



**DIGITAL  
WELDING  
SOLUTIONS**

PROBLEM SOLVING THROUGH TECHNOLOGY



# **Euro Connection** PullMig and Robacta Push-Pull Torch Set-Up

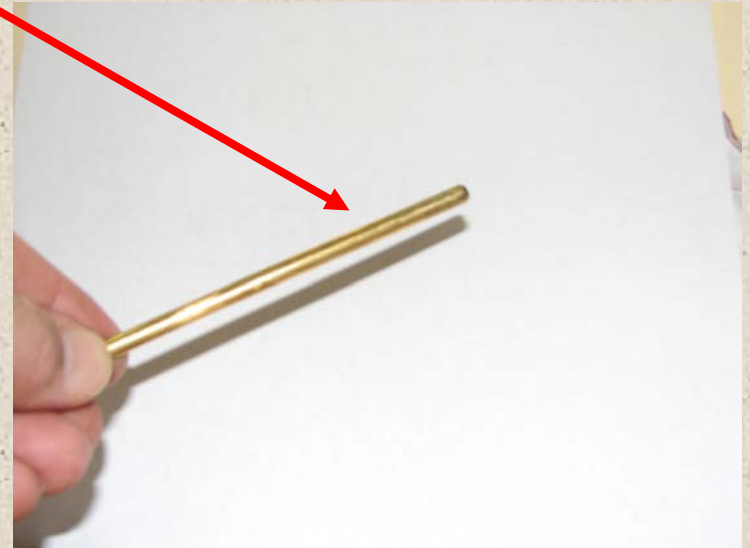
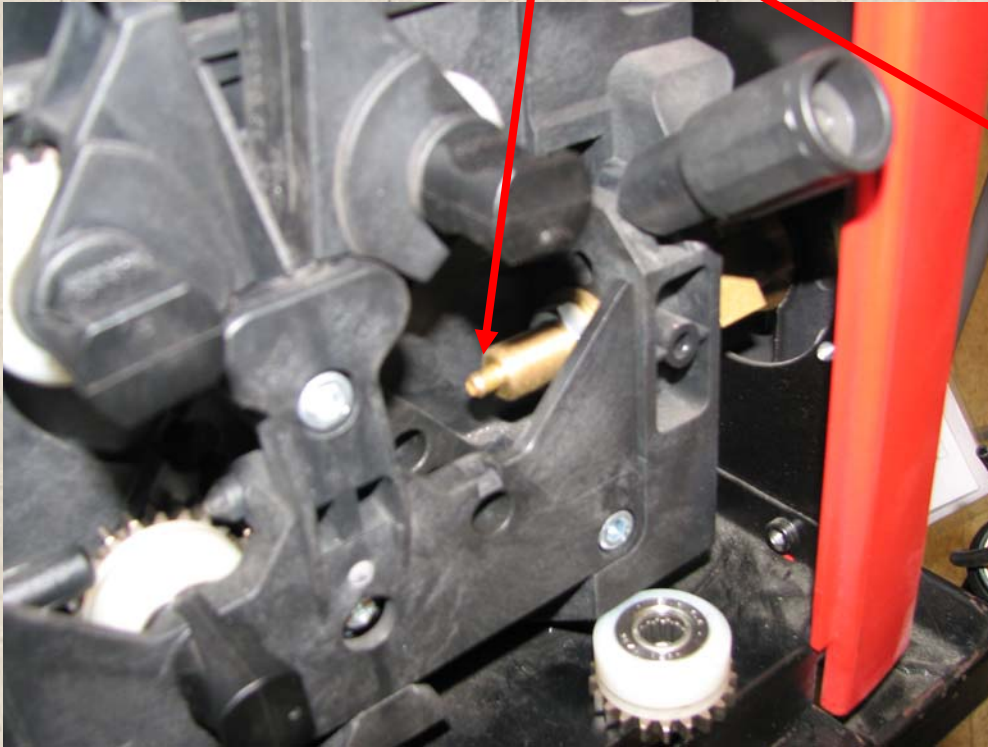
## Aluminum Welding

