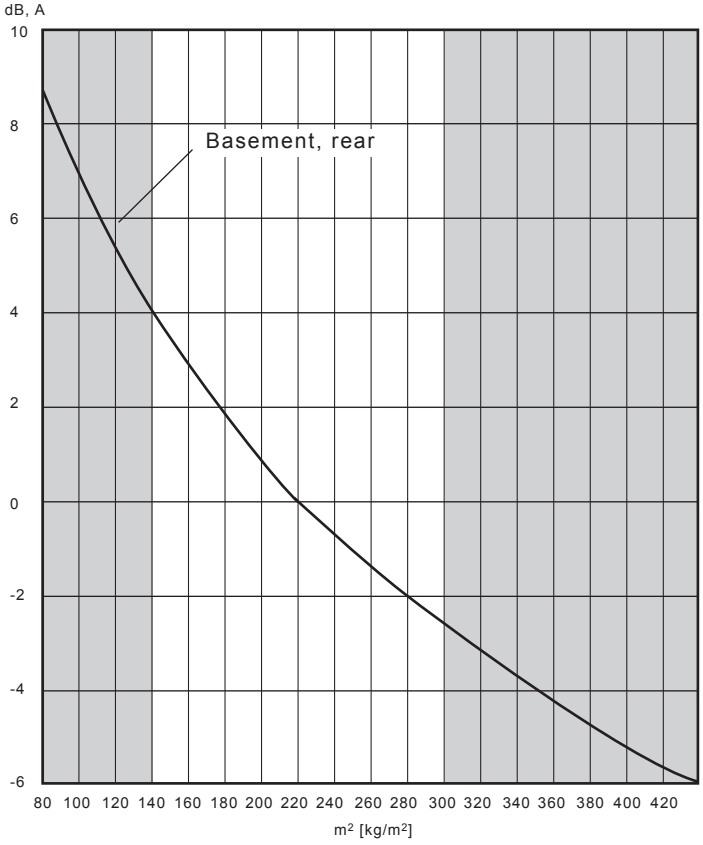
| | | |
|---|---|---|
| SST I | corresponds to DIN 4109 | ≤ 30 dB, (A) |
| SST II | flats in buildings with several flats | ≤ 27 dB, (A) |
| | semi-detached and terraced houses | ≤ 25 dB, (A) |
| SST III | flats in buildings with several flats | ≤ 24 dB, (A) |
| | semi-detached and terraced houses | ≤ 22 dB, (A) |

**Sound transmission within a flat:**
DIN 4109 does not contain any requirements regarding sound protection within flats. Sound protective measures might become necessary in certain cases where the need of protection is increased. Sound protective measures within flats must be agreed upon and taken into consideration during planning.
> the parameters cannot be observed for “open” layout designs.

Sound protection within a flat $L_{in}$ ≤ 35 dB, (A).

# 3.3_THE INFLUENCE OF THE WALL WEIGHT ON SOUND PROTECTION






**CHANGES OF PLUMBING NOISE LEVELS** in the adjacent room (basement, rear), depending on the mass per unit area of a solid plumbing wall with constant sound excitation. The diagram outlines the difference in levels as compared to a plumbing wall with a mass per unit area m2 = 220 kg/m2. The calculated results shown in the diagram relate to the conditions of the plumbing test bench in the Fraunhofer Institute for Building Physics and cannot simply be transferred to other building circumstances. The plumbing noise level is even more uncertain for masses per unit area below 140 kg/m2 and over 300 kg/m2 (coloured zones). A difference in the wall weight of 30 kg/m2 (more or less) results in approximately 1 dB difference in the plumbing noise level $L_{in}$ in the reception room.

## THE INFLUENCE OF WALL WEIGHTS ON SOUND PROTECTION

| | | Volume weight kg/m³ | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 700 | 800 | 1000 | 1200 | 1400 | 1600 | 1800 | 2000 | 2400 | 2500 |
| **Material** | **Whall thickness in cm** | **Wall mass per unit area kg/m²** | | | | | | | | | |
| **Brick** | 24 | 168 | 192 | 240 | 288 | 336 | 384 | 432 | 480 | | |
| | 30 | 210 | 240 | 300 | 360 | 420 | 480 | 540 | 600 | | |
| | 36,5 | 256 | 292 | 365 | 438 | 511 | 584 | 657 | 730 | | |
| | 49 | 343 | 392 | 490 | 588 | 686 | 784 | 882 | 980 | | |
| **Lime-sand brick** | 11,5 | 81 | 92 | 115 | 138 | 161 | 184 | 207 | 230 | | |
| | 15 | 105 | 120 | 150 | 180 | 210 | 240 | 270 | 300 | | |
| | 17,5 | 123 | 140 | 175 | 210 | 245 | 280 | 315 | 350 | | |
| | 20 | 140 | 160 | 240 | 240 | 280 | 320 | 360 | 400 | | |
| | 24 | 168 | 192 | 288 | 288 | 336 | 384 | 432 | 480 | | |
| **Concrete** | | | | | | | | | | | |
| Concrete C 20/25 | 20 | | | | | | | | | 480 | |
| | 25 | | | | | | | | | 600 | |
| | 30 | | | | | | | | | 720 | |
| **Reinforced** | 20 | | | | | | | | | | 500 |
| **concrete** | 25 | | | | | | | | | | 625 |

Calculation of wall masses per unit area following DIN 1055, part 1.

# 3.4_SOUND LEVEL MEASUREMENT

The measurements obtained during a sound test at the **Fraunhofer Institute Stuttgart** provide impressive proof of the high level of sound protective competence of the three-layer pipe systems POLO-KAL NG and POLO-KAL 3S.

**Test results of the Fraunhofer Institute Stuttgart:**

> **POLO-KAL NG with POLO-CLIP HS – test certificate: P-BA 48/2007**
(EN 14366 “Bench measurement of noise from waste-water installations”)

> **POLO-KAL 3S with POLO-CLIP HS - test certificate: P-BA 49/2007**
(EN 14366 “Bench measurement of noise from waste-water installations”)

> **POLO KAL NG with "Bismat 2000“ pipe clamps of the Walraven company – test certificate: P-BA 247/2009**

> **POLO KAL 3S with "Bismat 2000“ pipe clamps of the Walraven company – test certificate: P-BA 248/2009**

Sound insulation properties of domestic waste disposal pipes are measured according to the currently valid EN 14366 “Bench measurement of noise from above-ground drainage installations”.

> measurements are carried out only in the reception room on the basement level;
> the following two measurements are taken:

$L_{in}$ corresponds to the plumbing noise level of the pipe system measured in the basement. This is the measurement that is relevant in practise.

$L_{SC, A}$ corresponds to the characteristic structure-borne sound level, which is calculated following measurement with open clips. This value, as applies to any measurement with open clips, is not representative of a system’s practical sound insulation capacity.

Sound damping values in practice depend on the quality of the laying work and can deviate from laboratory values.

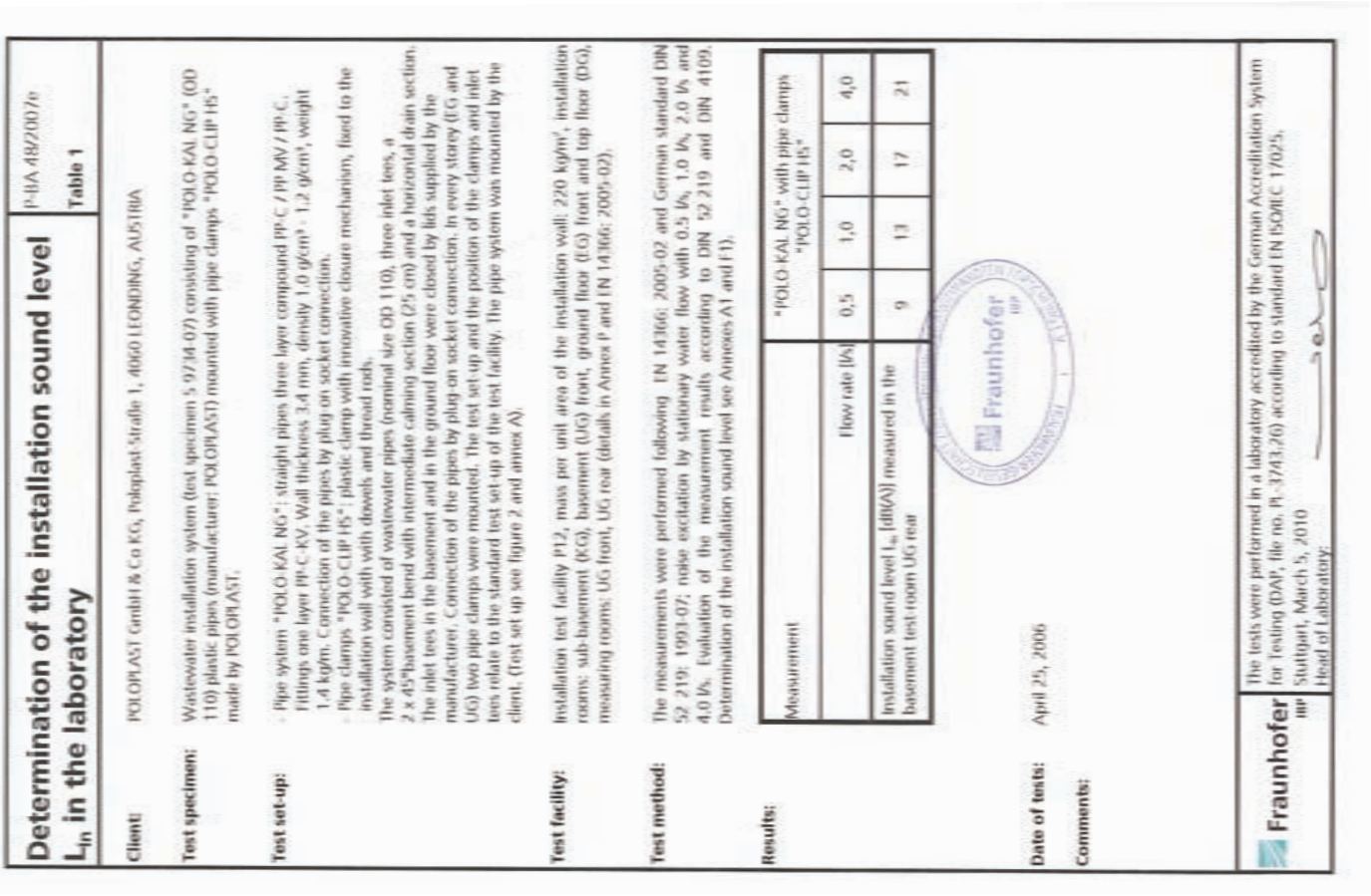
**Please observe:**
> the laying instructions for expert fitting of sound absorbing steel brackets with rubber insert on page 54;
> the laying instructions for the POLO-CLIP HS bracket on pages 65 to 67.

**Attention:**
For published sound level measurements please note:
> Make sure that comparable values are compared (Lin).
> Consider the type of brackets used.
> Make sure that full information on the test set and the stated measurements is available.

# 3.5_RESULTS OF SOUND LEVEL MEASUREMENTS



**Test results of the Fraunhofer Institute Stuttgart: POLO-KAL NG with POLO-CLIP HS**
**test certificate: P-BA 48/2007**



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Forschung, Entwicklung, Demonstration und Beratung auf den Gebieten der Bauphysik

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## Test report P-BA 48/2007e

## Determination of the Acoustic Performance of a Wastewater Installation System in the Laboratory

**Client:** POLOPLAST GmbH & Co KG
Poloplaststraße 1
4060 LEONDING
AUSTRIA

**Test specimen:** Wastewater installation system consisting of "POLO-KAL NG" (OD 110) plastic pipes (manufacturer: POLOPLAST) mounted with pipe clamps "POLO-CLIP HS" made by POLOPLAST.

**Contents:**



The tests were performed in a laboratory accredited by the German Accreditation System for Testing (DAP, file no. PL-3743.26) according to standard EN ISO/IEC 17025.

Any publication of this document in part is subject to written permission by the Fraunhofer Institute of Building Physics (IBP).

Stuttgart, March 5, 2010

Responsible test engineer: Head of Laboratory:

Dipl.-Ing.(FH) J. Mohr Dr.-Ing. habil. L. Weber

Fraunhofer IBP

## Determination of the installation sound level $L_{in}$ in the laboratory

P-BA 48/2007e
Table 1

**Client:** POLOPLAST GmbH & Co KG, Poloplast-Straße 1, 4060 LEONDING, AUSTRIA

**Test specimen:** Wastewater installation system (test specimen's 9734 07) consisting of "POLO-KAL NG" (OD 110) plastic pipes (manufacturer: POLOPLAST) mounted with pipe clamps "POLO-CLIP HS" made by POLOPLAST.

**Test set-up:**
- Pipe system "POLO-KAL NG": straight pipes three layer compound PP-C / PP MV / PP-C, Fittings one layer PP-C-KV. Wall thickness 3.4 mm, density 1.0 g/cm³ - 1.2 g/cm³, weight 1.4 kg/m. Connection of the pipes by plug on socket connection.
- Pipe clamps "POLO-CLIP HS": plastic clamp with innovative closure mechanism, fixed to the installation wall with with dowels and thread rods.

The system consisted of wastewater pipes (nominal size OD 110), three inlet tees, a 2 x 45°basement bend with intermediate calming section (25 cm) and a horizontal drain section. The inlet tees in the basement and in the ground floor were closed by lids supplied by the manufacturer. Connection of the pipes by plug-on socket connection. In every storey (EG and UG) two pipe clamps were mounted. The test set up and the position of the clamps and inlet tees relate to the standard test set-up of the test facility. The pipe system was mounted by the client. (Test set up see figure 2 and annex A).

**Test facility:** Installation test facility P12, mass per unit area of the installation wall: 220 kg/m², installation rooms: sub-basement (KG), basement (UG) front, ground floor (EG) front and top floor (DG); measuring rooms: UG front, UG rear (details in Annex P and EN 14366: 2005-02).

**Test method:** The measurements were performed following EN 14366: 2005-02 and German standard DIN 52 219: 1993-07; noise excitation by stationary water flow with 0.5 l/s, 1.0 l/s, 2.0 l/s and 4.0 l/s. Evaluation of the measurement results according to DIN 52 219 and DIN 4109. Determination of the installation sound level see Annexes A1 and F1).

**Results:**

| Measurement | "POLO-KAL NG" with pipe clamps "POLO-CLIP HS" | | | |
|---|---|---|---|---|
| Flow rate [l/s] | 0,5 | 1,0 | 2,0 | 4,0 |
| Installation sound level $L_{in}$ [dB(A)] measured in the basement test room UG rear | 9 | 13 | 17 | 21 |

Fraunhofer IBP

**Date of tests:** April 25, 2006

**Comments:**

Fraunhofer IBP

The tests were performed in a laboratory accredited by the German Accreditation System for Testing (DAP, file no. PL-3743.26) according to standard EN ISO/IEC 17025.

