



## Product Specifications

Custom Oligo Synthesis, antisense oligos, RNA oligos, chimeric oligos, Fluorescent dyes, Affinity Ligands, Spacers & Linkers, Duplex Stabilizers, Minor bases, labeled oligos, Molecular Beacons, siRNA, phosphonates  
Locked Nucleic Acids (LNA); 2'-5' linked Oligos

## Oligo Modifications

For research use only. Not for use in diagnostic procedures for clinical purposes.

## Click Chemistry Introduction

'Click chemistry' was defined by Sharpless and co-workers in 2001 (1) to describe a set of powerful, highly reliable and selective organic reactions which can be used for the rapid and facile synthesis of useful new compounds and combinatorial libraries. Each of these compounds is composed of small, modular sub-units stitched together through heteroatom linkages (C-X-C). Click chemistry reactions are simple, modular, stereospecific, very high yielding, wide in scope, can be conducted in benign/easily removable solvents, and generate side products which are easily removable by non-chromatographic methods. The primary driving force behind the development of click chemistry is the pharmaceutical industry's need to generate very large combinatorial libraries of small-molecule (< 500 Dalton) compounds that can be screened as drug candidates. Click chemistry has the potential to accelerate the drug discovery process, as it makes each reaction in the multi-step synthesis of a small molecule fast, efficient and predictable.

Although there are several types of organic reactions that fit the definition of click chemistry, for modification of oligonucleotides, the relevant one is the copper(I)-catalyzed [3+2] cycloaddition reaction between alkynes and azides (1,2). This reaction is extremely selective and regiospecific for conjugation reactions involving an oligo and a labeling moiety, as well as coupling reactions between two oligos. More detailed descriptions of specific click chemistry applications are provided in 'Click Chemistry Applications'.

## Click Chemistry Design Protocols

This section contains an example of a Copper(I)-catalyzed click reaction. This protocol may be used as a starting point for optimization of your particular click chemistry procedures.

### I. Preparation of the 'Click Solution'

1. NOTE: The 'click solution' (0.1 M CuBr / 0.1 M TBTA 1:2 (v/v) in DMSO/t-BuOH 3:1 (v/v)) must always be freshly prepared prior to use!
2. Dissolve 1 mg CuBr in 70  $\mu$ l DMSO/t-BuOH 3:1 (v/v) to obtain a 0.1 M solution. This solution must be freshly prepared and cannot be stored.
3. Dissolve 54 mg TBTA in 1 ml DMSO/t-BuOH 3:1 (v/v) for a 0.1 M solution. This solution can be stored at -20C.
4. Add 1 volume of the 0.1 M CuBr solution quickly to 2 volumes of the 0.1 M TBTA solution to obtain the click solution, which is ready to use.

### II. Click Procedure for Short DNA Oligos

Procedure using CuBr: To 5  $\mu$ l of a 2 mM DNA solution (10 nmol) in water, 2  $\mu$ l of an azide solution (50 mM, 50 nmol, 5 eq. in DMSO or in 3:1 (v/v) DMSO/t-BuOH), 3  $\mu$ l of a freshly prepared solution containing 0.1 M CuBr and 0.1 M TBTA ligand in a 1:2 (v/v) ratio in 3:1 (v/v) DMSO/t-BuOH is added. The mixture is thoroughly mixed and shaken at 25C for 3 h. The reaction is subsequently diluted with 0.3 M NaOAc (100  $\mu$ l) and the DNA is precipitated using 1 ml cold EtOH. The supernatant is then removed and the residue is washed twice with 1 ml cold EtOH. The washed residue is re-dissolved in pure water (20  $\mu$ l) and can be used without further purification.

## Click Chemistry Applications

Although the copper(I)-catalyzed alkyne-azide [3+2] cycloaddition reaction has many potential uses as a method for synthesis of unique oligo-based research tools, two specific applications currently dominate, (A) conjugation of anti-sense/siRNA oligonucleotides to cell-penetrating peptides (CPP), and (B) labeling of oligonucleotides with biotin and/or fluorescent dyes.

The efficacy of anti-sense and siRNA oligos in vivo is severely limited due to their inability to cross the cell membrane (3). One method for significantly increasing cell uptake of these oligos is to covalently conjugate cell penetrating peptides (CPP) to the oligo, most commonly through amide or disulfide linkages (4,5). While relatively straightforward to perform, such conjugations show wide variability in final yield, and often require complex and/or multiple purification. In addition, if the peptide is highly cationic, achieving a successful conjugation reaction can itself be problematic, due to non-specific binding between the cationic peptide and the anionic phosphate backbone of the oligo (6). Using click chemistry to form the CPP-oligo conjugate by linking an azidopeptide to an alkyne-modified oligo can provide an effective solution to these problems, as yield is essentially quantitative, and because the conjugation can be performed on a solid support, the need for expensive, multi-step purification is often eliminated (7-9). Please see the references provided for more details.

Similar advantages (quantitative yield, simple purification) favor the use of click chemistry for labeling oligos with such moieties as biotin, fluorescent dyes, and haptens (10-12). In all these cases, the oligo is alkyne-modified and the labels all contain an active azide group. A number of azide-modified labels are available, including biotin, desthiobiotin, 6-FAM, HEX and TET, among others. Additional labels will become available over time.

## References

1. Rostovtsev, V.V., Green, L.G., Fokin, V.V., Sharpless, K.B. A Stepwise Huisgen Cycloaddition Process: Copper(I)-Catalyzed Regioselective Ligation of Azides and Terminal Alkynes. *Angew. Chem. Int. Ed.* (2002), **41**: 2596-2599.
2. Huisgen, R. *Angew. Chem. Int. Ed.* (1963), **2**: 565-568.
3. Akhtar, S., Hughes, M.D., Khan, A., Bibby, M., Hussain, M., Nawaz, Q., Double, J., Sayyed, P. The delivery of antisense therapeutics. *Adv. Drug. Deliv. Rev.* (2000), **44**: 3-21.
4. Lundin, P., Johansson, H., Guterstam, P., Holm, T., Hansen, M., Langel, A., El Andaloussi, S. Distinct uptake routes of cell-penetrating peptide conjugates. *Bioconjug. Chem.* (2008), **19**: 2535-2542.
5. Frederic, H., May Catherine, M., Gilles, D., Twenty years of cell-penetrating peptides: from molecular mechanisms to therapeutics. *Br. J. Pharmacol.* (2009), **157**: 195-206.
6. Lu, K., Duan, Q-P., Ma, L., Zhao, D-X. Chemical strategies for the synthesis of peptide-oligonucleotide conjugates. *Bioconjug. Chem.* (2010), **21**: 187-202.
7. Gogoi, K., Mane, M.V., Kunte, S.S., Vijayanti, A.K. A versatile method for the preparation of conjugates of peptides with DNA/PNA/analog by employing chemo-selective click reaction in water. *Nucleic Acids Res.*, (2007), **35**: e139.
8. Brown, S.D., Graham, D. Conjugation of an oligonucleotide to Tat, a cell-penetrating peptide, via click chemistry. *Tet. Lett.*, (2010), **51**: 5032-5034.
9. Wenska, M., Alvira, M., Steunenbergh, P., Stenberg, A., Murtola, M., Stromberg, R. An activated triple bond linker enables 'click' attachment of peptides to oligonucleotides on solid support. *Nucleic Acids Res.*, (2011), **39**: 9047-9059.
10. Seo, T.S., Li, Z., Ruparel, H., Ju, J. Click chemistry to construct fluorescent oligonucleotides for DNA sequencing. *J. Org. Chem.*, (2003), **68**: 609-612.
11. Hall, L.M., Gerowska, M., Brown, T. A highly fluorescent DNA toolkit: synthesis and properties of oligonucleotides containing new Cy3, Cy5 and Cy3B monomers. *Nucleic Acids Res.*, (2012), **40**: e108.
12. Wengel, J., Astakhova, I.K. Interfacing click chemistry with automated oligonucleotide synthesis for the preparation of fluorescent DNA probes containing internal xanthene and cyanine dyes. *Chemistry*, (2013), **19**: 1112-1122.

## Modificaton Code List

Modification	Code	Catalog Number
3'-O-propargyl/Alkyne A 2'-5' linked	[PPG-3-O-A]	27-6919A
3'-O-propargyl/Alkyne C 2'-5' linked	[PPG-3-O-C]	27-6919C
3'-O-propargyl/Alkyne G 2'-5' linked	[PPG-3-O-G]	27-6919G
3'-O-propargyl/Alkyne U 2'-5' linked	[PPG-3-O-U]	27-6919U
5-Ethynyl-dU TIPS (5EdU)	[5E-dU-TIPS]	26-6615
Alkyne Photocleavable NHS	[Alk-PC-N]	26-6753
Alkyne PEG4 NHS	[Alk-PEG4-N]	26-6752
Alkyne-Modifier Serinol	[Alk-Ser]	26-6925
Alkyne-C2-(Propargyl-PEG1)	[Alk-C2-N]	26-6924
Alkyne-C3 (3')	[Alk-C3]	26-6739
Alkyne-PEG4-Maleimide Oligo	[Alk-PEG4-Mal]	26-6764
Azide C3	[N3-C3]	26-6720
Azide C6 (5')	[N3-C6]	26-6718
Azide dT (5')	[N3-dT]	26-6719
Azide Photocleavable NHS	[N3-PC-N]	26-6755
Azide PEG3 Maleimide Oligo	[N3-PEG3-Mal]	26-6761
Azide PEG4 NHS	[N3-PEG4-N]	26-6754
Azide-C2 NHS	[N3-C2-N]	26-6741
Azide butyrate NHS	[N3-C4-N]	26-6922
Azide-C6 NHS	[N3-C6-N]	26-6740

BCN-3' (Bicyclononyne) 3'	[BCN-3]	26-6743
BCN-5' (Bicyclononyne) 5'	[BCN-5]	26-6771
BiotinTEG Azide	[Bio-TEG-N3]	26-6721
Coumarin Azide	[Cou-N3]	26-6726
DBCO Photocleavable NHS	[DBCO-PC-N]	26-6744
DBCO PEG13 NHS	[DBCO-PEG13-N]	26-6746
DBCO PEG4 NHS	[DBCO-PEG4-N]	26-6745
DBCO Serinol	[DBCO-Ser]	26-6736
DBCO-C2 NHS	[DBCO-C2-N]	26-6742
DBCO-C6 NHS	[DBCO-C6-N]	26-6929
DBCO-dT	[DBCO-dT]	26-6927
DBCO-Maleimide	[DBCO-Mal]	26-6760
DBCO-TEG (5')	[DBCO-TEG]	26-6928
DesthiobiotinTEG Azide	[DesBioTEG-N3]	26-6725
Fam-TEG Azide	[Fam-TEG-N3]	26-6722
Hex-Azide-6	[Hex-N3]	26-6723
Hexynyl (Alkyne) Modifier (5')	[5Hexynyl]	26-6930
Iodo-dT-5'	[I-dT]	26-6926
Methylene Blue Azide	[MB-N3]	26-6988
Propargyl/Alkyne-3'-O-5-Me-dC	[PPG-3-O-5me-dC]	26-6946
TCO NHS Oligo	[TCO-N]	26-6756

TCO-PEG12 Oligo	[TCO-PEG12-N]	26-6759
TCO-PEG3 Maleimide Oligo	[TCO-PEG3-Mal]	26-6763
TCO-PEG4 Oligo	[TCO-PEG4-N]	26-6757
Tet Azide	[Tet-N3]	26-6724
Tetrazine methyl Oligo	[meTz-N]	26-6758
Tetrazine methyl Photocleavable Oligo	[meTz-PC-N]	26-6750
Tetrazine methyl PEG4 Oligo	[meTz-PEG4-N]	26-6749
Tetrazine Methyl PEG4 Maleimide Oligo	[meTzPEG4-Mal]	26-6762
Tetrazine methyl Sulfo Oligo	[me-Tz-Sulfo-N]	26-6796
Tetrazine-PEG5 Oligo	[Tz-PEG5-N]	26-6748
Tetrazine-Sulfo Oligo	[Tz-Sulfo-N]	26-6747



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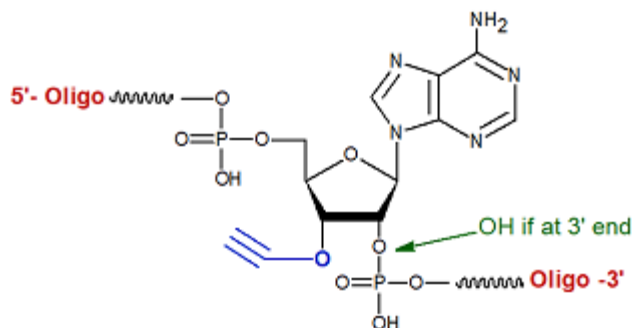
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## Oligo Modifications

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### 3'-O-propargyl A 2'-5' linked

Category	Click Chemistry
Modification Code	PPG-3-O-A
Reference Catalog Number	27-6919A
5 Prime	Y
3 Prime	Y
Internal	Y
Molecular Weight(mw)	354.23



**3'-O Propargyl A 2'-5' linked**  
[27-6919A-XX]

#### Click here for a complete list of Click Chemistry Oligo Modifications

Propargyl refers to triple/alkyne bond structure next to a saturated position with the following structure  $\text{HC}\equiv\text{C}-\text{CH}_2-$ . Placing a propargyl group at the 3' end in conjunction with an azide at the 5' position can be ligated using click chemistry.

Ligation of an oligo containing a 5'-azide with an oligo containing a 3'-propargyl group using Click Chemistry leads to a triazole linkage that has been shown to have in vivo biocompatibility. This technique has been used to synthesize DNA constructs up to 300 bases in length. When the resultant triazole linkage was placed in a PCR template, various polymerases were able to copy the sequence correctly. The linkage has also been shown to be compatible with transcription and rolling circle amplification, as well as gene expression in *E. coli*. In the RNA world, a hammerhead ribozyme containing the triazole linkage at the substrate cleavage site has been shown to retain its activity. A large variety of applications is envisaged for this biocompatible chemical ligation.

An azide can be introduced at the 5' end of an oligo using Iodo-dT (5'); catalog number. 26-6926.





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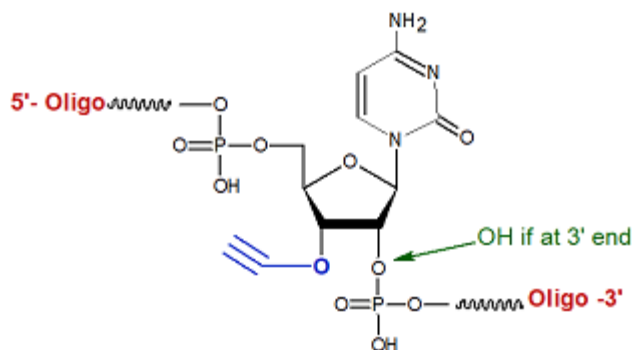
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### 3'-O-propargyl C 2'-5' linked

Category	Click Chemistry
Modification Code	PPG-3-O-C
Reference Catalog Number	27-6919C
5 Prime	Y
3 Prime	Y
Internal	Y
Molecular Weight(mw)	330.2



**3'-O Propargyl C 2'-5 linked**  
[27-6919C-XX]

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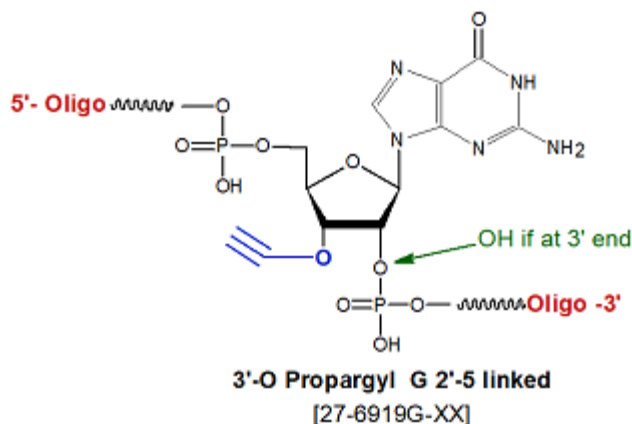
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### 3'-O-propargyl G 2'-5' linked

Category	Click Chemistry
Modification Code	PPG-3-O-G
Reference Catalog Number	27-6919G
5 Prime	Y
3 Prime	Y
Internal	Y
Molecular Weight(mw)	370.23



#### Click here for a complete list of Click Chemistry Oligo Modifications

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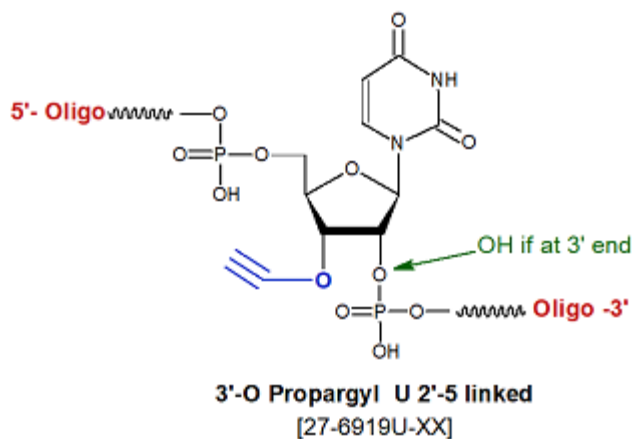
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### 3'-O-propargyl U 2'-5' linked

Category	Click Chemistry
Modification Code	PPG-3-O-U
Reference Catalog Number	27-6919U
5 Prime	Y
3 Prime	Y
Internal	Y
Molecular Weight(mw)	331.19



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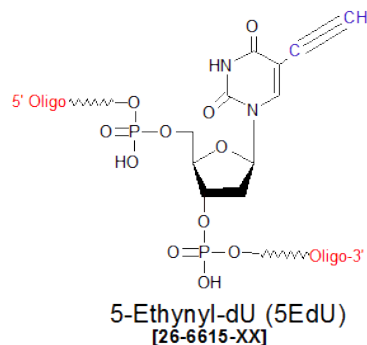
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### 5-Ethynyl-dU (5EdU)

Category	Click Chemistry
Modification Code	5E-dU-TIPS
Reference Catalog Number	26-6615
5 Prime	Y
3 Prime	Y
Internal	Y
Molecular Weight(mw)	314.19



#### Click here for a complete list of Click Chemistry Oligo Modifications

5-Ethynyl-dU offers convenient click conjugation with an azide to generate a label rigidly attached to one of the oligonucleotide bases. The alkyne group is separated from the oligo by an 11-atom spacer arm, which serves to reduce steric interaction between the reactive group and the oligo. The presence of the alkyne allows the user to use Click Chemistry (a [3+2] cycloaddition reaction between alkynes and azides, using copper (I) iodide as a catalyst) to conjugate it to a variety of azide-containing labels/tags (e.g., fluorescent dyes, biotin, or oligos, with extremely high regioselectivity and efficiency (1,2). When conjugation to an azide-oligo is desired, preparation of the azide-oligo can be achieved using either an Azidobutyrate NHS Ester or the 5'-Bromohexyl modifier (see their respective tech sheets for details). Click chemistry can be used to form short, cyclic oligos that can be used as research tools in various biophysical and biological studies (3). In particular, they have considerable potential for in vivo work, as cyclic oligos are known to be very stable in serum for up to several days.

