

# Question 2 - Forecasting

## 2.1

In this part, you will be asked to build a model to forecast the hourly readings in the future (next hour). Can you explain why you may want to forecast the gas consumption in the future? Who would find this information valuable? What can you do if you have a good forecasting model?

### Answer

The usefulness of IoT based systems is in the data that they collect and hence, forecasting the next hourly meter reading for a particular house would be a largely beneficial feature. Let us answer some of the questions below.

#### Why would we want to forecast the next hours readings and who would find this beneficial?

This is an interesting question and there are multiple reasons why it is beneficial. Firstly, the Gas Company would benefit a lot by having an accurate prediction of the next hours readings. This allows them to regulate the supply of gas based on its predicted demand. This means that at times when less gas needs to be produced, they can relax some of their production at the plants and this will save them a lot of manhours when gas is predicted to be less required. Looking at the bigger picture, this gas data is from just a single region, and the gas company may have multiple residential regions it needs to supply to. This could mean that the gas company could divert a gas supply from a district needing less gas to one that needs more gas in order to balance the output and save on unnecessary production which will lead to wastage.

However, this would not only benefit the gas company but also the public using the gas. It could be possible that in times where the gas consumption required by the housing area is unexpectedly increased, the gas company would have been slow to respond to the fluctuations in the demand since it was providing only a constant amount regardless of the consumption. With the prediction model, we will be able to predict these seasonal fluctuations with a greater probability and hence save situations in which high demand is not able to be met. This is beneficial for the residents as it ensures a greater user experience and satisfaction which would lead to a positive feedback to the Gas Companies' sales.

#### What can we do if we have a good forecasting model?

An IoT system's data is valuable since it can be used to create a good forecasting model. Once this model is proven to work with a high accuracy, a "gas as a service" type product can be given to the users (perhaps at a small price) where the Gas Company could provide the users with visualizations of their predicted usage, ways to reduce their usage and also their past trends all on their mobile phones. This would be a sort of attempt to communicate with the users and to raise awareness to consume less gas by giving them a predicted value. A good forecasting model may not help only with customer satisfaction, it can easily help the company itself plan ahead their factory loads and aid them to better plan their production resources and timelines, greatly affecting the scalability and efficiency of their business.

With a reliable forecasting model, companies can better detect anomalies and discover any deviations which would allow them to easily investigate the underlying factors. For example, an abnormally high reading outside the confidence interval of our model could indicate a gas leak present at the household.

Net, this forecasting model is a very lucrative resource for the Gas Company to have as it aids in customer satisfaction and their productivity.

## Building the Forecasting Model

In [1]:

```
import pandas as pd
import matplotlib.pyplot as plt
import matplotlib.dates as mdates
import datetime as dt
from datetime import datetime
import numpy as np
from functools import reduce
from sklearn.metrics import mean_squared_error as mse
from tqdm.auto import tqdm
from tqdm import tqdm
from copy import deepcopy

from sklearn.linear_model import LinearRegression
from sklearn.svm import SVR
from sklearn.preprocessing import StandardScaler
from sklearn.pipeline import make_pipeline

plt.rcParams.update({'figure.max_open_warning': 0})

pd.options.mode.chained_assignment = None # default='warn'
pd.set_option('display.max_rows', 157)
```

We modified the csv to include more features which we believe can improve the accuracy of our model in predicting the hourly forecasted gas consumption by performing some preprocessing. We noticed a non-linear trend in most households and decided to create new features from the localminute field provided, such as the day of the week, or whether it was a holiday or weekday/weekend. We have saved the dataset with the additional features in a csv along with the jupyter notebook. We have also included this csv in the zip submission for you to take a look.

In [2]:

```
df = pd.read_csv('Question_2_dataset.csv', index_col='localminute', parse_dates=True, date
```

Out[2]:

	dataid	meter_value	hours_passed	weekday	is_holiday	is_weekday	is_office_hour	is_sleeping	is_night
localminute									
2015-10-01 05:00:00+00:00	739.0	88858.000000	0	3	0	1	0	0	1
2015-10-01 06:00:00+00:00	739.0	88858.000000	1	3	0	1	0	0	1
2015-10-01 07:00:00+00:00	739.0	88860.000000	2	3	0	1	0	0	1
2015-10-01 08:00:00+00:00	739.0	88860.000000	3	3	0	1	0	0	1
2015-10-01 09:00:00+00:00	739.0	88860.000000	4	3	0	1	1	1	1
...	...	...	...	...	...	...	...	...	...
2016-03-08 12:00:00+00:00	4874.0	314452.311622	779	1	0	1	1	1	0

localminute	dataid	meter_value	hours_passed	weekday	is_holiday	is_weekday	is_office_hour	is_sleeping	n
2016-03-08 13:00:00+00:00	4874.0	314461.233716	780	1	0	1	1	0	
2016-03-08 14:00:00+00:00	4874.0	314470.155811	781	1	0	1	1	0	
2016-03-08 15:00:00+00:00	4874.0	314479.077905	782	1	0	1	1	0	
2016-03-08 16:00:00+00:00	4874.0	314488.000000	783	1	0	1	1	0	

610632 rows × 12 columns

In [3]:

```
unique_households = df['dataid'].unique()
unique_households.sort()
```

`plot_overall_timeseries` creates a timeseries plot with the actual meter values we used for training (denoted in blue), the actual meter values we used for testing (denoted in red) as well as the predicted meter values we derived from our model (denoted in orange). In each plot, we also calculated the Mean Squared Error derived from the entire dataset for that particular household, and noted it down in the title of each plot.

`plot_testing_scatter` creates a scatter plot with the actual meter values we used for testing versus the predicted meter values we derived from our model (denoted in red) as well as the line for goodness of fit that indicates a perfect prediction (denoted in green). In each plot, we also calculated the Mean Squared Error derived from the testing dataset for that particular household, and noted it down in the title of each plot.

`plot_lr_vs_svr_scatter` creates a scatter plot with the line for goodness of fit that indicates a perfect prediction (denoted in red) as well as the actual versus predicted meter values we derived from the Linear Regression Model, Support Vector Regression Model as well as the ensemble method (denoted in green, orange, and black respectively).

`train_each_house` takes in a string model which creates the respective model and trains the model for each individual household based on the features provided. After training, the plots for each household is displayed over their respective time period. We used the 3 features below as we observed a non-linear trend in the meter value for most households. We incorporated a boolean variable denoting if the particular day is a holiday and another boolean variable denoting if the particular day is a weekday. Our rationale is that households are likely to be at home if it is a weekend or possibly a holiday whereas most people would not be at home during working hours on a weekday. For our training, we took the month of January as the dataset. We used the first 26 days of January as the training dataset and the last 5 days to test the model. We observed that this smaller dataset provided a higher level of accuracy compared to training on the overall dataset. This is because we wanted to predict the next hours' consumption and including datapoints from older consumptions led to more noise during training. Hence the gas company should predict the hourly readings using more relevant readings from a month ago till now.

note : There are two houses names 4874 and 8967 which have incomplete data for this time period and hence we do not include them in our plots. Removing these two from the unique\_households is done below.

In [4]:

```
unique_households = np.delete(unique_households, [83, 140])
unique_households
```

```
Out[4]: array([ 35.,  44.,  77.,  94., 114., 187., 222., 252., 370.,
   483., 484., 661., 739., 744., 871., 1042., 1086., 1103.,
  1185., 1283., 1403., 1415., 1507., 1556., 1589., 1619., 1697.,
  1714., 1718., 1790., 1791., 1792., 1800., 1801., 2018., 2034.,
  2072., 2094., 2129., 2233., 2335., 2378., 2449., 2461., 2470.,
  2575., 2638., 2645., 2755., 2814., 2818., 2945., 2946., 2965.,
  2980., 3036., 3039., 3134., 3310., 3367., 3527., 3544., 3577.,
  3635., 3723., 3778., 3849., 3893., 3918., 4029., 4031., 4193.,
  4228., 4296., 4352., 4356., 4373., 4421., 4447., 4514., 4671.,
  4732., 4767., 4998., 5129., 5131., 5193., 5275., 5317., 5395.,
  5403., 5439., 5484., 5545., 5636., 5658., 5785., 5810., 5814.,
  5892., 5972., 6101., 6412., 6505., 6578., 6673., 6685., 6830.,
  6836., 6863., 6910., 7016., 7017., 7030., 7117., 7287., 7429.,
  7460., 7566., 7674., 7682., 7739., 7741., 7794., 7900., 7919.,
  7965., 7989., 8059., 8084., 8086., 8155., 8156., 8244., 8386.,
  8467., 8703., 8829., 8890., 9052., 9121., 9134., 9160., 9278.,
  9295., 9474., 9600., 9620., 9631., 9639., 9729., 9766., 9849.,
  9956., 9982.])
```

In [5]:

```
features = ['is_holiday', 'is_weekday', 'hours_passed']
hours_to_predict = 120
def plot_overall_timeseries(house_df, train_df, test_df, house):
    mean_squared_error = mse(house_df['predicted_meter_value'], house_df['meter_value'])

    plt.figure(figsize=(12, 8))
    plt.scatter(train_df['localminute'], train_df['meter_value'], c='blue', label = 'actual')
    plt.scatter(test_df['localminute'], test_df['meter_value'], c='red' , label = 'actual')
    plt.scatter(test_df['localminute'], test_df['predicted_meter_value'], c='orange' , label = 'predicted')
    plt.xlabel('Date')
    plt.ylabel('Gas Consumption')
    plt.title(f'Time Series Plot - Household {house} Overall MSE : {mean_squared_error}')
    plt.legend()
    return plt

def plot_testing_scatter(test_df, house):
    mean_squared_error = mse(test_df['predicted_meter_value'], test_df['meter_value'])
    plt.figure(figsize=(12, 8))
    plt.plot(test_df['meter_value'], test_df['predicted_meter_value'], 'o' ,c='red' ,label = 'Actual')
    plt.plot(test_df['meter_value'], test_df['meter_value'], c='green', label = 'line for go')
    plt.xlabel('Actual Meter Value')
    plt.ylabel('Predicted Meter Value')
    plt.title(f' Scatter Plot - Household {house} Testing MSE : {mean_squared_error}')
    plt.legend()
    return plt

def plot_lr_vs_svr_line(test_df, house):
    mean_lr_squared_error = mse(test_df['predicted_lr_meter_value'], test_df['meter_value'])
    mean_svr_squared_error = mse(test_df['predicted_svr_meter_value'], test_df['meter_value'])
    true_mean_squared_error = mse(test_df['mean_predicted_meter_value'], test_df['meter_value'])
    plt.figure(figsize=(12, 8))
    plt.plot(test_df['meter_value'], test_df['meter_value'], c='red' ,label = 'line for go')
    plt.plot(test_df['meter_value'], test_df['predicted_svr_meter_value'], '+', c='orange' ,label = 'SVR')
    plt.plot(test_df['meter_value'], test_df['predicted_lr_meter_value'], '+', c='green' ,label = 'LR')
    plt.plot(test_df['meter_value'], test_df['mean_predicted_meter_value'], 'o' ,c='black' ,label = 'Mean')
    plt.xlabel('Actual Meter Value')
    plt.ylabel('Predicted Meter Value')
    plt.title(f'Household {house} \nTesting SVR MSE : {mean_svr_squared_error}\nTesting LR MSE : {mean_lr_squared_error}\nTesting Mean MSE : {true_mean_squared_error}')
    plt.legend()
    return plt

def train_each_house(model, hours_to_predict):
    def get_mean(row):
        return (row['predicted_svr_meter_value'] + row['predicted_lr_meter_value']) / 2

    for house in unique_households:
```

```

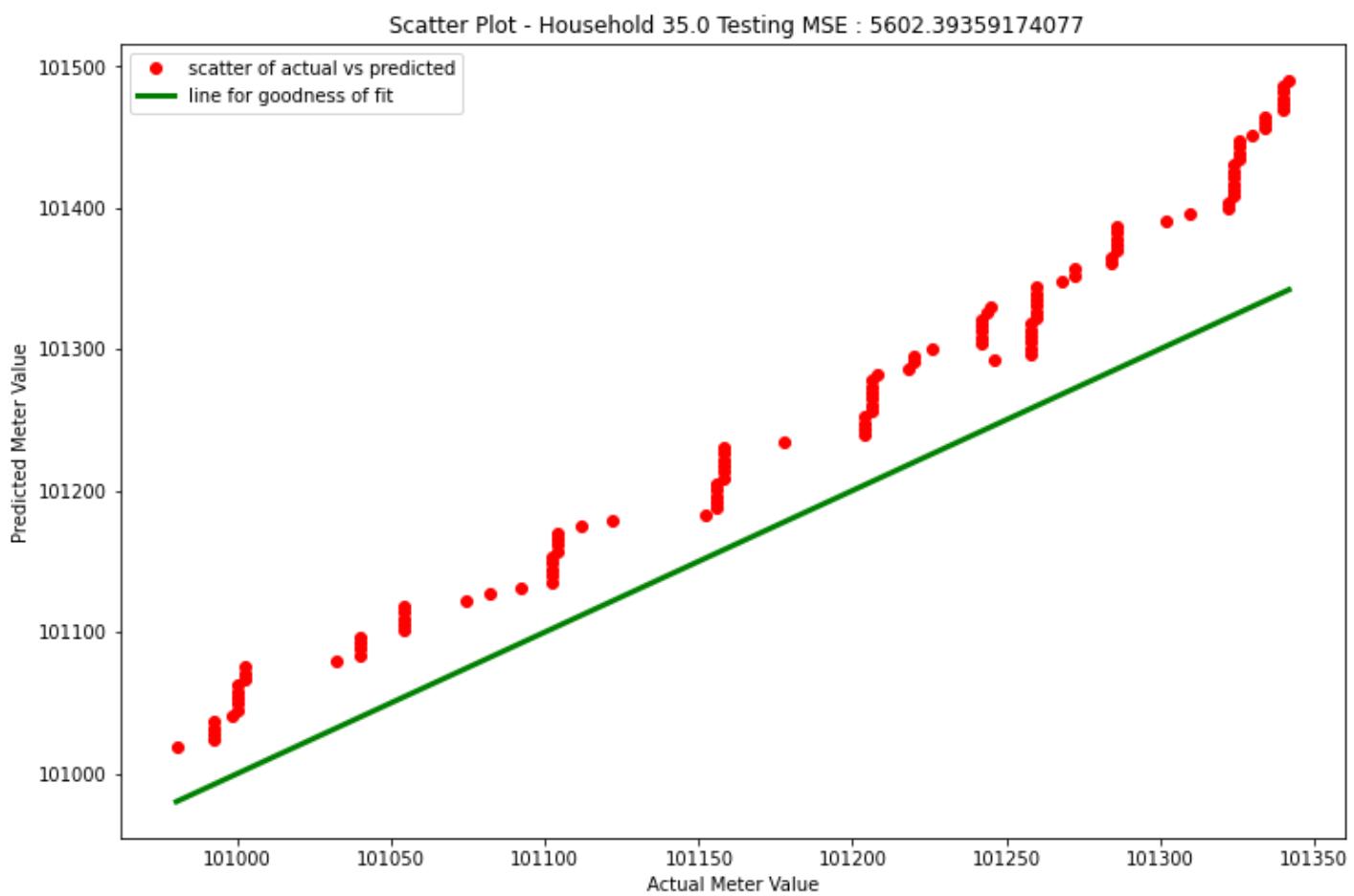
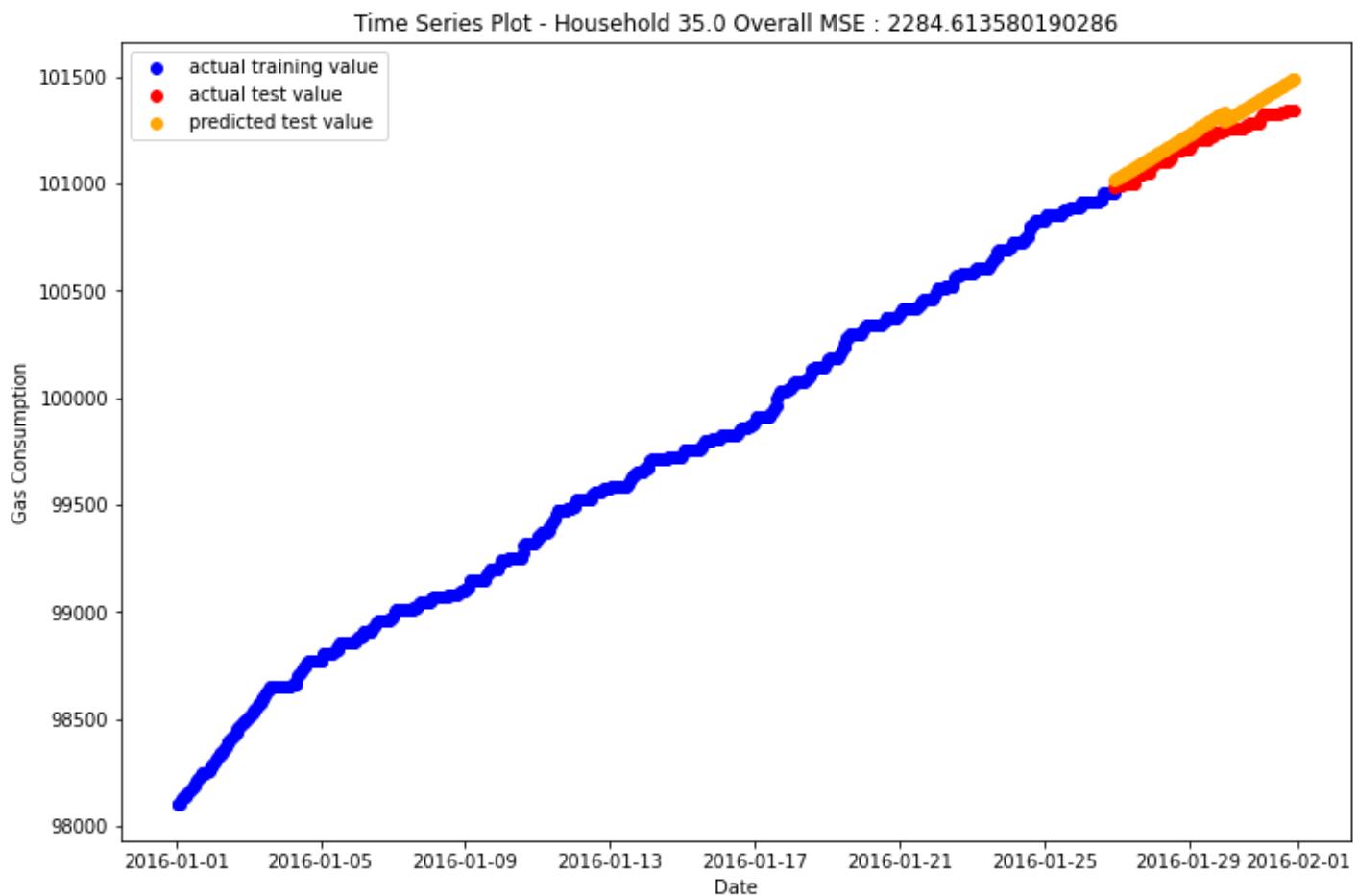
house_df = df.loc[df['dataid'] == house]
house_df = house_df.reset_index()
# we simply interpolate the hours with no data since meter_value is the cumulative
house_df = house_df[house_df['localminute'] > "2016-01-01 00:00:00+00:00"] & (house_df['localminute'] < "2016-01-01 23:00:00+00:00")
hours_to_predict = 24
hourly_df_train = house_df[:hours_to_predict]
hourly_df_test = house_df[-hours_to_predict:]
if model == "svr":
    temp_model = make_pipeline(StandardScaler(), SVR(kernel='linear', C=100, gamma=0.001))
    temp_model.fit(hourly_df_train[features], hourly_df_train['meter_value'])
elif model == 'lr':
    temp_model = make_pipeline(StandardScaler(), LinearRegression())
    temp_model.fit(hourly_df_train[features], hourly_df_train['meter_value'])
else :
    svr_model = make_pipeline(StandardScaler(), SVR(kernel='linear', C=100, gamma=0.001))
    svr_model.fit(hourly_df_train[features], hourly_df_train['meter_value'])
    lr_model = make_pipeline(StandardScaler(), LinearRegression())
    lr_model.fit(hourly_df_train[features], hourly_df_train['meter_value'])
if model == 'svr' or model == 'lr':
    hourly_df_train['predicted_meter_value'] = temp_model.predict(hourly_df_train)
    hourly_df_test['predicted_meter_value'] = temp_model.predict(hourly_df_test)
    house_df['predicted_meter_value'] = temp_model.predict(house_df[features])
    plot1 = plot_overall_timeseries(house_df, hourly_df_train, hourly_df_test, house)
    plot2 = plot_testing_scatter(hourly_df_test, house)
else :
    hourly_df_test['predicted_svr_meter_value'] = svr_model.predict(hourly_df_test)
    hourly_df_test['predicted_lr_meter_value'] = lr_model.predict(hourly_df_test)
    hourly_df_test['mean_predicted_meter_value'] = hourly_df_test.apply(lambda row: (row['predicted_svr_meter_value'] + row['predicted_lr_meter_value']) / 2, axis=1)
    plot = plot_lr_vs_svr_line(hourly_df_test, house)
plt.show()

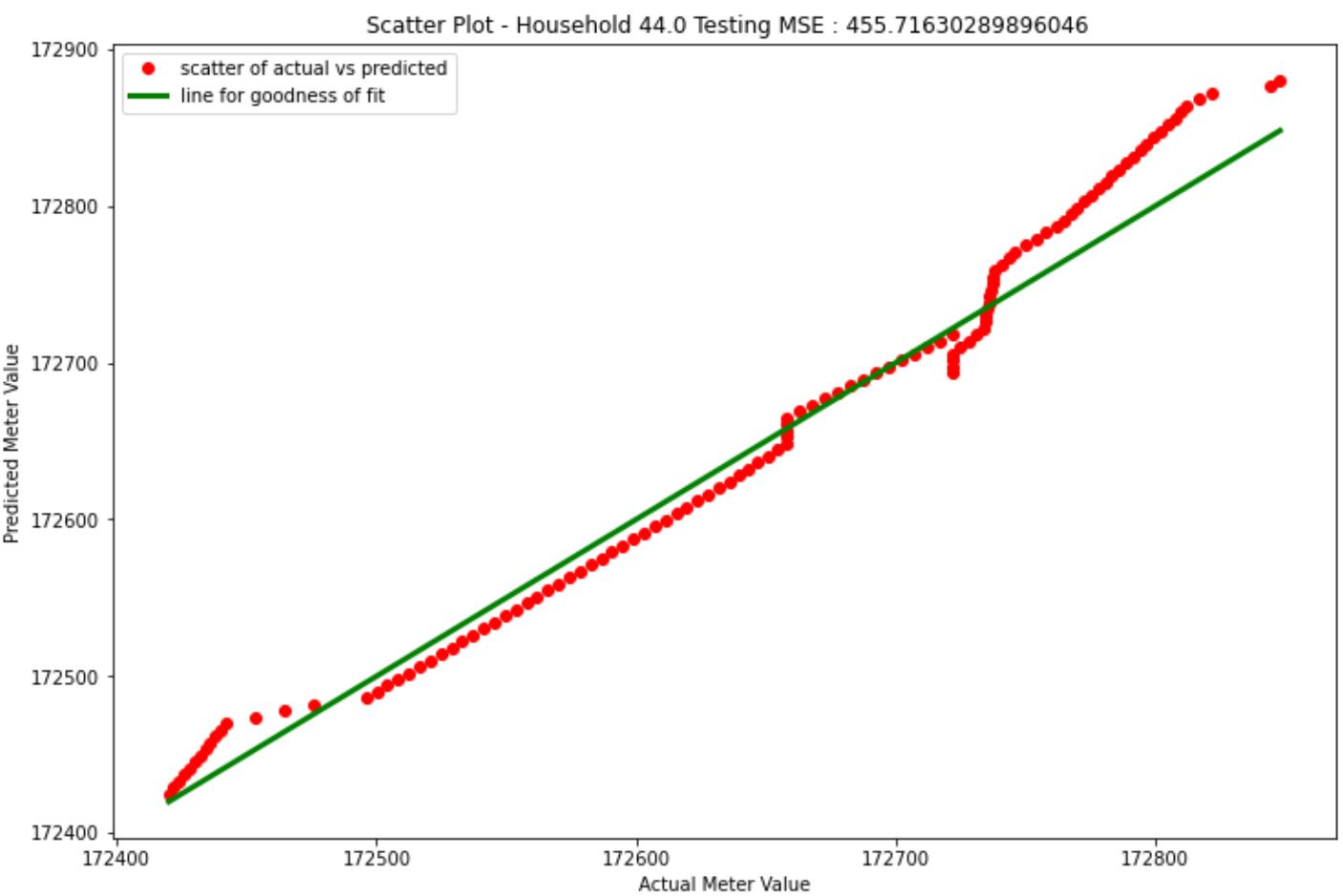
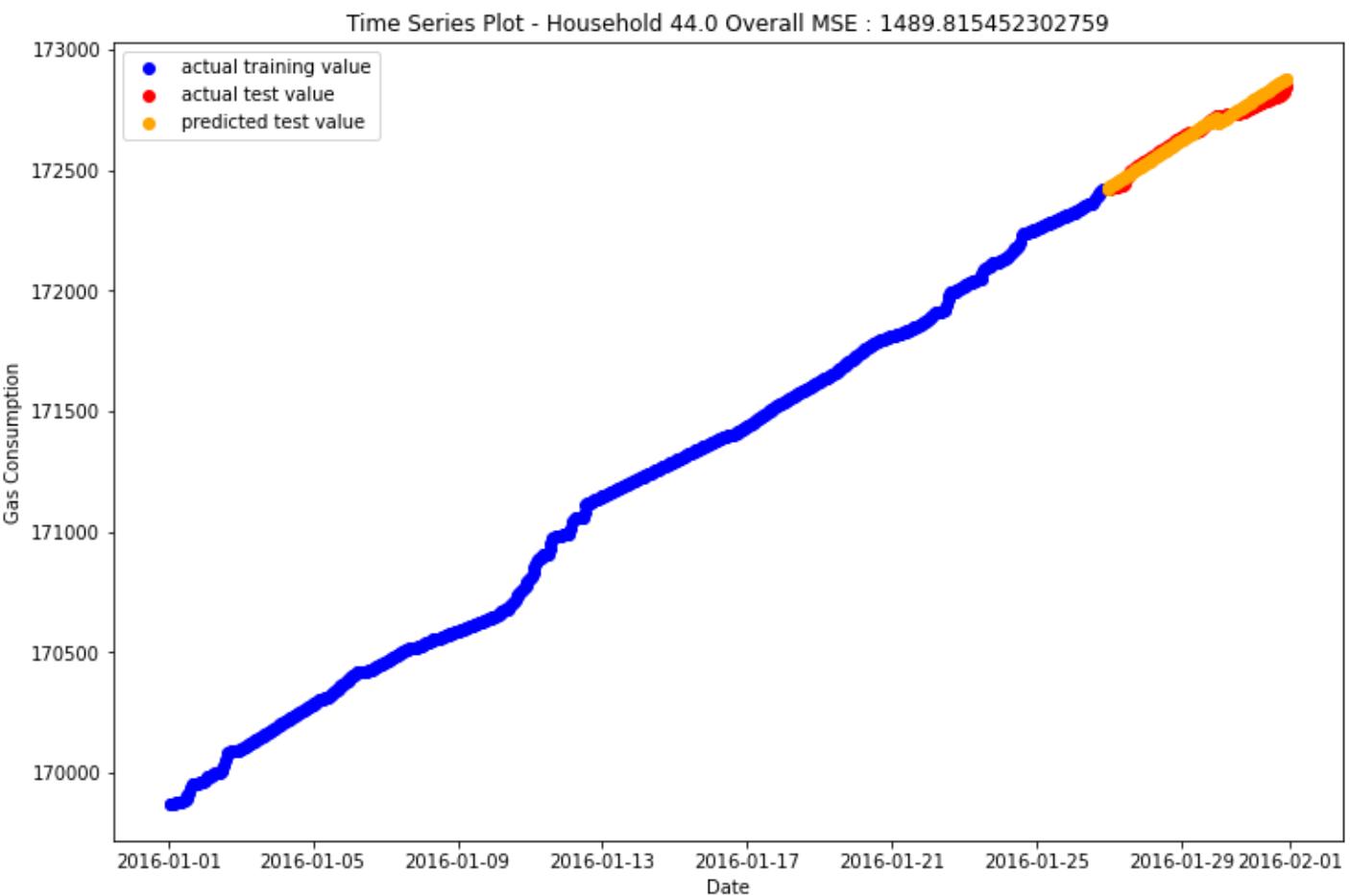
```

## 2.2 - Linear Regression

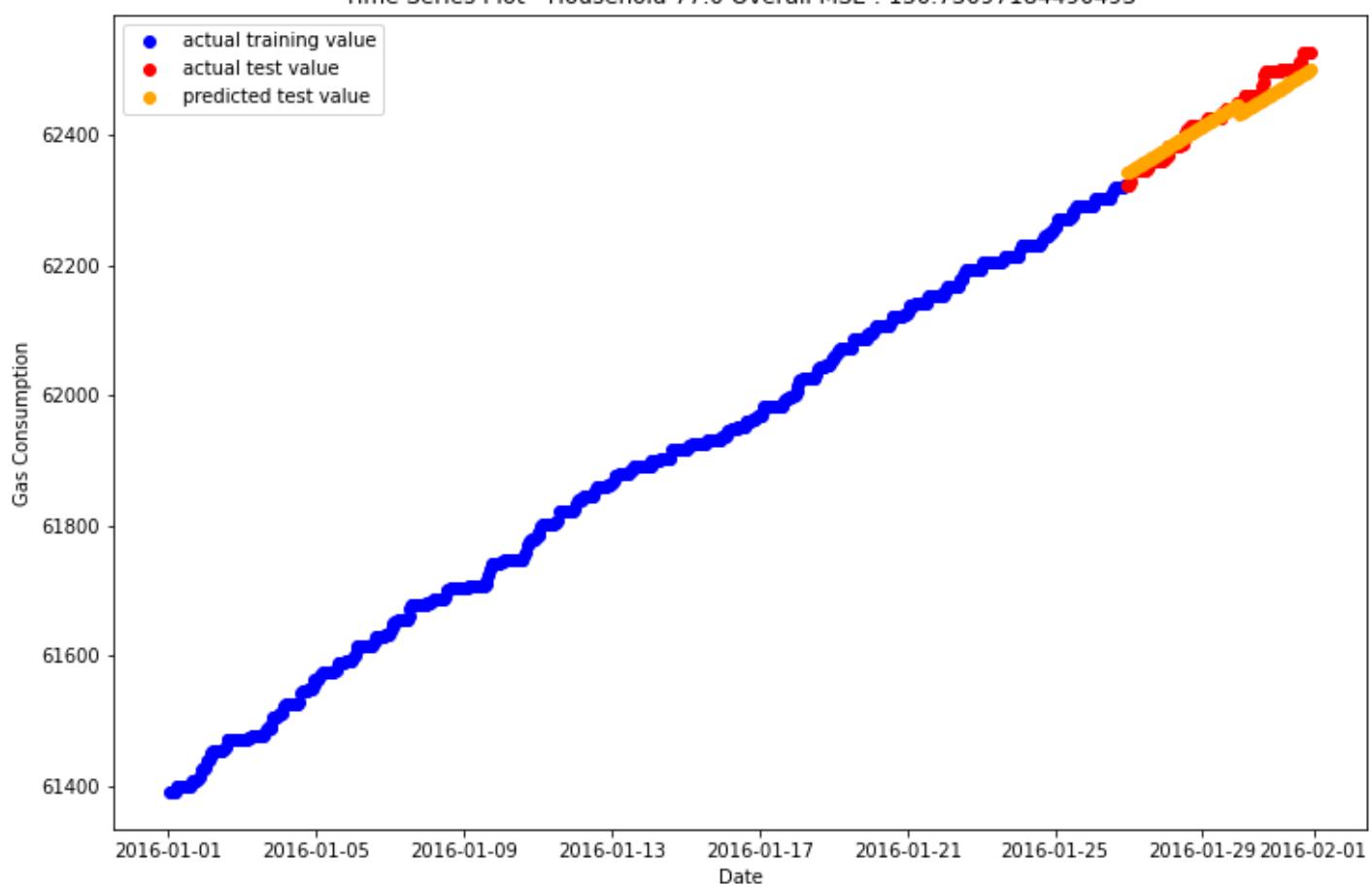
In [6]:

```
train_each_house("lr", hours_to_predict)
```

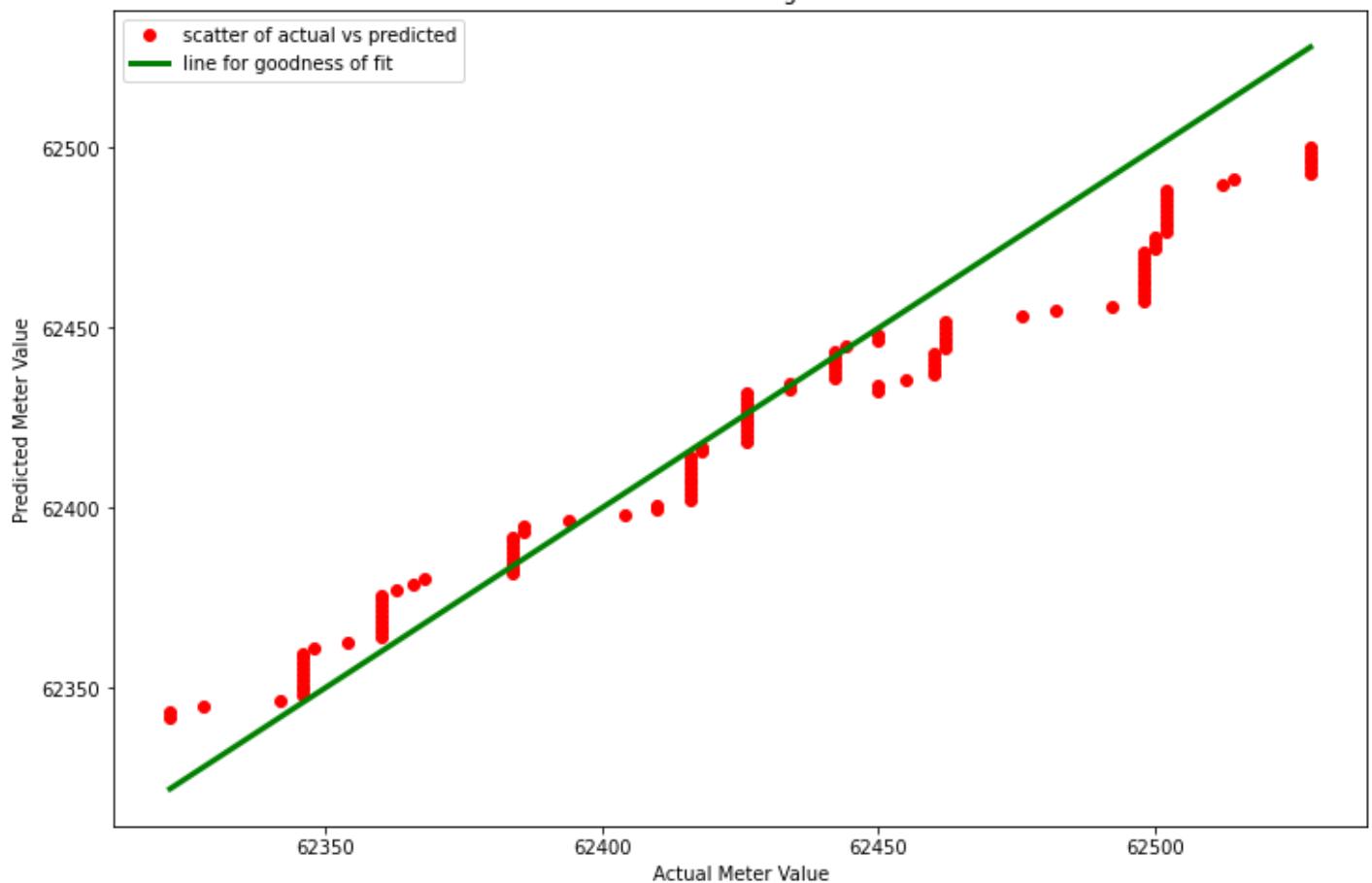




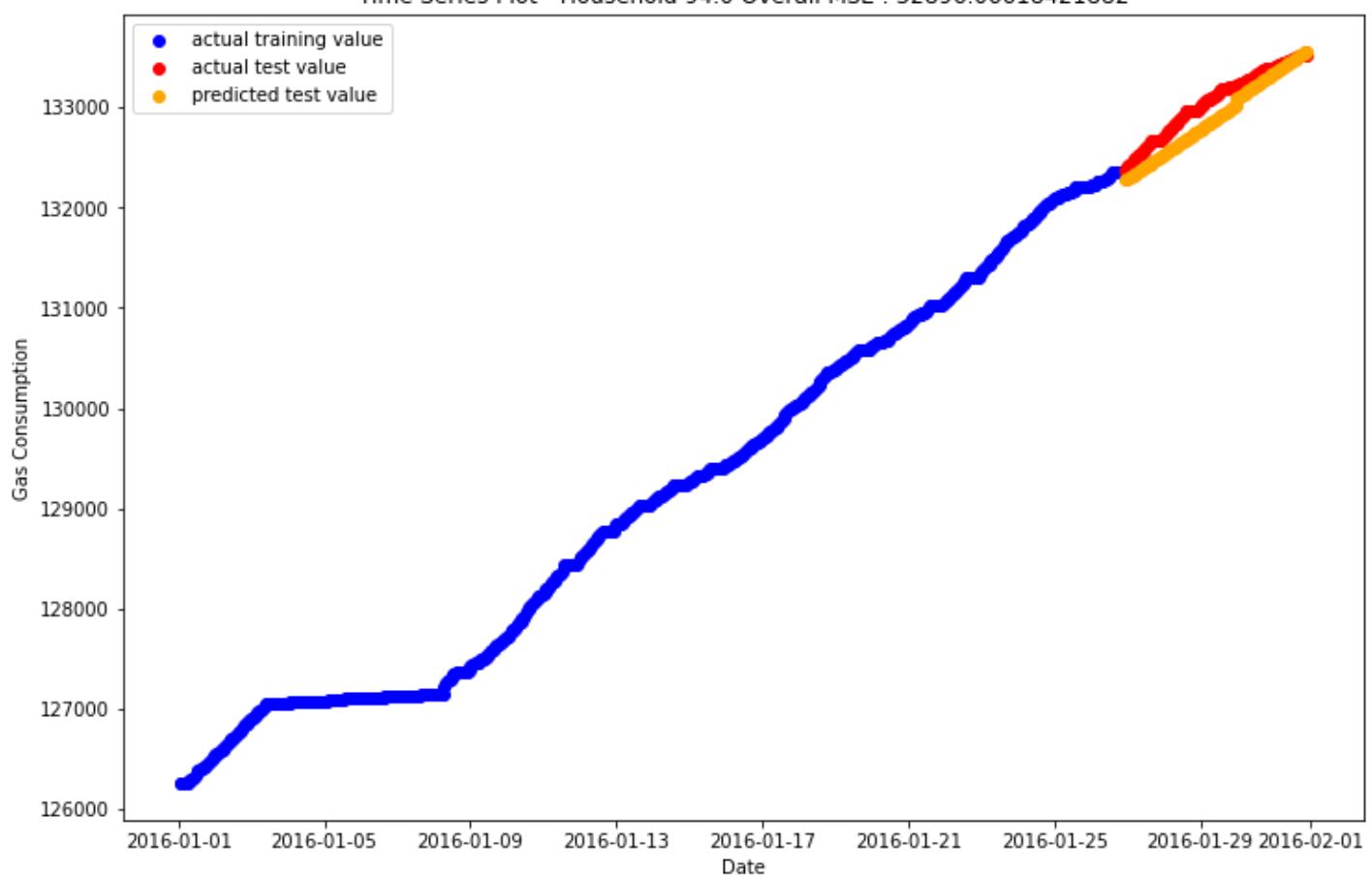
Time Series Plot - Household 77.0 Overall MSE : 150.73097184490493



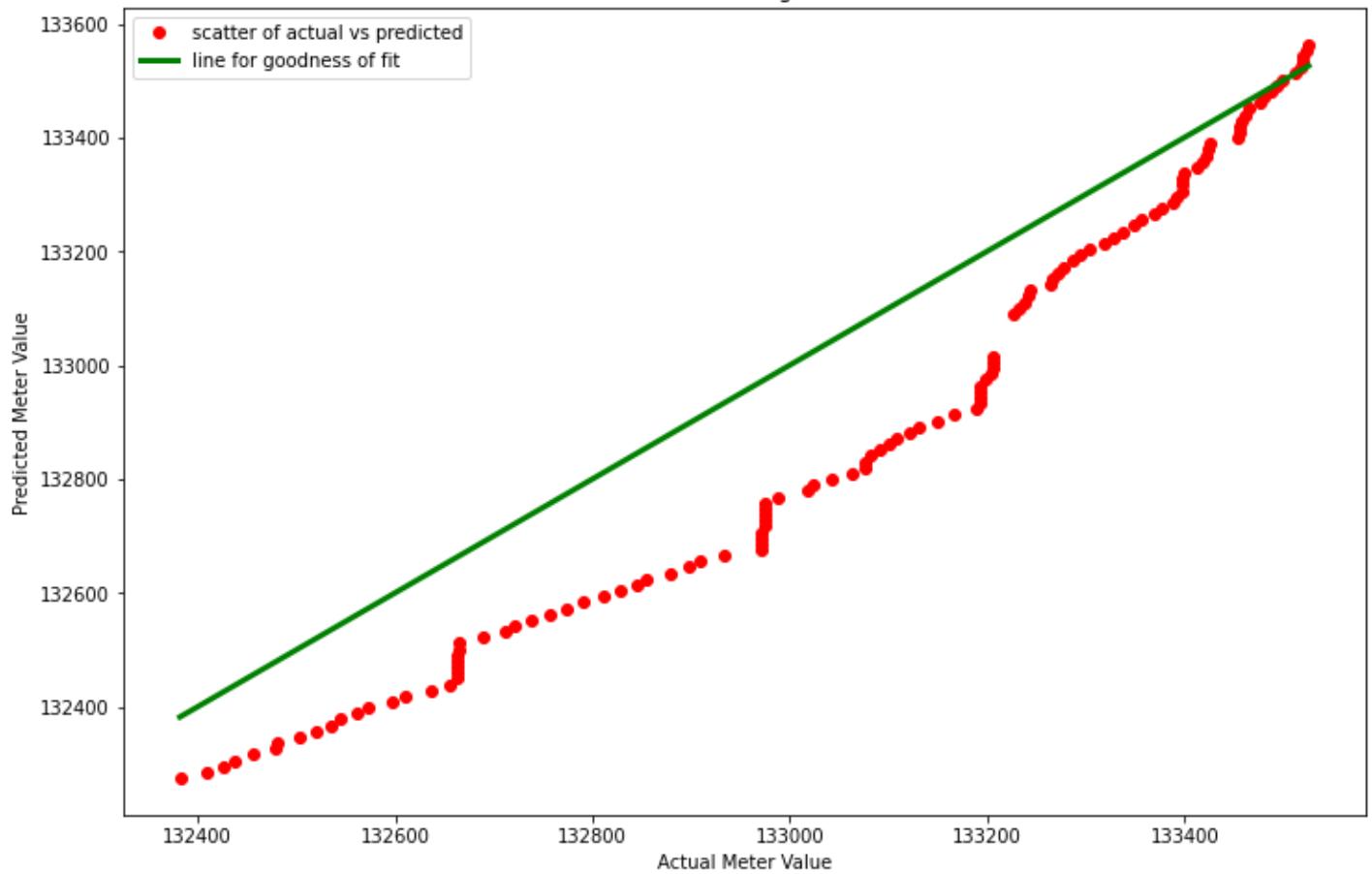
Scatter Plot - Household 77.0 Testing MSE : 300.5223648043685



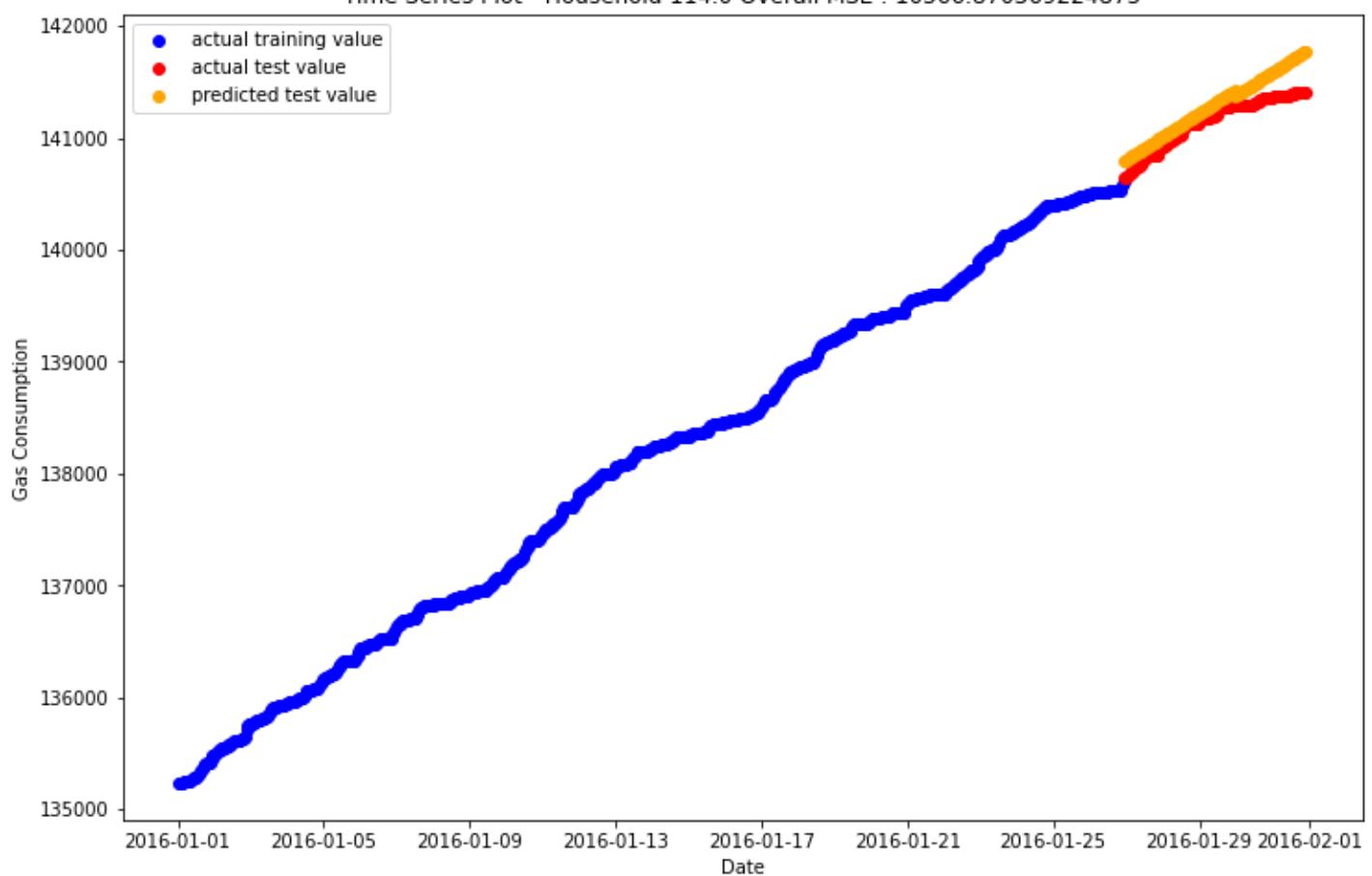
Time Series Plot - Household 94.0 Overall MSE : 52896.06618421882



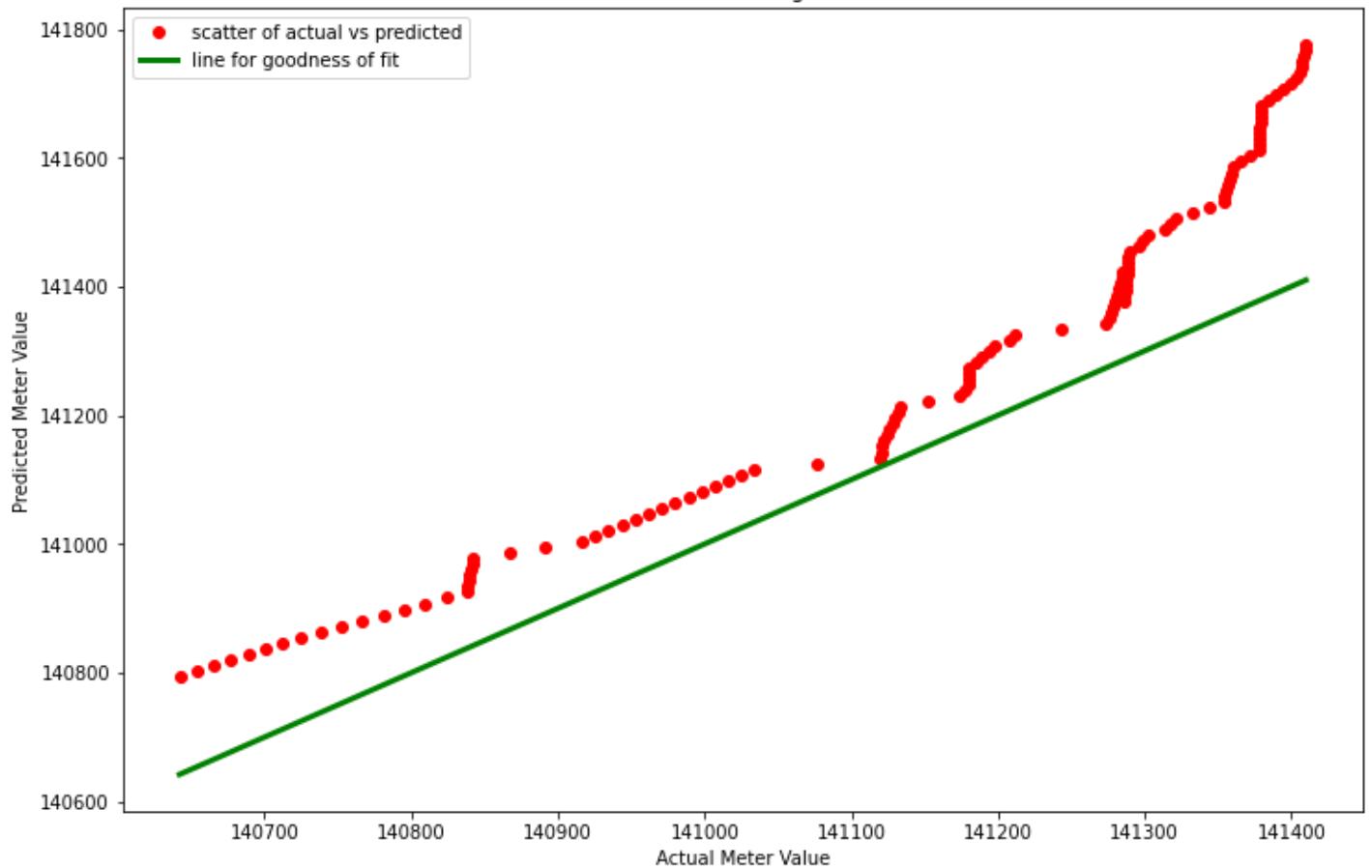
Scatter Plot - Household 94.0 Testing MSE : 30929.394604396548



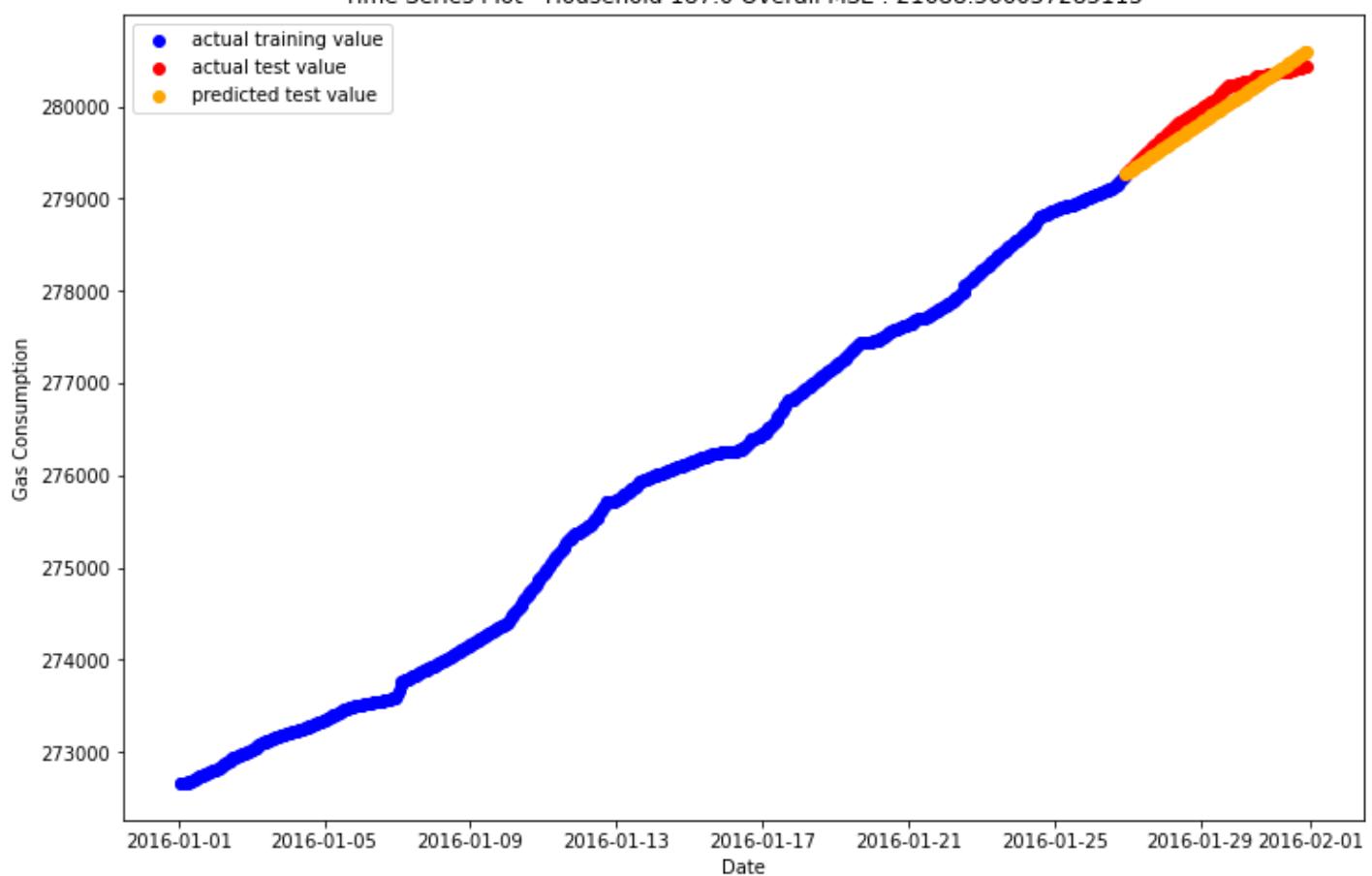
Time Series Plot - Household 114.0 Overall MSE : 10566.870369224875



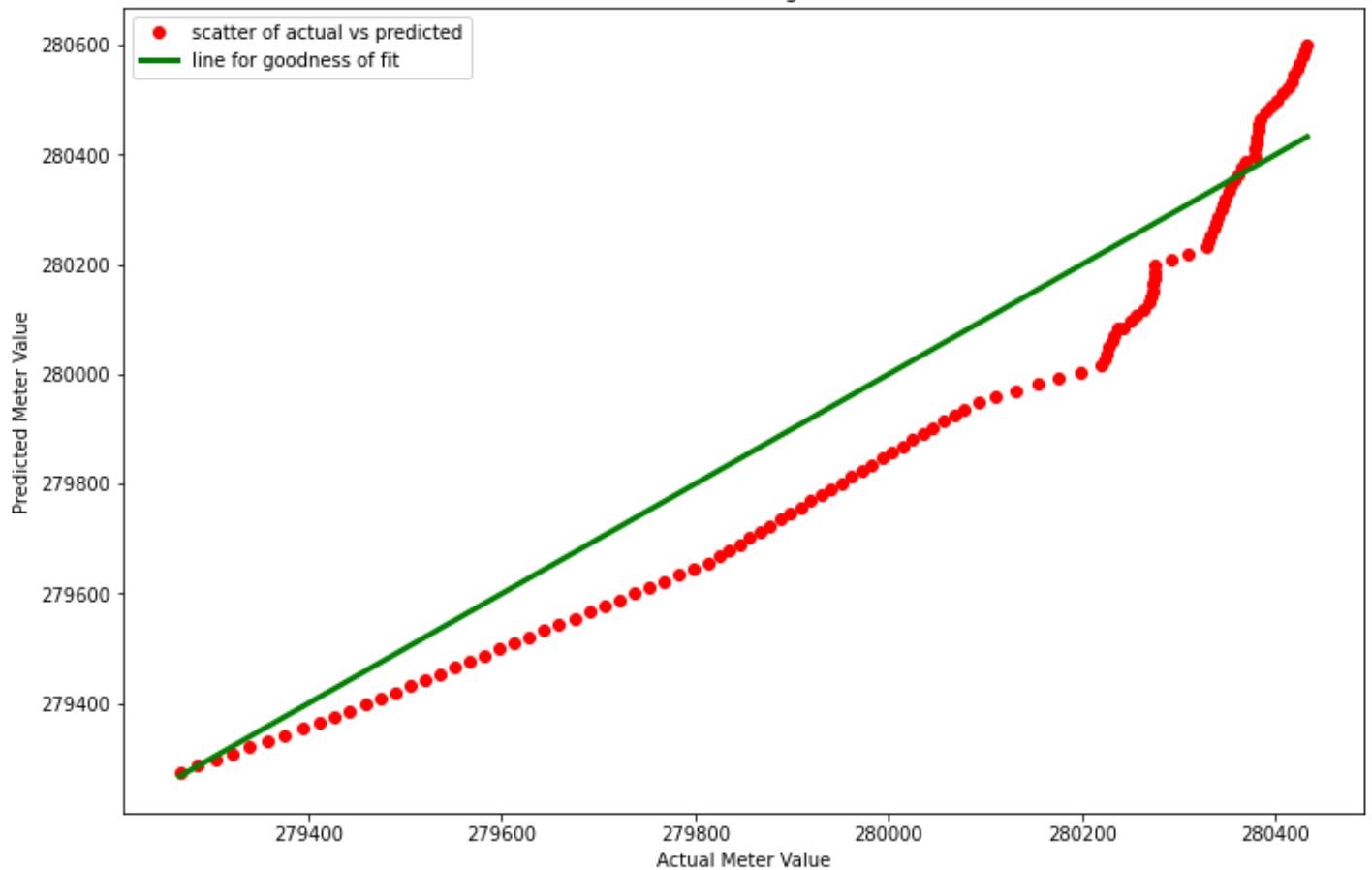
Scatter Plot - Household 114.0 Testing MSE : 28190.02342239906



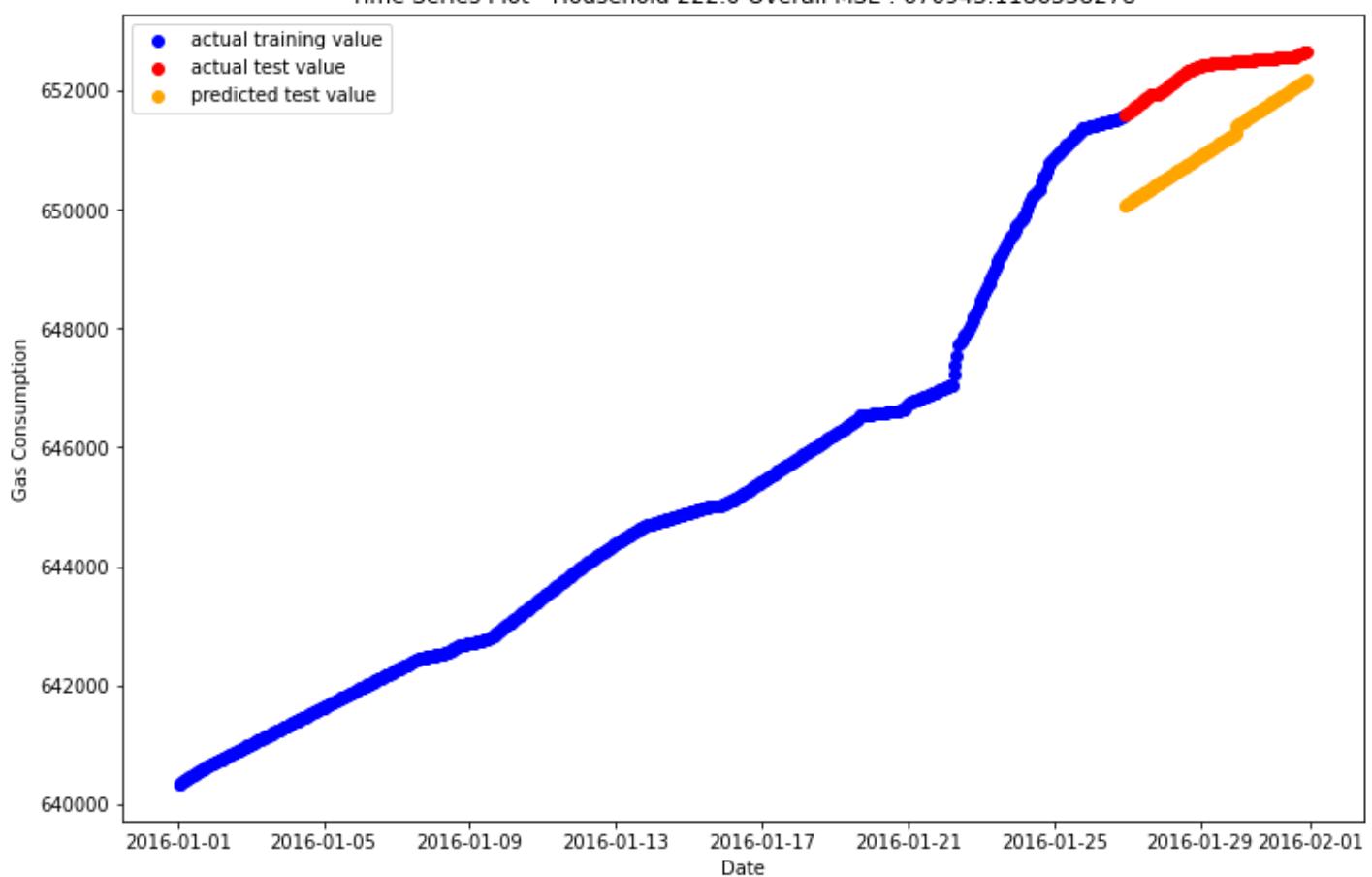
Time Series Plot - Household 187.0 Overall MSE : 21688.566037285113



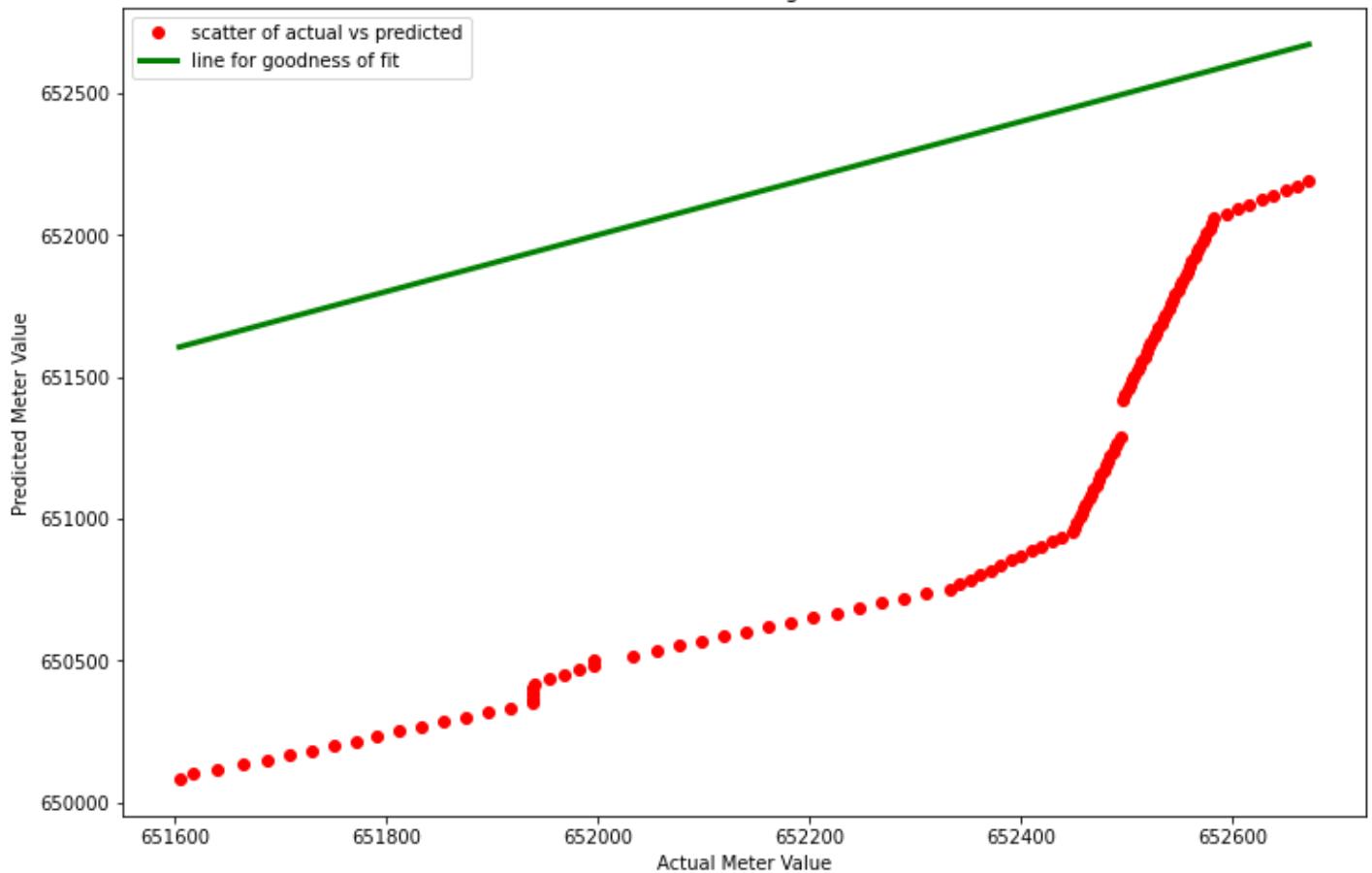
Scatter Plot - Household 187.0 Testing MSE : 14350.514912108822



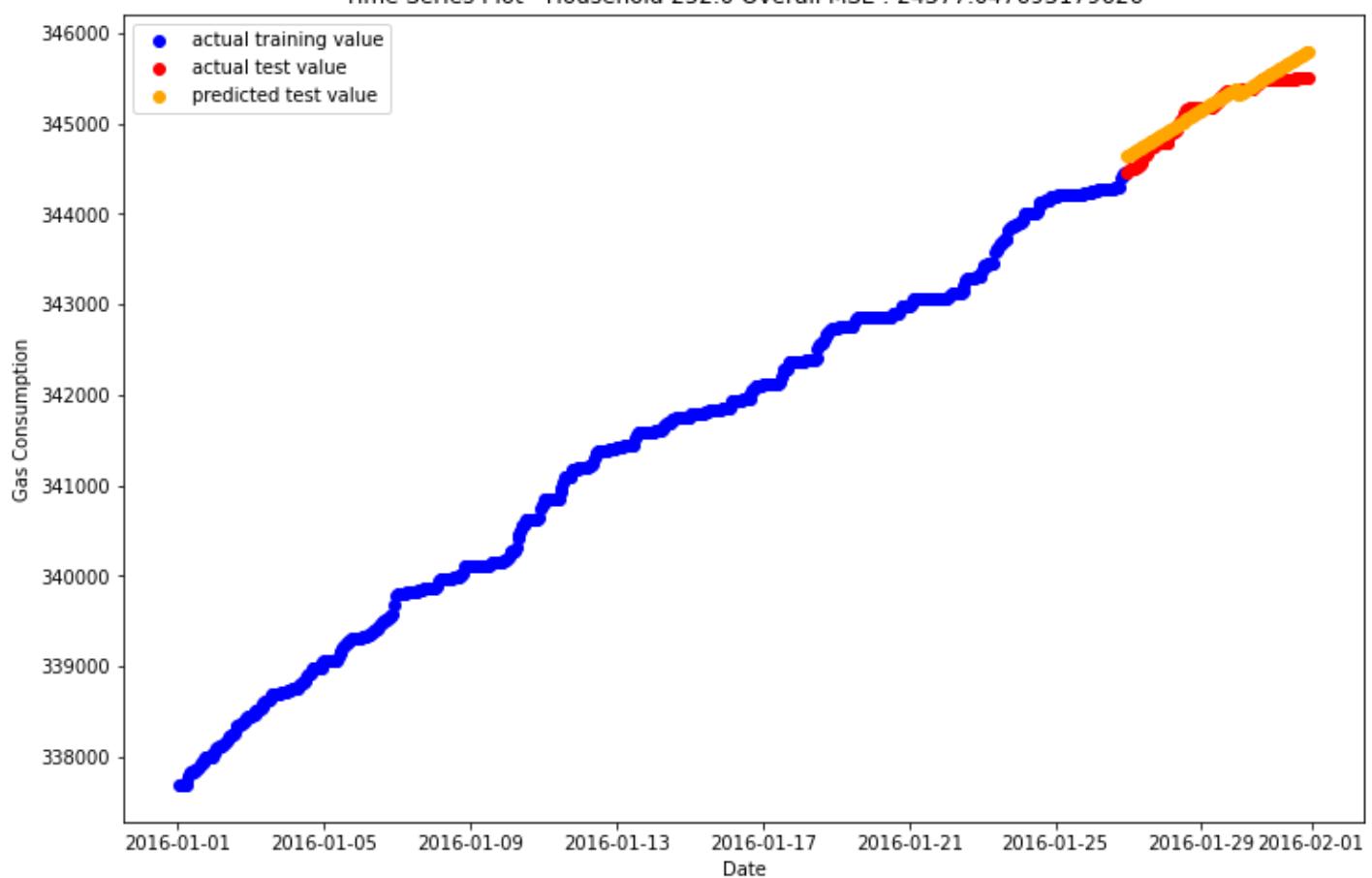
Time Series Plot - Household 222.0 Overall MSE : 670943.1186338278



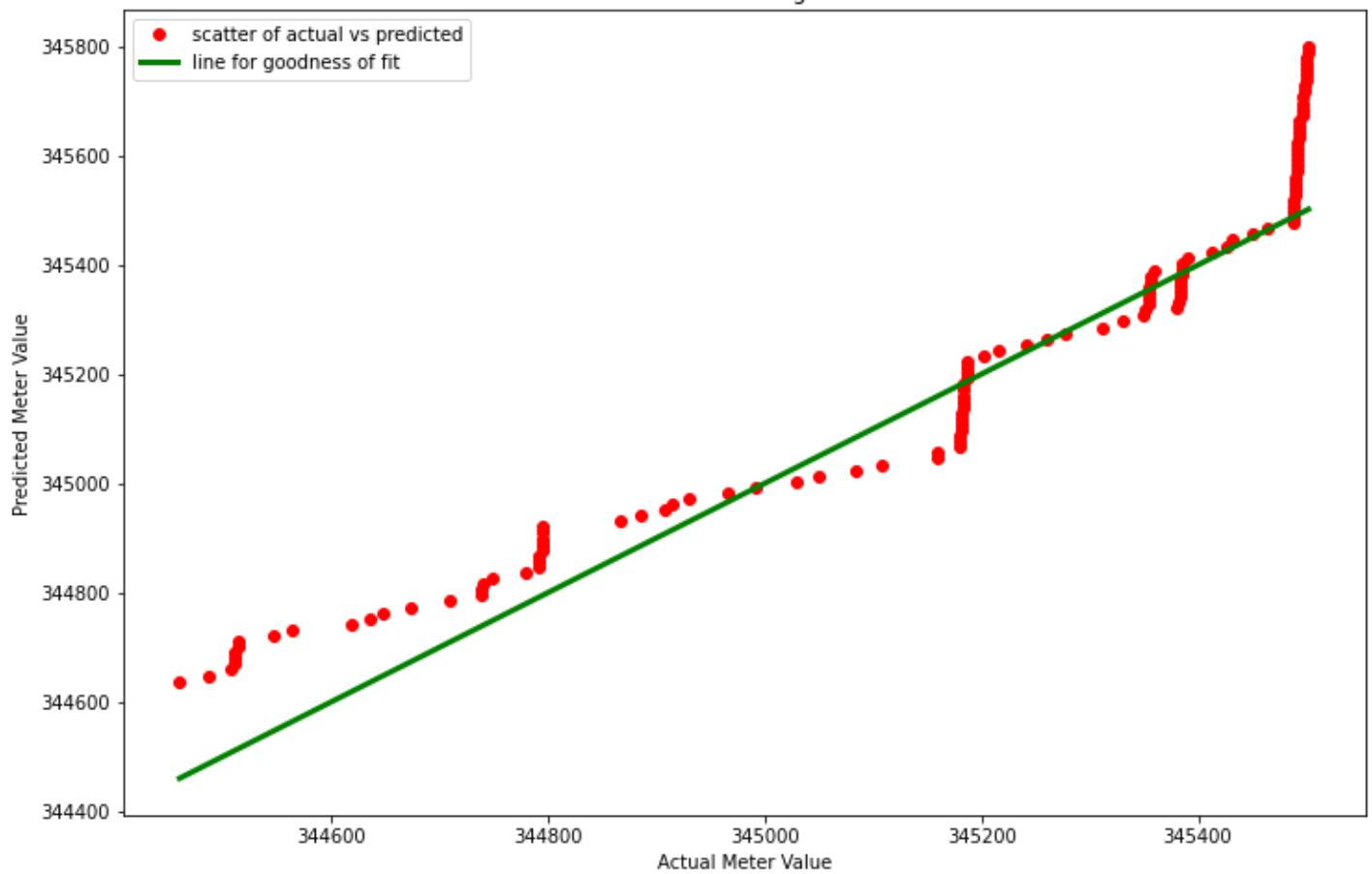
Scatter Plot - Household 222.0 Testing MSE : 1586433.9371943085



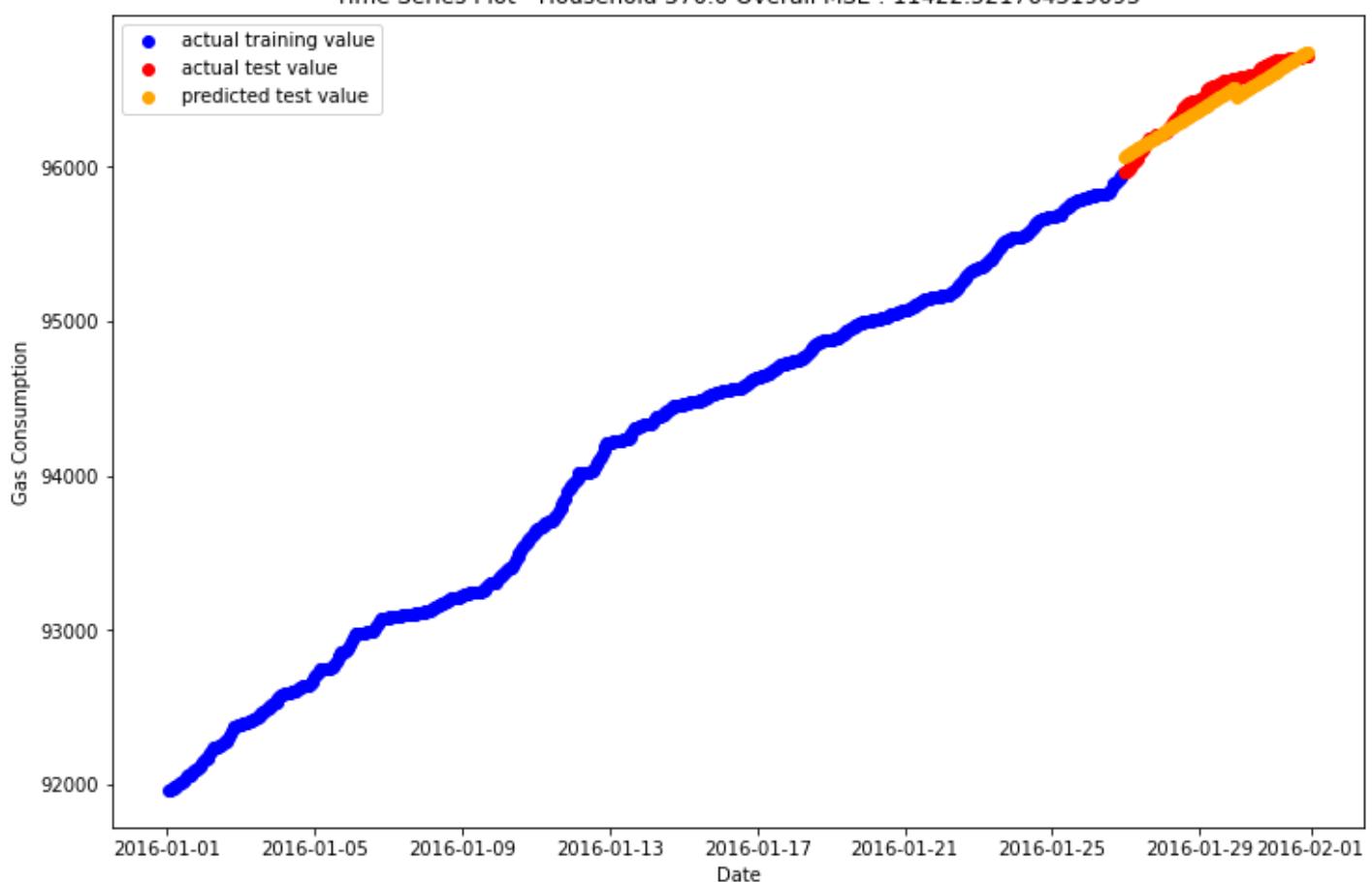
Time Series Plot - Household 252.0 Overall MSE : 24377.047693179626



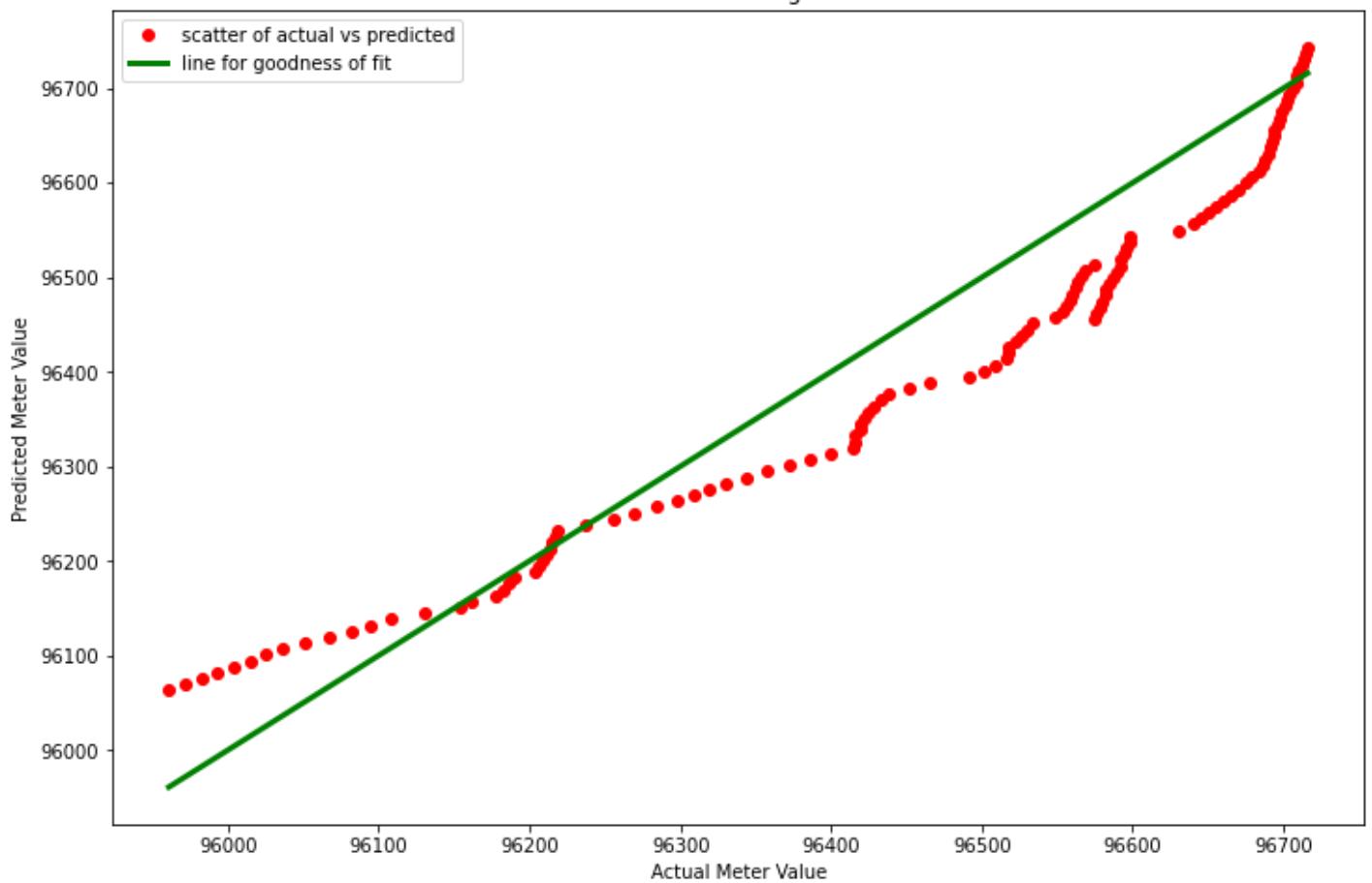
Scatter Plot - Household 252.0 Testing MSE : 12652.72724415086



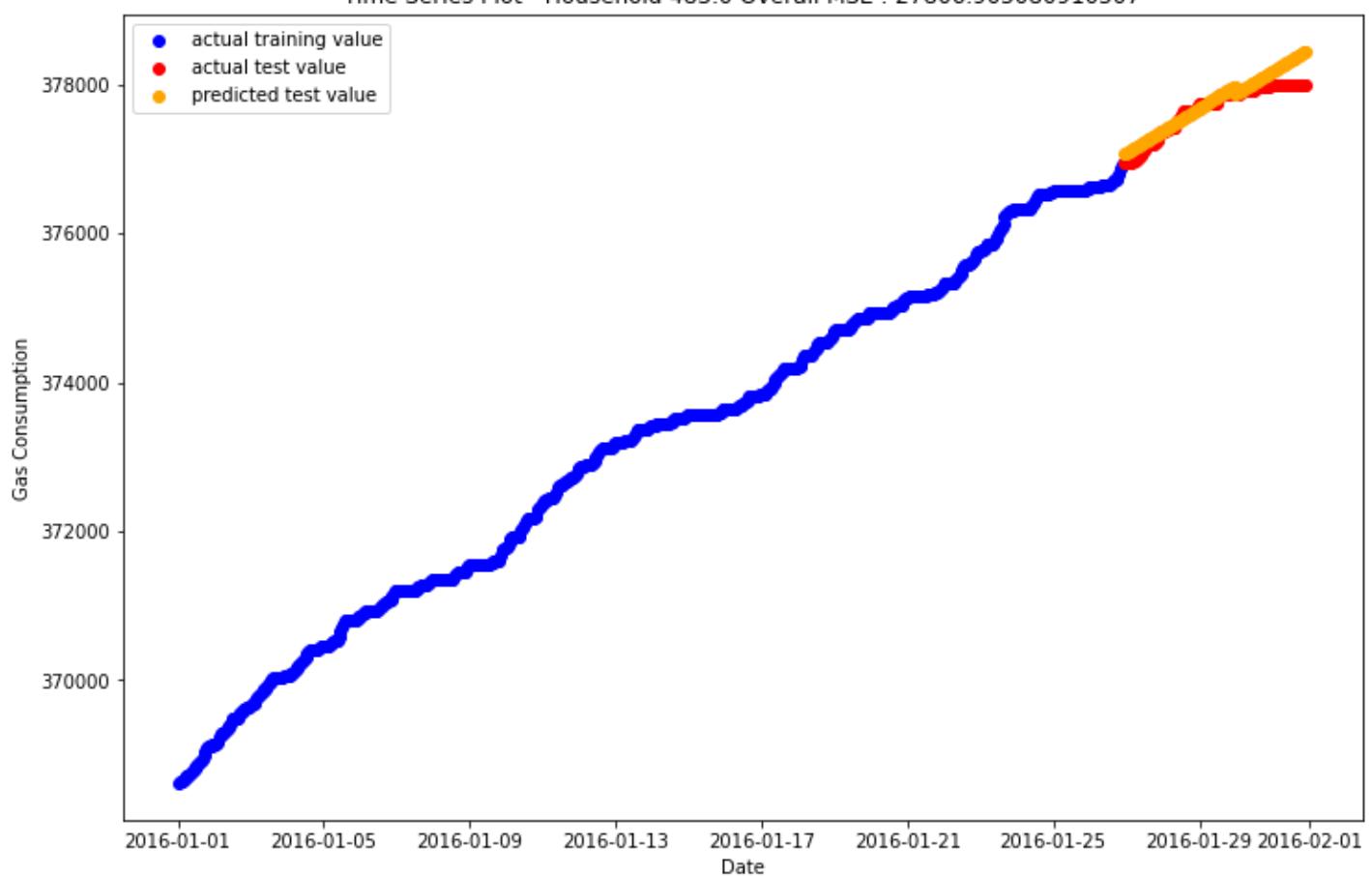
Time Series Plot - Household 370.0 Overall MSE : 11422.521764519095



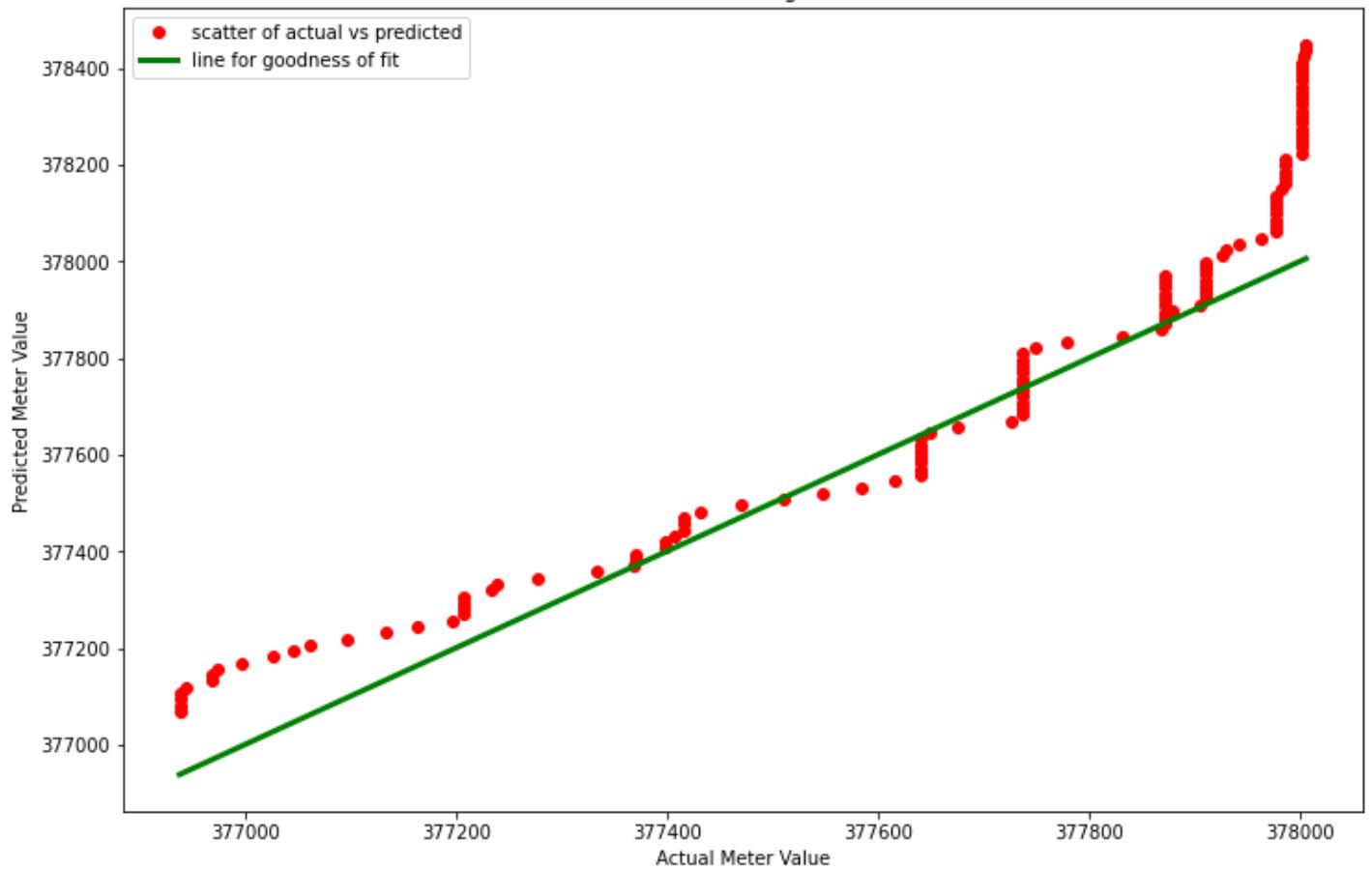
Scatter Plot - Household 370.0 Testing MSE : 4469.080176838165



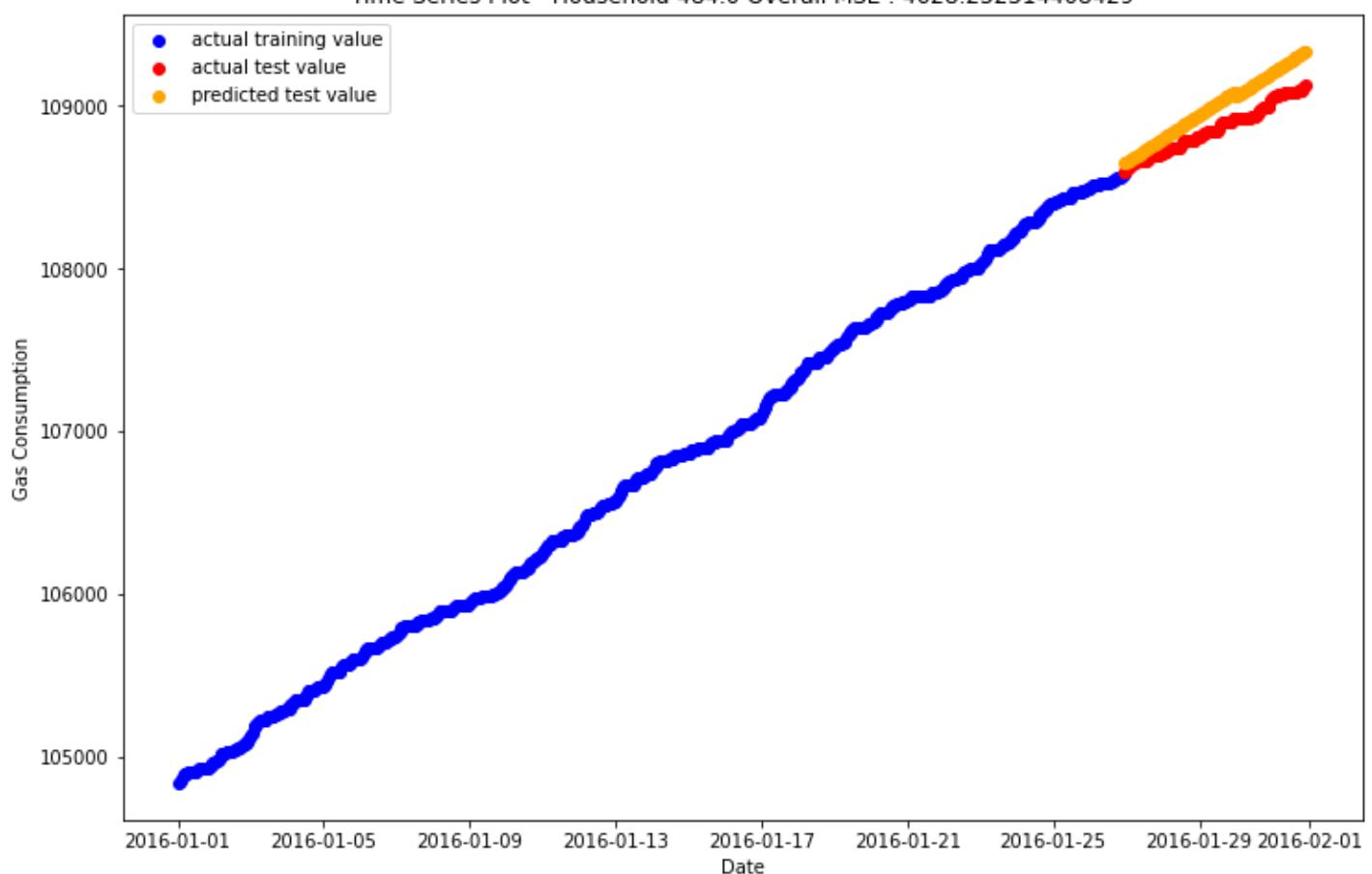
Time Series Plot - Household 483.0 Overall MSE : 27806.905080910507



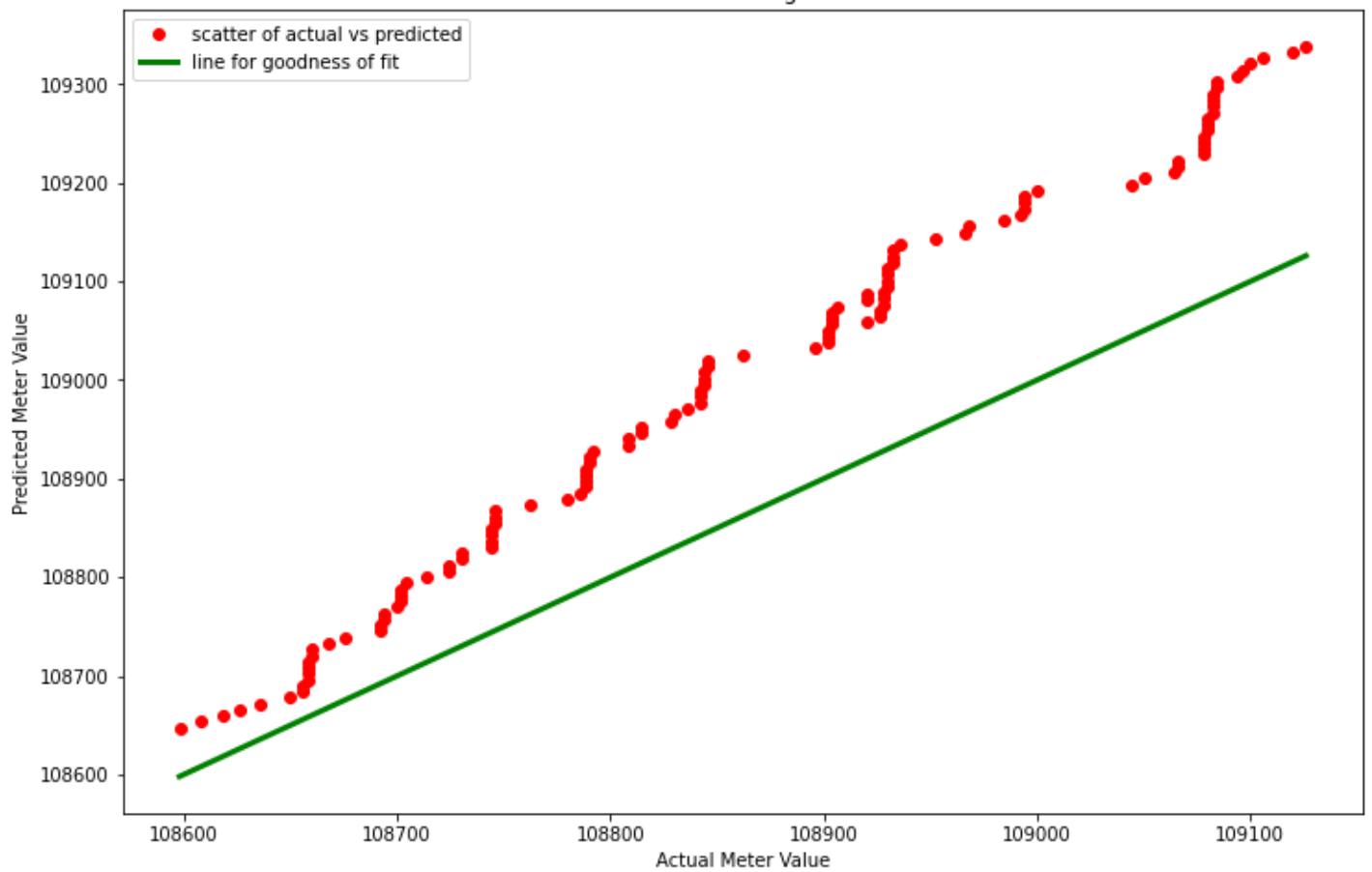
Scatter Plot - Household 483.0 Testing MSE : 25835.561760445366



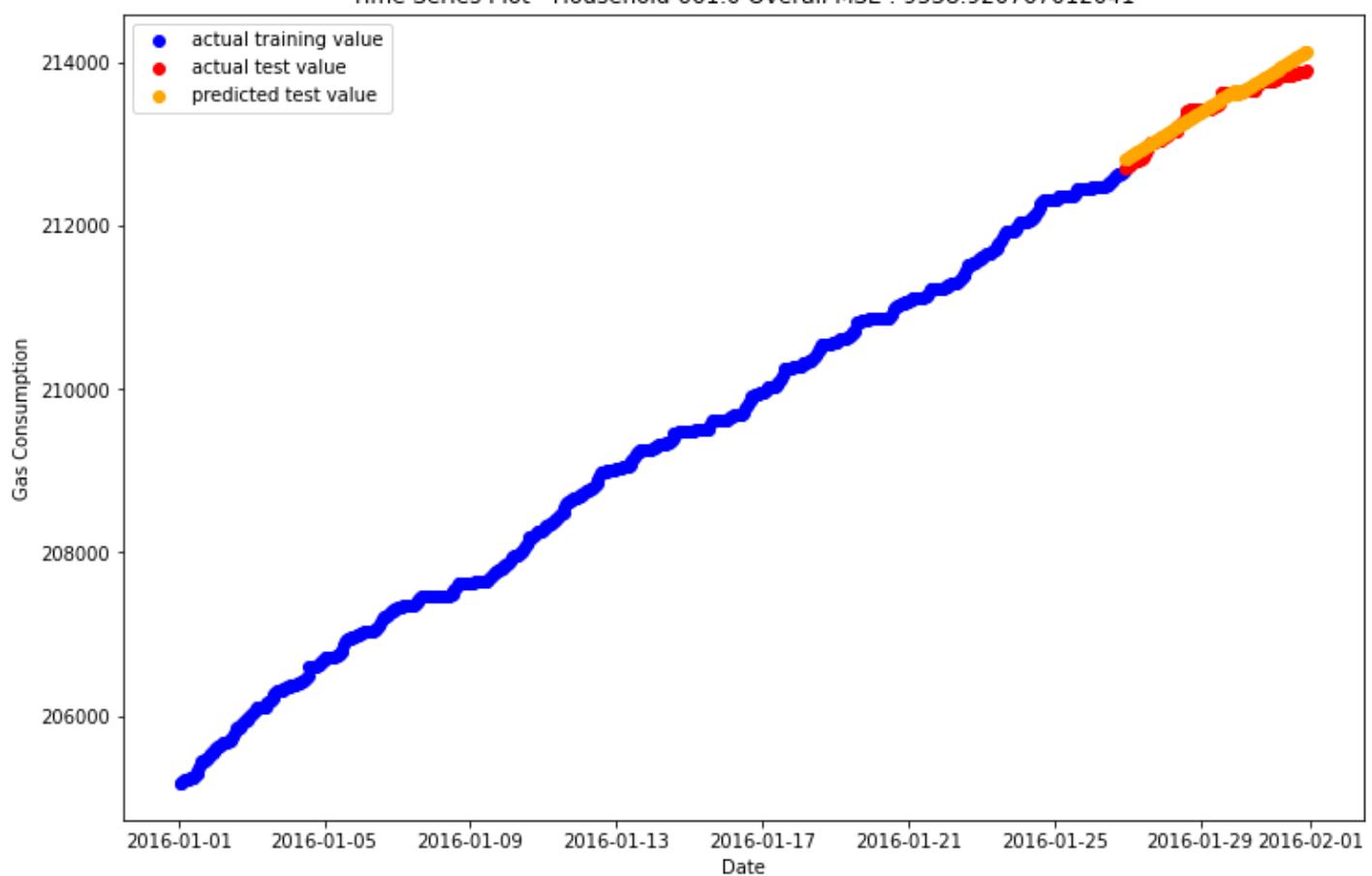
Time Series Plot - Household 484.0 Overall MSE : 4628.232314408429



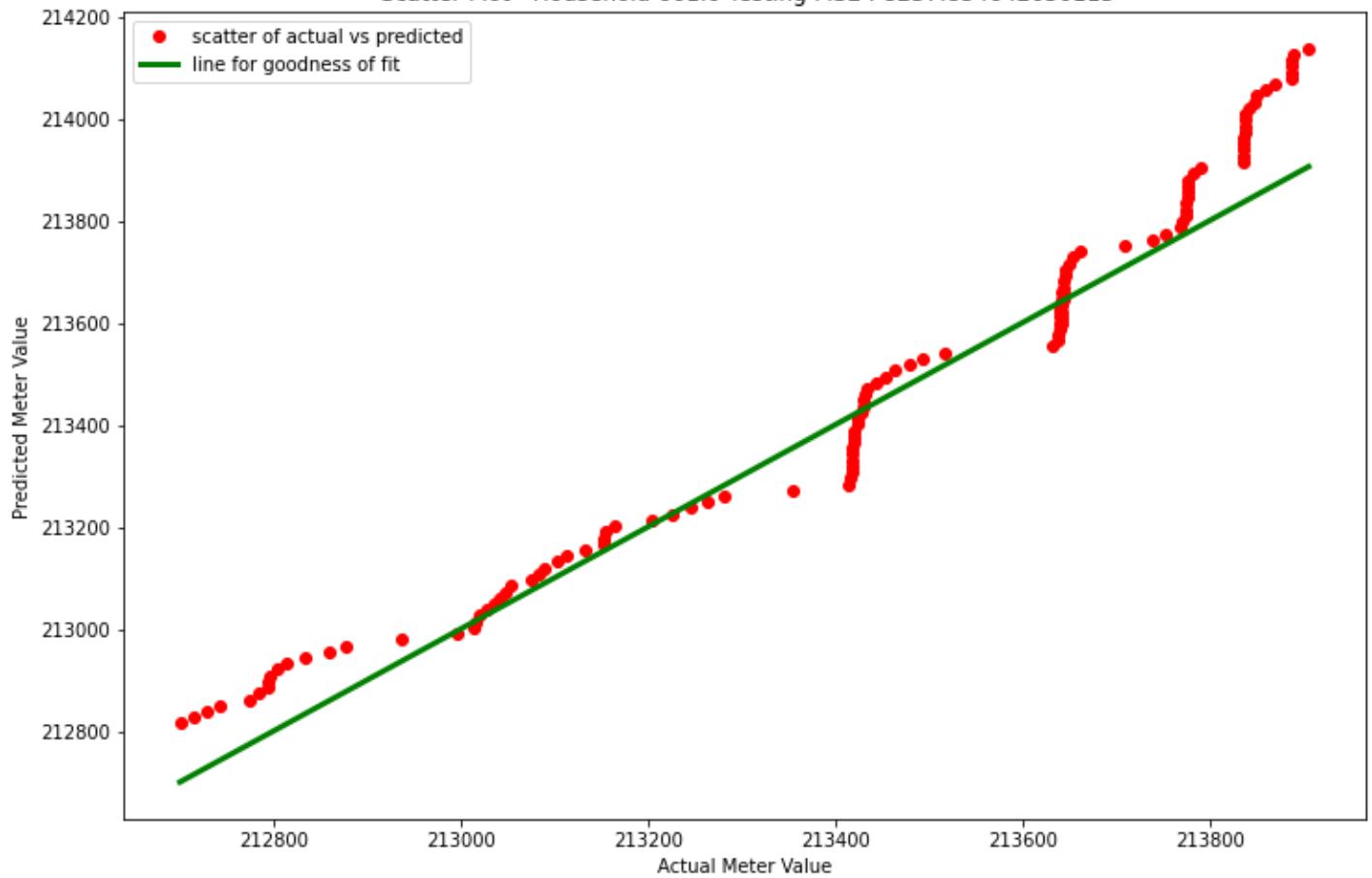
Scatter Plot - Household 484.0 Testing MSE : 20619.607839244432

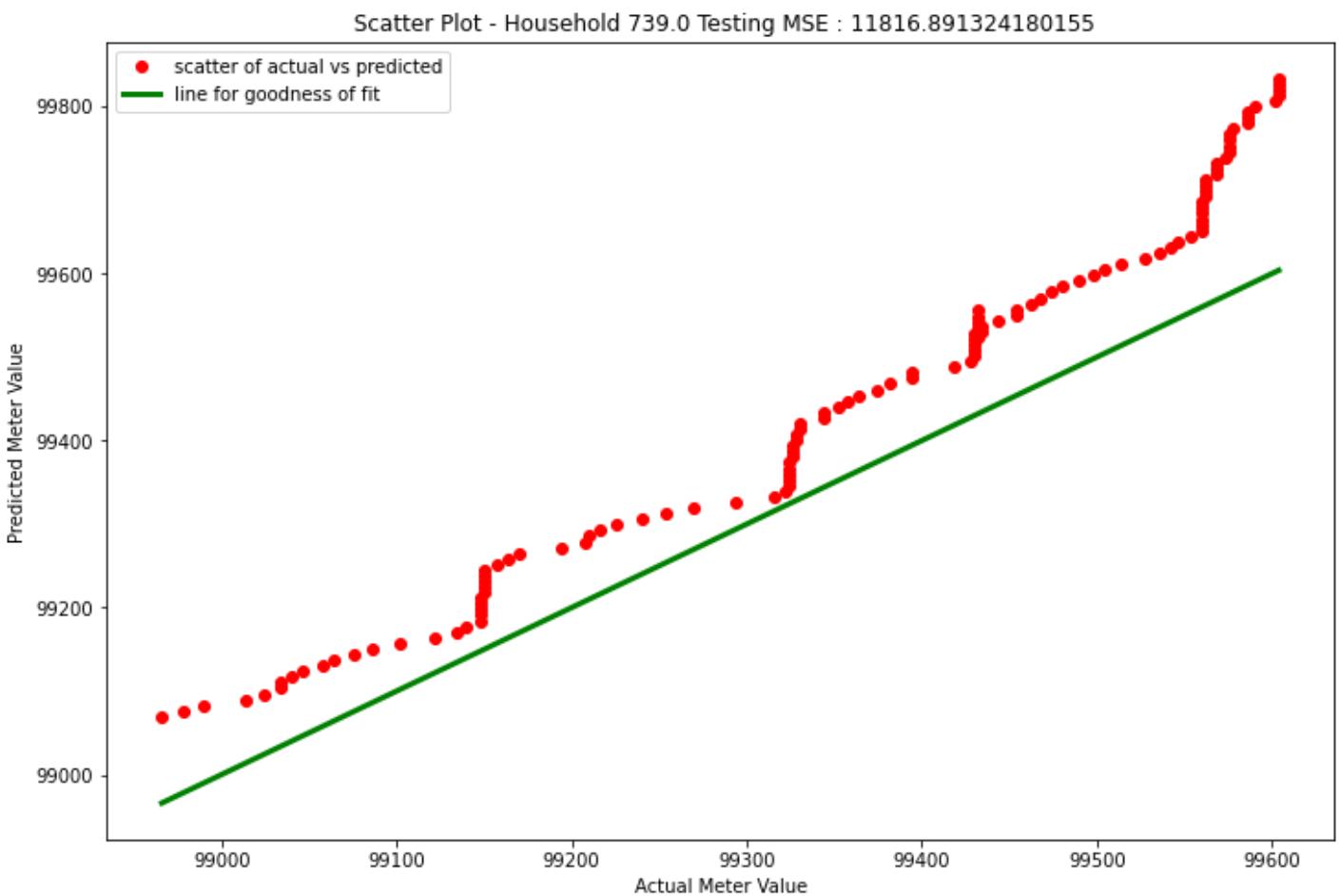
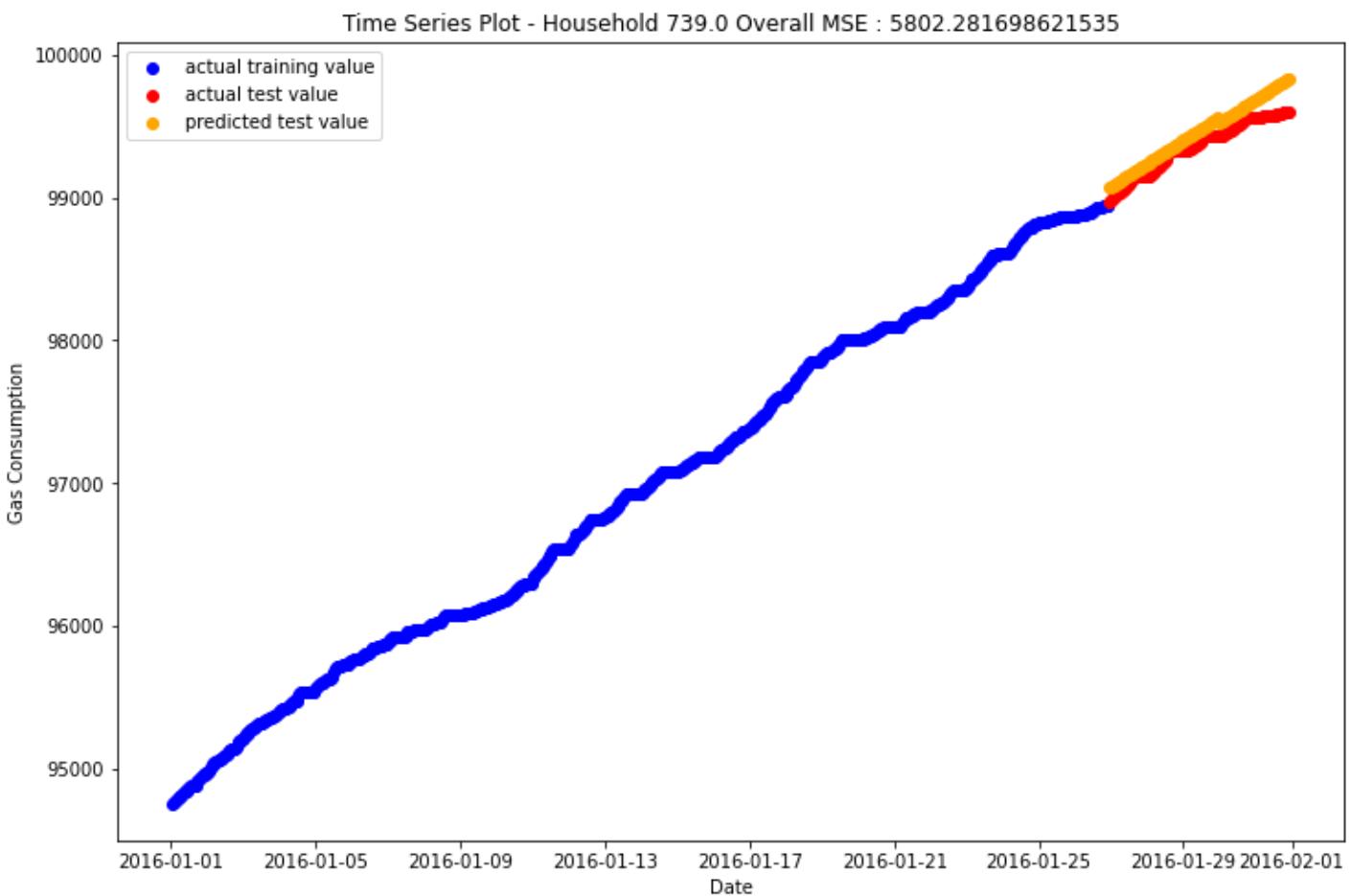


Time Series Plot - Household 661.0 Overall MSE : 9538.920767012041

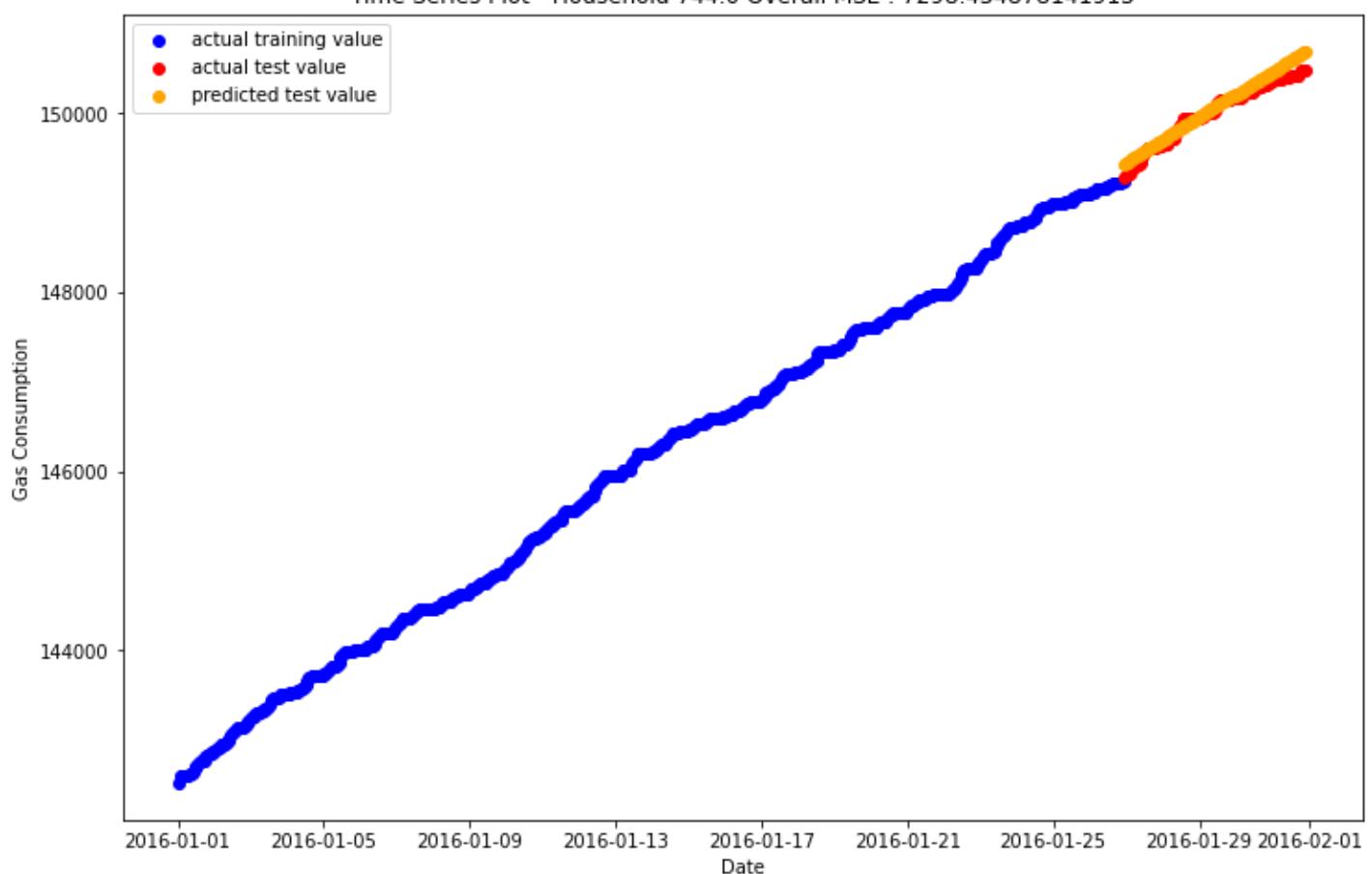


Scatter Plot - Household 661.0 Testing MSE : 8237.854642050115

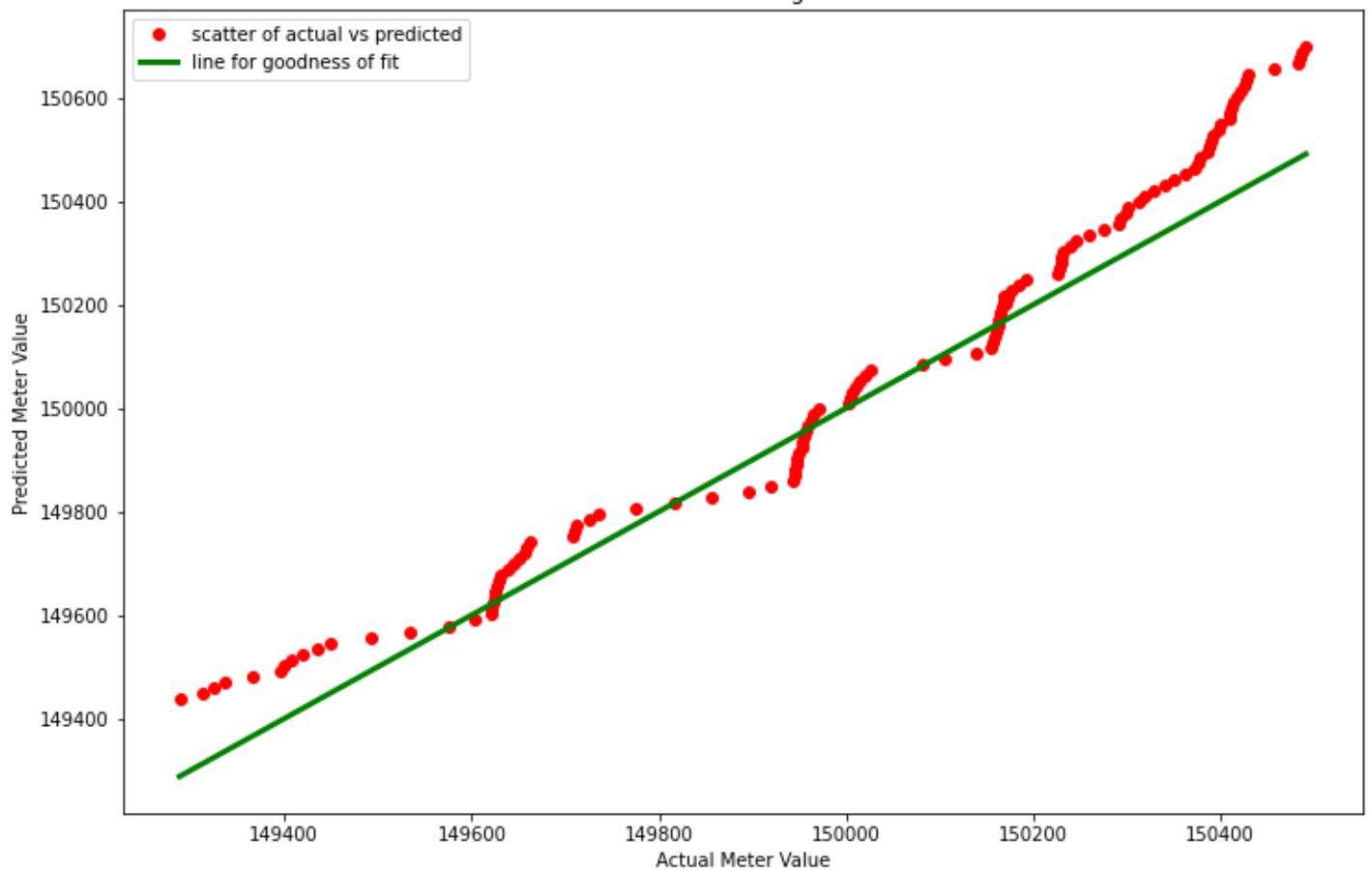




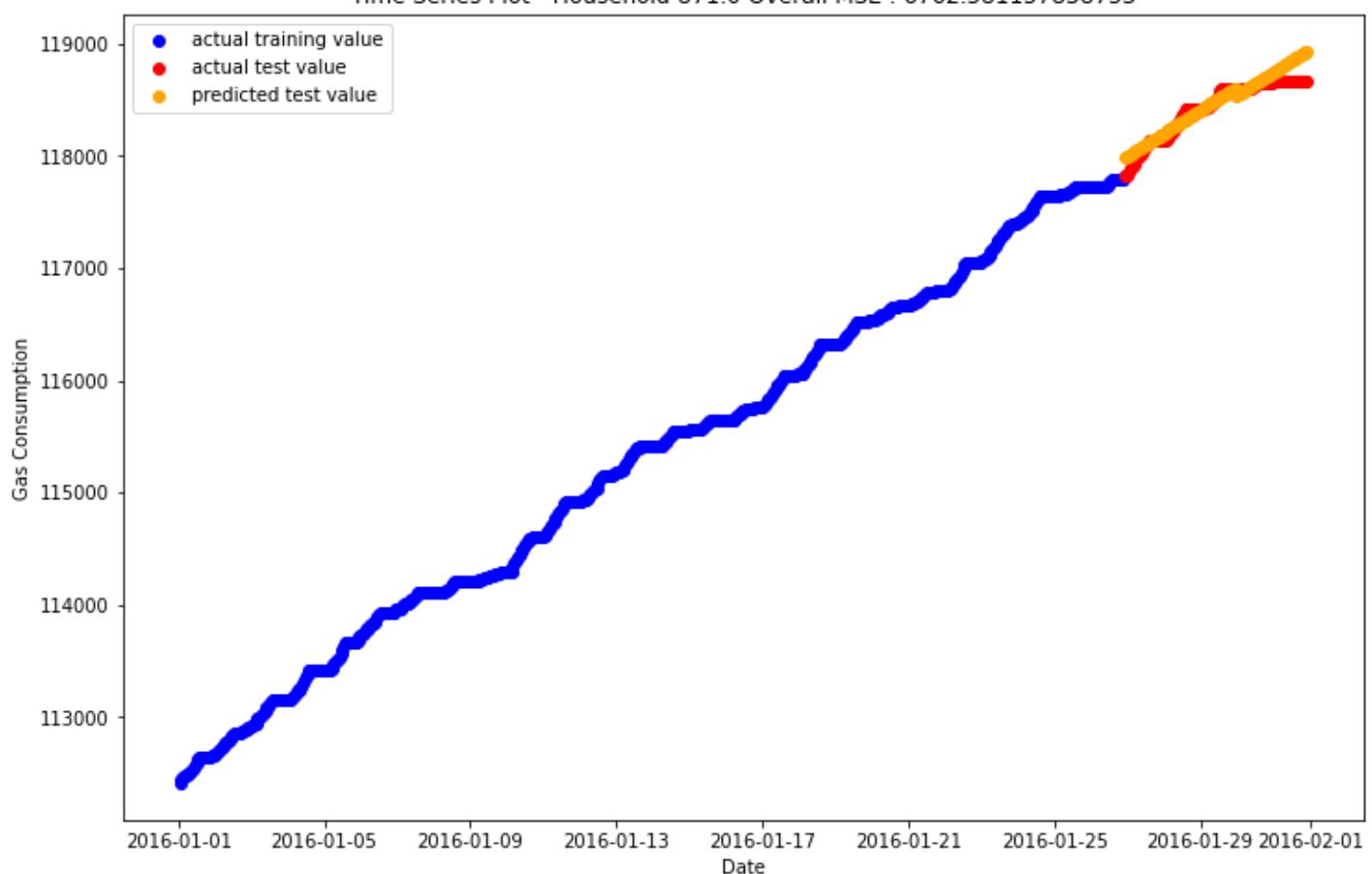
Time Series Plot - Household 744.0 Overall MSE : 7298.434878141913



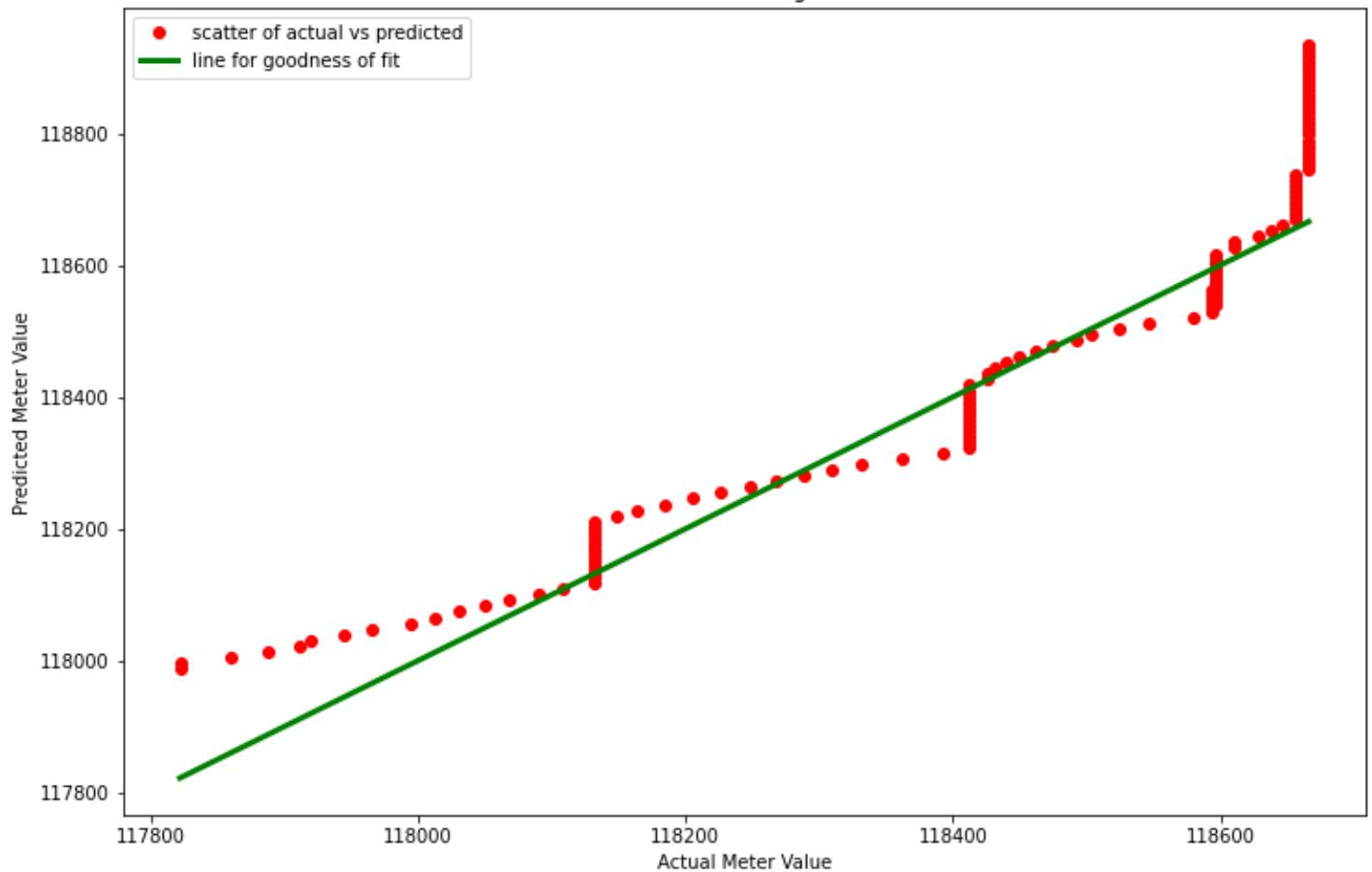
Scatter Plot - Household 744.0 Testing MSE : 8434.288323235643



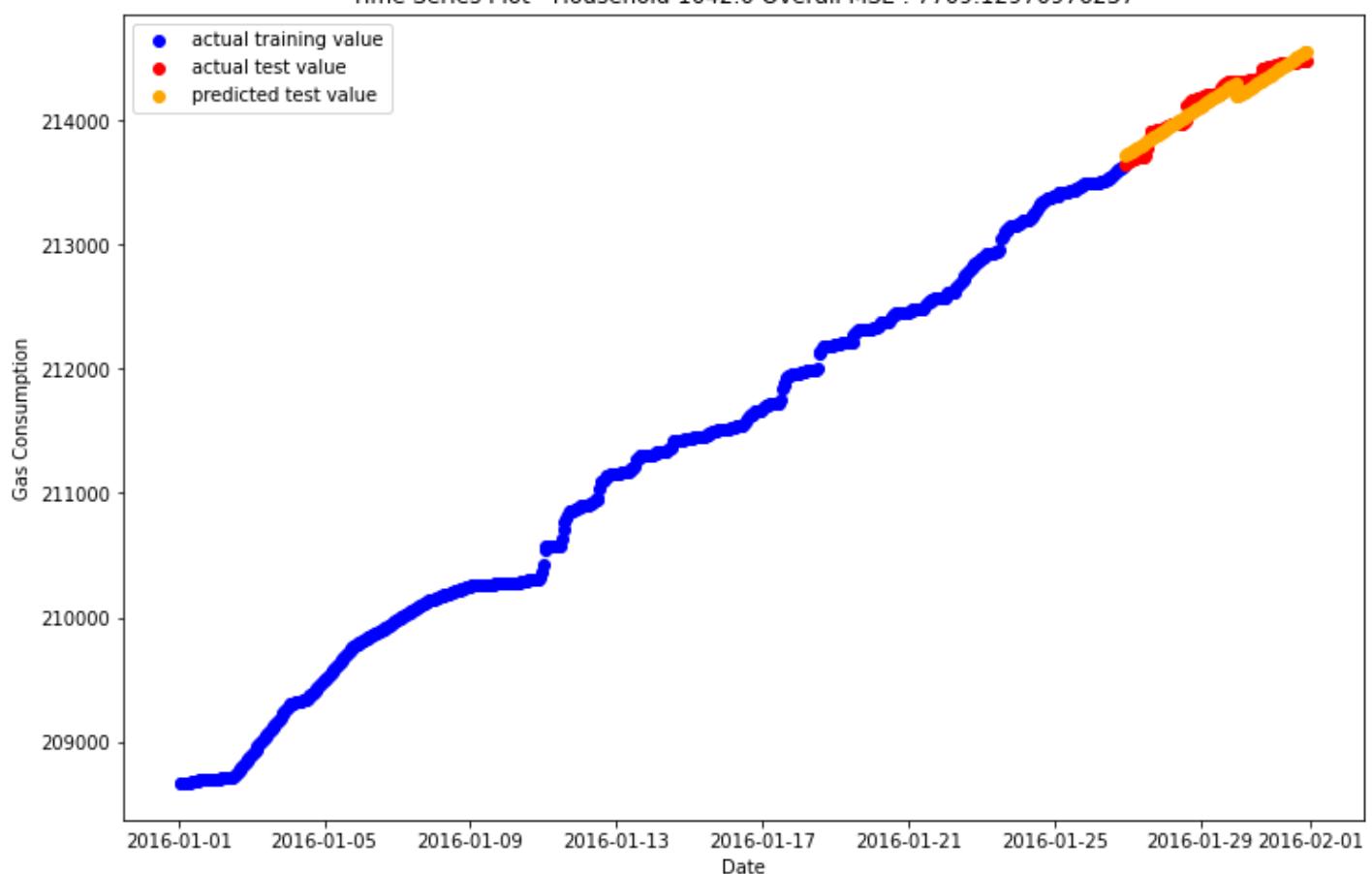
Time Series Plot - Household 871.0 Overall MSE : 6762.581157838753



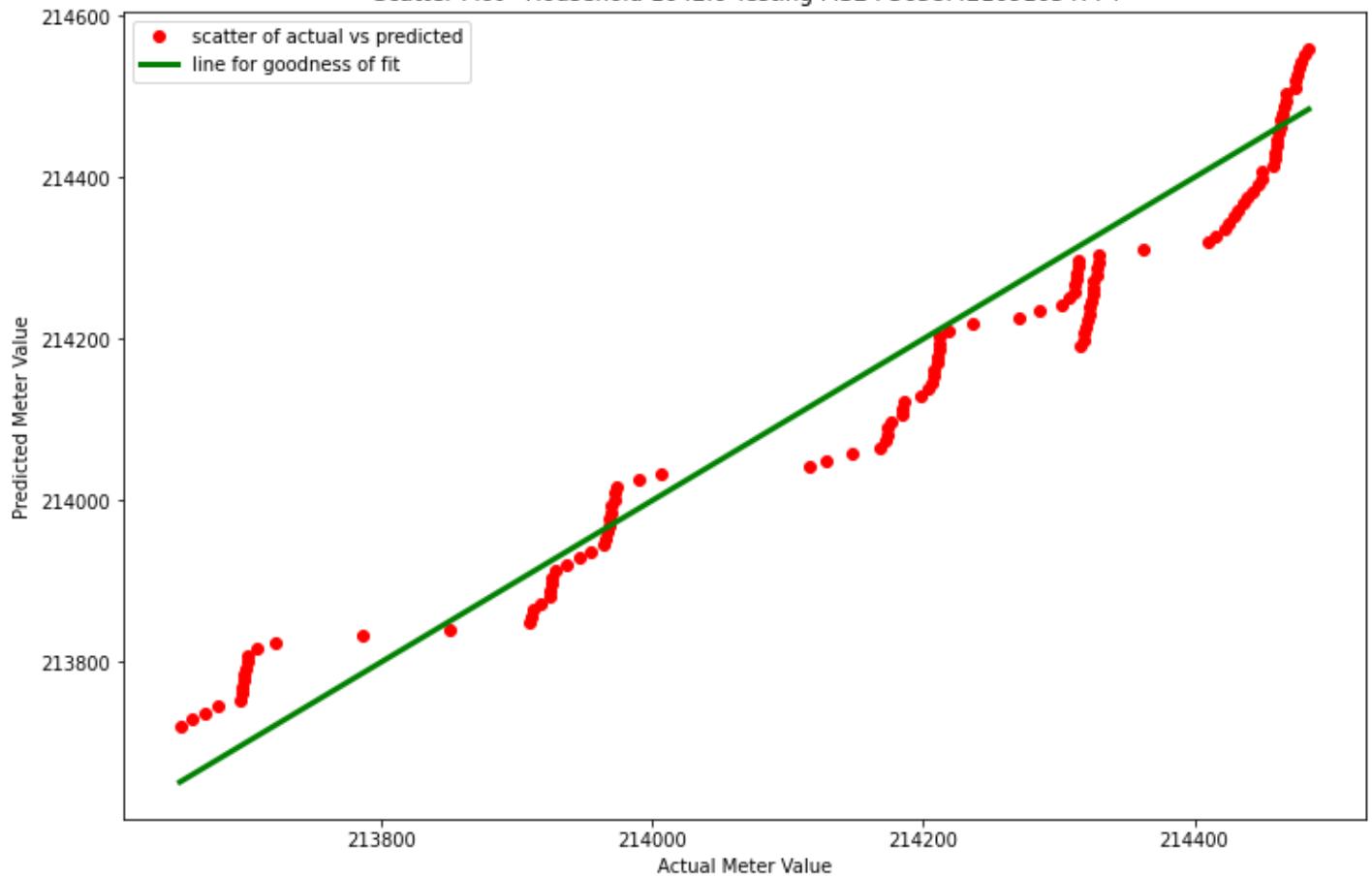
Scatter Plot - Household 871.0 Testing MSE : 8792.470073427667



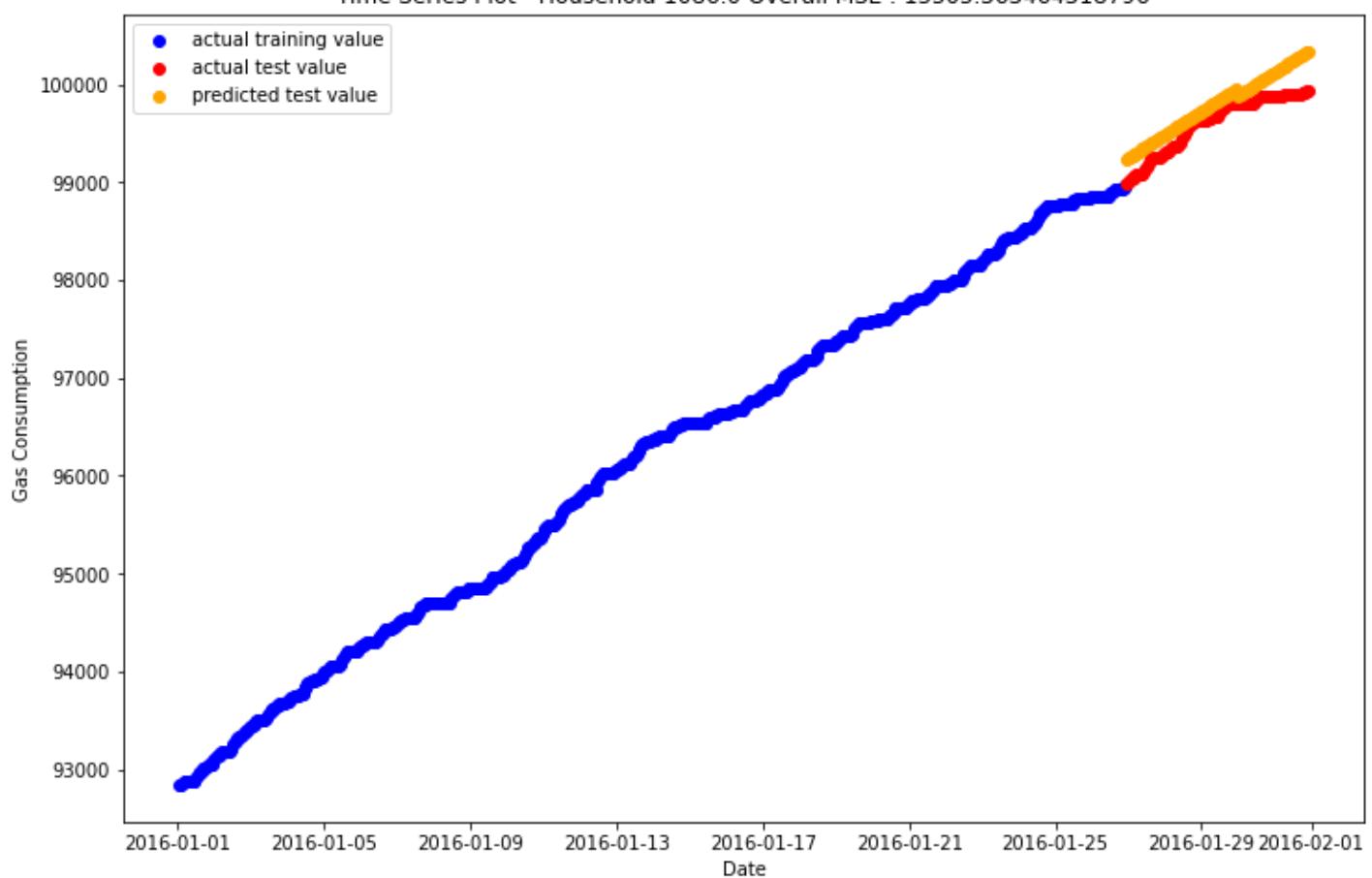
Time Series Plot - Household 1042.0 Overall MSE : 7709.12970976237



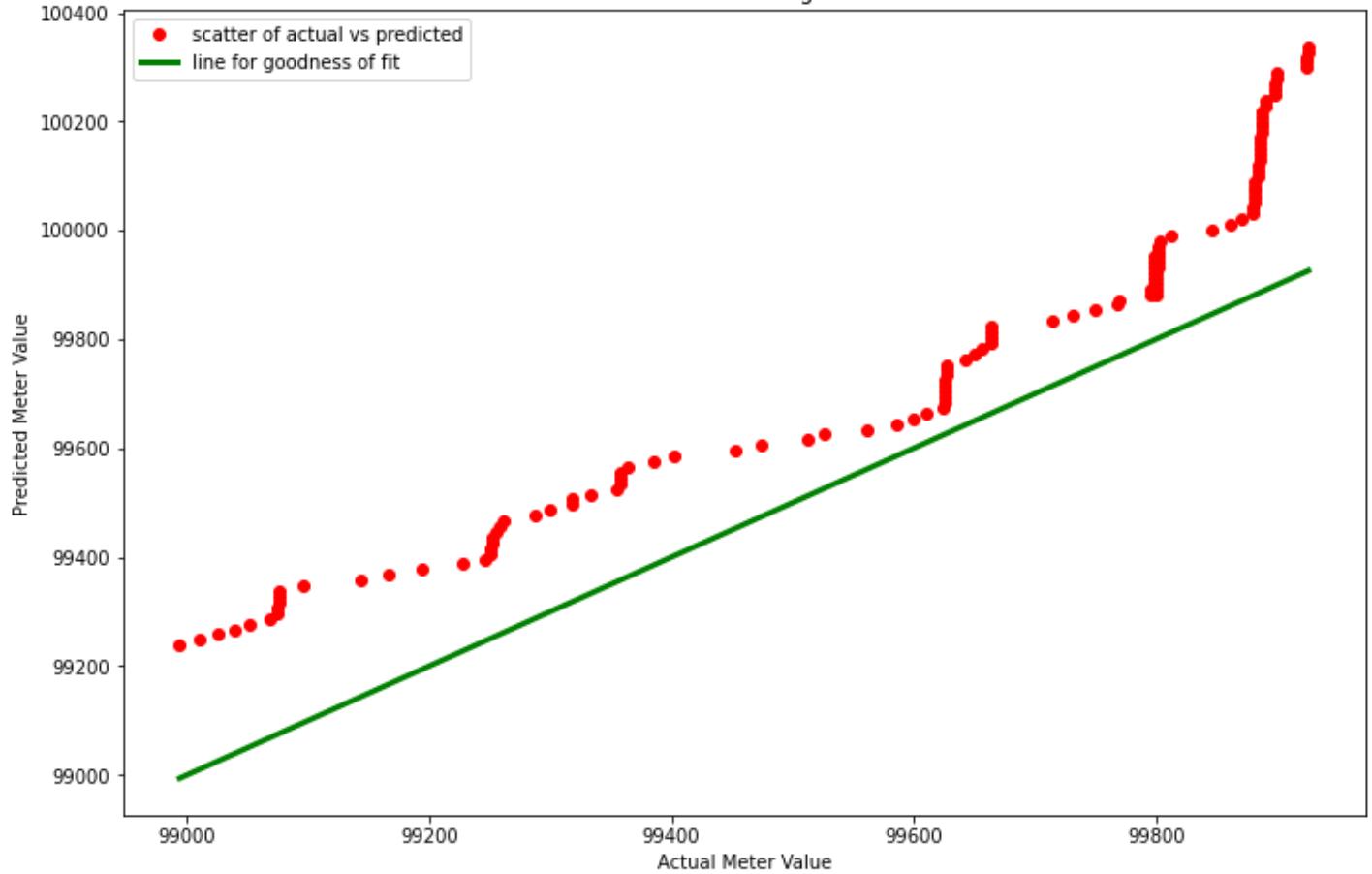
Scatter Plot - Household 1042.0 Testing MSE : 3658.421091054774



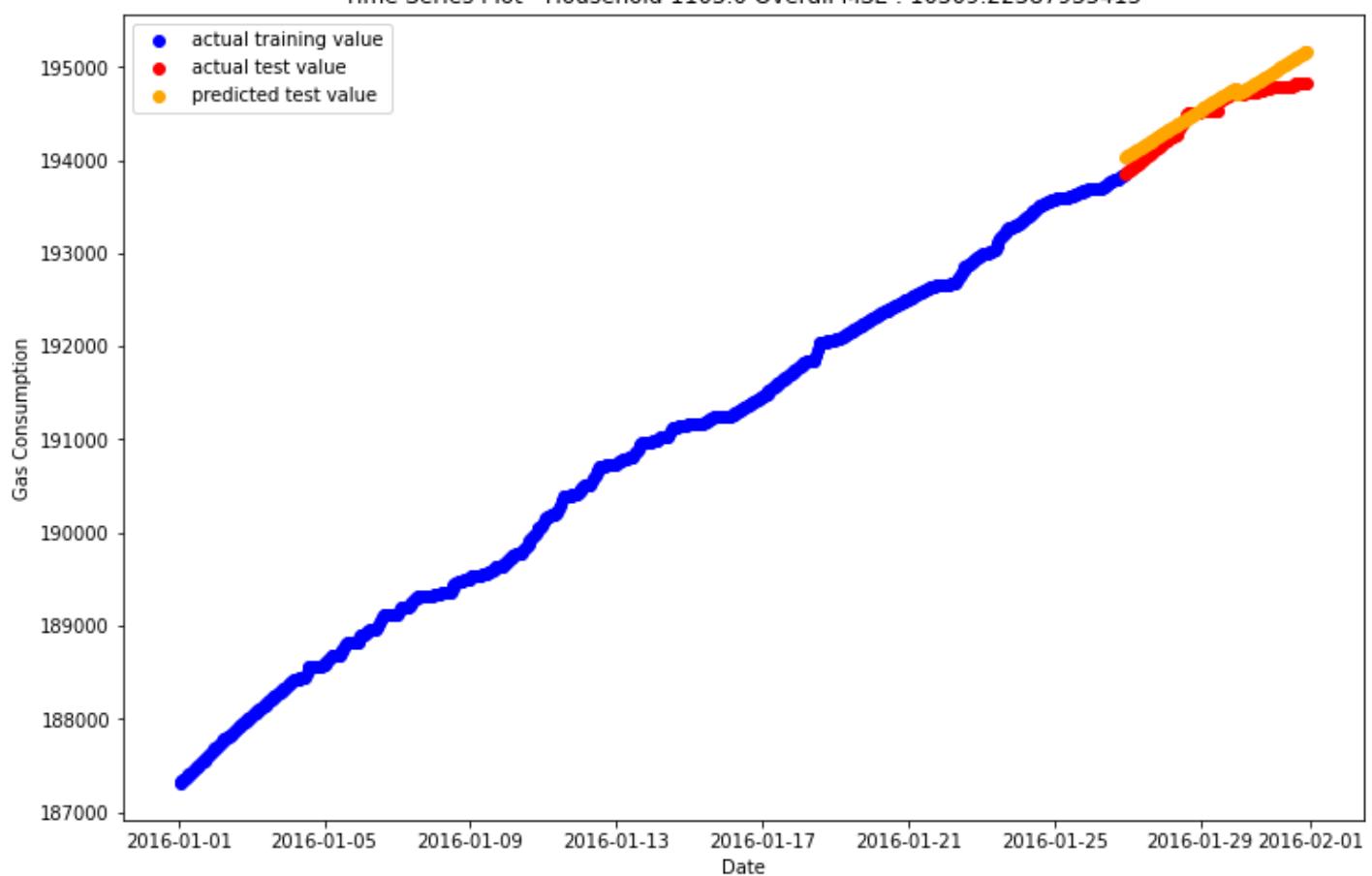
Time Series Plot - Household 1086.0 Overall MSE : 15505.363464318796



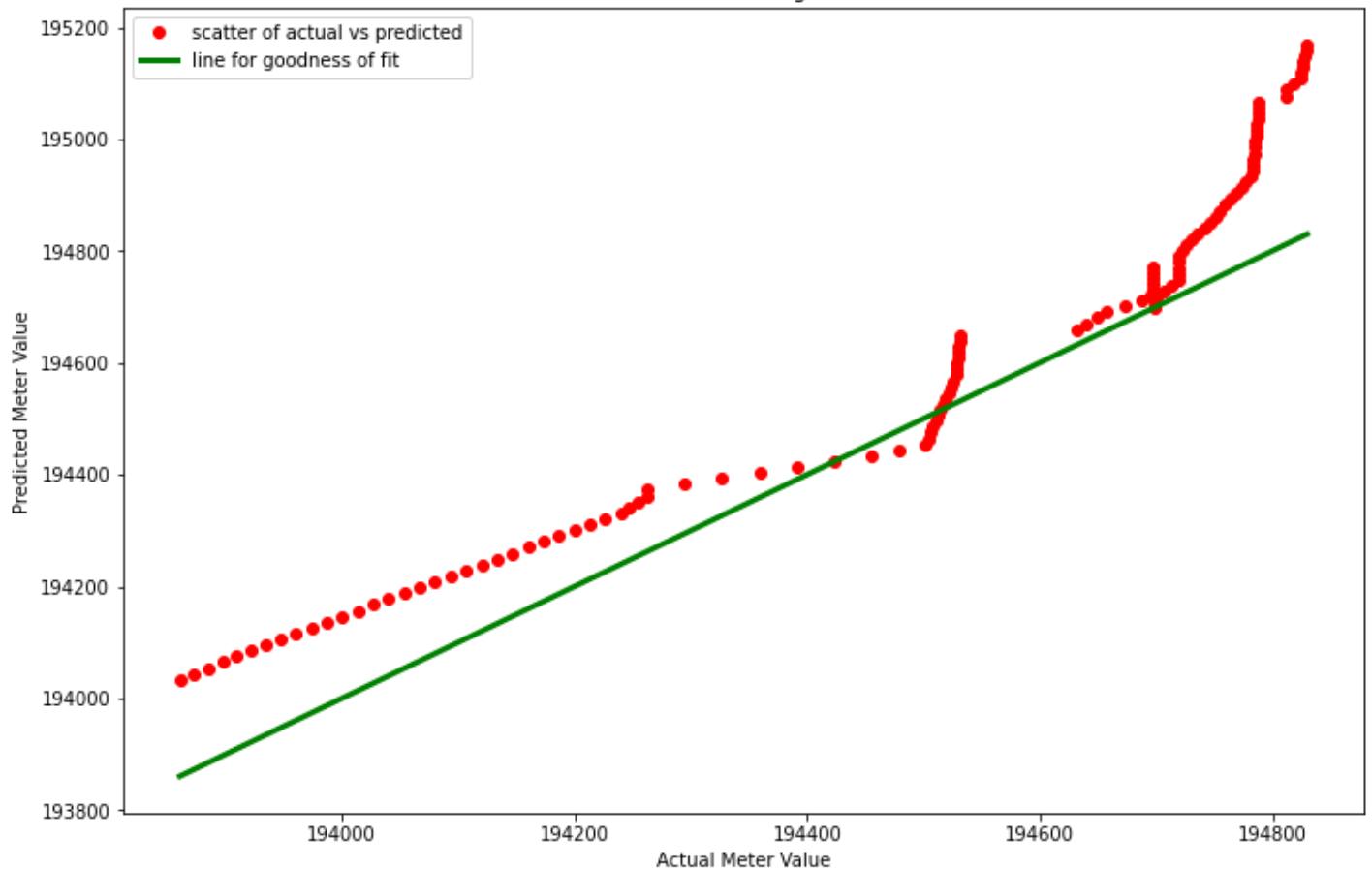
Scatter Plot - Household 1086.0 Testing MSE : 43030.65162630437



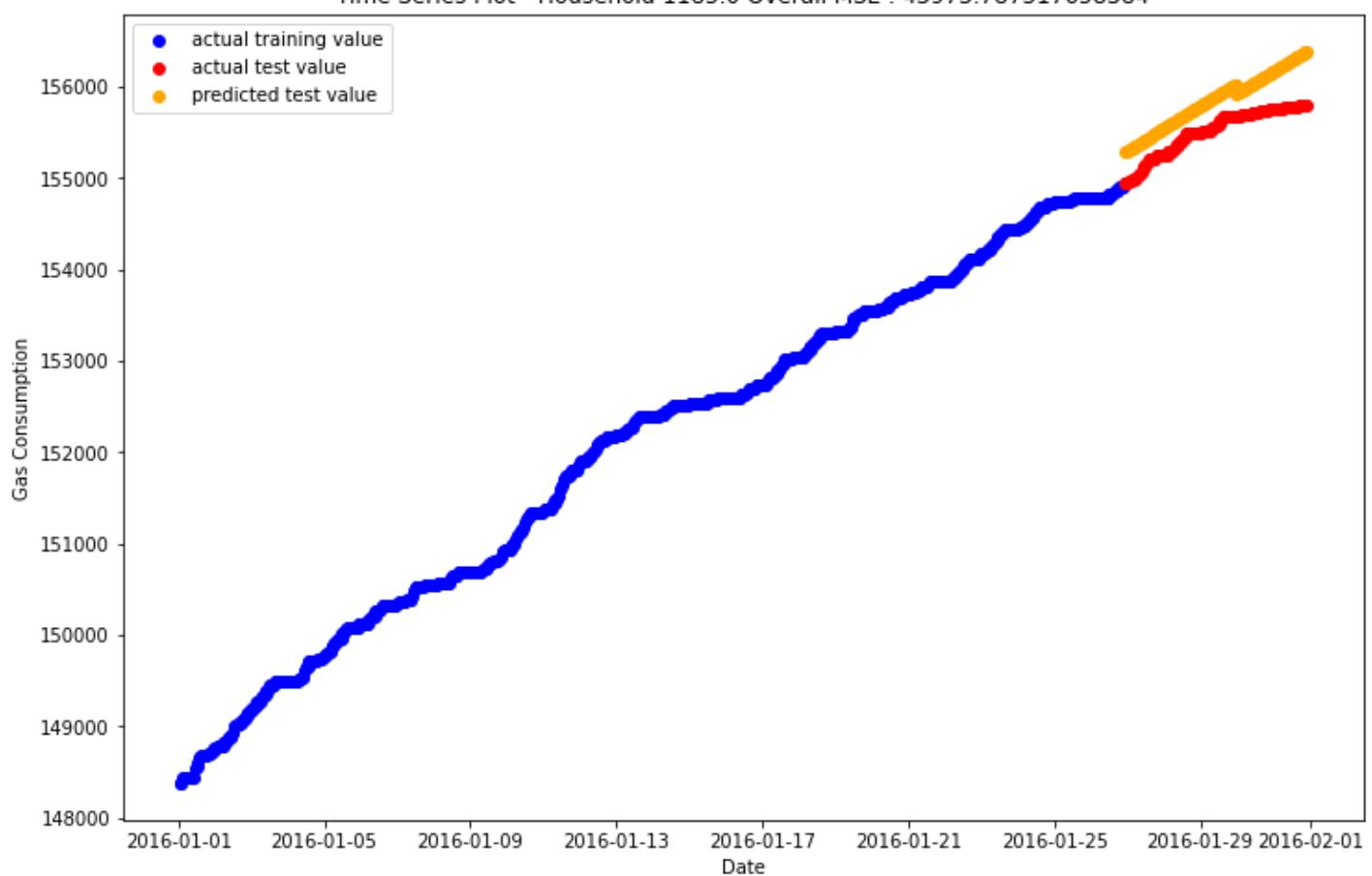
Time Series Plot - Household 1103.0 Overall MSE : 10309.22387935415



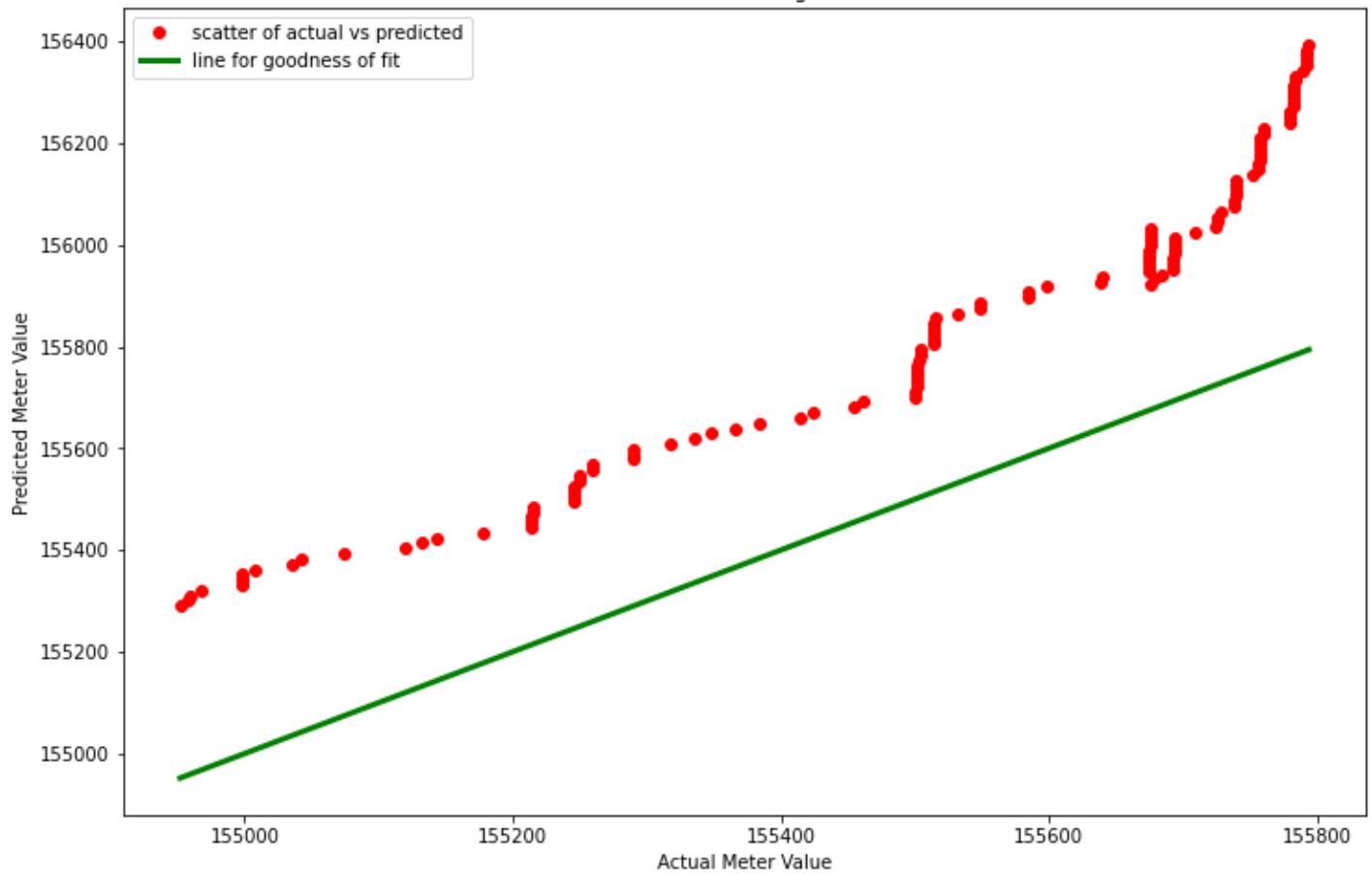
Scatter Plot - Household 1103.0 Testing MSE : 20602.415714704697



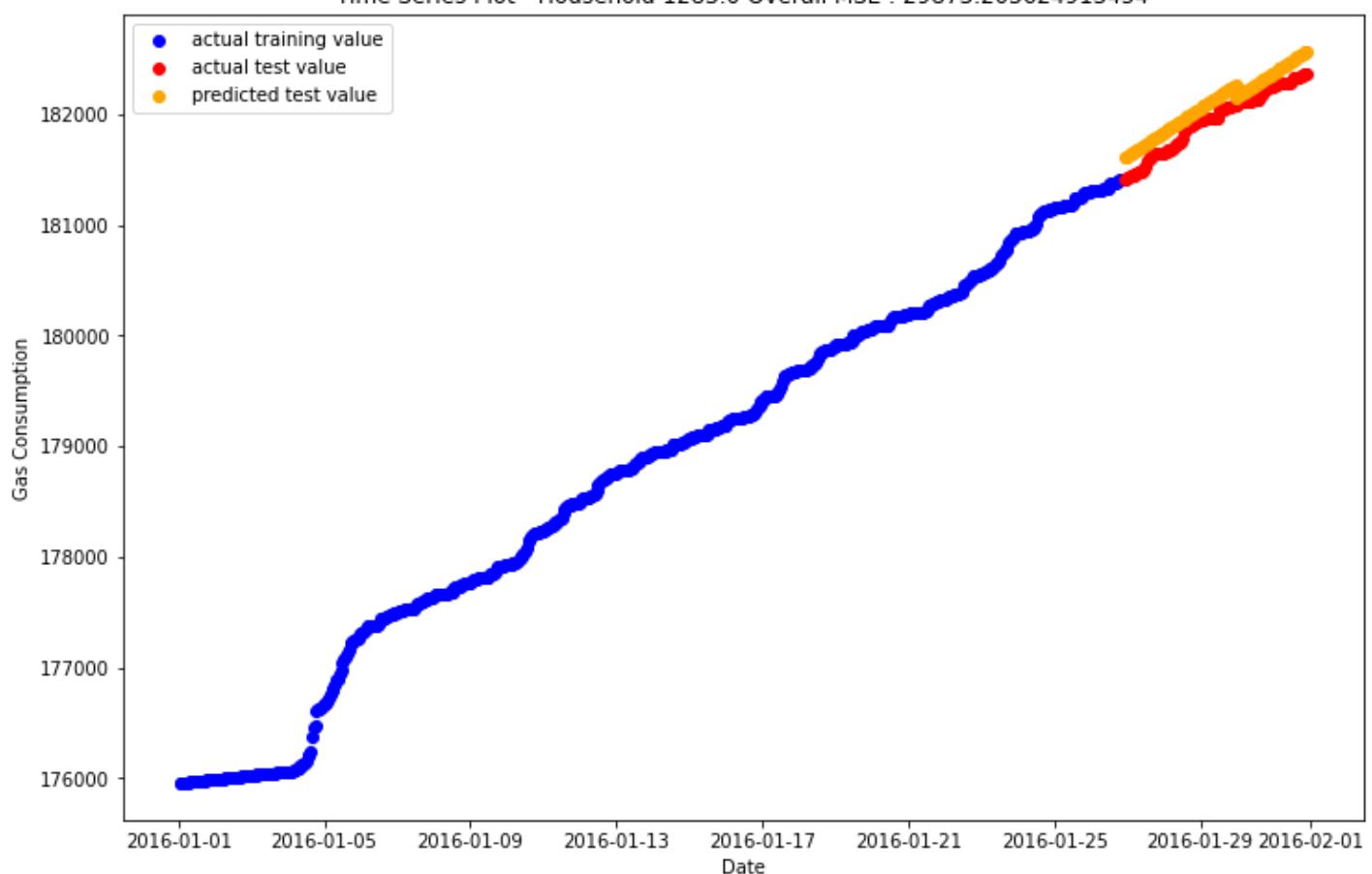
Time Series Plot - Household 1185.0 Overall MSE : 43973.787517658384



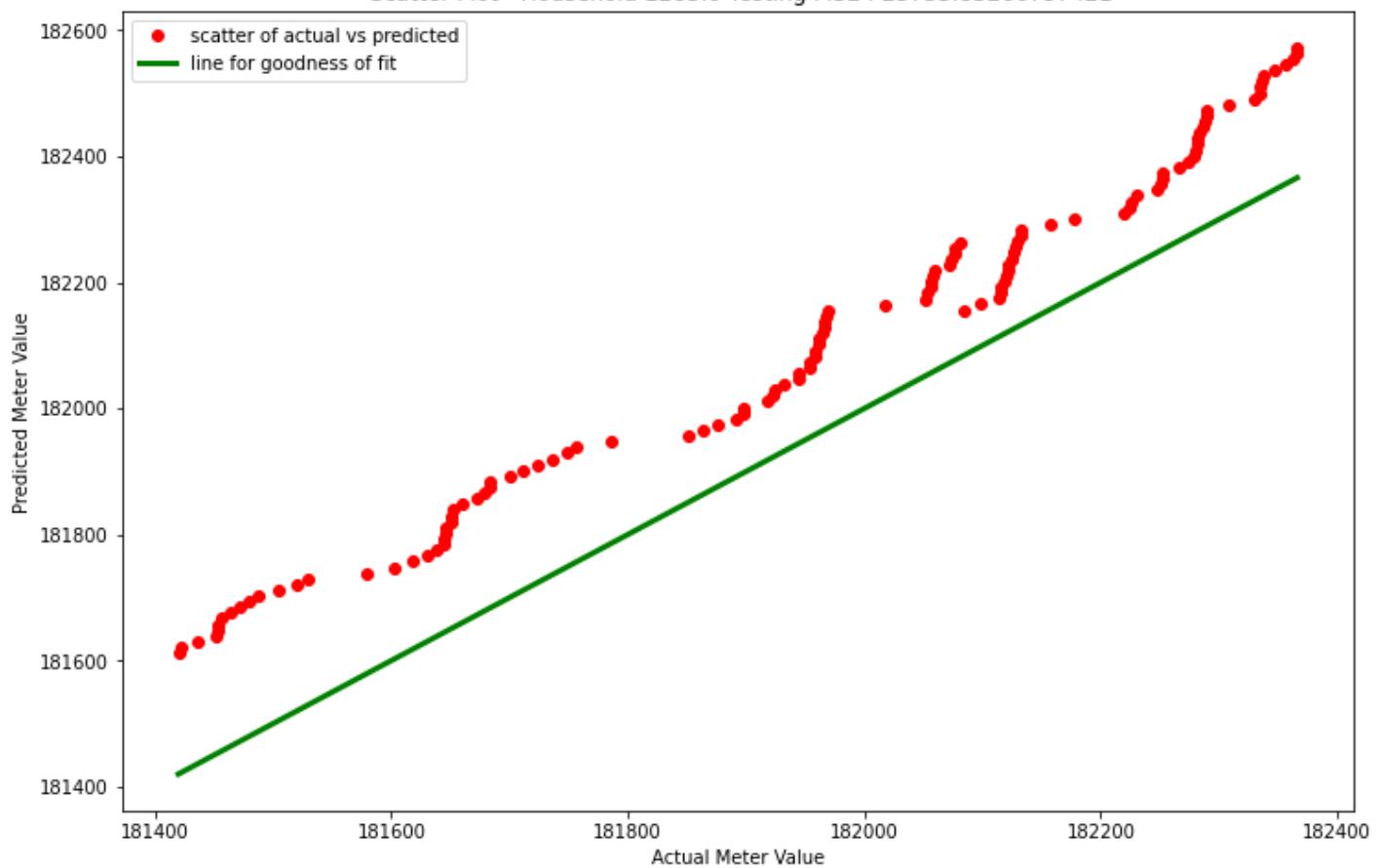
Scatter Plot - Household 1185.0 Testing MSE : 123264.45541013418



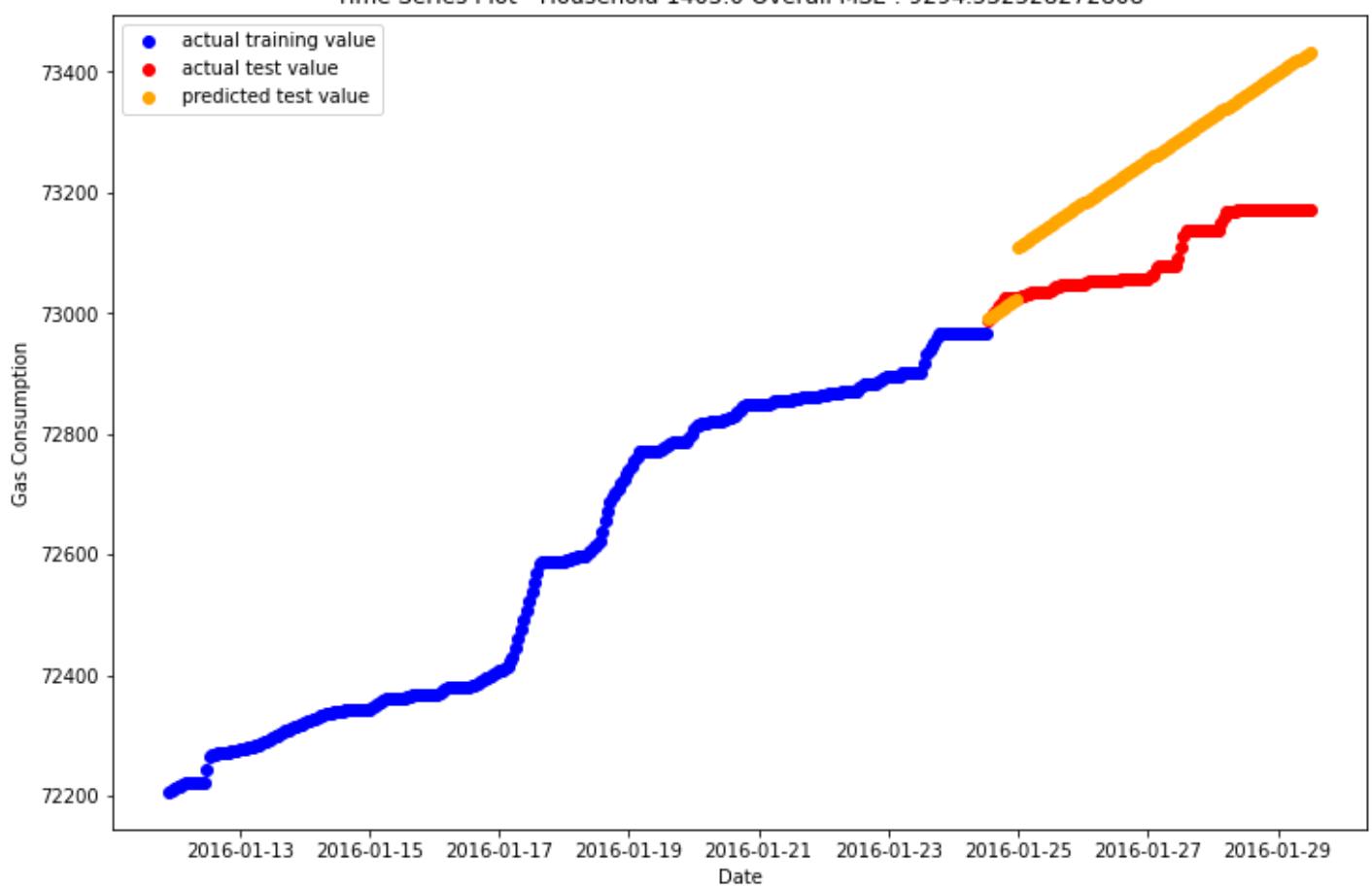
Time Series Plot - Household 1283.0 Overall MSE : 29873.203624913454



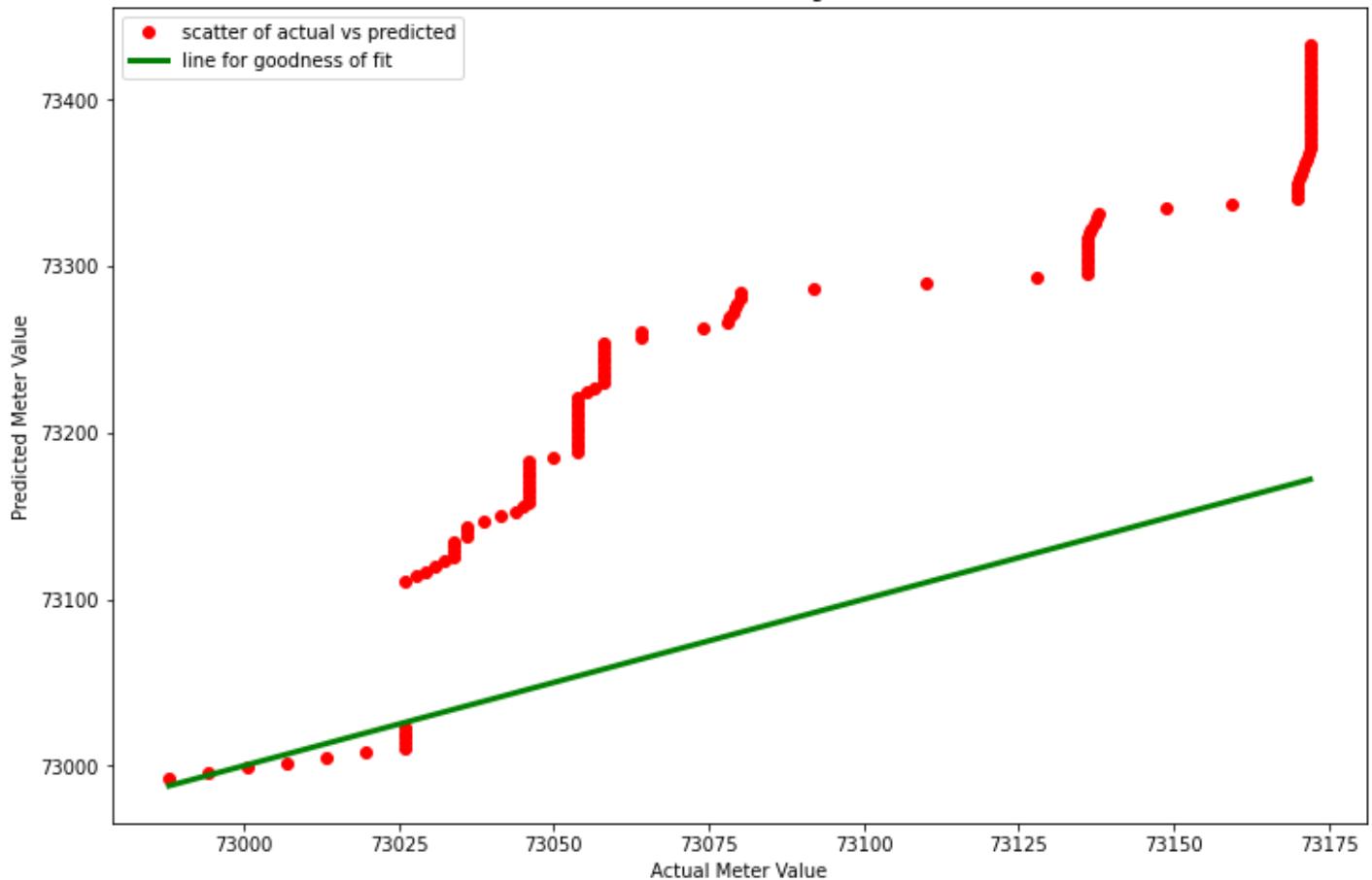
Scatter Plot - Household 1283.0 Testing MSE : 23733.83266757421



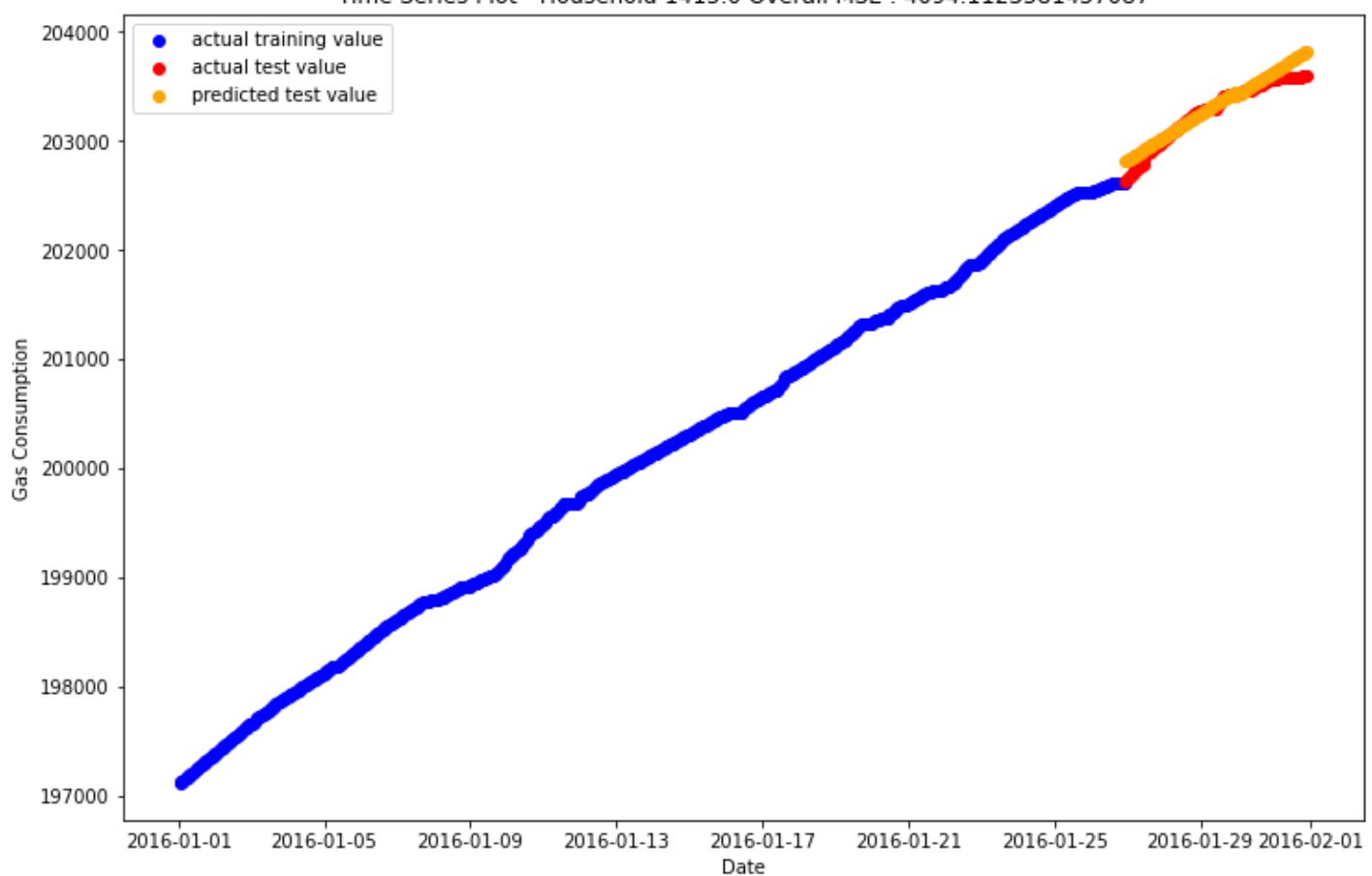
Time Series Plot - Household 1403.0 Overall MSE : 9294.532528272808



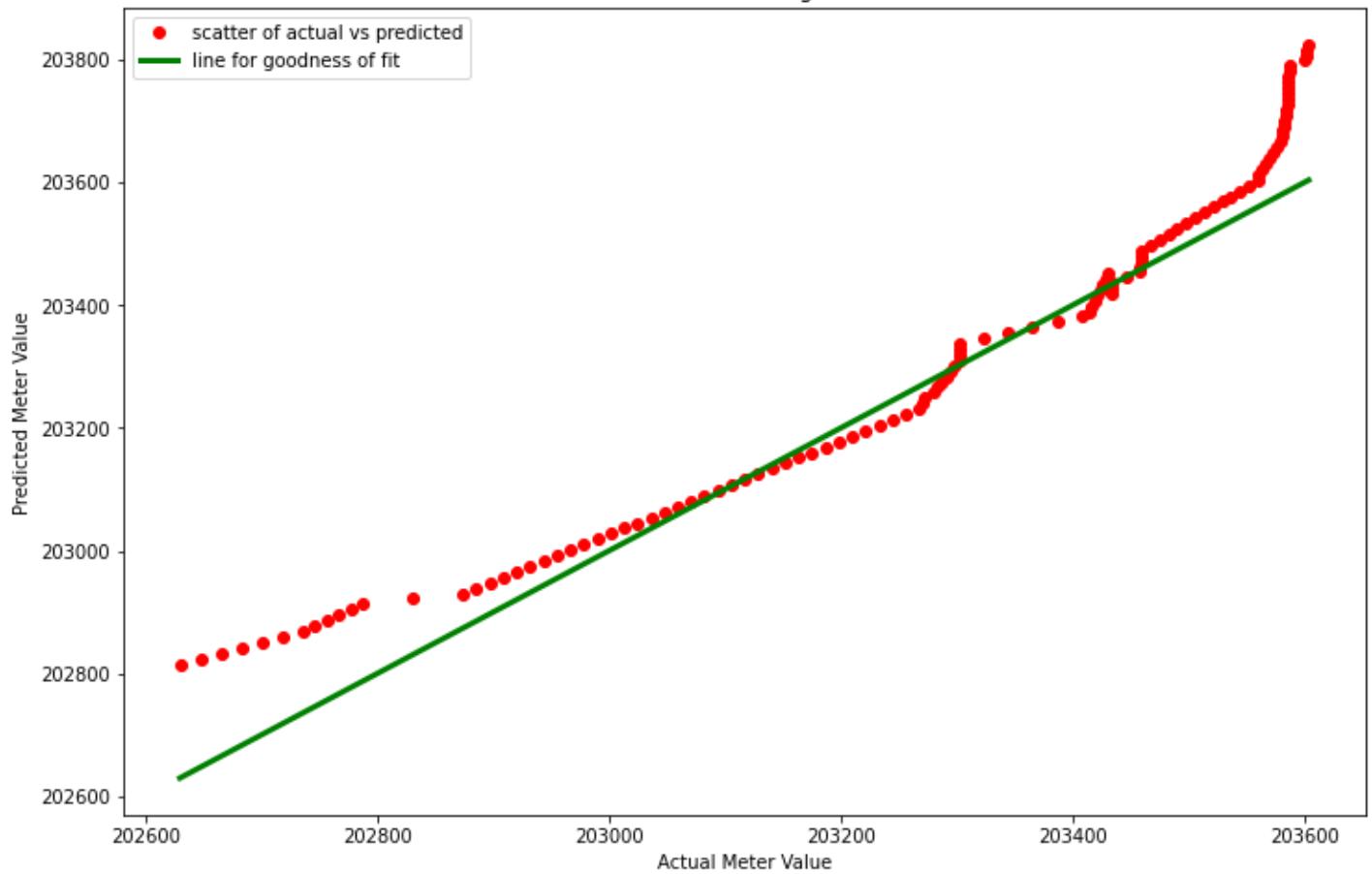
Scatter Plot - Household 1403.0 Testing MSE : 28483.540165646



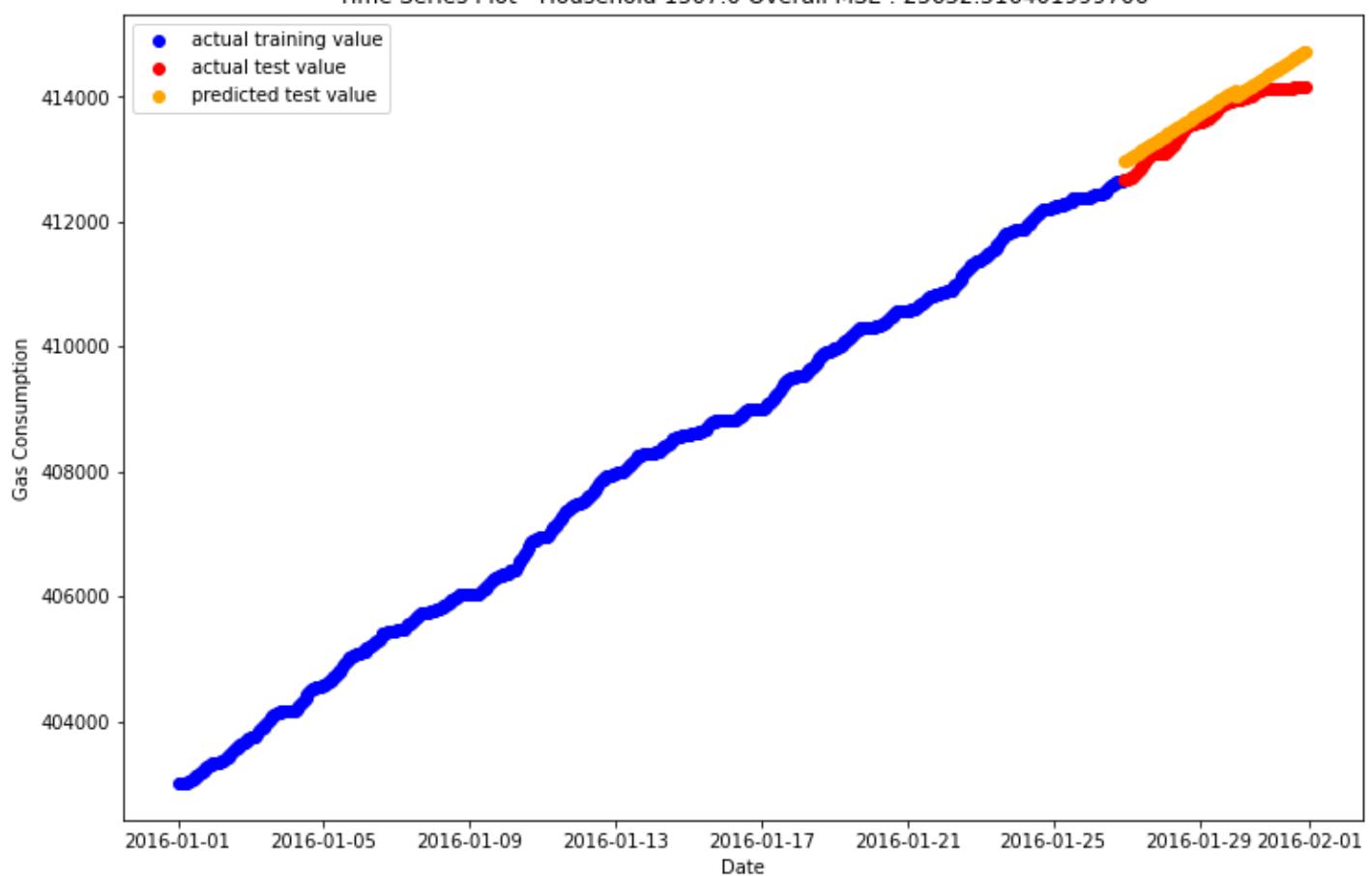
Time Series Plot - Household 1415.0 Overall MSE : 4094.1123581437087



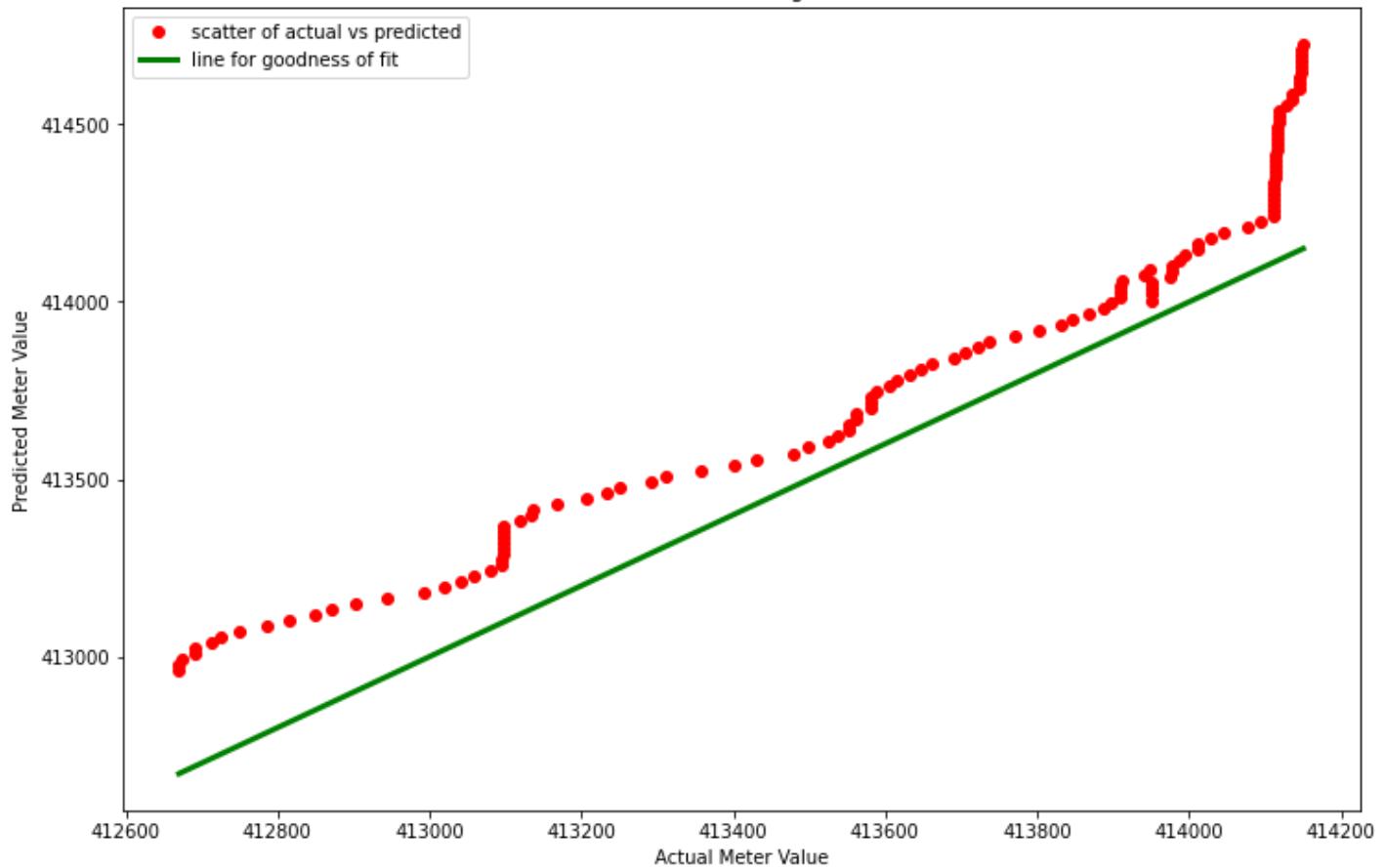
Scatter Plot - Household 1415.0 Testing MSE : 7169.962653859719



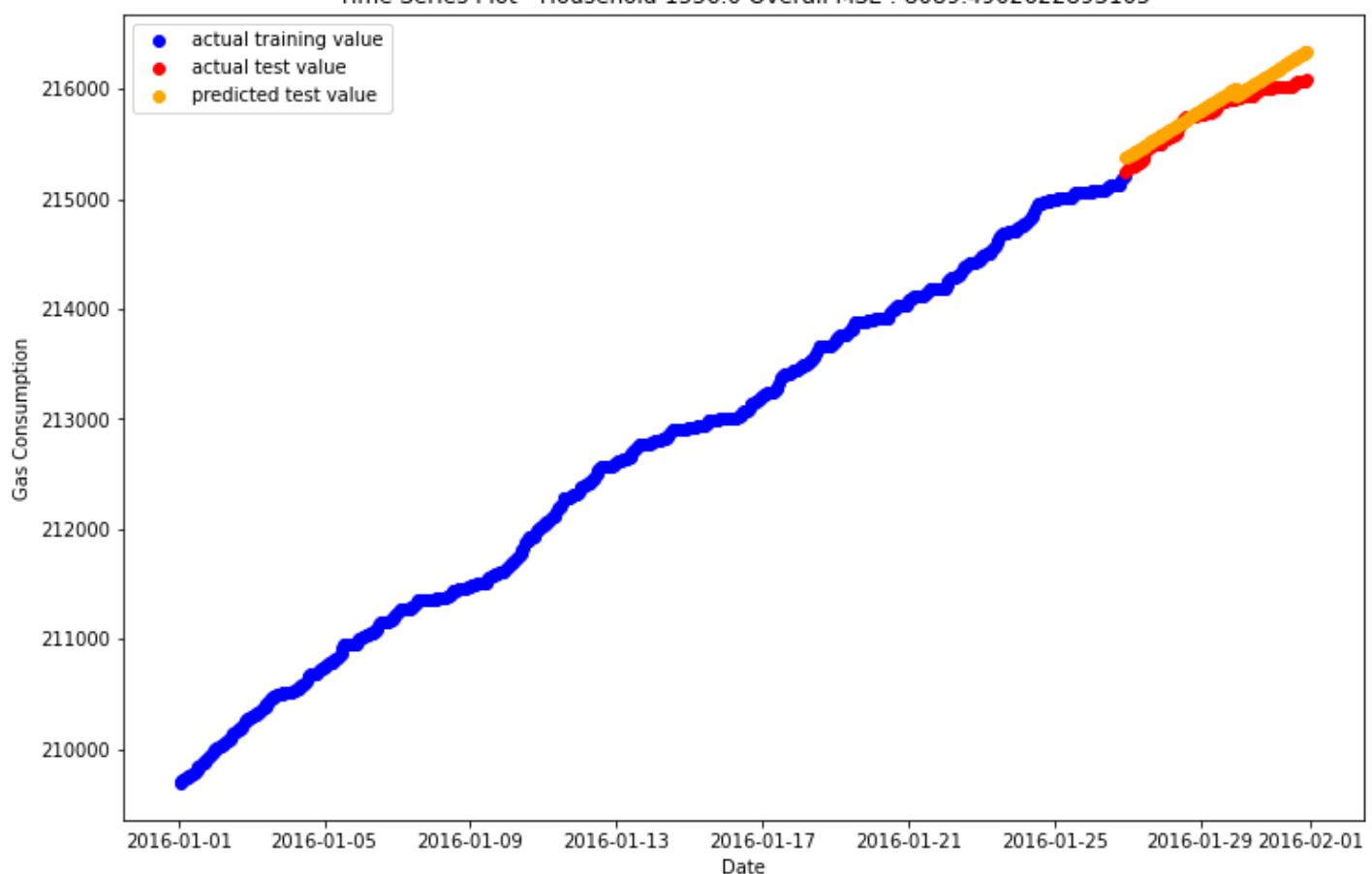
Time Series Plot - Household 1507.0 Overall MSE : 25652.516401999706



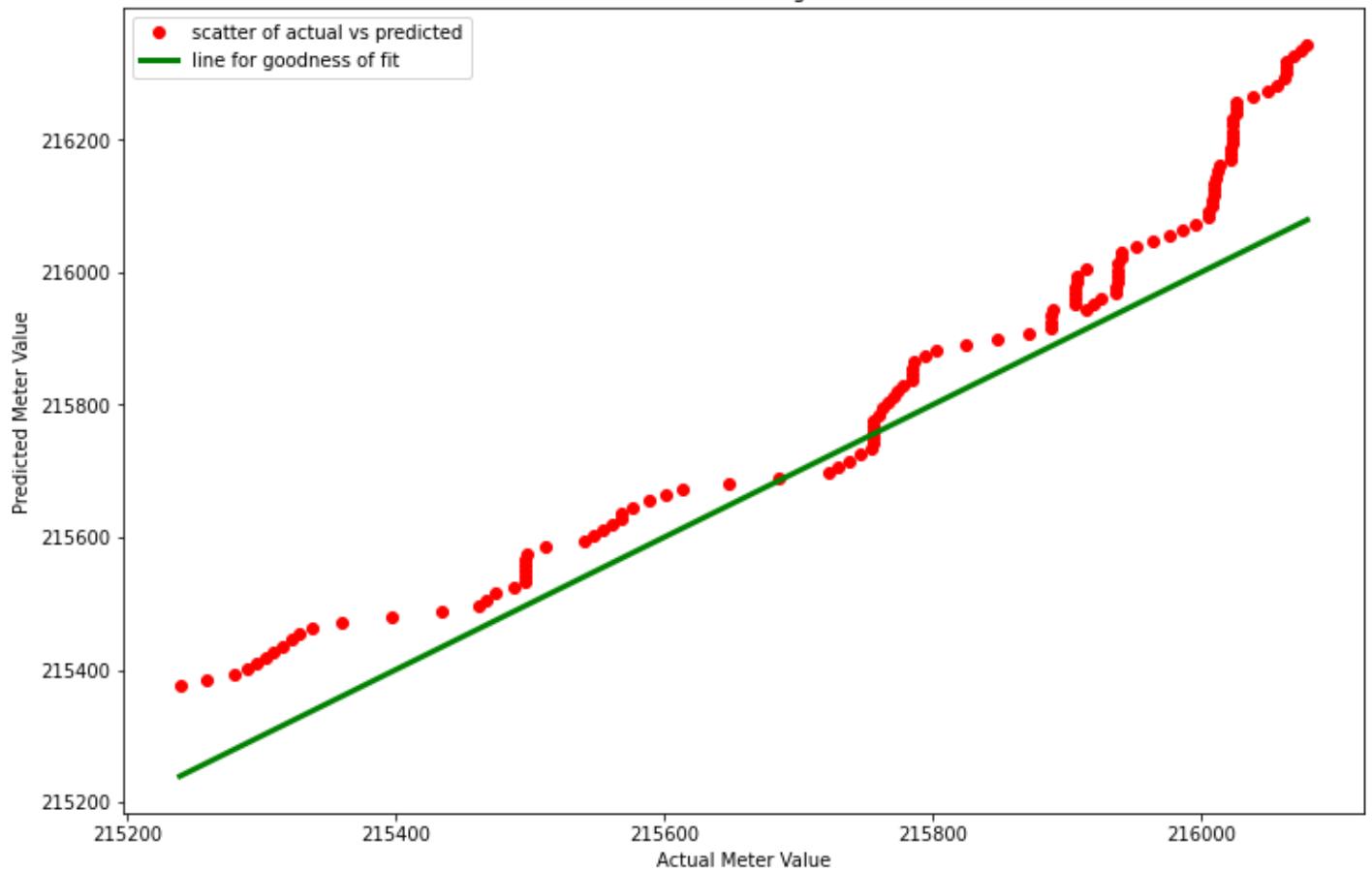
Scatter Plot - Household 1507.0 Testing MSE : 65143.993020567454



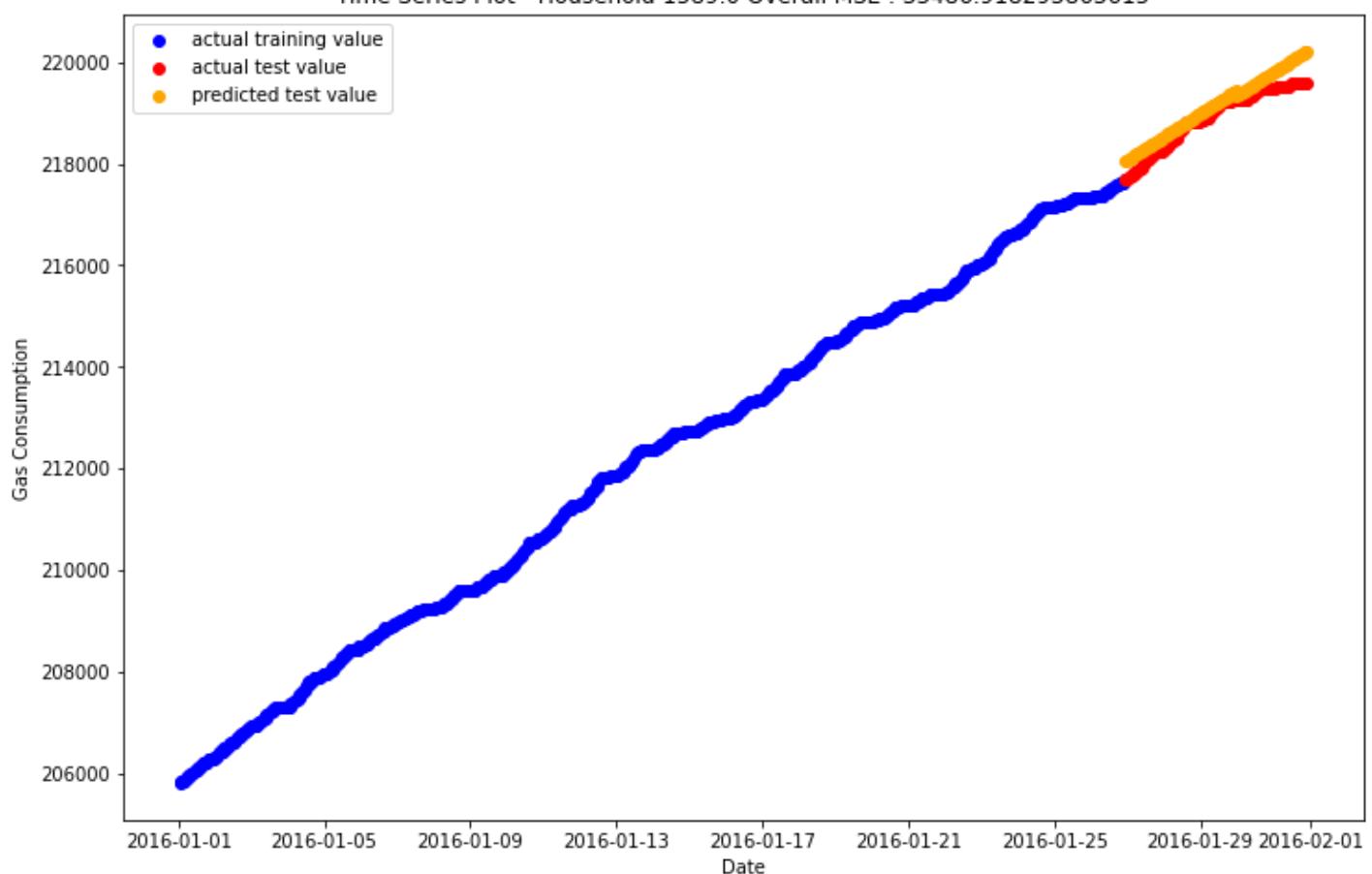
Time Series Plot - Household 1556.0 Overall MSE : 8089.4902622893105



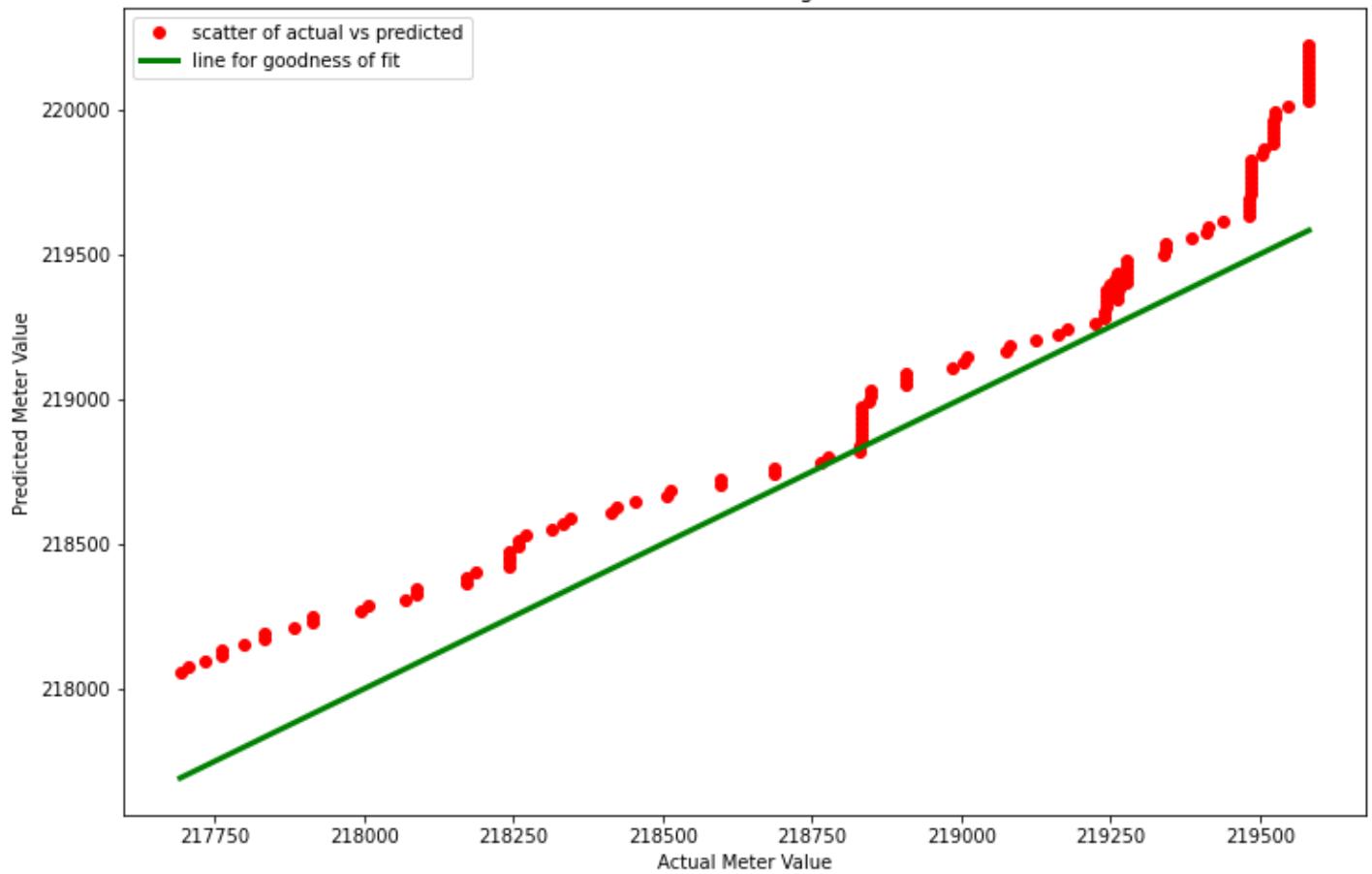
Scatter Plot - Household 1556.0 Testing MSE : 12847.740807590493



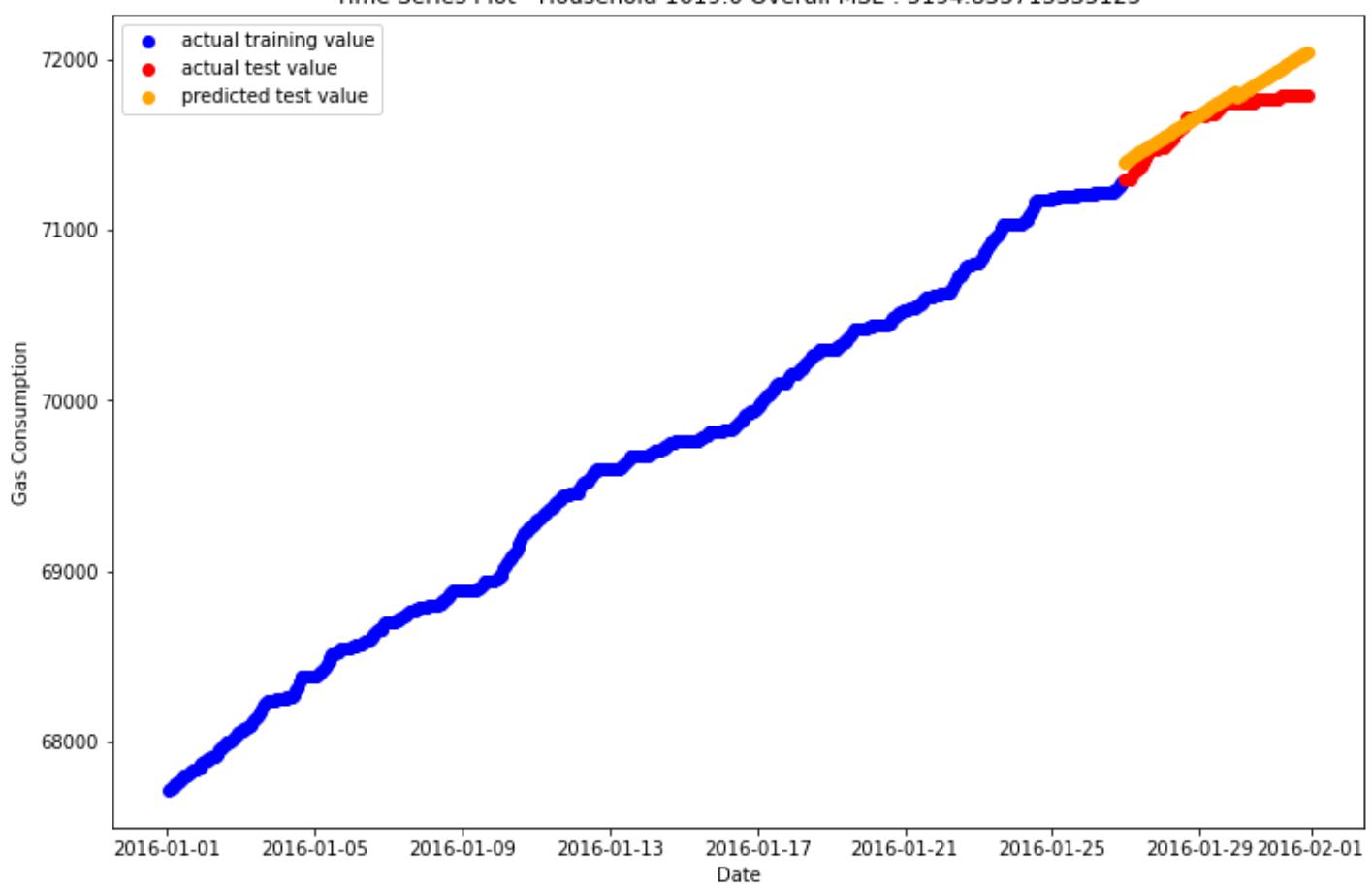
Time Series Plot - Household 1589.0 Overall MSE : 35486.918293863615



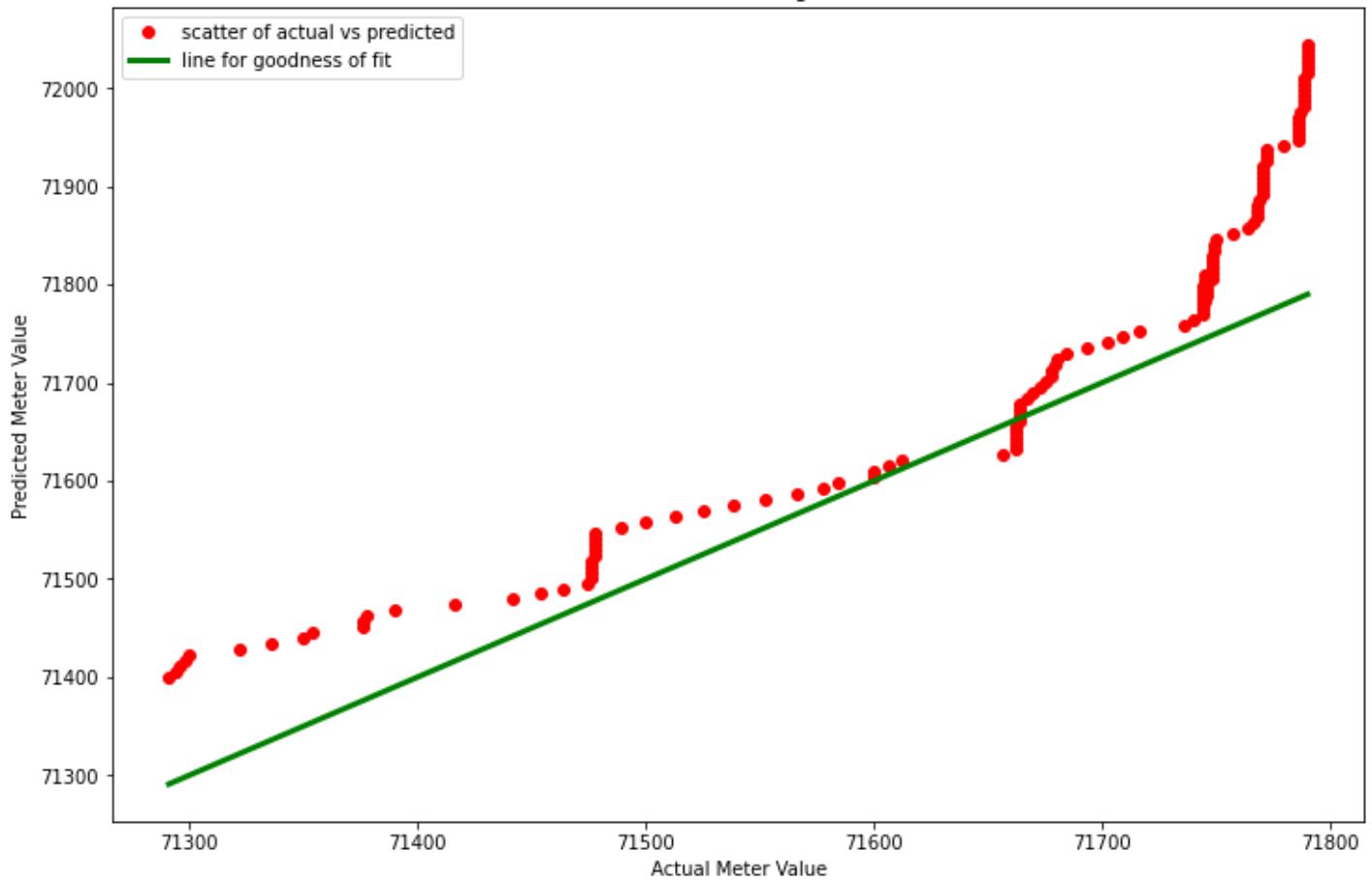
Scatter Plot - Household 1589.0 Testing MSE : 75425.72408298201



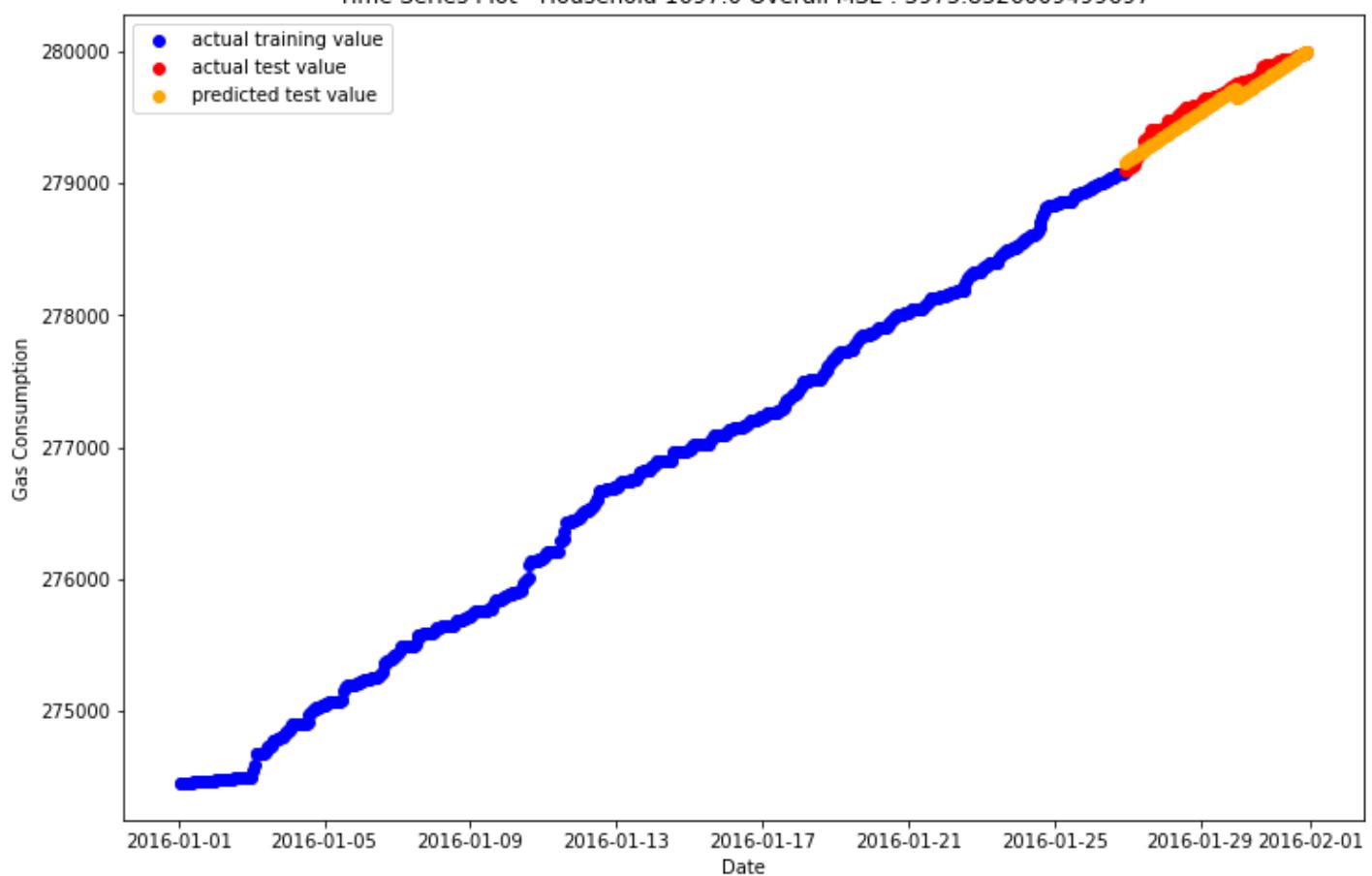
Time Series Plot - Household 1619.0 Overall MSE : 5194.833715335125



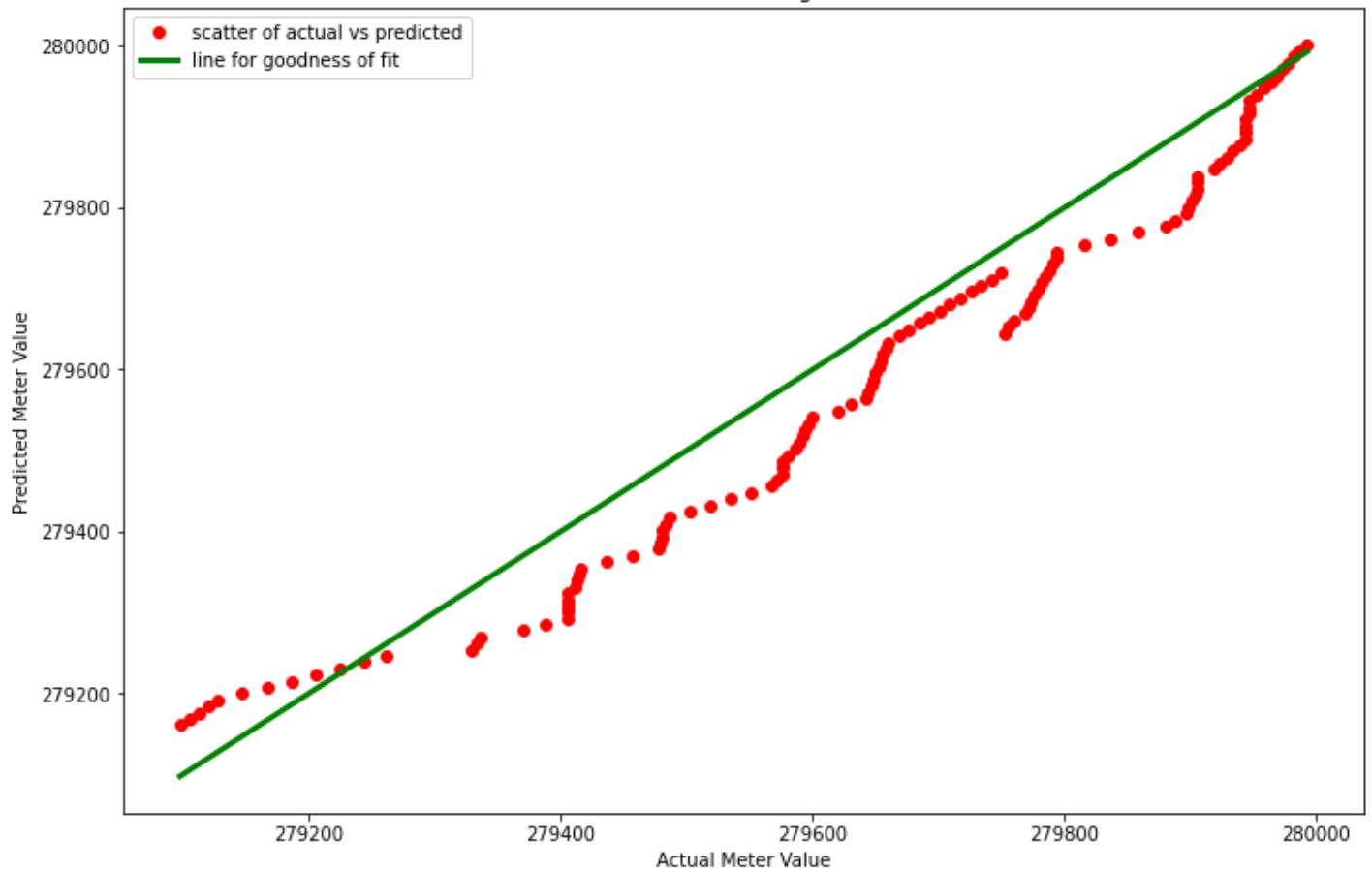
Scatter Plot - Household 1619.0 Testing MSE : 11248.79041719588



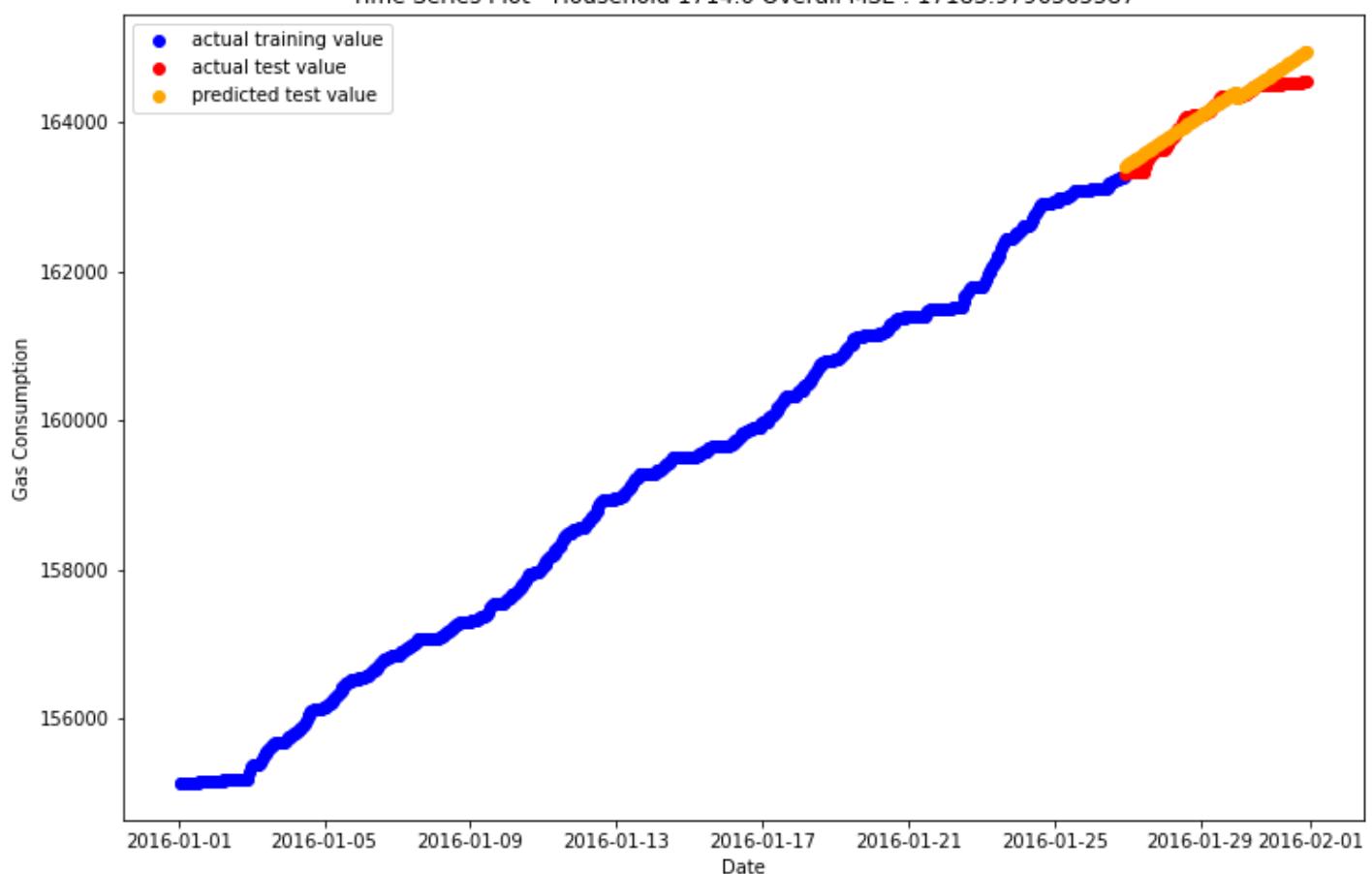
Time Series Plot - Household 1697.0 Overall MSE : 3975.8526009499697



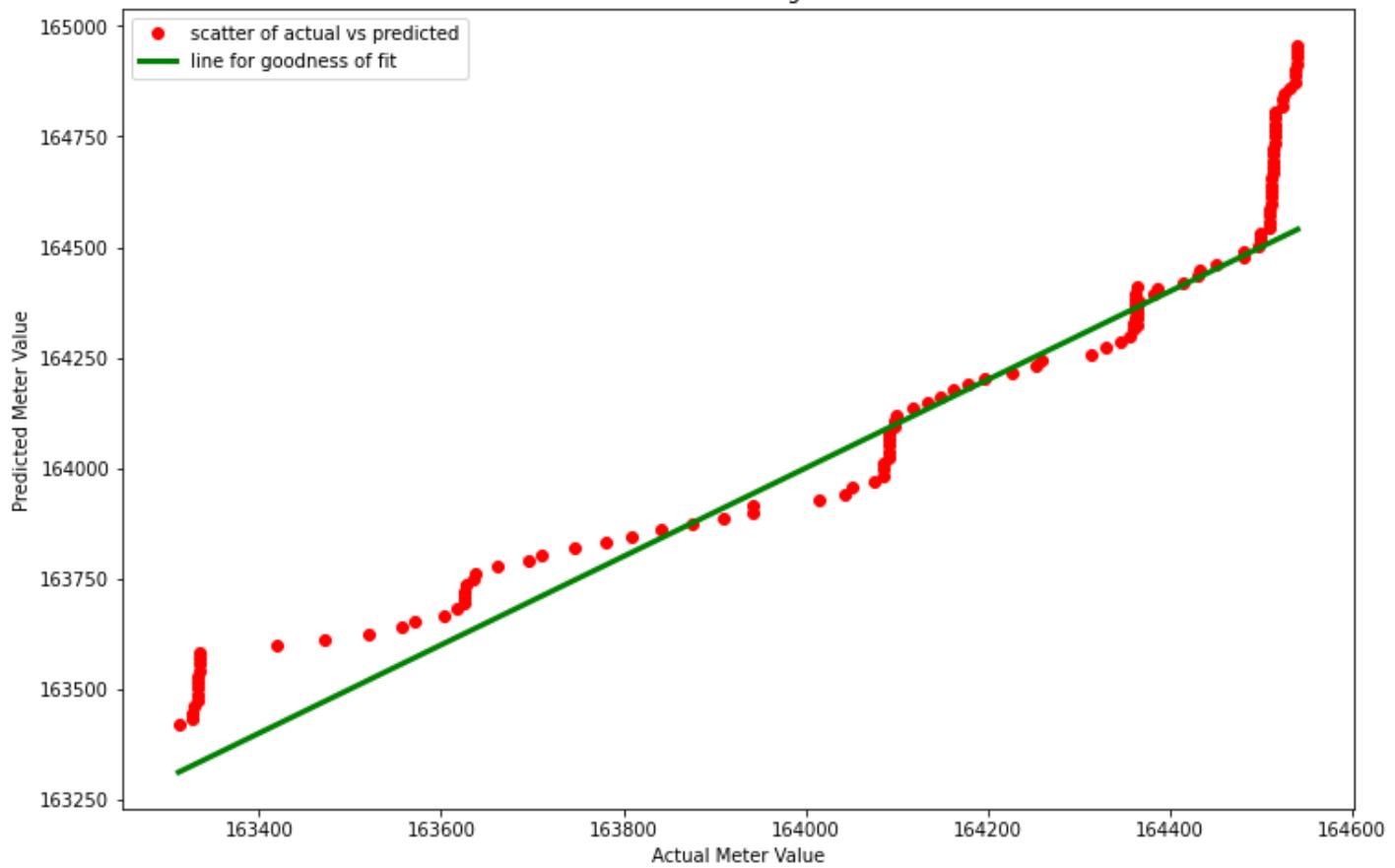
Scatter Plot - Household 1697.0 Testing MSE : 4816.303184180705



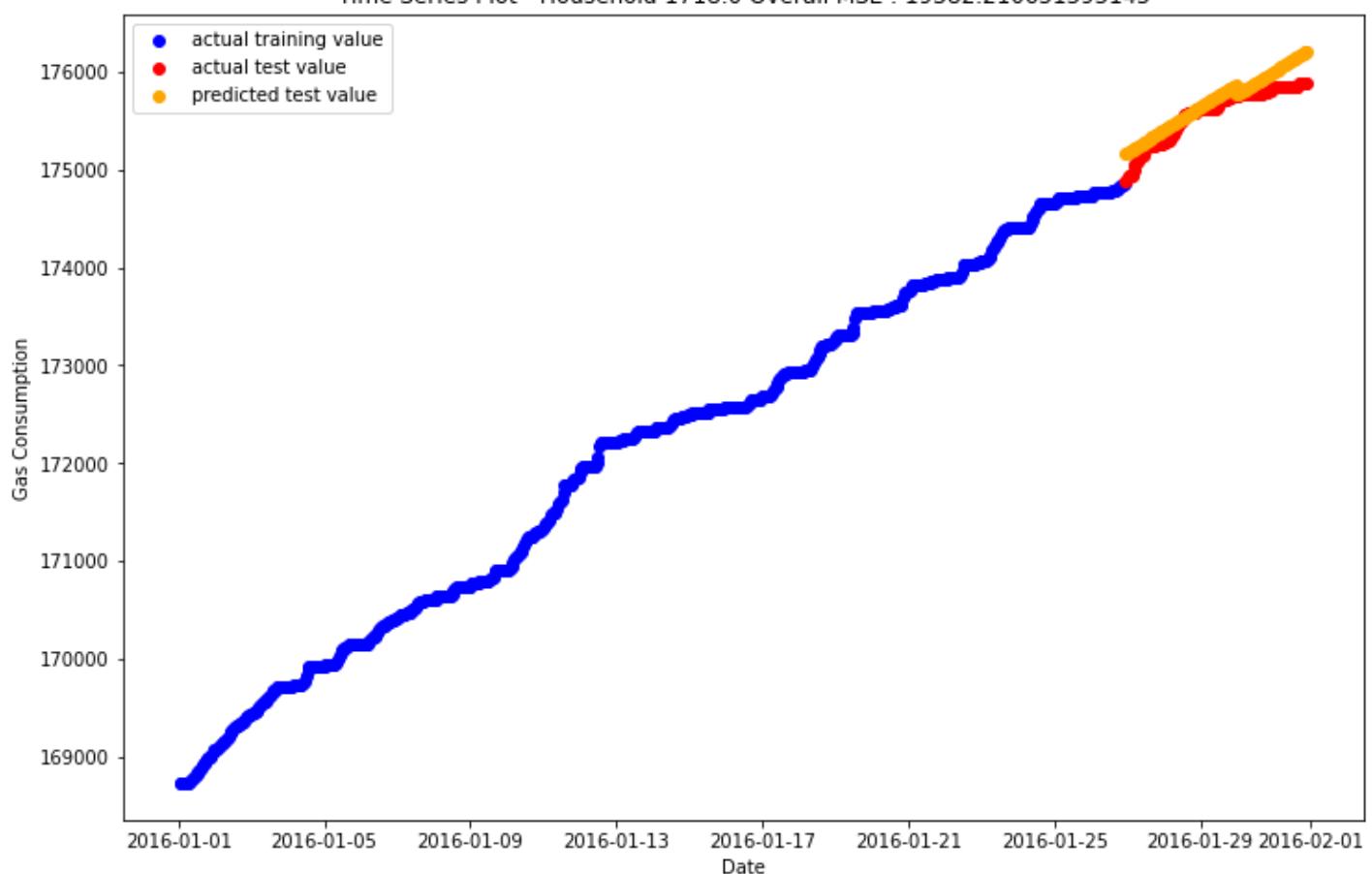
Time Series Plot - Household 1714.0 Overall MSE : 17183.9796565587



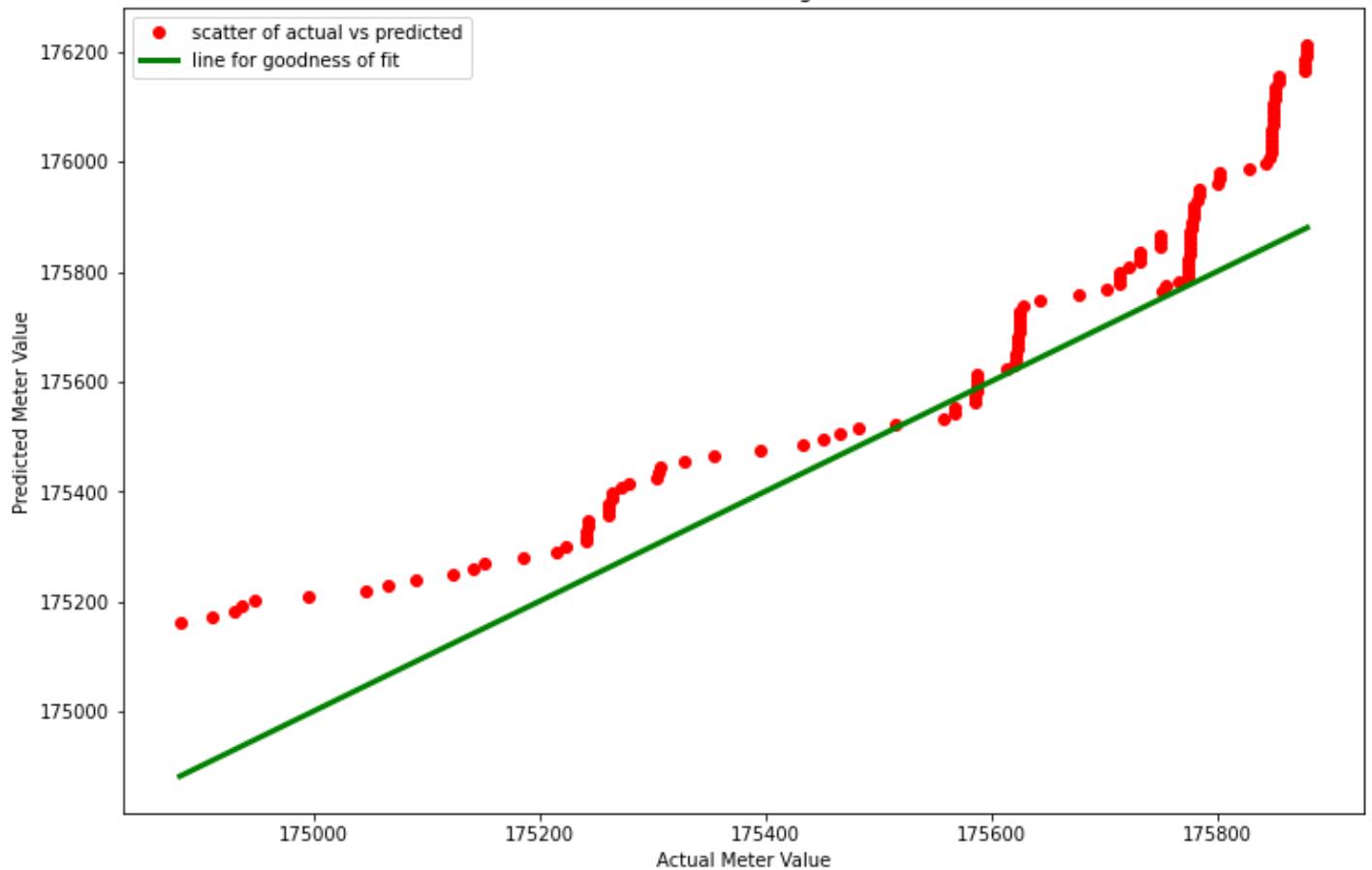
Scatter Plot - Household 1714.0 Testing MSE : 22782.214936957556



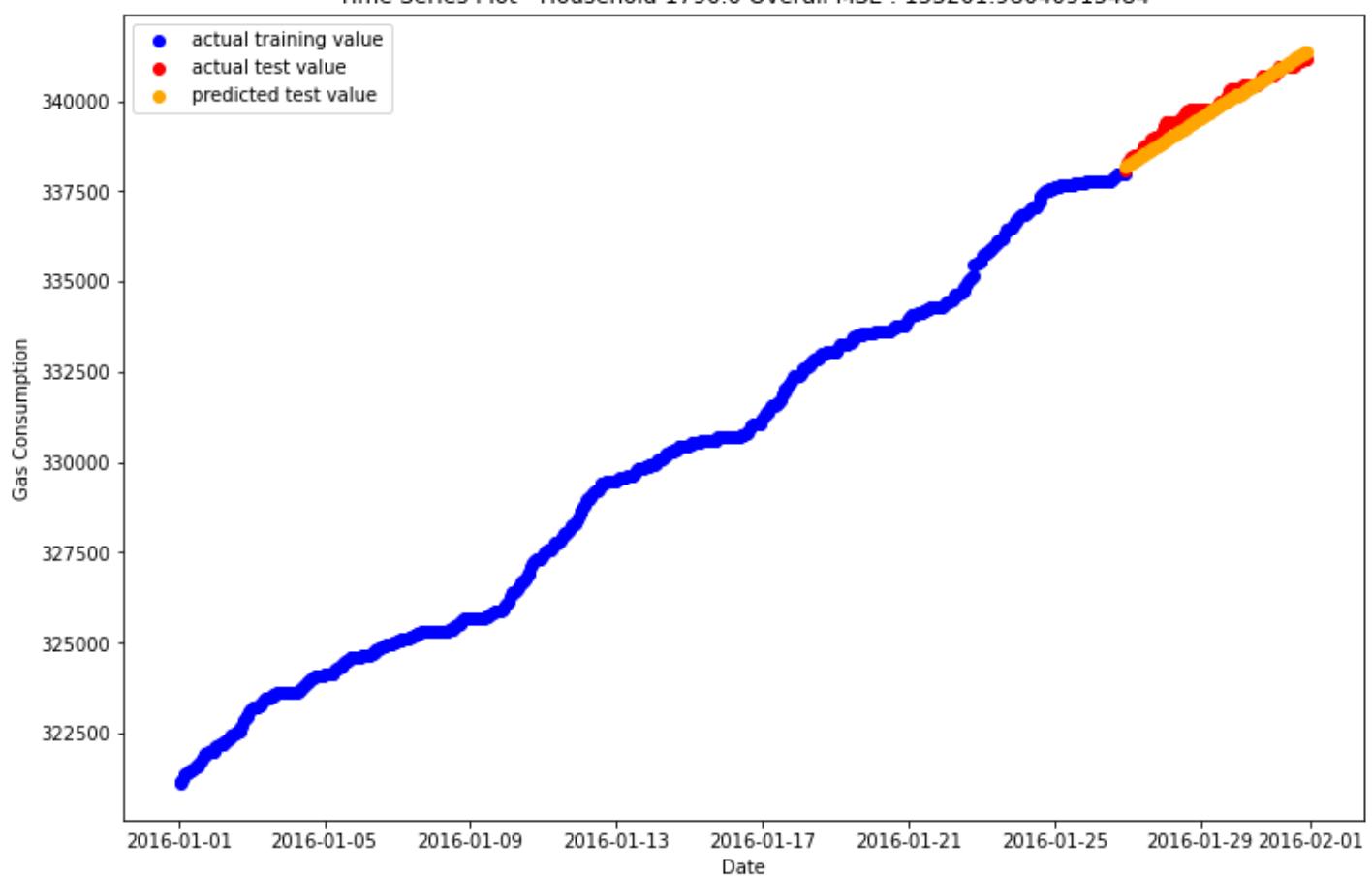
Time Series Plot - Household 1718.0 Overall MSE : 19382.210651595145



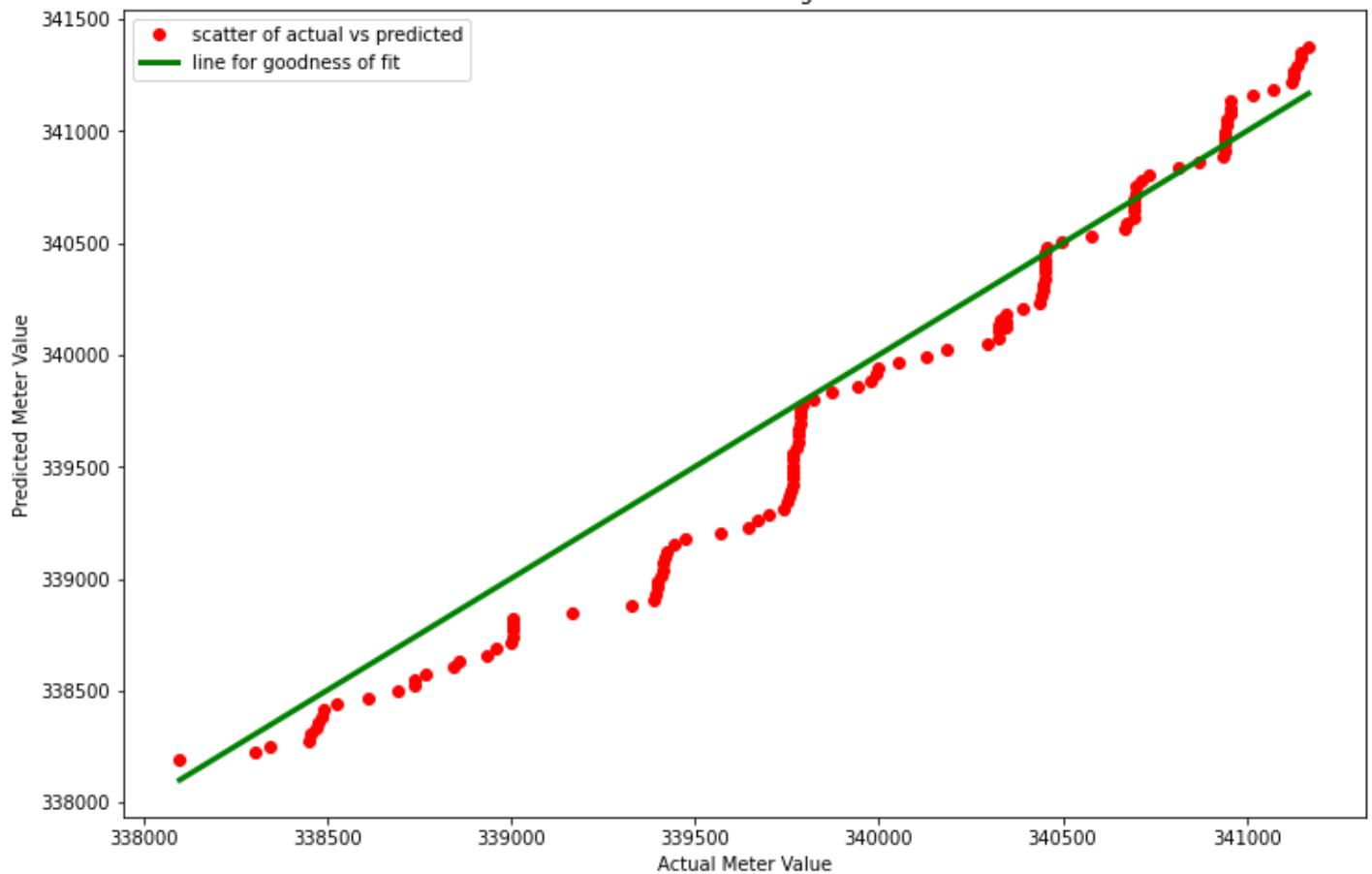
Scatter Plot - Household 1718.0 Testing MSE : 22570.53916233234



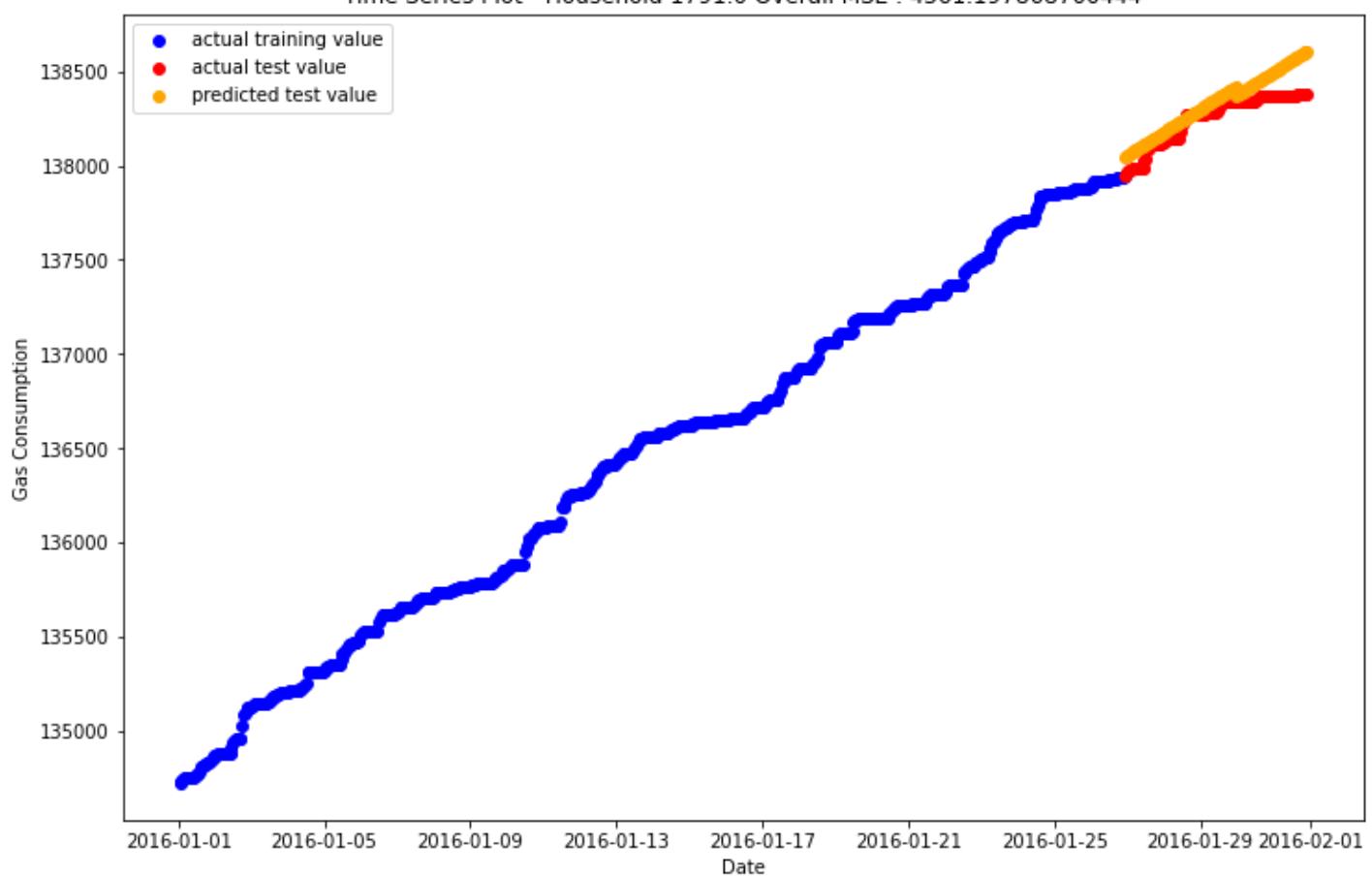
Time Series Plot - Household 1790.0 Overall MSE : 153201.98040915484



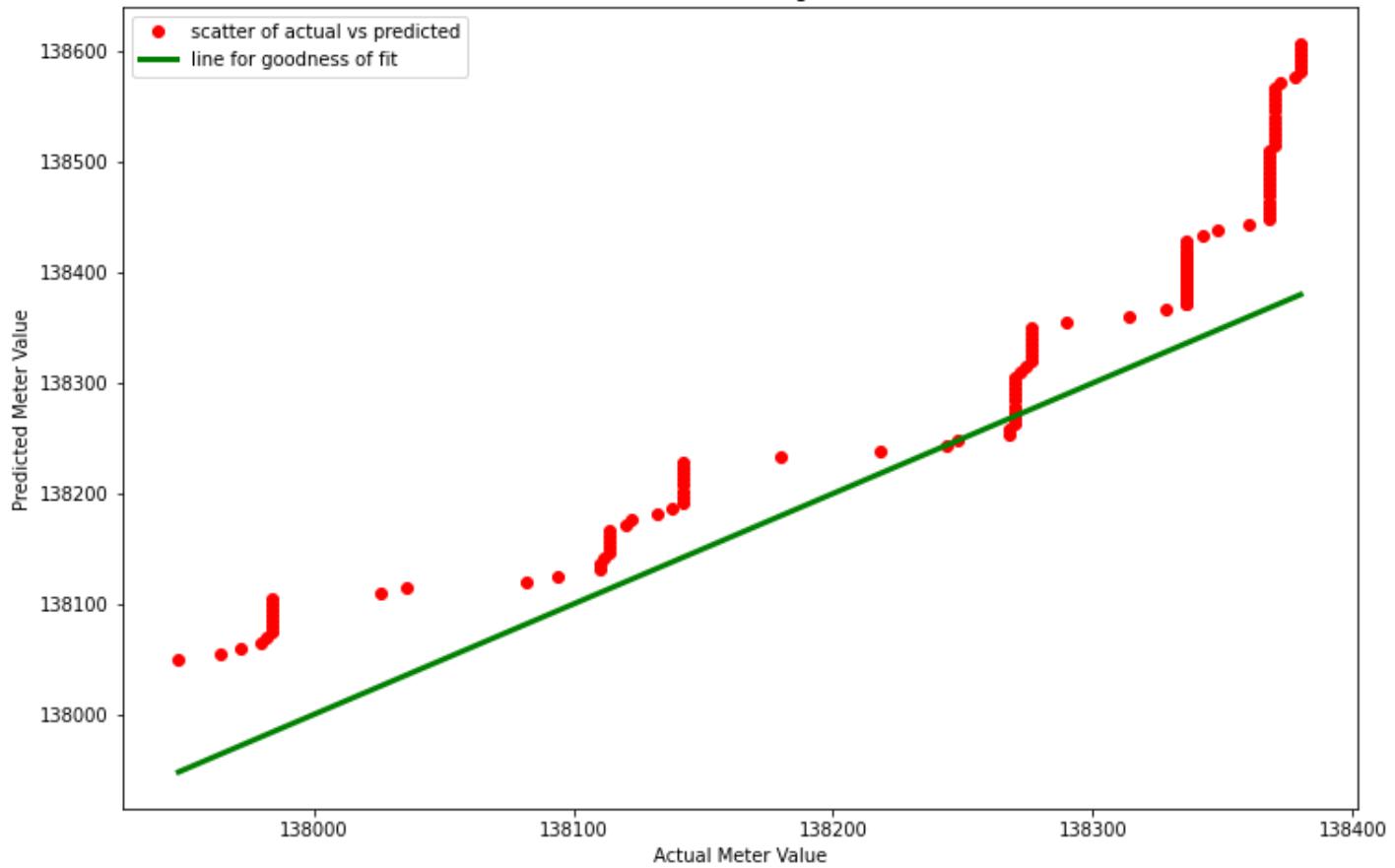
Scatter Plot - Household 1790.0 Testing MSE : 46536.59509296021



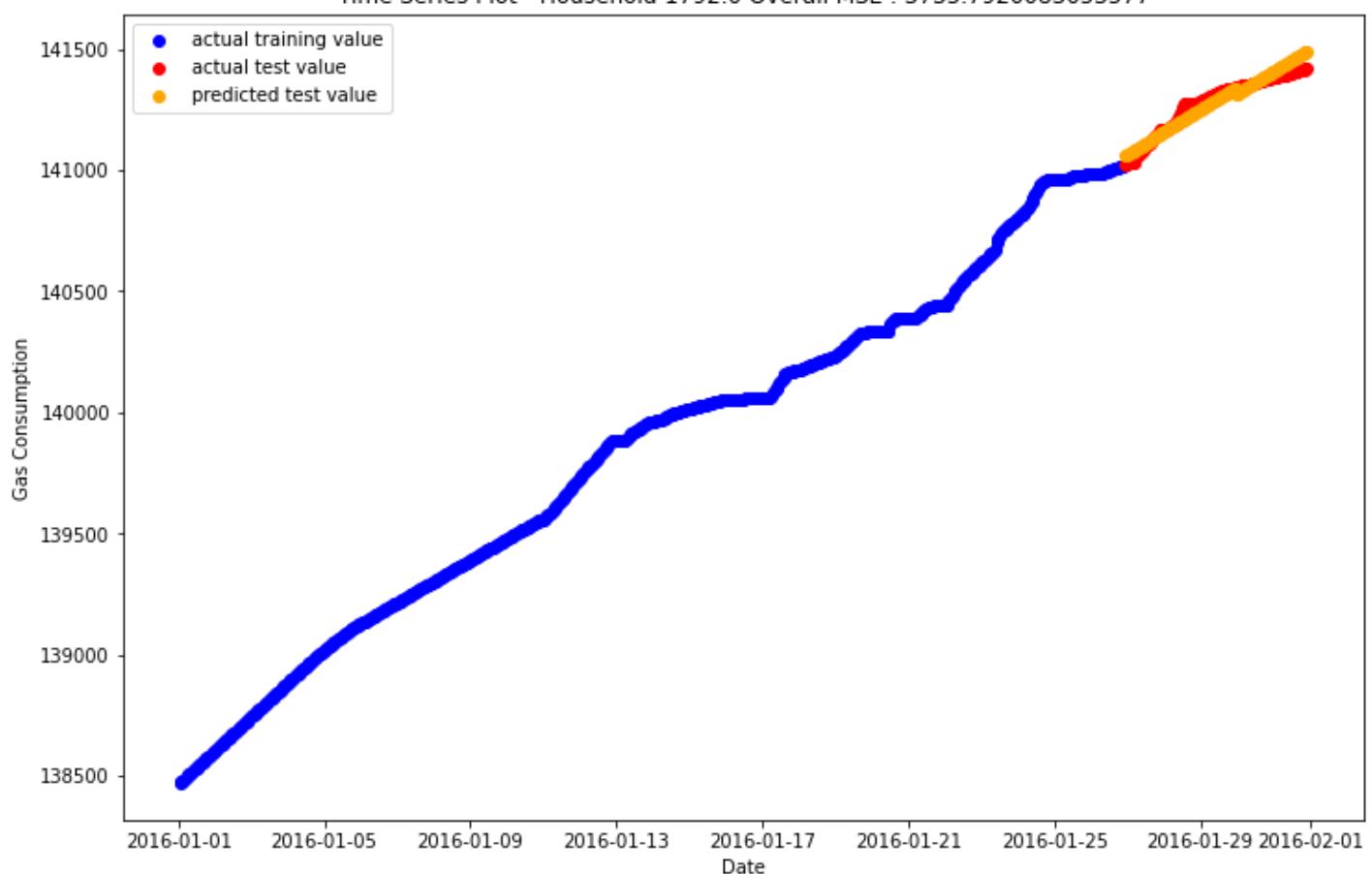
Time Series Plot - Household 1791.0 Overall MSE : 4561.197868700444



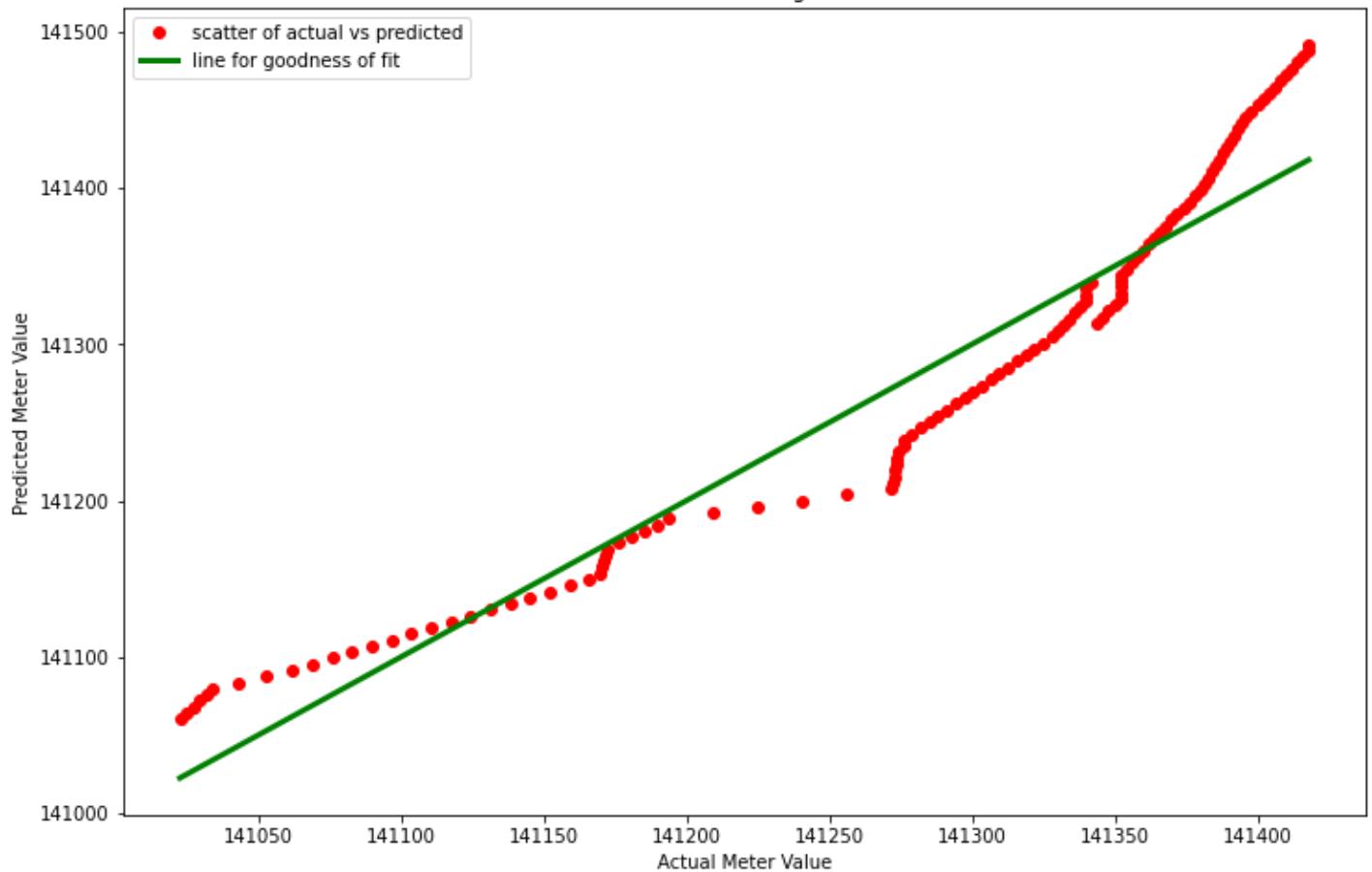
Scatter Plot - Household 1791.0 Testing MSE : 9997.907232580748



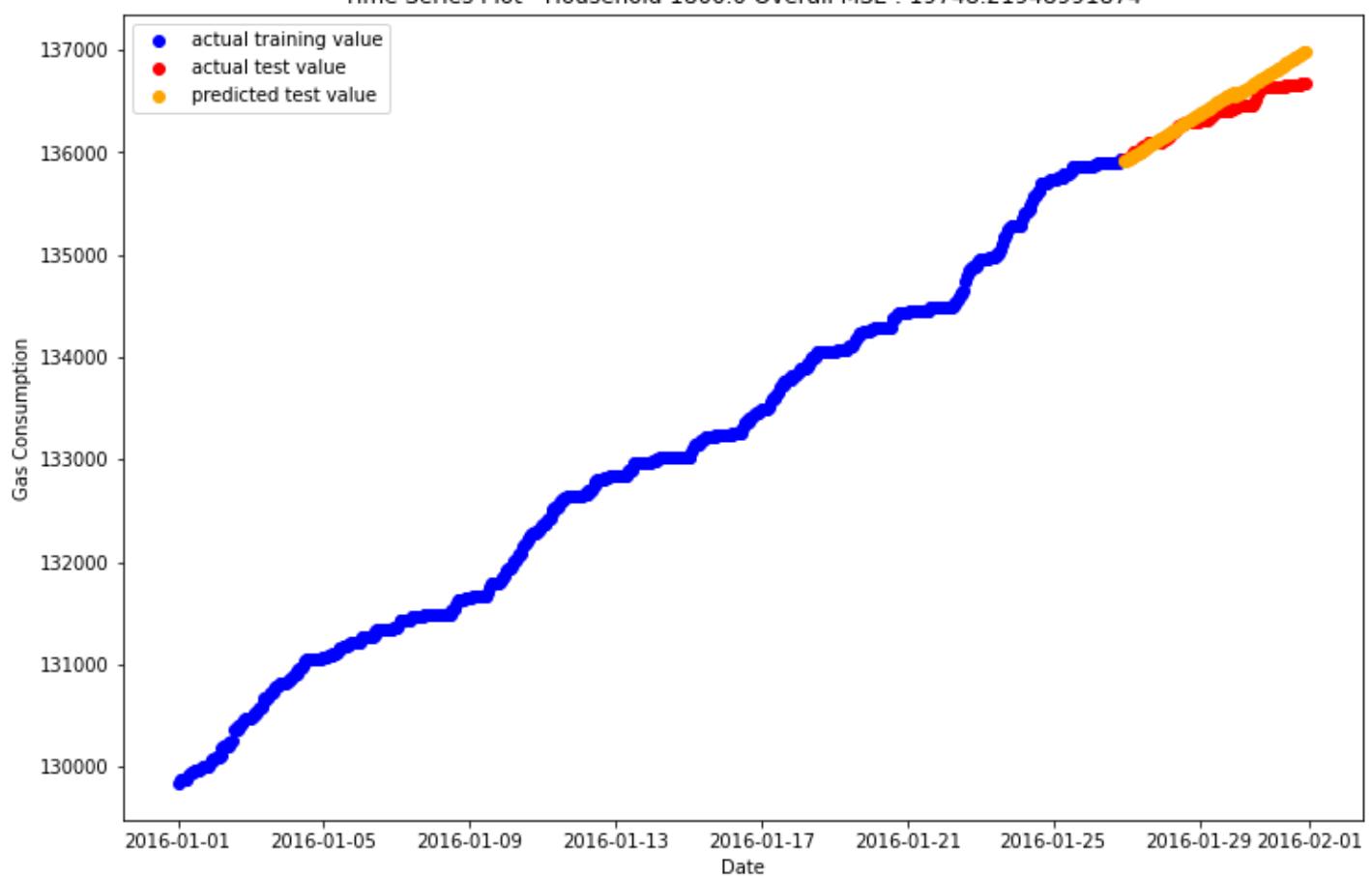
Time Series Plot - Household 1792.0 Overall MSE : 3735.7920083053577



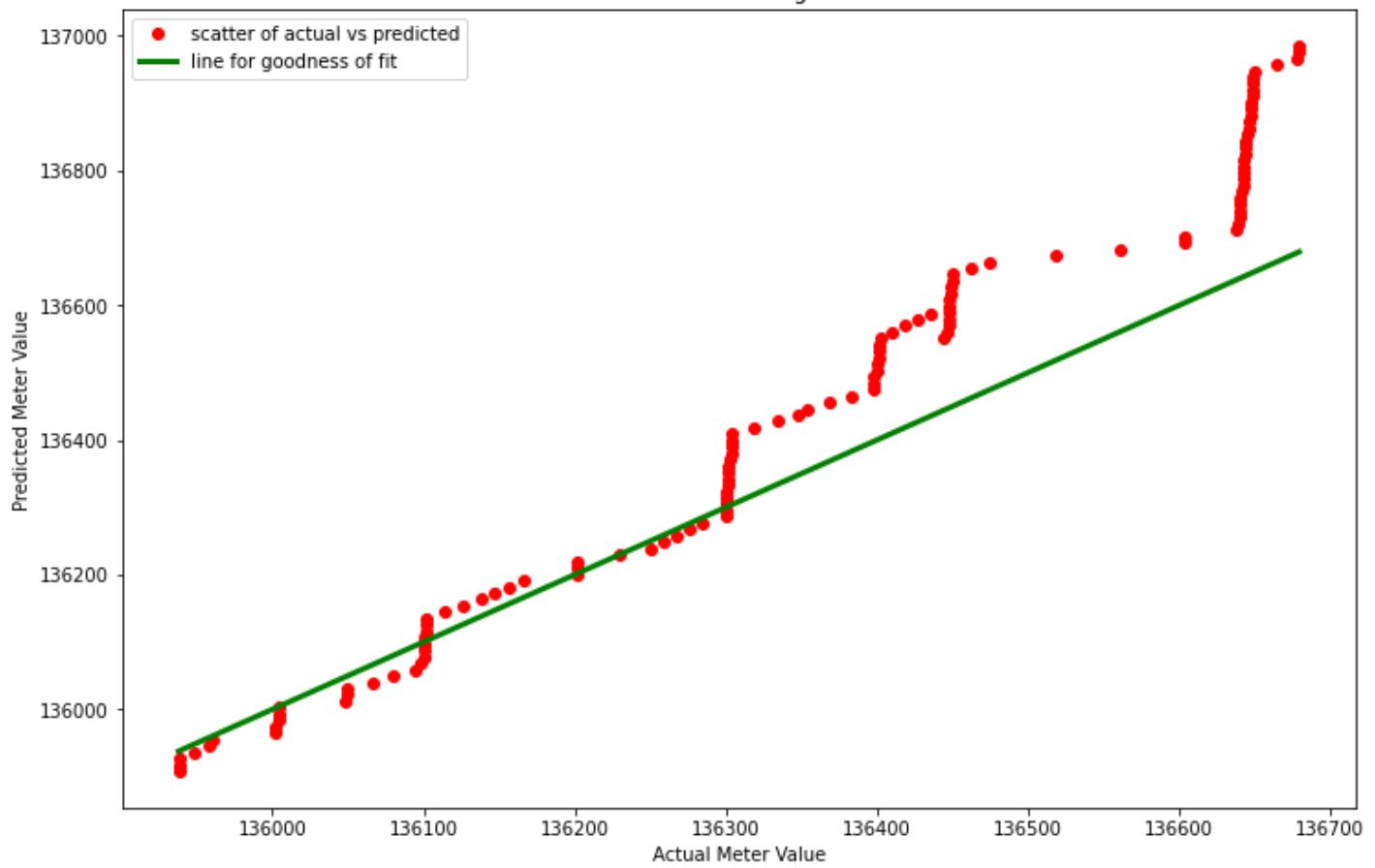
Scatter Plot - Household 1792.0 Testing MSE : 1103.1207786292994



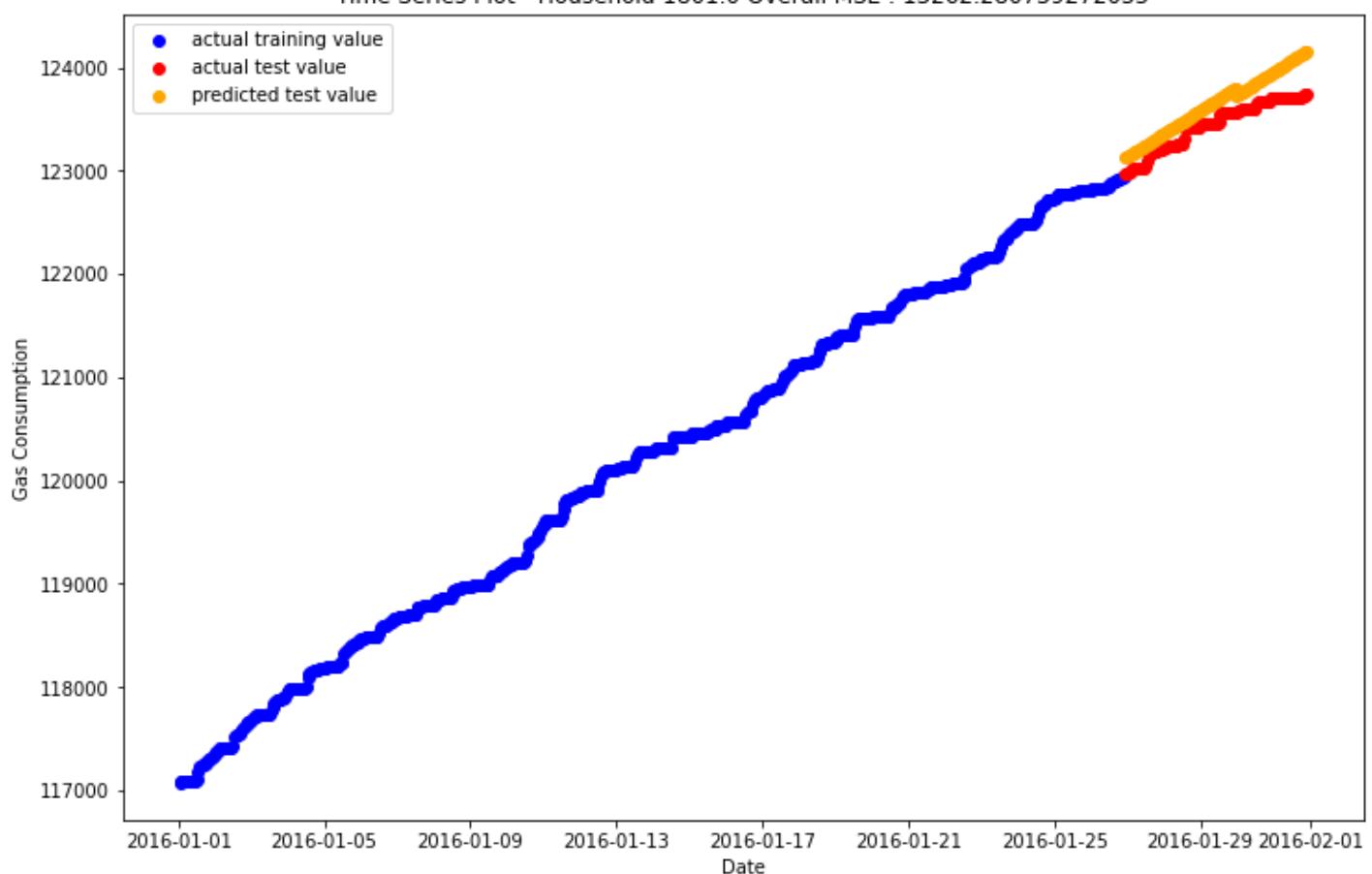
Time Series Plot - Household 1800.0 Overall MSE : 19748.21948991874



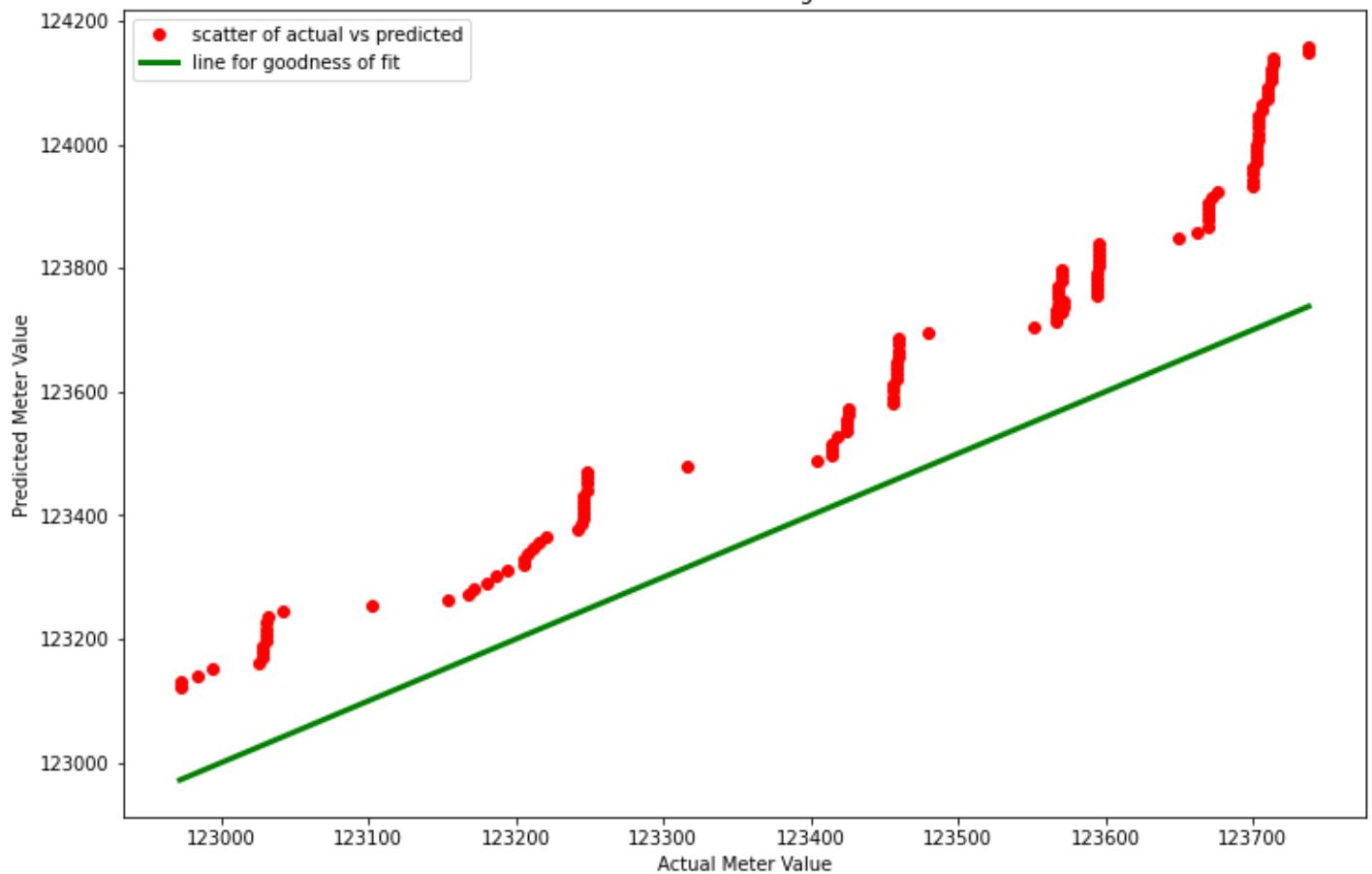
Scatter Plot - Household 1800.0 Testing MSE : 17376.61220998923



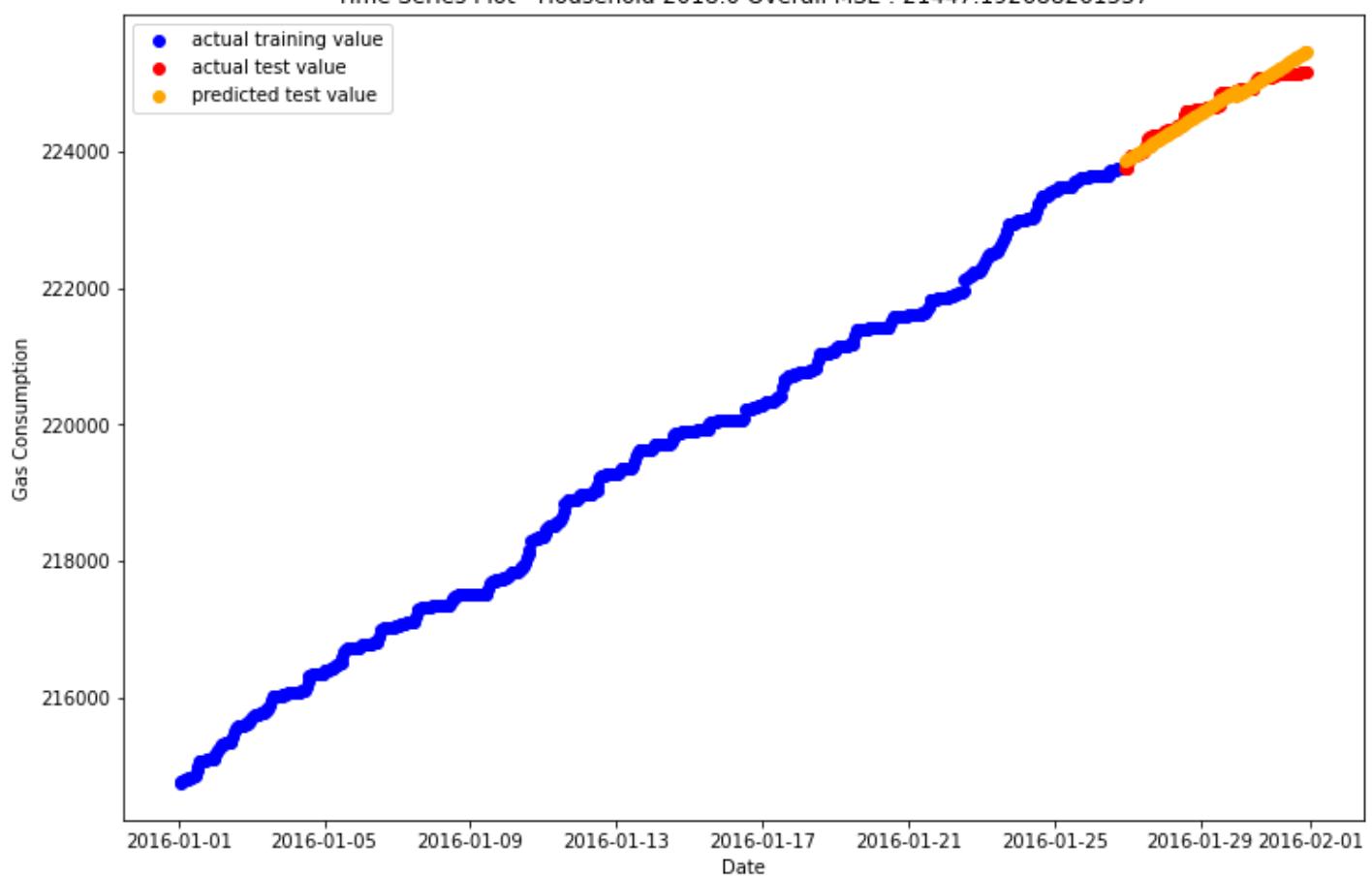
Time Series Plot - Household 1801.0 Overall MSE : 13262.280739272035



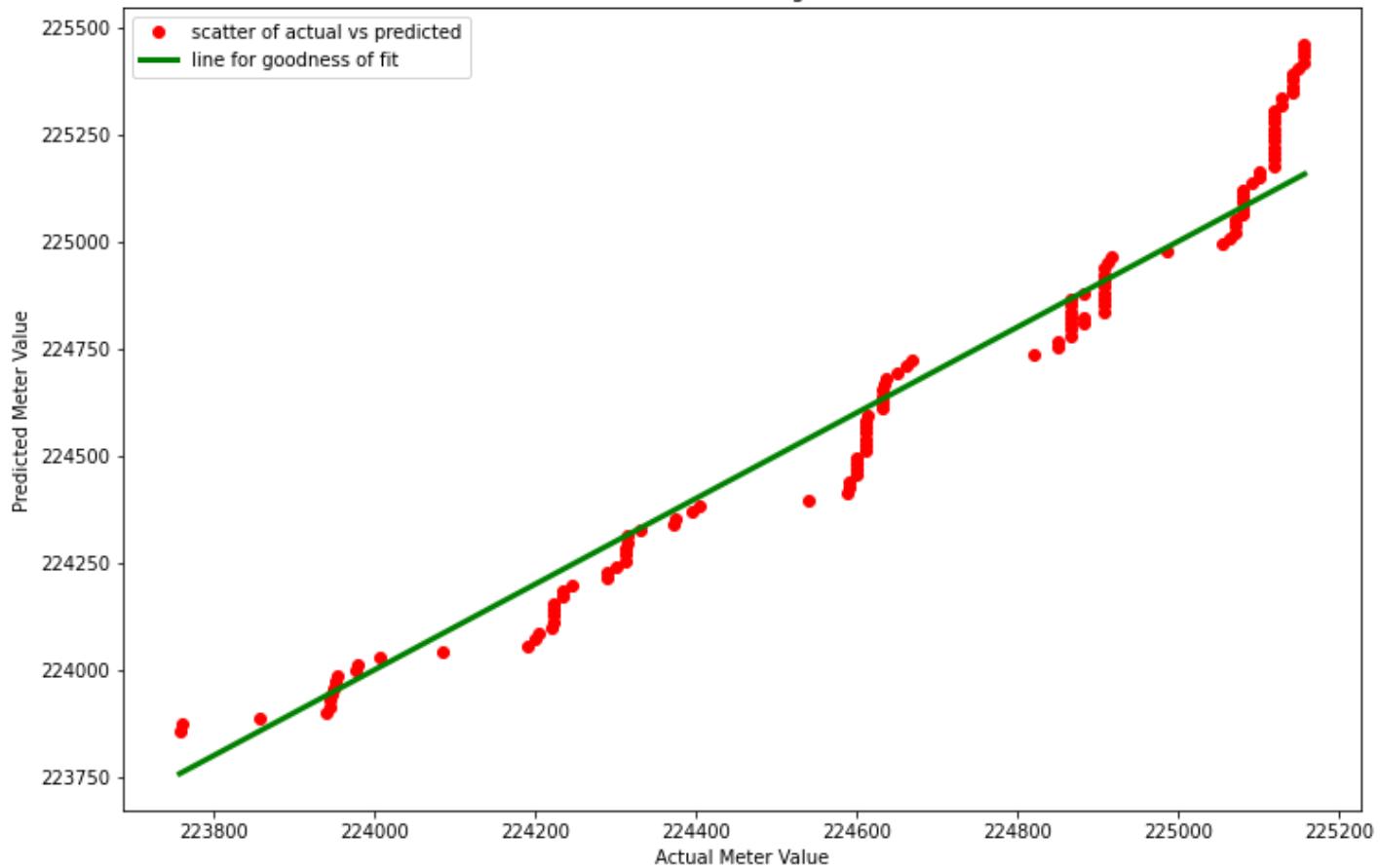
Scatter Plot - Household 1801.0 Testing MSE : 48298.17046092192



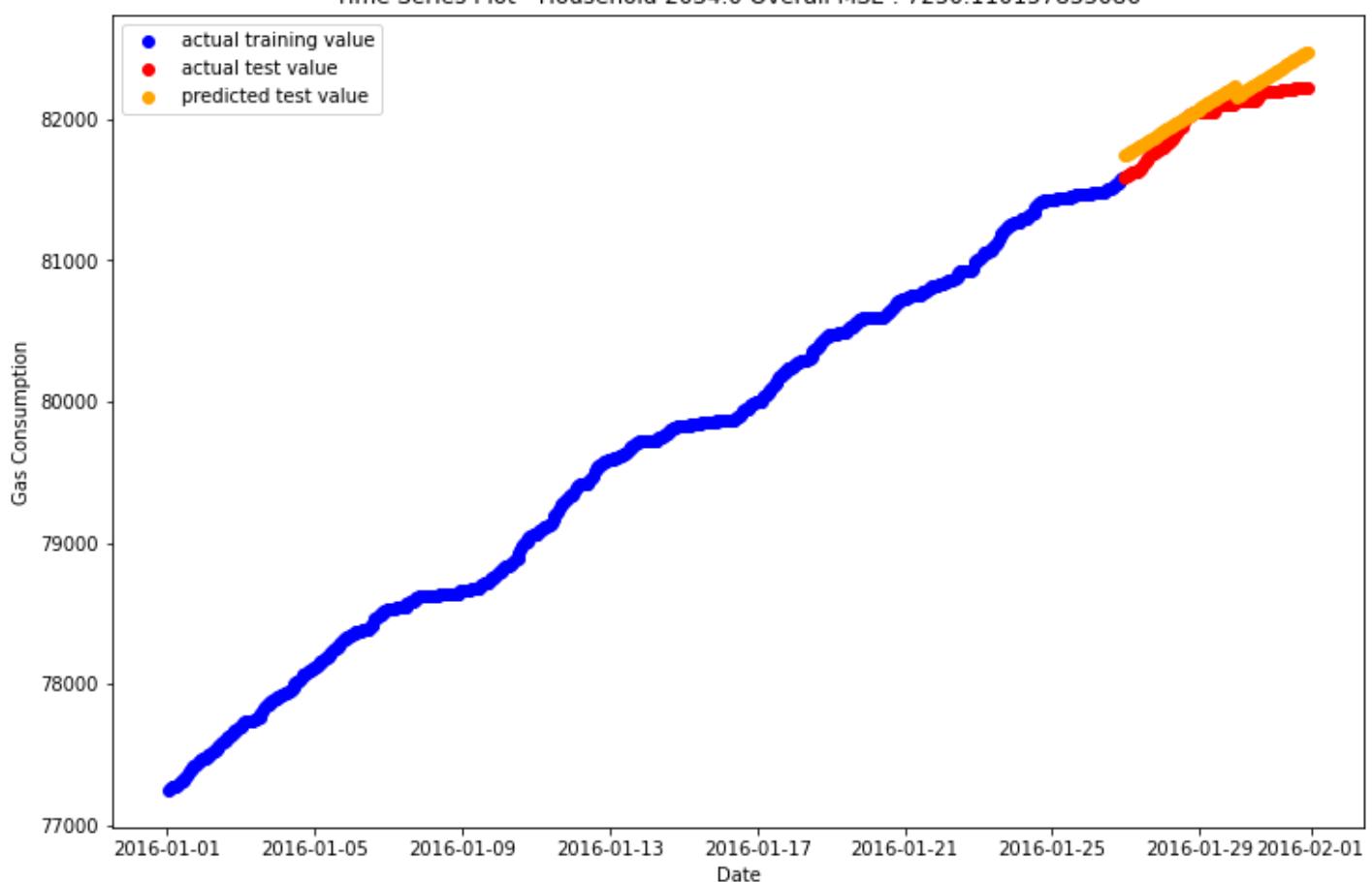
Time Series Plot - Household 2018.0 Overall MSE : 21447.192688261537



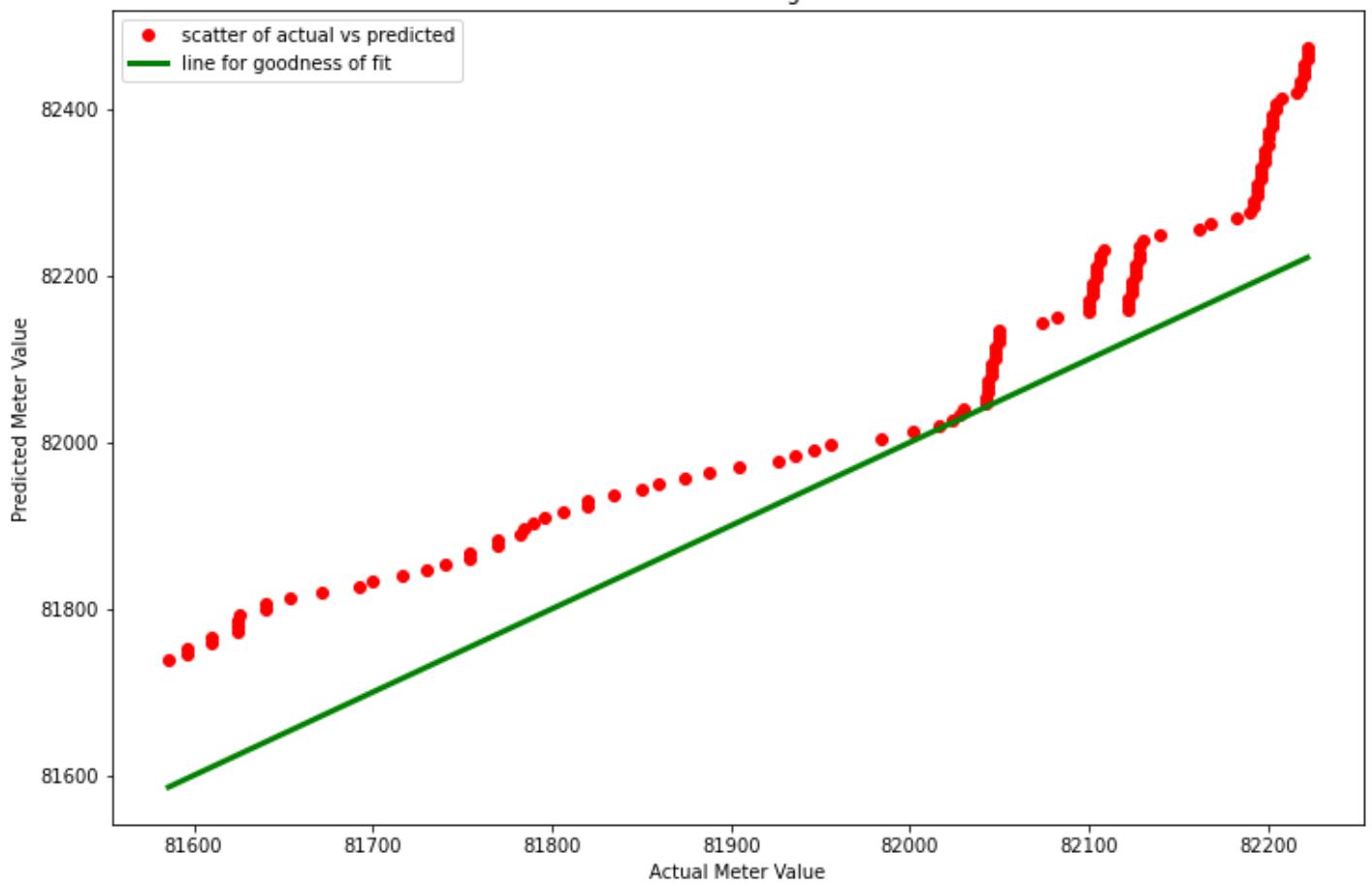
Scatter Plot - Household 2018.0 Testing MSE : 10756.683865093406



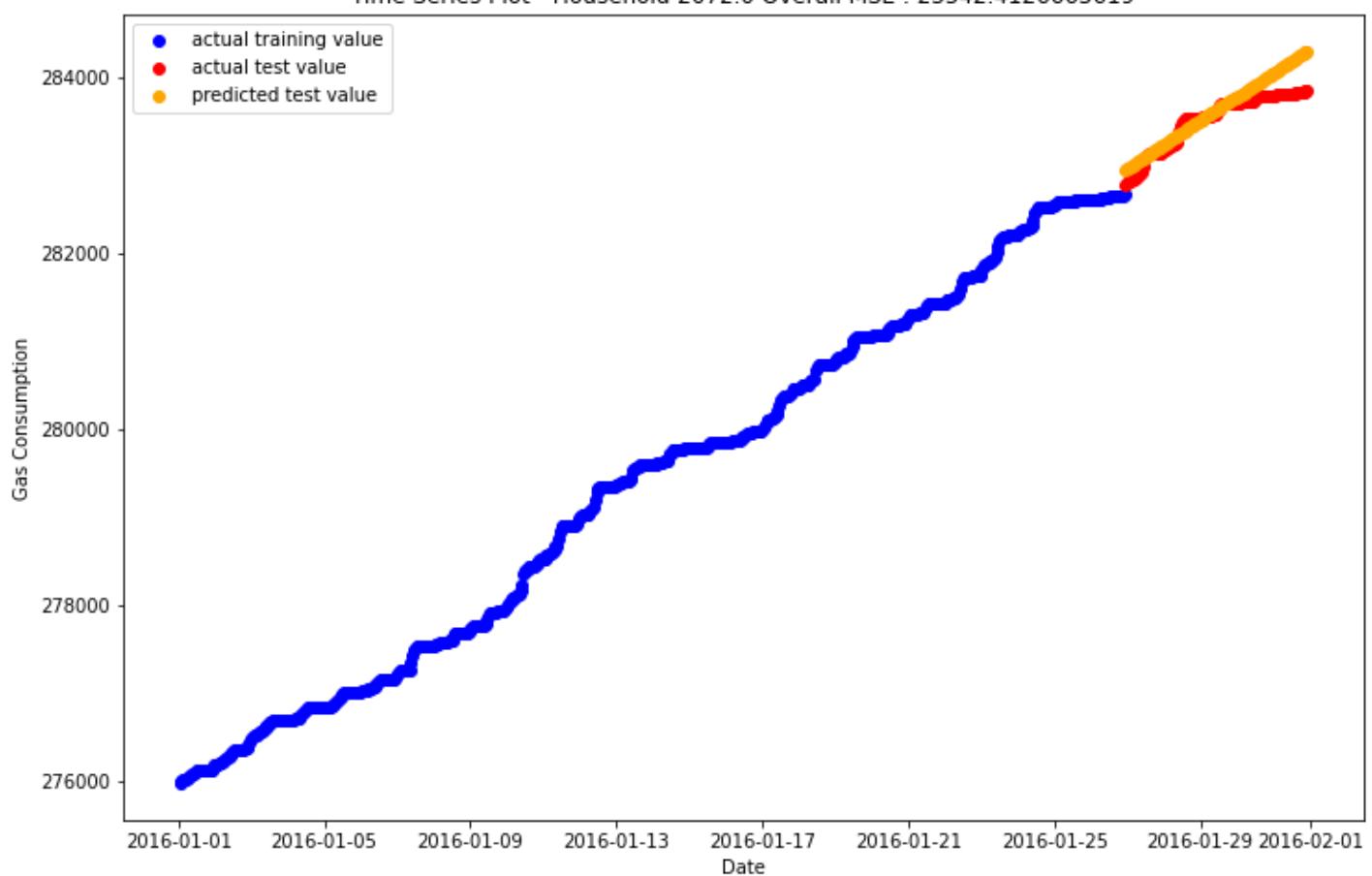
Time Series Plot - Household 2034.0 Overall MSE : 7250.110157835086



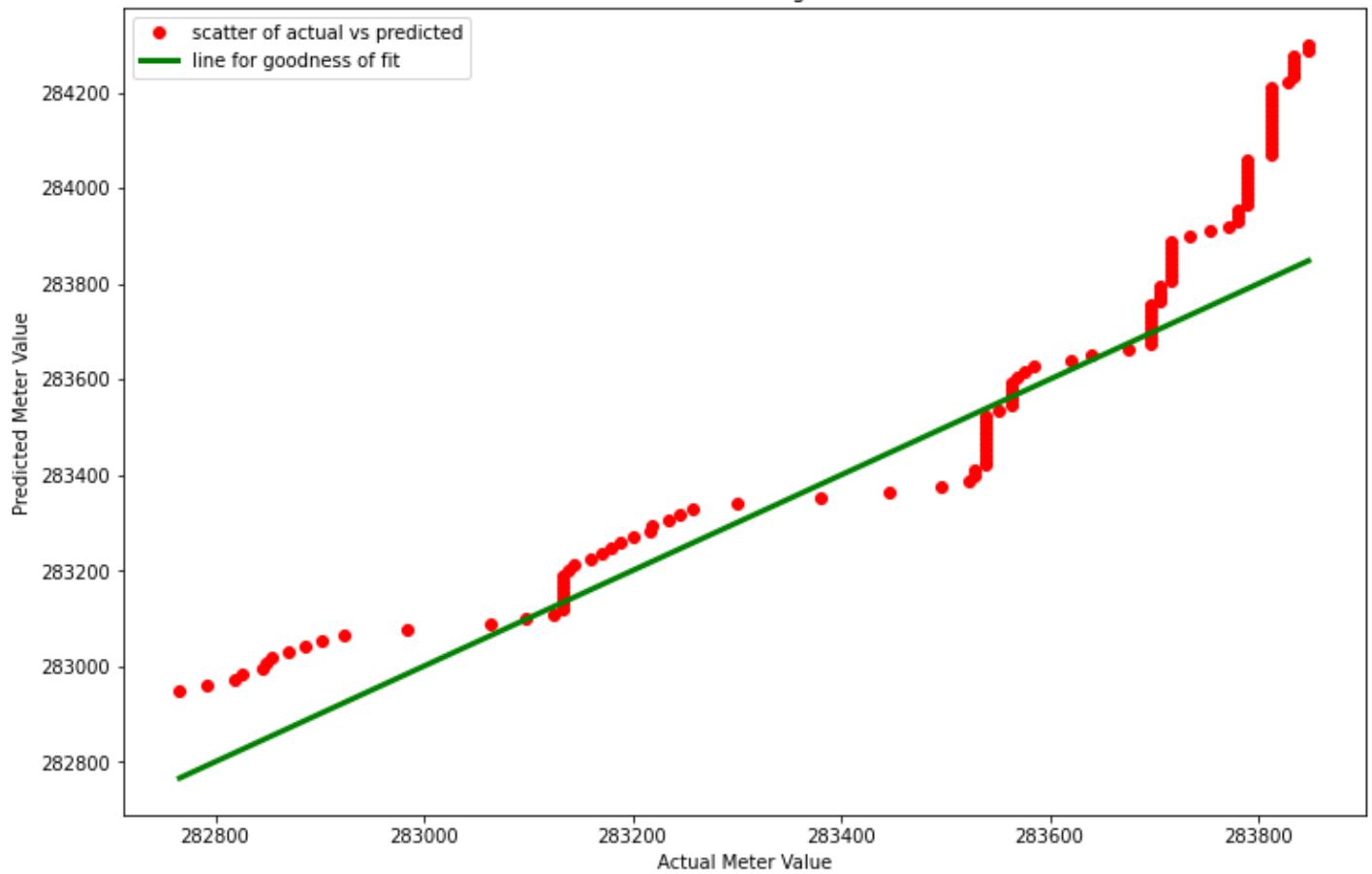
Scatter Plot - Household 2034.0 Testing MSE : 14982.592130908883



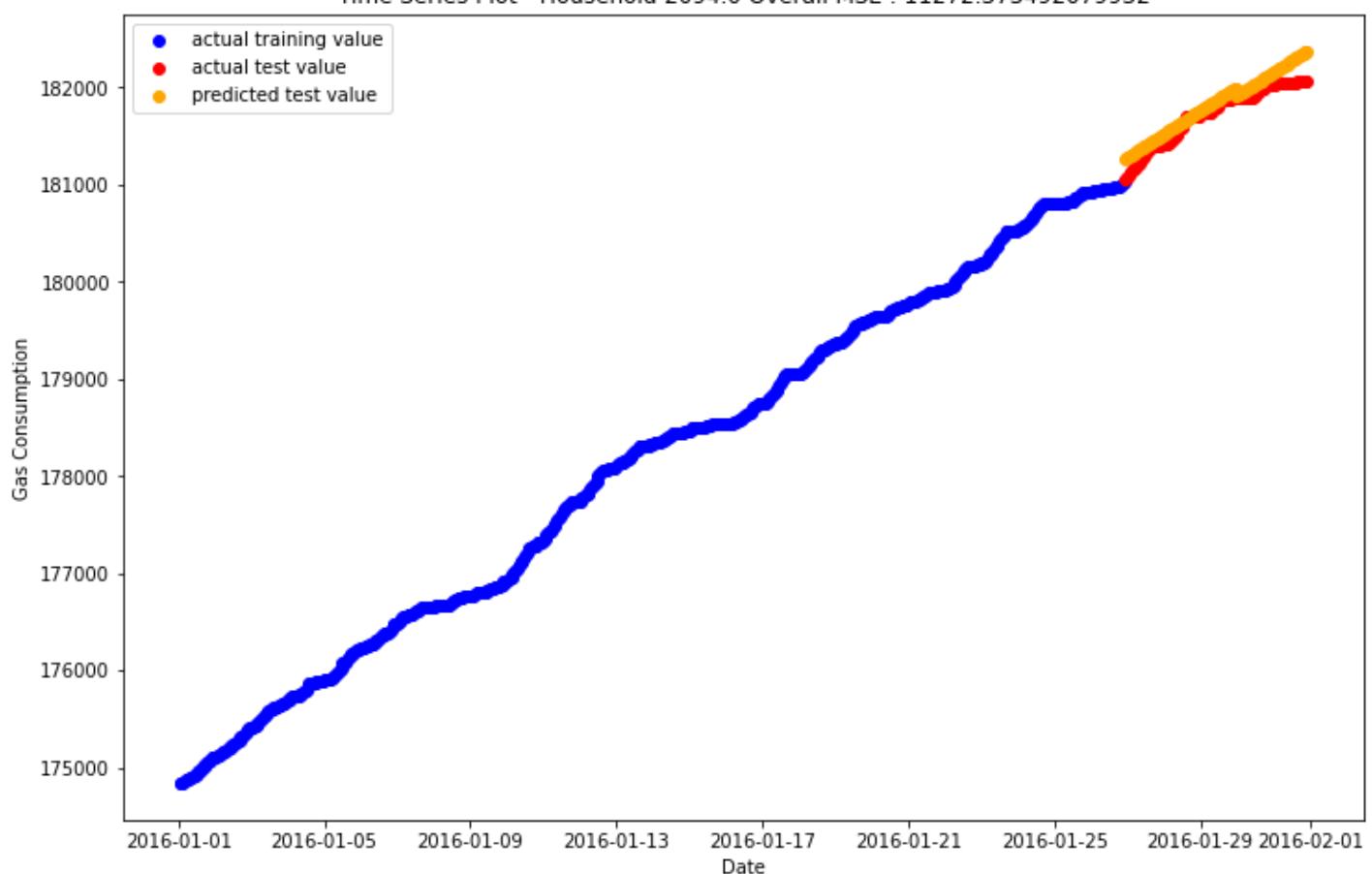
Time Series Plot - Household 2072.0 Overall MSE : 25542.4126663619



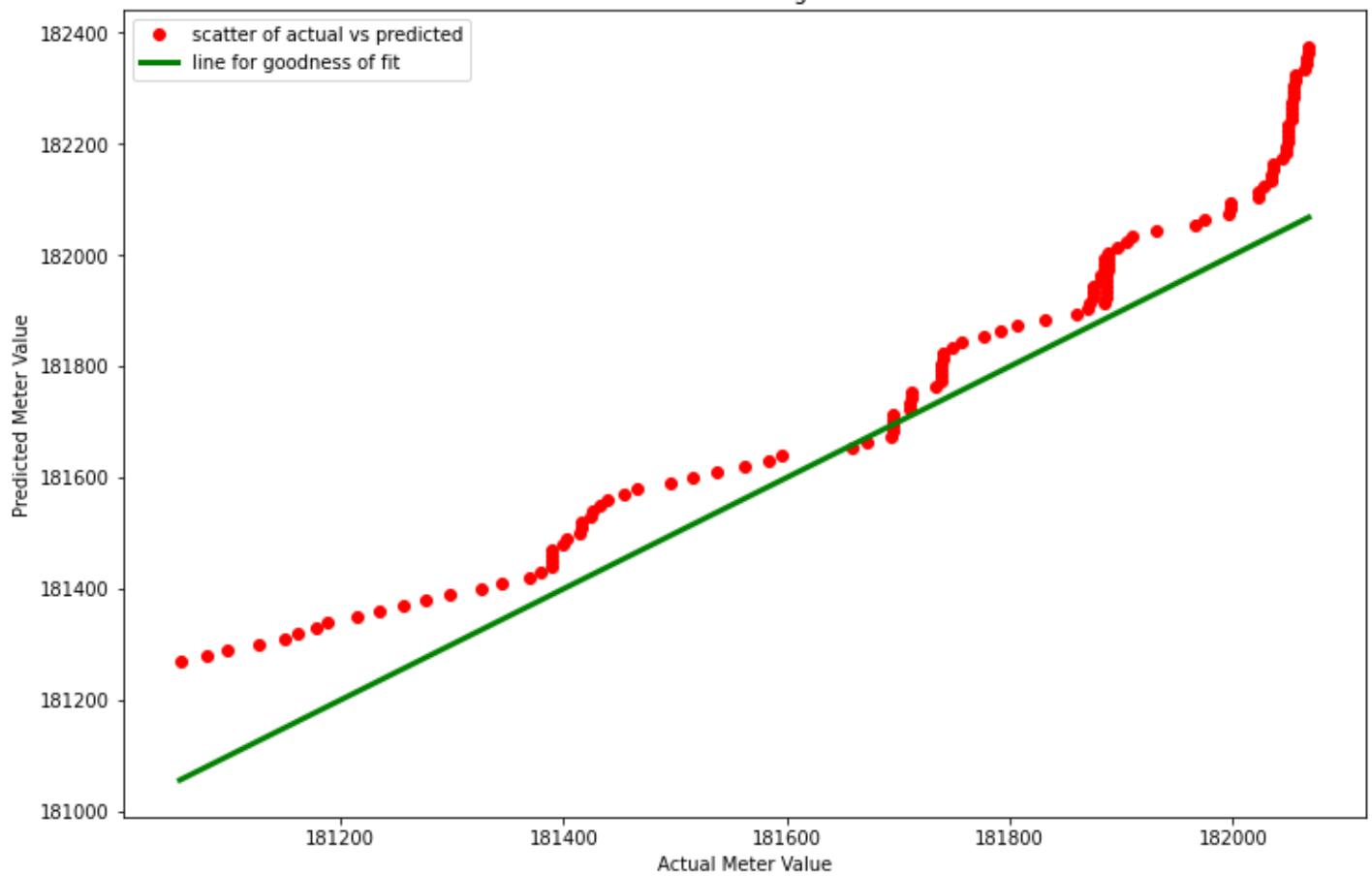
Scatter Plot - Household 2072.0 Testing MSE : 34379.928146457794



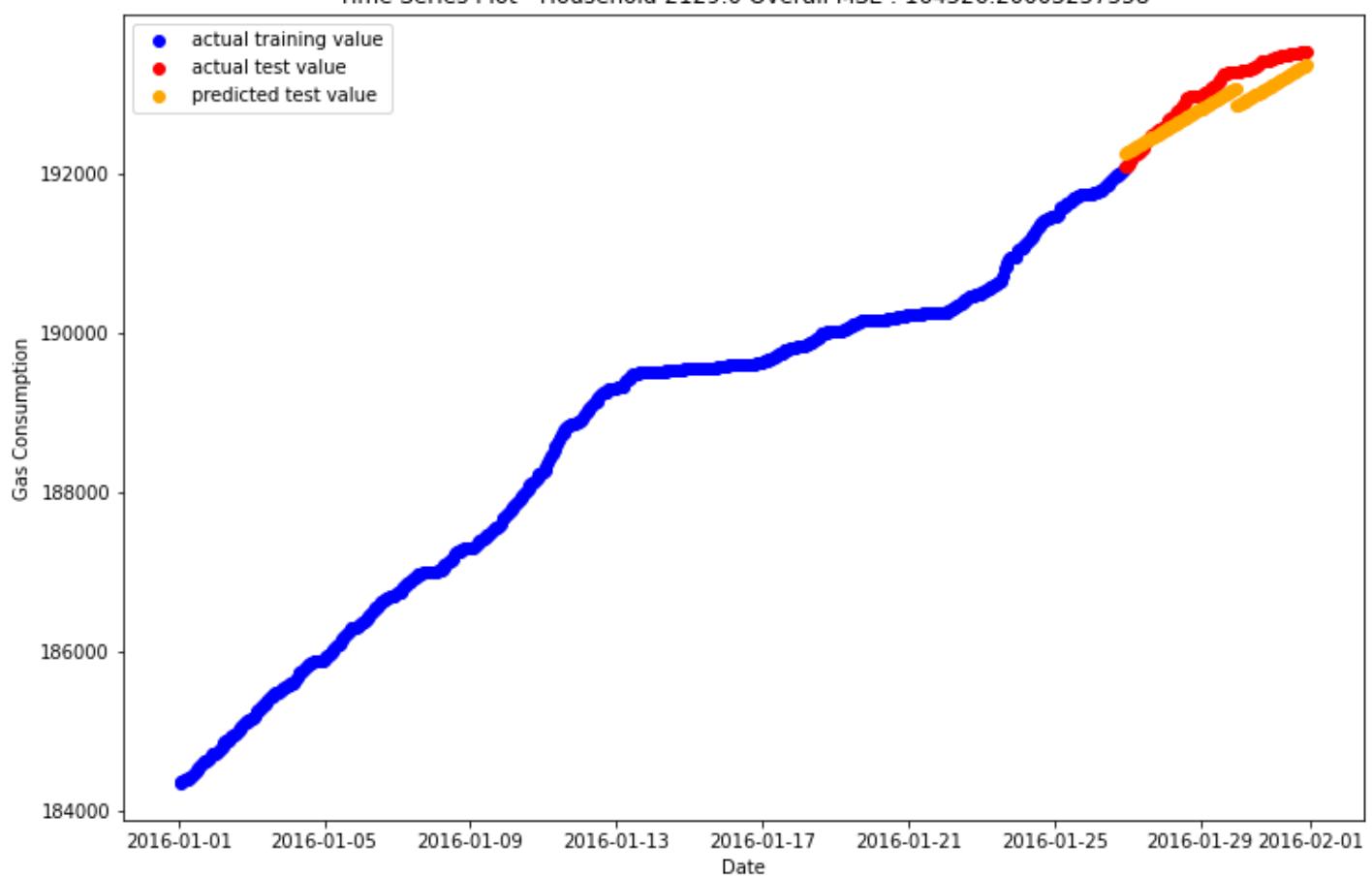
Time Series Plot - Household 2094.0 Overall MSE : 11272.373492079932



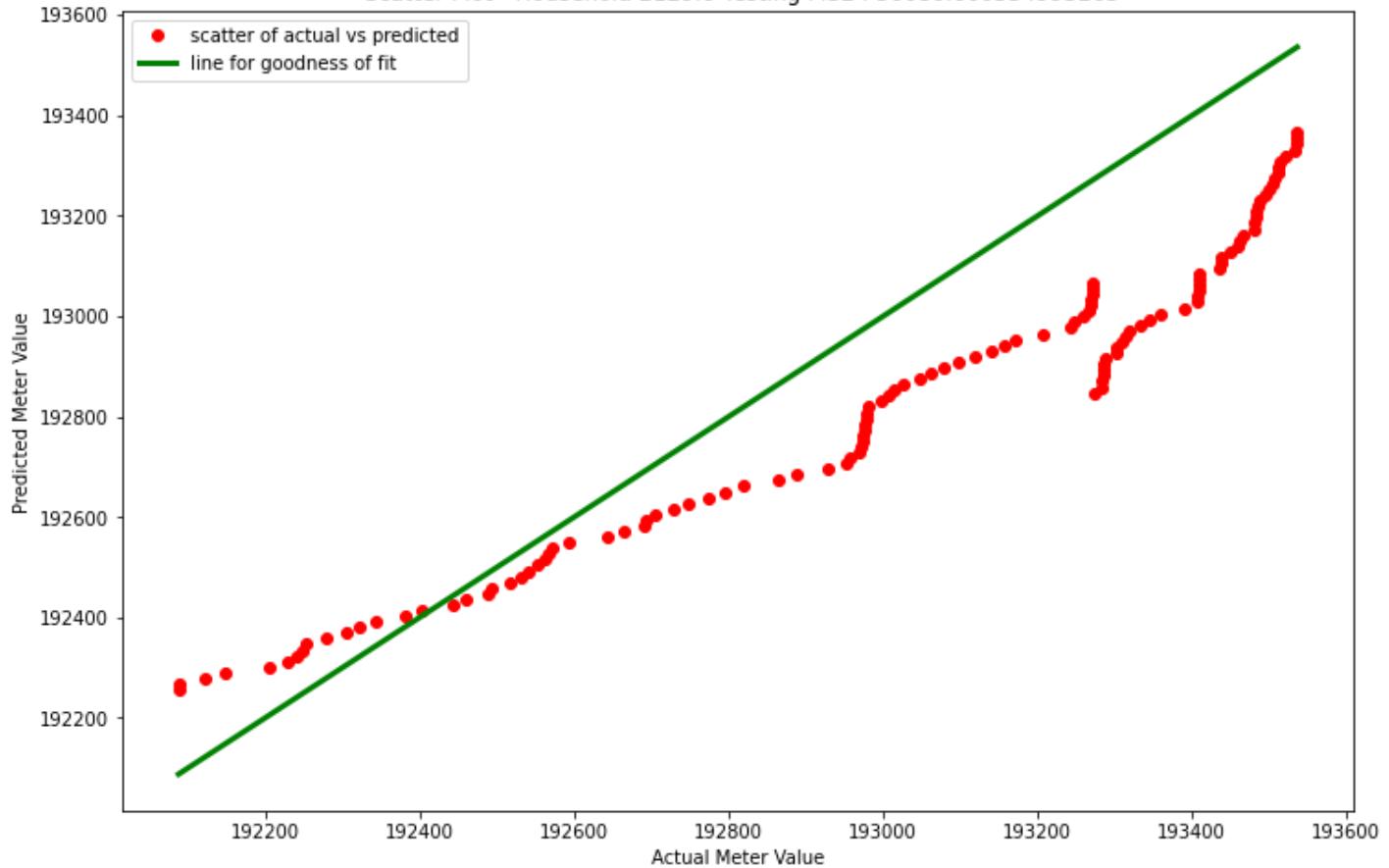
Scatter Plot - Household 2094.0 Testing MSE : 16114.315895097445



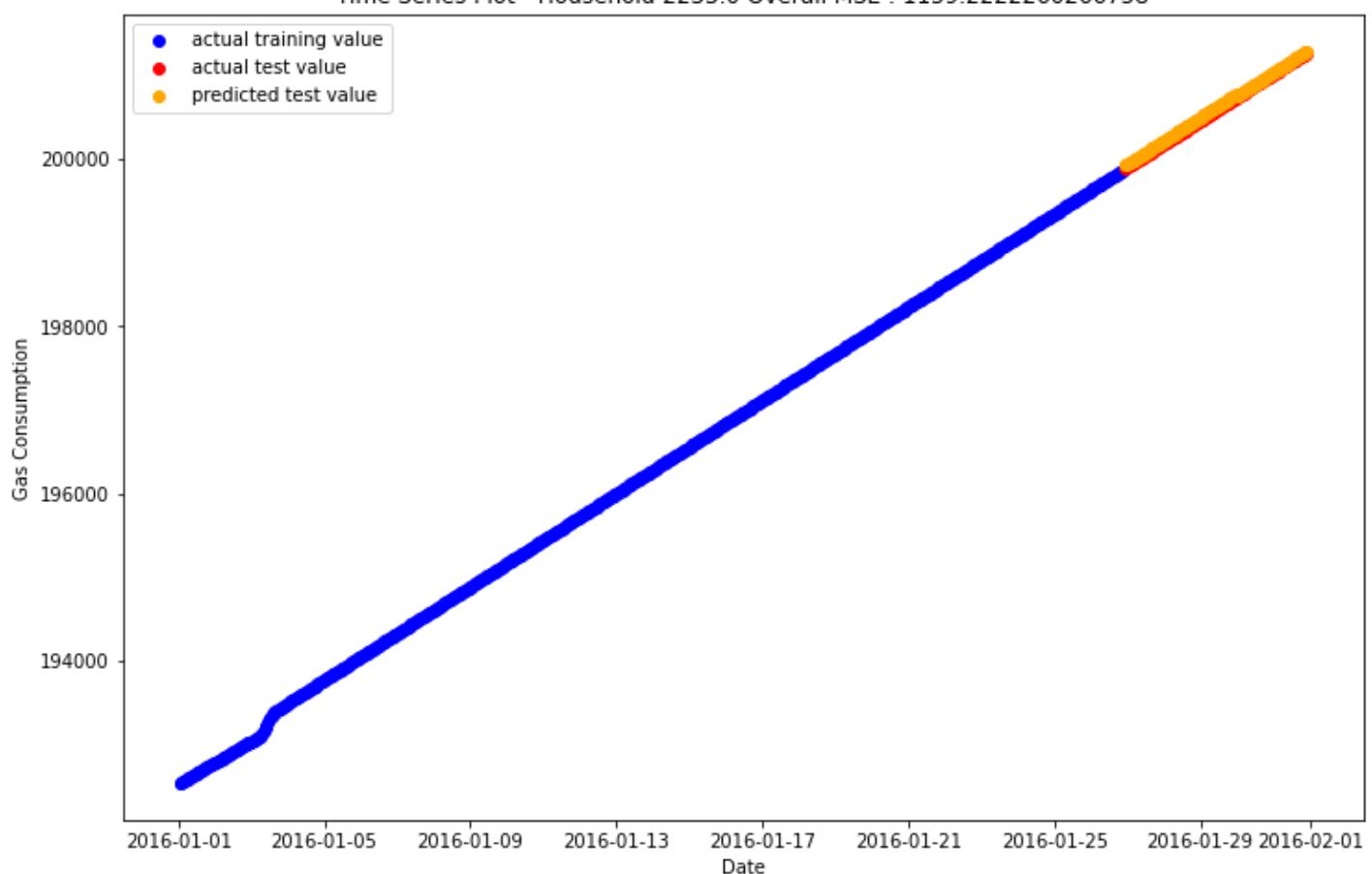
Time Series Plot - Household 2129.0 Overall MSE : 164526.20003257558



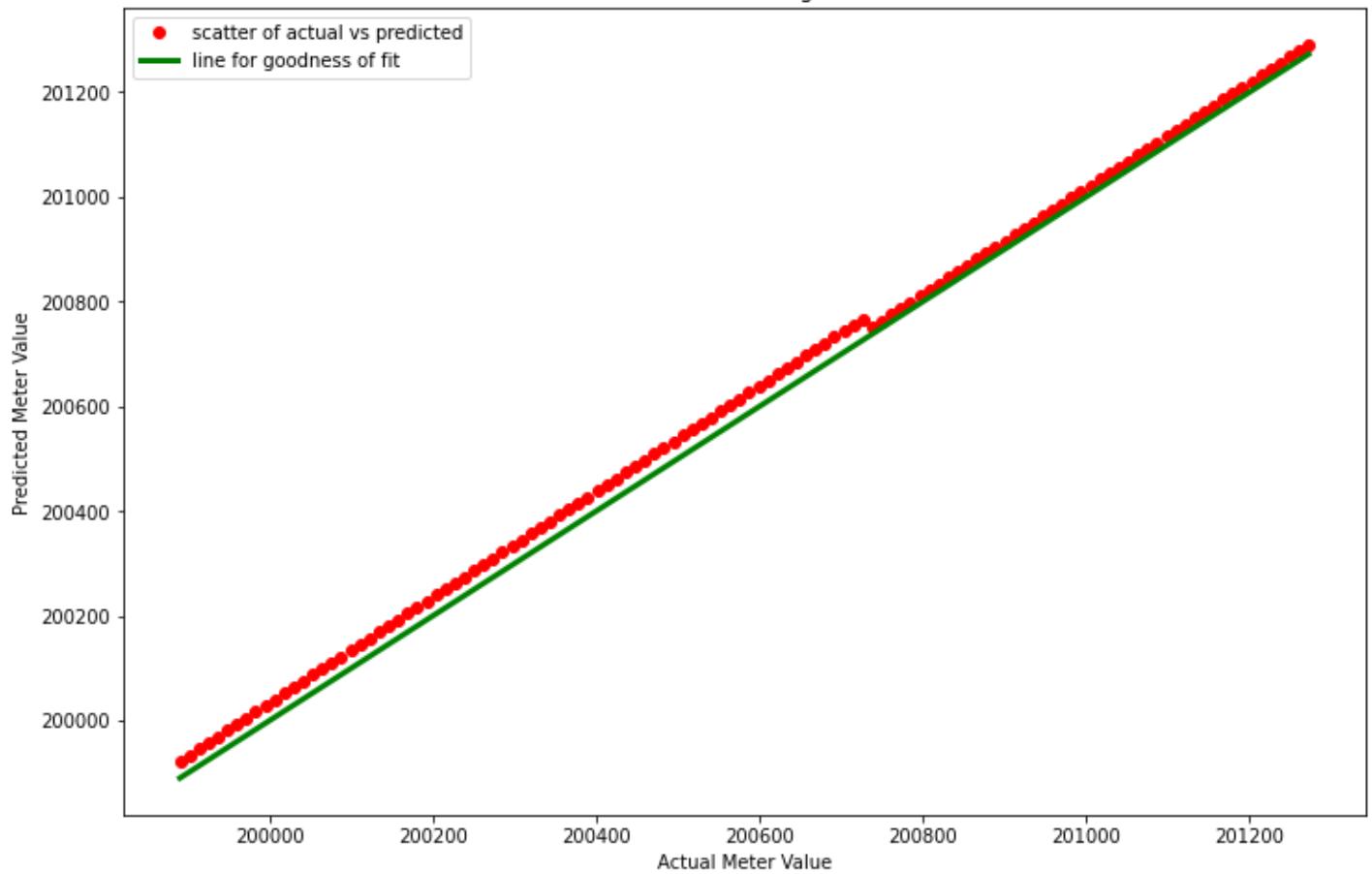
Scatter Plot - Household 2129.0 Testing MSE : 56080.600334993265



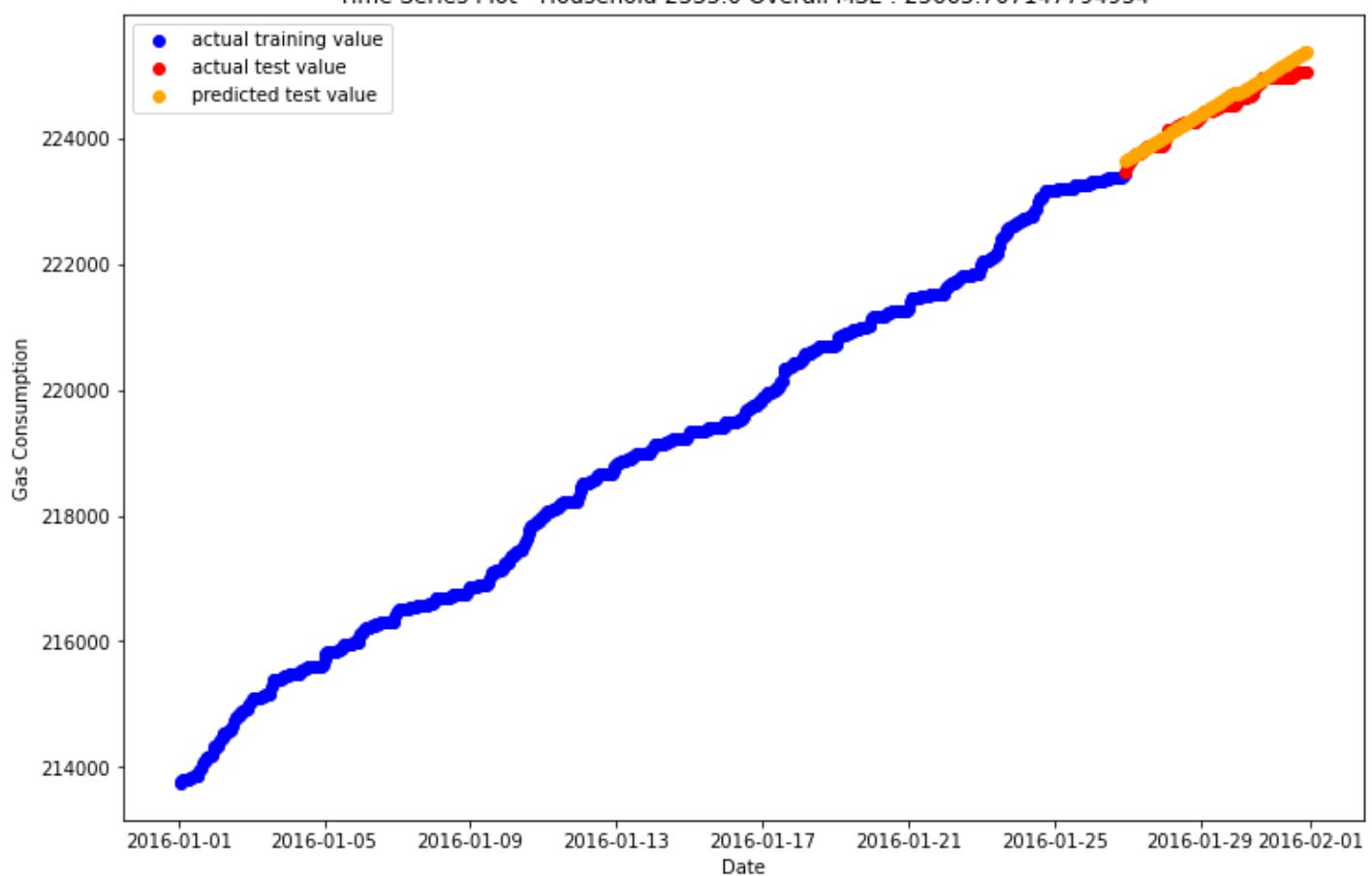
Time Series Plot - Household 2233.0 Overall MSE : 1159.2222260266758



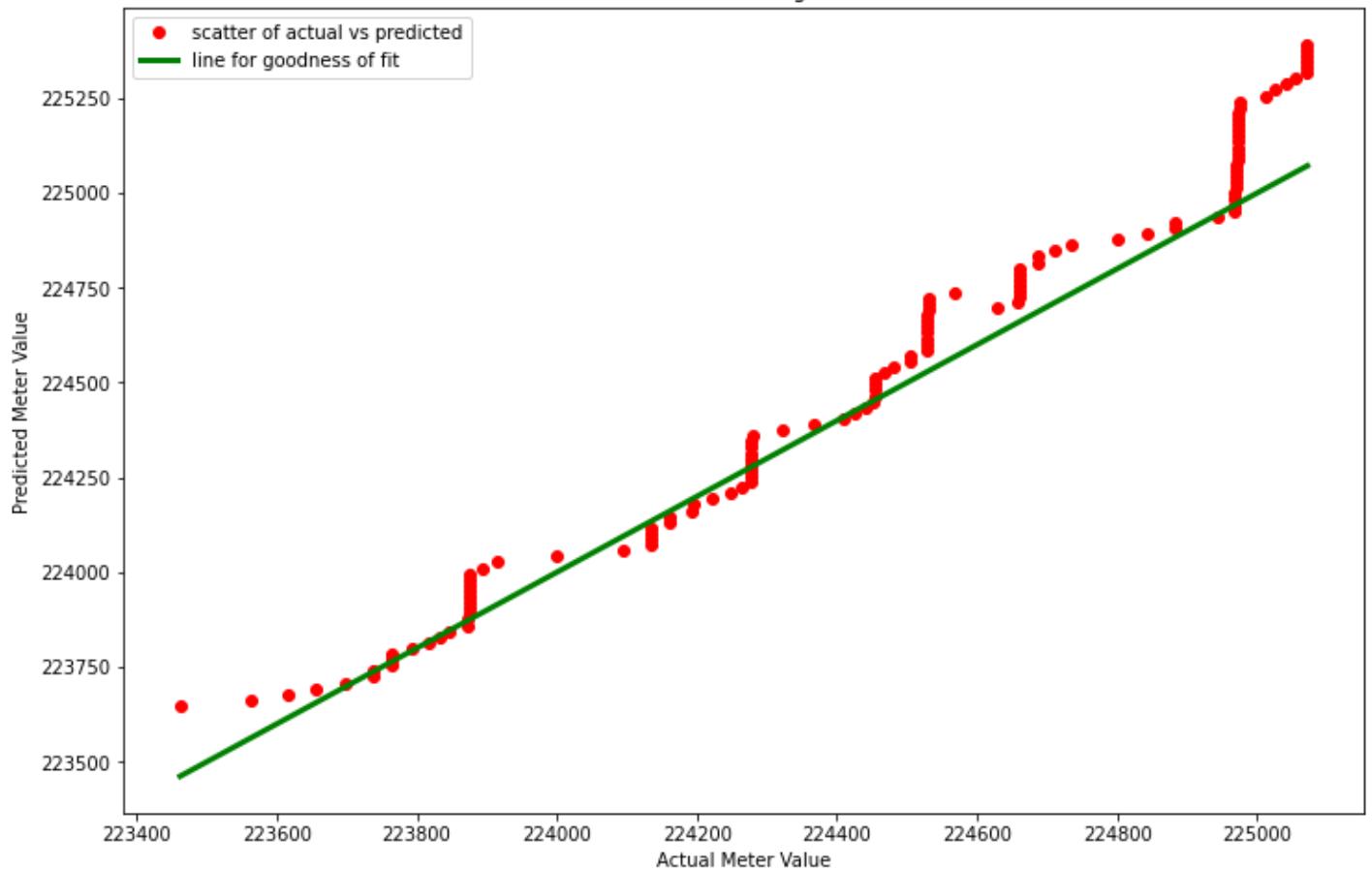
Scatter Plot - Household 2233.0 Testing MSE : 925.7689284302602



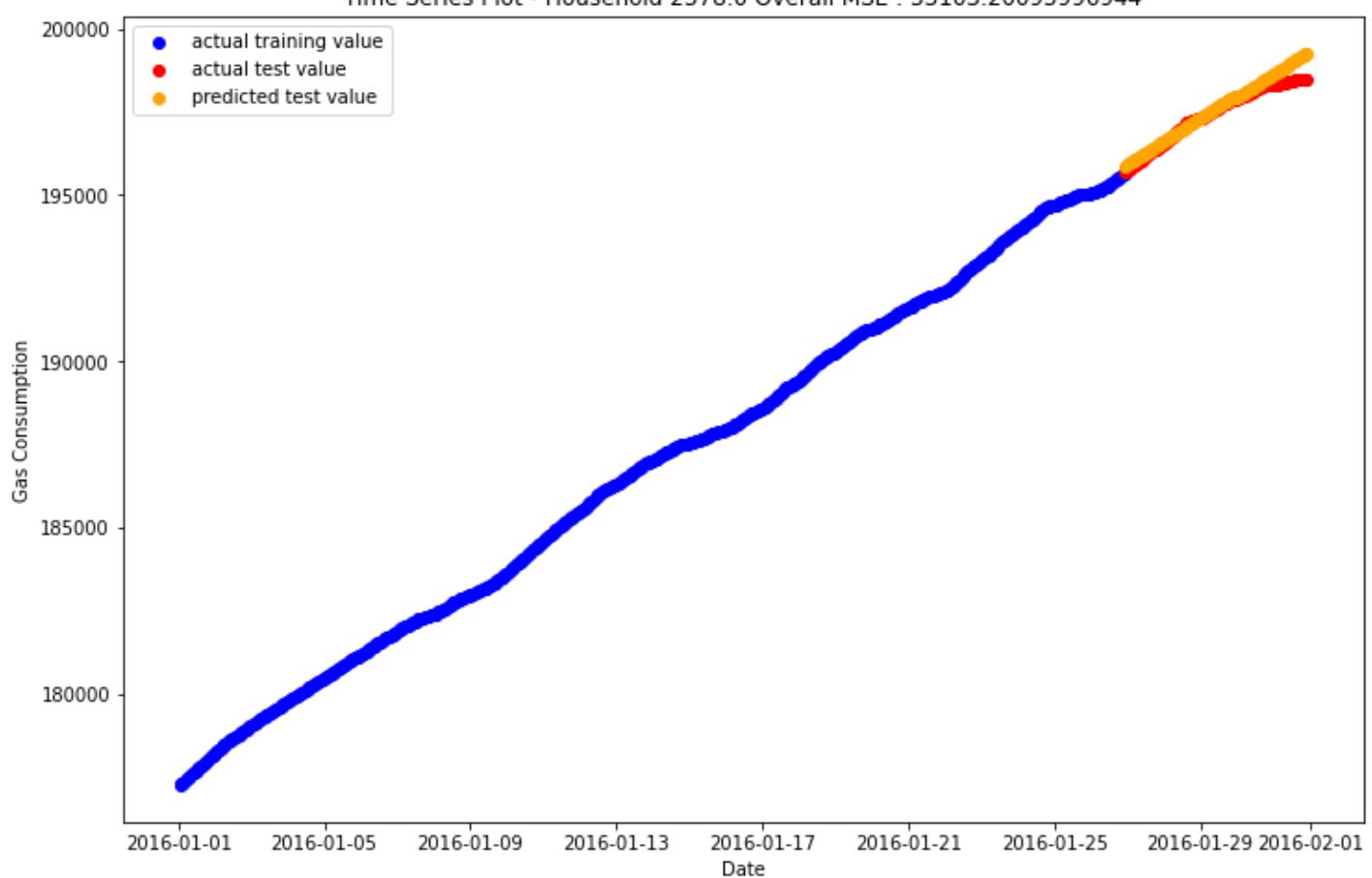
Time Series Plot - Household 2335.0 Overall MSE : 25665.707147794954



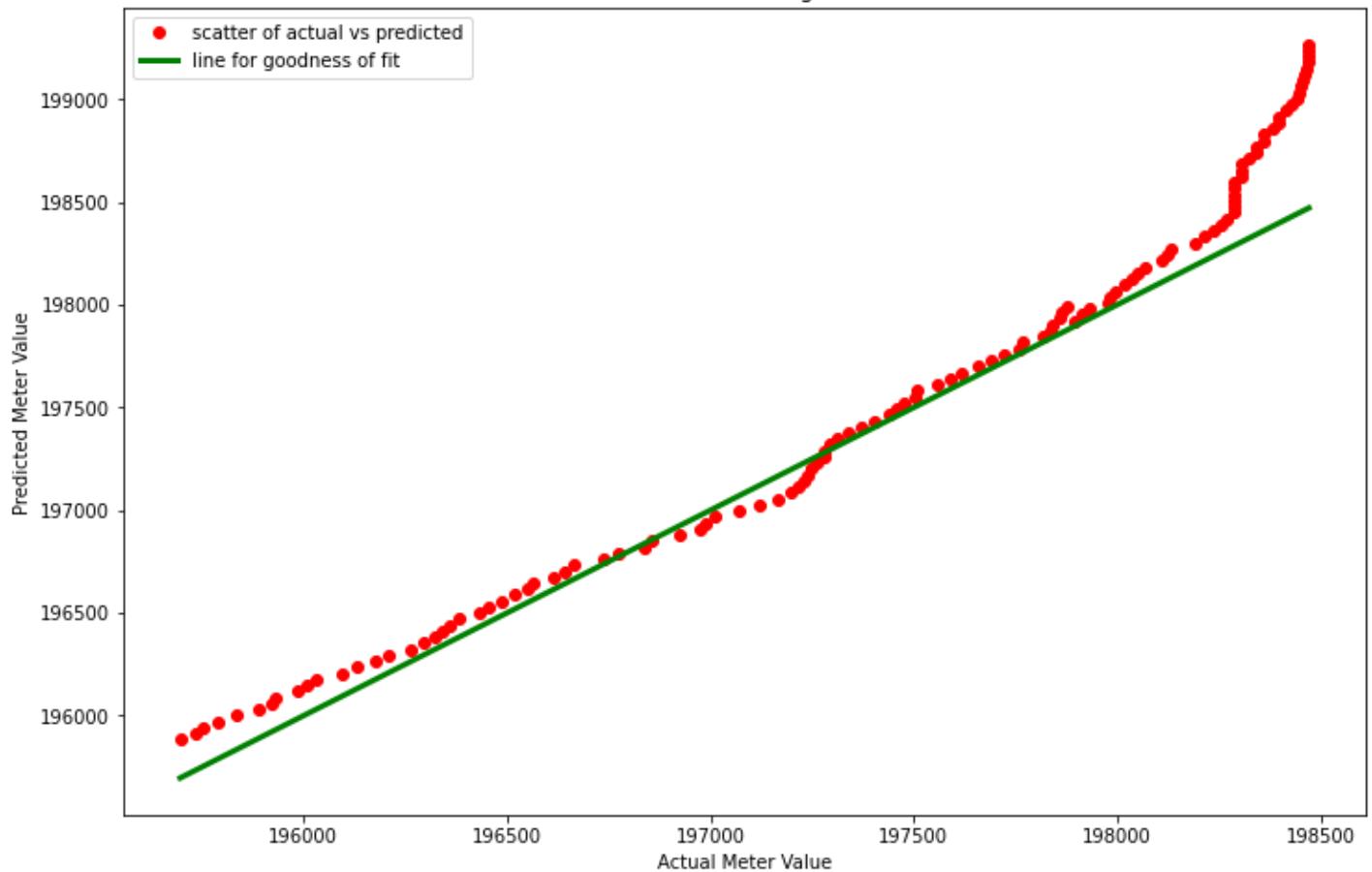
Scatter Plot - Household 2335.0 Testing MSE : 14468.111003147596



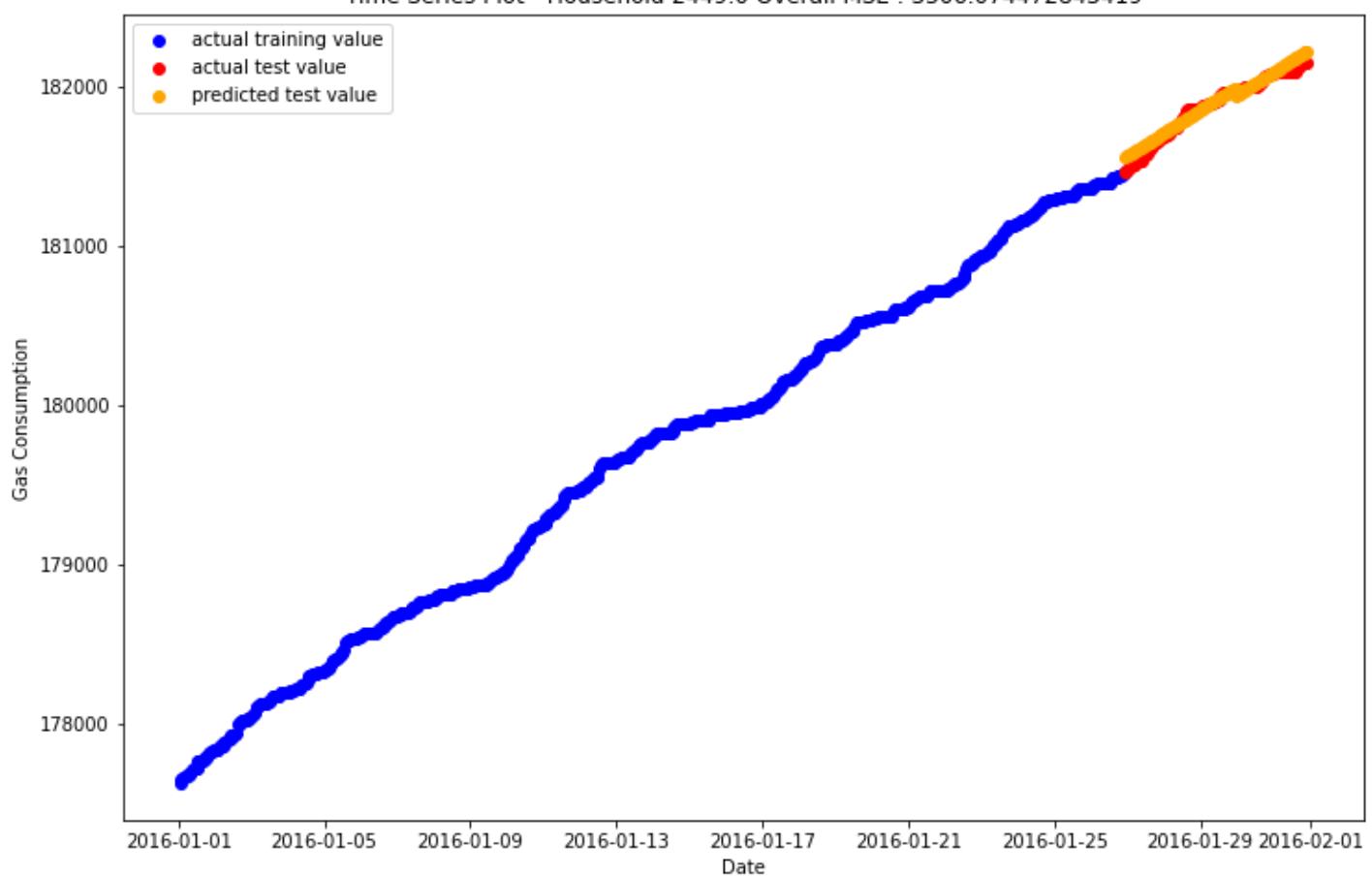
Time Series Plot - Household 2378.0 Overall MSE : 33103.20095996944



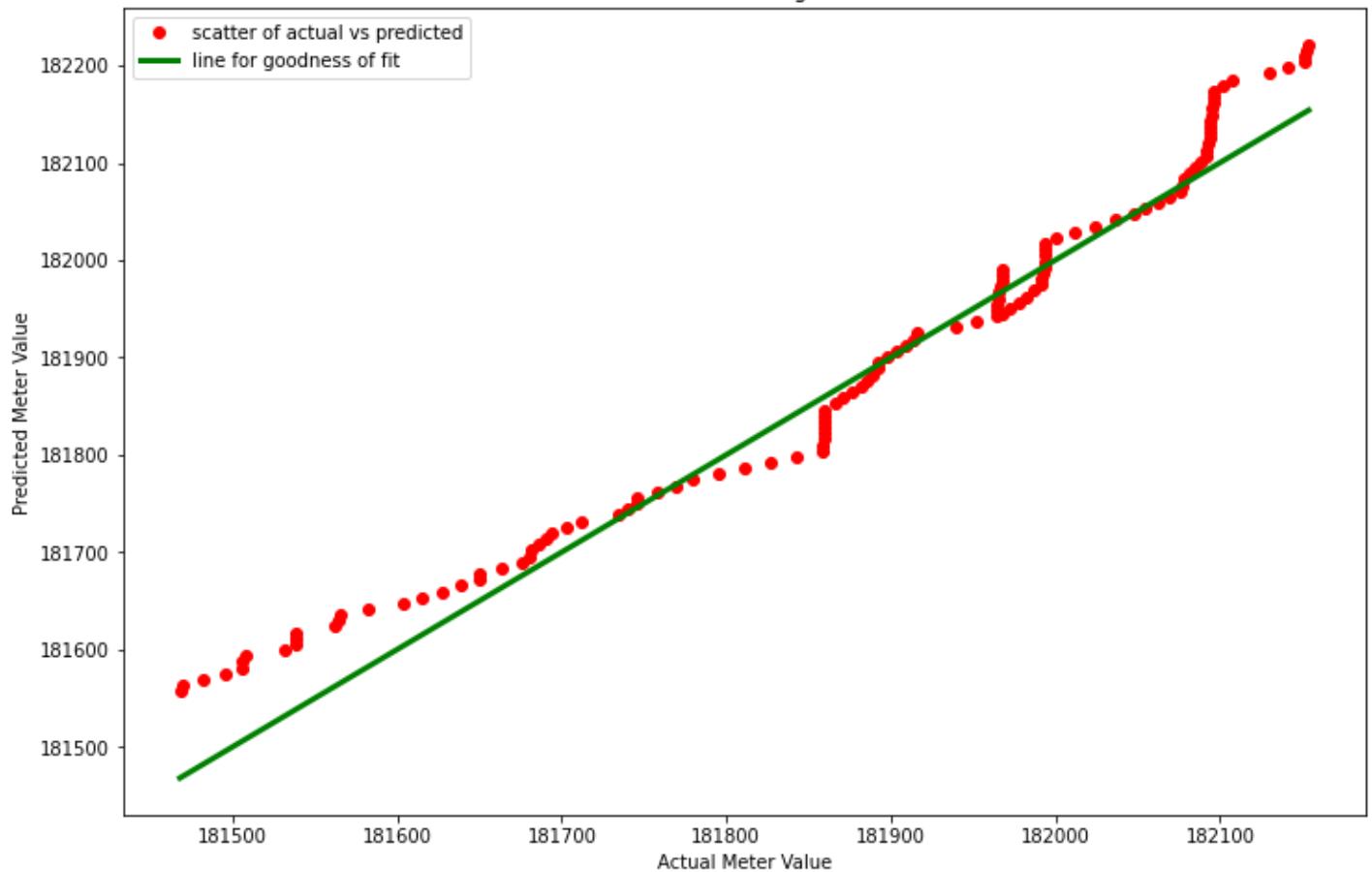
Scatter Plot - Household 2378.0 Testing MSE : 68918.24155283913



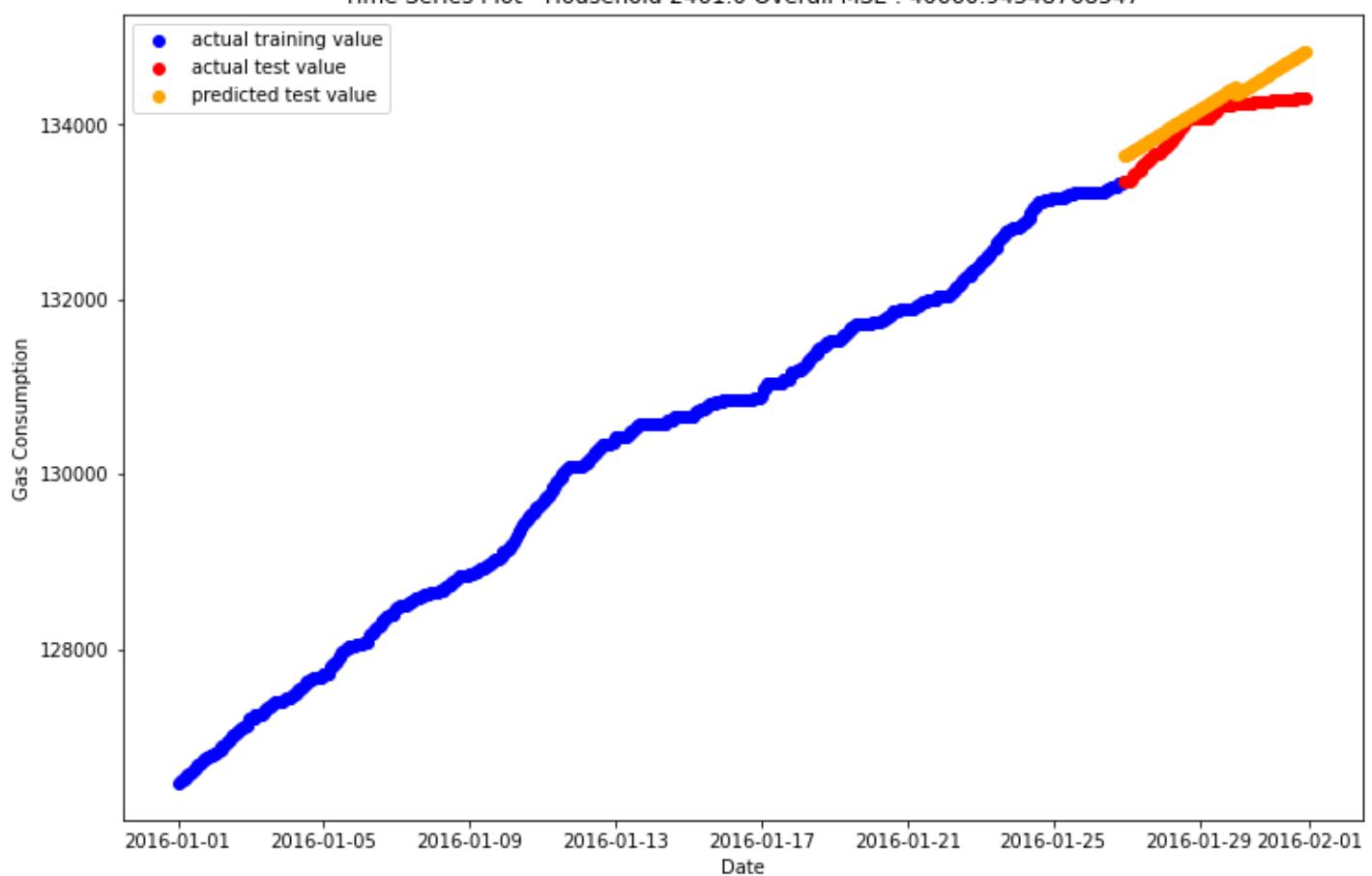
Time Series Plot - Household 2449.0 Overall MSE : 3506.074472843419



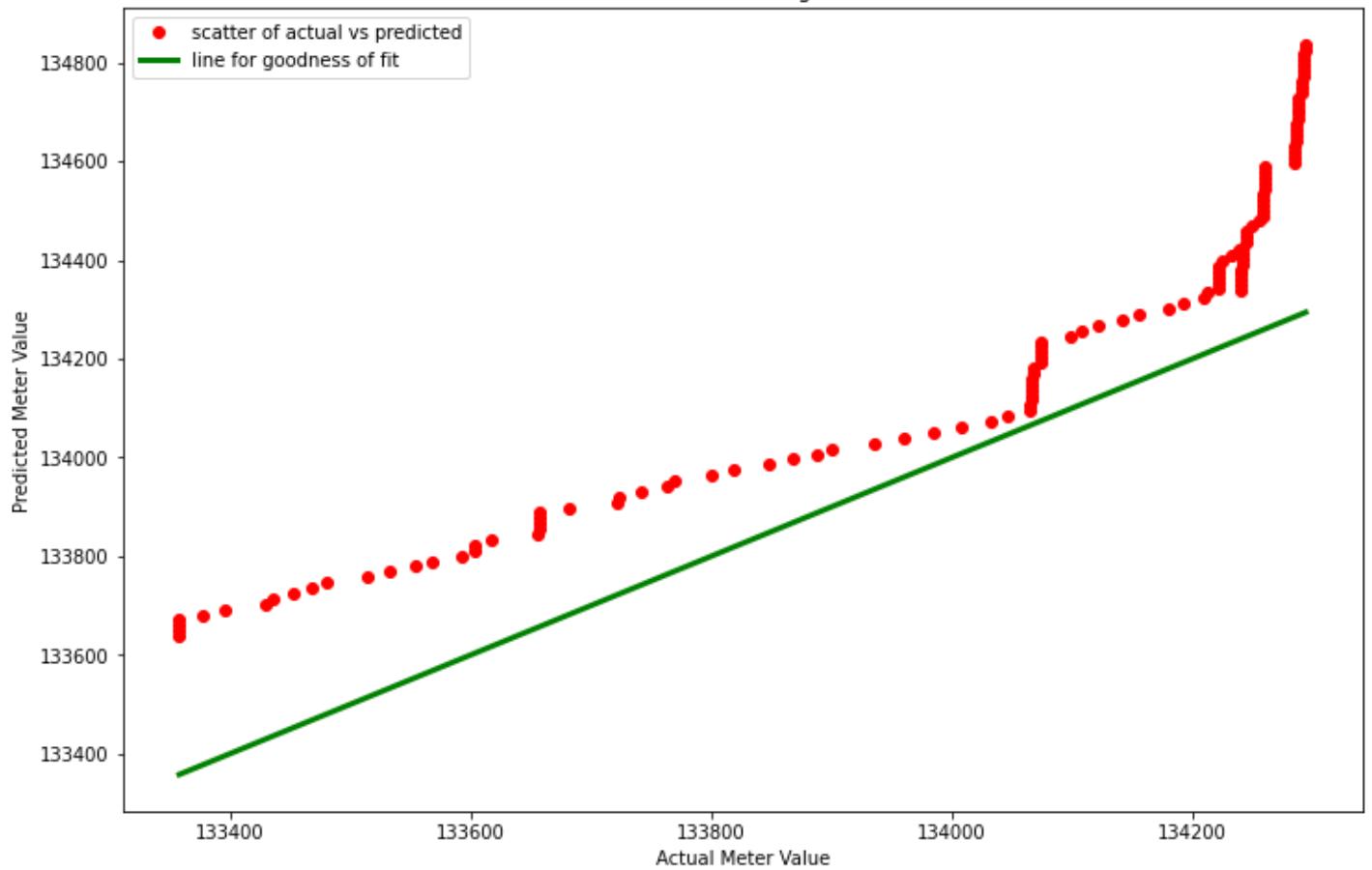
Scatter Plot - Household 2449.0 Testing MSE : 1534.4002722718035



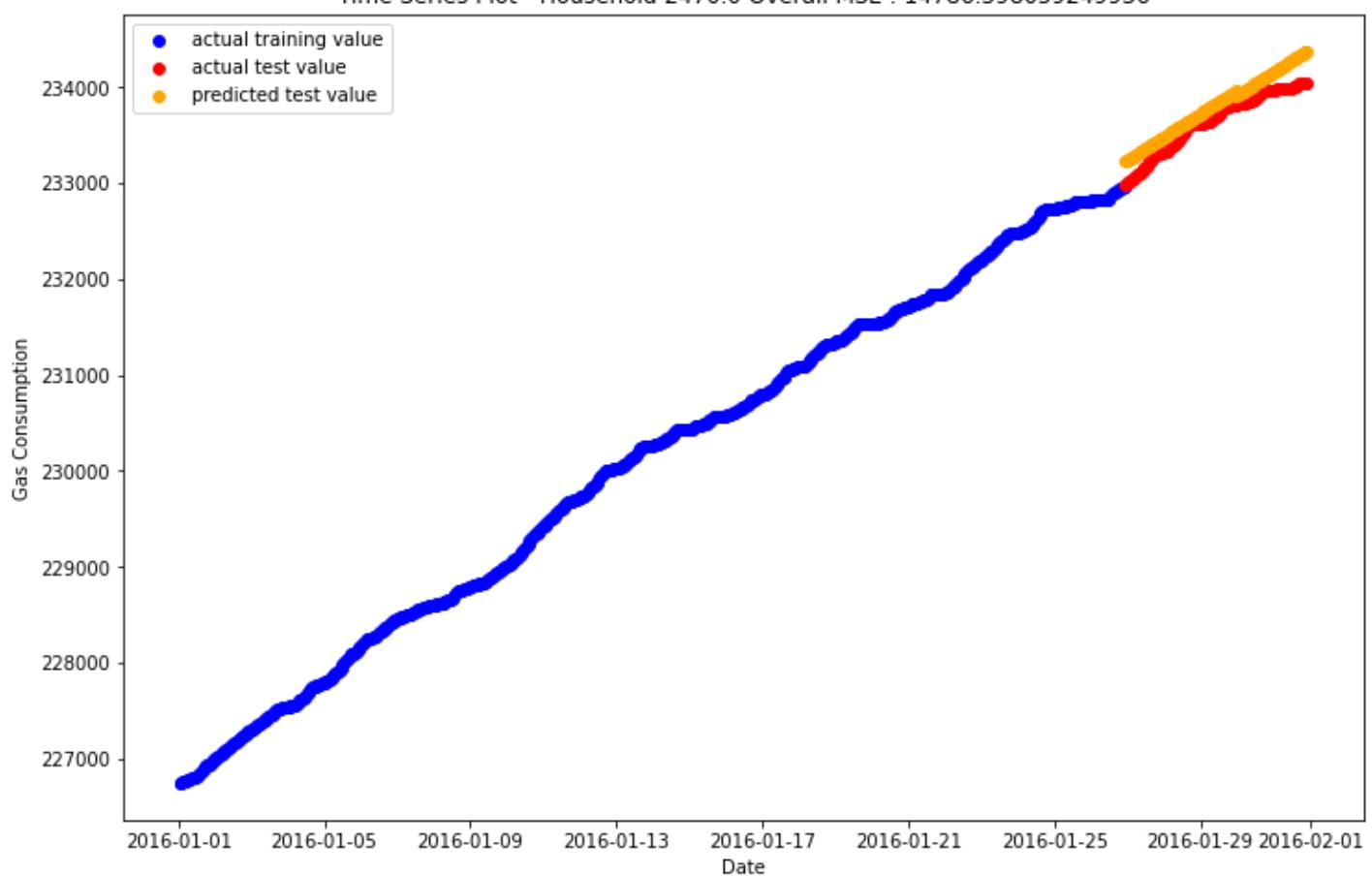
Time Series Plot - Household 2461.0 Overall MSE : 40660.94548768547



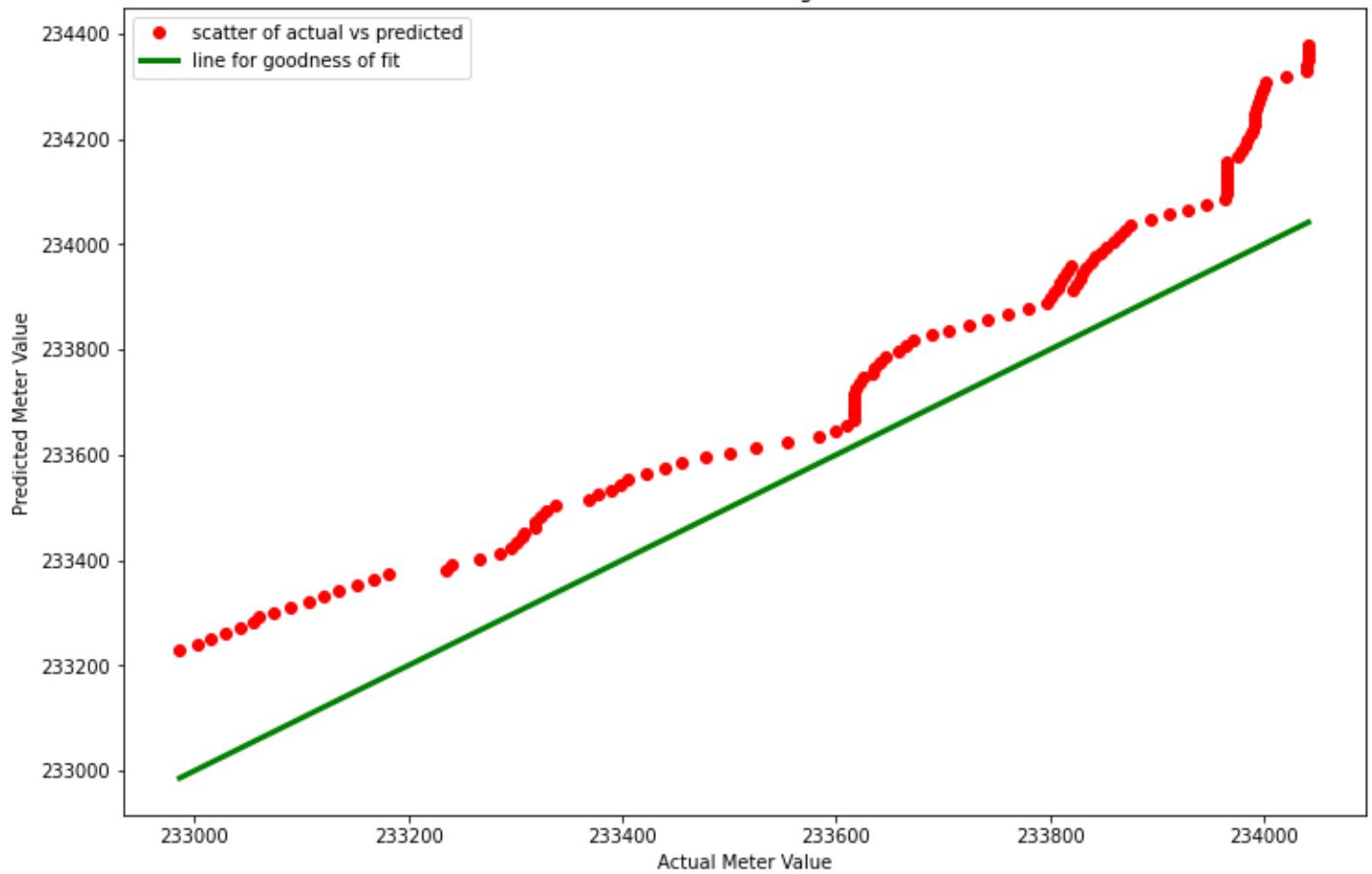
Scatter Plot - Household 2461.0 Testing MSE : 66041.30679296171



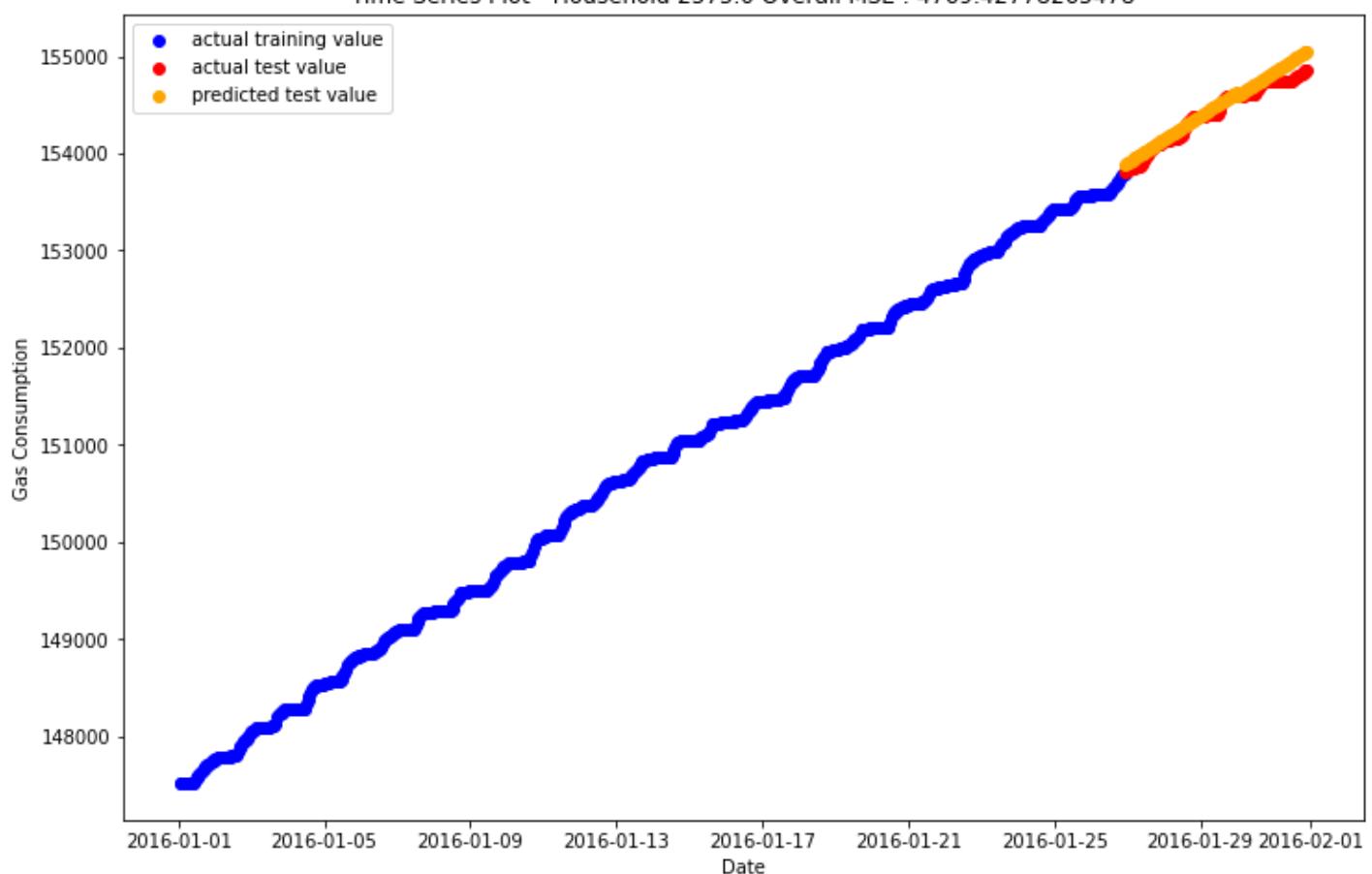
Time Series Plot - Household 2470.0 Overall MSE : 14786.598059249936



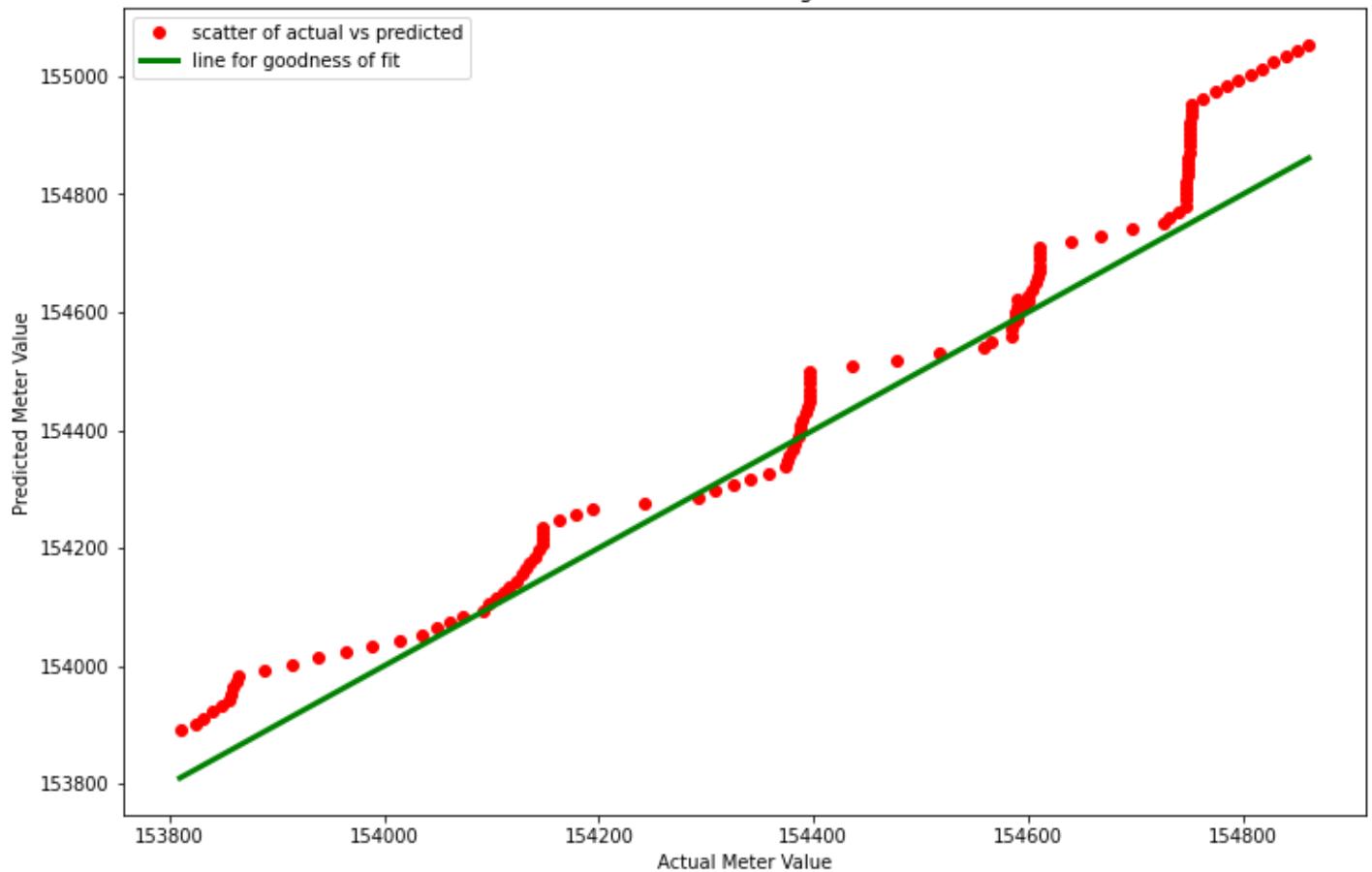
Scatter Plot - Household 2470.0 Testing MSE : 31184.18856584862

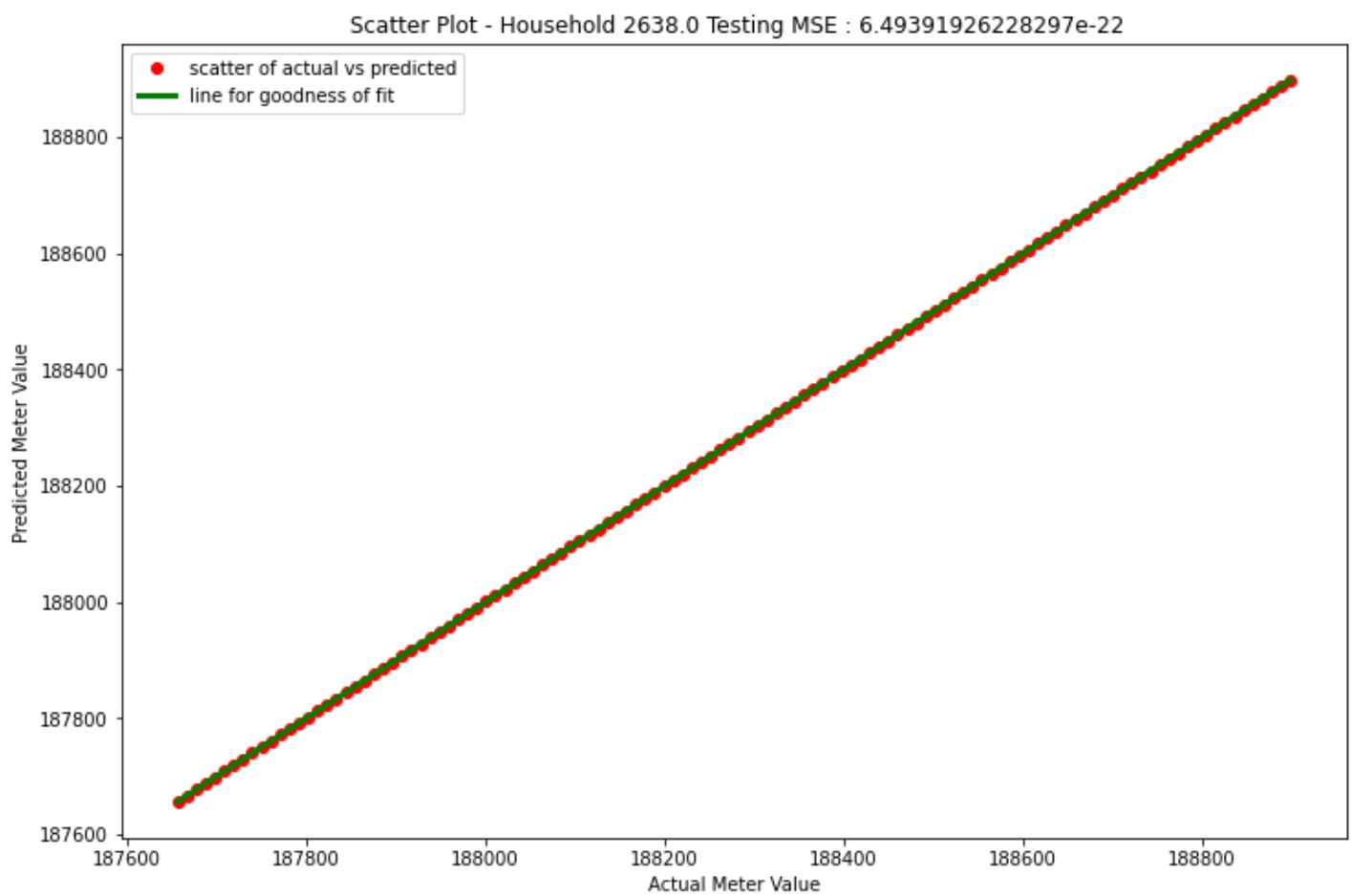
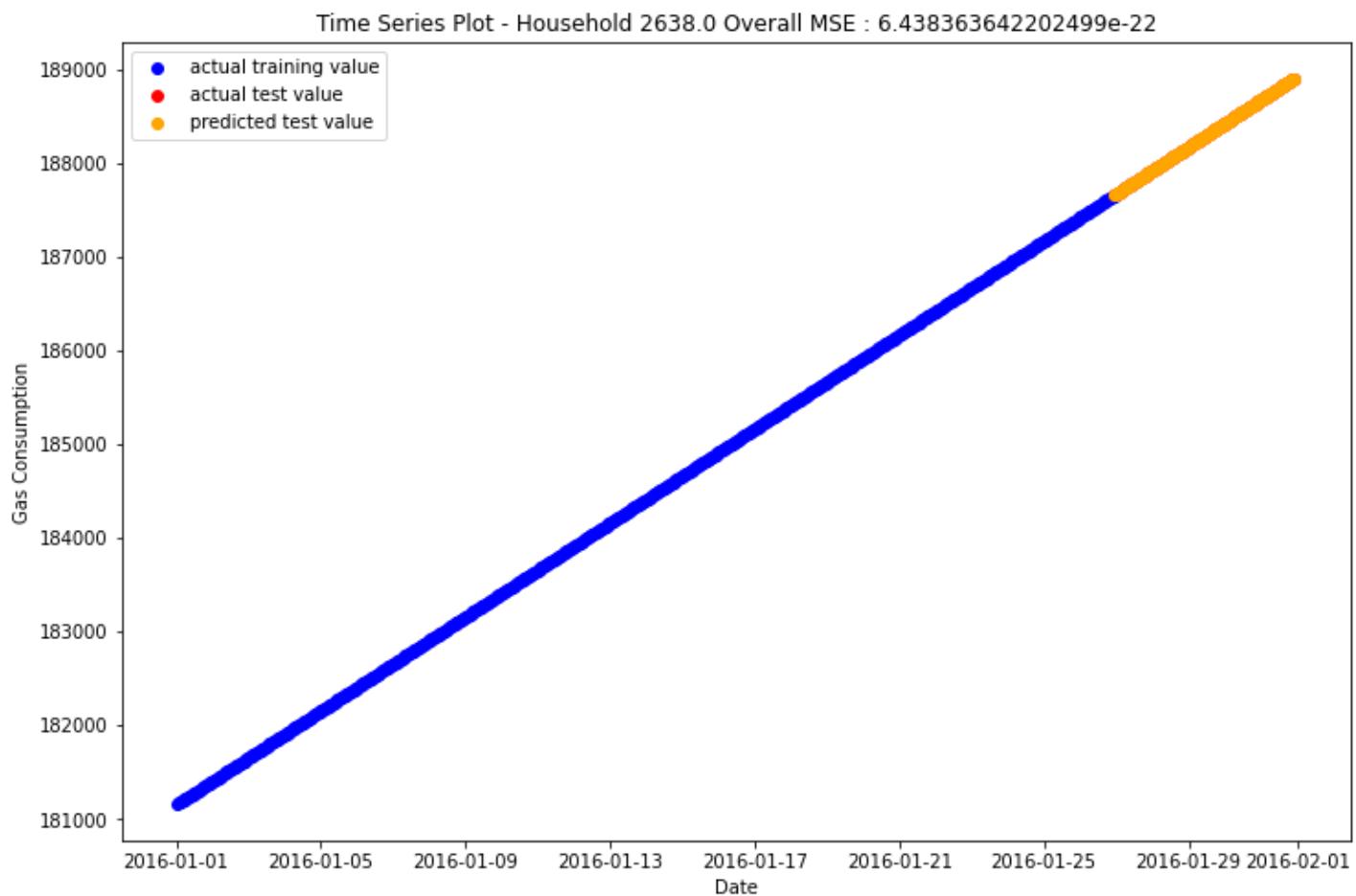