Stuttgart, March 5, 2010

Head of Laboratory:

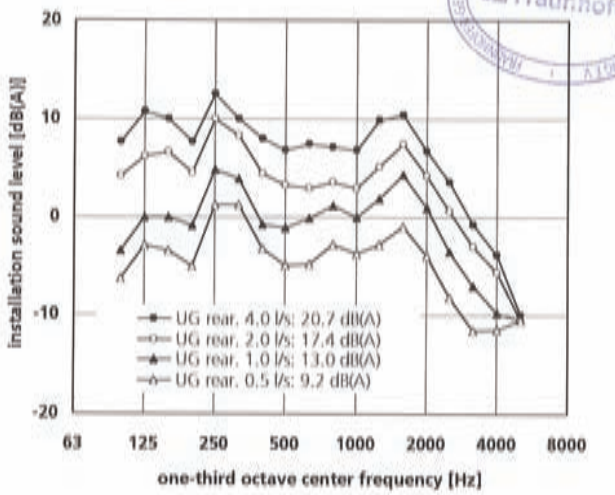


**Figure 1** Wastewater pipe system "POLO-KAL NG" OD 110 (manufacturer: POLOPLAST) with pipe clamps "POLO-CLIP HS" made by POLOPLAST. Installation sound level $L_{a,}$ at various flow rates in the test room UG rear.

The tests were performed in a laboratory accredited by the German Accreditation System for Testing (DAP, file no. PL-3743.26) according to standard EN ISO/IEC 17025.

Fraunhofer-Institut für Bauphysik P-BA 48/2007e

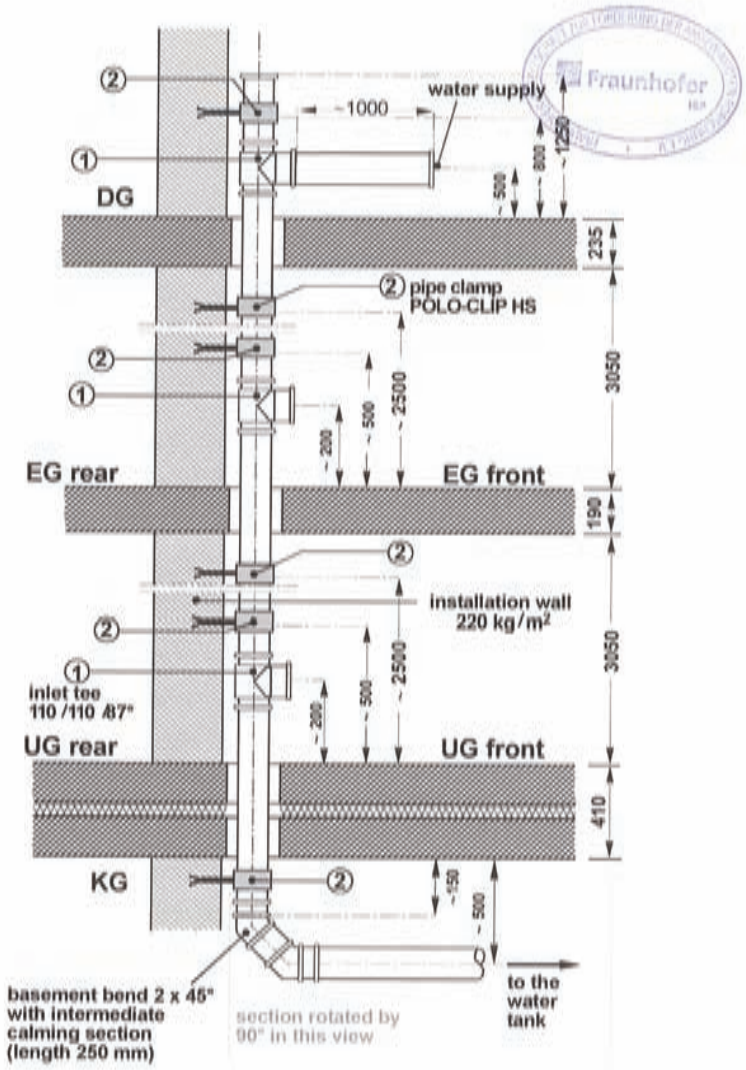


**Figure 2** Installation plan of the pipe system "POLO-KAL NG" OD 110 (manufacturer: POLOPLAST), mounted with clamps "POLO-CLIP HS" (drawing not to scale, dimensions in mm).

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Institutsleitung
Univ.-Prof. Dr.-Ing. Gerd Hauser
Univ.-Prof. Dr.-Ing. Klaus Sedlbauer

## Test report P-BA 49/2007e

# Determination of the Acoustic Performance of a Wastewater Installation System in the Laboratory

**Client:** POLOPLAST GmbH & Co KG
Poloplast-Straße 1
4060 LEONDING
AUSTRIA

**Test specimen:** Wastewater installation system consisting of "POLO-KAL 3S" (OD 110) plastic pipes (manufacturer: POLOPLAST) mounted with pipe clamps "POLO-CLIP HS" made by POLOPLAST.

**Contents:**

| | | |
|---|---|---|
| Table 1: | Summary of test results |
| Figure 1: | Detailed result |
| Figure 2: | Installation plan |
| Annex A1: | Measurement set-up, noise excitation, acoustic parameters |
| Annex F1: | Evaluation of measurements |
| Annex P: | Description of test facility |

The tests were performed in a laboratory accredited by the German Accreditation System for Testing (DAP, file no. PL-3743.26) according to standard EN ISO/IEC 17025.



Stuttgart, March 5, 2010

Responsible Test Engineer: Dipl.-Ing.(FH) I. Mohr

Head of Laboratory: Dr.-rer. nat. L. Weber

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## Determination of the installation sound level $L_{in}$ in the laboratory

P-BA 49/2007e
**Table 1**

**Client:** POLOPLAST GmbH & Co KG, Poloplast-Straße 1, 4060 LEONDING, AUSTRIA

**Test specimen:** Wastewater installation system (test specimen S 9822-08) consisting of "POLO-KAL 3S" (OD 110) plastic pipes (manufacturer: POLOPLAST) mounted with pipe clamps "POLO-CLIP HS" made by POLOPLAST.

**Test set-up:**
- Pipe system "POLO-KAL 3S": straight pipes three layer compound PP-H / PP MV / PP-C. Fittings one layer PP-C-MV. Wall thickness 4.8 mm, density 1.2 g/cm³ - 1.5 g/cm³, weight 2.2 kg/m. Connection of the pipes by plug-on socket connection.
- Pipe clamps "POLO-CLIP HS": plastic clamp with innovative closure mechanism, fixed to the installation wall with with dowels and thread rods.

The system consisted of wastewater pipes (nominal size OD 110), three inlet tees, a 2 x 45°basement bend with intermediate calming section (25 cm) and a horizontal drain section. The inlet tees in the basement and in the ground floor were closed by lids supplied by the manufacturer. Connection of the pipes by plug-on socket connection. In every storey (EG and UG) two pipe clamps were mounted. The test set-up and the position of the clamps and inlet tees relate to the standard test set-up of the test facility. The pipe system was mounted by the client. (Test set up see figure 2 and annex A).

**Test facility:** Installation test facility P12, mass per unit area of the installation wall: 220 kg/m², installation rooms: sub-basement (KG), basement (UG) front, ground floor (EG) front and top floor (DG), measuring rooms: UG front, UG rear (details in Annex P and EN 14366: 2005-02).

**Test method:** The measurements were performed following EN 14366: 2005-02 and German standard DIN 52 219: 1993-07; noise excitation by stationary water flow with 0.5 l/s, 1.0 l/s, 2.0 l/s and 4.0 l/s. Evaluation of the measurement results according to DIN 52 219 and DIN 4109. Determination of the installation sound level see Annexes A1 and F1).

**Results:**

| Measurement | "POLO-KAL 3S" with pipe clamps "POLO-CLIP HS" | | | |
|---|---|---|---|---|
| Flow rate [l/s] | 0,5 | 1,0 | 2,0 | 4,0 |
| Installation sound level $L_{in}$ [dB(A)] measured in the basement test-room UG rear | 6 | 11 | 14 | 17 |

**Date of tests:** November 13, 2006

**Comments:**

Fraunhofer IBP

The tests were performed in a laboratory accredited by the German Accreditation System for Testing (DAP, file no. PL-3743.26) according to standard EN ISO/IEC 17025.
Stuttgart, March 5, 2010
Head of Laboratory:

**Test results of the Fraunhofer Institute Stuttgart: POLO-KAL 3S with POLO-CLIP HS test certificate: P-BA 49/2007**

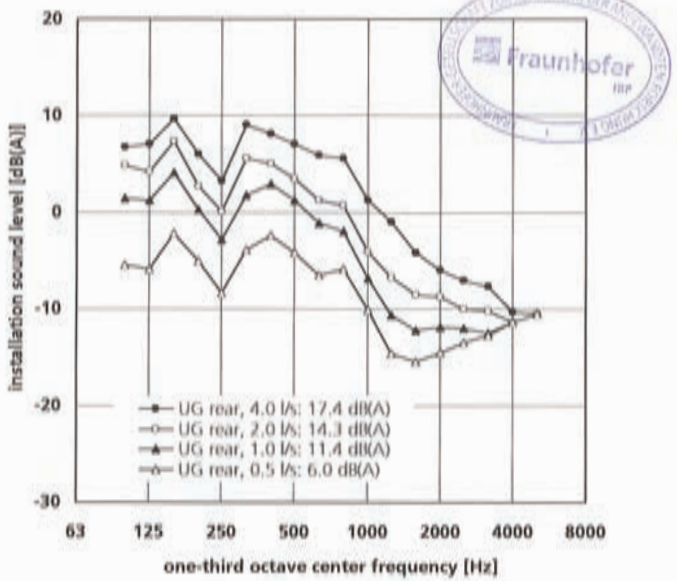


**Figure 1** Wastewater pipe system "POLO-KAL 35" OD 110 (manufacturer: POLOPLAST) with pipe clamps "POLO-CLIP HS" made by POLOPLAST. Installation sound level $L_{ln}$ at various flow rates in the test room UG rear.

The tests were performed in a laboratory accredited by the German Accreditation System for Testing (DAP, file no. PL-3743.26) according to standard EN ISO/IEC 17025.

Fraunhofer-Institut für Bauphysik P-BA 49/2007e

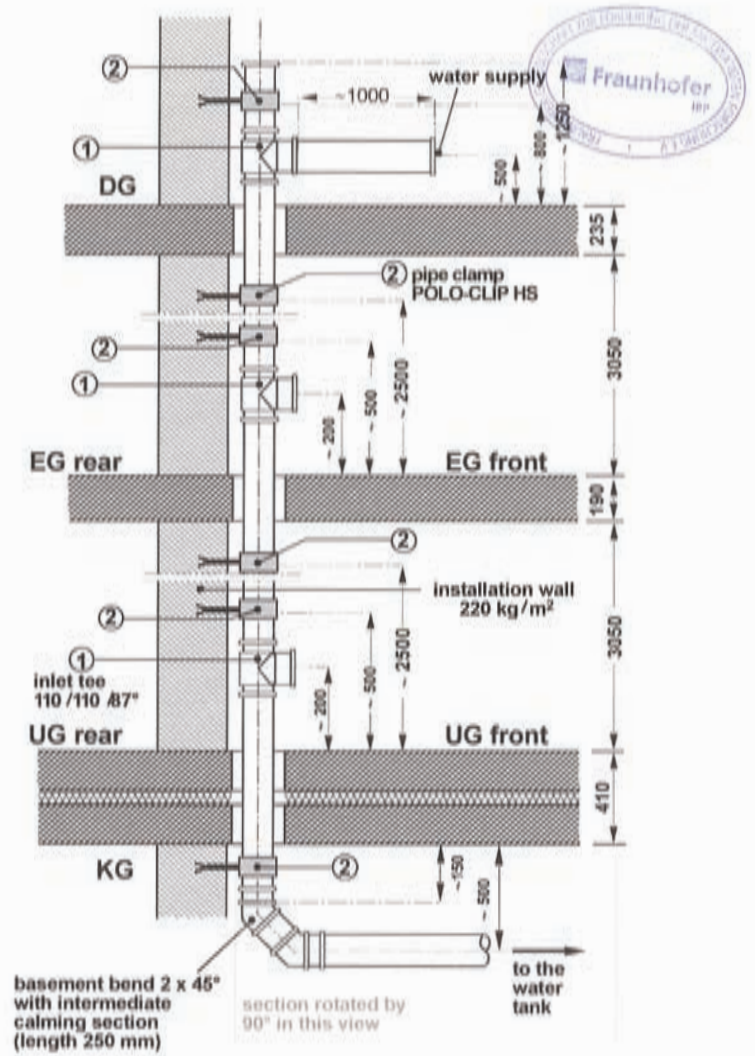


**Figure 2** Installation plan of the pipe system "POLO-KAL 35" OD 110 (manufacturer: POLOPLAST), mounted with clamps "POLO-CLIP HS" (drawing not to scale, dimensions in mm).

Fraunhofer-Institut für Bauphysik P-BA 49/2007e

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## Test report P-BA 247/2009e

# Determination of the Acoustic Performance of a Wastewater Installation System in the Laboratory

**Client:** POLOPLAST GmbH & Co KG
Poloplast-Straße 1
4060 LEONDING
AUSTRIA

**Test specimen:** Wastewater installation system consisting of "POLO-KAL NG" (OD 110) plastic pipes (manufacturer: POLOPLAST) mounted with pipe clamps "Bismat 2000" made by Walraven.

**Contents:**



The tests were performed in a laboratory accredited by the German Accreditation System for Testing (DAP, file no. PL-3743.26) according to standard EN ISO/IEC 17025.



Stuttgart, February 18, 2010

Responsible Test Engineer: Dipl.-Ing.(FH) J. Mehl

Head of Laboratory: Dr. rer. nat. L. Weber

Fraunhofer IBP

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## Determination of the installation sound level $L_{In}$ in the laboratory

P-BA 247/2009e
**Table 1**

**Client:** POLOPLAST GmbH & Co KG, Poloplast-Straße 1, 4060 LEONDING, AUSTRIA

**Test specimen:** Wastewater installation system (test specimen S 10210-4) consisting of "POLO-KAL NG" (OD 110) plastic pipes (manufacturer: POLOPLAST) mounted with pipe clamps "Bismat 2000" made by Walraven.