**Intellectual Property.** baseclick GmbH has been granted the following patents (1-3) besides its further patent applications (4-5). |1. WO 2006/117161 (New labelling strategies for the sensitive detection of analytes)|2. WO 2008/952775 (Click chemistry for the production of reporter molecules)|3. WO 2010/115957 (Click Chemistry on heterogeneous catalysts)|4. PCT/EP 2013/064610 (Anandamide-modified nucleic molecules)|5. PCT/EP 2015/056007 (Self-assembly of DNA Origami: a diagnostic tool)|baseclick GmbH holds a worldwide exclusive license for granted patent application|WO 03/101972 (Copper-catalysed ligation of azides and acetylenes for the nucleic acid field) in the area of diagnostics and research. As Glen Research and baseclick are partners, Glen Research is now able to help in sublicensing this outstanding technology. Gene Link purchases this product from Glen Research for custom oligo synthesis.

#### References

1. Huisgen, R. *Angew. Chem. Int. Ed.* (1963), **2**: 565-568.
2. Rostovtsev, V.V., Green, L.G., Fokin, V.V., Sharpless, K.B. A Stepwise Huisgen Cycloaddition Process: Copper(I)-Catalyzed Regioselective Ligation of Azides and Terminal Alkynes.

*Angew. Chem. Int. Ed.* (2002), **41**: 2596-2599.

3. Kumar, R., El-Sagheer, A., Tumpane, J., Lincoln, P., Wilhelmsson, L.M., Brown, T. Template-Directed Oligonucleotide Strand Ligation, Covalent Intramolecular DNA Circularization and Catenation Using Click Chemistry. *J. Am. Chem. Soc.* (2007), **129**: 6859-6864.



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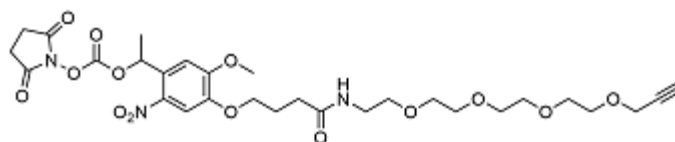
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### Alkyne PC NHS

Category	Click Chemistry
Modification Code	Alk-PC-N
Reference Catalog Number	26-6753
5 Prime	Y
3 Prime	Y
Internal	Y
Molecular Weight(mw)	302.11



This modification is a post synthesis NHS conjugation to a primary amino group thus an additional modification with an amino group is required. A C6 or C12 amino group can be placed at the 5' or for the 3' and a C3 or C7 amino and for internal positions an amino modified base is used, e.g Amino dT C6.

#### [Click here for a complete list of Click Chemistry Oligo Modifications](#)

Alkyne NHS ester can be used to incorporate an active alkyne onto the 5'- or 3'-end of an oligonucleotide, as well as at an internal position. Incorporation of this modification to the oligo is done via conjugation to an active primary amine (such as Amino Linker C6). As a result, the alkyne group is separated from the oligo by a spacer arm of varying length, which serves to reduce steric interaction between the reactive group and the oligo. The presence of the alkyne allows the user to use "Click Chemistry" (a [3+2] cycloaddition reaction between alkynes and azides, using copper (I) iodide as a catalyst) to conjugate it to a variety of azide-containing labels/tags (e.g., fluorescent dyes, biotin, or oligos, with extremely high regioselectivity and efficiency (1,2). When conjugation to an azide-oligo is desired, preparation of the azide-oligo can be achieved using either an Azidobutyrate NHS Ester or the 5'-Bromohexyl modifier (see their respective tech sheets for details). Click chemistry can be used to form short, cyclic oligos that can be used as research tools in various biophysical and biological studies (3). In particular, they have considerable potential for in vivo work, as cyclic oligos are known to be very stable in serum for up to several days.

**Photo Cleavage Protocol** Cleavage occurs by irradiation with near-UV light (300-350 nm, >90% cleavage occurs within 5-25 minutes. Try using a Black Ray XX-15 UV lamp (Ultraviolet Products Inc., San Gabriel, CA) at a distance of 15 cm (emission peak 365 nm, 300 nm cut-off, 1.1 mW intensity at ~31 cm).

#### References

- Huisgen, R. *Angew. Chem. Int. Ed.* (1963), **2**: 565-568.
- Rostovtsev, V.V., Green, L.G., Fokin, V.V., Sharpless, K.B. A Stepwise Huisgen Cycloaddition Process: Copper(I)-Catalyzed Regioselective Ligation of Azides and Terminal Alkynes.

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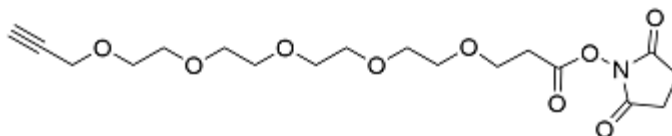
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### Alkyne PEG4 NHS

Category	Click Chemistry
Modification Code	Alk-PEG4-N
Reference Catalog Number	26-6752
5 Prime	Y
3 Prime	Y
Internal	Y
Molecular Weight(mw)	302.11



This modification is a post synthesis NHS conjugation to a primary amino group thus an additional modification with an amino group is required. A C6 or C12 amino group can be placed at the 5' or for the 3' end a C3 or C7 amino and for internal positions an amino modified base is used, e.g Amino dT C6.

#### [Click here for a complete list of Click Chemistry Oligo Modifications](#)

Alkyne NHS ester can be used to incorporate an active alkyne onto the 5'- or 3'-end of an oligonucleotide, as well as at an internal position. Incorporation of this modification to the oligo is done via conjugation to an active primary amine (such as Amino Linker C6). As a result, the alkyne group is separated from the oligo by a spacer arm of varying length, which serves to reduce steric interaction between the reactive group and the oligo. The presence of the alkyne allows the user to use "Click Chemistry" (a [3+2] cycloaddition reaction between alkynes and azides, using copper (I) iodide as a catalyst) to conjugate it to a variety of azide-containing labels/tags (e.g., fluorescent dyes, biotin, or oligos, with extremely high regioselectivity and efficiency (1,2). When conjugation to an azide-oligo is desired, preparation of the azide-oligo can be achieved using either an Azidobutyrate NHS Ester or the 5'-Bromohexyl modifier (see their respective tech sheets for details). Click chemistry can be used to form short, cyclic oligos that can be used as research tools in various biophysical and biological studies (3). In particular, they have considerable potential for in vivo work, as cyclic oligos are known to be very stable in serum for up to several days.

#### References

1. Huisgen, R. *Angew. Chem. Int. Ed.* (1963), **2**: 565-568.
2. Rostovtsev, V.V., Green, L.G., Fokin, V.V., Sharpless, K.B. A Stepwise Huisgen Cycloaddition Process: Copper(I)-Catalyzed Regioselective Ligation of Azides and Terminal Alkynes. *Angew. Chem. Int. Ed.* (2002), **41**: 2596-2599.
3. Kumar, R., El-Sagheer, A., Tumpance, J., Lincoln, P., Wilhelmsson, L.M., Brown, T. Template-Directed Oligonucleotide Strand Ligation, Covalent Intramolecular DNA Circularization and Catenation Using Click Chemistry.



*J. Am. Chem. Soc.* (2007), **129**: 6859-6864.



## Product Specifications

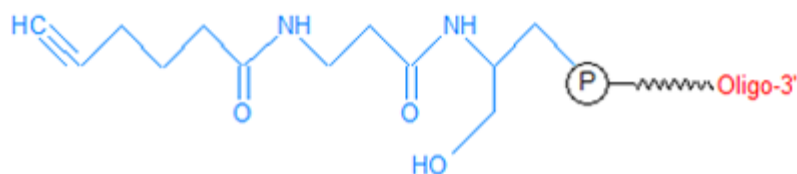
Custom Oligo Synthesis, antisense oligos, RNA oligos, chimeric oligos, Fluorescent dyes, Affinity Ligands, Spacers & Linkers, Duplex Stabilizers, Minor bases, labeled oligos, Molecular Beacons, siRNA, phosphonates Locked Nucleic Acids (LNA); 2'-5' linked Oligos

## Oligo Modifications

For research use only. Not for use in diagnostic procedures for clinical purposes.

### Alkyne- Serinol

Category	Click Chemistry
Modification Code	Alk-Ser
Reference Catalog Number	26-6925
5 Prime	Y
3 Prime	Y
Internal	Y
Molecular Weight(mw)	334.26



**Alkyne-Modifier Serinol**  
[26-6925-XX]

#### Click here for a complete list of Click Chemistry Oligo Modifications

Alkyne Modifier Serinol can be used to incorporate an active alkyne onto the 5'- or 3'-end of an oligonucleotide, as well as at an internal position. The alkyne group is separated from the oligo by an 11-atom spacer arm, which serves to reduce steric interaction between the reactive group and the oligo. The presence of the alkyne allows the user to use Click Chemistry (a [3+2] cycloaddition reaction between alkynes and azides, using copper (I) iodide as a catalyst) to conjugate it to a variety of azide-containing labels/tags (e.g., fluorescent dyes, biotin, or oligos, with extremely high regioselectivity and efficiency (1,2). When conjugation to an azide-oligo is desired, preparation of the azide-oligo can be achieved using either an Azidobutyrate NHS Ester or the 5'-Bromohexyl modifier (see their respective tech sheets for details). Click chemistry can be used to form short, cyclic oligos that can be used as research tools in various biophysical and biological studies (3). In particular, they have considerable potential for in vivo work, as cyclic oligos are known to be very stable in serum for up to several days.

#### References

1. Huisgen, R. *Angew. Chem. Int. Ed.* (1963), **2**: 565-568.
2. Rostovtsev, V.V., Green, L.G., Fokin, V.V., Sharpless, K.B. A Stepwise Huisgen Cycloaddition Process: Copper(I)-Catalyzed Regioselective Ligation of Azides and Terminal Alkynes. *Angew. Chem. Int. Ed.* (2002), **41**: 2596-2599.
3. Kumar, R., El-Sagheer, A., Tumpane, J., Lincoln, P., Wilhelmsson, L.M., Brown, T. Template-Directed Oligonucleotide Strand Ligation, Covalent Intramolecular DNA Circularization and Catenation Using Click Chemistry. *J. Am. Chem. Soc.* (2007), **129**: 6859-6864.



## Product Specifications

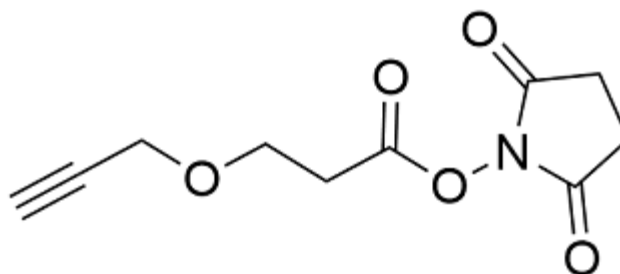
Custom Oligo Synthesis, antisense oligos, RNA oligos, chimeric oligos, Fluorescent dyes, Affinity Ligands, Spacers & Linkers, Duplex Stabilizers, Minor bases, labeled oligos, Molecular Beacons, siRNA, phosphonates Locked Nucleic Acids (LNA); 2'-5' linked Oligos

## Oligo Modifications

For research use only. Not for use in diagnostic procedures for clinical purposes.

### Alkyne-C2 NHS

Category	Click Chemistry
Modification Code	Alk-C2-N
Reference Catalog Number	26-6924
5 Prime	Y
3 Prime	Y
Internal	Y
Molecular Weight(mw)	302.11



Alkyne NHS modification is a post synthesis conjugation to a primary amino group. The amino group can be placed at the 5' and 3' and for internal positions an amino modified base is used, e.g Amino dT C6

#### Click here for a complete list of Click Chemistry Oligo Modifications

Alkyne NHS ester can be used to incorporate an active alkyne onto the 5'- or 3'-end of an oligonucleotide, as well as at an internal position. Incorporation of this modification to the oligo is done via conjugation to an active primary amine (such as Amino Linker C6). As a result, the alkyne group is separated from the oligo by a spacer arm of varying length, which serves to reduce steric interaction between the reactive group and the oligo. The presence of the alkyne allows the user to use "Click Chemistry" (a [3+2] cycloaddition reaction between alkynes and azides, using copper (I) iodide as a catalyst) to conjugate it to a variety of azide-containing labels/tags (e.g., fluorescent dyes, biotin, or oligos, with extremely high regioselectivity and efficiency (1,2). When conjugation to an azide-oligo is desired, preparation of the azide-oligo can be achieved using either an Azidobutyrate NHS Ester or the 5'-Bromohexyl modifier (see their respective tech sheets for details). Click chemistry can be used to form short, cyclic oligos that can be used as research tools in various biophysical and biological studies (3). In particular, they have considerable potential for in vivo work, as cyclic oligos are known to be very stable in serum for up to several days.

#### References

1. Huisgen, R. *Angew. Chem. Int. Ed.* (1963), **2**: 565-568.
2. Rostovtsev, V.V., Green, L.G., Fokin, V.V., Sharpless, K.B. A Stepwise Huisgen Cycloaddition Process: Copper(I)-Catalyzed Regioselective Ligation of Azides and Terminal Alkynes. *Angew. Chem. Int. Ed.* (2002), **41**: 2596-2599.
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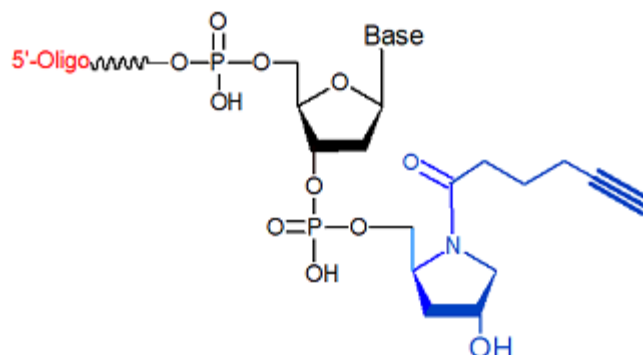
Custom Oligo Synthesis, antisense oligos, RNA oligos, chimeric oligos, Fluorescent dyes, Affinity Ligands, Spacers & Linkers, Duplex Stabilizers, Minor bases, labeled oligos, Molecular Beacons, siRNA, phosphonates Locked Nucleic Acids (LNA); 2'-5' linked Oligos

## Oligo Modifications

For research use only. Not for use in diagnostic procedures for clinical purposes.

### Alkyne-C3

Category	Click Chemistry
Modification Code	Alk-C3
Reference Catalog Number	26-6739
5 Prime	N
3 Prime	Y
Internal	N
Molecular Weight(mw)	273.1



Alkyne C3 (for 3')  
[26-6739-XX]

#### Click here for a complete list of Click Chemistry Oligo Modifications

Alkyne C3 can be used to incorporate an active alkyne at the 3' end of an oligonucleotide. The presence of the alkyne allows the user to use Click Chemistry (a [3+2] cycloaddition reaction between alkynes and azides, using copper (I) iodide as a catalyst) to conjugate it to a variety of azide-containing labels/tags (e.g., fluorescent dyes, biotin, or oligos, with extremely high regioselectivity and efficiency (1,2). When conjugation to an azide-oligo is desired, preparation of the azide-oligo can be achieved using either an Azidobutyrate NHS Ester or the 5'-Bromohexyl modifier (see their respective tech sheets for details). Click chemistry can be used to form short, cyclic oligos that can be used as research tools in various biophysical and biological studies (3). In particular, they have considerable potential for in vivo work, as cyclic oligos are known to be very stable in serum for up to several days.

#### References

- Huisgen, R. *Angew. Chem. Int. Ed.* (1963), **2**: 565-568.
- Rostovtsev, V.V., Green, L.G., Fokin, V.V., Sharpless, K.B. A Stepwise Huisgen Cycloaddition Process: Copper(I)-Catalyzed Regioselective Ligation of Azides and Terminal Alkynes. *Angew. Chem. Int. Ed.* (2002), **41**: 2596-2599.
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## Product Specifications

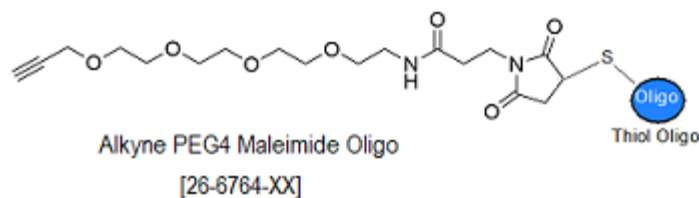
Custom Oligo Synthesis, antisense oligos, RNA oligos, chimeric oligos, Fluorescent dyes, Affinity Ligands, Spacers & Linkers, Duplex Stabilizers, Minor bases, labeled oligos, Molecular Beacons, siRNA, phosphonates Locked Nucleic Acids (LNA); 2'-5' linked Oligos

## Oligo Modifications

For research use only. Not for use in diagnostic procedures for clinical purposes.

### Alkyne-PEG4-Maleimide Oligo

Category	Click Chemistry
Modification Code	Alk-PEG4-Mal
Reference Catalog Number	26-6764
5 Prime	Y
3 Prime	Y
Internal	Y
Molecular Weight(mw)	382.41



This modification is a post synthesis maleimide conjugation to a reduced thiol amino group thus an additional modification with thiol group is required. A C3 or C6 thiol group can be placed at the 5' or for internal positions Thiol C6 dT modified base is used.

**Click here for a complete list of Click Chemistry Oligo Modifications**



## Product Specifications

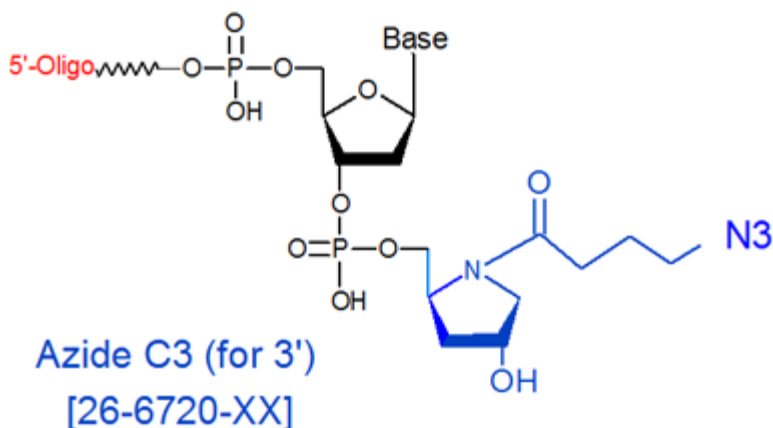
Custom Oligo Synthesis, antisense oligos, RNA oligos, chimeric oligos, Fluorescent dyes, Affinity Ligands, Spacers & Linkers, Duplex Stabilizers, Minor bases, labeled oligos, Molecular Beacons, siRNA, phosphonates Locked Nucleic Acids (LNA); 2'-5' linked Oligos

## Oligo Modifications

For research use only. Not for use in diagnostic procedures for clinical purposes.

### Azide C3 3'

Category	Click Chemistry
Modification Code	N3-C3
Reference Catalog Number	26-6720
5 Prime	N
3 Prime	Y
Internal	N
Molecular Weight(mw)	202.25



### Click here for a complete list of Click Chemistry Oligo Modifications Copper-free Click Chemistry Modifications

Use azide modified oligos with DBCO Cyclooctyne-based modifications for ease of copper-free click reagents. These are simple to use and has excellent click performance in 17 hours or less at room temperature. Gene Link offers 5'-DBCO-TEG for preparing oligos with 5'-DBCO and a 15 tom triethylene glycol spacer arm, DBCO-dT for inserting a DBCO group at any position within the oligonucleotide and DBCO-sulfo-NHS Ester is also offered for post-synthesis conjugation reactions. DBCO-modified oligos may be conjugated with azides in organic solvents, such as DMSO, or aqueous buffers. Depending on the azide used, the reaction will go to completion in 4-17 hours at room temperature.