Time Series Plot - Household 2575.0 Overall MSE : 4769.42778265478

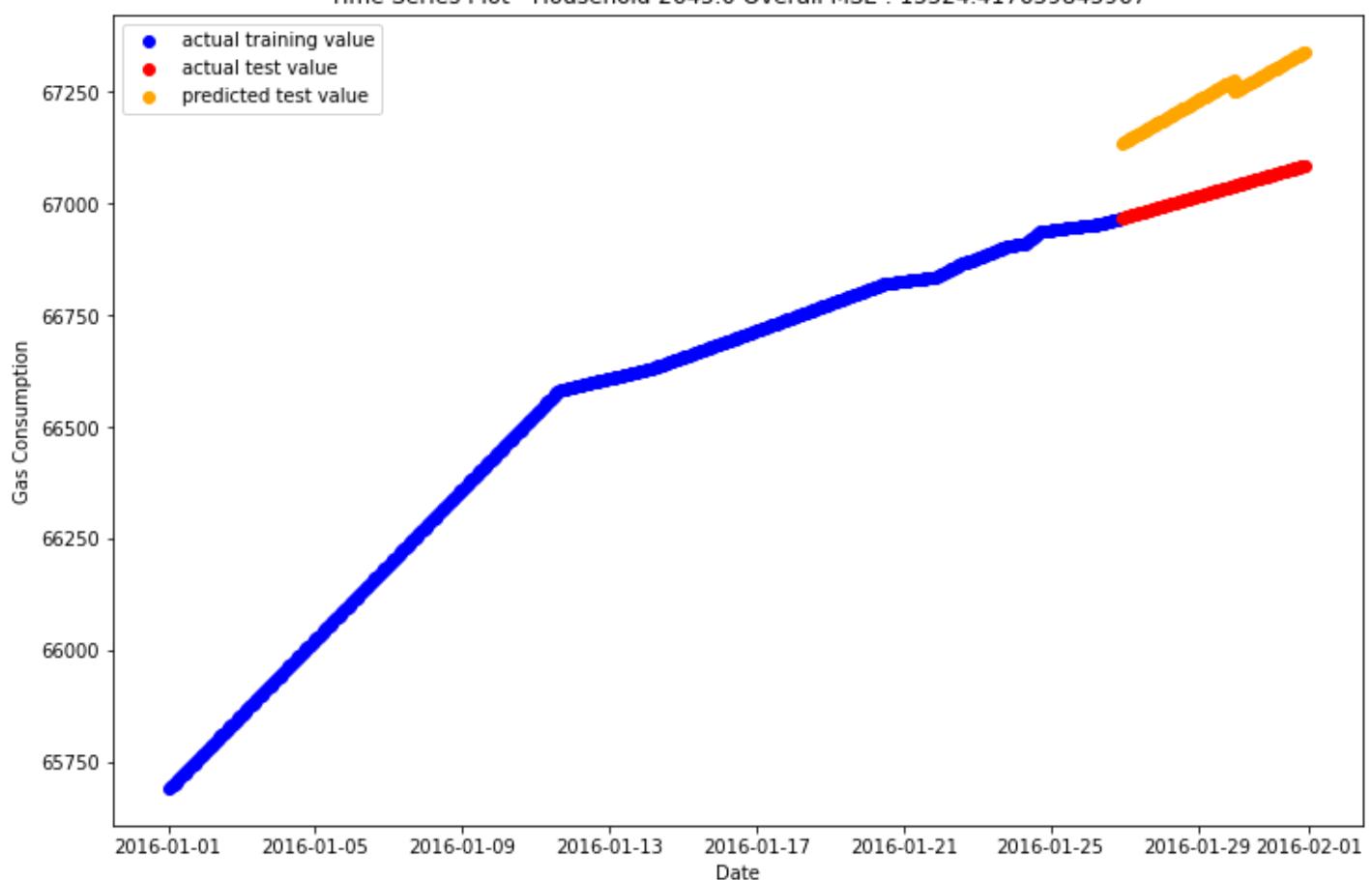


Scatter Plot - Household 2575.0 Testing MSE : 8021.703319871495

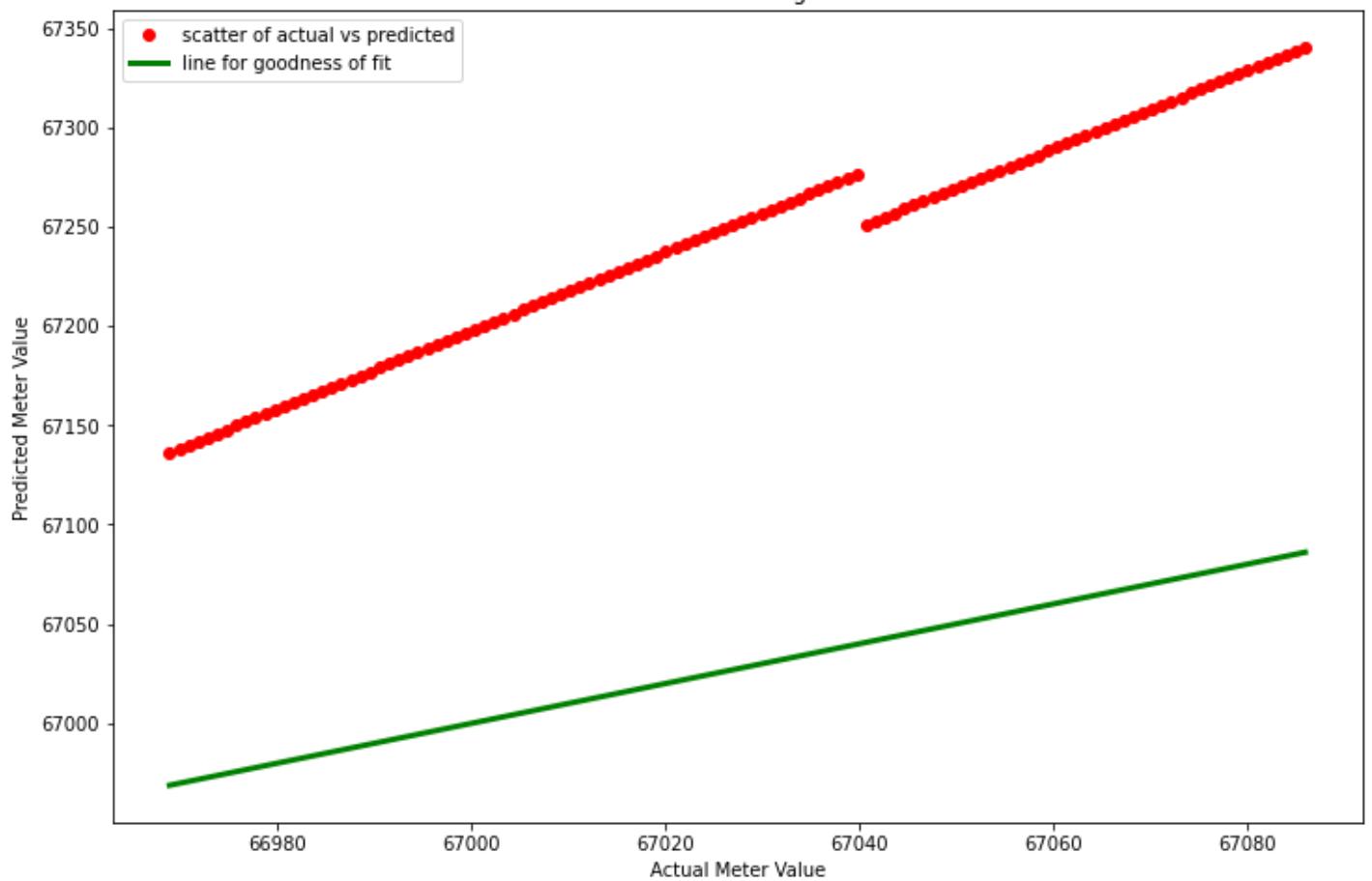




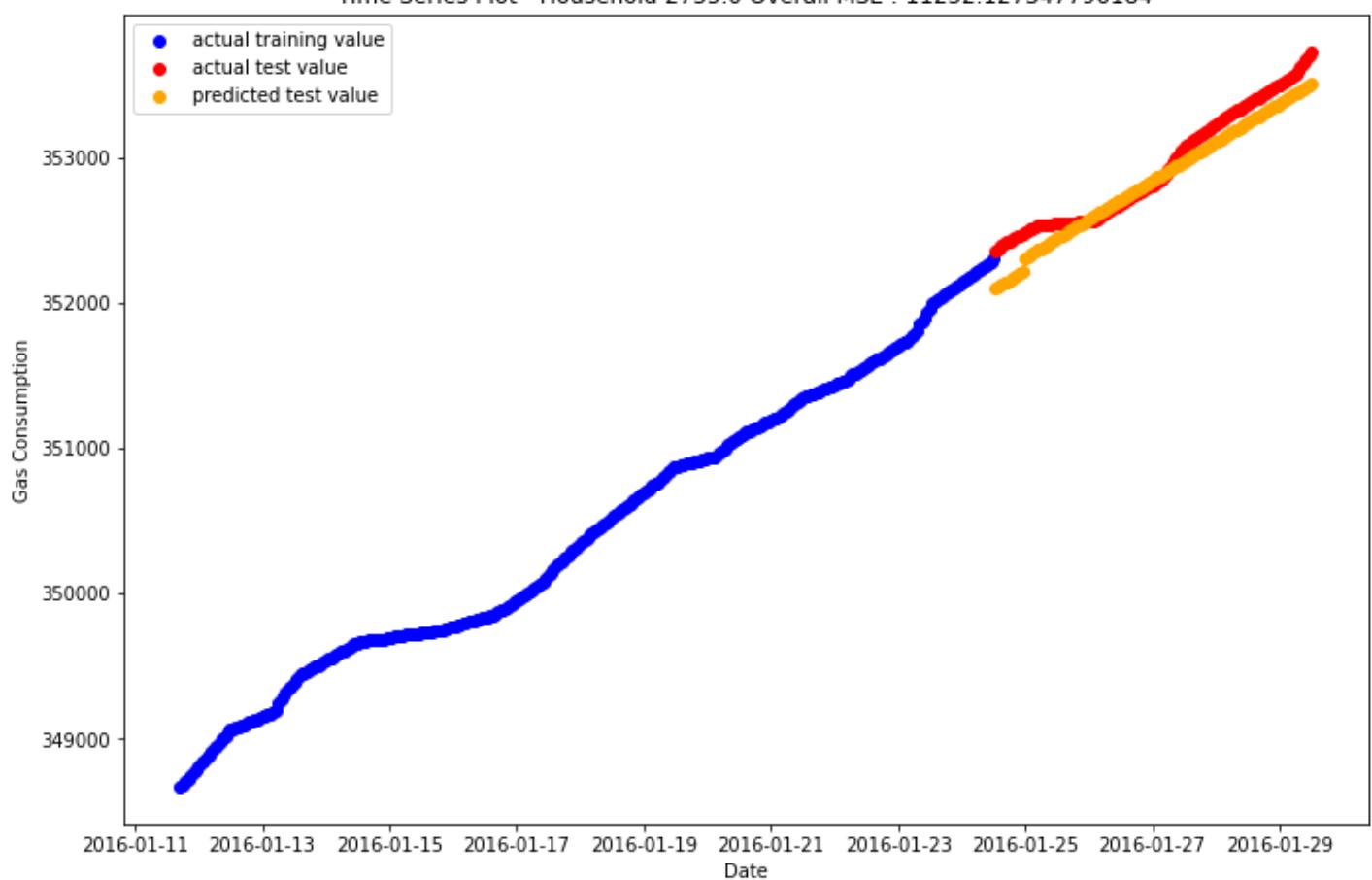
Time Series Plot - Household 2645.0 Overall MSE : 15524.417659845967



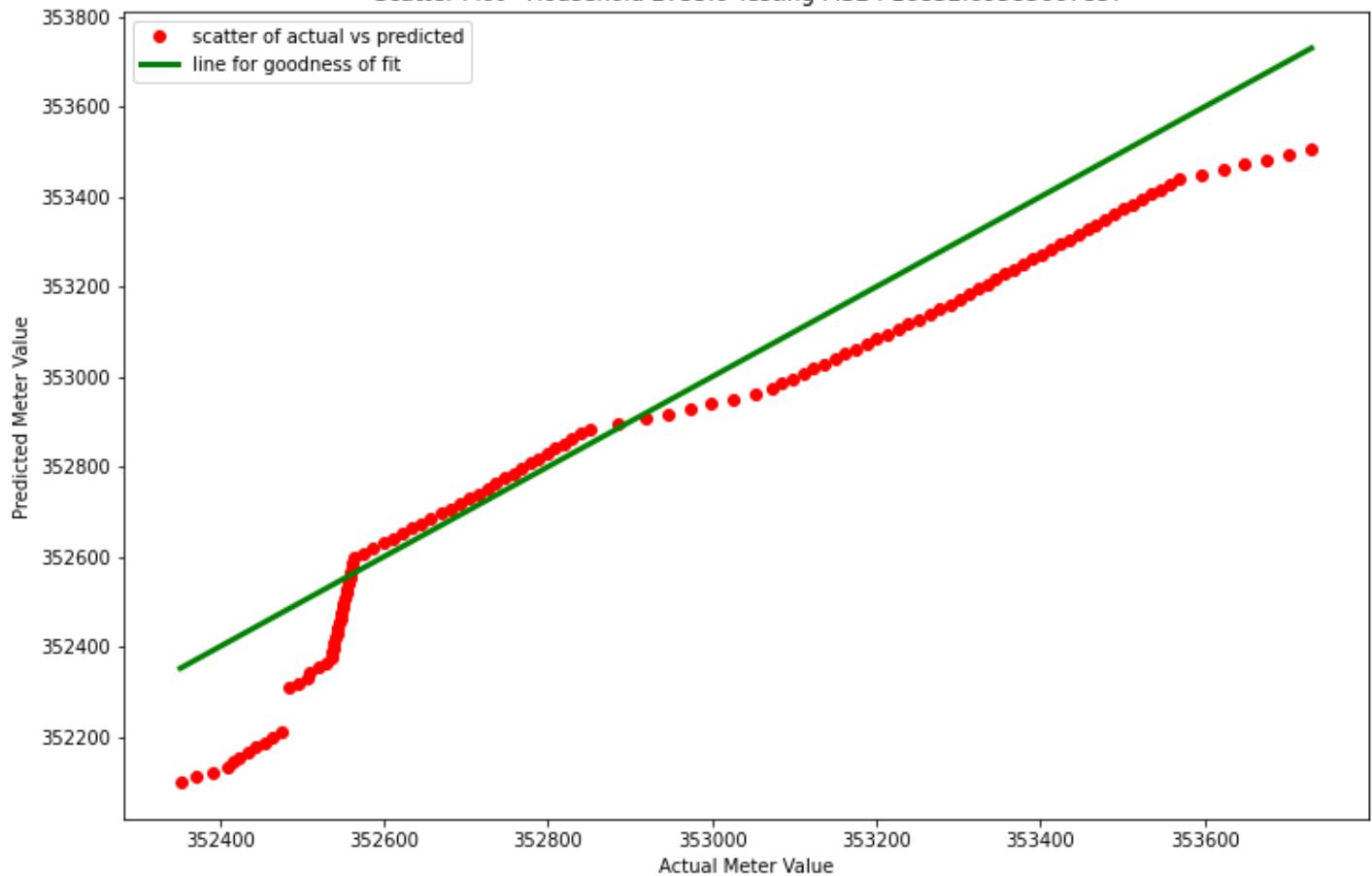
Scatter Plot - Household 2645.0 Testing MSE : 46265.31959085257



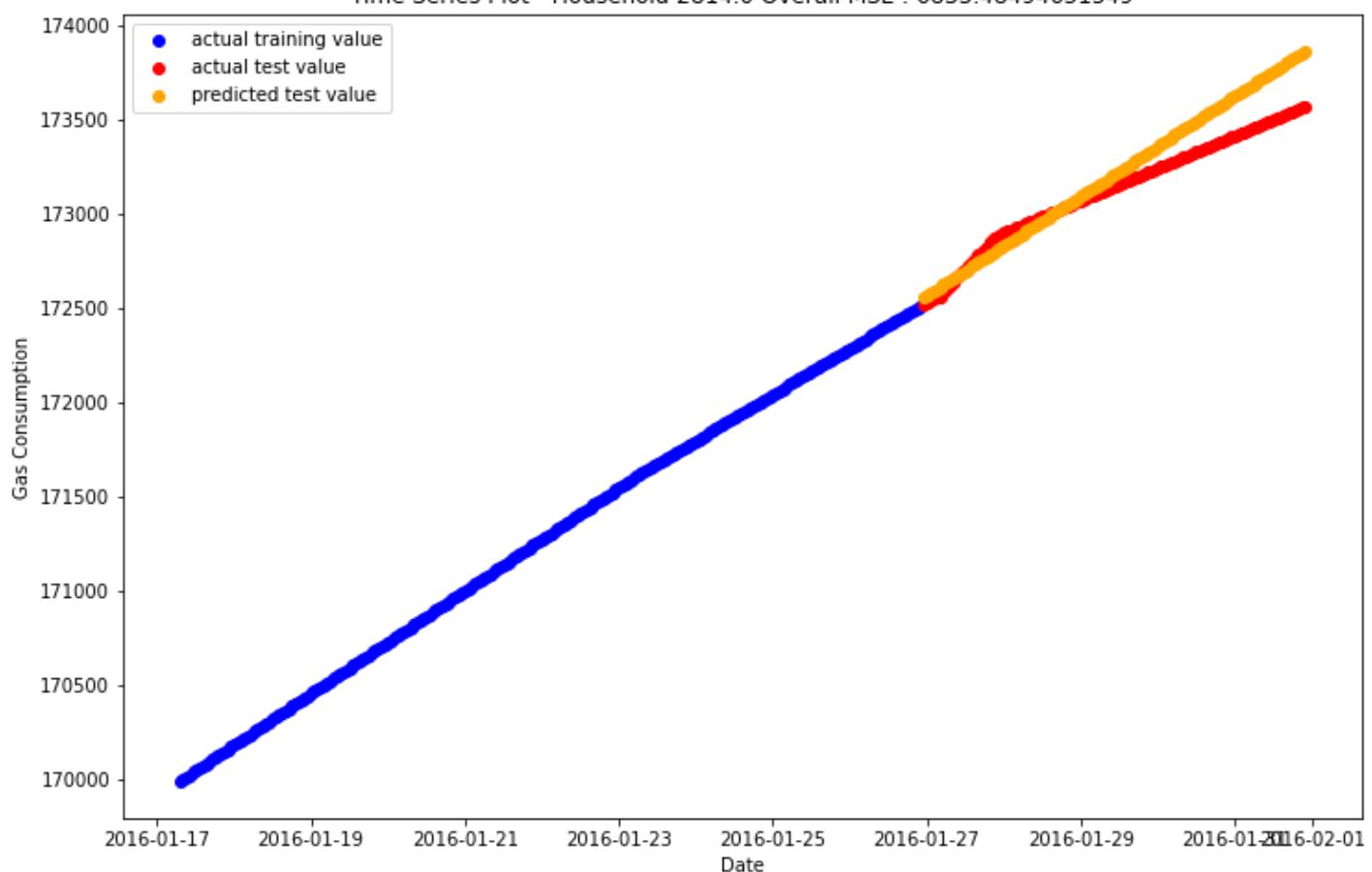
Time Series Plot - Household 2755.0 Overall MSE : 11252.127347796184



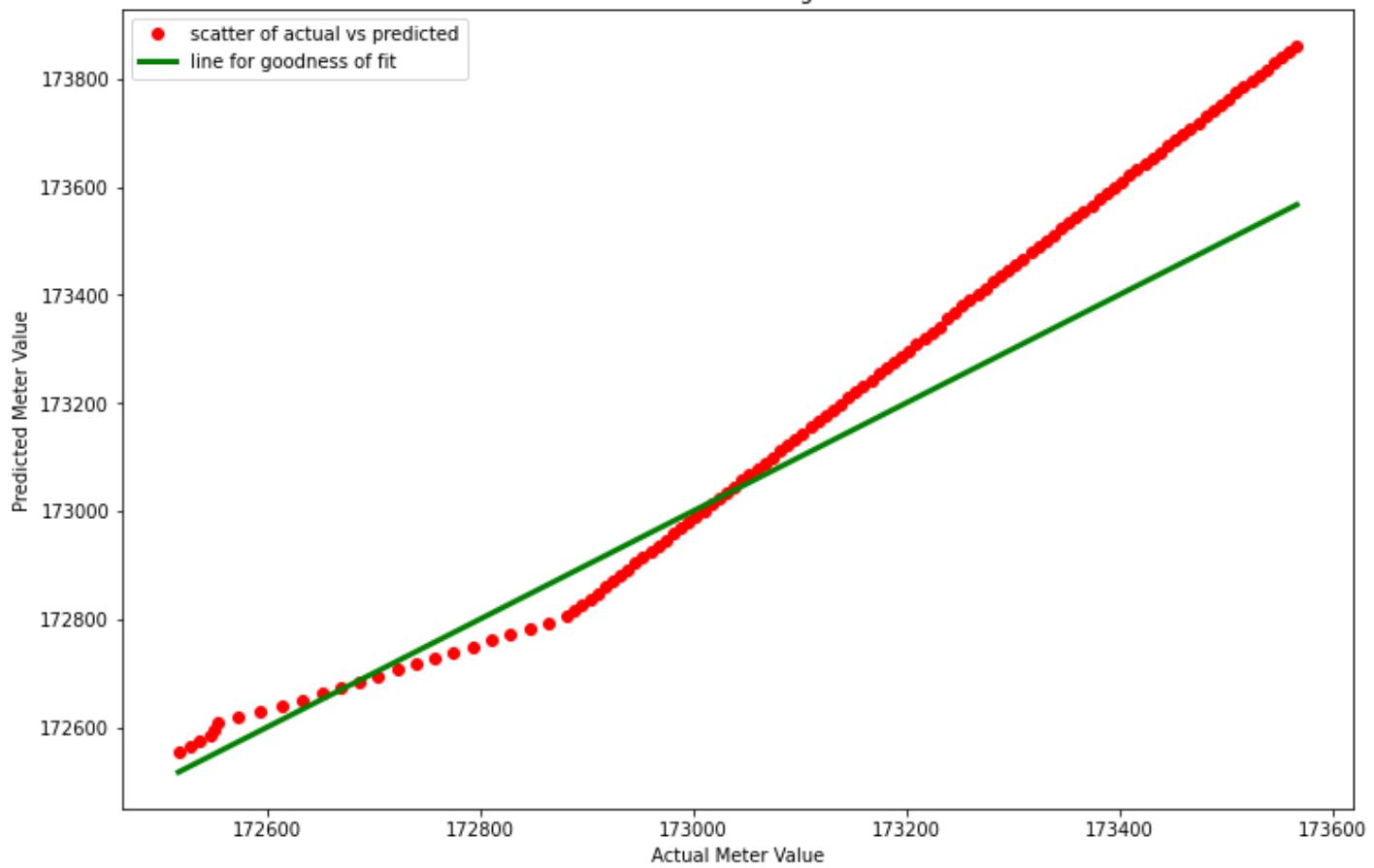
Scatter Plot - Household 2755.0 Testing MSE : 16832.69583667857



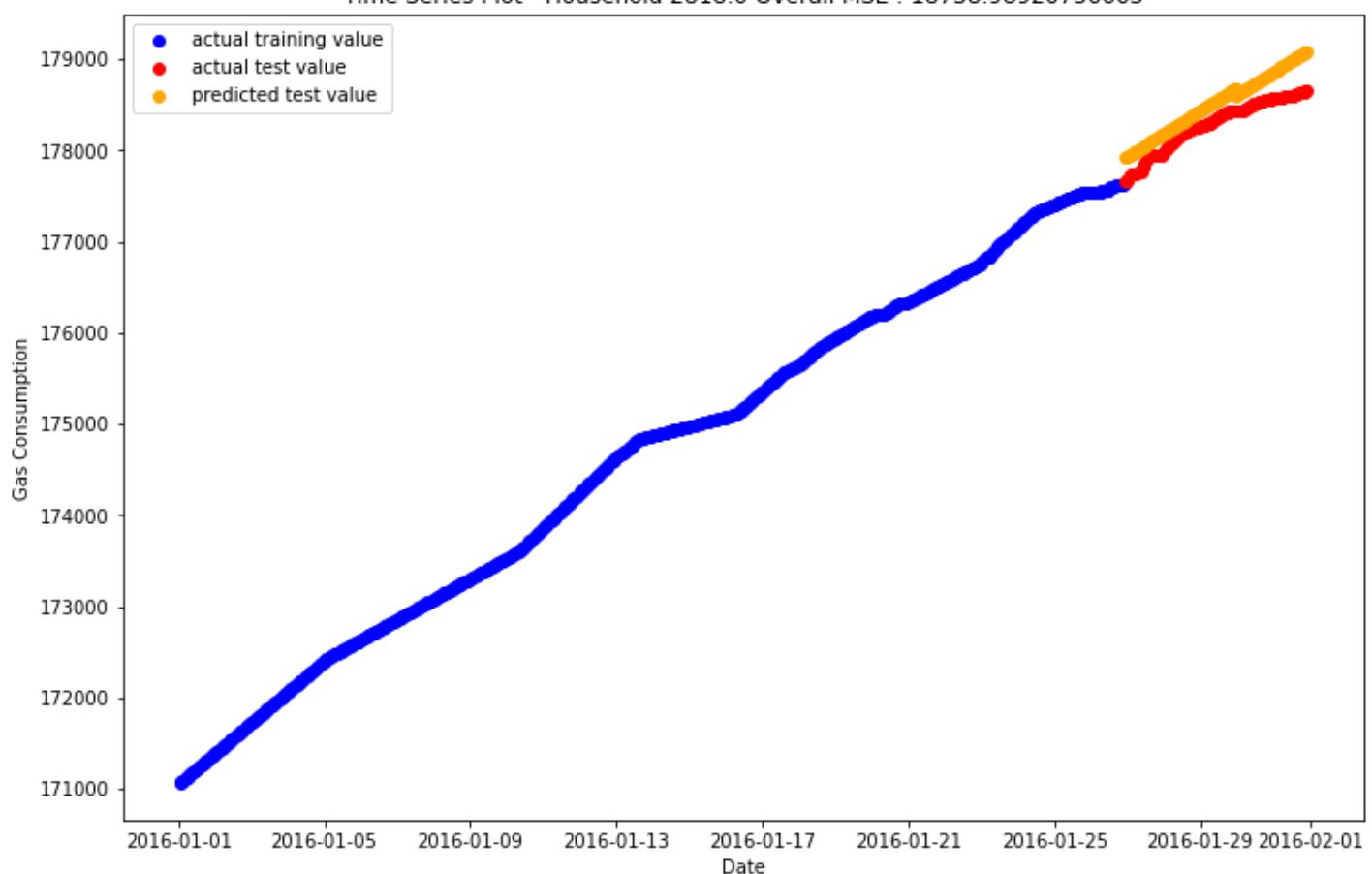
Time Series Plot - Household 2814.0 Overall MSE : 6833.48494651549



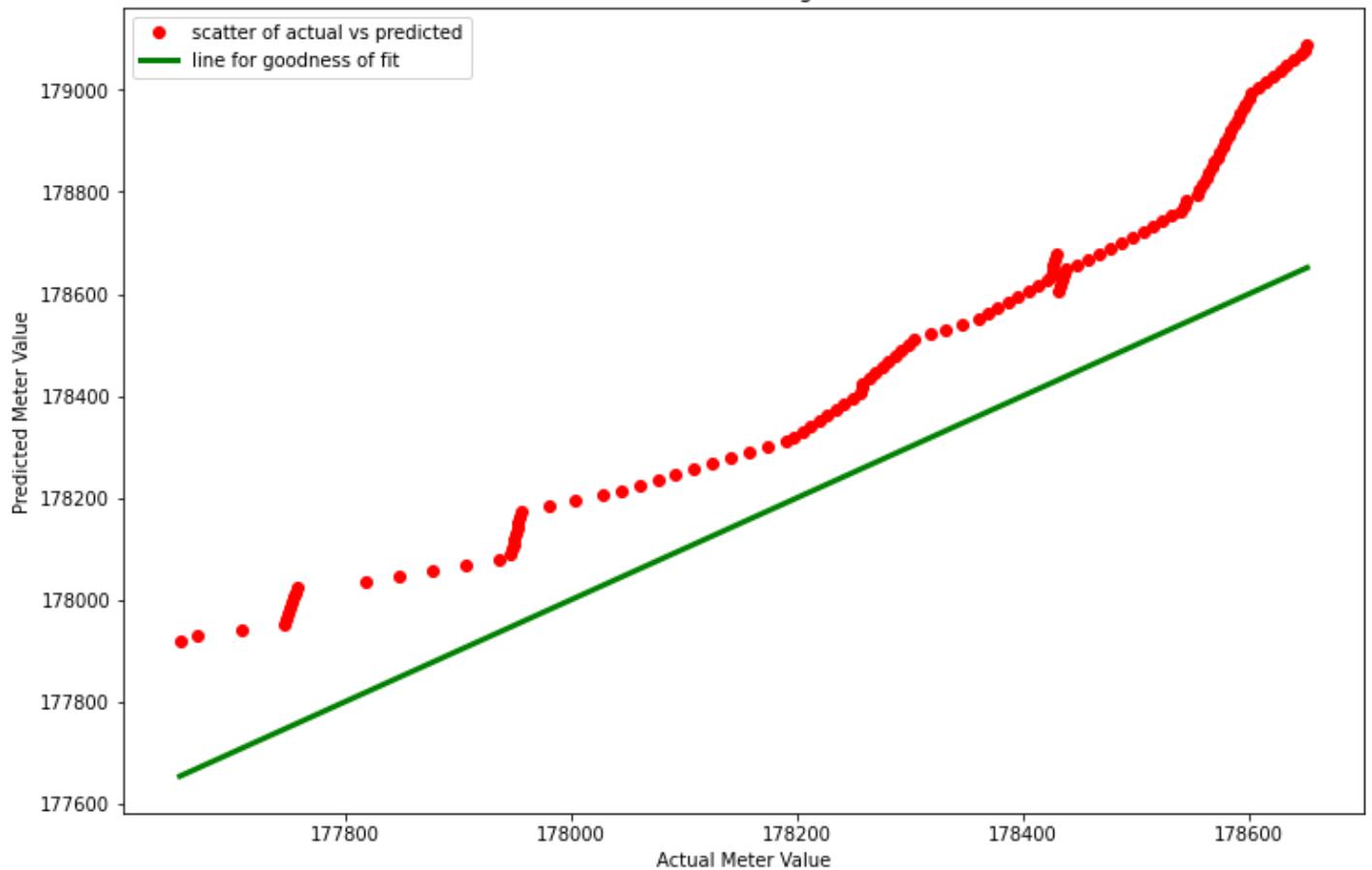
Scatter Plot - Household 2814.0 Testing MSE : 19475.3148910052



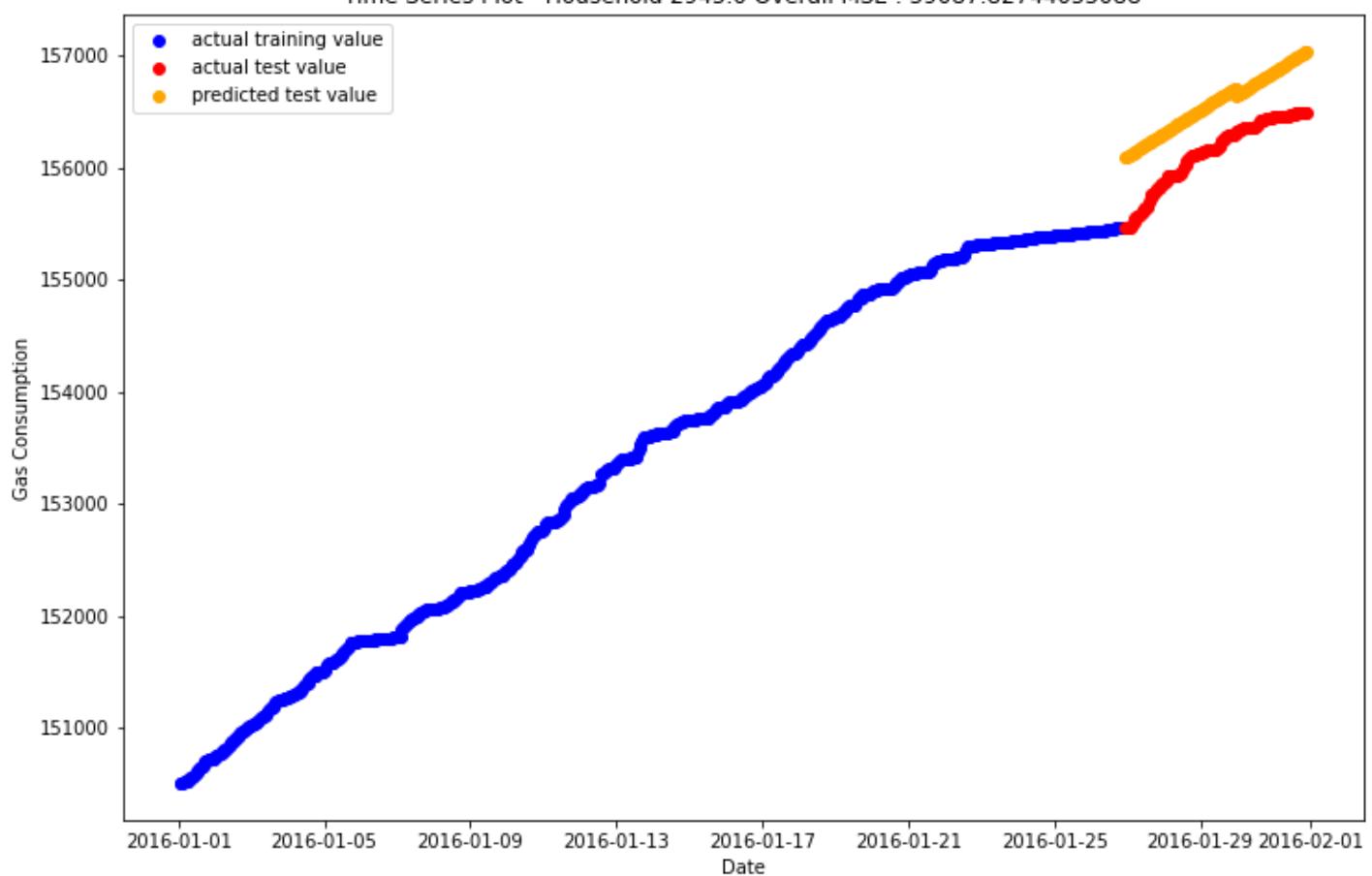
Time Series Plot - Household 2818.0 Overall MSE : 18738.98920736663



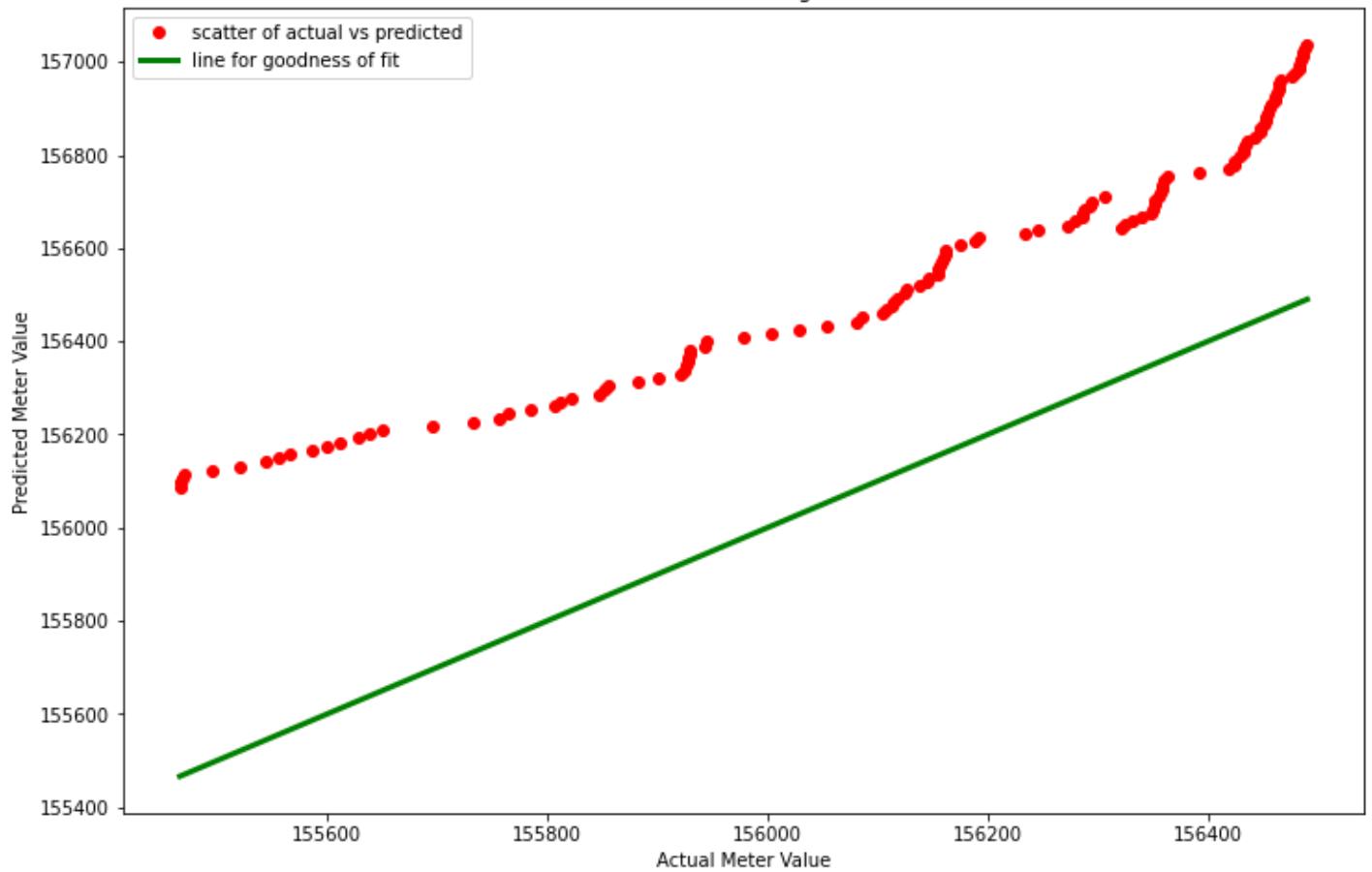
Scatter Plot - Household 2818.0 Testing MSE : 58708.28611959043



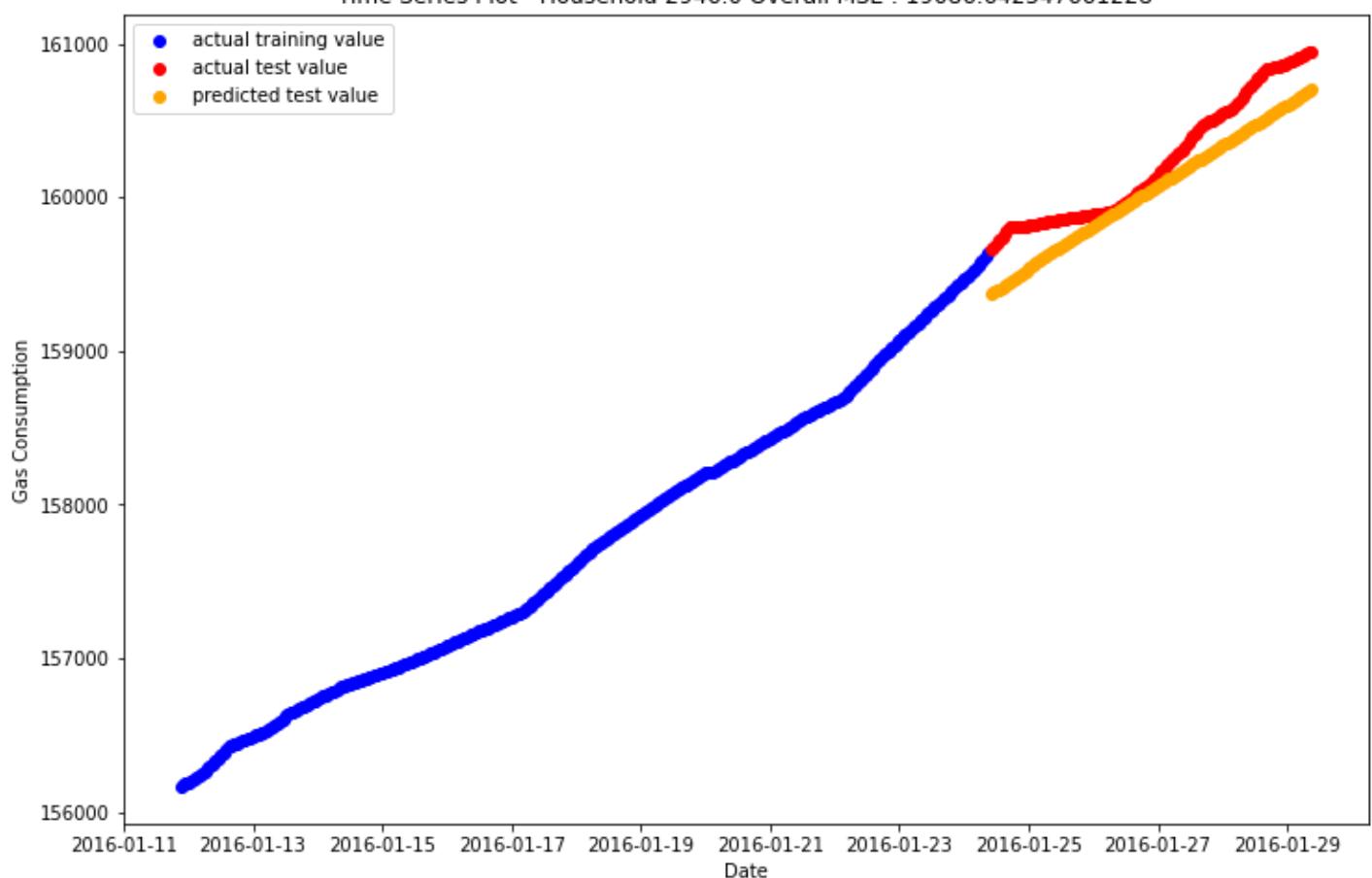
Time Series Plot - Household 2945.0 Overall MSE : 59087.82744055088



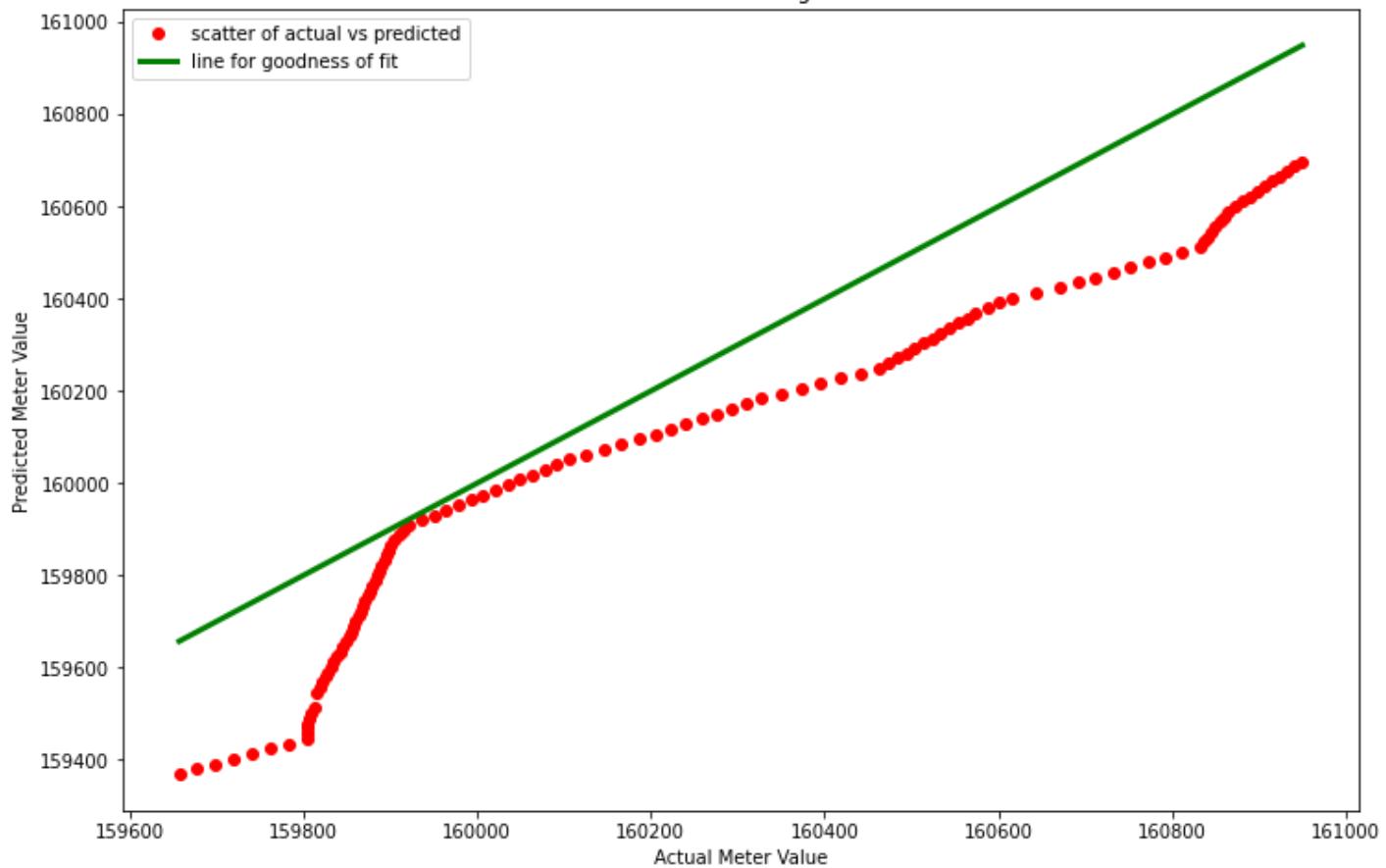
Scatter Plot - Household 2945.0 Testing MSE : 198494.3746176842

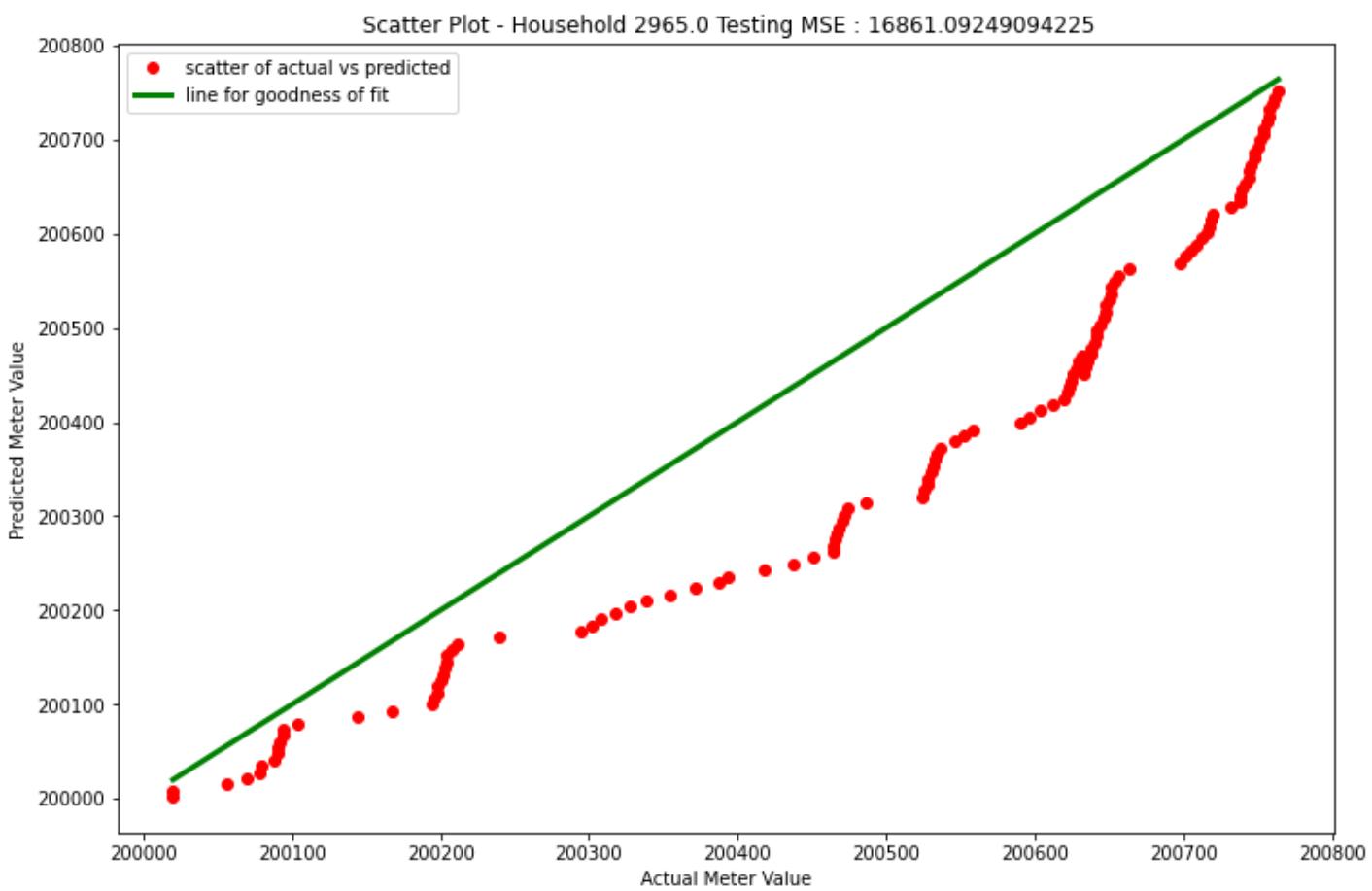
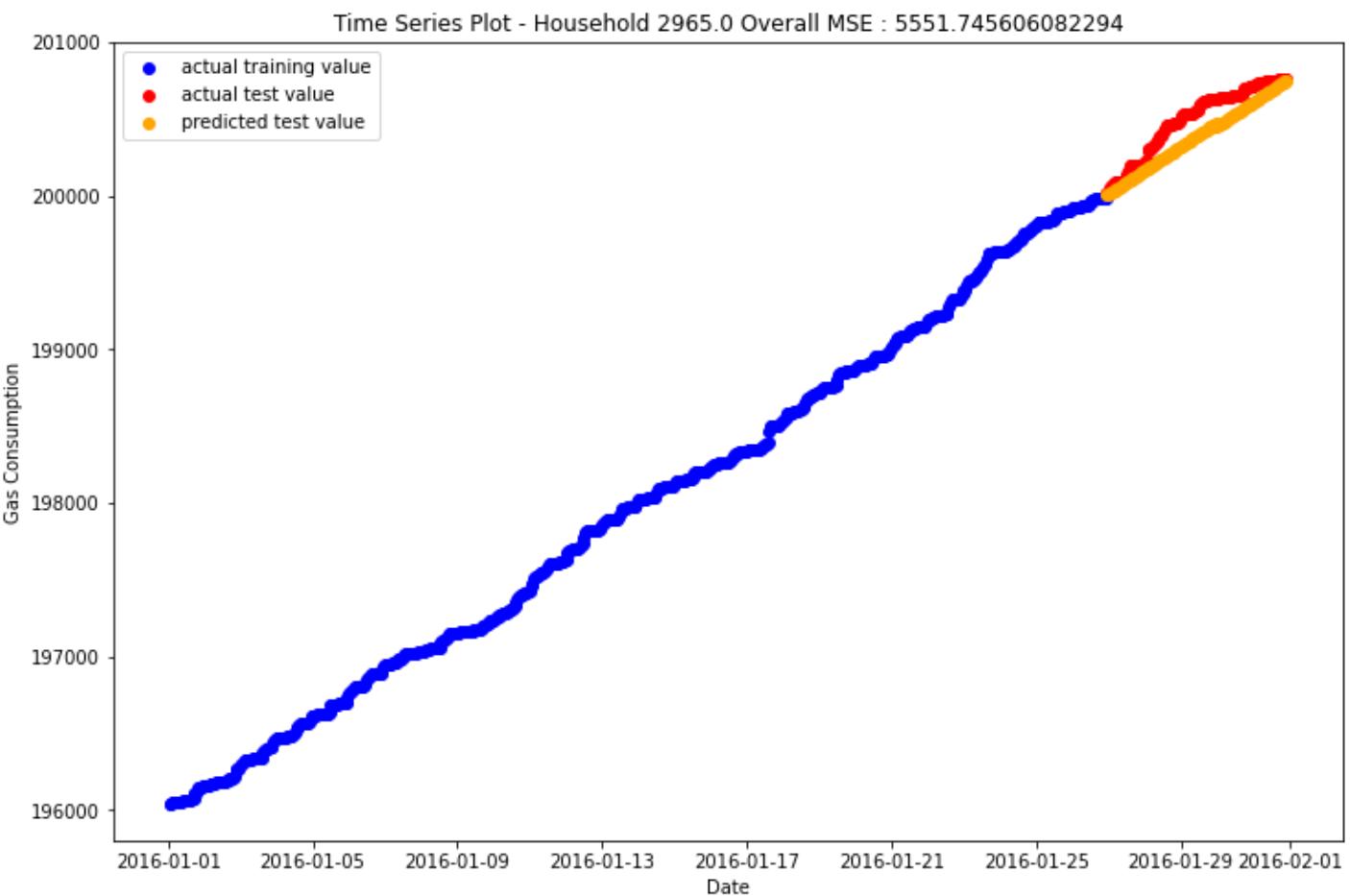


Time Series Plot - Household 2946.0 Overall MSE : 19086.642547661228

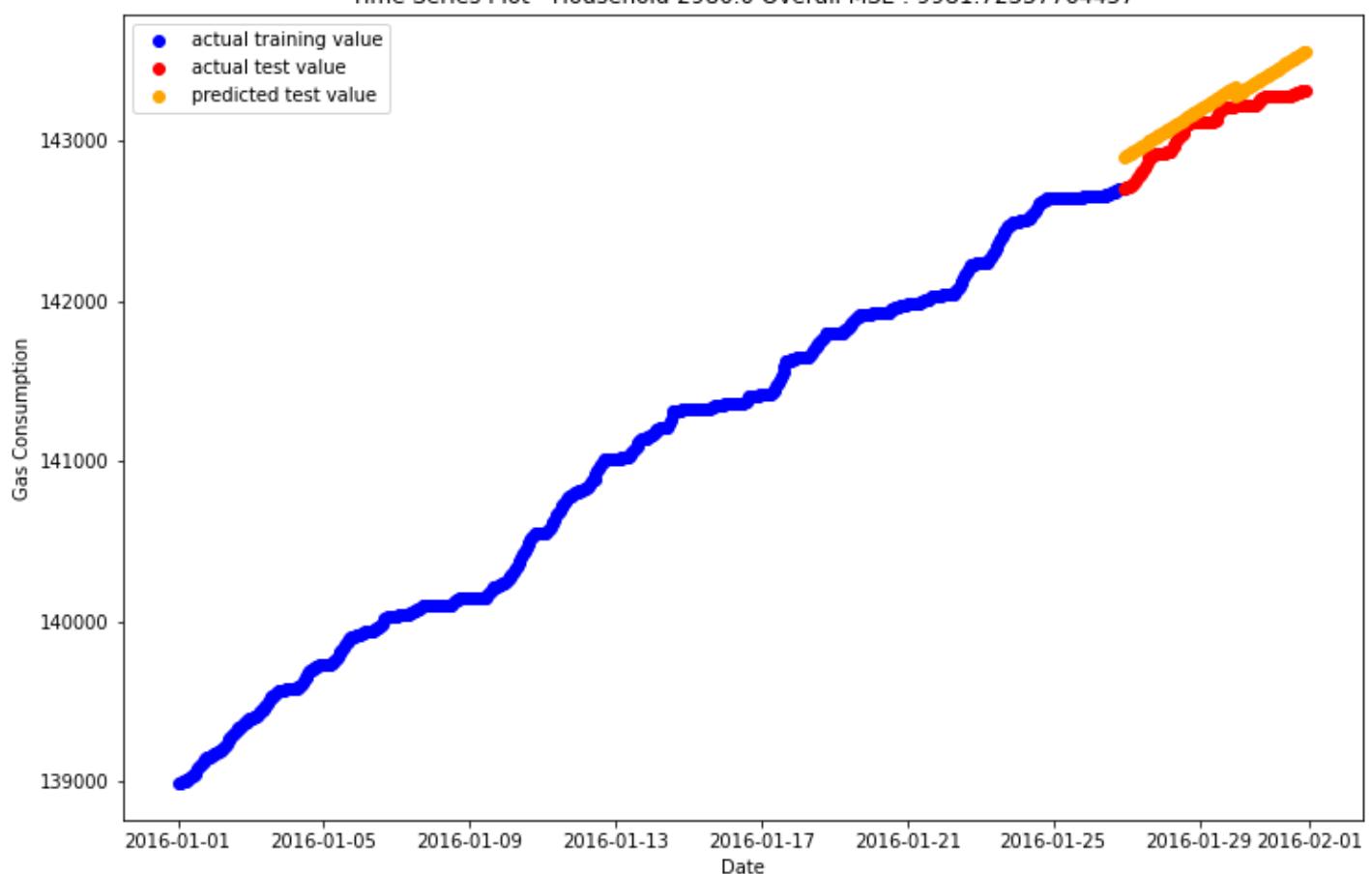


Scatter Plot - Household 2946.0 Testing MSE : 44805.13705285602

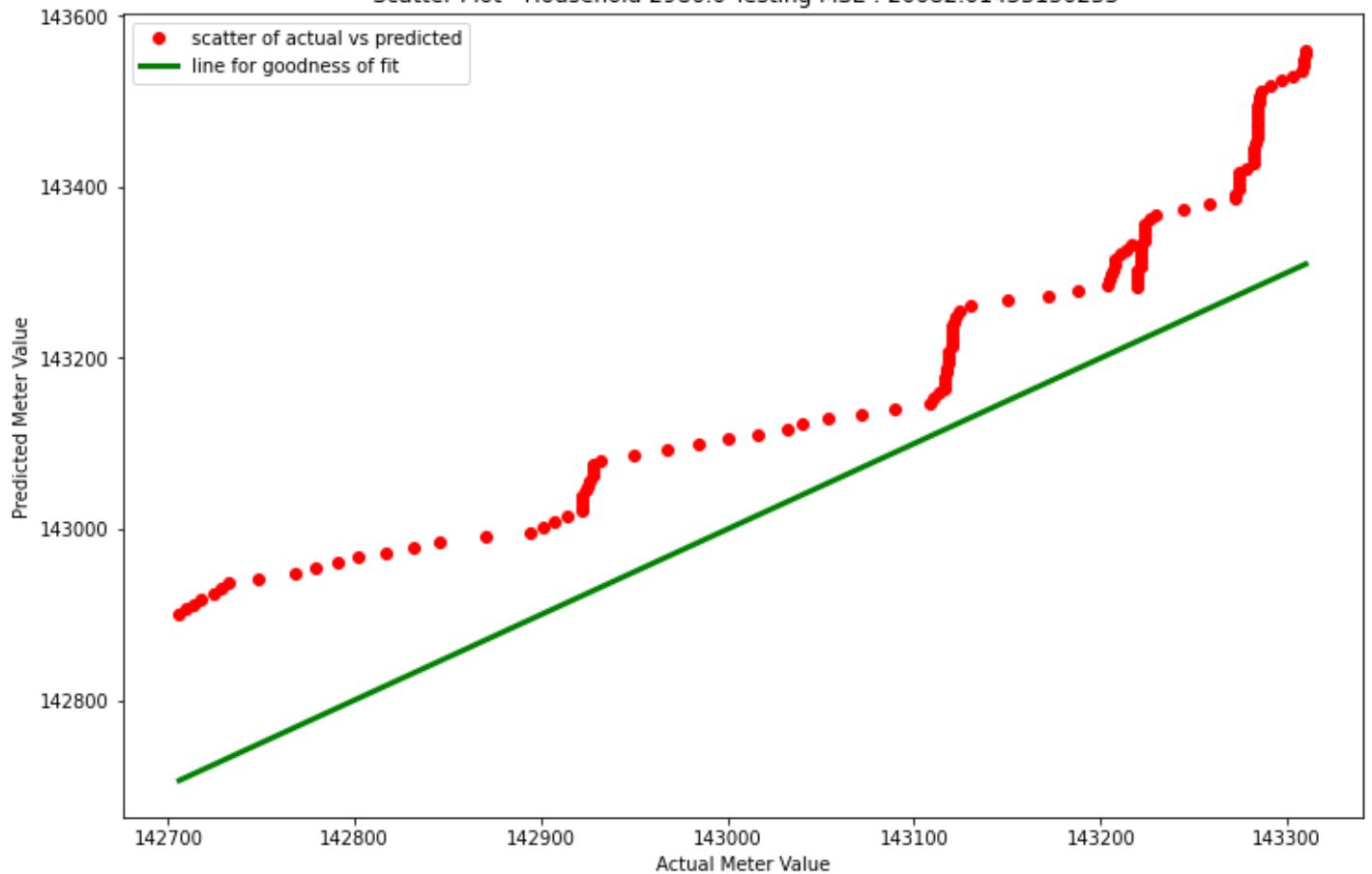


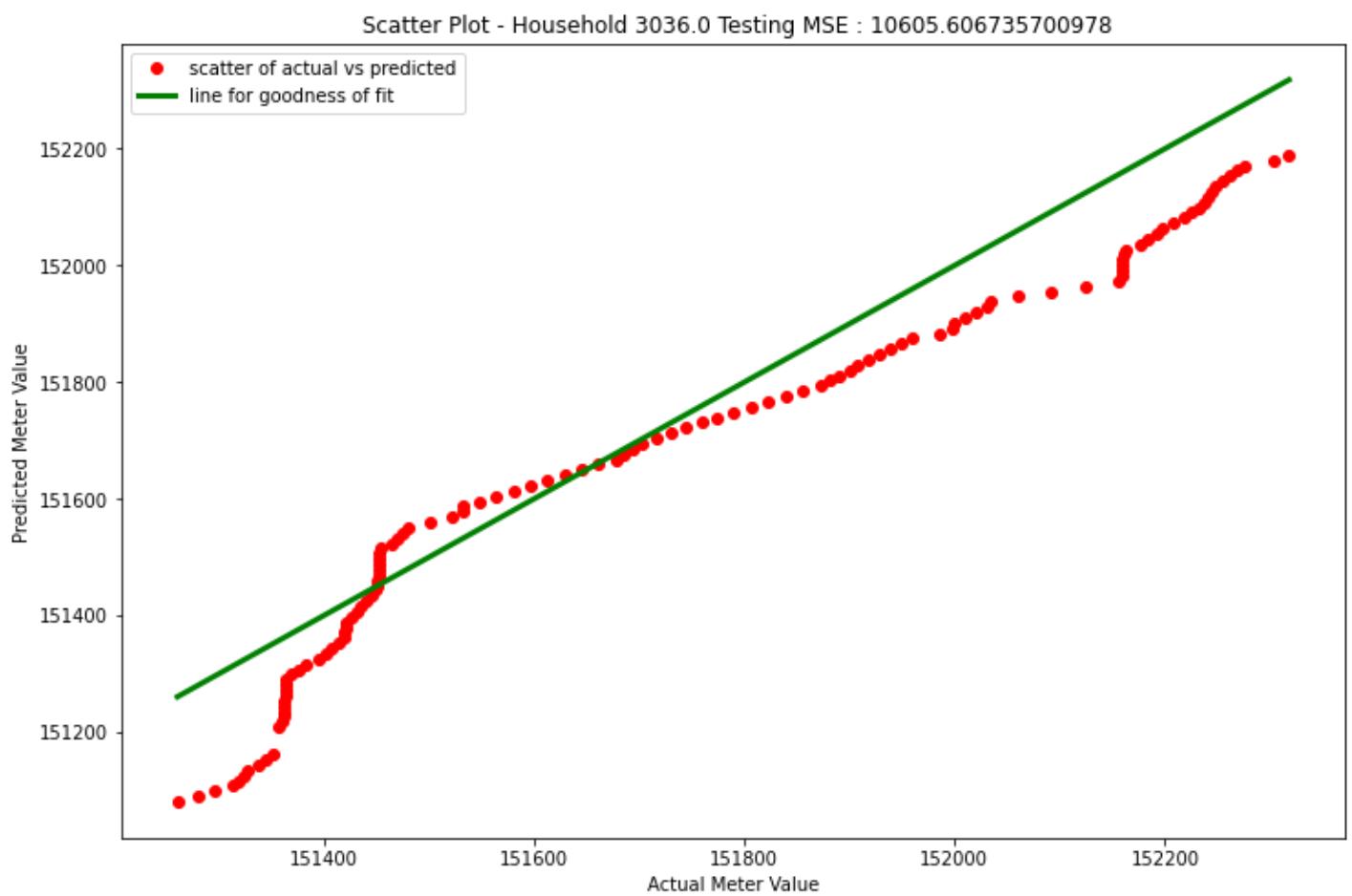
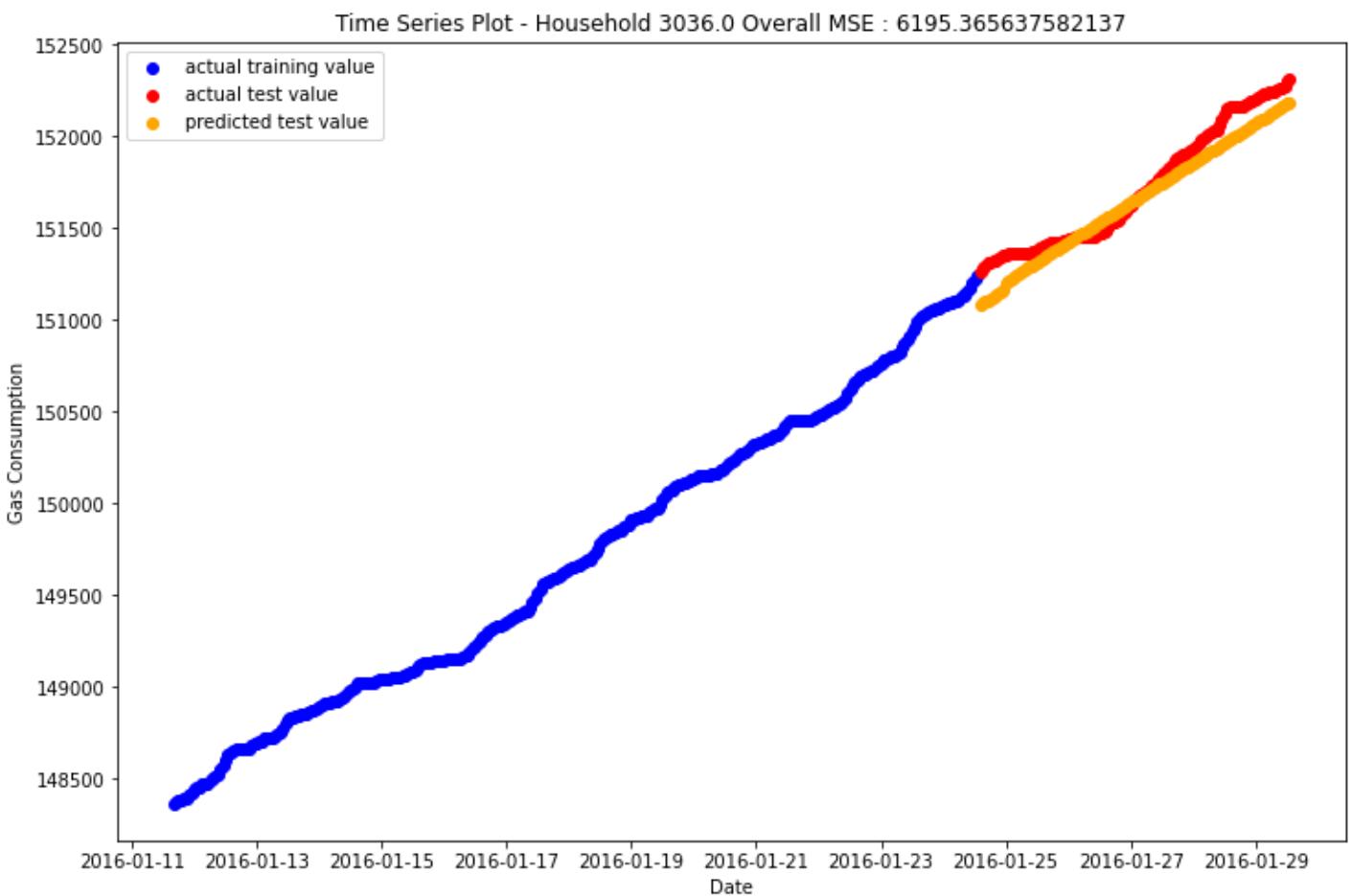


Time Series Plot - Household 2980.0 Overall MSE : 9981.72337764457

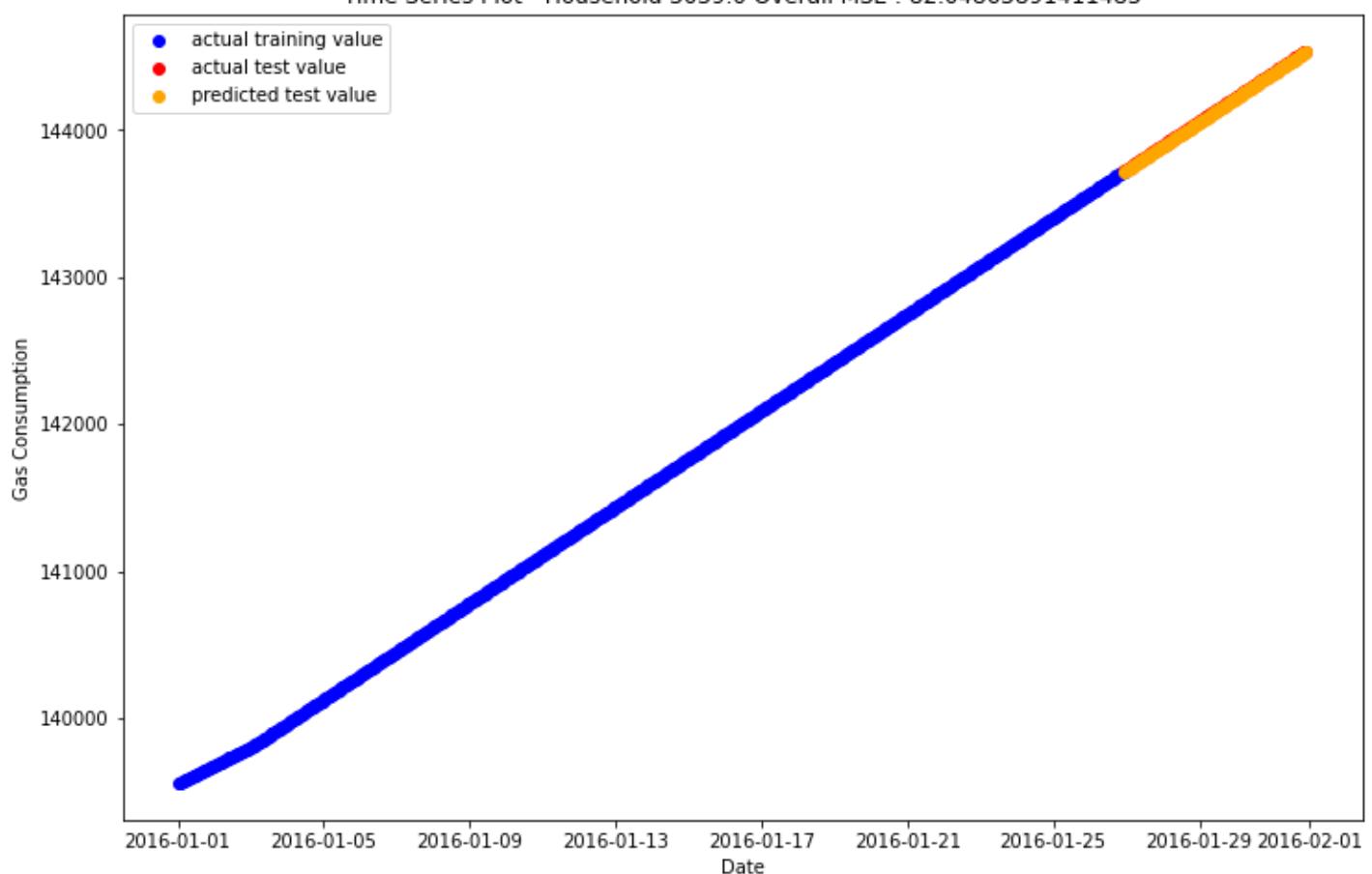


Scatter Plot - Household 2980.0 Testing MSE : 20082.01433150233

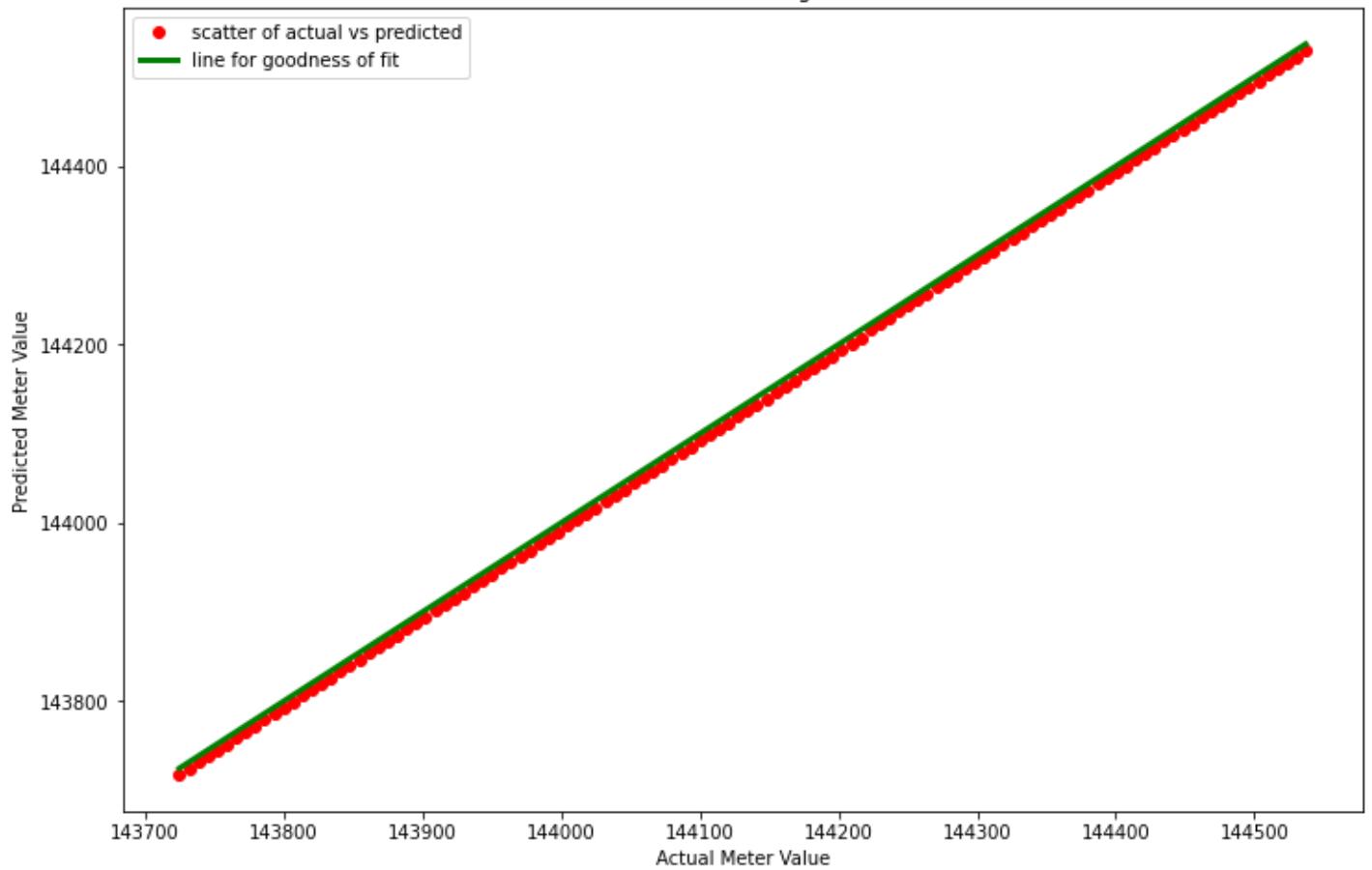




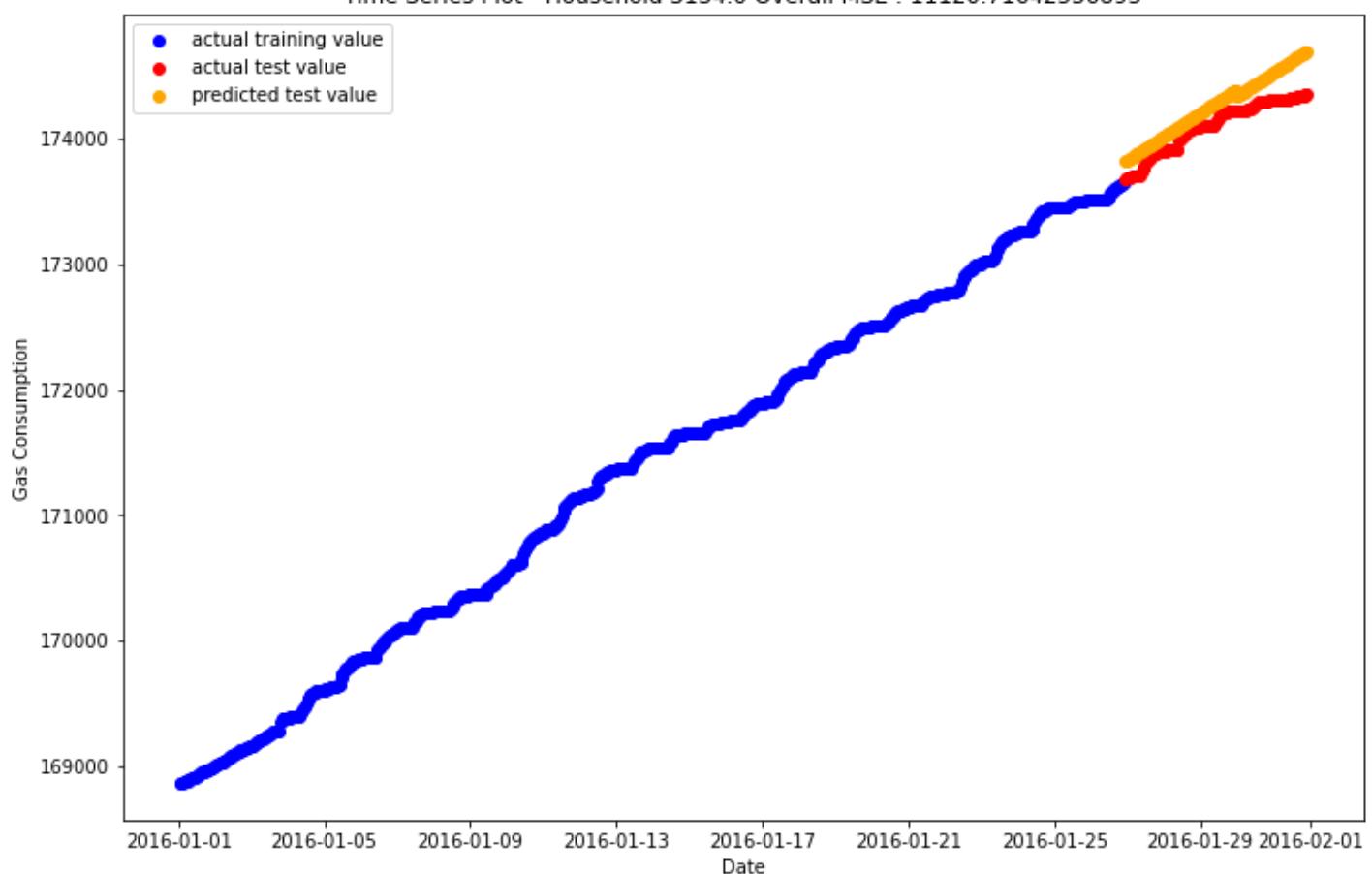
Time Series Plot - Household 3039.0 Overall MSE : 82.04863891411483



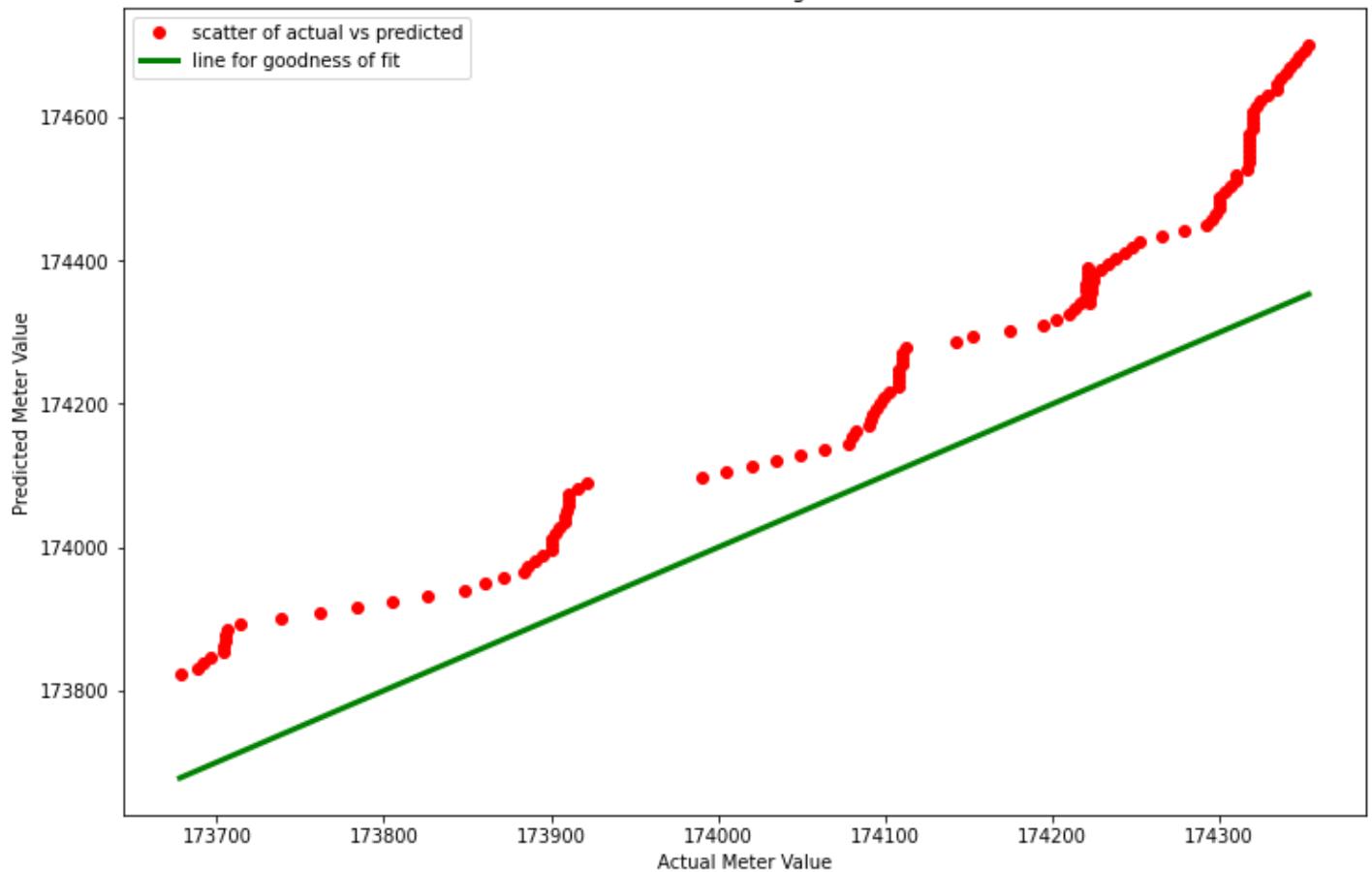
Scatter Plot - Household 3039.0 Testing MSE : 55.41740188706079



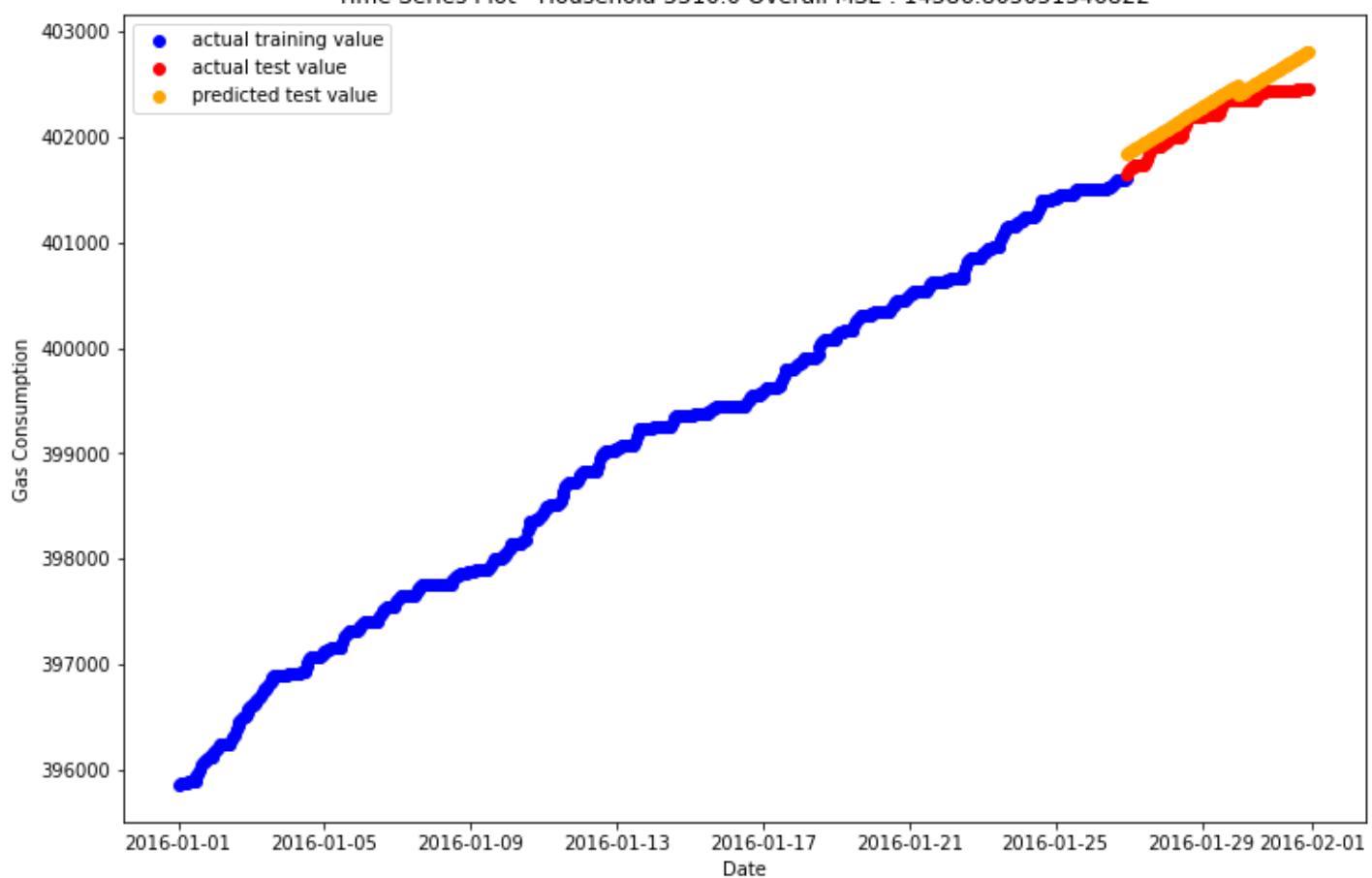
Time Series Plot - Household 3134.0 Overall MSE : 11120.71642536895



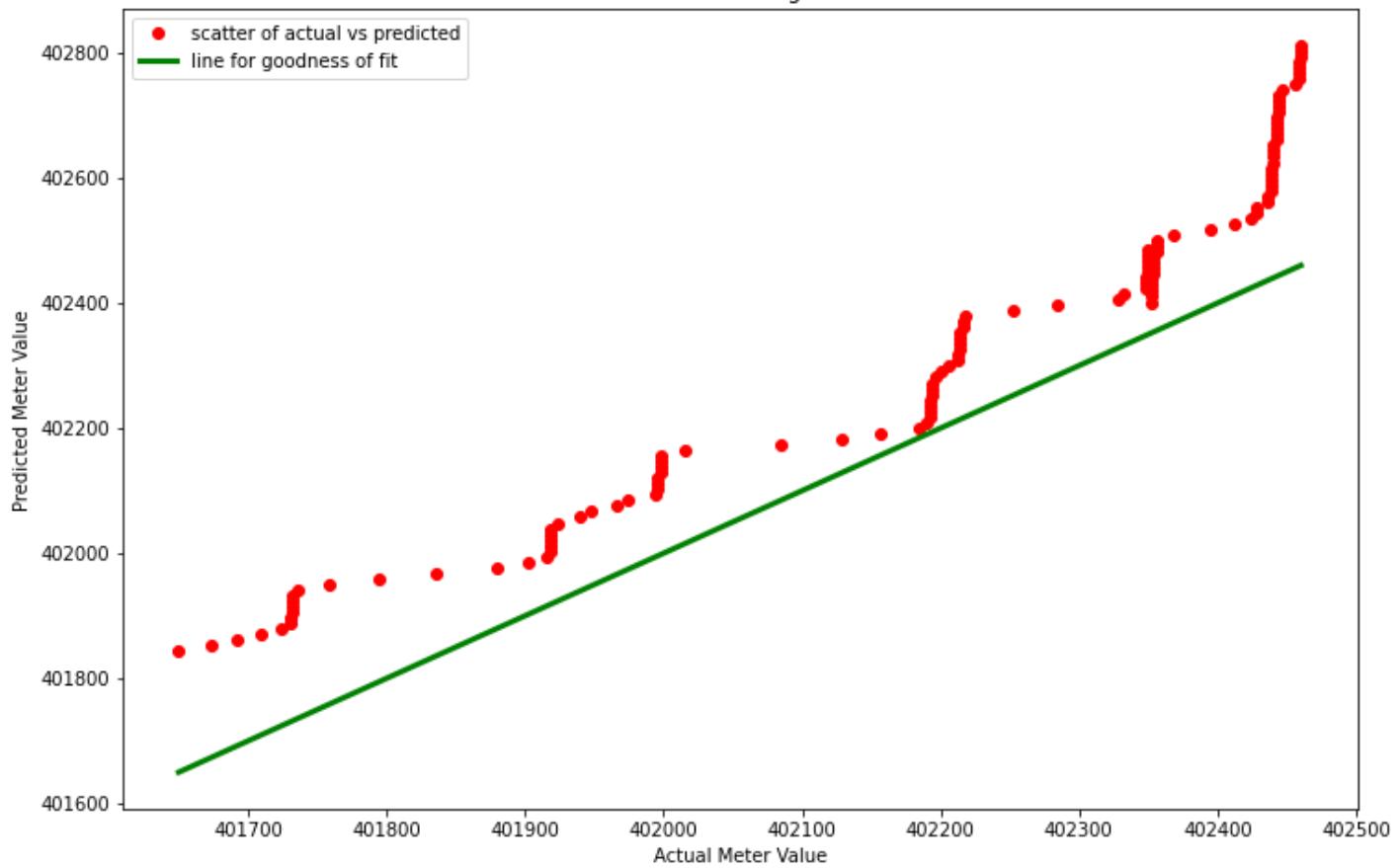
Scatter Plot - Household 3134.0 Testing MSE : 31774.578683420856



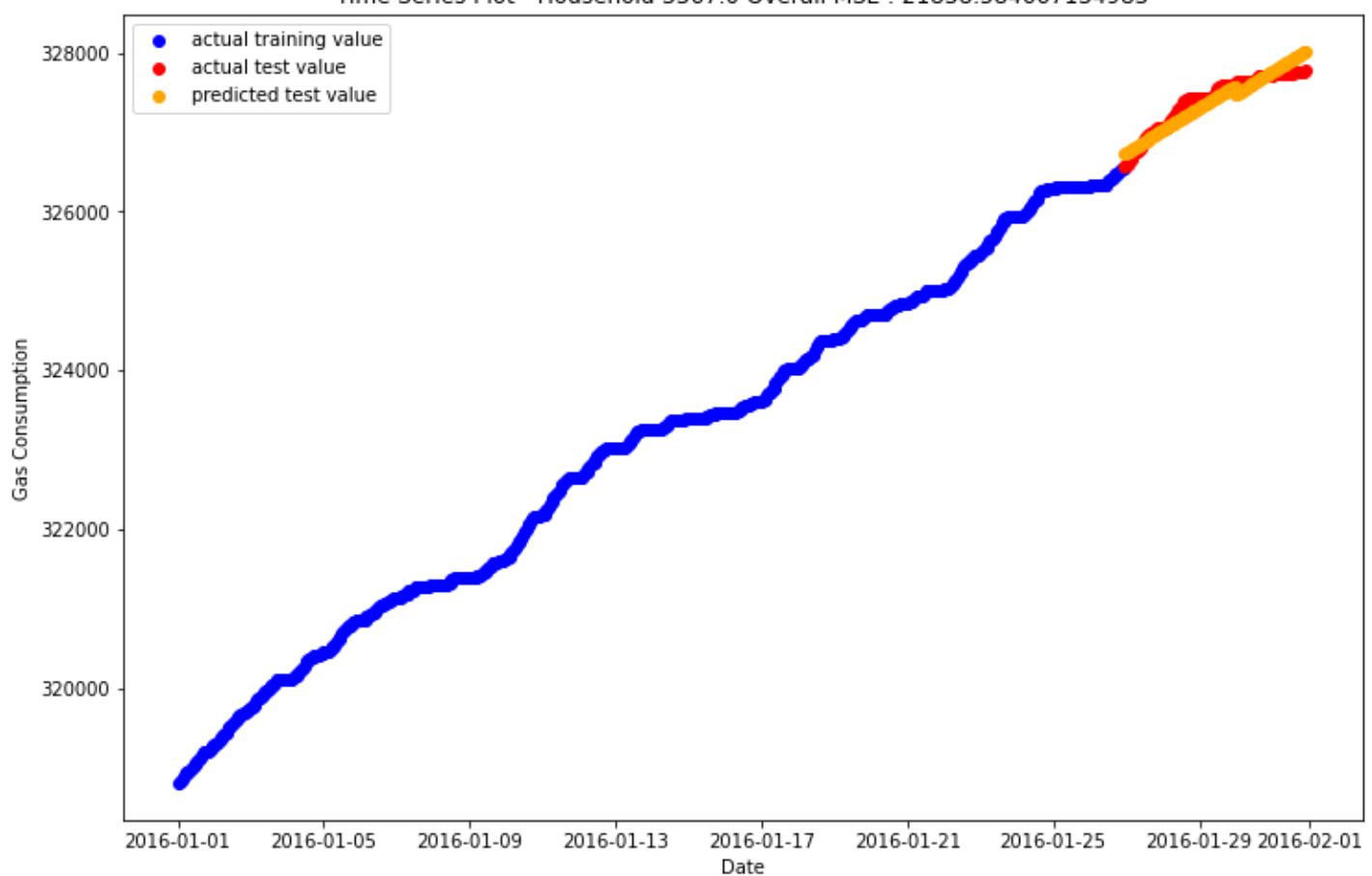
Time Series Plot - Household 3310.0 Overall MSE : 14386.805051346822



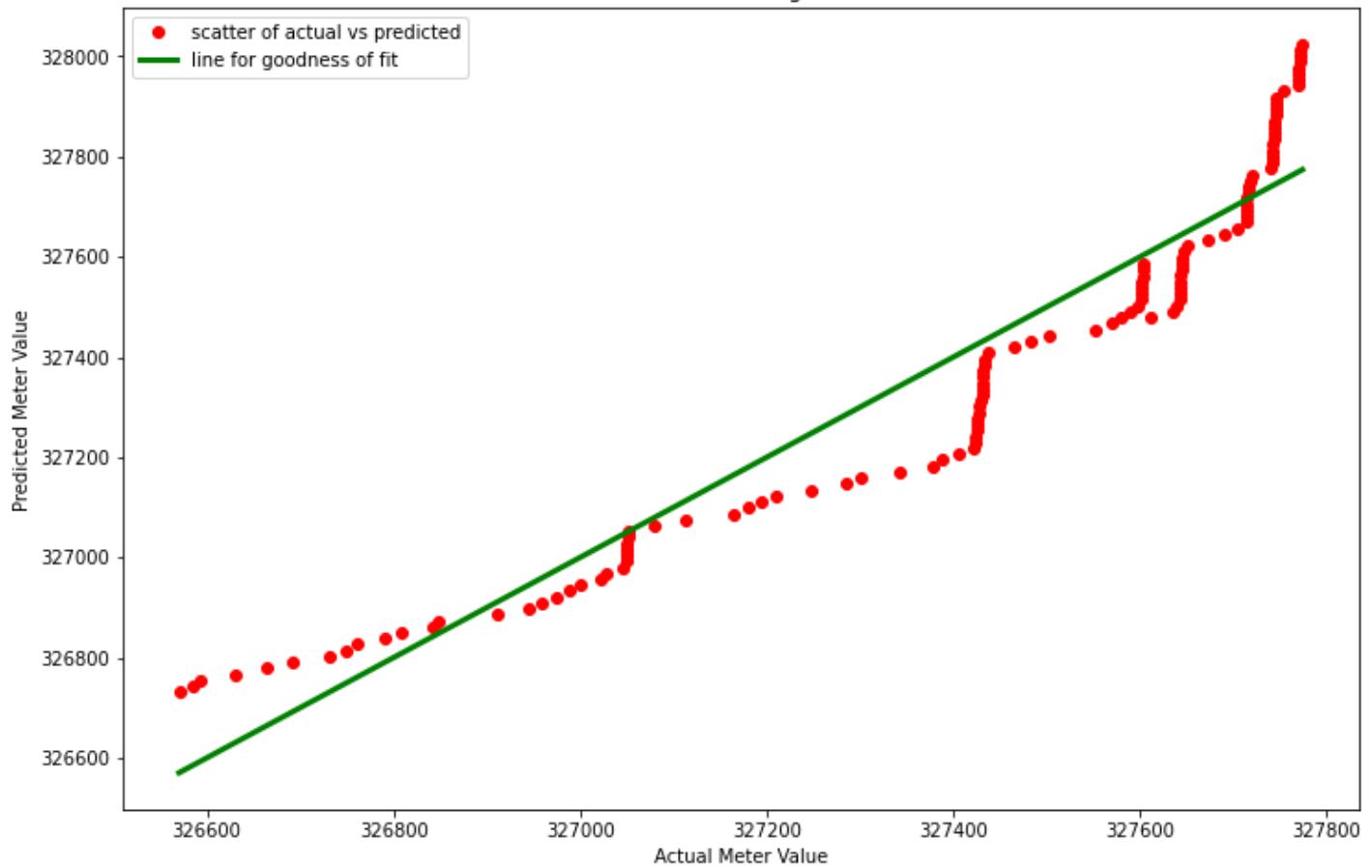
Scatter Plot - Household 3310.0 Testing MSE : 26223.913332409375



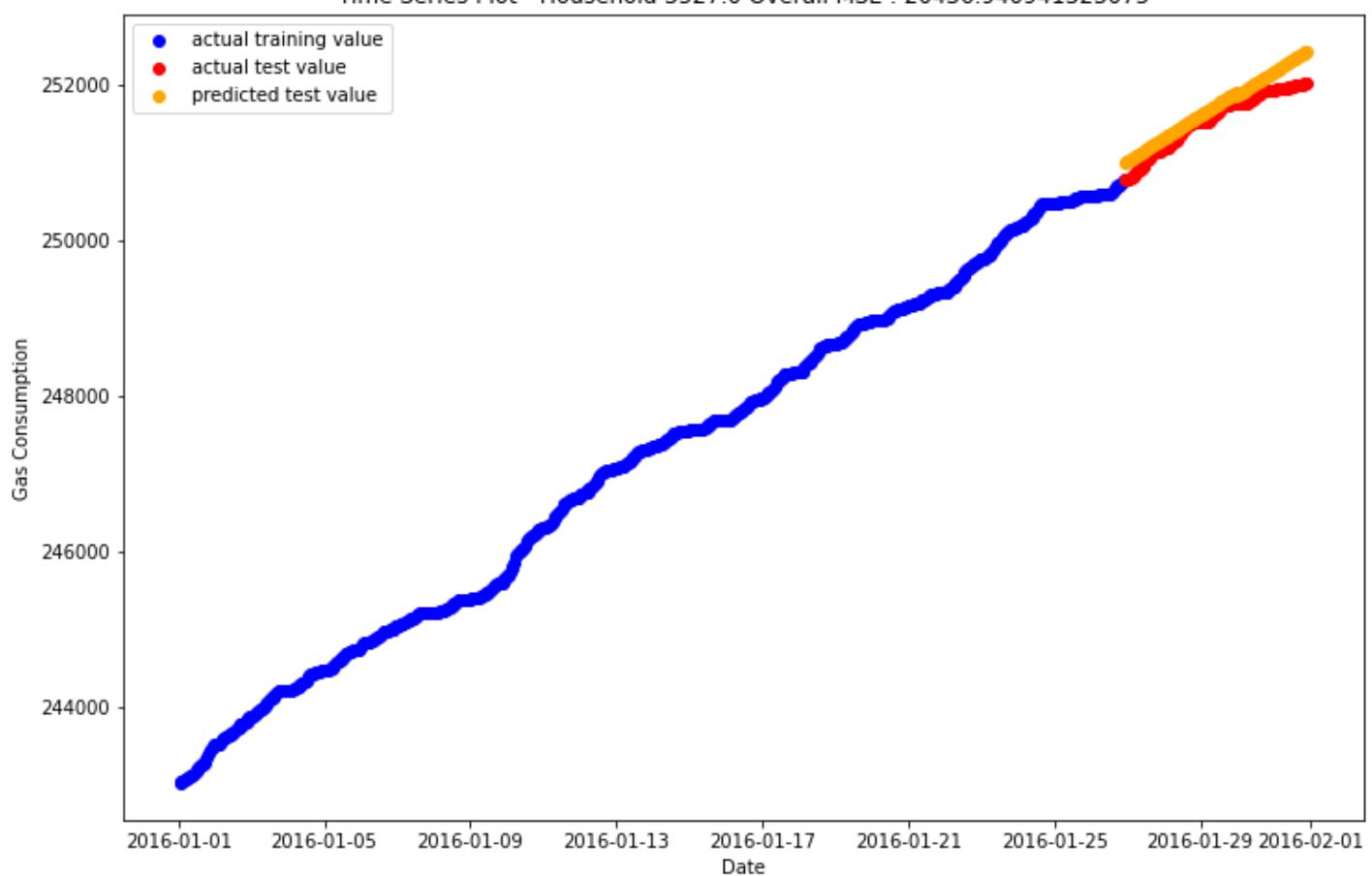
Time Series Plot - Household 3367.0 Overall MSE : 21838.584667134983



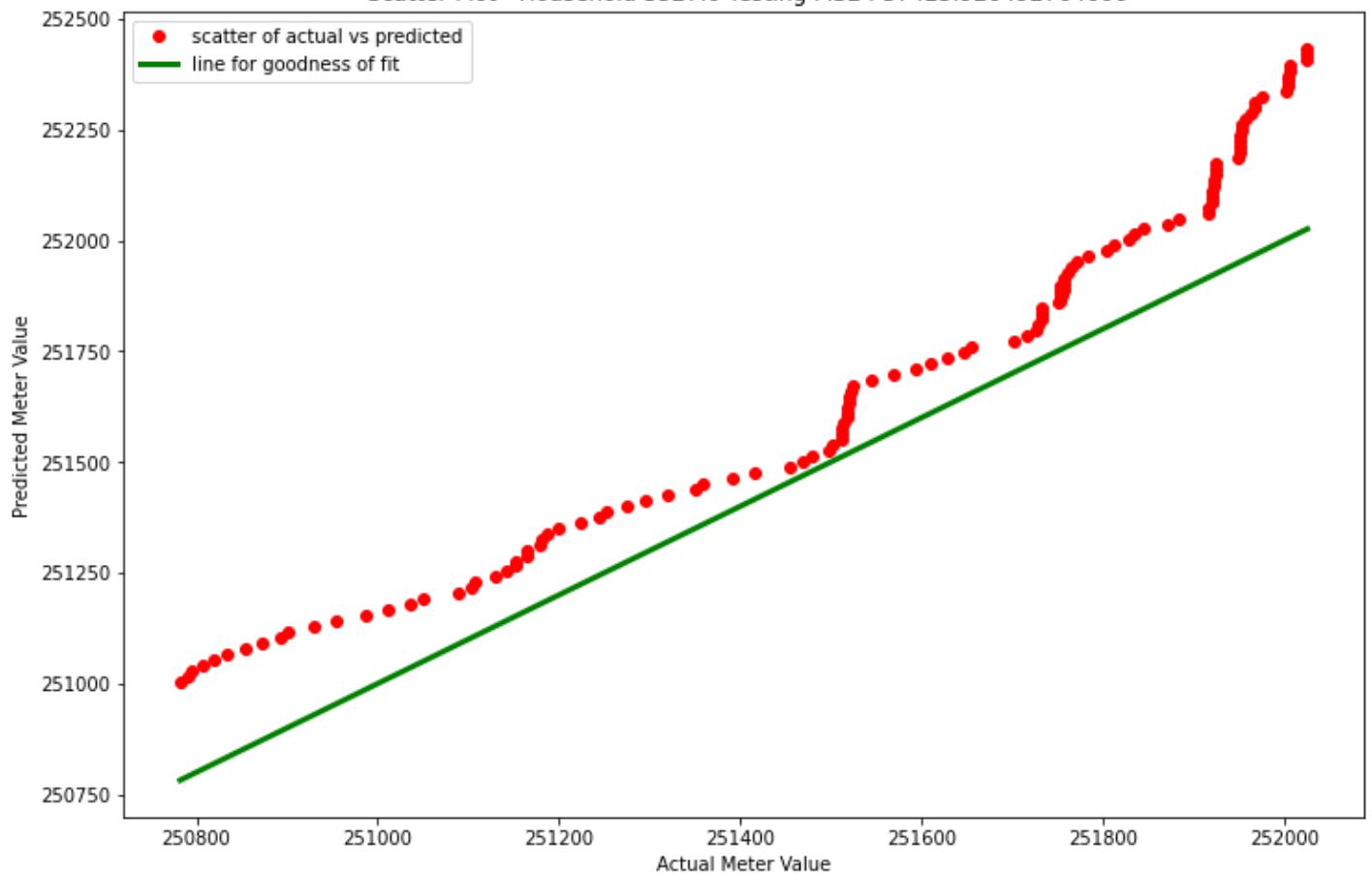
Scatter Plot - Household 3367.0 Testing MSE : 12142.733704242351



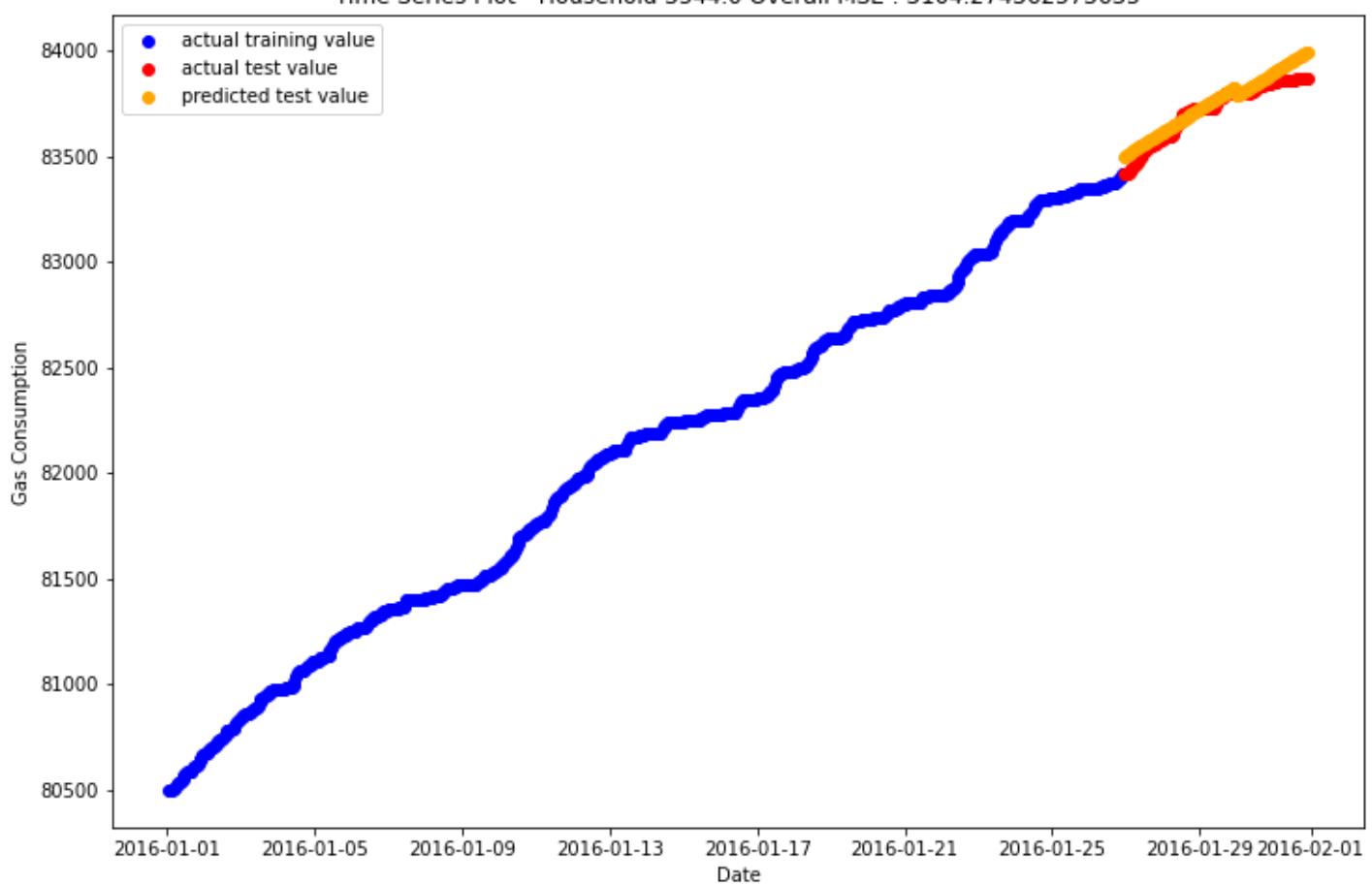
Time Series Plot - Household 3527.0 Overall MSE : 20436.940941323075



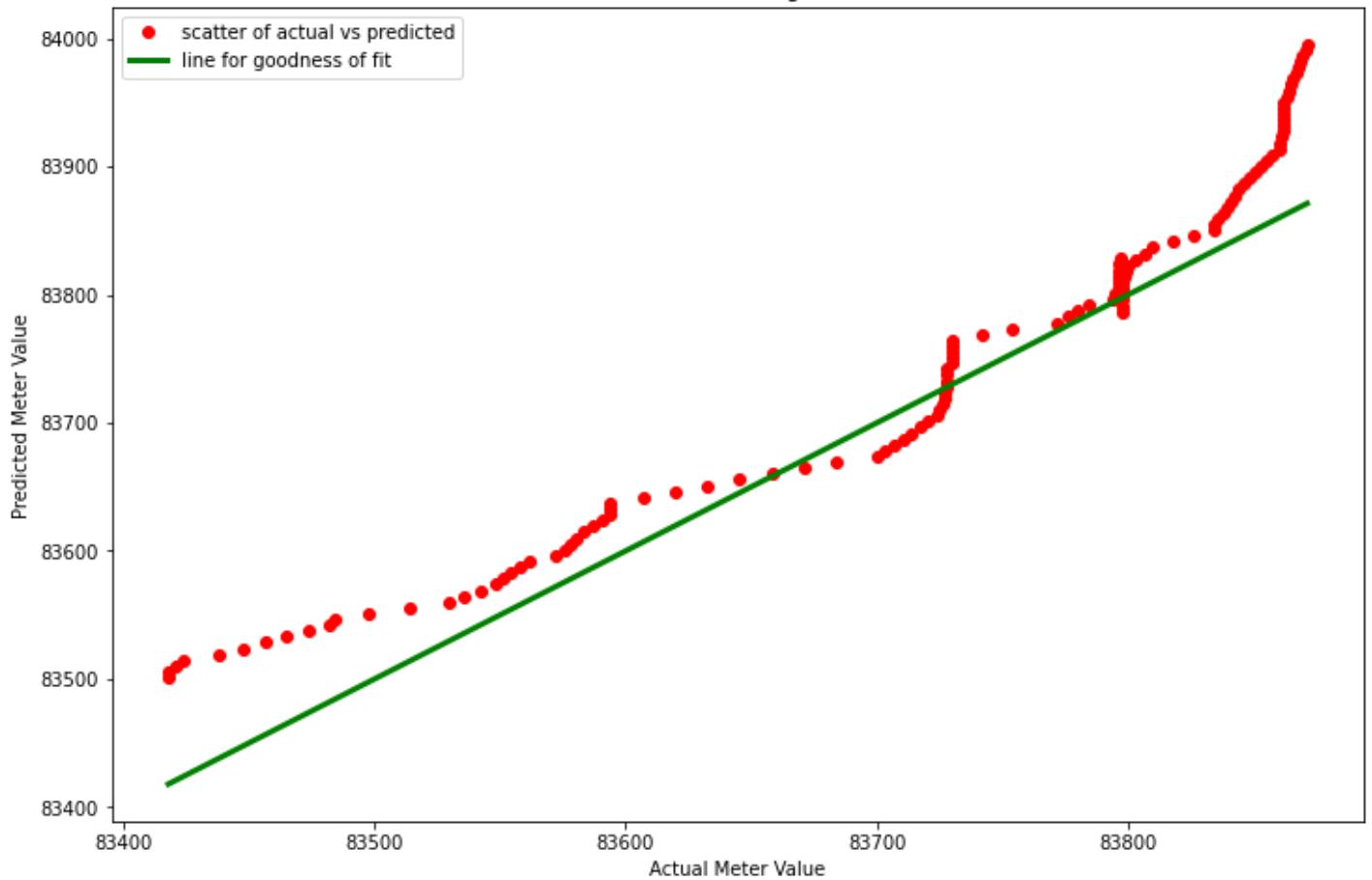
Scatter Plot - Household 3527.0 Testing MSE : 37425.920492764606



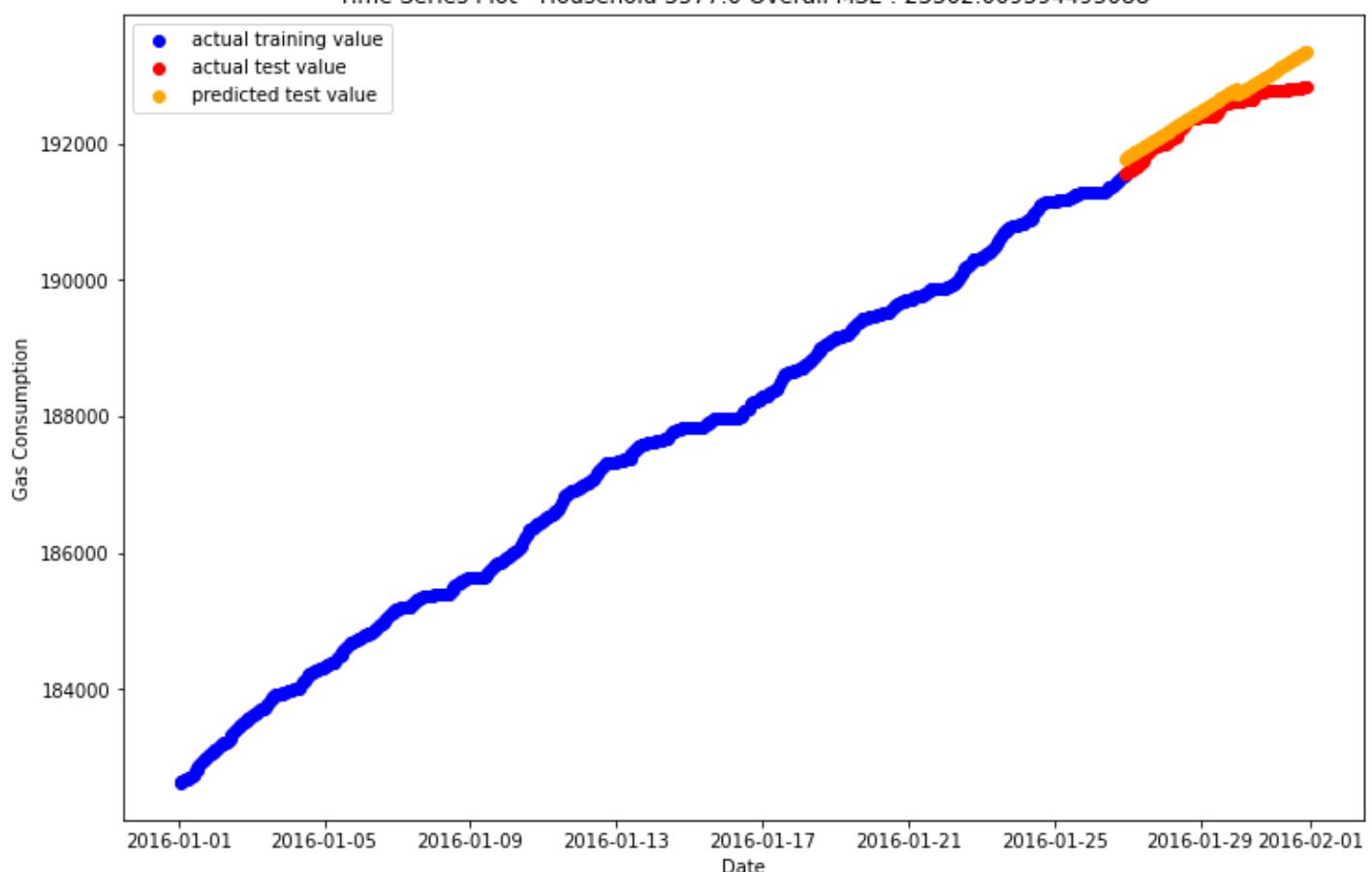
Time Series Plot - Household 3544.0 Overall MSE : 3104.274362573635



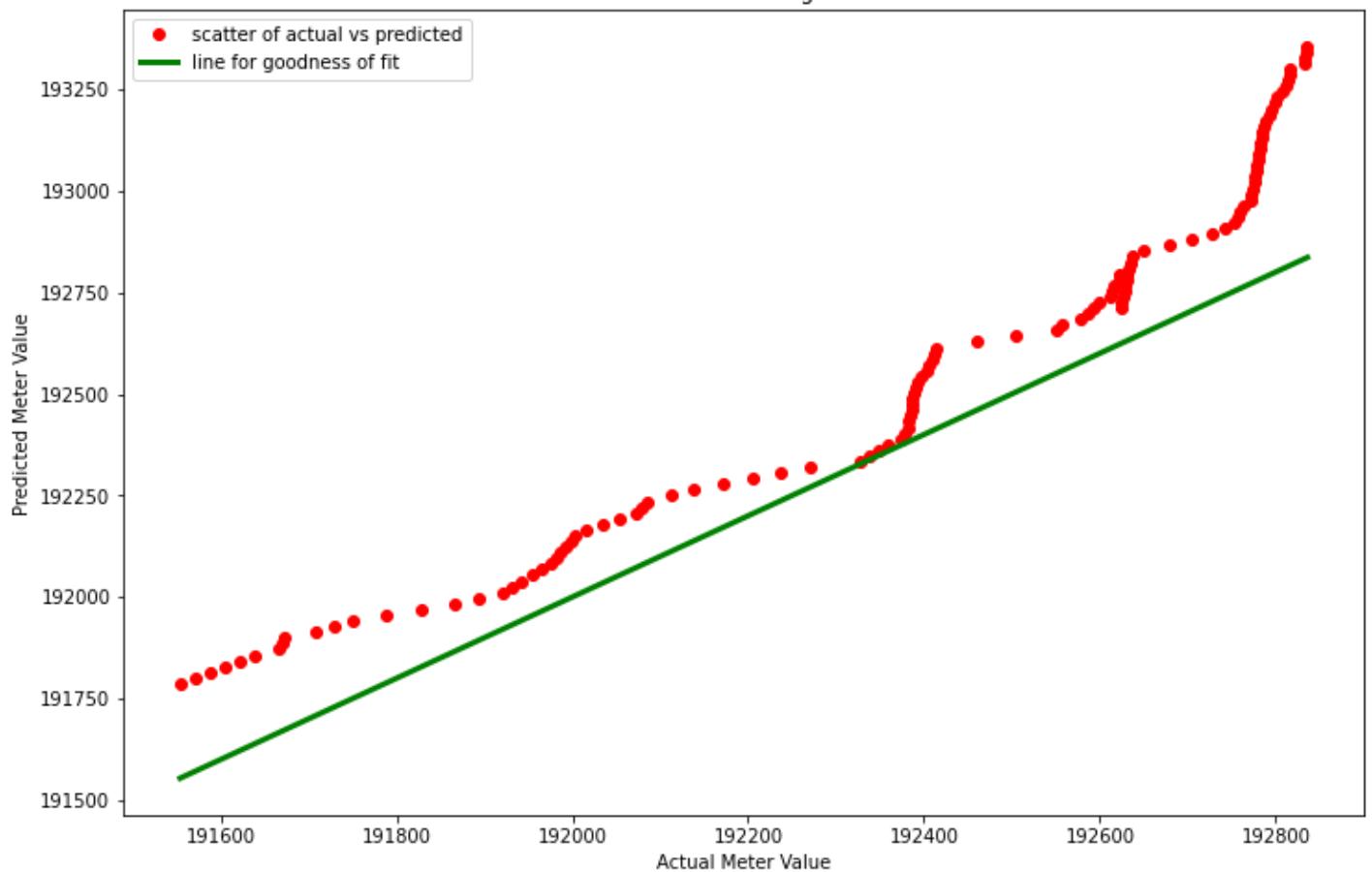
Scatter Plot - Household 3544.0 Testing MSE : 2407.2486695366283



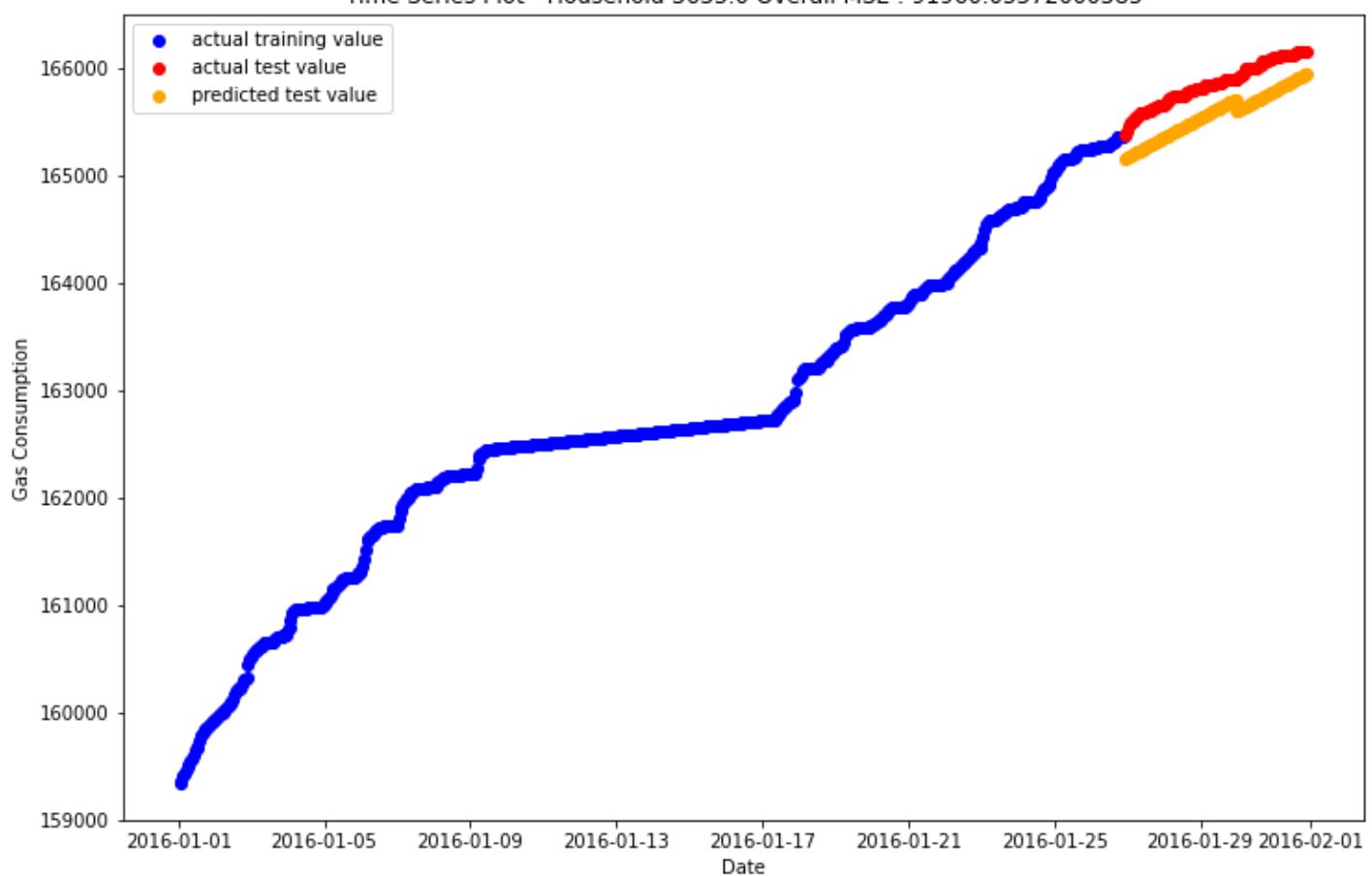
Time Series Plot - Household 3577.0 Overall MSE : 23302.009594495088



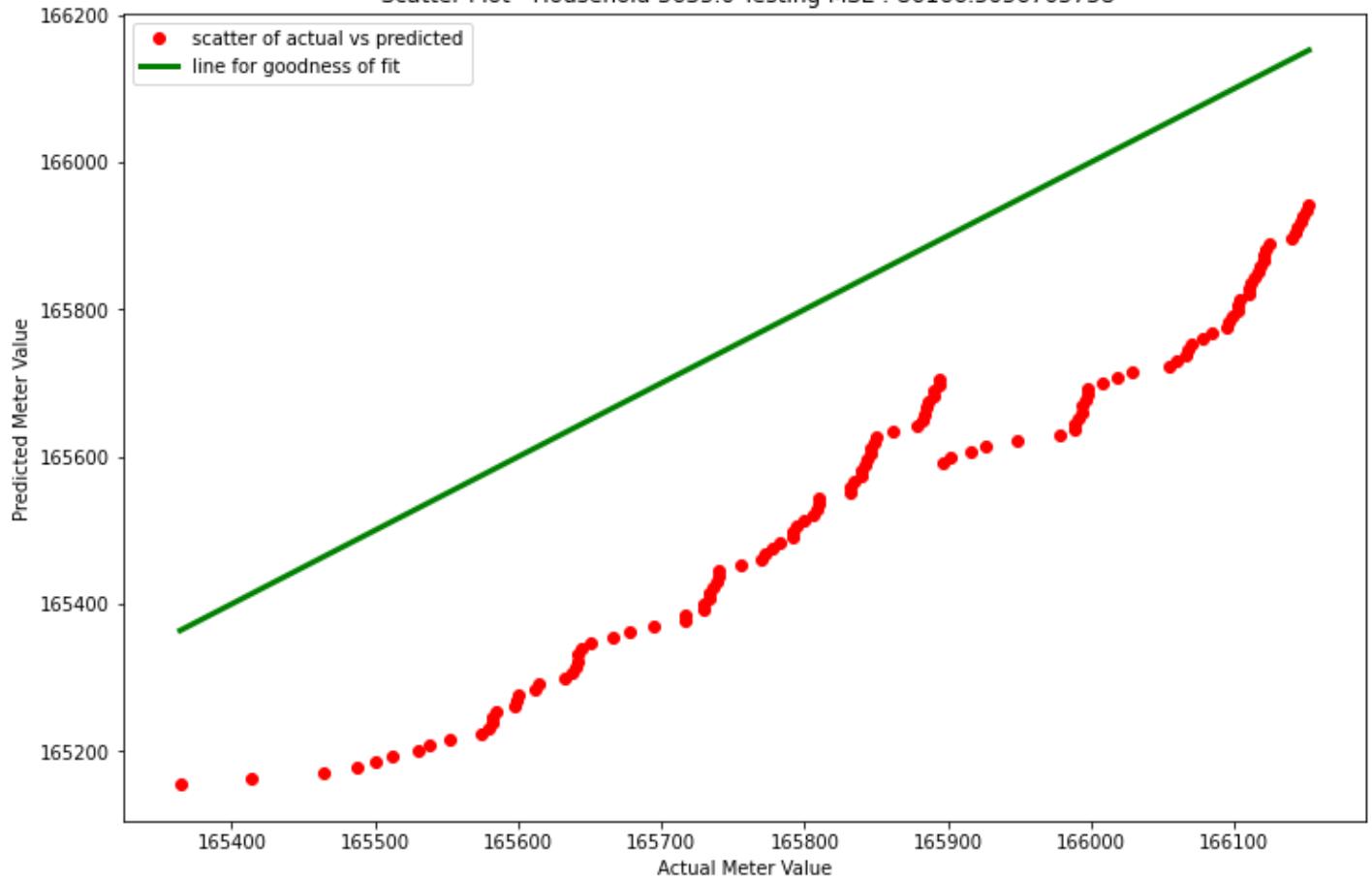
Scatter Plot - Household 3577.0 Testing MSE : 50758.56120597787



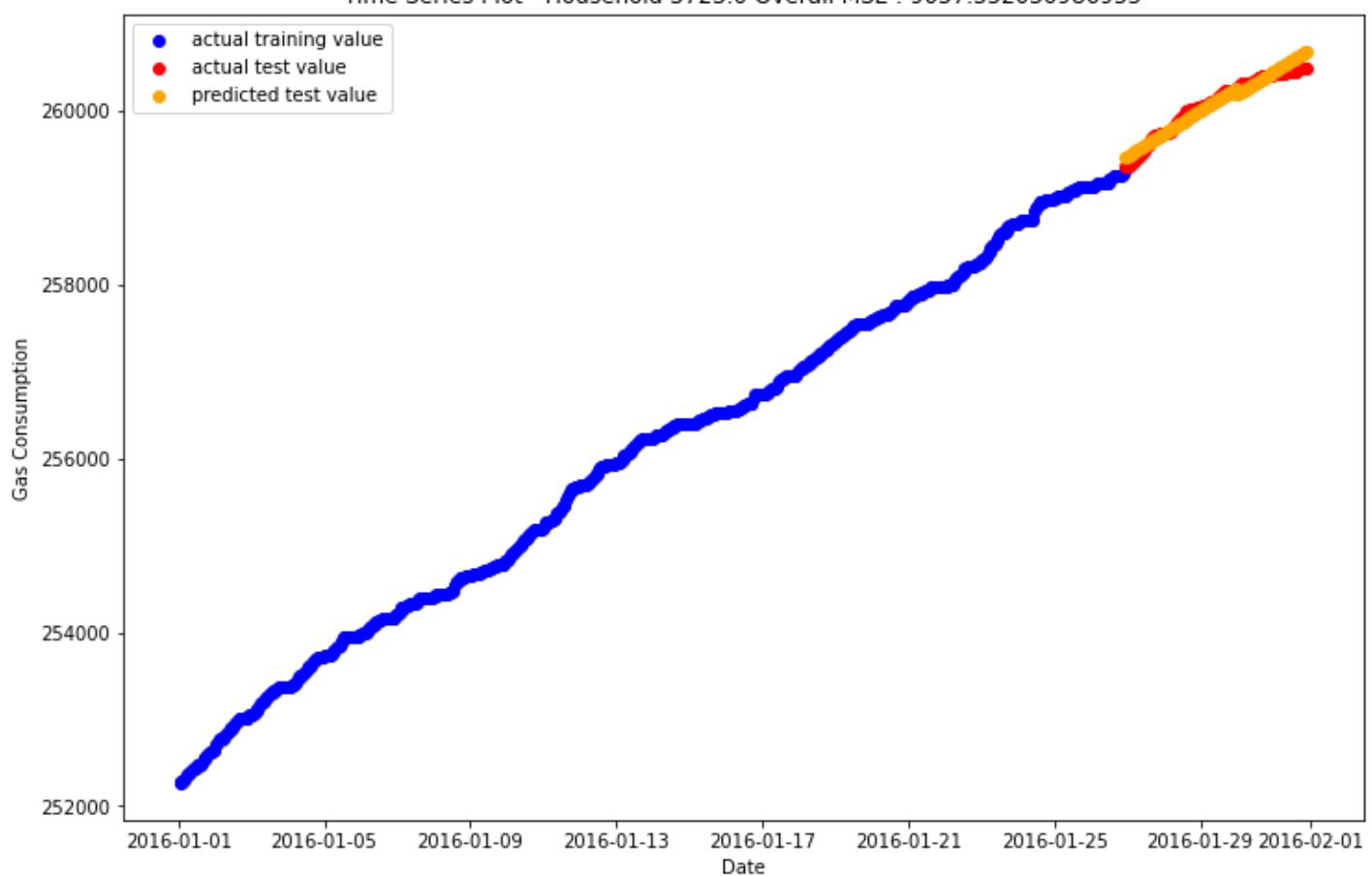
Time Series Plot - Household 3635.0 Overall MSE : 91960.05572000385



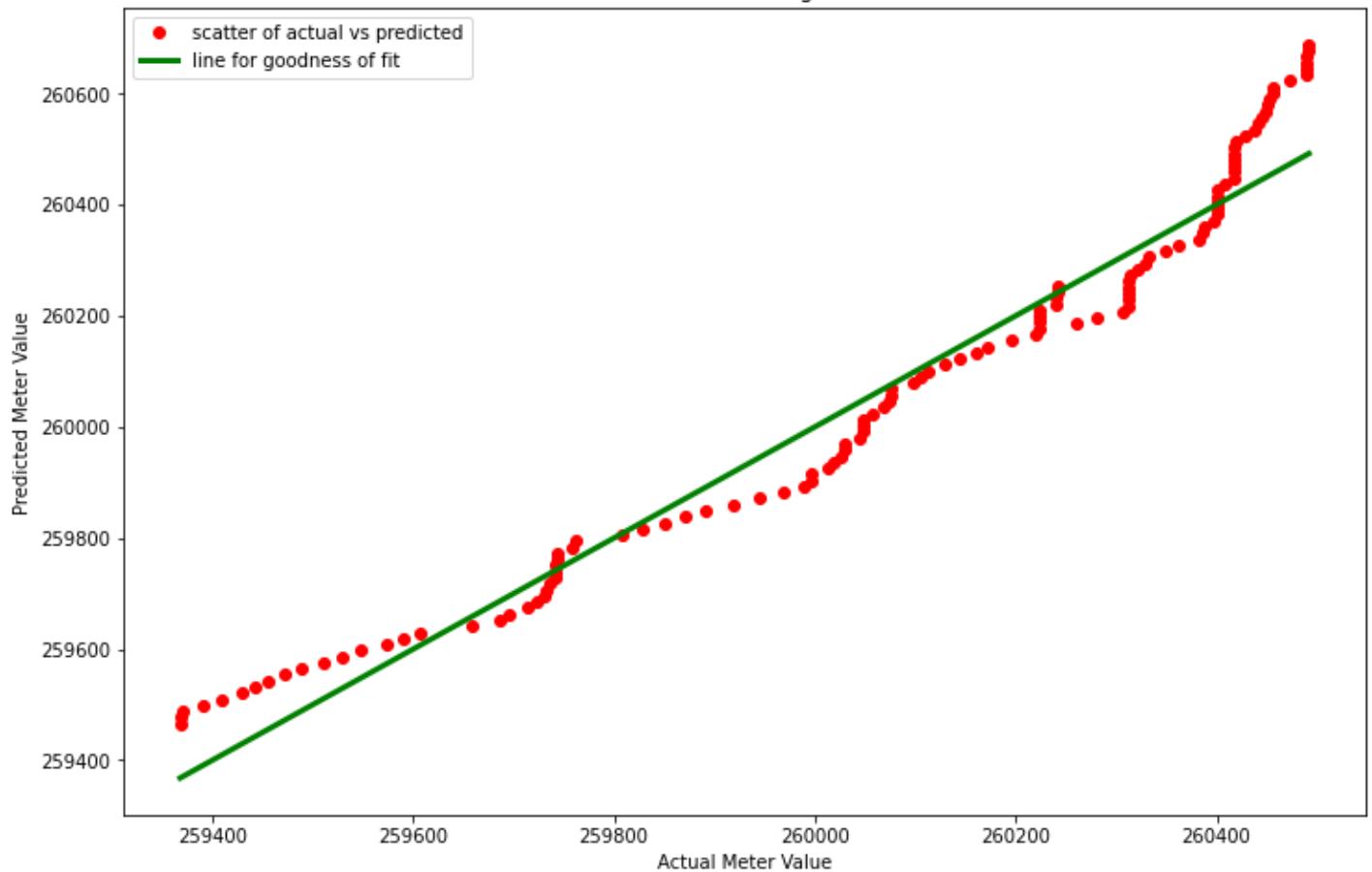
Scatter Plot - Household 3635.0 Testing MSE : 86166.5056705738



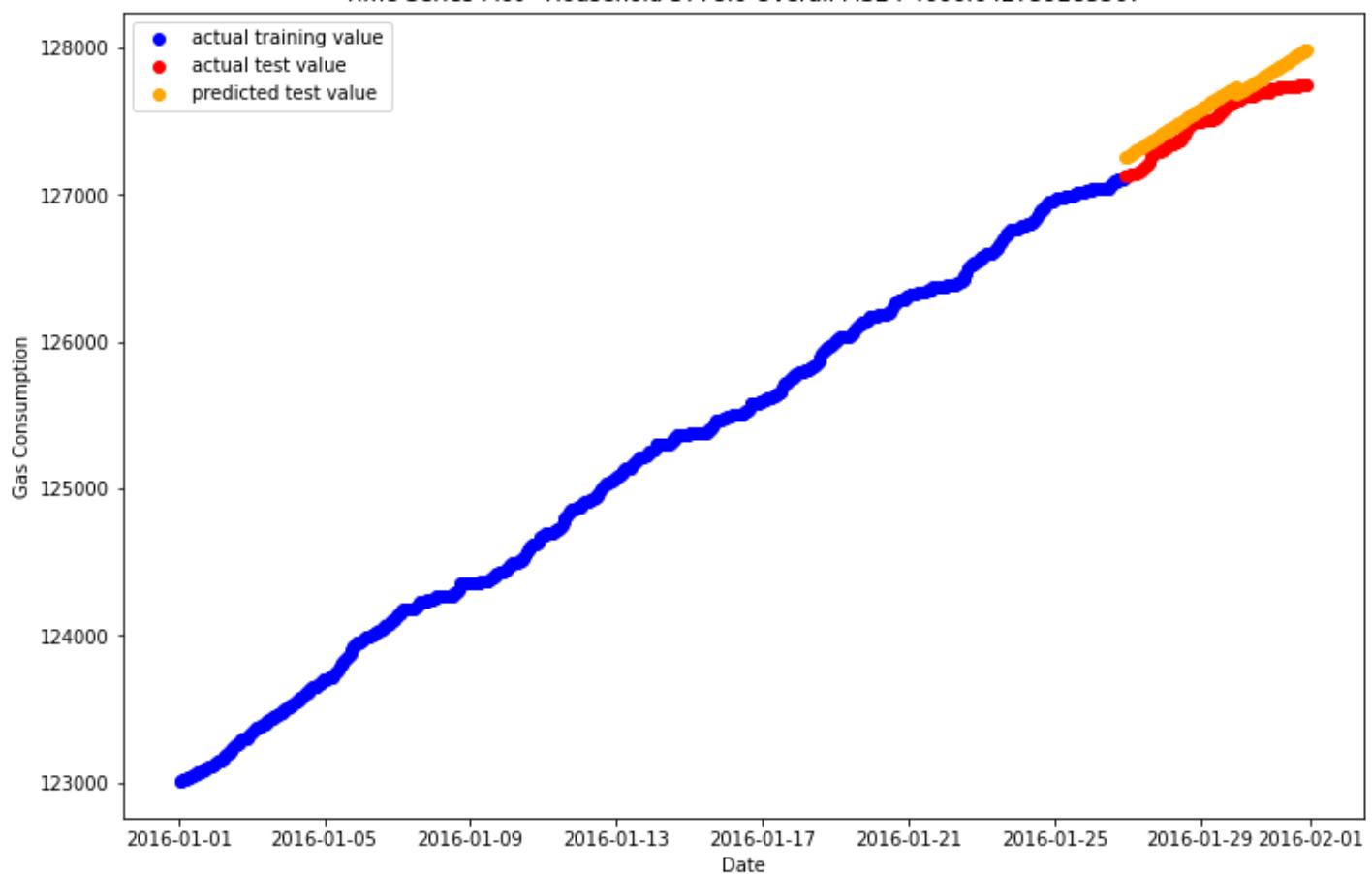
Time Series Plot - Household 3723.0 Overall MSE : 9037.352030986955



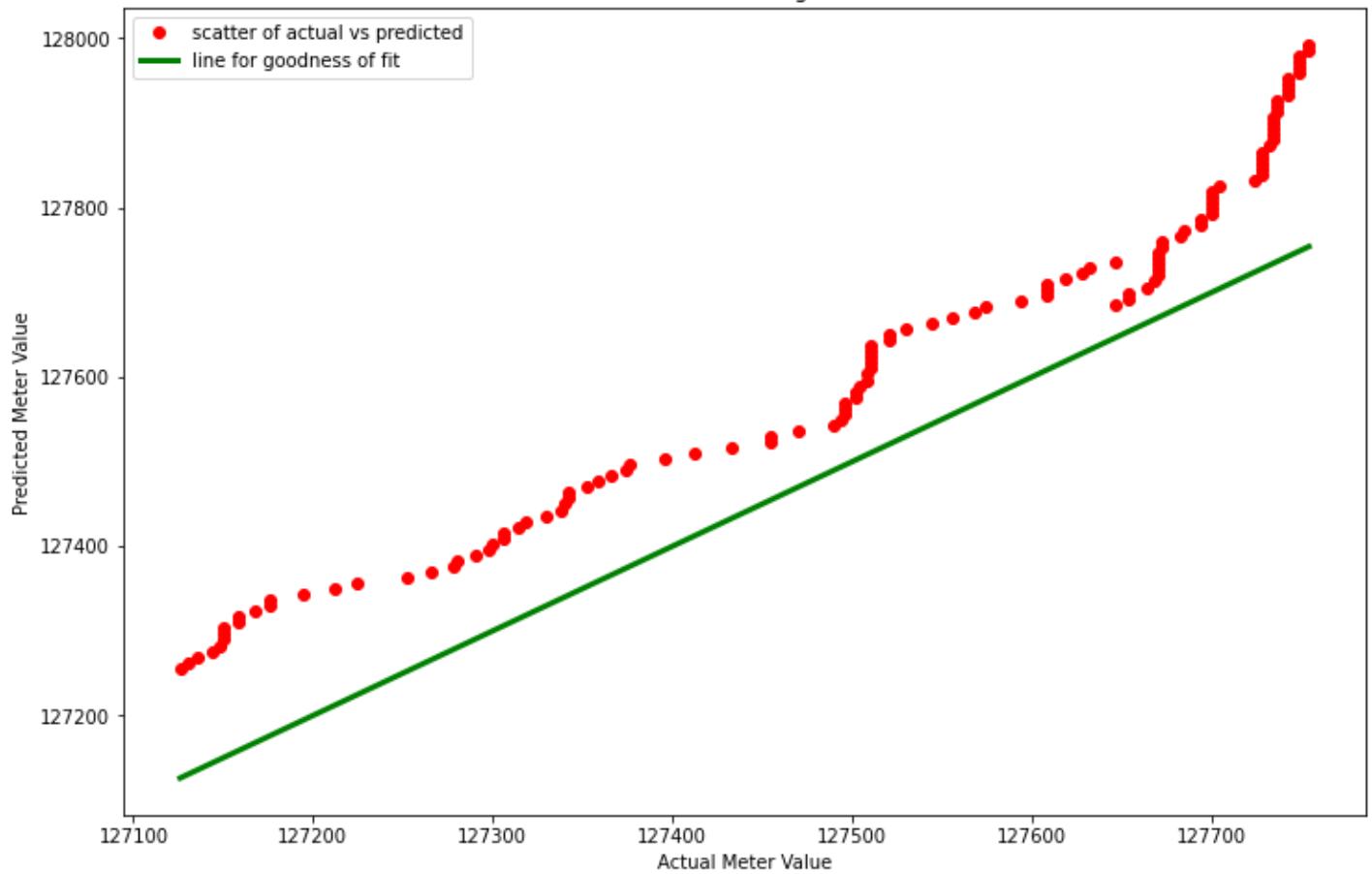
Scatter Plot - Household 3723.0 Testing MSE : 5400.899501796473



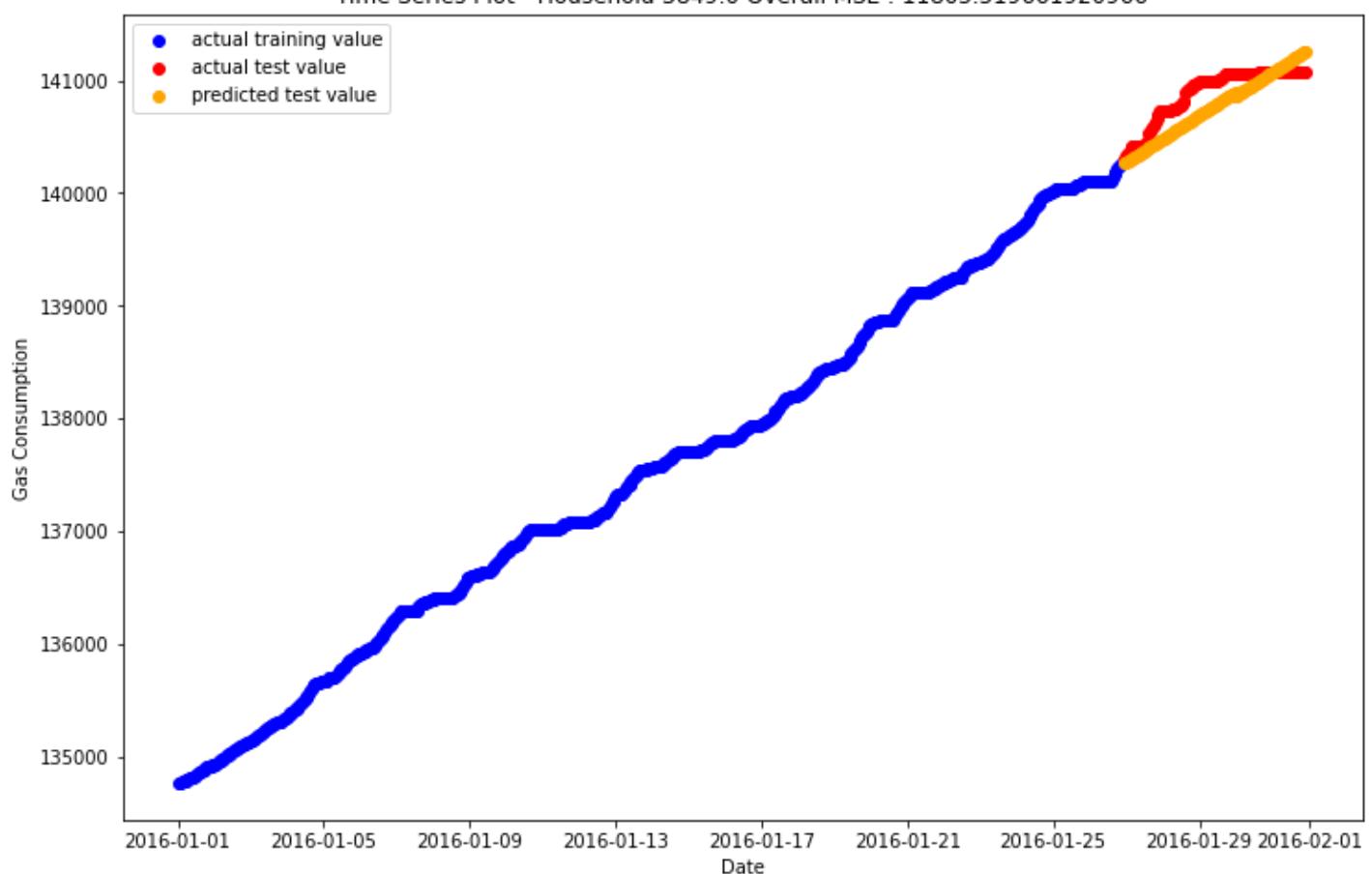
Time Series Plot - Household 3778.0 Overall MSE : 4606.642759283367



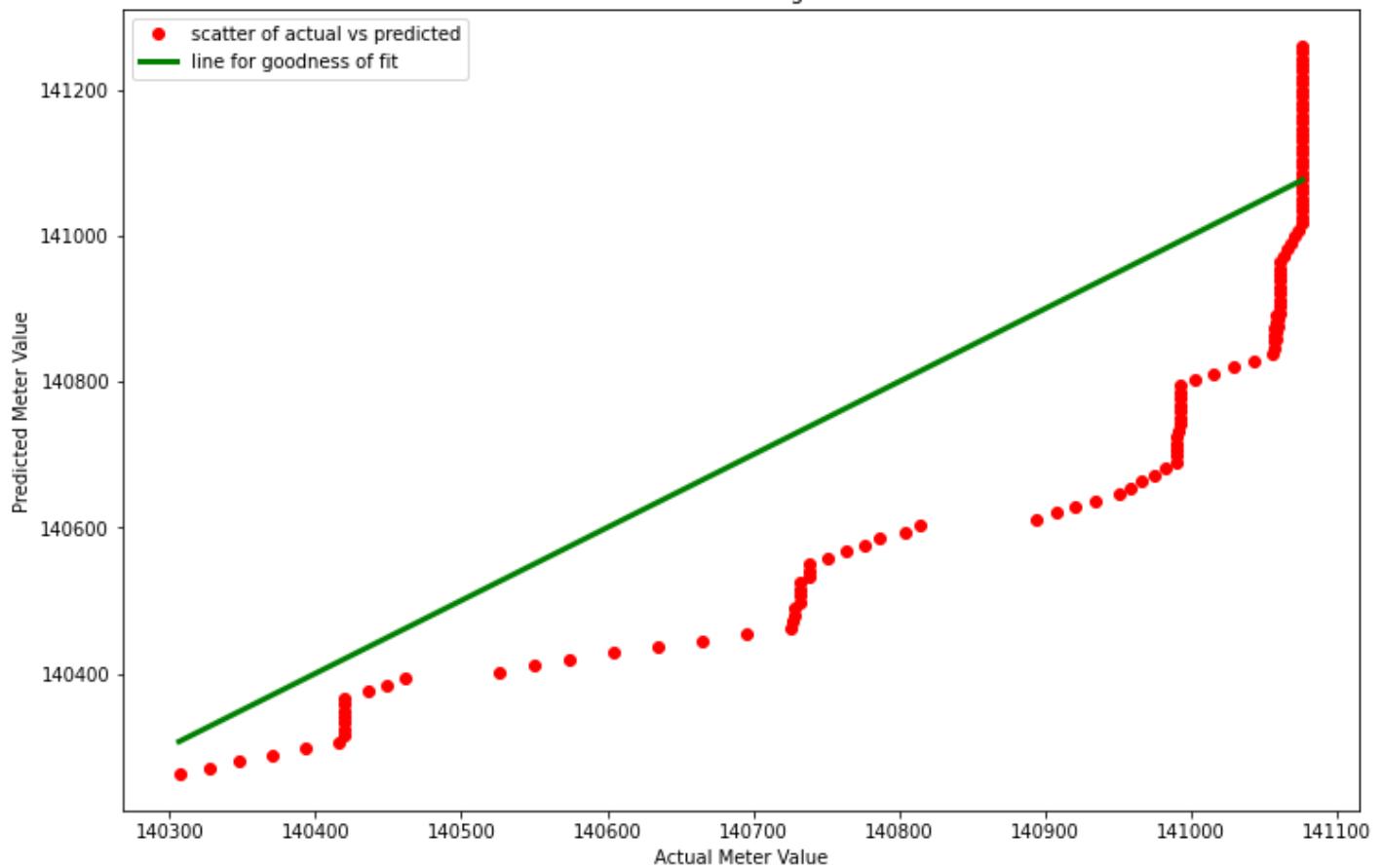
Scatter Plot - Household 3778.0 Testing MSE : 15595.062317469345

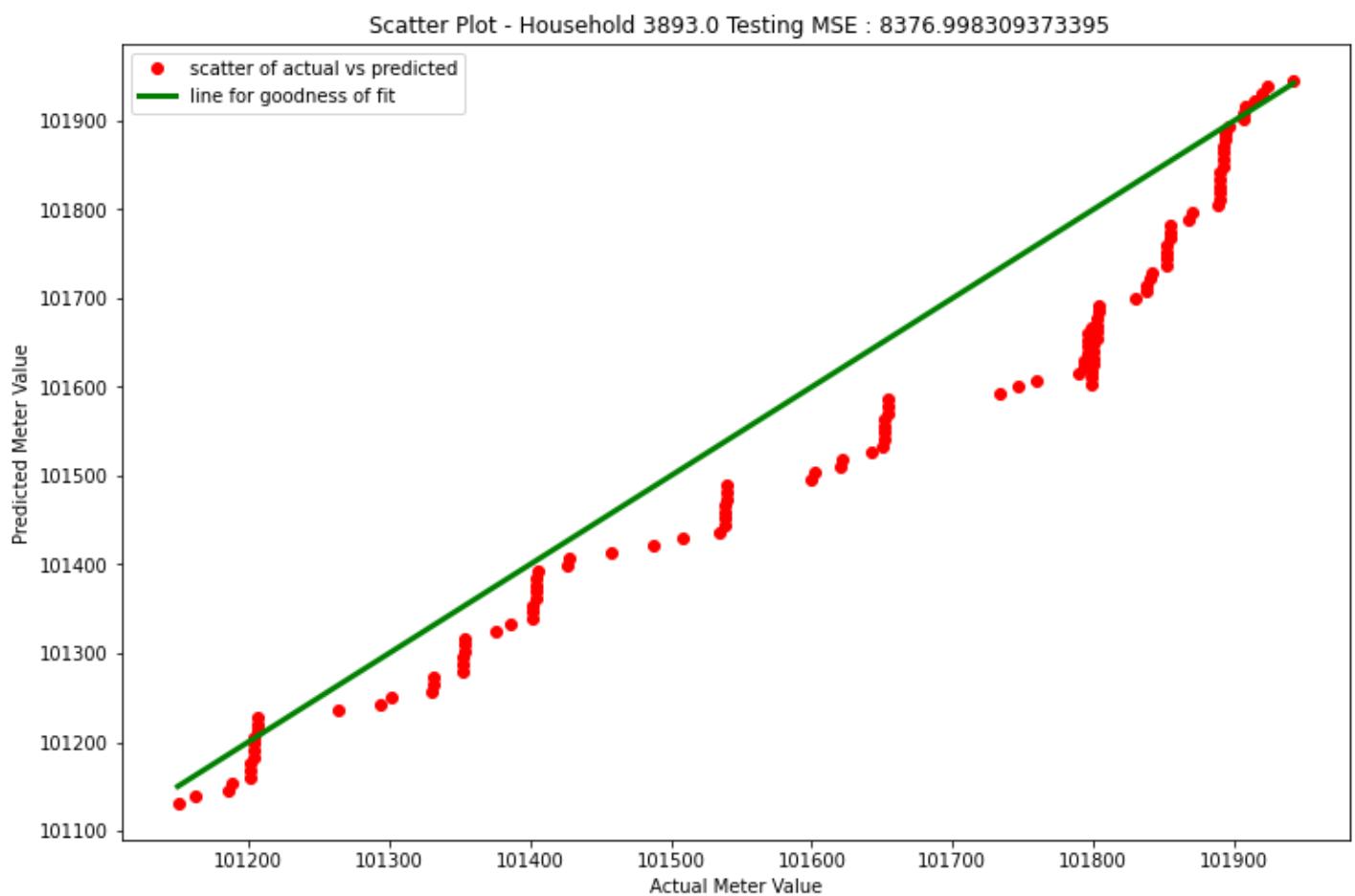
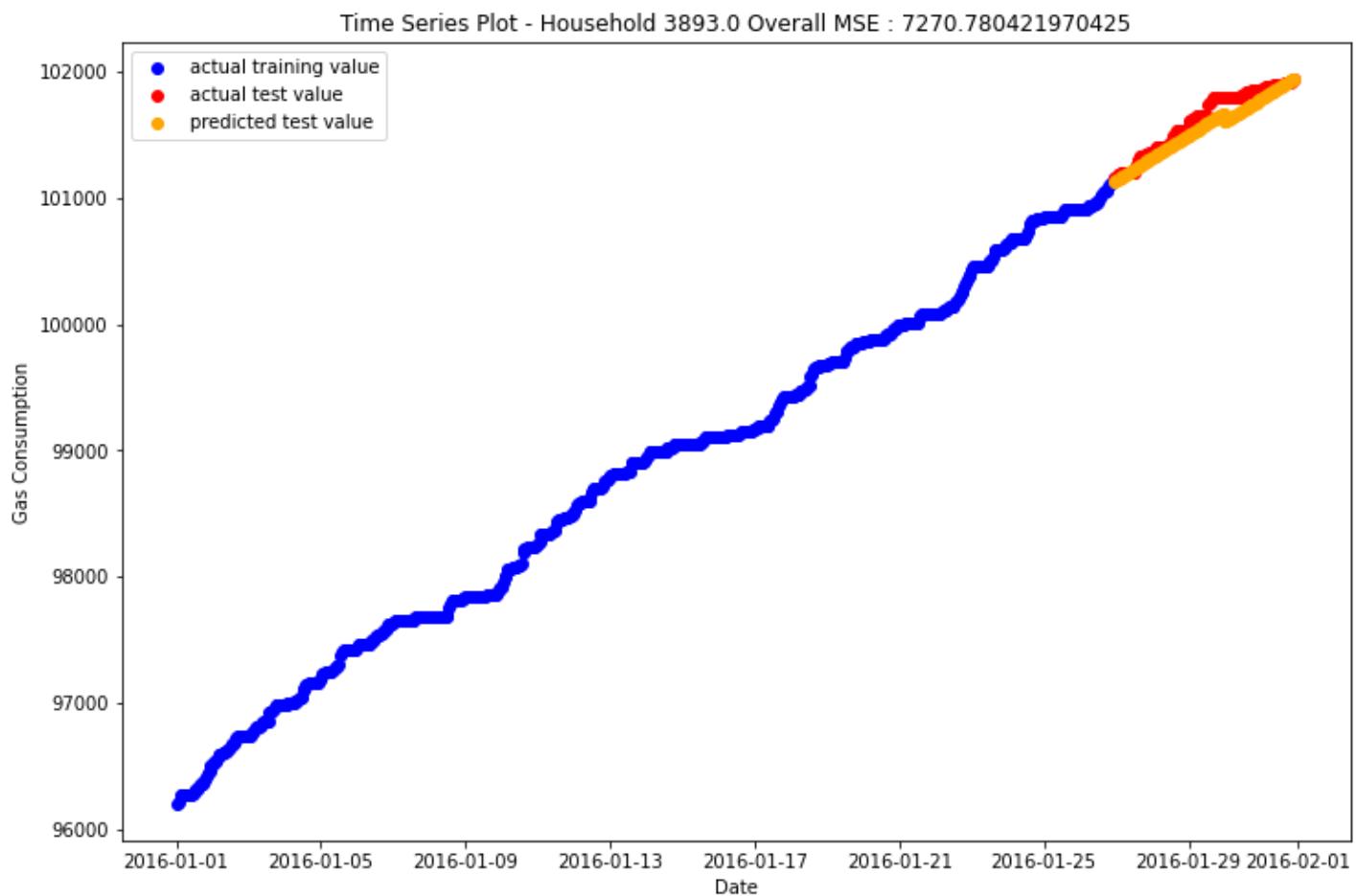


Time Series Plot - Household 3849.0 Overall MSE : 11805.519661920966

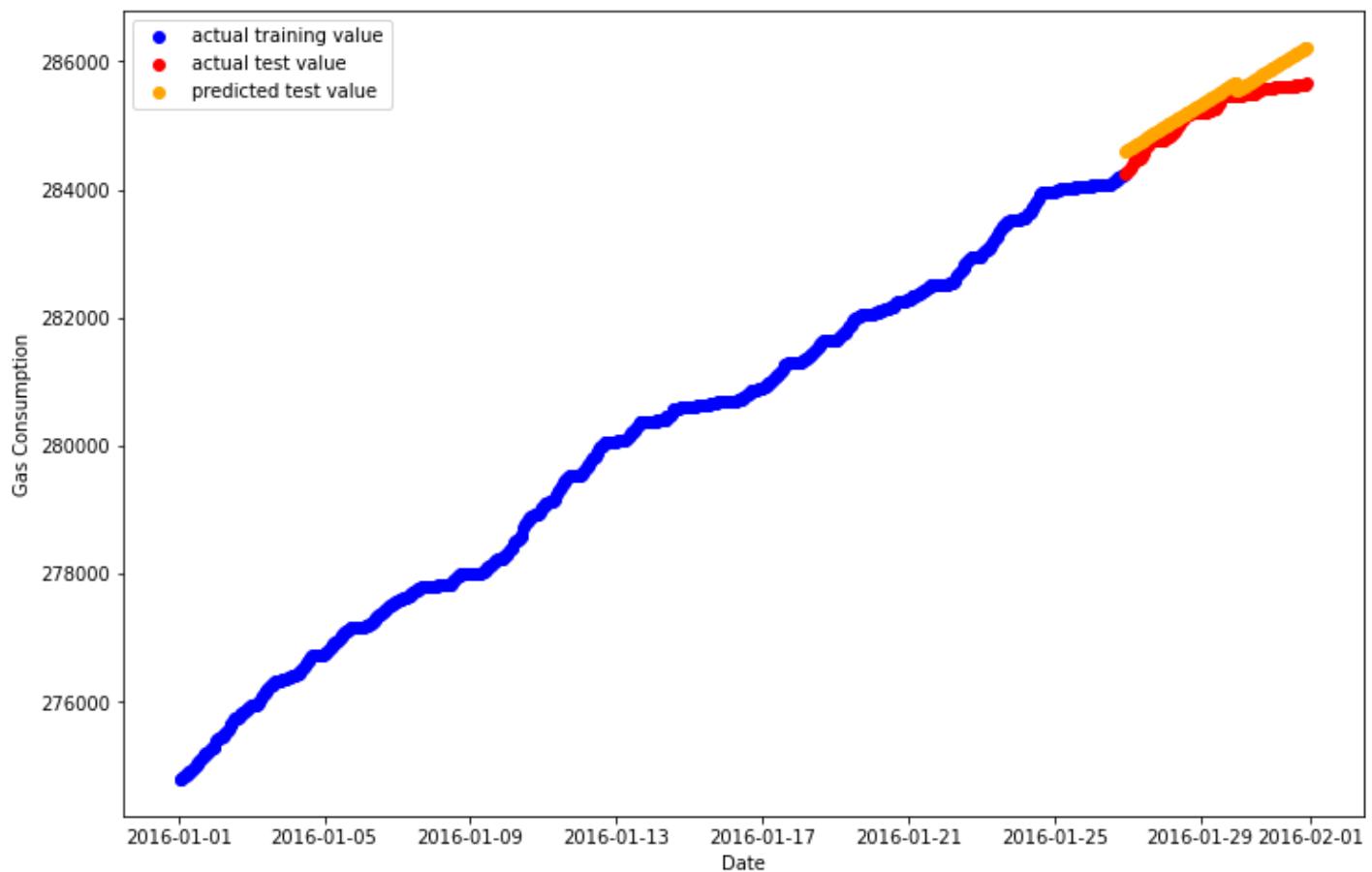


Scatter Plot - Household 3849.0 Testing MSE : 31567.005007364678

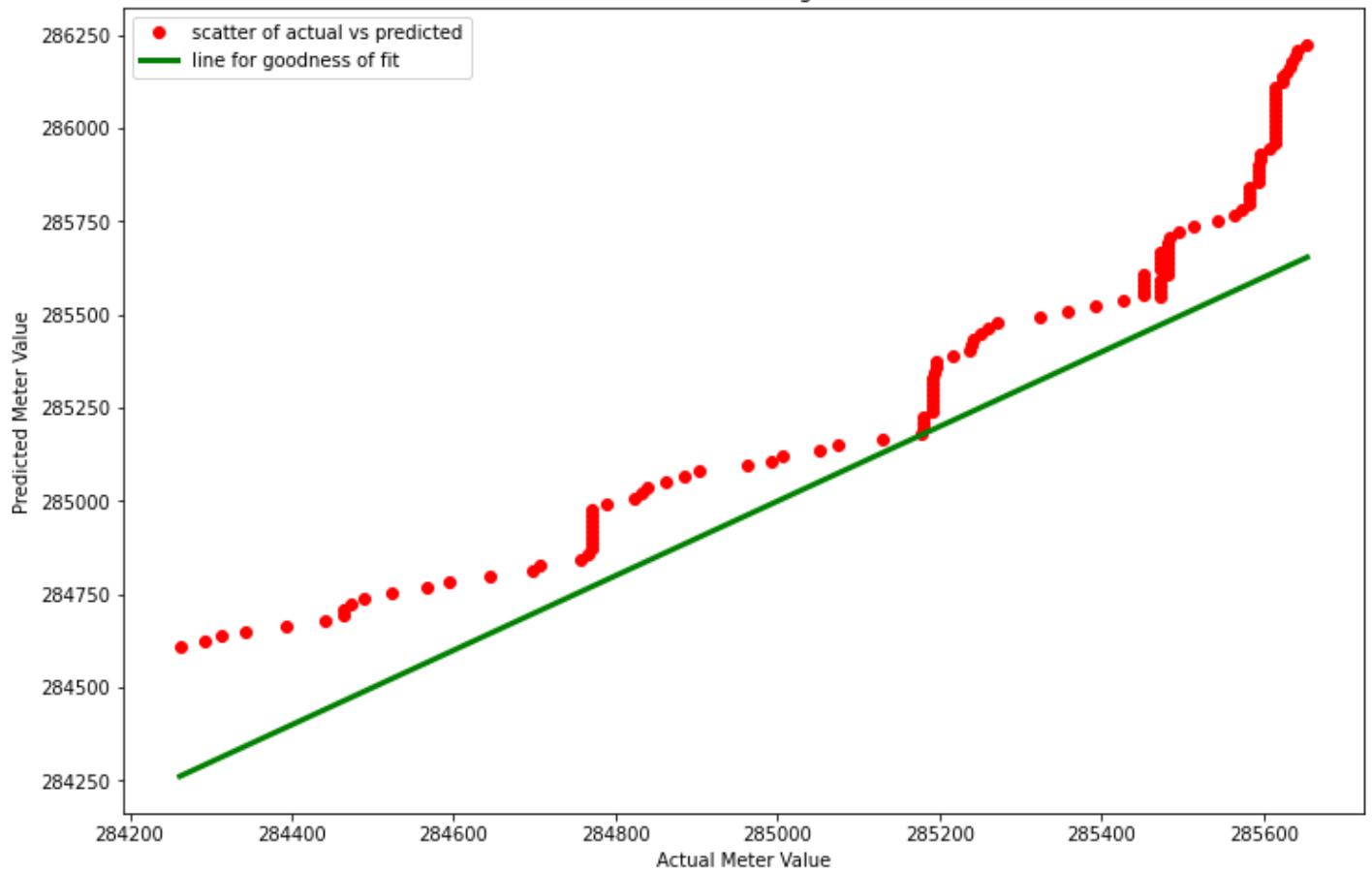




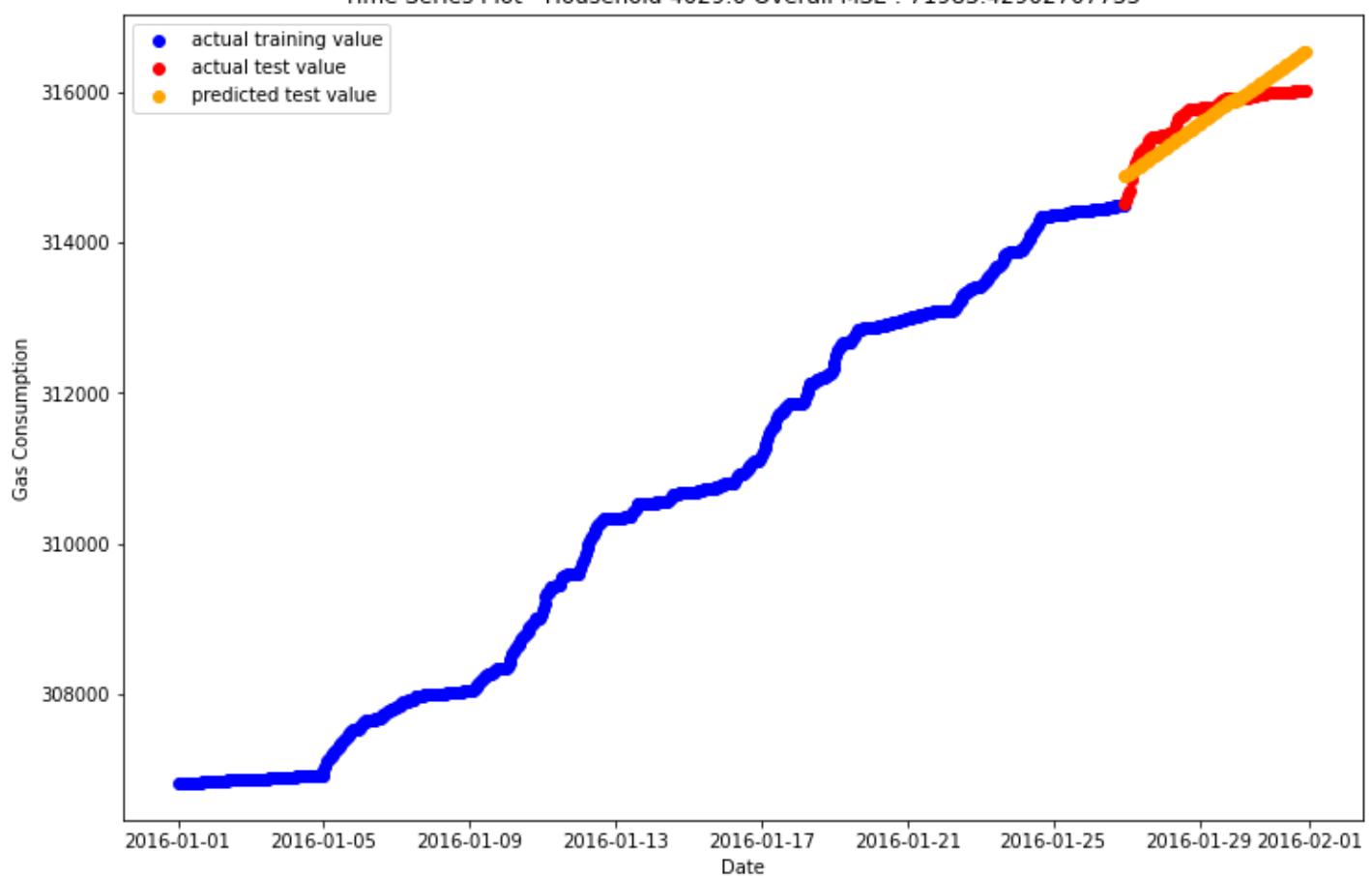
Time Series Plot - Household 3918.0 Overall MSE : 44013.28305470097



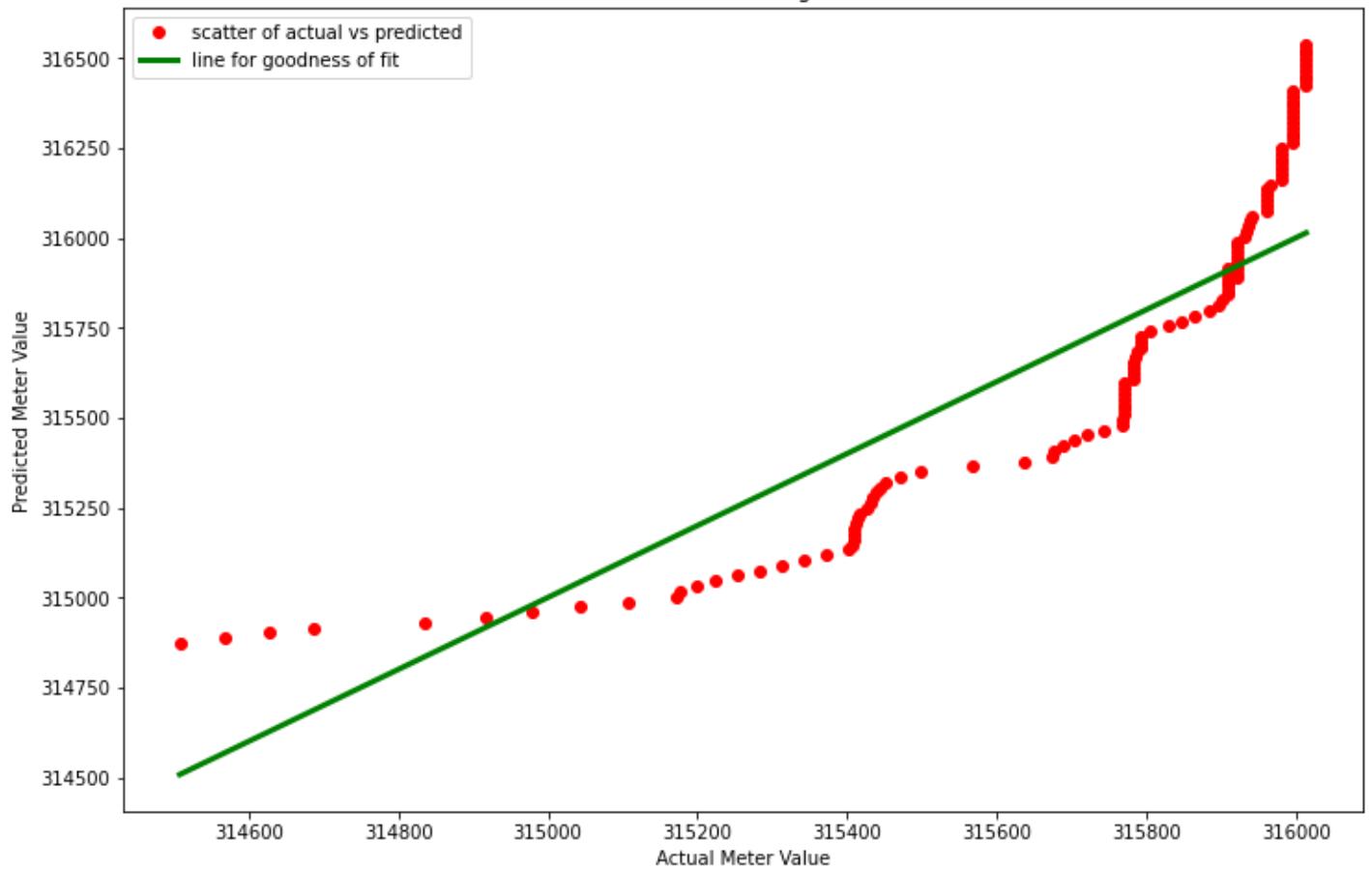
Scatter Plot - Household 3918.0 Testing MSE : 65745.59429904186



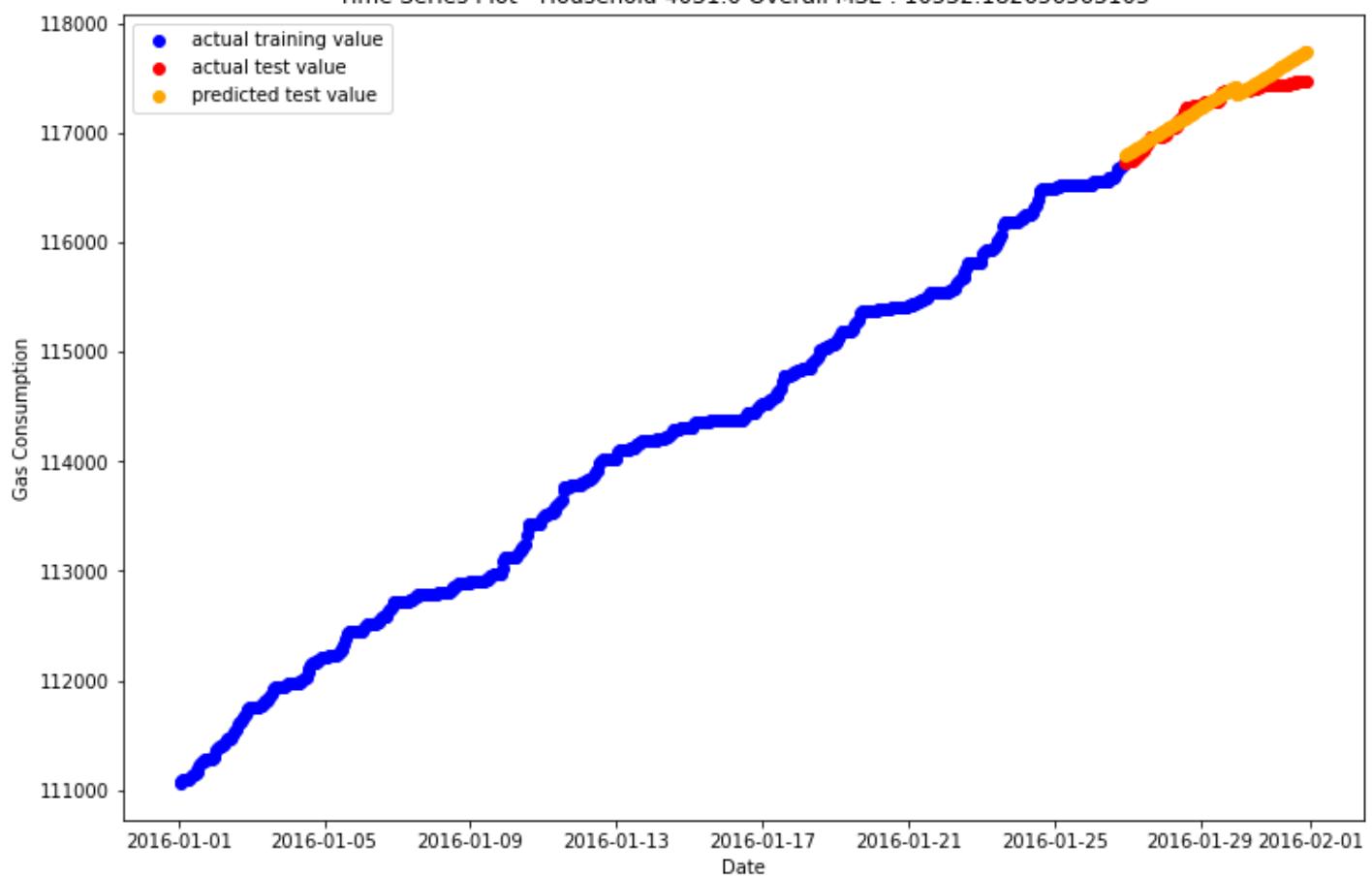
Time Series Plot - Household 4029.0 Overall MSE : 71983.42902707735



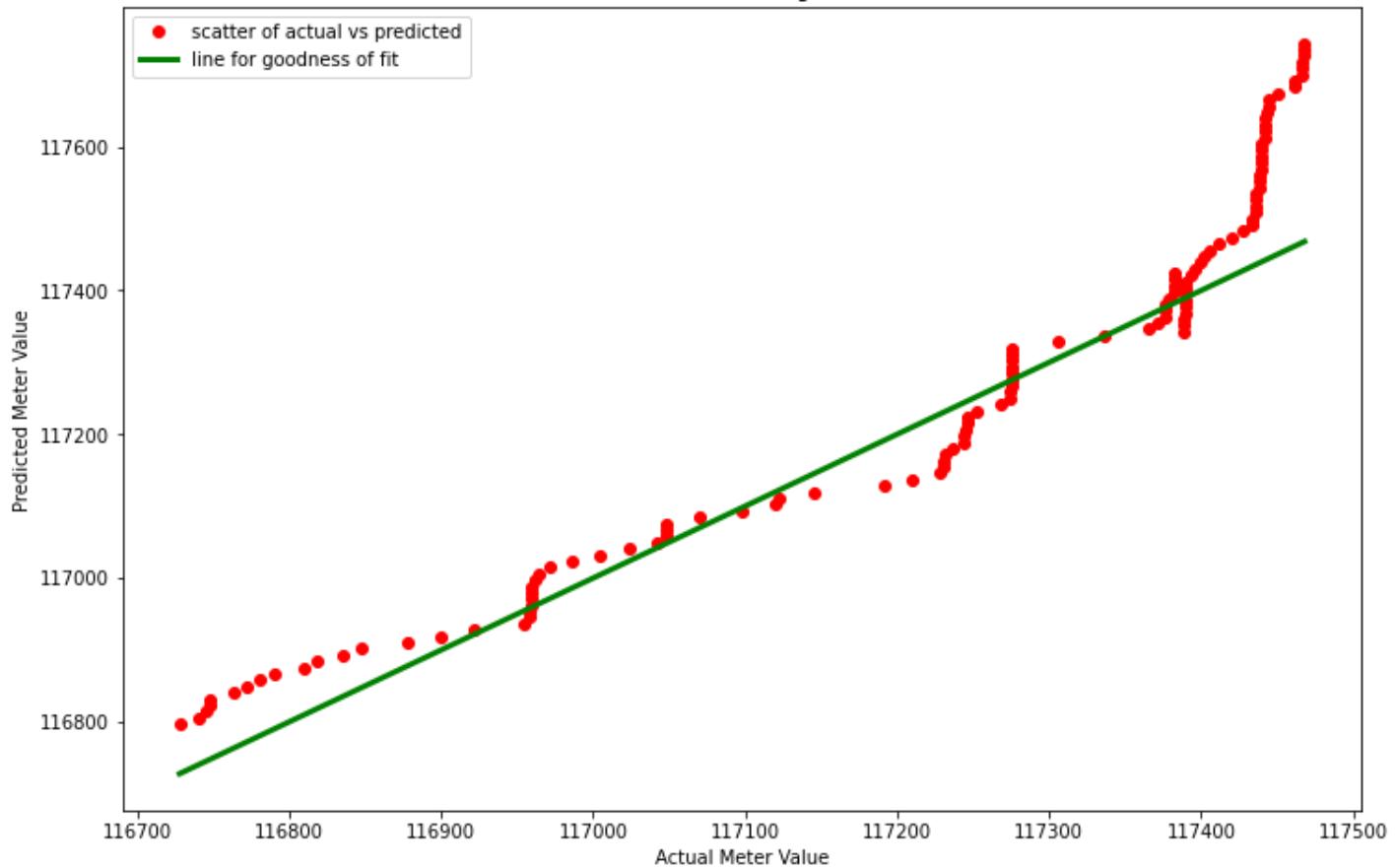
Scatter Plot - Household 4029.0 Testing MSE : 53613.10839864669



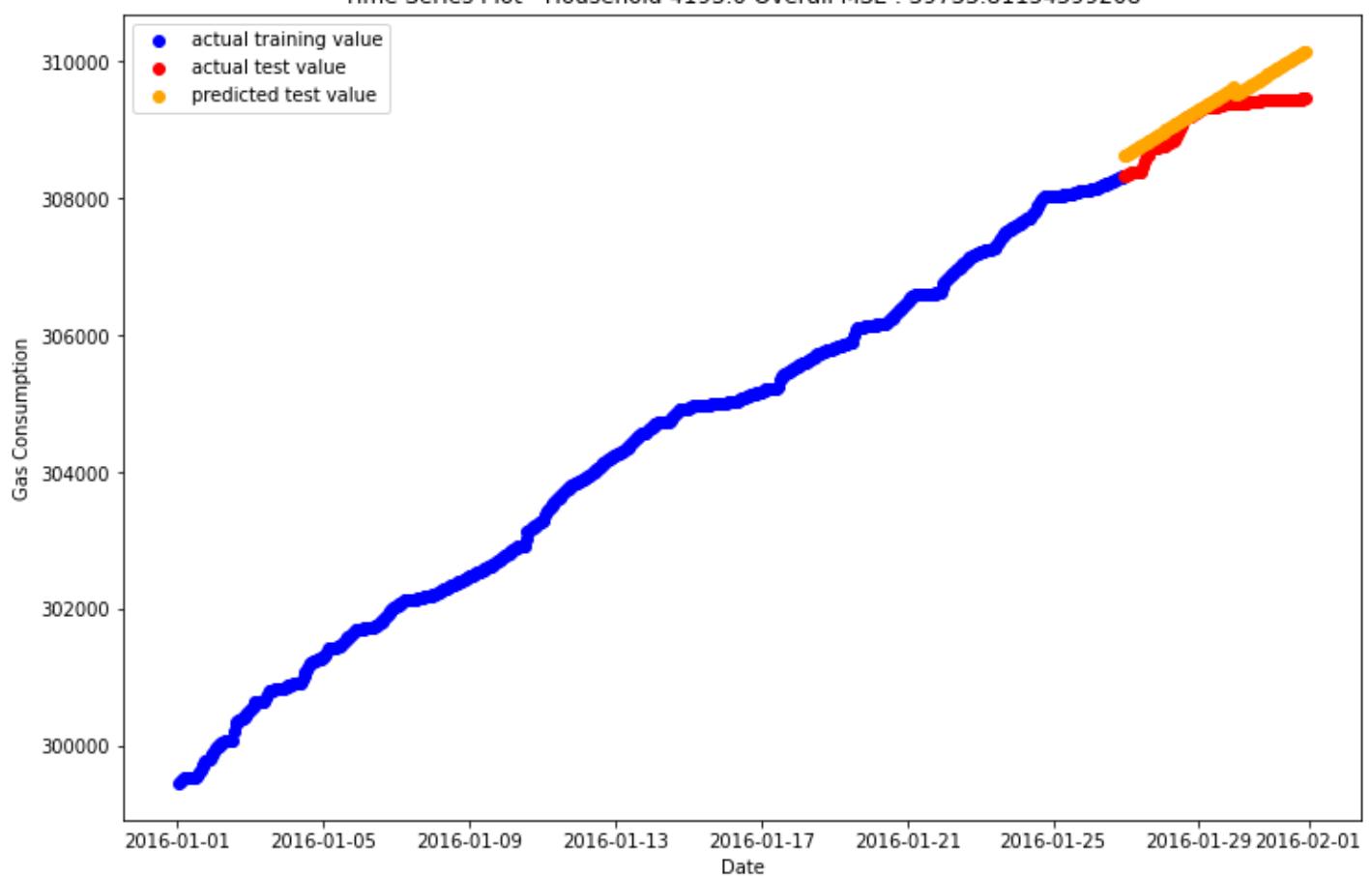
Time Series Plot - Household 4031.0 Overall MSE : 10532.182656563105



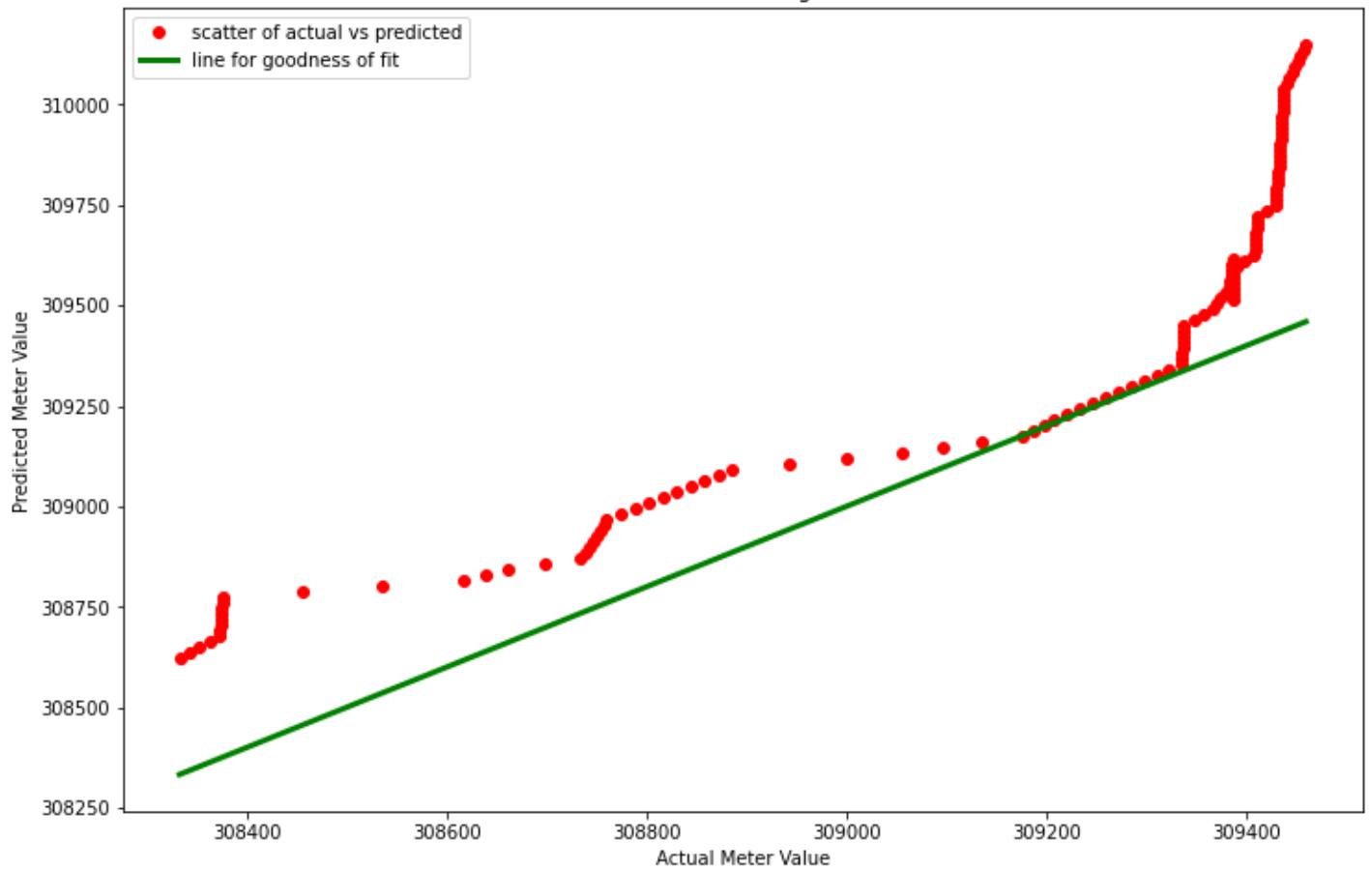
Scatter Plot - Household 4031.0 Testing MSE : 9595.532326469938



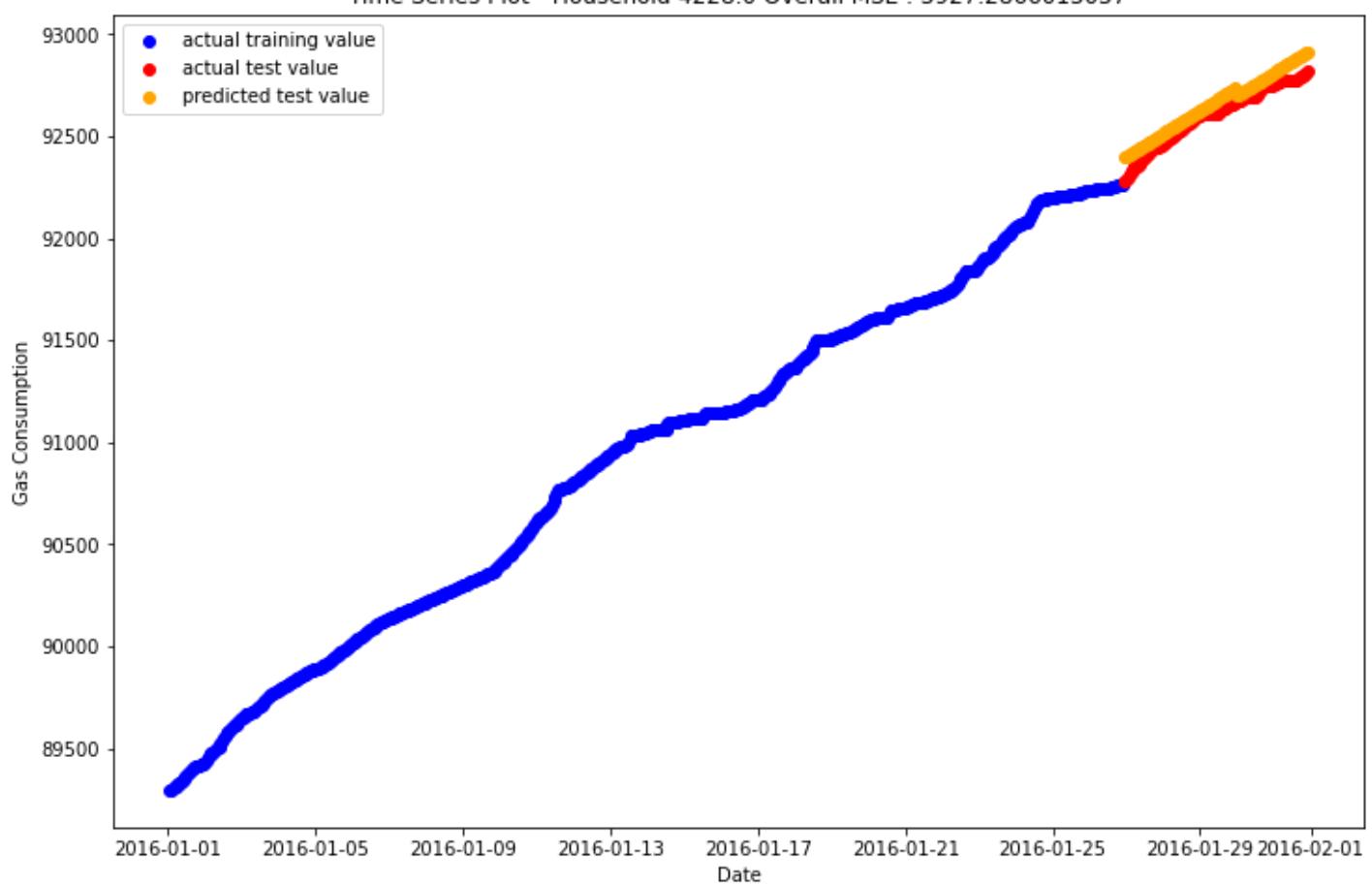
Time Series Plot - Household 4193.0 Overall MSE : 39733.81154599208



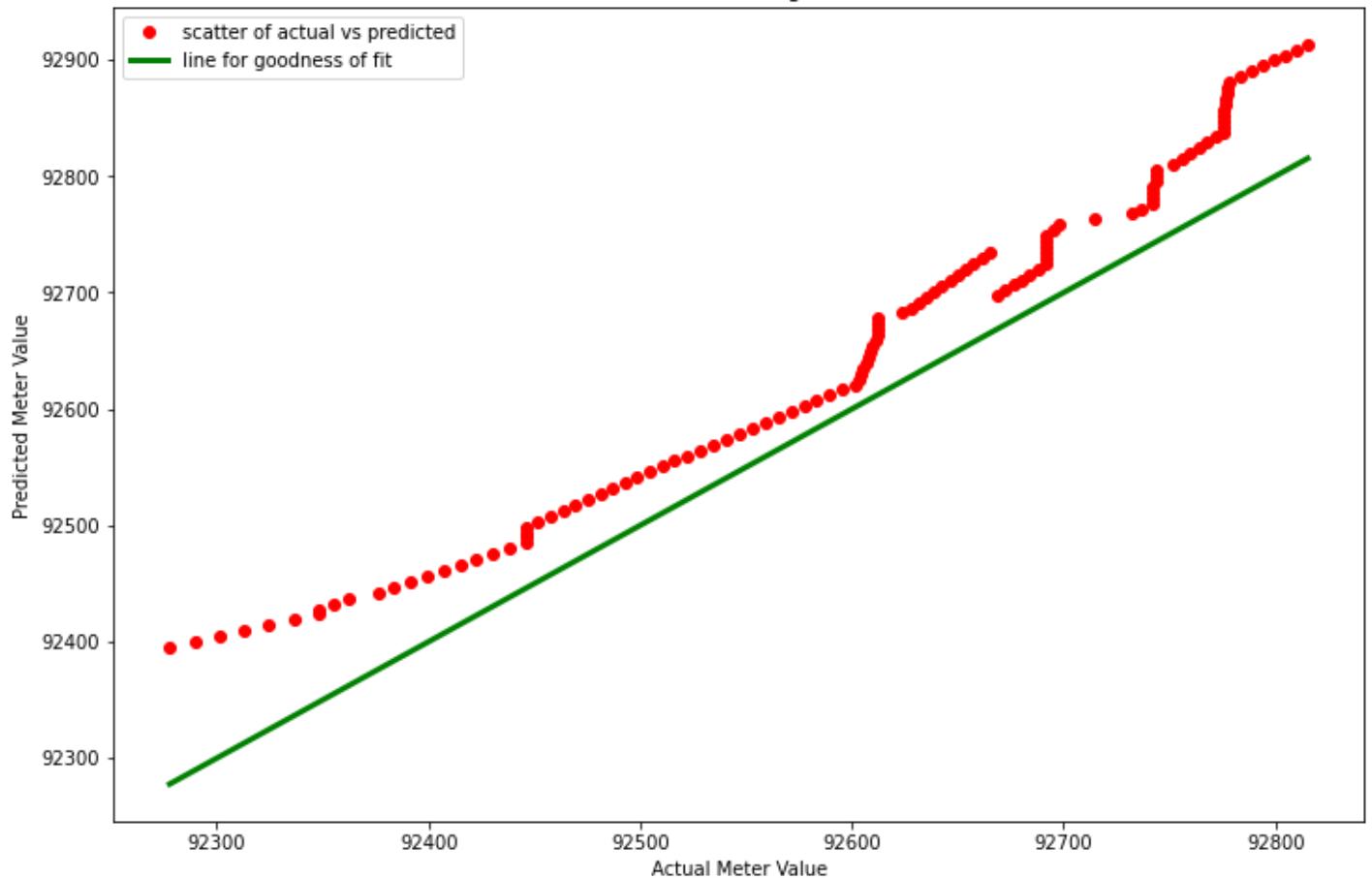
Scatter Plot - Household 4193.0 Testing MSE : 98701.88618961223

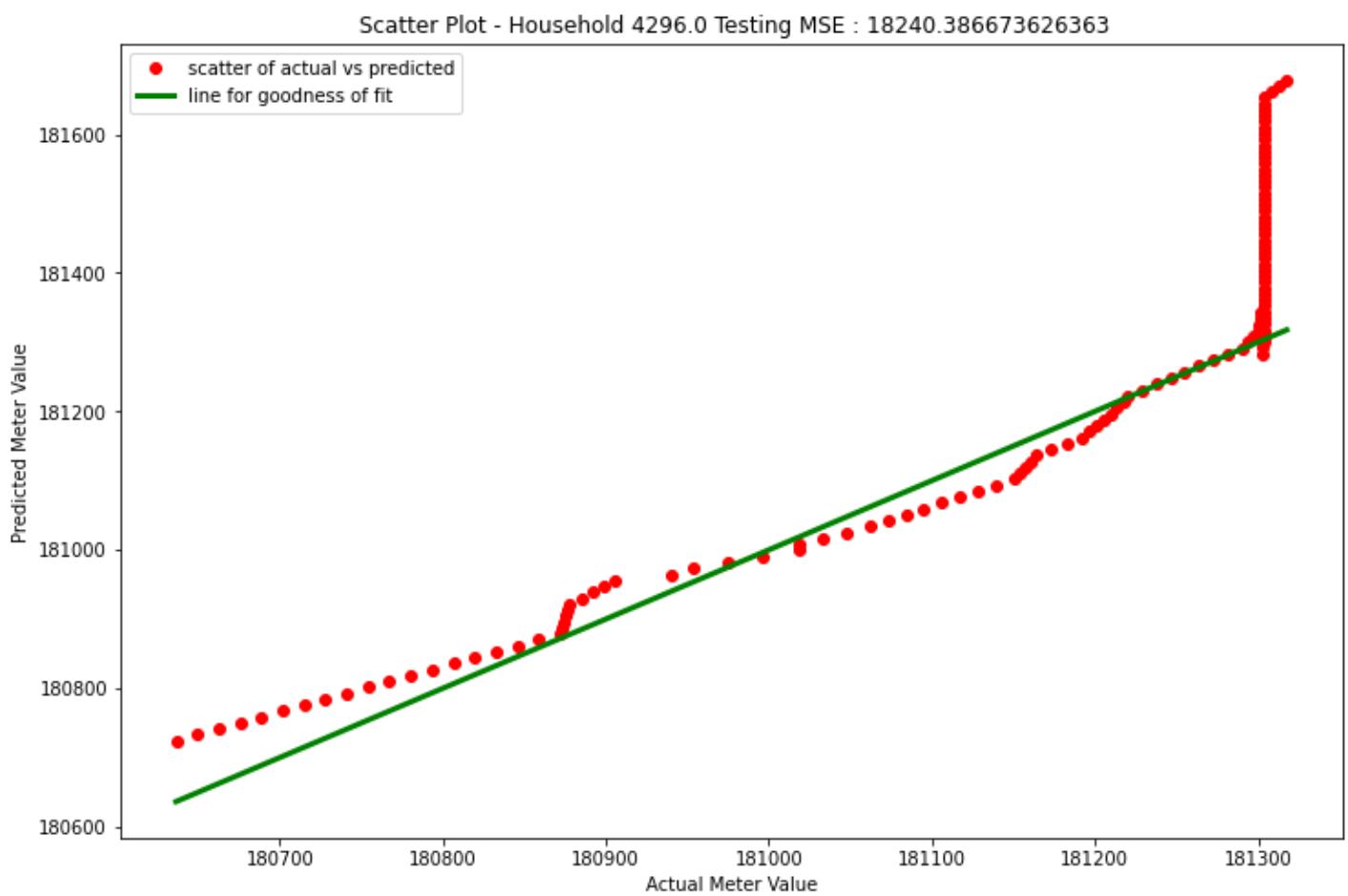
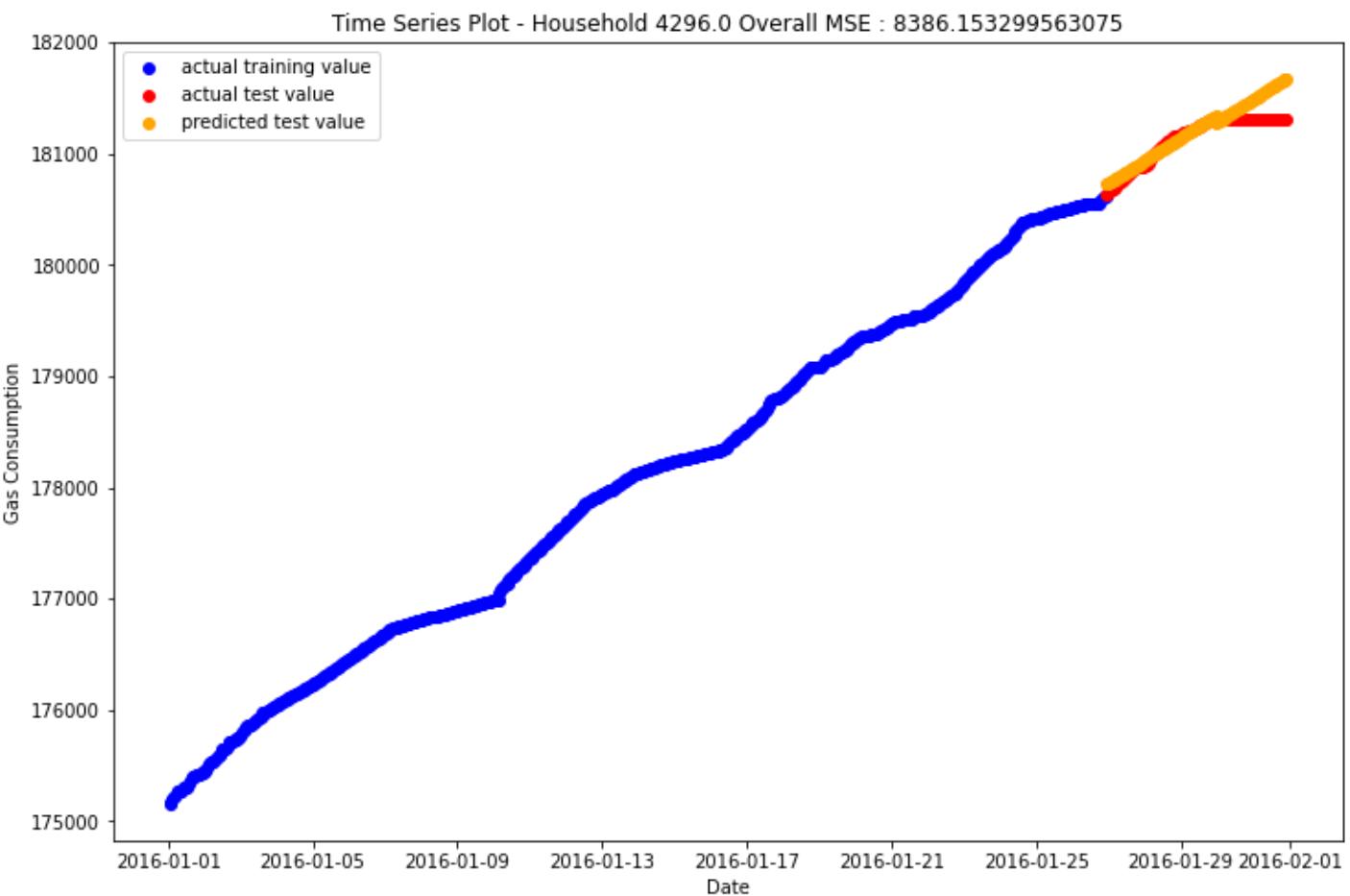


Time Series Plot - Household 4228.0 Overall MSE : 3927.2866013037

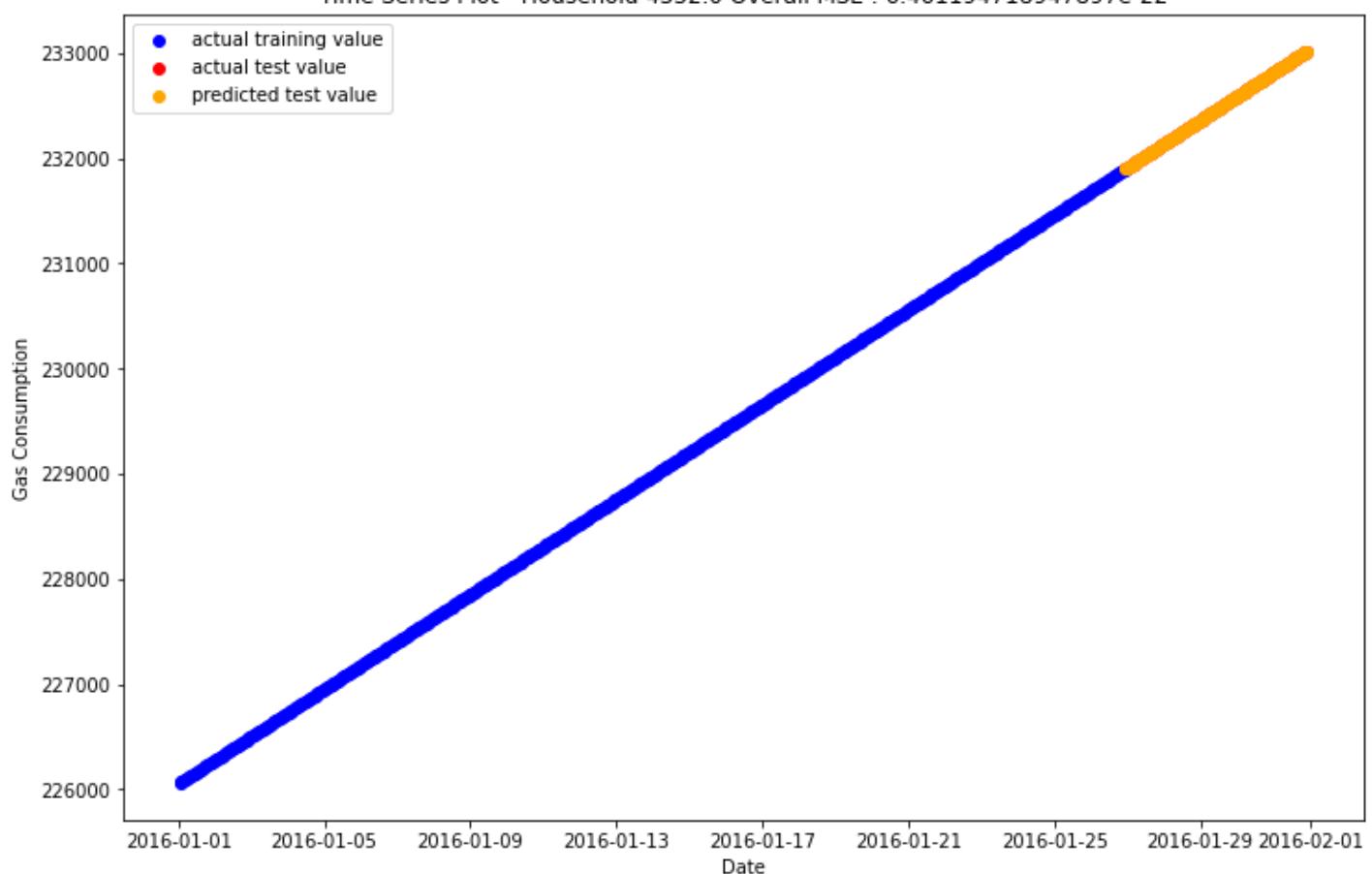


Scatter Plot - Household 4228.0 Testing MSE : 3654.8876006771734

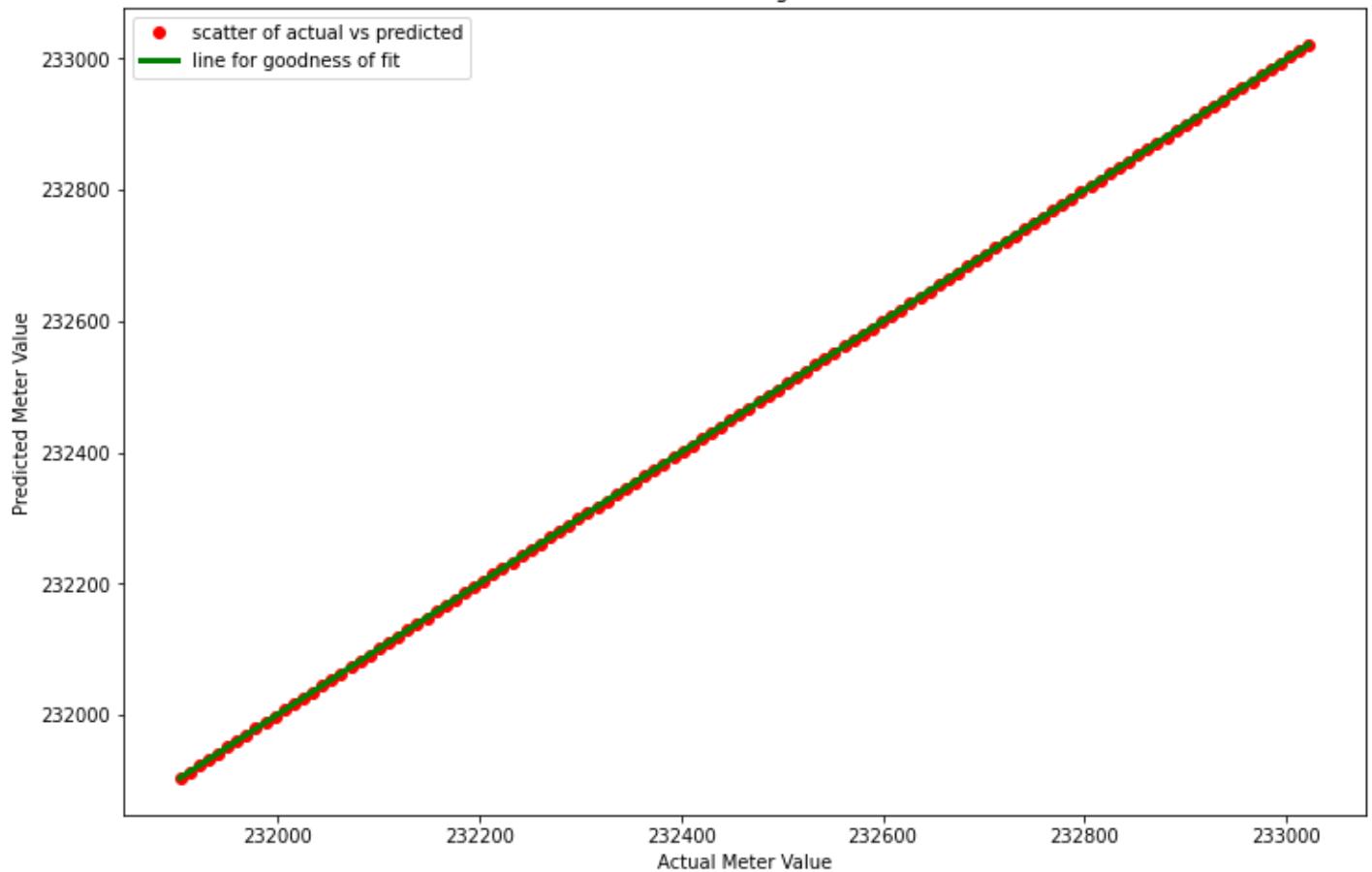




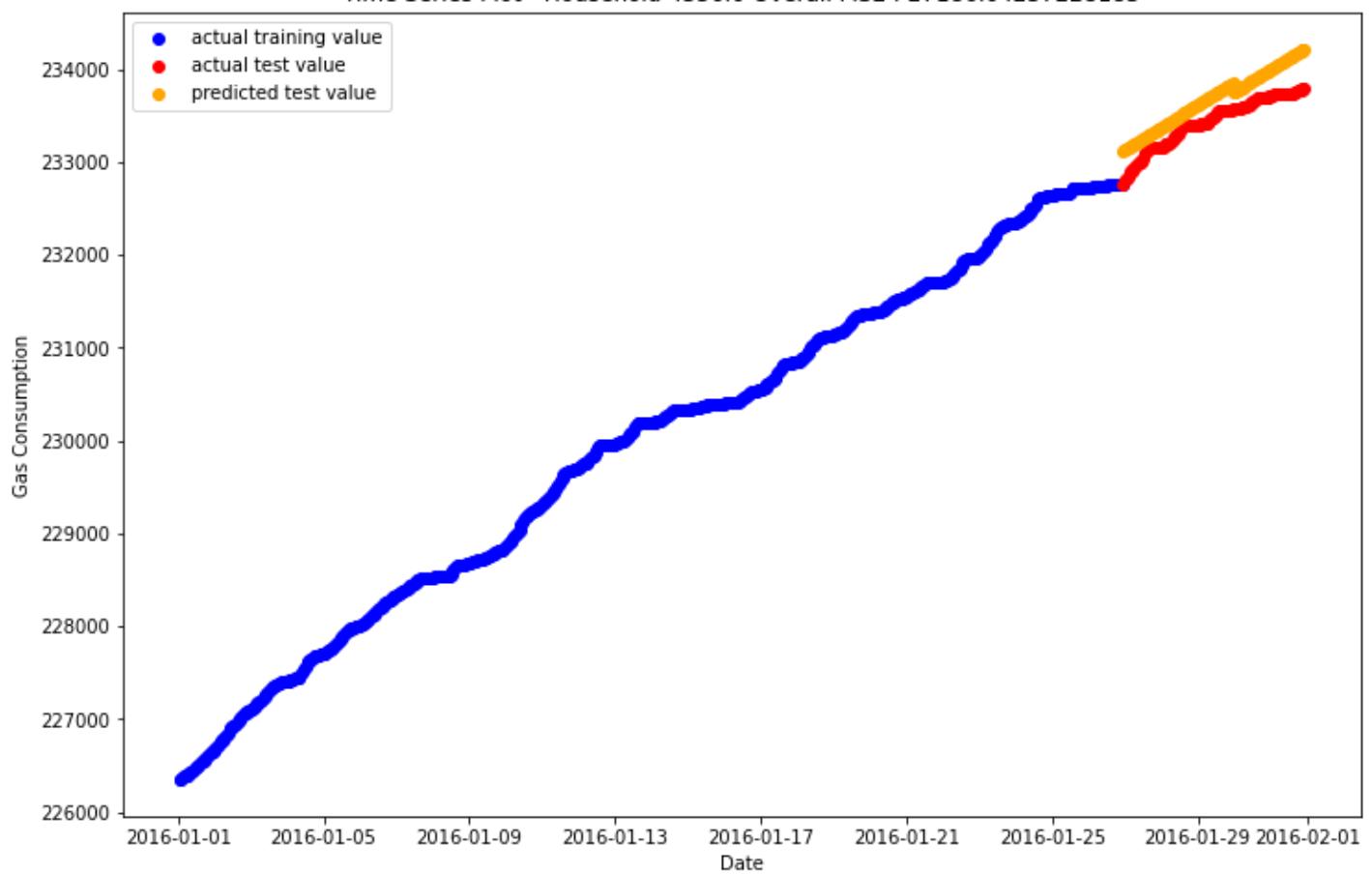
Time Series Plot - Household 4352.0 Overall MSE : 6.461194718947897e-22



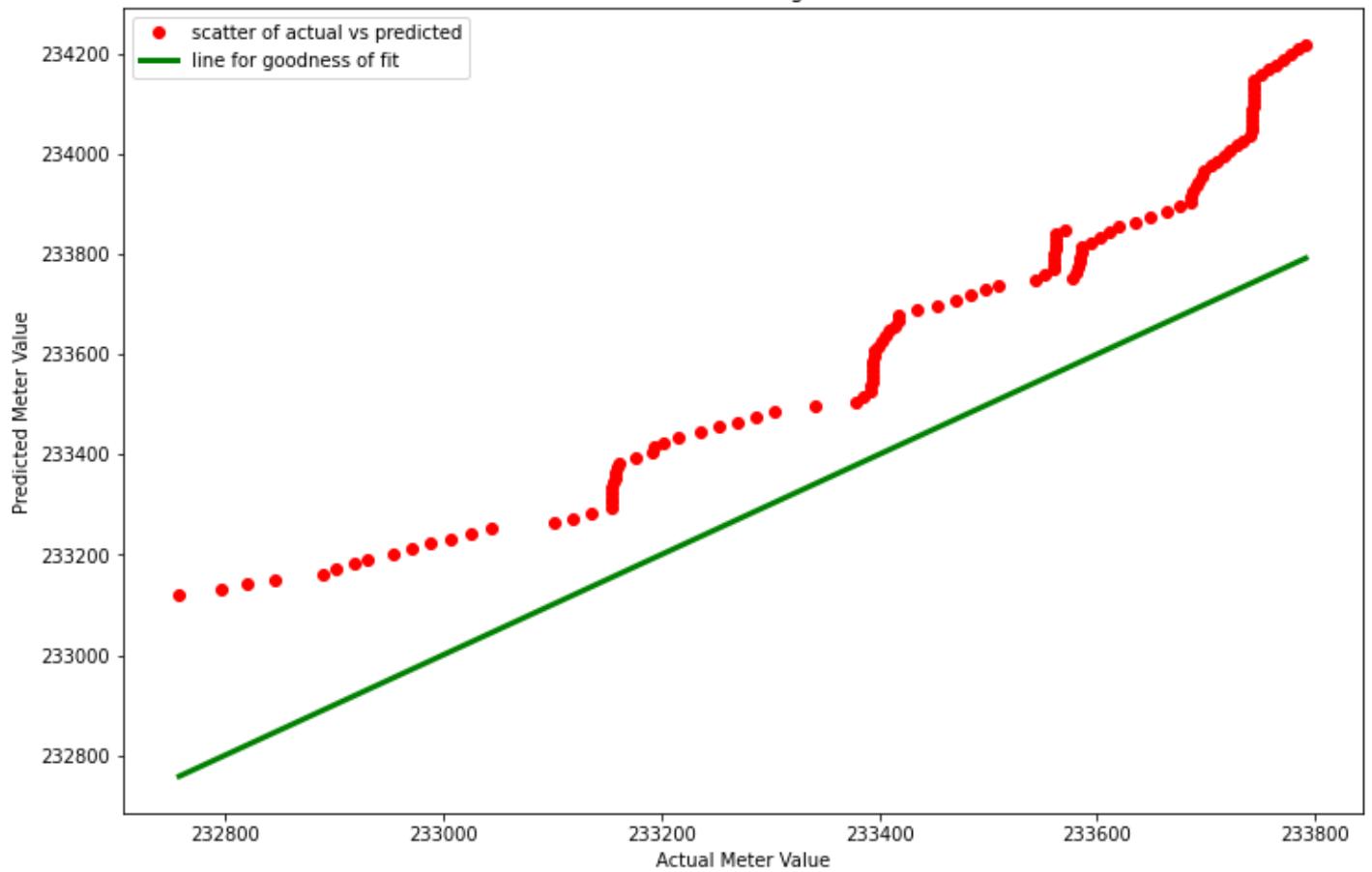
Scatter Plot - Household 4352.0 Testing MSE : 6.211574946531535e-22



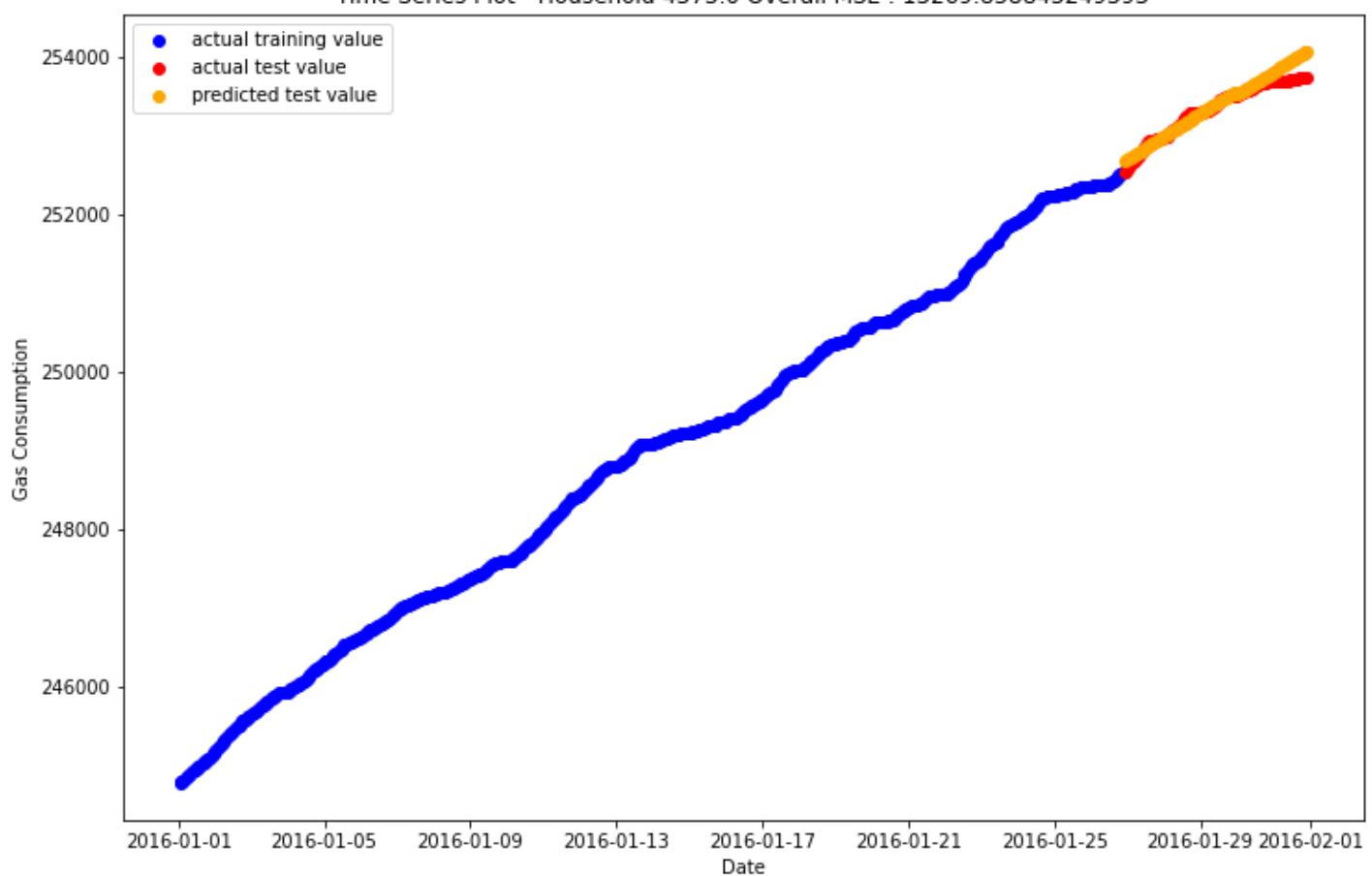
Time Series Plot - Household 4356.0 Overall MSE : 27186.04237228183



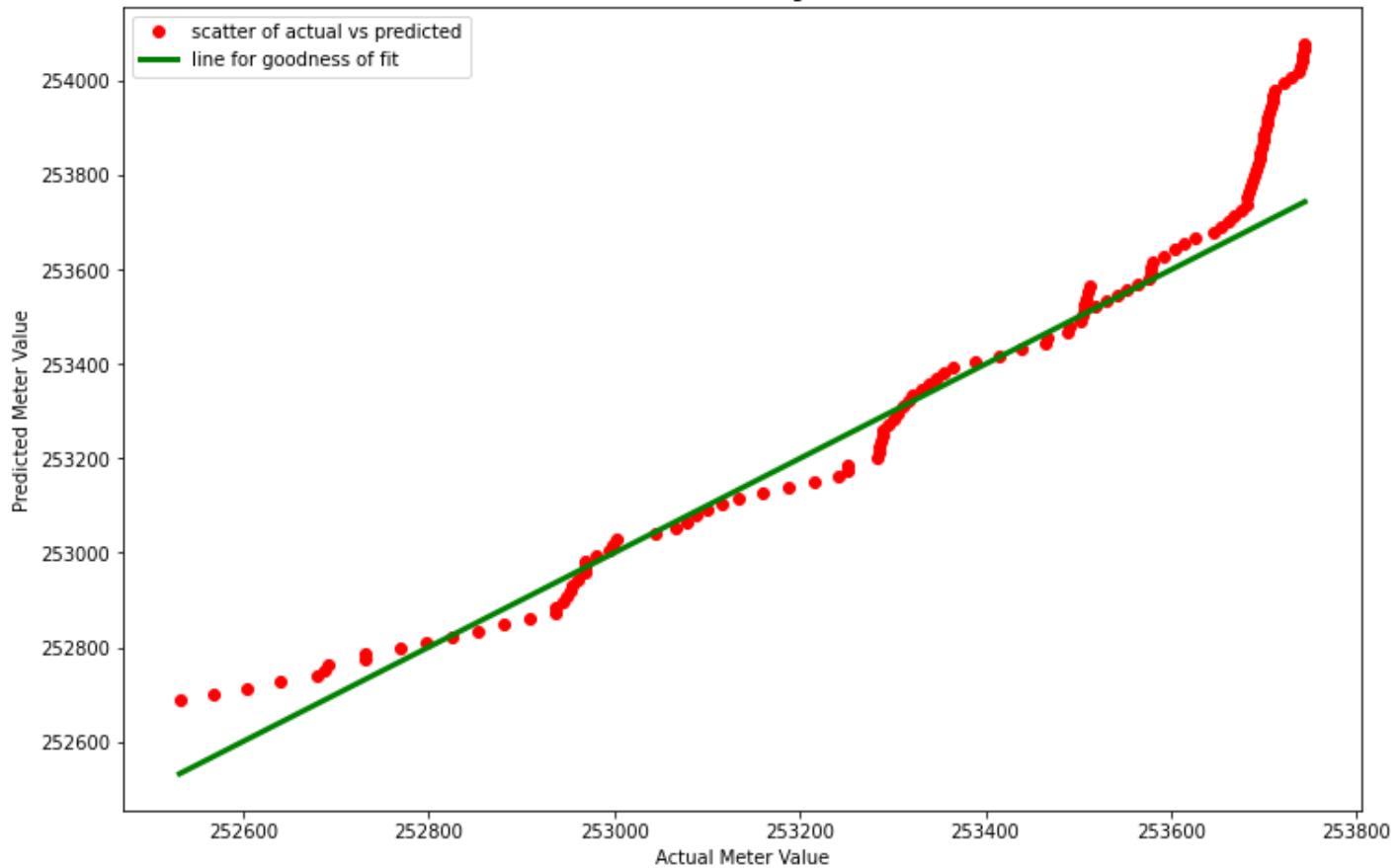
Scatter Plot - Household 4356.0 Testing MSE : 65499.486978976674

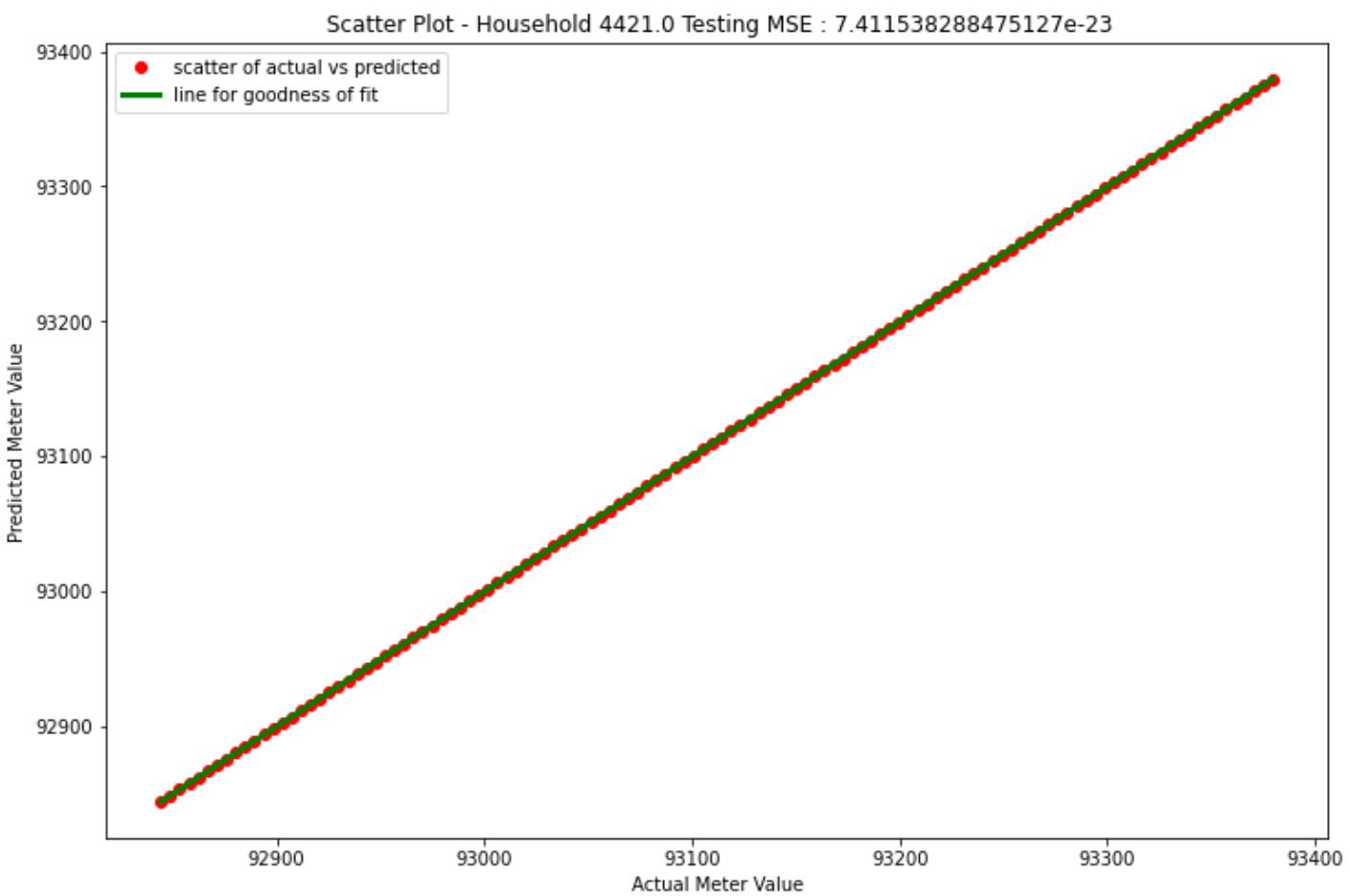
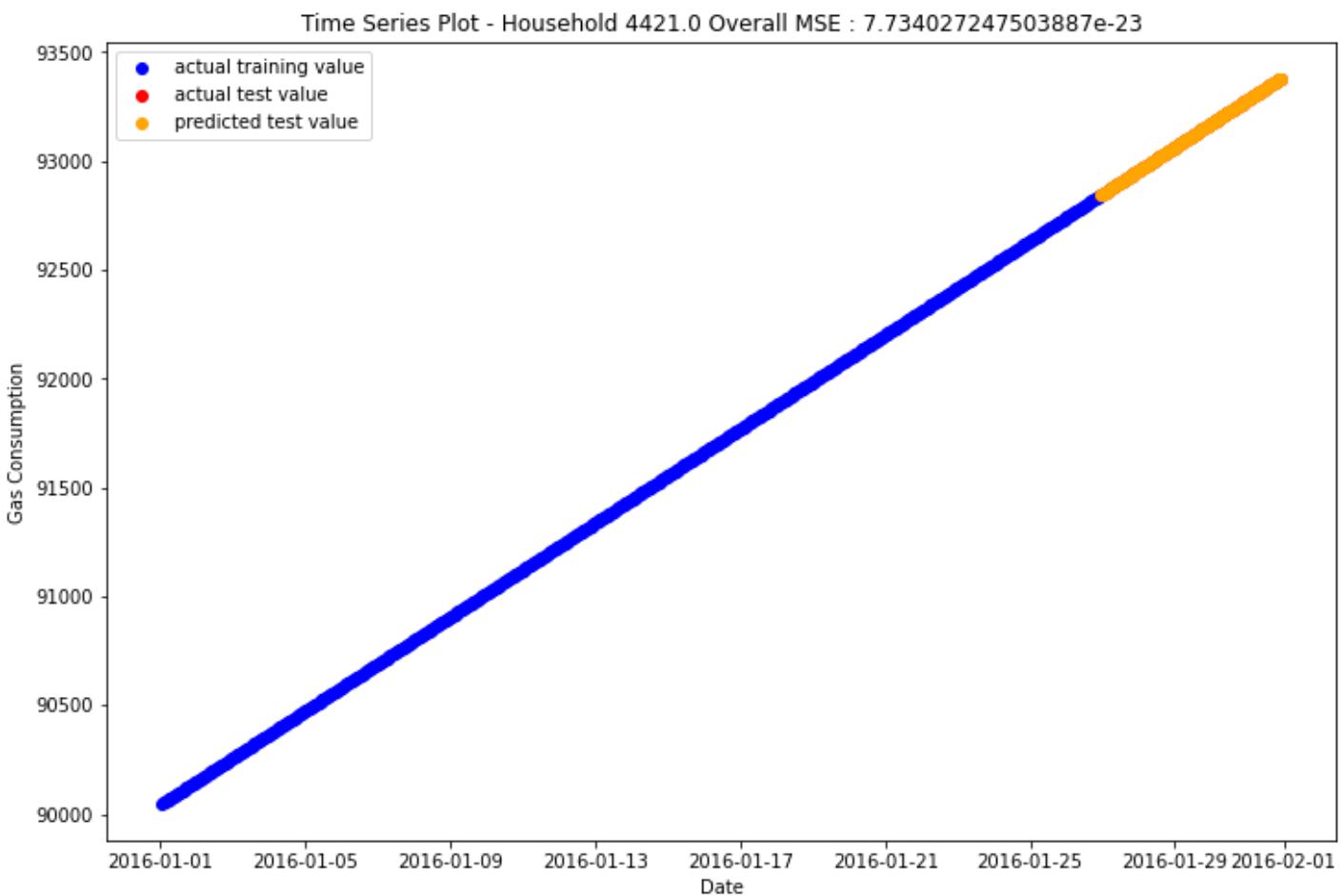


Time Series Plot - Household 4373.0 Overall MSE : 13269.858843249393

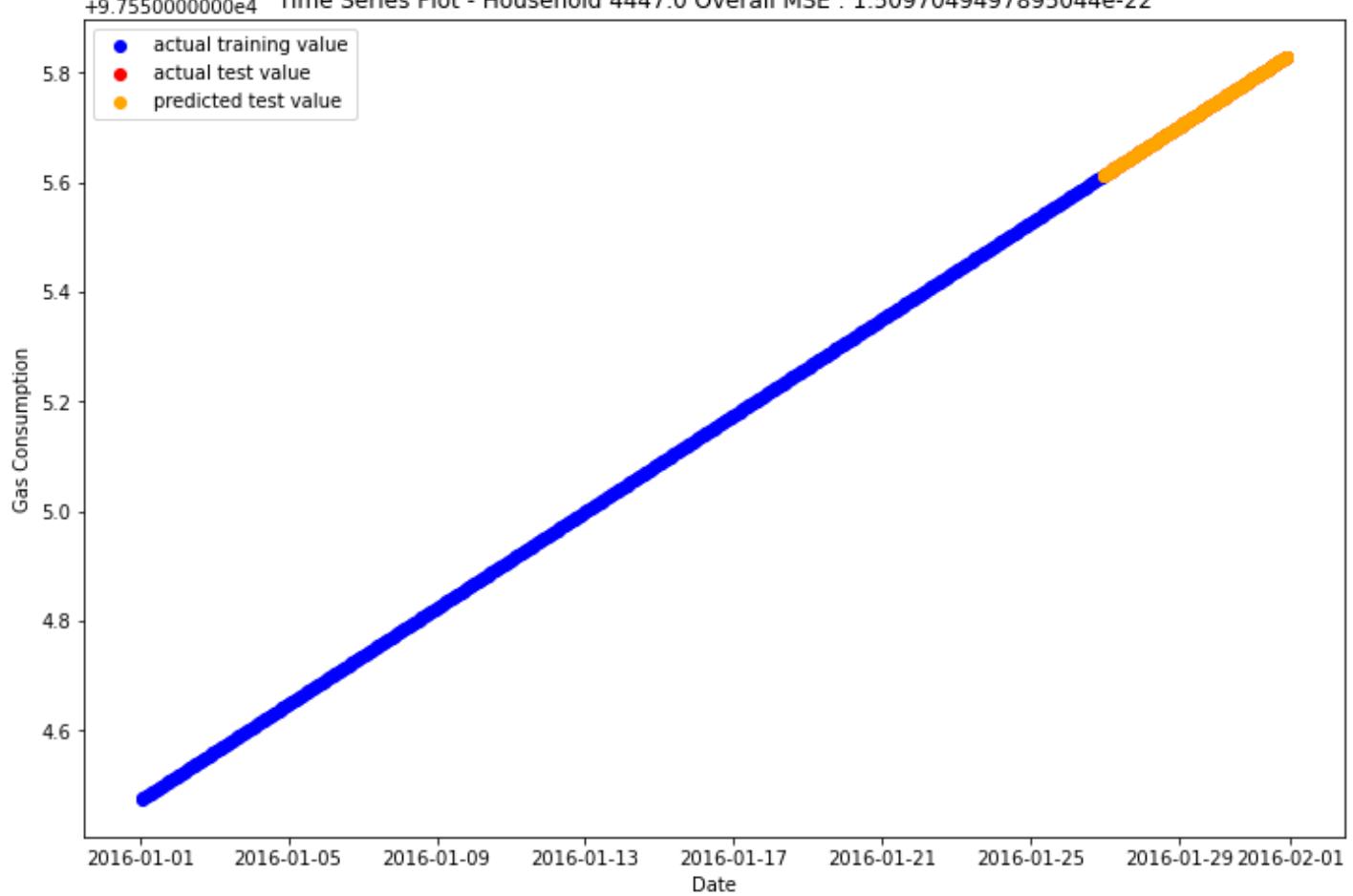


Scatter Plot - Household 4373.0 Testing MSE : 12915.661958845572

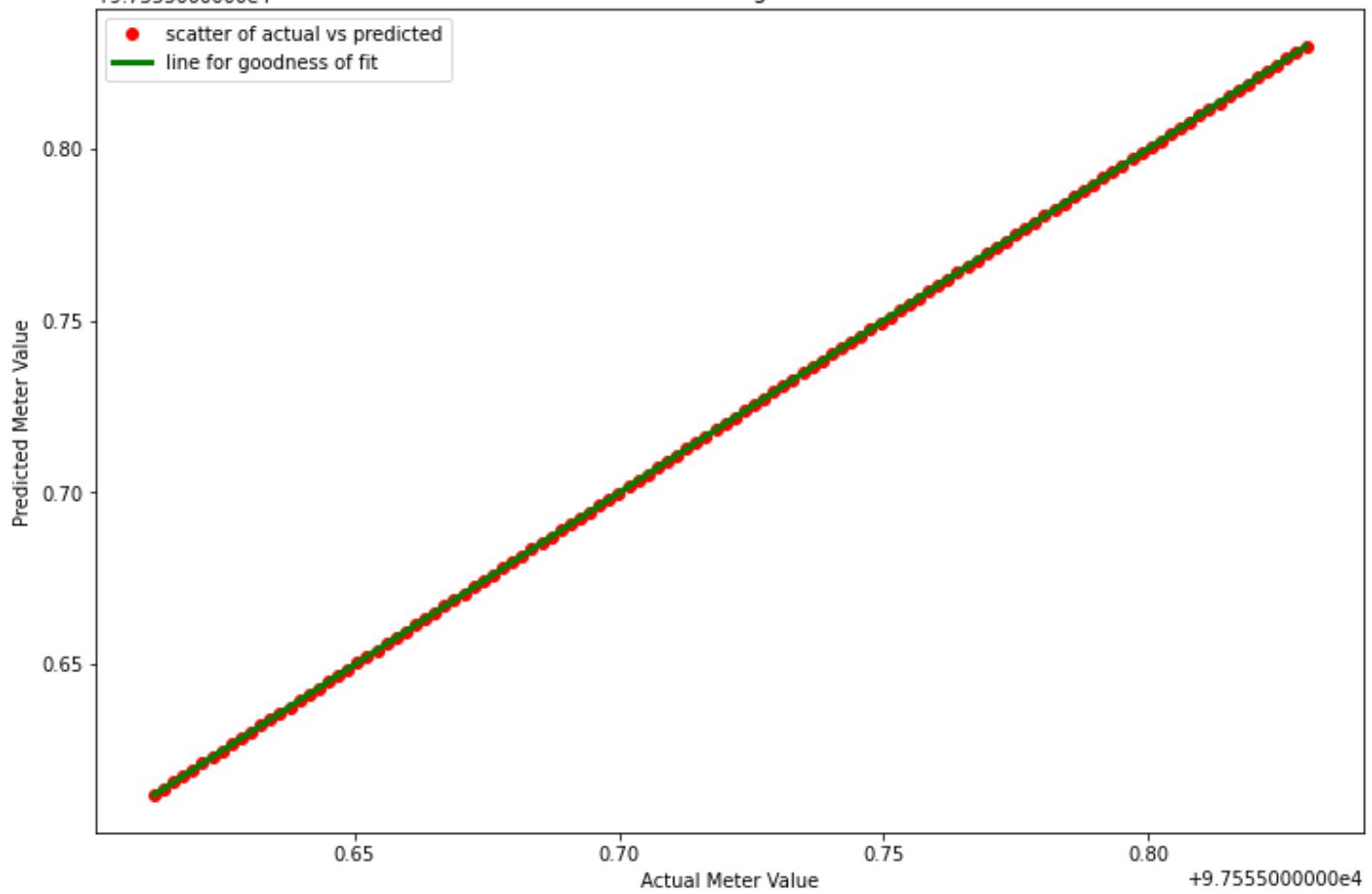


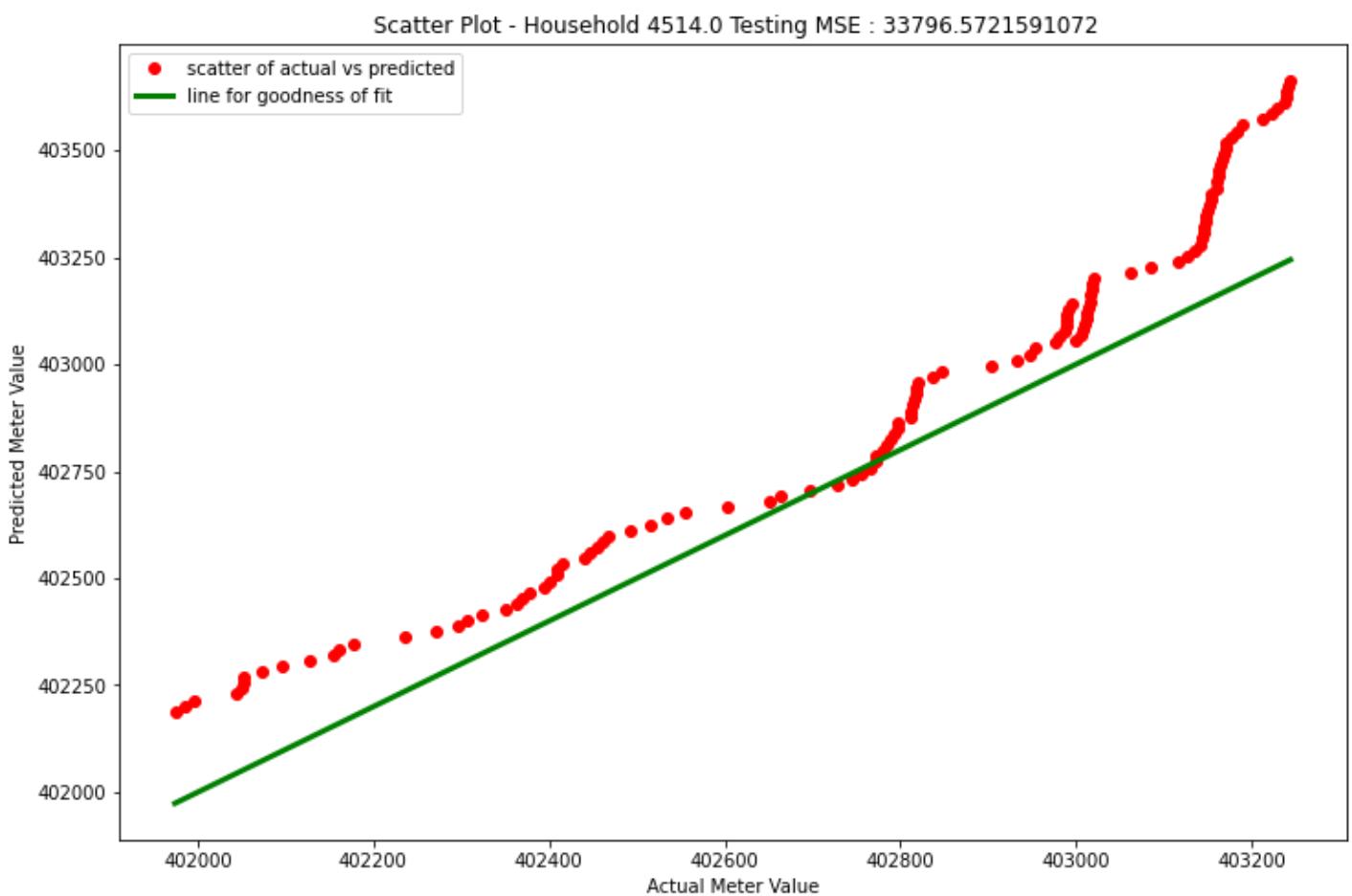
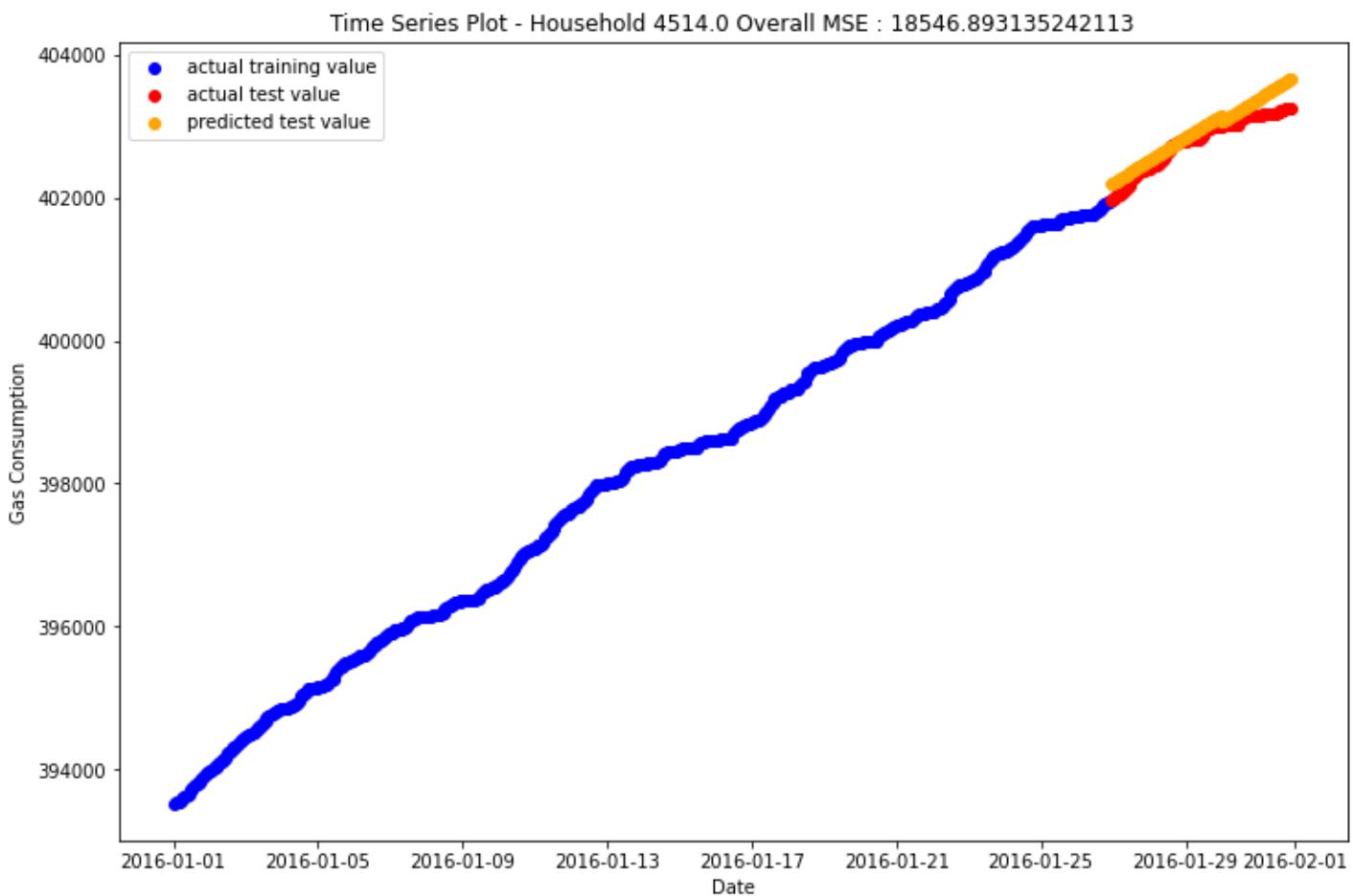


+9.7550000000e4 Time Series Plot - Household 4447.0 Overall MSE : 1.5097049497895044e-22

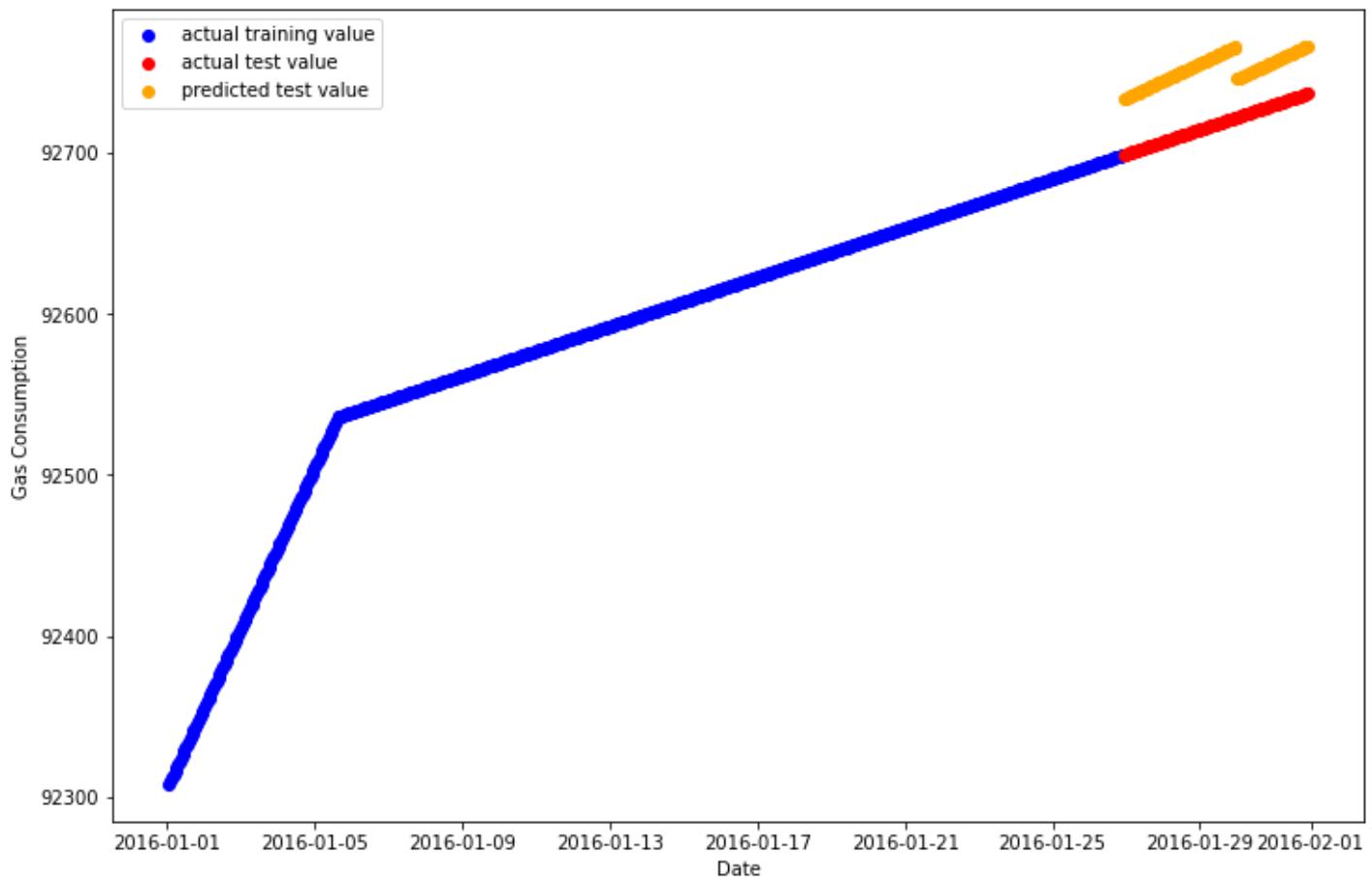


+9.7550000000e4 Scatter Plot - Household 4447.0 Testing MSE : 1.5352472168984193e-22

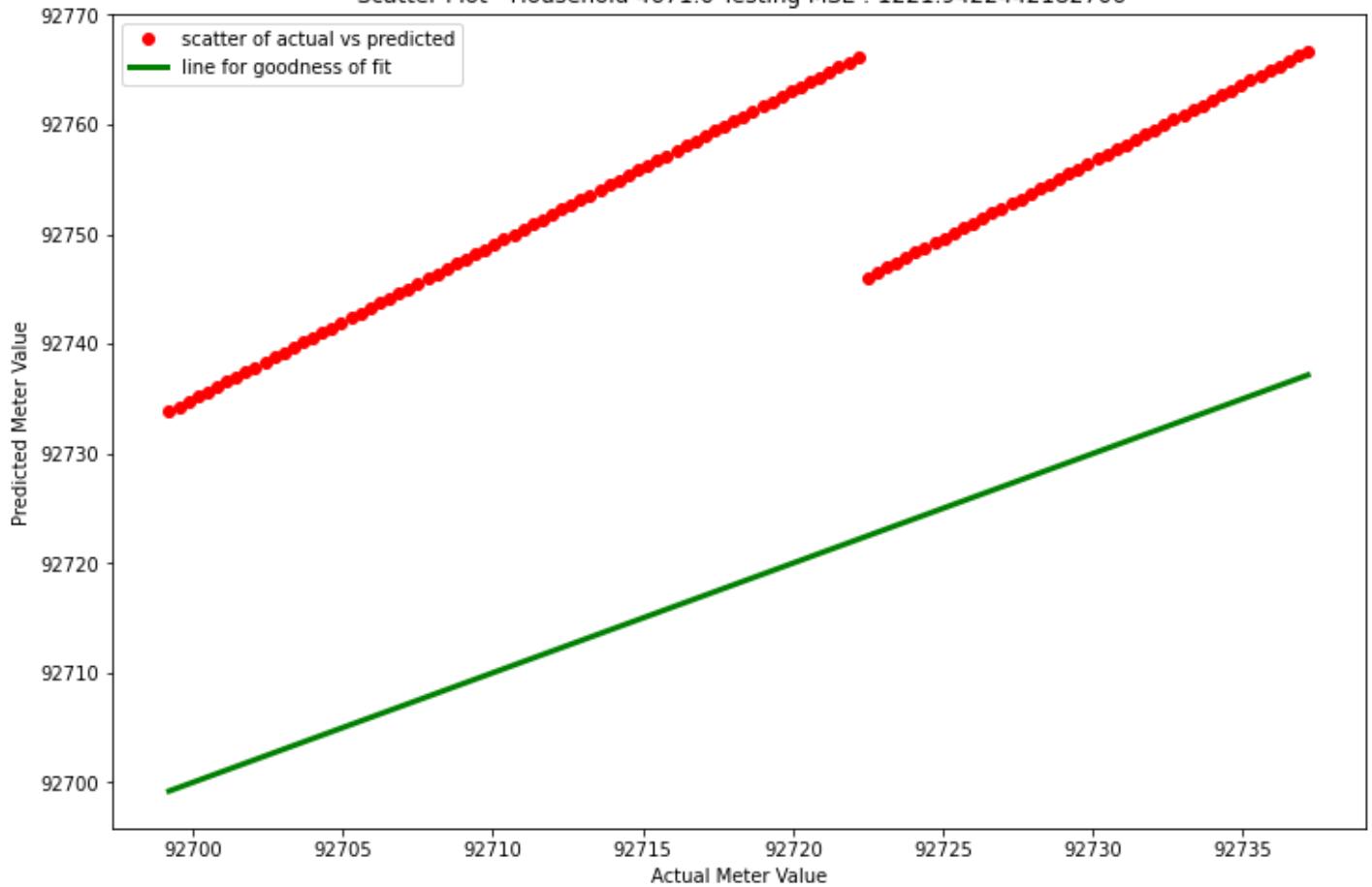




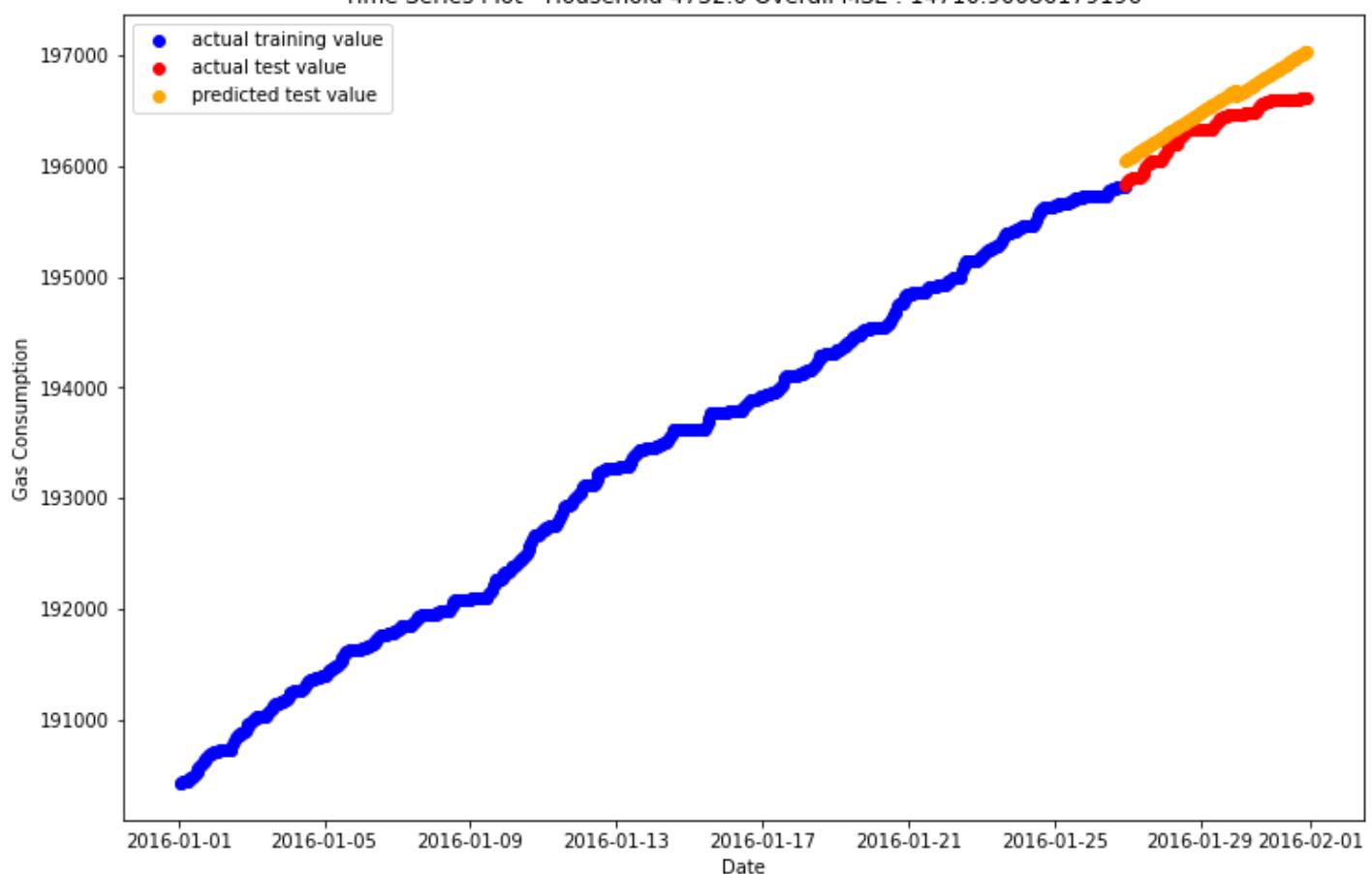
Time Series Plot - Household 4671.0 Overall MSE : 958.1426427349169



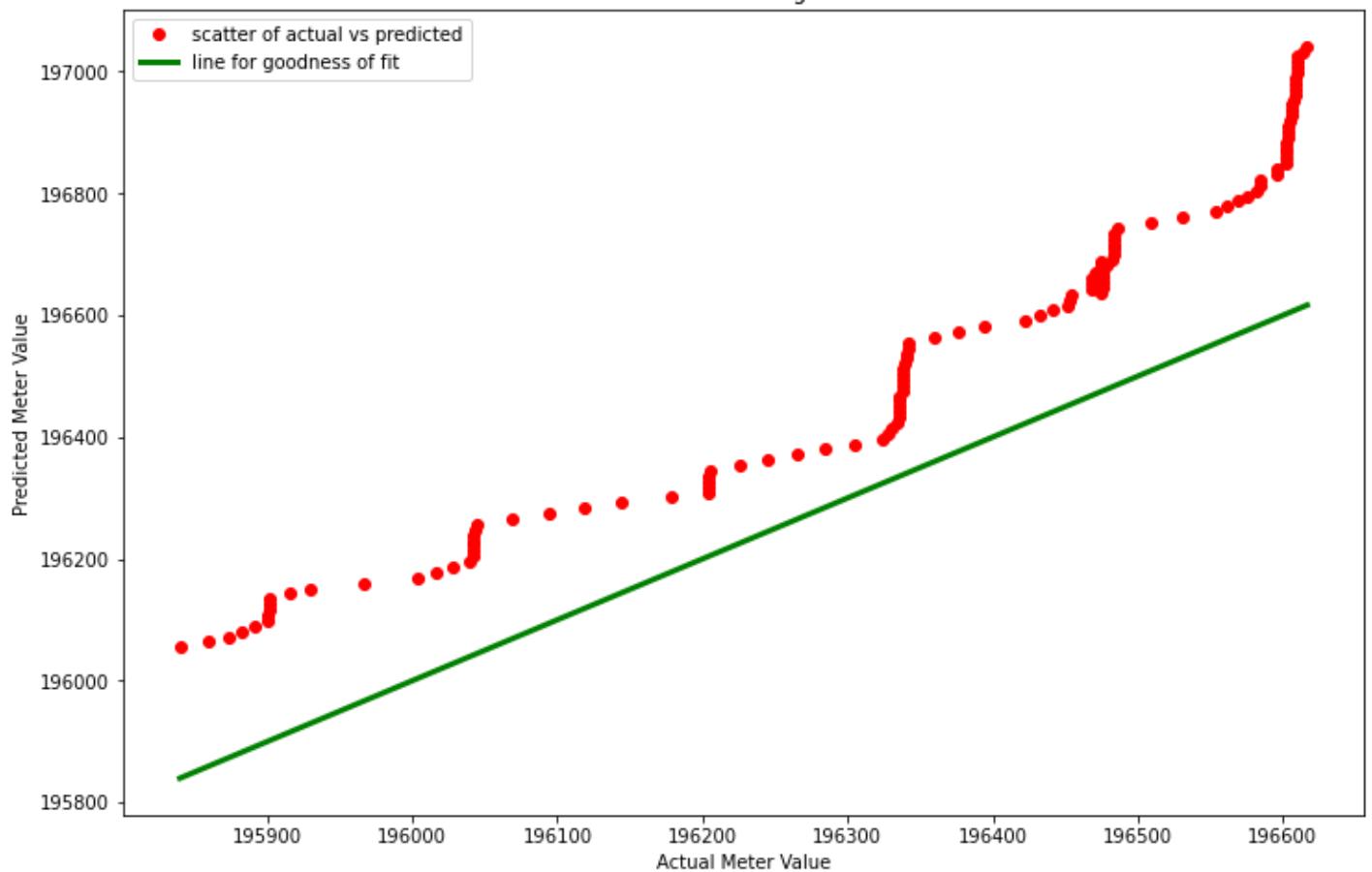
Scatter Plot - Household 4671.0 Testing MSE : 1221.9422442182706



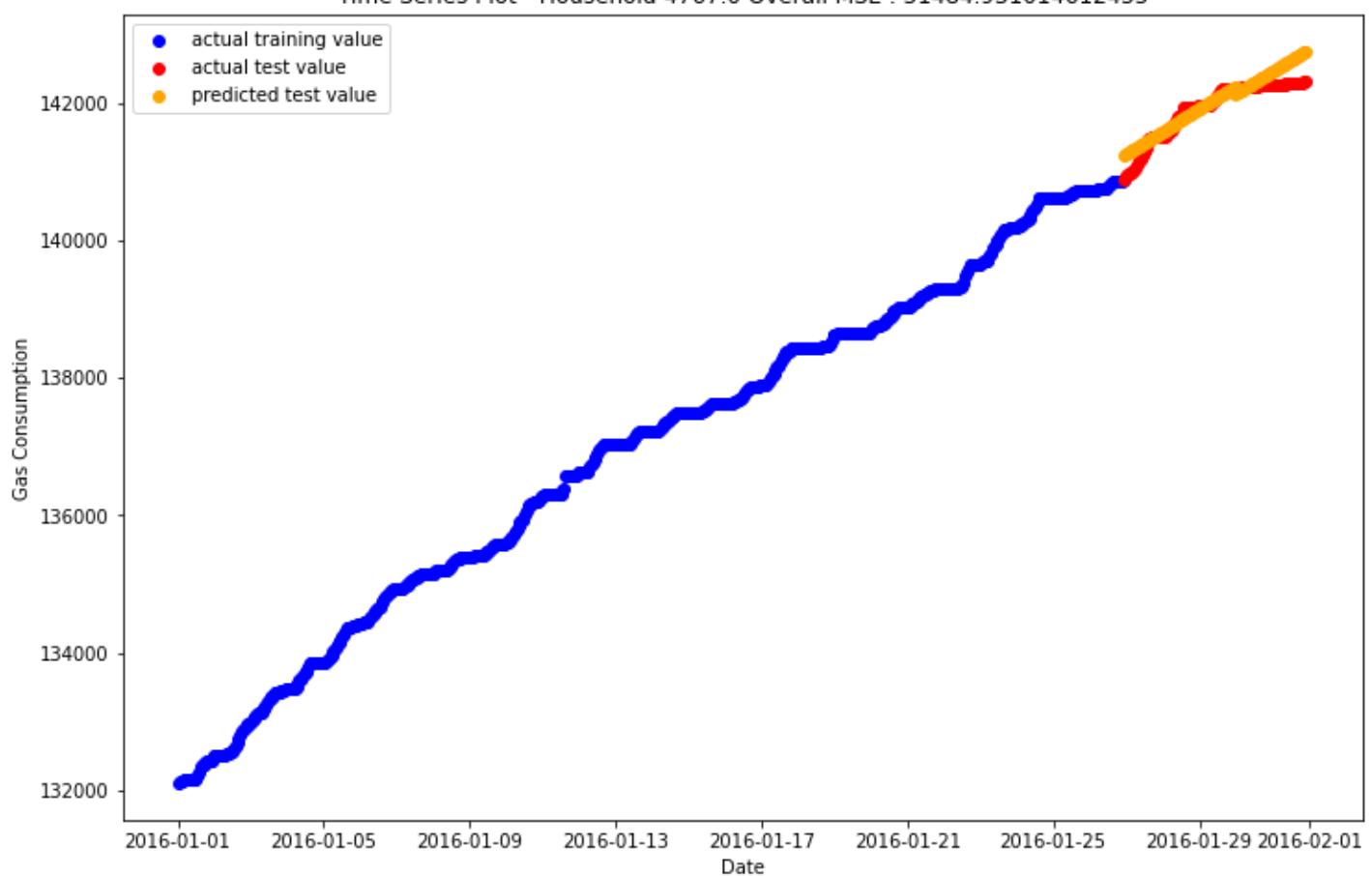
Time Series Plot - Household 4732.0 Overall MSE : 14710.90086179196



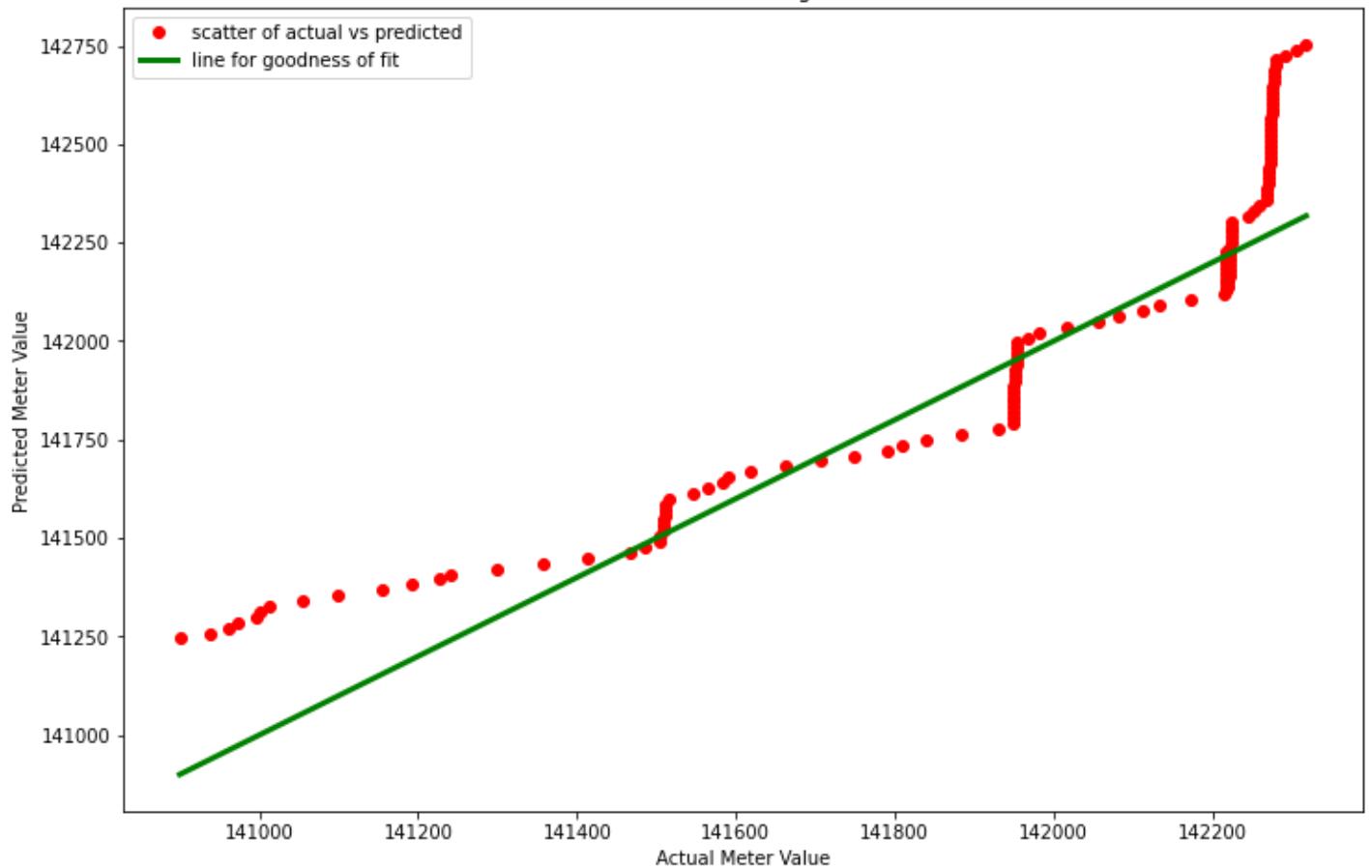
Scatter Plot - Household 4732.0 Testing MSE : 49930.878744400485



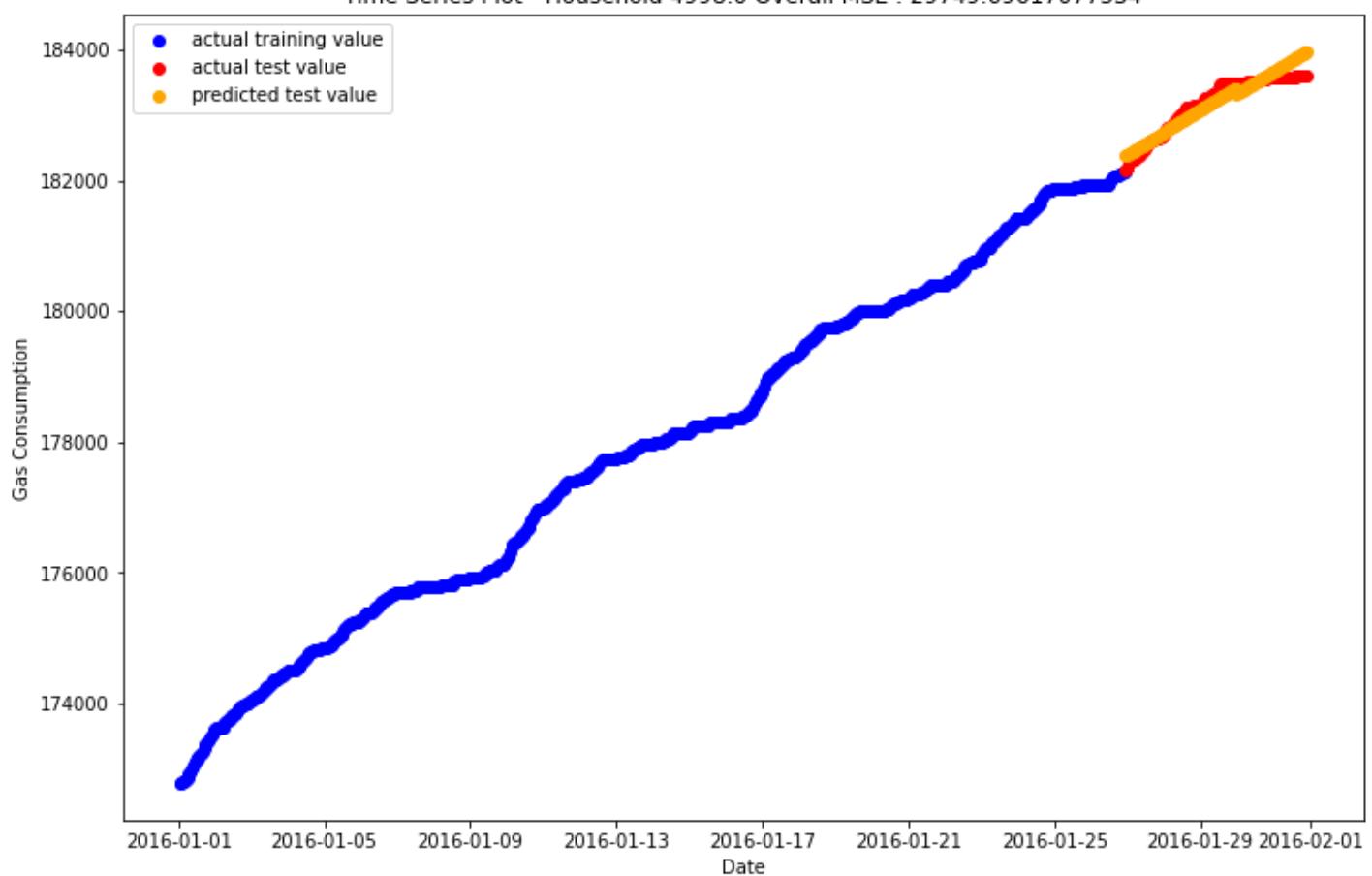
Time Series Plot - Household 4767.0 Overall MSE : 51484.931014612455



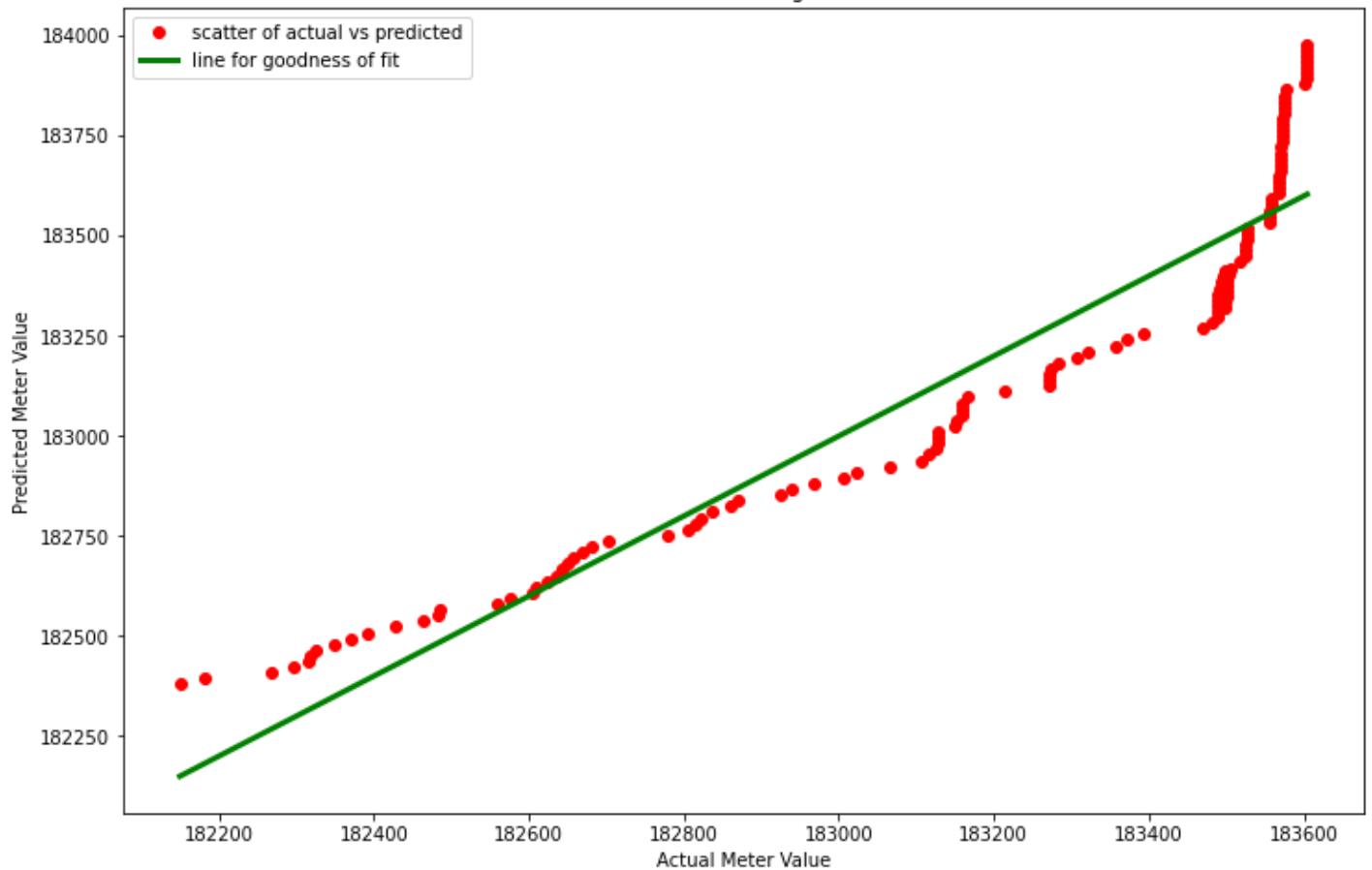
Scatter Plot - Household 4767.0 Testing MSE : 33570.87390292074



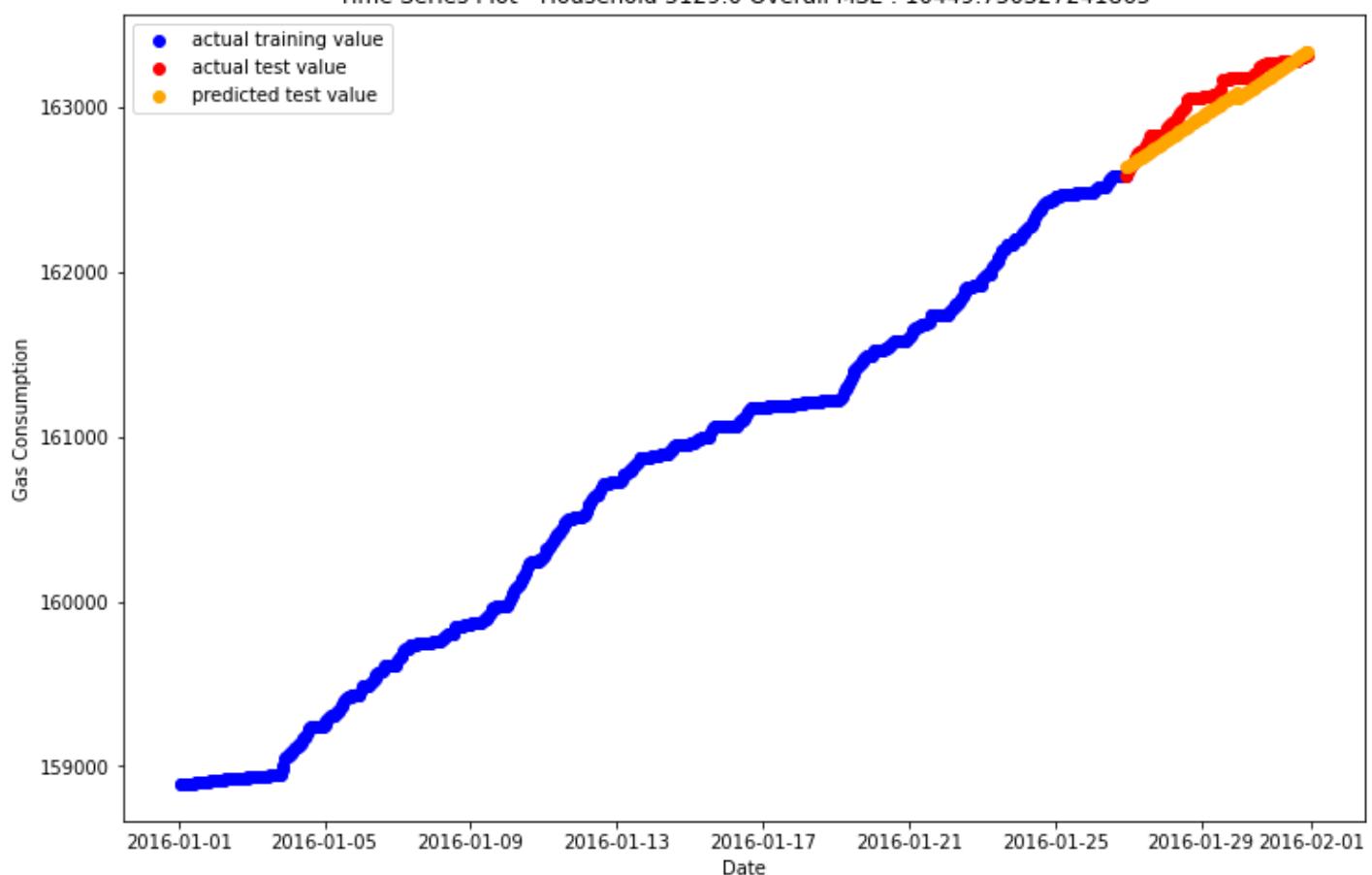
Time Series Plot - Household 4998.0 Overall MSE : 29749.69617077534



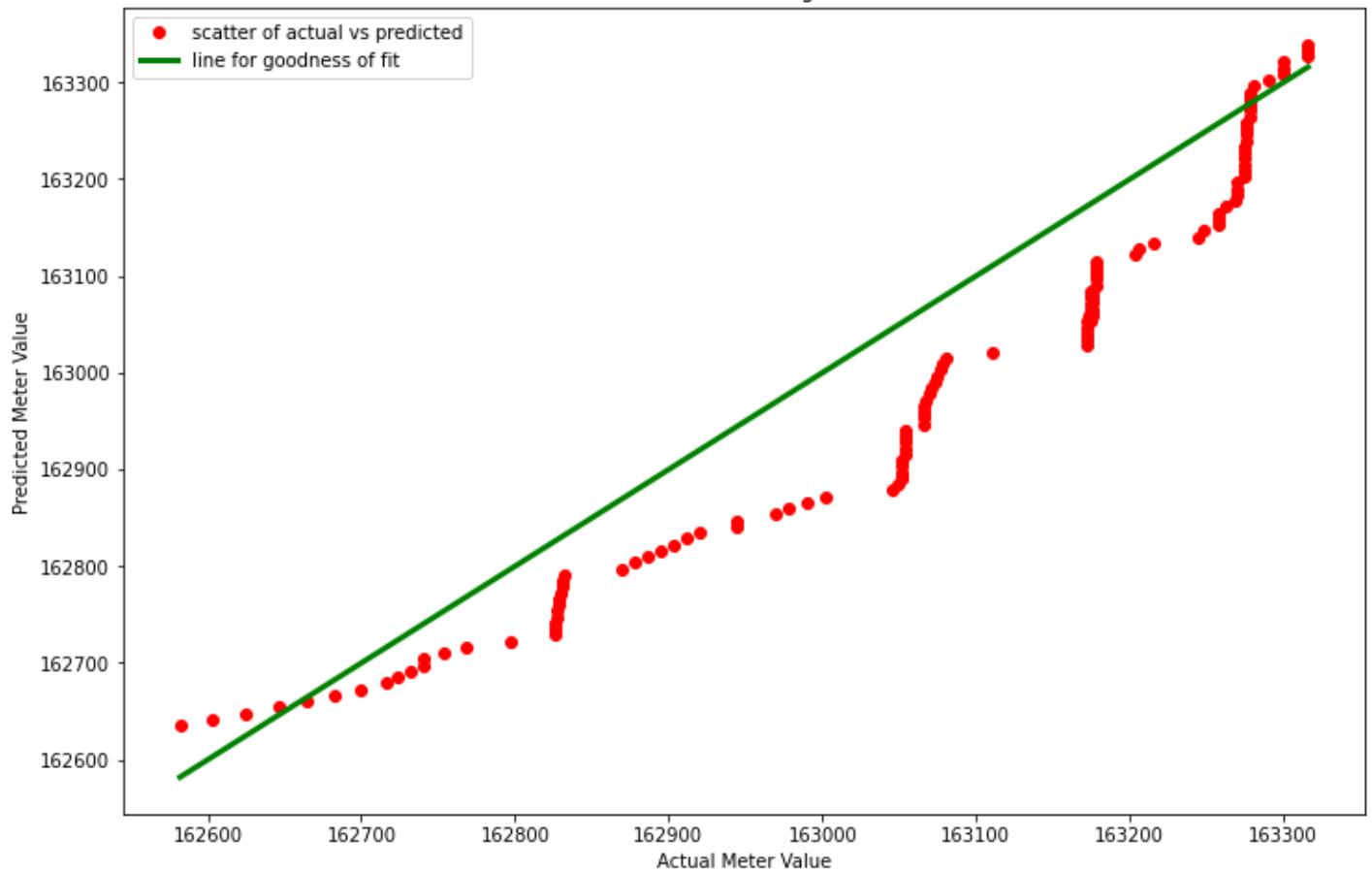
Scatter Plot - Household 4998.0 Testing MSE : 21648.813095886508



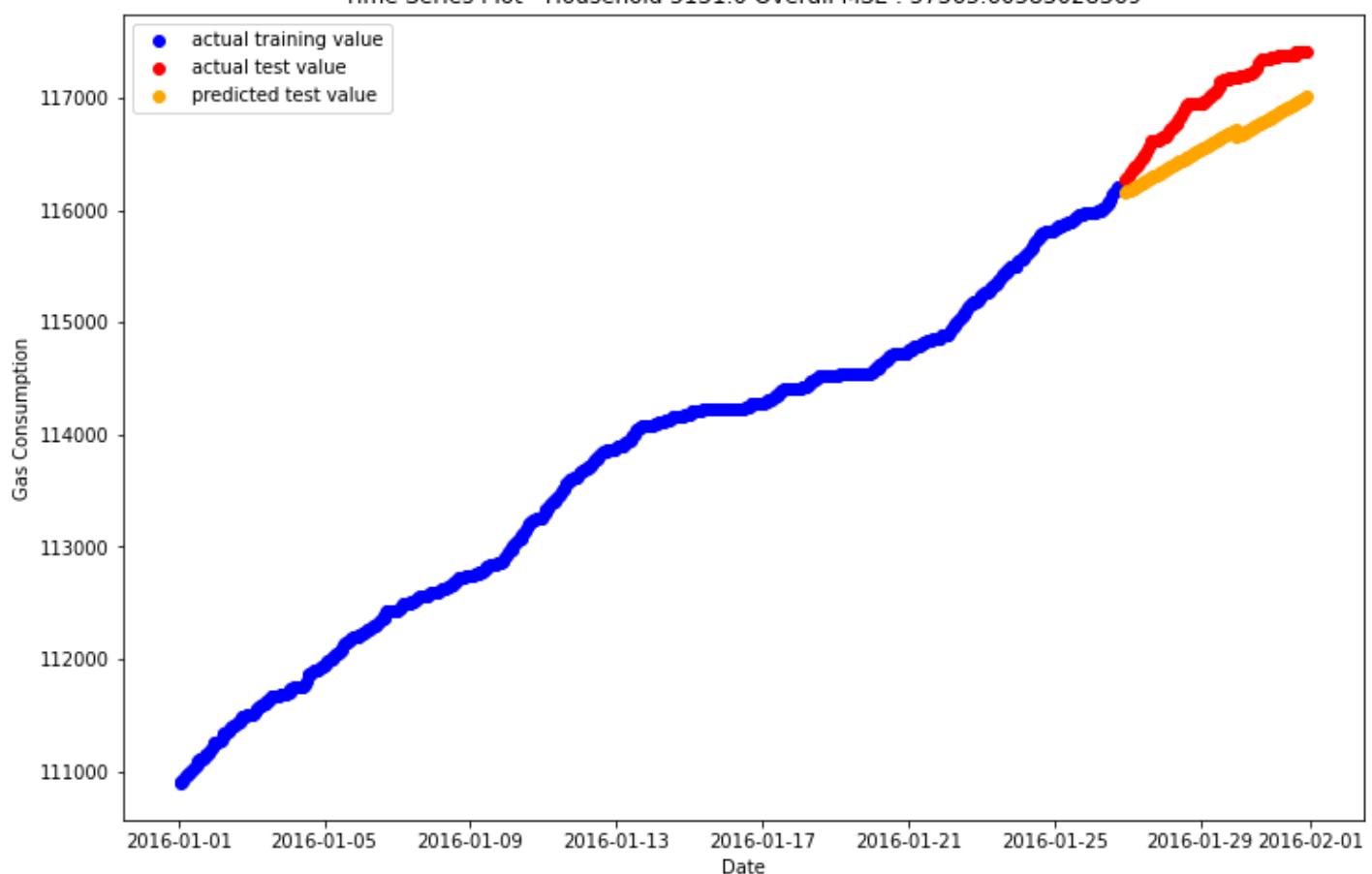
Time Series Plot - Household 5129.0 Overall MSE : 10449.750327241865



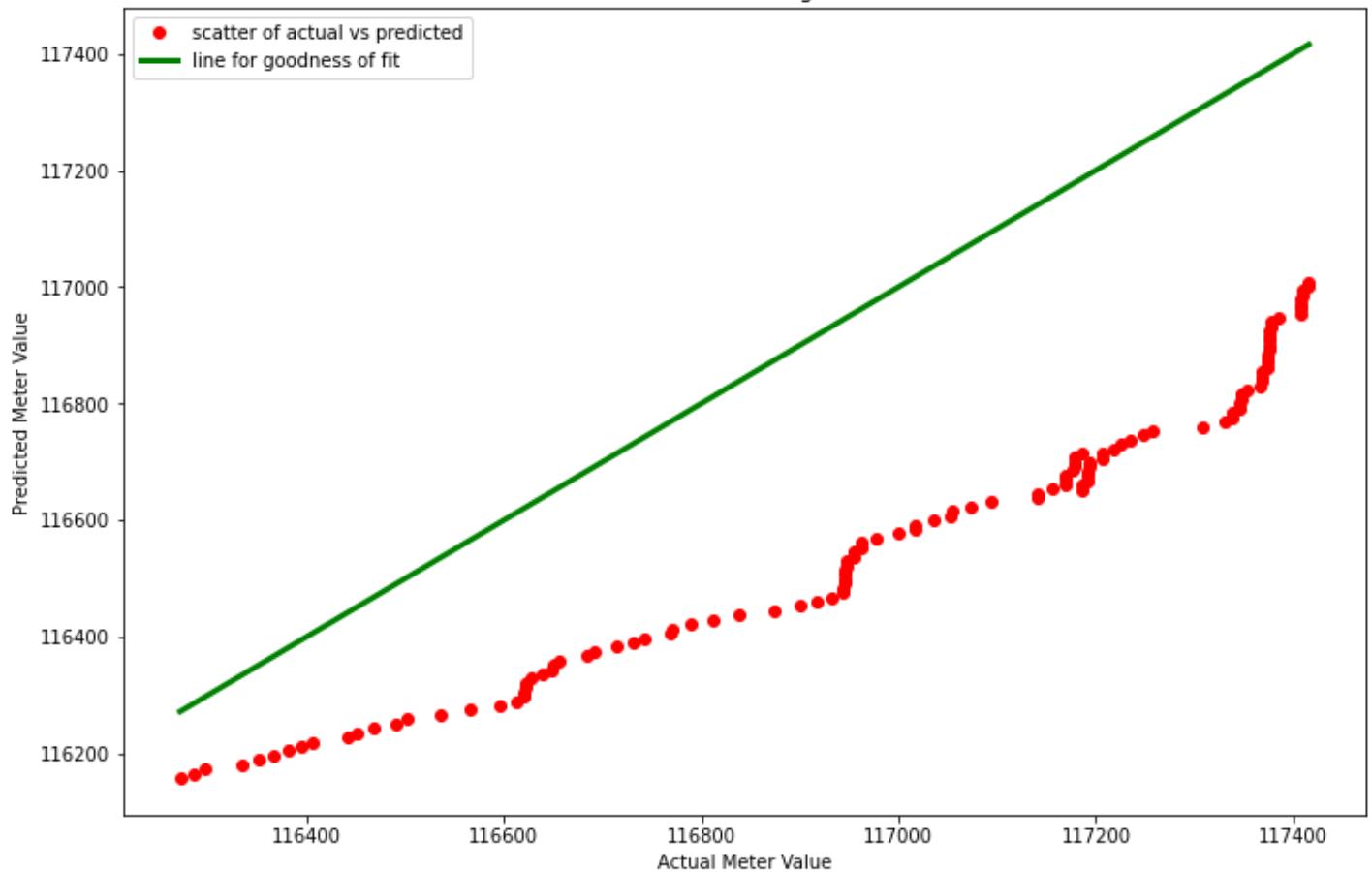
Scatter Plot - Household 5129.0 Testing MSE : 7561.253729695445



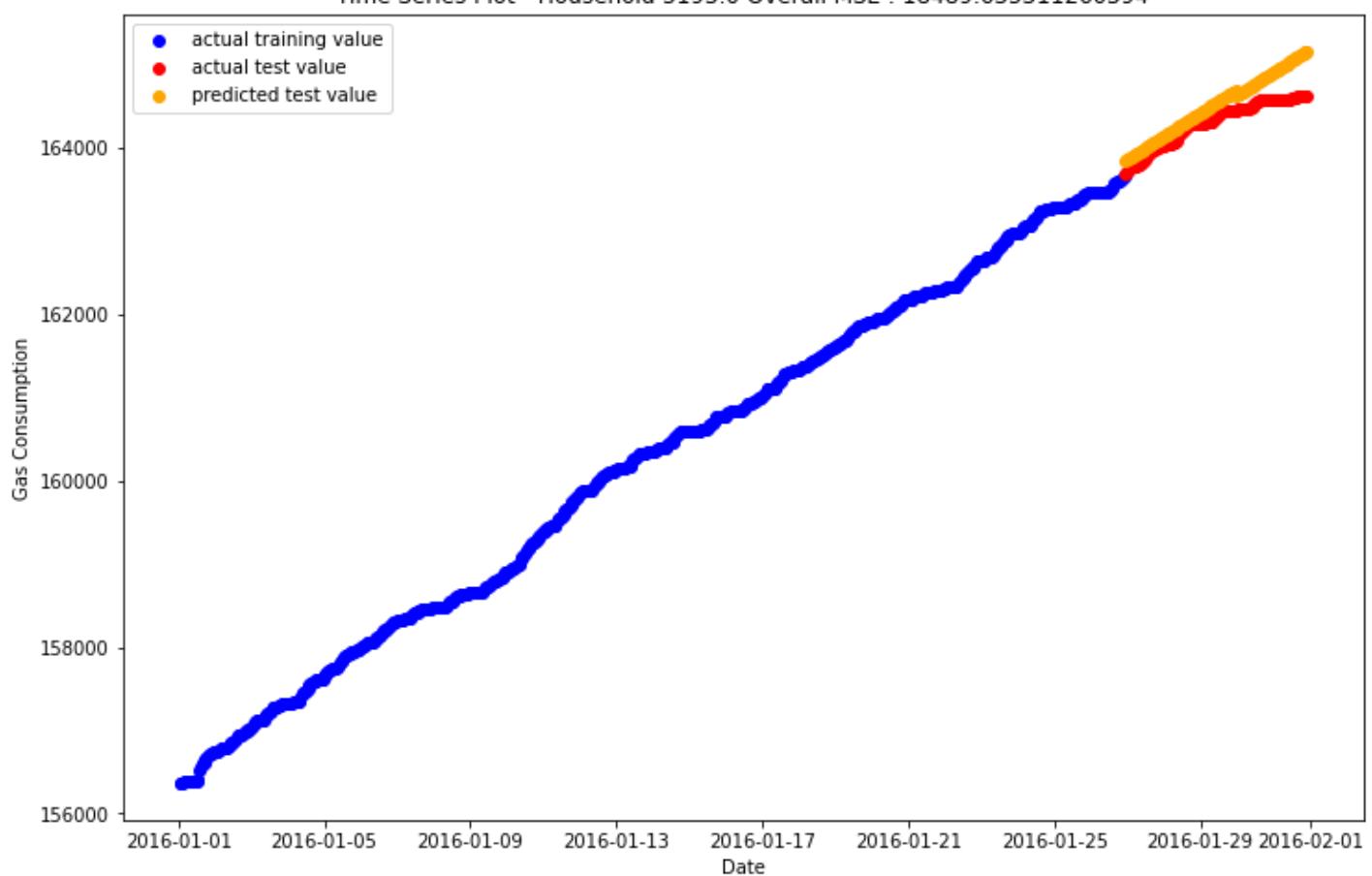
Time Series Plot - Household 5131.0 Overall MSE : 57365.60583028369



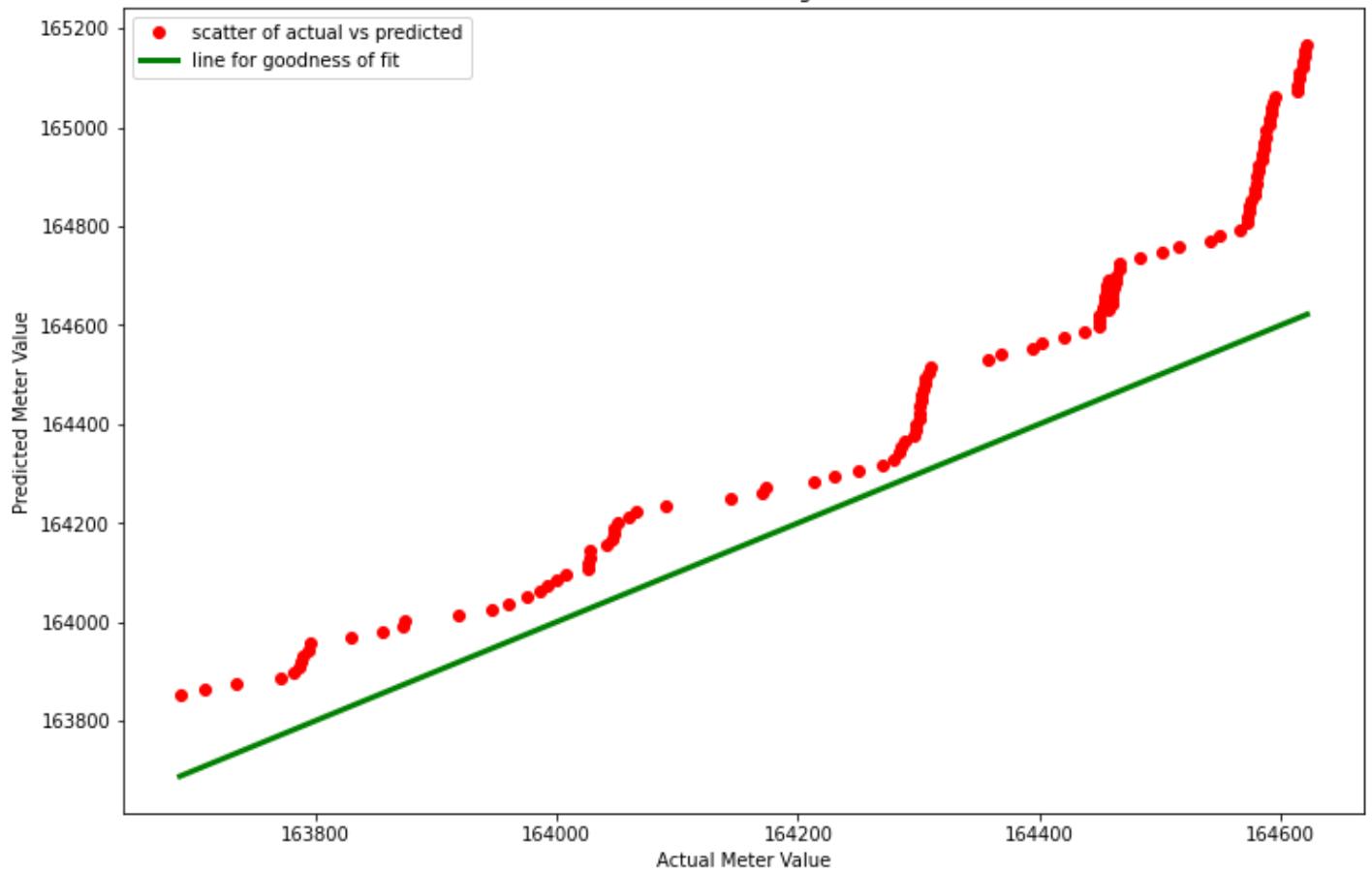
Scatter Plot - Household 5131.0 Testing MSE : 182269.3647590848

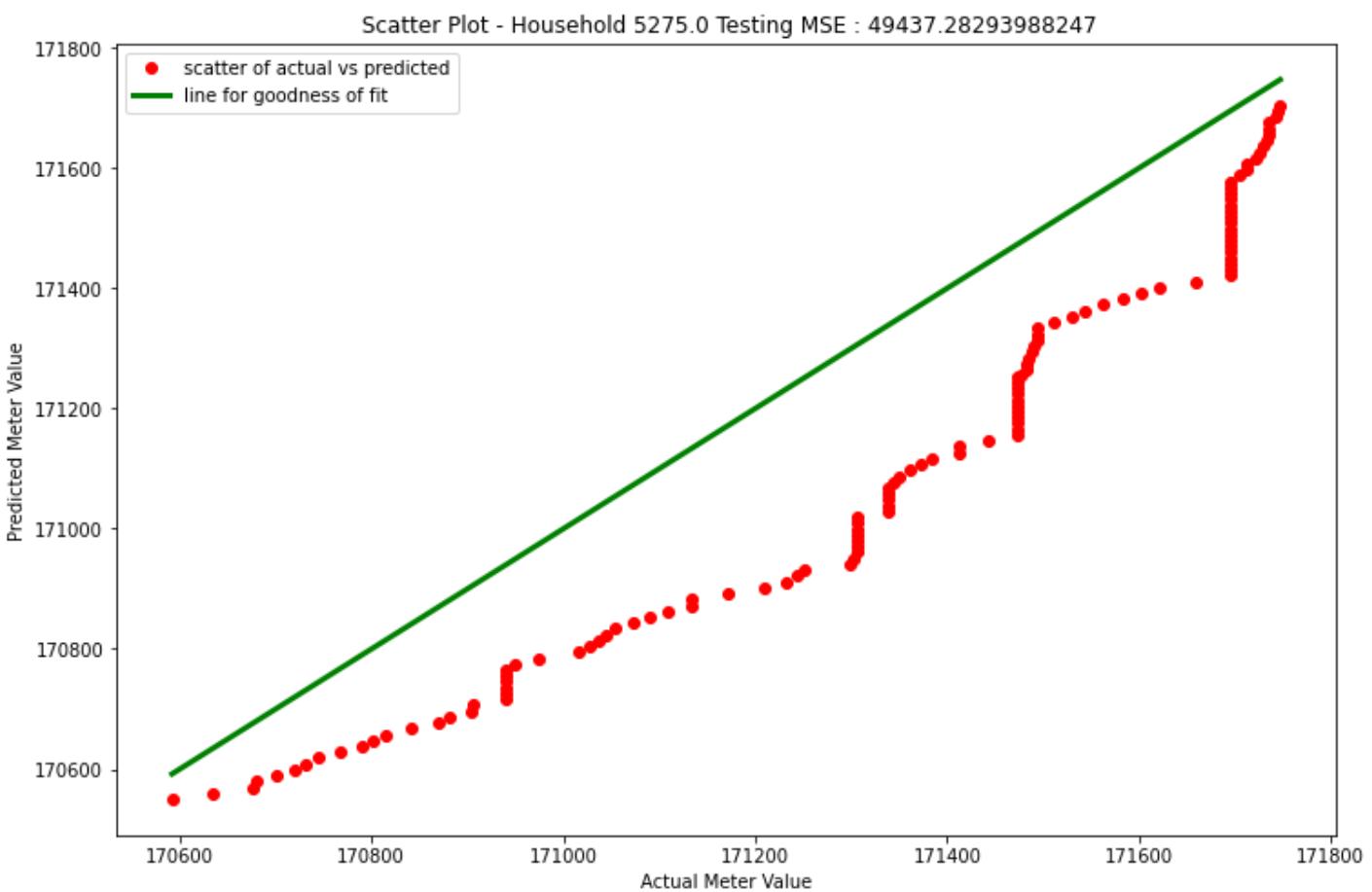
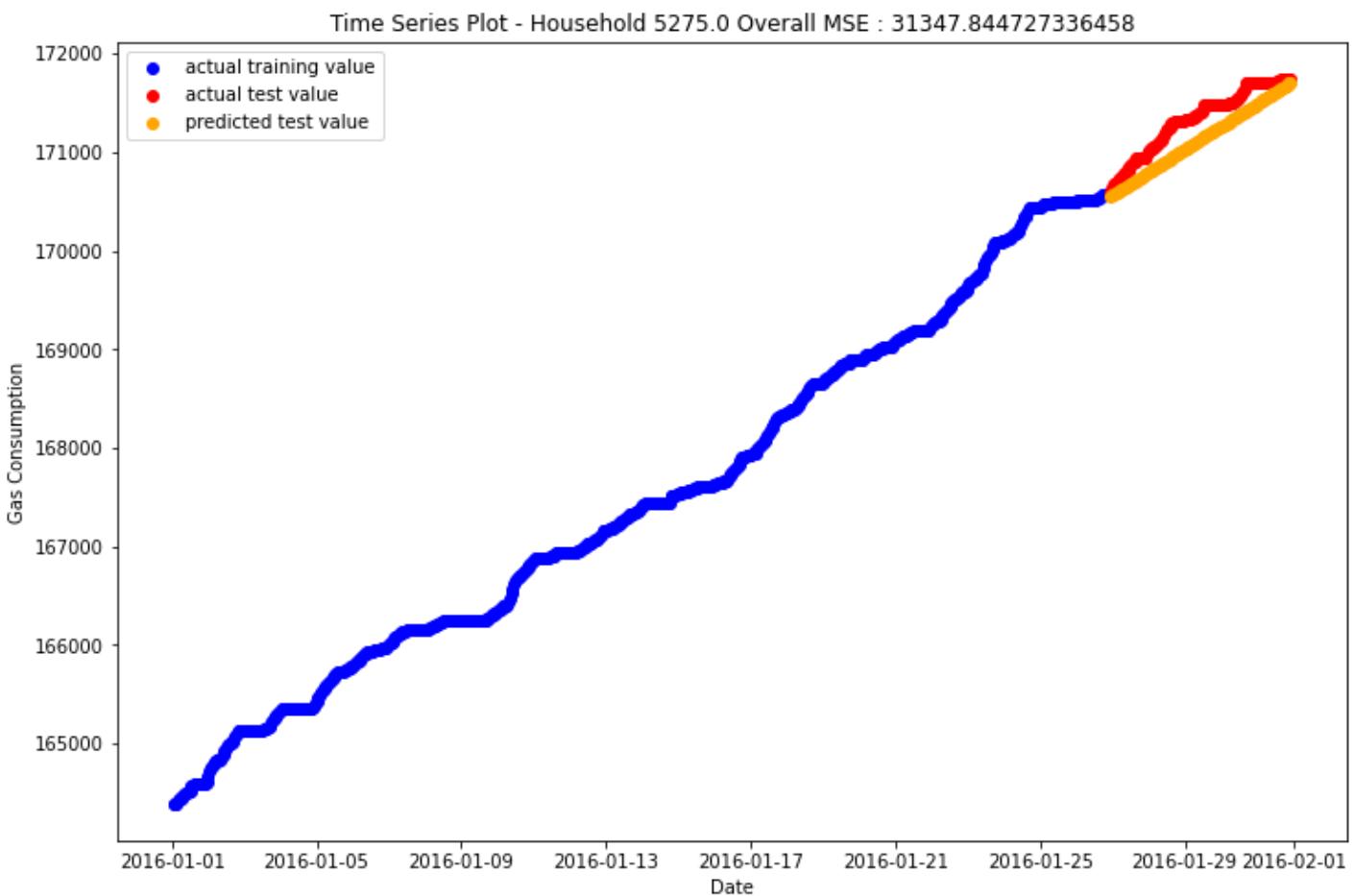


Time Series Plot - Household 5193.0 Overall MSE : 18489.635311260394

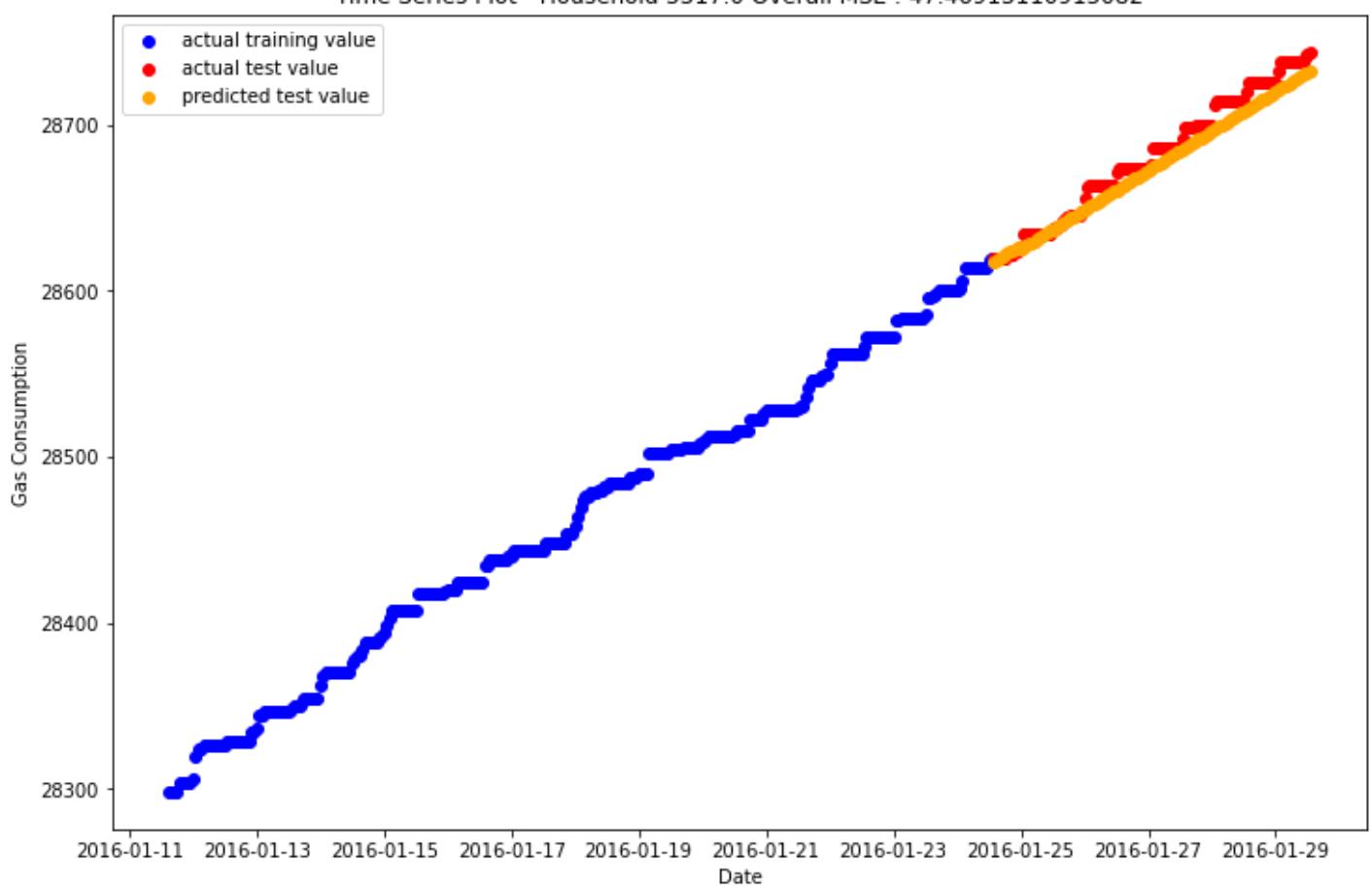


Scatter Plot - Household 5193.0 Testing MSE : 61400.25413931875

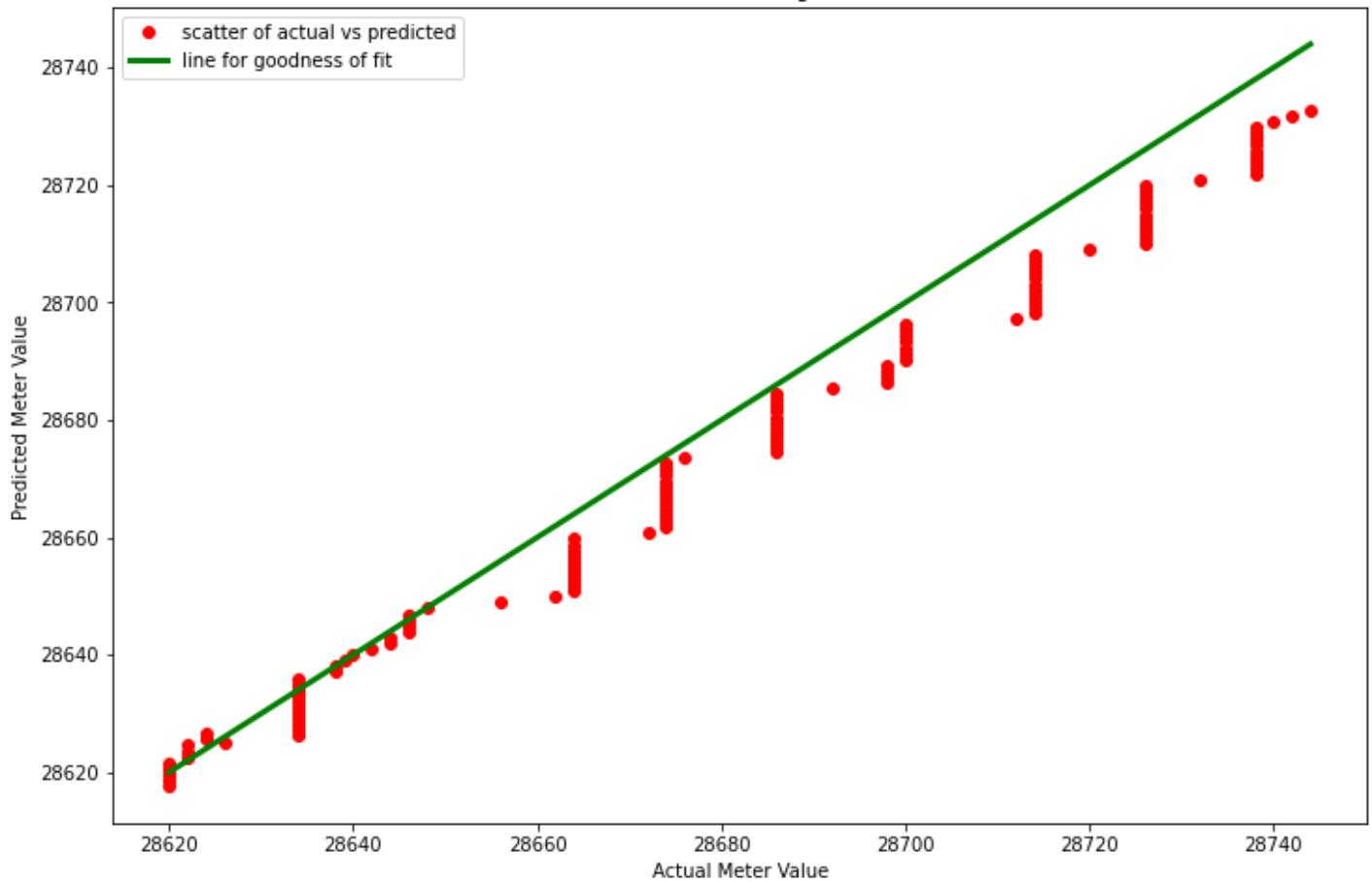




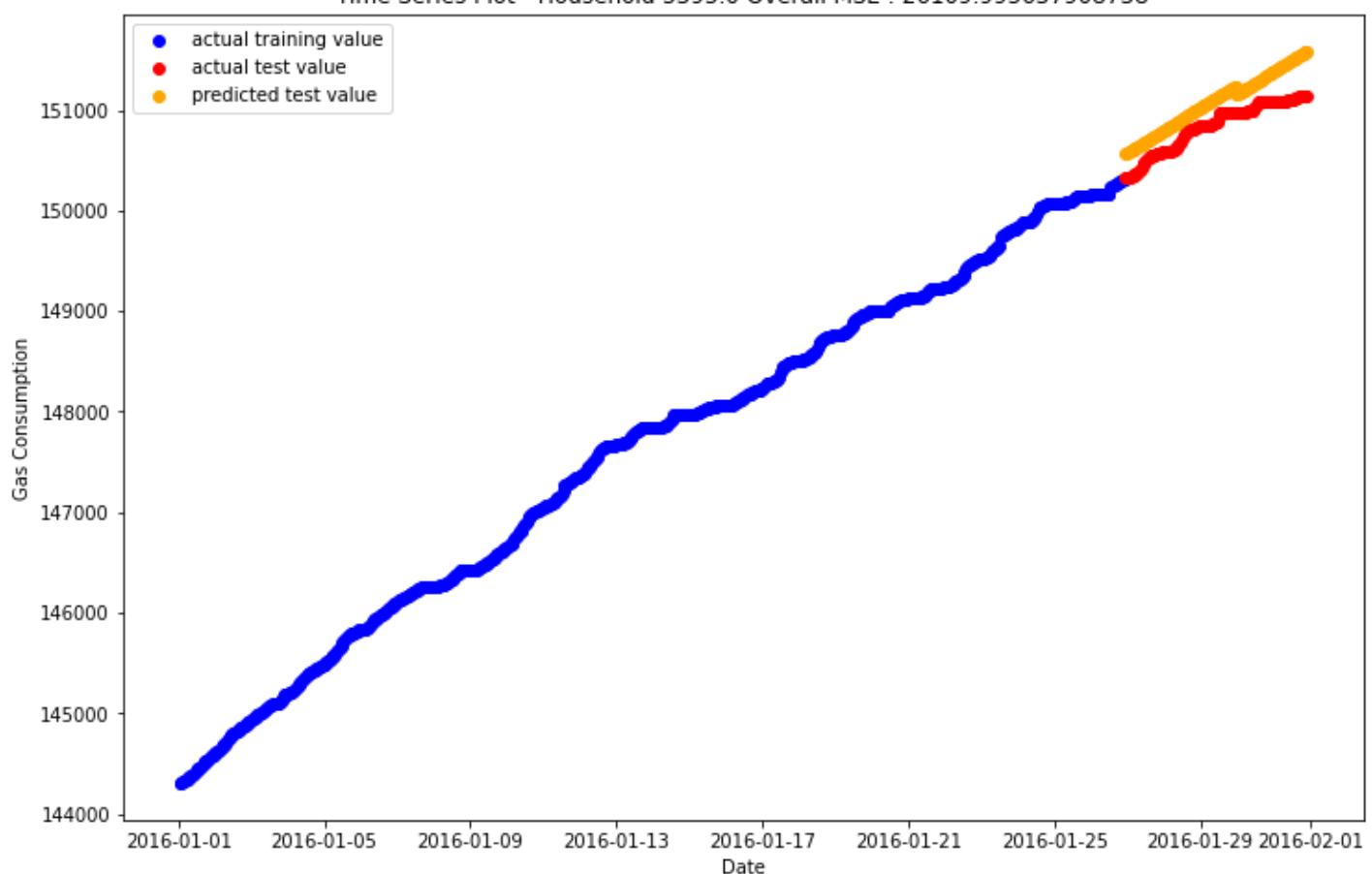
Time Series Plot - Household 5317.0 Overall MSE : 47.46913110915082



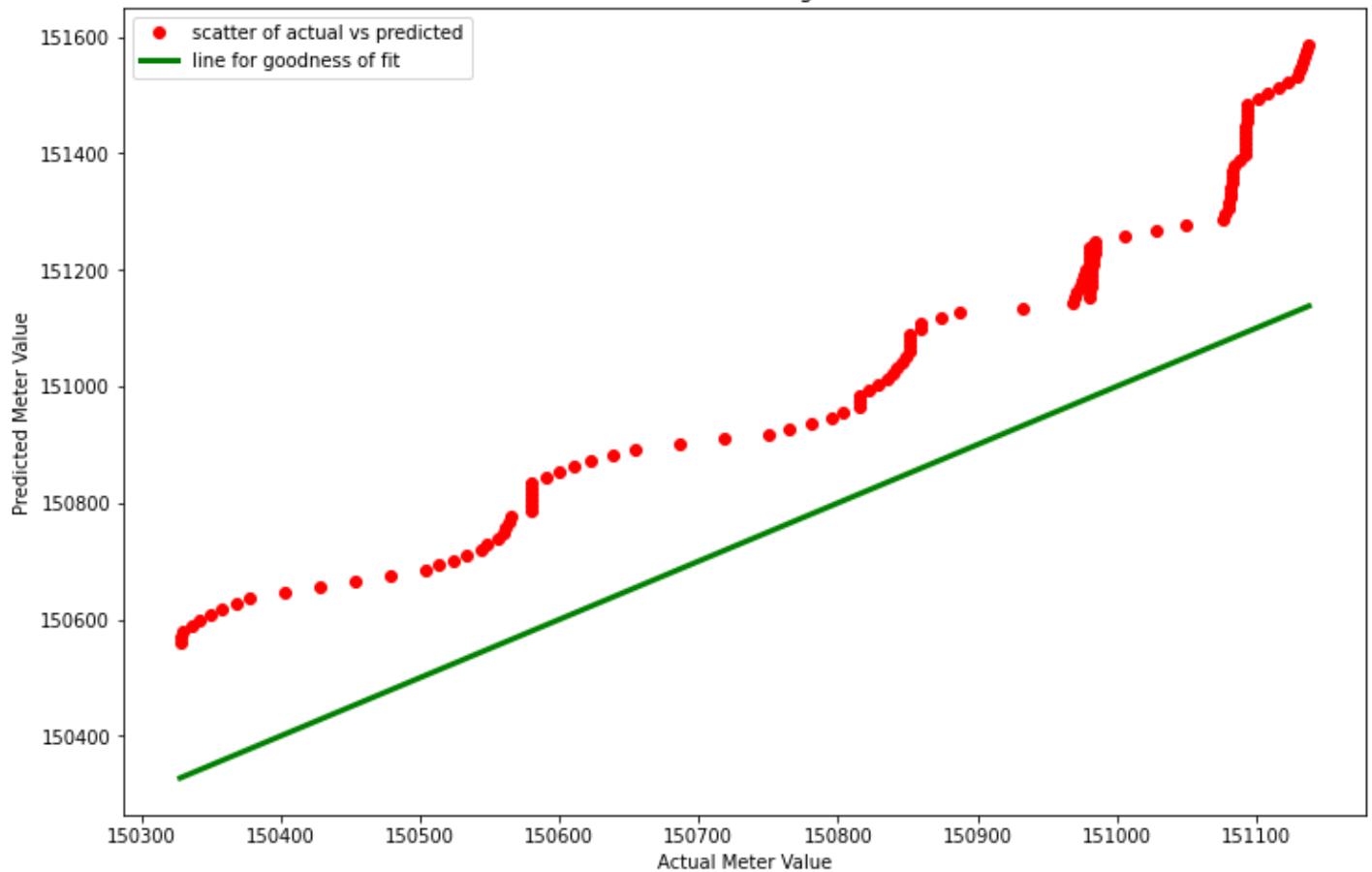
Scatter Plot - Household 5317.0 Testing MSE : 71.01293750343395



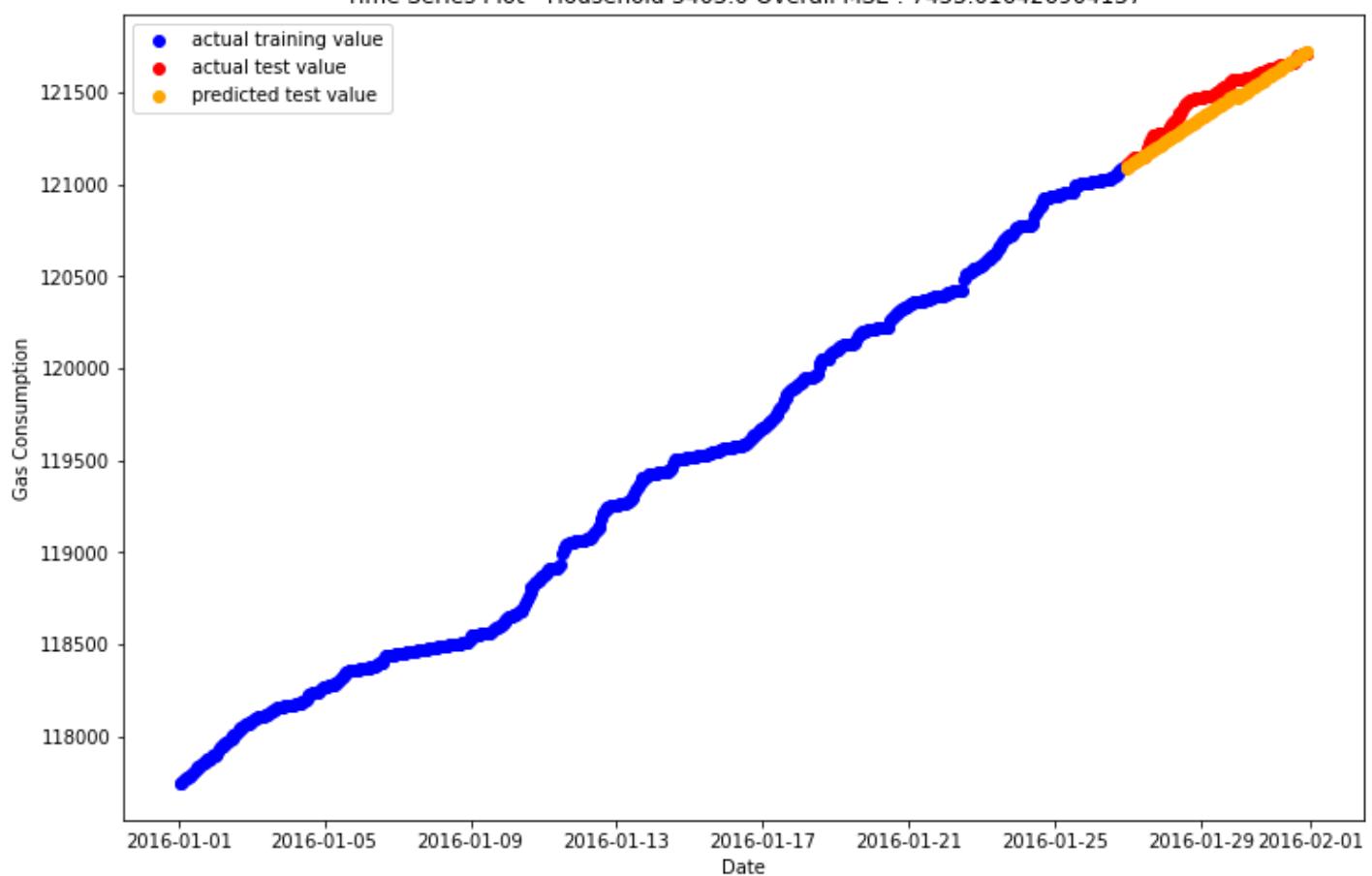
Time Series Plot - Household 5395.0 Overall MSE : 26109.995637908738



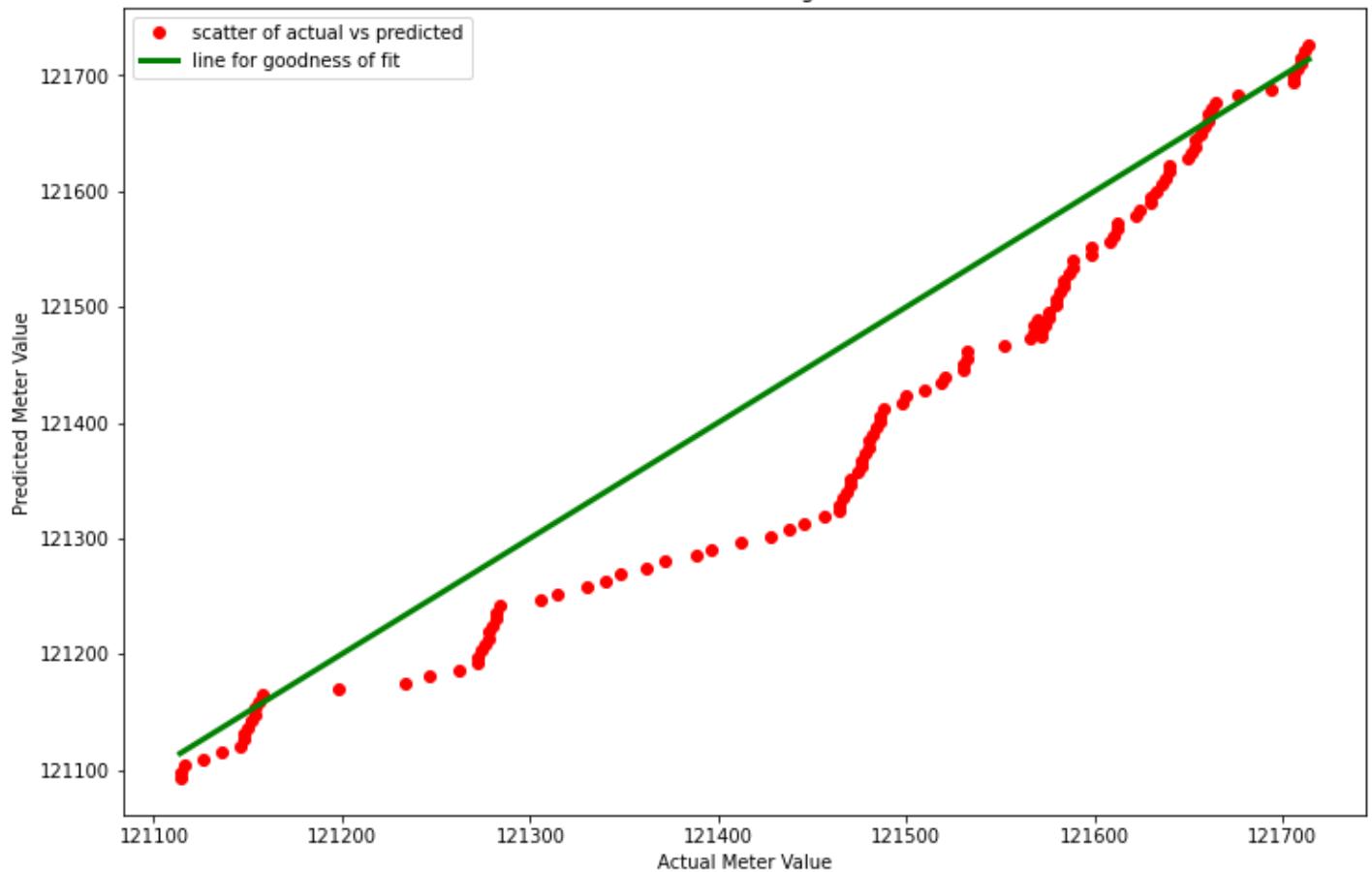
Scatter Plot - Household 5395.0 Testing MSE : 66434.92628291958



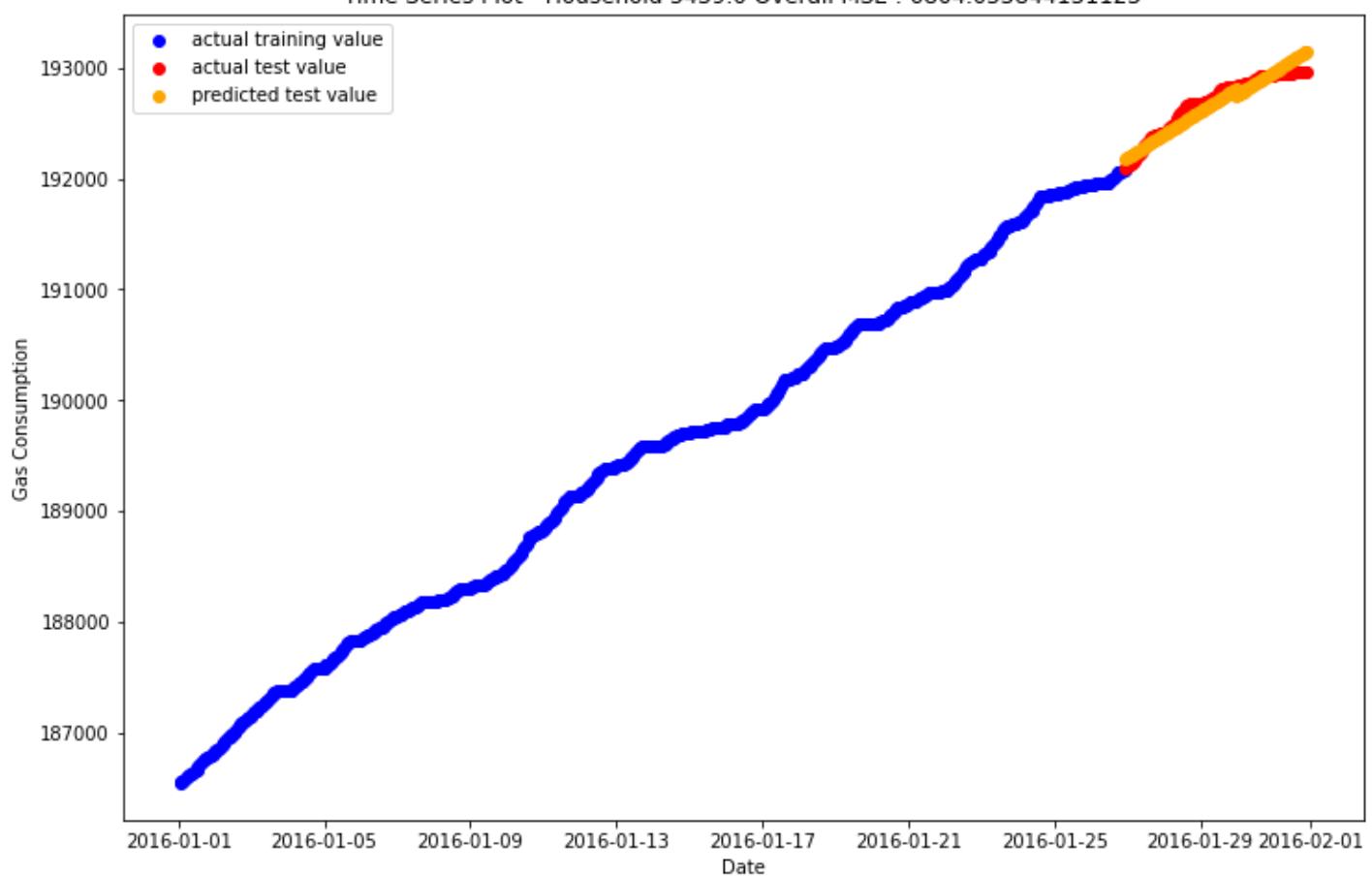
Time Series Plot - Household 5403.0 Overall MSE : 7453.016426904137



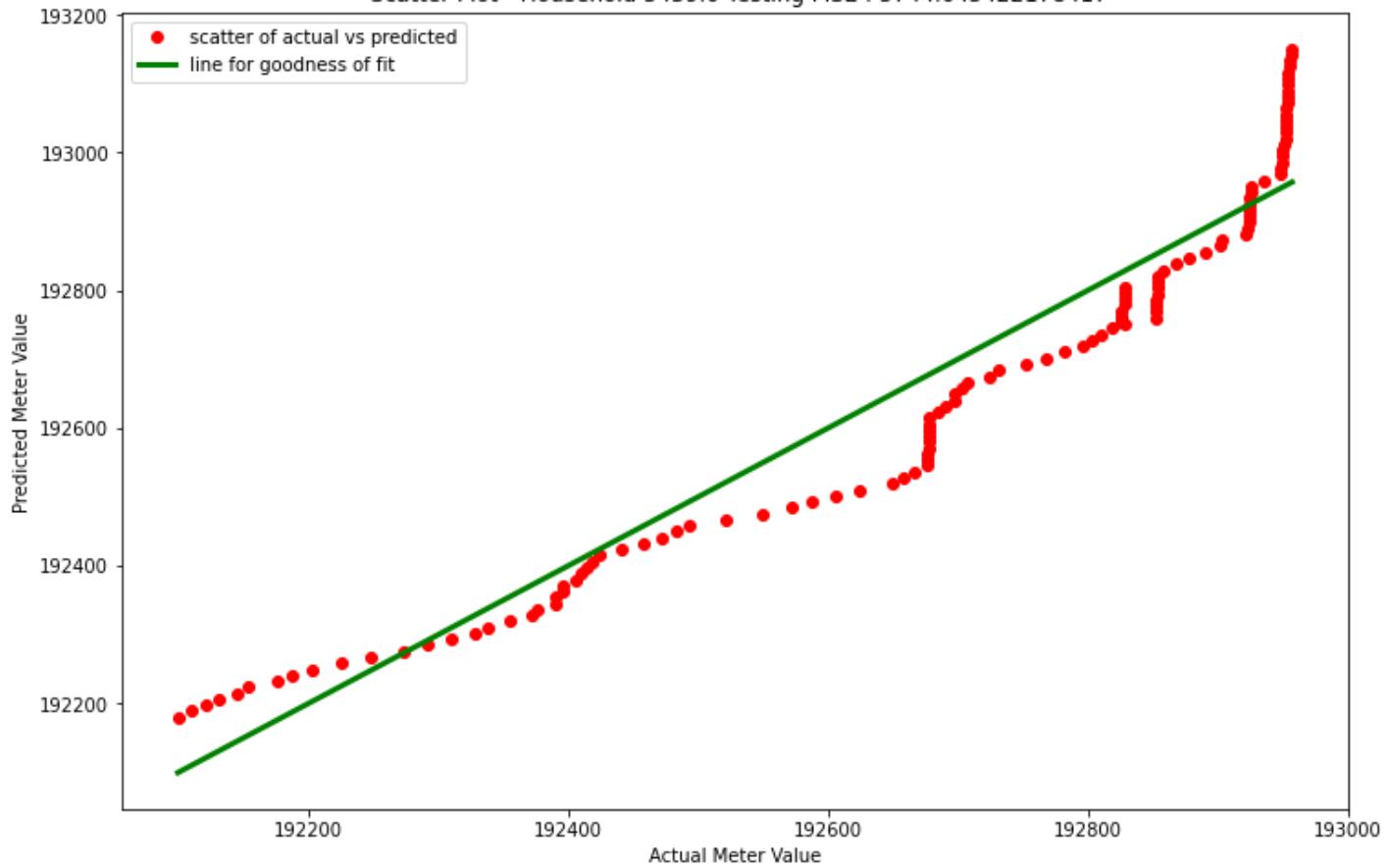
Scatter Plot - Household 5403.0 Testing MSE : 5000.910960512166



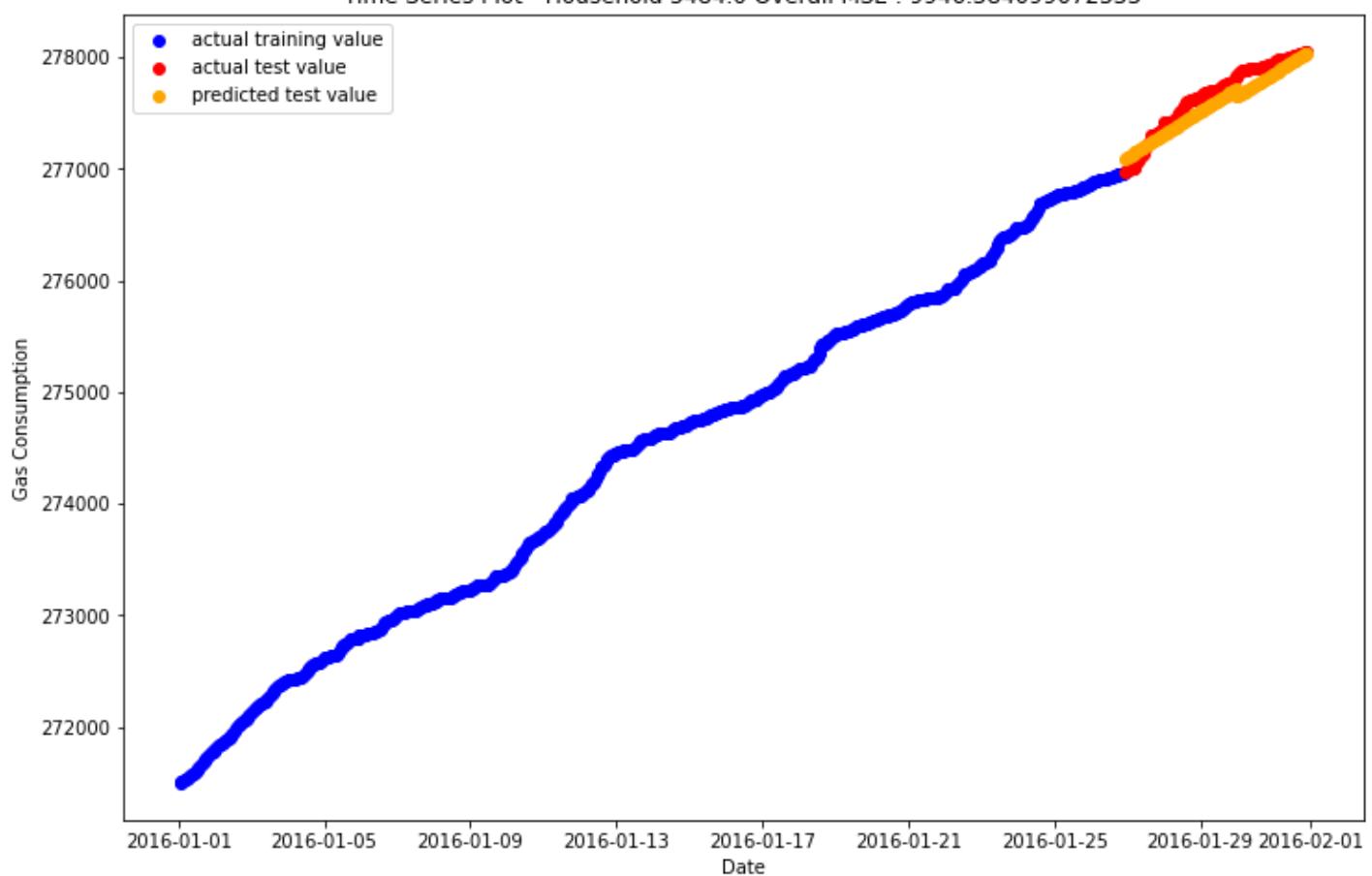
Time Series Plot - Household 5439.0 Overall MSE : 6804.053844131123



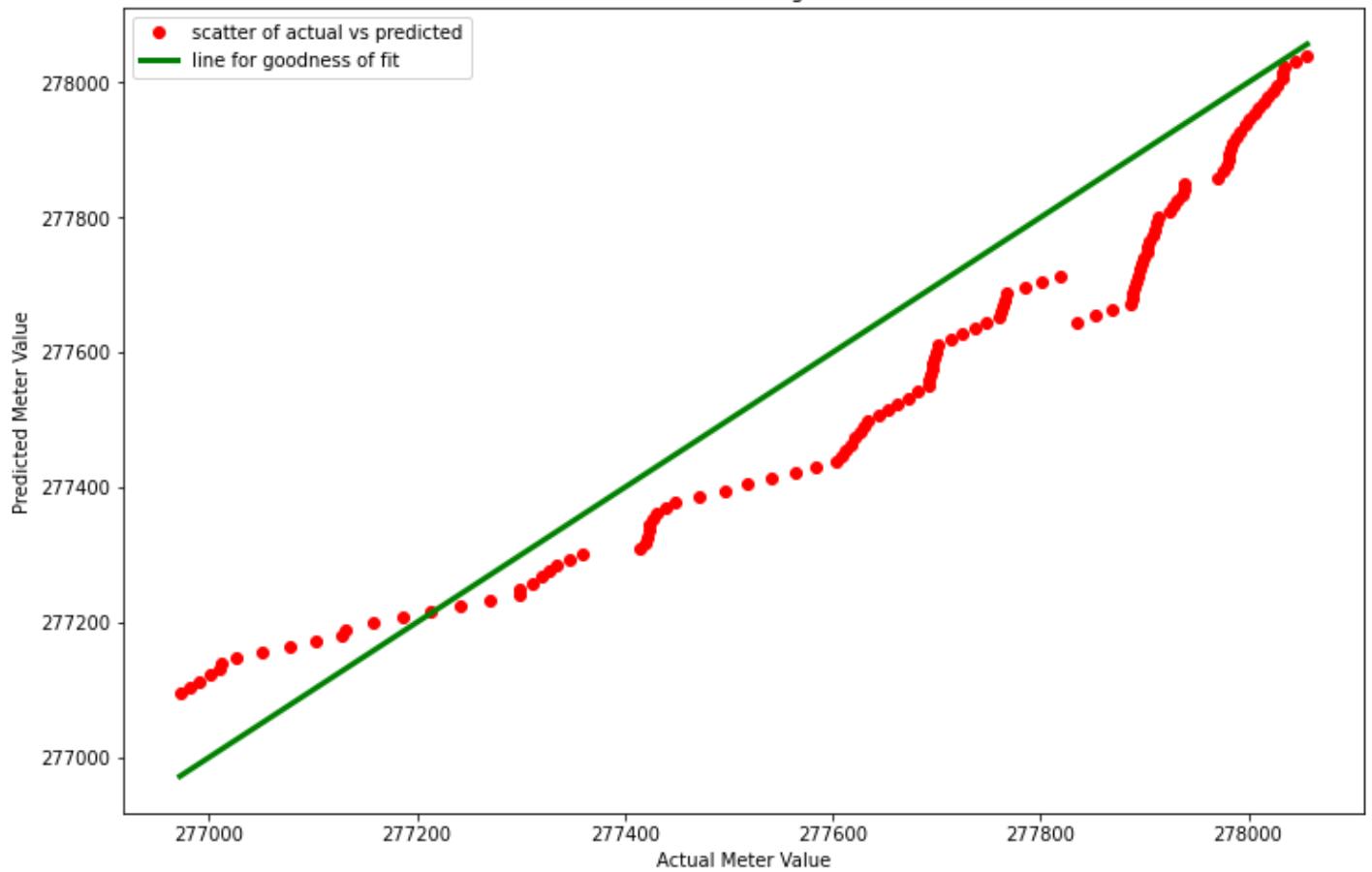
Scatter Plot - Household 5439.0 Testing MSE : 5744.045422178417



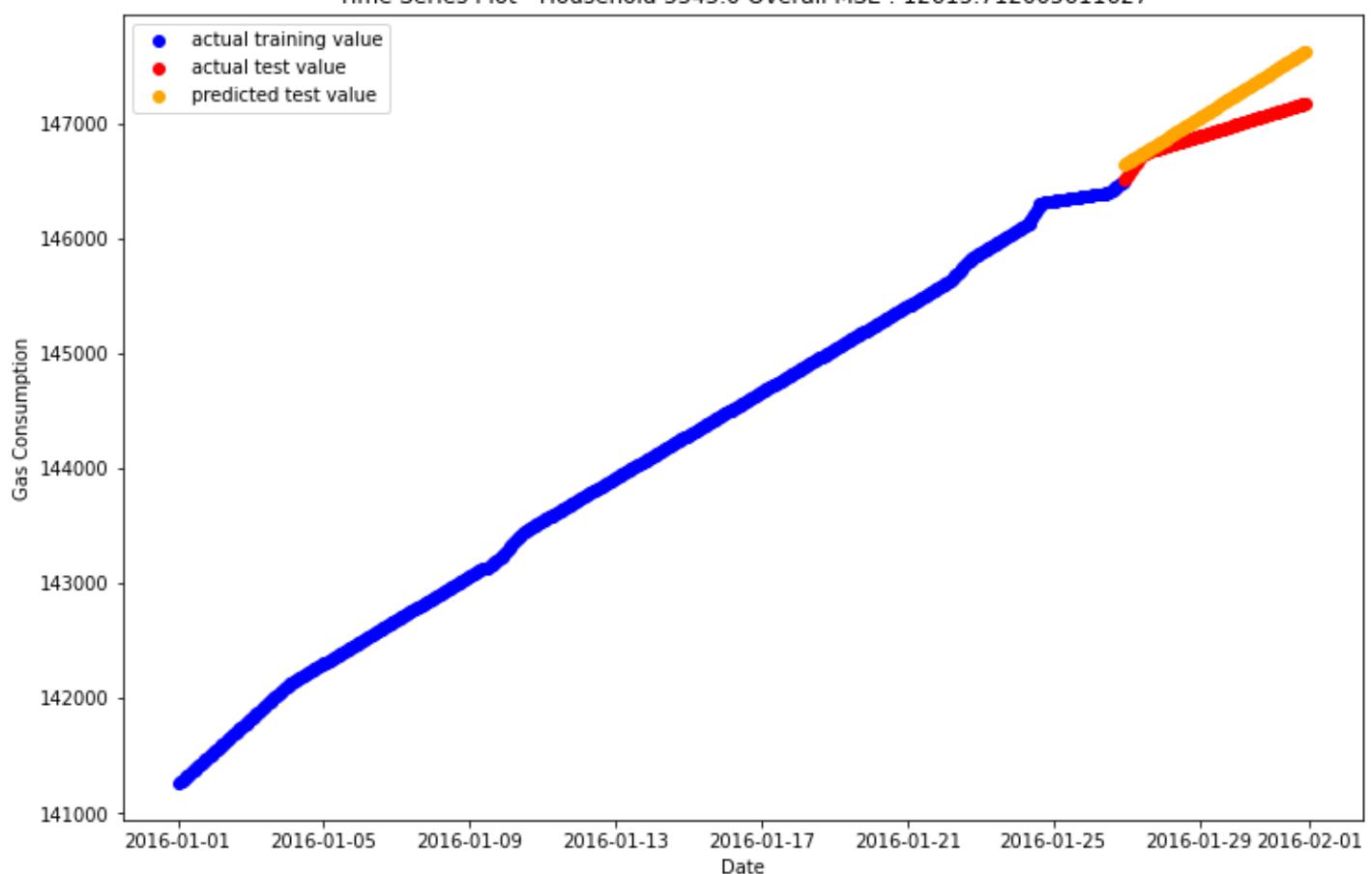
Time Series Plot - Household 5484.0 Overall MSE : 9946.384099072333



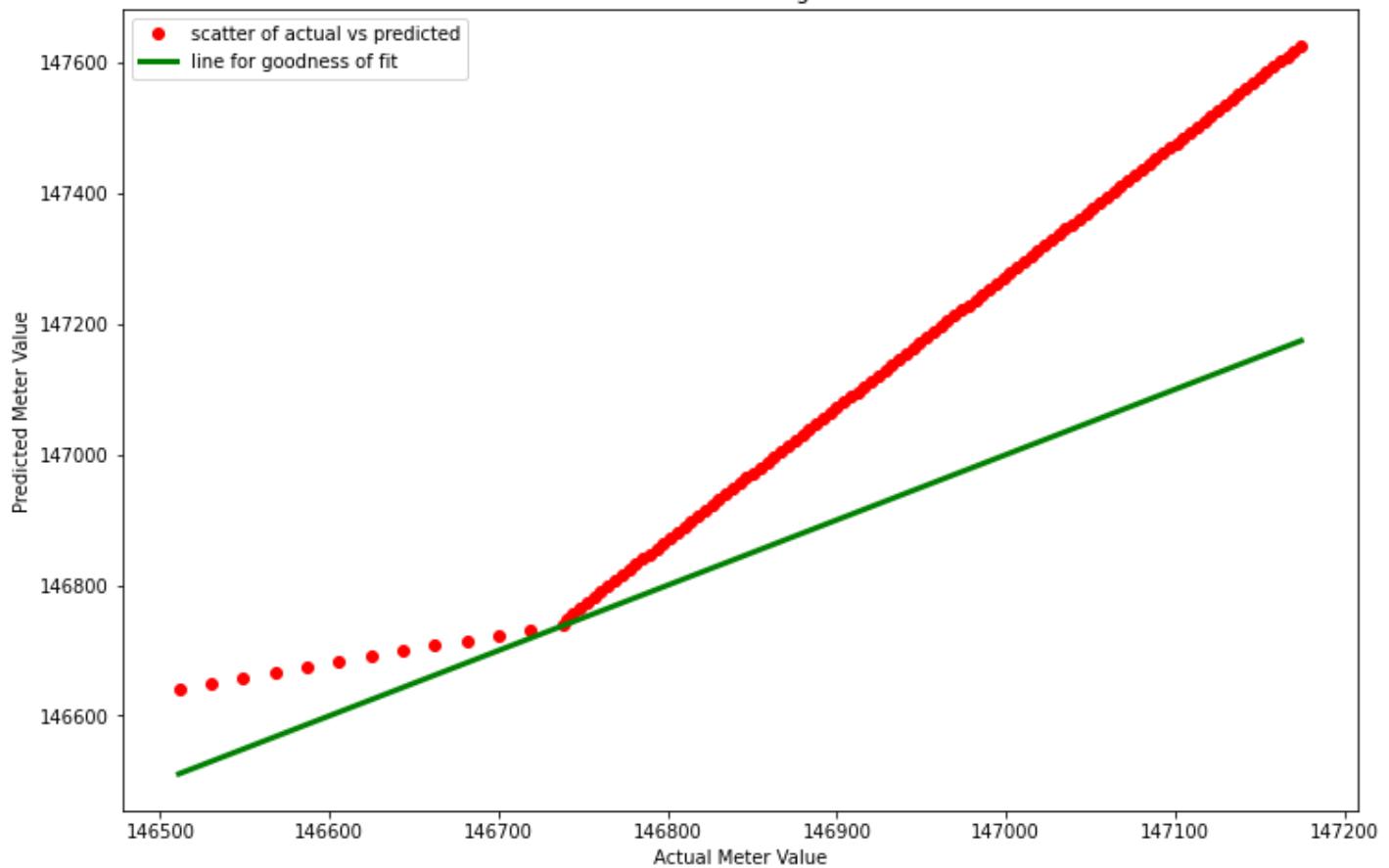
Scatter Plot - Household 5484.0 Testing MSE : 12798.020836972853



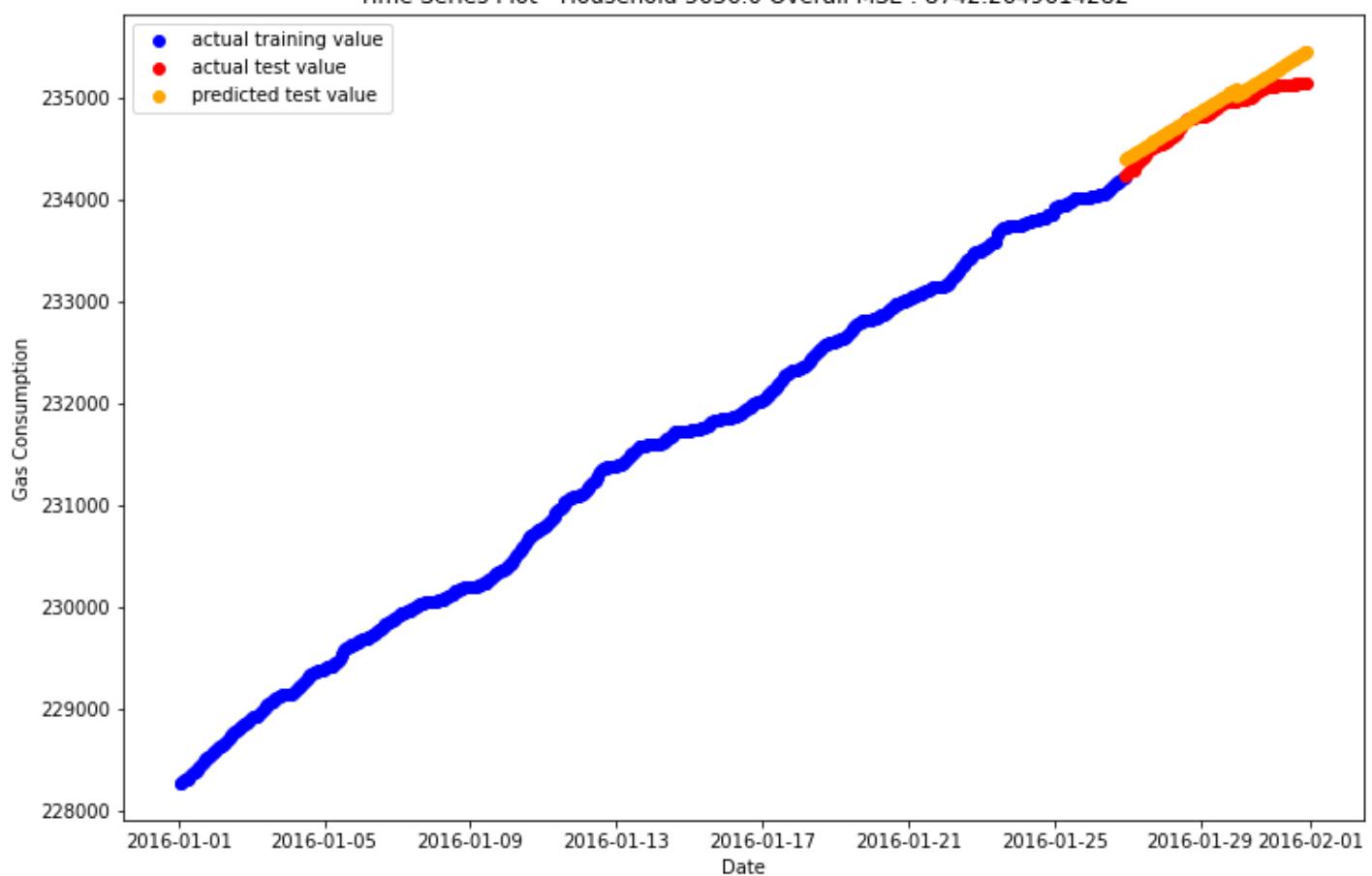
Time Series Plot - Household 5545.0 Overall MSE : 12615.712005611627



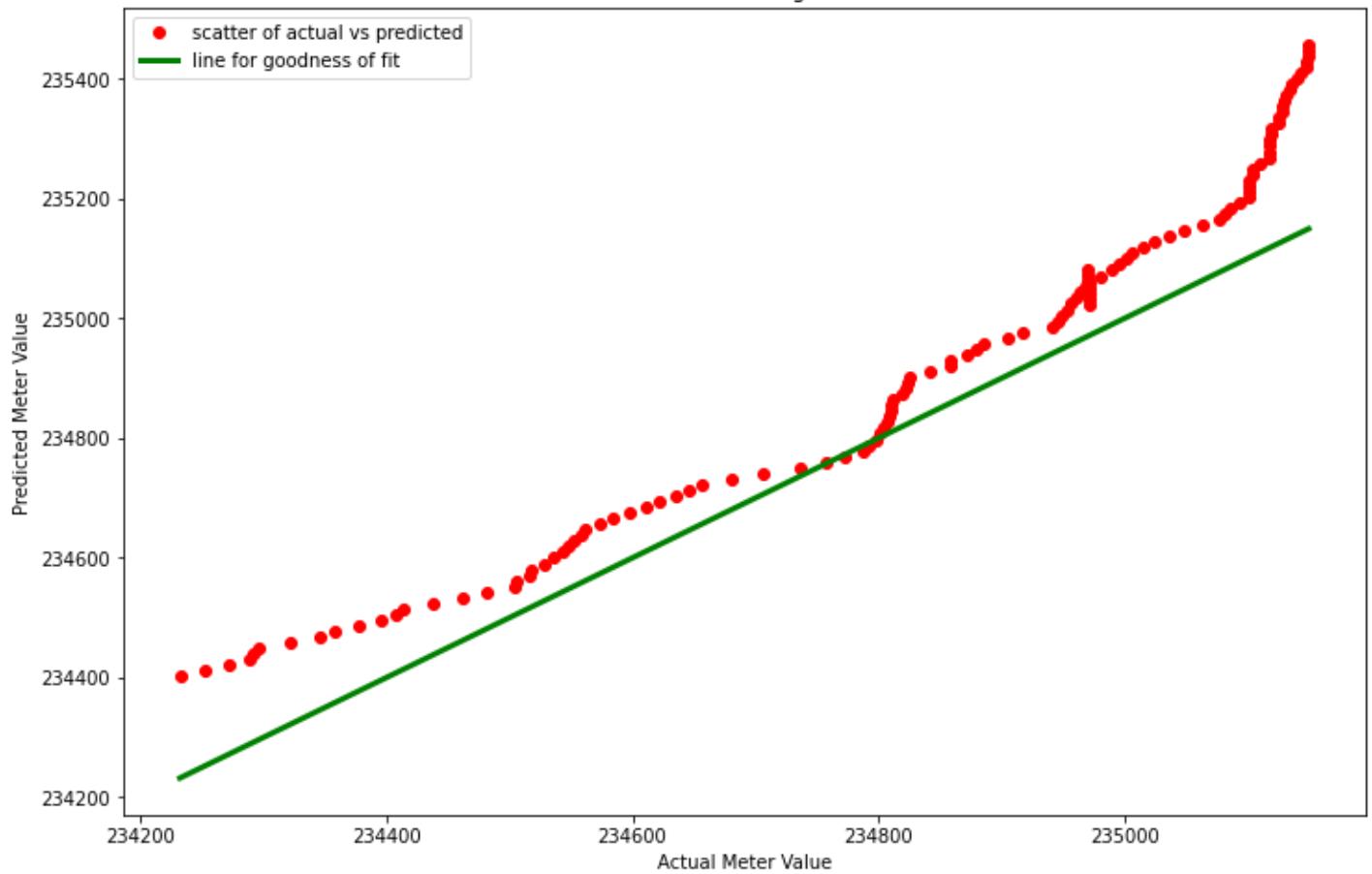
Scatter Plot - Household 5545.0 Testing MSE : 62954.40996721017



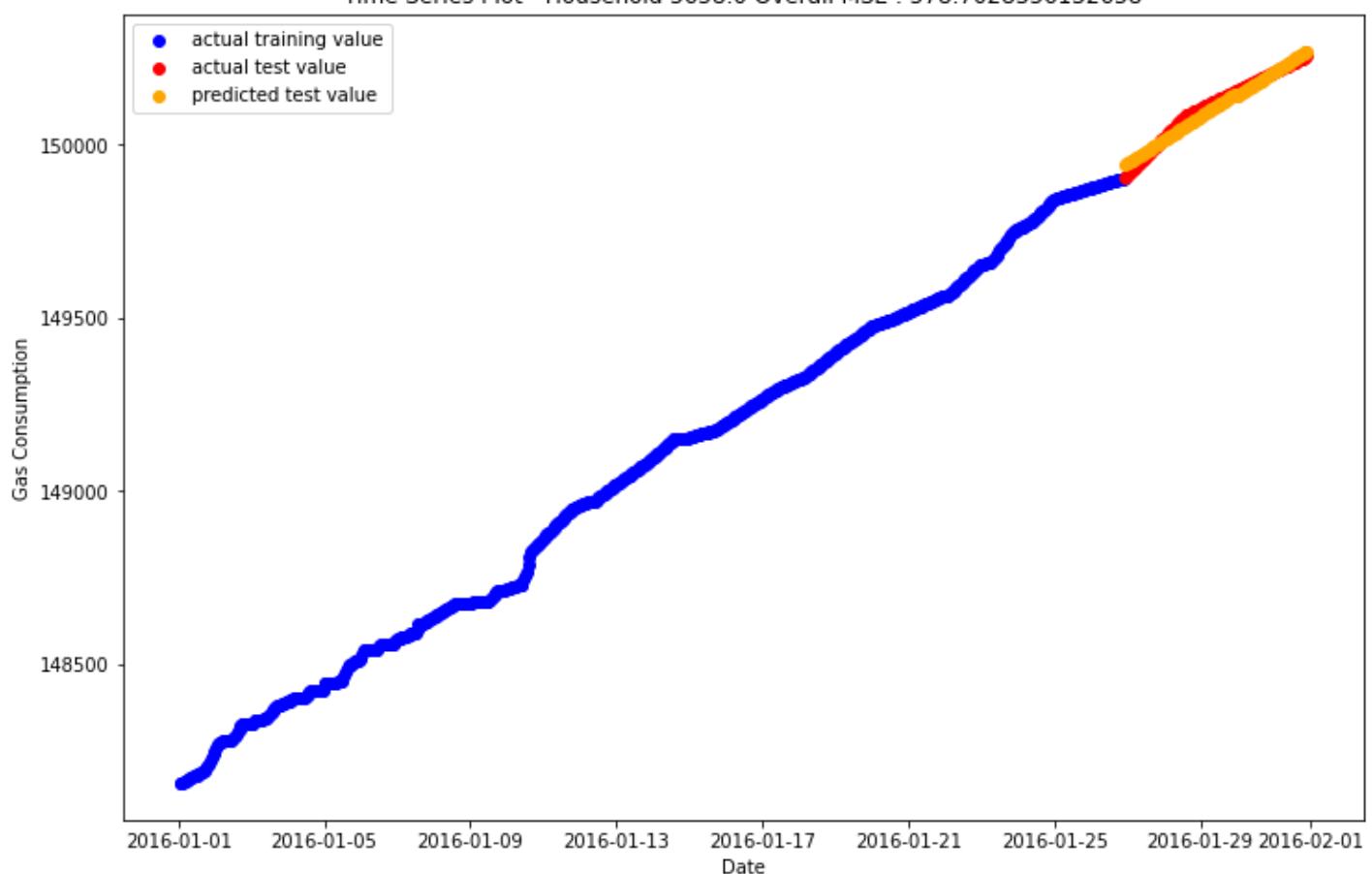
Time Series Plot - Household 5636.0 Overall MSE : 8742.2649614282



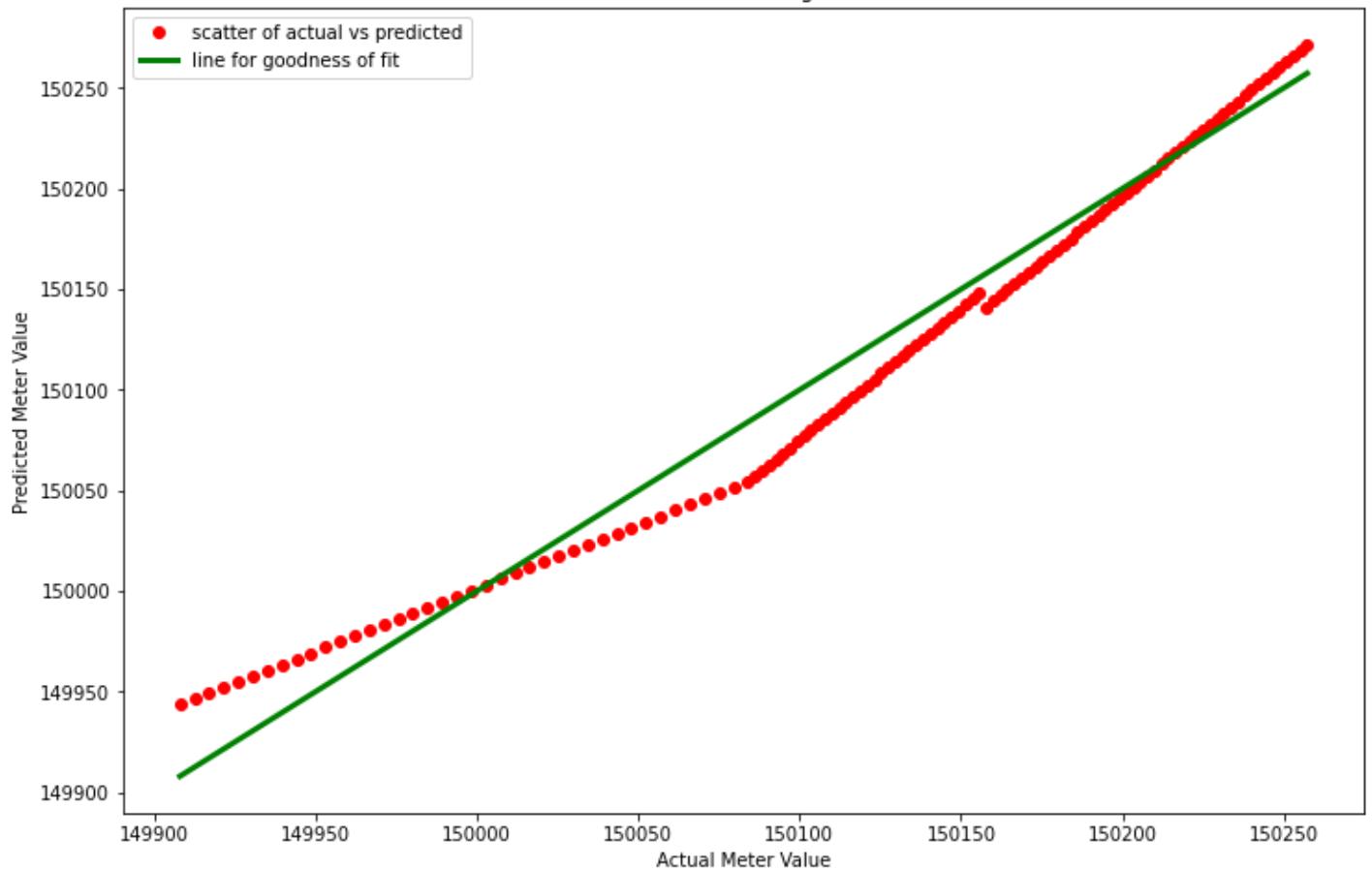
Scatter Plot - Household 5636.0 Testing MSE : 15924.198674109248