**Test set-up:**
- Pipe system "POLO-KAL NG": straight pipes three layer compound PP-C / PP MV / PP-C. Fittings one layer PP-C-KV. Wall thickness 3.4 mm, density 1.0 g/cm³ - 1.2 g/cm³, weight 1.4 kg/m. Connection of the pipes by plug-on socket connection.

The system consisted of wastewater pipes (nominal size OD 110), three inlet tees, a 2 x 45°basement bend with intermediate calming section (25 cm) and a horizontal drain section. The inlet tees in the basement and in the ground floor were closed by lids supplied by the manufacturer. Connection of the pipes by plug-on socket connection.
- Pipe clamps "Bismat 2000": standard steel clamp with profiled elastomer inlay. Range 108 to 114 mm. The installation of the pipe system was carried out by means of two pipe clamps in each storey (EG and UG). The upper clamp was mounted as a sliding clamp with light contact to the pipe (6 mm space between the locking tabs of the clamp) and the lower clamp was mounted as a fixed clamp with 5 mm space between the locking tabs of the clamp.

The test set-up and the position of the clamps and inlet tees relate to the standard test set-up of the test facility. The pipe system was mounted by the client. (Test set up see figure 2 and annex A).

**Test facility:** Installation test facility P12, mass per unit area of the installation wall: 220 kg/m², installation rooms: sub-basement (KG), basement (UG) front, ground floor (EG) front and top floor (DG), measuring rooms: UG front, UG rear (details in Annex P and EN 14366: 2005-02).

**Test method:** The measurements were performed following EN 14366: 2005-02 and German standard DIN 52 219: 1993-07; noise excitation by stationary water flow with 0.5 l/s, 1.0 l/s, 2.0 l/s and 4.0 l/s (details in Annexes A and F).

**Results:**

| Measurement | "POLO-KAL NG" with pipe clamps "Bismat 2000" (mounting details see test set-up) | | | |
|---|---|---|---|---|
| Flow rate [l/s] | 0,5 | 1,0 | 2,0 | 4,0 |
| Installation sound level $L_{In}$ [dB(A)] measured in the basement test-room UG rear | < 10 | 12 | 17 | 22 |

Fraunhofer IBP

**Date of tests:** October 29, 2009

**Comments:**
- Sound levels below 10 dB(A) are not mentioned in the test report, since they are subject to an increased measurement uncertainty and moreover are not noticeable in a normal living environment.

Fraunhofer IBP

The tests were performed in a laboratory accredited by the German Accreditation System for Testing (DAP, file no. PL-3743.26) according to standard EN ISO/IEC 17025.
Stuttgart, February 25, 2010
Head of Laboratory:

**Test results of the Fraunhofer Institute Stuttgart: POLO-KAL NG with "Bismat 2000" pipe clamps of the Walraven company: test certificate: P-BA 247/2009**

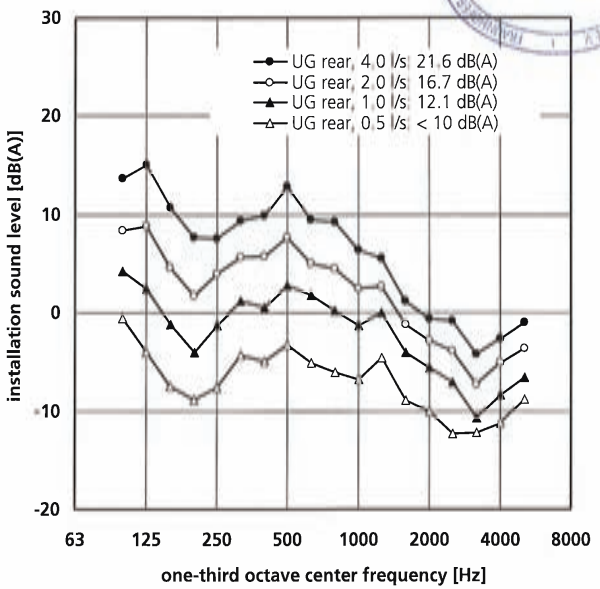


**Figure 1** Wastewater pipe system "POLO-KAL NG" OD 110 (manufacturer: POLOPLAST) with pipe clamps "Bismat 2000" made by Walraven (mounting details of the clamps: see test set-up). Installation sound level $L_{In}$ at various flow rates in the test room UG rear

The tests were performed in a laboratory accredited by the German Accreditation System for Testing (DAP, file no. PL-3743.26) according to standard EN ISO/IEC 17025.

Fraunhofer-Institut für Bauphysik P-BA 247/2009e

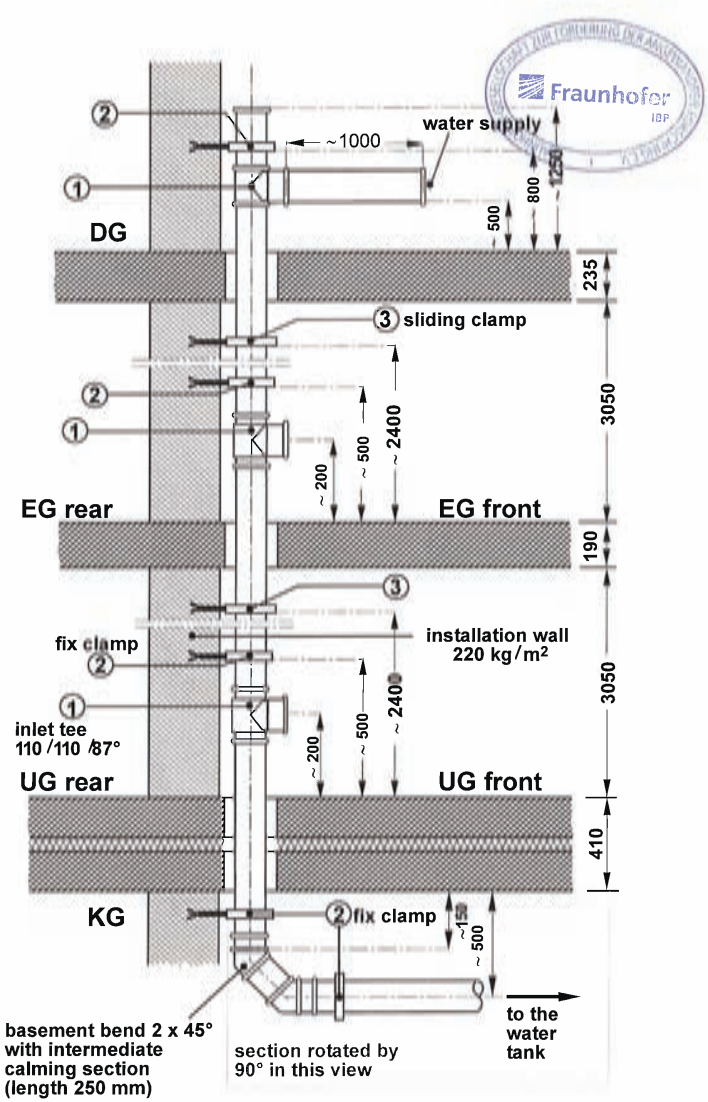


**Figure 2** Installation plan of the pipe system "POLO-KAL NG" OD 110 (manufacturer: POLOPLAST), mounted with clamps "Bismat 2000" (mounting details of the clamps see test set-up, drawing not to scale, dimensions in mm).

Fraunhofer-Institut für Bauphysik P-BA 247/2009e

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Zulassung neuer Baustoffe, Bauteile und Bauarten
Forschung, Entwicklung, Demonstration und Beratung auf den Gebieten der Bauphysik

Institutsleitung
Univ.-Prof. Dr.-Ing. Gerd Hauser
Univ.-Prof. Dr.-Ing. Klaus Sedlbauer

## Test report P-BA 248/2009e

# Determination of the Acoustic Performance of a Wastewater Installation System in the Laboratory

**Client:** POLOPLAST GmbH & Co KG
Poloplast-Straße 1
4060 LEONDING
AUSTRIA

**Test specimen:** Wastewater installation system consisting of "POLO-KAL 3S" (OD 110) plastic pipes (manufacturer: POLOPLAST) mounted with pipe clamps "Bismat 2000" made by Walraven.

**Contents:**



The tests were performed in a laboratory accredited by the German Accreditation System for Testing (DAP, file no. PL-3743.26) according to standard EN ISO/IEC 17025.



Stuttgart, February 18, 2010

Responsible Test Engineer: Dipl.-Ing.(FH) J. Mohr

Head of Laboratory: Dr. rer. nat. L. Weber

Fraunhofer IBP

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## Determination of the installation sound level $L_{In}$ in the laboratory

P-BA 248/2009e
**Table 1**

**Client:** POLOPLAST GmbH & Co KG, Poloplast-Straße 1, 4060 LEONDING, AUSTRIA

**Test specimen:** Wastewater installation system (test specimen S 10210-5) consisting of "POLO-KAL 3S" (OD 110) plastic pipes (manufacturer: POLOPLAST) mounted with pipe clamps "Bismat 2000" made by Walraven.

**Test set-up:**
- Pipe system "POLO-KAL 3S": straight pipes three layer compound PP-H / PP MV / PP-C. Fittings one layer PP-C-MV. Wall thickness 4.8 mm, density 1.2 g/cm³ - 1.5 g/cm³, weight 2.2 kg/m. Connection of the pipes by plug-on socket connection.

The system consisted of wastewater pipes (nominal size OD 110), three inlet tees, a 2 x 45°basement bend with intermediate calming section (25 cm) and a horizontal drain section. The inlet tees in the basement and in the ground floor were closed by lids supplied by the manufacturer. Connection of the pipes by plug-on socket connection.
- Pipe clamps "Bismat 2000": standard steel clamp with profiled elastomer inlay. Range 108 to 114 mm. The installation of the pipe system was carried out by means of two pipe clamps in each storey (EG and UG). The upper clamp was mounted as a sliding clamp with light contact to the pipe (6 mm space between the locking tabs of the clamp) and the lower clamp was mounted as a fixed clamp with 5 mm space between the locking tabs of the clamp.

The test set-up and the position of the clamps and inlet tees relate to the standard test set-up of the test facility. The pipe system was mounted by the client. (Test set up see figure 2 and annex A).

**Test facility:** Installation test facility P12, mass per unit area of the installation wall: 220 kg/m², installation rooms: sub-basement (KG), basement (UG) front, ground floor (EG) front and top floor (DG), measuring rooms: UG front, UG rear (details in Annex P and EN 14366: 2005-02).

**Test method:** The measurements were performed following EN 14366: 2005-02 and German standard DIN 52 219: 1993-07; noise excitation by stationary water flow with 0.5 l/s, 1.0 l/s, 2.0 l/s and 4.0 l/s (details in Annexes A and F).

**Results:**

| Measurement | "POLO-KAL 3S" with pipe clamps "Bismat 2000" (mounting details see test set-up) | | | |
|---|---|---|---|---|
| Flow rate [l/s] | 0,5 | 1,0 | 2,0 | 4,0 |
| Installation sound level $L_{In}$ [dB(A)] measured in the basement test-room UG rear | < 10 | 12 | 15 | 18 |

Fraunhofer IBP

**Date of tests:** October 30, 2009

**Comments:**
- Sound levels below 10 dB(A) are not mentioned in the test report, since they are subject to an increased measurement uncertainty and moreover are not noticeable in a normal living environment.

Fraunhofer IBP

The tests were performed in a laboratory accredited by the German Accreditation System for Testing (DAP, file no. PL-3743.26) according to standard EN ISO/IEC 17025.
Stuttgart, February 25, 2010
Head of Laboratory:

**Test results of the Fraunhofer Institute Stuttgart: POLO-KAL 3S with "Bismat 2000" pipe clamps of the Walraven company: test certificate: P-BA 248/2009**

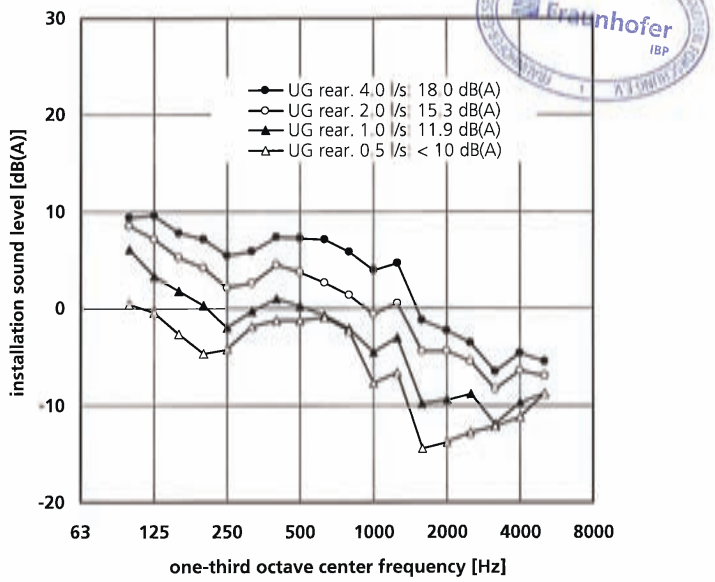



**Figure 1** Wastewater pipe system "POLO-KAL 3S" OD 110 (manufacturer: POLOPLAST) with pipe clamps "Bismat 2000" made by Walraven (mounting details of the clamps: see test set-up). Installation sound level $L_{in}$ at various flow rates in the test room UG rear

The tests were performed in a laboratory accredited by the German Accreditation System for Testing (DAP, file no. PL-3743.26) according to standard EN ISO/IEC 17025.