By Tim C. Marr

Weld Engineer

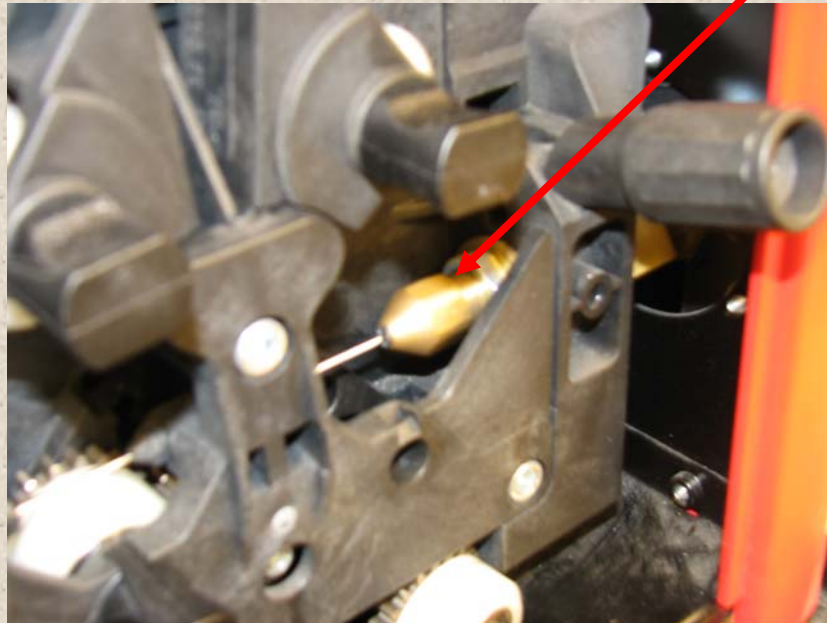
# TPS2700 Factory Configuration

**Brass Outlet Guide Factory Installed (for .030-.040" Dia. Wire)**



# TPS2700 Correct Aluminum MIG Welding Set-Up

**Brass Outlet Guide is removed & Graphite Liner Nut Installed**





# Set-Up Procedure

**Remove Brass Outlet Tube from feeder using Weldpers or Needle Nose Pliers**



# Set-Up Procedure

**Install Graphite Liner Nut: Fronius Part Number 42,0001,5421**



# Set-Up Procedure: PullMig

1. Hand Straighten first 12" of Graphite Liner
2. Insert through feeder end of gun
3. Make sure Graphite Liner bottoms out at gun end and is visible through site holes
4. Install collet and retaining nut at feeder end of gun leaving liner extended 7"





# Set-Up Procedure

**Install gun making sure Graphite Liner protrudes from Brass Nut.**

**Cut liner flush with Brass Nut**



# Contact Tips/Goose-Neck Liners

- Aluminum Expand/Contracts 2x versus Steel
- Aluminum MIG wire swells in diameter during welding
- Special oversized Aluminum Tips are required
- Aluminum tips with counter-bore are recommended for optimum feeding



# Contact Tips/Goose-Neck Liners

**Aluminum Tip with Counter-Bore**

**Brass or Graphite Neck Liner inserts into Aluminum Tip**



# Tips

- .035" 4xxx Wire Contact Tip w/Counter-Bore
  - Part Number: 42,0001,3654
- 3/64" 4xxx Wire Contact Tip w/Counter-Bore
  - Part Number: 42,0001,5005
- .035" 5xxx Wire Contact Tip w/Counter-Bore
  - Part Number: 42,0001,5057
- 3/64" 5xxx Wire Contact Tip w/Counter-Bore
  - Part Number: 42,0001,5059