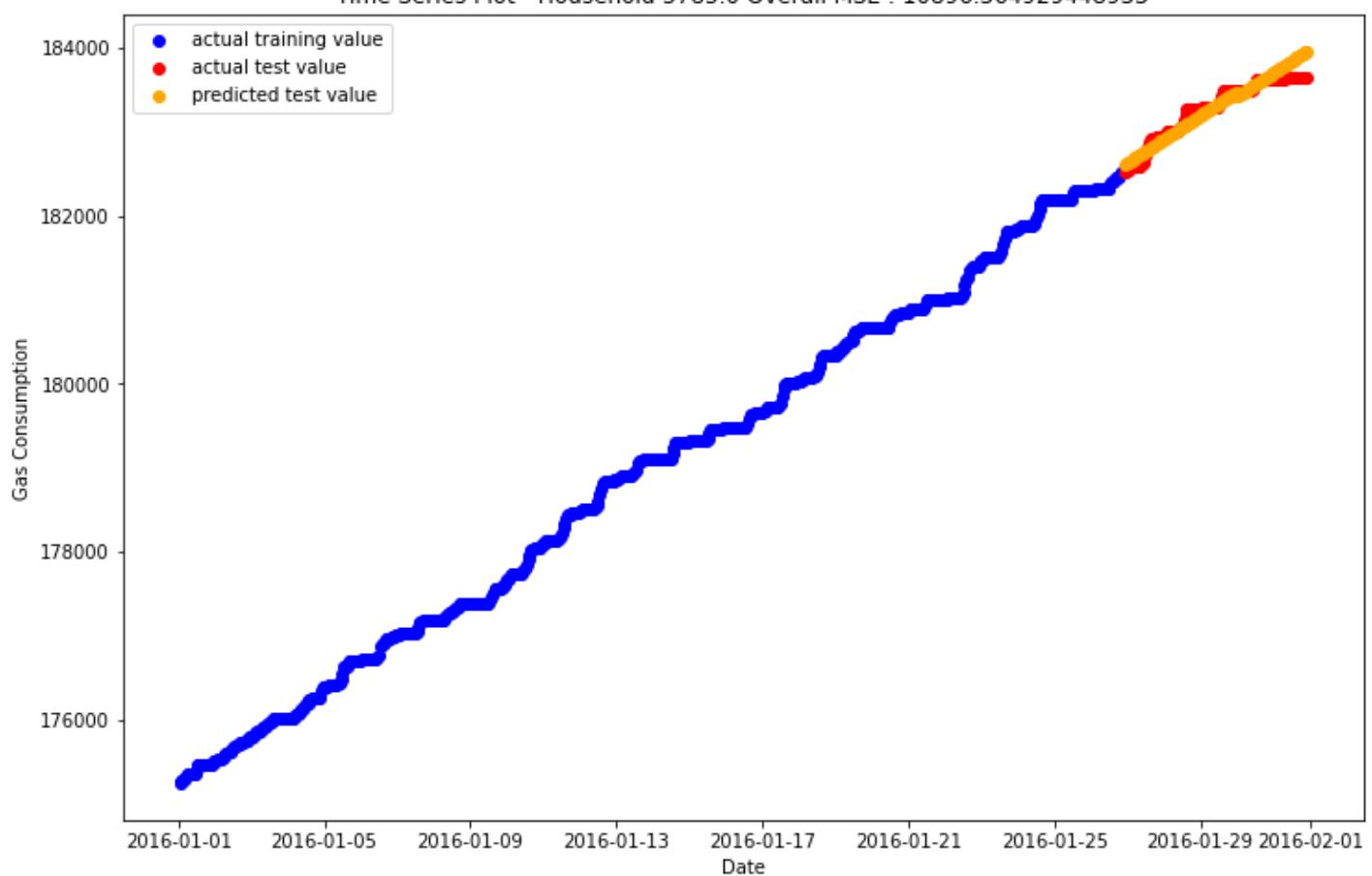
Time Series Plot - Household 5658.0 Overall MSE : 578.7028356132658



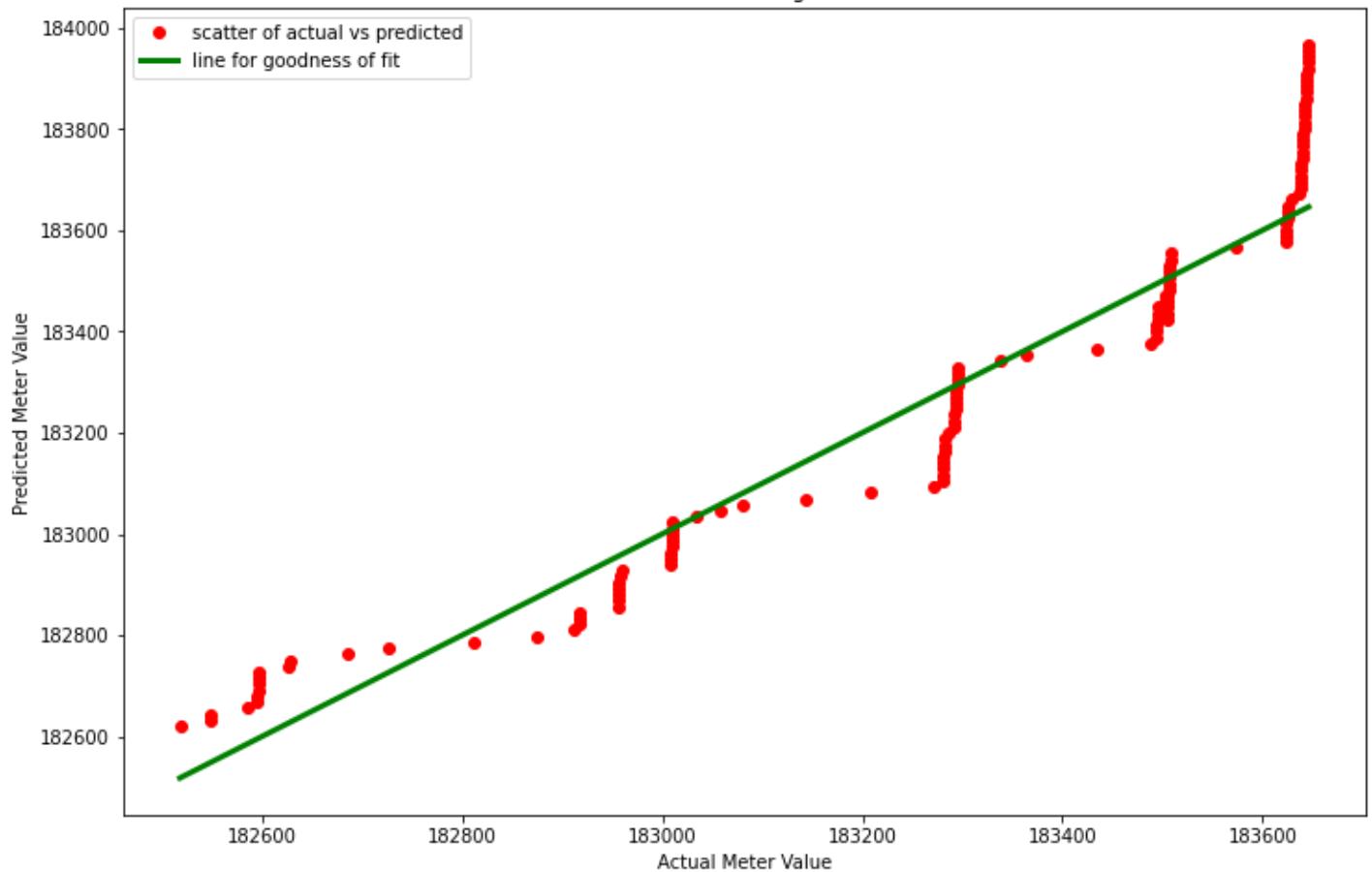
Scatter Plot - Household 5658.0 Testing MSE : 265.4326135053274



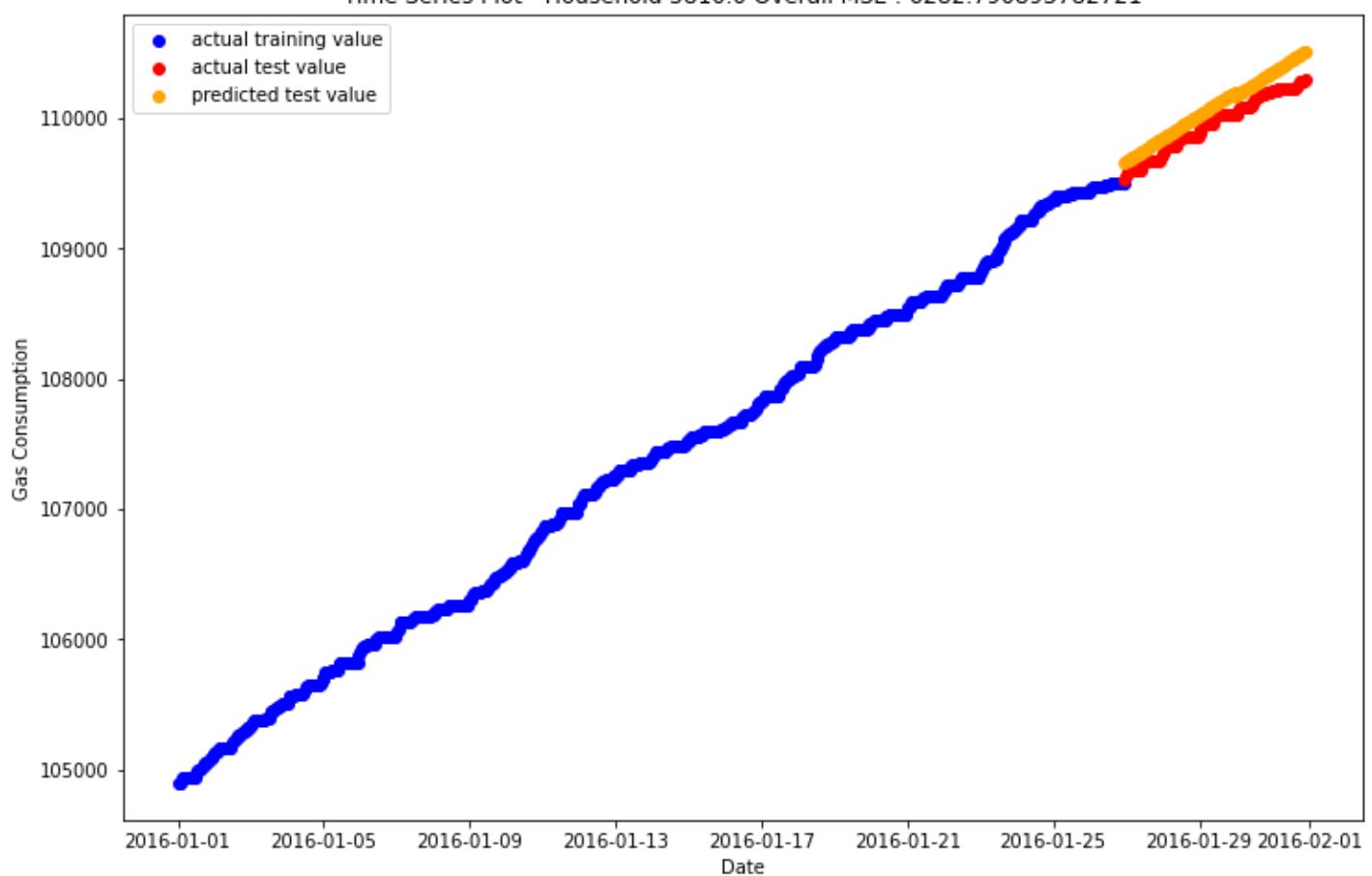
Time Series Plot - Household 5785.0 Overall MSE : 10896.364929448933



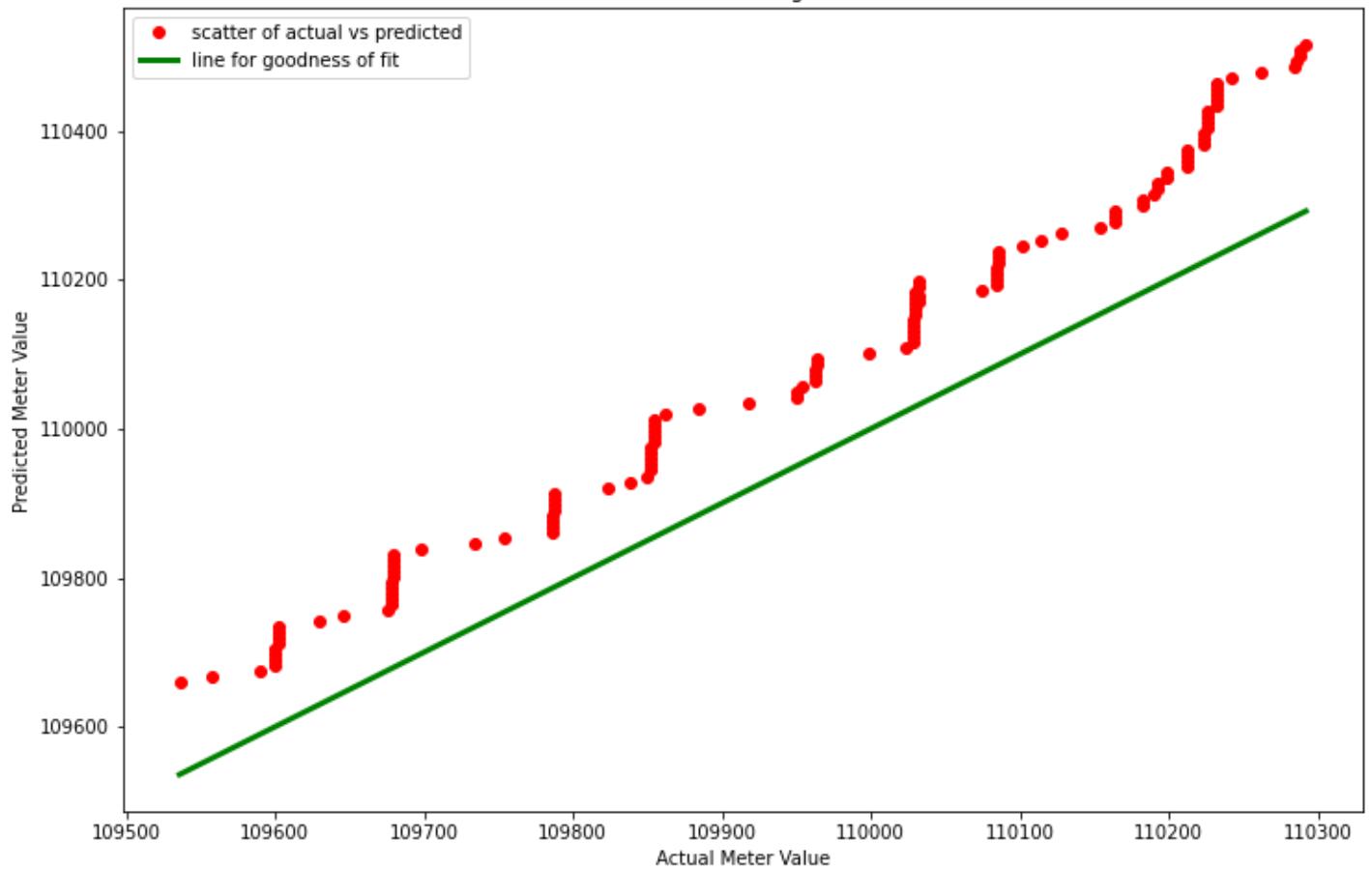
Scatter Plot - Household 5785.0 Testing MSE : 12885.179336473639



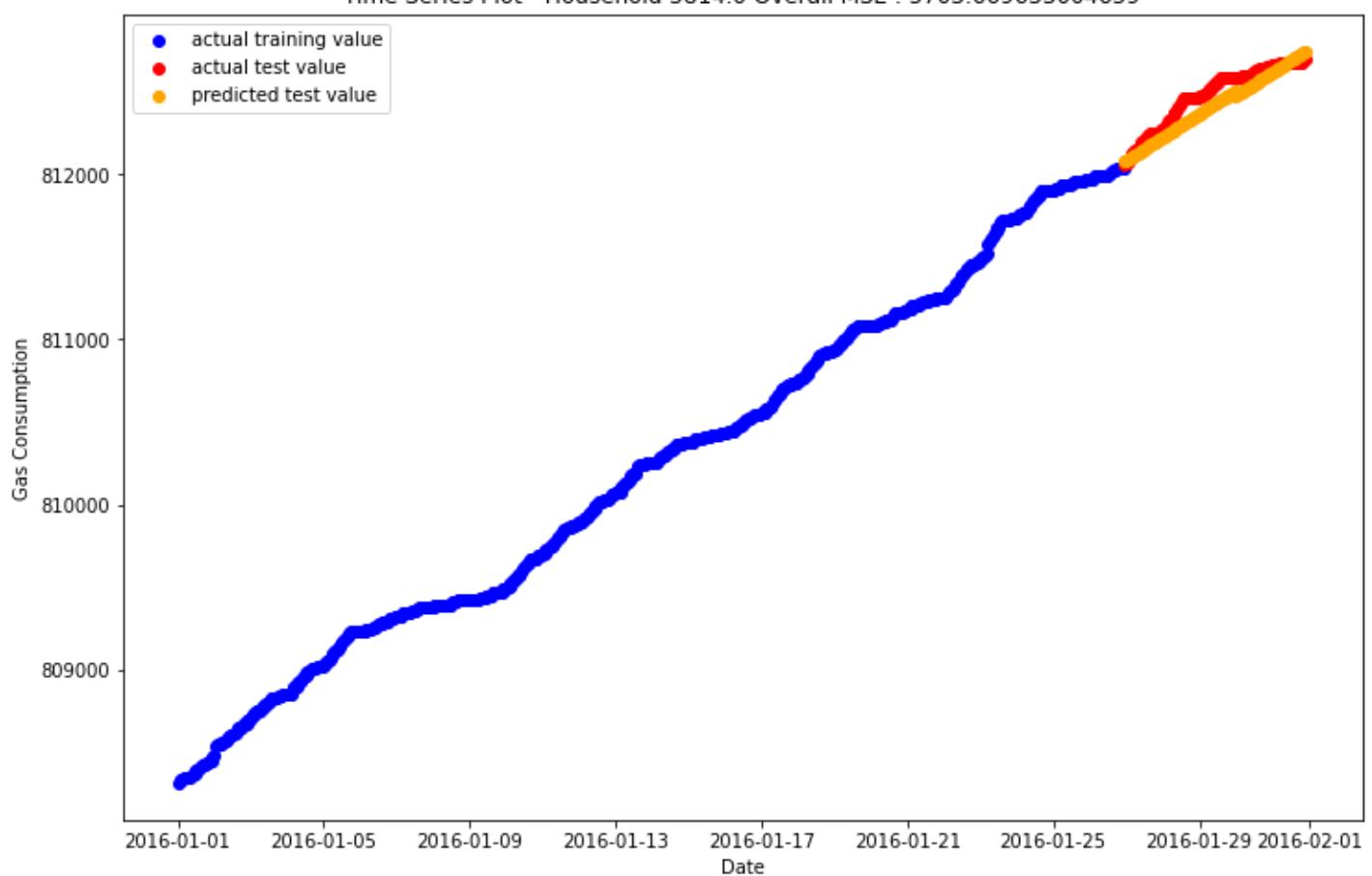
Time Series Plot - Household 5810.0 Overall MSE : 6282.790893782721



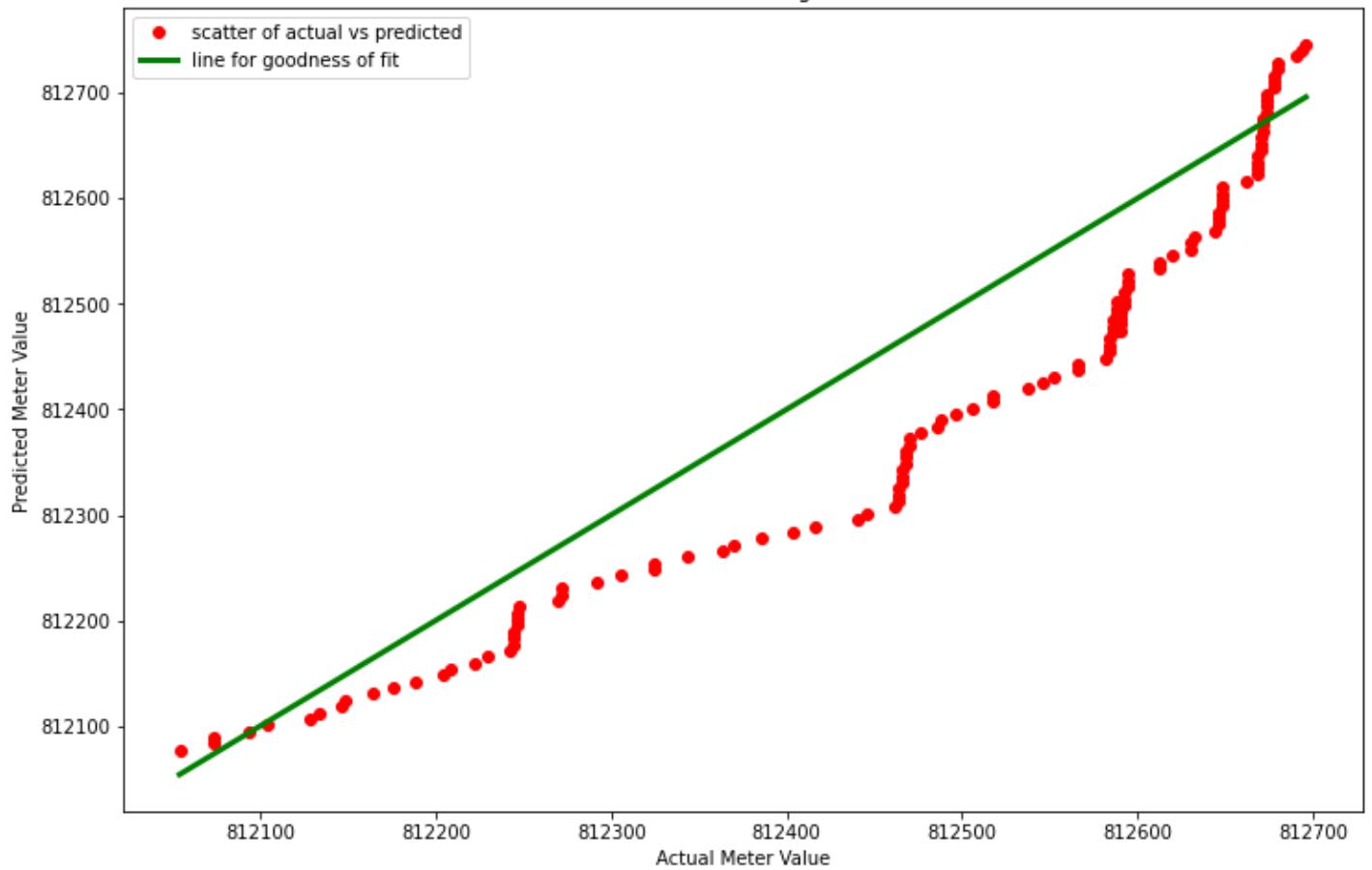
Scatter Plot - Household 5810.0 Testing MSE : 18983.946872115175



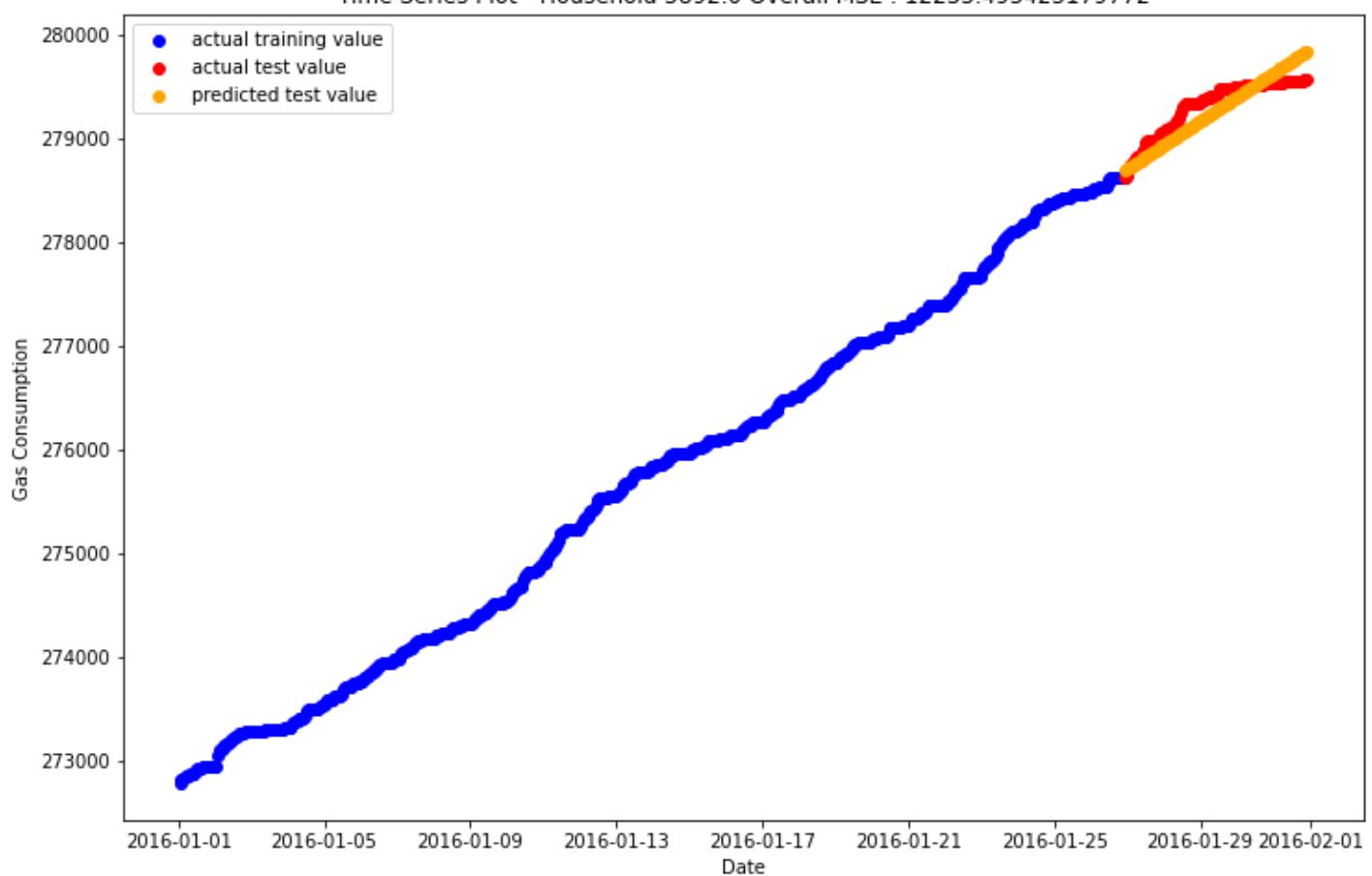
Time Series Plot - Household 5814.0 Overall MSE : 5703.669633004659



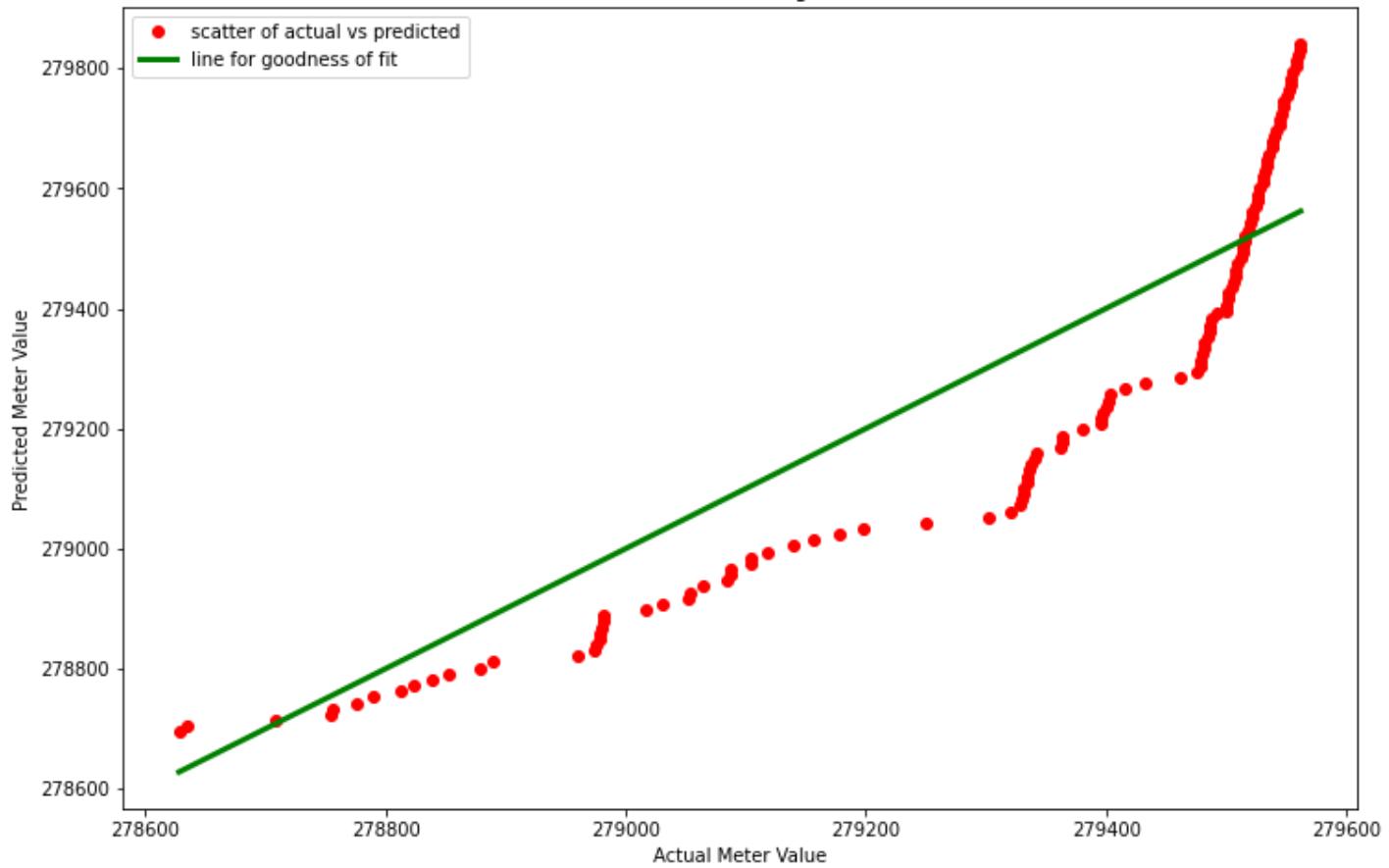
Scatter Plot - Household 5814.0 Testing MSE : 6810.470356546369



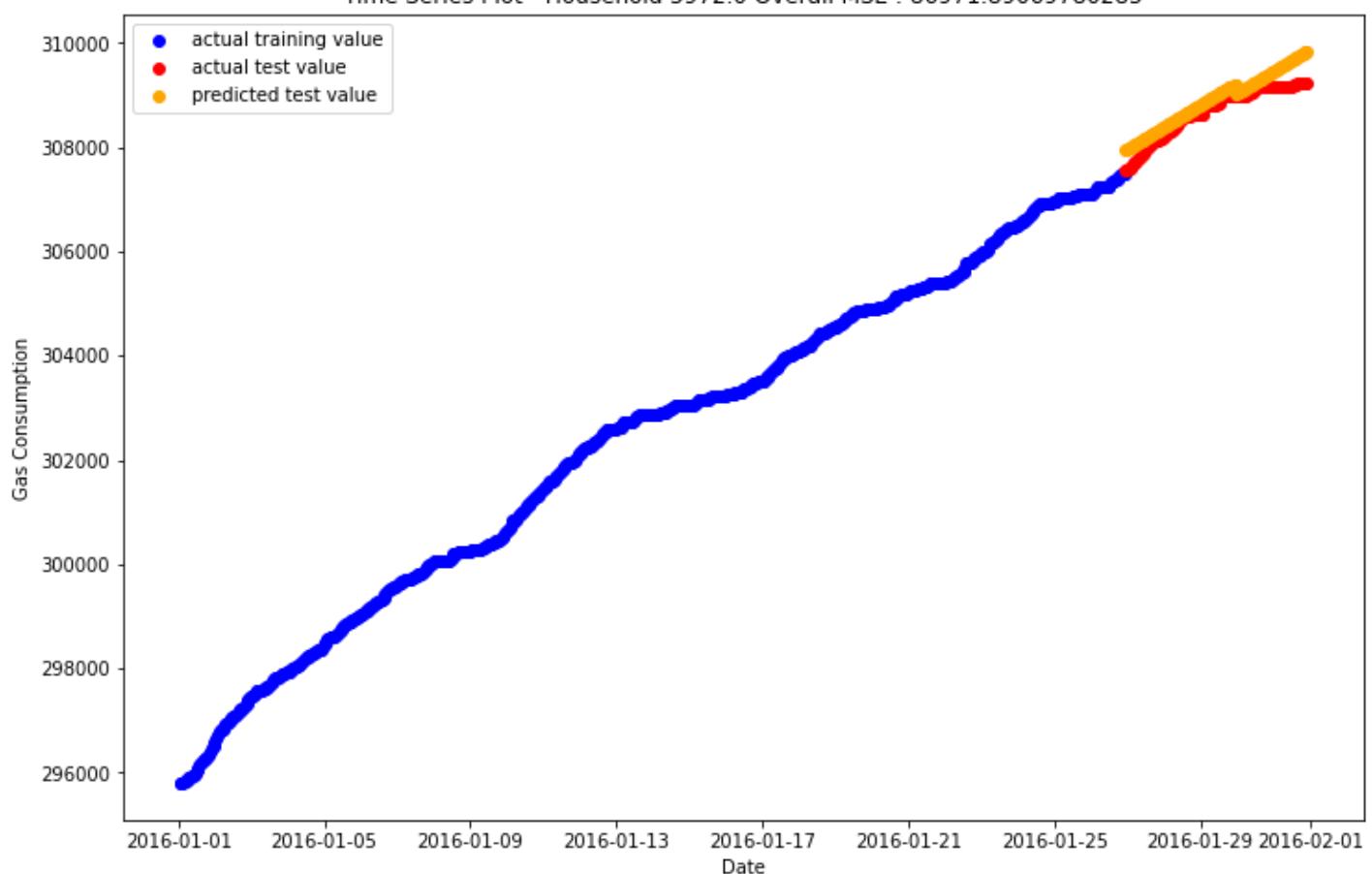
Time Series Plot - Household 5892.0 Overall MSE : 12235.495425179772



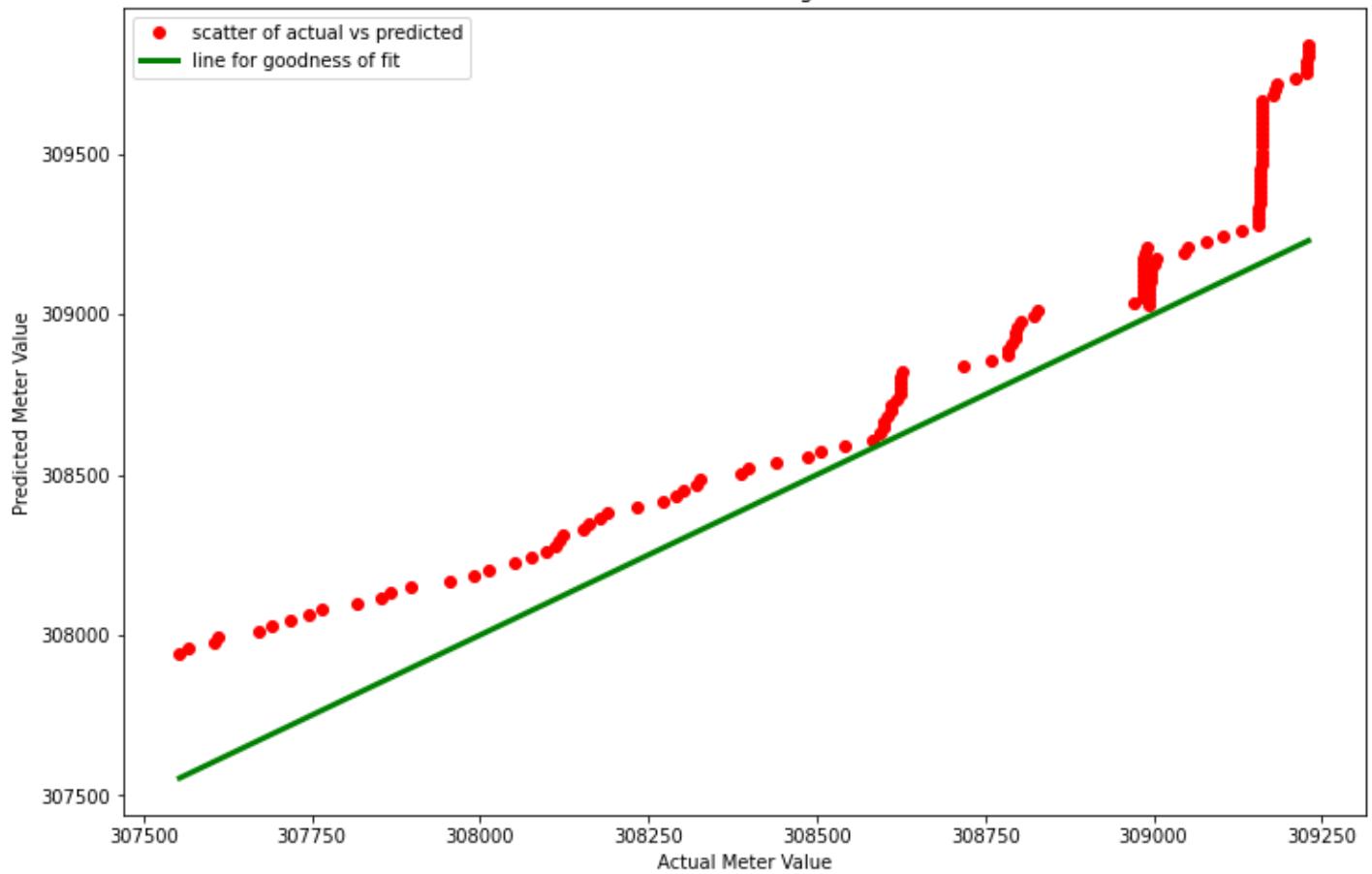
Scatter Plot - Household 5892.0 Testing MSE : 22067.35093060267



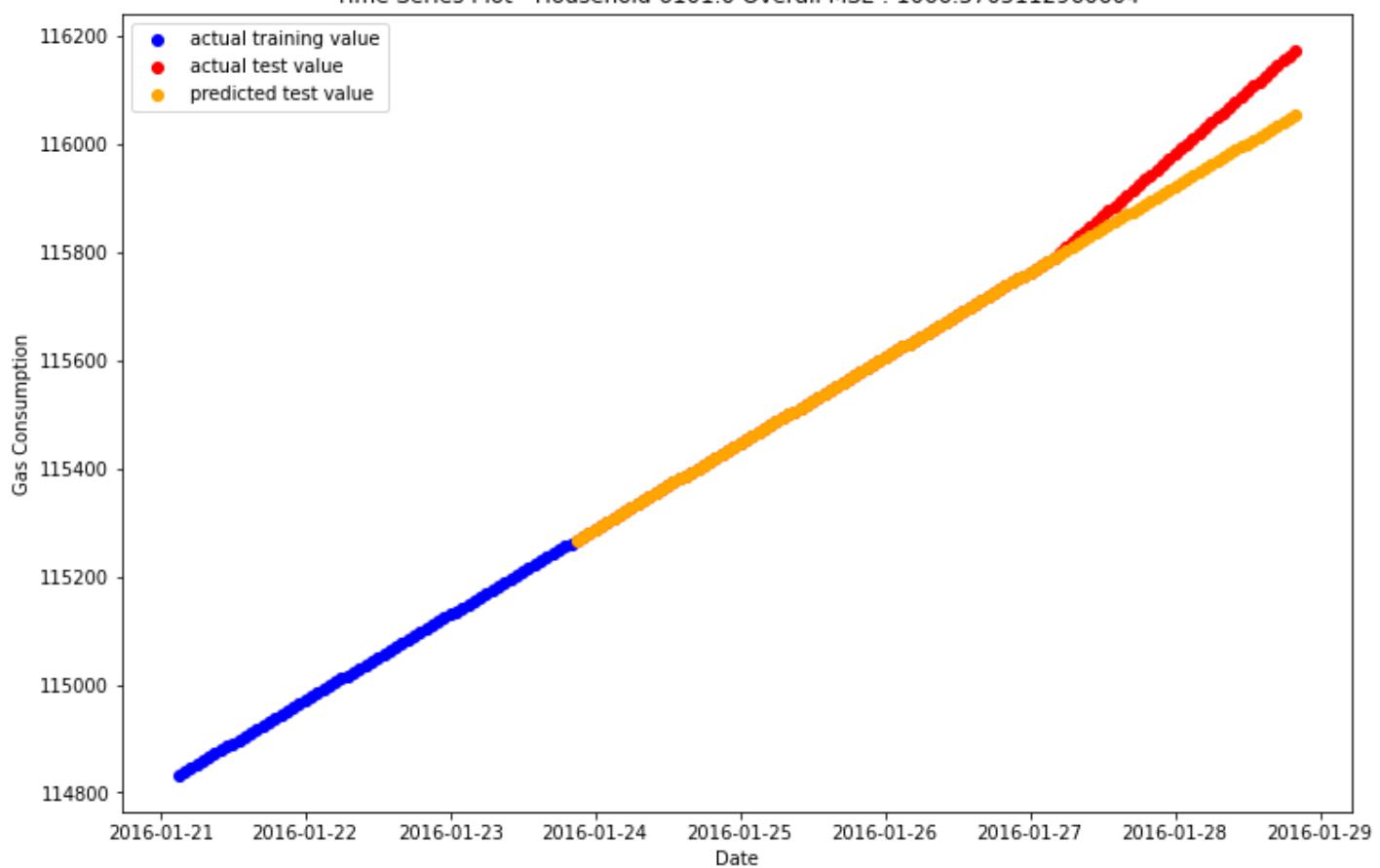
Time Series Plot - Household 5972.0 Overall MSE : 86971.89069780285



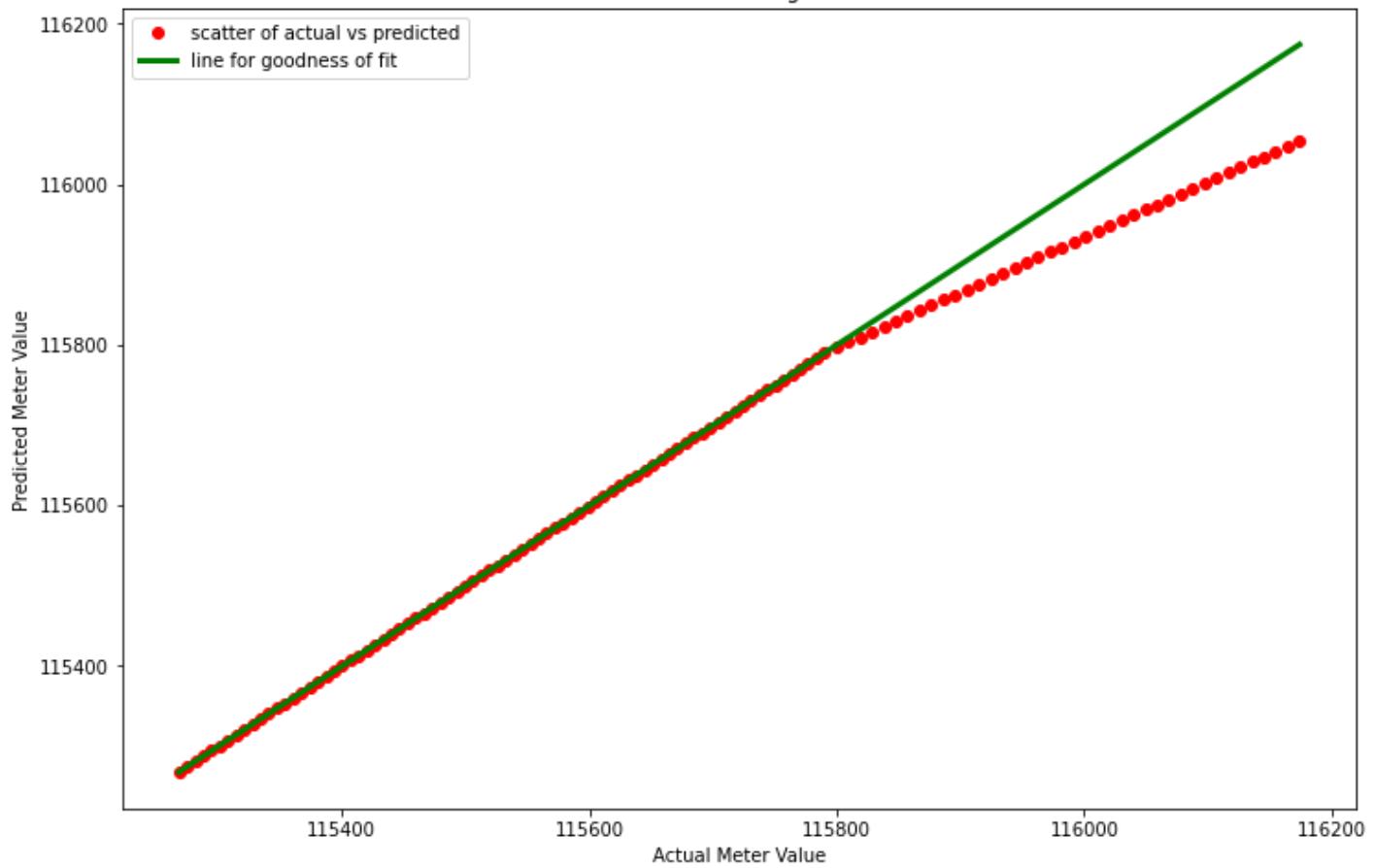
Scatter Plot - Household 5972.0 Testing MSE : 70929.24549324311



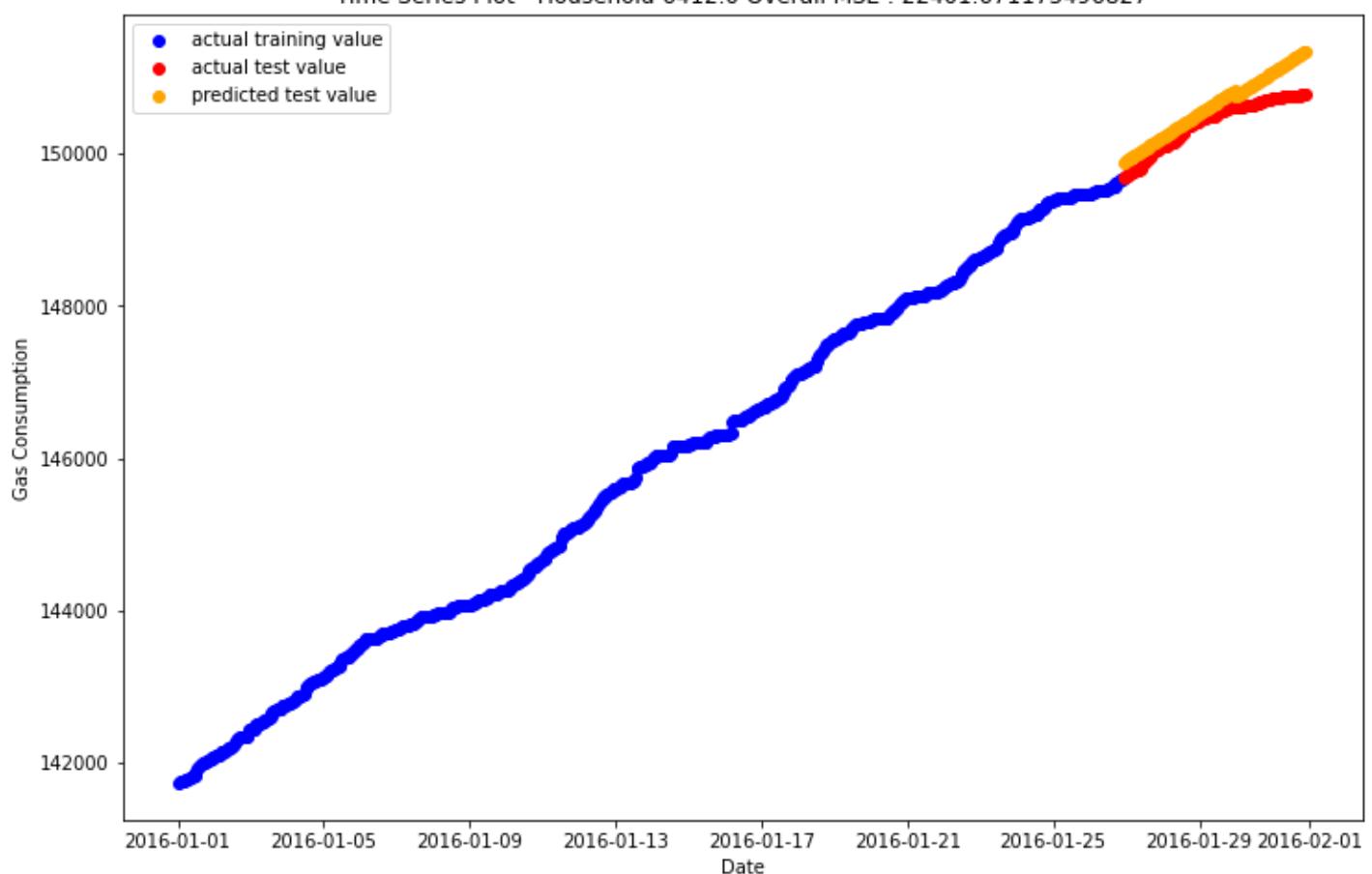
Time Series Plot - Household 6101.0 Overall MSE : 1066.3705112960604



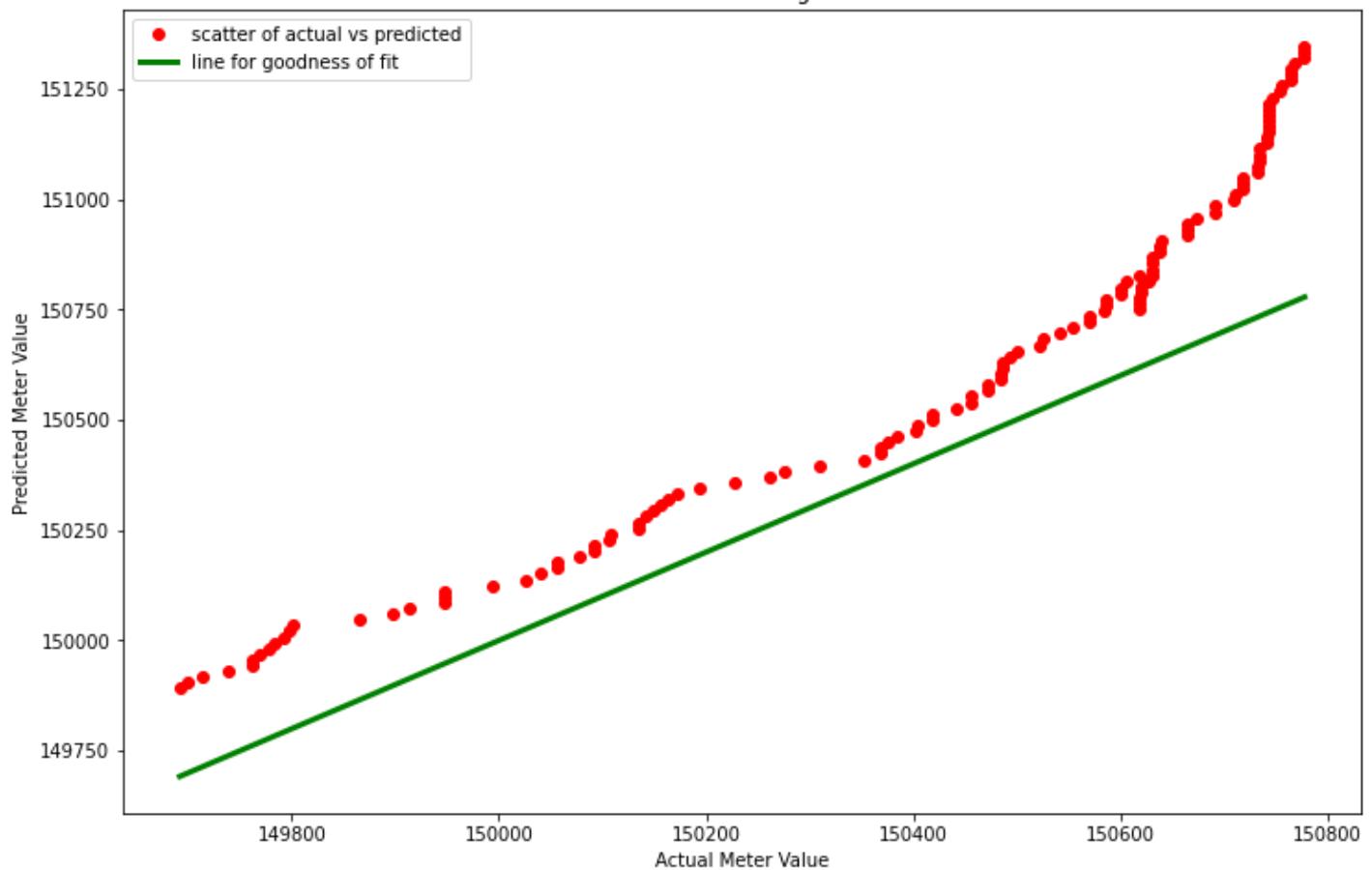
Scatter Plot - Household 6101.0 Testing MSE : 1652.8742925088939

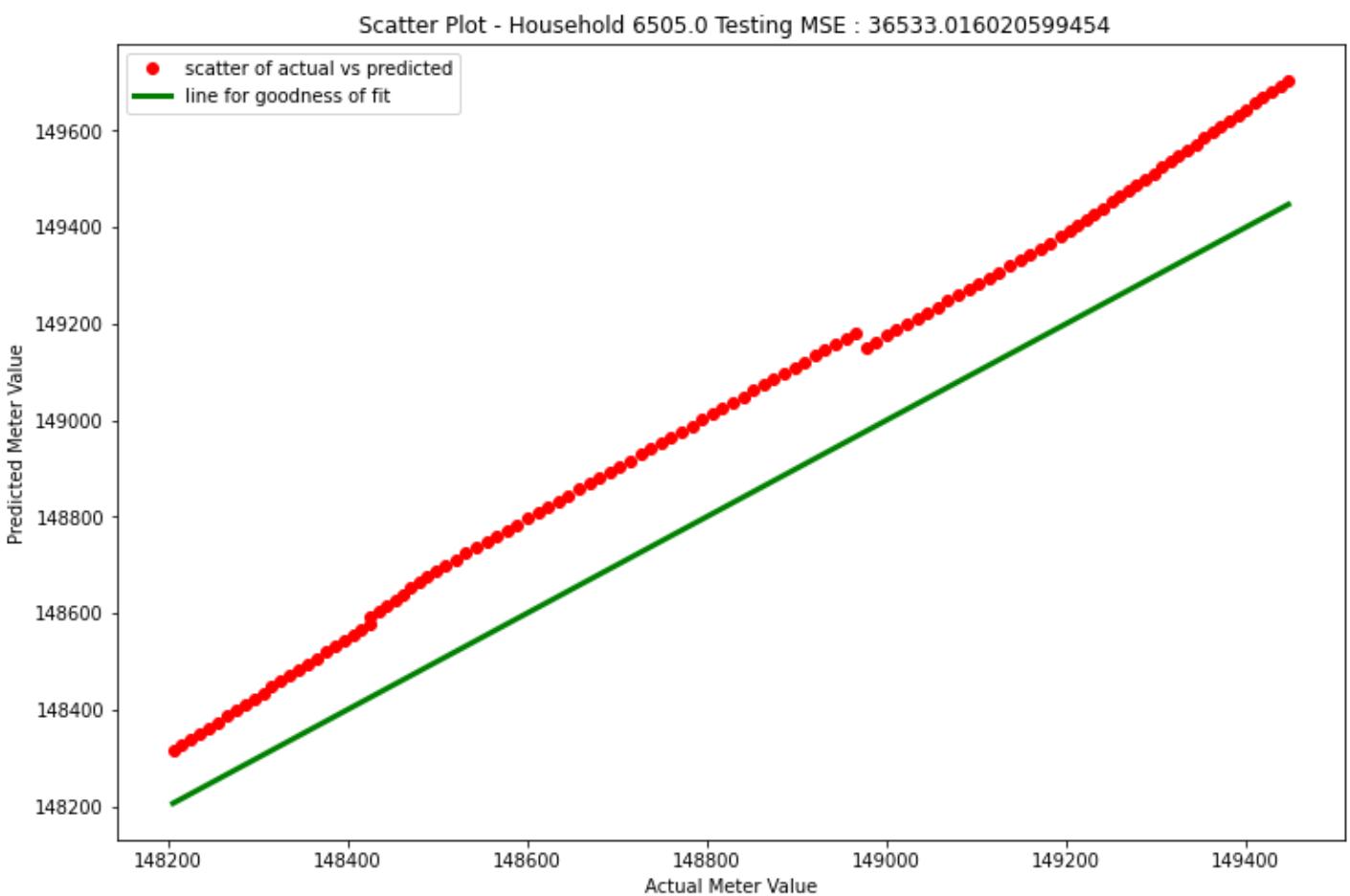
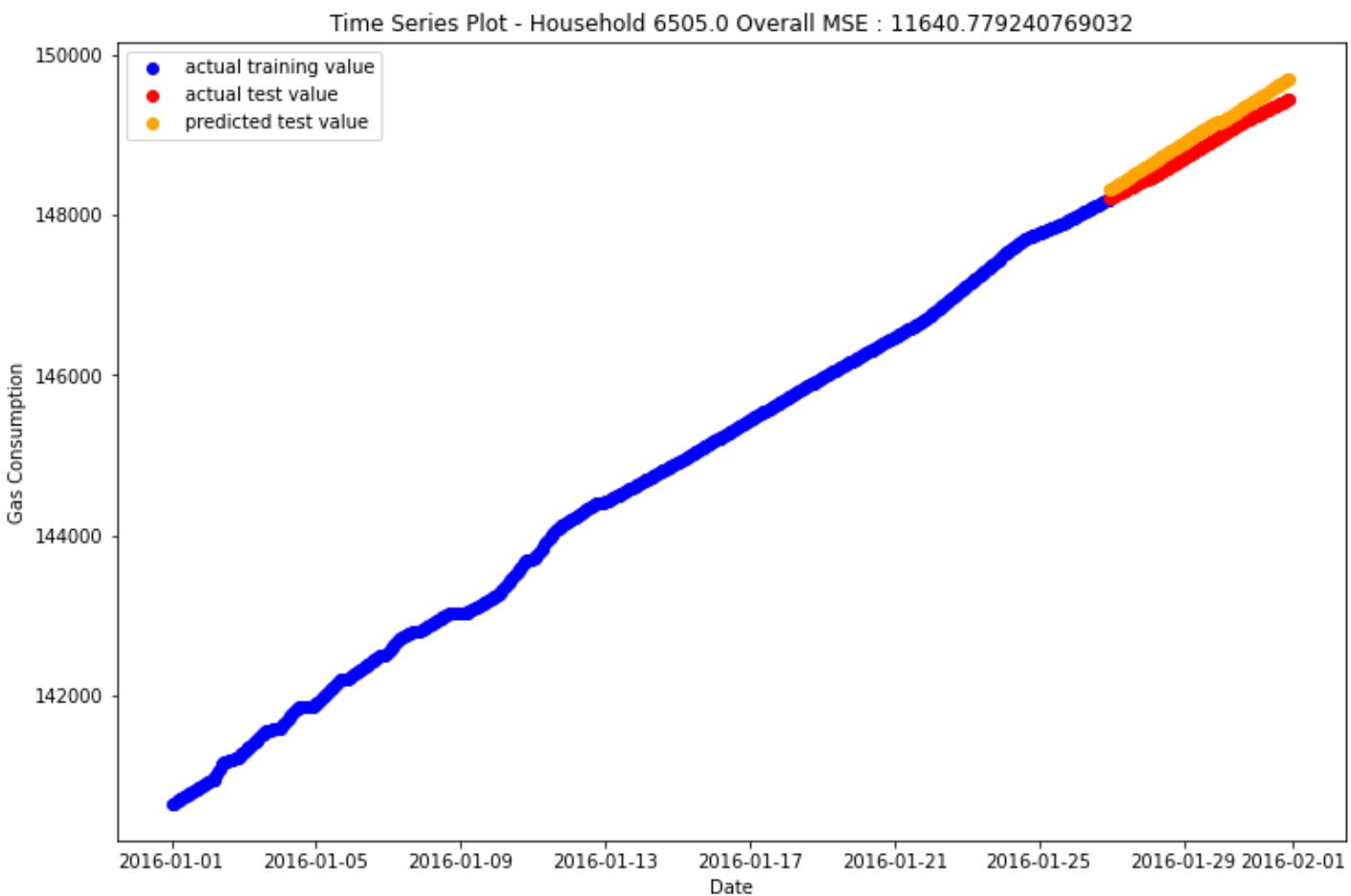


Time Series Plot - Household 6412.0 Overall MSE : 22401.671175496827

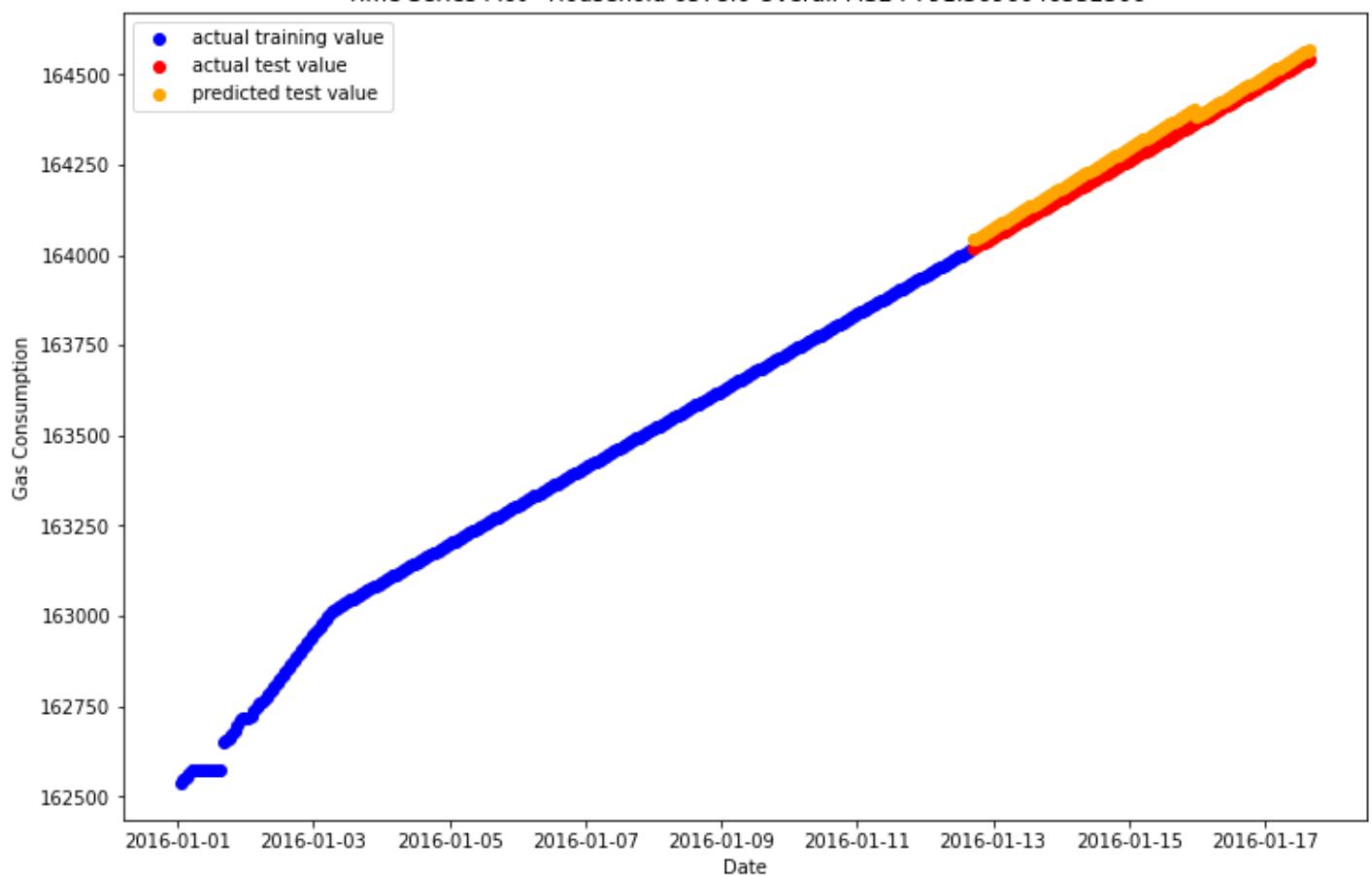


Scatter Plot - Household 6412.0 Testing MSE : 66160.65976709648

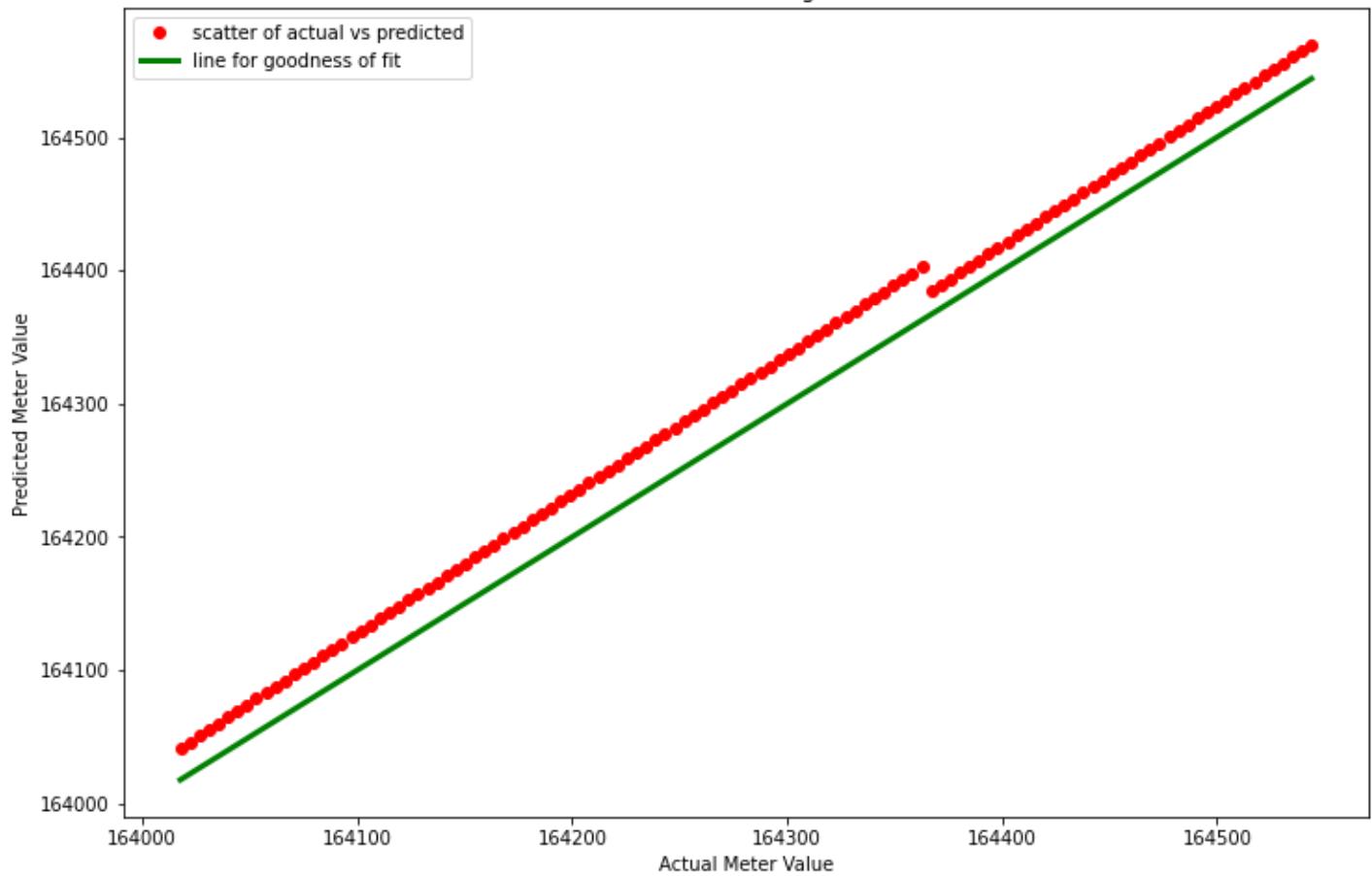




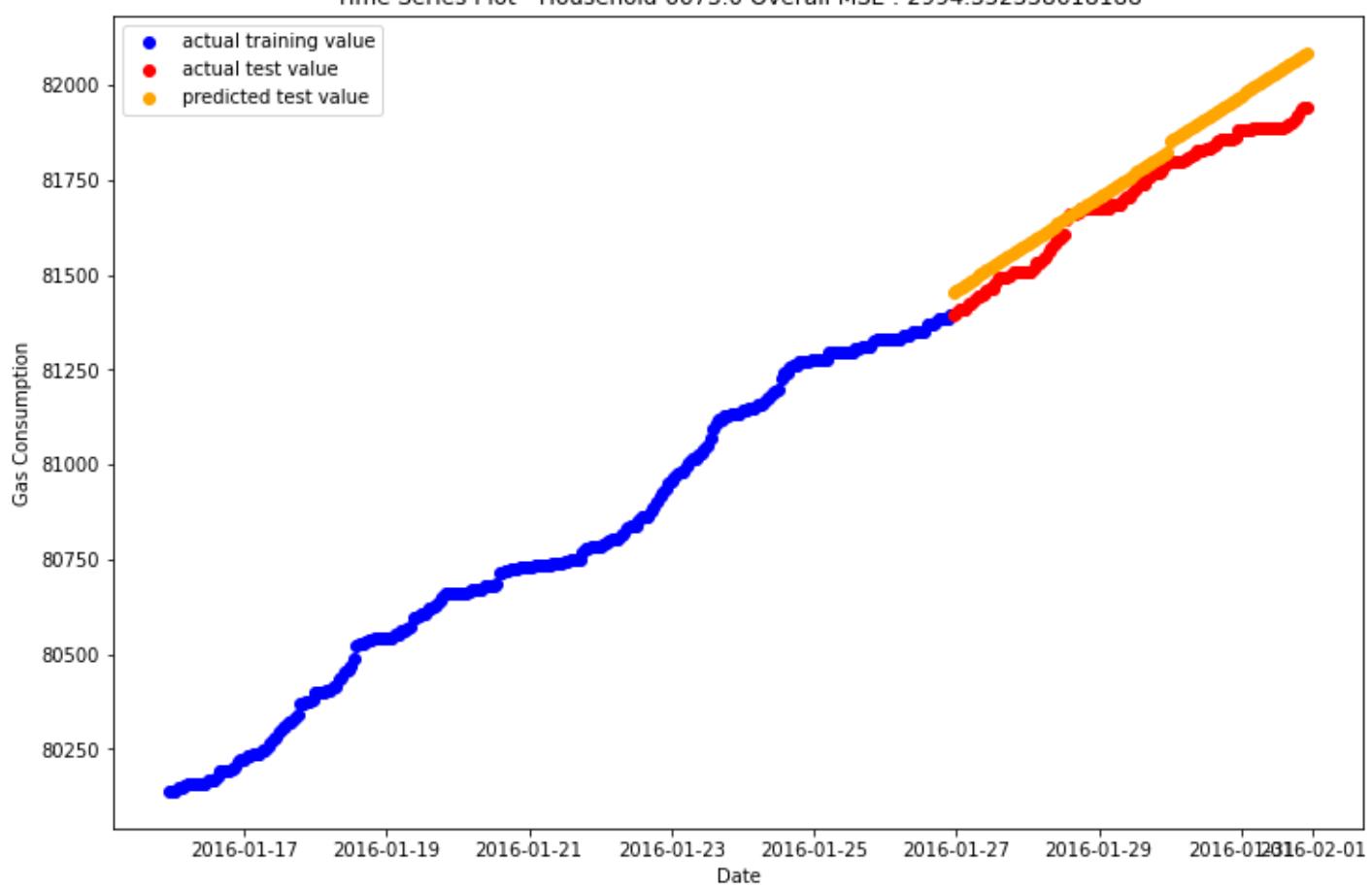
Time Series Plot - Household 6578.0 Overall MSE : 791.3696046532506



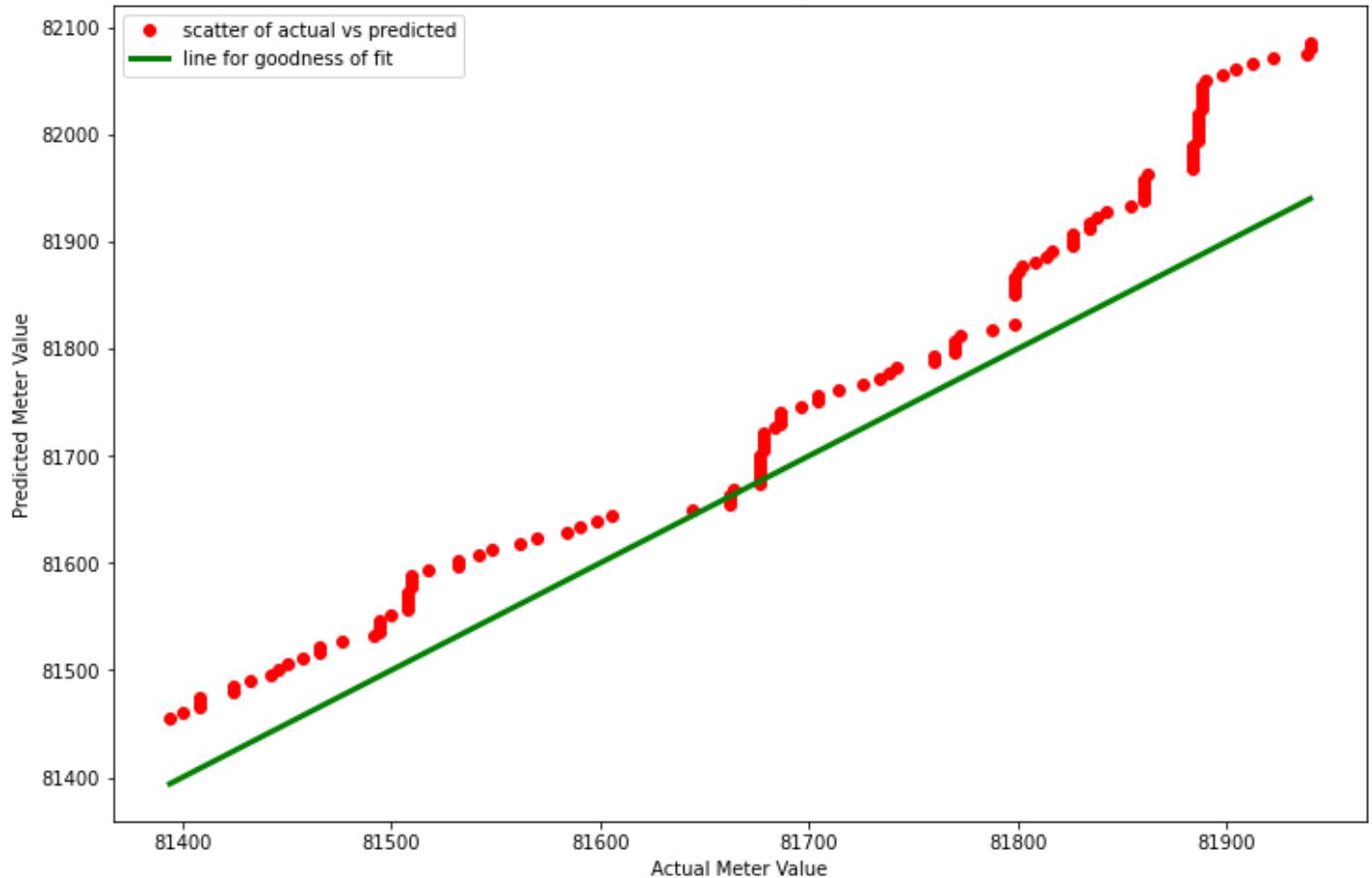
Scatter Plot - Household 6578.0 Testing MSE : 840.2218105636437



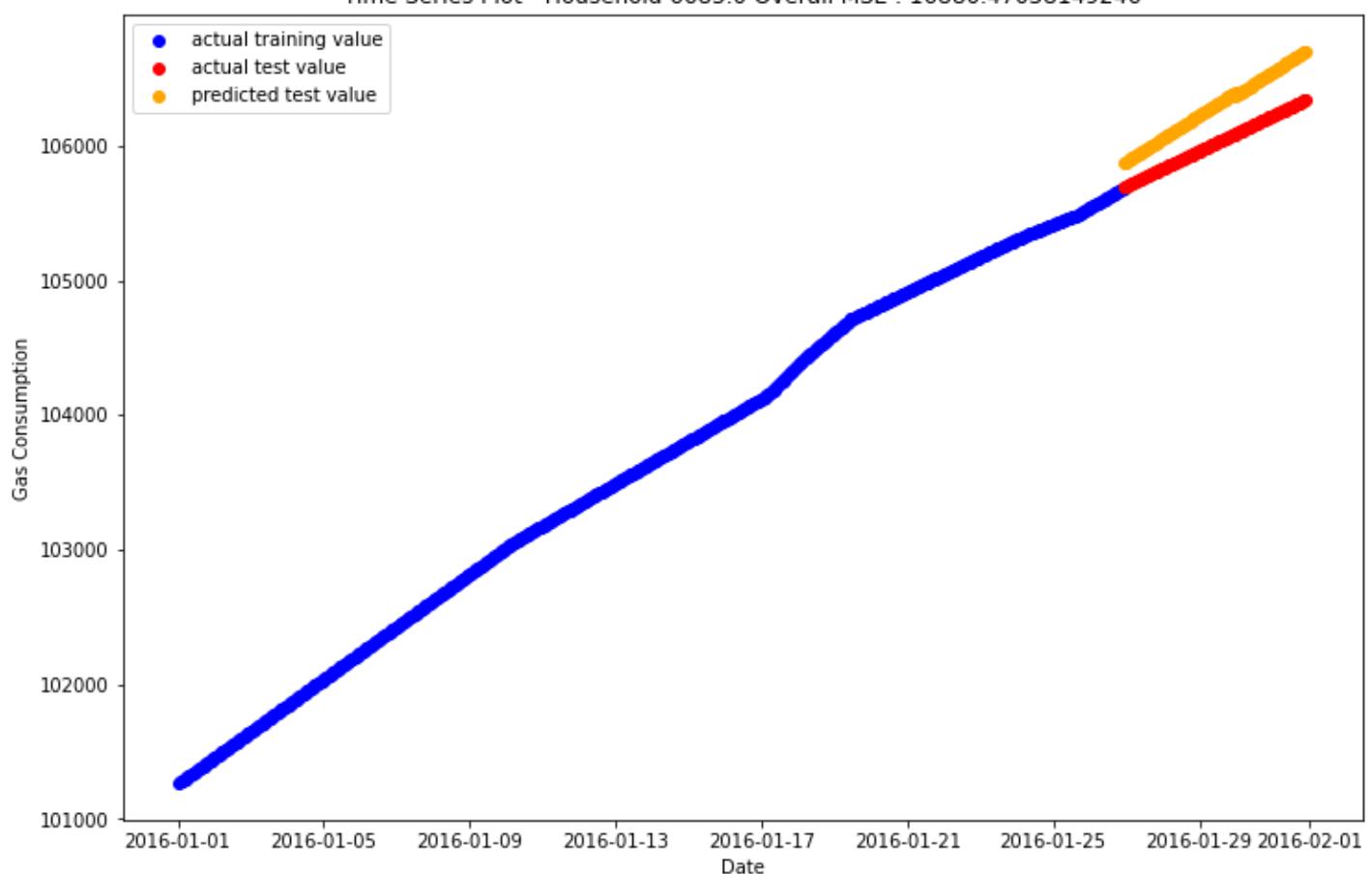
Time Series Plot - Household 6673.0 Overall MSE : 2994.352338618188



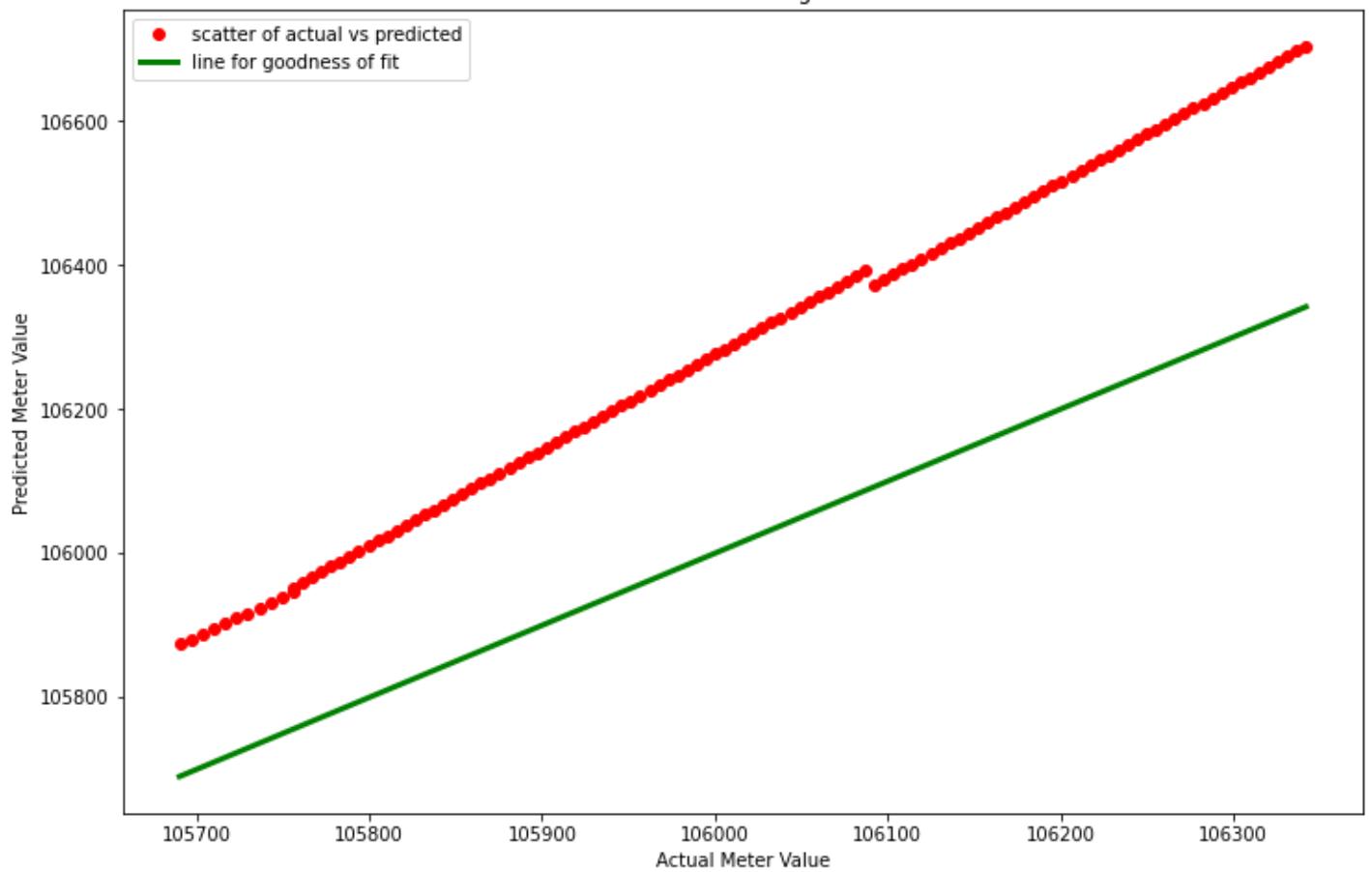
Scatter Plot - Household 6673.0 Testing MSE : 6084.951340510249



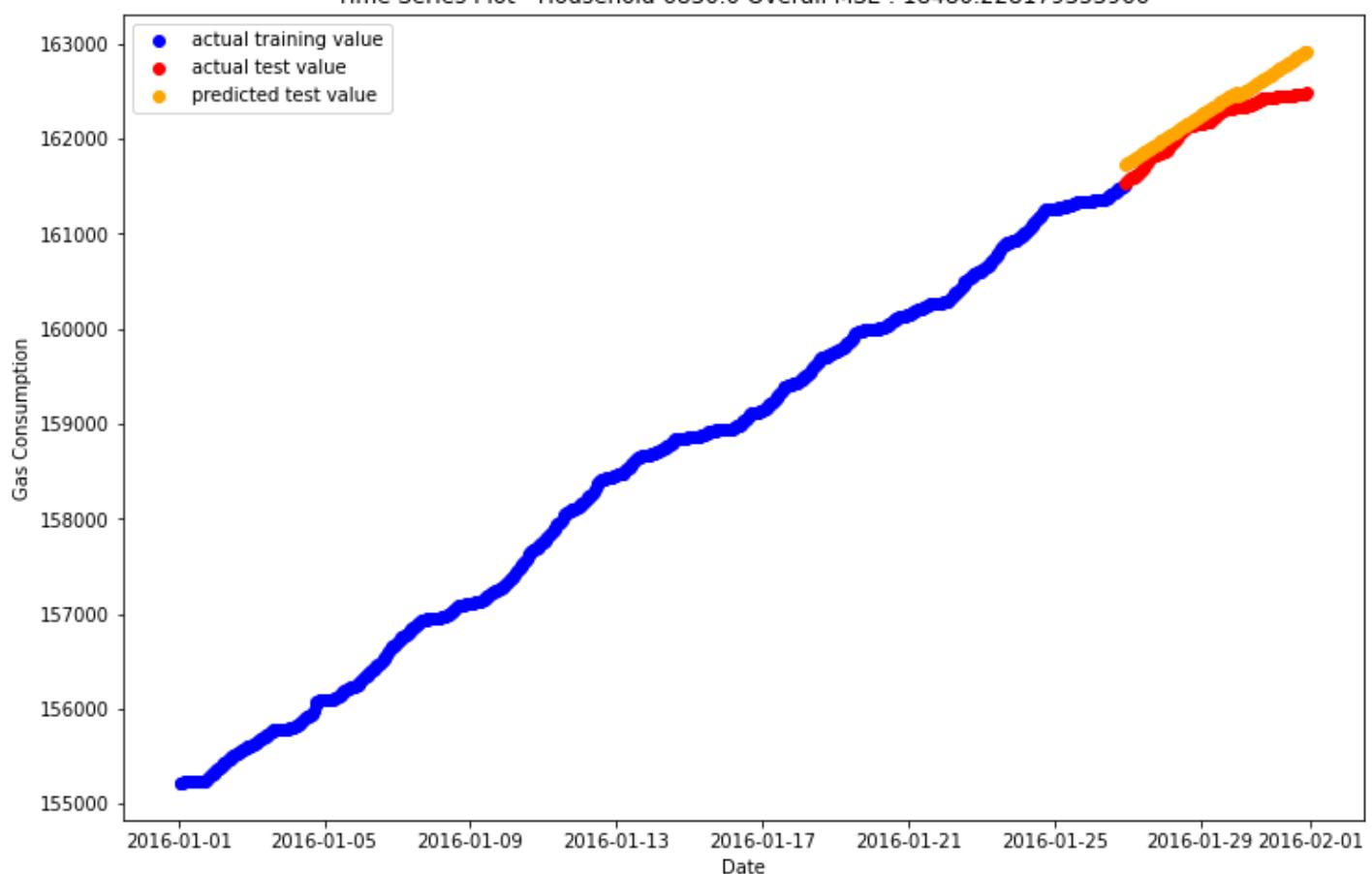
Time Series Plot - Household 6685.0 Overall MSE : 16880.47038149246



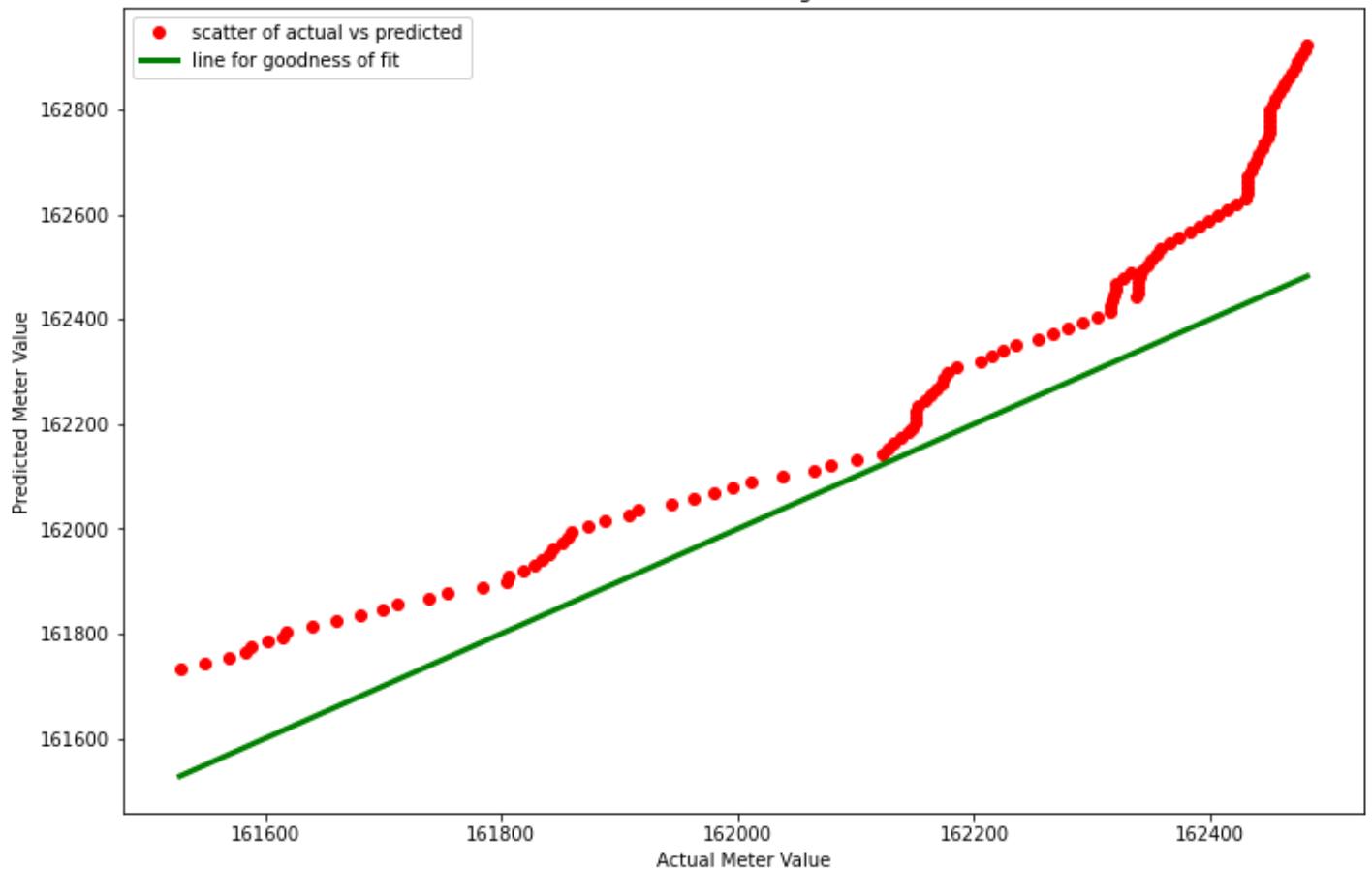
Scatter Plot - Household 6685.0 Testing MSE : 76869.08967516659



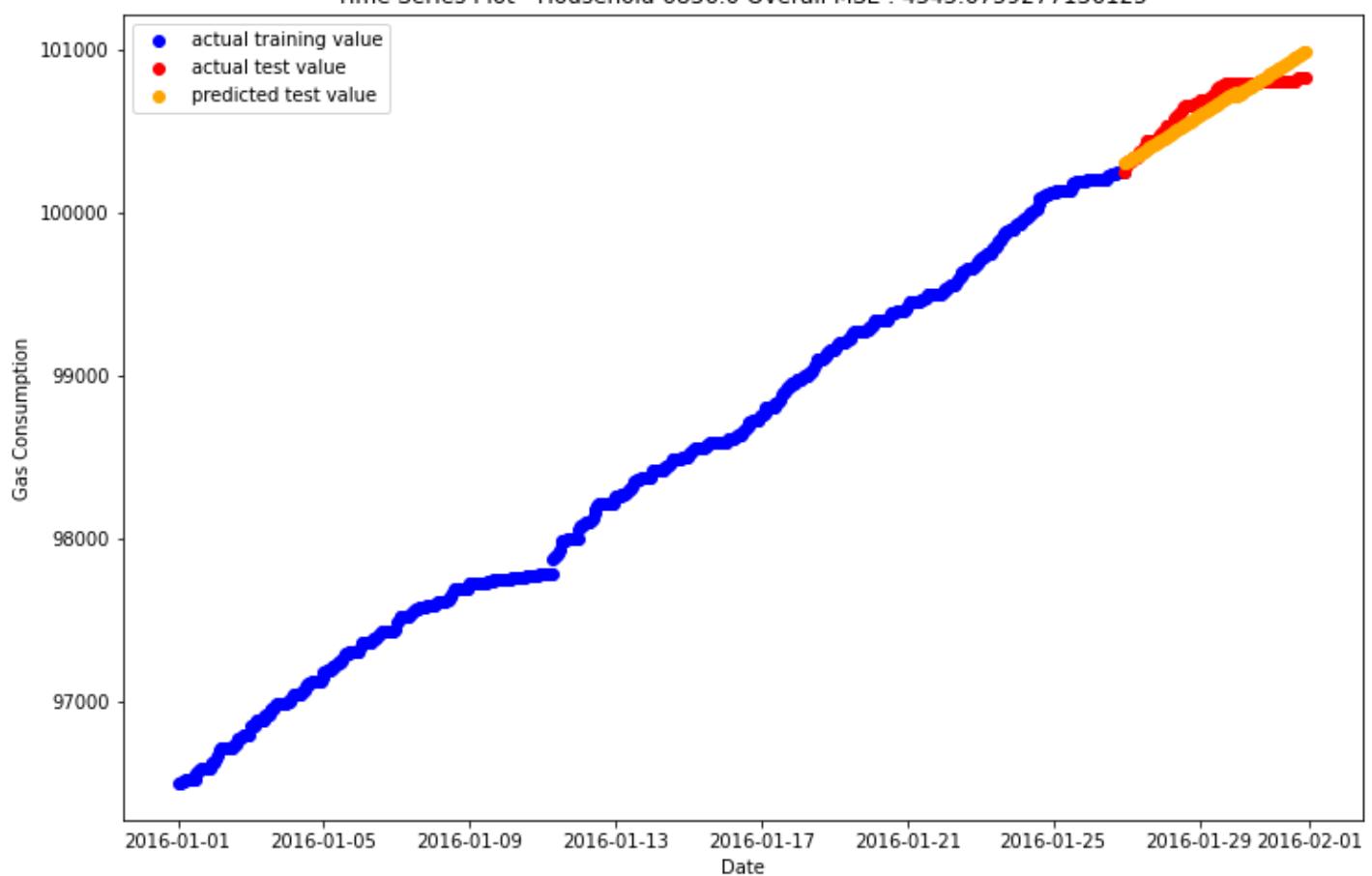
Time Series Plot - Household 6830.0 Overall MSE : 18480.228179353966



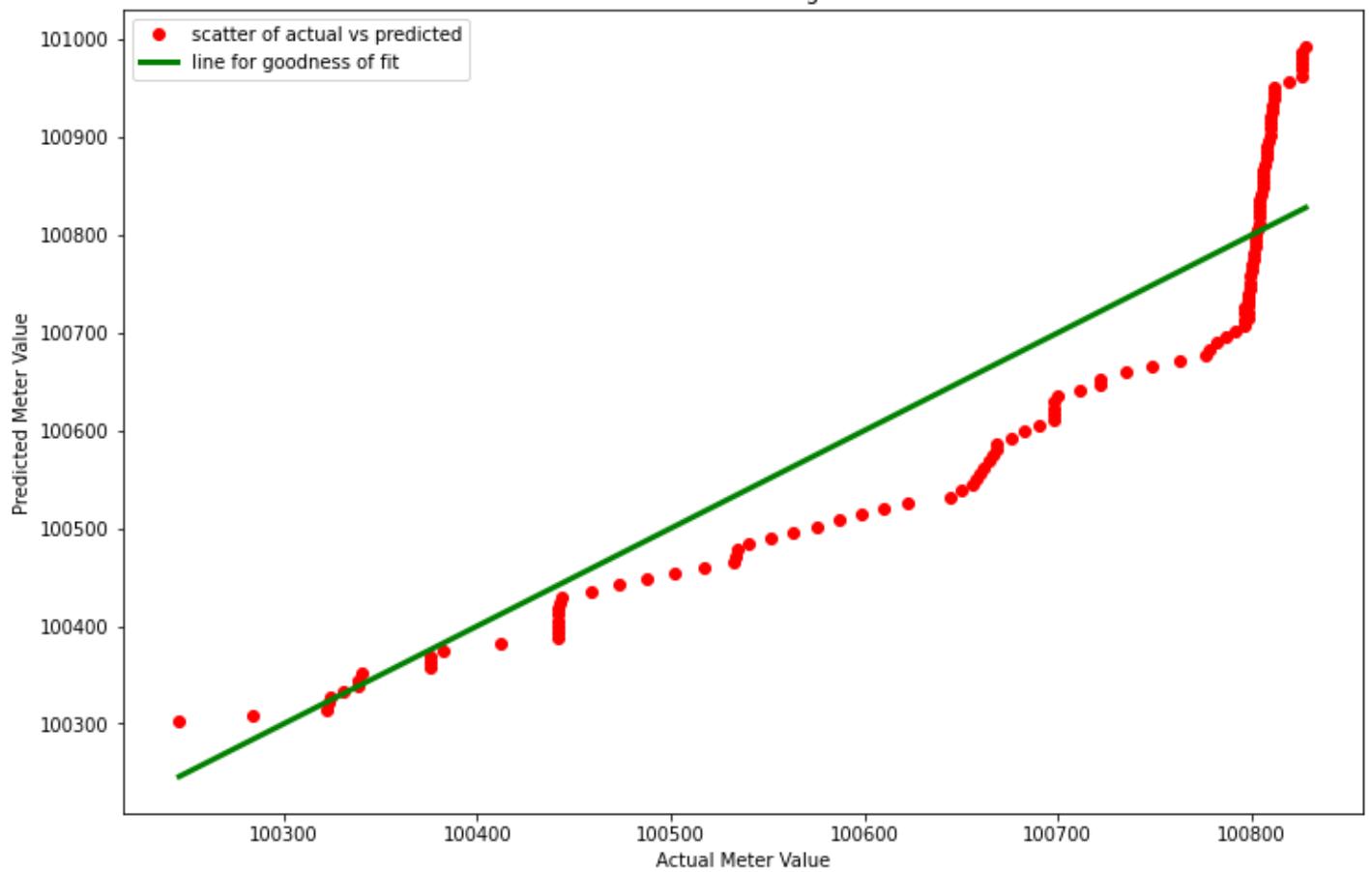
Scatter Plot - Household 6830.0 Testing MSE : 39807.50149143402

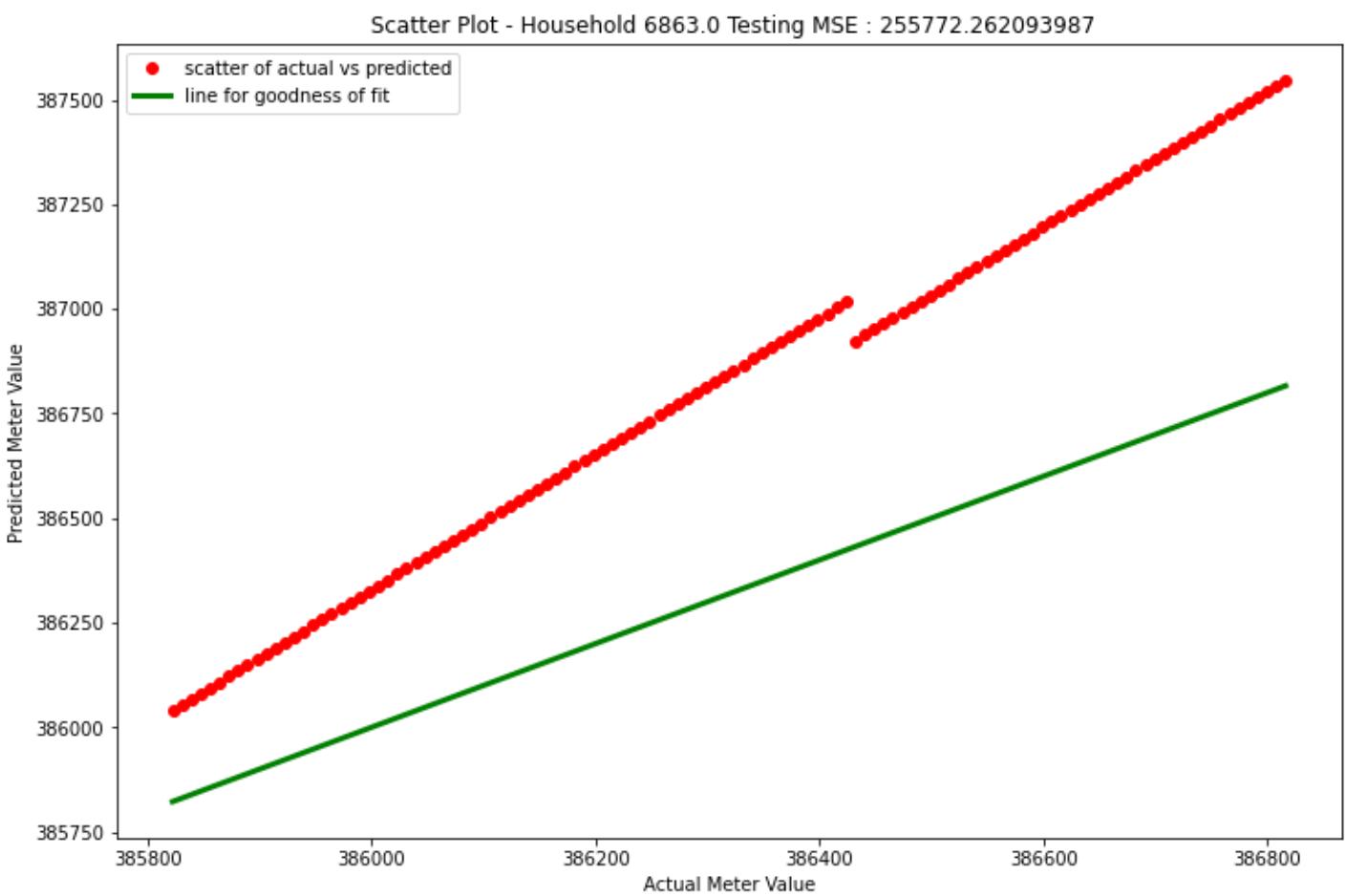
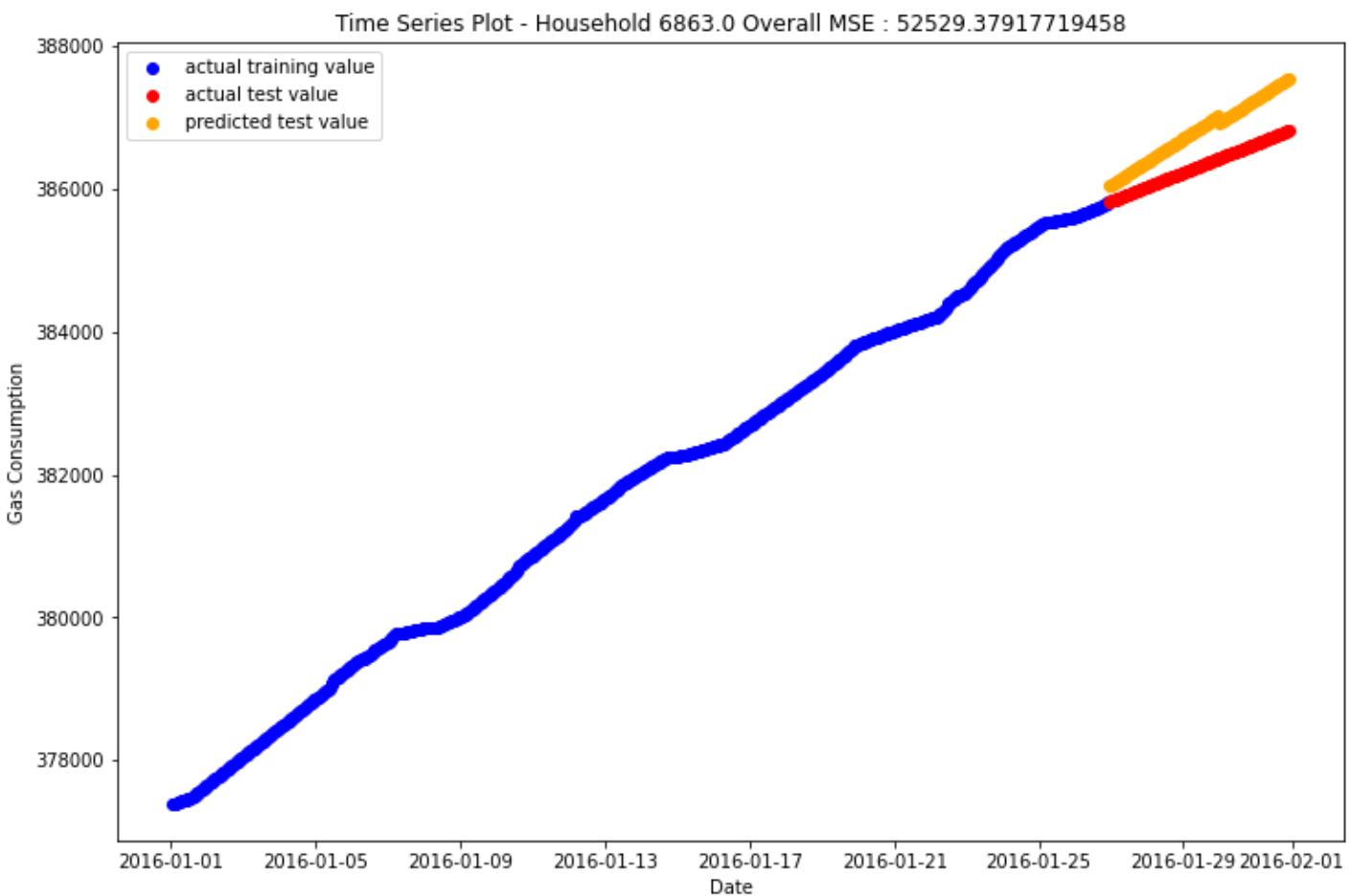


Time Series Plot - Household 6836.0 Overall MSE : 4545.6759277136125

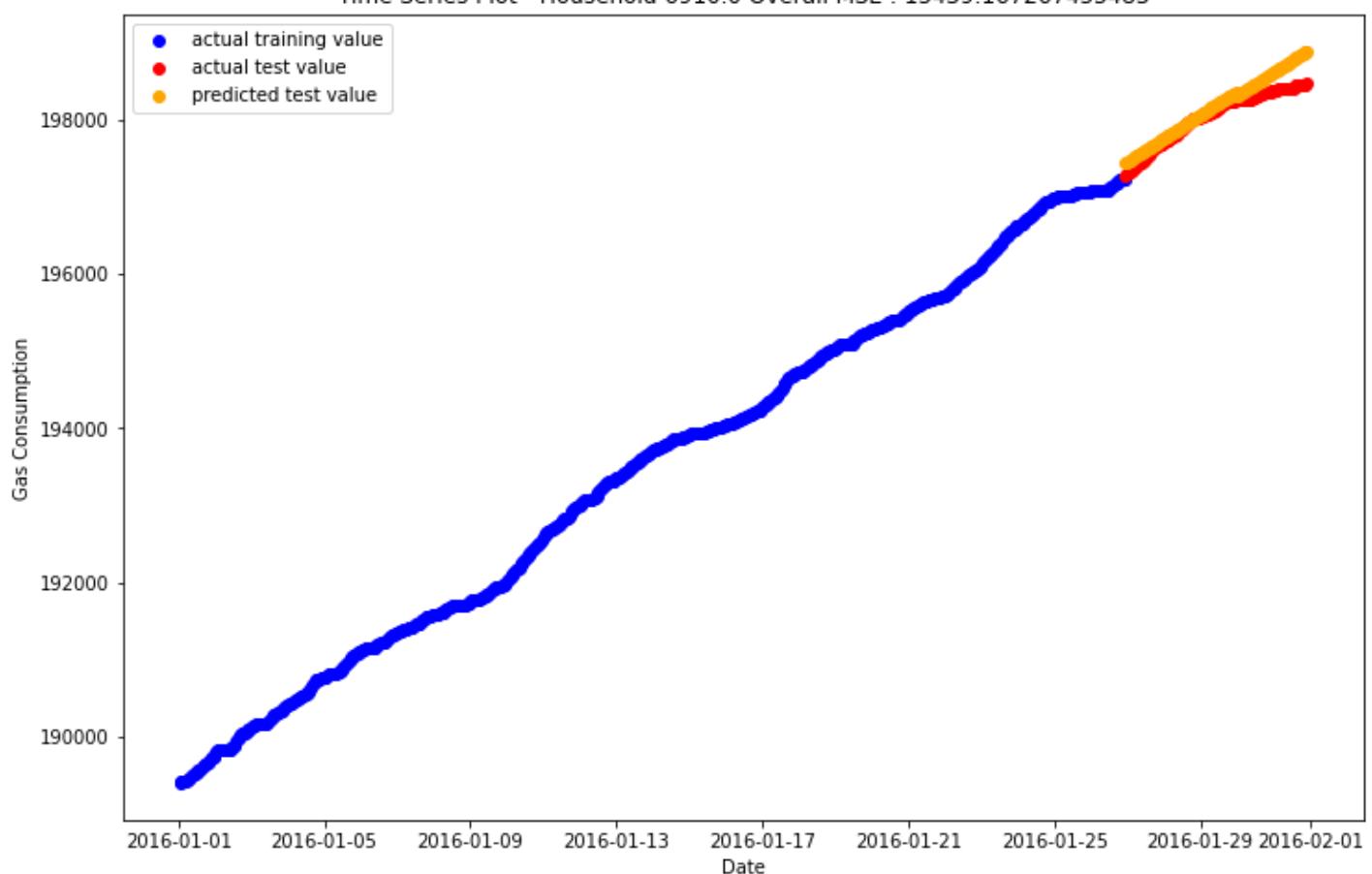


Scatter Plot - Household 6836.0 Testing MSE : 5912.96976793718

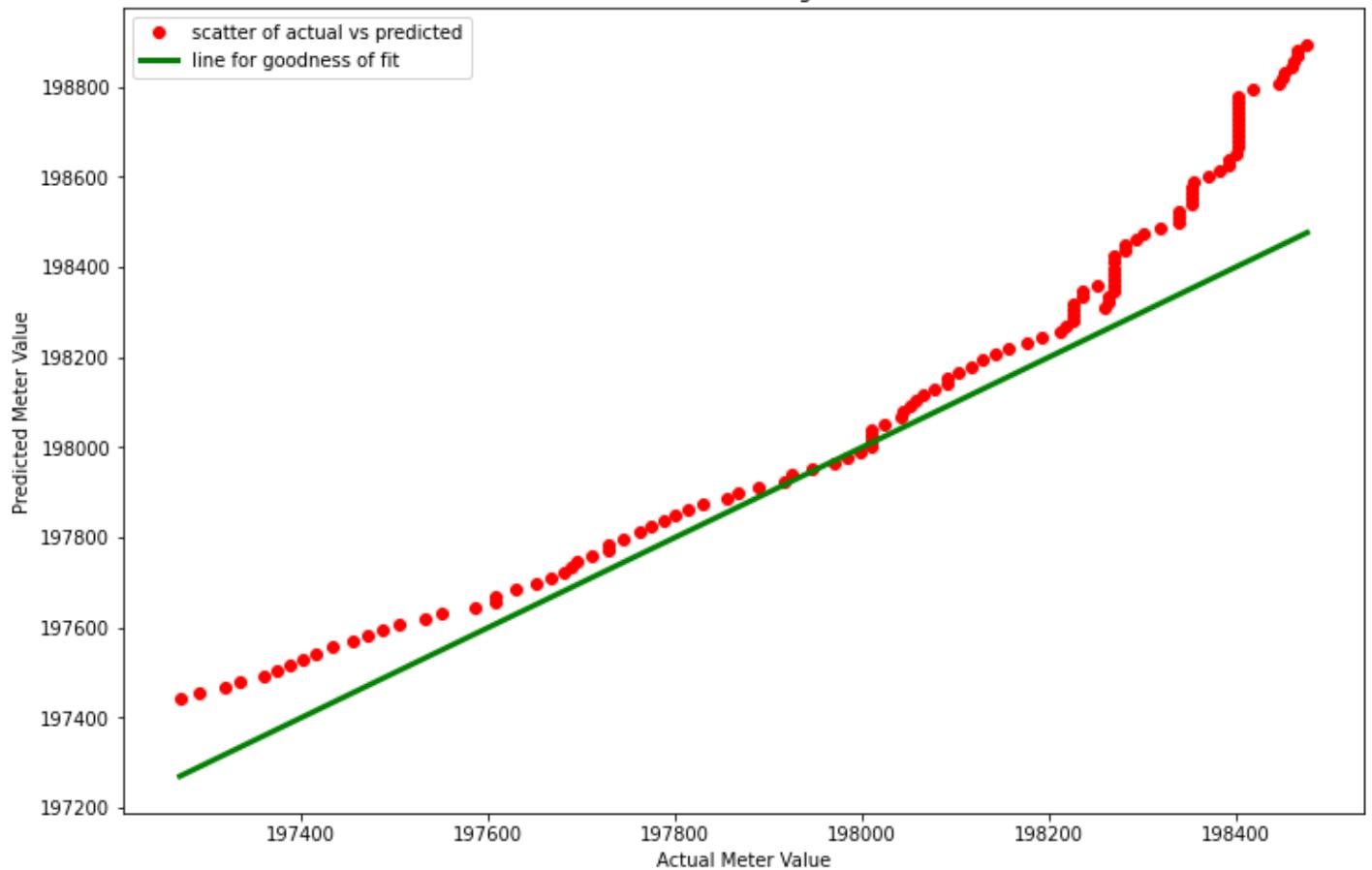


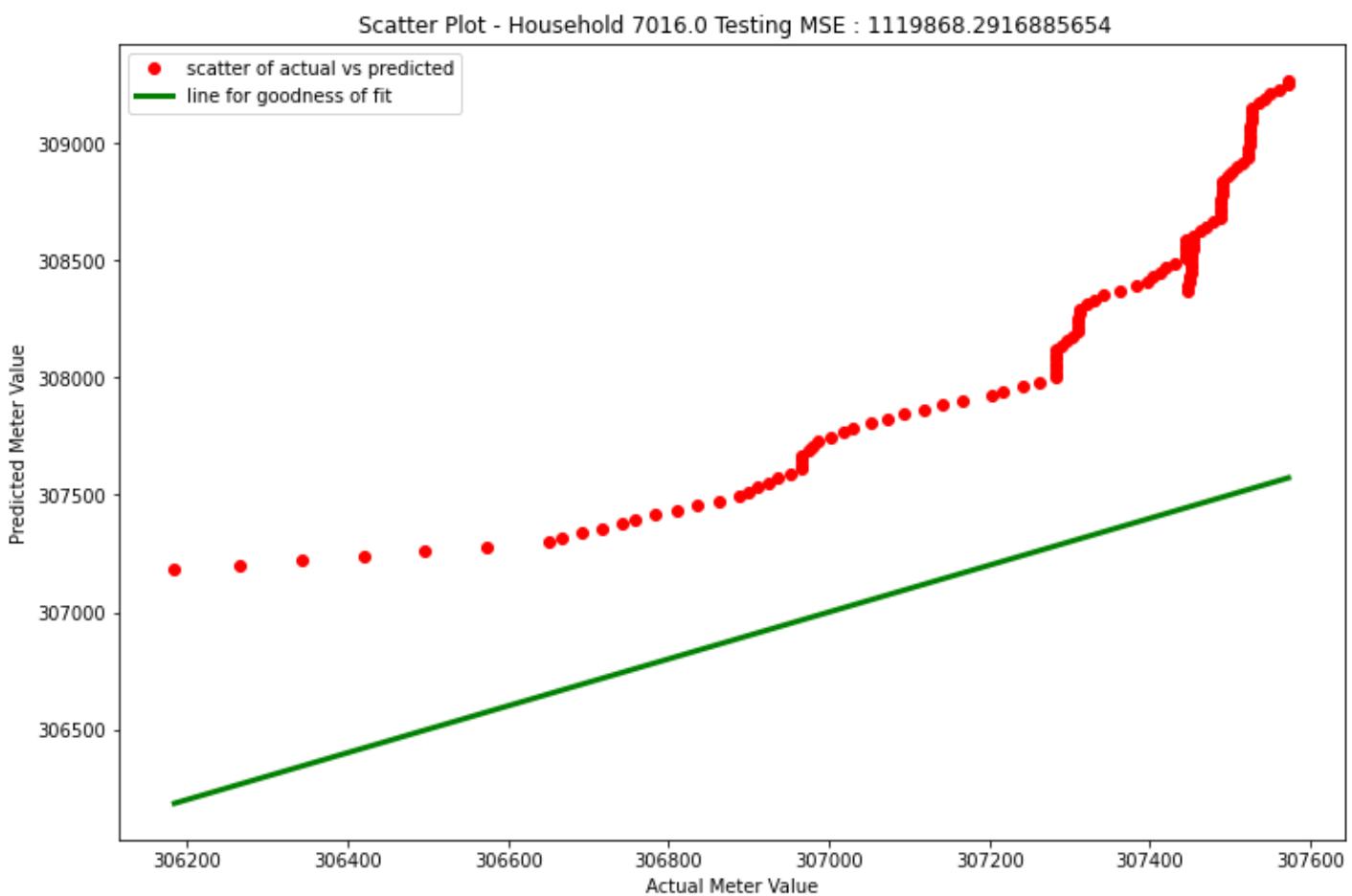
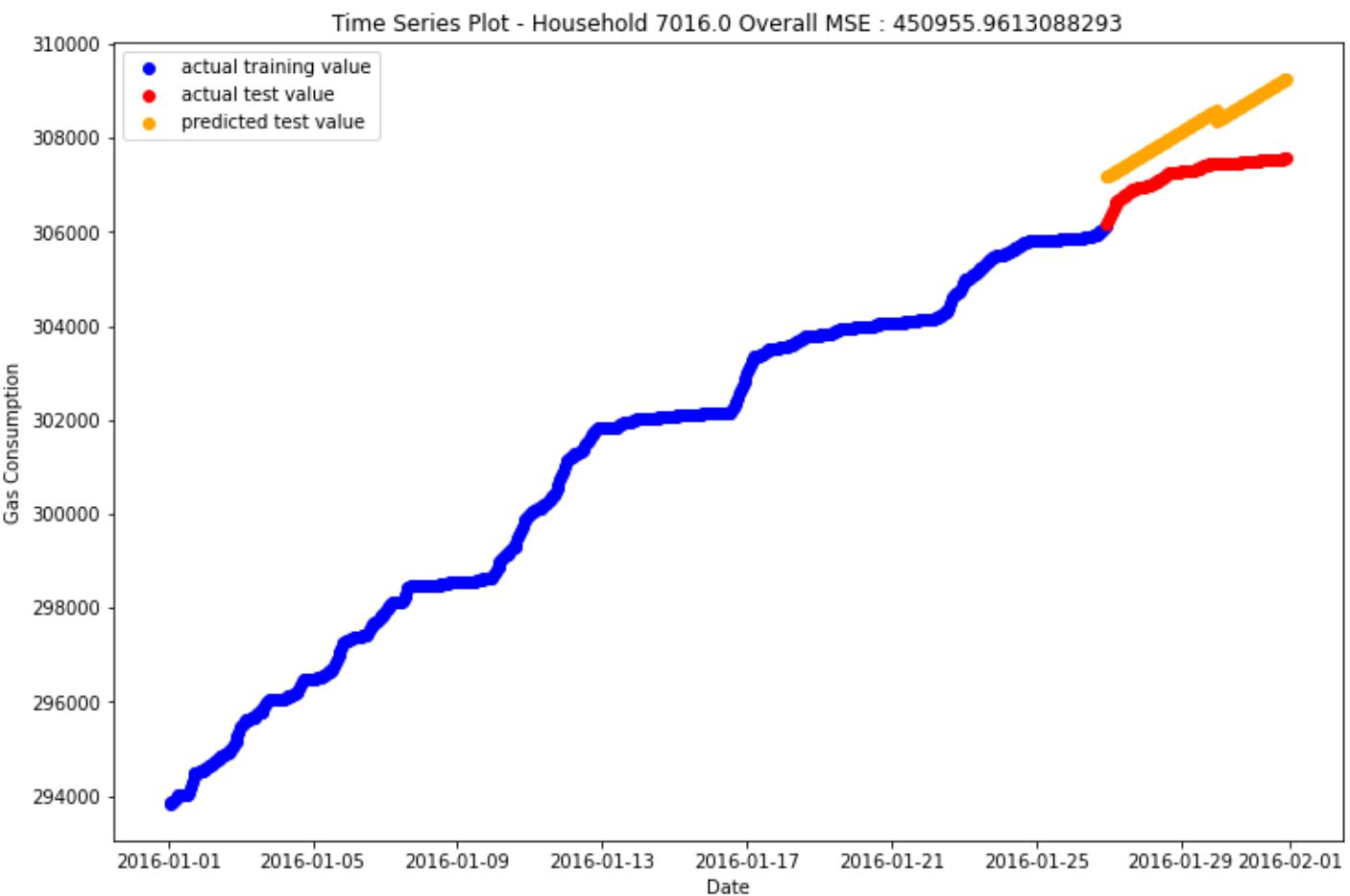


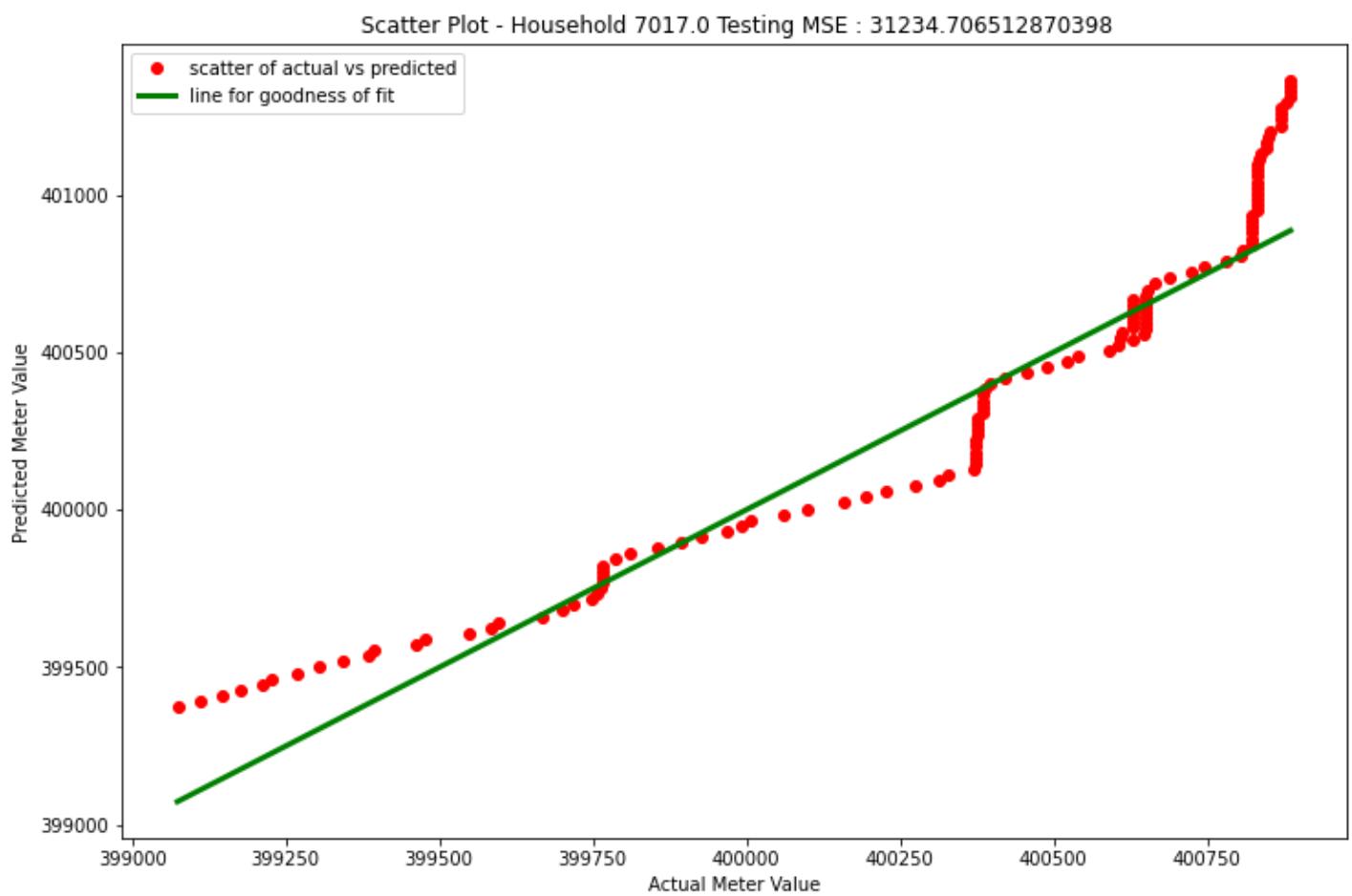
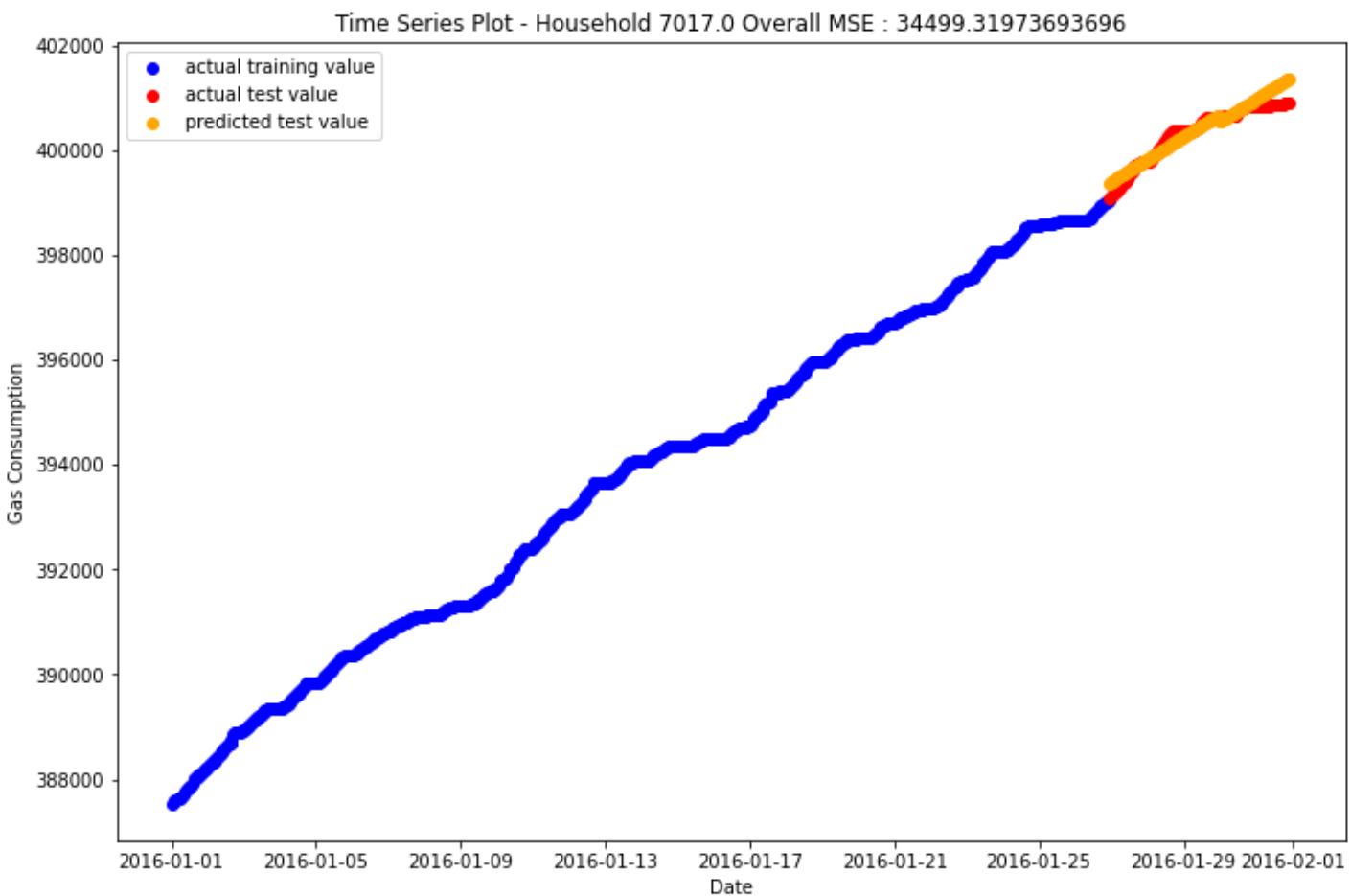
Time Series Plot - Household 6910.0 Overall MSE : 15439.167267455483

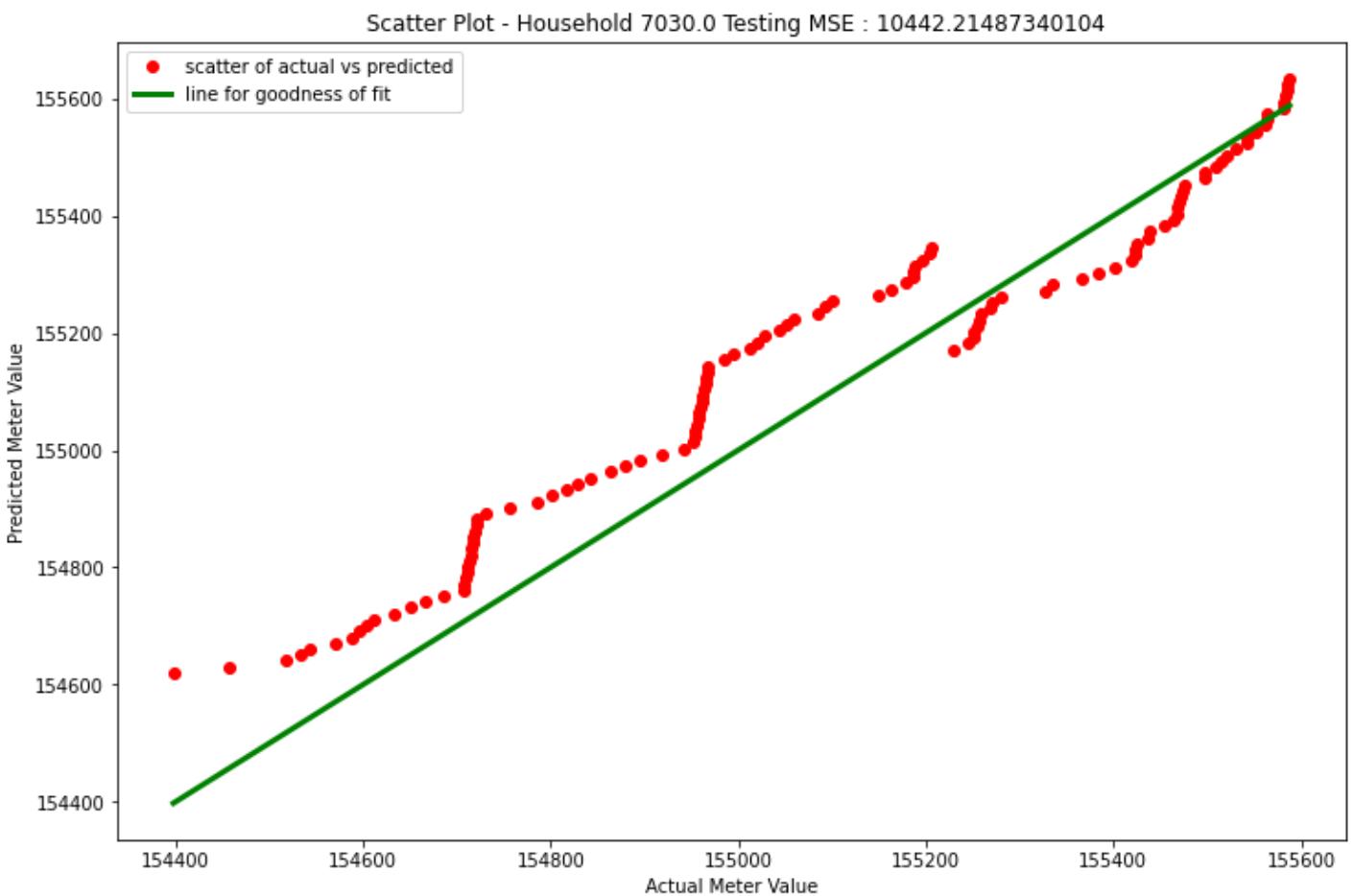
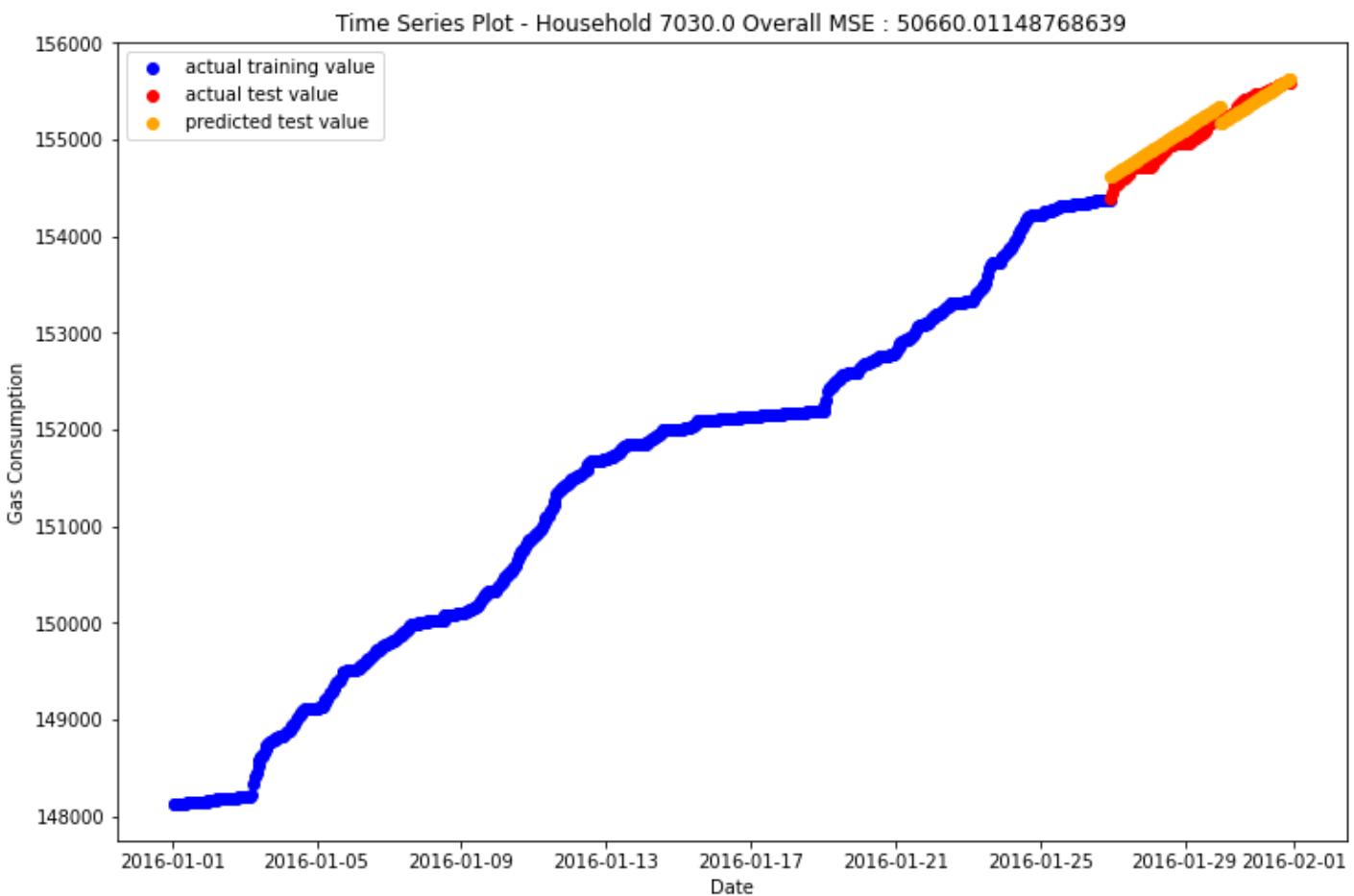


Scatter Plot - Household 6910.0 Testing MSE : 30529.25141647989

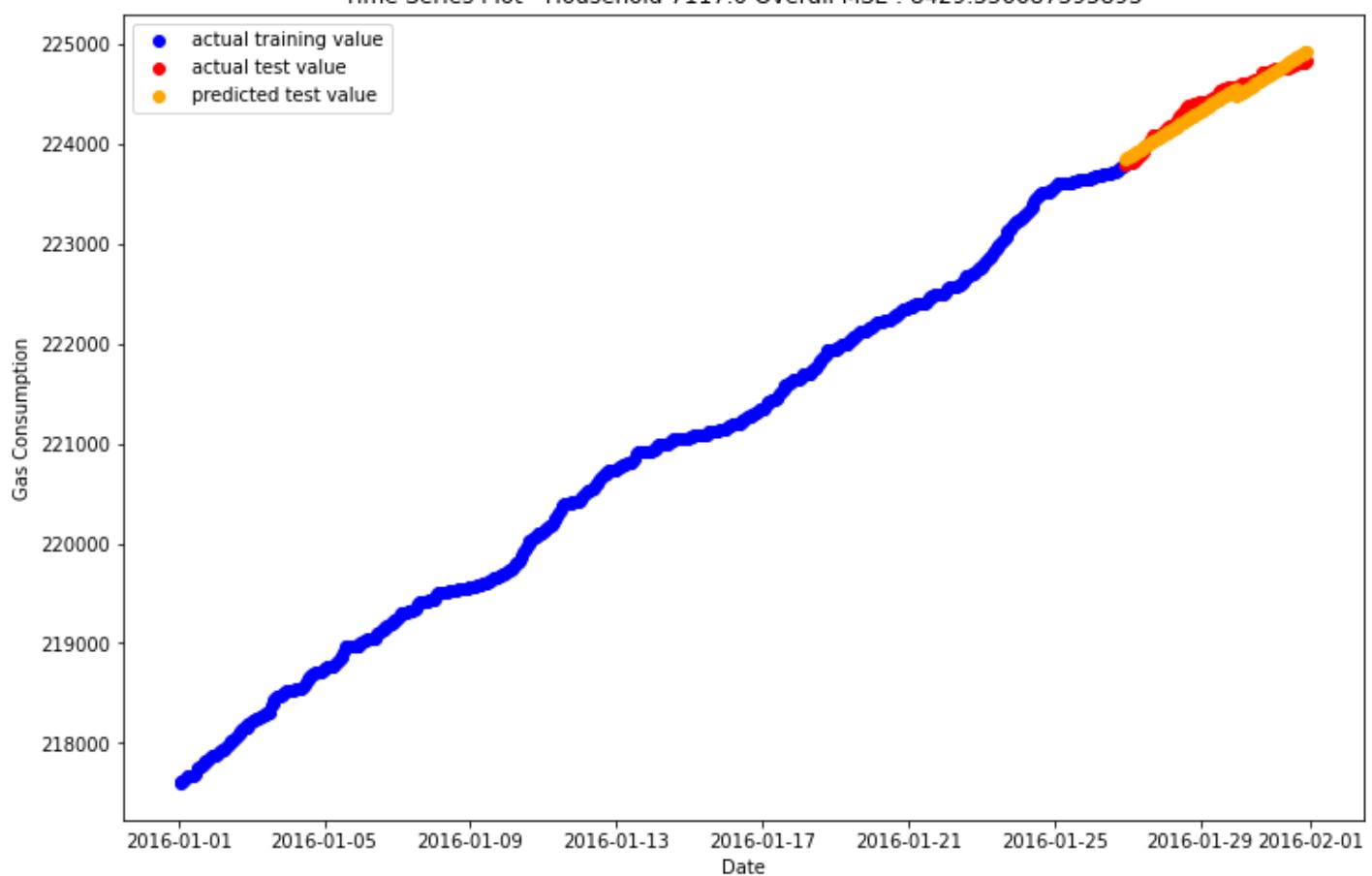




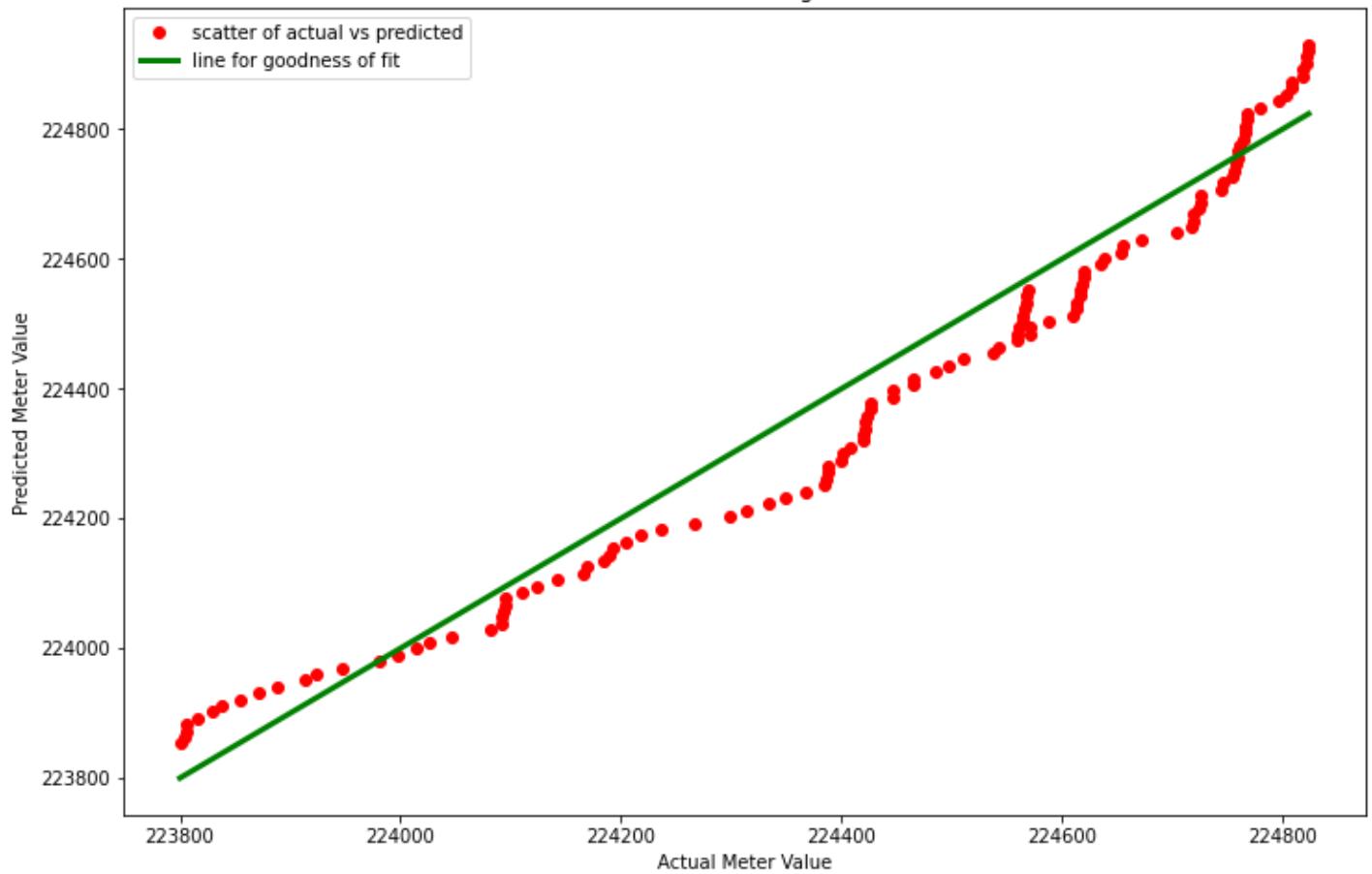




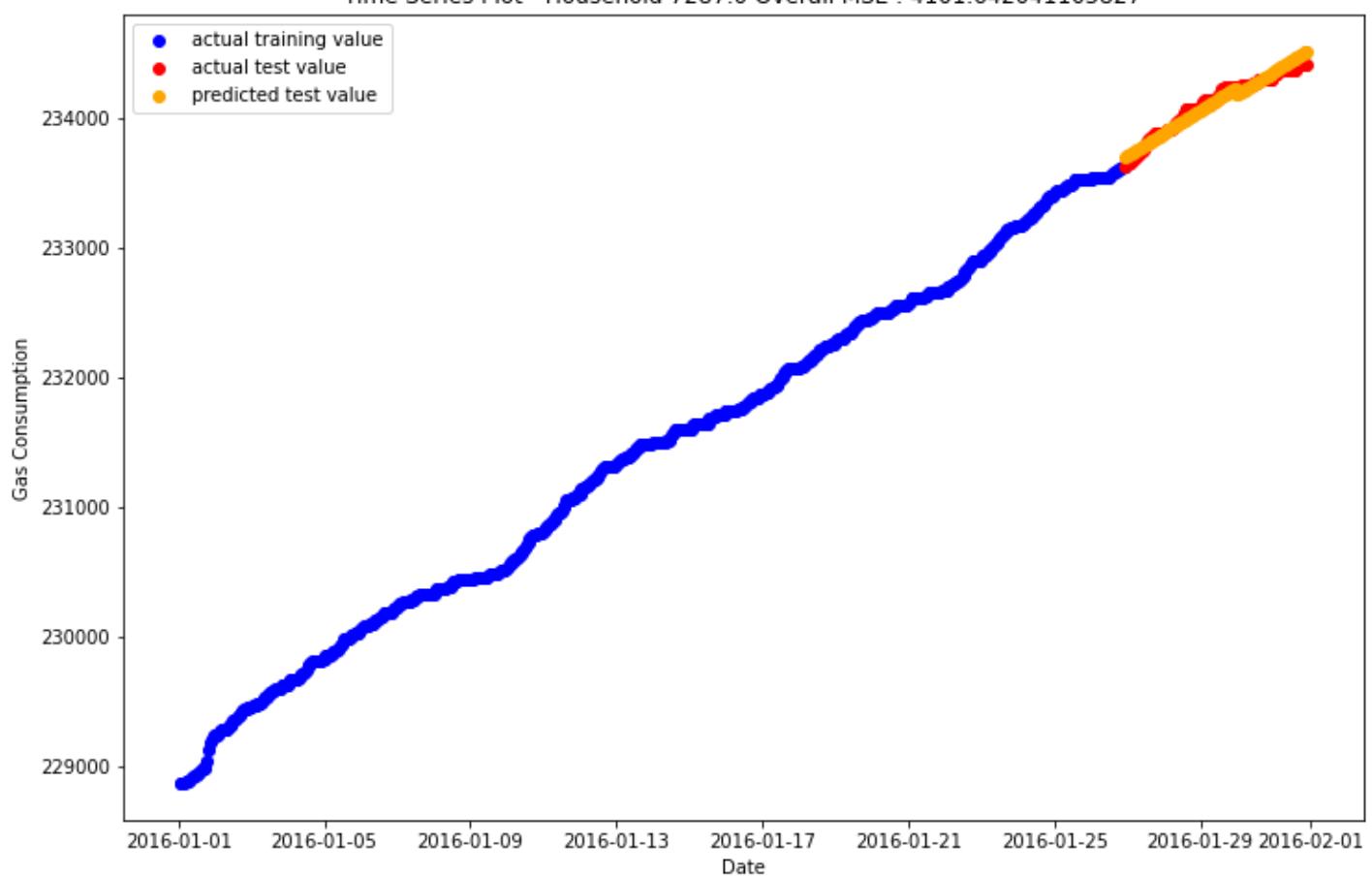
Time Series Plot - Household 7117.0 Overall MSE : 8429.356687395893



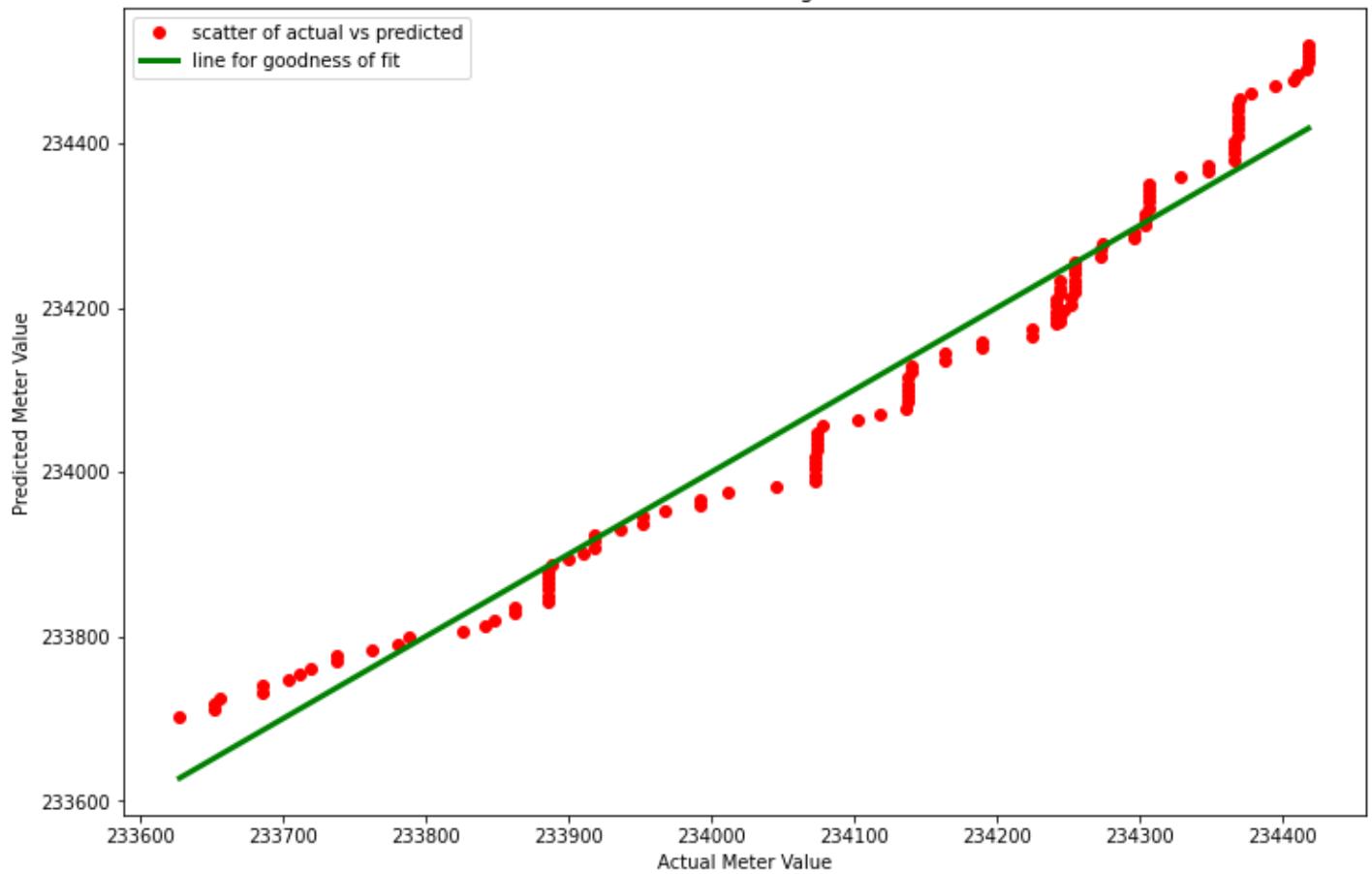
Scatter Plot - Household 7117.0 Testing MSE : 4172.824571101434



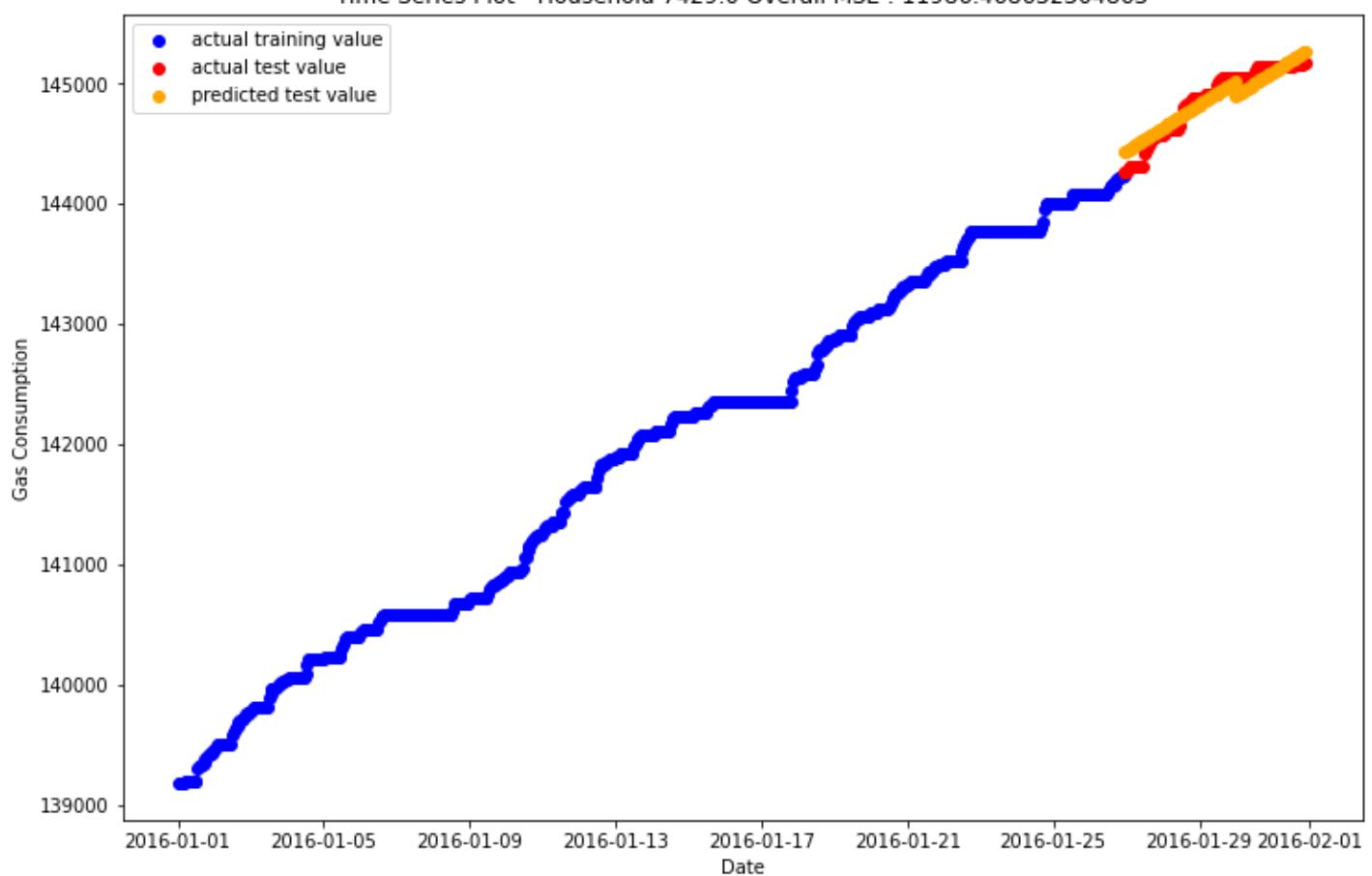
Time Series Plot - Household 7287.0 Overall MSE : 4101.642041105827



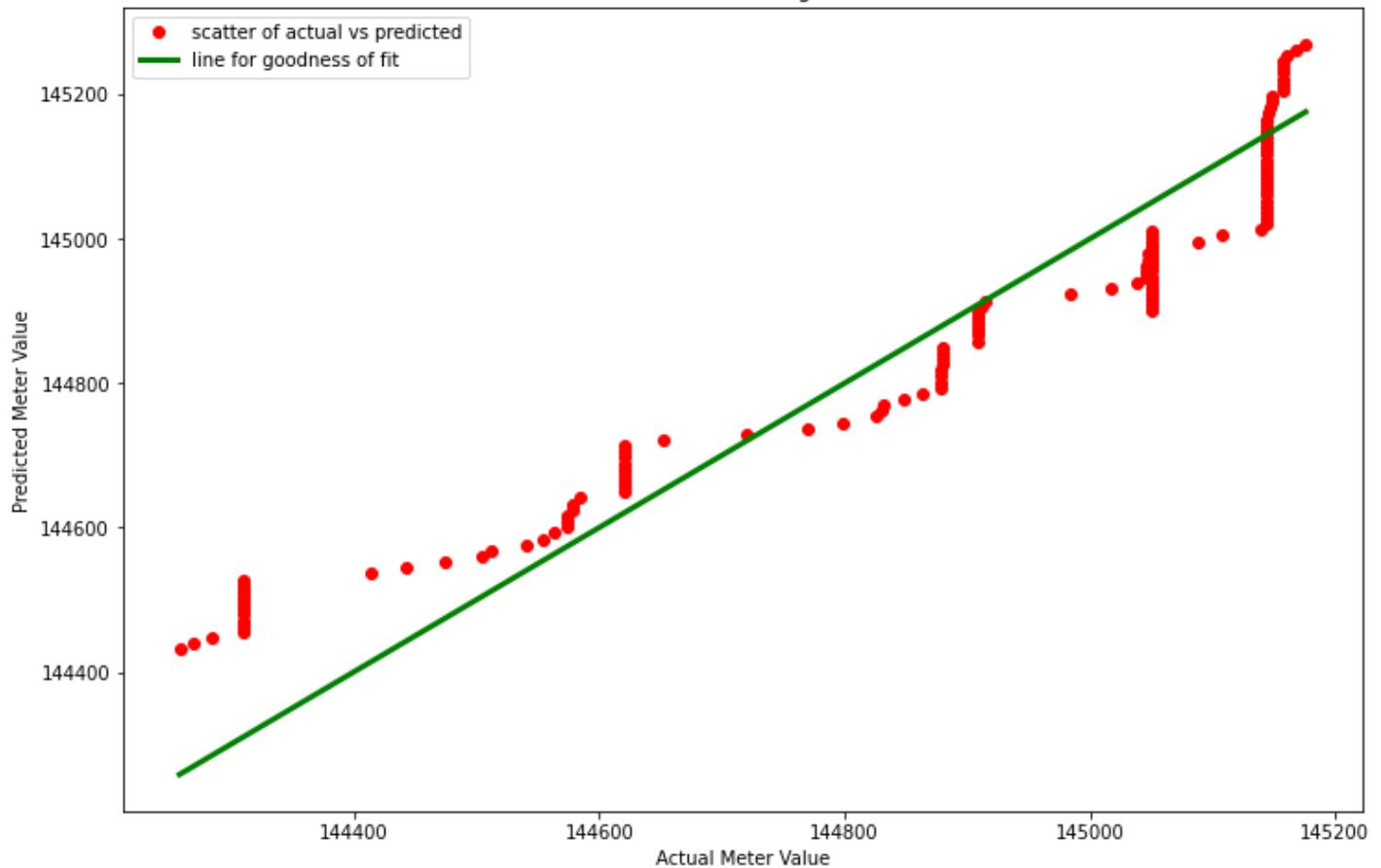
Scatter Plot - Household 7287.0 Testing MSE : 1940.681774300652



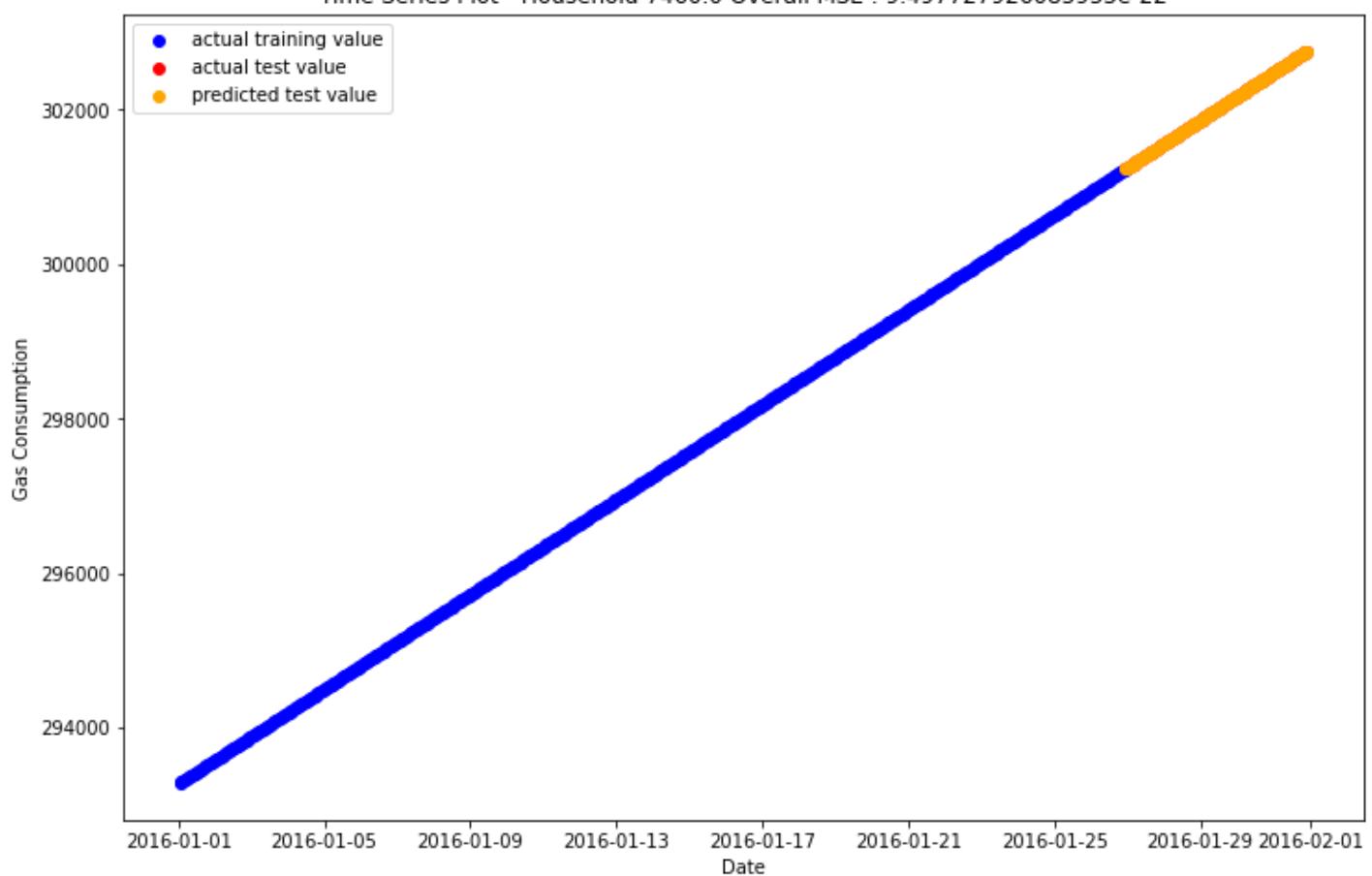
Time Series Plot - Household 7429.0 Overall MSE : 11986.468632304863



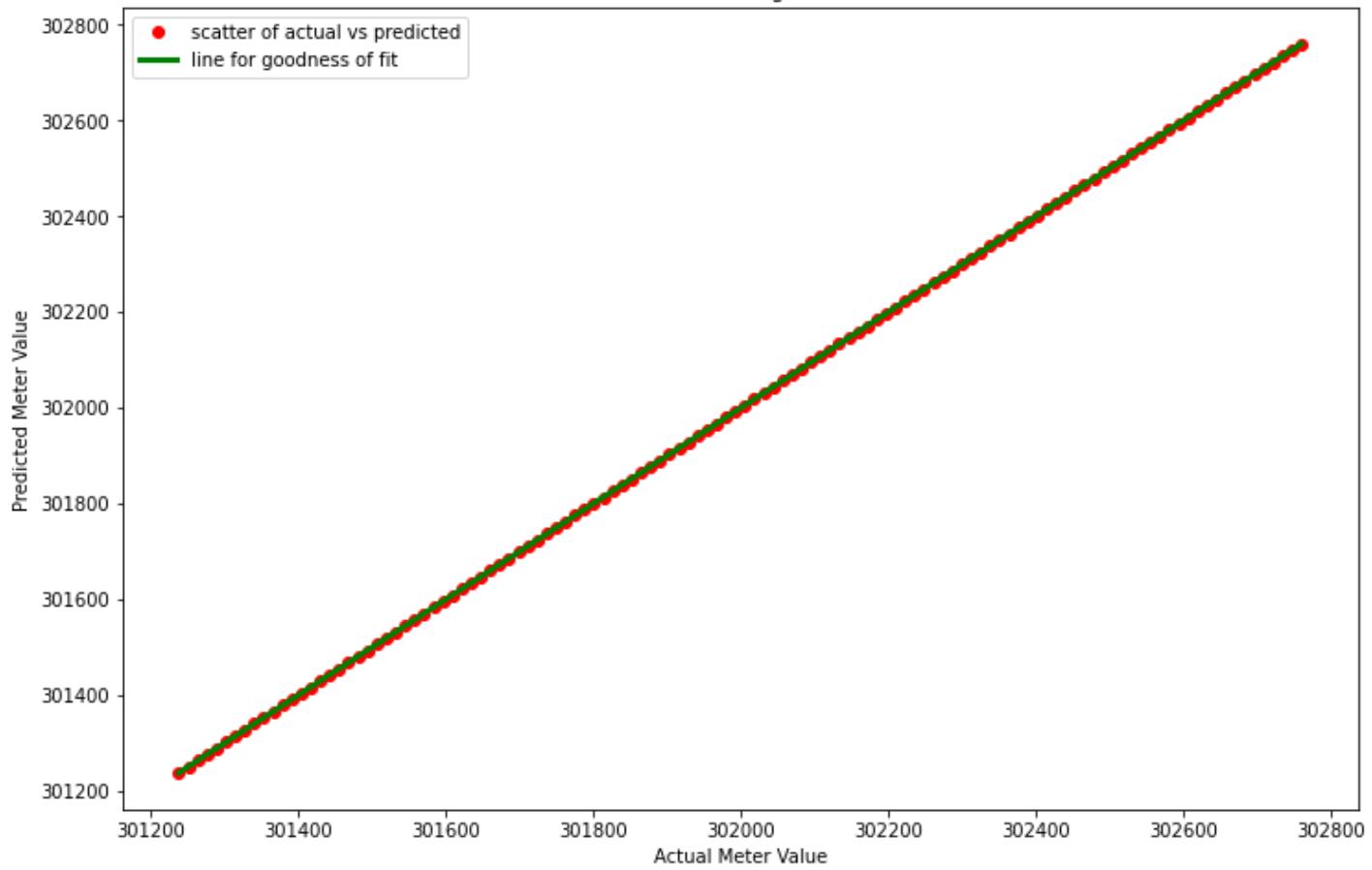
Scatter Plot - Household 7429.0 Testing MSE : 8128.134358669317



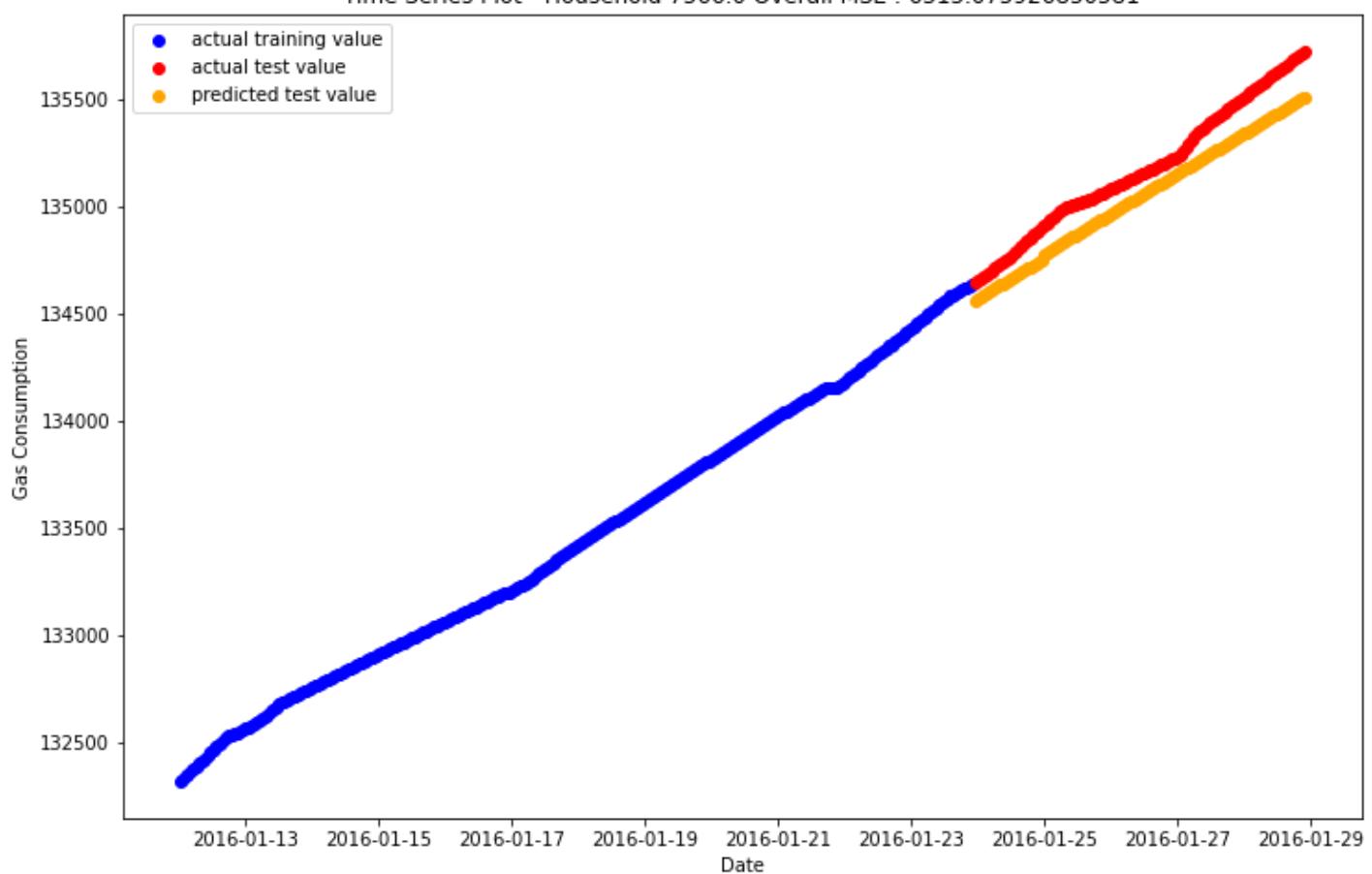
Time Series Plot - Household 7460.0 Overall MSE : 9.497727926085955e-22



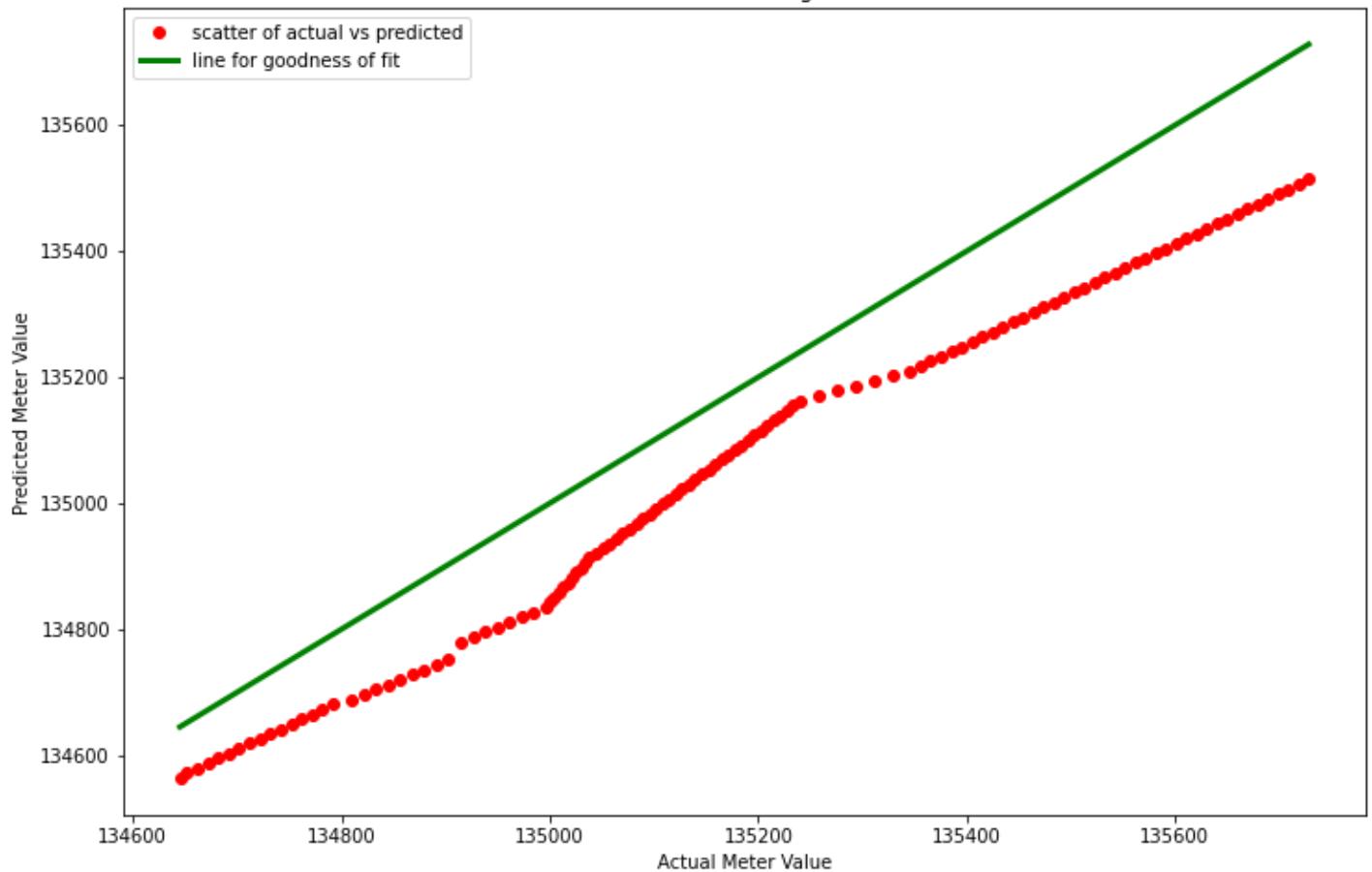
Scatter Plot - Household 7460.0 Testing MSE : 8.470329472543003e-22



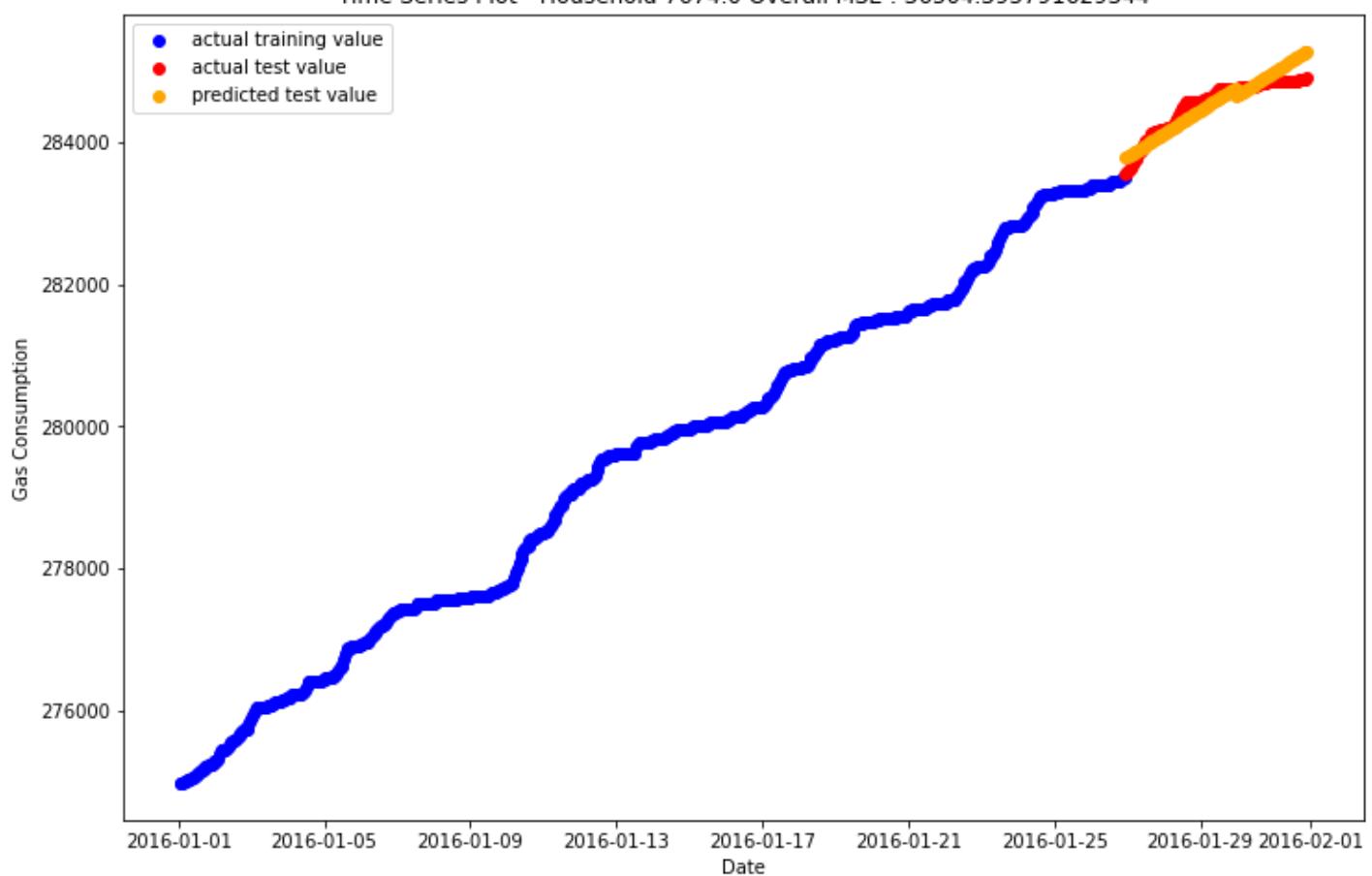
Time Series Plot - Household 7566.0 Overall MSE : 6515.075926850581



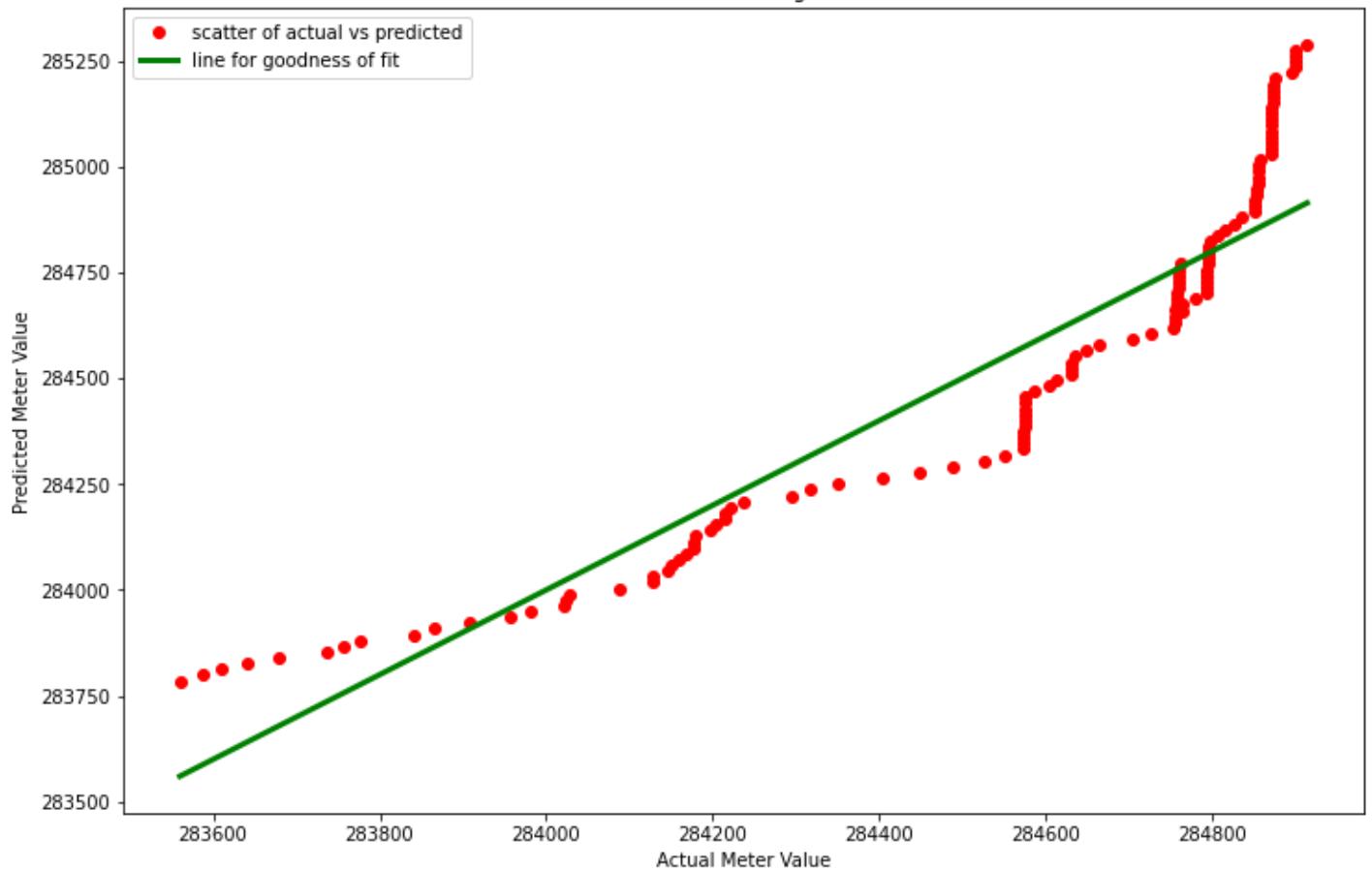
Scatter Plot - Household 7566.0 Testing MSE : 19391.41925836017



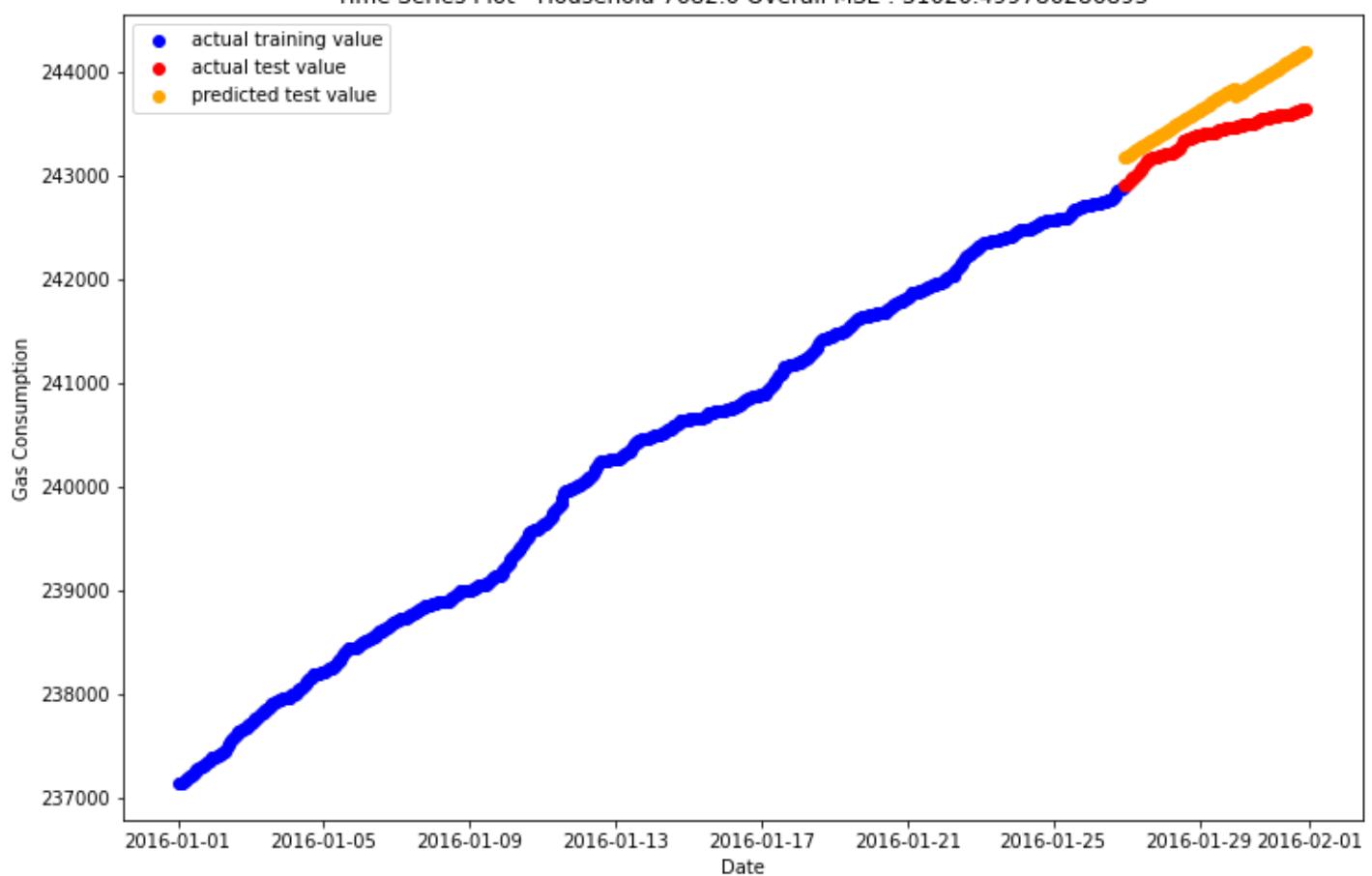
Time Series Plot - Household 7674.0 Overall MSE : 36504.395791629344



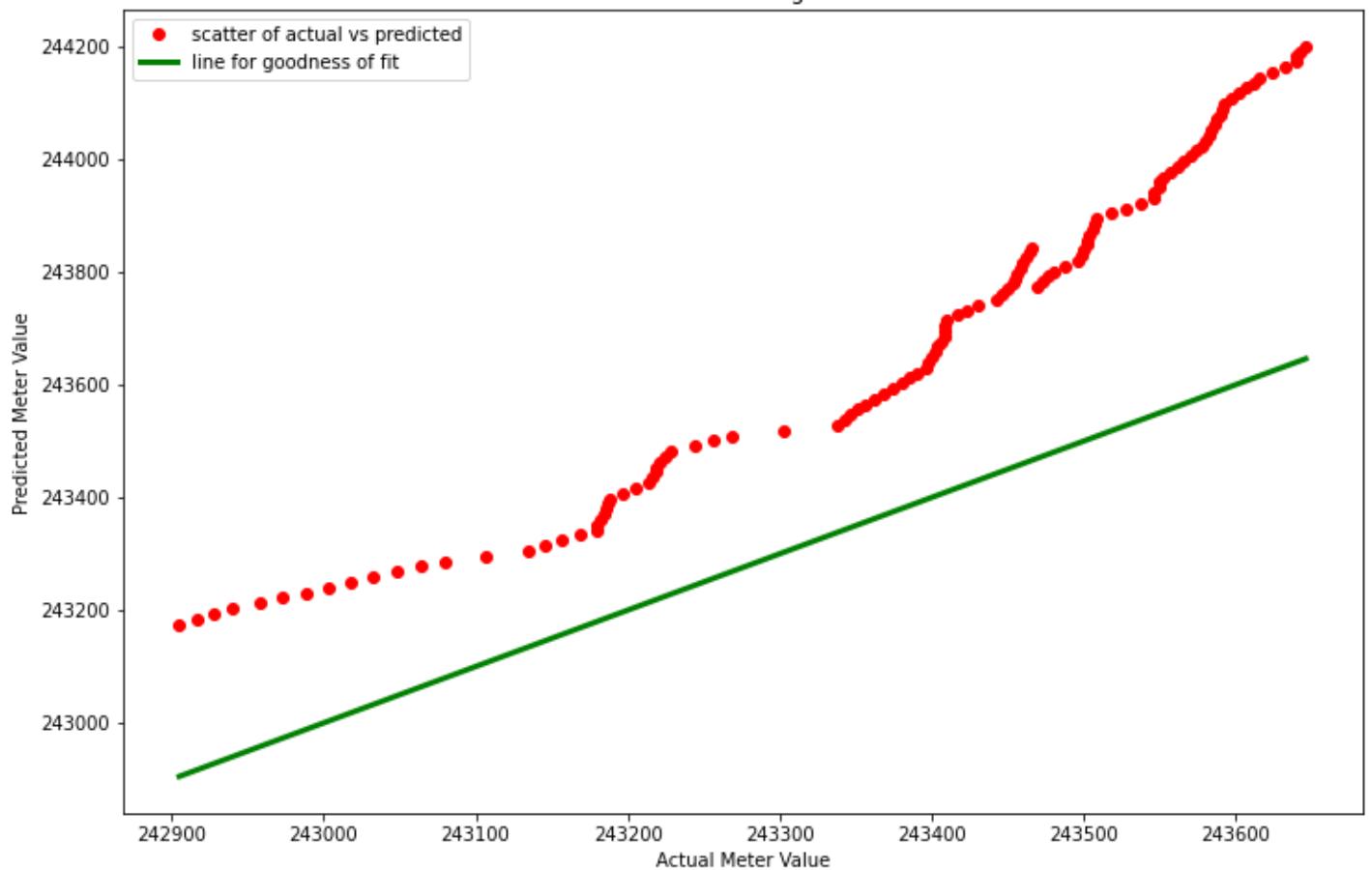
Scatter Plot - Household 7674.0 Testing MSE : 24073.281424893074



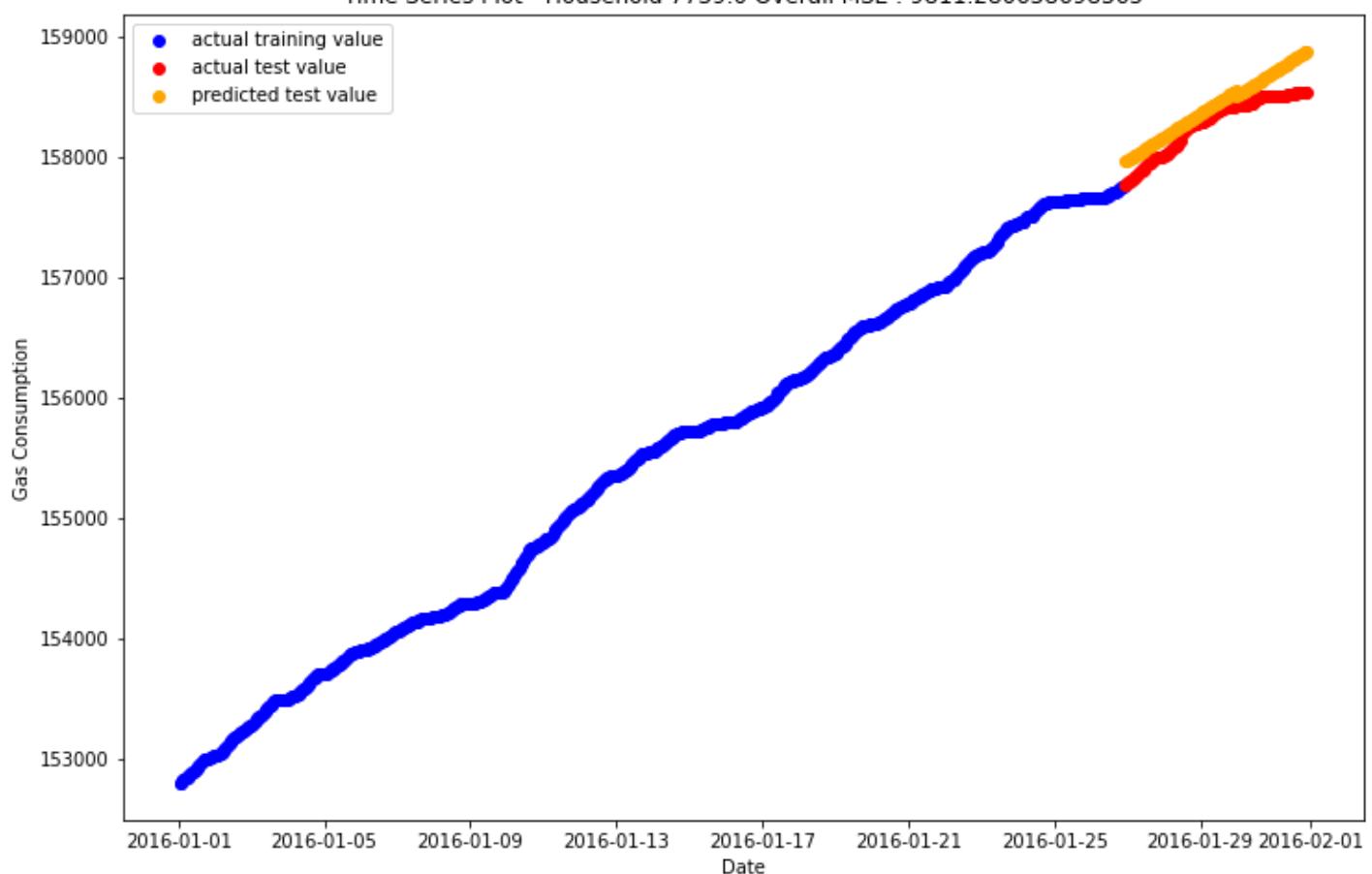
Time Series Plot - Household 7682.0 Overall MSE : 31020.499786286895



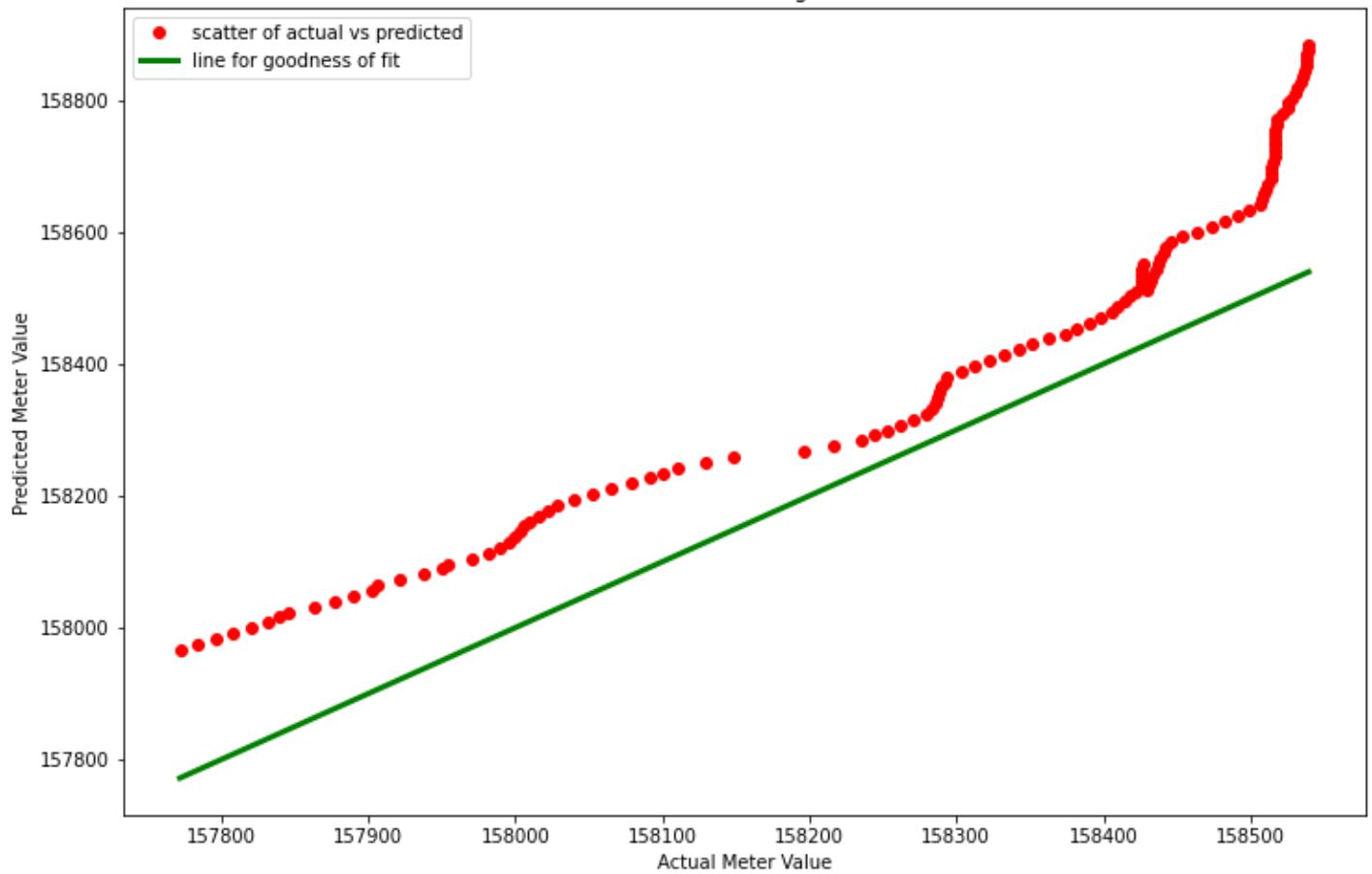
Scatter Plot - Household 7682.0 Testing MSE : 113434.09061592404



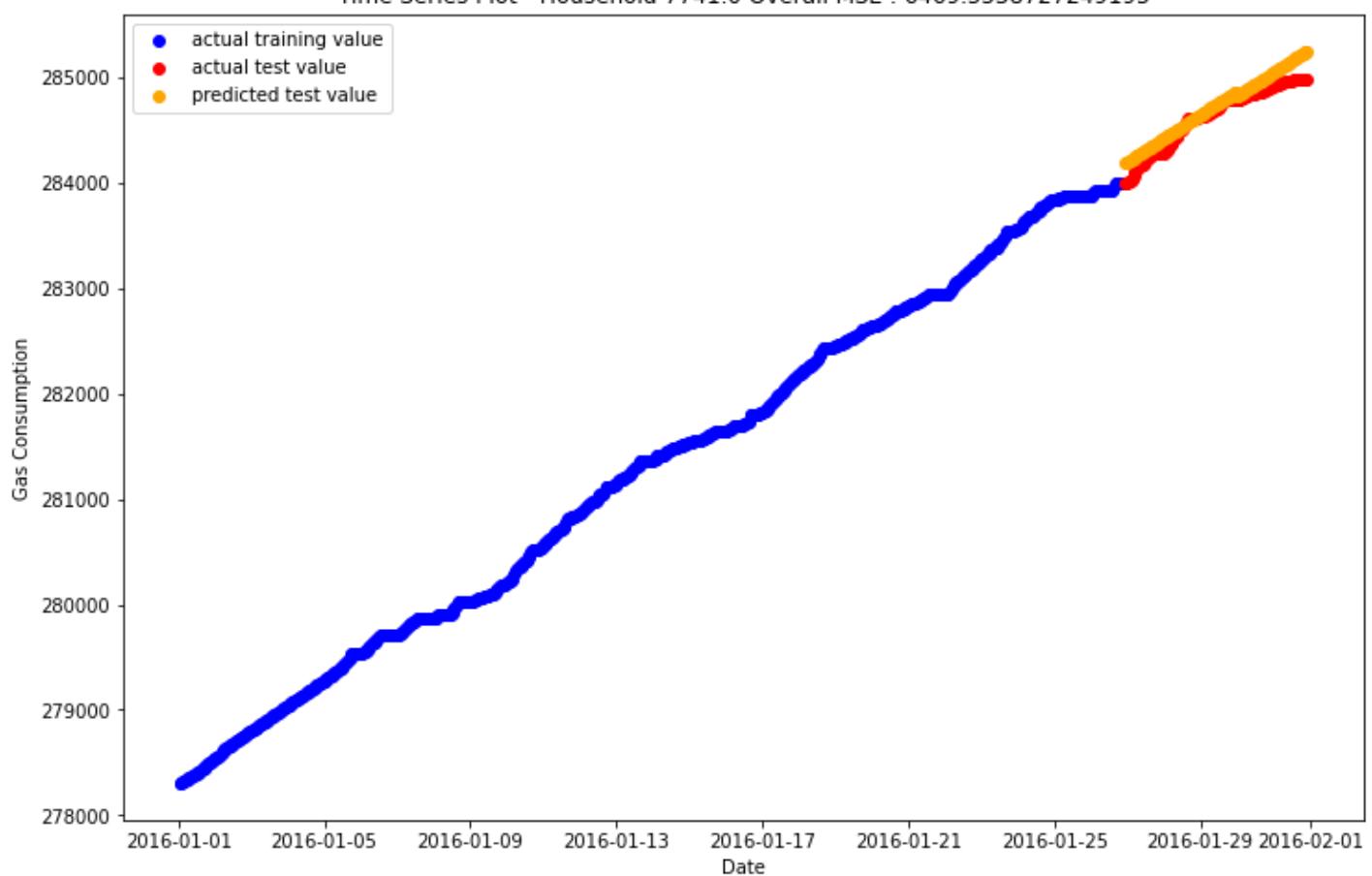
Time Series Plot - Household 7739.0 Overall MSE : 9811.280638698365



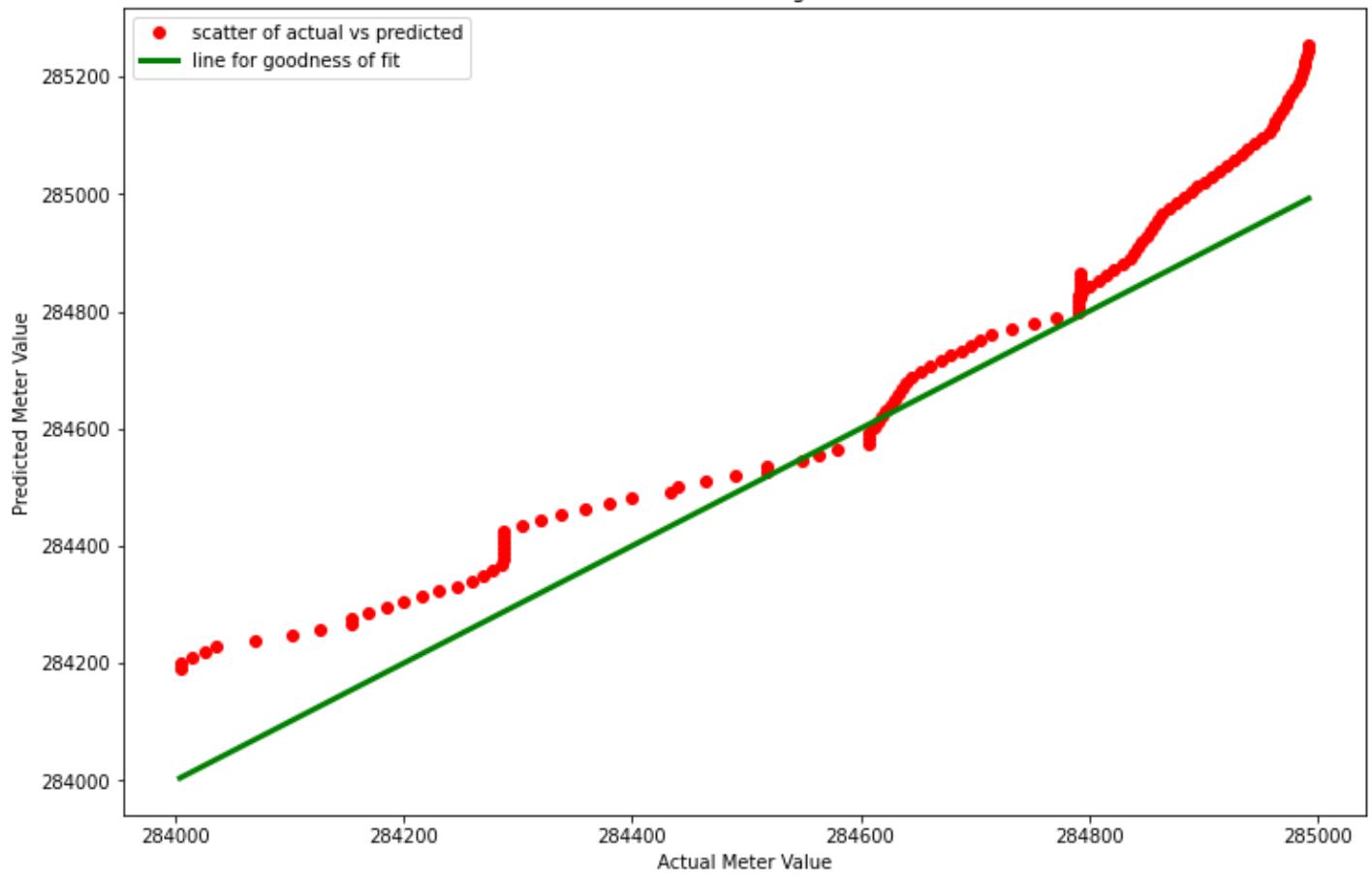
Scatter Plot - Household 7739.0 Testing MSE : 27005.075326009202



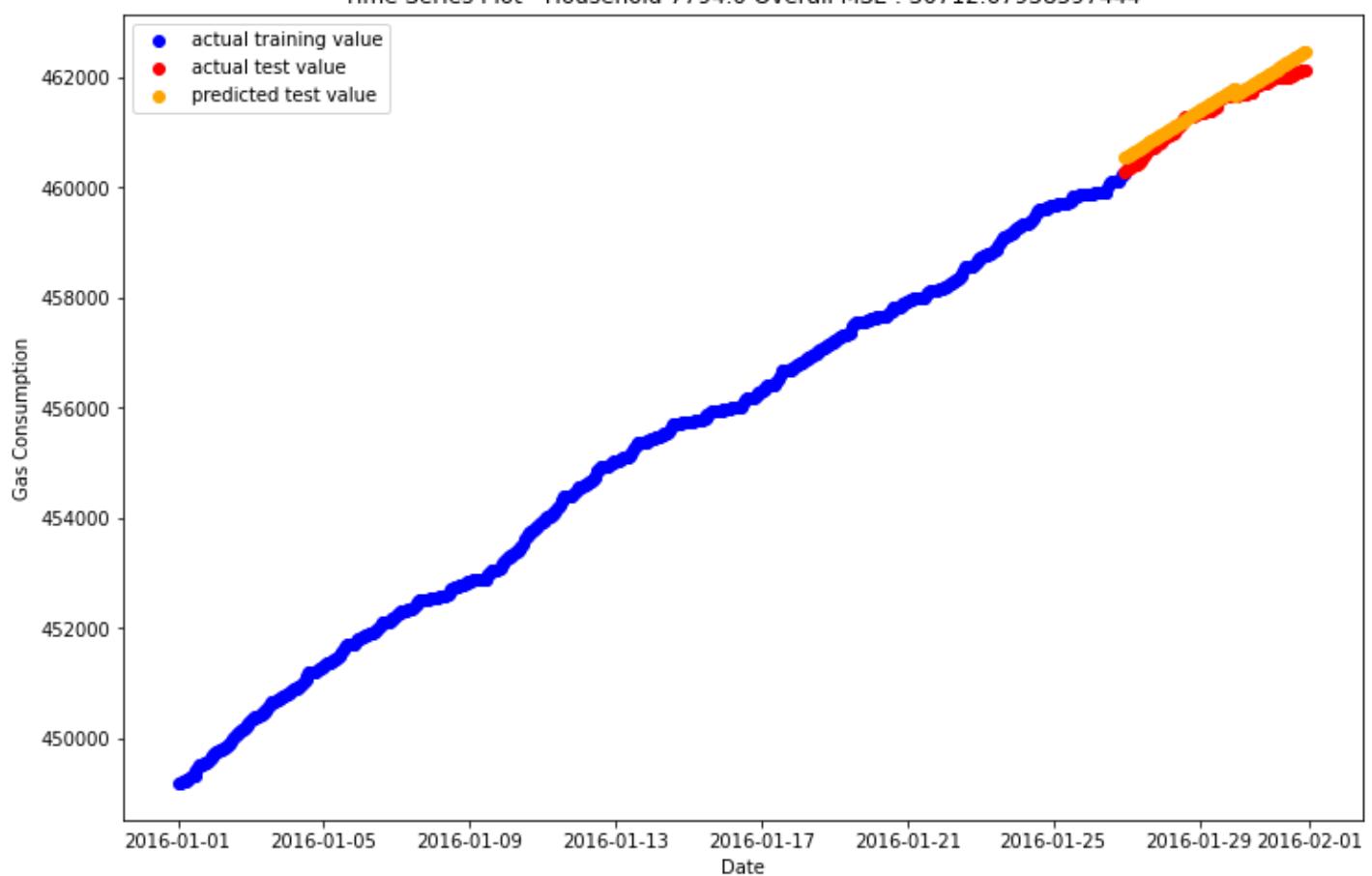
Time Series Plot - Household 7741.0 Overall MSE : 6469.5538727249195



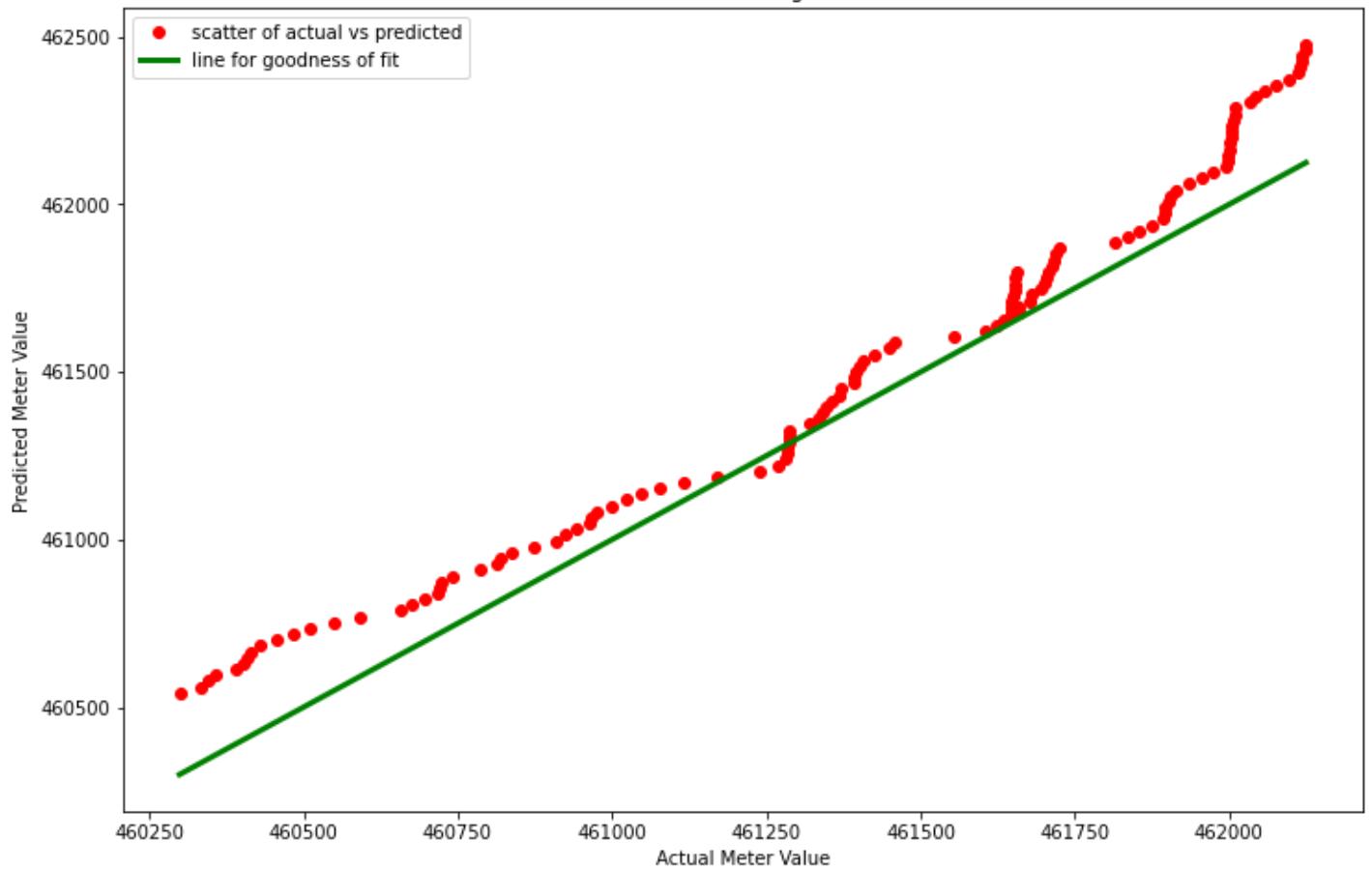
Scatter Plot - Household 7741.0 Testing MSE : 13159.391496697297



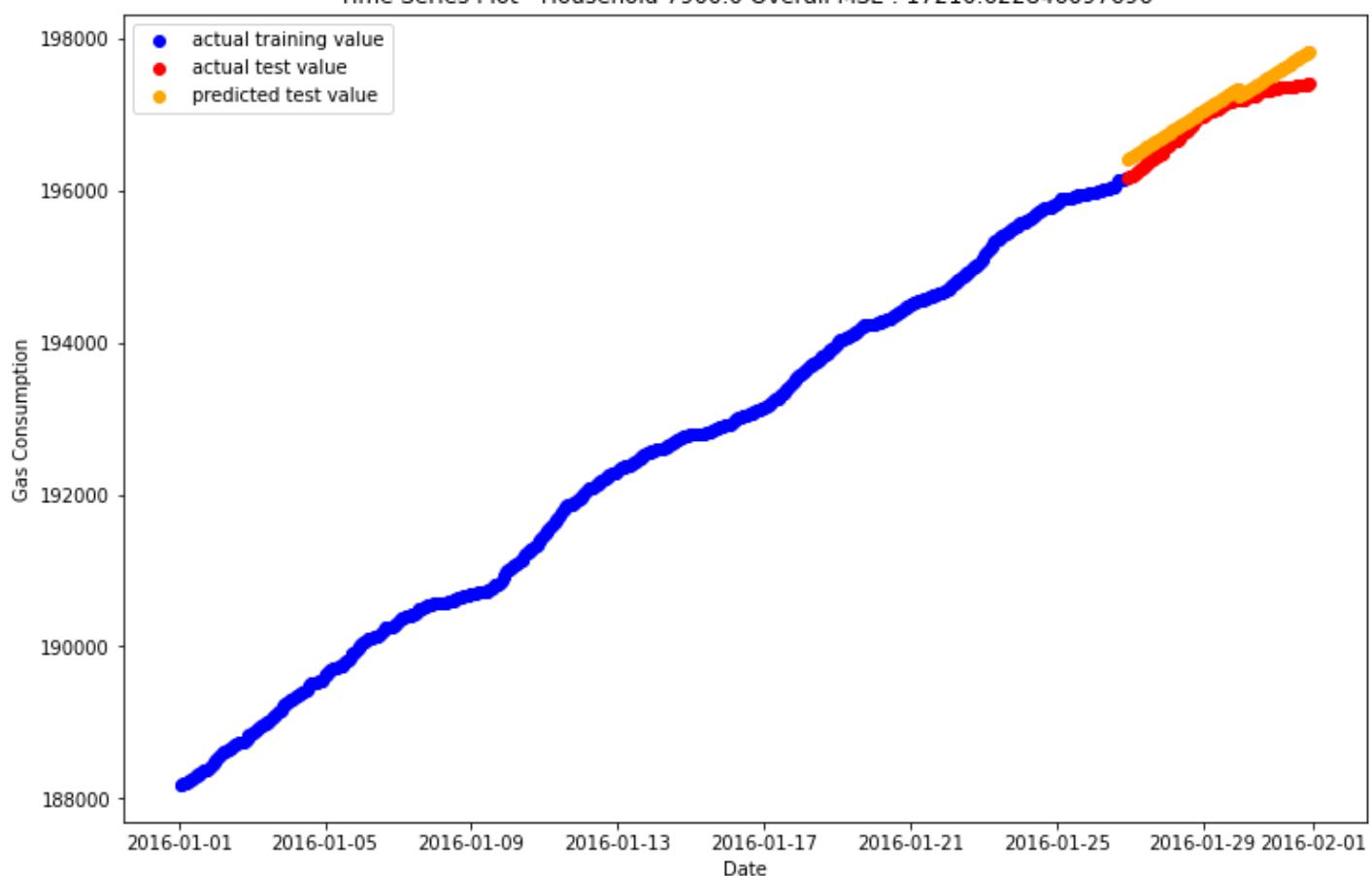
Time Series Plot - Household 7794.0 Overall MSE : 30712.67938597444



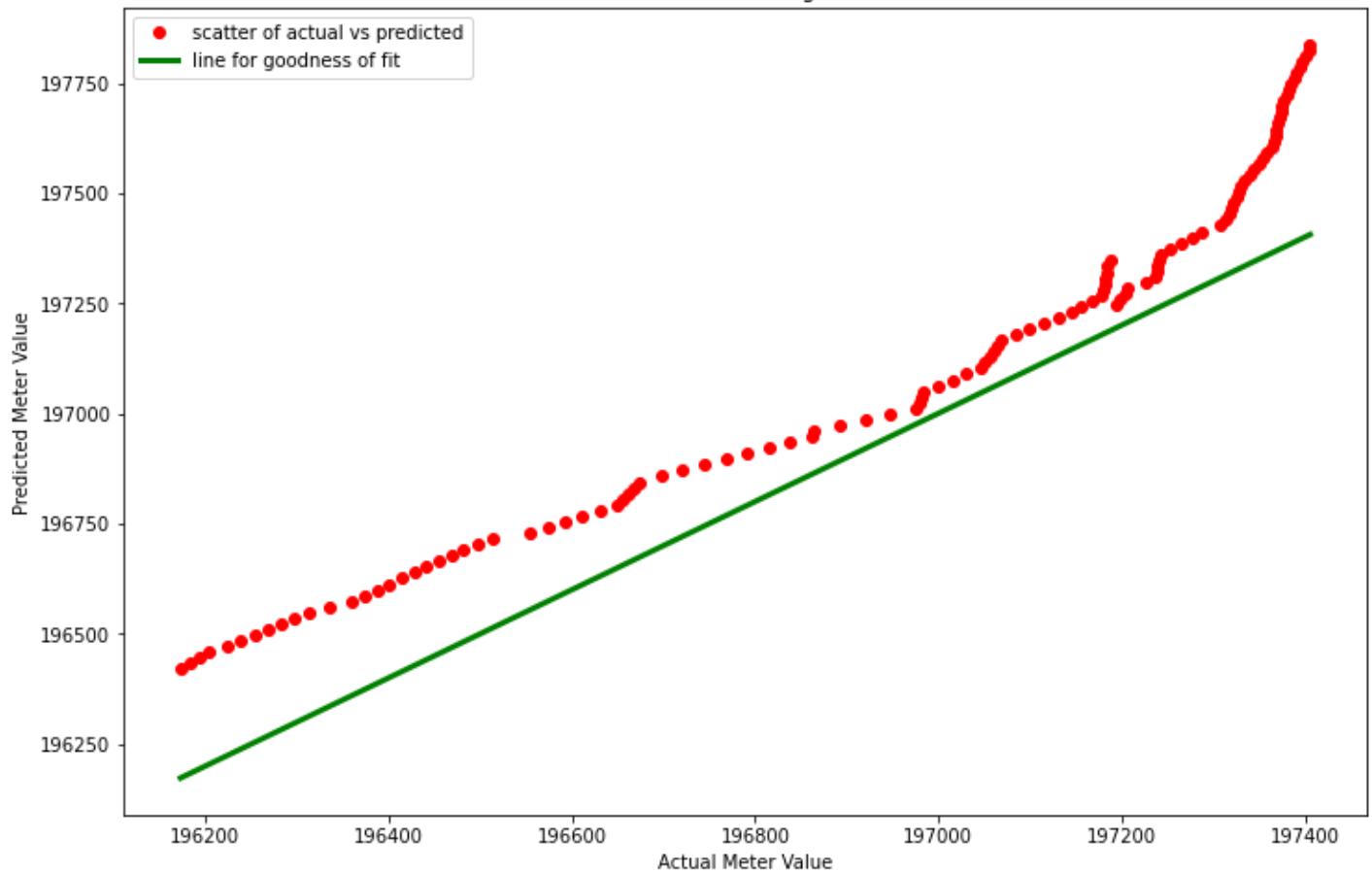
Scatter Plot - Household 7794.0 Testing MSE : 24182.952646350728



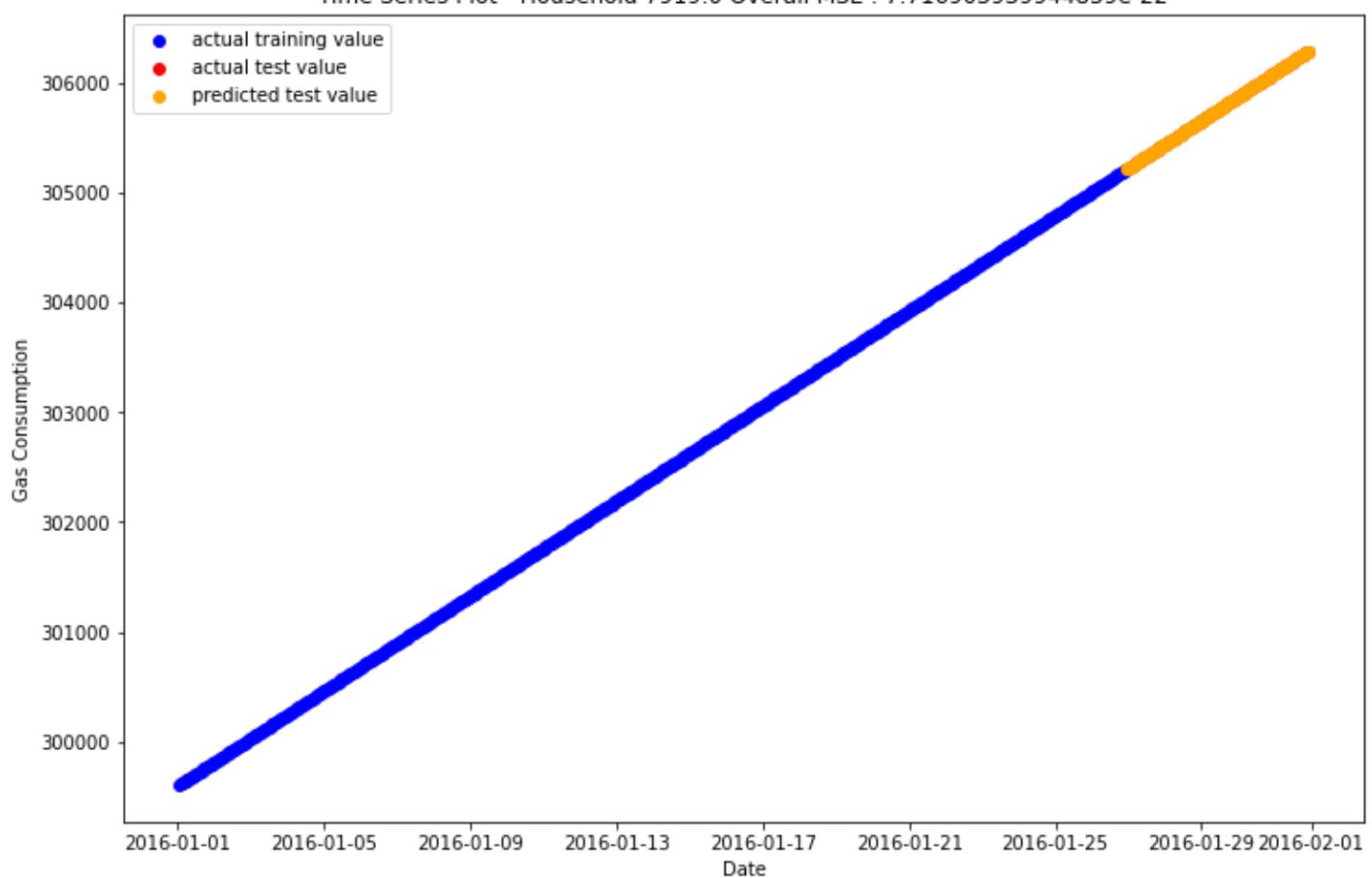
Time Series Plot - Household 7900.0 Overall MSE : 17210.622846097696



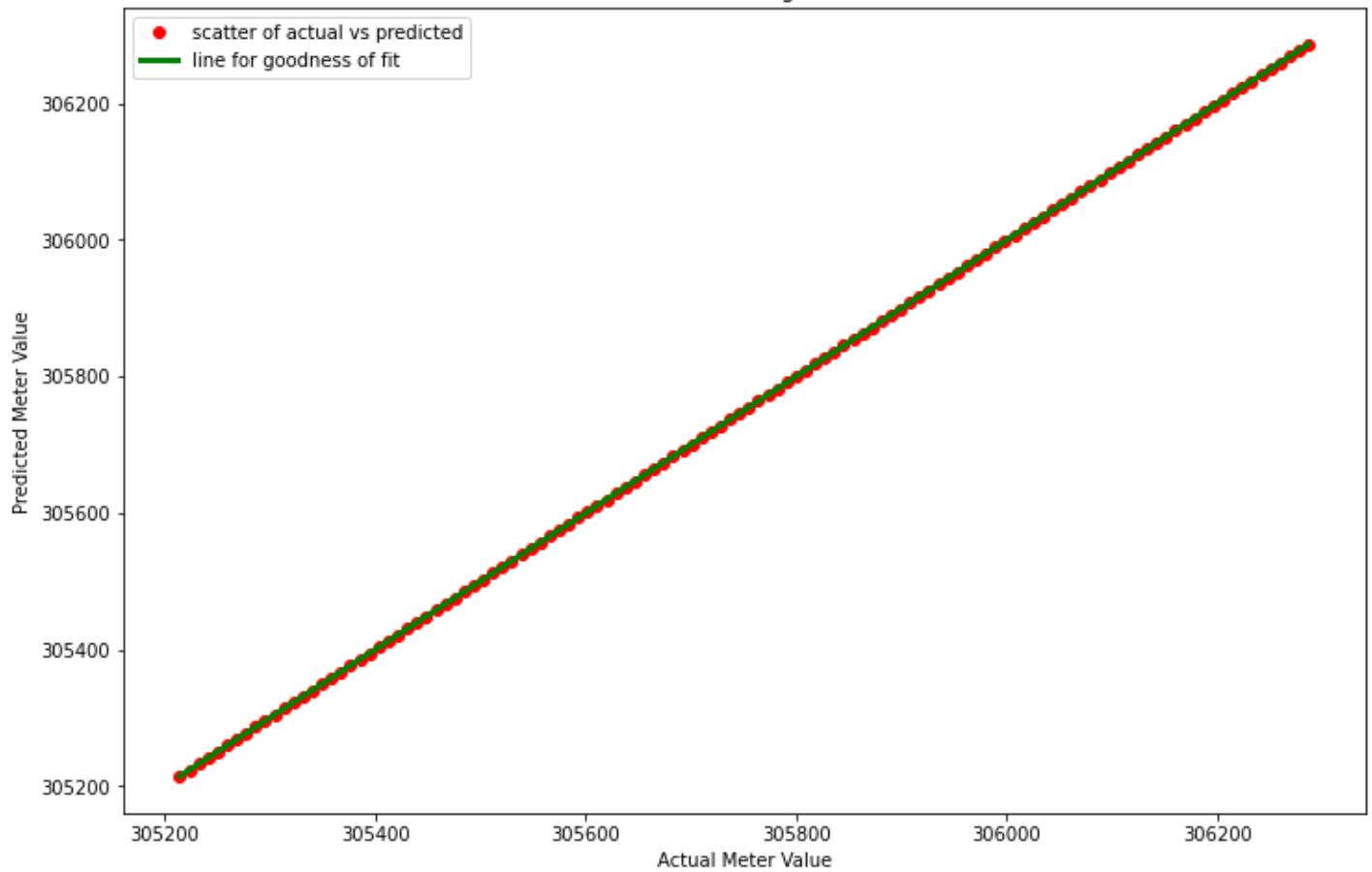
Scatter Plot - Household 7900.0 Testing MSE : 39285.61060174841



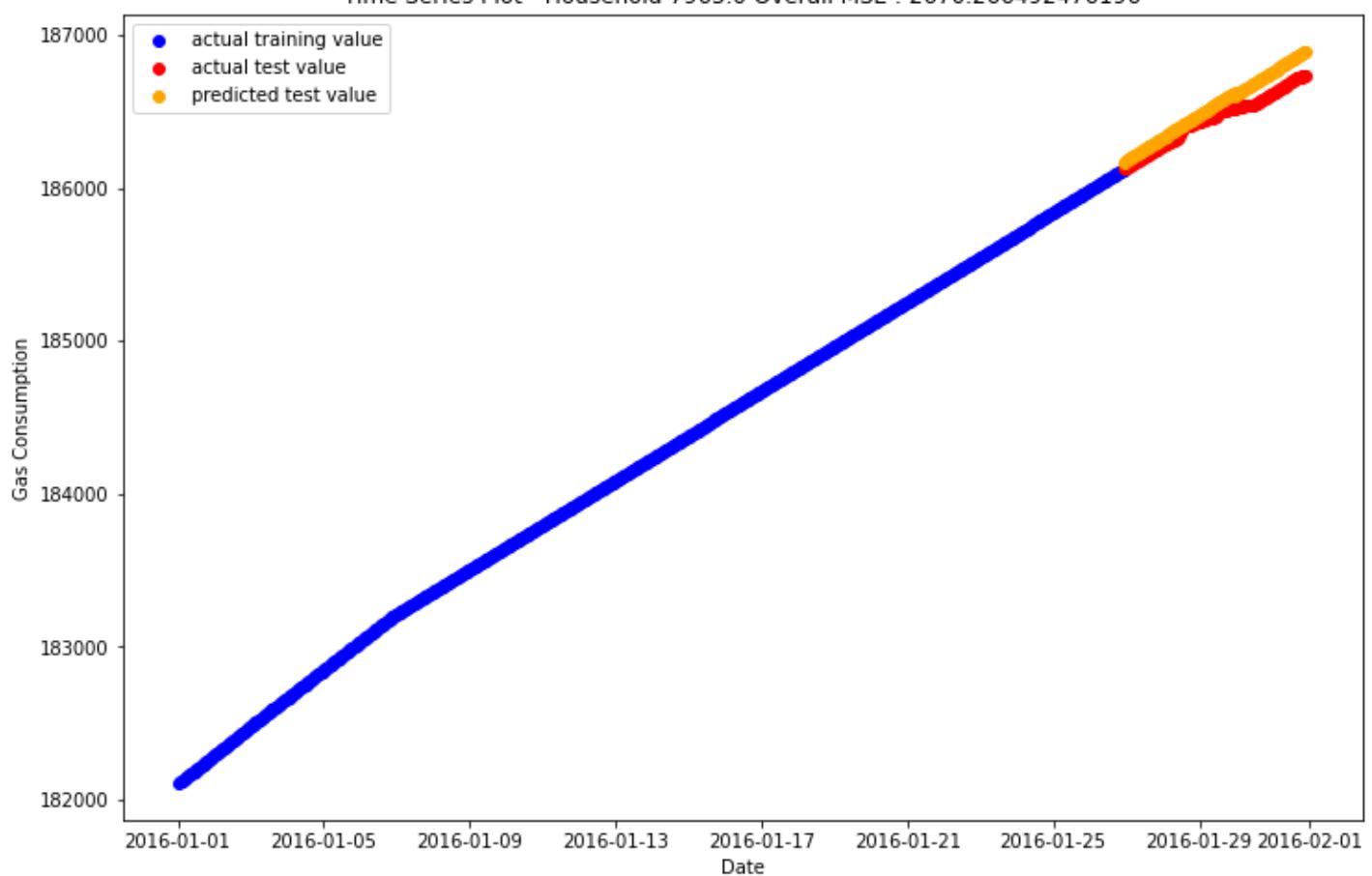
Time Series Plot - Household 7919.0 Overall MSE : 7.716903939944839e-22



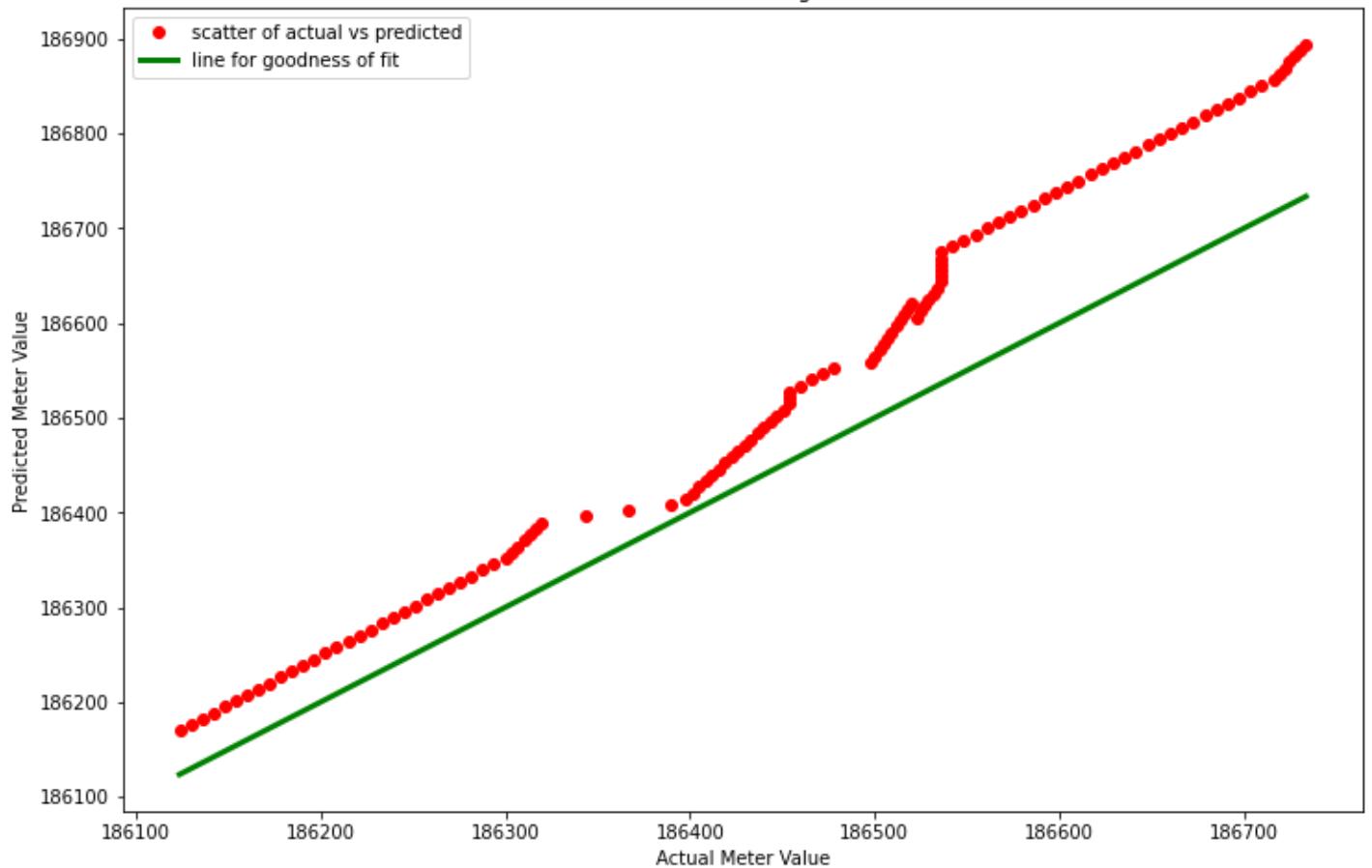
Scatter Plot - Household 7919.0 Testing MSE : 7.34095220953727e-22



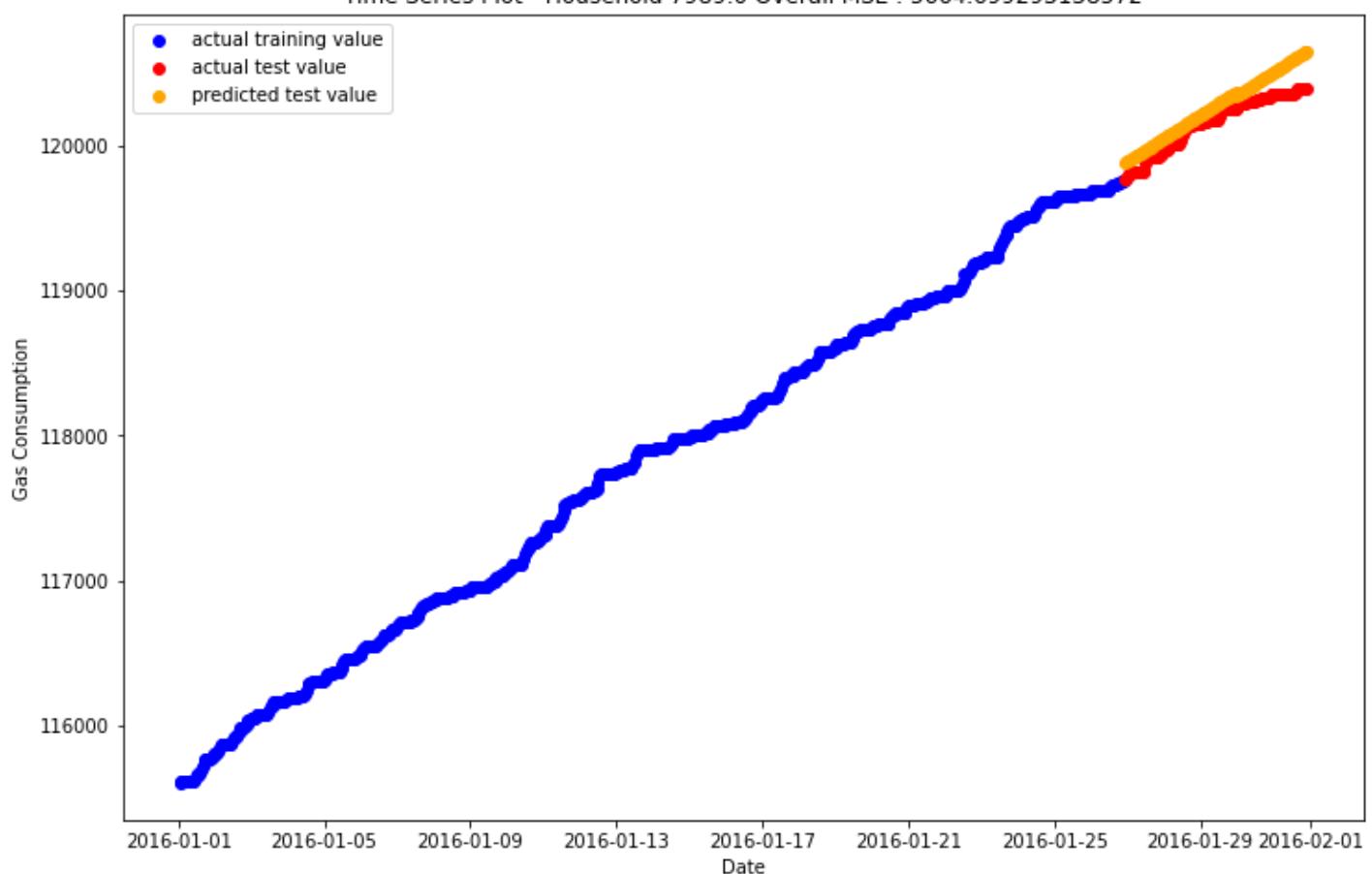
Time Series Plot - Household 7965.0 Overall MSE : 2670.266492476196



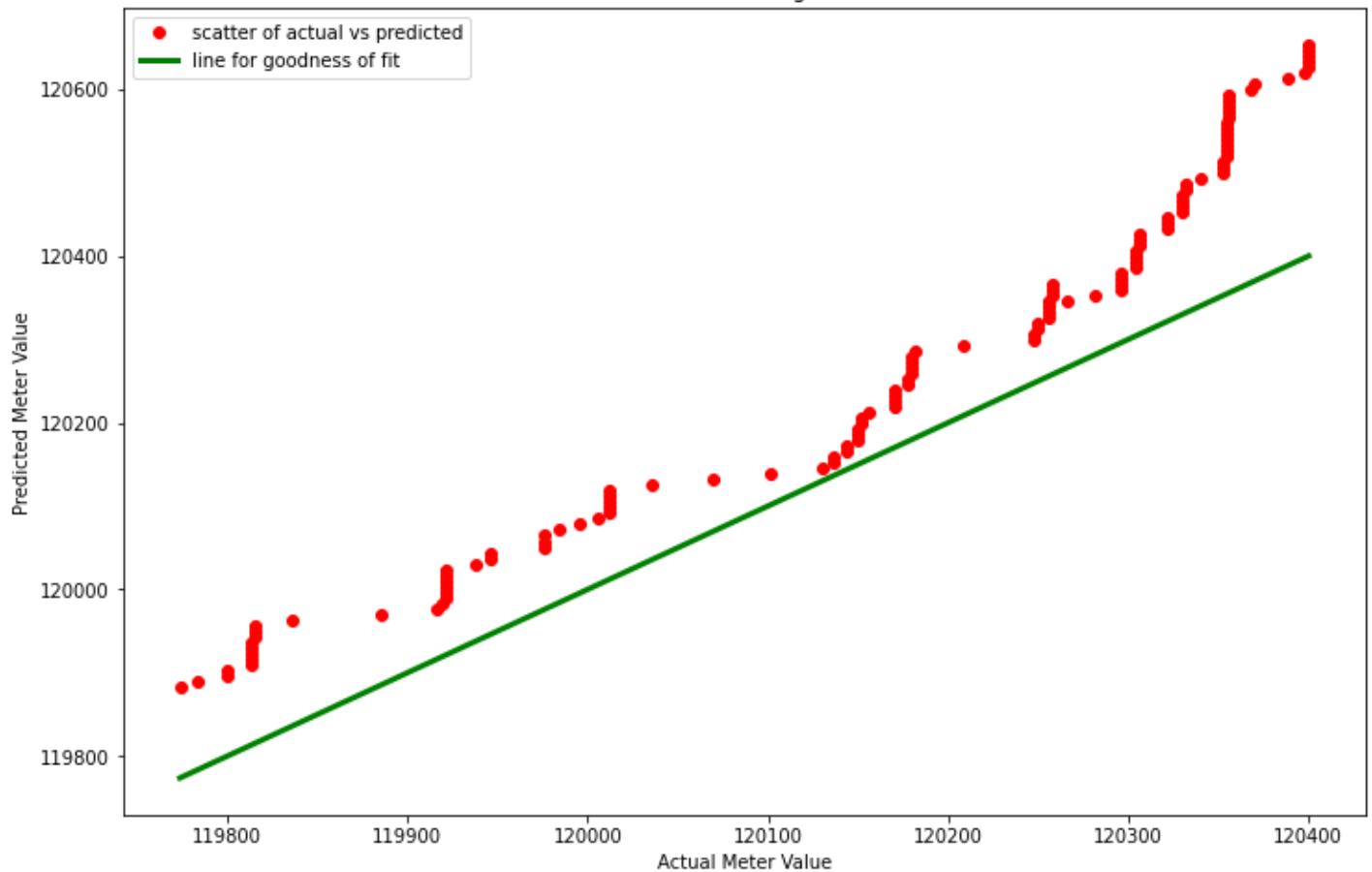
Scatter Plot - Household 7965.0 Testing MSE : 9054.505673564488



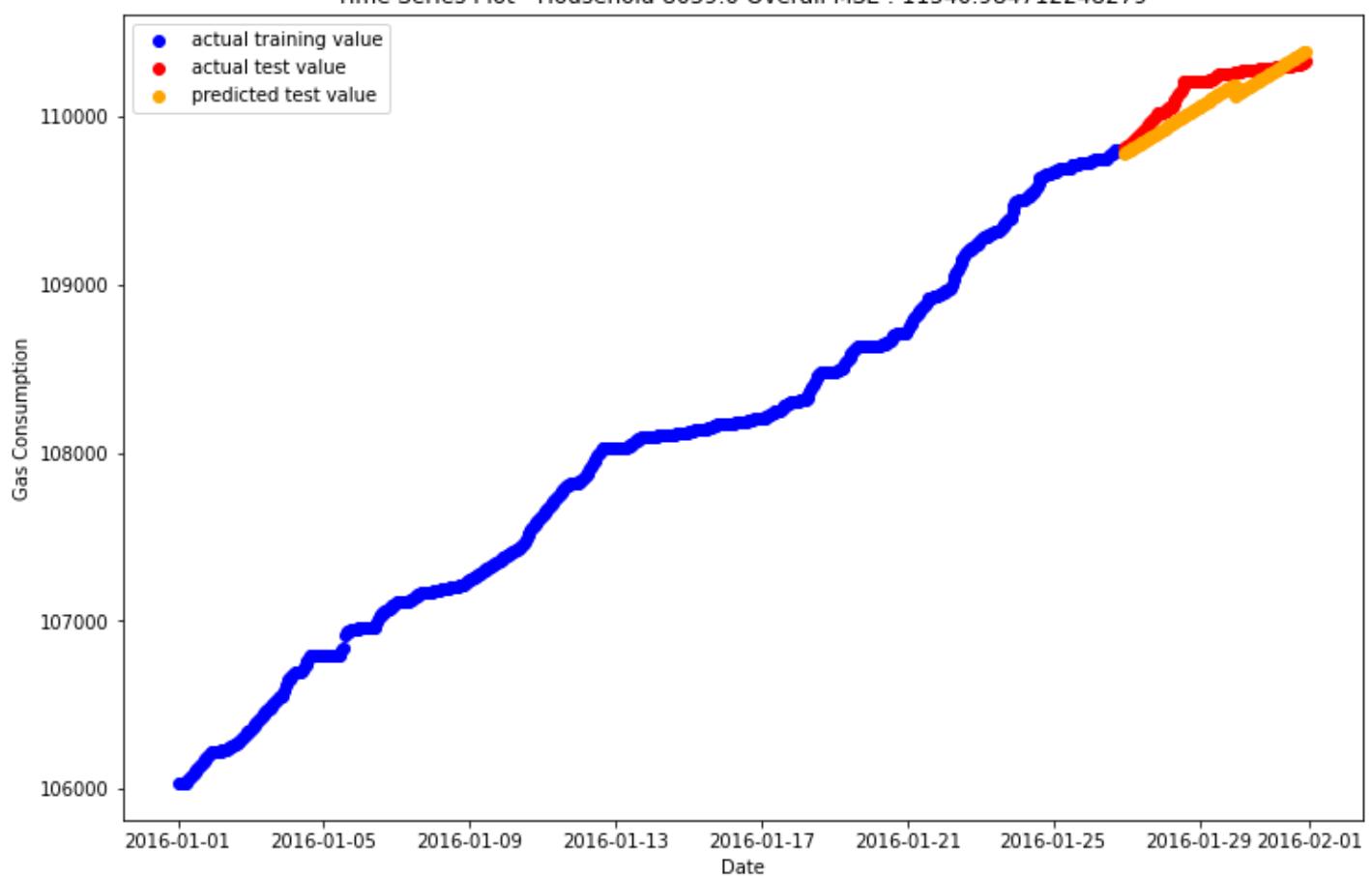
Time Series Plot - Household 7989.0 Overall MSE : 5664.699293138572



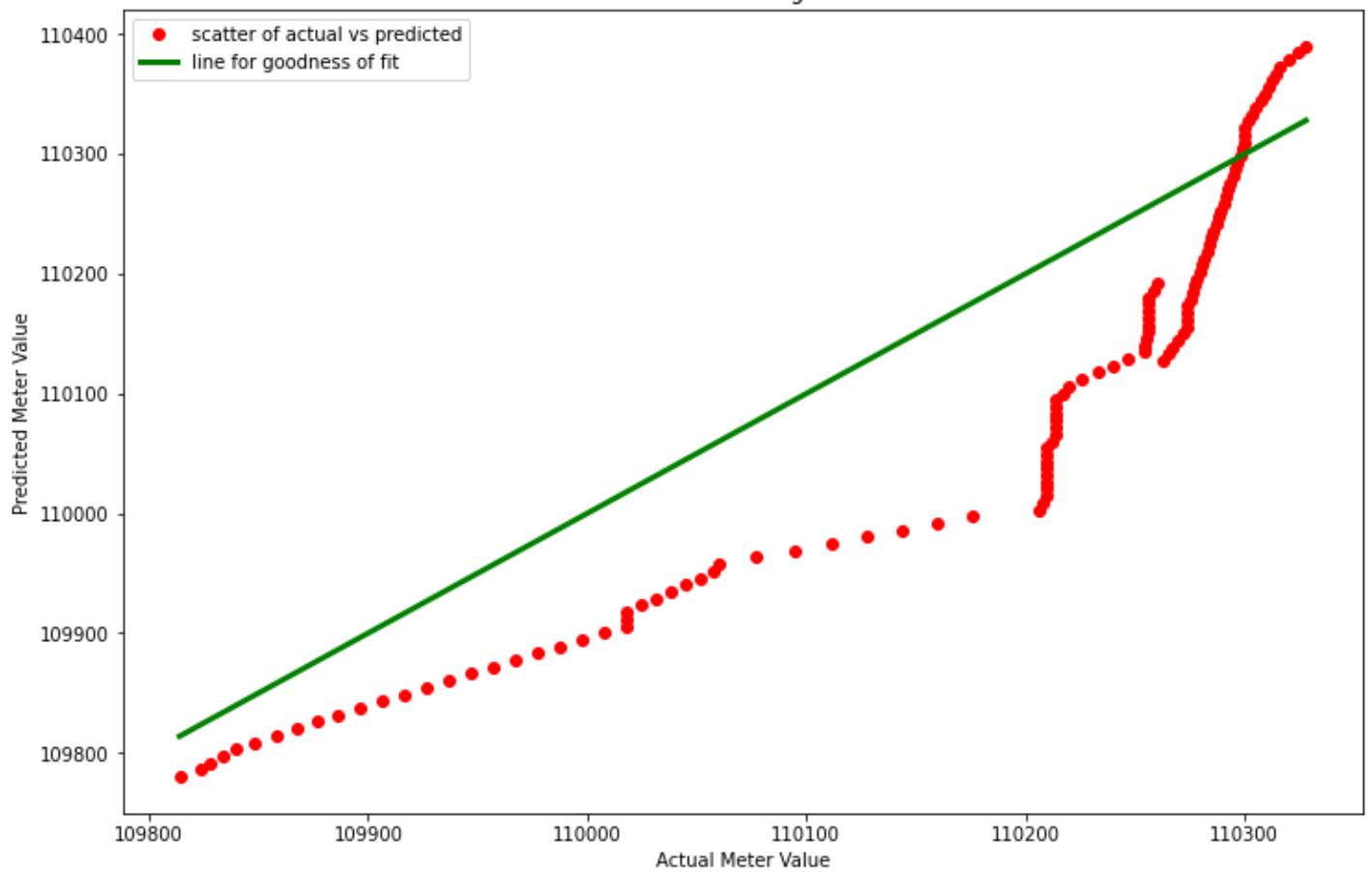
Scatter Plot - Household 7989.0 Testing MSE : 15584.349491660107



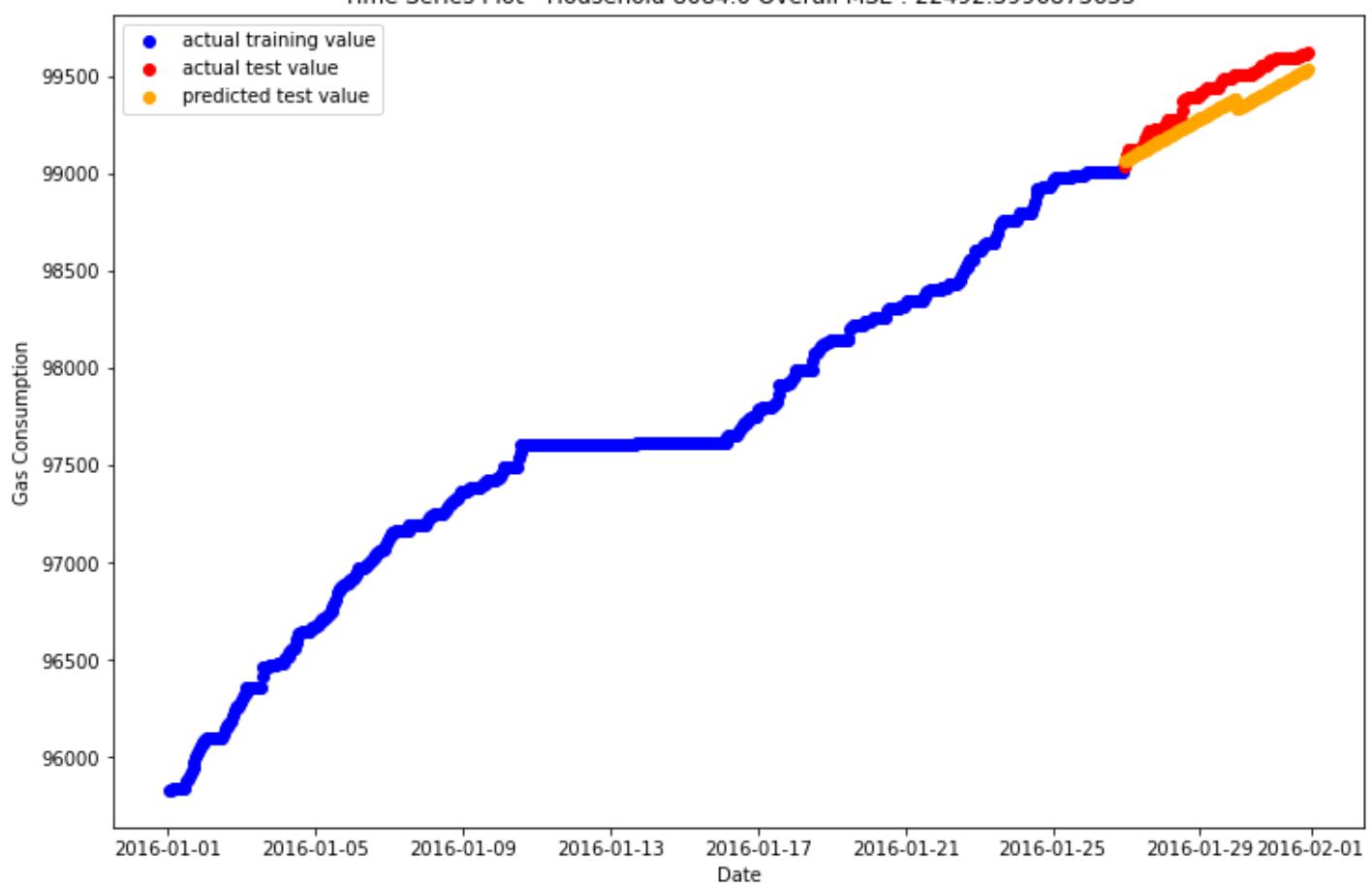
Time Series Plot - Household 8059.0 Overall MSE : 11540.984712248279



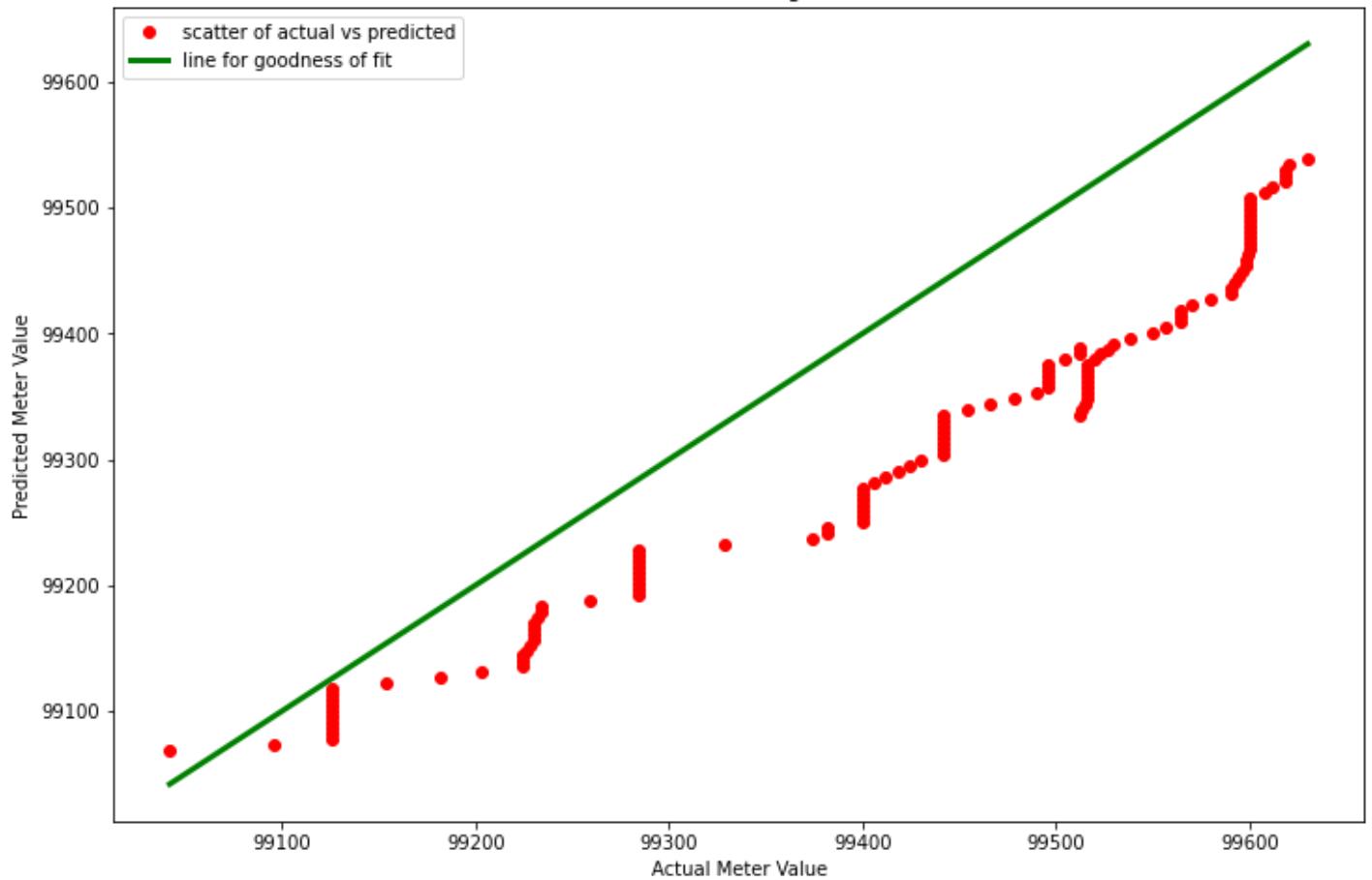
Scatter Plot - Household 8059.0 Testing MSE : 10270.321068529334



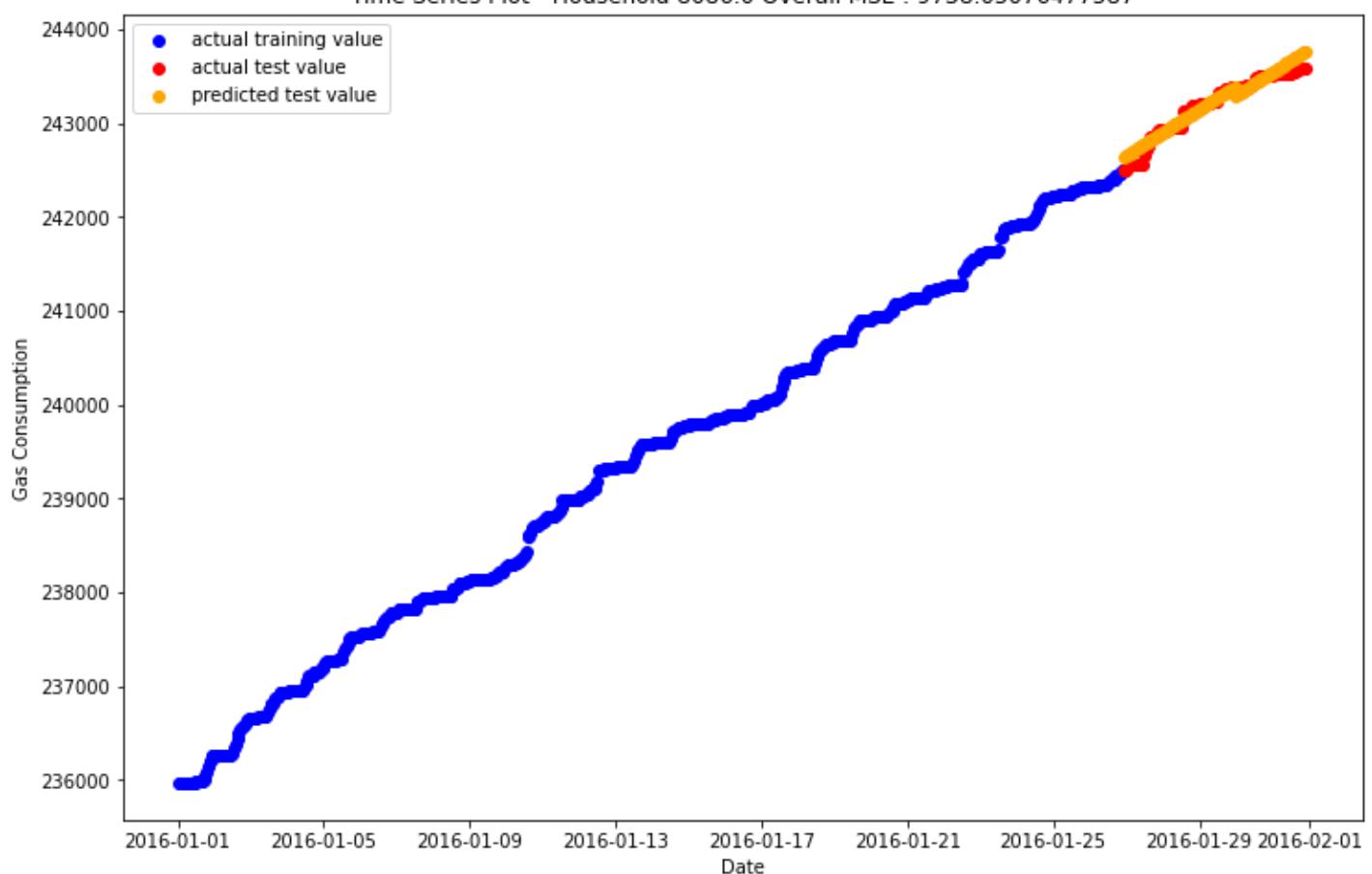
Time Series Plot - Household 8084.0 Overall MSE : 22492.3996873633



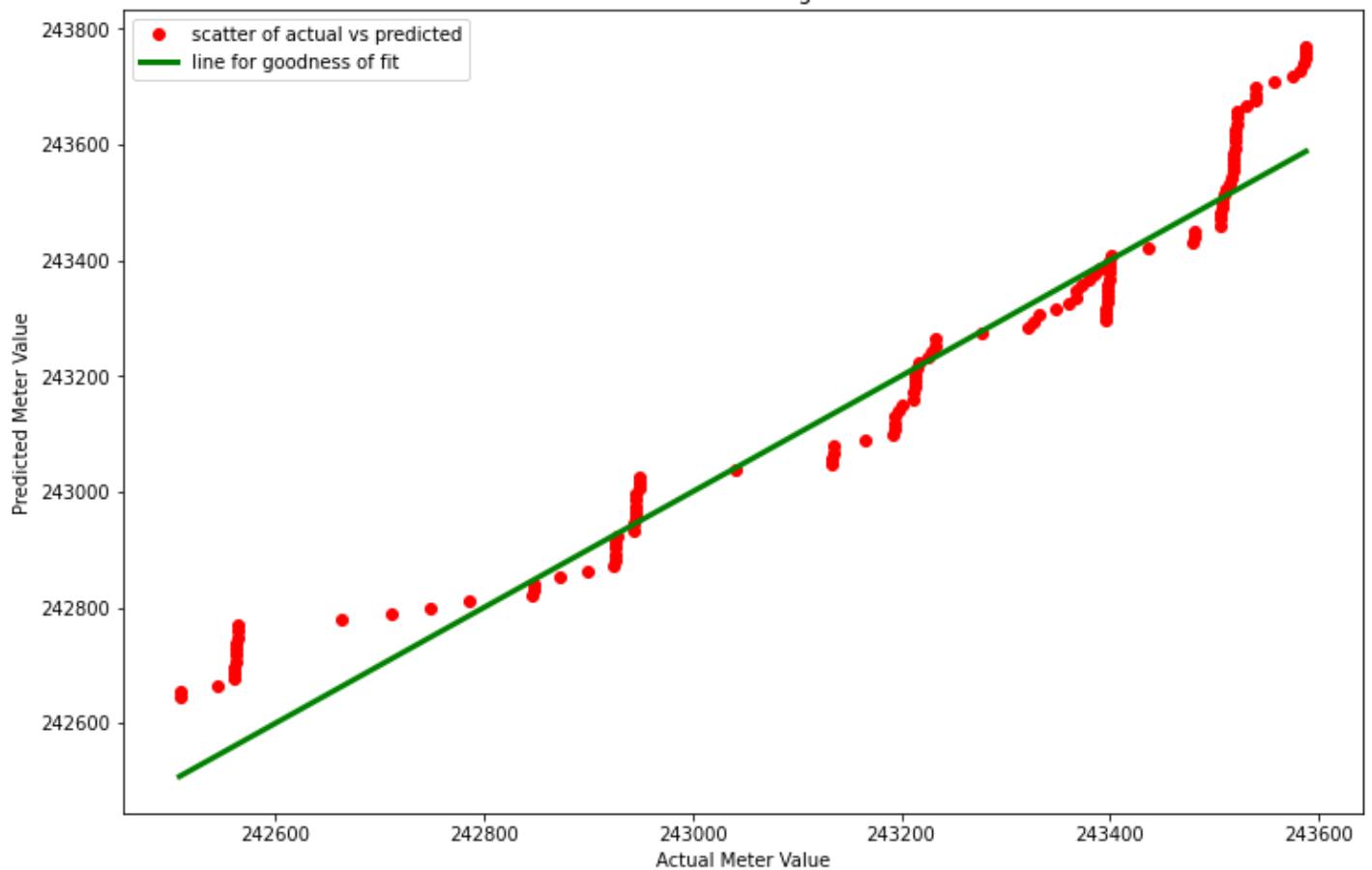
Scatter Plot - Household 8084.0 Testing MSE : 13362.798923076612



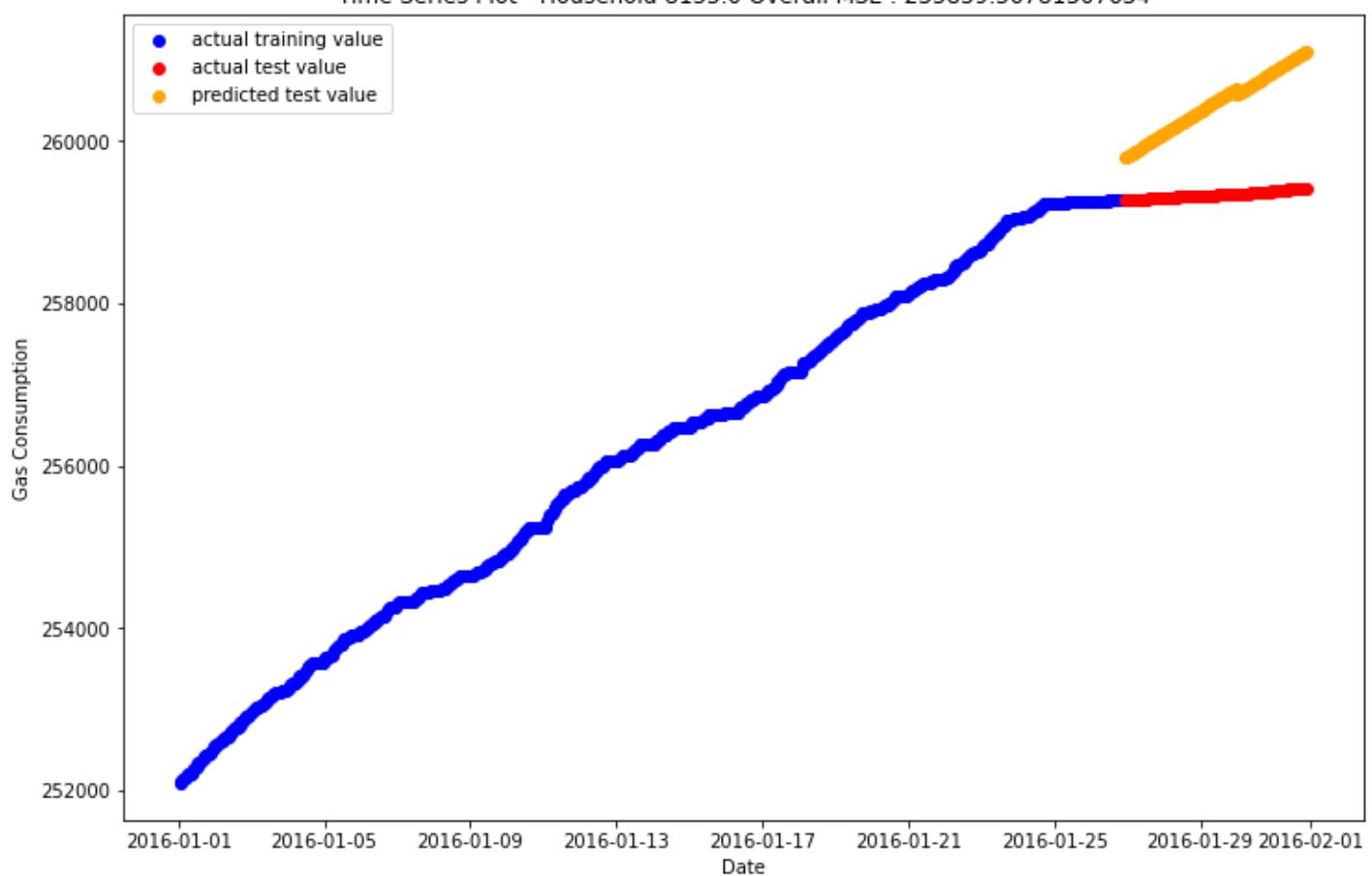
Time Series Plot - Household 8086.0 Overall MSE : 9738.05076477587



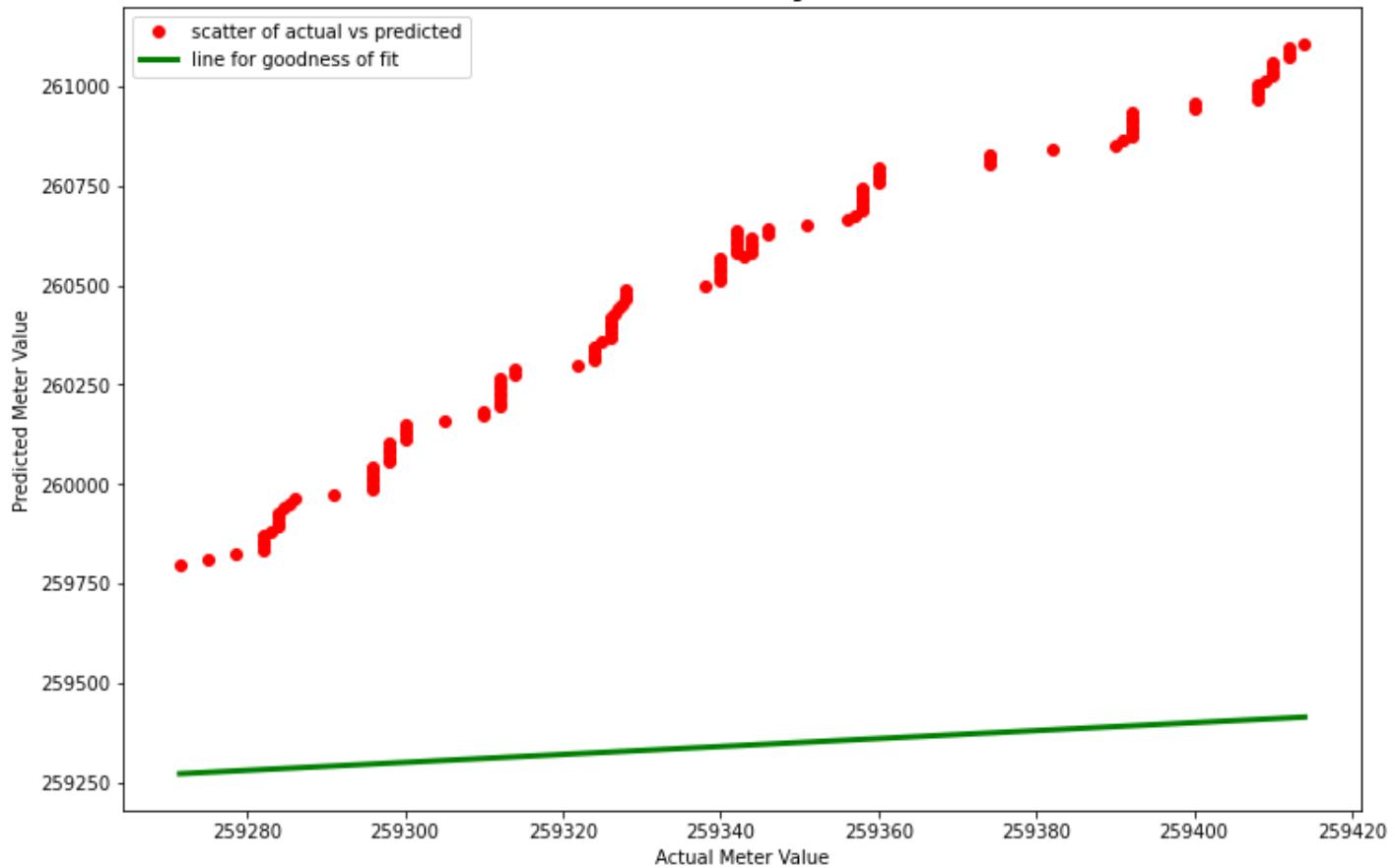
Scatter Plot - Household 8086.0 Testing MSE : 7062.656249929155



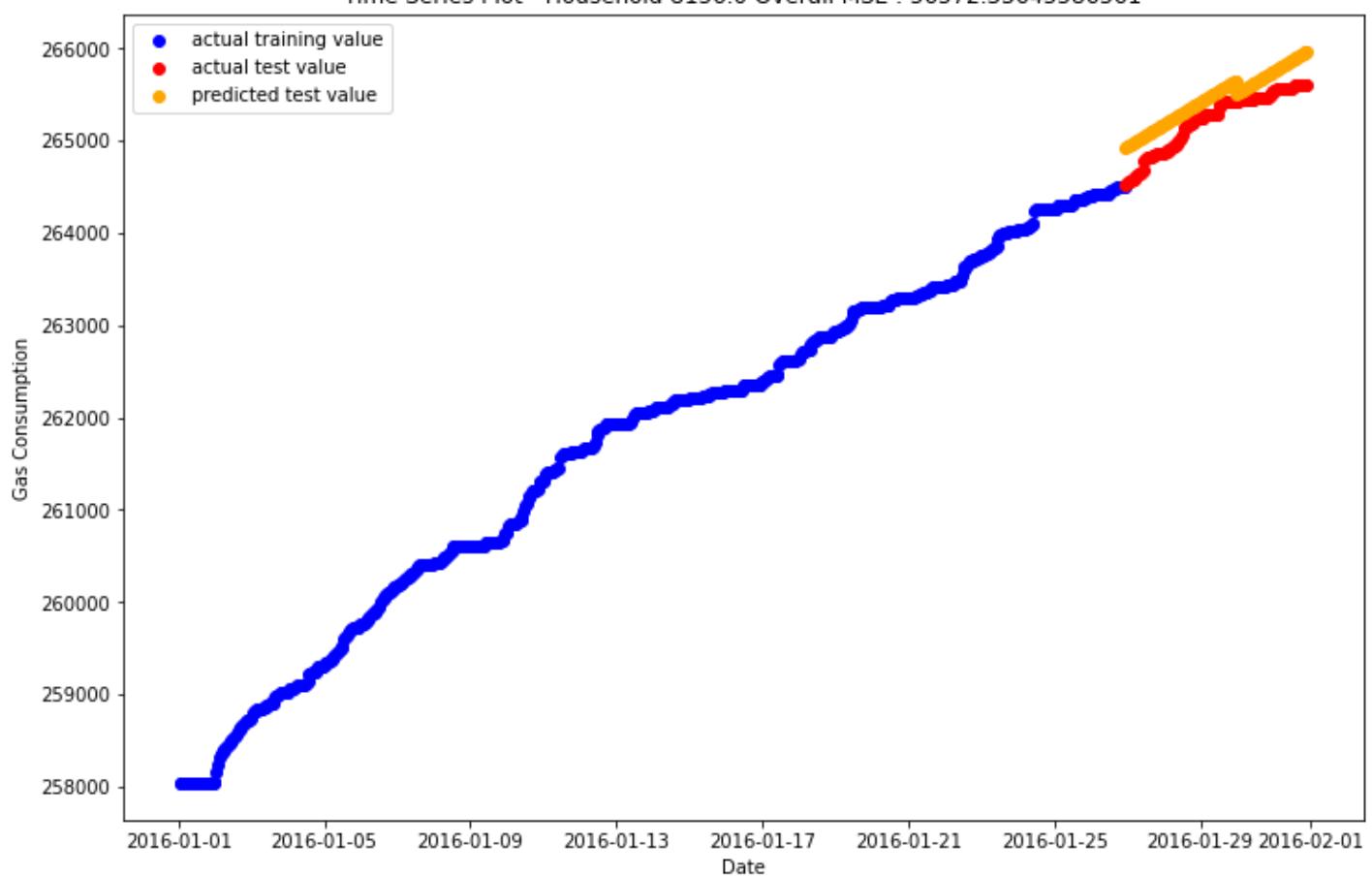
Time Series Plot - Household 8155.0 Overall MSE : 235859.56781307634



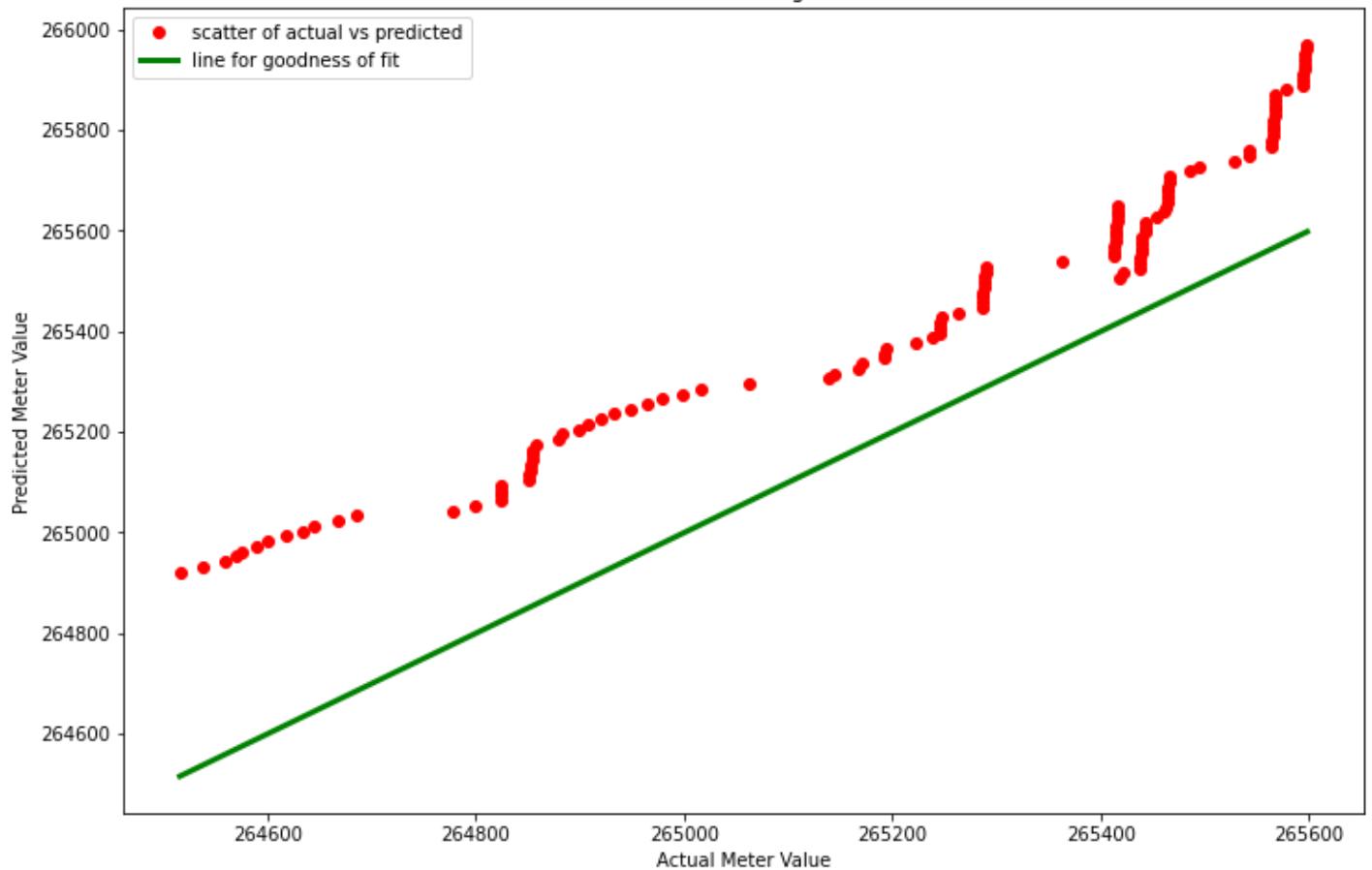
Scatter Plot - Household 8155.0 Testing MSE : 1375190.9515944517



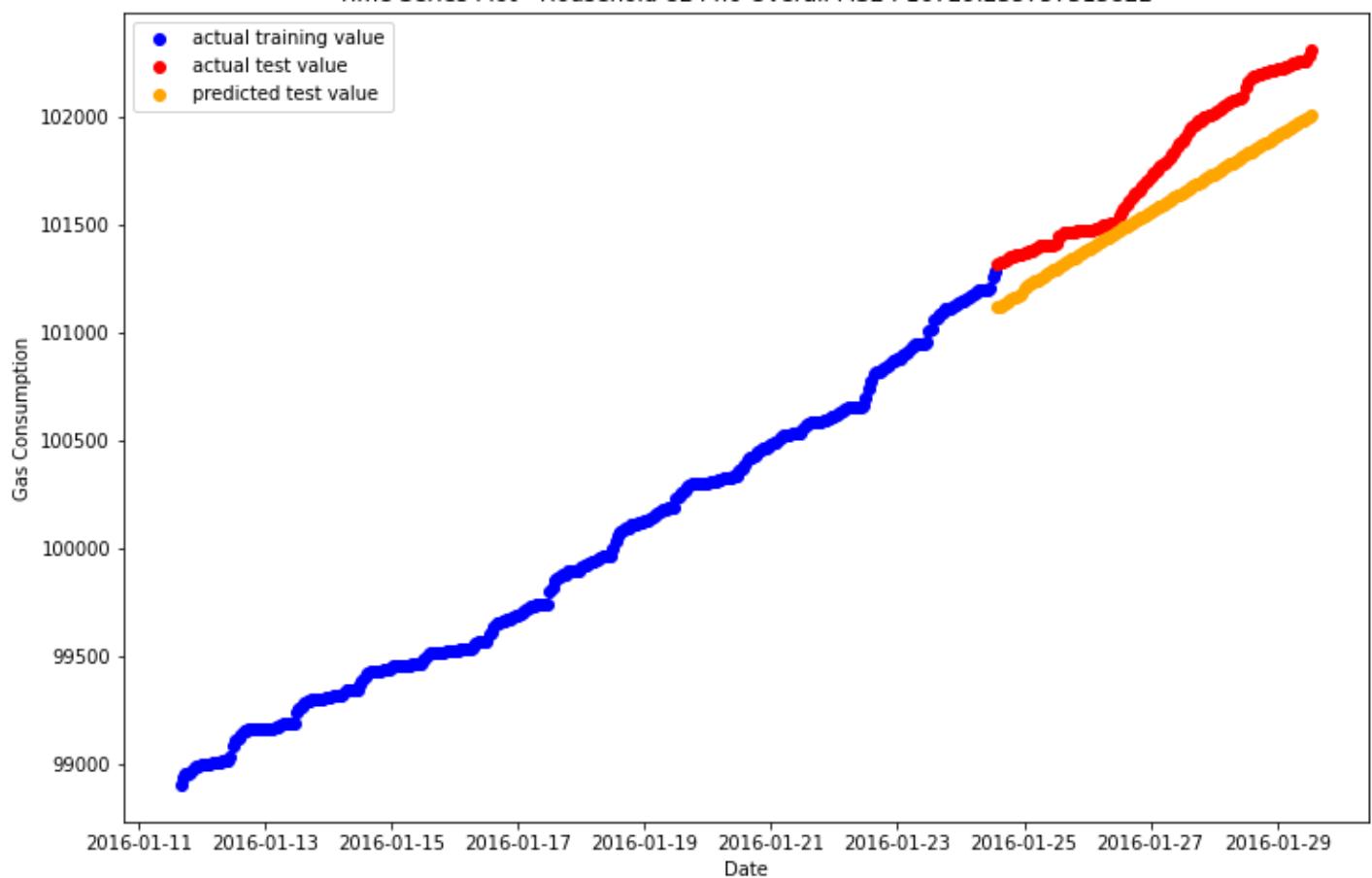
Time Series Plot - Household 8156.0 Overall MSE : 56572.33645586561



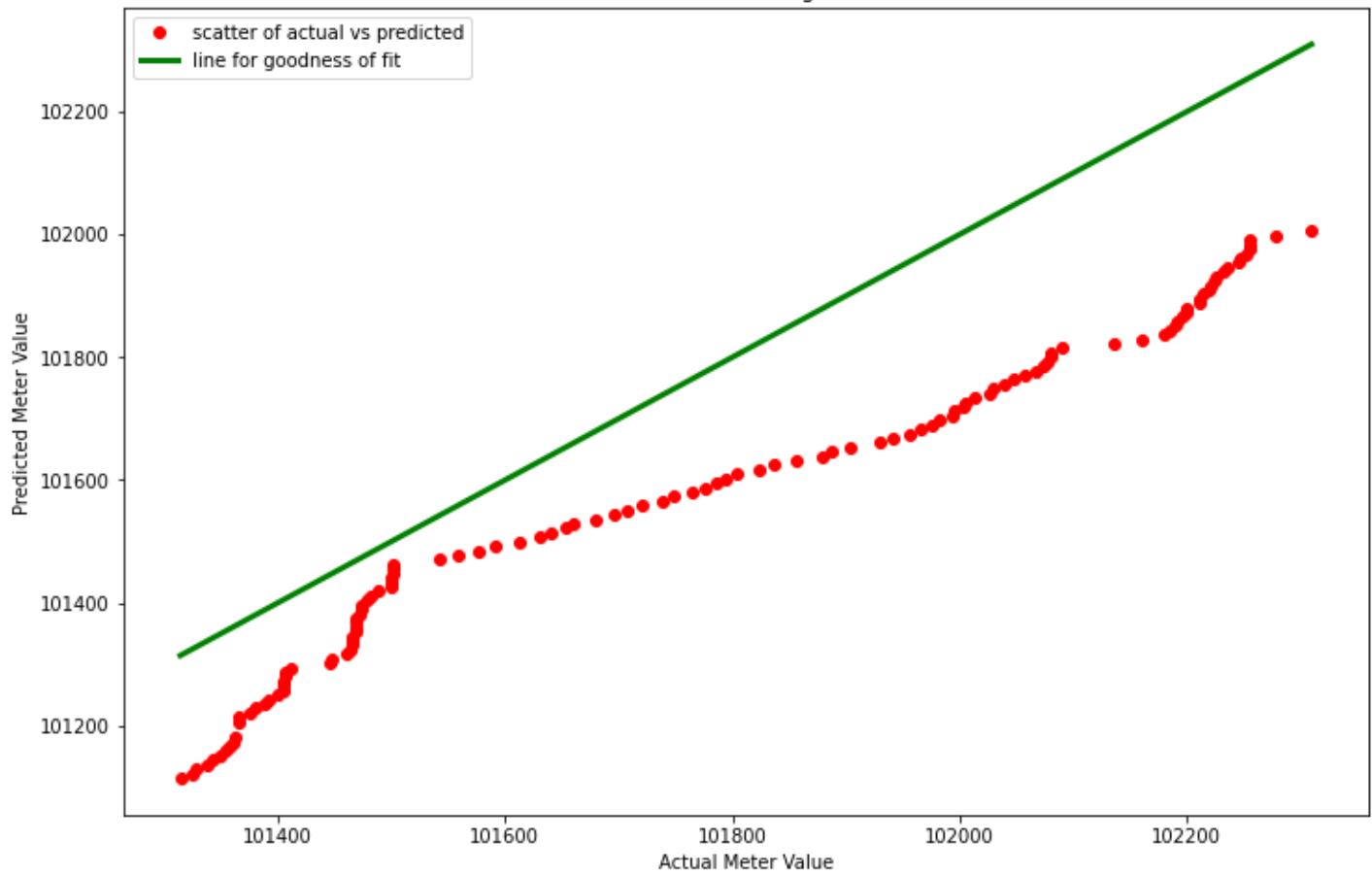
Scatter Plot - Household 8156.0 Testing MSE : 63341.238757180436



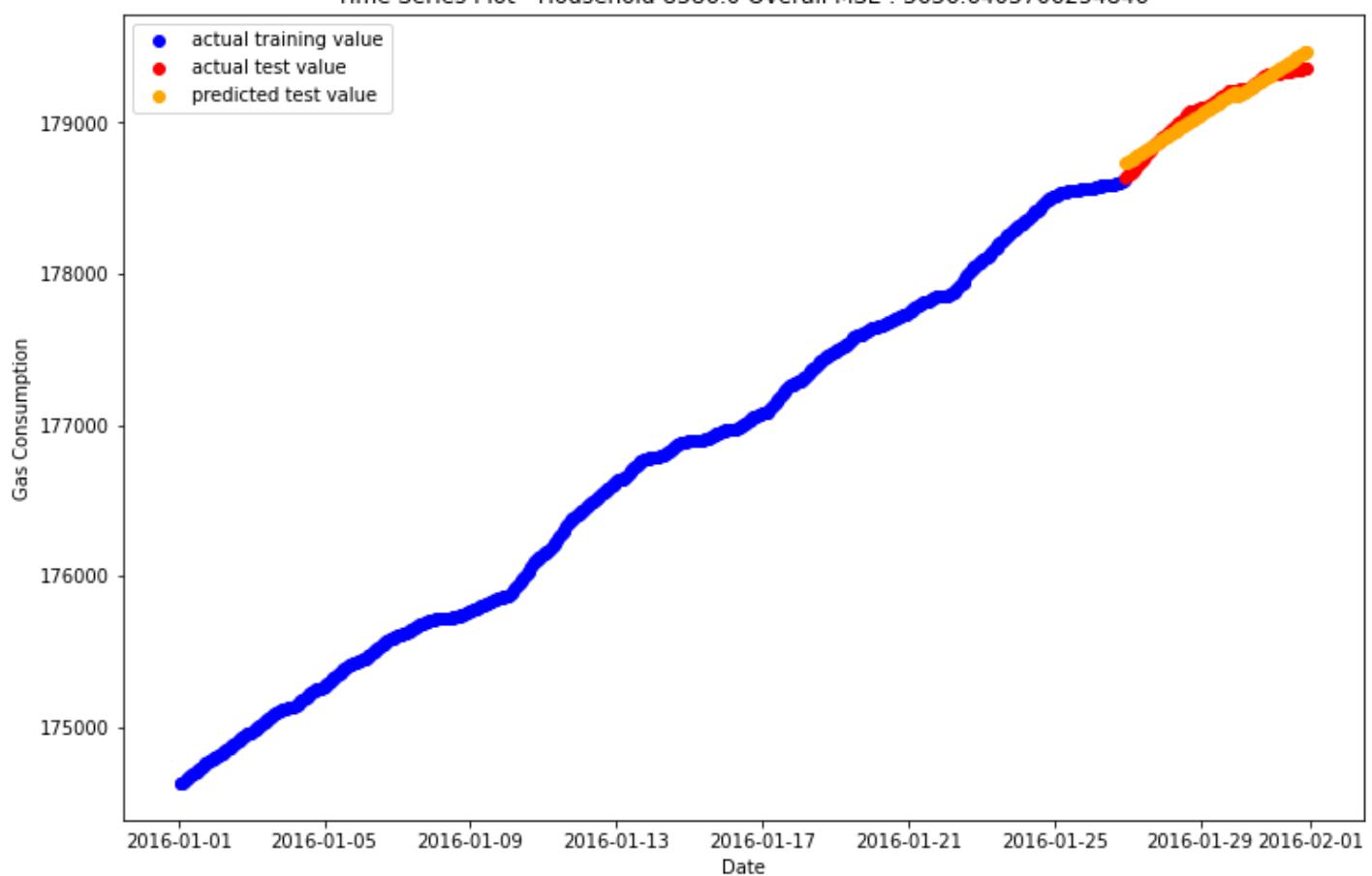
Time Series Plot - Household 8244.0 Overall MSE : 16729.235757315822



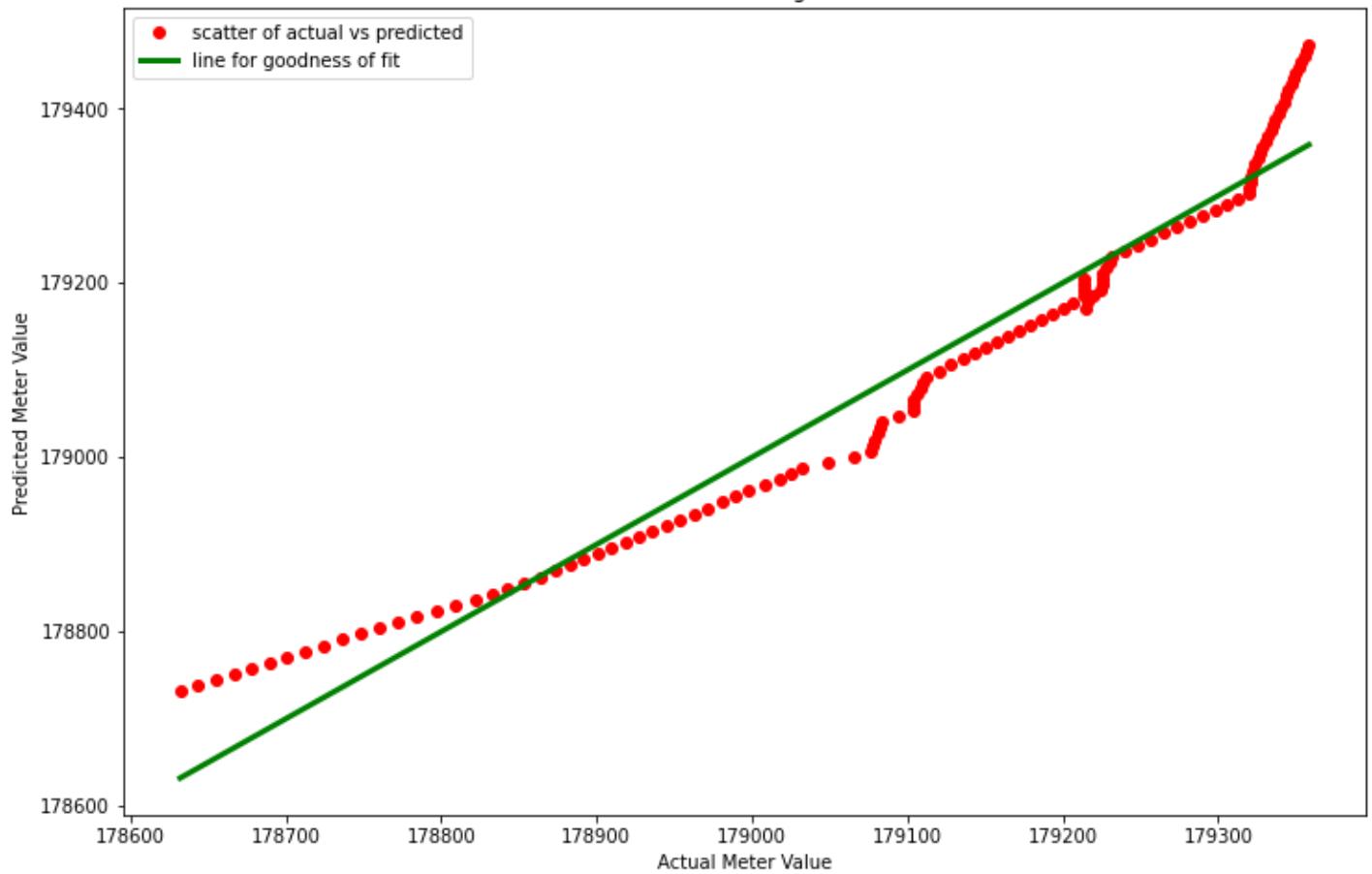
Scatter Plot - Household 8244.0 Testing MSE : 48822.65914142811



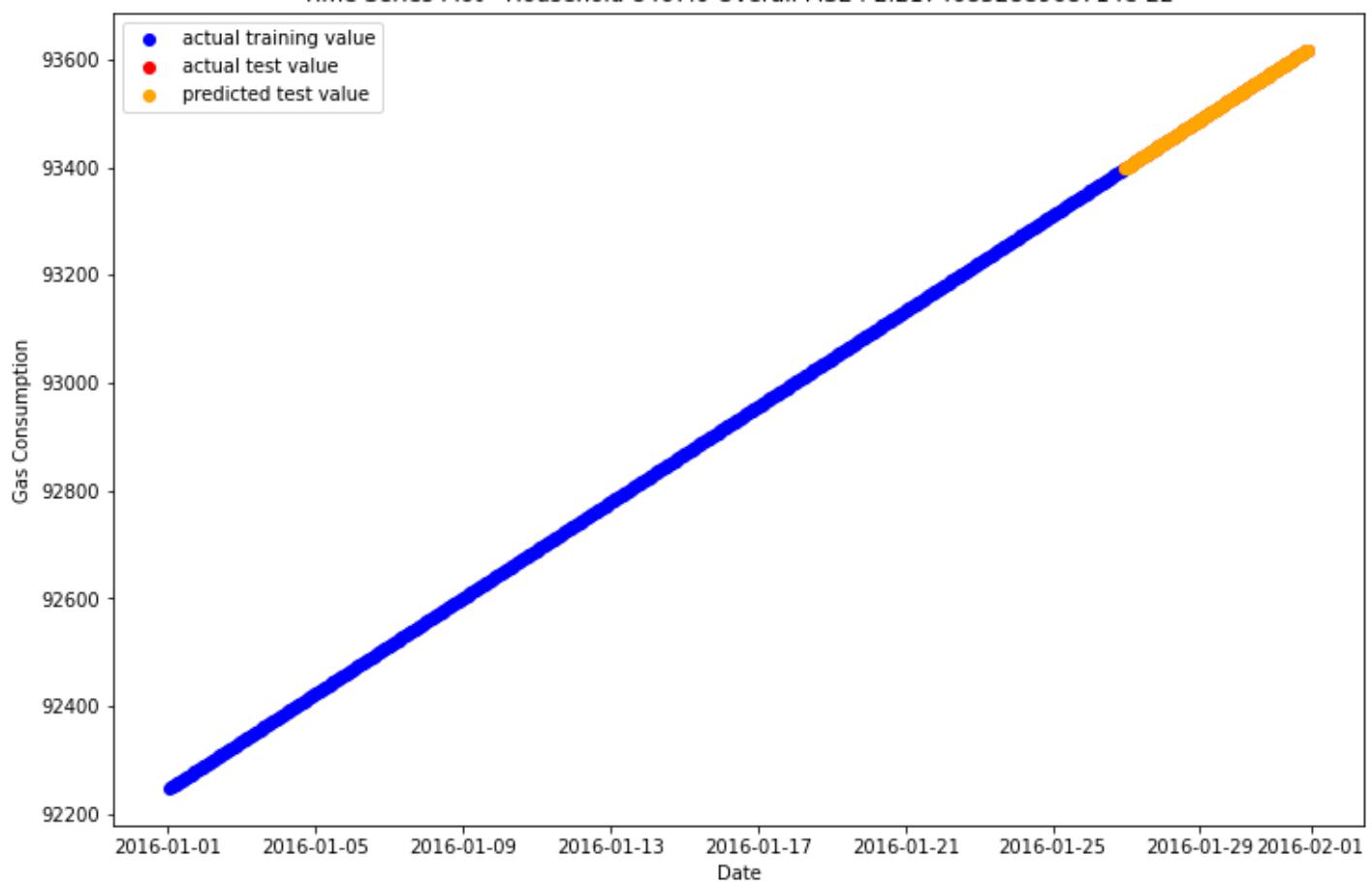
Time Series Plot - Household 8386.0 Overall MSE : 3636.6403706254846



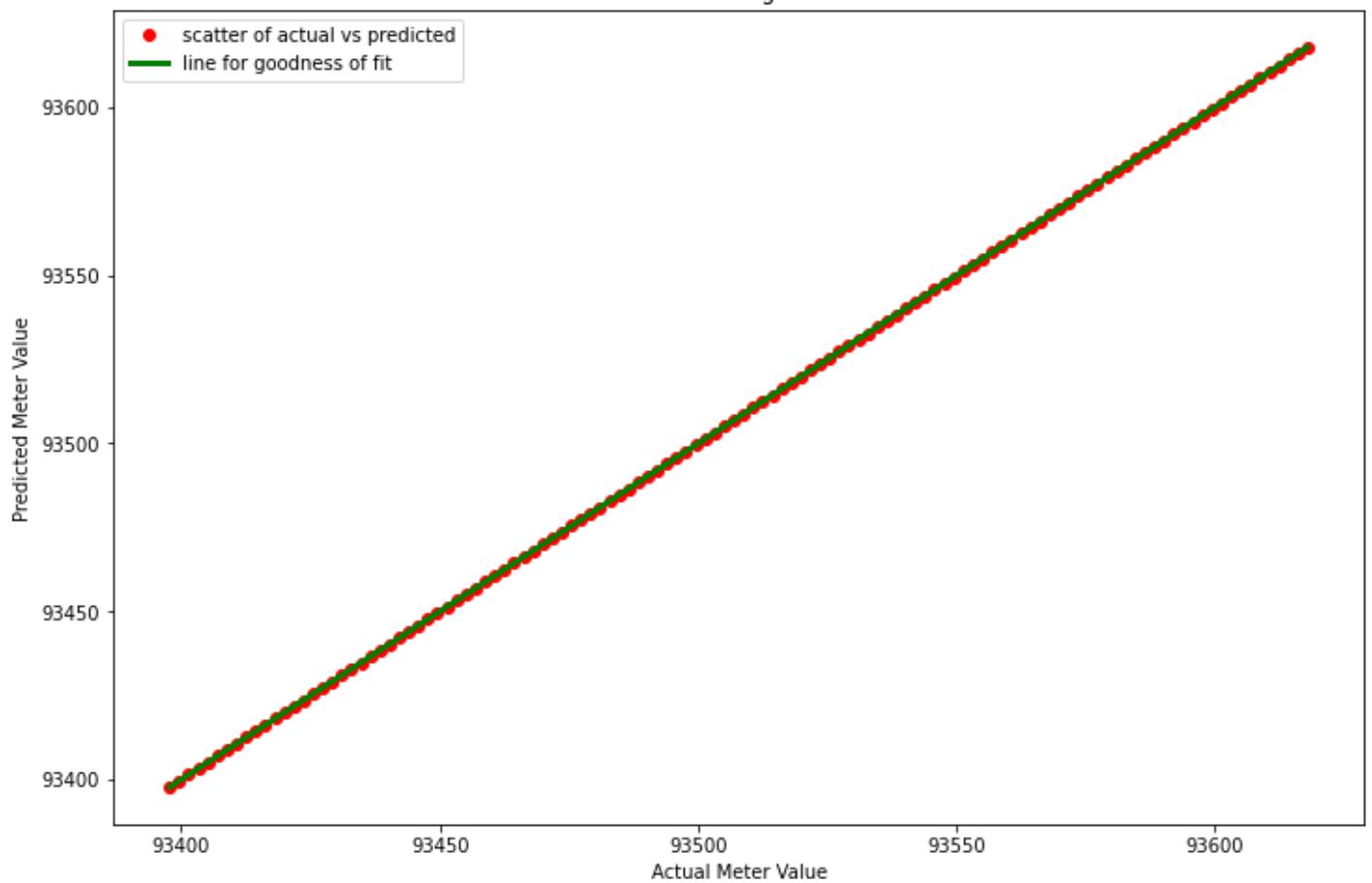
Scatter Plot - Household 8386.0 Testing MSE : 2106.6533087365515



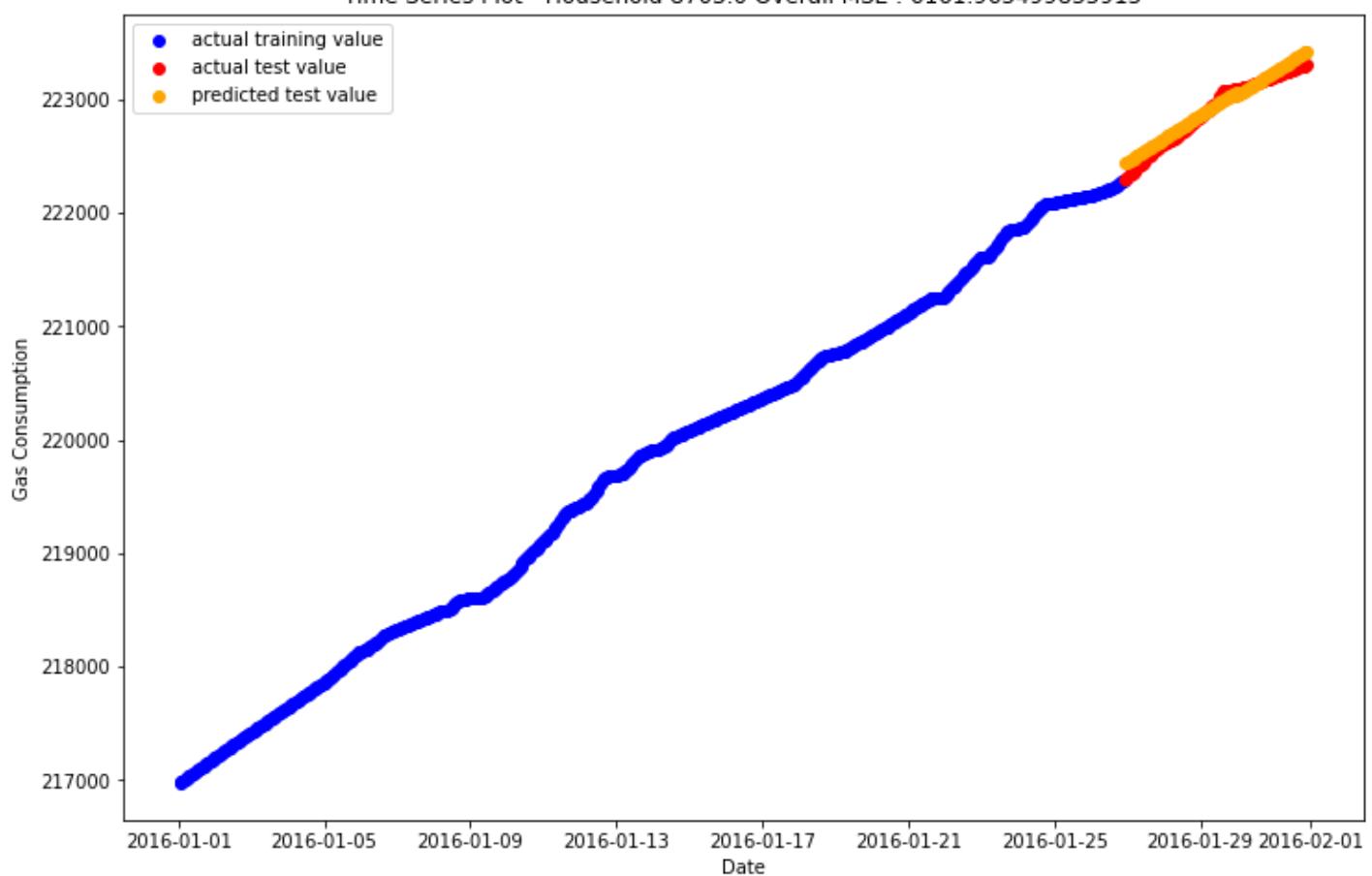
Time Series Plot - Household 8467.0 Overall MSE : 2.2174683288968714e-22



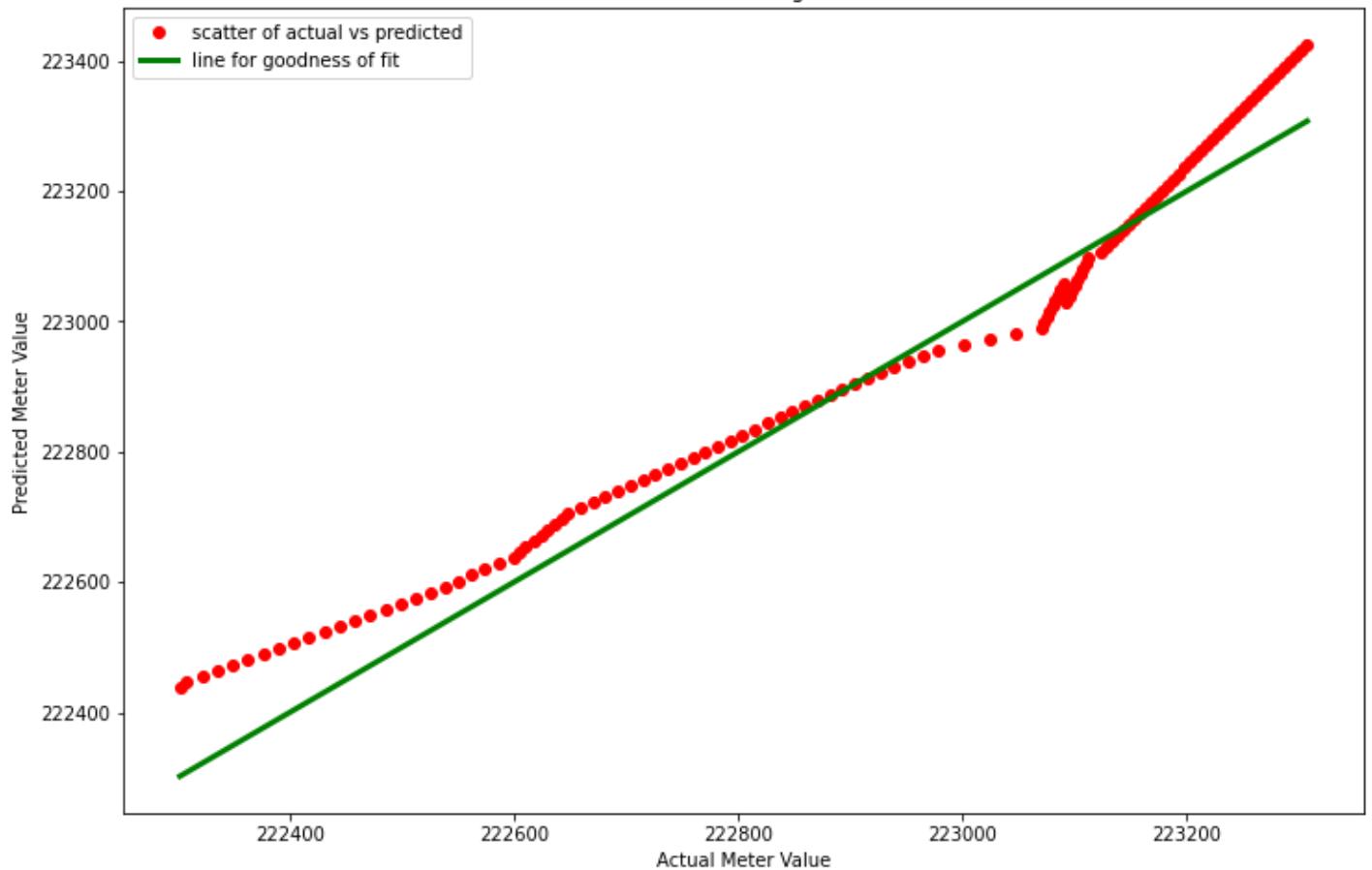
Scatter Plot - Household 8467.0 Testing MSE : 2.3469871246837906e-22



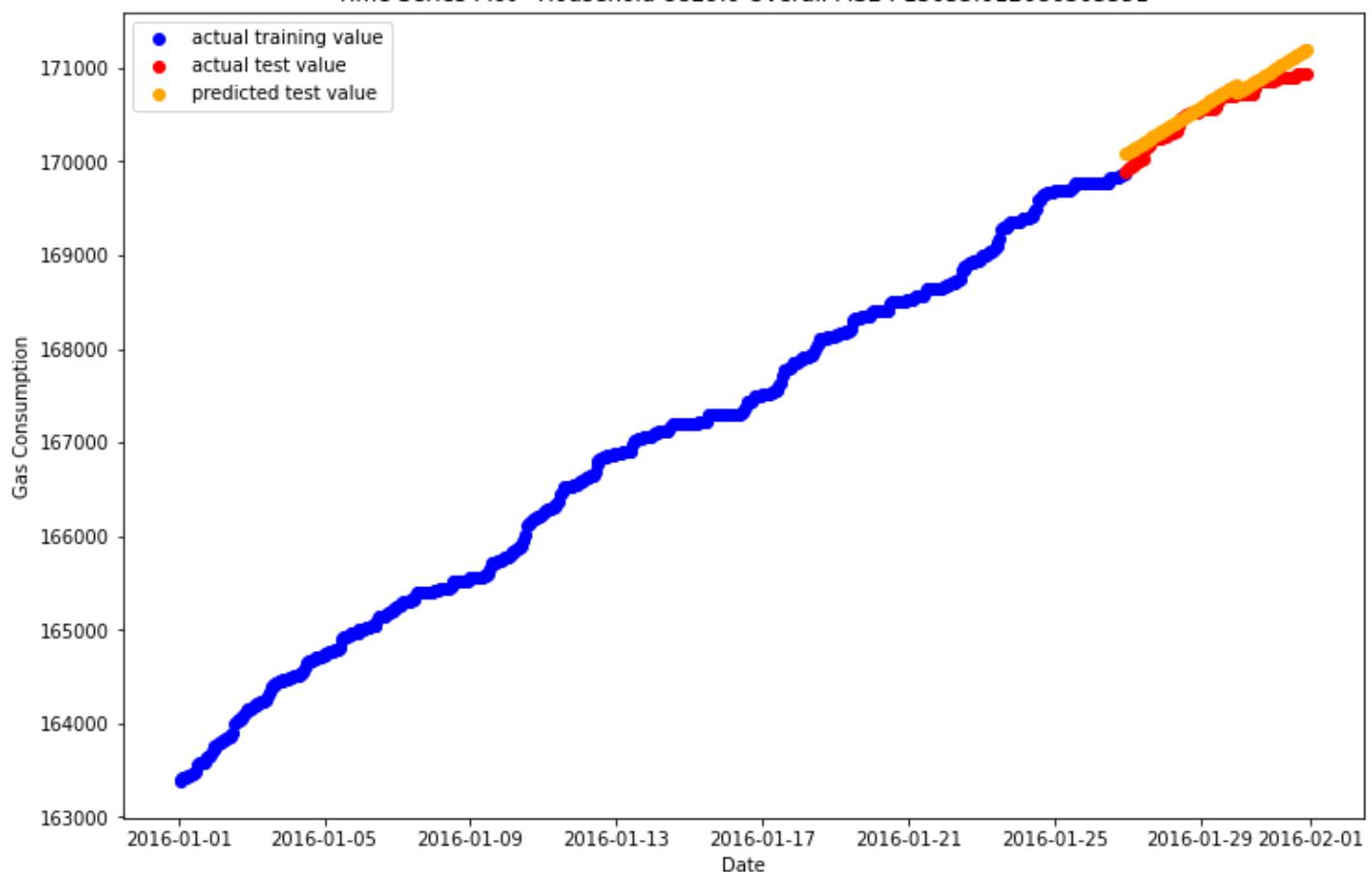
Time Series Plot - Household 8703.0 Overall MSE : 6161.965499855915



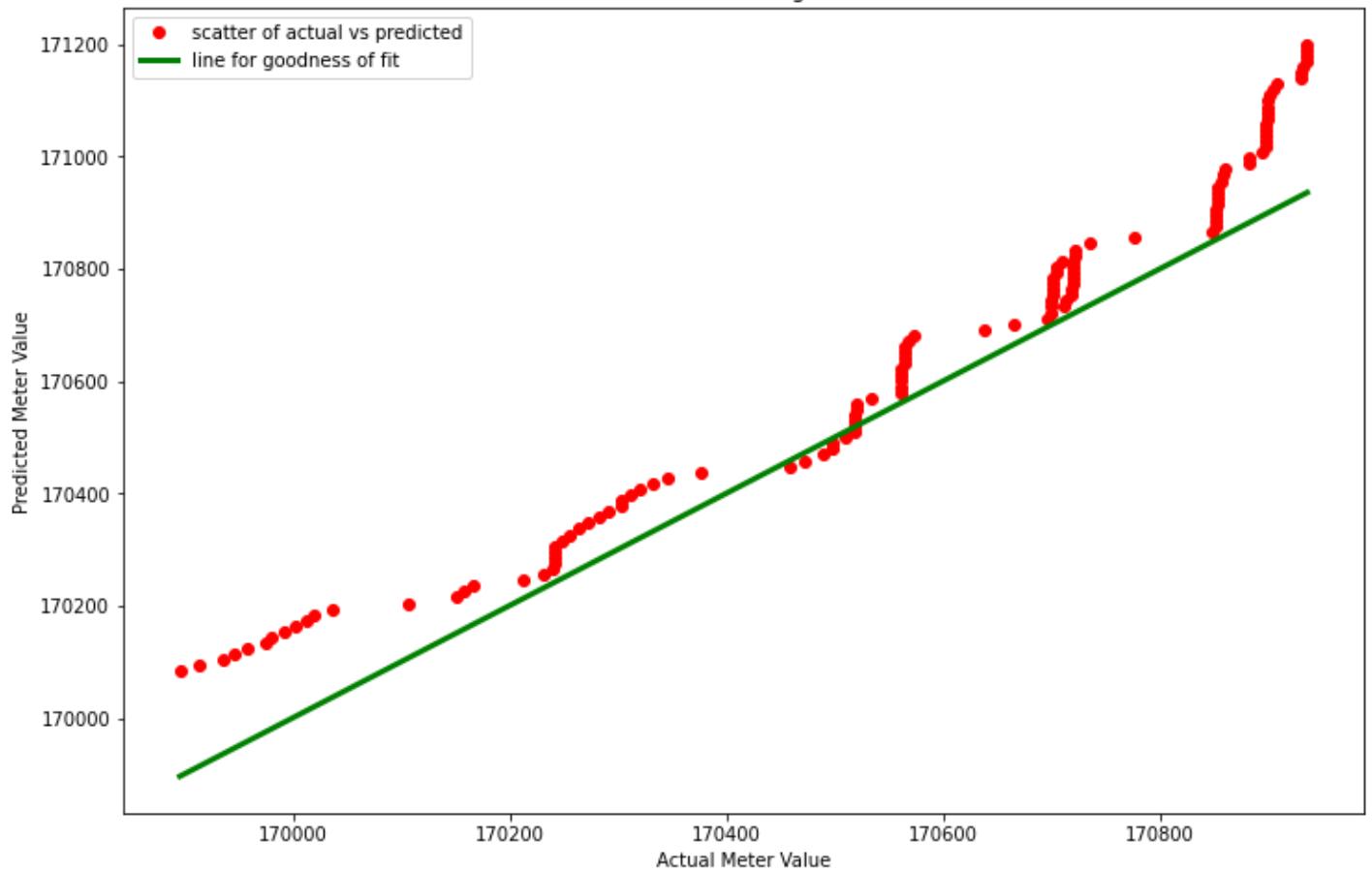
Scatter Plot - Household 8703.0 Testing MSE : 3847.7182920698747



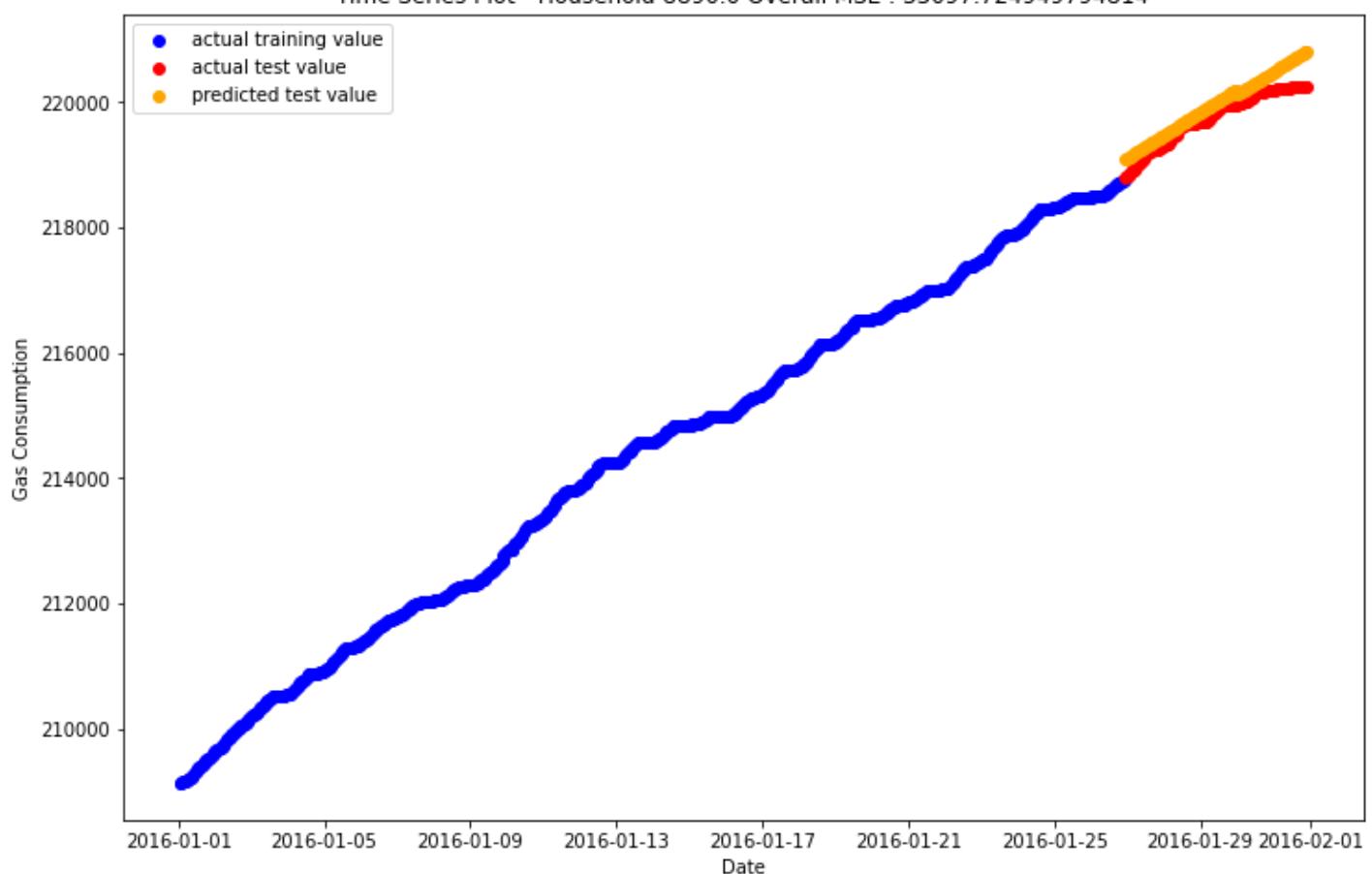
Time Series Plot - Household 8829.0 Overall MSE : 13033.012686303551



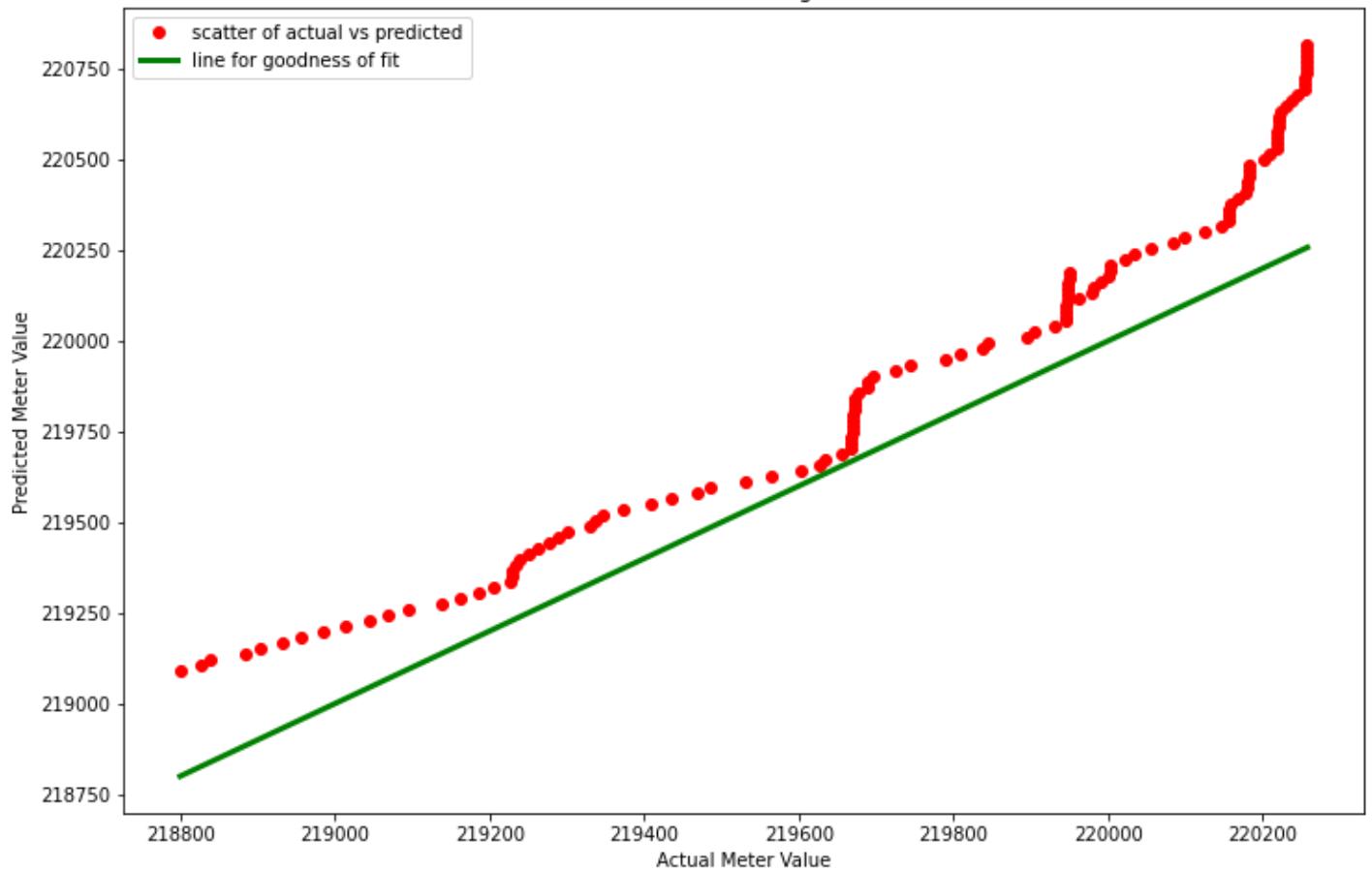
Scatter Plot - Household 8829.0 Testing MSE : 12554.753281519115



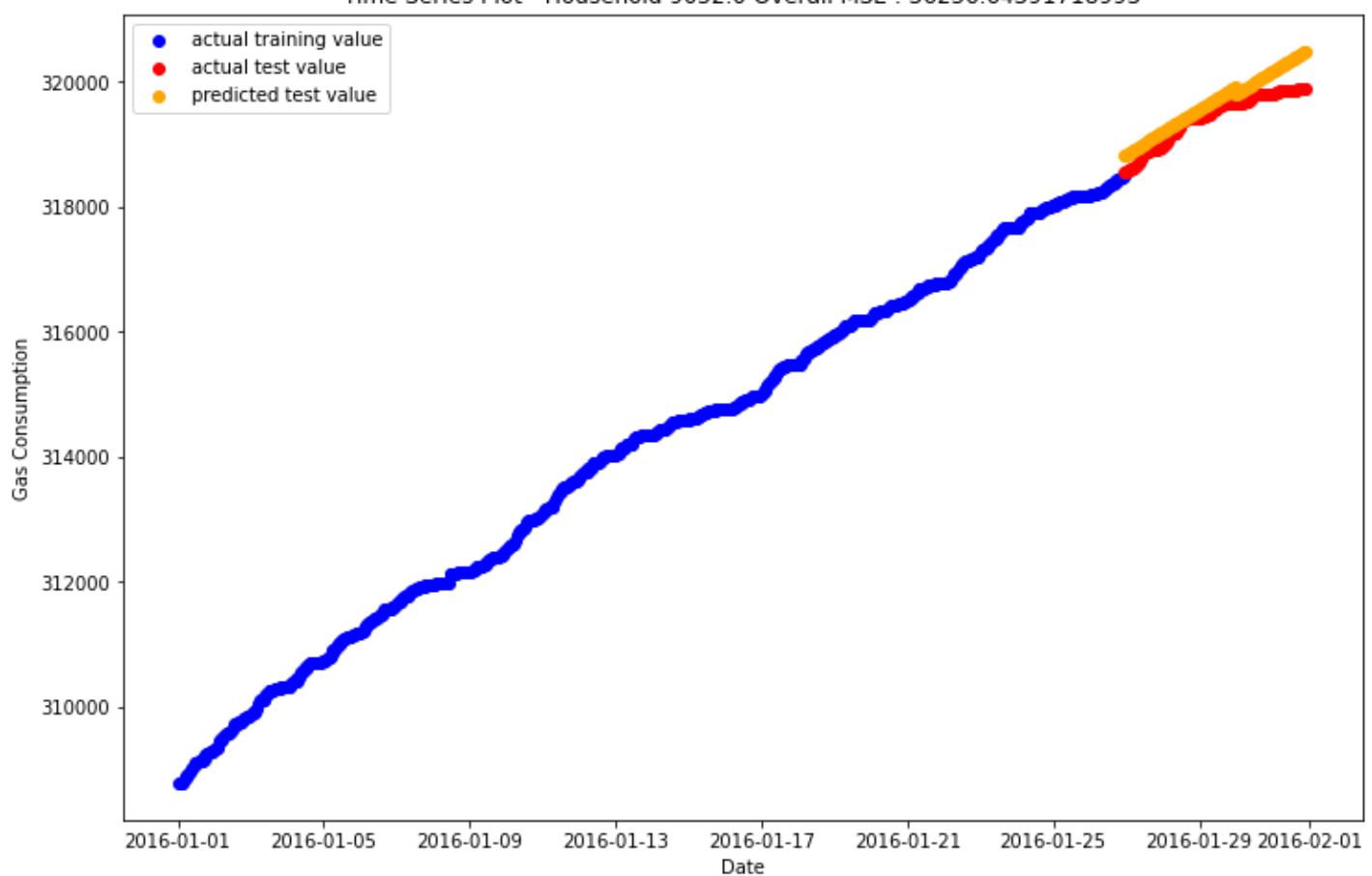
Time Series Plot - Household 8890.0 Overall MSE : 33097.724949794814



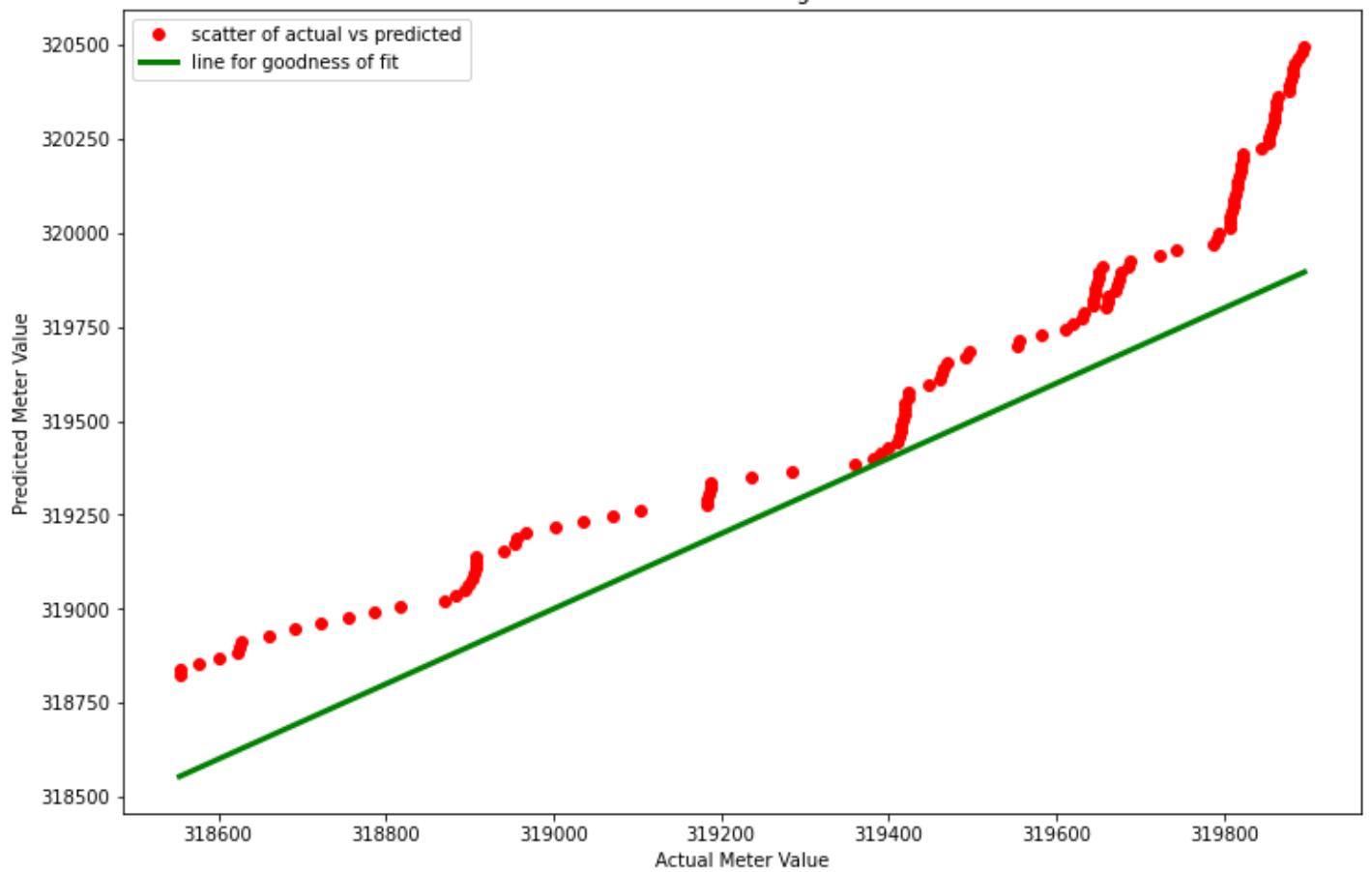
Scatter Plot - Household 8890.0 Testing MSE : 59131.70106763106



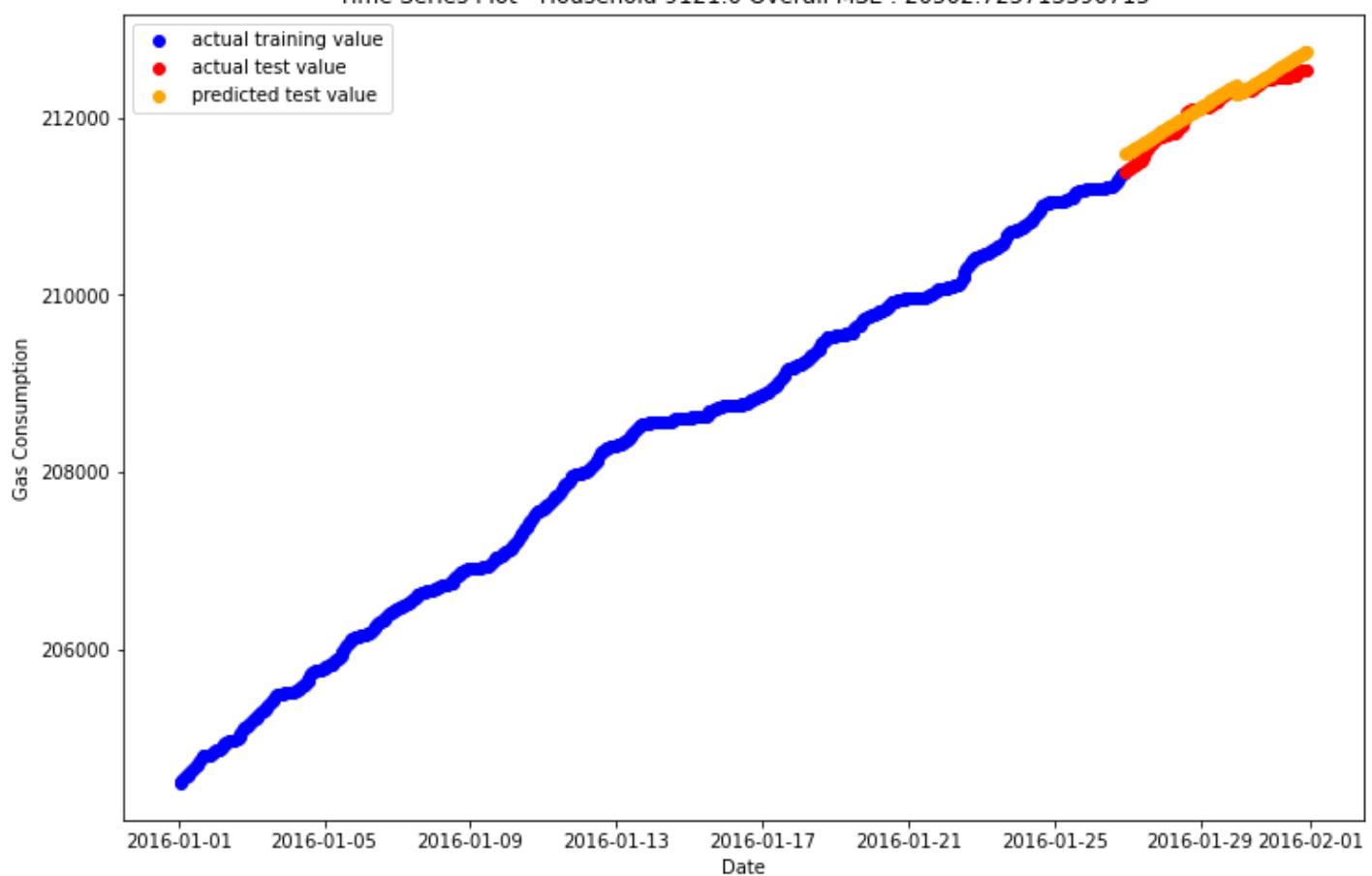
Time Series Plot - Household 9052.0 Overall MSE : 36256.64391718993



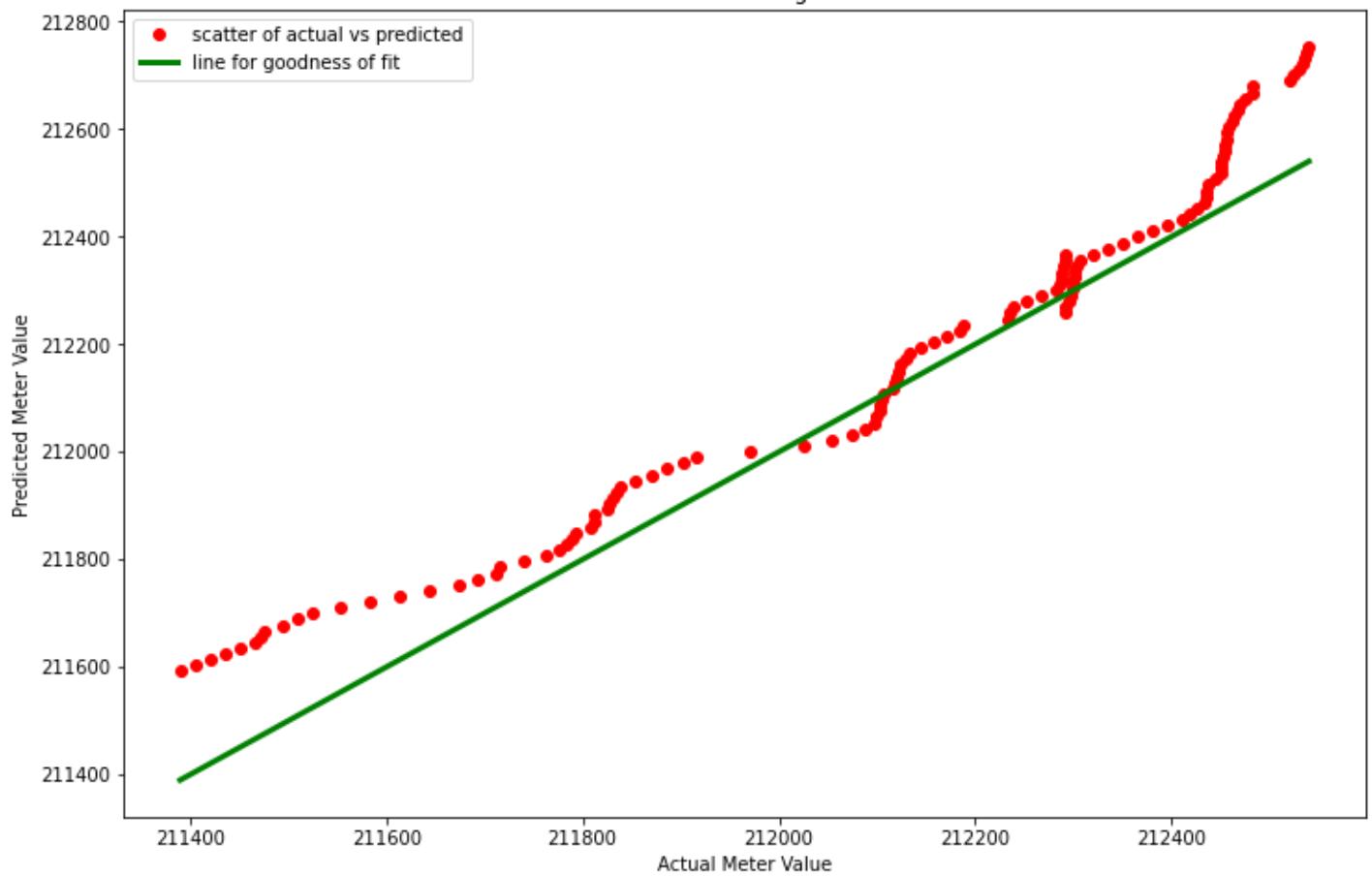
Scatter Plot - Household 9052.0 Testing MSE : 74265.82440438481



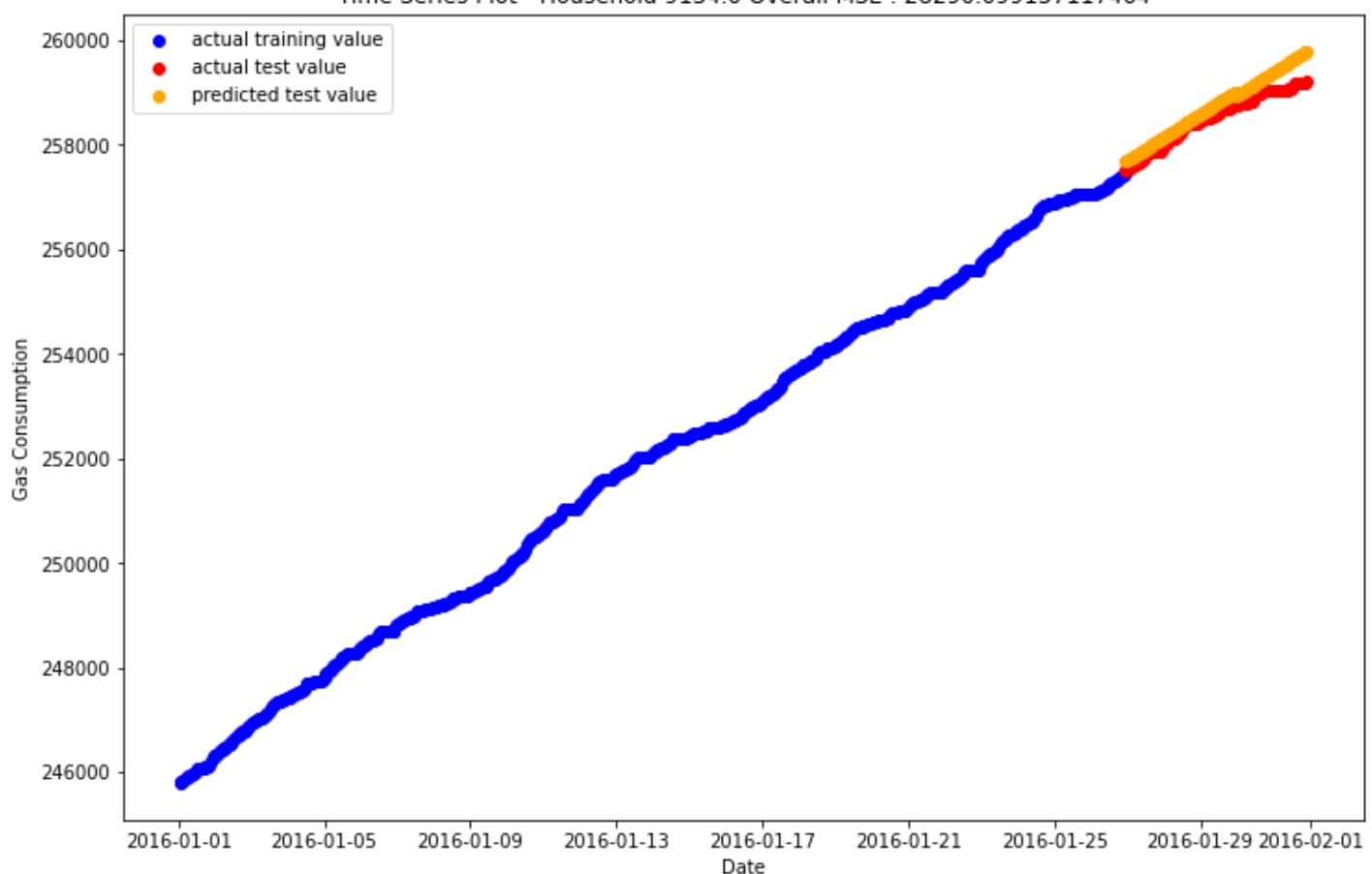
Time Series Plot - Household 9121.0 Overall MSE : 20502.725713390715



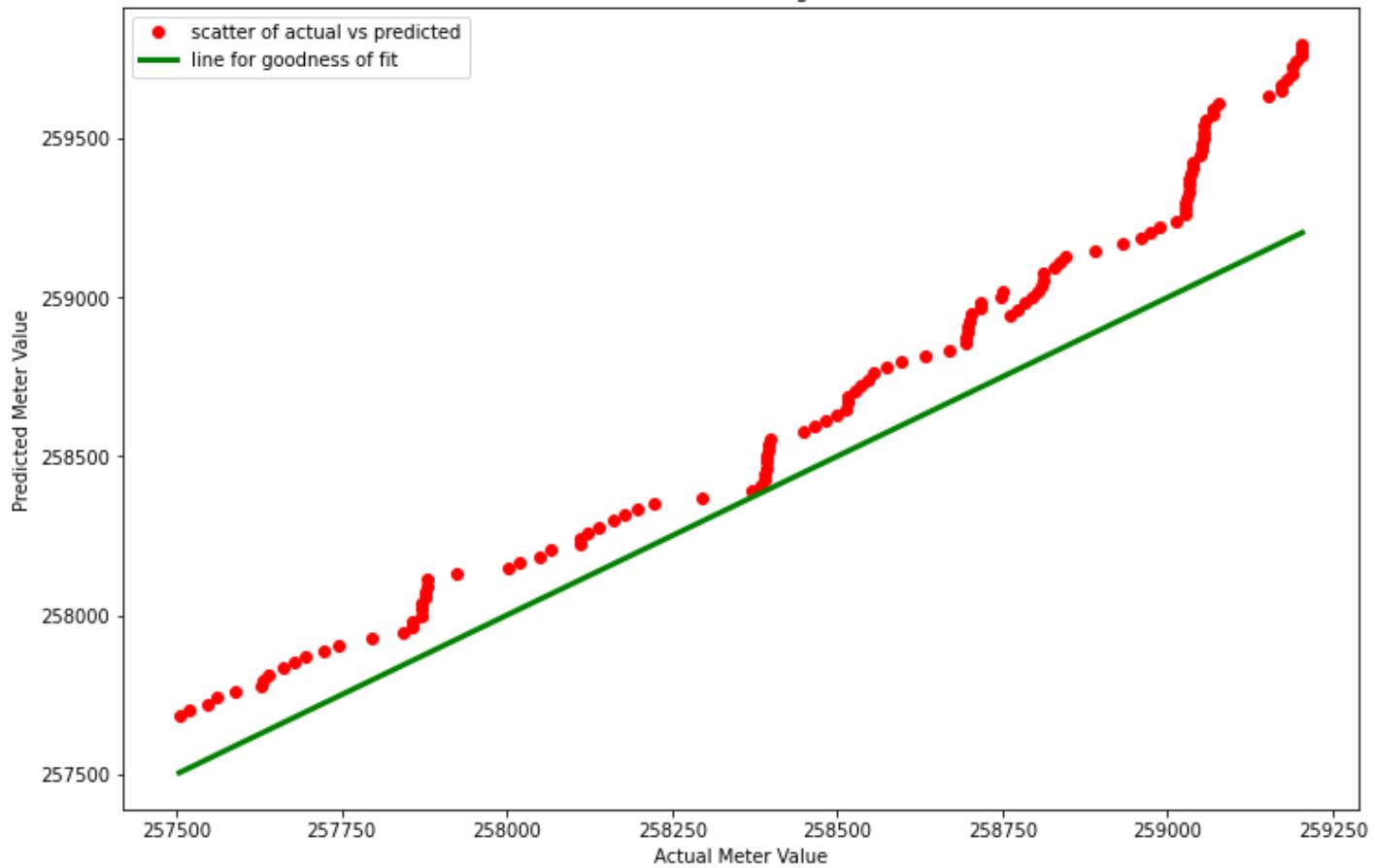
Scatter Plot - Household 9121.0 Testing MSE : 10179.529401043608



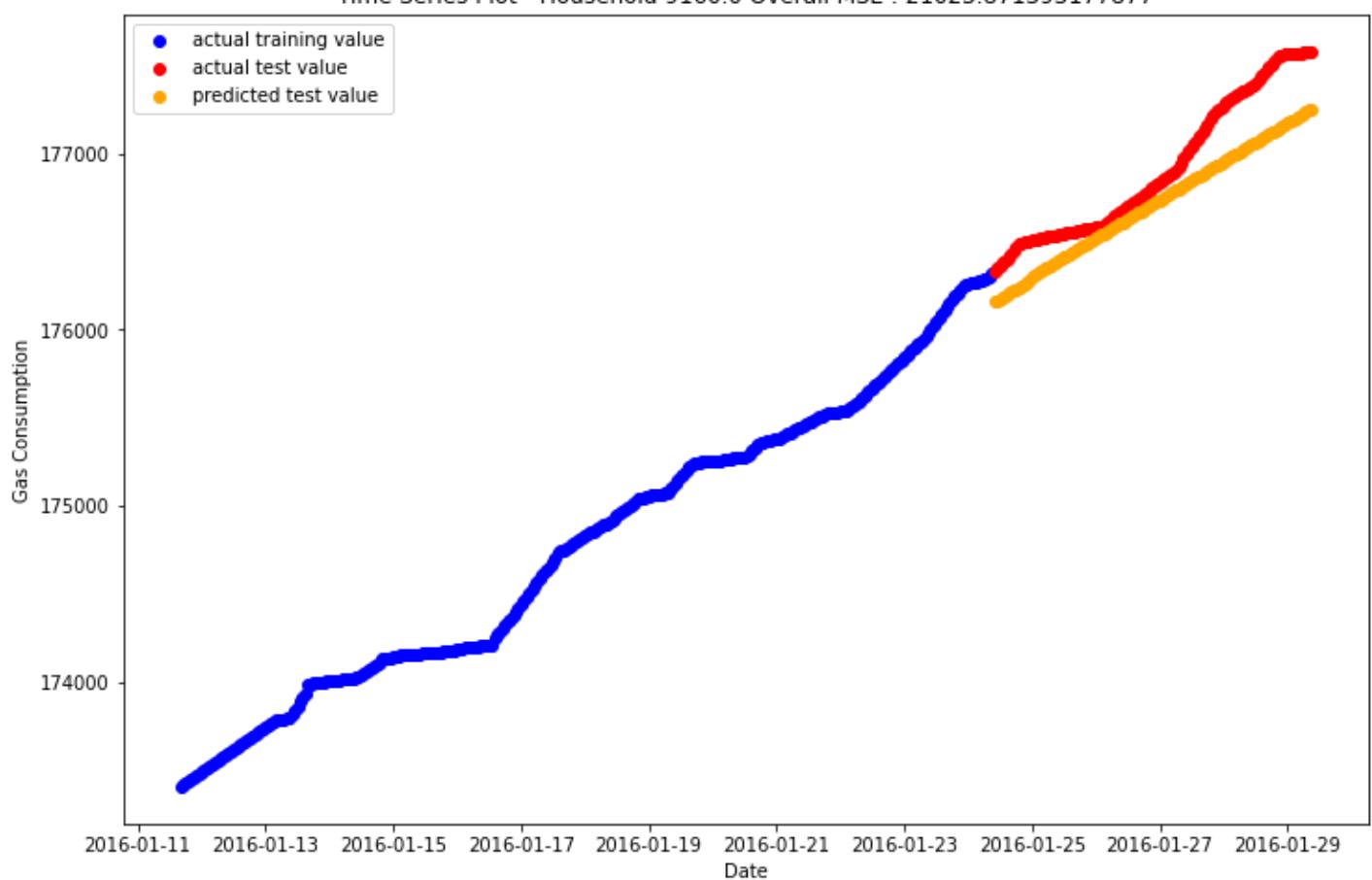
Time Series Plot - Household 9134.0 Overall MSE : 28290.099137117464



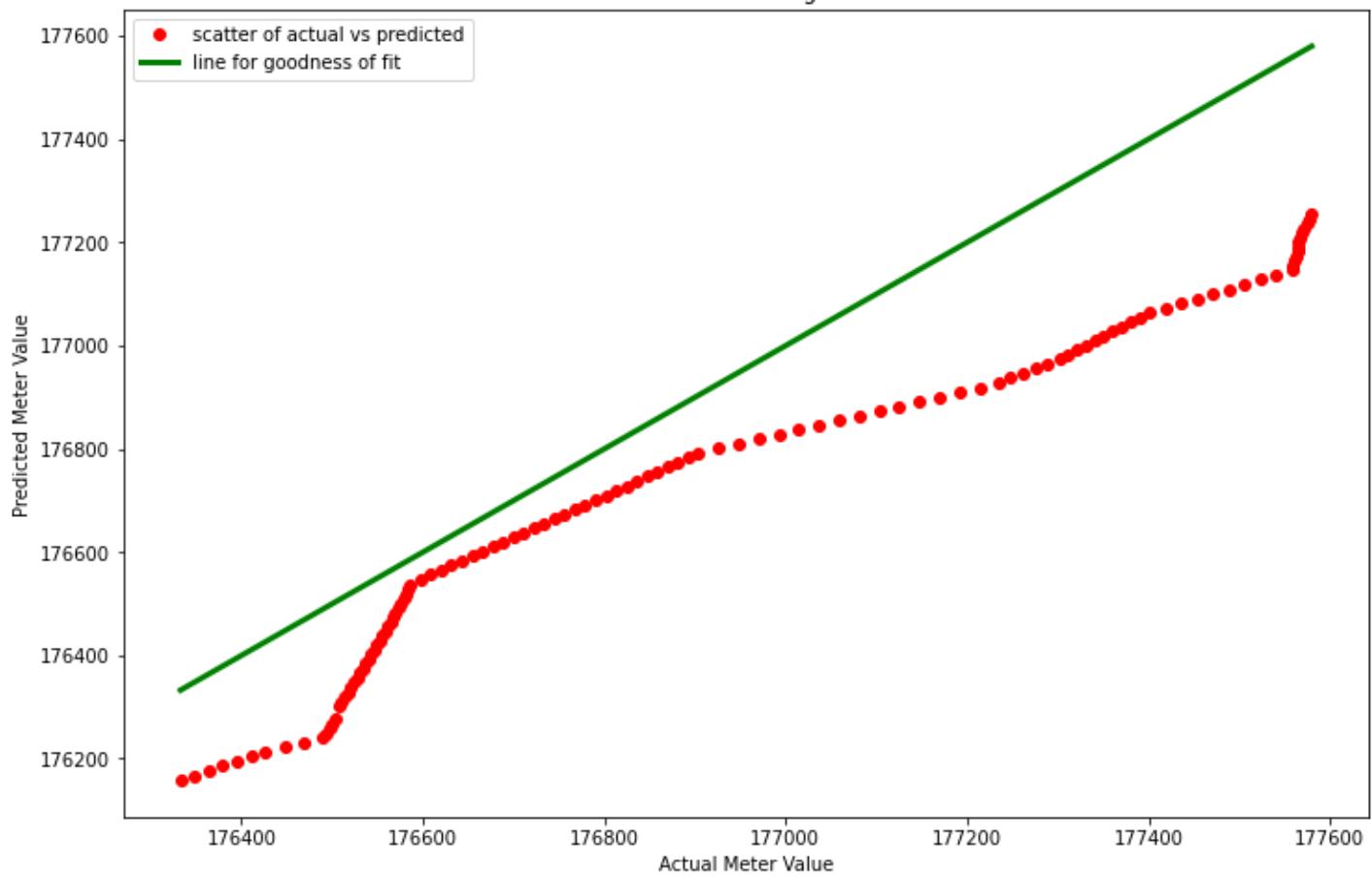
Scatter Plot - Household 9134.0 Testing MSE : 74535.91066457187



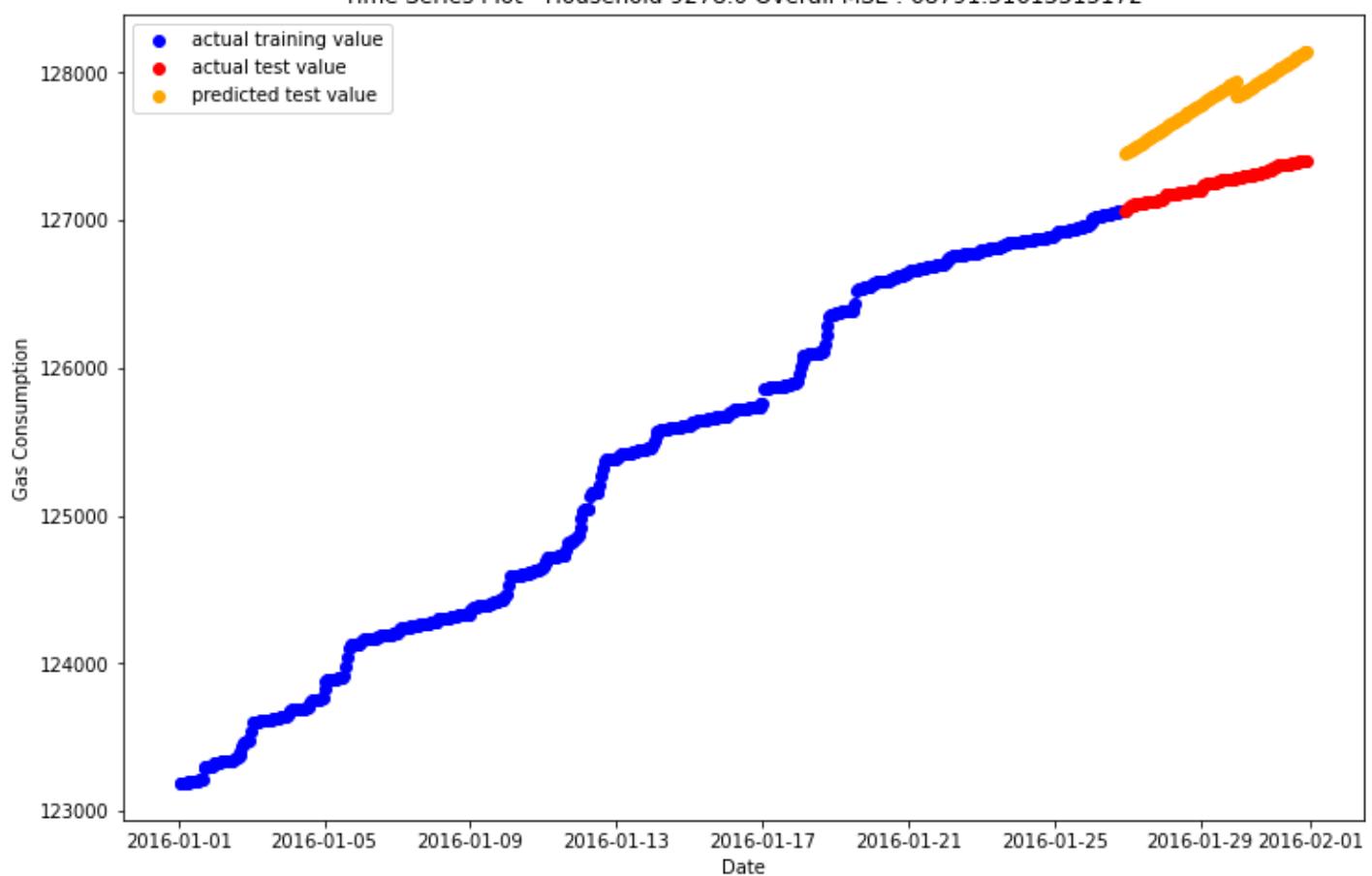
Time Series Plot - Household 9160.0 Overall MSE : 21023.871393177877



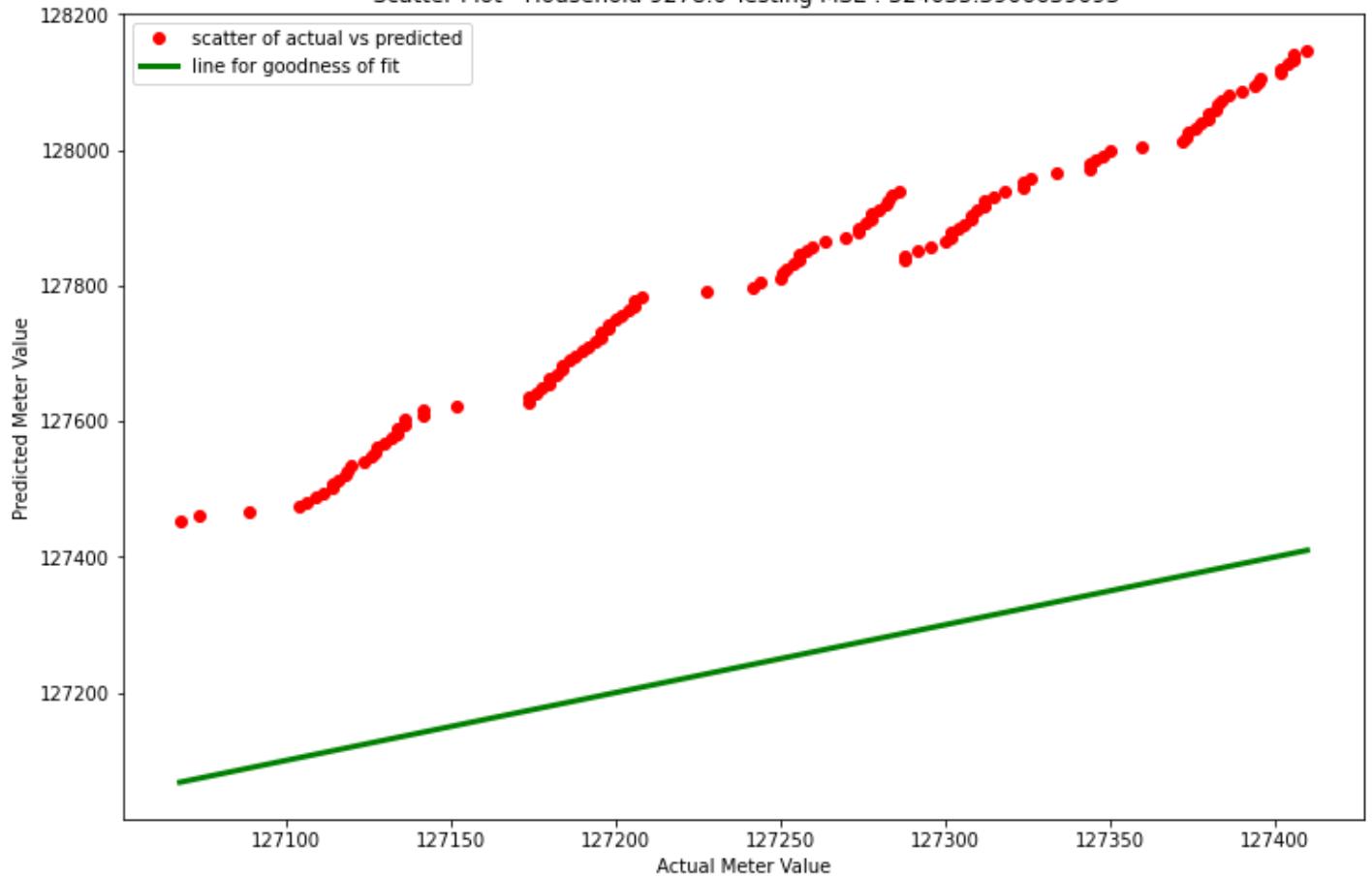
Scatter Plot - Household 9160.0 Testing MSE : 55093.06332729475



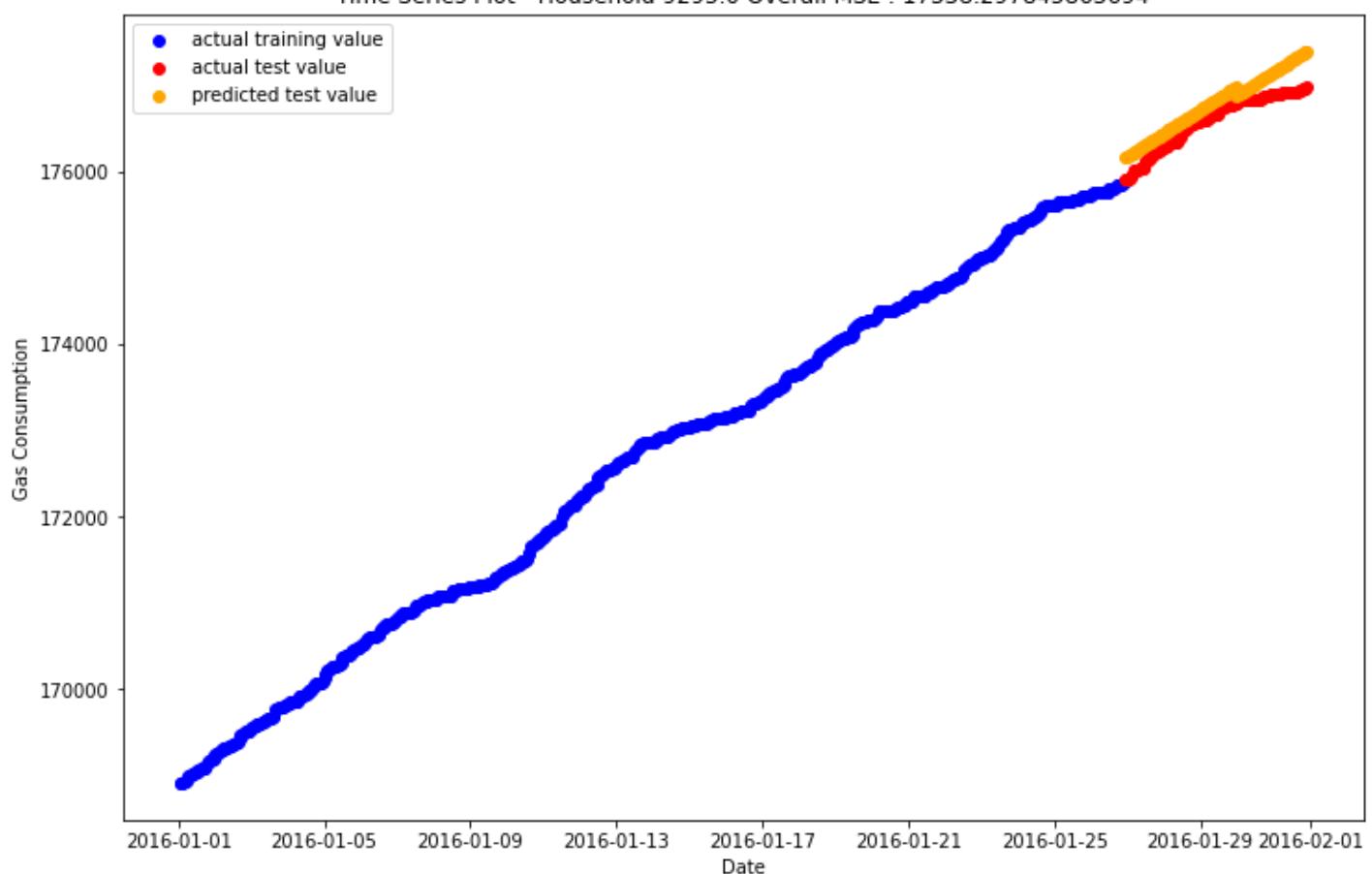
Time Series Plot - Household 9278.0 Overall MSE : 68791.51613315172



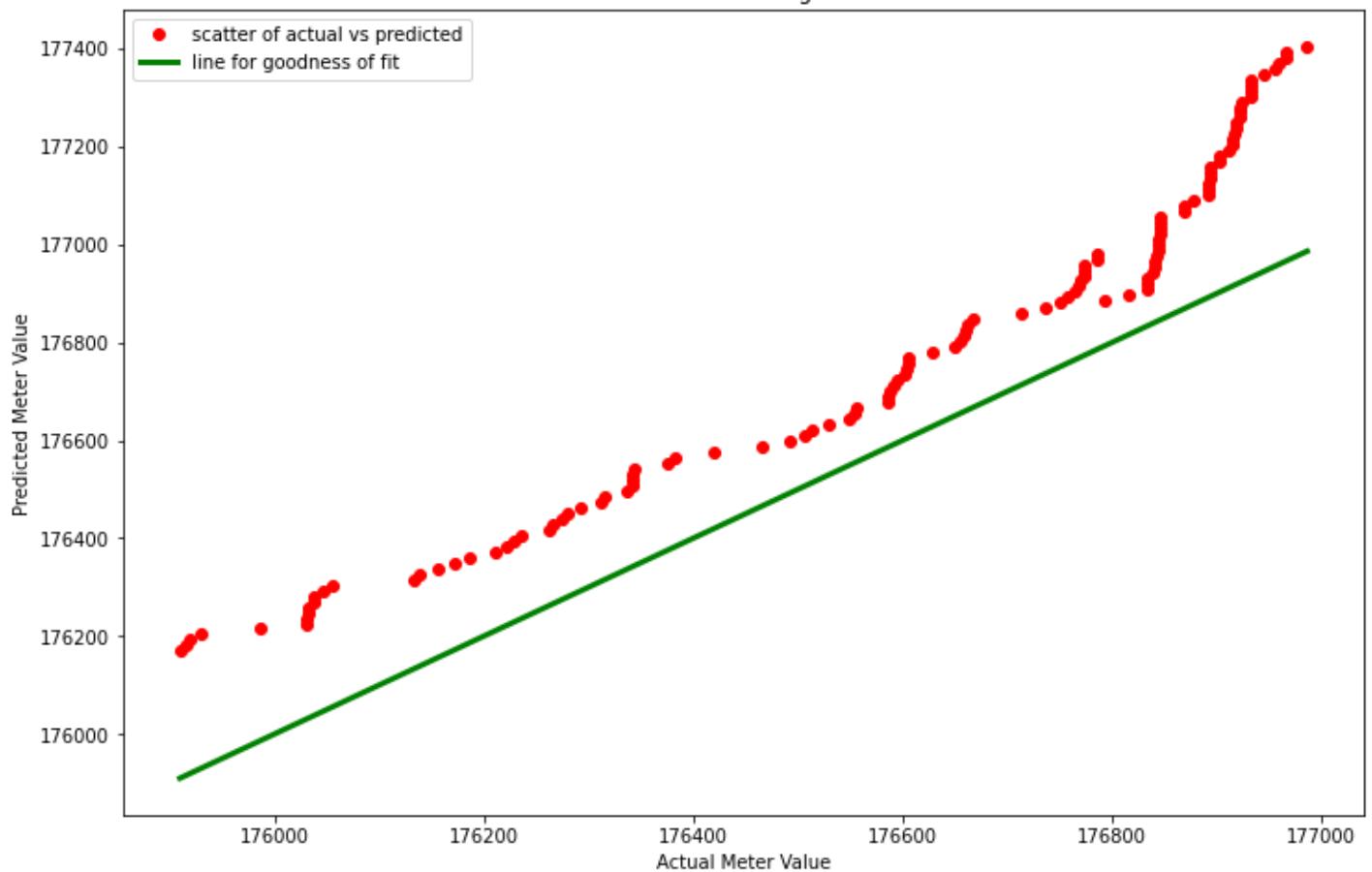
Scatter Plot - Household 9278.0 Testing MSE : 324035.3906639093