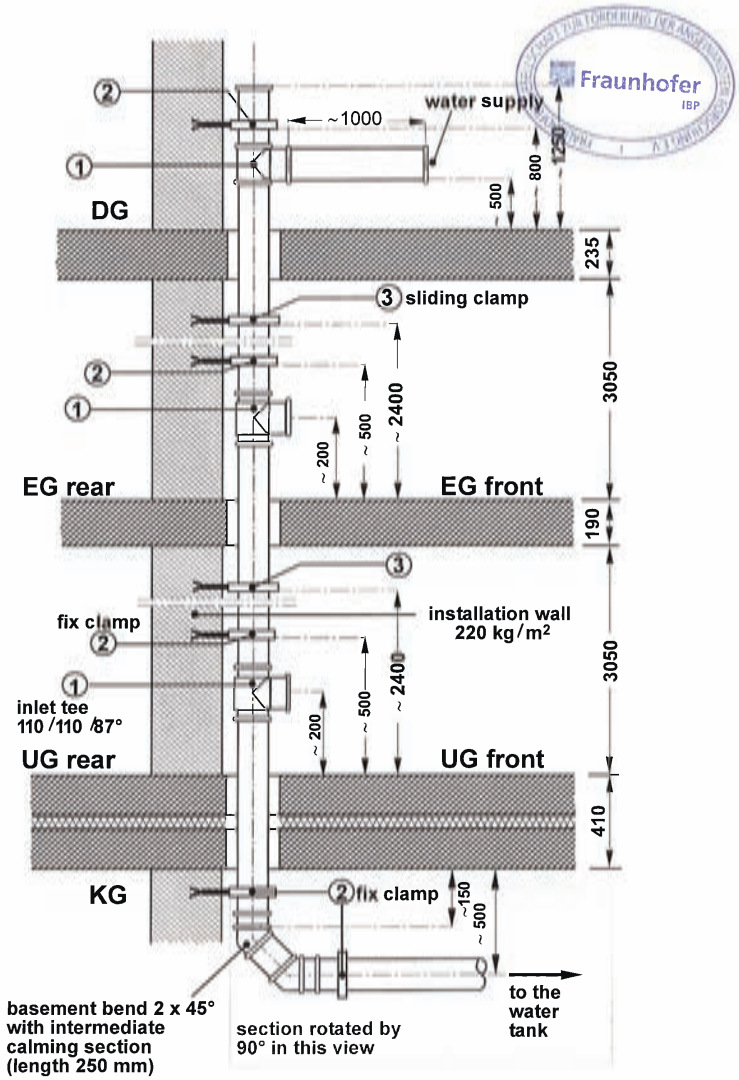



**Figure 2** Installation plan of the pipe system "POLO-KAL 3S" OD 110 (manufacturer: POLOPLAST), mounted with clamps "Bismat 2000" (mounting details of the clamps: see test set-up, drawing not to scale, dimensions in mm).

# 4.1_GENERAL INFORMATION



## 4.1.1 STANDARDS AND REGULATIONS

**Europe:**

> Construction products directive
> EN 13501: classification of construction products and construction types according to their fire behaviour

## 4.1.2 PURPOSE OF FIRE PROTECTION

**Personal protection:** protection of life and health
**Material value protection:** protection of property
**Environmental protection:** avoidance of contaminating air, water and soil

**A number of measures can be planned in order to achieve these goals:**

> reduction of the hazard of fire breaking out and spreading (including smoke);
> provision of measures to quickly discover fire;
> provision of suitable, barrier-free escape and rescue paths

## 4.2.1 FIRE PROTECTION PLAN

The purpose of a fire protection plan is to prove that the targets of protection have been reached or, in case of deviation, that equivalent targets of protection have been reached.

The fire protection plan describes the individual fire protection measures and their links in relation to the required targets of protection. It therefore contains all comprehensively coordinated structural, technical, organisational and fire-fighting measures.

The fire protection plan must correspond to the individual building and its usage; it is advisable to develop the plan at an early stage of planning.

An individual fire protection plan usually consists of risk assessment, a definition of the relevant targets of protection, as well as a definition of fire hazards, from which specific preventative and averting measures are derived.

## 4.2.2 CONSTRUCTION PRODUCTS DIRECTIVE

According to the construction products directive of the Council of the European Union (89/106/EWG) fire protection is one of the most essential requirements with regard to buildings. Its basic requirements stipulate that in case of fire:

> the bearing capacity of the building has to be maintained over a certain period,
> development and proliferation of fire and smoke must be fought within the building,
> spreading of the fire to adjacent buildings must be fought,
> the occupants can leave the building without injuries or can be saved by other measures and safety of the rescue brigades is taken into account.

## 4.2.3 FIRE COMPARTMENTS

Fire compartments are sections of buildings that are on all their sides bordered by structural elements of a certain degree of fire resistance and / or fire protection zone.

## 4.2.4 STRUCTURAL ELEMENTS THAT FORM FIRE COMPARTMENTS

Structural elements that form fire compartments are the borders of fire compartments. They can be situated in the interior of the building (fire walls) as well as on the border of the property (fire-proof party walls).

5_ PIPE INSULATION

# 5.1_ GENERAL INFORMATION

Grundsätzlich sind drei Arten der Dämmung zu unterscheiden, die unterschiedliche Anforderungen stellen und jedes für sich eigene Produkte als Lösung erfordern.

5_ PIPE INSULATION

# 5.2_ HEAT INSULATION

Domestic waste disposal pipes are usually routed within buildings. Even in unheated rooms there is normally no need to protect them from freezing. Therefore heat insulation is of no relevancy to domestic waste disposal pipes.

5_ PIPE INSULATION

# 5.3_ INSULATION FROM CONDENSATE DEVELOPMENT

It is necessary to insulate pipes in building engineering systems, if great differences in temperature occur and temperatures drop below the dew point.
This can occur with downpipes in the roof area, when a bay is heated and relatively cold rainwater keeps cooling down the pipe system over a longer period of time. Latent room air moisture precipitates on the cold outer surface of the pipe.

**Dew point table, °C**

| | Relative air humidity in % | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Air °C | 30% | 35% | 40% | 45% | 50% | 55% | 60% | 65% | 70% | 75% | 80% | 85% | 90% | 95% |
| 30 | 10,5 | 12,9 | 14,9 | 16,8 | 18,4 | 20,0 | 21,4 | 22,7 | 23,9 | 25,1 | 26,2 | 27,2 | 28,2 | 29,1 |
| 29 | 9,7 | 12,0 | 14,0 | 15,9 | 17,5 | 19,0 | 20,4 | 21,7 | 23,0 | 24,1 | 25,2 | 26,2 | 27,2 | 28,1 |
| 28 | 8,8 | 11,1 | 13,1 | 15,0 | 16,6 | 18,1 | 19,5 | 20,8 | 22,0 | 23,1 | 24,2 | 25,2 | 26,2 | 27,1 |
| 27 | 8,0 | 10,2 | 12,3 | 14,1 | 15,7 | 17,2 | 18,6 | 19,9 | 21,1 | 22,2 | 23,2 | 24,3 | 25,2 | 26,1 |
| 26 | 7,1 | 9,4 | 11,4 | 13,2 | 14,8 | 16,3 | 17,6 | 18,9 | 20,1 | 21,2 | 22,3 | 23,3 | 24,2 | 25,1 |
| 25 | 6,2 | 8,5 | 10,5 | 12,3 | 13,9 | 15,3 | 16,7 | 18,0 | 19,1 | 20,3 | 21,3 | 22,3 | 23,2 | 24,1 |
| 24 | 5,4 | 7,6 | 9,6 | 11,3 | 12,9 | 14,4 | 15,8 | 17,0 | 18,2 | 19,3 | 20,3 | 21,3 | 22,3 | 23,1 |
| 23 | 4,5 | 6,7 | 8,7 | 10,4 | 12,0 | 13,5 | 14,8 | 16,1 | 17,2 | 18,3 | 19,4 | 20,3 | 21,3 | 22,2 |
| 22 | 3,7 | 5,9 | 7,8 | 9,5 | 11,1 | 12,6 | 13,9 | 15,1 | 16,3 | 17,4 | 18,4 | 19,4 | 20,3 | 21,2 |
| 21 | 2,8 | 5,0 | 6,9 | 8,6 | 10,2 | 11,6 | 12,9 | 14,2 | 15,3 | 16,4 | 17,4 | 18,4 | 19,3 | 20,2 |
| 20 | 1,9 | 4,1 | 6,0 | 7,7 | 9,3 | 10,7 | 12,0 | 13,2 | 14,4 | 15,4 | 16,4 | 17,4 | 18,3 | 19,2 |
| 19 | 1,1 | 3,2 | 5,1 | 6,8 | 8,4 | 9,8 | 11,1 | 12,3 | 13,4 | 14,5 | 15,5 | 16,4 | 17,3 | 18,2 |
| 18 | 0,2 | 2,3 | 4,2 | 5,9 | 7,4 | 8,8 | 10,1 | 11,3 | 12,5 | 13,5 | 14,5 | 15,4 | 16,3 | 17,2 |
| 17 | -0,6 | 1,5 | 3,3 | 5,0 | 6,5 | 7,9 | 9,2 | 10,4 | 11,5 | 12,5 | 13,5 | 14,5 | 15,3 | 16,2 |
| 16 | -1,3 | 0,6 | 2,4 | 4,1 | 5,6 | 7,0 | 8,3 | 9,4 | 10,5 | 11,6 | 12,6 | 13,5 | 14,4 | 15,2 |
| 15 | -2,1 | -0,3 | 1,5 | 3,2 | 4,7 | 6,1 | 7,3 | 8,5 | 9,6 | 10,6 | 11,6 | 12,5 | 13,4 | 14,2 |
| 14 | -2,9 | -1,0 | 0,6 | 2,3 | 3,8 | 5,1 | 6,4 | 7,5 | 8,6 | 9,6 | 10,6 | 11,5 | 12,4 | 13,2 |
| 13 | -3,7 | -1,8 | -0,2 | 1,4 | 2,8 | 4,2 | 5,4 | 6,6 | 7,7 | 8,7 | 9,6 | 10,5 | 11,4 | 12,2 |
| 12 | -4,4 | -2,6 | -1,0 | 0,5 | 1,9 | 3,3 | 4,5 | 5,6 | 6,7 | 7,7 | 8,7 | 9,6 | 10,4 | 11,2 |
| 11 | -5,2 | -3,4 | -1,8 | -0,4 | 1,1 | 2,3 | 3,6 | 4,7 | 5,8 | 6,8 | 7,7 | 8,6 | 9,4 | 10,2 |
| 10 | -6,0 | -4,2 | -2,6 | -1,2 | 0,1 | 1,4 | 2,6 | 3,7 | 4,8 | 5,8 | 6,7 | 7,6 | 8,4 | 9,2 |
| 9 | -6,8 | -5,0 | -3,4 | -2,0 | -0,7 | 0,5 | 1,7 | 2,8 | 3,8 | 4,8 | 5,7 | 6,6 | 7,5 | 8,2 |
| 8 | -7,5 | -5,8 | -4,2 | -2,8 | -1,6 | -0,4 | 0,7 | 1,8 | 2,9 | 3,9 | 4,8 | 5,6 | 6,5 | 7,3 |
| 7 | -8,3 | -6,6 | -5,0 | -3,6 | -2,4 | -1,2 | -0,2 | 0,9 | 1,9 | 2,9 | 3,8 | 4,7 | 5,5 | 6,3 |
| 6 | -9,1 | -7,4 | -5,8 | -4,4 | -3,2 | -2,1 | -1,0 | 0,0 | 1,0 | 1,9 | 2,8 | 3,7 | 4,5 | 5,3 |
| 5 | -9,9 | -8,2 | -6,6 | -5,3 | -4,0 | -2,9 | -1,9 | -0,9 | 0,0 | 1,0 | 1,9 | 2,7 | 3,5 | 4,3 |
| 4 | -10,7 | -9,0 | -7,4 | -6,1 | -4,8 | -3,7 | -2,7 | -1,7 | -0,8 | 0,0 | 0,9 | 1,7 | 2,5 | 3,3 |
| 3 | -11,5 | -9,8 | -8,2 | -6,9 | -5,7 | -4,6 | -3,5 | -2,6 | -1,7 | -0,9 | -0,1 | 0,7 | 1,5 | 2,3 |
| 2 | -12,3 | -10,6 | -9,1 | -7,7 | -6,5 | -5,4 | -4,4 | -3,4 | -2,5 | -1,7 | -0,9 | -0,2 | 0,5 | 1,3 |
| 1 | -13,1 | -11,4 | -9,9 | -8,5 | -7,3 | -6,2 | -5,2 | -4,3 | -3,4 | -2,6 | -1,8 | -1,1 | -0,4 | 0,3 |
| 0 | -13,9 | -12,2 | -10,7 | -9,4 | -8,2 | -7,1 | -6,1 | -5,1 | -4,3 | -3,4 | -2,7 | -2,0 | -1,3 | -0,6 |

**Example:**
Room temperature 25°C
Relative air humidity 50%
Condensate precipitation on the pipe surface < 13,9°C

Suitable 2 – 3 cm thick insulating material is usually sufficient to prevent the precipitation of condensate. It is important to provide a diffusion-proof skin of the pipe insulation to prevent moisture from entering into the insulating layer.

5_ PIPE INSULATION

## 5.4_ SOUND INSULATION

### 5.4.1 INSULATION FROM AIRBORNE NOISE

If the pipe is located in a room requiring protection (e. g. suspended ceiling), specific sound insulation measures need to be taken. If necessary, they have to be planned separately. In areas that need sound protection downpipes should, as far as possible, be laid in a vertical direction, without distortion or bypasses.

### 5.4.2 INSULATION FROM STRUCTURE-BORNE NOISE

The fastening material used to mount the pipe on the ceiling or wall must allow structure-borne noise to be decoupled (e. g. POLO-CLIP HS). In apertures in walls and ceilings the pipe has to be sheathed with suitable insulating material (e. g. 4 mm PE hose). Even very small contact points (e. g. instances of mortar residue between pipe and wall) are sufficient to form structure-borne noise bridges. When the pipe is mounted in a pipe pit without being fastened, no all-over pipe damping is required. If the pipe is mounted in chases and plastered afterwards, as well as in cases when the pipe is laid in concrete, it is absolutely necessary to use an insulating hose (4 mm PE) to decouple structure-borne noise.

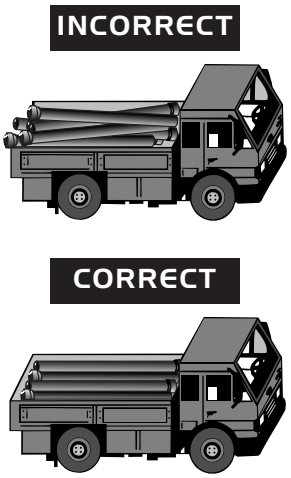
# 6.1_TRANSPORTATION AND STORAGE



## 6.1.1 LOADING AND TRANSPORTING

When loading pipes and fittings take care that no damage can occur during transportation.

Where possible during transportation the pipes should rest in their entire length on top of each other (when no longer in the original packing) so that sagging can be avoided. To do this the sleeves are to be placed offset. Avoid sudden and abrupt stresses on pipes and fittings, especially with temperatures in the frost range.



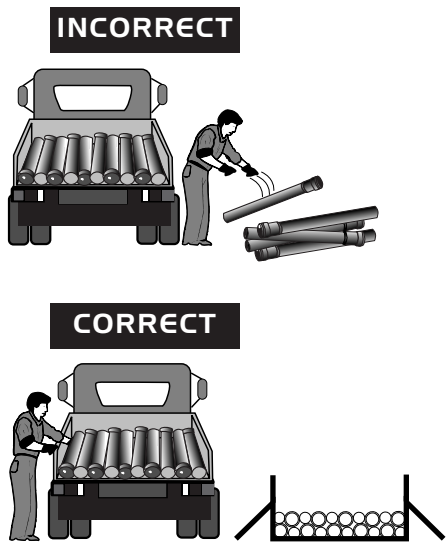

**(FIGURE 16)**
Loading and transporting

## 6.1.2 UNLOADING AND STORAGE

Unloading is to be carried out with appropriate care. Do not drop pipes or slide them over the ground. Furthermore, make sure that the pipes are not pulled over sharp edges (e.g. tailgate).