# Contact Tip Tool

**Provides right amount of torque for tightening**



**Fronius Part Number:  
42,0410,0138**



# Internal Wire Straightener

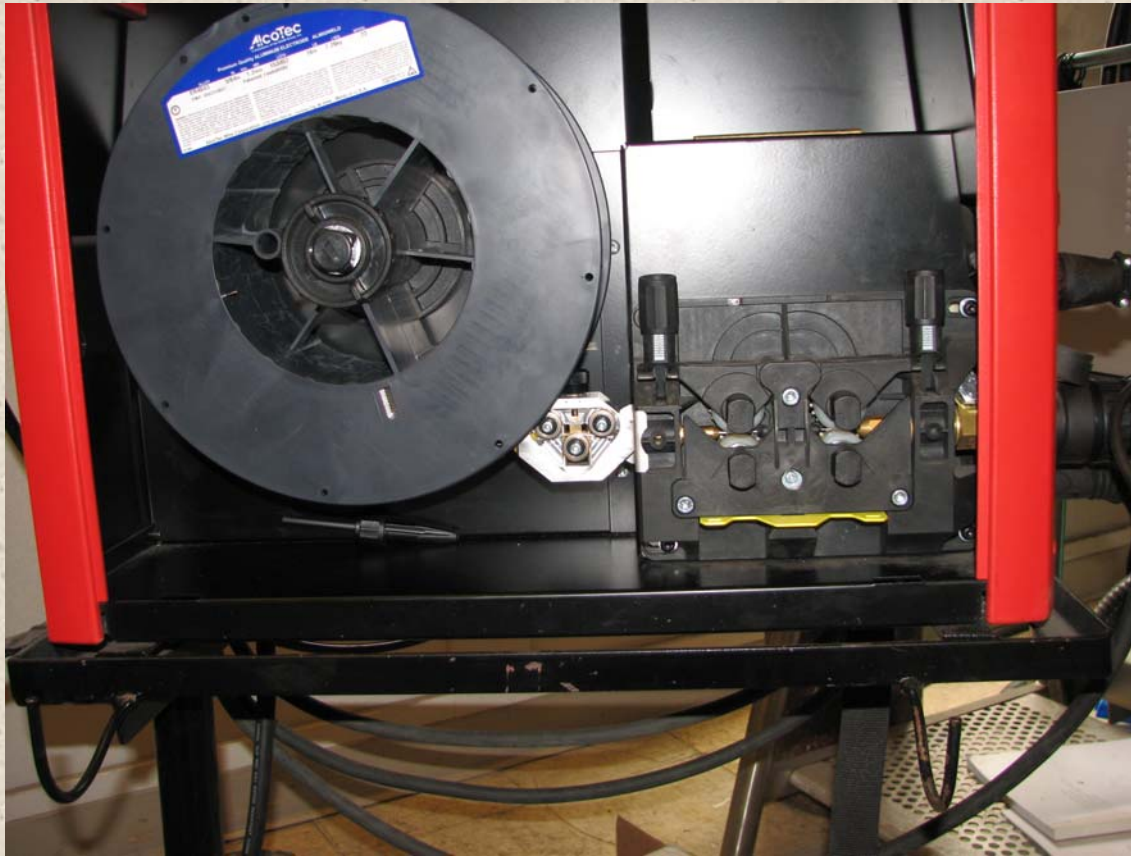
- Excellent to remove cast from Aluminum and Stainless Wires
- Improves Graphite Liner Life
- Improves Contact Tip Life
- Note: If the wire is too straight you may experience burn-back of the wire inside the contact tip

# Internal Wire Feeder Wire Straightener

**Fronius Part Number: 4,100,576**



# Wire Straightener Installation



- Remove Spool of Wire
- Remove Standard Plastic Inlet Guide
- Install Spool of Wire
- Insert Wire Straightener into feeder inlet



# Welding Machine Set-Up

- Fronius TPS2700 combination welder/wire feeder and separate wire feeders like model VR-4000 require a Push-Pull P.C. Board Installed
  - This provides DC power to the torch motor and a signal back the welder for synchronization
  - Fronius Part # 4,100,217
- Installation of PullMig or M.K. Products Push-Pull gun requires calibration of the welder
- This tells the welder which type of gun is installed
- This synchronizes the feeder in the welder and the feeder in the torch

# Push-Pull Operation Codes

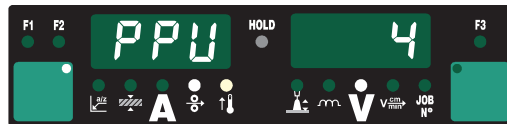
- Once the PullMig board is installed in the welder or feeder you must set the code which signifies what gun you choose to run
  - **3** ... Fronius robot push-pull “Robacta Drive” (Master control) \*)
  - **5** ... Fronius manual push-pull “PullMig” with power potentiometer
  - **6** ... Fronius manual push-pull “PullMig” without power potentiometer
  - **16** . M.K. Products Cobra Gold, Python or Prince XL manual push-pull 24 V

# Push-pull unit

## General remarks

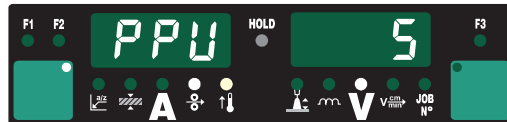
The push-pull unit must be aligned prior to each initial start-up and each time the wire-feeder software is updated. If no alignment of the push-pull unit is carried out, the standard parameters will be used - which may result in the welding result not being satisfactory.

## Calibrating the push-pull unit



1. Select the "PPU" function in the second menu level (2nd).

For an overview of the error messages that may occur during alignment of the push-pull unit, please refer to "Service codes for push-pull alignment".