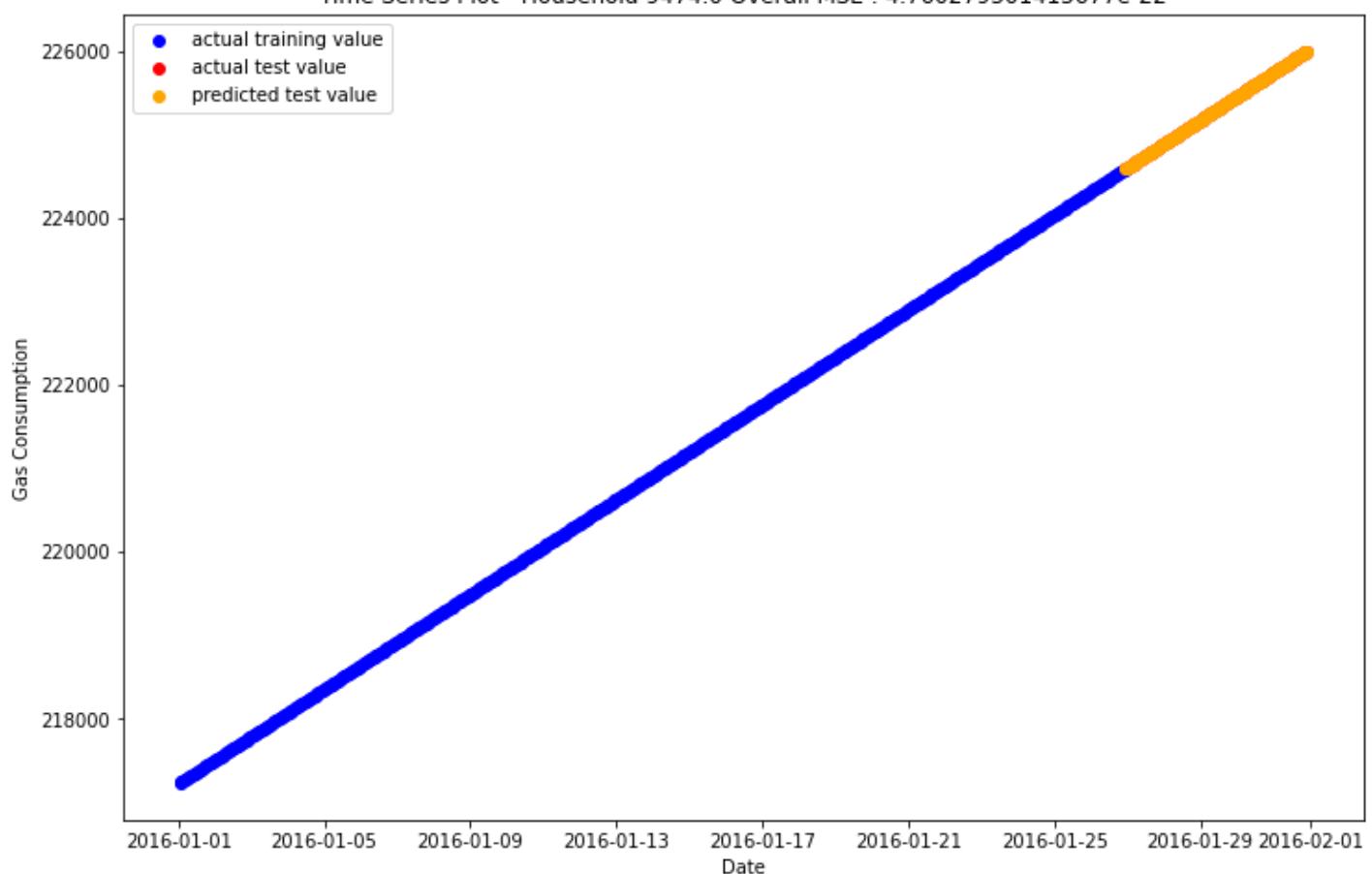
Time Series Plot - Household 9295.0 Overall MSE : 17338.297845863694



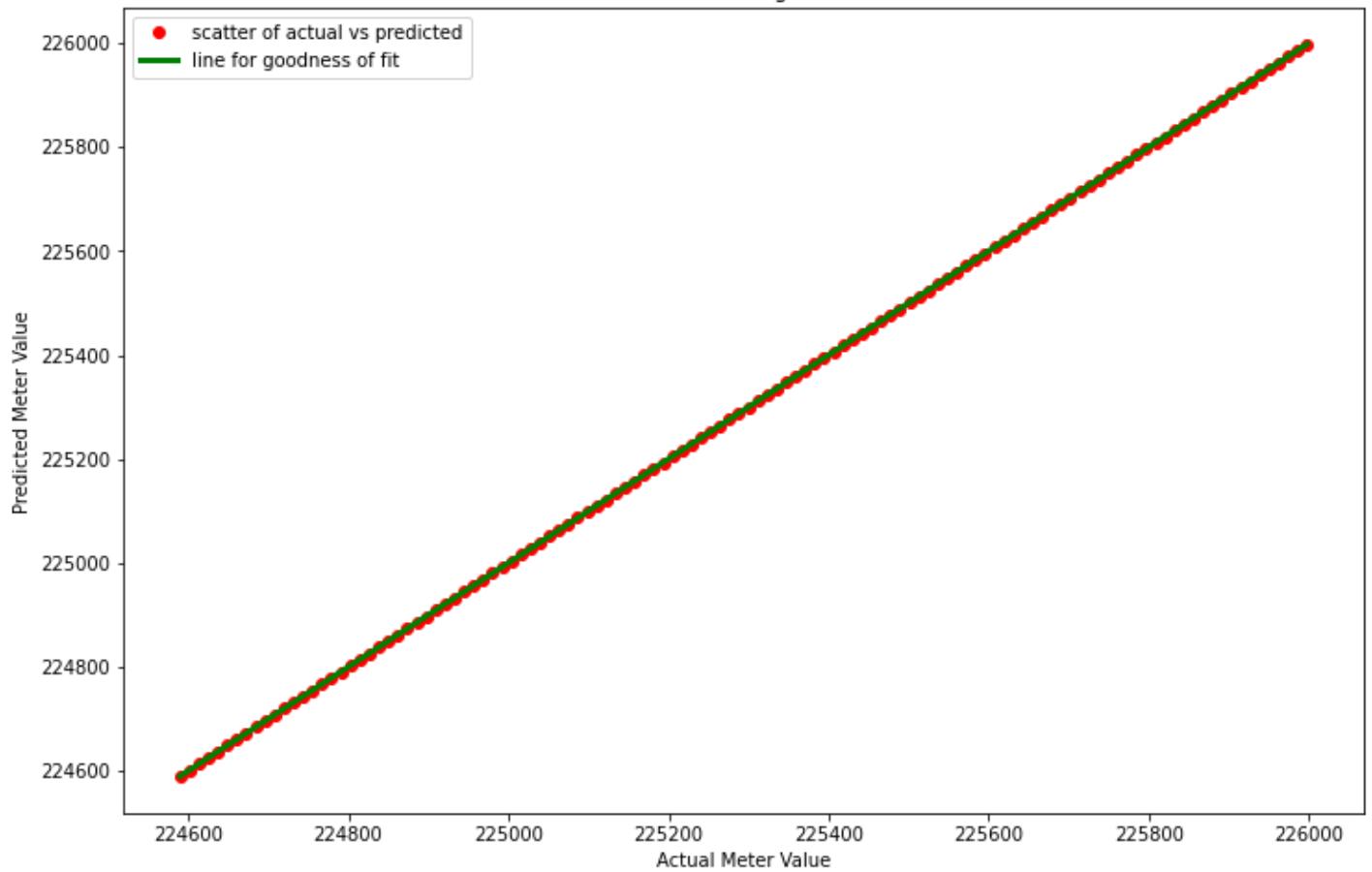
Scatter Plot - Household 9295.0 Testing MSE : 48245.74226680843



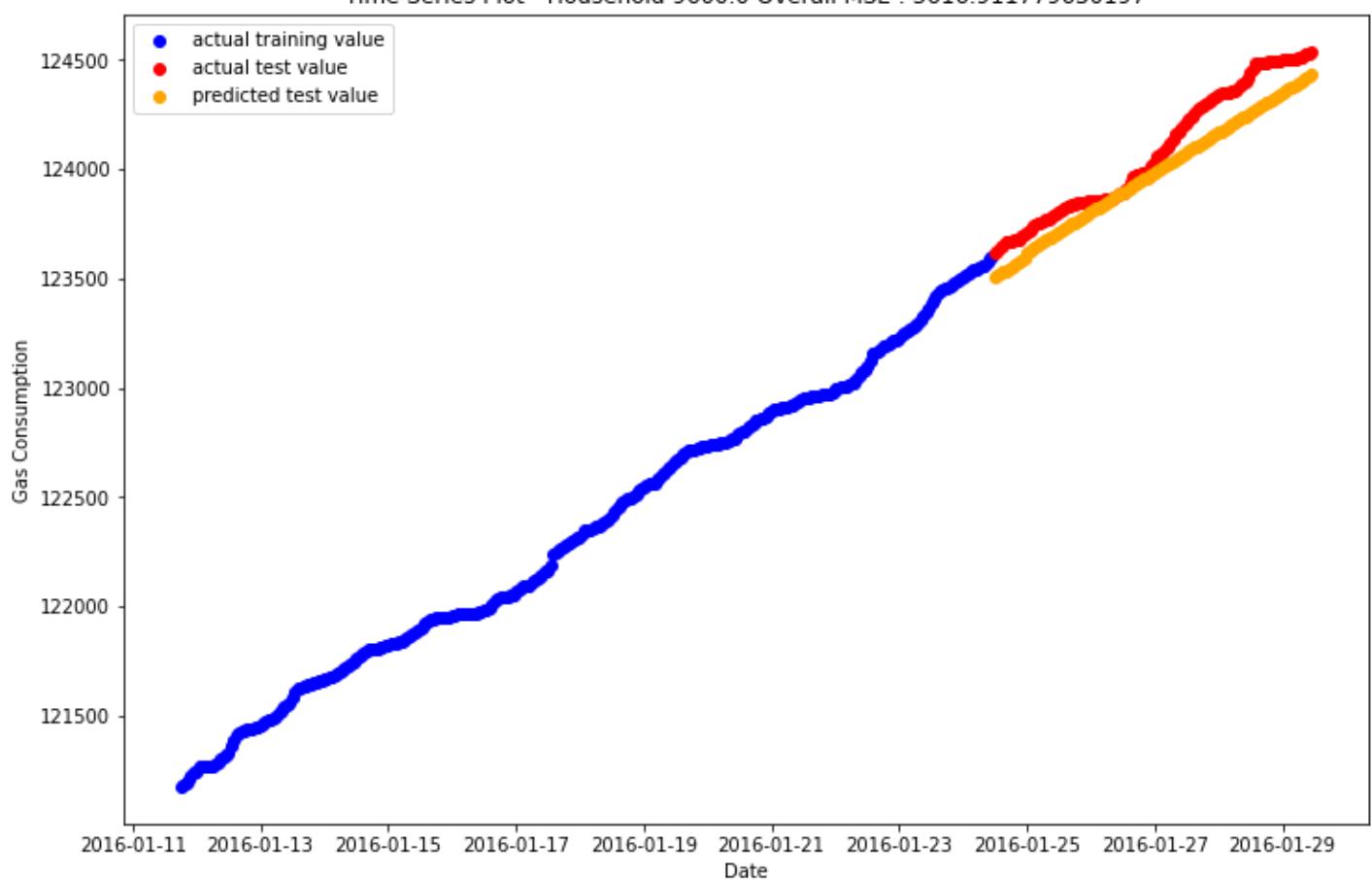
Time Series Plot - Household 9474.0 Overall MSE : 4.760279501415677e-22



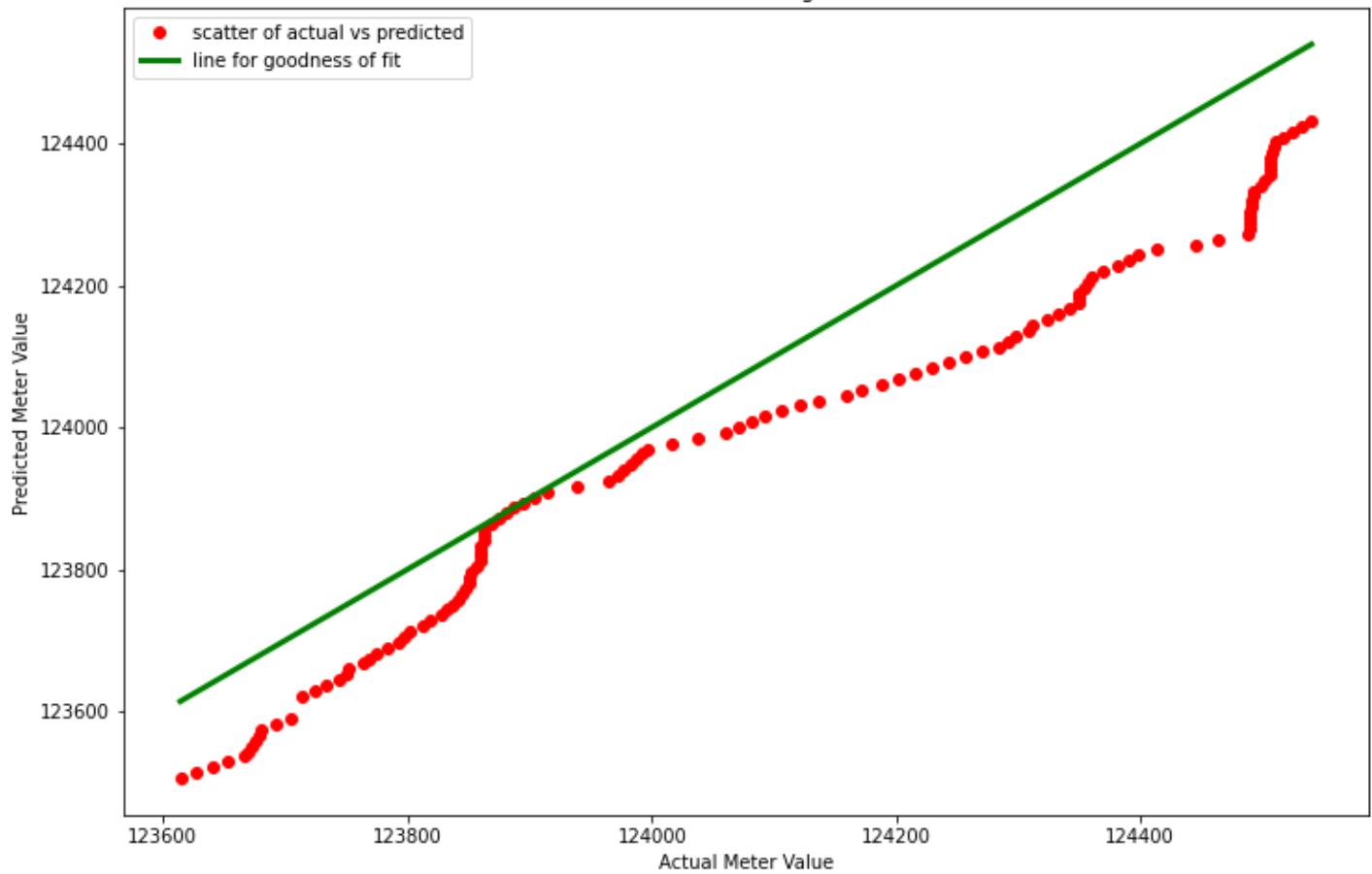
Scatter Plot - Household 9474.0 Testing MSE : 4.517509052022935e-22



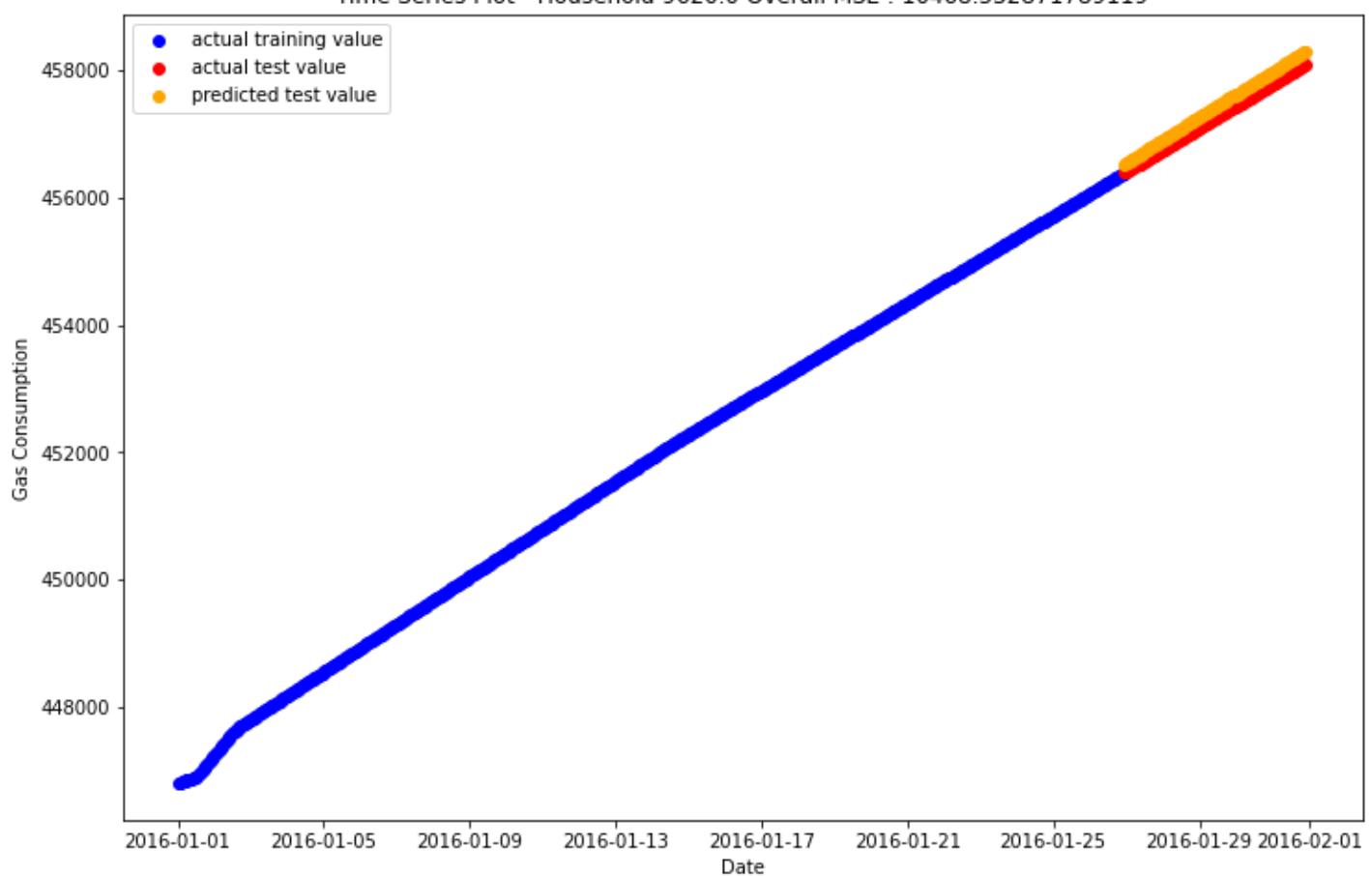
Time Series Plot - Household 9600.0 Overall MSE : 5616.911779630197



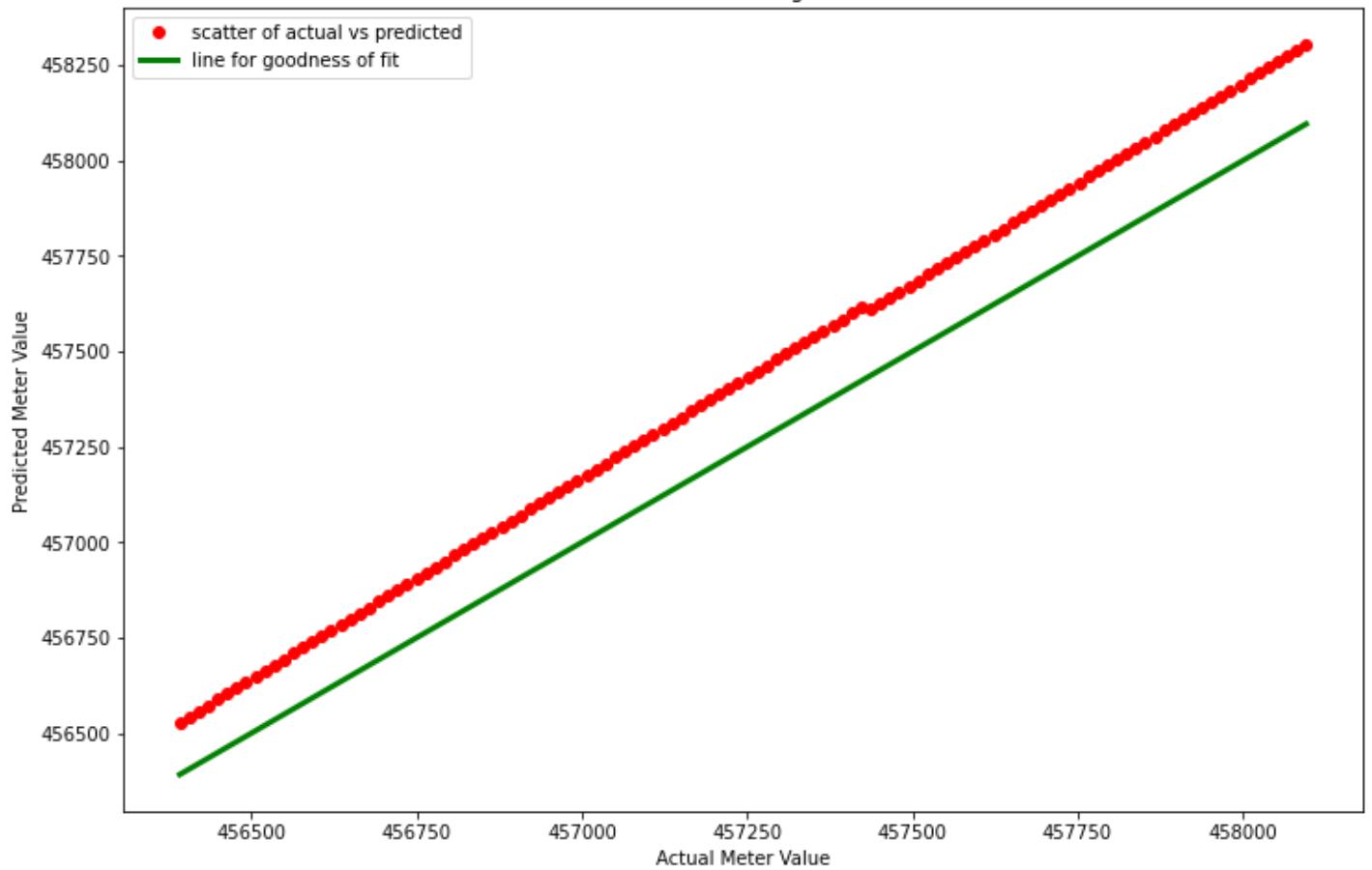
Scatter Plot - Household 9600.0 Testing MSE : 14221.39833402412



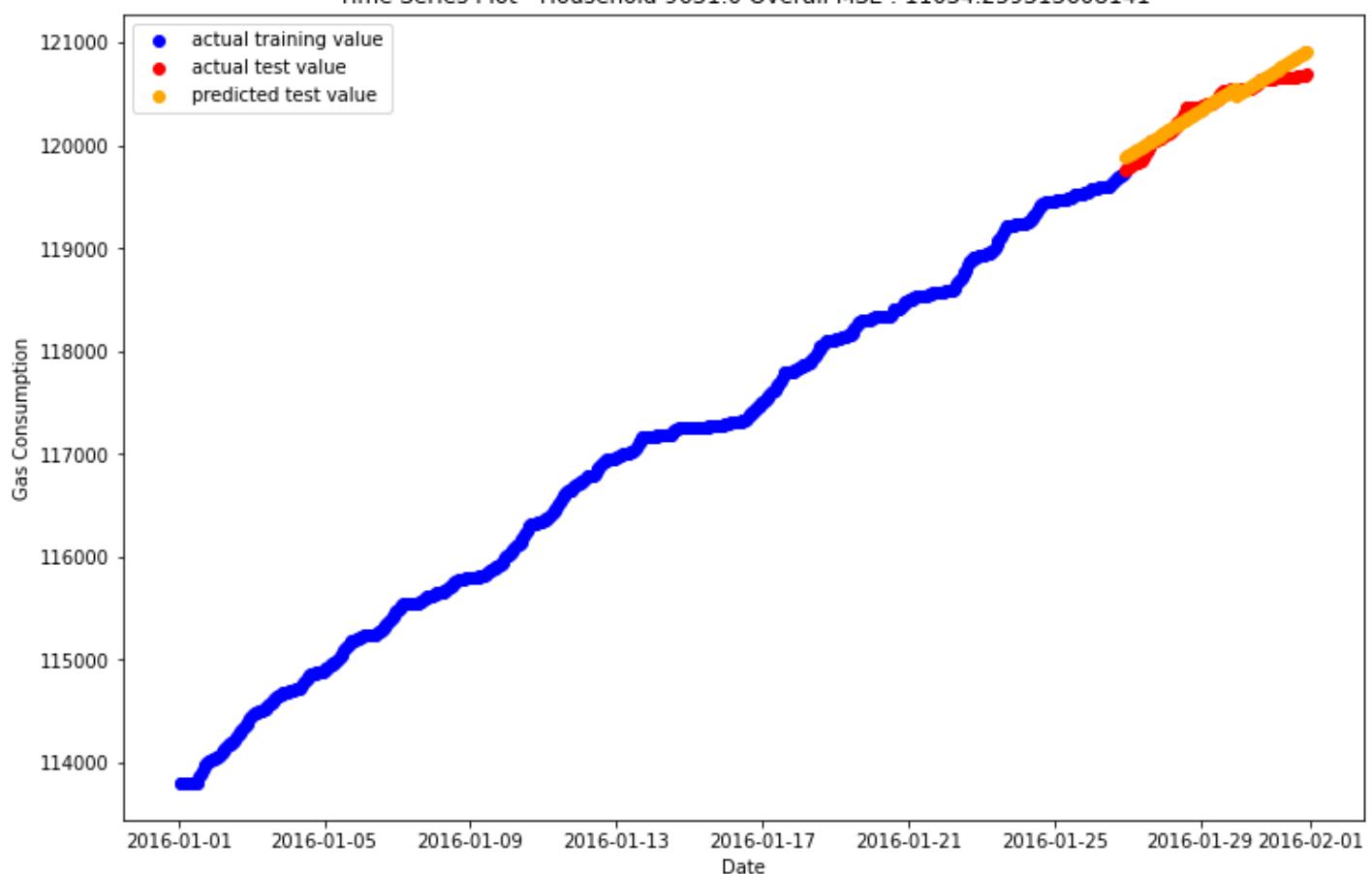
Time Series Plot - Household 9620.0 Overall MSE : 10468.532871789119



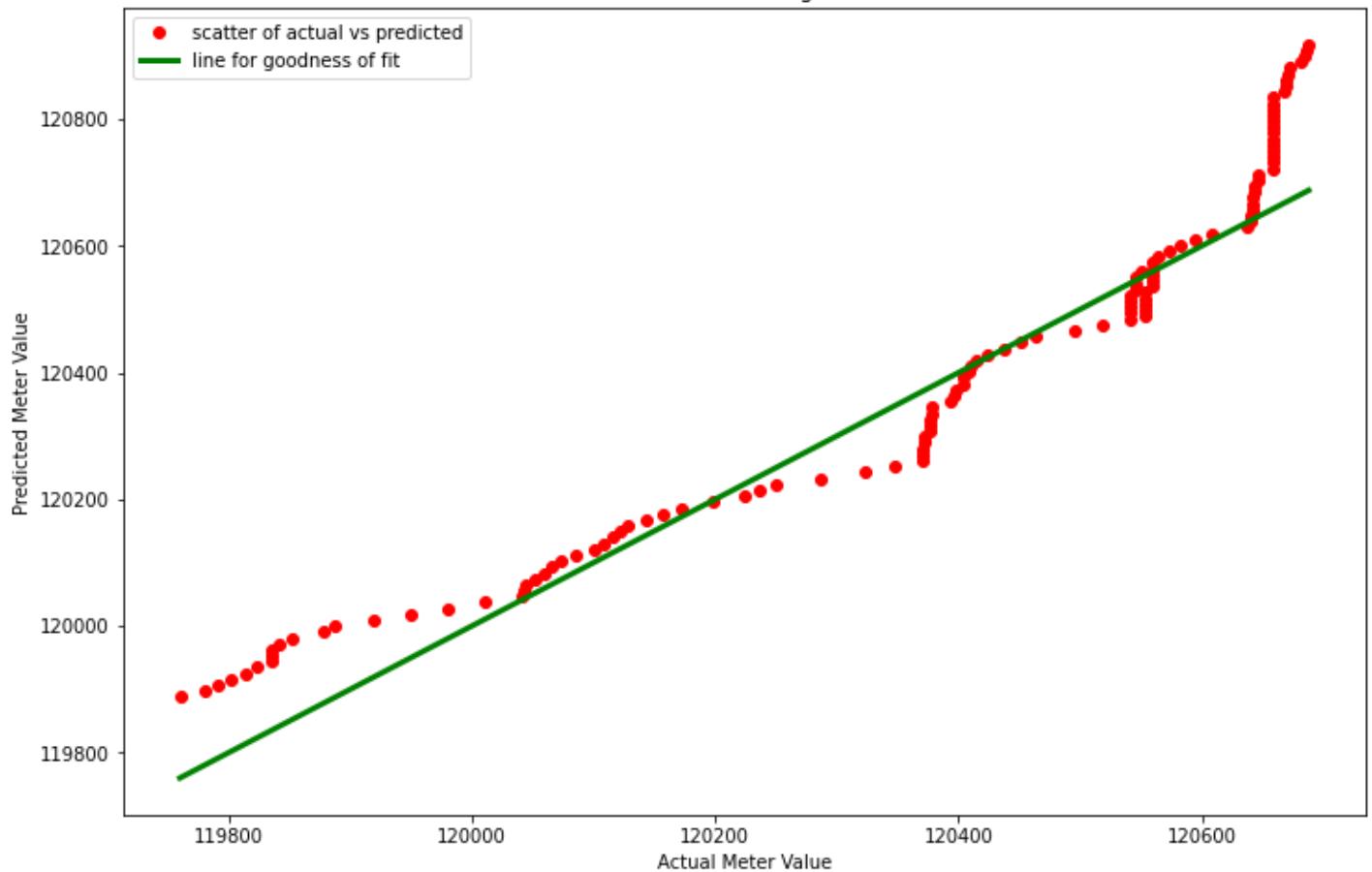
Scatter Plot - Household 9620.0 Testing MSE : 30916.854088978034



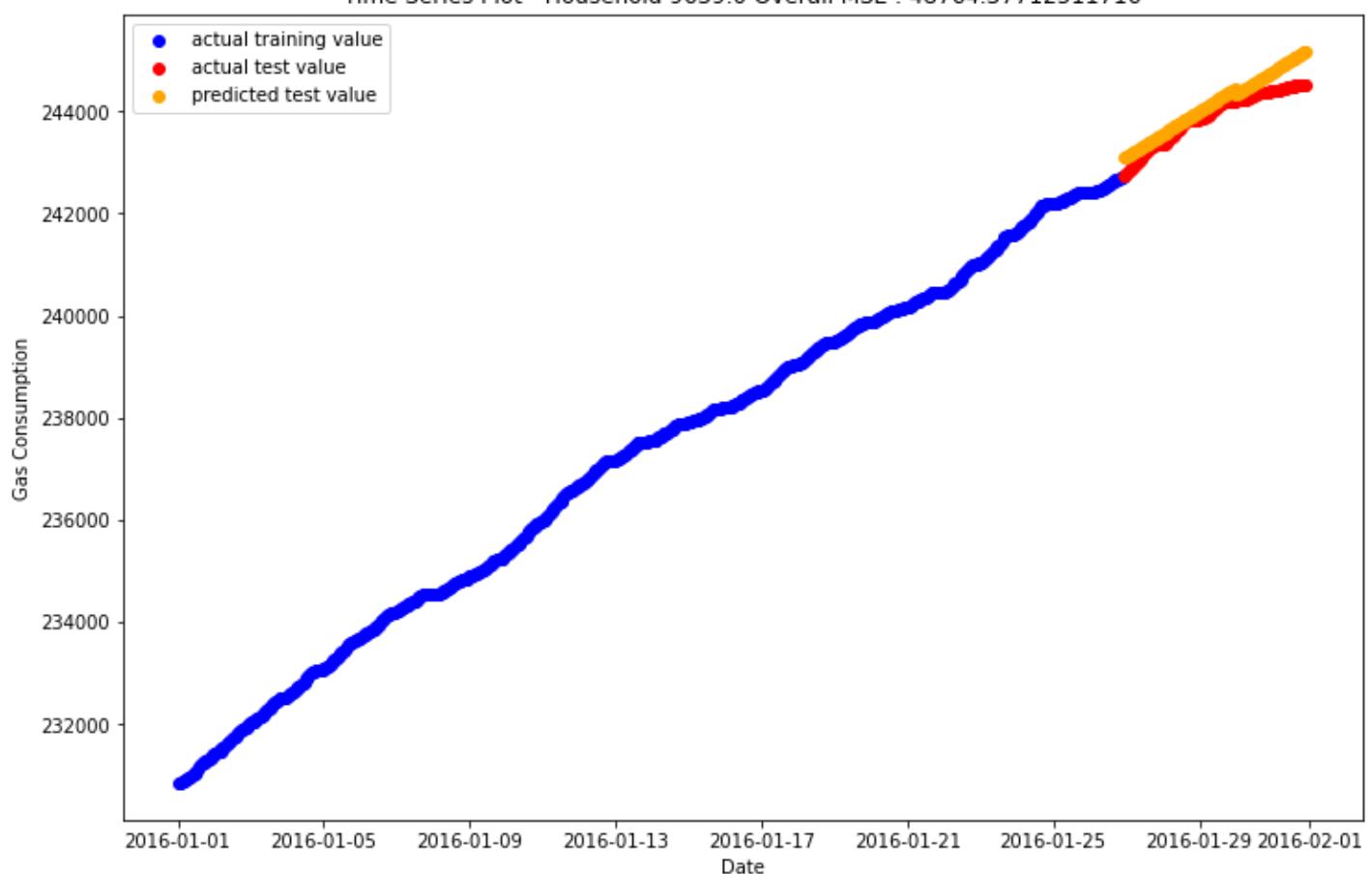
Time Series Plot - Household 9631.0 Overall MSE : 11034.259313608141



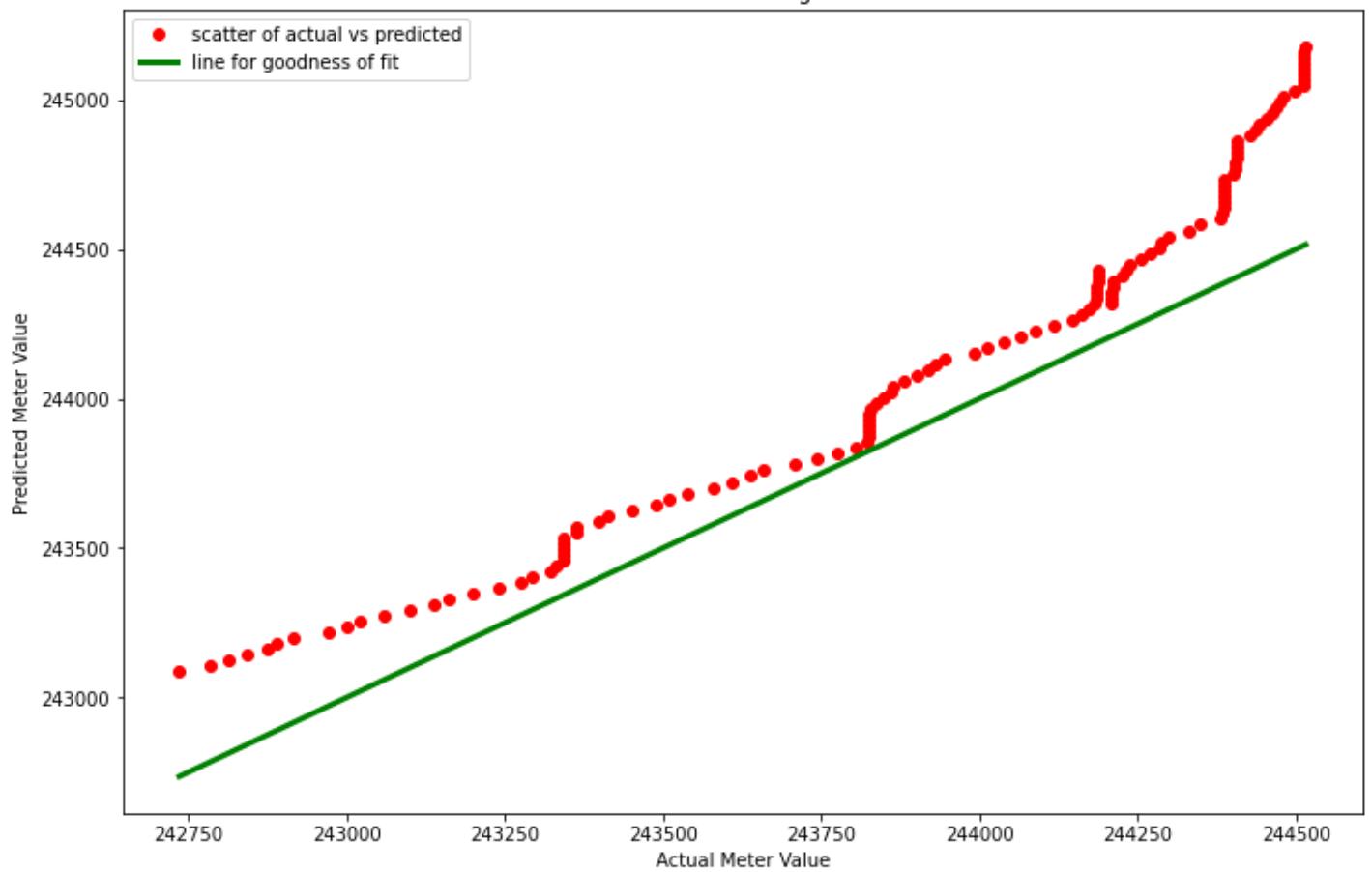
Scatter Plot - Household 9631.0 Testing MSE : 7573.359367840542



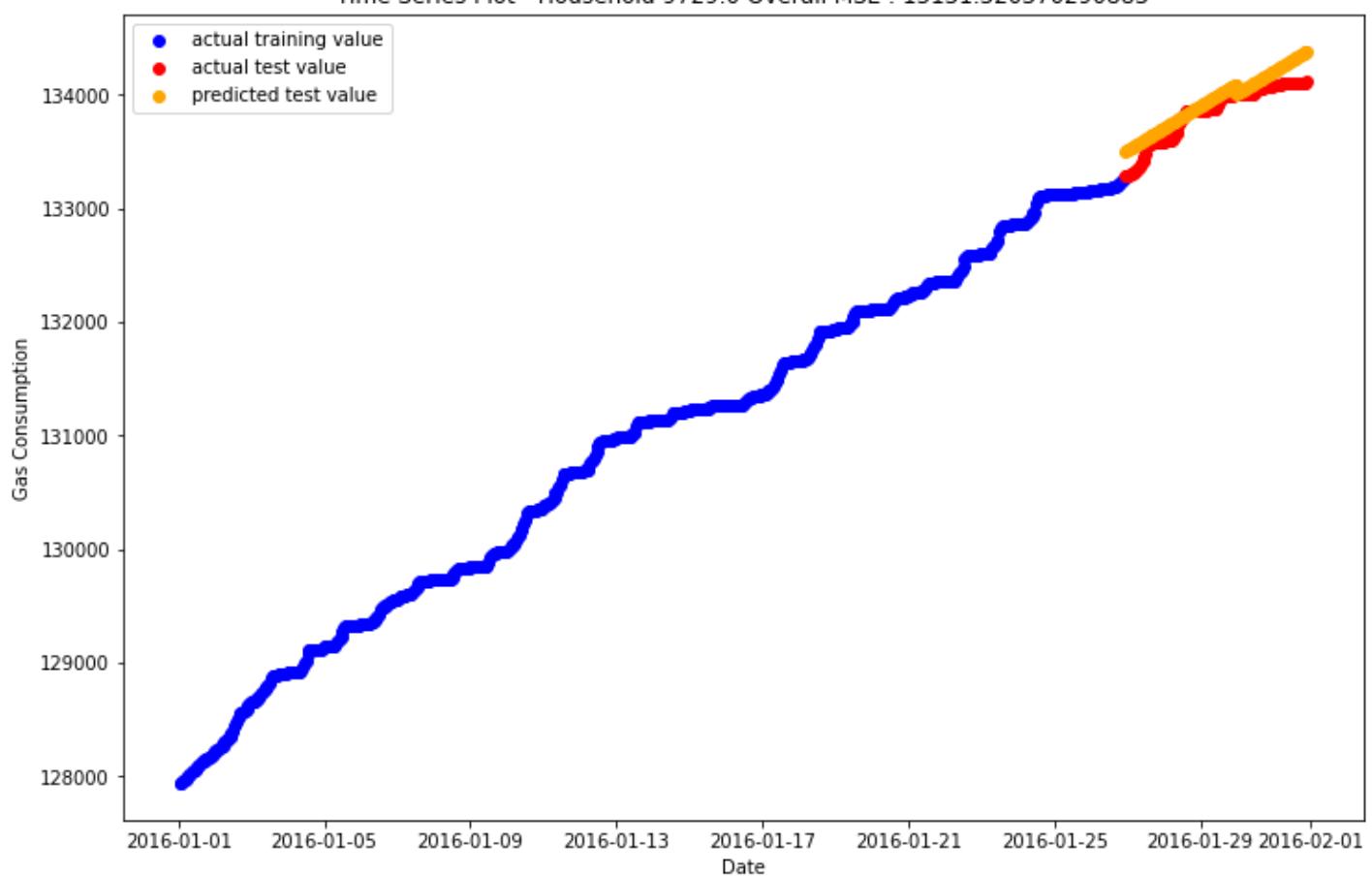
Time Series Plot - Household 9639.0 Overall MSE : 48764.37712511716



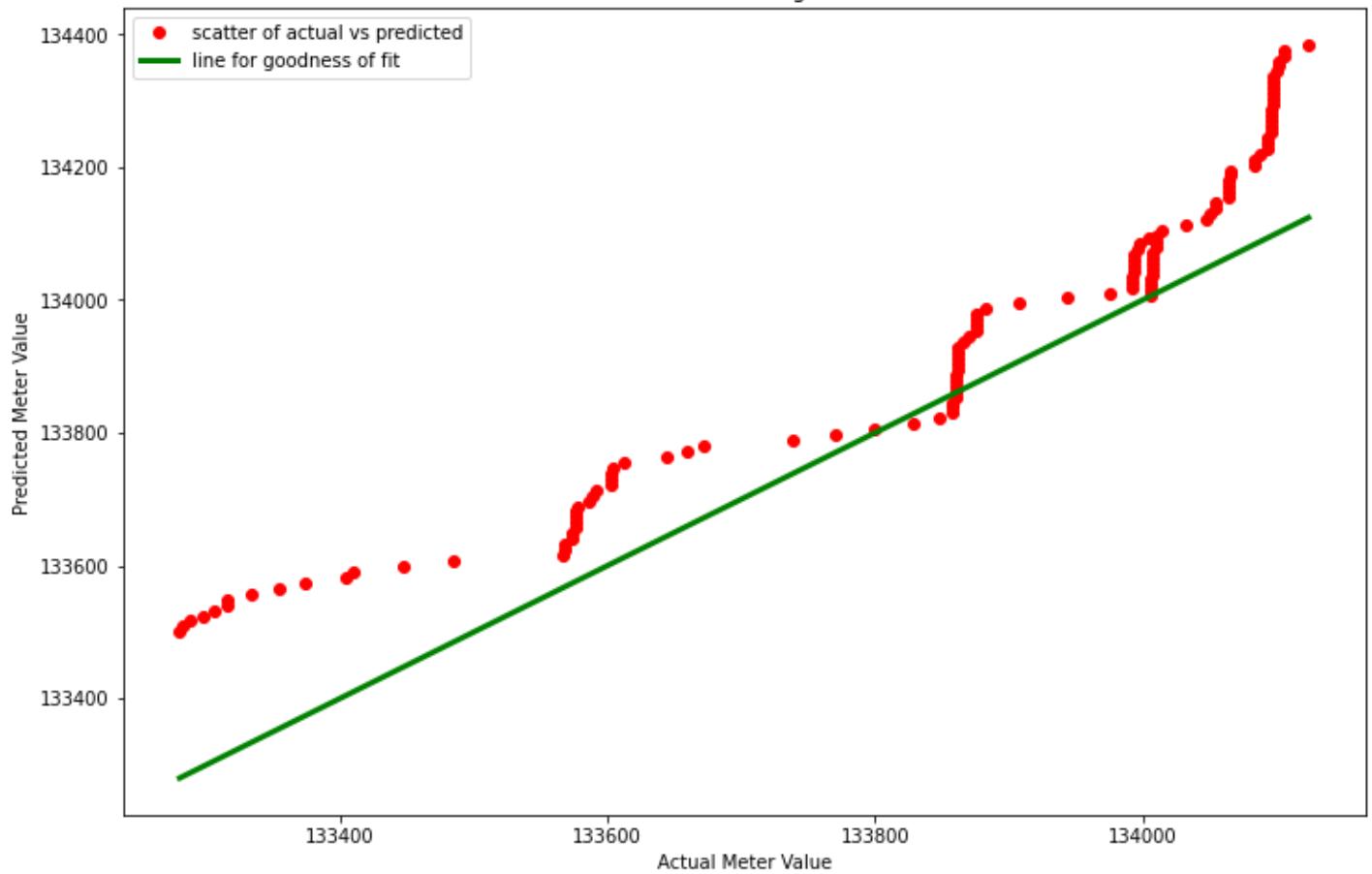
Scatter Plot - Household 9639.0 Testing MSE : 81222.97949754074



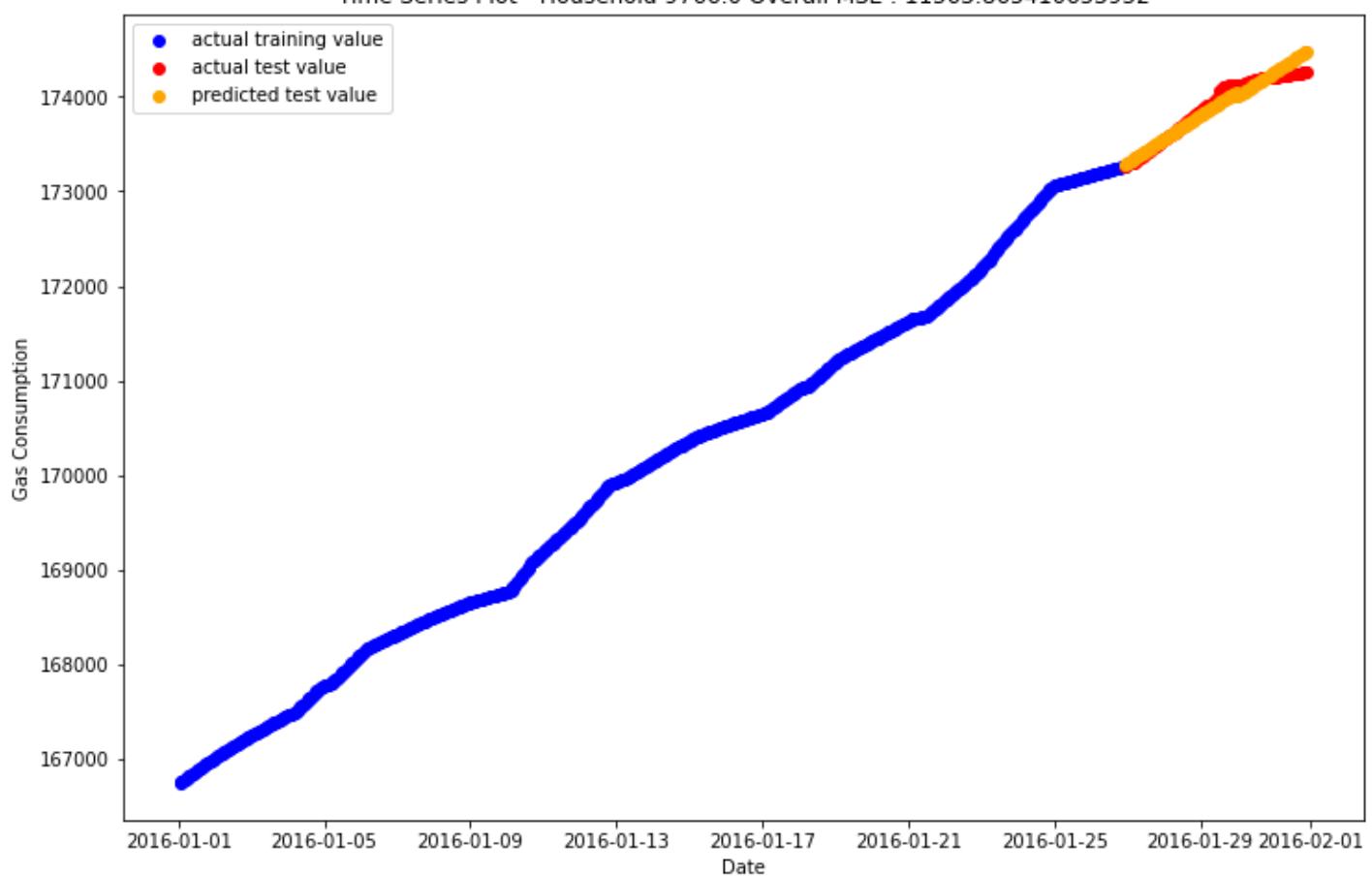
Time Series Plot - Household 9729.0 Overall MSE : 15131.320370290883



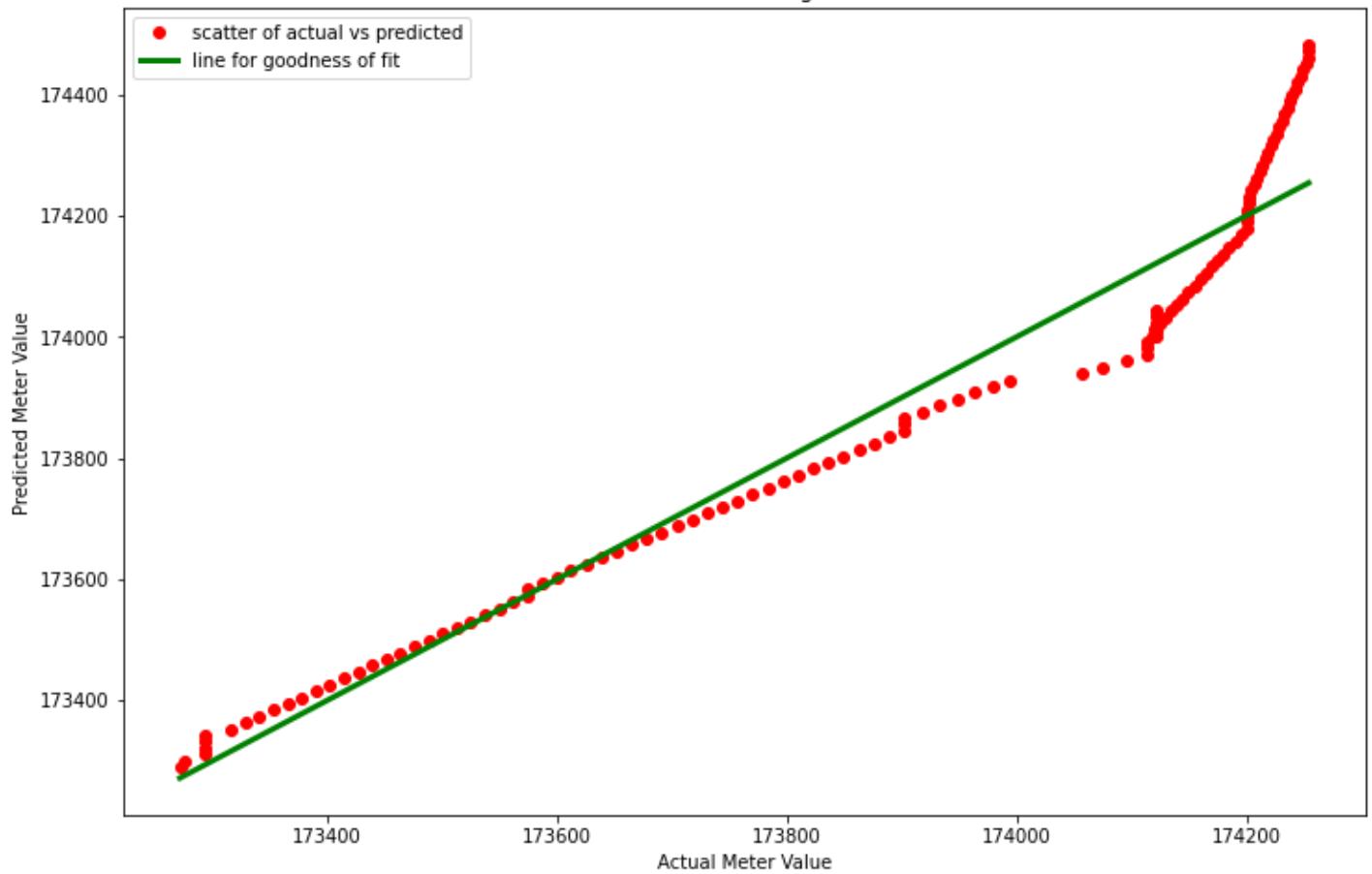
Scatter Plot - Household 9729.0 Testing MSE : 17102.182315034293



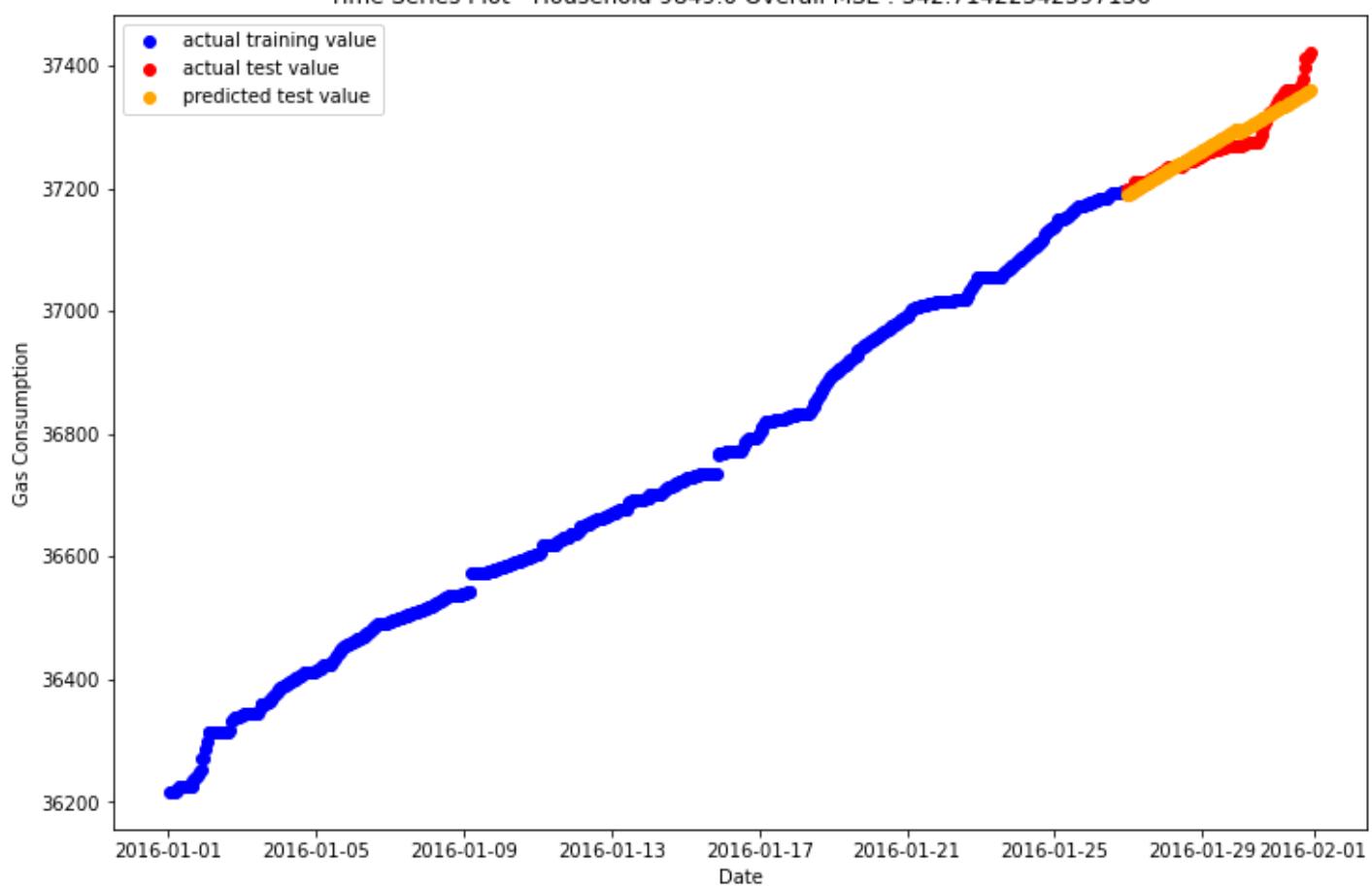
Time Series Plot - Household 9766.0 Overall MSE : 11563.865410653952



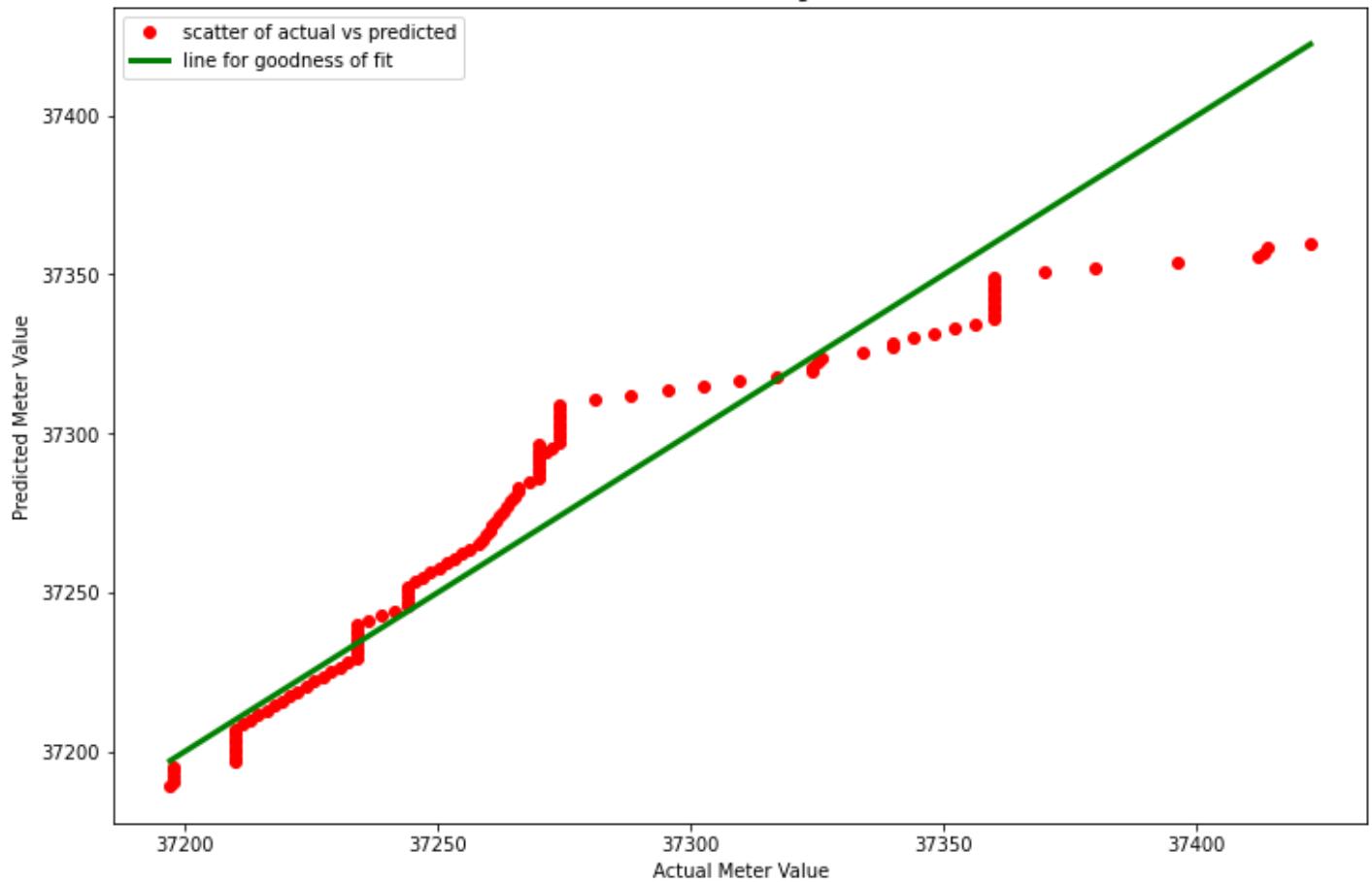
Scatter Plot - Household 9766.0 Testing MSE : 6651.580954214971



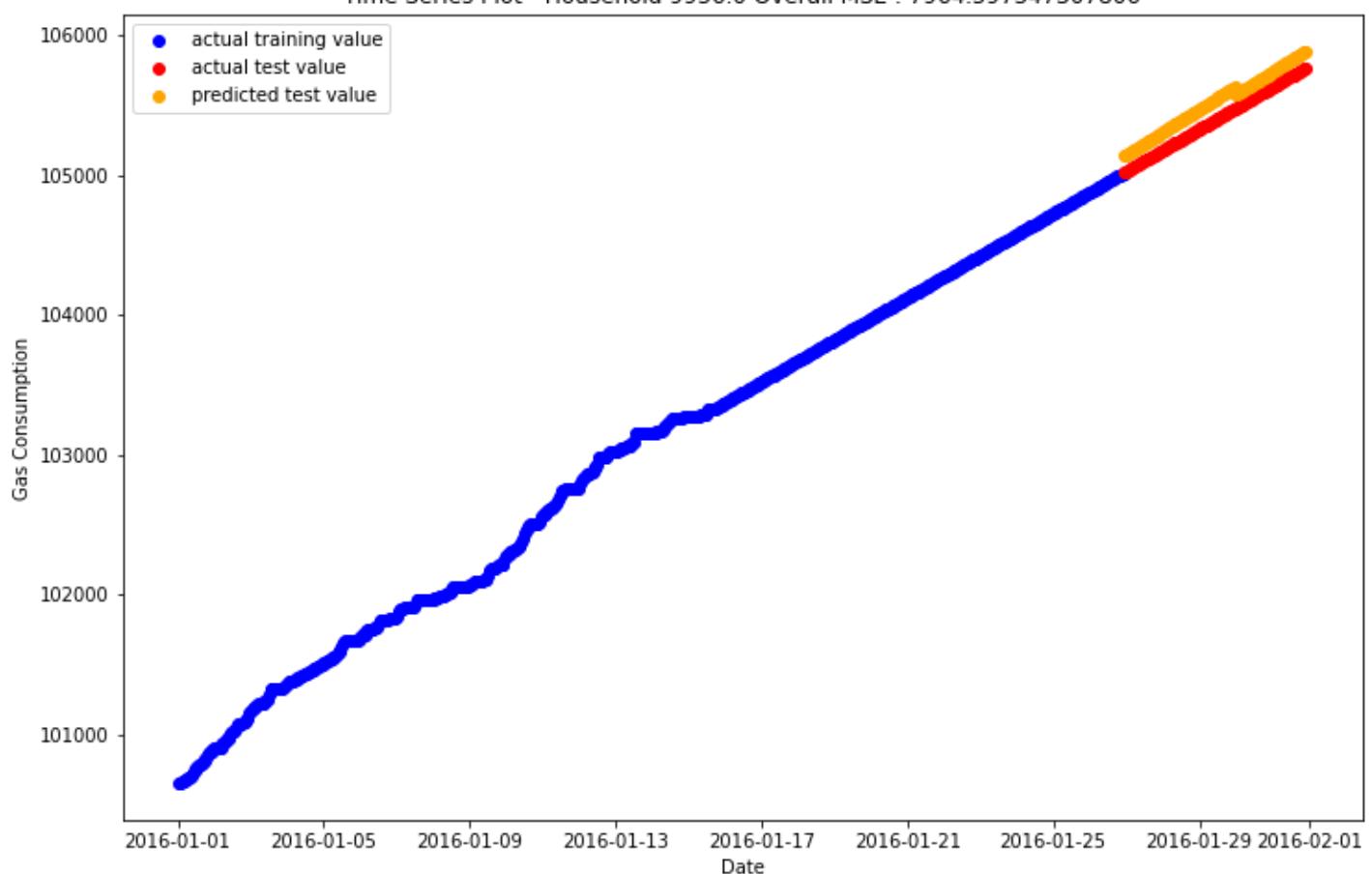
Time Series Plot - Household 9849.0 Overall MSE : 342.71422542397136



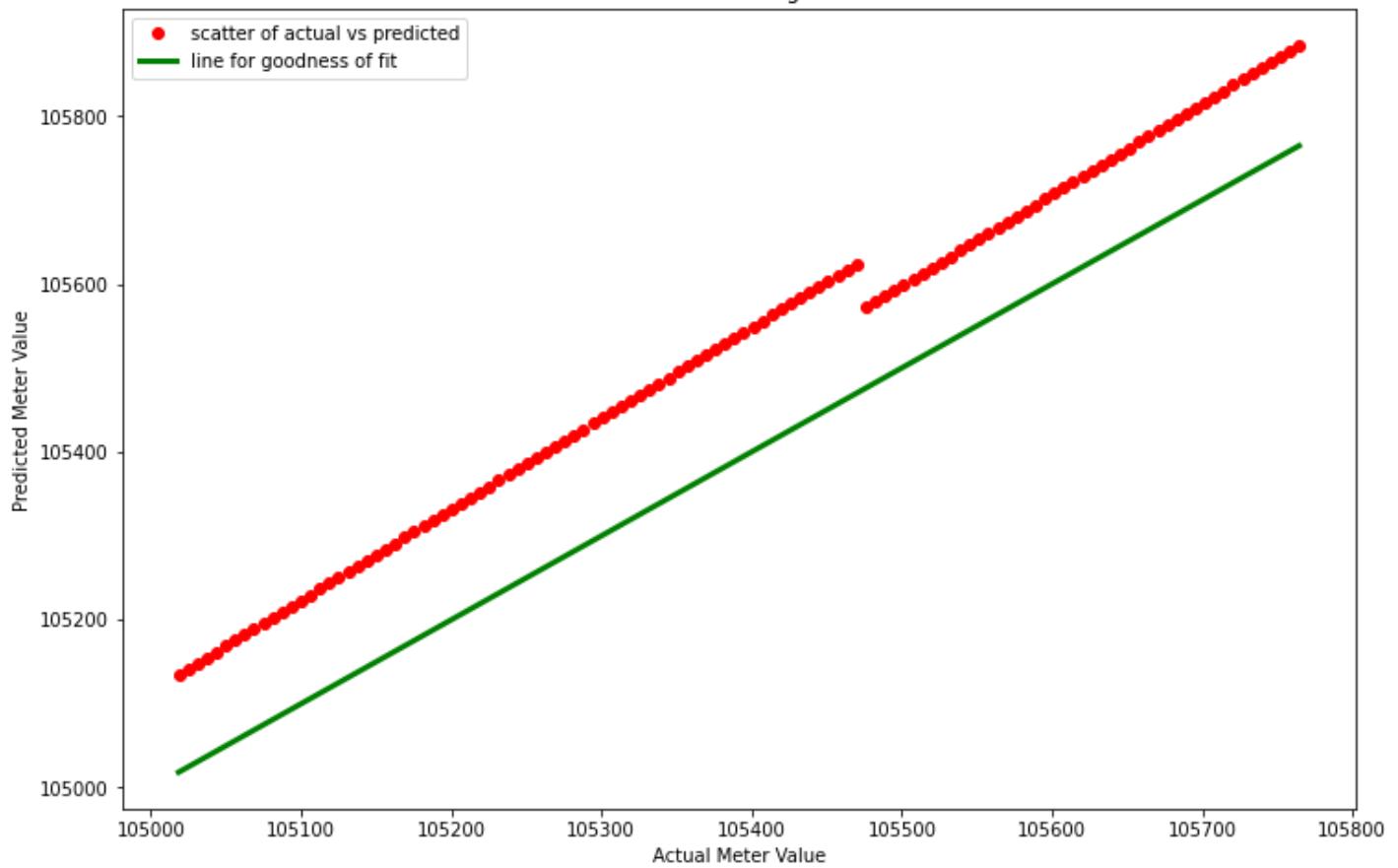
Scatter Plot - Household 9849.0 Testing MSE : 338.8055409628037

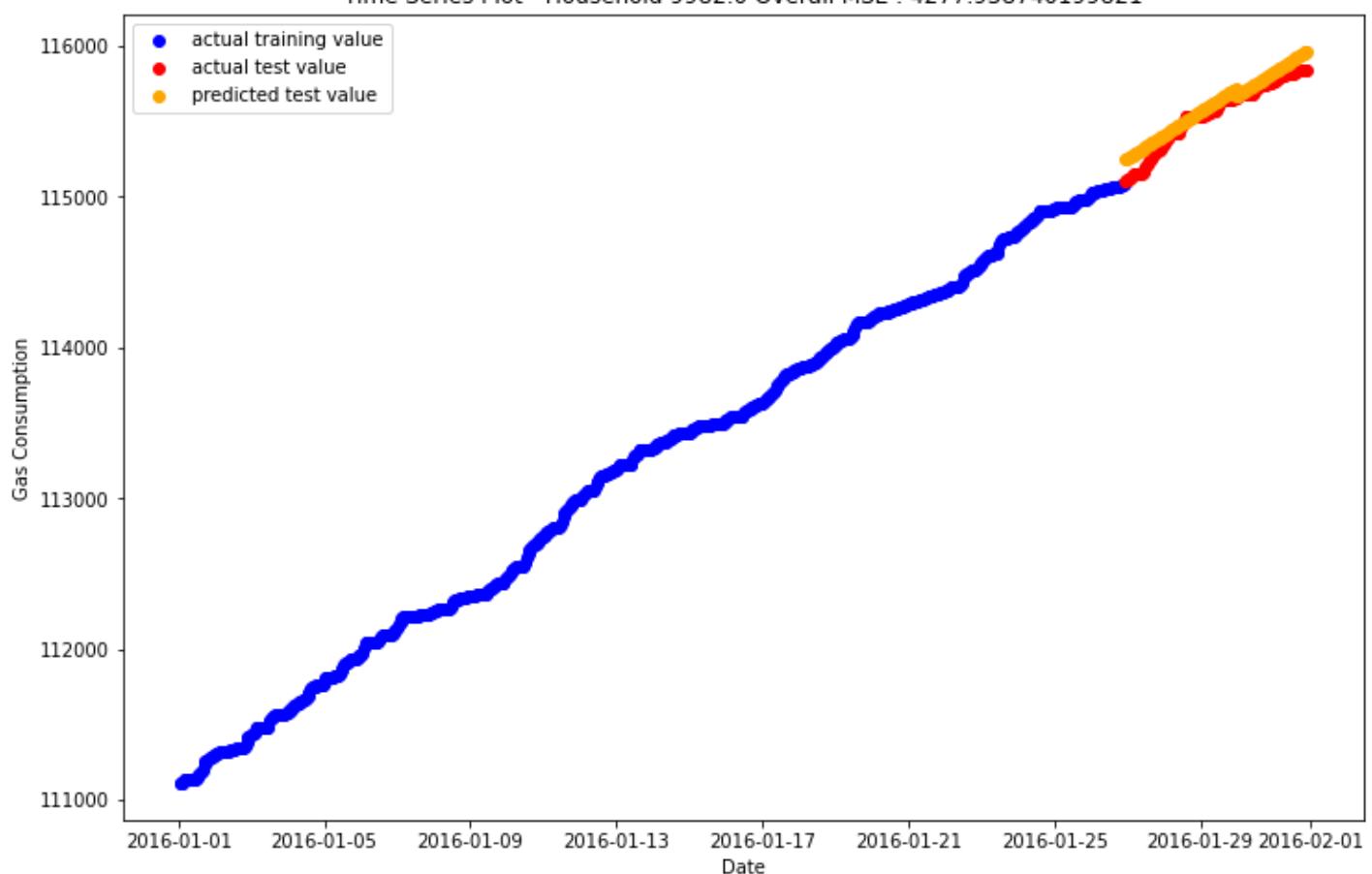


Time Series Plot - Household 9956.0 Overall MSE : 7964.597547307806

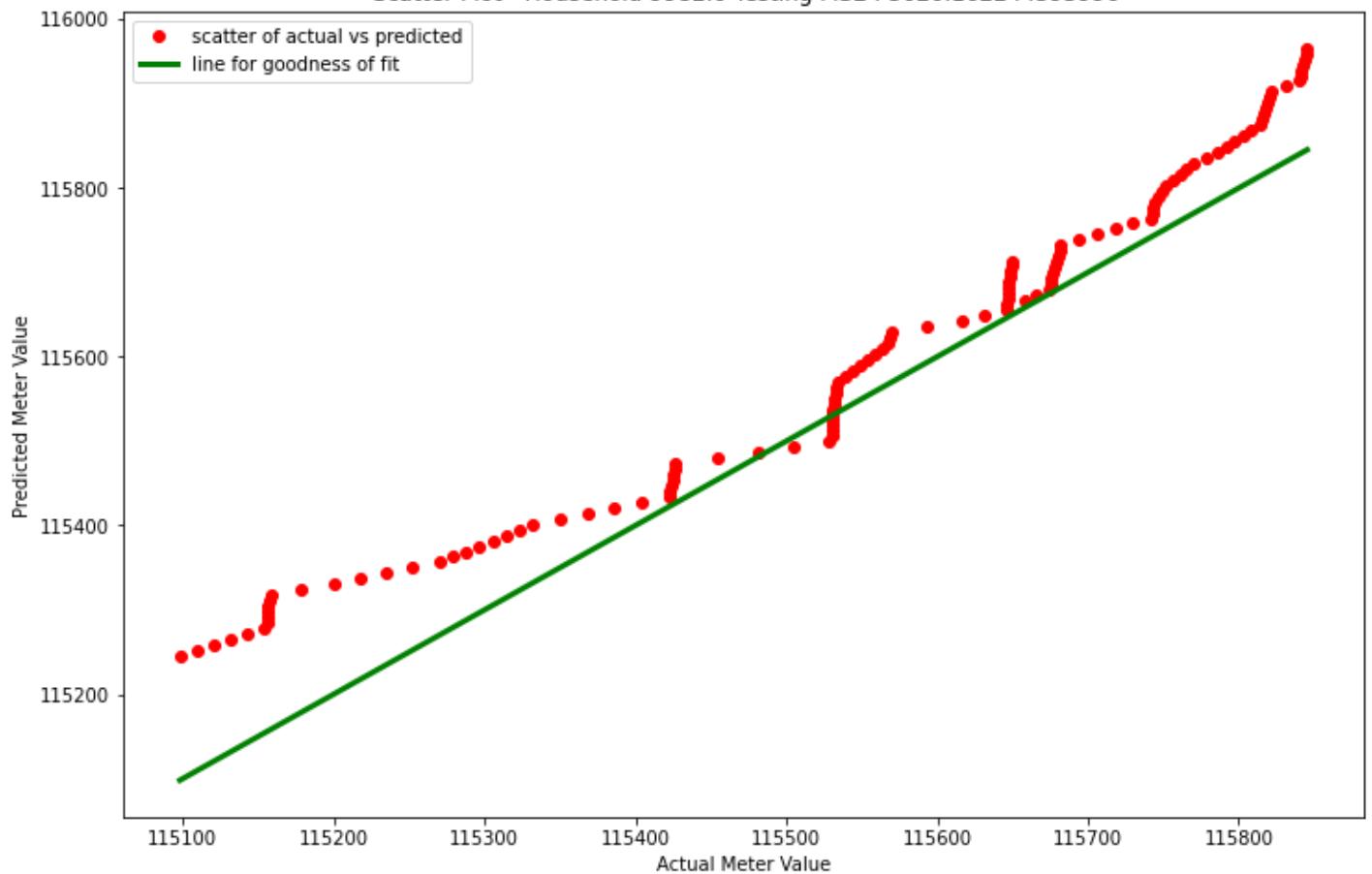


Scatter Plot - Household 9956.0 Testing MSE : 15778.372032876421





Scatter Plot - Household 9982.0 Testing MSE : 5020.162244593996

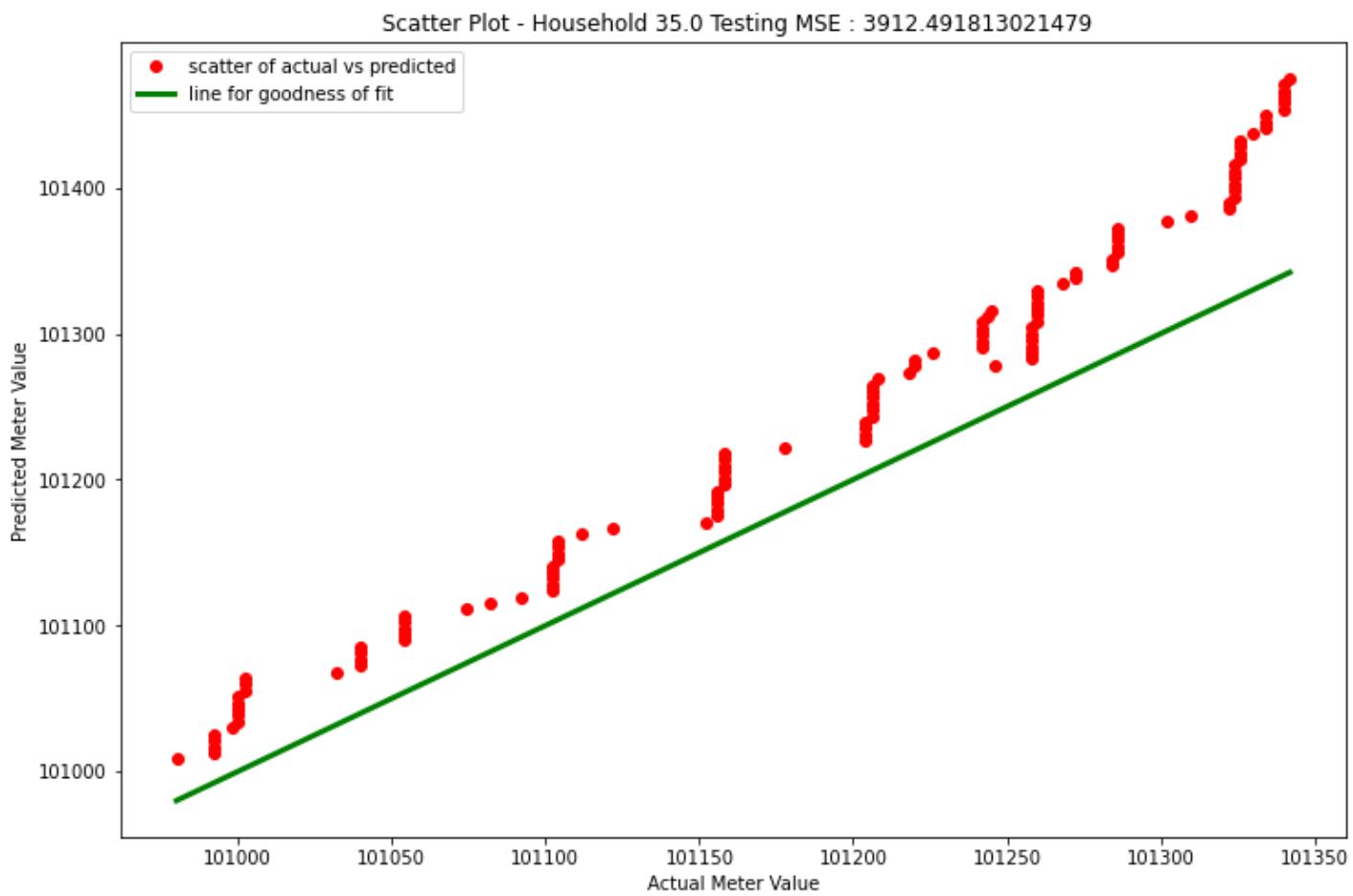
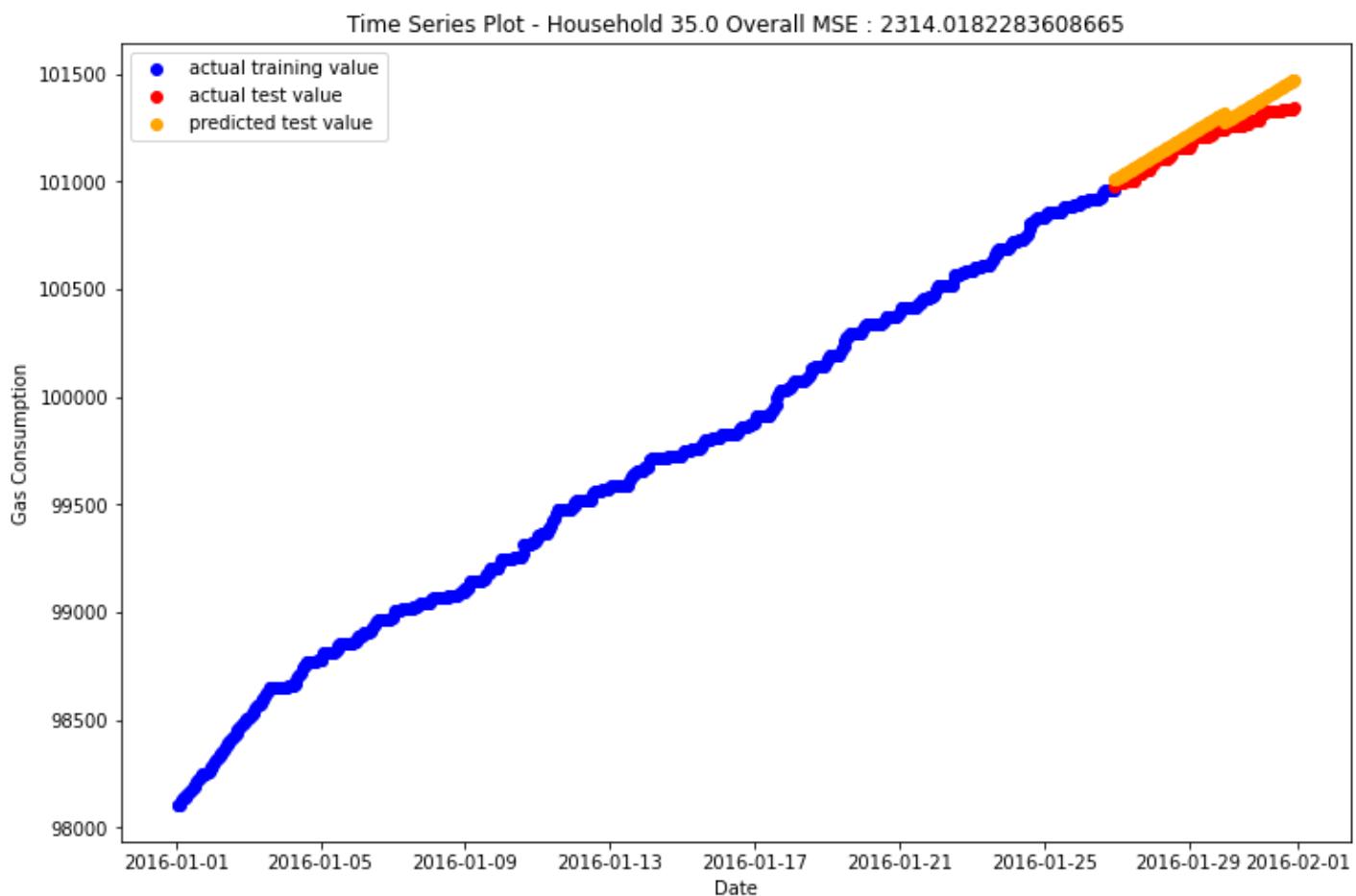


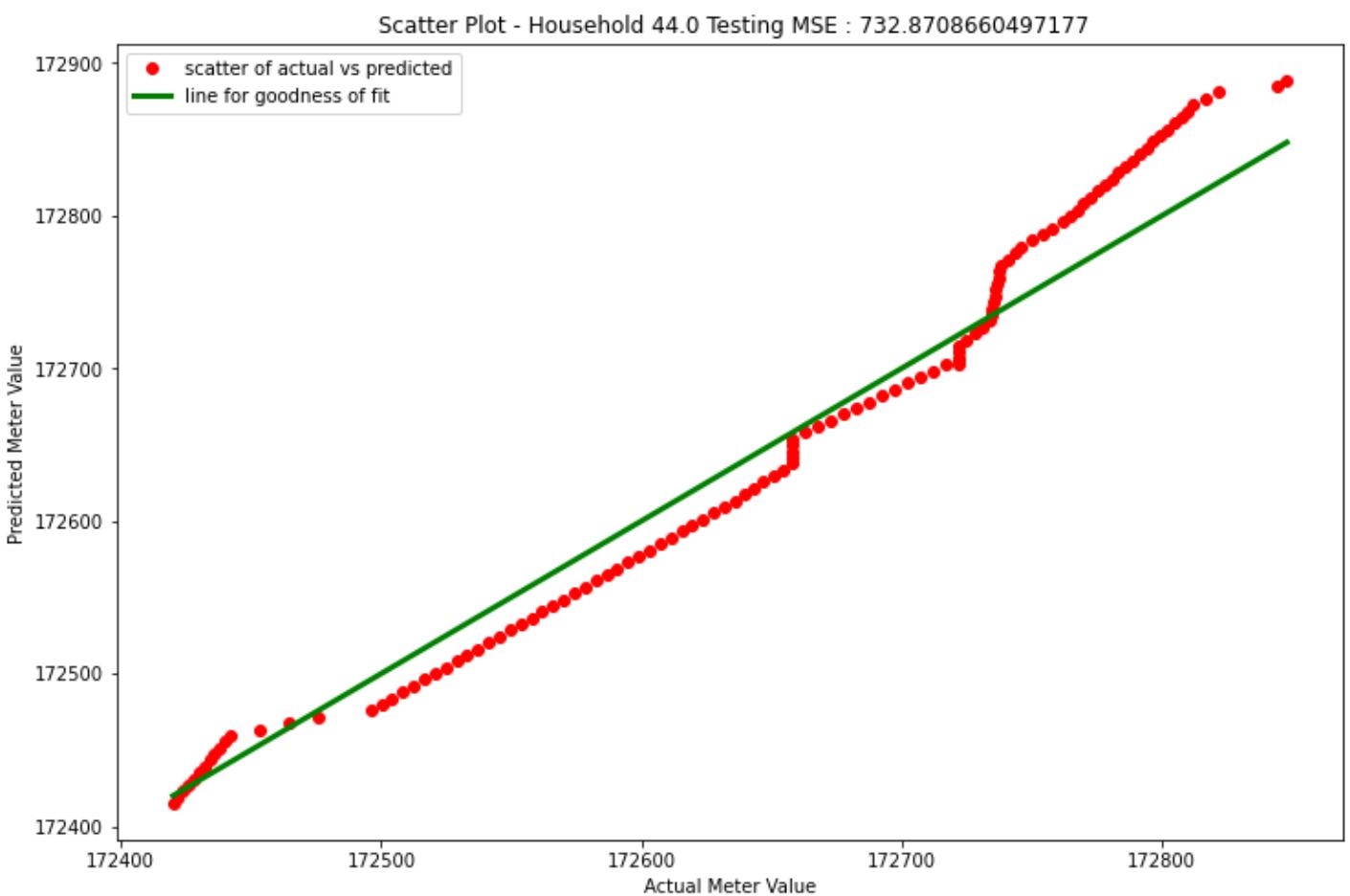
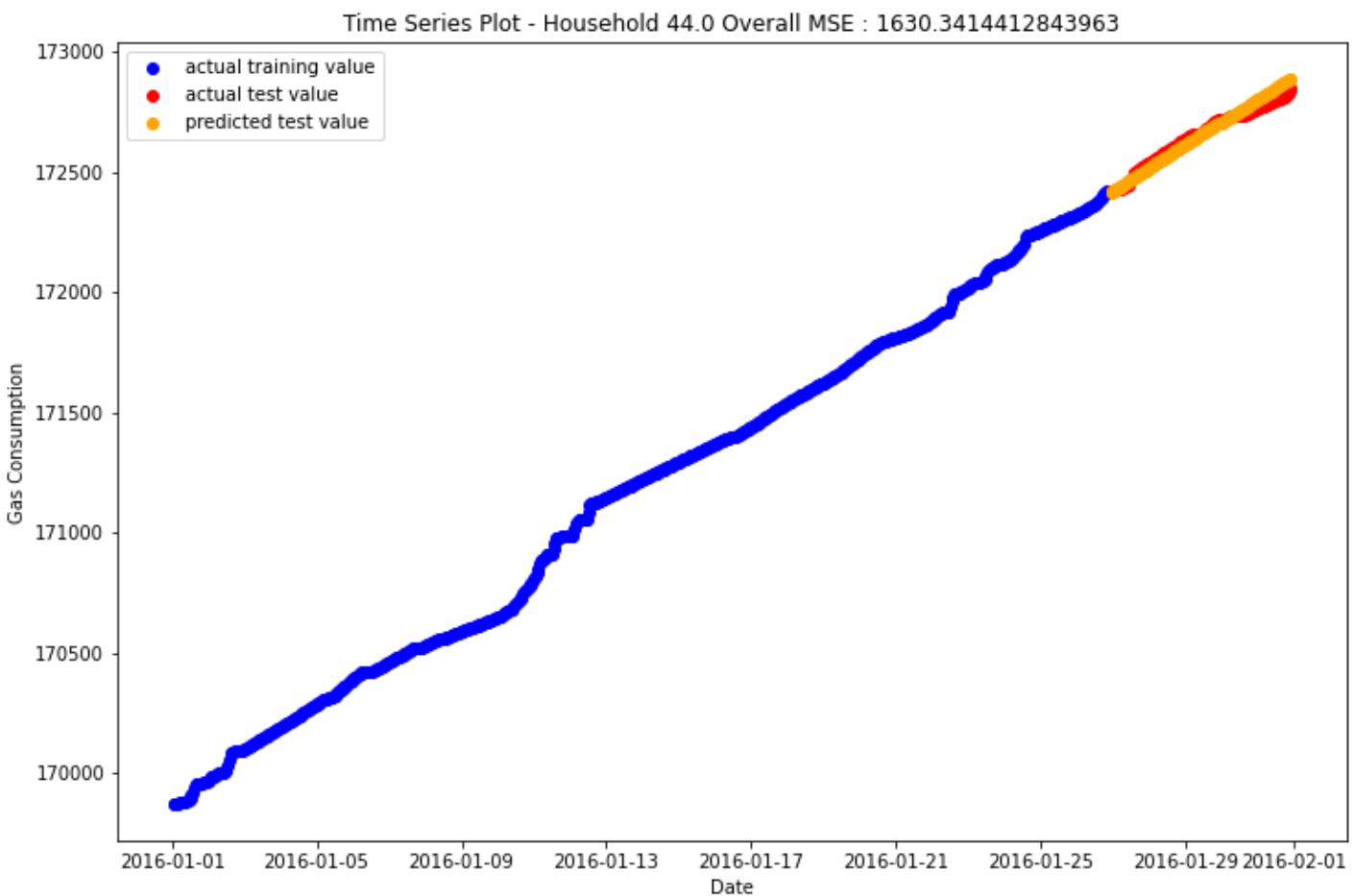
Note that in the above scatter plot for the linear regression model and the below scatter plot for the support vector regression, the line for goodness of fit (denoted in green) is a 45 degree straight line that indicates a perfect prediction.

## 2.3 - SVR

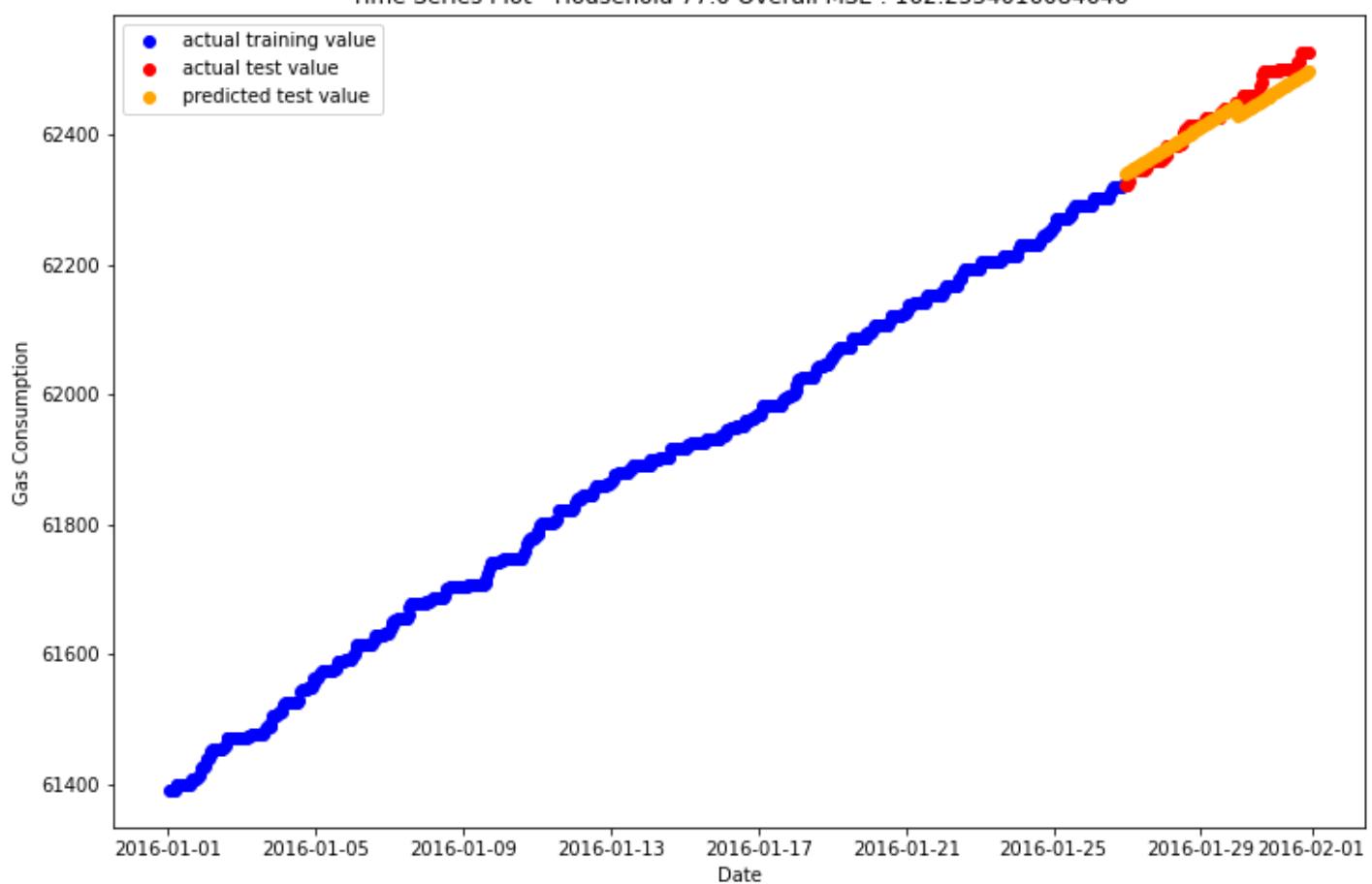
In [7]:

```
train_each_house ("svr", hours_to_predict)
```

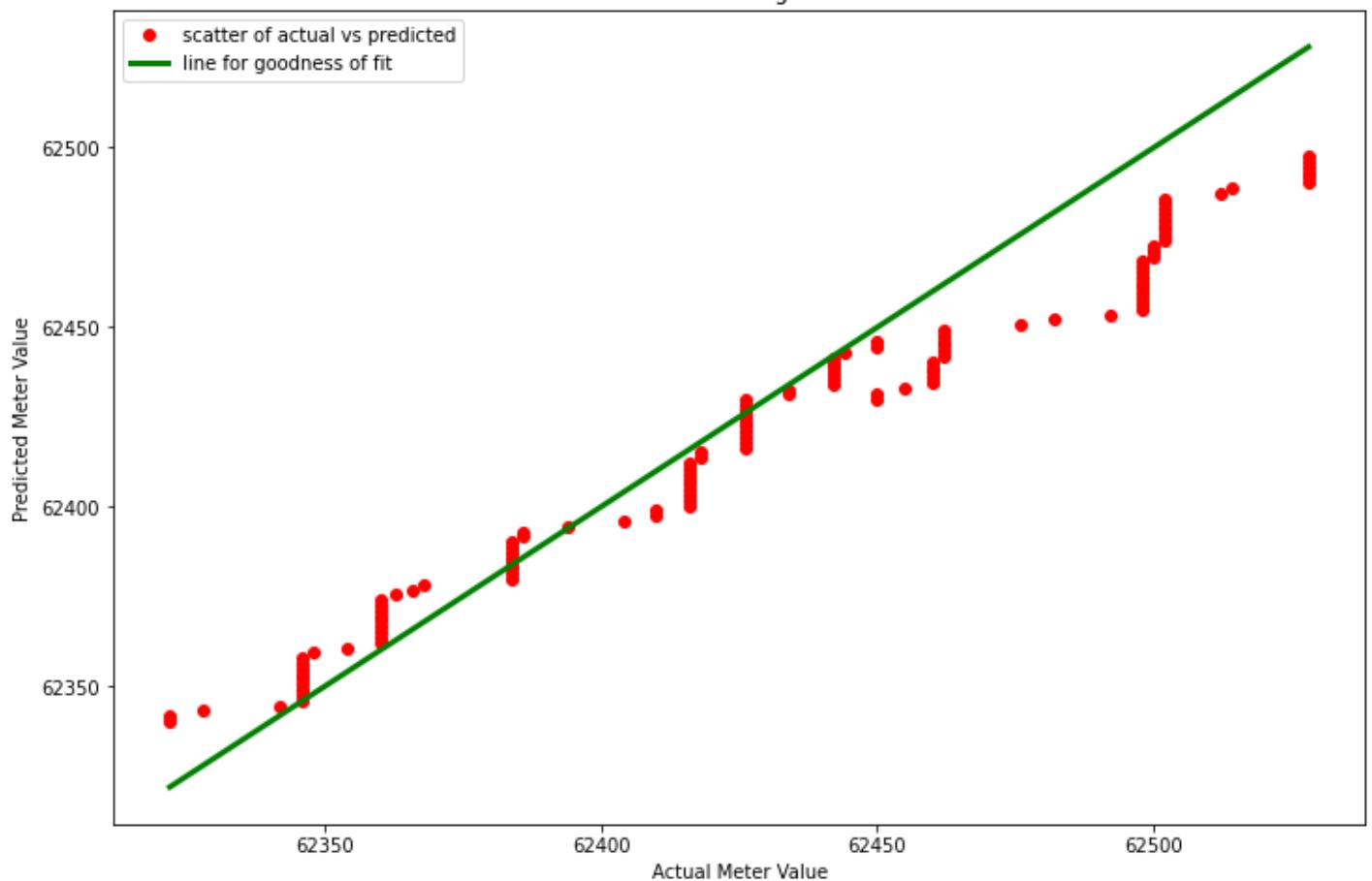




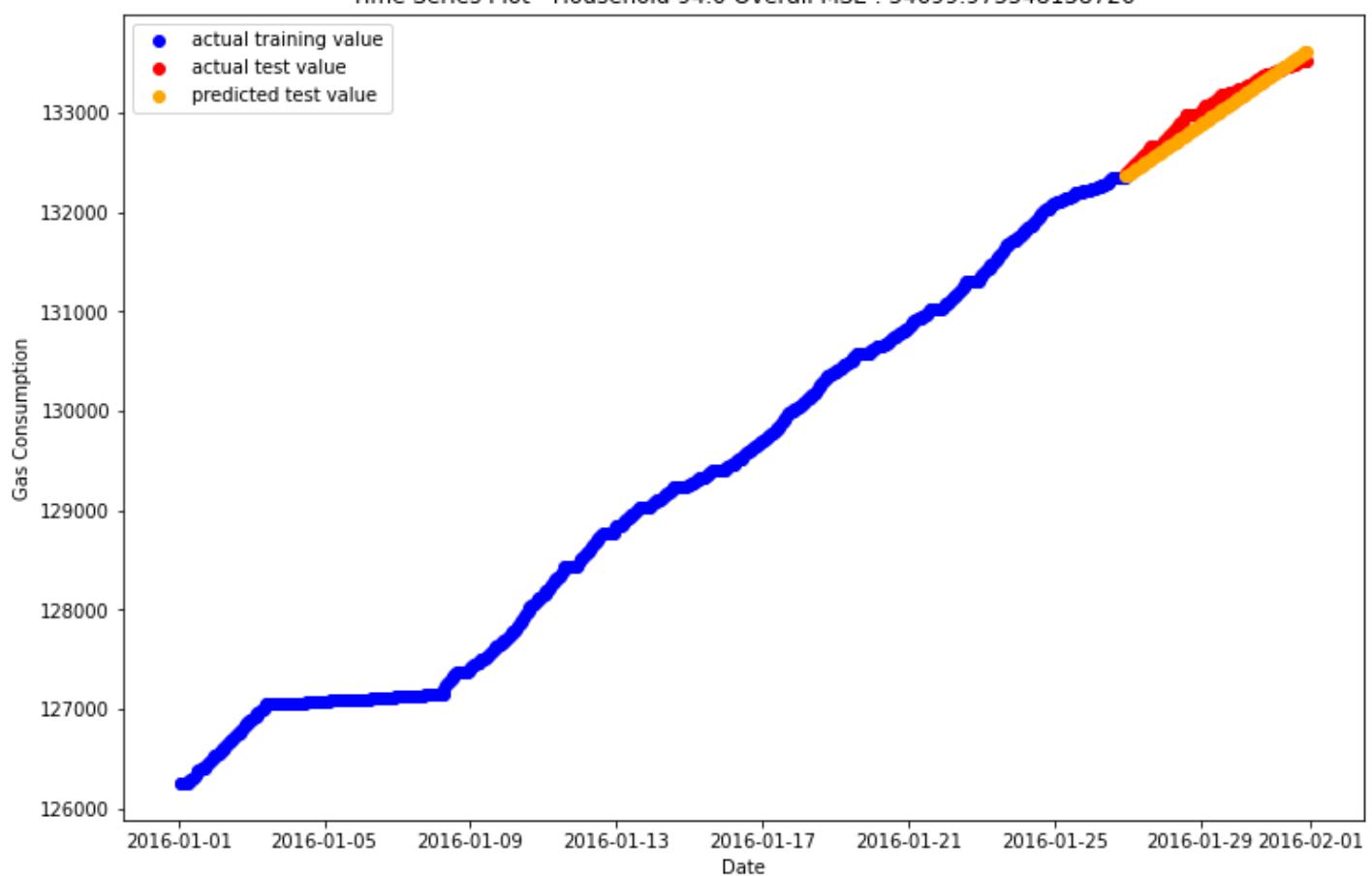
Time Series Plot - Household 77.0 Overall MSE : 162.2554016084646



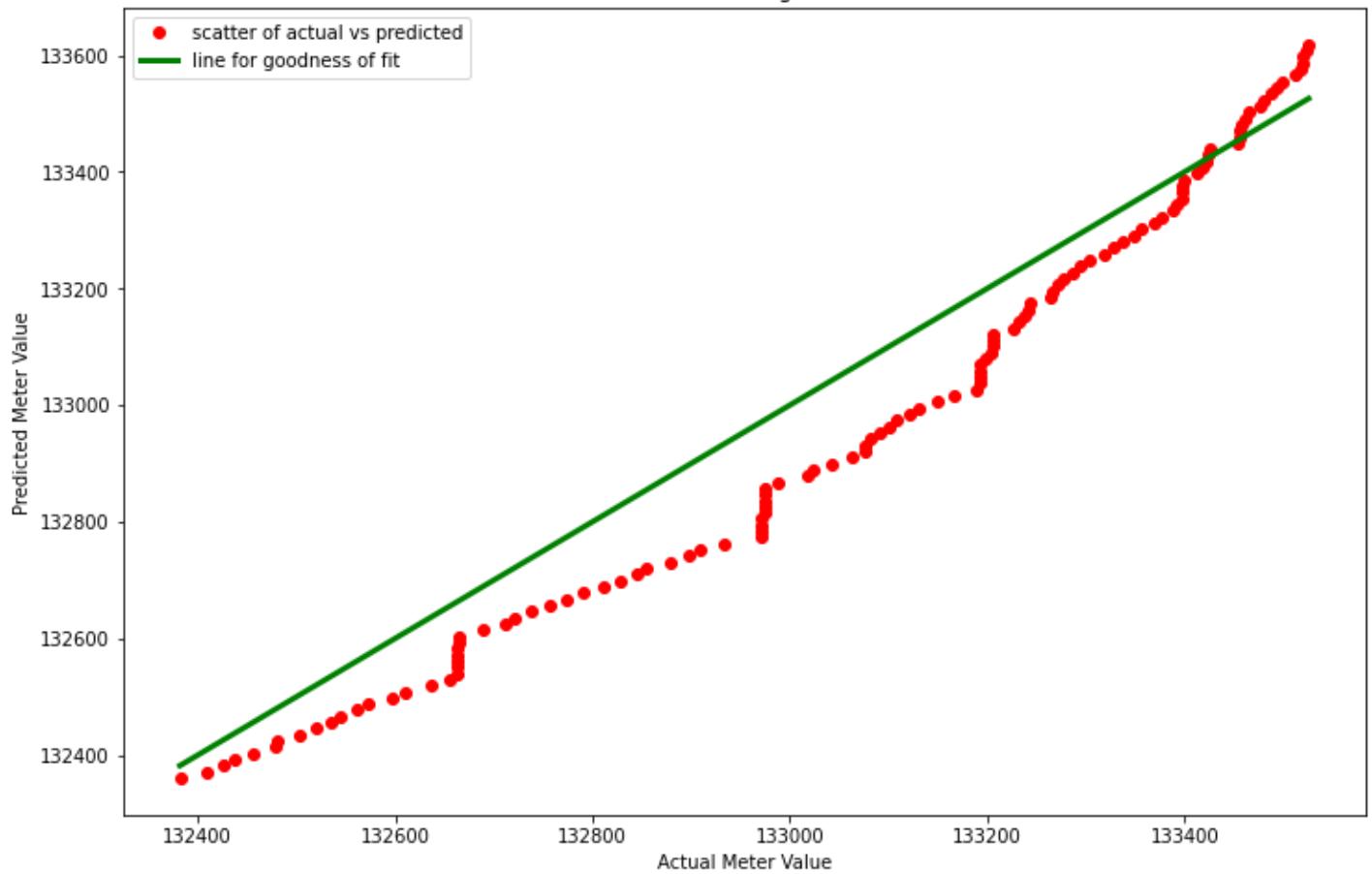
Scatter Plot - Household 77.0 Testing MSE : 348.34799264478136



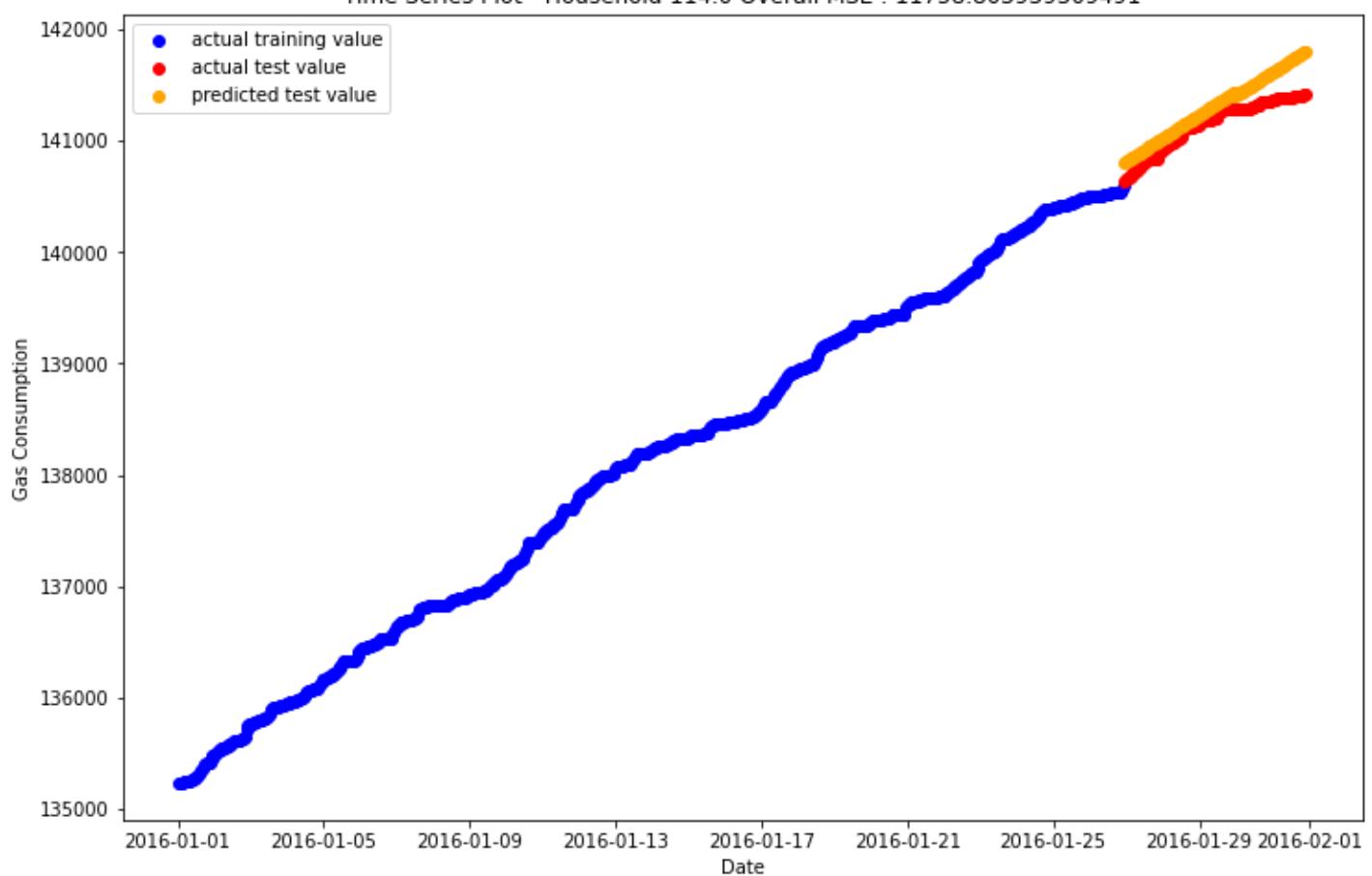
Time Series Plot - Household 94.0 Overall MSE : 54699.975548138726



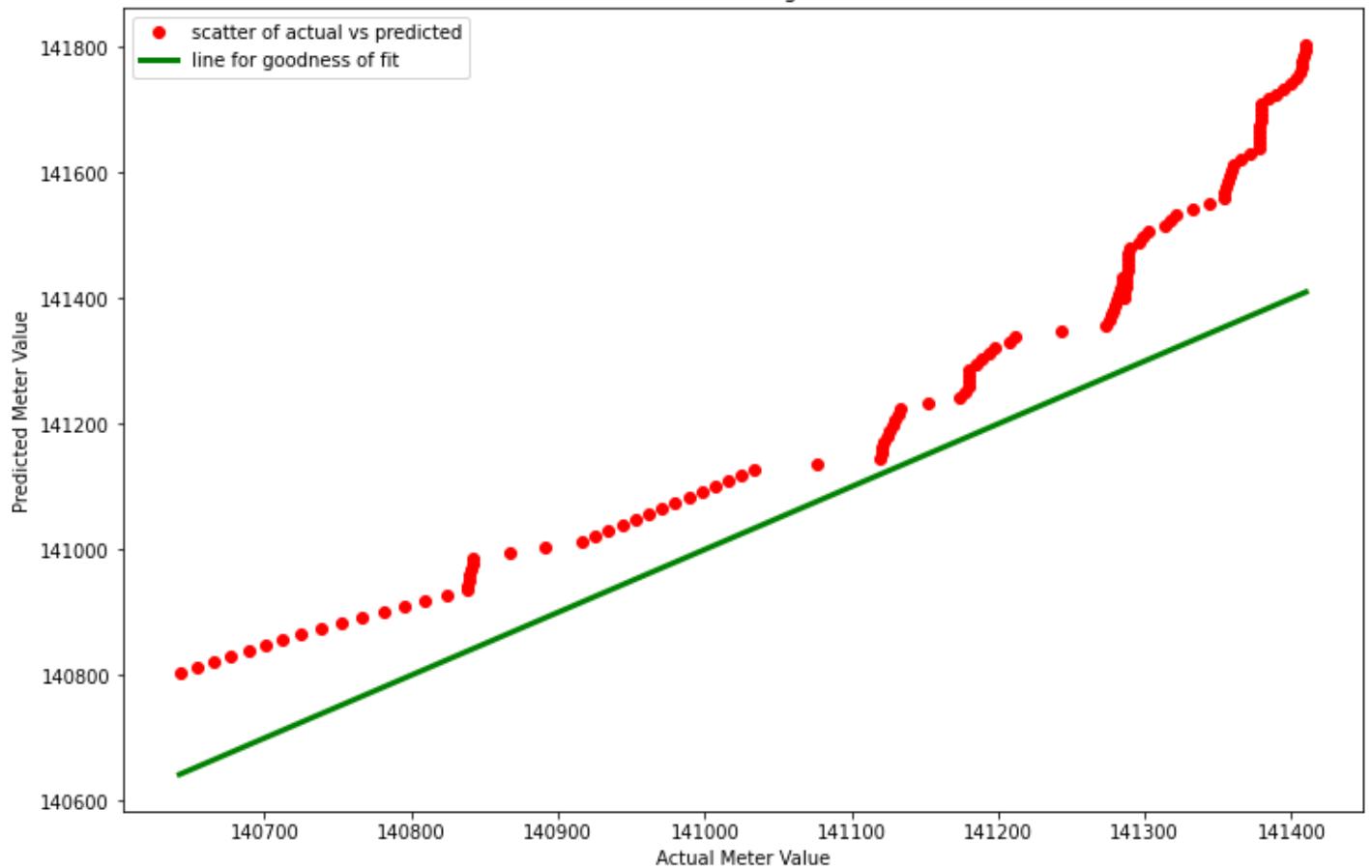
Scatter Plot - Household 94.0 Testing MSE : 10189.398449139186



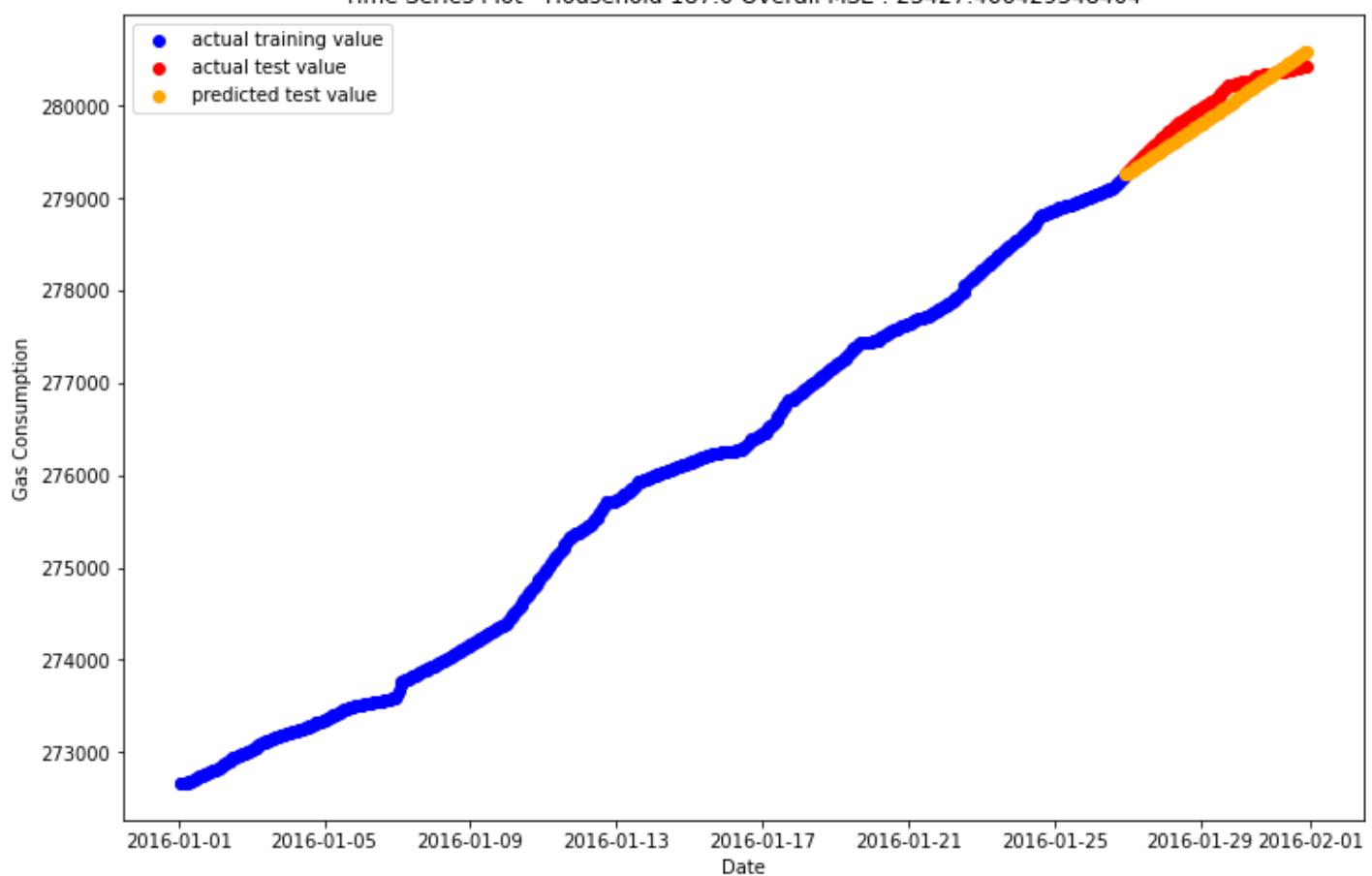
Time Series Plot - Household 114.0 Overall MSE : 11758.803939309491



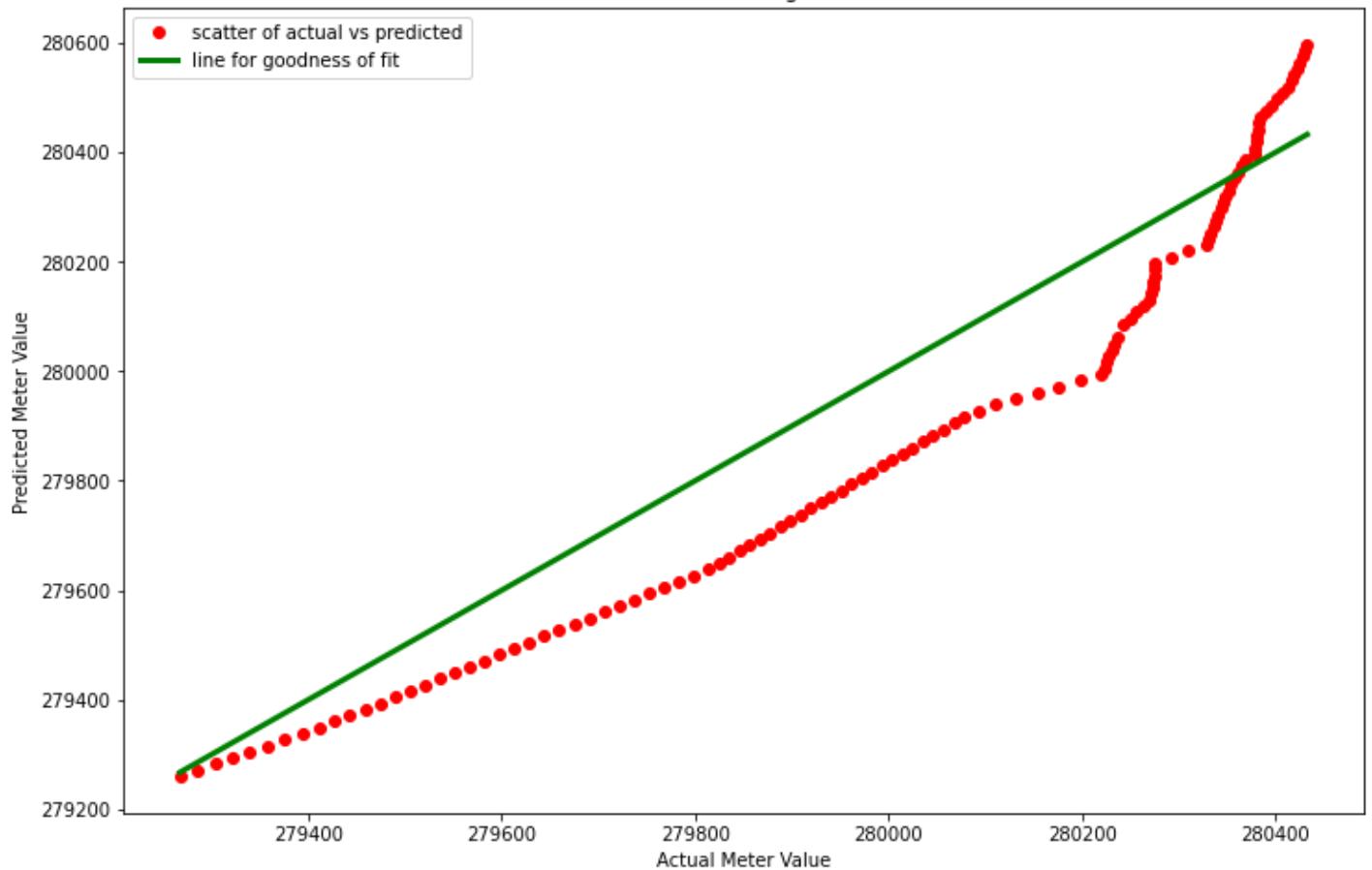
Scatter Plot - Household 114.0 Testing MSE : 34571.299311384355



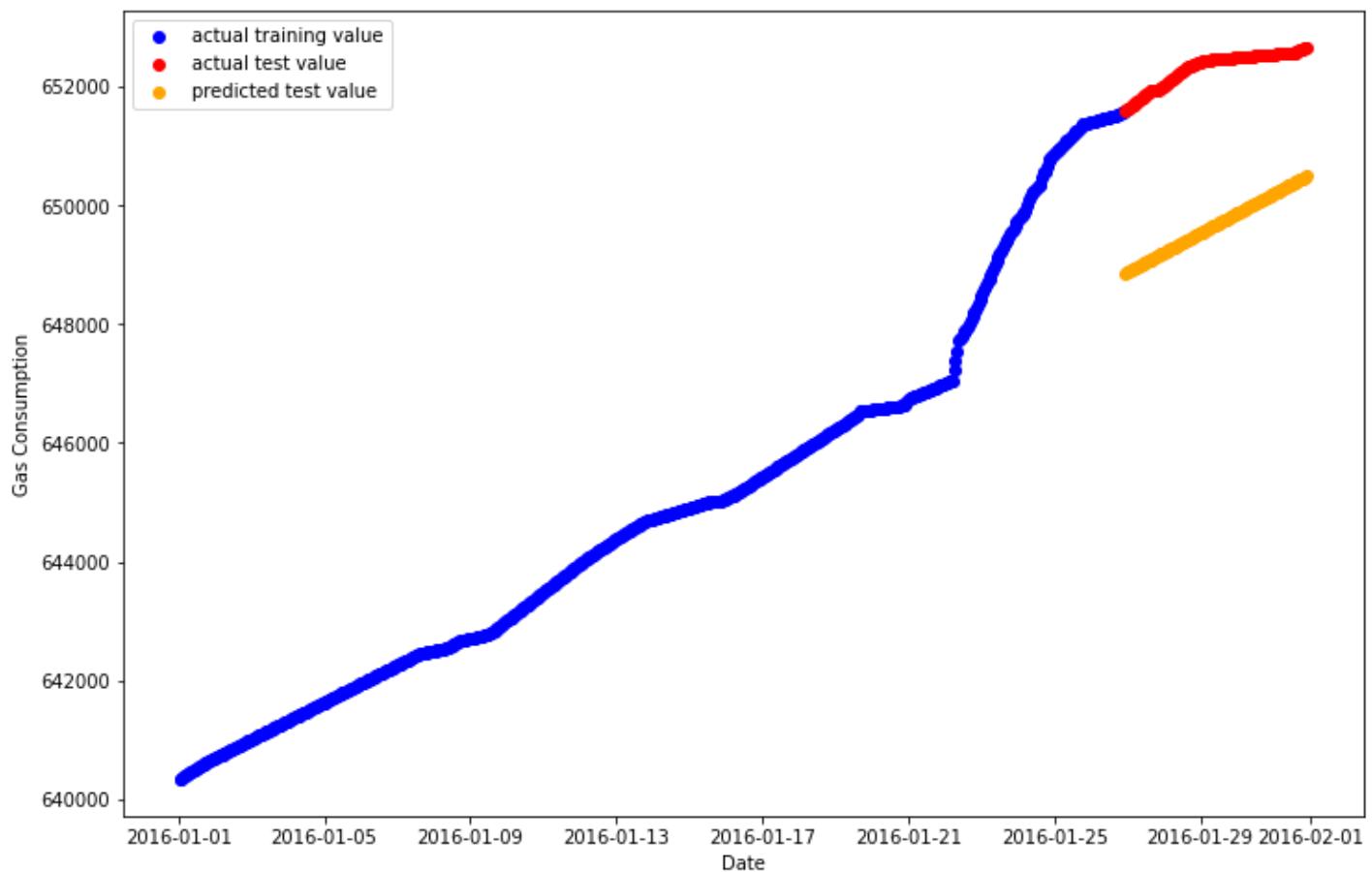
Time Series Plot - Household 187.0 Overall MSE : 23427.466429548404



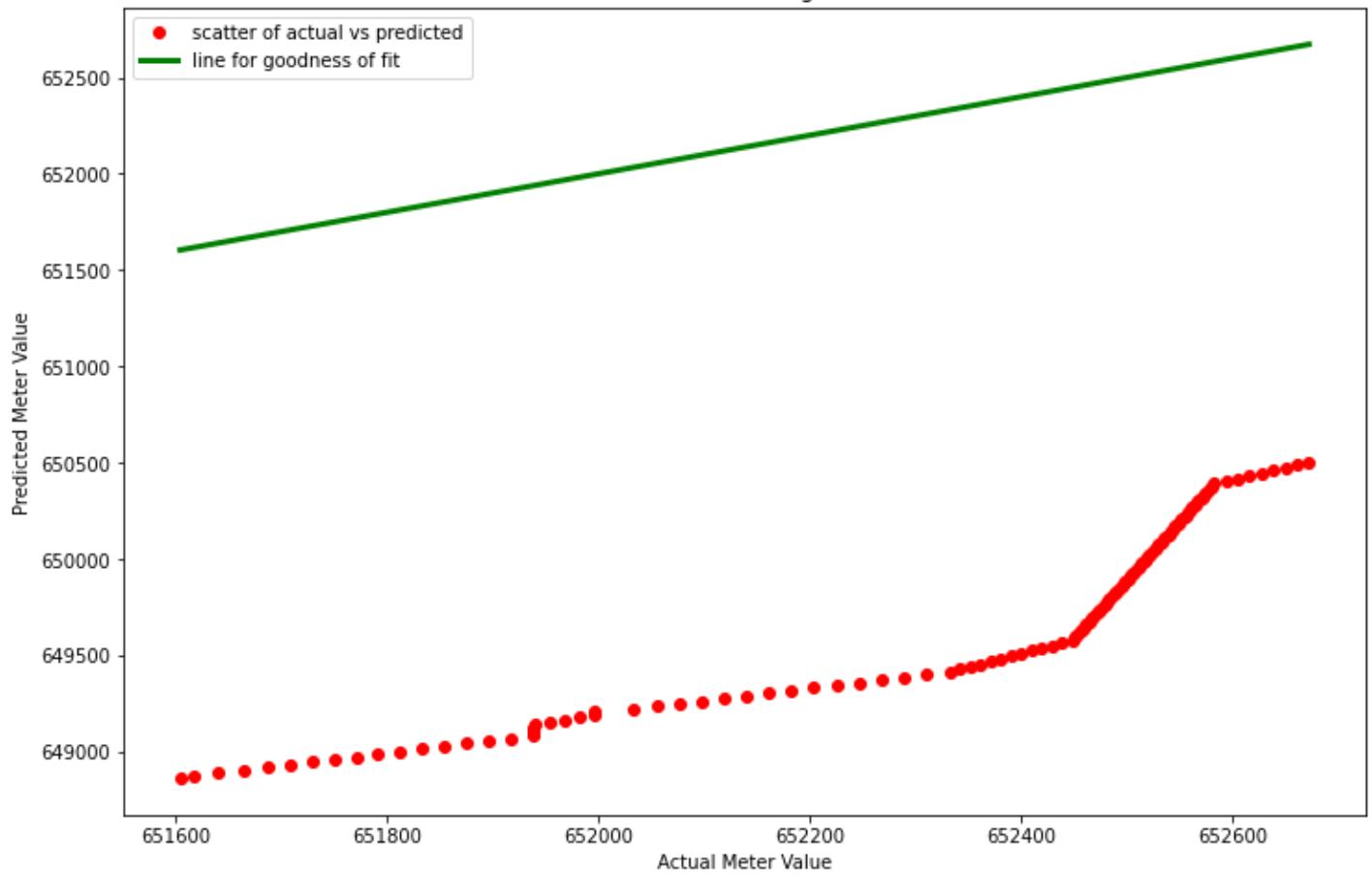
Scatter Plot - Household 187.0 Testing MSE : 17273.952872093876



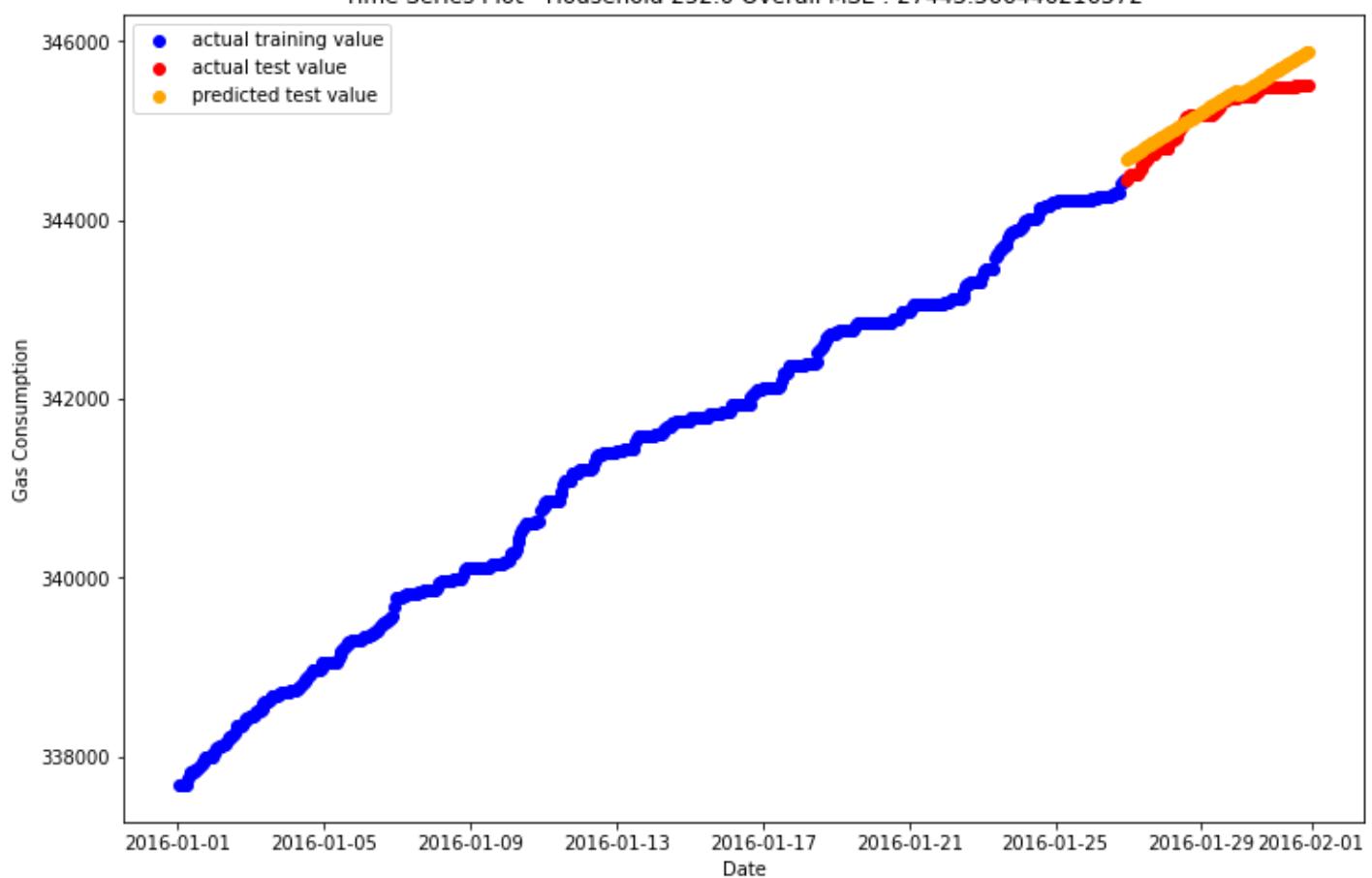
Time Series Plot - Household 222.0 Overall MSE : 1877941.7525241545



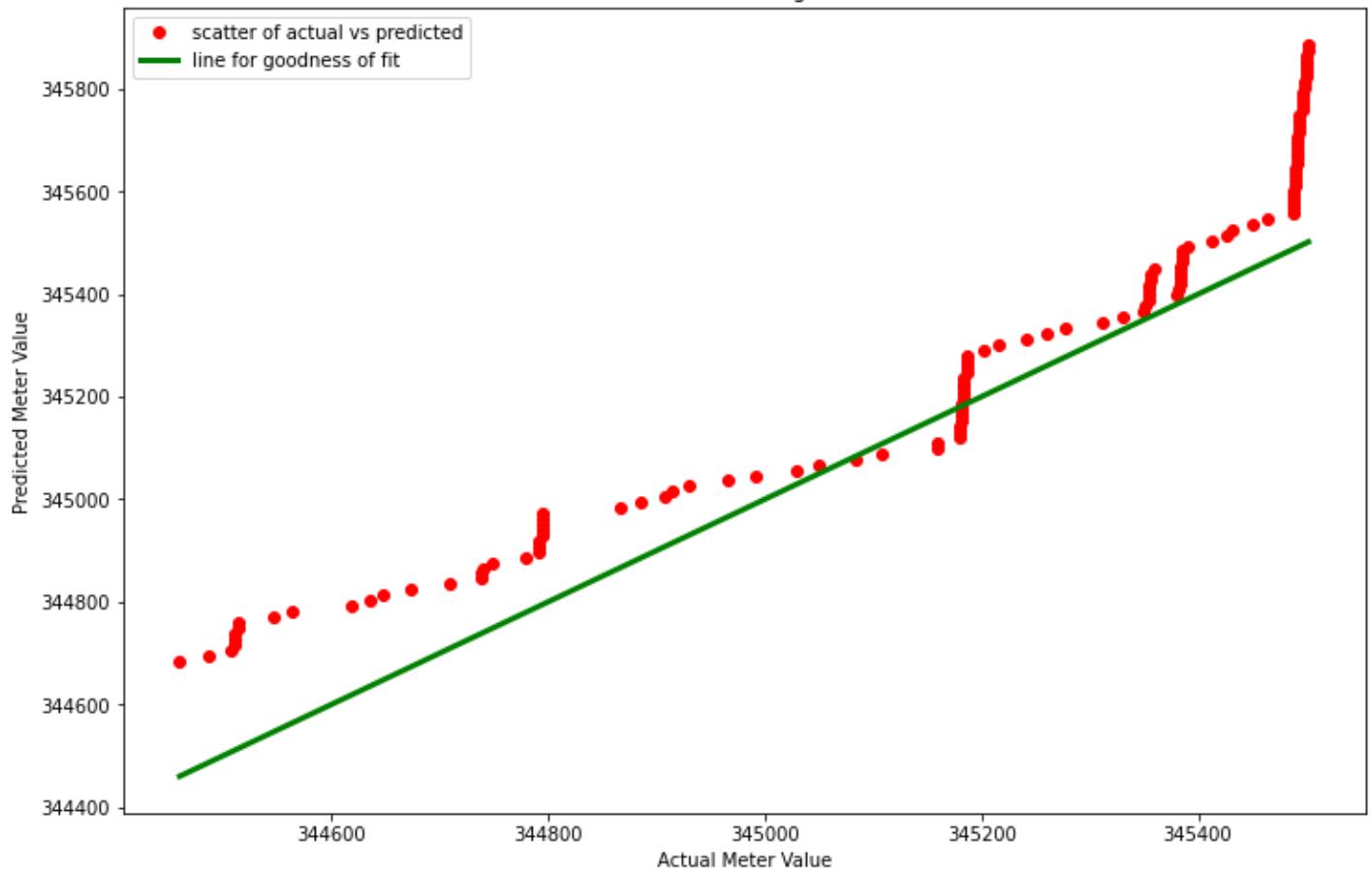
Scatter Plot - Household 222.0 Testing MSE : 7018920.97986777



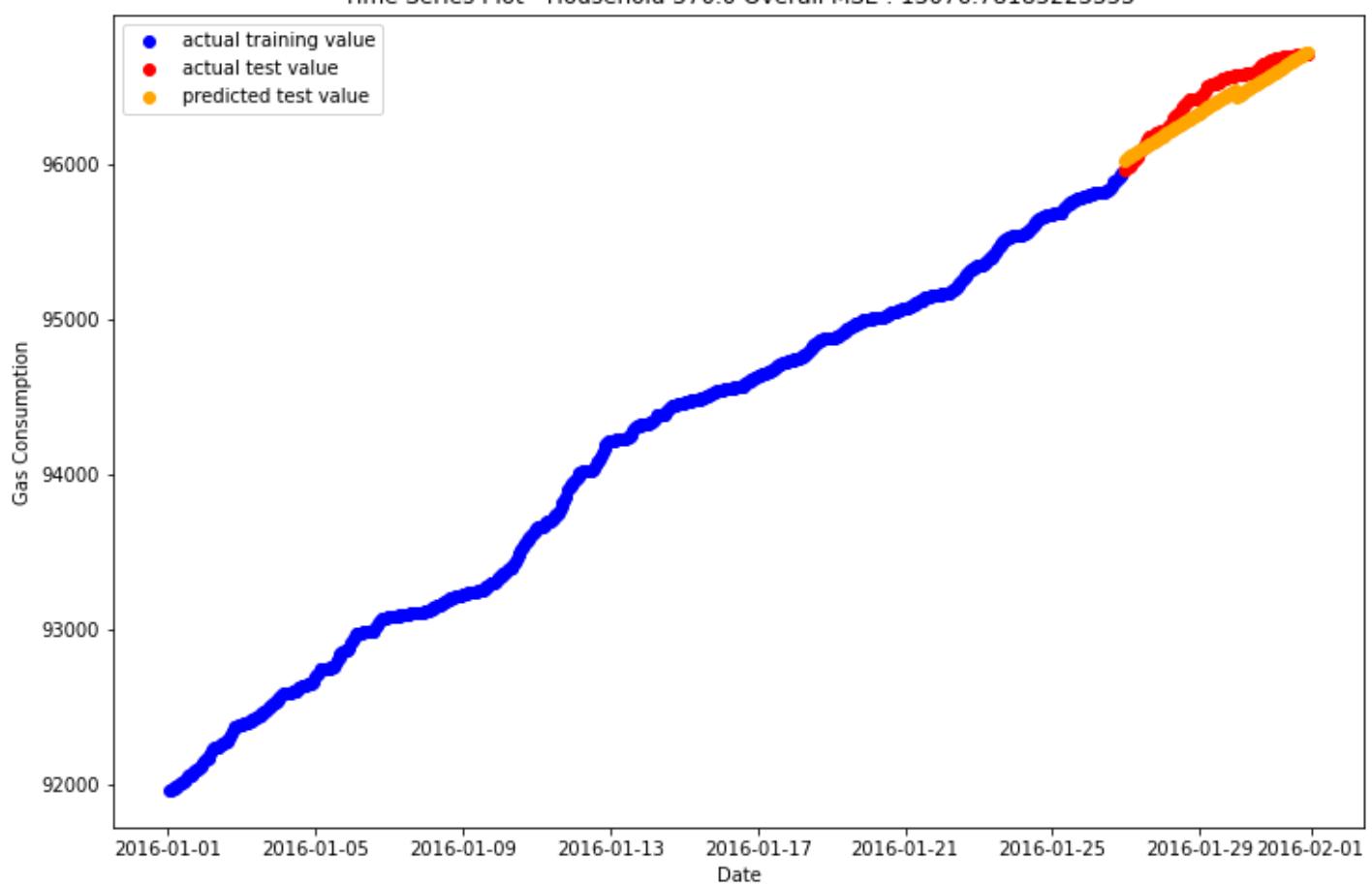
Time Series Plot - Household 252.0 Overall MSE : 27443.366446216372



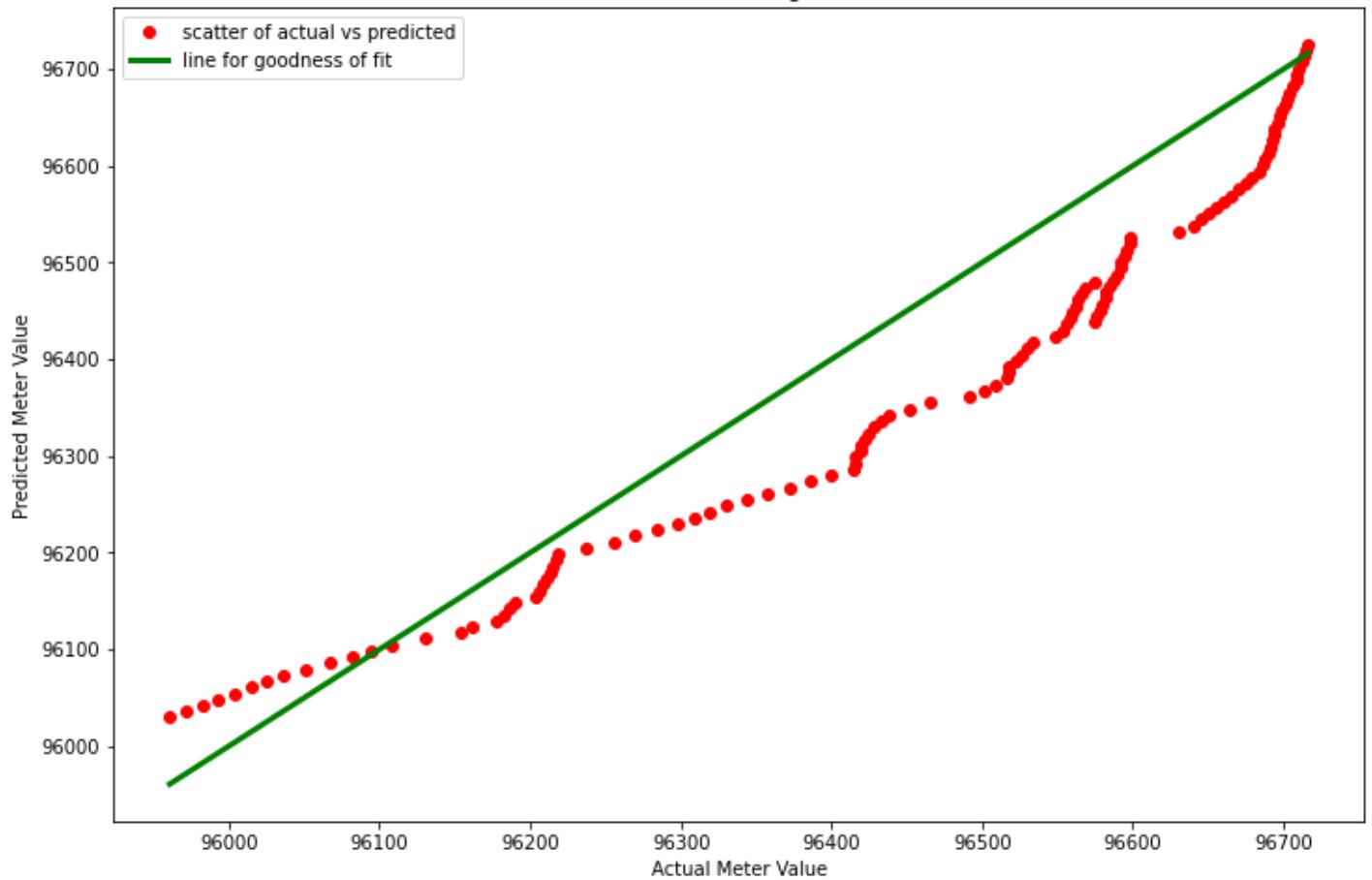
Scatter Plot - Household 252.0 Testing MSE : 25519.26093472204



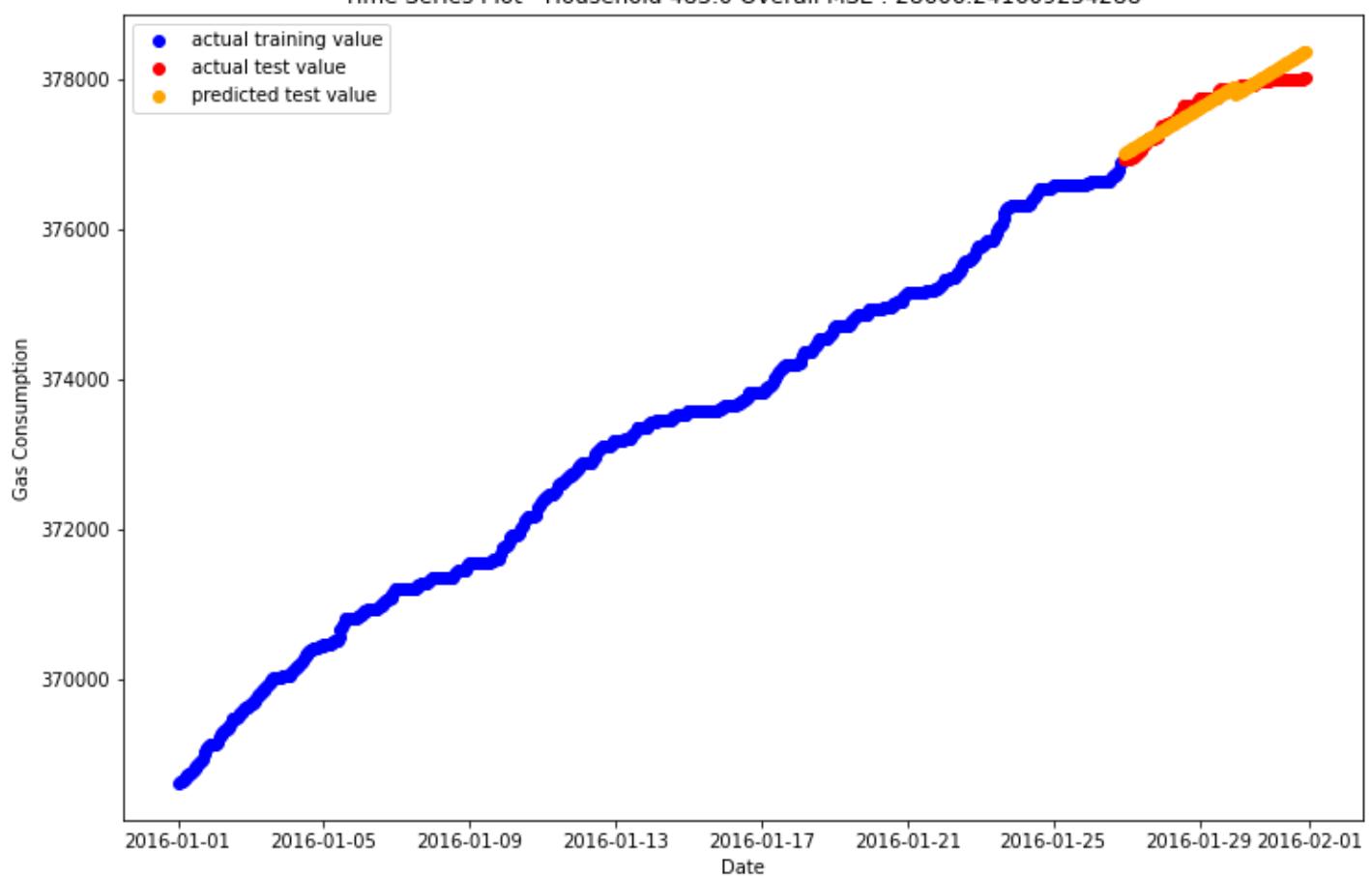
Time Series Plot - Household 370.0 Overall MSE : 13076.78185223353



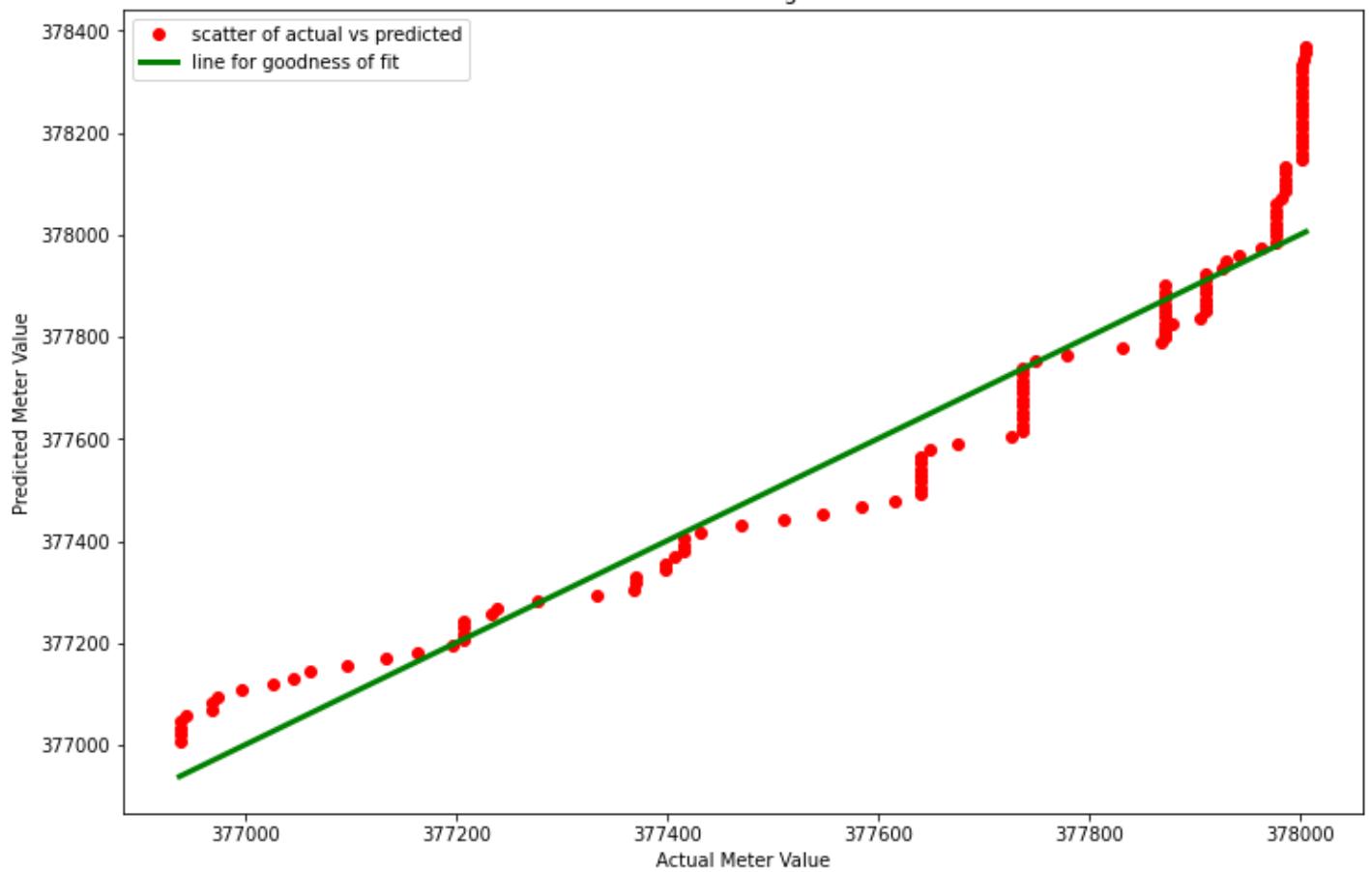
Scatter Plot - Household 370.0 Testing MSE : 7338.675067631452



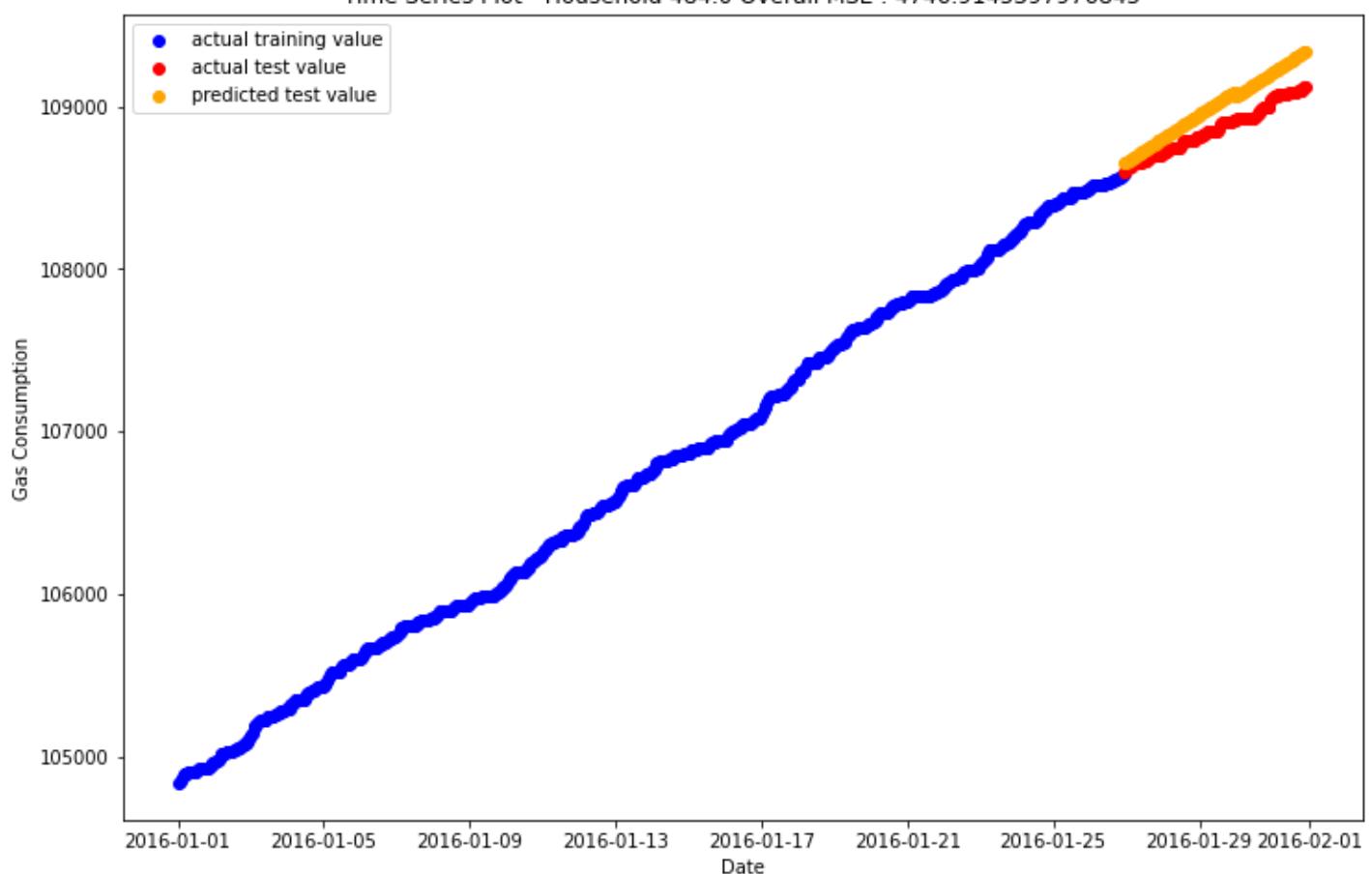
Time Series Plot - Household 483.0 Overall MSE : 28606.241609254288



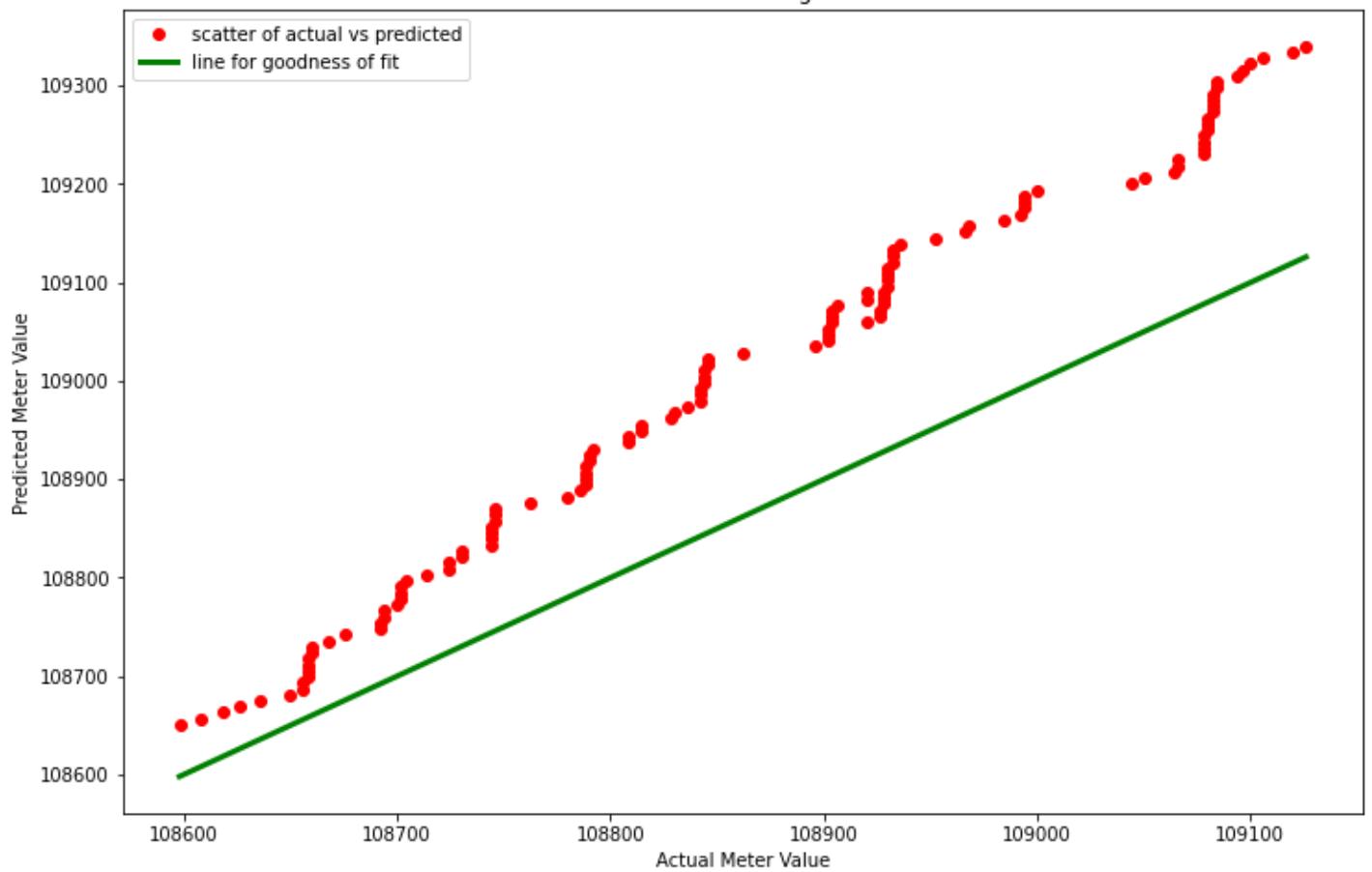
Scatter Plot - Household 483.0 Testing MSE : 15440.886492315065



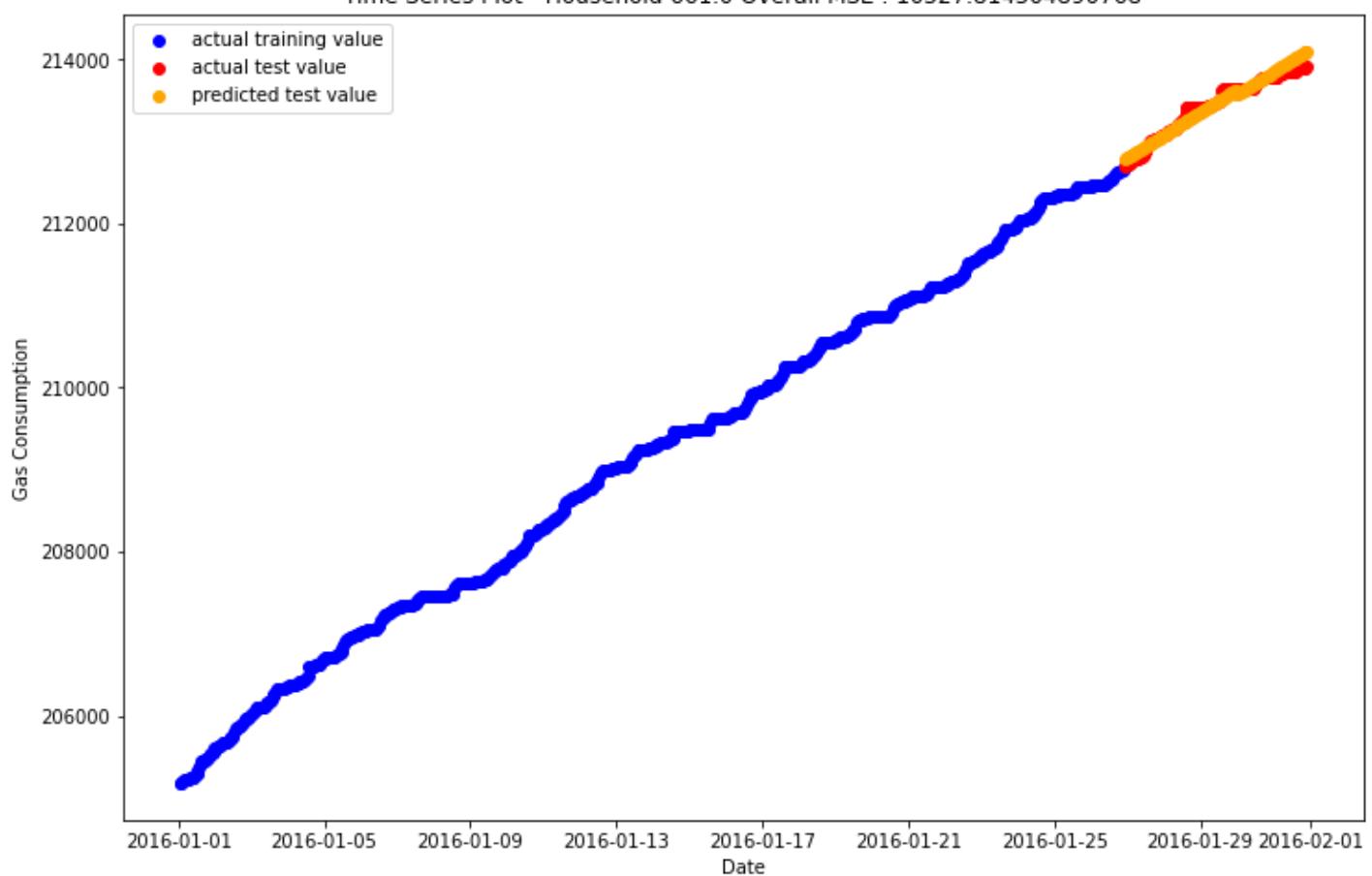
Time Series Plot - Household 484.0 Overall MSE : 4746.9145397976845



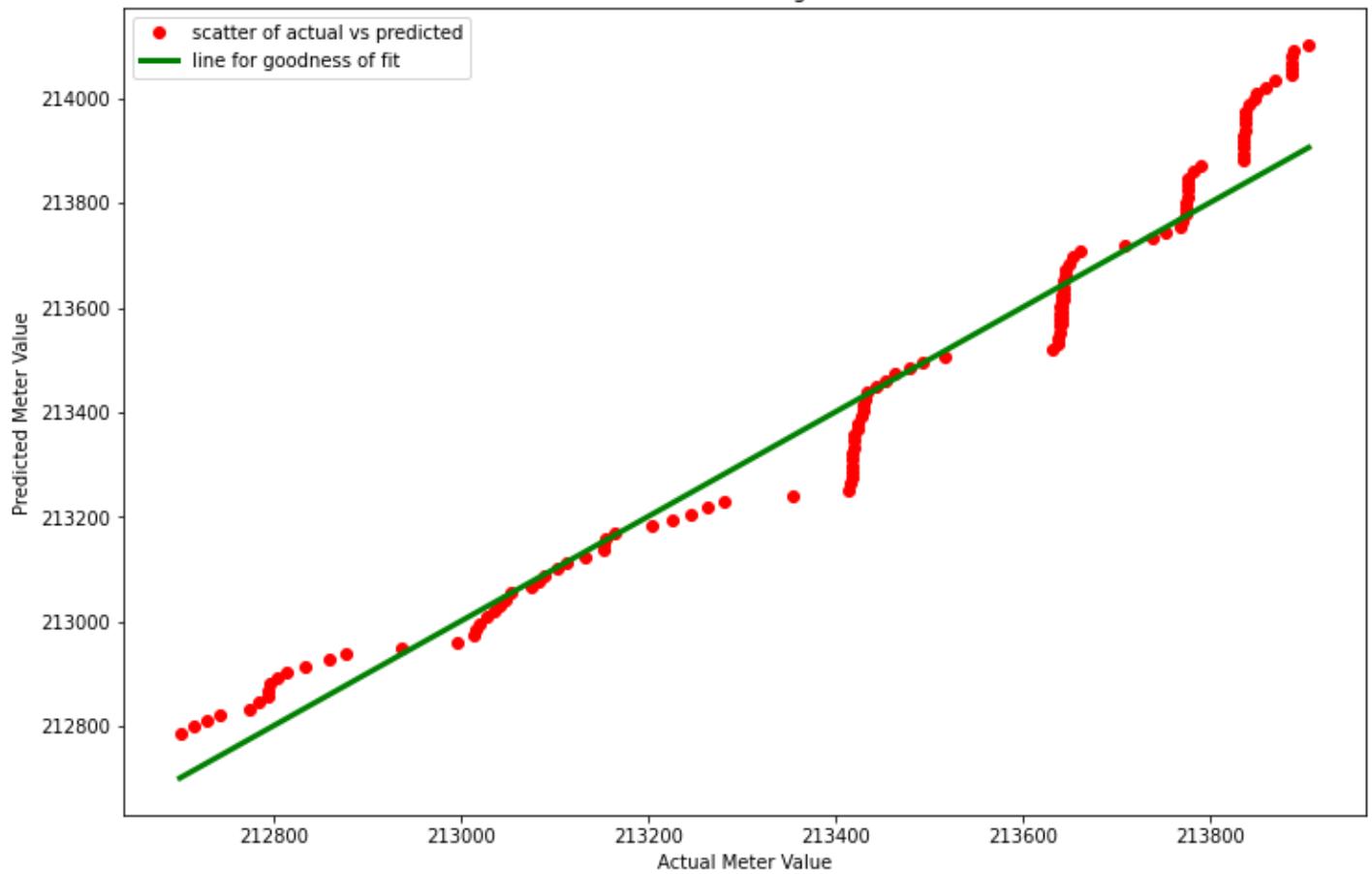
Scatter Plot - Household 484.0 Testing MSE : 21257.9554898404



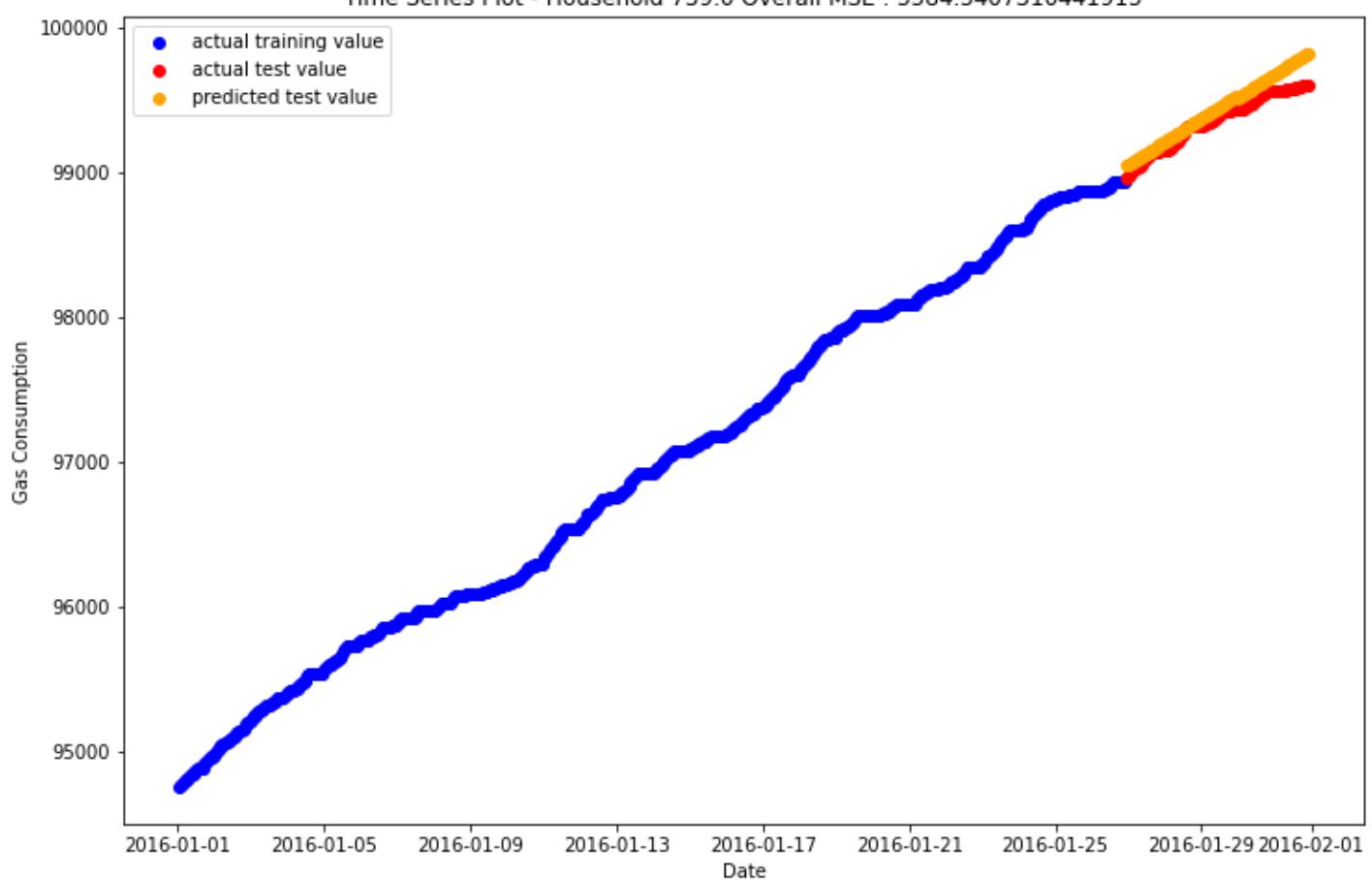
Time Series Plot - Household 661.0 Overall MSE : 10527.814504890768



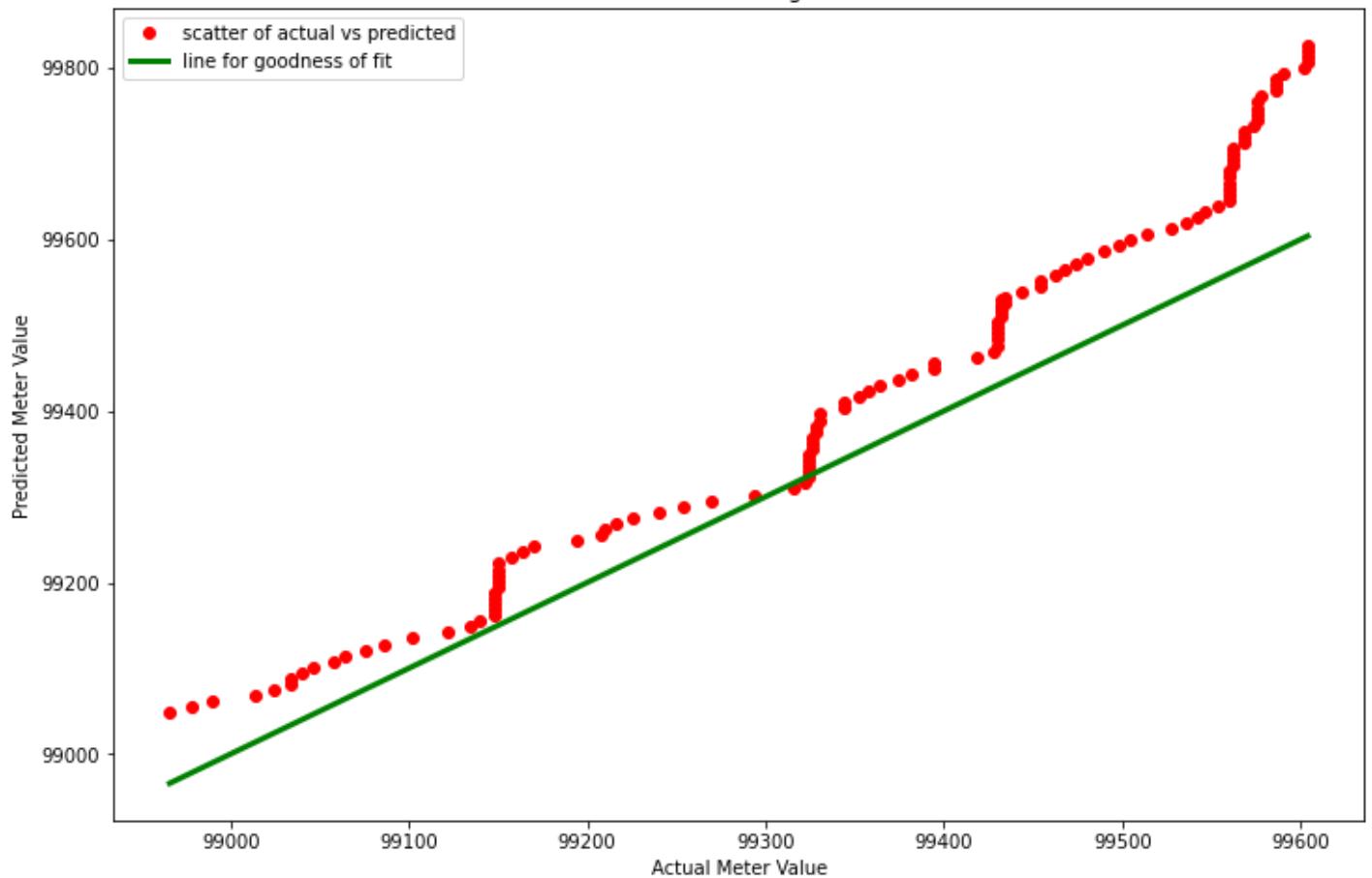
Scatter Plot - Household 661.0 Testing MSE : 6386.310223648567



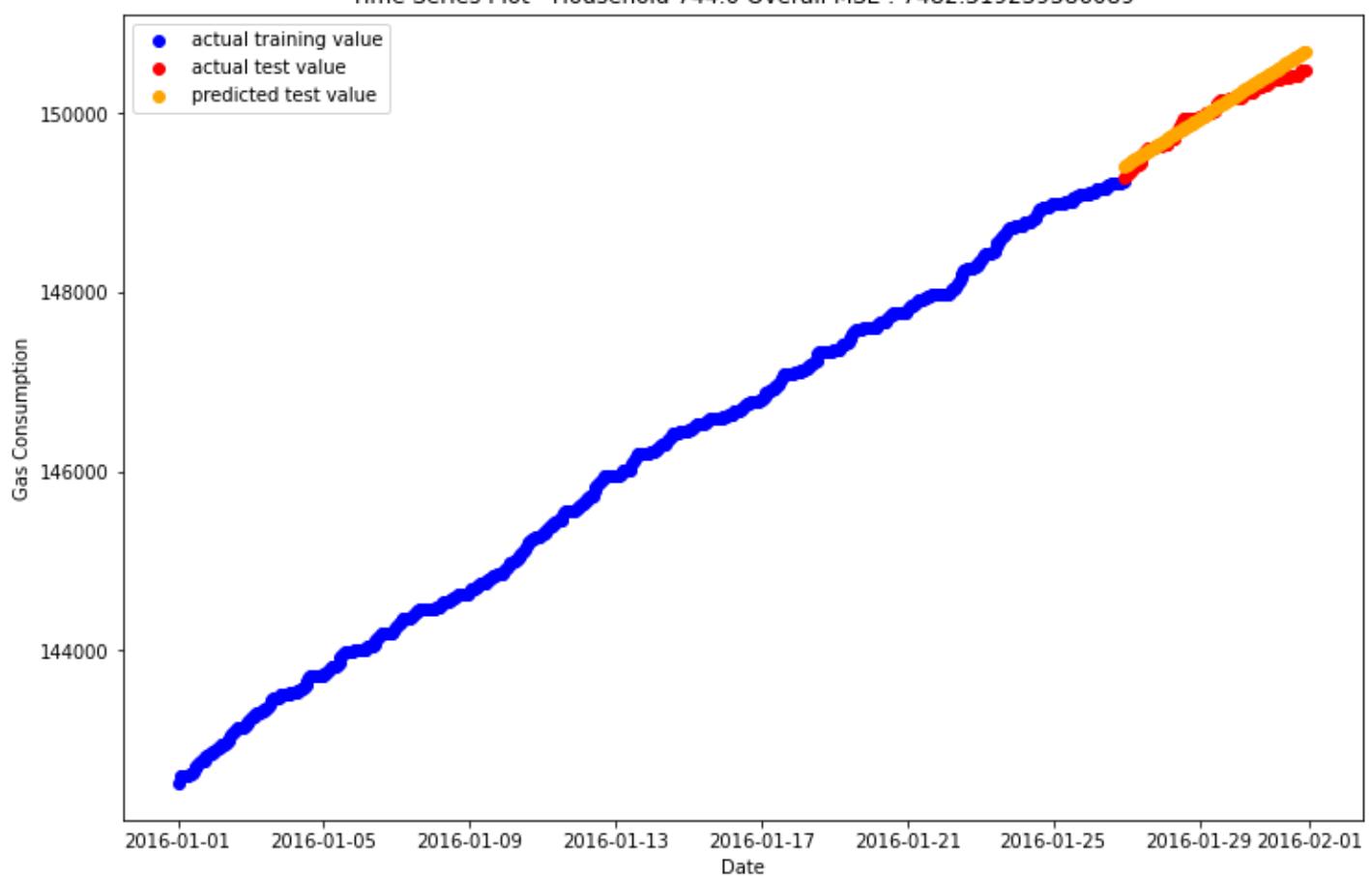
Time Series Plot - Household 739.0 Overall MSE : 5584.5407310441915



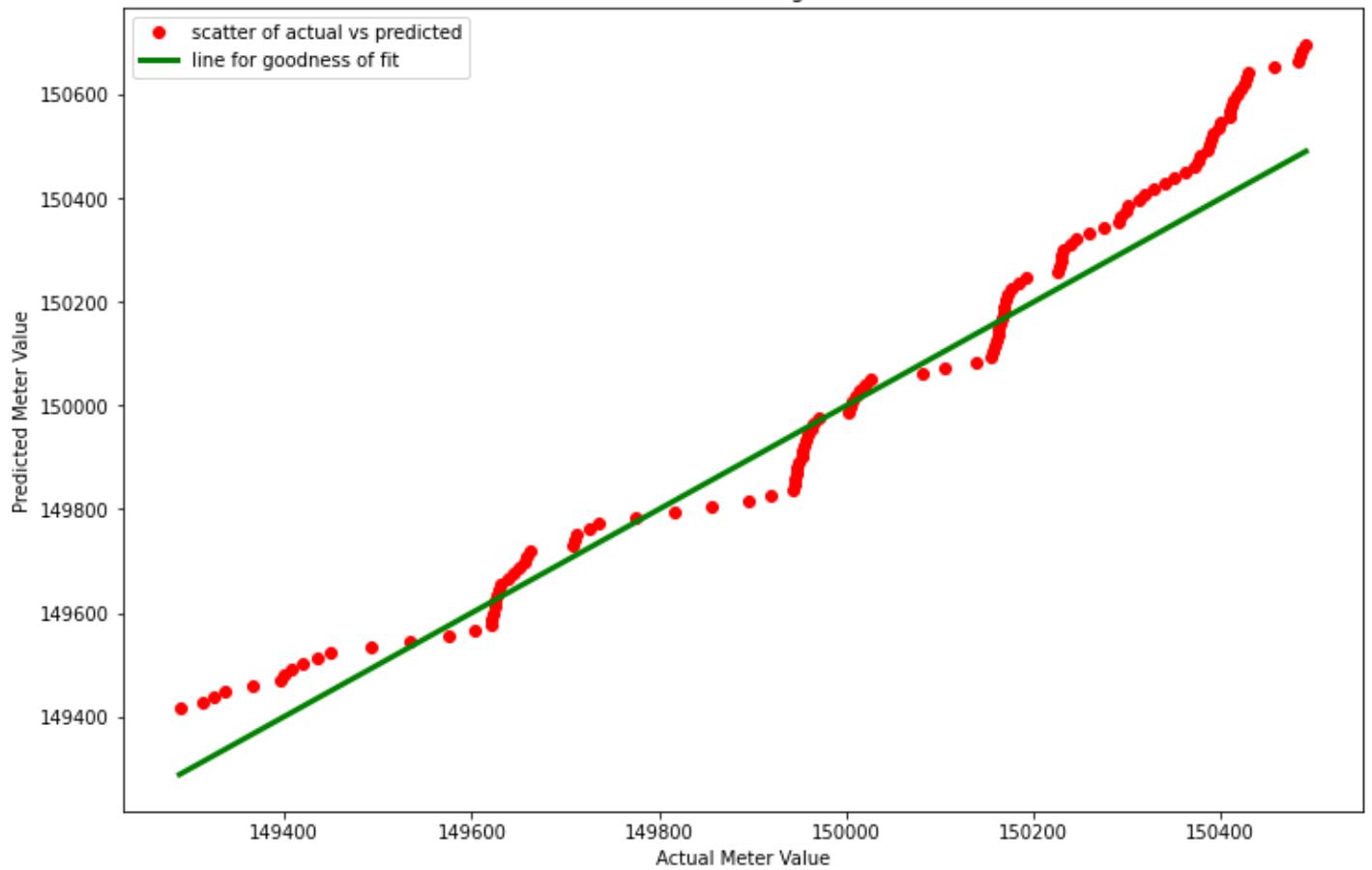
Scatter Plot - Household 739.0 Testing MSE : 9433.011608606837

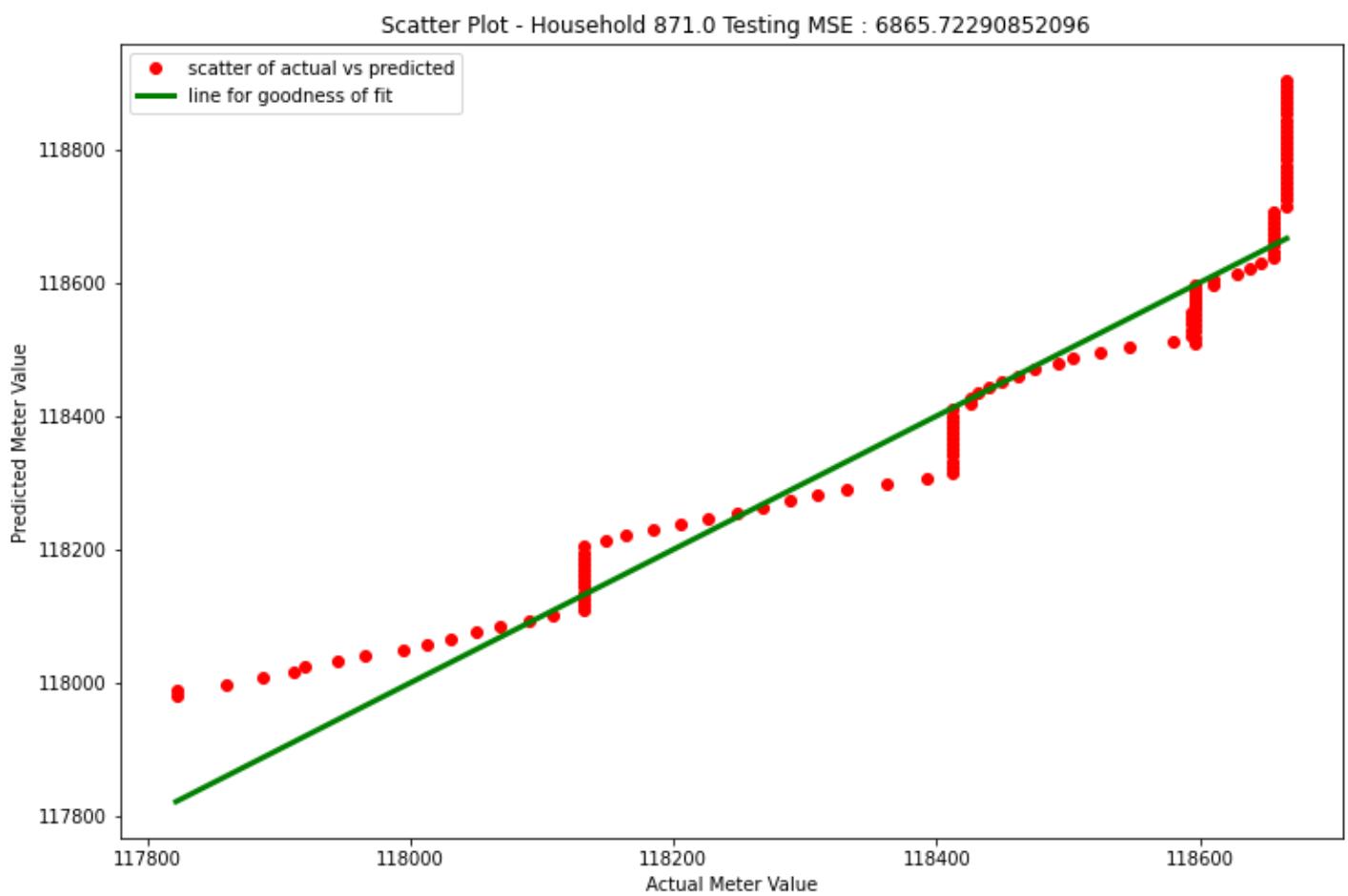
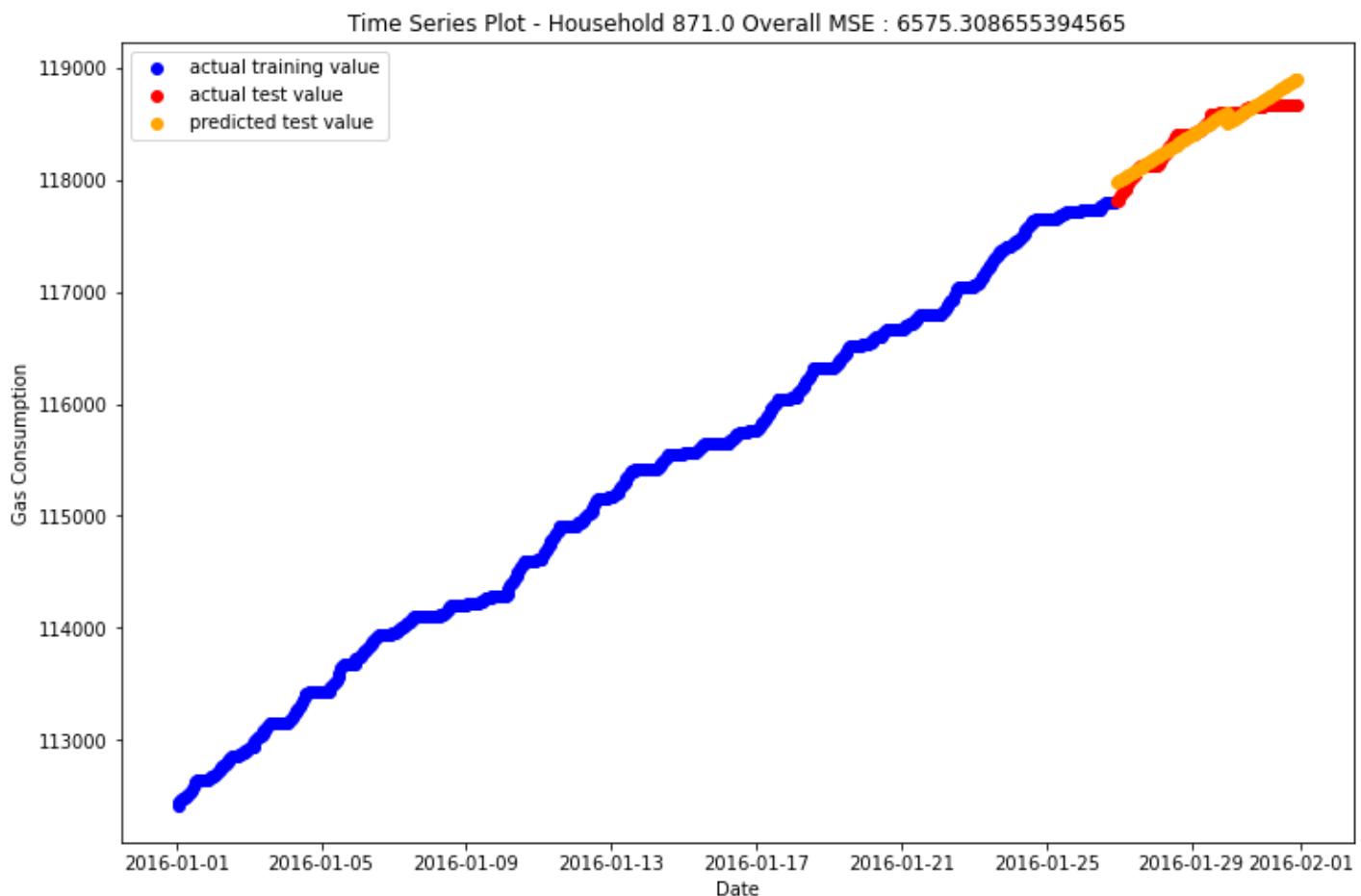


Time Series Plot - Household 744.0 Overall MSE : 7482.319239386089

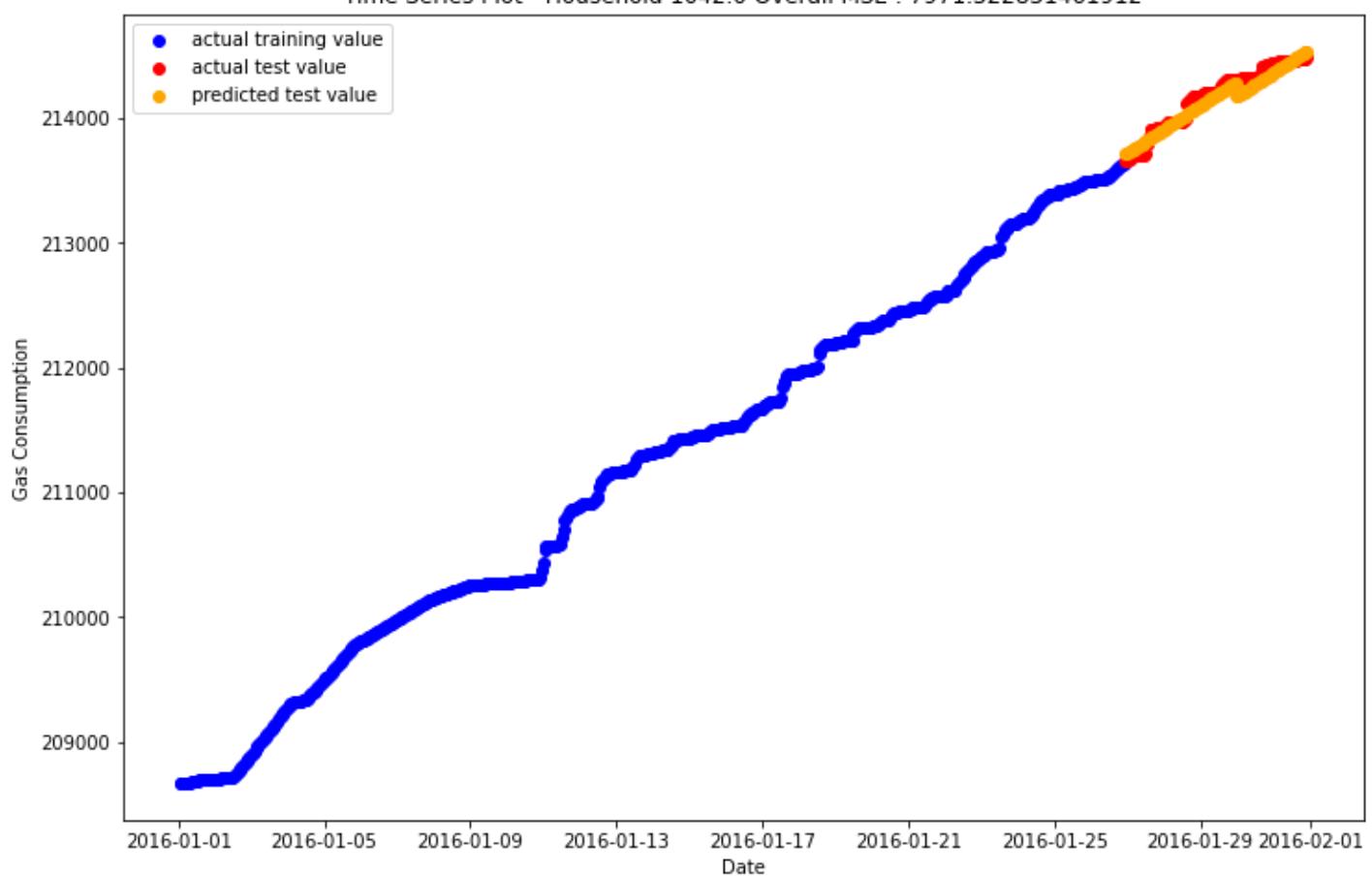


Scatter Plot - Household 744.0 Testing MSE : 7936.136552088397

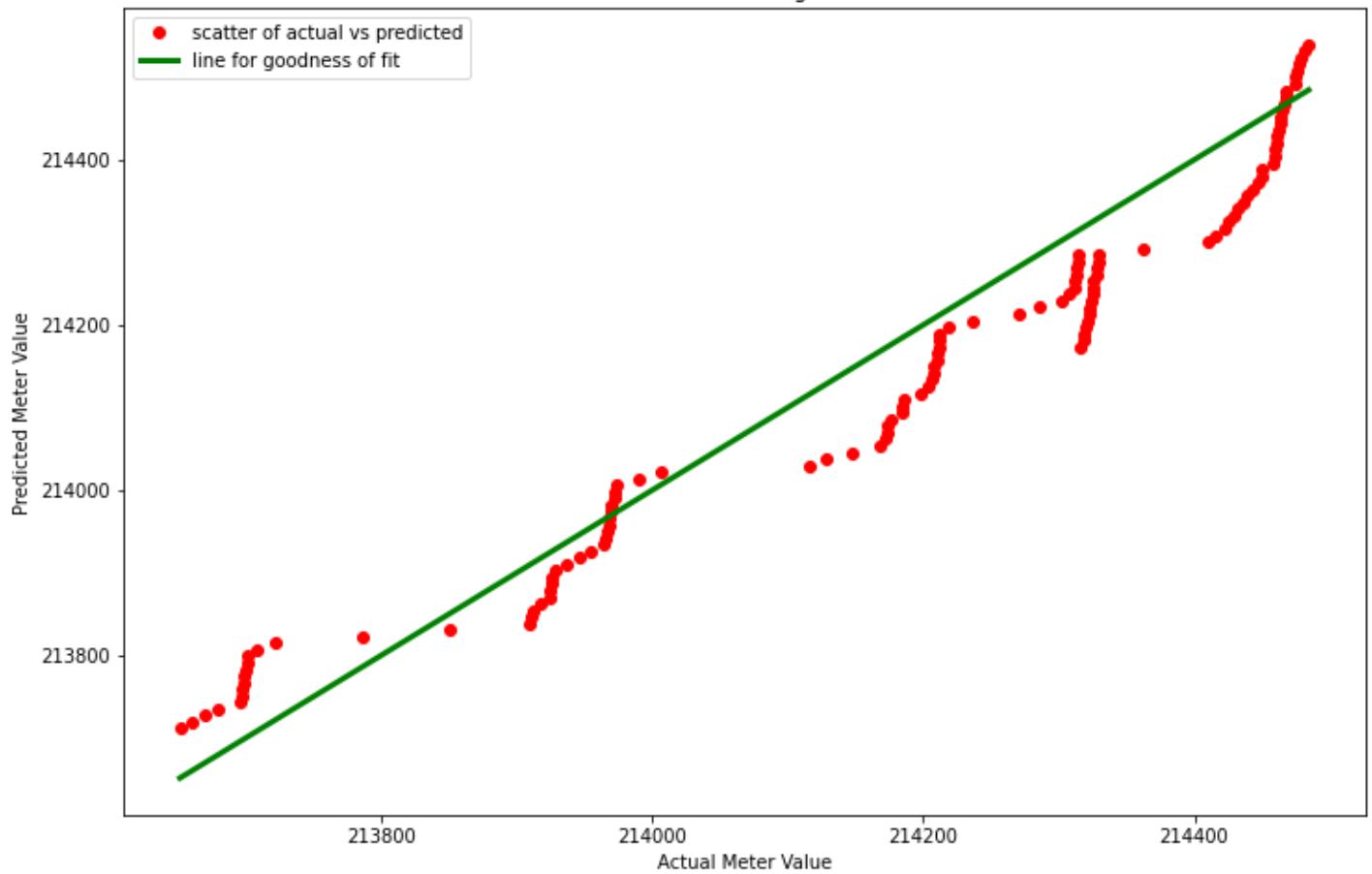




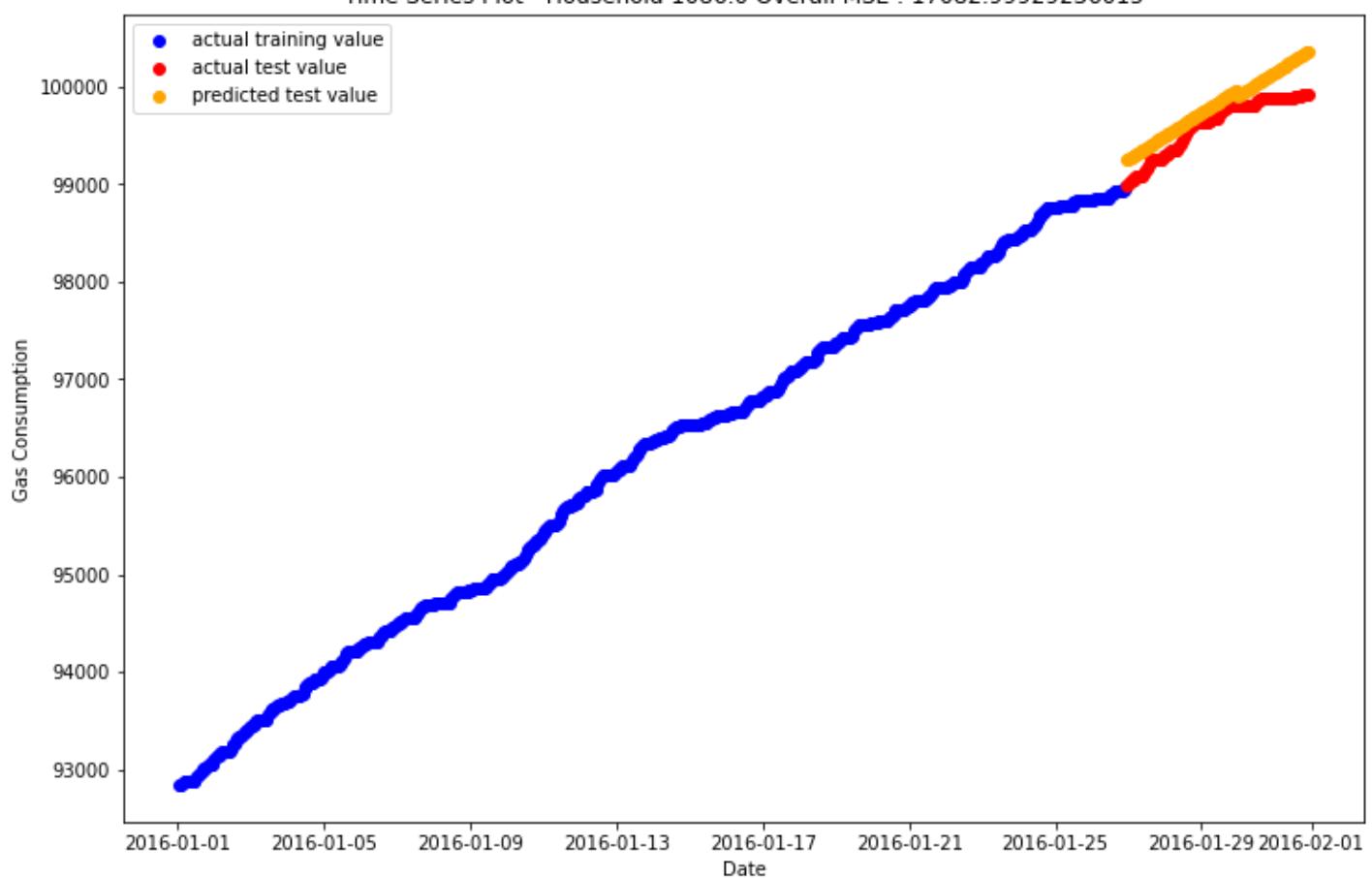
Time Series Plot - Household 1042.0 Overall MSE : 7971.322831461912



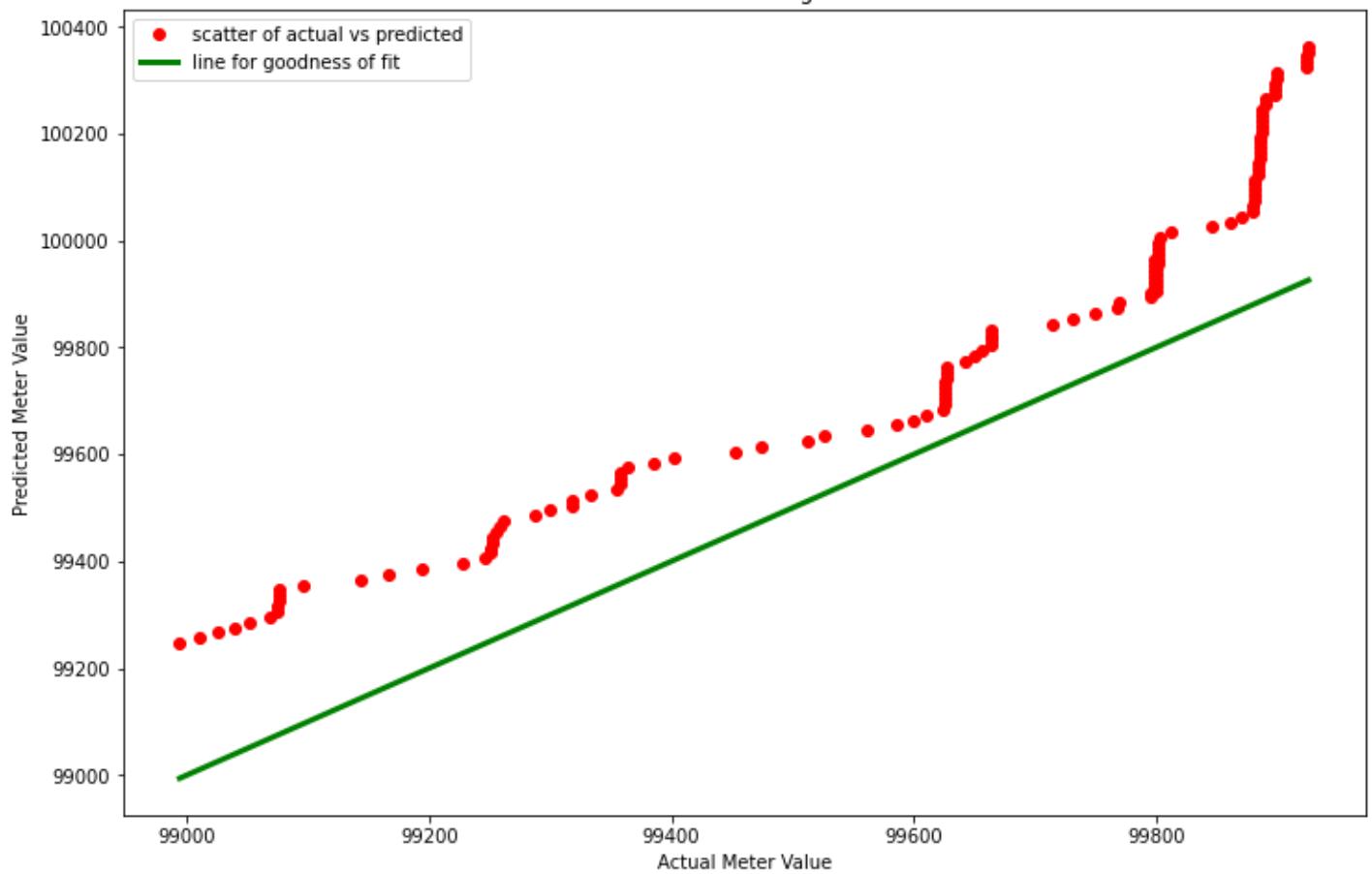
Scatter Plot - Household 1042.0 Testing MSE : 4589.1038326615535



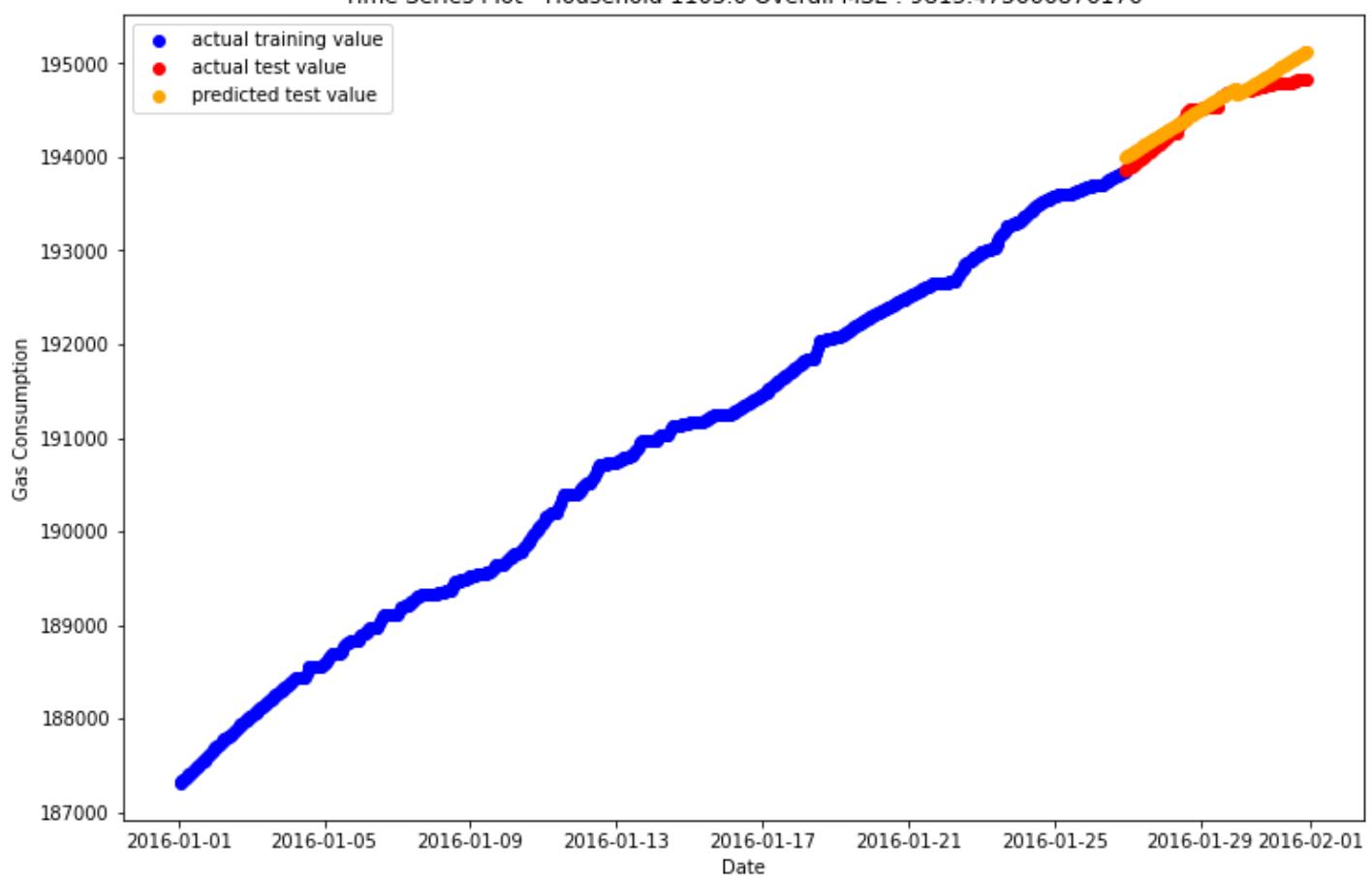
Time Series Plot - Household 1086.0 Overall MSE : 17082.99929236015



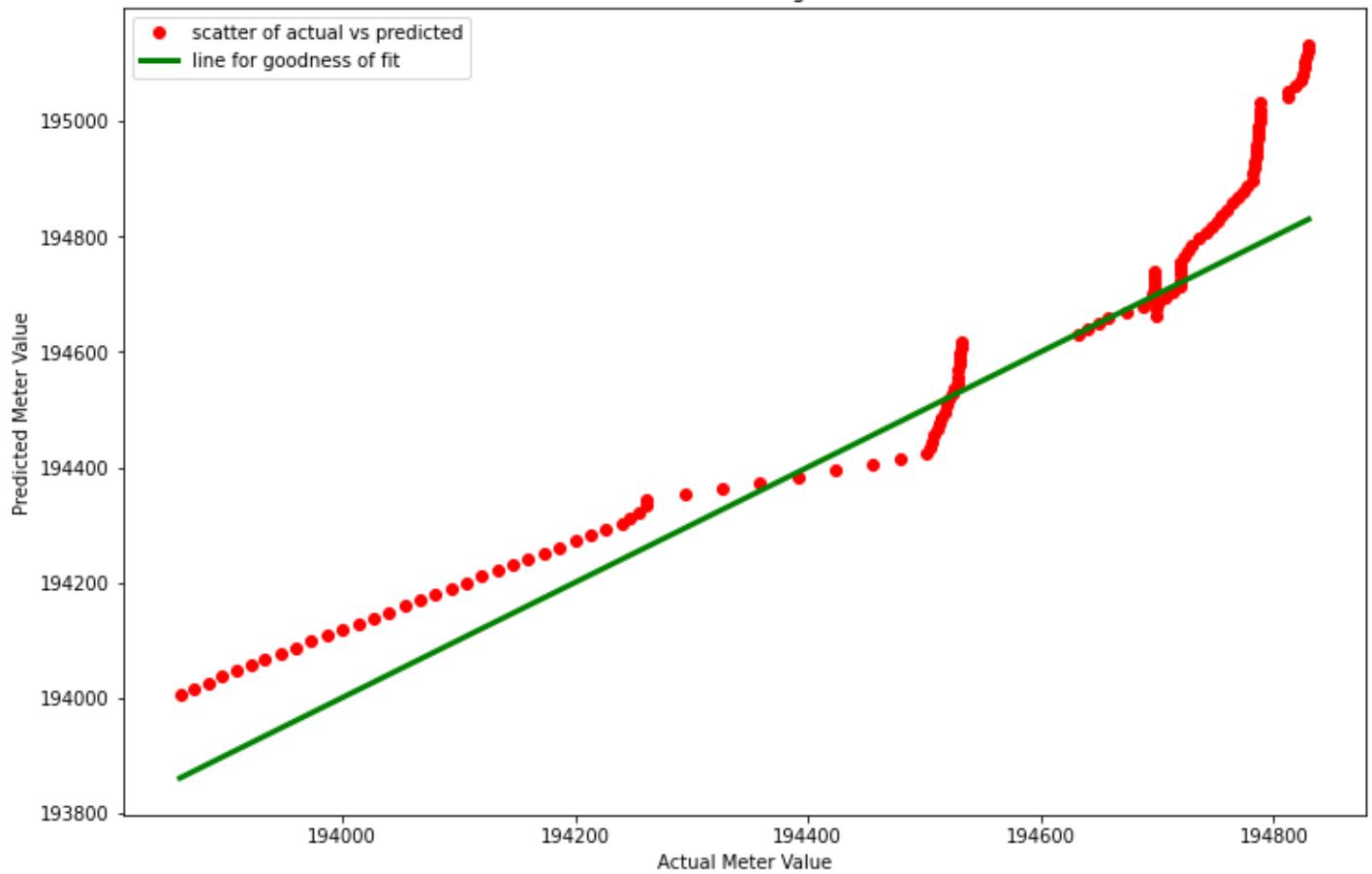
Scatter Plot - Household 1086.0 Testing MSE : 49785.21045899714



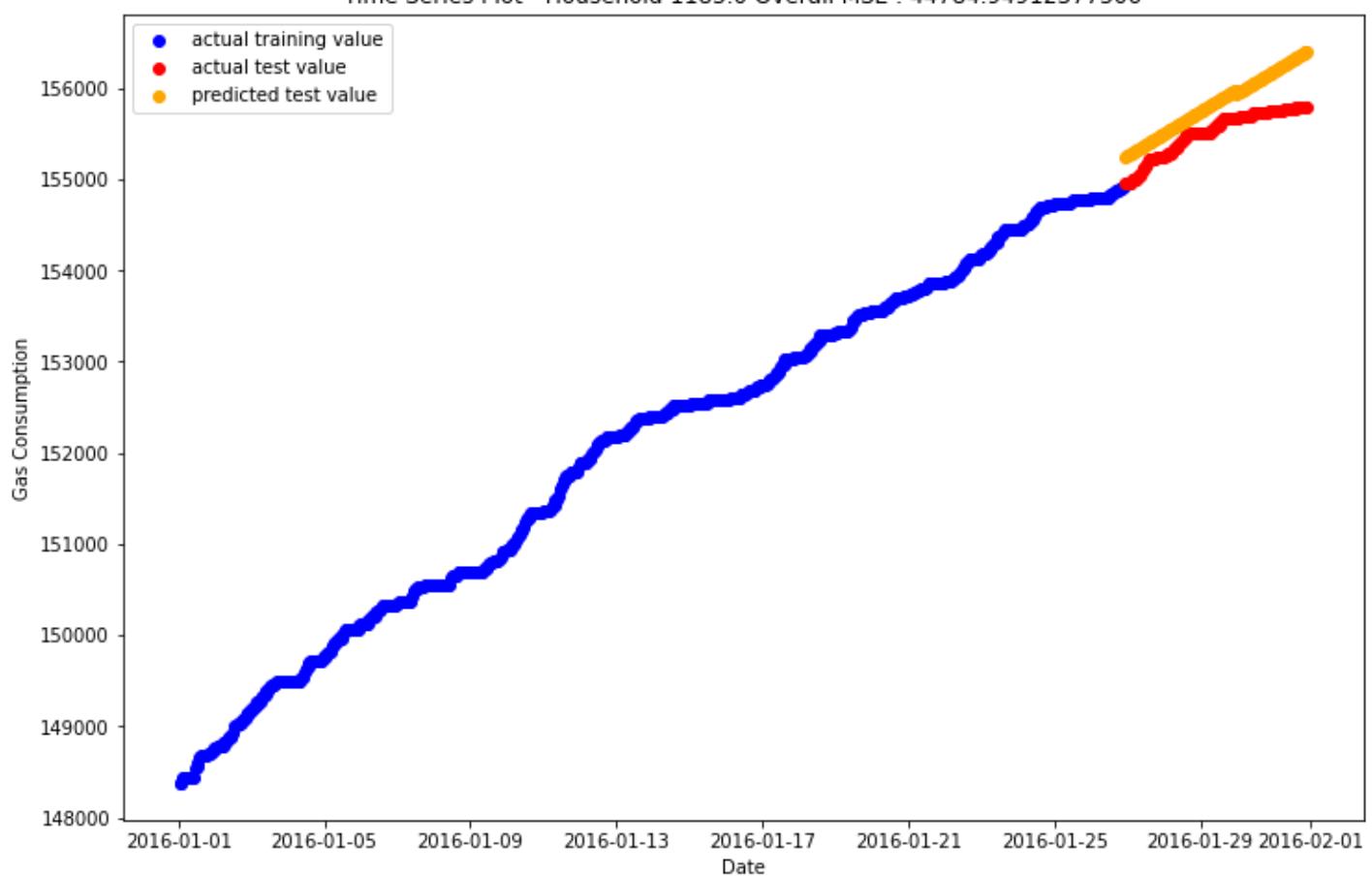
Time Series Plot - Household 1103.0 Overall MSE : 9815.473666876176



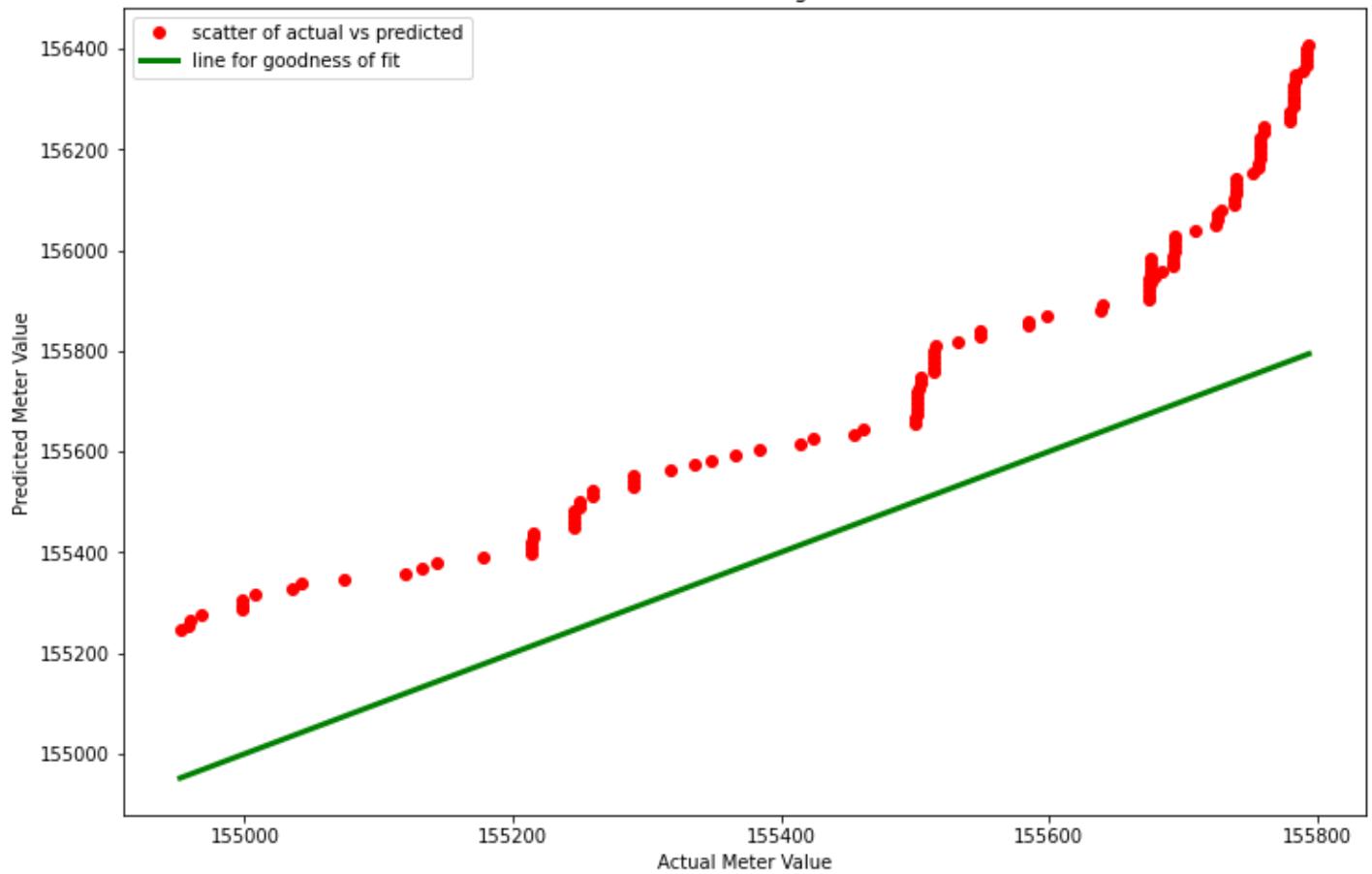
Scatter Plot - Household 1103.0 Testing MSE : 14216.914737306355



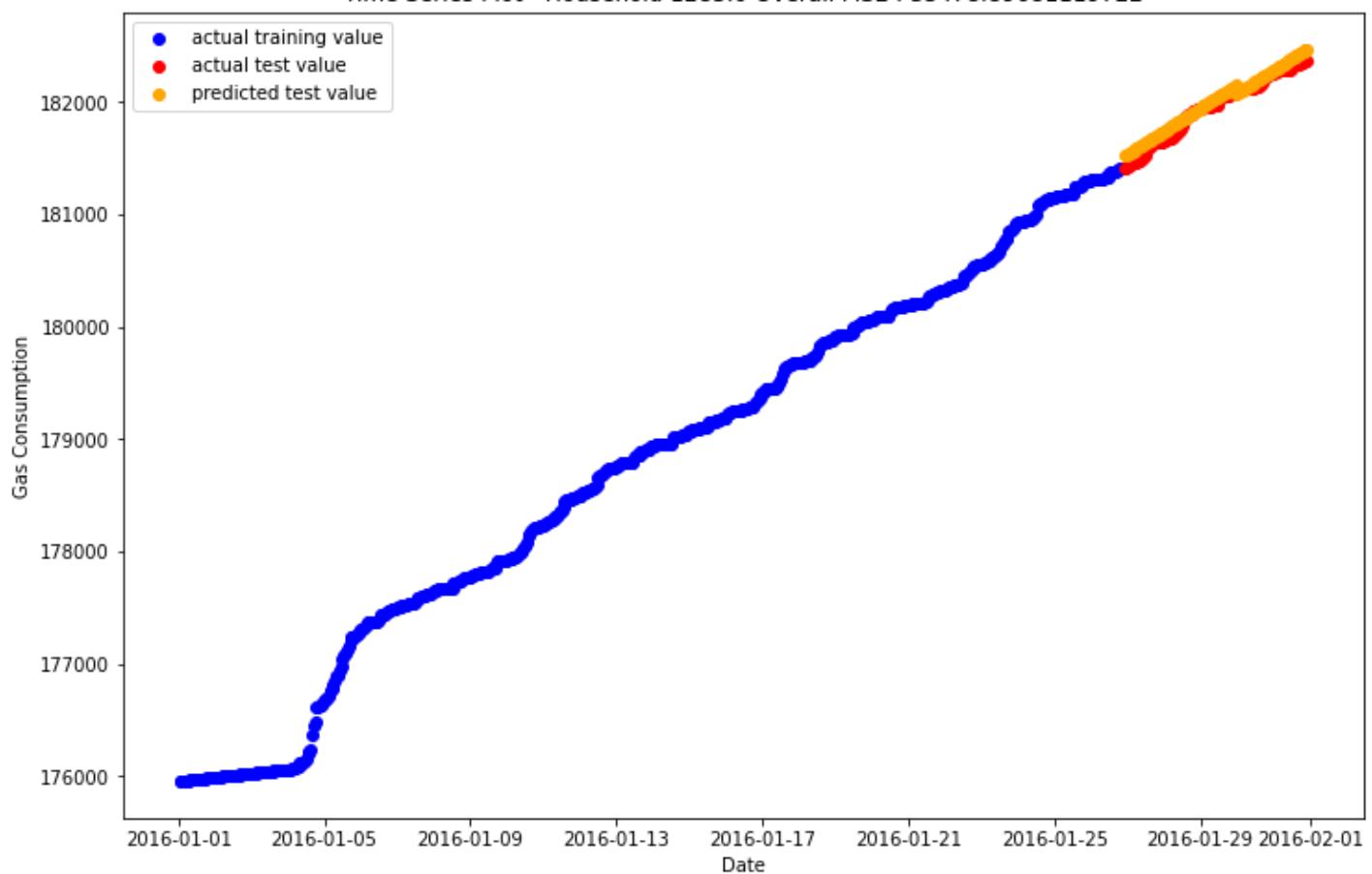
Time Series Plot - Household 1185.0 Overall MSE : 44784.94912377506



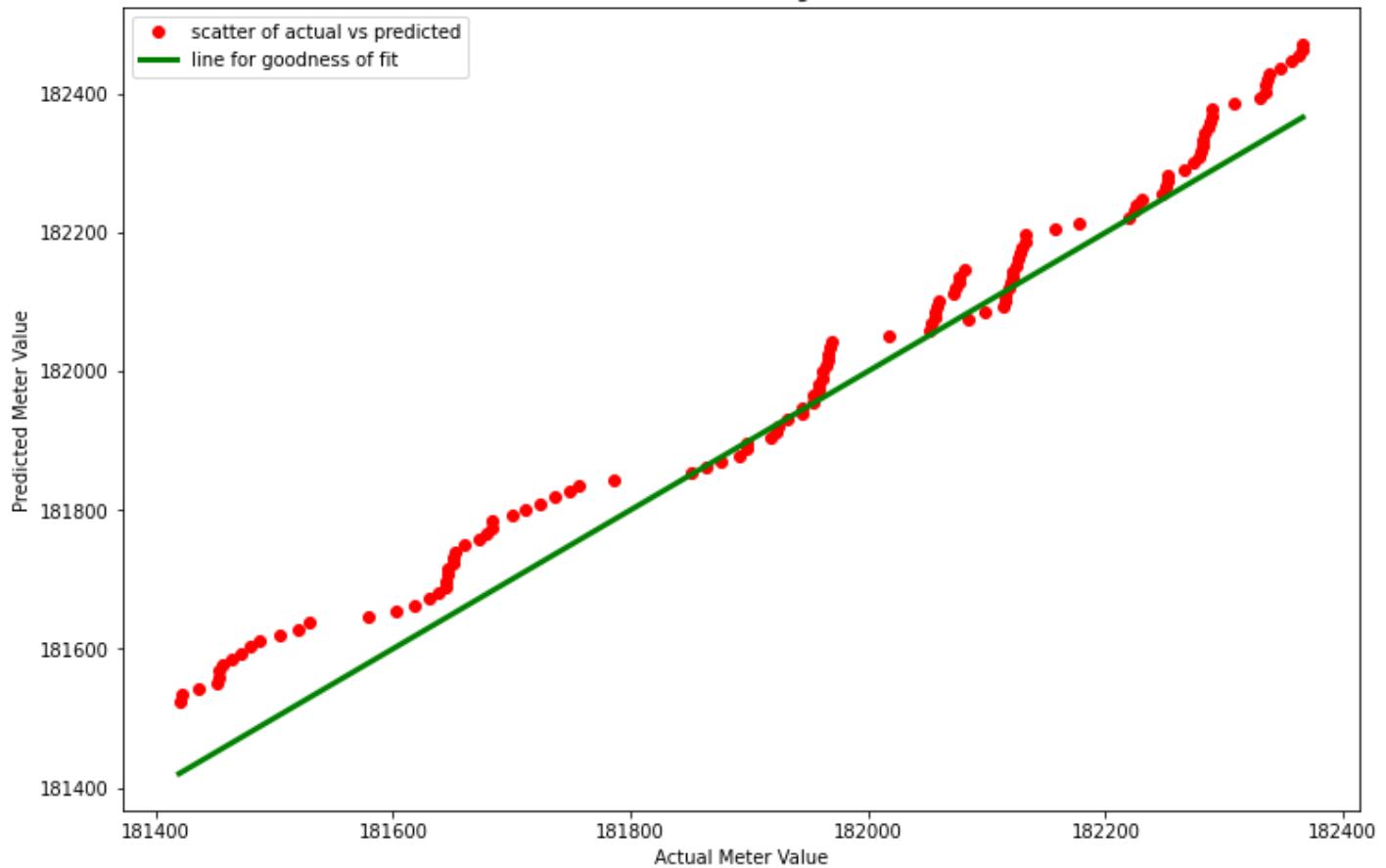
Scatter Plot - Household 1185.0 Testing MSE : 113060.57526864576



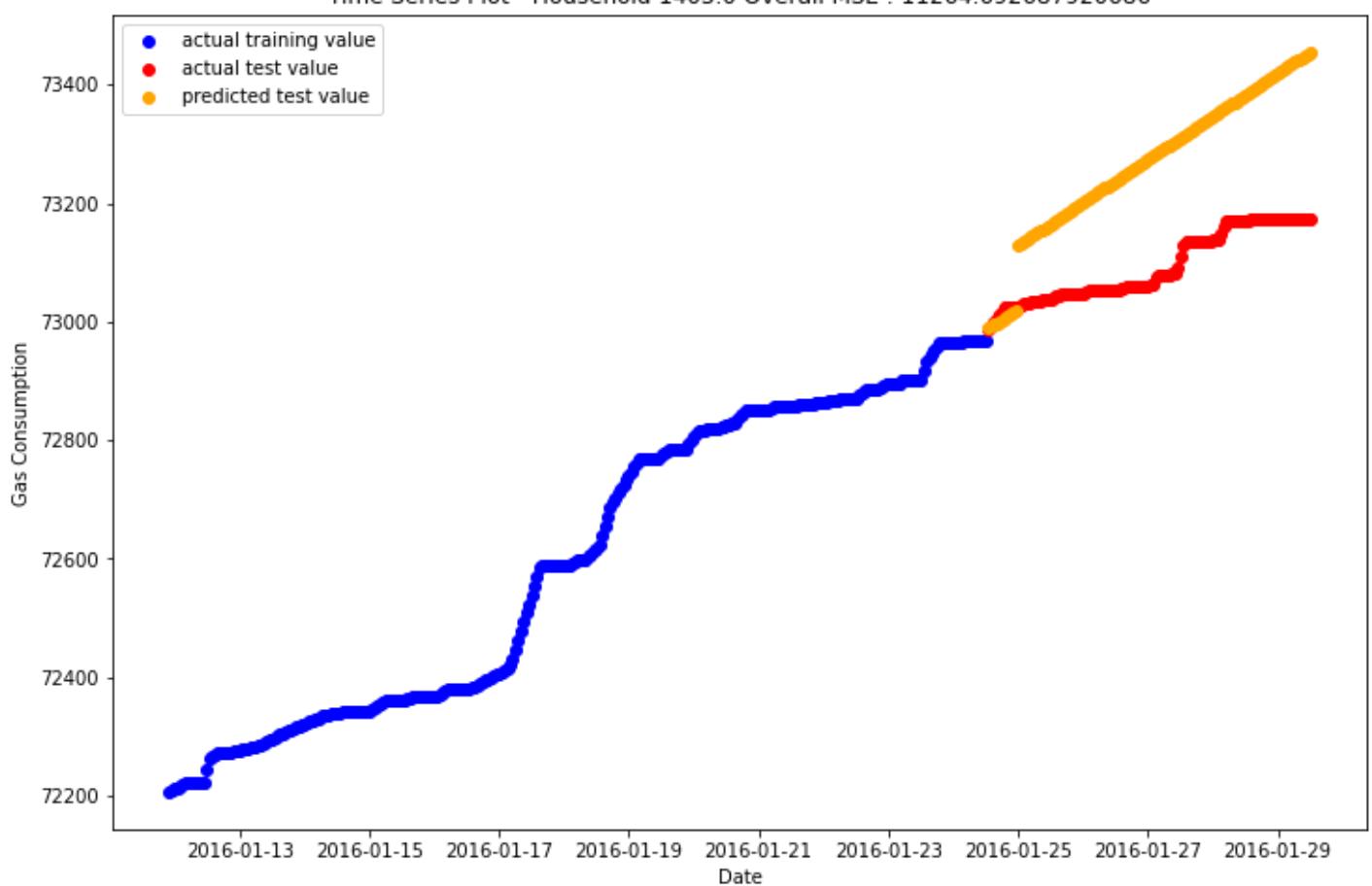
Time Series Plot - Household 1283.0 Overall MSE : 35478.89681119722



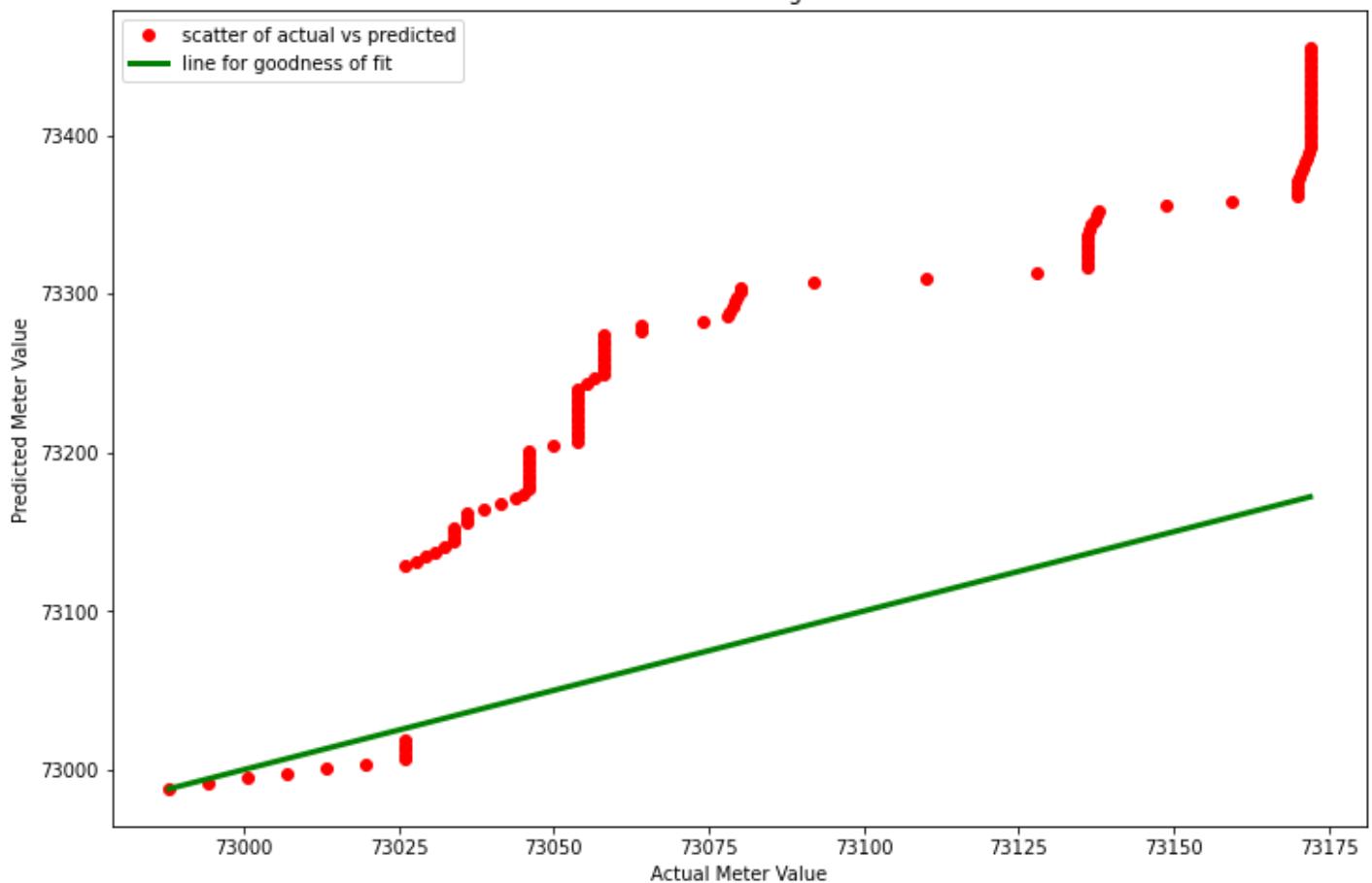
Scatter Plot - Household 1283.0 Testing MSE : 4118.802249915045



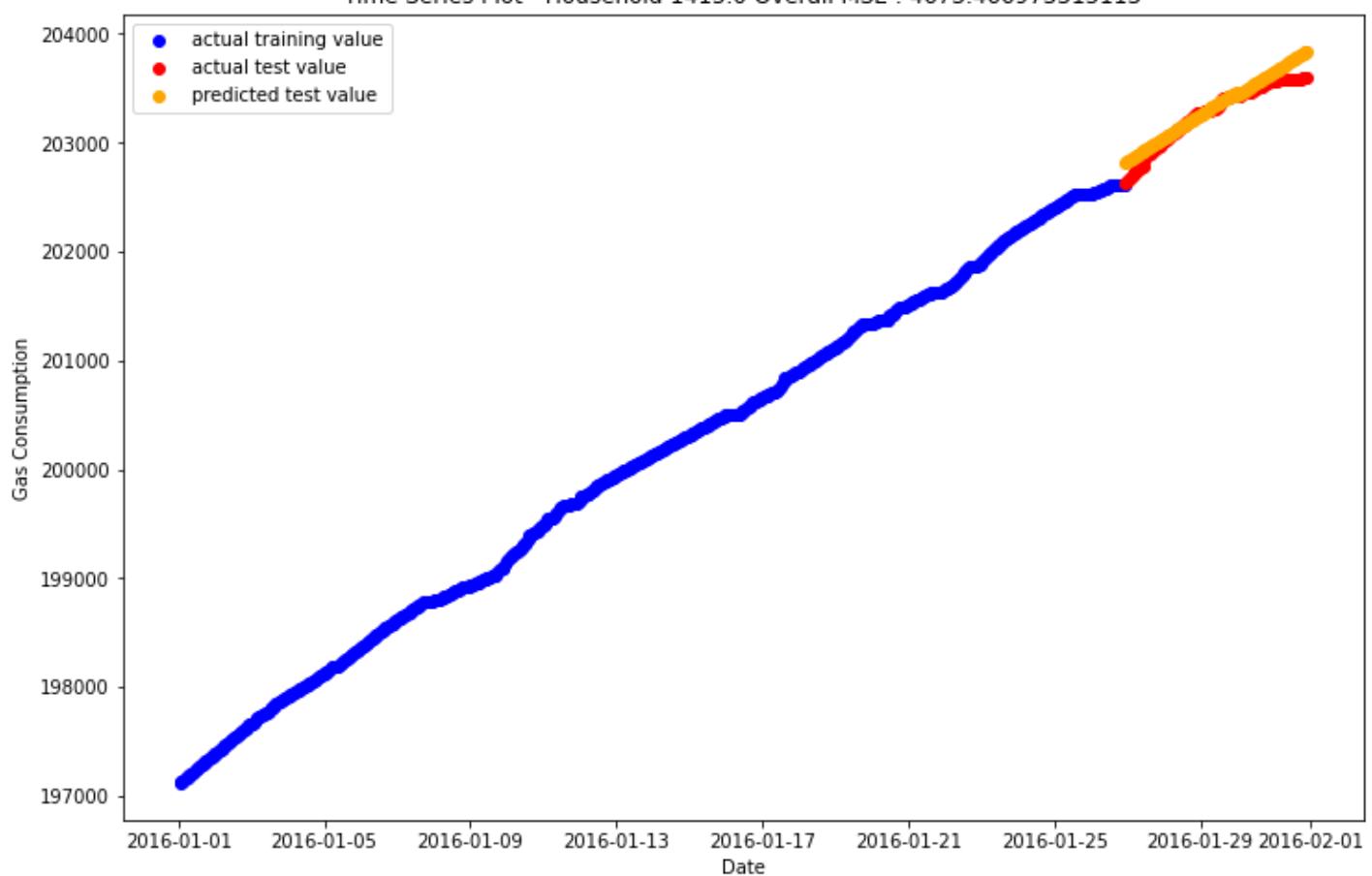
Time Series Plot - Household 1403.0 Overall MSE : 11264.692687920686



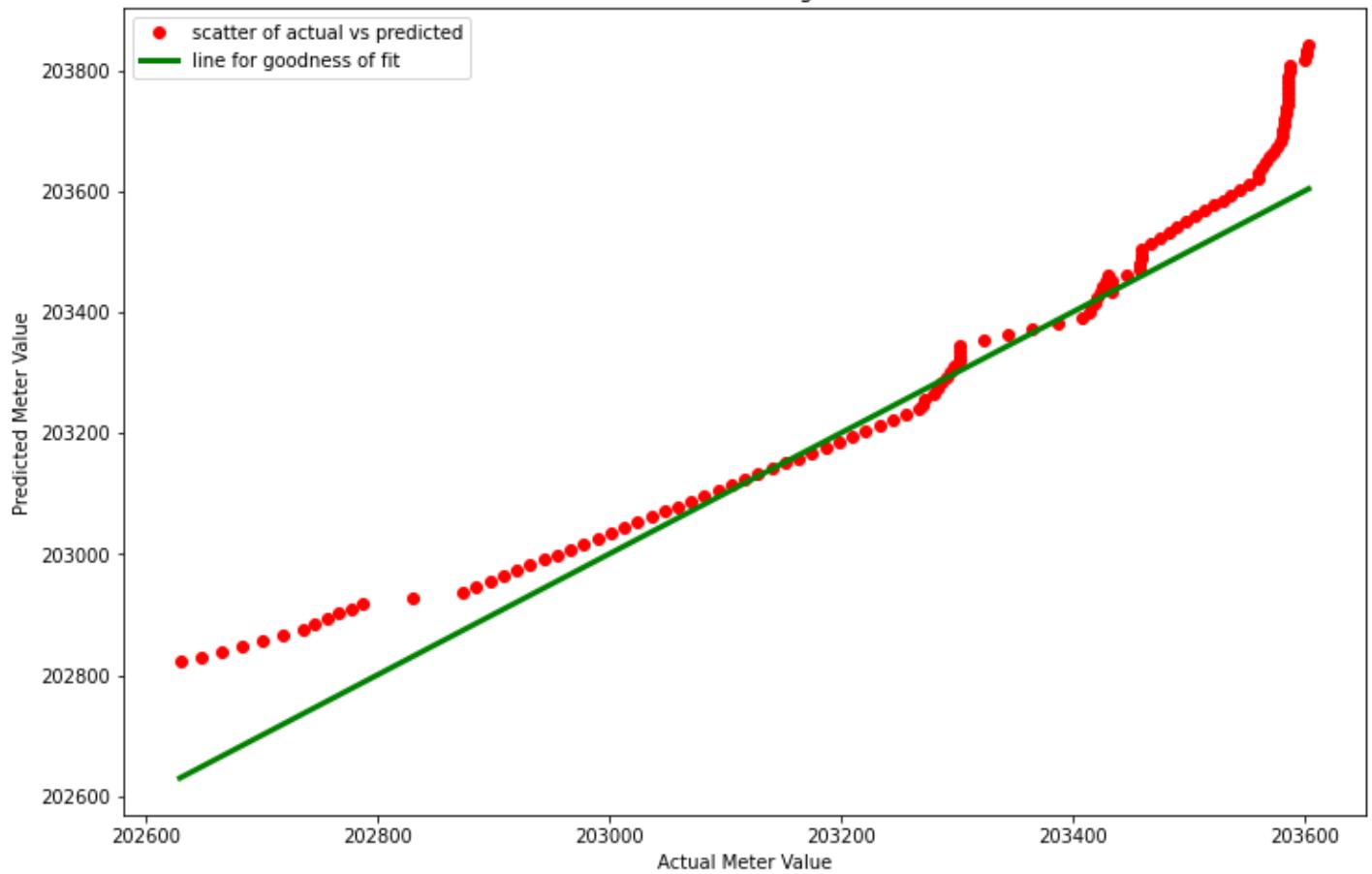
Scatter Plot - Household 1403.0 Testing MSE : 35117.183848459346



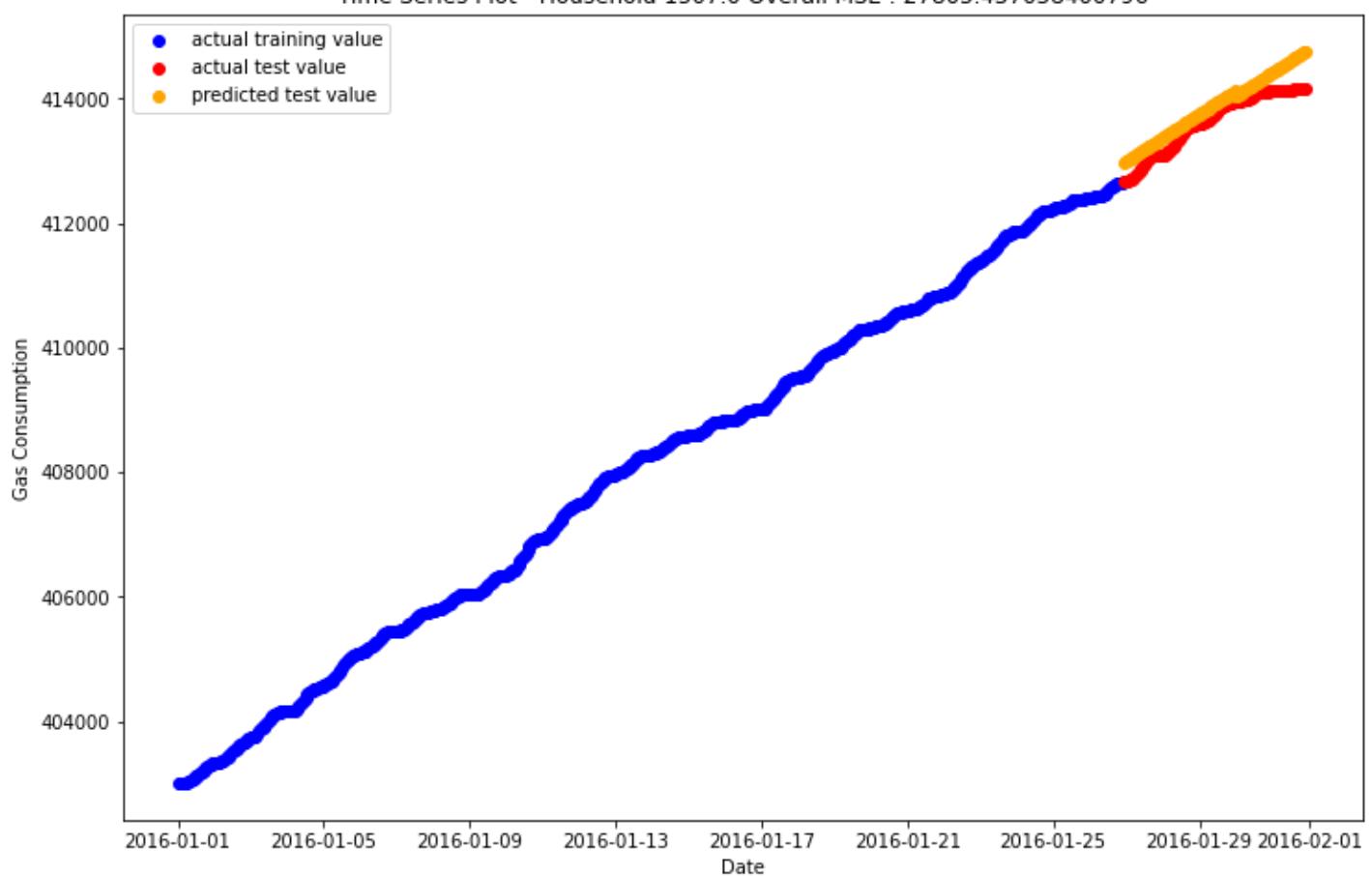
Time Series Plot - Household 1415.0 Overall MSE : 4673.466973315113



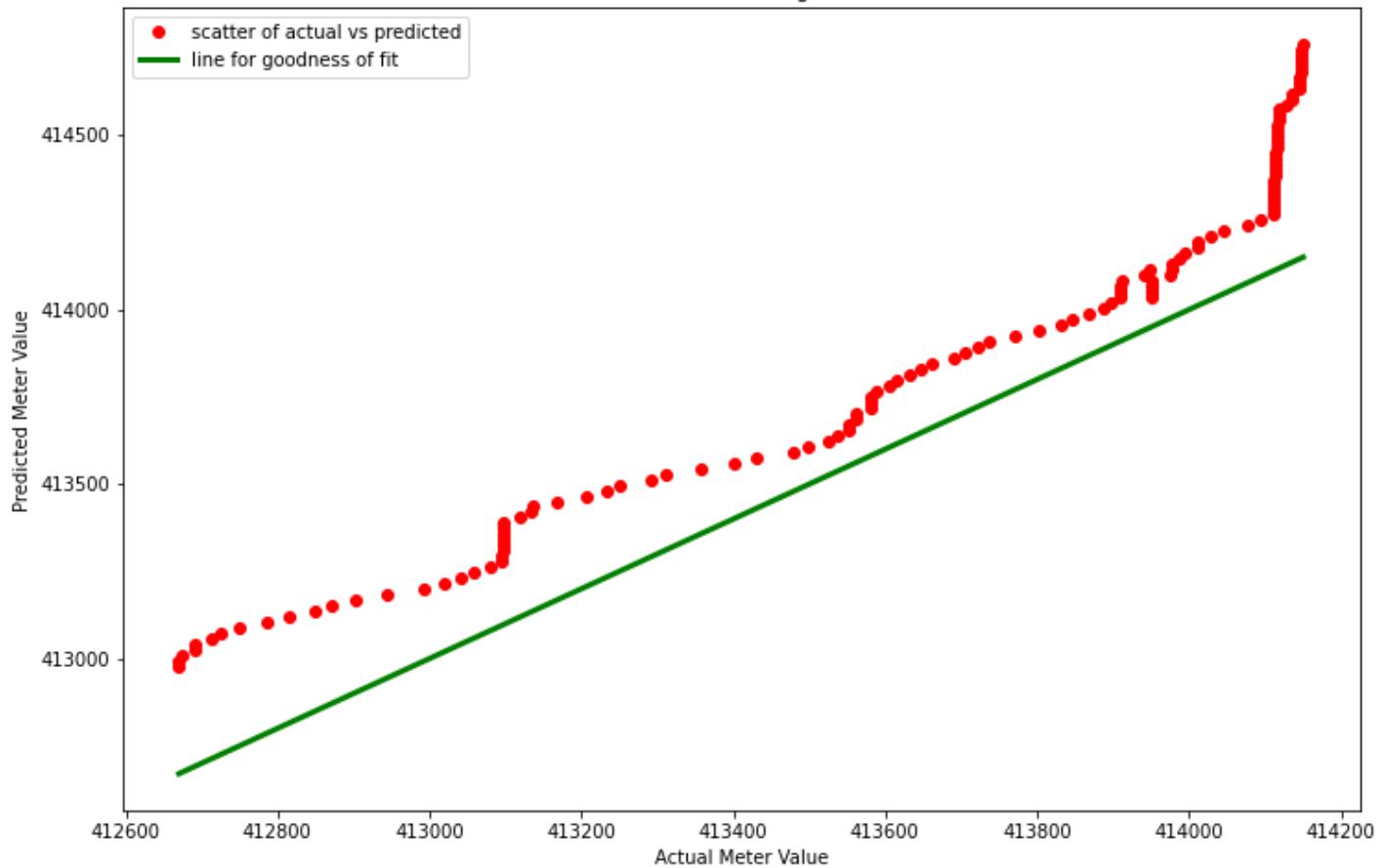
Scatter Plot - Household 1415.0 Testing MSE : 8661.478231311301



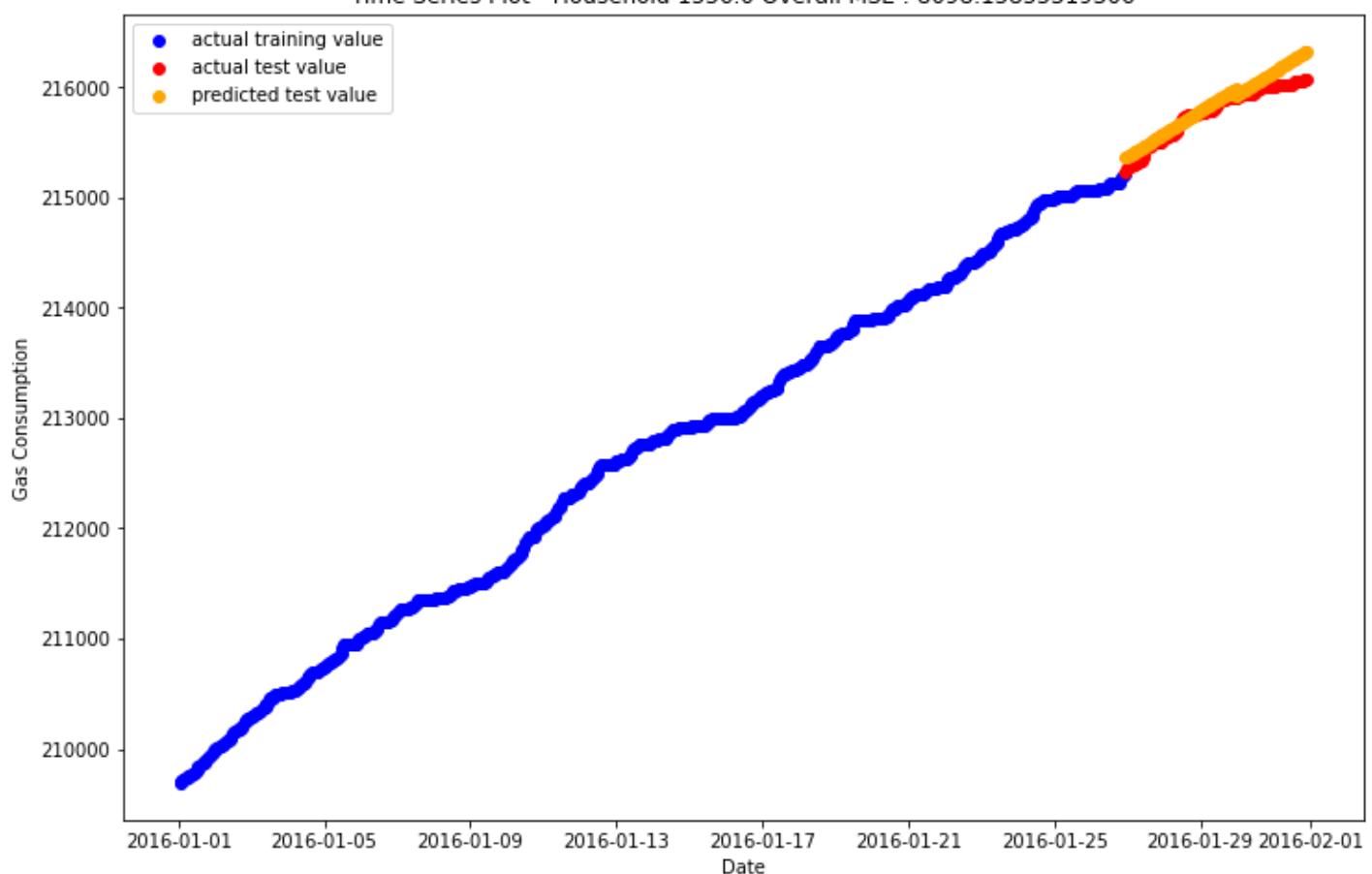
Time Series Plot - Household 1507.0 Overall MSE : 27805.437058400796



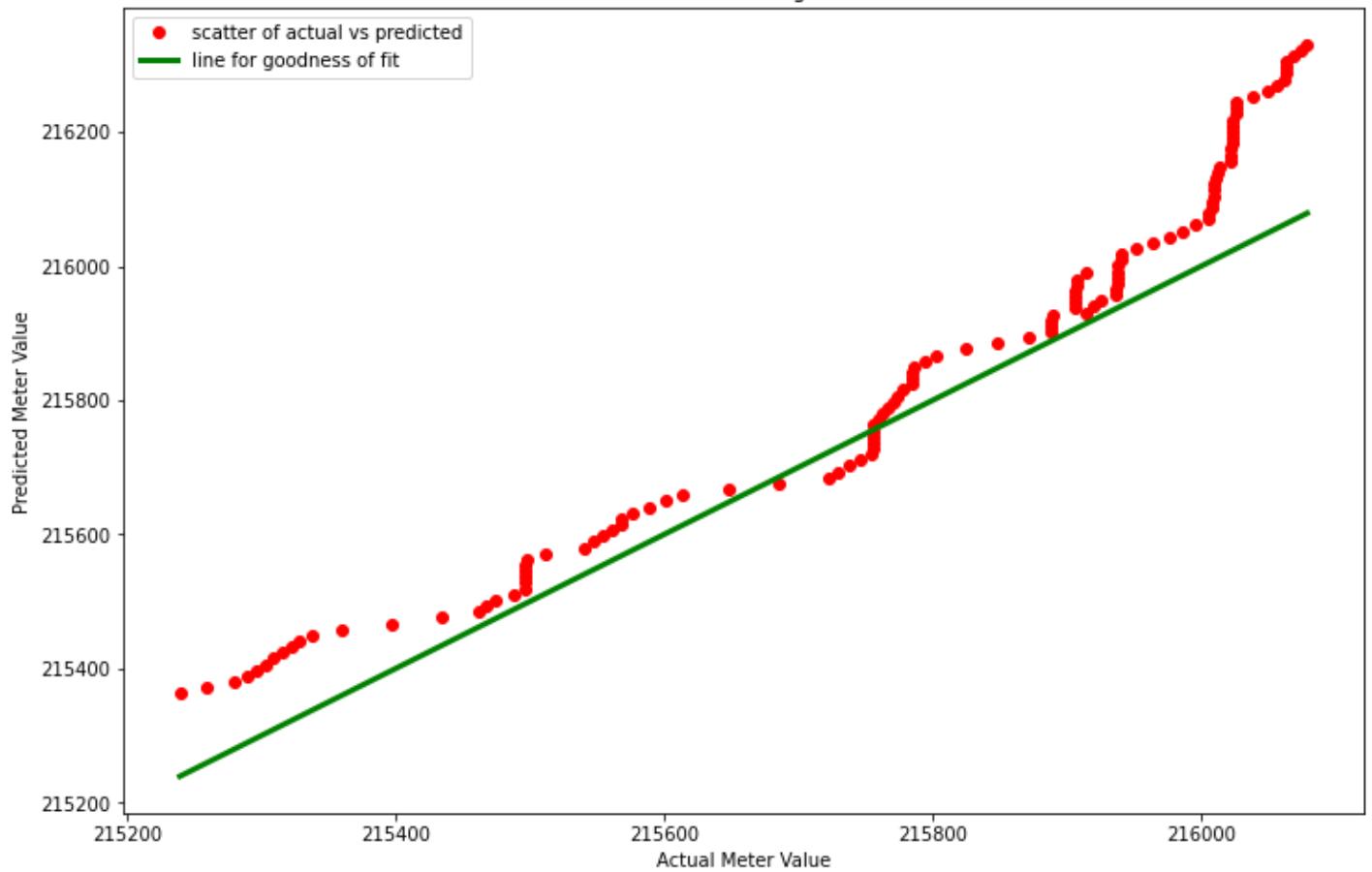
Scatter Plot - Household 1507.0 Testing MSE : 77299.09473900919



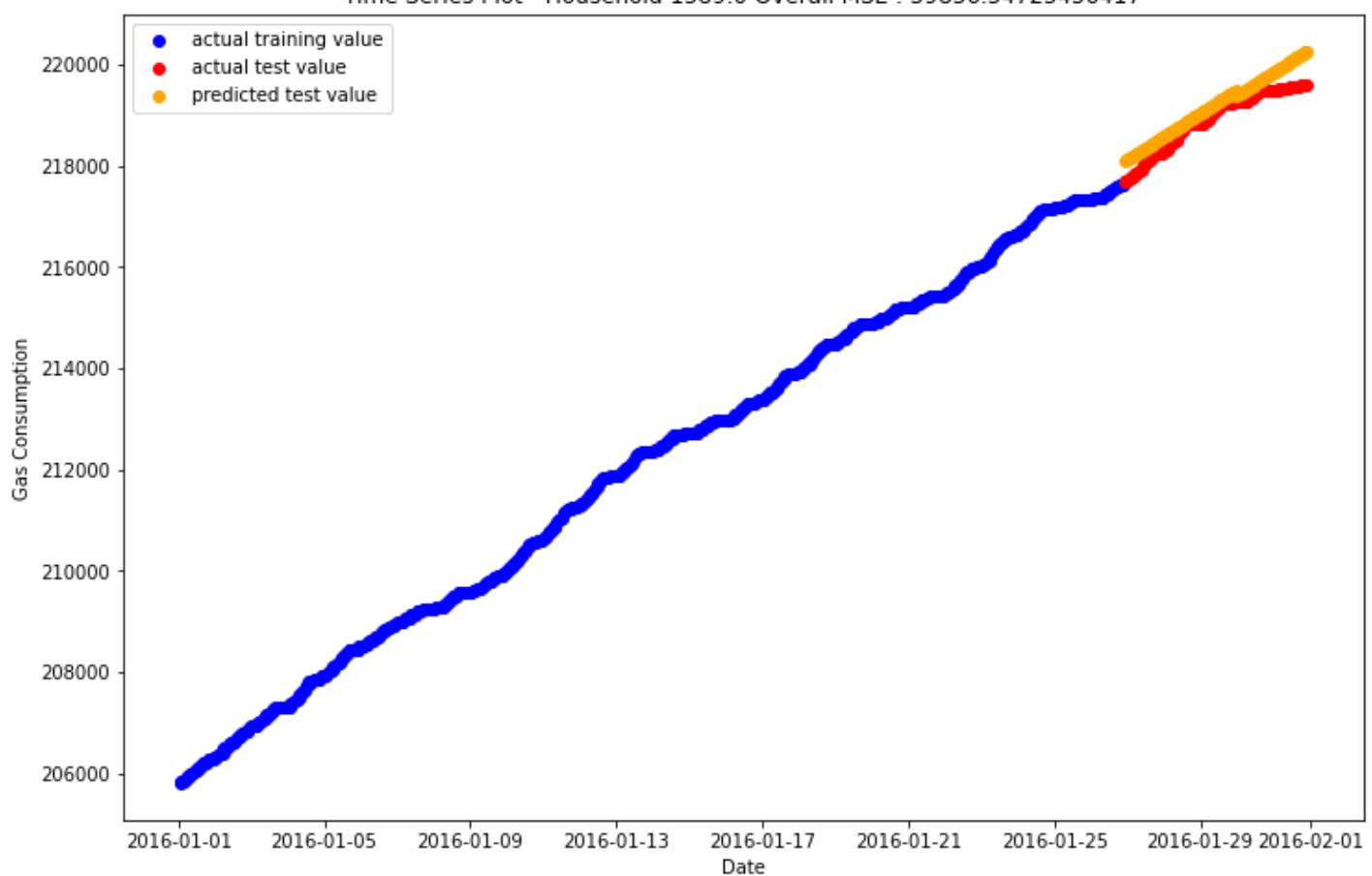
Time Series Plot - Household 1556.0 Overall MSE : 8098.15855319306



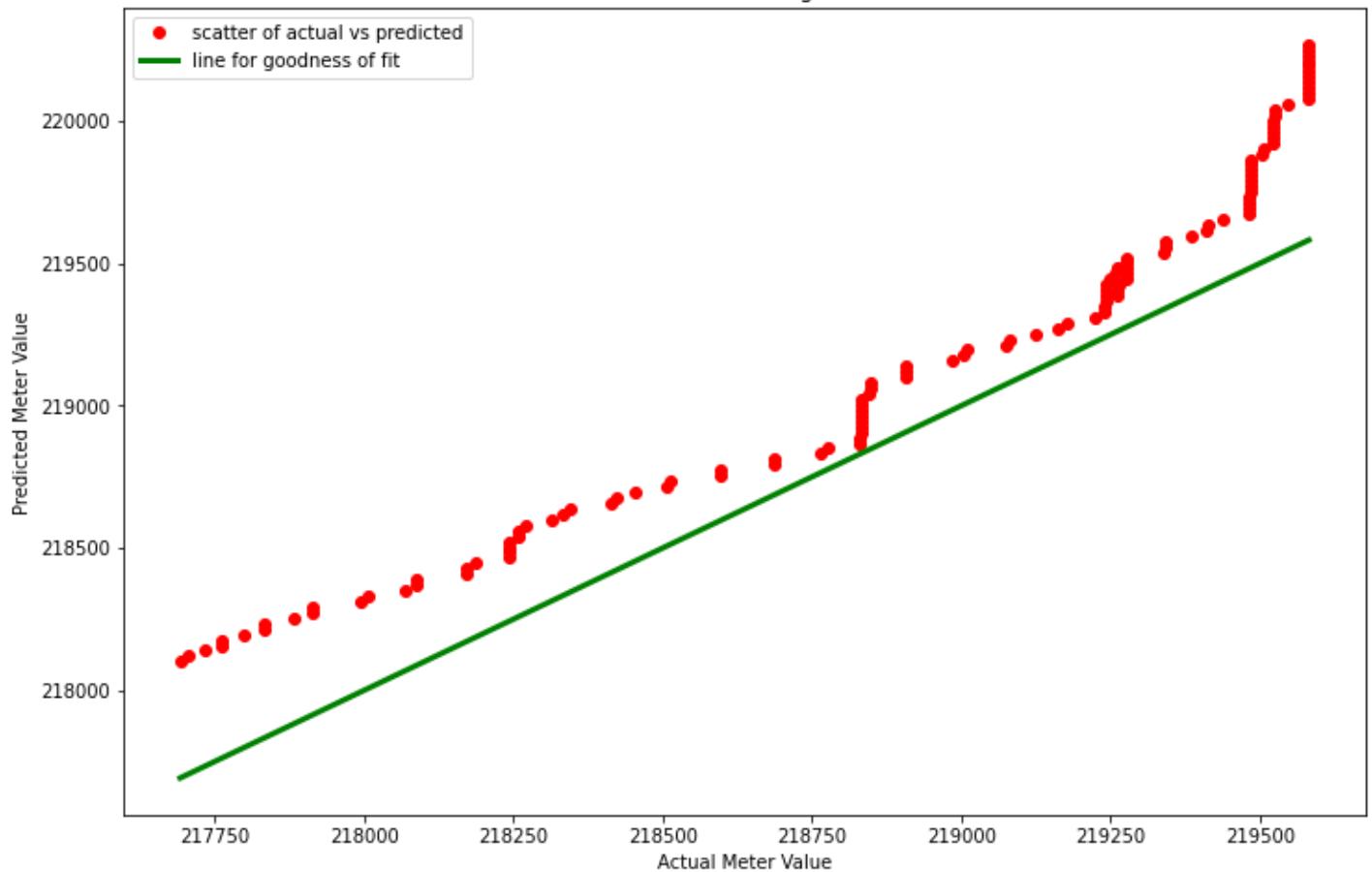
Scatter Plot - Household 1556.0 Testing MSE : 10703.772152579746



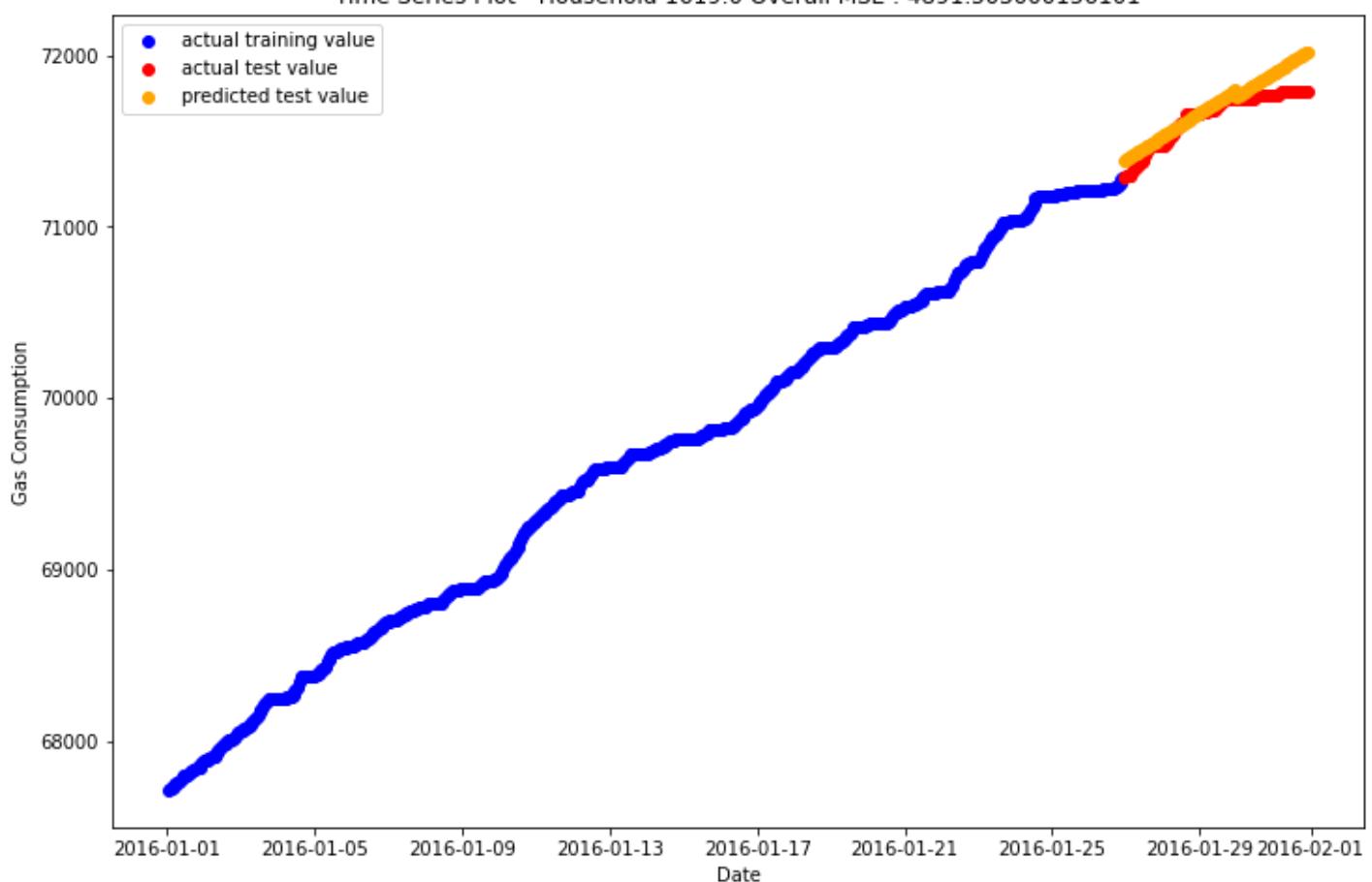
Time Series Plot - Household 1589.0 Overall MSE : 39856.54725456417



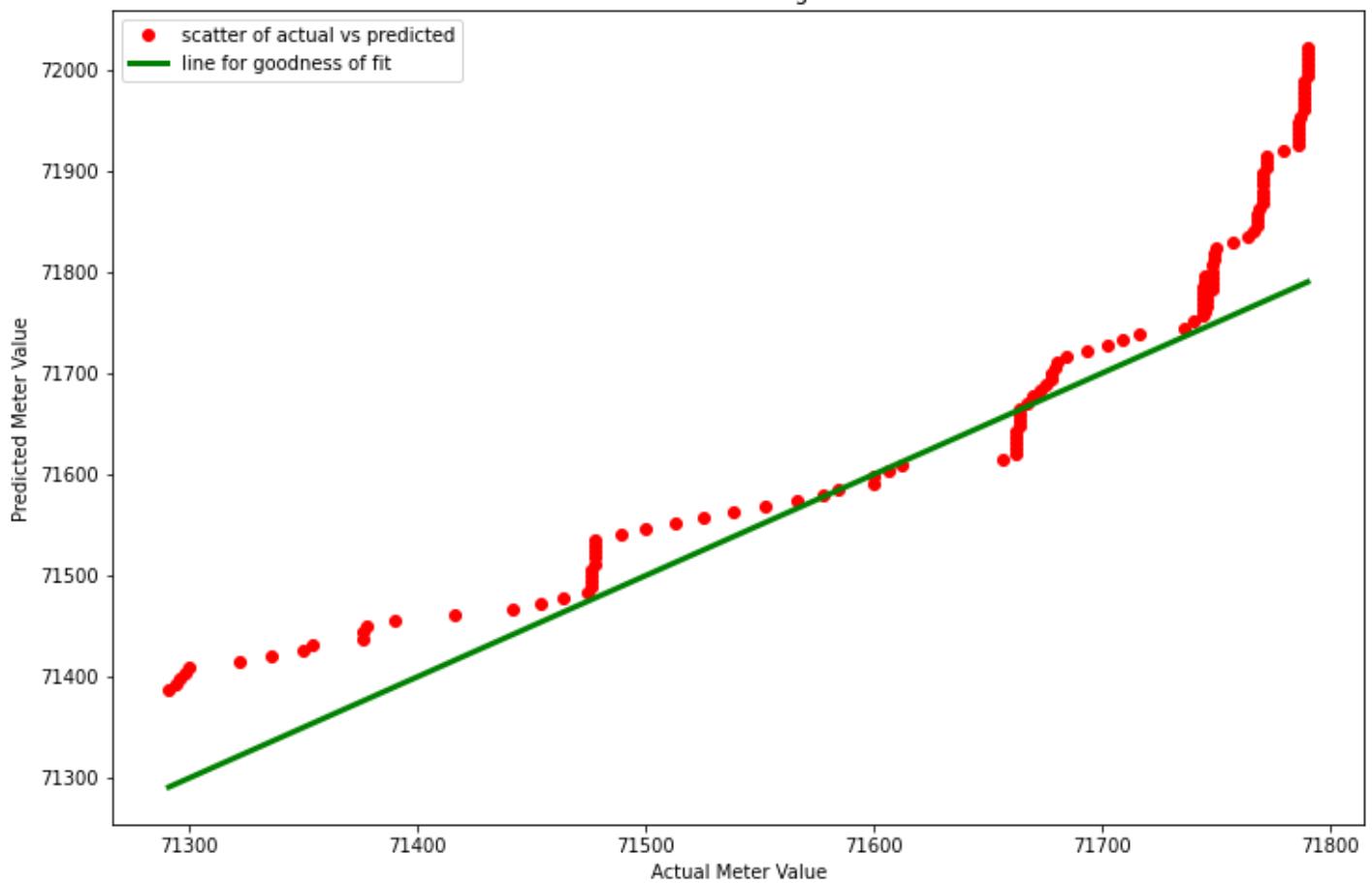
Scatter Plot - Household 1589.0 Testing MSE : 98640.08146227781



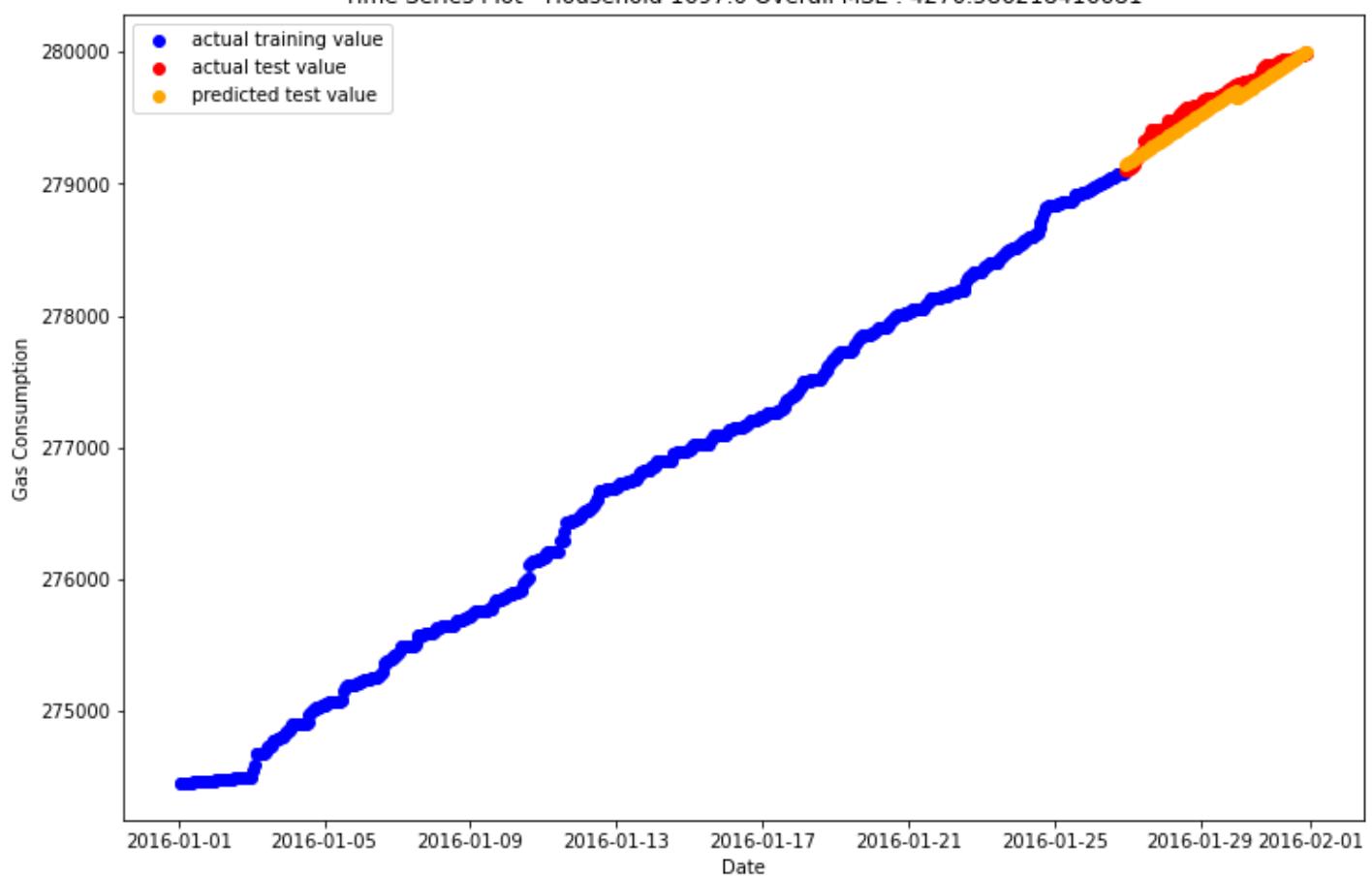
Time Series Plot - Household 1619.0 Overall MSE : 4891.503000156101



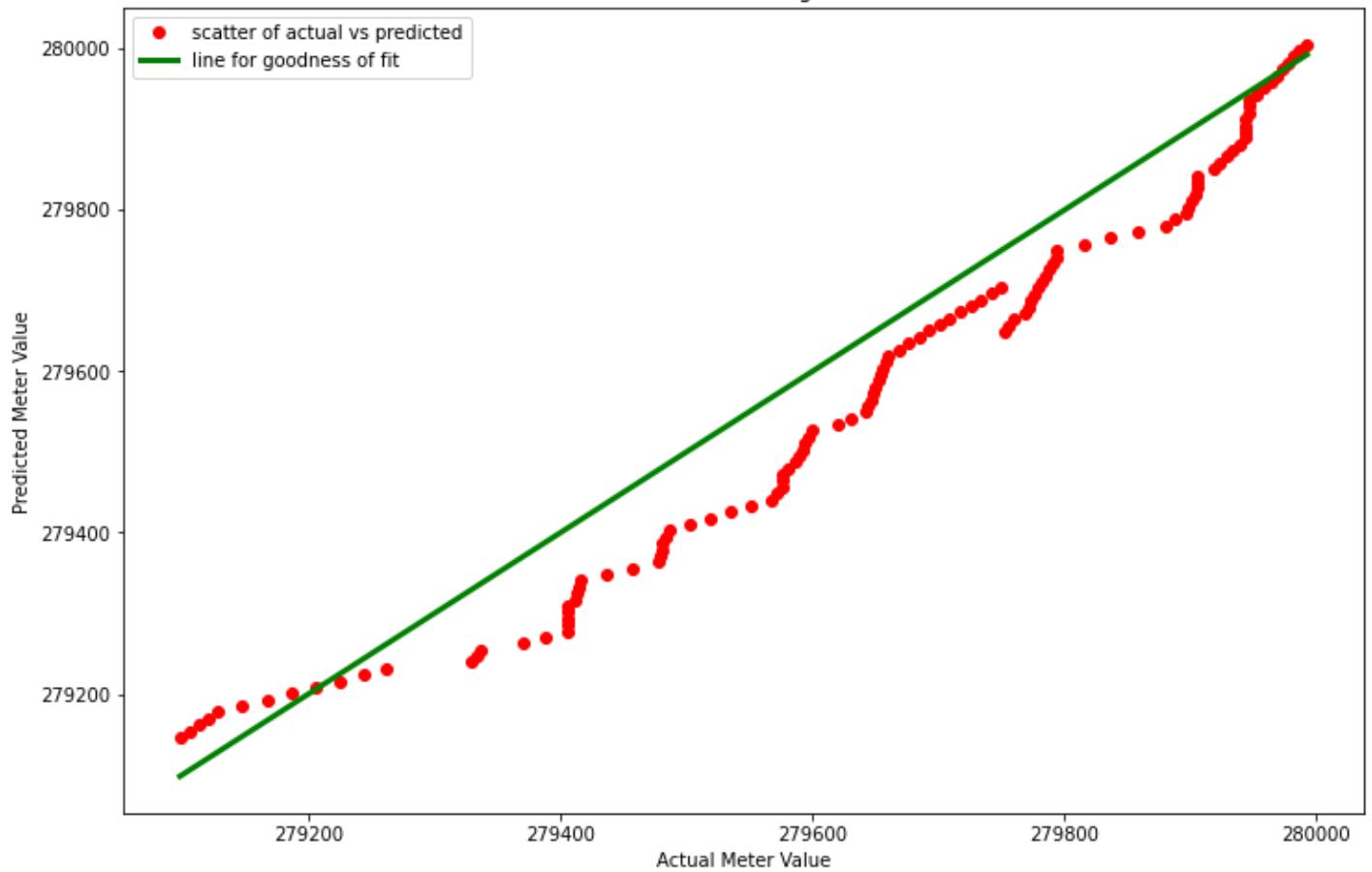
Scatter Plot - Household 1619.0 Testing MSE : 8394.332197374466



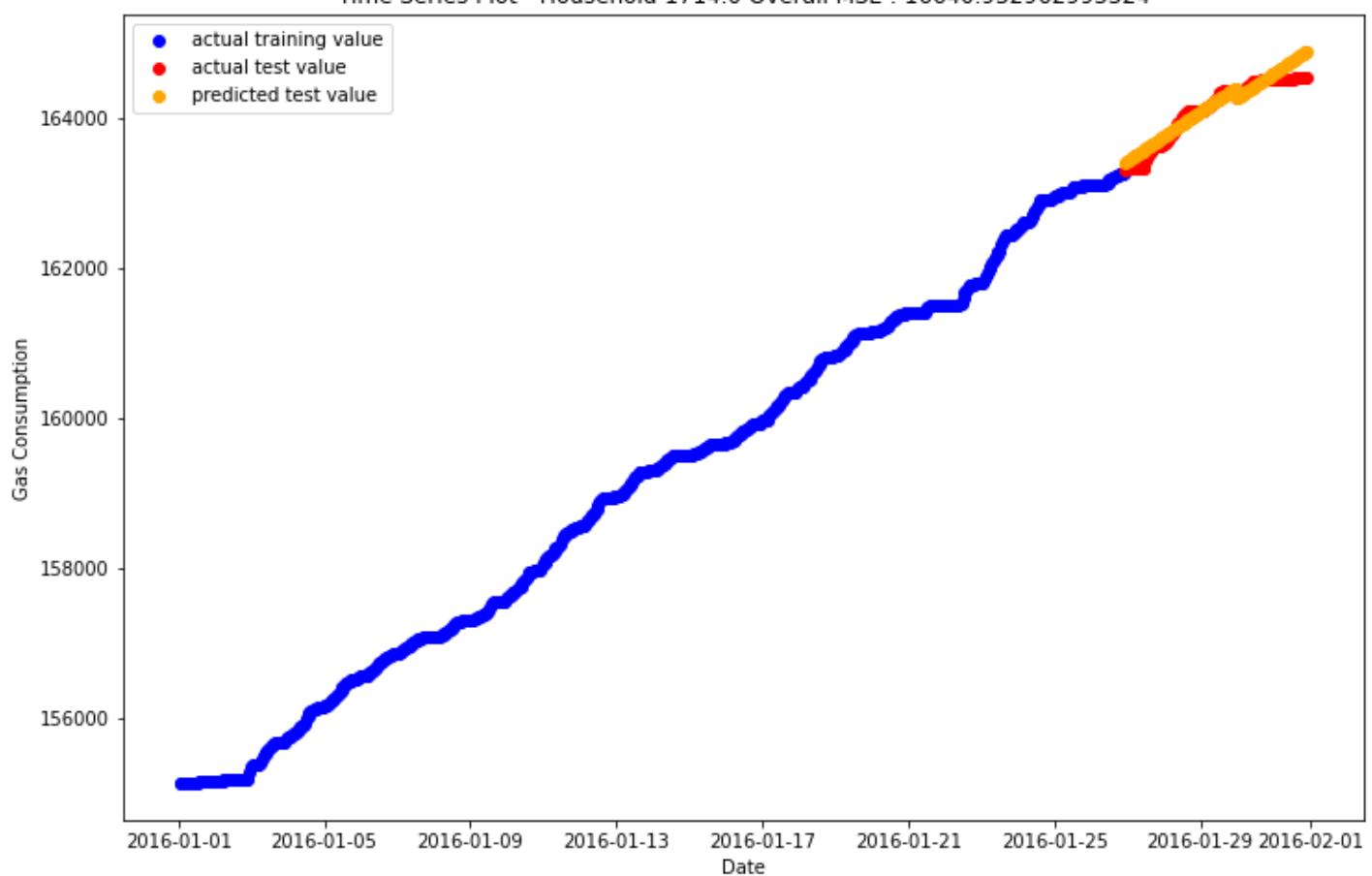
Time Series Plot - Household 1697.0 Overall MSE : 4270.586218416681



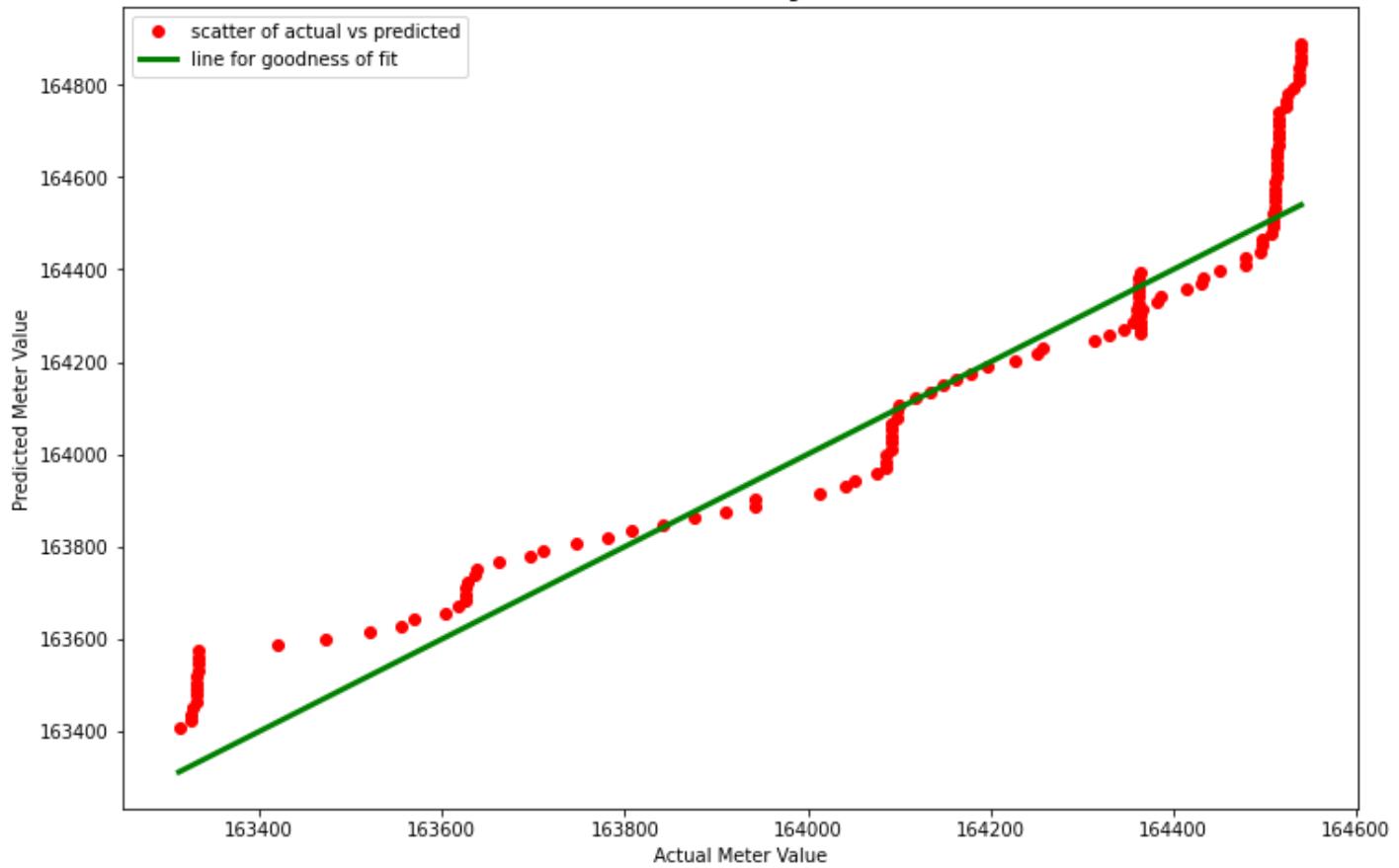
Scatter Plot - Household 1697.0 Testing MSE : 5719.980879142731



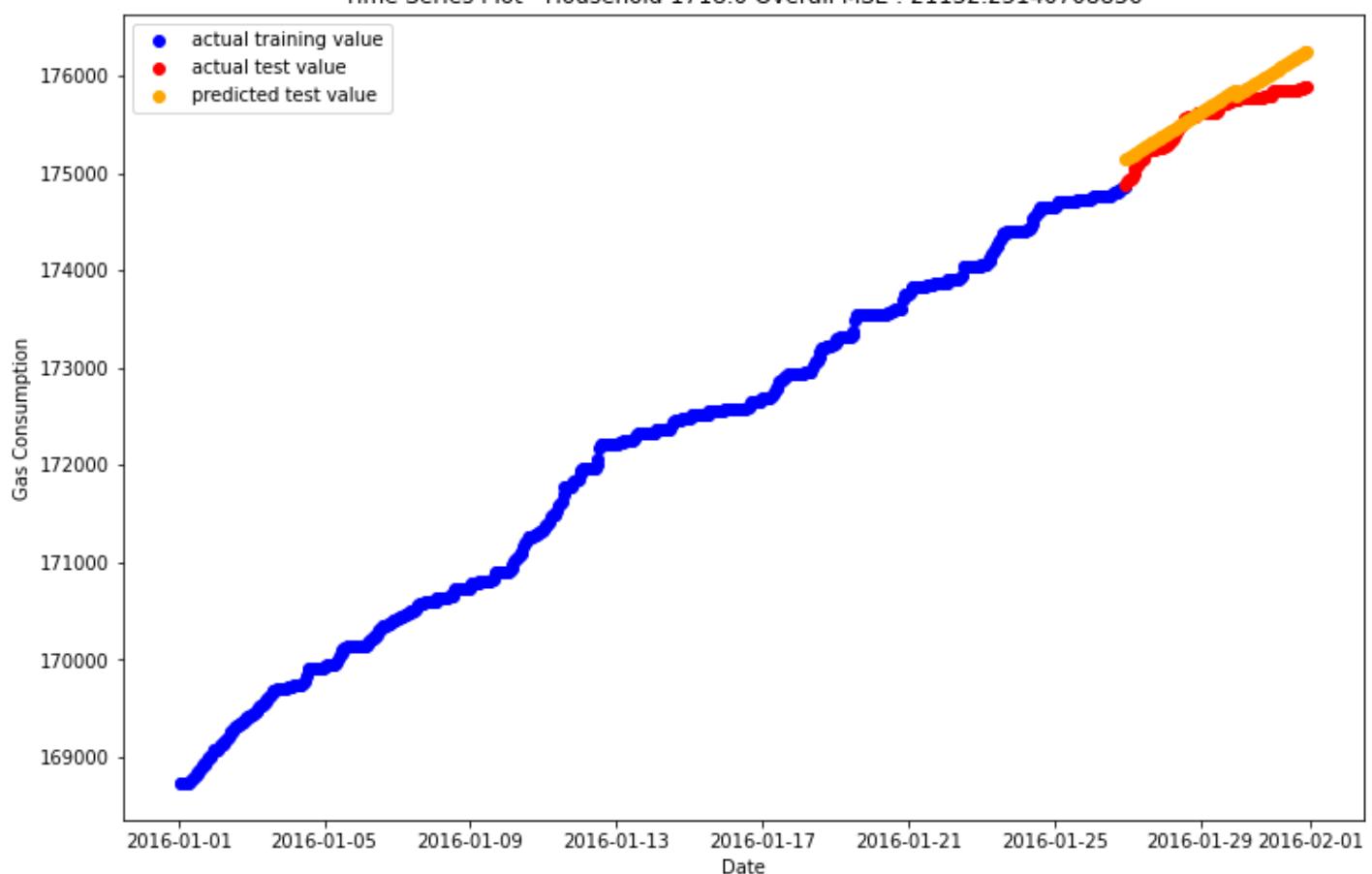
Time Series Plot - Household 1714.0 Overall MSE : 16640.932962995324



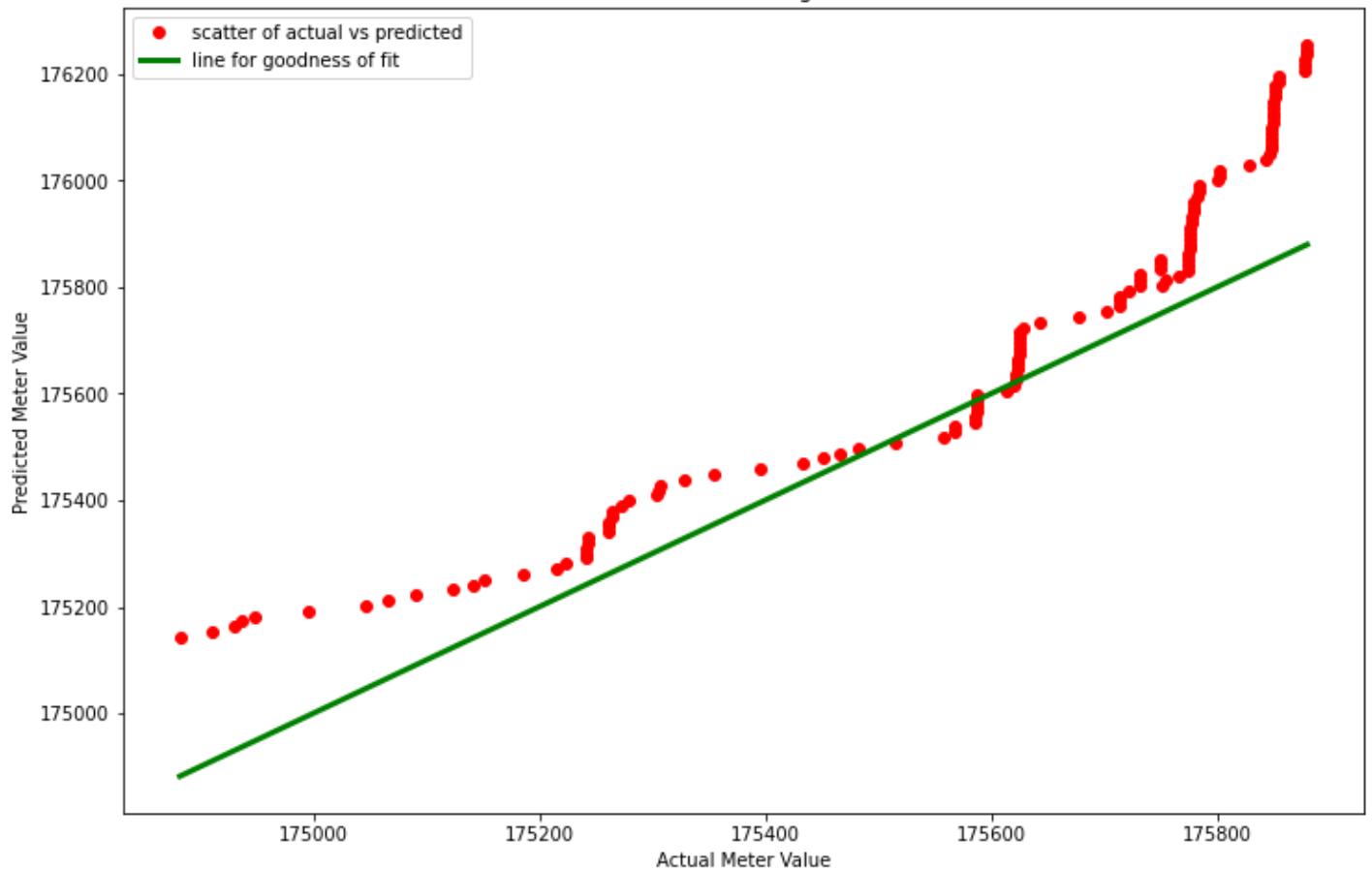
Scatter Plot - Household 1714.0 Testing MSE : 16166.712156878195



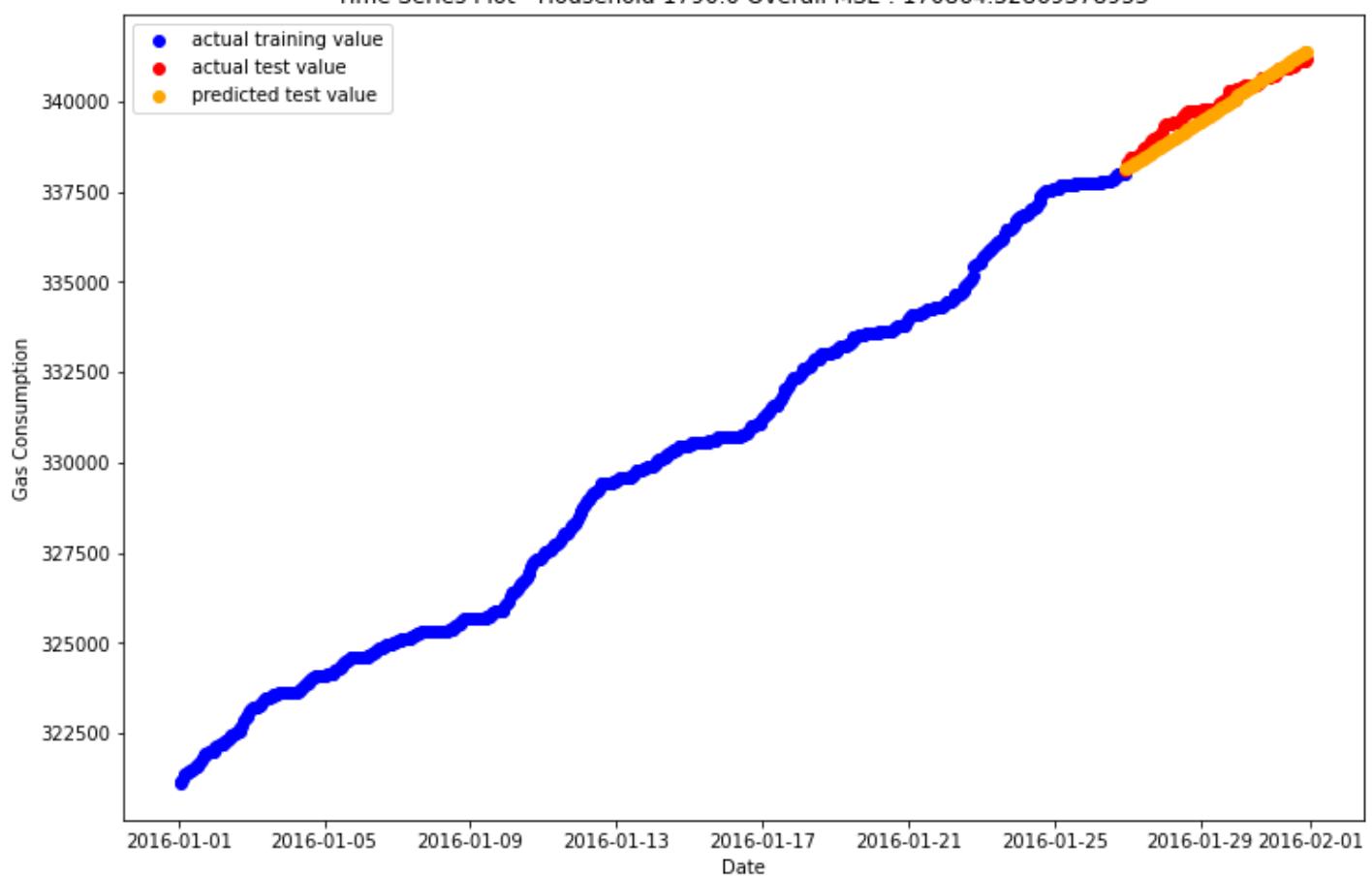
Time Series Plot - Household 1718.0 Overall MSE : 21132.25140708836



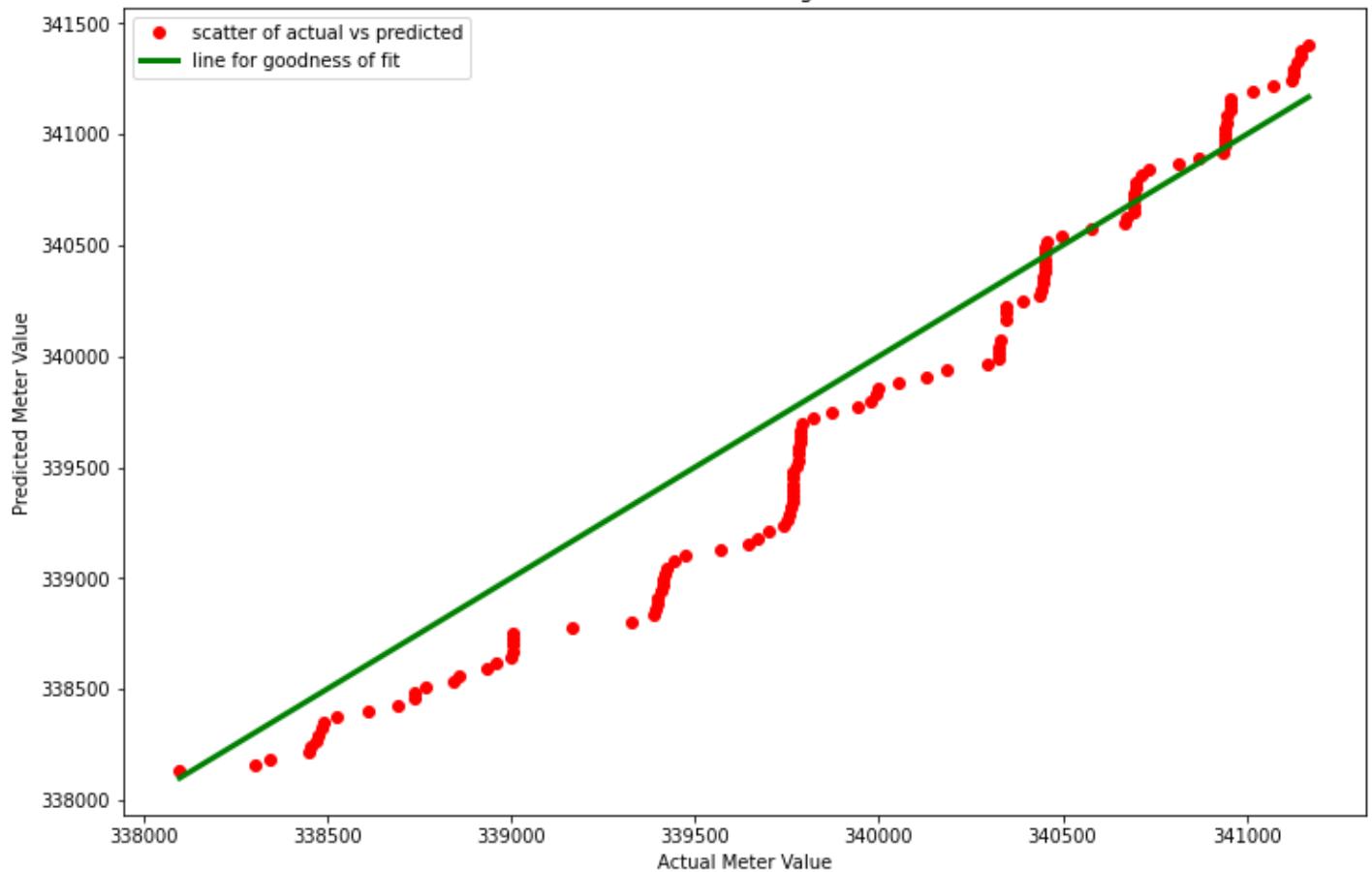
Scatter Plot - Household 1718.0 Testing MSE : 27081.13091221424



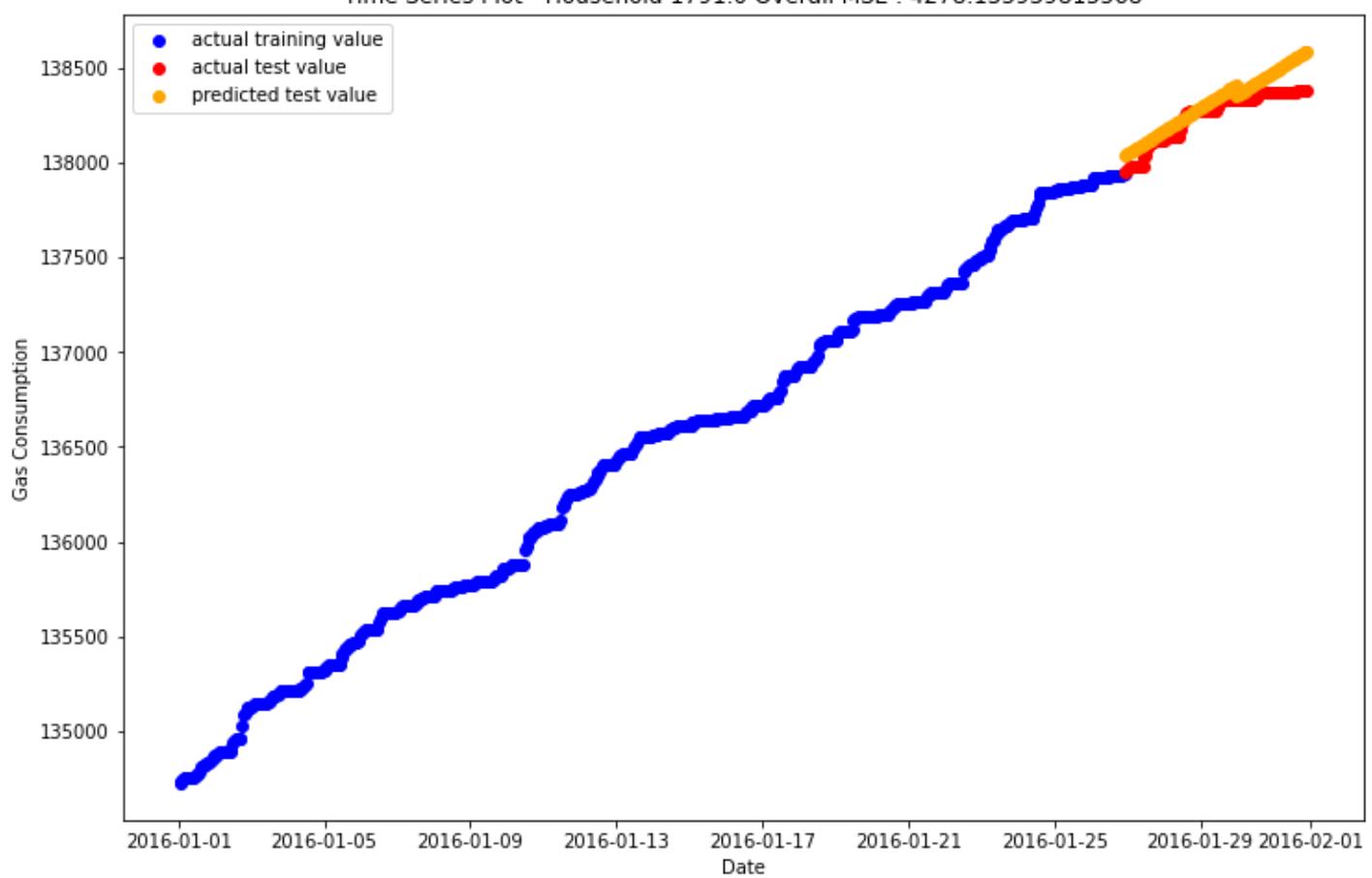
Time Series Plot - Household 1790.0 Overall MSE : 170864.32869378955



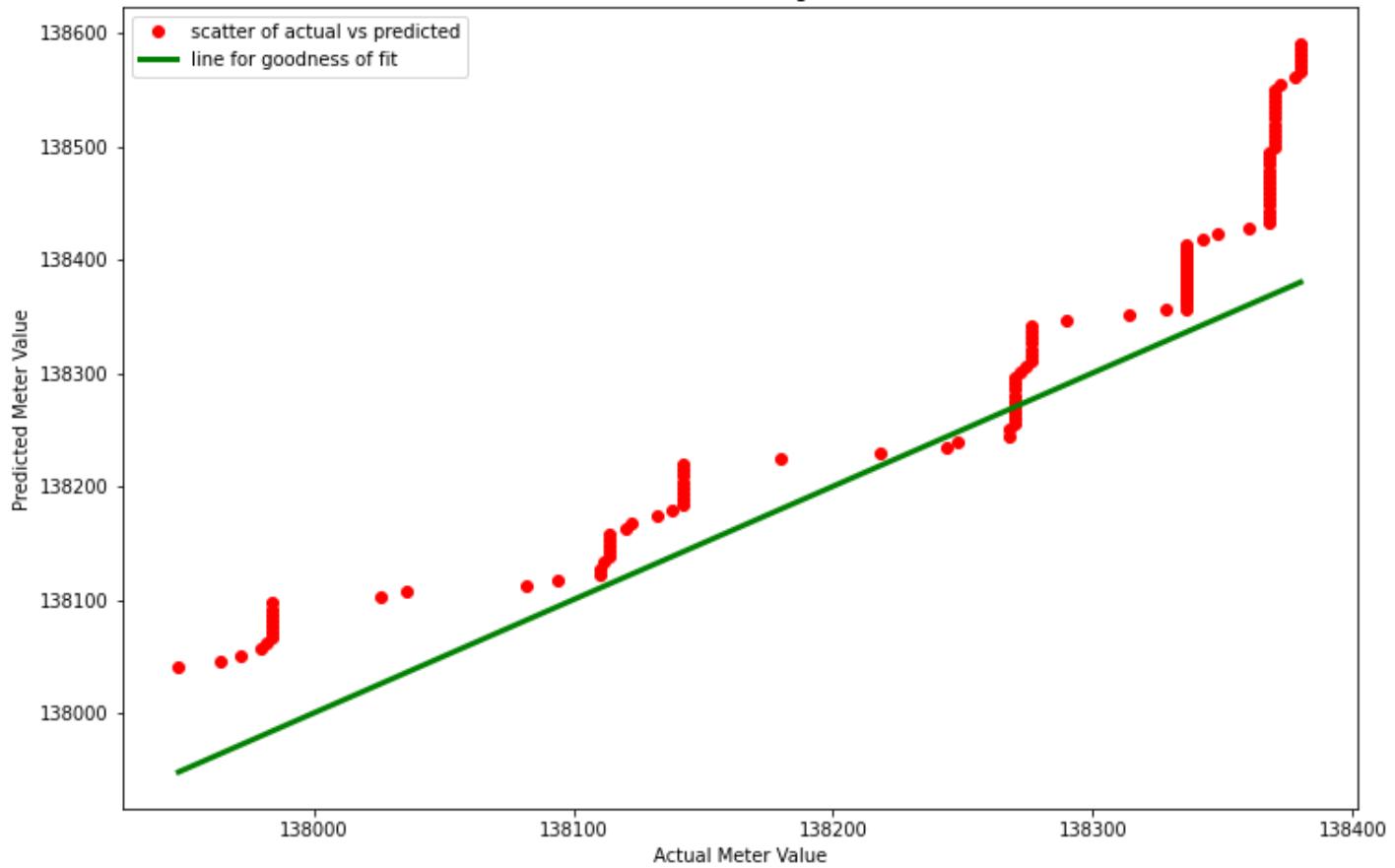
Scatter Plot - Household 1790.0 Testing MSE : 70616.29990283254



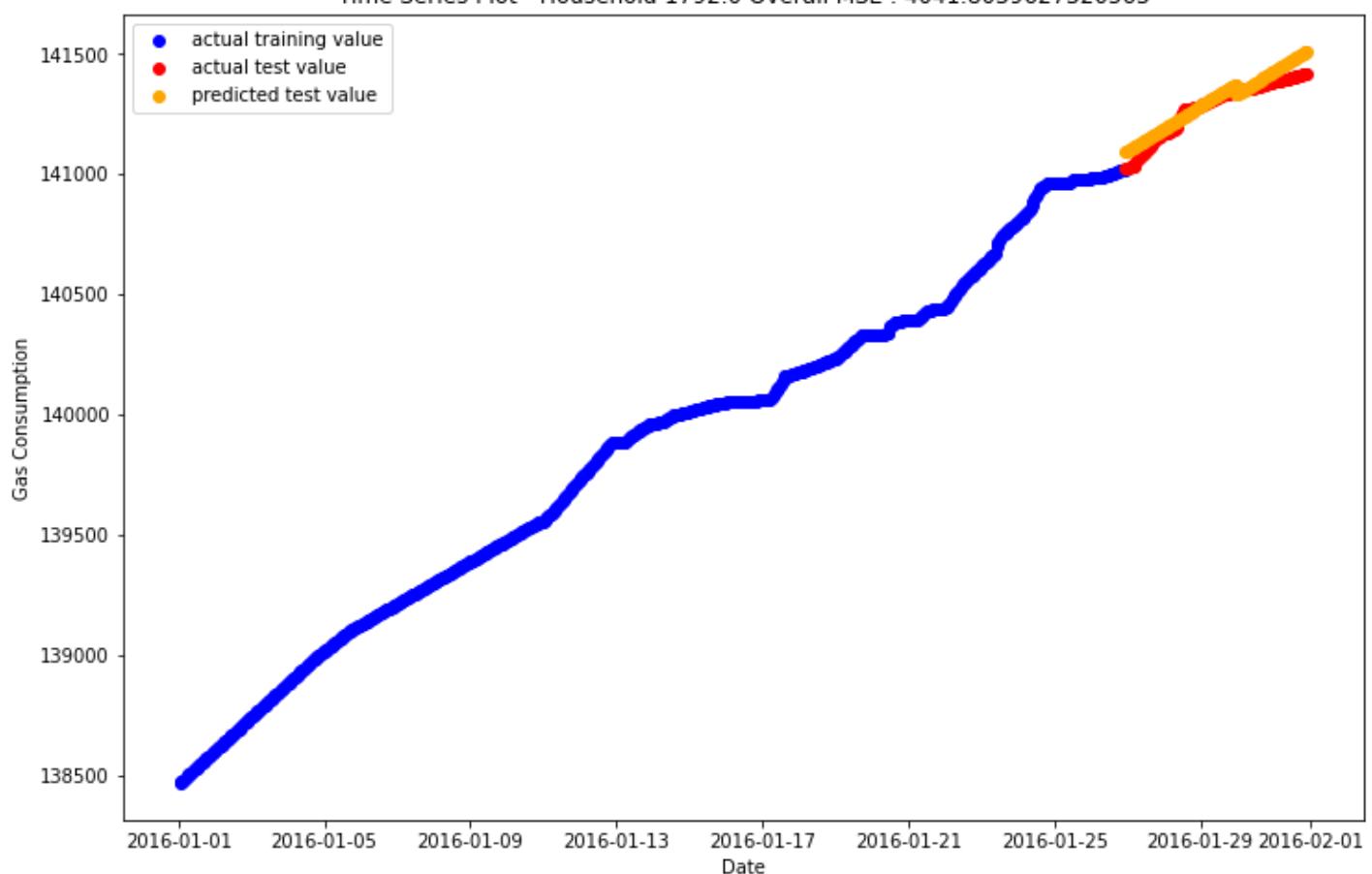
Time Series Plot - Household 1791.0 Overall MSE : 4278.135939815568



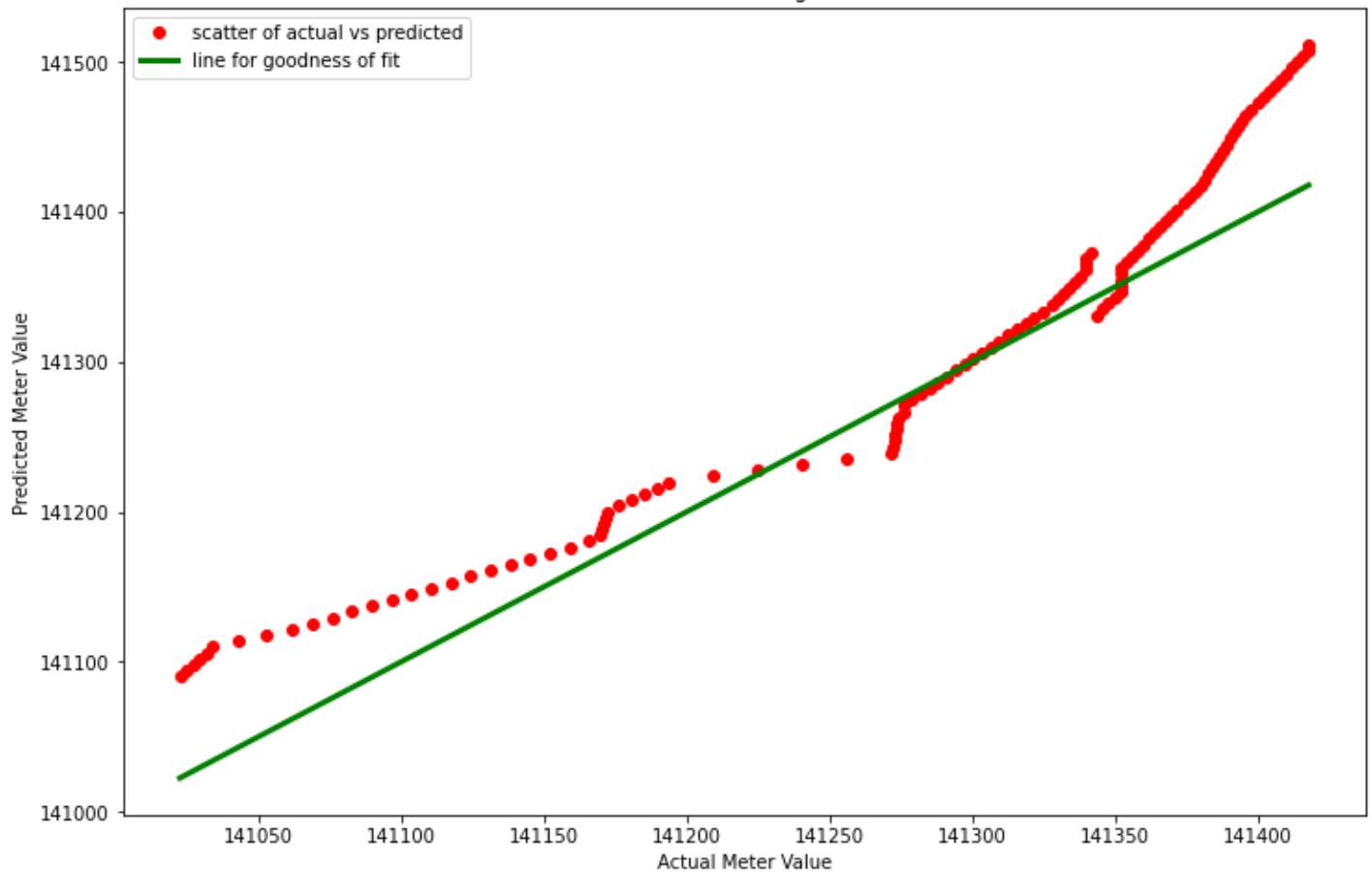
Scatter Plot - Household 1791.0 Testing MSE : 7934.245018370359



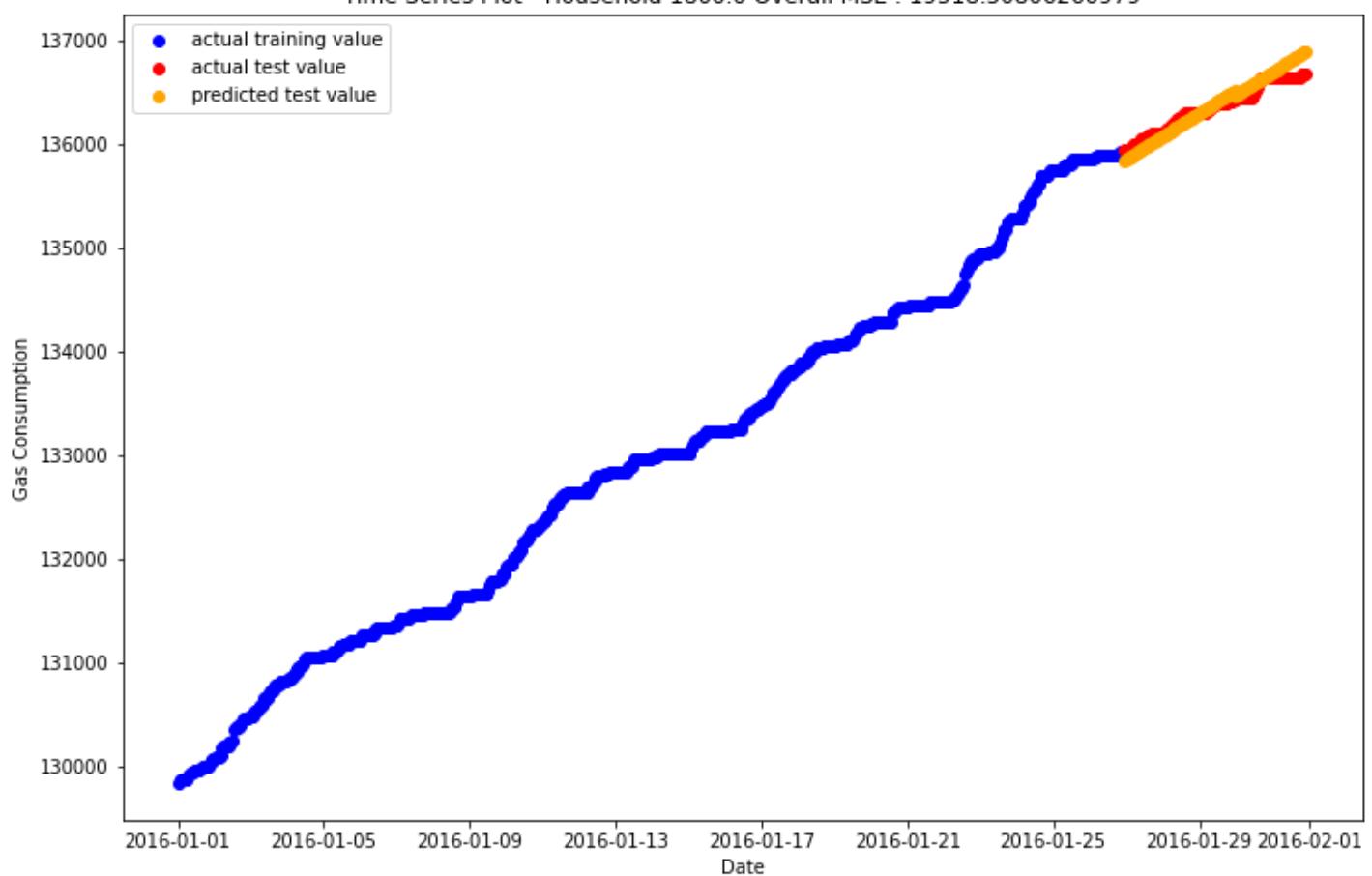
Time Series Plot - Household 1792.0 Overall MSE : 4041.8039627320563



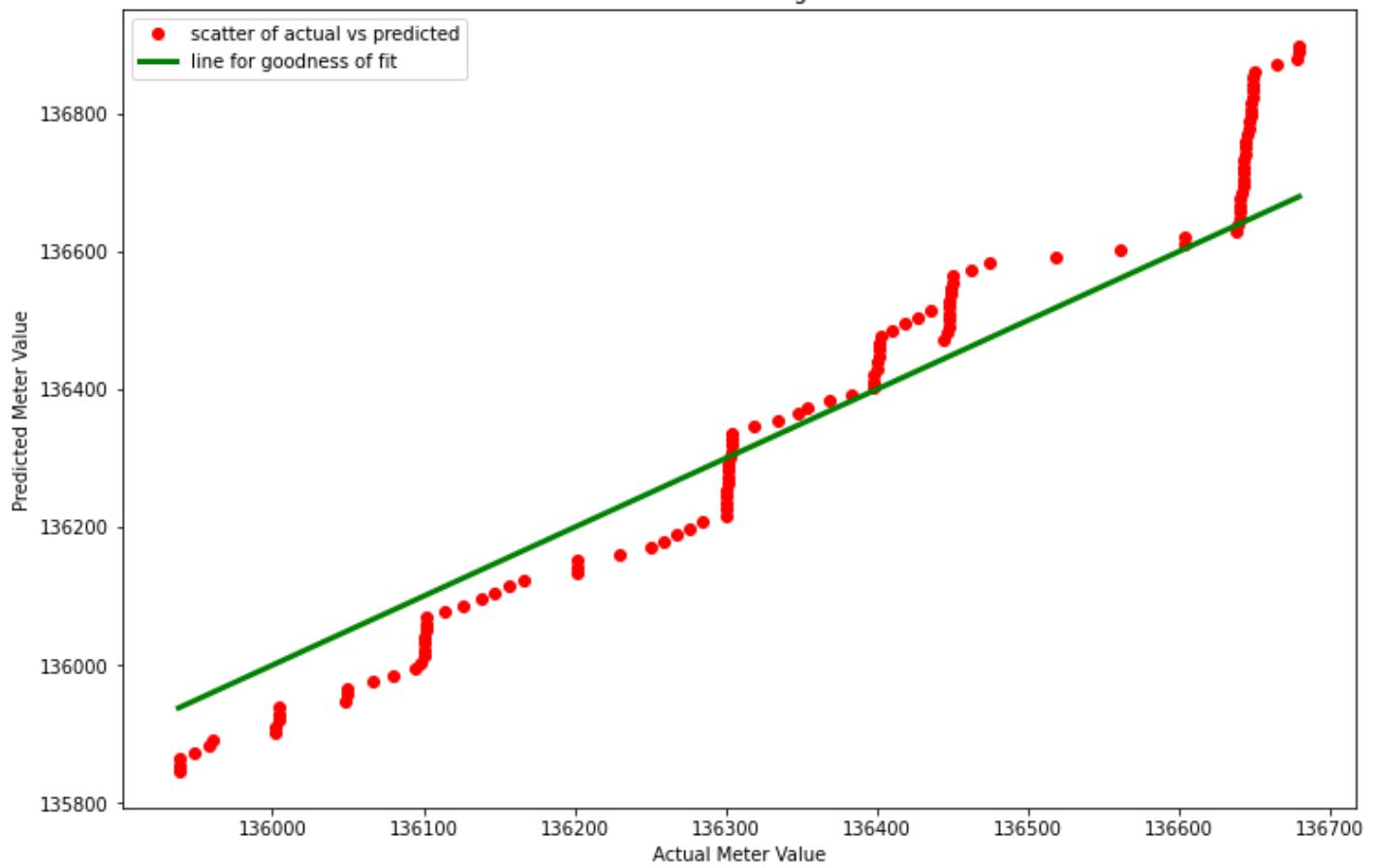
Scatter Plot - Household 1792.0 Testing MSE : 1730.5555447138142



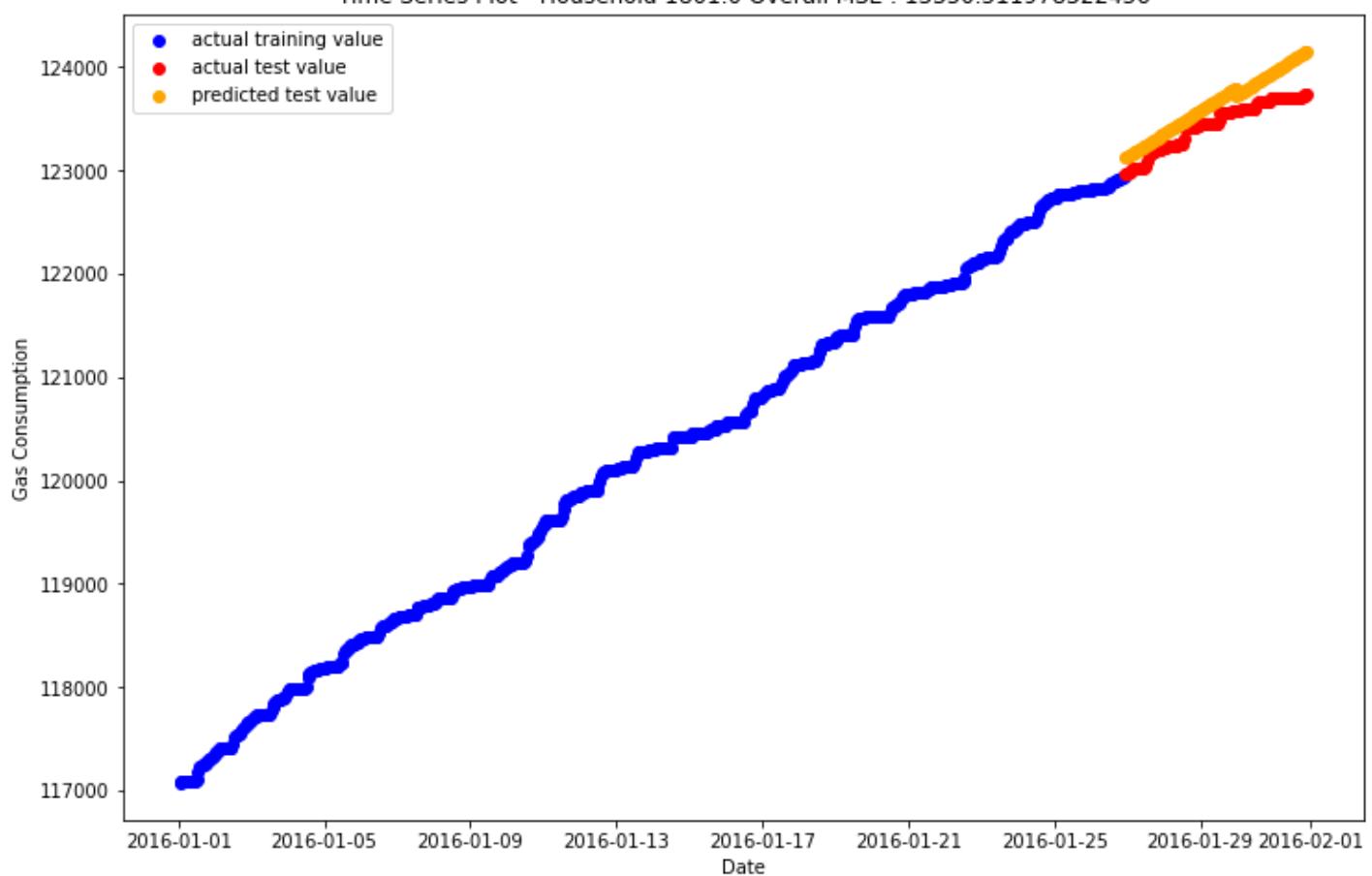
Time Series Plot - Household 1800.0 Overall MSE : 19518.50806260979



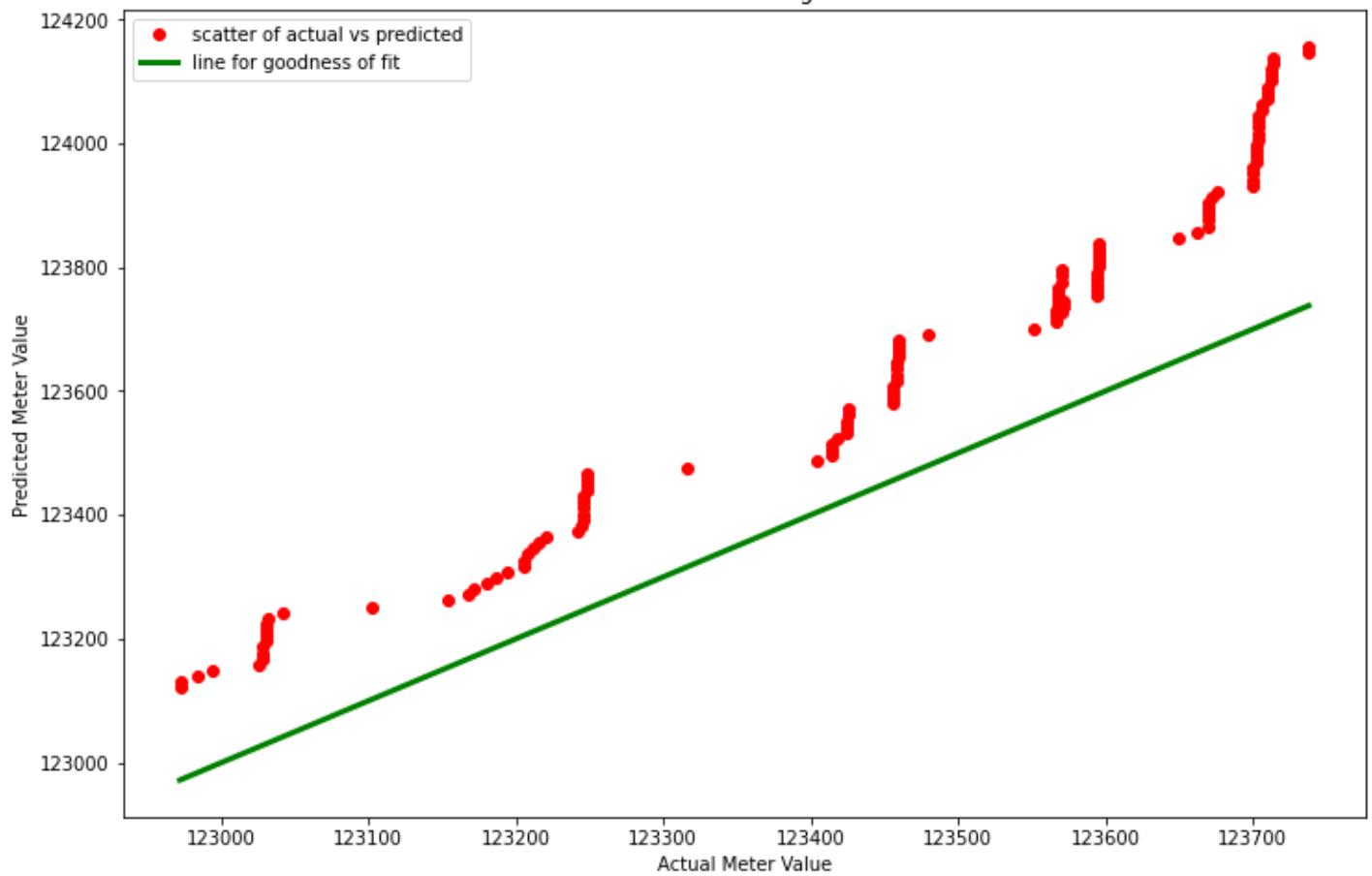
Scatter Plot - Household 1800.0 Testing MSE : 7836.270444647834



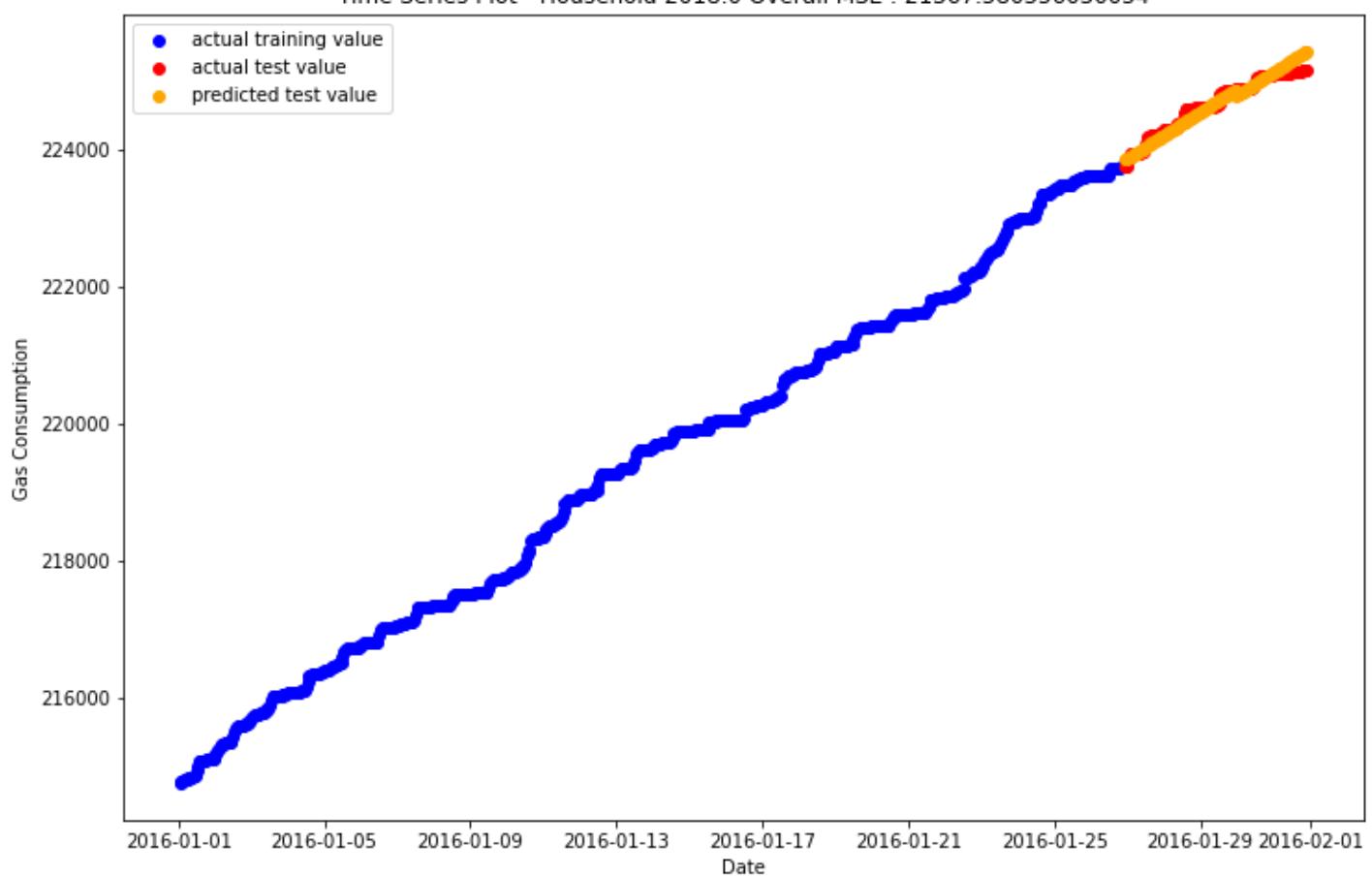
Time Series Plot - Household 1801.0 Overall MSE : 13350.511978322456



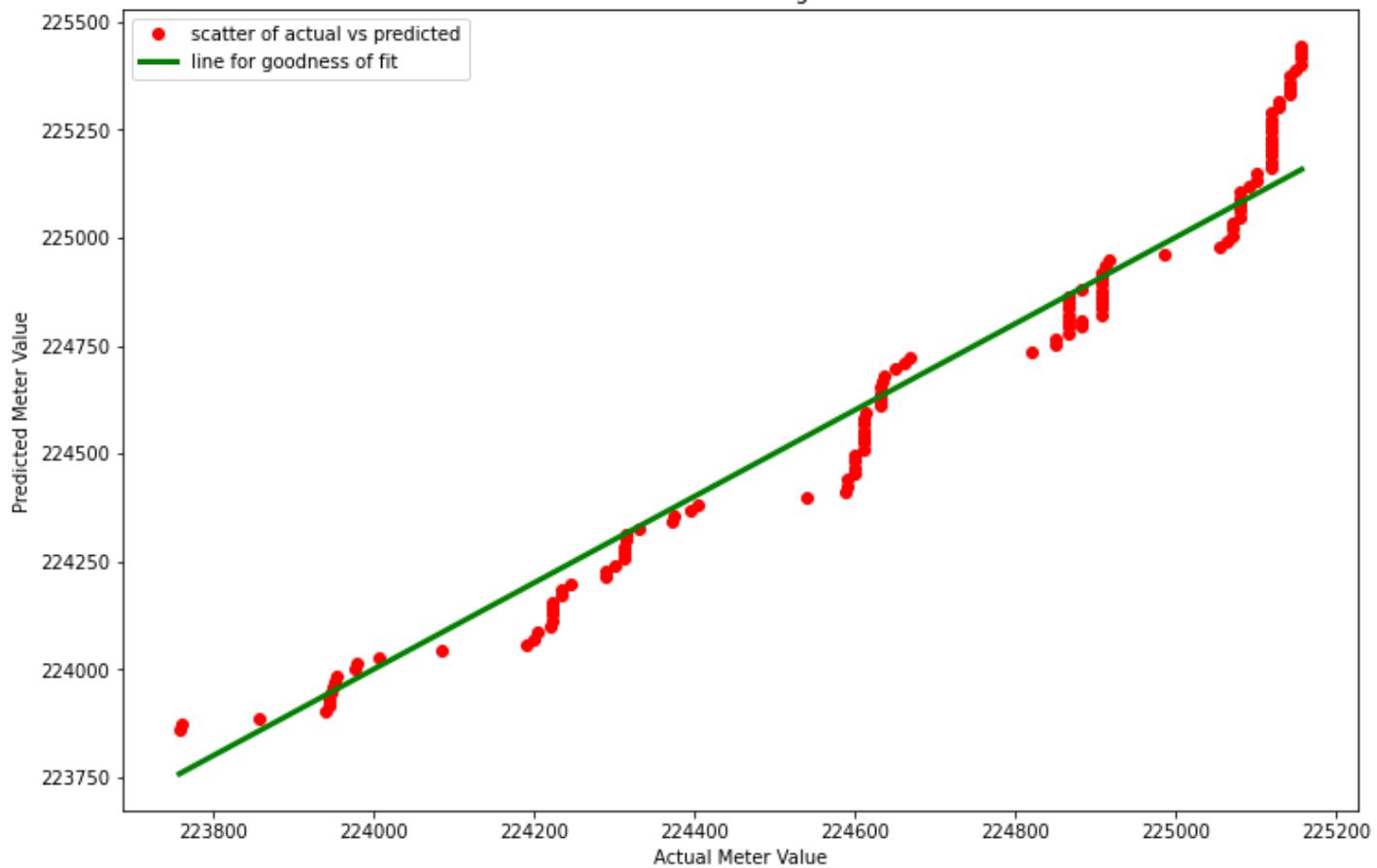
Scatter Plot - Household 1801.0 Testing MSE : 47547.17329871414



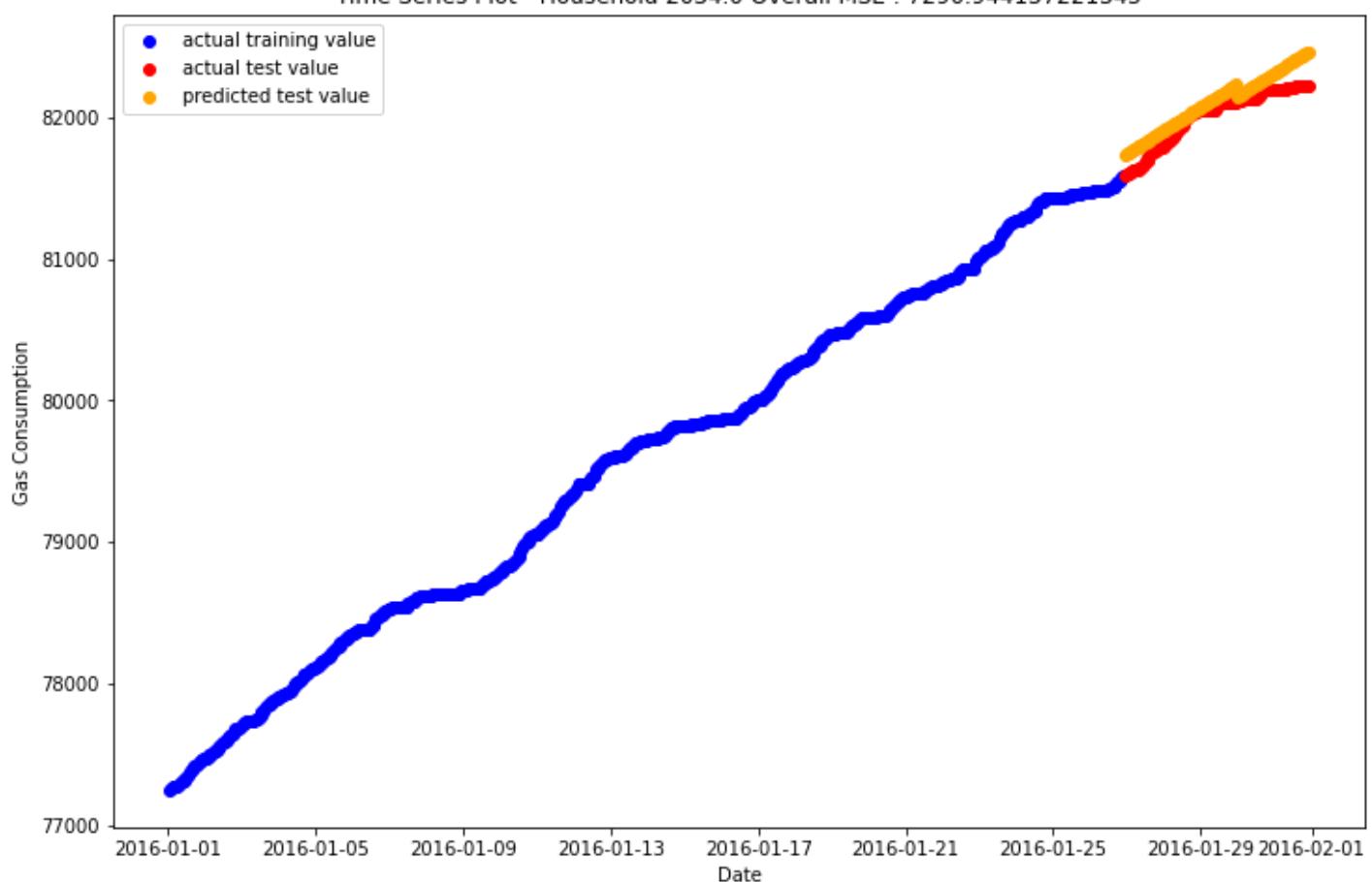
Time Series Plot - Household 2018.0 Overall MSE : 21367.580556030054



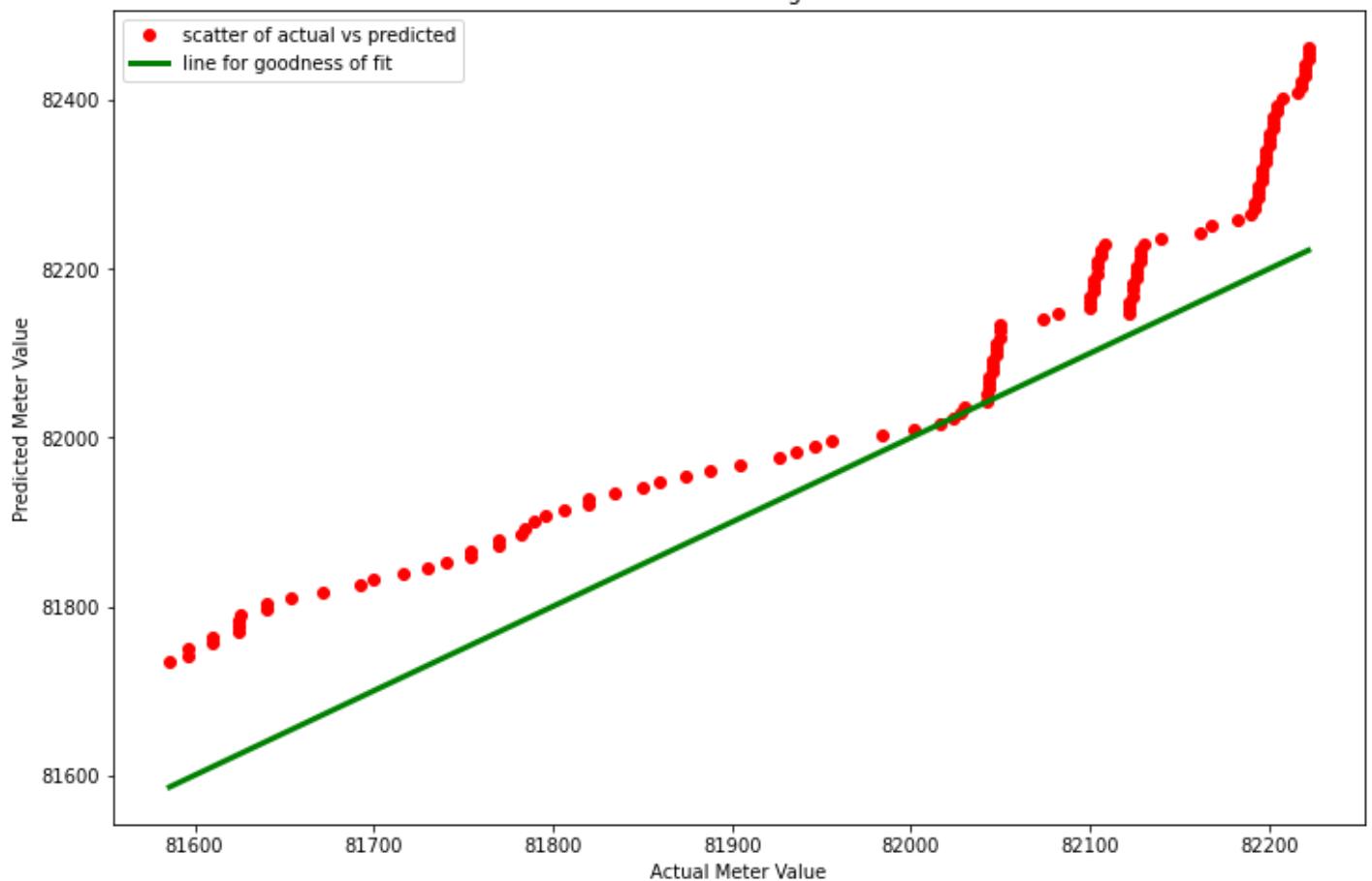
Scatter Plot - Household 2018.0 Testing MSE : 9824.279789529139



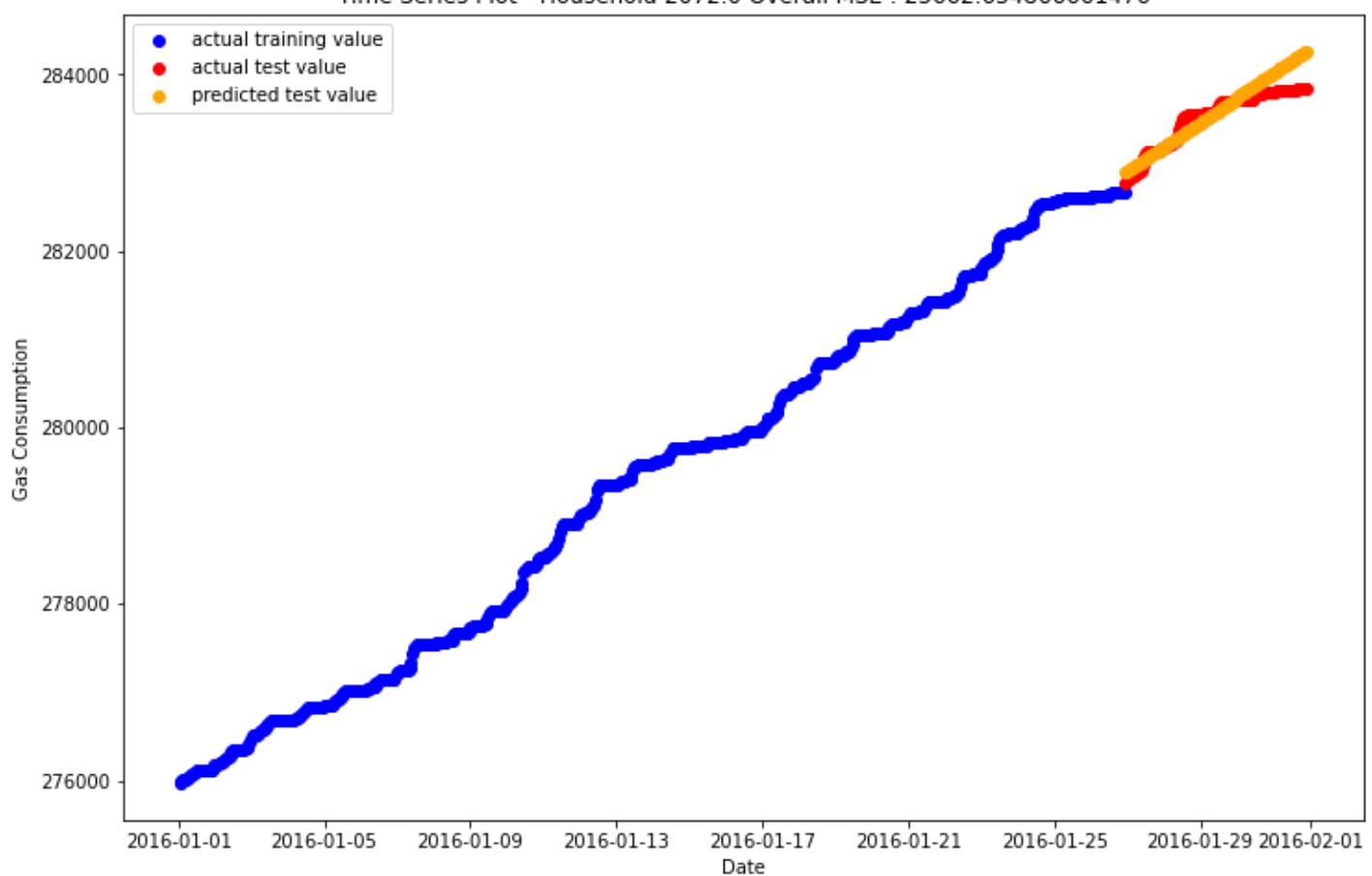
Time Series Plot - Household 2034.0 Overall MSE : 7290.944137221345



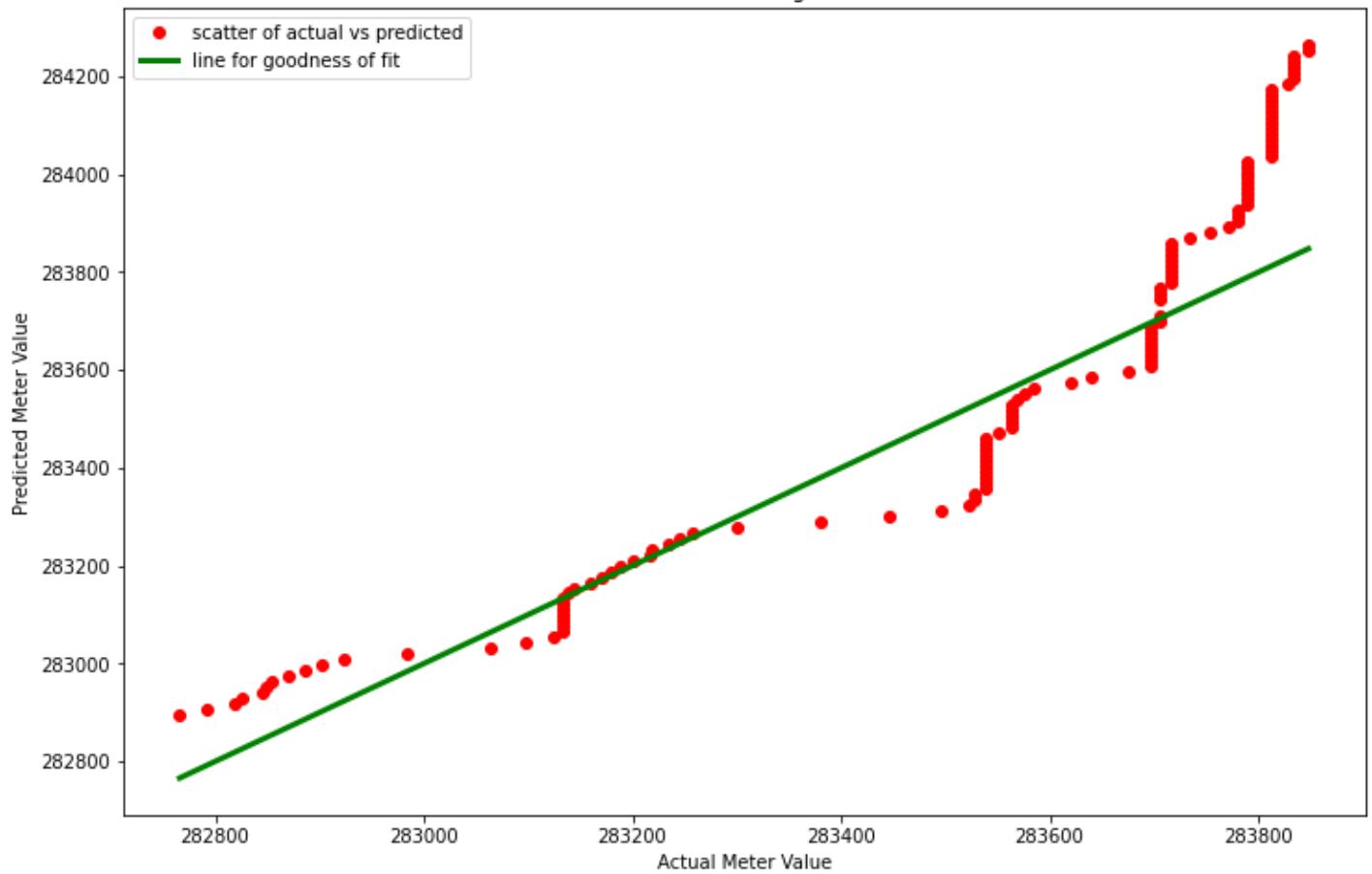
Scatter Plot - Household 2034.0 Testing MSE : 13501.393472718048



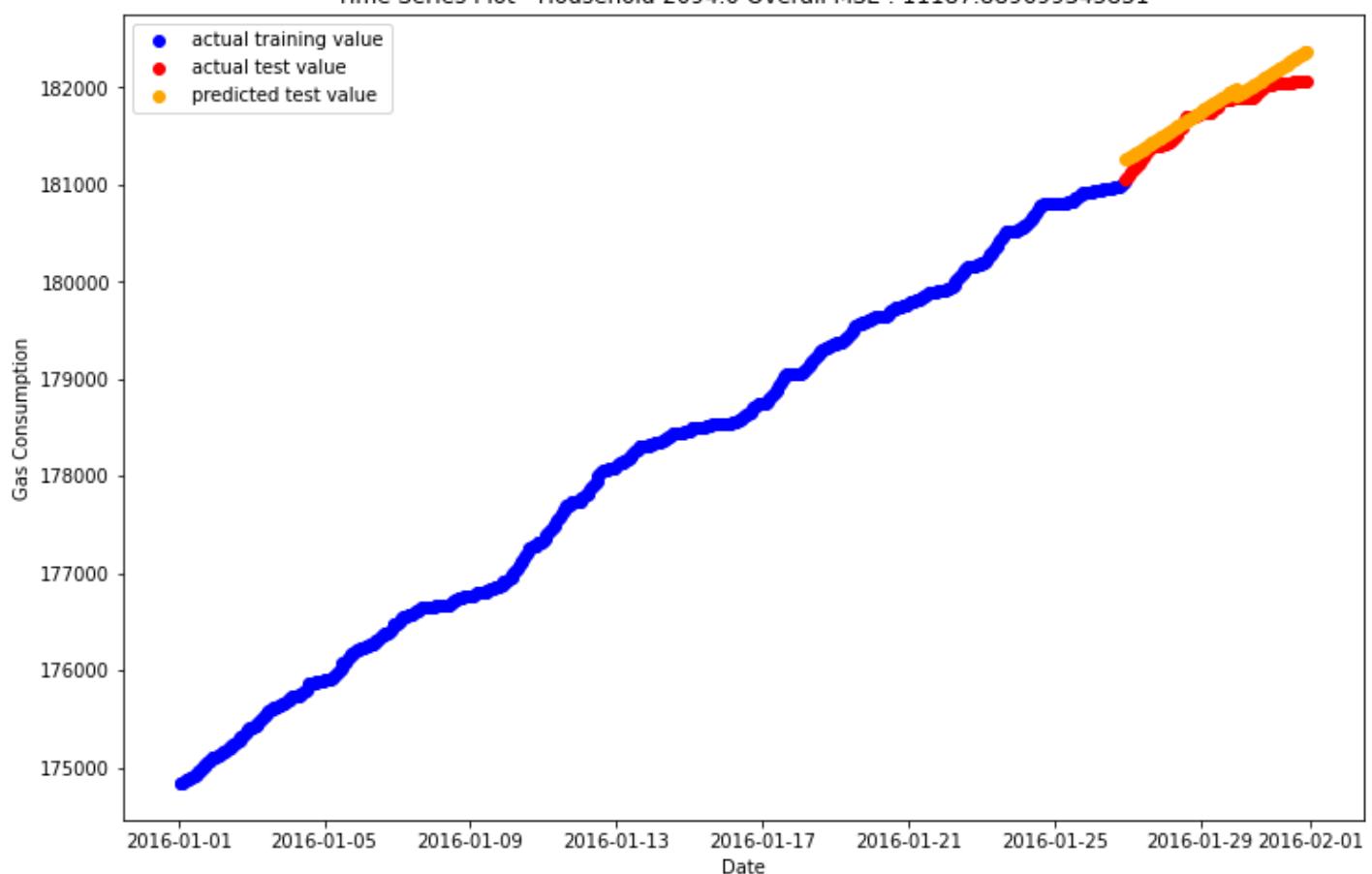
Time Series Plot - Household 2072.0 Overall MSE : 25662.654866661476



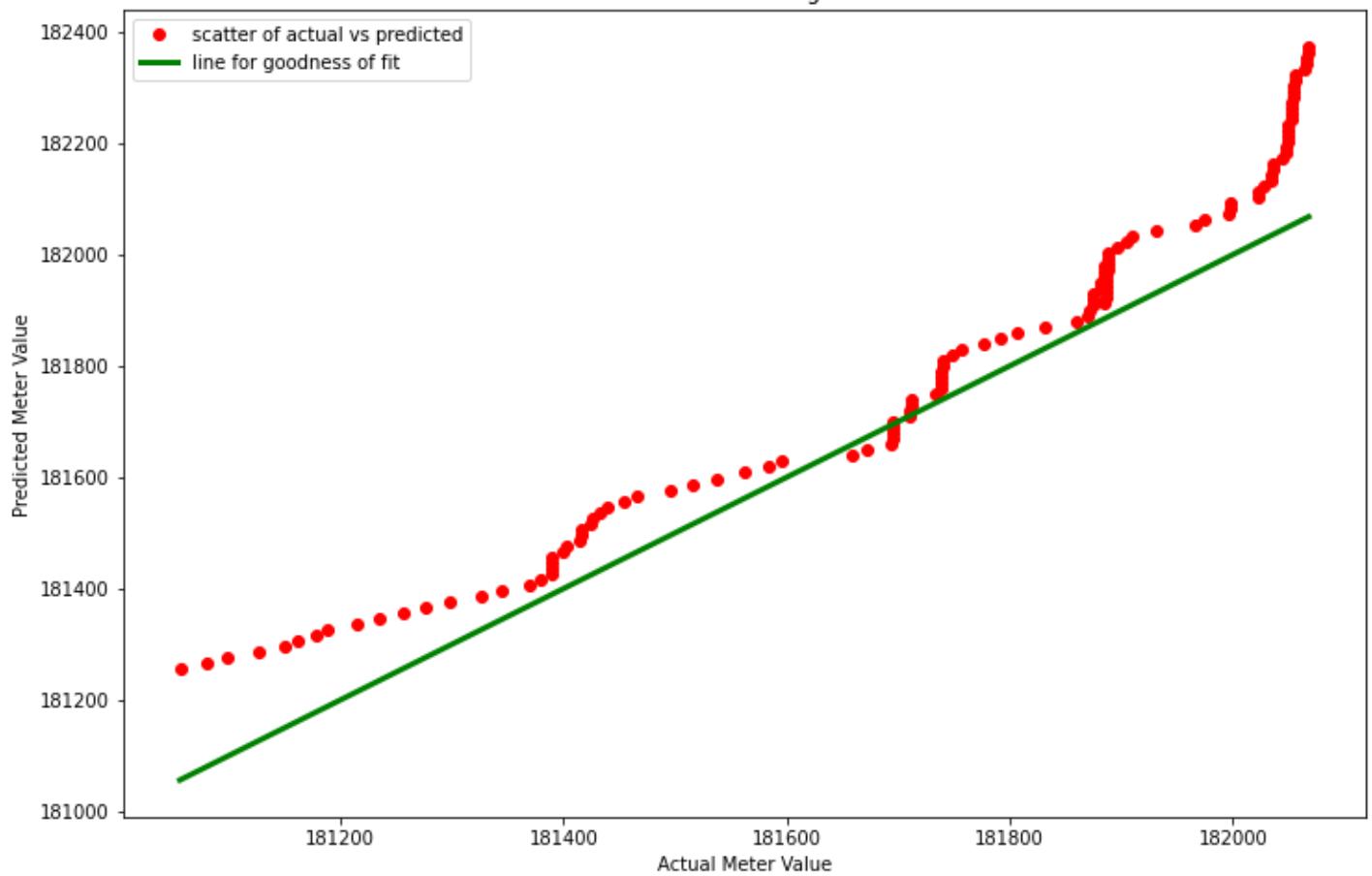
Scatter Plot - Household 2072.0 Testing MSE : 28742.317118751278



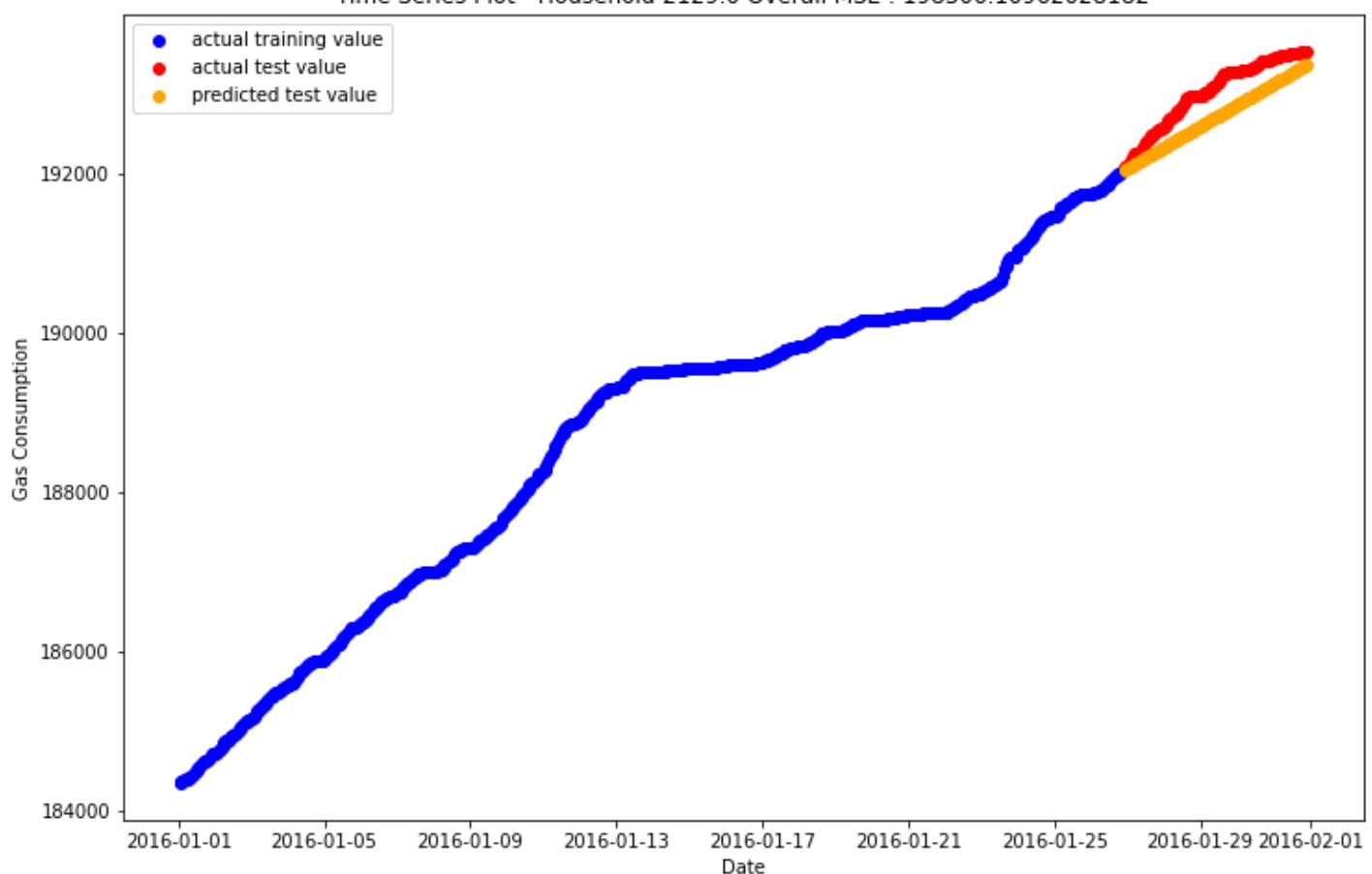
Time Series Plot - Household 2094.0 Overall MSE : 11187.889699345831



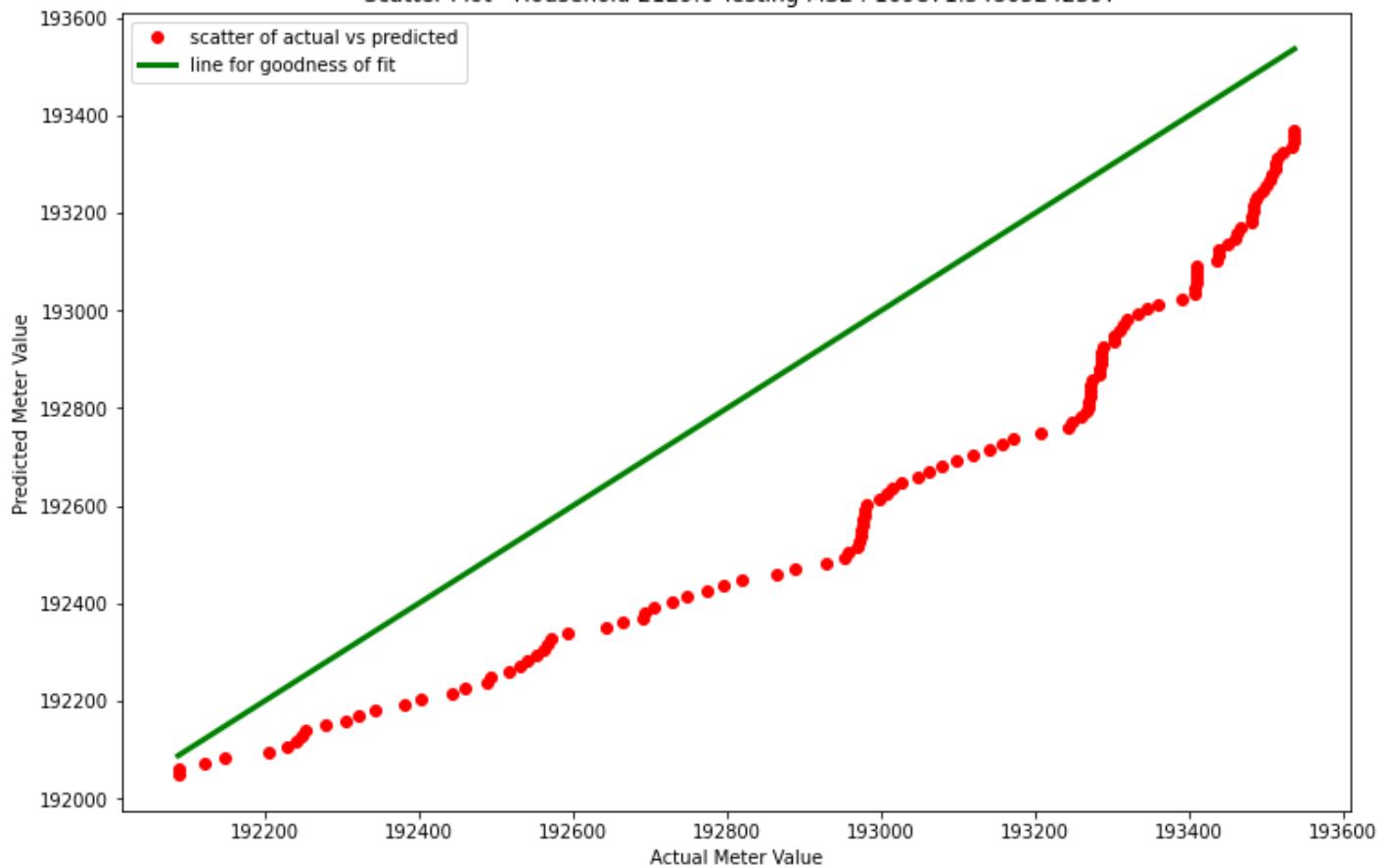
Scatter Plot - Household 2094.0 Testing MSE : 14752.5658074341