The manner of storage must not cause permanent sagging or damage to the pipes. Unpalletized pipes should not be stacked higher than 1.5 m. By placing the sleeves in an offset position, the individual pipe layers can be virtually completely supported. Pipe stacks must be secured against rolling apart.

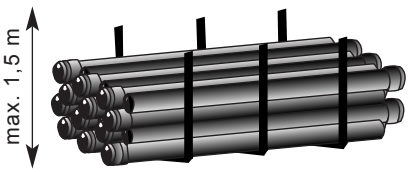
Short lengths of 150, 250 and 500 mm as well as fittings are packed in cartons that are practise-tried. Protect carton-packed pipes and fittings from moisture.




**(FIGURE 17)**
Unloading

## 6.1.3 OUTDOOR EXPOSURE

POLO-KAL 3S and POLO-KAL NG pipe systems are designed to withstand outdoor storage for 1 year. Longer outdoor storage periods and intense insolation might lead to discolouration which, however, is only an optical defect and in no way influences the quality of the pipe system.




**(FIGURE 18)**
Storing

When laying pipes outside buildings (e. g., rain water downpipes) they must be protected from mechanical impact.

The sealing material is designed to withstand outdoor storage for three years, after this time the seals must be replaced. This only applies to seals which are directly exposed to weathering – when inserted (spigot end sleeves), their service life equals that of seals installed inside a building.

# 6.2_CUTTING TO LENGTH AND BEVELLING

## 6.2.1 CUTTING TO LENGTH

Cut pipes to length at right angles to the pipe´s axis.

Cutting the pipe to length is to be carried out with a cutting and chamfering tool for plastic pipes as required.

Cutting and deburring is effected in one action and guarantees safety when installing.

**(FIGURE 19)**
Cutting to length with a cutting and chamfering tool

**FITTINGS MAY NOT BE SHORTENED.**

Pipes can also be cut to the required length using a fine-toothed saw or any other suitable parting-off tool.

In order to obtain the required right-angled cut for a clean fit, it is recommended that a cutting box is used.

Debur the cut edges inside and outside with a knife or a scraper.

**(FIGURE 20)**
Cutting to length with a fine-toothed saw

## 6.2.2 BEVELLING

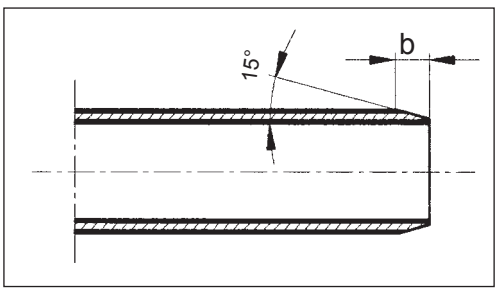
Bevelling is necessary for connections with double lip ring seals (e. g. when slip-on or long sleeves are used).

Bevelling is not necessary when using pipes with a factory installed lip ring, but is recommended for easier fitting in special installation situations.

**(FIGURE 21)**
Bevelling with a bevelling tool

When not using a cutting and chamfering tool for plastic pipes, the bevelling of the pipe ends can be effected using a suitable chamfering tool or coarse-cut file at an angle under approx. 15° according to the following table:

| DN/OD | 32 | 40 | 50 | 75 | 90 | 110 | 125 | 160 | 200 | 250 |
|---|---|---|---|---|---|---|---|---|---|---|
| b ca. mm | 4 | 4 | 4 | 4 | 5 | 6 | 6 | 7 | 8 | 10 |




**(FIGURE 22)**
Bevelling at an angle under approx. 15°

**THE CONVENTIONAL PIPE CUTTER FOR PE – HD PIPES IS NOT SUITABLE FOR CUTTING POLO-KAL NG AND POLO-KAL 3S PIPES.**

# 6.3_INFORMATION ON PUSH-FIT CONNECTIONS



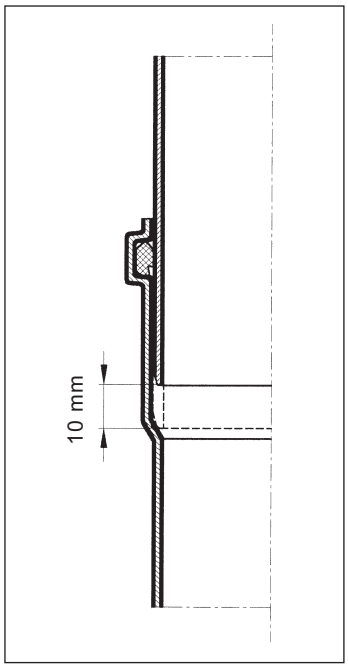
Vertically laid pipework: for each additional storey, retract the push-fit connection in the socket by 10 mm.

Horizontally laid pipework: after every 4 m of laid pipe length, retract the push-fit connection in the socket by 10 mm.

It is not necessary to make allowances for changes in length to push-fit connections between fittings, they can remain fully inserted.

## THE POLO-KAL NG PUSH-FIT CONNECTIONS ARE ESTABLISHED AS DESCRIBED BELOW:

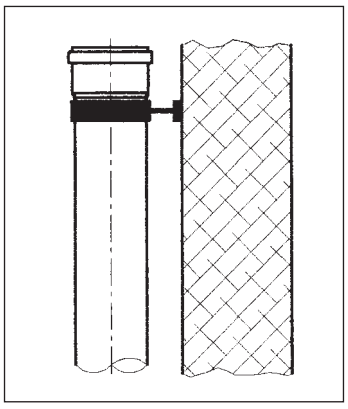
> Check the position and intactness of the lip ring in the socket flange. Clean lip ring seal if necessary.
> Clean the push-in ends of the pipe and fitting.
> Apply a thin, even coat of POLOPLAST lubricant over the push-in ends.
> Slide push-in end in turning slightly until sleeve base is reached.
> In this position mark the pipe at the socket edge with a felt pen.
> If necessary, retract the push-fit connection in the socket by 10 mm.




**(FIGURE 23)**
Push-fit connection

Where pipes are vertically arranged, the individual lengths must be fastened with brackets under the socket immediately after installation to avoid sinking (see figure 25).

**Length expansion coefficient:**
**_POLO-KAL NG 0.05 mm/m°K**
**_POLO-KAL 3S 0.09 mm/m°K**



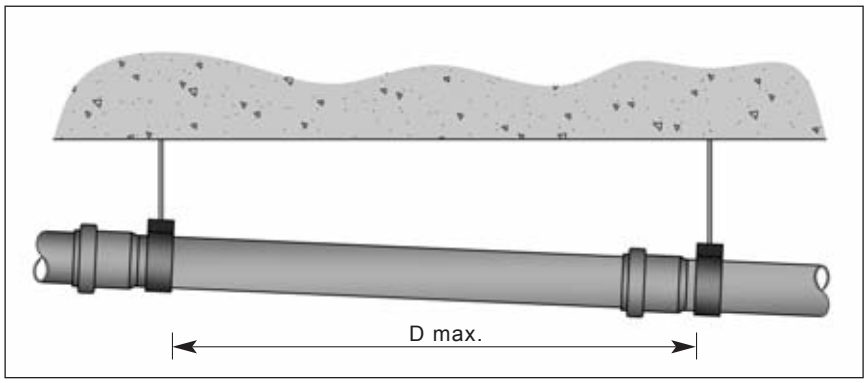
**(FIGURE 24)**
Fastening of the bracket

# 6.4_FASTENING WITH BRACKETS

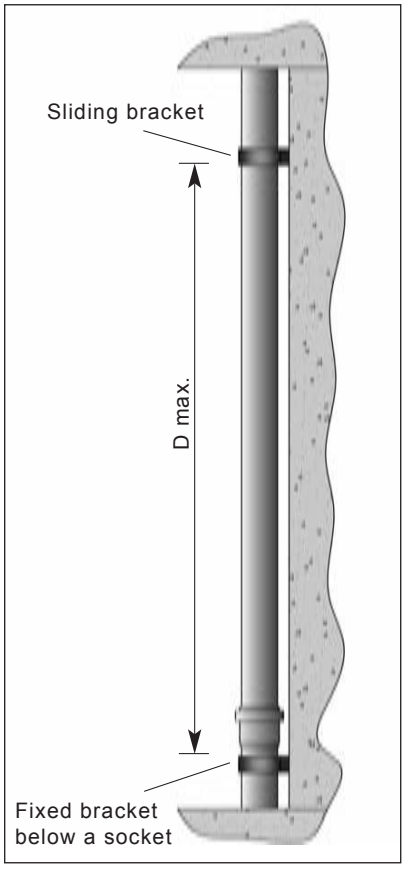
## 6.4.1_MAXIMUM DISTANCE BETWEEN BRACKETS

| Nominal outer diameter DN/OD mm | Bracket distance | |
|---|---|---|
| | Horizontal pipe routing*) D max. m (max. 15 x da) | Vertical pipe routing*) D max. m |
| 32 | 0,5 | 1,50 |
| 40 | 0,6 | 1,50 |
| 50 | 0,75 | 1,50 |
| 75 | 1,10 | 2,00 |
| 90 | 1,35 | 2,00 |
| 110 | 1,65 | 2,00 |
| 125 | 1,85 | 2,00 |
| 160 | 2,40 | 2,00 |
| 200 | 3,00 | 2,00 |
| 250 | 3,00 | 2,00 |

* If necessary, protect the pipe from lateral or axial yielding.
** One fixed and one sliding bracket have to be fitted on each storey. The fixed bracket has to be positioned below a socket. The sliding bracket is fitted on the plain pipe and is intended to allow linear expansion of the pipe, but prevent changes in alignment.



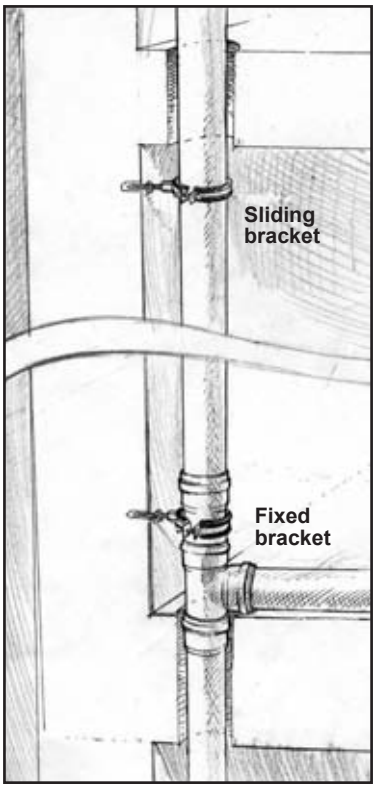

**(FIGURE 25)**
Horizontal pipe routing




**(FIGURE 26)**
Vertical pipe routing

## 6.4.2_PROFESSIONAL ASSEMBLY OF SOUND INSULATING STEEL BRACKETS WITH RUBBER INSERT

When mounting a pipe system with a sound insulating steel bracket with rubber insert on the wall, make sure to observe the correct distances when tightening the screws!




**WALL MOUNTING**

On principle, 2 brackets are fitted for **each storey. One fixed bracket** is fitted on the pipe below a socket in the lower third of the storey. The bracket has to be tightened to the **required extent. The fixed bracket must not be fully tightened in order to observe the span tolerances and to avoid increased structure-borne noise (see figures 27 and 28).**

**A sliding bracket** has to be fitted on the plain pipe in the upper third of the storey. The sliding bracket is to prevent lateral yielding and to allow linear expansion due to changes in temperature.
**Make sure that the sliding bracket only slightly touches the pipe to avoid unnecessary transmission of structure-borne sound into the room that needs to be protected.**

**Many steel brackets for plastic pipe dimensions DN/OD 110 have a span range from 108 to 114 mm. A fully tightened bracket would press the rubber insert too heavily. Consequentially, this strong pressing would give rise to avoidable structure-borne noise transmissions and eventually, the plumbing noise level Lin would increase.**

The insertion of spacers between the locking clips can also ensure the expert quality laying of the pipe.

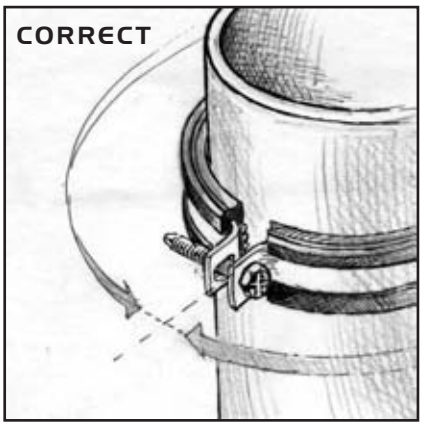


FIGURE 27

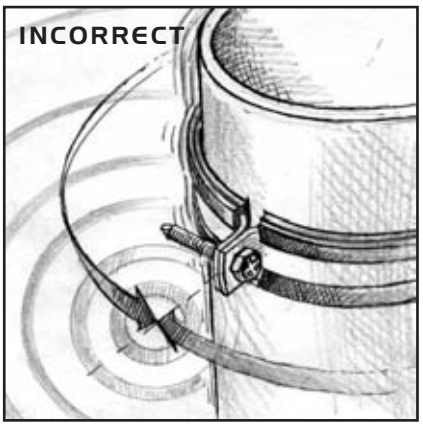


FIGURE 28

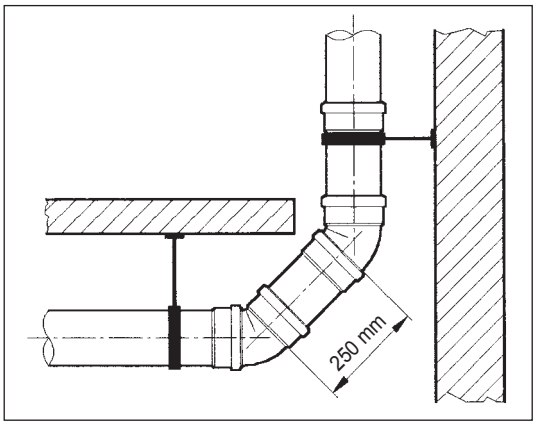
# 6.5_INFORMATION ON PIPE LAYING

## 6.5.1 STEADYING SECTION

Because the pipe arrangement has a significant impact not only on the development of sound but also on noise reduction, appropriate measures must be taken to reduce flow and impact sounds in areas of directional change, e.g. in the case of distortions of vertical down-pipes in the intermediate ceiling area.

