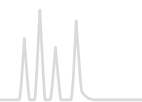

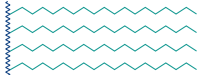

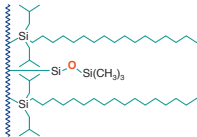

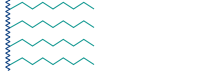

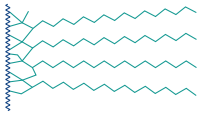

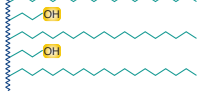

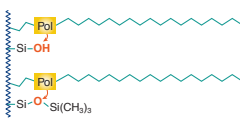

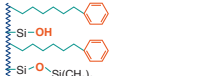

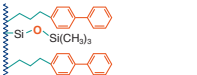




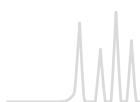
NUCLEODUR® phase overview



Overview of NUCLEODUR® HPLC phases

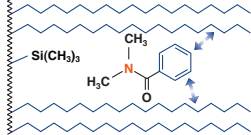
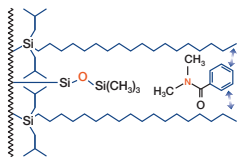
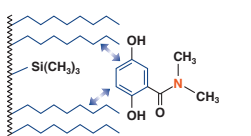
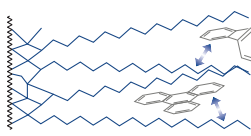
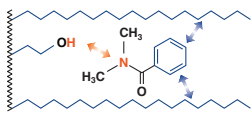
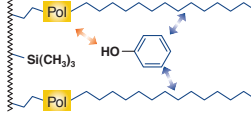
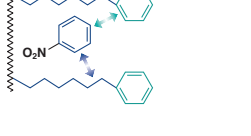
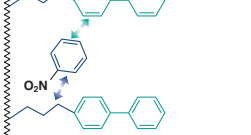
Phase	Specification	Page	Characteristic*	Stability	Structure
 C ₁₈ Gravity	octadecyl, high density coating, multi-endcapping 18 % C · USP L1	158	A ●●●●● B ● C ●●●	pH 1–11, suitable for LC/MS	NUCLEODUR® (Si-O) ₂ h 
 C ₁₈ Gravity-SB	octadecyl (monomeric), extensive endcapping 13 % C · USP L1	162	A ●●●●● B ●●●● C -	pH 1–9, suitable for LC/MS	NUCLEODUR® (Si-O) ₂ h 
 C ₈ Gravity	octyl, high density coating, multi-endcapping 11 % C · USP L7	158	A ●●●● B ●● C ●●	pH 1–11, suitable for LC/MS	NUCLEODUR® (Si-O) ₂ h 
 C ₁₈ Isis	octadecyl phase with specially crosslinked surface modification endcapping 20 % C · USP L1	164	A ●●●●● B ●●● C ●●●●●	pH 1–10, suitable for LC/MS	NUCLEODUR® (Si-O) ₂ h 
 C ₁₈ Pyramid	octadecyl with polar endcapping 14 % C · USP L1	166	A ●●●●● B ●●●● C ●●	stable in 100 % aqueous eluent, pH 1–9, suitable for LC/MS	NUCLEODUR® (Si-O) ₂ h 
 PolarTec	octadecyl with embedded polar group 17 % C · USP L1 and L60	168	A ●●●●● B ●●●● C ●●●●	stable in 100 % aqueous eluent, pH 1–9, suitable for LC/MS	NUCLEODUR® (Si-O) ₂ h 
 Phenyl-Hexyl	phenylhexyl, multi-endcapping 10 % C · USP L11	170	A ●● B ●●●● C ●	pH 1–10, suitable for LC/MS	NUCLEODUR® (Si-O) ₂ h 
 π ²	biphenylpropyl, multi-endcapping 17 % C · USP L11	172	A ●● B ●●●● C ●●●	pH 1.5–10	NUCLEODUR® (Si-O) ₂ h 

* A = ● hydrophobic selectivity, B = ● polar / ionic selectivity, C = ● steric selectivity