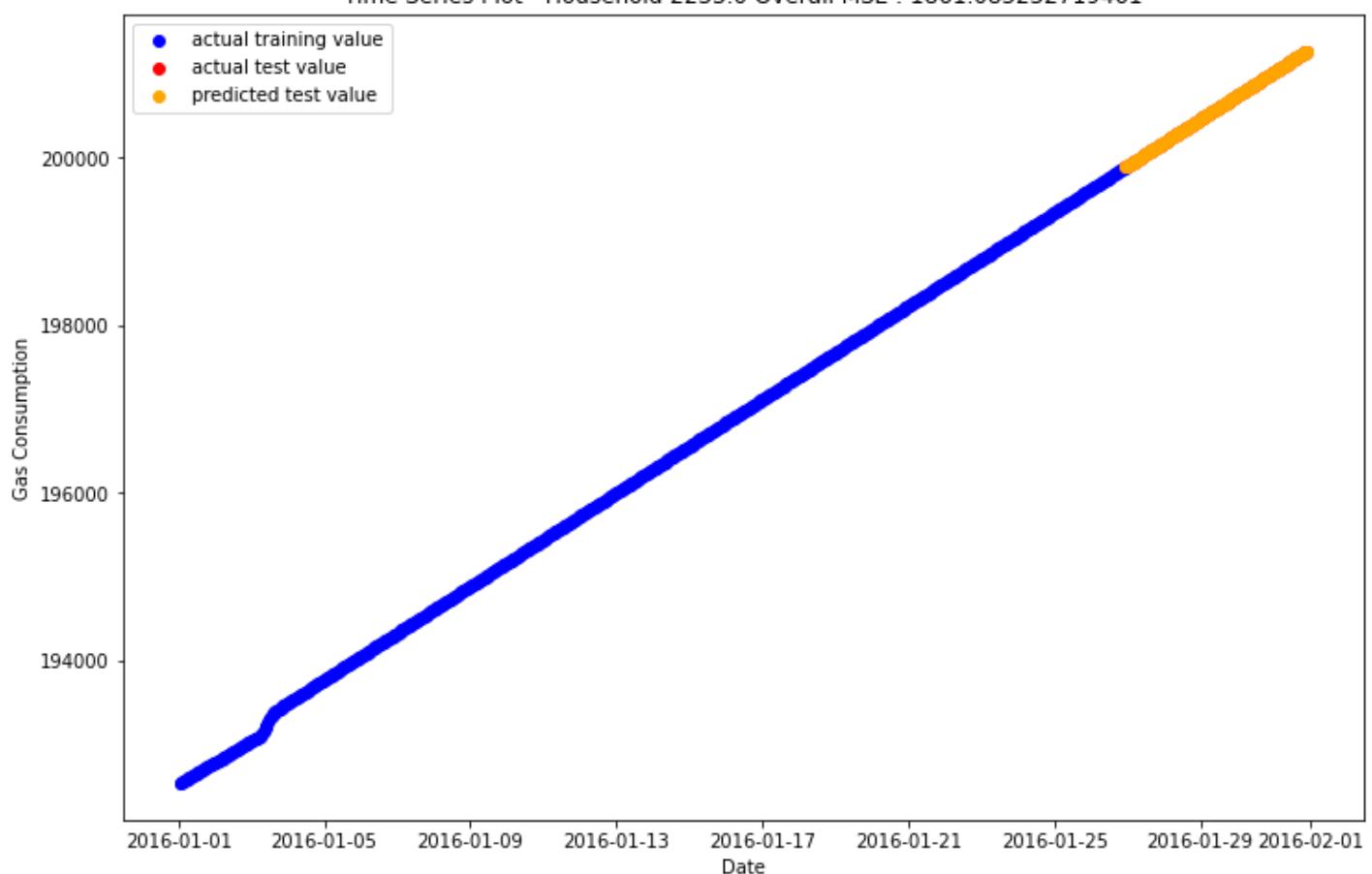
Time Series Plot - Household 2129.0 Overall MSE : 198306.10962028182



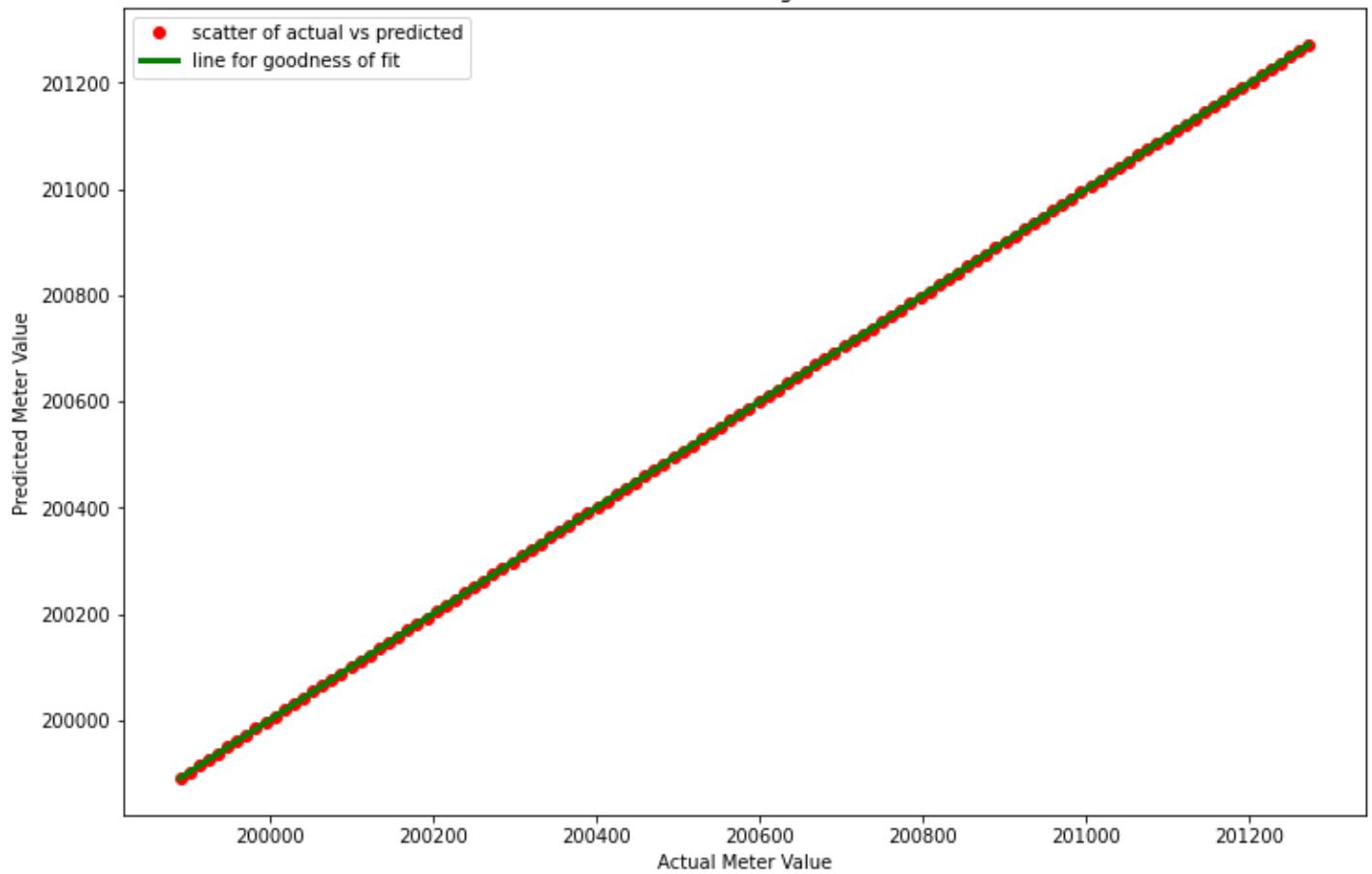
Scatter Plot - Household 2129.0 Testing MSE : 109871.54805242397



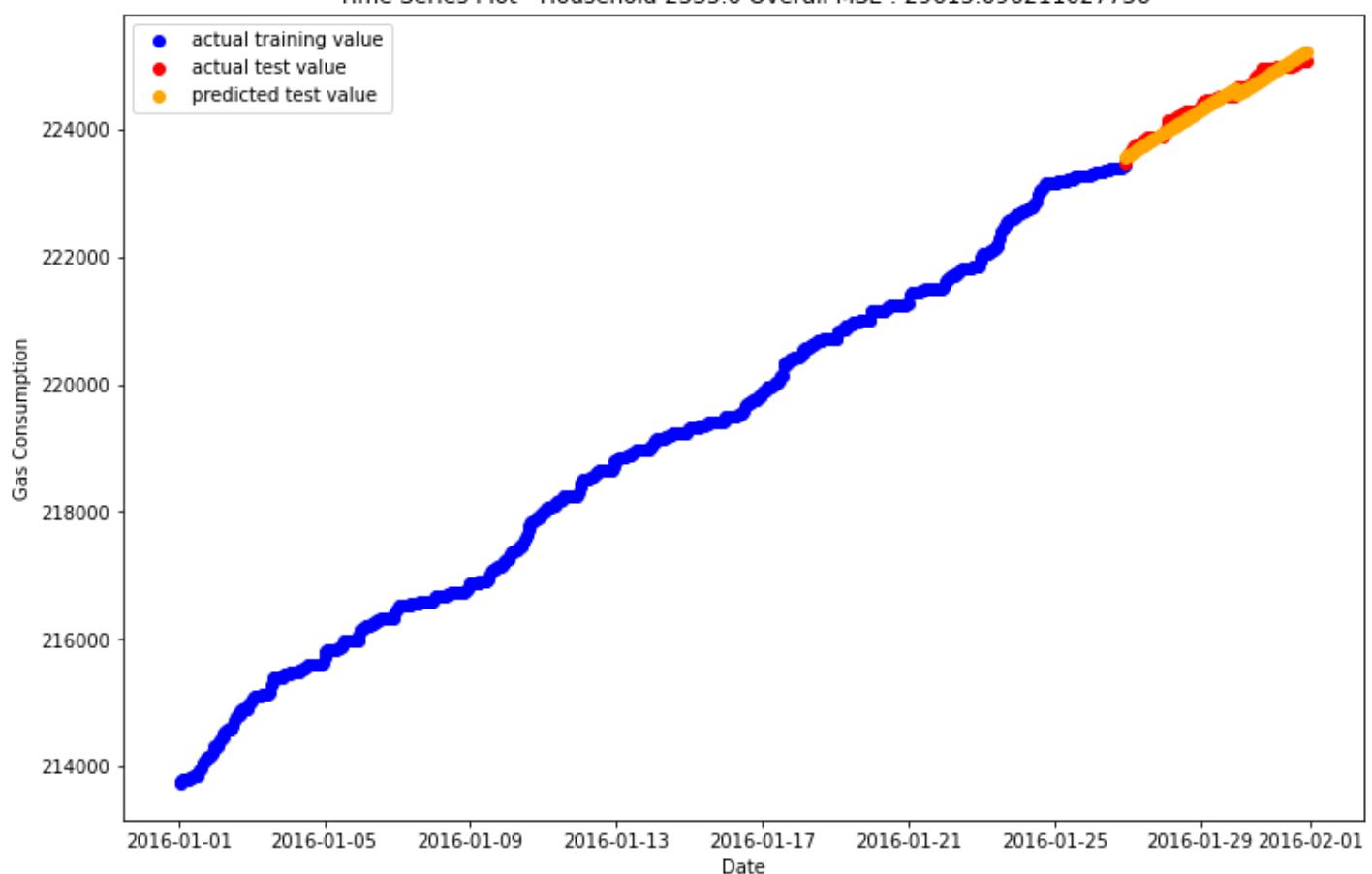
Time Series Plot - Household 2233.0 Overall MSE : 1861.085232719461



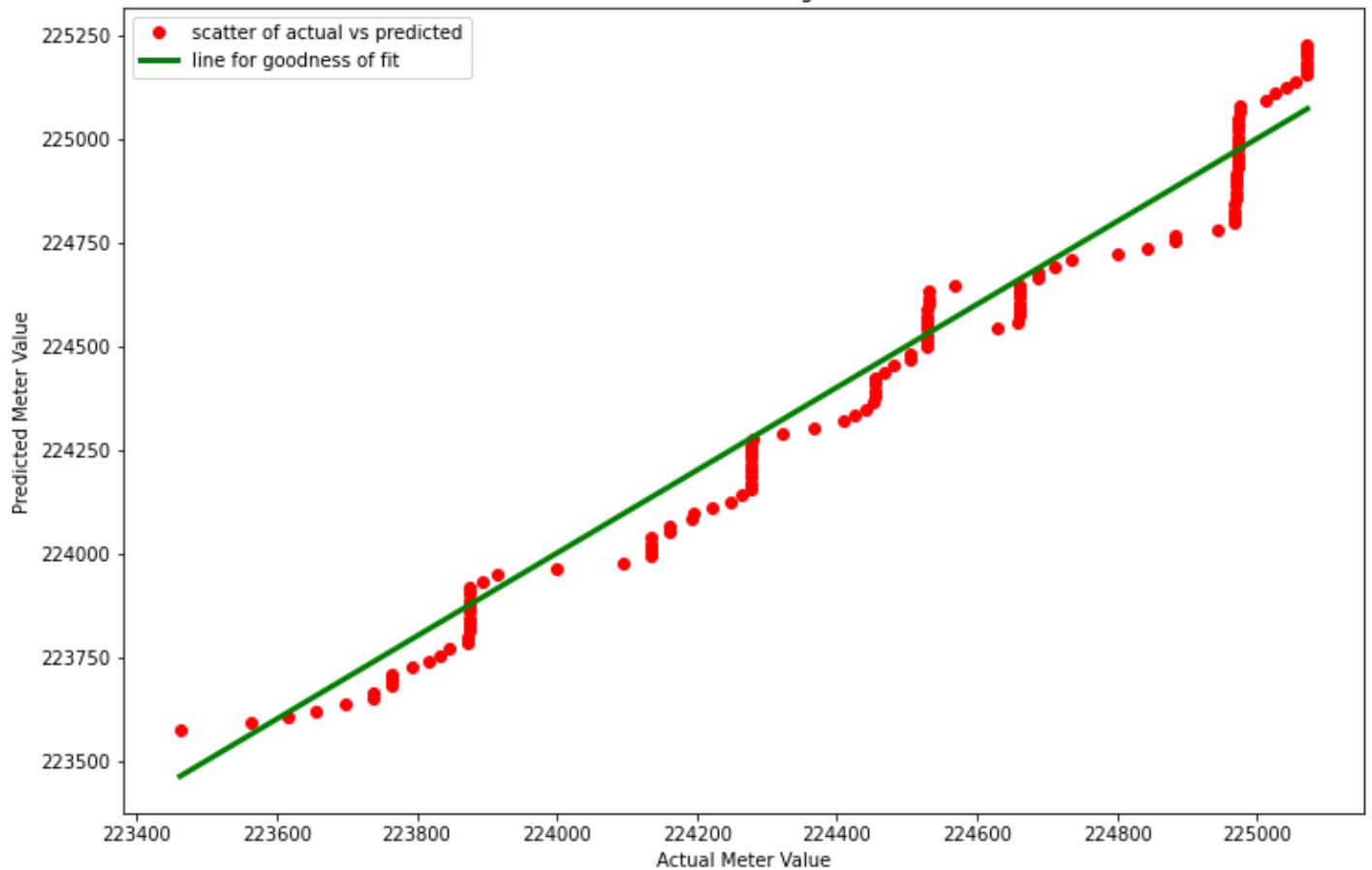
Scatter Plot - Household 2233.0 Testing MSE : 0.012686765191067555



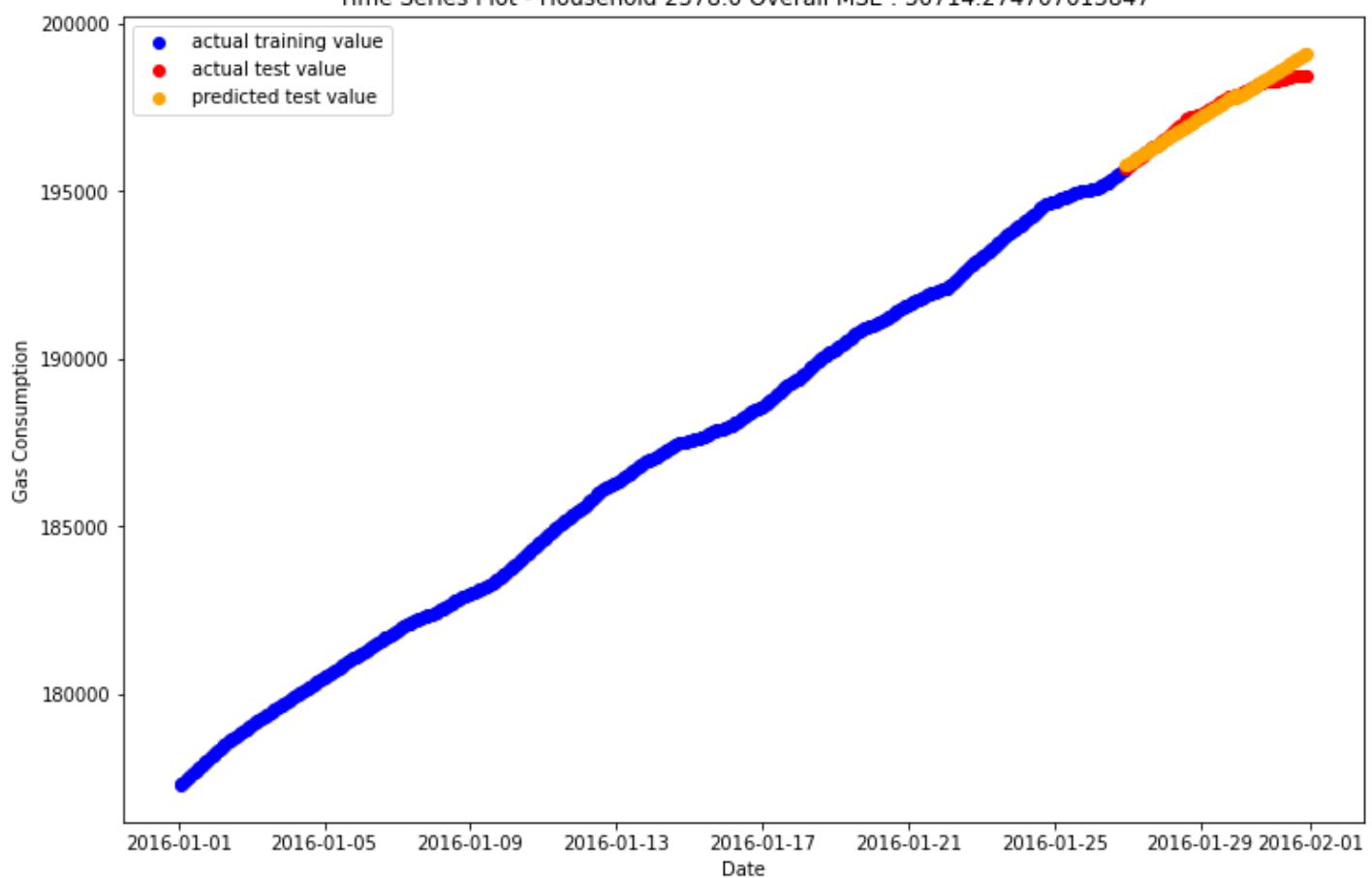
Time Series Plot - Household 2335.0 Overall MSE : 29615.096211027736



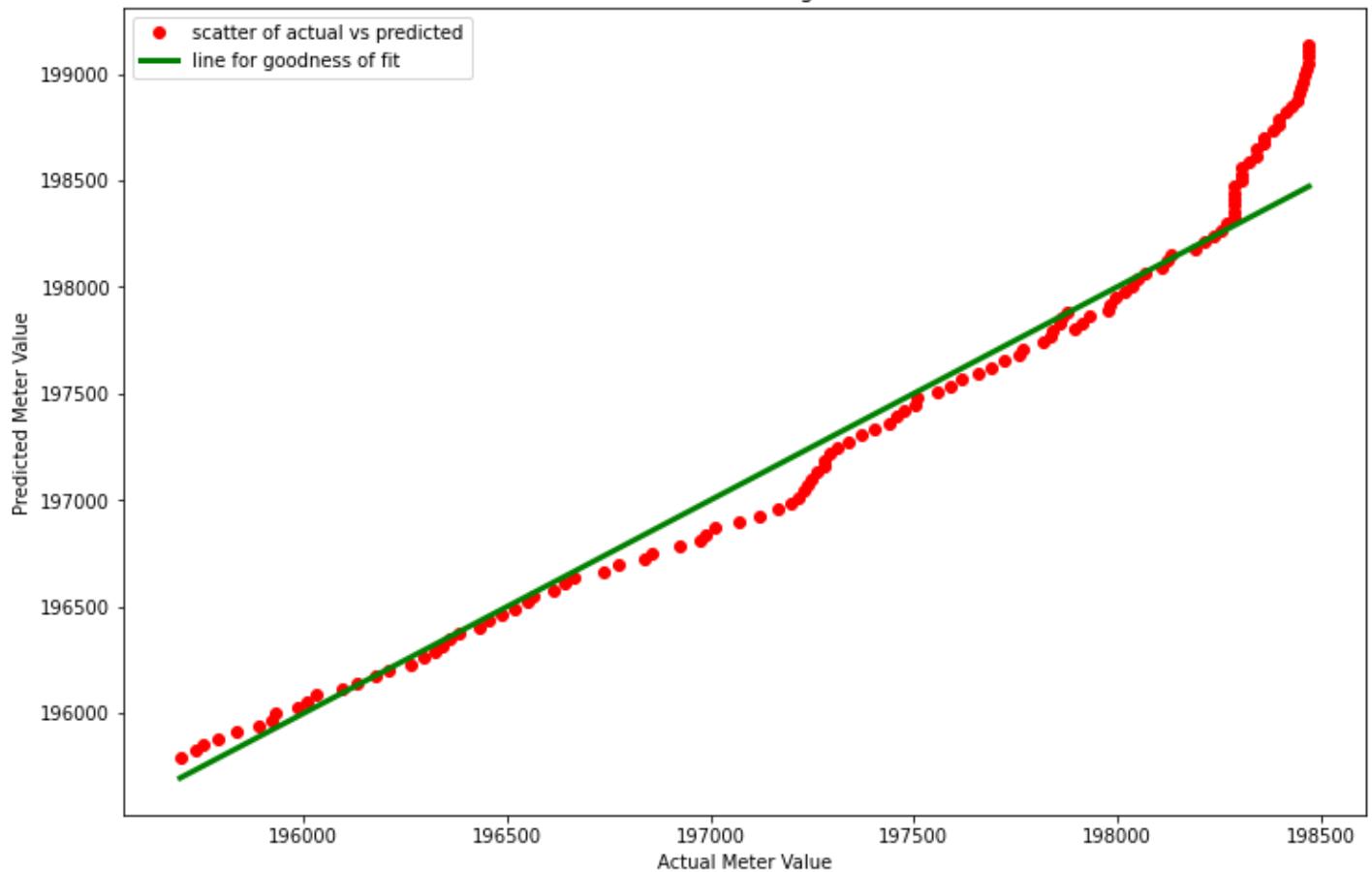
Scatter Plot - Household 2335.0 Testing MSE : 6553.669819140624



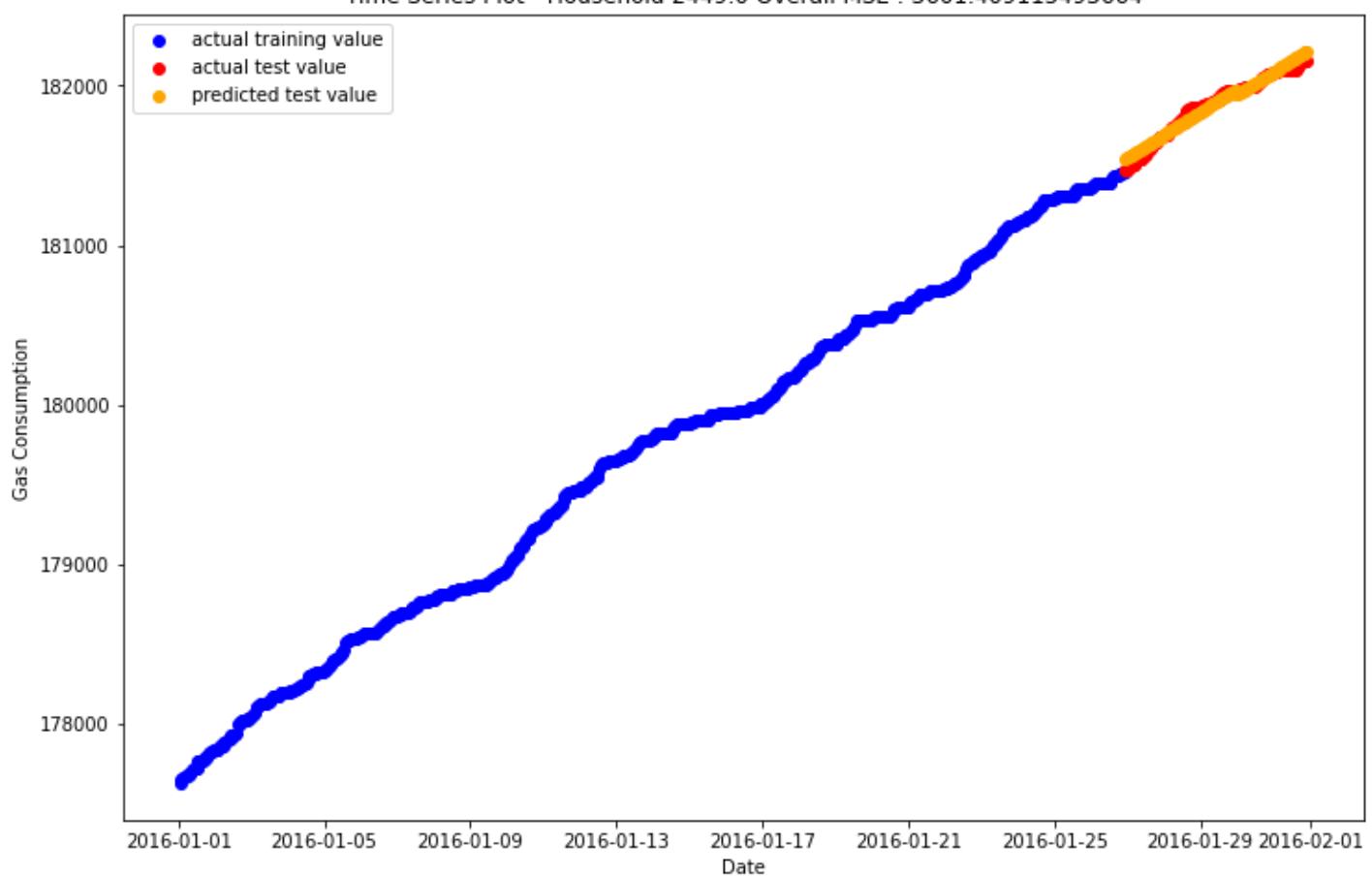
Time Series Plot - Household 2378.0 Overall MSE : 30714.274707013847



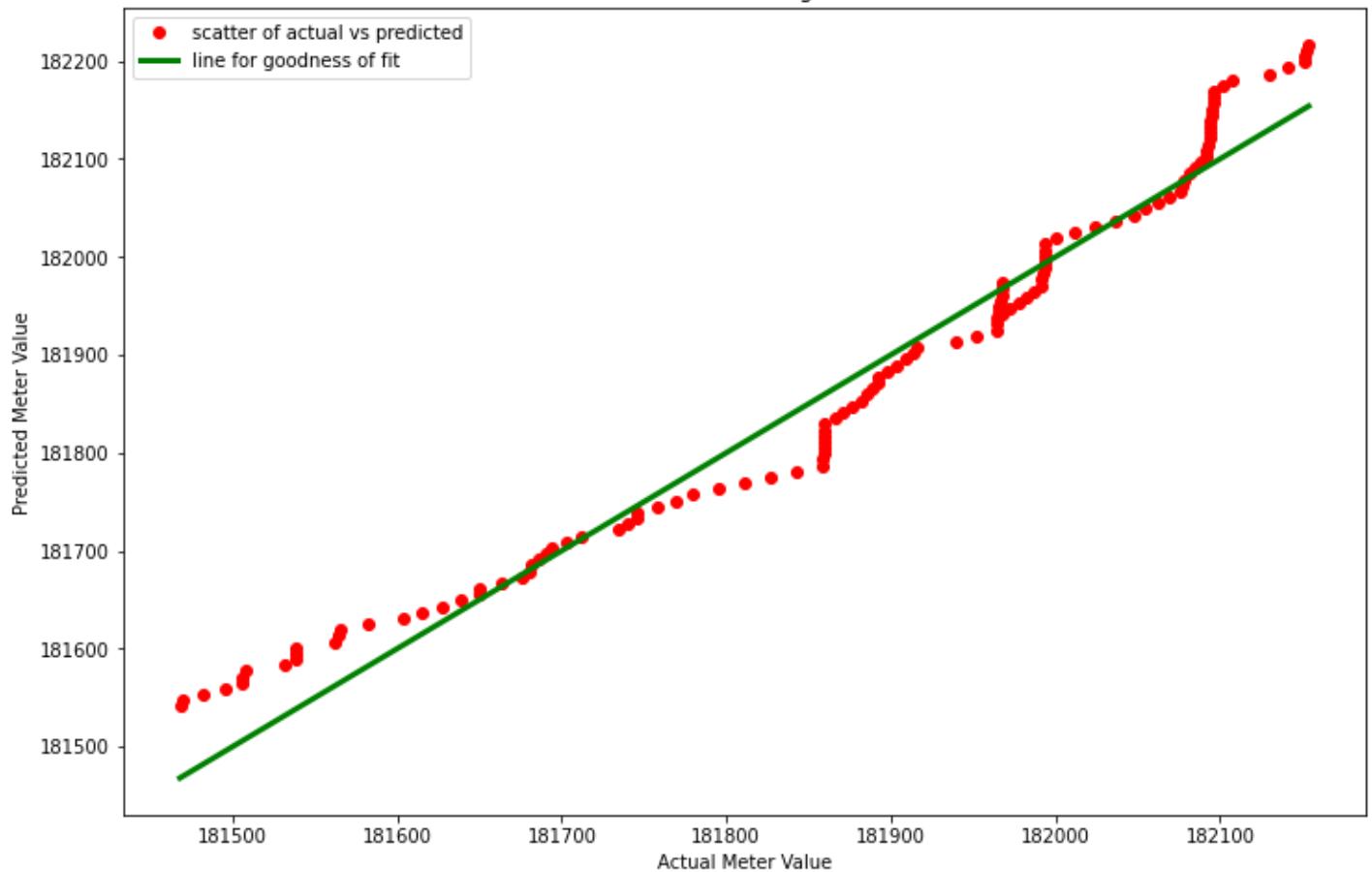
Scatter Plot - Household 2378.0 Testing MSE : 42640.51787323202



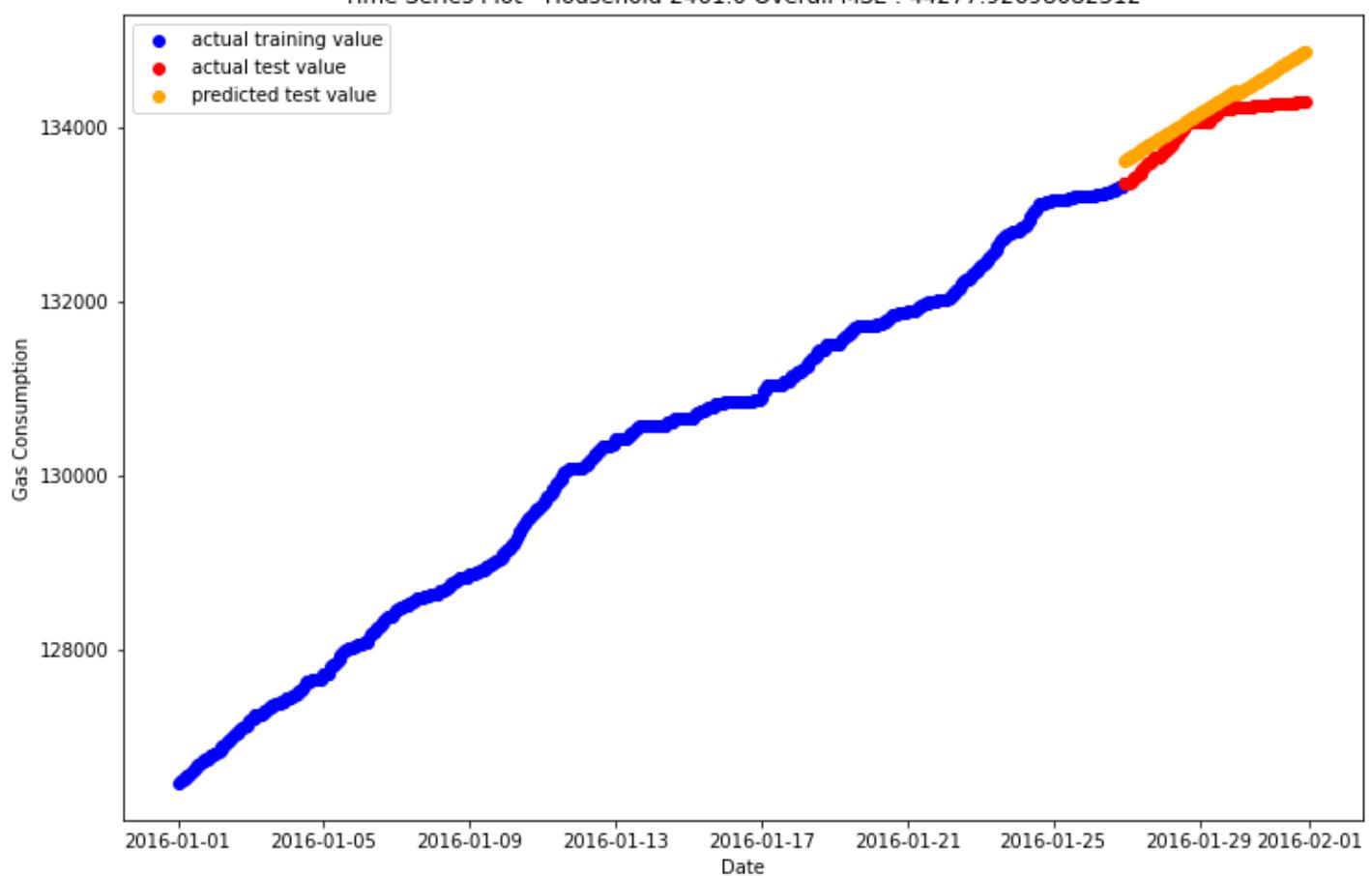
Time Series Plot - Household 2449.0 Overall MSE : 3601.409115493664



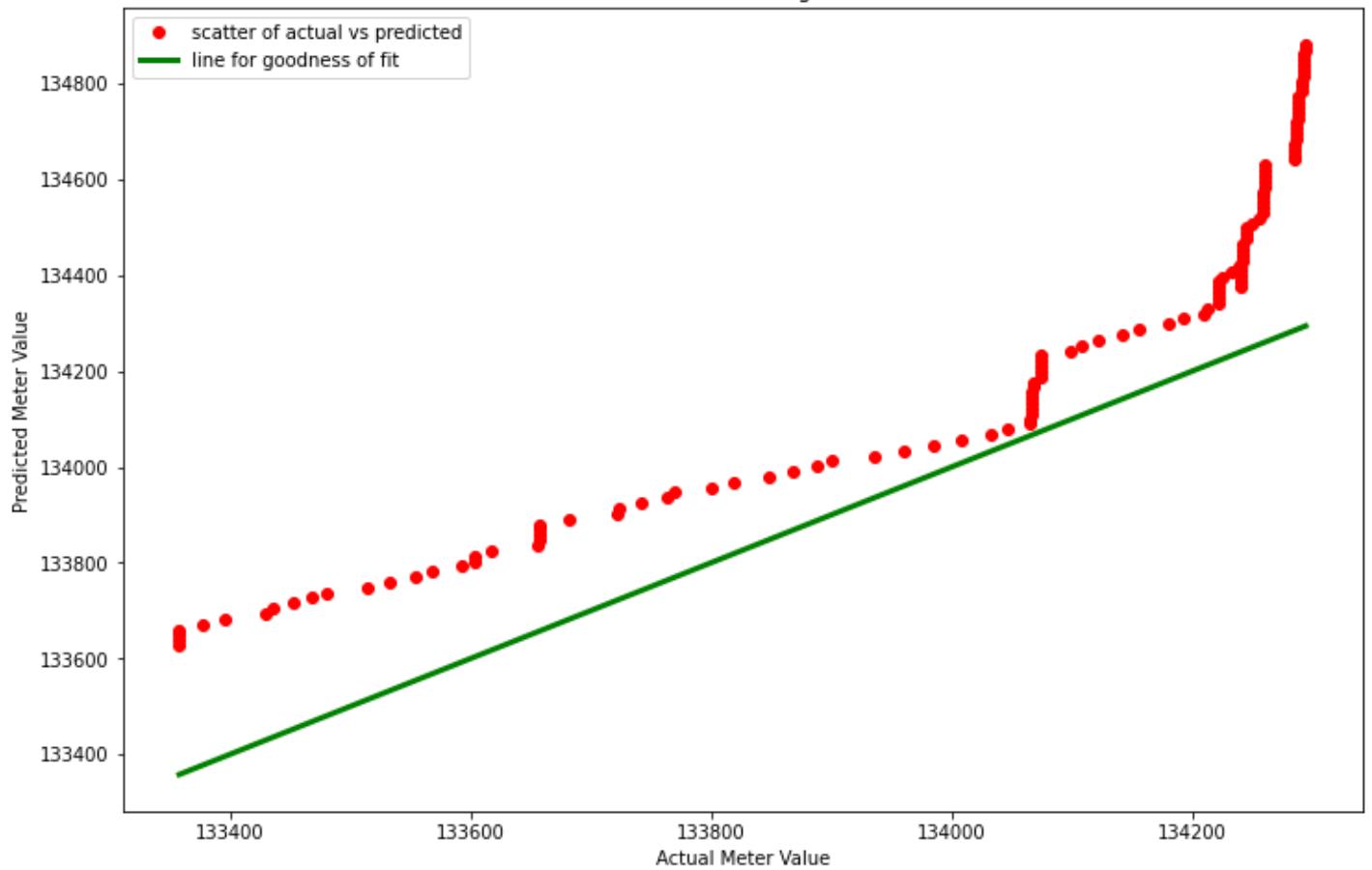
Scatter Plot - Household 2449.0 Testing MSE : 1347.113950703377



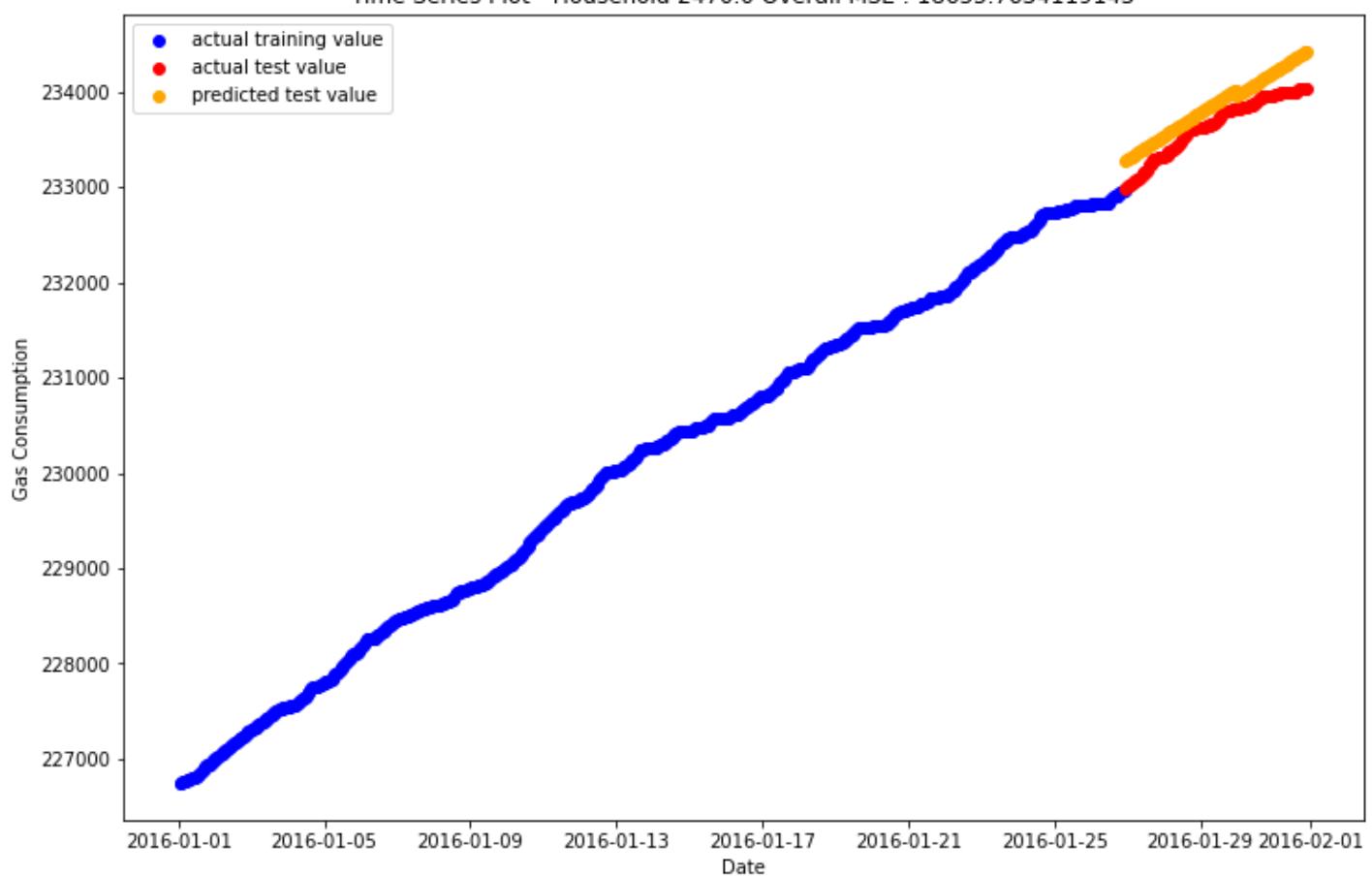
Time Series Plot - Household 2461.0 Overall MSE : 44277.92698082512



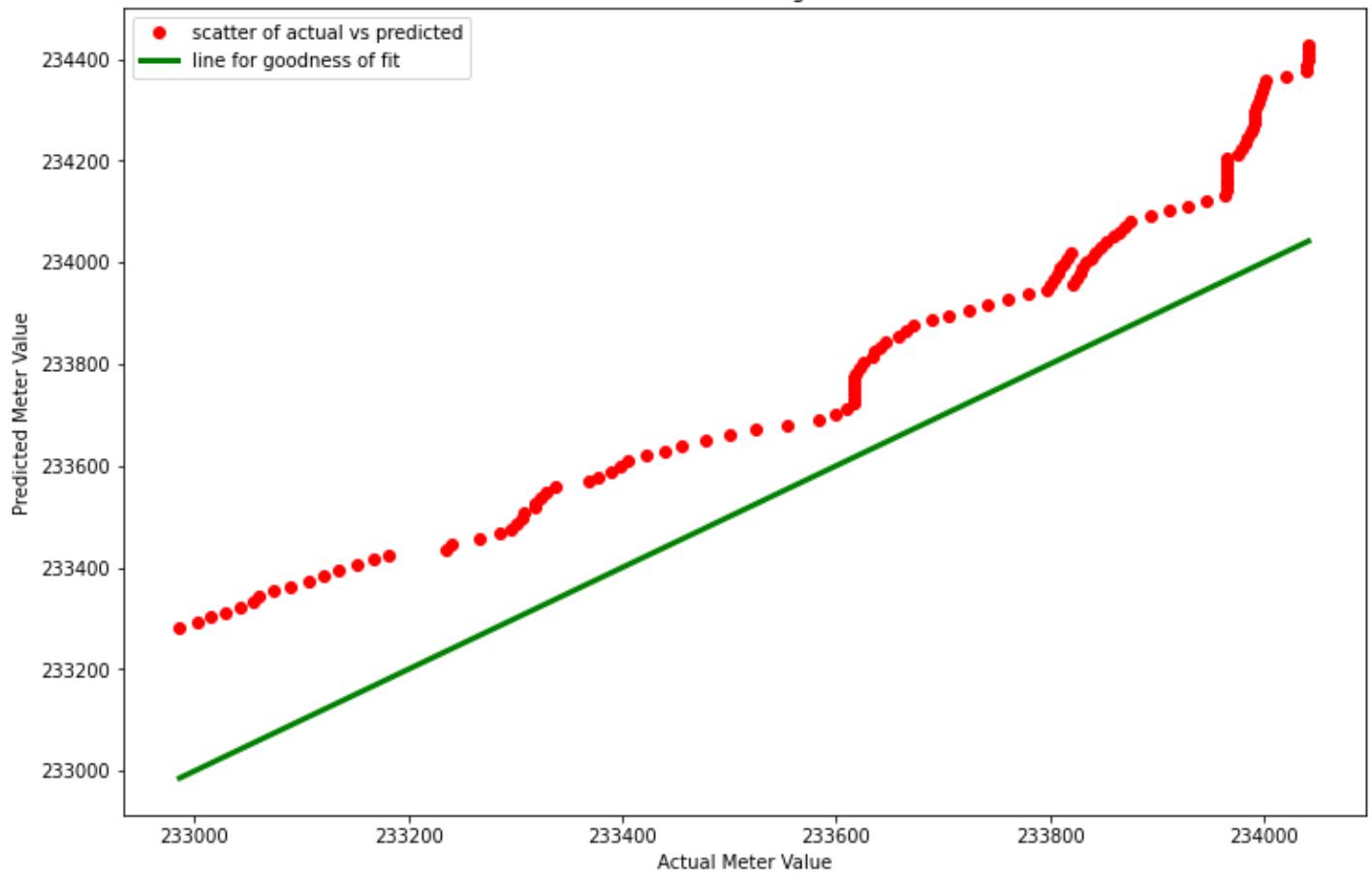
Scatter Plot - Household 2461.0 Testing MSE : 76072.49378579138



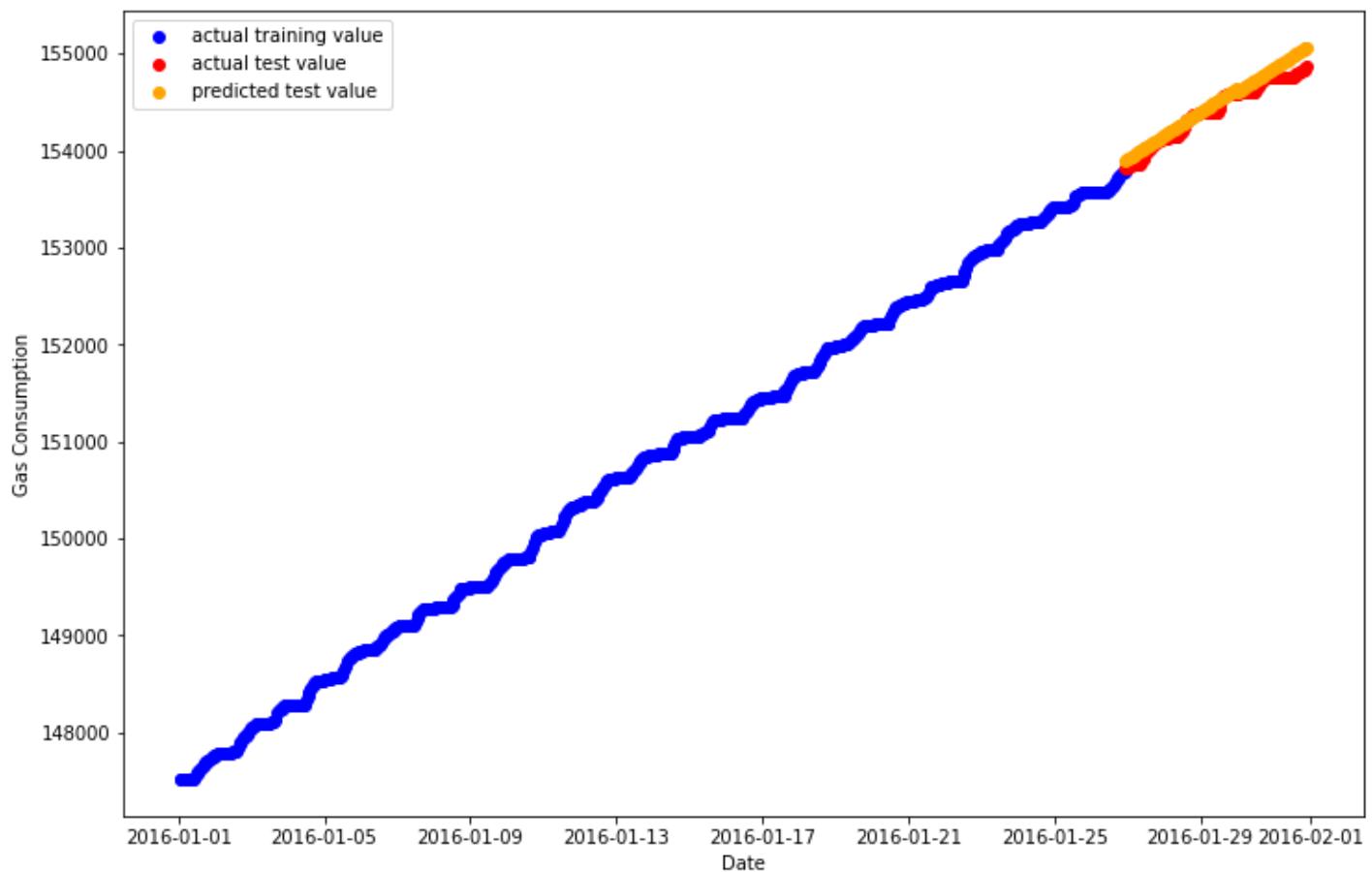
Time Series Plot - Household 2470.0 Overall MSE : 18655.7634119143



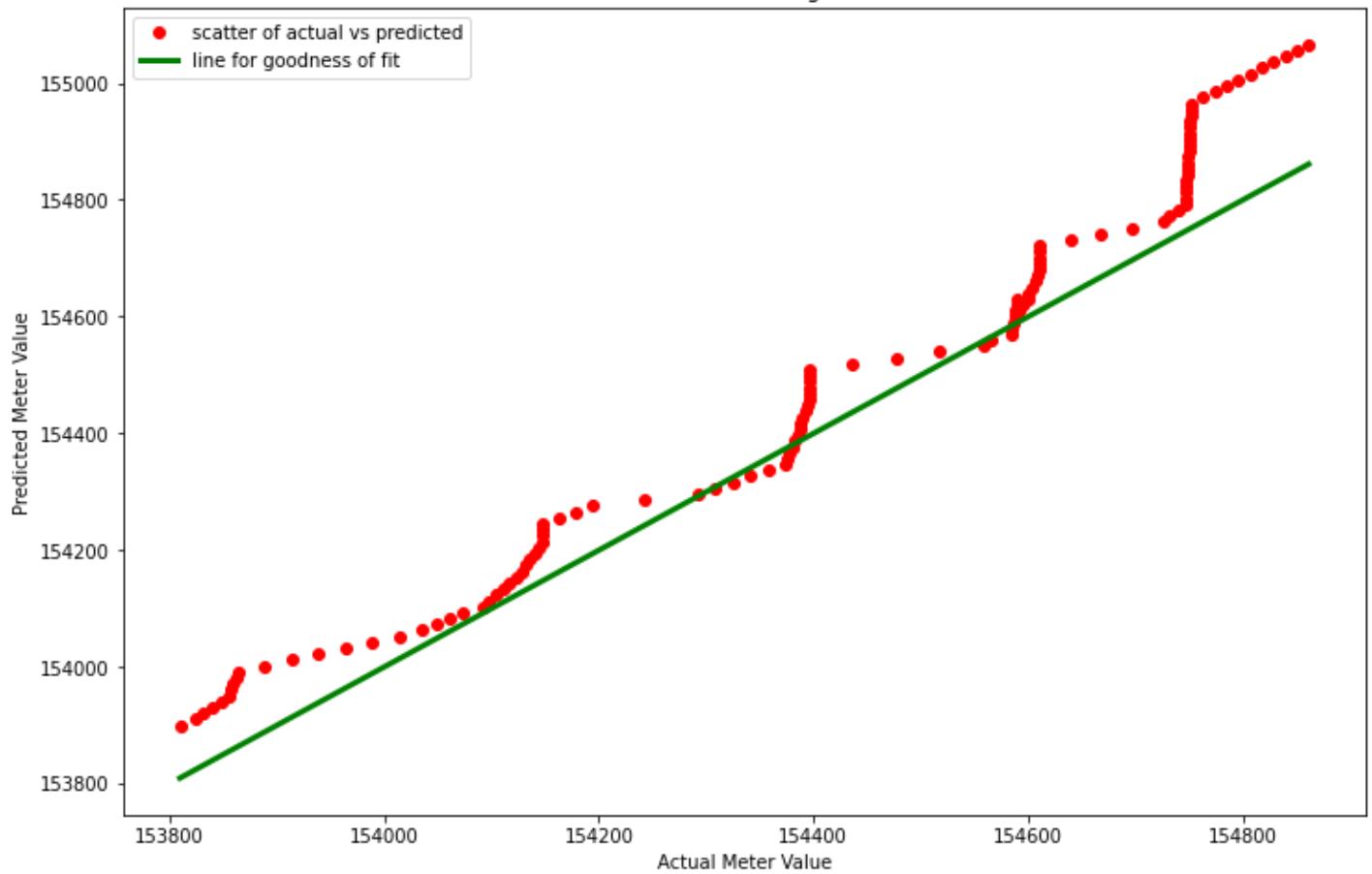
Scatter Plot - Household 2470.0 Testing MSE : 50611.267973108465

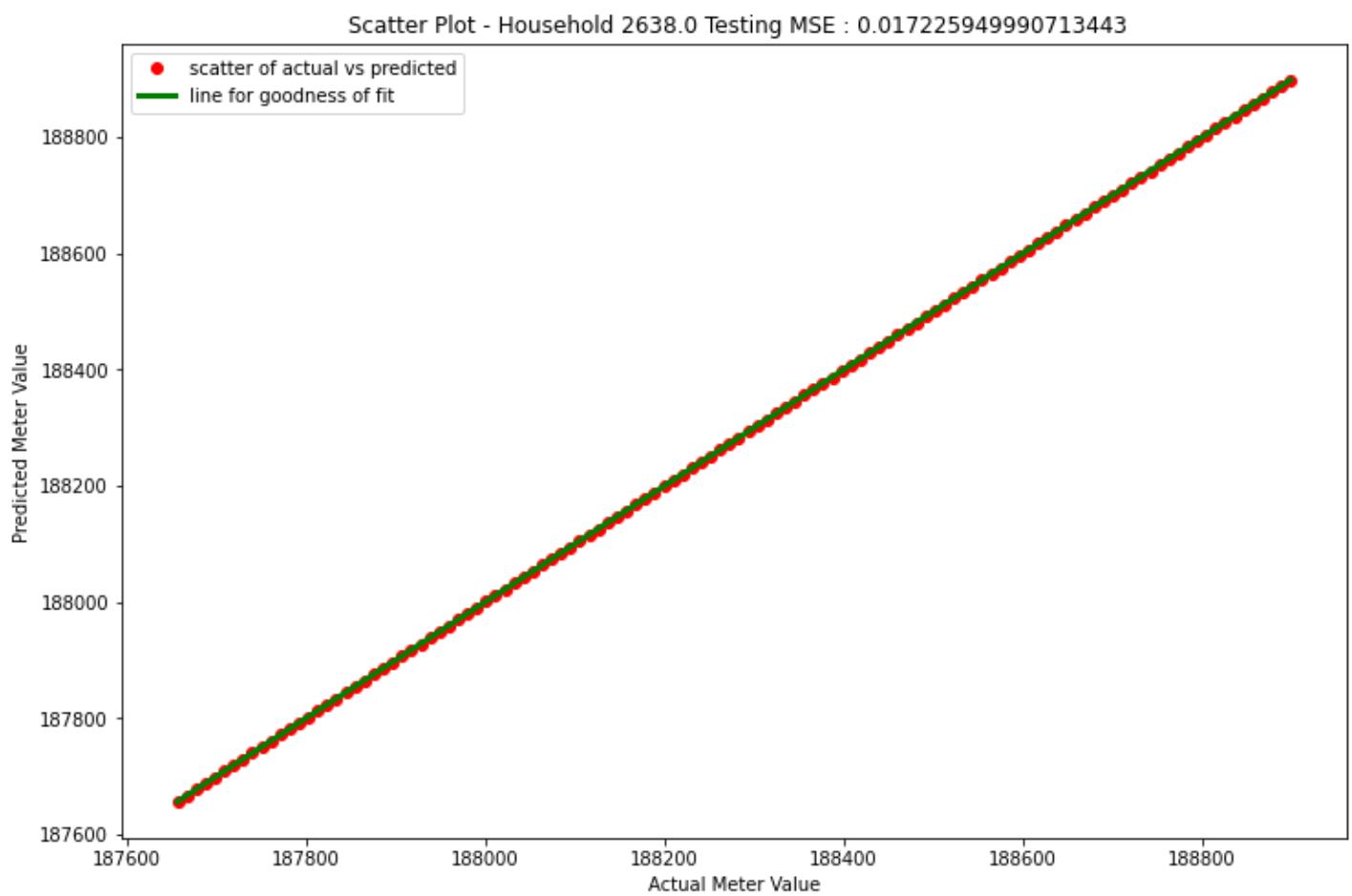
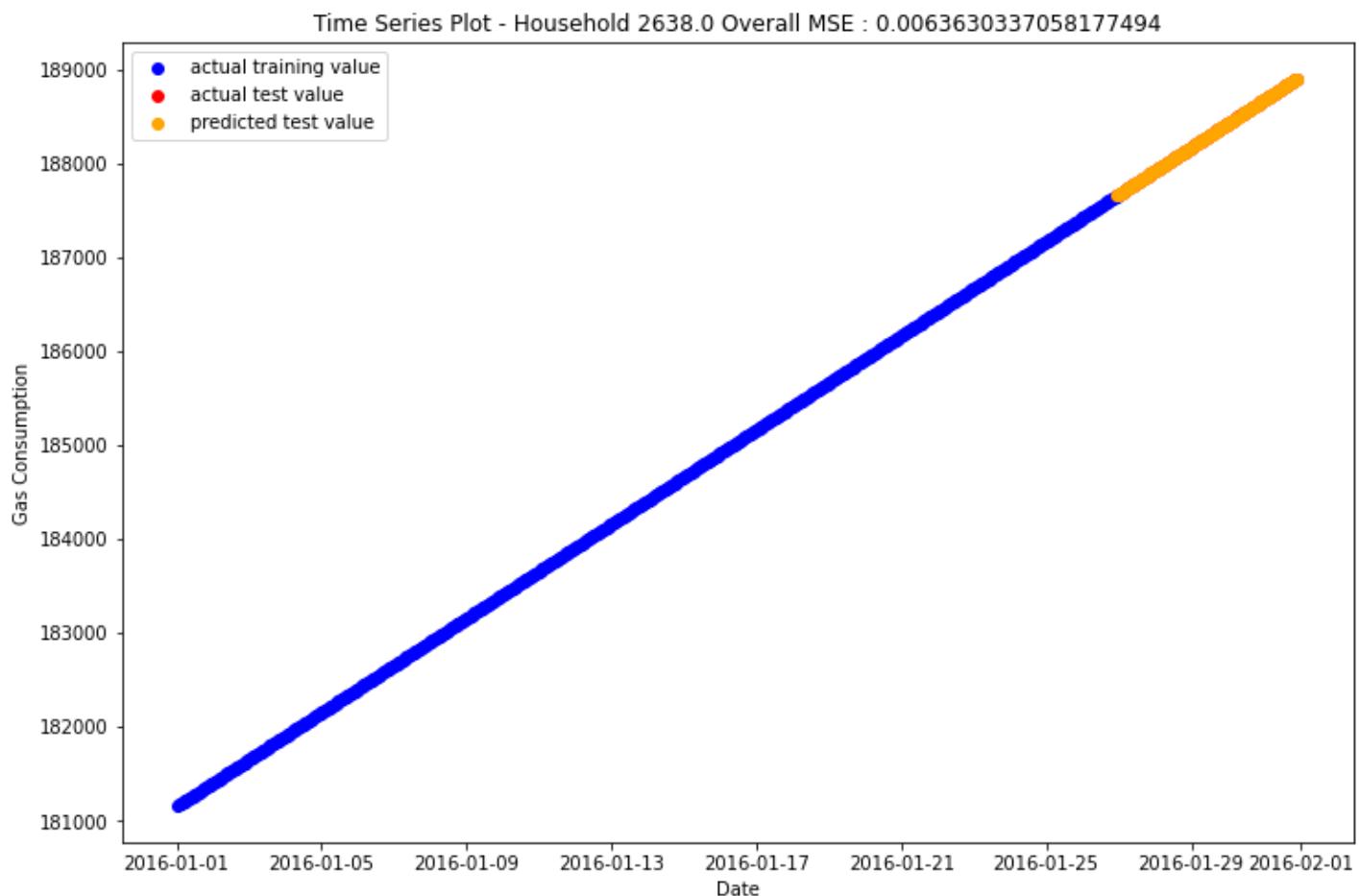


Time Series Plot - Household 2575.0 Overall MSE : 5032.872195443017

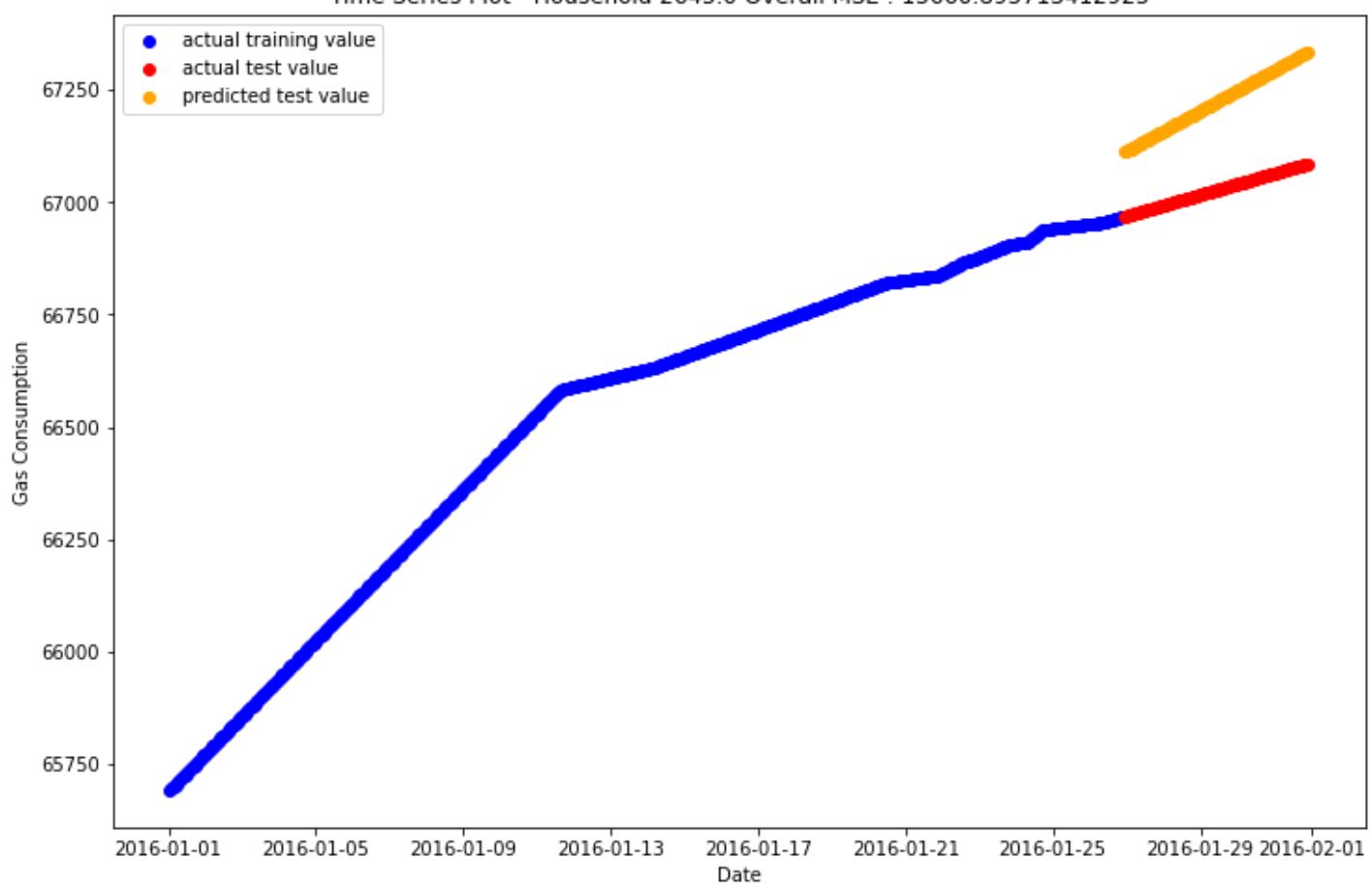


Scatter Plot - Household 2575.0 Testing MSE : 9522.06825482009

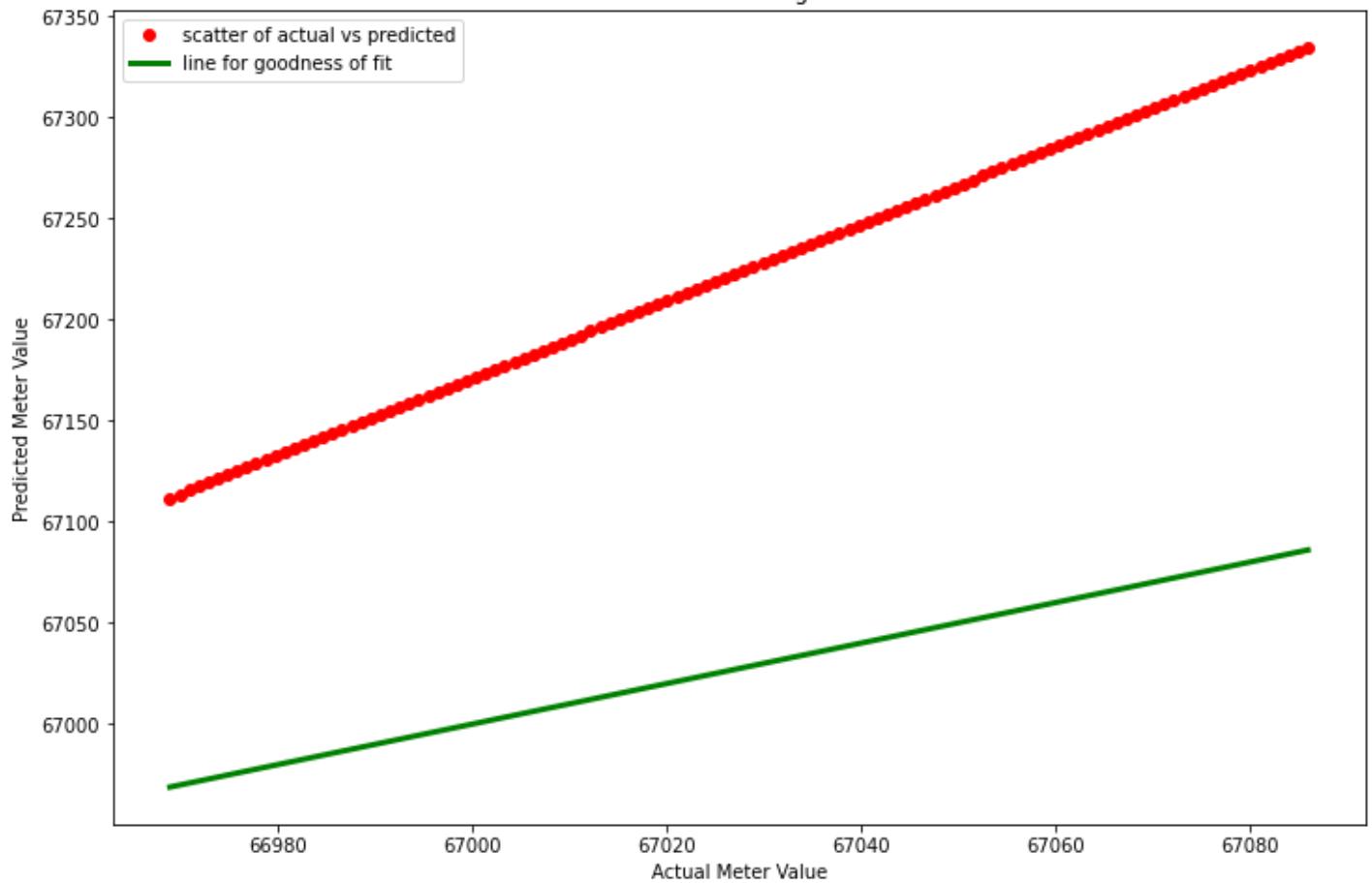




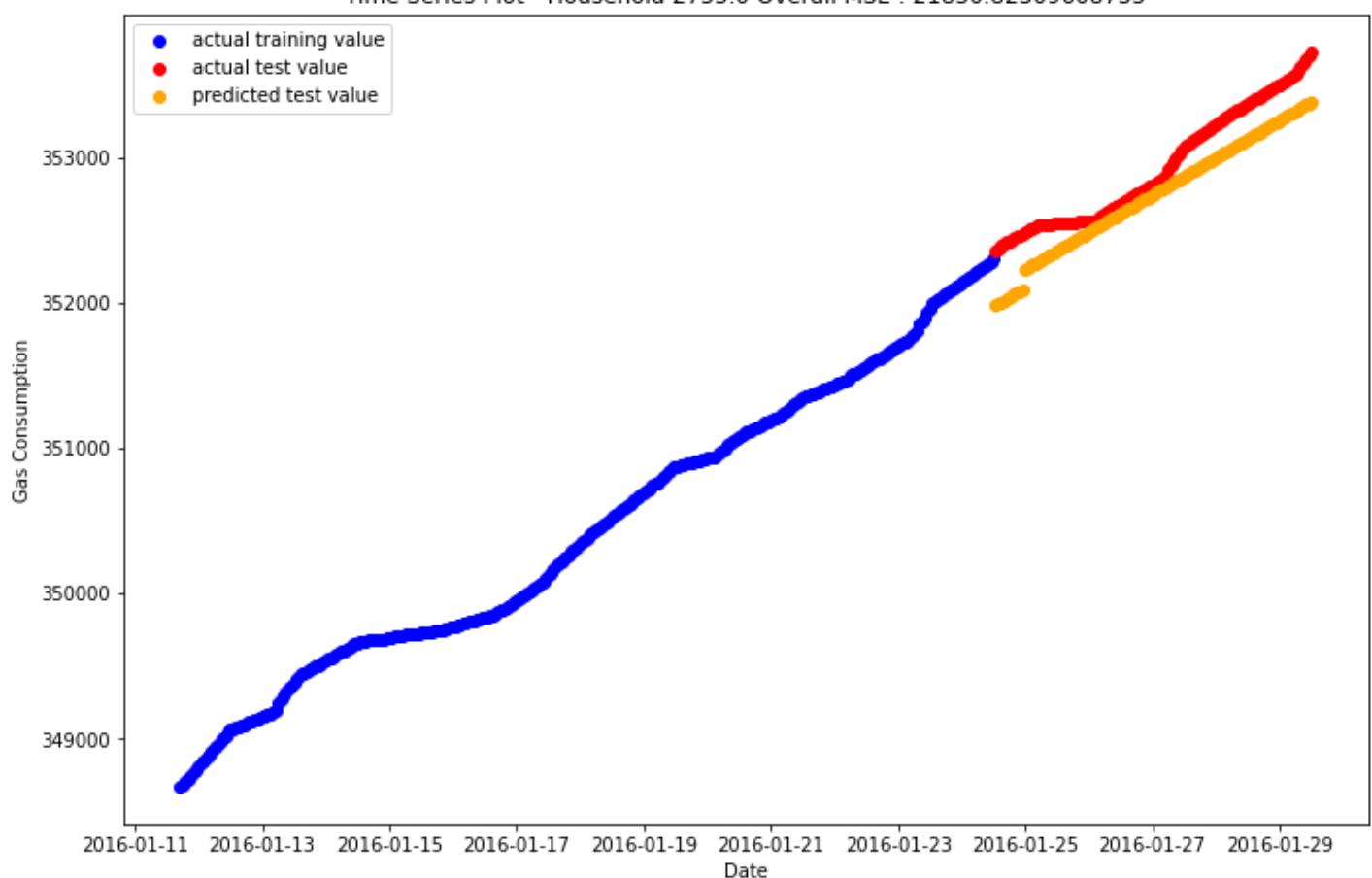
Time Series Plot - Household 2645.0 Overall MSE : 15660.895713412925



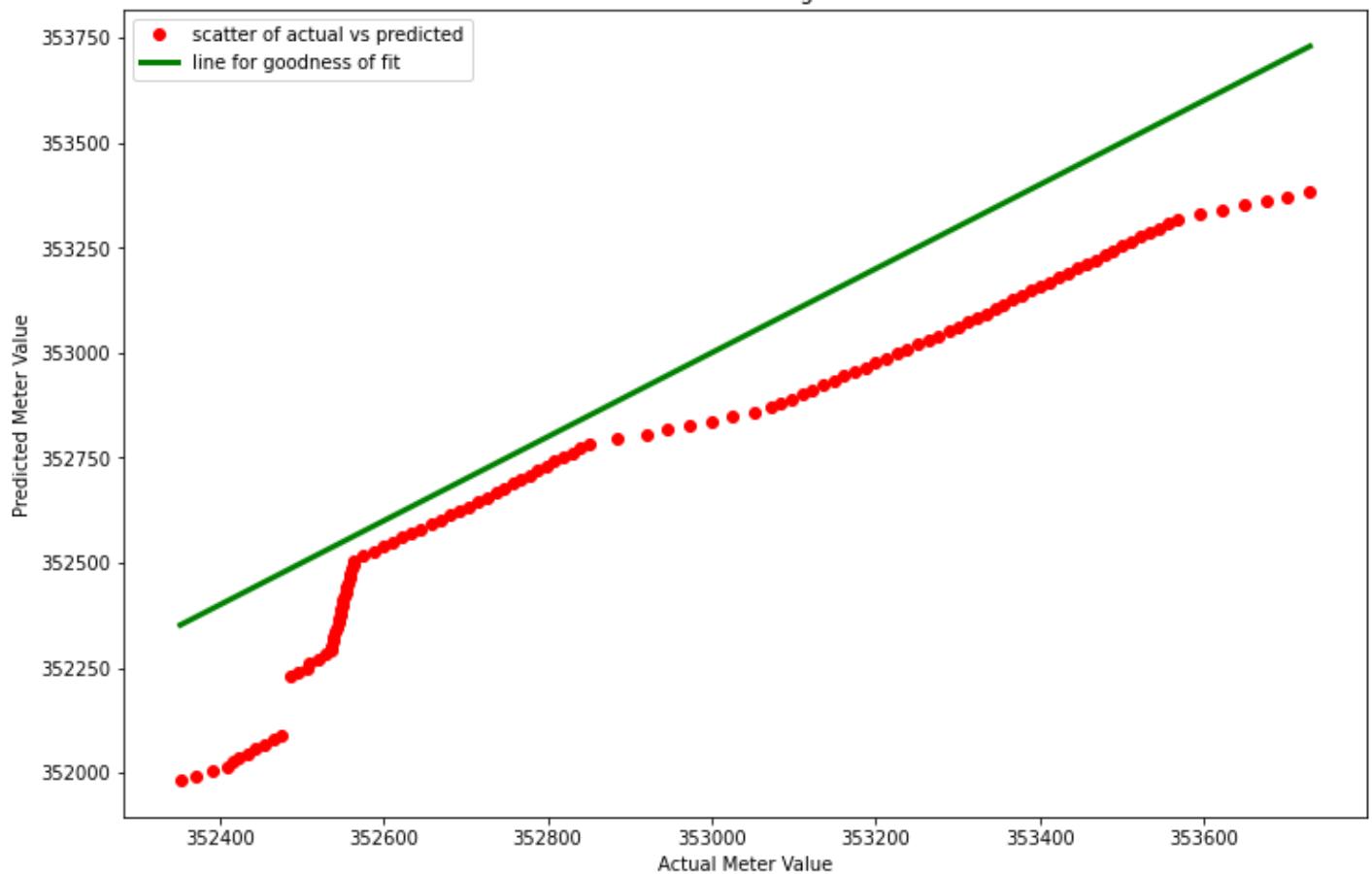
Scatter Plot - Household 2645.0 Testing MSE : 39348.38055833059



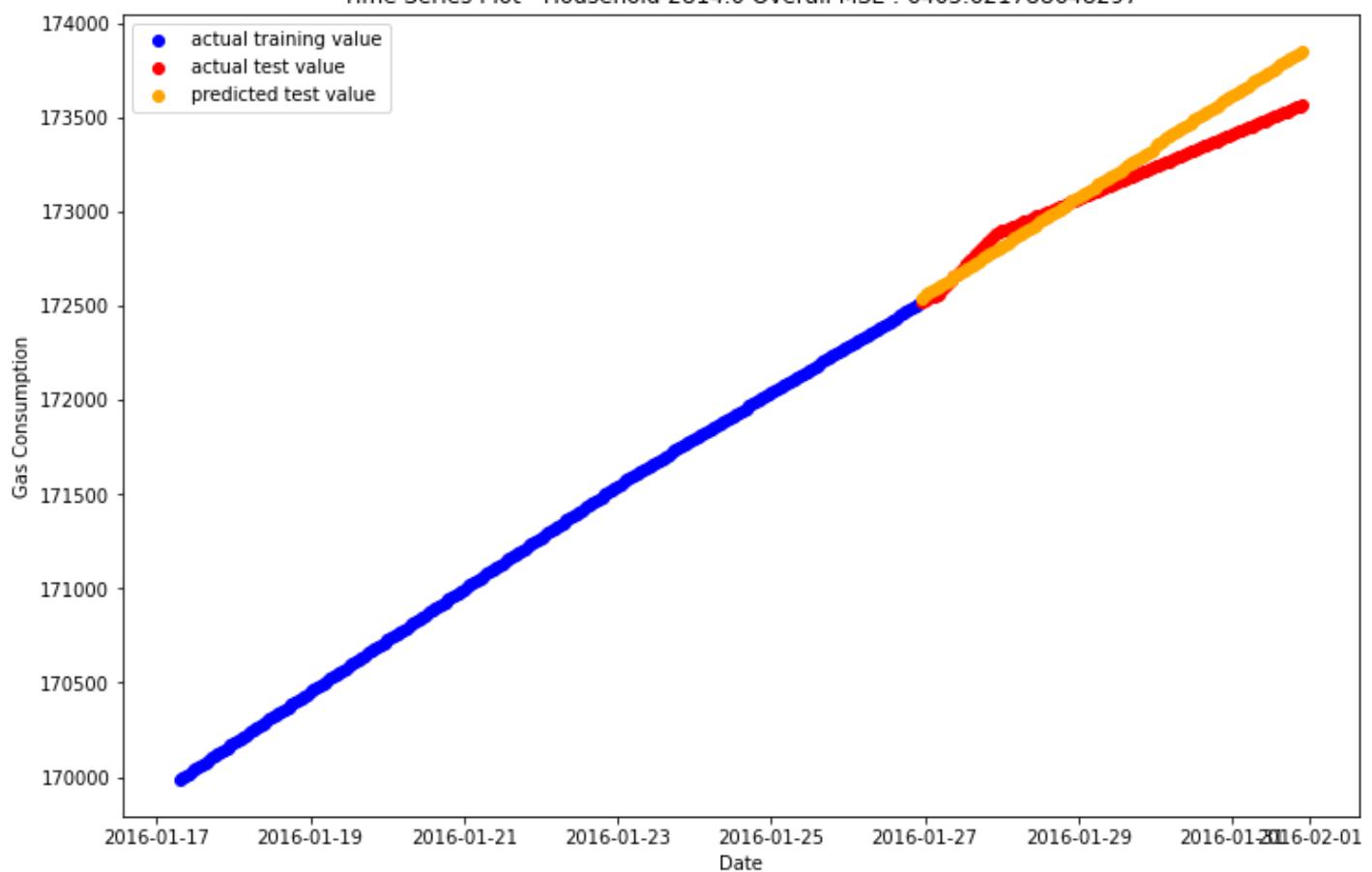
Time Series Plot - Household 2755.0 Overall MSE : 21850.82309608735



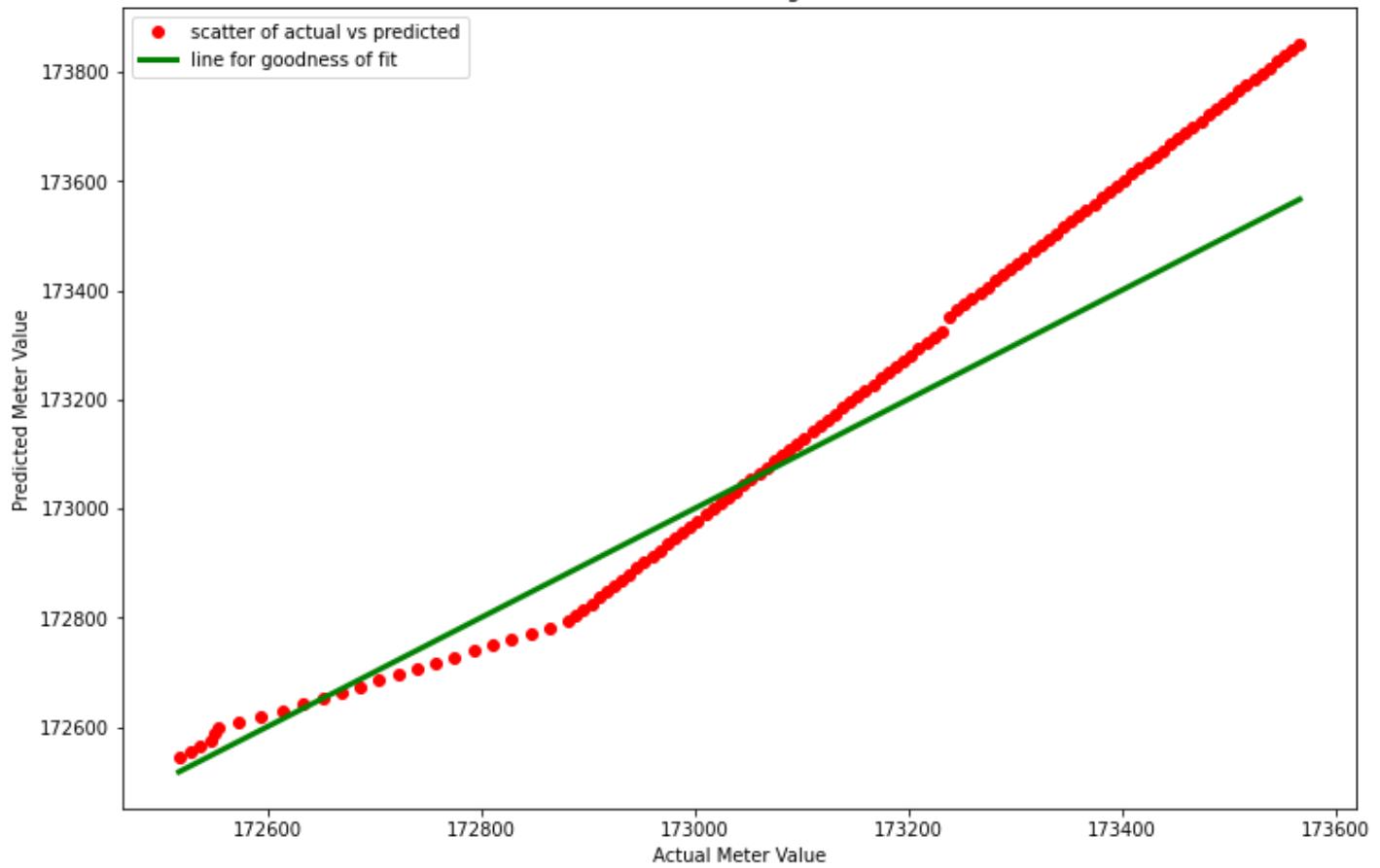
Scatter Plot - Household 2755.0 Testing MSE : 47949.64989469332



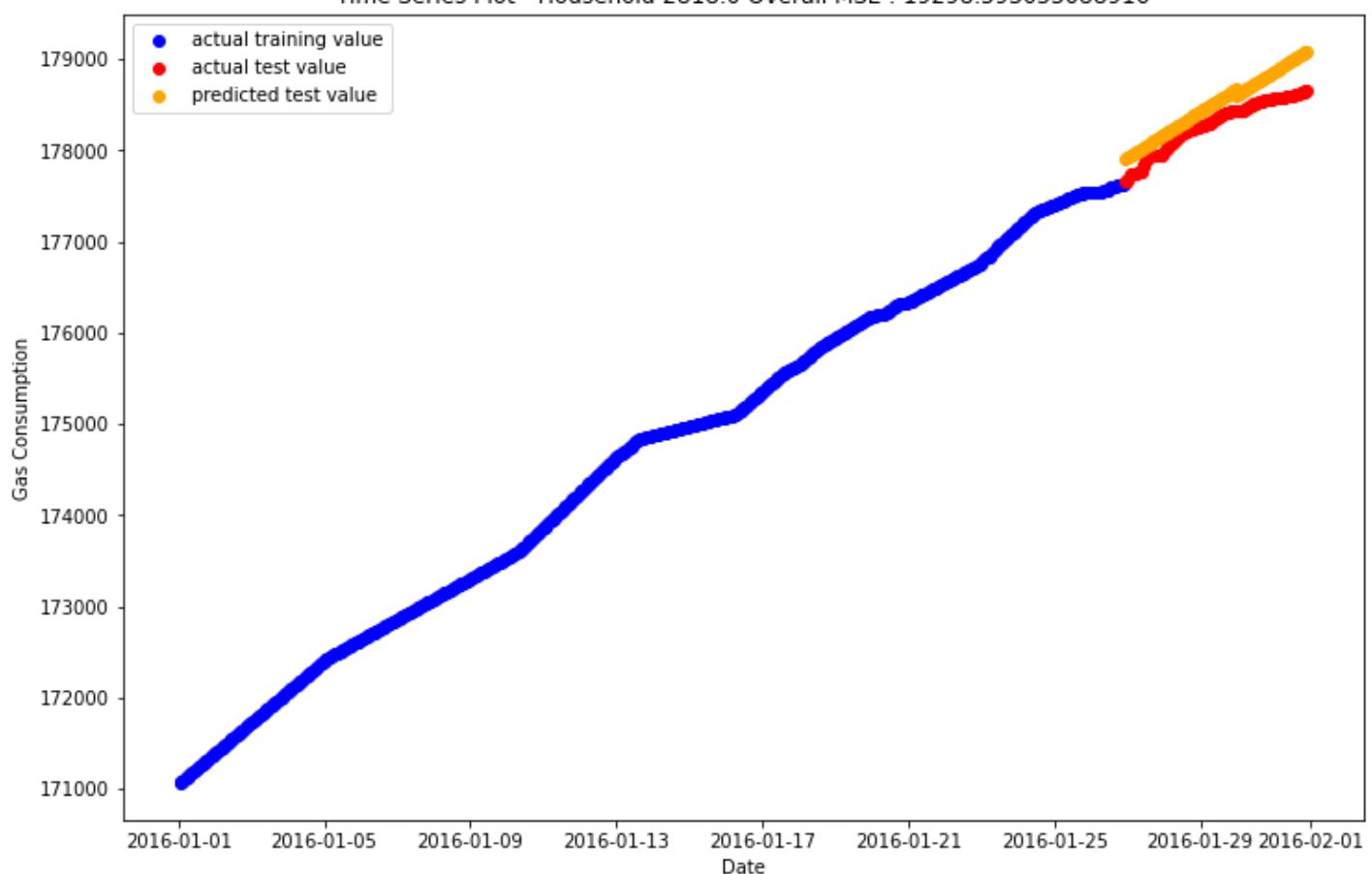
Time Series Plot - Household 2814.0 Overall MSE : 6405.621788648297



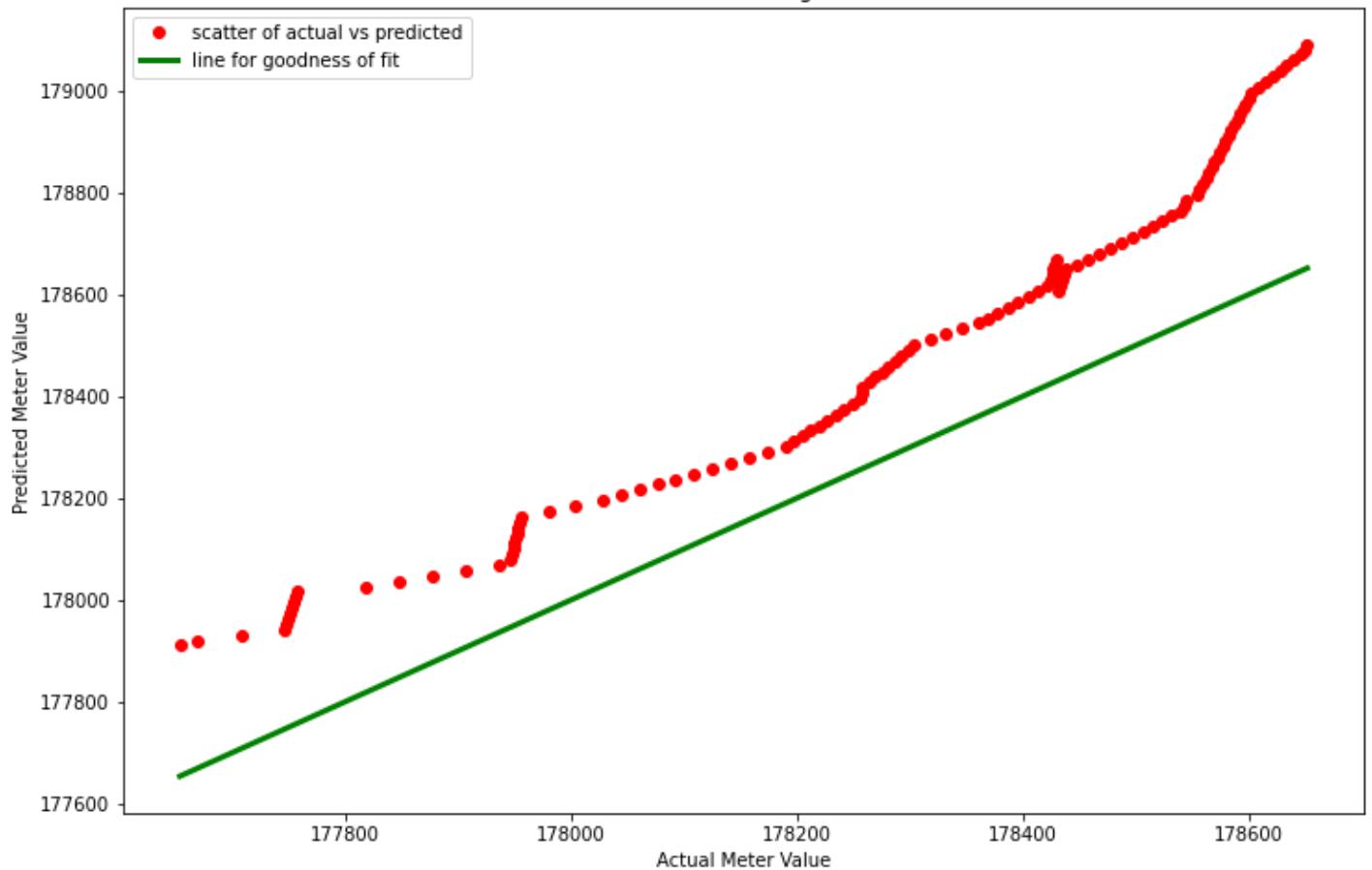
Scatter Plot - Household 2814.0 Testing MSE : 18131.850949671098



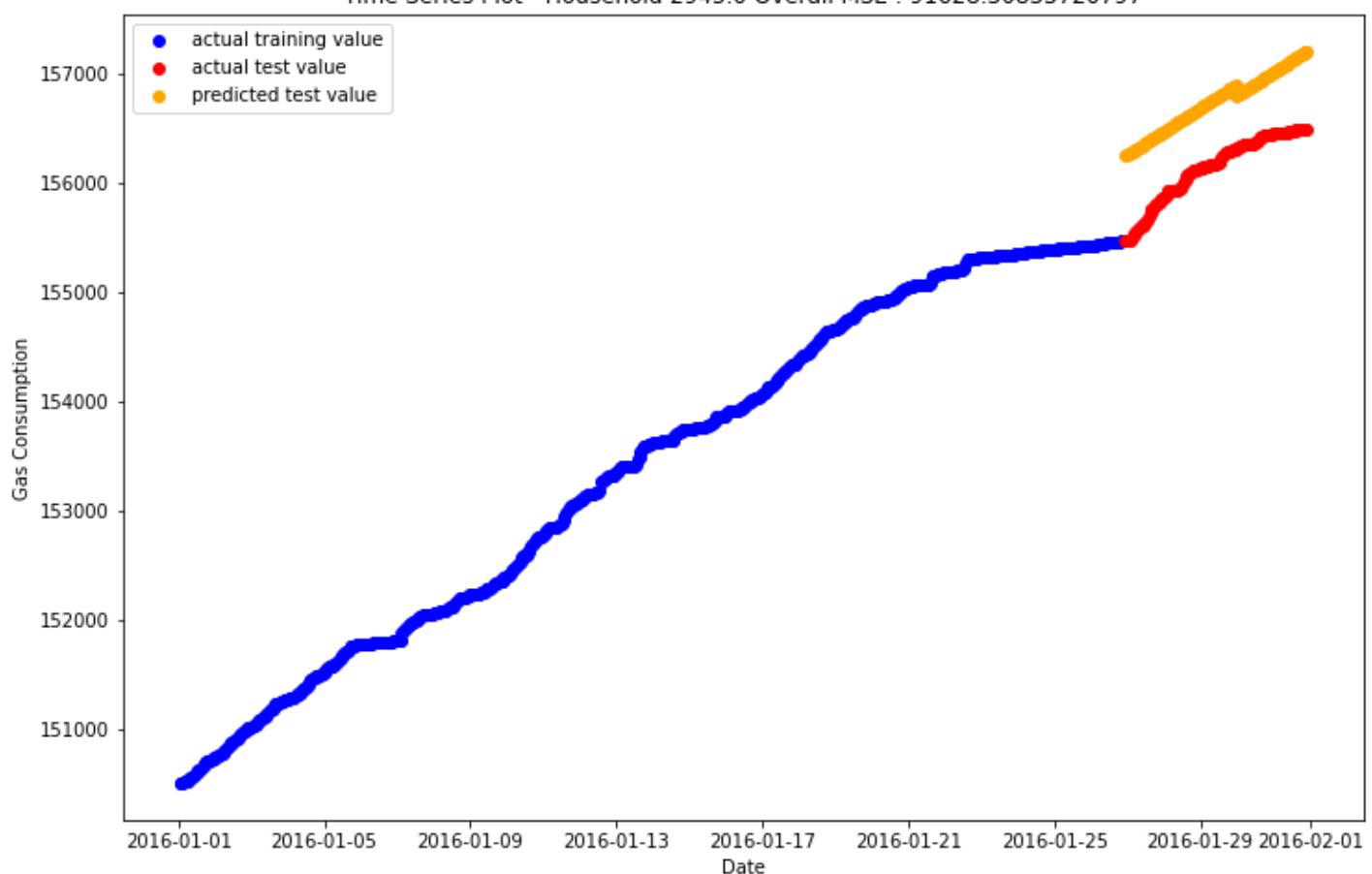
Time Series Plot - Household 2818.0 Overall MSE : 19298.593053088916



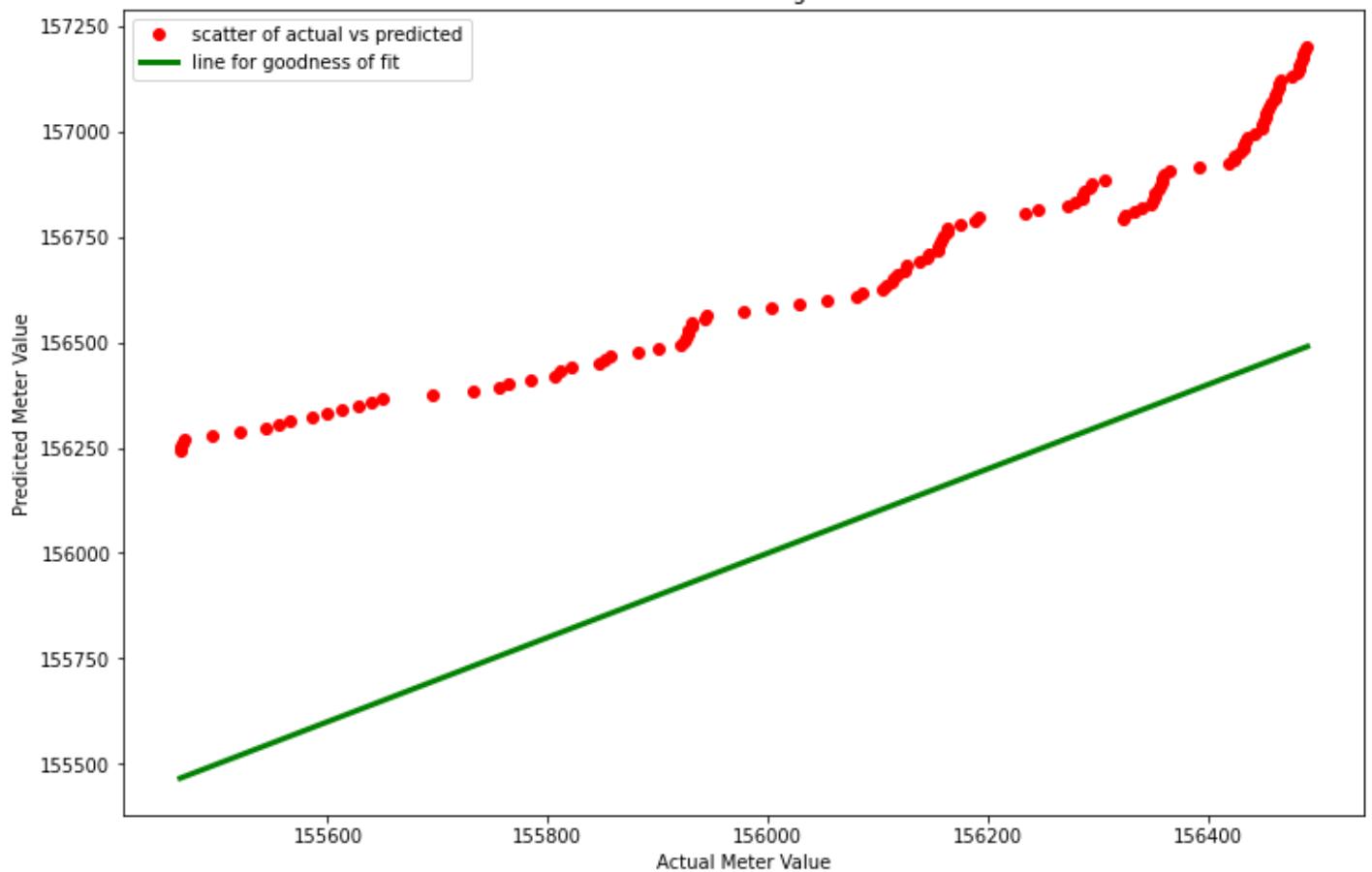
Scatter Plot - Household 2818.0 Testing MSE : 56925.41769821264



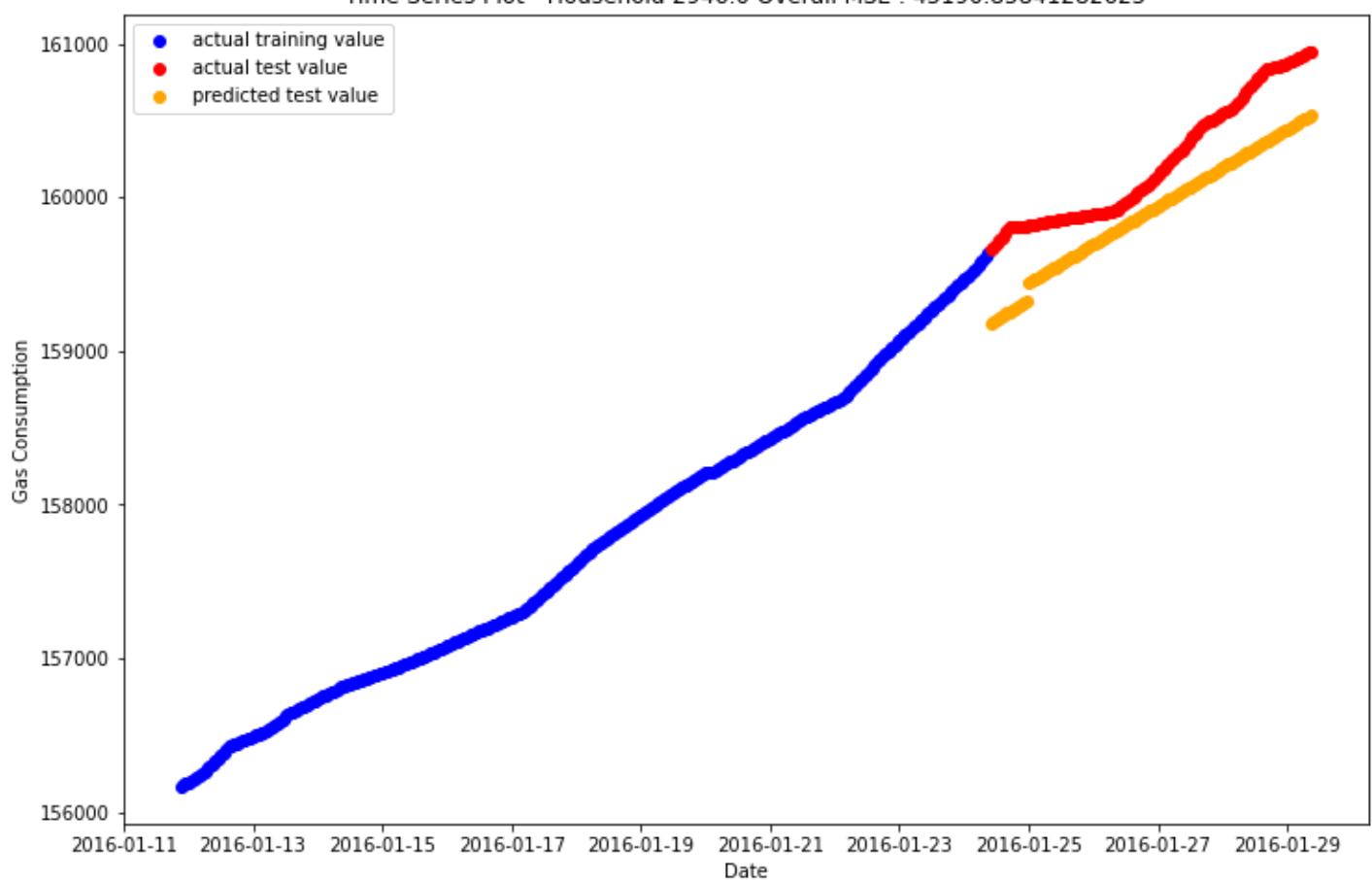
Time Series Plot - Household 2945.0 Overall MSE : 91628.30833720797



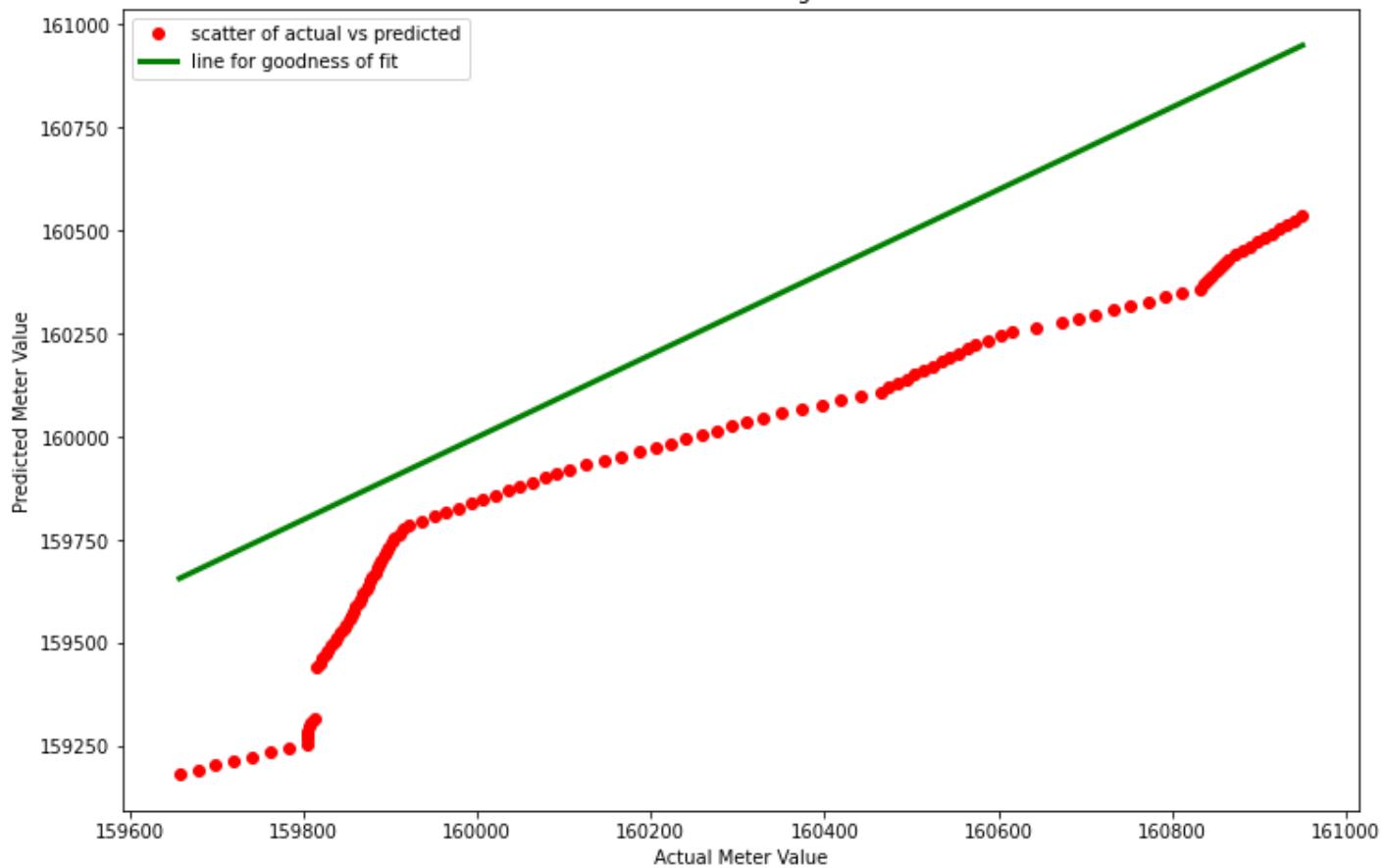
Scatter Plot - Household 2945.0 Testing MSE : 367304.00259126705

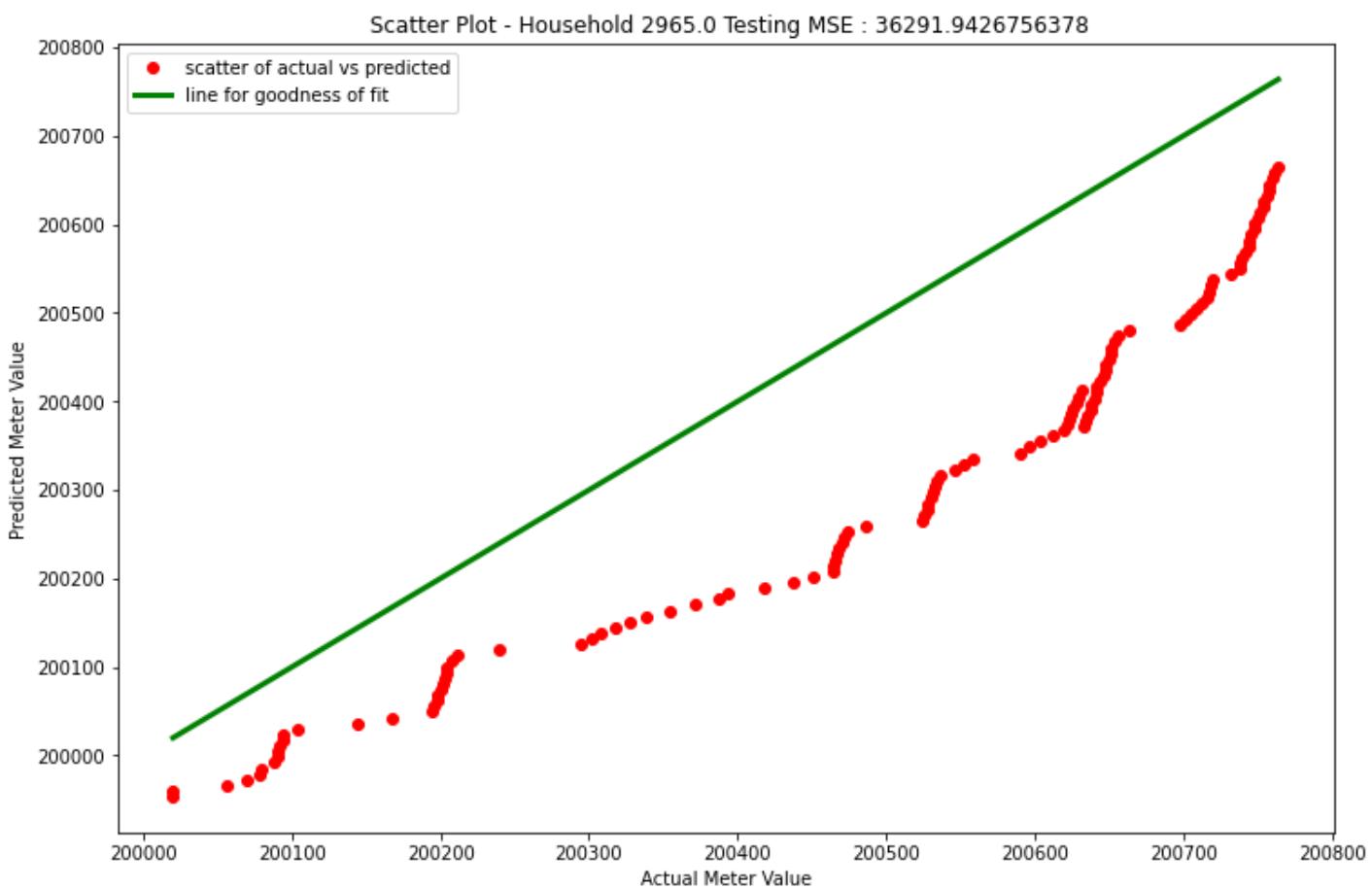
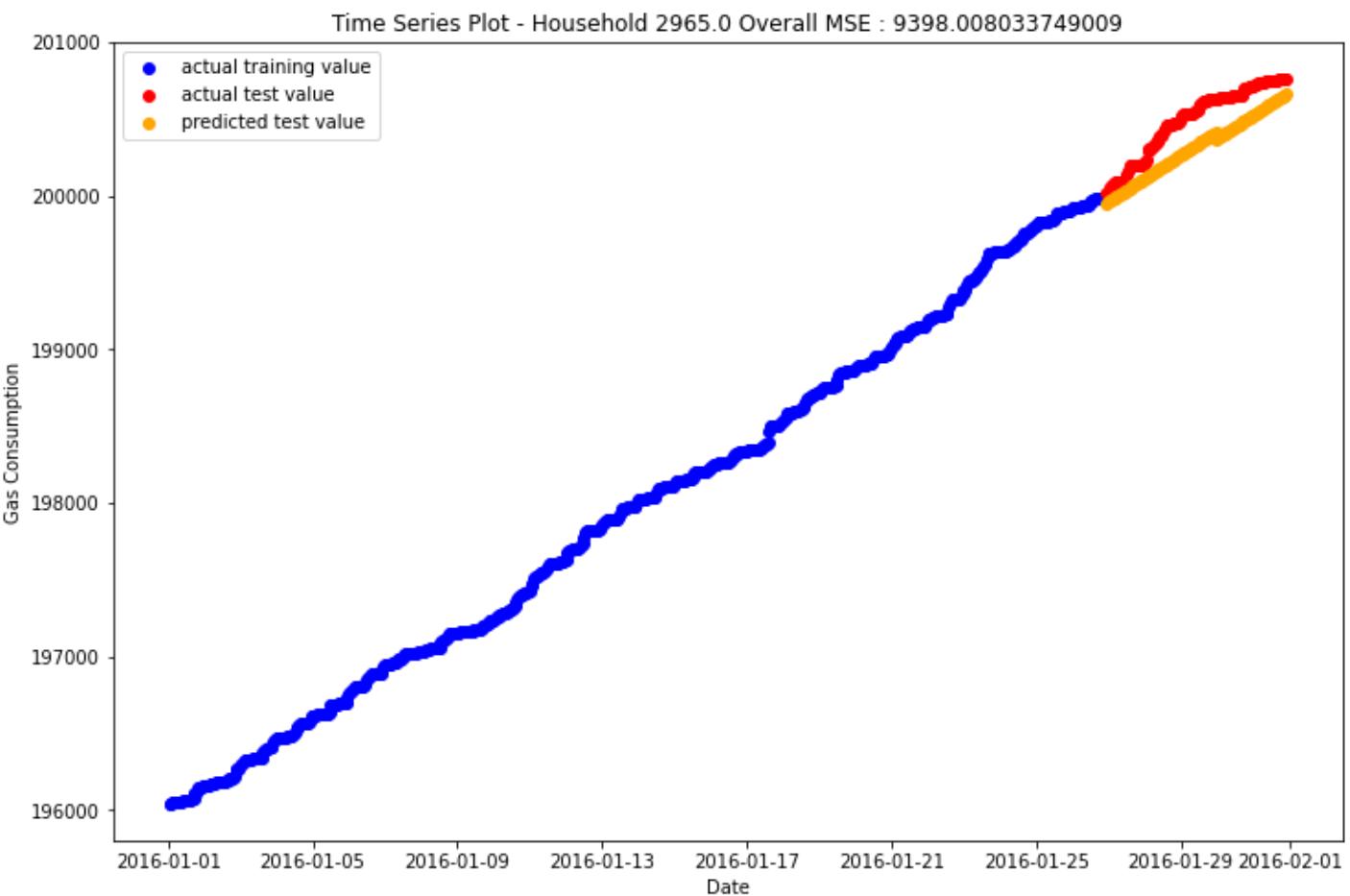


Time Series Plot - Household 2946.0 Overall MSE : 45190.85841282625

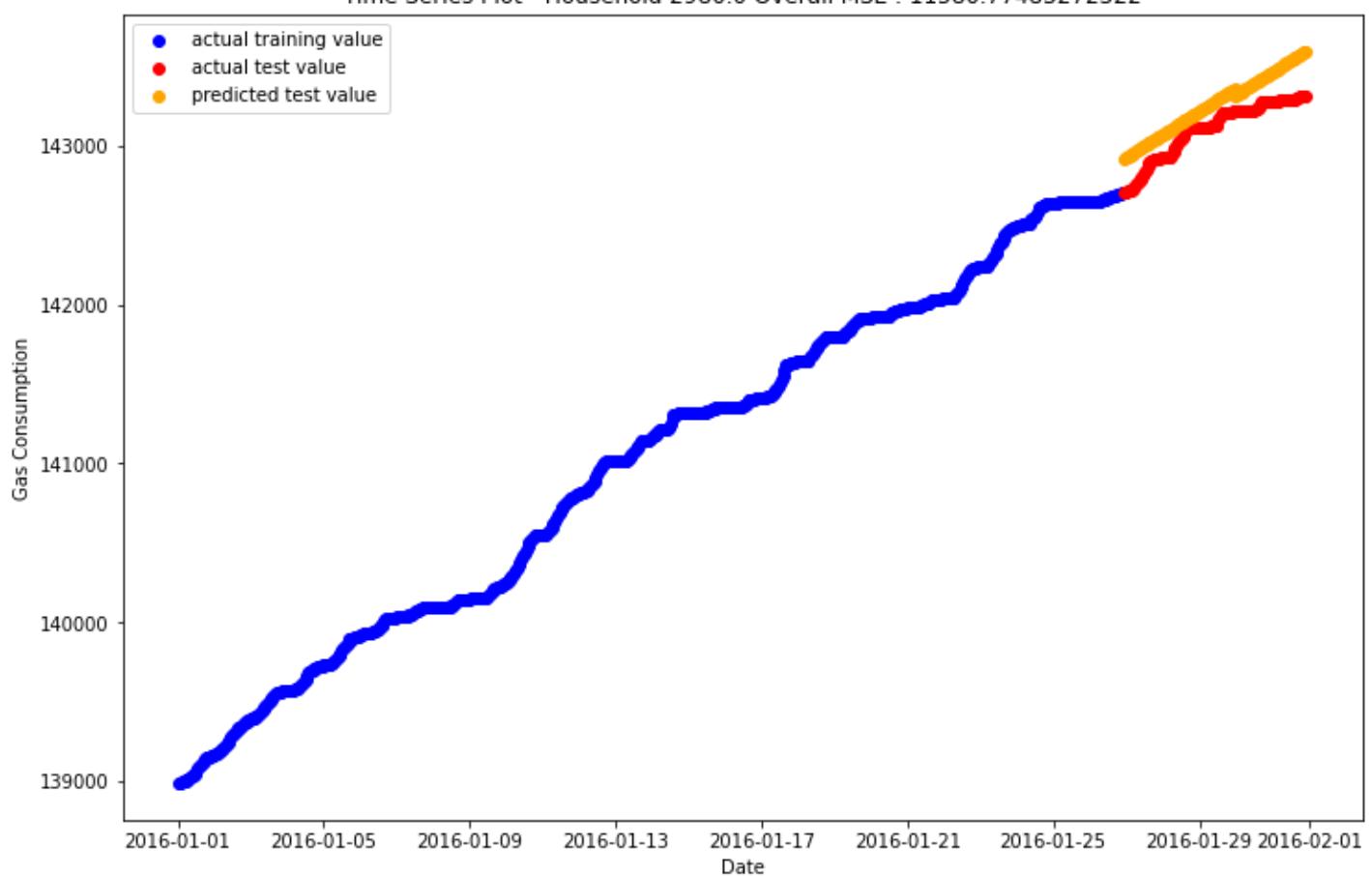


Scatter Plot - Household 2946.0 Testing MSE : 120493.4353835227

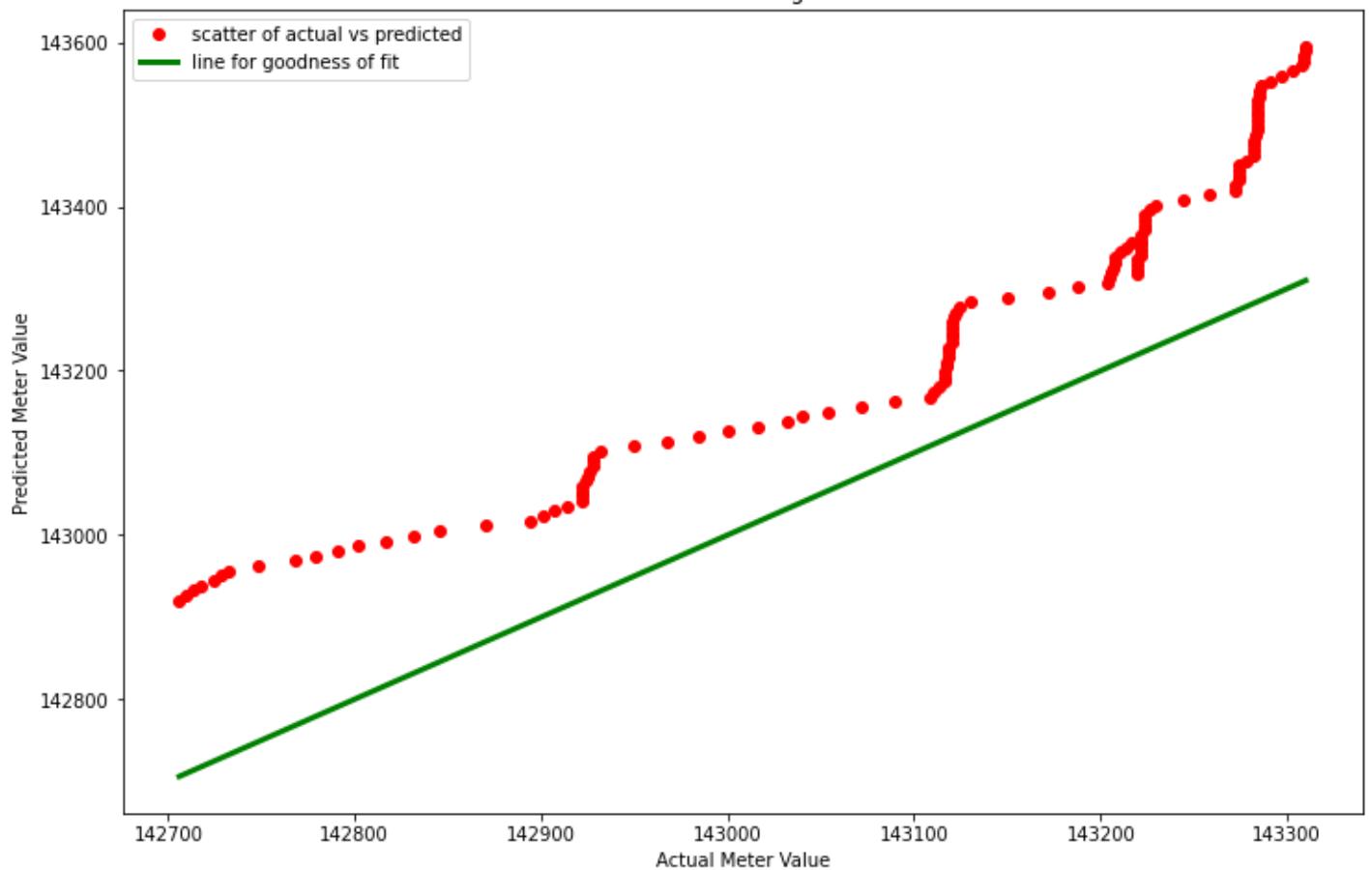


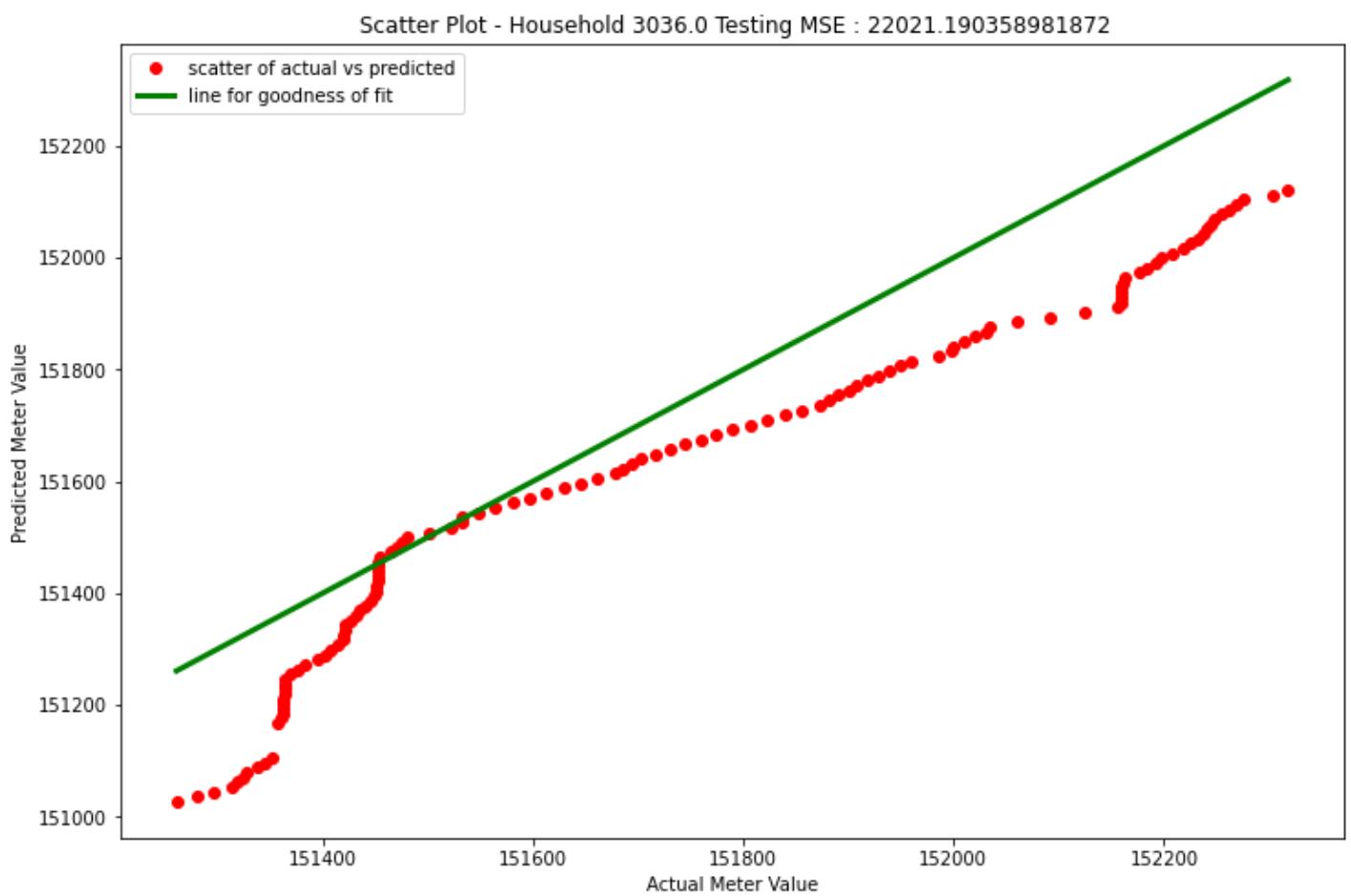
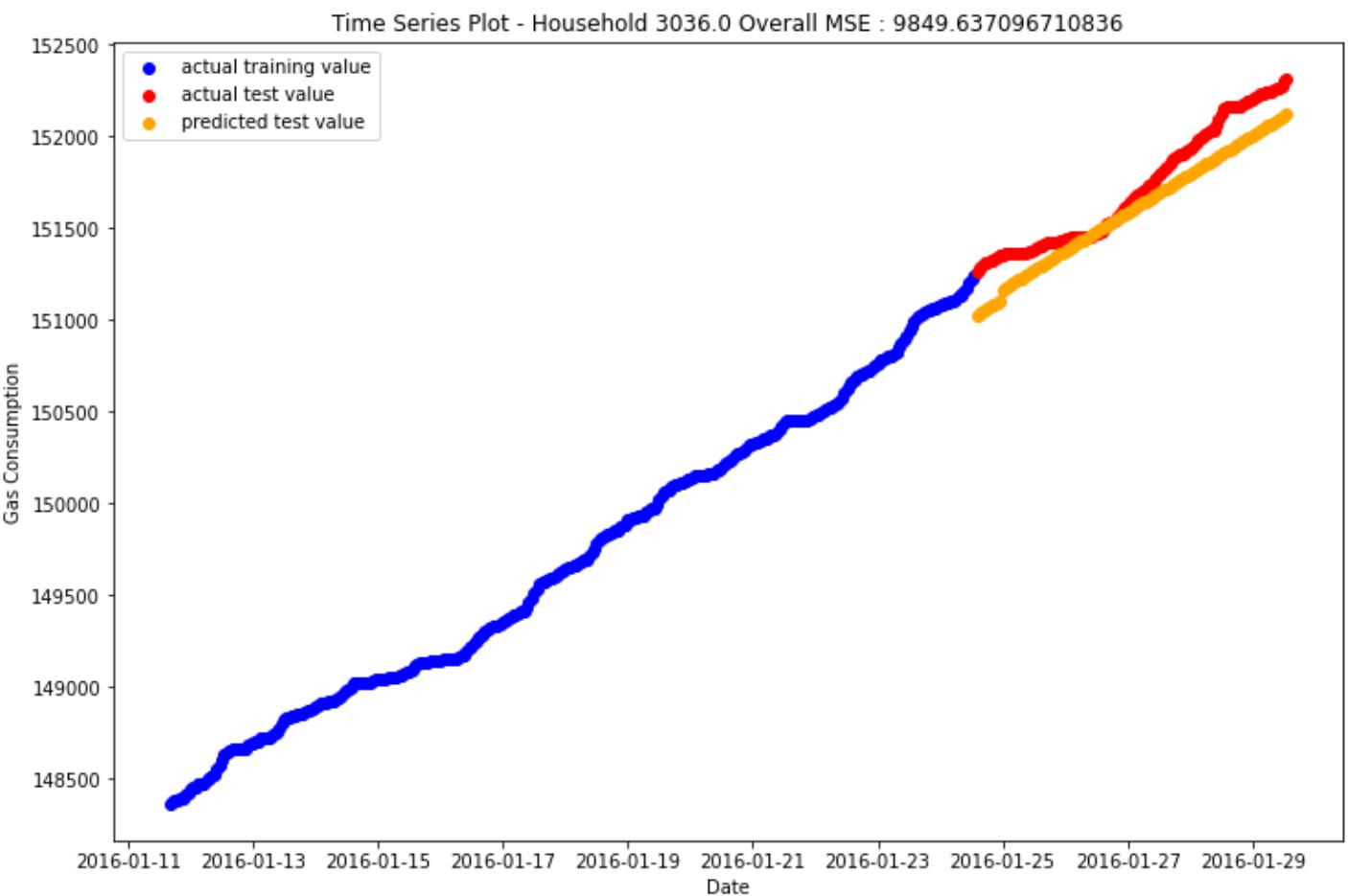


Time Series Plot - Household 2980.0 Overall MSE : 11580.77483272322

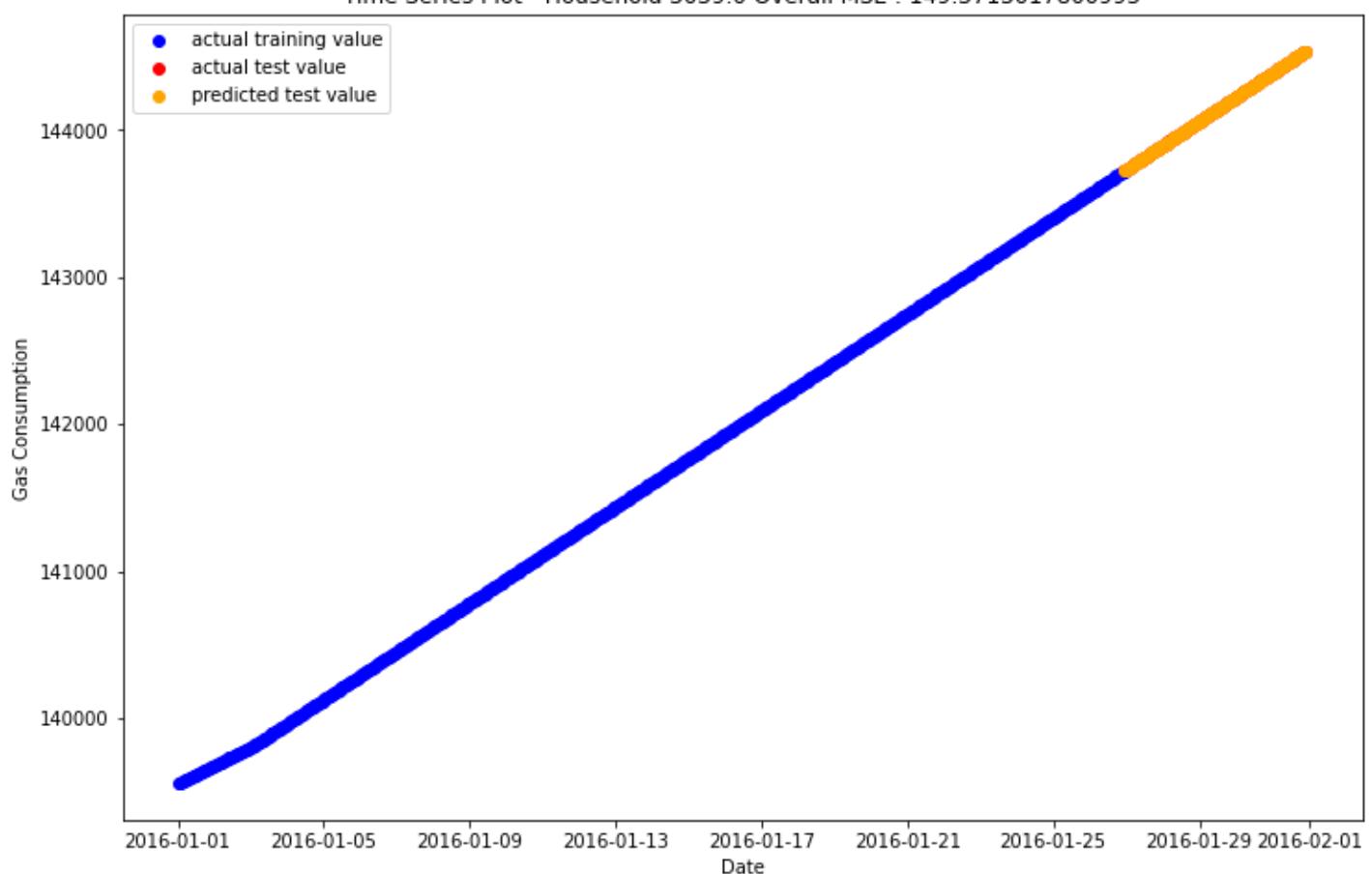


Scatter Plot - Household 2980.0 Testing MSE : 28025.923372175024

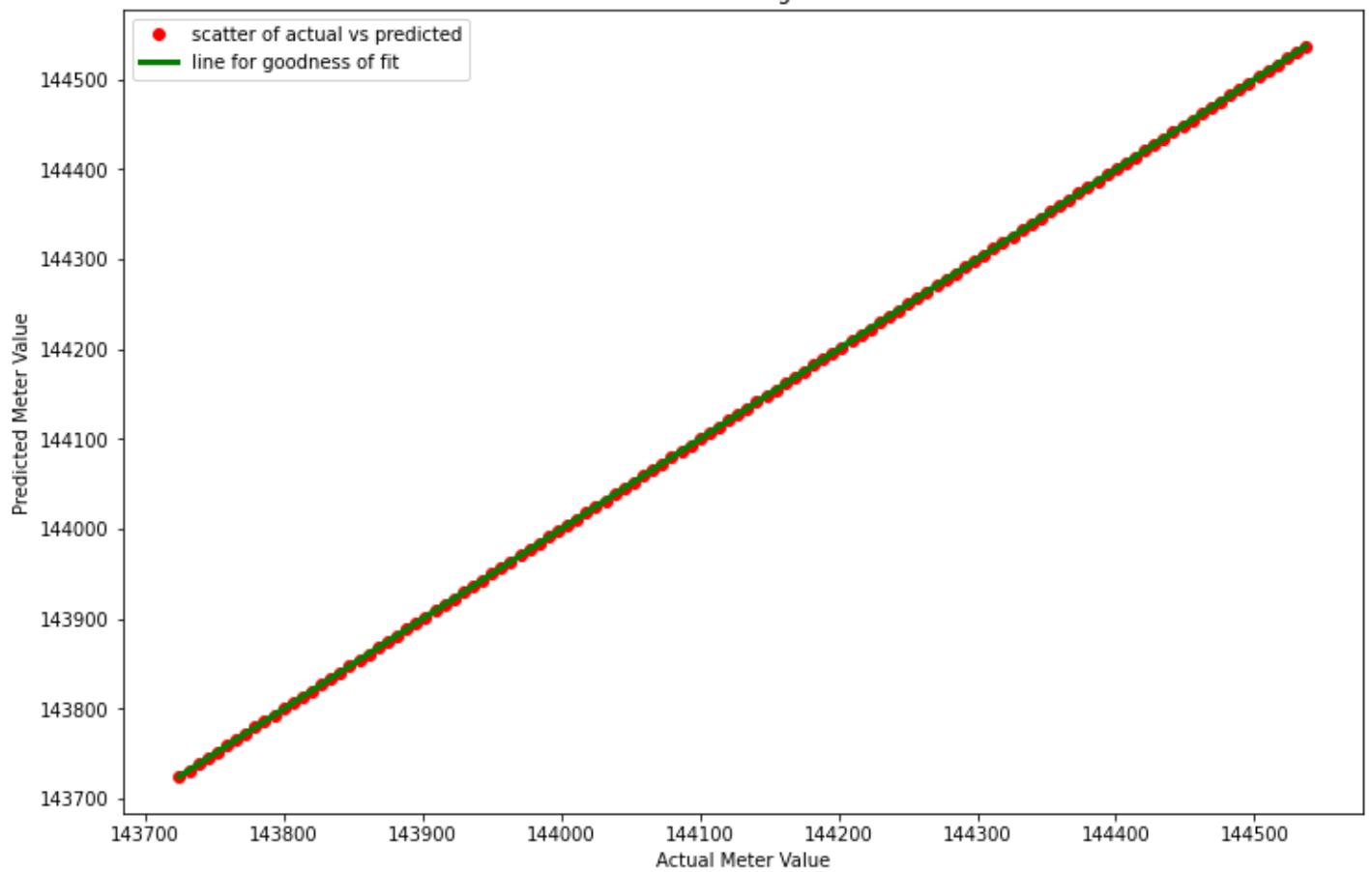


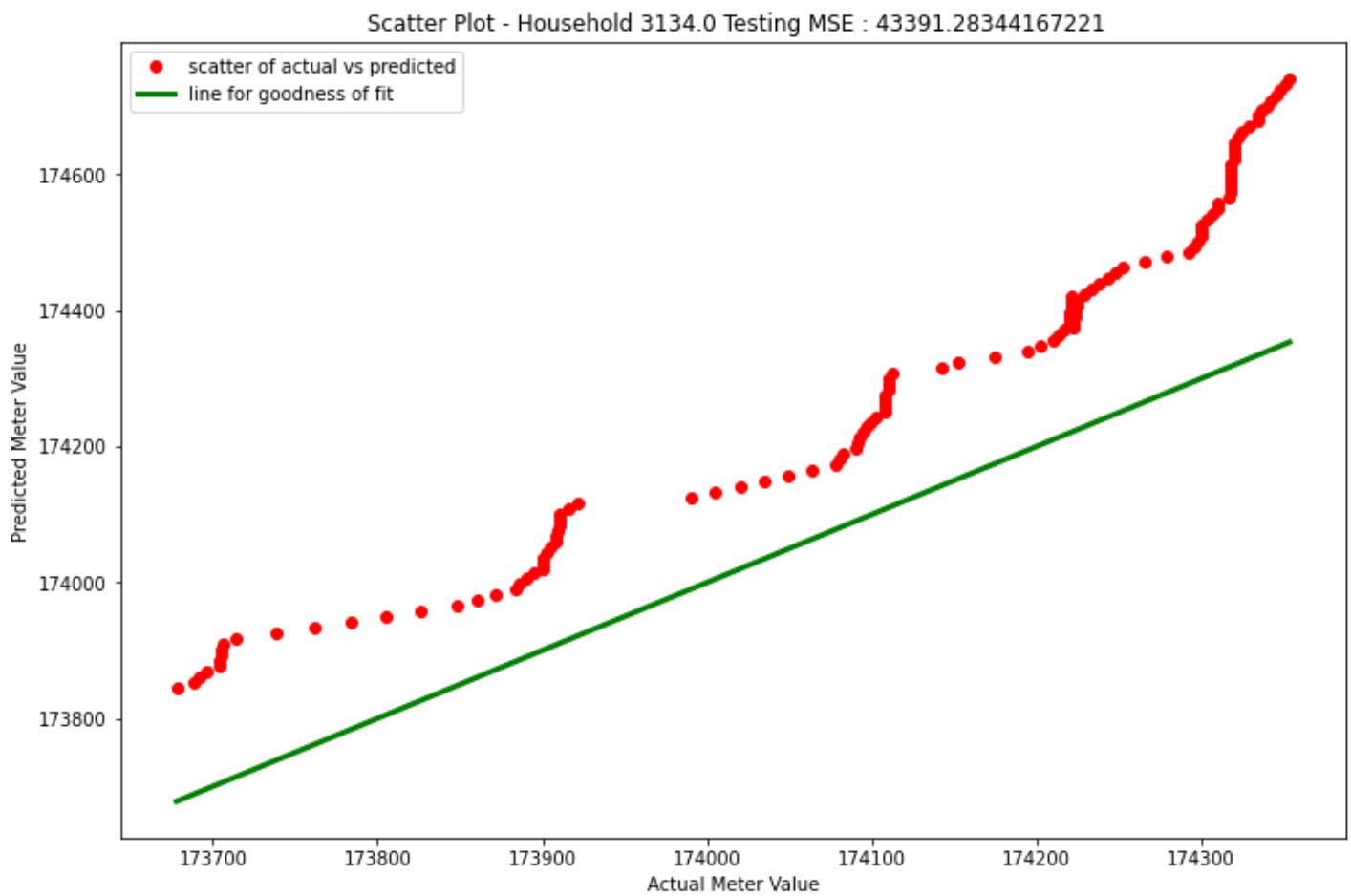
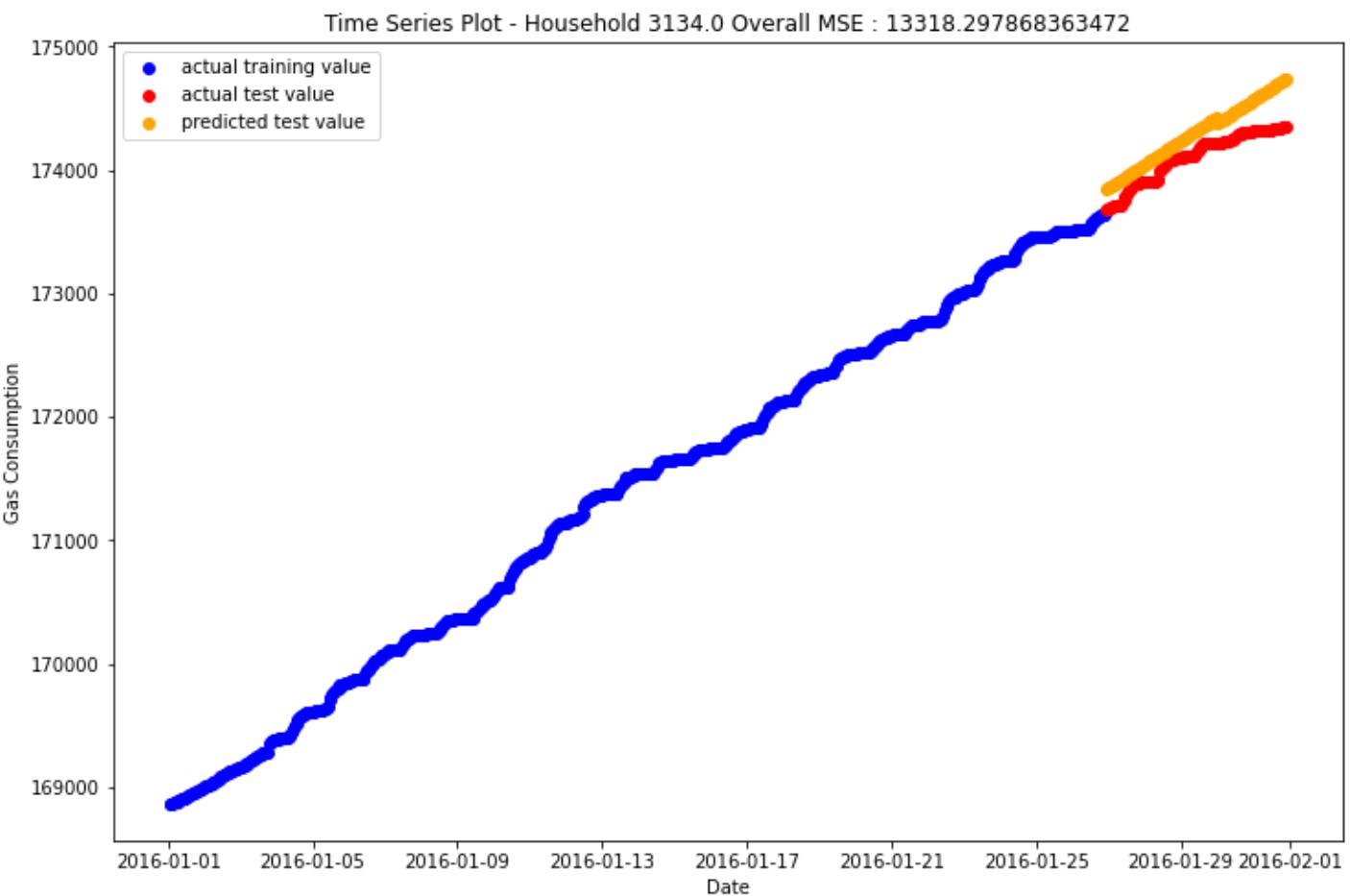


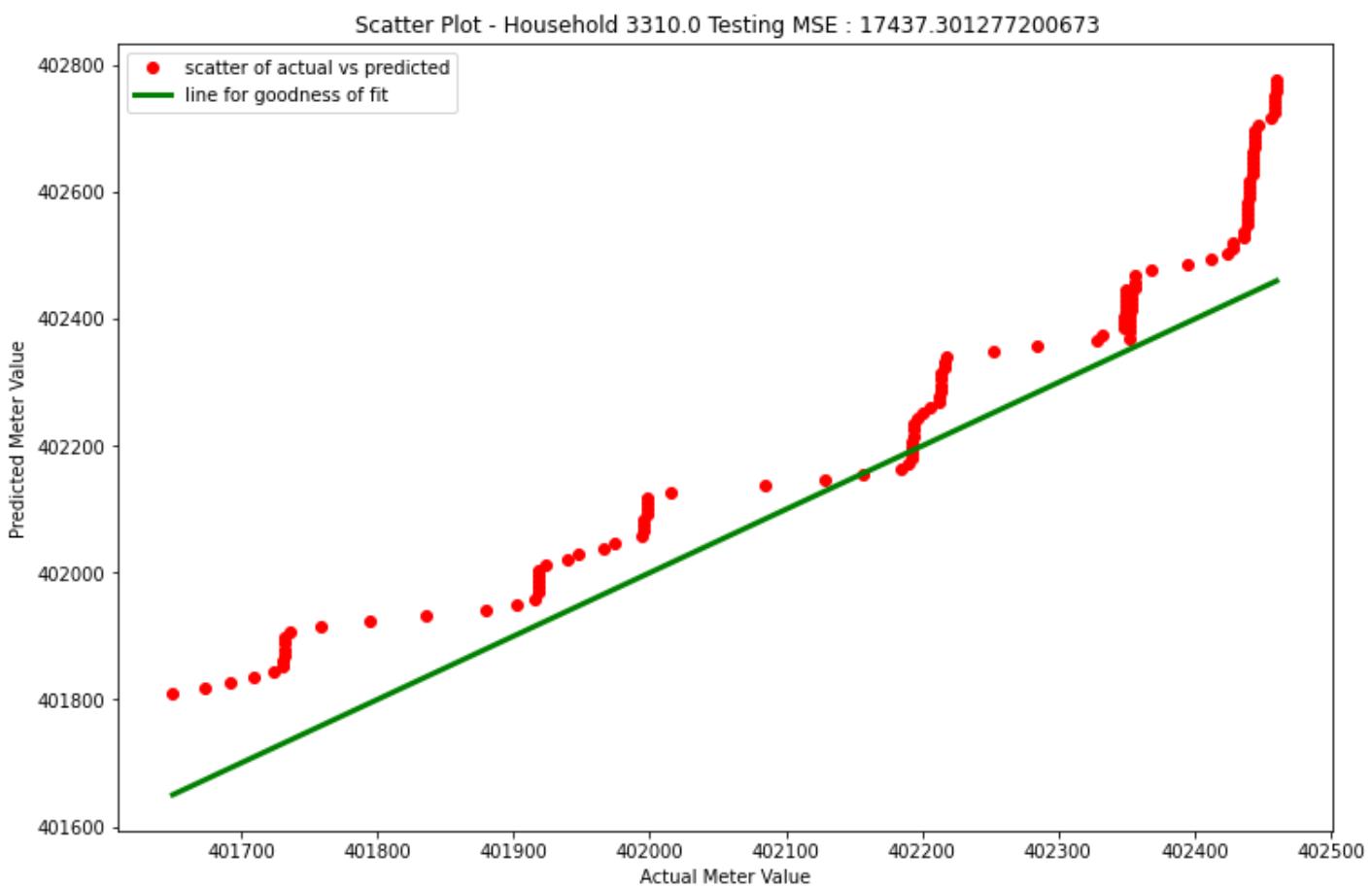
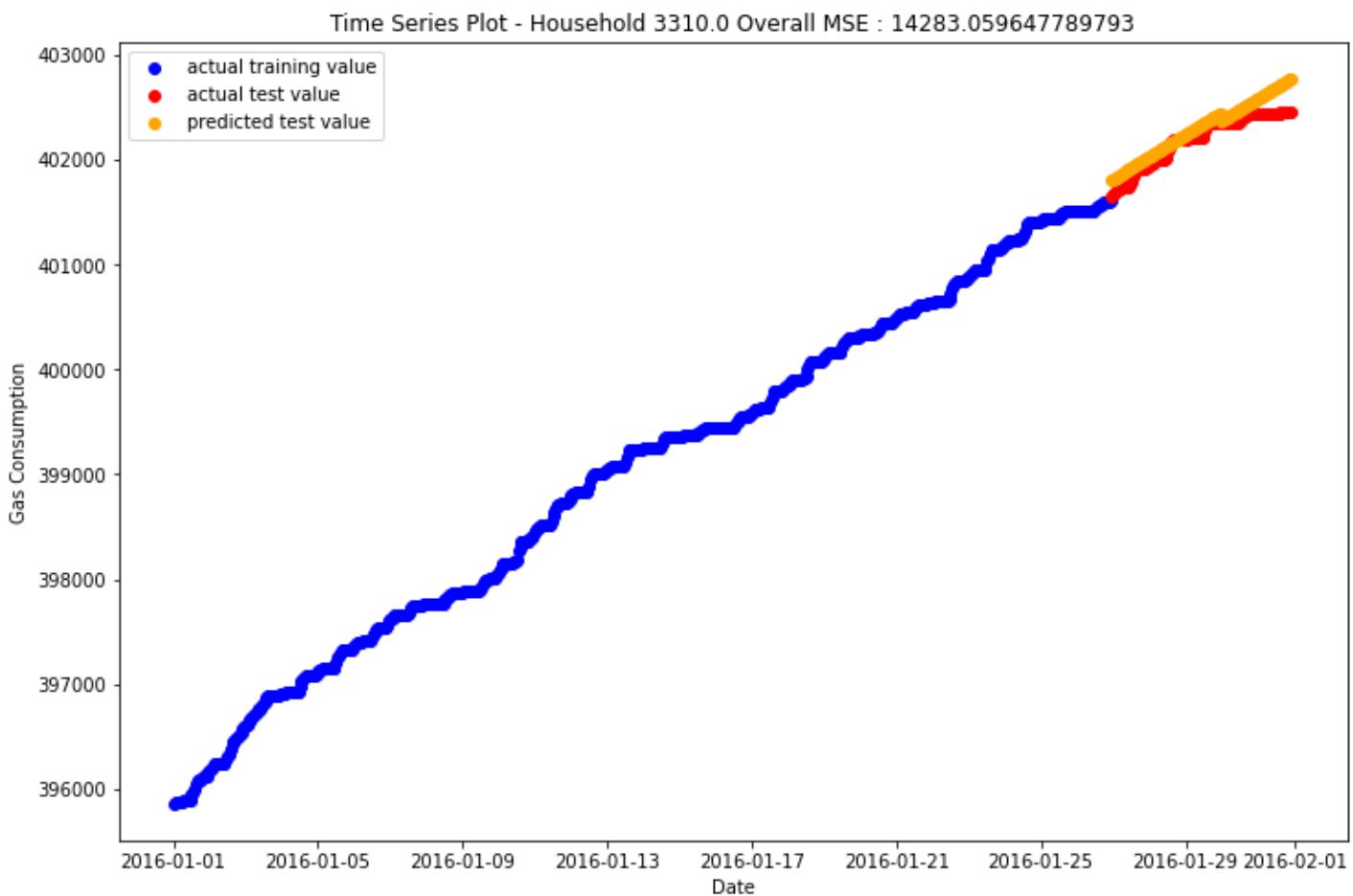
Time Series Plot - Household 3039.0 Overall MSE : 149.3713017800995



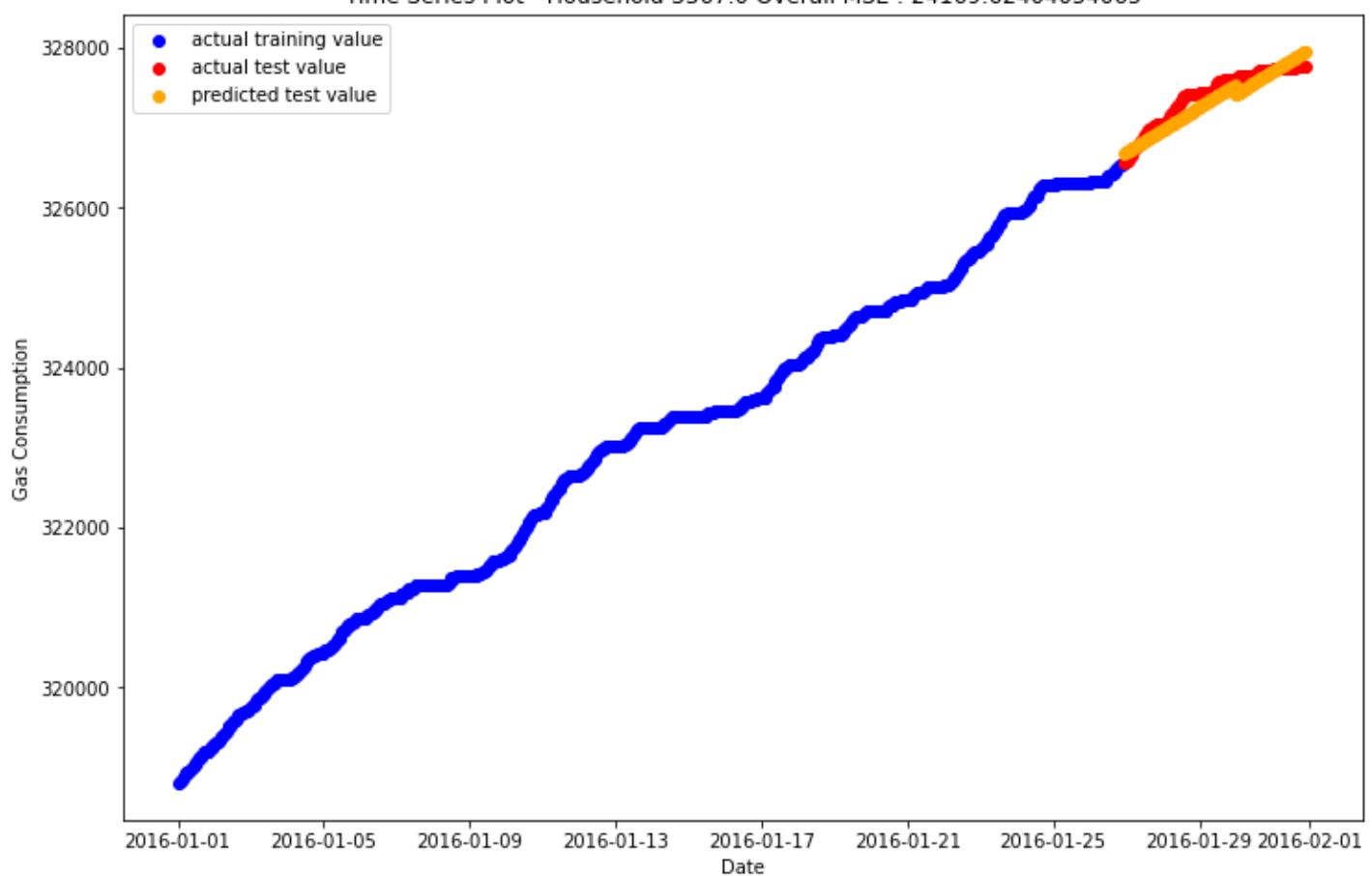
Scatter Plot - Household 3039.0 Testing MSE : 0.014088695958959004



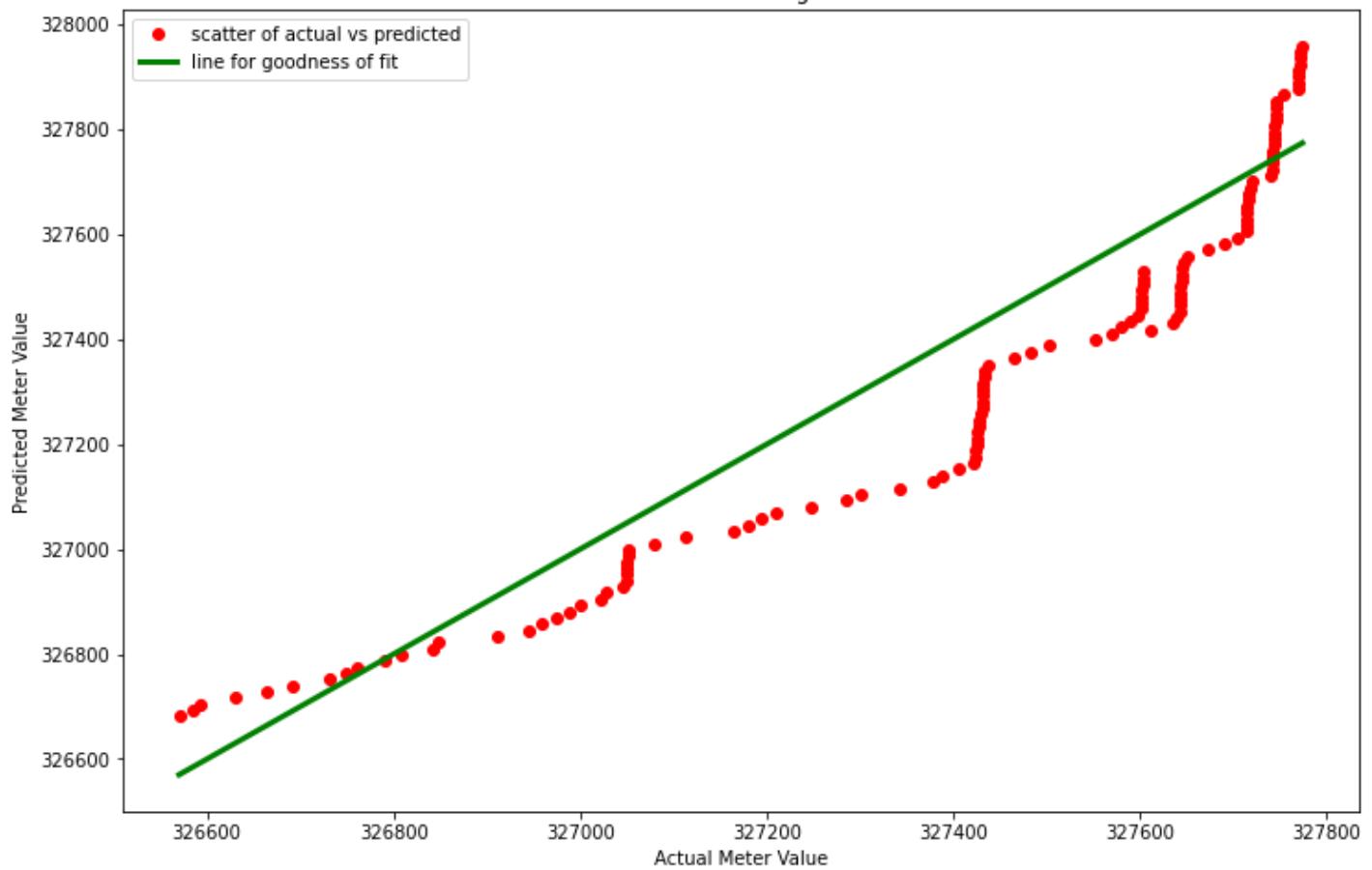




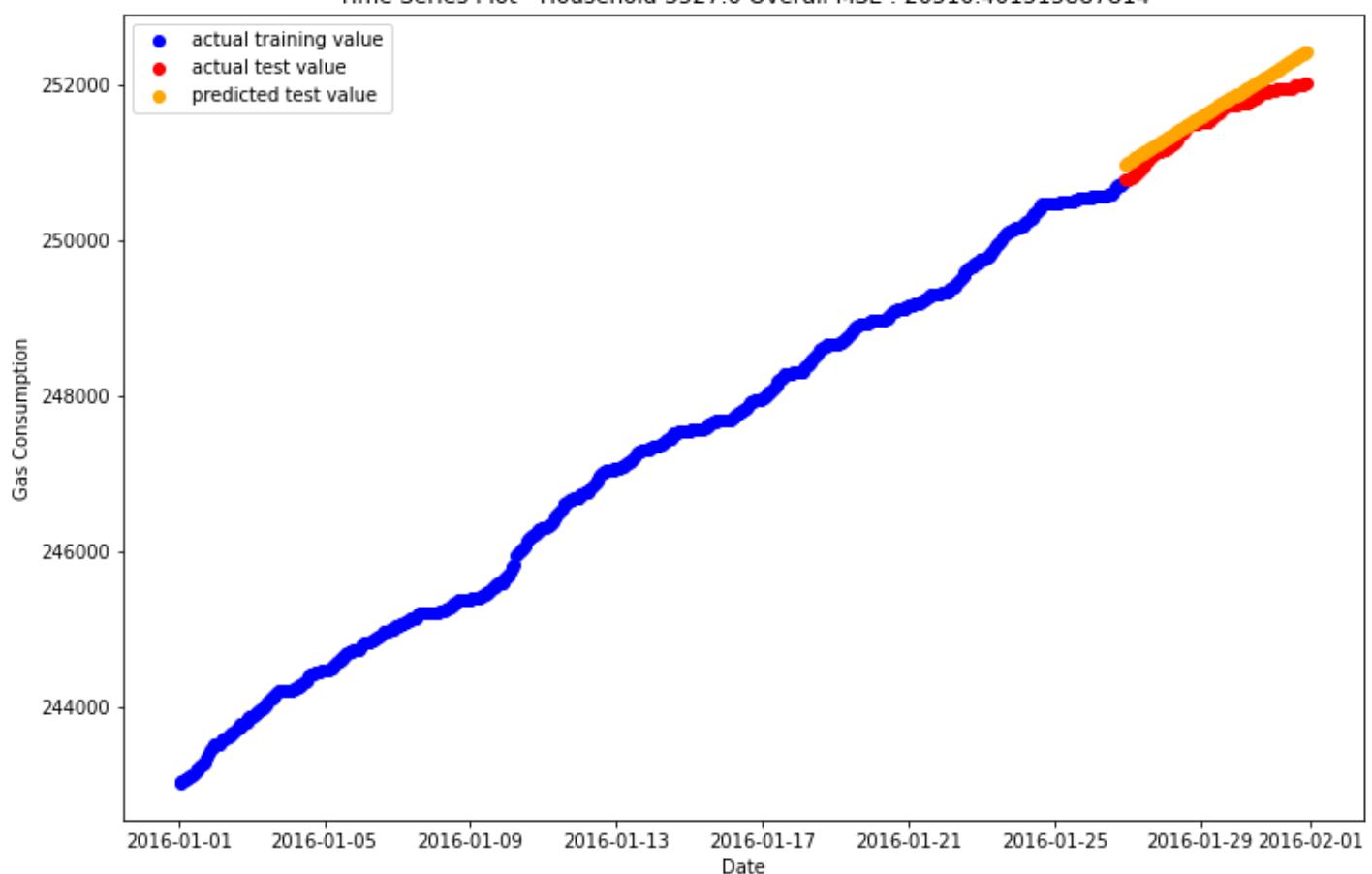
Time Series Plot - Household 3367.0 Overall MSE : 24169.62404054065



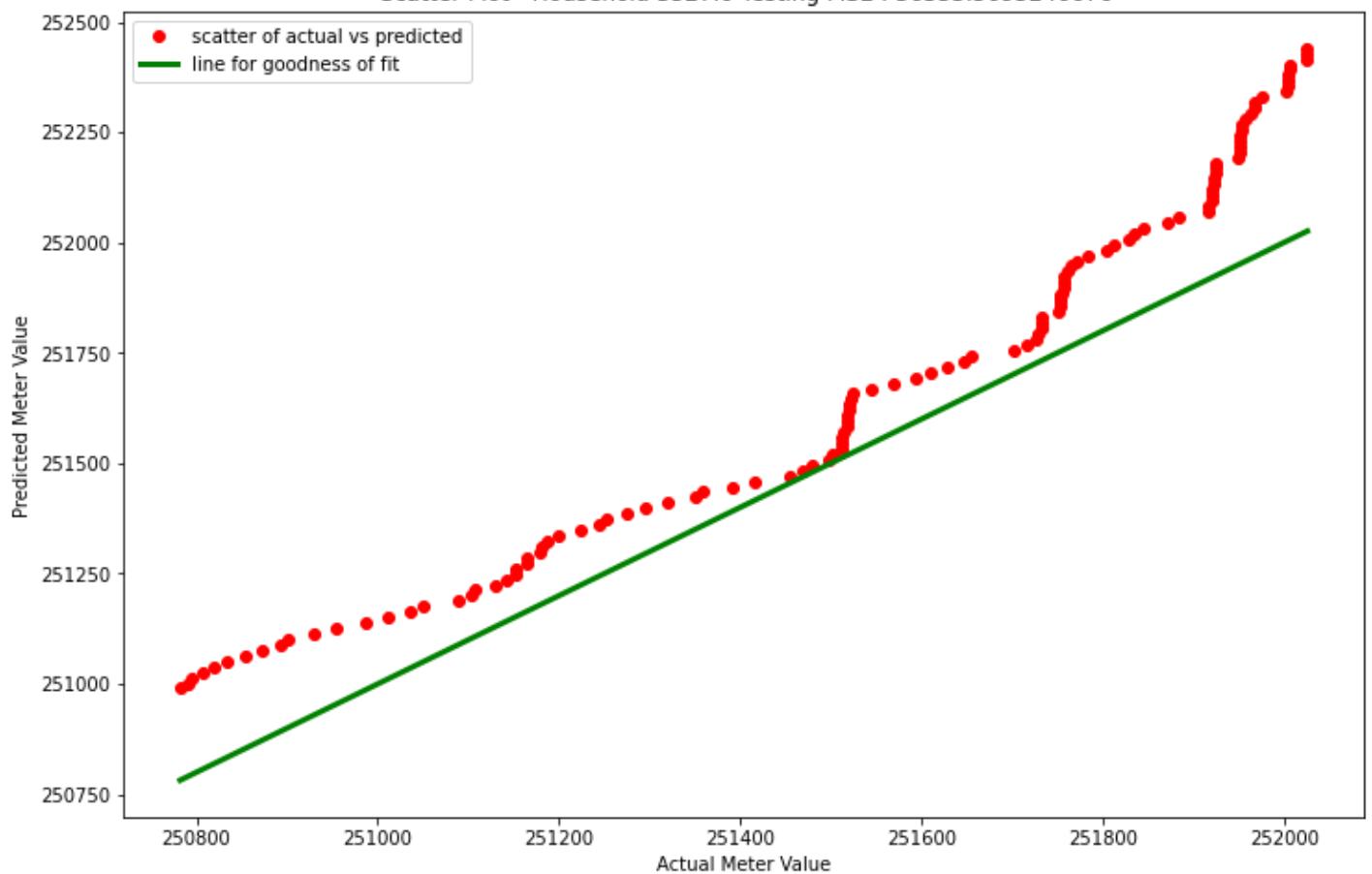
Scatter Plot - Household 3367.0 Testing MSE : 17051.65260398913



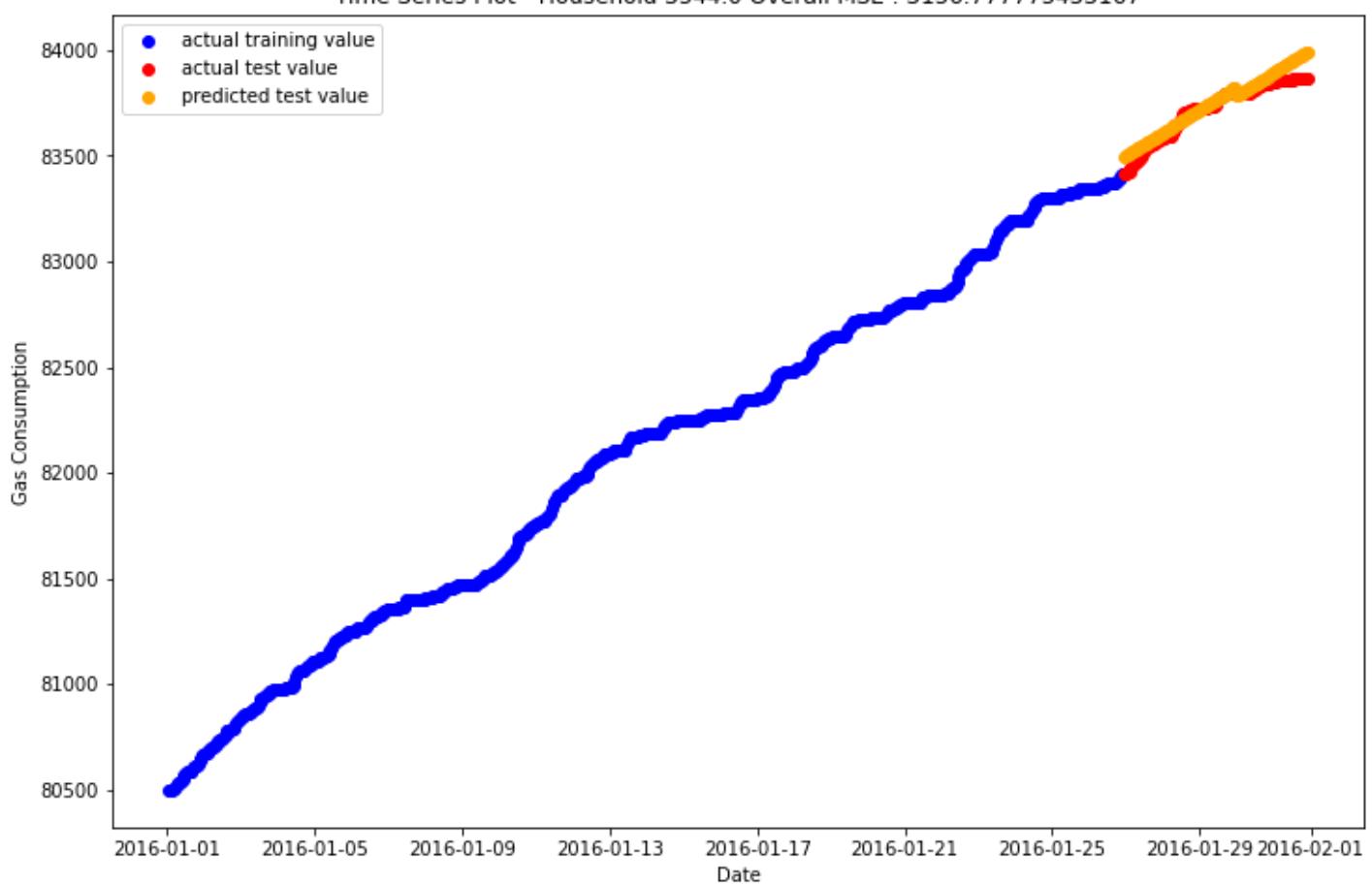
Time Series Plot - Household 3527.0 Overall MSE : 20510.401515887814



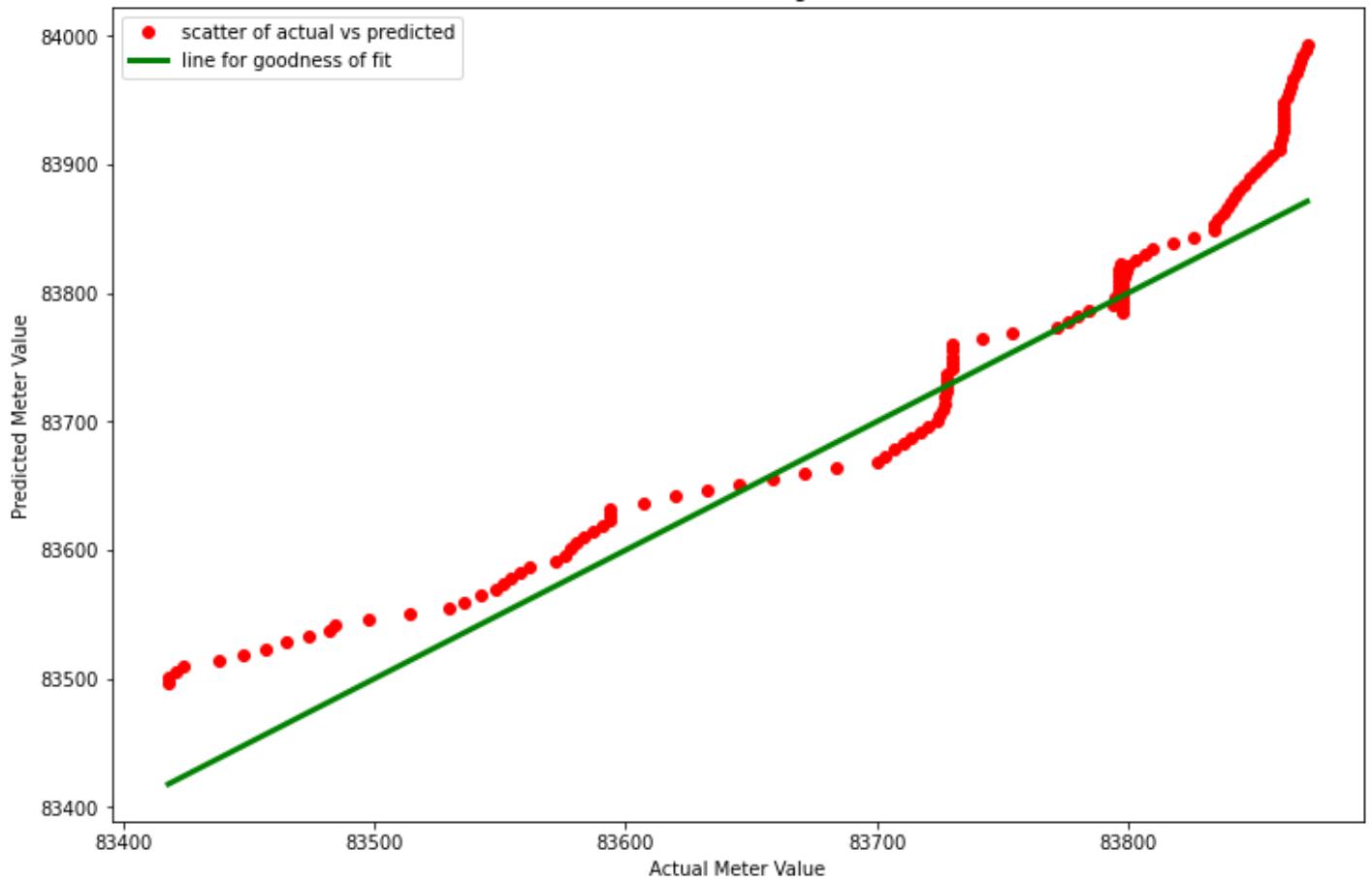
Scatter Plot - Household 3527.0 Testing MSE : 36533.5695246676



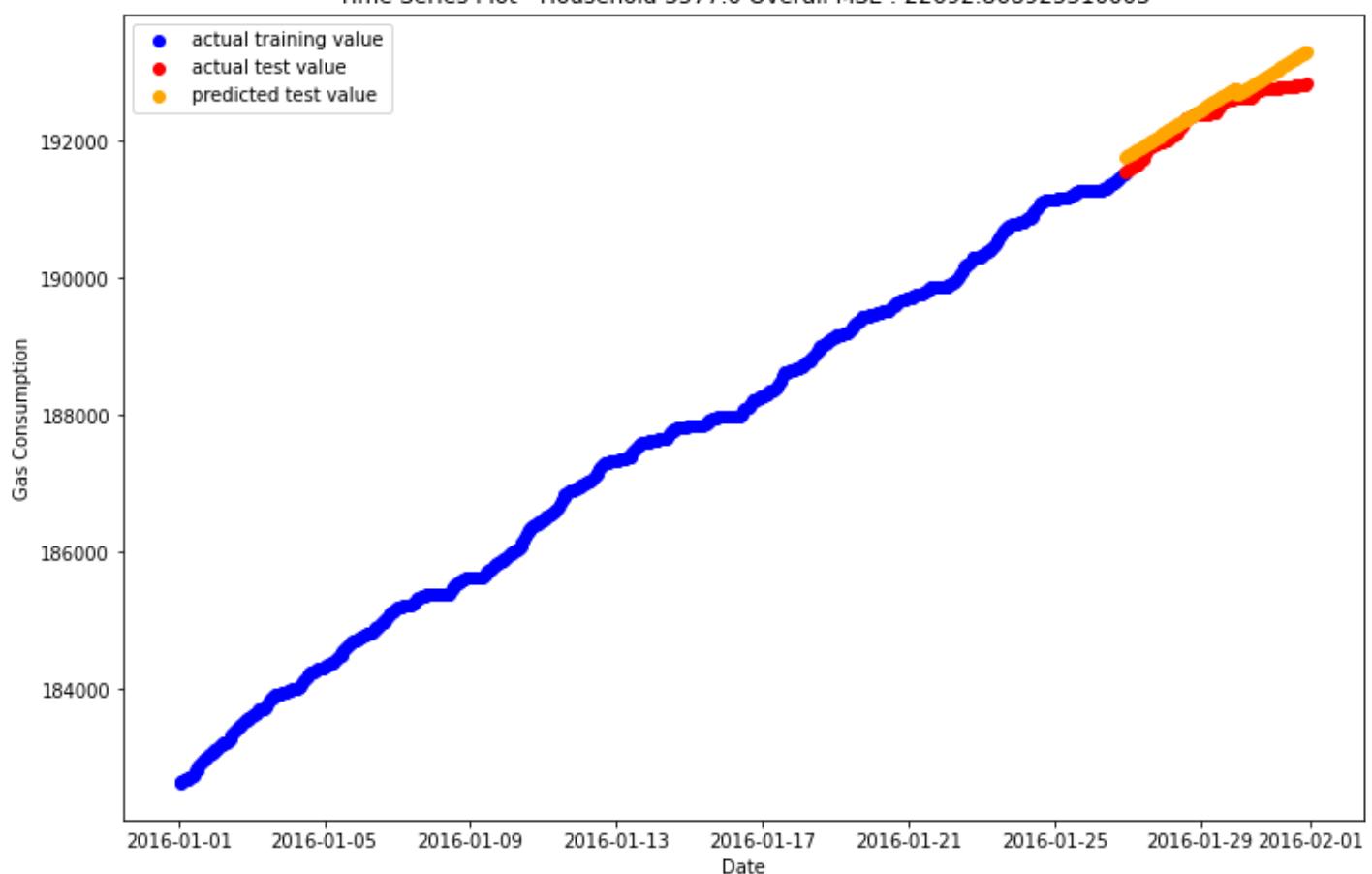
Time Series Plot - Household 3544.0 Overall MSE : 3156.777775433167



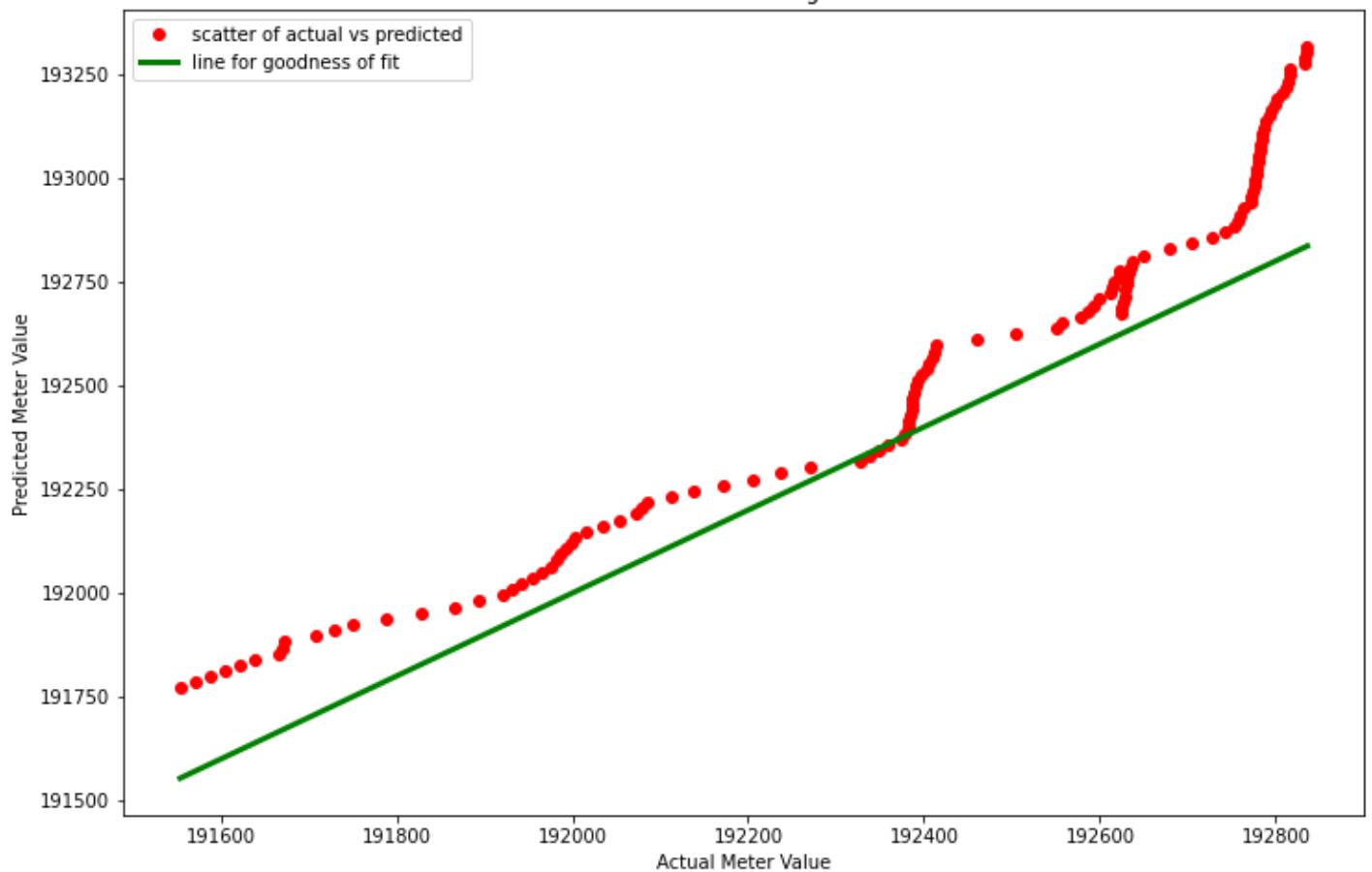
Scatter Plot - Household 3544.0 Testing MSE : 2207.115391092528



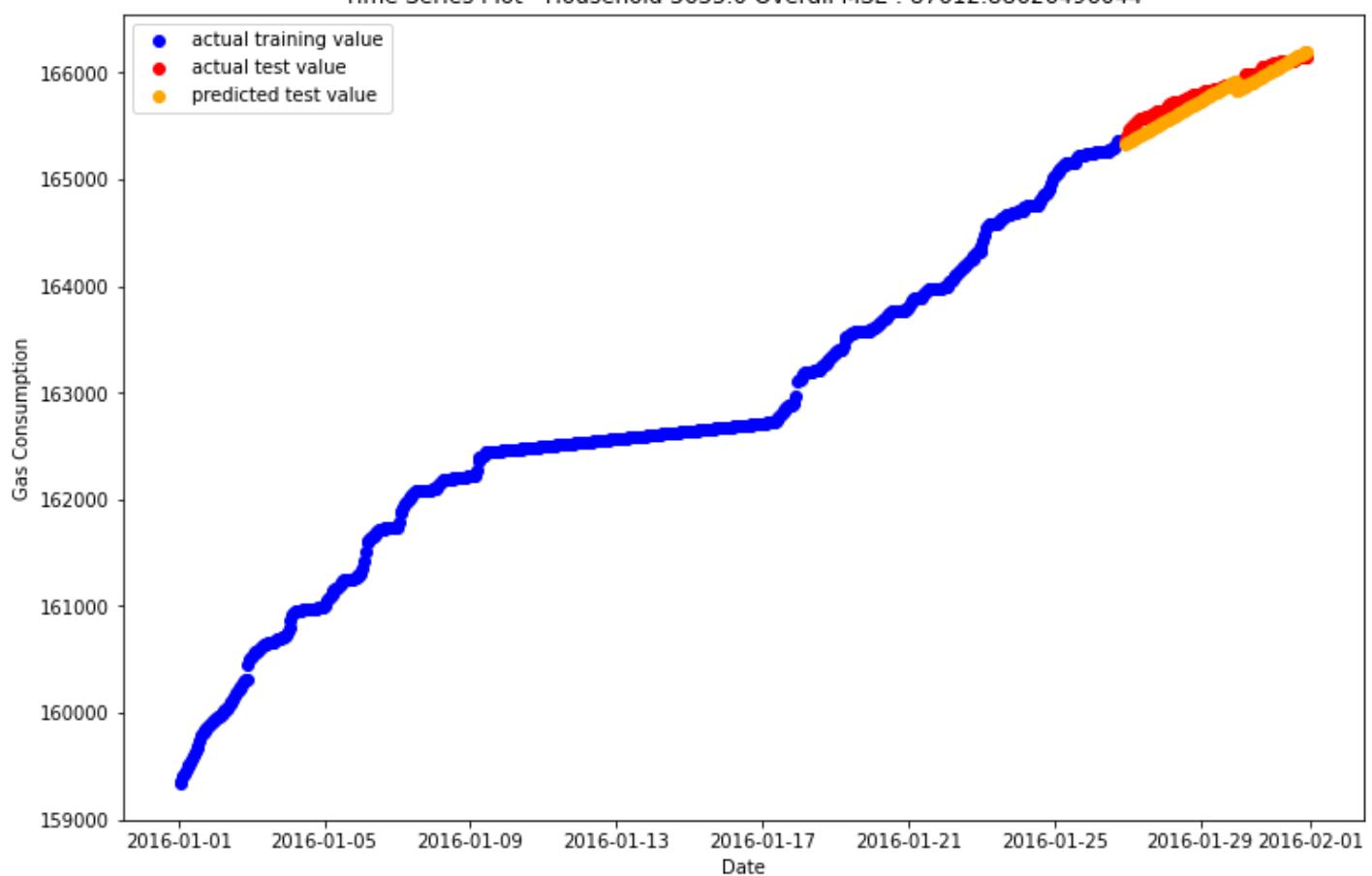
Time Series Plot - Household 3577.0 Overall MSE : 22692.868925510003



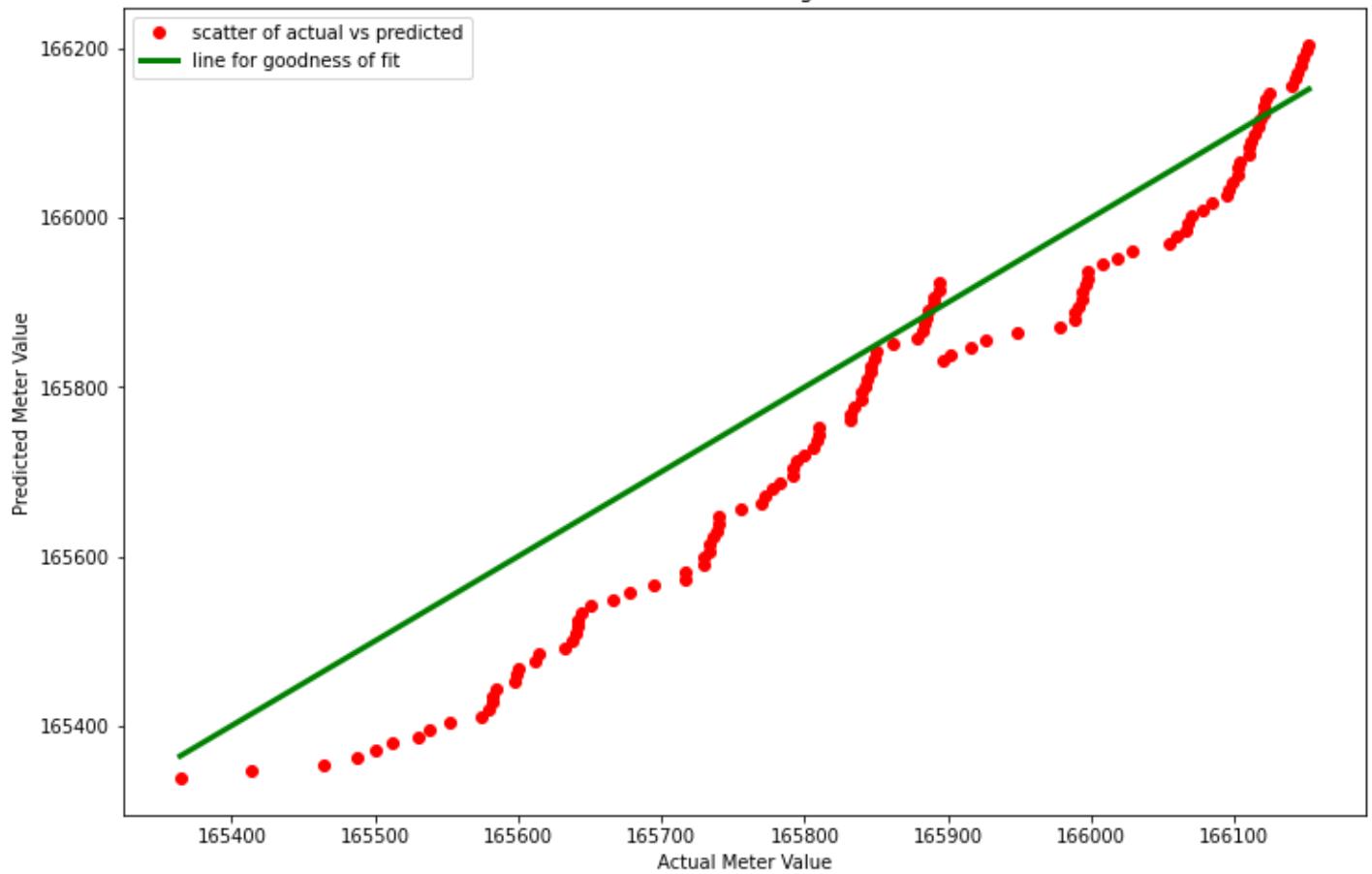
Scatter Plot - Household 3577.0 Testing MSE : 40178.5651275349



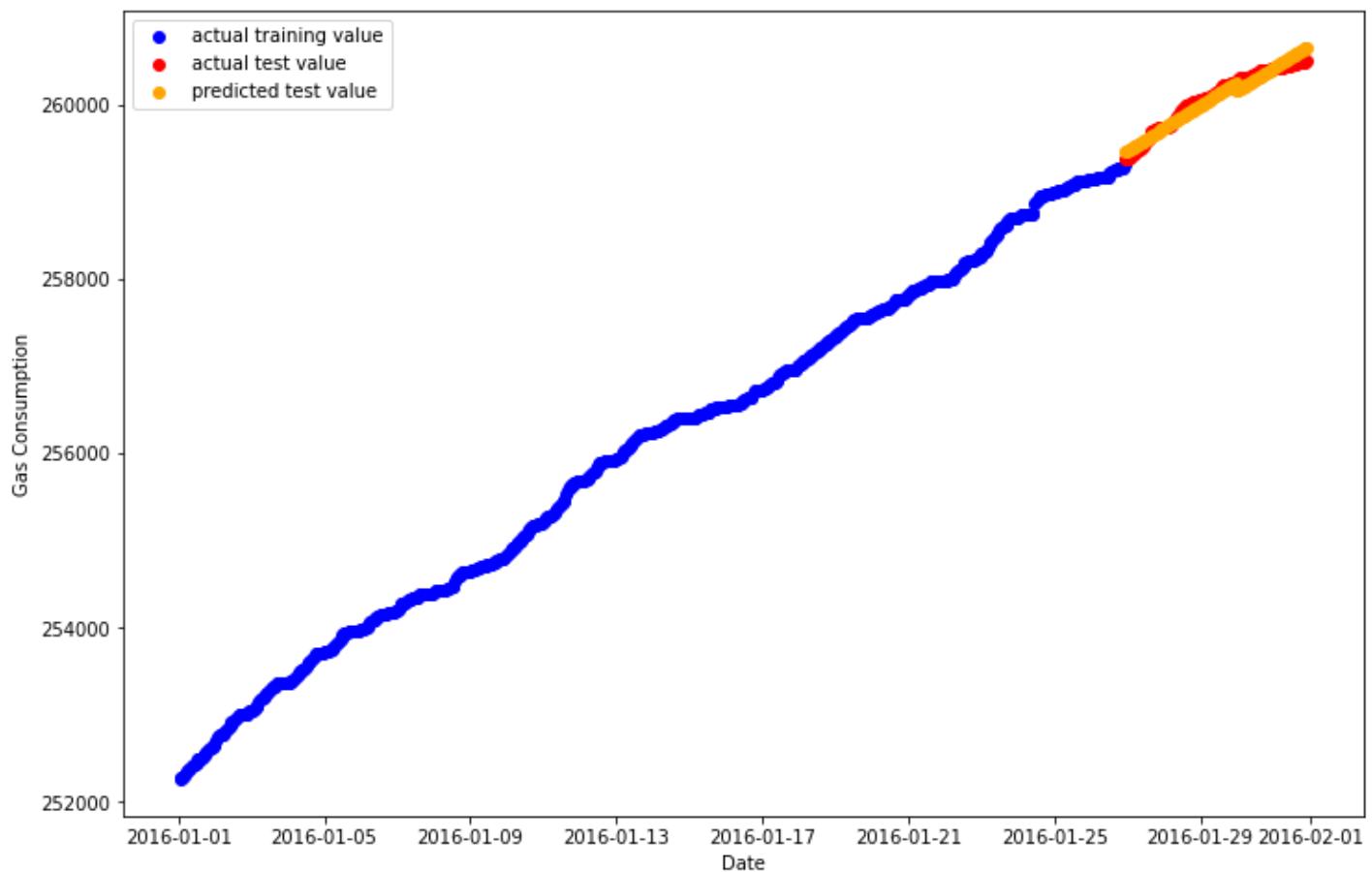
Time Series Plot - Household 3635.0 Overall MSE : 87612.88626496044



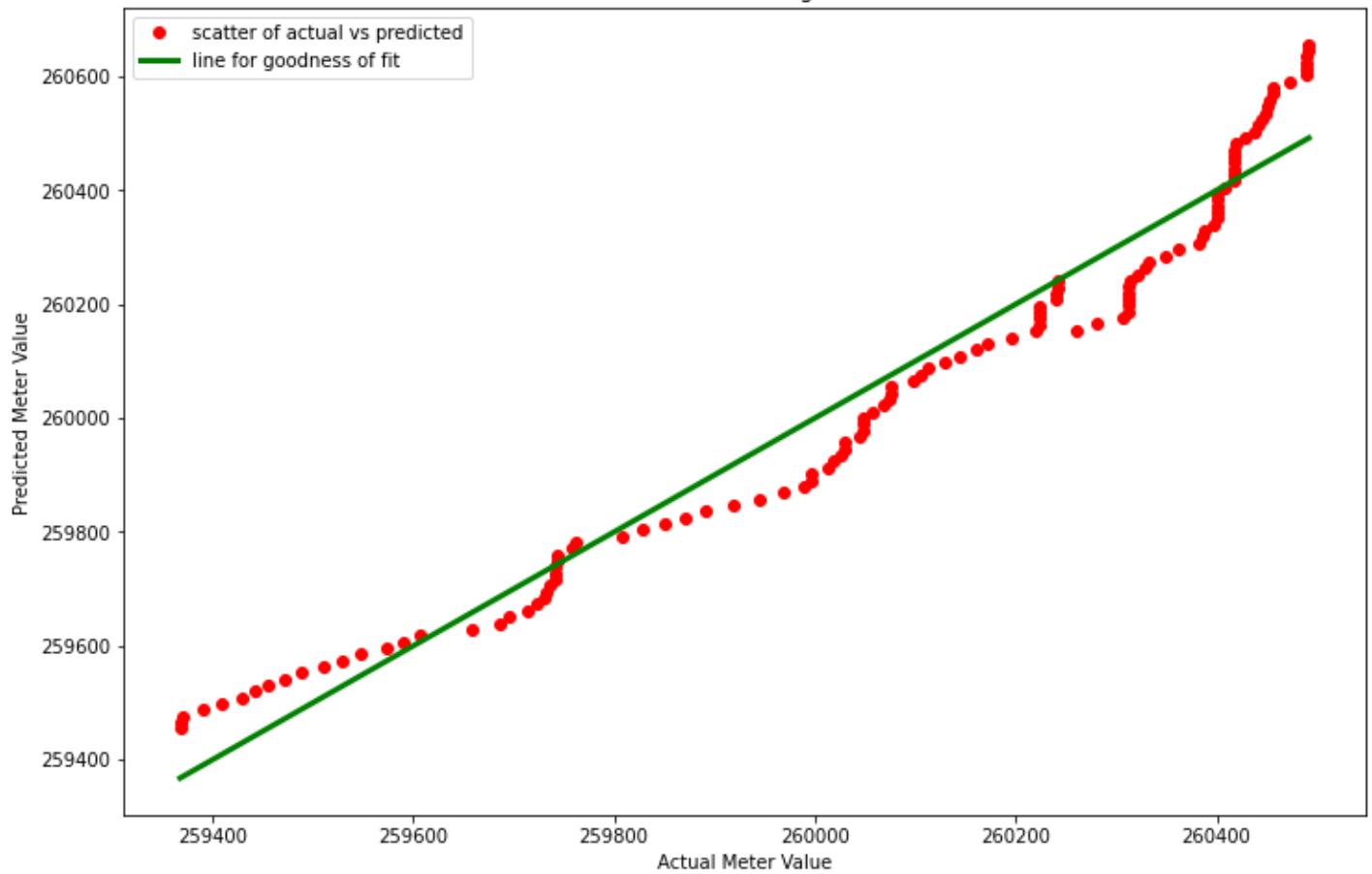
Scatter Plot - Household 3635.0 Testing MSE : 7892.933967680832



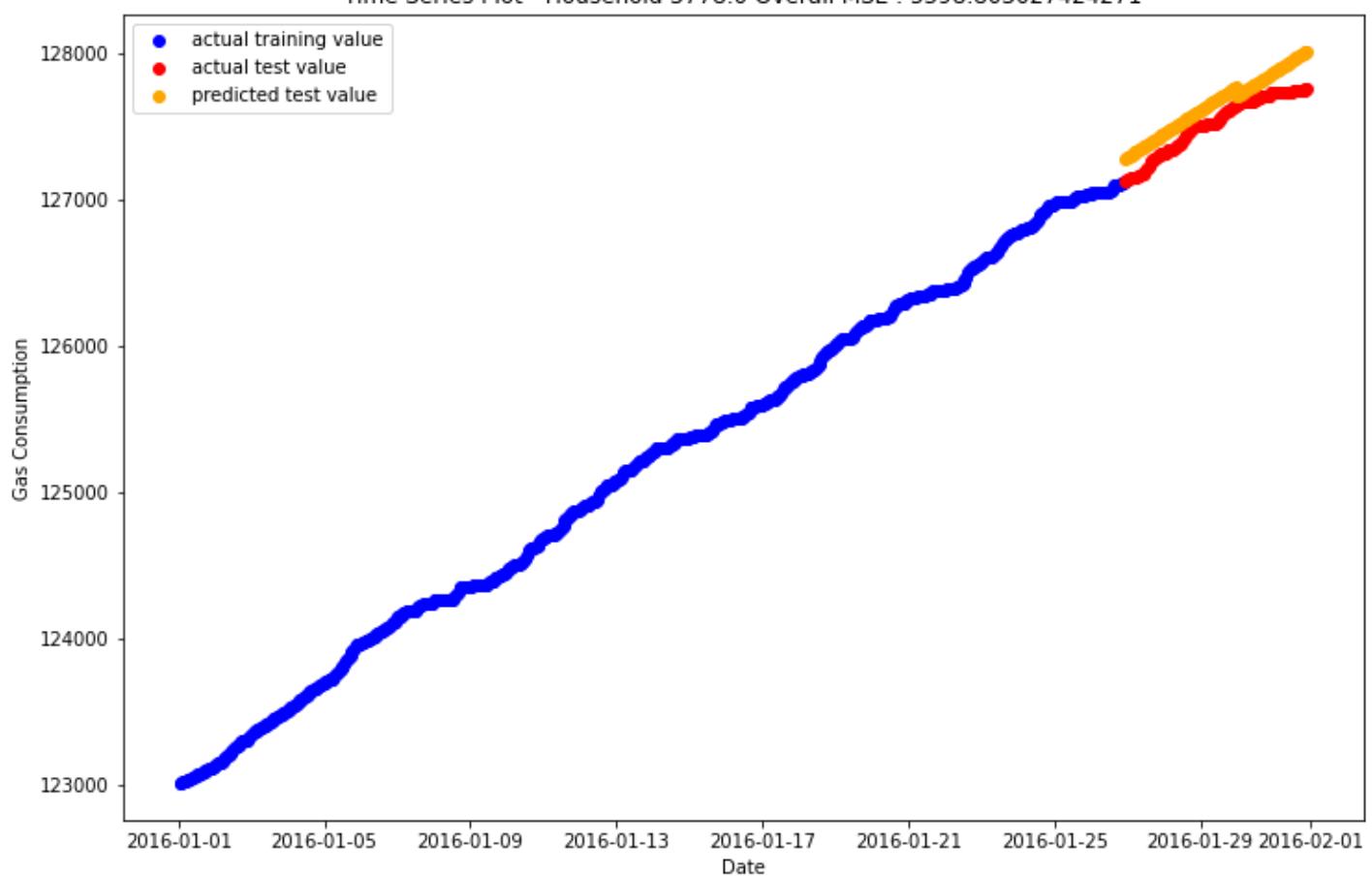
Time Series Plot - Household 3723.0 Overall MSE : 9718.440085755472



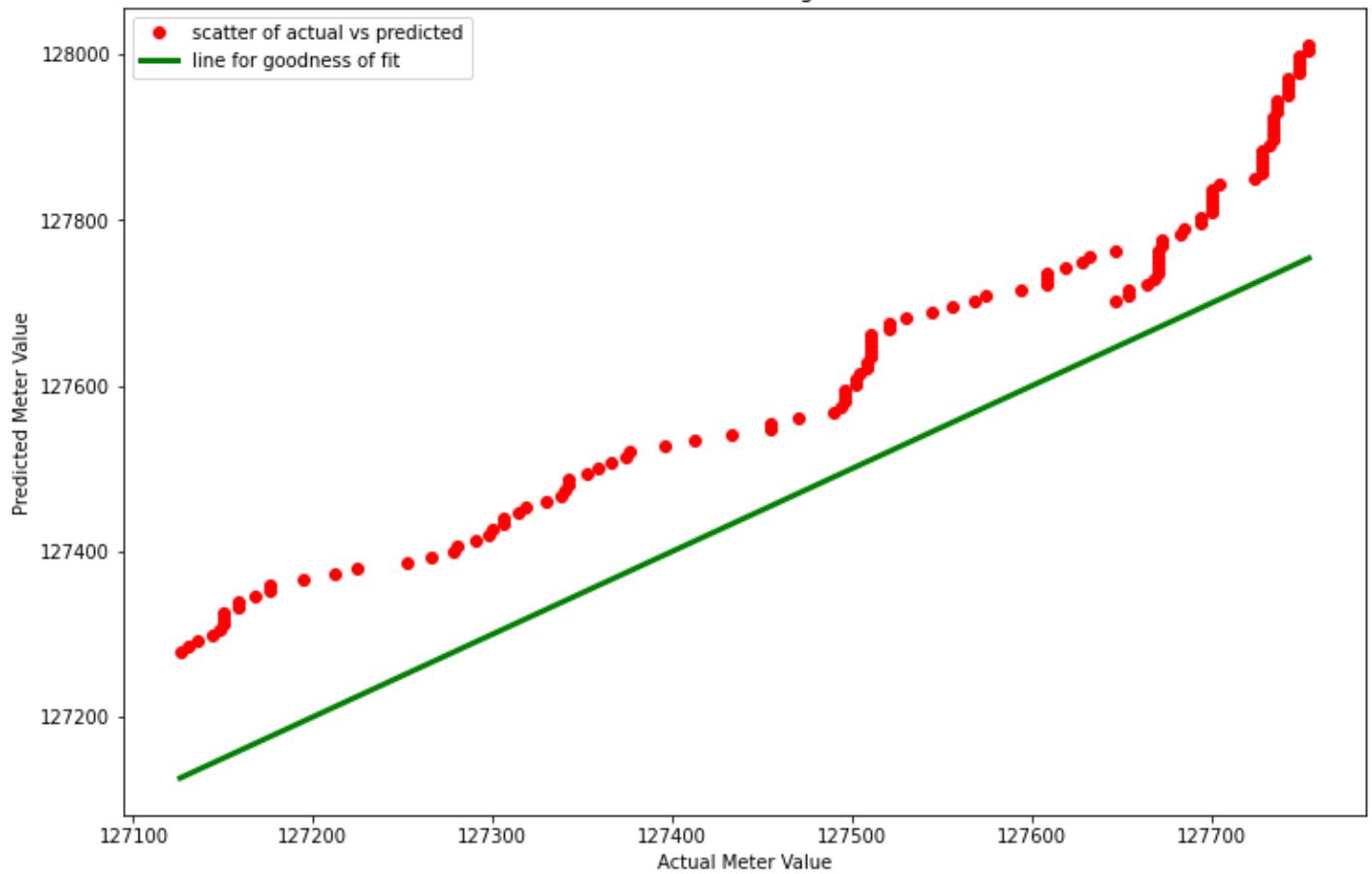
Scatter Plot - Household 3723.0 Testing MSE : 5067.326245389539



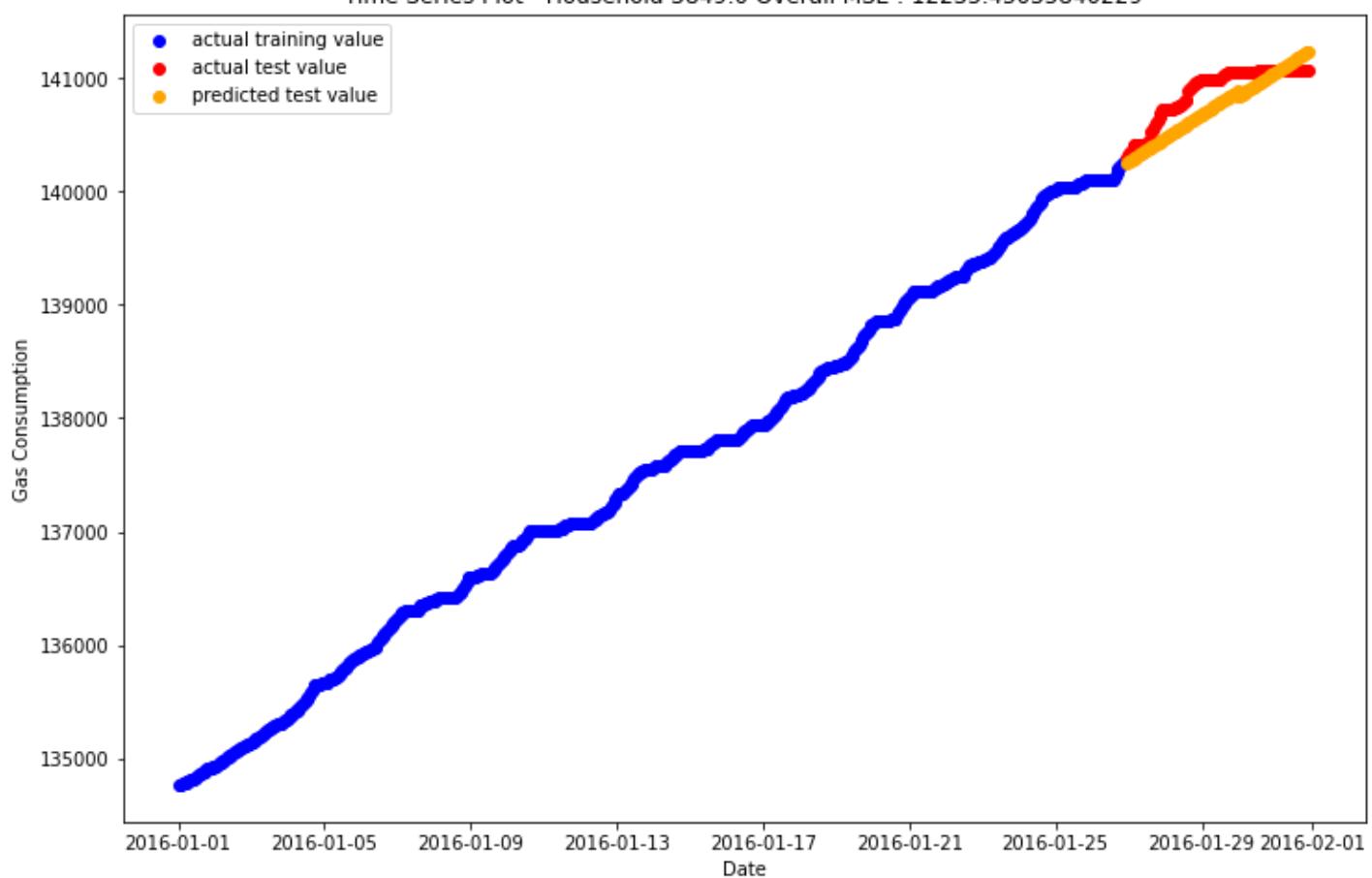
Time Series Plot - Household 3778.0 Overall MSE : 5598.803027424271



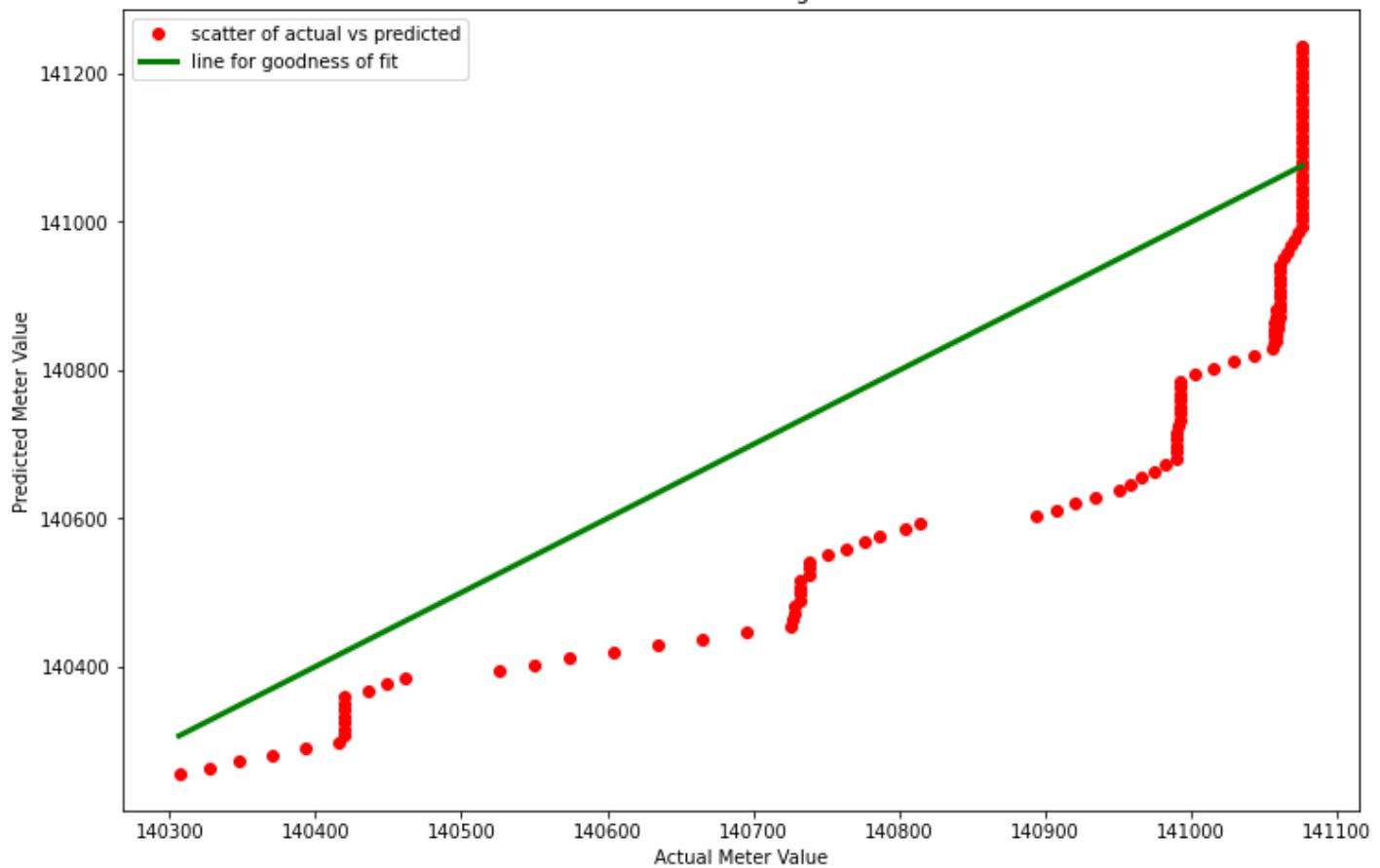
Scatter Plot - Household 3778.0 Testing MSE : 21081.76301541005



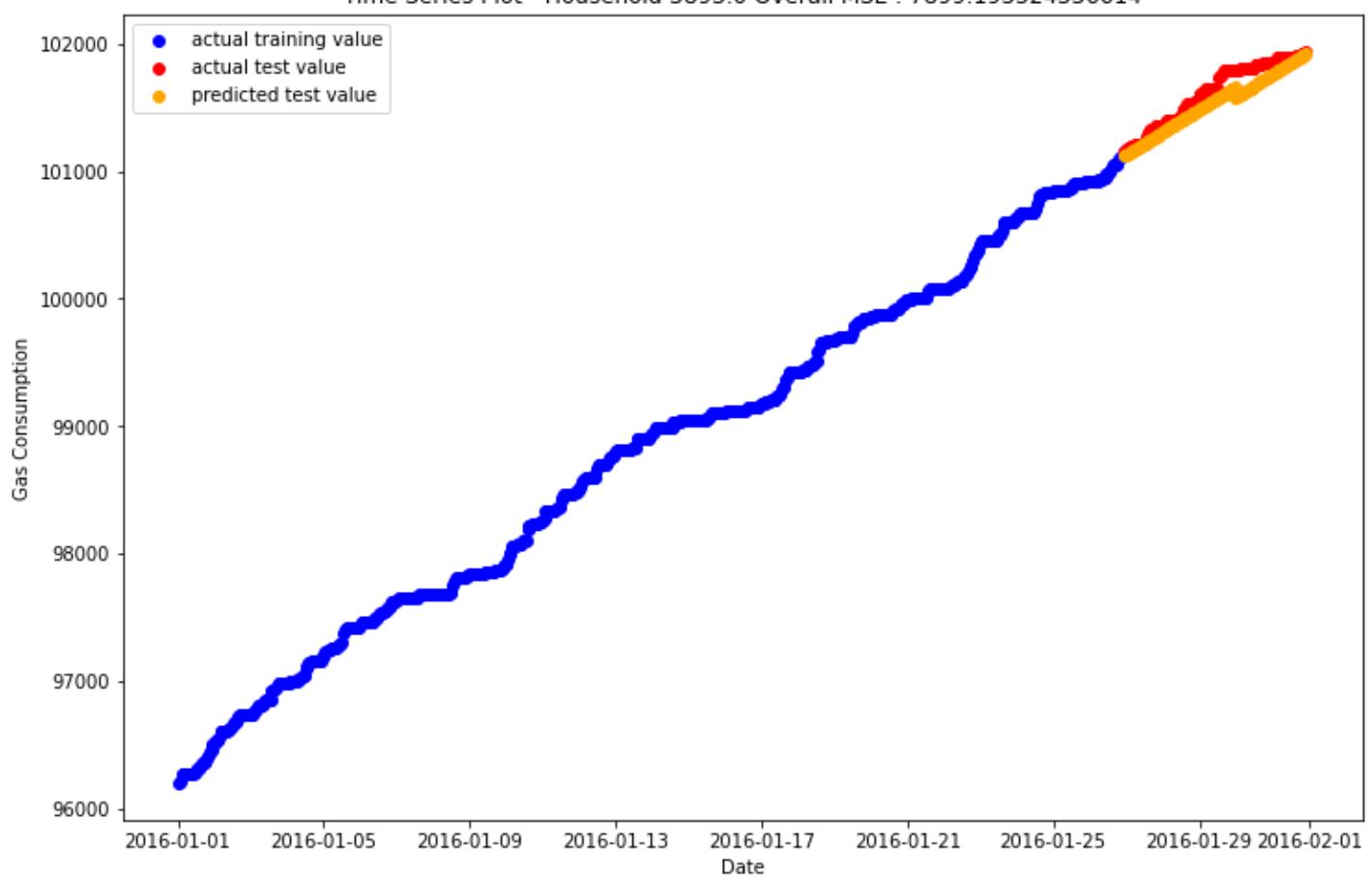
Time Series Plot - Household 3849.0 Overall MSE : 12235.45035840229



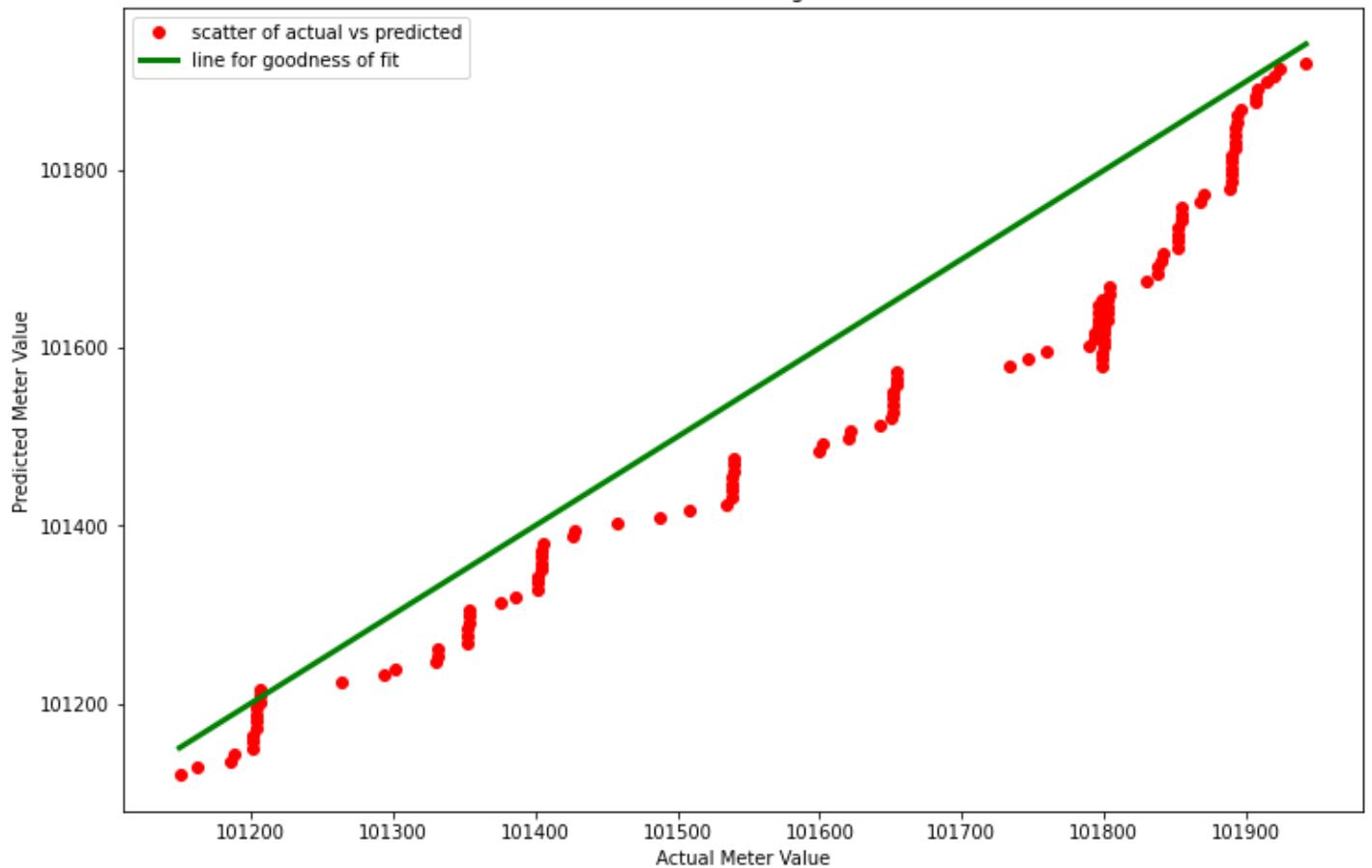
Scatter Plot - Household 3849.0 Testing MSE : 33862.45784590375



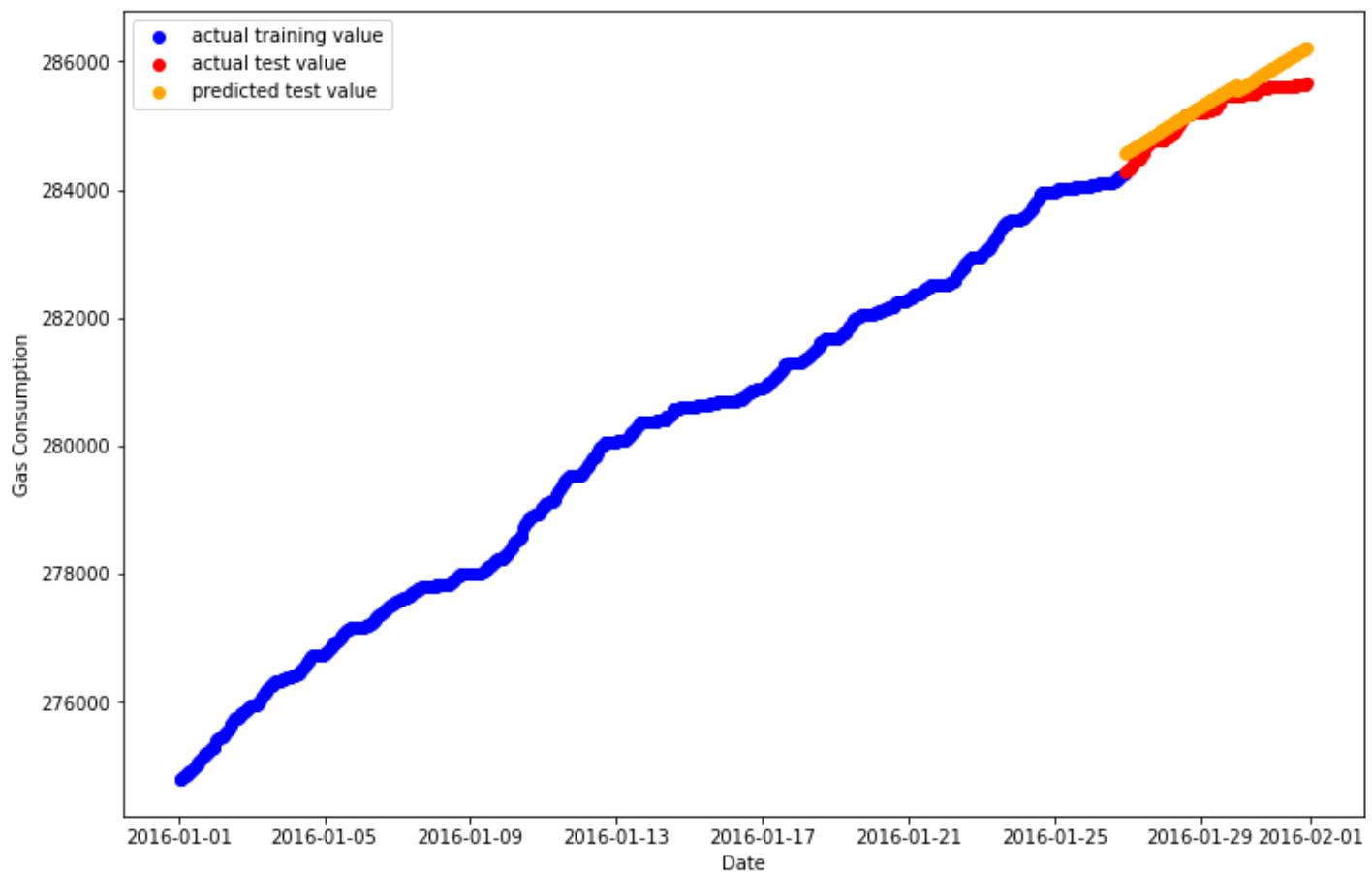
Time Series Plot - Household 3893.0 Overall MSE : 7899.193524336614



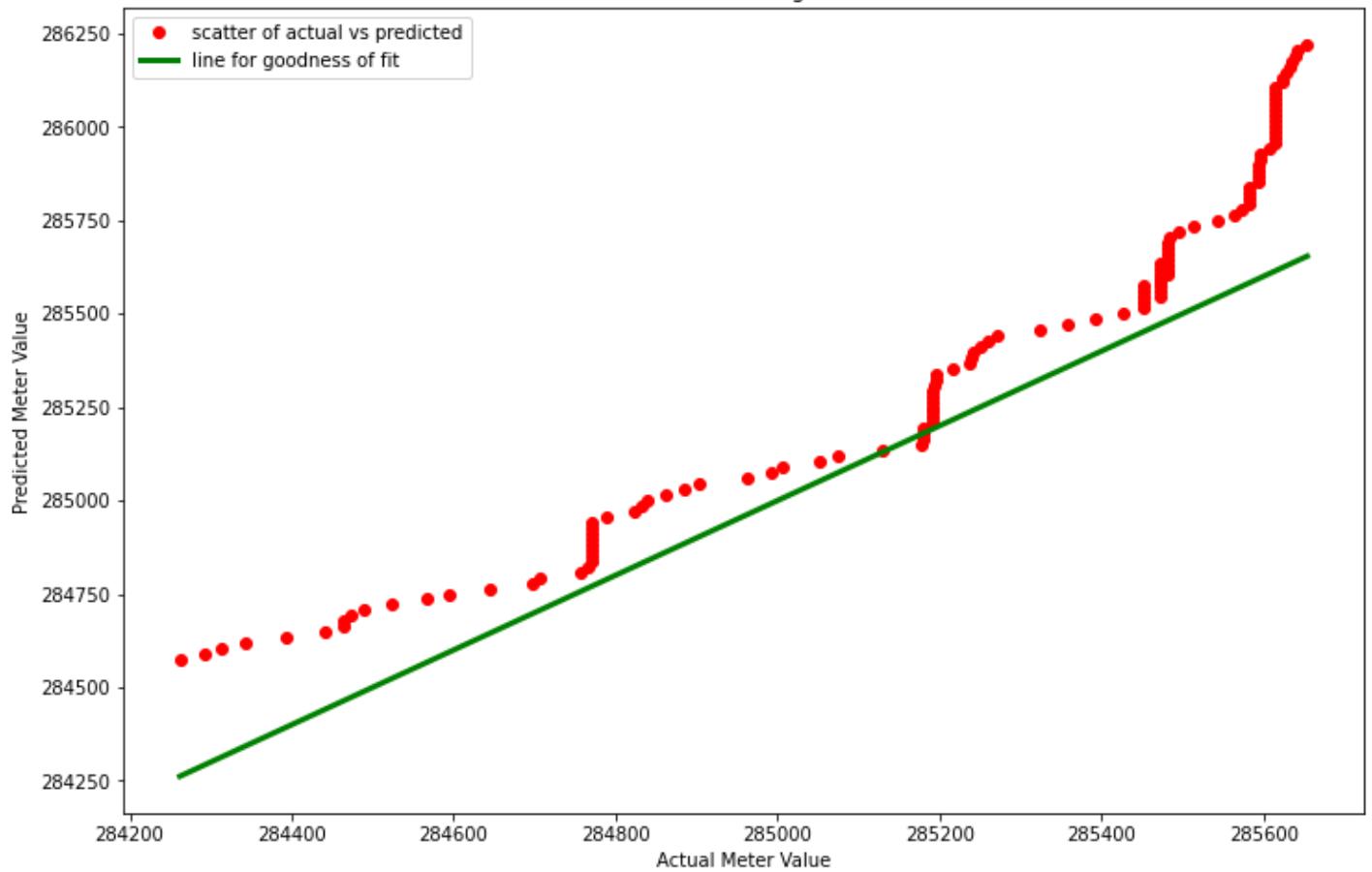
Scatter Plot - Household 3893.0 Testing MSE : 11271.470172614574



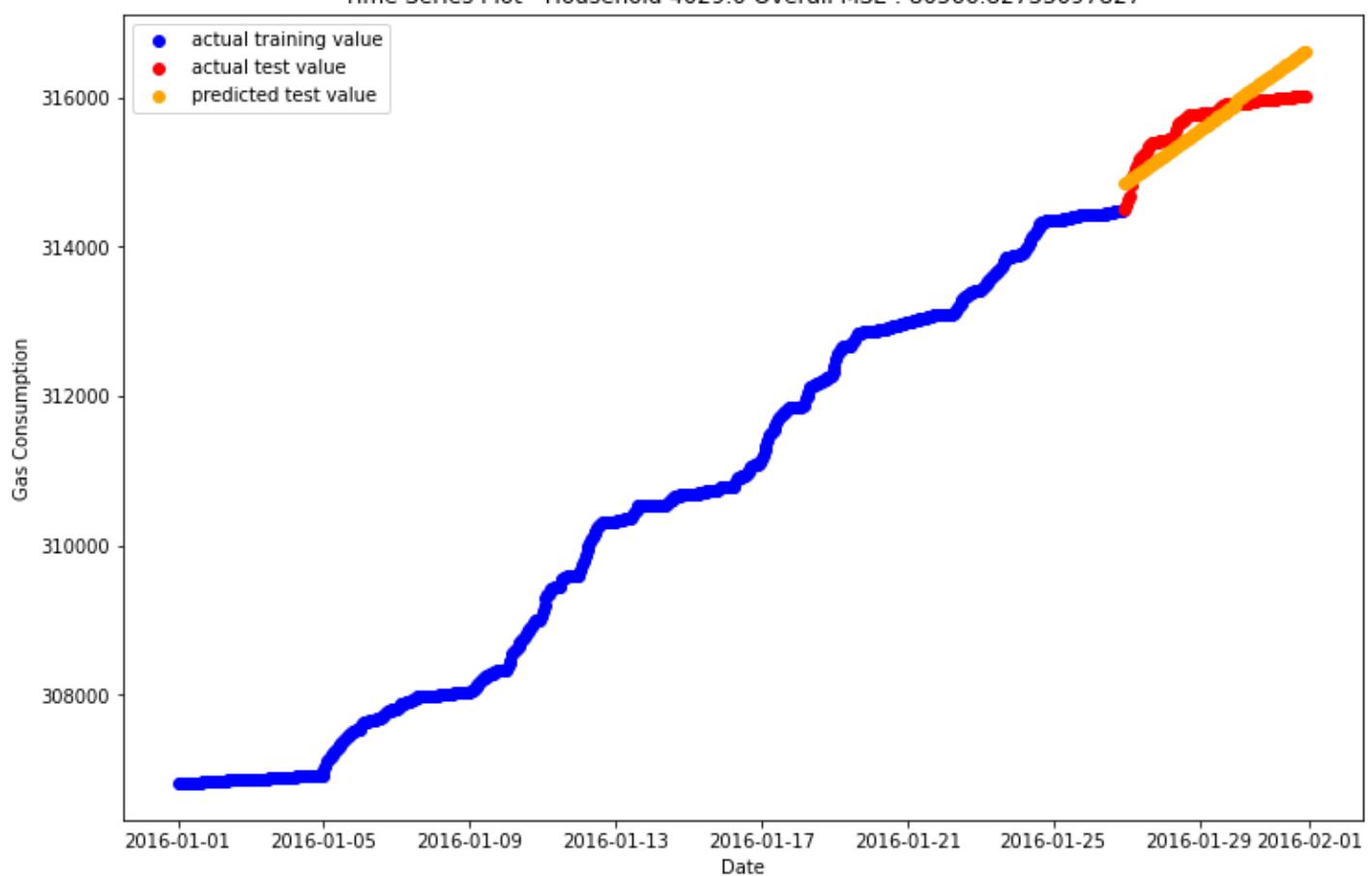
Time Series Plot - Household 3918.0 Overall MSE : 45457.28318949781



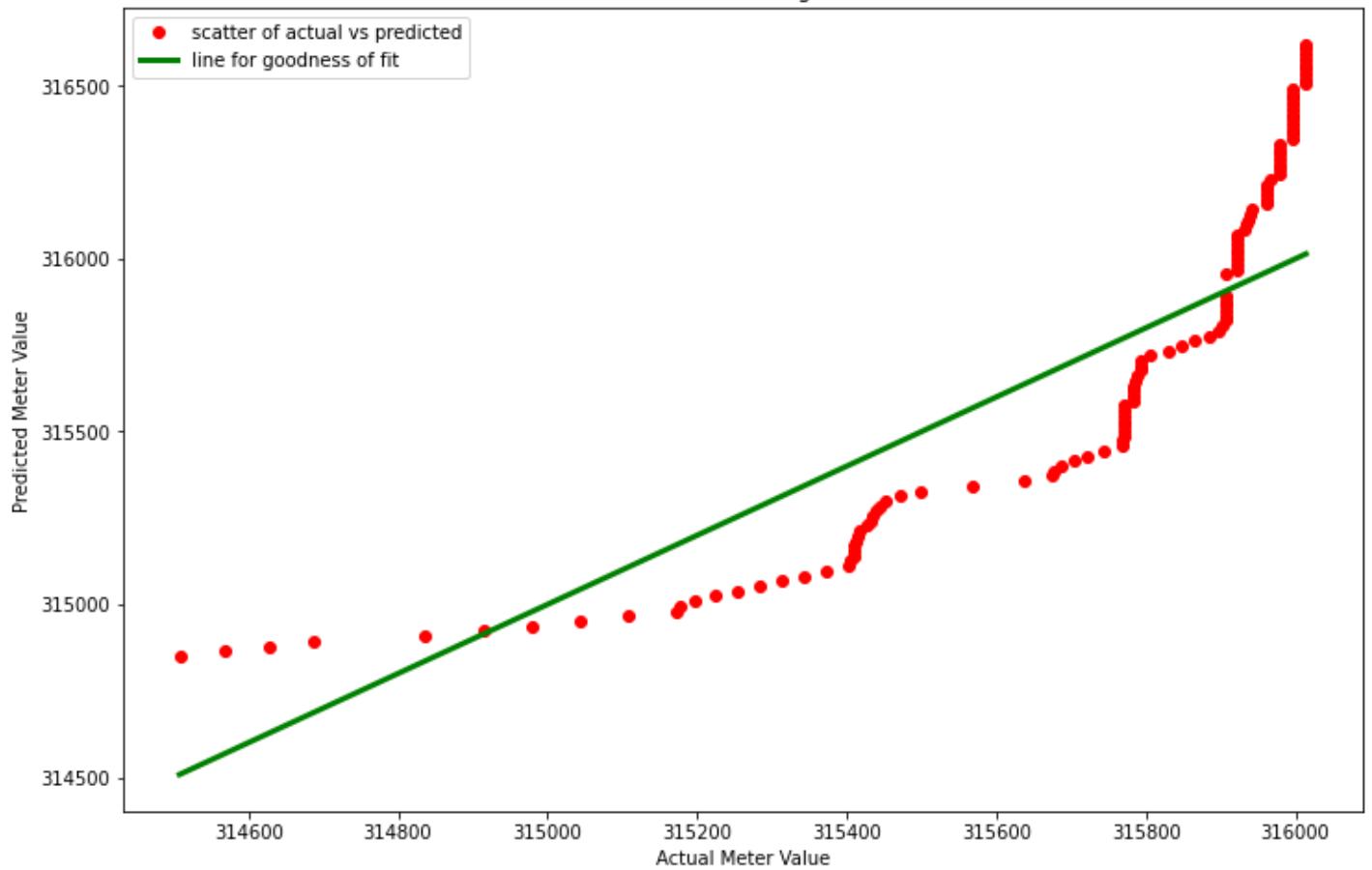
Scatter Plot - Household 3918.0 Testing MSE : 58865.588290950254



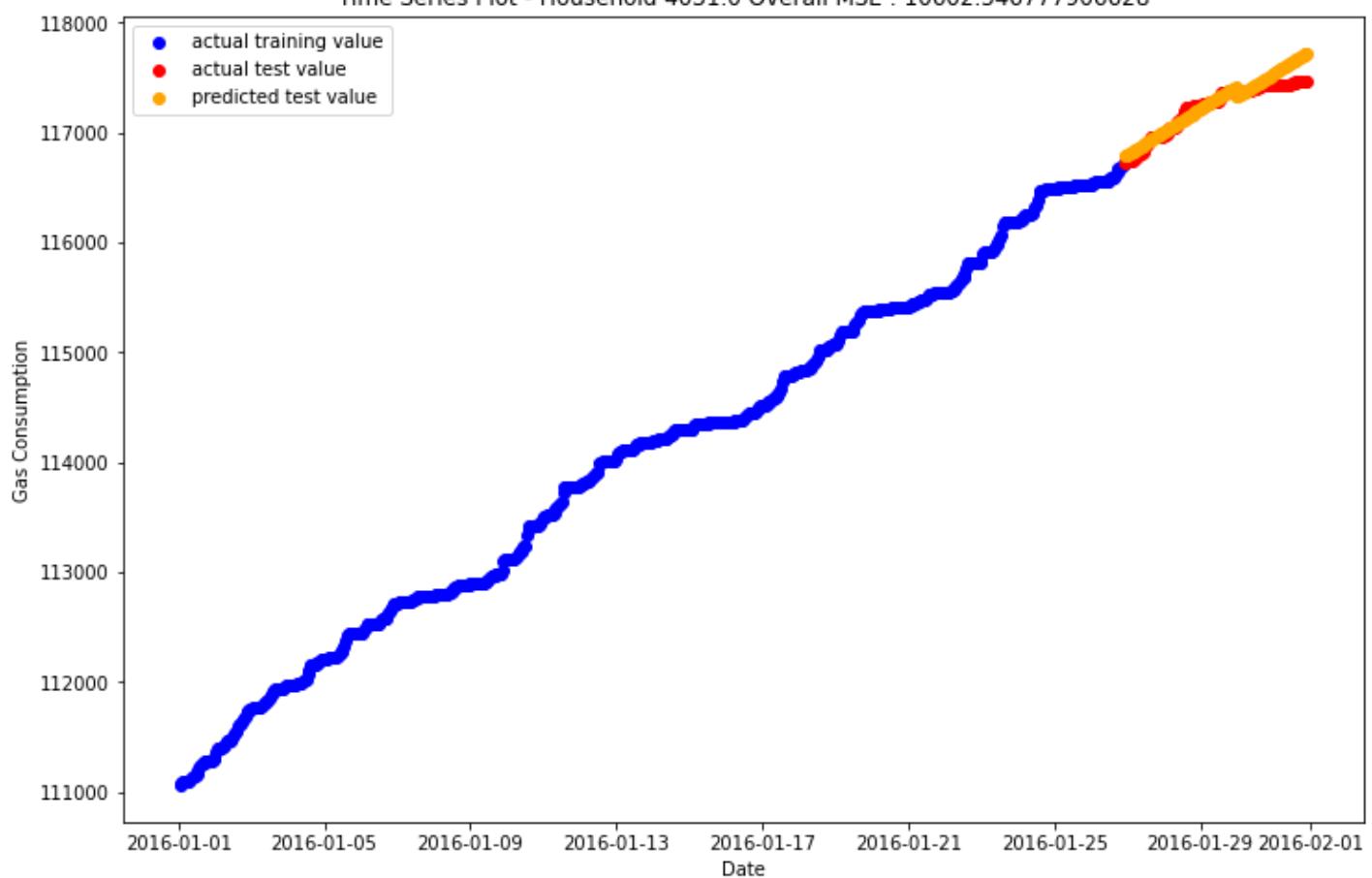
Time Series Plot - Household 4029.0 Overall MSE : 80566.82733097827



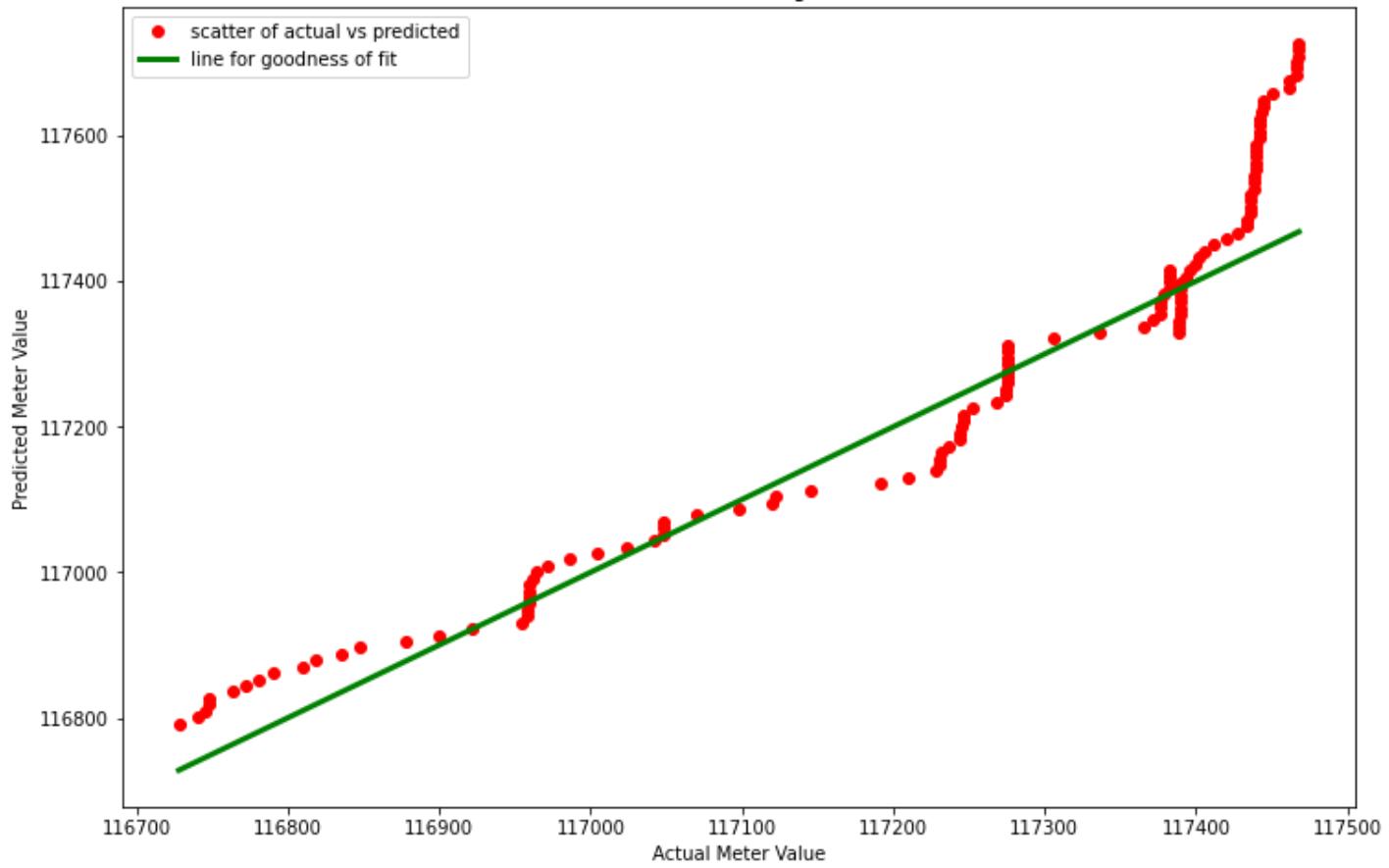
Scatter Plot - Household 4029.0 Testing MSE : 74938.00825325468



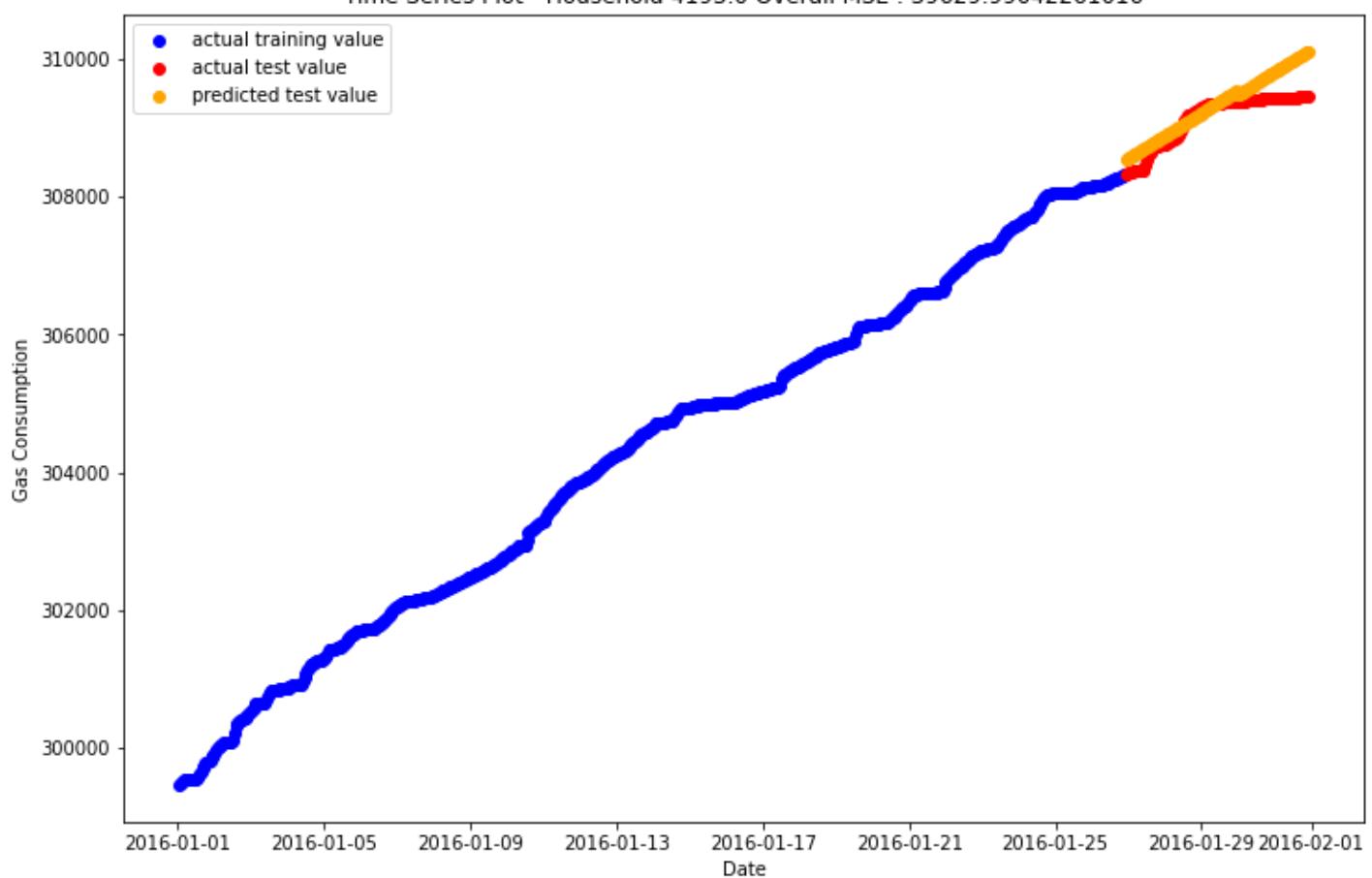
Time Series Plot - Household 4031.0 Overall MSE : 10602.546777906628



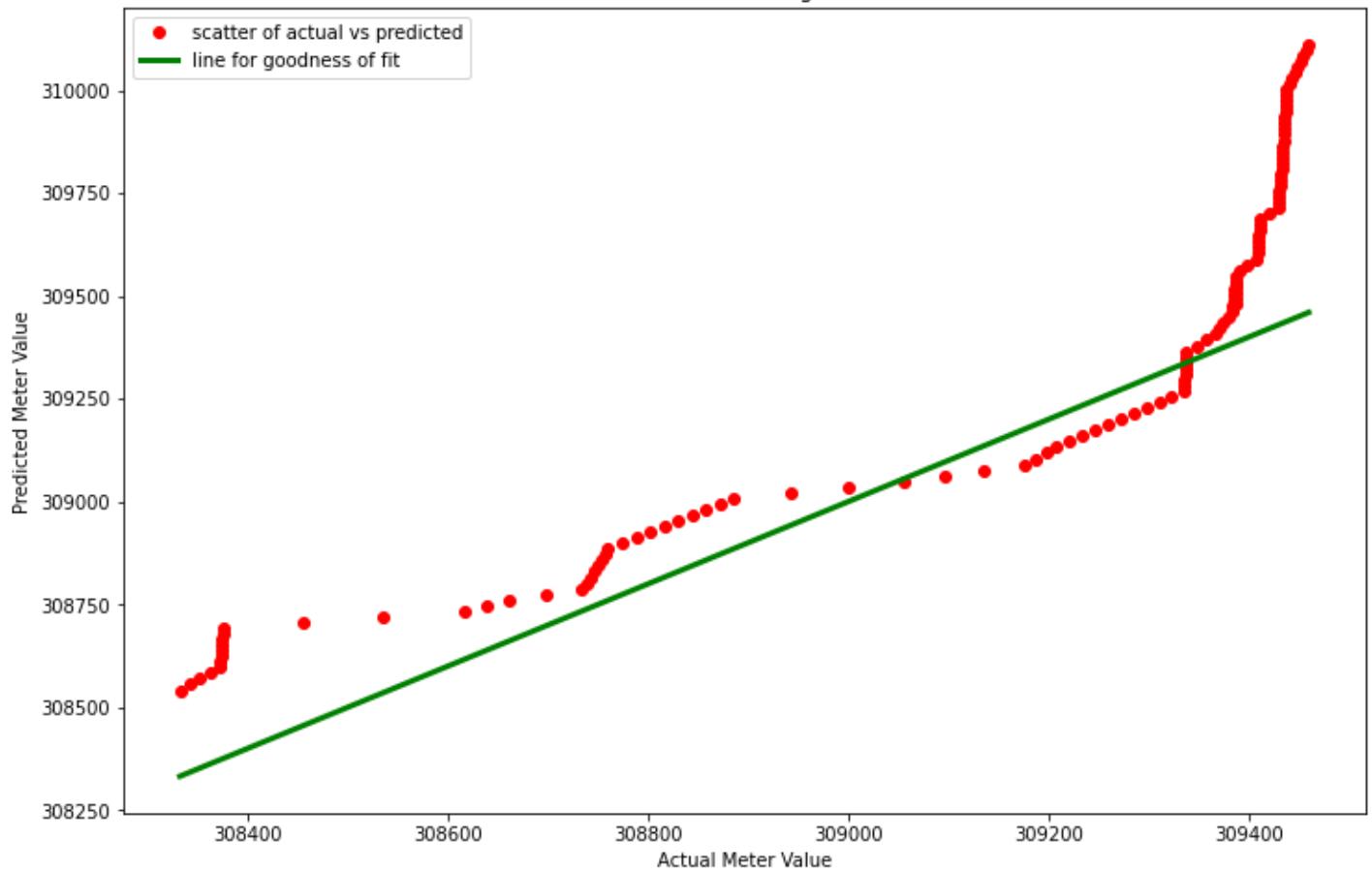
Scatter Plot - Household 4031.0 Testing MSE : 8238.493763573428



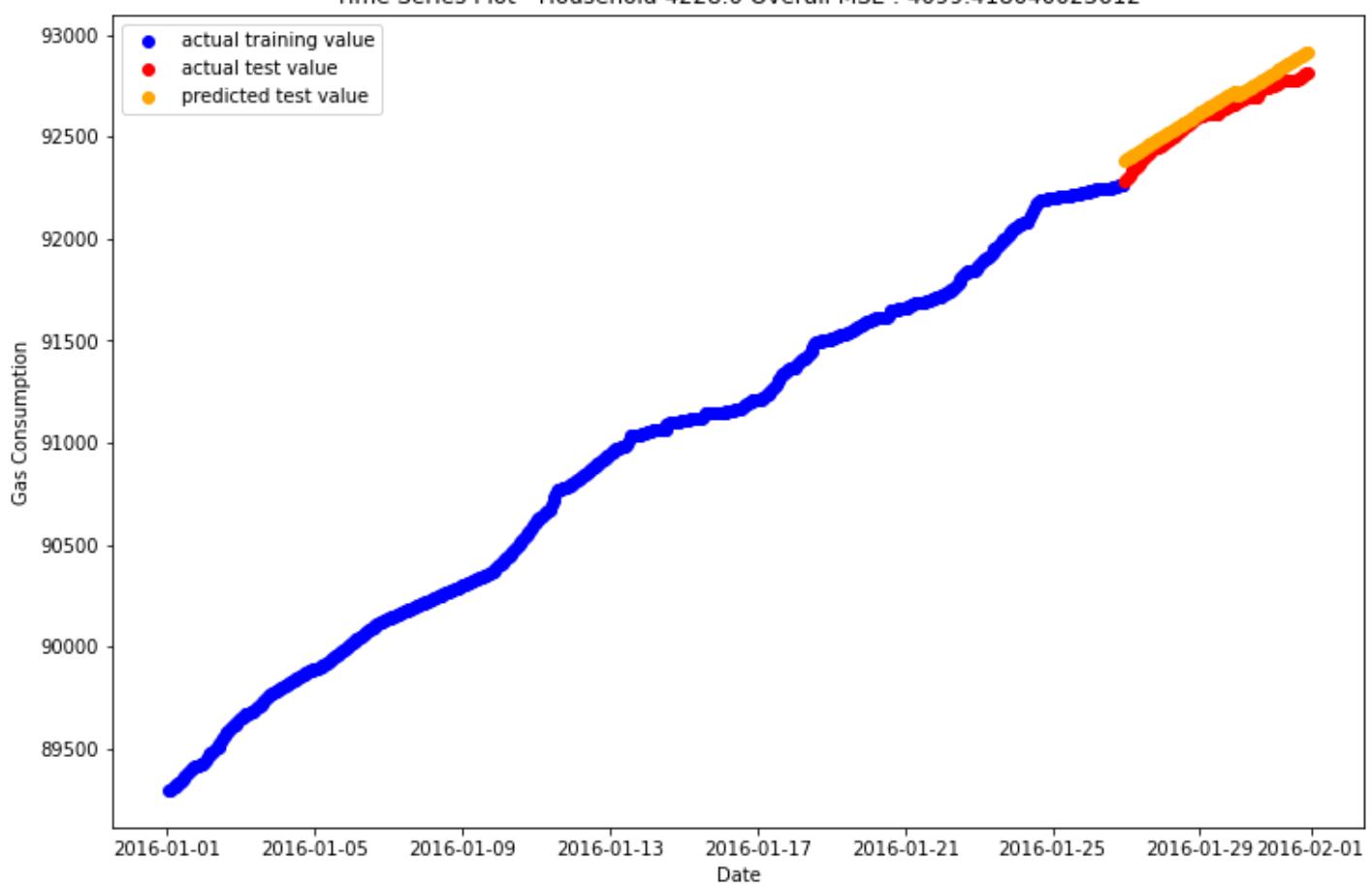
Time Series Plot - Household 4193.0 Overall MSE : 39629.99042261016



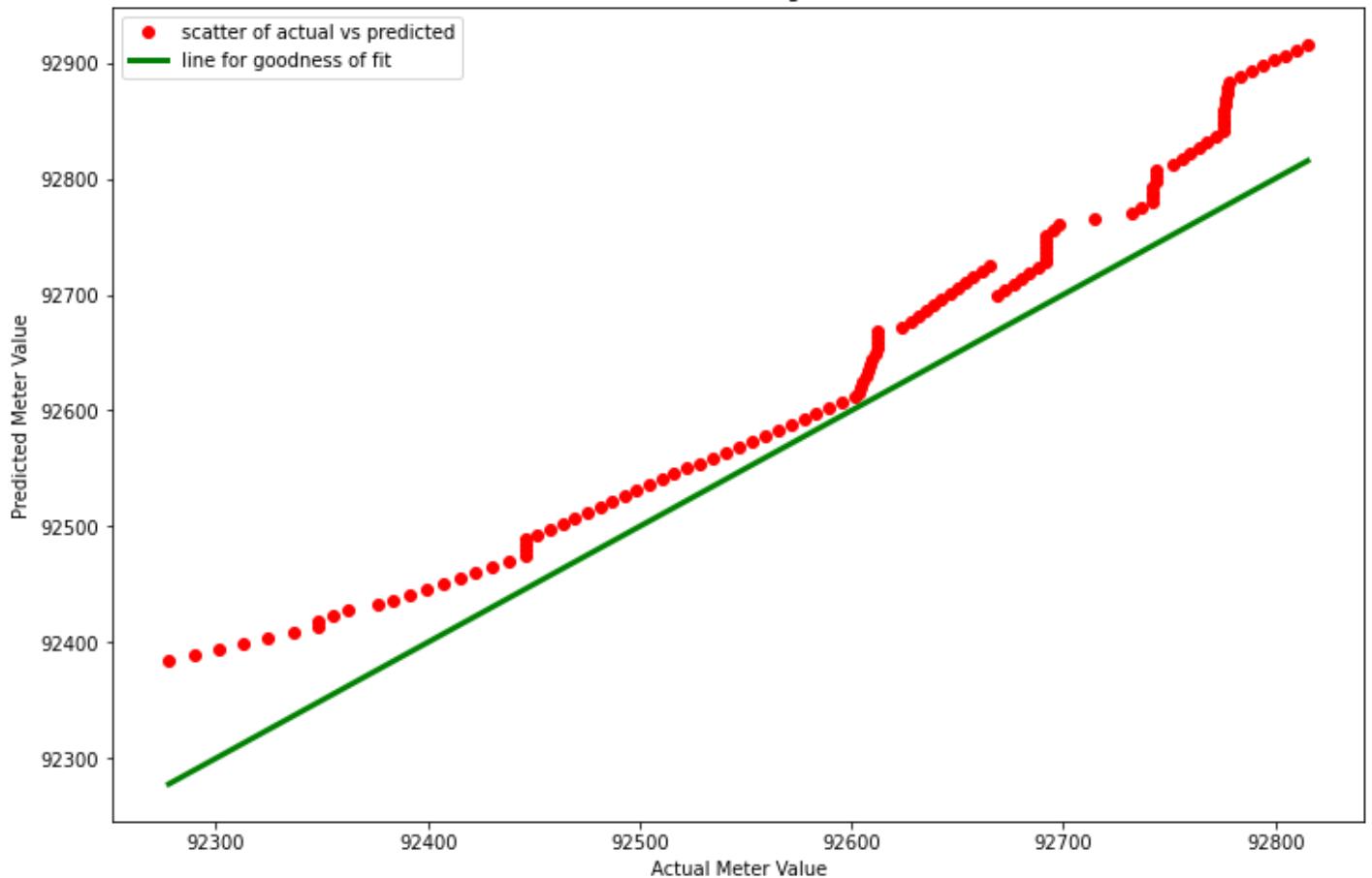
Scatter Plot - Household 4193.0 Testing MSE : 75813.58404915557



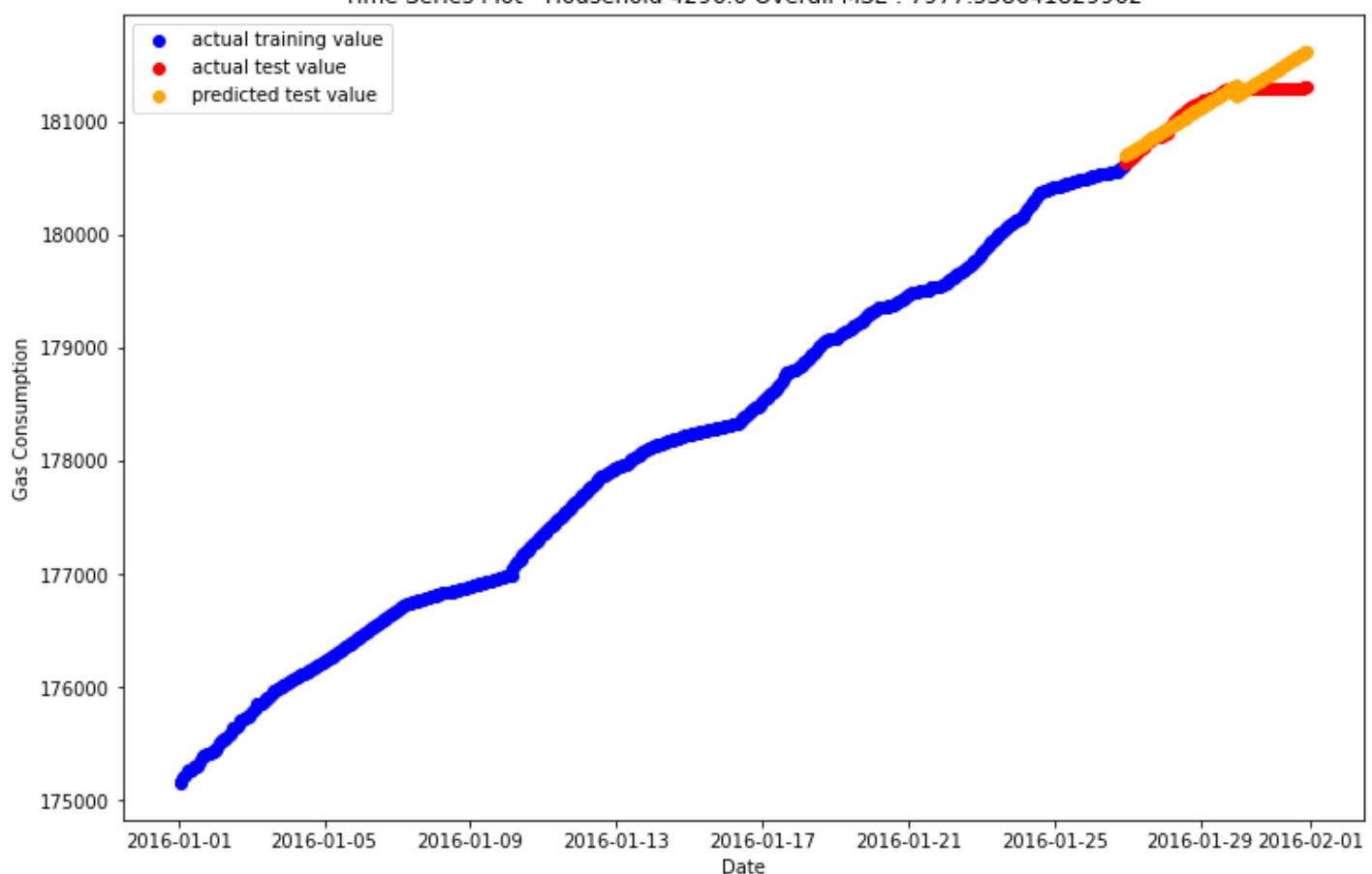
Time Series Plot - Household 4228.0 Overall MSE : 4099.418040023612



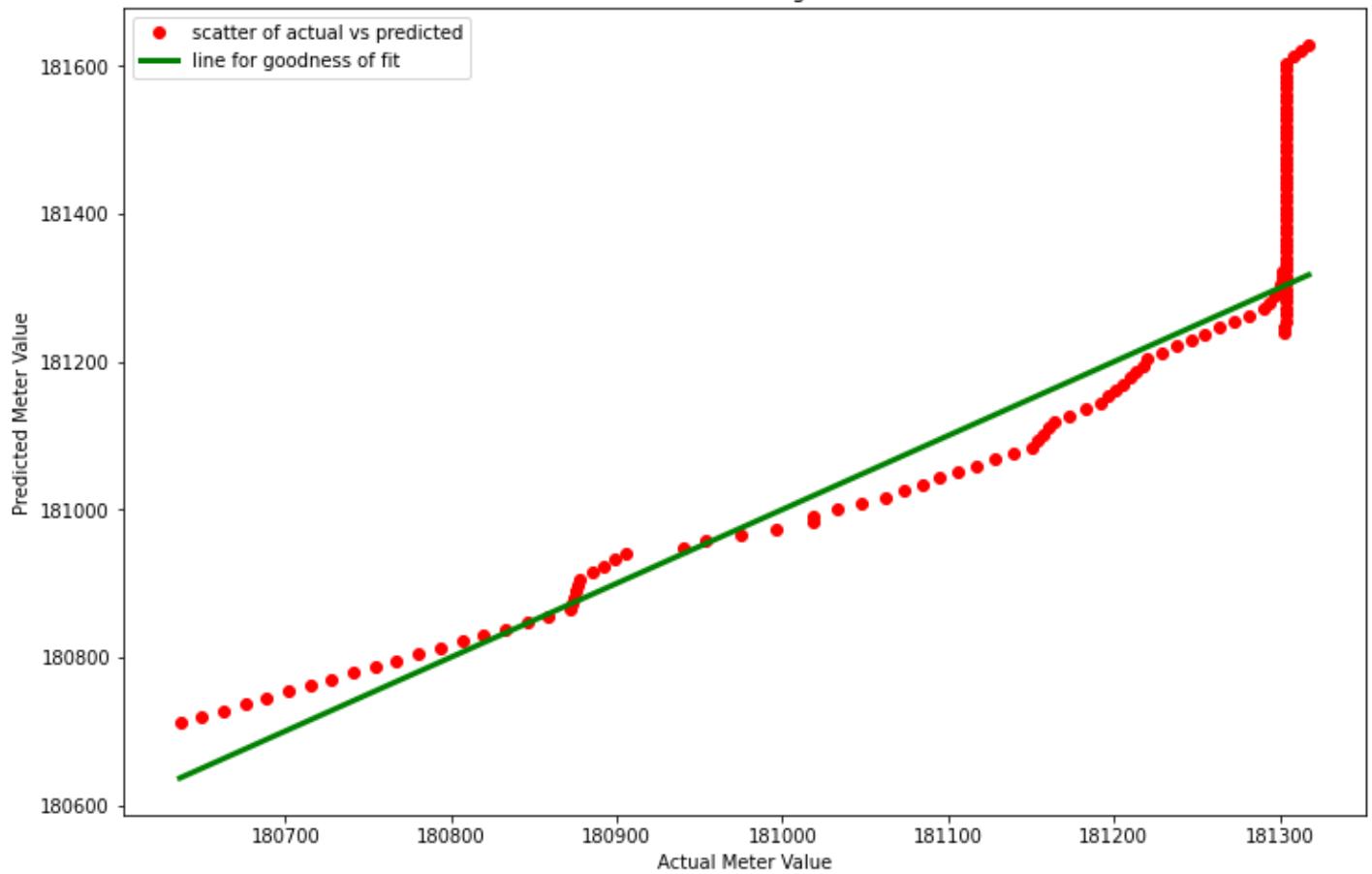
Scatter Plot - Household 4228.0 Testing MSE : 3198.1870665731735



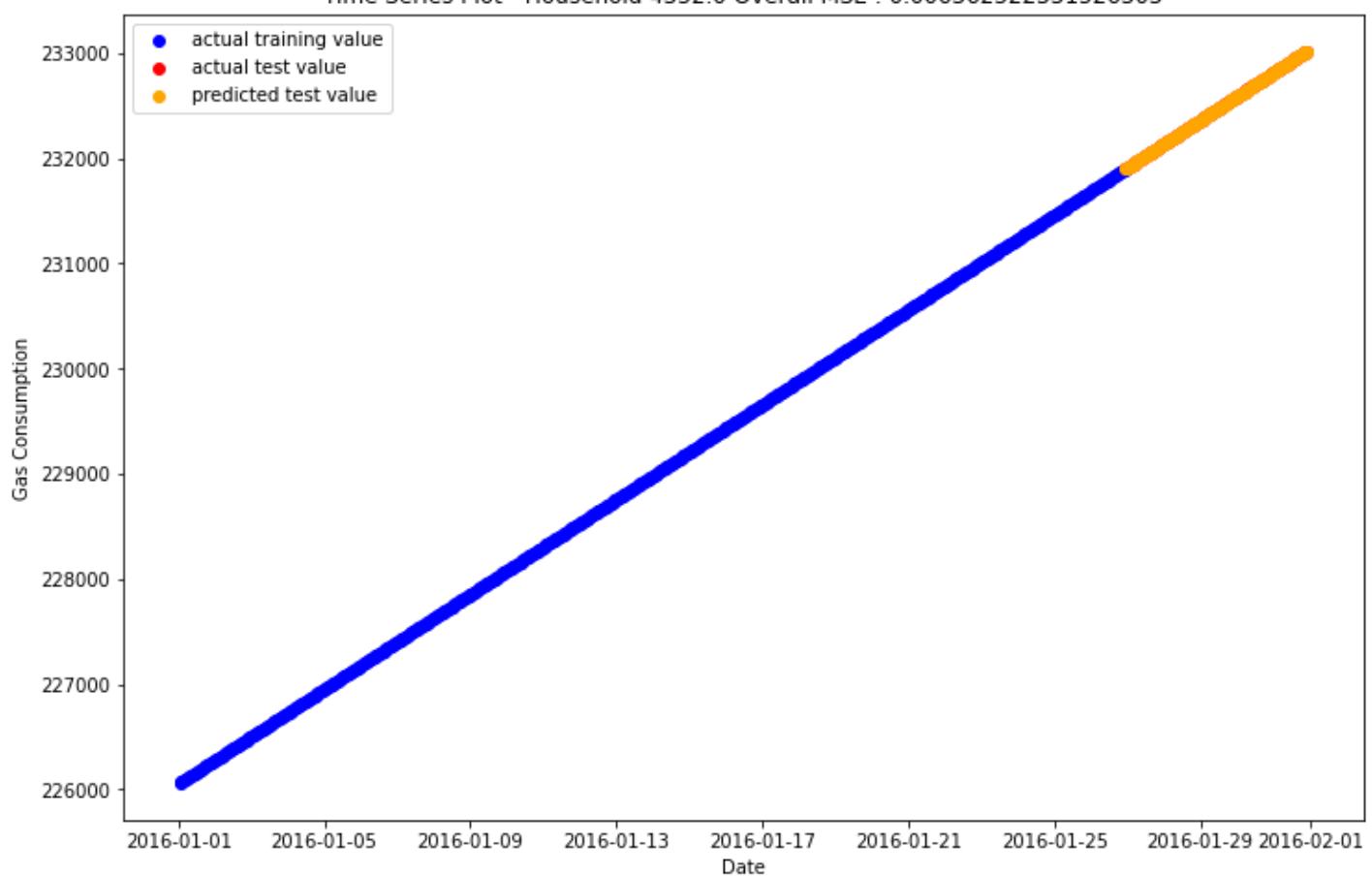
Time Series Plot - Household 4296.0 Overall MSE : 7977.538641829962



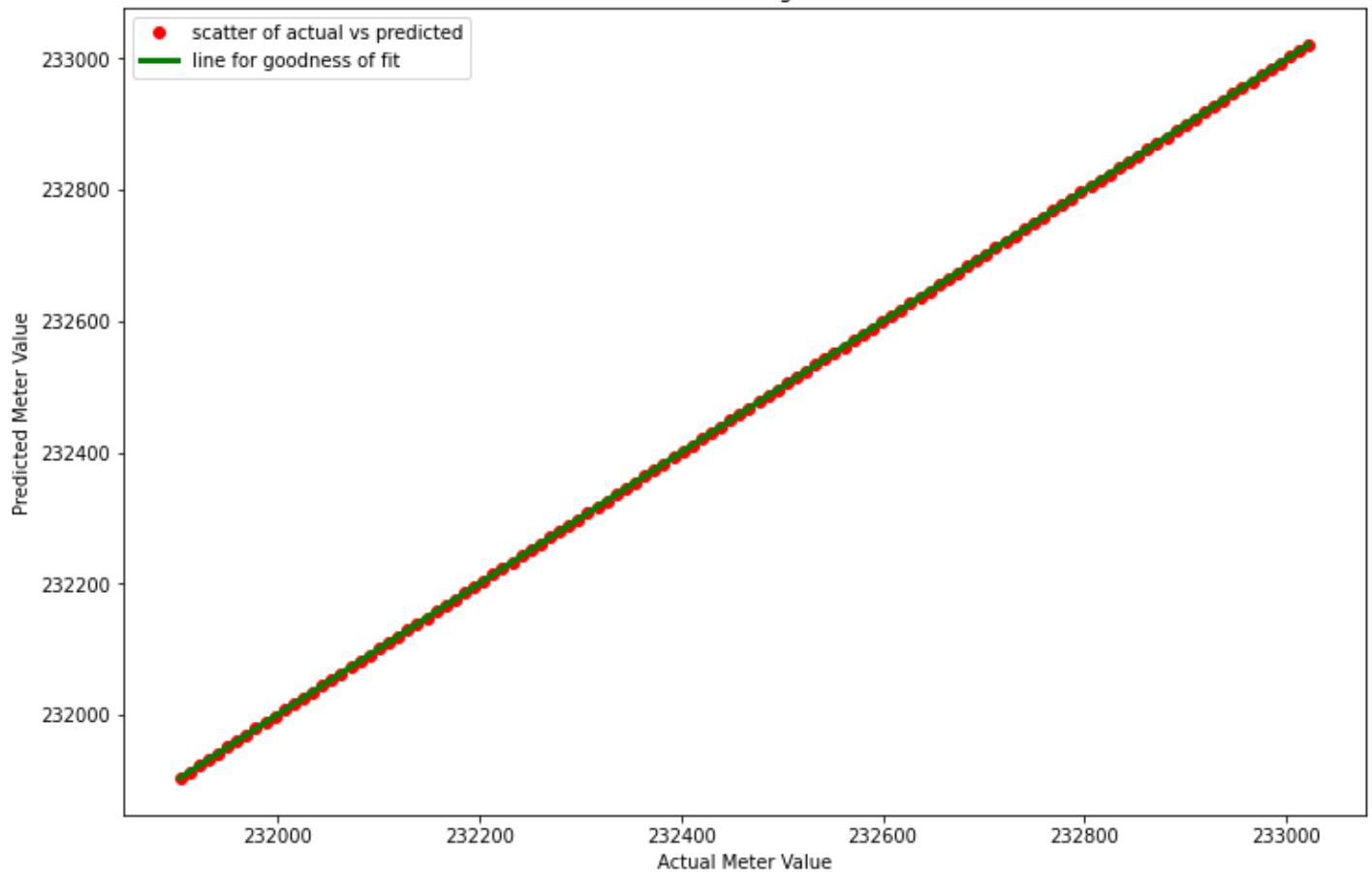
Scatter Plot - Household 4296.0 Testing MSE : 12521.335463151236



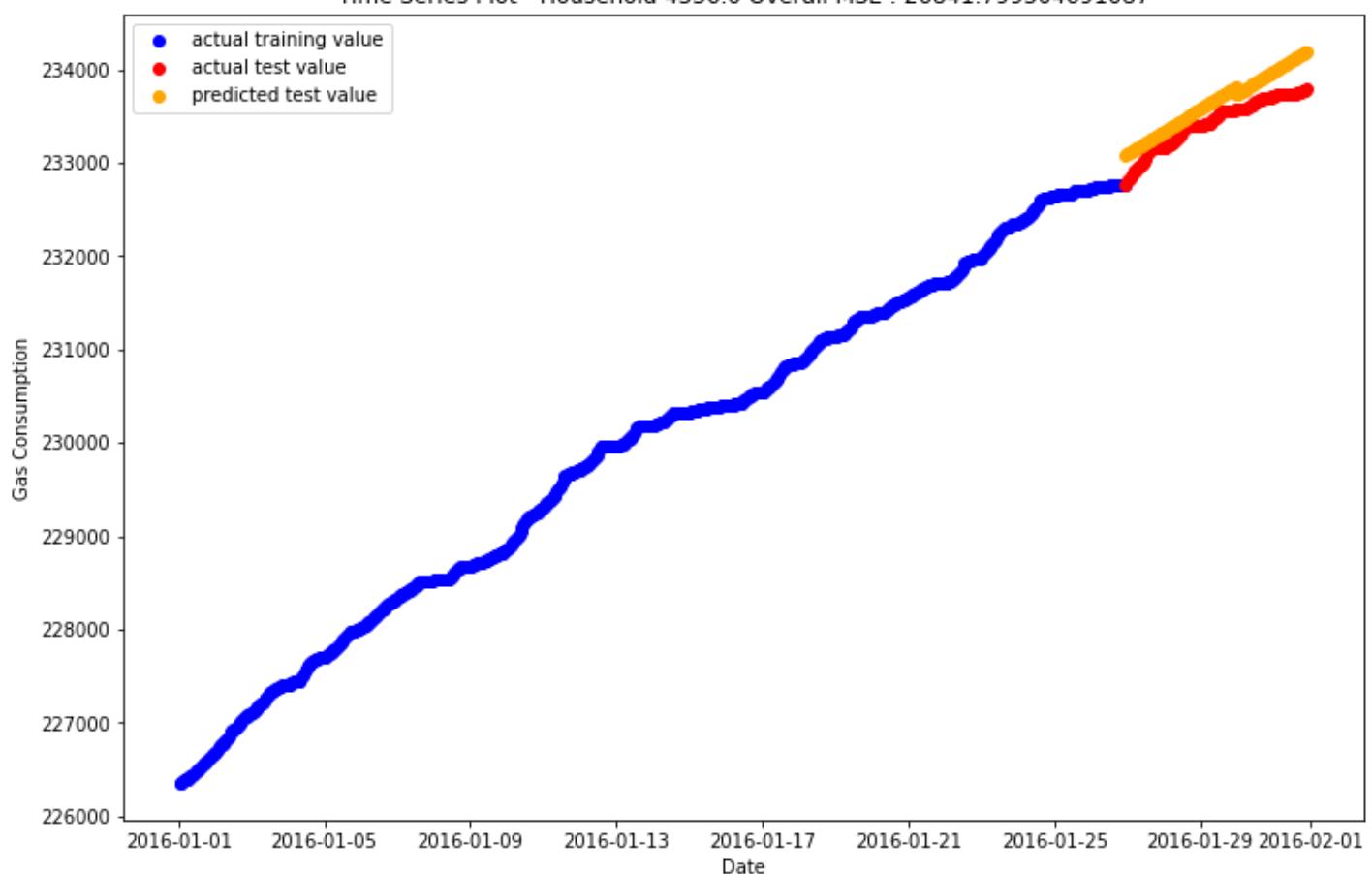
Time Series Plot - Household 4352.0 Overall MSE : 0.006362522331526303



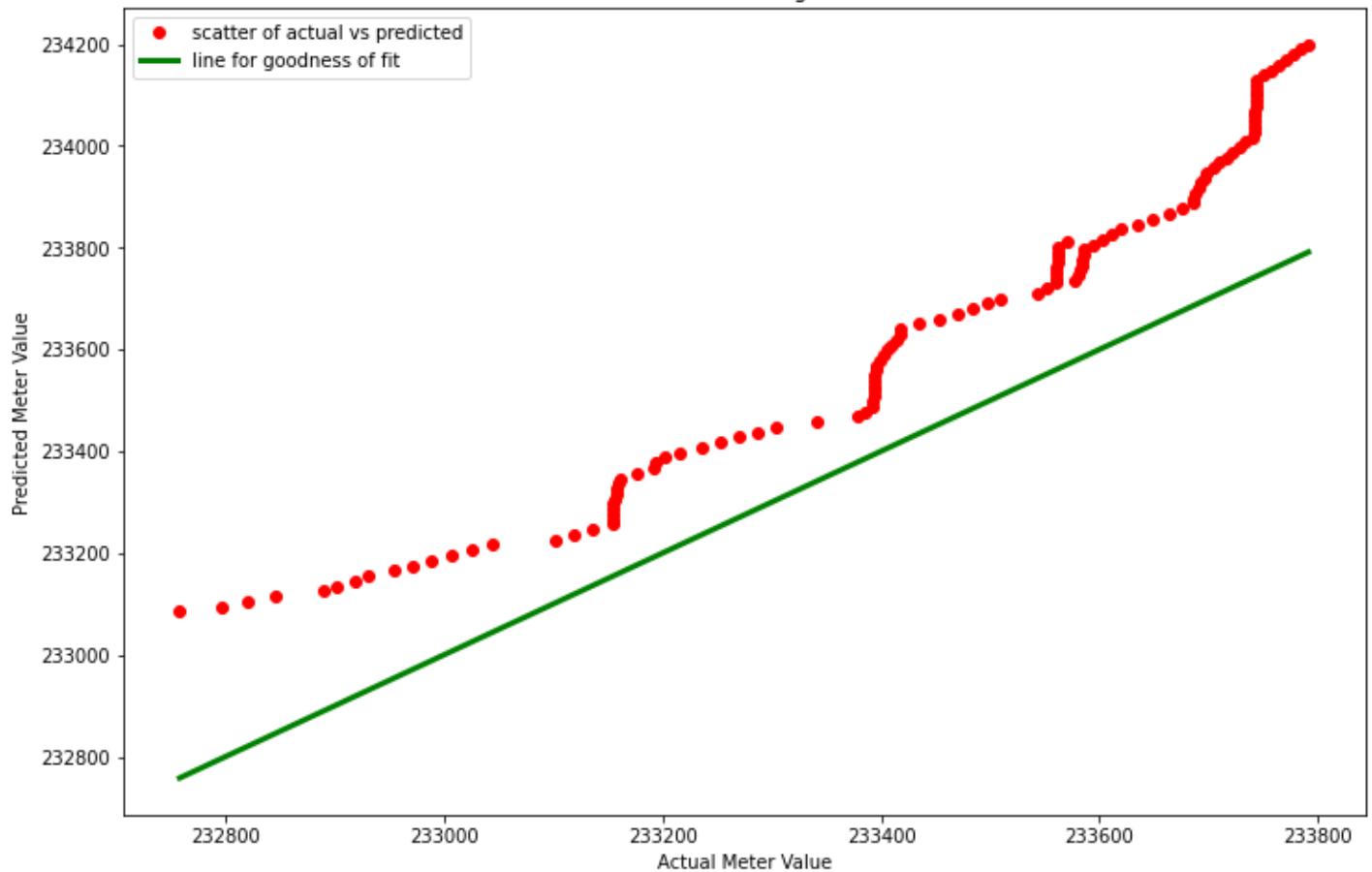
Scatter Plot - Household 4352.0 Testing MSE : 0.017223947363214635



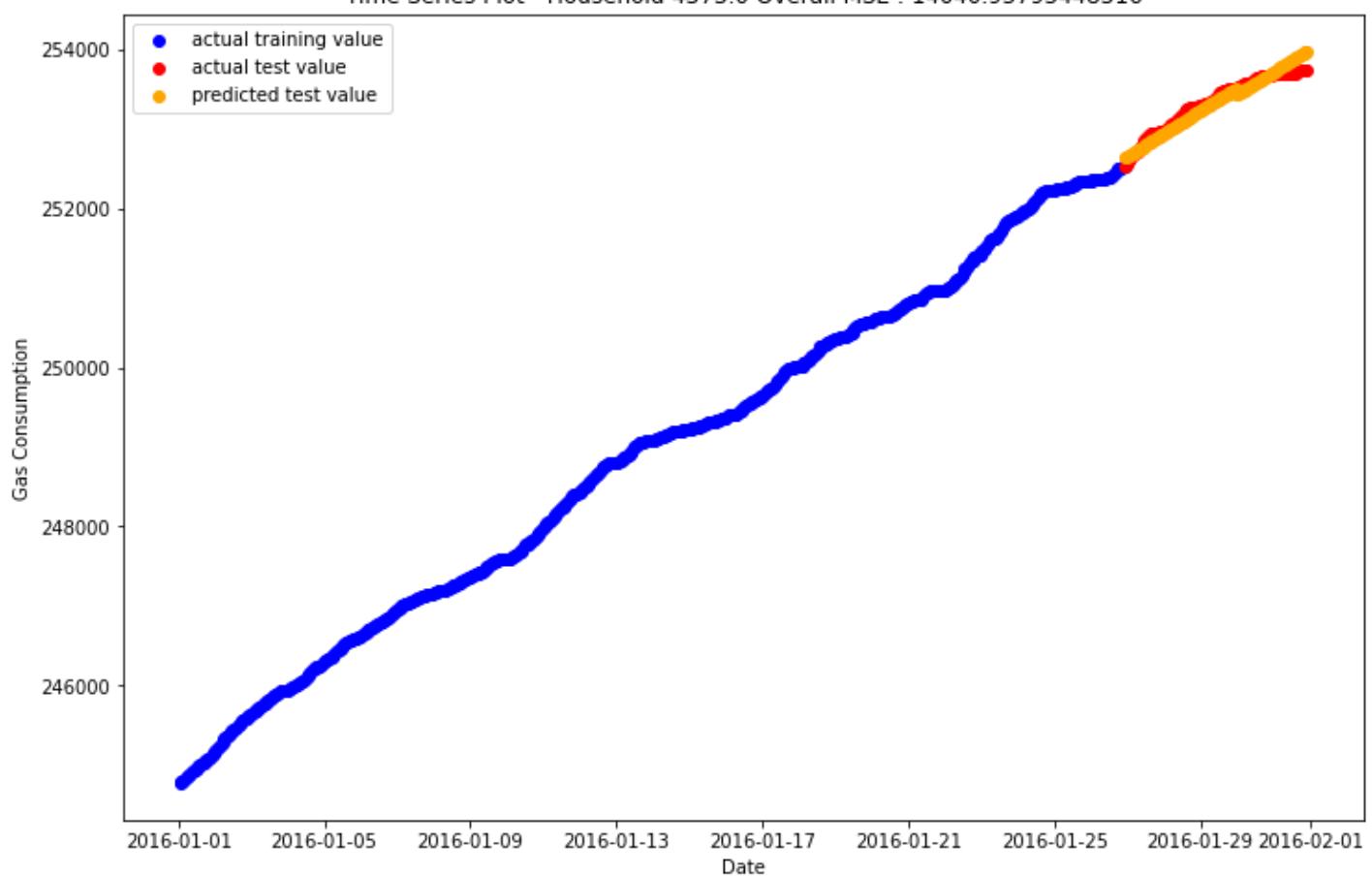
Time Series Plot - Household 4356.0 Overall MSE : 26841.799504691087



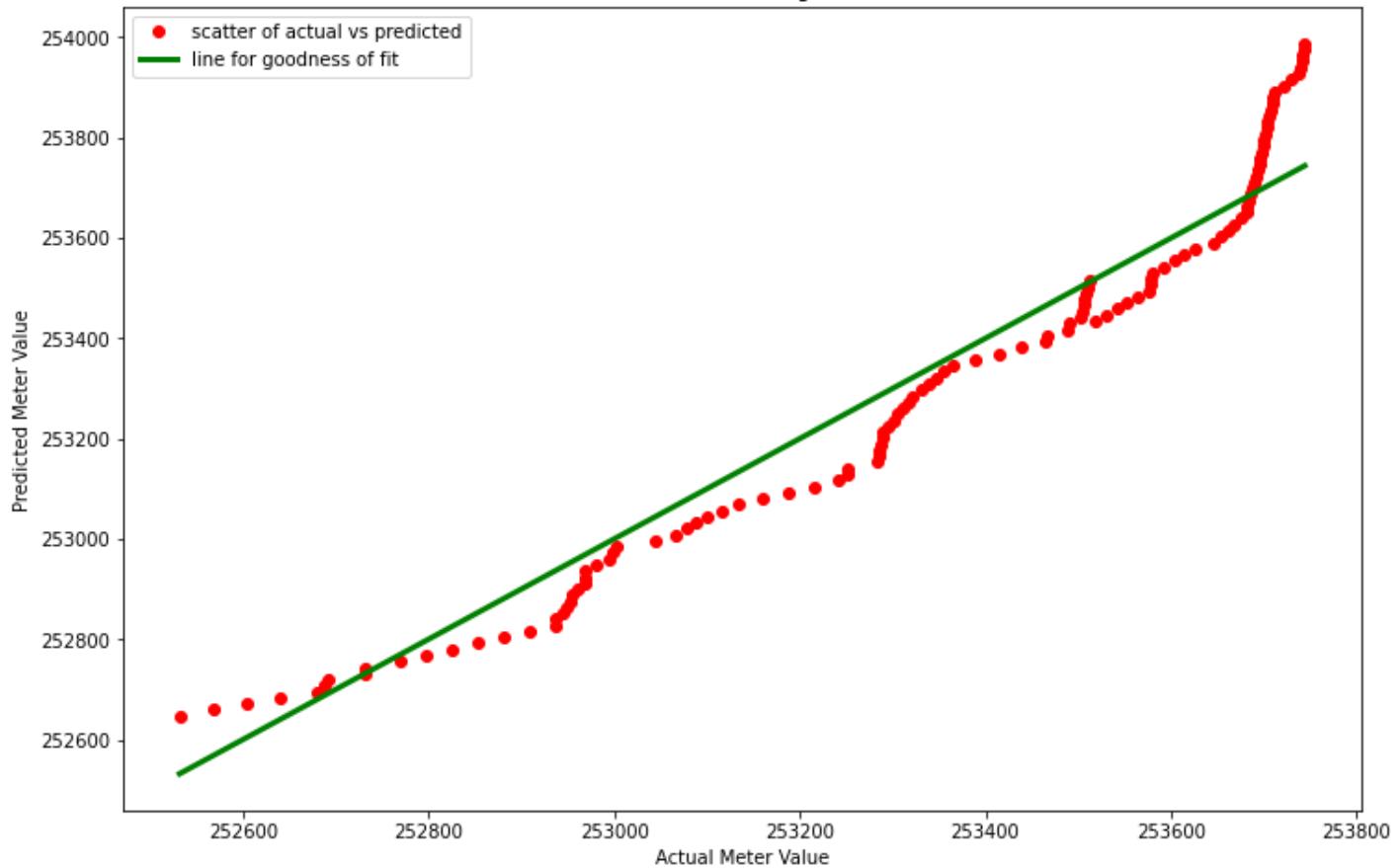
Scatter Plot - Household 4356.0 Testing MSE : 52540.874610951665

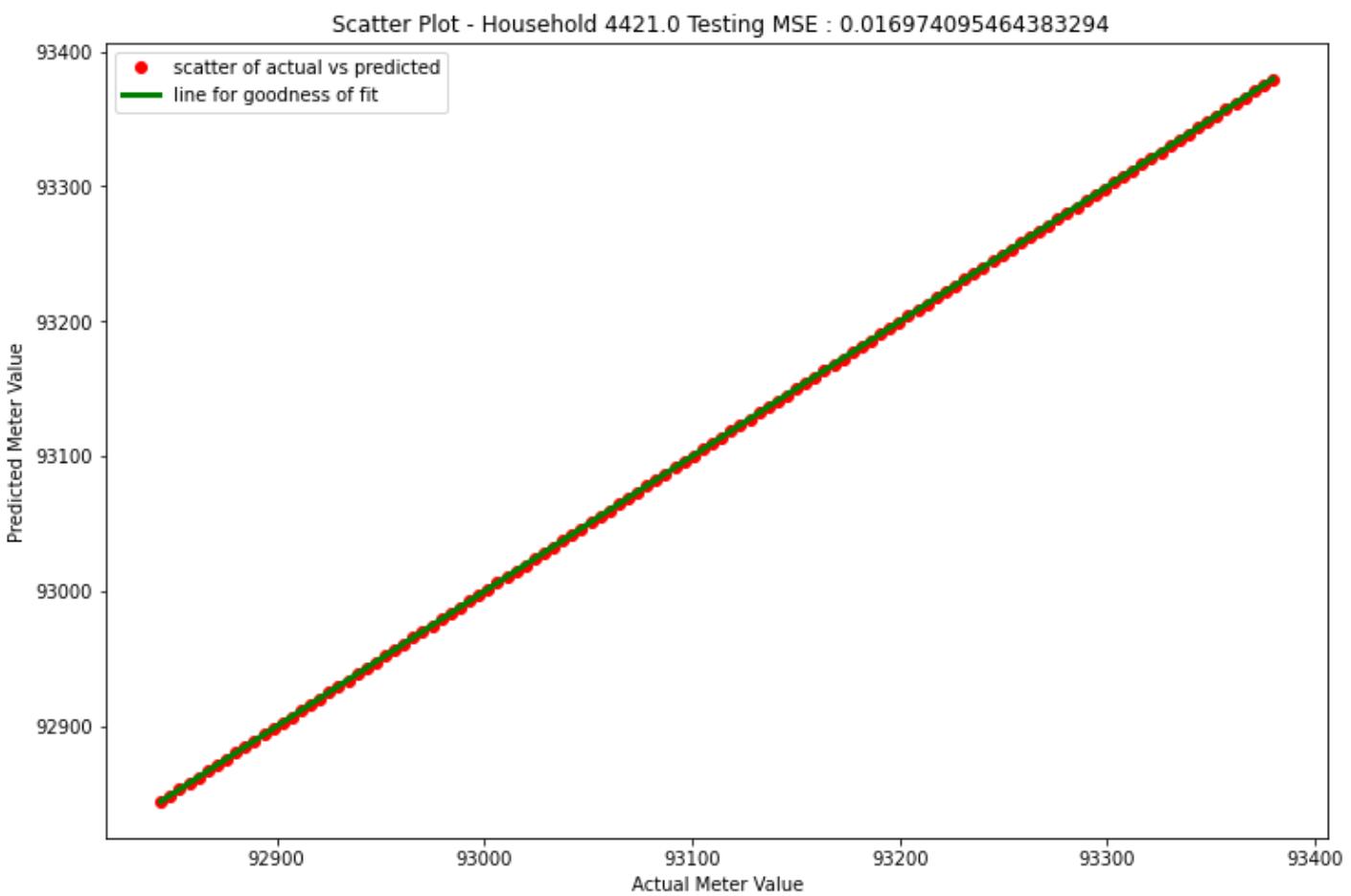
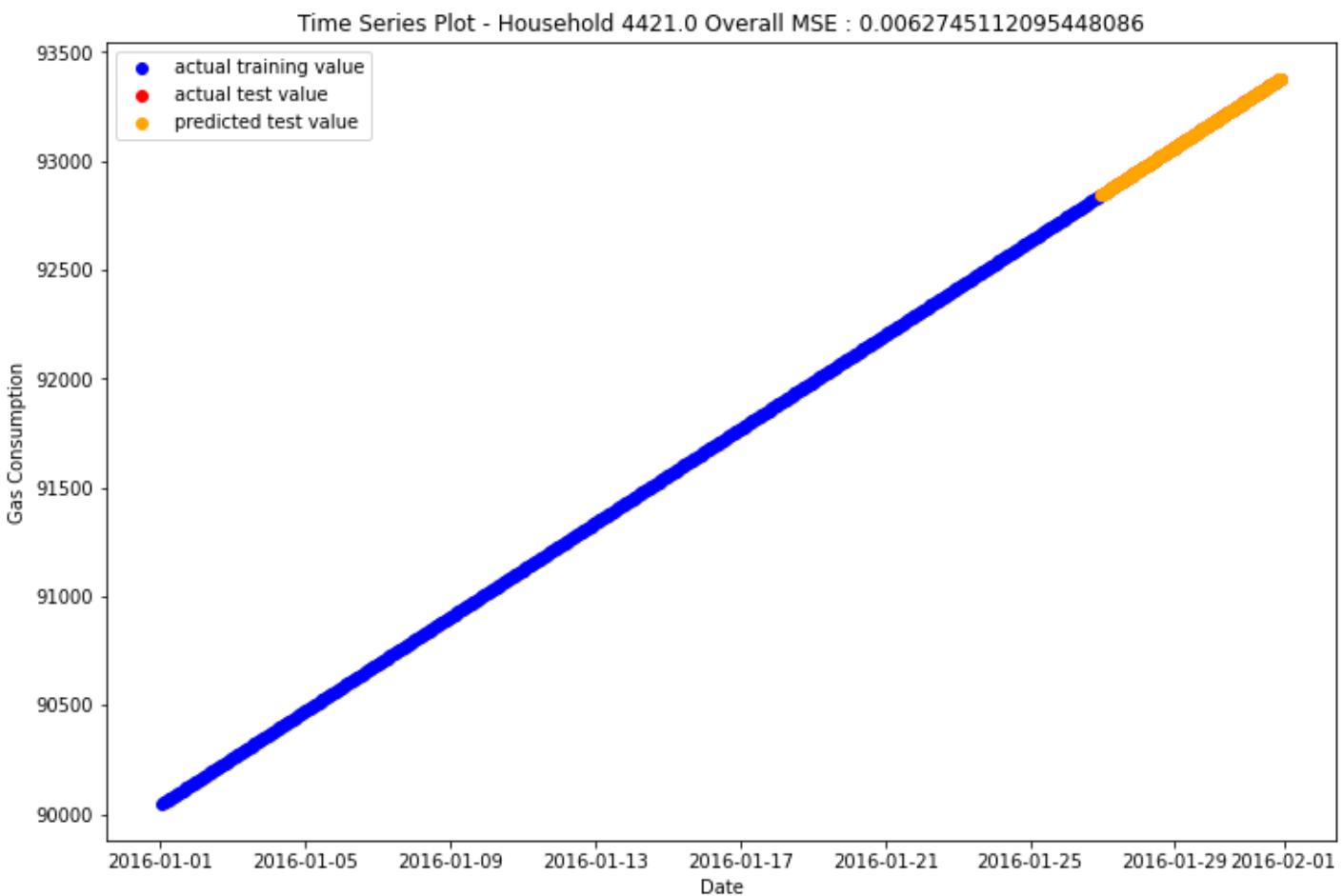


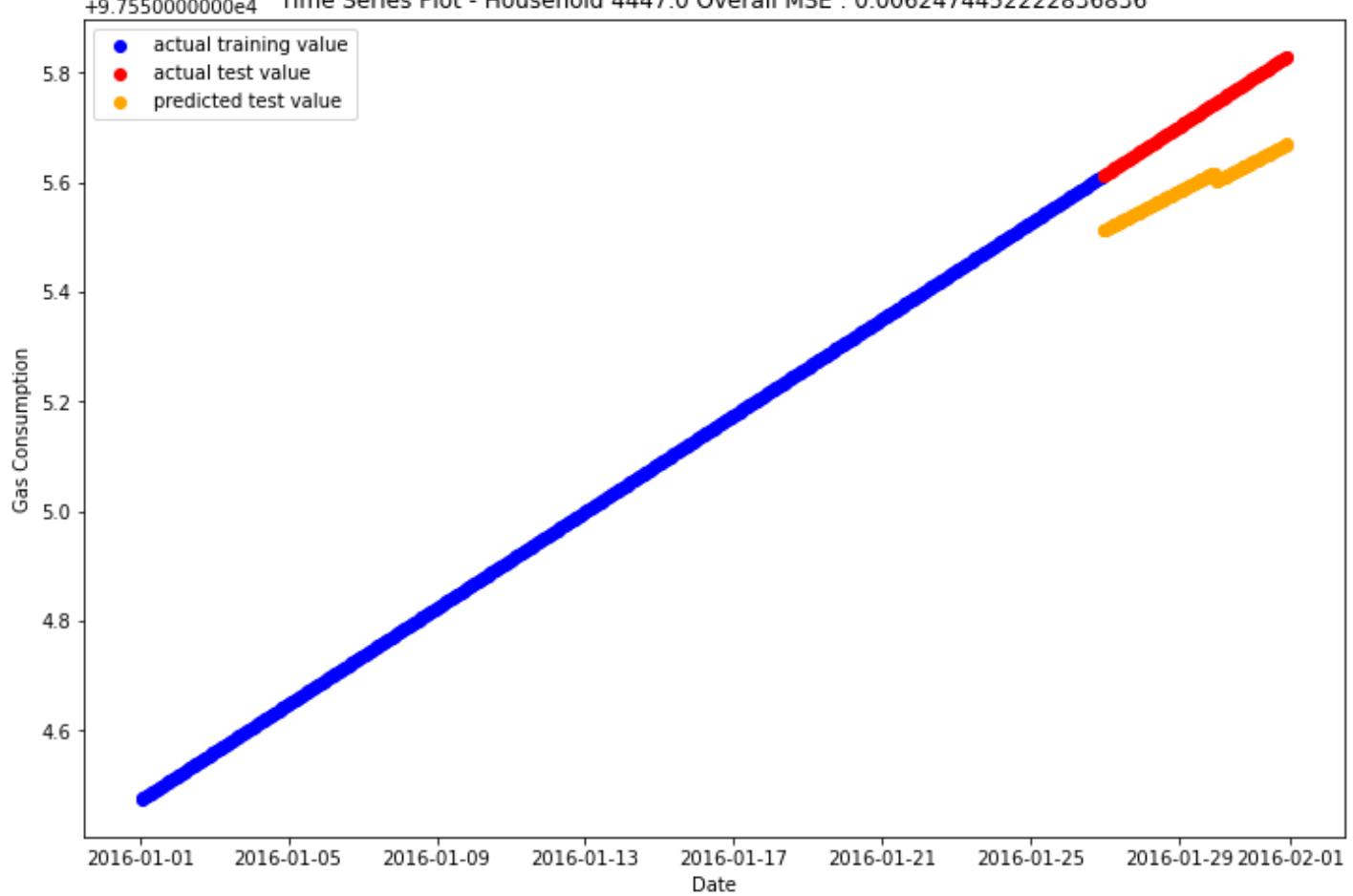
Time Series Plot - Household 4373.0 Overall MSE : 14040.95795448316



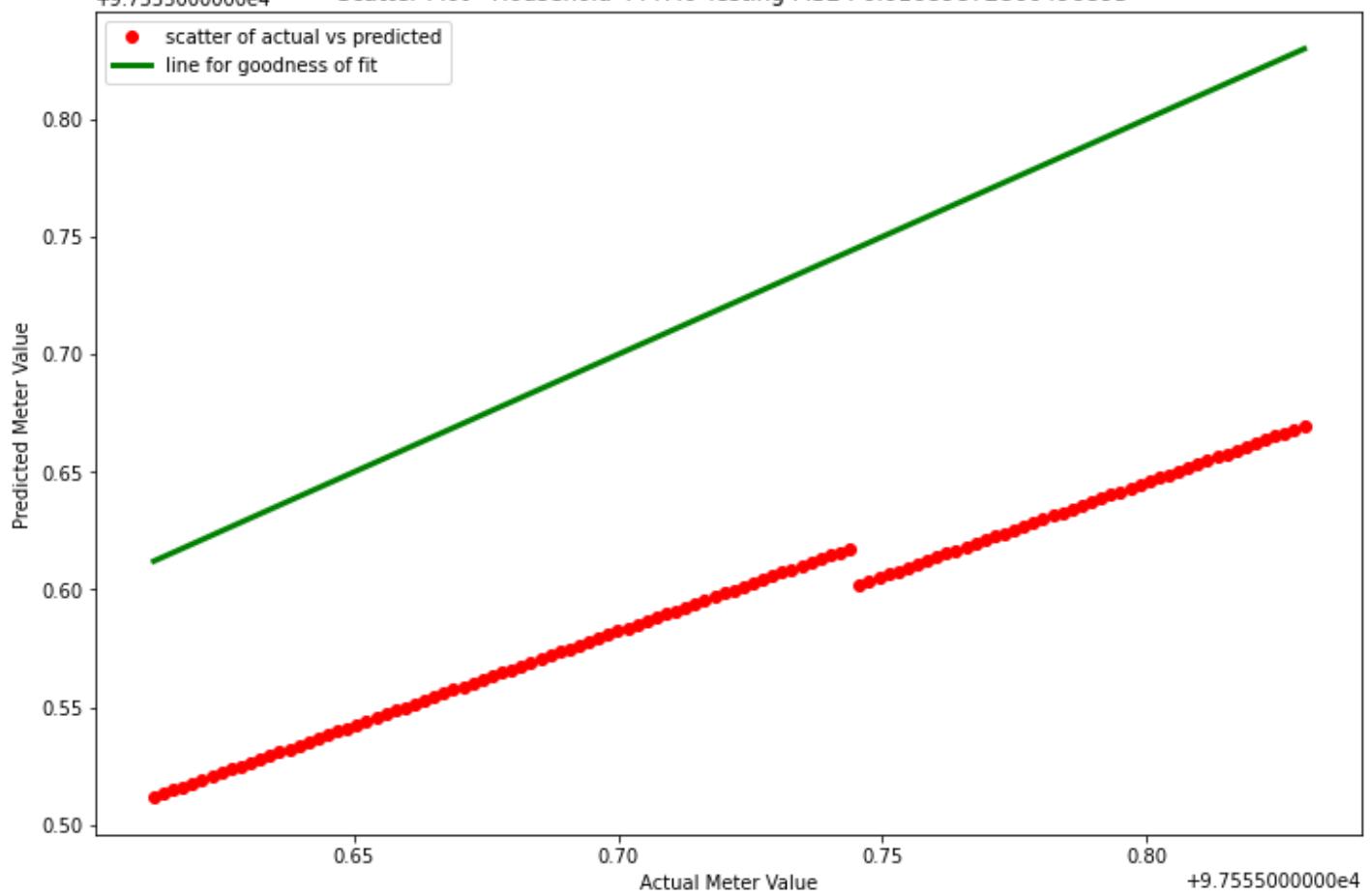
Scatter Plot - Household 4373.0 Testing MSE : 7918.897570074073

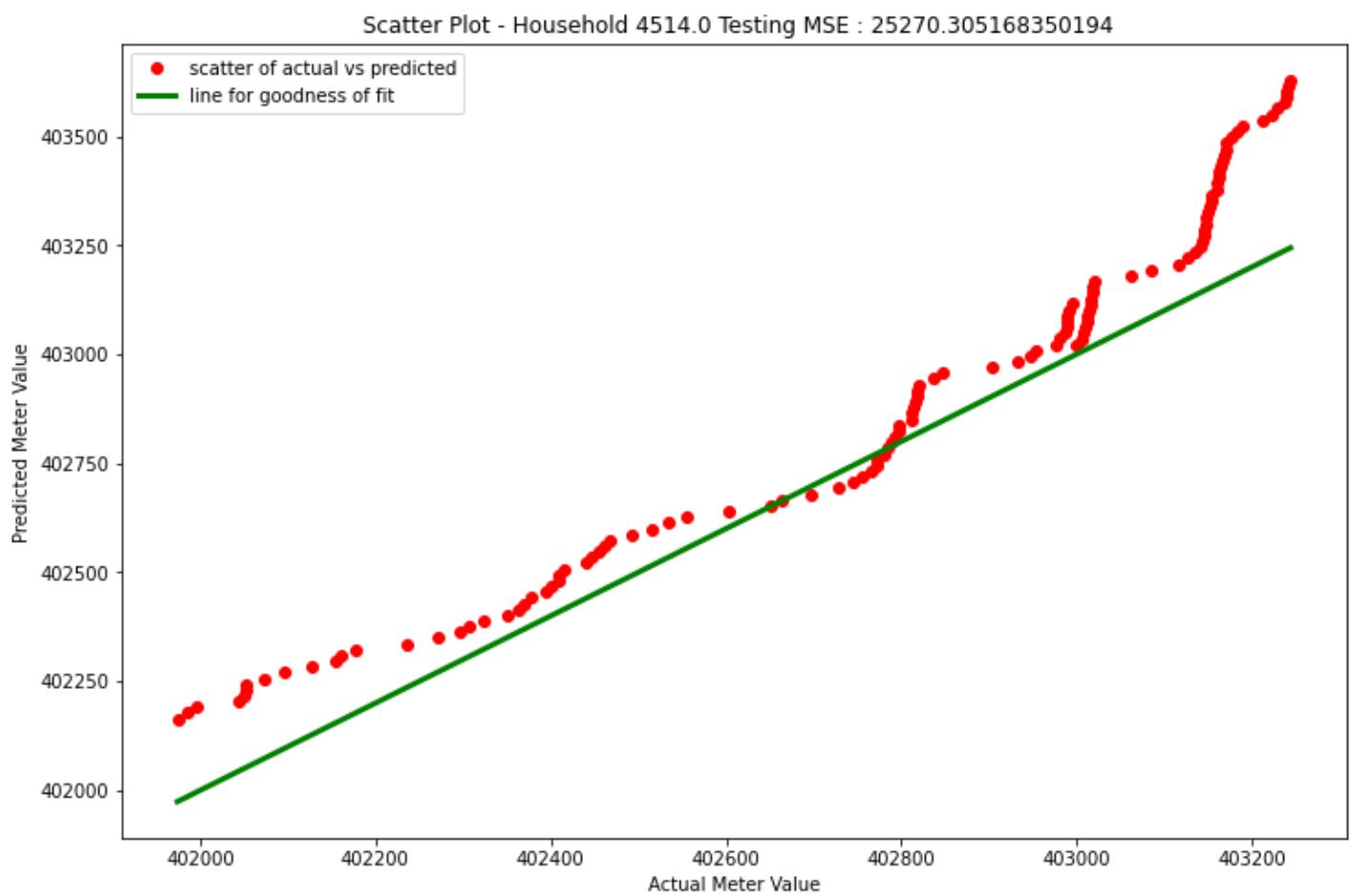
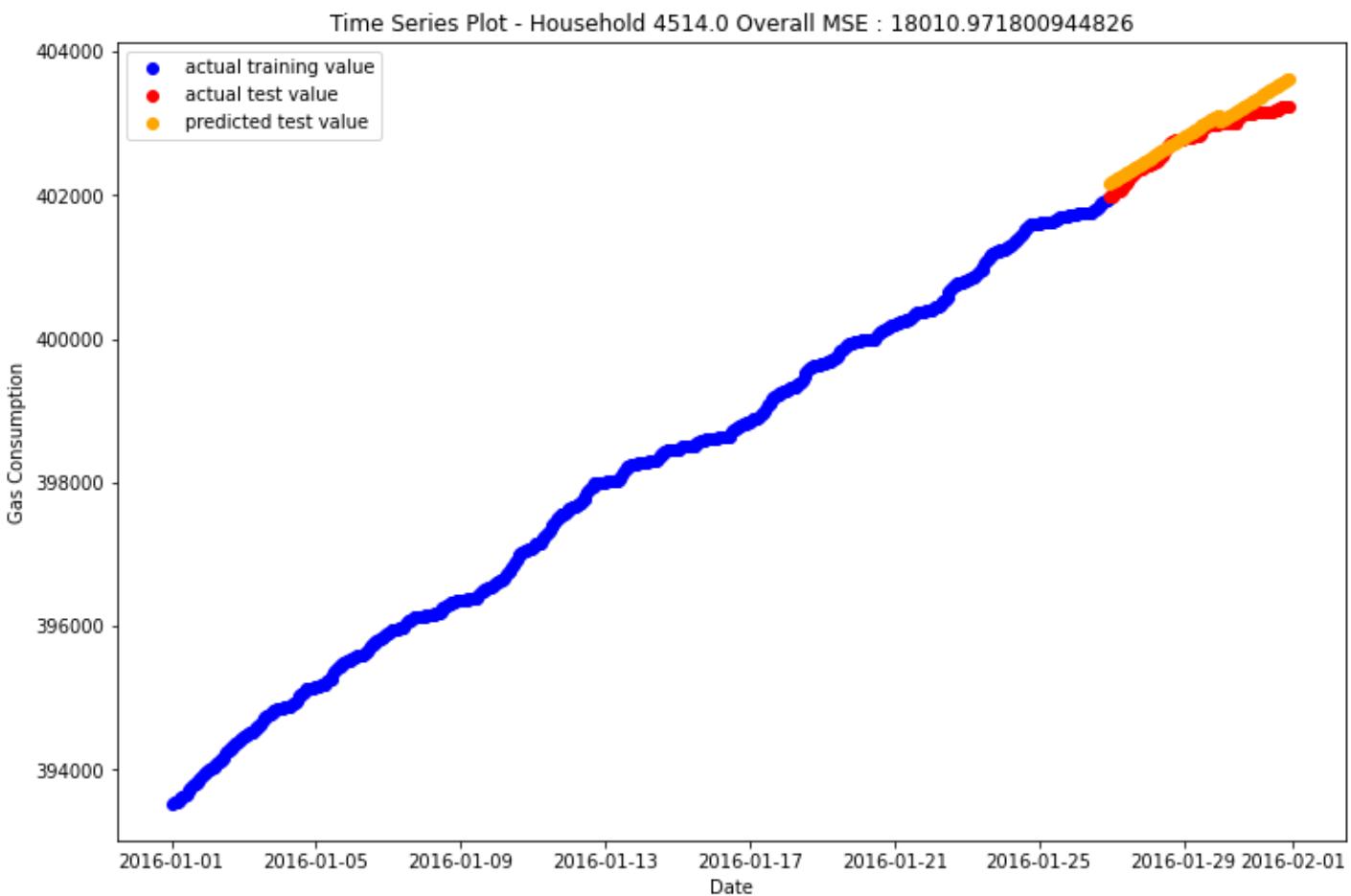




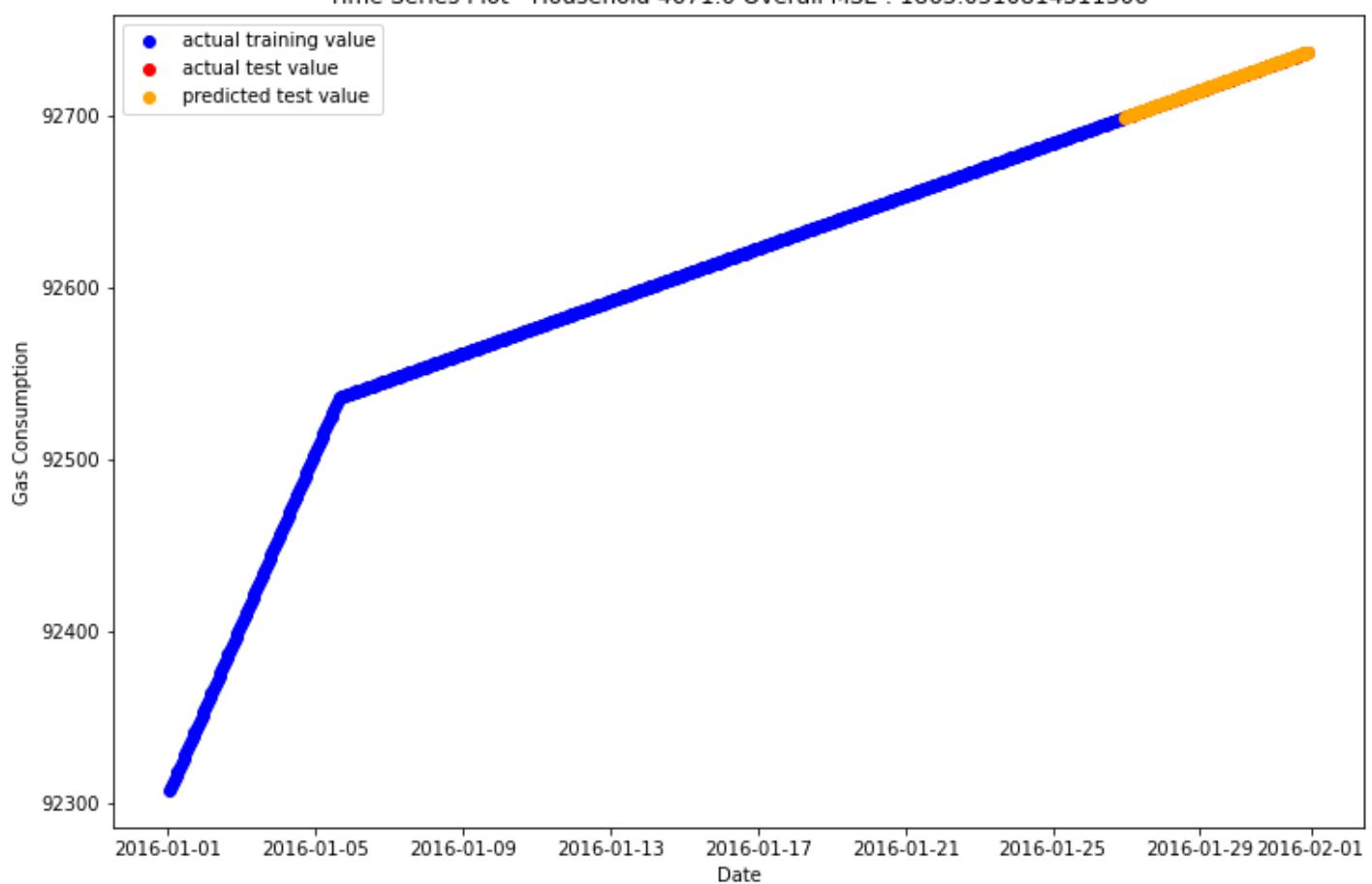


+9.7550000000e4 Scatter Plot - Household 4447.0 Testing MSE : 0.01689872860496893

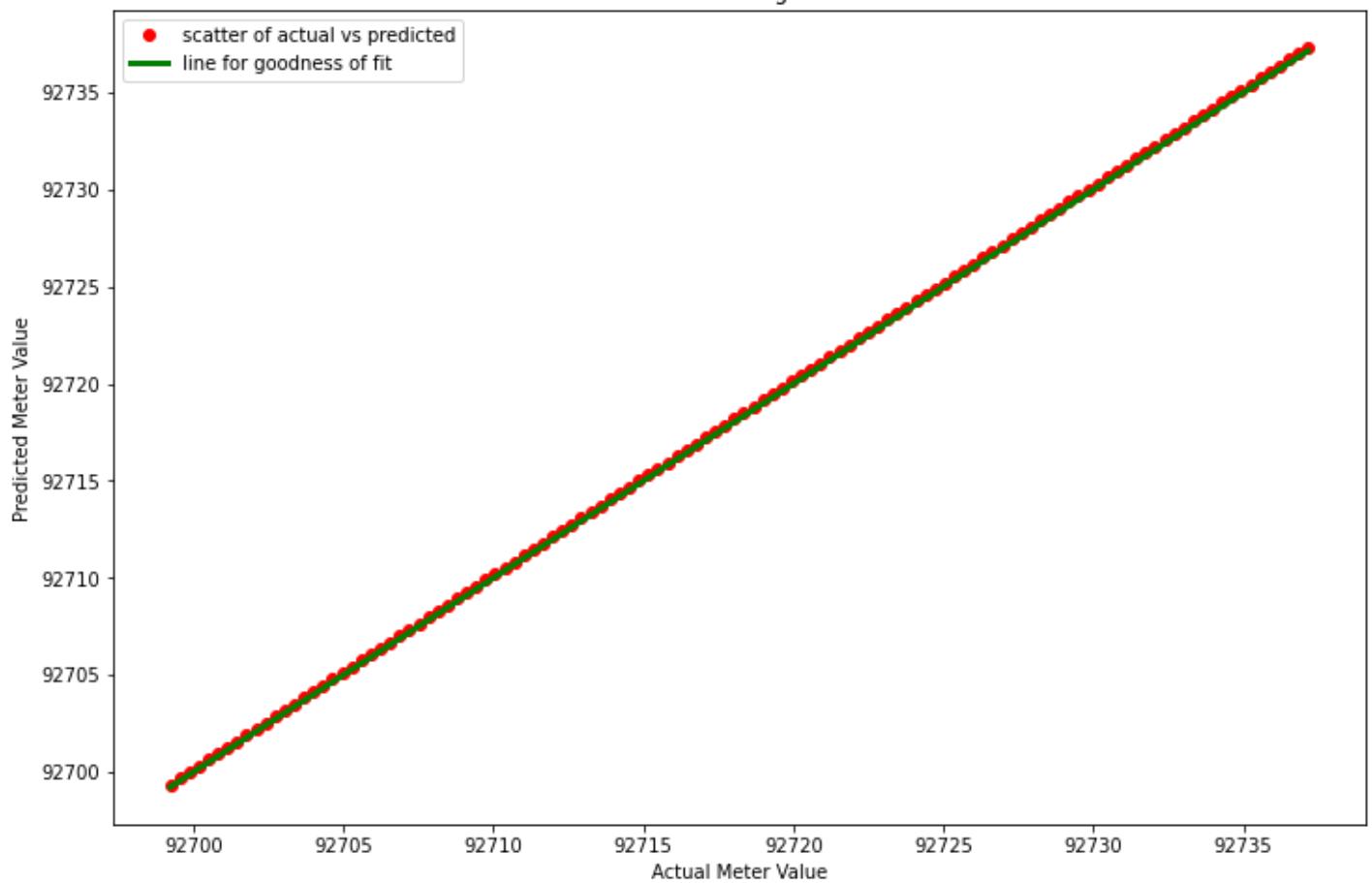




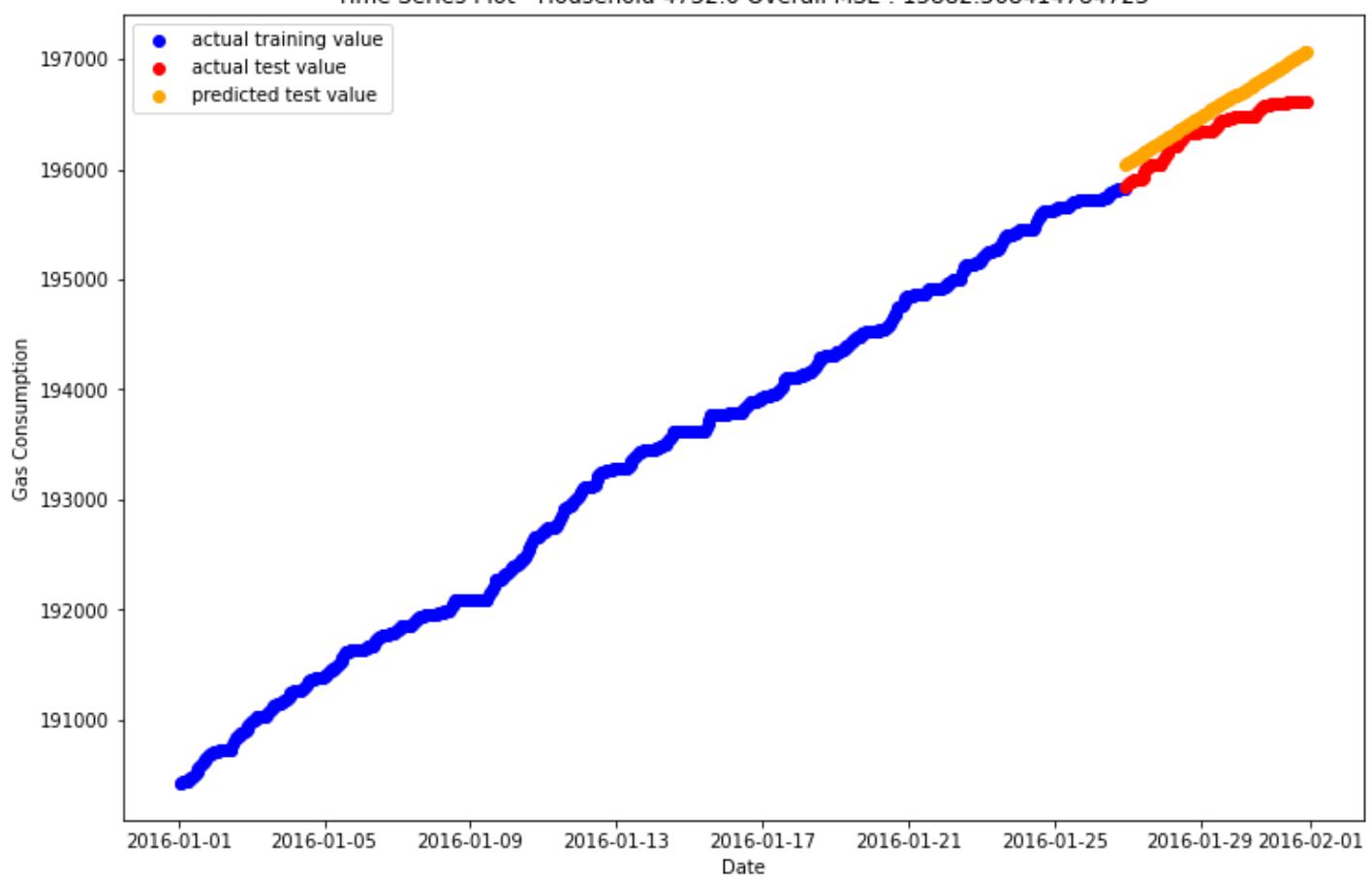
Time Series Plot - Household 4671.0 Overall MSE : 1863.0510814311306



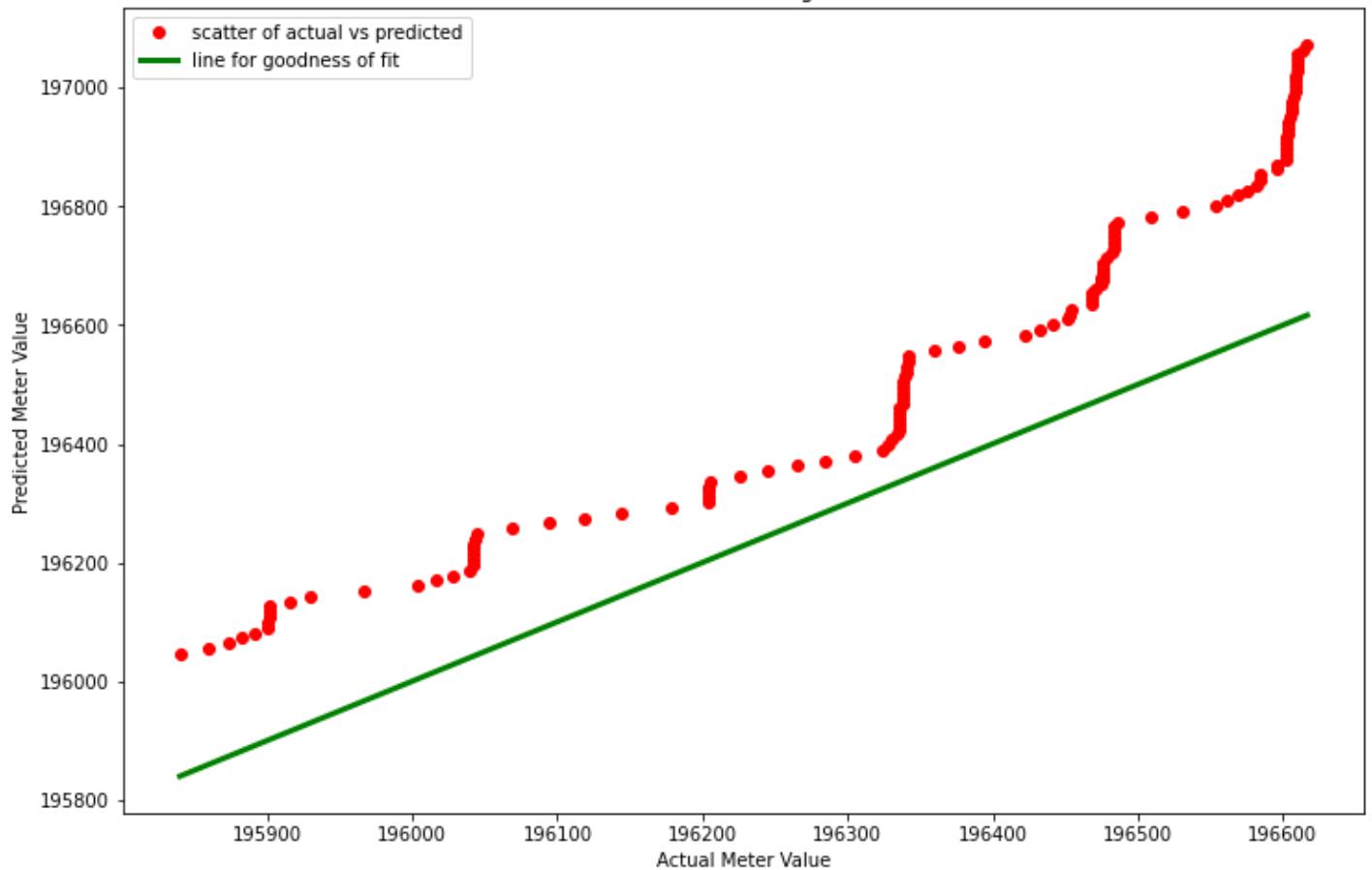
Scatter Plot - Household 4671.0 Testing MSE : 0.026661705693090943



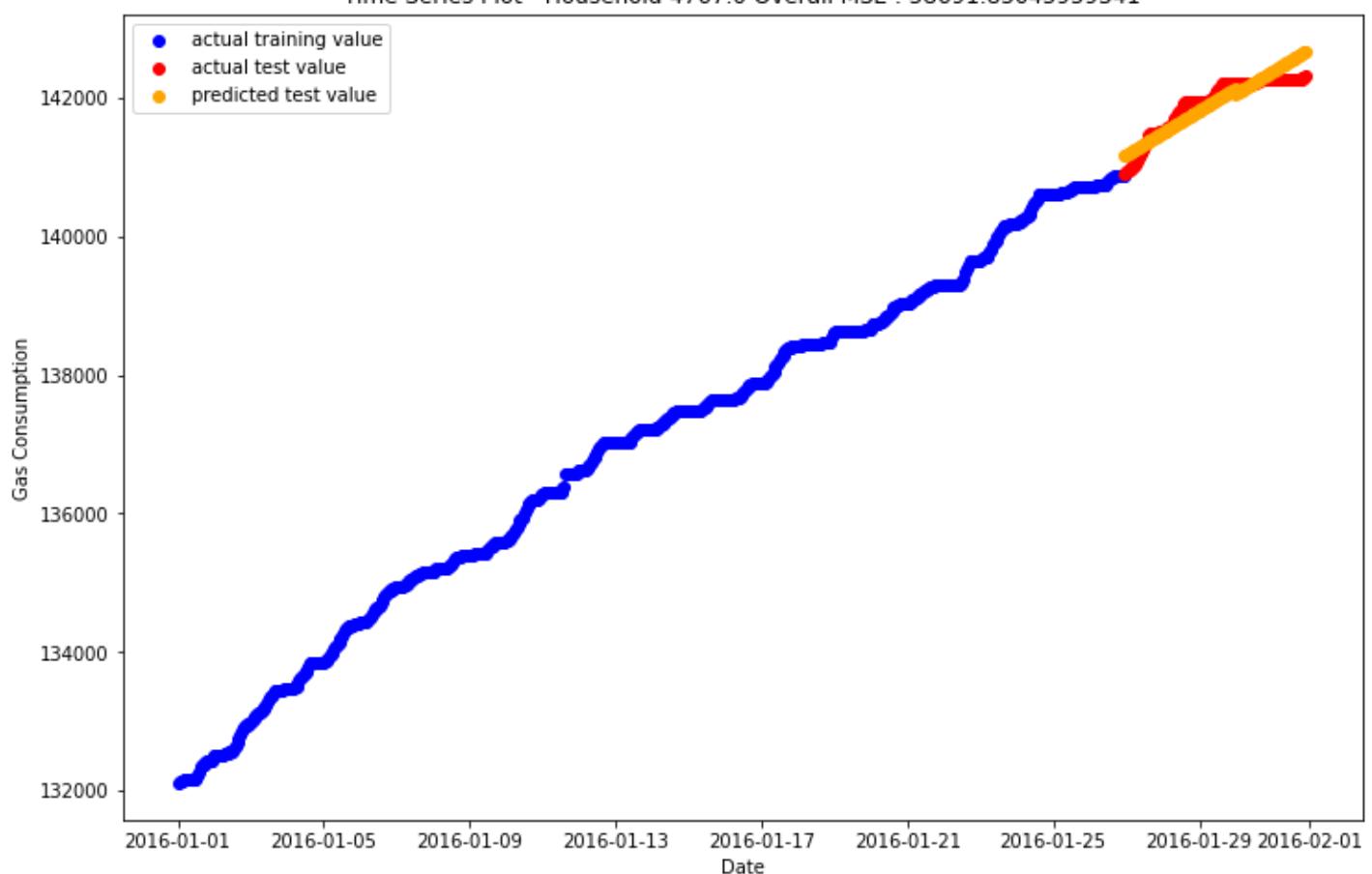
Time Series Plot - Household 4732.0 Overall MSE : 15882.368414784723



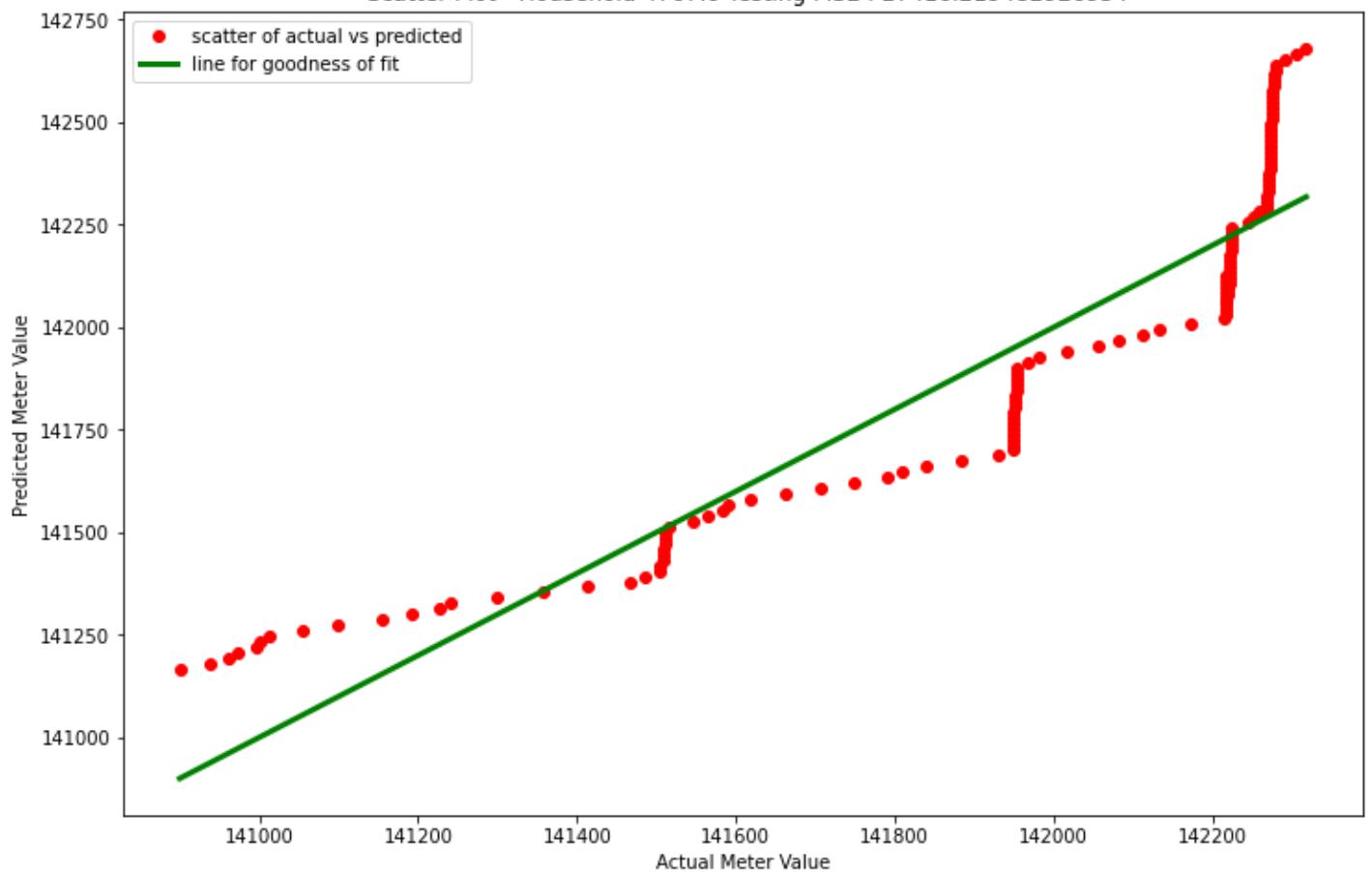
Scatter Plot - Household 4732.0 Testing MSE : 55497.46569444677



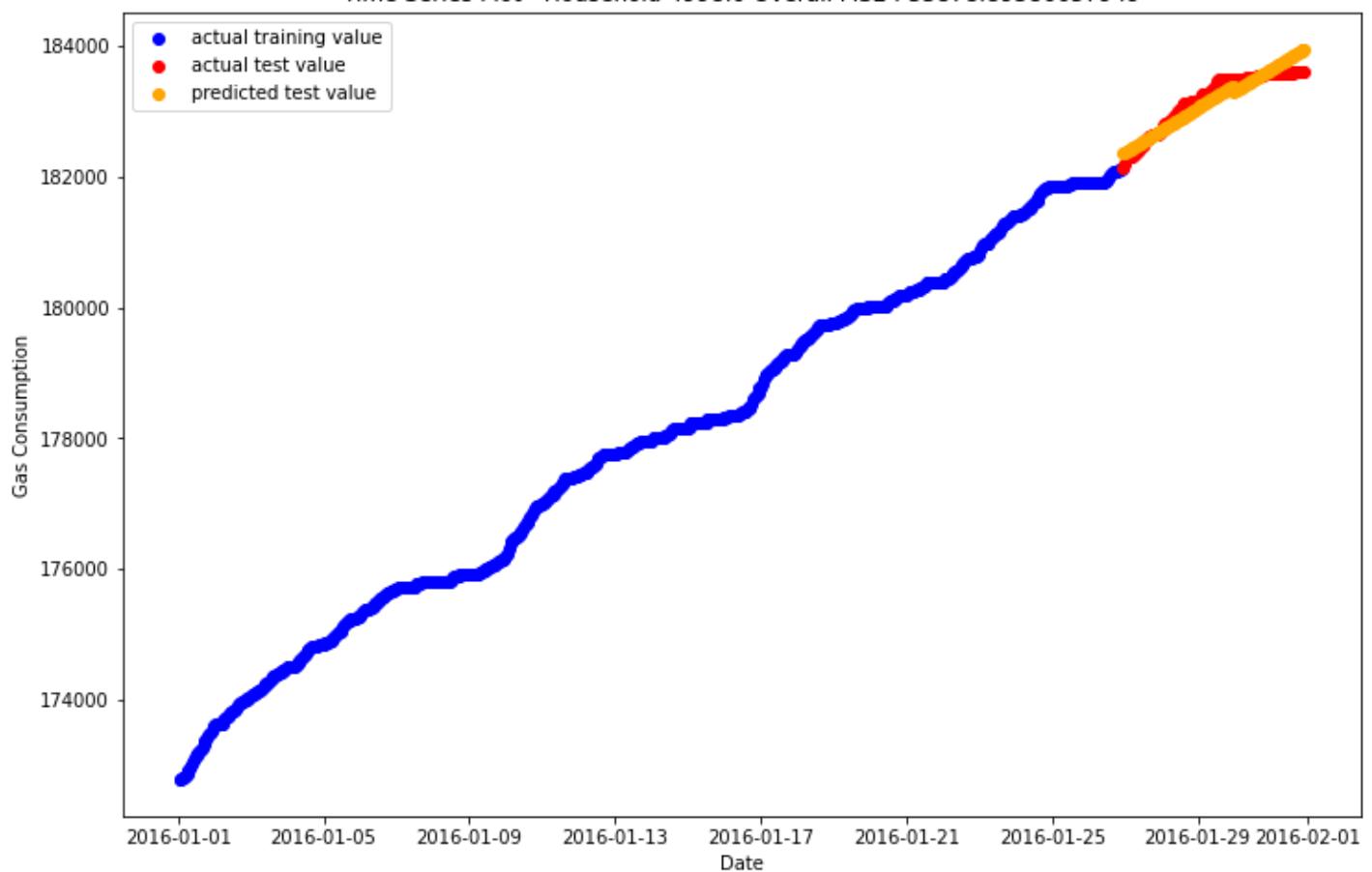
Time Series Plot - Household 4767.0 Overall MSE : 58691.85045959341



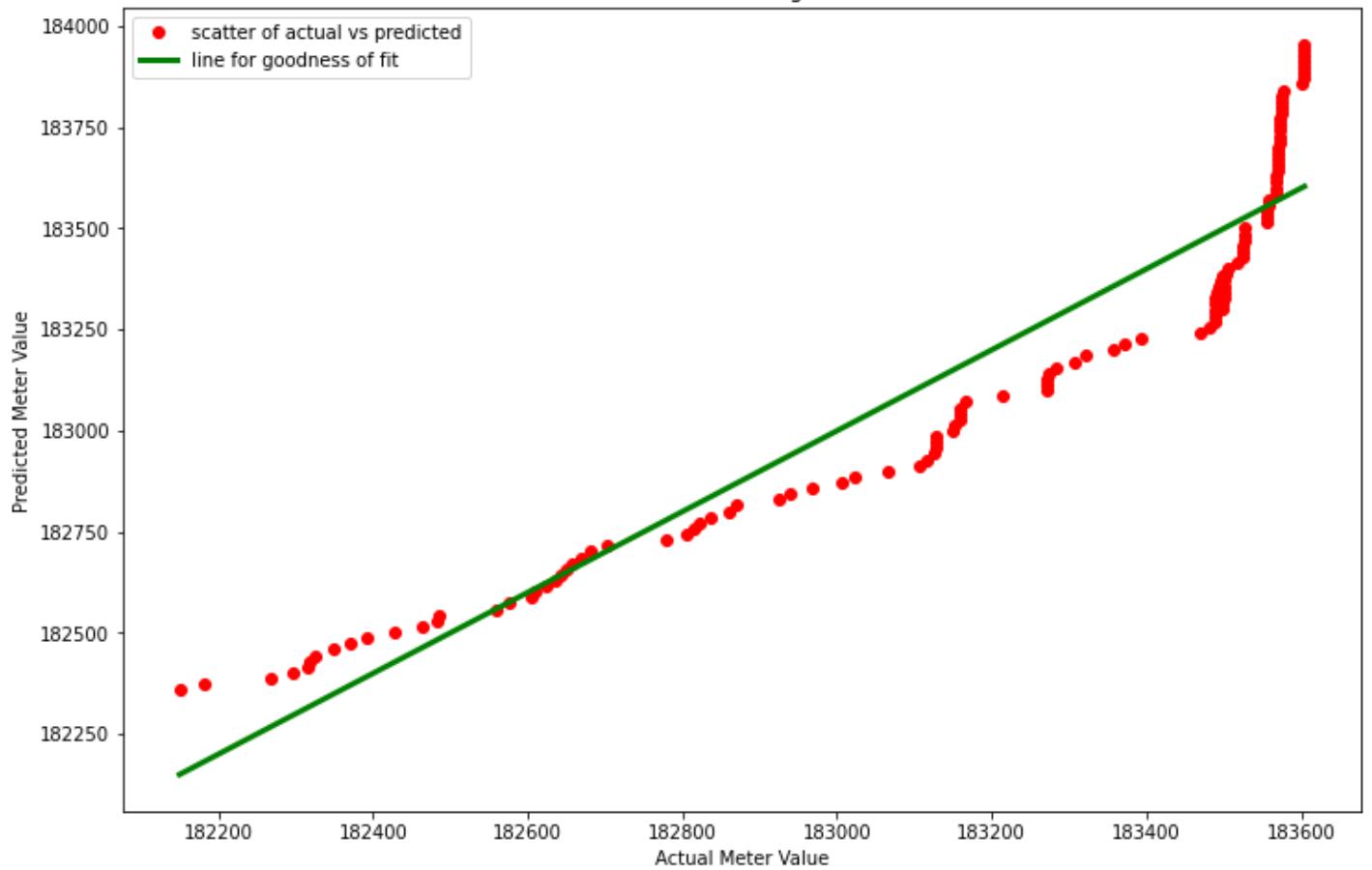
Scatter Plot - Household 4767.0 Testing MSE : 27416.219482926954



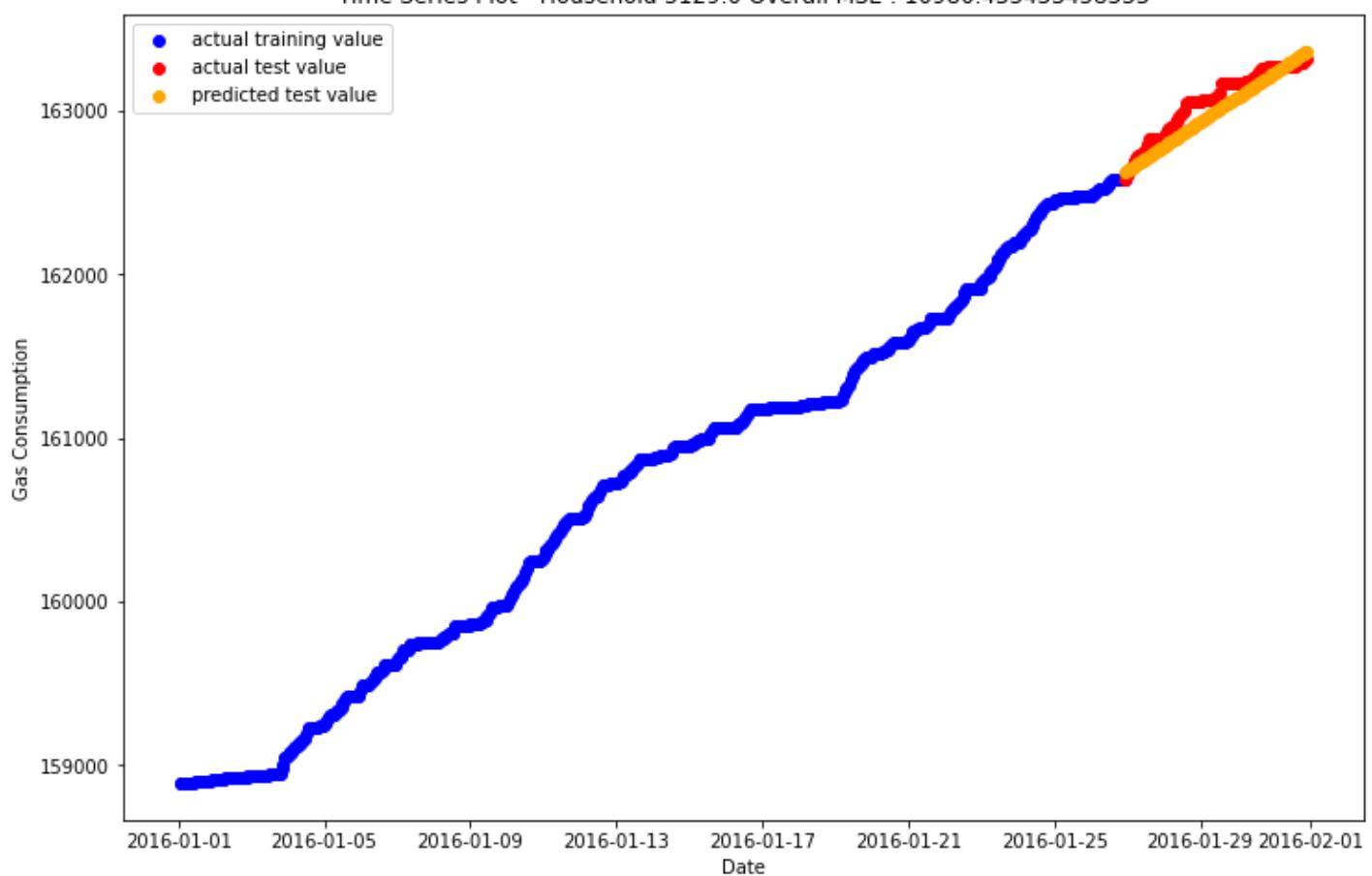
Time Series Plot - Household 4998.0 Overall MSE : 33878.89586657949



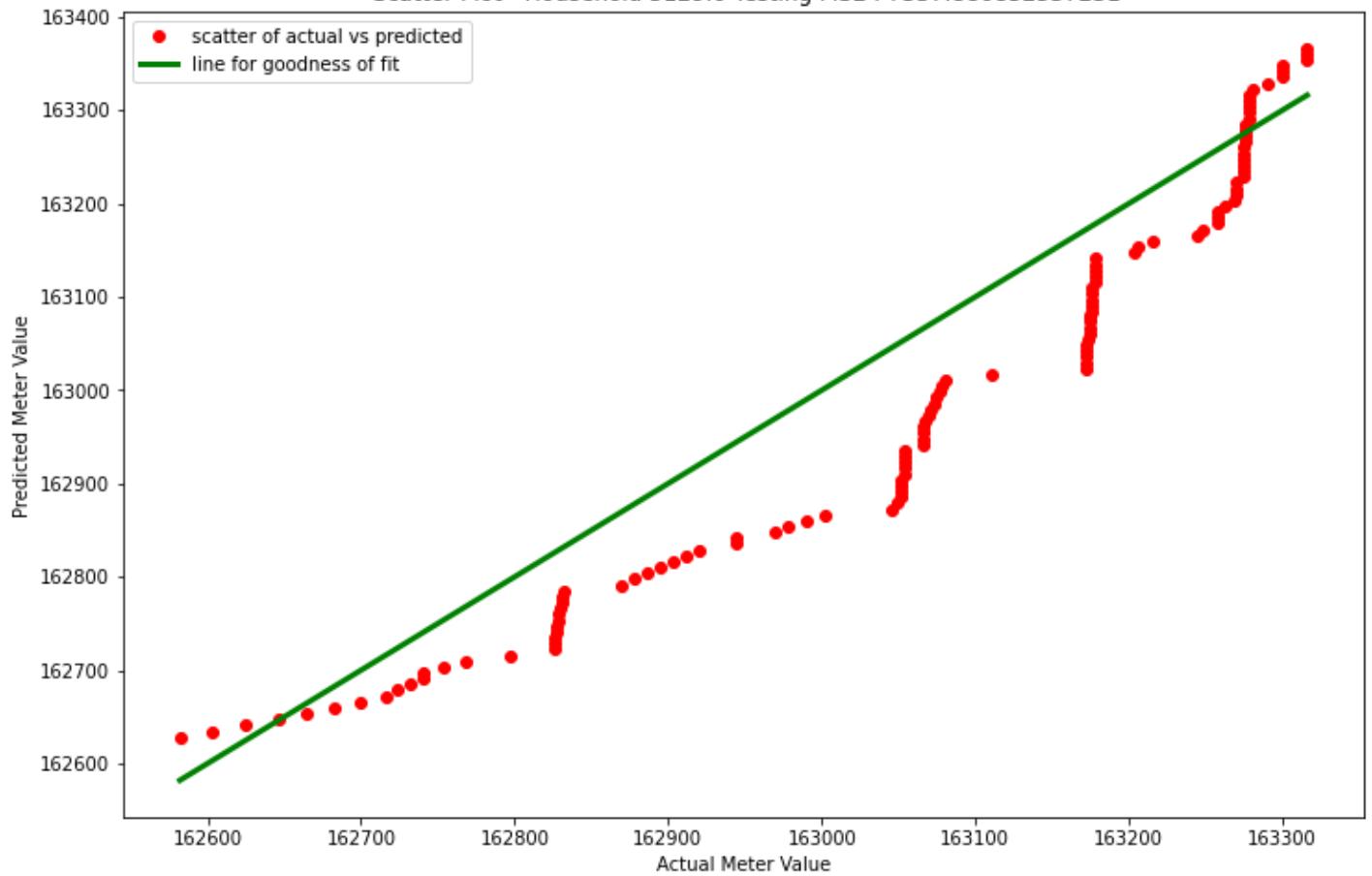
Scatter Plot - Household 4998.0 Testing MSE : 21986.109272943428



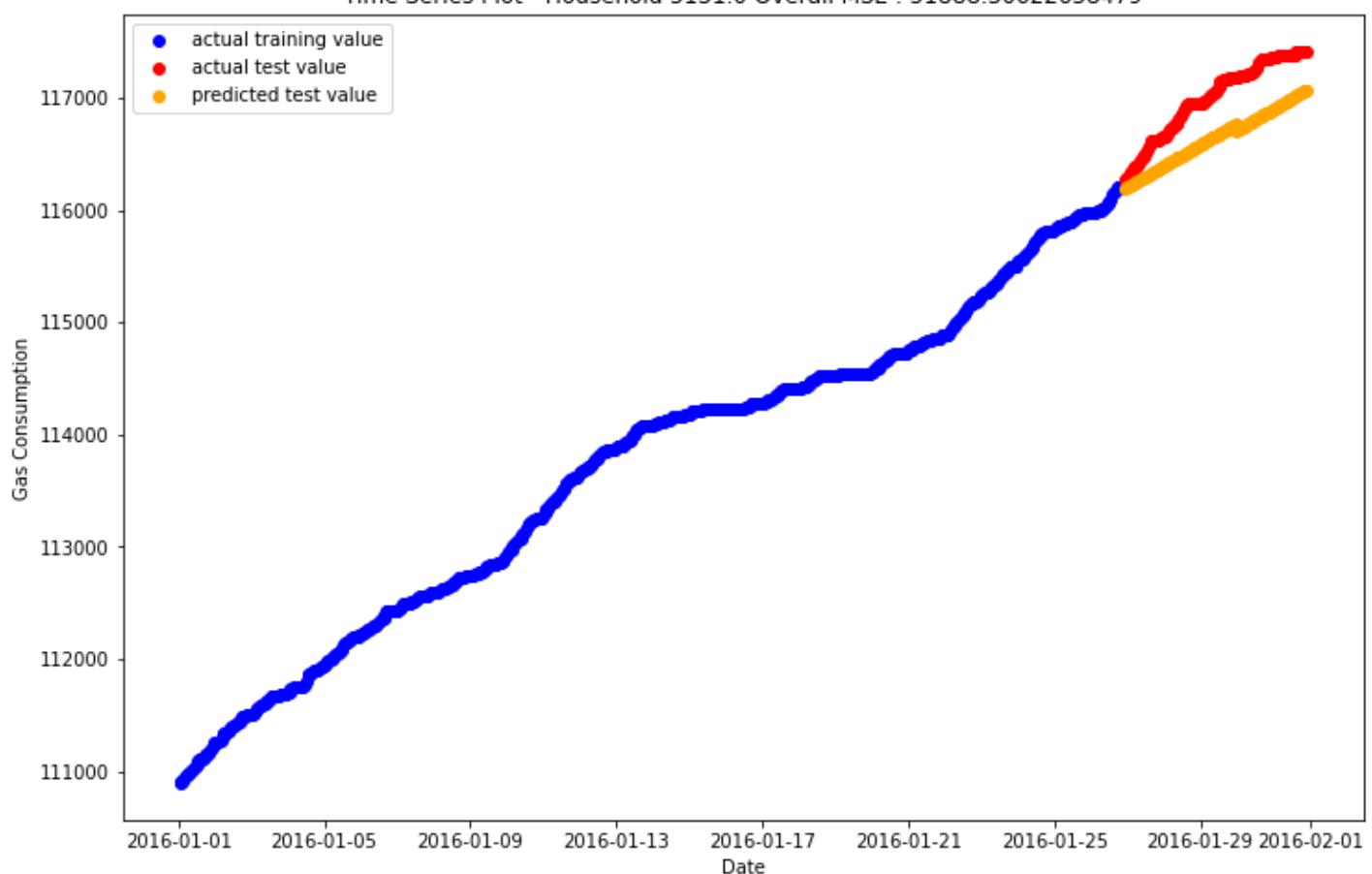
Time Series Plot - Household 5129.0 Overall MSE : 10980.435433458333



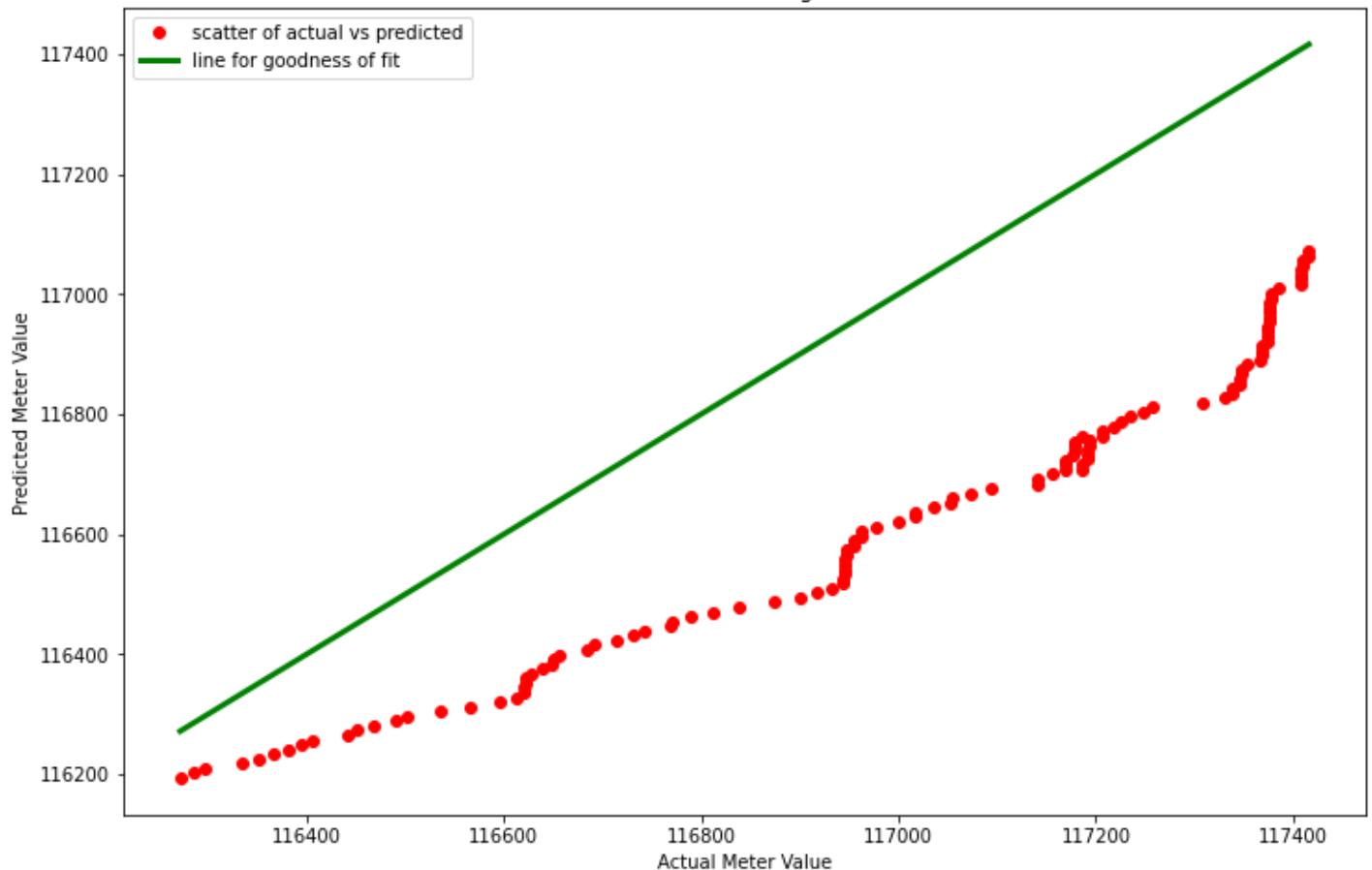
Scatter Plot - Household 5129.0 Testing MSE : 7337.880852537231



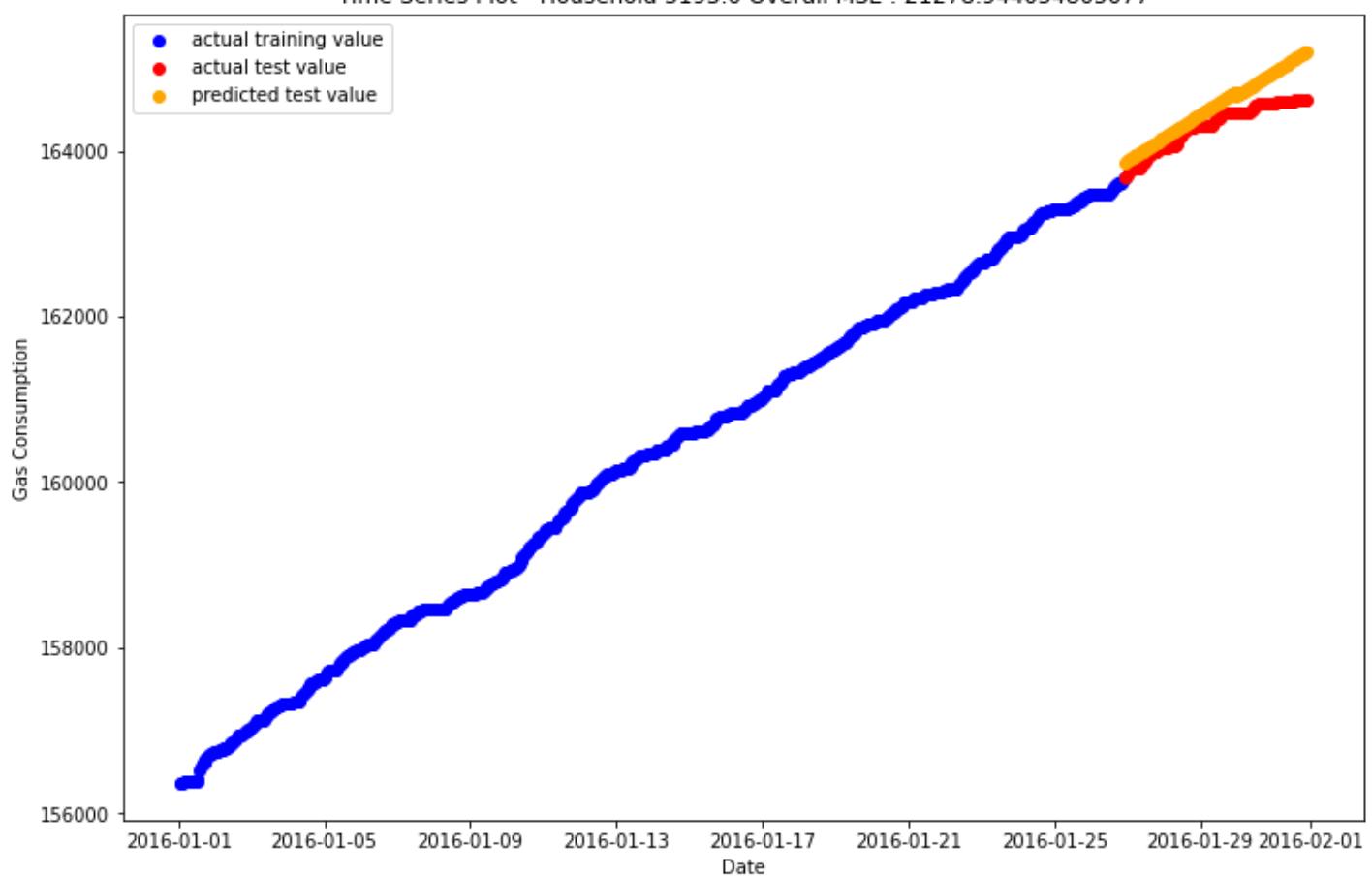
Time Series Plot - Household 5131.0 Overall MSE : 51888.30622658479



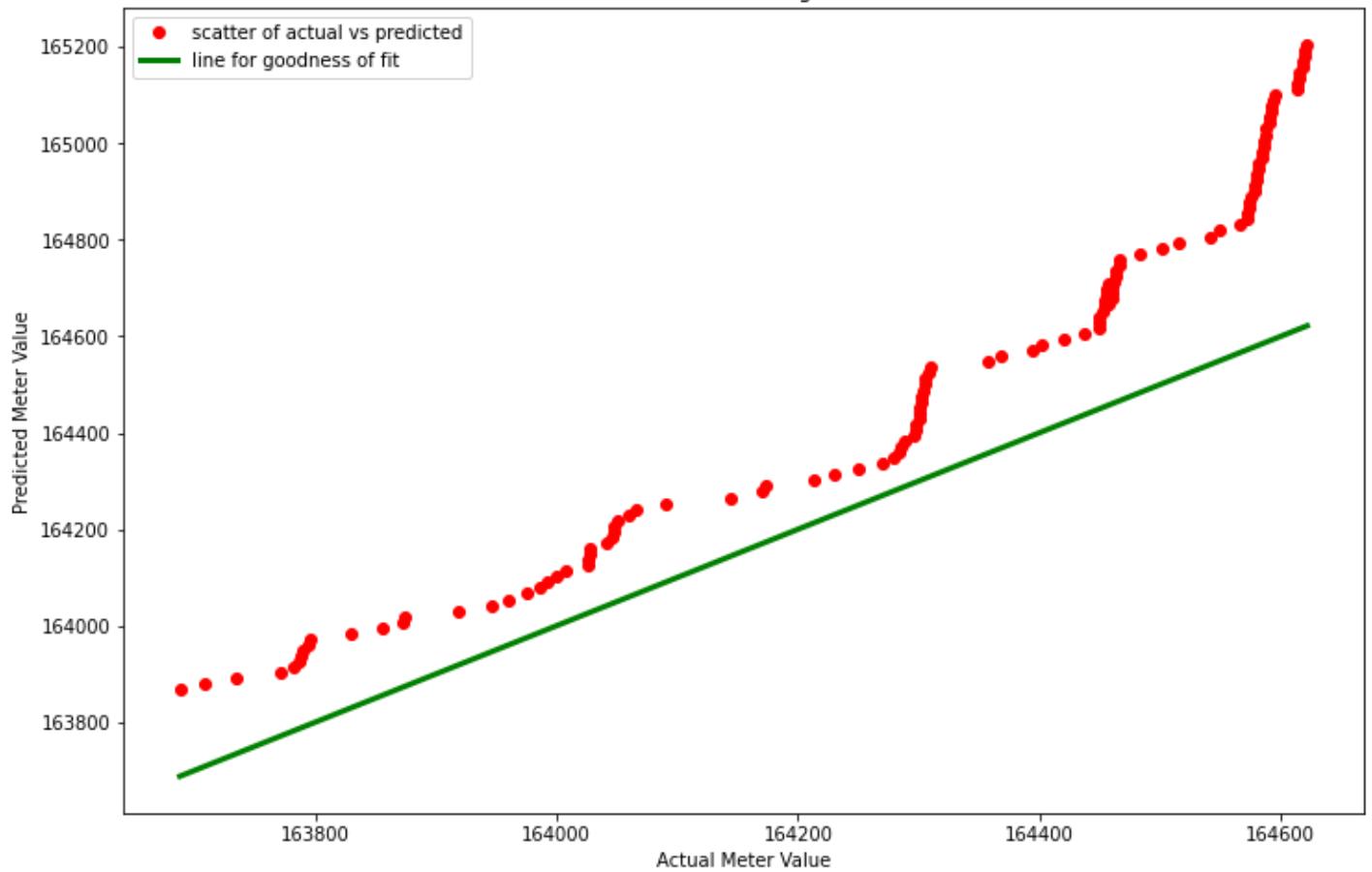
Scatter Plot - Household 5131.0 Testing MSE : 143261.2370310173

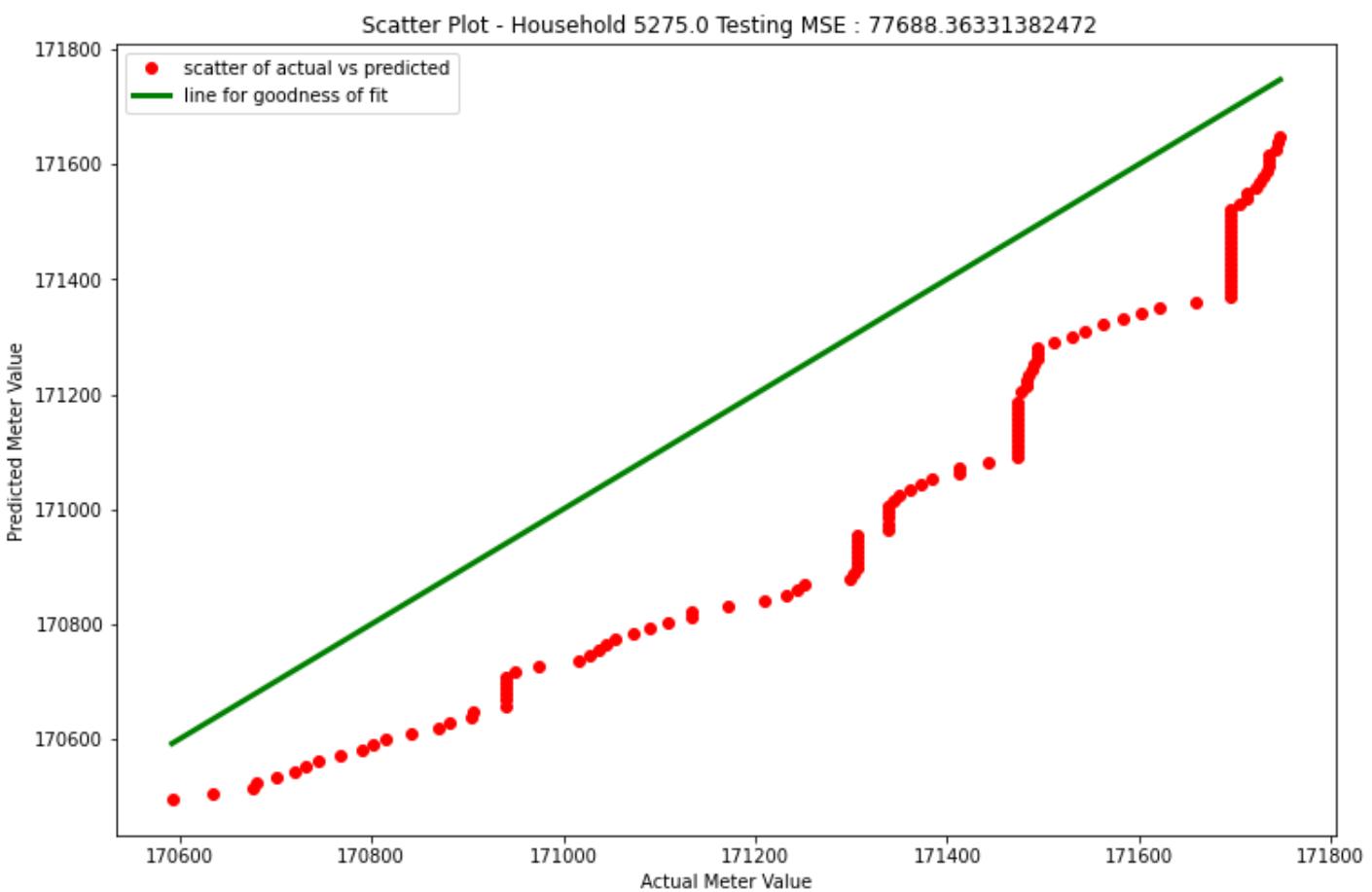
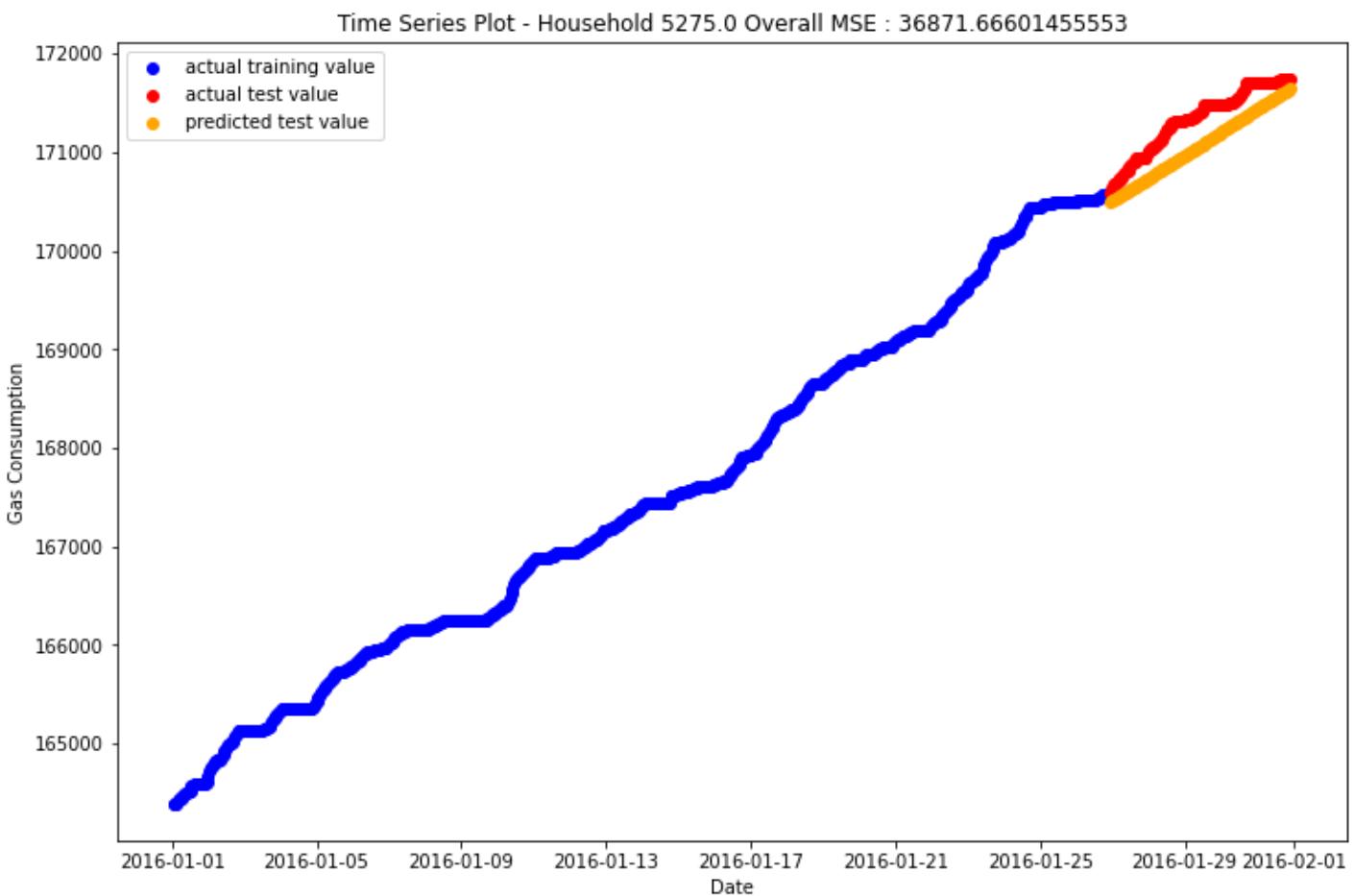