For hydraulic and acoustic reasons a steadying section consisting of two 45° bends and a 250 mm long pipe must be used for any 90-degree change of direction where the down pipe enters the horizontal main.

**87.5° BENDS MUST NOT BE FITTED IN THE TRANSITION AREA LEADING FROM A VERTICAL TO A HORIZONTAL ARRANGEMENT.**




**(FIGURE 29)**
Turn with steadying section

## 6.5.2 INSTALLING PIPES IN CONCRETE

POLO-KAL pipes and fittings can be set directly into concrete. The change in pipe length, as described above (see chapter 6.3 on Push-fit Connections), must be taken into account.

The pipe components are to be fastened in such a way that their position in the concrete cannot change. Pipe ends are to be closed and sleeve socket apertures are to be sealed with adhesive tape or foil to prevent cement slurry from seeping in during cementation and setting.

For larger concrete covers or given the possibility of line load in a longitudinal direction (wall), static proof must be established.

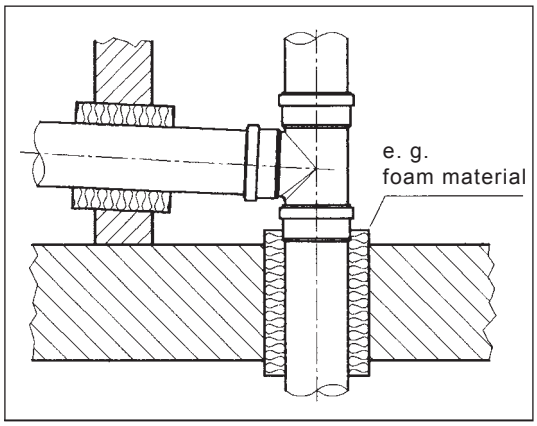
For soundproofing it is absolutely necessary to sheathe the entire length of piping in insulating material (e. g. 4 mm PE insulation hose).

## 6.5.3 WALL AND CEILING INSTALLATIONS

Wall and ceiling installations are to be made moisture tight and sound absorbing.

If a flooring substitute is to be applied, then the exposed pipe components are to be secured in protecting tubes or encased in soft materials (e. g. glass wool or foam material).

If floor apertures are cast in concrete later, the pipes need to be sheathed in a 4 mm PE foil.




**(FIGURE 30)**
Wall and ceiling installations

## 6.5.4 INSTALLING PIPES IN BRICKWORK (CHASES)

Chases and apertures in walls are only allowed when they do not cause a reduction in the stability and bearing capacity of supporting walls. Wall kervings are to be arranged so that the piping can be installed stress-free.

If the pipes are to be plastered immediately, i. e. without using a base or a facing, then the pipes and fittings must be completely wrapped beforehand in flexible materials, such as foam or PE foil (structure-born sound isolation).

In areas where increased temperatures occur due to external factors, heat-insulating measures must be carried out.

## SPACE REQUIRED FOR POLO-KAL ABOVE GROUND DRAINAGE PIPES IN CHASES

Dimensions in mm

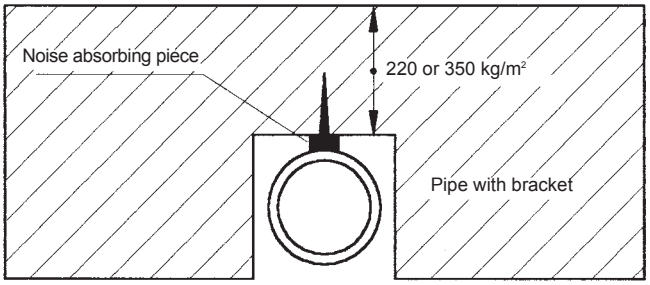
| Pipe diameter DN/OD | Chase depths without insulation | Chase depths with insulation (e.g. 20 mm) |
|---|---|---|
| 75 | 140 x 140 | 180 x 180 |
| 90 | 160 x 160 | 200 x 200 |
| 110 | 180 x 180 | 220 x 220 |
| 125 | 190 x 190 | 230 x 230 |
| 160 | 230 x 230 | 270 x 270 |
| 200 | 270 x 270 | 310 x 310 |
| 250 | 320 x 320 | 360 x 360 |

## DETAILS ON CHASE DEPTHS DO NOT INCLUDE PIPE CROSSINGS.

## 6.5.5 EXAMPLES OF INSTALLATION IN A GAP

The installation of above ground drainage pipes in chases and gaps is very problematic.

On principle, when no sound insulation element is used, above ground drainage pipes can only be installed in chases when a minimum wall weight of 220 kg/m² or 350 kg/m² remains in the chase area on the side facing the room that requires protection (see figure 31).

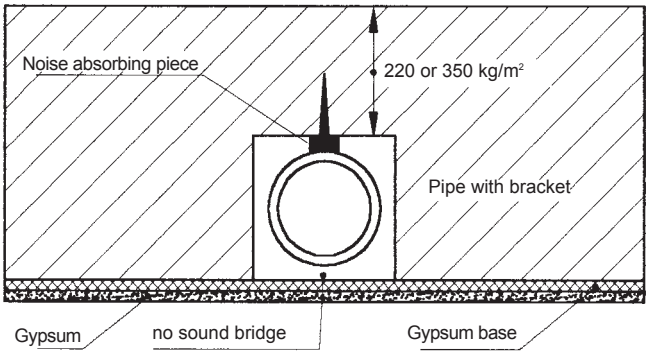



**(FIGURE 31)**
Fastening without sound insulation element

Chases can be faced using a plaster base (plaster base tiles or wire lattice) and a coat of plaster.

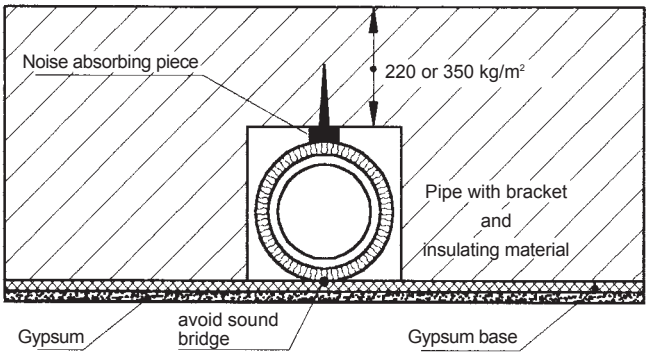
Coating can also be carried out with gypsum plaster boards or fibre cement sheets (see figure 32).

No connecting paths (= sound bridges) may develop between above ground drainage pipe and plaster base.




**(FIGURE 32)**
Traditional laying method

To guard against sound bridges between the pipe wall and the building in the case of installation in a gap, above ground drainage pipes can be fully encased in insulation materials (see figure 33).




**(FIGURE 33)**
Avoiding impact sound bridges

**THE WORKS MANAGEMENT SHOULD CHECK AND CONFIRM INSTALLATION IMPLEMENTATION BEFORE THE CHASES ARE CLOSED.**

## 6.5.6 LAYING OF PIPES ON BARE FLOORS

Sufficiently fasten the pipe in its position with the required gradient. You are advised to observe the fastening distances as stated in paragraph 6.4 “horizontal pipe routing”. Besides, measures must be taken to provide decoupling of structure-borne noise (e. g. wedges made of flexible insulating materials). Pieces of bricks and mortar are not suitable for the purpose of decoupling structure-borne noise. It is advisable to protect the pipes from being pulled apart in areas that are frequently crossed during structural work. This can be done easily and reliably with POLO-ASV.

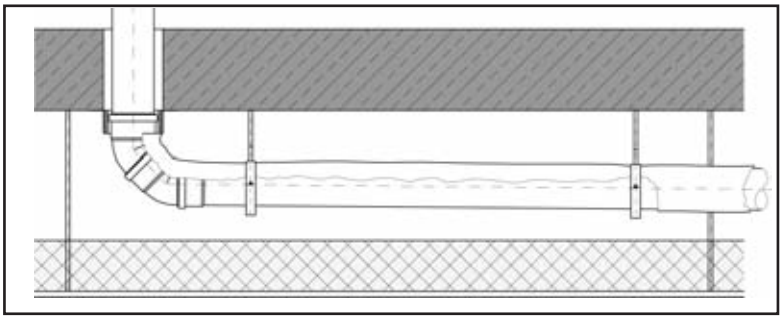
## 6.5.7 PIPE LAYING IN PITS

Make sure to lay the pipes without contact to other pipe systems and the structure. The use of an insulating hose is only necessary in the area of ceiling and wall apertures and in places where sound transmission can be expected due to unintentional connection points. A conventional insulating hose is more or less ineffective for purposes of airborne noise reduction.

## 6.5.8 LAYING IN SUSPENDED CEILINGS

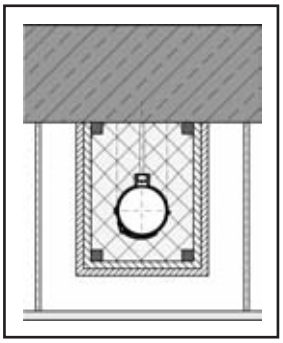
Open pipe laying in rooms that need to be protected should generally be avoided, as standard requirements cannot be fulfilled.
If due to the building design it becomes necessary to lay pipes horizontally in a suspended ceiling, additional insulation measures need to be taken

**Alternative 1**
> insulated suspended ceiling
> sheathe the pipes with lead foil (when downpipes are reversed to a horizontal routing the lead foil must be used 0.5 m before and at least 3 m behind the bend).



**(FIGURE 34)**

**Alternative 2**
Enclosure of the entire pipe (e. g. double-planked gypsum plaster board) and stuffing of the cavity with suitable insulating material.



**(FIGURE 35)**

# 6.6_SPECIAL INSTALLATION CASES

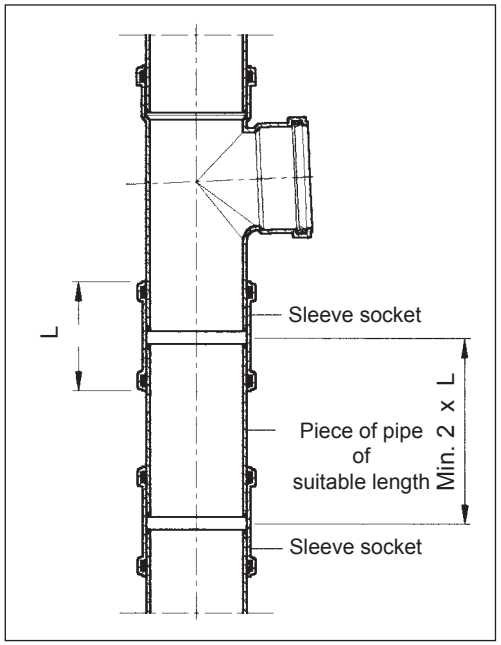
## 6.6.1 SUBSEQUENT INSTALLATION OF JUNCTIONS

### INSTALLATION OF A JUNCTION USING TWO SLEEVES

When using two sleeve sockets, a piece of pipe of suitable length (the length of the fitting plus twice the outside diameter of the pipe) is cut out, the pipe ends deburred and bevelled and the junction installed.

A sleeve socket is then slid onto the remaining sleeveless pipe end and the sleeveless piece of pipe, respectively.

The piece of pipe is inserted into the gap in the pipe and the connection is closed by sliding both sleeve sockets back (see figure 36).



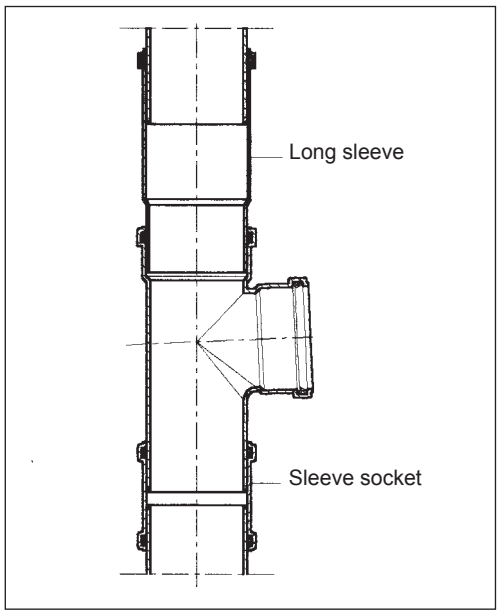

**(FIGURE 36)**
Installation of a junction with 2 sleeve sockets

### INSTALLATION OF A JUNCTION USING A LONG SLEEVE AND SLEEVE SOCKET

If long sleeves are to be used, a piece of pipe is cut out the length of which corresponds to that of the fitting plus push-in depth, the pipe ends are deburred and bevelled and the long sleeve pushed in until it stops.

Push the sleeve over the tapered end of the junction and insert into the pipe.

Then push the tapered end of the long sleeve into the socket of the fitting (see figure 37).




**(FIGURE 37)**
Installation of a junction with long sleeve and sleeve socket

**SLEEVE SOCKETS AND LONG SLEEVES ARE FITTED WITH DOUBLE LIP RING SEALS, MAKING IT EASIER TO PUSH BACK WHEN RETROFITTING THEM.**

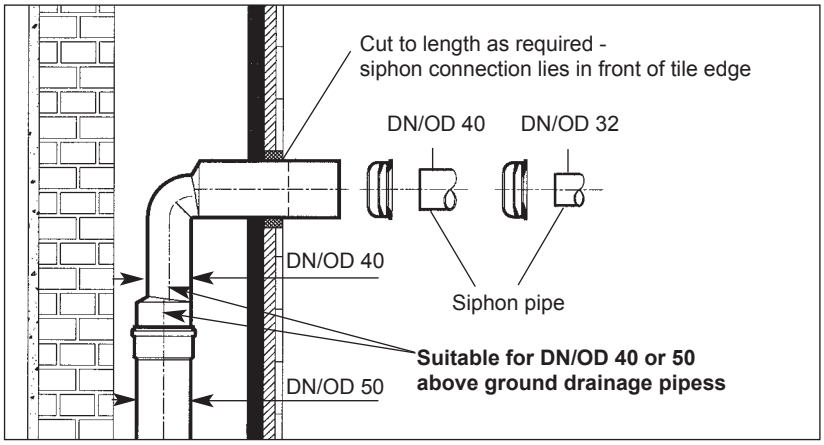
## 6.6.2 INSTALLATION OF LONG SIPHON-BENDS

The **long siphon-bends** can be used on plumbing walls, lightweight facings or for conventional types of installation.