Azide C3 is available to introduce a stable azide group at the 3' of an oligo. Use Azide butyrate NHS [26-6922] for introduction of azide at internal or 5' position by conjugating to an amino-modified oligonucleotide. Introduction can be done at either the 5'- or 3'-end, or internally. To do this, the oligo first must be synthesized with a primary amino functional group modification, e.g Amino C6 for the 5' end or amino C7 for the 3' end for the ends) or the amino C6 version of the base phosphoramidite (for internal labeling). The Azidobutyrate NHS ester is then manually attached to the oligo through the amino group in a separate reaction post-synthesis. The presence of the azide allows the user to use "Click Chemistry" (a [3+2] cycloaddition reaction between alkynes and azides, using copper (I) iodide as a catalyst) to conjugate the azide-modified oligo to a terminal alkyne-modified oligo with extremely high regioselectivity and efficiency (1,2). Preparation of the alkyne-modified oligo can be achieved using the 5'-Hexynyl modifier (see its respective tech sheet for details). Click chemistry can be used to form short, cyclic oligos that can be used as research tools in various biophysical and biological studies (3). In particular, they have considerable potential for in vivo work, as cyclic oligos are known to be very stable in serum for up to several days.

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#### References

1. Huisgen, R. *Angew. Chem. Int. Ed.* (1963), **2**: 565-568.
2. Rostovtsev, V.V., Green, L.G., Fokin, V.V., Sharpless, K.B. A Stepwise Huisgen Cycloaddition Process: Copper(I)-Catalyzed Regioselective Ligation of Azides and Terminal Alkynes. *Angew. Chem. Int. Ed.* (2002), **41**: 2596-2599.
3. Kumar, R., El-Sagheer, A., Tumpane, J., Lincoln, P., Wilhelmsson, L.M., Brown, T. Template-Directed Oligonucleotide Strand Ligation, Covalent Intramolecular DNA Circularization and Catenation Using Click Chemistry. *J. Am. Chem. Soc.* (2007), **129**: 6859-6864.





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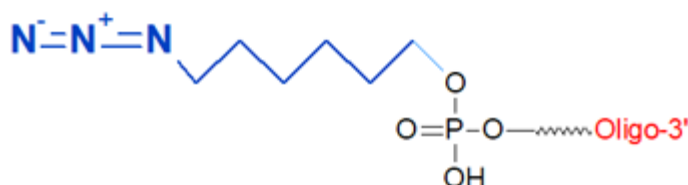
Custom Oligo Synthesis, antisense oligos, RNA oligos, chimeric oligos, Fluorescent dyes, Affinity Ligands, Spacers & Linkers, Duplex Stabilizers, Minor bases, labeled oligos, Molecular Beacons, siRNA, phosphonates  
Locked Nucleic Acids (LNA); 2'-5' linked Oligos

## Oligo Modifications

For research use only. Not for use in diagnostic procedures for clinical purposes.

### Azide C6 (5')

Category	Click Chemistry
Modification Code	N3-C6
Reference Catalog Number	26-6718
5 Prime	Y
3 Prime	N
Internal	N
Molecular Weight(mw)	205.15



**Azide C6 (5')**  
**[26-6718-XX]**

### Copper-free Click Chemistry Modifications

Use azide modified oligos with DBCO Cyclooctyne-based modifications for ease of copper-free click reagents. These are simple to use and has excellent click performance in 17 hours or less at room temperature. Gene Link offers 5'-DBCO-TEG for preparing oligos with 5'-DBCO and a 15 tom triethylene glycol spacer arm, DBCO-dT for inserting a DBCO group at any position within the oligonucleotide and DBCO-sulfo-NHS Ester is also offered for post-synthesis conjugation reactions. DBCO-modified oligos may be conjugated with azides in organic solvents, such as DMSO, or aqueous buffers. Depending on the azide used, the reaction will go to completion in 4-17 hours at room temperature.

Azide C3 is available to introduce a stable azide group at the 3' of an oligo. Use Azide butyrate NHS [26-6922] for introduction of azide at internal or 5' position by conjugating to an amino-modified oligonucleotide. Introduction can be done at either the 5'- or 3'-end, or internally. To do this, the oligo first must be synthesized with a primary amino functional group modification, e.g Amino C6 for the 5' end or amino C7 for the 3' end for the ends) or the amino C6 version of the base phosphoramidite (for internal labeling). The Azidobutyrate NHS ester is then manually attached to the oligo through the amino group in a separate reaction post-synthesis. The presence of the azide allows the user to use "Click Chemistry" (a [3+2] cycloaddition reaction between alkynes and azides, using copper (I) iodide as a catalyst) to conjugate the azide-modified oligo to a terminal alkyne-modified oligo with extremely high regioselectivity and efficiency (1,2). Preparation of the alkyne-modified oligo can be achieved using the 5'-Hexynyl modifier (see its respective tech sheet for details). Click chemistry can be used to form short, cyclic oligos that can be used as research tools in various biophysical and biological studies (3). In particular, they have considerable potential for in vivo work, as cyclic oligos are known to be very stable in serum for up to several days.

#### References

1. Huisgen, R. *Angew. Chem. Int. Ed.* (1963), **2**: 565-568.
2. Rostovtsev, V.V., Green, L.G., Fokin, V.V., Sharpless, K.B. A Stepwise Huisgen Cycloaddition Process: Copper(I)-Catalyzed Regioselective Ligation of Azides and Terminal Alkynes.

*Angew. Chem. Int. Ed.* (2002), **41**: 2596-2599.

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## Product Specifications

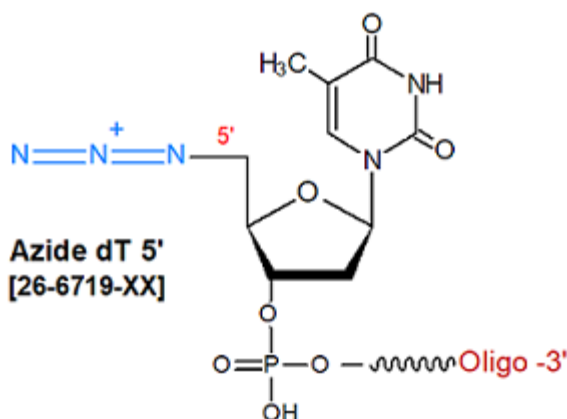
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## Oligo Modifications

For research use only. Not for use in diagnostic procedures for clinical purposes.

### Azide dT (5')

Category	Click Chemistry
Modification Code	N3-dT
Reference Catalog Number	26-6719
5 Prime	Y
3 Prime	N
Internal	N
Molecular Weight(mw)	329.21



Use azide modified oligos with DBCO Cyclooctyne-based modifications for ease of copper-free click reagents. These are simple to use and has excellent click performance in 17 hours or less at room temperature. Gene Link offers 5'-DBCO-TEG for preparing oligos with 5'-DBCO and a 15 tom triethylene glycol spacer arm, DBCO-dT for inserting a DBCO group at any position within the oligonucleotide and DBCO-sulfo-NHS Ester is also offered for post-synthesis conjugation reactions. DBCO-modified oligos may be conjugated with azides in organic solvents, such as DMSO, or aqueous buffers. Depending on the azide used, the reaction will go to completion in 4-17 hours at room temperature.

Azide C3 is available to introduce a stable azide group at the 3' of an oligo. Use Azide butyrate NHS [26-6922] for introduction of azide at internal or 5' position by conjugating to an amino-modified oligonucleotide. Introduction can be done at either the 5'- or 3'-end, or internally. To do this, the oligo first must be synthesized with a primary amino functional group modification, e.g Amino C6 for the 5' end or amino C7 for the 3' end for the ends) or the amino C6 version of the base phosphoramidite (for internal labeling). The Azidobutyrate NHS ester is then manually attached to the oligo through the amino group in a separate reaction post-synthesis. The presence of the azide allows the user to use "Click Chemistry" (a [3+2] cycloaddition reaction between alkynes and azides, using copper (I) iodide as a catalyst) to conjugate the azide-modified oligo to a terminal alkyne-modified oligo with extremely high regioselectivity and efficiency (1,2). Preparation of the alkyne-modified oligo can be achieved using the 5'-Hexynyl modifier (see its respective tech sheet for details). Click chemistry can be used to form short, cyclic oligos that can be used as research tools in various biophysical and biological studies (3). In particular, they have considerable potential for in vivo work, as cyclic oligos are known to be very stable in serum for up to several days.

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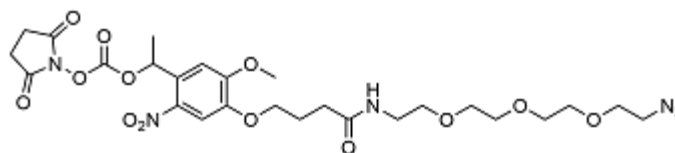
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## Oligo Modifications

For research use only. Not for use in diagnostic procedures for clinical purposes.

### Azide PC NHS

Category	Click Chemistry
Modification Code	N3-PC-N
Reference Catalog Number	26-6755
5 Prime	Y
3 Prime	Y
Internal	Y
Molecular Weight(mw)	85



This modification is a post synthesis conjugation to a primary amino group thus an additional modification with an amino group is required. A C3, C6 or C12 amino group can be placed at the 5' or for the 3' end a C3 or C7 amino and for internal positions an amino modified base is used, e.g Amino dT C6. **YIELD**  
 NHS based modifications yields are lower as compared to direct automated coupling of modifications that are available as amidites. Approximate yield for various scales are given below.  
 ~2 nmol final yield for 50 nmol scale synthesis.  
 ~5 nmol final yield for 200 nmol scale synthesis.  
 ~16 nmol final yield for 1 umol scale synthesis.

[Click here for a complete list of Click Chemistry Oligo Modifications](#)

Azide PC NHS ester can be used to introduce an active azide group to an amino-modified oligonucleotide. Introduction can be done at either the 5'- or 3'-end, or internally. To do this, the oligo first must be synthesized with a primary amino functional group modification, e.g Amino C3, C6 or C12 for the 5' end or amino C3, C6 or C7 for the 3' end for the ends) or the amino C6 version of the base phosphoramidite (for internal labeling). The Azide C2 NHS ester is then manually attached to the oligo through the amino group in a separate reaction post-synthesis. The presence of the azide allows the user to use "Click Chemistry" (a [3+2] cycloaddition reaction between alkynes and azides, using copper (I) iodide as a catalyst) to conjugate the azide-modified oligo to a terminal alkyne-modified oligo with extremely high regioselectivity and efficiency (1,2). Preparation of the alkyne-modified oligo can be achieved using the 5'-Hexynyl modifier (see its respective tech sheet for details). Click chemistry can be used to form short, cyclic oligos that can be used as research tools in various biophysical and biological studies (3). In particular, they have considerable potential for in vivo work, as cyclic oligos are known to be very stable in serum for up to several days.

**Photo Cleavage Protocol** Cleavage occurs by irradiation with near-UV light (300-350 nm, >90% cleavage occurs within 5-25 minutes. Try using a Black Ray XX-15 UV lamp (Ultraviolet Products Inc., San Gabriel, CA) at a distance of 15 cm (emission peak 365 nm, 300 nm cut-off, 1.

1 mW intensity at ~31 cm).

#### References

1. Huisgen, R. *Angew. Chem. Int. Ed.* (1963), **2**: 565-568.
2. Rostovtsev, V.V., Green, L.G., Fokin, V.V., Sharpless, K.B. A Stepwise Huisgen Cycloaddition Process: Copper(I)-Catalyzed Regioselective Ligation of Azides and Terminal Alkynes. *Angew. Chem. Int. Ed.* (2002), **41**: 2596-2599.
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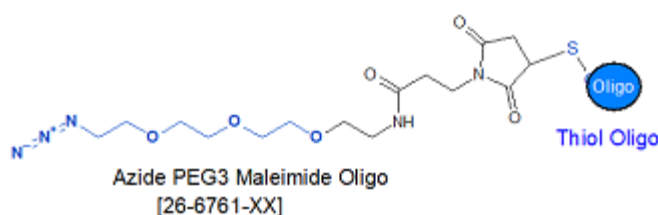
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## Oligo Modifications

For research use only. Not for use in diagnostic procedures for clinical purposes.

### Azide PEG3 Maleimide

Category	Click Chemistry
Modification Code	N3-PEG3-Mal
Reference Catalog Number	26-6761
5 Prime	Y
3 Prime	Y
Internal	Y
Molecular Weight(mw)	369.37



This modification is a post synthesis maleimide conjugation to a reduced thiol amino group thus an additional modification with thiol group is required. A C3 or C6 thiol group can be placed at the 5' or for internal positions Thiol C6 dT modified base is used.

[Click here for a complete list of Click Chemistry Oligo Modifications](#)

Azide PEG3 Maleimide can be used to introduce an active azide group to a thiol-modified oligonucleotide. The Azide C2 NHS ester is then manually attached to the oligo through the amino group in a separate reaction post-synthesis. The presence of the azide allows the user to use "Click Chemistry" (a [3+2] cycloaddition reaction between alkynes and azides, using copper (I) iodide as a catalyst) to conjugate the azide-modified oligo to a terminal alkyne-modified oligo with extremely high regioselectivity and efficiency (1,2). Preparation of the alkyne-modified oligo can be achieved using the 5'-Hexynyl modifier (see its respective tech sheet for details). Click chemistry can be used to form short, cyclic oligos that can be used as research tools in various biophysical and biological studies (3). In particular, they have considerable potential for in vivo work, as cyclic oligos are known to be very stable in serum for up to several days.

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3. Kumar, R., El-Sagheer, A., Tumpance, J., Lincoln, P., Wilhelmsson, L.M., Brown, T. Template-Directed Oligonucleotide Strand Ligation, Covalent Intramolecular DNA Circularization and Catenation Using Click Chemistry. *J. Am. Chem. Soc.* (2007), **129**: 6859-6864.



## Product Specifications

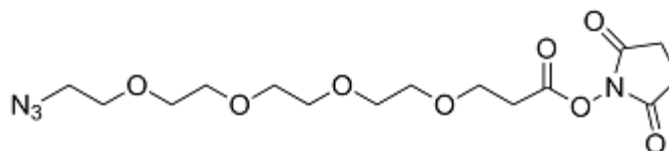
Custom Oligo Synthesis, antisense oligos, RNA oligos, chimeric oligos, Fluorescent dyes, Affinity Ligands, Spacers & Linkers, Duplex Stabilizers, Minor bases, labeled oligos, Molecular Beacons, siRNA, phosphonates Locked Nucleic Acids (LNA); 2'-5' linked Oligos

## Oligo Modifications

For research use only. Not for use in diagnostic procedures for clinical purposes.

### Azide PEG4 NHS

Category	Click Chemistry
Modification Code	N3-PEG4-N
Reference Catalog Number	26-6754
5 Prime	Y
3 Prime	Y
Internal	Y
Molecular Weight(mw)	274.3



This modification is a post synthesis conjugation to a primary amino group thus an additional modification with an amino group is required. A C3, C6 or C12 amino group can be placed at the 5' or for the 3' end a C3 or C7 amino and for internal positions an amino modified base is used, e.g Amino dT C6. **YIELD**  
 NHS based modifications yields are lower as compared to direct automated coupling of modifications that are available as amidites. Approximate yield for various scales are given below.  
 ~2 nmol final yield for 50 nmol scale synthesis.  
 ~5 nmol final yield for 200 nmol scale synthesis.  
 ~16 nmol final yield for 1 umol scale synthesis  
 ~32 nmol final yield for 2 umol scale synthesis  
 ~160 nmol final yield for 10 umol scale synthesis  
 ~240 nmol final yield for 15 umol scale synthesis

[Click here for a complete list of Click Chemistry Oligo Modifications](#)

Azide PEG4 NHS ester can be used to introduce an active azide group to an amino-modified oligonucleotide. Introduction can be done at either the 5'- or 3'-end, or internally. To do this, the oligo first must be synthesized with a primary amino functional group modification, e.g Amino C3, C6 or C12 for the 5' end or amino C3, C6 or C7 for the 3' end for the ends) or the amino C6 version of the base phosphoramidite (for internal labeling). The Azide C2 NHS ester is then manually attached to the oligo through the amino group in a separate reaction post-synthesis. The presence of the azide allows the user to use "Click Chemistry" (a [3+2] cycloaddition reaction between alkynes and azides, using copper (I) iodide as a catalyst) to conjugate the azide-modified oligo to a terminal alkyne-modified oligo with extremely high regioselectivity and efficiency (1,2). Preparation of the alkyne-modified oligo can be achieved using the 5'-Hexynyl modifier (see its respective tech sheet for details). Click chemistry can be used to form short, cyclic oligos that can be used as research tools in various biophysical and biological studies (3). In particular, they have considerable potential for in vivo work, as cyclic oligos are known to be very stable in serum for up to several days.



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#### References

1. Huisgen, R. *Angew. Chem. Int. Ed.* (1963), **2**: 565-568.
2. Rostovtsev, V.V., Green, L.G., Fokin, V.V., Sharpless, K.B. A Stepwise Huisgen Cycloaddition Process: Copper(I)-Catalyzed Regioselective Ligation of Azides and Terminal Alkynes. *Angew. Chem. Int. Ed.* (2002), **41**: 2596-2599.
3. Kumar, R., El-Sagheer, A., Tumpane, J., Lincoln, P., Wilhelmsson, L.M., Brown, T. Template-Directed Oligonucleotide Strand Ligation, Covalent Intramolecular DNA Circularization and Catenation Using Click Chemistry. *J. Am. Chem. Soc.* (2007), **129**: 6859-6864.



## Product Specifications

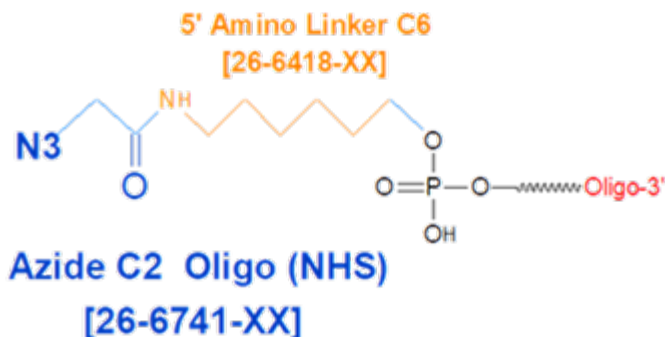
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## Oligo Modifications

For research use only. Not for use in diagnostic procedures for clinical purposes.

### Azide-C2 NHS

Category	Click Chemistry
Modification Code	N3-C2-N
Reference Catalog Number	26-6741
5 Prime	Y
3 Prime	Y
Internal	Y
Molecular Weight(mw)	84.93



This modification is a post synthesis conjugation to a primary amino group thus an additional modification with an amino group is required. A C3, C6 or C12 amino group can be placed at the 5' or for the 3' end a C3 or C7 amino and for internal positions an amino modified base is used, e.g Amino dT C6. **YIELD** NHS based modifications yields are lower as compared to direct automated coupling of modifications that are available as amidites. Approximate yield for various scales are given below.  
 ~2 nmol final yield for 50 nmol scale synthesis.  
 ~5 nmol final yield for 200 nmol scale synthesis.  
 ~16 nmol final yield for 1 umol scale synthesis.