2. Use the adjusting dial (1) (or "Mode" button (5) on the "Standard" control panel) to select the relevant push-pull unit from the following list:

- 0 ... Fronius unreeling device "VR 1530-22" 22 m/min or 865 ipm <sup>\*)</sup>
- 1 ... Fronius unreeling device "VR 1530-30" 30 m/min or 1180 ipm (display reads: 1.18) <sup>\*)</sup>
- 2 ... Fronius robot push-pull "KD Drive" 10m/min <sup>\*)</sup>
- 3 ... Fronius robot push-pull "Robacta Drive" (Master control) <sup>\*)</sup>
- 4 ... Fronius robot push-pull "Robacta Drive" (Slave-control)
- 5 ... Fronius manual push-pull "PullMig" with power potentiometer
- 6 ... Fronius manual push-pull "PullMig" without power potentiometer
- 7 ... Binzel manual push-pull 42V<sup>\*)</sup> with power potentiometer <sup>\*\*)</sup>
- 8 ... Binzel manual push-pull 42V<sup>\*)</sup> without power potentiometer <sup>\*\*)</sup>
- 9 ... Binzel robot push-pull 42V <sup>\*\*)</sup>
- 10 . Binzel robot push-pull 24V <sup>\*\*)</sup>
- 11 . Dinse robot push-pull 42V <sup>\*\*)</sup>
- 12 . Hulftegger manual push-pull 24 V <sup>\*\*)</sup>
- 13 . Fronius "VR 143-2" intermediate drive
- 14 . Fronius unreeling device "MS" 22 m/min or 865 ipm <sup>\*)</sup>
- 16 . "Cobra Gold" manual push-pull 24 V <sup>\*\*)</sup>
- 20 . Fronius unreeling device "VR 1530-12" 12 m/min or 470 ipm <sup>\*)</sup>
- 23 . Binzel robot push-pull 32V <sup>\*\*)</sup>
- 24 . Dinse robot push-pull new 42V <sup>\*\*)</sup>
- 50 . Fronius manual push-pull "PT Drive" (d=0.8 mm or 0.030 in.; material: aluminium) <sup>\*\*\*\*)</sup>
- 51 . Fronius manual push-pull "PT Drive" (d=1.0 mm or 0.040 in.; material: aluminium) <sup>\*\*\*\*)</sup>
- 52 . Fronius manual push-pull "PT Drive" (d=1.2 mm or 0.045 in.; material: aluminium) <sup>\*\*\*\*)</sup>
- 53 . Fronius manual push-pull "PT Drive" (d=1.6 mm or 1/16 in; material: aluminium) <sup>\*\*\*\*)</sup>
- 54 . Binzel robot push-pull "Master Feeder BG II" <sup>\*)\*\*\*\*)</sup>
- 55 . Fronius "VR 1530 PD" unreeling device (d = 1.0mm or 0.040 in; material: steel) <sup>\*\*\*\*)</sup>
- 56 . Fronius "VR 1530 PD" unreeling device (d = 1.2mm or 0.045 in; material: steel) <sup>\*\*\*\*)</sup>
- 57 . Fronius "VR 1530 PD" unreeling device (d = 1.6mm or 1/16 in; material: steel) <sup>\*\*\*\*)</sup>
- 59 . Fronius manual push-pull "PT Drive" (d=1.0 mm or 0.040 in.; materials: steel, CrNi, CuSi3) <sup>\*\*\*\*)</sup>
- 60 . Fronius manual push-pull "PT Drive" (d=1.2mm or 0.045 in; materials: steel, CrNi) <sup>\*\*\*\*)</sup>
- 61 . Fronius manual push-pull "PT Drive" (d=0.8mm or 0.030 in; materials: steel, CrNi) <sup>\*\*\*\*)</sup>
- 62 . Binzel robot push-pull 32V with IWG <sup>\*)\*\*\*\*)</sup>

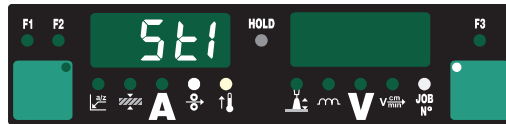
<sup>\*)</sup> ... It is not necessary to calibrate the unit under load (St2)

<sup>\*\*)</sup> ... Motor and gear tolerances may cause functional anomalies. Calibration may have to be carried out by Fronius.