NUCLEODUR[®] phase overview

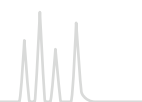


Application	Similar phases**	Interactions · retention mechanism
in general compounds with ionizable functional groups such as basic pharmaceuticals and pesticides	NUCLEOSIL [®] C ₁₈ HD Xterra [®] RP18 / MS C18; Luna [®] C18(2), Gemini [®] , Synergi [®] Max RP; Zorbax [®] Extend-C18; Inertsil [®] ODS III; Purospher [®] STAR RP-18; Hypersil [™] BDS	hydrophobic (van der Waals interactions) 
overall sophisticated analytical separations, especially for polar compounds, e.g., antibiotics, water-soluble vitamins, organic acids	–	hydrophobic (van der Waals interactions) with additional polar interactions 
like C ₁₈ Gravity, however, generally shorter retention times for nonpolar compounds	NUCLEOSIL [®] C ₈ HD Xterra [®] RP8 / MS C8; Luna [®] C8; Zorbax [®] Eclipse XDB-C8	hydrophobic (van der Waals interactions) 
high steric selectivity, thus suited for separation of positional and structural isomers, planar / nonplanar molecules	NUCLEOSIL [®] C ₁₈ AB Inertsil [®] ODS-P; Pro C18 RS	steric and hydrophobic 
basic pharmaceuticals, very polar compounds, organic acids	Aqua, Synergi [®] Hydro-RP; AQ; Atlantis [®] dC18; Polaris [®] C18-A	hydrophobic and polar (H bonds) 
basic pharmaceuticals, organic acids, pesticides, amino acids, water-soluble vitamins	NUCLEOSIL [®] C ₁₈ Nautilus ProntoSIL [®] C18 AQ, Zorbax [®] Bonus-RP, Polaris [®] Amide-C18; Ascentis [®] RP Amide, SymmetryShield [™] RP18; SUPELCOSIL [™] LC-ABZ ⁺ ; HyPURITY [™] ADVANCE; ACCLAIM Polar AD.II	hydrophobic and polar (H bonds) 
aromatic and unsaturated compounds, polar compounds like pharmaceuticals, antibiotics	Luna [®] Phenyl-Hexyl; Zorbax [®] Eclipse Plus Phenyl-Hexyl; Kromasil [®] Phenyl-Hexyl	π-π and hydrophobic 
aromatic and unsaturated compounds, polar compounds like pharmaceuticals, antibiotics	Pinnacle [®] DB Biphenyl; Ultra Biphenyl	π-π and hydrophobic 




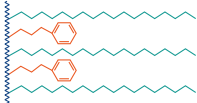

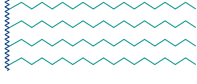

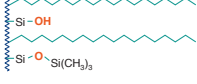





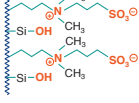

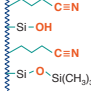
** phases which provide a similar selectivity based on chemical and physical properties



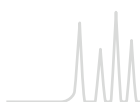
NUCLEODUR[®] phase overview



Overview of NUCLEODUR[®] HPLC phases

Phase	Specification	Page	Characteristic*	Stability	Structure
 PFP	pentafluorophenylpropyl, multi-endcapping 8% C · USP L43	174	A ●● B ●●●● C ●●●●	pH 1–9, suitable for LC/MS	NUCLEODUR [®] (Si-O) ₂ h 
 Sphinx RP	bifunctional, balanced ratio of propylphenyl and octadecyl, endcapping 15% C · USP L1 and L11	176	A ●●●● B ●●●● C ●	pH 1–10, suitable for LC/MS	NUCLEODUR [®] (Si-O) ₂ h 
 C ₁₈ HTec	octadecyl, high density coating, high capacity, multi-endcapping 18% C · USP L1	178	A ●●●●●● B ●●●●●● C ●●●●●●	pH 1–11, suitable for LC/MS	NUCLEODUR [®] (Si-O) ₂ h 
 C ₁₈ ec	octadecyl, medium density, endcapping available in 110 Å and 300 Å pore size 17.5% / 4% C · USP L1	181	A ●●●●●● B ●●●●●● C ●●●●●●	pH 1–9	NUCLEODUR [®] (Si-O) ₂ h 
 C ₈ ec	octyl, medium density, endcapping 10.5% C · USP L7	181	A ●●●●●● B ●●●●●● C ●●●●●●	pH 1–9	NUCLEODUR [®] (Si-O) ₂ h 
 C ₄ ec	butyl, medium density, endcapping, 300 Å pore size 2.5% C · USP L26	181	A ●●●●●● B ●●●●●● C ●●●●●●	pH 1–9	NUCLEODUR [®] (Si-O) ₂ h 
 HILIC	zwitterionic ammonium – sulfonic acid phase 7% C	184	A ●●●●●● B ●●●●●● C -	pH 2–8.5	NUCLEODUR [®] (Si-O) ₂ h 
 CN/CN-RP	cyano (nitrile) for NP and RP separations 7% C · USP L10	186	A ●●●●●● B ●●●●●● C -	pH 1–8, stable towards highly aqueous mobile phases	NUCLEODUR [®] (Si-O) ₂ h 