## SIPHON-BEND LONG DN/OD 40/50 OUTLET REDUCED

Dimensions in mm

| Areas of use | Siphon pipe Ø |
|---|---|
| Washstands | 32 |
| Bidets | 32 |
| Sink basins | 40 |
| Small sinks | 40 |

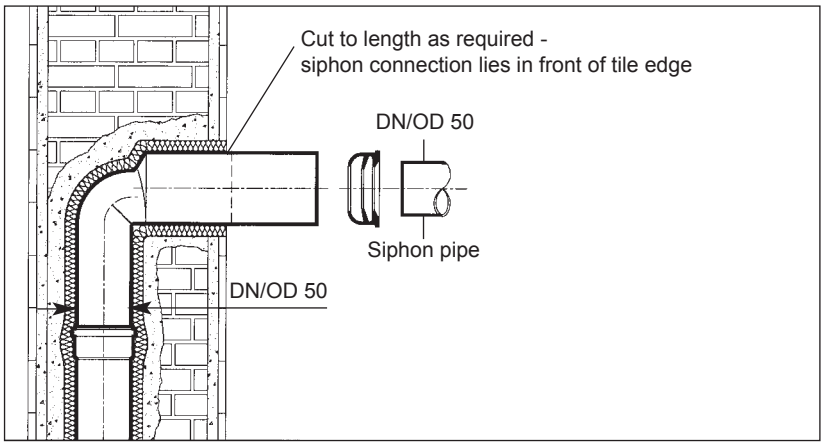



**(FIGURE 38)**
Example of plumping wall installation

## SIPHON-BEND LONG DN/OD 50

Dimensions in mm

| Areas of use | Siphon pipe Ø |
|---|---|
| Urinals | 50 |
| Large sinks | 50 |
| Washing machines | 50 |
| Bathtubs | 50 |

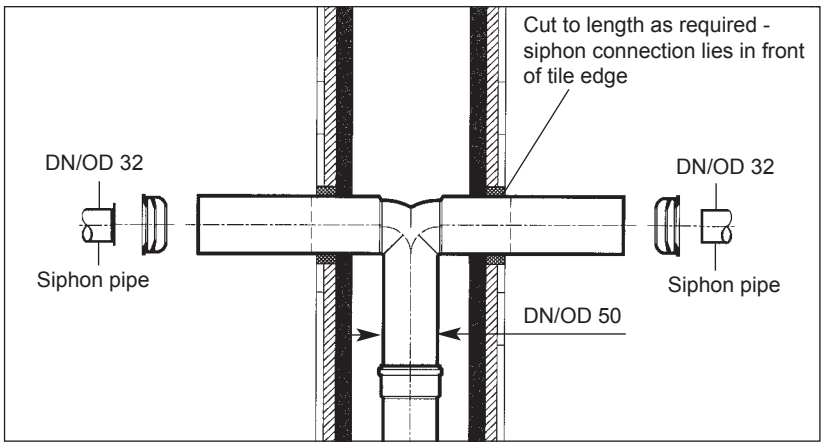



**(FIGURE 39)**
Example of a conventional installation (fixed onto or into a wall)

## DOUBLE SIPHON-BEND LONG DN/OD 50

Dimensions in mm

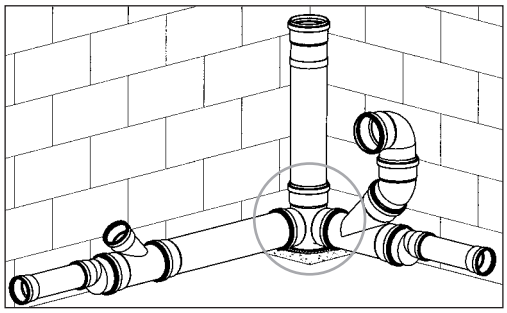
| Areas of use | Siphon pipe Ø |
|---|---|
| Washstands<br>Long line facility | 32 |




**(FIGURE 40)**
Example of lightweight facings

## 6.6.3 INSTALLATION OF DOUBLE CORNER BRANCHES

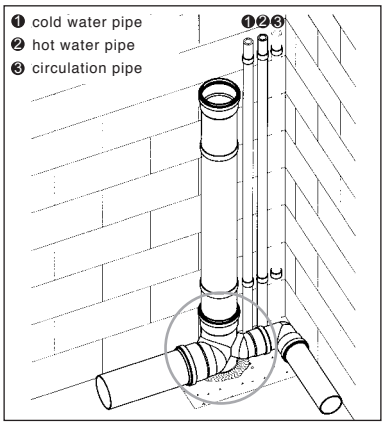
Double corner branches are used for installations in corner areas. The space-saving cross section allows several sanitary objects to be connected at the same time and is ideal for installations in corner areas, in pipe pits, behind plumbing walls or in sanitary cells.



**(FIGURE 41)**
Example of installation of a double corner branch

## 6.6.4 INSTALLATION OF BENT DOUBLE BRANCHES

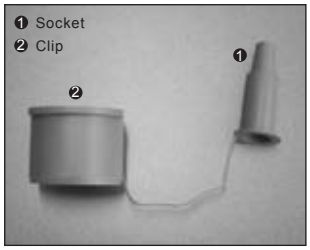
Bent double branches are used as bypasses, e.g. in the area of household plumbing. The flow-enhancing design of the cross section allows several sanitary objects to be connected at the same time. The space-saving above ground drainage connection is ideal for installation in pipe pits, behind plumbing walls or in sanitary cells.




**(FIGURE 42)**
Example of installation of a bent double branch

## 6.6.5 INSTALLATION OF CONDENSATE DISCHARGE ELEMENTS

The POLO-KAL NG condensate discharge element serves as a connection to ventilation, condensing value and air conditioning devices. It is a PP part consisting of socket and clip and stands out against traditional connections for flexible hoses due to its following advantages: low amount of assembly work involved, no need for tools, compactness.




**(FIGURE 43)**
POLO-KAL NG
condensate discharge element

**(FIGURE 44)**
Insert the hose into the clip

**(FIGURE 45)**
Insert the socket into the hose end

**(FIGURE 46)**
Push the clip over the socket and clamp the hose (the connecting wire can be severed at any time)

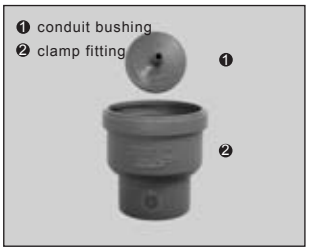
**(FIGURE 47)**
Fit the condensate discharge element into the pipe.

## 6.6.6 INSTALLATION OF CONDENSATE DISCHARGE ELEMENTS DN 100 / DN OD 100 TO 1/2"

In order to ensure professional discharge of condensate from ventilating pipes (bathroom, WC, kitchen, etc.): POLOPLAST´s condensate discharge element for POLO-KAL NG: the leakproof connection to plastics and spiro-tubes!

In practice, condensate discharge devices for ventilating pipes are frequently still made with the aid of sheet metal, silicone, hemp and various other materials. The consequences of such inadequate methods are corrosion and the occurrence of leaks. POLOPLAST´s professional solution puts a stop to that: the new POLO-KAL NG condensate discharge element! It guarantees lasting leakproofness and is easy to lay without any tools.

### ASSEMBLY WITH PLASTIC PIPES OD 110




**(FIGURE 48)**
POLO-KAL NG
condensate discharge element

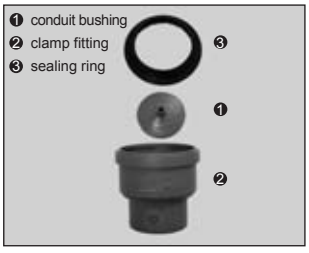
**(FIGURE 49)**
Insert the hose through the clamp fitting

**(FIGURE 50)**
Insert the bushing into the hose end as far as possible

**(FIGURE 51)**
Insert the bushing into the clamp fitting – pull the hose from below to secure a firm connection

**(FIGURE 52)**
Fit the condensate discharge element into the pipe

### ASSEMBLY WITH SPIRO-PIPES DN 100




**(FIGURE 53)**
POLO-KAL NG
condensate discharge element

**(FIGURE 54)**
Insert the hose through the clamp fitting

**(FIGURE 55)**
Insert the bushing into the hose end as far as possible

**(FIGURE 56)**
Insert the bushing into the clamp fitting – pull the hose from below to secure a firm connection

**(FIGURE 57)**
Insert the sealing ring into the clamp fitting

**(FIGURE 58)**
Fit the condensate discharge element into the pipe

**(FIGURE 59)**
The sealing ring is generally suitable for use as transition fitting from DN 100, tapered end, to an OD 110 socket

## 6.6.7 INSTALLATION OF SHORT TRANSITION PIPES

**Field of application:** in cramped conditions where there is no room for commercial transition pipes (e. g. connections near to the floor).

| DN/OD | Art. No. |
|---|---|
| 75/50 | 2875 |
| 90/50 | 2292 |
| 90/75 | 2289 |
| 110/50 | 2876 |
| 110/75 | 2877 |
| 110/90 | 2290 |
| 160/110 | 2878 |

## INSTALLATION OF CENTRIC TRANSITION PIPES WITH SMALL SPIGOT

**Field of application:** wherever the downpipe must be reduced centrically for hydraulic reasons, e. g., in low-pressure drainage systems.

| DN/OD | Art. No. |
|---|---|
| 50/40 | 1786 |
| 75/50 | 1787 |
| 110/90 | 1791 |
| | |
| | |
| | |
| | |

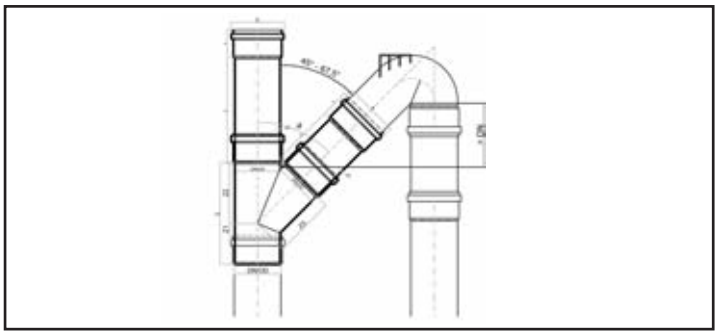
## 6.6.8 INSTALLATION OF INSIDE / INSIDE TRANSITION PIPES

**Field of application:** wherever domestic waste disposal pipes are laid in concrete with the sockets damaged, protruding with one spigot or ending flush with the floor.

| DN/OD | Art. No. |
|---|---|
| 110/50 | 2369 |
| 110/75 | 2370 |
| 110/90 | 2367 |
| 110/110 | 2381 |
| 160/110 | 2366 |
| | |
| | |

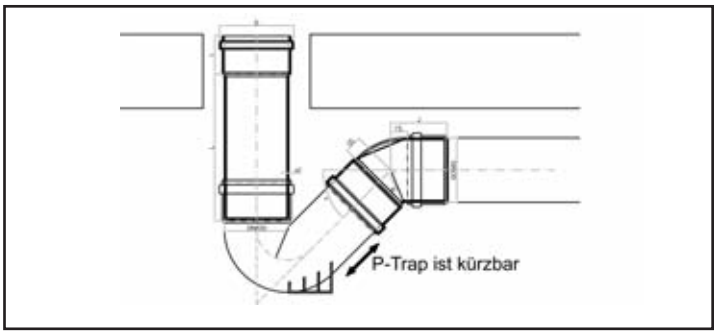
## 6.6.9 INSTALLATION OF CIRCULAR-VENTILATION BENDS

1) Circular ventilation bend for the junction of the bypass line and the downpipe.



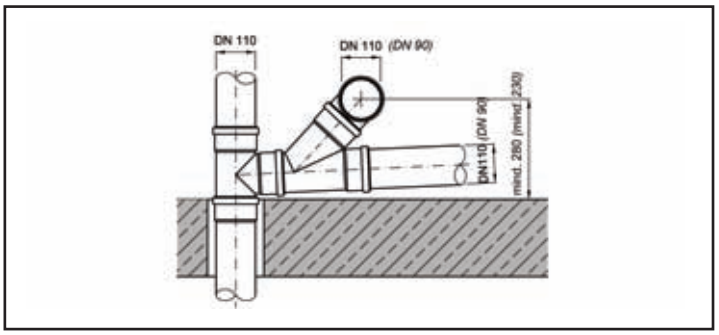
**(FIGURE 60)**

2) This can also be used as a P trap for WC connection below the floor.

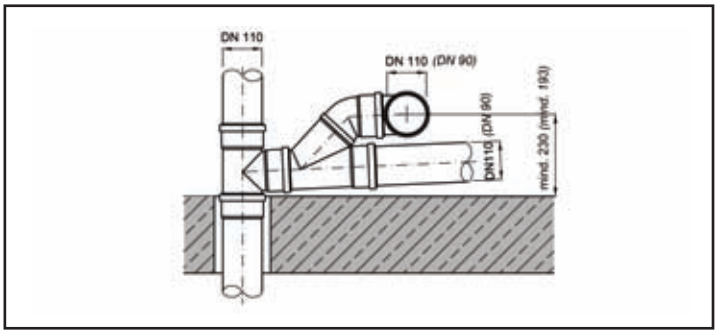



**(FIGURE 61)**

## 6.6.10 INSTALLATION OF PARALLEL BRANCHES




**(FIGURE 62)**
with 45° branch

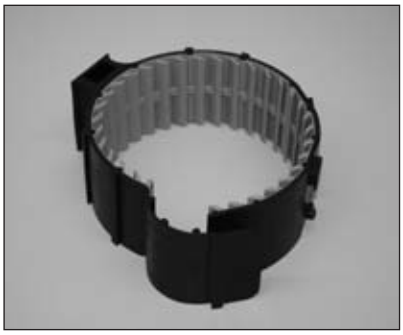



**(FIGURE 63)**
with 45° parallel branch

# 6.7_LAYING INSTRUCTIONS – POLO-CLIP HS BRACKET

## 6.7.1 DESCRIPTION OF THE POLO-CLIP HS BRACKET SYSTEM

The POLO-CLIP HS bracket is a fastening system for three nominal pipe diameters, DN/OD 110, 90 and 75, which provides a high level of sound insulation. The bracket base, its ribs (of TPE material = vulcanized rubber) and the lock are of special shape.



**(FIGURE 64)**
POLO-CLIP HS bracket

### BRACKET BASE

An M8 or alternatively an M10 nut is inserted in the bracket base. This is to allow work to be carried out in two dimensions with a threaded rod as well as with a screw with woodwork and metric thread. In the transition area to the bracket body the bracket base is reinforced, to guarantee the firmness of the bracket.

**(FIGURE 65)**
Bracket base

### TPE RIBS

Due to their slanted position and the air cushion in between the ribs are optimally adjusted to the acoustic behaviour of the POLOPLAST above ground drainage systems POLO-KAL NG and POLO-KAL 3S.