<sup>\*\*\*\*)</sup> ... Software must be specially enabled

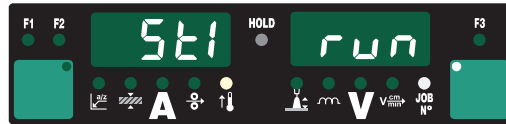


**Calibrating the push-pull unit**  
(continued)

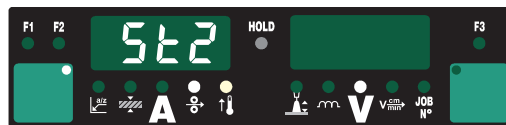


3. Press the torch trigger or the "Feeder inching" button
4. Disengage the drive units of both wirefeeder motors (e.g. welding torch and wirefeeder) - the wirefeeder motors must not be under load (push-pull alignment - open circuit)

**Caution!** Danger from rotating cogs and drive parts. Keep hands away from rotating cogs and the wire drive.



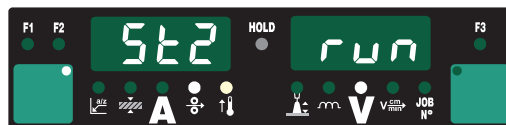
5. Press the torch trigger or the "Feeder inching" button  
The wirefeeder motors are aligned while not under load. During the alignment operation, the right-hand display will read "run".



6. As soon as the alignment operation - in the unloaded state - is complete, the display will read "St2".

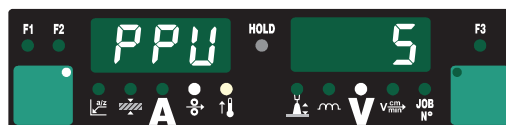
7. Engage the drive units of both wirefeeder motors (e.g. welding torch and wirefeeder) once again - the wirefeeder motors must be under load (push-pull alignment - engaged)

**Caution!** Danger from welding wire emerging at speed and from rotating cogs and drive parts. Hold the torch so that it points away from your face and body. Keep hands away from rotating cogs and the wire drive.



8. Press the torch trigger or the "Feeder inching" button  
The wirefeeder motors are aligned while under load. During the alignment operation, the right-hand display will read "run".

If it is not necessary to perform the alignment on a push-pull unit while this unit is under load (St2), the previously set values - e.g. "PPU" and "5" - will appear on the display as soon as you press the torch trigger or the "Feeder inching" button.



9. The alignment operation on the push-pull unit is finished when the previously set values - e.g. "PPU" and "5" - reappear on the display.
10. Press the Store button twice to exit from the Set-up menu.