[Click here for a complete list of Click Chemistry Oligo Modifications](#)

Azide C2 NHS ester can be used to introduce an active azide group to an amino-modified oligonucleotide. Introduction can be done at either the 5'- or 3'-end, or internally. To do this, the oligo first must be synthesized with a primary amino functional group modification, e.g Amino C3, C6 or C12 for the 5' end or amino C3, C6 or C7 for the 3' end for the ends) or the amino C6 version of the base phosphoramidite (for internal labeling). The Azide C2 NHS ester is then manually attached to the oligo through the amino group in a separate reaction post-synthesis. The presence of the azide allows the user to use "Click Chemistry" (a [3+2] cycloaddition reaction between alkynes and azides, using copper (I) iodide as a catalyst) to conjugate the azide-modified oligo to a terminal alkyne-modified oligo with extremely high regioselectivity and efficiency (1,2). Preparation of the alkyne-modified oligo can be achieved using the 5'-Hexynyl modifier (see its respective tech sheet for details). Click chemistry can be used to form short, cyclic oligos that can be used as research tools in various biophysical and biological studies (3). In particular, they have considerable potential for in vivo work, as cyclic oligos are known to be very stable in serum for up to several days.

#### References

1. Huisgen, R. *Angew. Chem. Int. Ed.* (1963), **2**: 565-568.
2. Rostovtsev, V.V., Green, L.

G., Fokin, V.V., Sharpless, K.B. A Stepwise Huisgen Cycloaddition Process: Copper(I)-Catalyzed Regioselective Ligation of Azides and Terminal Alkynes. *Angew. Chem. Int. Ed.* (2002), **41**: 2596-2599.

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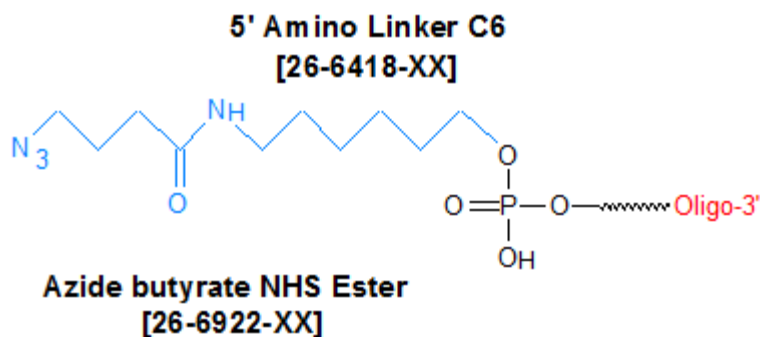
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## Oligo Modifications

For research use only. Not for use in diagnostic procedures for clinical purposes.

### Azide-C4 NHS (butyrate)

Category	Click Chemistry
Modification Code	N3-C4-N
Reference Catalog Number	26-6922
5 Prime	Y
3 Prime	Y
Internal	Y
Molecular Weight(mw)	113.12



This modification is a post synthesis conjugation to a primary amino group thus an additional modification with an amino group is required. A C3, C6 or C12 amino group can be placed at the 5' or for the 3' end a C3 or C7 amino and for internal positions an amino modified base is used, e.g Amino dT C6. **YIELD**  
NHS based modifications yields are lower as compared to direct automated coupling of modifications that are available as amidites. Approximate yield for various scales are given below.  
~2 nmol final yield for 50 nmol scale synthesis.  
~5 nmol final yield for 200 nmol scale synthesis.  
~16 nmol final yield for 1 umol scale synthesis.

[Click here for a complete list of Click Chemistry Oligo Modifications](#)

Azidobutyrate NHS ester can be used to introduce an active azide group to an amino-modified oligonucleotide. Introduction can be done at either the 5'- or 3'-end, or internally. To do this, the oligo first must be synthesized with a primary amino functional group modification, e.g Amino C6 for the 5' end or amino C7 for the 3' end for the ends) or the amino C6 version of the base phosphoramidite (for internal labeling). The Azidobutyrate NHS ester is then manually attached to the oligo through the amino group in a separate reaction post-synthesis. The presence of the azide allows the user to use "Click Chemistry" (a [3+2] cycloaddition reaction between alkynes and azides, using copper (I) iodide as a catalyst) to conjugate the azide-modified oligo to a terminal alkyne-modified oligo with extremely high regioselectivity and efficiency (1,2). Preparation of the alkyne-modified oligo can be achieved using the 5'-Hexynyl modifier (see its respective tech sheet for details). Click chemistry can be used to form short, cyclic oligos that can be used as research tools in various biophysical and biological studies (3). In particular, they have considerable potential for in vivo work, as cyclic oligos are known to be very stable in serum for up to several days.

#### References

1. Huisgen, R. *Angew. Chem. Int. Ed.* (1963), **2**: 565-568.
2. Rostovtsev, V.V., Green, L.G.

, Fokin, V.V., Sharpless, K.B. A Stepwise Huisgen Cycloaddition Process: Copper(I)-Catalyzed Regioselective Ligation of Azides and Terminal Alkynes. *Angew. Chem. Int. Ed.* (2002), **41**: 2596-2599.

3. Kumar, R., El-Sagheer, A., Tumpene, J., Lincoln, P., Wilhelmsson, L.M., Brown, T. Template-Directed Oligonucleotide Strand Ligation, Covalent Intramolecular DNA Circularization and Catenation Using Click Chemistry. *J. Am. Chem. Soc.* (2007), **129**: 6859-6864.



## Product Specifications

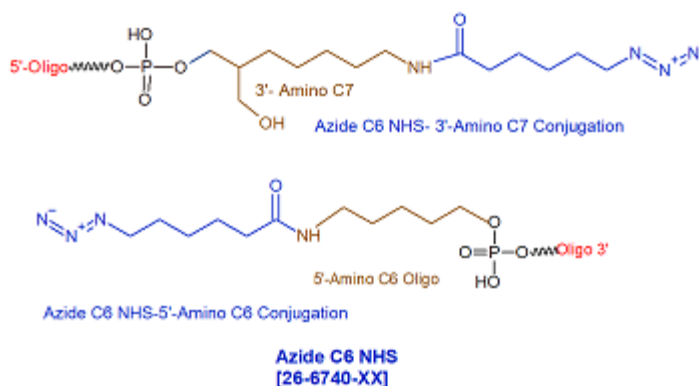
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## Oligo Modifications

For research use only. Not for use in diagnostic procedures for clinical purposes.

### Azide-C6 NHS

Category	Click Chemistry
Modification Code	N3-C6-N
Reference Catalog Number	26-6740
5 Prime	Y
3 Prime	Y
Internal	Y
Molecular Weight(mw)	140.14



This modification is a post synthesis conjugation to a primary amino group thus an additional modification with an amino group is required. A C3, C6 or C12 amino group can be placed at the 5' or for the 3' end a C3 or C7 amino and for internal positions an amino modified base is used, e.g Amino dT C6. **YIELD**  
NHS based modifications yields are lower as compared to direct automated coupling of modifications that are available as amidites. Approximate yield for various scales are given below.  
~2 nmol final yield for 50 nmol scale synthesis.  
~5 nmol final yield for 200 nmol scale synthesis.  
~16 nmol final yield for 1 umol scale synthesis.

[Click here for a complete list of Click Chemistry Oligo Modifications](#)

Azide C6 NHS ester can be used to introduce an active azide group to an amino-modified oligonucleotide. Introduction can be done at either the 5'- or 3'-end, or internally. To do this, the oligo first must be synthesized with a primary amino functional group modification, e.g Amino C3, C6 or C12 for the 5' end or amino C3, C6 or C7 for the 3' end for the ends) or the amino C6 version of the base phosphoramidite (for internal labeling). The Azide C2 NHS ester is then manually attached to the oligo through the amino group in a separate reaction post-synthesis. The presence of the azide allows the user to use "Click Chemistry" (a [3+2] cycloaddition reaction between alkynes and azides, using copper (I) iodide as a catalyst) to conjugate the azide-modified oligo to a terminal alkyne-modified oligo with extremely high regioselectivity and efficiency (1,2). Preparation of the alkyne-modified oligo can be achieved using the 5'-Hexynyl modifier (see its respective tech sheet for details). Click chemistry can be used to form short, cyclic oligos that can be used as research tools in various biophysical and biological studies (3). In particular, they have considerable potential for in vivo work, as cyclic oligos are known to be very stable in serum for up to several days.

#### References

1. Huisgen, R. *Angew. Chem. Int. Ed.* (1963), **2**: 565-568.
2. Rostovtsev, V.V., Green, L.

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3. Kumar, R., El-Sagheer, A., Tumpene, J., Lincoln, P., Wilhelmsson, L.M., Brown, T. Template-Directed Oligonucleotide Strand Ligation, Covalent Intramolecular DNA Circularization and Catenation Using Click Chemistry. *J. Am. Chem. Soc.* (2007), **129**: 6859-6864.



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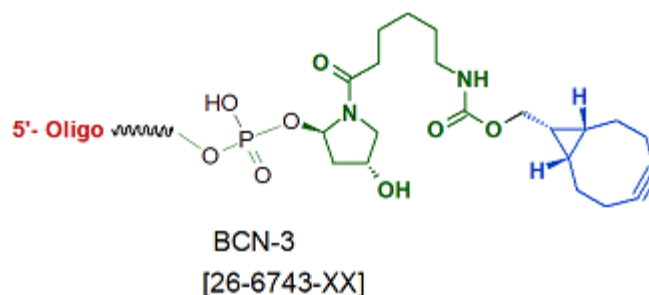
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## Oligo Modifications

For research use only. Not for use in diagnostic procedures for clinical purposes.

### BCN-3' (Bicyclononyne) 3'

Category	Click Chemistry
Modification Code	BCN-3
Reference Catalog Number	26-6743
5 Prime	N
3 Prime	Y
Internal	N
Molecular Weight(mw)	468.49



[Click here for a complete list of Click Chemistry Oligo Modifications](#)

**Bicyclononyne (BCN) is stable and one of the most reactive cyclooctynes for copper-free click chemistry. Unlike dibenzocyclooctyne (DBCO), BCN is reactive both to azides (strain-promoted azyde-alkyne cycloaddition, SPAAC) and tetrazines (inverse electron demand Diels-Alder reaction, IEDDA).**

**BCN-labeled oligonucleotides may be used for the conjugation to azide- or tetrazine-containing solid surfaces, polymers, and large proteins.**

DBCO conjugation chemistry is based on the reaction of a dibenzylcyclooctyne (DBCO) linker with an azide linker to form a stable triazole. The dibenzocyclooctyne group (DBCO) allows Copper-free Click Chemistry to be done with live cells, whole organisms, and non-living samples. DBCO groups will preferentially and spontaneously label molecules containing azide groups (-N<sub>3</sub>). Within physiological temperature and pH ranges, the DBCO group does not react with amines or hydroxyls, which are naturally present in many biomolecules. Reaction of the DBCO group with the azide group is significantly faster than with the sulfhydryl group (-SH, thiol).

Cyclooctyne-based modifications offers the ease of copper-free click reagents. These are simple to use and has excellent click performance in 17 hours or less at room temperature. Gene Link offers 5'-DBCO-TEG for preparing oligos with 5'-DBCO and a 15 tom triethylene glycol spacer arm, DBCO-dT for inserting a DBCO group at any position within the oligonucleotide and DBCO-sulfo-NHS Ester is also offered for post-synthesis conjugation reactions. DBCO-modified oligos may be conjugated with azides in organic solvents, such as DMSO, or aqueous buffers. Depending on the azide used, the reaction will go to completion in 4-17 hours at room temperature.





## Product Specifications

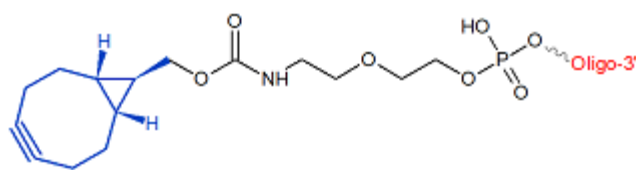
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## Oligo Modifications

For research use only. Not for use in diagnostic procedures for clinical purposes.

### BCN-5' (Bicyclononyne) 5'

Category	Click Chemistry
Modification Code	BCN-5
Reference Catalog Number	26-6771
5 Prime	Y
3 Prime	N
Internal	N
Molecular Weight(mw)	343.11



5'-BCN-II Oligo  
[26-6771-XX]

[Click here for a complete list of Click Chemistry Oligo Modifications](#)

**Bicyclononyne (BCN) is stable and one of the most reactive cyclooctynes for copper-free click chemistry. Unlike dibenzocyclooctyne (DBCO), BCN is reactive both to azides (strain-promoted azyde-alkyne cycloaddition, SPAAC) and tetrazines (inverse electron demand Diels-Alder reaction, IEDDA).**

**BCN-labeled oligonucleotides may be used for the conjugation to azide- or tetrazine-containing solid surfaces, polymers, and large proteins.**

DBCO conjugation chemistry is based on the reaction of a dibenzylcyclooctyne (DBCO) linker with an azide linker to form a stable triazole. The dibenzocyclooctyne group (DBCO) allows Copper-free Click Chemistry to be done with live cells, whole organisms, and non-living samples. DBCO groups will preferentially and spontaneously label molecules containing azide groups (-N<sub>3</sub>). Within physiological temperature and pH ranges, the DBCO group does not react with amines or hydroxyls, which are naturally present in many biomolecules. Reaction of the DBCO group with the azide group is significantly faster than with the sulfhydryl group (-SH, thiol).

Cyclooctyne-based modifications offers the ease of copper-free click reagents. These are simple to use and has excellent click performance in 17 hours or less at room temperature. Gene Link offers DBCO NHS modification with various length of Carbon and PEG for preparing oligos inserting a DBCO group at any position within the oligonucleotide. DBCO NHS are post synthesis conjugation and requires a primary amino group. DBCO-modified oligos may be conjugated with azides in organic solvents, such as DMSO, or aqueous buffers. Depending on the azide used, the reaction will go to completion in 4-17 hours at room temperature.



## Product Specifications

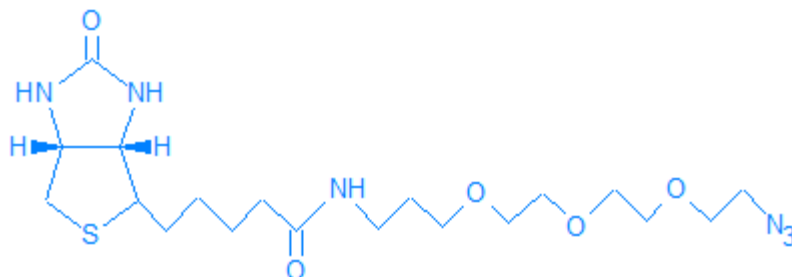
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## Oligo Modifications

For research use only. Not for use in diagnostic procedures for clinical purposes.

### BiotinTEG Azide

Category	Click Chemistry
Modification Code	Bio-TEG-N3
Reference Catalog Number	26-6721
5 Prime	Y
3 Prime	Y
Internal	Y
Molecular Weight(mw)	444.55



**Biotin-TEG Azide**  
**[26-6721-XX]**

Biotin-TEG Azide is a biotin attached to a 15-atom mixed polarity triethylene glycol spacer with an azide group at the end of the spacer. The presence of the azide allows the user to use "Click Chemistry" (a [3+2] cycloaddition reaction between alkynes and azides, using copper (I) iodide as a catalyst) to conjugate the Biotin-TEG Azide to a terminal alkyne-modified oligo with extremely high regioselectivity and efficiency (1,2). Preparation of the alkyne-modified oligo can be achieved using the 5'-Hexynyl modifier (see its respective tech sheet for details). The spacer acts to minimize steric hindrance between the biotin moiety and the oligo, thereby providing streptavidin easy access to the biotin for capture and immobilization of the oligo. Additional technical details for biotin are presented in the Biotin technical sheet. **References**

1. Huisgen, R. *Angew. Chem. Int. Ed.* (1963), **2**: 565-568.
2. Rostovtsev, V.V., Green, L.G., Fokin, V.V., Sharpless, K.B. A Stepwise Huisgen Cycloaddition Process: Copper(I)-Catalyzed Regioselective Ligation of Azides and Terminal Alkynes. *Angew. Chem. Int. Ed.* (2002), **41**: 2596-2599.



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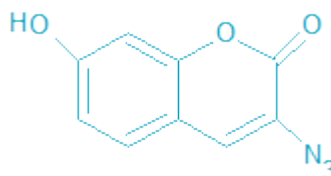
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Locked Nucleic Acids (LNA); 2'-5' linked Oligos

## Oligo Modifications

For research use only. Not for use in diagnostic procedures for clinical purposes.

### Coumarin Azide

Category	Click Chemistry
Modification Code	Cou-N3
Reference Catalog Number	26-6726
5 Prime	Y
3 Prime	Y
Internal	Y
Molecular Weight(mw)	203.15



**Coumarin Azide**  
**[26-6726-XX]**

This modification is a post synthesis conjugation to an alkyne or DBCO modification at the appropriate site for click conjugation.

Coumarin (7-Hydroxycoumarin)-Azide is a fluorescent dye containing a terminal azide group. Coumarin is also known as umbelliferone. Coumarin is highly fluorescent and pH-sensitive, with an absorbance maximum of 358 nm and an emission maximum of 480 nm; thus it emits in the blue region of the visible spectrum. The presence of the azide allows the user to use "Click Chemistry" (a [3+2] cycloaddition reaction between alkynes and azides, using copper (I) iodide as a catalyst) to conjugate the Coumarin-Azide to a terminal alkyne-modified oligo with extremely high regioselectivity and efficiency (1,2). Preparation of the alkyne-modified oligo can be achieved using the 5'-Hexynyl modifier (see its respective tech sheet for details). Because coumarin is effectively quenched if its hydroxyl group is either alkylated or phosphorylated, it is useful in high-throughput screening for enzyme lipases and phosphatases. **References**

1. Huisgen, R. *Angew. Chem. Int. Ed.* (1963), **2**: 565-568.
2. Rostovtsev, V.V., Green, L.G., Fokin, V.V., Sharpless, K.B. A Stepwise Huisgen Cycloaddition Process: Copper(I)-Catalyzed Regioselective Ligation of Azides and Terminal Alkynes. *Angew. Chem. Int. Ed.* (2002), **41**: 2596-2599.



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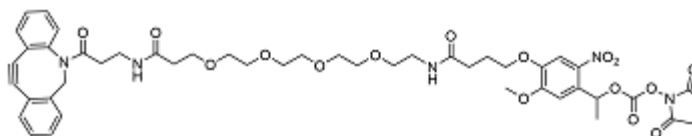
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## Oligo Modifications

For research use only. Not for use in diagnostic procedures for clinical purposes.

### DBCO PC NHS

Category	Click Chemistry
Modification Code	DBCO-PC-N
Reference Catalog Number	26-6744
5 Prime	Y
3 Prime	Y
Internal	Y
Molecular Weight(mw)	847.96



This modification is a post synthesis NHS conjugation to a primary amino group thus an additional modification with an amino group is required. A C6 or C12 amino group can be placed at the 5' or for the 3' end a C3 or C7 amino and for internal positions an amino modified base is used, e.g Amino dT C6. **YIELD** NHS based modifications are post synthesis conjugation performed using a primary amino group. The yield is lower as compared to direct automated coupling of modifications that are available as amidites. Approximate yield for various scales are given below.