**(FIGURE 66)**
TPE ribbing

### LOCKING MECHANISM

The special V-shaped locking mechanism securely holds the bracket in its position on the pipe and at the same time prevents uncontrolled pressing.

**(FIGURE 67)**
Locking mechanism

## 6.7.2 HANDLING OF THE POLO-CLIP HS BRACKET

POLO-CLIP HS is simple and easy to mount. The DN/OD 110 nominal width can be immediately used without modifying the bracket body.

POLO-CLIP HS is fitted on the wall or the ceiling with the help of a screw with woodwork and metric thread or a threaded rod and a two-hole base plate. Make sure that the pipe, when ceiling-fitted with the help of longer threaded rods, be additionally secured to prevent lateral yielding.

After fitting the bracket, the pipe is inserted (see figure 68). If the pipe is laid in a vertical direction and the bracket has to serve as a fixed point, it must always be installed below a sleeve.

The bracket engages when the lock is pressed into the latching point (see figure 69). The established connection is now friction-locked (see figure 70).

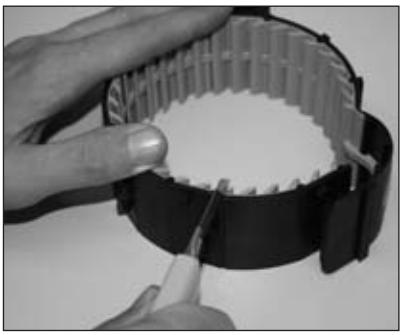
**(FIGURE 68)**
Mounting of the POLO-CLIP HS bracket

**(FIGURE 69)**
Fixing the locking mechanism

**(FIGURE 70)**
Mounted bracket

## 6.7.3 MODIFICATION OF THE BRACKET FOR USE WITH OTHER NOMINAL PIPE DIAMETERS

The basic bracket has to be cut to length for use with pipes of DN/OD 90 and DN/OD 75 diameters. Use a cutting tool, e.g. snips or knife, to cut the bracket body, which is marked by notches, to the required pipe dimension. The shortened bracket can be used immediately.

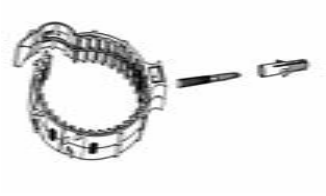


**(FIGURE 71)**
Cutting the bracket body

## 6.7.4 MOUNTING PIPES WITH THE POLO-CLIP HS BRACKET

### MOUNTING THE BRACKET ON THE WALL

(1) mounting the POLO-CLIP HS bracket on the wall with the help of a screw with woodwork and metric thread



(2) mounting the POLO-CLIP HS bracket on the wall with the help of a threaded rod and a two-hole base plate

### MOUNTING THE BRACKET ON THE CEILING

(1) mounting the POLO-CLIP HS bracket on the ceiling with the help of a screw with woodwork and metric thread

(2) mounting the POLO-CLIP HS bracket on the ceiling with the help of a threaded rod and a two-hole base plate

(3) mounting the POLO-CLIP HS bracket on a bar with the help of a screw with woodwork and metric thread

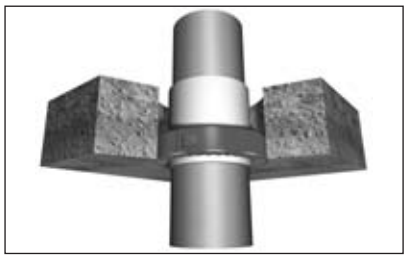
**NOTE: IF A LONGER THREADED ROD IS USED FOR FITTING THE BRACKET, THE PIPE HAS TO BE SECURED AGAINST LATERAL YIELDING.**

# 6.8_INSTALLATION INSTRUCTIONS FOR POLO-BSM



## (1) FLOOR - STANDARD INSTALLATION

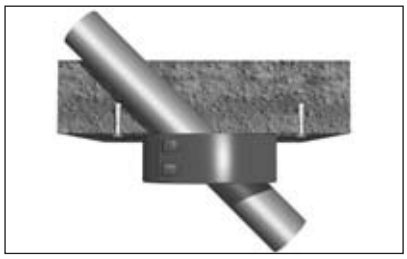
In this case fasten the collar on the lower floor surface or insert it in a floor aperture. NOTE: in Germany the BSM has to protrude from the lower floor surface by 2 cm!



**(FIGURE 72)**
Floor - standard installation

## FLOOR - SPECIAL INSTALLATION "DIAGONAL FITTING AT 45°"

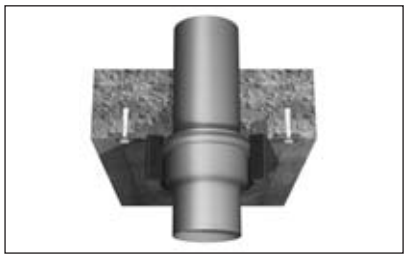
In this case fix the collar to the lower floor surface (see figure 73).



**(FIGURE 73)**
Floor - special installation
“diagonal fitting at 45°”

## (3) FLOOR - SPECIAL INSTALLATION "FITTING ON THE SOCKET"

In this case fix the collar to the lower floor surface (see figure 74).



**(FIGURE 74)**
Floor - special installation
“fitting on the socket”

## (4) INSTALLATION ON THE WALL

In this case fix the collars on either side on the wall and connect them with screws (see figure 75).

**(FIGURE 75)**
Installation on the wall

When the fire protective collar is fitted **IN** the wall or floor aperture, the fastening straps can be bent back. To fasten the fire protective collar **ON** the wall or floor, use the fastening set supplied.

All fire protection requirements for plastic waste disposal pipes of fire protection categories B1 and B2 are met, if the following criteria are adhered to:

> keep mounting apertures as small as possible;
> completely seal remaining apertures with non-combustible building materials;
> encase plastic pipes in the area of openings with fibre wool or foamed hoses (at least B2) for heat, cold or sound insulation.

## 7.1. INVITATION TO TENDER TEXTS FOR POLO-KAL NG ABOVE GROUND DRAINAGE SYSTEMS

Introductory remarks:

**Sound absorbing compound waste pipes made of PP-C.**

**POLO-KAL NG Socket pipe**
3-layer, mineral-reinforced compound pipe made of non-halogen plastic,
PP-C inner layer, hot water resistant up to 97°C, sound-absorbing intermediate layer made of PP-TV mineral-reinforced compound, PP-C exterior layer.
Minimum rigidity da 40-160 4 kN/m² (SN4), da 200 and 250 8 kN/m² (SN8).
Application classification B/D.
Colour RAL 5014, dove blue.
Moulded connecting sleeve with factory-fitted lip ring,
low temperature impact resistant to -20°C in accordance with EN 1411
average coefficient of linear expansion: LAK 0.05 mm/m°K
Fire behaviour according to EN 13501-1: Classification D-s2 d2
Modulus of elasticity: 2600MPA according to ISO 178
Leakproof under low pressure to 900 mbar
Product: POLO-KAL NG Socket pipe da .....

**POLO-KAL NG Moulded part (bend)**
Single layer, mineral-reinforced moulded part made of non-halogen plastic PP-C-KV with connecting sleeve and factory-fitted lip ring, hot water resistant up to 97°C.
Product: POLO-KAL NG bend 45° da .....

**POLO-KAL NG Moulded part (branch pipe)**
Single layer, mineral-reinforced moulded part made of non-halogen plastic PP-C-KV with connecting sleeve and factory-fitted lip ring, hot water resistant up to 97°C.
Product: POLO-KAL NG branch pipe 45° da/da ...../.....

**POLO-KAL NG Moulded part (transition pipe)**
Single layer, mineral-reinforced moulded part made of non-halogen plastic PP-C-KV with connecting sleeve and factory-fitted lip ring, hot water resistant up to 97°C.
Product: POLO-KAL NG transition pipe da/da ...../.....

**POLO-KAL NG Moulded part (centric transition pipe with small spigot)**
Single layer, mineral-reinforced moulded part made of non-halogen plastic PP-C-KV with connecting sleeve and factory-fitted lip ring, hot water resistant up to 97°C.
Product: POLO-KAL NG centric transition pipe with small spigot da/da ...../.....

**POLO-KAL NG Moulded part (double socket)**
Single layer, mineral-reinforced moulded part made of non-halogen plastic PP-C-KV with connecting sleeve and factory-fitted lip ring, hot water resistant up to 97°C.
Product: POLO-KAL NG double socket da .....

**POLO-KAL NG Moulded part (collar)**
Single layer, mineral-reinforced moulded part made of non-halogen plastic PP-C-KV with connecting sleeve and factory-fitted double lip ring, hot water resistant up to 97°C.
Product: POLO-KAL NG collar da .....

**POLO-KAL NG Moulded part (long socket)**
Single layer, mineral-reinforced moulded part made of non-halogen plastic PP-C-KV with connecting sleeve and factory-fitted double lip ring, hot water resistant up to 97°C.
Product: POLO-KAL NG long socket da .....

**POLO-KAL NG Moulded part (socket plug)**
Single layer, mineral-reinforced moulded part made of non-halogen plastic PP-C-KV, hot water resistant up to 97°C.
Product: POLO-KAL NG socket plug da .....

**POLO-KAL NG Moulded part (cleaning pipe)**
Single layer, mineral-reinforced moulded part made of non-halogen plastic PP-C-KV with connecting sleeve and factory-fitted lip ring, hot water resistant up to 97°C.

7_TEXT MODULES FOR TENDERS

## 7.2_TEXT MODULES FOR POLO-KAL 3S

Introductory remarks:

**Sound-absorbing compound waste pipes made of PP-C**

**POLO-KAL 3S socket pipe**
3-layer, mineral-reinforced compound pipe made of non-halogen plastic, PP-C inner layer, hot water resistant up to 97°C, sound-absorbing intermediate layer made of PP-KV, mineral-reinforced compound, PP-C exterior layer.
Minimum rigidity da 75 - 160 4 kN/m2 (SN4)
Application classification B
Colour: RAL 7053, light grey.
Moulded push-fit socket with factory-fitted lip ring, average coefficient of linear expansion: LAK 0.09 mm/m K°
Fire behaviour according to ÖNORM B 3800 and DIN 4102, Part 1, respectively. B2/Q2/TR1
Product: POLO-KAL 3S socket pipe da ...

**POLO-KAL 3S Moulded part (bend)**
Single-layer, mineral-reinforced moulded part made of non-halogen plastic PP-C-KV with push-fit socket and factory-fitted lip ring, hot water resistant up to 97°C.
Product: POLO-KAL 3S bend ....° da ....

**POLO-KAL 3S Moulded part (branch)**
Single-layer, mineral-reinforced moulded part made of non-halogen plastic PP-C-KV with push-fit socket and factory-fitted lip ring, hot water resistant up to 97°C.
Product: POLO-KAL 3S branch ....° da/da .... /....

**POLO-KAL 3S Moulded part (double branch)**
Single-layer, mineral-reinforced moulded part made of non-halogen plastic PP-C-KV with push-fit socket and factory-fitted lip ring, hot water resistant up to 97°C.
Product: POLO-KAL 3S double branch, independent of branch angle and diameter
da/da/da .... /.... / ....

**POLO-KAL 3S Moulded part (parallel branch)**
Single-layer, mineral-reinforced moulded part made of non-halogen plastic PP-C-KV with push-fit socket and factory-fitted lip ring, hot water resistant up to 97°C.
Product: POLO-KAL 3S parallel branch, independent of branch angle and diameter
da/da .... /....

**POLO-KAL 3S Moulded part (double corner branch)**
Single-layer, mineral-reinforced moulded part made of non-halogen plastic PP-C-KV with push-fit socket and factory-fitted lip ring, hot water resistant up to 97°C.
Product: POLO-KAL 3S double corner branch, independent of branch angle and diameter
da/da/da .... /.... / ....

**POLO-KAL 3S Moulded part (transition pipe)**
Single-layer, mineral-reinforced moulded part made of non-halogen plastic PP-C-KV with push-fit socket and factory-fitted lip ring, hot water resistant up to 97°C.
Product: POLO-KAL 3S transition pipe.... da/da .... /....

**POLO-KAL 3S Moulded part (double socket)**
Single-layer, mineral-reinforced moulded part made of non-halogen plastic PP-C-KV with push-fit socket and factory-fitted lip ring, hot water resistant up to 97°C.
Product: POLO-KAL 3S double socket da ...

**POLO-KAL 3S Moulded part (slip-on socket)**
Single-layer, mineral-reinforced moulded part made of non-halogen plastic PP-C-KV with push-fit socket and factory-fitted lip ring, hot water resistant up to 97°C.
Product: POLO-KAL 3S slip-on socket da ...

**POLO-KAL 3S Moulded part (socket plug)**
Single-layer, mineral-reinforced moulded part made of non-halogen plastic PP-C-KV, hot water resistant up to 97°C.
Product: POLO-KAL 3S socket plug da ...

**POLO-KAL 3S Moulded part (cleanout pipe)**
Single-layer, mineral-reinforced moulded part made of non-halogen plastic PP-C-KV with push-fit socket and factory-fitted lip ring, hot water resistant up to 97°C.
Product: POLO-KAL 3S cleaning pipe da ...

## 7.3_TENDER TEXTS FOR POLO-ASV

**POLO-ASV (extension-proof connection)**
Mineral-reinforced plastic claw fastener made of non-halogen plastic PA-GFV, hot water resistant up to 97°C, minimum protection from extension: 140 kg.

Product: POLO-ASV da ....



## 7.4_TENDER TEXTS FOR POLO-BSM

**POLO-BSM (Fire sleeve)**
Fire sleeve for the pipe systems POLO-KAL NG and POLO-KAL 3S.
System-tested and approved fire protection system for the POLO-KAL NG and POLO-KAL 3S pipe systems where they are ducted through a fire compartment.
Sleeve body made of sheet steel, starting at temperatures around 130°C the fire protective compound expands to 10 times its volume with a pressure of up to 10 bar.
Product: POLO-BSM DN/OD ....



## 7.5_TENDER TEXTS FOR POLO-CLIP HS

**POLO-CLIP HS (highly sound insulating pipe fastening system)**
Pipe bracket made of a PP hard component and a TPE soft component in one manufacturing operation (optimally balanced materials providing maximum sound insulation).
Fastening system for POLO-KAL NG or POLO-KAL 3S pipes on walls or ceilings (horizontal or vertical laying) providing optimal sound insulation.
Due to their slanted position and the air cushion in between, the ribs of the soft component part are an optimal sound decoupling element.
The special locking mechanism prevents uncontrolled pressing and securely holds the clip in its position.
Available with M8 or M10 nut.

Product: POLO-CLIP HS

# NOTES

# NOTES

# poloplast

## The Polypropylene Acoustic Pipe System

**NEW GENERATION MULTI-LAYER PIPE SYSTEM**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