**Calibrating the push-pull unit**  
(continued)

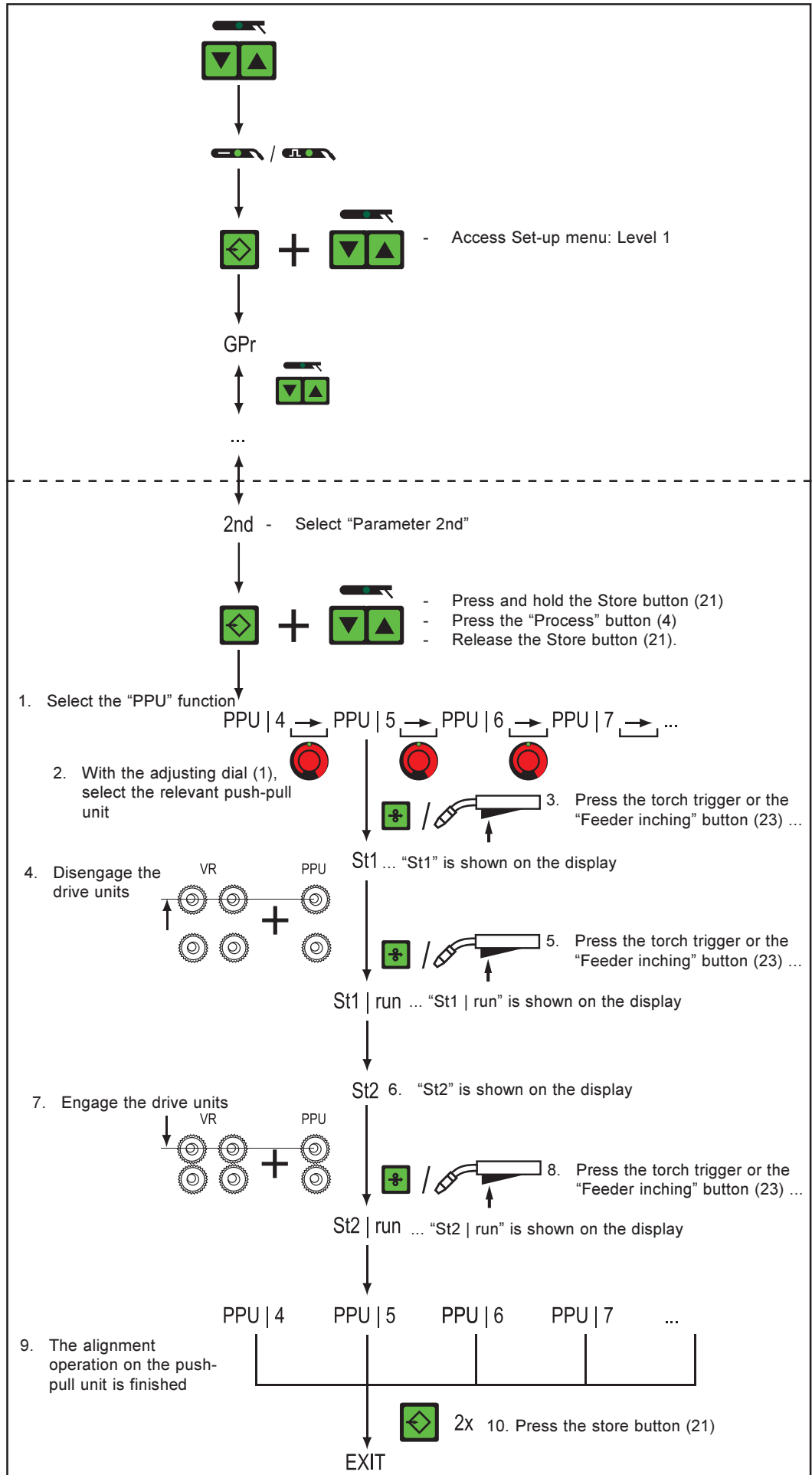


Fig.53 "Comfort" control panel: Aligning the push-pull unit

# Service codes for push-pull calibration

## Safety



**Warning!** An electric shock can be fatal. Before opening up the machine

- Switch the mains switch to the “O” position
- Unplug machine from the mains
- Put up an easy-to-understand warning sign to stop anybody inadvertently switching it back on again
- Using a suitable measuring instrument, check to make sure that electrical-ly charged components (e.g. capacitors) have been discharged

## Error codes shown when the drive units are engaged (“engaged” calibration)

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### Err | Eto

Cause: Incorrect measurement during push-pull alignment.  
Remedy: Repeat push-pull alignment

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### St1 | E 1

Cause: At minimum wirefeed speed, the wirefeeder motor does not deliver any actual rotational speed value.  
Remedy: Repeat the push-pull alignment. If the error message re-appears: Contact After-Sales Service

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### St1 | E 2

Cause: At maximum wirefeed speed, the wirefeeder motor does not deliver any actual rotational speed value.  
Remedy: Repeat the push-pull alignment. If the error message re-appears: Contact After-Sales Service.

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### St1 | E 3

Cause: At minimum wirefeed speed, the wirefeeder motor does not deliver any actual rotational speed value.  
Remedy: Repeat the push-pull alignment. If the error message re-appears: Contact After-Sales Service.

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### St1 | E 4

Cause: At minimum wirefeed speed, the motor of the push-pull unit does not deliver any actual rotational speed value.  
Remedy: Repeat the push-pull alignment. If the error message re-appears: Contact After-Sales Service.

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### St1 | E 5

Cause: At maximum wirefeed speed, the wirefeeder motor does not deliver any actual rotational speed value.  
Remedy: Repeat the push-pull alignment. If the error message re-appears: Contact After-Sales Service.

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### St1 | E 6

Cause: At maximum wirefeed speed, the motor of the push-pull unit does not deliver any actual rotational speed value.  
Remedy: Repeat the push-pull alignment. If the error message re-appears: Contact After-Sales Service.

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**Error codes shown when the drive units are engaged (“engaged” calibration)**

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**St1 | E 16**

Cause: Push-pull alignment has been interrupted: Quick-stop was activated by pressing the torch trigger.  
Remedy: Repeat push-pull alignment

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**St2 | E 7**

Cause: “Push-pull alignment - open-circuit” has not been carried out  
Remedy: Carry out “push-pull alignment - open-circuit”

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**St2 | E 8**

Cause: At minimum wirefeed speed, the wirefeeder motor does not deliver any actual rotational speed value.  
Remedy: Repeat the push-pull alignment. If the error message re-appears: Contact After-Sales Service.

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**St2 | E 9**

Cause: At minimum wirefeed speed, the motor of the push-pull unit does not deliver any actual rotational speed value.  
Remedy: Repeat the push-pull alignment. If the error message re-appears: Contact After-Sales Service.

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**St2 | E 10**

Cause: At minimum wirefeed speed, the motor current of the wirefeeder motor is outside the permitted range. Possible causes of this include the wirefeeder motors not being engaged, and other wirefeed problems.  
Remedy: Engage the drive units of both wirefeeder motors, arrange the hosepack in as straight a line as possible; check the inner liner for kinks or soiling; check the contact pressure on the 2-roller or 4-roller drive of the push-pull unit.  
Repeat the push-pull alignment. If the error message re-appears: Contact After-Sales Service.

