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Technical Note
TN0003

New designed Injector Needle for

Alliance 2695 and 717

Titel
New designed Injector Needle for Alliance 2695 and 717

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Instruments
Waters Alliance 2690/95, 2790/95, 717

Contents

1 Introduction

We like to introduce our new injector needle used in Alliance and 717 instruments. There was a need to engineer a new needle that shows superior performance compared to the original Waters part. One reason was a larger durability of the seal pack and the elimination of leaks at high pressures. We proudly present this new product which has some novel features that are described below.

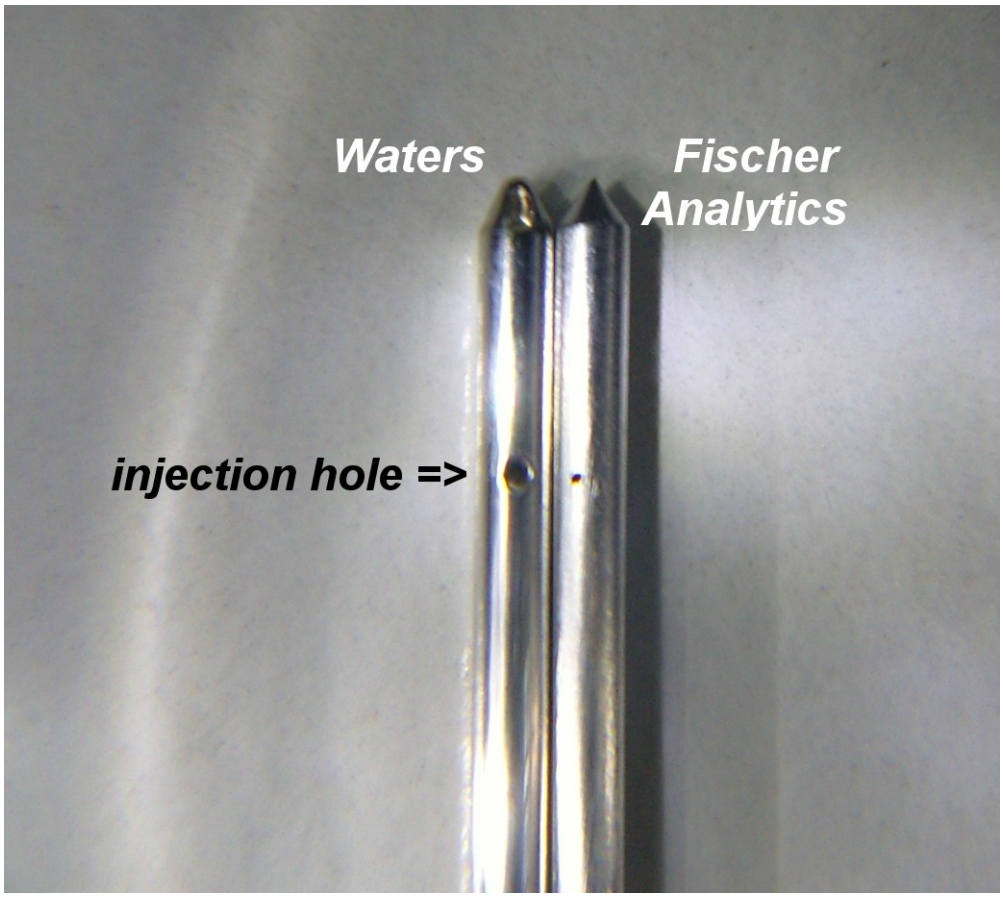

Figure 1: Injector needle comparison

During the development of the new needle, we needed to consider the surface, tribology, chemical resistance, and mechanical properties. We found the best result to make this needle superior. The needle is made out of highest quality stainless steel that is more chemical inert than the 316 steel that is used by Waters. The surface is smoothed by electro-polishing to a certain point to achieve maximum sealing. The injector hole is another critical point. If the hole is too large, it will rumple across the seal lips when the needle is moved up and down. Remember, the seal might be pressurized and the lip will be pushed into the groove of the hole (Fig. 2, 3, 4). Our hole has a 0,25 mm inner diameter and is made by electro discharge machining. The outer diameter is the same like the one from Waters which has 1,47 mm, but the inner diameter across the length of the needle is 0,40 mm / Waters 0,50 mm. That leads to

a thicker wall and more mechanical strength. For example the needle will handle an axial tensile strength of >2000N before rupture.

This pictures show the groove around the injection hole created with Solidworks CAD and Modeling Software

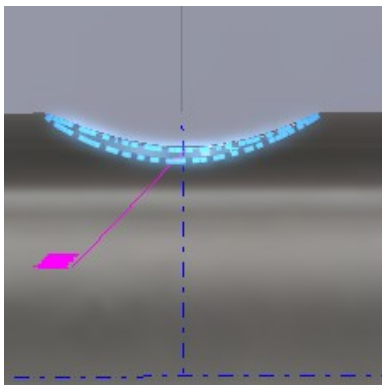

Figure 2: CAD drawings of the needle hole "Waters"

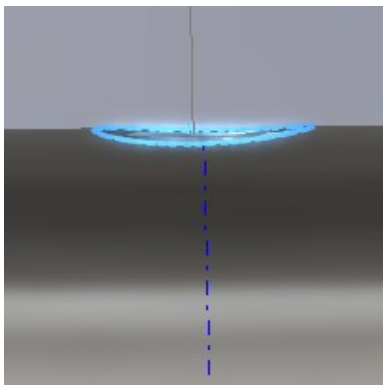

Figure 3: CAD drawings of the needle hole "fischer analytics"

You may ask, how does the smaller hole influence the seal pack geometry? In general the values will change like shown below.

/Motor Steps/	Waters	fischer analytics
Top	42	33
Bottom	119	128
Width	77	95

Lets talk about the quality of the needle. Our needles are produced by a DIN EN ISO 9000 certified company. All batches come with a test certificate.

Parts made in ultimate perfection:

Parameter	Target	Average	Delta min/max
total length	121,000	121,043	0,059
inj. Hole	0,250	0,230	0,000
outer diameter	1,470	1,458	0,006
inner diameter	0,400	0,396	0,010

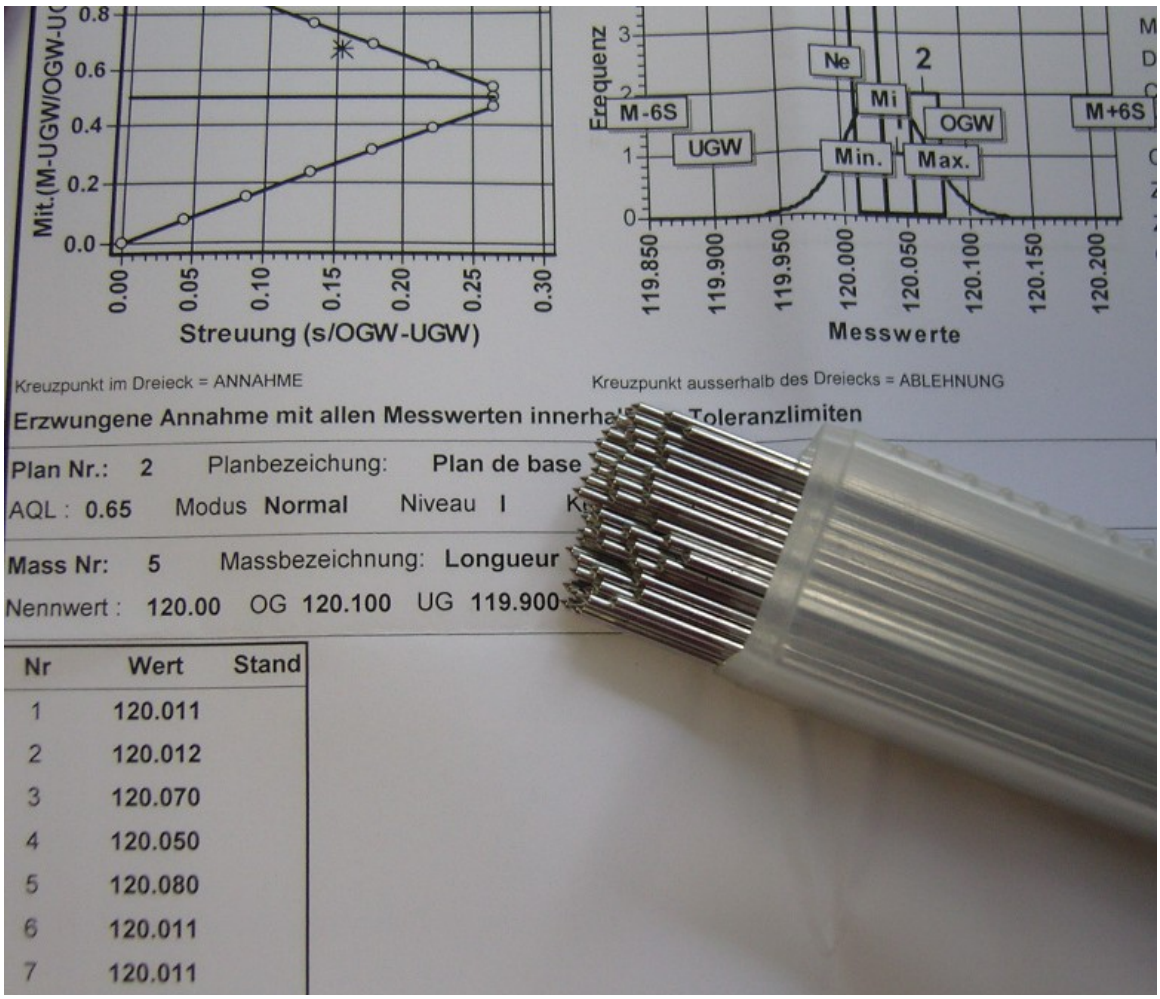

Figure 4: manufacturing protocol

2 Summary

Our needle is a highly precisely engineered spare part. You can use it with our sealpack seals WAT271019_SEAL. It is a good way to get more for less. The Seal Pack repair kit for the 2690/95 retails at Waters Germany for €487,-.

Our new needle is also available with a Titanium Nitride (TiN) coating. This is a long lasting investment. This coating lowers friction and the seals last longer. Due to the chemical inertness your application is not influenced. The needle only needs to be replaced if the silver stainless steel is visible through the 3µm TiN coating. We cannot predict the lifetime of this part, because we never had a broken one, maybe it lasts forever. It is not only the reason to save money, you always have a better injector.