* A = ● hydrophobic selectivity, B = ● polar / ionic selectivity, C = ● steric selectivity



NUCLEODUR[®] phase overview

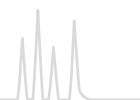


Application	Similar phases**	Interactions · retention mechanism
aromatic and unsaturated compounds, halogen compounds, phenols, isomers, polar pharmaceuticals, antibiotics	ACQUITY [®] CSH Fluoro-Phenyl; Hypersil [™] GOLD PFP; Luna [®] PFP(2); Discovery [®] HS F5; Allure [®] PFP Propyl; Ultra II PFP Propyl	polar (H bond), dipole-dipole, π - π and hydrophobic
compounds with aromatic and multiple bond systems	no similar phases	π - π and hydrophobic
robust and well base deactivated C ₁₈ phase; all separation tasks with preparative potential	Xterra [®] RP18 / MS C18 / SunFire [™] C18; Luna [®] C18(2), Gemini [®] , Synergi [®] Max RP; Zorbax [®] Extend-C18; Inertsil [®] ODS III; Purospher [®] STAR RP-18; Hypersil [®] BDS	hydrophobic (van der Waals interactions)
robust C ₁₈ phase for routine analyses	NUCLEOSIL [®] C ₁₈ Spherisorb [®] ODS II; Symmetry [®] C18; Hypersil [®] ODS; Inertsil [®] ODS II; Kromasil [®] C18; LiChrospher [®] RP-18	hydrophobic (van der Waals interactions) some residual silanol interactions
robust C ₈ phase for routine analyses	NUCLEOSIL [®] C ₈ ec / C ₈ Spherisorb [®] C8; Symmetry [®] C8; Hypersil [®] MOS; Kromasil [®] C8; LiChrospher [®] RP-8	hydrophobic (van der Waals interactions) some residual silanol interactions
biological macromolecules like proteins or peptides	Jupiter [®] C4; ACE [®] C4	hydrophobic (van der Waals interactions) some residual silanol interactions
hydrophilic compounds such as polar organic acids and bases, polar natural compounds	Sequant [™] ZIC [®] -HILIC; Obelisc [™]	ionic / hydrophilic and electrostatic
polar organic compounds (basic drugs), molecules containing π -electron systems	NUCLEOSIL [®] CN / CN-RP	π - π and polar (H bond), hydrophobic


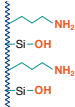

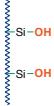
** phases which provide a similar selectivity based on chemical and physical properties



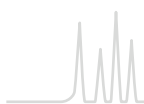
NUCLEODUR[®] phase overview



Overview of NUCLEODUR[®] HPLC phases

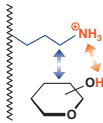
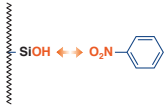
Phase	Specification	Page	Characteristic*	Stability	Structure
 NH ₂ / NH ₂ -RP	aminopropyl for NP and RP separations 2.5% C · USP L8	188	A ● B ●●●● C -	pH 2–8, stable towards highly aqueous mobile phases	NUCLEODUR [®] (Si-O) ₂ H 
 SiOH	unmodified high purity silica · USP L3	190	A - B - C -	pH 2–8	NUCLEODUR [®] (Si-O) ₂ H 

* A = ● hydrophobic selectivity, B = ● polar / ionic selectivity, C = ● steric selectivity



NUCLEODUR[®] phase overview



Application	Similar phases**	Interactions · retention mechanism
sugars, sugar alcohols and other hydroxy compounds, DNA bases, polar compounds in general	NUCLEOSIL [®] NH ₂ /NH ₂ -RP	polar / ionic and hydrophobic 
polar compounds in general	NUCLEOSIL [®] SiOH	polar / ionic 

** phases which provide a similar selectivity based on chemical and physical properties