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**St2 | E 11**

Cause: At minimum wirefeed speed, the motor current of the push-pull unit is outside the permitted range. Possible causes of this include the wirefeeder motors not being engaged, and other wirefeed problems.  
Remedy: Engage the drive units of both wirefeeder motors, arrange the hosepack in as straight a line as possible; check the inner liner for kinks or soiling; check the contact pressure on the 2-roller or 4-roller drive of the push-pull unit.  
Repeat the push-pull alignment. If the error message re-appears: Contact After-Sales Service.

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**St2 | E 12**

Cause: At maximum wirefeed speed, the wirefeeder motor does not deliver any actual rotational speed value.  
Remedy: Repeat the push-pull alignment. If the error message re-appears: Contact After-Sales Service.

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**St2 | E 13**

Cause: At maximum wirefeed speed, the motor of the push-pull unit does not deliver any actual rotational speed value.  
Remedy: Repeat the push-pull alignment. If the error message re-appears: Contact After-Sales Service (faulty actual-value pick-up)

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**Error codes  
shown when the  
drive units are  
engaged (“enga-  
ged” alignment)**  
(continued)

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**St2 | E 14**

- Cause: At maximum wirefeed speed, the motor current of the wirefeeder motor is outside the permitted range. Possible causes of this include the wirefeeder motors not being engaged, and other wirefeed problems.
- Remedy: Engage the drive units of both wirefeeder motors, arrange the hosepack in as straight a line as possible; check the inner liner for kinks or soiling; check the contact pressure on the 2-roller or 4-roller drive of the push-pull unit.  
Repeat the push-pull alignment. If the error message re-appears: Contact After-Sales Service
- 

**St2 | E 15**

- Cause: At maximum wirefeed speed, the motor current of the push-pull unit is outside the permitted range. Possible causes of this include the wirefeeder motors not being engaged, and other wirefeed problems.
- Remedy: Engage the drive units of both wirefeeder motors, arrange the hosepack in as straight a line as possible; check the inner liner for kinks or soiling; check the contact pressure on the 2-roller or 4-roller drive of the push-pull unit.  
Repeat the push-pull alignment. If the error message re-appears: Contact After-Sales Service.
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**St2 | E 16**

- Cause: Push-pull alignment has been interrupted: Quick-stop was activated by pressing the torch trigger.
- Remedy: Repeat push-pull alignment
-

# Measuring the welding circuit resistance “r”

## General remarks

Measuring the welding circuit resistance “r” makes it possible to have a constant welding result at all times, even with hosepacks of different lengths. The welding voltage at the arc is then always precisely regulated, regardless of the length and cross-sectional area of the hosepack. It is no longer necessary to adjust with the “Arc length correction” parameter (15).

After it has been measured, the welding circuit resistance is indicated on the right-hand display.

r ... Welding circuit resistance (in mΩ)

If the welding circuit resistance “r” has been measured correctly, the welding voltage will correspond exactly to the welding voltage at the arc. If you manually measure the voltage on the output jacks of the power source, this voltage will be higher than the welding voltage at the arc - that is, higher by the same amount as the voltage-drop taking place in the hosepack.



**Note!** The welding circuit resistance “r” will depend upon which hosepack is being used. This means that the measurement to find out the welding circuit resistance “r” will have to be:

- repeated if there is any change in the length or cross-sectional area of the hosepack
- repeated if there is any change in the length or cross-sectional area of the hosepack

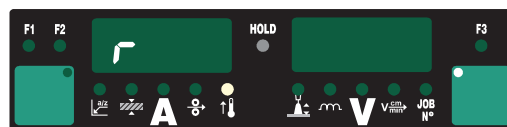
## Measuring the welding circuit resistance “r”

1. Make a ground (earth) connection to the workpiece



**Note!** In order to obtain good welding results, it is essential to measure the welding circuit resistance correctly. Make sure that the contact between the grounding (earthing) clamp and the workpiece is on a clean part of the workpiece.