Time Series Plot - Household 5193.0 Overall MSE : 21278.944054805077

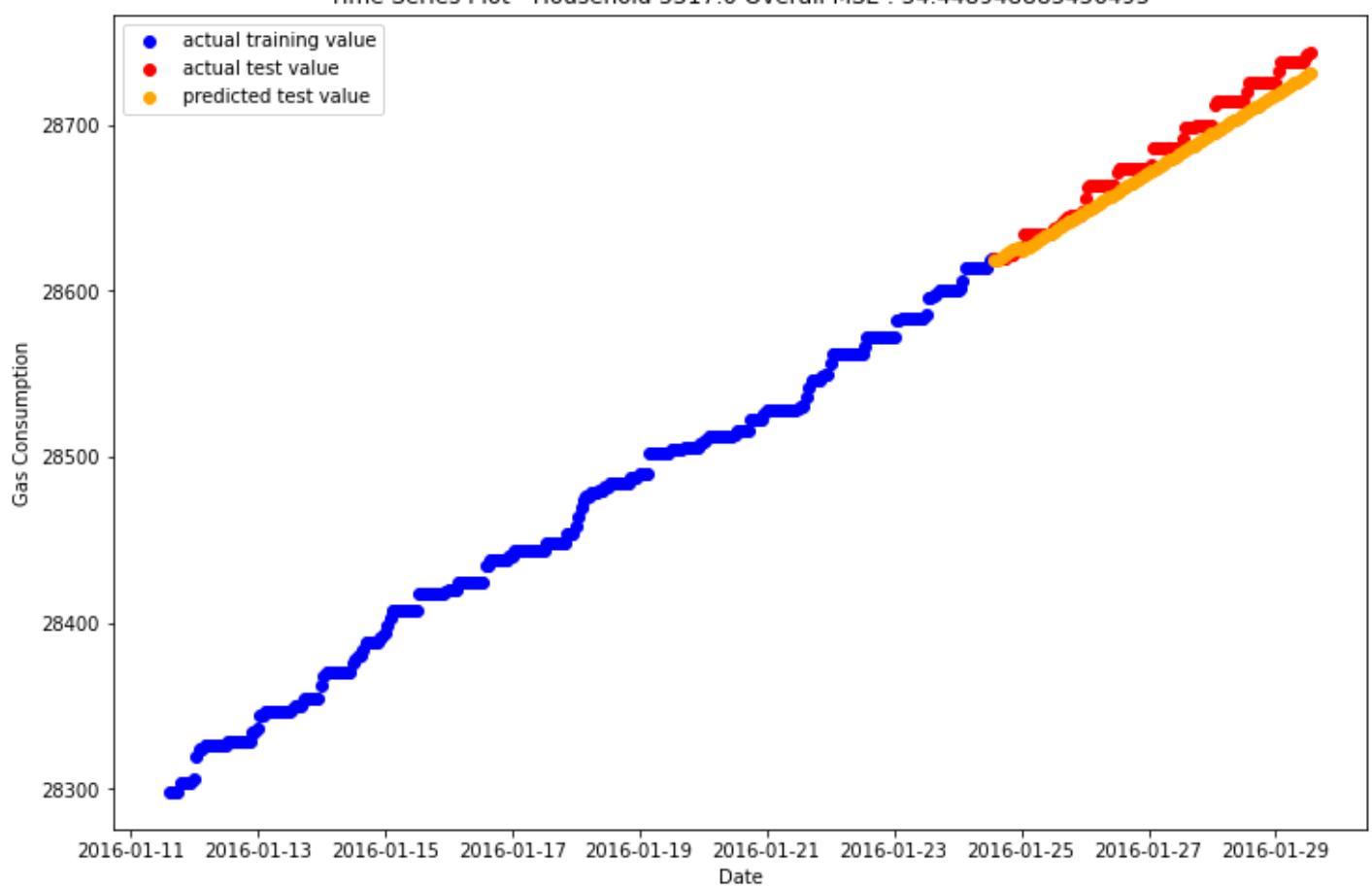


Scatter Plot - Household 5193.0 Testing MSE : 74752.31280078637

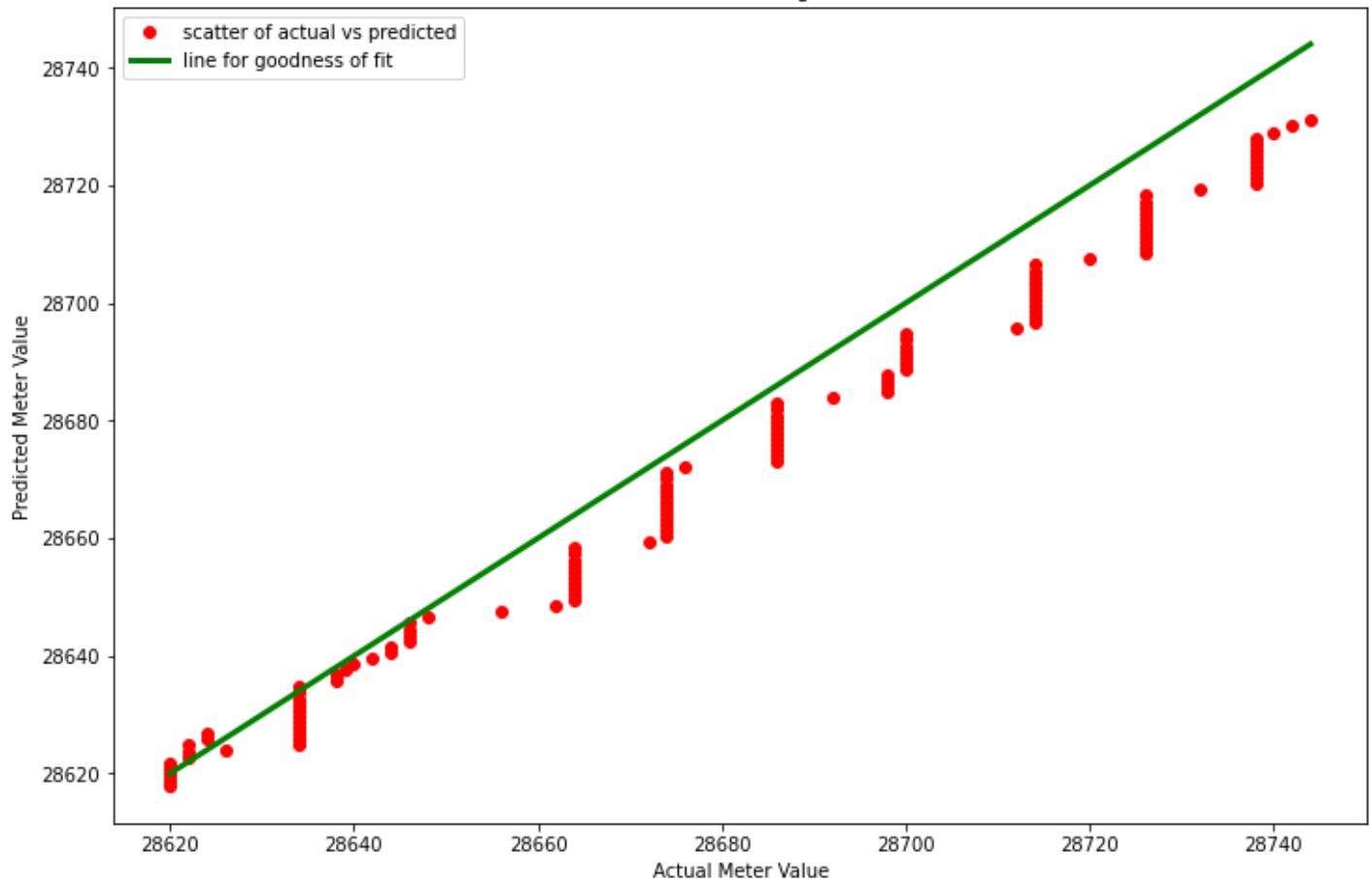




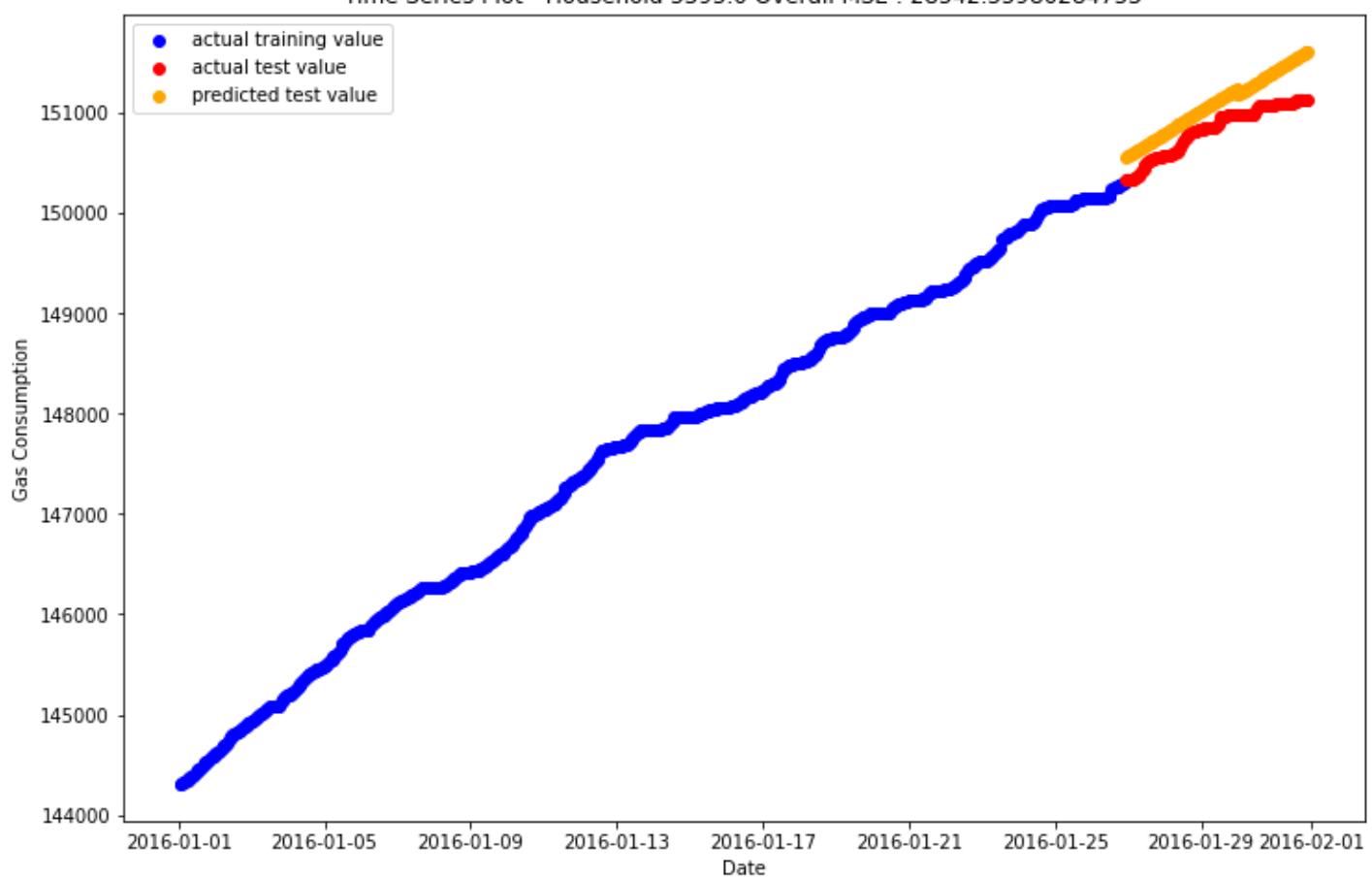
Time Series Plot - Household 5317.0 Overall MSE : 54.448948885456495



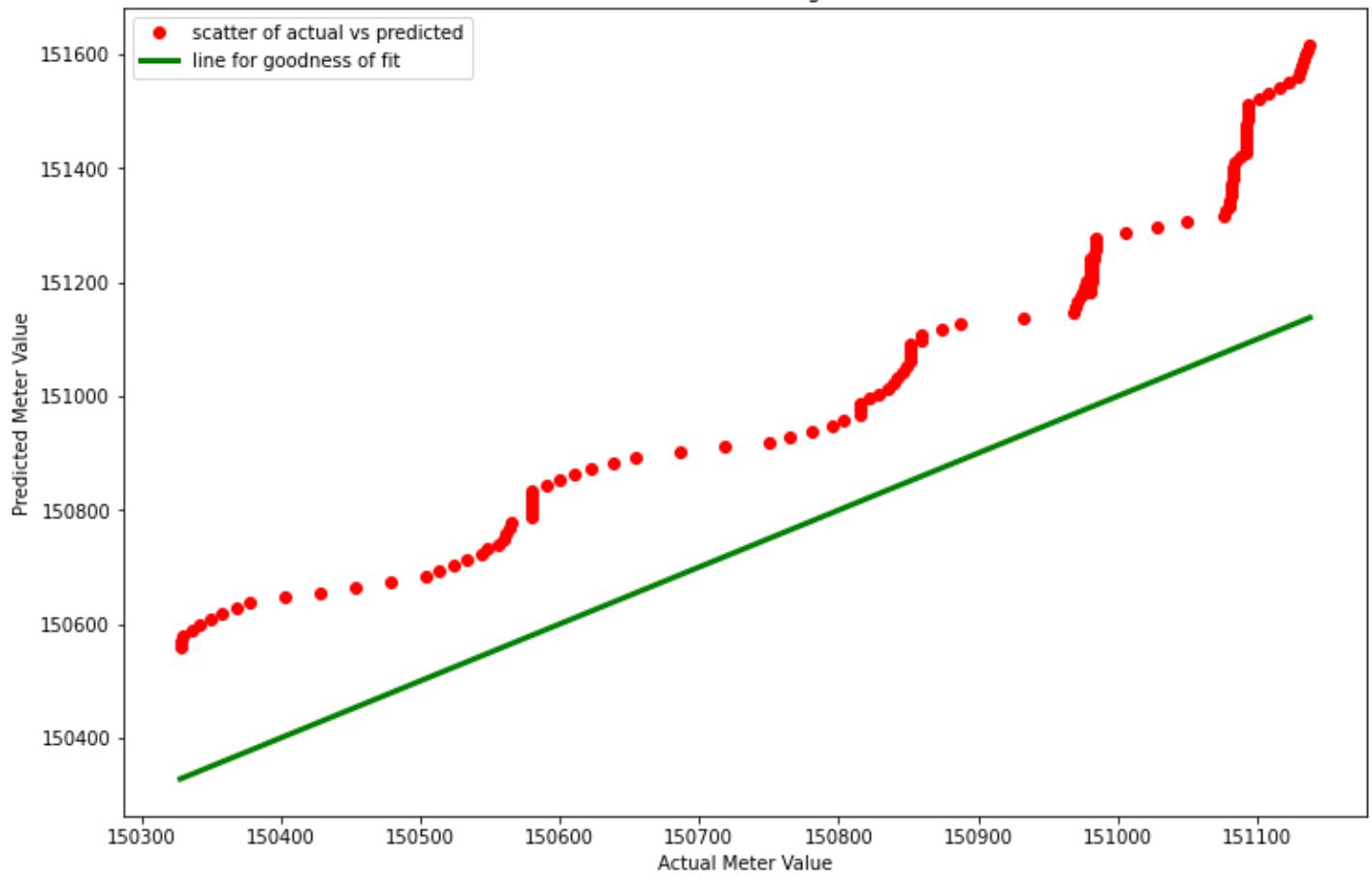
Scatter Plot - Household 5317.0 Testing MSE : 94.73657825381848



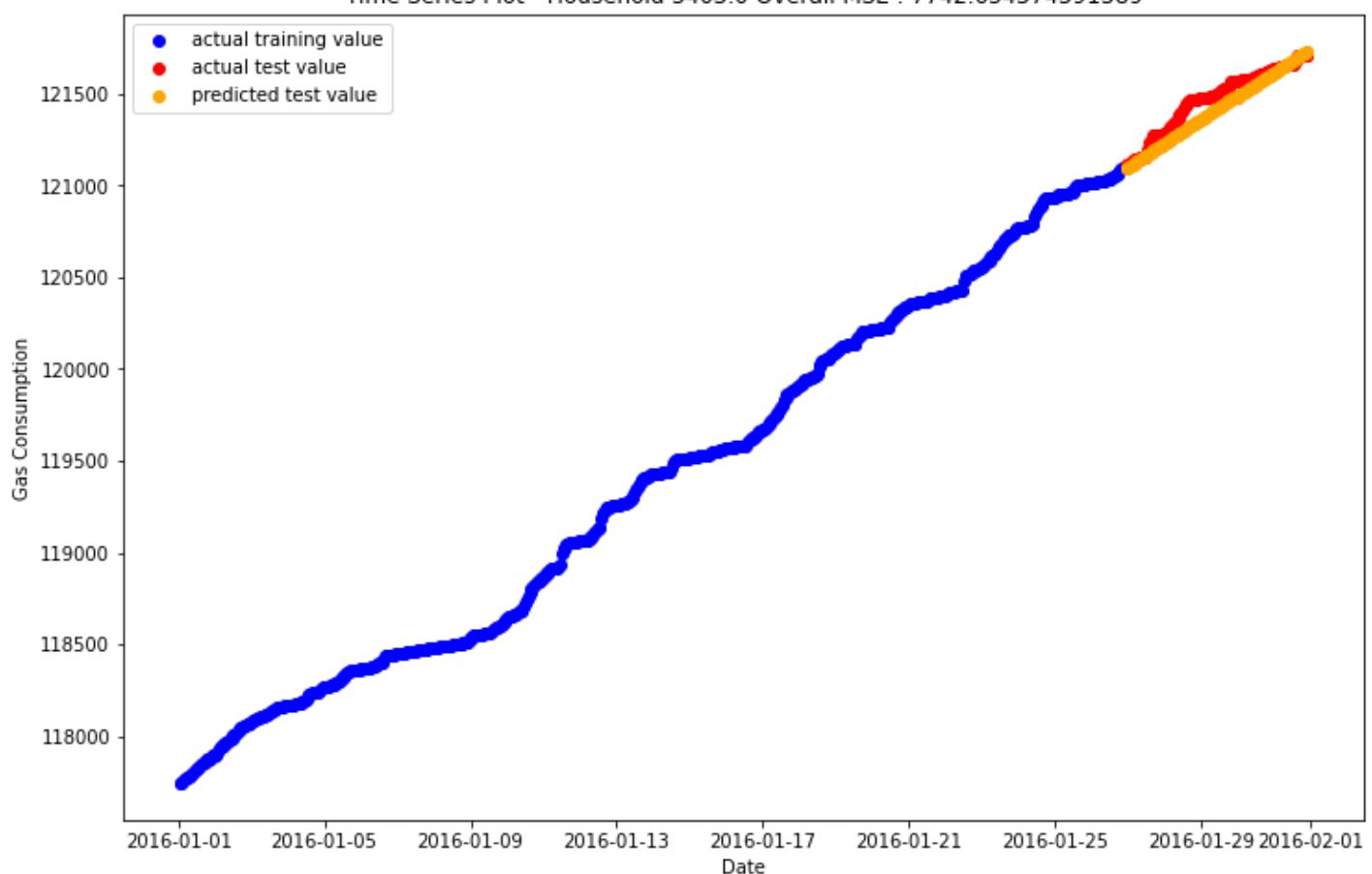
Time Series Plot - Household 5395.0 Overall MSE : 28542.55980284753



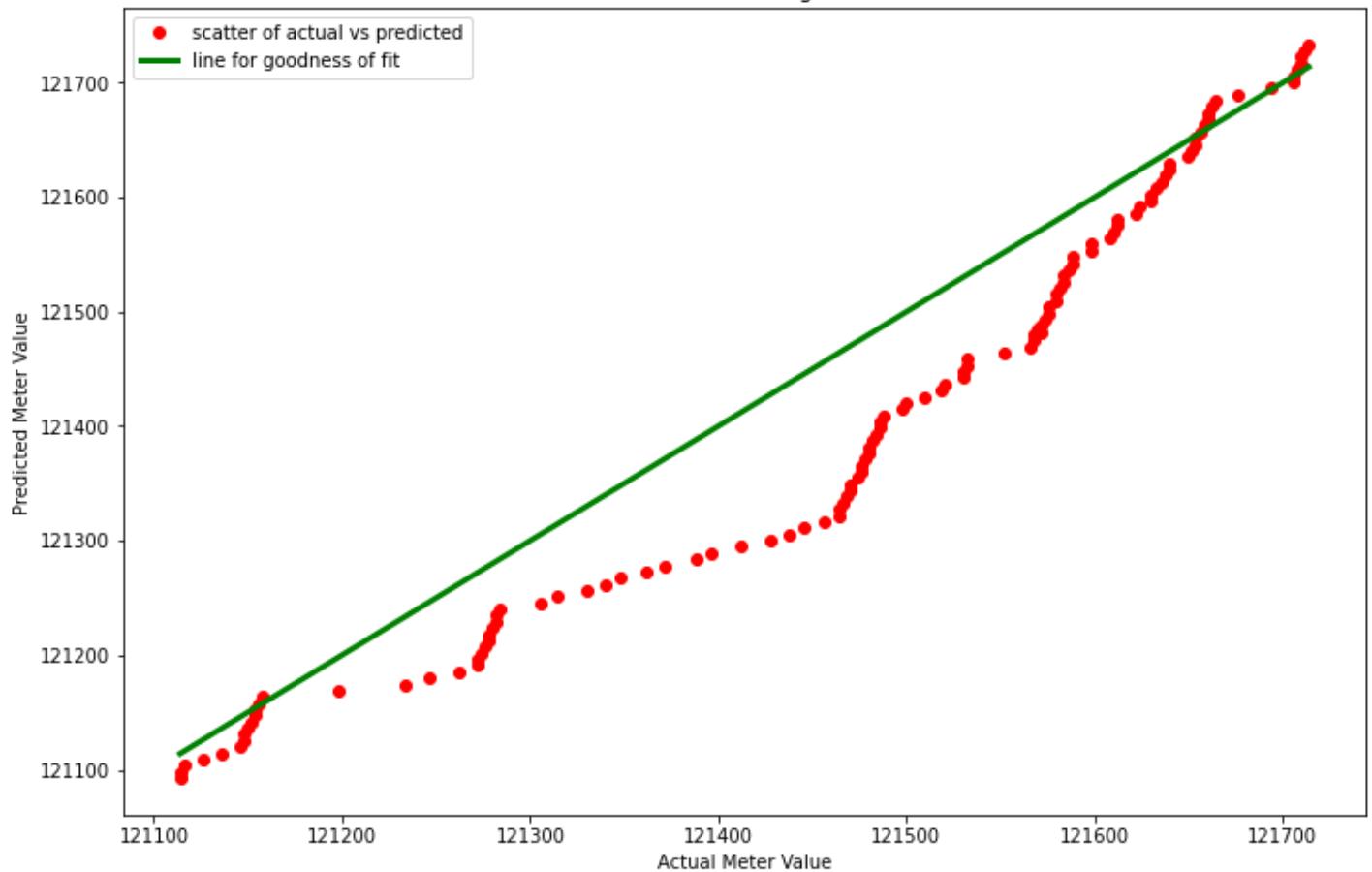
Scatter Plot - Household 5395.0 Testing MSE : 74294.3932768335



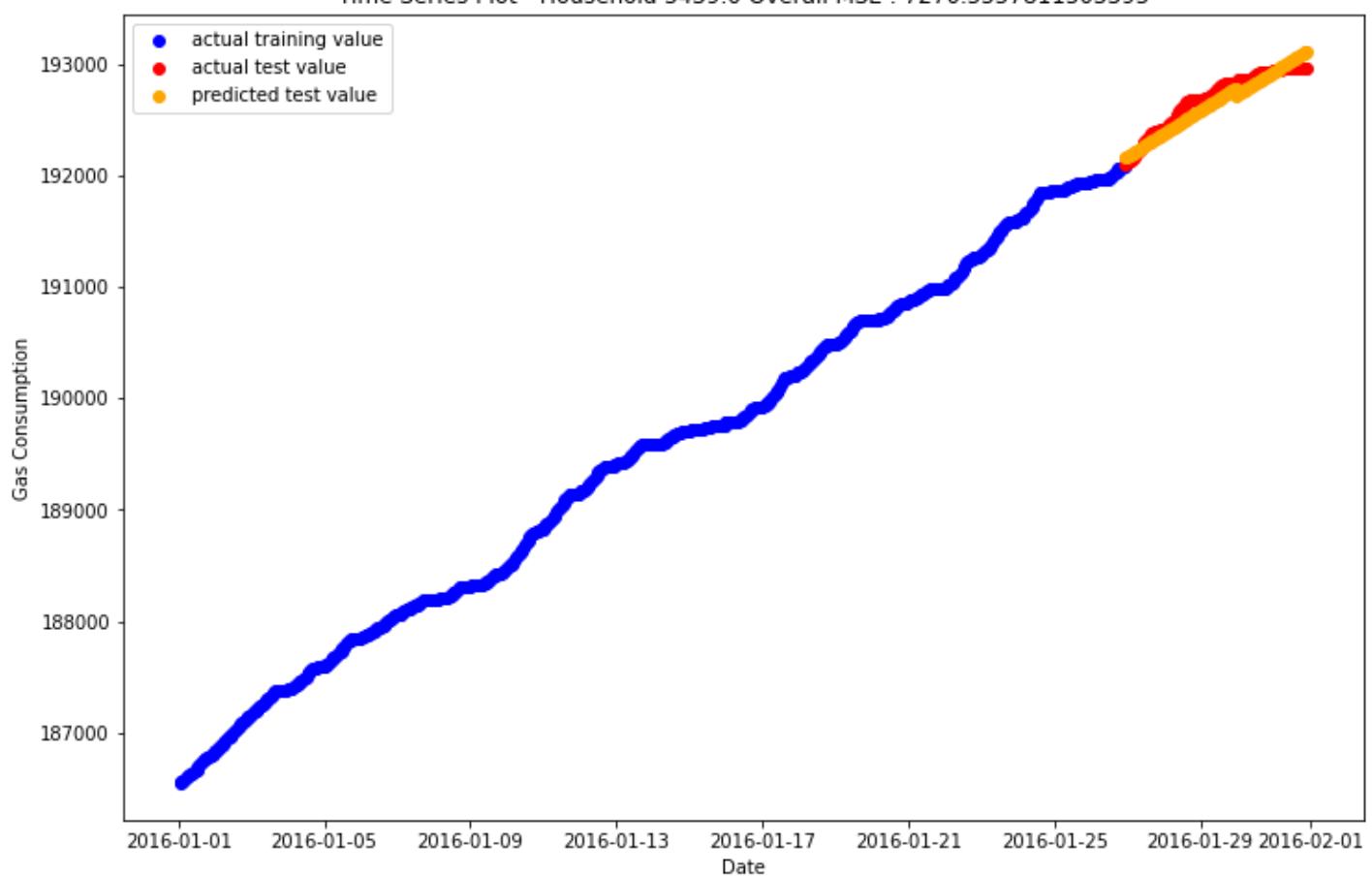
Time Series Plot - Household 5403.0 Overall MSE : 7742.654374391389



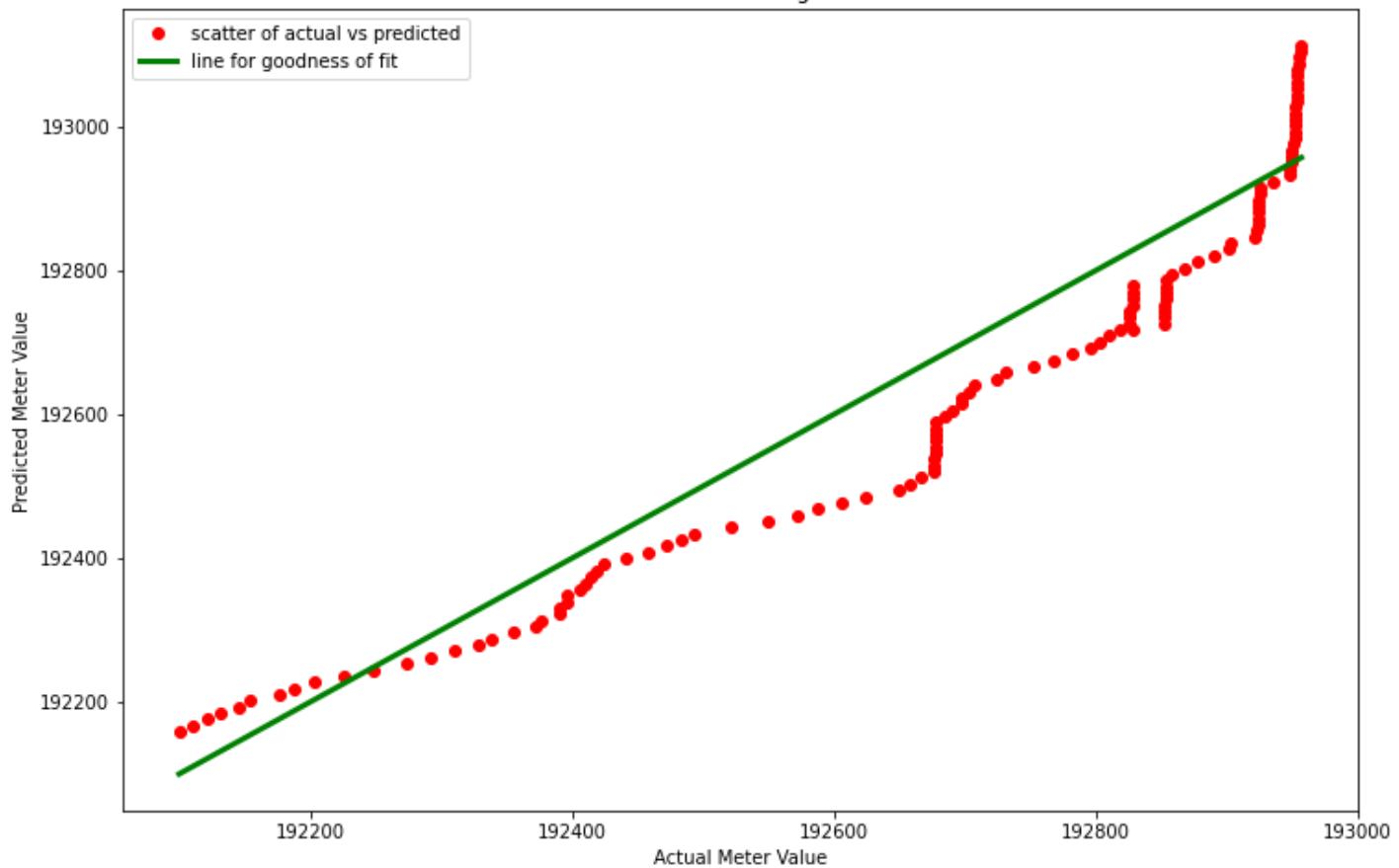
Scatter Plot - Household 5403.0 Testing MSE : 4982.108964858819



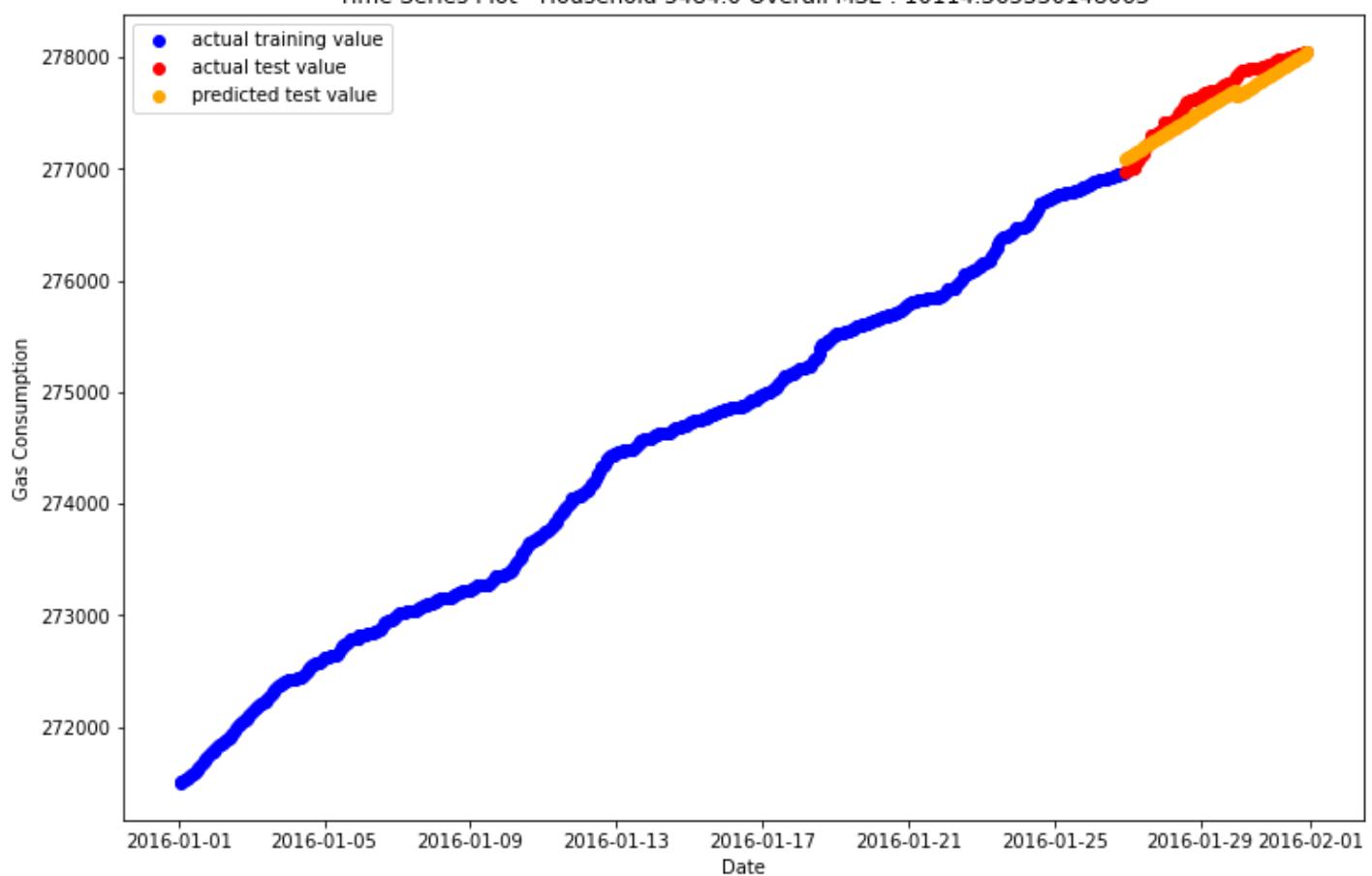
Time Series Plot - Household 5439.0 Overall MSE : 7270.5557811503395



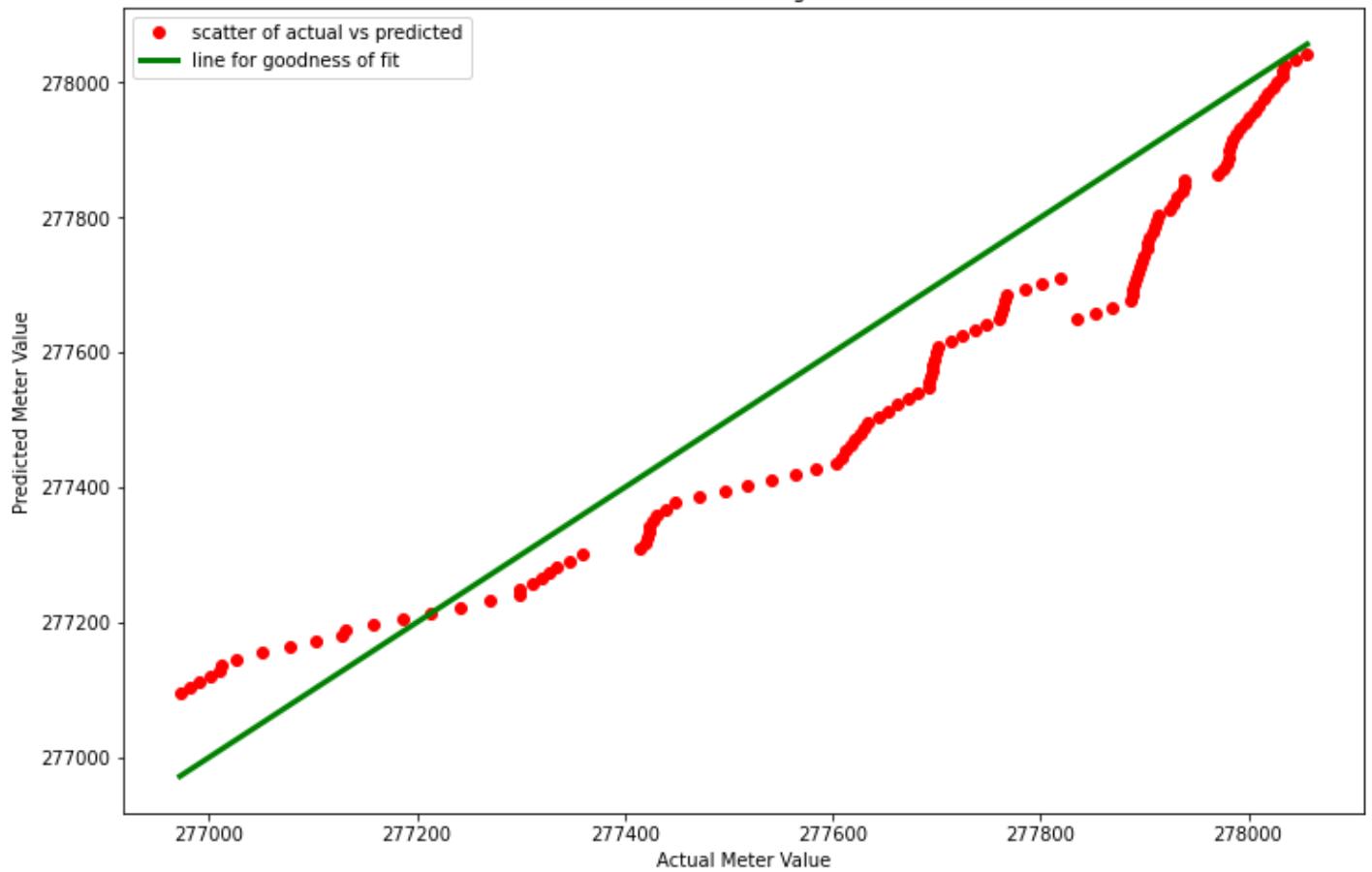
Scatter Plot - Household 5439.0 Testing MSE : 6904.431705920306



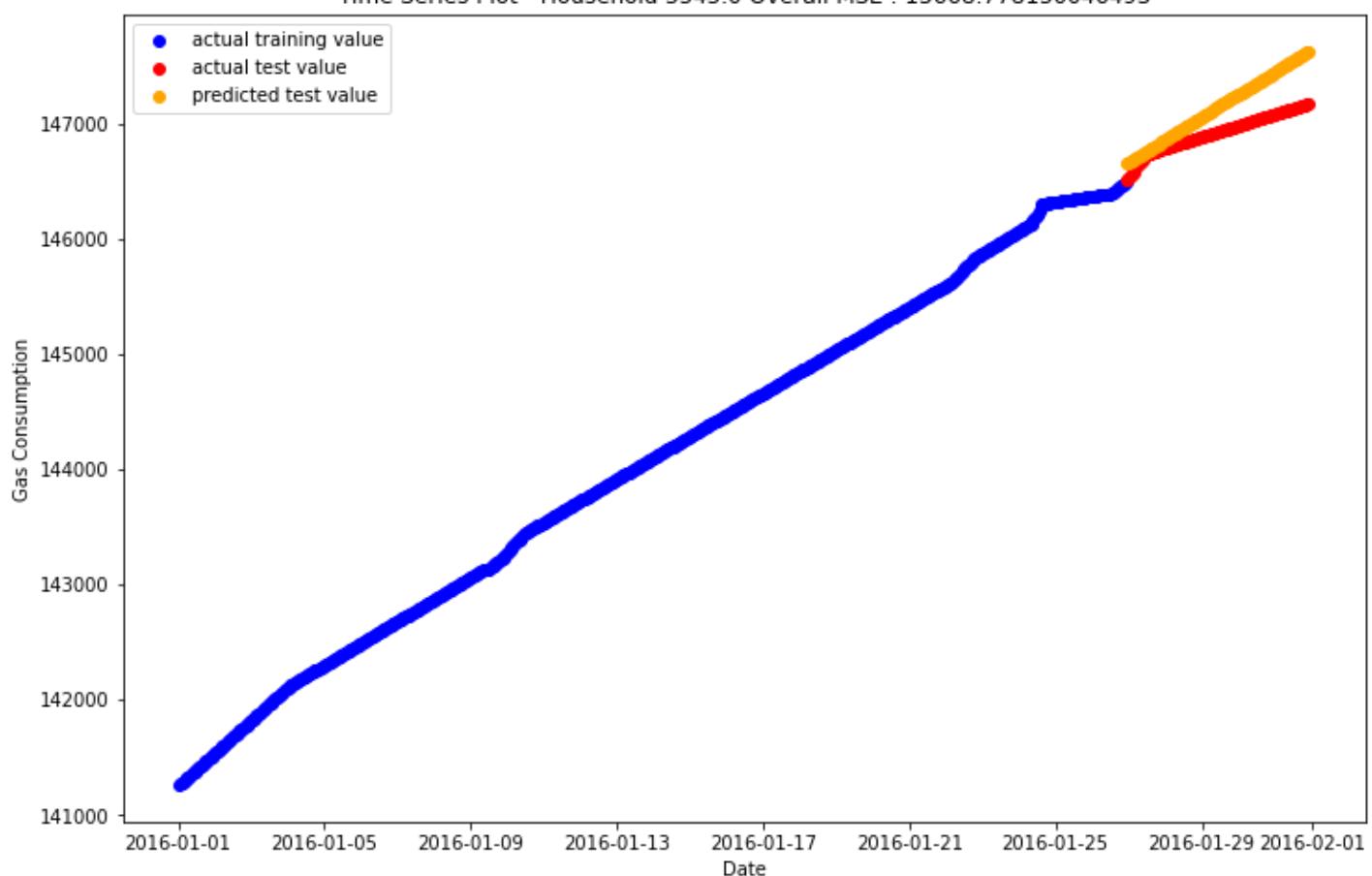
Time Series Plot - Household 5484.0 Overall MSE : 10114.365330148063



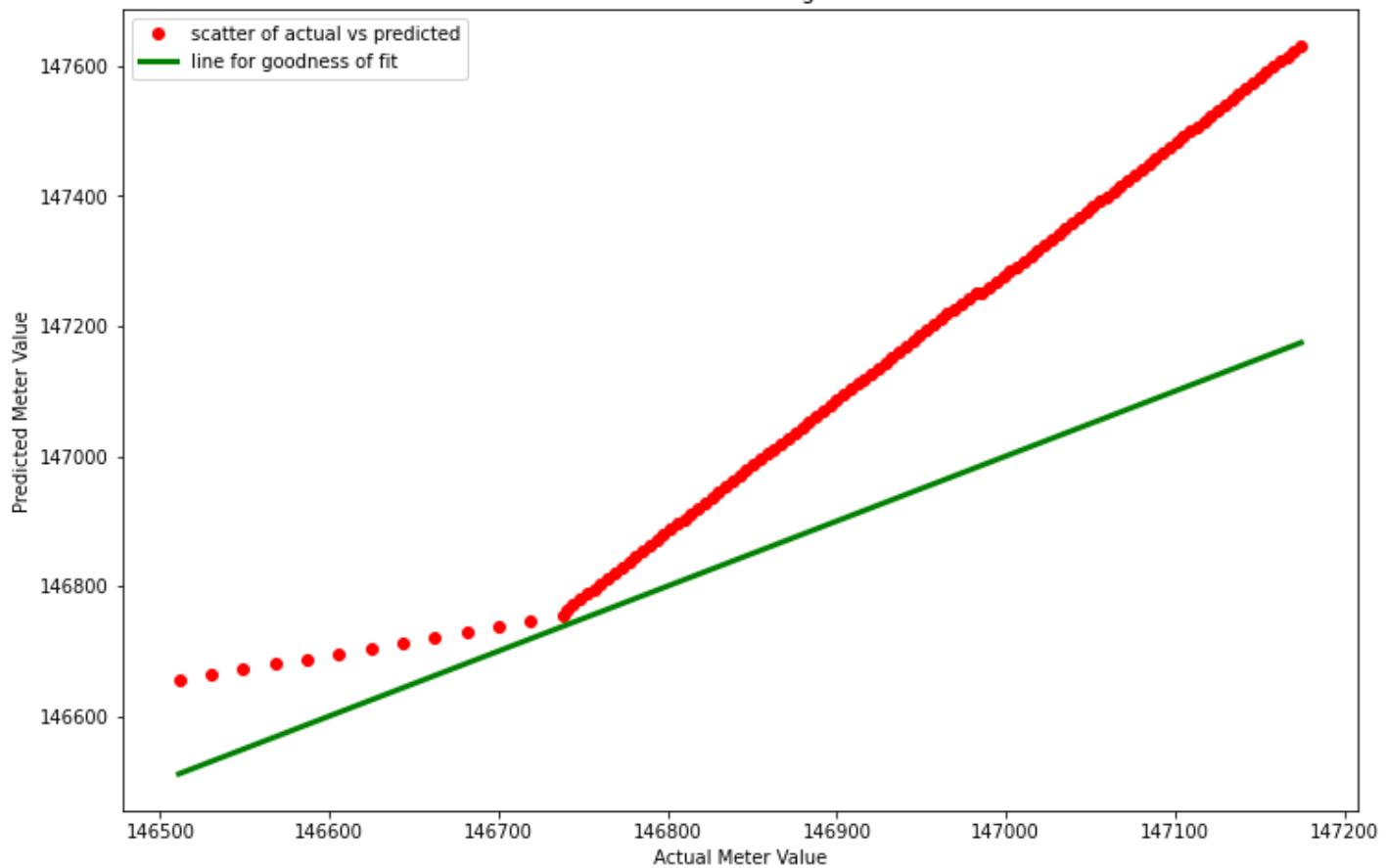
Scatter Plot - Household 5484.0 Testing MSE : 12596.954658198745



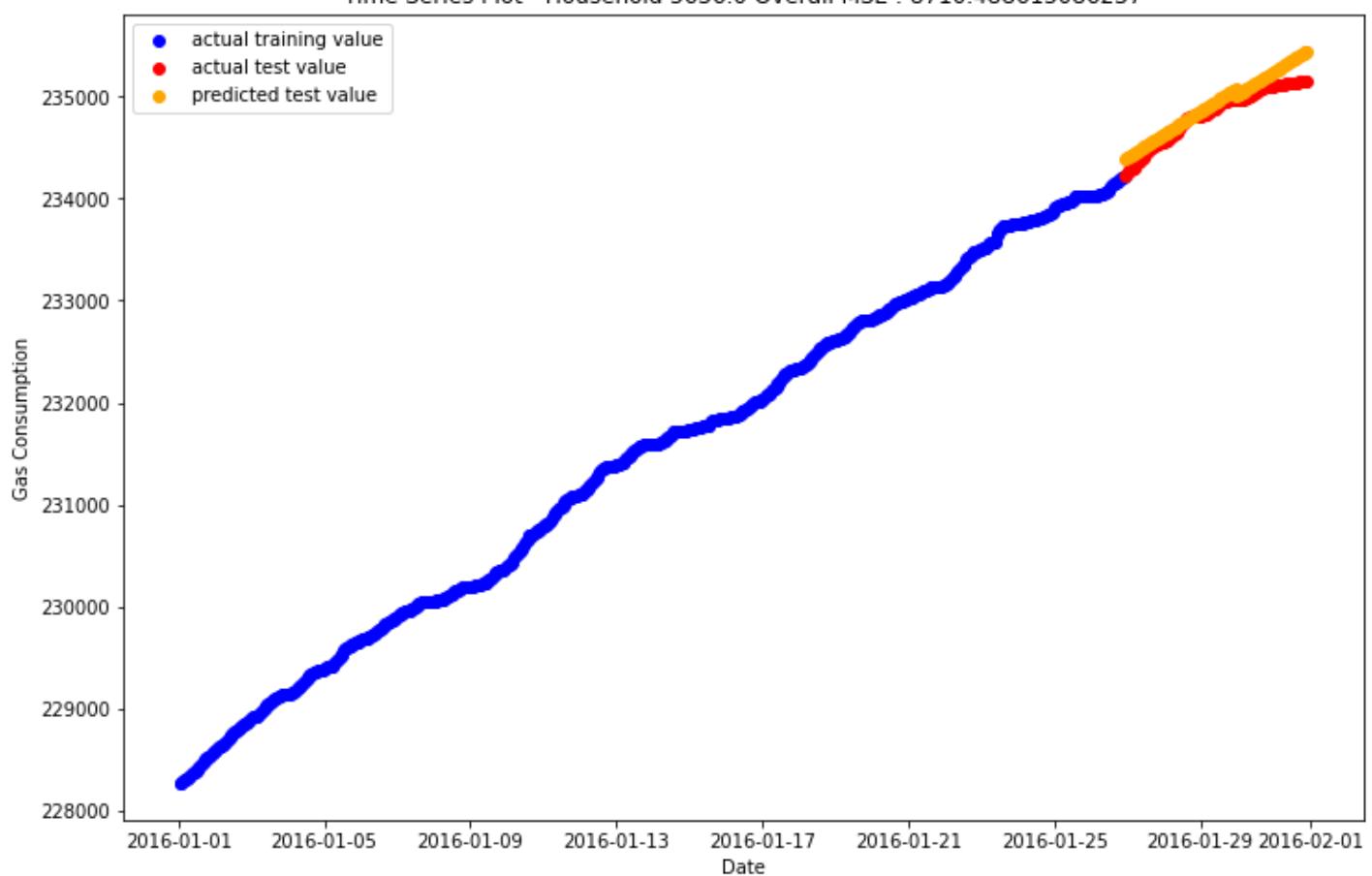
Time Series Plot - Household 5545.0 Overall MSE : 13668.778150046493



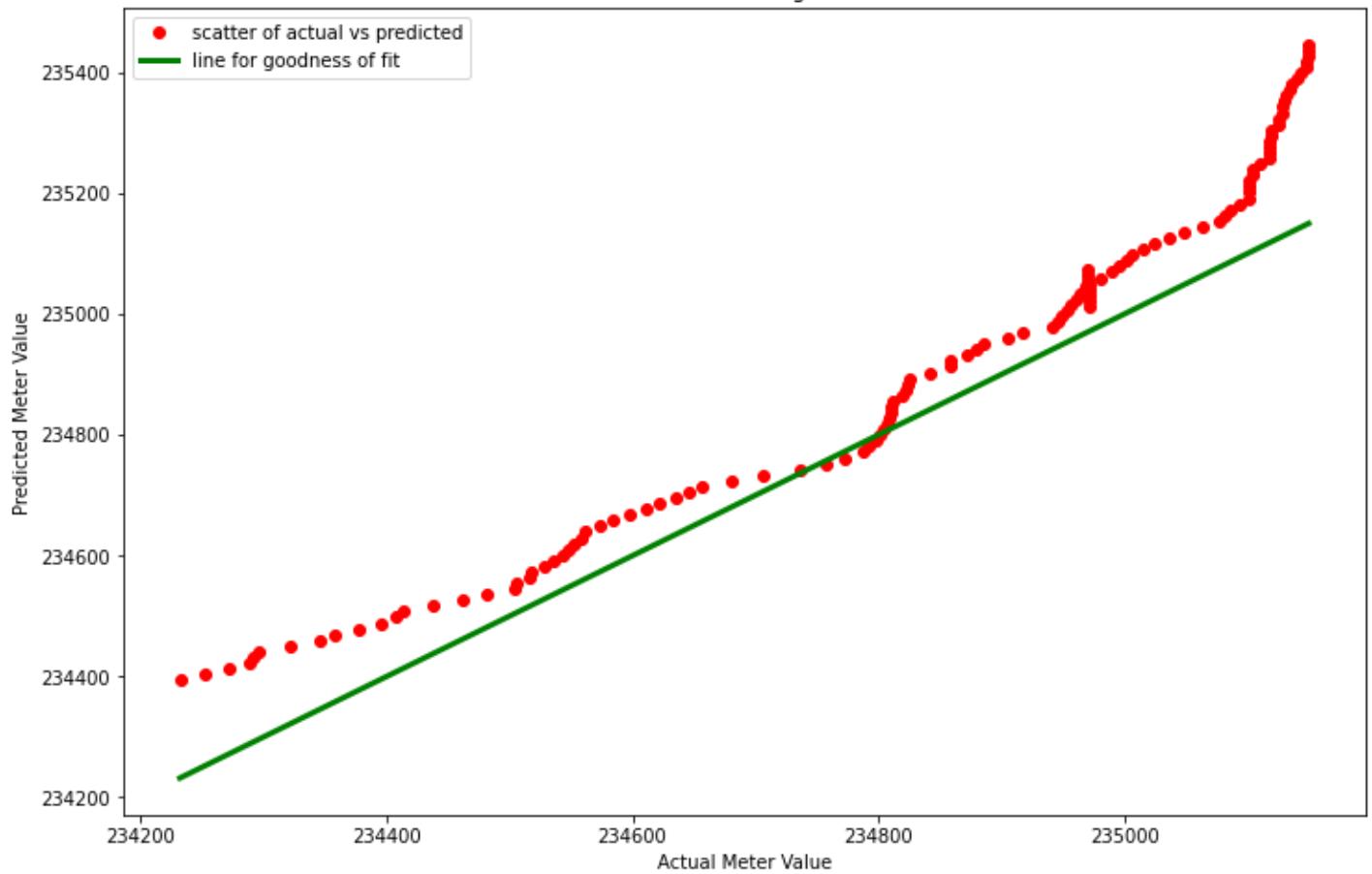
Scatter Plot - Household 5545.0 Testing MSE : 66557.0243330102



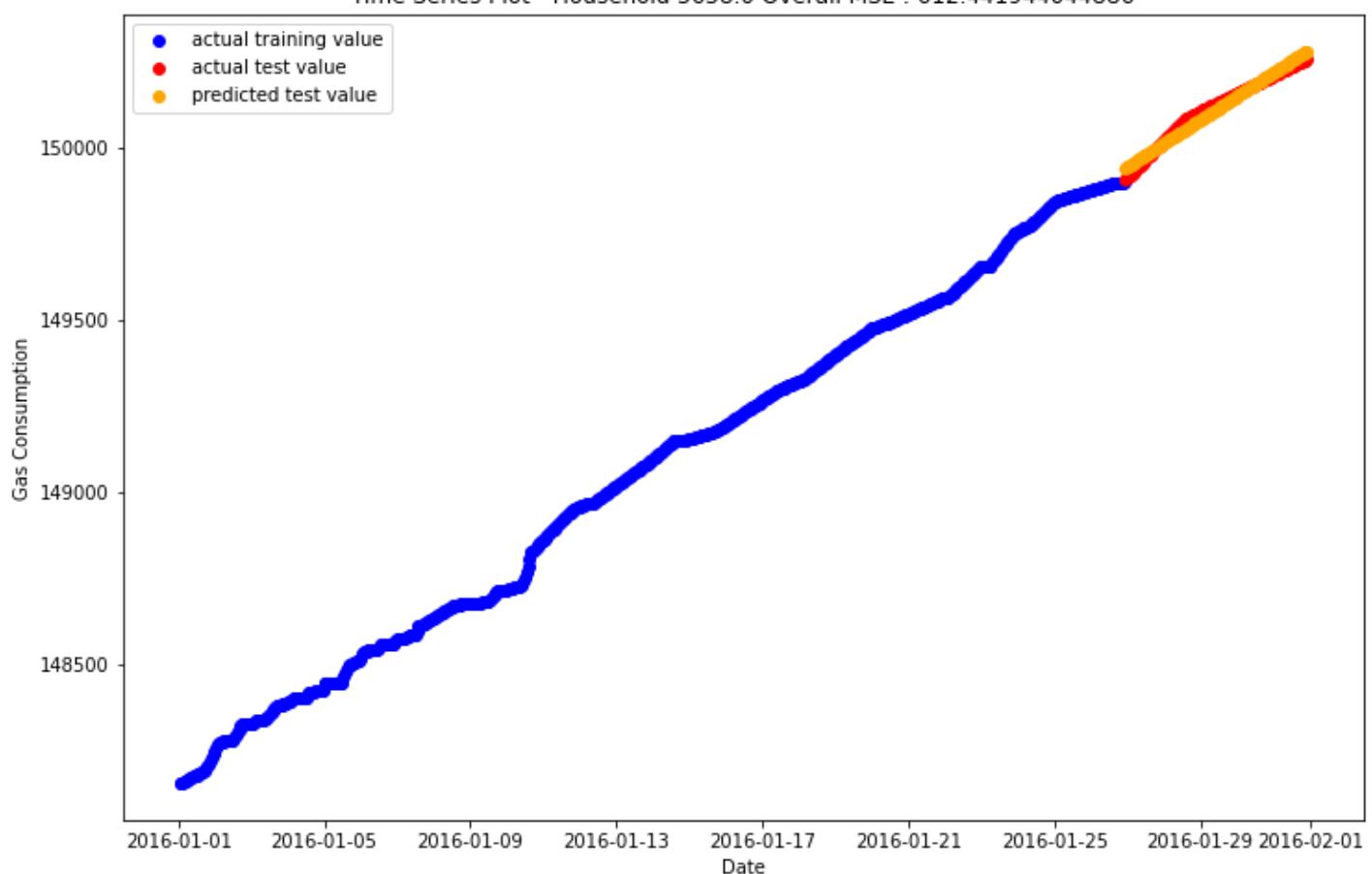
Time Series Plot - Household 5636.0 Overall MSE : 8710.488615086237



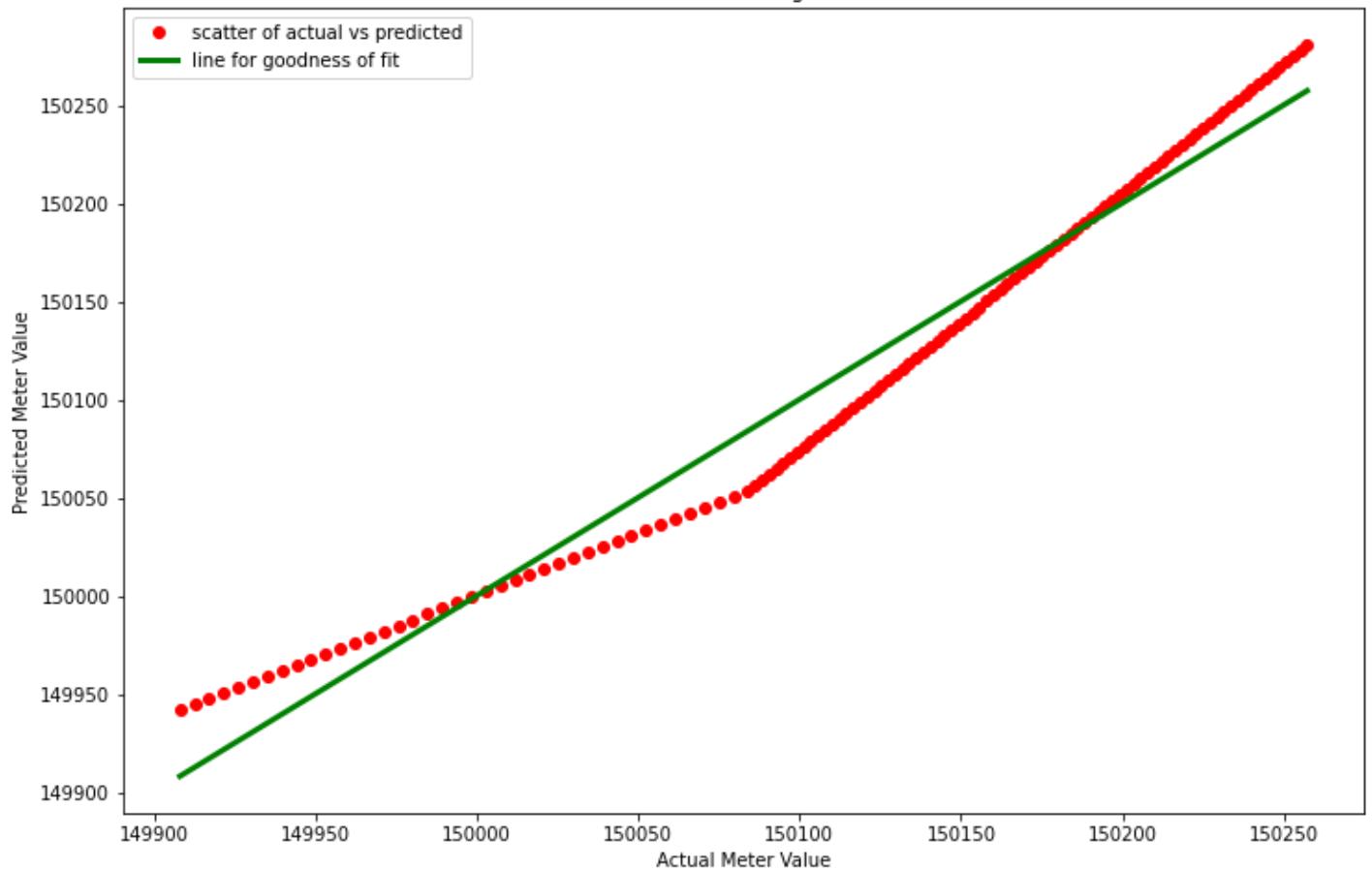
Scatter Plot - Household 5636.0 Testing MSE : 13928.364371666685



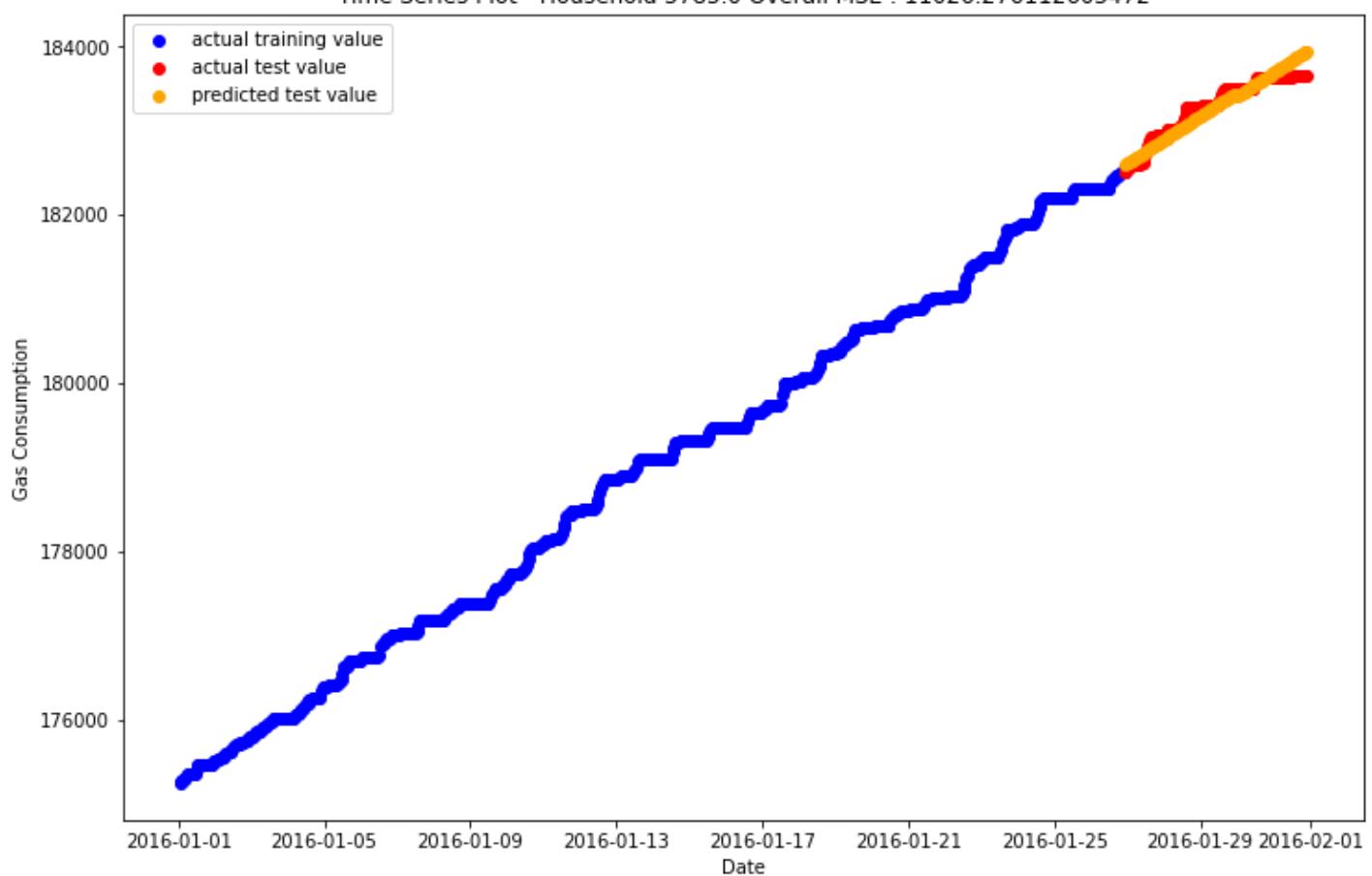
Time Series Plot - Household 5658.0 Overall MSE : 612.441944044886



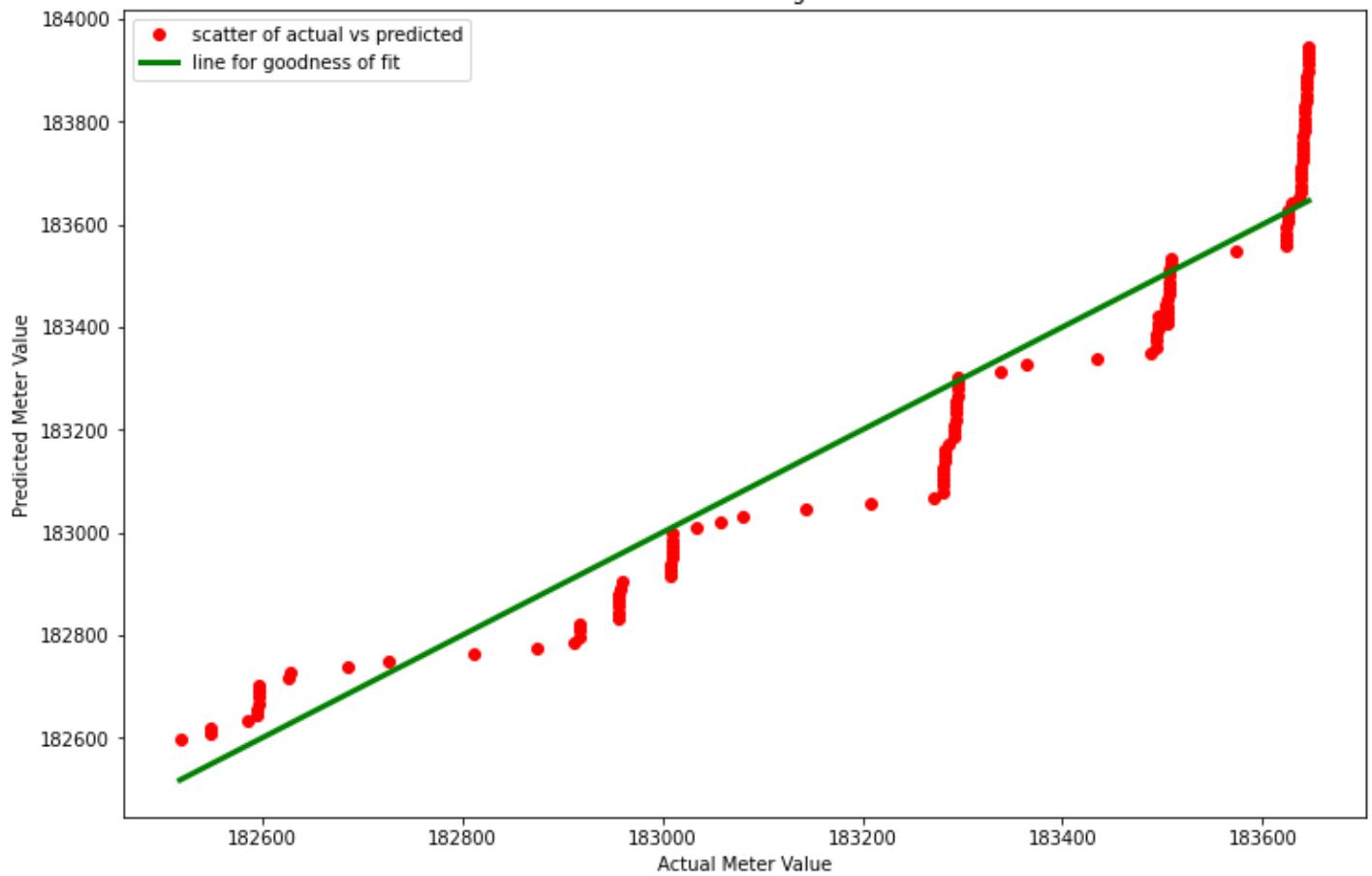
Scatter Plot - Household 5658.0 Testing MSE : 302.84683646466823



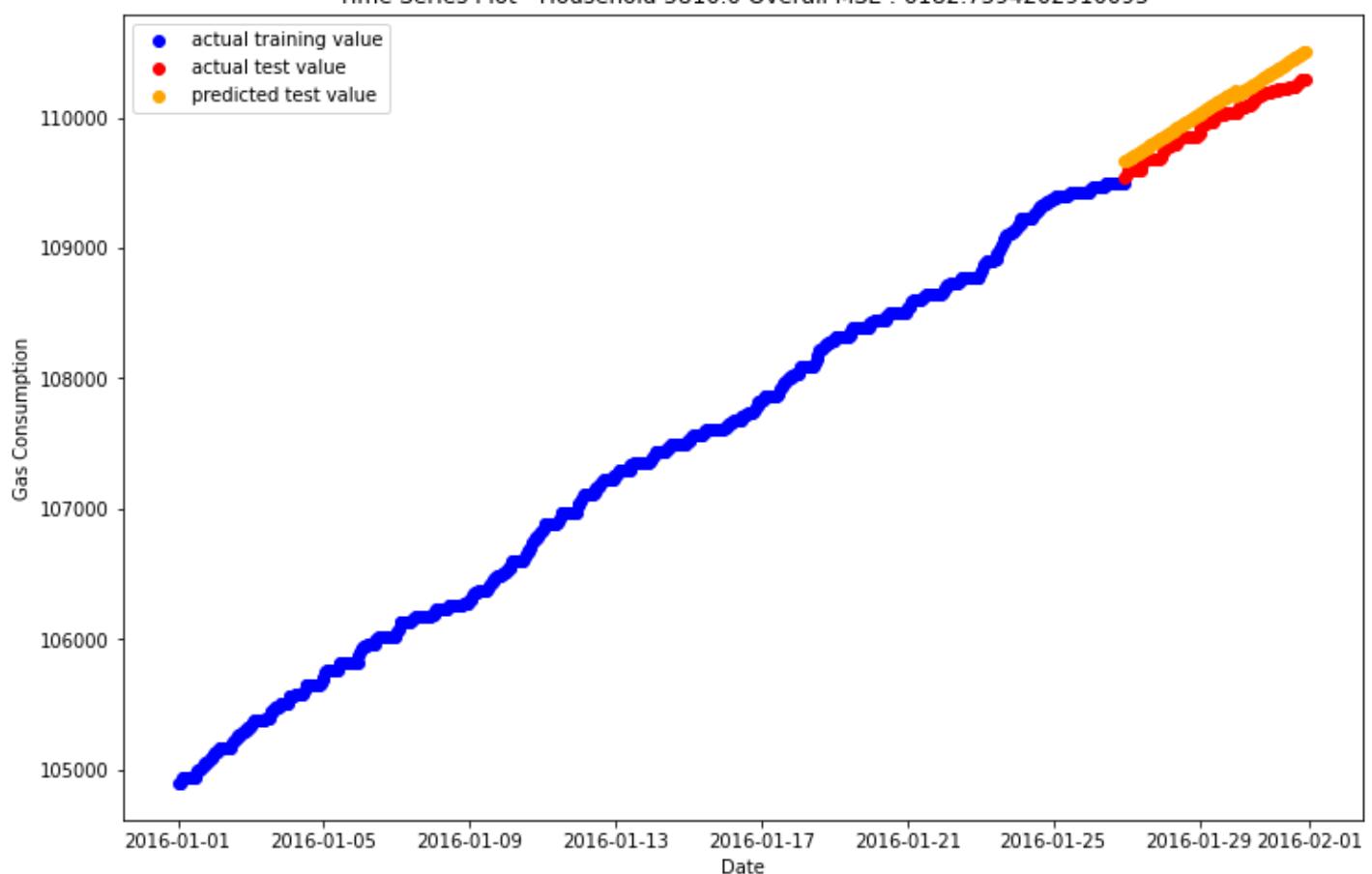
Time Series Plot - Household 5785.0 Overall MSE : 11026.276112605472



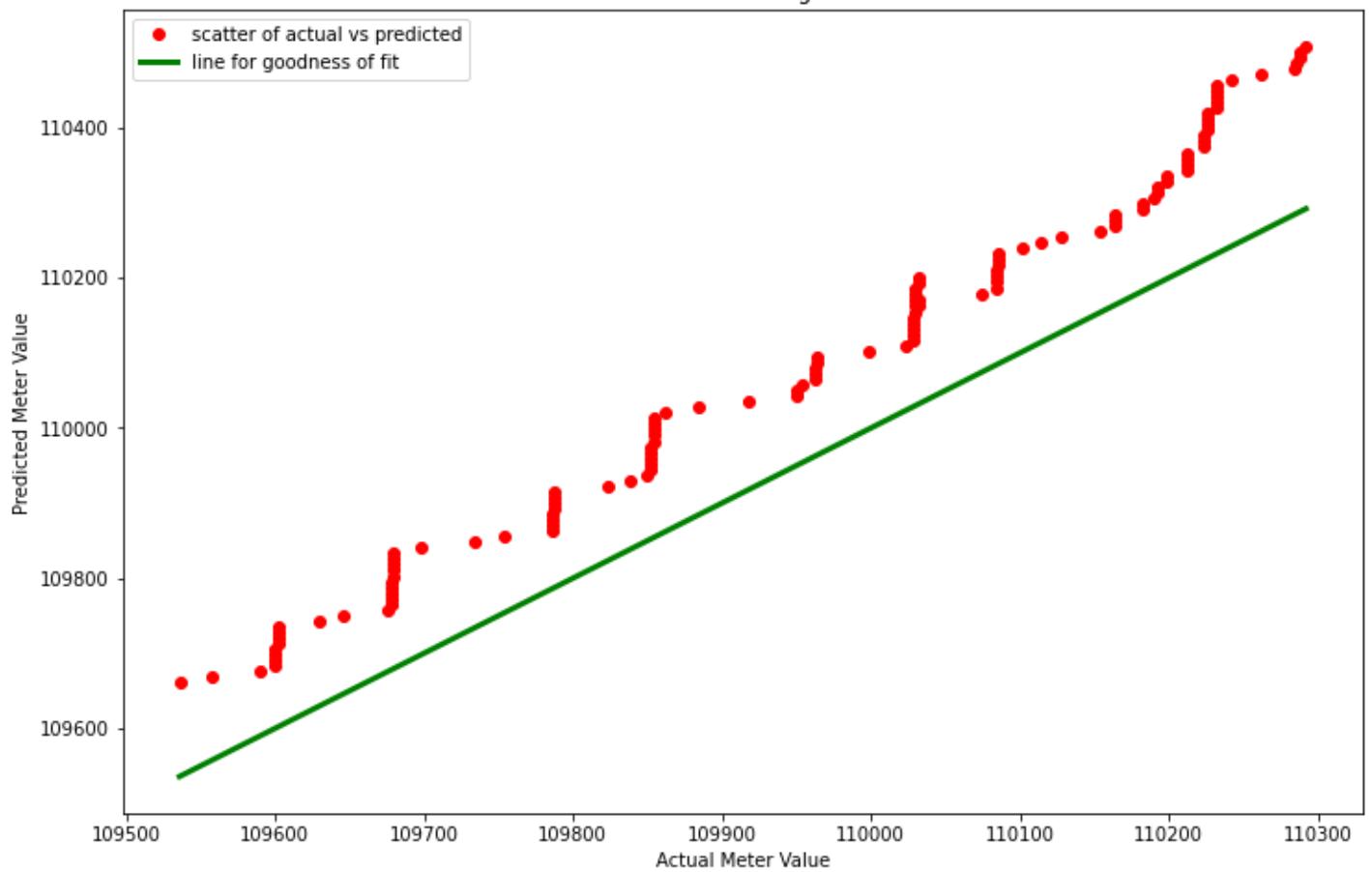
Scatter Plot - Household 5785.0 Testing MSE : 13007.029684290299



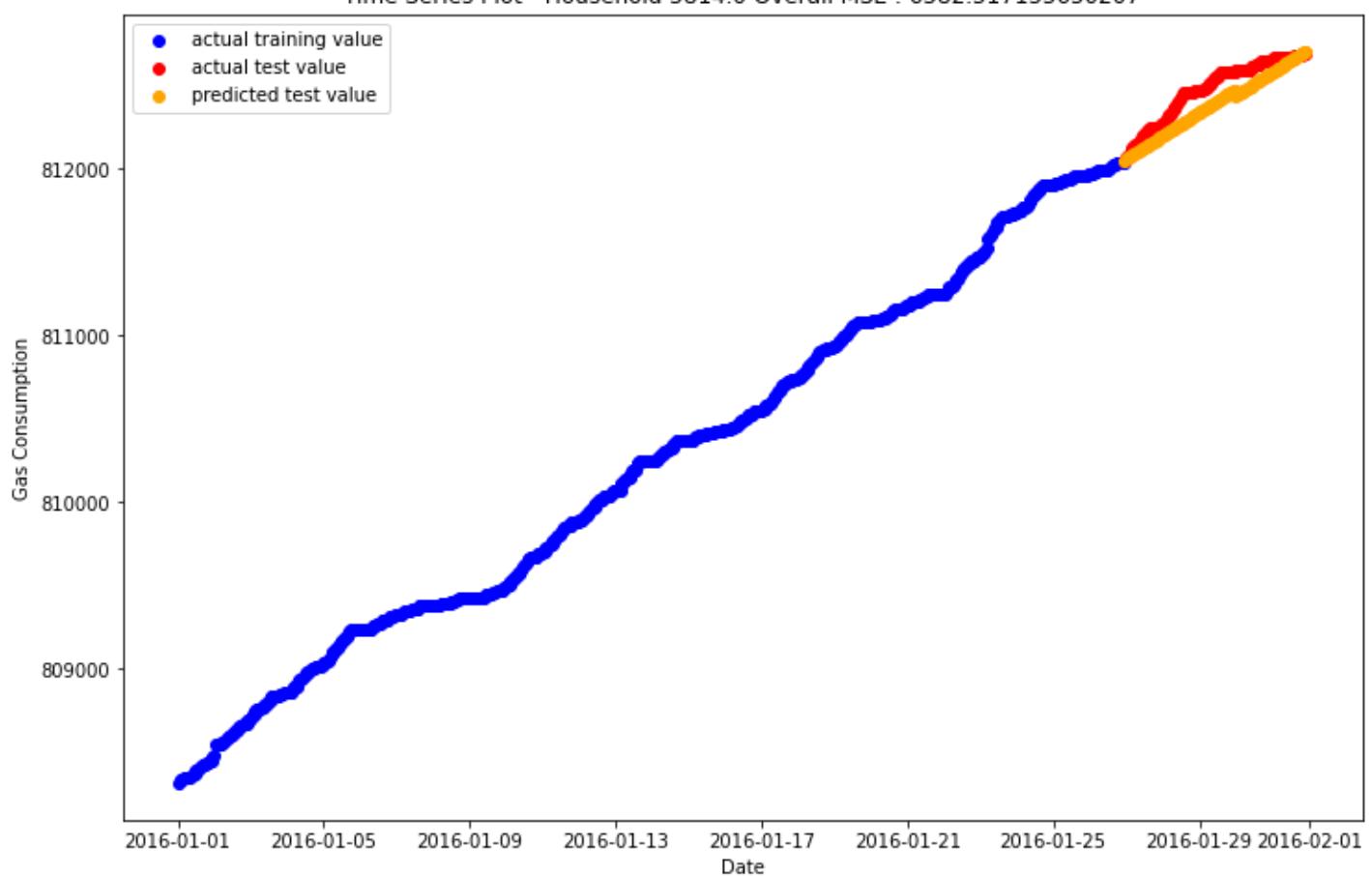
Time Series Plot - Household 5810.0 Overall MSE : 6182.7594202910095



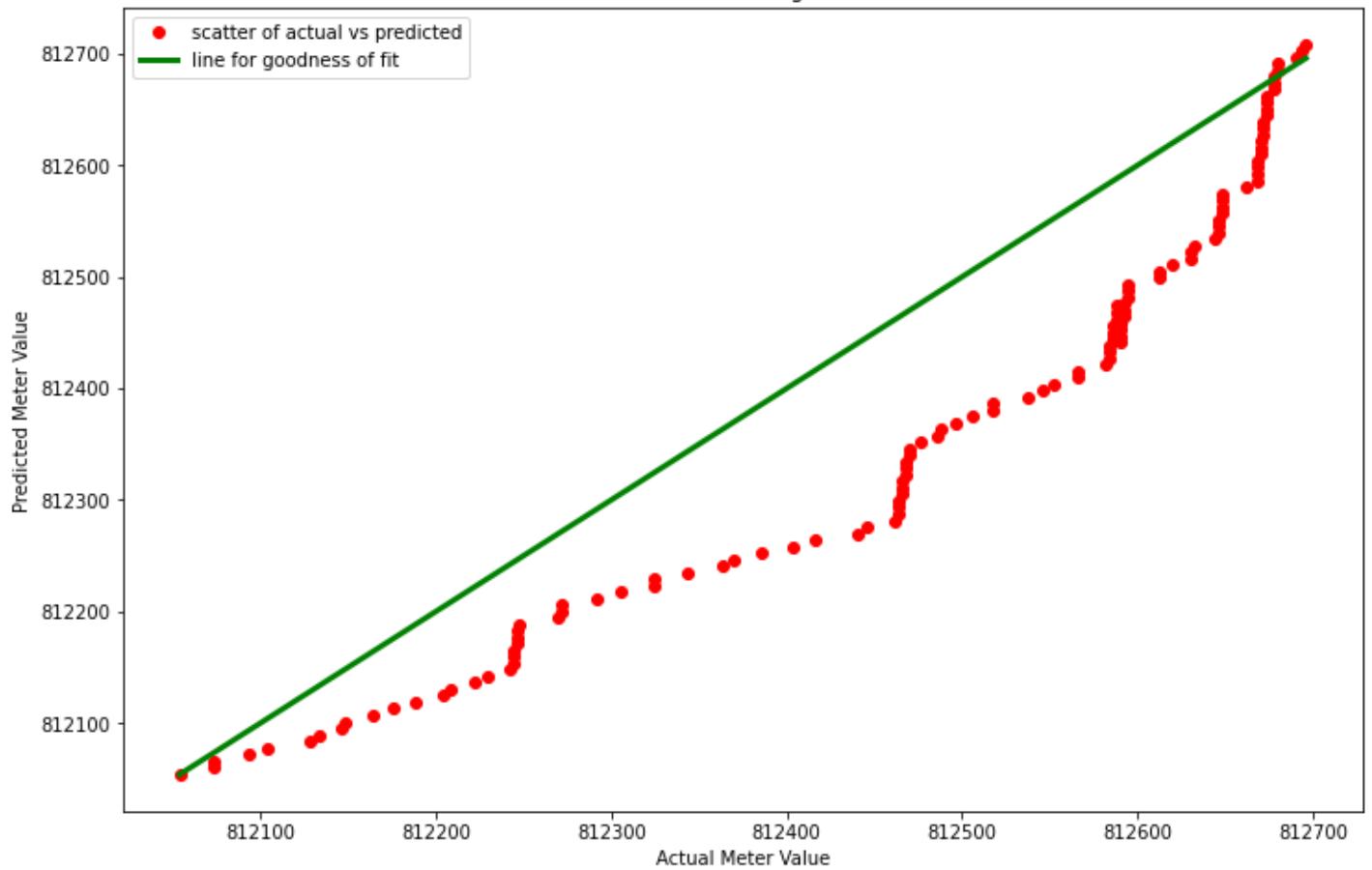
Scatter Plot - Household 5810.0 Testing MSE : 18271.69113635517



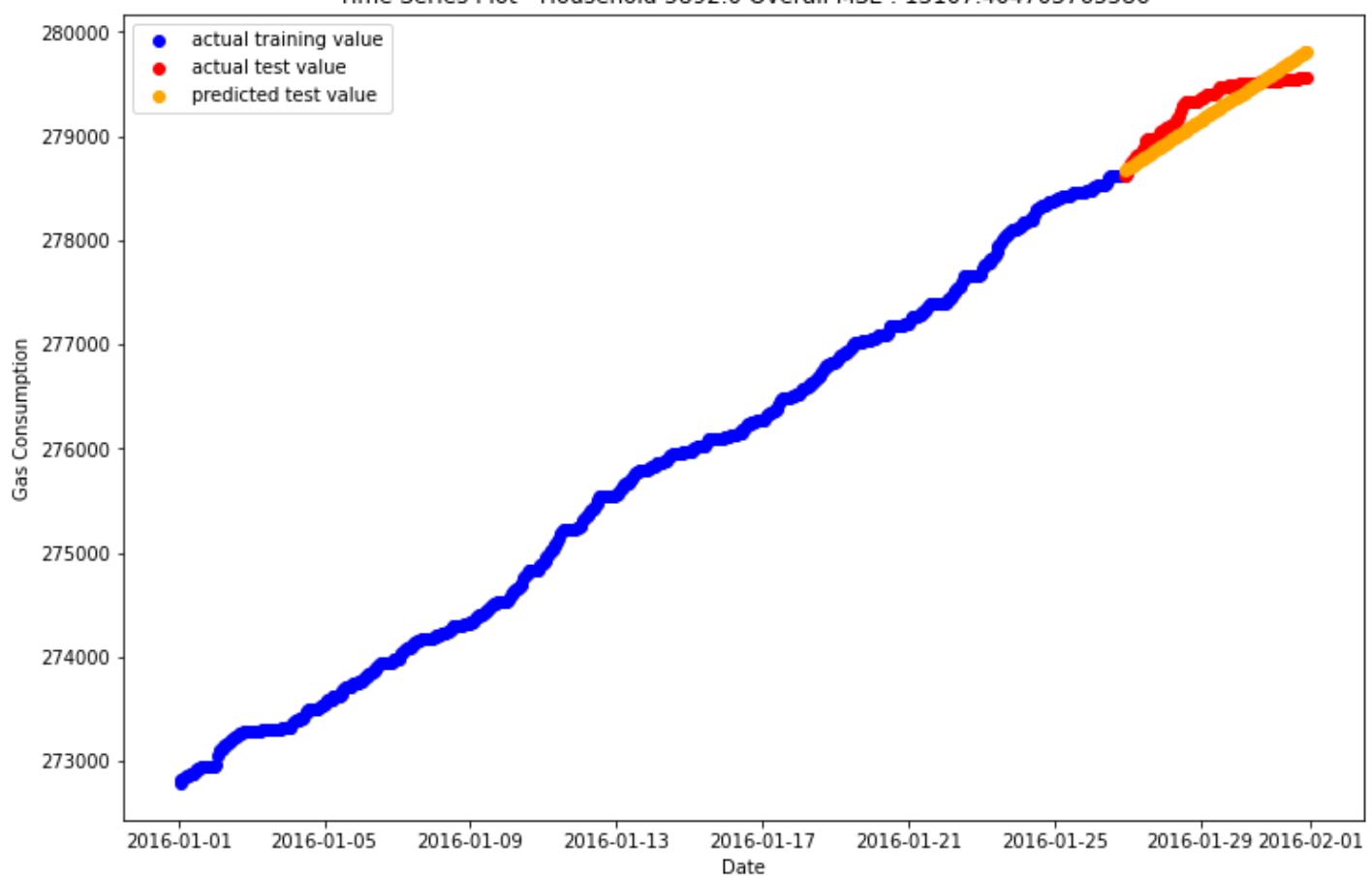
Time Series Plot - Household 5814.0 Overall MSE : 6582.517155650207



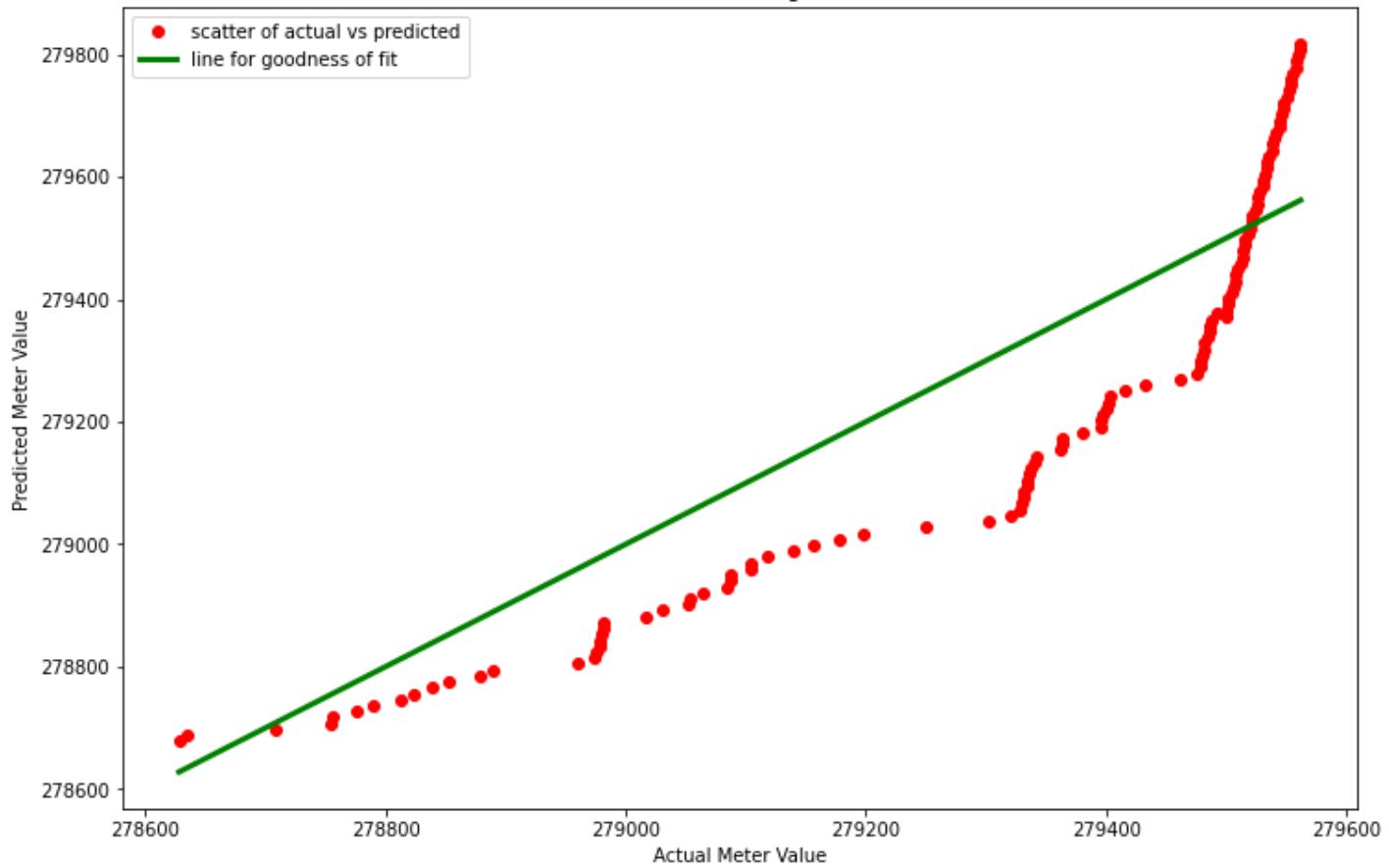
Scatter Plot - Household 5814.0 Testing MSE : 11299.837099419216



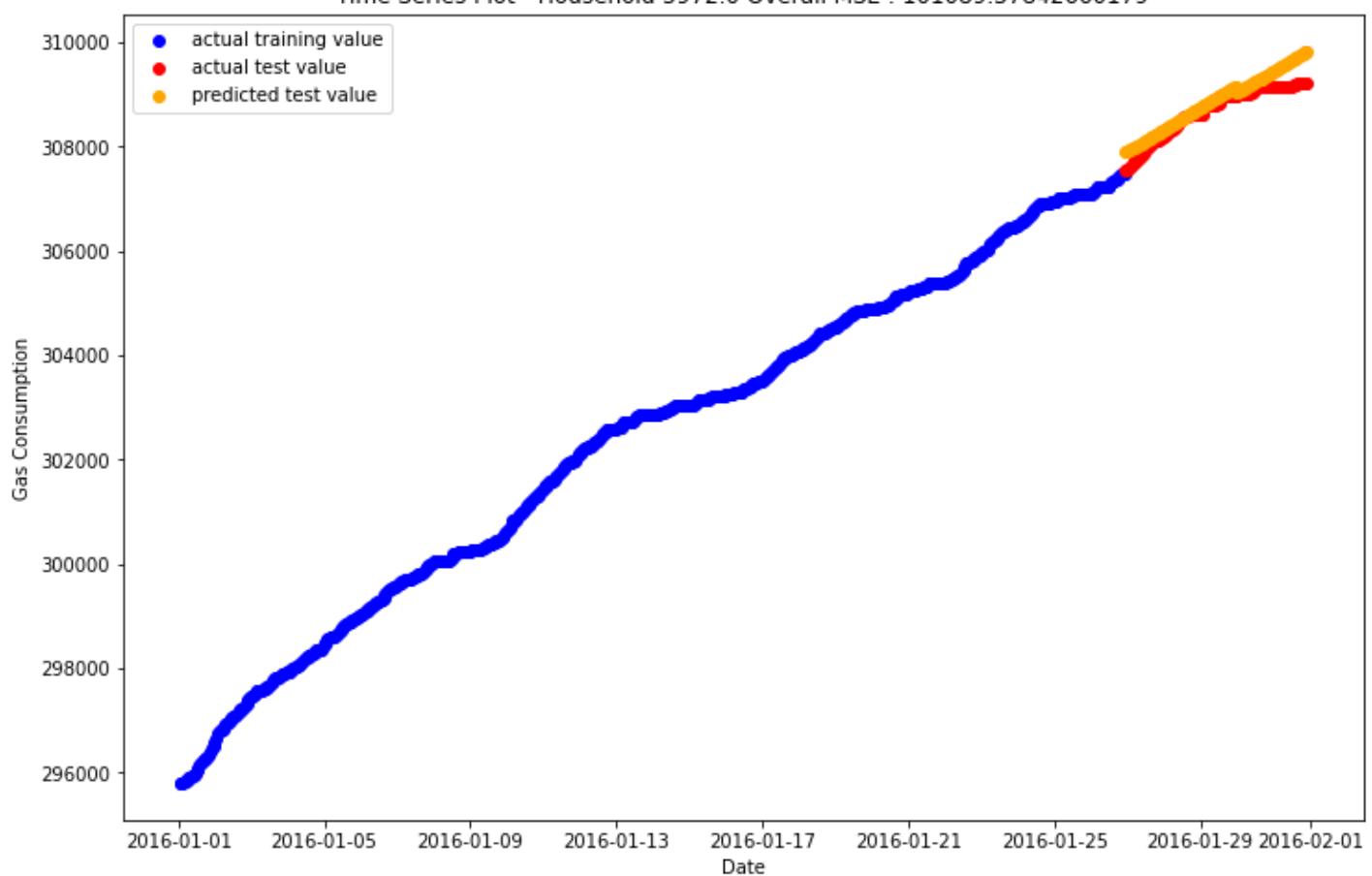
Time Series Plot - Household 5892.0 Overall MSE : 13107.404703765586



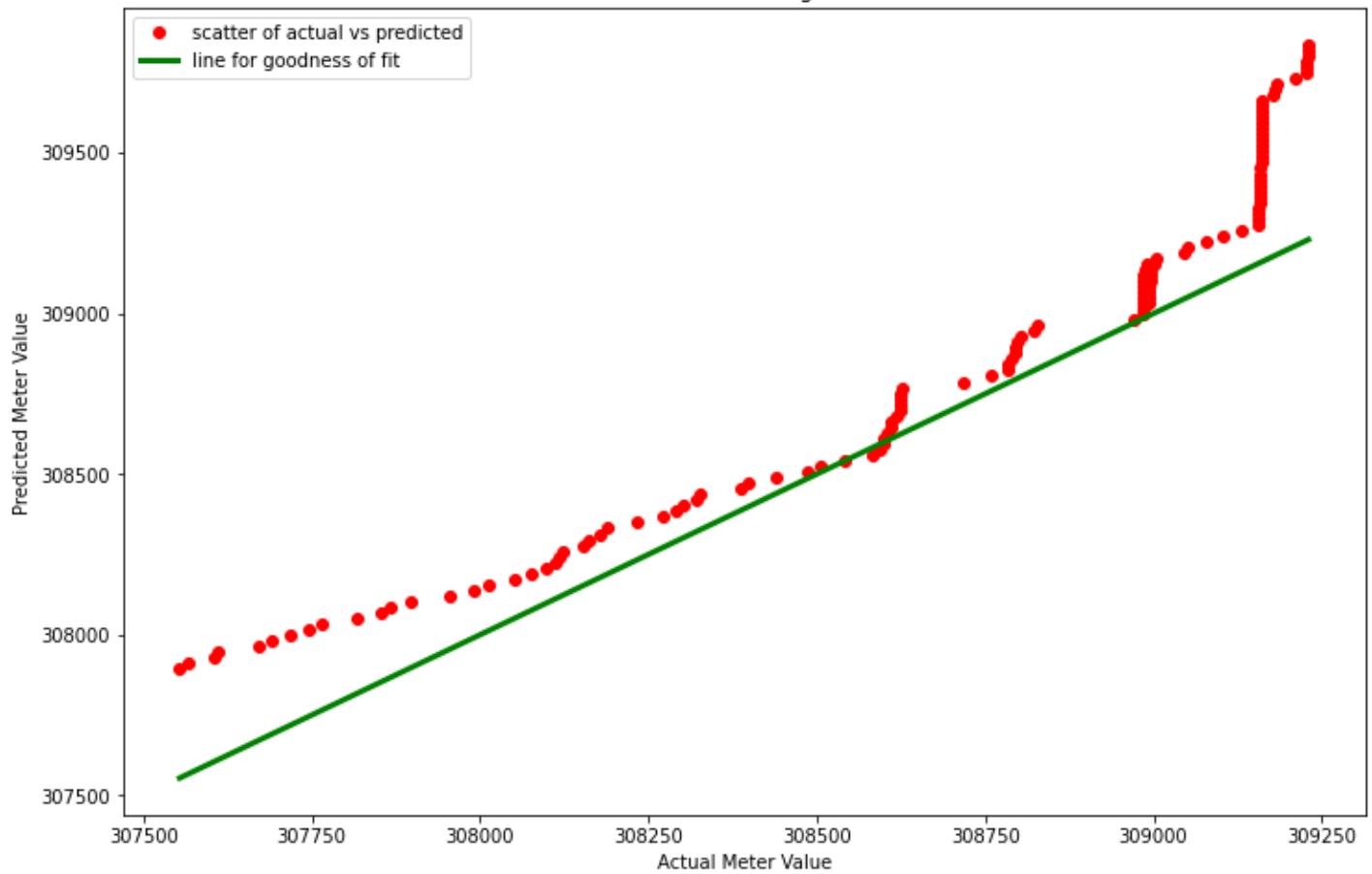
Scatter Plot - Household 5892.0 Testing MSE : 23399.896695063337



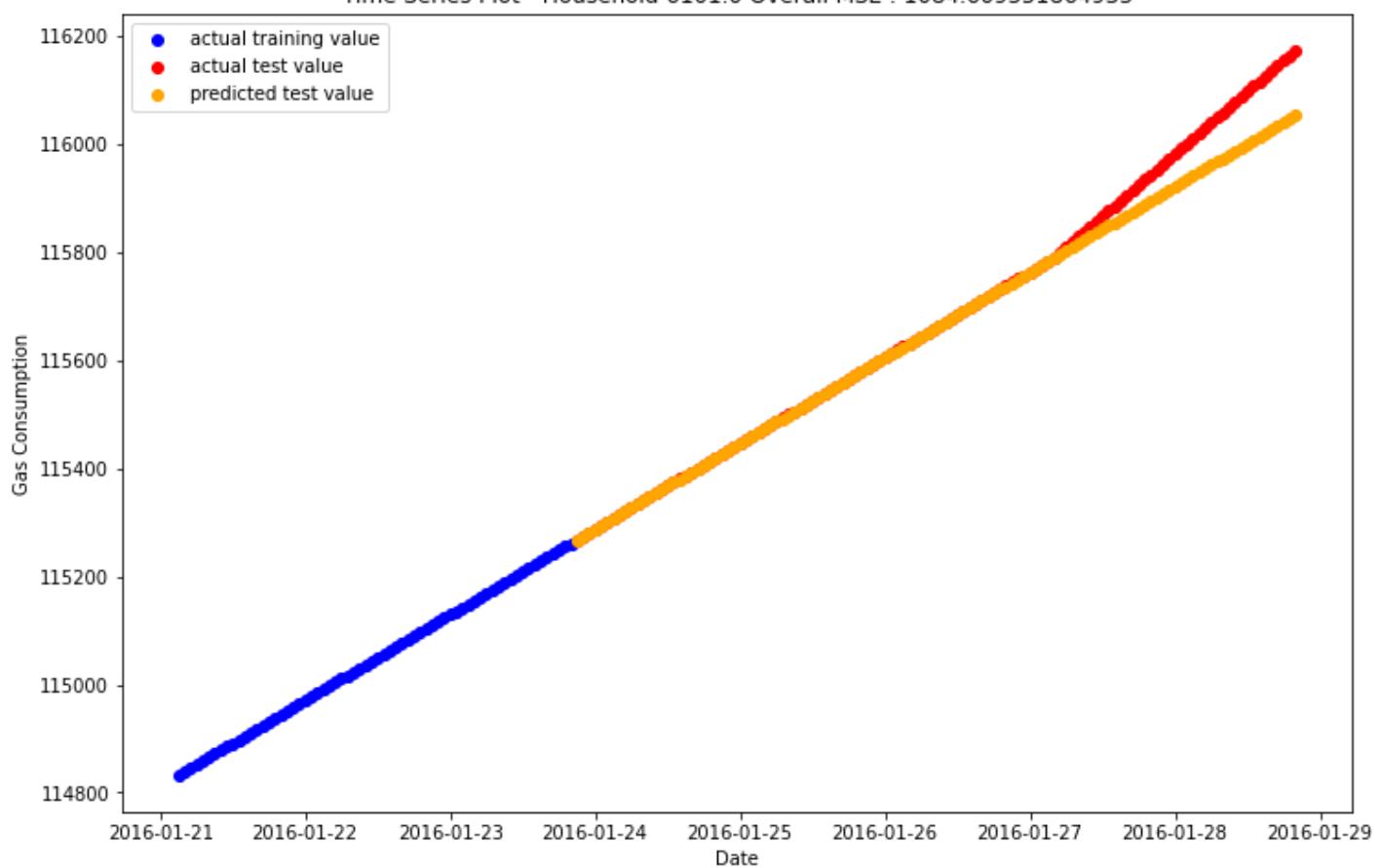
Time Series Plot - Household 5972.0 Overall MSE : 101089.37842660179



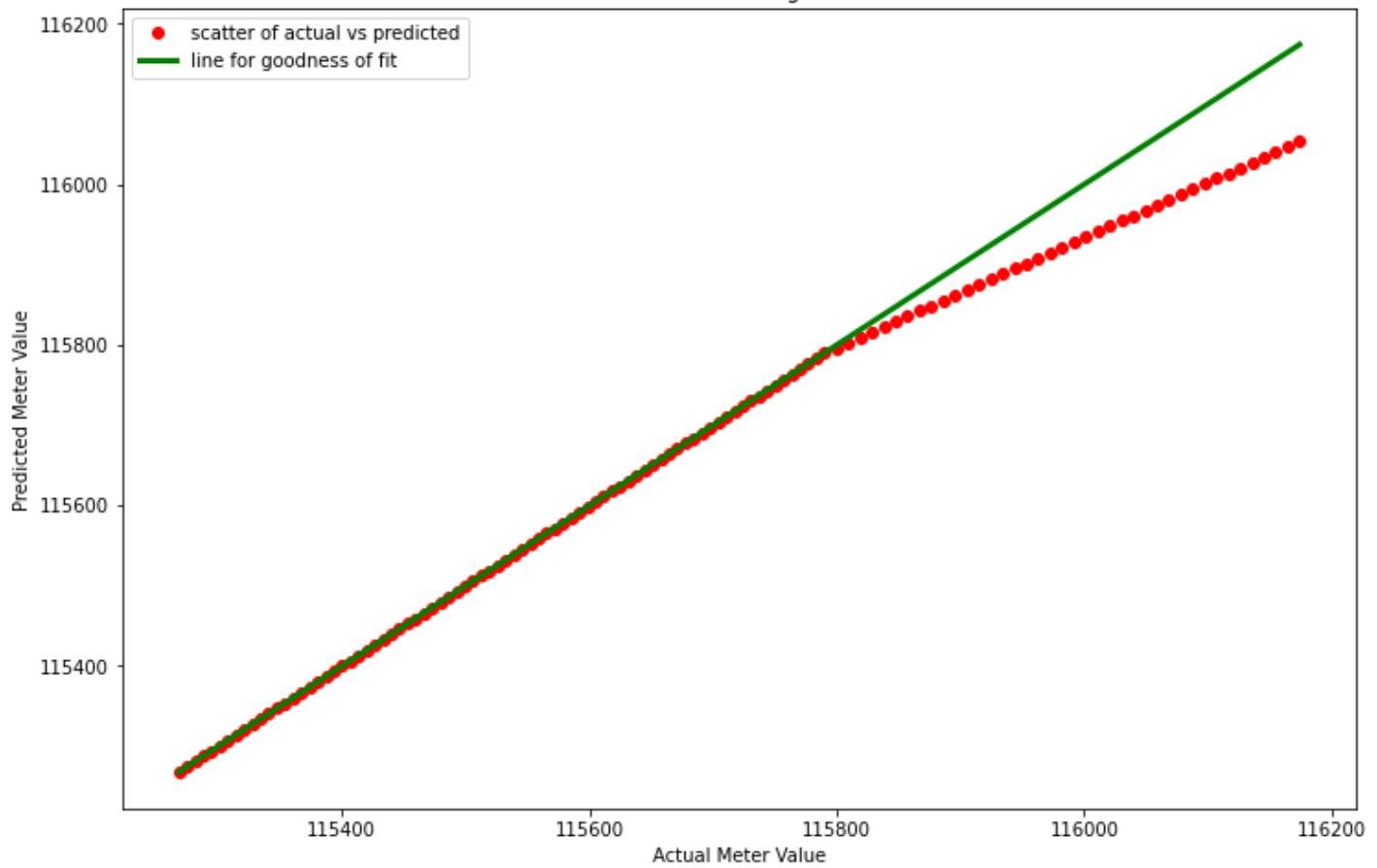
Scatter Plot - Household 5972.0 Testing MSE : 61209.82657603046



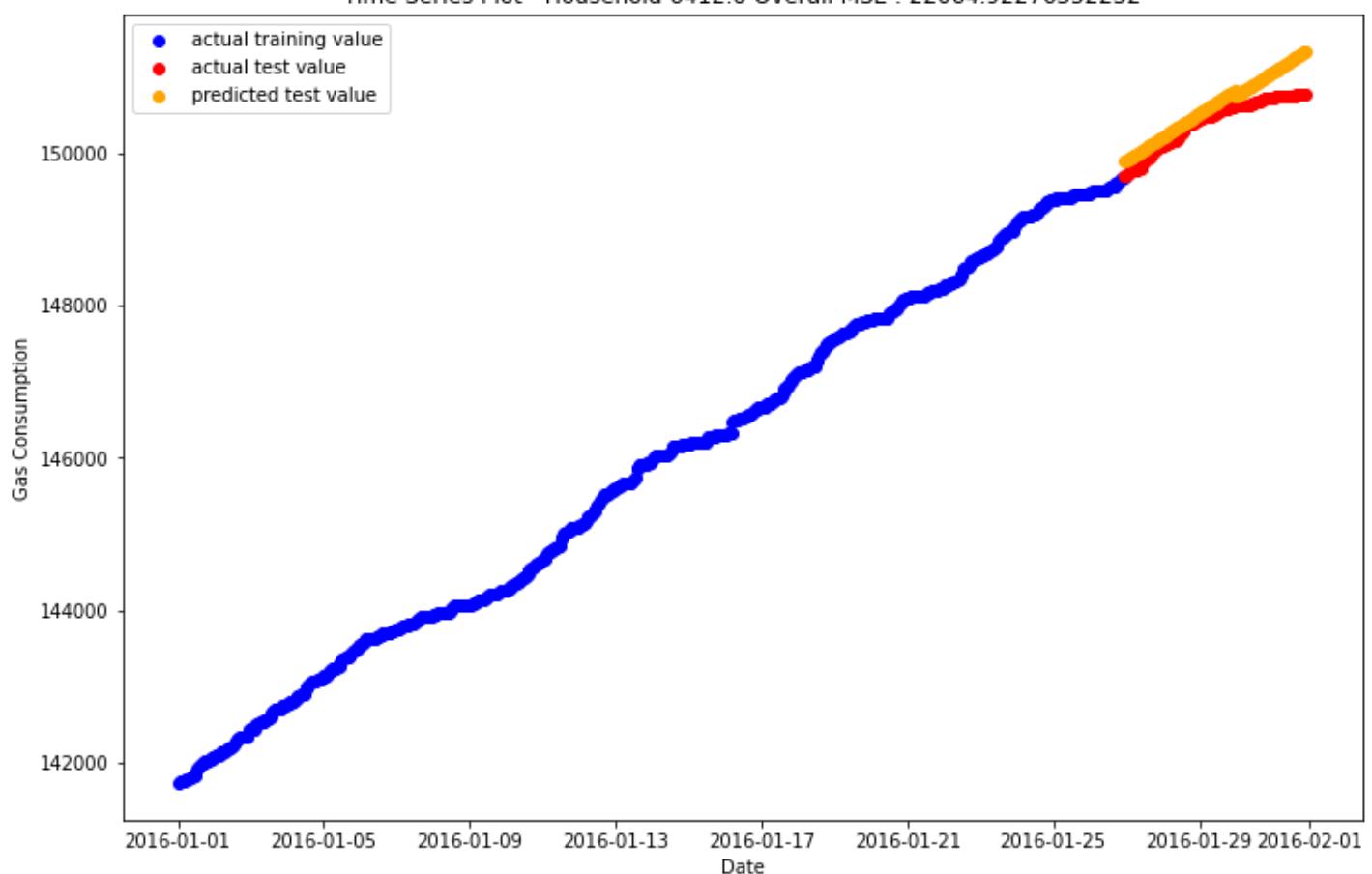
Time Series Plot - Household 6101.0 Overall MSE : 1084.609551864935



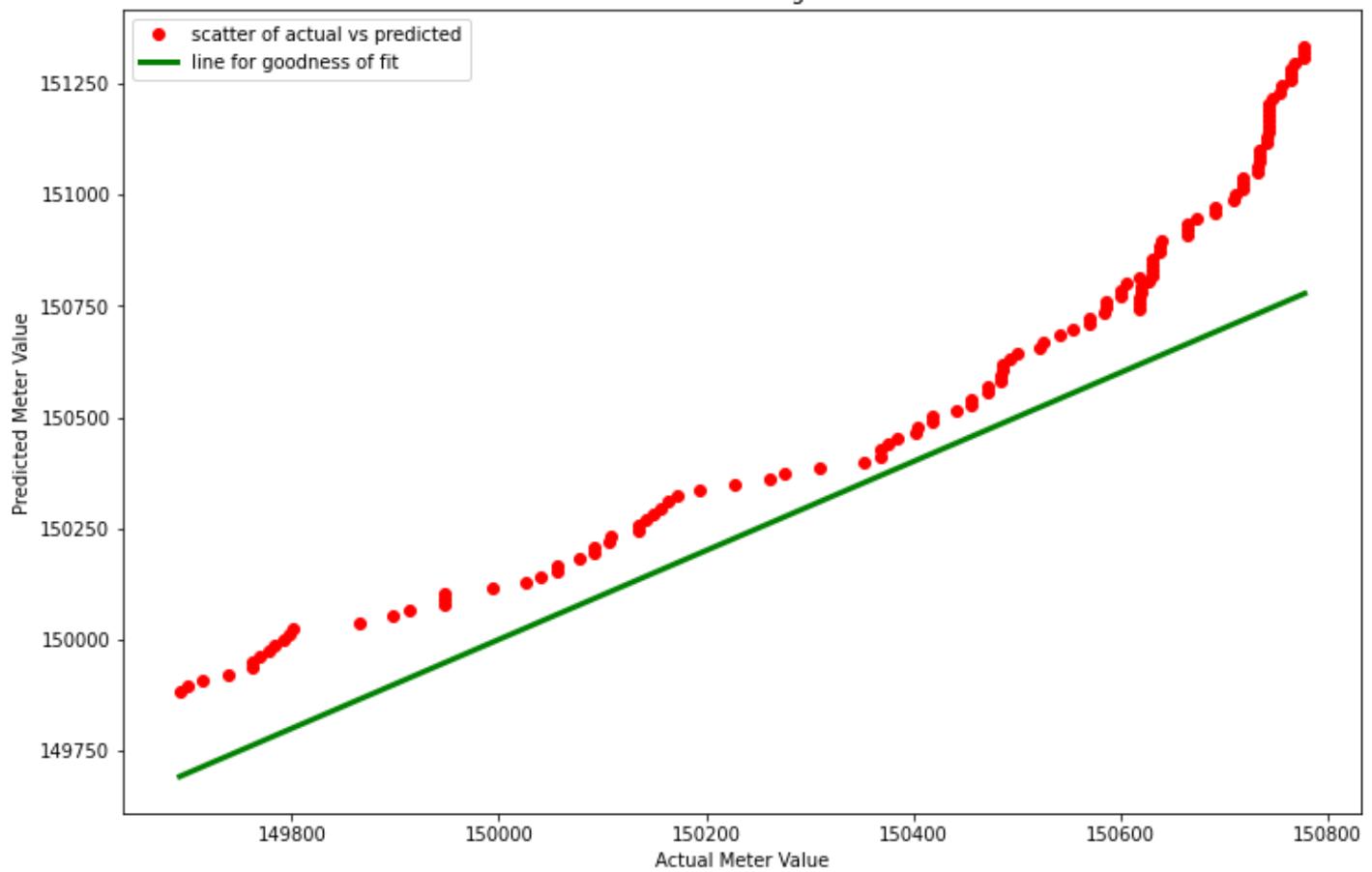
Scatter Plot - Household 6101.0 Testing MSE : 1681.1428416273664

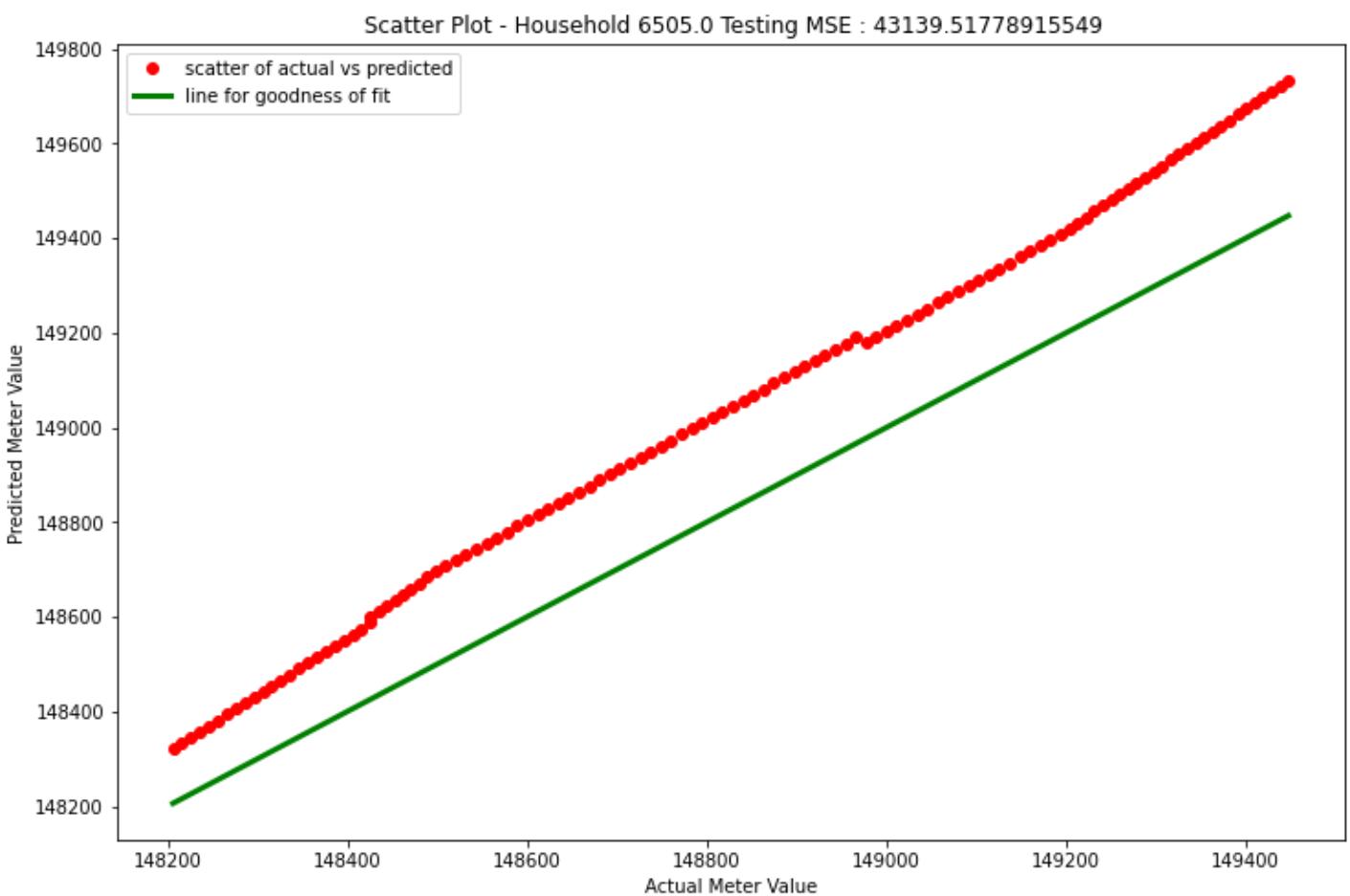
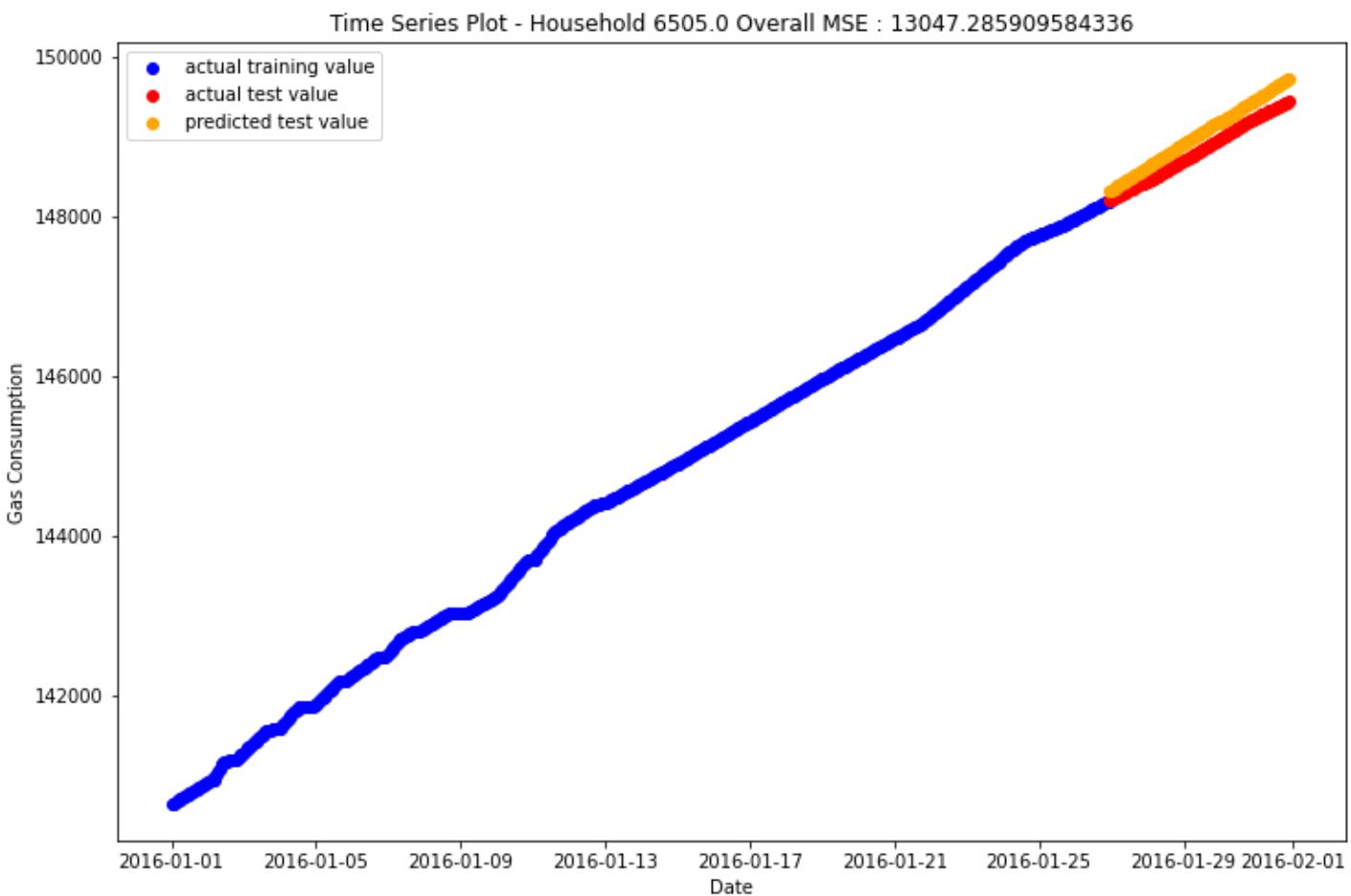


Time Series Plot - Household 6412.0 Overall MSE : 22064.92276352232

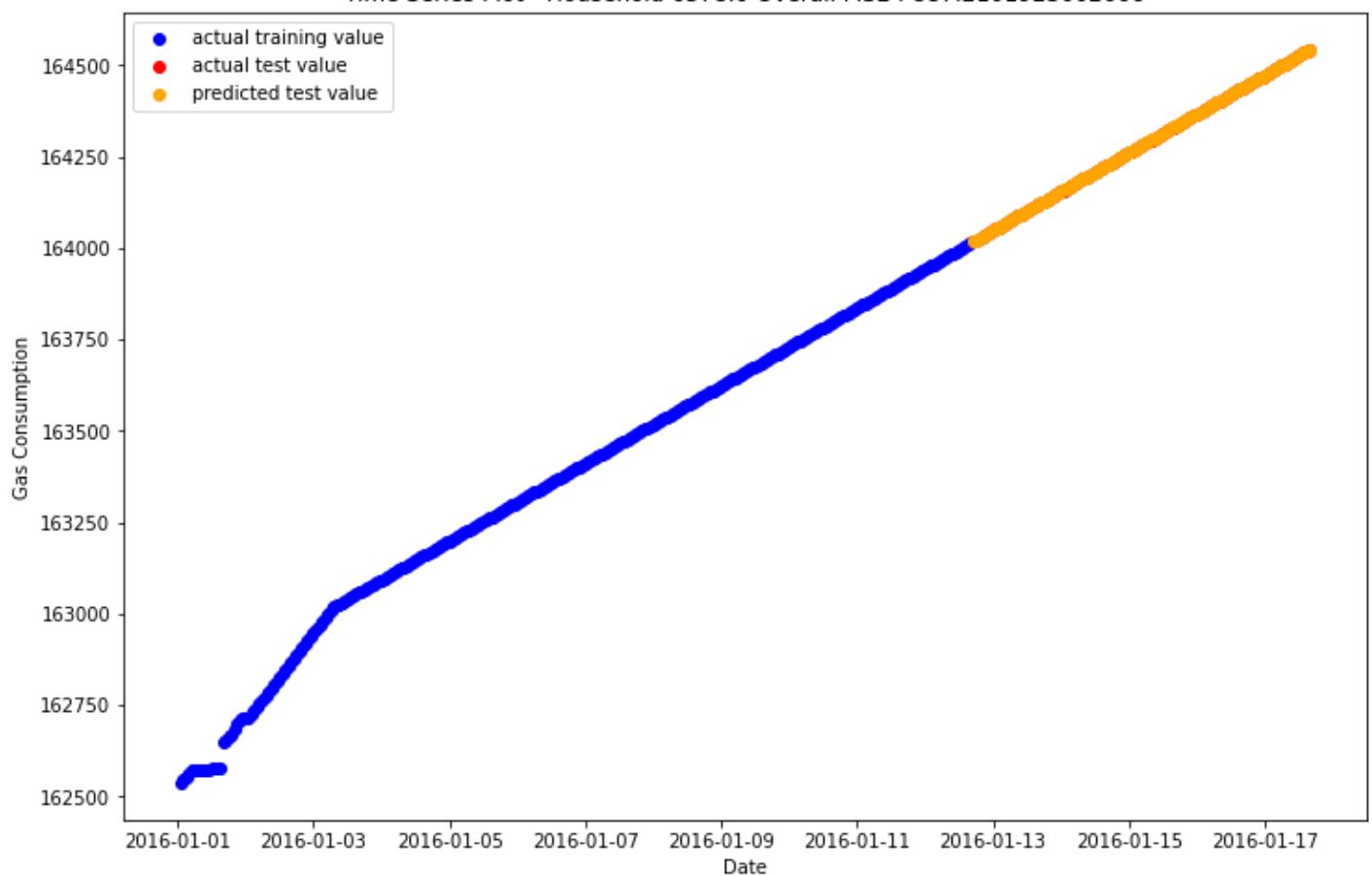


Scatter Plot - Household 6412.0 Testing MSE : 61625.854604763575

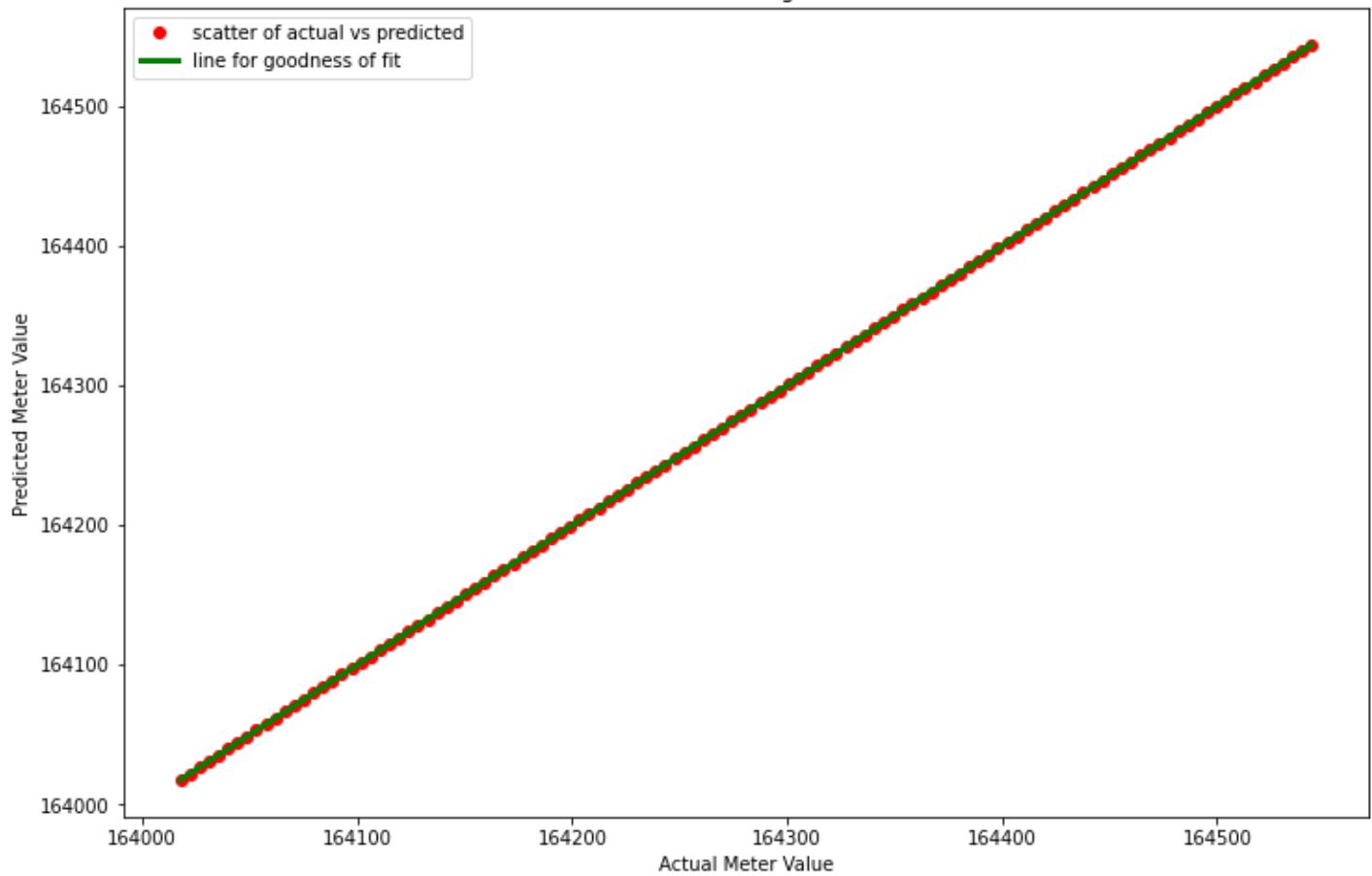




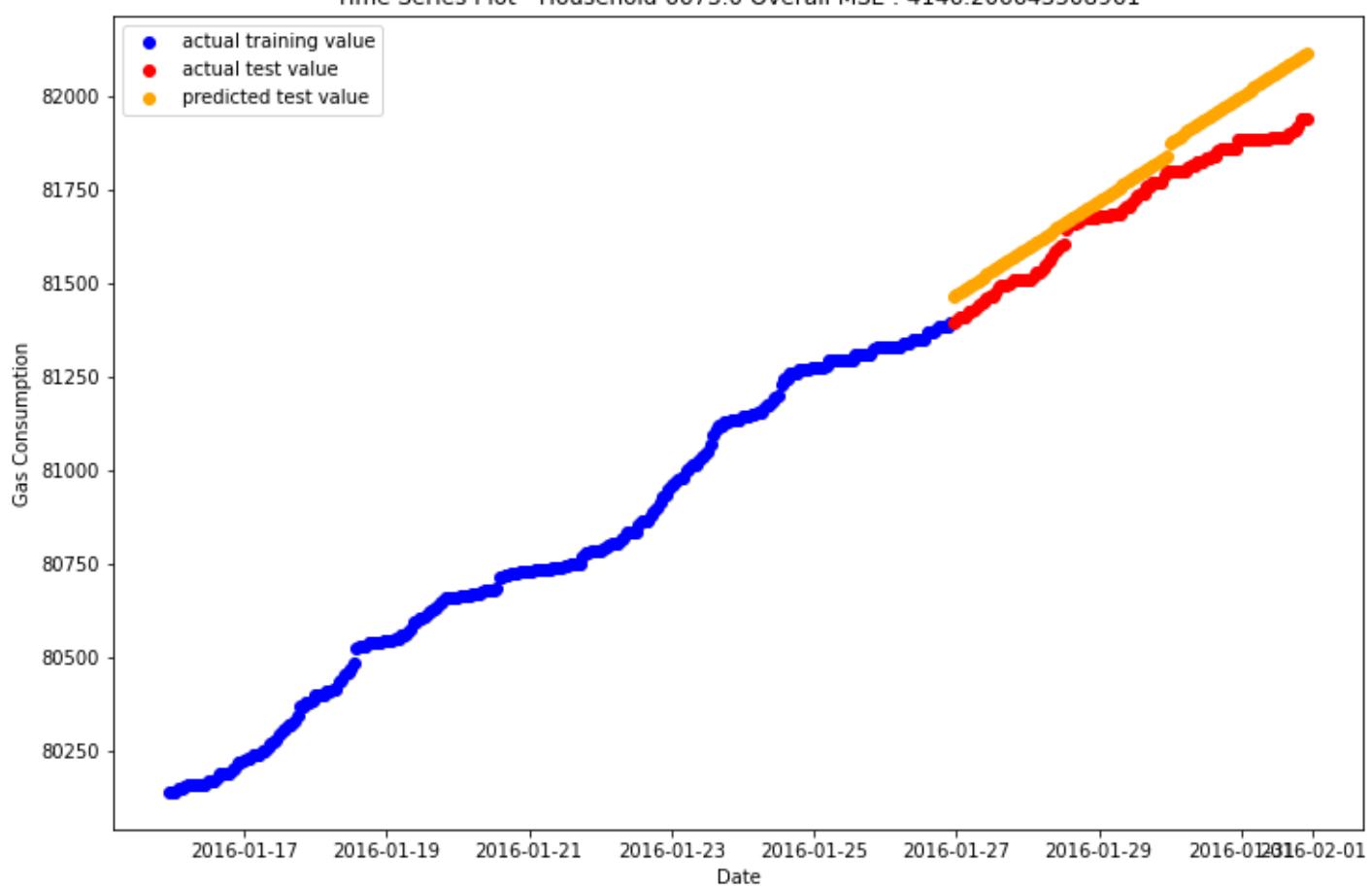
Time Series Plot - Household 6578.0 Overall MSE : 887.2101923002666



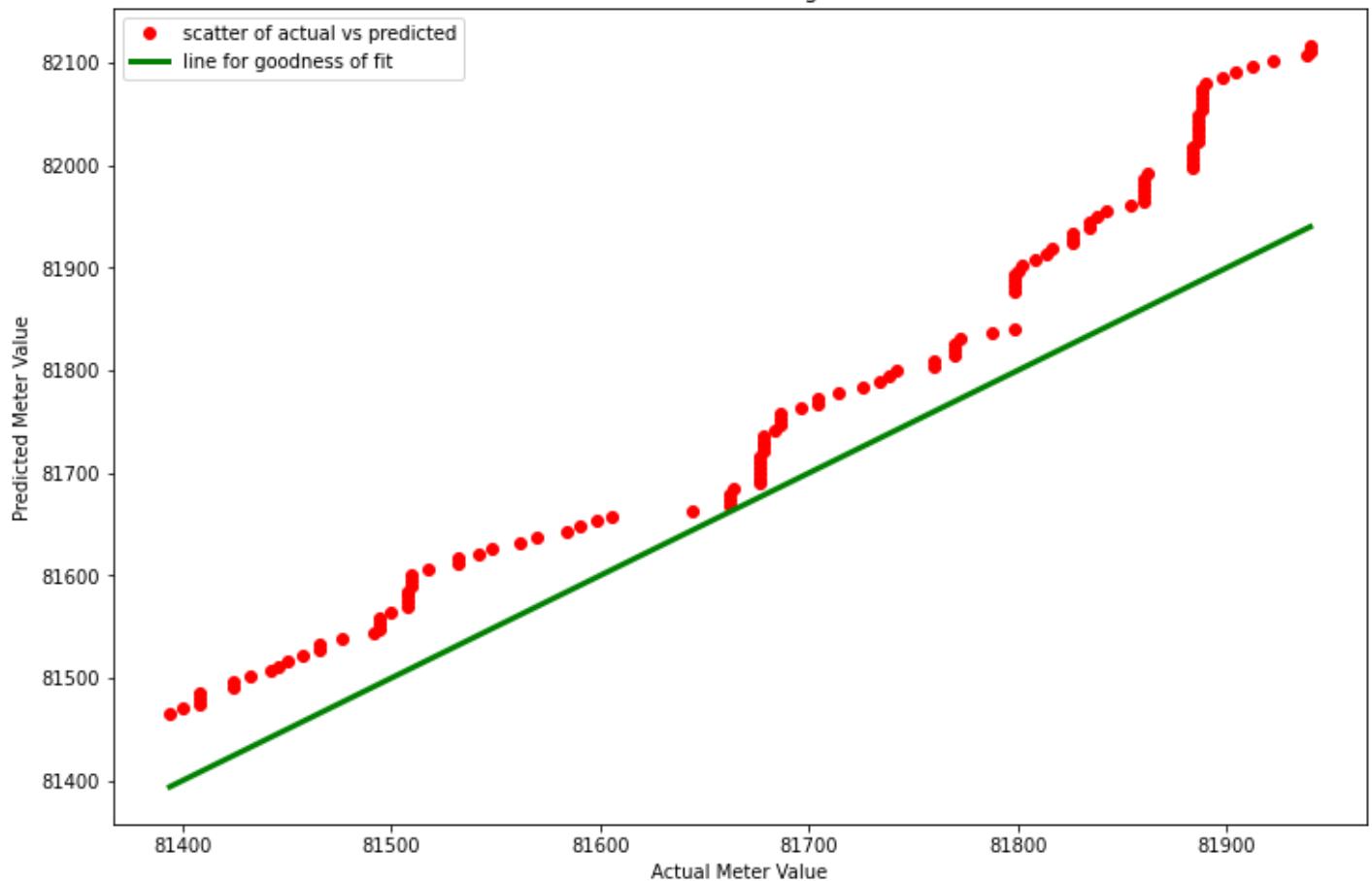
Scatter Plot - Household 6578.0 Testing MSE : 0.019297004247248676

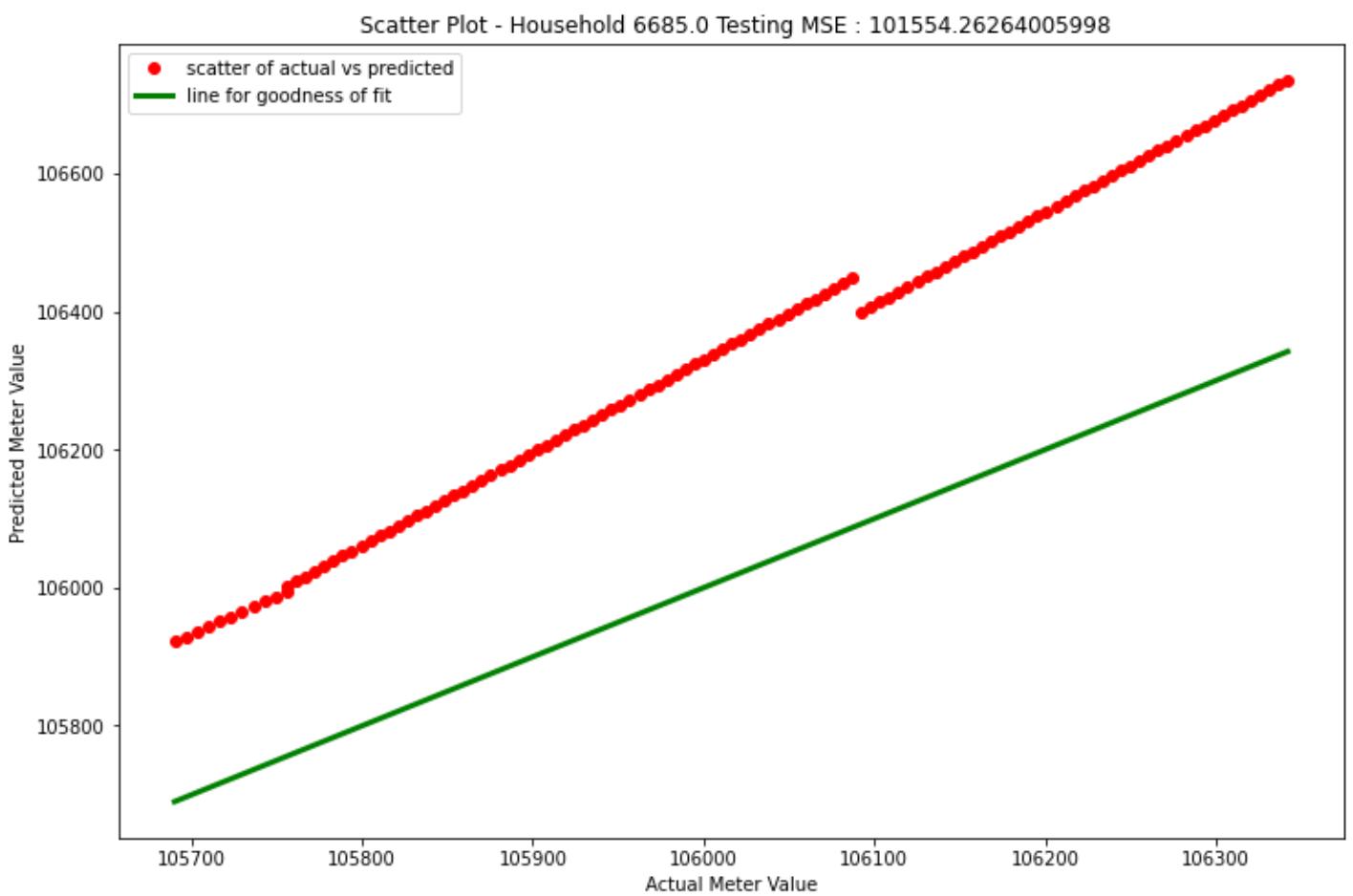
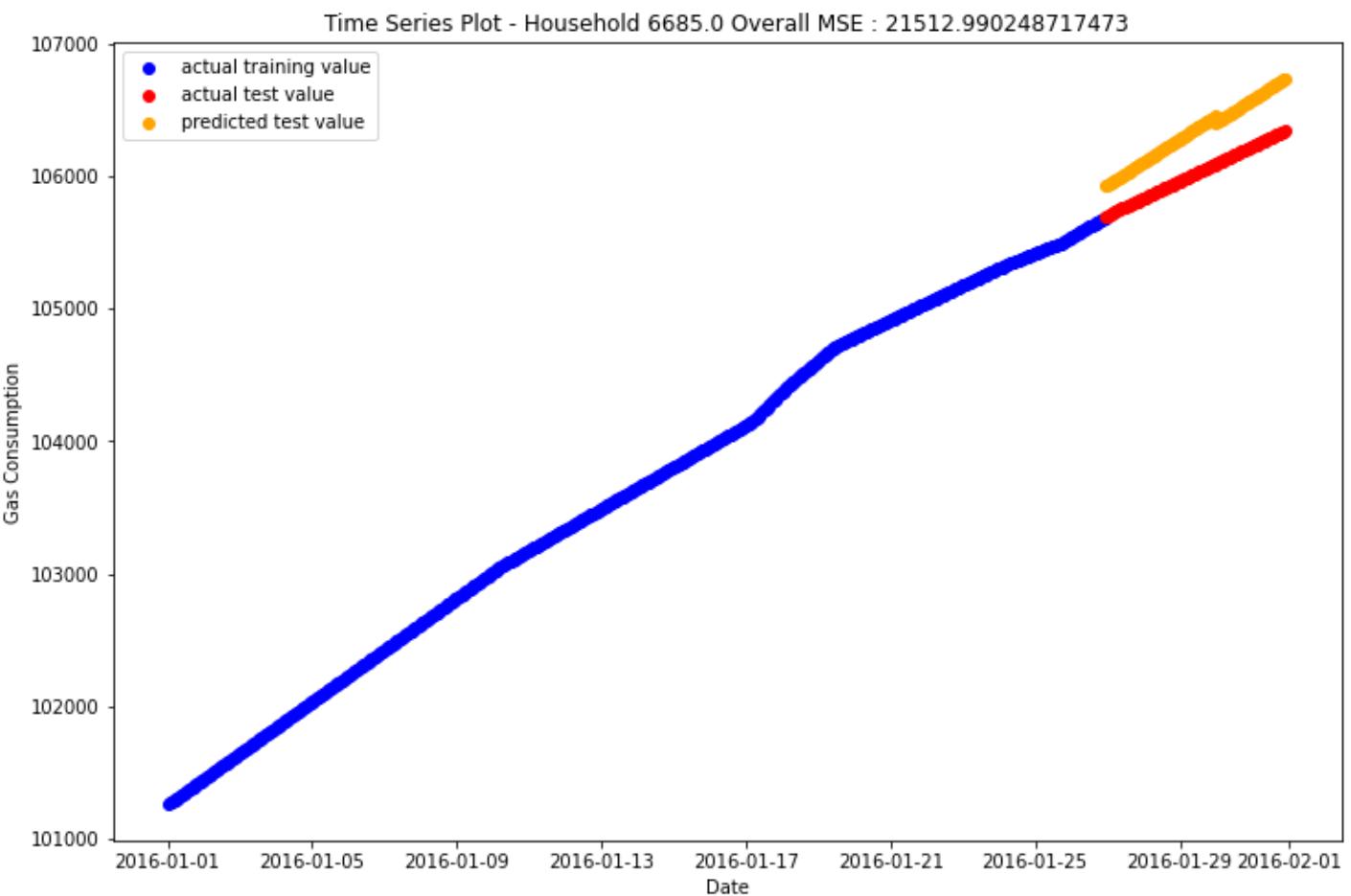


Time Series Plot - Household 6673.0 Overall MSE : 4146.206643508961

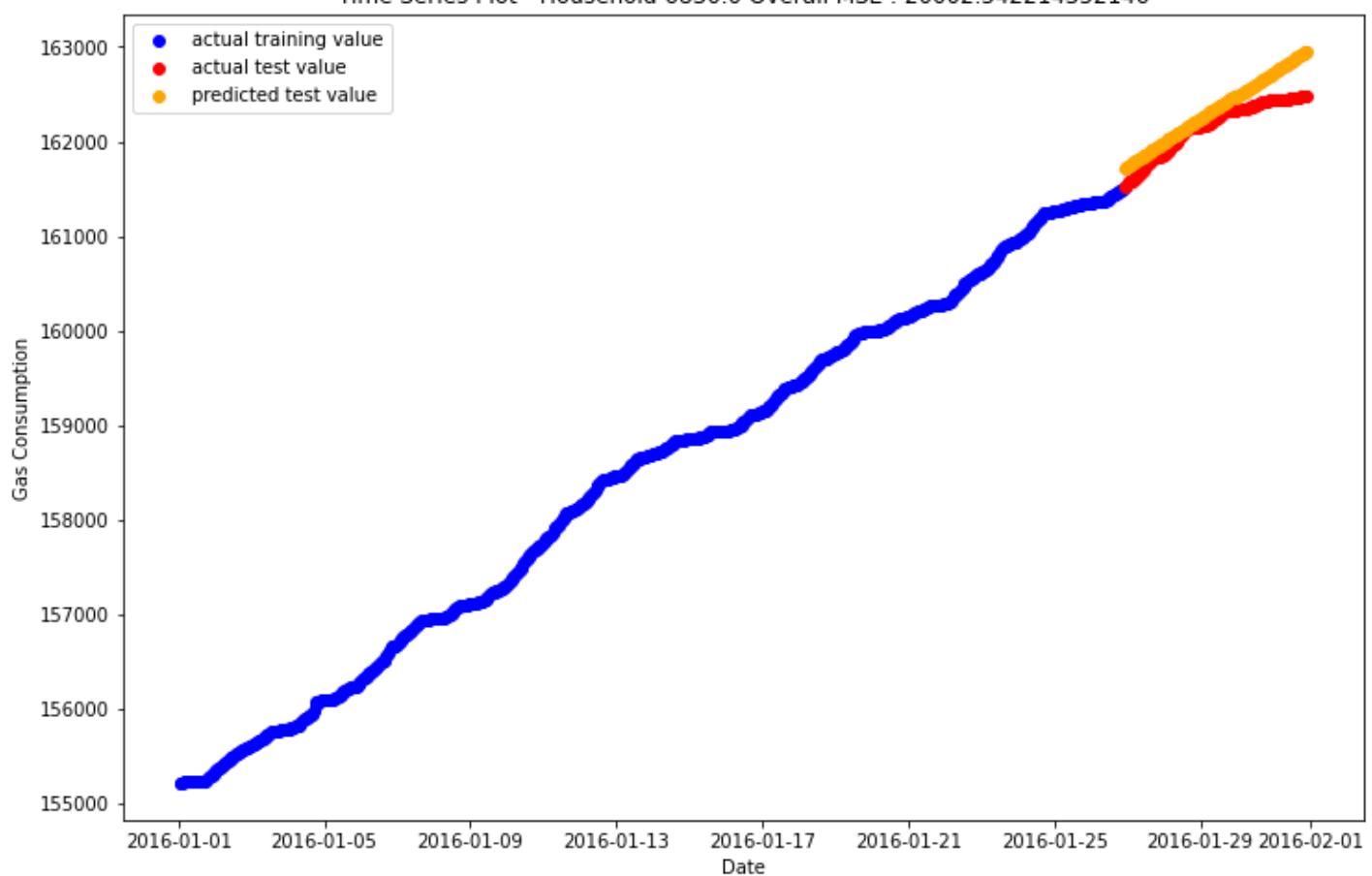


Scatter Plot - Household 6673.0 Testing MSE : 9625.19608290153

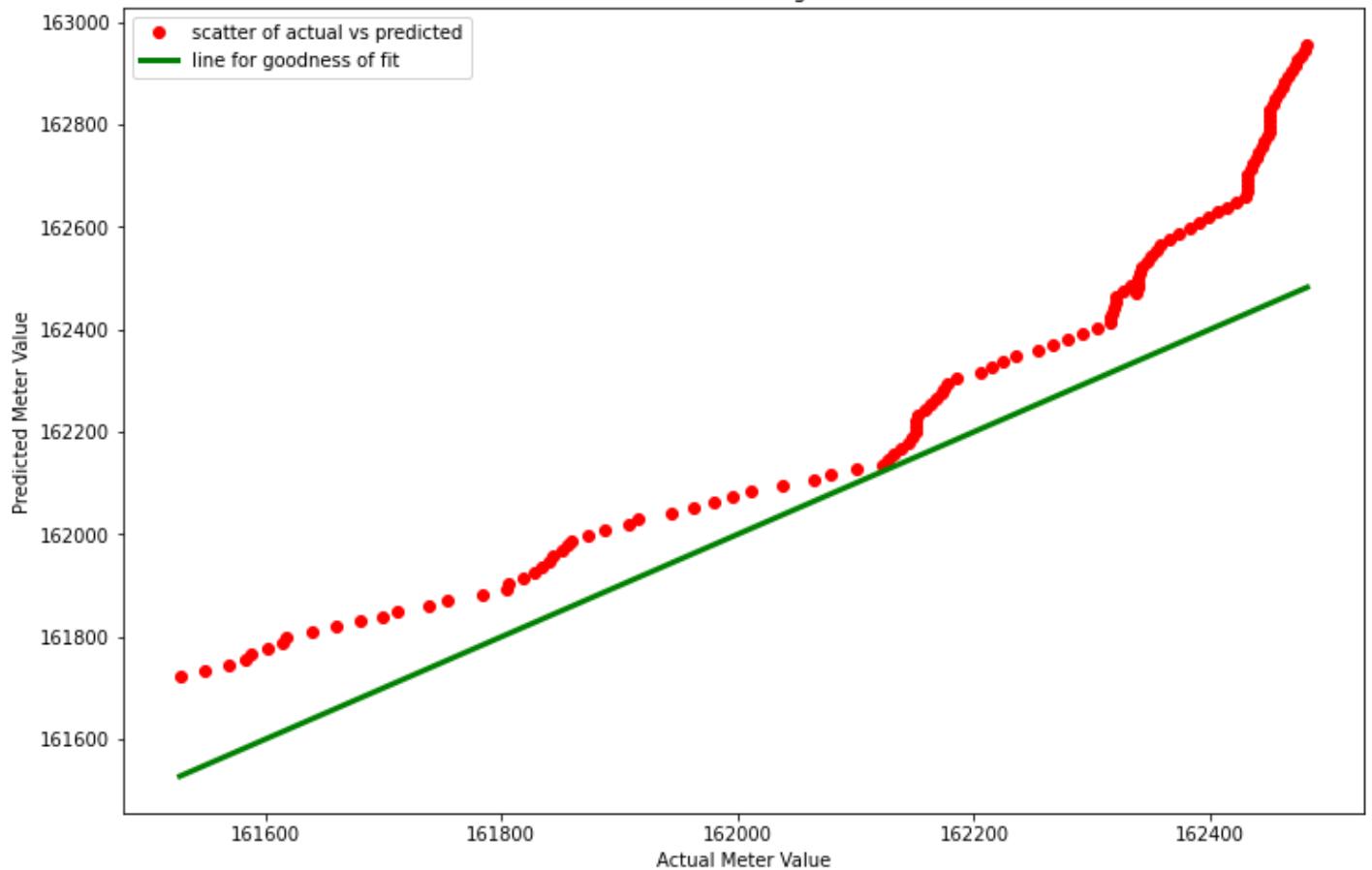




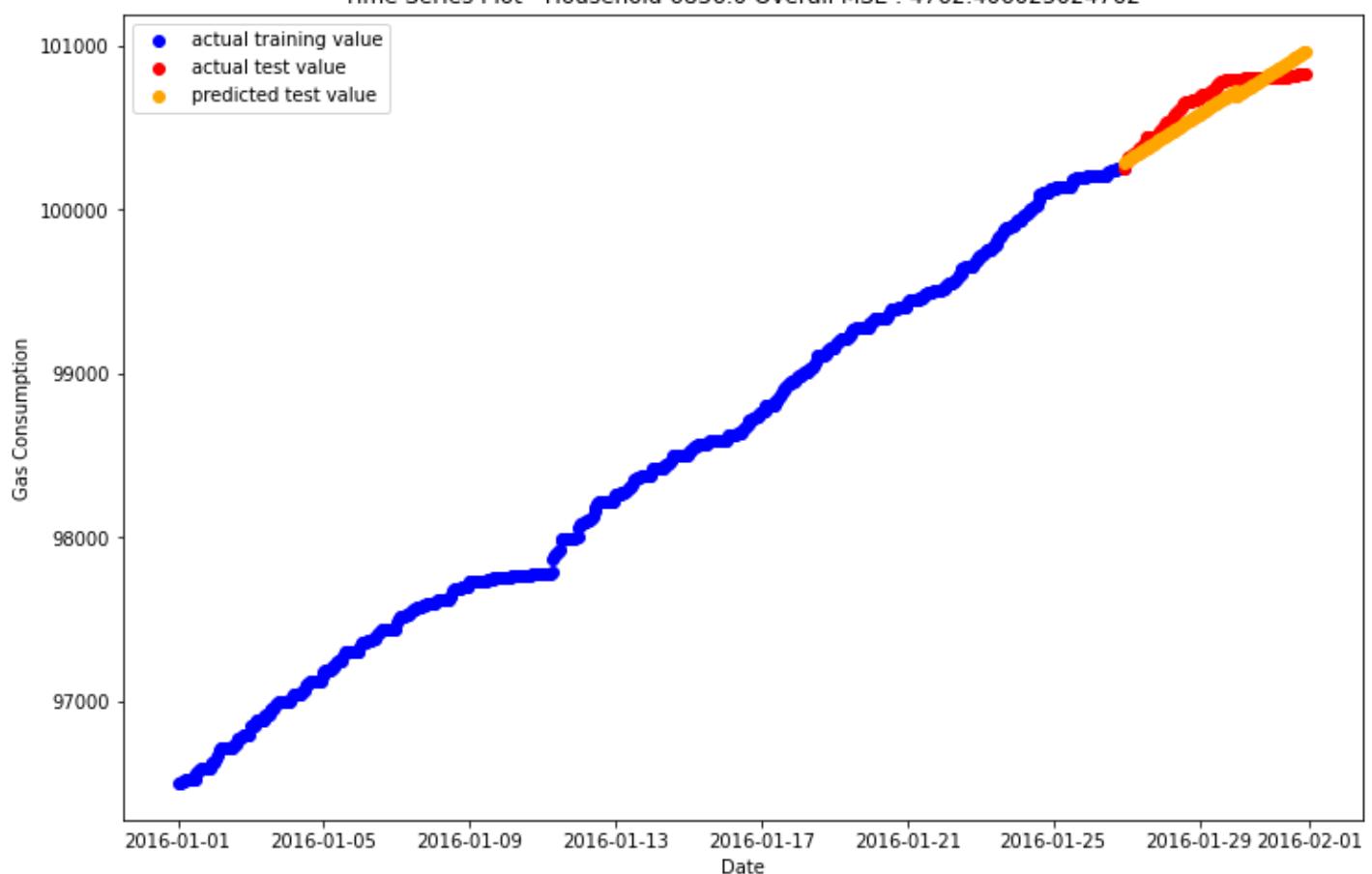
Time Series Plot - Household 6830.0 Overall MSE : 20002.542214352146



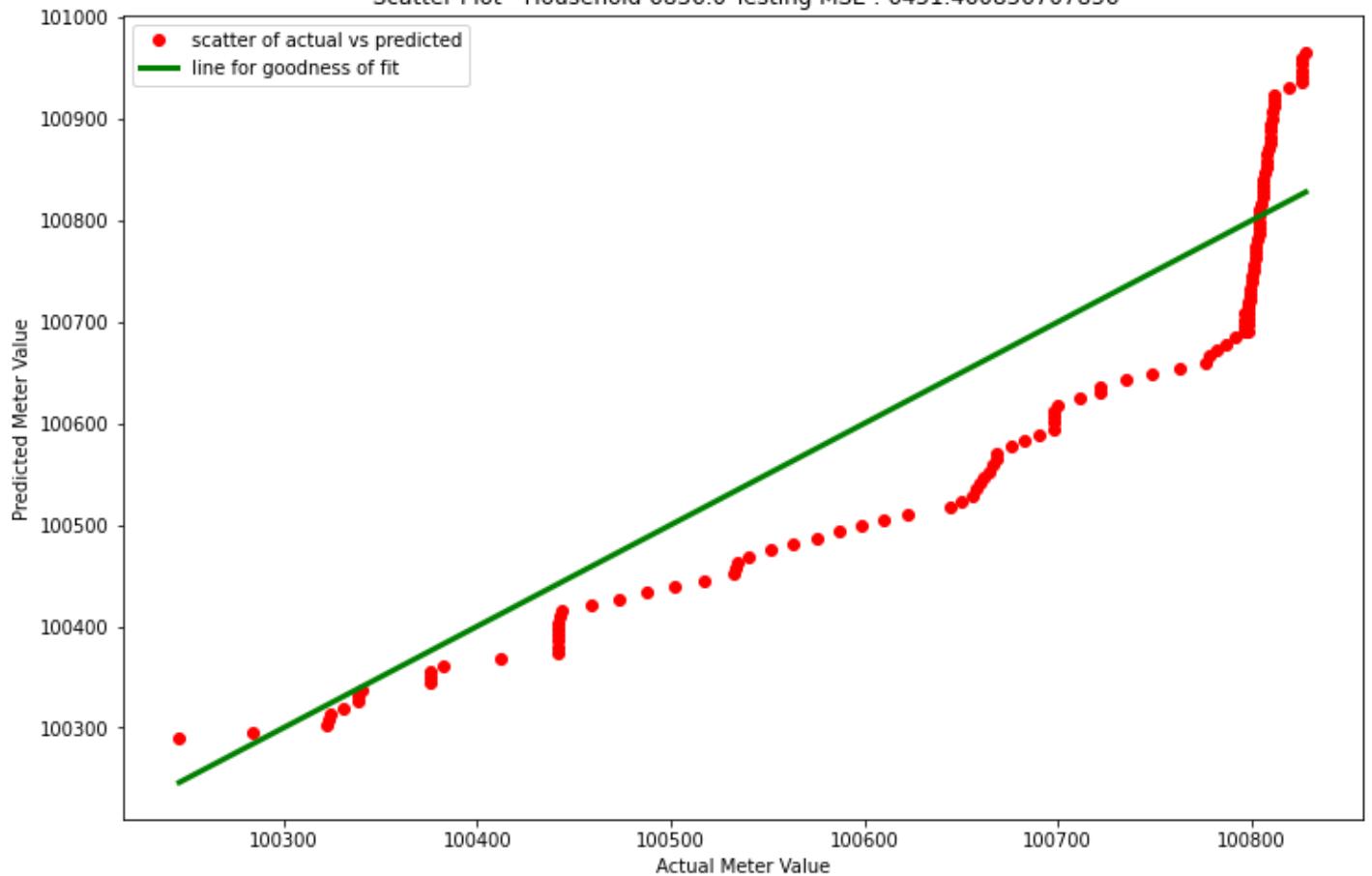
Scatter Plot - Household 6830.0 Testing MSE : 45752.531944547125

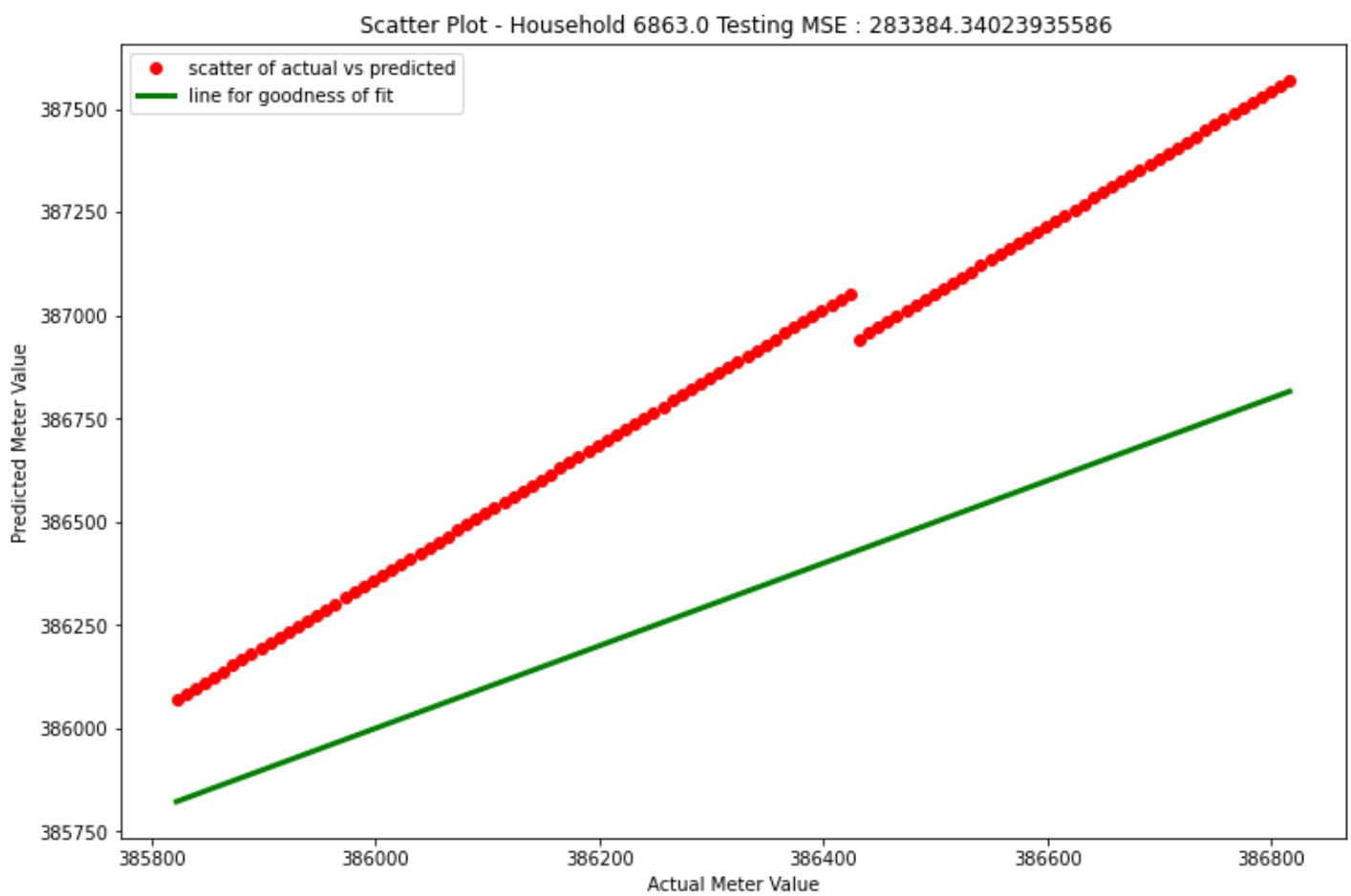
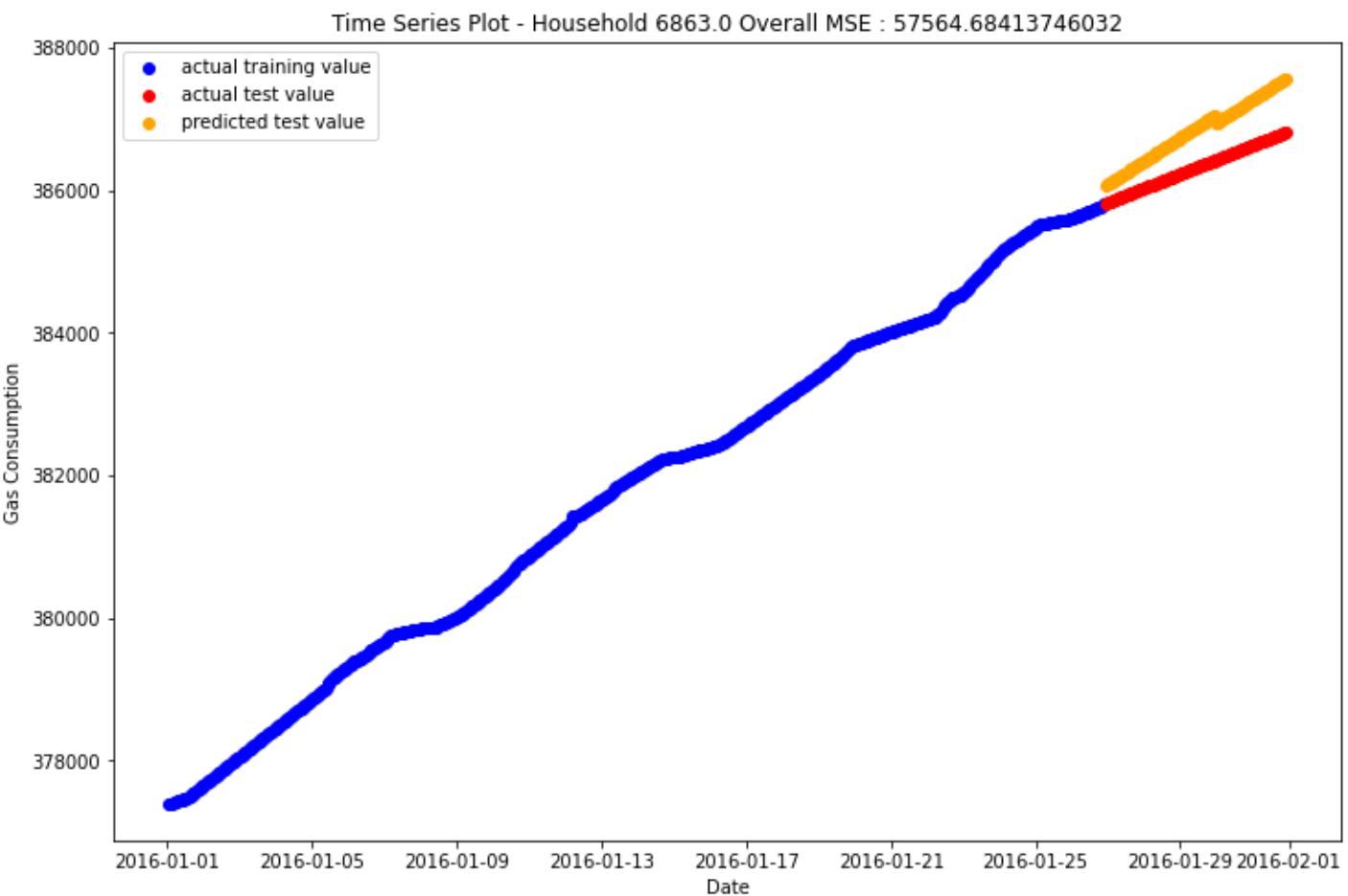


Time Series Plot - Household 6836.0 Overall MSE : 4762.406025024762

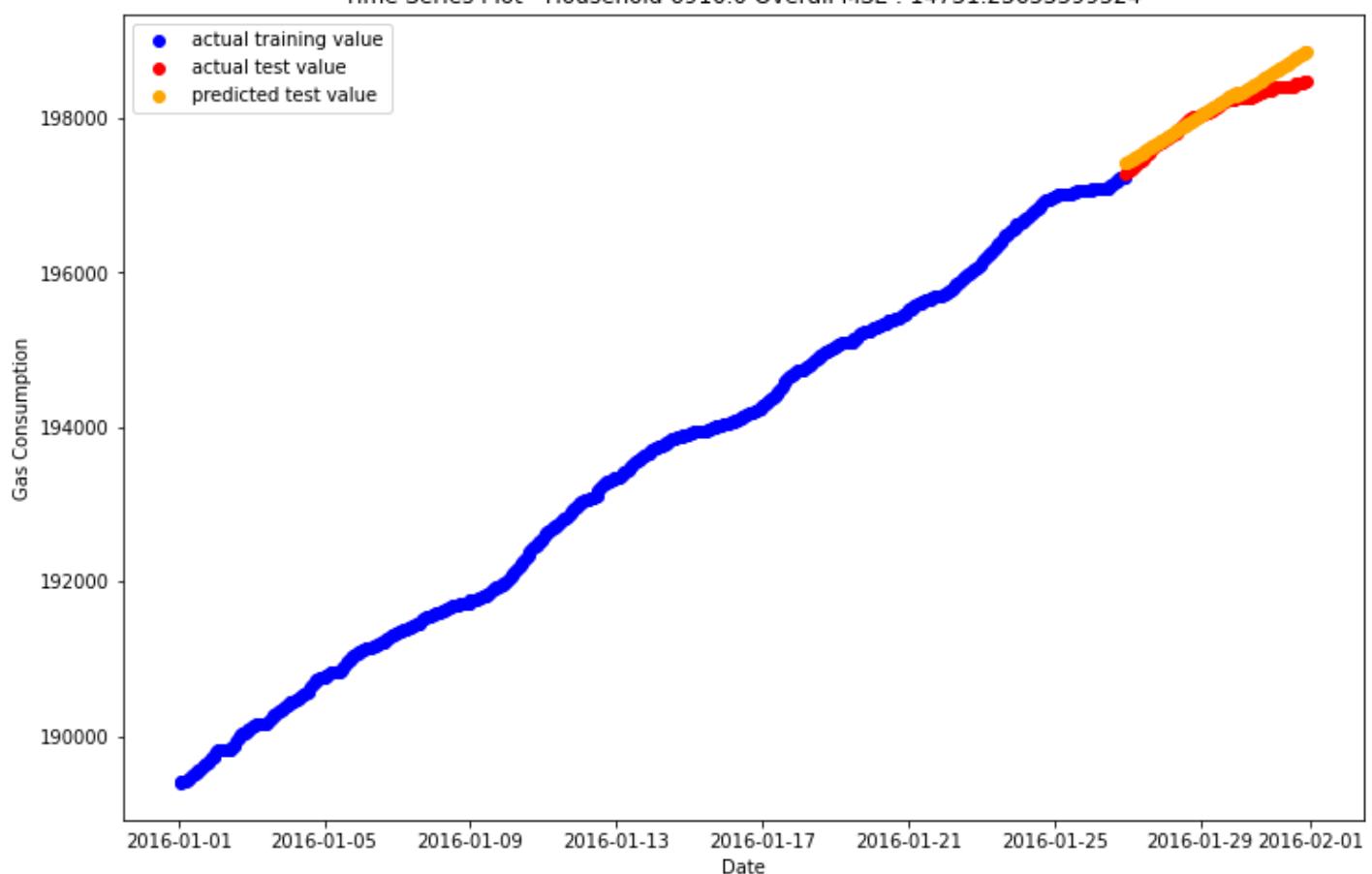


Scatter Plot - Household 6836.0 Testing MSE : 6451.460856707856

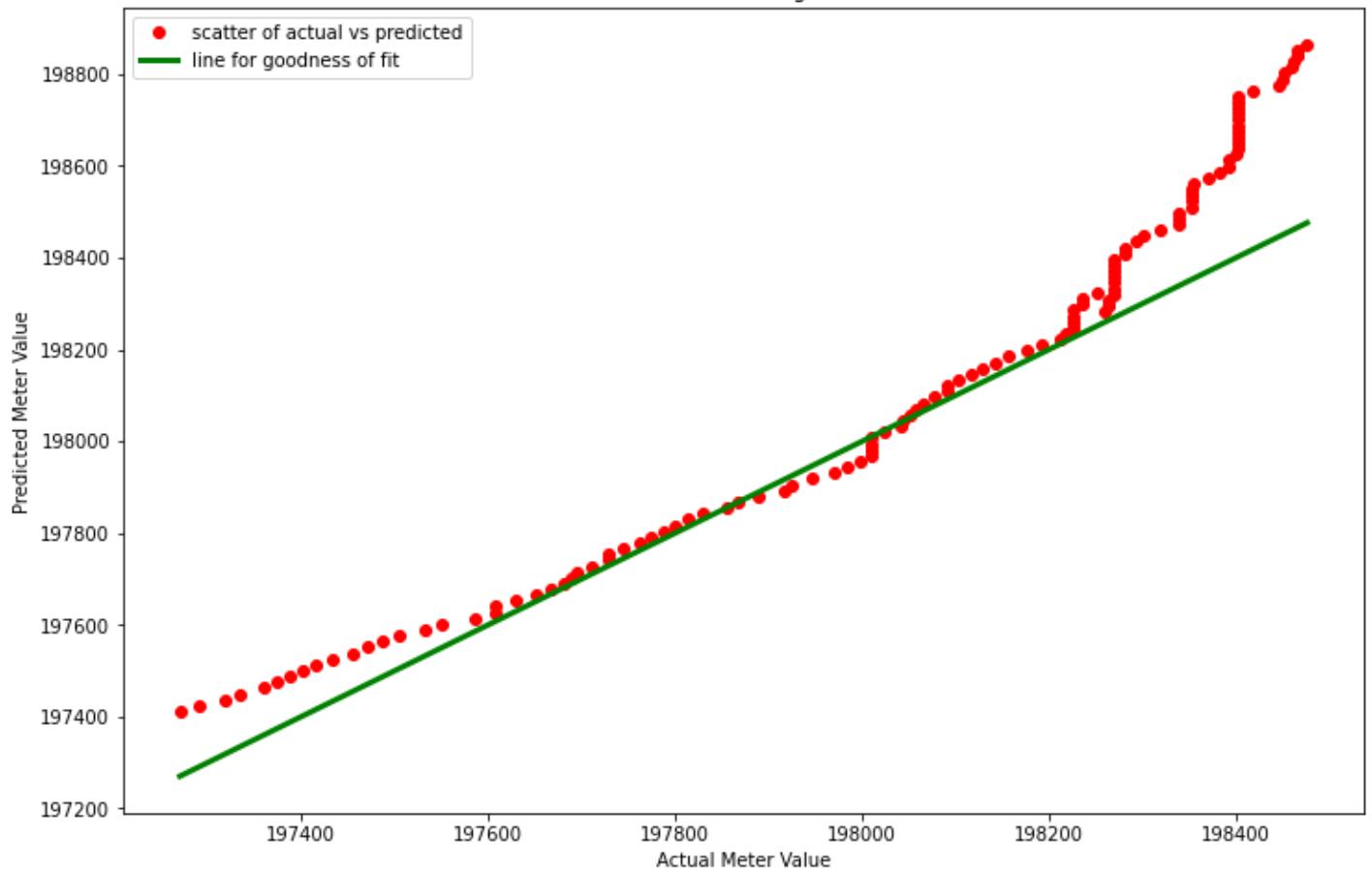




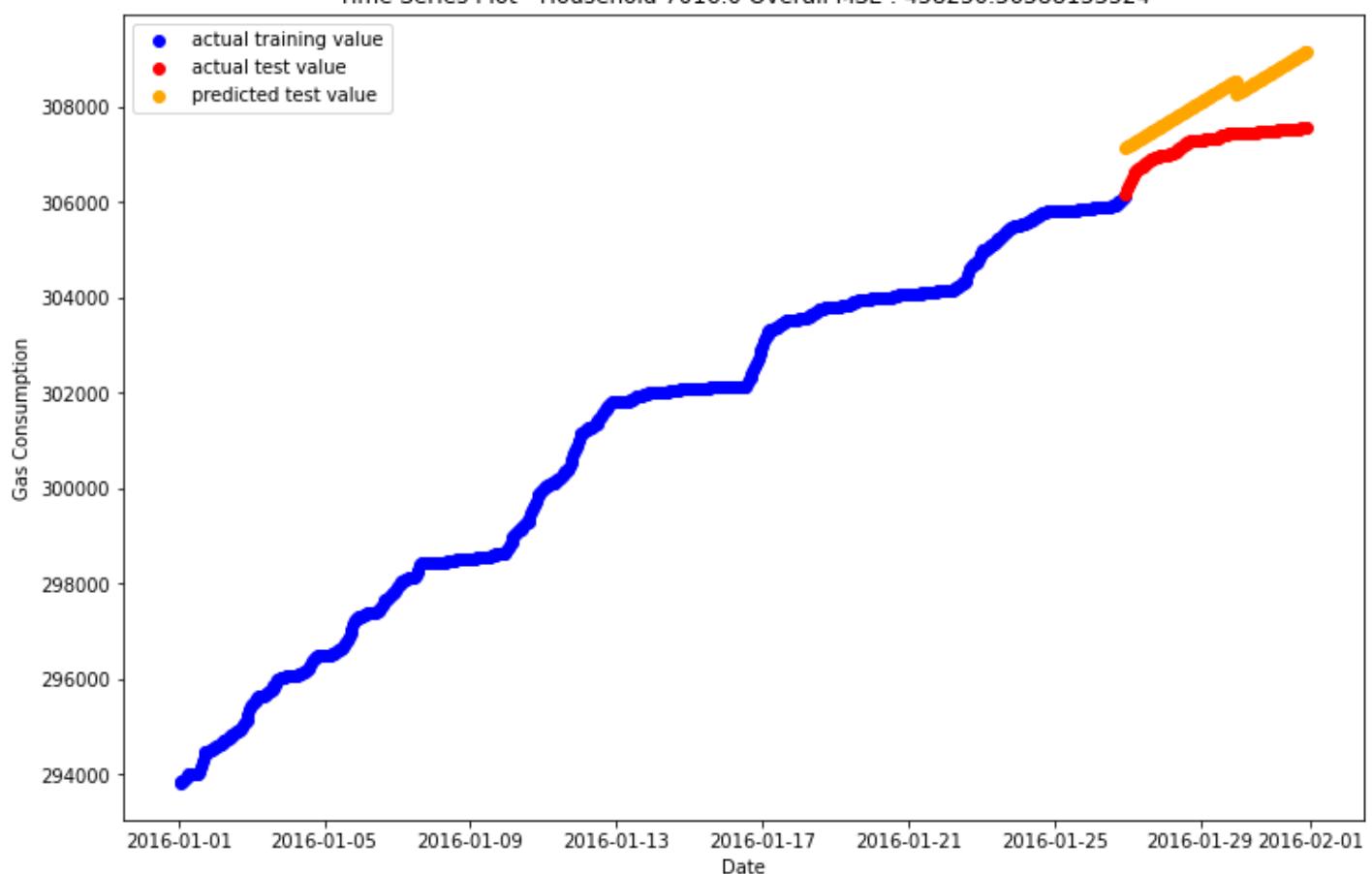
Time Series Plot - Household 6910.0 Overall MSE : 14731.23653599524



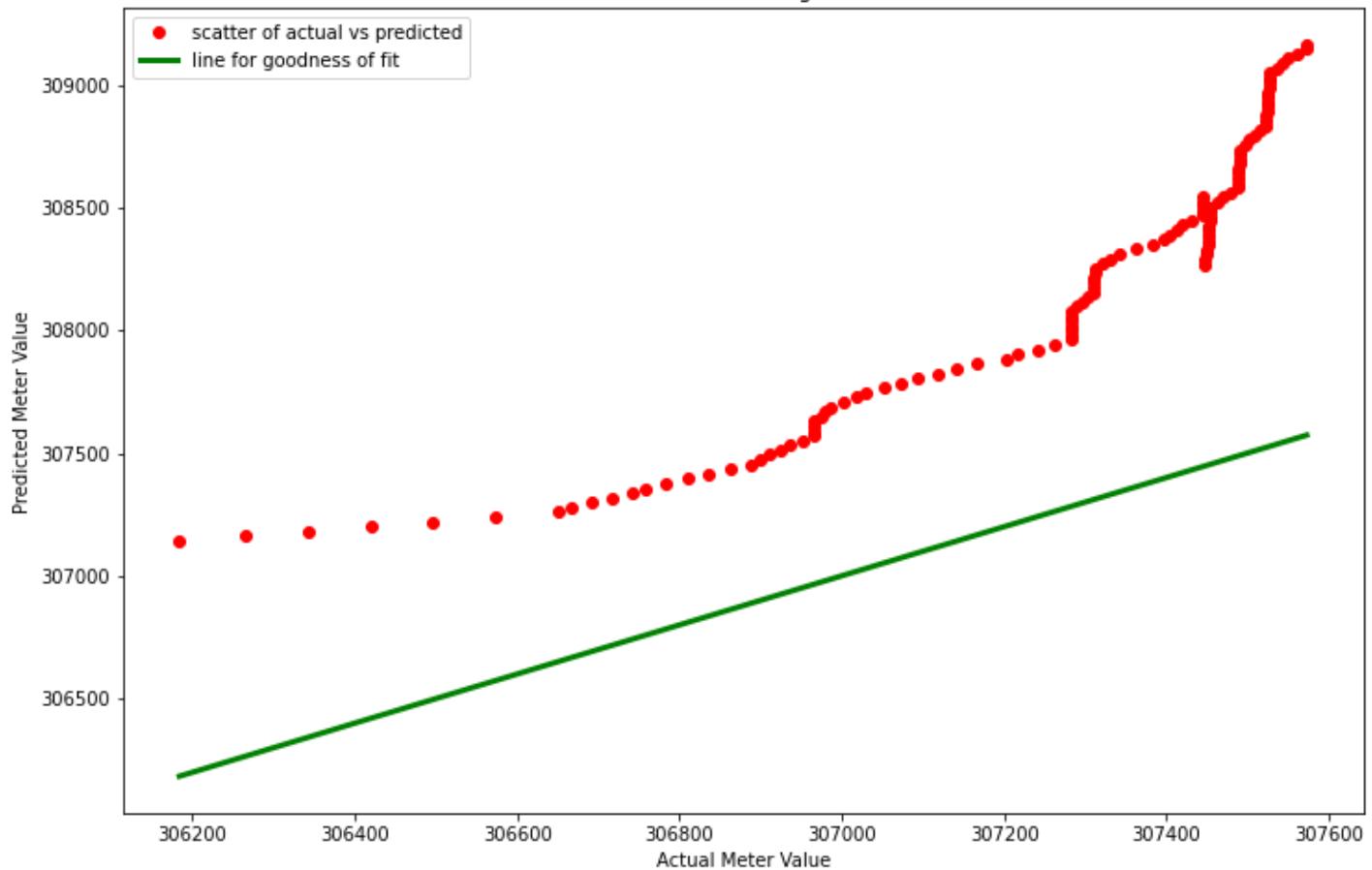
Scatter Plot - Household 6910.0 Testing MSE : 23782.308006623534

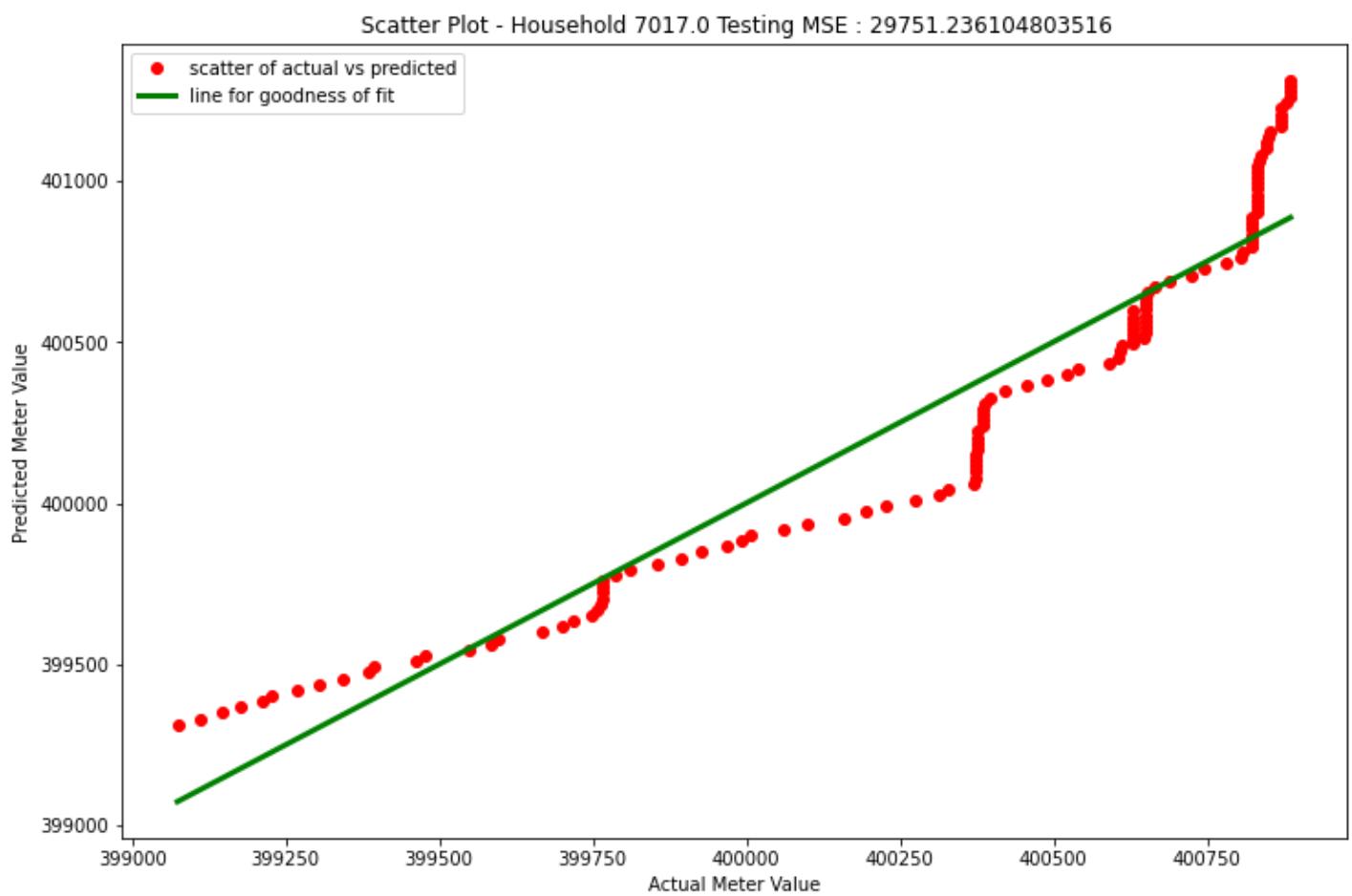
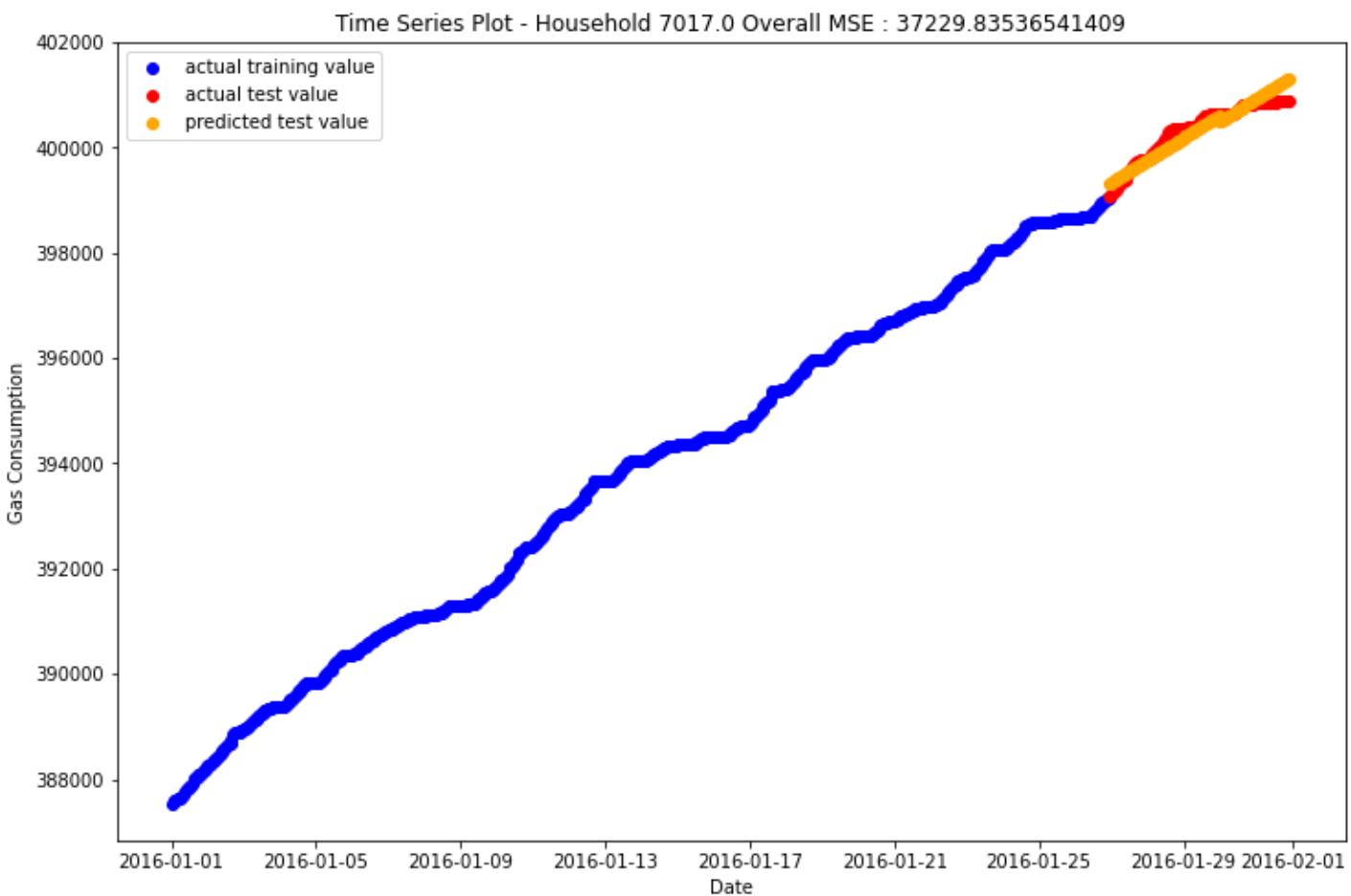


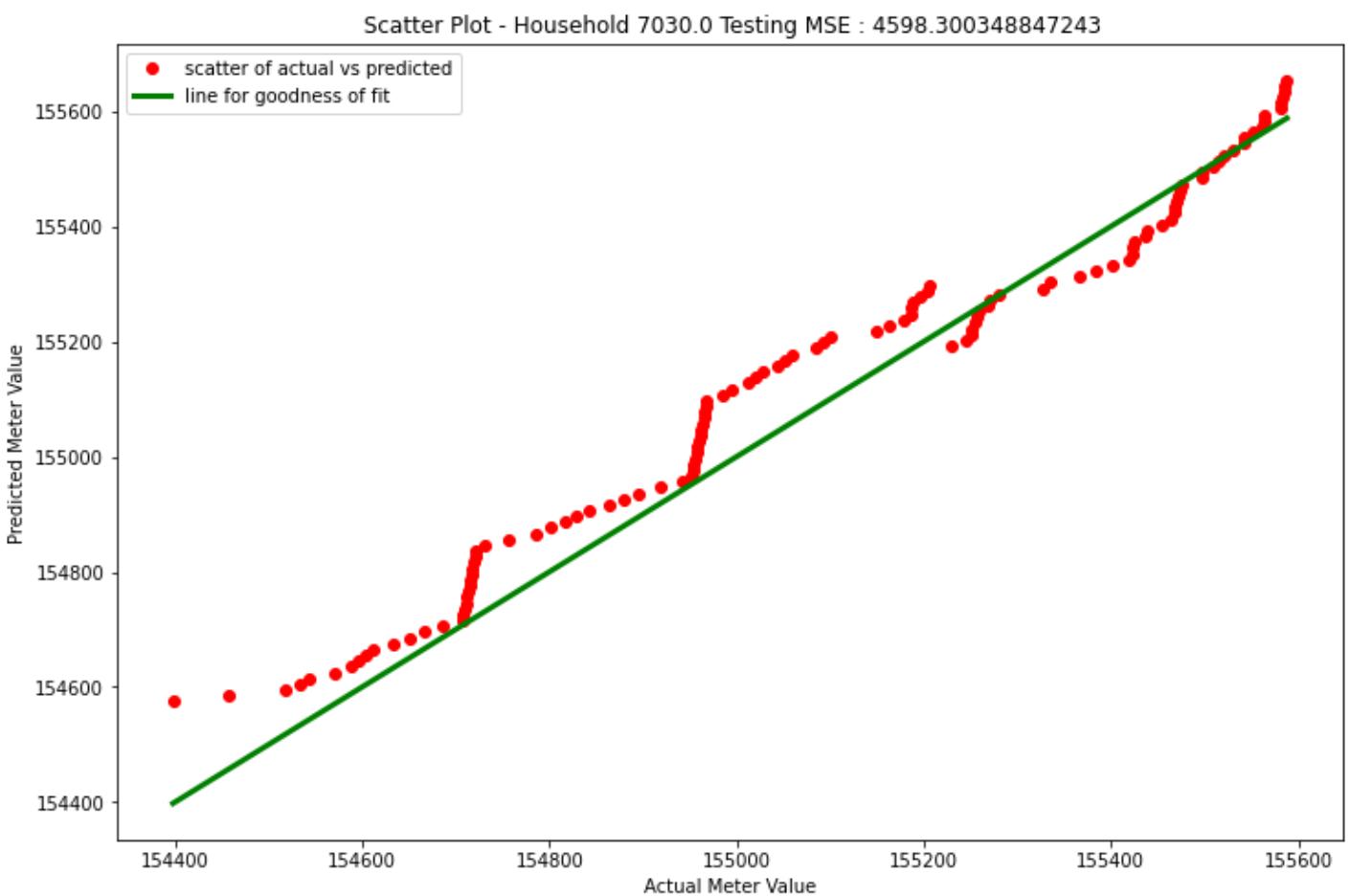
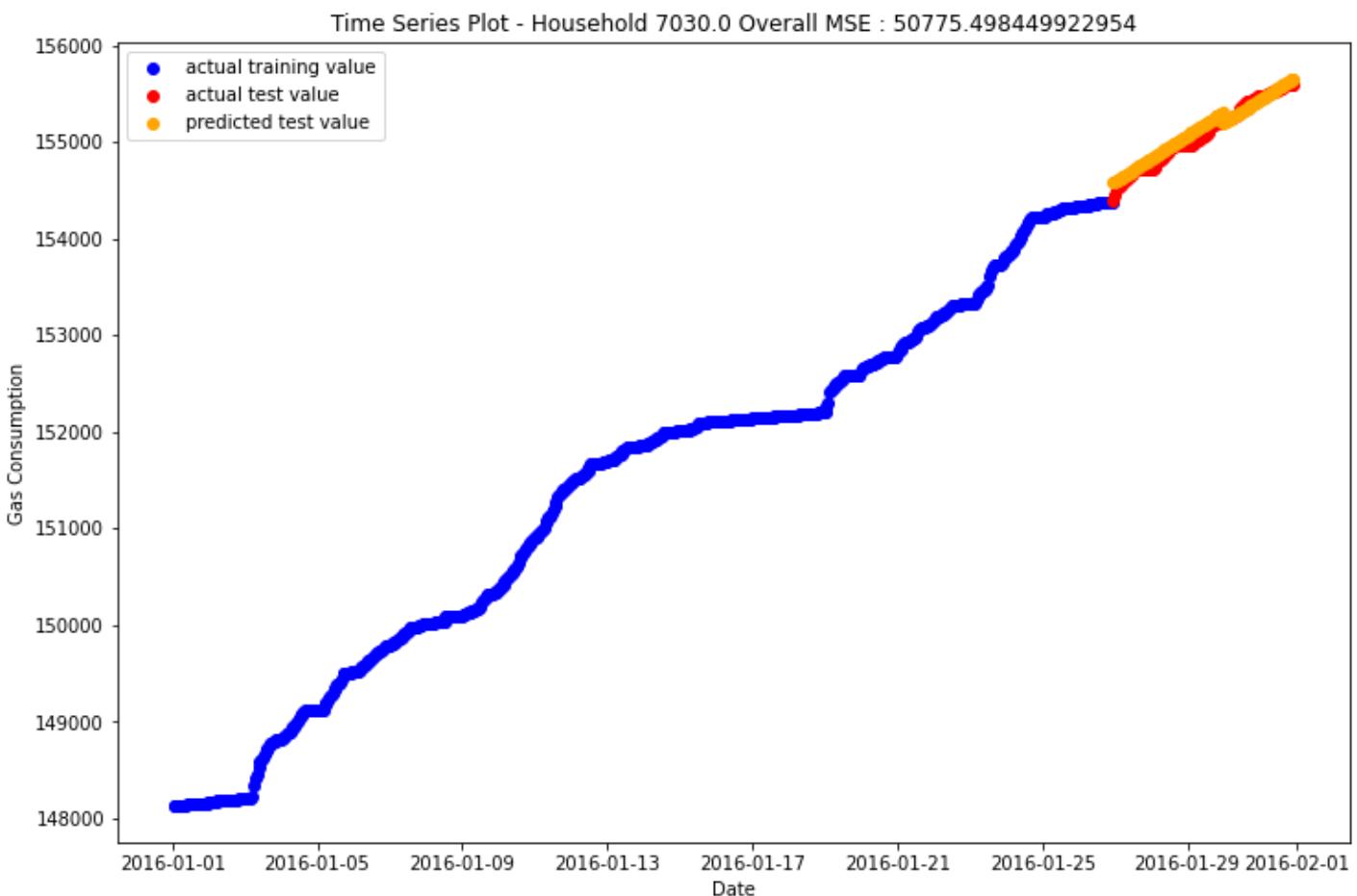
Time Series Plot - Household 7016.0 Overall MSE : 458250.36388133524



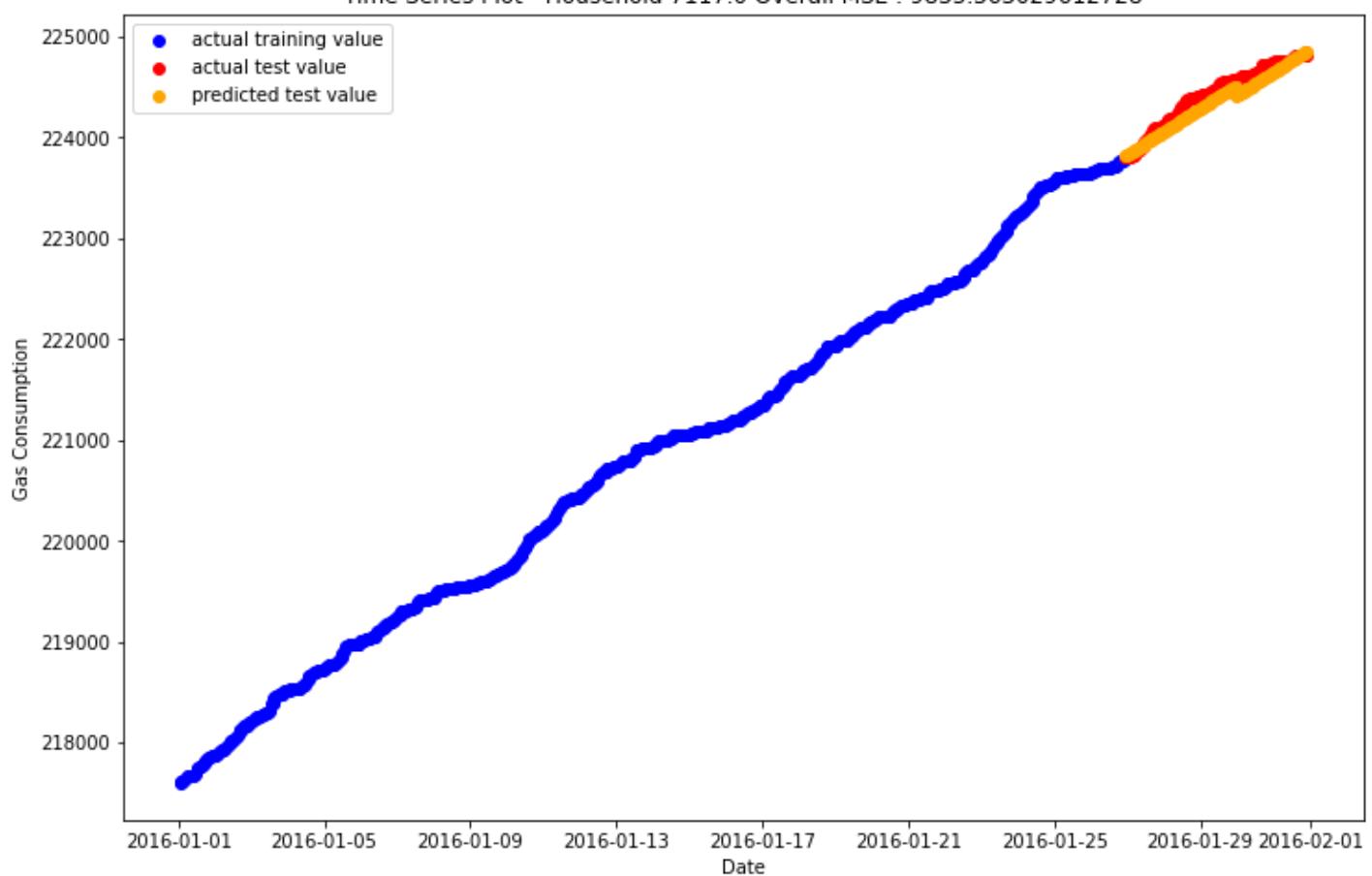
Scatter Plot - Household 7016.0 Testing MSE : 977269.2605041533



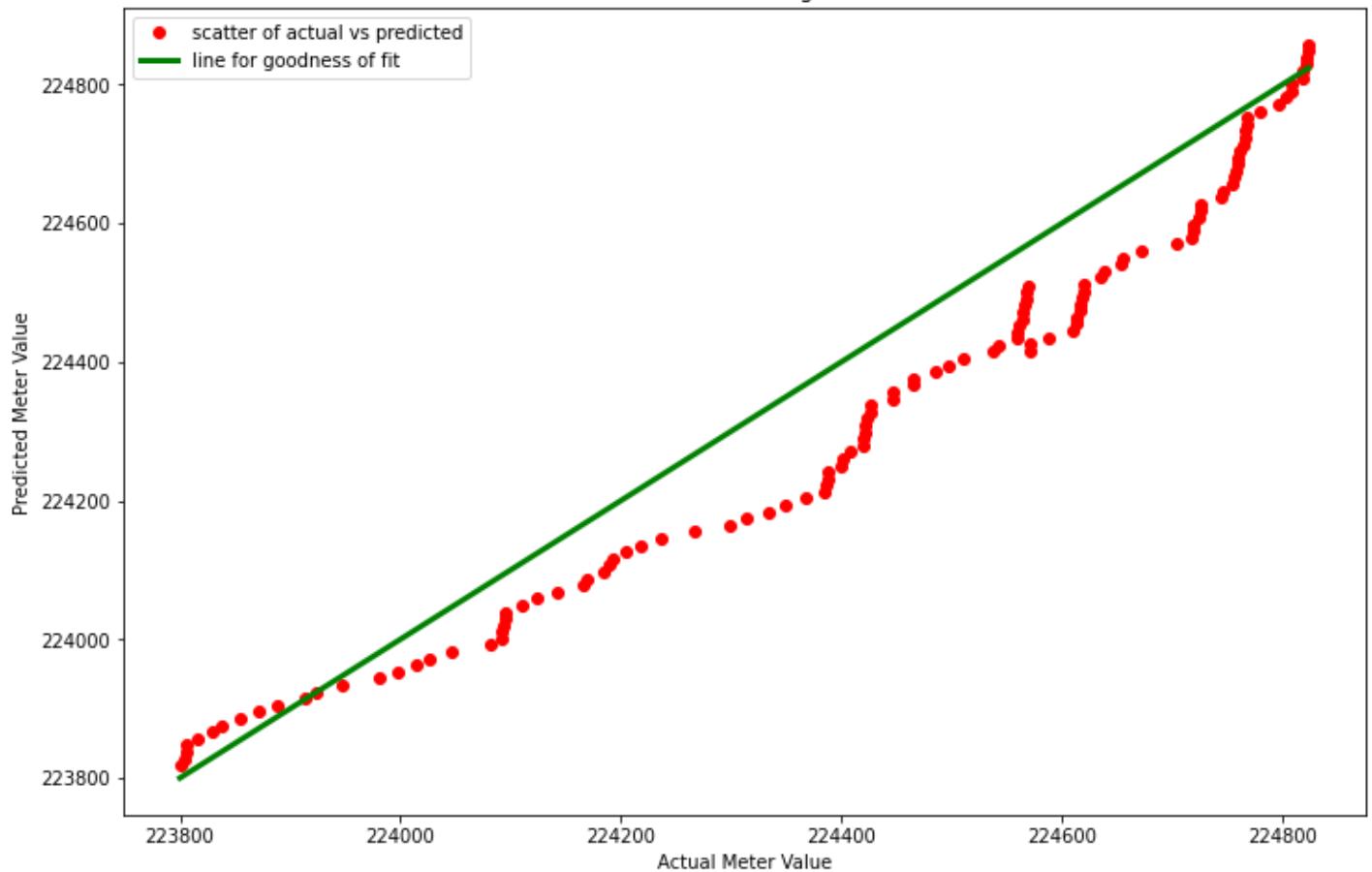




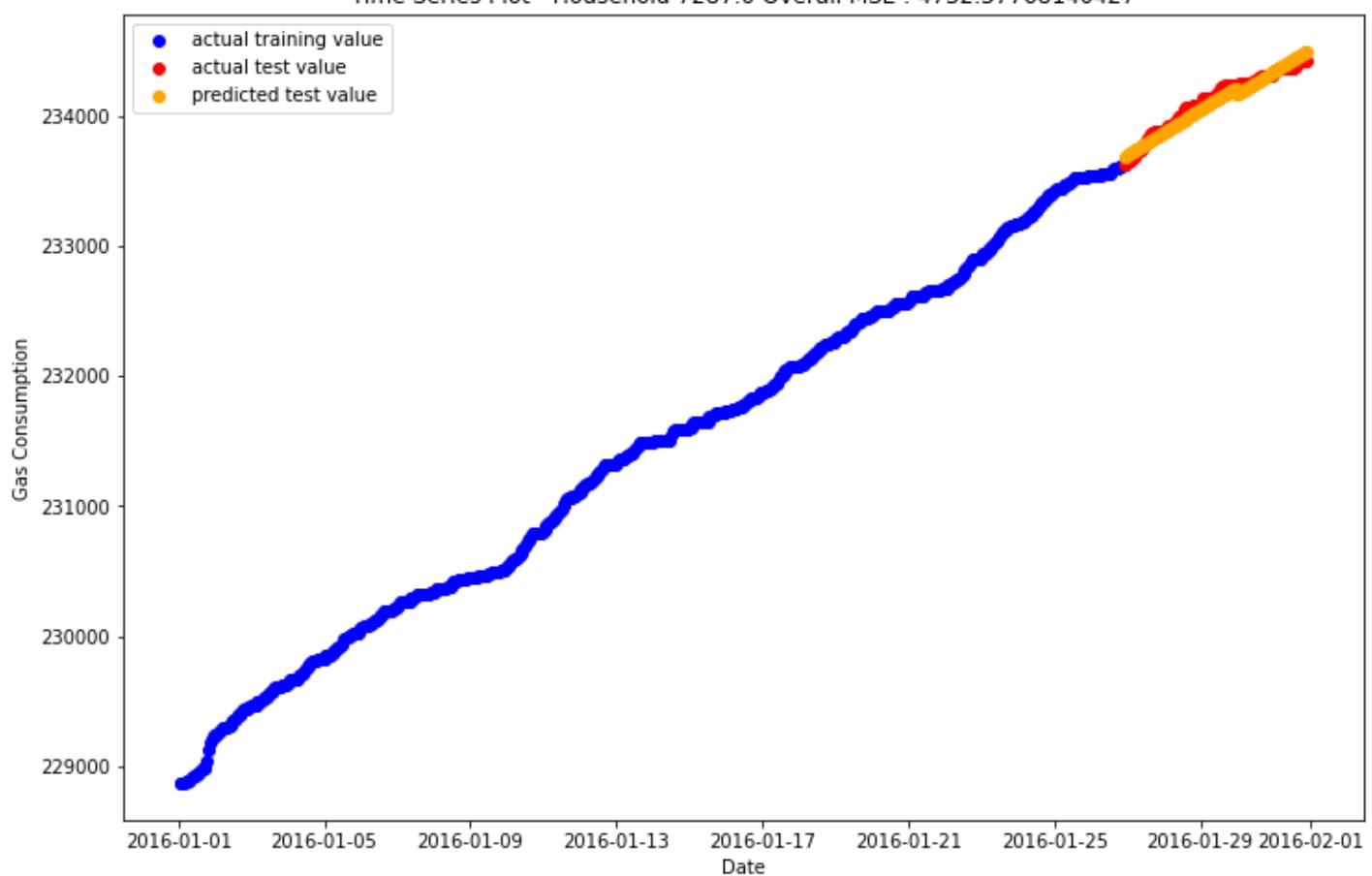
Time Series Plot - Household 7117.0 Overall MSE : 9835.363029612728



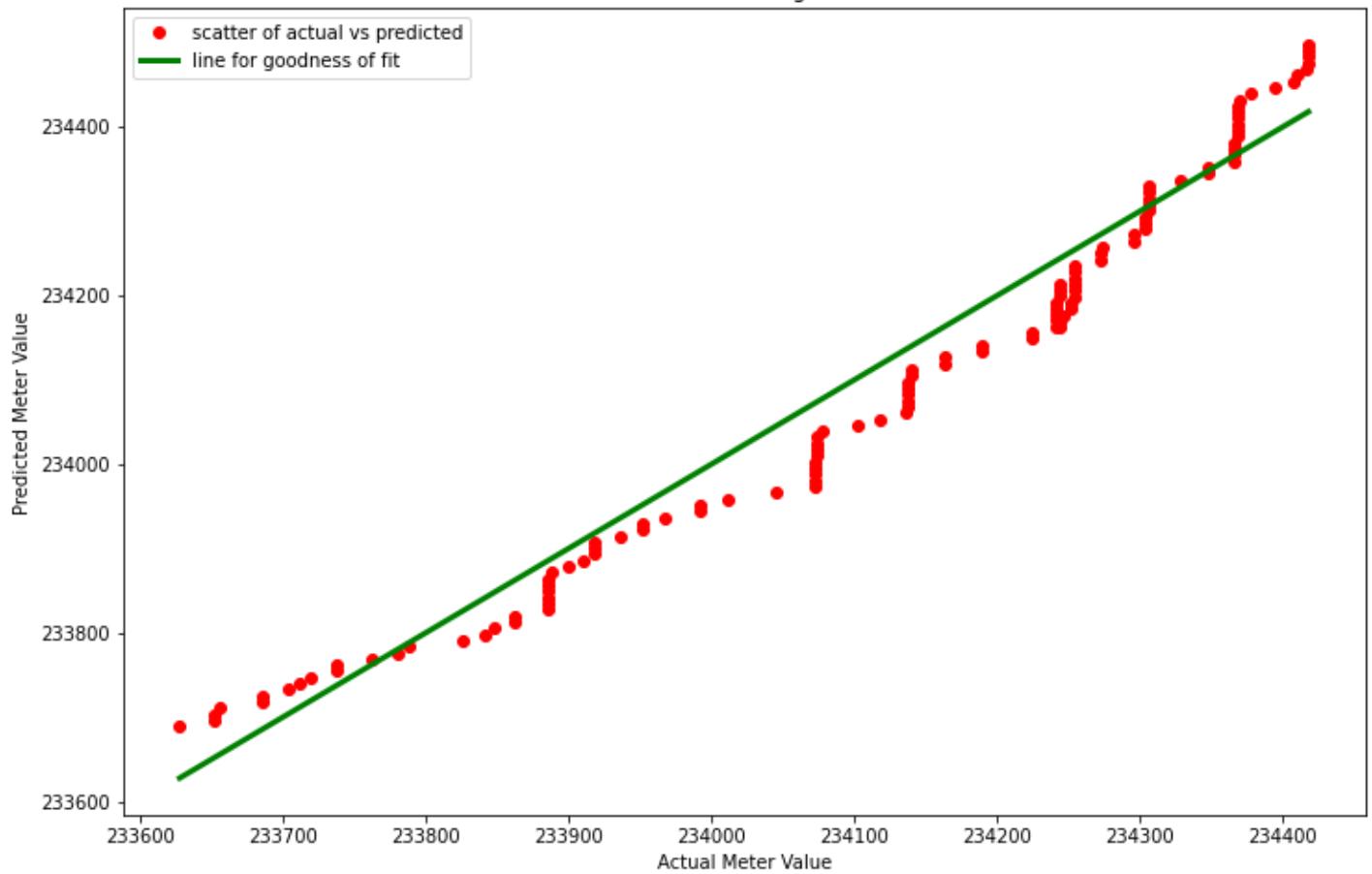
Scatter Plot - Household 7117.0 Testing MSE : 9542.950642849148



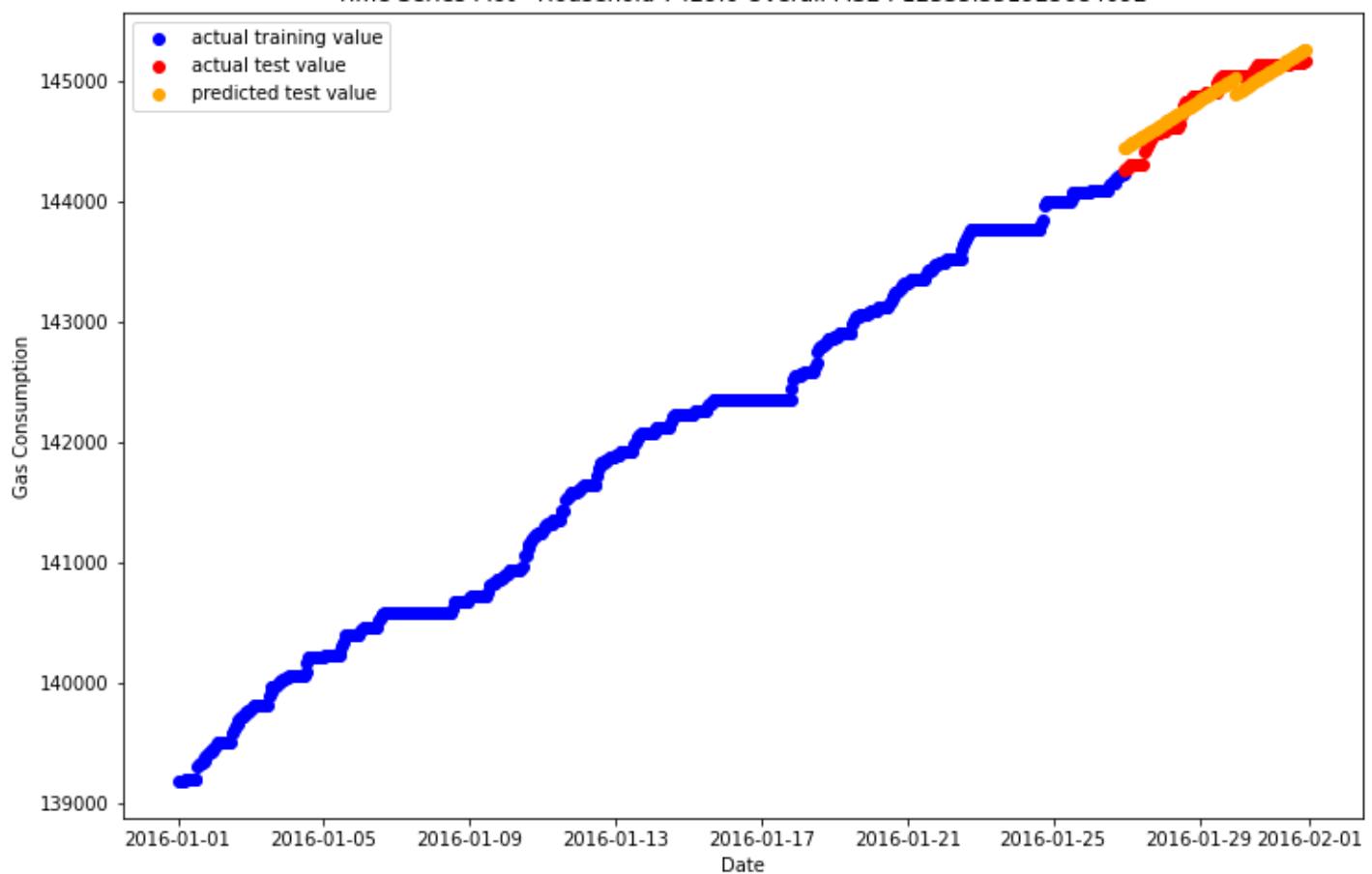
Time Series Plot - Household 7287.0 Overall MSE : 4732.37768140427



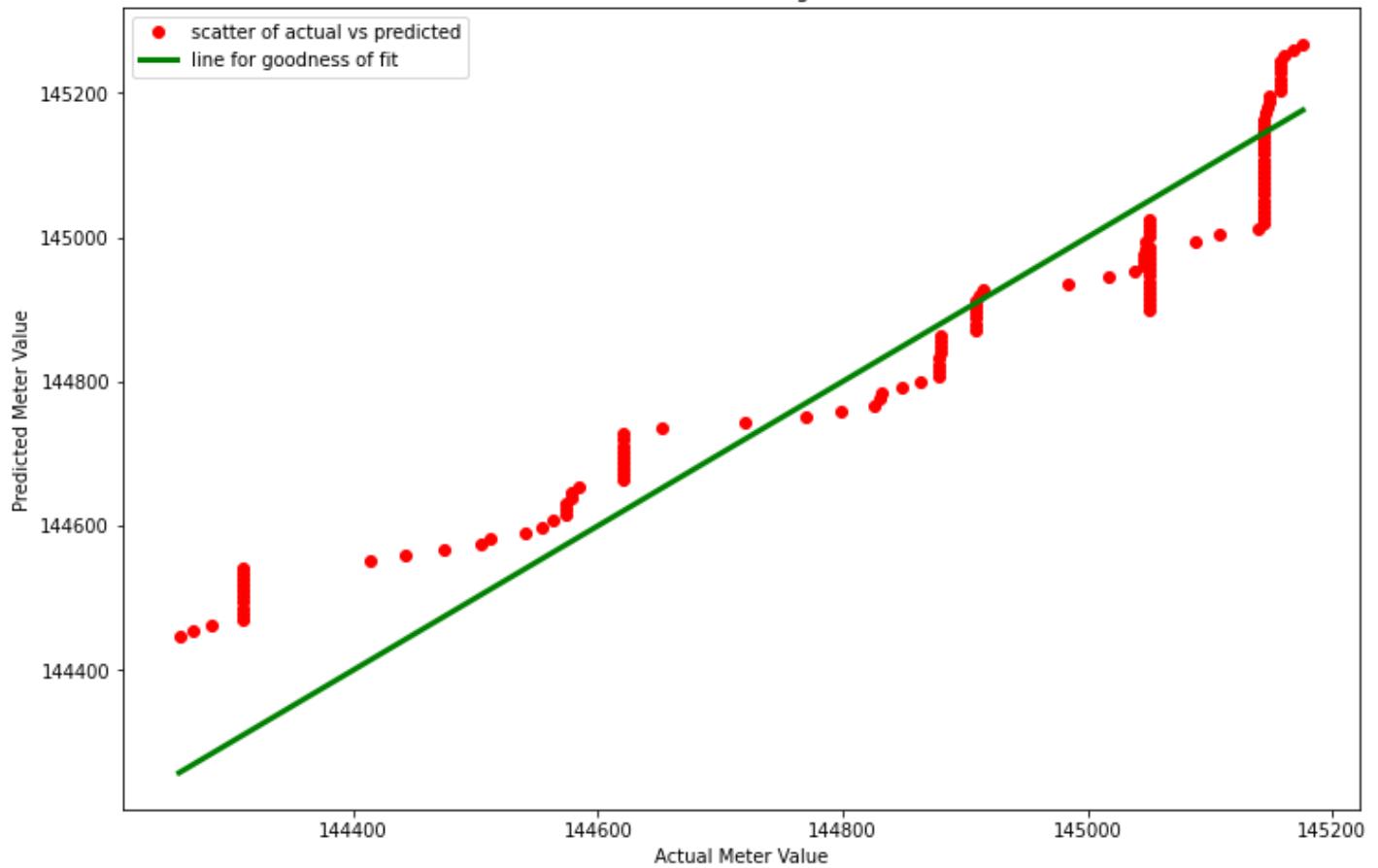
Scatter Plot - Household 7287.0 Testing MSE : 2217.4468280243777



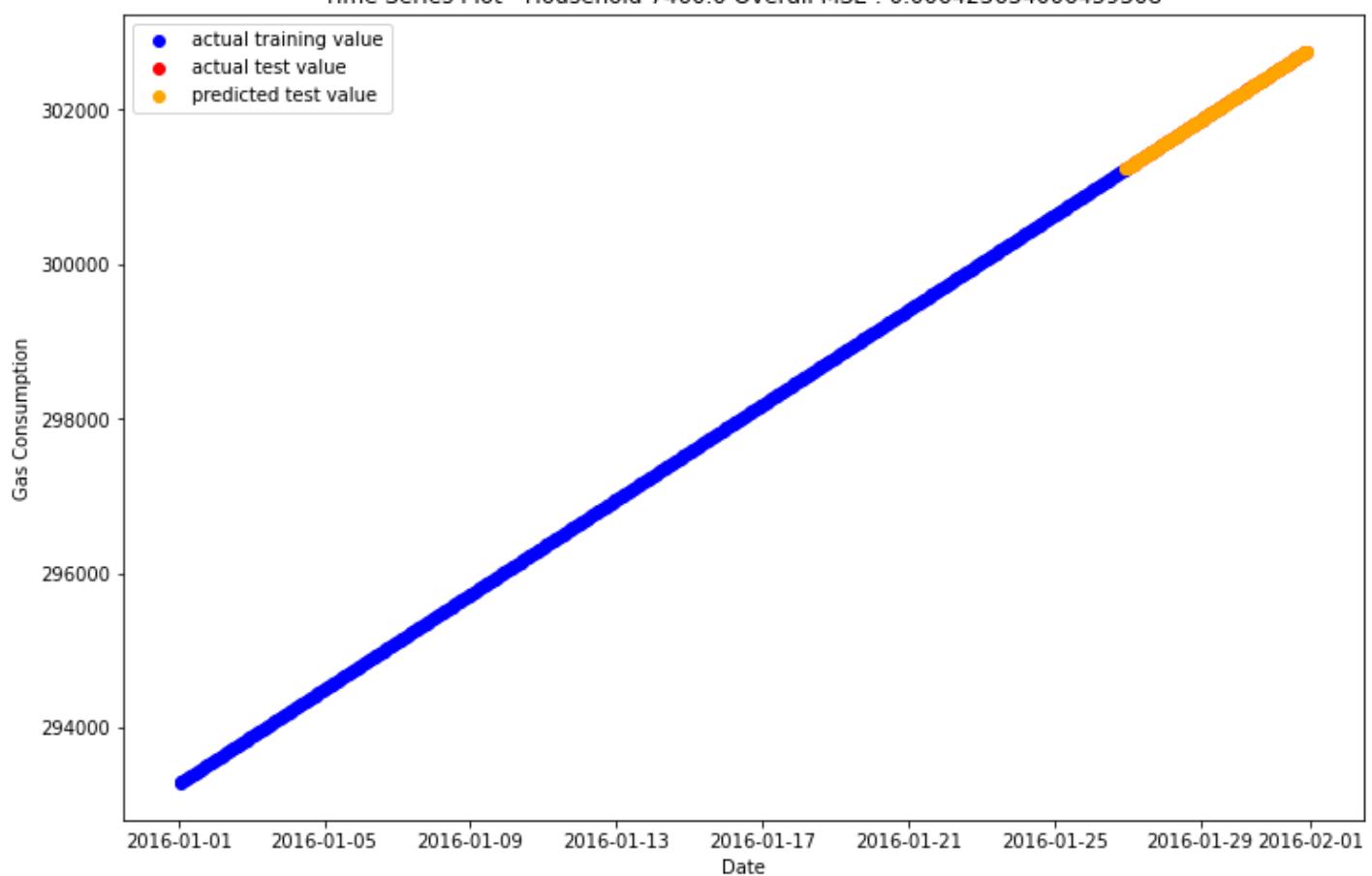
Time Series Plot - Household 7429.0 Overall MSE : 12335.351925684092



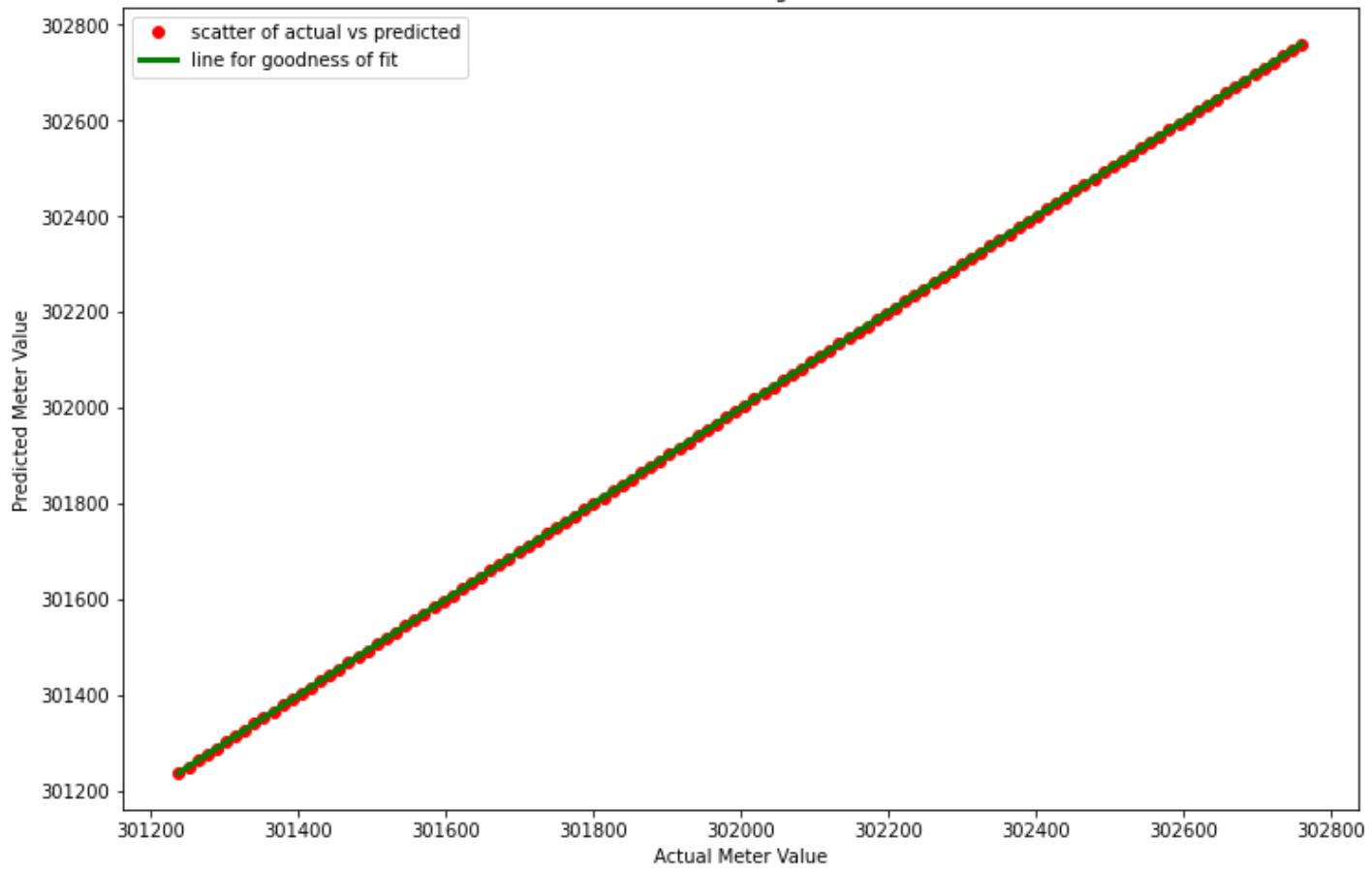
Scatter Plot - Household 7429.0 Testing MSE : 8747.504154330092



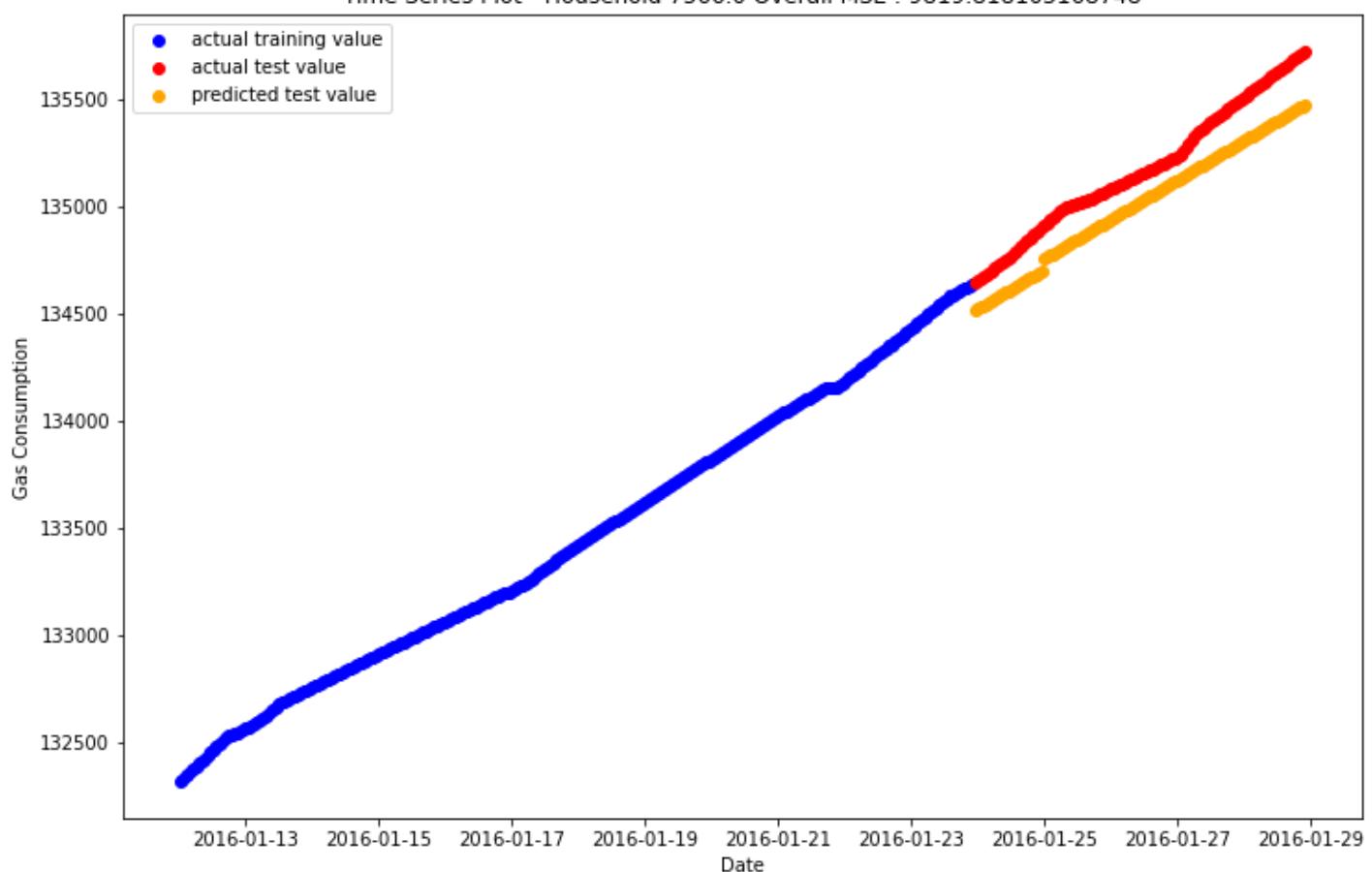
Time Series Plot - Household 7460.0 Overall MSE : 0.006423634006459308



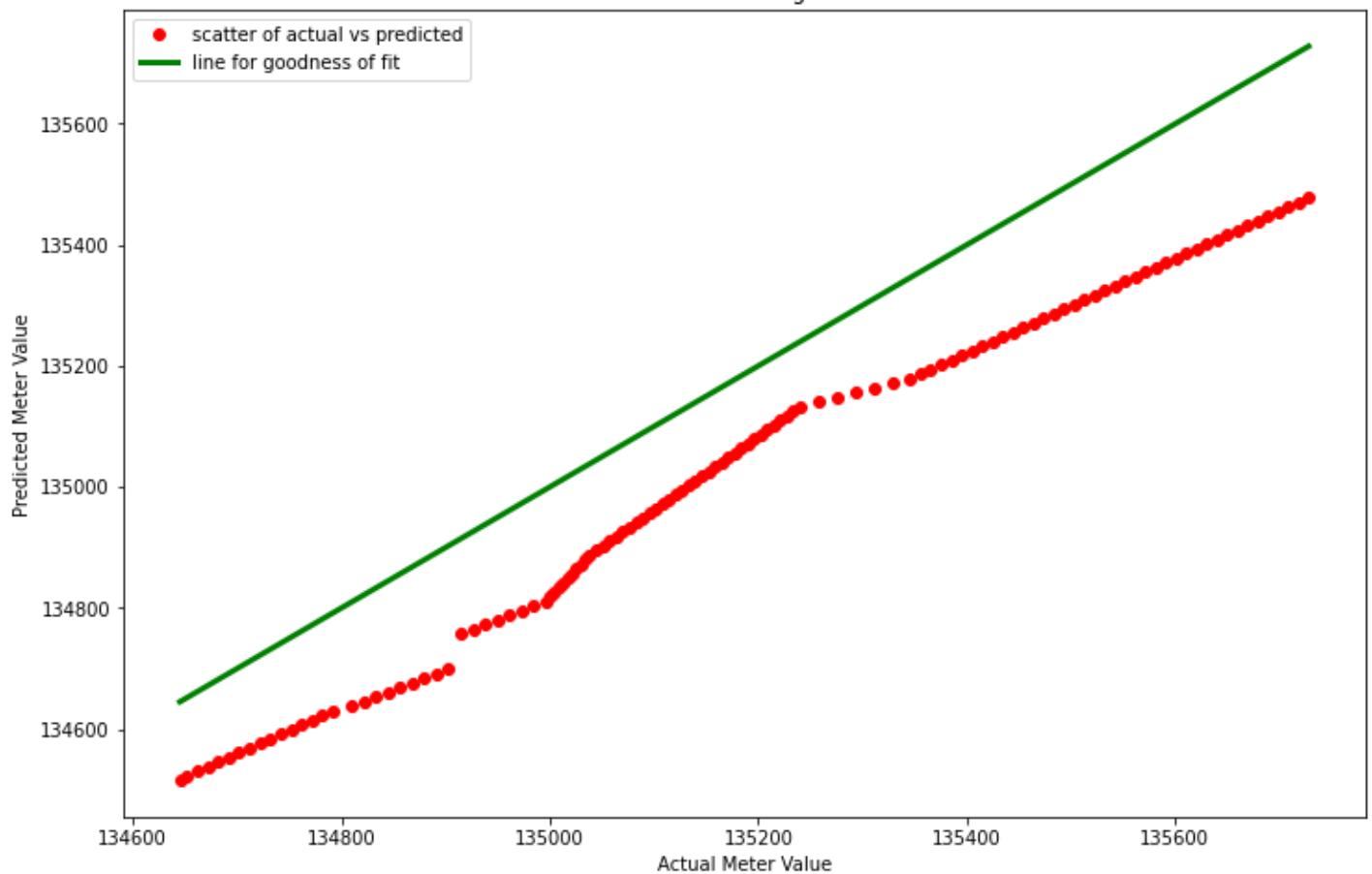
Scatter Plot - Household 7460.0 Testing MSE : 0.017429471703388624



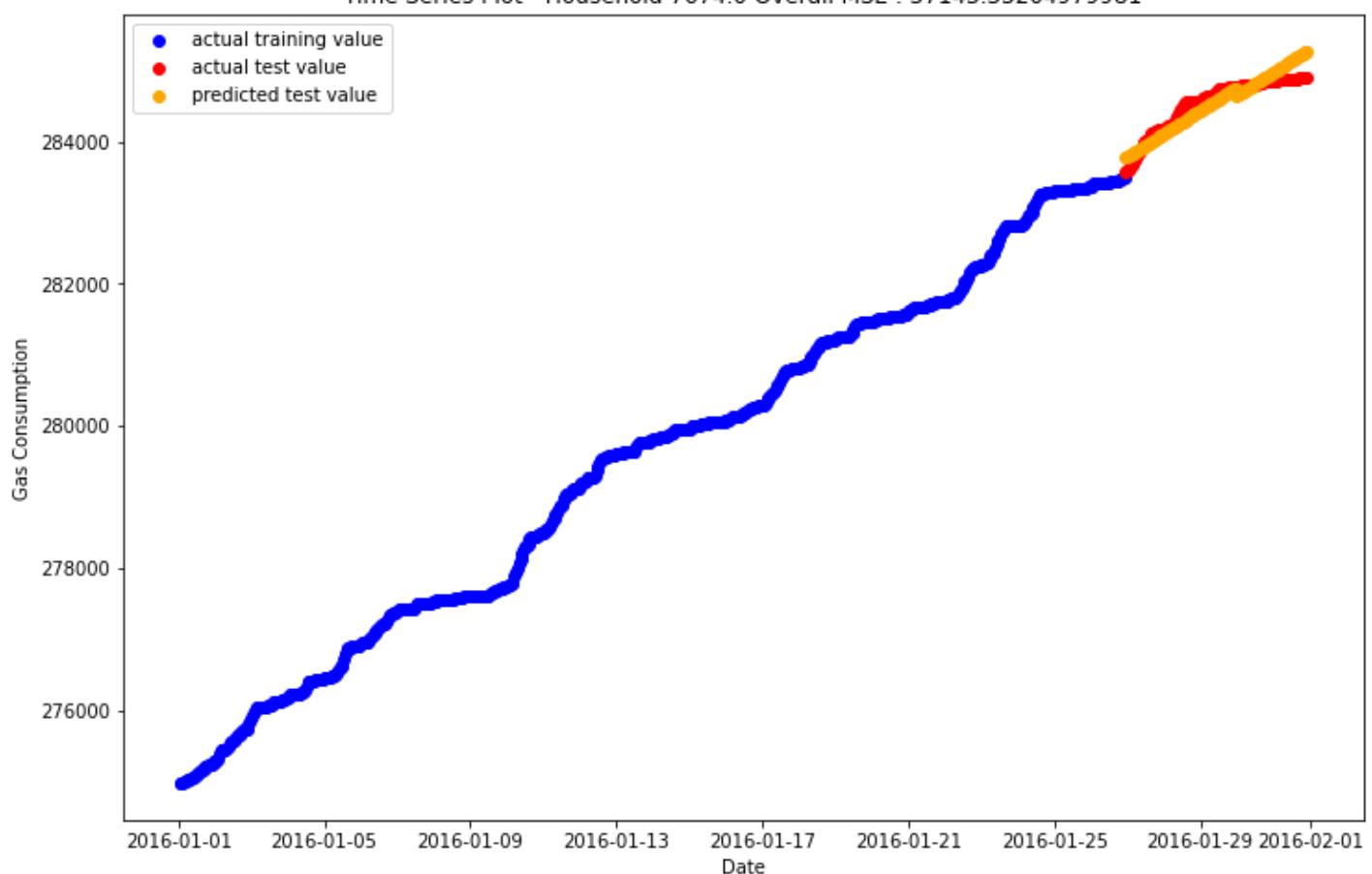
Time Series Plot - Household 7566.0 Overall MSE : 9819.818105168748



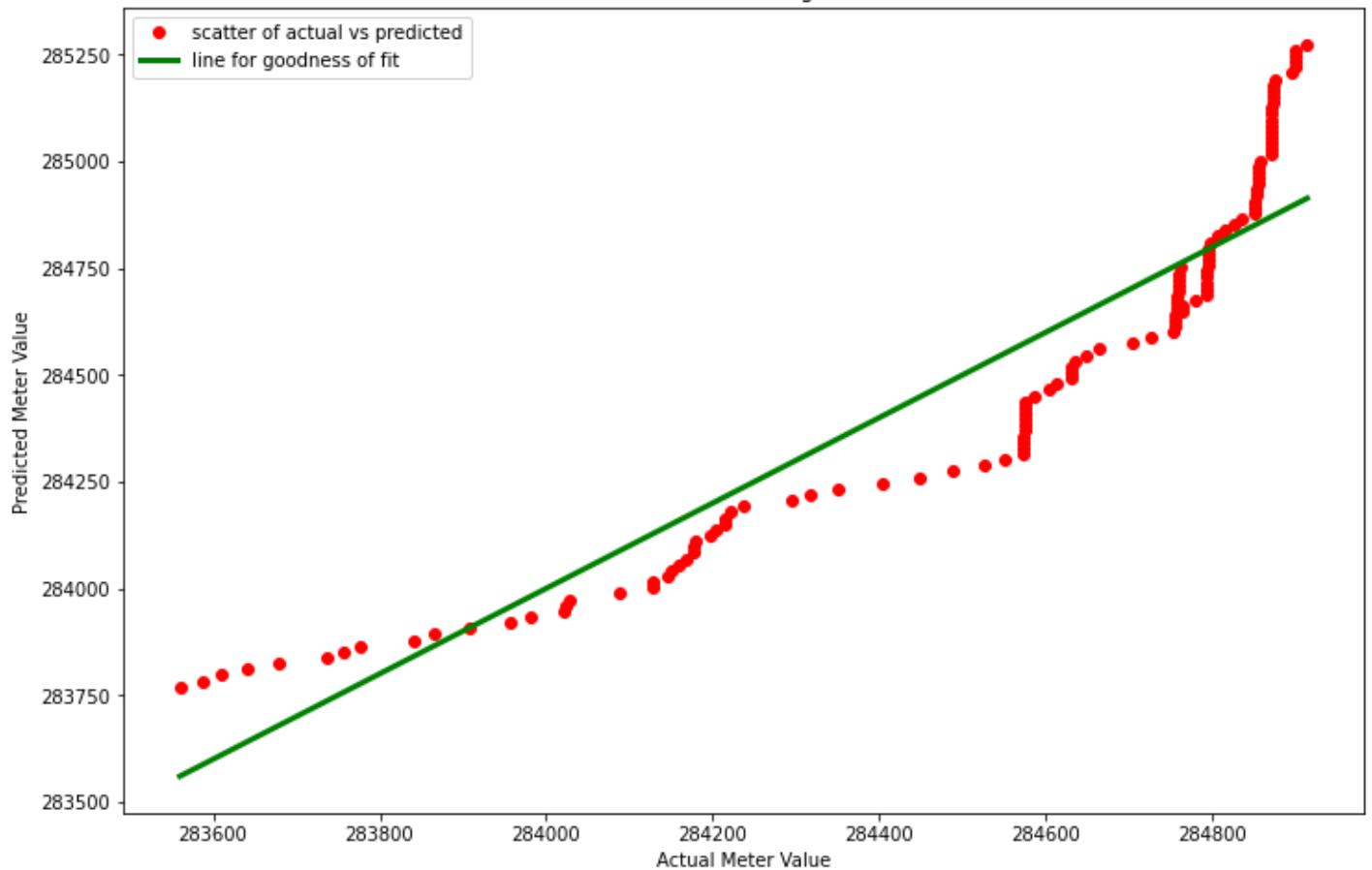
Scatter Plot - Household 7566.0 Testing MSE : 29694.516488266883



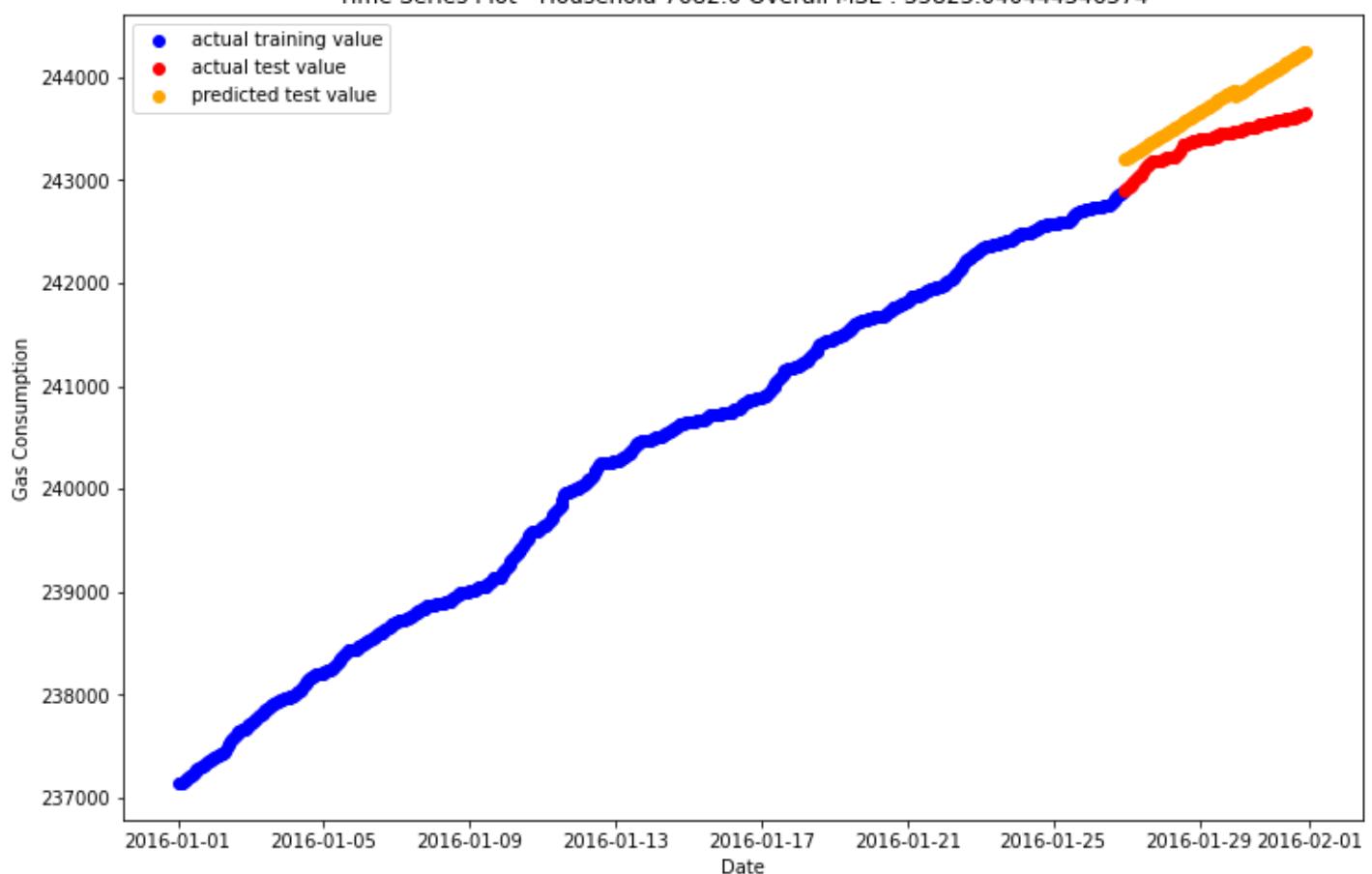
Time Series Plot - Household 7674.0 Overall MSE : 37143.33204979981



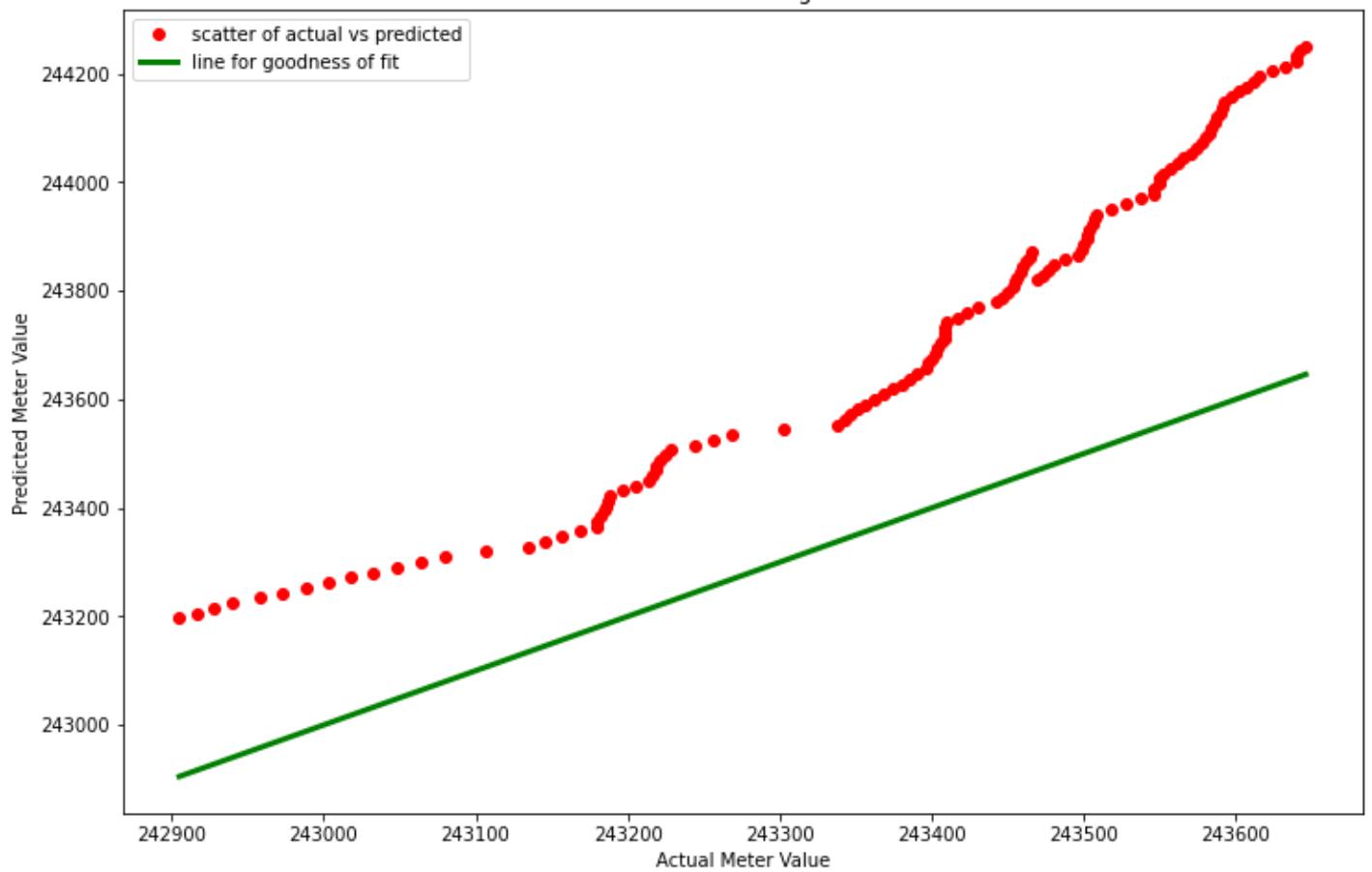
Scatter Plot - Household 7674.0 Testing MSE : 24359.29777930404



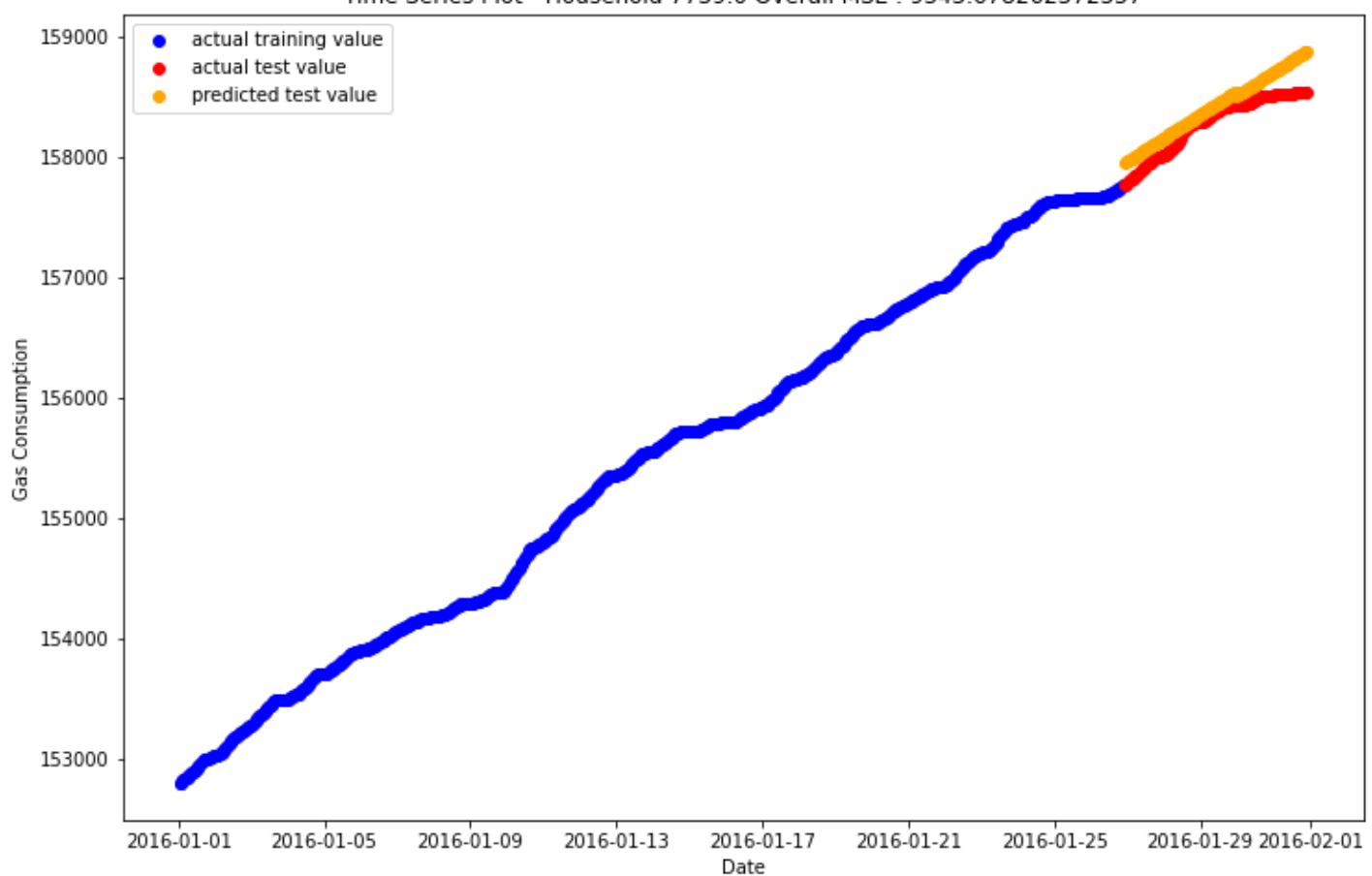
Time Series Plot - Household 7682.0 Overall MSE : 35825.040444346574



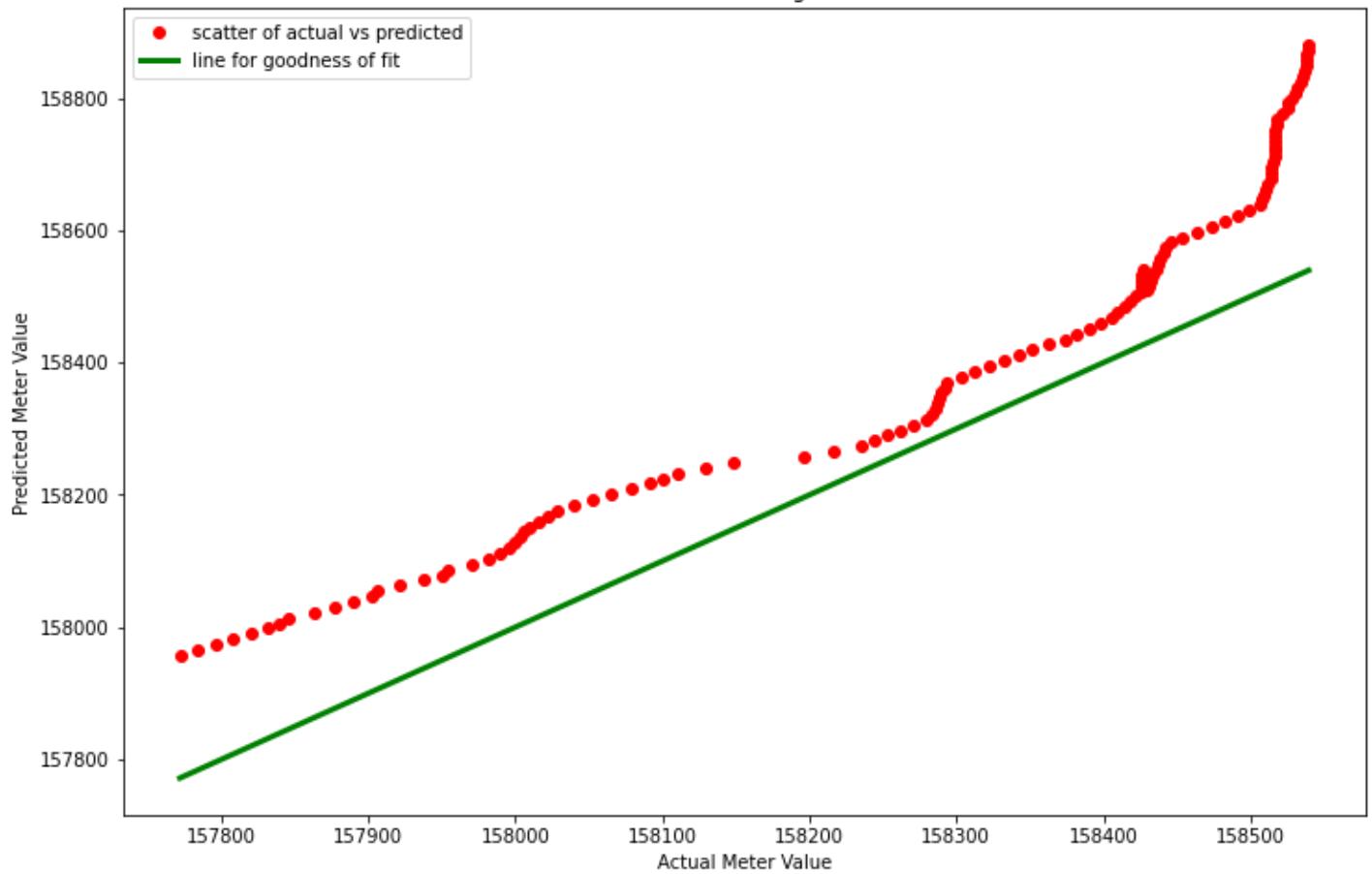
Scatter Plot - Household 7682.0 Testing MSE : 138652.7168097906



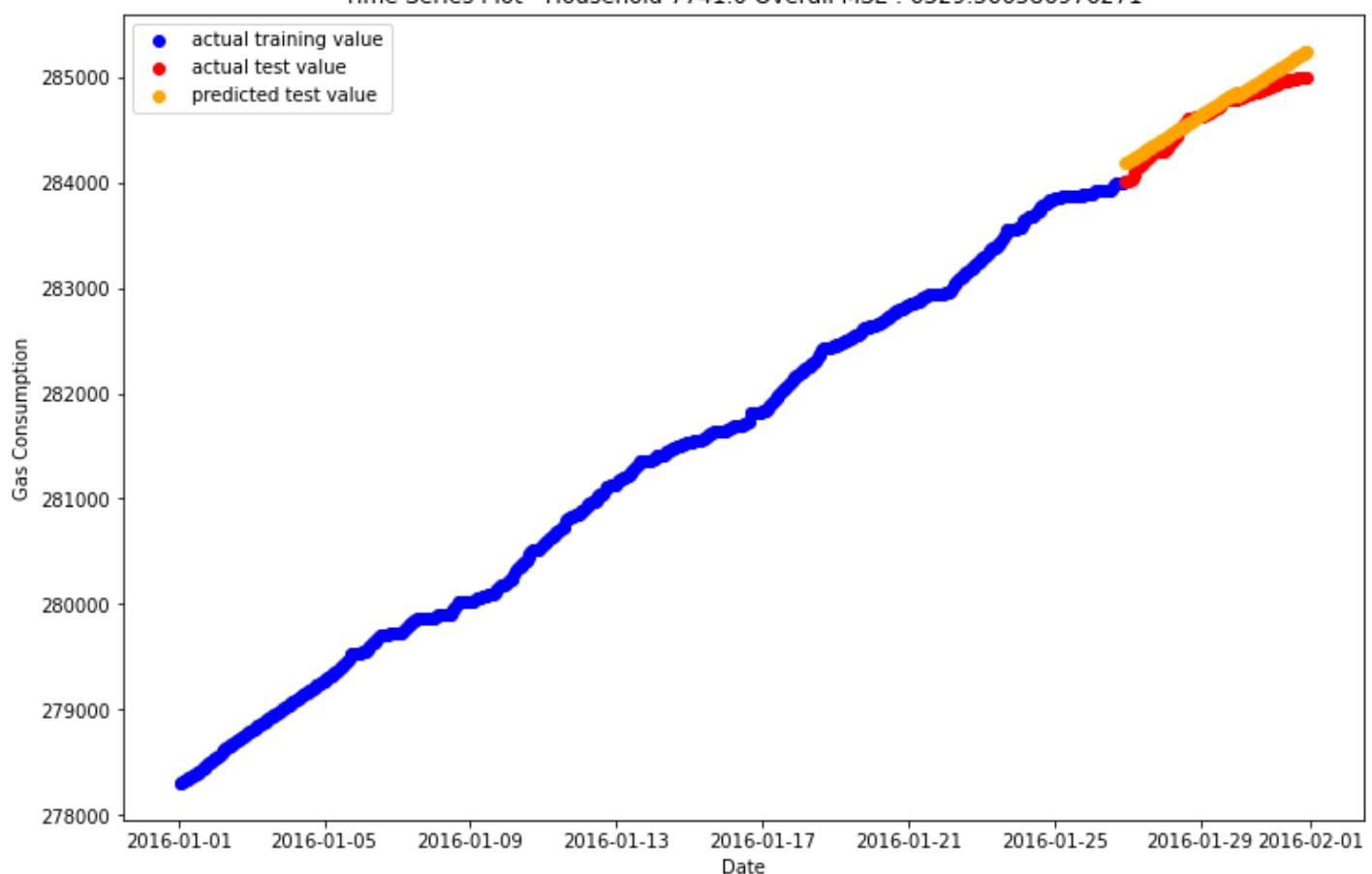
Time Series Plot - Household 7739.0 Overall MSE : 9543.678262372357



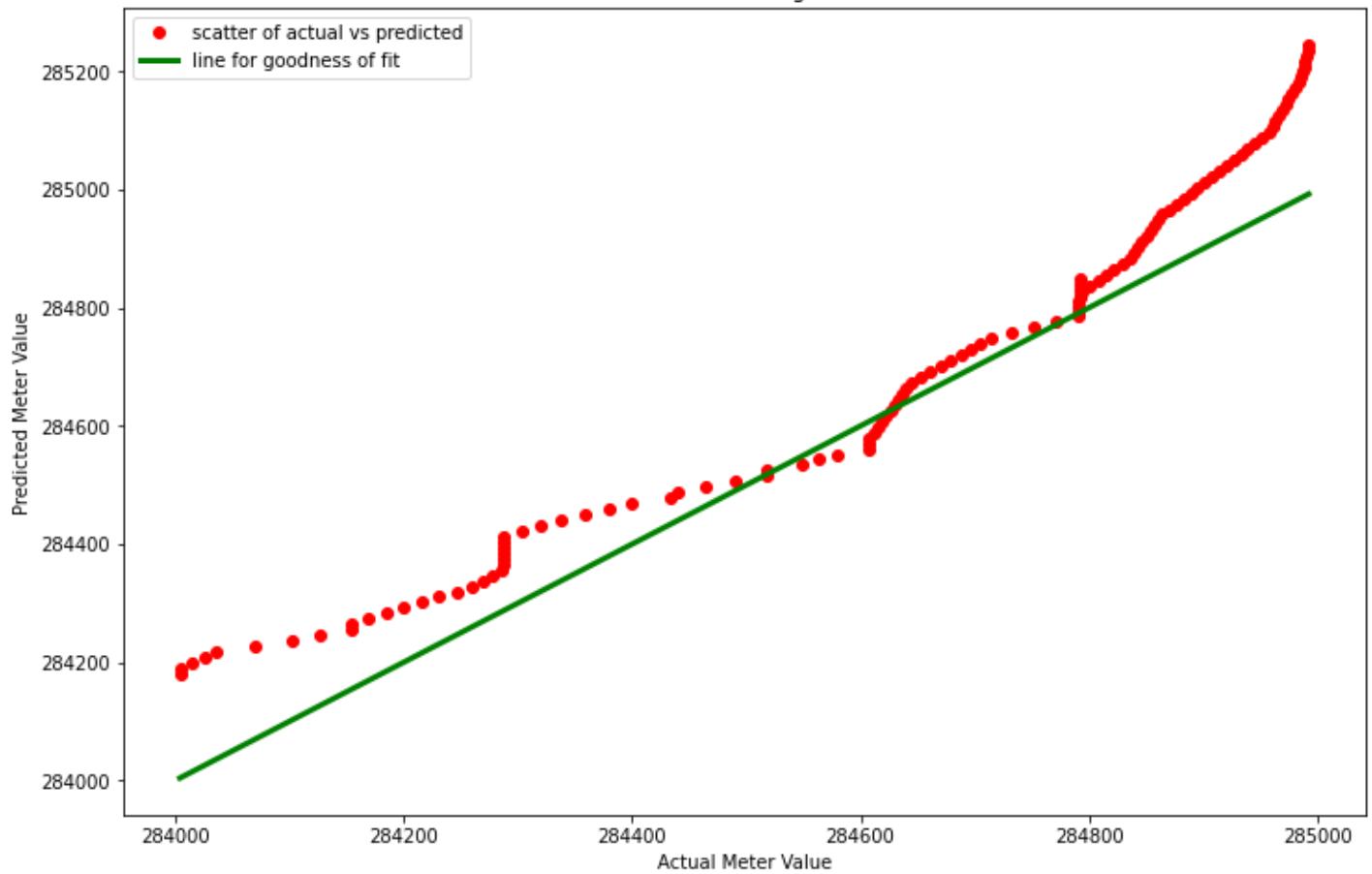
Scatter Plot - Household 7739.0 Testing MSE : 25217.302018522114



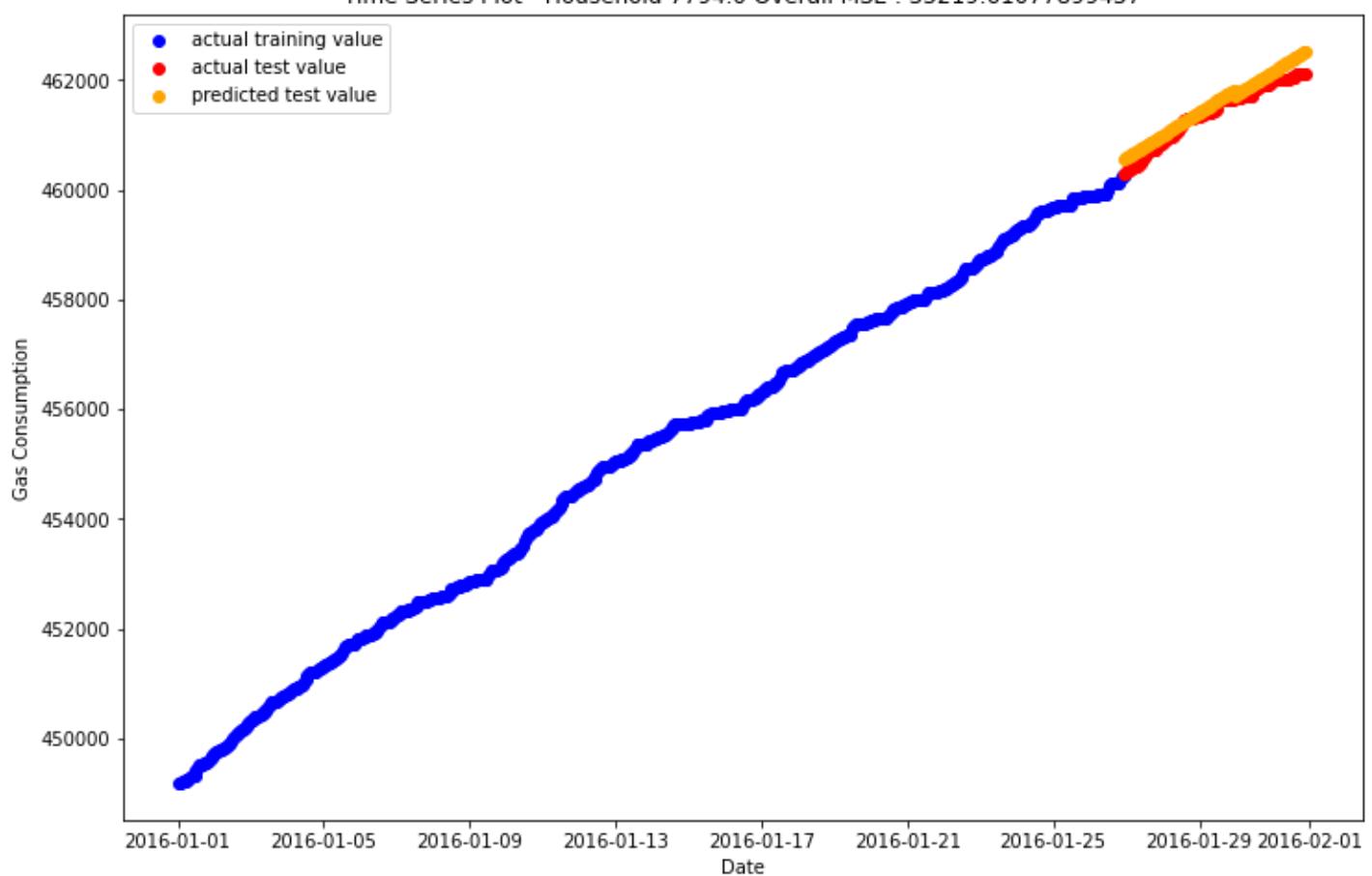
Time Series Plot - Household 7741.0 Overall MSE : 6329.366586976271



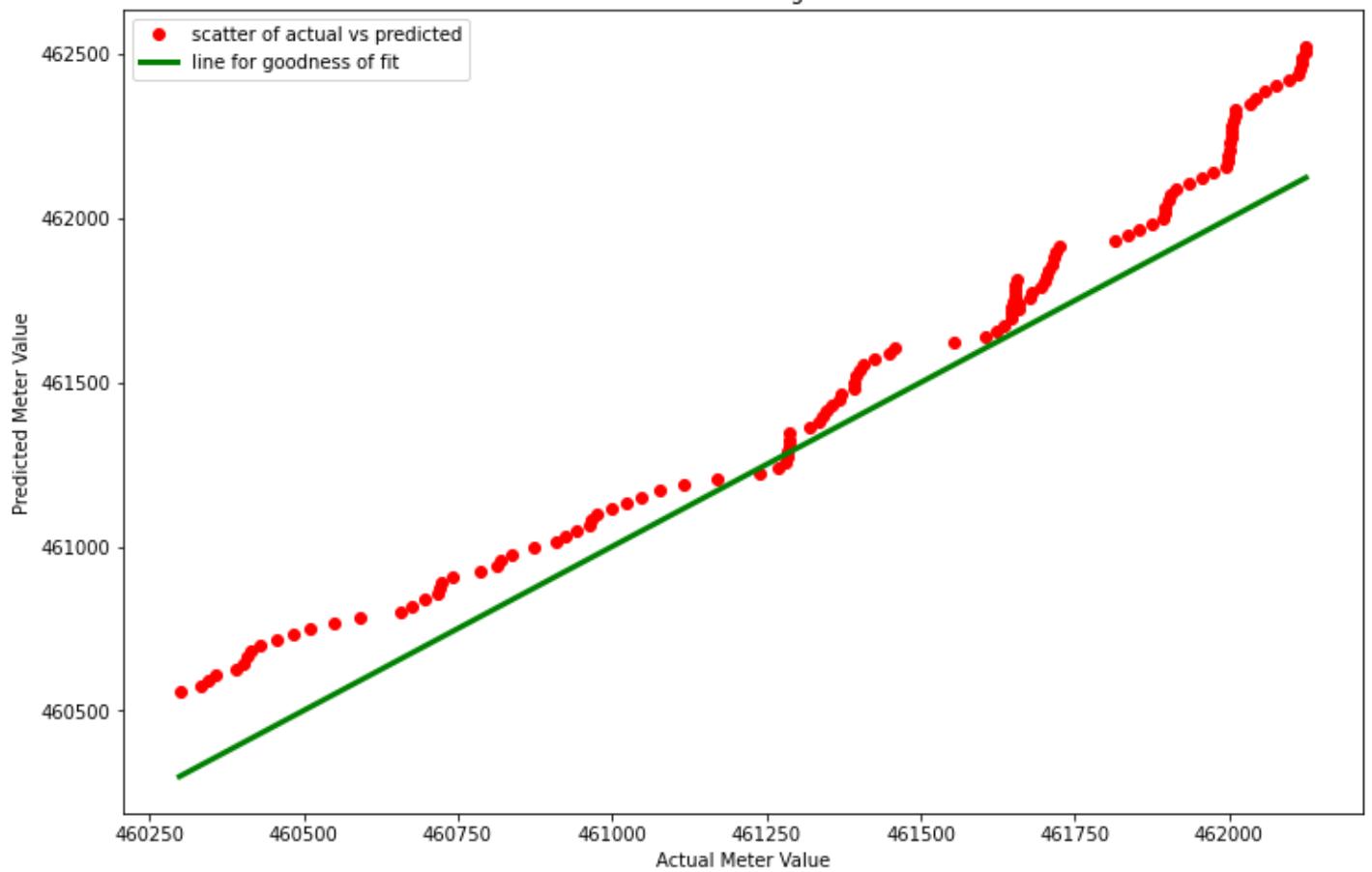
Scatter Plot - Household 7741.0 Testing MSE : 11386.208528147185



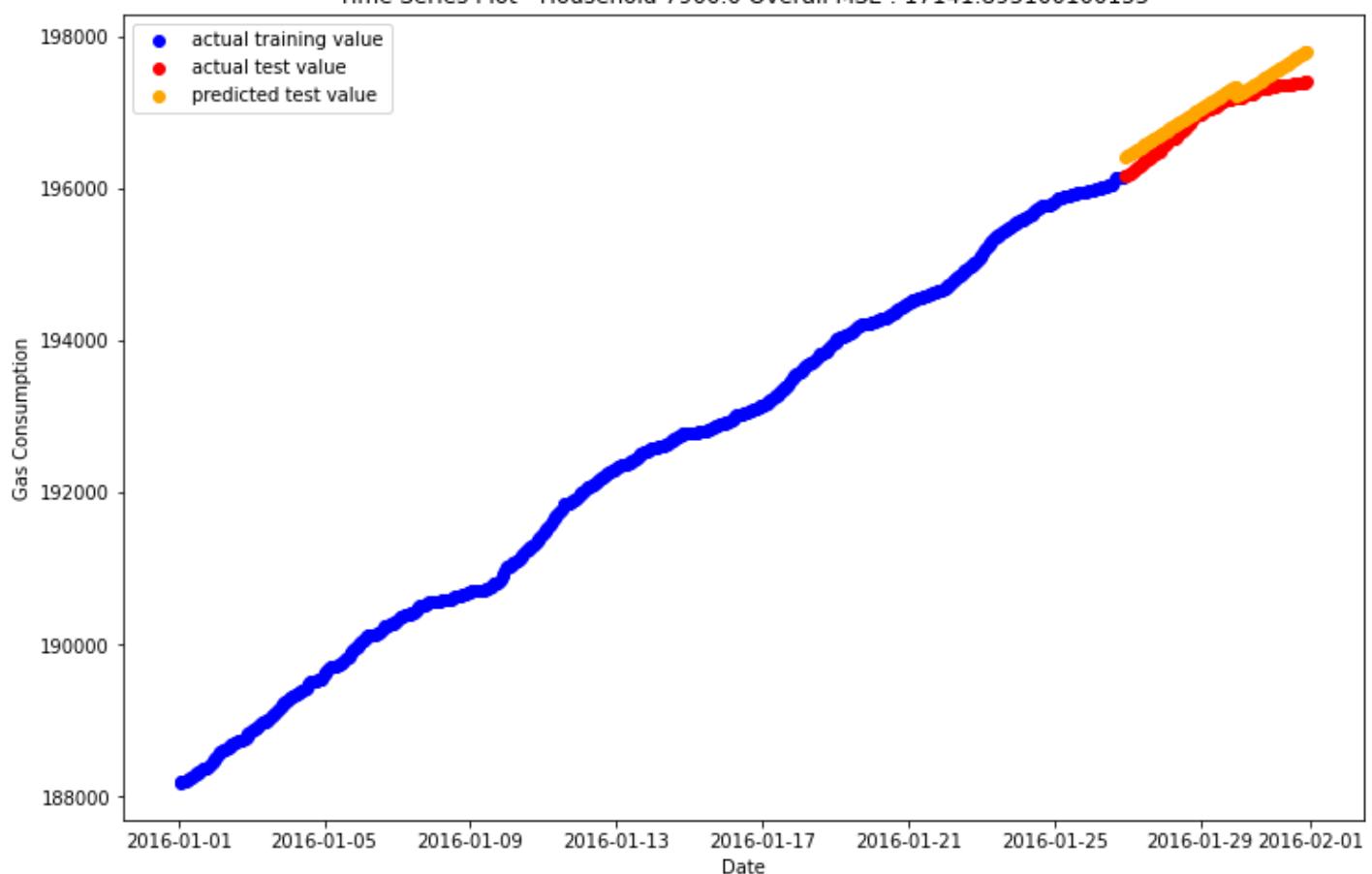
Time Series Plot - Household 7794.0 Overall MSE : 35219.61077899437



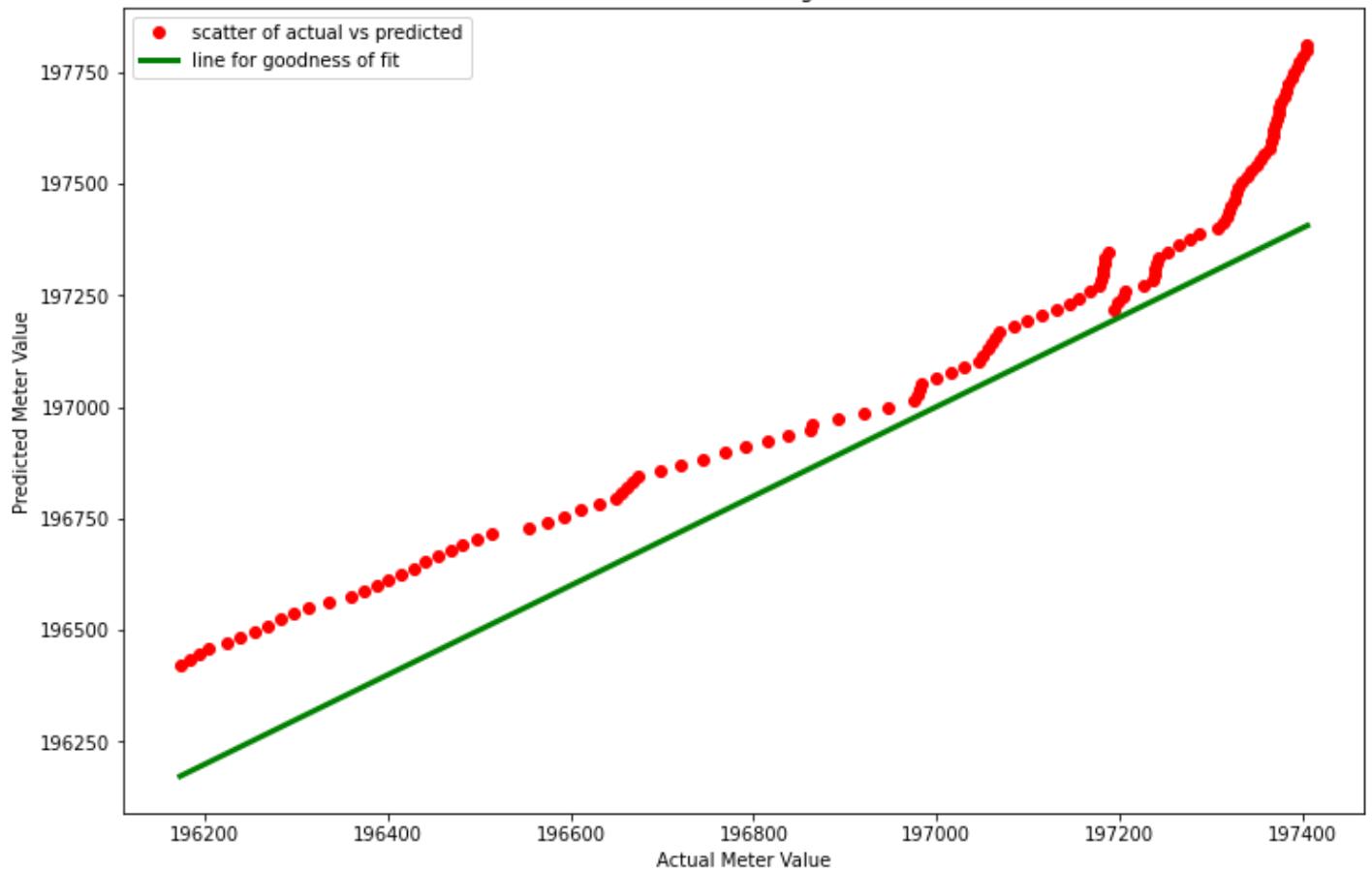
Scatter Plot - Household 7794.0 Testing MSE : 33173.674424531666



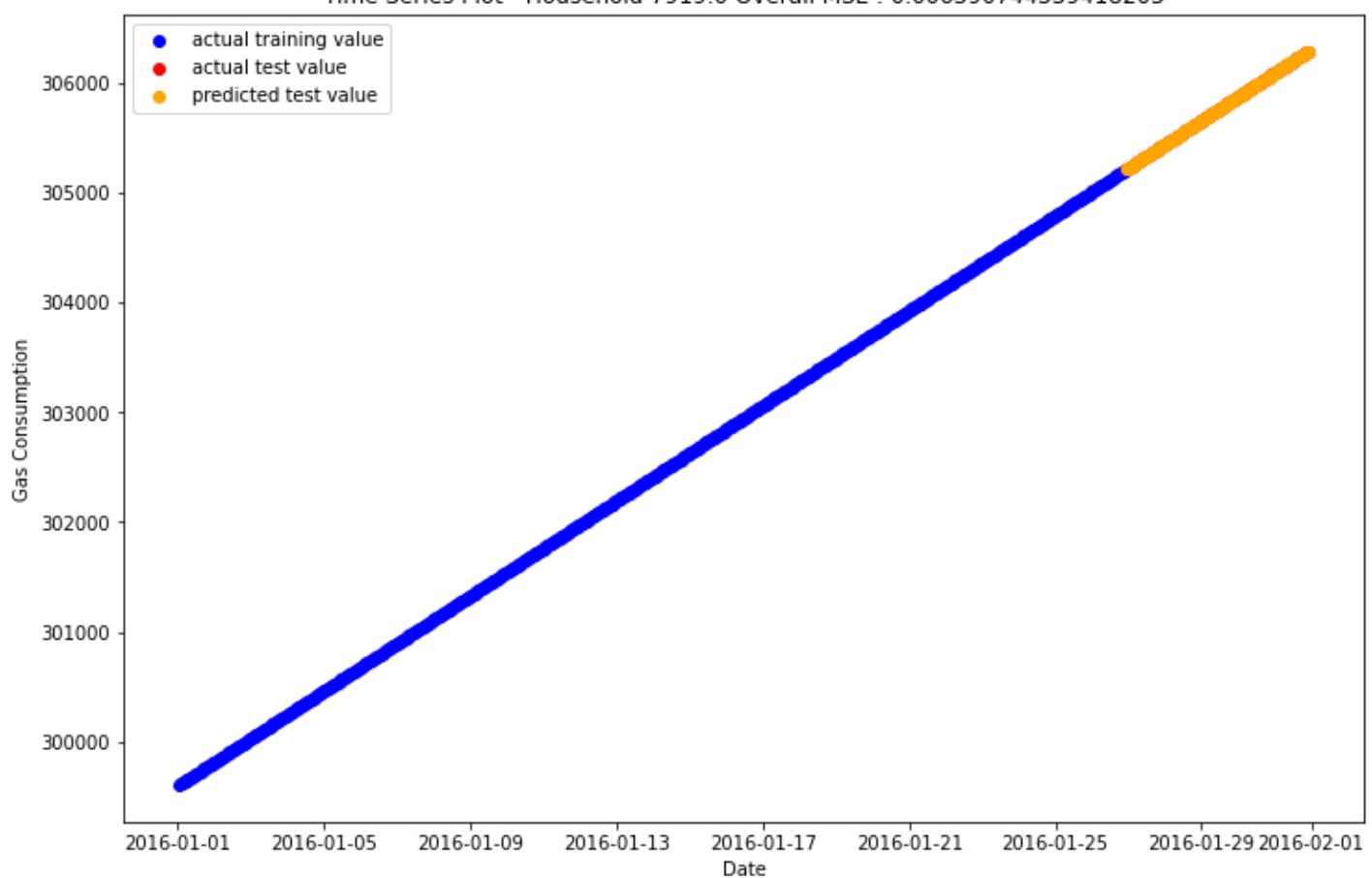
Time Series Plot - Household 7900.0 Overall MSE : 17141.895100100155



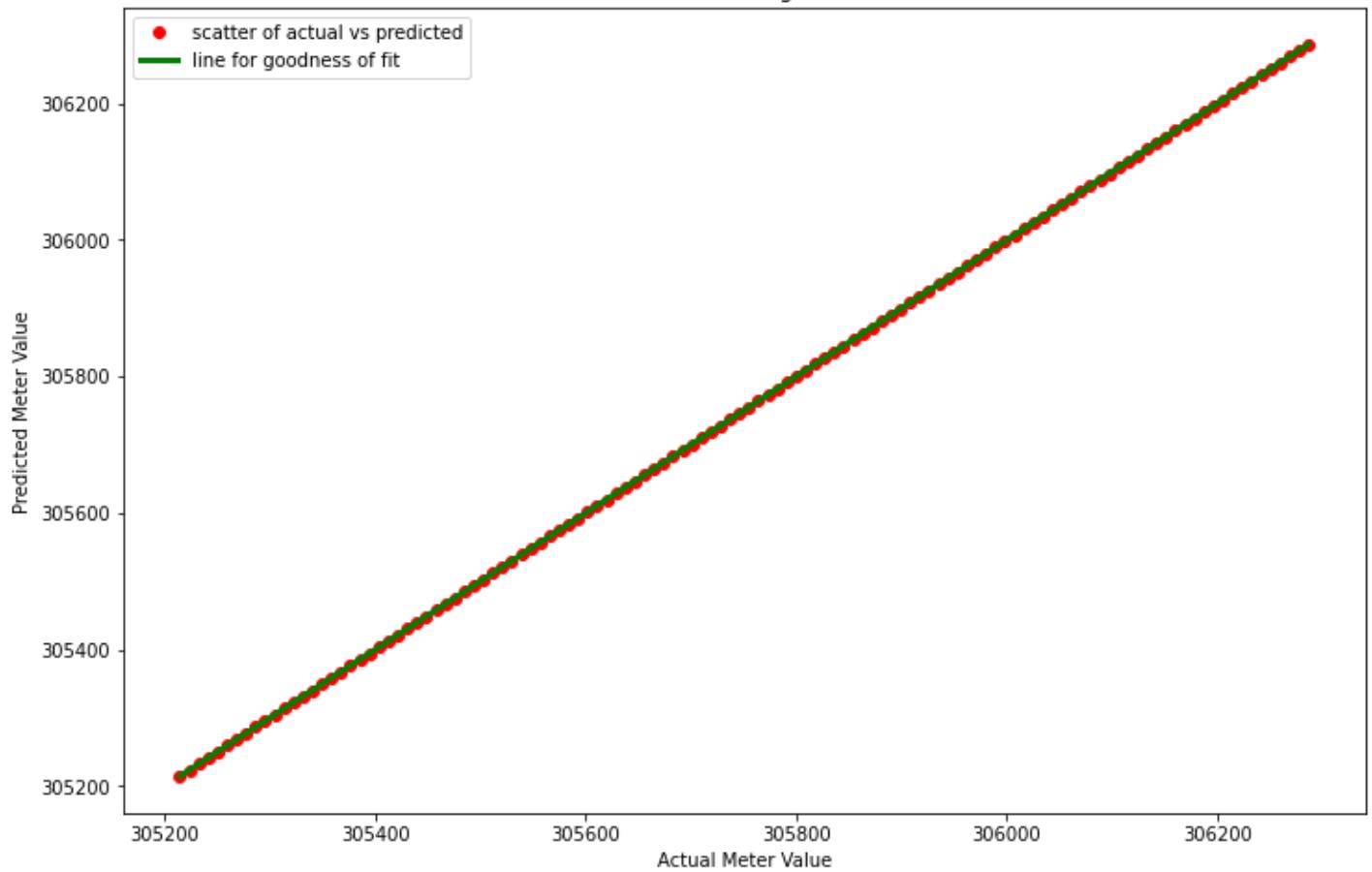
Scatter Plot - Household 7900.0 Testing MSE : 35314.04491489434

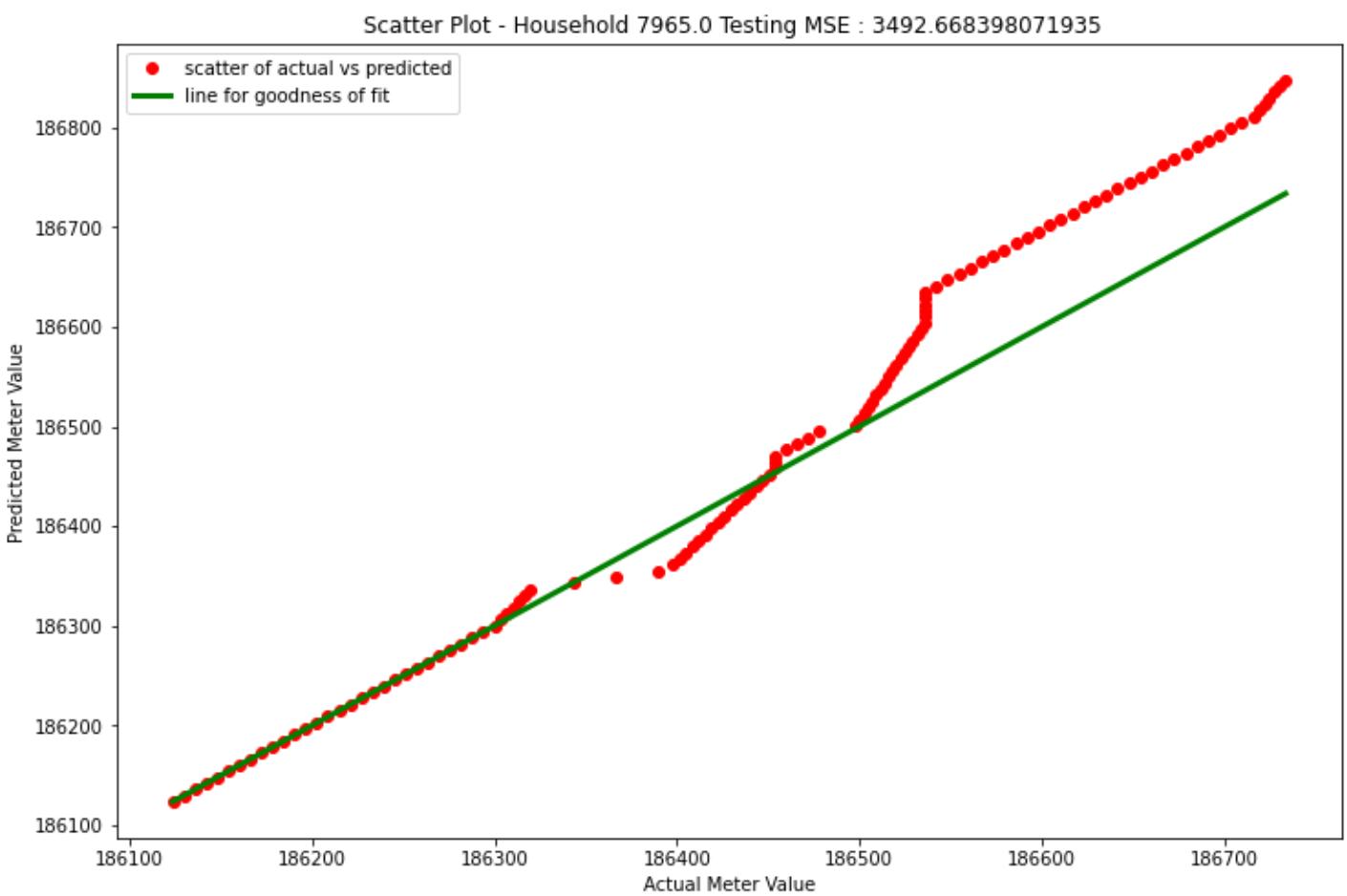
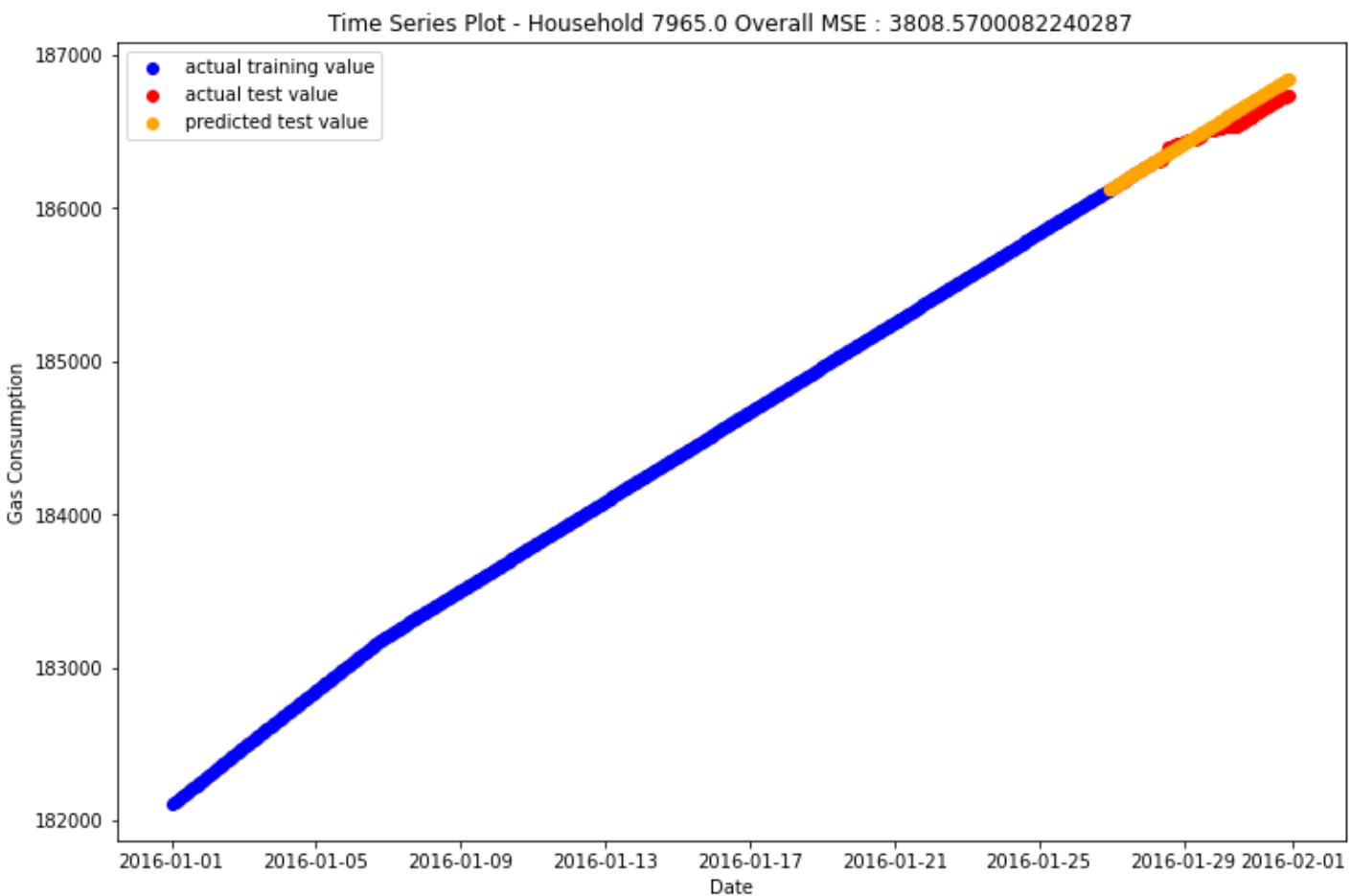


Time Series Plot - Household 7919.0 Overall MSE : 0.006390744339418203

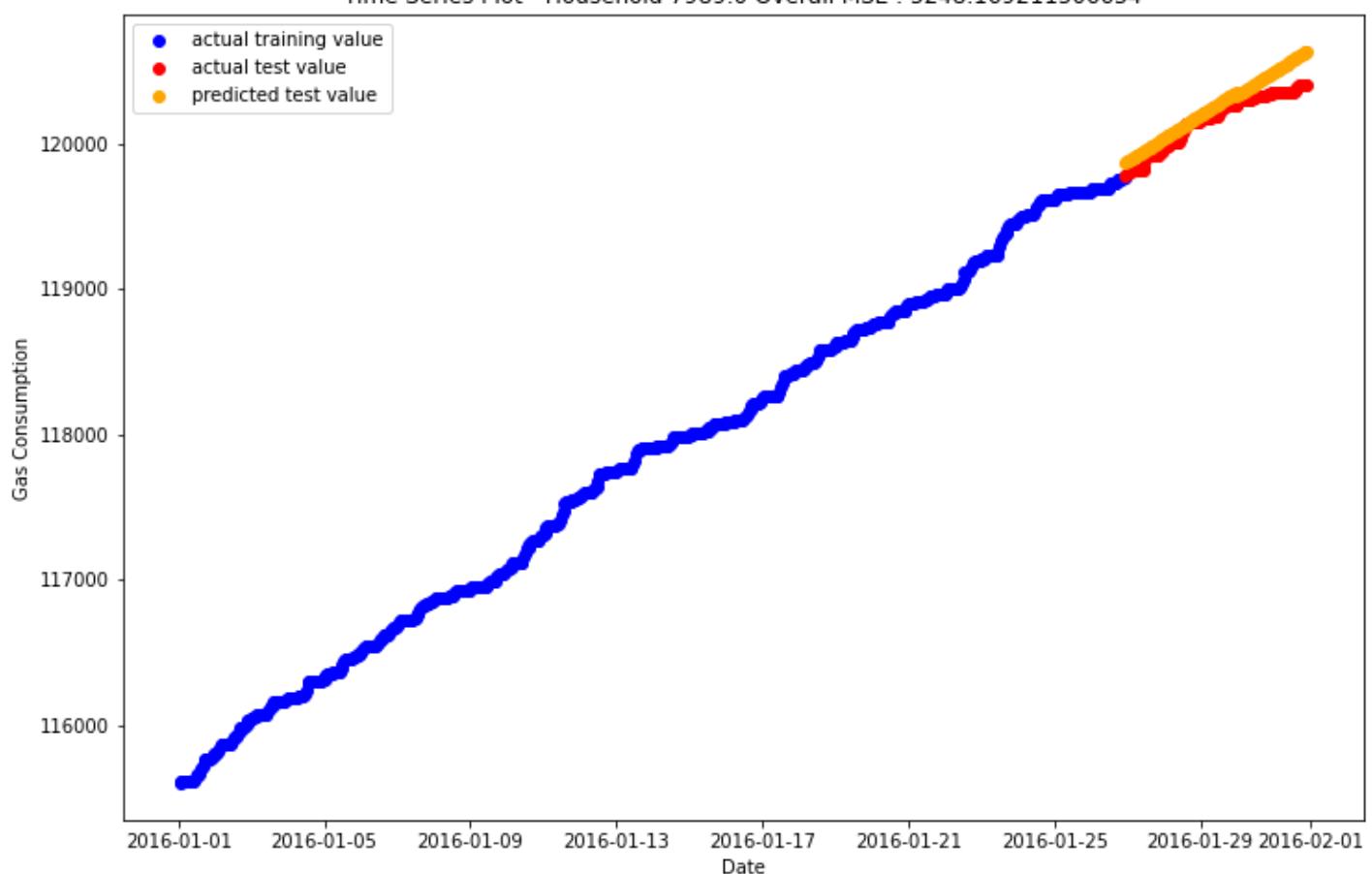


Scatter Plot - Household 7919.0 Testing MSE : 0.017317931202970132

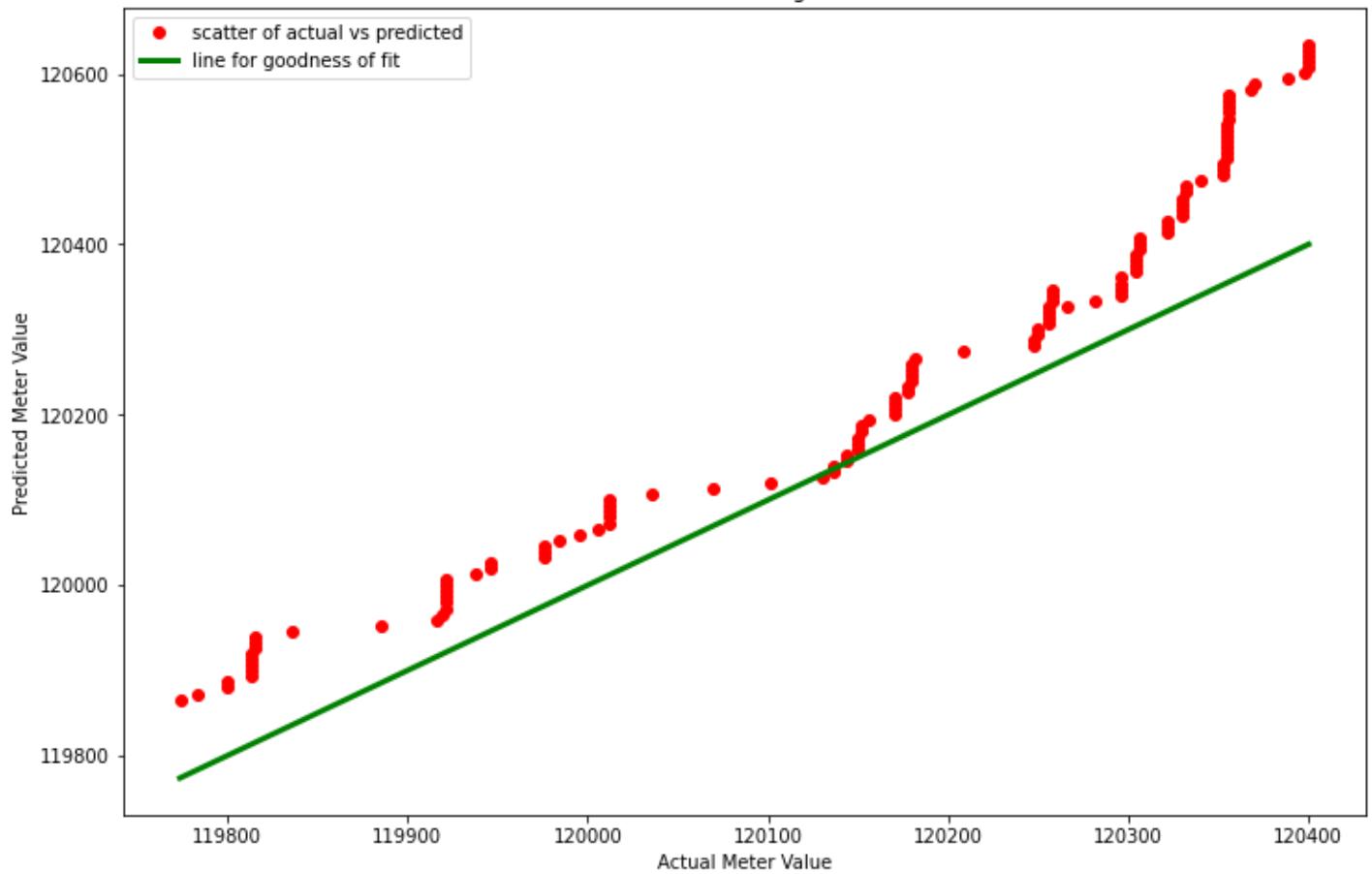




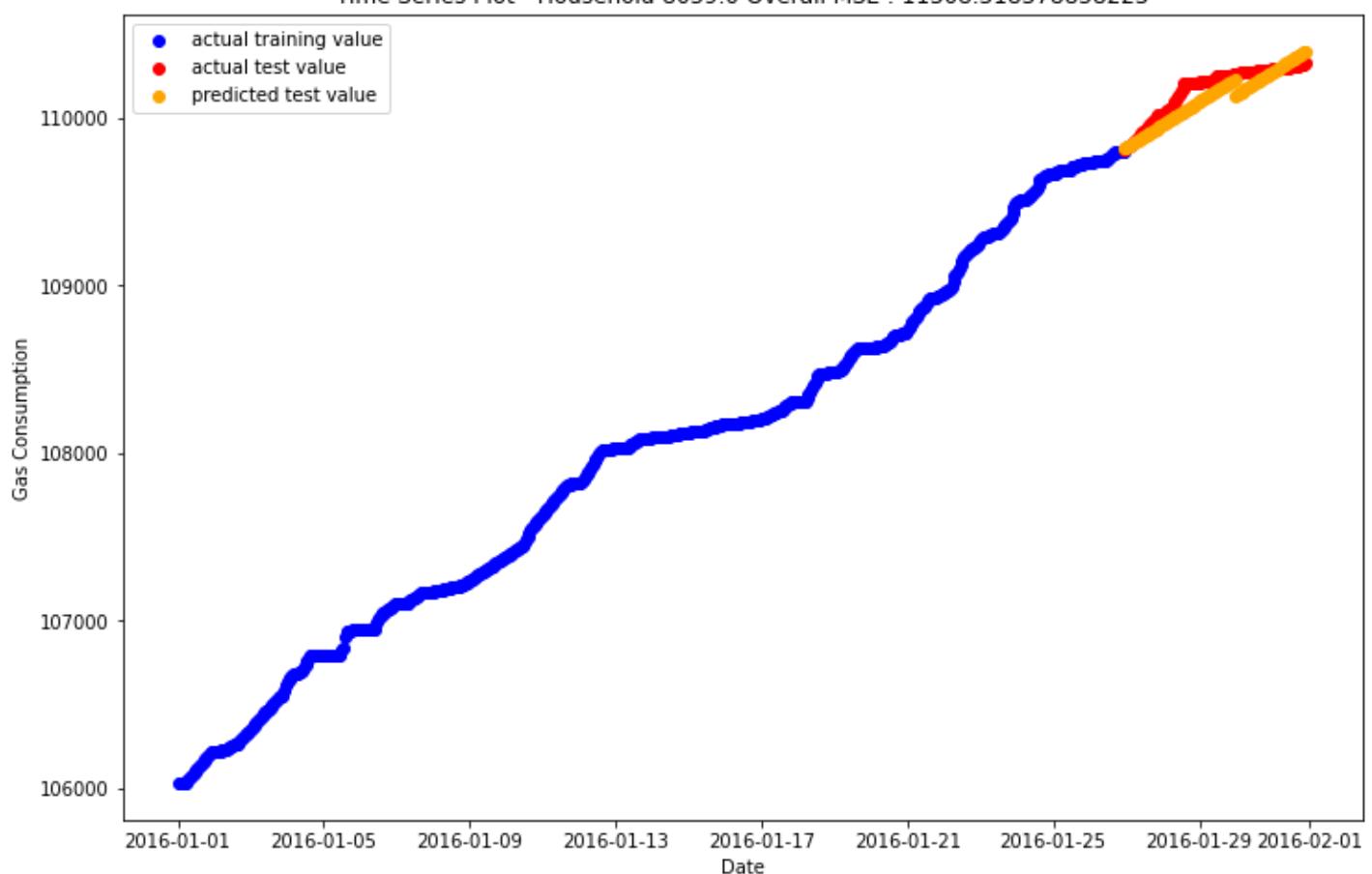
Time Series Plot - Household 7989.0 Overall MSE : 5248.169211506654



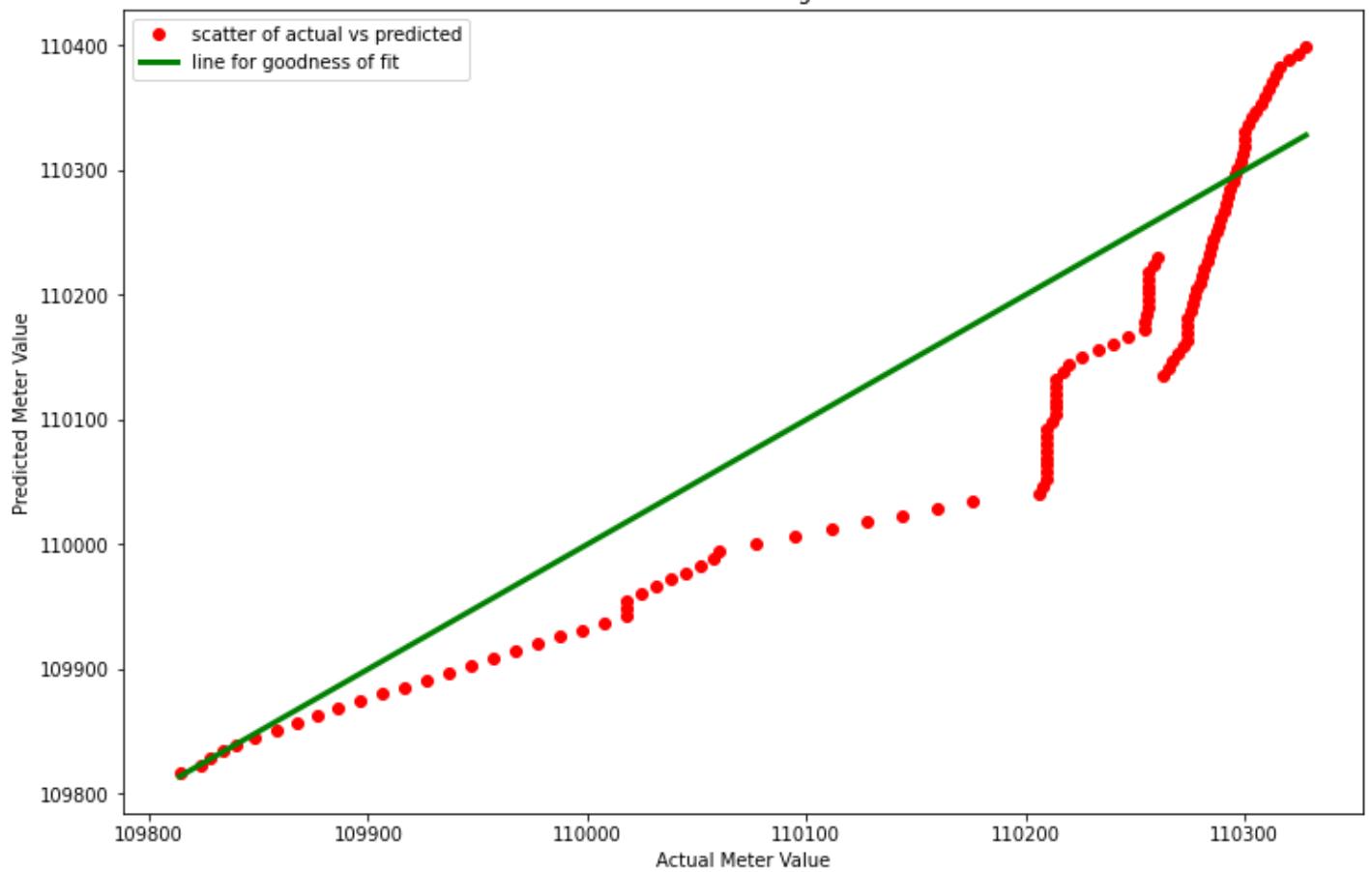
Scatter Plot - Household 7989.0 Testing MSE : 11824.67629396654



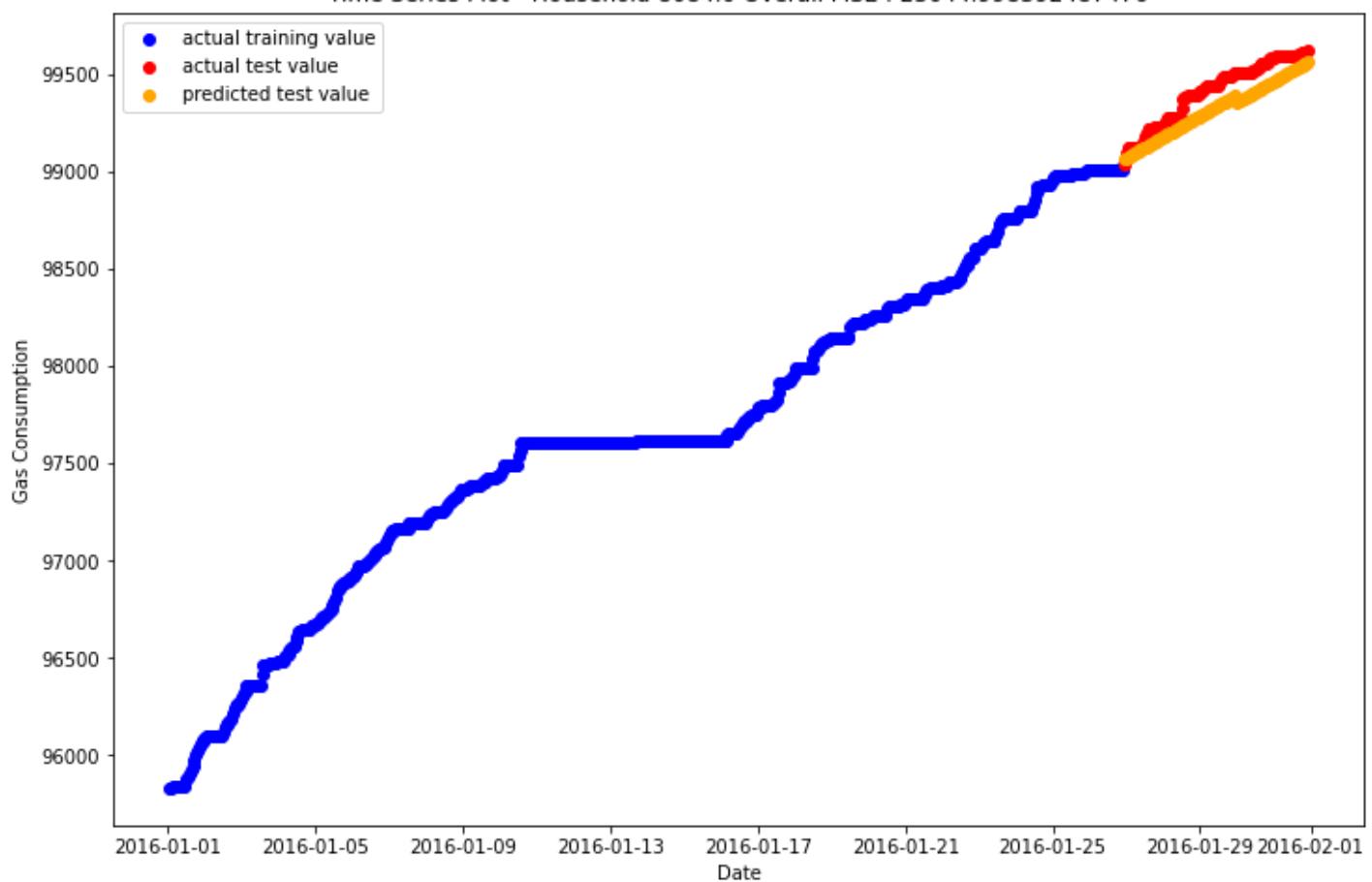
Time Series Plot - Household 8059.0 Overall MSE : 11308.318378858223



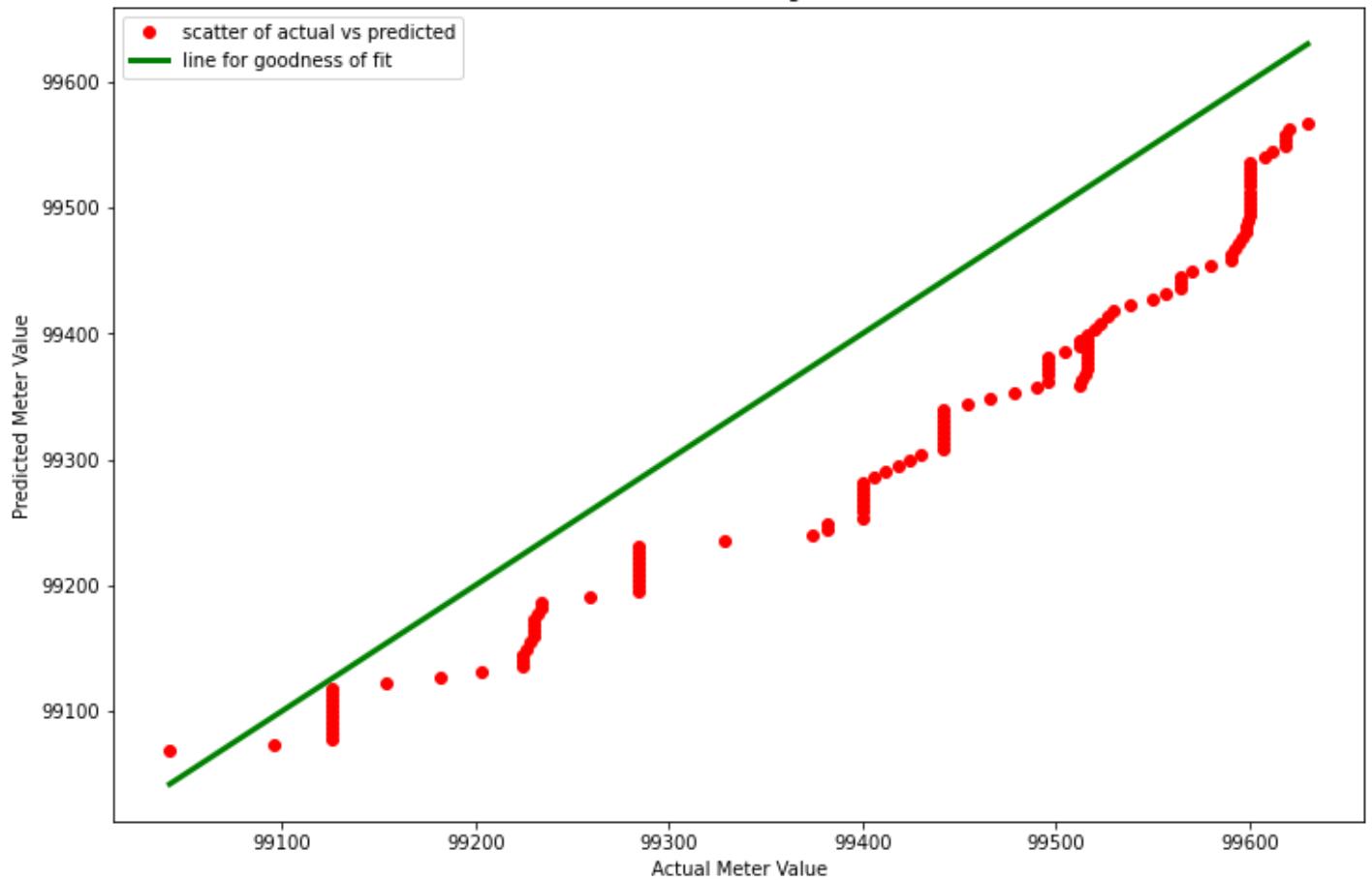
Scatter Plot - Household 8059.0 Testing MSE : 5961.477750937773



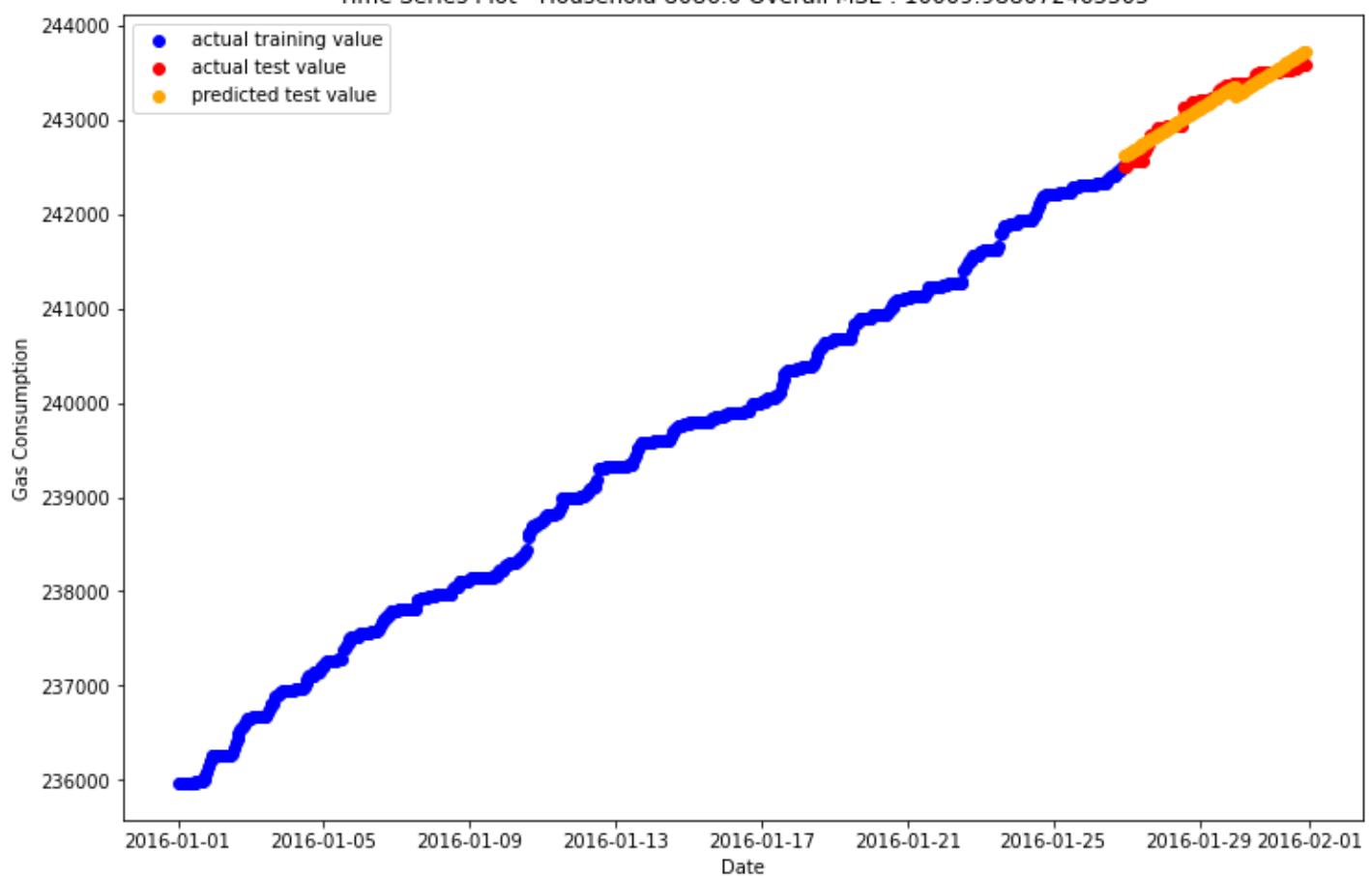
Time Series Plot - Household 8084.0 Overall MSE : 23044.998392487476



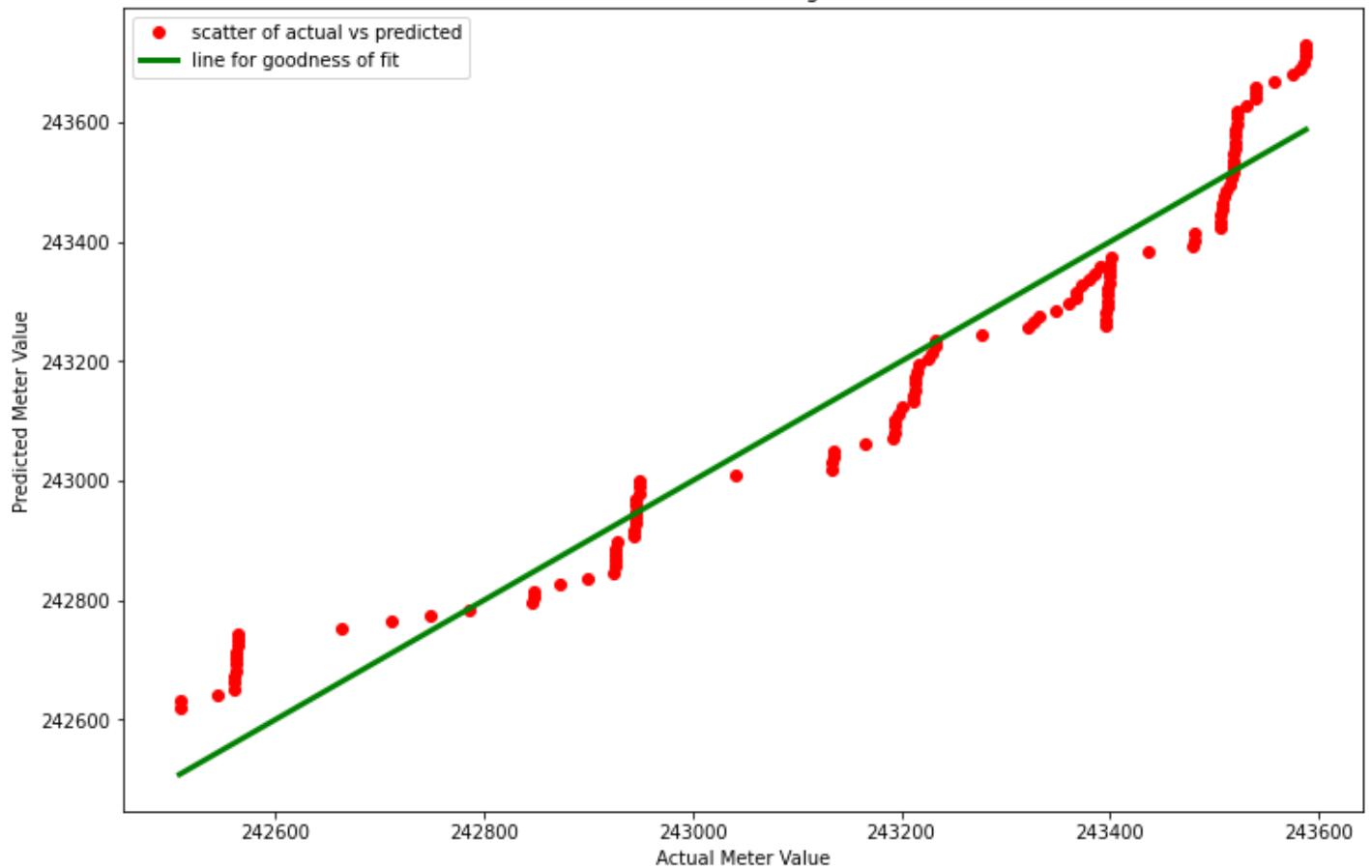
Scatter Plot - Household 8084.0 Testing MSE : 10497.870034984642



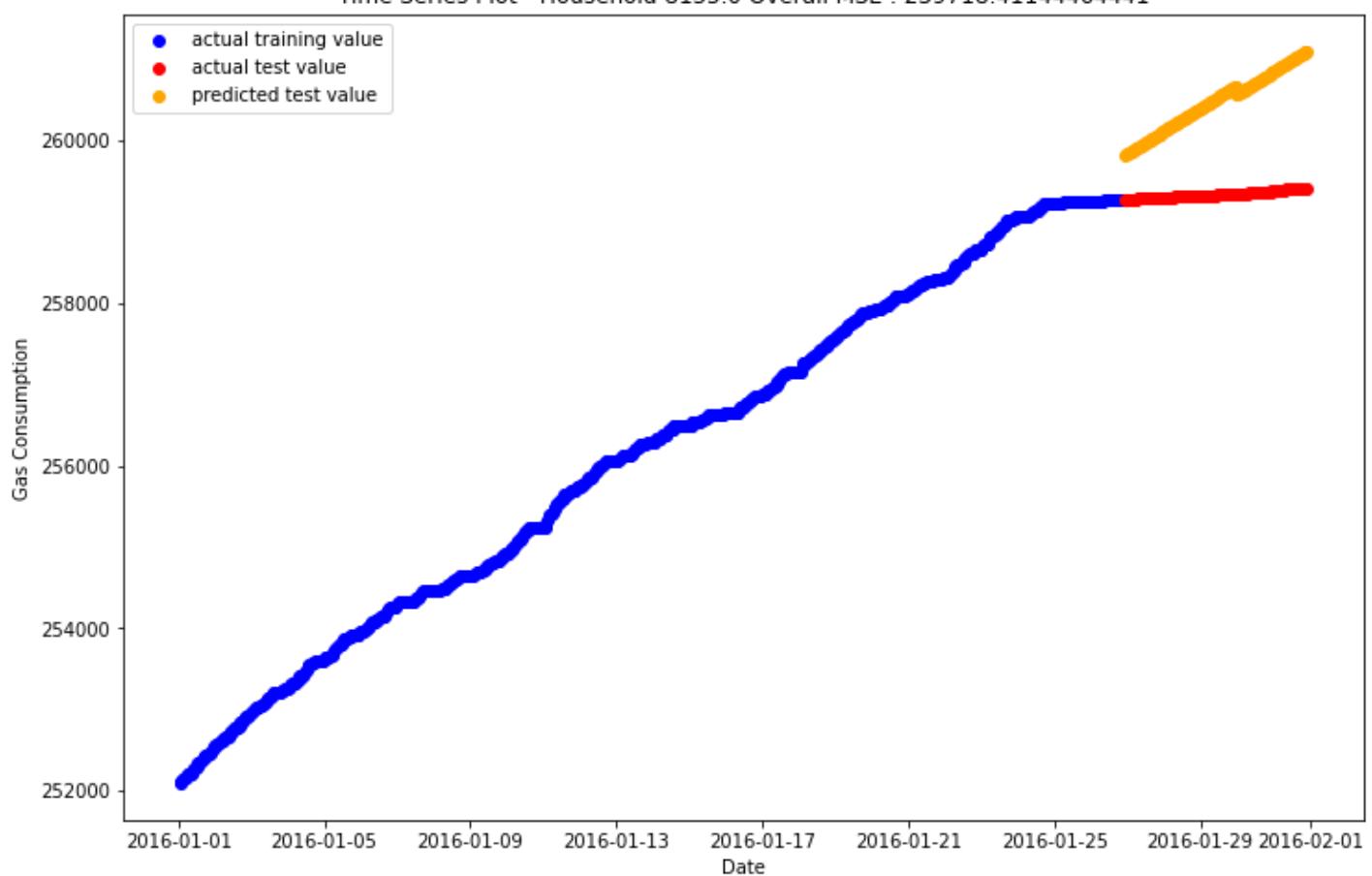
Time Series Plot - Household 8086.0 Overall MSE : 10009.988072465505



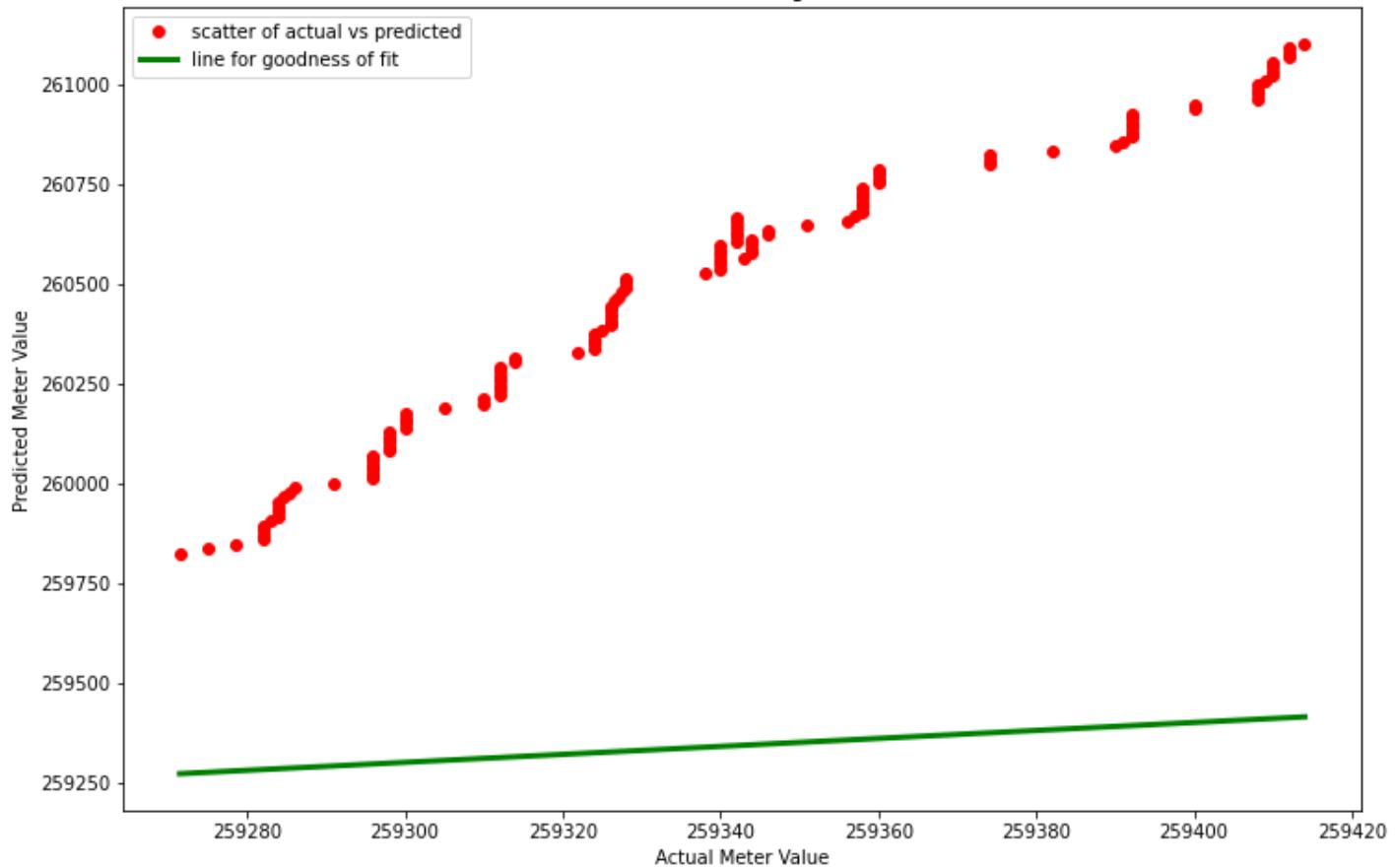
Scatter Plot - Household 8086.0 Testing MSE : 6377.89599359121



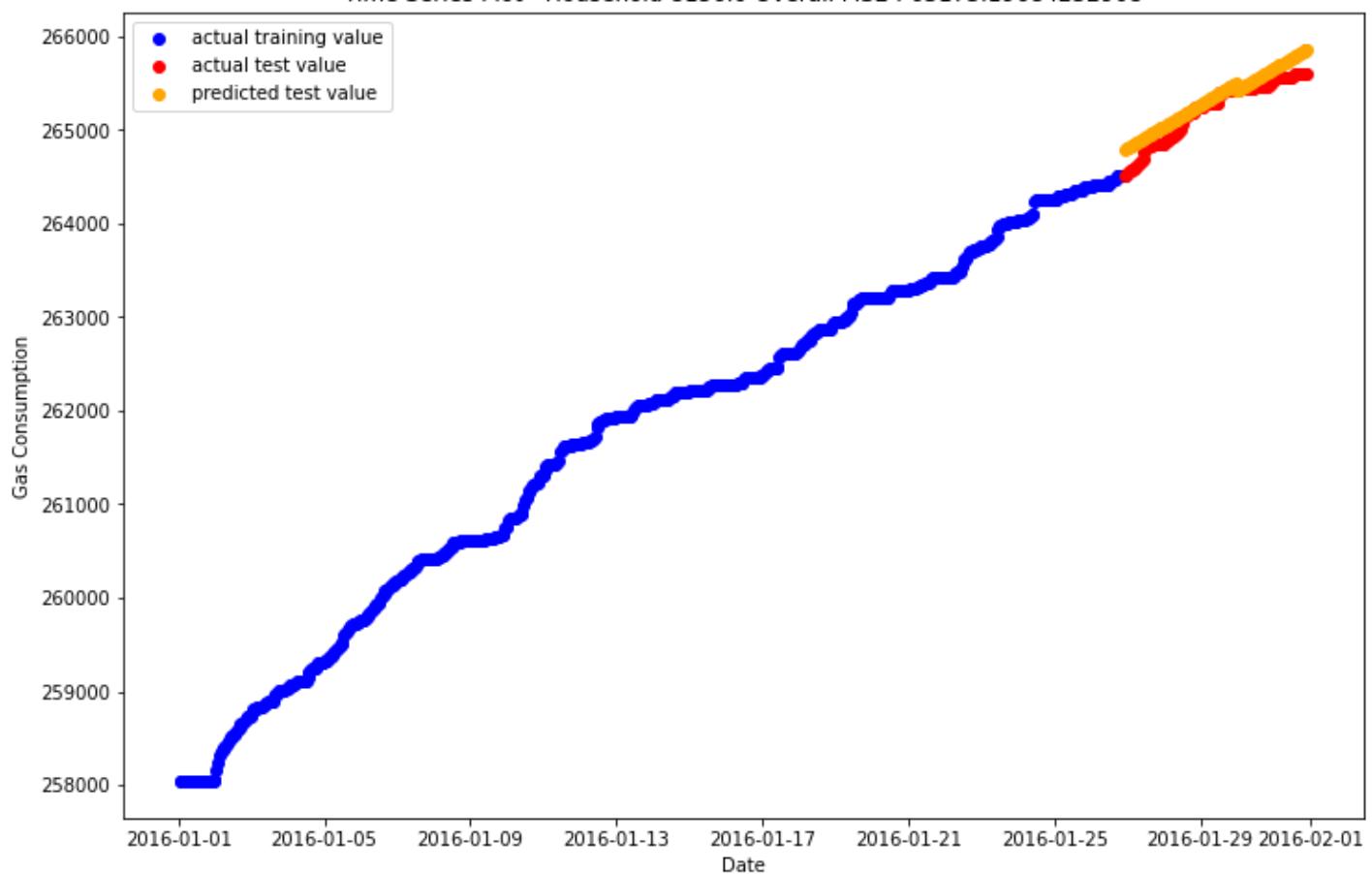
Time Series Plot - Household 8155.0 Overall MSE : 239718.41144464441



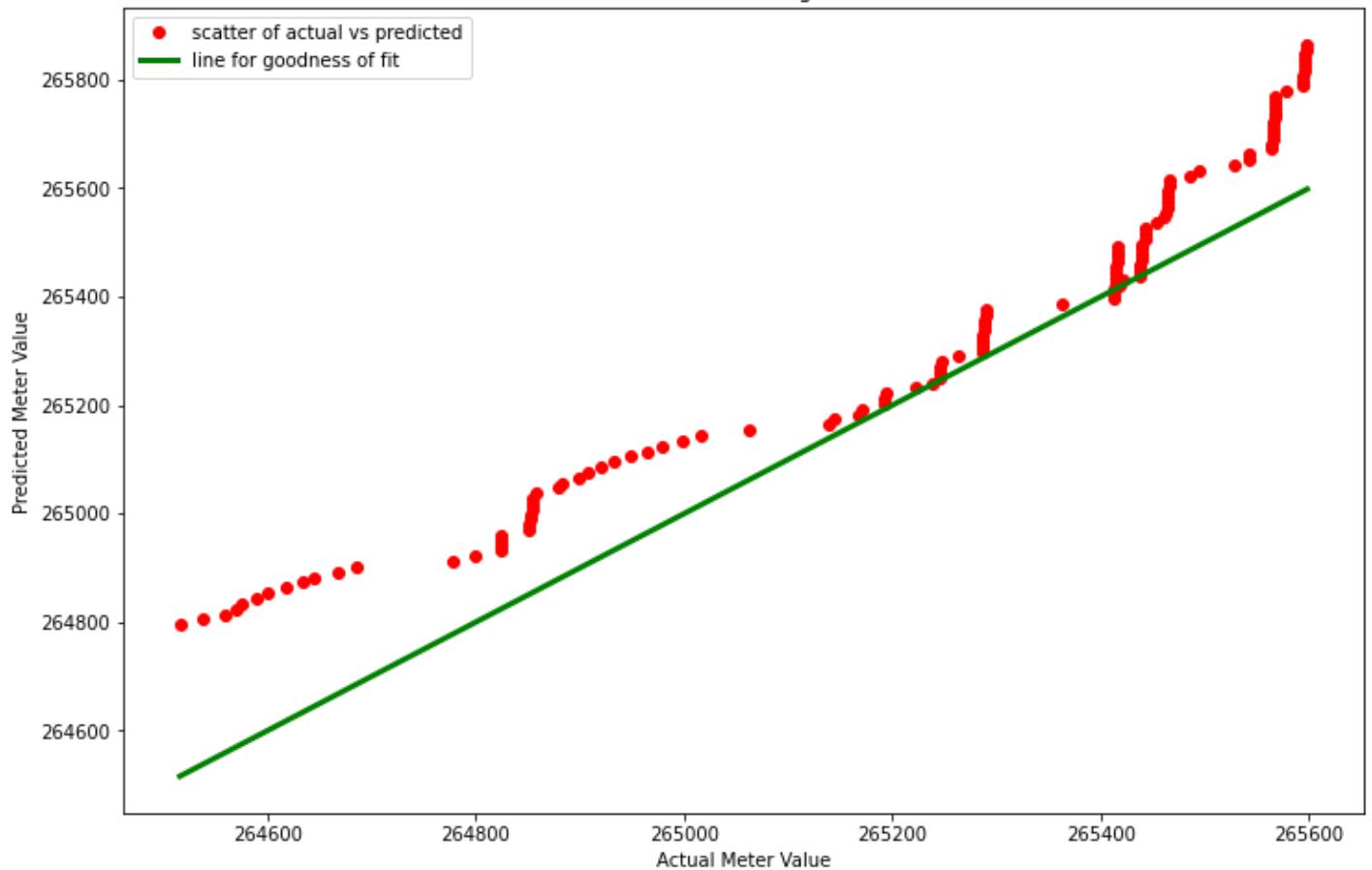
Scatter Plot - Household 8155.0 Testing MSE : 1396398.6942949225



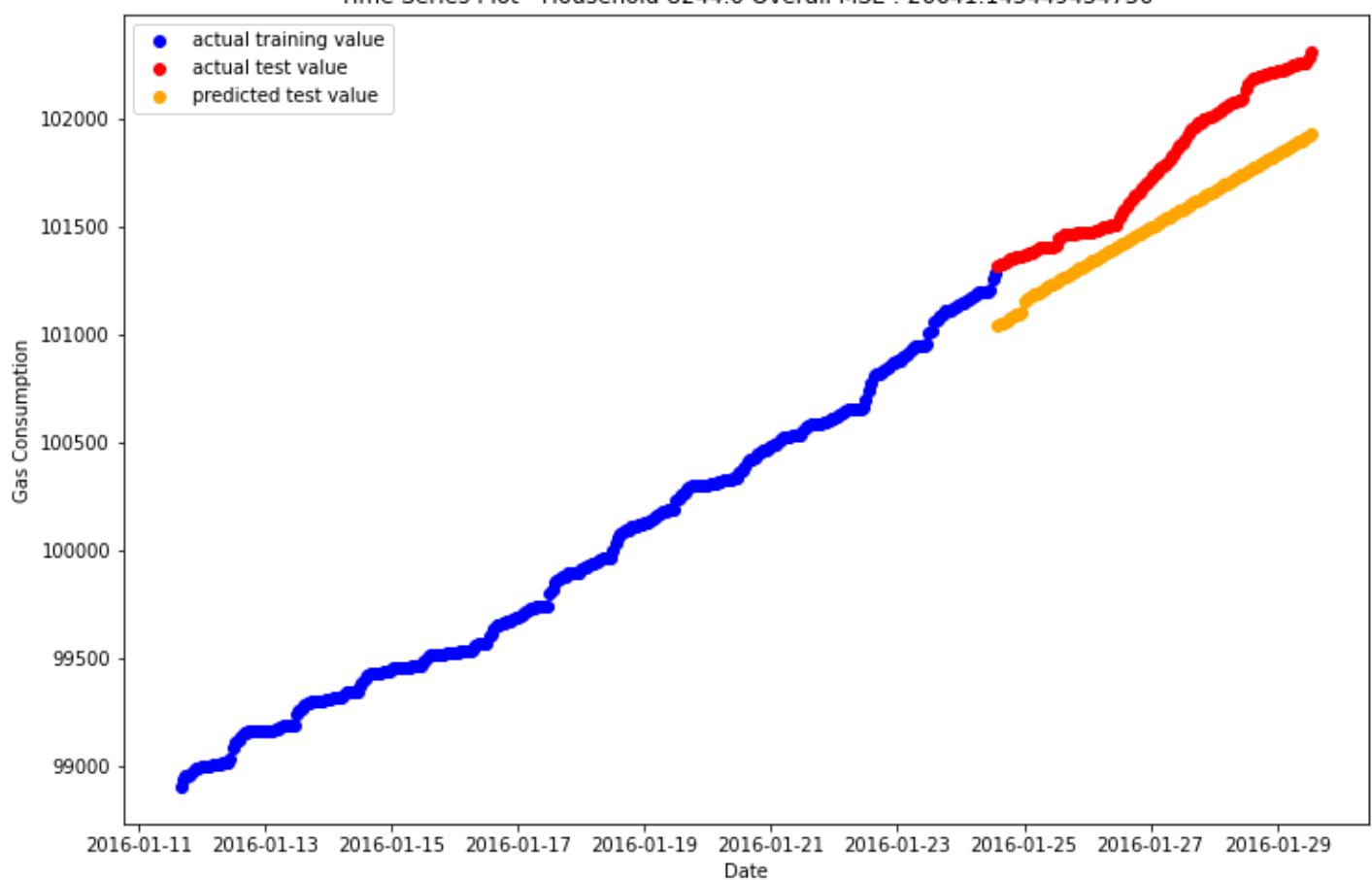
Time Series Plot - Household 8156.0 Overall MSE : 63173.19684232908



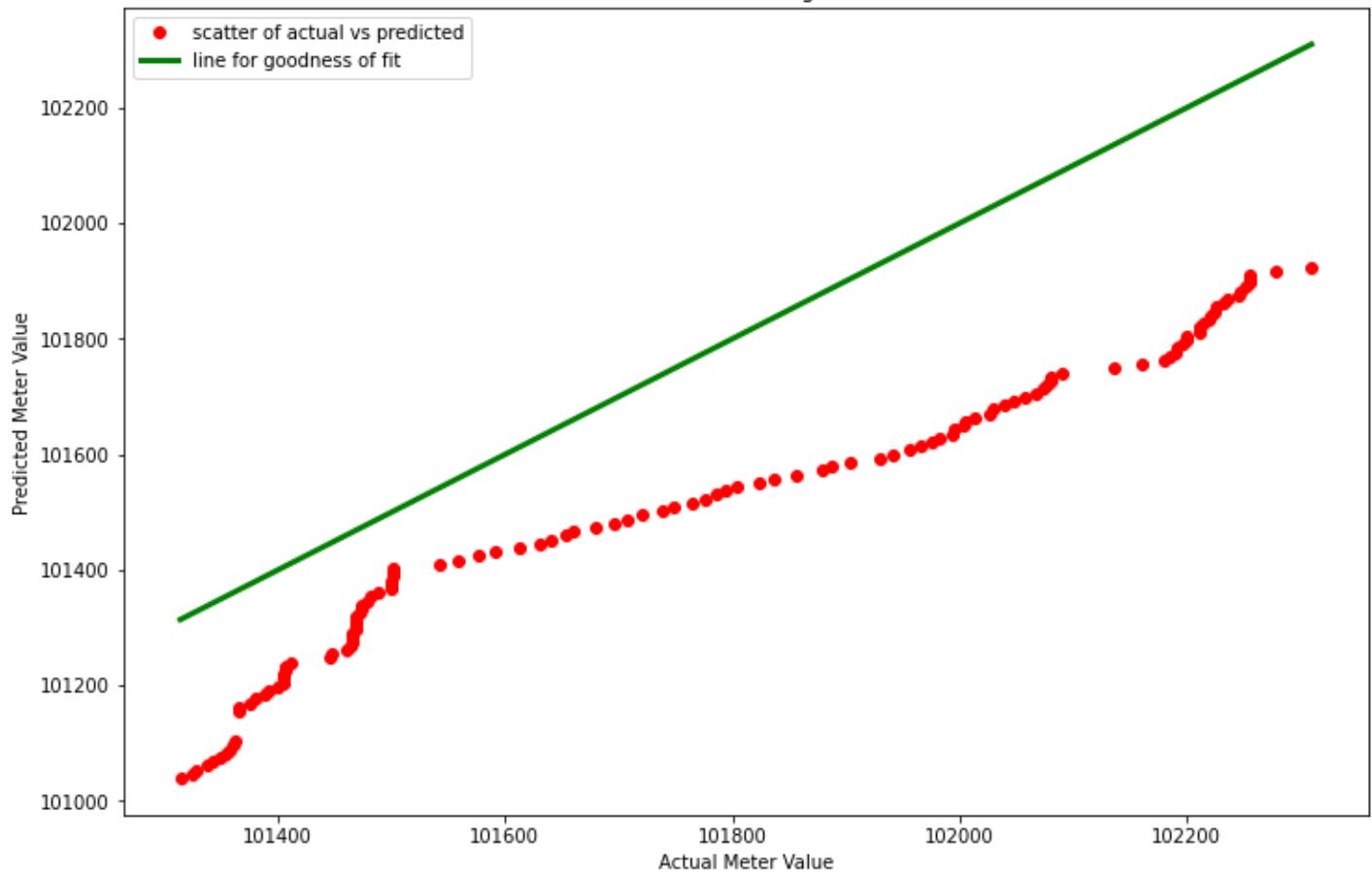
Scatter Plot - Household 8156.0 Testing MSE : 19740.84546789044



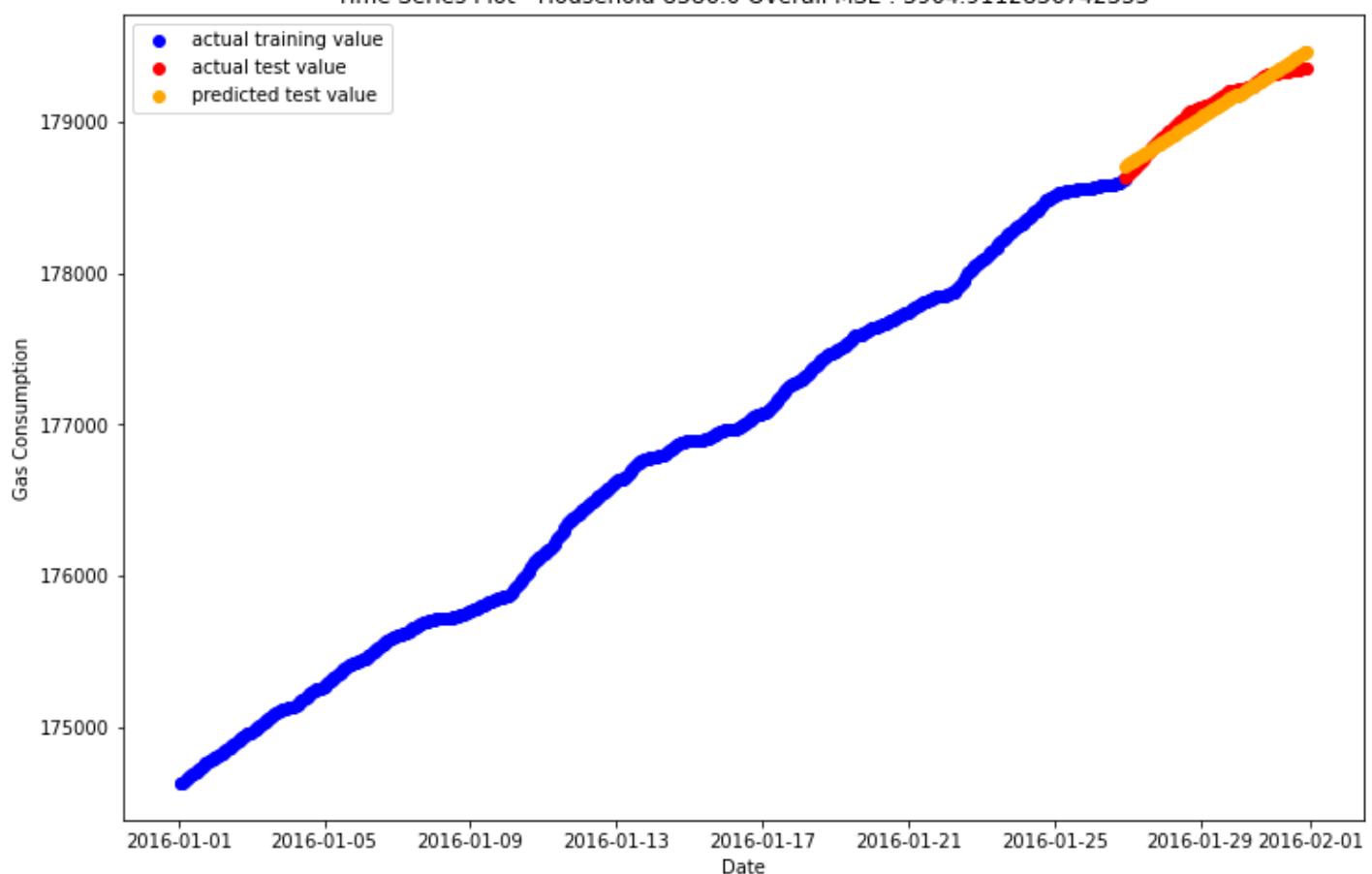
Time Series Plot - Household 8244.0 Overall MSE : 26641.145449454736



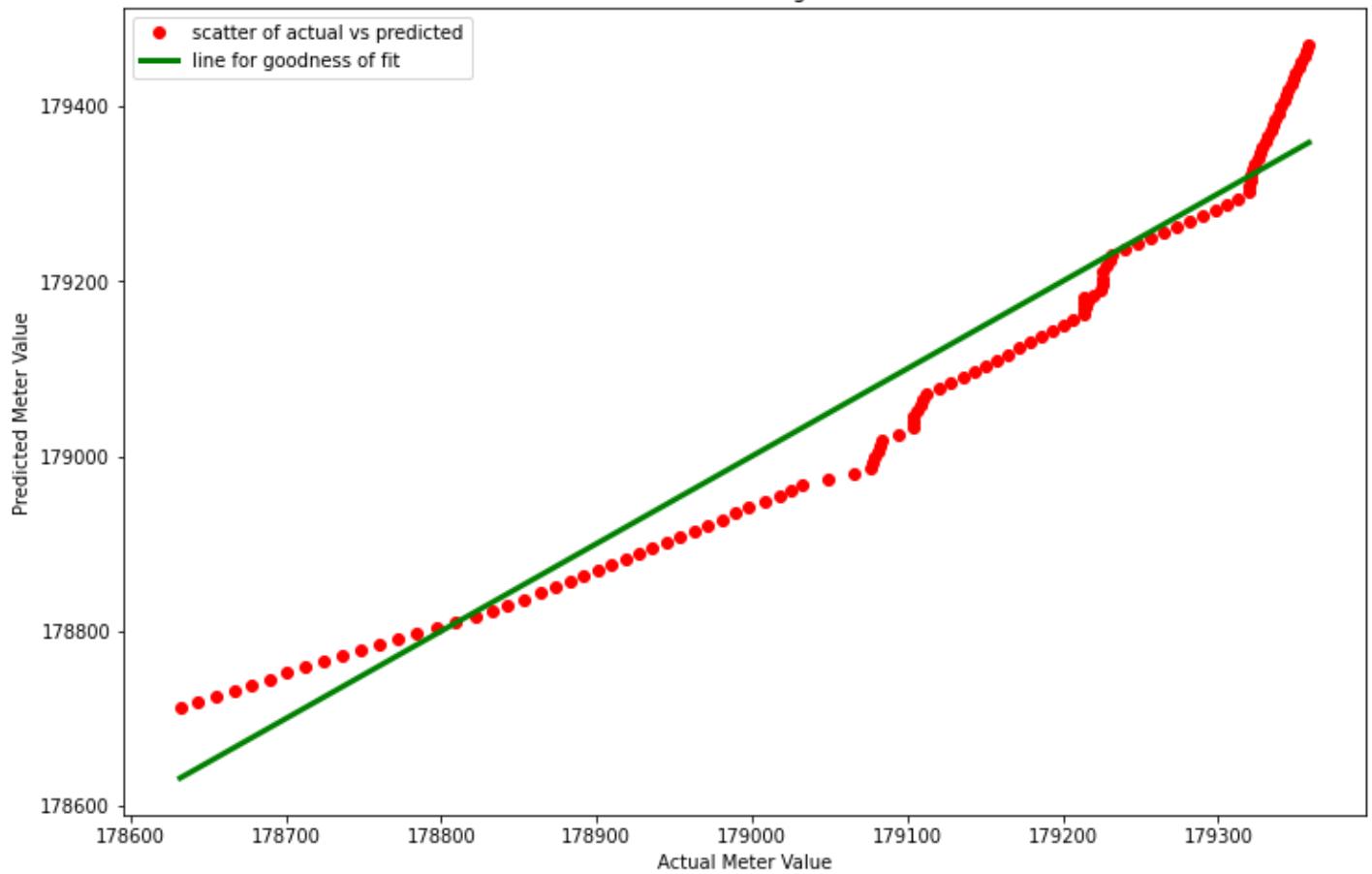
Scatter Plot - Household 8244.0 Testing MSE : 81468.23345642461



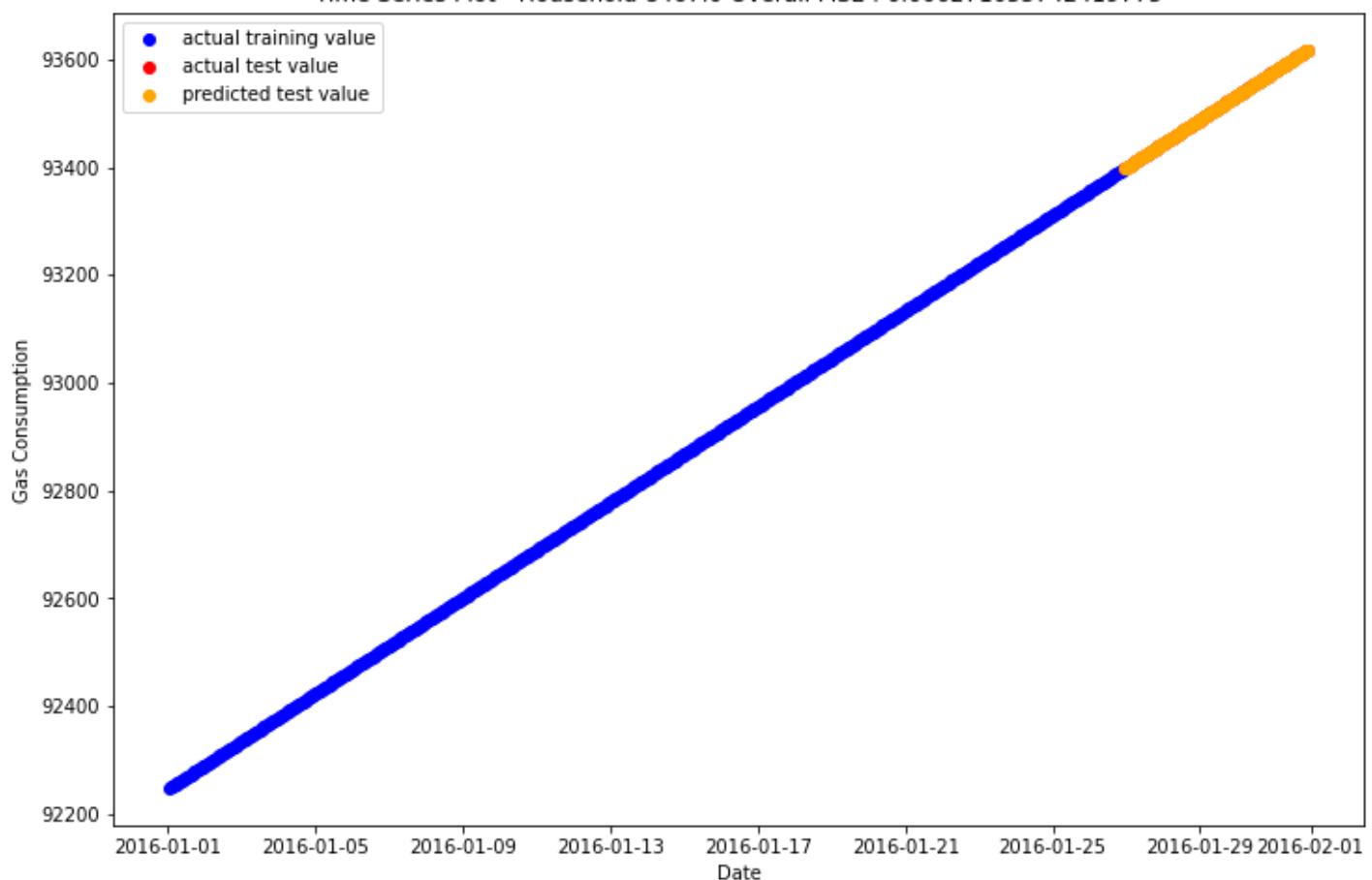
Time Series Plot - Household 8386.0 Overall MSE : 3904.9112836742333



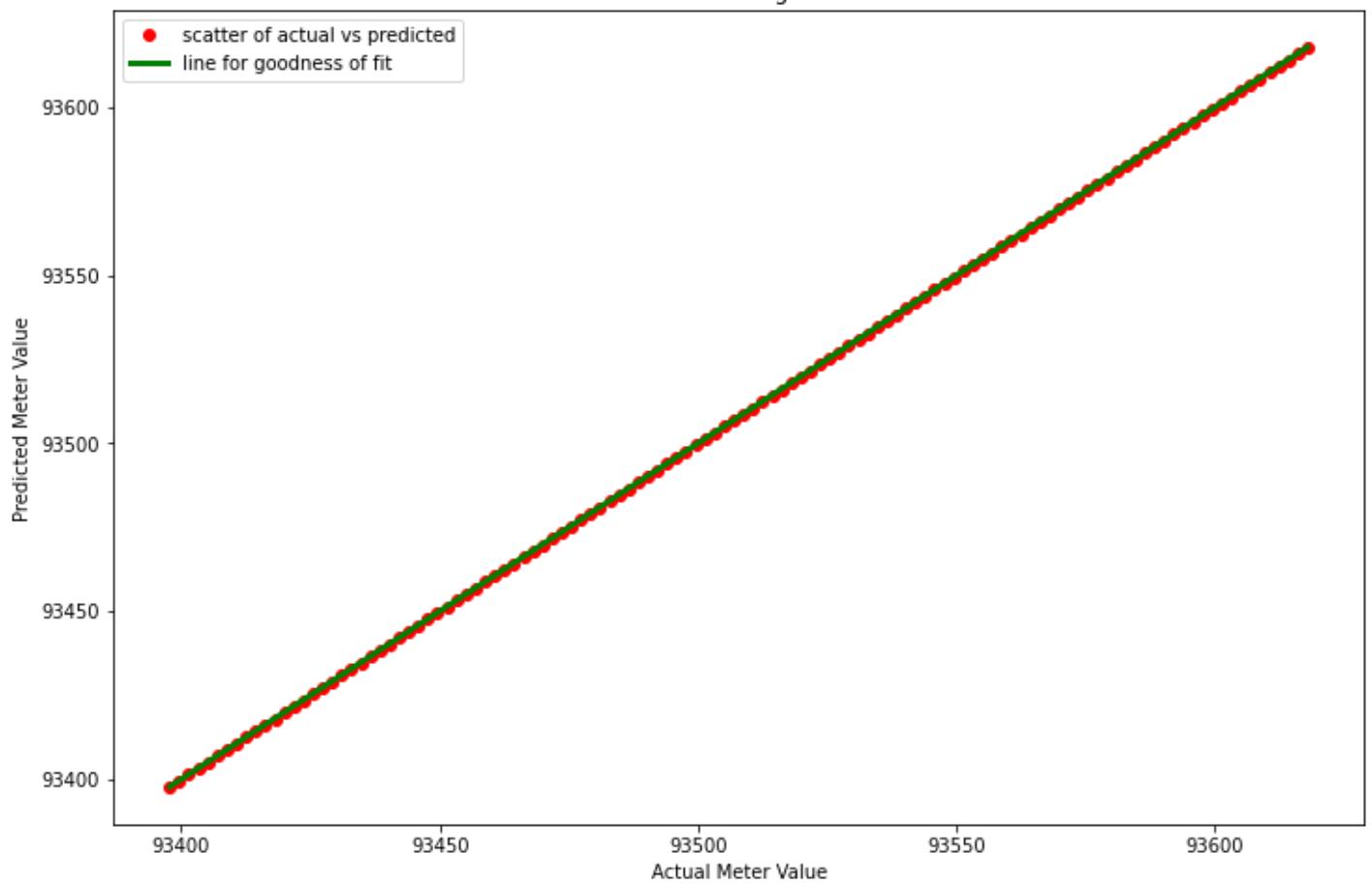
Scatter Plot - Household 8386.0 Testing MSE : 2565.3248912289255



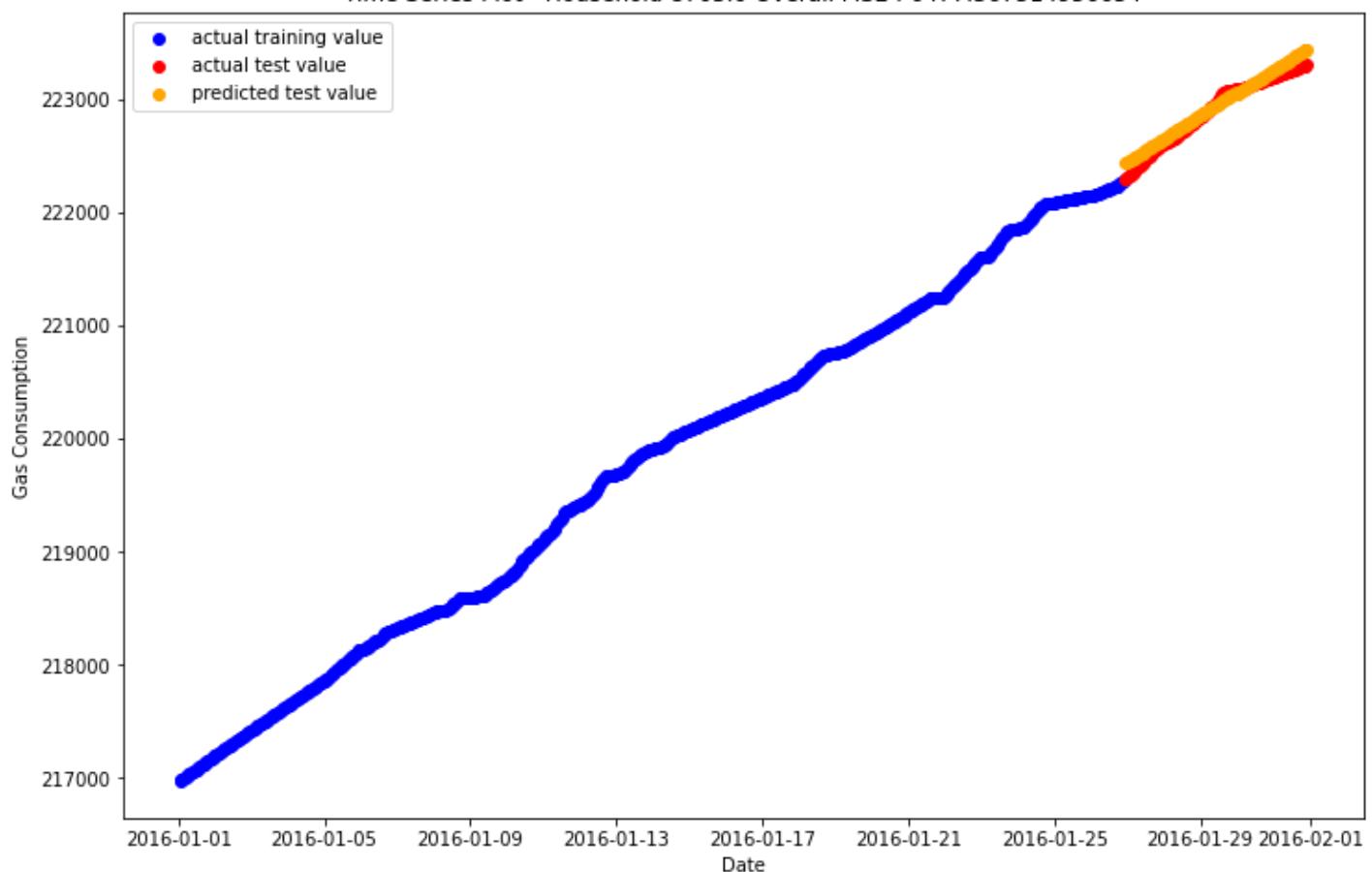
Time Series Plot - Household 8467.0 Overall MSE : 0.006271055742419775