- ~2 nmol final yield for 50 nmol scale synthesis.
- ~5 nmol final yield for 200 nmol scale synthesis.
- ~16 nmol final yield for 1 umol scale synthesis
- ~160 nmol final yield for 10 umol scale synthesis
- ~240 nmol final yield for 15 umol scale synthesis

#### Click here for a complete list of Click Chemistry Oligo Modifications

Photocleavable DBCO-NHS ester contains a spacer arm containing a photocleavable moiety, this can be efficiently photoreleased, typically >90% in 5-25 minutes using an near-UV low intensity lamp (e.g. 365 nm lamp at 1-5 mW/cm<sup>2</sup>). Cyclooctyne-based (dibenzocyclooctynes, DBCO) modifications offers the ease of copper-free click reagents. These are simple to use and has excellent click performance in 17 hours or less at room temperature. Gene Link offers 5'-DBCO-TEG for preparing oligos with 5'-DBCO and a 15 tom triethylene glycol spacer arm, DBCO-dT for inserting a DBCO group at any position within the oligonucleotide and DBCO-sulfo-NHS Ester is also offered for post-synthesis conjugation reactions. DBCO-modified oligos may be conjugated with azides in organic solvents, such as DMSO, or aqueous buffers. Depending on the azide used, the reaction will go to completion in 4-17 hours at room temperature.

**Photo Cleavage Protocol** Cleavage occurs by irradiation with near-UV light (300-350 nm, >90% cleavage occurs within 5-25 minutes. Try using a Black Ray XX-15 UV lamp (Ultraviolet Products Inc., San Gabriel, CA) at a distance of 15 cm (emission peak 365 nm, 300 nm cut-off, 1.1 mW intensity at ~31 cm).

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## Product Specifications

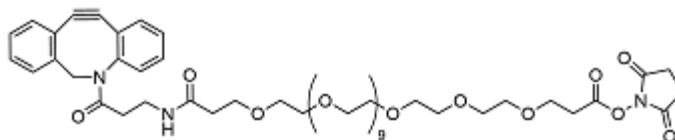
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## Oligo Modifications

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### DBCO PEG13 NHS

Category	Click Chemistry
Modification Code	DBCO-PEG13-N
Reference Catalog Number	26-6746
5 Prime	Y
3 Prime	Y
Internal	Y
Molecular Weight(mw)	1046



This modification is a post synthesis NHS conjugation to a primary amino group thus an additional modification with an amino group is required. A C6 or C12 amino group can be placed at the 5' or for the 3' end a C3 or C7 amino and for internal positions an amino modified base is used, e.g Amino dT C6.

This modification is a post synthesis NHS conjugation to a primary amino group thus an additional modification with an amino group is required. A C6 or C12 amino group can be placed at the 5' or for the 3' end a C3 or C7 amino and for internal positions an amino modified base is used, e.g Amino dT C6. **YIELD** NHS based modifications are post synthesis conjugation performed using a primary amino group. The yield is lower as compared to direct automated coupling of modifications that are available as amidites. Approximate yield for various scales are given below.

- ~2 nmol final yield for 50 nmol scale synthesis.
- ~5 nmol final yield for 200 nmol scale synthesis.
- ~16 nmol final yield for 1 umol scale synthesis
- ~160 nmol final yield for 10 umol scale synthesis
- ~240 nmol final yield for 15 umol scale synthesis

#### Click here for a complete list of Click Chemistry Oligo Modifications

Cyclooctyne-based (dibenzocyclooctynes, DBCO) modifications offers the ease of copper-free click reagents. These are simple to use and has excellent click performance in 17 hours or less at room temperature. Gene Link offers 5'-DBCO-TEG for preparing oligos with 5'-DBCO and a 15 tom triethylene glycol spacer arm, DBCO-dT for inserting a DBCO group at any position within the oligonucleotide and DBCO-sulfo-NHS Ester is also offered for post-synthesis conjugation reactions. DBCO-modified oligos may be conjugated with azides in organic solvents, such as DMSO, or aqueous buffers. Depending on the azide used, the reaction will go to completion in 4-17 hours at room temperature.



## Product Specifications

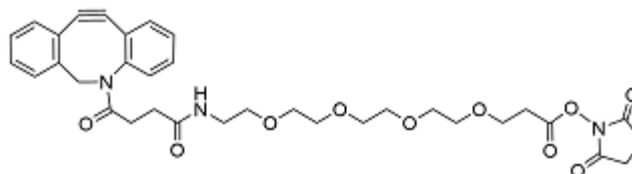
Custom Oligo Synthesis, antisense oligos, RNA oligos, chimeric oligos, Fluorescent dyes, Affinity Ligands, Spacers & Linkers, Duplex Stabilizers, Minor bases, labeled oligos, Molecular Beacons, siRNA, phosphonates Locked Nucleic Acids (LNA); 2'-5' linked Oligos

## Oligo Modifications

For research use only. Not for use in diagnostic procedures for clinical purposes.

### DBCO PEG4 NHS

Category	Click Chemistry
Modification Code	DBCO-PEG4-N
Reference Catalog Number	26-6745
5 Prime	Y
3 Prime	Y
Internal	Y
Molecular Weight(mw)	551.68



This modification is a post synthesis NHS conjugation to a primary amino group thus an additional modification with an amino group is required. A C6 or C12 amino group can be placed at the 5' or for the 3' end a C3 or C7 amino and for internal positions an amino modified base is used, e.g Amino dT C6.

This modification is a post synthesis NHS conjugation to a primary amino group thus an additional modification with an amino group is required. A C6 or C12 amino group can be placed at the 5' or for the 3' end a C3 or C7 amino and for internal positions an amino modified base is used, e.g Amino dT C6. **YIELD** NHS based modifications are post synthesis conjugation performed using a primary amino group. The yield is lower as compared to direct automated coupling of modifications that are available as amidites. Approximate yield for various scales are given below.

- ~2 nmol final yield for 50 nmol scale synthesis.
- ~5 nmol final yield for 200 nmol scale synthesis.
- ~16 nmol final yield for 1 umol scale synthesis
- ~160 nmol final yield for 10 umol scale synthesis
- ~240 nmol final yield for 15 umol scale synthesis

#### Click here for a complete list of Click Chemistry Oligo Modifications

Cyclooctyne-based (dibenzocyclooctynes, DBCO) modifications offers the ease of copper-free click reagents. These are simple to use and has excellent click performance in 17 hours or less at room temperature. Gene Link offers 5'-DBCO-TEG for preparing oligos with 5'-DBCO and a 15 tom triethylene glycol spacer arm, DBCO-dT for inserting a DBCO group at any position within the oligonucleotide and DBCO-sulfo-NHS Ester is also offered for post-synthesis conjugation reactions. DBCO-modified oligos may be conjugated with azides in organic solvents, such as DMSO, or aqueous buffers. Depending on the azide used, the reaction will go to completion in 4-17 hours at room temperature.





## Product Specifications

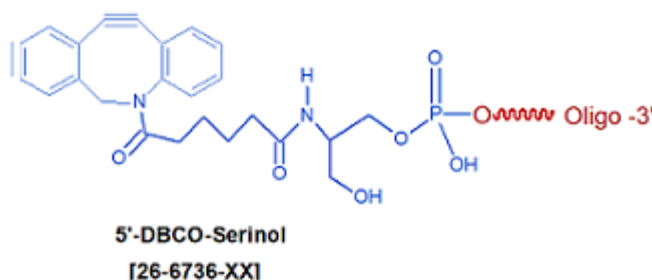
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## Oligo Modifications

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### DBCO Serinol

Category	Click Chemistry
Modification Code	DBCO-Ser
Reference Catalog Number	26-6736
5 Prime	Y
3 Prime	N
Internal	N
Molecular Weight(mw)	468.45



DBCO-TEG, DBCO-dT and DBCO Serinol are discontinued modifications due to their instability during direct oligo synthesis protocols. We offer a range of post synthesis DBCO NHS modifications as alternate. See above related modifications.

DBCO (dibenzocyclooctynes, DBCO) conjugation chemistry is based on the reaction of a dibenzylcyclooctyne (DBCO) linker with an azide linker to form a stable triazole. The dibenzocyclooctyne group (DBCO) allows Copper-free Click Chemistry to be done with live cells, whole organisms, and non-living samples. DBCO groups will preferentially and spontaneously label molecules containing azide groups (-N<sub>3</sub>). Within physiological temperature and pH ranges, the DBCO group does not react with amines or hydroxyls, which are naturally present in many biomolecules. Reaction of the DBCO group with the azide group is significantly faster than with the sulfhydryl group (-SH, thiol).

Cyclooctyne-based modifications offers the ease of copper-free click reagents. These are simple to use and has excellent click performance in 17 hours or less at room temperature. Gene Link offers 5'-DBCO-TEG for preparing oligos with 5'-DBCO and a 15 tom triethylene glycol spacer arm, DBCO-dT for inserting a DBCO group at any position within the oligonucleotide and DBCO-sulfo-NHS Ester is also offered for post-synthesis conjugation reactions. DBCO-modified oligos may be conjugated with azides in organic solvents, such as DMSO, or aqueous buffers. Depending on the azide used, the reaction will go to completion in 4-17 hours at room temperature.

Glen Report 27.1: Technical Brief - DBCO-dT - An Unusual Case of Iodine Sensitivity





## Product Specifications

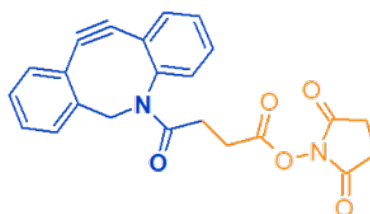
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## Oligo Modifications

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### DBCO-C2 NHS

Category	Click Chemistry
Modification Code	DBCO-C2-N
Reference Catalog Number	26-6742
5 Prime	Y
3 Prime	Y
Internal	Y
Molecular Weight(mw)	289.23



DBCO-C2 NHS  
26-6742-XX

This modification is a post synthesis NHS conjugation to a primary amino group thus an additional modification with an amino group is required. A C6 or C12 amino group can be placed at the 5' or for the 3' end a C3 or C7 amino and for internal positions an amino modified base is used, e.g Amino dT C6.

This modification is a post synthesis NHS conjugation to a primary amino group thus an additional modification with an amino group is required. A C6 or C12 amino group can be placed at the 5' or for the 3' end a C3 or C7 amino and for internal positions an amino modified base is used, e.g Amino dT C6. **YIELD** NHS based modifications are post synthesis conjugation performed using a primary amino group. The yield is lower as compared to direct automated coupling of modifications that are available as amidites. Approximate yield for various scales are given below.

- ~2 nmol final yield for 50 nmol scale synthesis.
- ~5 nmol final yield for 200 nmol scale synthesis.
- ~16 nmol final yield for 1 umol scale synthesis
- ~160 nmol final yield for 10 umol scale synthesis
- ~240 nmol final yield for 15 umol scale synthesis

#### Click here for a complete list of Click Chemistry Oligo Modifications

Cyclooctyne-based (dibenzocyclooctynes, DBCO) modifications offers the ease of copper-free click reagents. These are simple to use and has excellent click performance in 17 hours or less at room temperature. Gene Link offers 5'-DBCO-TEG for preparing oligos with 5'-DBCO and a 15 tom triethylene glycol spacer arm, DBCO-dT for inserting a DBCO group at any position within the oligonucleotide and DBCO-sulfo-NHS Ester is also offered for post-synthesis conjugation reactions. DBCO-modified oligos may be conjugated with azides in organic solvents, such as DMSO, or aqueous buffers. Depending on the azide used, the reaction will go to completion in 4-17 hours at room temperature.



## Product Specifications

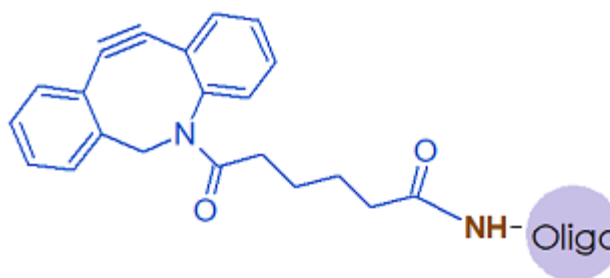
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## Oligo Modifications

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### DBCO-C6 NHS

Category	Click Chemistry
Modification Code	DBCO-C6-N
Reference Catalog Number	26-6929
5 Prime	Y
3 Prime	Y
Internal	Y
Molecular Weight(mw)	316.37



DBCO C6 NHS  
[26-6929-XX]

This modification is a post synthesis NHS conjugation to a primary amino group thus an additional modification with an amino group is required. A C6 or C12 amino group can be placed at the 5' or for the 3' end a C3 or C7 amino and for internal positions an amino modified base is used, e.g Amino dT C6. **YIELD** NHS based modifications are post synthesis conjugation performed using a primary amino group. The yield is lower as compared to direct automated coupling of modifications that are available as amidites. Approximate yield for various scales are given below.

~2 nmol final yield for 50 nmol scale synthesis.

~5 nmol final yield for 200 nmol scale synthesis.

~16 nmol final yield for 1 umol scale synthesis

~160 nmol final yield for 10 umol scale synthesis

~240 nmol final yield for 15 umol scale synthesis

#### Click here for a complete list of Click Chemistry Oligo Modifications

Cyclooctyne-based (dibenzocyclooctynes, DBCO) modifications offers the ease of copper-free click reagents. These are simple to use and has excellent click performance in 17 hours or less at room temperature. Gene Link offers 5'-DBCO-TEG for preparing oligos with 5'-DBCO and a 15 tom triethylene glycol spacer arm, DBCO-dT for inserting a DBCO group at any position within the oligonucleotide and DBCO-sulfo-NHS Ester is also offered for post-synthesis conjugation reactions.

DBCO-modified oligos may be conjugated with azides in organic solvents, such as DMSO, or aqueous buffers. Depending on the azide used, the reaction will go to completion in 4-17 hours at room temperature.

Addition of DBCO-Sulfo-NHS is post synthesis and requires synthesis of oligo with primary amino group.



## Product Specifications

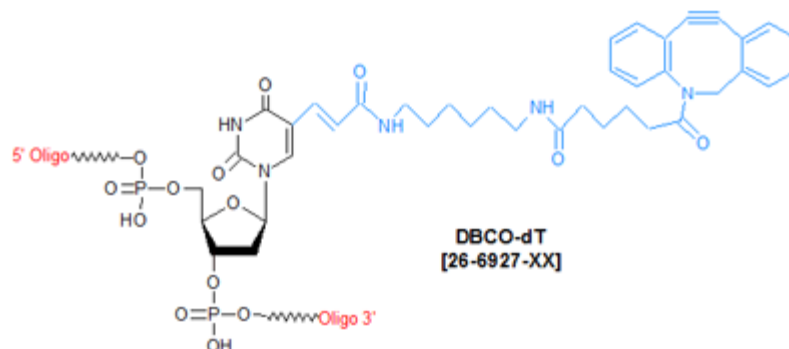
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## Oligo Modifications

For research use only. Not for use in diagnostic procedures for clinical purposes.

### DBCO-dT

Category	Click Chemistry
Modification Code	DBCO-dT
Reference Catalog Number	26-6927
5 Prime	Y
3 Prime	N
Internal	N
Molecular Weight(mw)	773.77



DBCO-TEG, DBCO-dT and DBCO Serinol are discontinued modifications due to their instability during direct oligo synthesis protocols. We offer a range of post synthesis DBCO NHS modifications as alternate. See above related modifications.

DBCO (dibenzocyclooctynes, DBCO) conjugation chemistry is based on the reaction of a dibenzylcyclooctyne (DBCO) linker with an azide linker to form a stable triazole. The dibenzocyclooctyne group (DBCO) allows Copper-free Click Chemistry to be done with live cells, whole organisms, and non-living samples. DBCO groups will preferentially and spontaneously label molecules containing azide groups (N<sub>3</sub>). Within physiological temperature and pH ranges, the DBCO group does not react with amines or hydroxyls, which are naturally present in many biomolecules. Reaction of the DBCO group with the azide group is significantly faster than with the sulfhydryl group (SH, thiol).

Cyclooctyne-based modifications offers the ease of copper-free click reagents. These are simple to use and has excellent click performance in 17 hours or less at room temperature. Gene Link offers 5' DBCO-TEG for preparing oligos with 5' DBCO and a 15 tom triethylene glycol spacer arm, **DBCO-dT is used for inserting a DBCO group preferably at the 5' or internally within 3-4 bases from the 5'** and DBCO-sulfo-NHS Ester is also offered for post-synthesis conjugation reactions. DBCO-modified oligos may be conjugated with azides in organic solvents, such as DMSO, or aqueous buffers. Depending on the azide used, the reaction will go to completion in 4-17 hours at room temperature.

Glen Report 27.1: Technical Brief - DBCO-dT - An Unusual Case of Iodine Sensitivity



## Product Specifications

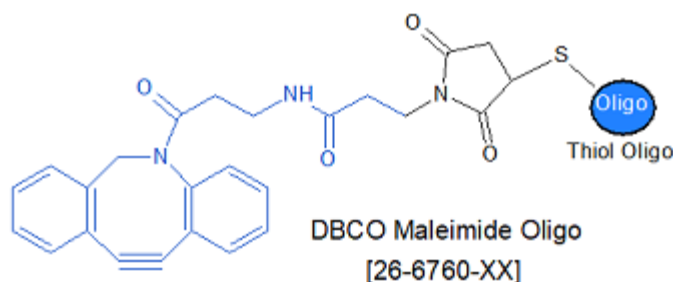
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## Oligo Modifications

For research use only. Not for use in diagnostic procedures for clinical purposes.

### DBCO-Maleimide

Category	Click Chemistry
Modification Code	DBCO-Mal
Reference Catalog Number	26-6760
5 Prime	Y
3 Prime	Y
Internal	Y
Molecular Weight(mw)	427.4



This modification is a post synthesis maleimide conjugation to a reduced thiol amino group thus an additional modification with thiol group is required. A C3 or C6 thiol group can be placed at the 5' or for internal positions Thiol C6 dT modified base is used.

This modification is a post synthesis NHS conjugation to a primary amino group thus an additional modification with an amino group is required. A C6 or C12 amino group can be placed at the 5' or for the 3' end a C3 or C7 amino and for internal positions an amino modified base is used, e.g Amino dT C6. **YIELD** DBCO-Maleimide modifications is a post synthesis conjugation performed using a thiol group. The yield is lower as compared to direct automated coupling of modifications that are available as amidites. Approximate yield for various scales are given below.

- ~2 nmol final yield for 50 nmol scale synthesis.
- ~5 nmol final yield for 200 nmol scale synthesis.
- ~16 nmol final yield for 1 umol scale synthesis
- ~160 nmol final yield for 10 umol scale synthesis
- ~240 nmol final yield for 15 umol scale synthesis

#### Click here for a complete list of Click Chemistry Oligo Modifications

Cyclooctyne-based (dibenzocyclooctynes, DBCO) modifications offers the ease of copper-free click reagents. These are simple to use and has excellent click performance in 17 hours or less at room temperature. Gene Link offers 5'-DBCO-TEG for preparing oligos with 5'-DBCO and a 15 tom triethylene glycol spacer arm, DBCO-dT for inserting a DBCO group at any position within the oligonucleotide and DBCO-sulfo-NHS Ester is also offered for post-synthesis conjugation reactions. DBCO-modified oligos may be conjugated with azides in organic solvents, such as DMSO, or aqueous buffers. Depending on the azide used, the reaction will go to completion in 4-17 hours at room temperature.



## Product Specifications

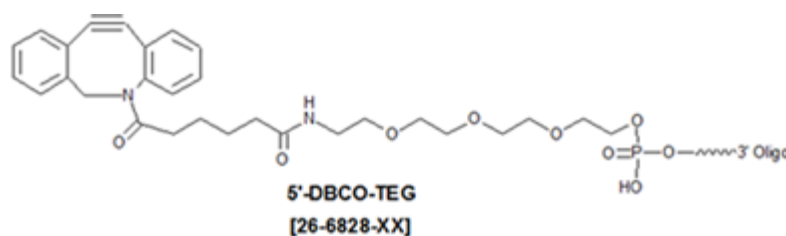
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## Oligo Modifications

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### DBCO-TEG (5')

Category	Click Chemistry
Modification Code	DBCO-TEG
Reference Catalog Number	26-6928
5 Prime	Y
3 Prime	N
Internal	N
Molecular Weight(mw)	570.57



DBCO-TEG, DBCO-dT and DBCO Serinol are discontinued modifications due to their instability during direct oligo synthesis protocols. We offer a range of post synthesis DBCO NHS modifications as alternate. See above related modifications.

**[Click here for a complete list of Click Chemistry Oligo Modifications](#)**

Cyclooctyne-based (dibenzocyclooctynes, DBCO) modifications offers the ease of copper-free click reagents. These are simple to use and has excellent click performance in 17 hours or less at room temperature. Gene Link offers 5'-DBCO-TEG for preparing oligos with 5'-DBCO and a 15 tom triethylene glycol spacer arm, DBCO-dT for inserting a DBCO group at any position within the oligonucleotide and DBCO-sulfo-NHS Ester is also offered for post-synthesis conjugation reactions. DBCO-modified oligos may be conjugated with azides in organic solvents, such as DMSO, or aqueous buffers. Depending on the azide used, the reaction will go to completion in 4-17 hours at room temperature.

Glen Report 27.1: Technical Brief - DBCO-dT - An Unusual Case of Iodine Sensitivity



## Product Specifications

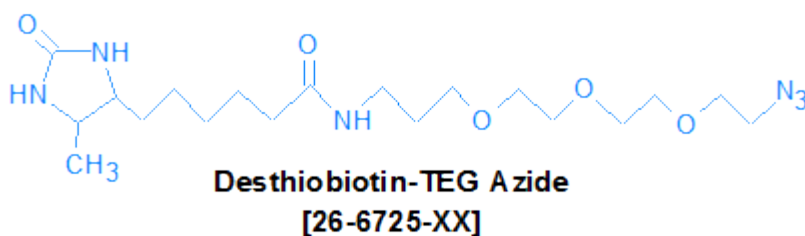
Custom Oligo Synthesis, antisense oligos, RNA oligos, chimeric oligos, Fluorescent dyes, Affinity Ligands, Spacers & Linkers, Duplex Stabilizers, Minor bases, labeled oligos, Molecular Beacons, siRNA, phosphonates Locked Nucleic Acids (LNA); 2'-5' linked Oligos

## Oligo Modifications

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### DesthiobiotinTEG Azide

Category	Click Chemistry
Modification Code	DesBioTEG-N3
Reference Catalog Number	26-6725
5 Prime	Y
3 Prime	Y
Internal	Y
Molecular Weight(mw)	414.5



This modification is a post synthesis conjugation to BCN, alkyne or DBCO modification at the appropriate site for click conjugation. Gene Link offers post synthesis click free conjugation to oligos labelled with BCN at the 5' or 3' end. The azide group of Methylene Blue is linked to BCN group on the oligo. BCN group is required on the oligo. Additional charges applies for BCN

#### BCN-3

#### BCN-5

#### YIELD

Post synthesis conjugation modifications yields are lower as compared to direct automated coupling of modifications that are available as amidites. Approximate yield for various scales are given below.

~2 nmol final yield for 50 nmol scale synthesis.

~5 nmol final yield for 200 nmol scale synthesis.

~16 nmol final yield for 1 umol scale synthesis.

Desthiobiotin-TEG Azide is a desthiobiotin attached to a 15-atom mixed polarity triethylene glycol spacer with an azide group at the end. The presence of the azide allows the user to use Click Chemistry (a [3+2] cycloaddition reaction between alkynes and azides, using copper (I) iodide as a catalyst) to conjugate the Desthiobiotin-TEG Azide to a terminal alkyne-modified oligo with extremely high regioselectivity and efficiency (1,2). Preparation of the alkyne-modified oligo can be achieved using the 5'-Hexynyl modifier (see its respective tech sheet for details). The spacer acts to minimize steric hindrance between the desthiobiotin moiety and the oligo.

Like biotin, desthiobiotin binds to streptavidin, but its binding affinity is considerably less ( $2 \times 10^{-9}$  M) than that of biotin ( $4.0 \times 10^{-14}$  M) (3). Consequently, oligonucleotides labeled with desthiobiotin can be easily displaced from streptavidin by biotin, thereby making recovery of the labeled oligo (for example, in affinity purification protocols) from a streptavidin-coated support a relatively simple process (4). Desthiobiotin-labeled oligos can also be conveniently eluted from streptavidin-coated supports by incubation in distilled water at 95°C for 10 minutes (5). Gene Link recommends substitution of desthiobiotin for biotin for those cases where reversible capture of oligonucleotides is desirable. **References**

1.



- Huisgen, R. *Angew. Chem. Int. Ed.* (1963), **2**: 565-568.
2. Rostovtsev, V.V., Green, L.G., Fokin, V.V., Sharpless, K.B. A Stepwise Huisgen Cycloaddition Process: Copper(I)-Catalyzed Regioselective Ligation of Azides and Terminal Alkynes. *Angew. Chem. Int. Ed.* (2002), **41**: 2596-2599.
3. Green, N.M. Spectrophotometric determination of avidin and biotin. *Methods Enzymol.* (1970), **18A**: 418-424.
4. Hirsch, J.D., Eslamizar, L., Filanoski, B.J., Malekzadeh, N., Haugland, R.P., Beechem, J.M., Haugland, R.P. Easily reversible desthiobiotin binding to streptavidin, avidin, and other biotin-binding proteins: uses for protein labeling, detection, and isolation. *Anal. Biochem.* (2002), **308**: 343-357.
5. van Doorn, R., Slawiak, M., Szemes, M., Dullemans, A.M., Bonants, P., Kowalchuk, G.A., Schoen, C.D. Robust Definition and Identification of Multiple Oomycetes and Fungi in Environmental Samples by Using a Novel Cleavable Padlock Probe-Based Ligation Detection Assay. *Appl. Environ. Microbiol.* (2009), **75**: 4185-4193.



## Product Specifications

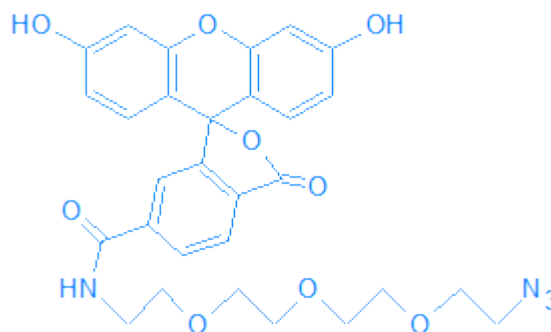
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## Oligo Modifications

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### Fam-TEG Azide

Category	Click Chemistry
Modification Code	Fam-TEG-N3
Reference Catalog Number	26-6722
5 Prime	Y
3 Prime	Y
Internal	Y
Molecular Weight(mw)	576.55



**6-FAM-TEG Azide**  
**[26-6722-XX]**

This modification is a post synthesis conjugation to an alkyne or DBCO modification at the appropriate site for click conjugation.

6-FAM (6-carboxyfluorescein)-TEG Azide is a 6-FAM fluorescent dye attached to a 15-atom mixed polarity triethylene glycol spacer with an azide group at the end of the spacer. 6-FAM is the most commonly used fluorescent dye for labeling oligonucleotides, and is reactive and water-soluble, with an absorbance maximum of 492 nm and an emission maximum of 517 nm. The presence of the azide allows the user to use "Click Chemistry" (a [3+2] cycloaddition reaction between alkynes and azides, using copper (I) iodide as a catalyst) to conjugate the 6-FAM-TEG Azide to a terminal alkyne-modified oligo with extremely high regioselectivity and efficiency (1,2). Preparation of the alkyne-modified oligo can be achieved using the 5'-Hexynyl modifier (see its respective tech sheet for details). The spacer acts to minimize steric hindrance between the biotin moiety and the oligo. **References**

1. Huisgen, R. *Angew. Chem. Int. Ed.* (1963), **2**: 565-568.
2. Rostovtsev, V.V., Green, L.G., Fokin, V.V., Sharpless, K.B. A Stepwise Huisgen Cycloaddition Process: Copper(I)-Catalyzed Regioselective Ligation of Azides and Terminal Alkynes. *Angew. Chem. Int. Ed.* (2002), **41**: 2596-2599.





## Product Specifications

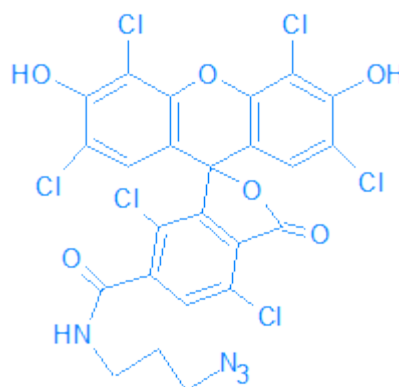
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## Oligo Modifications

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### Hex-Azide-6

Category	Click Chemistry
Modification Code	Hex-N3
Reference Catalog Number	26-6723
5 Prime	Y
3 Prime	Y
Internal	Y
Molecular Weight(mw)	665.09



**6-HEX Azide**  
**[26-6723-XX]**

This modification is a post synthesis conjugation to an alkyne or DBCO modification at the appropriate site for click conjugation.

HEX (Hexachloro-fluorescein)-Azide is a fluorescent dye containing an terminal azide group. HEX has an absorbance maximum of 535 nm and an emission maximum of 556 nm. The presence of the azide allows the user to use "Click Chemistry" (a [3+2] cycloaddition reaction between alkynes and azides, using copper (I) iodide as a catalyst) to conjugate the HEX-Azide to a terminal alkyne-modified oligo with extremely high regioselectivity and efficiency (1,2). Preparation of the alkyne-modified oligo can be achieved using the 5'-Hexynyl (Alkyne) modifier or for copper free conjugation use the cyclooctyne DBCO dT, DBCO TEG(see its respective tech sheet for details). **References**

1. Huisgen, R. *Angew. Chem. Int. Ed.* (1963), **2**: 565-568.
2. Rostovtsev, V.V., Green, L.G., Fokin, V.V., Sharpless, K.B. A Stepwise Huisgen Cycloaddition Process: Copper(I)-Catalyzed Regioselective Ligation of Azides and Terminal Alkynes. *Angew. Chem. Int. Ed.* (2002), **41**: 2596-2599.



## Product Specifications

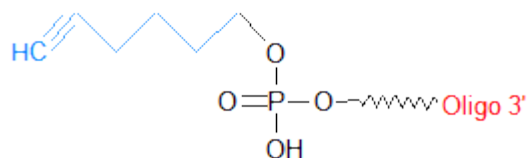
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## Oligo Modifications

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### Hexynyl (Alkyne) Modifier (5')

Category	Click Chemistry
Modification Code	5Hexynyl
Reference Catalog Number	26-6930
5 Prime	Y
3 Prime	N
Internal	N
Molecular Weight(mw)	160.11



**5'-Hexynyl Modifier**  
**[26-6930-XX]**

The 5'-Hexynyl modifier can be used to incorporate an active alkyne onto the 5'-end of an oligonucleotide. The alkyne is separated from the 5'-end nucleotide base by a 4-carbon spacer arm, which serves to reduce steric interaction between the reactive group and the oligo. The presence of the alkyne allows the user to use "Click Chemistry" (a [3+2] cycloaddition reaction between alkynes and azides, using copper (I) iodide as a catalyst) to conjugate it to a variety of azide-containing labels/tags (e.g., fluorescent dyes, biotin), or oligos, with extremely high regioselectivity and efficiency (1,2). When conjugation to an azide-oligo is desired, preparation of the azide-oligo can be achieved using either an Azidobutyrate NHS Ester or the 5'-Bromohexyl modifier (see their respective tech sheets for details). Click chemistry can be used to form short, cyclic oligos that can be used as research tools in various biophysical and biological studies (3). In particular, they have considerable potential for in vivo work, as cyclic oligos are known to be very stable in serum for up to several days.

#### References

1. Huisgen, R. *Angew. Chem. Int. Ed.* (1963), **2**: 565-568.
2. Rostovtsev, V.V., Green, L.G., Fokin, V.V., Sharpless, K.B. A Stepwise Huisgen Cycloaddition Process: Copper(I)-Catalyzed Regioselective Ligation of Azides and Terminal Alkynes. *Angew. Chem. Int. Ed.* (2002), **41**: 2596-2599.
3. Kumar, R., El-Sagheer, A., Tumpene, J., Lincoln, P., Wilhelmsson, L.M., Brown, T. Template-Directed Oligonucleotide Strand Ligation, Covalent Intramolecular DNA Circularization and Catenation Using Click Chemistry. *J. Am. Chem. Soc.* (2007), **129**: 6859-6864.



## Product Specifications

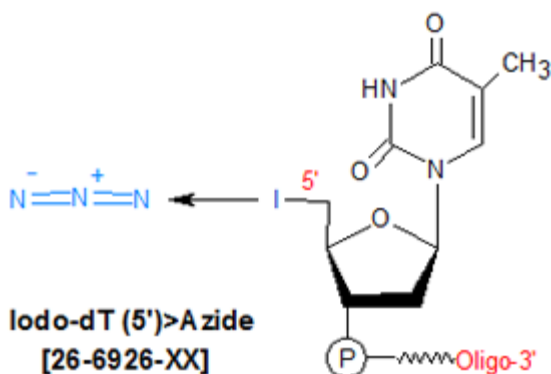
Custom Oligo Synthesis, antisense oligos, RNA oligos, chimeric oligos, Fluorescent dyes, Affinity Ligands, Spacers & Linkers, Duplex Stabilizers, Minor bases, labeled oligos, Molecular Beacons, siRNA, phosphonates Locked Nucleic Acids (LNA); 2'-5' linked Oligos

## Oligo Modifications

For research use only. Not for use in diagnostic procedures for clinical purposes.

### Iodo-dT-5'

Category	Minor Bases
Modification Code	I-dT
Reference Catalog Number	26-6926
5 Prime	Y
3 Prime	N
Internal	N
Molecular Weight(mw)	414.09



5'-Iodo dT modification is available as an Azide dT [Catalog #: 26-6719] for Click Chemistry. 5'-Iodo dT modification has a setup charge of \$250.00 for mild synthesis reagents per order. Azide version does not have additional charges

Iodo-dT (5') can be used to introduce an active azide group to the 5'-end of an oligonucleotide. The oligo is chemically synthesized with Iodo-dT at the 5' end and then post synthesis converted to an active azide. The oligo is provided as an azide or 5'-iodo. The selection should be indicated in the comments of the order.

The presence of the azide allows the user to use "Click Chemistry" (a [3+2] cycloaddition reaction between alkynes and azides, using copper (I) iodide as a catalyst) to conjugate the azide-modified oligo to a terminal alkyne-modified oligo with extremely high regioselectivity and efficiency (1,2). Preparation of the alkyne-modified oligo can be achieved using the 5'-Hexynyl modifier (see its respective tech sheet for details). Click chemistry can be used to form short, cyclic oligos that can be used as research tools in various biophysical and biological studies (3). In particular, they have considerable potential for in vivo work, as cyclic oligos are known to be very stable in serum for up to several days. **References**

1. Huisgen, R. *Angew. Chem. Int. Ed.* (1963), **2**: 565-568.
2. Rostovtsev, V.V., Green, L.G., Fokin, V.V., Sharpless, K.B. A Stepwise Huisgen Cycloaddition Process: Copper(I)-Catalyzed Regioselective Ligation of Azides and Terminal Alkynes. *Angew. Chem. Int. Ed.* (2002), **41**: 2596-2599.
3. Kumar, R., El-Sagheer, A., Tumpane, J., Lincoln, P., Wilhelmsson, L.M., Brown, T. Template-Directed Oligonucleotide Strand Ligation, Covalent Intramolecular DNA Circularization and Catenation Using Click Chemistry. *J. Am. Chem. Soc.* (2007), **129**: 6859-6864.



## Product Specifications

Custom Oligo Synthesis, antisense oligos, RNA oligos, chimeric oligos, Fluorescent dyes, Affinity Ligands, Spacers & Linkers, Duplex Stabilizers, Minor bases, labeled oligos, Molecular Beacons, siRNA, phosphonates  
Locked Nucleic Acids (LNA); 2'-5' linked Oligos

## Oligo Modifications

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### Methylene Blue Azide

Category Redox Electrochemical

Modification Code MB-N3

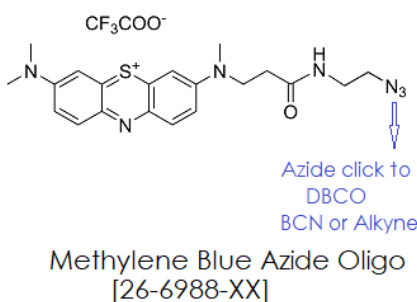
Reference Catalog Number 26-6988

5 Prime Y

3 Prime Y

Internal Y

Molecular Weight(mw) 553



This modification is a post synthesis conjugation to BCN, alkyne or DBCO modification at the appropriate site for click conjugation. Gene Link offers post synthesis click free conjugation to oligos labelled with BCN at the 5' or 3' end. The azide group of Methylene Blue is linked to BCN group on the oligo. BCN group is required on the oligo. Additional charges applies for BCN

#### BCN-3

#### BCN-5

#### YIELD

Post synthesis conjugation modifications yields are lower as compared to direct automated coupling of modifications that are available as amidites. Approximate yield for various scales are given below.

~2 nmol final yield for 50 nmol scale synthesis.

~5 nmol final yield for 200 nmol scale synthesis.

~16 nmol final yield for 1 umol scale synthesis.

Methylene Blue Azide is a derivative of the well-known redox dye Methylene Blue. The azide derivative enables use in copper free click chemistry reactions with DBCO labelled reactants.

The dye can be reversibly reduced to the colorless leuco form. Upon oxidation (e.g. with oxygen) the dye recovers, and the absorption is fully restored. Conventional and popular dyes that are derivatives of fluorescein (FAM, HEX and TET) and Cyanine dye derivatives (Cy3, Cy5, Cy5.5, Cy7 etc) are commonly used for fluorescently labeling oligos for use as molecular probes for real time PCR, FISH analysis and fragment analysis. For most purposes these provide a good range in wavelength and other optical properties and are available as amidites for direct coupling to oligos using automated chemistry. Other fluorescent dyes are available as N-hydroxysuccinimide (NHS) for conjugation using a primary amine group linked to the oligos. A new series of Atto dyes are now available that are designed for high sensitivity applications, including single-molecule detection.

ATTO Dyes are a series of fluorescent labels and dyes manufactured by ATTO-TEC GmbH in Siegen, Germany. The ATTO Dye series covers a spectral range from 390 nm in the UV to 740 nm in the near infrared allowing excitation with most commonly used light sources. The dyes typically are derivatives of coumarins, rhodamines, carbopyronins and oxazines.

Compared with other labels especially for the red region of the spectrum, ATTO-labels show excellent photostability and brightness. Atto labels have rigid structures that do not show any cis-trans isomerization. Thus these labels display exceptional intensity with minimal spectral shift on conjugation. The molecules of most common dyes, e.g. cyanines, have a more or less flexible structure. Hence their solutions contain a mixture of several isomers with varying properties. Since the equilibrium between the isomers depends on temperature and other environmental factors, absorption and fluorescence of such dyes are ill-defined. ATTO-dyes have a molecular structure that ensures high rigidity of the chromophore. They do not form equilibria with various isomers, their optical properties are nearly independent of solvent and temperature. ATTO 647N fluoresces twice as strong as Cy5 in aqueous solution. In addition many common fluorescent labels especially cyanine dyes like Cy5 deteriorate even without any irradiation (in the dark), in particular when exposed to small concentrations of ozone present in the laboratory atmosphere. Under identical conditions of ozone exposure the new dyes ATTO 633, ATTO 647N and ATTO 655 last up to 100 times longer than cyanines like Cy5 and Alexa Fluor 647. This is very important in microarray applications, where the dye molecules are located at the surface and thus are in direct contact with the atmosphere.

## Copper-free Click Chemistry Modifications

Use azide modified oligos with DBCO Cyclooctyne-based modifications for ease of copper-free click reagents. These are simple to use and has excellent click performance in 17 hours or less at room temperature. Gene Link offers 5'-DBCO-TEG for preparing oligos with 5'-DBCO and a 15 tom triethylene glycol spacer arm, DBCO-dT for inserting a DBCO group at any position within the oligonucleotide and DBCO-sulfo-NHS Ester is also offered for post-synthesis conjugation reactions. DBCO-modified oligos may be conjugated with azides in organic solvents, such as DMSO, or aqueous buffers. Depending on the azide used, the reaction will go to completion in 4-17 hours at room temperature.

Azide C3 is available to introduce a stable azide group at the 3' of an oligo. Use Azide butyrate NHS [26-6922] for introduction of azide at internal or 5' position by conjugating to an amino-modified oligonucleotide. Introduction can be done at either the 5'- or 3'-end, or internally. To do this, the oligo first must be synthesized with a primary amino functional group modification, e.g Amino C6 for the 5' end or amino C7 for the 3' end for the ends) or the amino C6 version of the base phosphoramidite (for internal labeling). The Azidobutyrate NHS ester is then manually attached to the oligo through the amino group in a separate reaction post-synthesis. The presence of the azide allows the user to use "Click Chemistry" (a [3+2] cycloaddition reaction between alkynes and azides, using copper (I) iodide as a catalyst) to conjugate the azide-modified oligo to a terminal alkyne-modified oligo with extremely high regioselectivity and efficiency (1,2). Preparation of the alkyne-modified oligo can be achieved using the 5'-Hexynyl modifier (see its respective tech sheet for details). Click chemistry can be used to form short, cyclic oligos that can be used as research tools in various biophysical and biological studies (3). In particular, they have considerable potential for in vivo work, as cyclic oligos are known to be very stable in serum for up to several days.

### References

1. Huisgen, R. *Angew. Chem. Int. Ed.* (1963), **2**: 565-568.
2. Rostovtsev, V.V., Green, L.G., Fokin, V.V., Sharpless, K.B. A Stepwise Huisgen Cycloaddition Process: Copper(I)-Catalyzed Regioselective Ligation of Azides and Terminal Alkynes. *Angew. Chem. Int. Ed.* (2002), **41**: 2596-2599.
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## Product Specifications

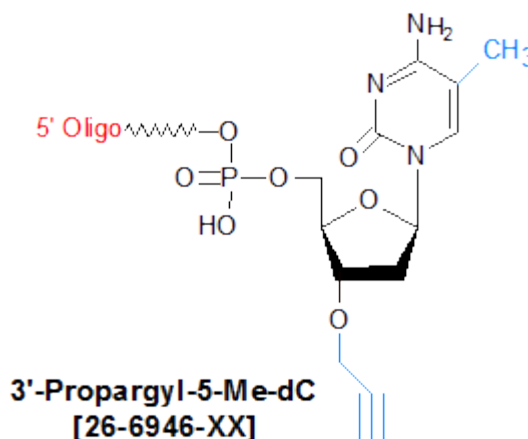
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## Oligo Modifications

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### Propargyl-3'-5-Me-dC

Category	Click Chemistry
Modification Code	PPG-3-O-5me-dC
Reference Catalog Number	26-6946
5 Prime	N
3 Prime	Y
Internal	N
Molecular Weight(mw)	341.26



#### Click here for a complete list of Click Chemistry Oligo Modifications

Propargyl refers to triple/alkyne bond structure next to a saturated position with the following structure  $\text{HC}\equiv\text{C}-\text{CH}_2-$ . Placing a propargyl group at the 3' end in conjunction with an azide at the 5' position can be ligated using click chemistry.

Ligation of an oligo containing a 5'-azide with an oligo containing a 3'-propargyl group using Click Chemistry leads to a triazole linkage that has been shown to have in vivo biocompatibility. This technique has been used to synthesize DNA constructs up to 300 bases in length. When the resultant triazole linkage was placed in a PCR template, various polymerases were able to copy the sequence correctly. The linkage has also been shown to be compatible with transcription and rolling circle amplification, as well as gene expression in *E. coli*. In the RNA world, a hammerhead ribozyme containing the triazole linkage at the substrate cleavage site has been shown to retain its activity. A large variety of applications is envisaged for this biocompatible chemical ligation.

An azide can be introduced at the 5' end of an oligo using Iodo-dT (5'); catalog number. 26-6926.





## Product Specifications

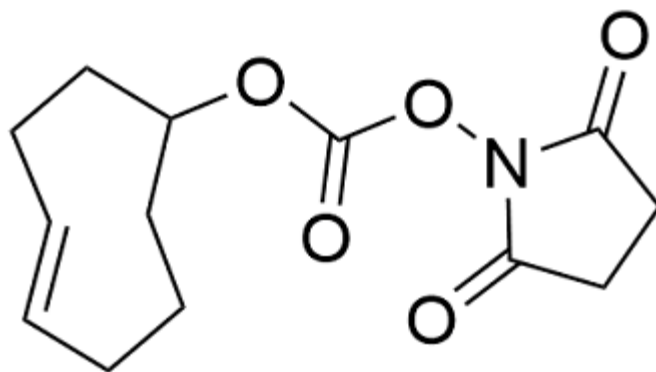
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## Oligo Modifications

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### TCO NHS

Category	Click Chemistry
Modification Code	TCO-N
Reference Catalog Number	26-6756
5 Prime	Y
3 Prime	Y
Internal	Y
Molecular Weight(mw)	153.21



This modification is a post synthesis conjugation to a primary amino group thus an additional modification with an amino group is required. A C3, C6 or C12 amino group can be placed at the 5' or for the 3' end a C3 or C7 amino and for internal positions an amino modified base is used, e.g Amino dT C6. **YIELD**  
 NHS based modifications yields are lower as compared to direct automated coupling of modifications that are available as amidites. Approximate yield for various scales are given below.  
 ~2 nmol final yield for 50 nmol scale synthesis.  
 ~5 nmol final yield for 200 nmol scale synthesis.  
 ~16 nmol final yield for 1 umol scale synthesis.

[Click here for a complete list of Click Chemistry Oligo Modifications](#)

TCO (trans-cyclooctene) NHS ester can be used to introduce an active azide group to an amino-modified oligonucleotide. Introduction can be done at either the 5'- or 3'-end, or internally. To do this, the oligo first must be synthesized with a primary amino functional group modification, e.g Amino C3, C6 or C12 for the 5' end or amino C3, C6 or C7 for the 3' end for the ends) or the amino C6 version of the base phosphoramidite (for internal labeling). The Azide C2 NHS ester is then manually attached to the oligo through the amino group in a separate reaction post-synthesis. The presence of the azide allows the user to use "Click Chemistry" (a [3+2] cycloaddition reaction between alkynes and azides, using copper (I) iodide as a catalyst) to conjugate the azide-modified oligo to a terminal alkyne-modified oligo with extremely high regioselectivity and efficiency (1,2). Preparation of the alkyne-modified oligo can be achieved using the 5'-Hexynyl modifier (see its respective tech sheet for details). Click chemistry can be used to form short, cyclic oligos that can be used as research tools in various biophysical and biological studies (3). In particular, they have considerable potential for in vivo work, as cyclic oligos are known to be very stable in serum for up to several days.

#### References

1. Huisgen, R. *Angew. Chem. Int. Ed.* (1963), **2**: 565-568.
- 2.

Rostovtsev, V.V., Green, L.G., Fokin, V.V., Sharpless, K.B. A Stepwise Huisgen Cycloaddition Process: Copper(I)-Catalyzed Regioselective Ligation of Azides and Terminal Alkynes. *Angew. Chem. Int. Ed.* (2002), **41**: 2596-2599.

3. Kumar, R., El-Sagheer, A., Tumpane, J., Lincoln, P., Wilhelmsson, L.M., Brown, T. Template-Directed Oligonucleotide Strand Ligation, Covalent Intramolecular DNA Circularization and Catenation Using Click Chemistry. *J. Am. Chem. Soc.* (2007), **129**: 6859-6864.





## Product Specifications

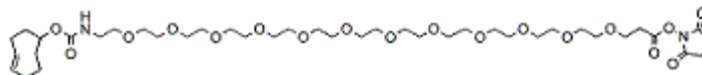
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## Oligo Modifications

For research use only. Not for use in diagnostic procedures for clinical purposes.

### TCO-PEG12 NHS

Category	Click Chemistry
Modification Code	TCO-PEG12-N
Reference Catalog Number	26-6759
5 Prime	Y
3 Prime	Y
Internal	Y
Molecular Weight(mw)	752.93



All NHS modifications are post synthesis conjugation to a primary amino group thus an additional modification with an amino group is required. A C3, C6 or C12 amino group can be placed at the 5' or for the 3' end a C3 or C7 amino and for internal positions an amino modified base is used, e.g Amino dT C6. **YIELD** NHS based modifications yields are lower as compared to direct automated coupling of modifications that are available as amidites. Approximate yield for various scales are given below.

~2 nmol final yield for 50 nmol scale synthesis.

~5 nmol final yield for 200 nmol scale synthesis.

~16 nmol final yield for 1 umol scale synthesis.

[Click here for a complete list of Click Chemistry Oligo Modifications](#)

TCO (trans-cyclooctene) NHS ester can be used to introduce an active TCO group to an amino-modified oligonucleotide. Introduction can be done at either the 5'- or 3'-end, or internally. To do this, the oligo first must be synthesized with a primary amino functional group modification, e.g Amino C3, C6 or C12 for the 5' end or amino C3, C6 or C7 for the 3' end for the ends) or the amino C6 version of the base phosphoramidite (for internal labeling). The TCO NHS ester is then manually attached to the oligo through the amino group in a separate reaction post-synthesis. The presence of the TCO allows the user to use "Click Chemistry" (a [3+2] cycloaddition reaction between alkynes and azides, using copper (I) iodide as a catalyst) to conjugate the azide-modified oligo to a terminal alkyne-modified oligo with extremely high regioselectivity and efficiency (1,2). Preparation of the alkyne-modified oligo can be achieved using the 5'-Hexynyl modifier (see its respective tech sheet for details). Click chemistry can be used to form short, cyclic oligos that can be used as research tools in various biophysical and biological studies (3). In particular, they have considerable potential for in vivo work, as cyclic oligos are known to be very stable in serum for up to several days.

#### References

1. Huisgen, R. *Angew. Chem. Int. Ed.* (1963), **2**: 565-568.
2. Rostovtsev, V.

V., Green, L.G., Fokin, V.V., Sharpless, K.B. A Stepwise Huisgen Cycloaddition Process: Copper(I)-Catalyzed Regioselective Ligation of Azides and Terminal Alkynes. *Angew. Chem. Int. Ed.* (2002), **41**: 2596-2599.

3. Kumar, R., El-Sagheer, A., Tumpane, J., Lincoln, P., Wilhelmsson, L.M., Brown, T. Template-Directed Oligonucleotide Strand Ligation, Covalent Intramolecular DNA Circularization and Catenation Using Click Chemistry. *J. Am. Chem. Soc.* (2007), **129**: 6859-6864.



## Product Specifications

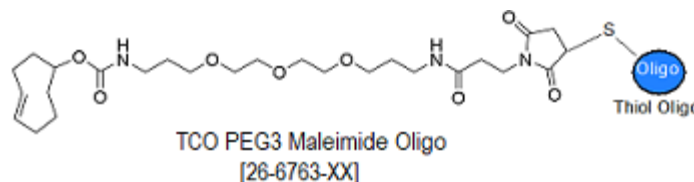
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## Oligo Modifications

For research use only. Not for use in diagnostic procedures for clinical purposes.

### TCO-PEG3 Mal Oligo

Category	Click Chemistry
Modification Code	TCO-PEG3-Mal
Reference Catalog Number	26-6763
5 Prime	Y
3 Prime	Y
Internal	Y
Molecular Weight(mw)	523.62



This modification is a post synthesis maleimide conjugation to a reduced thiol amino group thus an additional modification with thiol group is required. A C3 or C6 thiol group can be placed at the 5' or for internal positions Thiol C6 dT modified base is used.

#### YIELD

Maleimide based modifications yields are lower as compared to direct automated coupling of modifications that are available as amidites. Approximate yield for various scales are given below.

- ~2 nmol final yield for 50 nmol scale synthesis.
- ~5 nmol final yield for 200 nmol scale synthesis.
- ~16 nmol final yield for 1 umol scale synthesis
- ~32 nmol final yield for 2 umol scale synthesis
- ~160 nmol final yield for 10 umol scale synthesis
- ~240 nmol final yield for 15 umol scale synthesis

#### Click here for a complete list of Click Chemistry Oligo Modifications

TCO (trans-cyclooctene) NHS ester can be used to introduce an active azide group to an amino-modified oligonucleotide. Introduction can be done at either the 5'- or 3'-end, or internally. To do this, the oligo first must be synthesized with a primary amino functional group modification, e.g Amino C3, C6 or C12 for the 5' end or amino C3, C6 or C7 for the 3' end for the ends) or the amino C6 version of the base phosphoramidite (for internal labeling). The Azide C2 NHS ester is then manually attached to the oligo through the amino group in a separate reaction post-synthesis. The presence of the azide allows the user to use "Click Chemistry" (a [3+2] cycloaddition reaction between alkynes and azides, using copper (I) iodide as a catalyst) to conjugate the azide-modified oligo to a terminal alkyne-modified oligo with extremely high regioselectivity and efficiency (1,2). Preparation of the alkyne-modified oligo can be achieved using the 5'-Hexynyl modifier (see its respective tech sheet for details). Click chemistry can be used to form short, cyclic oligos that can be used as research tools in various biophysical and biological studies (3). In particular, they have considerable potential for in vivo work, as cyclic oligos are known to be very stable in serum for up to several days.

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## References

1. Huisgen, R. *Angew. Chem. Int. Ed.* (1963), **2**: 565-568.
2. Rostovtsev, V.V., Green, L.G., Fokin, V.V., Sharpless, K.B. A Stepwise Huisgen Cycloaddition Process: Copper(I)-Catalyzed Regioselective Ligation of Azides and Terminal Alkynes. *Angew. Chem. Int. Ed.* (2002), **41**: 2596-2599.
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## Product Specifications

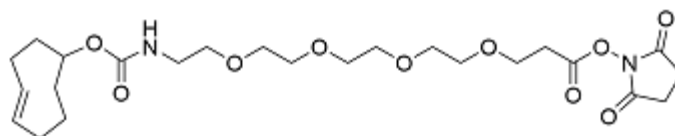
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## Oligo Modifications

For research use only. Not for use in diagnostic procedures for clinical purposes.

### TCO-PEG4 NHS

Category	Click Chemistry
Modification Code	TCO-PEG4-N
Reference Catalog Number	26-6757
5 Prime	Y
3 Prime	Y
Internal	Y
Molecular Weight(mw)	400.53



All NHS modifications are post synthesis conjugation to a primary amino group thus an additional modification with an amino group is required. A C3, C6 or C12 amino group can be placed at the 5' or for the 3' end a C3 or C7 amino and for internal positions an amino modified base is used, e.g Amino dT C6. **YIELD** NHS based modifications yields are lower as compared to direct automated coupling of modifications that are available as amidites. Approximate yield for various scales are given below.

~2 nmol final yield for 50 nmol scale synthesis.

~5 nmol final yield for 200 nmol scale synthesis.

~16 nmol final yield for 1 umol scale synthesis.

[Click here for a complete list of Click Chemistry Oligo Modifications](#)

TCO (trans-cyclooctene) PEG4 NHS ester can be used to introduce an active azide group to an amino-modified oligonucleotide. Introduction can be done at either the 5'- or 3'-end, or internally. To do this, the oligo first must be synthesized with a primary amino functional group modification, e.g Amino C3, C6 or C12 for the 5' end or amino C3, C6 or C7 for the 3' end for the ends) or the amino C6 version of the base phosphoramidite (for internal labeling). The Azide C2 NHS ester is then manually attached to the oligo through the amino group in a separate reaction post-synthesis. The presence of the azide allows the user to use "Click Chemistry" (a [3+2] cycloaddition reaction between alkynes and azides, using copper (I) iodide as a catalyst) to conjugate the azide-modified oligo to a terminal alkyne-modified oligo with extremely high regioselectivity and efficiency (1,2). Preparation of the alkyne-modified oligo can be achieved using the 5'-Hexynyl modifier (see its respective tech sheet for details). Click chemistry can be used to form short, cyclic oligos that can be used as research tools in various biophysical and biological studies (3). In particular, they have considerable potential for in vivo work, as cyclic oligos are known to be very stable in serum for up to several days.

#### References

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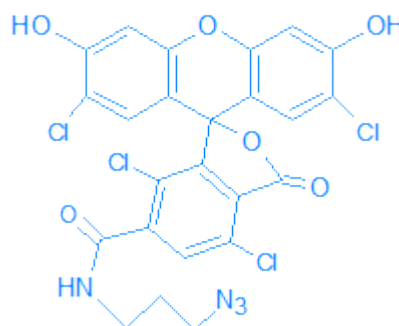
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Locked Nucleic Acids (LNA); 2'-5' linked Oligos

## Oligo Modifications

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### Tet-Azide

Category	Click Chemistry
Modification Code	Tet-N3
Reference Catalog Number	26-6724
5 Prime	Y
3 Prime	Y
Internal	Y
Molecular Weight(mw)	596.2



**6-TET Azide**  
**[26-6724-XX]**

This modification is a post synthesis conjugation to an alkyne or DBCO modification at the appropriate site for click conjugation.