2. Plug in the mains plug
3. Switch the mains switch (G) to the “I” position
4. Select function “r” in the second menu level (2nd)

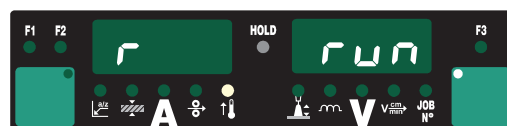


5. Take off the gas nozzle from the welding torch
6. Tighten the contact tube
7. Place the contact tube down firmly on the surface of the workpiece



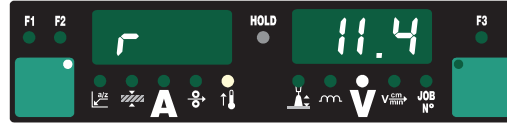
**Note!** Make sure that the contact between the contact tube and the workpiece is on a clean part of the workpiece. While the measurement is being performed, the wirefeeder and the cooling unit are deactivated.

8. Briefly press the torch trigger or the “Feeder inching” button.  
The welding circuit resistance is now calculated; during the measurement, the right-hand display reads “run”.



**Measuring the welding circuit resistance “r”**  
(continued)

9. The measurement is finished when the welding circuit resistance is shown on the right-hand display (e.g. 11.4 milliohms)



10. Fit the gas nozzle back onto the welding torch



# Indicating the welding circuit inductivity L

## Indicating the welding circuit inductivity L

The way that the hosepack is arranged has a very significant effect on the welding properties. Particularly with MIG/MAG pulse synergic welding, a high welding circuit inductivity may occur, depending on the length of the hosepack and the way it is arranged. The result is that the current rise during the droplet transfer is limited.

The welding circuit inductivity L is calculated during welding and shown on the right-hand display.

- Select function "L" in the second menu level (2nd)

L ... Welding circuit inductivity (in microhenrys)

**Important!** Wherever possible, compensation for the welding circuit inductivity is performed automatically. Where very high welding circuit inductivity occurs, it is also possible to attempt to influence the welding results with the droplet detachment correction parameter (16). If this does not lead to the desired result, you must re-arrange the hosepack.

## Correct arrangement of the hosepack

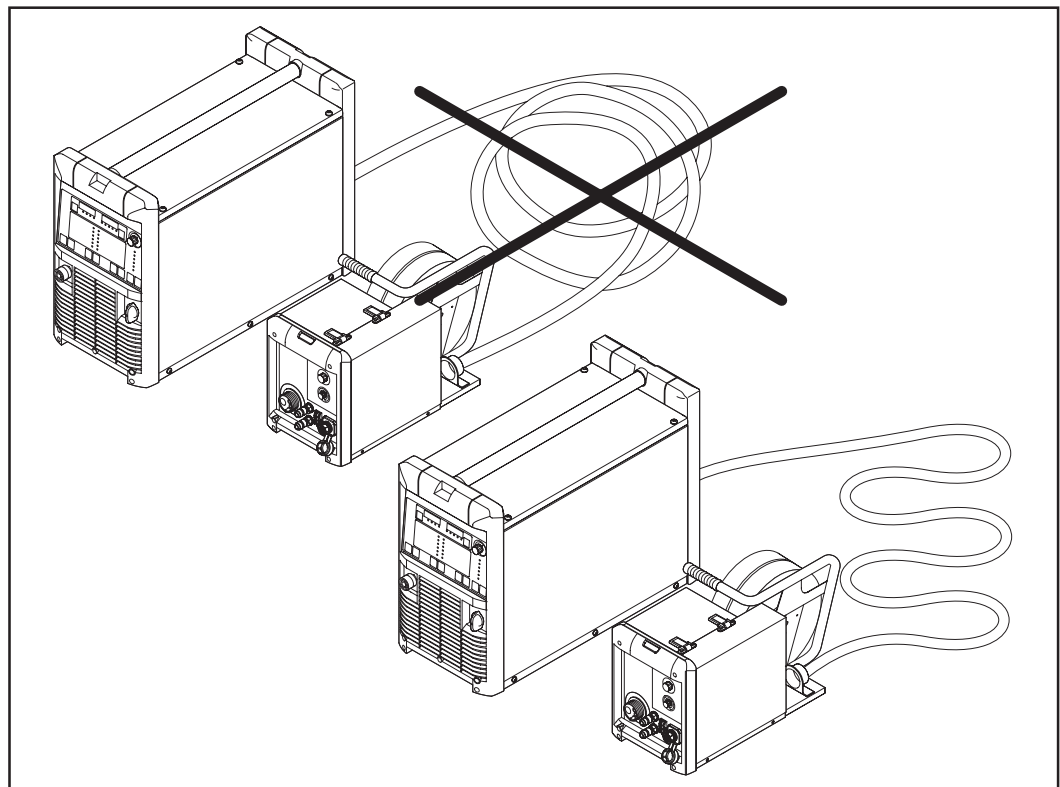


Fig.54 Correct arrangement of the hosepack