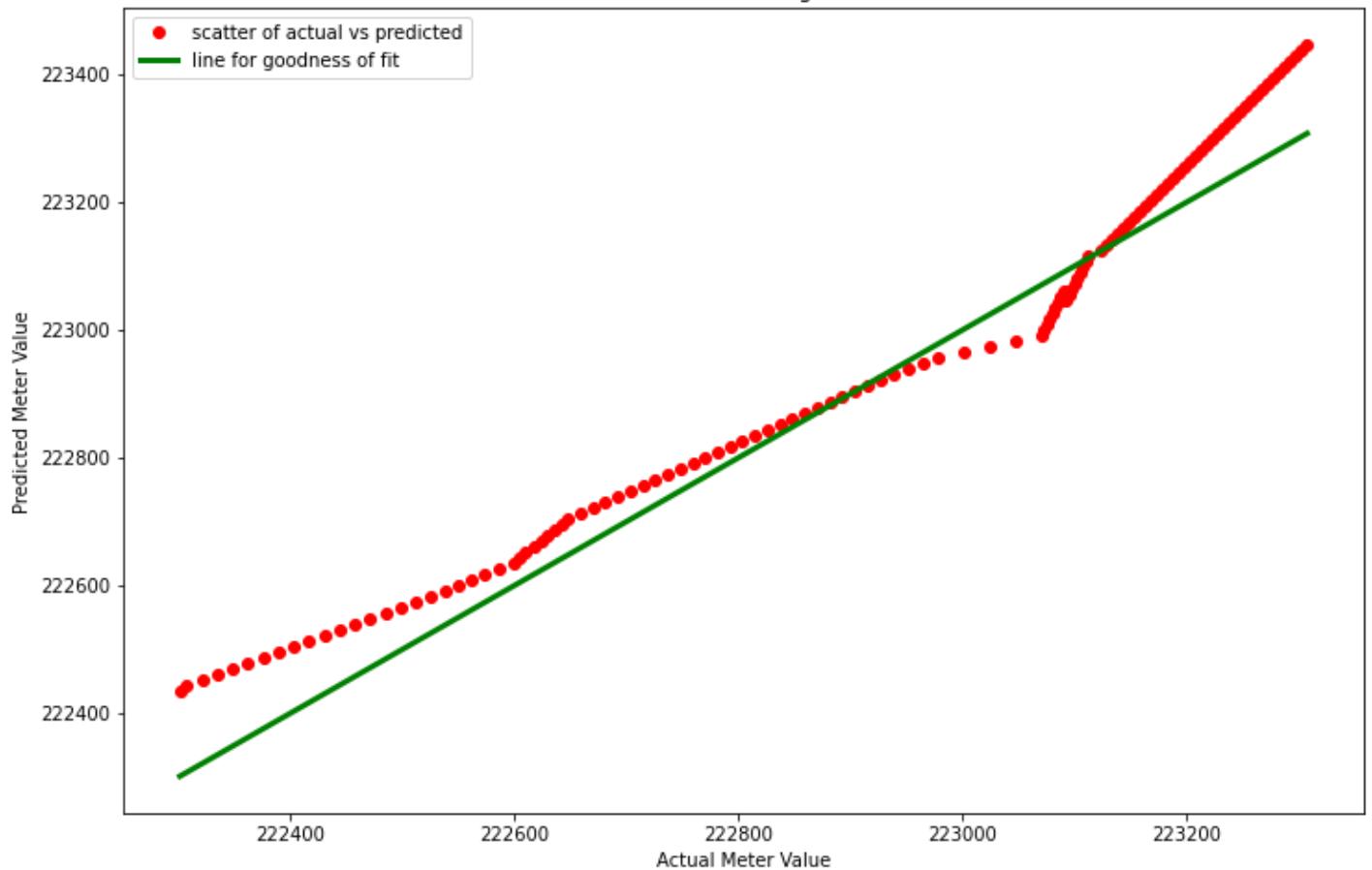
Scatter Plot - Household 8467.0 Testing MSE : 0.017000543547843187



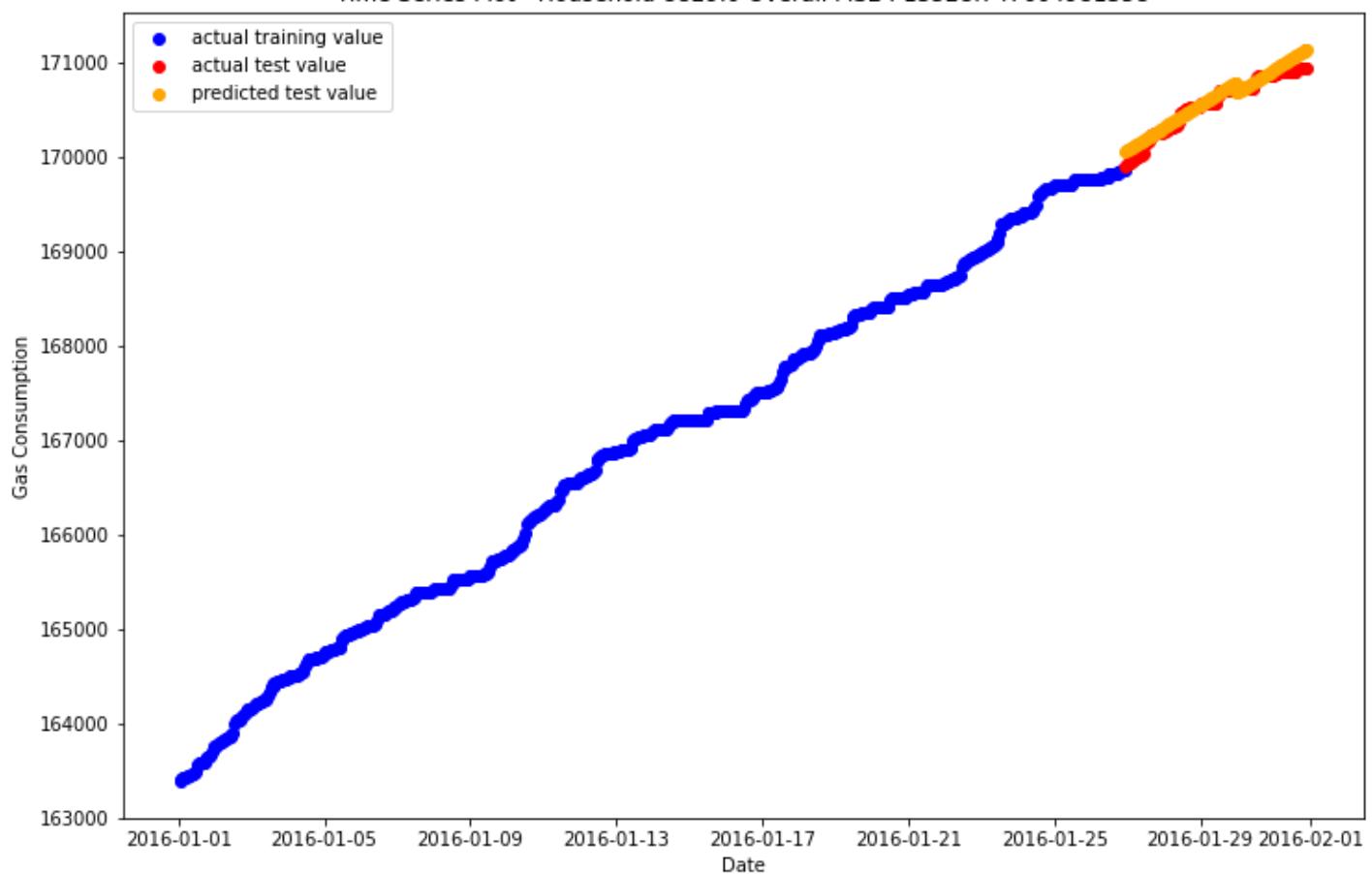
Time Series Plot - Household 8703.0 Overall MSE : 6477.367514956654



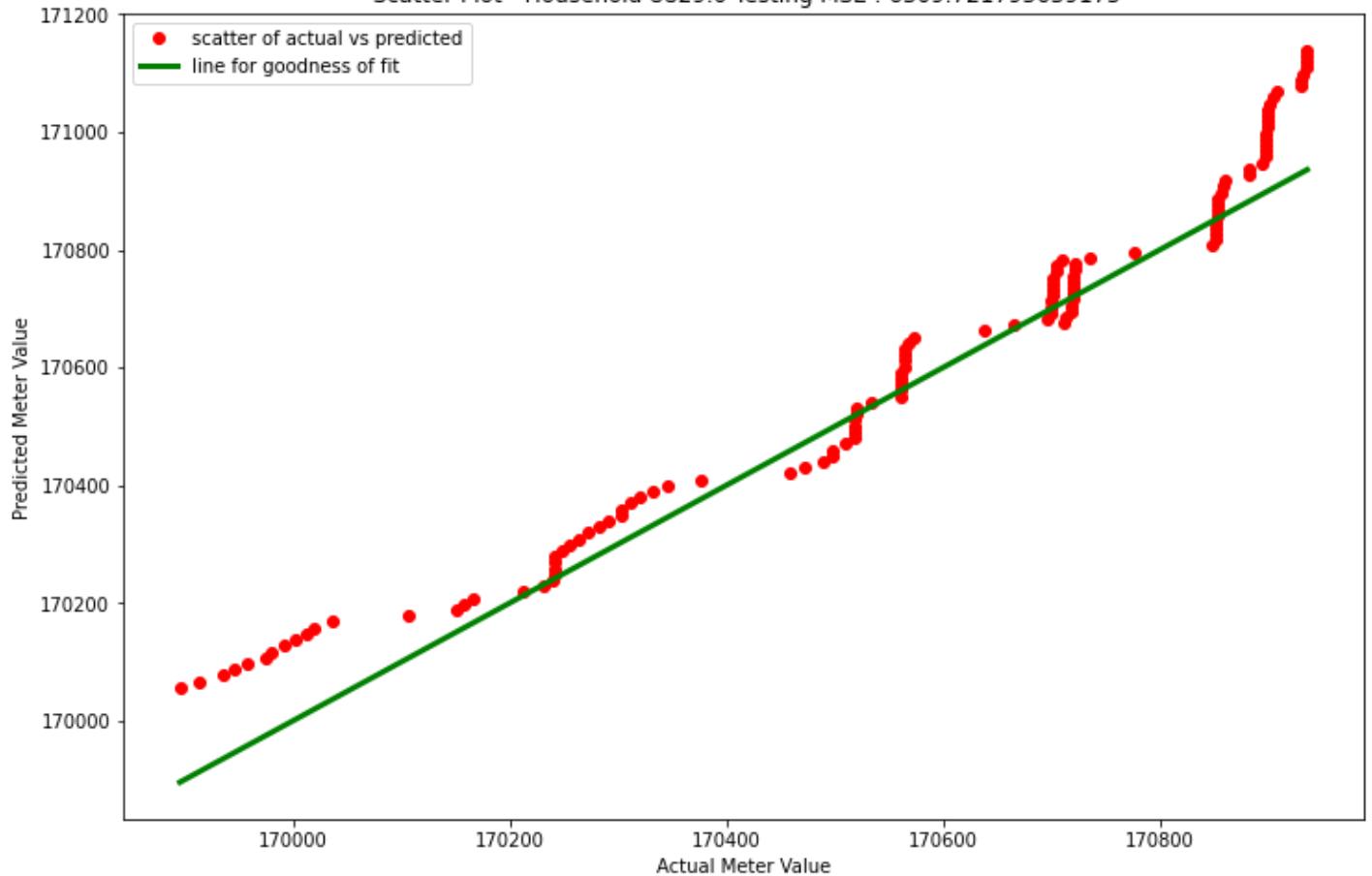
Scatter Plot - Household 8703.0 Testing MSE : 4516.087938347537



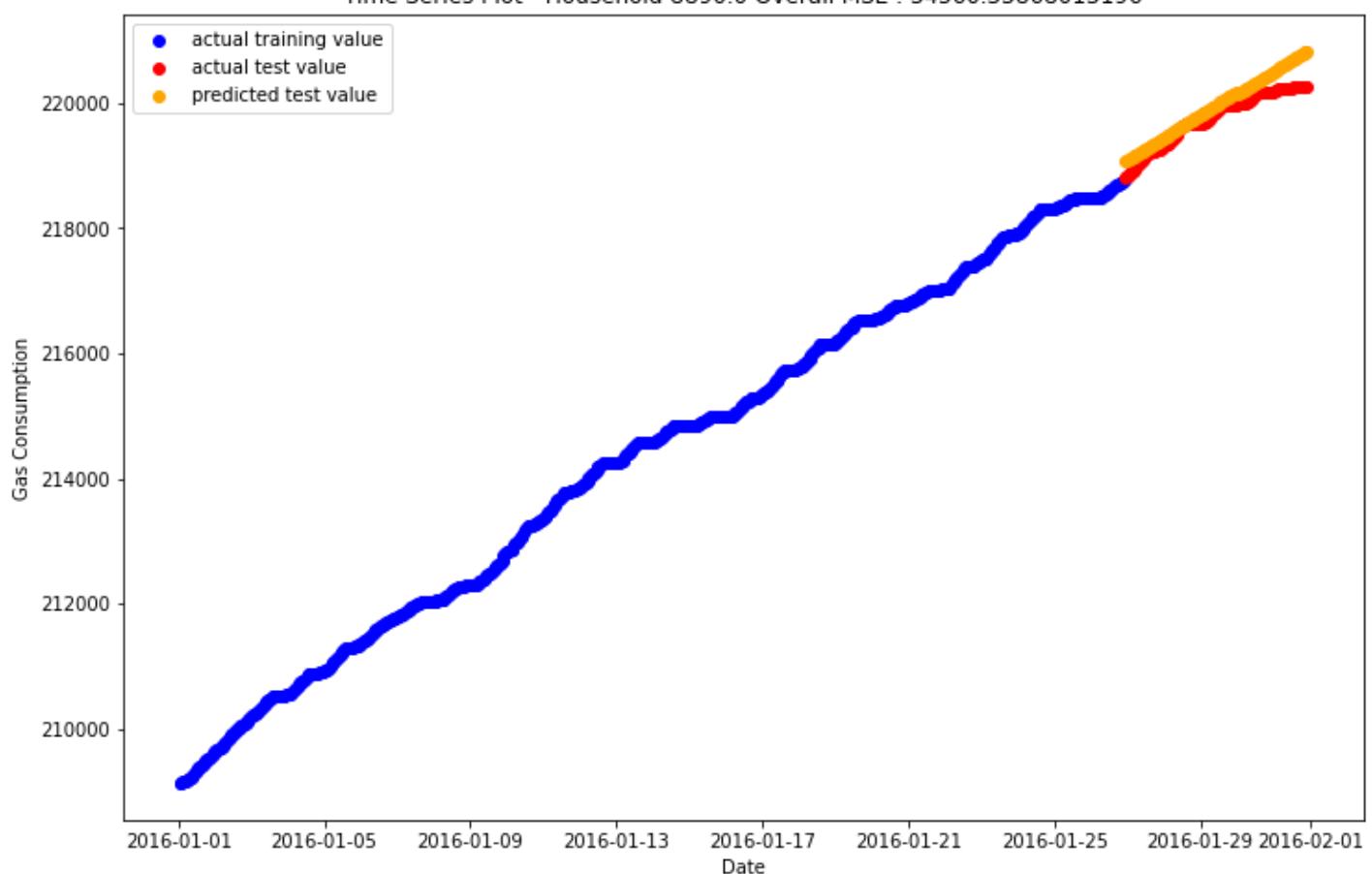
Time Series Plot - Household 8829.0 Overall MSE : 13528.747604981358



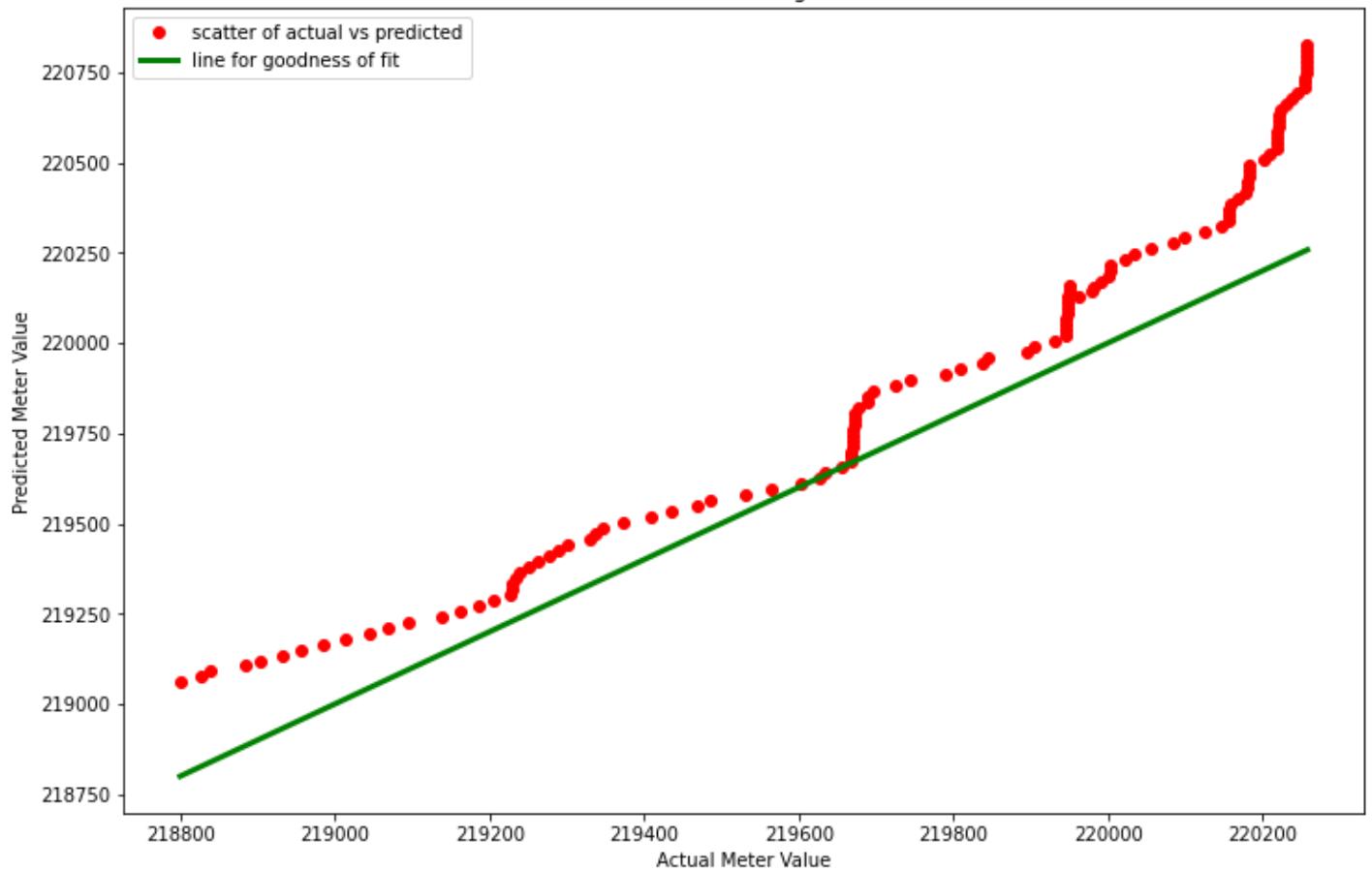
Scatter Plot - Household 8829.0 Testing MSE : 6309.721795639175



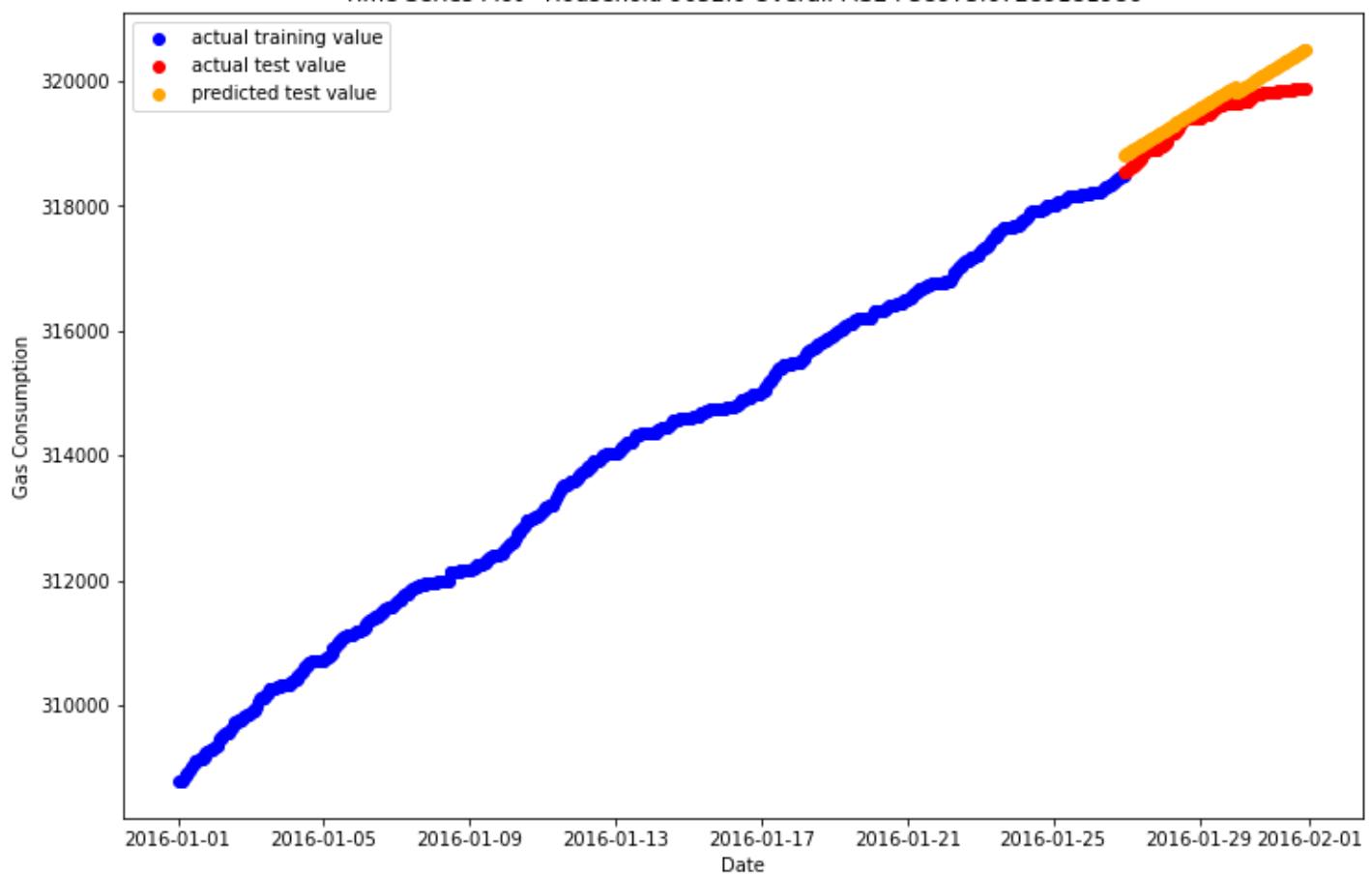
Time Series Plot - Household 8890.0 Overall MSE : 34560.33868013196



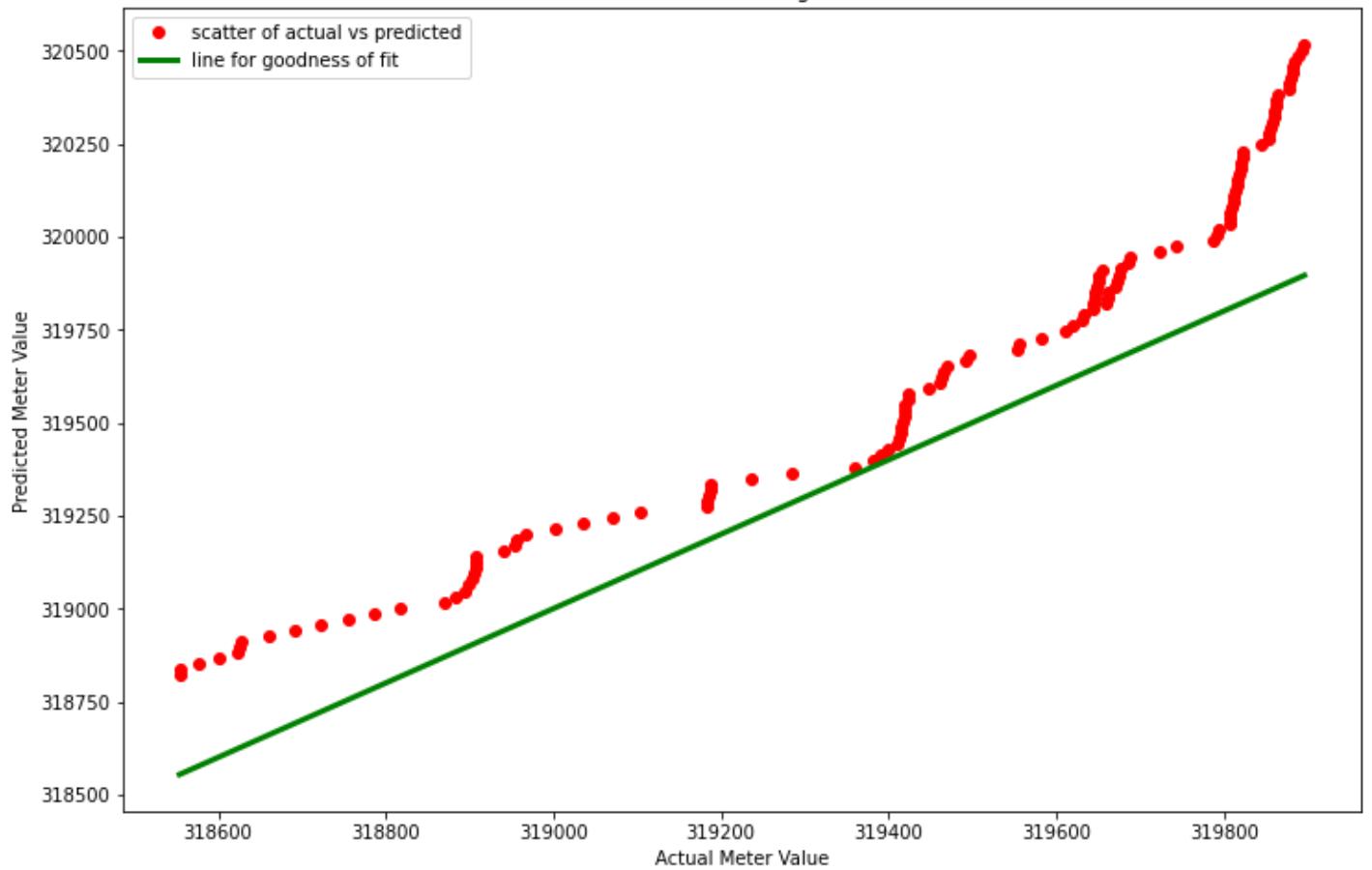
Scatter Plot - Household 8890.0 Testing MSE : 55935.568156950656



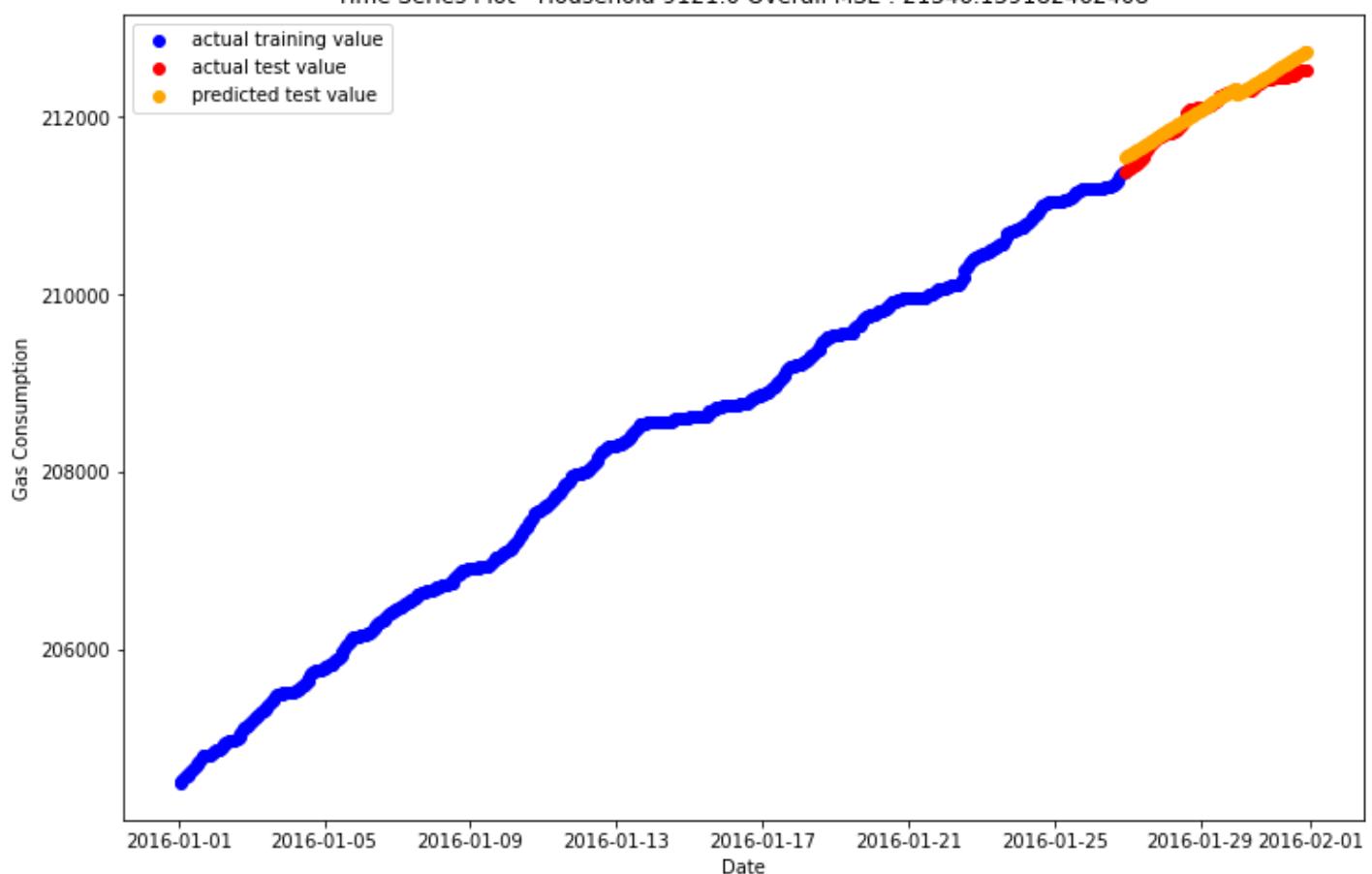
Time Series Plot - Household 9052.0 Overall MSE : 38973.67289181986



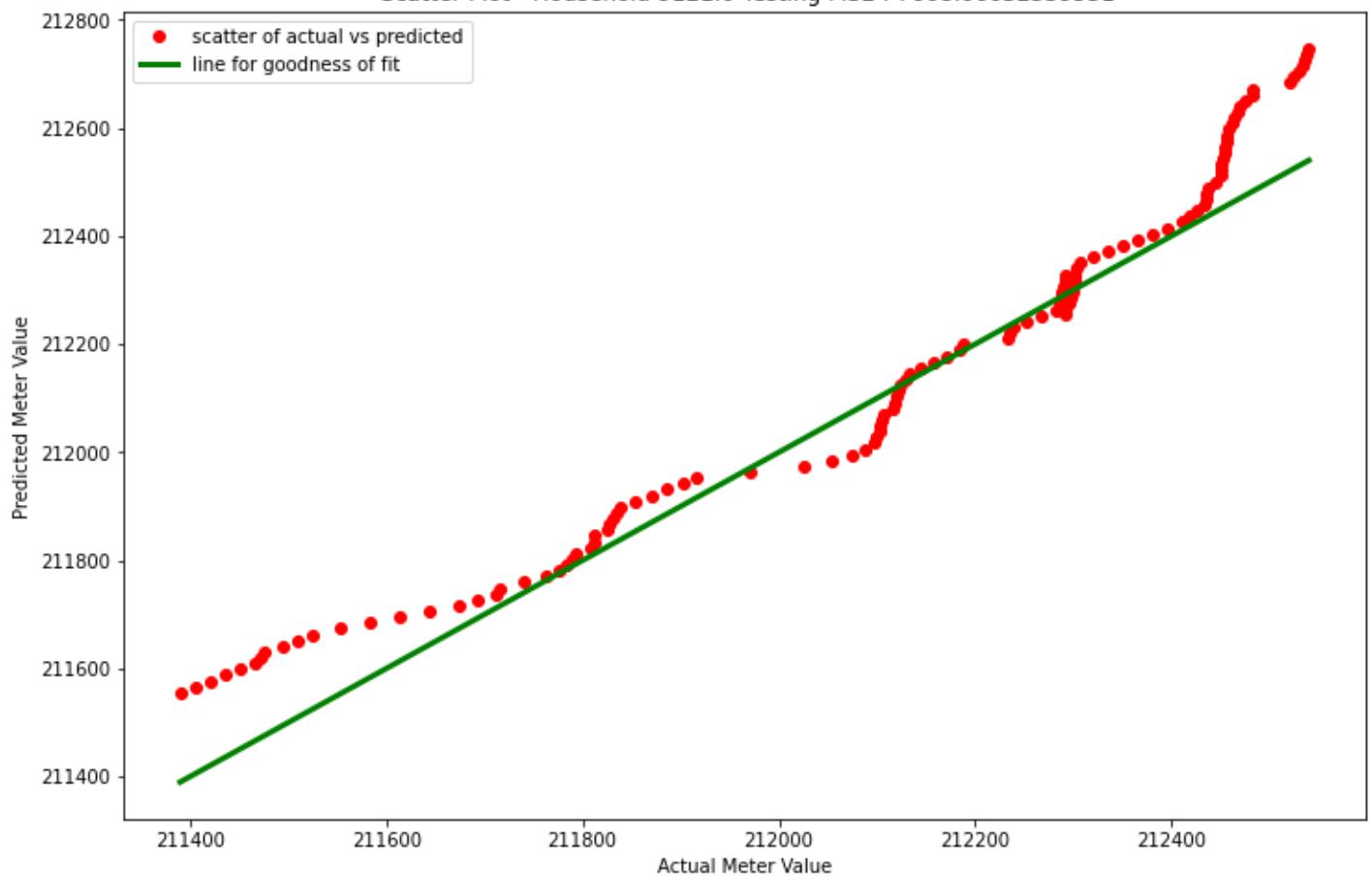
Scatter Plot - Household 9052.0 Testing MSE : 79464.28350388166



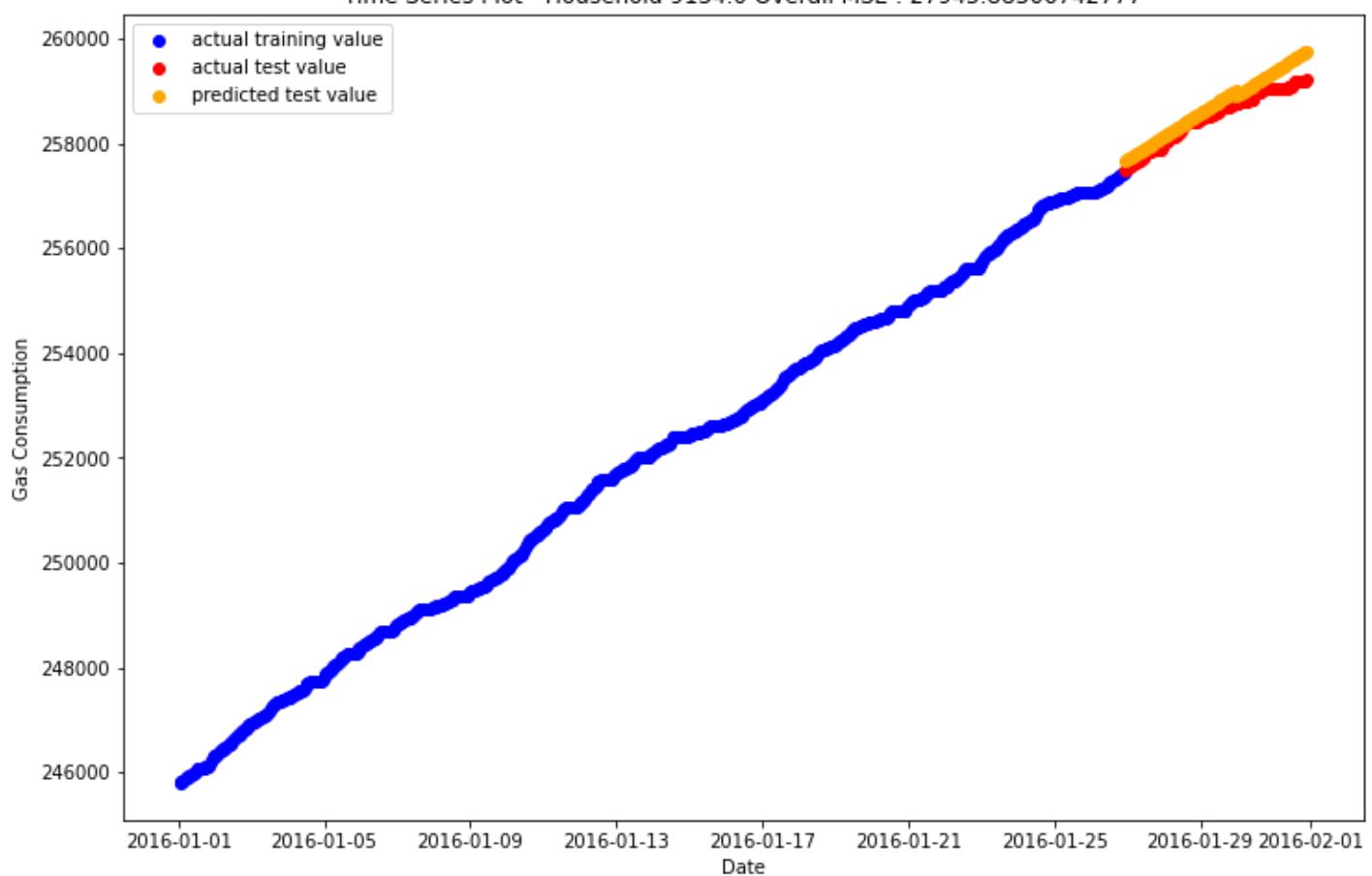
Time Series Plot - Household 9121.0 Overall MSE : 21346.139182462408



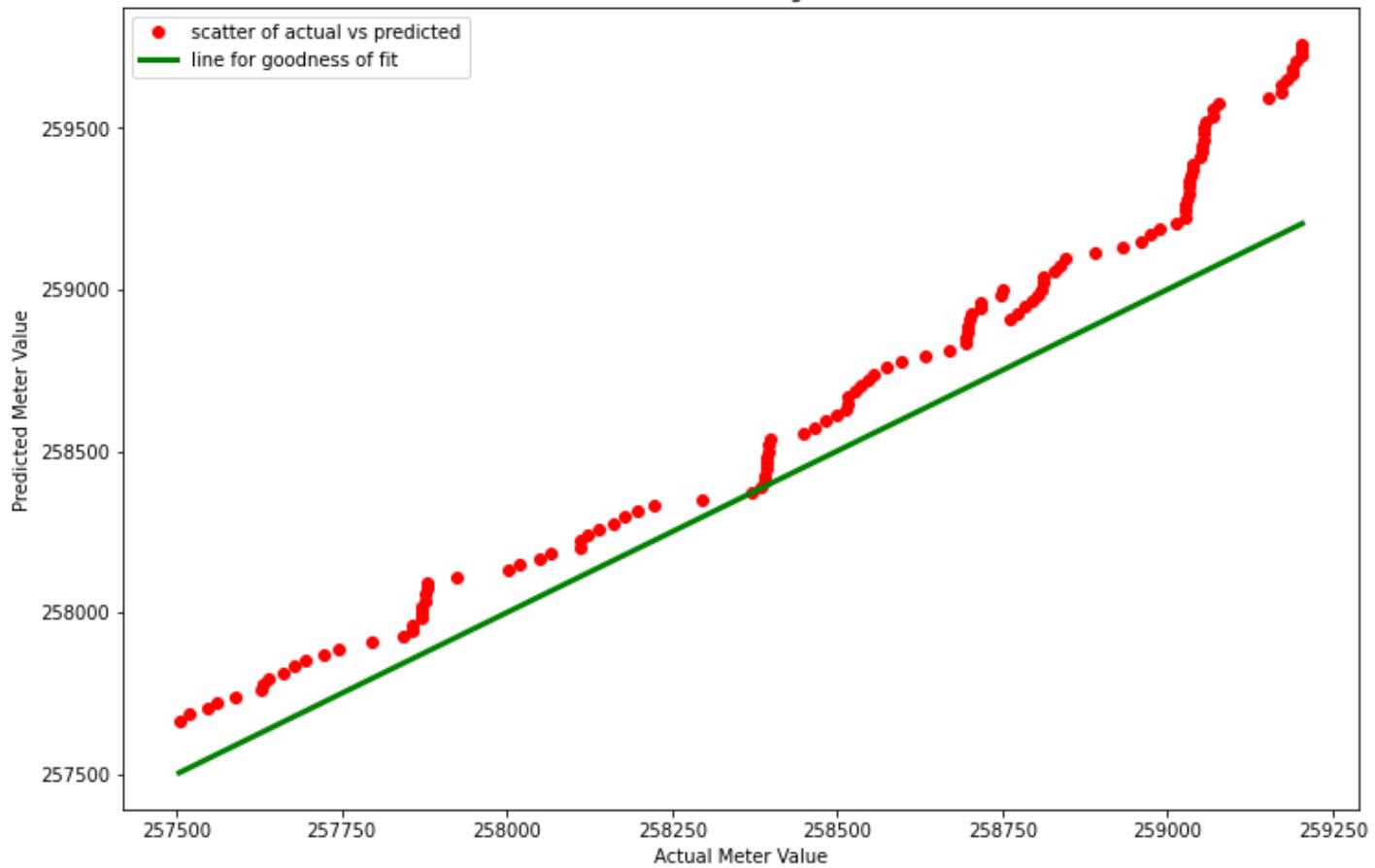
Scatter Plot - Household 9121.0 Testing MSE : 7668.06032539531



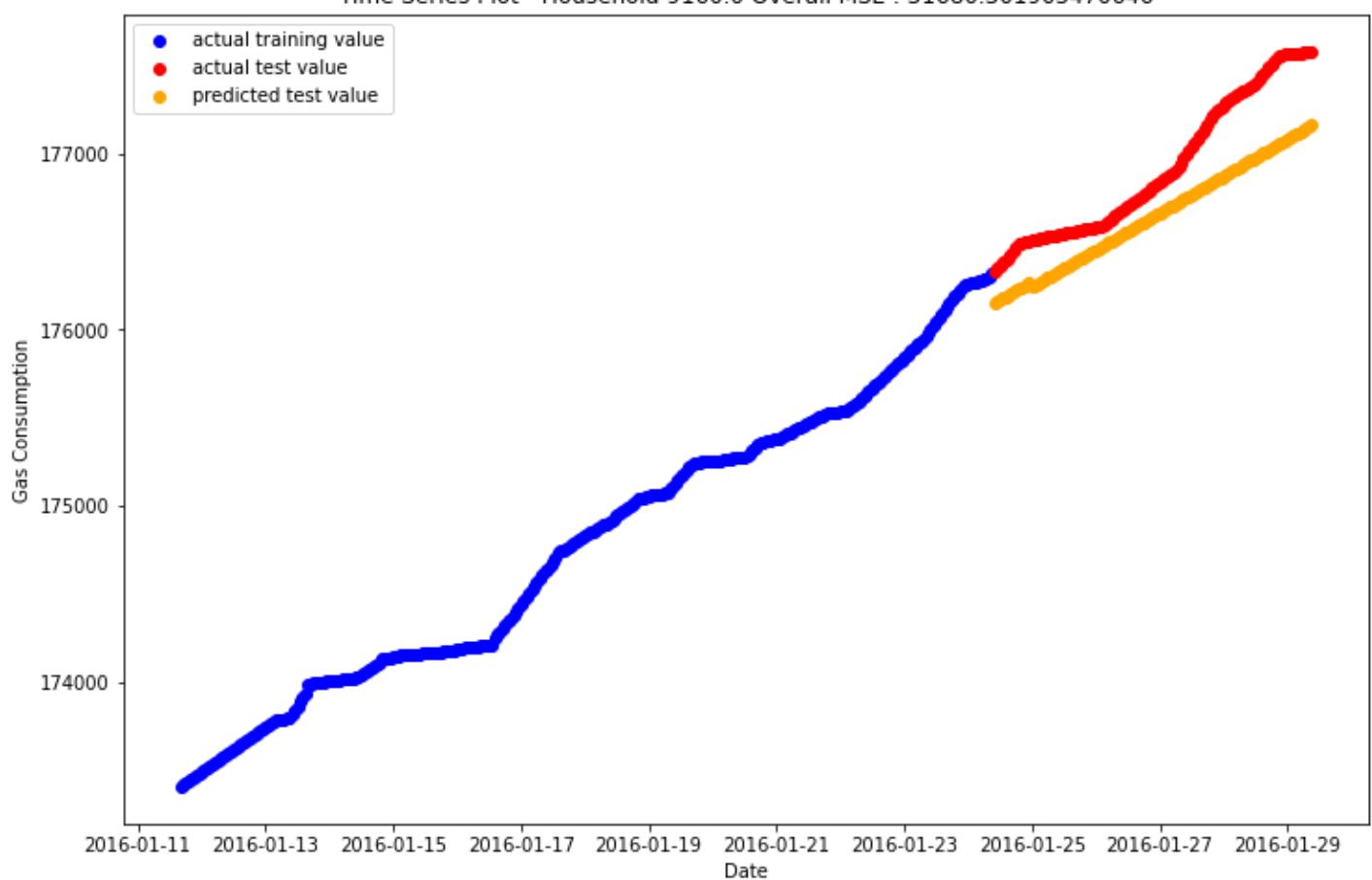
Time Series Plot - Household 9134.0 Overall MSE : 27945.88306742777



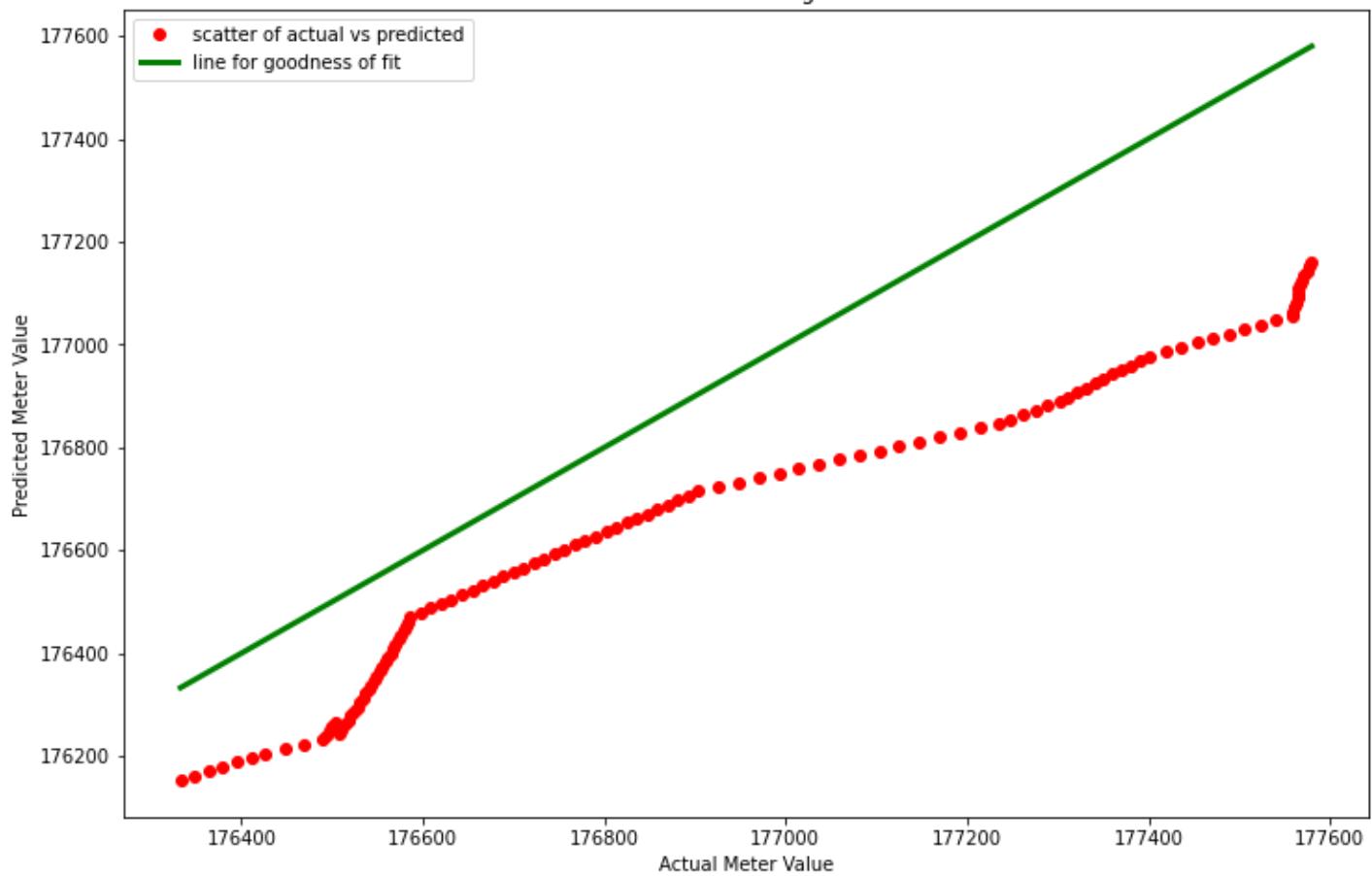
Scatter Plot - Household 9134.0 Testing MSE : 61174.538284956805



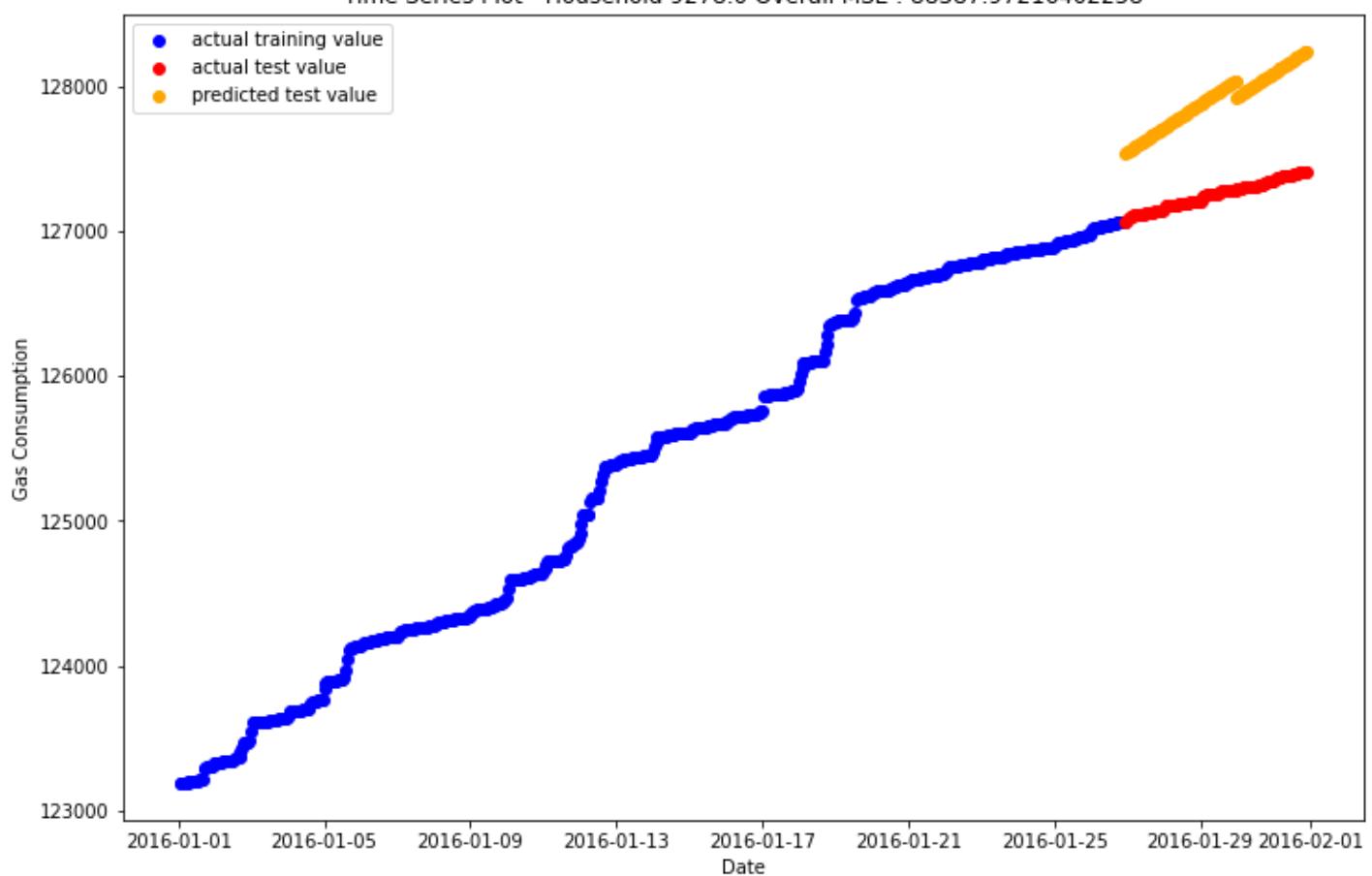
Time Series Plot - Household 9160.0 Overall MSE : 31680.301905470646



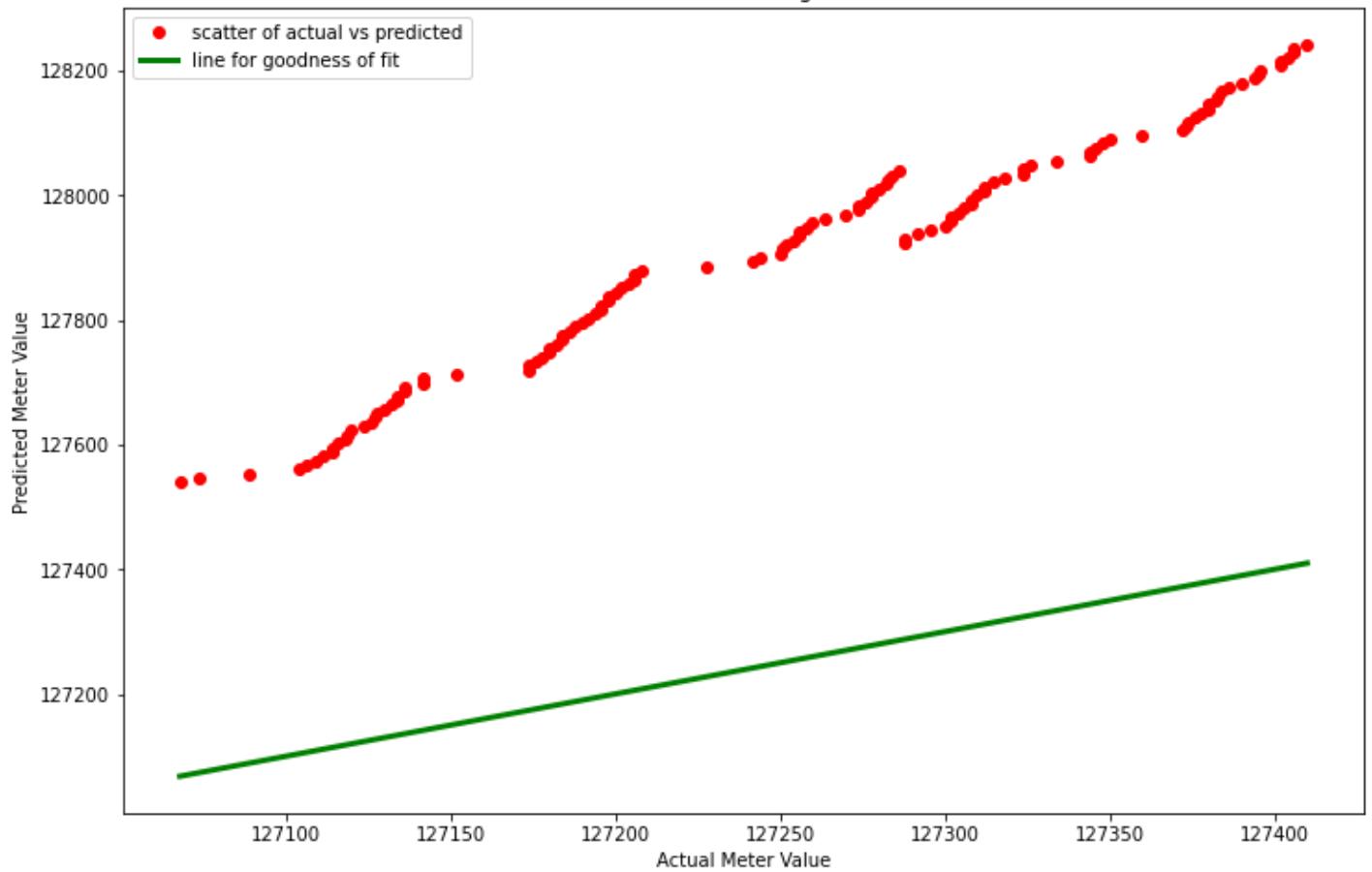
Scatter Plot - Household 9160.0 Testing MSE : 90202.90280113759



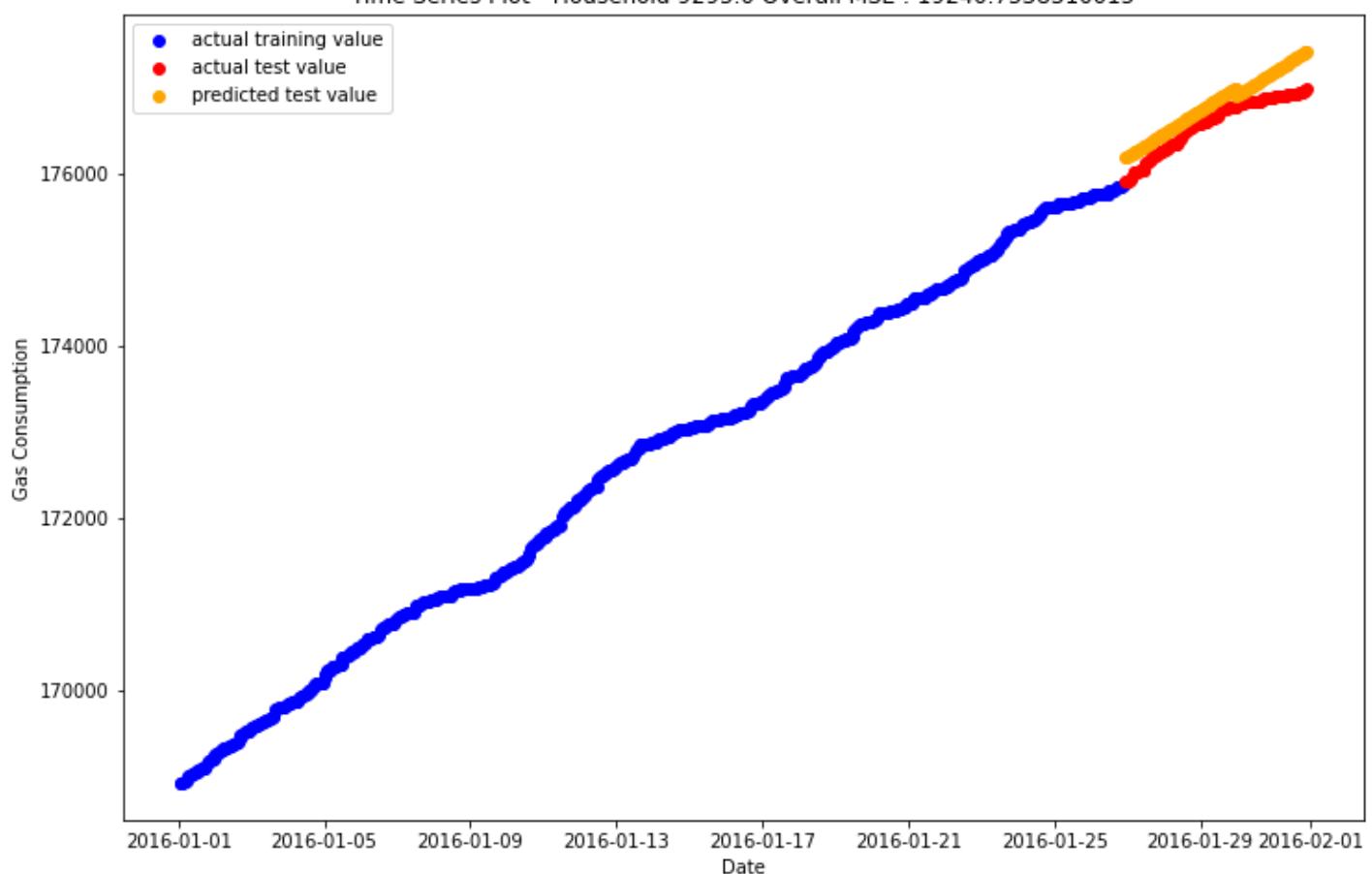
Time Series Plot - Household 9278.0 Overall MSE : 88387.97216402258



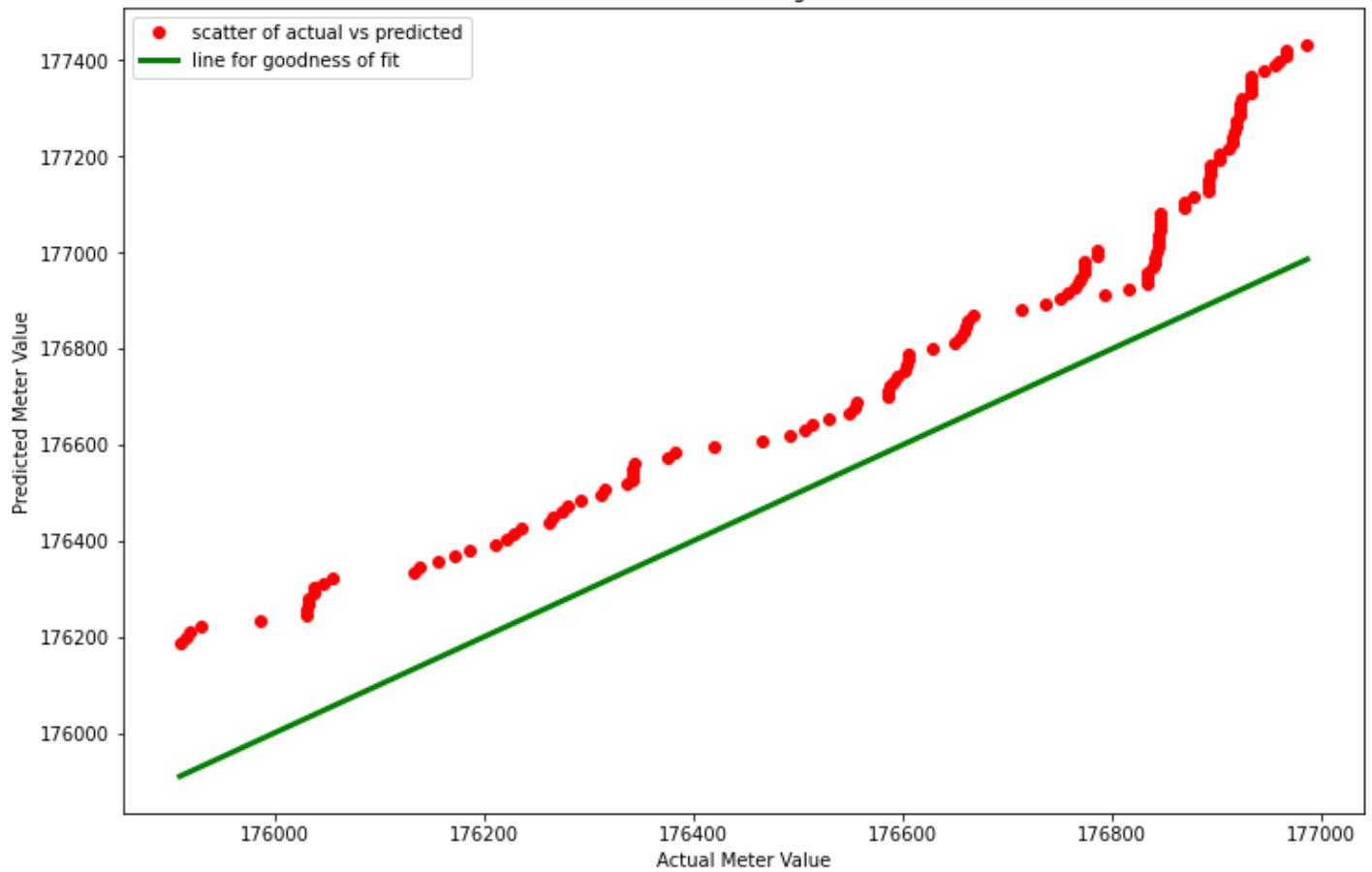
Scatter Plot - Household 9278.0 Testing MSE : 436015.7927351698



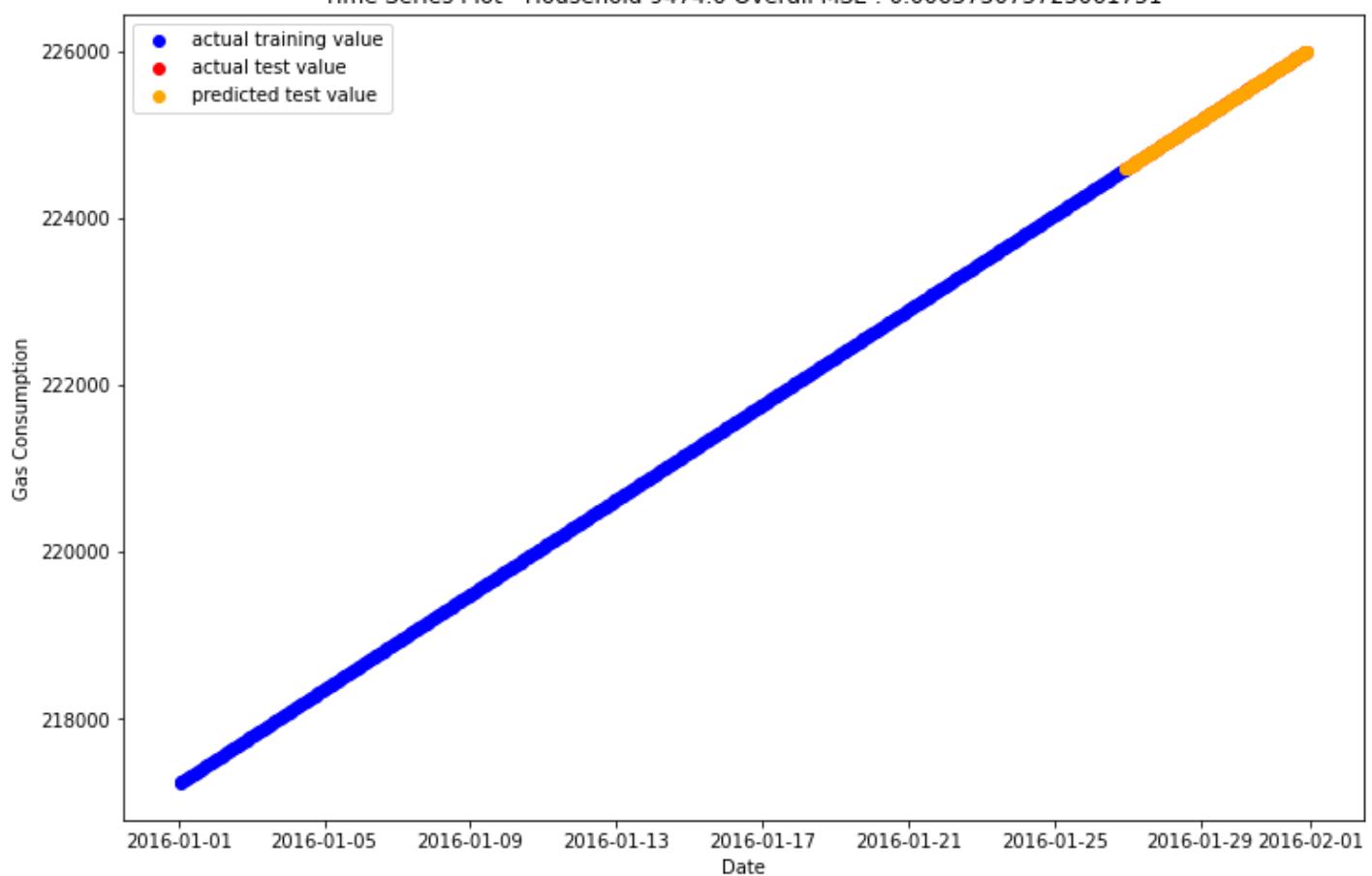
Time Series Plot - Household 9295.0 Overall MSE : 19240.7538310015



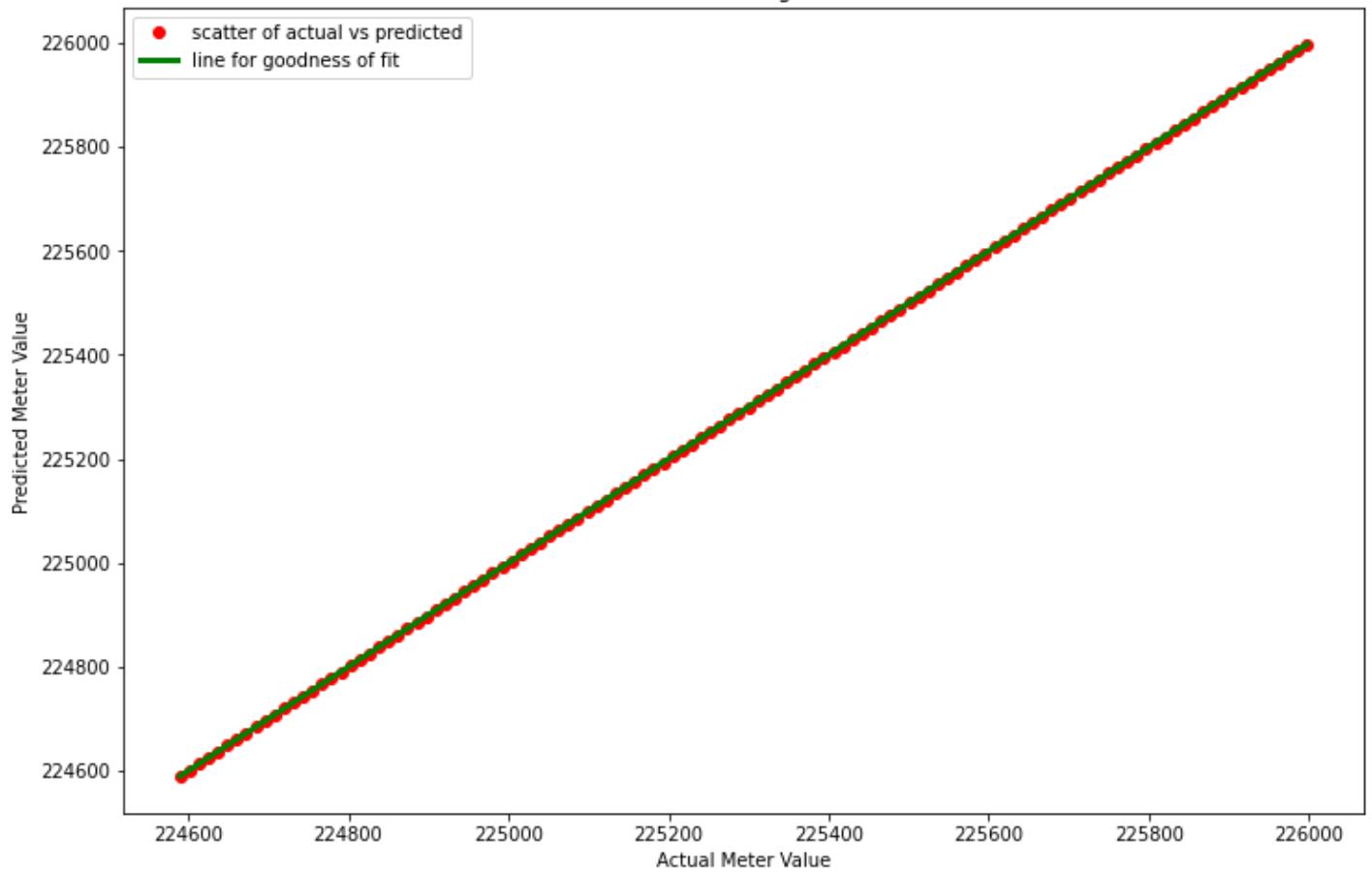
Scatter Plot - Household 9295.0 Testing MSE : 58611.984264506005



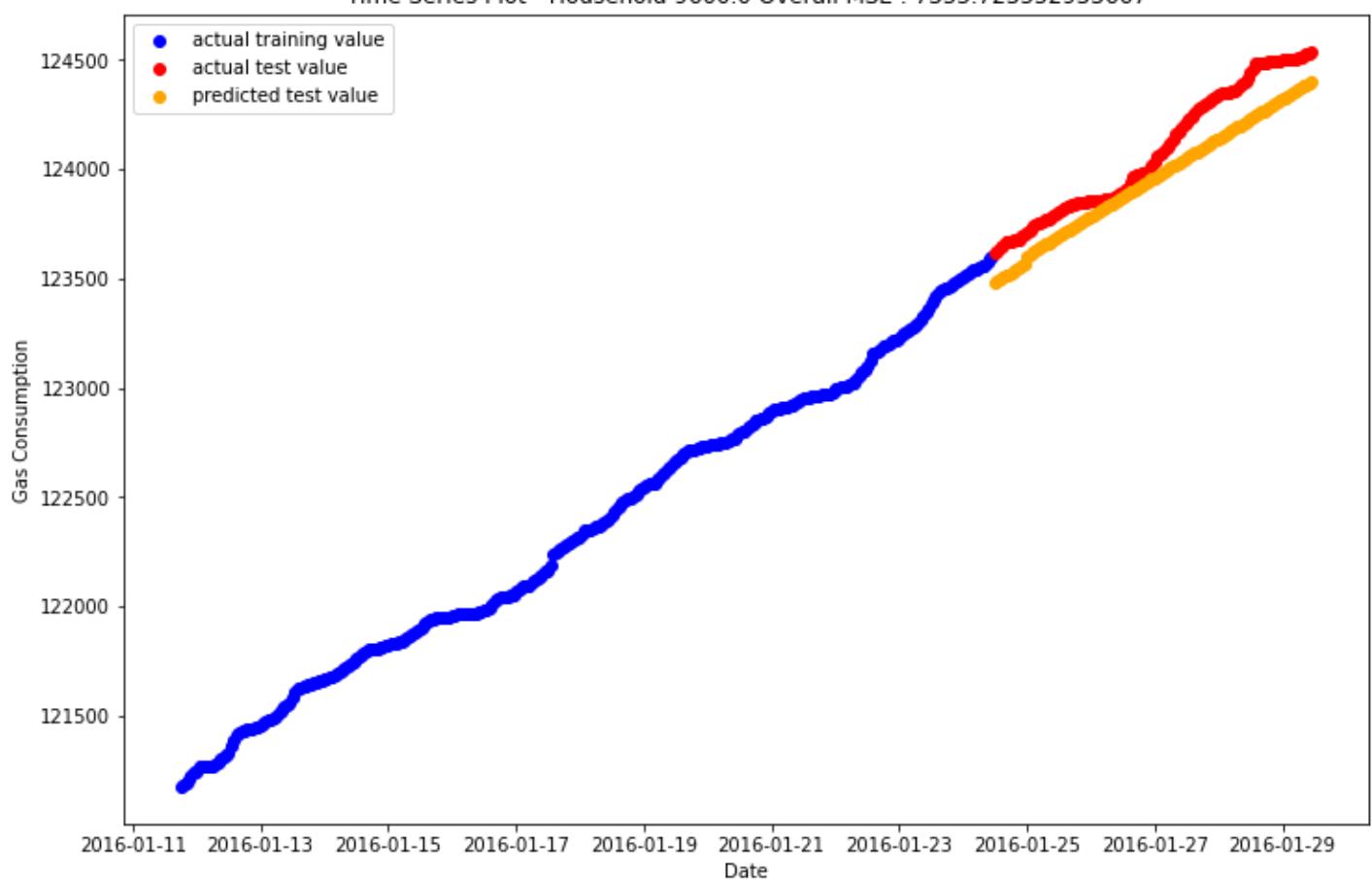
Time Series Plot - Household 9474.0 Overall MSE : 0.006373075725061751



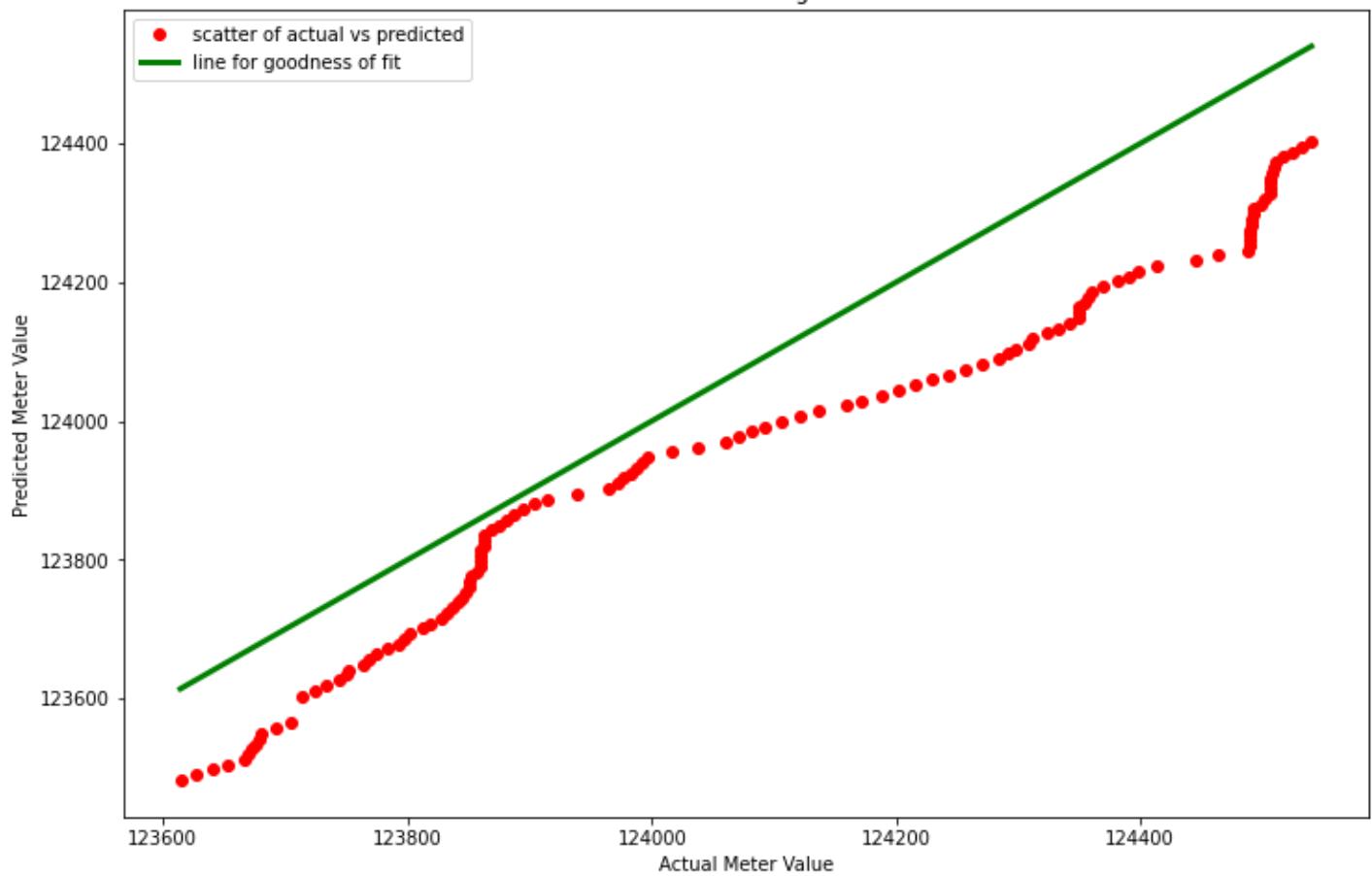
Scatter Plot - Household 9474.0 Testing MSE : 0.017260815568490604



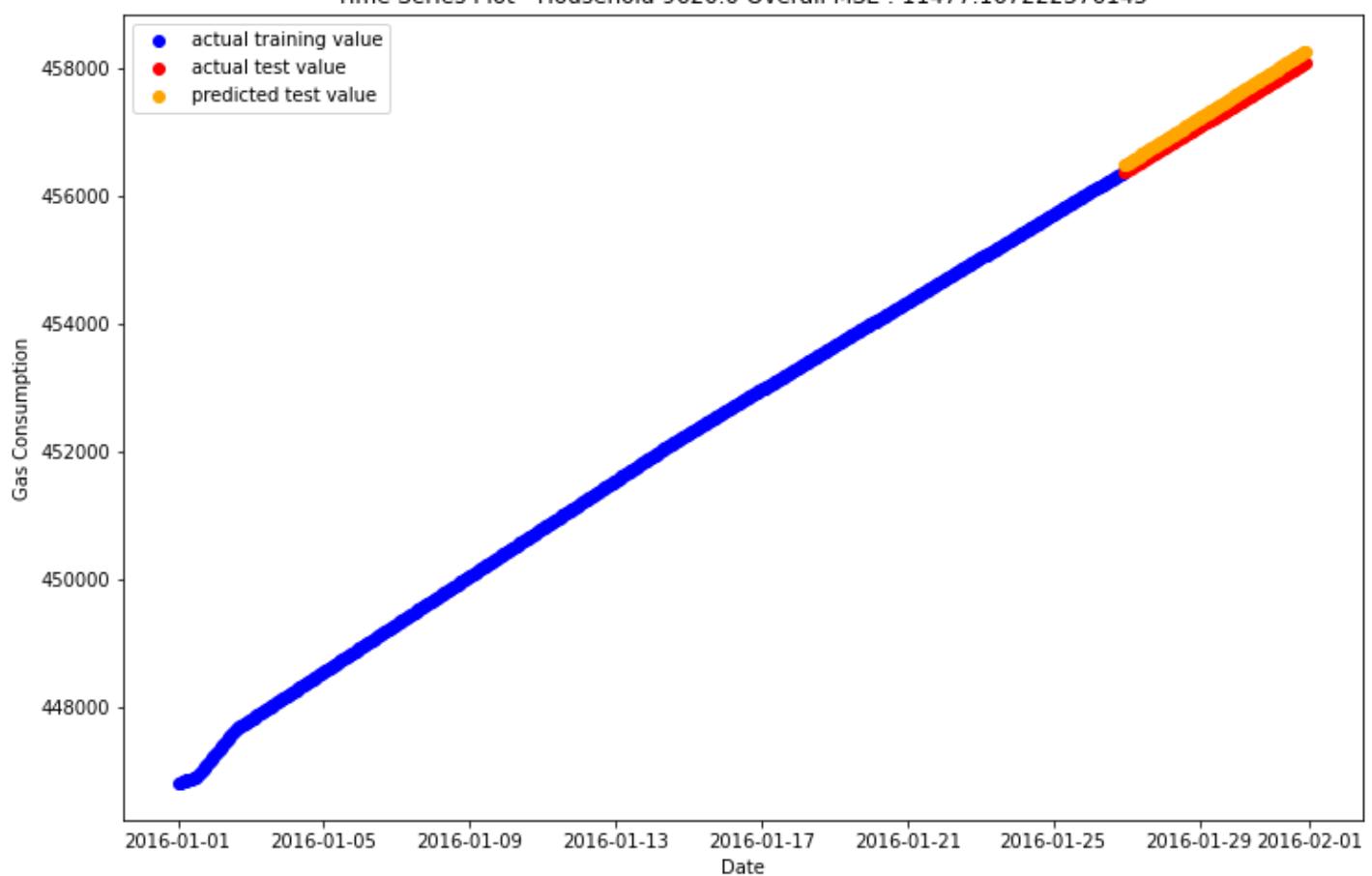
Time Series Plot - Household 9600.0 Overall MSE : 7355.723552933667



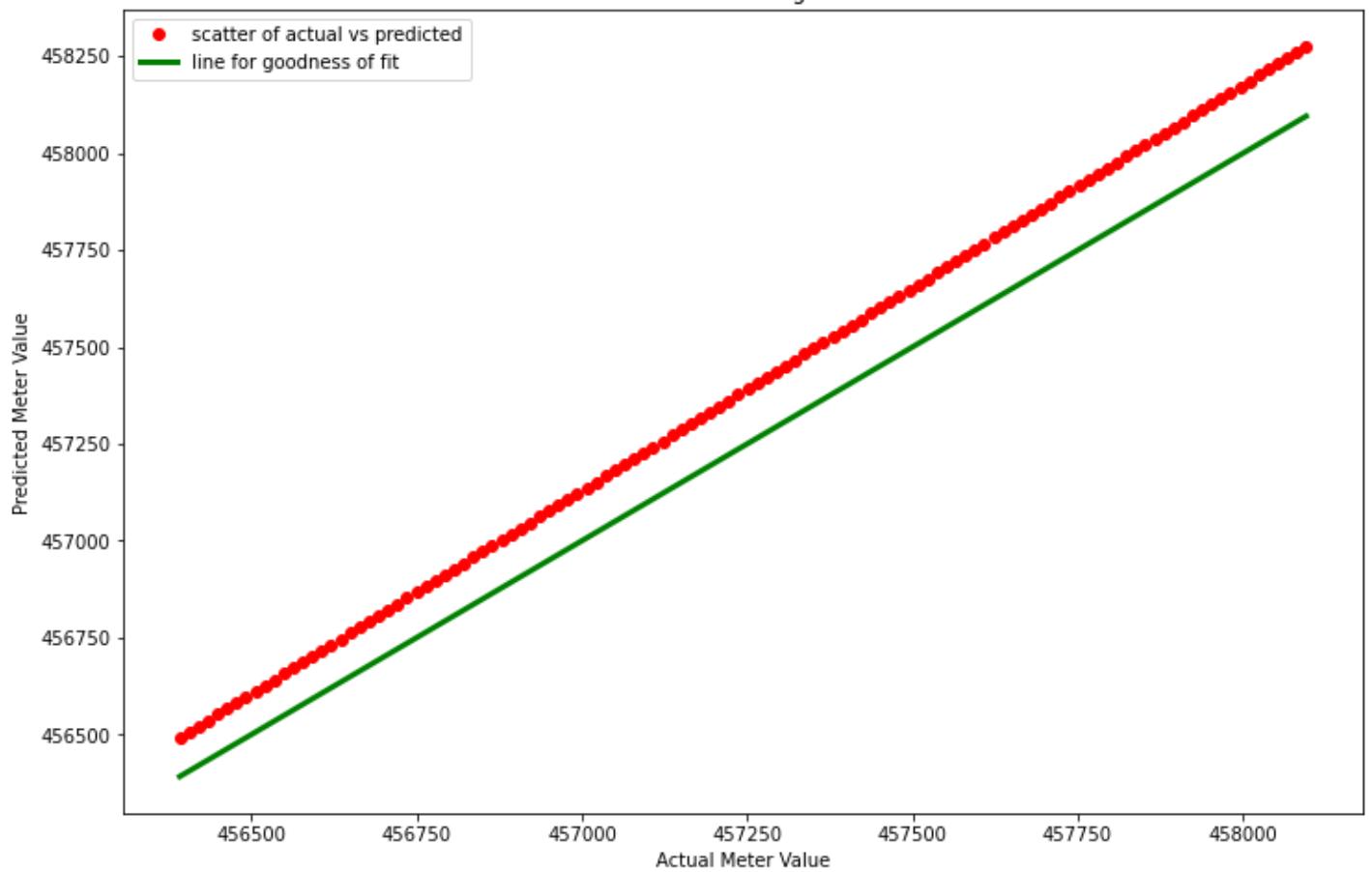
Scatter Plot - Household 9600.0 Testing MSE : 20049.572133556856



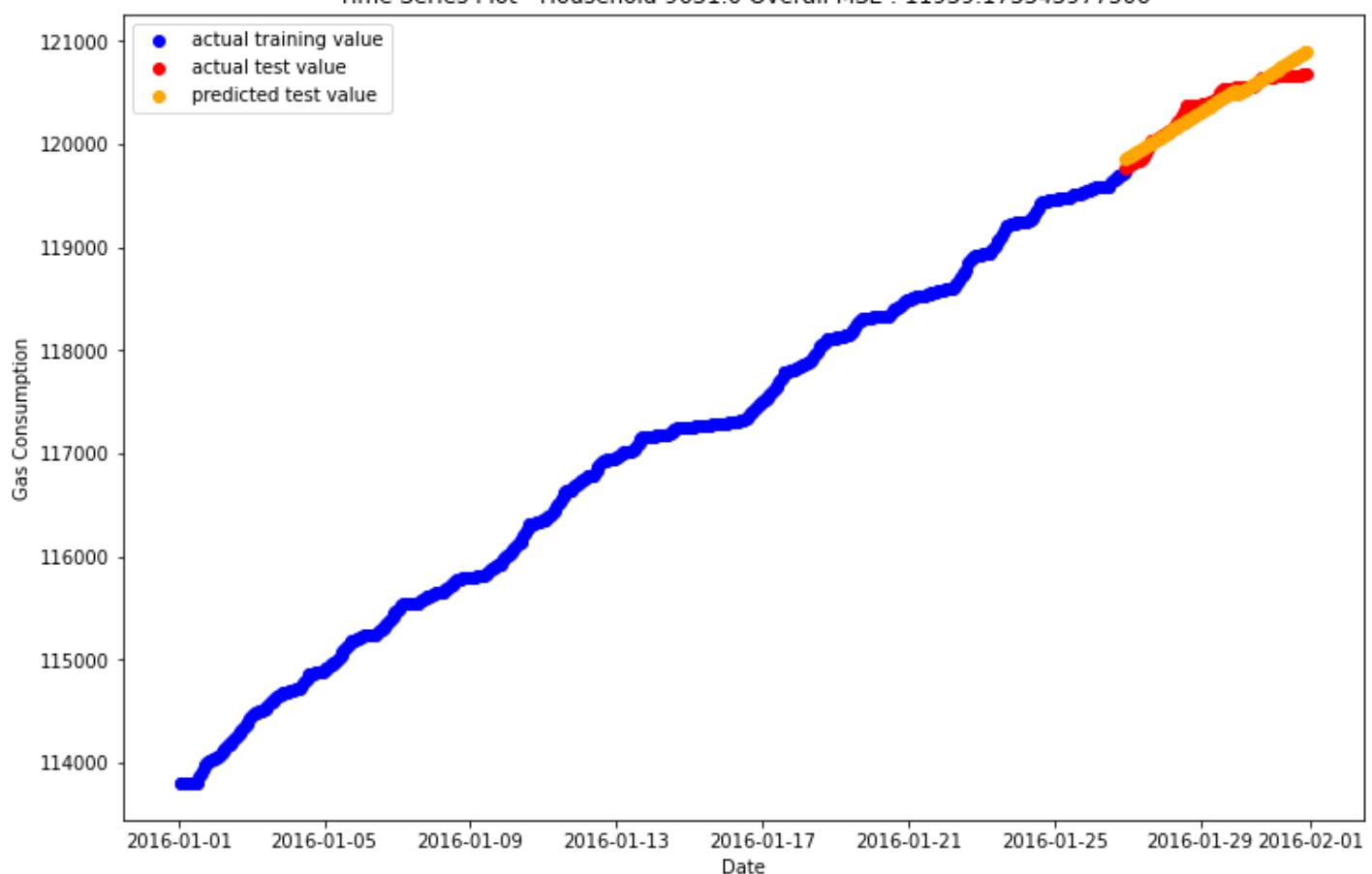
Time Series Plot - Household 9620.0 Overall MSE : 11477.167222376145



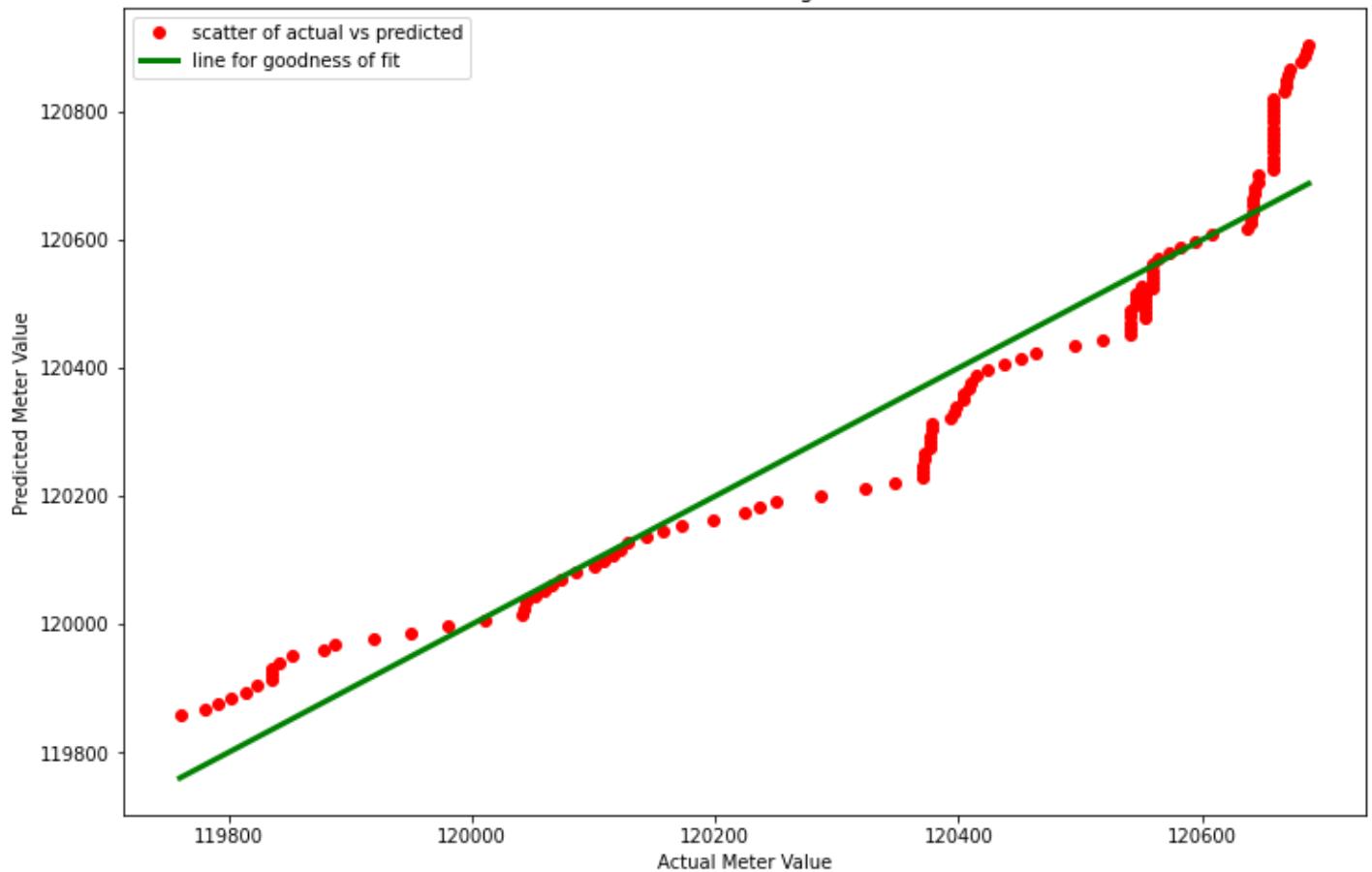
Scatter Plot - Household 9620.0 Testing MSE : 20352.231433646615



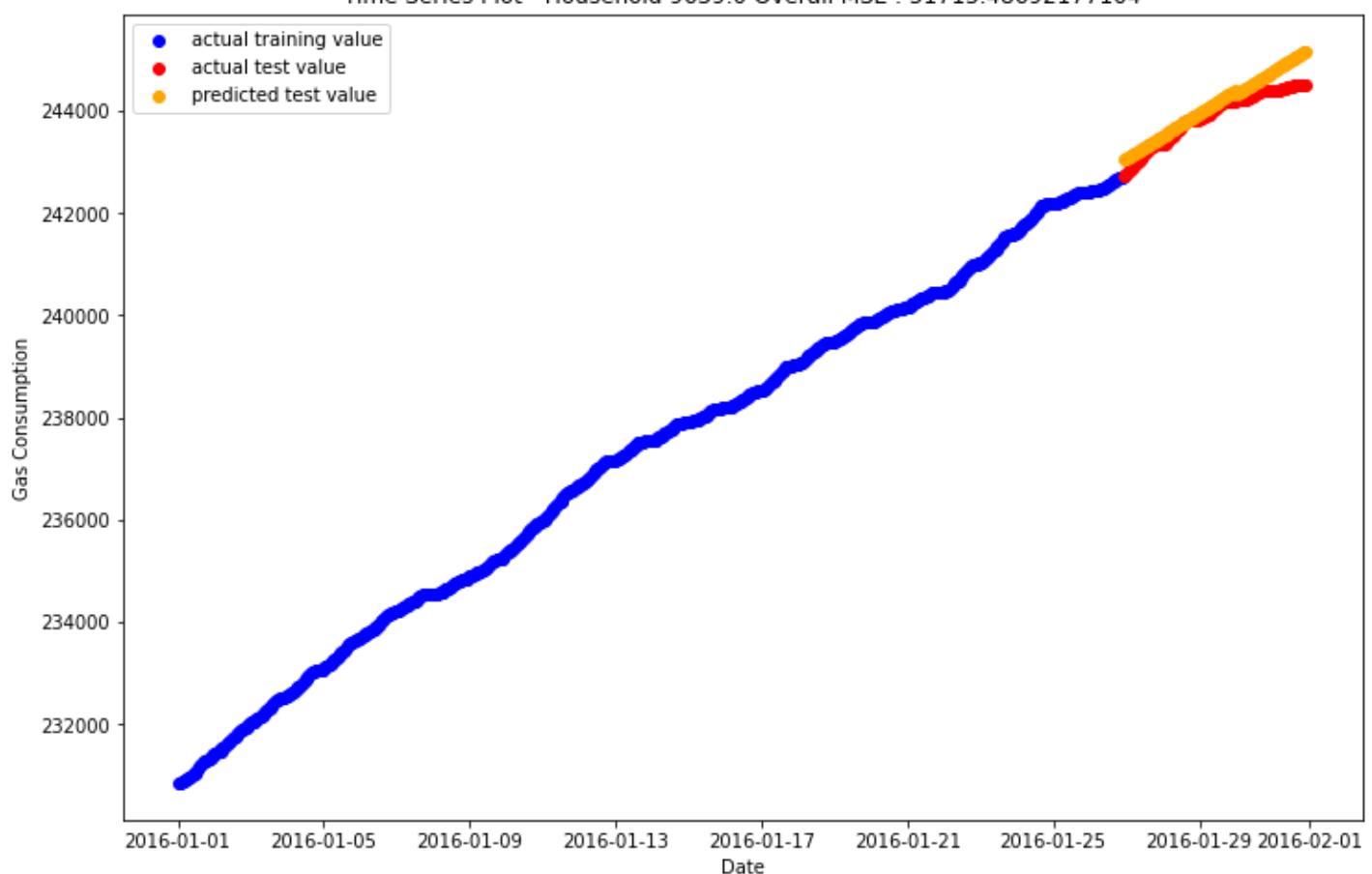
Time Series Plot - Household 9631.0 Overall MSE : 11939.173543977506



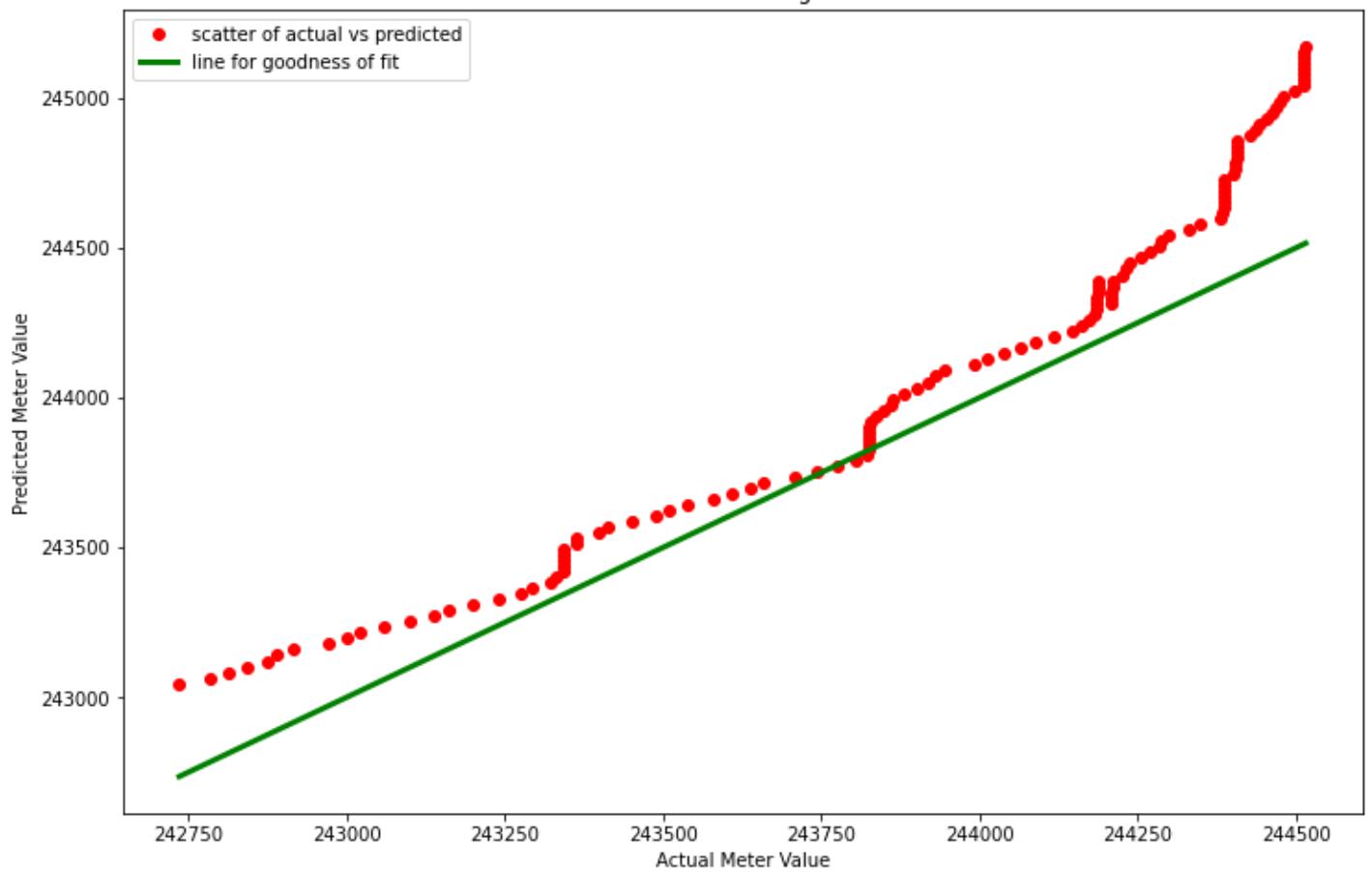
Scatter Plot - Household 9631.0 Testing MSE : 7149.672376042905



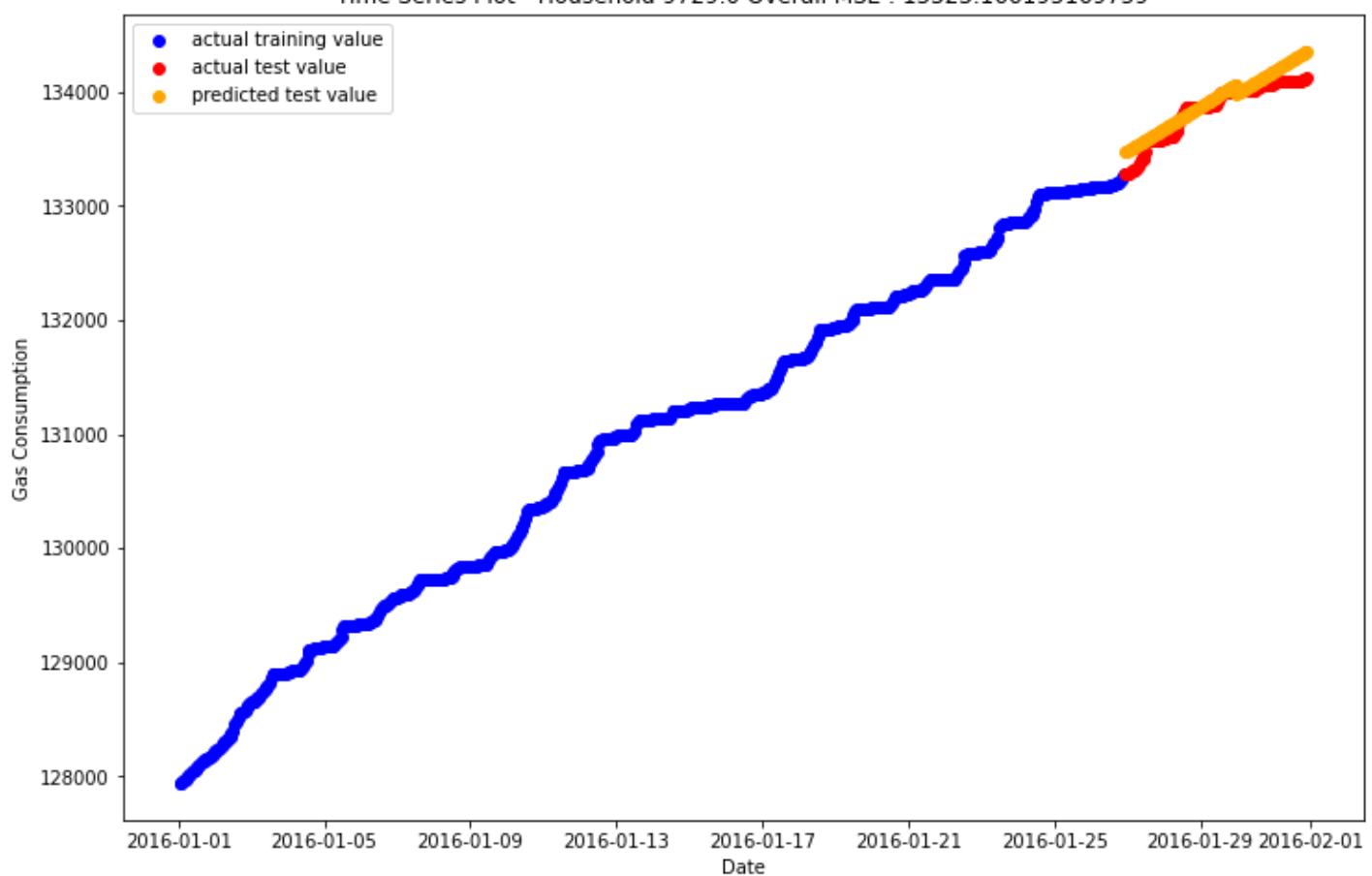
Time Series Plot - Household 9639.0 Overall MSE : 51715.48692177104



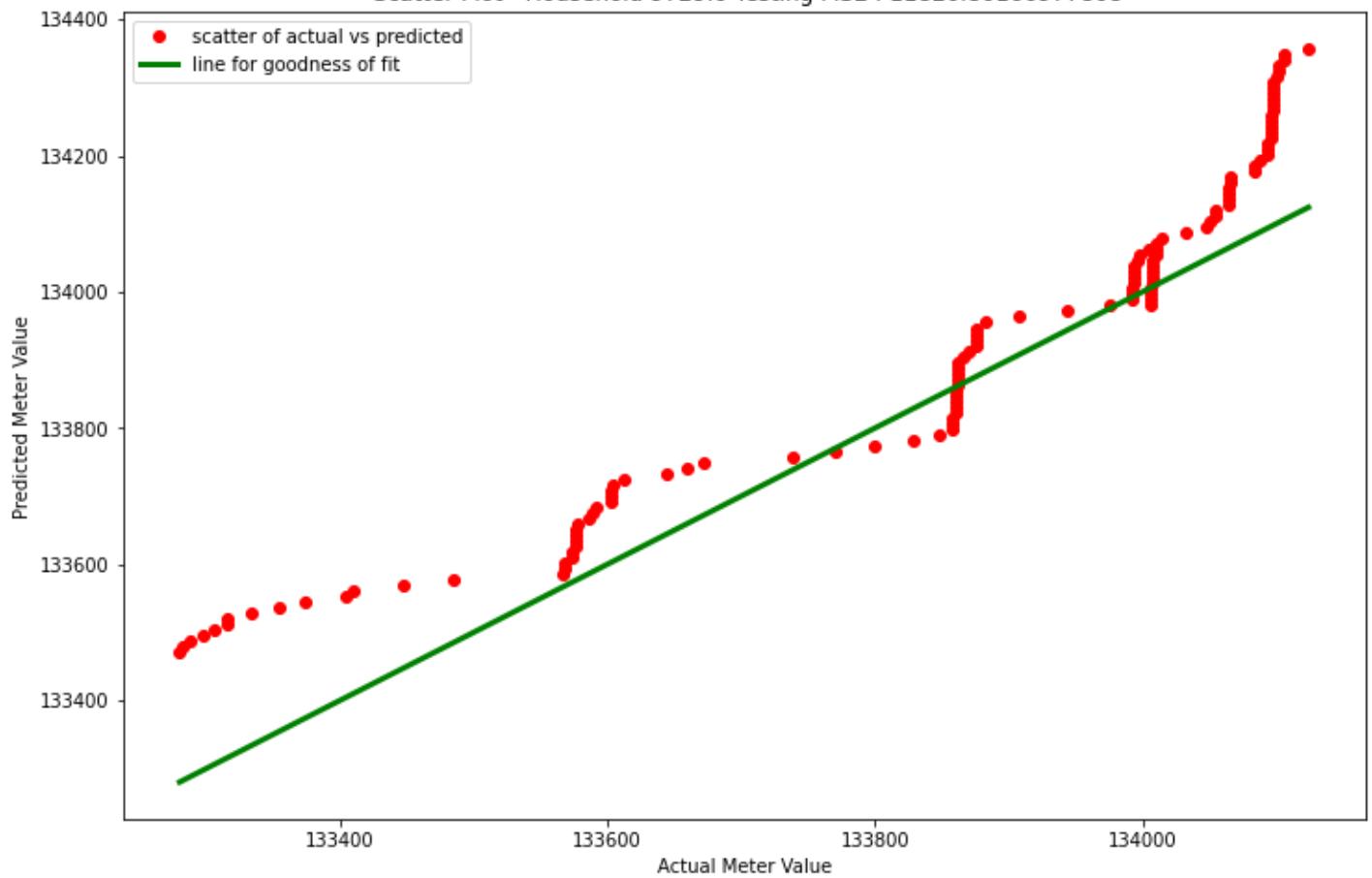
Scatter Plot - Household 9639.0 Testing MSE : 72669.78613752365



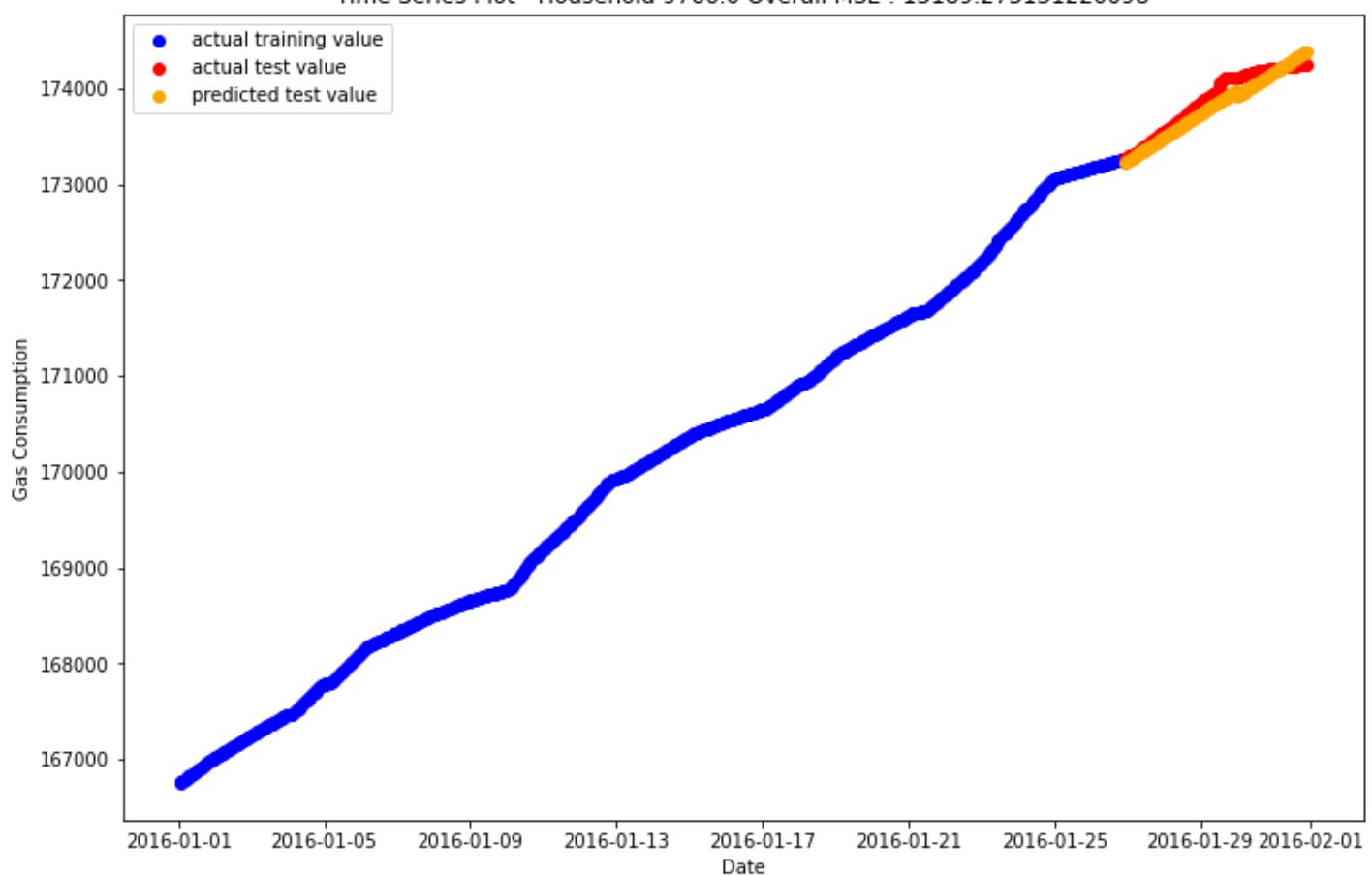
Time Series Plot - Household 9729.0 Overall MSE : 15323.166195169759



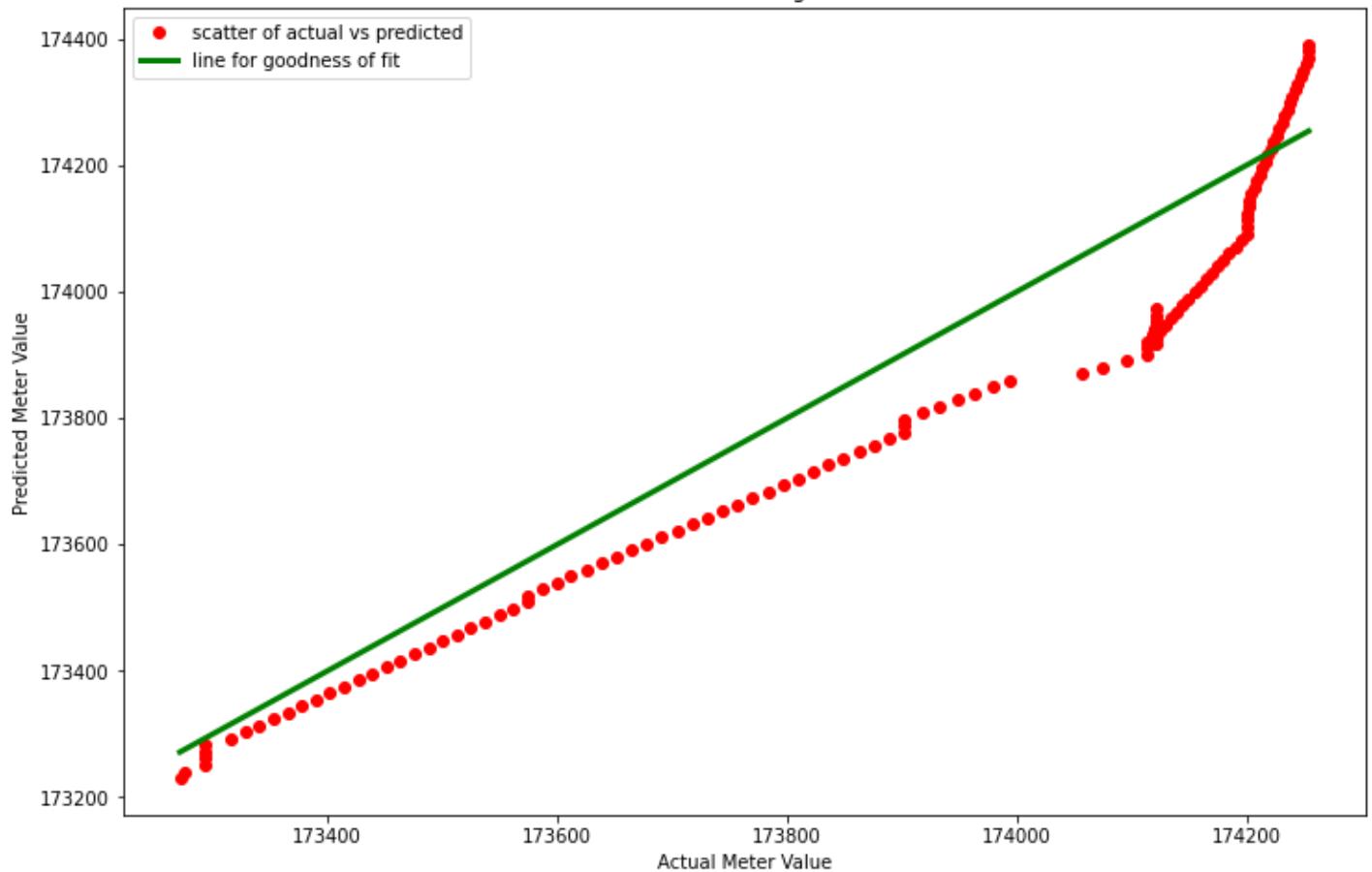
Scatter Plot - Household 9729.0 Testing MSE : 11820.80166977808



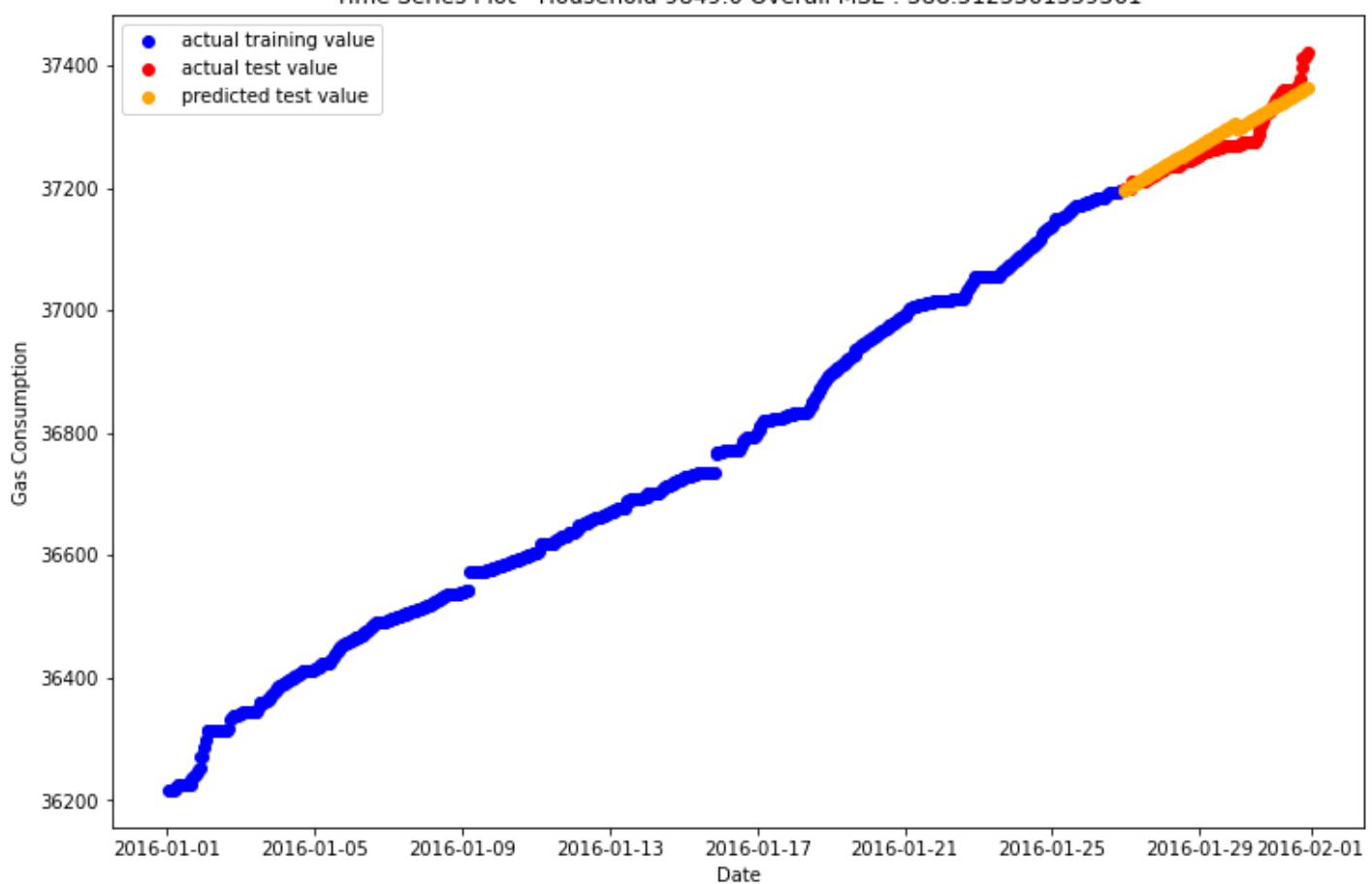
Time Series Plot - Household 9766.0 Overall MSE : 13189.273131220098



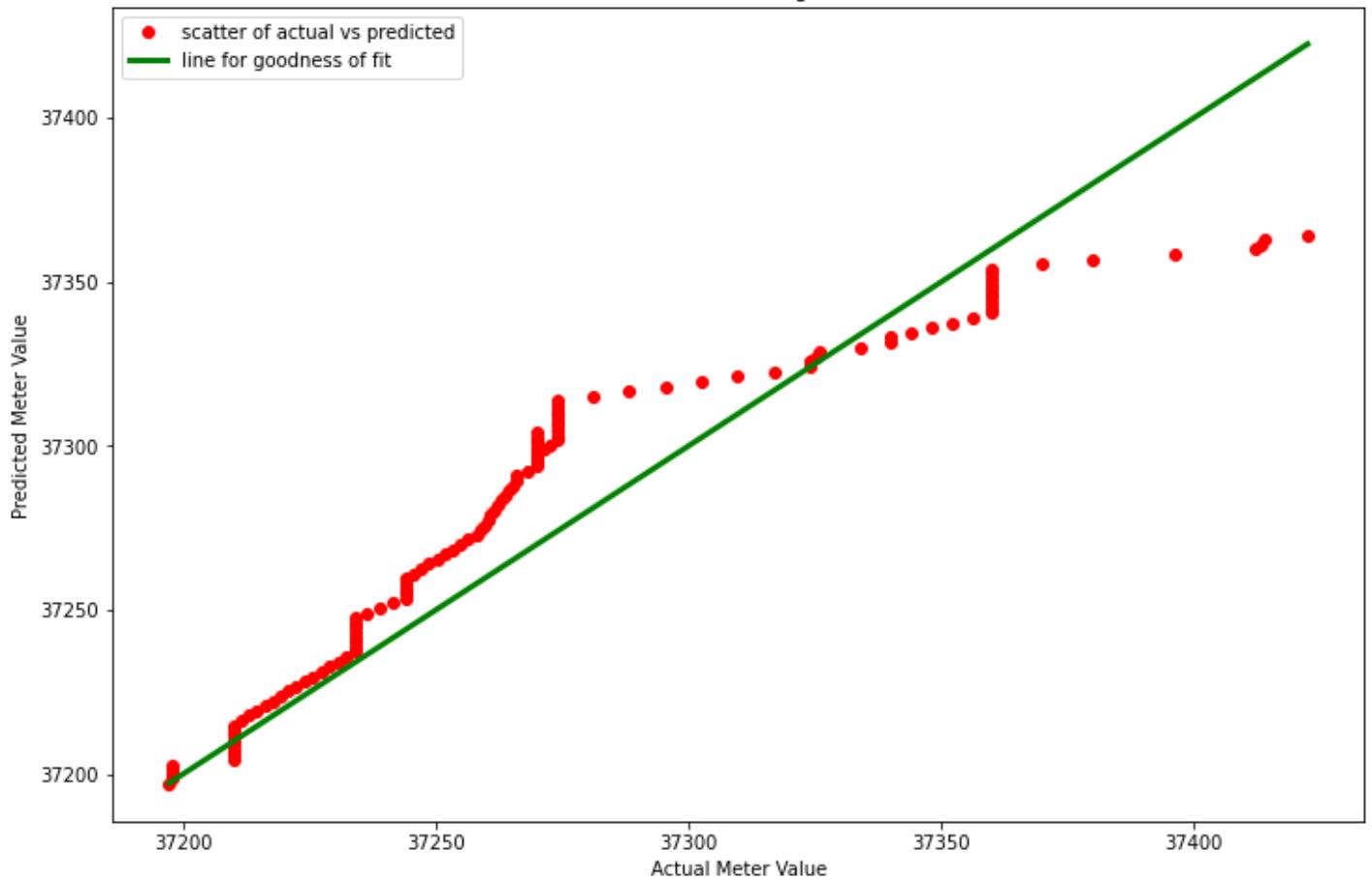
Scatter Plot - Household 9766.0 Testing MSE : 11252.429788450569



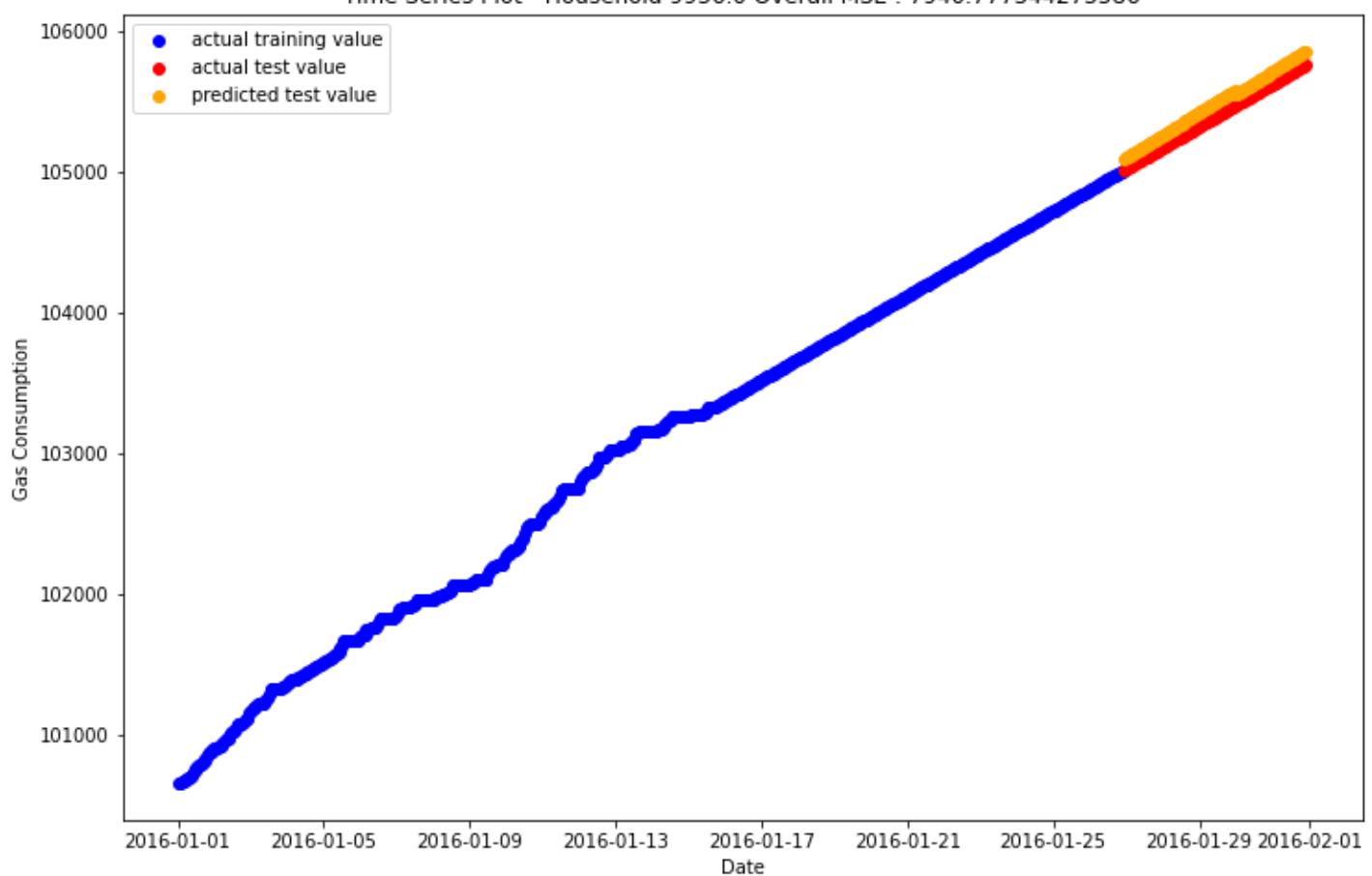
Time Series Plot - Household 9849.0 Overall MSE : 388.5125361359361



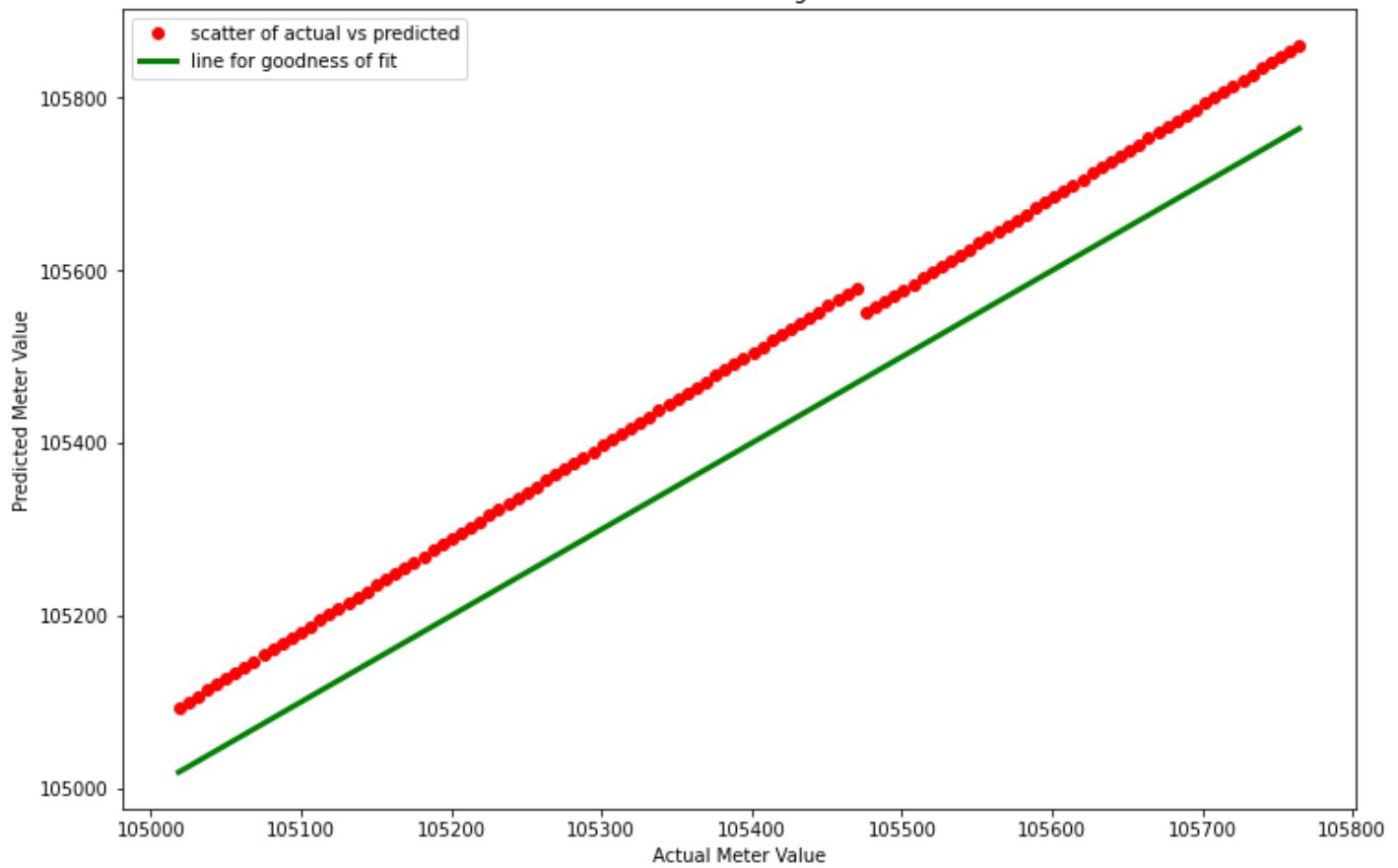
Scatter Plot - Household 9849.0 Testing MSE : 408.9855927626835

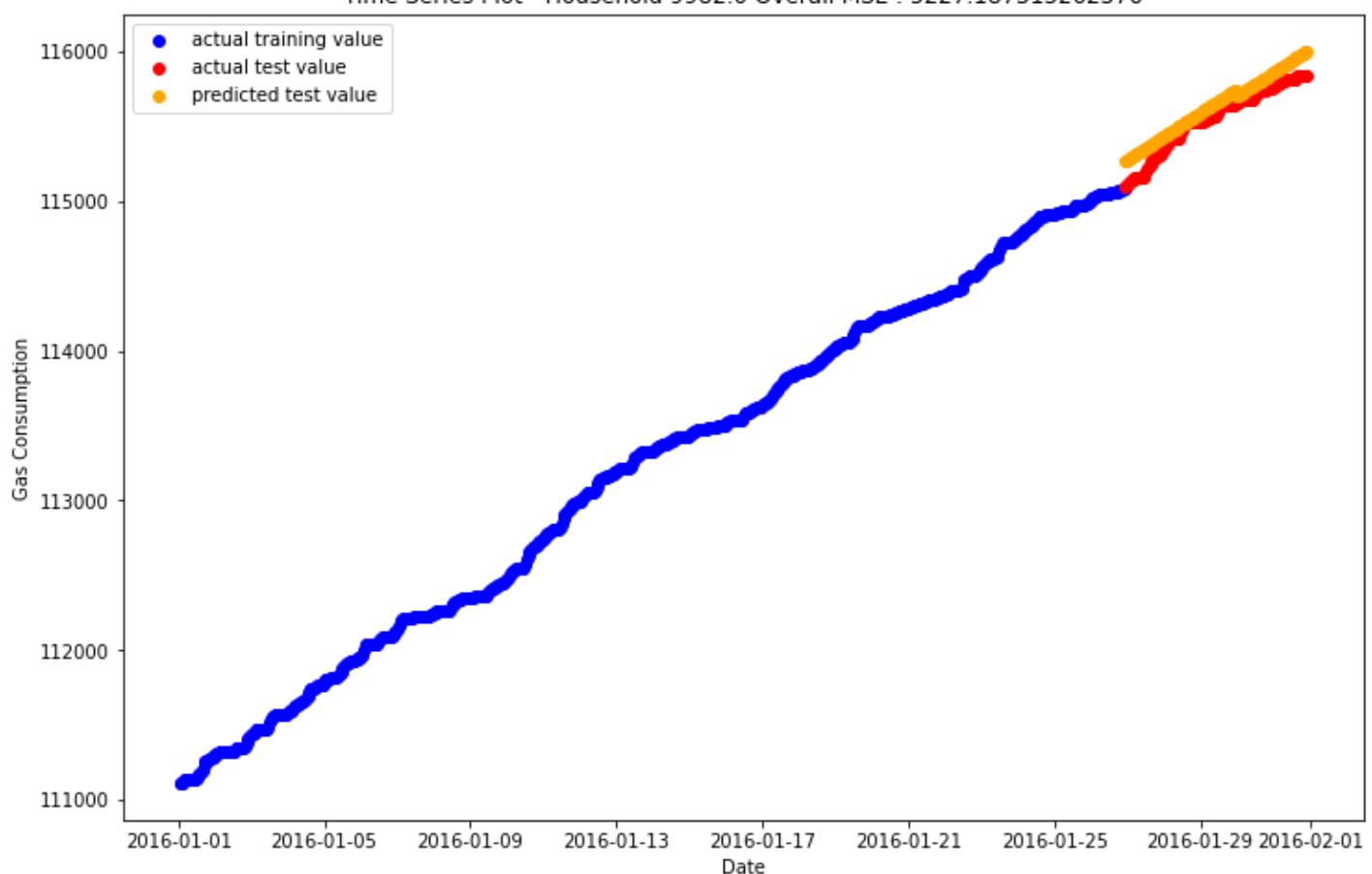


Time Series Plot - Household 9956.0 Overall MSE : 7940.777544275586

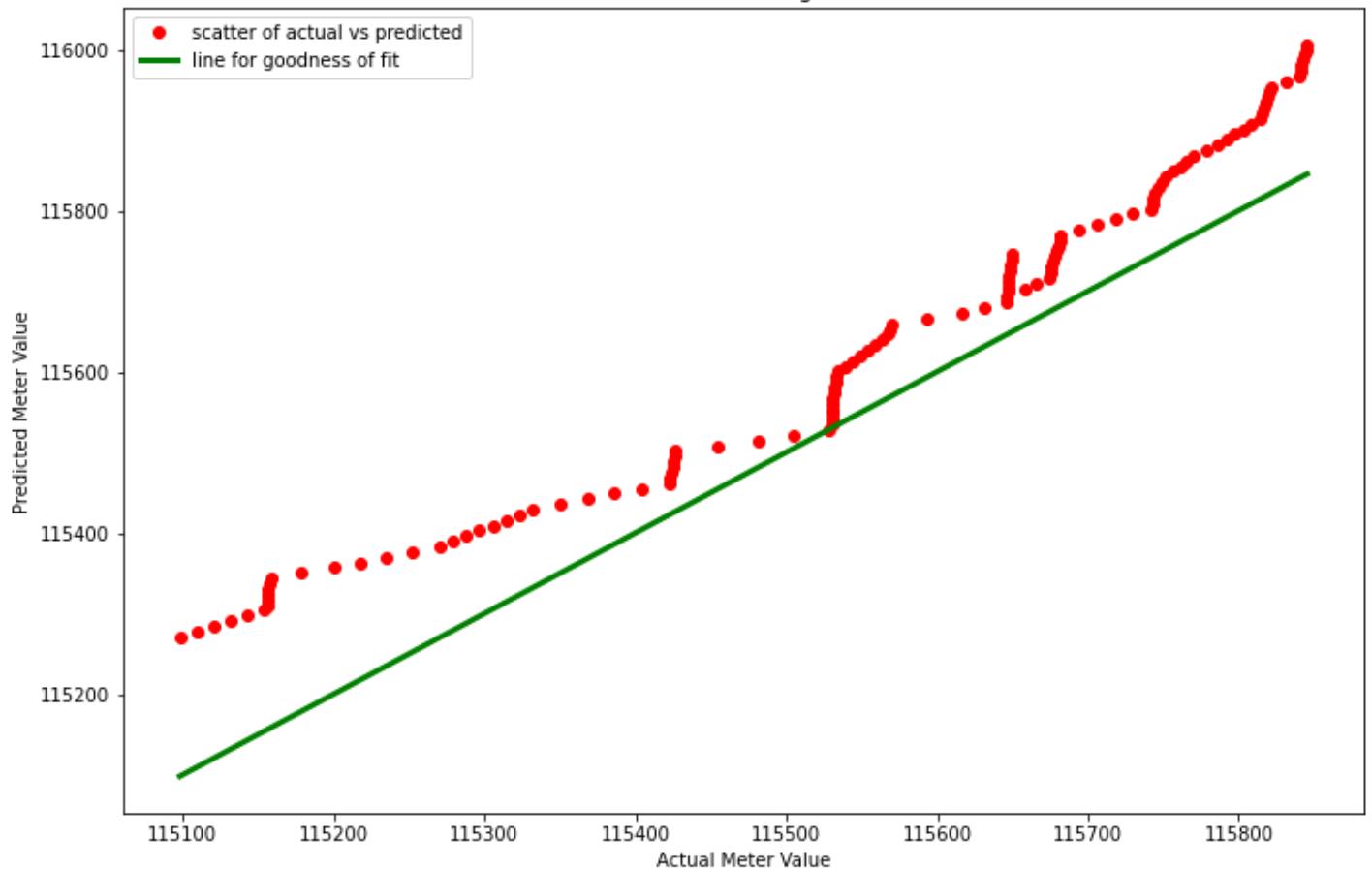


Scatter Plot - Household 9956.0 Testing MSE : 8128.734347378593





Scatter Plot - Household 9982.0 Testing MSE : 9718.988262352854

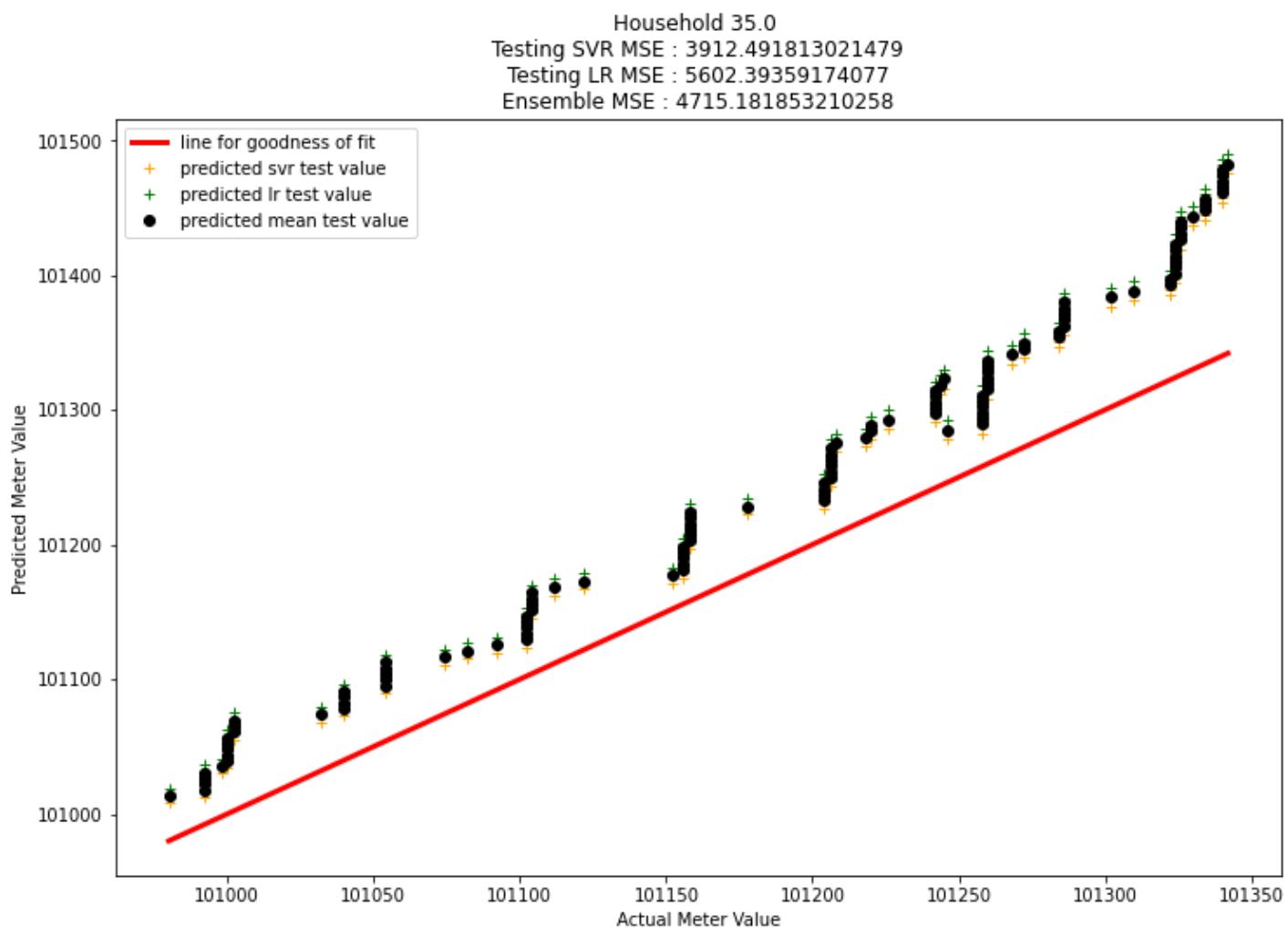


Based on the plots below, we have concluded that there is no meaningful difference between Linear Regression and Support Vector Regression. There are occasions where the LR model performs better than the SVR model and there are also occasions where the SVR model outperforms the LR model. Our team tried using an ensemble

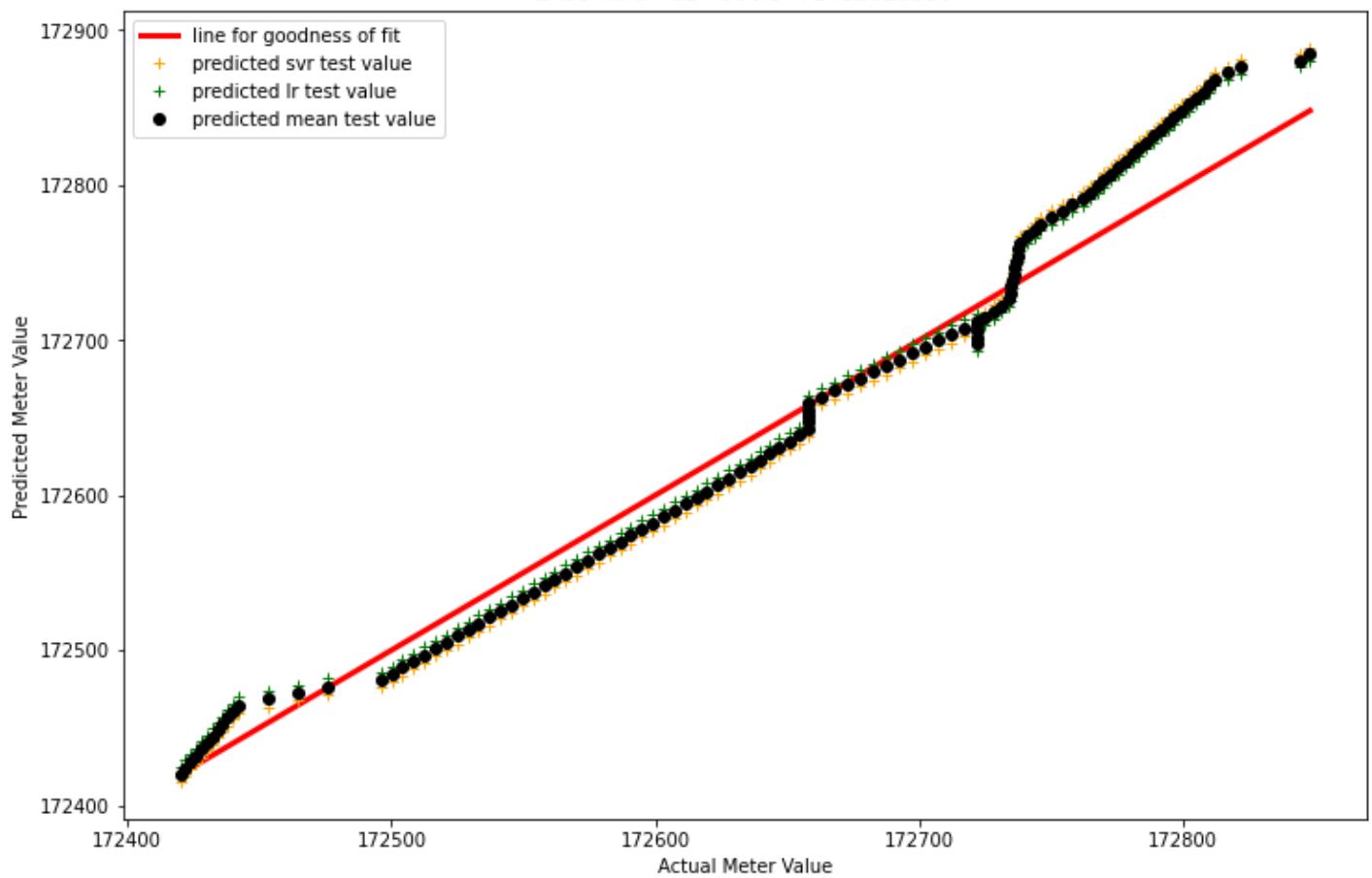
method by combining the predictions of both the LR model as well as the SVR model to get better overall performances by reducing the variation in both of them.

In [8]:

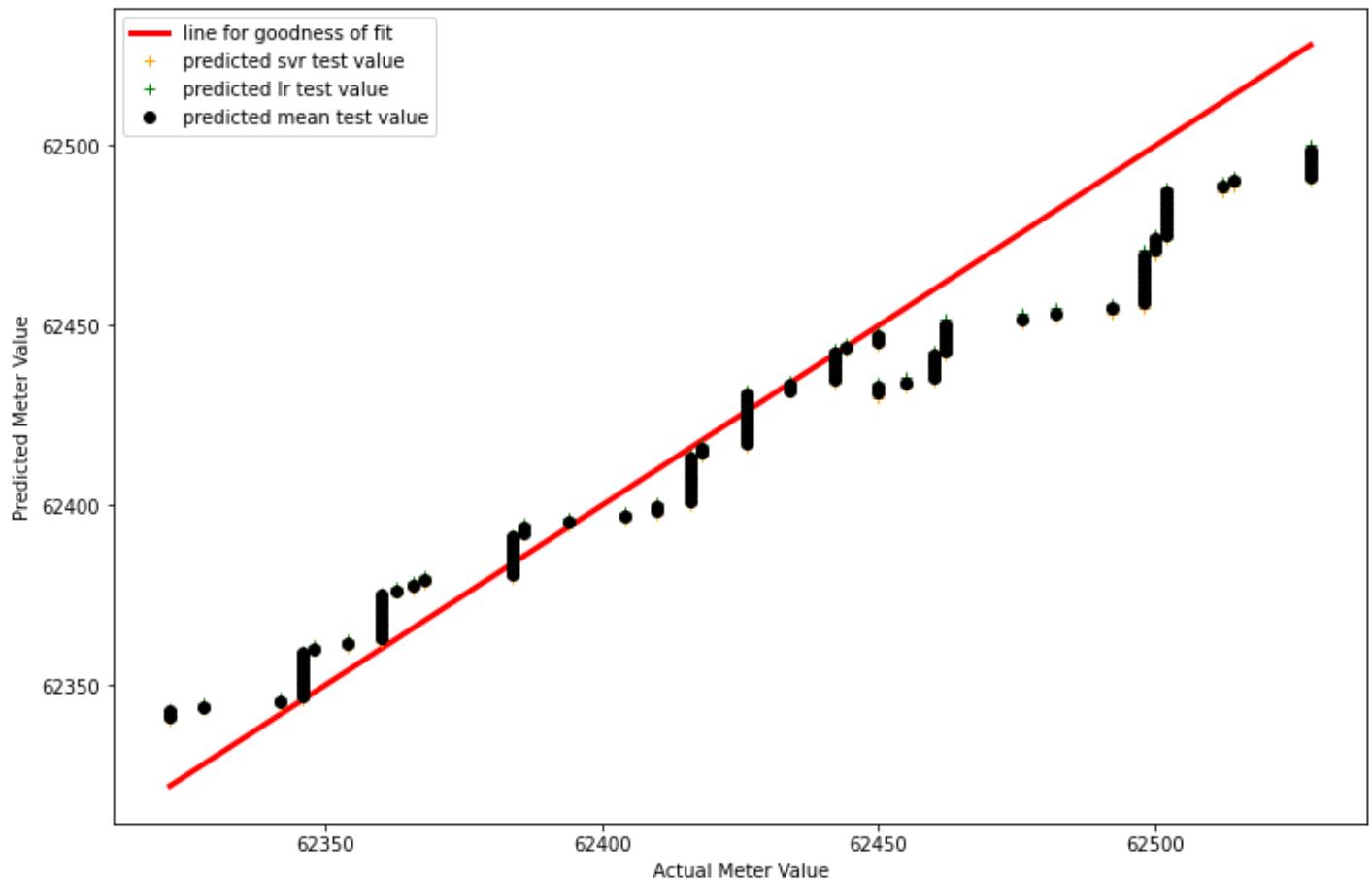
```
train_each_house("both", hours_to_predict)
```



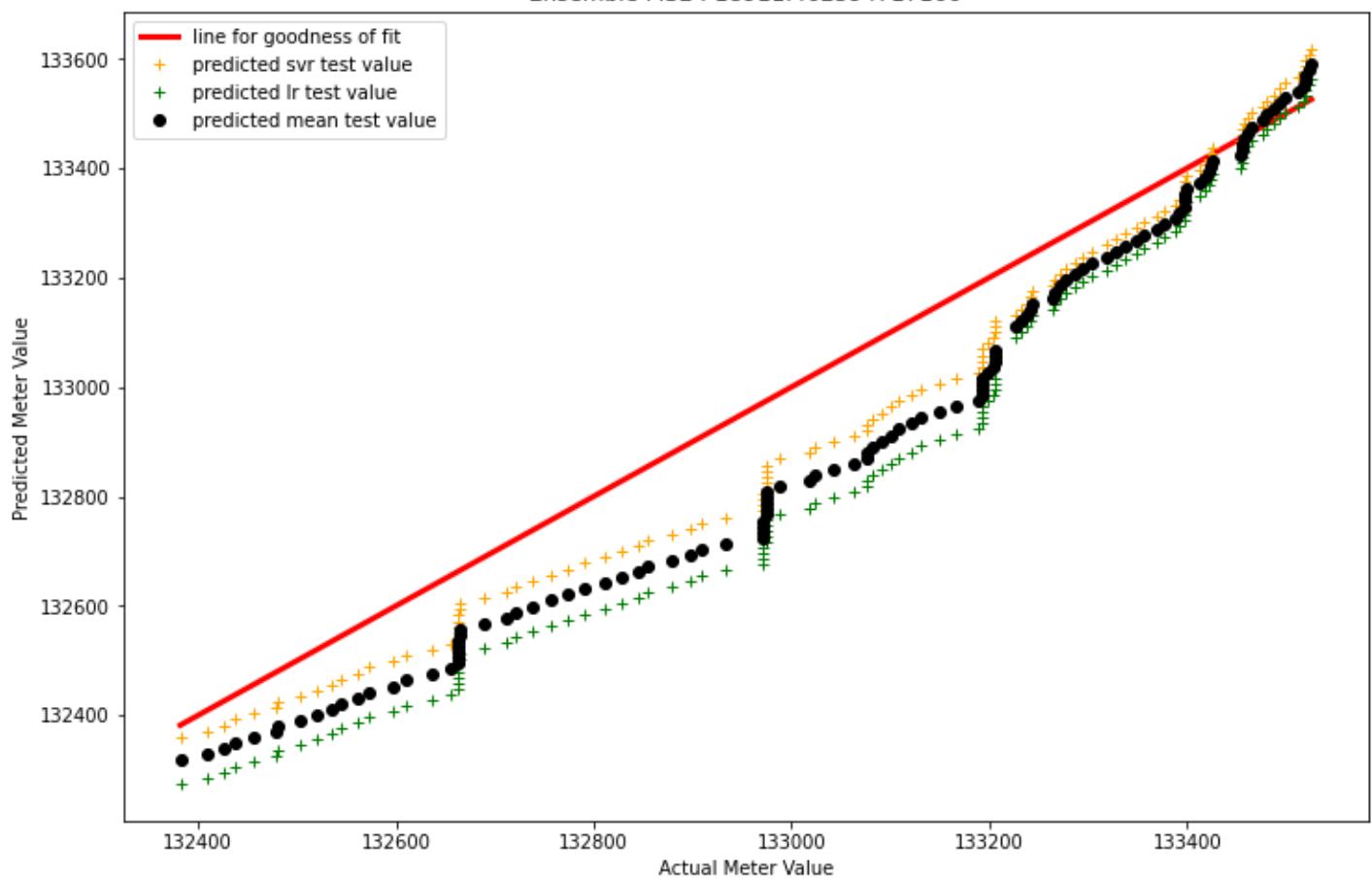
Household 44.0  
Testing SVR MSE : 732.8708660497177  
Testing LR MSE : 455.71630289896046  
Ensemble MSE : 569.5772422823558



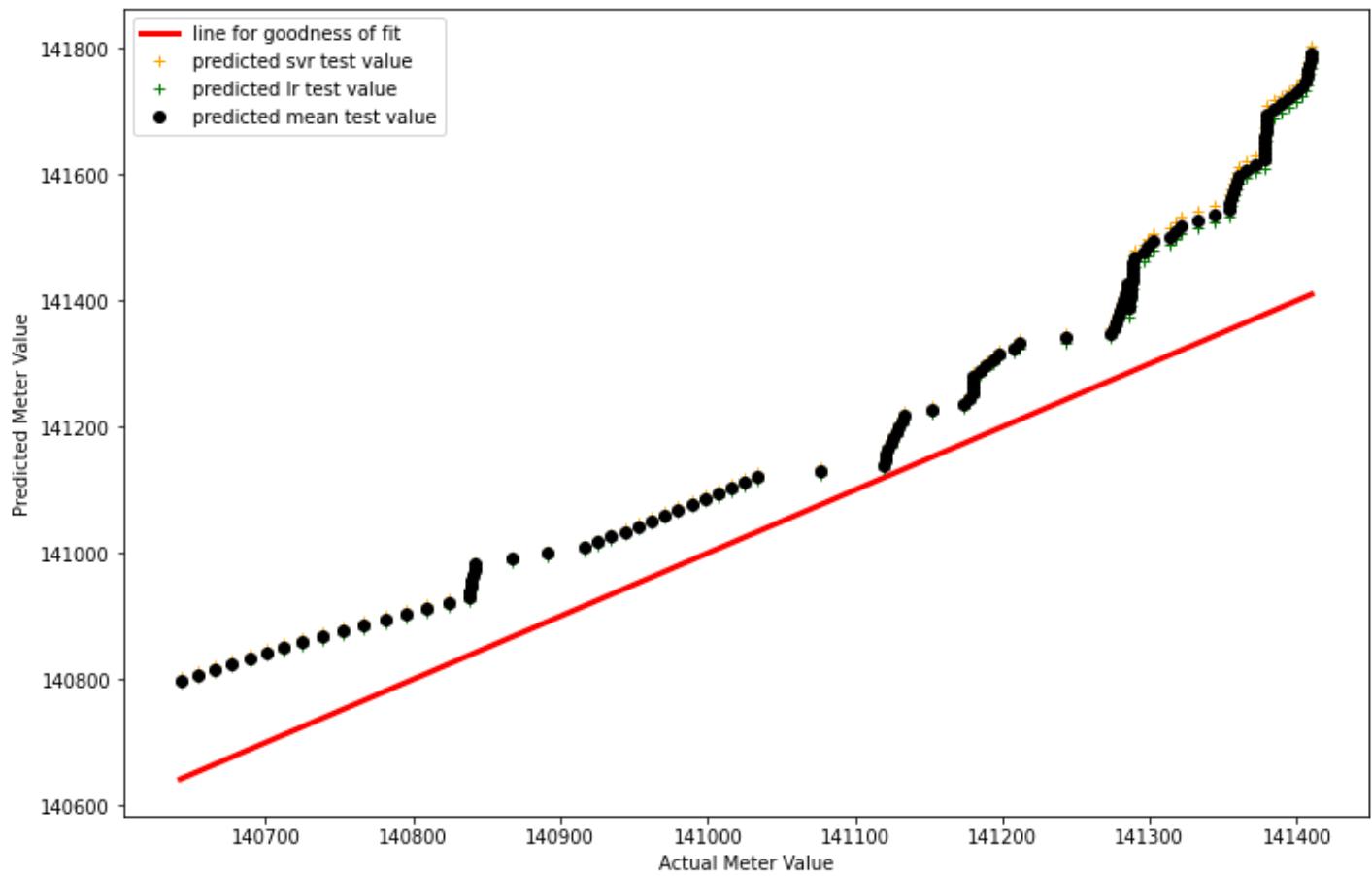
Household 77.0  
Testing SVR MSE : 348.34799264478136  
Testing LR MSE : 300.5223648043685  
Ensemble MSE : 323.22946859219724



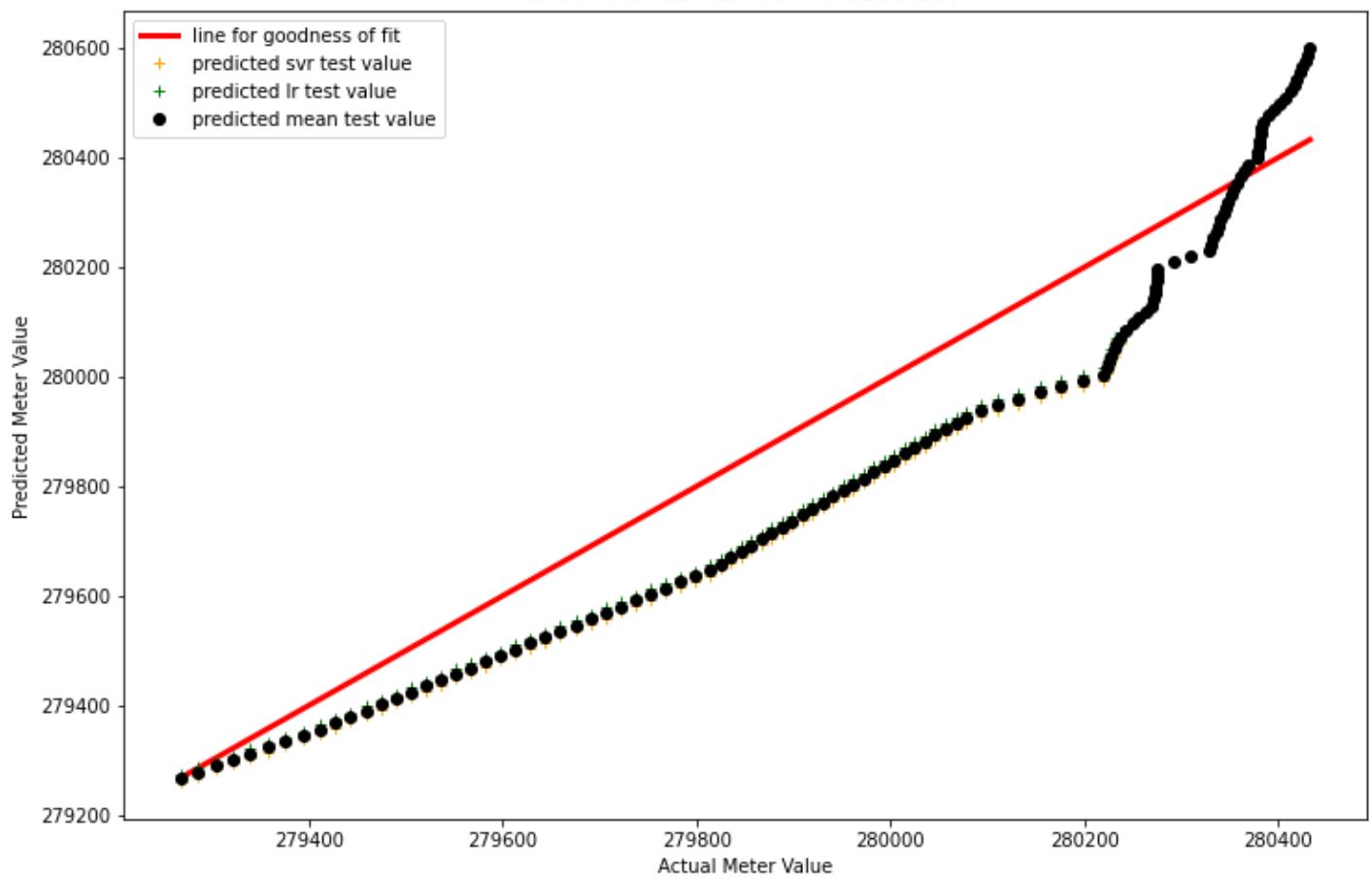
Household 94.0  
Testing SVR MSE : 10189.398449139186  
Testing LR MSE : 30929.394604396548  
Ensemble MSE : 18911.462594717166



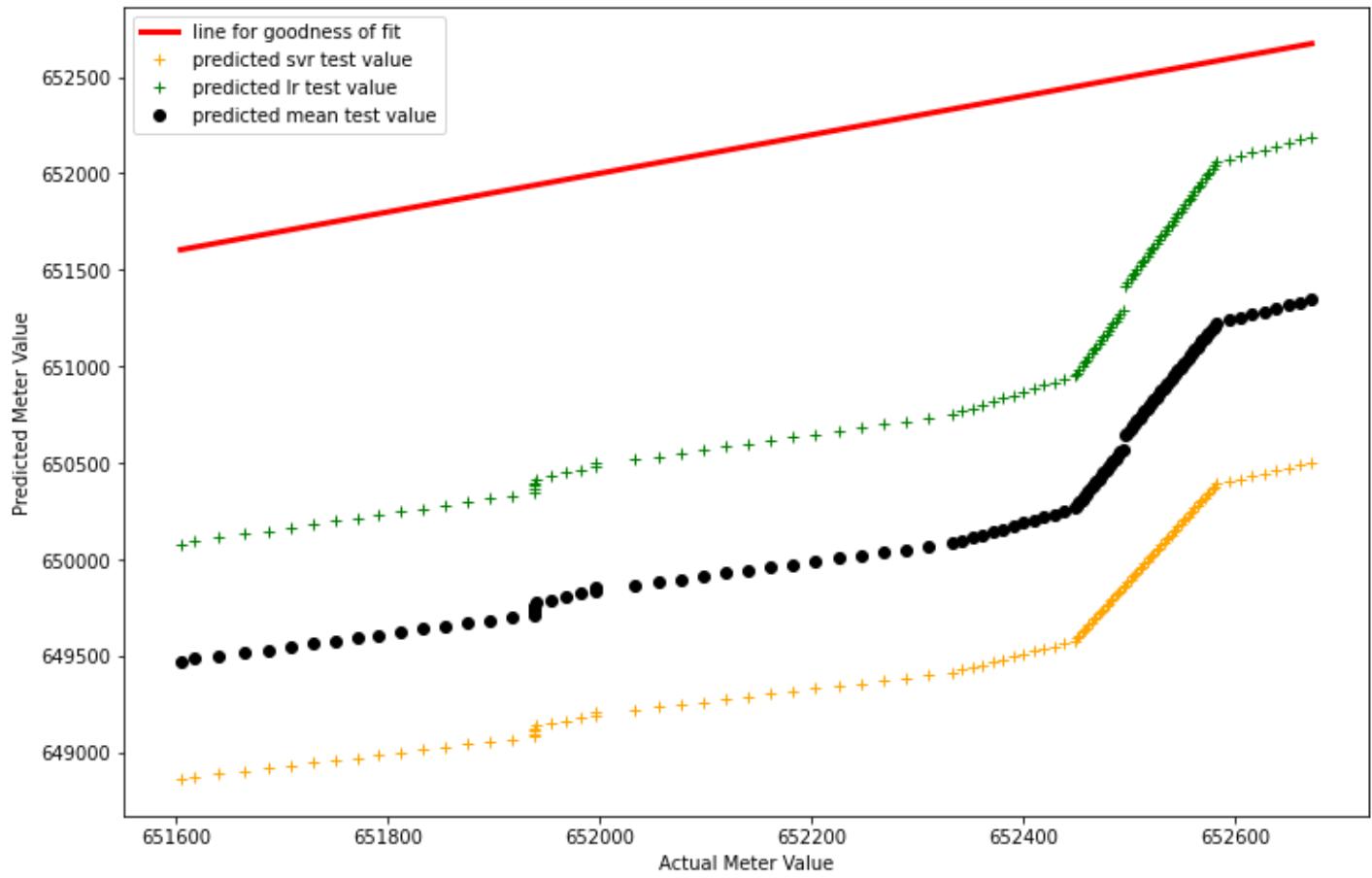
Household 114.0  
Testing SVR MSE : 34571.299311384355  
Testing LR MSE : 28190.02342239906  
Ensemble MSE : 31291.732945823034



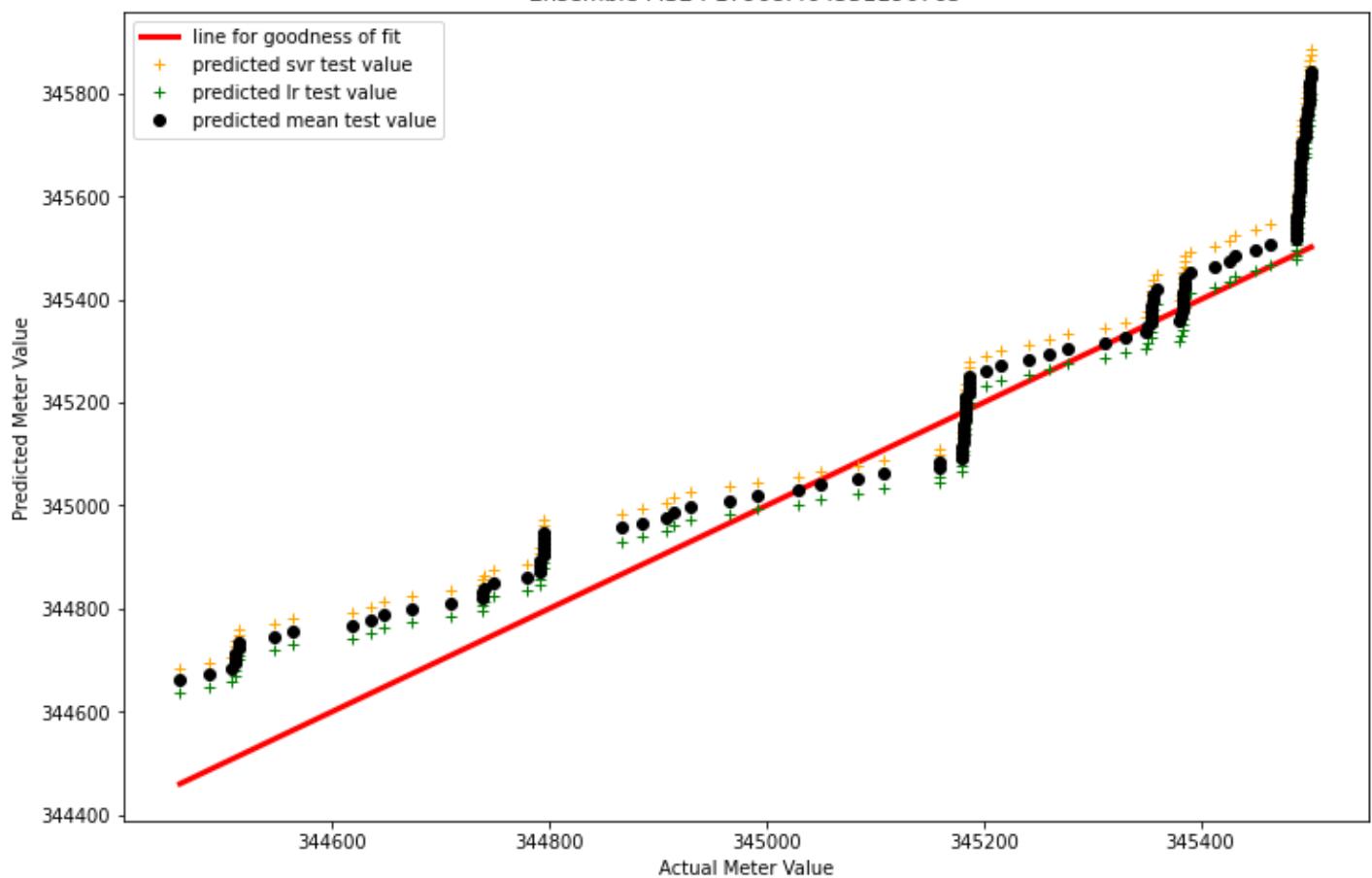
Household 187.0  
Testing SVR MSE : 17273.952872093876  
Testing LR MSE : 14350.514912108822  
Ensemble MSE : 15760.746721668309



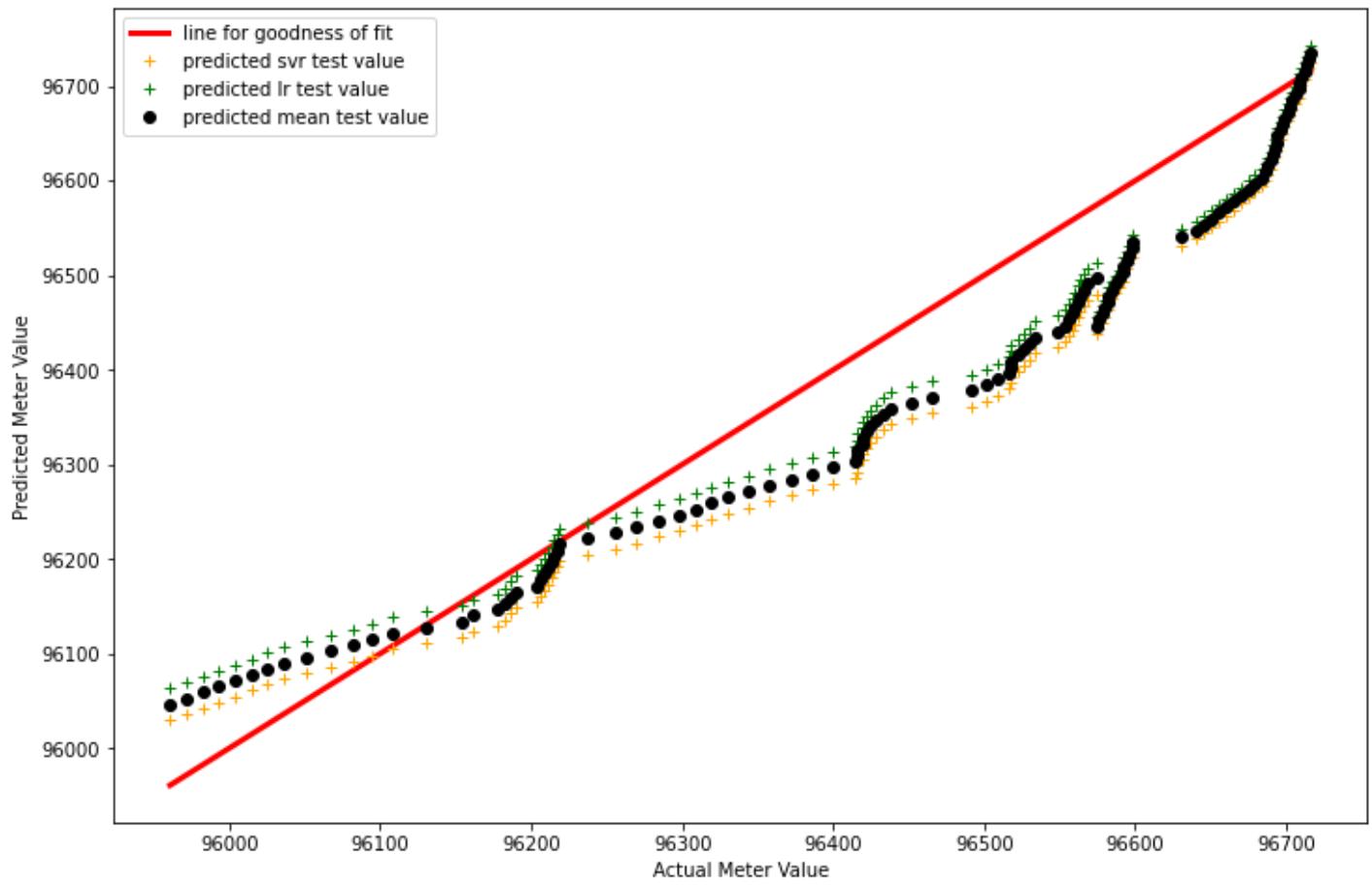
Household 222.0  
Testing SVR MSE : 7018920.97986777  
Testing LR MSE : 1586433.9371943085  
Ensemble MSE : 3778290.340997552



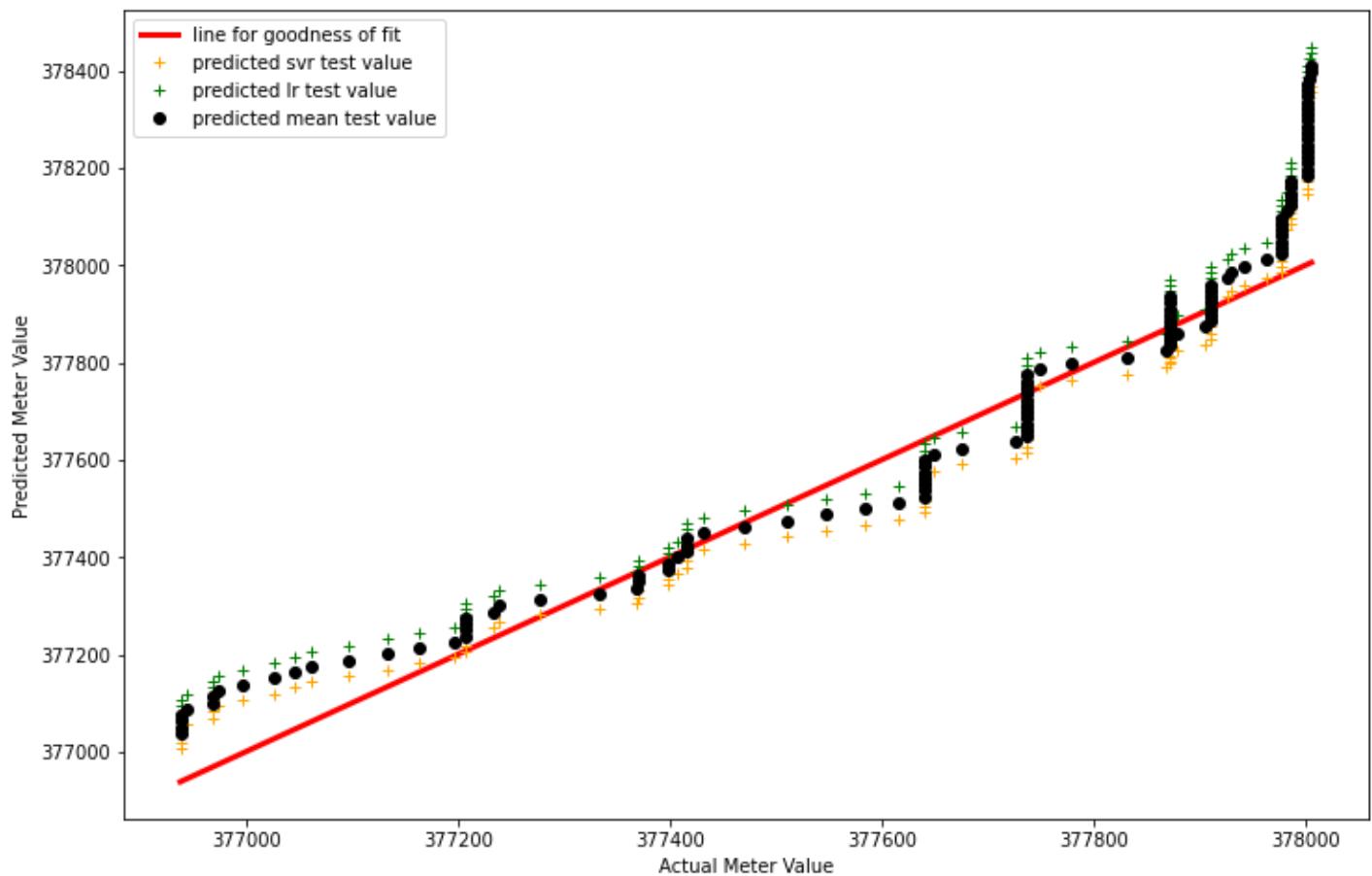
Household 252.0  
Testing SVR MSE : 25519.26093472204  
Testing LR MSE : 12652.72724415086  
Ensemble MSE : 17968.464531196765



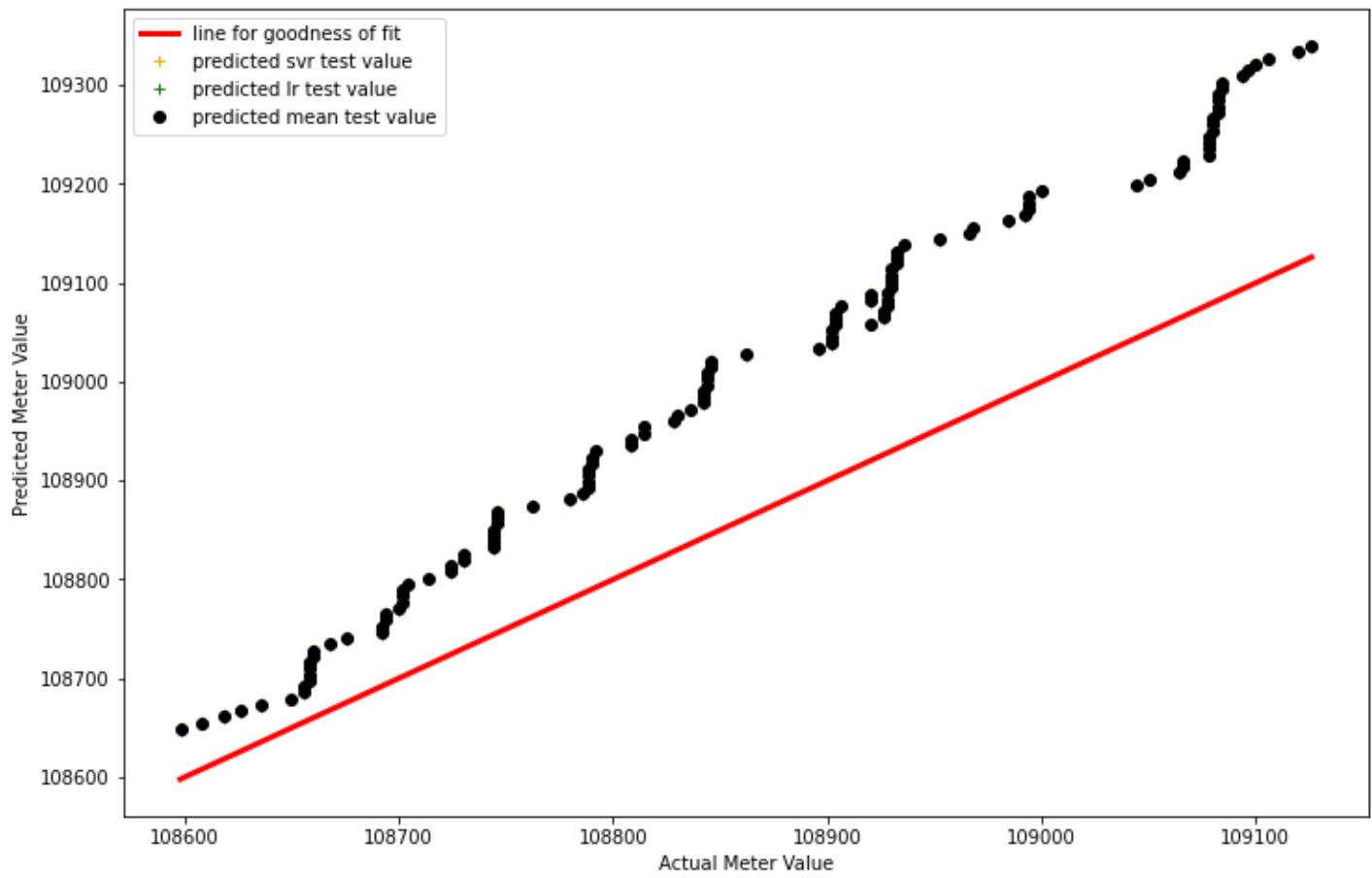
Household 370.0  
Testing SVR MSE : 7338.675067631452  
Testing LR MSE : 4469.080176838165  
Ensemble MSE : 5701.418352749779



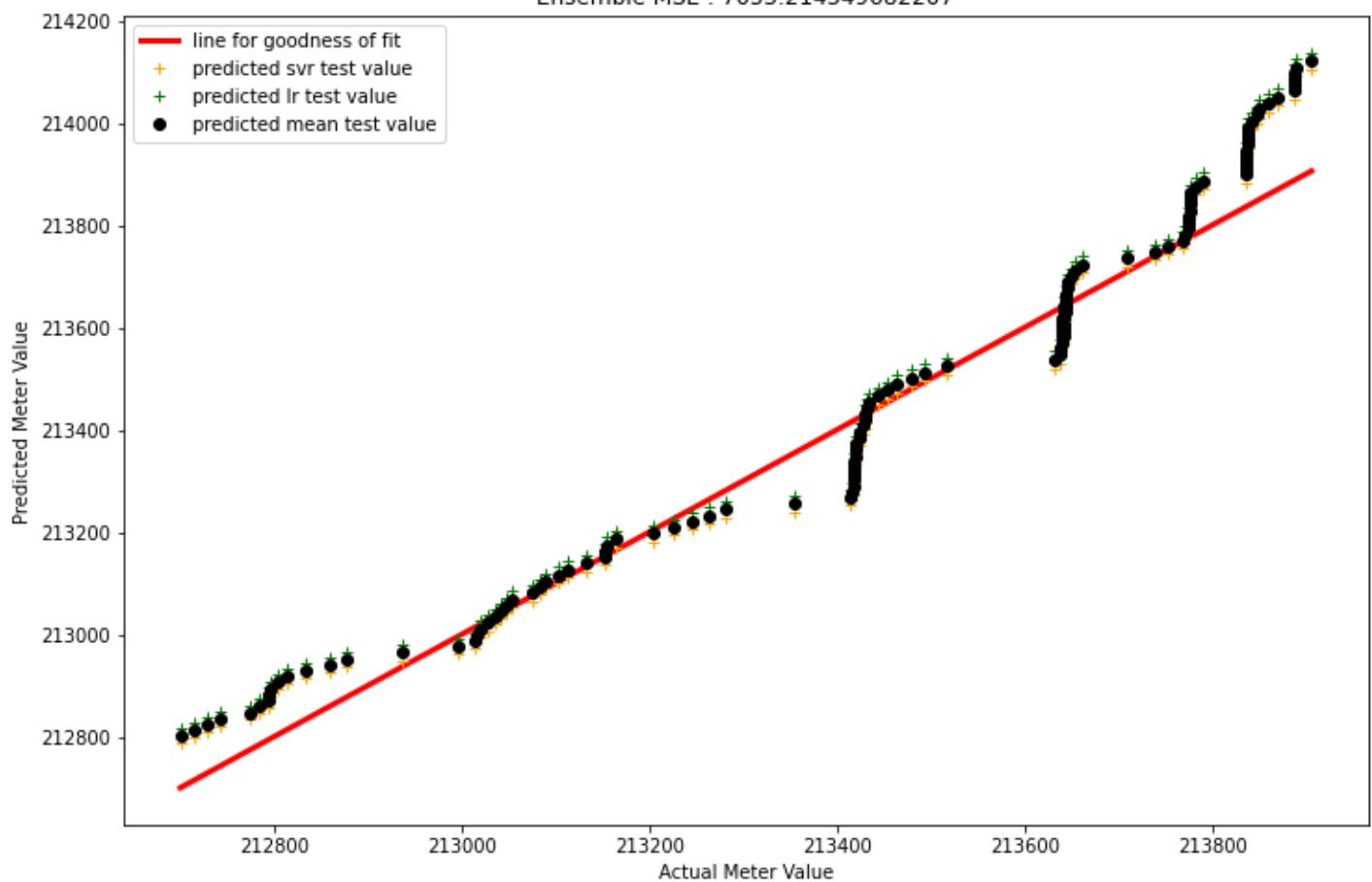
Household 483.0  
Testing SVR MSE : 15440.886492315065  
Testing LR MSE : 25835.561760445366  
Ensemble MSE : 19400.398880381086



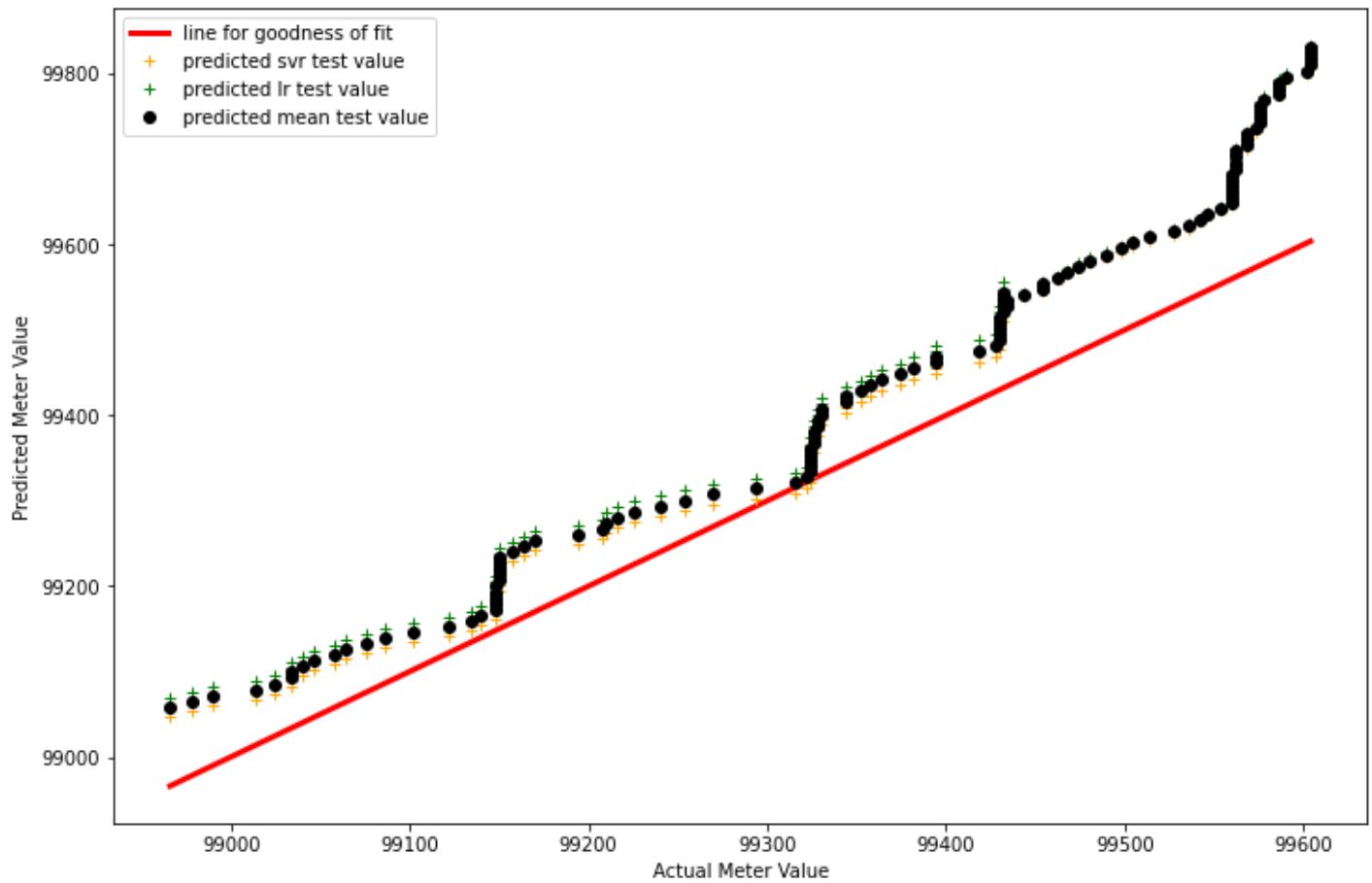
Household 484.0  
Testing SVR MSE : 21257.9554898404  
Testing LR MSE : 20619.607839244432  
Ensemble MSE : 20937.102599964517



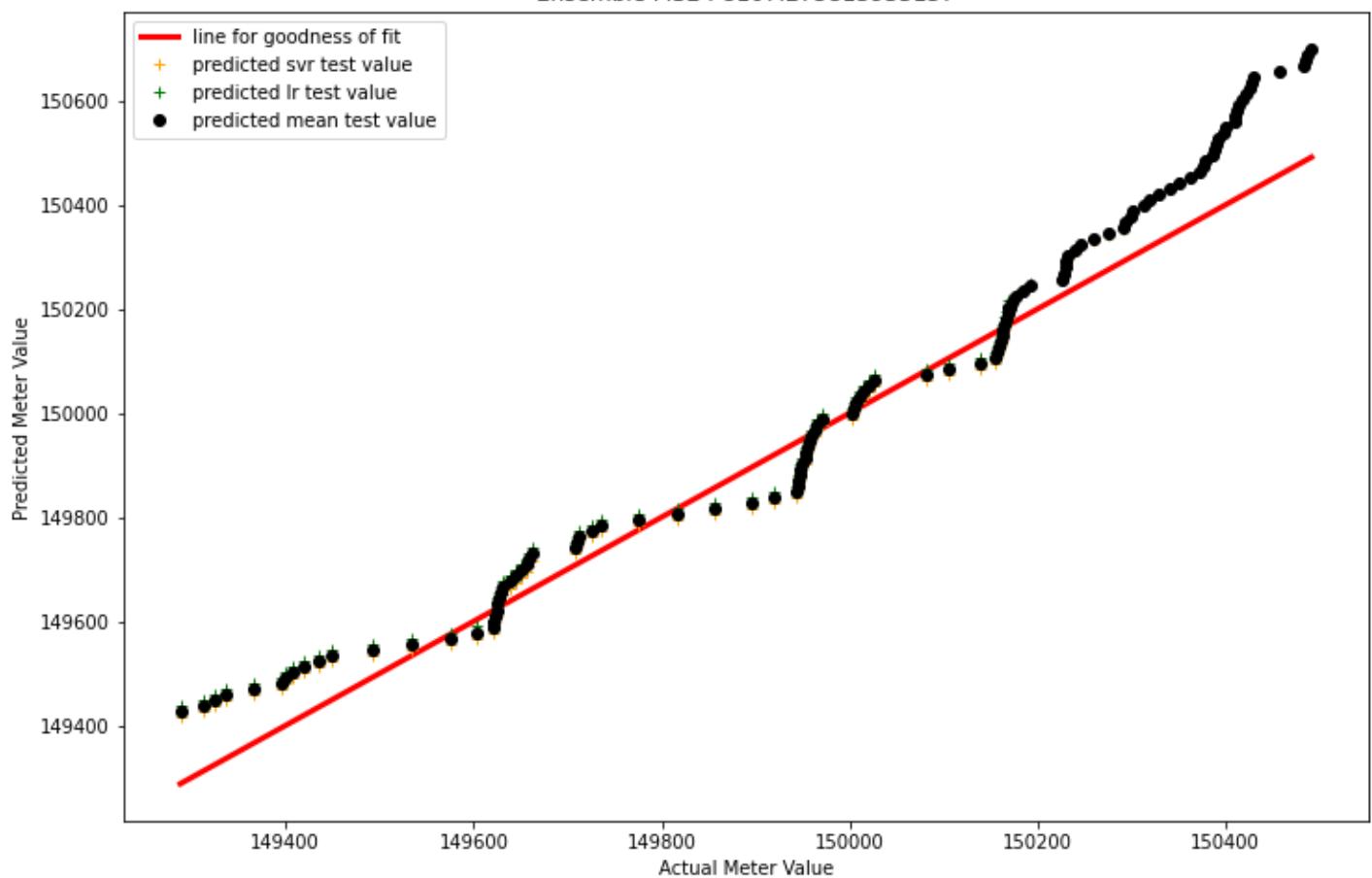
Household 661.0  
Testing SVR MSE : 6386.310223648567  
Testing LR MSE : 8237.854642050115  
Ensemble MSE : 7055.214549682207



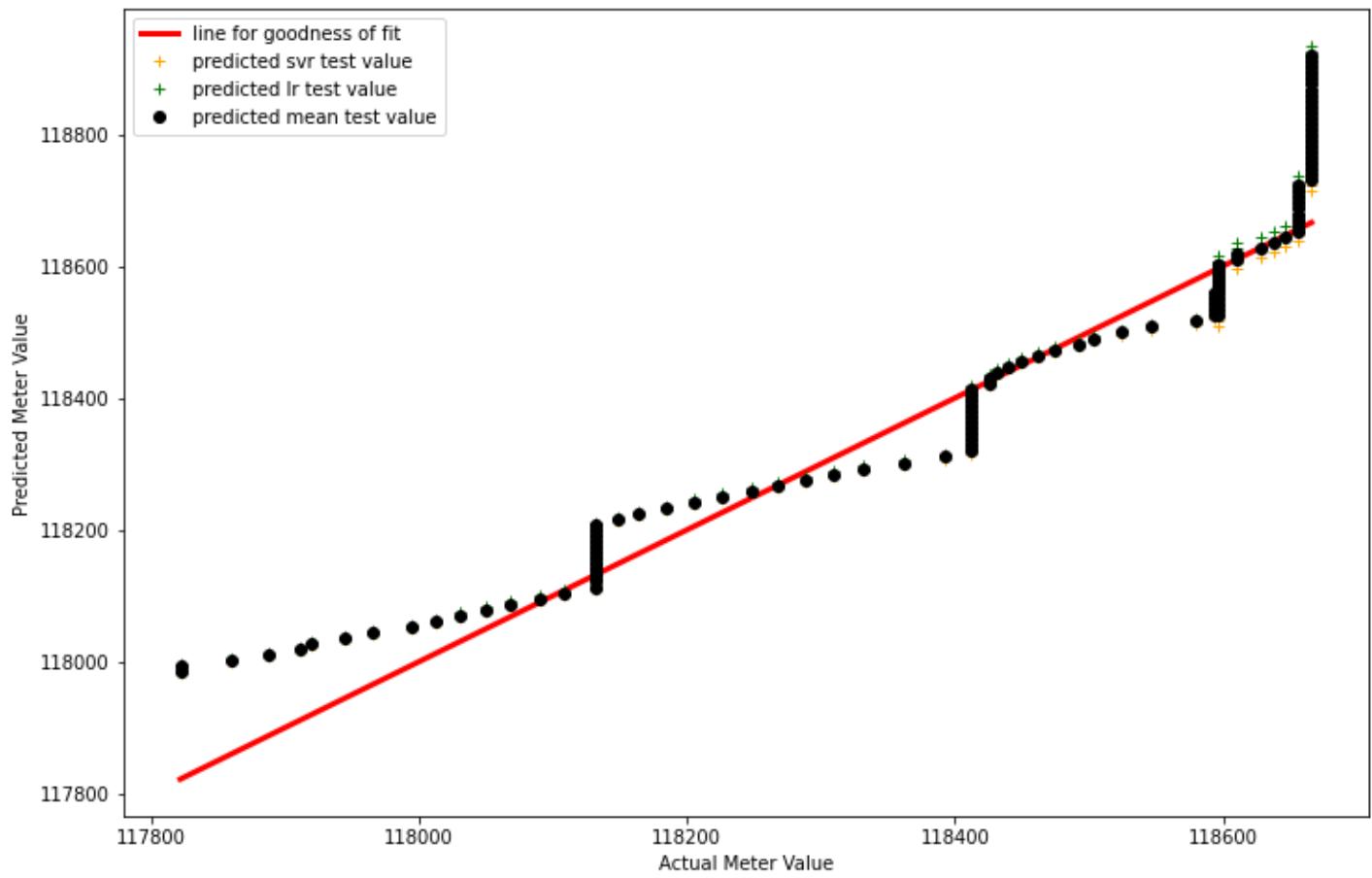
Household 739.0  
Testing SVR MSE : 9433.011608606837  
Testing LR MSE : 11816.891324180155  
Ensemble MSE : 10536.470433305418



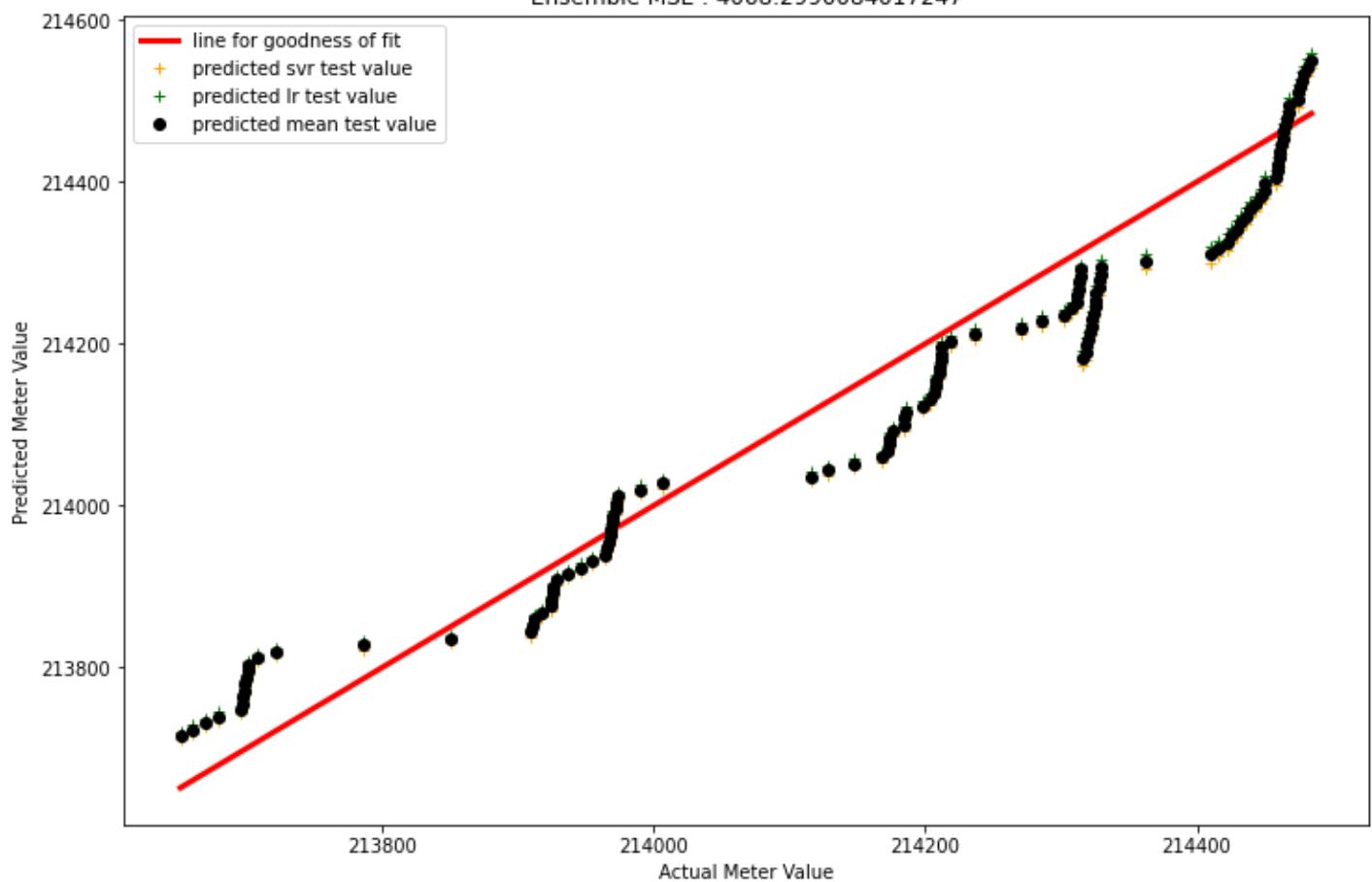
Household 744.0  
Testing SVR MSE : 7936.136552088397  
Testing LR MSE : 8434.288323235643  
Ensemble MSE : 8107.275813933157



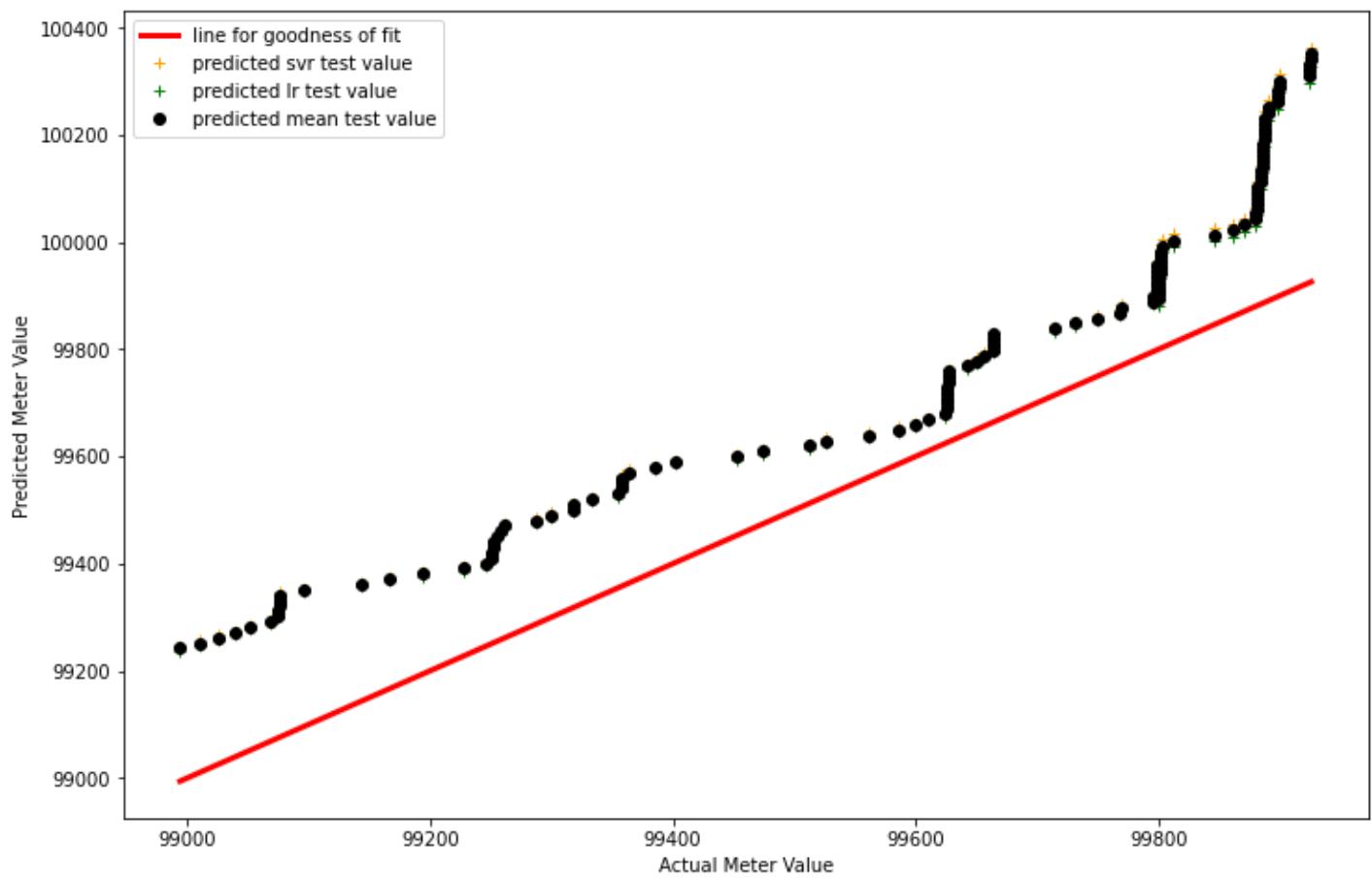
Household 871.0  
Testing SVR MSE : 6865.72290852096  
Testing LR MSE : 8792.470073427667  
Ensemble MSE : 7727.5873607162175



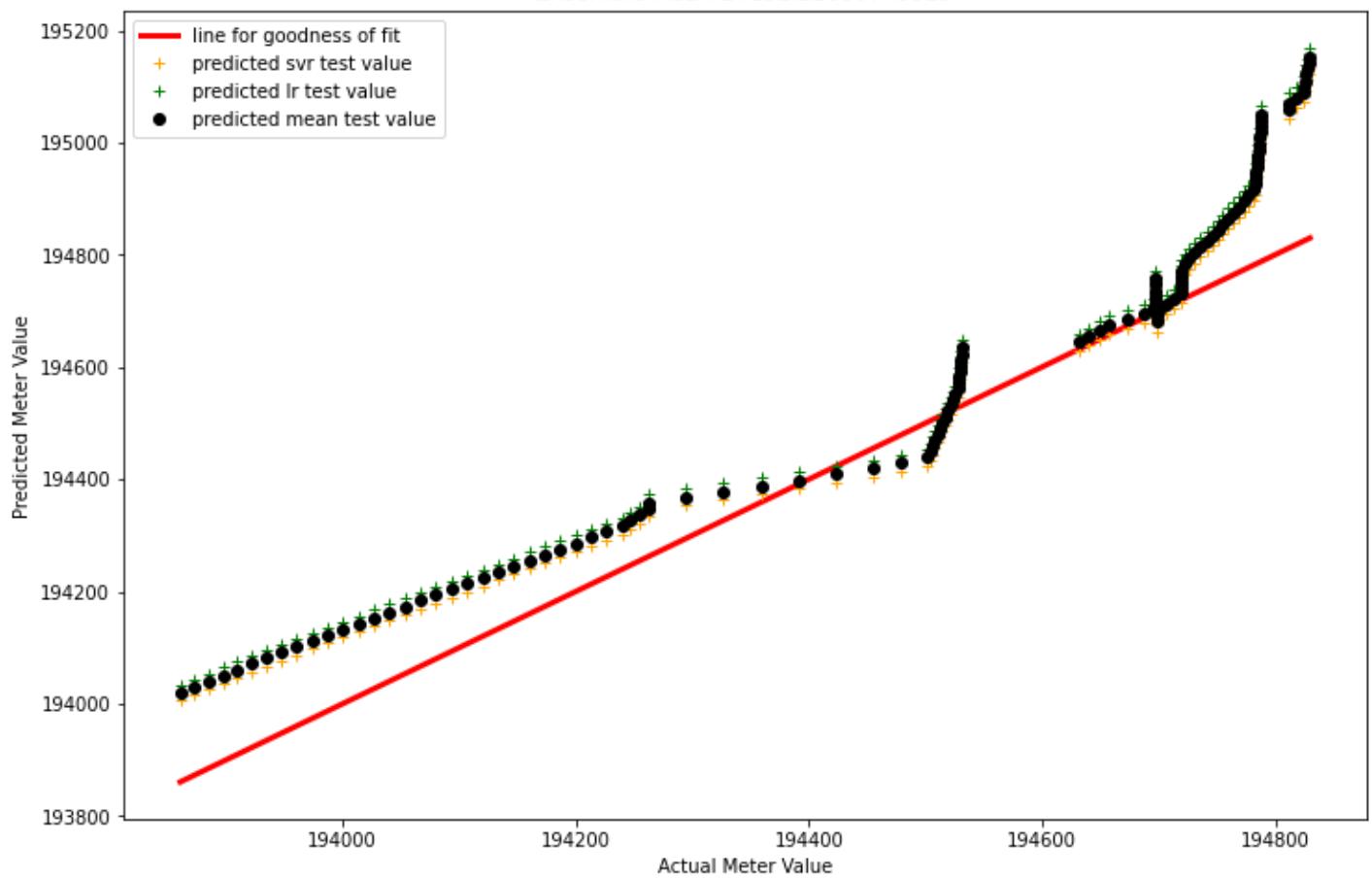
Household 1042.0  
Testing SVR MSE : 4589.1038326615535  
Testing LR MSE : 3658.421091054774  
Ensemble MSE : 4068.2990084017247



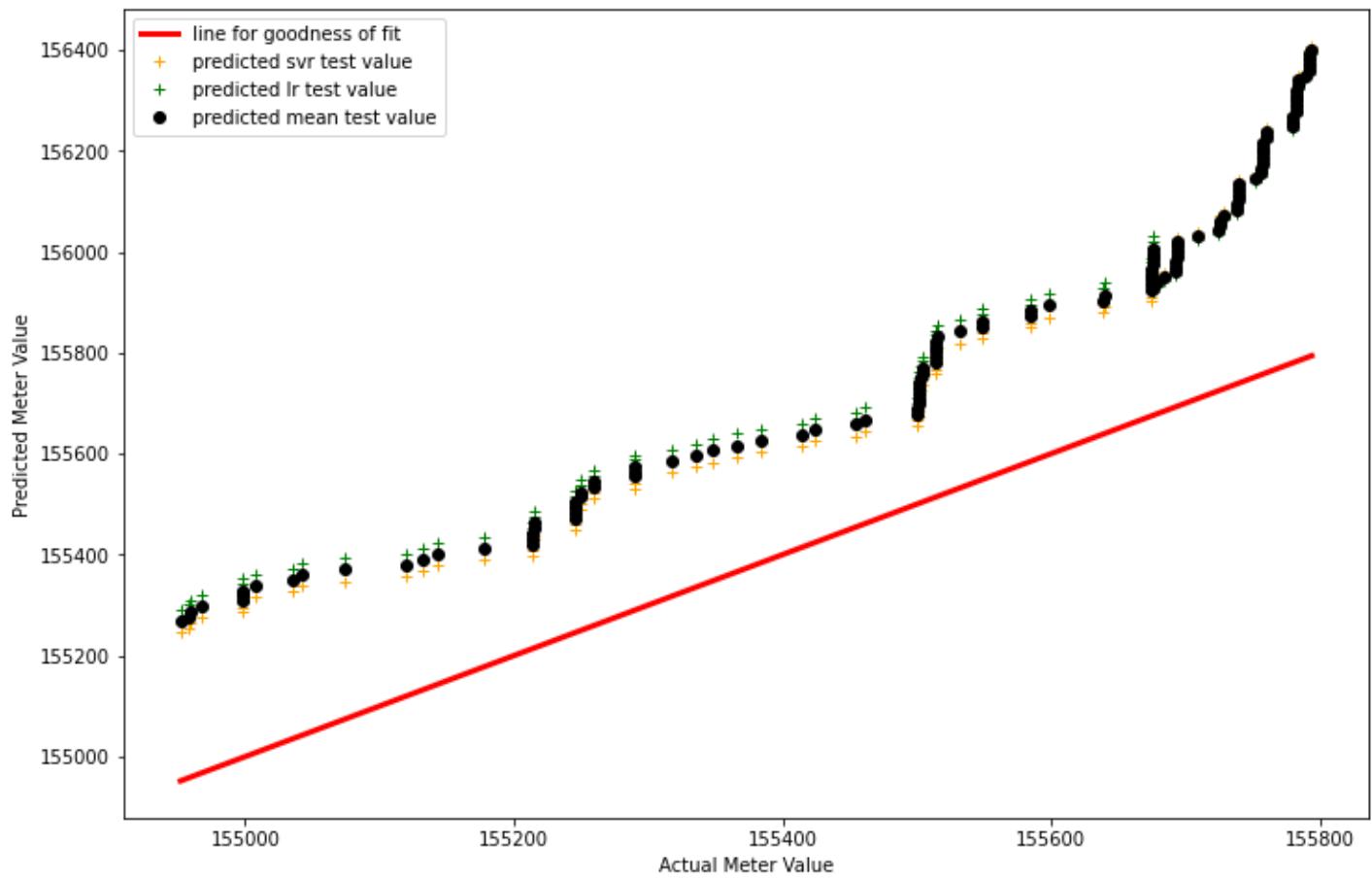
Household 1086.0  
Testing SVR MSE : 49785.21045899714  
Testing LR MSE : 43030.65162630437  
Ensemble MSE : 46334.31708198415



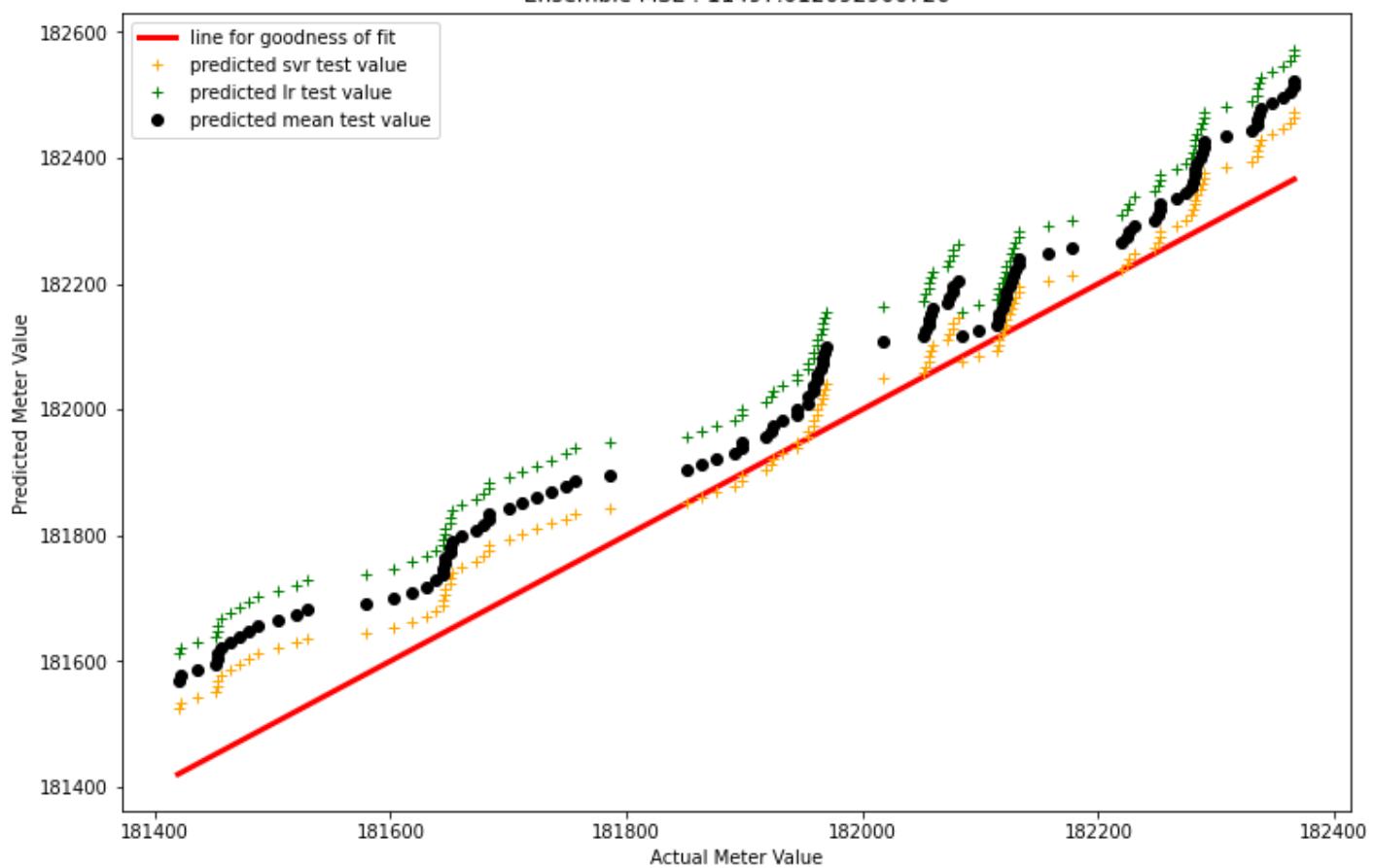
Household 1103.0  
Testing SVR MSE : 14216.914737306353  
Testing LR MSE : 20602.415714704697  
Ensemble MSE : 17152.21090749325



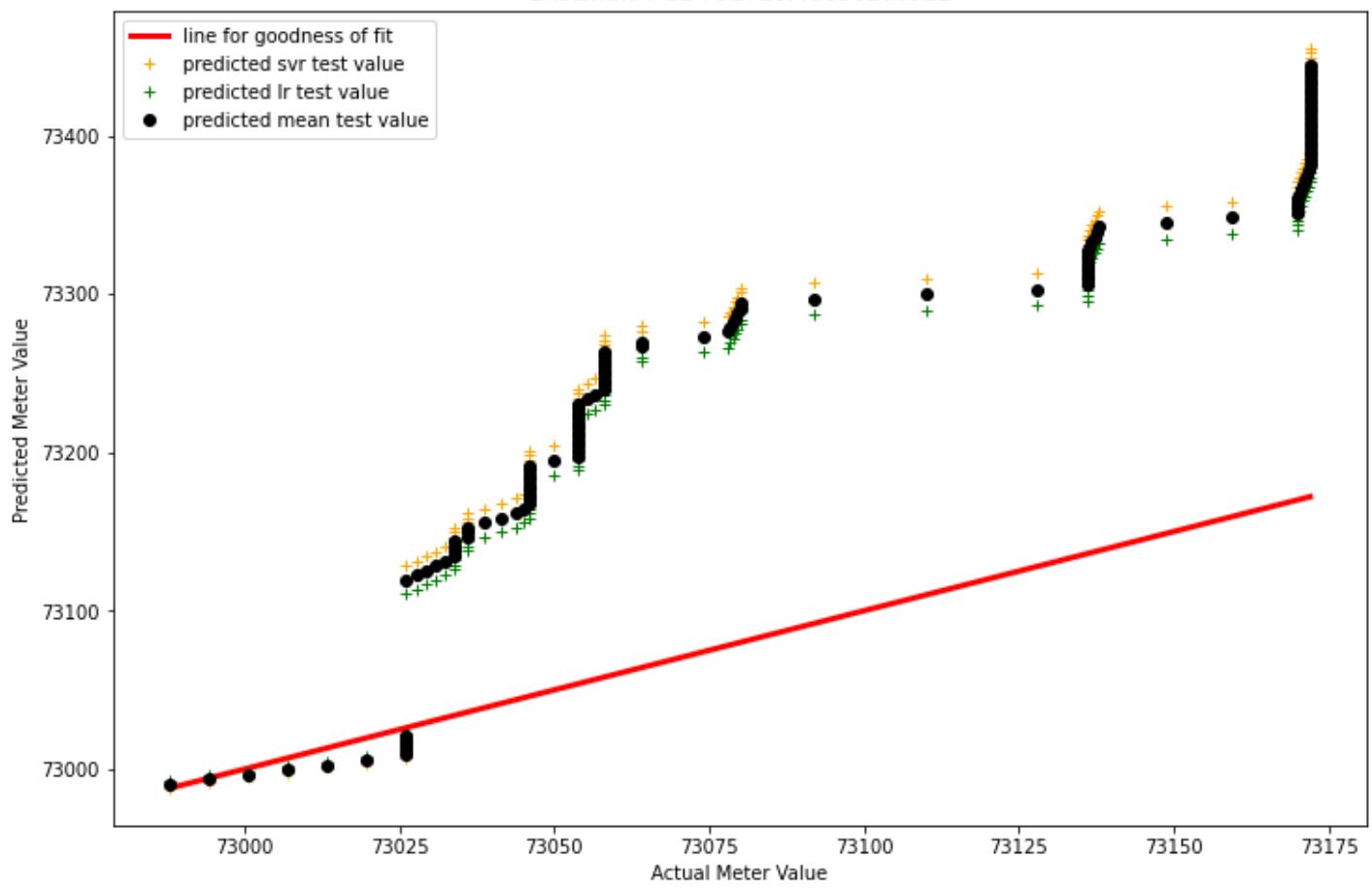
Household 1185.0  
Testing SVR MSE : 113060.57526864576  
Testing LR MSE : 123264.45541013418  
Ensemble MSE : 117818.6432346001



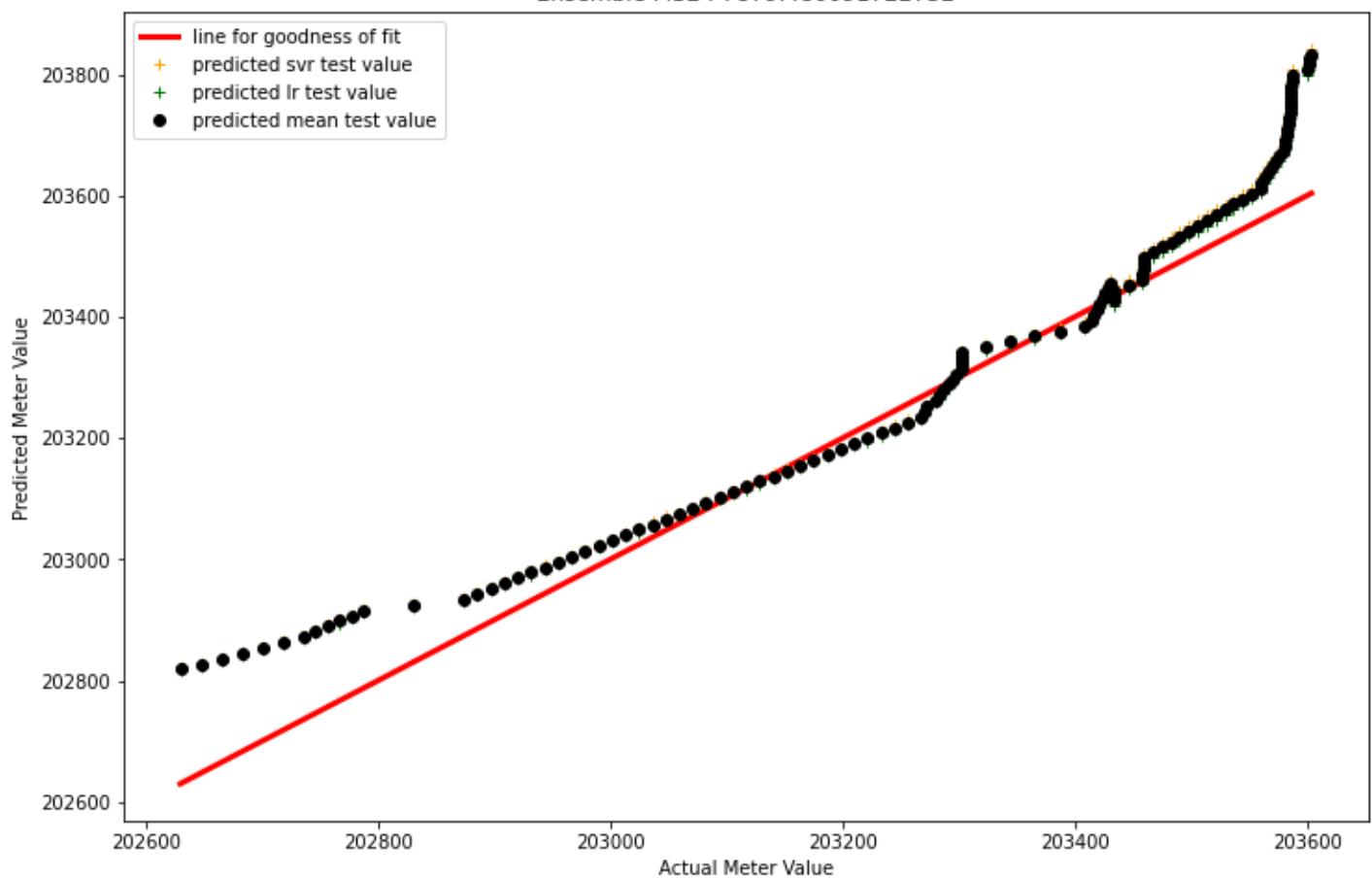
Household 1283.0  
Testing SVR MSE : 4118.802249915045  
Testing LR MSE : 23733.83266757421  
Ensemble MSE : 11497.012092900726



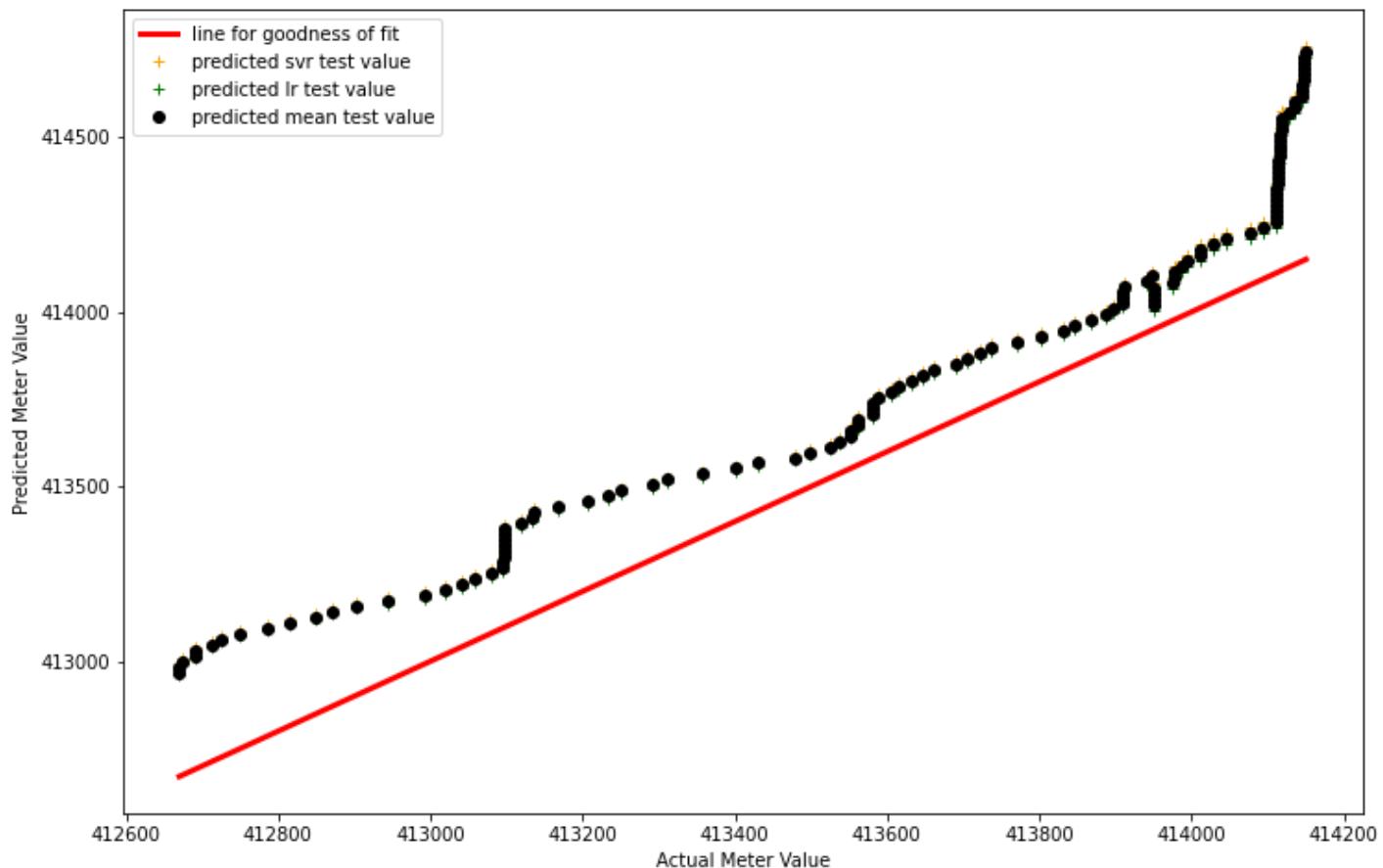
Household 1403.0  
Testing SVR MSE : 35117.183848459346  
Testing LR MSE : 28483.540165646  
Ensemble MSE : 31710.46836206911



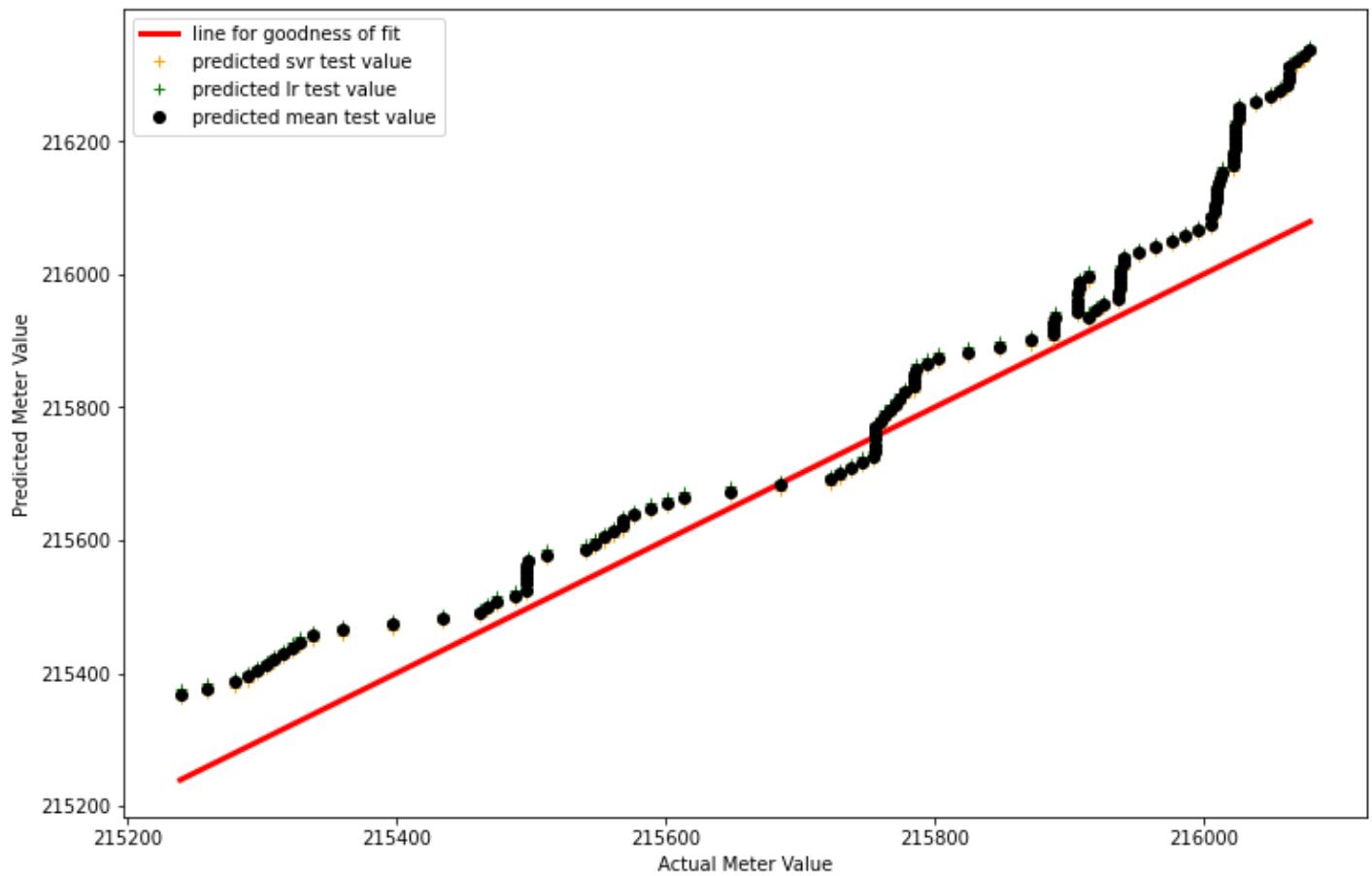
Household 1415.0  
Testing SVR MSE : 8661.478231311301  
Testing LR MSE : 7169.962653859719  
Ensemble MSE : 7879.480091722732



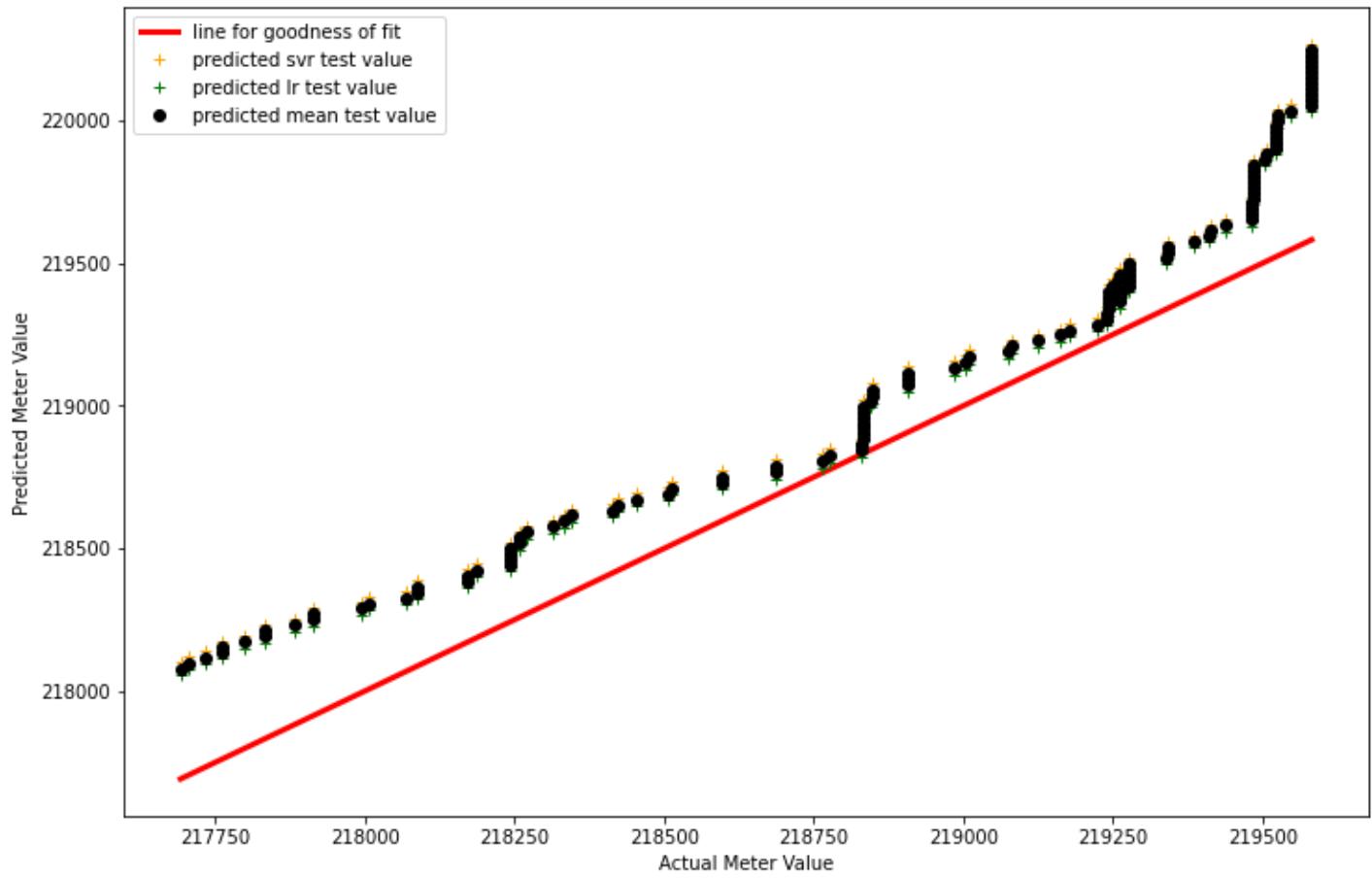
Household 1507.0  
Testing SVR MSE : 77299.09473900919  
Testing LR MSE : 65143.993020567454  
Ensemble MSE : 71062.06889401261



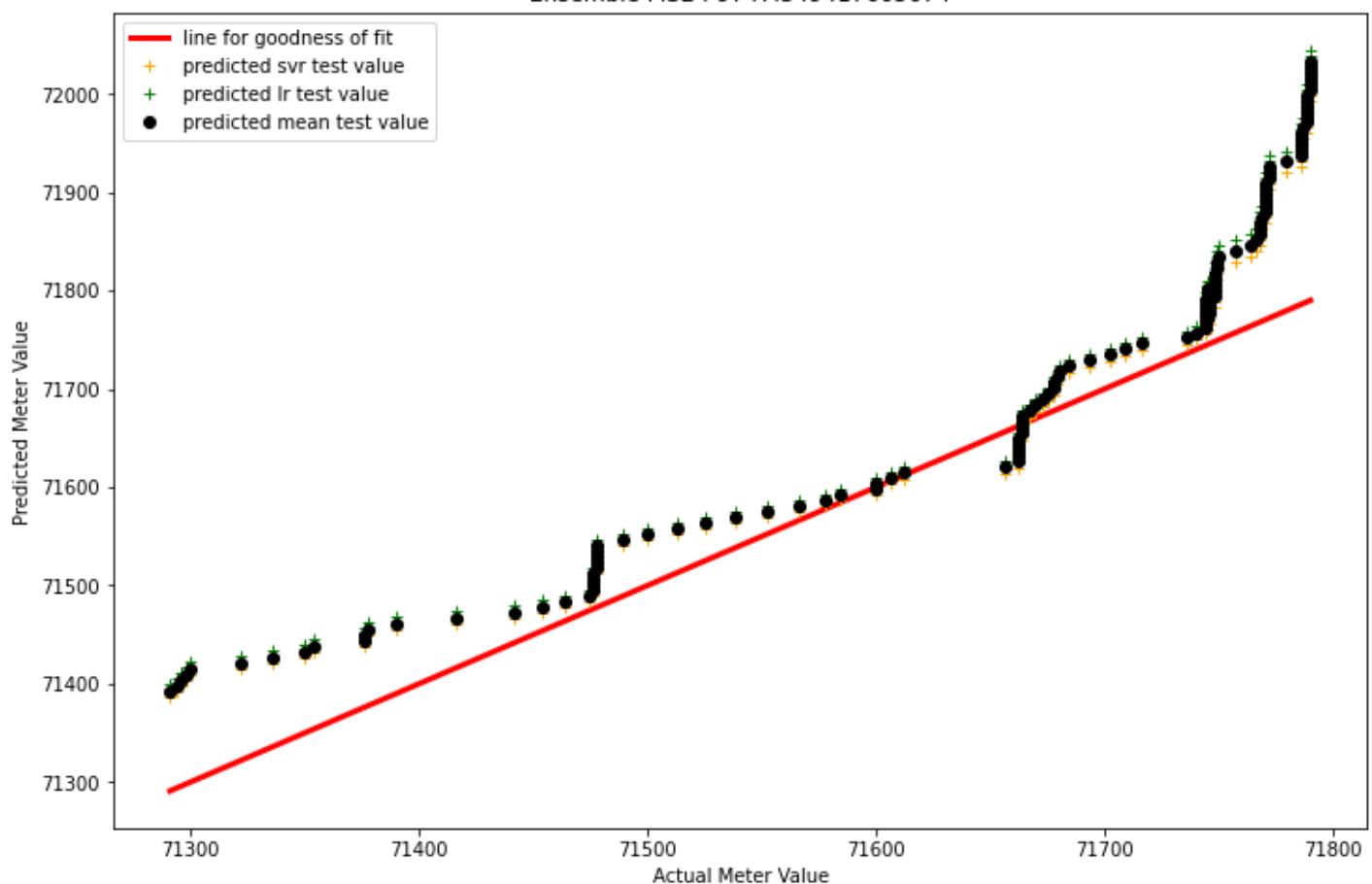
Household 1556.0  
Testing SVR MSE : 10703.772152579746  
Testing LR MSE : 12847.740807590493  
Ensemble MSE : 11733.02416444709



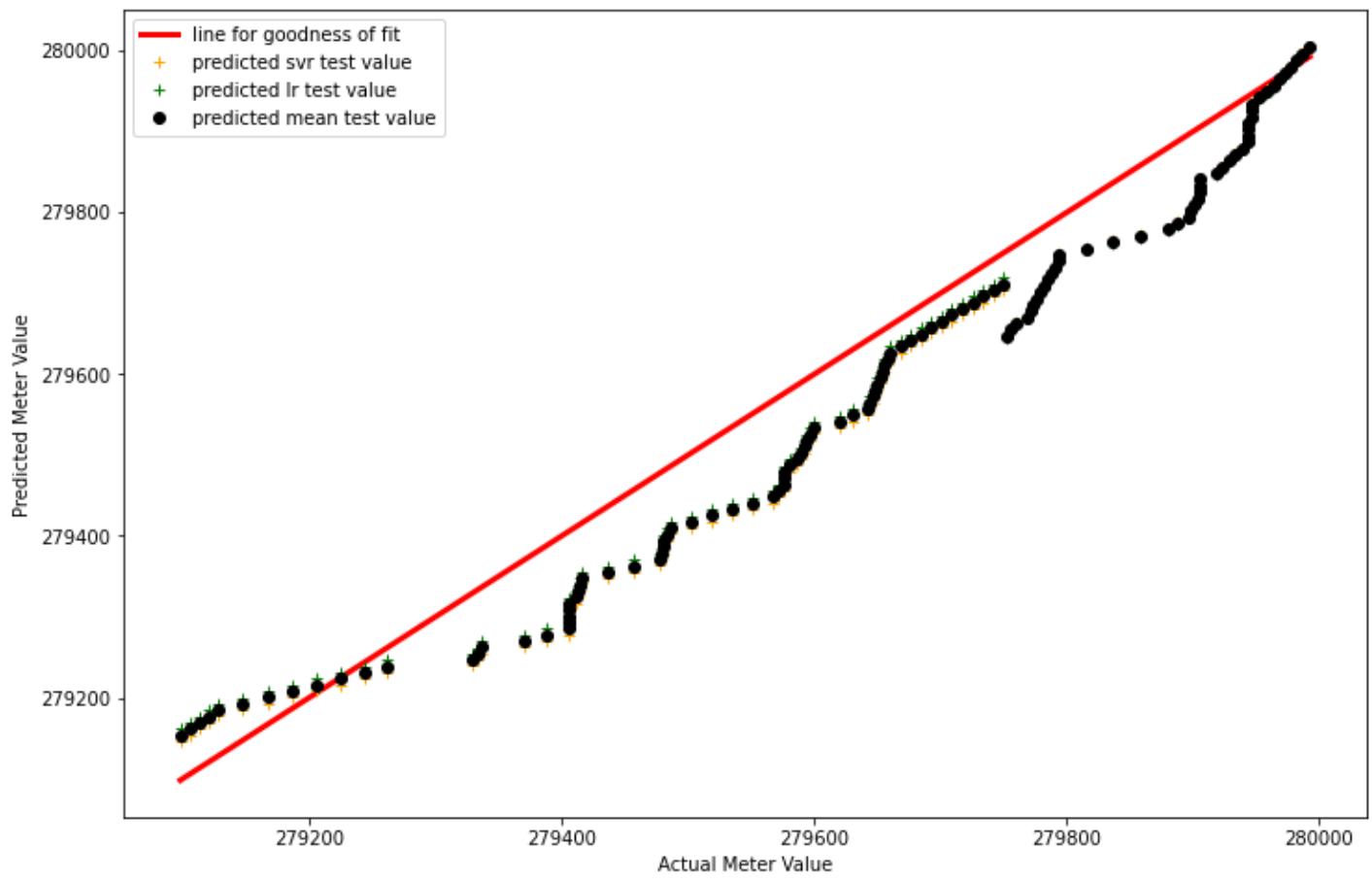
Household 1589.0  
Testing SVR MSE : 98640.08146227781  
Testing LR MSE : 75425.72408298201  
Ensemble MSE : 86501.02622962715



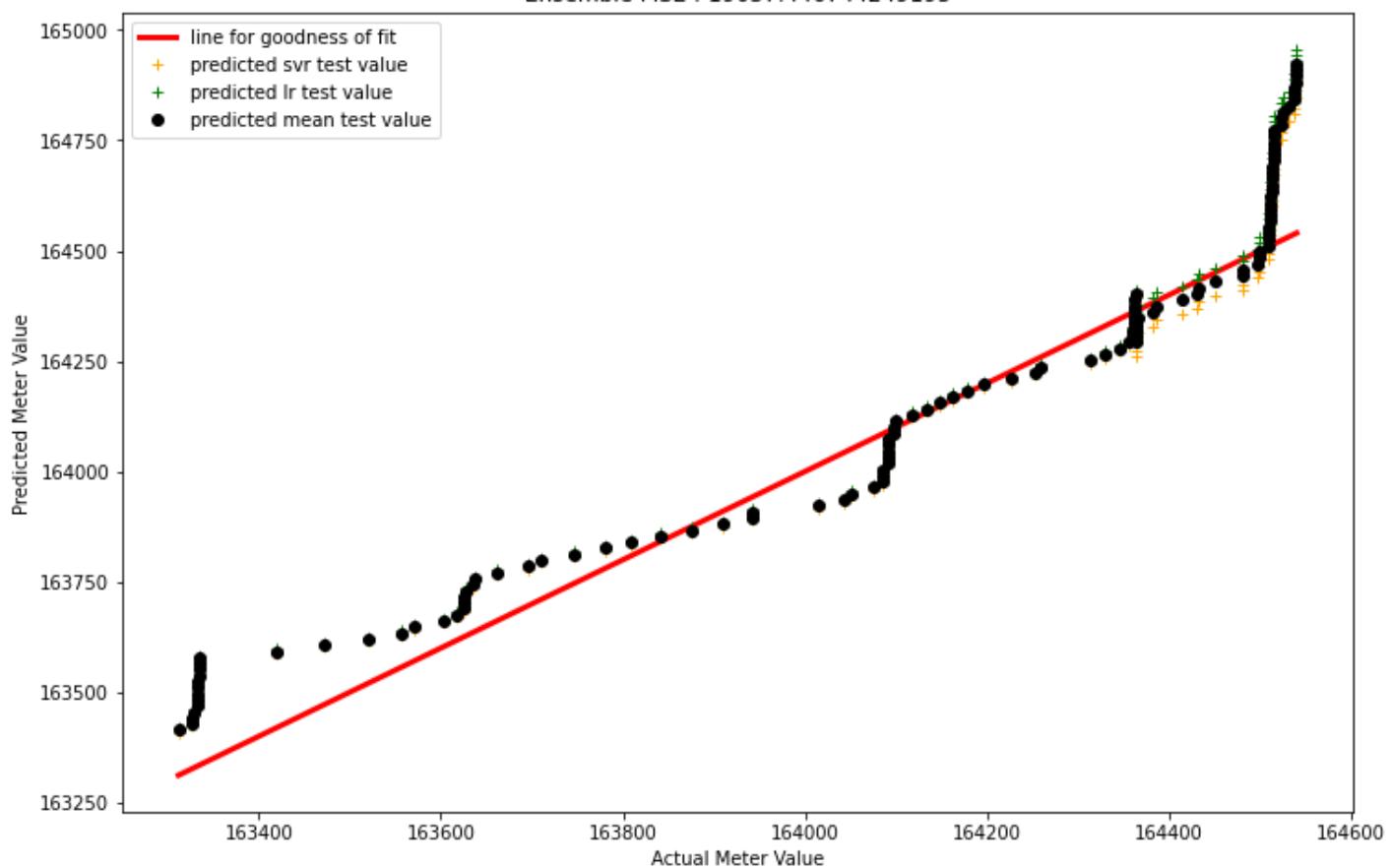
Household 1619.0  
Testing SVR MSE : 8394.332197374466  
Testing LR MSE : 11248.79041719588  
Ensemble MSE : 9747.349417605674



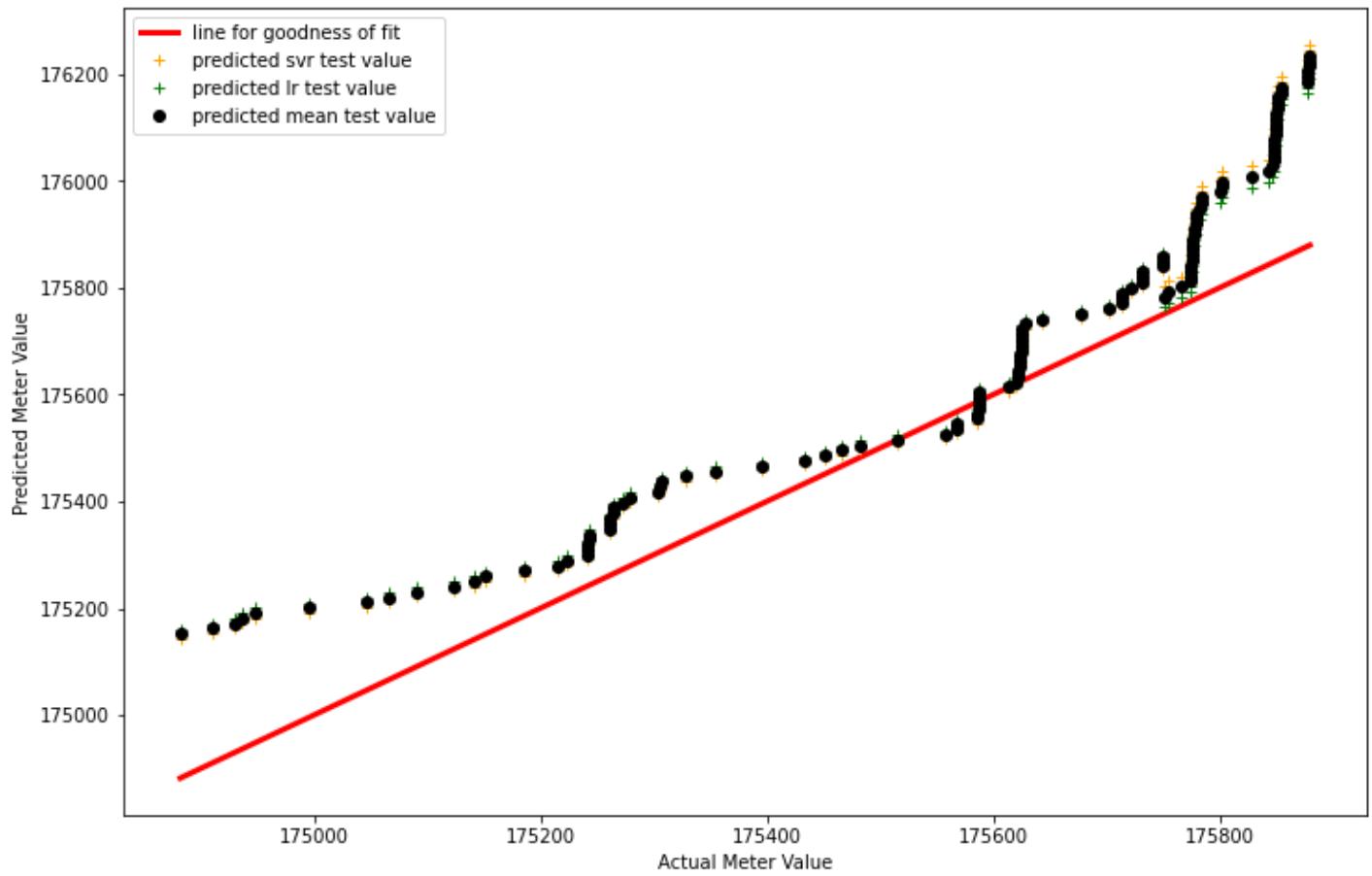
Household 1697.0  
Testing SVR MSE : 5719.980879142731  
Testing LR MSE : 4816.303184180705  
Ensemble MSE : 5233.3972432661



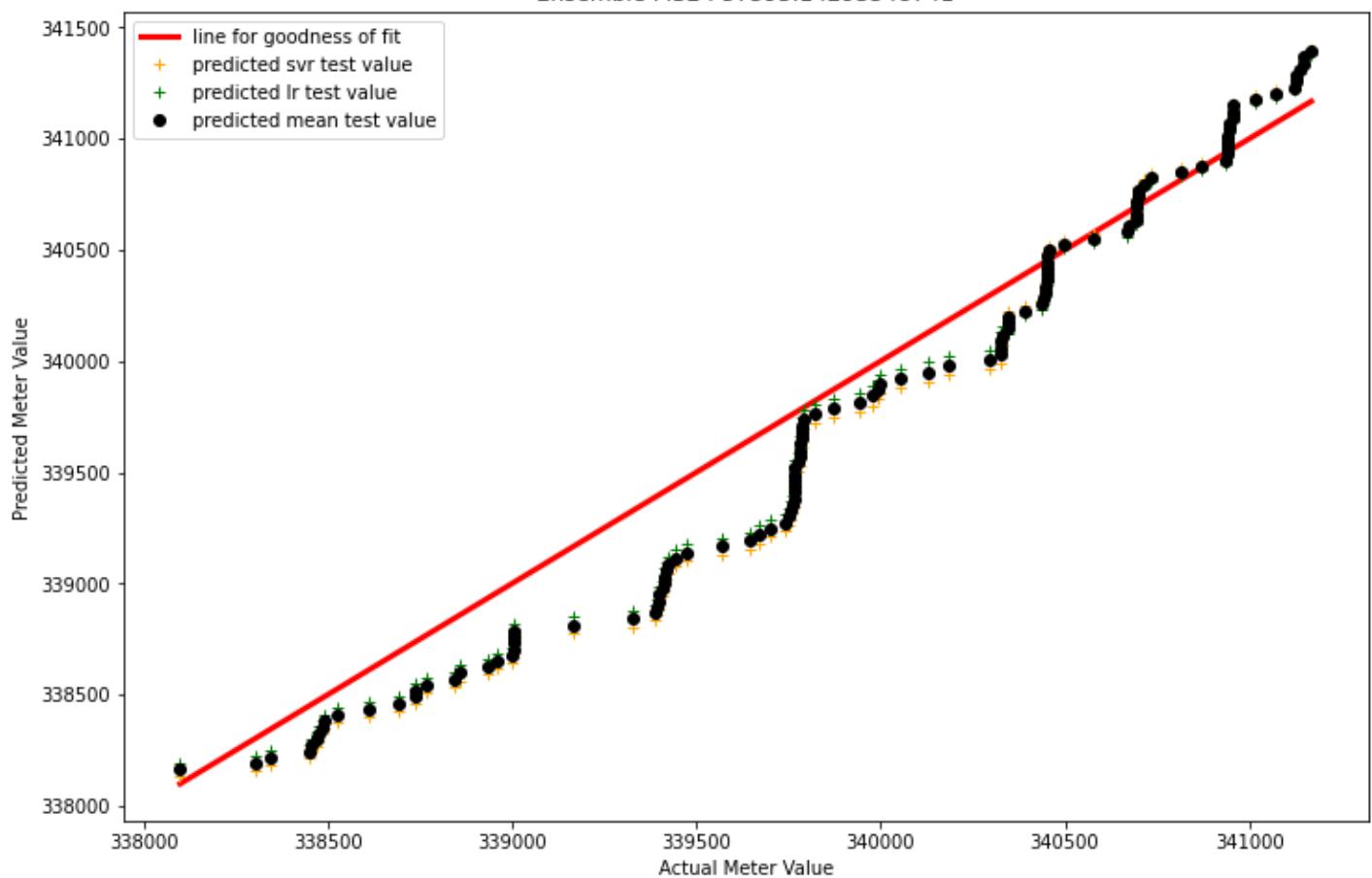
Household 1714.0  
Testing SVR MSE : 16166.712156878195  
Testing LR MSE : 22782.214936957556  
Ensemble MSE : 19037.446744249195



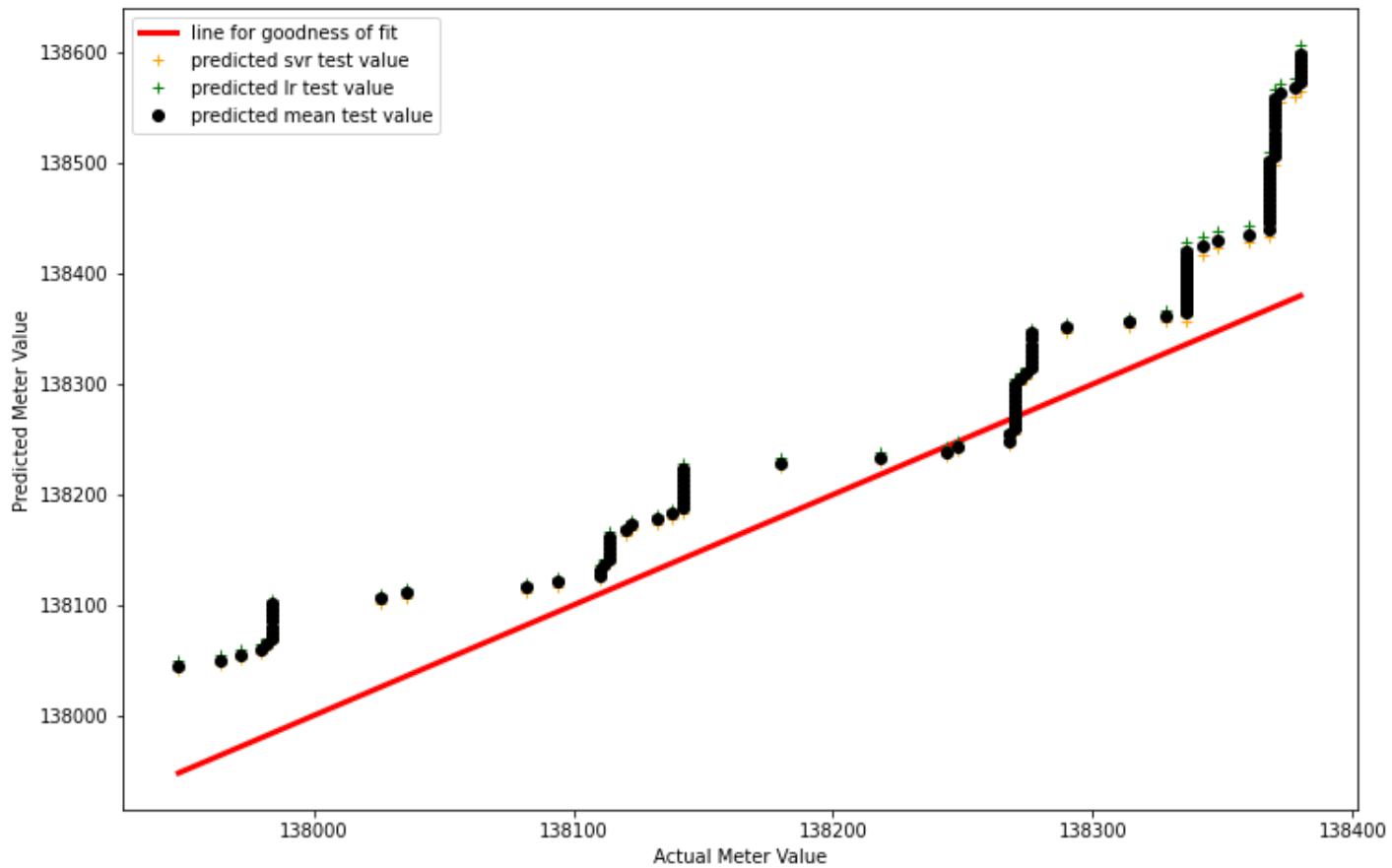
Household 1718.0  
Testing SVR MSE : 27081.13091221424  
Testing LR MSE : 22570.53916233234  
Ensemble MSE : 24625.02670243444



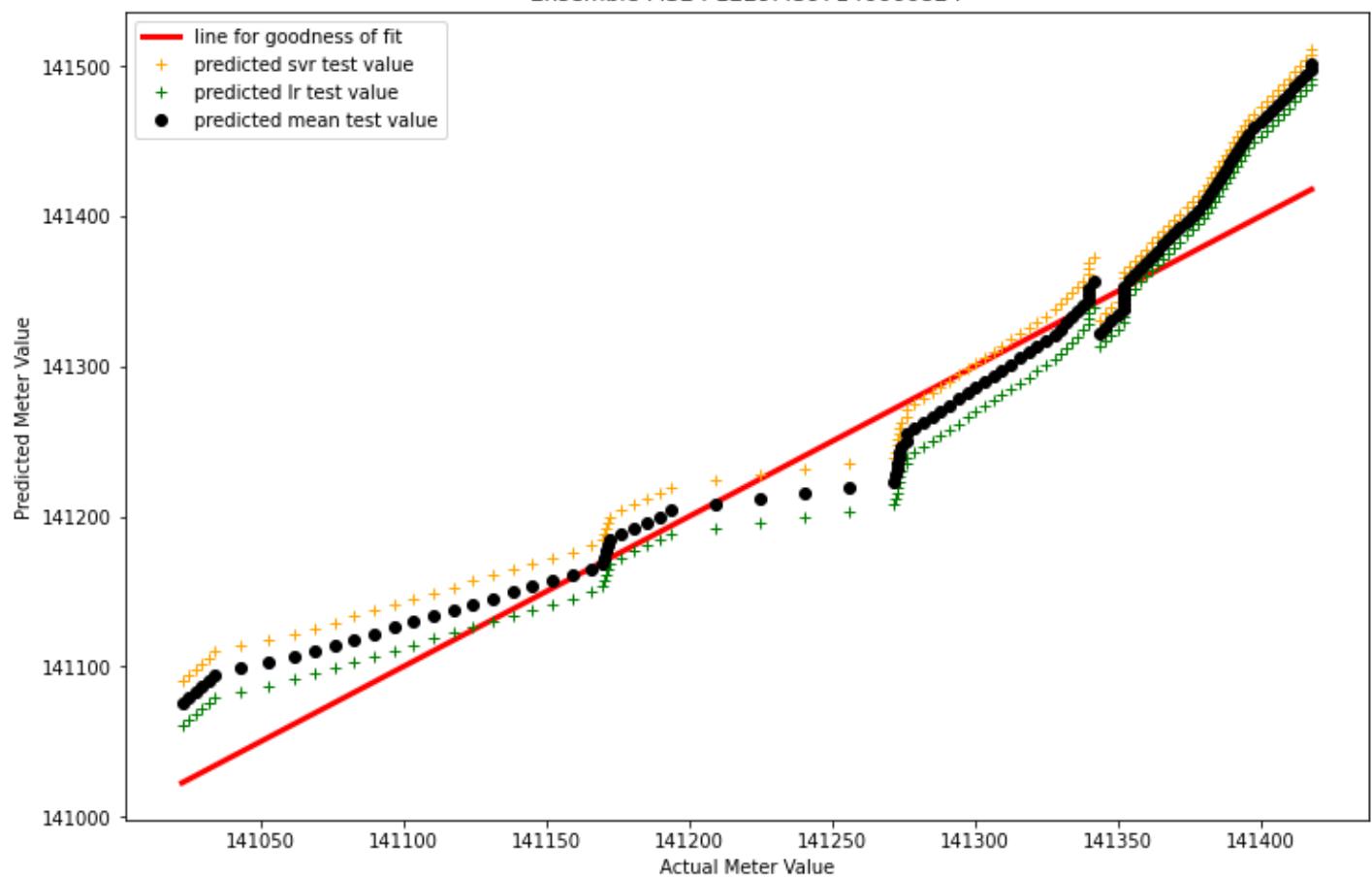
Household 1790.0  
Testing SVR MSE : 70616.29990283254  
Testing LR MSE : 46536.59509296021  
Ensemble MSE : 57593.14293548741



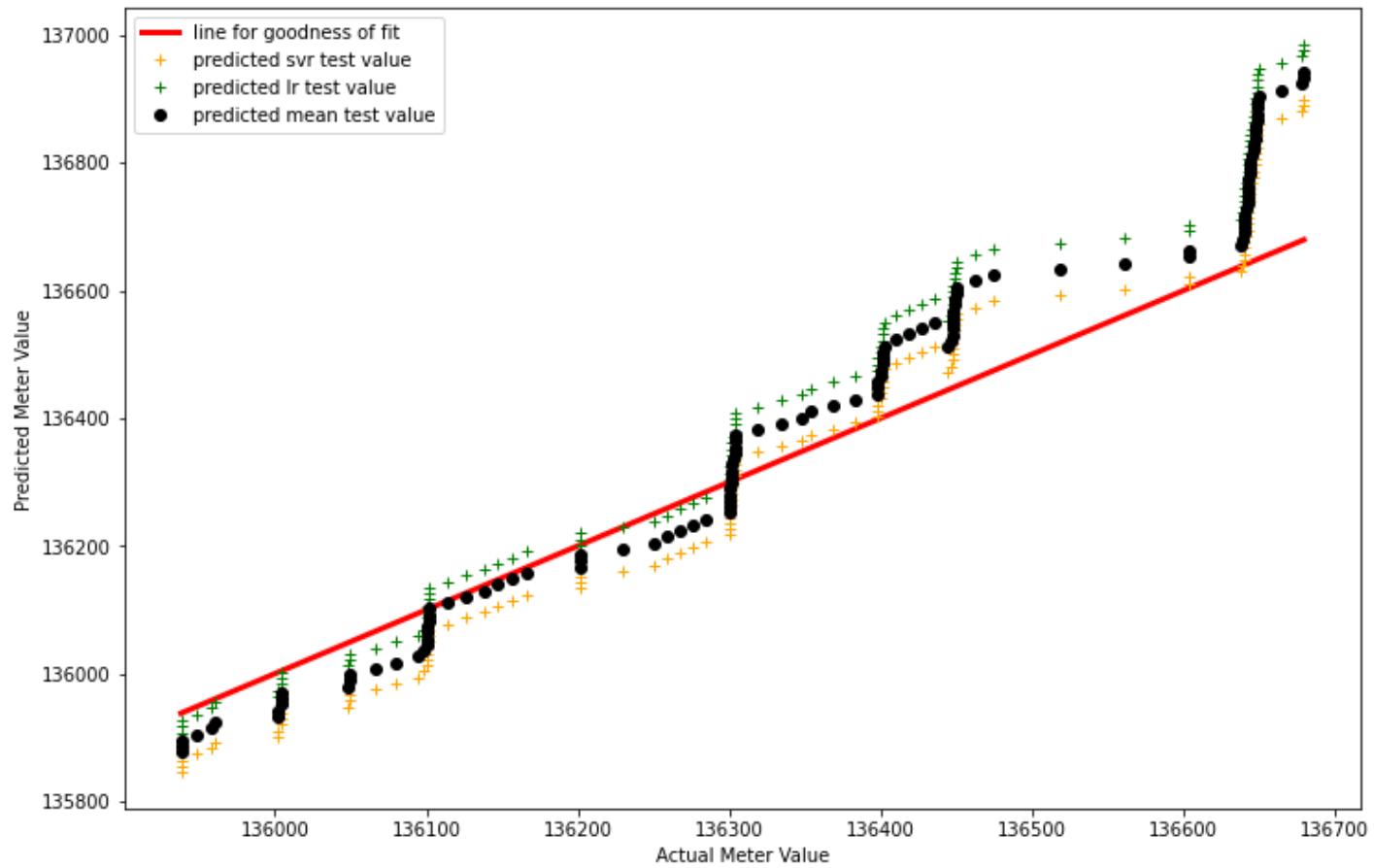
Household 1791.0  
Testing SVR MSE : 7934.245018370359  
Testing LR MSE : 9997.907232580748  
Ensemble MSE : 8928.402065133401



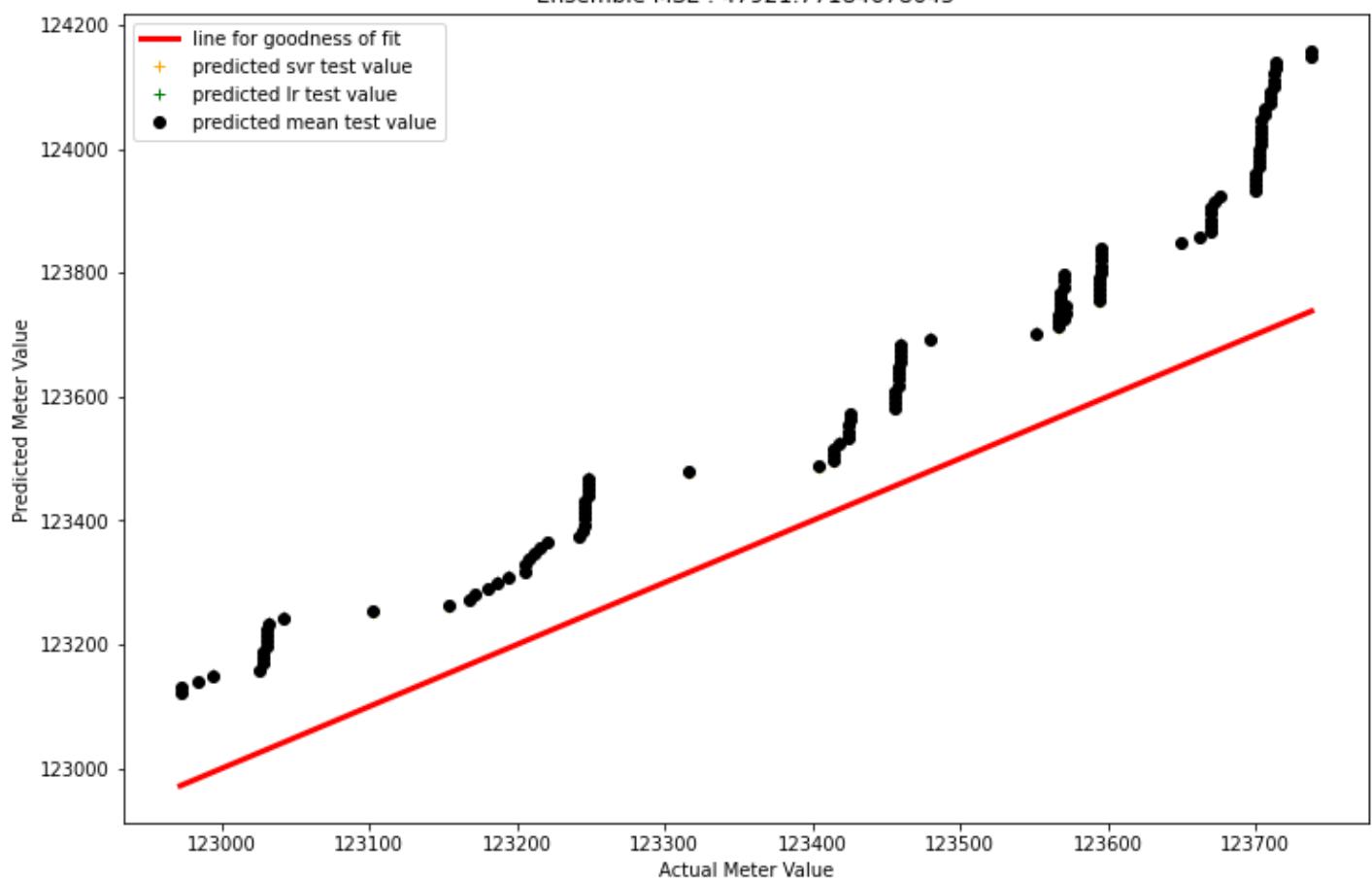
Household 1792.0  
Testing SVR MSE : 1730.5555447138142  
Testing LR MSE : 1103.1207786292994  
Ensemble MSE : 1229.4397146666824



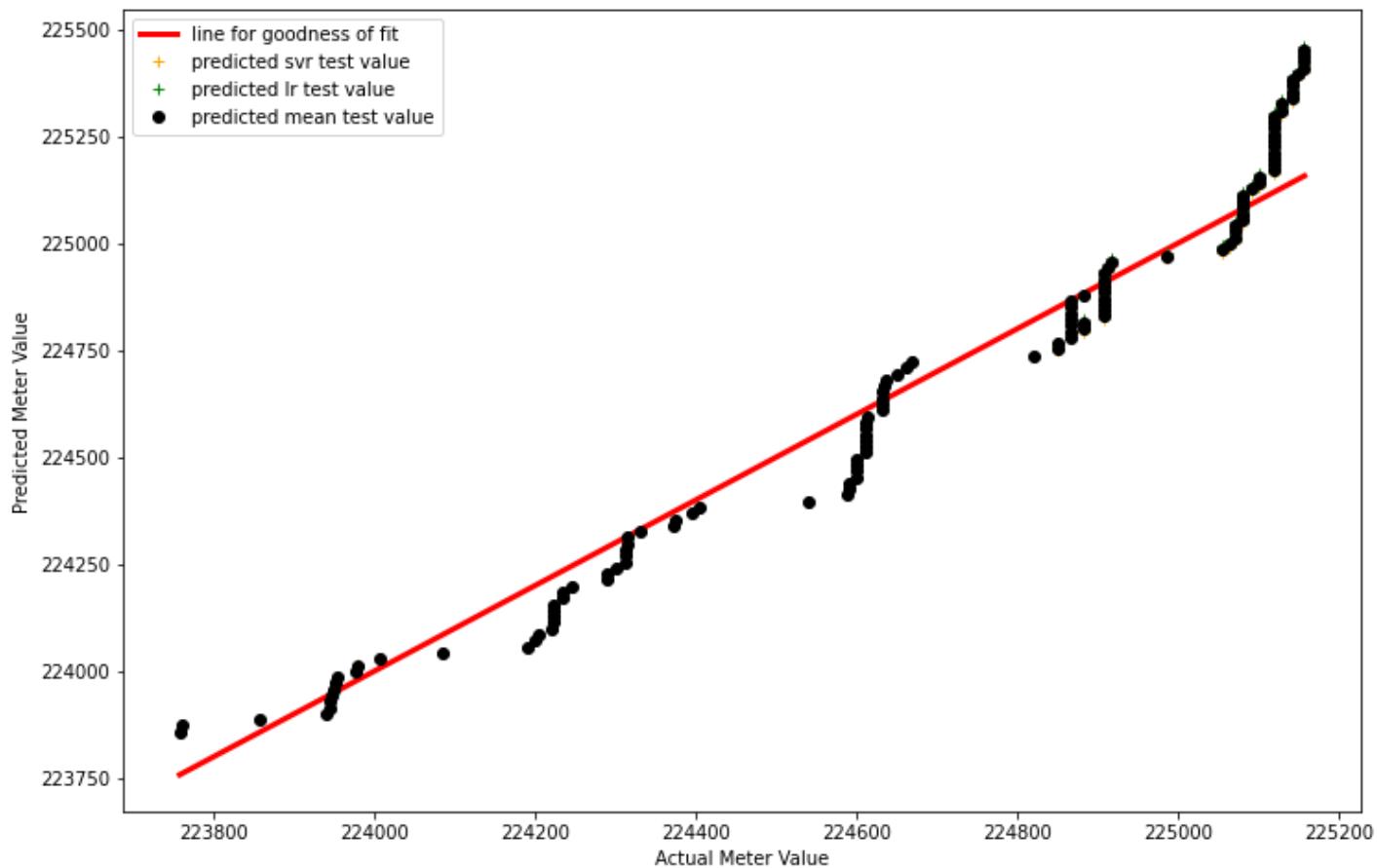
Household 1800.0  
Testing SVR MSE : 7836.270444647834  
Testing LR MSE : 17376.61220998923  
Ensemble MSE : 11214.208399455898



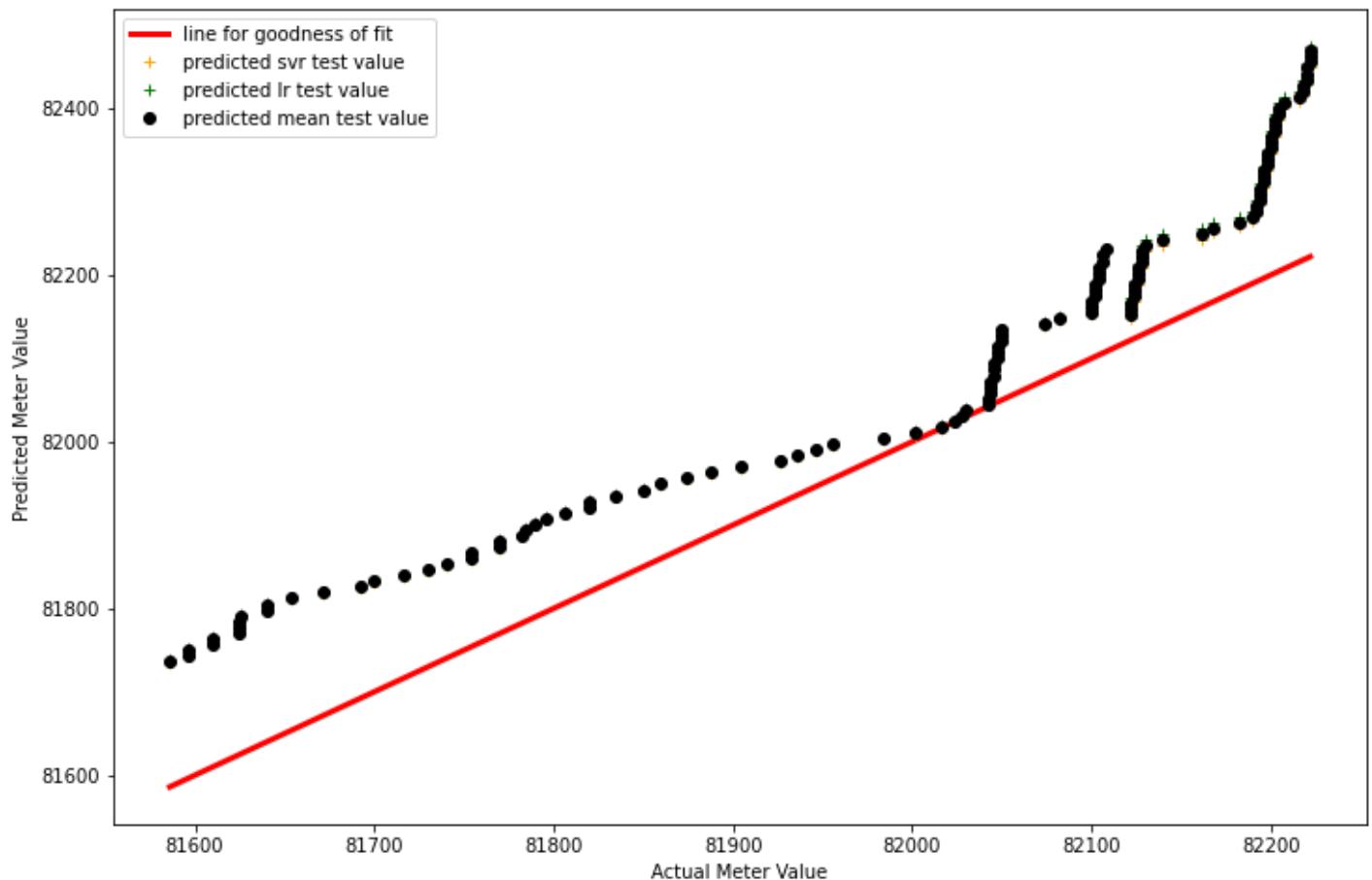
Household 1801.0  
Testing SVR MSE : 47547.17329871414  
Testing LR MSE : 48298.17046092192  
Ensemble MSE : 47921.77184678045



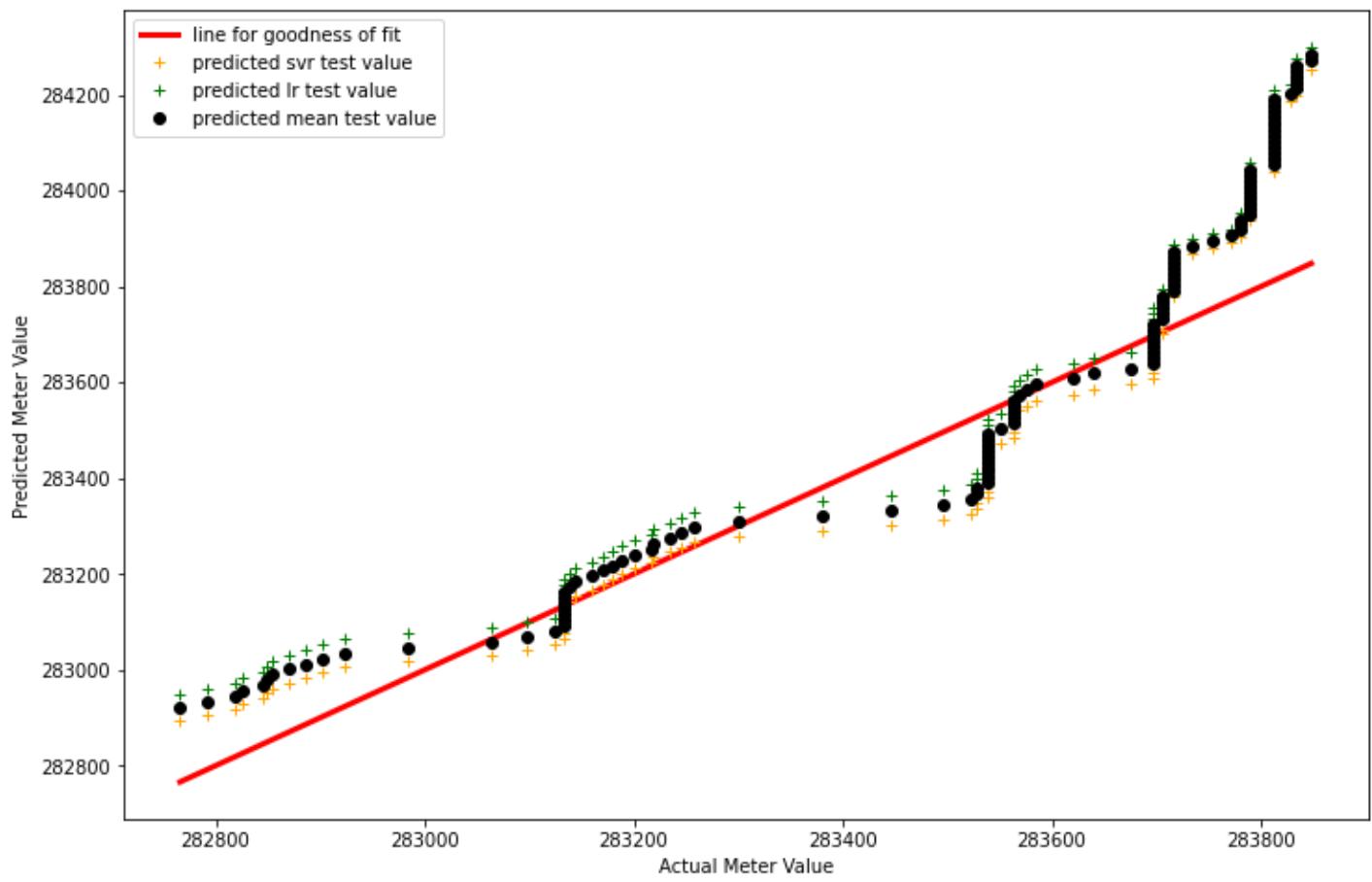
Household 2018.0  
Testing SVR MSE : 9824.279789529139  
Testing LR MSE : 10756.683865093406  
Ensemble MSE : 10262.322591192096



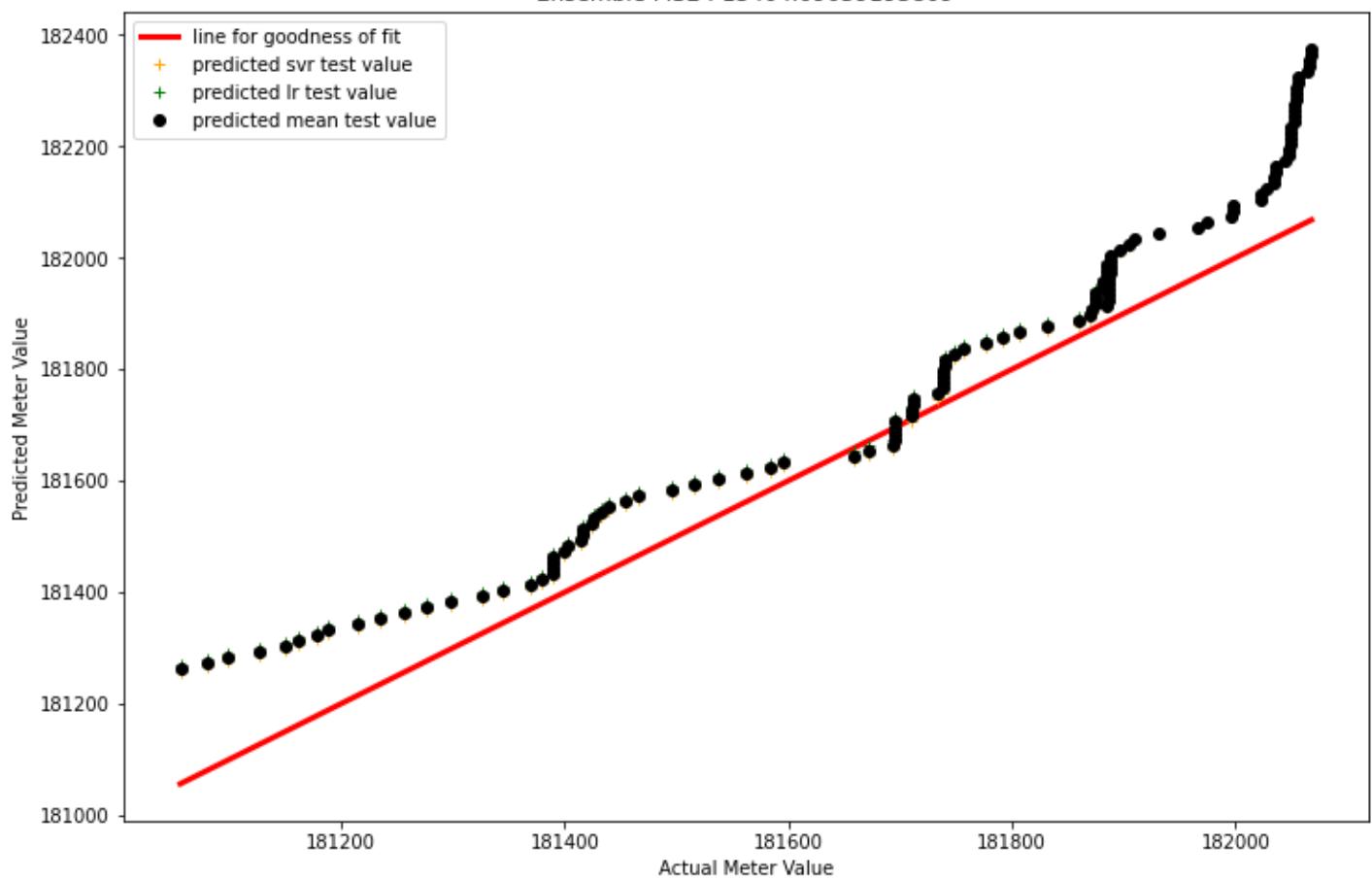
Household 2034.0  
Testing SVR MSE : 13501.393472718048  
Testing LR MSE : 14982.592130908883  
Ensemble MSE : 14227.48341179242



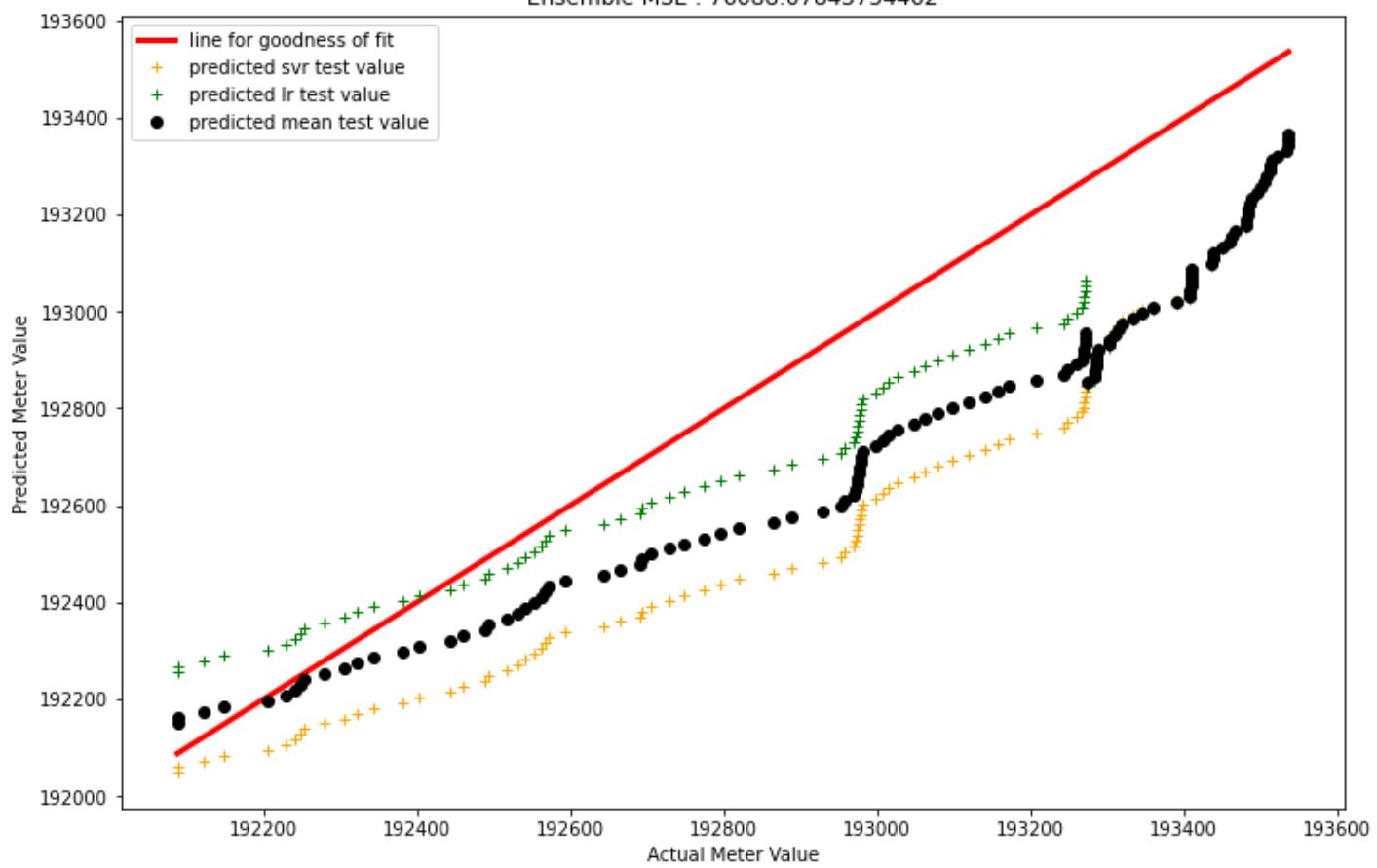
Household 2072.0  
Testing SVR MSE : 28742.317118751278  
Testing LR MSE : 34379.928146457794  
Ensemble MSE : 30909.95103059694



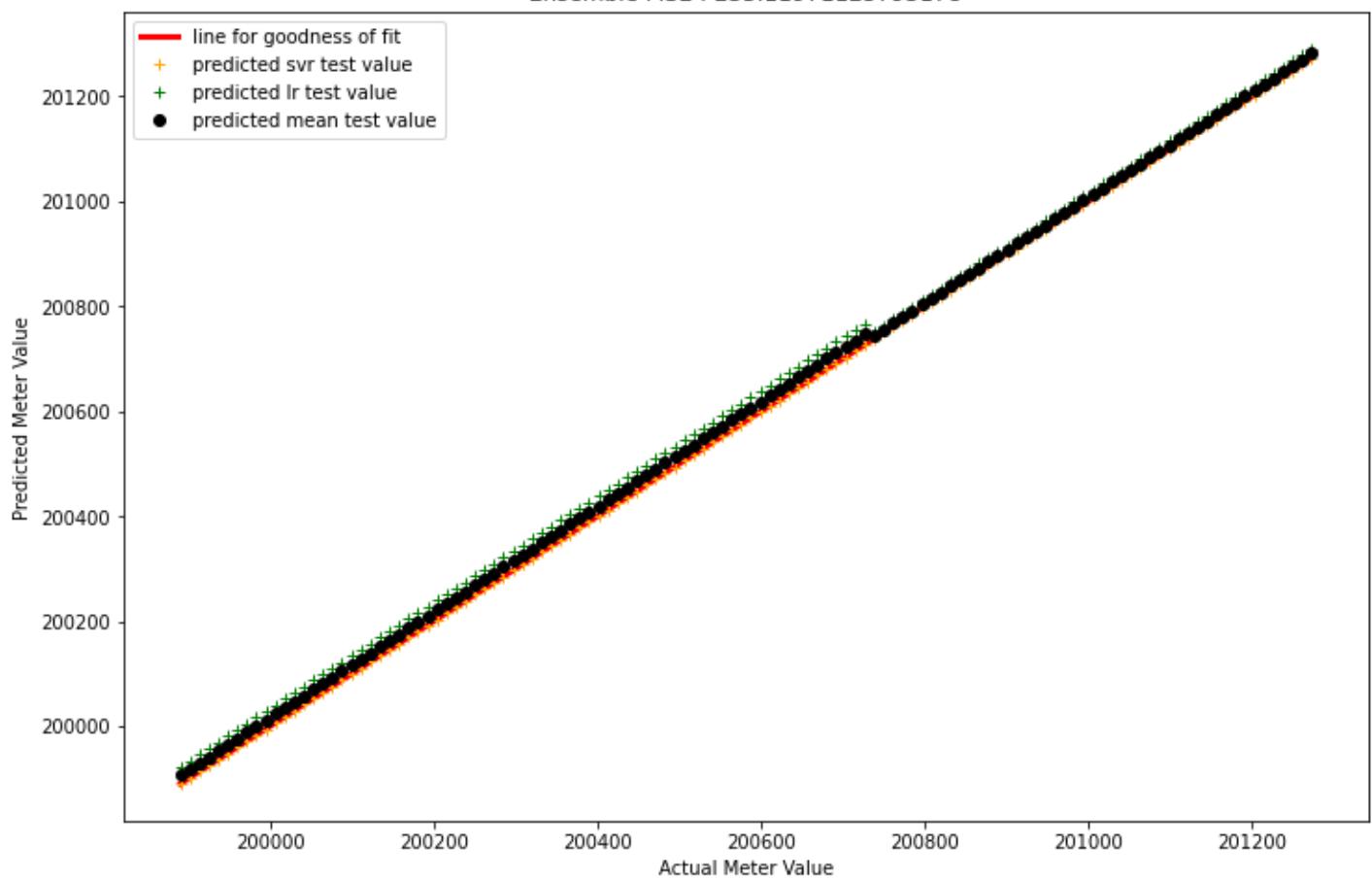
Household 2094.0  
Testing SVR MSE : 14752.5658074341  
Testing LR MSE : 16114.315895097445  
Ensemble MSE : 15404.09039193809



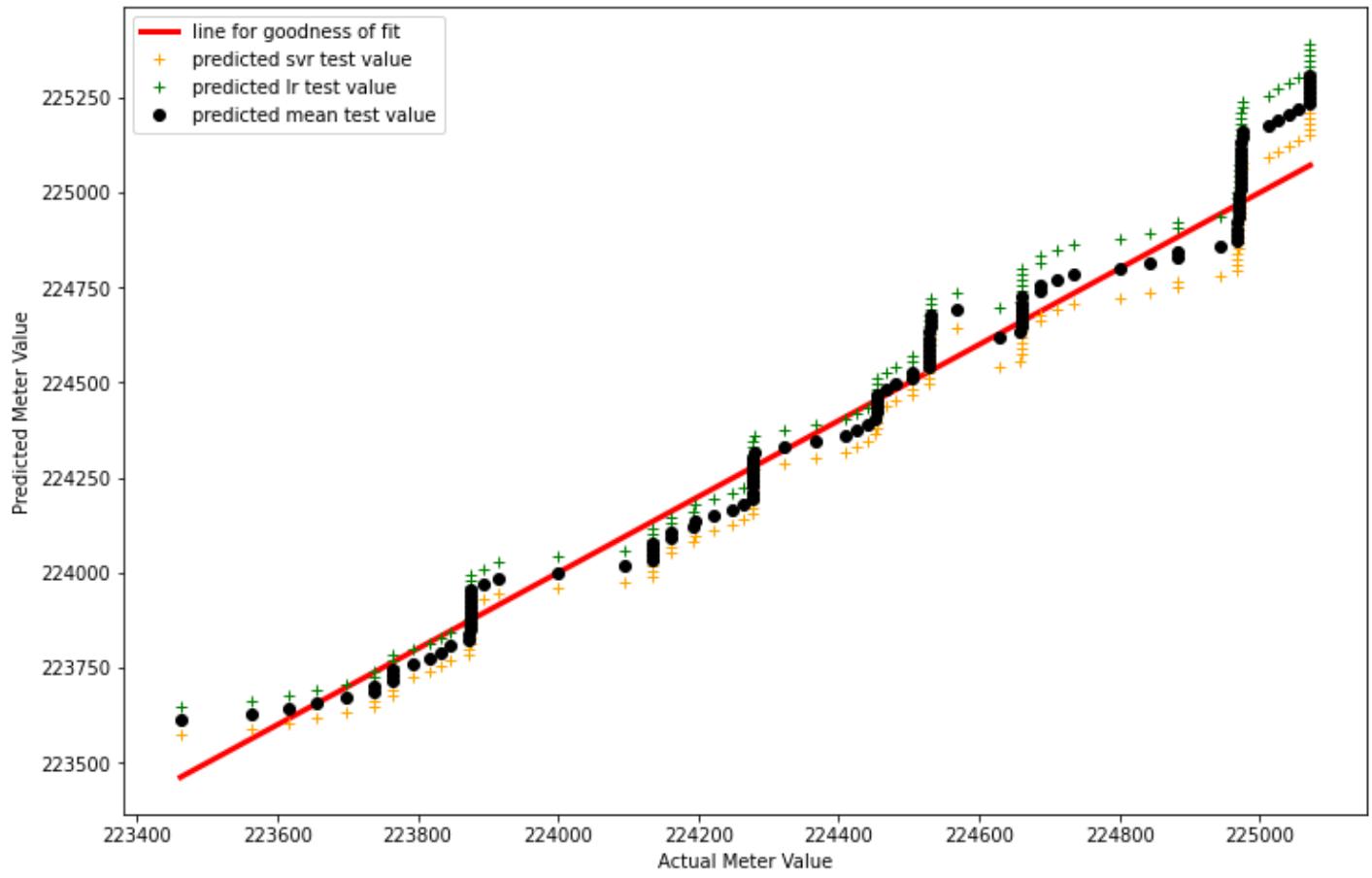
Household 2129.0  
Testing SVR MSE : 109871.54805242397  
Testing LR MSE : 56080.600334993265  
Ensemble MSE : 76088.07843754462



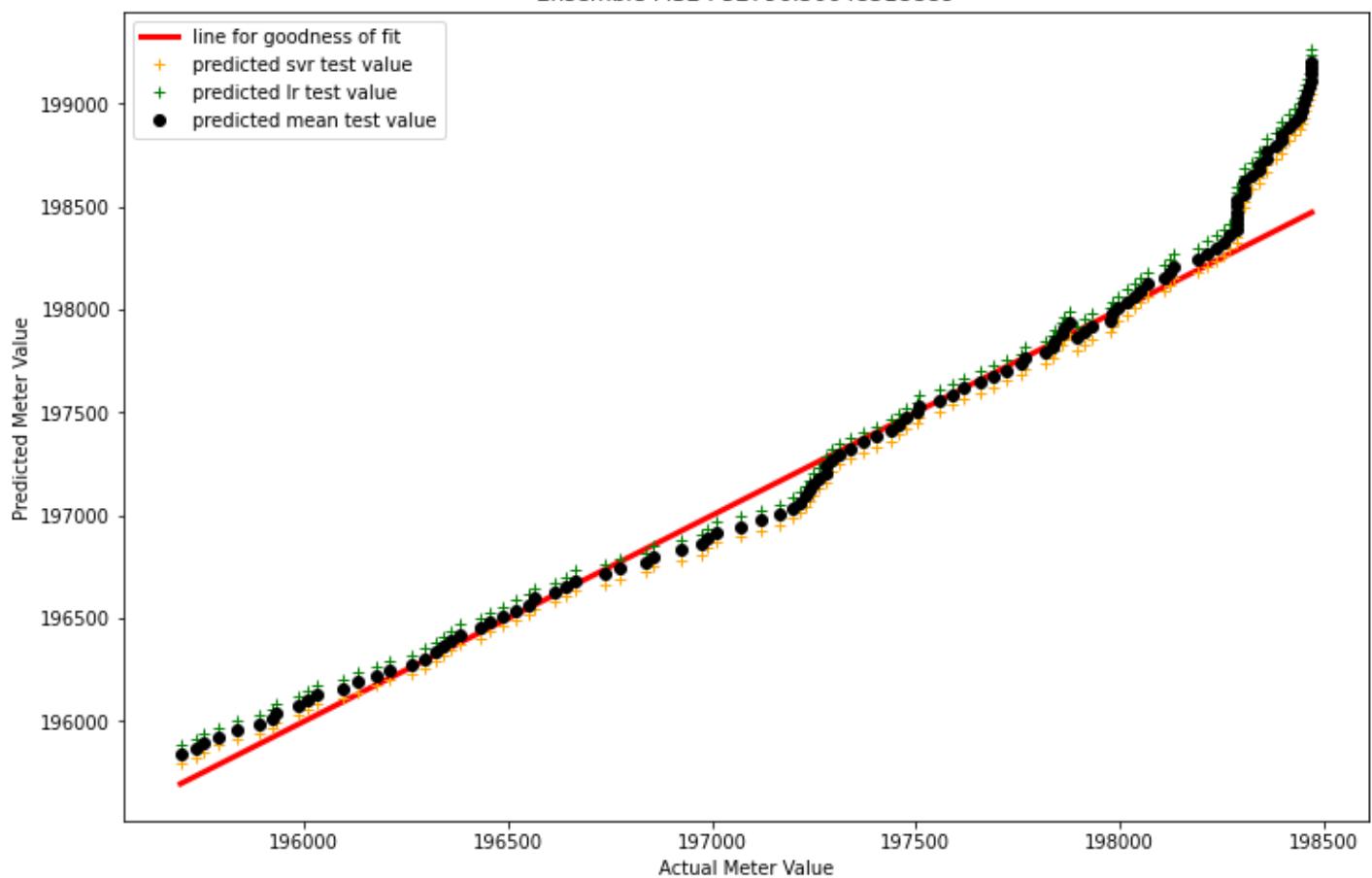
Household 2233.0  
Testing SVR MSE : 0.012686765191067555  
Testing LR MSE : 925.7689284302602  
Ensemble MSE : 233.11971125793178



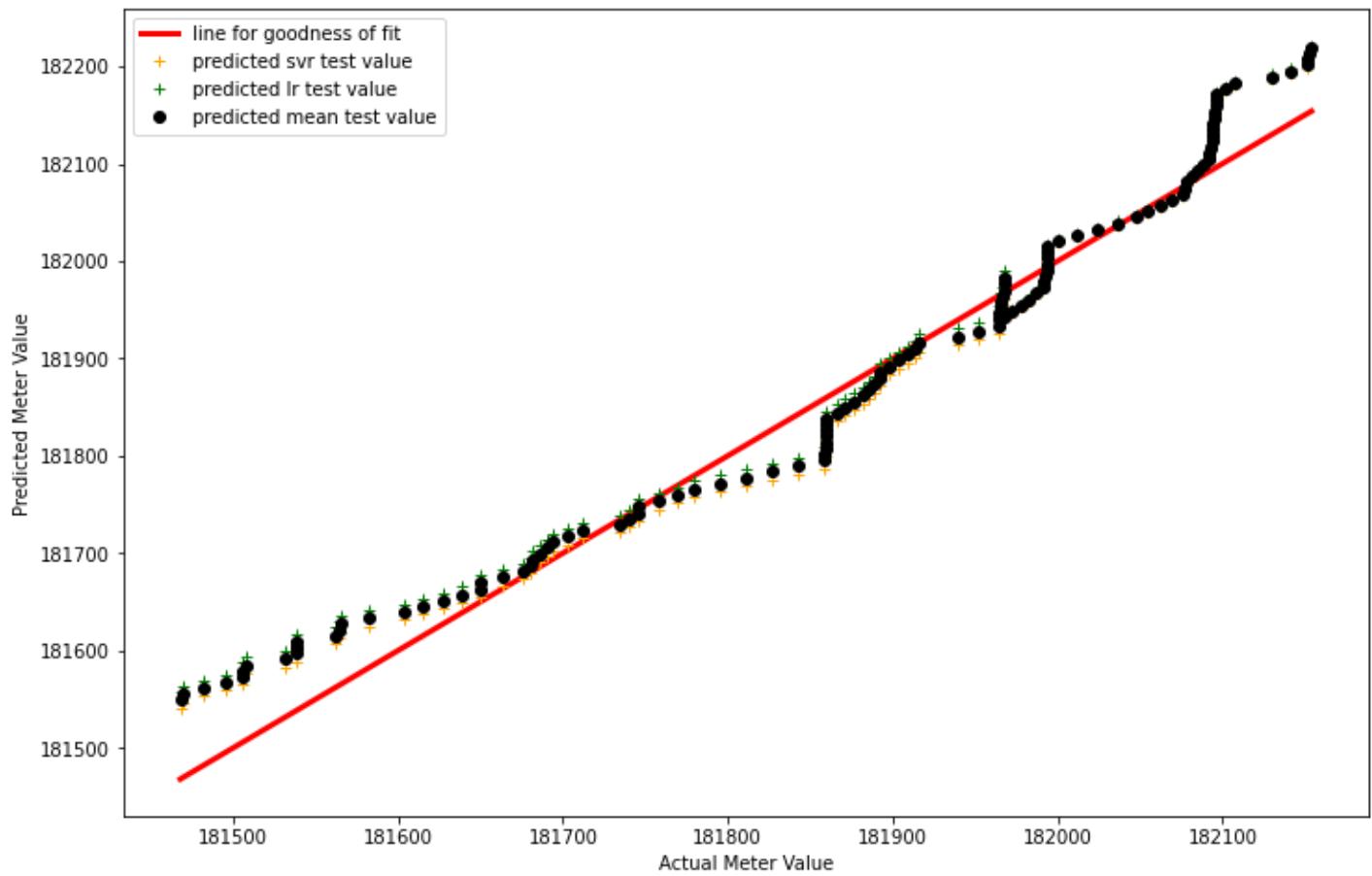
Household 2335.0  
Testing SVR MSE : 6553.669819140624  
Testing LR MSE : 14468.111003147596  
Ensemble MSE : 6999.231168171808



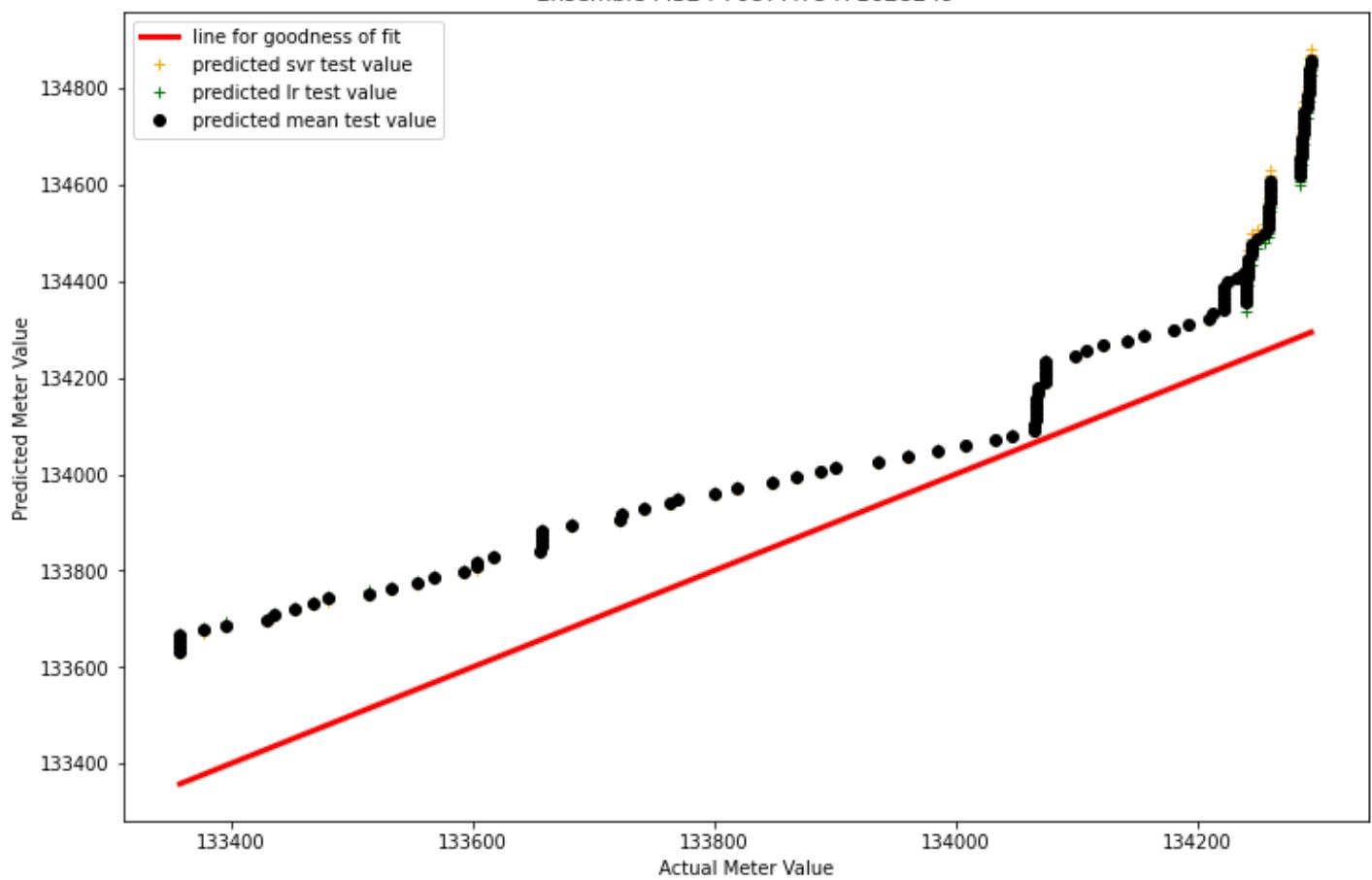
Household 2378.0  
Testing SVR MSE : 42640.51787323202  
Testing LR MSE : 68918.24155283913  
Ensemble MSE : 52796.50648518889



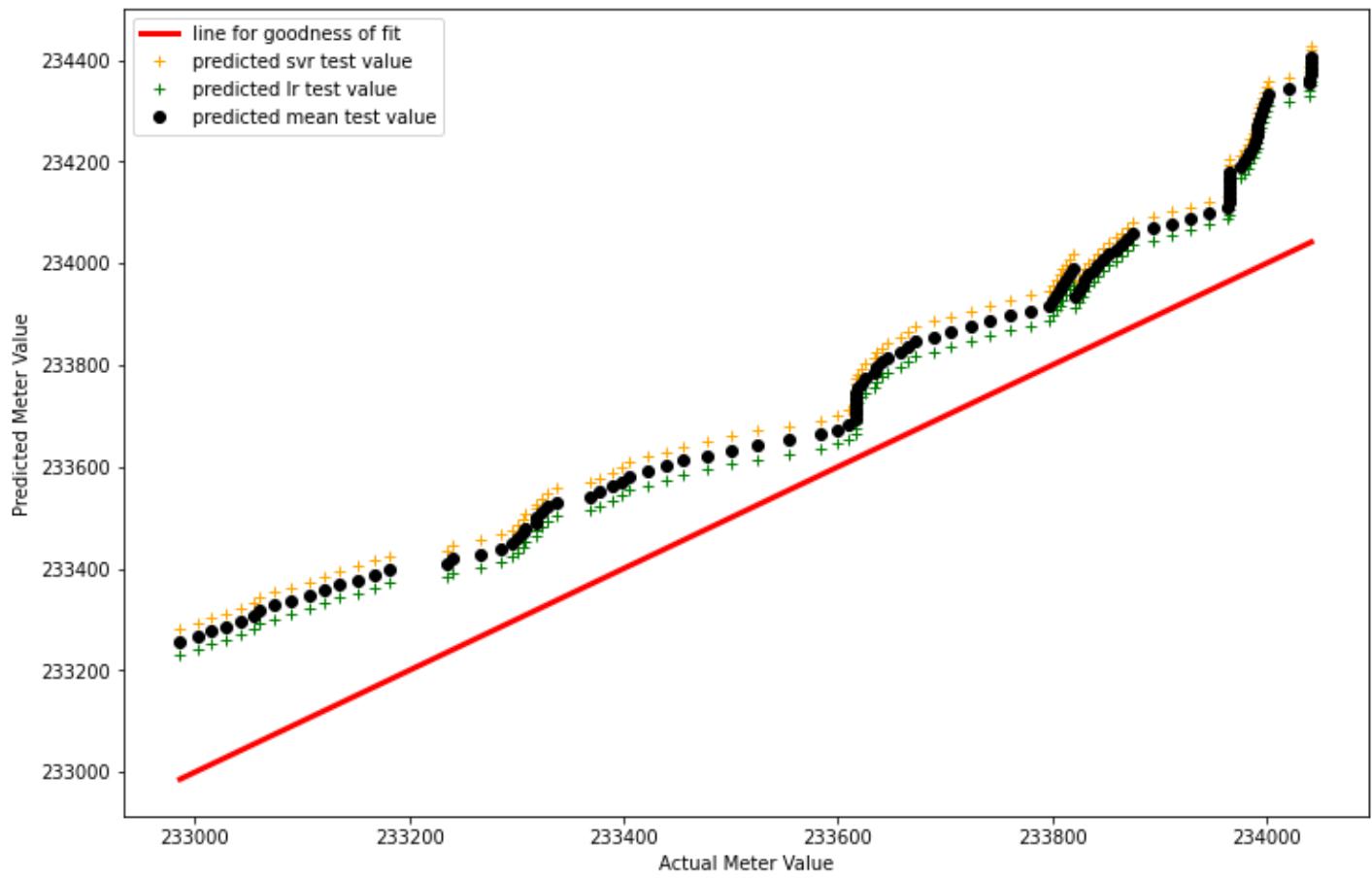
Household 2449.0  
Testing SVR MSE : 1347.113950703377  
Testing LR MSE : 1534.4002722718035  
Ensemble MSE : 1396.0016828967305



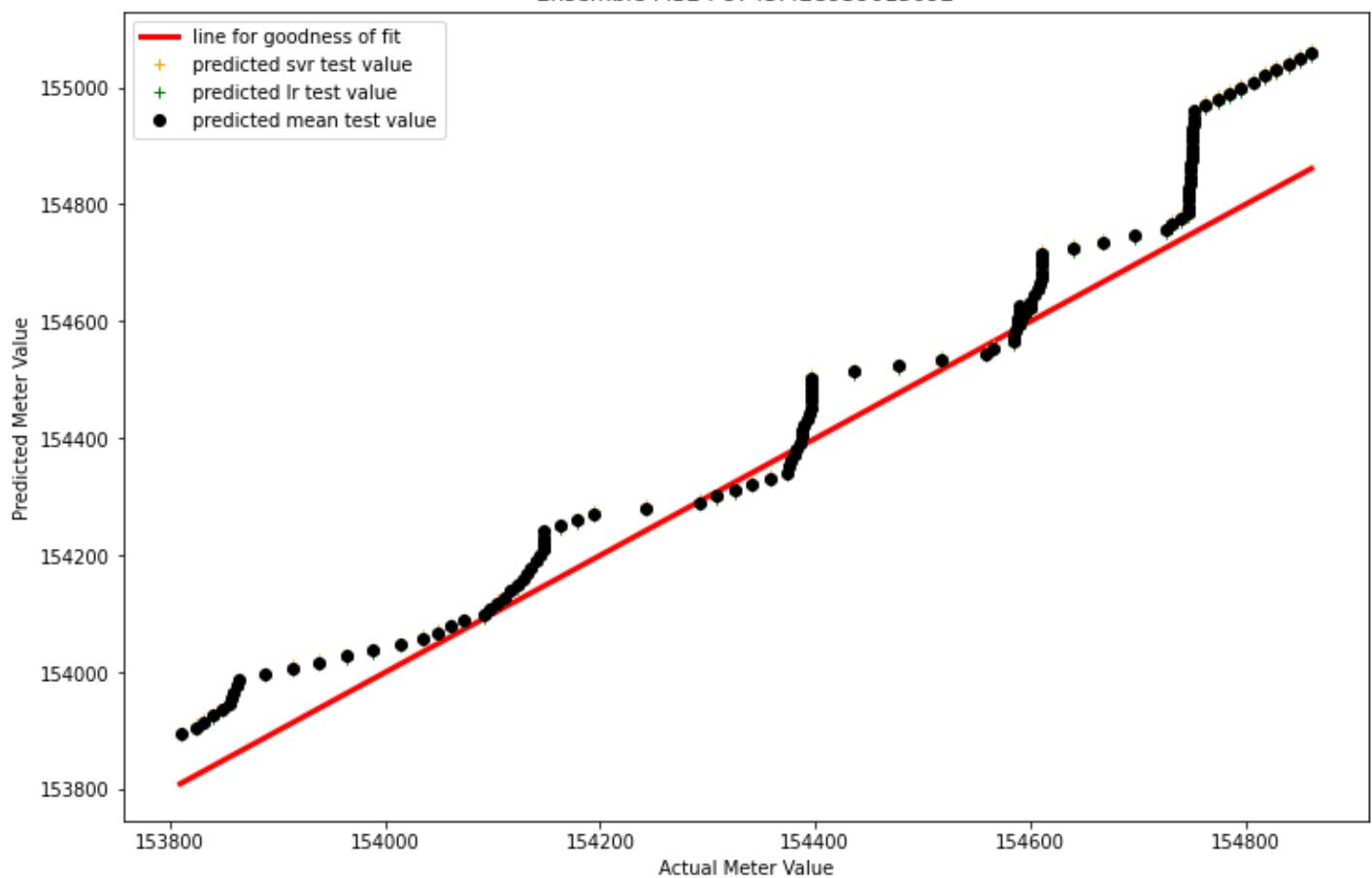
Household 2461.0  
Testing SVR MSE : 76072.49378579138  
Testing LR MSE : 66041.30679296171  
Ensemble MSE : 70877.75471628249



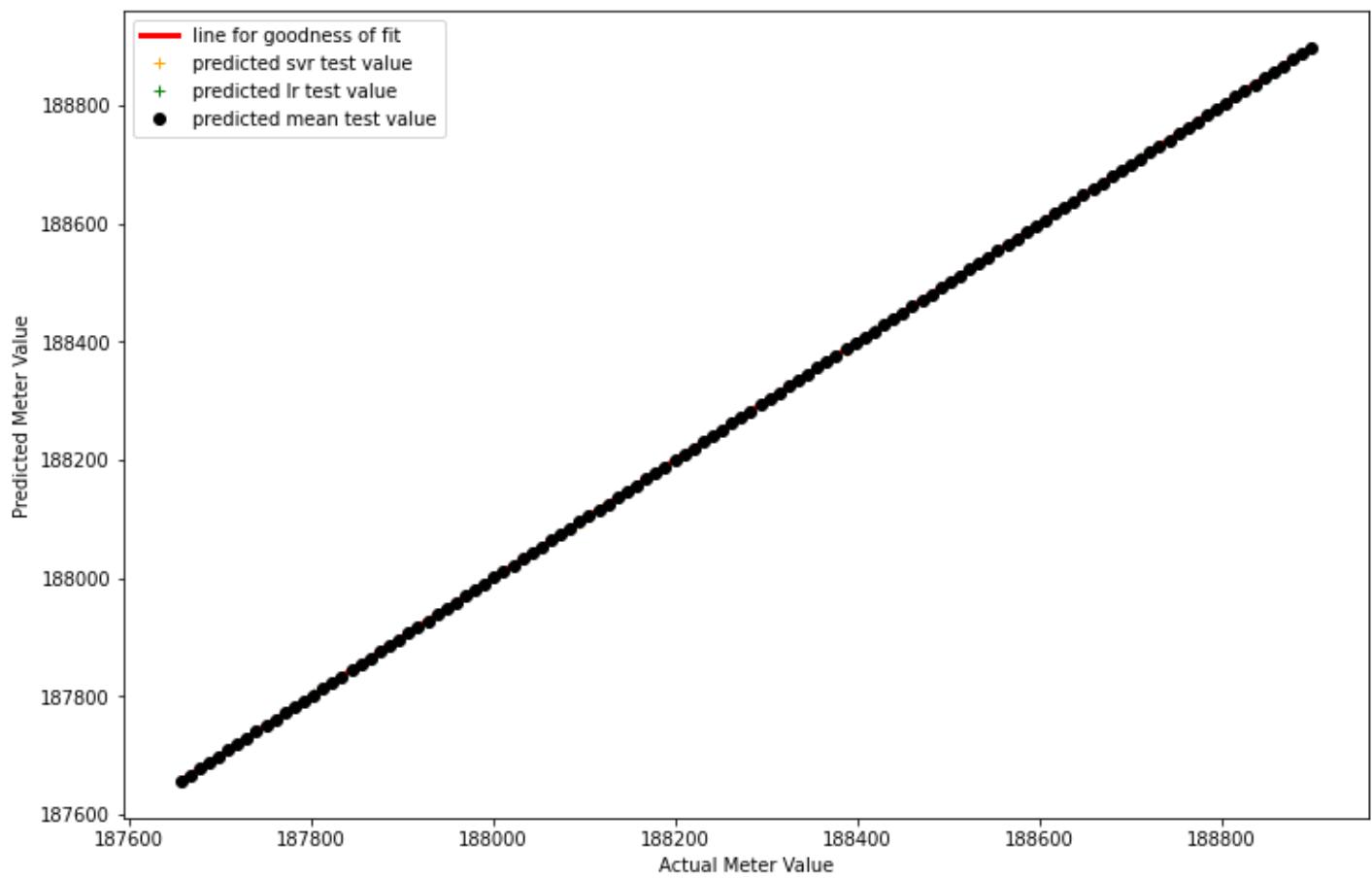
Household 2470.0  
Testing SVR MSE : 50611.267973108465  
Testing LR MSE : 31184.18856584862  
Ensemble MSE : 40217.12335154095



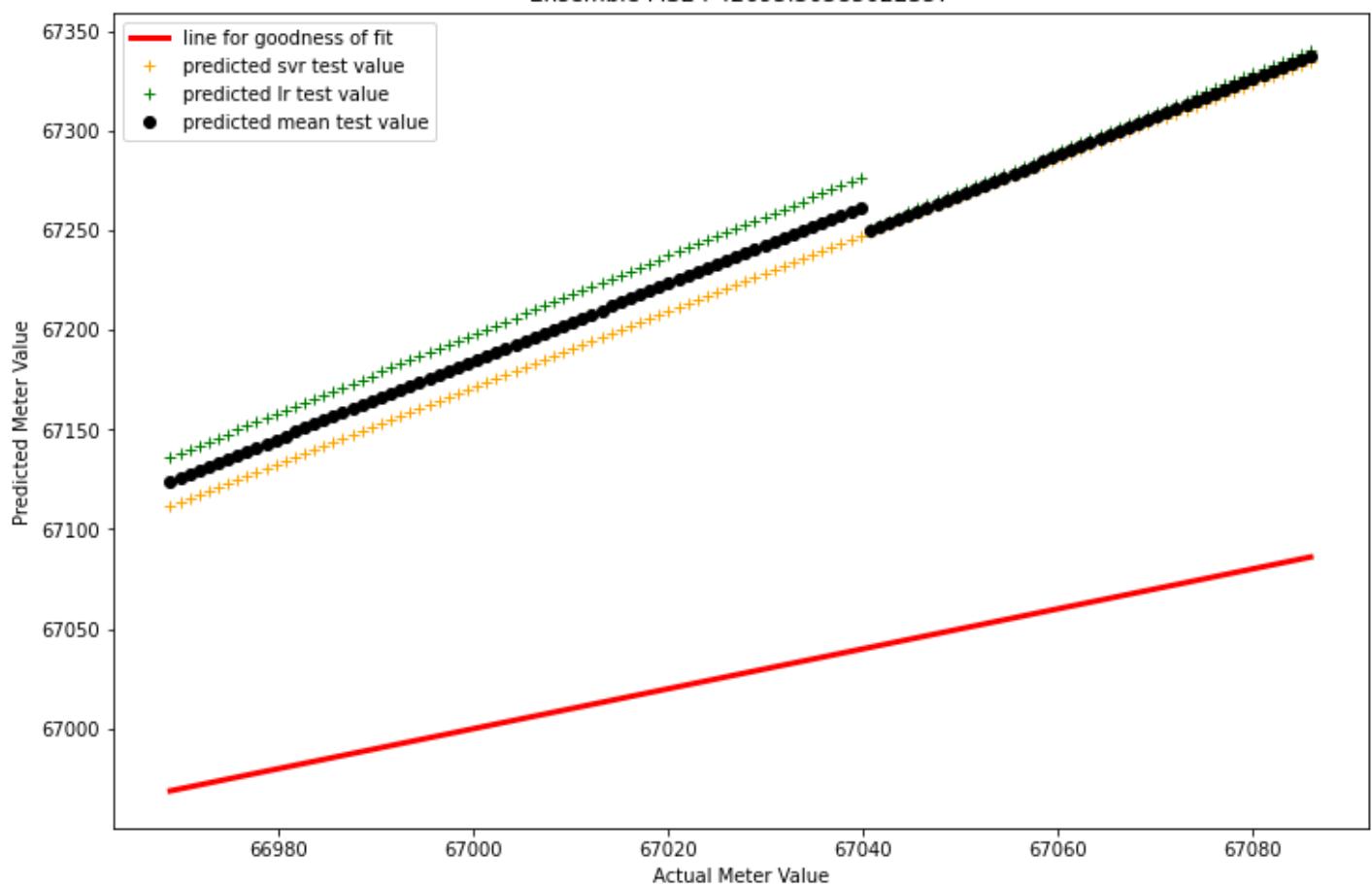
Household 2575.0  
Testing SVR MSE : 9522.06825482009  
Testing LR MSE : 8021.703319871495  
Ensemble MSE : 8745.428939015092



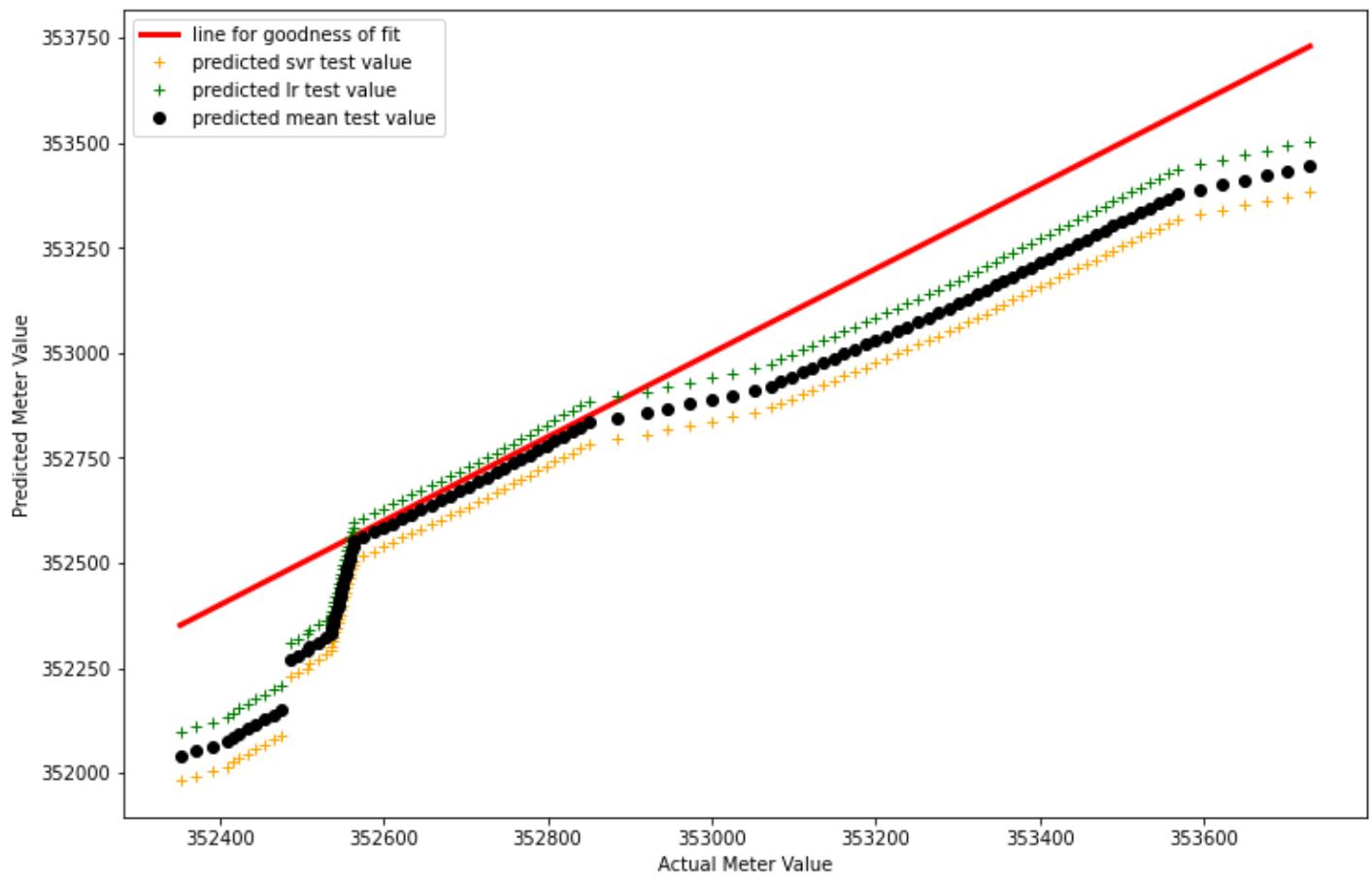
Household 2638.0  
Testing SVR MSE : 0.017225949990713443  
Testing LR MSE : 6.49391926228297e-22  
Ensemble MSE : 0.004306487498324722



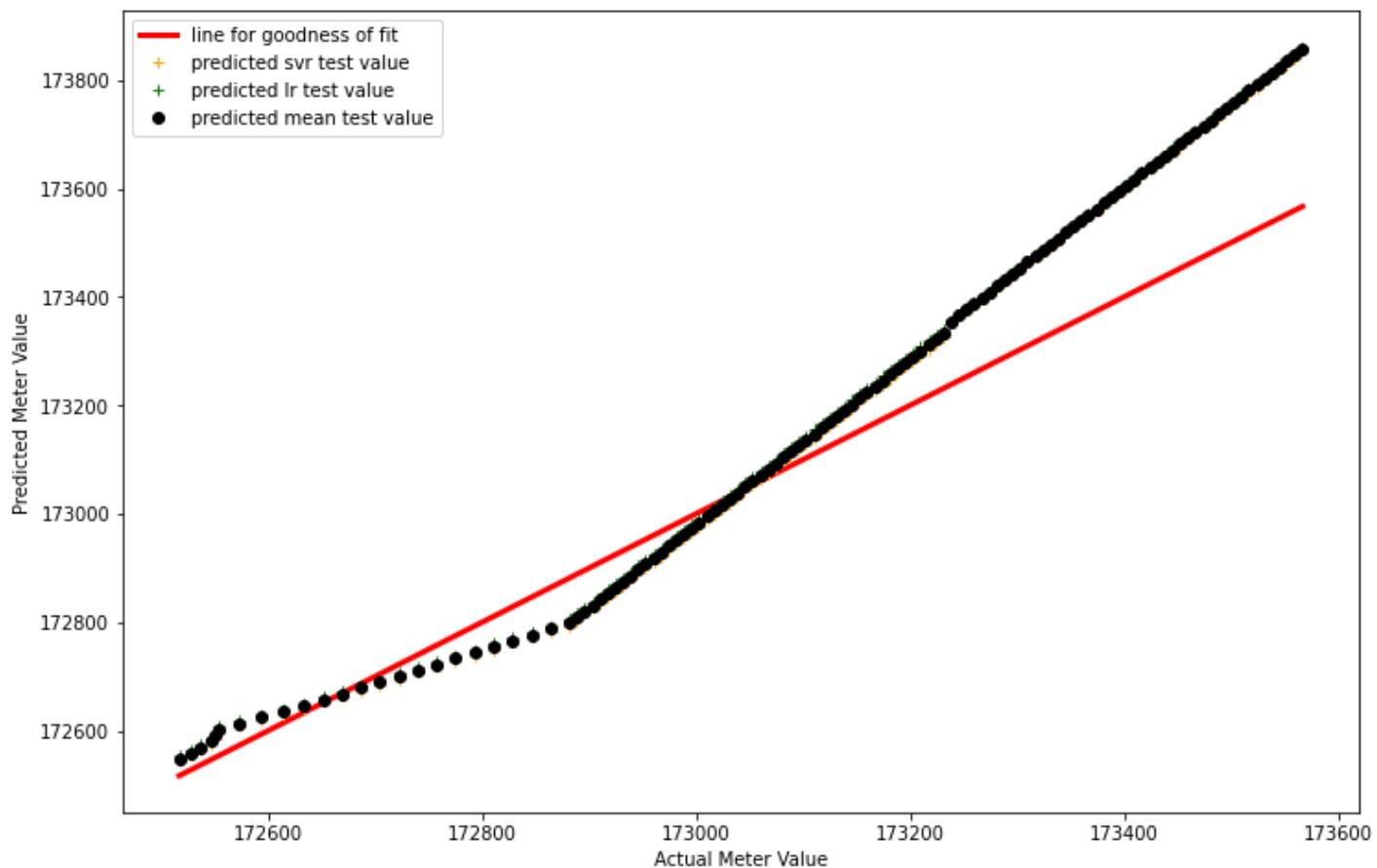
Household 2645.0  
Testing SVR MSE : 39348.38055833059  
Testing LR MSE : 46265.31959085257  
Ensemble MSE : 42695.30385022357



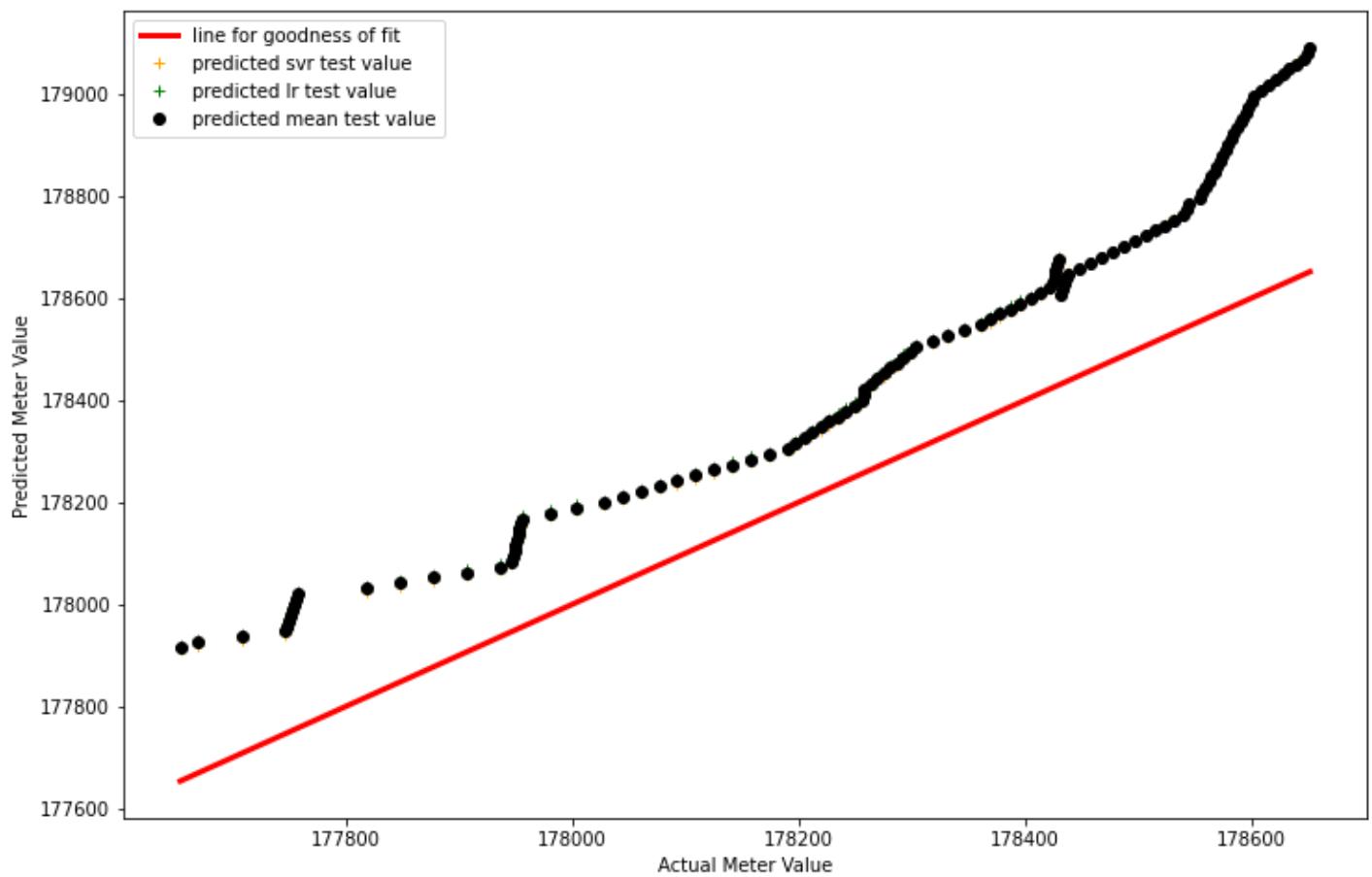
Household 2755.0  
Testing SVR MSE : 47949.64989469332  
Testing LR MSE : 16832.69583667857  
Ensemble MSE : 29715.12609477662



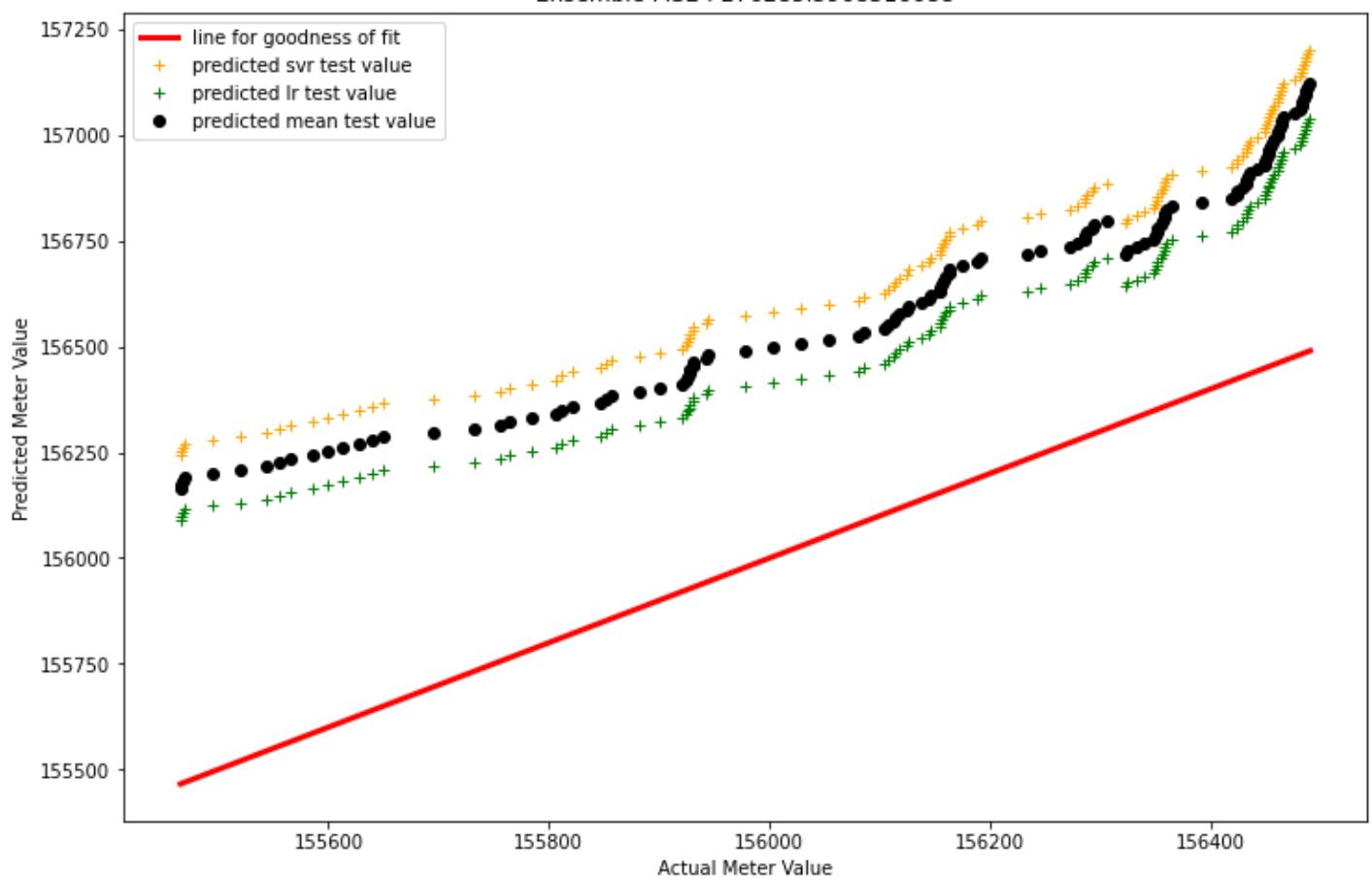
Household 2814.0  
Testing SVR MSE : 18131.850949671098  
Testing LR MSE : 19475.3148910052  
Ensemble MSE : 18773.362534232157



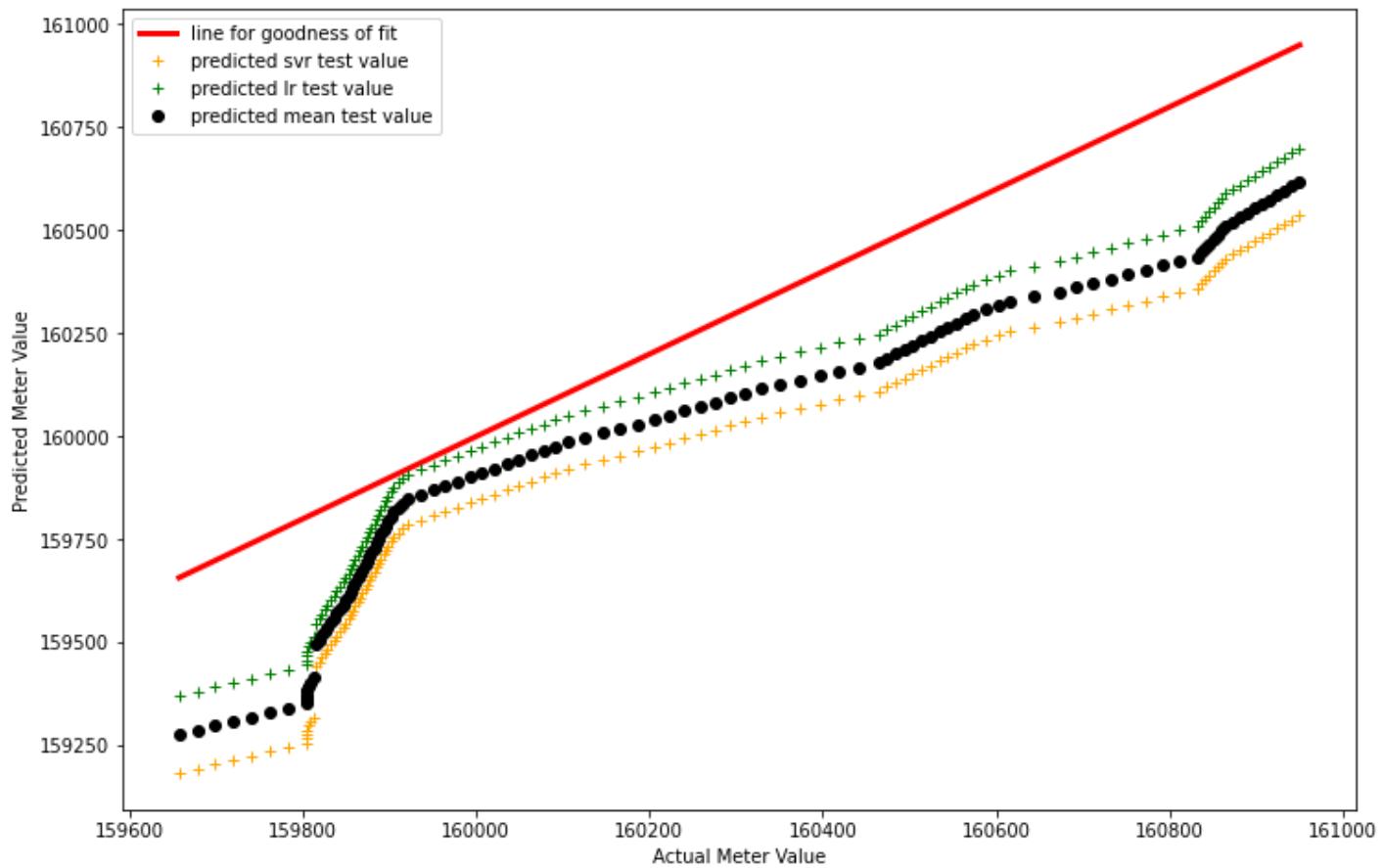
Household 2818.0  
Testing SVR MSE : 56925.41769821264  
Testing LR MSE : 58708.28611959043  
Ensemble MSE : 57803.477760500245



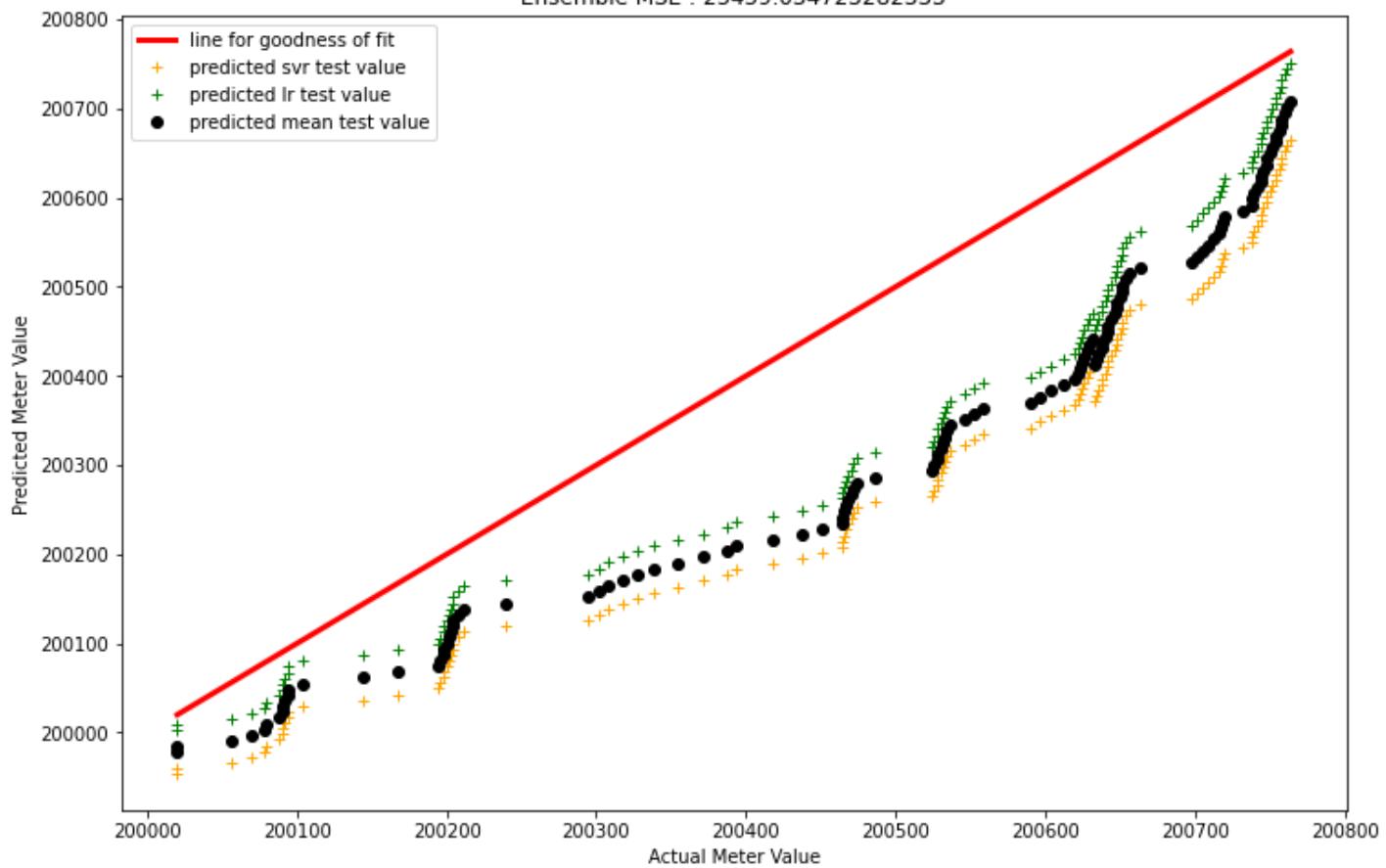
Household 2945.0  
Testing SVR MSE : 367304.00259126705  
Testing LR MSE : 198494.3746176842  
Ensemble MSE : 276285.5968316688



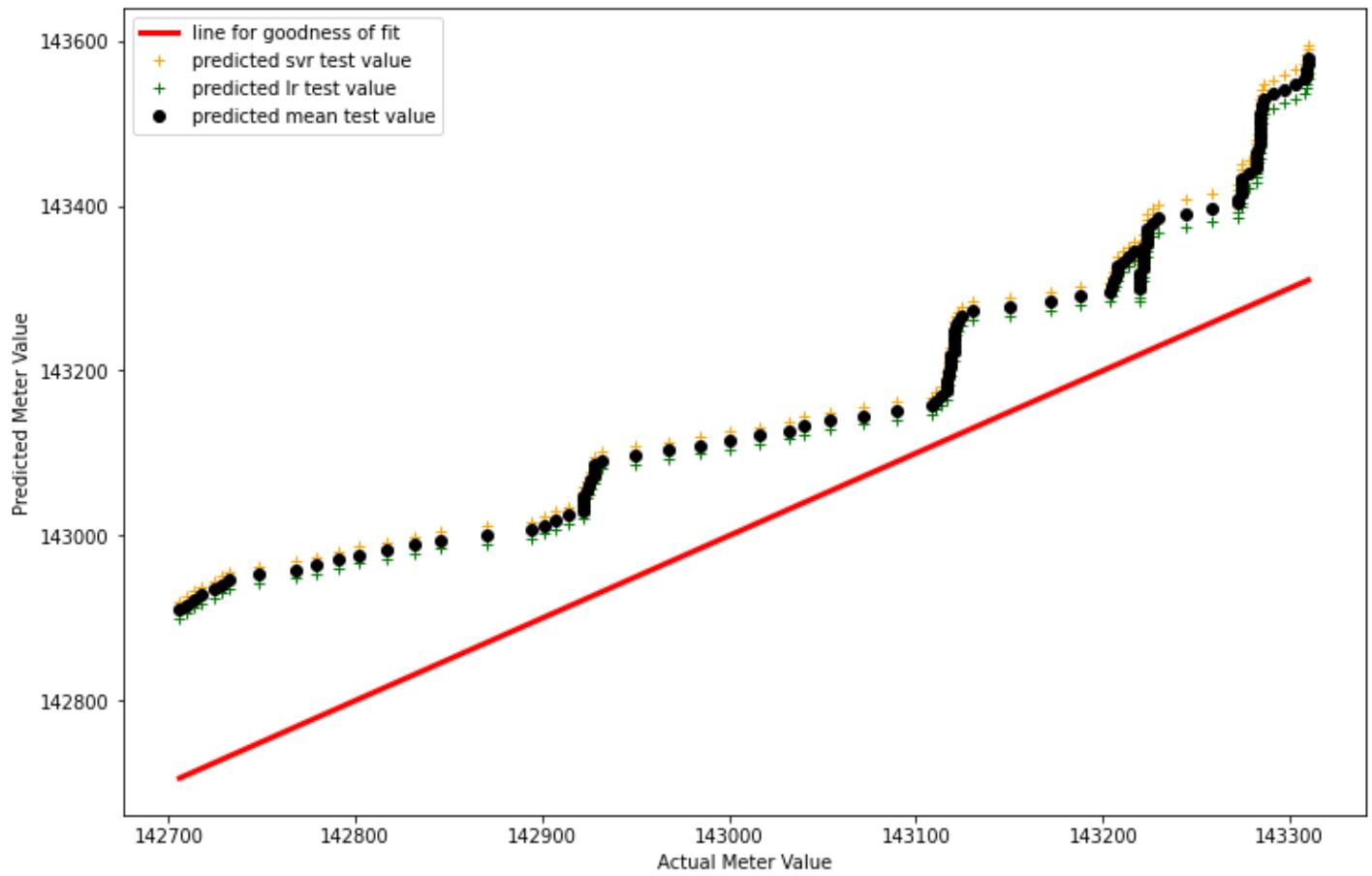
Household 2946.0  
Testing SVR MSE : 120493.4353835227  
Testing LR MSE : 44805.13705285602  
Ensemble MSE : 77617.99827276023



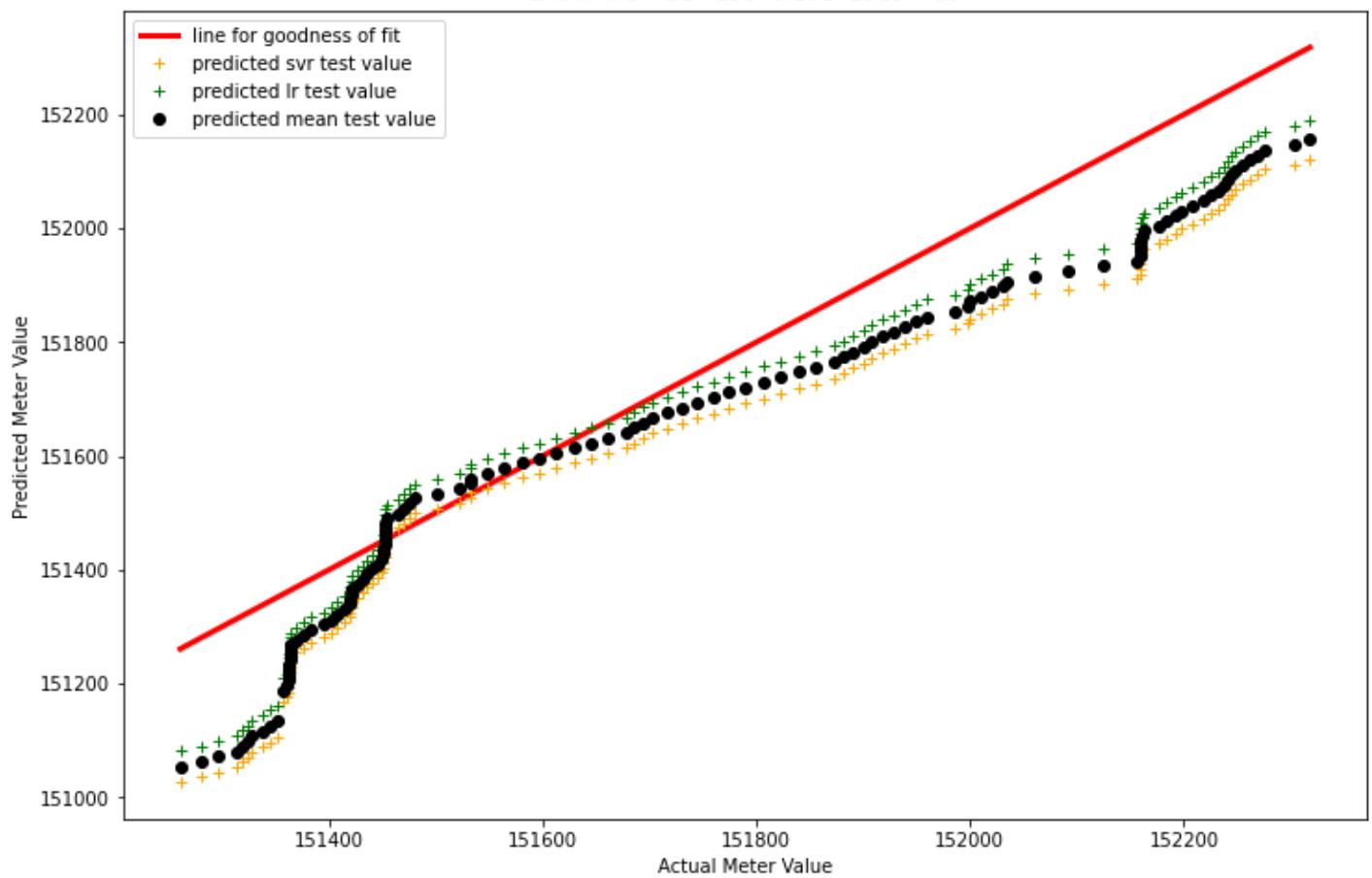
Household 2965.0  
Testing SVR MSE : 36291.9426756378  
Testing LR MSE : 16861.09249094225  
Ensemble MSE : 25459.034723282333



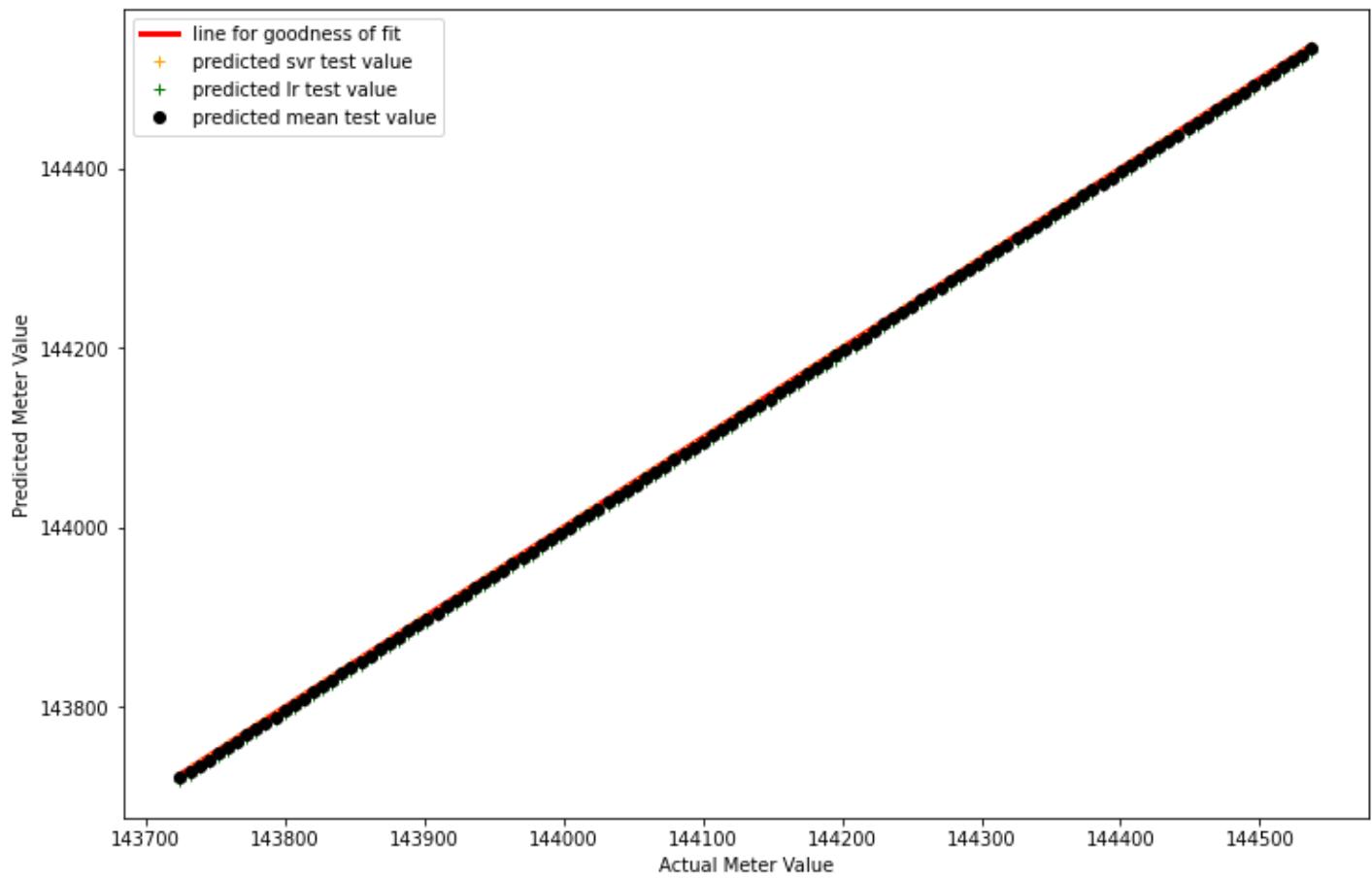
Household 2980.0  
Testing SVR MSE : 28025.923372175024  
Testing LR MSE : 20082.01433150233  
Ensemble MSE : 23870.890357937802



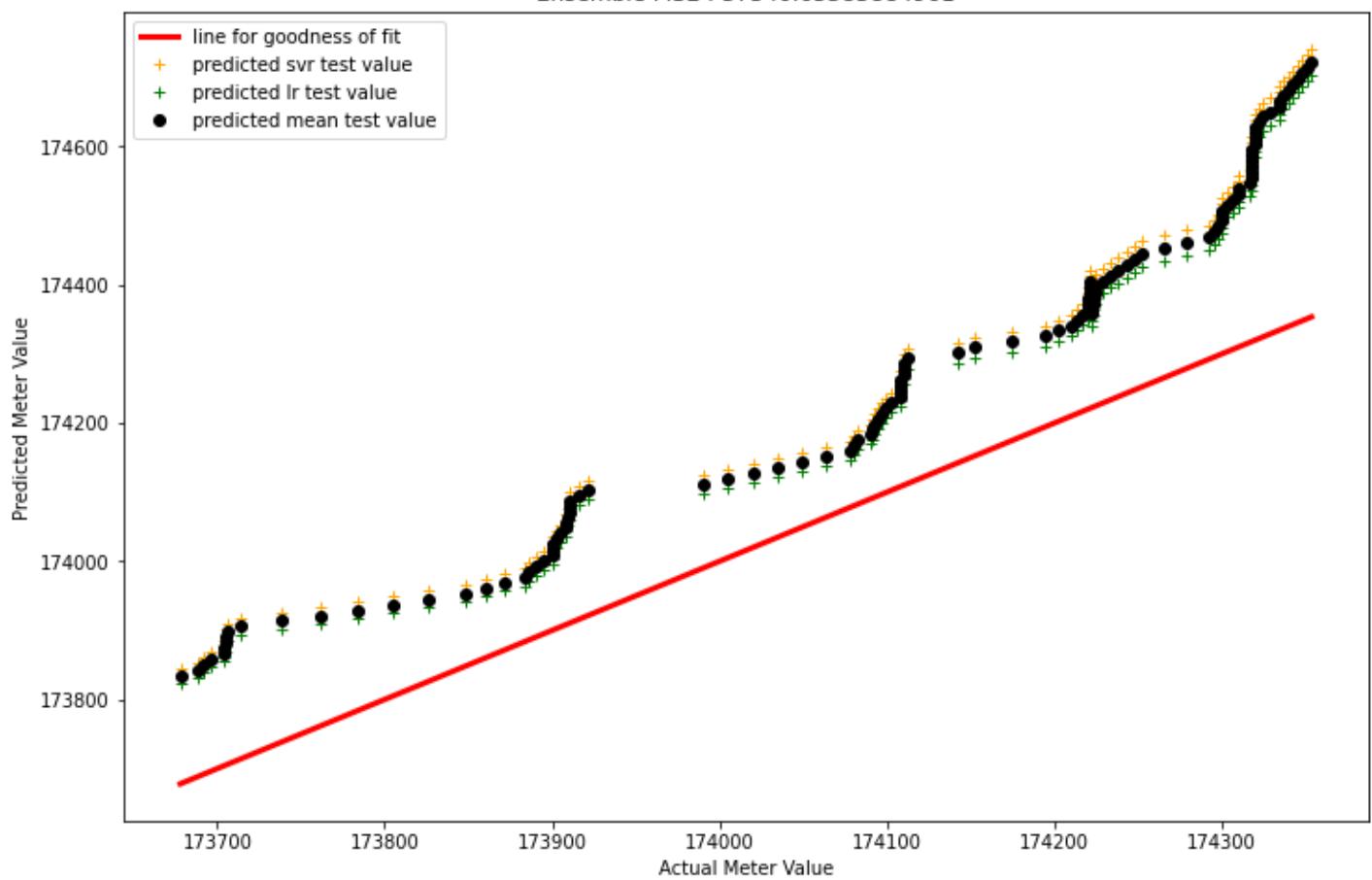
Household 3036.0  
Testing SVR MSE : 22021.190358981872  
Testing LR MSE : 10605.606735700978  
Ensemble MSE : 15548.192725157789



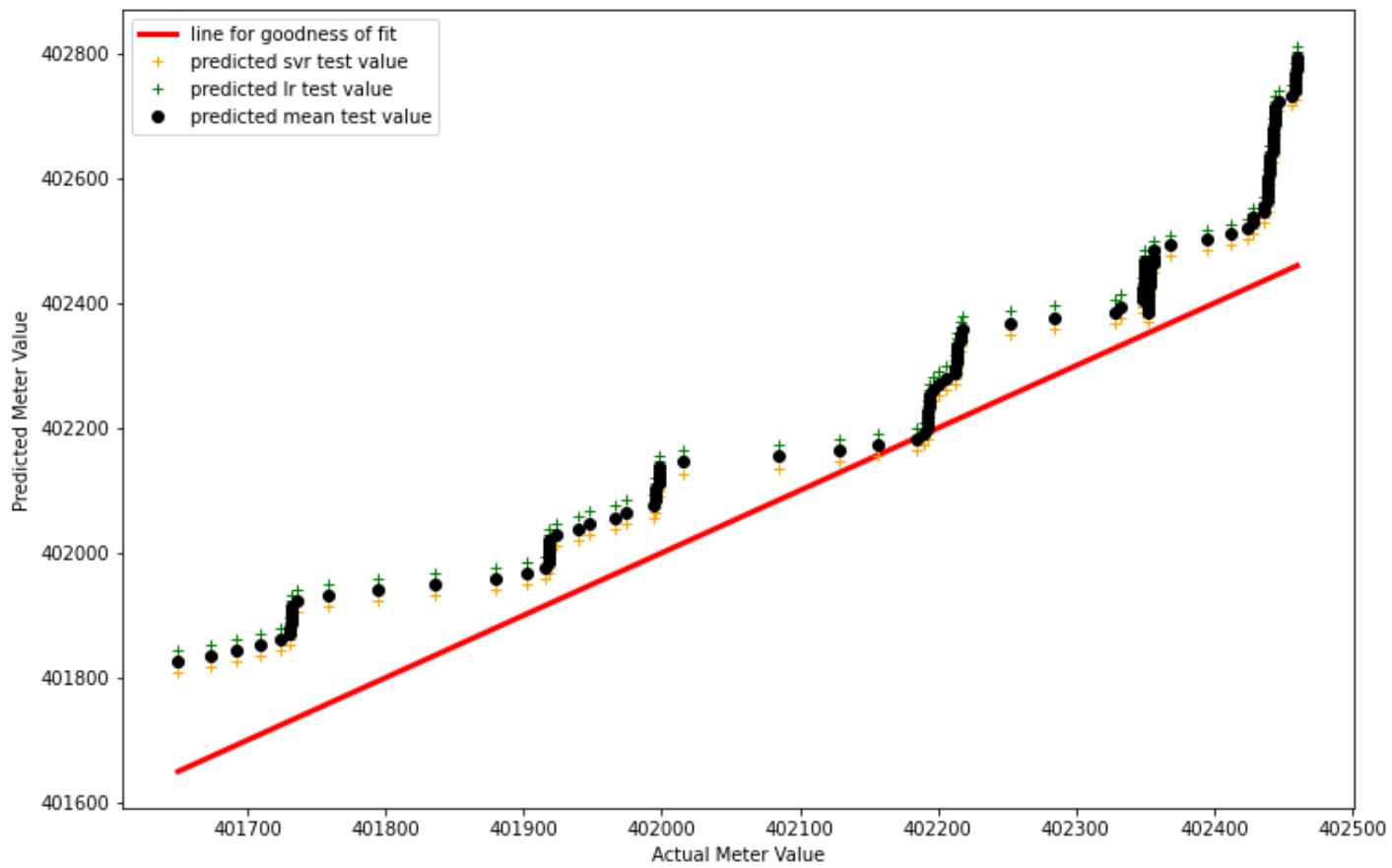
Household 3039.0  
Testing SVR MSE : 0.014088695958959004  
Testing LR MSE : 55.41740188706079  
Ensemble MSE : 14.299671548704799



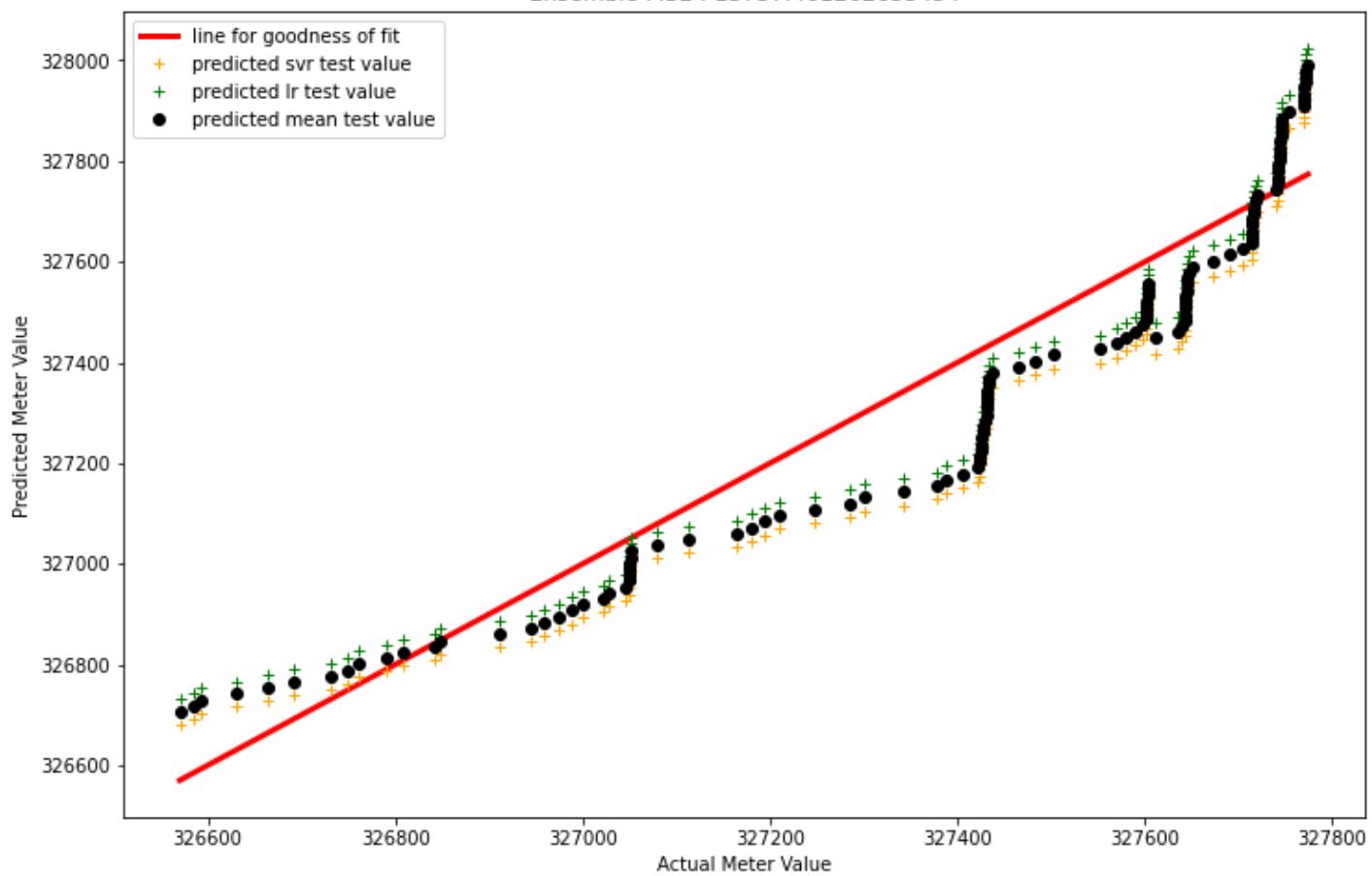
Household 3134.0  
Testing SVR MSE : 43391.28344167221  
Testing LR MSE : 31774.578683420856  
Ensemble MSE : 37340.65383884961