TET (Tetrachloro fluorescein)-Azide is a fluorescent dye containing a terminal azide group. TET has an absorbance maximum of 522 nm and an emission maximum of 538 nm. The presence of the azide allows the user to use "Click Chemistry" (a [3+2] cycloaddition reaction between alkynes and azides, using copper (I) iodide as a catalyst) to conjugate the TET-Azide to a terminal alkyne-modified oligo with extremely high regioselectivity and efficiency (1,2). Preparation of the alkyne-modified oligo can be achieved using the 5'-Hexynyl modifier (see its respective tech sheet for details). **References**

1. Huisgen, R. *Angew. Chem. Int. Ed.* (1963), **2**: 565-568.

2. Rostovtsev, V.V., Green, L.G., Fokin, V.V., Sharpless, K.B. A Stepwise Huisgen Cycloaddition Process:

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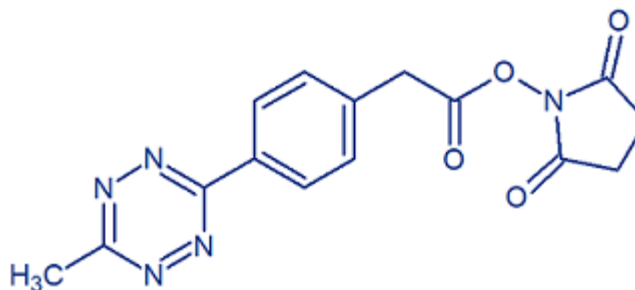
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## Oligo Modifications

For research use only. Not for use in diagnostic procedures for clinical purposes.

### Tetrazine methyl NHS

Category	Click Chemistry
Modification Code	meTz-N
Reference Catalog Number	26-6758
5 Prime	Y
3 Prime	Y
Internal	Y
Molecular Weight(mw)	230.2



All NHS modifications are post synthesis conjugation to a primary amino group thus an additional modification with an amino group is required. A C3, C6 or C12 amino group can be placed at the 5' or for the 3' end and a C3 or C7 amino and for internal positions an amino modified base is used, e.g Amino dT C6. **YIELD** NHS based modifications yields are lower as compared to direct automated coupling of modifications that are available as amidites. Approximate yield for various scales are given below.

~2 nmol final yield for 50 nmol scale synthesis.

~5 nmol final yield for 200 nmol scale synthesis.

~16 nmol final yield for 1 umol scale synthesis.

#### [Click here for a complete list of Click Chemistry Oligo Modifications](#)

Tetrazines are even more reactive than triazines toward nucleophiles and electron-rich dienophiles. This makes them attractive for click chemistry and they find application as conjugation tags for materials chemistry and, especially, for bio-orthogonal chemistry. In other applications they are attractive for high-energy materials, coordinating ligands, and as potent bioactive compounds.

The tetrazine will react with strained alkenes such as trans-cyclooctene, norbornene and cyclopropene to yield a stable dihydropyridazine linkage. The extremely fast kinetics and selectivity enables the conjugation of two low abundance biopolymers in an aqueous and otherwise complex chemical environment. This bioorthogonal reaction possesses excellent selectivity and biocompatibility such that the complimentary partners can react with each other within richly functionalized biological systems, in some cases, living organisms. Thus, tetrazine-TCO ligation has found numerous applications in fluorescent imaging, drug delivery, PET and SPECT imaging, radionuclide therapy, radiochemistry or drug target identification among several others.

#### **Biocompatible**

Click reaction occurs efficiently under mild buffer conditions; requires no accessory reagents such as a copper catalyst or reducing agents (e.g. DTT)

#### **Chemoselective**

Tetrazines and trans-cyclooctene groups do not react or interfere with other functional groups found in biological samples but conjugate to one another with high efficiency

#### **Unprecedented kinetics**

Inverse-electron demand Diels-Alder chemistry is the fastest bioorthogonal ligation available

#### **Solubility**

Easily dissolves in aqueous buffers

Methyltetrazine NHS Ester is one of the most stable tetrazines commercially available.



In addition to stabilization provided by the electron donating methyl group, the electron donating alkoxy substituent on the aromatic ring further improves the stability of Methyltetrazine-PEG4-NHS Ester. Methyltetrazine NHS is poorly soluble in aqueous solutions whereas methylterazine PEG4 NHS solubility is substantially enhanced by a hydrophilic polyethylene glycol (PEG) spacer arm.

#### References

1. Devaraj, N.K. and Weissleder, R. Biomedical Applications of Tetrazine Cycloadditions. *Acc Chem Res.*(2011) 44: 816–827



## Product Specifications

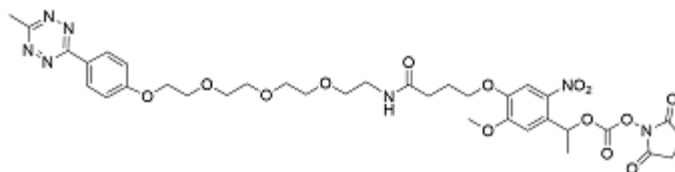
Custom Oligo Synthesis, antisense oligos, RNA oligos, chimeric oligos, Fluorescent dyes, Affinity Ligands, Spacers & Linkers, Duplex Stabilizers, Minor bases, labeled oligos, Molecular Beacons, siRNA, phosphonates  
Locked Nucleic Acids (LNA); 2'-5' linked Oligos

## Oligo Modifications

For research use only. Not for use in diagnostic procedures for clinical purposes.

### Tetrazine methyl PC NHS

Category	Click Chemistry
Modification Code	meTz-PC-N
Reference Catalog Number	26-6750
5 Prime	Y
3 Prime	Y
Internal	Y
Molecular Weight(mw)	419.45



All NHS modifications are post synthesis conjugation to a primary amino group thus an additional modification with an amino group is required. A C3, C6 or C12 amino group can be placed at the 5' or for the 3' end a C3 or C7 amino and for internal positions an amino modified base is used, e.g Amino dT C6. **YIELD** NHS based modifications yields are lower as compared to direct automated coupling of modifications that are available as amidites. Approximate yield for various scales are given below.

~2 nmol final yield for 50 nmol scale synthesis.

~5 nmol final yield for 200 nmol scale synthesis.

~16 nmol final yield for 1 umol scale synthesis.

#### [Click here for a complete list of Click Chemistry Oligo Modifications](#)

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The tetrazine will react with strained alkenes such as trans-cyclooctene, norbornene and cyclopropene to yield a stable dihydropyridazine linkage. The extremely fast kinetics and selectivity enables the conjugation of two low abundance biopolymers in an aqueous and otherwise complex chemical environment. This bioorthogonal reaction possesses excellent selectivity and biocompatibility such that the complimentary partners can react with each other within richly functionalized biological systems, in some cases, living organisms. Thus, tetrazine-TCO ligation has found numerous applications in fluorescent imaging, drug delivery, PET and SPECT imaging, radionuclide therapy, radiochemistry or drug target identification among several others.

**Biocompatible** – click reaction occurs efficiently under mild buffer conditions; requires no accessory reagents such as a copper catalyst or reducing agents (e.g. DTT)

**Chemoselective** – tetrazines and trans-cyclooctene groups do not react or interfere with other functional groups found in biological samples but conjugate to one another with high efficiency

**Unprecedented kinetics** – inverse-electron demand Diels-Alder chemistry is the fastest bioorthogonal ligation available

**Solubility** – easily dissolves in aqueous buffers

Methyltetrazine-PEG4-NHS Ester is one of the most stable tetrazines commercially available.

In addition to stabilization provided by the electron donating methyl group, the electron donating alkoxy substituent on the aromatic ring further improves the stability of Methyltetrazine-PEG4-NHS Ester. The aqueous solubility of this reagent is substantially enhanced by a hydrophilic polyethylene glycol (PEG) spacer arm.

**Photo Cleavage Protocol** Cleavage occurs by irradiation with near-UV light (300-350 nm, >90% cleavage occurs within 5-25 minutes. Try using a Black Ray XX-15 UV lamp (Ultraviolet Products Inc., San Gabriel, CA) at a distance of 15 cm (emission peak 365 nm, 300 nm cut-off, 1.1 mW intensity at ~31 cm).

#### References

1. Devaraj, N.K. and Weissleder, R. Biomedical Applications of Tetrazine Cycloadditions. *Acc Chem Res.*(2011) 44: 816–827



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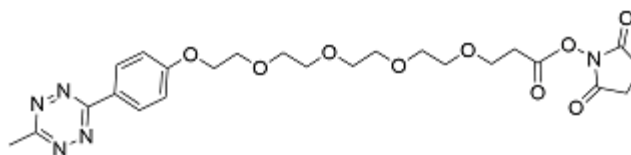
Custom Oligo Synthesis, antisense oligos, RNA oligos, chimeric oligos, Fluorescent dyes, Affinity Ligands, Spacers & Linkers, Duplex Stabilizers, Minor bases, labeled oligos, Molecular Beacons, siRNA, phosphonates  
Locked Nucleic Acids (LNA); 2'-5' linked Oligos

## Oligo Modifications

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### Tetrazine methyl PEG4

Category	Click Chemistry
Modification Code	meTz-PEG4-N
Reference Catalog Number	26-6749
5 Prime	Y
3 Prime	Y
Internal	Y
Molecular Weight(mw)	419.45



All NHS modifications are post synthesis conjugation to a primary amino group thus an additional modification with an amino group is required. A C3, C6 or C12 amino group can be placed at the 5' or for the 3' end and a C3 or C7 amino and for internal positions an amino modified base is used, e.g Amino dT C6. **YIELD** NHS based modifications yields are lower as compared to direct automated coupling of modifications that are available as amidites. Approximate yield for various scales are given below.

~2 nmol final yield for 50 nmol scale synthesis.

~5 nmol final yield for 200 nmol scale synthesis.

~16 nmol final yield for 1 umol scale synthesis.

#### [Click here for a complete list of Click Chemistry Oligo Modifications](#)

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The tetrazine will react with strained alkenes such as trans-cyclooctene, norbornene and cyclopropene to yield a stable dihydropyridazine linkage. The extremely fast kinetics and selectivity enables the conjugation of two low abundance biopolymers in an aqueous and otherwise complex chemical environment. This bioorthogonal reaction possesses excellent selectivity and biocompatibility such that the complimentary partners can react with each other within richly functionalized biological systems, in some cases, living organisms. Thus, tetrazine-TCO ligation has found numerous applications in fluorescent imaging, drug delivery, PET and SPECT imaging, radionuclide therapy, radiochemistry or drug target identification among several others.

#### **Biocompatible**

Click reaction occurs efficiently under mild buffer conditions; requires no accessory reagents such as a copper catalyst or reducing agents (e.g. DTT)

#### **Chemoselective**

Tetrazines and trans-cyclooctene groups do not react or interfere with other functional groups found in biological samples but conjugate to one another with high efficiency

#### **Unprecedented kinetics**

Inverse-electron demand Diels-Alder chemistry is the fastest bioorthogonal ligation available

#### **Solubility**

Easily dissolves in aqueous buffers

Methyltetrazine-PEG4-NHS Ester is one of the most stable tetrazines commercially available.

In addition to stabilization provided by the electron donating methyl group, the electron donating alkoxy substituent on the aromatic ring further improves the stability of Methyltetrazine-PEG4-NHS Ester. The aqueous solubility of this reagent is substantially enhanced by a hydrophilic polyethylene glycol (PEG) spacer arm.

#### References

1. Devaraj, N.K. and Weissleder, R. Biomedical Applications of Tetrazine Cycloadditions. *Acc Chem Res.*(2011) 44: 816–827



## Product Specifications

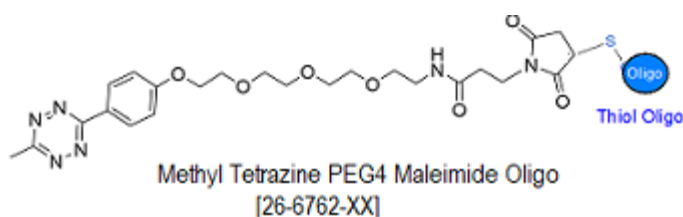
Custom Oligo Synthesis, antisense oligos, RNA oligos, chimeric oligos, Fluorescent dyes, Affinity Ligands, Spacers & Linkers, Duplex Stabilizers, Minor bases, labeled oligos, Molecular Beacons, siRNA, phosphonates Locked Nucleic Acids (LNA); 2'-5' linked Oligos

## Oligo Modifications

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### Tetrazine Methyl PEG4 Maleimide

Category	Click Chemistry
Modification Code	meTzPEG4-Mal
Reference Catalog Number	26-6762
5 Prime	Y
3 Prime	Y
Internal	Y
Molecular Weight(mw)	514.43



This modification is a post synthesis maleimide conjugation to a reduced thiol amino group thus an additional modification with thiol group is required. A C3 or C6 thiol group can be placed at the 5' or for internal positions Thiol C6 dT modified base is used.

[Click here for a complete list of Click Chemistry Oligo Modifications](#)



## Product Specifications

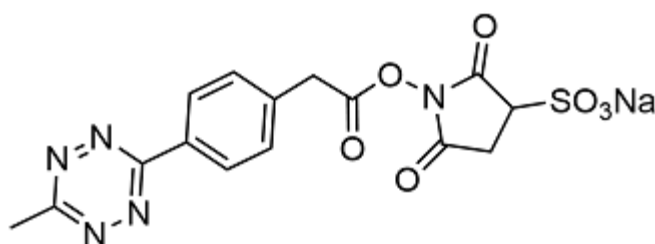
Custom Oligo Synthesis, antisense oligos, RNA oligos, chimeric oligos, Fluorescent dyes, Affinity Ligands, Spacers & Linkers, Duplex Stabilizers, Minor bases, labeled oligos, Molecular Beacons, siRNA, phosphonates Locked Nucleic Acids (LNA); 2'-5' linked Oligos

## Oligo Modifications

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### Tetrazine methyl Sulfo-NHS

Category	Click Chemistry
Modification Code	me-Tz-Sulfo-N
Reference Catalog Number	26-6796
5 Prime	Y
3 Prime	Y
Internal	Y
Molecular Weight(mw)	315.27



All NHS modifications are post synthesis conjugation to a primary amino group thus an additional modification with an amino group is required. A C3, C6 or C12 amino group can be placed at the 5' or for the 3' end and a C3 or C7 amino and for internal positions an amino modified base is used, e.g Amino dT C6. **YIELD** NHS based modifications yields are lower as compared to direct automated coupling of modifications that are available as amidites. Approximate yield for various scales are given below.

~2 nmol final yield for 50 nmol scale synthesis.

~5 nmol final yield for 200 nmol scale synthesis.

~16 nmol final yield for 1 umol scale synthesis.

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Tetrazines are even more reactive than triazines toward nucleophiles and electron-rich dienophiles. This makes them attractive for click chemistry and they find application as conjugation tags for materials chemistry and, especially, for bio-orthogonal chemistry. In other applications they are attractive for high-energy materials, coordinating ligands, and as potent bioactive compounds.

Methyl Tetrazine Sulfo is The tetrazine will react with strained alkenes such as trans-cyclooctene, norbornene and cyclopropene to yield a stable dihydropyridazine linkage. The extremely fast kinetics and selectivity enables the conjugation of two low abundance biopolymers in an aqueous and otherwise complex chemical environment. This bioorthogonal reaction possesses excellent selectivity and biocompatibility such that the complimentary partners can react with each other within richly functionalized biological systems, in some cases, living organisms. Thus, tetrazine-TCO ligation has found numerous applications in fluorescent imaging, drug delivery, PET and SPECT imaging, radionuclide therapy, radiochemistry or drug target identification among several others.

**Biocompatible** click reaction occurs efficiently under mild buffer conditions; requires no accessory reagents such as a copper catalyst or reducing agents (e.g. DTT)

**Chemoselective** tetrazines and trans-cyclooctene groups do not react or interfere with other functional groups found in biological samples but conjugate to one another with high efficiency

**Unprecedented kinetics** inverse-electron demand Diels-Alder chemistry is the fastest bioorthogonal ligation available Solubility easily dissolves in aqueous buffers

Methyltetrazine-PEG4-NHS Ester is one of the most stable tetrazines commercially available.

In addition to stabilization provided by the electron donating methyl group, the electron donating alkoxy substituent on the aromatic ring further improves the stability of Methyltetrazine-PEG4-NHS Ester. The aqueous solubility of this reagent is substantially enhanced by a hydrophilic polyethylene glycol (PEG) spacer arm.

#### References

1. Devaraj, N.K. and Weissleder, R. Biomedical Applications of Tetrazine Cycloadditions. *Acc Chem Res.*(2011) 44: 816–827





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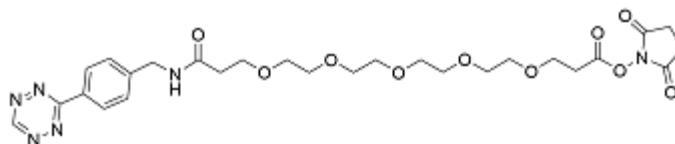
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## Oligo Modifications

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### Tetrazine-PEG5-NHS

Category	Click Chemistry
Modification Code	Tz-PEG5-N
Reference Catalog Number	26-6748
5 Prime	Y
3 Prime	Y
Internal	Y
Molecular Weight(mw)	419.45



All NHS modifications are post synthesis conjugation to a primary amino group thus an additional modification with an amino group is required. A C3, C6 or C12 amino group can be placed at the 5' or for the 3' end a C3 or C7 amino and for internal positions an amino modified base is used, e.g Amino dT C6. **YIELD** NHS based modifications yields are lower as compared to direct automated coupling of modifications that are available as amidites. Approximate yield for various scales are given below.

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~16 nmol final yield for 1 umol scale synthesis.

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**Biocompatible** – click reaction occurs efficiently under mild buffer conditions; requires no accessory reagents such as a copper catalyst or reducing agents (e.g. DTT)

**Chemoselective** – tetrazines and trans-cyclooctene groups do not react or interfere with other functional groups found in biological samples but conjugate to one another with high efficiency

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**Solubility** – easily dissolves in aqueous buffers

Methyltetrazine-PEG4-NHS Ester is one of the most stable tetrazines commercially available.

In addition to stabilization provided by the electron donating methyl group, the electron donating alkoxy substituent on the aromatic ring further improves the stability of Methyltetrazine-PEG4-NHS Ester. The aqueous solubility of this reagent is substantially enhanced by a hydrophilic polyethylene glycol (PEG) spacer arm.

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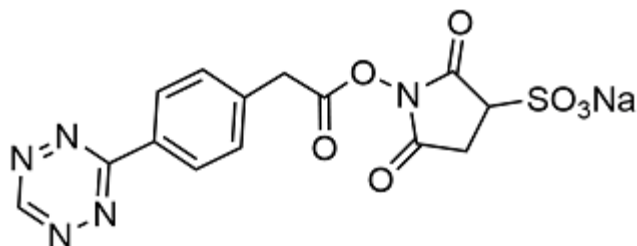
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## Oligo Modifications

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### Tetrazine-Sulfo-NHS

Category	Click Chemistry
Modification Code	Tz-Sulfo-N
Reference Catalog Number	26-6747
5 Prime	Y
3 Prime	Y
Internal	Y
Molecular Weight(mw)	300.93



All NHS modifications are post synthesis conjugation to a primary amino group thus an additional modification with an amino group is required. A C3, C6 or C12 amino group can be placed at the 5' or for the 3' end and a C3 or C7 amino and for internal positions an amino modified base is used, e.g. Amino dT C6. **YIELD** NHS based modifications yields are lower as compared to direct automated coupling of modifications that are available as amidites. Approximate yield for various scales are given below.

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