Gold Anchor™

Gold Anchor product selection

Thank you for considering using the Gold Anchor fiducial markers. To help you select a suitable product version, this document discusses:

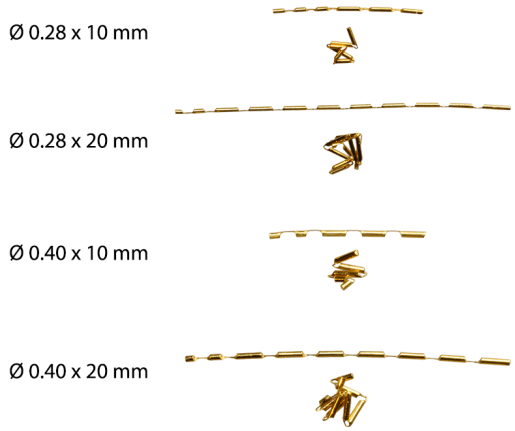
- Choice of marker: dependent on imaging needs.
- Choice of needle: dependent on organ and implantation route.
- Product trends: list of product codes most typically used by application.

Choice of marker

There are four different Gold Anchor markers. They vary in diameter (0.28 or 0.40 mm) and length (10 or 20 mm). The markers are made from an alloy consisting of 98.5% pure gold and 1.5% pure iron. The gold content ensures excellent visibility on kV X-ray imaging. The iron content provides significantly enhanced visibility on MRI. The markers are too small to provide good visibility on MV-EPID imaging. However, the largest marker, implanted with a ball shape is typically visible on MCVT.

All markers can be implanted with different shapes depending on the implantation technique:

- Ball shape: achieved by holding the Gold Anchor needle still while pushing the stylet. The marker needs to meet tissue resistance to start to fold. This marker shape makes it easier to fuse/register CT and MR images. It is also recommended for use with systems that automatically detect fiducial markers.
- Line shape: achieved by withdrawing the Gold Anchor needle while holding the stylet still. This marker shape causes the least CT/CBCT artifacts. It also limits the dose perturbation in particle therapy (proton and carbon ion).



The table below shows what applications each marker size is typically used for, and the suitable implantation shape (ball or line). Less frequent use is marked with grey font. More frequent use is marked with bold font.

Radiotherapy equipment:	Linear acceletor with		Tomo-Therapy (MVCT)	Proton therapy with kV imaging
Marker:	kV imaging	automatic marker detection/tracking*		
0.28 x 10 mm	Ball or line	Ball		Ball or line
0.28 x 20 mm	**Ball** or line	**Ball**		Line
0.40 x 10 mm	**Ball** or line	**Ball**		**Line**
0.40 x 20 mm	Ball or line	Ball	**Ball**	Line

*Includes CyberKnife, Radixact, Varian TrueBeam Auto-Beam-Hold (ABH), and Brainlab ExacTrac Dynamic.

Choice of needle

There are eight different Gold Anchor needles. They vary in thickness and length. Product codes start with the digits XXYY where XX means needle gauge and YY means needle length in cm, e.g. 2215 means 22-gauge 15 cm**.**

Needle with 0.5 mm outer diameter (25-gauge)

- **2515** is recommended whenever the target can be reached with that needle, e.g. for most cases in lung, liver, pancreas, kidney, adrenal gland, oligomets in abdomen and inguinal metastases. The reason for recommending 2515 is that it is thinner than the other needles. 2515 is thereby even safer to use. 2515 is only available with 0.28 mm diameter markers.

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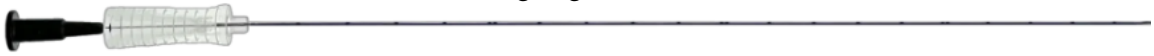
Needles with 0.7 mm outer diameter (22-gauge)



- **2208** is mostly used for breast and for marking other superficial lesions.
- **2215** provides an alternative to 2515 for those cases in which a stiffer needle is beneficial, e.g. in cirrhotic liver, or when the 0.40 mm diameter marker is preferred.
- **2220** is mostly used for transrectal implantation in prostate.
- **2225** is mostly used for transrectal implantation in prostate when using an endfire ultrasound probe (which requires a longer needle).

Needles with 0.9 mm outer diameter (20-gauge)

- **2010** is mostly used for breast (by those that prefer a stiffer needle than 2208).
- **2020** is mostly used for transperineal implantation in prostate and for cervix uteri.
- **2035** is mostly used in bladder and rectal wall, through rigid cystoscope/rectoscope.

Introducer

- **GATD** is used to transfer the marker over into a 22G endoscopic ultrasound aspiration ("EUS") needle. The Gold Anchor can then be placed in for example rectal, esophageal, pancreatic and central lung tumors.

Product trends

Available product codes are listed below.

Needle Ø		25G (0.5 mm)		22G (0.7 mm)				20G (0.9 mm)		
Length (cm)		Introducer	15	8	15	20	25	10	20	35
Marker (mm)	0.28 x 10	GATD-10	2515-10	2208-10	2215-10	2220-10	2225-10		2020-10	
	0.28 x 20	GATD-20	2515-20			2220-20				
	0.40 x 10			2208-10-B	2215-10-B	2220-10-B	2225-10-B	2010-10-B	2020-10-B	2035-10-B
	0.40 x 20			2208-20-B	2215-20-B	2220-20-B	2225-20-B	2010-20-B	2020-20-B	

The table below shows the product codes most typically used for each application.

Radiotherapy equipment:	Linear acceletor with		Tomo-Therapy (MVCT)	Proton therapy with kV imaging	
	kV imaging	automatic marker detection/tracking*			
Implanted marker shape:	Ball or line	Ball	Ball	Ball	Line
Abdominal organs	2515-20 or 2215-10-B		2215-20-B	2515-10	2215-10-B
Peripheral lung; Head & neck	2515-20 or 2215-10-B		2215-20-B	2515-10	
Prostate transrectally	2220-10-B		2220-20-B		2220-10-B
Prostate transperineally; Cervix uteri	2020-10-B		2020-20-B		2020-10-B
Breast	2208-10-B		2208-20-B	2208-10	2208-10-B
Bladder and rectal wall	2035-10-B				
Pancreas, esophagus, central lung rectal wall, through endoscope	GATD-10			GATD-10	

*Includes CyberKnife, Radixact, Varian TrueBeam Auto-Beam-Hold (ABH), and Brainlab ExacTrac Dynamic.

Comments:

- If you prefer more visibility, choose a bigger marker.
- If you find it important to minimize CT artifacts, implant the marker with a line shape or choose a smaller marker.
- If a needle is too flexible for a certain application, try a stiffer needle instead.