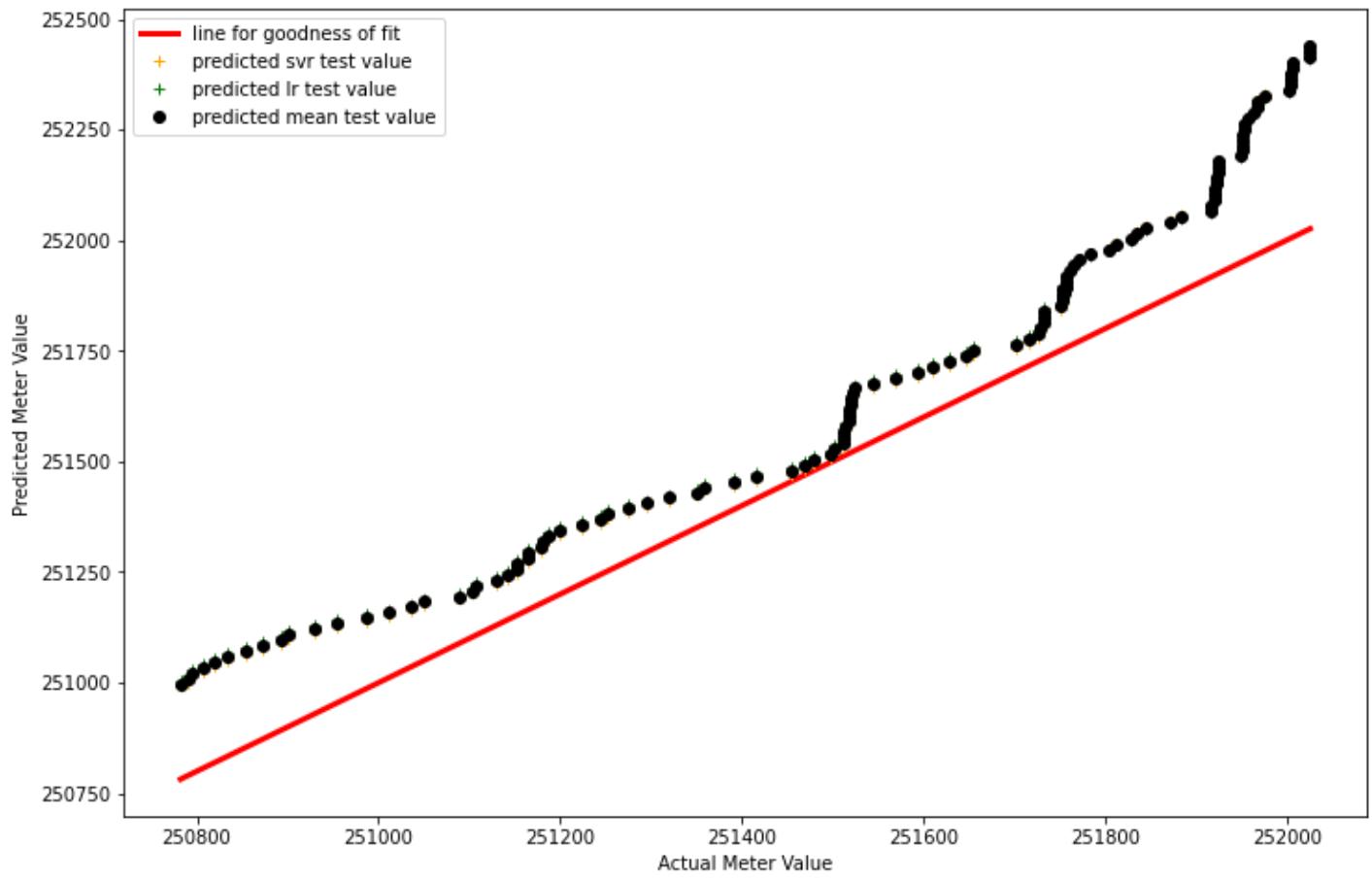
Household 3310.0  
Testing SVR MSE : 17437.301277200673  
Testing LR MSE : 26223.913332409375  
Ensemble MSE : 21519.678566318045



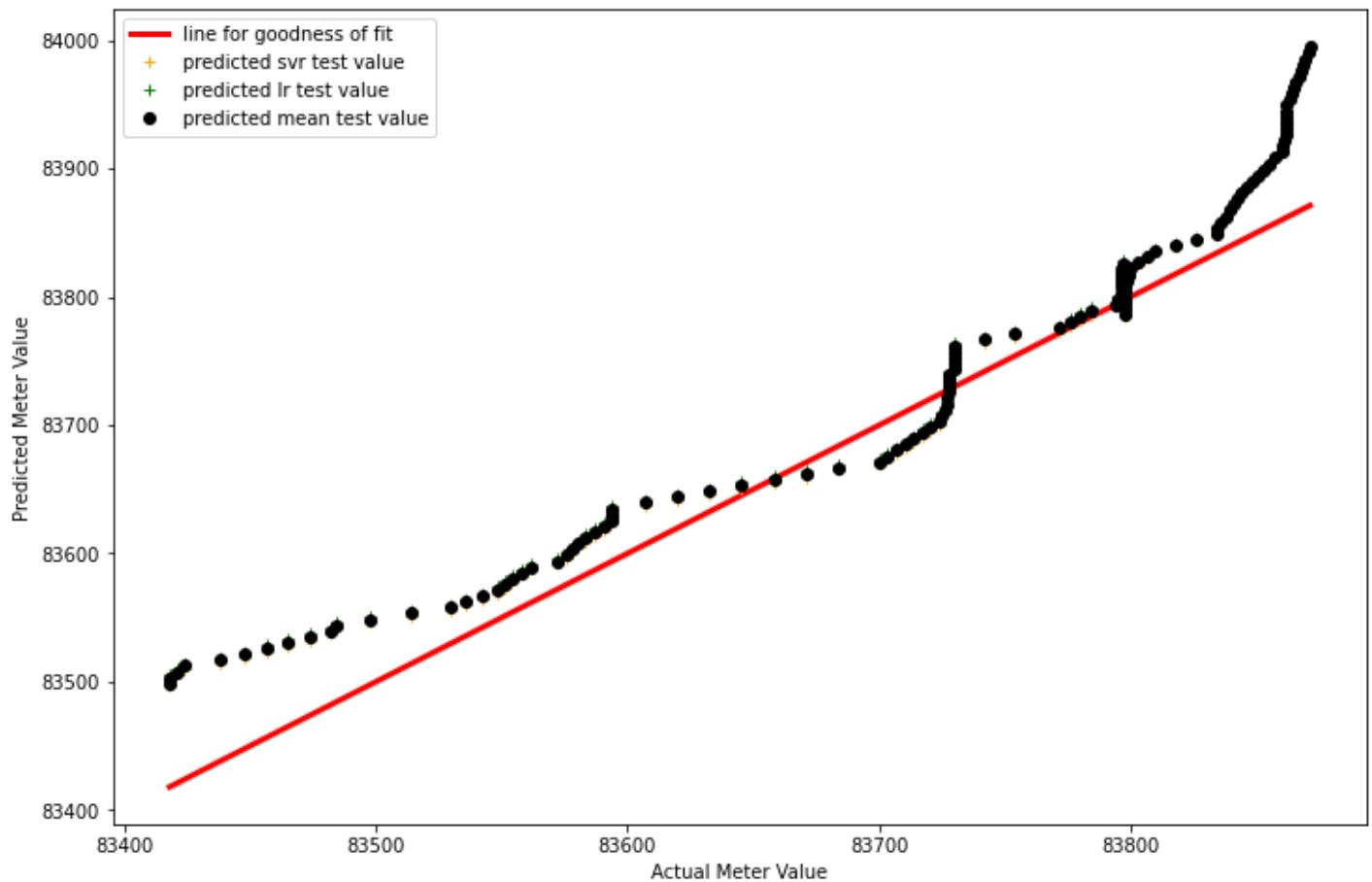
Household 3367.0  
Testing SVR MSE : 17051.65260398913  
Testing LR MSE : 12142.733704242351  
Ensemble MSE : 13757.461262653454



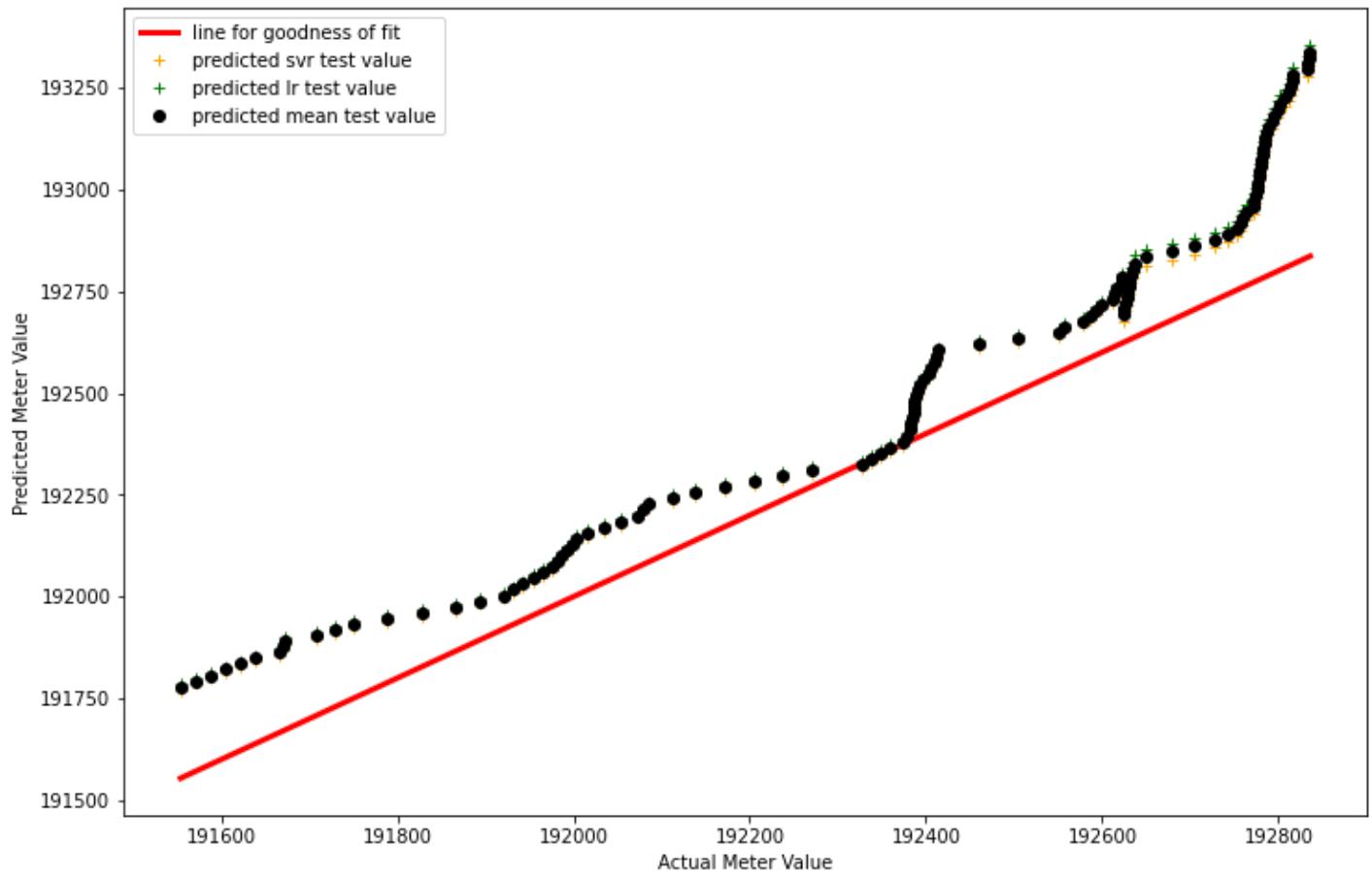
Household 3527.0  
Testing SVR MSE : 36533.5695246676  
Testing LR MSE : 37425.920492764606  
Ensemble MSE : 36935.888996495254



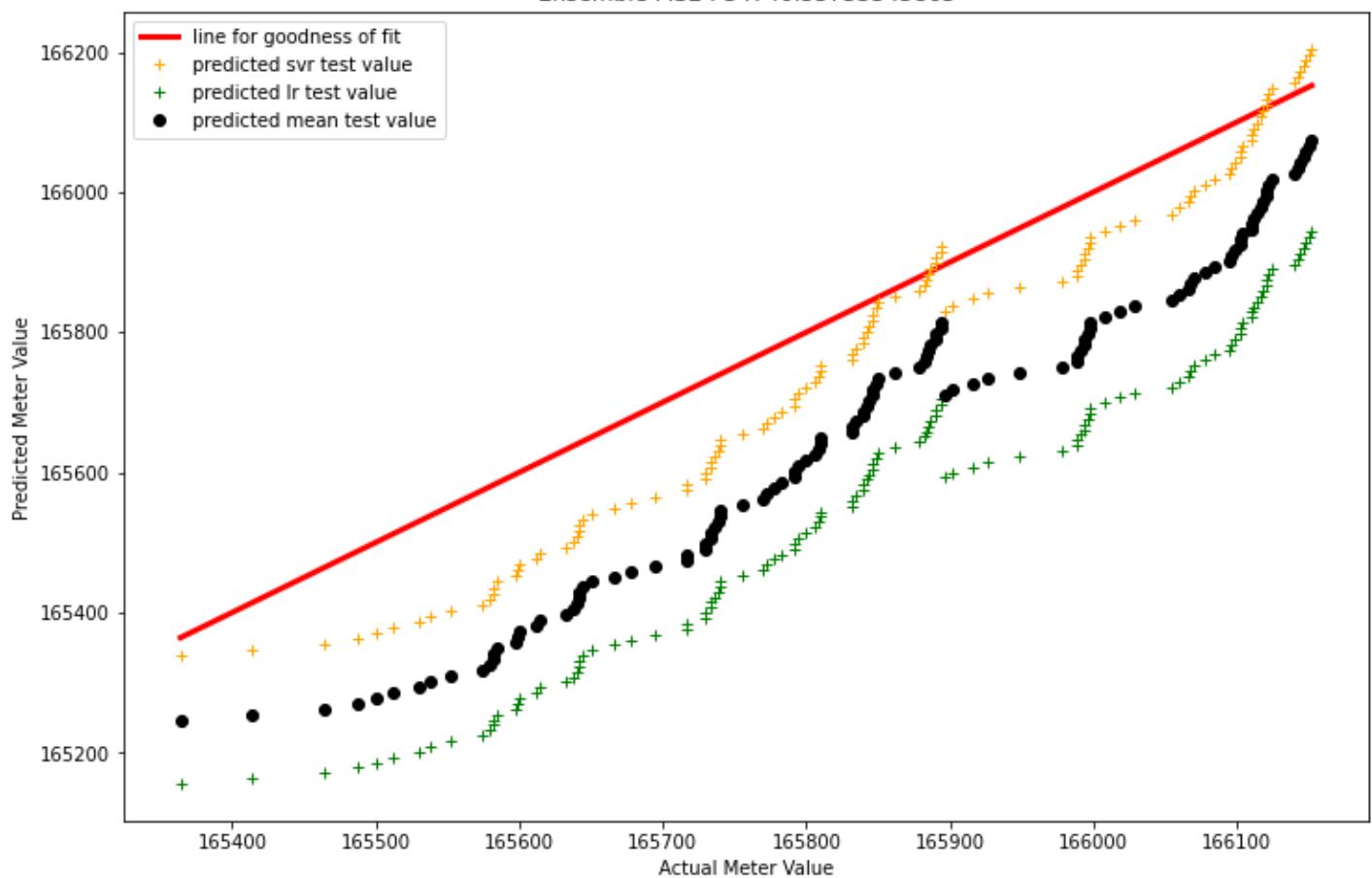
Household 3544.0  
Testing SVR MSE : 2207.115391092528  
Testing LR MSE : 2407.2486695366283  
Ensemble MSE : 2303.247347909231



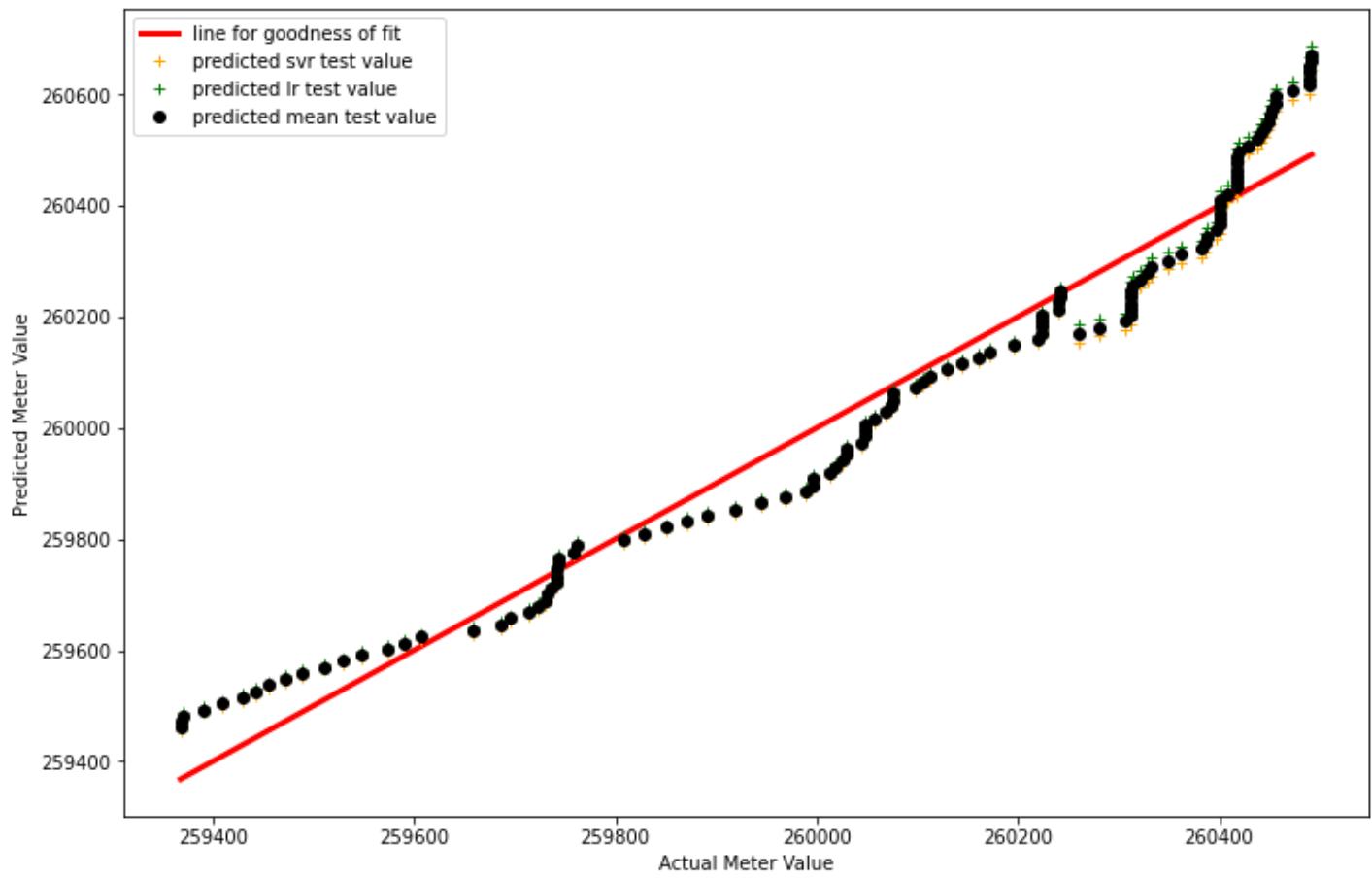
Household 3577.0  
Testing SVR MSE : 40178.5651275349  
Testing LR MSE : 50758.56120597787  
Ensemble MSE : 45279.868806641694



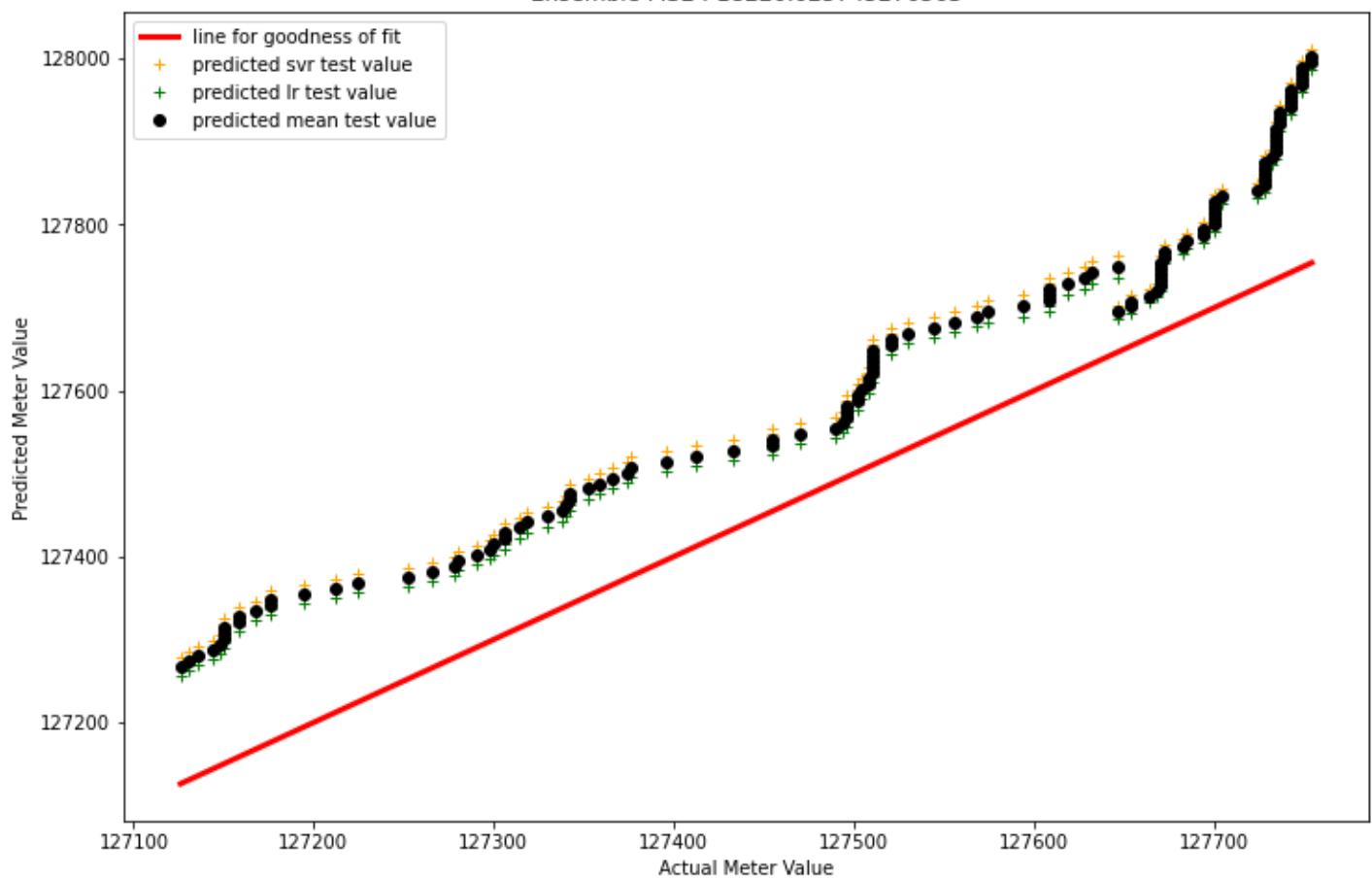
Household 3635.0  
Testing SVR MSE : 7892.933967680832  
Testing LR MSE : 86166.5056705738  
Ensemble MSE : 34740.55733343865



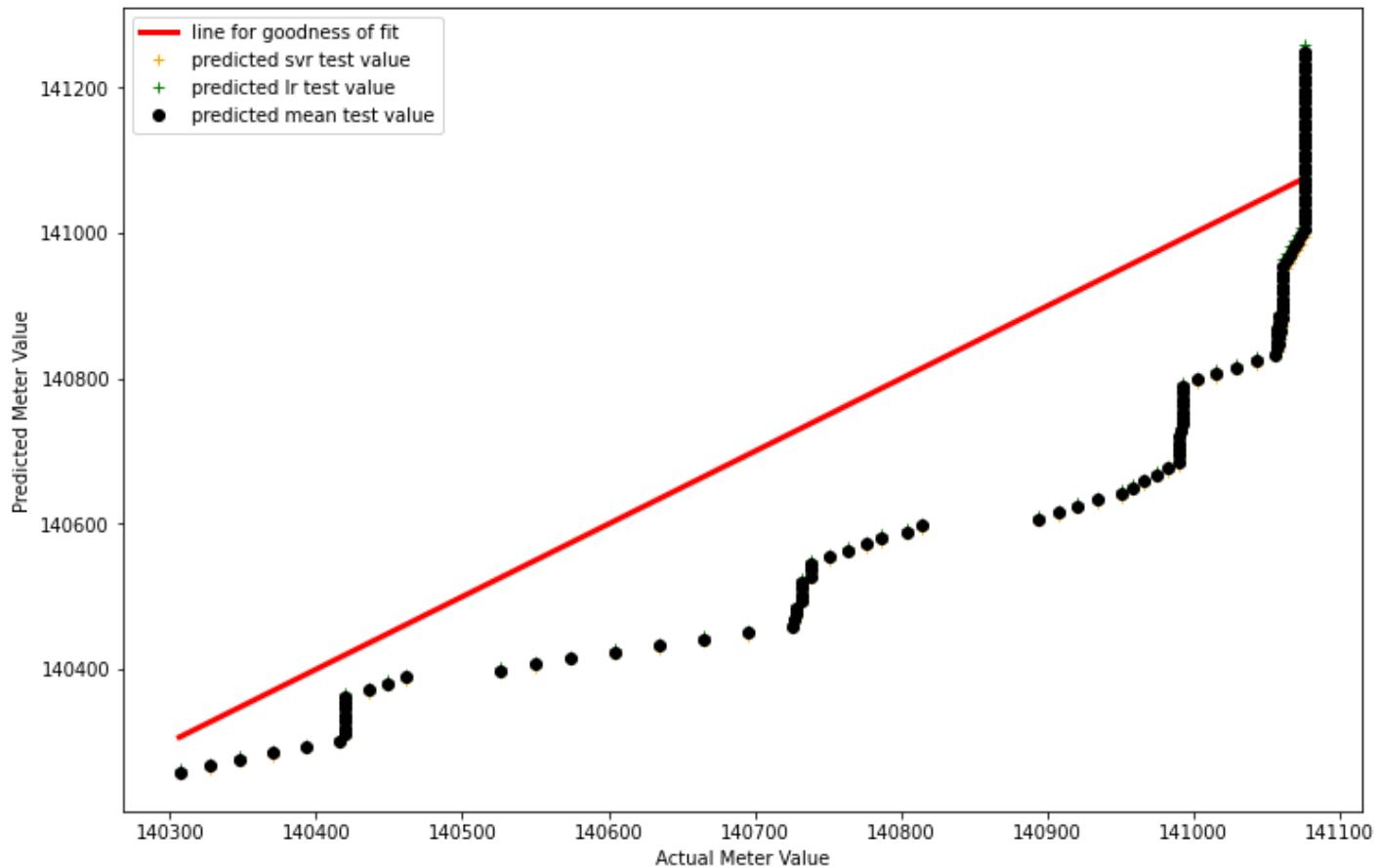
Household 3723.0  
Testing SVR MSE : 5067.326245389539  
Testing LR MSE : 5400.899501796473  
Ensemble MSE : 5111.836839453209



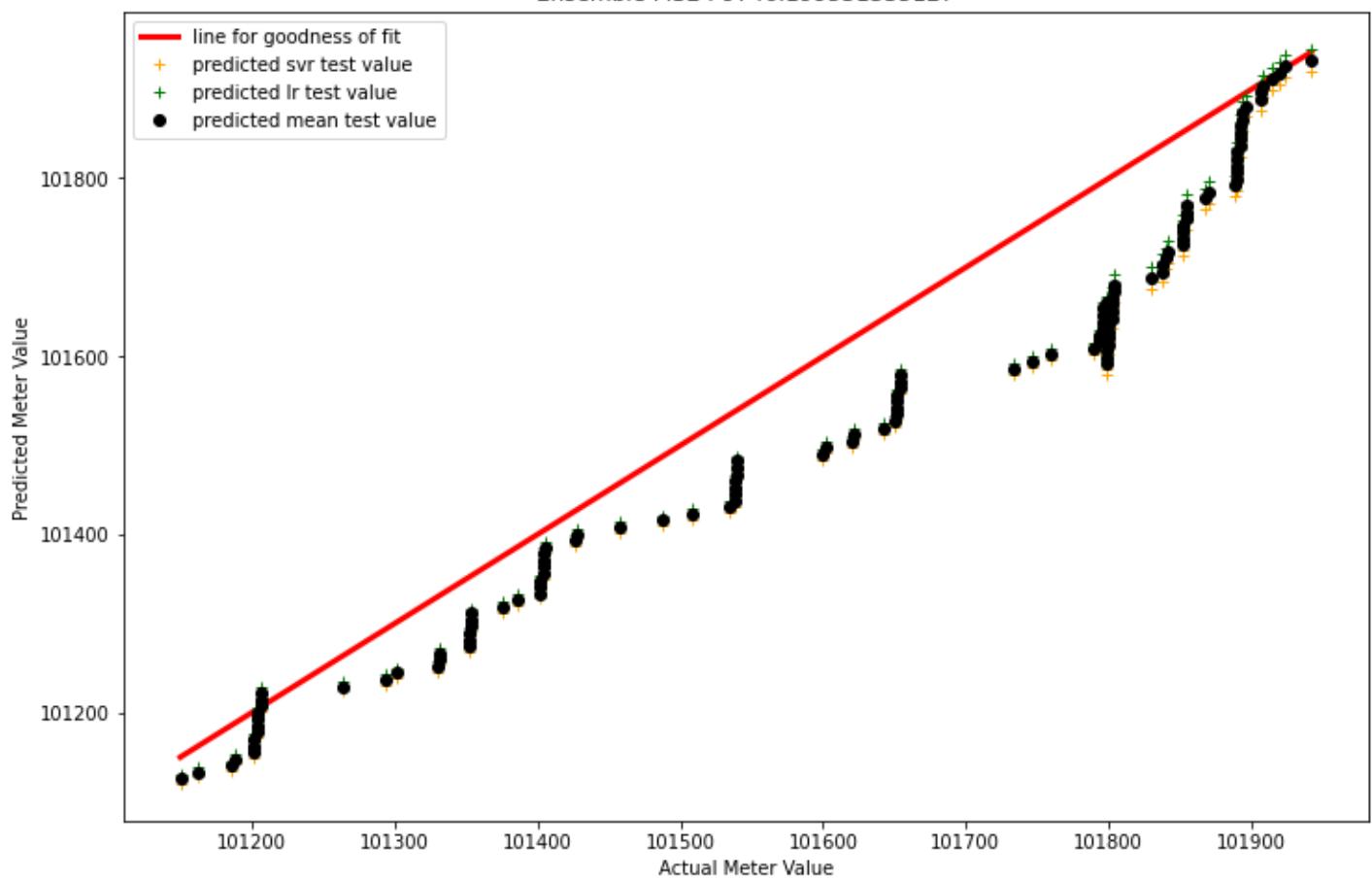
Household 3778.0  
Testing SVR MSE : 21081.76301541005  
Testing LR MSE : 15595.062317469345  
Ensemble MSE : 18220.025745270563



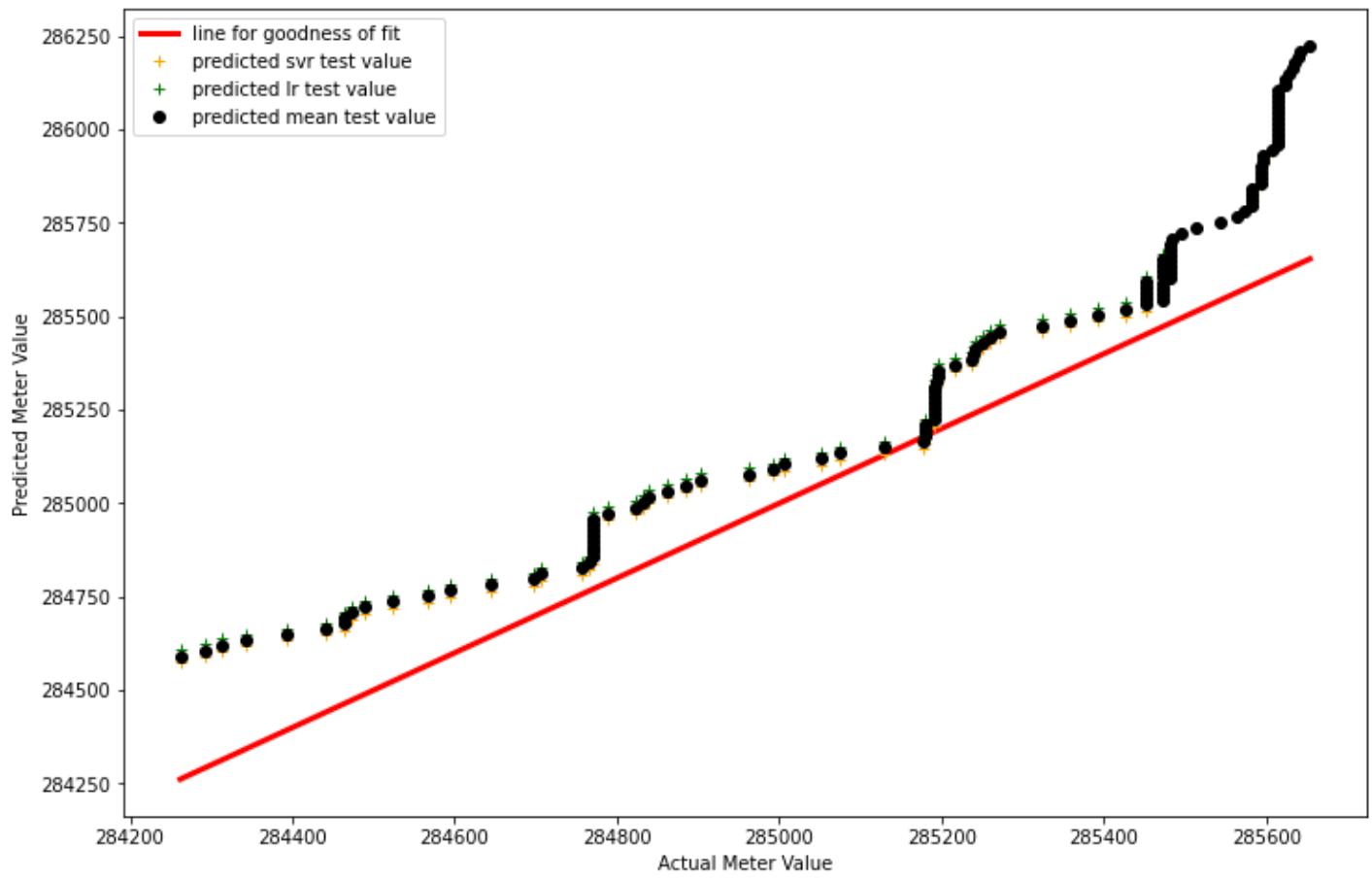
Household 3849.0  
Testing SVR MSE : 33862.45784590375  
Testing LR MSE : 31567.005007364678  
Ensemble MSE : 32659.327033341382



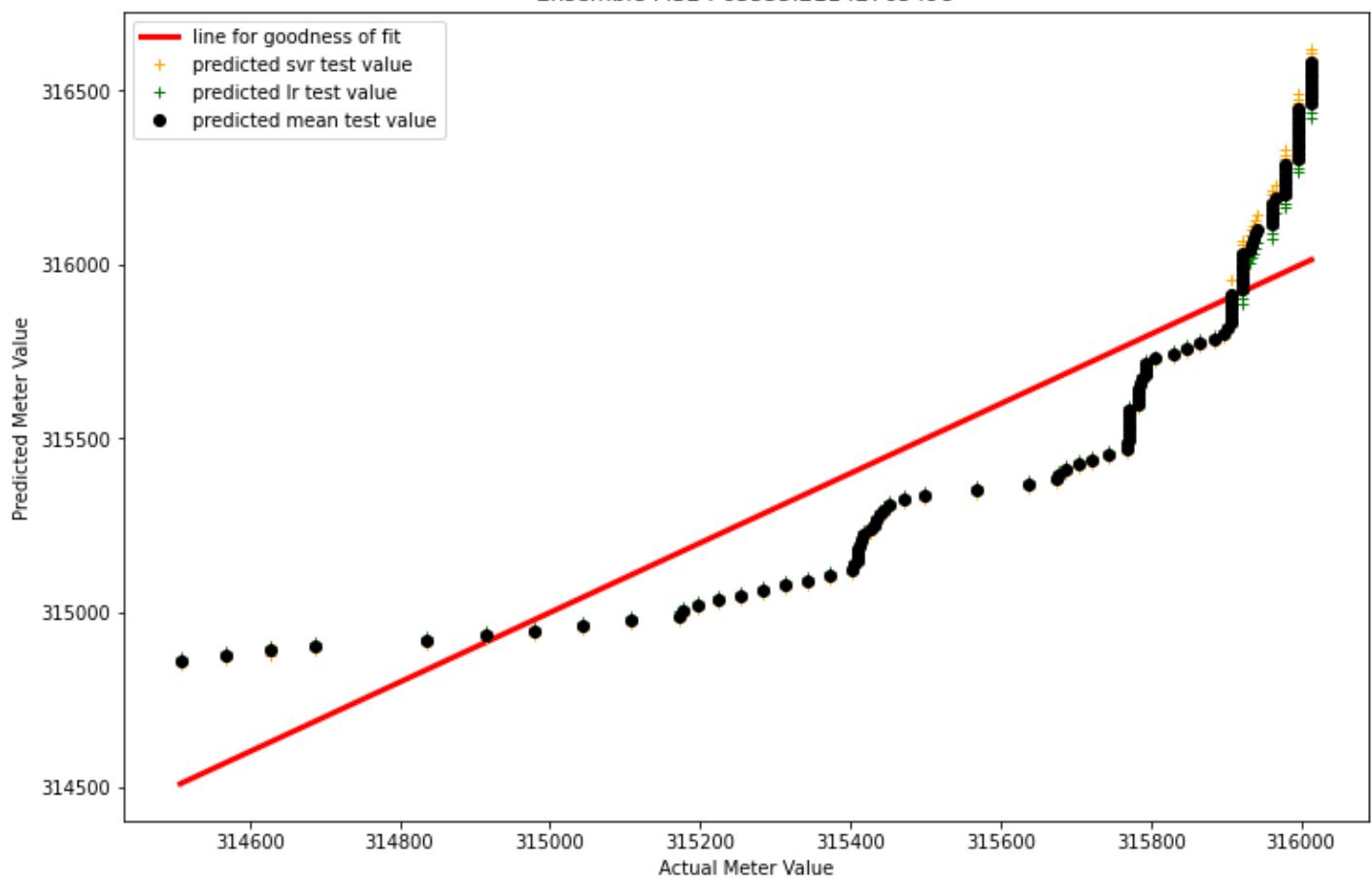
Household 3893.0  
Testing SVR MSE : 11271.470172614574  
Testing LR MSE : 8376.998309373395  
Ensemble MSE : 9746.199531335127



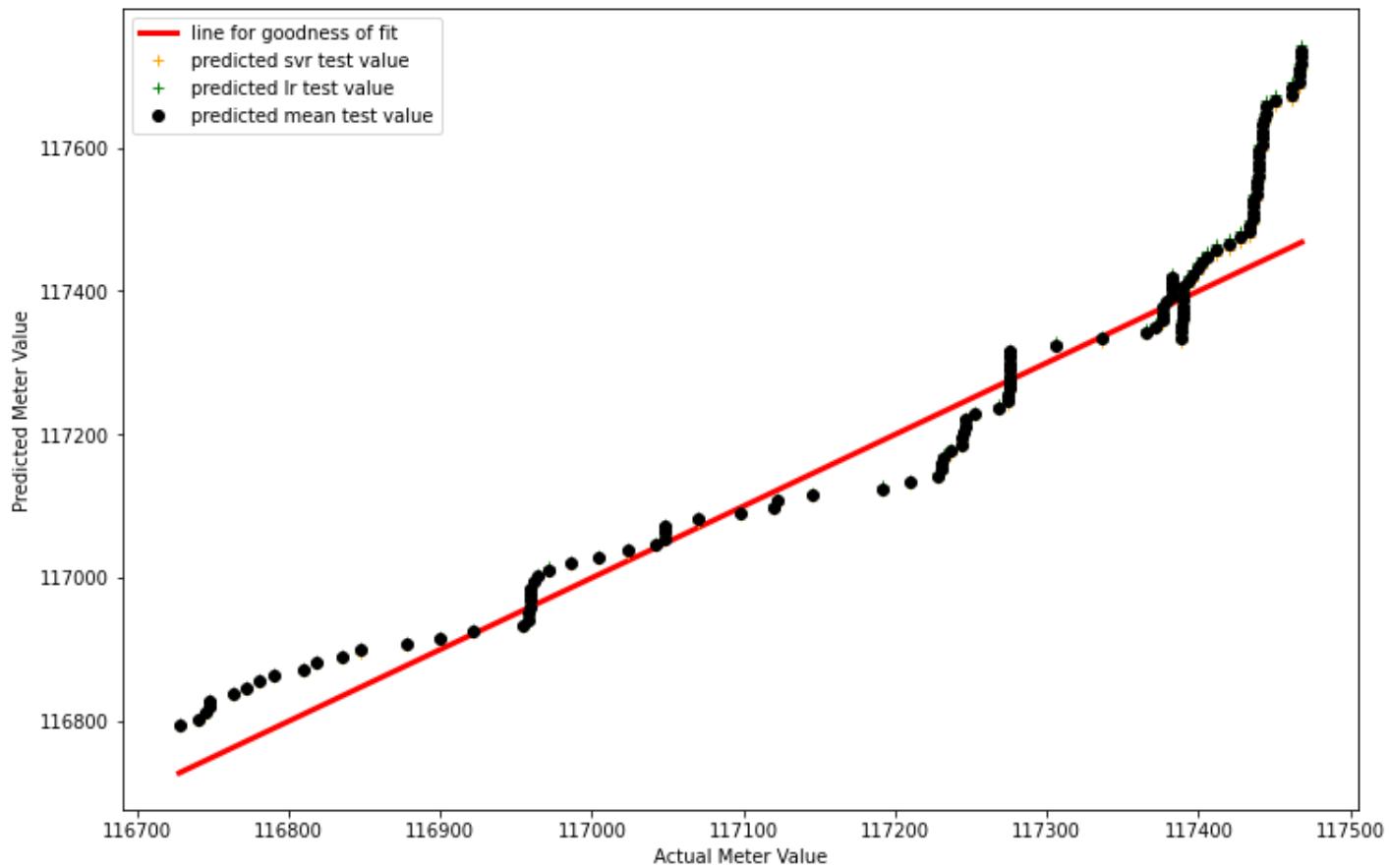
Household 3918.0  
Testing SVR MSE : 58865.588290950254  
Testing LR MSE : 65745.59429904186  
Ensemble MSE : 62121.38949878521



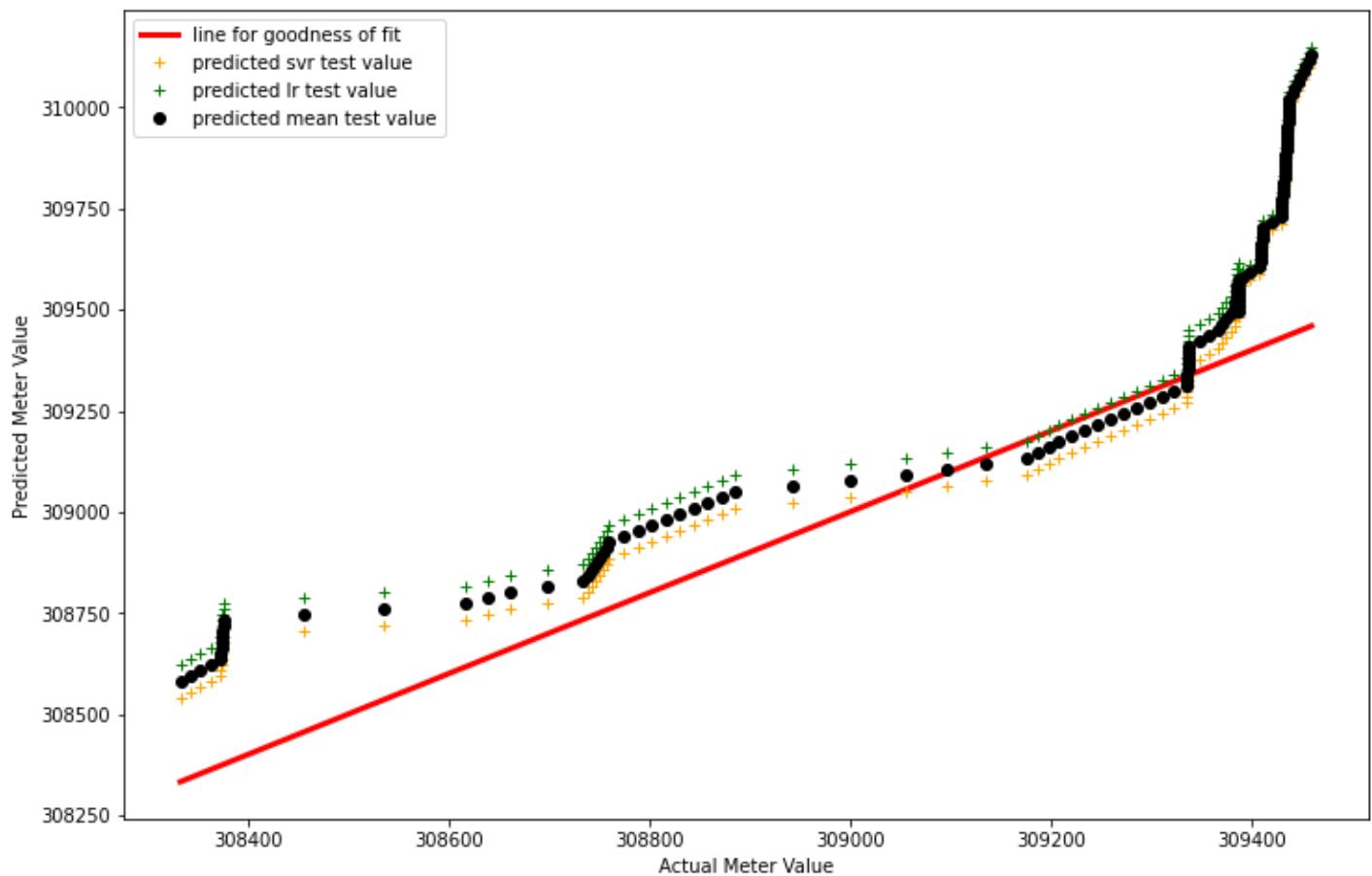
Household 4029.0  
Testing SVR MSE : 74938.00825325468  
Testing LR MSE : 53613.10839864669  
Ensemble MSE : 63555.21142765498



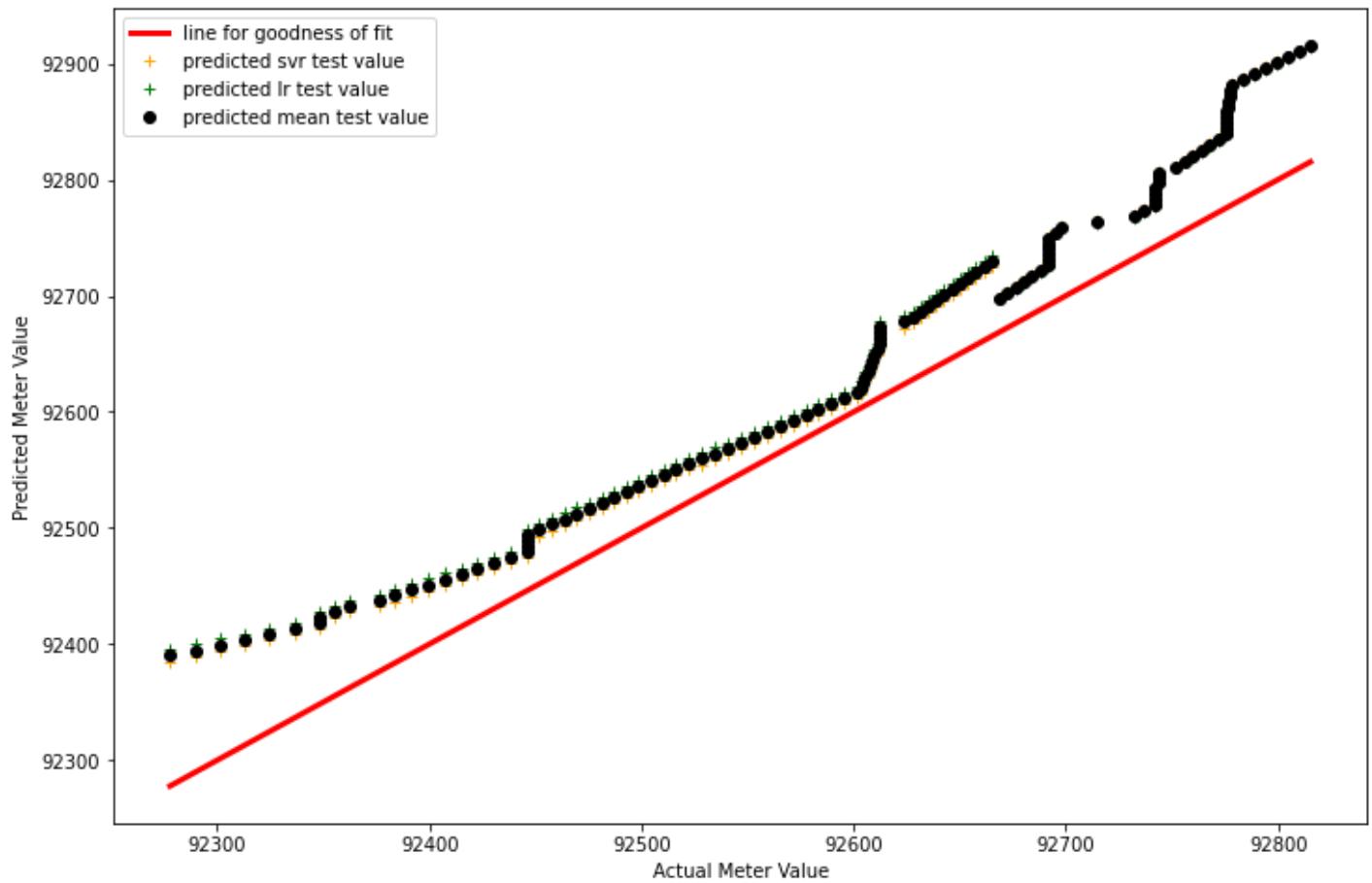
Household 4031.0  
Testing SVR MSE : 8238.493763573428  
Testing LR MSE : 9595.532326469938  
Ensemble MSE : 8887.335542247723



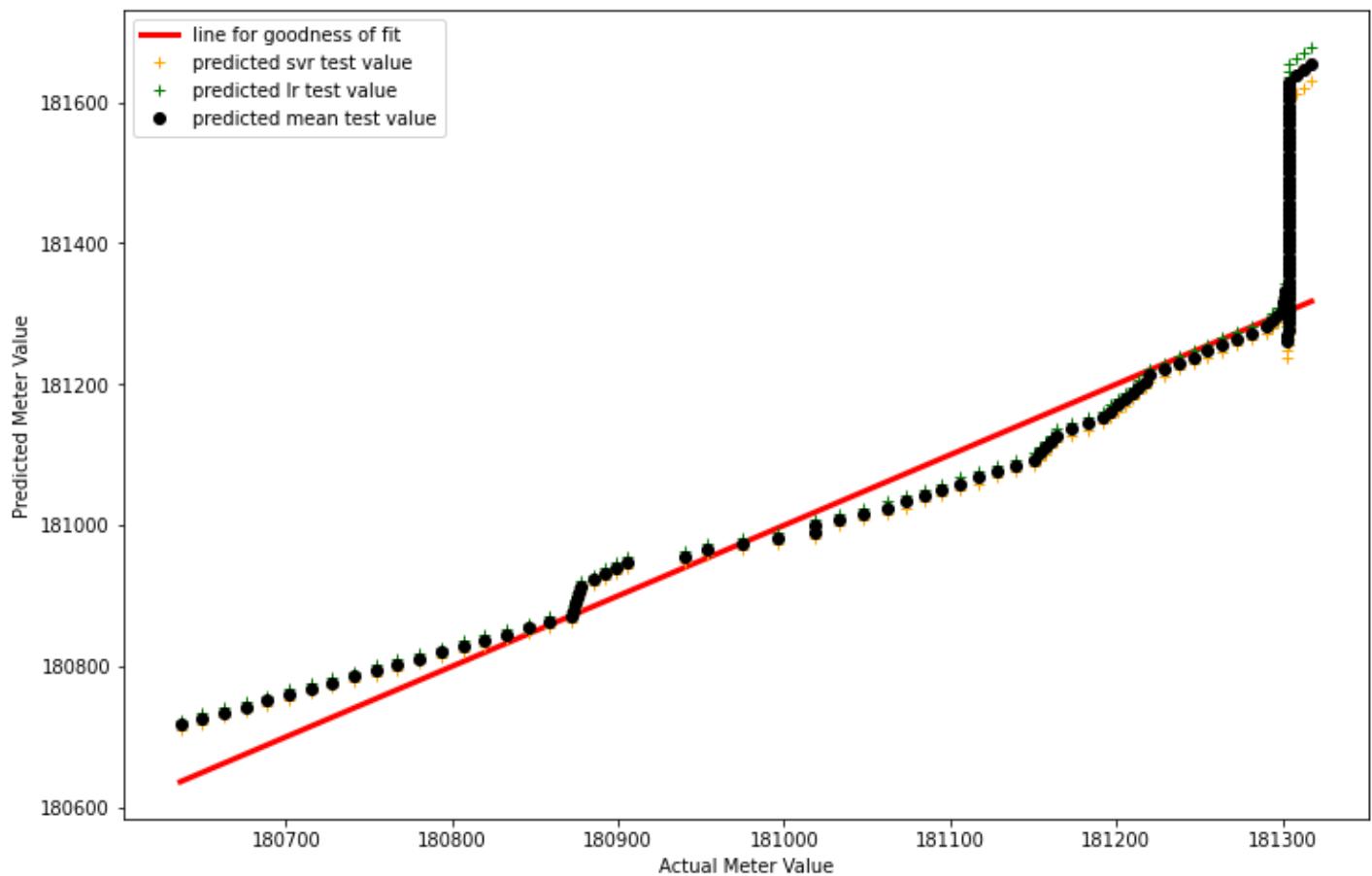
Household 4193.0  
Testing SVR MSE : 75813.58404915557  
Testing LR MSE : 98701.88618961223  
Ensemble MSE : 86091.1027880442



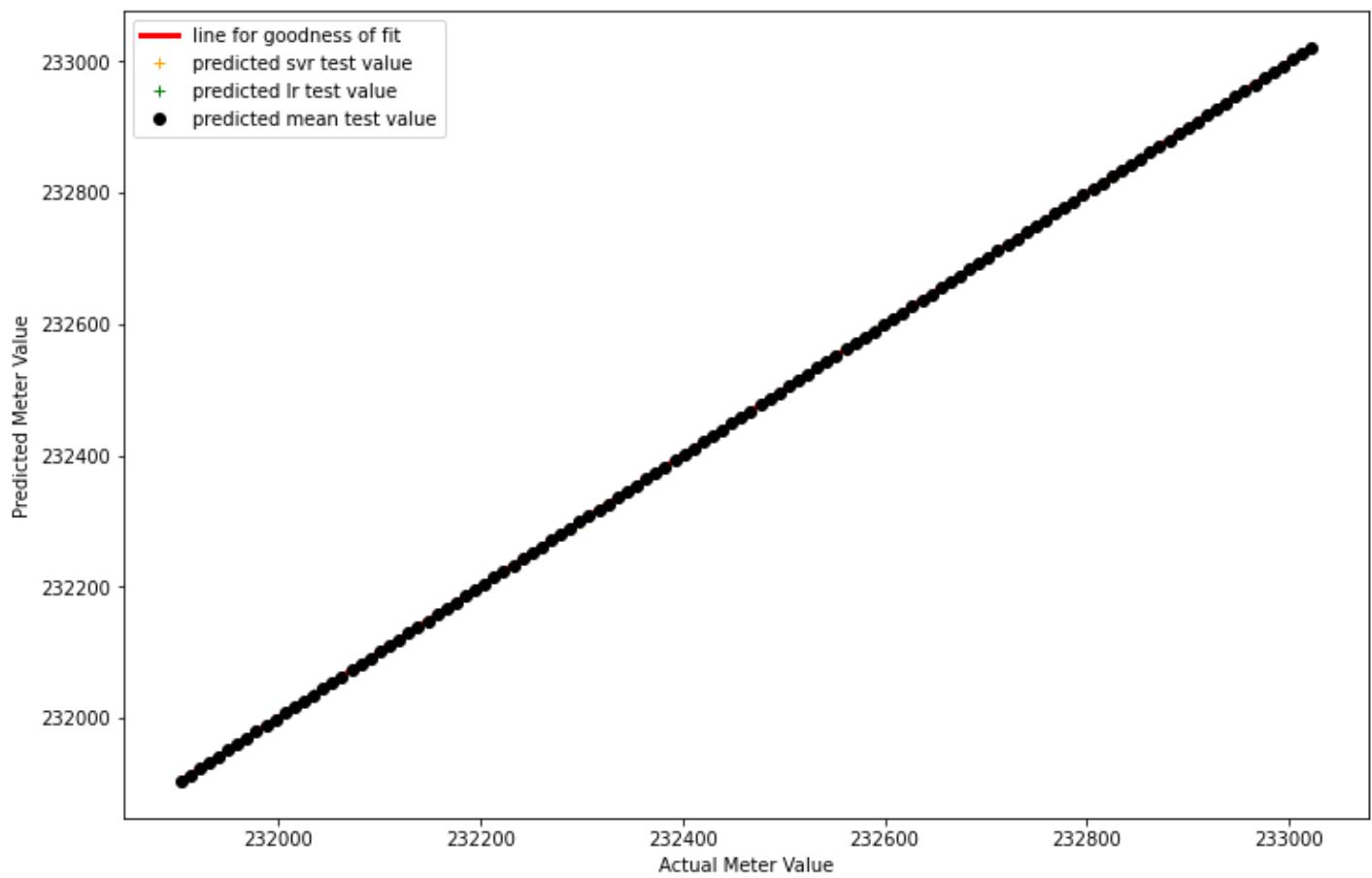
Household 4228.0  
Testing SVR MSE : 3198.1870665731735  
Testing LR MSE : 3654.8876006771734  
Ensemble MSE : 3410.7526579886617



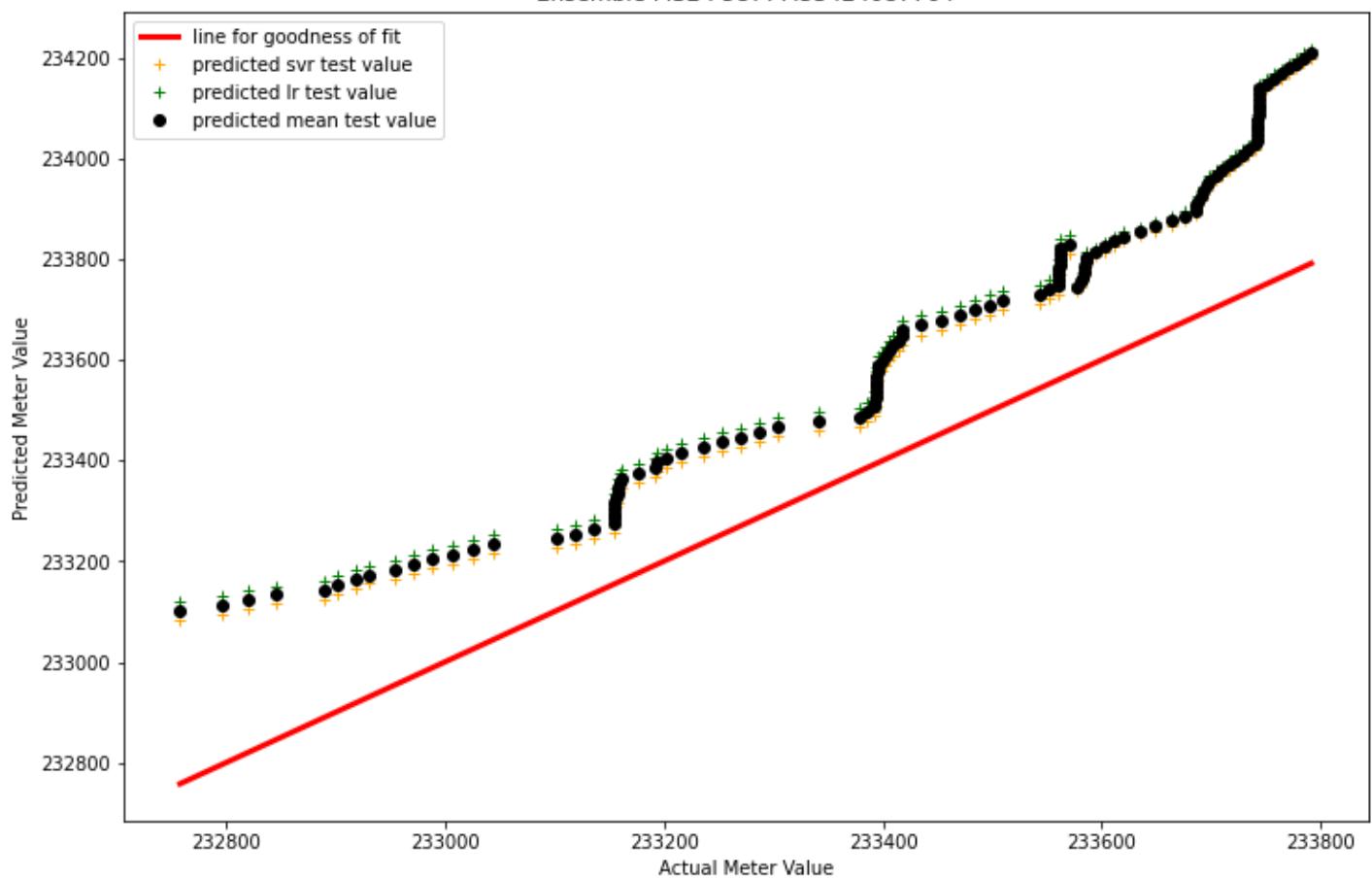
Household 4296.0  
Testing SVR MSE : 12521.335463151236  
Testing LR MSE : 18240.386673626363  
Ensemble MSE : 15122.350456247543



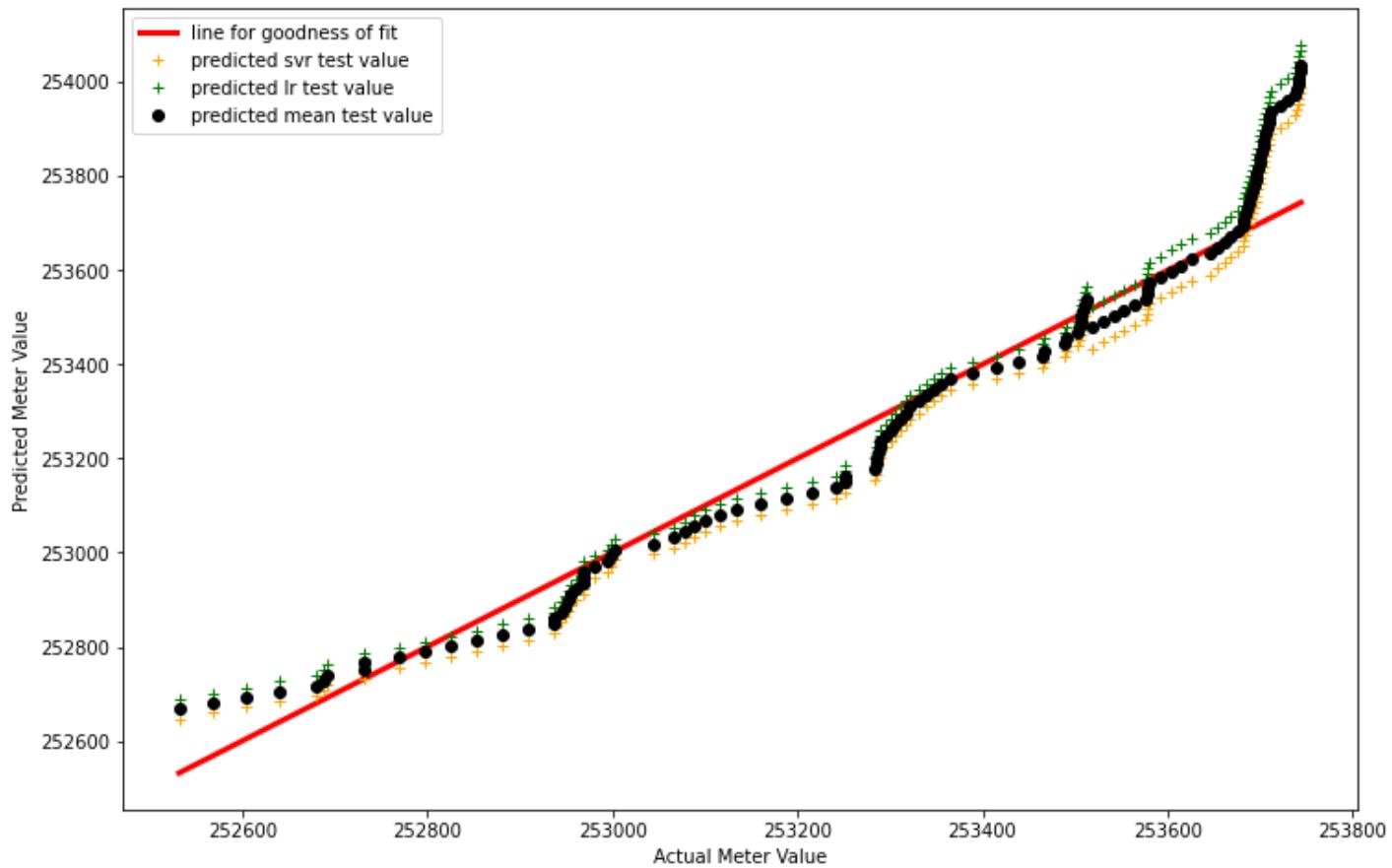
Household 4352.0  
Testing SVR MSE : 0.017223947363214635  
Testing LR MSE : 6.211574946531535e-22  
Ensemble MSE : 0.004305986840089047



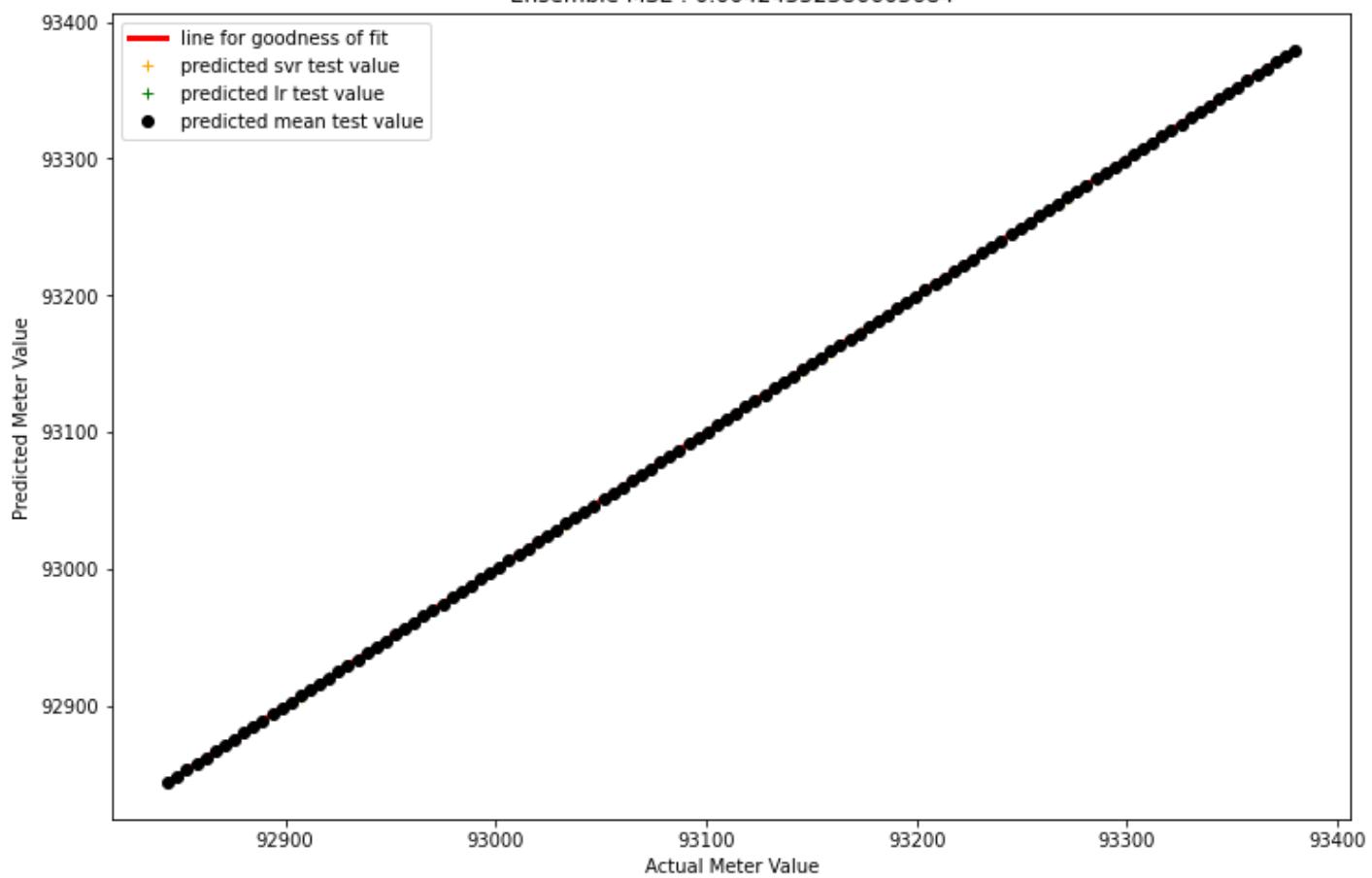
Household 4356.0  
Testing SVR MSE : 52540.874610951665  
Testing LR MSE : 65499.486978976674  
Ensemble MSE : 58777.53424087764



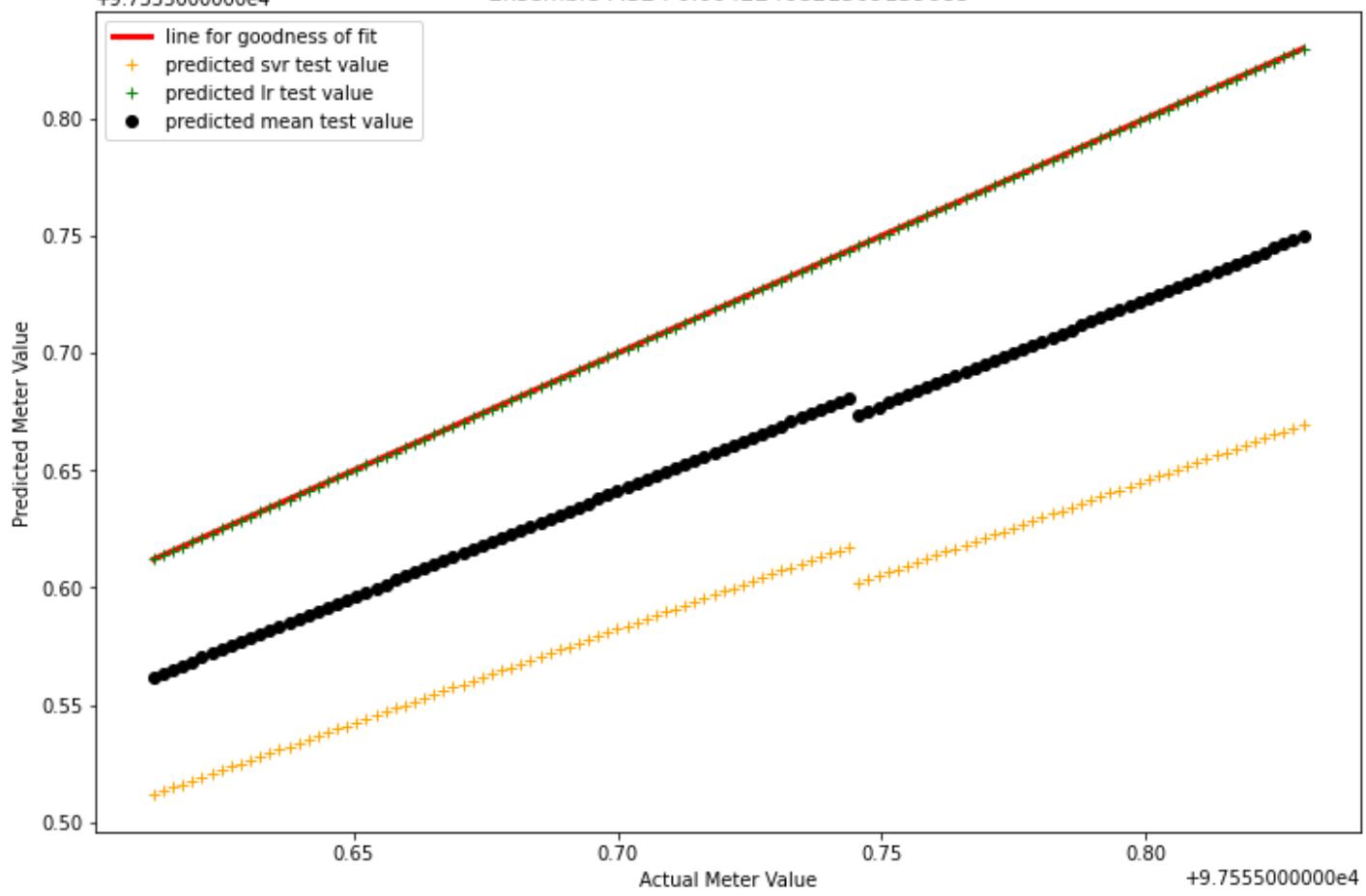
Household 4373.0  
Testing SVR MSE : 7918.897570074073  
Testing LR MSE : 12915.661958845572  
Ensemble MSE : 9311.928888752274



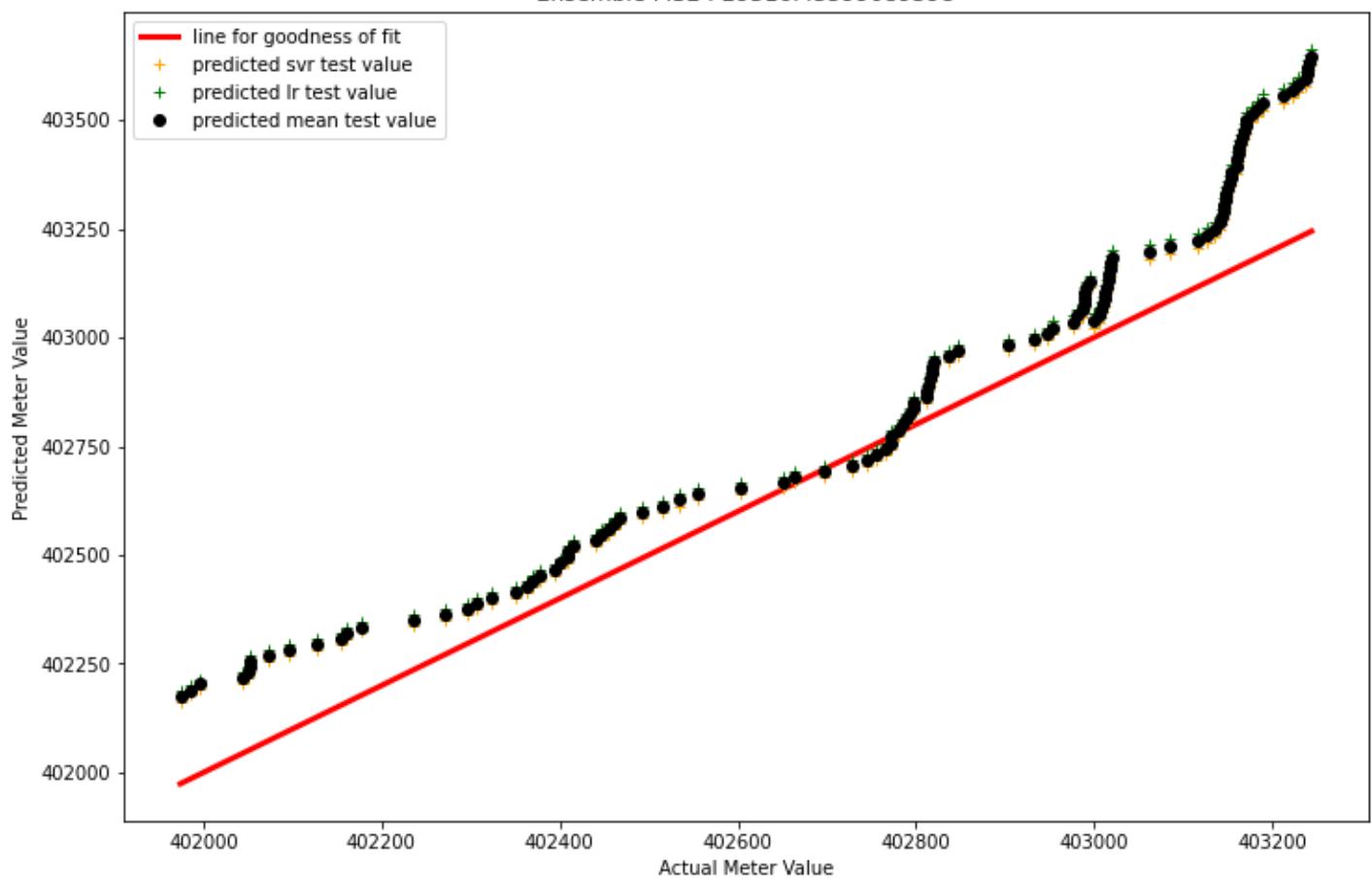
Household 4421.0  
Testing SVR MSE : 0.016974095464383294  
Testing LR MSE : 7.411538288475127e-23  
Ensemble MSE : 0.00424352386605684



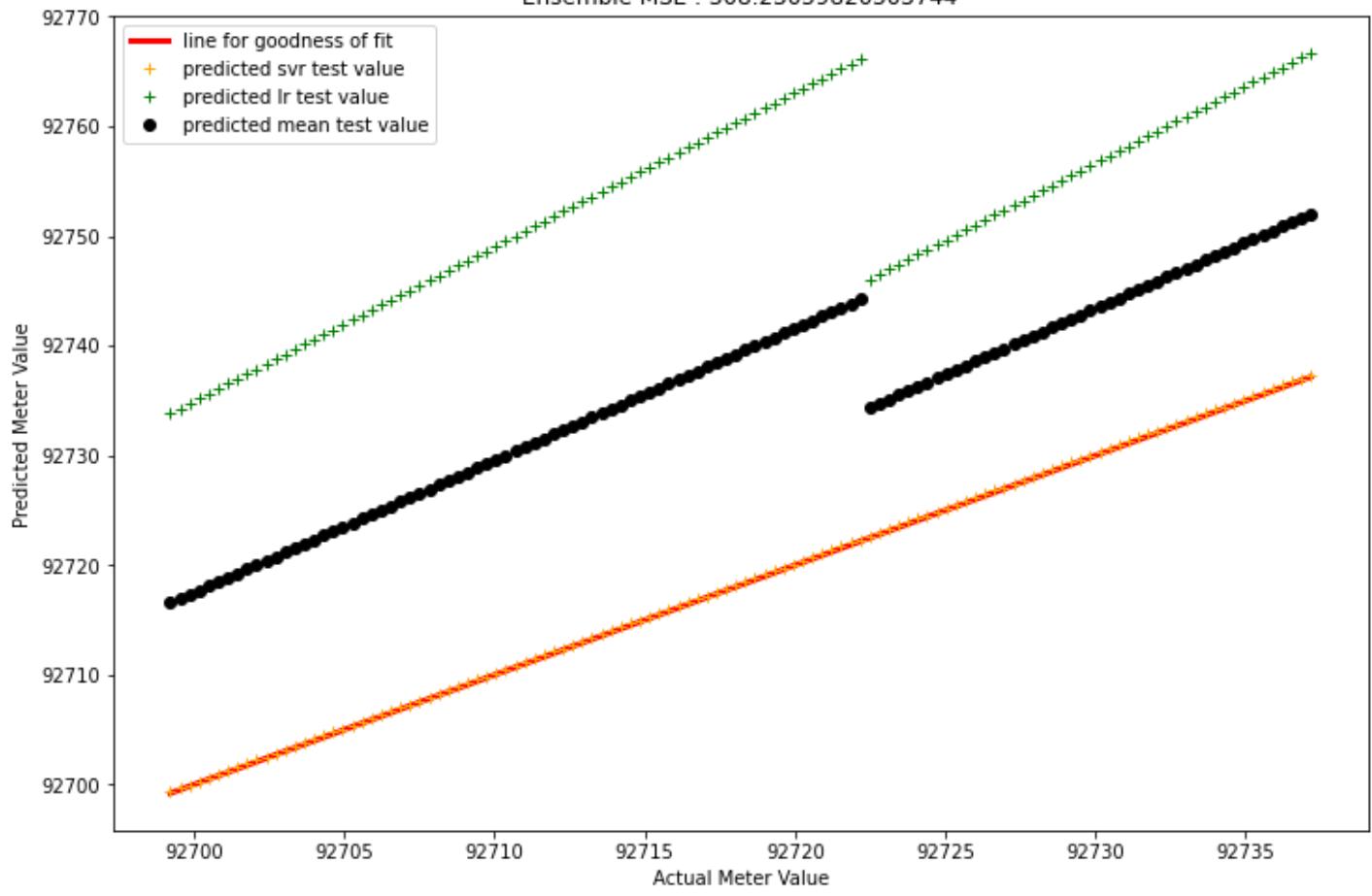
Household 4447.0  
Testing SVR MSE : 0.01689872860496893  
Testing LR MSE : 1.5352472168984193e-22  
Ensemble MSE : 0.0042246821509159685



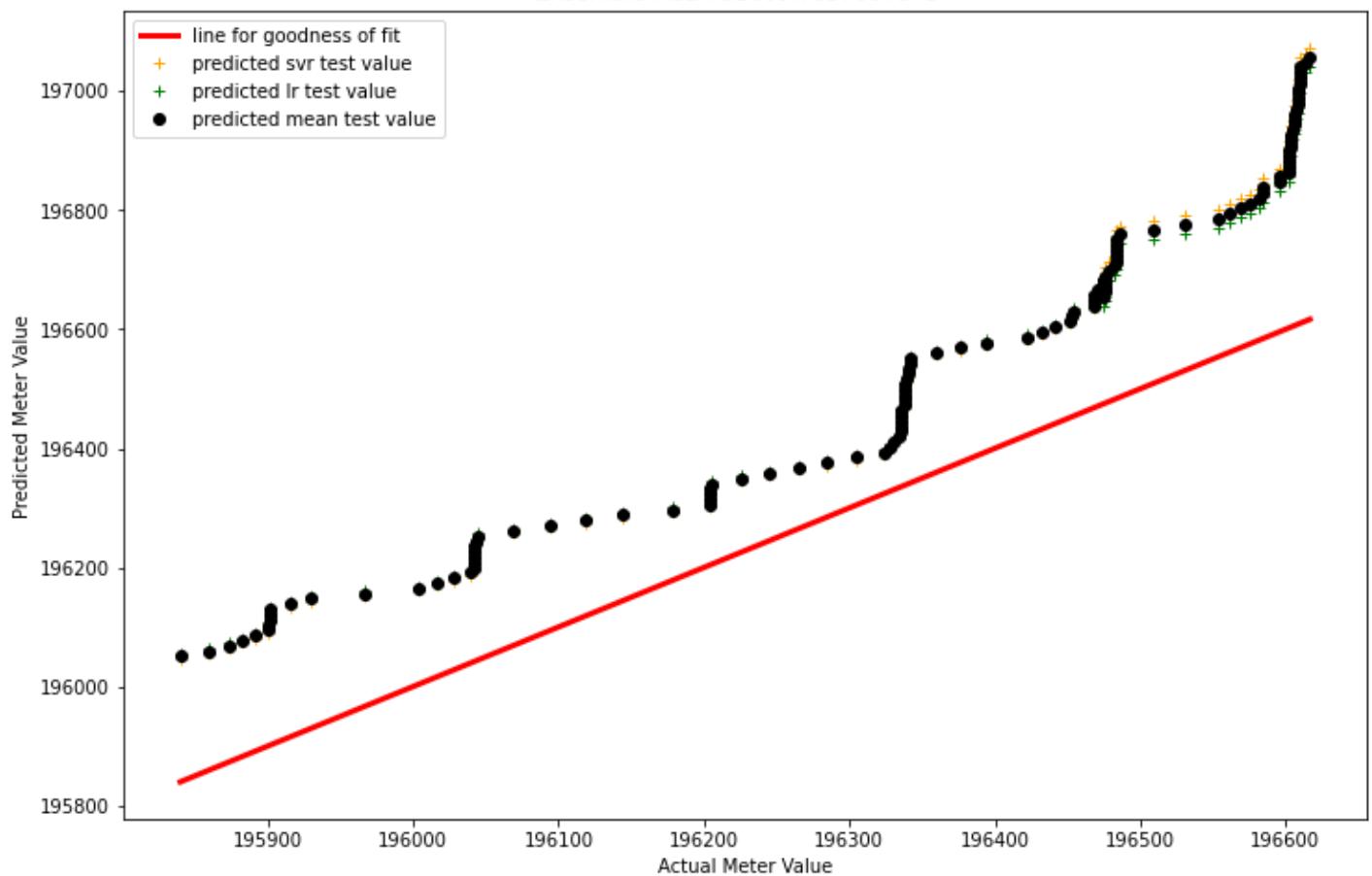
Household 4514.0  
Testing SVR MSE : 25270.305168350194  
Testing LR MSE : 33796.5721591072  
Ensemble MSE : 29316.45599089398



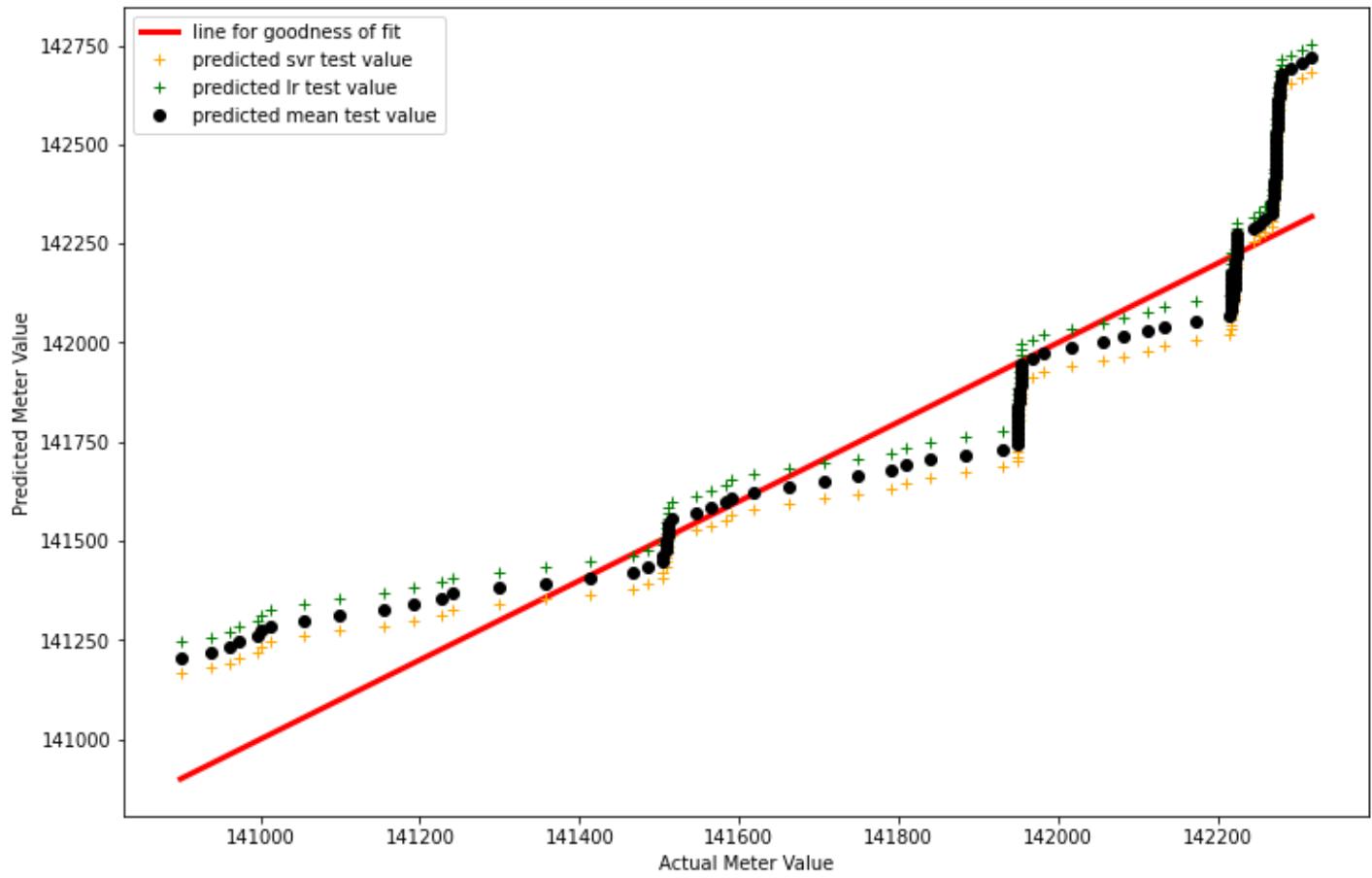
Household 4671.0  
Testing SVR MSE : 0.026661705693090943  
Testing LR MSE : 1221.9422442182706  
Ensemble MSE : 308.23059820503744



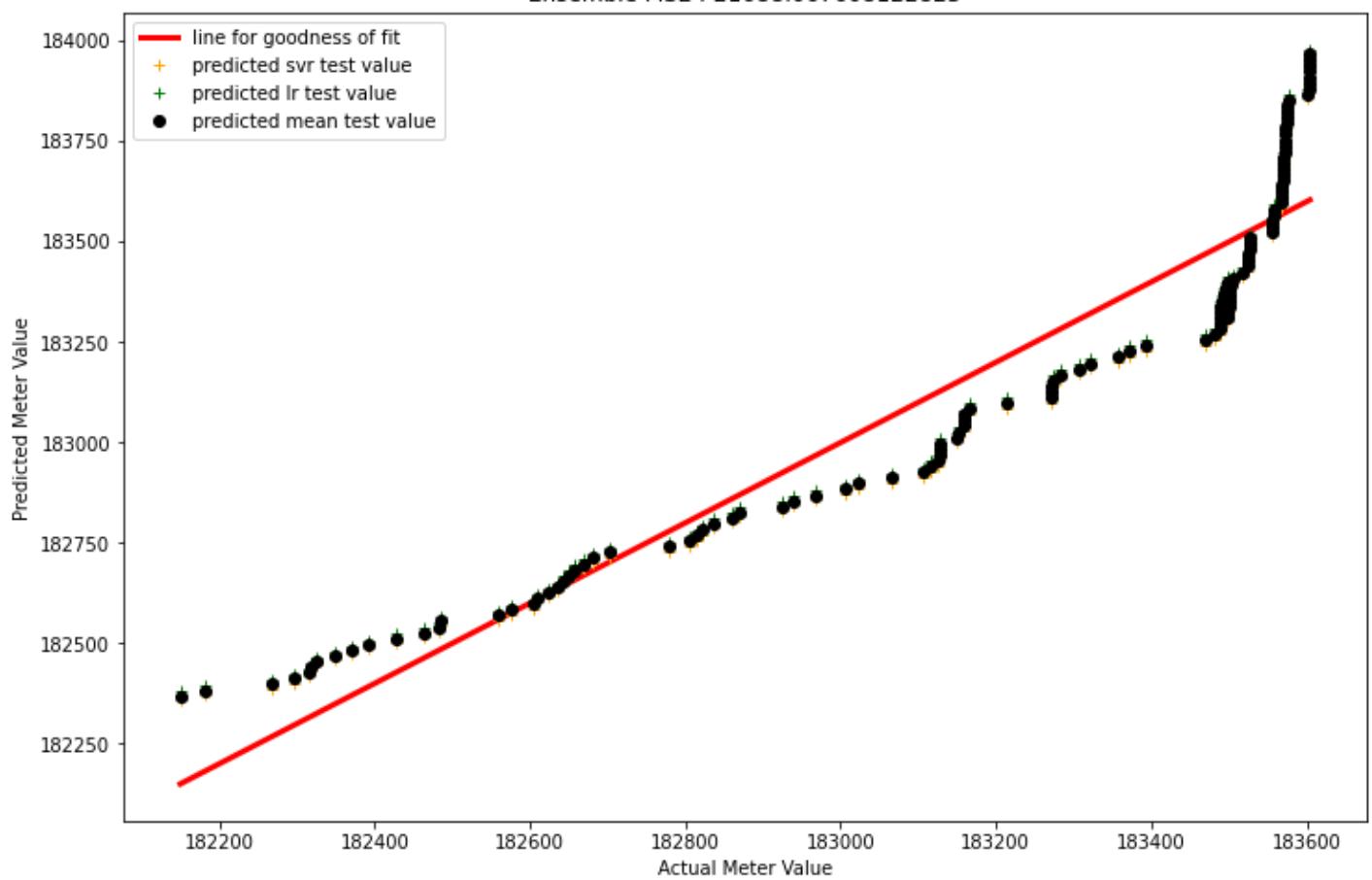
Household 4732.0  
Testing SVR MSE : 55497.46569444677  
Testing LR MSE : 49930.878744400485  
Ensemble MSE : 52609.73576873734



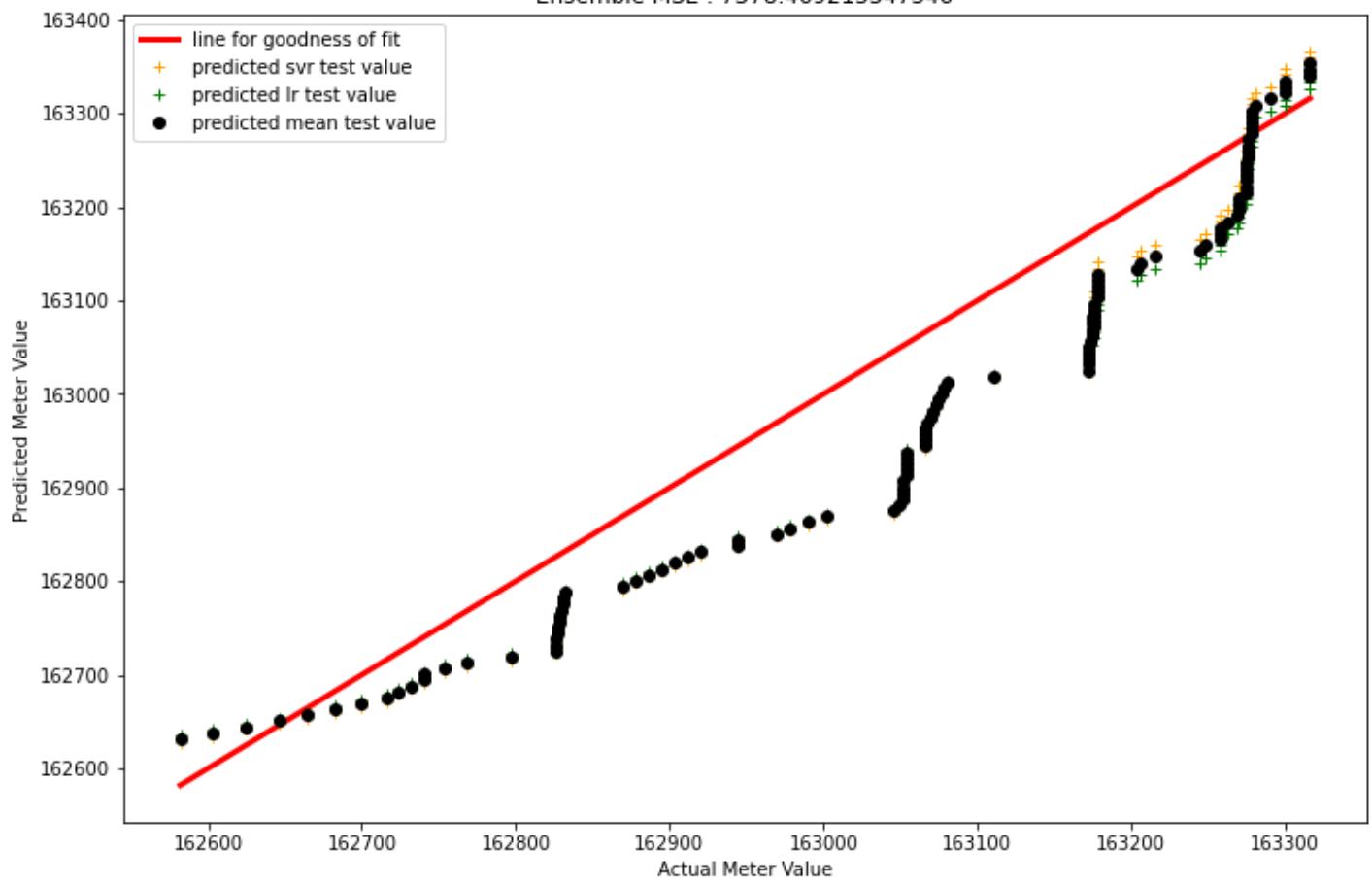
Household 4767.0  
Testing SVR MSE : 27416.219482926954  
Testing LR MSE : 33570.87390292074  
Ensemble MSE : 28840.529306578086



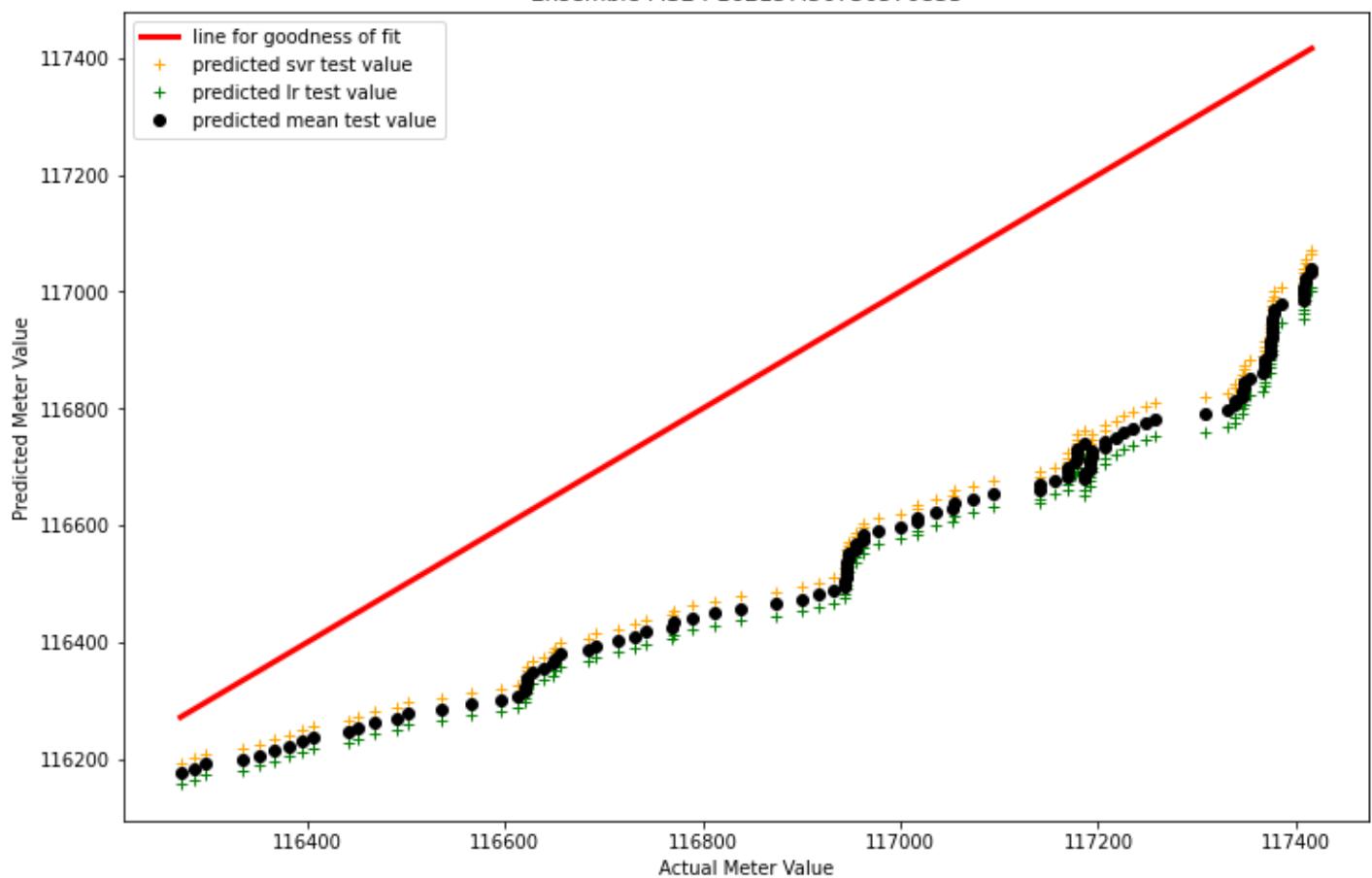
Household 4998.0  
Testing SVR MSE : 21986.109272943428  
Testing LR MSE : 21648.813095886508  
Ensemble MSE : 21688.067608122823



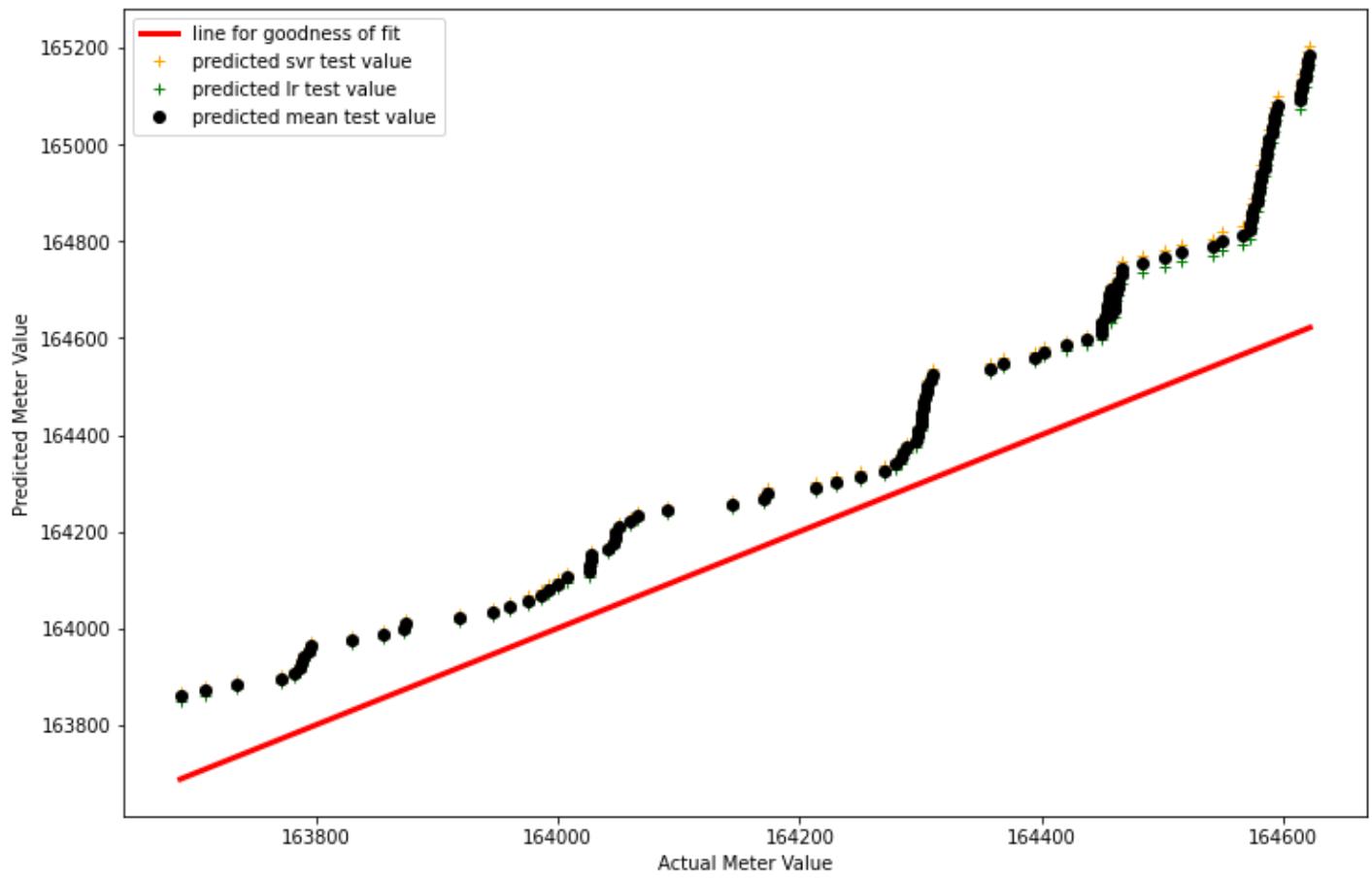
Household 5129.0  
Testing SVR MSE : 7337.880852537231  
Testing LR MSE : 7561.253729695445  
Ensemble MSE : 7378.469215347546



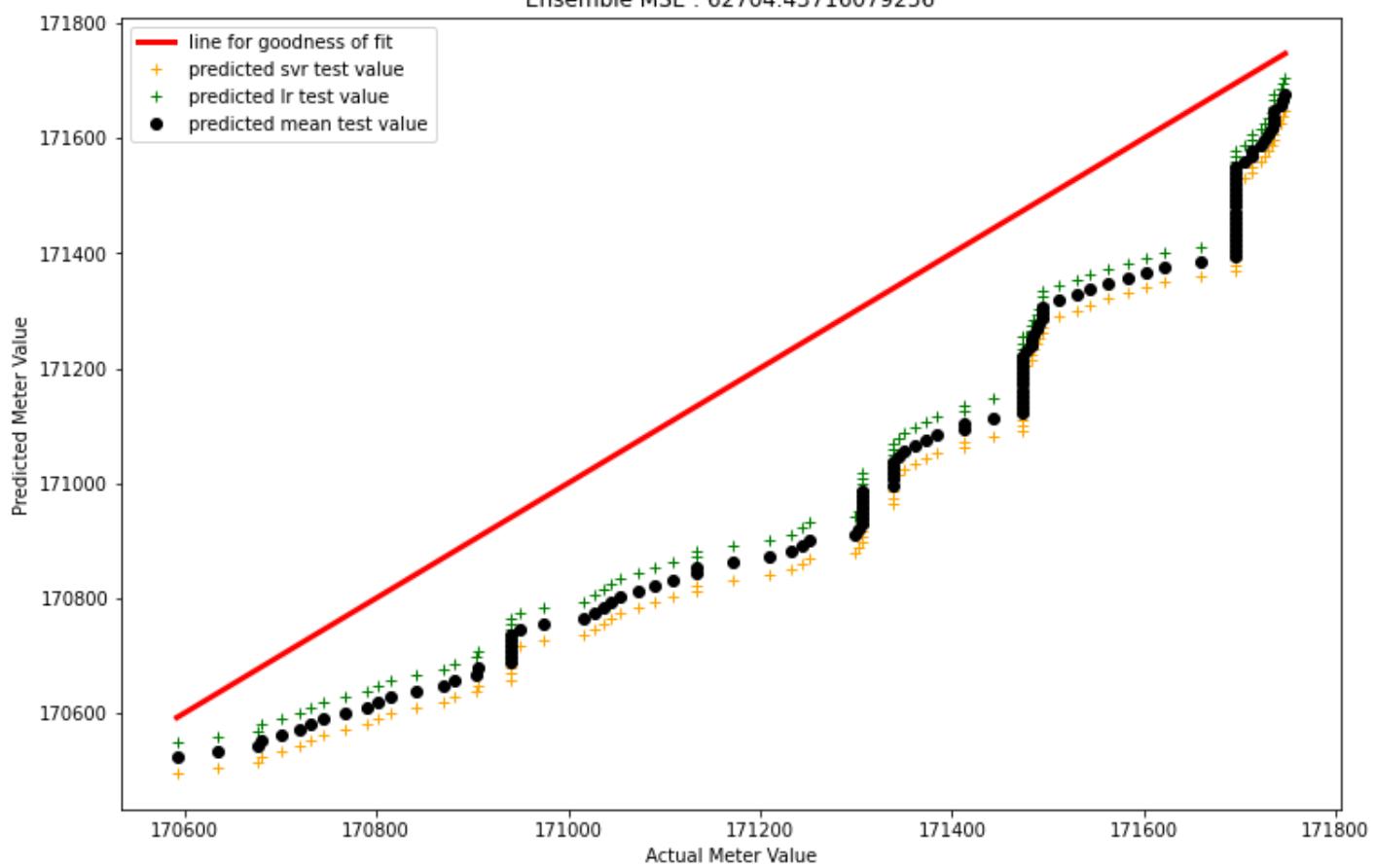
Household 5131.0  
Testing SVR MSE : 143261.2370310173  
Testing LR MSE : 182269.3647590848  
Ensemble MSE : 162157.56730570833



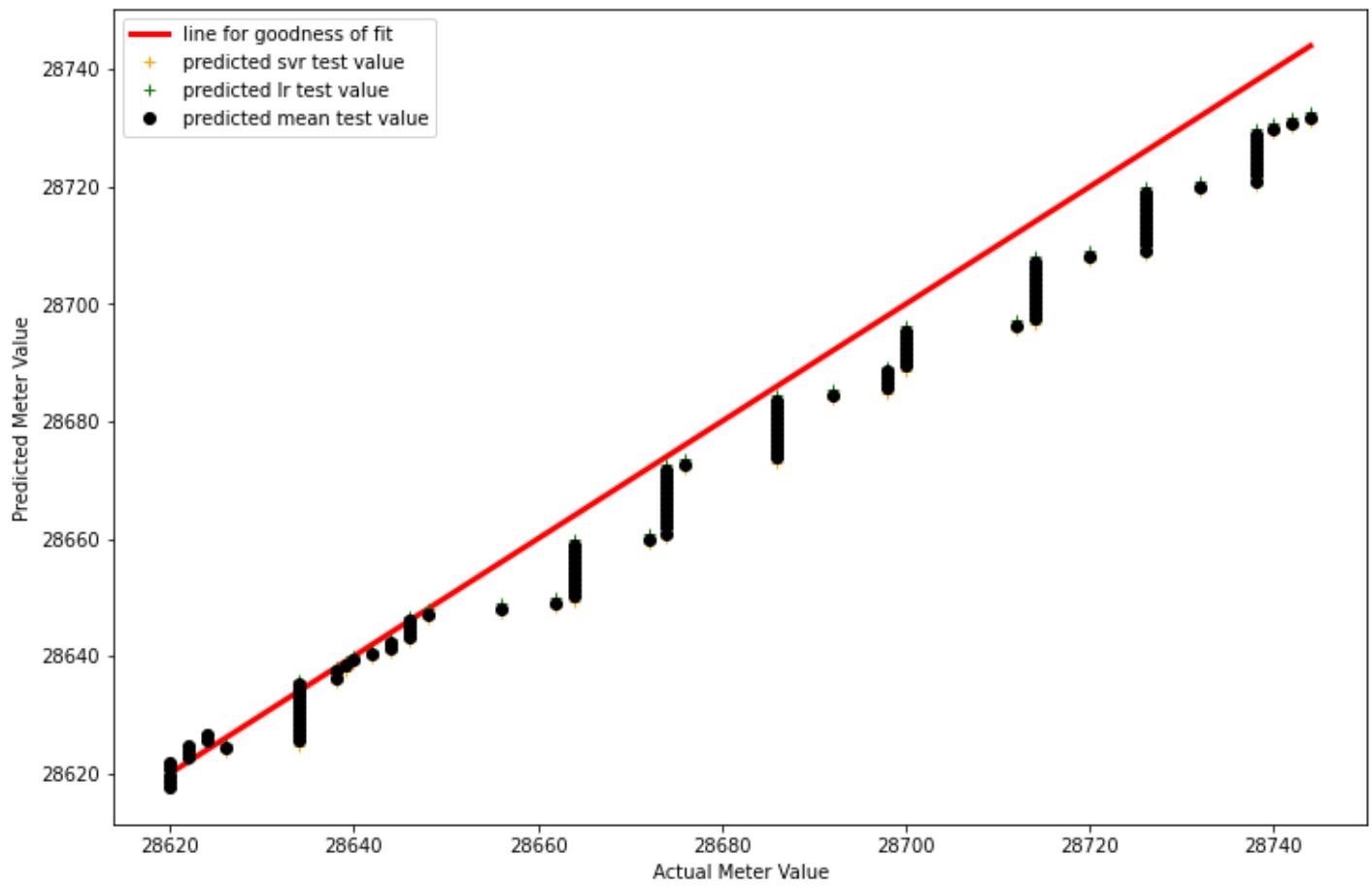
Household 5193.0  
Testing SVR MSE : 74752.31280078637  
Testing LR MSE : 61400.25413931875  
Ensemble MSE : 67896.4372937801



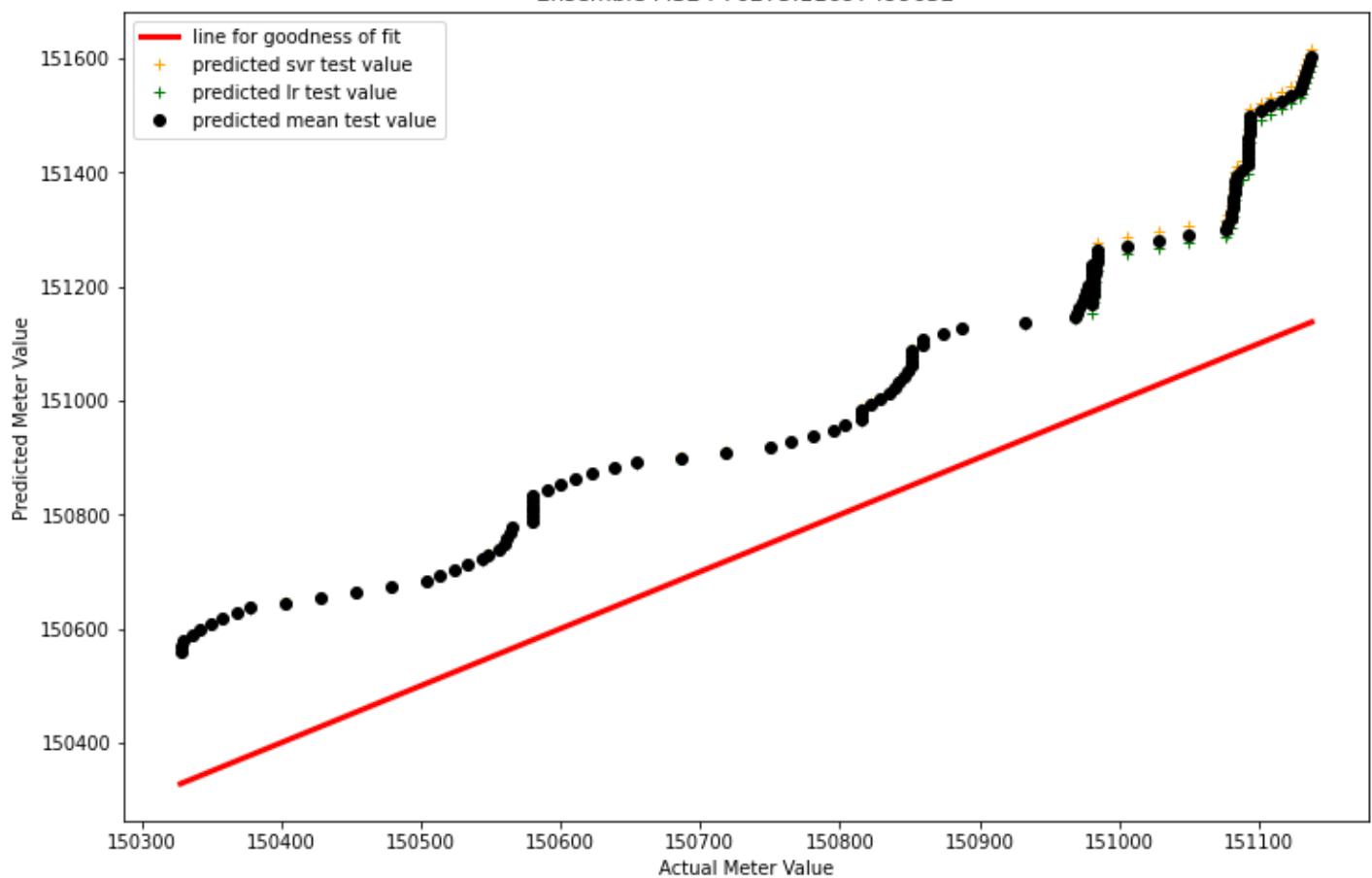
Household 5275.0  
Testing SVR MSE : 77688.36331382472  
Testing LR MSE : 49437.28293988247  
Ensemble MSE : 62704.43716079256



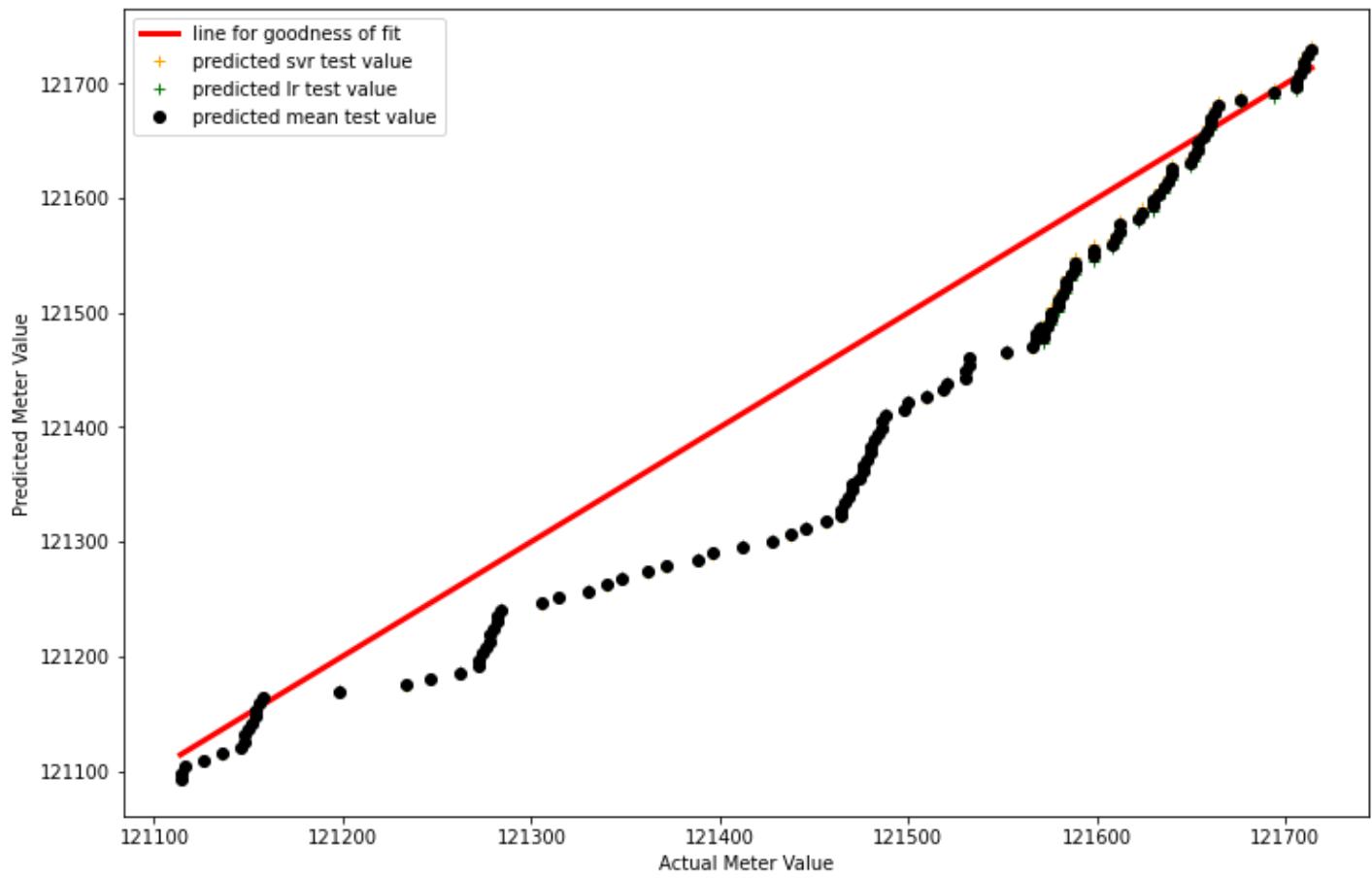
Household 5317.0  
Testing SVR MSE : 94.73657825381848  
Testing LR MSE : 71.01293750343395  
Ensemble MSE : 82.34208550496365



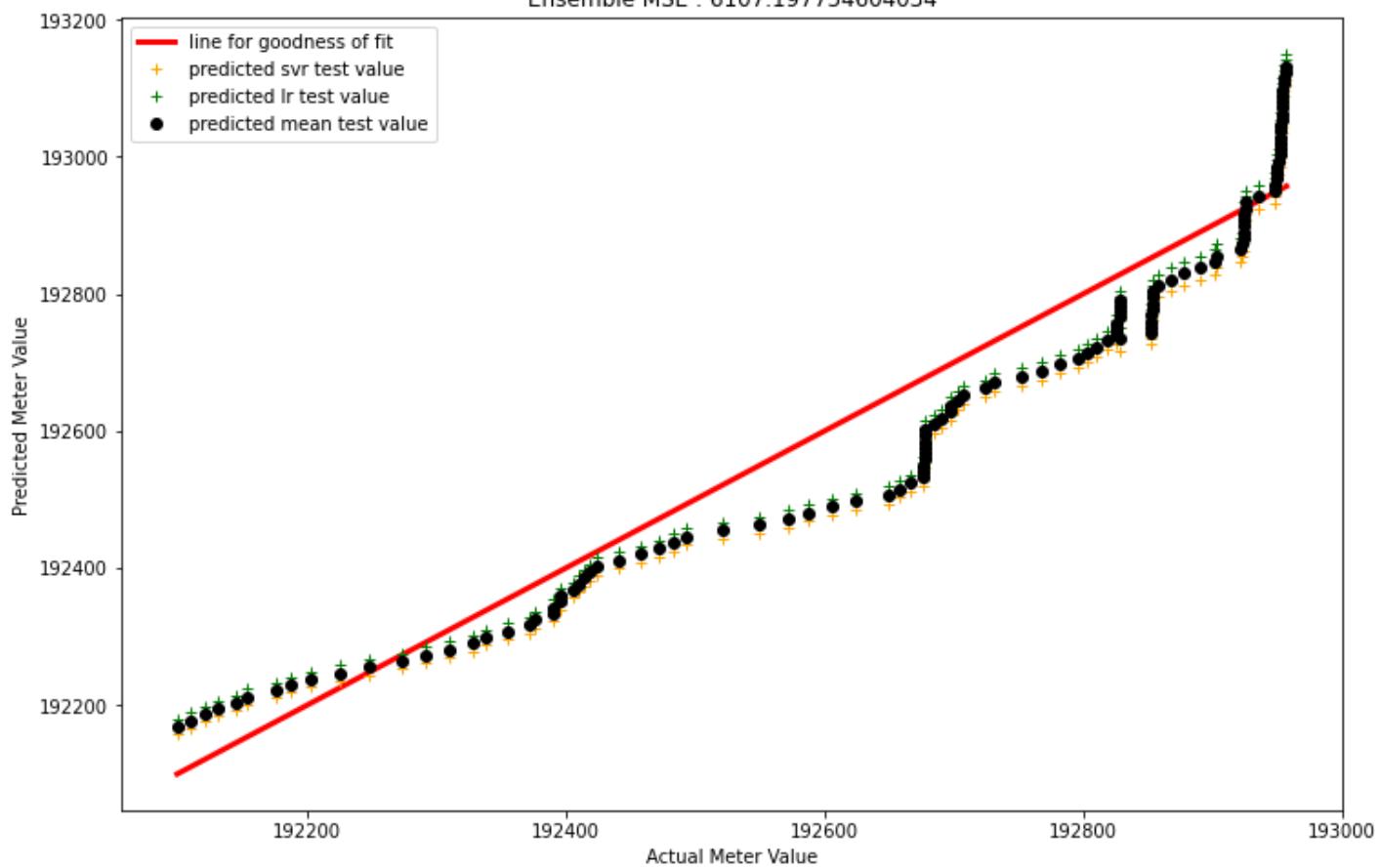
Household 5395.0  
Testing SVR MSE : 74294.3932768335  
Testing LR MSE : 66434.92628291958  
Ensemble MSE : 70275.11697499632



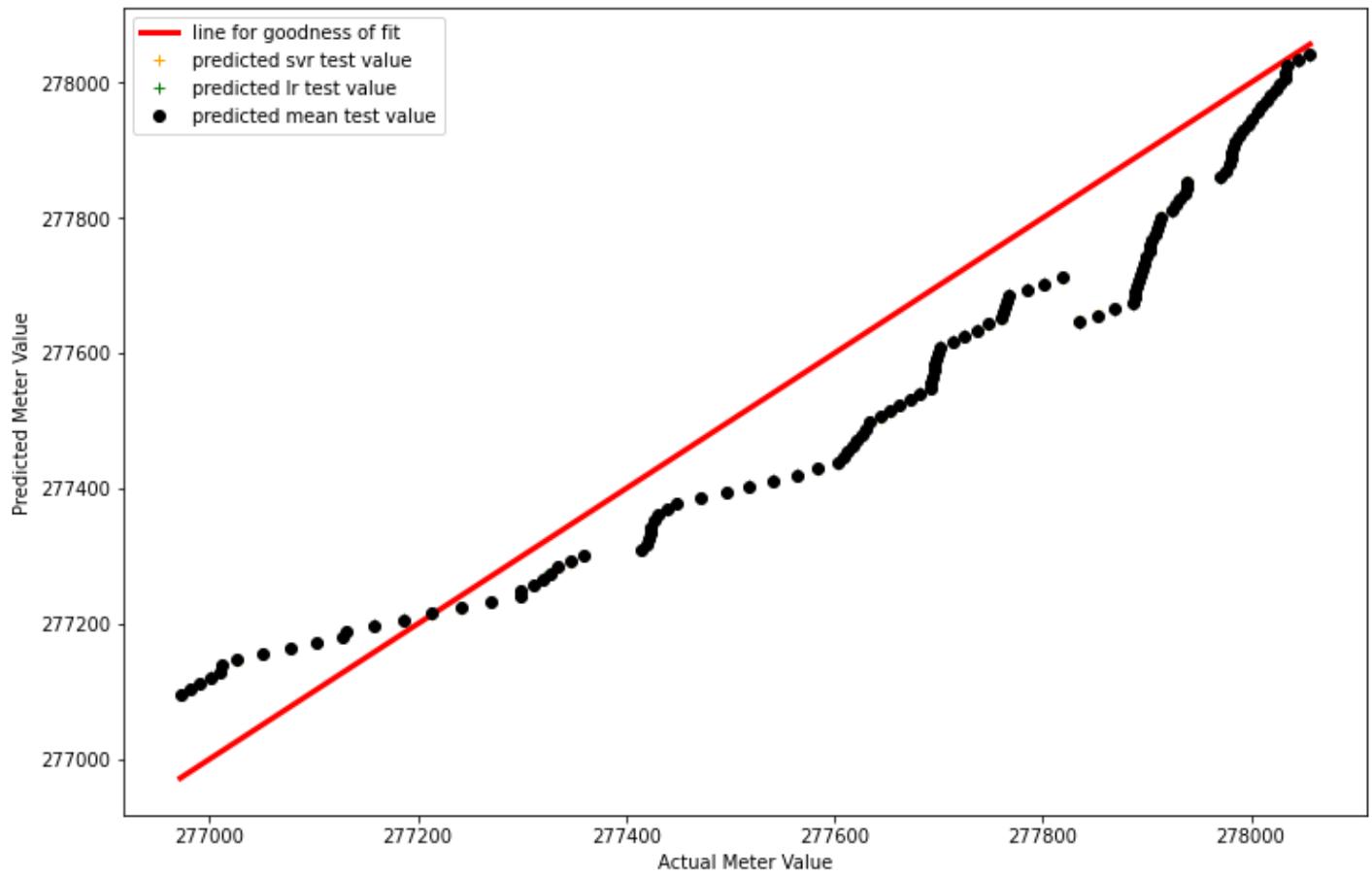
Household 5403.0  
Testing SVR MSE : 4982.108964858819  
Testing LR MSE : 5000.910960512166  
Ensemble MSE : 4985.177912462873



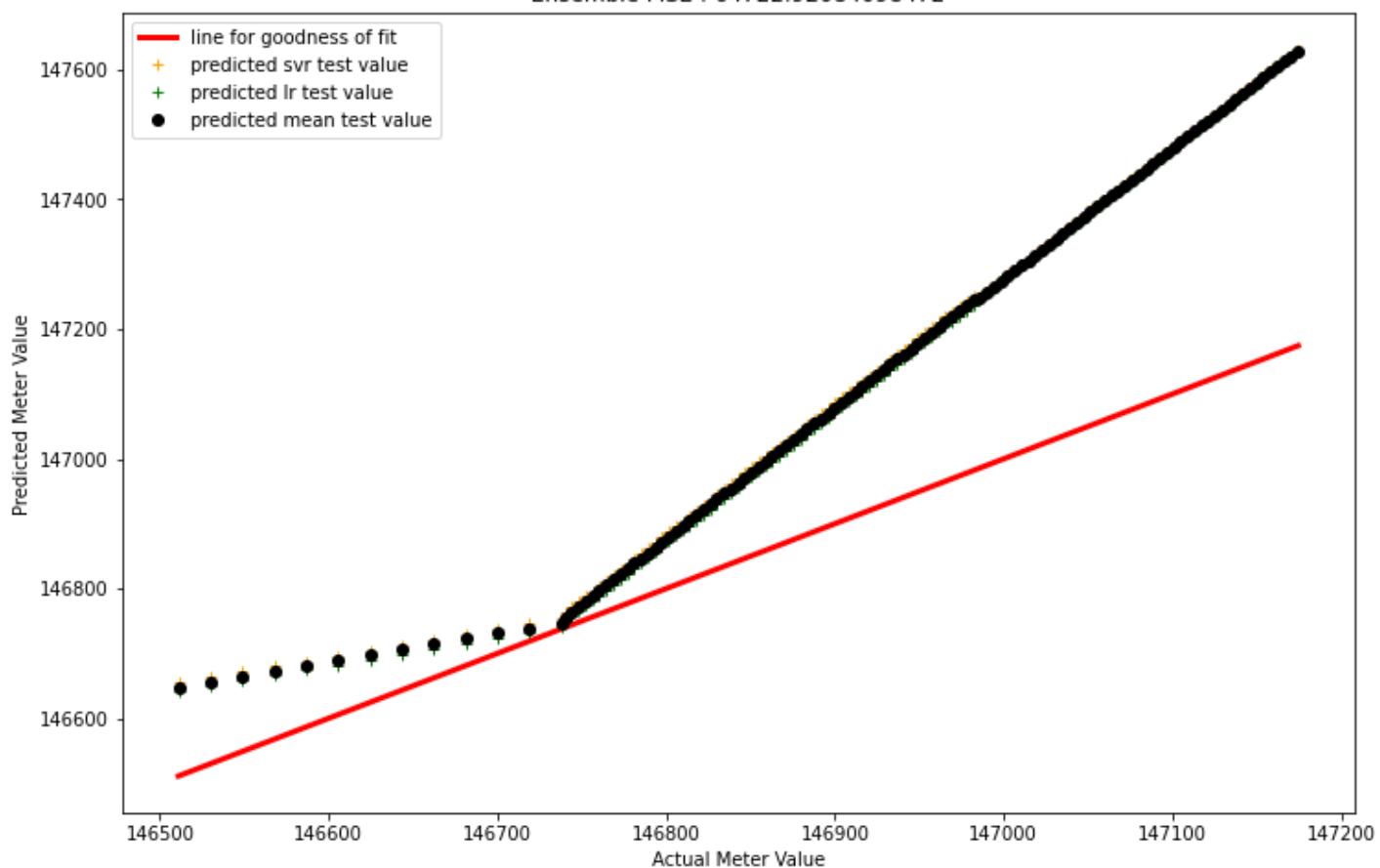
Household 5439.0  
Testing SVR MSE : 6904.431705920306  
Testing LR MSE : 5744.045422178417  
Ensemble MSE : 6107.197754604034



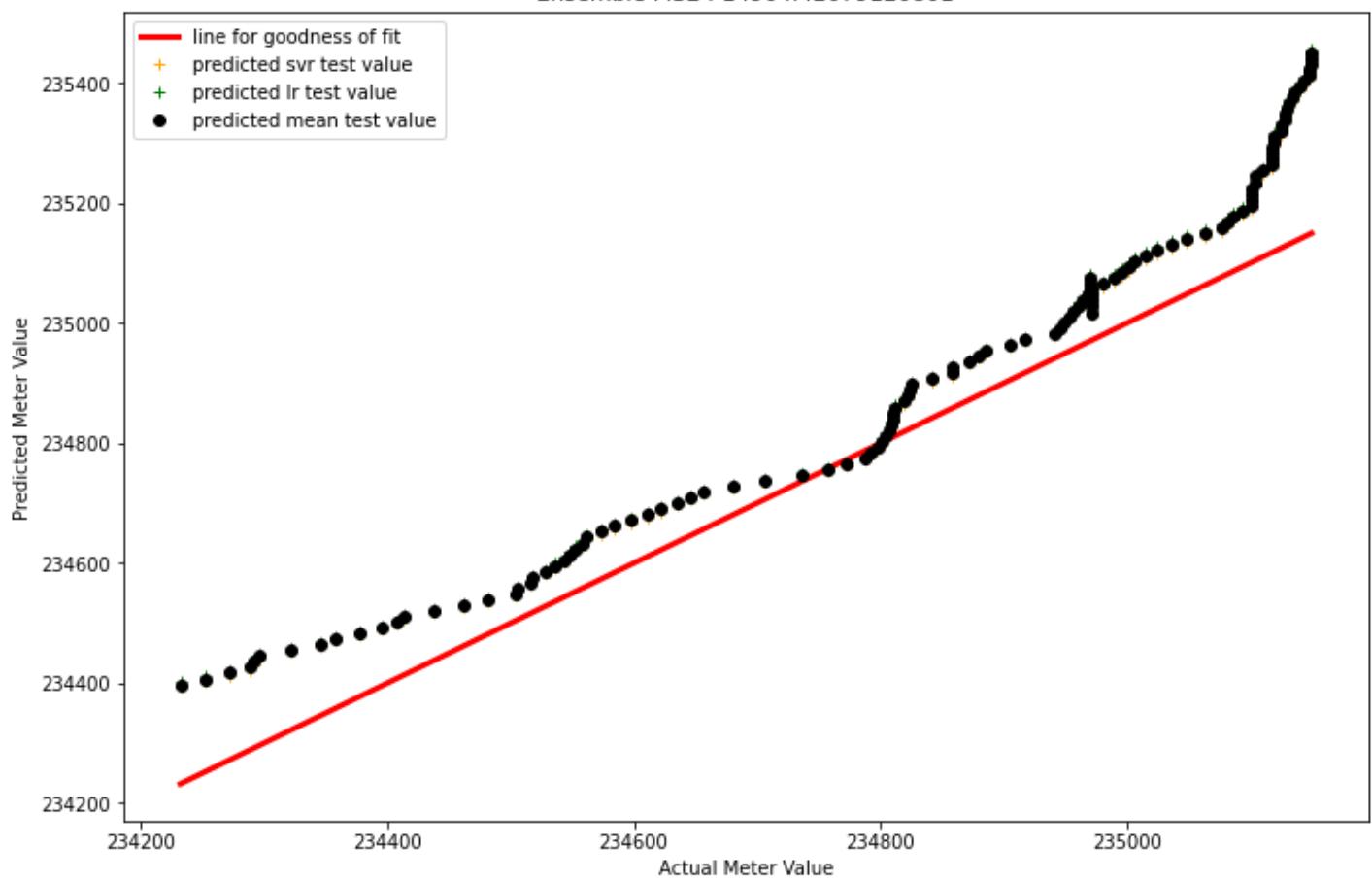
Household 5484.0  
Testing SVR MSE : 12596.954658198745  
Testing LR MSE : 12798.020836972853  
Ensemble MSE : 12695.105208347513



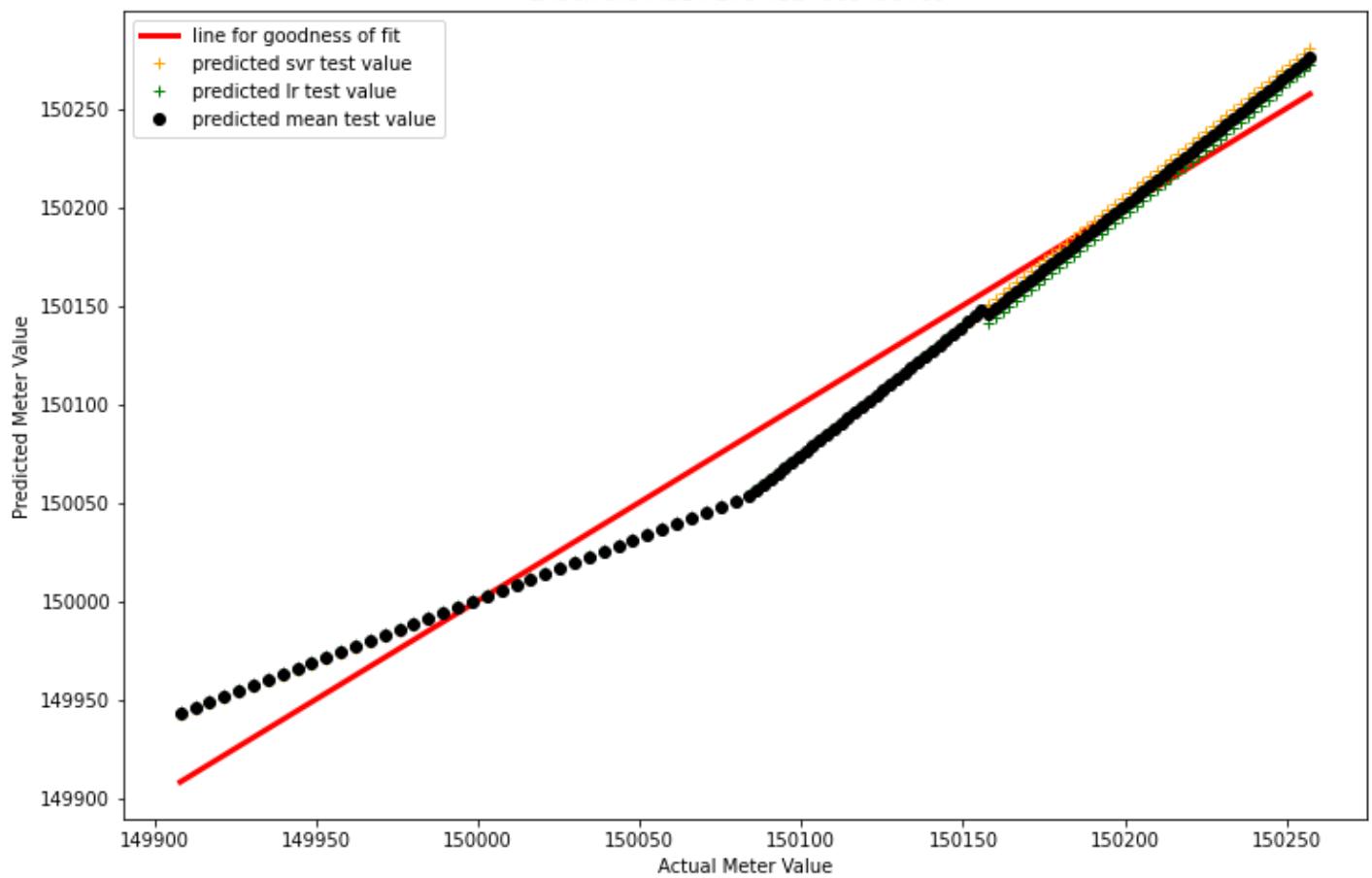
Household 5545.0  
Testing SVR MSE : 66557.0243330102  
Testing LR MSE : 62954.40996721017  
Ensemble MSE : 64722.92084098472



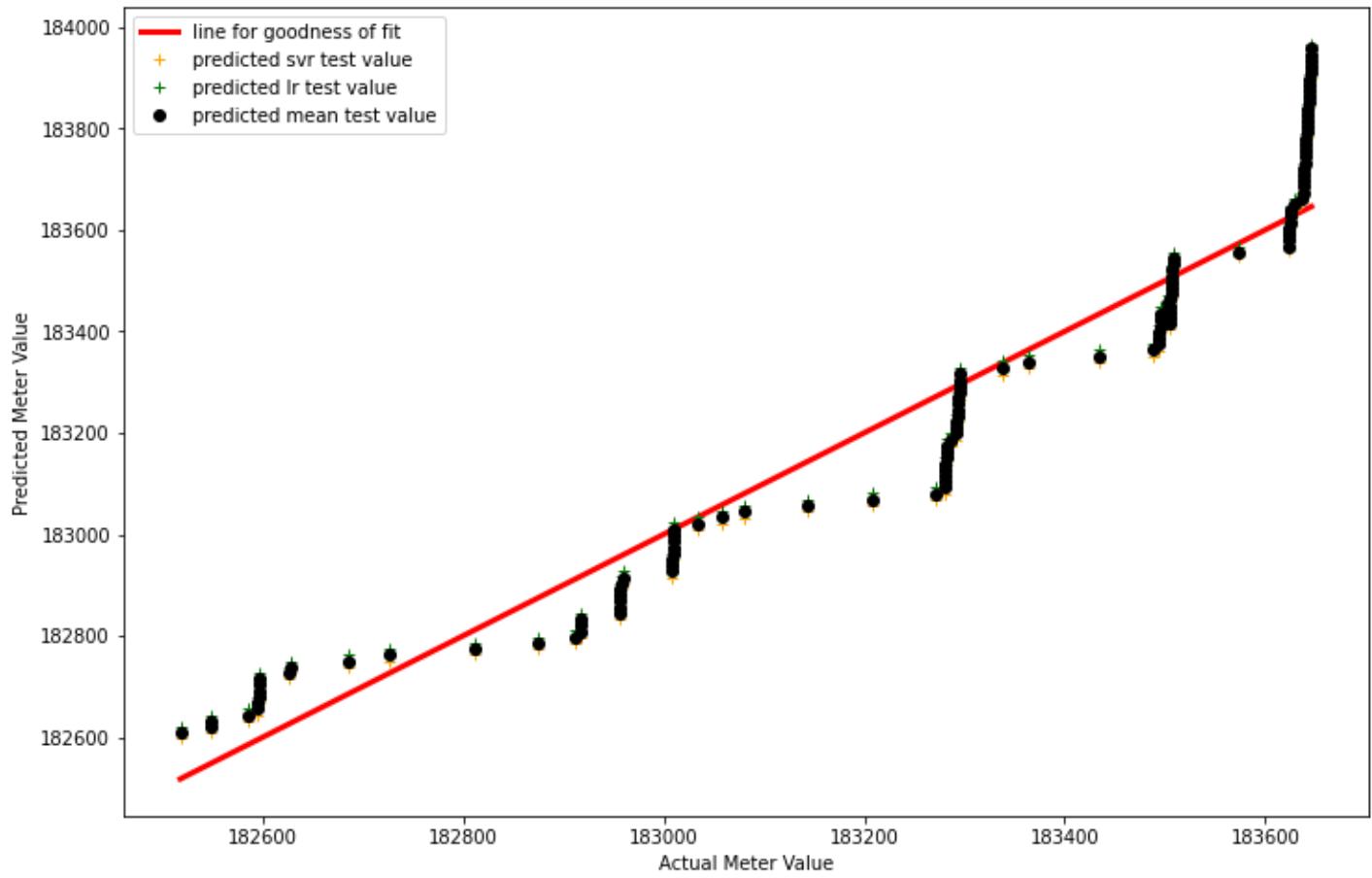
Household 5636.0  
Testing SVR MSE : 13928.364371666685  
Testing LR MSE : 15924.198674109248  
Ensemble MSE : 14904.42079120801



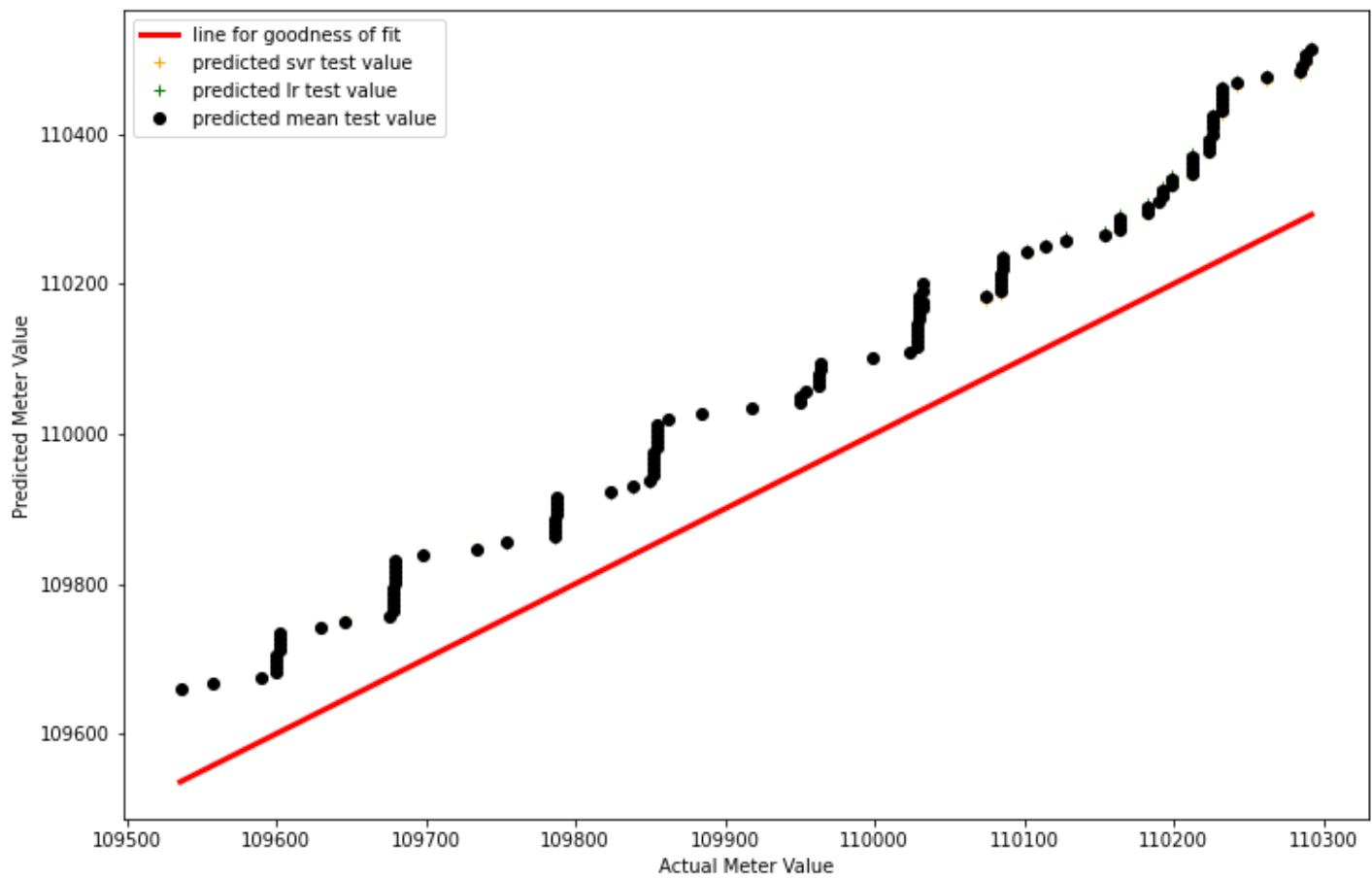
Household 5658.0  
Testing SVR MSE : 302.84683646466823  
Testing LR MSE : 265.4326135053274  
Ensemble MSE : 275.45240854984894



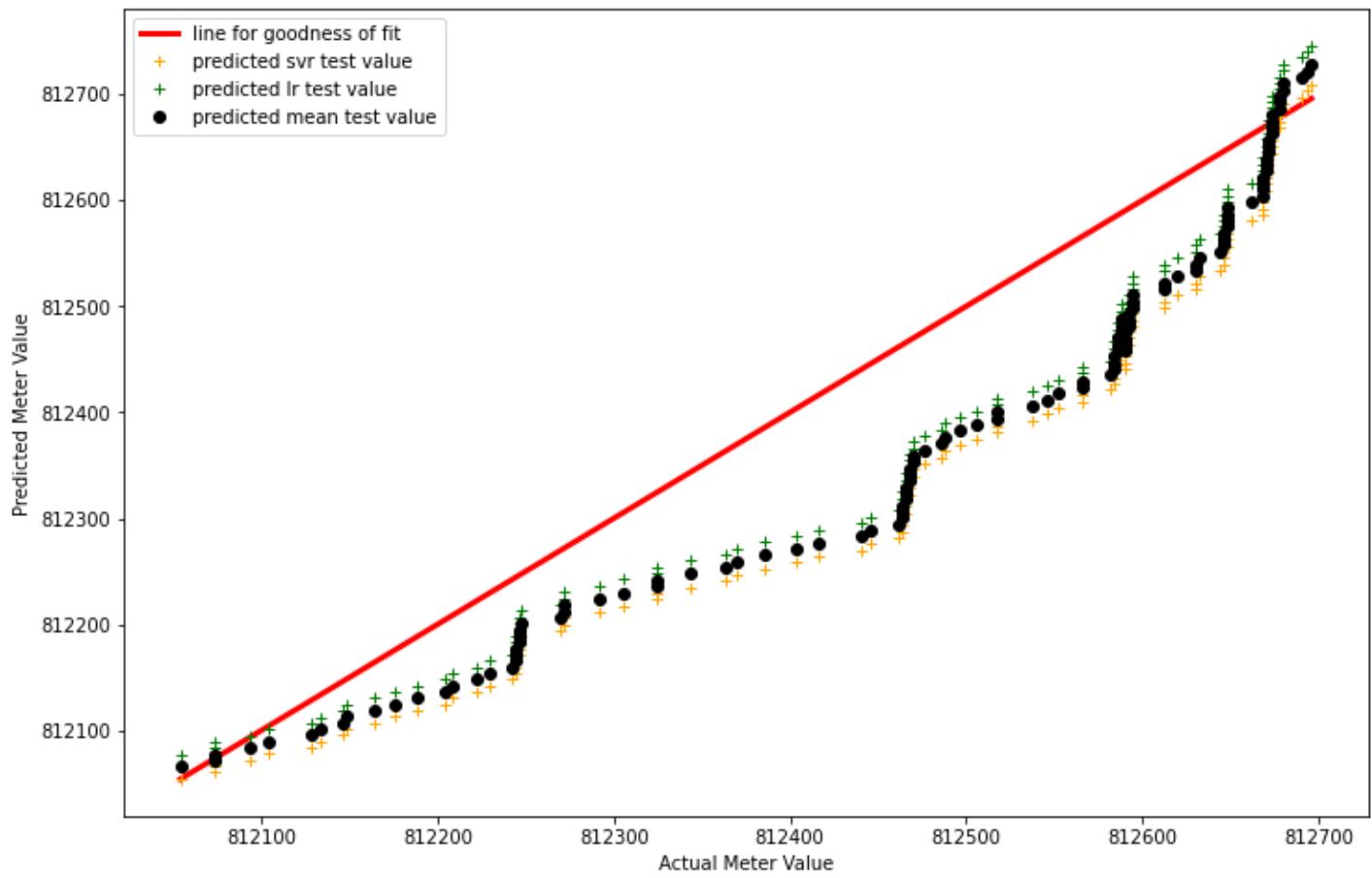
Household 5785.0  
Testing SVR MSE : 13007.029684290299  
Testing LR MSE : 12885.179336473639  
Ensemble MSE : 12814.648009009235



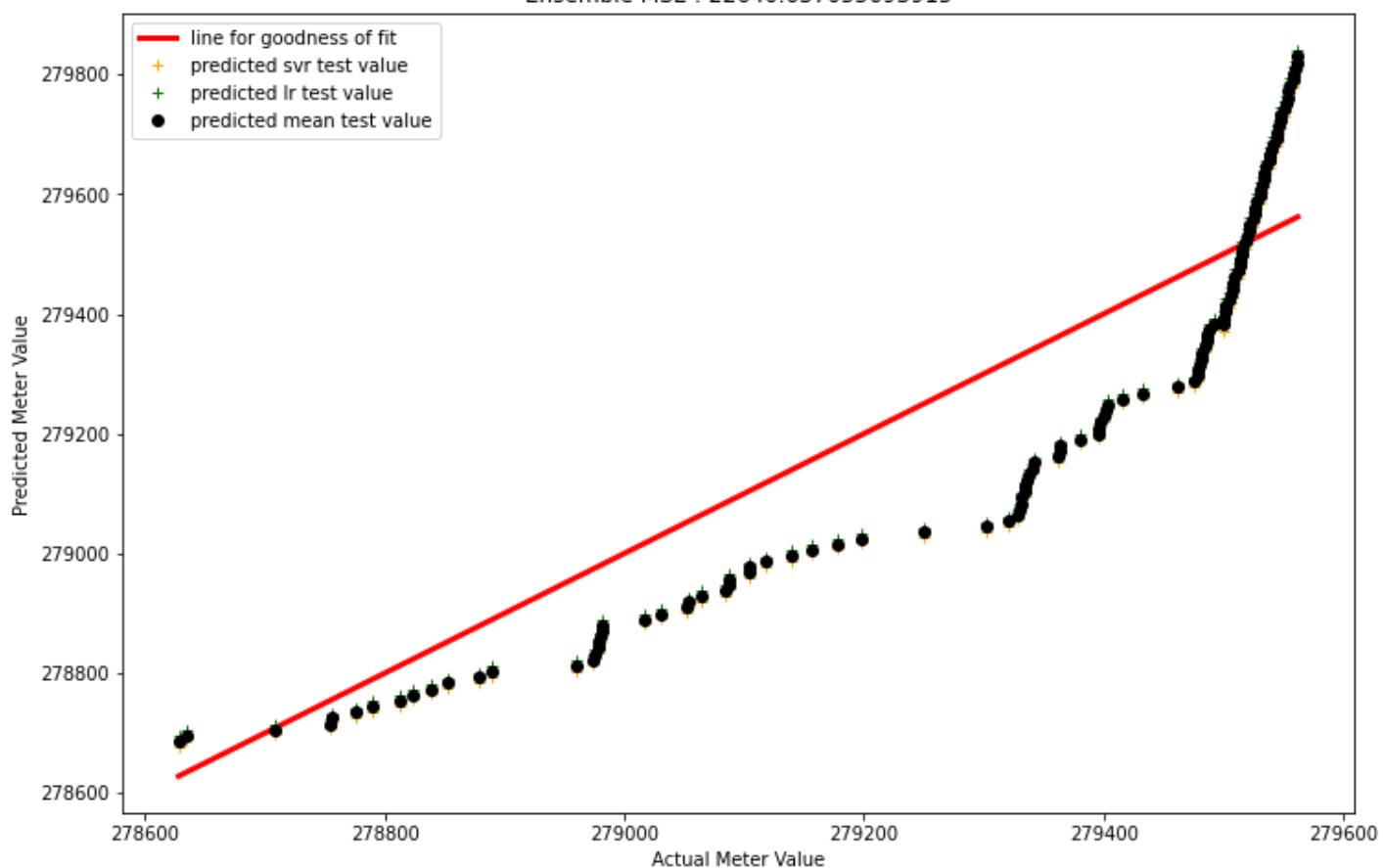
Household 5810.0  
Testing SVR MSE : 18271.69113635517  
Testing LR MSE : 18983.946872115175  
Ensemble MSE : 18622.483022911845



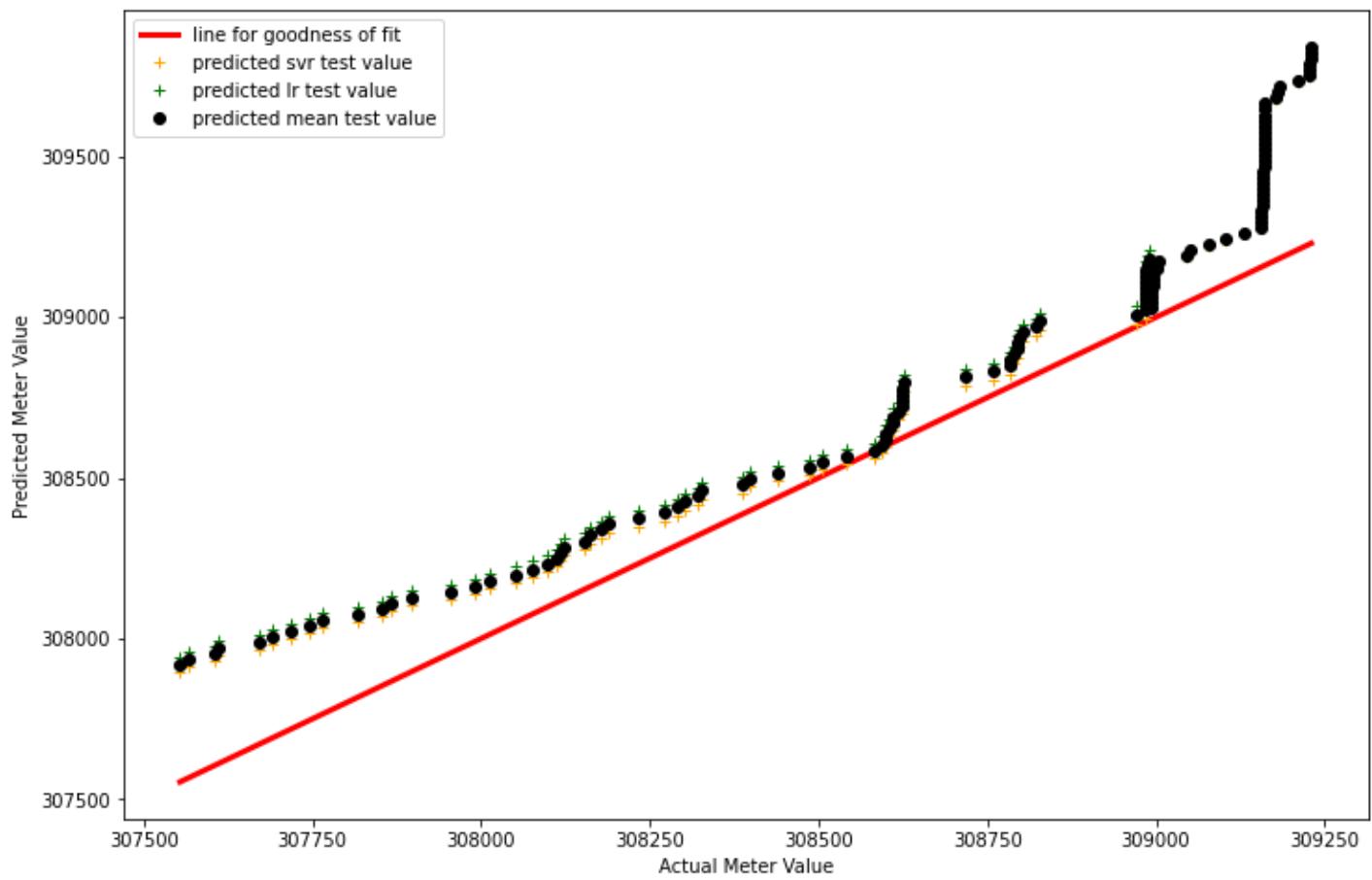
Household 5814.0  
Testing SVR MSE : 11299.837099419216  
Testing LR MSE : 6810.470356546369  
Ensemble MSE : 8831.574563736403



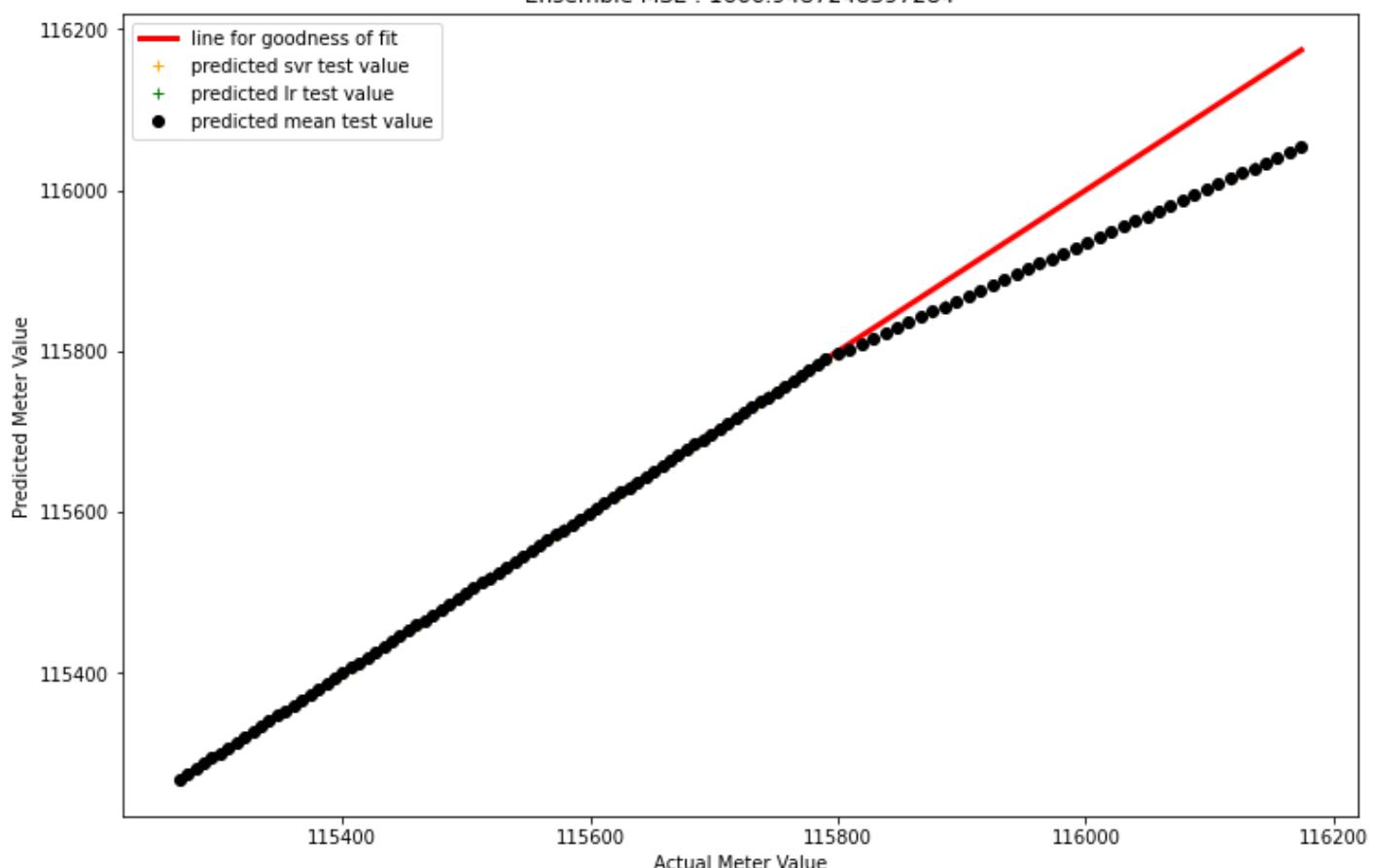
Household 5892.0  
Testing SVR MSE : 23399.896695063337  
Testing LR MSE : 22067.35093060267  
Ensemble MSE : 22640.637055693915



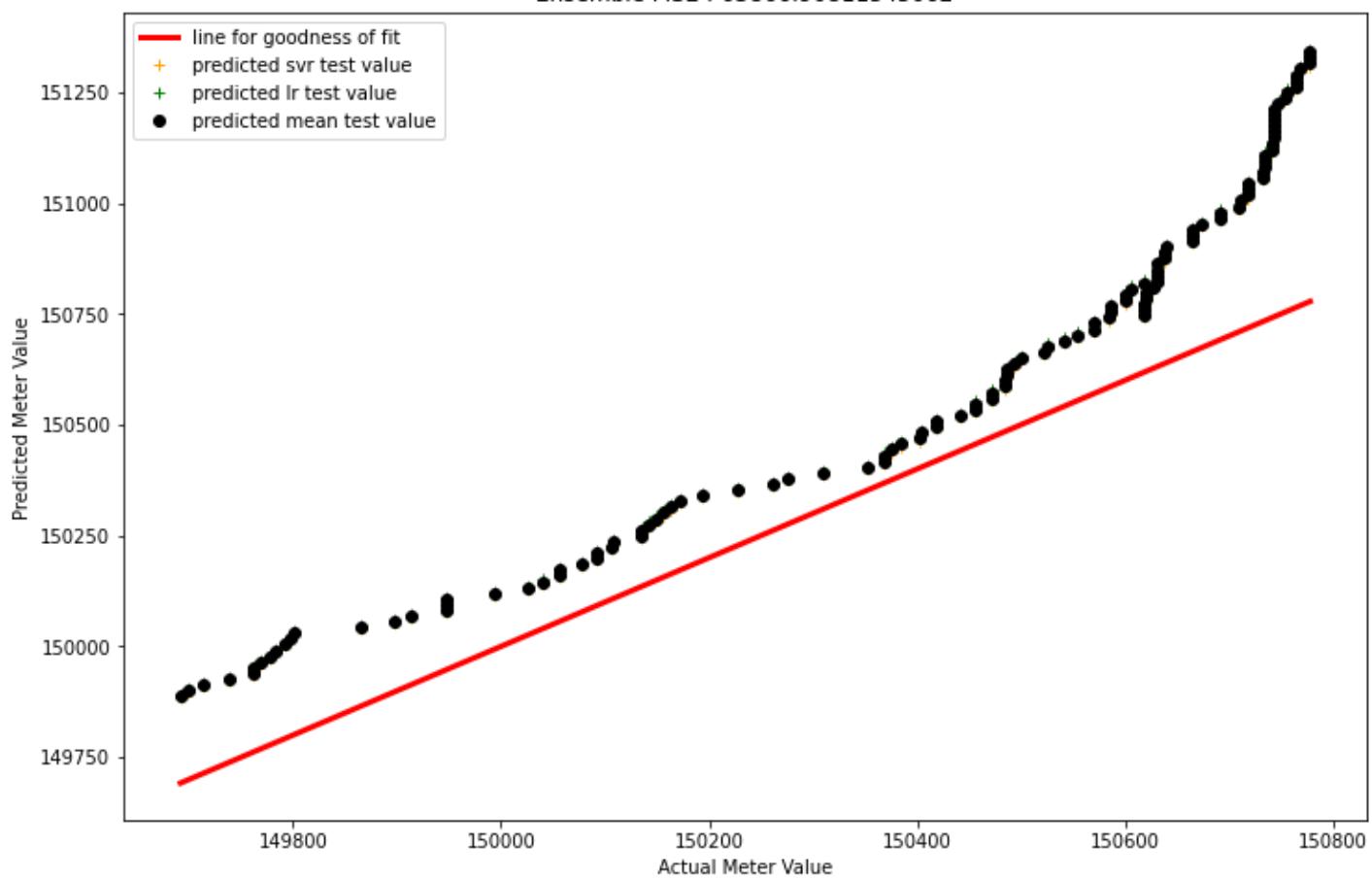
Household 5972.0  
Testing SVR MSE : 61209.82657603046  
Testing LR MSE : 70929.24549324311  
Ensemble MSE : 65673.96709736342



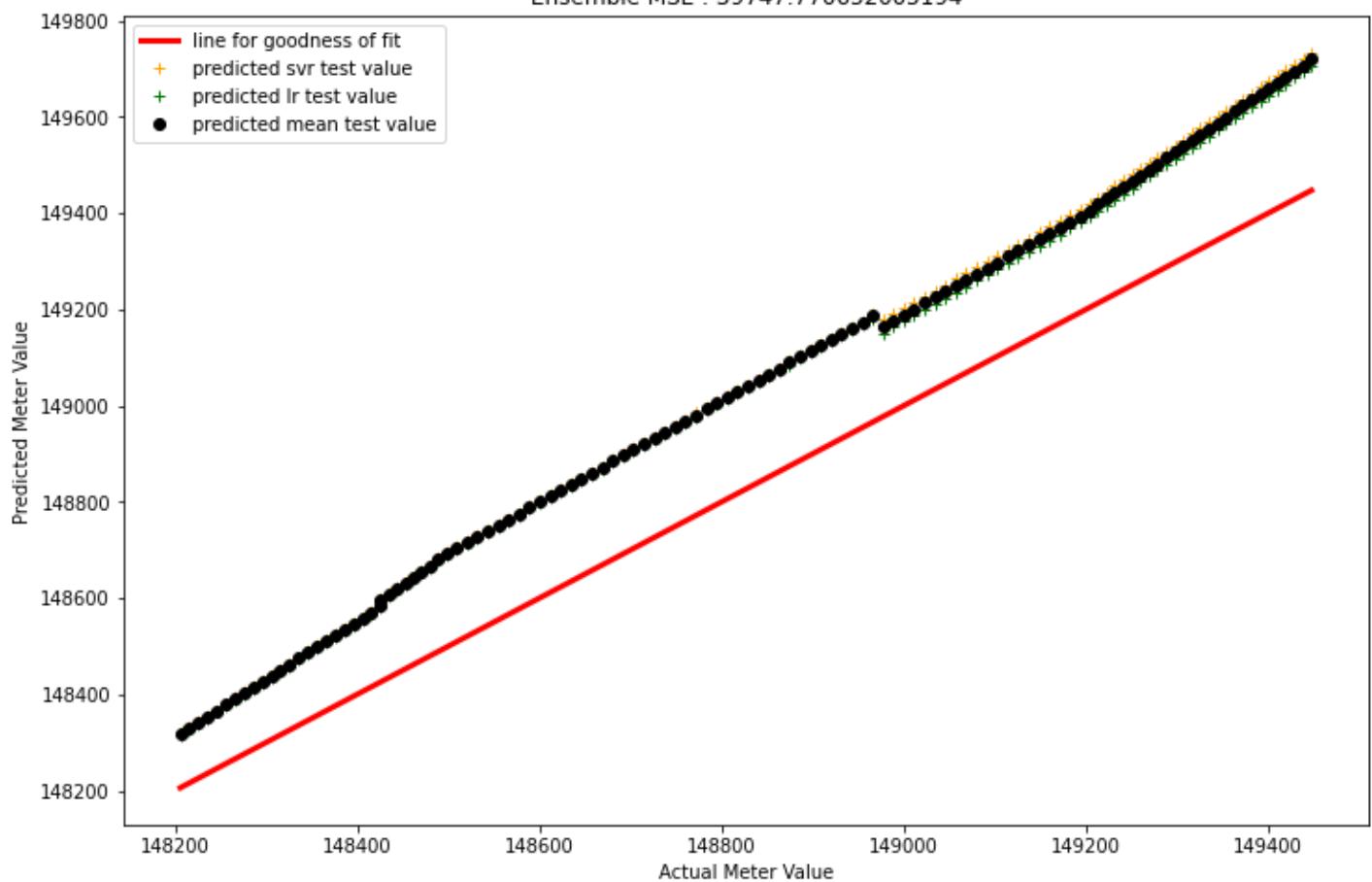
Household 6101.0  
Testing SVR MSE : 1681.1428416273664  
Testing LR MSE : 1652.8742925088939  
Ensemble MSE : 1666.9487248397284



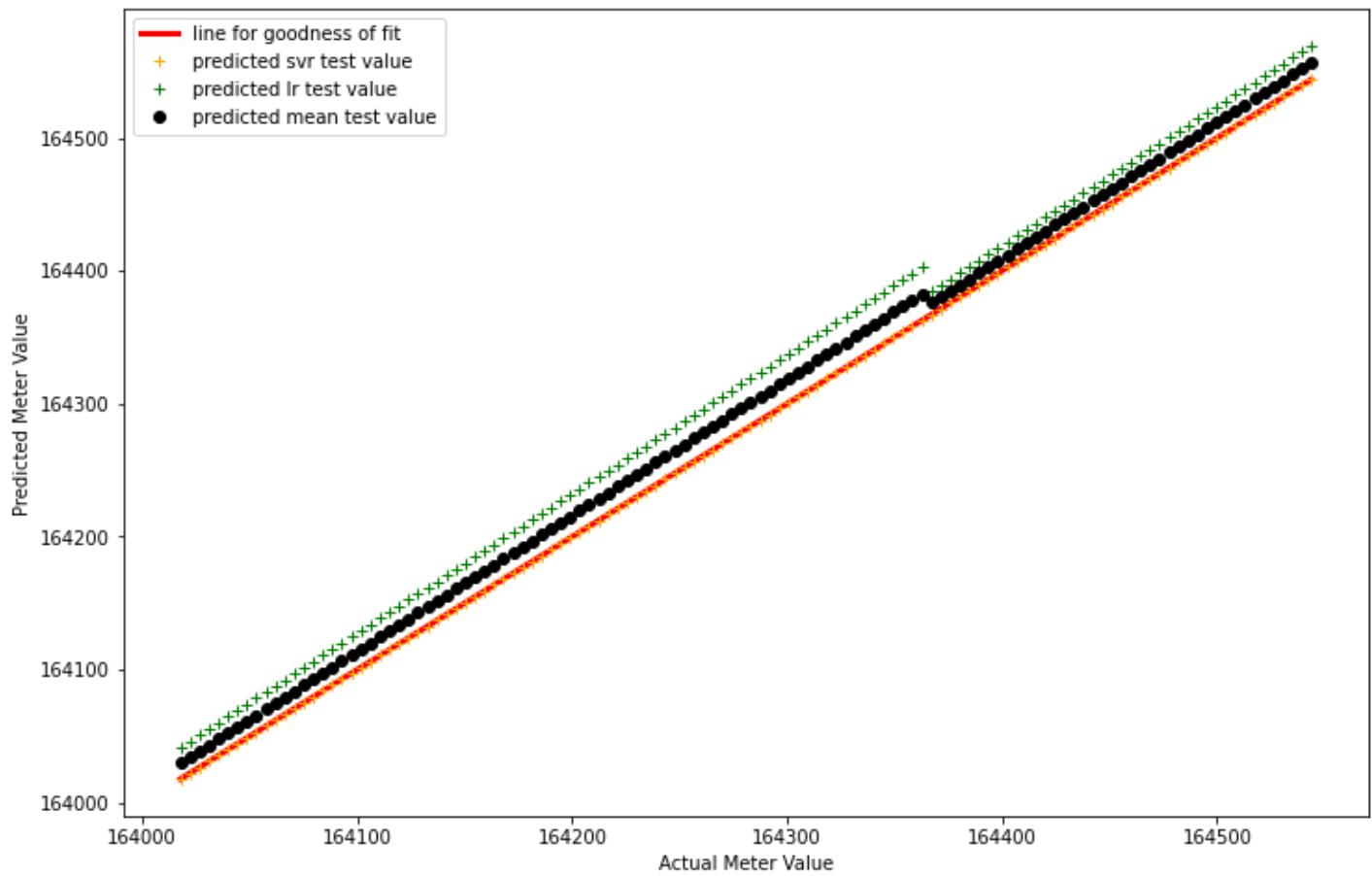
Household 6412.0  
Testing SVR MSE : 61625.854604763575  
Testing LR MSE : 66160.65976709648  
Ensemble MSE : 63866.90811545062



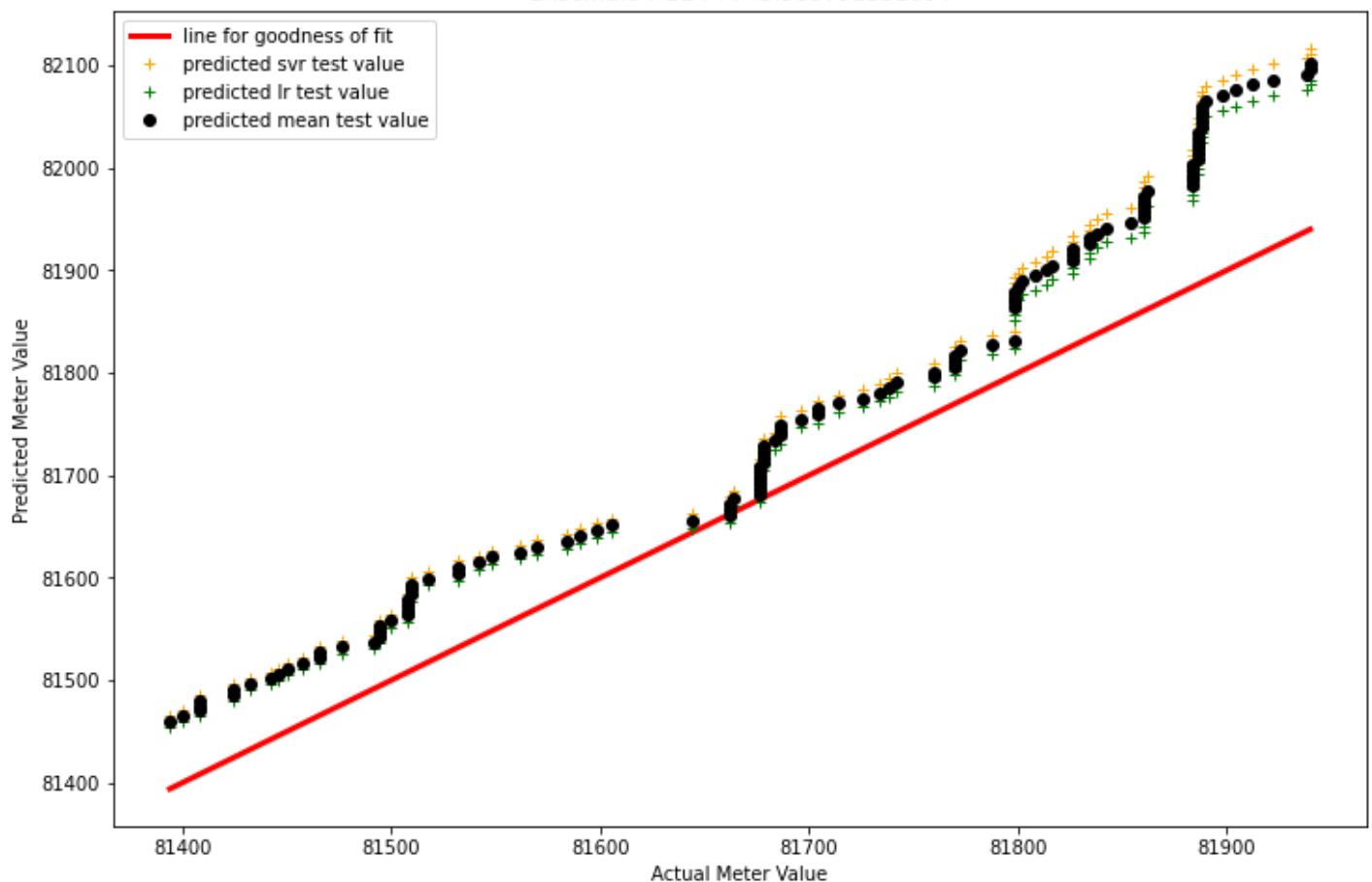
Household 6505.0  
Testing SVR MSE : 43139.51778915549  
Testing LR MSE : 36533.016020599454  
Ensemble MSE : 39747.770652005194



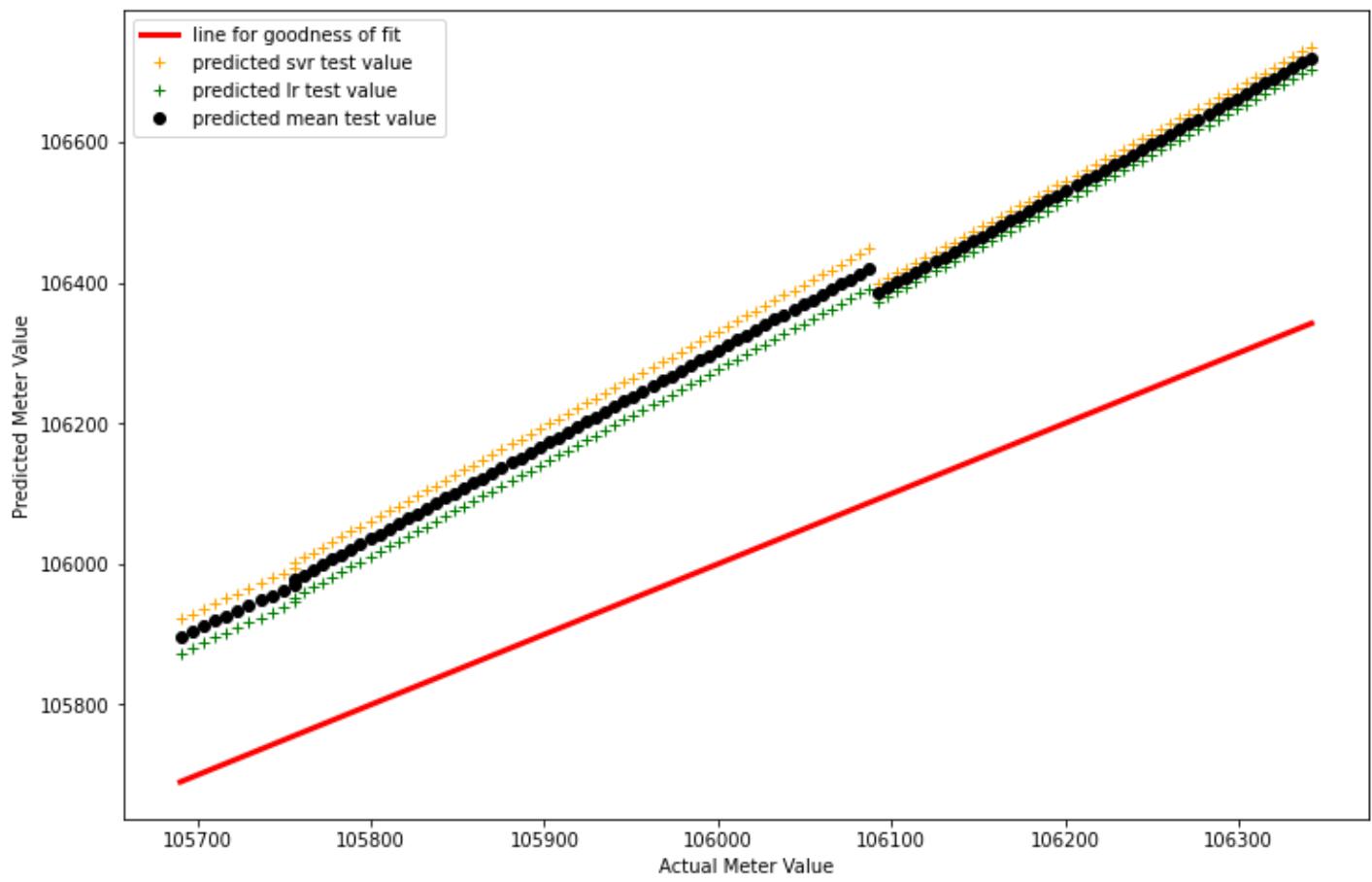
Household 6578.0  
Testing SVR MSE : 0.019297004247248676  
Testing LR MSE : 840.2218105636437  
Ensemble MSE : 212.0695074136076



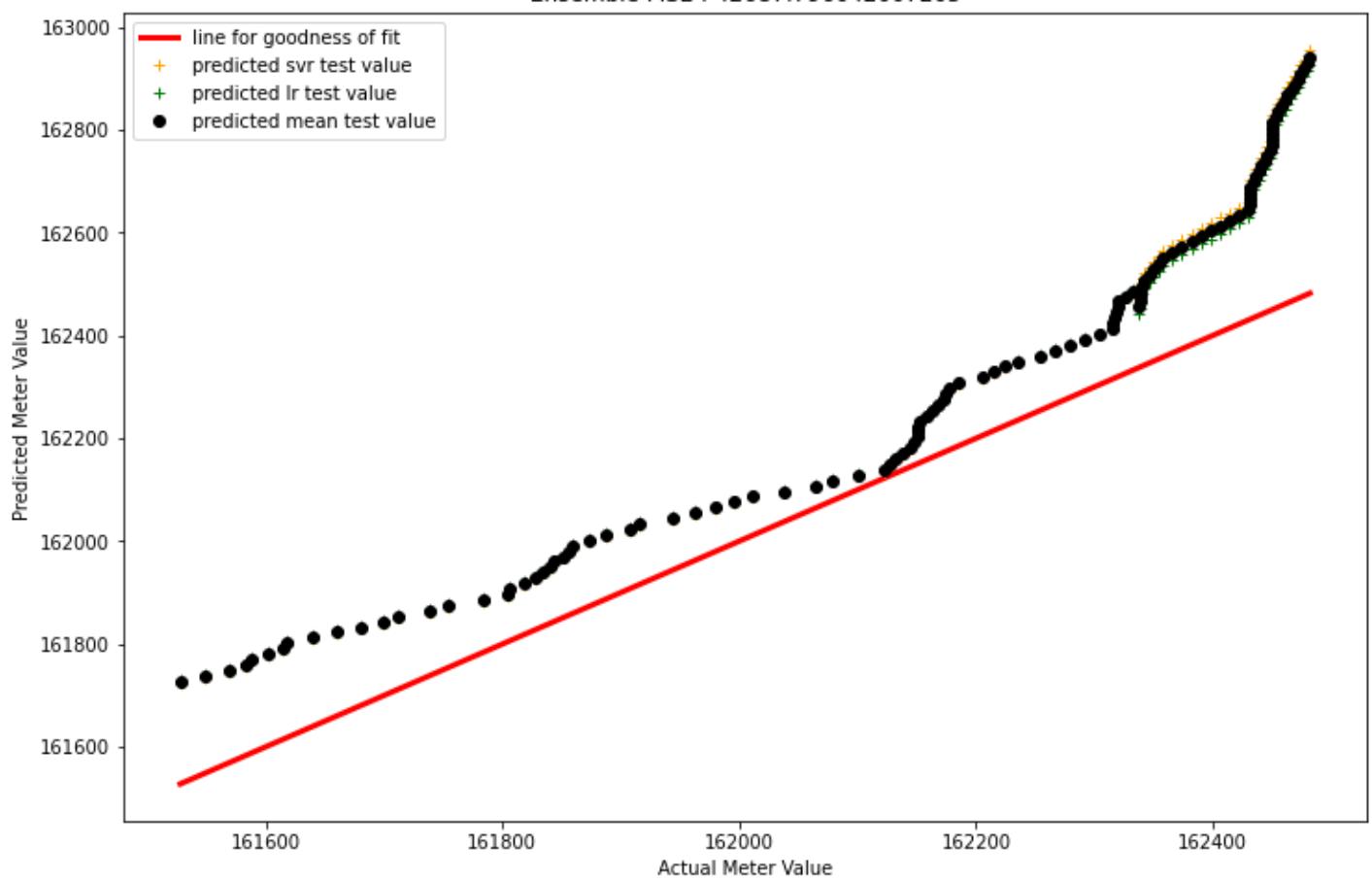
Household 6673.0  
Testing SVR MSE : 9625.19608290153  
Testing LR MSE : 6084.951340510249  
Ensemble MSE : 7743.983792531004



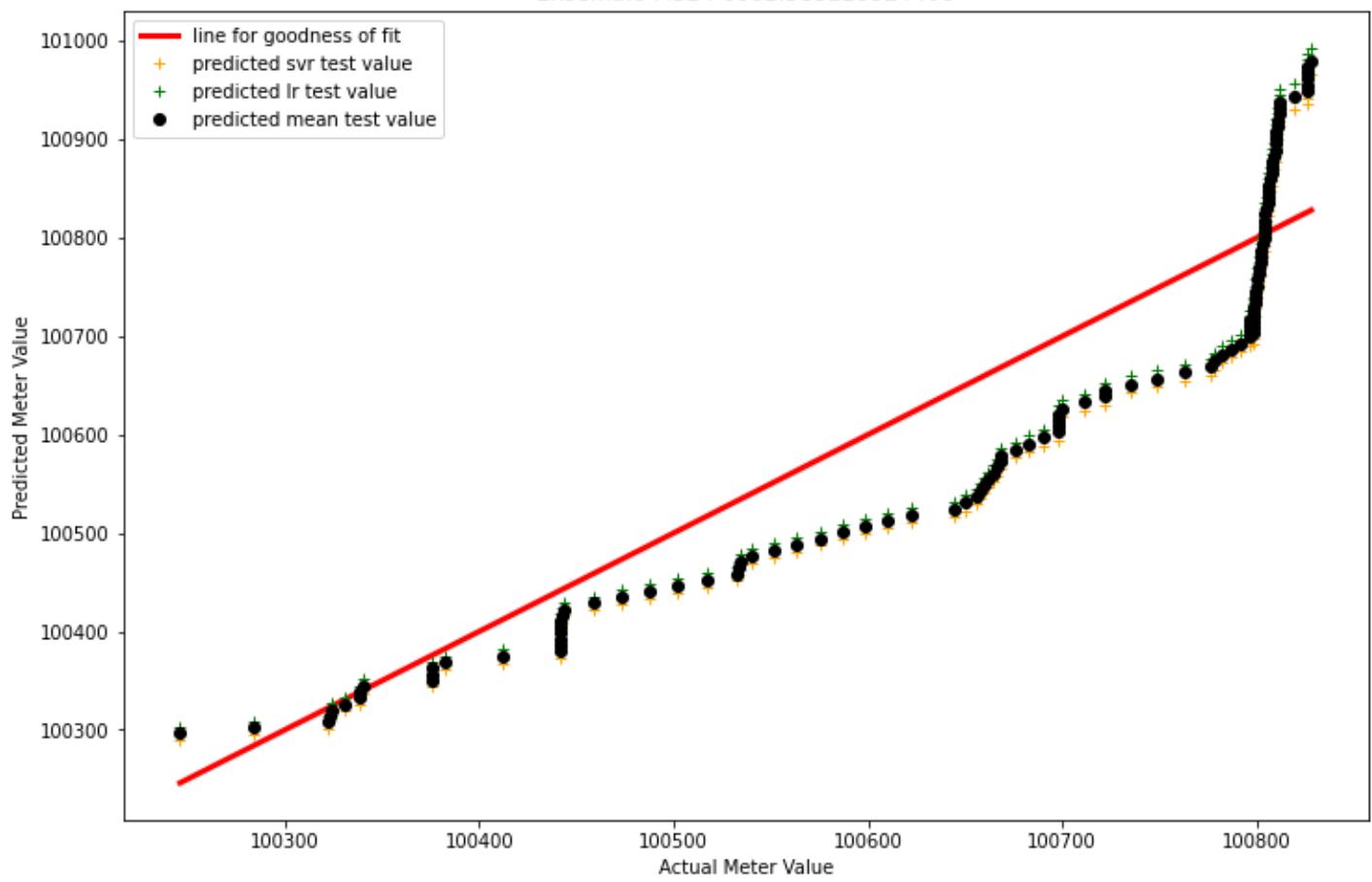
Household 6685.0  
Testing SVR MSE : 101554.26264005998  
Testing LR MSE : 76869.08967516659  
Ensemble MSE : 88716.29826513396



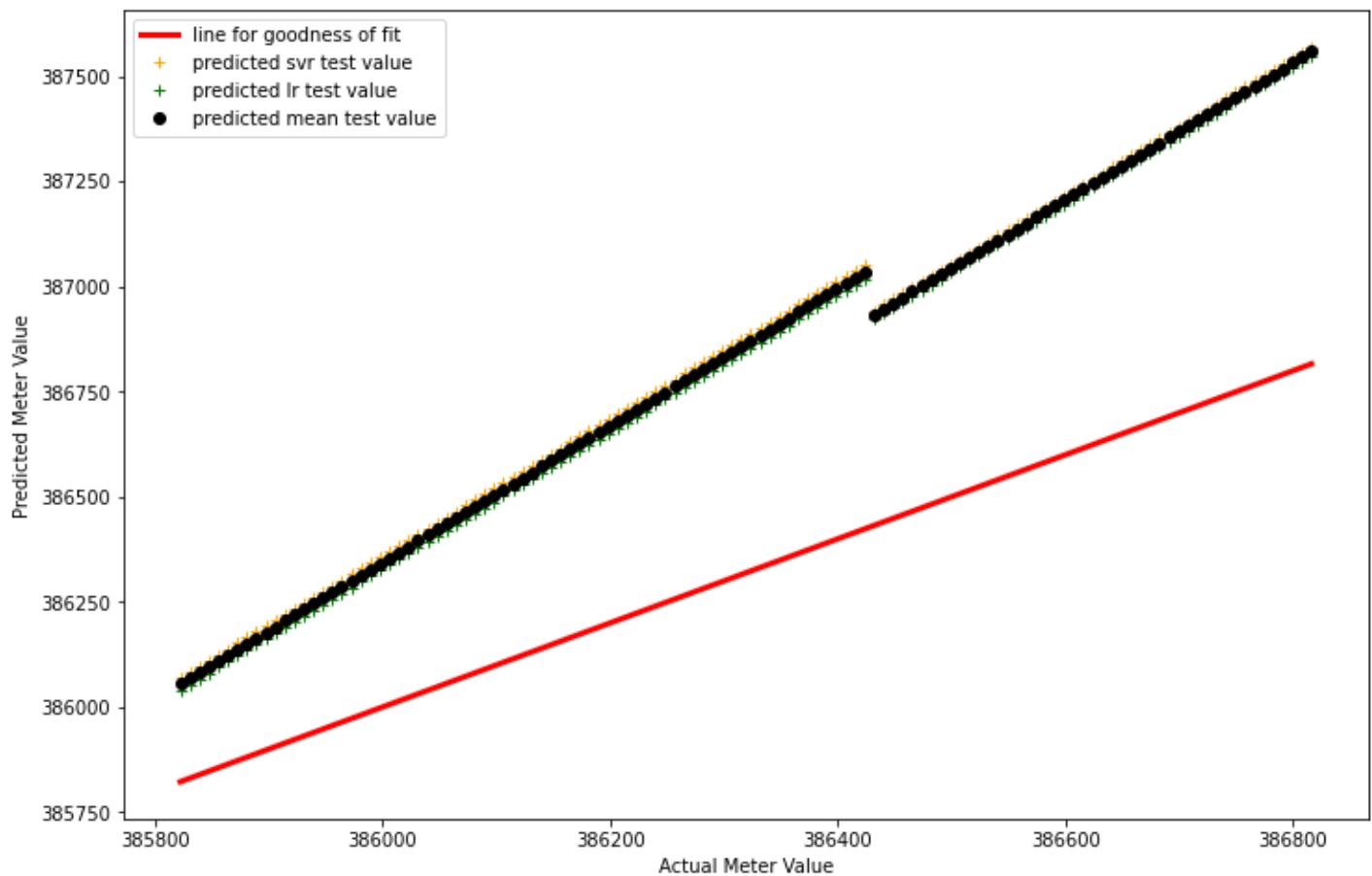
Household 6830.0  
Testing SVR MSE : 45752.531944547125  
Testing LR MSE : 39807.50149143402  
Ensemble MSE : 42687.796042007205



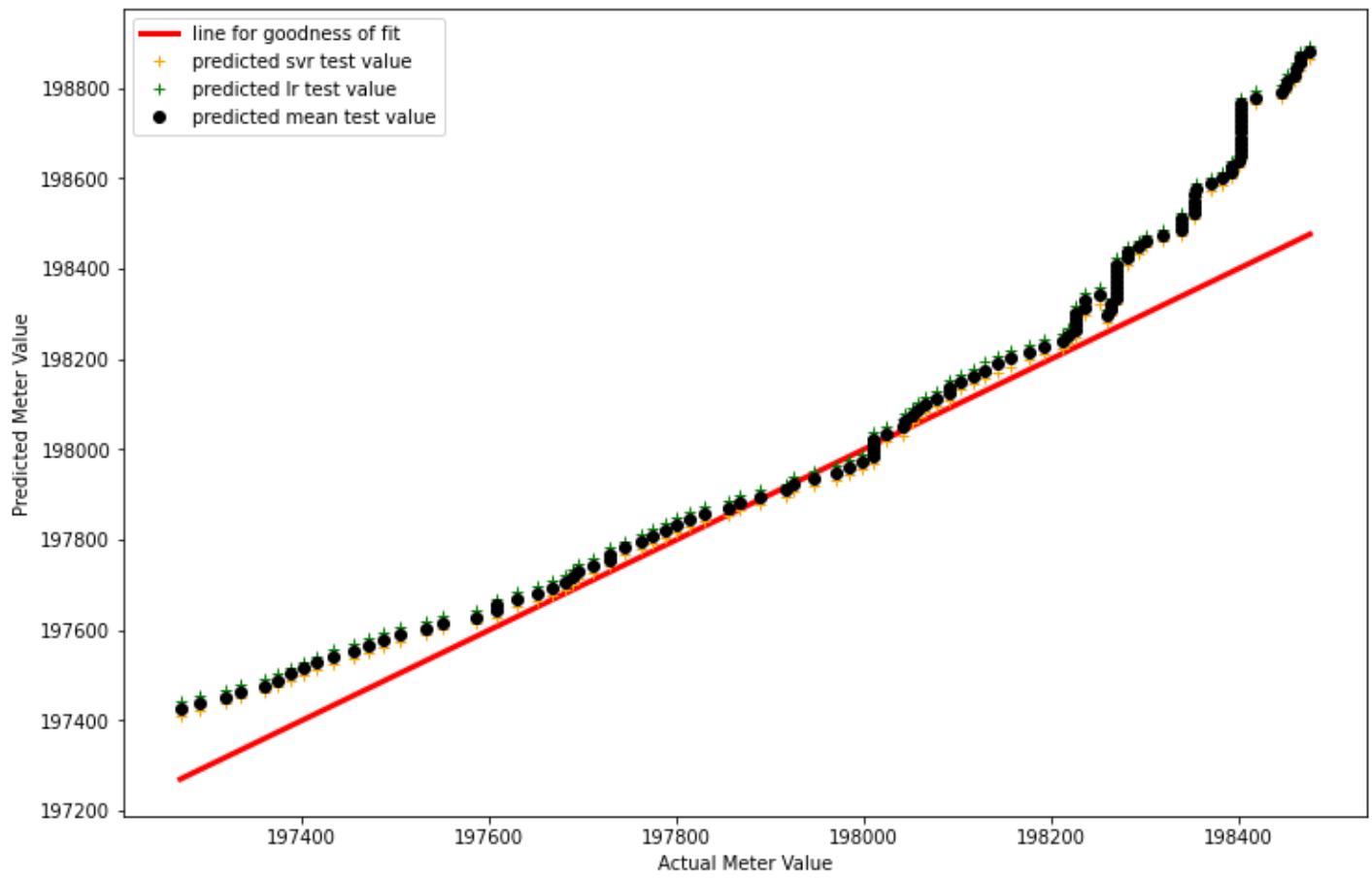
Household 6836.0  
Testing SVR MSE : 6451.460856707856  
Testing LR MSE : 5912.96976793718  
Ensemble MSE : 6082.585229924466



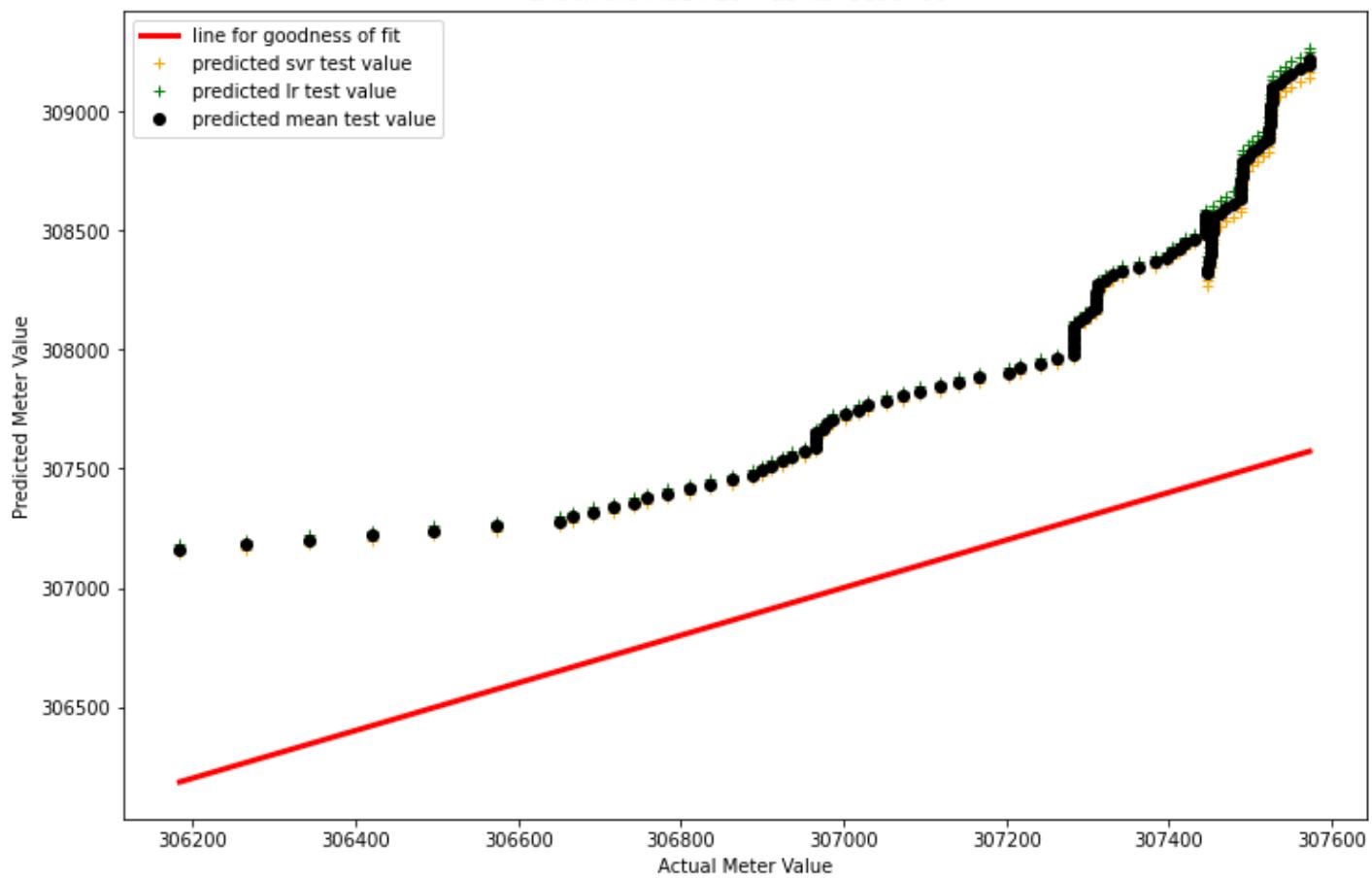
Household 6863.0  
Testing SVR MSE : 283384.34023935586  
Testing LR MSE : 255772.262093987  
Ensemble MSE : 269368.46328693436



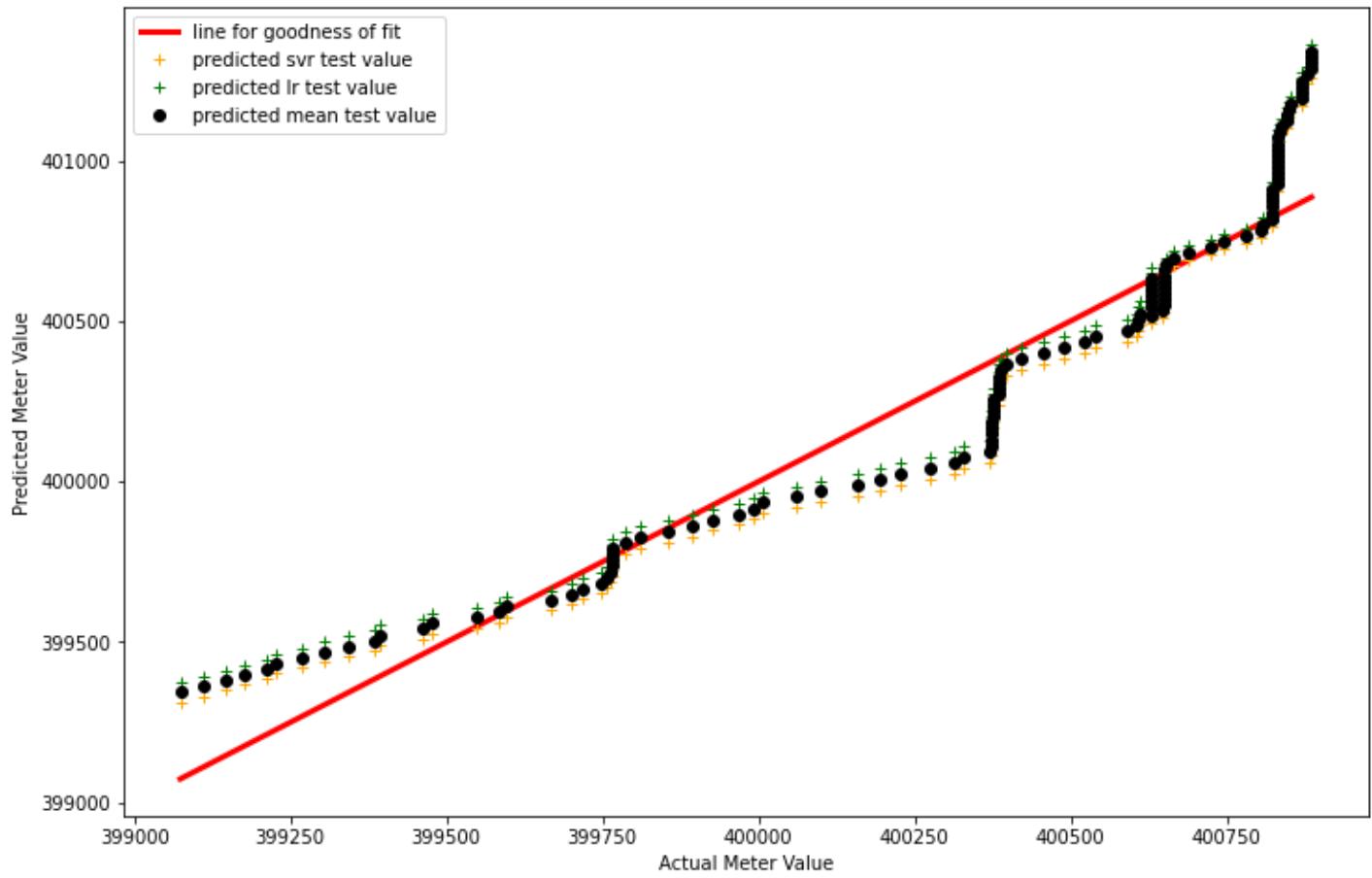
Household 6910.0  
Testing SVR MSE : 23782.308006623534  
Testing LR MSE : 30529.25141647989  
Ensemble MSE : 26923.465971146354



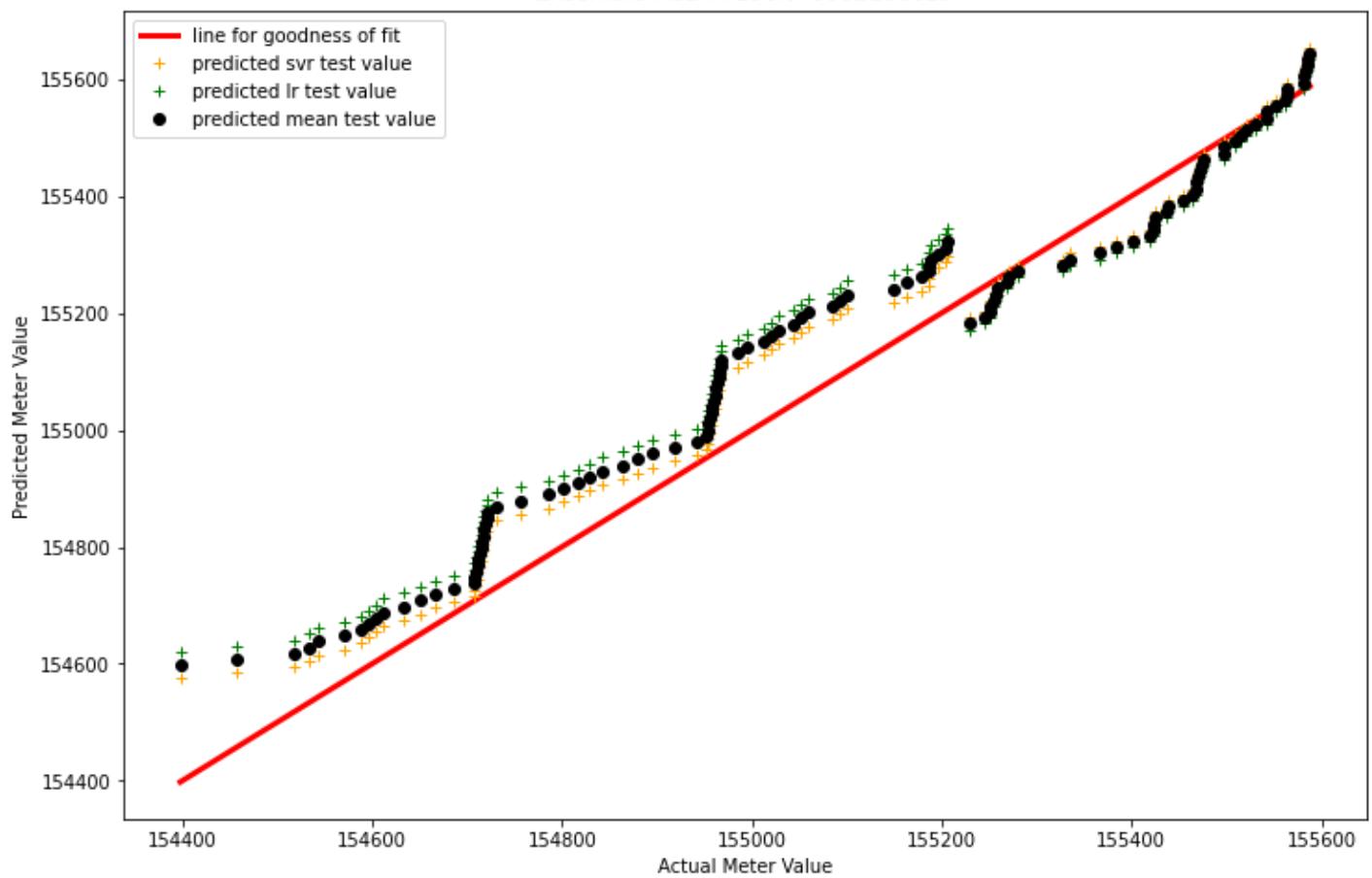
Household 7016.0  
Testing SVR MSE : 977269.2605041533  
Testing LR MSE : 1119868.2916885654  
Ensemble MSE : 1047254.5736337604



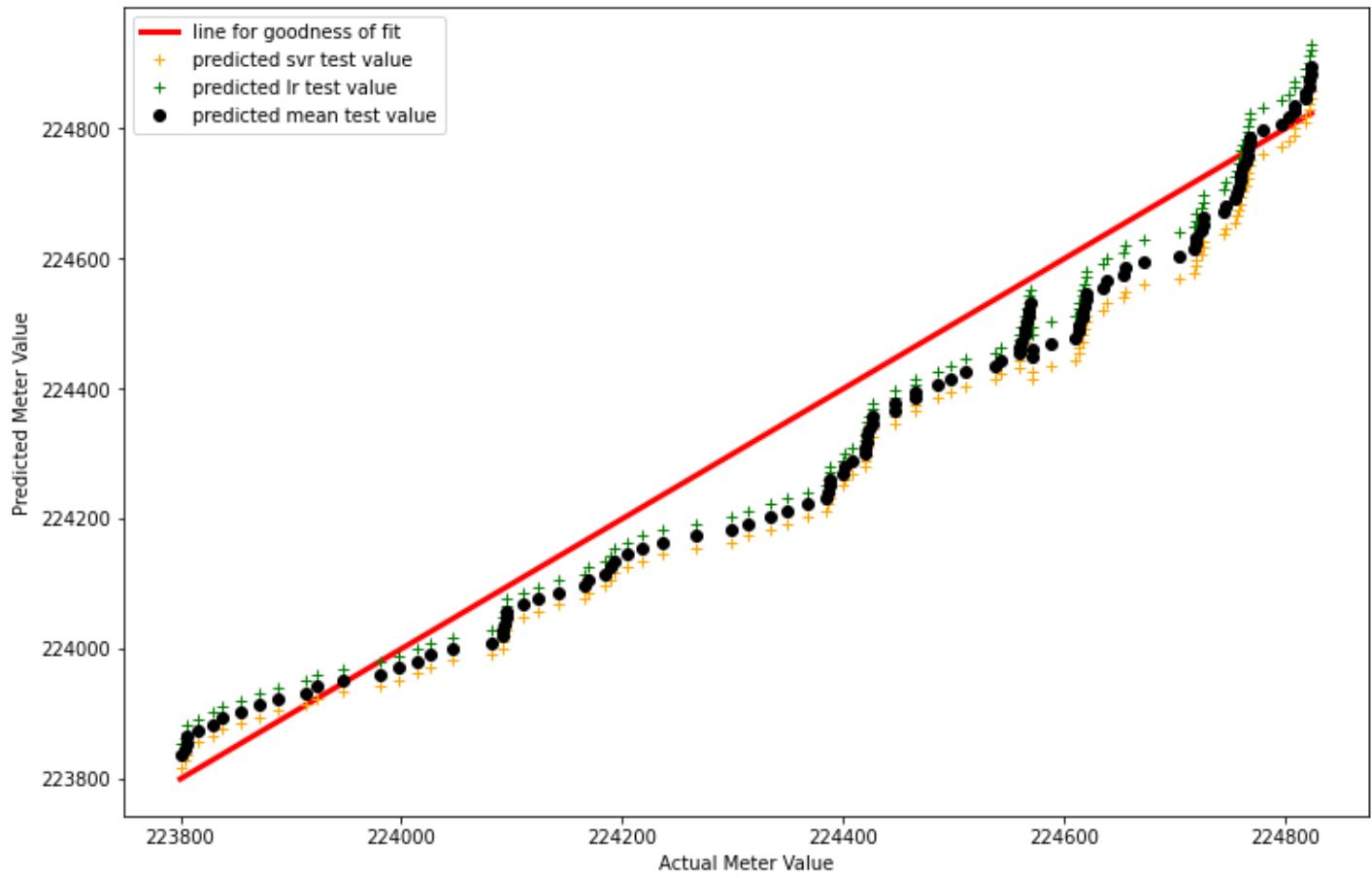
Household 7017.0  
Testing SVR MSE : 29751.236104803516  
Testing LR MSE : 31234.706512870398  
Ensemble MSE : 29591.147963171596



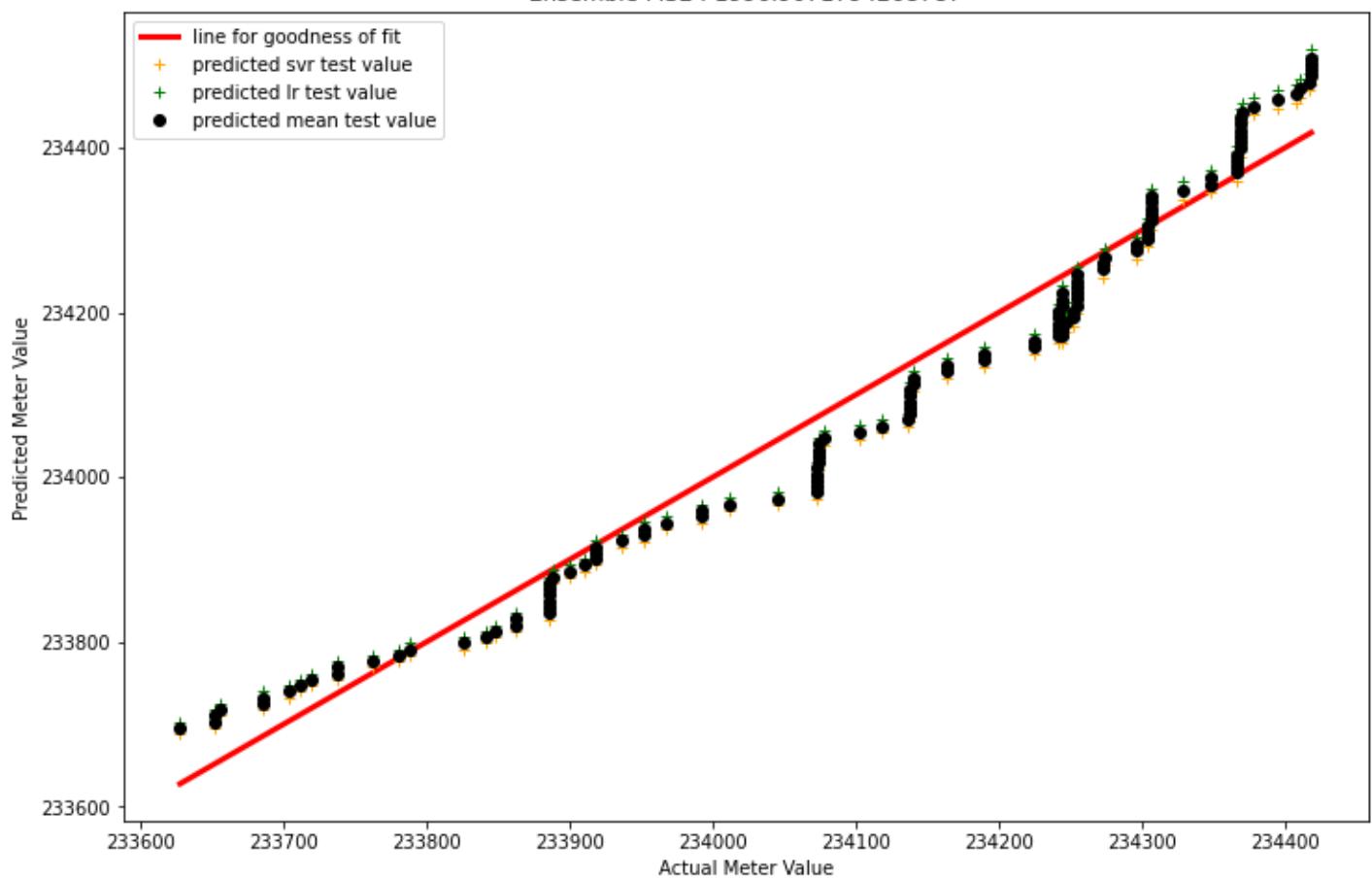
Household 7030.0  
Testing SVR MSE : 4598.300348847243  
Testing LR MSE : 10442.21487340104  
Ensemble MSE : 7156.049992168625



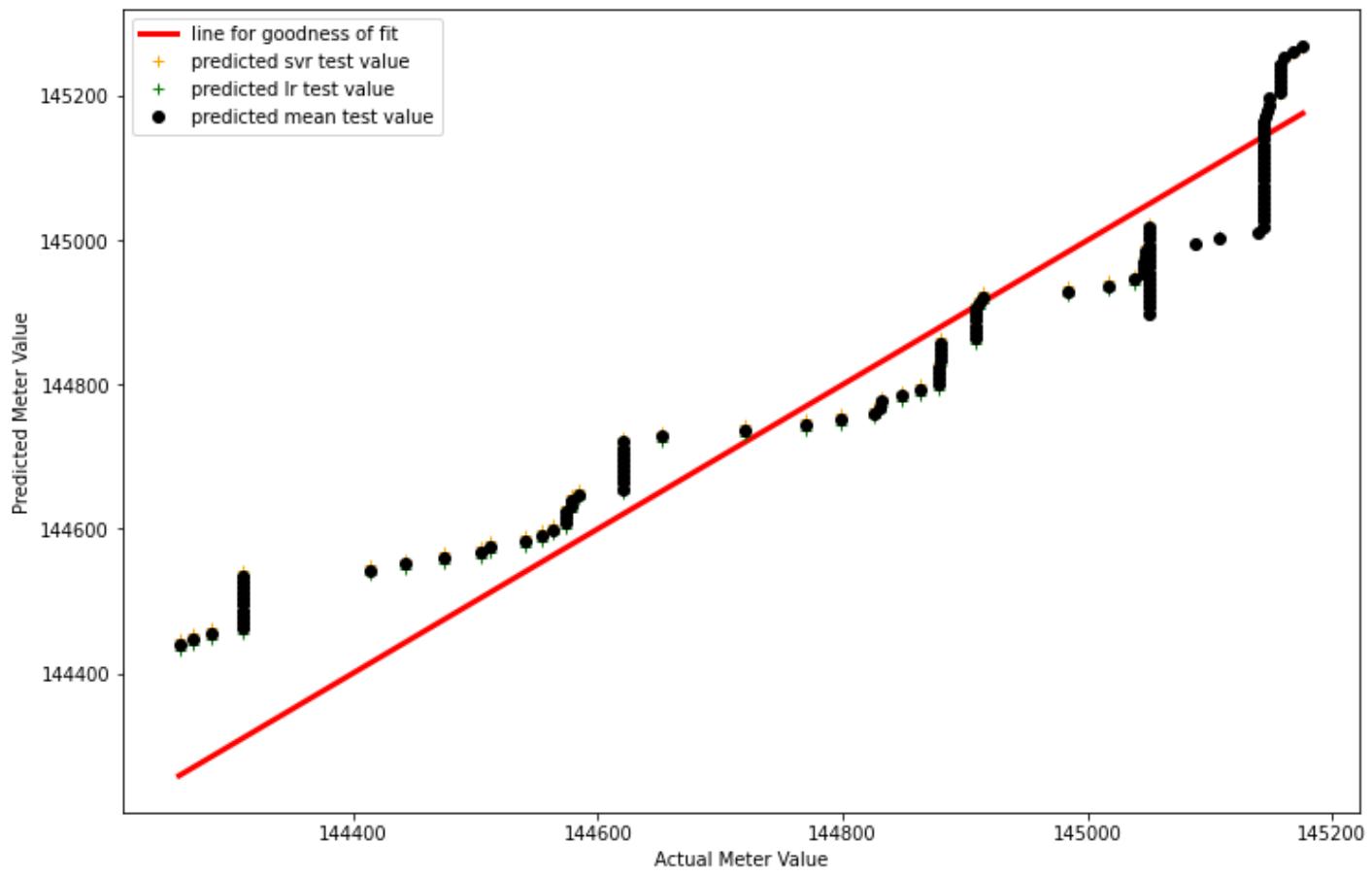
Household 7117.0  
Testing SVR MSE : 9542.950642849148  
Testing LR MSE : 4172.824571101434  
Ensemble MSE : 6142.971062114152



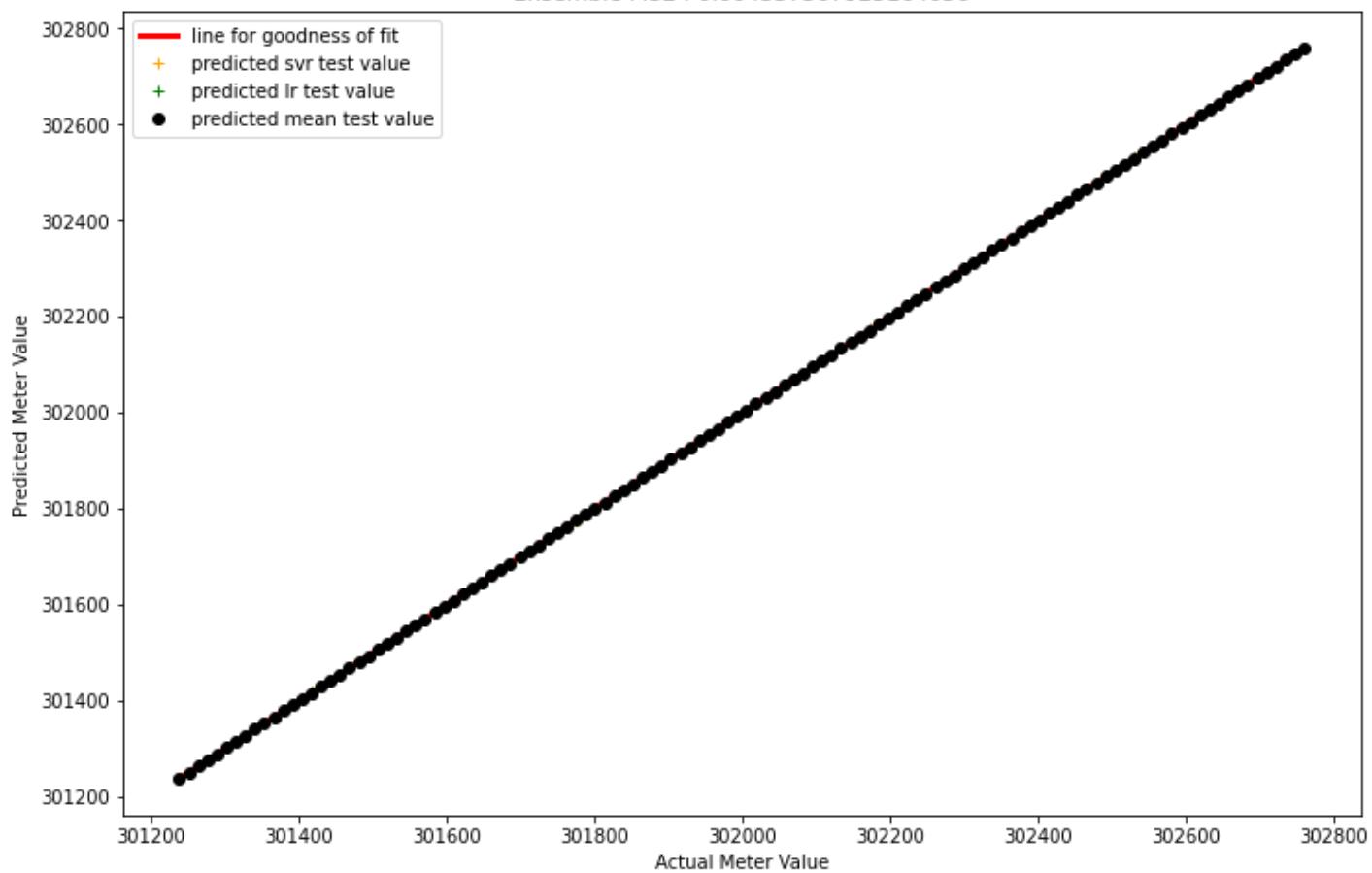
Household 7287.0  
Testing SVR MSE : 2217.4468280243777  
Testing LR MSE : 1940.681774300652  
Ensemble MSE : 1996.9071794268787



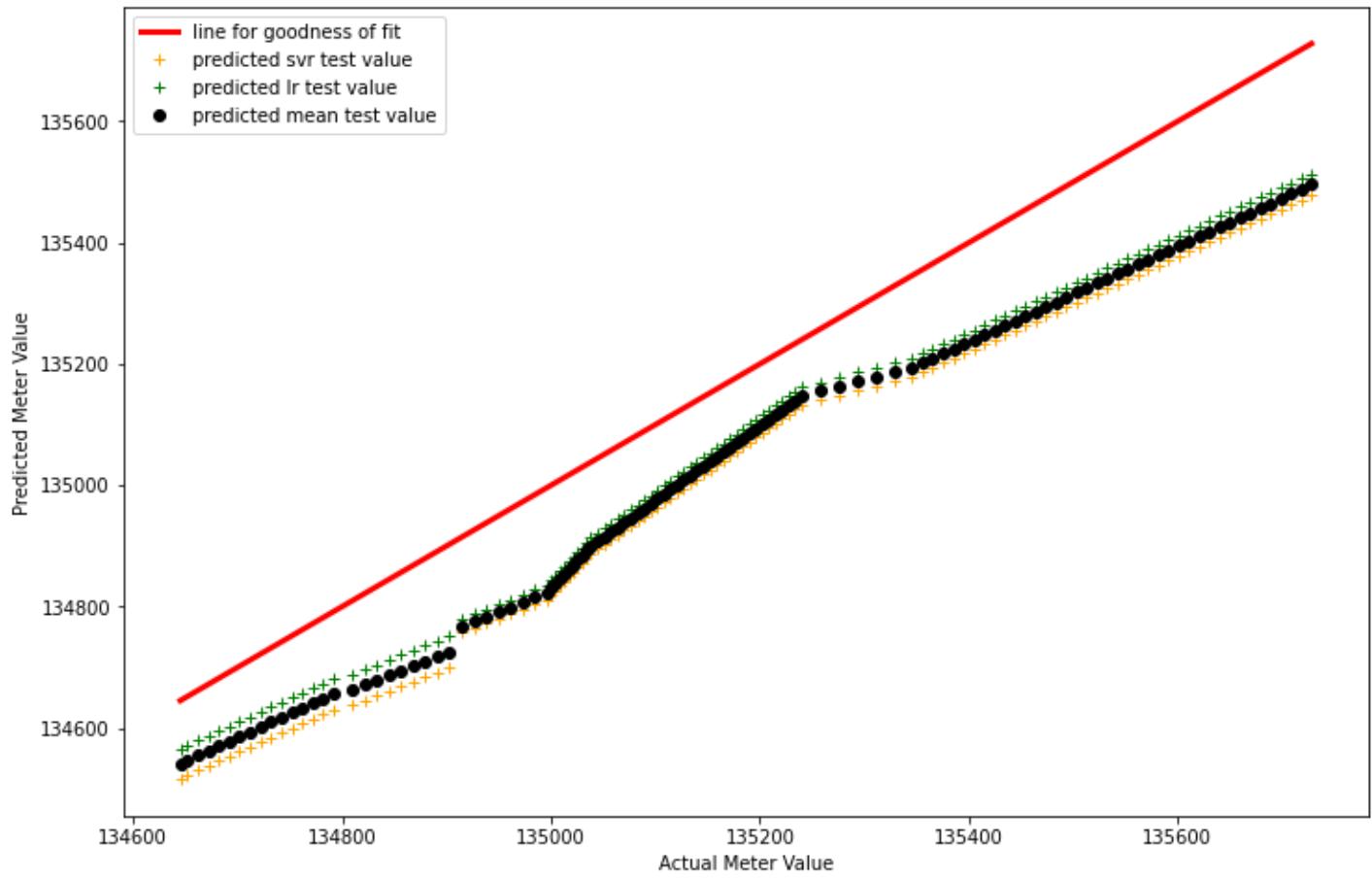
Household 7429.0  
Testing SVR MSE : 8747.504154330092  
Testing LR MSE : 8128.134358669317  
Ensemble MSE : 8407.1165668481



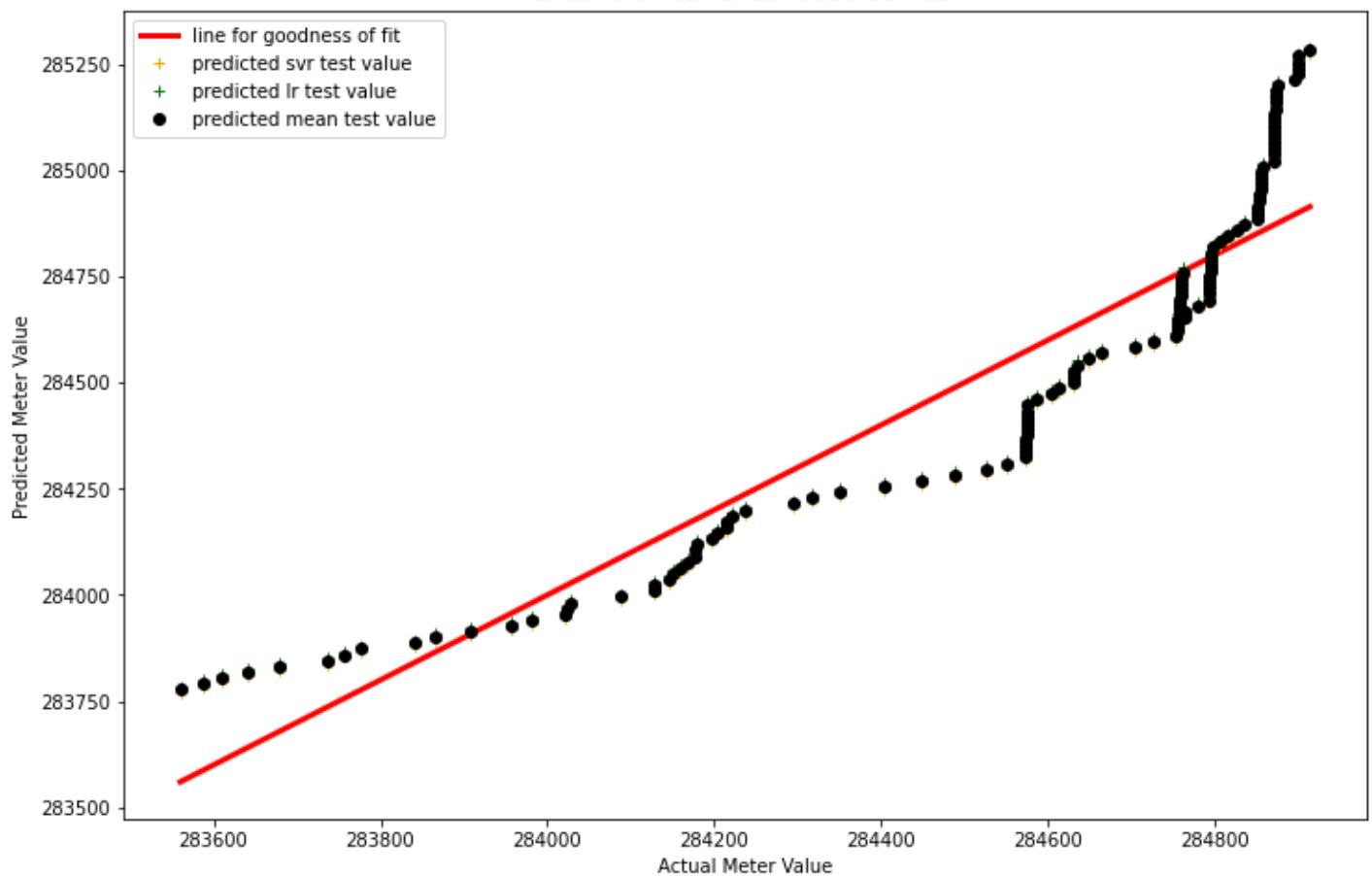
Household 7460.0  
Testing SVR MSE : 0.017429471703388624  
Testing LR MSE : 8.470329472543003e-22  
Ensemble MSE : 0.004357367925164056



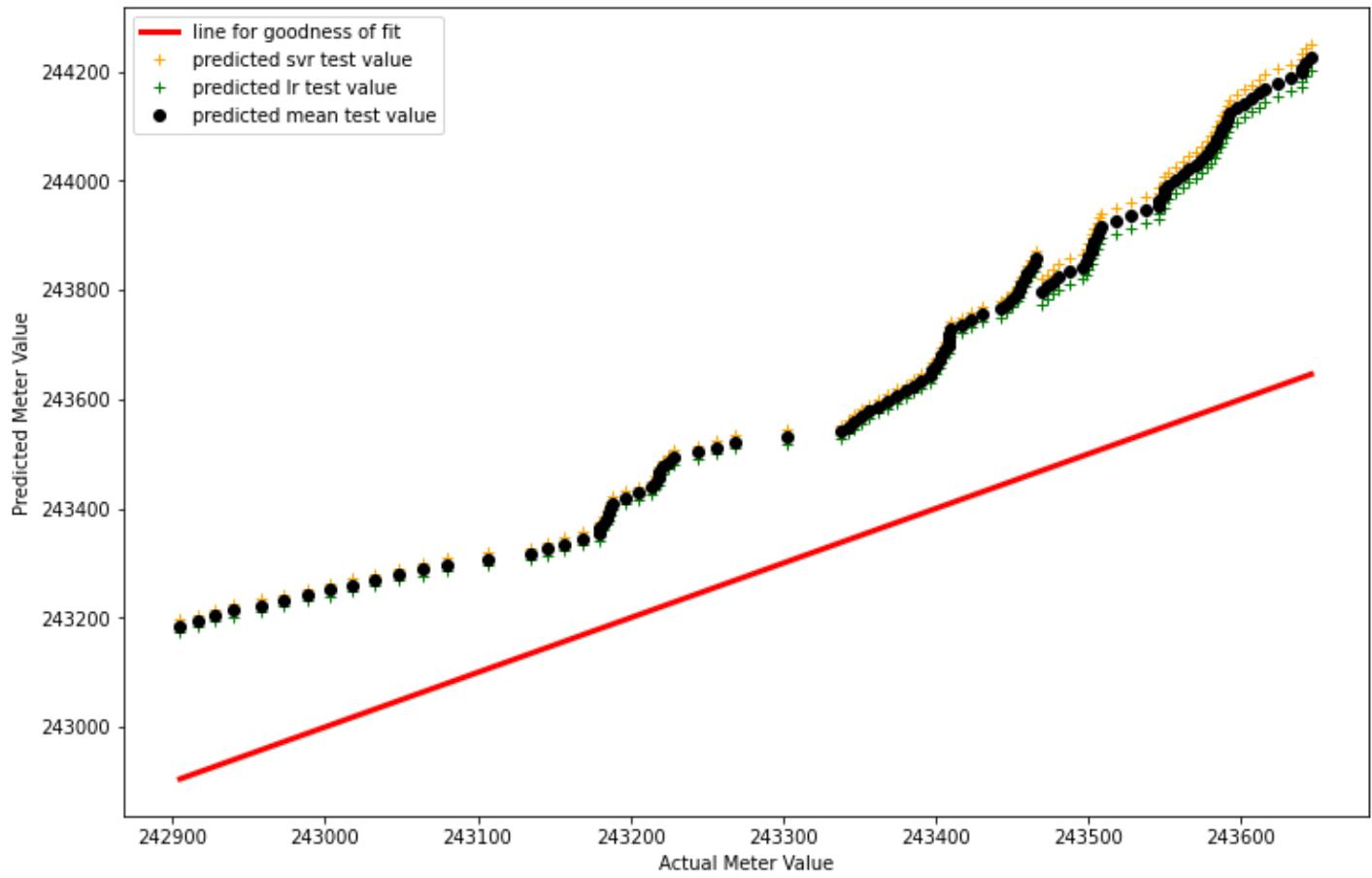
Household 7566.0  
Testing SVR MSE : 29694.516488266883  
Testing LR MSE : 19391.41925836017  
Ensemble MSE : 24234.4935471288



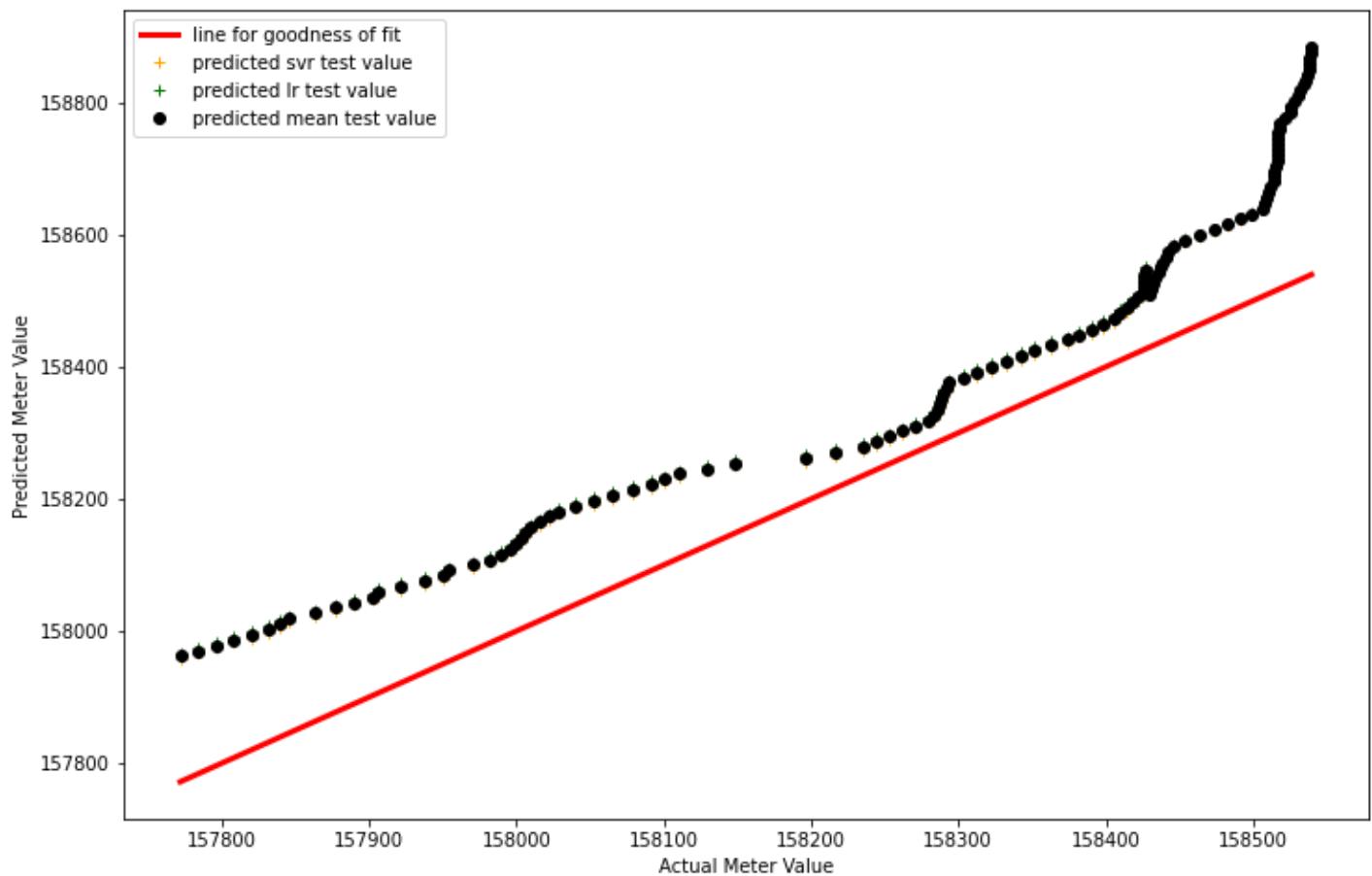
Household 7674.0  
Testing SVR MSE : 24359.29777930404  
Testing LR MSE : 24073.281424893074  
Ensemble MSE : 24154.86104327785



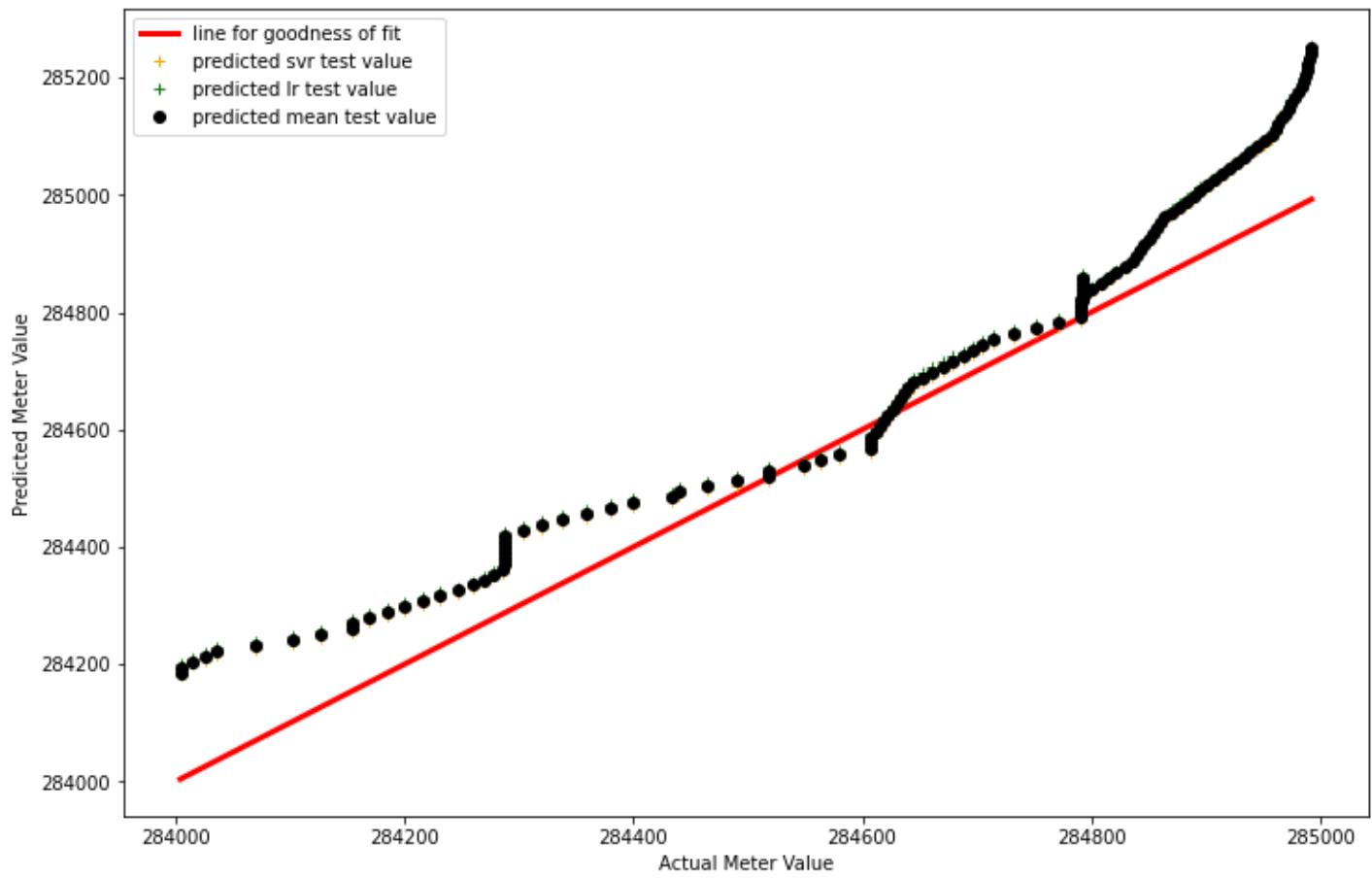
Household 7682.0  
Testing SVR MSE : 138652.7168097906  
Testing LR MSE : 113434.09061592404  
Ensemble MSE : 125719.80440926137



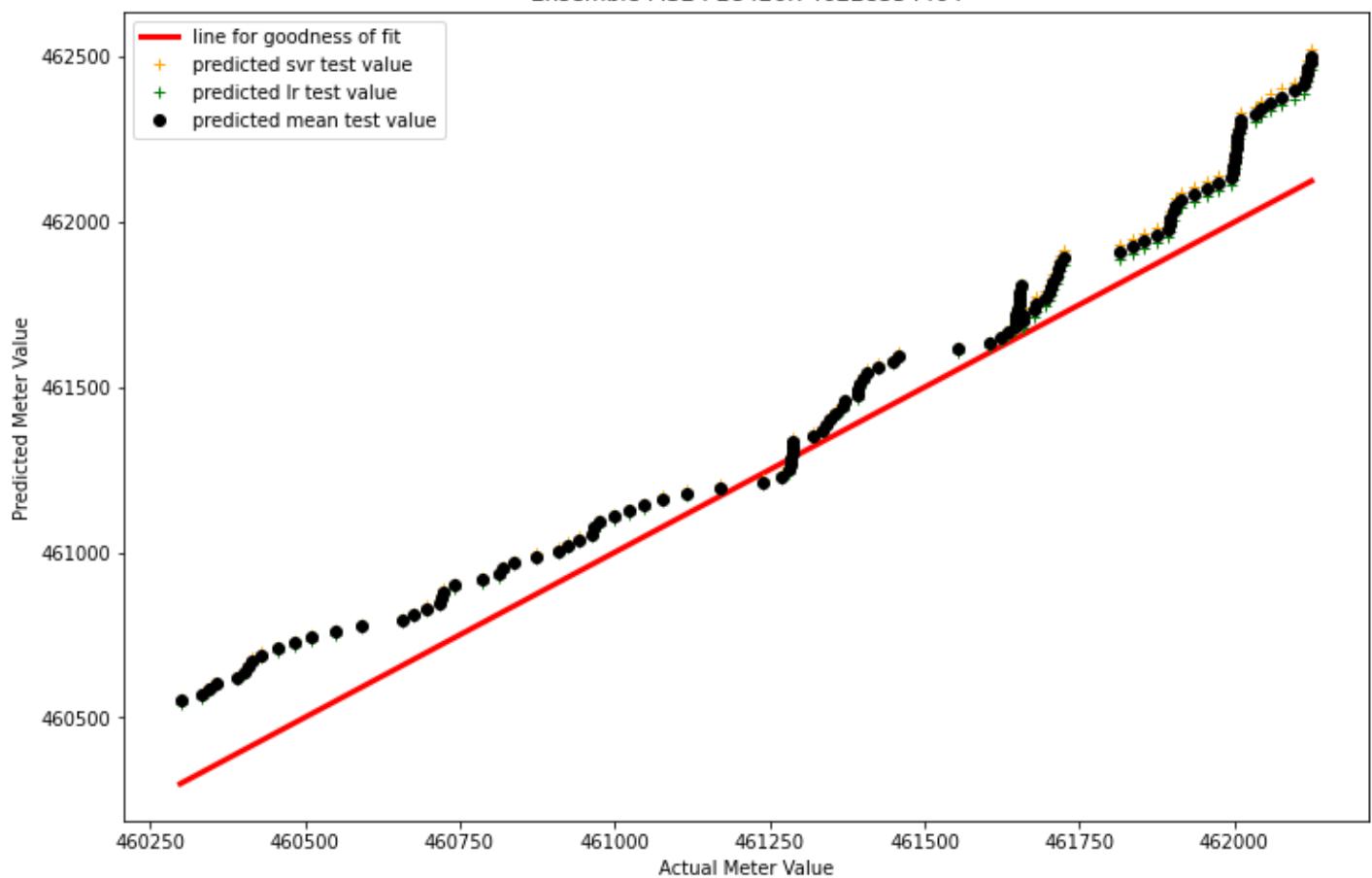
Household 7739.0  
Testing SVR MSE : 25217.302018522114  
Testing LR MSE : 27005.075326009202  
Ensemble MSE : 26095.40168155371



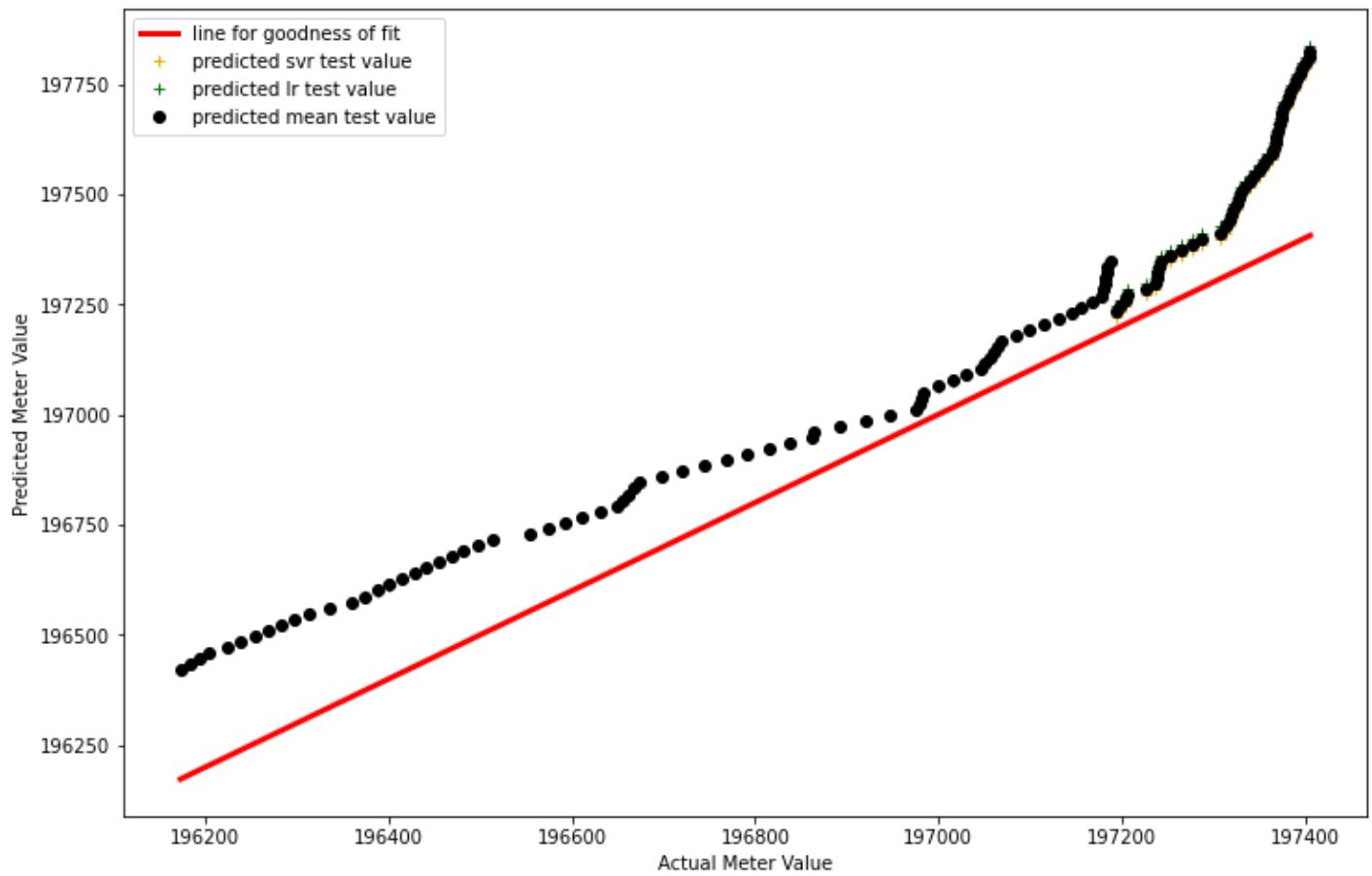
Household 7741.0  
Testing SVR MSE : 11386.208528147185  
Testing LR MSE : 13159.391496697297  
Ensemble MSE : 12240.833064664881



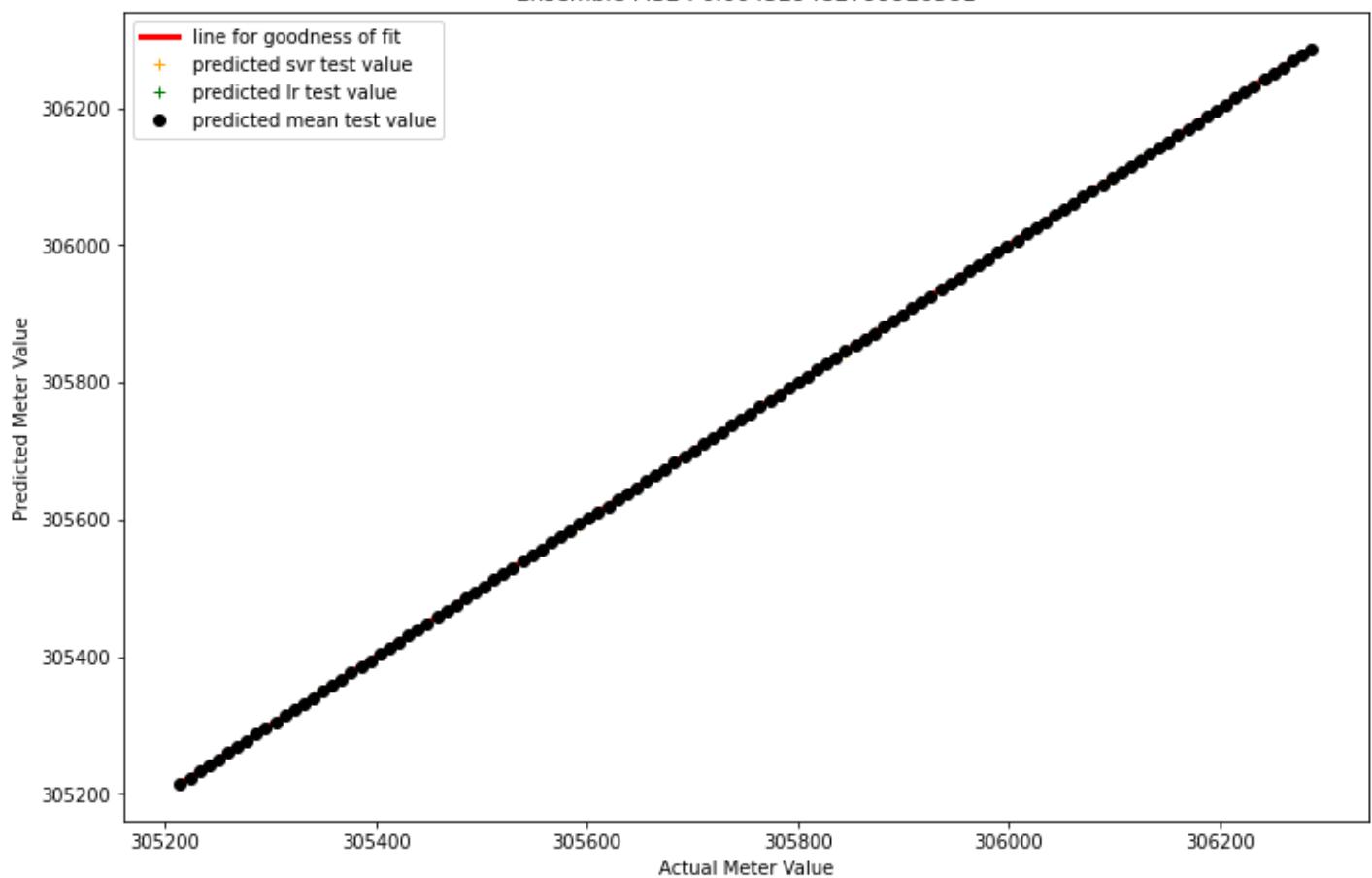
Household 7794.0  
Testing SVR MSE : 33173.674424531666  
Testing LR MSE : 24182.952646350728  
Ensemble MSE : 28426.746228554464



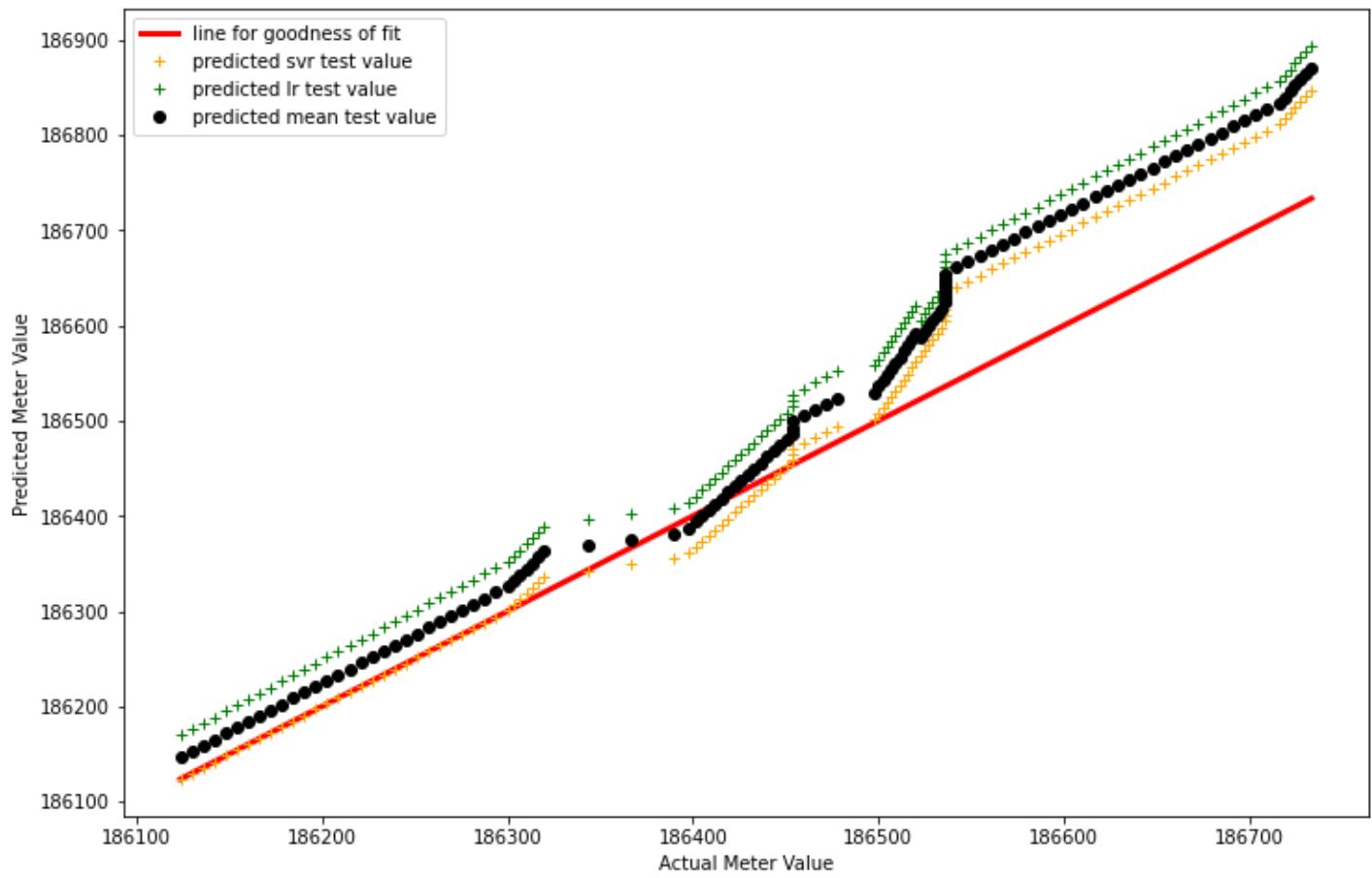
Household 7900.0  
Testing SVR MSE : 35314.04491489434  
Testing LR MSE : 39285.61060174841  
Ensemble MSE : 37234.27453329817



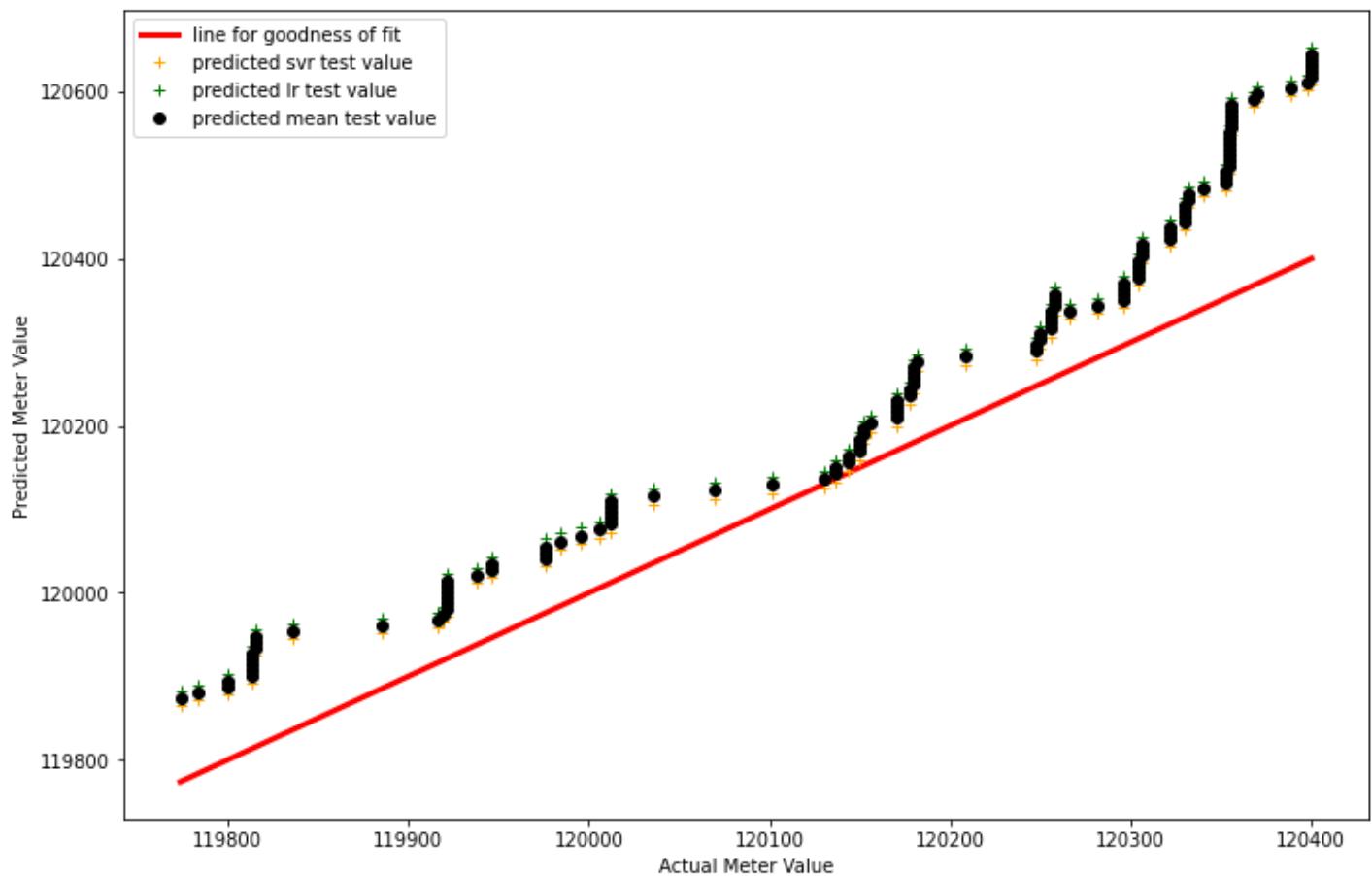
Household 7919.0  
Testing SVR MSE : 0.017317931202970132  
Testing LR MSE : 7.34095220953727e-22  
Ensemble MSE : 0.004329482799920581



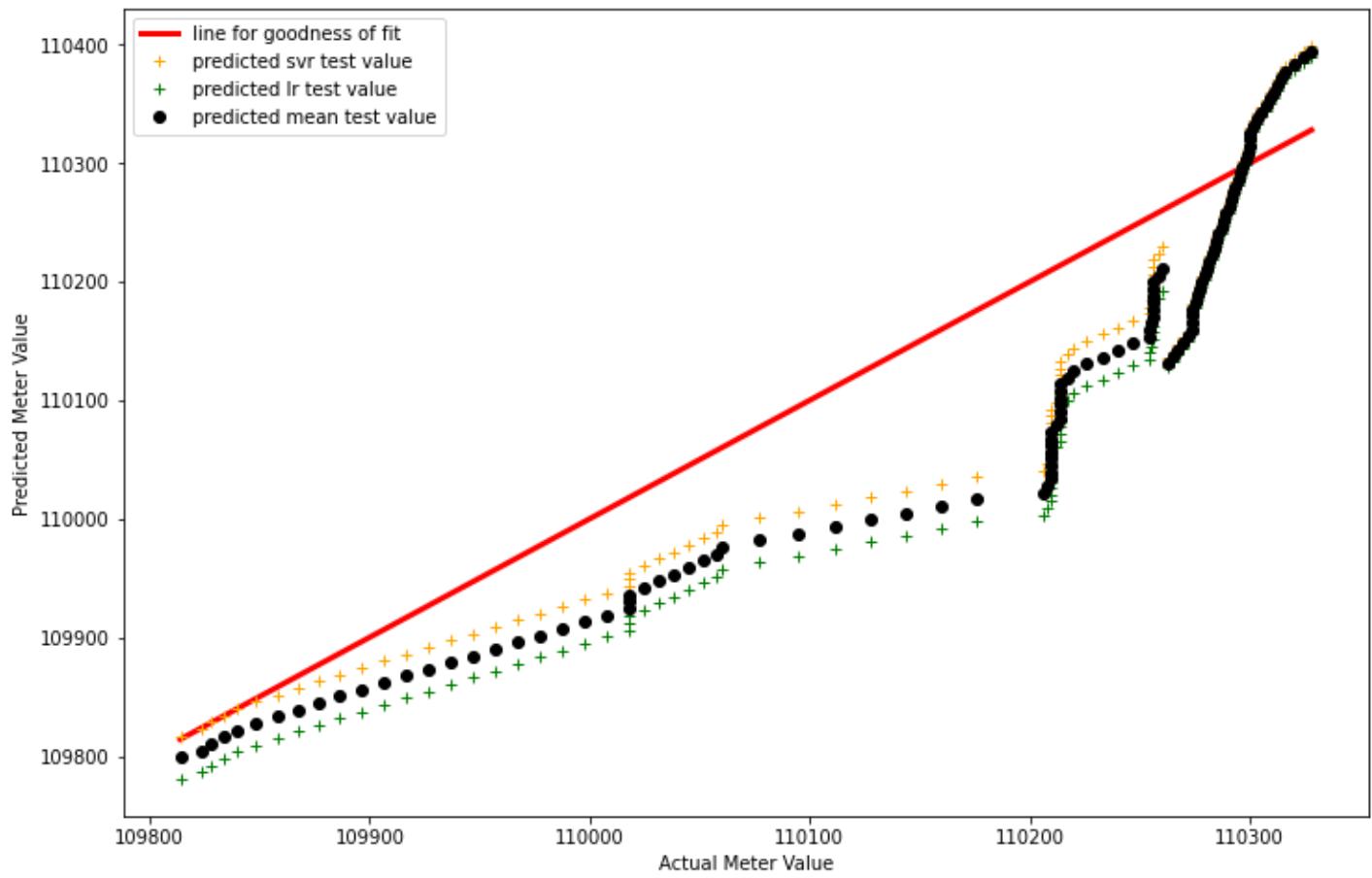
Household 7965.0  
Testing SVR MSE : 3492.668398071935  
Testing LR MSE : 9054.505673564488  
Ensemble MSE : 5667.492804948296



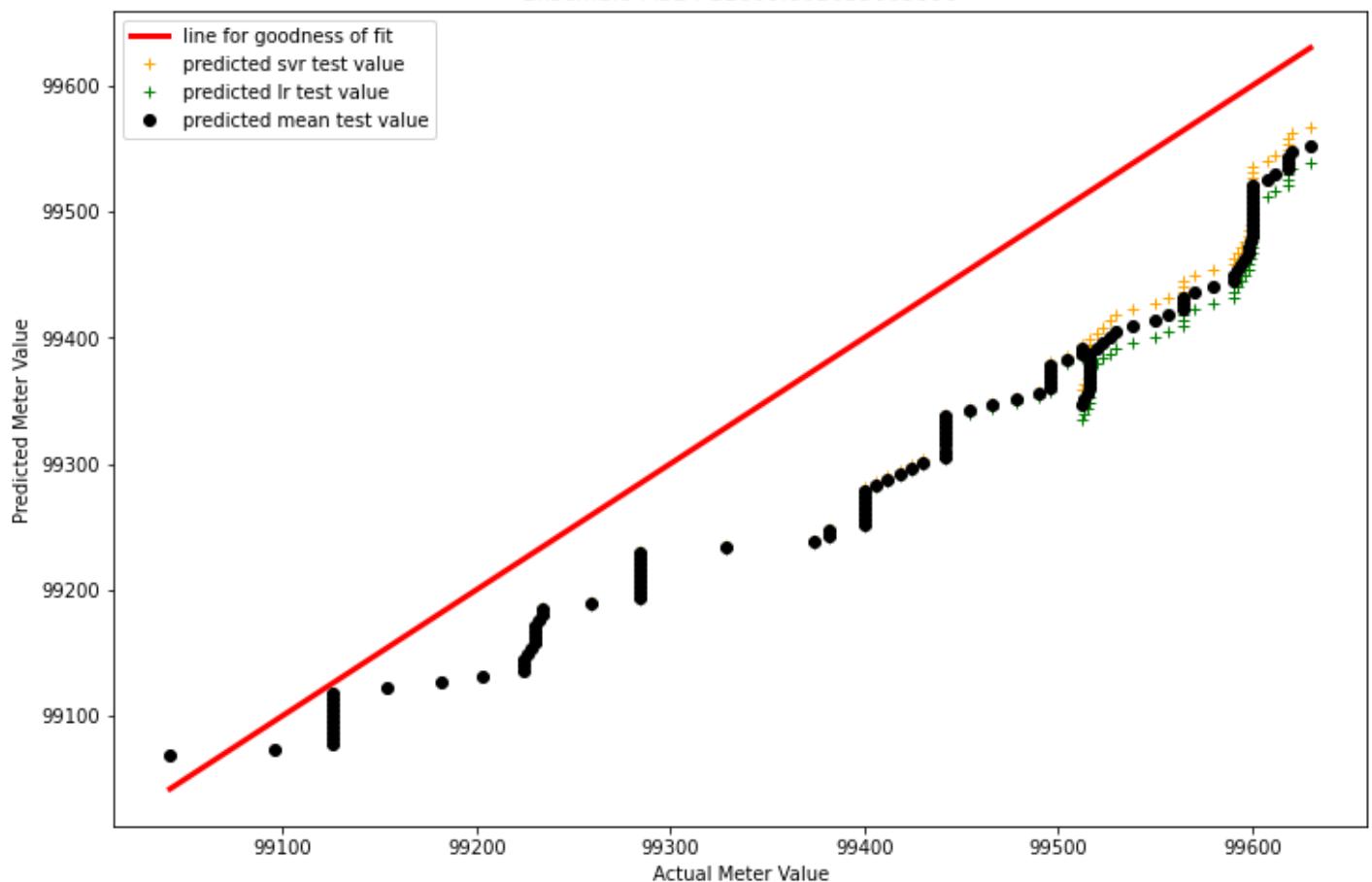
Household 7989.0  
Testing SVR MSE : 11824.676293966546  
Testing LR MSE : 15584.349491660107  
Ensemble MSE : 13620.24768280474



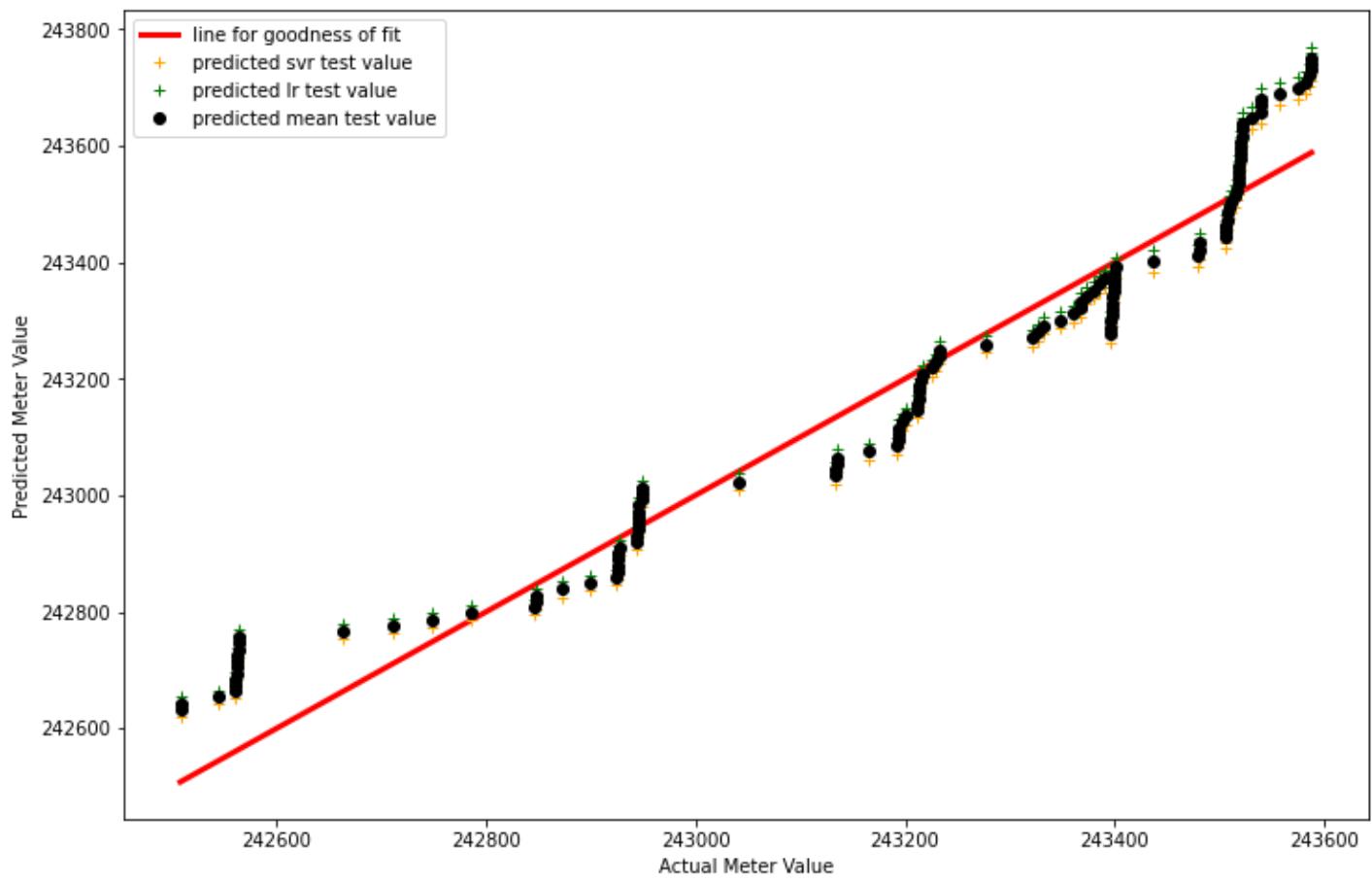
Household 8059.0  
Testing SVR MSE : 5961.477750937773  
Testing LR MSE : 10270.321068529334  
Ensemble MSE : 7894.581006487798



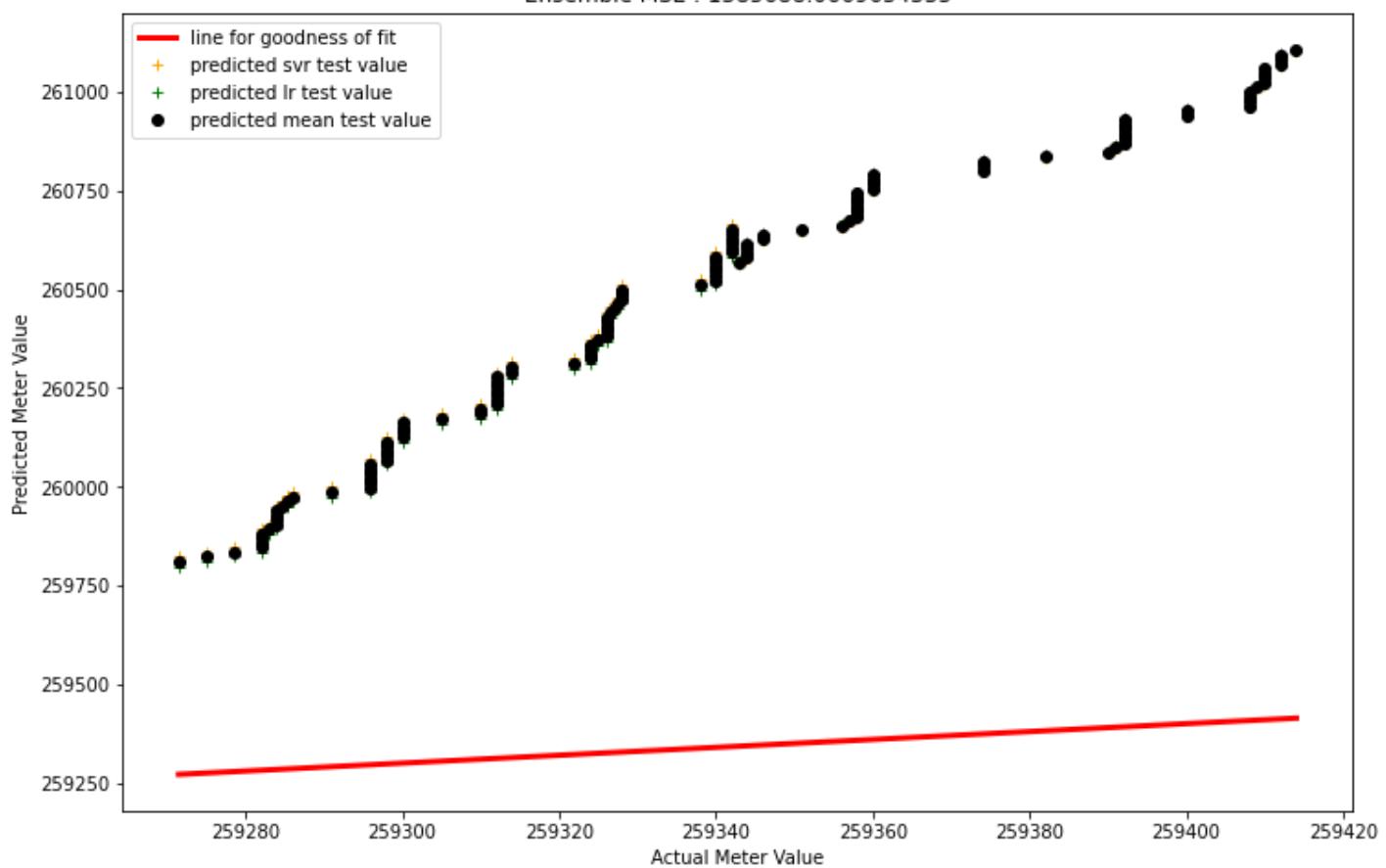
Household 8084.0  
Testing SVR MSE : 10497.870034984642  
Testing LR MSE : 13362.798923076612  
Ensemble MSE : 11860.802655665806



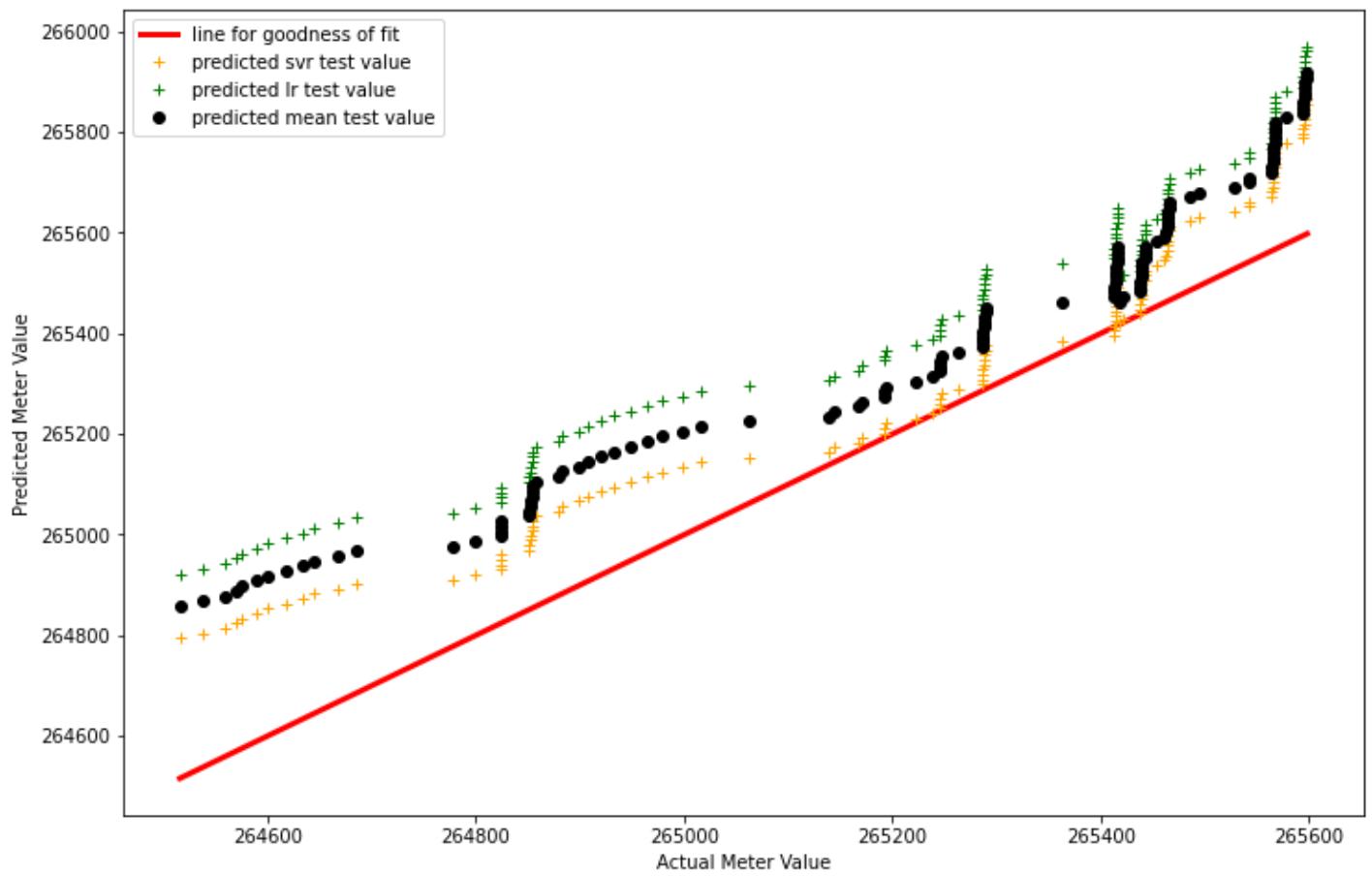
Household 8086.0  
Testing SVR MSE : 6377.89599359121  
Testing LR MSE : 7062.656249929155  
Ensemble MSE : 6475.066317646357



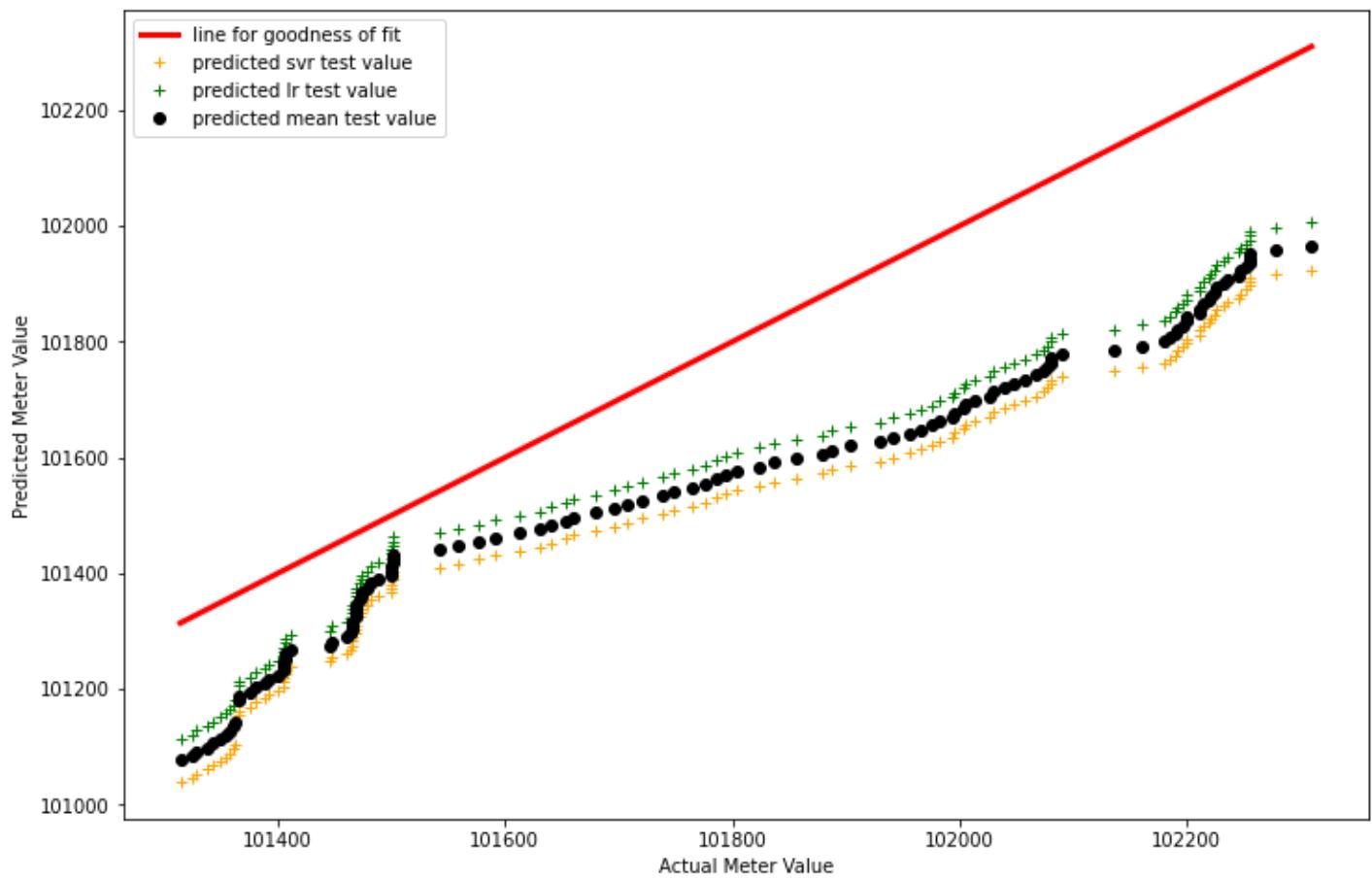
Household 8155.0  
Testing SVR MSE : 1396398.6942949225  
Testing LR MSE : 1375190.9515944517  
Ensemble MSE : 1385688.0669654335



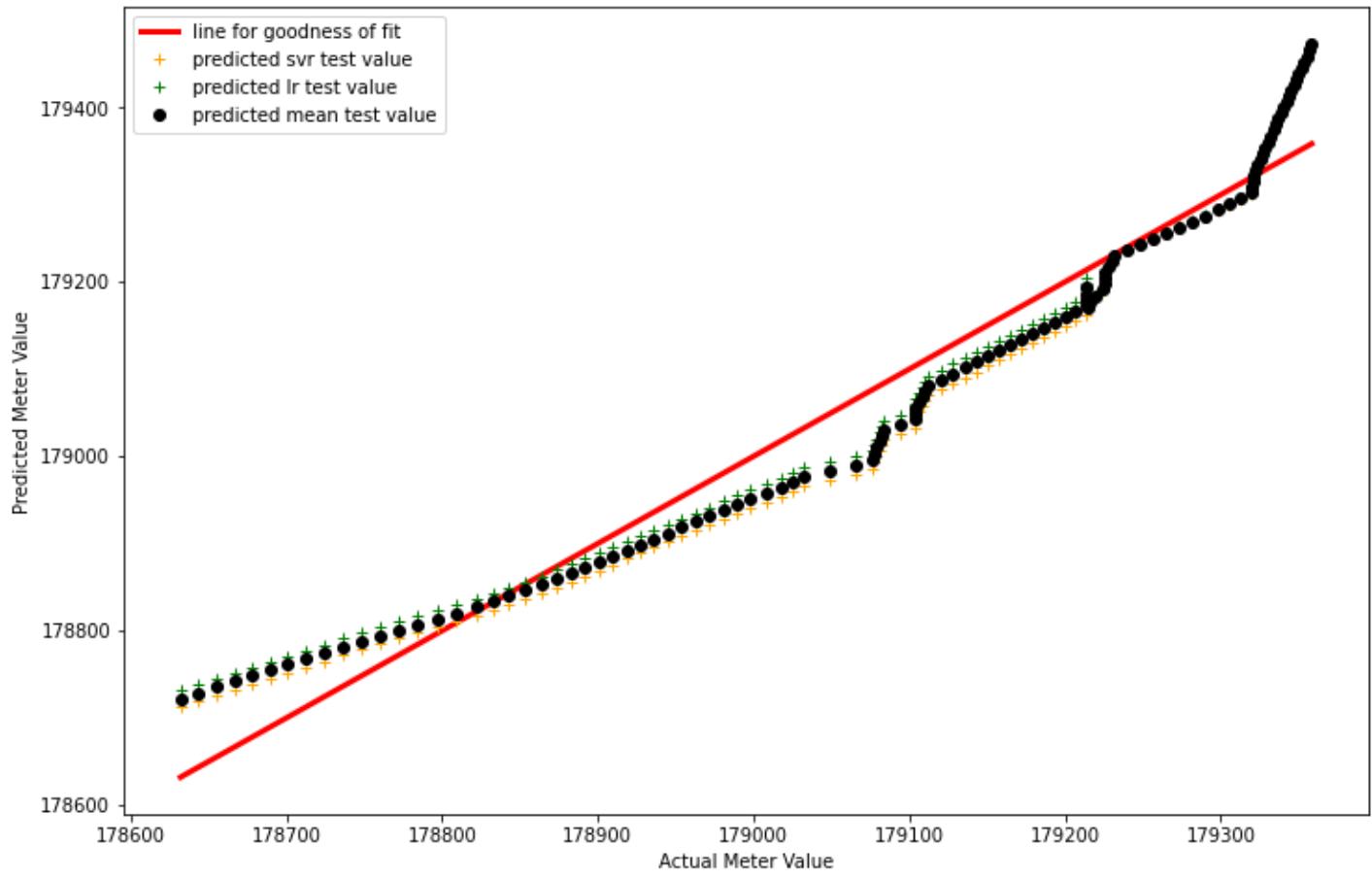
Household 8156.0  
Testing SVR MSE : 19740.84546789044  
Testing LR MSE : 63341.238757180436  
Ensemble MSE : 37559.69819829301



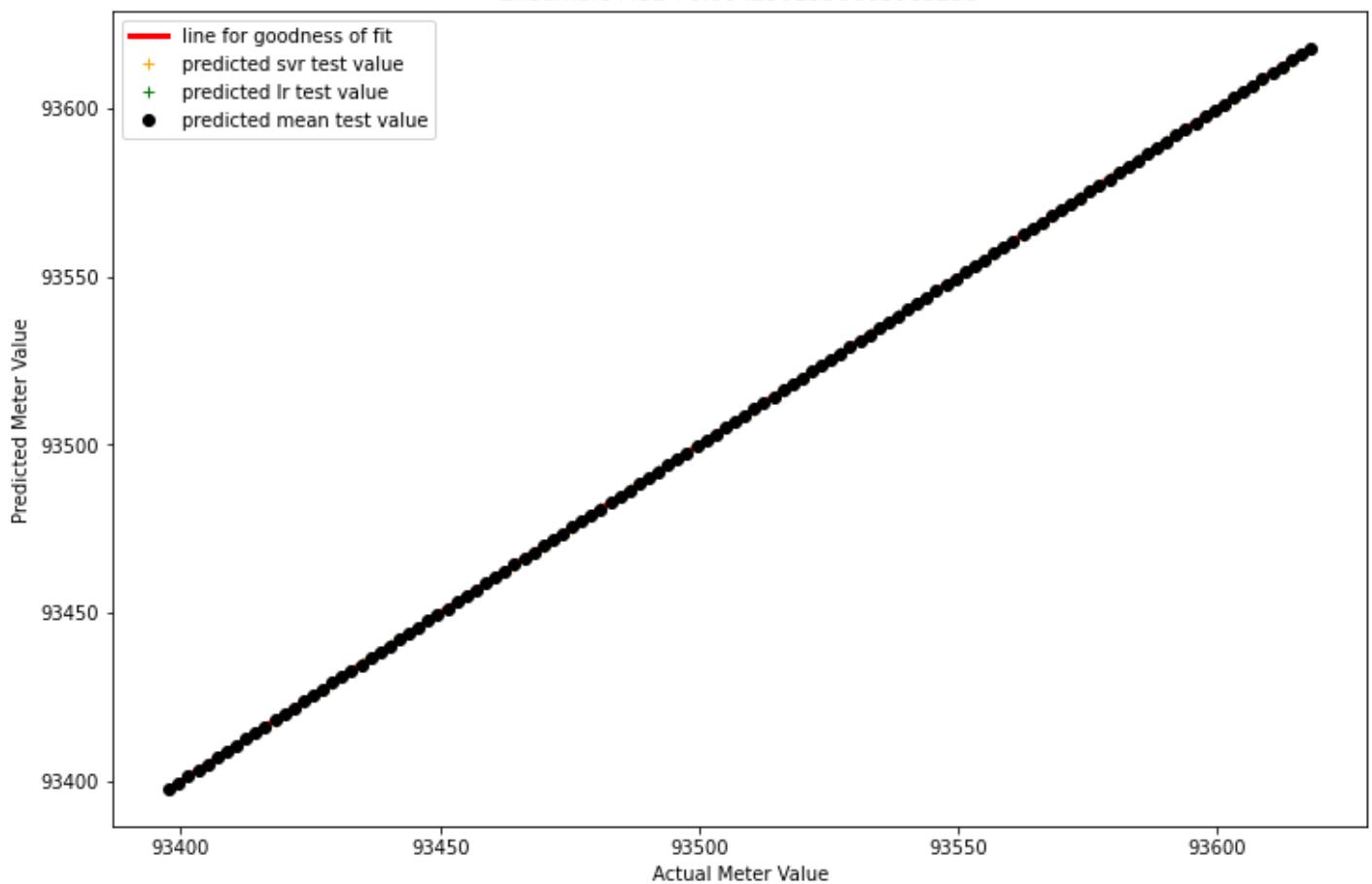
Household 8244.0  
Testing SVR MSE : 81468.23345642461  
Testing LR MSE : 48822.65914142811  
Ensemble MSE : 64029.001631422056



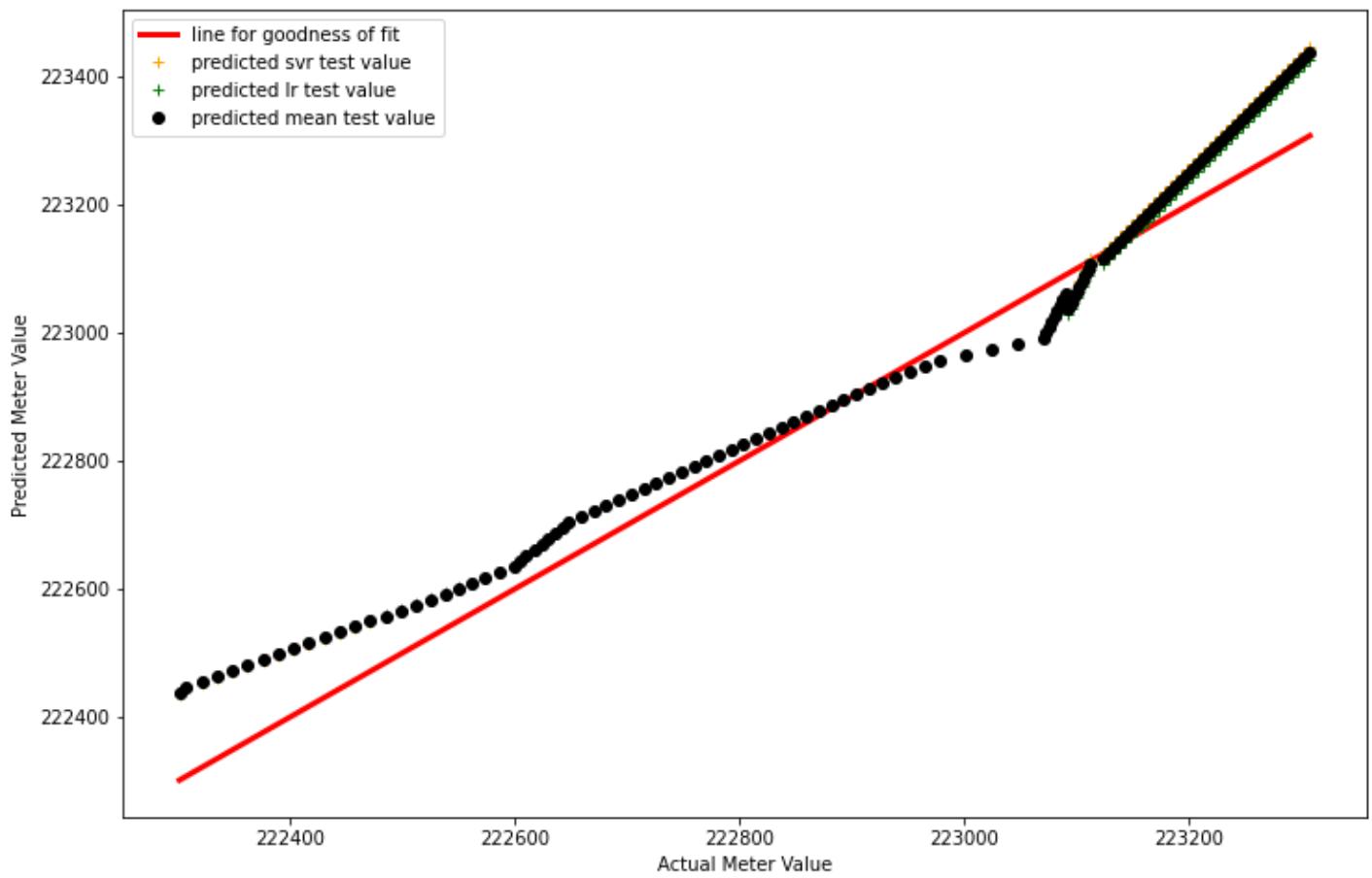
Household 8386.0  
Testing SVR MSE : 2565.3248912289255  
Testing LR MSE : 2106.6533087365515  
Ensemble MSE : 2270.942553956599



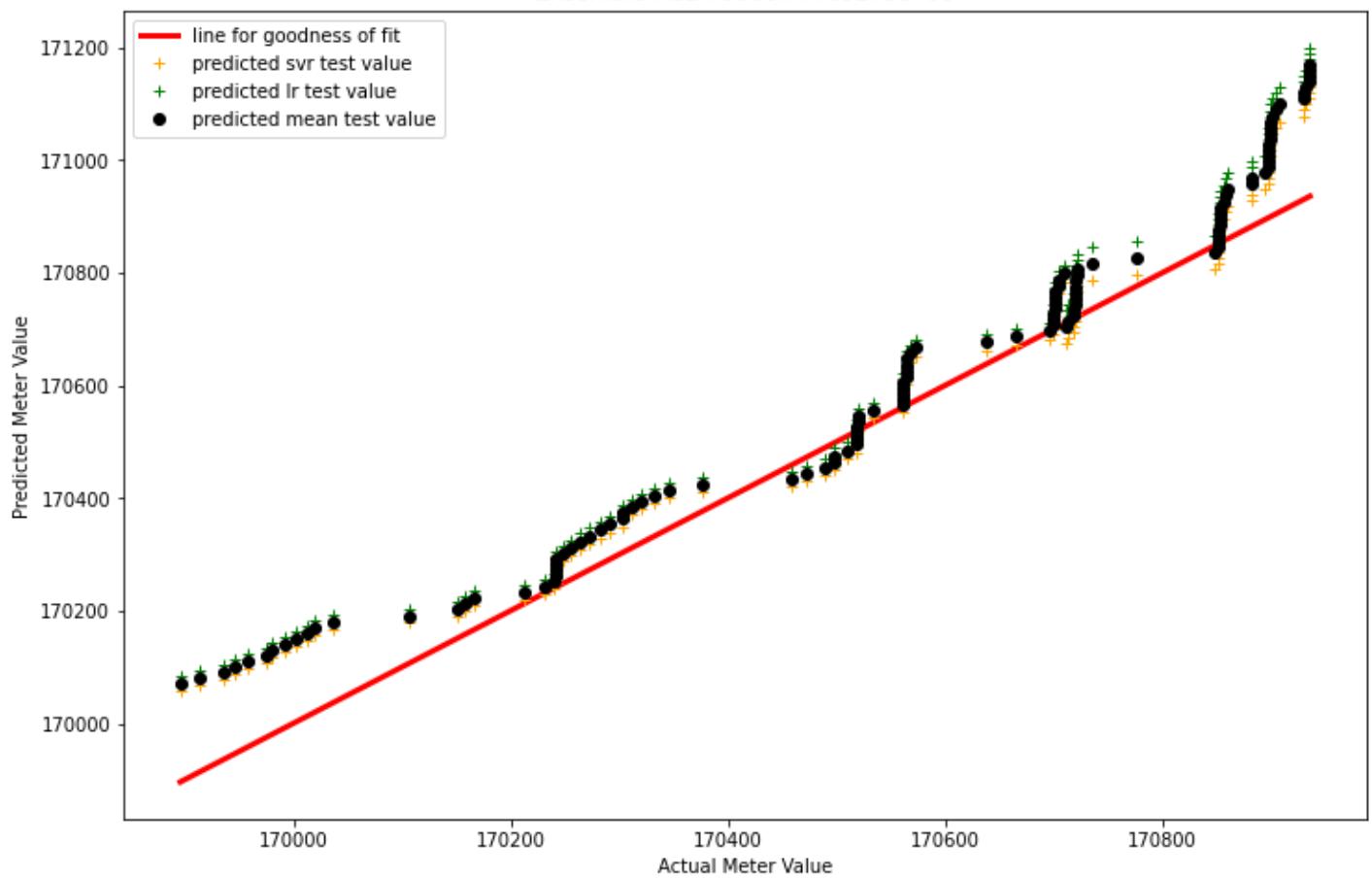
Household 8467.0  
Testing SVR MSE : 0.017000543547843187  
Testing LR MSE : 2.3469871246837906e-22  
Ensemble MSE : 0.0042501358863985235



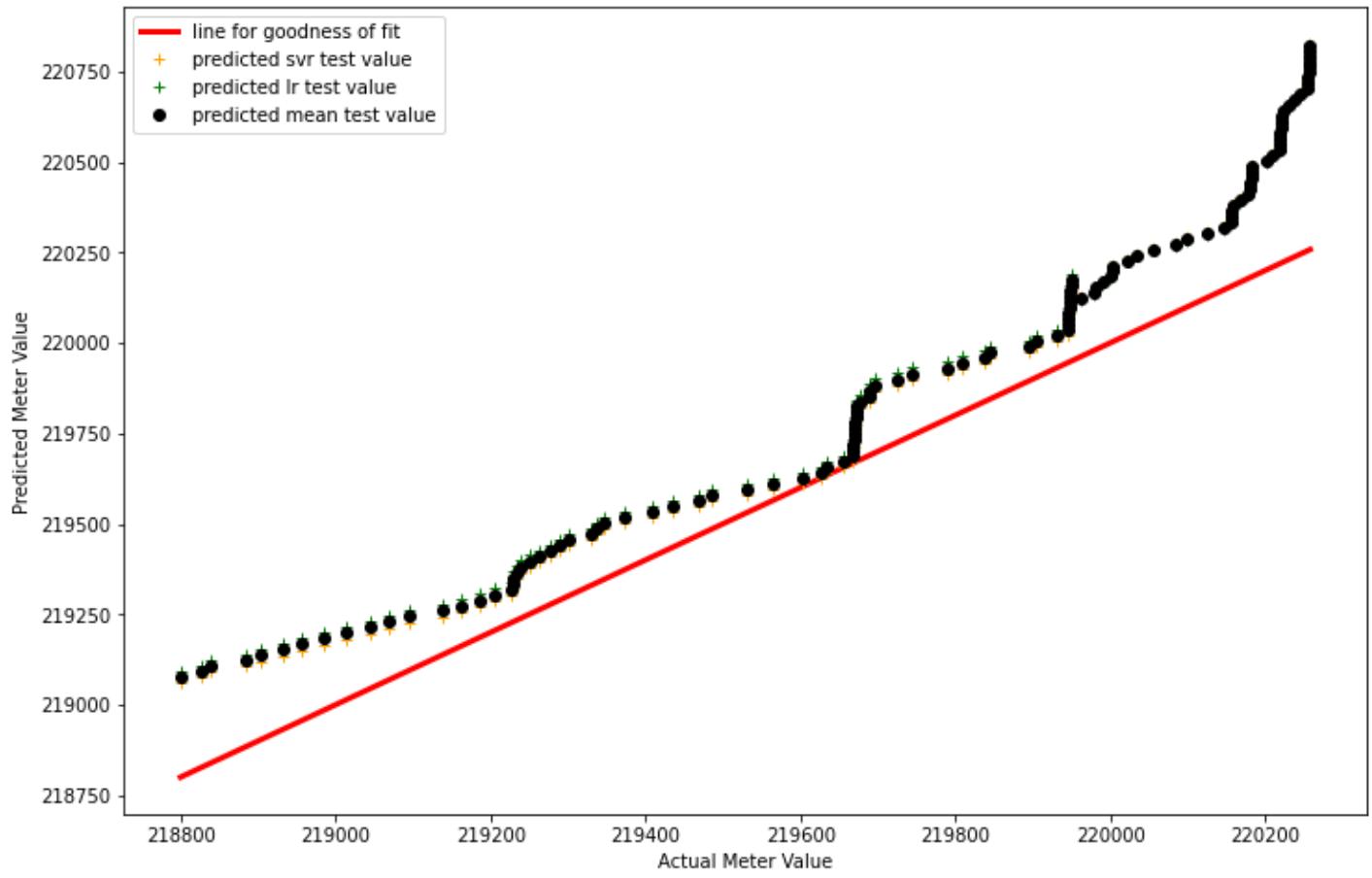
Household 8703.0  
Testing SVR MSE : 4516.087938347537  
Testing LR MSE : 3847.7182920698747  
Ensemble MSE : 4140.951624919299



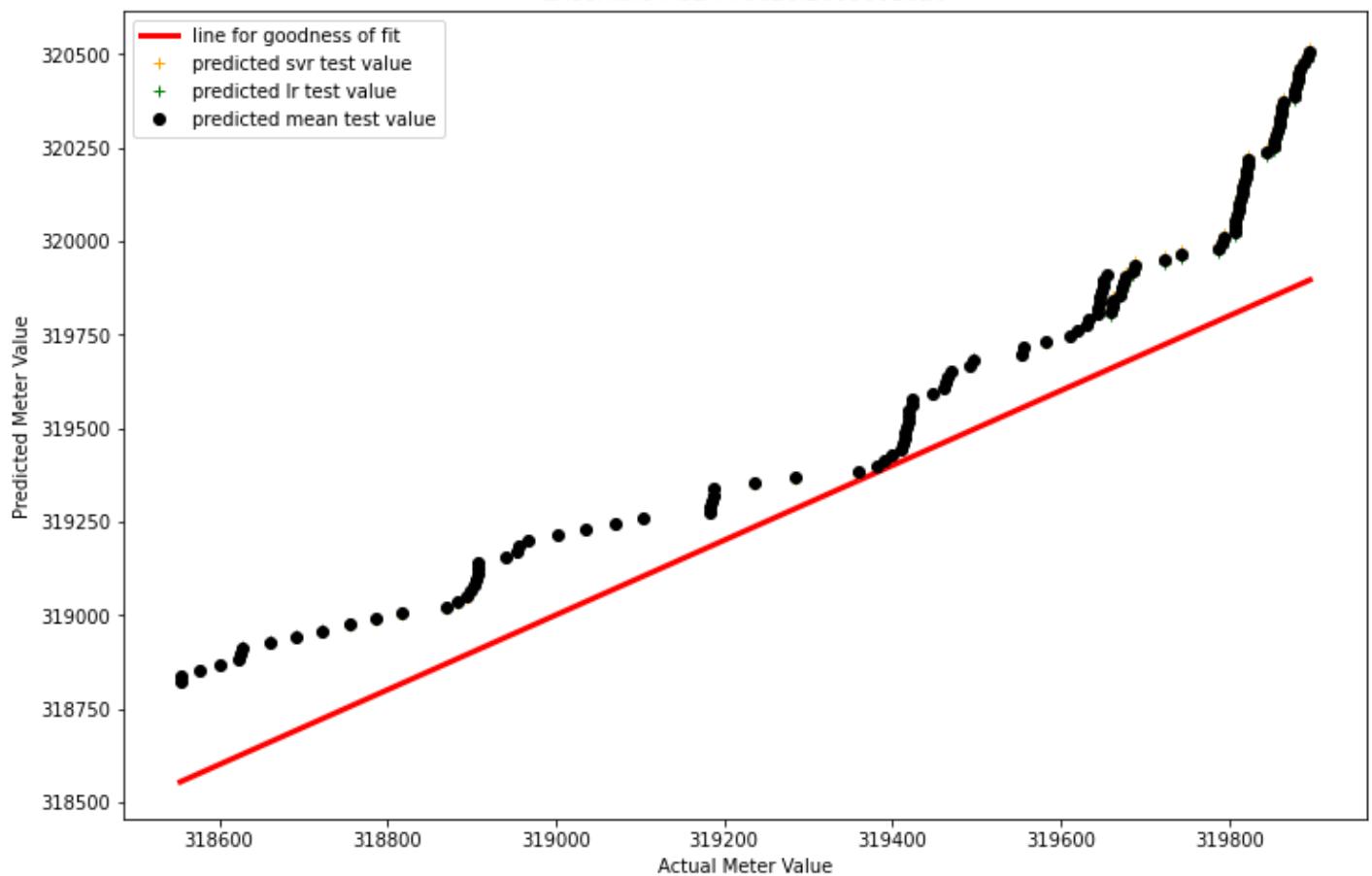
Household 8829.0  
Testing SVR MSE : 6309.721795639175  
Testing LR MSE : 12554.753281519115  
Ensemble MSE : 8966.777092738706



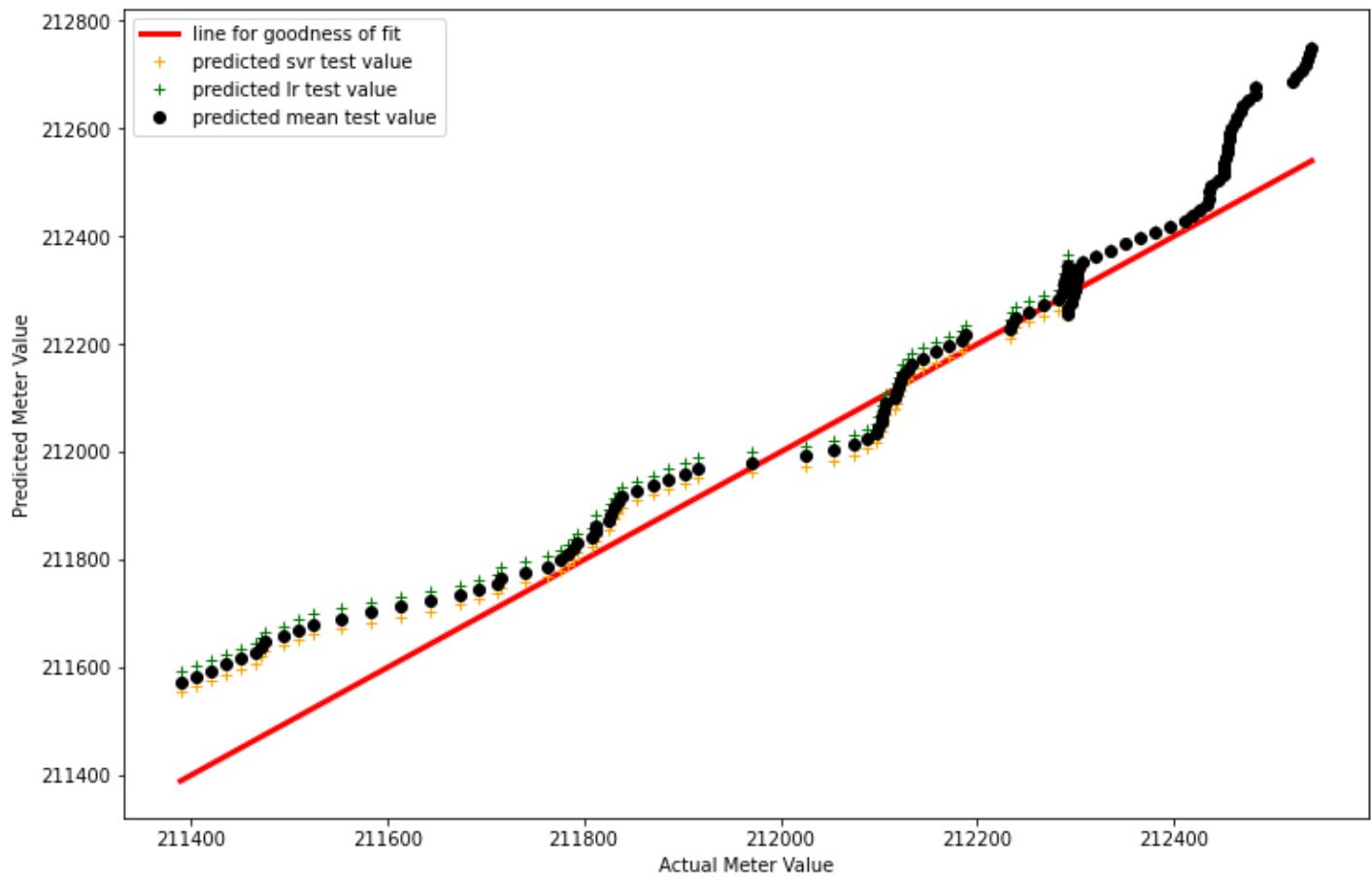
Household 8890.0  
Testing SVR MSE : 55935.568156950656  
Testing LR MSE : 59131.70106763106  
Ensemble MSE : 57357.5388636558



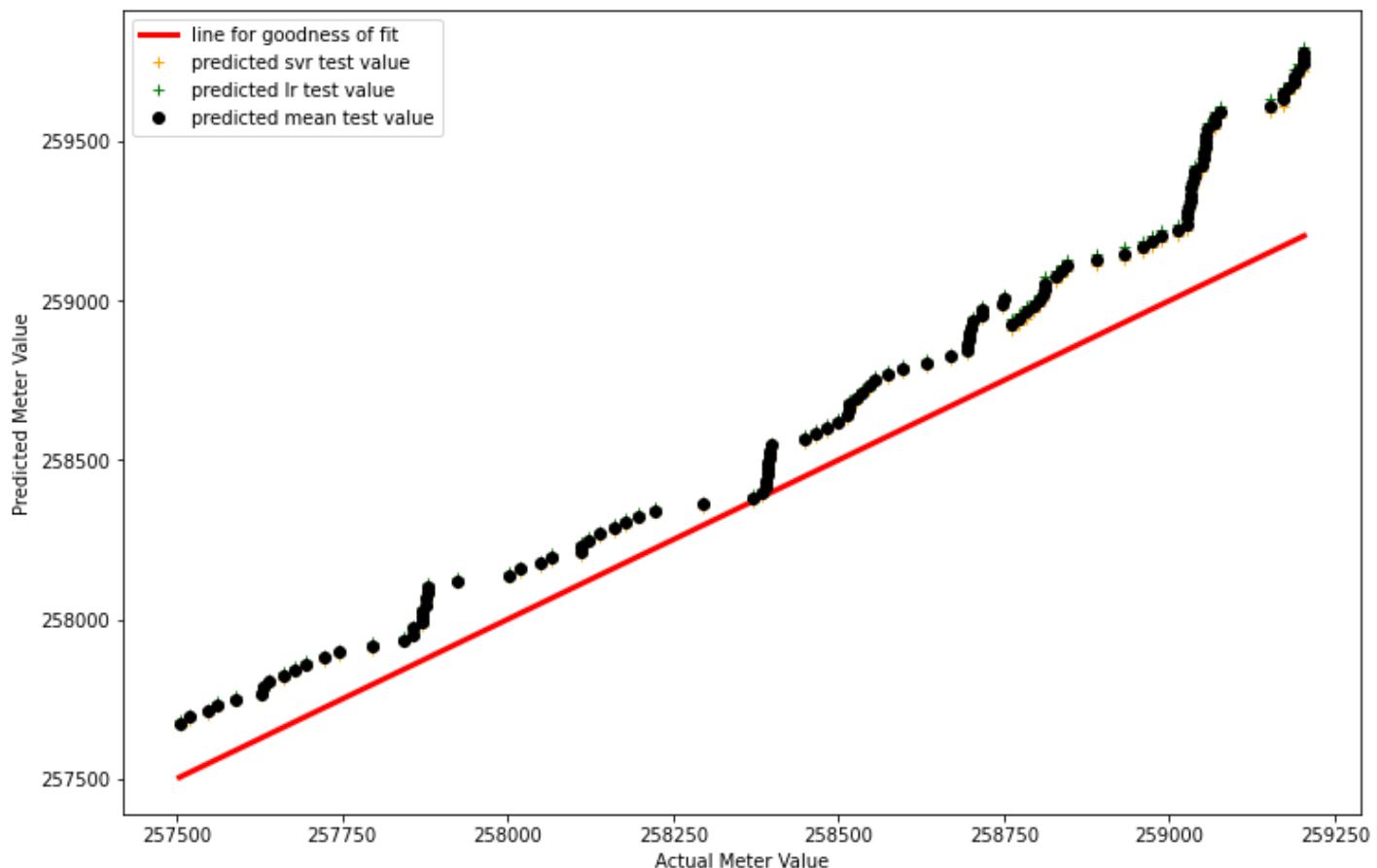
Household 9052.0  
Testing SVR MSE : 79464.28350388166  
Testing LR MSE : 74265.82440438481  
Ensemble MSE : 76826.2693001826



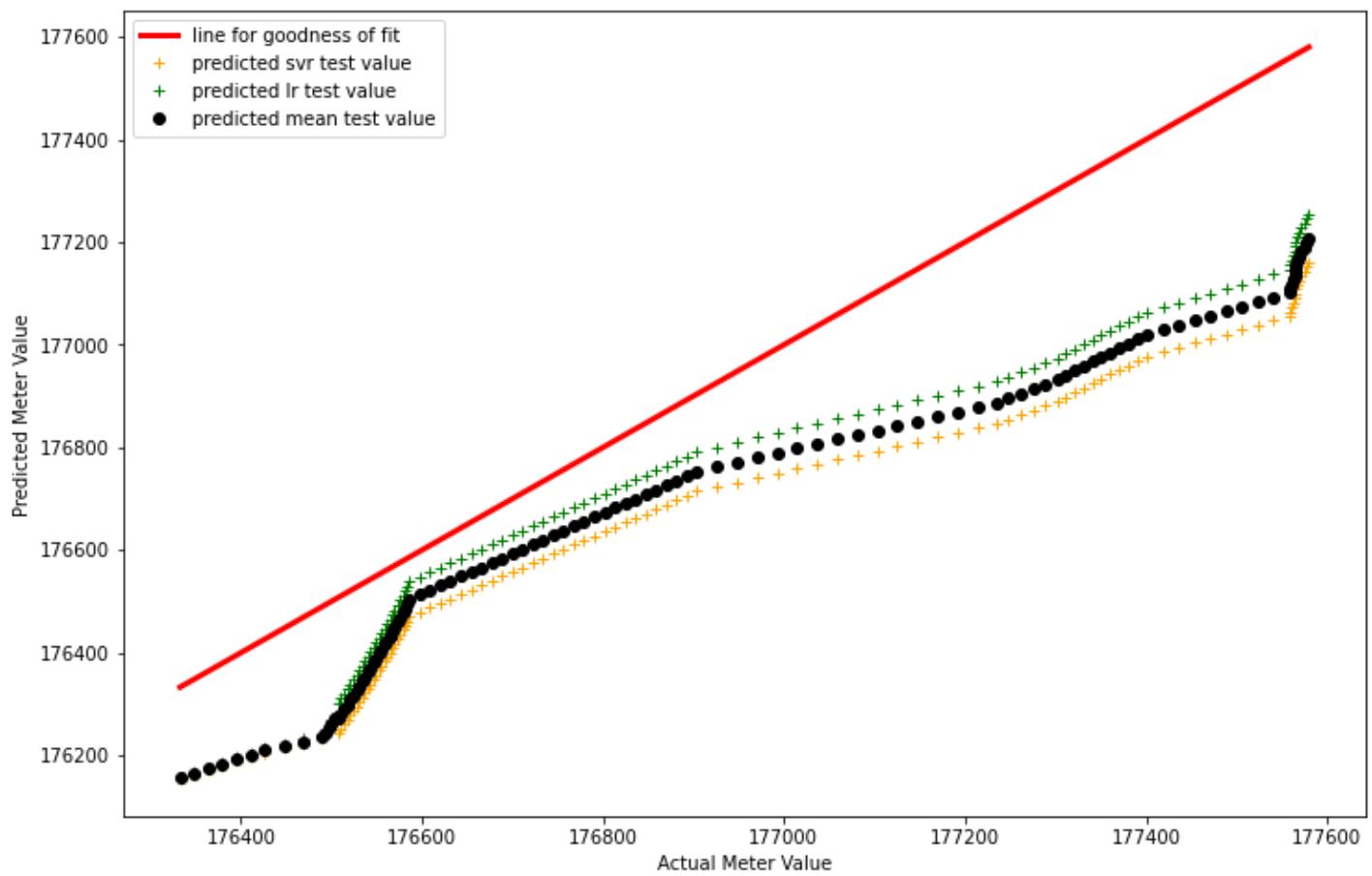
Household 9121.0  
Testing SVR MSE : 7668.06032539531  
Testing LR MSE : 10179.529401043608  
Ensemble MSE : 8711.245669172404



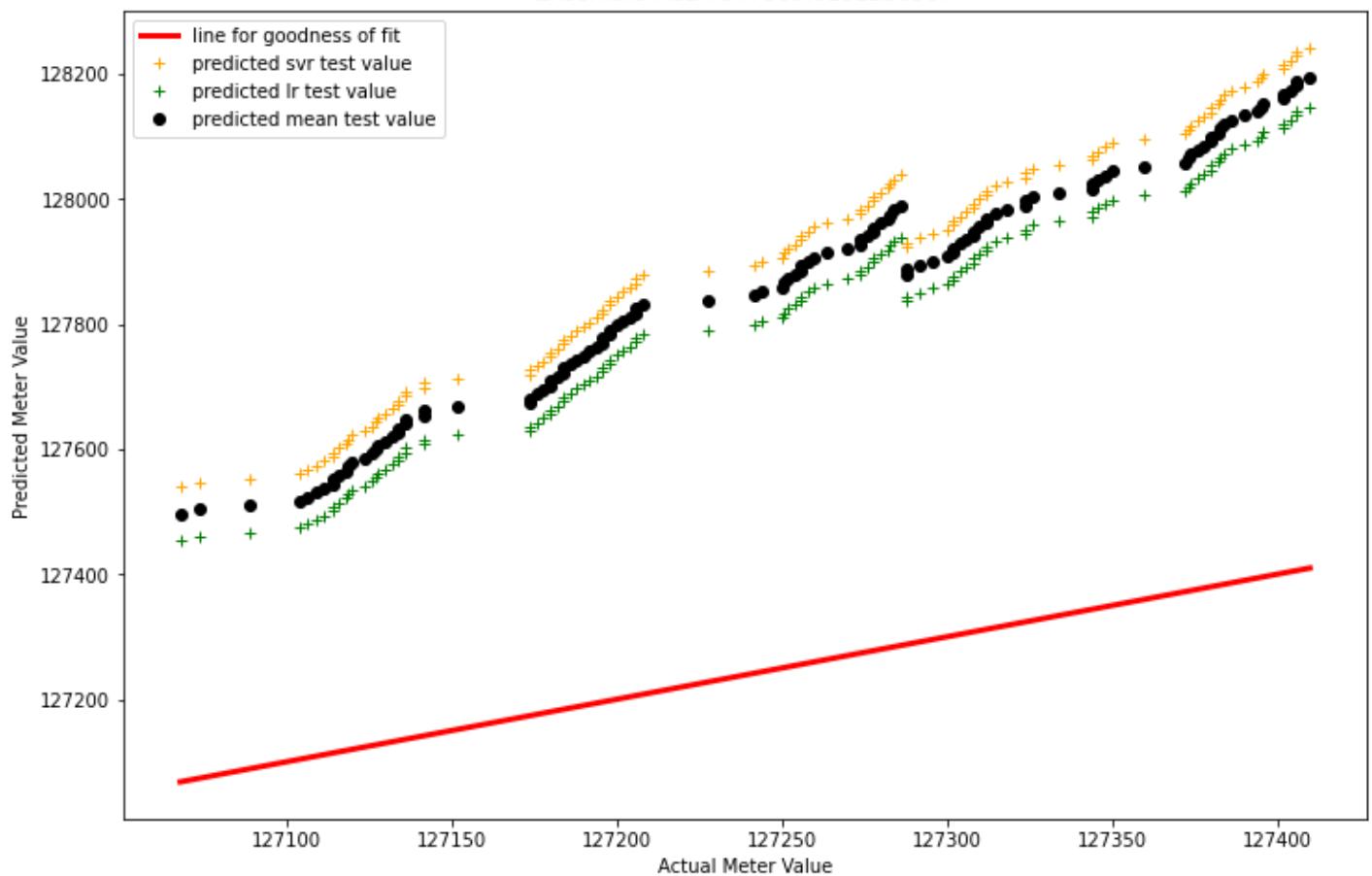
Household 9134.0  
Testing SVR MSE : 61174.538284956805  
Testing LR MSE : 74535.91066457187  
Ensemble MSE : 67668.94148172082



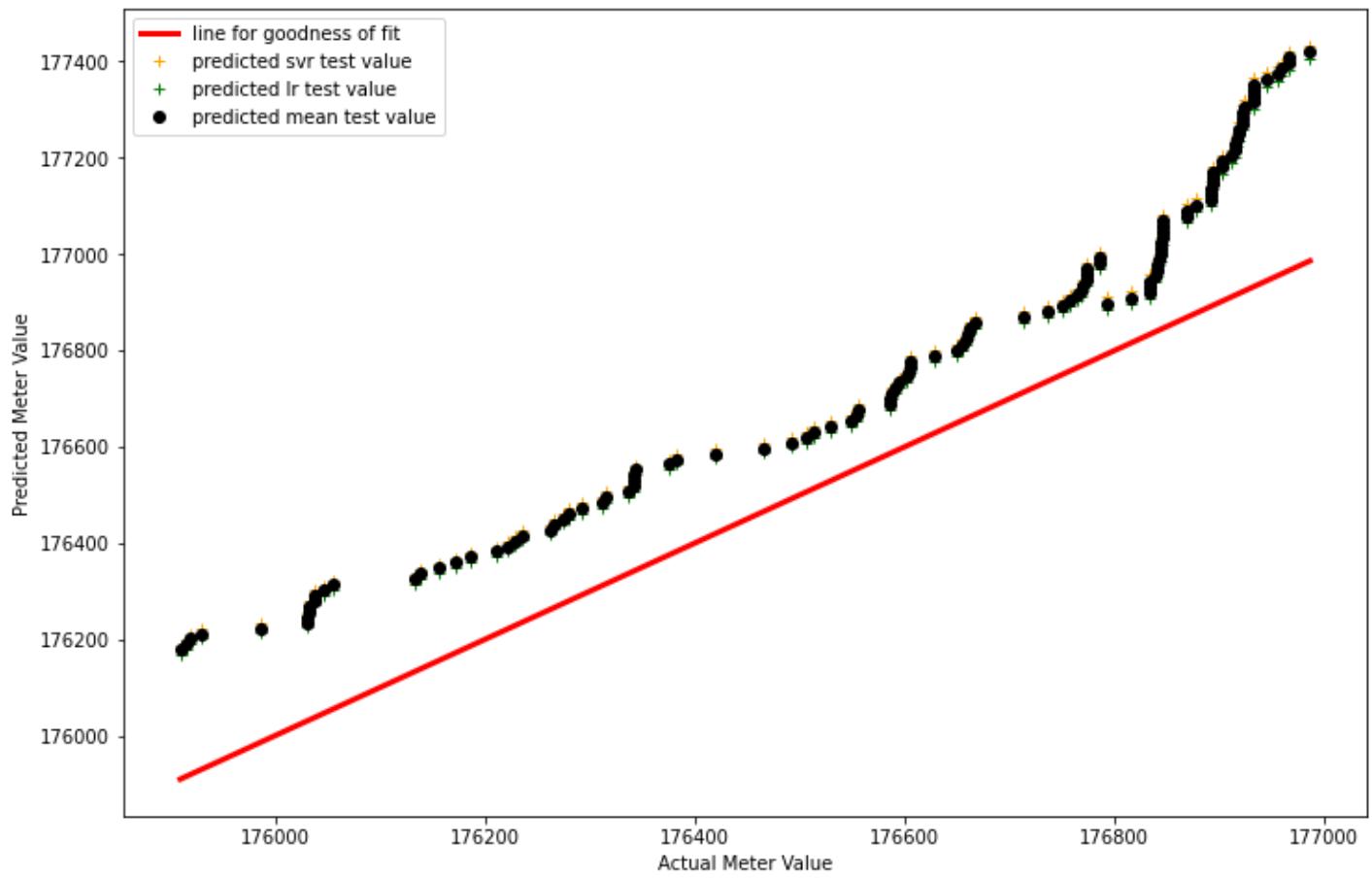
Household 9160.0  
Testing SVR MSE : 90202.90280113759  
Testing LR MSE : 55093.06332729475  
Ensemble MSE : 71326.49739446261



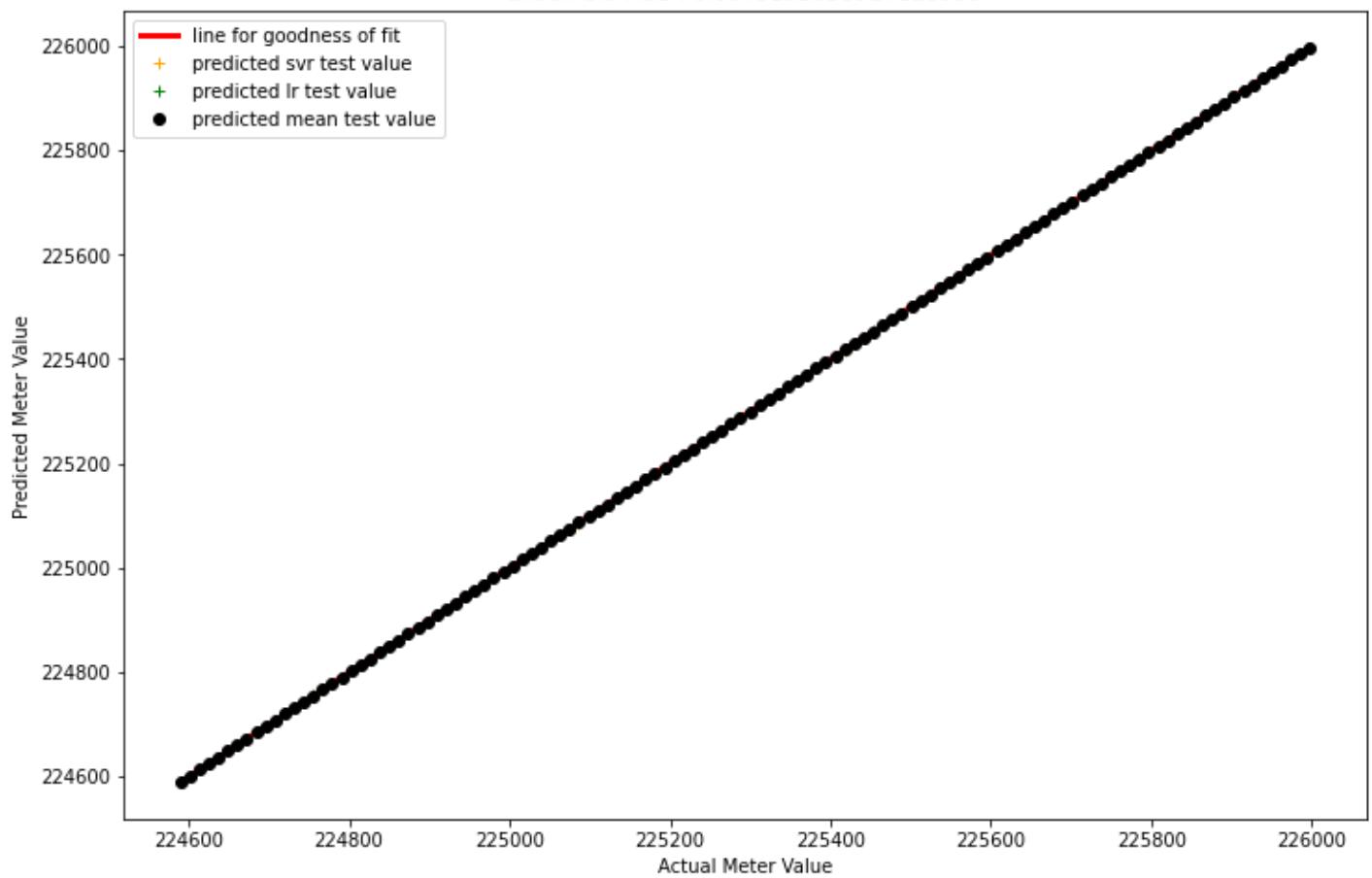
Household 9278.0  
Testing SVR MSE : 436015.7927351698  
Testing LR MSE : 324035.3906639093  
Ensemble MSE : 377909.0191230367



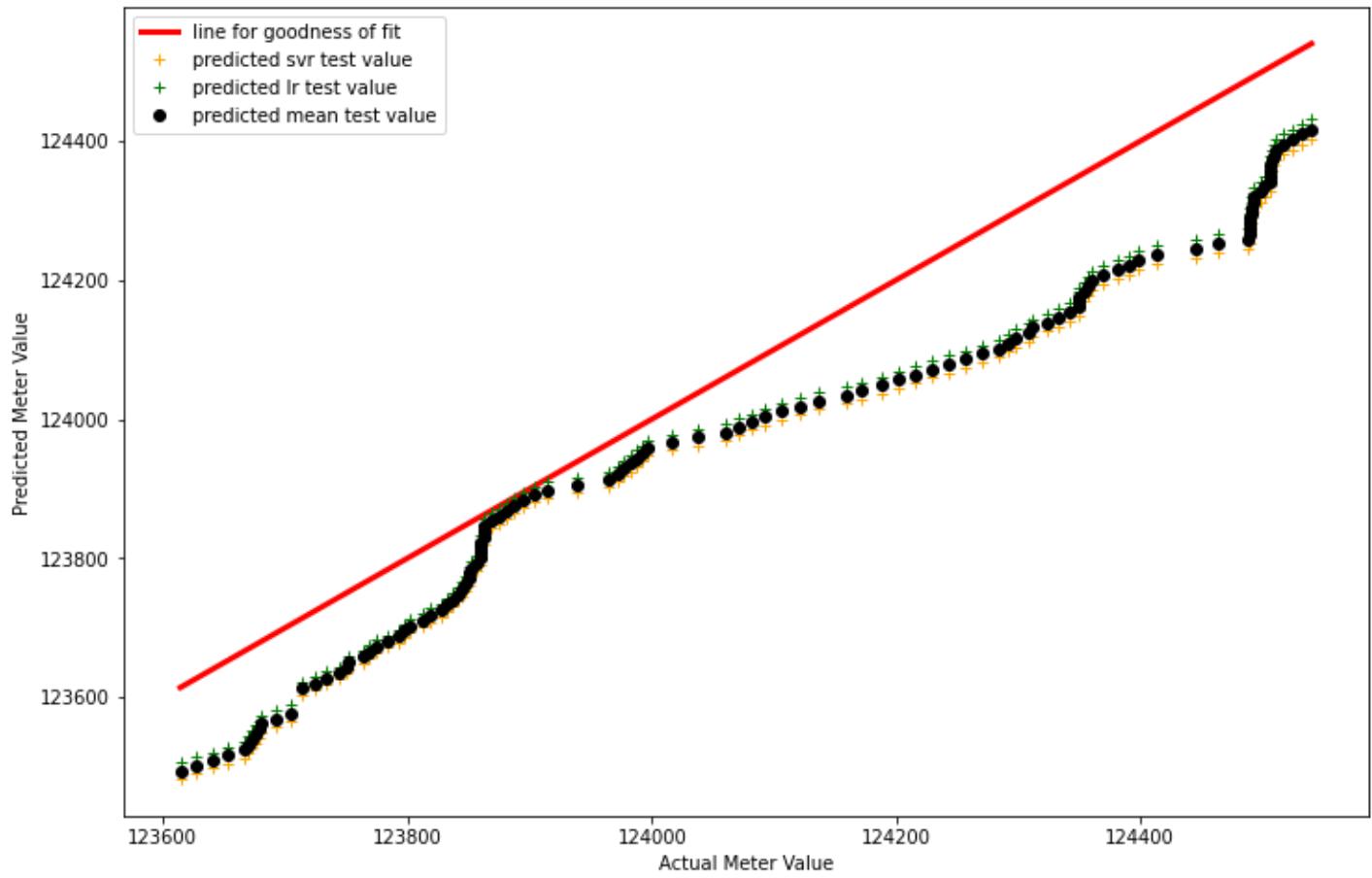
Household 9295.0  
Testing SVR MSE : 58611.984264506005  
Testing LR MSE : 48245.74226680843  
Ensemble MSE : 53287.164743733316



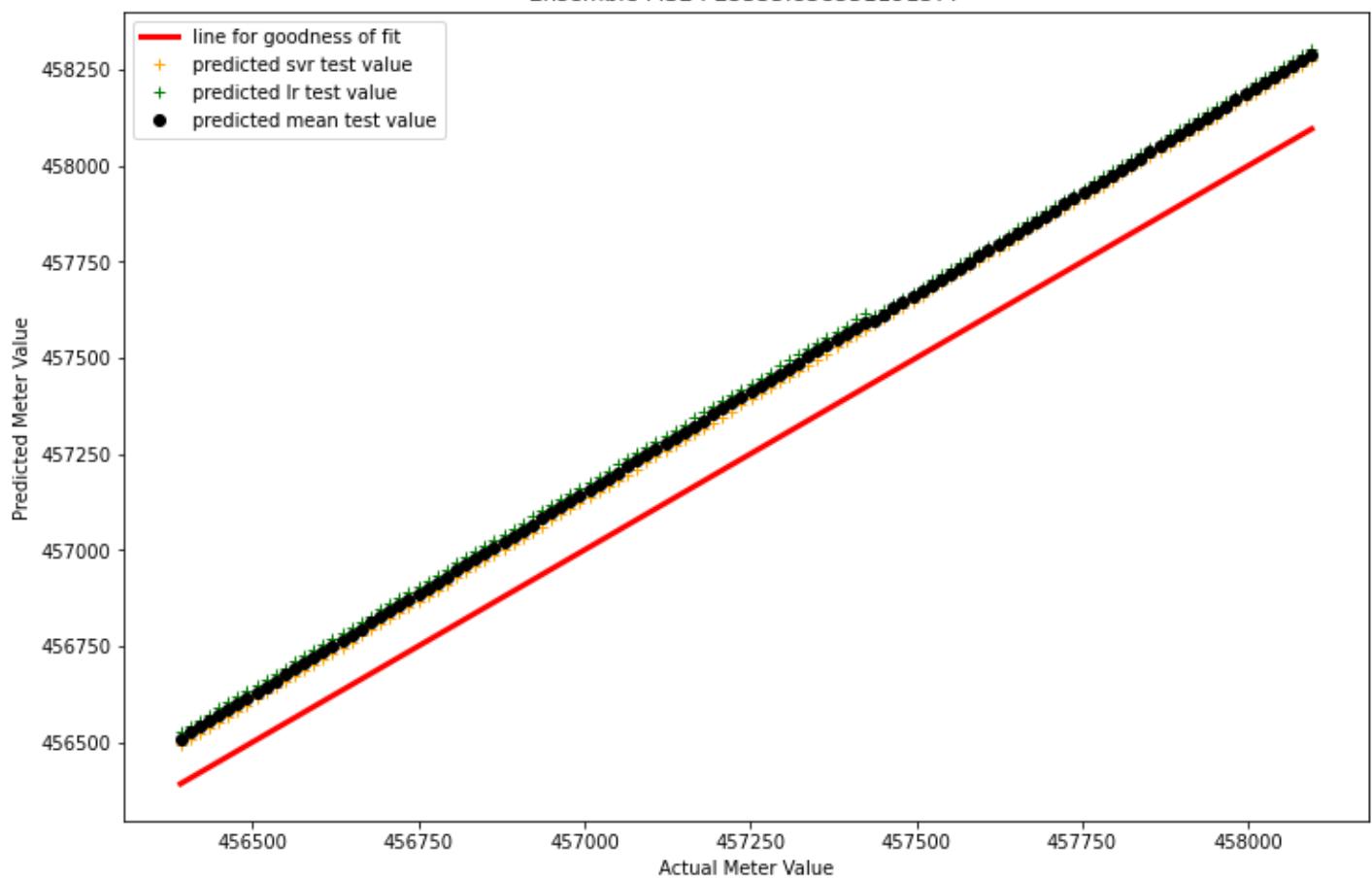
Household 9474.0  
Testing SVR MSE : 0.017260815568490604  
Testing LR MSE : 4.517509052022935e-22  
Ensemble MSE : 0.0043152038917118355



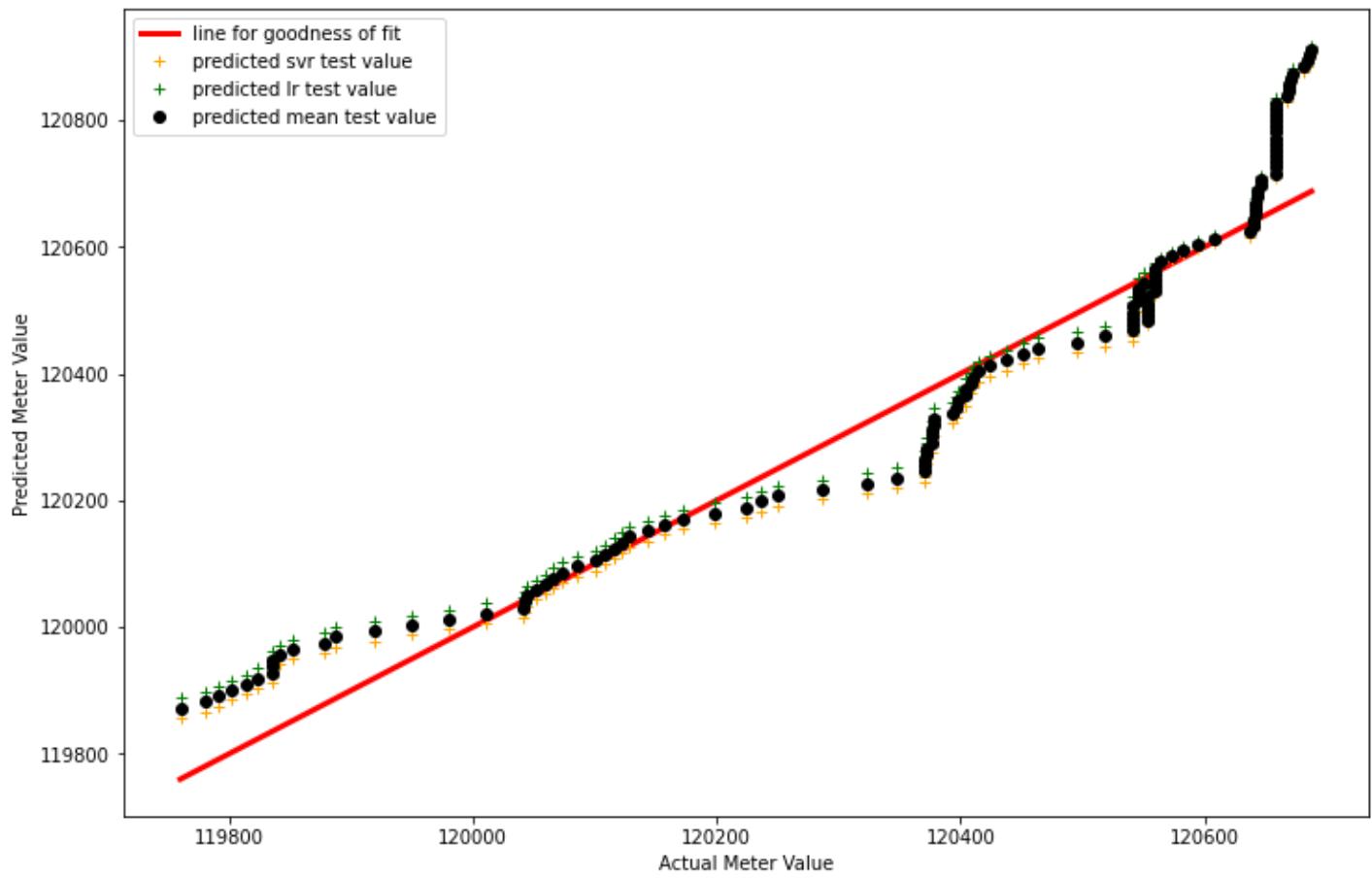
Household 9600.0  
Testing SVR MSE : 20049.572133556856  
Testing LR MSE : 14221.39833402412  
Ensemble MSE : 16992.487095763172



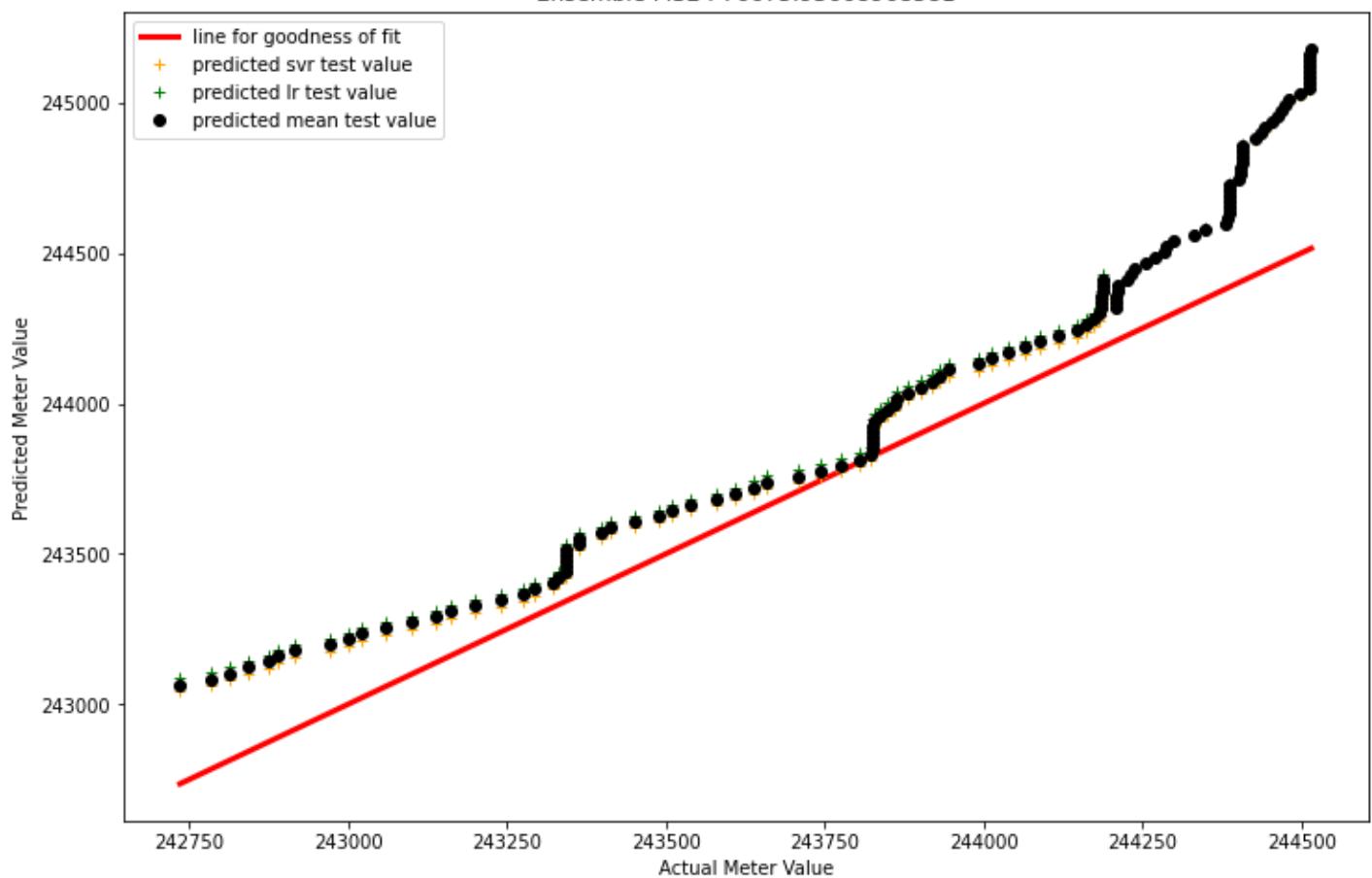
Household 9620.0  
Testing SVR MSE : 20352.231433646615  
Testing LR MSE : 30916.854088978034  
Ensemble MSE : 25333.838531191377



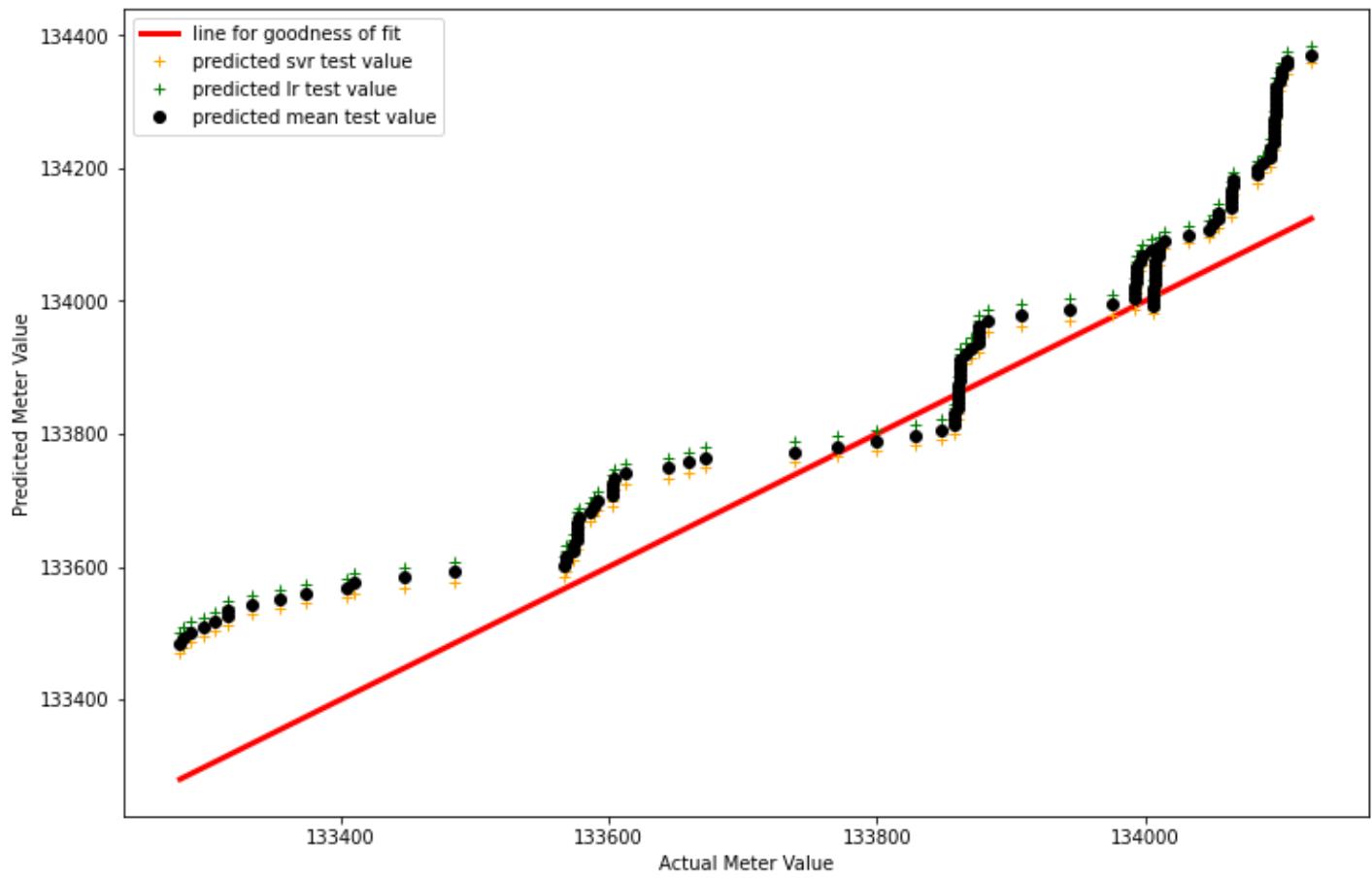
Household 9631.0  
Testing SVR MSE : 7149.672376042905  
Testing LR MSE : 7573.359367840542  
Ensemble MSE : 7193.212898661213



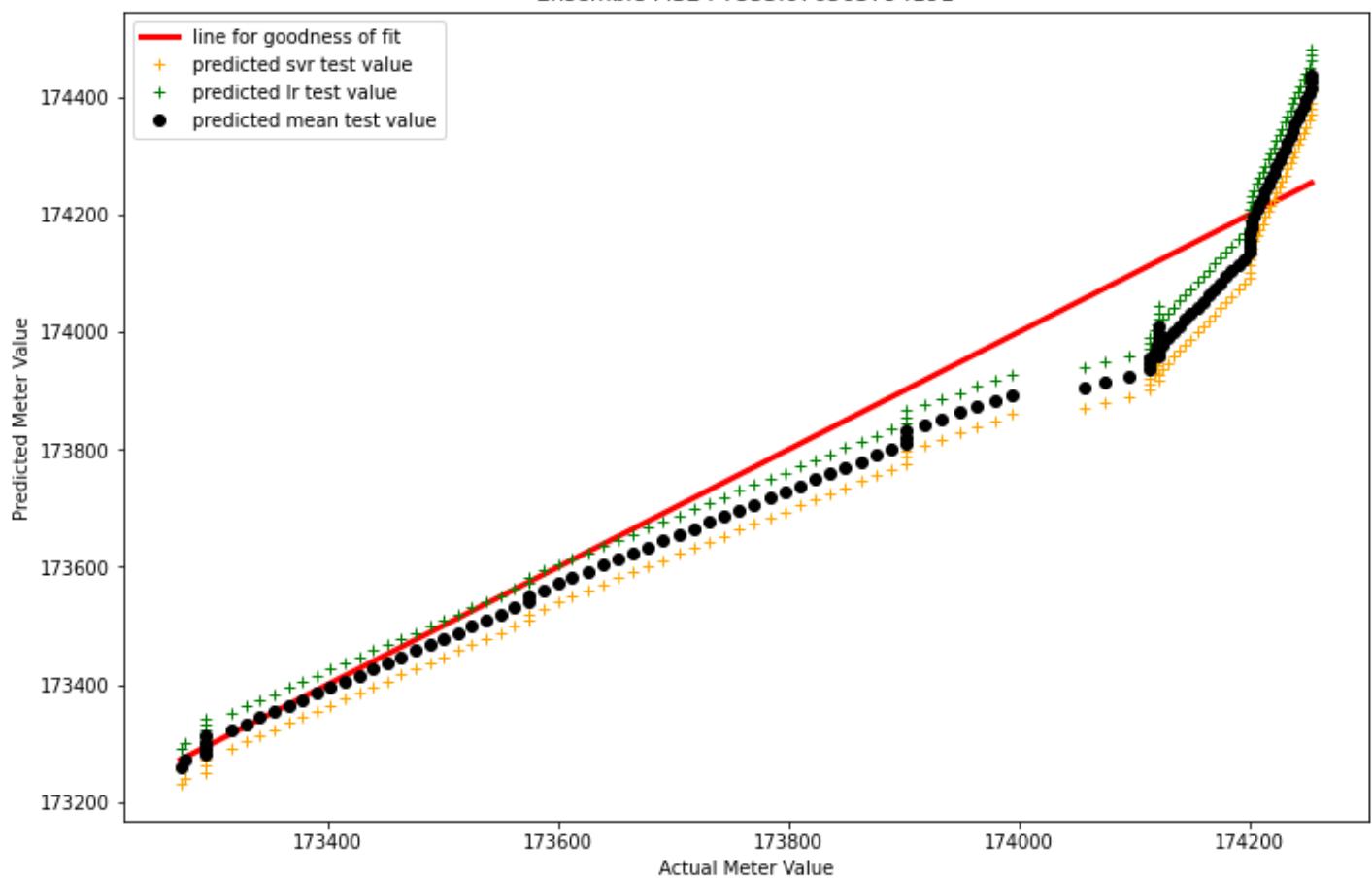
Household 9639.0  
Testing SVR MSE : 72669.78613752365  
Testing LR MSE : 81222.97949754074  
Ensemble MSE : 76675.93668968581



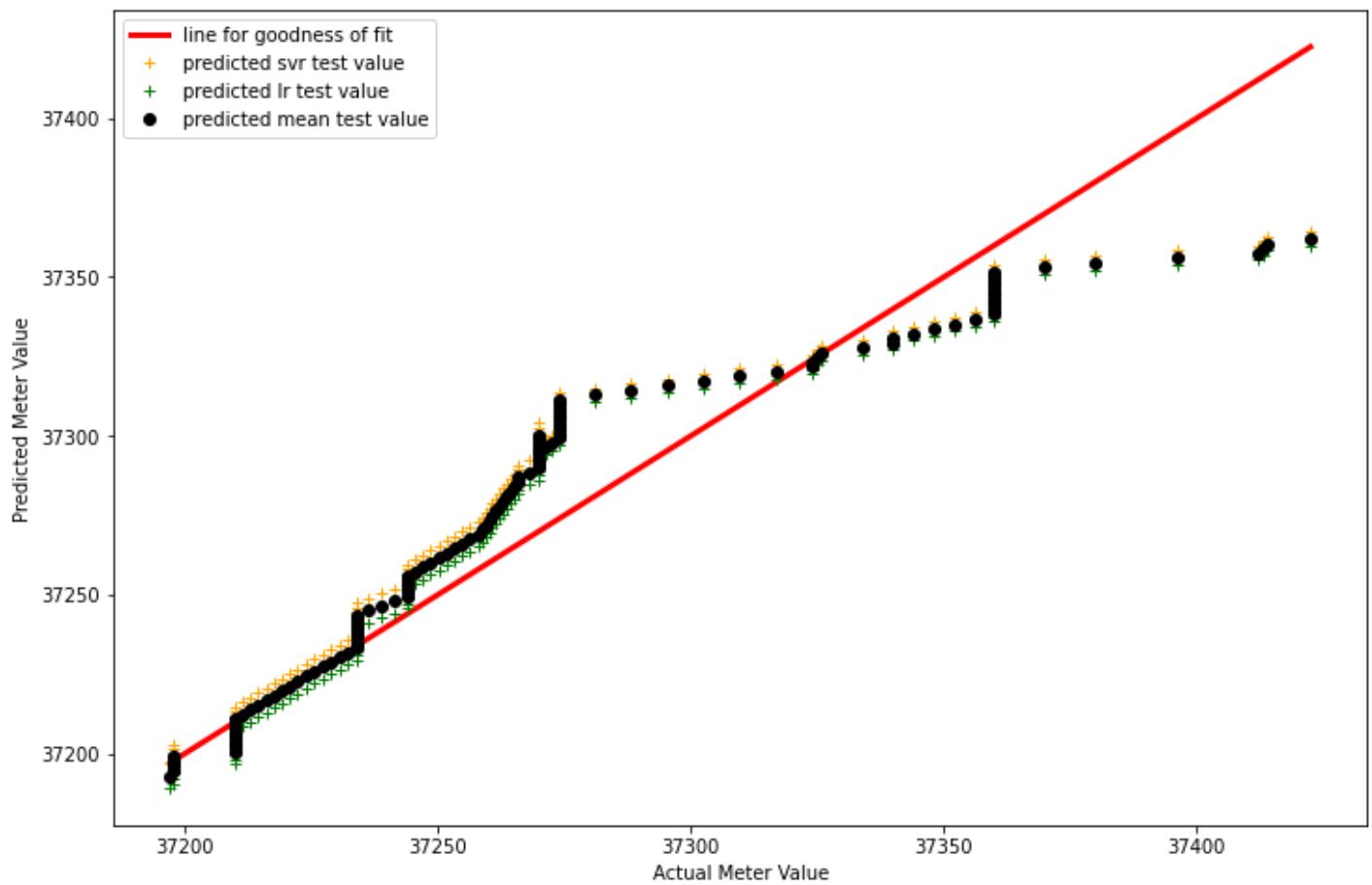
Household 9729.0  
Testing SVR MSE : 11820.80166977808  
Testing LR MSE : 17102.182315034293  
Ensemble MSE : 14251.595910042242



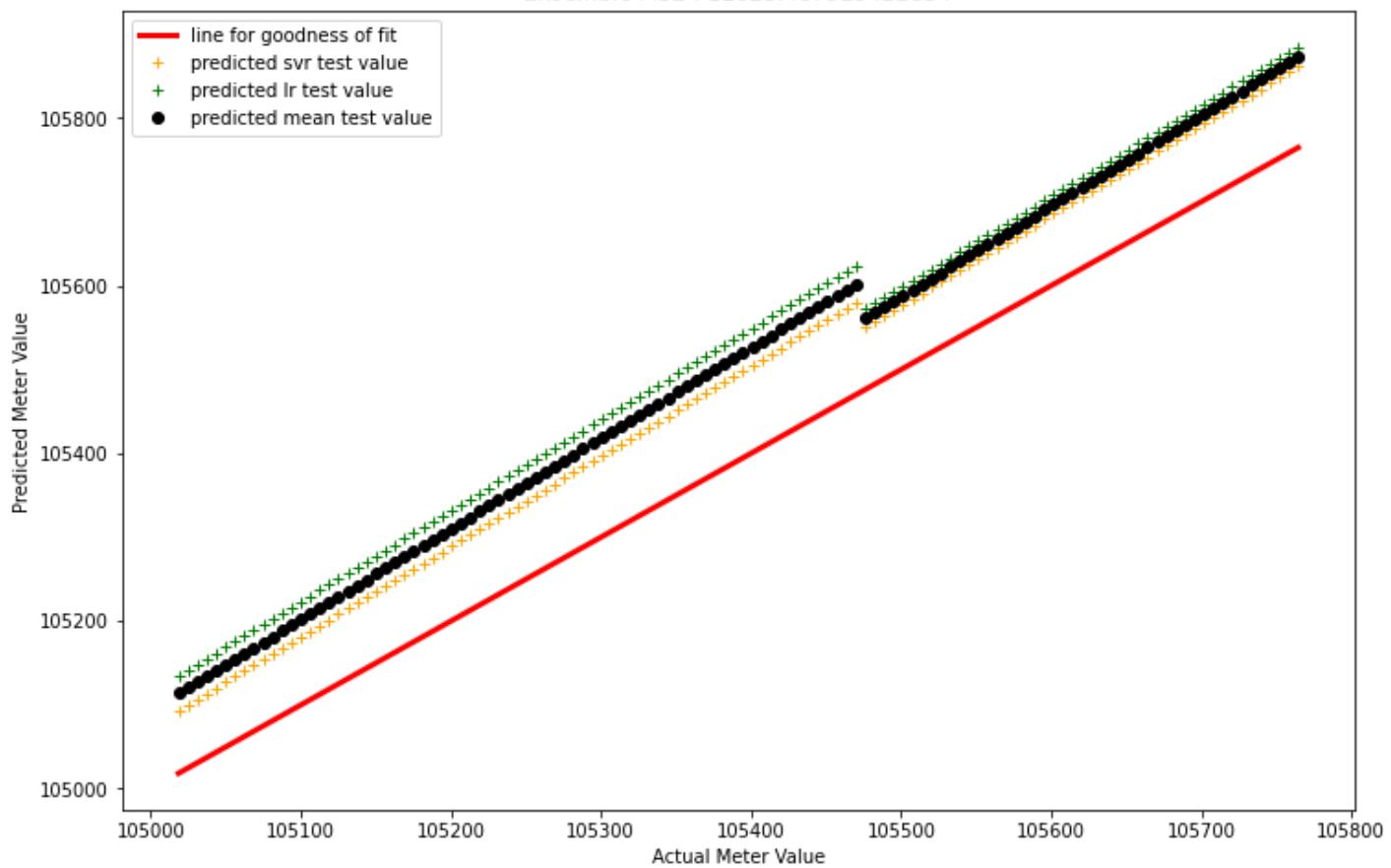
Household 9766.0  
Testing SVR MSE : 11252.429788450569  
Testing LR MSE : 6651.580954214971  
Ensemble MSE : 7553.076563794191



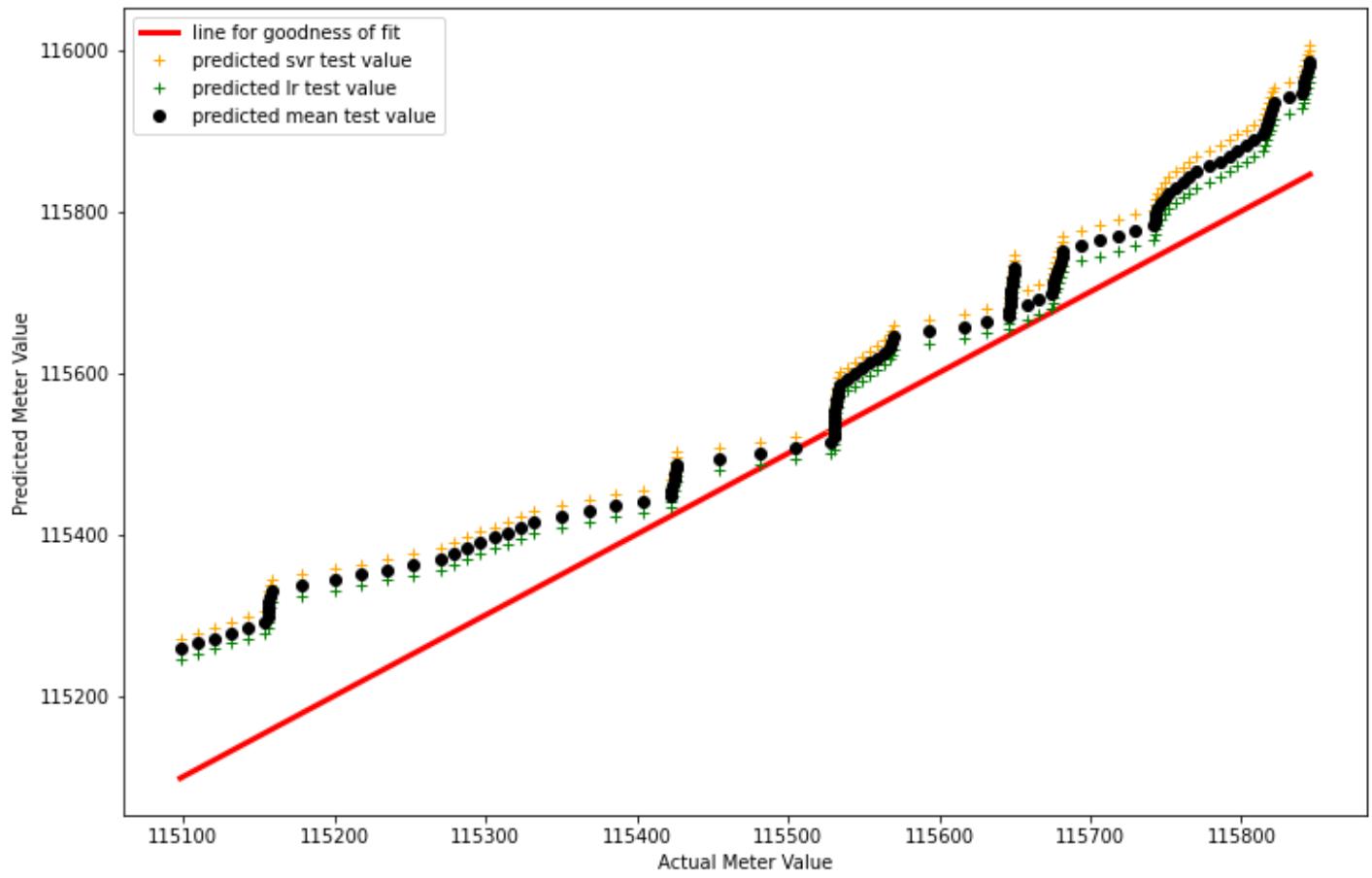
Household 9849.0  
Testing SVR MSE : 408.9855927626835  
Testing LR MSE : 338.8055409628037  
Ensemble MSE : 362.9434852898767



Household 9956.0  
Testing SVR MSE : 8128.734347378593  
Testing LR MSE : 15778.372032876421  
Ensemble MSE : 11623.487515422854



Household 9982.0  
Testing SVR MSE : 9718.988262352854  
Testing LR MSE : 5020.162244593996  
Ensemble MSE : 7099.993091730826



Note that in the above diagram, the line for goodness of fit (denoted in red) is a 45 degree straight line that indicates a perfect prediction.

In [ ]:

In [ ]: